APPENDICES

APPENDIX A

MINERAL AND SURFACE OWNERSHIP INFORMATION

Document No. TMM-LA-025-0001 Rev 0A

December 18, 2019

To Whom It May Concern:

The attached figures and table provide an overview of Twin Metals Minnesota LLC's (TMM's) interest in the surface lands and minerals within the Twin Metals Minnesota Project (Project) area.

Figure 1, Figure 1-1, Figure 1-2, and Figure 1-3 show the current surface ownership within the Project area. Figure 2, Figure 2-1, Figure 2-2, and Figure 2-3 show the current mineral ownership within the Project area. Table 1 provides additional details regarding ownership for both surface and mineral resources.

Information in Table 1 is organized by Township, Range, Section, Quarter Section, and Quarter-Quarter Section (or government lot) land survey boundaries. The geographic boundaries, as well as landowner and taxpayer information, are sourced from the October 2018 St. Louis and Lake Counties, Minnesota parcel data. Updates to the St. Louis and Lake Counties data are provided where TMM is aware of additional information that is not reflected in the St. Louis and Lake Counties GIS database. Acreages identified in Table 1 reflect surface and mineral ownership, and *do not* reflect Project-related disturbance. Project-related disturbance is discussed in the *Mine Plan of Operations, Twin Metals Minnesota Project* dated December 18, 2019.

Attached:
Figure 1: Current Surface Ownership
Figure 1-1: Current Surface Ownership Area 1
Figure 1-2: Current Surface Ownership Area 2
Figure 1-3: Current Surface Ownership Area 3
Figure 2: Current Mineral Ownership
Figure 2-1: Current Mineral Ownership Area 1
Figure 2-2: Current Mineral Ownership Area 2
Figure 2-3: Current Mineral Ownership Area 3
Table 1: Surface and Mineral Ownership Information for Project Area

Sincerely,

Twin Metals Minnesota LLC

CURRENT SURFACE OWNERSHIP
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 1

County
Township
Section
Lakes
Rivers & Streams

Surface Ownership
County
USA
State
Private

N

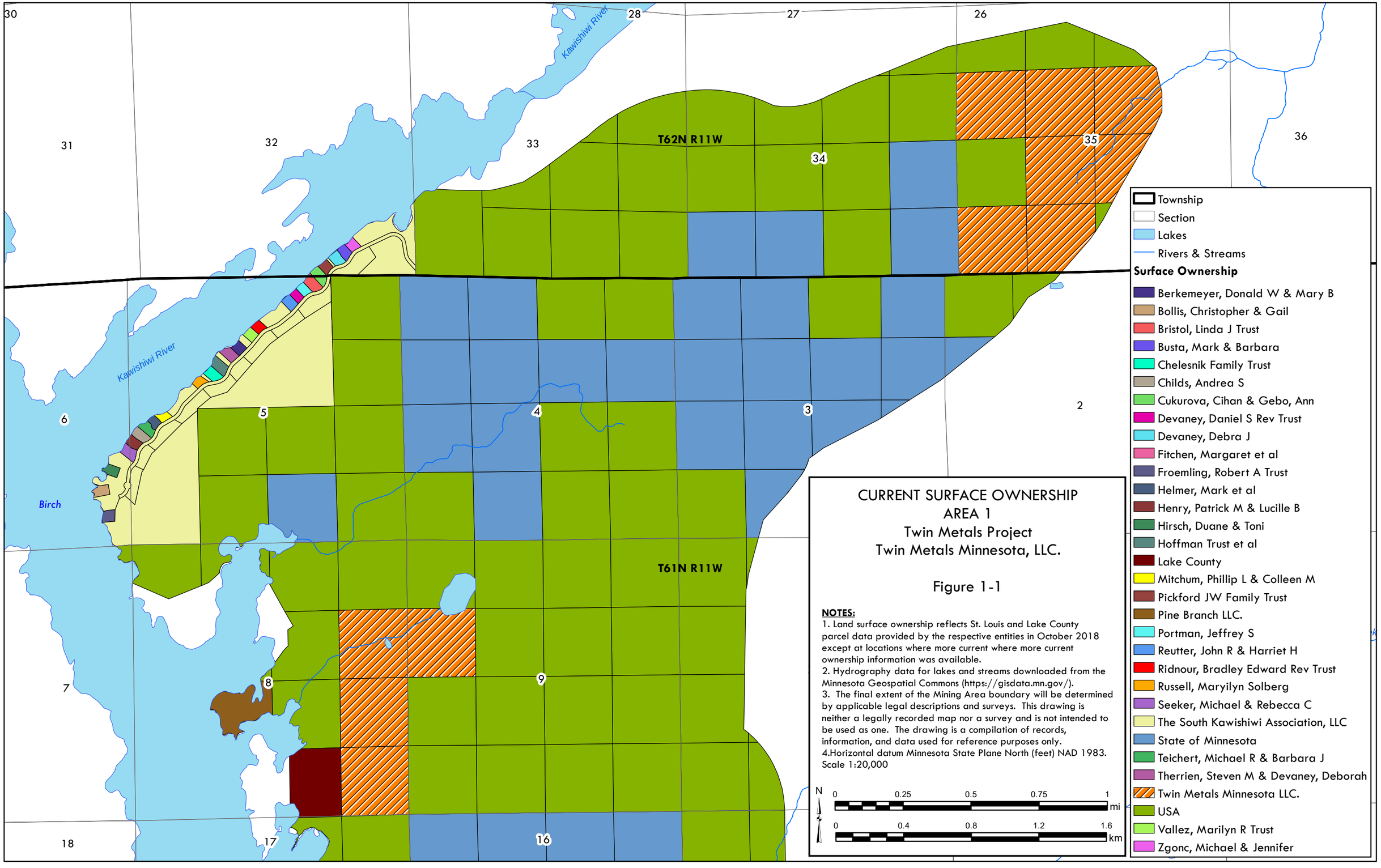
0 1 2 3 Miles
0 1 2 3 4 5 km

NOTES:
1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
2. Hydrography data for lakes and streams downloaded from the Minnesota Geospatial Commons (https://gisdata.mn.gov/).
3. The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys. This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. The drawing is a compilation of records, information, and data used for reference purposes only.
4.Horizontal datum Minnesota State Plane North (feet) NAD 1983. Scale 1:60,000

See Fig. 1-1
See Fig. 1-2
See Fig. 1-3

T62N R11W
T61N R11W
T61N R12W
T61N R13W
T60N R11W
T60N R12W
T60N R13W

Kawishiwi River
Keeley Creek
Kenagas Creek
Nina Creek
Denley Creek
Birch River
Birch Lake
Dunka River
Stony River



CURRENT SURFACE OWNERSHIP
AREA 1
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 1-1

NOTES:

1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
2. Hydrography data for lakes and streams downloaded from the Minnesota Geospatial Commons (https://gisdata.mn.gov/).
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4. Horizontal datum Minnesota State Plane North (feet) NAD 1983.

Scale 1:20,000

N

0 0.25 0.5 0.75 1 mi

0 0.4 0.8 1.2 1.6 km

CURRENT SURFACE OWNERSHIP
AREA 2
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 1-2

N

- County
- Township
- Section
- Lakes
- Rivers & Streams

Surface Ownership

- State of Minnesota
- USA

NOTES:

1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
2. Hydrography data for lakes and streams downloaded from the Minnesota Geospatial Commons (https://gisdata.mn.gov/).
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4. Horizontal datum Minnesota State Plane North (feet) NAD 1983.

Scale 1:20,000

0 0.1 0.2 0.4 0.6 0.8 1 mi

0 0.3 0.6 0.9 1.2 1.5 km

18 17 16 15 14

19 20 21 22

25 30 29 28 27

36 31 32 33 34

T61N R11W

Birch

Keeley Creek

Nira Creek

Stony River

Denley Creek

Unnamed

CURRENT SURFACE OWNERSHIP
AREA 3
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 1-3

County
Township
Section
Lakes
Rivers & Streams

N

Surface Ownership

- Allete Inc.
- Cliffs Erie LLC & TMM
- Cliffs Erie LLC.
- Franconia Minerals LLC.
- Mesabi Iron Co.
- Rendfield Land Co. Inc.
- State of Minnesota
- USA

NOTES:

1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
2. Hydrography data for lakes and streams downloaded from the Minnesota Geospatial Commons (https://gisdata.mn.gov/).
3. The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys. This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. The drawing is a compilation of records, information, and data used for reference purposes only.
4. Horizontal datum Minnesota State Plane North (feet) NAD 1983.

Scale 1:20,000

0 0.1 0.2 0.4 0.6 0.8 1 mi

0 0.3 0.6 0.9 1.2 1.5 km

T61N R12W

T61N R11W

T60N R12W

T60N R11W

Birch

Unnamed

Unnamed

Denley Cr

Dunka Pit

Stony River

19 30 31 32 23 24 25 26 33 34 35 36 4 3 2 1 6 5 7 8

CURRENT MINERAL OWNERSHIP
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 2

NOTES:

1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
2. Hydrography data for lakes and streams downloaded from the Minnesota Geospatial Commons (https://gisdata.mn.gov/).
3. The final extent of the Mining Area boundary will be determined by applicable legal descriptions and surveys. This drawing is neither a legally recorded map nor a survey and is not intended to be used as one. The drawing is a compilation of records, information, and data used for reference purposes only.
4. Horizontal datum Minnesota State Plane North (feet) NAD 1983.

Scale 1:60,000

- County
- Township
- Section
- Lakes
- Rivers & Streams

Mineral Ownership

- Allete Inc.
- DRM/KMK/Dunka
- Du Nord/Worthen/et al
- Foster/Maki/et al
- Franconia/Hector Iron Co.
- Longyear Mesaba
- Mesabi Iron Co.
- RGGS Land & Minerals
- Rendrag Inc.
- St. Croix/USA
- State of MN
- State/DRM/KMK/Dunka
- State/St. Croix
- USA
- Woodbury et al

N

0 1 2 3 Miles

0 1 2 3 km

See Fig. 2-1

See Fig. 2-2

See Fig. 2-3

T62N R11W

T61N R13W

T61N R12W

T61N R11W

T60N R13W

T60N R12W

T60N R11W

Bear Island River

Blueberry Lake Outlet

Kawishiwi River

Kangas Creek

Keeley Creek

Birch River

Birch Lake

Dunka River

Nira Creek

Denley Creek

Stony River

Township
Section
Lakes
Rivers & Streams

Mineral Ownership

- Foster/Maki/et al
- Franconia/Hector Iron Co.
- RGGS Land & Minerals
- St. Croix/USA
- State of MN
- State/St. Croix
- USA

T62N R11W

T61N R11W

Kawishiwi River

Birch

30 28 27 26 32 33 34 35 36 6 5 4 3 2 1 7 8 9 10 18 17 16 15

CURRENT MINERAL OWNERSHIP
AREA 1
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 2-1

NOTES:

1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
2. Hydrography data for lakes and streams downloaded from the Minnesota Geospatial Commons (https://gisdata.mn.gov/).
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4. Horizontal datum Minnesota State Plane North (feet) NAD 1983.

Scale 1:20,000

N

0 0.25 0.5 0.75 1 mi

0 0.4 0.8 1.2 1.6 km

CURRENT MINERAL OWNERSHIP
AREA 2
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 2-2

County
Township
Section
Lakes
Rivers & Streams

Mineral Ownership

St. Croix/USA
State of MN
State/St. Croix
USA

N

NOTES:

1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
2. Hydrography data for lakes and streams downloaded from the Minnesota Geospatial Commons (https://gisdata.mn.gov/).
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4. Horizontal datum Minnesota State Plane North (feet) NAD 1983.

Scale 1:20,000

0 0.1 0.2 0.4 0.6 0.8 1 mi

0 0.3 0.6 0.9 1.2 1.5 km

T61N R12W

T61N R11W

Birch

Keeley Creek

Nira Creek

Stony River

Denley Creek

14 15 16 17 19 20 21 22 24 25 27 28 29 30 31 32 33 34 36

CURRENT MINERAL OWNERSHIP
AREA 3
Twin Metals Project
Twin Metals Minnesota, LLC.

Figure 2-3

- County
- Township
- Section
- Lakes
- Rivers & Streams

Mineral Ownership

- Allete Inc.
- DRM/KMK/Dunka
- Du Nord/Worthen/et al
- Longyear Mesaba
- Mesabi Iron Co.
- Rendrag Inc.
- State of MN
- State/DRM/KMK/Dunka
- USA
- Woodbury et al

NOTES:

1. Land surface ownership reflects St. Louis and Lake County parcel data provided by the respective entities in October 2018 except at locations where more current where more current ownership information was available.
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4. Horizontal datum Minnesota State Plane North (feet) NAD 1983.

Scale 1:20,000

0 0.1 0.2 0.4 0.6 0.8 1 mi

0 0.3 0.6 0.9 1.2 1.5 km

N

23 24 25 26 31 32 33 34 35 36 1 2 3 4 5 6 7 8

T61N R12W

T61N R11W

T60N R12W

T60N R11W

Unnamed

Unnamed

Dunka Pit

Stony River

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

PARCELID	SECTION	TOWNSHIP	RANGE	LEGAL	SURFACE OWNER	MAJORITY MINERAL OWNER	MINOR MINERAL OWNERS	GIS ACRES
20-6011-06310	6	60	11	GOVT LOT 4	USA	USA		0.585
20-6011-06983	6	60	11	GOVT LOT 5	USA	USA		17.415
20-6011-06984	6	60	11	GOVT LOT 6	USA	USA		14.502
20-6011-06986	6	60	11	GOVT LOT 8	USA	USA		23.748
20-6011-06987	6	60	11	GOVT LOT 9	USA	STATE OF MINNESOTA		26.379
20-6011-06988	6	60	11	GOVT LOT 10	USA	STATE OF MINNESOTA		0.699
20-6011-06990	6	60	11	GOVT LOT 16	USA	UNCLEAR: STATE OF MN?		0.533
20-6011-06991	6	60	11	GOVT LOT 17	STATE OF MINNESOTA	UNCLEAR: STATE OF MN?		3.968
20-6111-02250	2	61	11	GOVT LOT 3	USA	USA		8.548
20-6111-02310	2	61	11	GOVT LOT 4	USA	USA		35.712
20-6111-02370	2	61	11	SW 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		8.517
20-6111-03010	3	61	11	GOVT LOT 1	STATE OF MINNESOTA	STATE OF MINNESOTA		34.279
20-6111-03070	3	61	11	GOVT LOT 2	USA	USA		38.292
20-6111-03130	3	61	11	SW 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		37.99
20-6111-03190	3	61	11	SE 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		30.964
20-6111-03250	3	61	11	GOVT LOT 3	STATE OF MINNESOTA	STATE OF MINNESOTA		36.042
20-6111-03310	3	61	11	GOVT LOT 4	STATE OF MINNESOTA	STATE OF MINNESOTA		36.072
20-6111-03370	3	61	11	SW 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		36.176
20-6111-03430	3	61	11	SE 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		36.352
20-6111-03490	3	61	11	NE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		39.725
20-6111-03550	3	61	11	NW 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.219
20-6111-03610	3	61	11	SW 1/4 OF SW 1/4	USA	USA		40.113
20-6111-03670	3	61	11	SE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		19.662
20-6111-03730	3	61	11	NE 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		2.191
20-6111-03790	3	61	11	NW 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		21.69
20-6111-04010	4	61	11	GOVT LOT 1	USA	USA		36.381
20-6111-04070	4	61	11	GOVT LOT 2	USA	USA		36.033
20-6111-04130	4	61	11	SW 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		36.884
20-6111-04190	4	61	11	SE 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		36.677
20-6111-04250	4	61	11	GOVT LOT 3	STATE OF MINNESOTA	STATE OF MINNESOTA		37.135
20-6111-04310	4	61	11	GOVT LOT 4	STATE OF MINNESOTA	STATE OF MINNESOTA		37.764
20-6111-04370	4	61	11	SW 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		37.942
20-6111-04430	4	61	11	SE 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		37.685
20-6111-04490	4	61	11	NE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.354
20-6111-04550	4	61	11	NW 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.068
20-6111-04610	4	61	11	SW 1/4 OF SW 1/4	USA	Goldie I. Foster; a/k/a Goldie I. Parker; a/k/a Goldie I. Mayer; and Walter B. Foster (17/81)	Richard A. Maki (1/9) Diane J. Manuszak (1/2 of 1/9) Kristina Metheny (1/2 of 1/6 of 17/81) Robert F. Adolfson (1/6 of 17/81) Paula Moser (1/6 of 17/81) Sandra I. Stigar (1/6 of 17/81) Matthew Adolfson (1/6 of 17/81) Robert Rodriguez (1/2 of 1/6 of 17/81) Laura Richert (1/6 of 17/81) Earl C. Hook (2/81) Jean M. Maki (1/9) David A. Maki (1/2 of 1/9) James K. Maki (1/9) Ina Lassi/Lake-Forest Enterprise, Inc. (1/9)	40
20-6111-04670	4	61	11	SE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.551
20-6111-04730	4	61	11	NE 1/4 OF SE 1/4	USA	USA		40.481
20-6111-04790	4	61	11	NW 1/4 OF SE 1/4	USA	USA		40.199
20-6111-04850	4	61	11	SW 1/4 OF SE 1/4	USA	USA		40.333
20-6111-04910	4	61	11	SE 1/4 OF SE 1/4	USA	USA		40.256
20-6111-05010	5	61	11	GOVT LOT 1	USA	USA		38.149
20-6111-05190	5	61	11	SE 1/4 OF NE 1/4	USA	USA		39.116
20-6111-05490	5	61	11	NE 1/4 OF SW 1/4	USA	USA		39.728
20-6111-05670	5	61	11	SE 1/4 OF SW 1/4	USA	USA		37.519
20-6111-05730	5	61	11	NE 1/4 OF SE 1/4	USA	USA		40.235
20-6111-05790	5	61	11	NW 1/4 OF SE 1/4	USA	USA		40.151
20-6111-05850	5	61	11	SW 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		37.744

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

20-6111-05910	5	61	11	SE 1/4 OF SE 1/4	USA	Goldie I. Foster; a/k/a Goldie I. Parker; a/k/a Goldie I. Mayer; and Walter B. Foster (17/81)	Richard A. Maki (1/9) Diane J. Manuszak (1/2 of 1/9) Kristina Metheny (1/2 of 1/6 of 17/81) Robert F. Adolfson (1/6 of 17/81) Paula Moser (1/6 of 17/81) Sandra I. Stigar (1/6 of 17/81) Matthew Adolfson (1/6 of 17/81) Robert Rodriguez (1/2 of 1/6 of 17/81) Laura Richert (1/6 of 17/81) Earl C. Hook (2/81) Jean M. Maki (1/9) David A. Maki (1/2 of 1/9) James K. Maki (1/9) Ina Lassi/Lake-Forest Enterprise, Inc. (1/9)	40.293
20-6178-00020	5	61	11	OUTLOT B	SOUTH KAWISHIWI ASSOCIATION LLC	USA		3.214
20-6178-00030	5	61	11	OUTLOT C	SOUTH KAWISHIWI ASSOCIATION LLC	USA		0.771
20-6178-00040	5	61	11	OUTLOT D	SOUTH KAWISHIWI ASSOCIATION LLC	USA		0.73
20-6178-00050	5	61	11	OUTLOT E	SOUTH KAWISHIWI ASSOCIATION LLC	USA		0.303
20-6178-00060	5	61	11	OUTLOT F	SOUTH KAWISHIWI ASSOCIATION LLC	USA		2.643
20-6178-00080	5	61	11	OUTLOT H	SOUTH KAWISHIWI ASSOCIATION LLC	USA		65.553
20-6178-00090	5	61	11	OUTLOT I	SOUTH KAWISHIWI ASSOCIATION LLC	USA		2.944
20-6178-00100	5	61	11	OUTLOT J	SOUTH KAWISHIWI ASSOCIATION LLC	USA		2.038
20-6178-00110	5	61	11	OUTLOT K	SOUTH KAWISHIWI ASSOCIATION LLC	USA		3.089
20-6178-00120	5	61	11	OUTLOT L	SOUTH KAWISHIWI ASSOCIATION LLC	USA		3.636
20-6178-00130	5	61	11	OUTLOT M	SOUTH KAWISHIWI ASSOCIATION LLC	USA		3
20-6178-00140	5	61	11	OUTLOT N	SOUTH KAWISHIWI ASSOCIATION LLC	USA		2.28
20-6178-00150	5	61	11	OUTLOT O	SOUTH KAWISHIWI ASSOCIATION LLC	USA		3.604
20-6178-00160	5	61	11	OUTLOT P	SOUTH KAWISHIWI ASSOCIATION LLC	USA		2.872
20-6178-00170	5	61	11	OUTLOT Q	SOUTH KAWISHIWI ASSOCIATION LLC	USA		4.342
20-6178-00180	5	61	11	OUTLOT R	SOUTH KAWISHIWI ASSOCIATION LLC	USA		63.415
20-6178-01050	5	61	11	LOT 5 BLOCK 1	CUKUROVA CIHAN + GEBO ANN	USA		1.653
20-6178-01060	5	61	11	LOT 6 BLOCK 1	BRISTOL LINDA J TRUST 1/24/10	USA		1.631
20-6178-01070	5	61	11	LOT 7 BLOCK 1	PORTMAN JEFFREY S	USA		1.062
20-6178-01080	5	61	11	LOT 8 BLOCK 1	DEVANEY DANIEL S REV TRUST	USA		0.932
20-6178-01090	5	61	11	LOT 9 BLOCK 1	REUTTER JOHN R & HARRIET H	USA		1.324
20-6178-01100	5	61	11	LOT 10 BLOCK 1	RIDNOUR BRADLEY EDWARD REV TRUST	USA		1.028
20-6178-01110	5	61	11	LOT 11 BLOCK 1	VALLEZ MARILYN R TRUST 12/2/88	USA		1.097
20-6178-01120	5	61	11	LOT 12 BLOCK 1	BERKEMEYER DONALD W & MARY B	USA		1.061
20-6178-01130	5	61	11	LOT 13 BLOCK 1	THERRIEN STEVEN M & DEVANEY DEBORAH	USA		1.414
20-6178-01140 and 20-6178-01141	5	61	11	1/2 INTEREST (EACH OWN) LOT 14 BLOCK 1	HOFFMAN FAMILY REAL ESTATE TRUST AND HOFFMAN TRUST ET AL	USA		1.657
20-6178-01150	5	61	11	LOT 15 BLOCK 1	CHELESNIK FAMILY TRUST	USA		1.418
20-6178-01160	5	61	11	LOT 16 BLOCK 1	RUSSELL MARILYN SOLBERG	USA		0.94
20-6178-01170	5	61	11	LOT 17 BLOCK 1	MITCHUM PHILLIP L & COLLEEN M	USA		0.879

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

20-6178-01180 and 20-6178-01181 and 20-6178-01182	5	61	11	LOT 18 BLOCK 1 - 1/3 UDI (each own)	HELMER MARK AND CLARK RICHARD C AND JOHNSON JEANINE ET AL	USA		0.955
20-6178-01190	5	61	11	LOT 19 BLOCK 1	TEICHERT MICHAEL R & BARBARA J	USA		1.245
20-6178-01200	5	61	11	LOT 20 BLOCK 1	CHILDS ANDREA S	USA		1.5
20-6178-01210	5	61	11	LOT 21 BLOCK 1	HENRY PATRICK M & LUCILLE B	USA		1.232
N/A	5	61	11	Road right of way	The South Kawishiwi Association, LLC	USA		13.165
20-6178-00070	6	61	11	OUTLOT G	SOUTH KAWISHIWI ASSOCIATION LLC	USA		8.715
20-6178-01230	6	61	11	LOT 23 BLOCK 1	HIRSCH DUANE C & TONI L	USA		1.274
20-6178-01240	6	61	11	LOT 24 BLOCK 1	BOLLIS CHRISTOPHER J & GAIL M	USA		1.392
20-6178-01250	6	61	11	LOT 25 BLOCK 1	FROEMLING ROBERT A TRUST #12-12 +	USA		1.247
20-6111-07010	7	61	11	GOVT LOT 1	USA	USA		1.78
20-6111-07011	7	61	11	GOVT LOT 12	USA	USA		0.001
20-6111-08010	8	61	11	NE 1/4 OF NE 1/4	USA	Goldie I. Foster; a/k/a Goldie I. Parker; a/k/a Goldie I. Mayer; and Walter B. Foster (17/81)	Richard A. Maki (1/9) Diane J. Manuszak (1/2 of 1/9) Kristina Metheny (1/2 of 1/6 of 17/81) Robert F. Adolfson (1/6 of 17/81) Paula Moser (1/6 of 17/81) Sandra I. Stigar (1/6 of 17/81) Matthew Adolfson (1/6 of 17/81) Robert Rodriguez (1/2 of 1/6 of 17/81) Laura Richert (1/6 of 17/81) Earl C. Hook (2/81) Jean M. Maki (1/9) David A. Maki (1/2 of 1/9) James K. Maki (1/9) Ina Lassi/Lake-Forest Enterprise, Inc. (1/9)	40.695
20-6111-08070	8	61	11	NW 1/4 OF NE 1/4	USA	USA		37.278
20-6111-08130	8	61	11	SW 1/4 OF NE 1/4	USA	USA		33.747
20-6111-08190	8	61	11	SE1/4 OF NE1/4	TWIN METALS MINNESOTA LLC	STATE OF MN (1/2)	St. Croix Lumber Co (1/2)	40.457
20-6111-08250	8	61	11	GOVT LOT 1	USA	USA		8.937
20-6111-08310	8	61	11	GOVT LOT 2	USA	USA		27.191
20-6111-08430	8	61	11	GOVT LOT 4	USA	USA		0.759
20-6111-08490	8	61	11	LOT 5	PINE BRANCH LLC	STATE OF MN (1/2)	St. Croix Lumber Co (1/2)	16.312
20-6111-08730	8	61	11	NE1/4 OF SE1/4	TWIN METALS MINNESOTA LLC	STATE OF MN (1/2)	St. Croix Lumber Co (1/2)	40.218
20-6111-08790	8	61	11	NW 1/4 OF SE 1/4	USA	USA		31.46
20-6111-08850	8	61	11	SW 1/4 OF SE 1/4	LAKE COUNTY	STATE OF MN (1/2)	St. Croix Lumber Co (1/2)	29.269
20-6111-08910	8	61	11	SE1/4 OF SE1/4	TWIN METALS MINNESOTA LLC	STATE OF MN (1/2)	St. Croix Lumber Co (1/2)	39.98
20-6111-09010	9	61	11	NE 1/4 OF NE 1/4	USA	USA		40.065
20-6111-09070	9	61	11	NW 1/4 OF NE 1/4	USA	USA		40.016
20-6111-09130	9	61	11	SW 1/4 OF NE 1/4	USA	USA		40.05
20-6111-09190	9	61	11	SE 1/4 OF NE 1/4	USA	USA		40.1
20-6111-09250	9	61	11	NE 1/4 OF NW 1/4	USA	USA		40.169
20-6111-09310	9	61	11	NW 1/4 OF NW 1/4	USA	GOLDIE I. FOSTER; A/K/A GOLDIE I. PARKER; A/K/A GOLDIE I. MAYER; AND WALTER B. FOSTER (17/81)	Richard A. Maki (1/9) Diane J. Manuszak (1/2 of 1/9) Kristina Metheny (1/2 of 1/6 of 17/81) Robert F. Adolfson (1/6 of 17/81) Paula Moser (1/6 of 17/81) Sandra I. Stigar (1/6 of 17/81) Matthew Adolfson (1/6 of 17/81) Robert Rodriguez (1/2 of 1/6 of 17/81) Laura Richert (1/6 of 17/81) Earl C. Hook (2/81) Jean M. Maki (1/9) David A. Maki (1/2 of 1/9) James K. Maki (1/9) Ina Lassi/Lake-Forest Enterprise, Inc. (1/9)	40.151
20-6111-09370	9	61	11	SW1/4 OF NW1/4	TWIN METALS MINNESOTA LLC	STATE OF MN (1/2)	St. Croix Lumber Co (1/2)	40.37
20-6111-09430	9	61	11	SE 1/4 OF NW 1/4	USA	USA		40.236
20-6111-09490	9	61	11	NE 1/4 OF SW 1/4	USA	USA		40.265
20-6111-09550	9	61	11	NW 1/4 OF SW 1/4	USA	USA		40.399
20-6111-09610	9	61	11	SW 1/4 OF SW 1/4	USA	USA		40.429

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

20-6111-09670	9	61	11	SE 1/4 OF SW 1/4	USA	USA		40.294
20-6111-09730	9	61	11	NE 1/4 OF SE 1/4	USA	USA		40.134
20-6111-09790	9	61	11	NW 1/4 OF SE 1/4	USA	USA		40.084
20-6111-09850	9	61	11	SW 1/4 OF SE 1/4	USA	USA		40.118
20-6111-09910	9	61	11	SE 1/4 OF SE 1/4	USA	USA		40.168
20-6111-10250	10	61	11	NE 1/4 OF NW 1/4	USA	USA		2.284
20-6111-10310	10	61	11	NW 1/4 OF NW 1/4	USA	USA		39.863
20-6111-10370	10	61	11	SW 1/4 OF NW 1/4	USA	USA		38.766
20-6111-10490	10	61	11	NE 1/4 OF SW 1/4	USA	USA		0.404
20-6111-10550	10	61	11	NW 1/4 OF SW 1/4	USA	USA		38.129
20-6111-10610	10	61	11	SW 1/4 OF SW 1/4	USA	USA		39.937
20-6111-10670	10	61	11	SE 1/4 OF SW 1/4	USA	USA		16.021
20-6111-15250	15	61	11	NE 1/4 OF NW 1/4	USA	USA		20.834
20-6111-15310	15	61	11	NW 1/4 OF NW 1/4	USA	USA		39.903
20-6111-15370	15	61	11	SW 1/4 OF NW 1/4	USA	USA		39.886
20-6111-15430	15	61	11	SE 1/4 OF NW 1/4	USA	USA		20.845
20-6111-15490	15	61	11	NE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		20.855
20-6111-15550	15	61	11	NW 1/4 OF SW 1/4	USA	USA		39.868
20-6111-15610	15	61	11	SW 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		39.85
20-6111-15670	15	61	11	SE 1/4 OF SW 1/4	USA	USA		20.866
20-6111-16010	16	61	11	NE 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.126
20-6111-16070	16	61	11	NW 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.133
20-6111-16130	16	61	11	SW 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.076
20-6111-16190	16	61	11	SE 1/4 OF NE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.069
20-6111-16250	16	61	11	NE 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.215
20-6111-16310	16	61	11	NW 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.173
20-6111-16370	16	61	11	SW 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.049
20-6111-16430	16	61	11	SE 1/4 OF NW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.092
20-6111-16490	16	61	11	NE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.027
20-6111-16550	16	61	11	NW 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.035
20-6111-16610	16	61	11	SW 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		39.978
20-6111-16670	16	61	11	SE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		39.97
20-6111-16730	16	61	11	NE 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.012
20-6111-16790	16	61	11	NW 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		40.019
20-6111-16850	16	61	11	SW 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		39.962
20-6111-16910	16	61	11	SE 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		39.955
20-6111-17010	17	61	11	NE 1/4 OF NE 1/4	USA	STATE OF MN (1/2)	St. Croix Lumber Co (1/2)	37.299
20-6111-17070	17	61	11	GOVT LOT 1	USA	ST. CROIX LUMBER CO (1/2)	USA	11.701
20-6111-17190	17	61	11	SE 1/4 OF NE 1/4	USA	USA		30.413
20-6111-17730	17	61	11	GOVT LOT 8	USA	USA		29.309
20-6111-17910	17	61	11	SE 1/4 OF SE 1/4	USA	USA		30.409
20-6111-20010	20	61	11	NE 1/4 OF NE 1/4	USA	USA		33.873
20-6111-20070	20	61	11	NW 1/4 OF NE 1/4	USA	USA		1.508
20-6111-20130	20	61	11	SW 1/4 OF NE 1/4	USA	USA		8.6
20-6111-20190	20	61	11	SE 1/4 OF NE 1/4	USA	USA		22.24
20-6111-20730	20	61	11	NE 1/4 OF SE 1/4	USA	USA		19.668
20-6111-20790	20	61	11	NW 1/4 OF SE 1/4	USA	USA		10.749
20-6111-20850	20	61	11	SW 1/4 OF SE 1/4	USA	USA		11.479
20-6111-20910	20	61	11	SE 1/4 OF SE 1/4	USA	USA		18.937
20-6111-21010	21	61	11	NE 1/4 OF NE 1/4	USA	USA		30.789
20-6111-21070	21	61	11	NW 1/4 OF NE 1/4	USA	USA		36.226
20-6111-21250	21	61	11	NE 1/4 OF NW 1/4	USA	USA		30.167
20-6111-21310	21	61	11	NW 1/4 OF NW 1/4	USA	USA		30.161
20-6111-22250	22	61	11	NE 1/4 OF NW 1/4	USA	USA		10.838
20-6111-22310	22	61	11	NW 1/4 OF NW 1/4	USA	USA		29.495
20-6111-29010	29	61	11	NE 1/4 OF NE 1/4	USA	USA		18.149
20-6111-29070	29	61	11	NW 1/4 OF NE 1/4	USA	USA		12.188
20-6111-29130	29	61	11	SW 1/4 OF NE 1/4	USA	USA		13.048
20-6111-29190	29	61	11	SE 1/4 OF NE 1/4	USA	USA		17.394
20-6111-29670	29	61	11	SE 1/4 OF SW 1/4	USA	USA		9.273
20-6111-29730	29	61	11	NE 1/4 OF SE 1/4	USA	USA		7.967
20-6111-29790	29	61	11	NW 1/4 OF SE 1/4	USA	USA		26.6
20-6111-29850	29	61	11	SW 1/4 OF SE 1/4	USA	USA		25.422
20-6111-31190	31	61	11	SE 1/4 OF NE 1/4	USA	USA		8.398
20-6111-31490	31	61	11	GOVT LOT 8	USA	USA		0.292
20-6111-31610	31	61	11	GOVT LOT 12	USA	USA		4.147
20-6111-31670	31	61	11	GOVT LOT 13	USA	USA		27.057
20-6111-31730	31	61	11	NE 1/4 OF SE 1/4	USA	USA		27.288
20-6111-31790	31	61	11	NW 1/4 OF SE 1/4	USA	USA		17.407
20-6111-31850	31	61	11	GOVT LOT 14	USA	USA		18.78
20-6111-31910	31	61	11	GOVT LOT 15	USA	USA		0.532
20-6111-32070	32	61	11	NW 1/4 OF NE 1/4	USA	USA		4.493

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

20-6111-32250	32	61	11	NE 1/4 OF NW 1/4	USA	USA		29.383
20-6111-32310	32	61	11	NW 1/4 OF NW 1/4	USA	USA		0.868
20-6111-32370	32	61	11	SW 1/4 OF NW 1/4	USA	USA		30.674
20-6111-32430	32	61	11	SE 1/4 OF NW 1/4	USA	USA		14.414
20-6111-32550	32	61	11	NW 1/4 OF SW 1/4	USA	USA		4.698
20-6178-01220	5 & 6	61	11	LOT 22 BLOCK 1	SEEKER MICHAEL & REBECCA C	USA		1.473
28-6278-00010	32	62	11	OUTLOT A	SOUTH KAWISHIWI ASSOCIATION LLC	USA		0.205
28-6278-00190	32	62	11	OUTLOT S	SOUTH KAWISHIWI ASSOCIATION LLC	USA		5.007
28-6278-00200	32	62	11	OUTLOT T	SOUTH KAWISHIWI ASSOCIATION LLC	USA		11.807
28-6278-00210	32	62	11	OUTLOT U	SOUTH KAWISHIWI ASSOCIATION LLC	USA		9.324
28-6278-01010	32	62	11	LOT 1 BLOCK 1	ZGONC MICHAEL J & JENNIFER L	USA		1.029
28-6278-01020	32	62	11	LOT 2 BLOCK 1	BUSTA MARK W & BARBARA A	USA		1.137
28-6278-01030	32	62	11	LOT 3 BLOCK 1	DEVANEY DEBRA J	USA		1.325
28-6278-01040	32	62	11	LOT 4 BLOCK 1	PICKFORD JW FAMILY TRUST	USA		1.045
28-6211-33130	33	62	11	GOVT LOT 2	USA	USA		4.99
28-6211-33190	33	62	11	SE1/4 OF NE1/4	USA	USA		26.91
28-6211-33490	33	62	11	GOVT LOT 7	USA	USA		15.651
28-6211-33550	33	62	11	GOVT LOT 6	USA	USA		49.997
28-6211-33670	33	62	11	SE 1/4 OF SW 1/4	USA	RGGS Land & Minerals Ltd LP		40.757
28-6211-33730	33	62	11	NE 1/4 OF SE 1/4	USA	USA		39.67
28-6211-33790	33	62	11	NW 1/4 OF SE 1/4	USA	RGGS Land & Minerals Ltd LP		37.127
28-6211-33850	33	62	11	SW 1/4 OF SE 1/4	USA	USA		40.175
28-6211-33910	33	62	11	SE 1/4 OF SE 1/4	USA	RGGS Land & Minerals Ltd LP		39.384
28-6211-34010	34	62	11	NE 1/4 OF NE 1/4	USA	FRANCONIA MINERALS CORPORATION INC. (1/2)	Hector Iron Co. (1/2)	10.034
28-6211-34070	34	62	11	NW 1/4 OF NE 1/4	USA	FRANCONIA MINERALS CORPORATION INC. (1/2)	Hector Iron Co. (1/2)	0.24
28-6211-34130	34	62	11	SW 1/4 OF NE 1/4	USA	USA		33.857
28-6211-34190	34	62	11	SE 1/4 OF NE 1/4	USA	USA		38.731
28-6211-34370	34	62	11	SW 1/4 OF NW 1/4	USA	USA		31.828
28-6211-34430	34	62	11	SE 1/4 OF NW 1/4	USA	USA		23.993
28-6211-34490	34	62	11	NE 1/4 OF SW 1/4	USA	USA		38.934
28-6211-34550	34	62	11	NW 1/4 OF SW 1/4	USA	USA		38.66
28-6211-34610	34	62	11	SW 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		38.645
28-6211-34670	34	62	11	SE 1/4 OF SW 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		38.919
28-6211-34730	34	62	11	NE 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		38.889
28-6211-34790	34	62	11	NW 1/4 OF SE 1/4	USA	USA		38.68
28-6211-34850	34	62	11	SW 1/4 OF SE 1/4	USA	USA		38.928
28-6211-34910	34	62	11	SE 1/4 OF SE 1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		39.173
28-6211-35070	35	62	11	NW 1/4 OF NE 1/4	USA	USA		10.157
28-6211-35130	35	62	11	SW1/4 OF NE1/4	TWIN METALS MINNESOTA LLC	RGGS Land & Minerals Ltd LP		37.757
28-6211-35250	35	62	11	NE 1/4 OF NW 1/4	USA	USA		25.002
28-6211-35310	35	62	11	NW 1/4 OF NW 1/4	USA	USA		20.265
28-6211-35370	35	62	11	SW1/4 OF NW1/4	TWIN METALS MINNESOTA LLC	RGGS Land & Minerals Ltd LP		40.037
28-6211-35430	35	62	11	SE1/4 OF NW1/4	TWIN METALS MINNESOTA LLC	RGGS Land & Minerals Ltd LP		40.196
28-6211-35490	35	62	11	NE1/4 OF SW1/4	TWIN METALS MINNESOTA LLC	RGGS Land & Minerals Ltd LP		40.684
28-6211-35550	35	62	11	NW 1/4 OF SW 1/4	USA	USA		40.347
28-6211-35610	35	62	11	SW1/4 OF SW1/4	TWIN METALS MINNESOTA LLC	RGGS Land & Minerals Ltd LP		40.071
28-6211-35670	35	62	11	SE1/4 OF SW1/4	TWIN METALS MINNESOTA LLC	RGGS Land & Minerals Ltd LP		34.599
28-6211-35790	35	62	11	NW1/4 OF SE1/4	TWIN METALS MINNESOTA LLC	RGGS LAND & MINERALS LTD LP		21.677
28-6211-35850	35	62	11	SW 1/4 OF SE 1/4	USA	USA		2.175
105-0060-00010	1	60	12	GOVT LOT 1	USA	Rendrag Inc.		29.23
105-0060-00010	1	60	12	GOVT LOT 2	USA	Longyear Mesaba		25.821
105-0060-00010	1	60	12	GOVT LOT 3	USA	Rendrag Inc.		8.904

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

105-0060-00370	3	60	12	LOT 3	CLIFFS ERIE LLC	DUNKA MINERALS CORP. (1/3)	KMK Dunka Inc. (1/3) DRM Minerals Corp. (1/3)	5.512
105-0060-00380	3	60	12	N 660 FT OF W 660 OF GOVT LOT 4	ALLETE INC	STATE OF MN (1/3)	Dunka Minerals Corp. (2/9) KMK Dunka Inc. (2/9) DRM Minerals Corp. (2/9)	9.997
105-0060-00382	3	60	12	GOVT LOT 4 EX N 660 FT OF W 660 FT	FRANCONIA MINERALS (US) LLC	STATE OF MN (1/3)	Dunka Minerals Corp. (2/9) KMK Dunka Inc. (2/9) DRM Minerals Corp. (2/9)	24.544
105-0060-00490	4	60	12	NE1/4 OF NE1/4	USA	RENDRAG INC.		3.996
610-0011-03620	25	61	12	Government Lot 4, Section 25, Township 61 North, Range 12, EXCEPT that part beginning at a point where the southerly line of Government Lot 4 meets the easterly shoreline of Bobs Bay; thence East 400 feet; thence North 470 feet; thence West 400 feet; thence Southerly to the point of beginning.	RENDFIELD LAND CO INC	STATE OF MINNESOTA		0.041
610-0011-03630	25	61	12	That part of the NW1/4 of SW1/4 Section 25 Township 61 North Range 12 West lying SE'ly of the following described "Lines A and B": Commencing at the NW corner of the SE1/4 of NW1/4, said Section 26; thence S 76 degrees 38 minutes 05 seconds E bearing based on the Saint Louis County Transverse Mercador 1996 Projection, a distance of 268.32 ft; thence SE'ly along a non-tangential curve concave to the NE having a radius of 50.00 ft, central angle of 81 degrees 41minutes 24 seconds (chord bearing of S 51 degrees 45 minutes 17 seconds E), a distance of 71.29 ft to the point of tangency; thence N 87 degrees 24 minutes 03 seconds E a distance of 486.88 ft; thence SE'ly, along a tangential curve concave to the S having a radius of 1734.00 ft, central angle of 16 degrees 03 minutes 24 seconds, a distance of 485.94 ft to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 717.00 ft, central angle of 37 degrees 33 minutes 26 seconds, a distance of 469.99 ft to the point of tangency; thence S 38 degrees 59 minutes 07 seconds E a distance of 143.72 ft; thence SE'ly, along a tangential curve concave to the NE having a radius of 333.00 ft, central angle of 43 degrees 11 minutes 47 seconds, a distance of 251.05 ft to the point of compound curvature; thence NE'ly, along said compound curve concave to the NW having a radius of 1433.00 ft, central angle of 22 degrees 33 minutes 42 seconds, a distance of 564.28 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 267.00 ft, central angle of 61 degrees 17 minutes 29 seconds, a distance of 285.62 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 32 degrees 25 minutes 27 seconds, a distance of 188.45 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 1600.00 ft, central angle of 30 degrees 23 minutes 54 seconds, a distance of 848.88 ft to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 267.00 ft, central angle of 51 degrees 58 minutes 24 seconds, a distance of 242.20 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 90 degrees 48 minutes 32 seconds, a distance of 527.78 ft; thence S 50 degrees 05 minutes 02 seconds E a distance of 98.03 ft; thence SE'ly, along a tangential curve concave to the N having a radius of 70.00 ft, central angle of 81 degrees 17 minutes 29 seconds, a distance of 99.32 ft to the point of tangency and the point of beginning of "LIne A": "Line A" - thence N 48 degrees 37 minutes 29 seconds E a distance of 90.93 ft; thence N 00 degrees 00 minutes 00 seconds W a distance of 66.00 ft; thence N 28 degrees 00 minutes 12 seconds E a distance of 568.9 ft to the N line of said NW1/4 of SW1/4, Section 25, and there terminating. "Line B" - beginning at the point of beginning of the above designated "Line A"; thence S 02 degrees 31 minutes 39 seconds W a distance of 694.58 ft to the S line of said NW1/4 of SW1/4, and there terminating.	ALLETE INC	DU NORD LAND CO (1/2)	Frederic Paine Worthen/Frederic P. Worthen 1980 Trust (1/22) Anna Welles Paines Williams/Sarah Townsend Williams (1/22) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo Rebecca Paine Fields (1/32) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo John S. Paine (1/32) Thomas H. Paine, Jr. (1/32) Roger Townsend Williams (1/60) Geoffrey Paine Williams (1/60) Joel Hooker Williams (1/60) Sarah Townsend Williams (1/60) Susan Barton Williams (1/60) Mary T. Morton Revocable Trust/Jane M. Fetter and Barbara D. Morton (3/64) State of Minnesota (391/2112)	14.995
610-0011-03631	25	61	12	That part of the NW¼ of SW¼, Section 25 in Township 61 North, Range 12 West lying N'ly, NE'ly and NW'ly of the following described line: Beginning at the NW corner of SE¼ of NW¼, said Section 26; thence S 76 degrees 38 minutes 05 seconds E bearing based on the Saint Louis County Transverse Mercador 1996 Projection, a distance of 268.32 ft.; thence SE'ly, along a non-tangential curve concave to the NE having a radius of 50.00 ft., central angle of 81 degrees 41 minutes 24 seconds (chord bearing of S 51 degrees 45 minutes 17 seconds E), a distance of 71.29 ft. to the point of tangency ; thence N 87 degrees 24 minutes 03 seconds E a distance of 486.88 ft.; thence SE'ly, along a tangential curve concave to the S having a radius of 1734.00 ft., central angle of 16 degrees 03 minutes 24 seconds, a distance of 485.94 ft. to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 717.00 ft., central angle of 37 degrees 33 minutes 26 seconds, a distance of 469.99 ft. to the point of tangency; thence S 38 degrees 59 minutes 07 seconds E a distance of 143.72 ft.; thence SE'ly, along a tangential curve concave to the NE having a radius of 333.00 ft., central angle of 43 degrees 11 minutes 47 seconds , a distance of 251 . 05 ft. to the point of compound curvature; thence NE'ly, along said compound curve concave to the NW having a radius of 1433. 00 ft., central angle of 22 degrees 33 minutes 42 seconds , a distance of 564.28 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 267.00 ft., central angle of 61 degrees 17 minutes 29 seconds, a distance of 285.62 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 ft., central angle of 32 degrees 25 minutes 27 seconds, a distance of 188.45 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 1600.00 ft., central angle of 30 degrees 23 minutes 54 seconds, a distance of 848.88 ft. to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 267.00 ft., central angle of 51 degrees 58 minutes 24 seconds, a distance of 242.20 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 feet, central angle of 90 degrees 48 minutes 32 seconds, a distance of 527.78 ft.; thence S 50 degrees 05 minutes 02 seconds E a distance of 98.03 ft.; thence SE'ly, along a tangential curve concave to the N having a radius of 70.00 ft., central angle of 81 degrees 17 minutes 29 seconds, a distance of 99.32 ft. to the point of tangency; thence N 48 degrees 37 minutes 29 seconds E a distance of 90.93 ft.; thence N 00 degrees 00 minutes 00 seconds W a distance of 66.00 ft., thence N 28 degrees 00 minutes 12 seconds E a distance of 568.9 ft. to the N line of said NW¼ of SW¼, Section 25, and there terminating.	RENDFIELD LAND CO INC	DU NORD LAND CO (1/2)	Frederic Paine Worthen/Frederic P. Worthen 1980 Trust (1/22) Anna Welles Paines Williams/Sarah Townsend Williams (1/22) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo Rebecca Paine Fields (1/32) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo John S. Paine (1/32) Thomas H. Paine, Jr. (1/32) Roger Townsend Williams (1/60) Geoffrey Paine Williams (1/60) Joel Hooker Williams (1/60) Sarah Townsend Williams (1/60) Susan Barton Williams (1/60) Mary T. Morton Revocable Trust/Jane M. Fetter and Barbara D. Morton (3/64) State of Minnesota (391/2112)	2.48

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-03632	25	61	12	That part of the NW1/4 of the SW1/4 lying S'ly and W'ly of the following described line; Commencing at the NW corner of the SE1/4 of NW1/4, Section 26, Township 61 North, Range 12 West; thence S 76 degrees 38 minutes 05 seconds E bearing based on Saint Louis County Tansverse Mercardor 1996 Projection, a distance of 268.32 ft; thence SE'ly along a non-tangential curve concave to the NE having a radius of 50.00 ft, central angle of 81 degrees 41 minutes 24 seconds (chord bearing S 51 degrees 45 minutes 17 seconds E), a distance of 71.29 ft to the point of tangency; thence N 87 degrees 24 minutes 03 seconds E, a distance of 486.88 ft; thence SE'ly along a tangential curve concave to the S having a radius of 1734.00 ft, central angle of 16 degrees 03 minutes 24 seconds, a distance of 485.94 ft to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 717.00 ft, central angle of 37 degrees 33 minutes 26 seconds, a distance of 469.99 ft to the point of tangency; thence S 38 degrees 59 minutes 07 seconds E, a distance of 143.72 ft; thence SE'ly along a tangential curve concave to the NE having a radius of 333.00 ft, central angle of 43 degrees 11 minutes 47 seconds, a distance of 251.05 ft to the point of compound curvature; thence NE'ly along said compound curve concave to the NW having a radius of 1433.00 ft, central angle of 22 degrees 33 minutes 42 seconds, a distance of 564.28 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 267.00 ft, cetral angle of 61 degrees 17 minutes 29 seconds, a distance of 285.62 ft to the point of reverse curve; thene SE'ly along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 32 degrees 25 minutes 27 seconds, a distance of 188.45 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 1600.00 ft, central angle of 30 degrees 23 minutes 54 seconds, a distance of 848.88 ft to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 267.00 ft, central angle of 51 degrees 58 minutes 24 seconds, a distance of 242.20 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the NE having a radius of 33.00 ft, central angle of 66 degrees 19 minutes 22 seconds, a distance of 385.46 ft to the point of beginning of the line to be described; thence continuing SE'ly, along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 66 degrees 19 minutes 22 seconds, a distance of 385.46 ft to the point of beginning of the line to be described; thence continuing SE'ly, along said reverse curve concave to the NE having a radius of 33.00 ft, central angle of 24 degrees 29 minutes 10 seconds, a distance of 142.31 ft; thence S 50 degrees 05 minutes 02 seconds E, a distance of 98.03 ft; thence SE'ly along a tangential curve concave to the N having a radius of 70.00 ft, central angle of 81 degrees 17 minutes 29 seconds, a distance of 99.32 ft; thence S 02 degrees 31 minutes 39 seconds W, a distance of 694.58 ft to the S line of said NW1/4 of SW1/4 and said line there terminating.	FRANCONIA MINERALS (US) LLC	DU NORD LAND CO (1/2)	Frederic Paine Worthen/Frederic P. Worthen 1980 Trust (1/22) Anna Welles Paines Williams/Sarah Townsend Williams (1/22) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo Rebecca Paine Fields (1/32) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo John S. Paine (1/32) Thomas H. Paine, Jr. (1/32) Roger Townsend Williams (1/60) Geoffrey Paine Williams (1/60) Joel Hooker Williams (1/60) Sarah Townsend Williams (1/60) Susan Barton Williams (1/60) Mary T. Morton Revocable Trust/Jane M. Fetter and Barbara D. Morton (3/64) State of Minnesota (391/2112)	4.79
610-0011-03640	25	61	12	SW1/4 of SW1/4 Section 25 in Township 61 North Range 12 West of the Fourth Principal Meridian EXCEPT that part of the SW1/4 of SW1/4 Section 25 Township 61 North Range 12 West lying S'ly and W'ly of "Line A" to be described and 300.00 ft NW'ly of, measured at right angles to and parallel with "Line B" to be described. "Line A" and "Line B" are described as follows: "Line A" Commencing at the NW corner of the SE1/4 of NW1/4 Section 26 Township 61 North Range 12 West; thence S 76 degrees 38 minutes 05 seconds E bearing based on Saint Louis County Transverse Mercador 1996 Projection, a distance of 268.32 ft; thence SE'ly, along a non-tangential curve concave to the NE having a radius of 50.00 ft, central angle of 81 degrees 41 minutes 24 seconds (chord bearing of S 51 degrees 45 minutes 17 seconds E), a distance of 71.29 ft to the point of tangency; thence N 87 degrees 24 minutes 03 seconds E a distance of 486.88 ft; thence SE'ly, along a tangential curve concave to the S having a radius of 1734.00 ft, central angle of 16 degrees 03 minutes 24 seconds, a distance of 485.94 ft to the point of compound curvature; thence SE'y along said compound curve concave to the SW having a radius of 717.00 ft, central angle of 37 degrees 33 minutes 26 seconds, a distance of 469.99 ft to the point of tangency; thence S 38 degrees 59 minutes 07 seconds E a distance of 143.72 ft; thence SE'ly, along a tangential curve concave to the NE having a radius of 333.00 ft, cental angle of 43 degrees 11 minutes 47 seconds, a distance of 251.05 ft to the point of compound curvature; thence NE'ly, along said compound curve concave to the NW having a radius of 1433.00 ft, central angle of 22 degrees 33 minutes 42 seconds, a distance of 564.28 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the SW having a radius of 267.00 ft, central angle of 61 degrees 17 minutes 29 seconds, a distance of 285.62 ft to the point of reverse curve, thence SE'ly along said reverse curve concave to the NE having a radius of 33.00 ft, central angle of 32 degrees 25 minutes 27 seconds, a distance of 188.45 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the SW having a radius of 1600.00 ft, central angle of 30 degrees 23 minutes 54 seconds, a distance of 848.88 ft to the point of compound curvature; thence SE'ly along said compound curve concave to the SW having a radius of 267.00 ft, central angle of 51 degrees 58 minutes 24 seconds, a distance of 242.20 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 90 degrees 48 minutes 32 seconds, a distance of 527.78 ft; thence S 50 degrees 05 minutes 02 seconds E a distance of 98.03 ft; thence SE'ly along a tangential curve concave to the N having a radius of 70.00 ft, central angle of 81 degrees 17 minutes 29 seconds, a distance of 99.32 ft to a point; thence S 02 degrees 31 minutes 39 seconds W, a distance of 694.58 ft to the N line of said SW1/4 of SW1/4 and also being the point of beginning of the line to be decribed; thence continuing S 02 degrees 31 minutes 39 seconds W, a distance of 256.53 ft; thence SW'ly along a tangential curve concave to the NW having a radius of 1134.00 ft, central angle of 30 degrees 15 minutes 34 seconds, a distance of 598.90 ft to the point of reverse curve; thence SW'ly, S'ly and SE'ly, along said reverse curve concave to the E having a radius of 333.00 ft, cental angle of 60 degrees 16 minutes 05 seconds, a distance of 350.27 ft to a point being 300.00 ft NW'ly of, measured at right angles to and parallel with "Line B" to be described and said "Line A" there terminating. "Line B" Commencing at the SW corner of said Section 25; thence S 88 degrees 33 minutes 39 seconds E along the S line of said Section 25, a distance of 334.90 ft to the beginning of the line to be described; thence N 14 degrees 59 minutes 50 seconds E, a distance of 70.97 ft; thence N 26 degrees 29 minutes 50 seconds E, a distance of 1393.23 ft to the N line of said SW1/4 of SW1/4 and said "Line B" there terminating. The side line of said 300.00 ft wide strip terminates on said "Line A" and the S line of said SW1/4 of SW1/4. SE1/4 of SE1/4 Section 35 in Township 61 North Range 12 West of the Fourth Principal Meridian.	ALLETE INC	USA		22.881

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-03641	25	61	12	That part of the SW1/4 of SW1/4, Section 25, Township 61 North, Range 12 West, lying S'ly and W'ly of "Line A" to be described and 300.00 ft NW'ly of, measured at right angles to and parallel with "Line B" to be described. "Line A" and "Line B" are described as follows: "Line A" Commencing at the NW corner of the SE1/4 of NW1/4, Section 26, Township 61 North, Range 12 West; thence S 76 degrees 38 minutes 05 seconds E bearing based on Saint Louis County Transverse Mercador 1996 Projection, a distance of 268.32 ft; thence SE'ly, along a non-tangential curve concave to the NE having a radius of 50.00 ft, central angle of 81 degrees 41 minutes 24 seconds (chord bearing of S 51 degrees 45 minutes 17 seconds E), a distance of 71.29 ft to the point of tangency; thence N 87 degrees 24 minutes 03 seconds E a distance of 486.88 ft; thence SE'ly, along a tangential curve concave to the S having a radius of 1734.00 ft, central angle of 16 degrees 03 minutes 24 seconds, a distance of 485.94 ft to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 717.00 ft, central angle of 37 degrees 33 minutes 26 seconds, a distance of 469.99 ft to the point of tangency; thence S 38 degrees 59 minutes 07 seconds E a distance of 143.72 ft; thence SE'ly, along a tangential curve concave to the NE having a radius of 333.00 ft, central angle of 43 degrees 11 minutes 47 seconds, a distance of 251.05 ft to the point of compound curvature; thence NE'ly, along said compound curve concave to the NW having a radius of 1433.00 ft, central angle of 22 degrees 33 minutes 42 seconds, a distance of 564.28 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the SW having a radius of 267.00 ft, central angle of 61 degrees 17 minutes 29 seconds, a distance of 285.62 ft to the point of reverse curve, thence SE'ly along said reverse curve concave to the NE having a radius of 33.00 ft, central angle of 32 degrees 25 minutes 27 seconds, a distance of 188.45 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the SW having a radius of 1600.00 ft, central angle of 30 degrees 23 minutes 54 seconds, a distance of 848.88 ft to the point of compound curvature; thence SE'ly, along said compund curve concave to the SW having a radius of 267.00 ft, central angle of 51 degrees 58 minutes 24 seconds, a distance of 242.20 ft to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 90 degrees 48 minutes 32 seconds, a distance of 527.78 ft; thence S 50 degrees 05 minutes 02 seconds E a distance of 98.03 ft; thence SE'ly, along a tangential curve concave to the N having a radius of 70.00 ft, central angle of 81 degrees 17 minutes 29 seconds, a distance of 99.32 ft to a point; thence S 02 degrees 31 minutes 39 seconds W, a distance of 694.58 ft to the N line of said SW1/4 of SW1/4 and also being the point of beginning of the line to be described; thence continuing S 02 degrees 31 minutes 39 seconds W, a distance of 256.53 ft; thence SW'ly, along a tangential curve concave to the NW having a radius of 1134.00 ft, central angle of 30 degrees 15 minutes 34 seconds, a distance of 598.90 ft to the point of reverse curve; thence SW'ly, S'ly and SE'ly, along said reverse curve concave to the E having a radius of 333.00 ft, central angle of 60 degrees 16 minutes 05 seconds, a distance of 350.27 ft to a point being 300.00 ft NW'ly of, measured at right angles to and parallel with "Line B" to be described and said "Line A" there terminating. "Line B" Commencing at the SW corner of said Section 25; thence S 88 degrees 33 minutes 39 seconds E along the S line of said Section 25, a distance of 334.90 ft to the beginning of the line to be described; thence N 14 degrees 59 minutes 50 seconds E, a distance of 70.97 ft; thence N 26 degrees 29 minutes 50 seconds E, a distance of 1393.23 ft to the N line of said SW1/4 of SW1/4 and said "Line B" there terminating. The side line of said 300.00 ft wide strip terminates on said "Line A" and the S line of said SW1/4 of SW1/4.	FRANCONIA MINERALS (US) LLC	USA		6.911
610-0011-03650	25	61	12	SE1/4 OF SW 1/4	RENDFIELD LAND CO INC	STATE OF MINNESOTA		0.971
610-0011-03740	26	61	12	NE 1/4 OF SW 1/4	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		16.208
610-0011-03760	26	61	12	SW 1/4 OF SW 1/4	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		20.88
610-0011-03770	26	61	12	SE 1/4 OF SW 1/4	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		25.9
610-0011-03780	26	61	12	That part of the NE1/4 of the SE1/4 lying S'ly and SW'ly ofthe following described line: Beginning at the NW corner of the SE1/4 of NW1/4, said Section 26; thence S 76 degrees 38 minutes 05 seconds E bearing based on St Louis County Transverse Mercardor 1996 Projection, a distance of 268.32 ft; thence SE'ly, along a non-tangential curve concave to the NE having a radius of 50.00 ft, central angle of 81 degrees 41 minutes 24 seconds (chord bearing of S 51 degrees 45 minutes 17 seconds E), a distance of 71.29 ft to the point of tangency; thence N 87 degrees 24 minutes 03 seconds E, a distance of 486.88 ft; thence SE'ly along a tangential curve concave to the S having a radius of 1734.00 ft, central angle of 16 degrees 03 minutes 24 seconds, a distance of 485.94 ft to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 717.00 ft, central angle of 37 degrees 33 minutes 26 seconds, a distance of 469.99 ft to the point of tangency; thence S 38 degrees 59 minutes 07 seconds E, a distance of 143.72 ft; thence SE'ly, along a tangential curve concave to the NE having a radius of 333.00 ft, central angle of 43 degrees 11 minutes 47 seconds, a distance of 251.05 ft to the point of compound curvature; thence NE'ly along said compound curve concave to the NW having a radius of 1433.00 ft; central angle of 22 degrees 33 minutes 42 seconds, a distance 564.28 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the SW having a radius of 267.00 ft, central angle of 61 degrees 17 minutes 17 minutes 29 seconds, a distance of 285.62 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 32 degrees 25 minutes 27 seconds, a distance of 188.45 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the SW having a radius of 1600.00 ft, central angle of 30 degrees 23 minutes 54 seconds, a distance 848.88 ft to the point of compound curvature; thence SE'ly along said compound curve concave to the SW having a radius of 267.00 ft, central angle of 51 degrees 58 minutes 24 seconds, a distance of 242.20 ft to the point of reverse curve; thence SE'ly along said reverse curve concave to the NE having a radius of 333.00 ft, central angle of 66 degrees 19 minutes 22 seconds, a distance 385.46 ft to the E line of said NE1/4 of SE1/4 and said line there terminating.	FRANCONIA MINERALS (US) LLC	DU NORD LAND CO (1/2)	Emilie WashburnWorthen Hall (1/32) John Stuart Paine (1/32) Thomas H. Paine (1/32) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo Rebecca Paine Fields (1/32) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo John S. Paine (1/32) Thomas H. Paine, Jr. (1/32) Mary T. Morton Revocable Trust/Jane M. Fetter and Barbara D. Morton (3/64) Frederic Paine Worthen (1/22) Anna Welles Paines Williams (1/22) Rebecca Paine Field (1/22) Mary Paine Worthen (1/22) Mary Worthen Morton (1/22) State of Minnesota (391/2112)	29.118

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-03781	26	61	12	That part of the NE¼ of SE¼, Section 26, in Township 61 North, Range 12 West lying N'ly, NE'ly and NW'ly of the following described line: Beginning at the NW corner of SE¼ of NW¼, said Section 26; thence S 76 degrees 38 minutes 05 seconds E bearing based on the Saint Louis County Transverse Mercador 1996 Projection, a distance of 268.32 ft.; thence SE'ly, along a non-tangential curve concave to the NE having a radius of 50.00 ft., central angle of 81 degrees 41 minutes 24 seconds (chord bearing of S 51 degrees 45 minutes 17 seconds E), a distance of 71.29 ft. to the point of tangency ; thence N 87 degrees 24 minutes 03 seconds E a distance of 486.88 ft.; thence SE'ly, along a tangential curve concave to the S having a radius of 1734.00 ft., central angle of 16 degrees 03 minutes 24 seconds, a distance of 485.94 ft. to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 717.00 ft., central angle of 37 degrees 33 minutes 26 seconds, a distance of 469.99 ft. to the point of tangency; thence S 38 degrees 59 minutes 07 seconds E a distance of 143.72 ft.; thence SE'ly, along a tangential curve concave to the NE having a radius of 333.00 ft., central angle of 43 degrees 11 minutes 47 seconds , a distance of 251 . 05 ft. to the point of compound curvature; thence NE'ly, along said compound curve concave to the NW having a radius of 1433. 00 ft., central angle of 22 degrees 33 minutes 42 seconds , a distance of 564.28 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 267.00 ft., central angle of 61 degrees 17 minutes 29 seconds, a distance of 285.62 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 ft., central angle of 32 degrees 25 minutes 27 seconds, a distance of 188.45 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the SW having a radius of 1600.00 ft., central angle of 30 degrees 23 minutes 54 seconds, a distance of 848.88 ft. to the point of compound curvature; thence SE'ly, along said compound curve concave to the SW having a radius of 267.00 ft., central angle of 51 degrees 58 minutes 24 seconds, a distance of 242.20 ft. to the point of reverse curve; thence SE'ly, along said reverse curve concave to the NE having a radius of 333.00 feet, central angle of 90 degrees 48 minutes 32 seconds, a distance of 527.78 ft.; thence S 50 degrees 05 minutes 02 seconds E a distance of 98.03 ft.; thence SE'ly, along a tangential curve concave to the N having a radius of 70.00 ft., central angle of 81 degrees 17 minutes 29 seconds, a distance of 99.32 ft. to the point of tangency; thence N 48 degrees 37 minutes 29 seconds E a distance of 90.93 ft.; thence N 00 degrees 00 minutes 00 seconds W a distance of 66.00 ft., thence N 28 degrees 00 minutes 12 seconds E a distance of 568.9 ft. to the N line of said NW¼ of SW¼, Section 25, and there terminating.	RENDFIELD LAND CO INC	DU NORD LAND CO (1/2)	Emilie WashburnWorthen Hall (1/32) John Stuart Paine (1/32) Thomas H. Paine (1/32) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo Rebecca Paine Fields (1/32) U.S. Bank N.A., Trustee of F. Rodney Paine Article VI Trust U/W fbo John S. Paine (1/32) Thomas H. Paine, Jr. (1/32) Mary T. Morton Revocable Trust/Jane M. Fetter and Barbara D. Morton (3/64) Frederic Paine Worthen (1/22) Anna Welles Paines Williams (1/22) Rebecca Paine Field (1/22) Mary Paine Worthen (1/22) Mary Worthen Morton (1/22) State of Minnesota (391/2112)	0.634
610-0011-03790	26	61	12	NW 1/4 OF SE 1/4	FRANCONIA MINERALS (US) LLC	ALLETE INC		30.063
610-0011-03800 and 610-0011-03801	26	61	12	That part of the SW¼ of SE¼ Section 26 Township 61 North Range 12 West lying westerly, northwesterly and northerly of the following described line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence South 71 degrees 44 minutes 20 seconds West, bearing based on the east line of said Section 9 having a bearing of South 03 degrees 27 minutes 19 seconds East, St Louis County Transverse Mercator 1996 projection a distance of 462.67 feet; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears North 22 degrees 35 minutes 37 seconds West a distance of 2378.47 feet to the point of tangency; thence North 23 degrees 59 minutes 36 seconds East a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds a distance of 280.81 feet to the point of tangency; thence North 37 degrees 12 minutes 41 seconds East a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds a distance of 2168.30 feet to the point of tangency; thence North 04 degrees 21 minutes 02 seconds East a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds a distance of 2463.58 feet to the point of tangency; thence North 53 degrees 35 minutes 54 seconds East a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds a distance of 63.66 feet to the point of tangency; thence North 57 degrees 36 minutes 21 seconds East a distance of 1469.17 feet; thence North 32 degrees 23 minutes 39 seconds West a distance of 200 feet; thence North 06 degrees 23 minutes 50 seconds West a distance of 482.88 feet; thence North 34 degrees 17 minutes 24 seconds East a distance of 1692.54 feet; thence South 77 degrees 26 minutes 00 seconds East a distance of 1541.34 feet; thence North 52 degrees 08 minutes 41 seconds East a distance of 670.95 feet to the point of beginning of the line to be described; thence continuing North 52 degrees 08 minutes 41 seconds East a distance of 783.84 feet; thence North 68 degrees 02 minutes 16 seconds East a distance of 148.61 feet; thence North 50 degrees 50 minutes 08 seconds East a distance of 328.73 feet; thence North 41 degrees 52 minutes 40 seconds East a distance of 385.23 feet to the east line of said SW¼-SE¼ , and there terminating.	CLIFFS ERIE LLC AND TWIN METALS MN LLC.	PETER WOODBURY (3/4)	DUNKA MINERALS CORP. (1/12) KMK DUNKA INC. (1/12) DRM MINERALS CORP. (1/12)	0.677
610-0011-03810 and 610-0011-03811	26	61	12	UND 3/4 (CE) AND UND 1/4 (CE) OF SE1/4 OF SE1/4	CLIFFS ERIE LLC	PETER WOODBURY (3/4)	DUNKA MINERALS CORP. (1/12) KMK DUNKA INC. (1/12) DRM MINERALS CORP. (1/12)	0.048
610-0011-03860	27	61	12	SE1/4 OF SE1/4	USA	STATE OF MINNESOTA		0.333
610-0011-04400	33	61	12	SE1/4 OF SE 1/4	MESABI IRON CO	MESABI IRON CO		2.152
610-0011-04440	34	61	12	That part of the NE1/4 OF NE1/4 lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		22.694

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-04441	34	61	12	That part of the NE¼ of NE¼, Section 34, Township 61 North, Range 12 West, EXCEPT that part lying W'ly and NW'ly of a line drawn parallel with and distant 200 ft. W'ly and NW'ly of the first following described line and W'ly, NW'ly and N'ly of the second following described line: First Described Line: Commencing at the E quarter corner of Section 9, Township 60 North, Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the E line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St Louis County Transverse Mercator 1996 projection, a distance of 462.67 ft. to the point of beginning of the line to be described; thence NE'ly along a non-tangential curve concave to the E, having a radius of 2925.20 ft., central angle of 46 degrees 35 minutes 13 seconds, the tangent to said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 ft. to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 ft.; thence NE'ly along a tangential curve concave to the SE, having a radius of 1217.20 ft., central angle of 13 degrees 13 minutes 05 seconds, a distance 280.81 ft. to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 ft.; thence NE'ly along a tangential curve concave to the NW, having a radius of 3780.62 ft., central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 ft. to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 ft.; thence NE'ly along a tangential curve concave to the SE, having a radius of 2866.16 ft., central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 ft. to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 ft.; thence NE'ly along a tangential curve concave to the SE, having a radius of 910.15 ft., central angle of 04 degrees 00 minutes 27 seconds , a distance of 63.66 ft. to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 ft. and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 ft. to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of482.88 ft.; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 ft.; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 ft.; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 ft.; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 ft.; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 ft.; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 ft., and there terminating.	CLIFFS ERIE LLC	STATE OF MINNESOTA		0.465
610-0011-04450	34	61	12	NW1/4 OF NE1/4	USA	STATE OF MINNESOTA		0.125
610-0011-04450	34	61	12	NW1/4 OF SW1/4	USA	USA		1.248
610-0011-04450	34	61	12	SE1/4 OF NW1/4	USA	USA		0.606
610-0011-04450	34	61	12	SW1/4 OF SW1/4	USA	USA		34.392
610-0011-04460	34	61	12	That part of the SW1/4 OF NE1/4 lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	USA		24.741
610-0011-04470	34	61	12	That part of the SE¼ of NE¼, Section 34 Township 61 North Range 12 West; lying E'ly and SE'ly of a line drawn parallel with and distant 200 feet W'ly and NW'ly of the first following described line and E'ly, SE'ly and S'ly of the second following described line: First Described Line: Commencing at the East quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the East line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection, a distance of 462.67 feet to the point of beginning of the line to be described ; thence NE'ly along a non-tangential curve concave to the East, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence NE'ly along a tangential curve concave to the NW, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 910.15 feet , central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148 .61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	CLIFFS ERIE LLC	USA		1.156

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-04475	34	61	12	That part of the SE1/4 OF NE1/4 lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	USA		18.534
610-0011-04520	34	61	12	That part of the NE¼ of SW¼, Section 34 Township 61 North Range 12 West; lying E'ly and SE'ly of a line drawn parallel with and distant 200 feet W'ly and NW'ly of the first following described line and E'ly, SE'ly and S'ly of the second following described line: First Described Line: Commencing at the East quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the East line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection, a distance of 462.67 feet to the point of beginning of the line to be described ; thence NE'ly along a non-tangential curve concave to the East, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence NE'ly along a tangential curve concave to the NW, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 910.15 feet , central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148 .61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	CLIFFS ERIE LLC	STATE OF MINNESOTA		0.886
610-0011-04525	34	61	12	That part of the NE1/4 OF SW1/4 lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		26.34

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-04550	34	61	12	That part of the SE¼ of SW¼, Section 34 Township 61 North Range 12 West; lying E'ly and SE'ly of a line drawn parallel with and distant 200 feet W'ly and NW'ly of the first following described line and E'ly, SE'ly and S'ly of the second following described line: First Described Line: Commencing at the East quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the East line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection, a distance of 462.67 feet to the point of beginning of the line to be described ; thence NE'ly along a non-tangential curve concave to the East, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence NE'ly along a tangential curve concave to the NW, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 910.15 feet , central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148 .61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	CLIFFS ERIE LLC	STATE OF MINNESOTA		0.286
610-0011-04555	34	61	12	That part of the SE1/4 OF SW1/4 lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		15.915
610-0011-04570	34	61	12	That part of the NW¼ of SE¼, Section 34 Township 61 North Range 12 West; lying E'ly and SE'ly of a line drawn parallel with and distant 200 feet W'ly and NW'ly of the first following described line and E'ly, SE'ly and S'ly of the second following described line: First Described Line: Commencing at the East quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the East line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection, a distance of 462.67 feet to the point of beginning of the line to be described ; thence NE'ly along a non-tangential curve concave to the East, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence NE'ly along a tangential curve concave to the NW, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 910.15 feet , central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148 .61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	CLIFFS ERIE LLC	STATE OF MINNESOTA		3.004

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-04575	34	61	12	That part of the NW1/4 OF SE1/4 lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		13.173
610-0011-04645	35	61	12	Northeast Quarter of Northwest Quarter, Section 35, Township 61 North, Range 12 West, St. Louis County, Minnesota, lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast , having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds , a distance of 2463.58 feet to the point of tangency ; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet ; thence northeasterly along a tangential curve concave to the southeast , having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	State of Minnesota (Remainder. See notes)	Dunka Minerals Corporation (20/864) KMK Dunka Inc. (20/864) DRM Minerals Corporation (20/864) Harold A. Knutson, as trustee of the Harold A. Knutson Living Trust under Agreement dated April 30, 2008 (5/576) Darryl E. Coons (5/576) Duluth-Superior Area Community Foundation (5/576) Peter Woodbury (180/864) Nancy Jordan (1/10 of 10/864) Susan Eastep (1/10 of 10/864) Cynthia Williams (1/10 of 10/864) John Mahler (1/10 of 10/864) Elizabeth Gowdy (1/10 of 10/864) The Thomas J. Manthey Disclaimer Trust F/B/O Virginia P Manthey (1/2 of 864) John Jacob Spencer Jr. (10/4032) Frank Christopher Spencer (10/4032) Charlotte Spencer Miller (10/4032) Florence Spencer Schmidt (10/4032)	0.314
610-0011-04650	35	61	12	That part of the NW¼ of NW¼, Section 35 Township 61 North Range 12 West; lying E'ly and SE'ly of a line drawn parallel with and distant 200 feet W'ly and NW'ly of the first following described line and E'ly, SE'ly and S'ly of the second following described line: First Described Line: Commencing at the East quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the East line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection, a distance of 462.67 feet to the point of beginning of the line to be described ; thence NE'ly along a non-tangential curve concave to the East, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence NE'ly along a tangential curve concave to the NW, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence NE'ly along a tangential curve concave to the SE, having a radius of 910.15 feet , central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148 .61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	CLIFFS ERIE LLC	STATE OF MINNESOTA		5.956

Table 1: Surface and Mineral Ownership Information for the Twin Metals Minnesota Project Area

610-0011-04655	35	61	12	That part of the NW1/4 OF NW1/4 lying westerly and northwesterly of a line drawn parallel with and distant 200 feet westerly and northwesterly of the first following described line and westerly, northwesterly and northerly of the second following described line: First Described Line: Commencing at the east quarter corner of Section 9 Township 60 North Range 12 West; thence S 71 degrees 44 minutes 20 seconds W, bearing based on the east line of said Section 9 having a bearing of S 03 degrees 27 minutes 19 seconds E, St. Louis County Transverse Mercator 1996 projection , a distance of 462.67 feet to the point of beginning of the line to be described; thence northeasterly along a non-tangential curve concave to the east, having a radius of 2925.20 feet, central angle of 46 degrees 35 minutes 13 seconds, the tangent of said curve at this point bears N 22 degrees 35 minutes 37 seconds W a distance of 2378.47 feet to the point of tangency; thence N 23 degrees 59 minutes 36 seconds E a distance of 426.28 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 1217.20 feet, central angle of 13 degrees 13 minutes 05 seconds, a distance of 280.81 feet to the point of tangency; thence N 37 degrees 12 minutes 41 seconds E, a distance of 1001.36 feet; thence northeasterly along a tangential curve concave to the northwest, having a radius of 3780.62 feet, central angle of 32 degrees 51 minutes 39 seconds, a distance of 2168.30 feet to the point of tangency; thence N 04 degrees 21 minutes 02 seconds E, a distance of 2244.11 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 2866.16 feet, central angle of 49 degrees 14 minutes 53 seconds, a distance of 2463.58 feet to the point of tangency; thence N 53 degrees 35 minutes 54 seconds E, a distance of 664.36 feet; thence northeasterly along a tangential curve concave to the southeast, having a radius of 910.15 feet, central angle of 04 degrees 00 minutes 27 seconds, a distance of 63.66 feet to the point of tangency; thence N 57 degrees 36 minutes 21 seconds E a distance of 1469.17 feet, and there terminating. Second Described Line: Commencing at the point of termination of the first above-described line; thence N 32 degrees 23 minutes 39 seconds W a distance of 200 feet to the point of beginning of the line to be described; thence N 06 degrees 23 minutes 50 seconds W a distance of 482.88 feet; thence N 34 degrees 17 minutes 24 seconds E a distance of 1692.54 feet; thence S 77 degrees 26 minutes 00 seconds E a distance of 1541.34 feet; thence N 52 degrees 08 minutes 41 seconds E a distance of 1454.79 feet; thence N 68 degrees 02 minutes 16 seconds E a distance of 148.61 feet; thence N 51 degrees 03 minutes 13 seconds E a distance of 321 feet; thence N 41 degrees 52 minutes 37 seconds E a distance of 459.18 feet, and there terminating.	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		13.584
610-0011-04760	36	61	12	SE1/4 OF SE1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		1.985
610-0011-04760	36	61	12	SW1/4 OF SE1/4	STATE OF MINNESOTA	STATE OF MINNESOTA		7.441
610-0011-04800	36	61	12	NE1/4 OF NW1/4 TO THE WEST OF THE NORMAL HIGH WATER MARK OF BIRCH LAKE	RENDFIELD LAND CO INC	STATE OF MINNESOTA		0.772
610-0011-04810	36	61	12	NW1/4 of Section 36 Township 61 North Range 12 West of the Fourth Principal Meridian EXCEPT SE1/4 of NW1/4, Section 36, Township 61 North, Range 12 West. AND FURTHER EXCEPT Those parts of NW1/4 of NW1/4, Section 36, Township 61 North, Range 12 West, lying W'ly of "Line A" to be described and 300.00 feet NW'ly of and 300.00 SE'ly of, measured at right angles to and parallel with "Line B" to be described. "Line A" and "Line B" are described as follows; "Line A" Commencing at the NW corner of said Section 36; thence S 88 degrees 33 minutes 39 seconds E along the N line of said NW1/4 of NW1/4, a distance of 334.90 feet; thence E'ly a distance of 22.42 feet along a non-tangential curve concave to the N, having a radius of 333.00 feet, a central angle of 03 degrees 51 minutes 28 seconds, and a chord bearing S 89 degrees 30 minutes 36 seconds E; thence E'ly a distance of 257.22 feet along a reverse curve concave to the S, having a radius of 484.00 feet, and a central angle of 30 degrees 26 minutes 59 seconds to the beginning of the line to be described; thence continuing E'ly a distance of 491.25 feet along the same curve having a radius of 484.00 feet, a central angle of 58 degrees 09 minutes 15 seconds; thence S 03 degrees 48 minutes 53 seconds E, a distance of 919.86 feet to the S line of said NW1/4 of NW1/4 and said "Line A" there terminating. "Line B" Commencing at the NW corner of said Section 36; thence S 88 degrees 33 minutes 39 seconds E along the N line of said Section 36, a distance of 334.90 feet to the beginning of the line to be described; thence S 14 degrees 59 minutes 50 seconds W, a distance of 1325.94 feet and said "Line B" there terminating. The side lines of said 300.00 foot wide strips terminate on the N and W lines of said NW1/4 of NW1/4. AND FURTHER EXCEPTING That part of SW1/4 of NW1/4 Section 36, Township 61 North, Range 12 West, lying 300.00 SE'ly of, measured at right angles to and parallel with a line described as follows: Commencing at the NW corner of said Section 36; thence S 88 degrees 33 minutes 39 seconds E along the N line of said Section 36, a distance of 334.90 feet to the beginning of the line to be described; thence S 14 degrees 59 minutes 50 seconds W, a distance of 1895.30 and said line there terminating. The said line of said 300.00 foot wide strip terminates on the N and W lines of said SW1/4 of NW1/4.	RENDFIELD LAND CO INC	STATE OF MINNESOTA		19.391
610-0011-04811	36	61	12	Those parts of NW1/4 of NW1/4, Section 36, Township 61 North, Range 12 West, lying W'ly of "Line A" to be described and 300.00 feet NW'ly of and 300.00 SE'ly of, measured at right angles to and parallel with "Line B" to be described. "Line A" and "Line B" are described as follows; "Line A" Commencing at the NW corner of said Section 36; thence S 88 degrees 33 minutes 39 seconds E along the N line of said NW1/4 of NW1/4, a distance of 334.90 feet; thence E'ly a distance of 22.42 feet along a non-tangential curve concave to the N, having a radius of 333.00 feet, a central angle of 03 degrees 51 minutes 28 seconds, and a chord bearing S 89 degrees 30 minutes 36 seconds E; thence E'ly a distance of 257.22 feet along a reverse curve concave to the S, having a radius of 484.00 feet, and a central angle of 30 degrees 26 minutes 59 seconds to the beginning of the line to be described; thence continuing E'ly a distance of 491.25 feet along the same curve having a radius of 484.00 feet, a central angle of 58 degrees 09 minutes 15 seconds; thence S 03 degrees 48 minutes 53 seconds E, a distance of 919.86 feet to the S line of said NW1/4 of NW1/4 and said "Line A" there terminating. "Line B" Commencing at the NW corner of said Section 36; thence S 88 degrees 33 minutes 39 seconds E along the N line of said Section 36, a distance of 334.90 feet to the beginning of the line to be described; thence S 14 degrees 59 minutes 50 seconds W, a distance of 1325.94 feet and said "Line B" there terminating. The side lines of said 300.00 foot wide strips terminate on the N and W lines of said NW1/4 of NW1/4.	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		10.944
610-0011-04821	36	61	12	That part of SW1/4 of NW1/4 Section 36, Township 61 North, Range 12 West, lying 300.00 SE'ly of, measured at right angles to and parallel with a line described as follows: Commencing at the NW corner of said Section 36; thence S 88 degrees 33 minutes 39 seconds E along the N line of said Section 36, a distance of 334.90 feet to the beginning of the line to be described; thence S 14 degrees 59 minutes 50 seconds W, a distance of 1895.30 and said line there terminating. The said line of said 300.00 foot wide strip terminates on the N and W lines of said SW1/4 of NW1/4.	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		31.131
610-0011-04840	36	61	12	NE 1/4 OF SW 1/4	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		15.511
610-0011-04850	36	61	12	NW 1/4 OF SW 1/4	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		28.883
610-0011-04860	36	61	12	SW 1/4 OF SW 1/4	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		0.787
610-0011-04870	36	61	12	SE 1/4 OF SW 1/4	FRANCONIA MINERALS (US) LLC	STATE OF MINNESOTA		31.431

APPENDIX B

RECLAMATION PLAN

PROJECT RECLAMATION PLAN

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared for Twin Metals Minnesota LLC
Prepared by Barr Engineering Co.

Document No. TMM-EG-115-0004
Revision 0A
12-18-2019

REVISION RECORD

Revision	Date	Description	EDMS Download Date	Project Configuration Version
0A	12-18-2019	Issued for Agency Review	n/a	1.0

REVISION NARRATIVE

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.

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FIGURES

TABLES

ATTACHMENTS

LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

%	percent
Barr	Barr Engineering Co.
BLM	Bureau of Land Management
BMPs	best management practices
Declines	mine declines
e.g.	Latin phrase exempli gratia meaning “for example”
etc.	abbreviation for the Latin phrase et cetera meaning "and other similar things" or "and so forth"
FSM	Forest Service Manual
ft	feet
i.e.	Latin phrase *id est* meaning “That is (to say)…”
km	kilometer
LLR	longitudinal longhole retreat
m	meter
MDH	Minnesota Department of Health
MDNR	Minnesota Department of Natural Resources
Minn. R.	Minnesota Administrative Rules
MPCA	Minnesota Pollution Control Agency
MPO	Mine Plan of Operations
NPDES	National Pollutant Discharge Elimination System
Plan	Reclamation Plan
Project	Twin Metals Minnesota Project
PTM	Permit to Mine
RCRA	Resource Conservation and Recovery Act
SNF	Superior National Forest
SPCC	spill prevention, control, and countermeasure
SWMS	surface water management system
TDP	tailings dewatering plant
TMM	Twin Metals Minnesota LLC
USFS	U.S. Forest Service
USNRC	U.S. Nuclear Regulatory Commission

1.0 INTRODUCTION / BACKGROUND

1.1 Project Overview

The Twin Metals Minnesota LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, cobalt, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of Ely, Minnesota, and 11 miles (18 km) northeast of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

The Project encompasses the following primary areas: the underground mine area, the plant site, the tailings management site for filtered tailings preparation and storage, the non-contact water diversion area, the access road corridor, the water intake corridor, and the transmission corridor.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at http://www.twin-metals.com/.

1.2 Reclamation Plan Purpose and Objectives

This document is the Reclamation Plan to be submitted by TMM for the purpose of providing necessary information for the environmental review and future permitting processes. TMM retained Barr Engineering Co. (Barr) to complete this Reclamation Plan (Plan). The Plan for the Project is submitted by TMM to the U.S. Department of the Interior, Bureau of Land Management (BLM) Northeastern State Office and the Minnesota Department of Natural Resources (MDNR) in compliance with requirements set forth in Title 43, Code of Federal Regulations Sections 3592.1 (and applicable sub-sections referenced therein) and Minnesota Rules (Minn. R.), chapter 6132, respectively. TMM is submitting, under separate cover, a Mine Plan of Operations (MPO) for the Project.

A summary of the Project components that would be reclaimed, the general reclamation approach for each component, and an estimated schedule for the closure and post-closure maintenance and monitoring project development stages is provided in Attachment B.1.

Reclamation is the process of restoring properties mined or modified to support mining, to a natural condition or economically usable purpose, including controlling and protecting against potential adverse environmental effects and planning for and facilitating future orderly development of the properties. Reclamation includes the measures undertaken to bring about the necessary reconditioning or restoration of

lands or water affected by exploration, mining, on-site processing operations or waste disposal in a manner which, among other things, will prevent or control on- or off-site damage to the environment. Reclamation can occur during all stages of the Project including construction, operations, closure, and post-closure maintenance and monitoring. In this Plan, when reclamation occurs during the construction or operations stage it is referred to as concurrent reclamation. Project development stages are described in Section 1.5.

Under 43 CFR, Subpart 3592[1], before conducting operations on lease lands, the BLM requires the lessee to submit an MPO providing for, among other things, "the protection of non-mineral resources and for the reclamation of the surface of the lands affected by the operations." The BLM's regulations also require the MPO to include "a reclamation schedule and the measures to be taken for surface reclamation."

This Plan, in addition to providing reclamation information for supporting Project environmental review and future state and federal permitting processes, has been prepared to fulfill the requirements of the MPO. The Plan was prepared to a level of detail commensurate with current Project definition. Additional detail would be added to the Plan to support future permitting (e.g., Permit to Mine (PTM) application) and address regulatory agency input. Following permitting, this Plan would be updated annually to remain current with in-field conditions and TMM reclamation obligations.

Ultimately, TMM would be required under Minn. R., part 6132.1100 to provide the MDNR with mining and reclamation maps showing both the anticipated mining operation and the planned closure and post-closure activities for facilities used in the mining operations, including storage piles, tailings management facilities, mine, reservoirs, dams, diversion channels, and drainage control structures.

TMM would also need to comply with all applicable reclamation requirements set forth in federal or state surface authorizations, mineral leases, permits, and applicable land management plans. TMM expects that specific reclamation requirements will be developed during the environmental review and permitting process.

1.3 Project Location and Description

The vicinity of the Project relative to regional features and the general configuration of the Project is shown on Figure 1-1. The Maturi deposit lies between the

[1] U.S. Code of Federal Regulations, Title 43 Public Lands: Interior. Part 3590. Subpart 3592 Plans and Maps. Section 3592.1 Operating Plans

northernmost end of the Iron Range and the southwestern border of the Boundary Waters Canoe Area Wilderness within the SNF.

The primary Project features are shown on Figure 1-2 through Figure 1-5 and include:

- Underground mine area including mine declines (declines) and ventilation raise sites 1, 2, and 3;
- Plant site;
- Tailings management site, including the tailings dewatering plant and lined dry stack facility (which would be a permanent feature) for tailings management;
- non-contact water diversion area (inclusive of permanent water diversion features consisting of dikes and ditches);
- Access road corridor;
- Water intake corridor; and
- Transmission corridor

A comprehensive description of the Project is provided in the MPO.

1.4 Project Environmental Setting

The Project environmental setting is described in the MPO.

1.5 Project Development Stages

Table 1-1 summarizes development stages for the Project. As noted in Section 1.2, reclamation can occur during all stages of the Project. When reclamation occurs during the construction or operations stage, it is referred to as concurrent reclamation.

Table 1-1 Project Development Stages and Associated Project Activities

Project Development Stages	Associated Project Activities
Construction	In this Plan, the “construction” stage includes Project activities occurring prior to extraction of ore such as, but not limited to, construction of processing facilities, mine declines, utilities, TDP, the first phase of the lined dry stack facility, and water management features.
Operations	In this Plan, the “operations” stage includes Project activities performed to extract and process ore, and ancillary activities such as, but not limited to, water and waste management. Reclamation that occurs during this Project development stage is referred to as “concurrent reclamation” in this Plan.
Closure	In this Plan, the "closure" stage includes Project activities to rehabilitate the mine site after operations have ceased, to create the intended post-mining landscape. Closure stage activities include, but are not limited to, decommissioning, removal, and / or abandonment of infrastructure, land forming, and revegetation. Reclamation activities that occur during the Closure stage are referred to as “reclamation” in this Plan. *Note, closure is also an activity (in addition to being a Project development stage). Closure, the activity, means the process of terminating and completing final steps in reclaiming any specific portion of a mining operation (e.g., closure of a pond may include removing and disposing of residual sediments and liner materials, filling and regrading the surface depression, and revegetating the pond footprint to meet future land use plans).*
Post-Closure Maintenance and Monitoring	In this Plan, the “post-closure maintenance and monitoring” stage includes Project monitoring activities performed to confirm post-mining requirements (including post-closure performance criteria) have been achieved. It also includes maintenance activities that may be required to sustain reclaimed areas after cessation of mining.

2.0 RECLAMATION PLAN DESIGN BASIS

The Plan design basis considers regulatory requirements, planned post-closure land use, material characterization, and health and safety hazards. The combination of these aspects provides the key considerations used in the development of the Plan. The Plan design basis relies on information available at the time of Plan issuance. The design basis would be periodically updated as Project definition increases during future phases of Project design and development.

2.1 Regulatory Framework

A synopsis of the regulatory framework for reclamation plans is provided in Attachment B.2.

Further, “storm water or stormwater” is defined in Minn. R., chapter 7090, part 7090.0080, as storm water runoff, snow melt runoff, and surface runoff and drainage. Instead of using only the regulatory term “stormwater” throughout this Plan, reference is made to specific sub-parts of stormwater and methods of management, as needed for clarity.

Plan content would change over time as the Project progresses through environmental review and permitting, final design, and the construction, operations, closure, and post-closure maintenance and monitoring project development stages. Further, none of the infrastructure depicted in this Plan has been constructed.

2.2 Post-Closure Land Use

While there are many post-closure land use options for the Project, this Plan is based on the post-closure land uses listed in Table 2-1.

Table 2-1 Proposed Post-Closure Land Use

Project Area / Feature	Proposed Post-Closure Land Use
Underground Mine *(including declines)*	No planned post-closure use; to be reclaimed per approvals required under Title 43 CFR Subpart 3595.2 – Abandonment of Underground Workings
Plant Site, Access Road Corridor, Water Intake Corridor, Transmission Corridor, and Ventilation Raise Sites	Natural area, with publically accessible portions returned to existing uses such as recreation - would include range of mixed hardwood pine forest to jack pine barrens
Non-Contact Water Diversion Area	Natural area, with publically accessible portions returned to existing uses such as recreation – would include permanent drainage features (dikes and ditches) and be reclaimed as a range of mixed hardwood pine forest to jack pine barrens
Tailings Management Site	Natural area, with publically accessible portions returned to existing uses such as recreation – would include permanent lined dry stack facility features and be reclaimed as a range of diverse grasslands with pollinator species

2.3 Geochemistry

Geochemical information for development rock, waste rock, ore, and tailings continues to be developed. Future testing would be performed per work plans developed with input from the MDNR and BLM. Refer to the MPO for additional geochemistry information.

2.4 Development Rock, Waste Rock, and Ore

Refer to the MPO for a description of development rock, waste rock, and ore.

Development rock used in above grade construction would be integrated into the reclaimed surface at the closure stage of the Project. As part of closure stage activities, development rock could also be relocated from the surface to the upper segment of the declines and at the portal to serve as mass structural barrier. Ore would be processed prior to the closure stage of the Project. As a result, no ore stockpiles would remain on the surface after the operations stage of the Project.

2.5 Underground Mine Backfill

During mining, the underground mine would be progressively backfilled with an engineered tailings backfill produced at the surface and distributed via the declines through the underground mine using a system of pipes secured within the stopes and drifts. The engineered tailings backfill would contain thickened tailings and binder. In some stopes, waste rock would be backfilled into empty stopes prior to the stopes being filled with the engineered tailings backfill. In reclaimed portions of the underground mine, in-mine groundwater levels would naturally reestablish over time.

3.0 CLOSURE

Closure and reclamation procedures described herein are based on the best available information at the time of Plan preparation, including industry standard practices, site-specific conditions, and preliminary engineering and design evaluations. This Plan would be periodically updated as Project definition increases leading up to the construction project stage. Additionally, some aspects of the environmental and operational conditions would need to be investigated further during the operations stage of the Project to inform closure and reclamation planning. This information would be incorporated into the Plan through periodic updates in accordance with regulatory requirements.

Public safety would be maintained throughout the closure stage of the Project and equipment and facilities would be maintained in a safe and orderly manner. To protect public safety, activities would be conducted in conformance with applicable federal and state health and safety requirements. In critical areas not already fenced, temporary perimeter fencing would be installed to restrict public access during the

closure stage and appropriate signage would be displayed. Access roads with restricted access during the operations stage of the Project would retain restricted access during the closure stage. Critical areas include, but are not limited to, mine portals and ventilation raise sites. The plan for infrastructure closure and reclamation is summarized in the following sections.

3.1 Underground Mine Area and Associated Facilities

The ore deposit would be accessed by two declines extending from the plant site (an access decline and a conveyor decline). The underground mine operation would use the Longitudinal Longhole Retreat (LLR) mining method (a type of sublevel stoping where ore is progressively blasted from a higher level and falls to a draw point for removal). LLR would utilize both primary and secondary stopes. Engineered tailings backfill and waste rock would be used to backfill mined out stopes throughout the life of mine. The intake raises and exhaust raises would be constructed for mine ventilation. Fans would be installed at the top of the intake raises and at the bottom of the exhaust raises.

The location of the surface facilities (i.e., ventilation raise sites) associated with the underground mine requiring closure are shown on Figure 3-1 through Figure 3-3, which generally show:

- Pre-mine site conditions (as reference for potential closed condition objective);
- End of operations site conditions; and
- Surface infrastructure removal for closure.

3.1.1 Underground Equipment and Infrastructure

For underground mine area equipment and infrastructure, closure would include removal of mobile items and items having potential alternate off-site uses or salvage value, and removal of equipment and infrastructure having potential to impact future groundwater quality.

Underground equipment and infrastructure whose useful life has been consumed, having limited or no off-site reuse or salvage value, that would not easily be removed and recovered from underground, and / or that has no notable potential to impact future groundwater quality (i.e., cable casing of polyethylene or similar, insufficient quantity to cause impact, etc.) would remain in place below ground (in accordance with federal and / or state approvals as necessary).

Prior to closing the underground mine, self-propelled mobile equipment (inclusive of associated coolant, oil, and gas) would be removed from the underground mine, and mobile but not self-propelled (and not fixed in place) equipment having economic re-use or salvage value off site would be removed from the underground mine.

If spills were to occur in the underground mine area and supporting facilities, or anywhere on the Project, they would be addressed in accordance with Project spill prevention, control, and countermeasure (SPCC) plans, which would be developed prior to the construction stage of the Project.

Fixed equipment is bolted, structurally mounted, epoxied, drilled into, or fastened by some other means to the floor, walls, or roof of the underground mine. Examples of underground fixed equipment include low and high voltage power distribution cables, communication cables, cable trays, lighting, magazines for explosives storage, ventilation ducts, roof supports, mine backfill distribution piping, and water removal piping systems. Because none of this equipment and infrastructure would be likely to have economic value for reuse or salvage, such infrastructure would be difficult to remove, and such infrastructure would be unlikely to affect future groundwater quality (i.e., cable casing of polyethylene or similar, insufficient quantity to cause impact, etc.), it would remain in place at closure.

3.1.2 Mine Declines and Underground Mine

Much of the underground mine would be progressively backfilled during the operations Project stage, as a means of providing ground support for underground mining activities, and as a means of permanently storing tailings generated during mining. Approximately 40% of tailings are anticipated to be returned underground in the form of engineered tailings backfill during the operations stage.

While much of the underground mine would be backfilled through the course of mining, there would be portions of the underground mine remaining unfilled. After mine operations cease these portions of the mine would be allowed to passively fill with groundwater as groundwater levels progressively rise to pre-mining conditions. Because of the plan to fill the stopes with engineered tailings backfill within the ore zone, to allow the mine to fill with groundwater, and to seal the mine portal and ventilation shafts upon closure, the potential for oxidation of sulfide minerals along the wall rock, in the underground mine, would be limited. As a result, mobilization of metals from exposed mine walls and ore remaining underground would be expected to be minimal.

The ground surface above the declines and above the underground mining area are not expected to be subject to measurable ground subsidence, so on-surface reclamation to address subsidence is not expected.

3.1.3 Ventilation Shafts and Surface Ventilation Structures

For the surface ventilation structures and for all Project structures, prior to demolition, equipment would be inventoried and generally categorized as saleable, salvageable (for reuse), recyclable, or for disposal. Equipment would be recovered from the structures and managed according to these classifications preceding the initiation of demolition.

Surface ventilation structures would be demolished unless a post-mining land use is identified and concurred with by the appropriate regulatory and land management agencies. Some of the building materials may be salvageable or recyclable and would be removed from the site. Pipelines associated with the buildings would be removed. Those materials which are unsalvageable and unrecyclable, and meet the solid waste disposal criteria, would be disposed of in a licensed landfill.

Project-wide, above-grade building foundation walls and equipment foundations buried 0 to 2 ft (0 to 0.6 m) below grade, would be broken and buried in place or in some instances may be removed and placed in the declines. Below grade, non-ventilation shaft spaces would be filled with clean material. Non-hazardous demolition debris would be removed and disposed of as deemed appropriate and in accordance with regulatory requirements. If present, hazardous debris would be removed and transported to a licensed facility for disposal. Prefabricated buildings would be dismantled and hauled to a licensed landfill for disposal or removed from the site for alternate use.

Ventilation shafts, which would vary between 17 and 20 ft (5.2m and 6.1m) in diameter, would be sealed in accordance with requirements of Minnesota state law and local requirements. The sites would be covered with growth media and revegetated to establish a land use similar to adjacent undisturbed lands. Revegetation procedures are described in Section 5.0.

3.2 Plant Site and Associated Facilities

Typical existing, end of operations, closure, and post-closure site conditions for the plant are shown on Figure 3-4 through Figure 3-7, respectively. The plant site includes a variety of structures and supporting infrastructure, generally categorized as follows:

- Portals to the underground mine
- Buildings
- Electrical / power
- Supporting equipment / infrastructure
- Fuel storage
- Laydown / pad / storage
- Ponds
- Service roads (to aide figure clarity, minor service roads are not shown) and parking areas
- Pipelines
- Stockpiles

Removal of structures and supporting infrastructure would generally include sale, salvage or recycling (when practicable / feasible), demolition, or disposal, followed by landscape restoration. Application of this sequence to the plant site surface

infrastructure is summarized in the following sections. Surface water management at the plant site for the closure and post-closure stages is described in Section 3.2.12. Erosion control best management practices (BMPs), and general surface water controls to protect water quality to be applied throughout closure and reclamation, are presented in Section 4.0. The general methods for restoration, typically consisting of landscape restoration and revegetation, are described in Section 5.0.

Table 3-1 provides an inventory of plant site surface features requiring closure and reclamation, and the planned reclamation approach.

Table 3-1 Plant Site Surface Features for Closure

Feature Type	Name	Reclamation Approach
Portals to the Underground Mine	Portals	Permanently sealed to prevent access
Buildings	Concentrator	Remove and sell, salvage, recycle, or dispose – regrade and revegetate footprint
	Concentrator Services Building	
	Service Building (for Ponds)	
	Reagent Storage	
	Security	
	Mine Services Building	
Electrical / Power	General Power Distribution Lines within Plant Site Footprint	Remove and sell, salvage, recycle, or dispose – regrade and revegetate footprint
	Plant Site Substation and the Primary Overhead Power-line from the Off-Site Substation	Leave in place – future use to be determined by utility provider
Supporting Equipment / Infrastructure	Explosives Magazine	Remove and sell, salvage, recycle, or dispose – regrade and revegetate footprint
	Propane Storage Tanks	
	Grinding Ball Storage	
	Conveyors	
	Tanks (mine water, process water, and fresh / fire water)	
	Shotcrete Plant	
	Transfer Station / Feed Hopper	
Fuel Storage	Diesel Fuel	Remove – regrade and revegetate footprint
Pipelines	Tailings	Remove and sell, salvage, recycle, or dispose
	Engineered Tailings Backfill	
	Process Water	

Feature Type	Name	Reclamation Approach
Laydown and Storage Areas	Laydown Areas	Regrade and revegetate
	Snow Storage Areas	
	Waste Storage Area	
	General Storage	
Ponds	North Contact Water Pond	Remove – regrade and / or fill as appropriate and revegetate (which could include converting to surface runoff drainage features or wetlands)
	Central Contact Water Pond	
	South Contact Water Pond	
	Process Water Pond	
	Sedimentation Water Pond	
Service Roads and Parking	Bus Loop	Remove or dispose – regrade and revegetate
	Parking Areas	
	Service Roadways	Retain and maintain portions needed to support future land use – otherwise, remove and regrade once no longer needed for closure and post-closure maintenance stage activities
Stockpiles (including liners if present)	Aggregate Stockpile (adjacent to the shotcrete plant)	Remove and recycle or dispose – regrade and revegetate
	Coarse Ore Stockpile	
	Overflow Ore Stockpile	
	Reclamation Material Stockpile 1 and 2	

3.2.1 Portals to the Underground Mine

The portal would remain open for delivery of power and other utilities as needed, through the course of closure until underground equipment and infrastructure planned for removal from the underground mine has been removed, and the planned underground mine backfilling has been completed. Access to the underground mine would be closed off to the public throughout the operations, closure, and post-closure maintenance and monitoring stages.

Once the underground mine closure activities had been completed as subsequently described, development rock (or other appropriate fill material) would be placed within the upper segment of the declines and at the portal to serve as a mass structural barrier to mine reentry. The exterior face of the barrier would be covered with a granular soil layer, above which rooting soil would be placed to support revegetation of the portal area. The mass structural barrier and soil cover would

serve to prevent future, conceivable means of unauthorized reentry to the declines and underground mine by way of the portal.

3.2.2 Buildings

The plant site includes a concentrator and a number of support buildings as listed in Table 3-1 and shown on Figure 3-5.

The concentrator and other buildings would be closed and the building sites reclaimed in the same manner as previously described for surface ventilation structures.

Materials regulated under RCRA would be stored within buildings, and would be containerized for bulk transport and shipped to storage facilities that comply with RCRA regulations. Solid wastes would be transported to licensed solid waste disposal facilities.

Buildings associated with the Project would be demolished unless a post-mining on-site use is identified and concurred with by the appropriate regulatory and land management agencies.

3.2.3 Electrical / Power

The closure approach for the overhead electric transmission lines at the plant site and for the plant site substation would be determined by TMM based on input from the utility provider. If a post-Project need is confirmed by TMM or the utility provider, these transmission lines and the substation would remain in place at closure. If a post-Project need is not confirmed, plant site power lines, distribution facilities, and the substation would be dismantled and the sites reclaimed in the manner previously described for surface ventilation structures.

Section 3.3.3 discusses the transmission line providing power to the plant site. Section 3.5.5 discusses power from the plant site to the tailings management site.

3.2.4 Supporting Equipment and Infrastructure

Supporting equipment / infrastructure includes but is not limited to:

- Explosives Magazine
- Propane Storage Tank
- Grinding Ball Storage
- Conveyors
- Tanks (mine water, process water, and fresh / fire water)
- Shotcrete Plant
- Transfer Station / Feed Hopper

Explosives remaining in the explosives magazine and propane remaining in storage would be retrieved by the corresponding supply vendors and transported off site for re-sale. Cement remaining in storage at the shotcrete plant would be consumed in mine site backfill or during closure of the mine site ventilation shafts.

3.2.5 Fuel Storage Area

Fuel storage areas include propane storage and diesel fuel storage. Remaining fuel would be consumed on site during the Closure stage, or hauled off site for uses allowed. On-site fuel storage areas would be dismantled. Saleable equipment and salvageable or recyclable materials would be removed and transported off site. Other debris would be hauled to a licensed landfill for disposal.

If spills were to occur they would be addressed in accordance with Project SPCC plans, which would be developed prior to the construction stage of the Project.

3.2.6 Pipelines

See Section 3.5.2 for discussion of pipeline extending between the plant site and tailings management site.

3.2.7 Laydown and Storage Areas

Saleable equipment and salvageable or recyclable materials in laydown areas would be removed and transported off site. Other debris would be hauled to a licensed landfill for disposal.

Additional cover soil would be imported as needed and the laydown areas would be regraded as necessary to restore, to the extent practicable, pre-mining surface runoff conditions. Snow storage areas would be regraded and re-vegetated as necessary to achieve desired post-closure surface runoff and re-vegetated surface conditions. Vegetation would be re-established per Section 5.0.

3.2.8 Ponds

Solids remaining in ponds would be removed and transported below grade at the mine site for mine backfill, or if sufficiently dewatered or dry, to the lined dry stack facility.

Saleable pumping or piping systems and salvageable or recyclable materials in pond areas would be removed and transported off site. Pond liners and other debris would be hauled to a licensed landfill for disposal.

Additional cover soil would be imported as needed and the pond areas would be regraded as necessary to restore, to the extent practicable, pre-mining surface runoff

conditions. Ponds could potentially be converted into surface runoff drainage features or wetlands. Vegetation would be re-established per Section 5.0.

3.2.9 Service Roads and Parking

Plant site service roads and associated infrastructure (i.e., parking areas and the bus loop) without a defined post-mining use would be reclaimed concurrent with mine operations if they are no longer needed for access. Plant site service roads needed to support future land use would be retained. Plant site service roads (including small vehicle roads) would be reclaimed once no longer needed for closure and post-closure maintenance stage activities. The primary reclamation objective for the roads would be to provide long-term stabilization and surface water management consistent with the intended post-closure land use.

3.2.10 Stockpiles

Stockpile areas would include:

- Coarse ore stockpile
- Overflow ore stockpile
- Reclamation material stockpiles

During the operations stage of the project, ore stockpile areas would be closed by processing the stockpiled ore to the extent possible. No ore would remain on the surface during the closure stage. Soil / rock materials located above stockpile liners, and used for construction of the hydraulic barrier component of stockpile liners, would be removed and transported along with remaining ore to the mine for backfill and / or closure of declines. Piping used in stockpile drainage systems would be removed and salvaged or disposed of at a licensed demolition debris landfill. Synthetic liners used for the hydraulic barriers in stockpile liner systems would be removed and disposed of at a licensed demolition debris landfill. Soils located below the hydraulic barrier component of stockpile liners would be regraded to match planned post-closure ground contours and would then be re-vegetated per Section 5.0

Reclamation material stockpiled during the construction stage of the Project would be spread across the plant site to create a growth medium for revegetation. The reclamation material stockpile locations would be regraded to match post-closure contours and would also be revegetated per Section 5.0.

3.2.11 Sanitary Management Systems

Sanitary management systems would be pumped out and the holding tanks would be removed and disposed of in a licensed landfill or filled with soil (or crushed rock) and then backfilled.

3.2.12 Surface Water Management

Closure and reclamation of the plant site would include use of surface water management features to control erosion and water runoff quality, quantity, and rates. Once the planned plant site post-closure surface topography is established, reclamation cover materials, serving as a growth medium for revegetation, would be placed. Additional details on placement of cover soils and establishing a growth medium for revegetation is provided in Section 5.2.

The post-closure surface of the plant site would be graded to re-establish pre-mining hydrology, which generally would allow the site to drain toward adjacent wetland complexes as shown on Figure 3-7, which would generally re-establish pre-mining flow directions and discharge locations. Reclamation design would aim to create conditions where runoff rates and volumes estimated for runoff reaching downstream surface water receptors are similar to pre-mining site conditions.

Post-closure grading plans and drainage features would be designed to minimize concentrated flow and limit flow velocities such that, together with the vegetated cover, the resulting site would be stabilized with erosion potential generally similar to pre-mining site conditions.

3.3 Corridors

The Project would include three main corridors including:

- Access road corridor
- Water intake corridor
- Transmission corridor

Typical existing, end of operations, and closure site conditions for the access road and water intake corridors are shown on Figure 3-8 to Figure 3-10, respectively. Typical existing, end of operations, and closure site conditions for the transmission corridor are shown on Figure 3-11 to Figure 3-13, respectively. Table 3-2 provides an inventory of corridor features requiring closure and reclamation and planned reclamation approach.

Table 3-2 Corridor Features for Closure

Feature Type	Name	Reclamation Approach
Access Road Corridor	Access Road	Maintain and potentially transfer ownership
Water Intake Corridor	Intake Pipeline(s) (from the Birch Lake reservoir to the water intake facility)	Remove and salvage, or dispose or abandon pipelines in place – per future agreements with MDNR
	Water Intake Facility (pump house)	Remove and sell, salvage, recycle, or dispose – regrade and revegetate
	Buried Communication Cables and Power Lines	Leave in place – terminate power supply
	Water Intake Pipeline (from intake facility to the plant site)	Remove and sell, salvage, recycle, or dispose
	Maintenance Access Road	Abandon in place – regrade and revegetate; removal of culverts to be determined on case-by-case basis
Transmission Corridor	Overhead Electric Transmission and Off-Site Electrical Substation	Leave in place – future use to be determined based on input from utility provider

3.3.1 Access Road Corridor

The access road would be left in place and maintained through the closure stage of the Project. Maintenance and / or reclamation of the access road after the closure stage would be determined based on future land use and access needs of surrounding properties. Transfer of ownership to a third party could also be considered if appropriate.

If the access road is not needed to meet future land use needs, it would be removed and reclaimed. Culverts crossing the access road would be removed and drainage channels would be formed and vegetated to facilitate proper drainage. Closure mitigations at access road crossings of wetlands would be per U.S. Army Corps of Engineers permit conditions. Unless otherwise required by permit, at wetland crossing locations, the access road would be abandoned in place. Culverts installed to maintain hydraulic connectivity between wetland locations intersected by the access road would be left in place or removed during the closure stage of the Project on a case-by-case, location-specific basis. If culverts are removed, drainage

channels would be constructed in place of the culverts and organic soil types would be placed. Portions of the access road remaining in place at the closure stage would be loosened and revegetated.

3.3.2 Water Intake Corridor

The water intake corridor would generally include the water intake facility (water intake building, intake pumps, intake pipes, parking area, and a vegetative screen); buried power and communication lines; buried water intake pipeline (from the intake facility to the plant site); and a maintenance road.

At the water intake facility, saleable equipment and salvageable or recyclable materials would be removed and transported off site. Remaining equipment and infrastructure would be removed and transported to a licensed landfill for disposal unless it is determined that abandoning infrastructure in place has a lower environmental impact (e.g., cap the intake pipeline and abandon in place to avoid temporary impacts to the Birch Lake reservoir associated with removal activities). The gravel parking area and access road would be ripped to loosen compacted surfaces and left in place. The vegetative screen would remain in place during the closure stage of the Project.

Buried power and communications lines would be decommissioned and abandoned in place. Once it is confirmed that the power supply to buried power lines has been disconnected, no further action would be performed.

The water intake pipeline between the water intake facility and the plant site would be removed and, if not saleable, salvageable, or recyclable, transported to a licensed landfill for disposal.

The maintenance access road would remain in place until infrastructure within the corridor has been fully reclaimed, after which maintenance access road restoration would be completed. Corridor surface restoration, including the maintenance access road, would consist of loosening compacted surfaces and regrading as needed to facilitate and manage surface runoff.

Additional cover soil would be imported as needed along the water intake corridor (including at the water intake facility). The water intake corridor would be regraded as necessary to restore, to the extent practicable, pre-mining surface water drainage patterns. Erosion control BMPs and general surface water controls to protect water quality, to be applied throughout the closure stage of the Project, are presented in Section 4.0. Once grading is complete, rooting soil would be imported as needed to establish vegetation per Section 5.0.

3.3.3 Transmission Corridor

Electric service would be delivered to the plant site from an off-site electrical substation using overhead electric transmission (power) lines. Overhead electric transmission lines providing power to the plant site would be disconnected from Project infrastructure and then be left in place at the closure stage of the Project. Future use of overhead electric transmission lines and the off-site electrical substation would be determined based on future input from the utility provider. Once it is confirmed power supply to the Project has been disconnected, no further action would be performed.

3.3.4 Corridor Surface Water Management

Reclamation design would aim to create conditions where runoff rates and volumes estimated to reach downstream surface water receptors are similar to pre-mining site conditions. Post-closure grading plans and drainage features would be designed to minimize concentrated flow and limit flow velocities such that, together with the vegetated cover, the resulting site would be stabilized with erosion potential generally similar to pre-mining site conditions. Additional details on placement of cover soils and establishing a growth medium for revegetation is provided in Section 5.2.

3.4 Non-contact Water Diversion Area

Typical existing, end of operations, and closure site conditions for the non-contact water diversion area are shown on Figure 3-14 through Figure 3-16, respectively. The non-contact water diversion area includes a variety of features and supporting infrastructure to divert non-contact water away from the tailings management site, generally including:

- Dikes
- Native soil fill areas
- Non-contact water ponds
- Non-contact water ditches
- Culverts

Reclamation of non-contact water diversion area features would generally include integration of non-structural features into the watershed as permanent landforms. Reclamation of the non-contact water diversion area would also include removal of physical structures (e.g., culverts) as appropriate to support future land use. Erosion control BMPs and general surface water controls to protect water quality to be applied throughout the closure stage are presented in Section 4.0. The general methods for restoration, typically consisting of landscape restoration and revegetation, are described in Section 5.0.

Table 3-3 provides an inventory of non-contact water diversion area features requiring closure and reclamation, and planned reclamation approach.

Table 3-3 Non-Contact Water Diversion Area Features for Closure

Feature Type	Name	Reclamation Approach
Non-contact Water Diversion	Dikes	Reclaimed during the construction stage and integrated into the permanent local watershed
	Native soil fill areas	
	Non-contact water ponds	
	Non-contact water ditches	
	Culverts	Manage in-place if service road is left in place for future land use; otherwise remove and sell, salvage, or dispose – regrade and revegetate as a permanent drainage channel

During the operations stage of the Project, a box culvert would convey non-contact water under the service road connecting the plant site and tailings management site. At the closure stage of the Project, the box culvert would be managed in place if the service road is needed to meet future land use plans. If the service road is not needed to meet future land use plans, the culvert would be removed and salvaged, recycled, or disposed, while the area previously occupied by the culvert would be converted to an open channel, reclaimed, and revegetated as a permanent drainage feature in the local watershed.

Design of non-contact water diversion area features would be developed to control erosion, and water runoff quality, quantity, and rates. Reclamation design would aim to create conditions where runoff rates and volumes estimated for runoff reaching downstream surface water receptors are similar to pre-mining site conditions. Post-closure grading plans and drainage features would be designed to limit flow velocities such that, together with vegetated cover, the resulting non-contact water diversion area would be stabilized with erosion potential generally similar to pre-mining site conditions.

3.5 Tailings Management Site

Typical existing, concurrent reclamation, end of operations, closure, and post-closure site conditions for the tailings management site are shown on Figure 3-17 through Figure 3-21, respectively. The tailings management site includes a variety of primary structures and supporting infrastructure, generally categorized as follows:

- Buildings at the TDP
  - Tailings thickener
  - Filter plant

  - E-house (electrical house), switch yard (electrical), and air compressors
  - Backfill plant
  - Filter cake storage and load-out building
- Pipelines, supporting equipment / infrastructure
- Lined dry stack facility
  - Liner system (including geomembrane liner, under-liner drain, over-liner drain, and blanket toe drain)
  - Groundwater cutoff wall (including a compacted soil seepage cutoff trench and, where needed based on site conditions, a grout curtain) (the groundwater cutoff wall is not shown on figures)
  - Compacted, dewatered tailings
  - Tailings cover system
  - Surface water management system (SWMS)
- Ponds
  - Contact water ponds
  - Settling / detention ponds
  - Emergency pond (at the TDP)
- Electrical / power
- Laydown / storage areas
- Service roads

Reclamation of primary tailings management site structures and supporting infrastructure would generally include leave in place, abandon in place, salvage or recycle (when practicable / feasible), demolition, or disposal. Reclamation of infrastructure types previously described in the Plan would generally follow the previously described reclamation sequence. Unique aspects of these reclamation sequences as applied to the tailings management site are summarized in the following sections. Surface water management at the tailings management site for the closure and post-closure stages of the Project is discussed in Section 3.5.9. Erosion control BMPs and general surface water controls to protect water quality to be applied throughout the closure stage are presented in Section 4.0. The general methods for restoration, typically consisting of landscape restoration and revegetation, are described in Section 5.0.

Table 3-4 provides an inventory of tailings management site features requiring closure and reclamation.

577 Table 3-4 Tailings Management Site Features for Closure

Feature Type	Name	Reclamation Approach
Buildings at the Tailings Dewatering Plant	Tailings Thickener	Remove and sell, salvage, recycle, or dispose – fill and regrade as necessary and revegetate
	Filter Plant	
	E-House, Switch Yard, and Air Compressors	
	Backfill Plant	
	Filter Cake Storage and Loadout Building	
Pipelines	Tailings	Remove and sell, salvage, recycle, or dispose
	Engineered Tailings Backfill	
	Process Water	
Lined Dry Stack Facility	Geomembrane and Soil Liner	Leave in place
	Blanket Toe Drain	
	Base Drain System	
	Seepage Cutoff Trench and Grout Curtain	
	Compacted Filtered Tailings	
	Tailings Cover System	Complete cover placement and revegetate
	SWMS	Complete SWMS and integrate into final closure drainage design
Ponds	Contact Water Ponds	Remove, fill and regrade as necessary, and revegetate (including converting to surface runoff drainage features or wetlands)
	Emergency Pond (at TDP)	
	Non-Contact Water Sedimentation / Detention Ponds (or alternate suspended solids management controls)	
Electrical / Power	Overhead Power Line From Plant Site to the Tailings Management Site	Sell, salvage, recycle, dispose, or leave in place per Section 3.3.3
	Power Distribution Within the Tailings Management Site	
Service Roads and Parking Areas	Service Roads	Leave in place until no longer needed, then regrade as necessary and revegetate; or mitigate as otherwise described per Section 3.3.1
	Parking Areas	

Feature Type	Name	Reclamation Approach
Stockpiles	Reclamation Material Stockpile	Reuse stockpiled material then regrade and revegetate the stockpile footprint
Laydown / Storage Areas	Laydown Areas	Regrade and revegetate

3.5.1 Tailings Dewatering Plant

TDP facilities (including the tailings thickener; filter plant; E-house, switch yard, and air compressors; backfill plant; and the filter cake storage and load-out building) at the tailings management site would be reclaimed at the closure stage of the Project using the general methods as described for other buildings, such as presented in Section 3.2.2. In summary, building content would be inventoried to identify materials and equipment for sale, salvage, recycling, or demolition and disposal. Tailings remaining in the tailings thickener would be removed and transported below grade to the underground mine area for mine backfill or be dewatered at the filter plant and transported to the lined dry stack facility. The filter equipment could have use by other mining operations, depending on equipment condition, and if so, would be cleaned, disassembled, and transported off site. The remaining unusable, salvageable, or recyclable portions of the buildings would be demolished, with demolition material properly disposed of, and then the site reclaimed using methods as previously described for plant site buildings.

3.5.2 Pipelines

At the end of the operations stage of the Project, the tailings supply lines (from the concentrator to the tailings thickener), engineered tailings backfill pipeline (from the backfill plant to the declines), and other associated tailings and process water pipelines not needed to continue management of contact water at the lined dry stack facility during the closure stage of the Project, would be flushed with clean make-up water to transport remaining tailings to the lined dry stack facility or a tailings management site contact water pond. Where possible, the pipelines would then be blown out, using compressed air and a pipe cleaning pig, to push make-up water remaining in the pipelines to a tailings management site contact water pond or to collection points where the water would be captured with a vacuum truck and then transported to the lined dry stack facility or an appropriate off-site disposal facility. Once emptied, pipelines would be removed. Pipeline segments would be disassembled and pipes would be salvaged and recycled or disposed of. Other pipelines used for contact water management during the closure stage of the Project, and possibly during the post-closure stage, would be managed using the same approach described, once they are no longer needed.

3.5.3 Lined Dry Stack Facility

Dry stack facility closure and reclamation is described by component in the following sub-sections of Section 3.5.3.

Dry Stack Facility Liner and Base Drain System

The lined dry stack facility would have a geomembrane and compacted soil liner, over-liner and under-liner drainage systems, blanket toe drain, and seepage cutoff and grout curtain constructed in increments, as needed for tailings storage through the life of the Project. This lined dry stack facility infrastructure would remain in place at closure.

During operations (including concurrent reclamation of the lined dry stack facility), dry stack facility draindown and seepage, if they occurred, would be collected and managed with the contact water system as described in the MPO. During the closure stage of the lined dry stack facility, the dry stack facility cover system would mitigate the generation of dry stack facility draindown and seepage. If draindown and / or seepage occurred and did not meet water quality requirements, and if planned management methods without treatment of water are no longer available, treatment technologies would be evaluated to identify additional management methods to meet water quality standards. Section 4.4 discusses water treatment. If draindown and / or seepage did occur and was shown by monitoring to meet surface water quality requirements, it would be routed to non-contact water ditches and discharged to the environment. The contact water ditches and contact water ponds would be reclaimed and revegetated as permanent drainage features. This would include constructing permanent channel outfalls from the contact water ponds to adjacent wetland complexes near the lined dry stack facility.

External Slopes and Dry Stack Facility Surface

The lined dry stack facility would include berms of densely compacted tailings placed on the dry stack facility perimeter to contain tailings-contact surface runoff, and draindown that may emanate from the dry stack during the operations stage of the Project and associated concurrent reclamation activities. Tailings placed on the perimeter, after completed to finished grade, would be concurrently reclaimed. The dry stack facility lined area would be constructed in three stages, generally starting on the west side of the dry stack facility nearest the TDP, and progressing eastward during the life of the Project. The perimeter berms would correspondingly be constructed in increments as tailings are generated and as needed to accompany dry stack facility liner construction and to provide the necessary liquid containment. The exterior face of the perimeter berms would be vegetated concurrent with their construction and BMPs, such as silt fences, erosion control mats and / or logs, and temporary mulch erosion controls, placed until vegetation became established. Therefore, the only reclamation required for the dry stack facility perimeter berms

would be associated with repair of areas disturbed by dry stack facility concurrent reclamation activities.

Conceptual Design of Dry Stack Facility Cover

Throughout the operations stage of the Project, areas of the lined dry stack facility would be filled to final grade and reclaimed. This concurrent reclamation approach would aid in:

- Minimizing particulate emissions from the stacked tailings;
- Minimizing infiltration of precipitation into the tailings and contact water runoff from the tailings, and the resulting generation of runoff and draindown requiring further management;
- Facilitating diversion of non-contact surface runoff to the environment following appropriate suspended solids removal; and
- Reducing financial assurance obligations upon final project completion.

For final dry stack facility operating areas, and other supporting operating areas within the tailings management site not concurrently reclaimed during the operations stage of the Project, reclamation would occur at the closure stage. Reclamation of the dry stack facility surface, whether concurrently or at the closure stage, would consist of fine grading of the tailings surface as needed, followed by placement of any required hydraulic barrier, a vegetation rooting media, then revegetated as described in Section 5.0. The perimeter of the lined dry stack facility fill area (within the tailings management site), which would have a relatively long 4 horizontal – to 1 vertical (4H:1V) finished slope at some locations, would incorporate intermediate non-contact water ditches to transfer runoff downslope and minimize erosion risk.

The filtered tailings placed in the lined dry stack facility would be compacted and placed at grades and contours that would promote drainage and minimize differential settlement and ponding, and would be designed to remain stable post-closure. The relatively flat tailings fill slopes (at 4H:1V and flatter) would aid in achieving and maintaining both operational and post-closure stability.

A cover system designed to function as a growth medium to support revegetation would be installed over the dry stack facility. The cover is anticipated to consist of a cover soil underlain by a hydraulic barrier. The type of hydraulic barrier would be selected based on future design evaluations that would assess compatibility with infiltration design criteria and availability of cover soil materials. Infiltration criteria would be determined based on future tailings geochemistry test work results and permitting requirements. At least 2 ft (0.6 m) of cover soil would be placed over the dry stacked tailings. Cover soil would be sourced from reclamation material stockpiles produced as part of tailings management site footprint development. If material stockpiled from initial site clearing is insufficient to meet volume requirements to establish the minimum 2 ft (0.6 m) soil cover, then supplemental cover soil would be imported once on-site material is consumed. Cover soil would be

seeded to establish grasslands per the final land use description provided in Section 11.0. Additional details on placement of cover soils and establishing a growth medium for revegetation is provided in Section 5.2.

Dry Stack Facility Surface Water Management for Non-Contact Water

The conceptual arrangement of surface water management at the lined dry stack facility during concurrent reclamation in the form of a site conceptual model (cross-section) is shown in Figure 3-22.

The contouring of the dry stack facility surface and placement of cover material would be done in a manner that promotes runoff and inhibits infiltration (e.g., avoid large surface depressions resulting in water ponding) to reduce (as far as practicable) the volume of contact water produced during dry stack facility construction. Tailings would be preferentially placed as part of operations and likely relatively little grading would be required to establish a finished slope towards the perimeter of the lined dry stack facility; this grading would occur as part of routine dry stack facility operations. Filling of the lined dry stack facility would generally be from west to east.

The placement of tailings at the lined dry stack facility would be managed to support concurrent reclamation of the facility. The lined dry stack facility would be incrementally filled to grade, and once covered, the non-contact surface runoff would drain to non-contact water ditches. The post-closure surface of the dry stack facility would be graded to drain toward the perimeter of the dry stack facility. Non-contact water runoff from the dry stack facility would be collected in non-contact water ditches on the exterior slope of the dry stack facility to convey water toward the toe of the dry stack facility perimeter embankment.

Initially (including during concurrent reclamation) the non-contact water ditches on the lined dry stack facility would drain to controls for removal of suspended solids. Controls for suspended solids removal may include temporary dedicated settling / detention ponds, contact water ponds, or other controls to be determined as part of future design. Water from non-contact water controls would drain to the environment following removal of suspended solids. Once the lined dry stack facility surface was fully revegetated and vegetation growth dense and well established, runoff may no longer require suspended solids removal to meet water quality standards. Once suspended solids removal is no longer necessary, runoff would be discharged directly to the environment. Water from contact water ponds would be managed as described elsewhere in this Plan.

Non-contact water ditches would be maintained throughout concurrent reclamation activities and would be integrated into permanent drainage features at the tailings management site during the closure stage of the Project. The non-contact water ditches that would be incorporated into the closed and reclaimed surface of the dry stack facility would reduce the uninterrupted flow length on the sloped areas of the

dry stack facility cover. Ditch revetment or riprap would be sized based on the range of flow velocities, flow depth, and channel shear stresses associated with the design storm event(s).

Once vegetation has matured on the dry stack facility surface, little erosion and siltation would be anticipated. As a result, for long-term closure, the temporary settling / detention ponds would be breached (or other suspended solids controls removed) and allowed to develop vegetation on a natural time scale and eventually develop into grasslands with no additional management. If controls other than settling / detention ponds are utilized, they would also be removed and the area they occupied would be reclaimed.

Leaving the lined dry stack facility largely in place in the final reclaimed landform would result in different drainage patterns compared to pre-mining conditions. Reclamation would include the use of surface water management features to control erosion and water runoff quality, quantity, and rates. Per state requirements, drainage would also be reintegrated into the natural watershed within three years of the start of closure.

Reclamation design would aim to create conditions where runoff rates and volumes are similar to runoff reaching downstream surface water receptors for pre-mining site conditions. Post-closure grading plans and drainage features would be designed to minimize concentrated flow and limit flow velocities such that, together with the vegetated cover, the resulting site would be stabilized with erosion potential generally similar to pre-mining site conditions. Stormwater would be collected in non-contact water ditches that discharge into the settling / detention ponds (or alternate controls) allowing for settlement of suspended solids before discharging to surrounding surface water receptors. The primary receiving water bodies downstream of the lined dry stack facility for non-contact water that meets surface water requirements would be Keeley Creek and the Birch Lake reservoir. Erosion control BMPs to be applied throughout reclamation are presented in Section 4.0.

3.5.4 Ponds

Ponds no longer needed at the tailings management site would be reclaimed in the same manner described in Section 3.2.8 for the Plant Site ponds. Ponds planned to remain would be reclaimed and revegetated as permanent drainage features. This would include constructing permanent channel outfalls from contact water ponds and settling / detention ponds to adjacent wetland complexes near the lined dry stack facility. Vegetation would be re-established per Section 5.0.

3.5.5 Electrical / Power

Unless a post-closure use is determined for the power lines between the plant site and the tailings management site, power lines and distribution facilities at the tailings management site would be dismantled (including the power line from the plant site

substation to the tailings management site) and reclamation performed in the manner previously described in Section 3.2.3.

3.5.6 Tailings Management Site Service Roads

Tailings management site service roads and associated infrastructure (e.g., parking areas) would be maintained in a form appropriate to provide access through the closure and into post-closure stages of the Project including access for monitoring. Once no longer needed for access, tailings management site service roads would be reclaimed. The reclamation approach would be similar to what is described for the Project access road in Section 3.3.1. The primary reclamation objective for the roads would be to provide long-term stabilization and surface water management consistent with the intended post-closure land use.

3.5.7 Reclamation Material Stockpile

Tailings management site reclamation material stockpiles would be closed by utilizing the stockpiled material to reclaim the lined dry stack facility surface and adjacent disturbed areas. Remaining reclamation material (if any) would be transported to the plant site to support reclamation activities. No reclamation material stockpiles would remain after the closure stage of the project.

The tailings management site reclamation material stockpile area would be regraded and re-vegetated as necessary to achieve desired surface runoff and re-vegetated surface conditions. Vegetation would be re-established per Section 5.0.

3.5.8 Laydown and Storage Areas

Saleable equipment and salvageable or recyclable materials in laydown and storage areas would be removed and transported off site. Other debris would be hauled to a licensed landfill for disposal.

Additional cover soil would be imported as needed and the laydown and storage areas would be regraded as necessary to restore, to the extent practicable, pre-mining surface runoff conditions. Vegetation would be re-established per Section 5.0.

3.5.9 Surface Water Management

The feature with overriding impact on surface water management within the tailings management site would be the lined dry stack facility. Surface water management is described in Section 3.5.3. Elsewhere within the tailings management site reclamation design, TMM would aim to create conditions where runoff rates and volumes estimated for runoff reaching downstream surface water receptors are similar to pre-mining site conditions. Post-closure grading plans and drainage features would be designed to minimize concentrated flow and limit flow velocities such that, together with the vegetated cover, the resulting tailings management site

would be stabilized with erosion potential generally similar to pre-mining site conditions. Additional details on placement of cover soils and establishing a growth medium for revegetation is provided in Section 5.2.

3.6 Other Supporting Infrastructure

Other supporting infrastructure would be removed or closed prior to or during the closure stage of the Project, unless required to support an agency-approved post-closure land use.

3.6.1 Drill Holes and Wells

TMM routinely seals their exploratory borings in accordance with requirements of Minn. R., part 4727.1000 through 4727.1250 and additional Minn. R. referenced therein. At the closure stage of the Project, temporarily sealed boreholes would be scheduled for permanent sealing within 10 years of temporary seal installation. Borehole permanent sealing would be scheduled to occur as soon as practicable within this 10-year window. For example, an exploratory borehole installed and temporarily sealed 4 years prior to closure would be permanently closed within 6 years of initiation of closure, but possibly sooner, dependent on the number of wells needing permanent closure.

Wells (including monitor wells, water supply wells, and piezometers associated with the Project) not needed for post-closure monitoring would be plugged and abandoned by a licensed well driller in accordance with applicable state rules (e.g., Minnesota Department of Health [MDH]) and local requirements.

Many drill holes and wells would be sealed and plugged concurrent with the operations stage of the Project when determined to have no future use. A plan describing drill hole and well abandonment procedures and locations would be developed prior to the construction stage of the Project and then would be routinely updated to document new and abandoned locations. Plans for monitor well, water supply well, piezometer, and / or exploratory borehole abandonment required to be established during initial permitting of these installations would be followed and may supplant the need for further action and / or supersede requirements of this Plan.

Access roads and drill pads authorized by the MDNR, and U.S. Forest Service (USFS) where required, would continue to be decommissioned in accordance with specific requirements of TMM's associated Plan of Operation for the specific drilling activities to be performed, and per requirements of the corresponding Stipulations to Federal Hardrock Minerals Prospecting Permits. These permits are on file with the authorized regulatory agencies and with TMM, and the corresponding stipulations are not repeated herein.

3.6.2 Fencing

Prior to final reclamation, installed fences around the plant site, tailings management site, and other Project locations would be removed, unless otherwise deemed necessary to support an agency-approved post-closure land use or ongoing access restriction.

3.7 Material Disposal

3.7.1 Product Disposal

Product (concentrate) would be shipped to customers. If product cannot be shipped, such as that recovered from pre-demolition building clean-up, it would be disposed in an appropriate off-site landfill.

The reagent suppliers, which would be under contract to TMM, would remove reagents remaining at the closure stage of the Project. In many cases, the suppliers of chemicals and equipment would be responsible for furnishing tanks and would therefore also be required to remove and dispose of those tanks during closure.

3.7.2 Demolition Waste Disposal

It is anticipated the majority of the demolition waste (material not salvageable, saleable, recyclable, or reusable) from removal of structures would be acceptable for disposal in a new (location to be determined) or existing demolition debris landfill. Concrete from demolition, with the exception of oil-stained concrete, would be crushed and used for on-site structural fill for closure, placed in building basements where possible, or placed in landfills as required. Oil- or chemical-stained concrete would be managed as solid waste.

3.7.3 Solid Waste and Industrial Solid Waste Disposal

Solid waste and industrial solid waste would be managed per the requirements of Minn. R., chapter 7035. Solid waste and industrial solid waste, not recyclable or of other suitable alternate end use, would be disposed of in a permitted solid waste or industrial solid waste land disposal facility.

3.7.4 Special Material Disposal

For this Plan, special materials is defined as those materials not classified as demolition debris, not classified as solid waste, and not a RCRA-regulated material. Management of special materials may be governed by local ordinance and / or by a subpart of Minnesota Pollution Control Agency (MPCA) solid waste rules. Special materials on site at the time of closure may include nuclear sources, partially used paint, chemical and petroleum products, fluorescent and sodium halide bulbs,

batteries, electronic waste, lighting ballasts, and small capacitors. These materials would be safely collected, removed, and properly recycled or disposed.

Nuclear sources would be disposed in accordance with U.S. Nuclear Regulatory Commission (USNRC) regulations, as regulated by the MDH pursuant to their 2006 agreement with the USNRC.

Partially used paint, chemical, and petroleum products would be collected and properly recycled or disposed.

Fluorescent and sodium halide bulbs would be removed from fixtures, collected, and properly disposed.

4.0 WATER QUALITY

4.1 Erosion Control BMPs

Erosion control BMPs would be implemented concurrent with the seeding and revegetation processes. In seeded areas with slopes of 4H:1V or flatter, mulch would be applied. Mulching material would consist of straw, prairie hay, or other suitable mulch type, and would be applied uniformly over the soil surface within 24 hours after seeding. Immediately after placement, mulch material would be anchored into the soil by crimping (straight disking) in a direction perpendicular to the overland stormwater flow.

In seeded areas with slopes steeper than 4H:1V, mulch, biodegradable erosion control blankets, or other BMPs would be installed. If erosion problems impacting the ability to achieve overall reclamation objectives occur, then other controls would be evaluated and implemented as appropriate based on the observed conditions, root cause of the erosion, and reclamation goals targeted.

The Project would meet sediment yield requirements as per Minnesota Permit MN R100001, consisting of the state-wide National Pollutant Discharge Elimination System (NPDES) / State Disposal System (SDS) Construction Stormwater Permit for discharges of stormwater from areas of land disturbance during reclamation activities (where stormwater has not mixed with contact water). BMPs for the Project would include erosion and sediment controls, conveyance, stormwater diversions, and treatment structures, in addition to procedures used to minimize the exposure of stormwater to pollutants or to remove pollutants from stormwater.

4.2 Groundwater Quality

The groundwater quality monitoring network, sampling schedule, and analytical parameters established for permit compliance would be reviewed as part of closure

planning – generally within 12 to 18 months prior to planned closure. The purpose of the review would be to:

- Identify groundwater quality monitor wells for which sampling can cease at the time of planned closure;
- Identify changes to the analytical parameter list that can be made at the time of planned closure; and
- Identify modifications to the groundwater quality monitoring schedule that can be implemented at the time of planned closure.

One or more of the changes noted may be warranted due to the decreased risk to the environment presented by the post-closure condition in comparison to the routine operating condition.

Post-closure review of the groundwater quality monitoring network, sampling schedule, and analytical parameters list would occur periodically and at minimum once every other year during the first 10 years of closure, and once every 5 years thereafter, unless mutually agreed otherwise by TMM and the MPCA, through negotiation or by permit condition.

4.3 Surface Runoff Control

Surface runoff originating from the interior dry stack facility surface would be collected and used as described in the MPO or possibly discharged underground at the mine site (assuming it meets discharge standards).

Surface runoff quality would be managed after closure and reclamation to meet applicable surface water quality standards. Surface runoff from the reclaimed dry stack facility surface and embankment slopes would be contained in settling / detention ponds when necessary. The settling / detention ponds would remove suspended sediments from the runoff prior to discharge to the environment.

The proposed restoration of the plant site and corridor surfaces to generally mimic pre-mining conditions would result in runoff water quality similar to pre-mining conditions.

A surface runoff sampling plan would be developed 12 to 18 months prior to planned closure, then implemented at the Closure stage of the Project to confirm compliance with surface water quality standards.

4.4 Water Treatment

TMM anticipates closure of the Project with no need for water treatment and associated surface water discharge permit. Further test work and engineering analyses of tailings geochemistry and the overall site water balance is required to verify this conclusion. If test work and engineering analyses show water treatment or

other water management methods are required, then water treatment systems and management methods would be evaluated and designed as part of future studies. Should water treatment or another management method be necessary, this Plan would be updated to address closure and reclamation of water treatment systems.

5.0 REVEGETATION

Revegetation during the operations stage (concurrent reclamation) and the closure stage would be carried out according to the information and data obtained from studies related to revegetation initiated at the start of mining, including studies of seed mixtures, growth media, and soil amendments. Existing land cover at the plant site and lined dry stack facility are shown on Figure 5-1.

5.1 Reference Sites and Revegetation Test Plots

Reference sites (areas to be undisturbed by the Project) would be identified, evaluated, and selected prior to mining as a method to monitor and document pre-mining vegetation type and quality at various locations on the Project (i.e., plant site, corridors, and the tailings management site) and natural variation in vegetation type and quality over time. Monitoring at reference sites would not only aid in developing concurrent-reclamation and closure-stage-reclamation-vegetation type and quality targets, but also make it easier to judge when revegetation could be considered complete.

5.2 Soil Preparation / Management

During concurrent reclamation and the closure stage of the Project, salvaged or manufactured growth media (a material having sufficient combinations of organic, mineral, and nutrient content to sustain vegetation) would be placed over the surface of the areas to be reclaimed. Growth media would be salvaged and stockpiled during the construction stage of the Project. If additional growth media is required, then it would be manufactured on site by mixing stockpiled inorganic mineral soil with organic soil / peat salvaged during the construction stage of the Project or it would be imported from off-site borrow sources as appropriate. Revegetation test plots would be used to test a range of growth media thicknesses.

At the tailings management site, a plant growth medium (reclamation material / topsoil) would be placed on top of dry stack facility areas, as part of concurrent reclamation, and as part of remaining closure stage reclamation activities. The dry stack facility subsoil materials would be shaped to facilitate proper drainage.

Through the process of stripping and stockpiling, essential soil microbes are destroyed. Their presence would be essential to vegetation establishment success. Restoration of soil microbes would occur through a two year sequence of cover cropping prior to planting the final perennial cover as described in Section 5.3.

5.3 Plantings

Plant communities selected for revegetation would be confirmed based on reference site and revegetation plot findings. Until then, plant communities have been selected considering climate change and the anticipated evolution of plant communities in the project region. These native plant communities are expected to readily establish and evolve on the site.

Target plant communities would include:

- Lined Dry Stack Facility: Diverse grasslands with pollinator species;
- Plant Site: Range of mixed hardwood pine forest to jack pine barrens;
- Non-contact water diversion area: Drainage features and a range of mixed hardwood pine forest to jack pine barrens; and
- Corridors: Range of mixed hardwood pine forest to jack pine barrens (unless an alternate future use is identified for the corridor and / or infrastructure).

Seed mixes along with a cover crop would be planted as soon as practicable after growth medium is placed, to quickly establish and to provide comprehensive cover that would help mitigate erosion. It would also provide a diversity of species that can thrive on site and would provide valuable wildlife habitat for birds, insects, reptiles, and mammals.

Scheduling of reclamation activities would occur as soon as possible after the mining activities in an area are completed, thus minimizing erosion and sedimentation. General scheduling procedures to be followed would include, but would not be limited to, the following:

- Grading, drainage control establishment, and maintenance would be conducted in late spring to late summer;
- Seedbed preparation would be conducted prior to seeding; and
- Seeding would preferably be completed in mid to late fall or in winter.

In some cases, early to mid-spring seeding would take place when weather constraints or other unavoidable circumstances preclude fall seeding.

During the life of the mine, concurrent reclamation and interim reclamation would be performed wherever possible, to reduce erosion and weed invasion. The remainder of the revegetation would occur following the cessation of site activities.

5.4 Revegetation Success Criteria

TMM anticipates proposing revegetation success criteria consistent with Minn. R., part 6132.2700 Vegetation, which generally require:

- Evaluate the vegetation growth on the reclaimed facilities for ten seasons. The evaluations would consist of field measuring established transects for percent ground cover and species composition. Sampling would be conducted at the "peak green season;"
- After three growing seasons, revegetation would be considered successful if there is 90% ground cover within a 90% confidence interval, consisting of living vegetation and its litter. Within 10 growing seasons following the initiation of vegetation, the vegetative community would have characteristics similar to those of the approved reference sites. After the evaluation and documentation that the revegetation standards for the project have been achieved, TMM would request the release from permit obligations related to revegetation; and
- If revegetation standards for a site have not been achieved, TMM would evaluate the best course of actions necessary to meet the reclamation goals. If appropriate, seeding would again be conducted during the upcoming season.

During vegetation establishment, selective weed control practices would be implemented to limit the growth and spread of noxious weeds and to ensure revegetation is successful.

To meet vegetation management goals, periodic site evaluations during the growing season (May-October) are critical during the first few years of vegetation establishment. Monitoring is useful in identifying issues, tracking progress, and reevaluating management needs.

A site evaluation and vegetation maintenance plan for each site visit would be produced each year in June and may include:

- Issues observed with vegetation establishment such as compacted soils, failure of seeding and / or invasive species encroachment;
- Proposed management activities;
- Schedule of management activities;
- Issues with stormwater management such as flooding; and
- Issues with soil management such as erosion or new ground disturbance.

Vegetation monitoring would be differentiated between an establishment phase (1 to 3 years) and a maintenance phase (3+ years).

5.5 Wildlife

Revegetation plans would proceed as described in Sections 5.2 through 5.4 and on the basis of reference site and revegetation plot outcomes. Wildlife are supported and sustained by existing site conditions, and are expected to naturally remain throughout the mining operation due to the limited extent of the planned surface

disturbance. Post-closure conditions would gradually mimic surrounding conditions and therefore should support a similar diversity and density of wildlife as compared to pre-mining site conditions.

6.0 RECLAMATION EQUIPMENT AND RESOURCES

TMM would rely on local and regional consultants and contractors for implementation of this Plan. There are no specialized skills or expertise required for Plan implementation not available locally and regionally. In addition to engineering and science personnel normally engaged to plan and support reclamation, local and regional construction contractors would also be utilized for removal / demolition of Project infrastructure and for closure of infrastructure described within this Plan. Typical contractor services and equipment required and readily available include:

- Erosion control contractors
- Earthwork contractors
- Demolition contractors
- Licensed well drillers
- Electricians
- Surveyors
- Waste management contractors (recycling, solid waste, hazardous waste)
- Landscape / seeding contractors

There would be no specialized equipment needed to implement requirements of this Plan. Plan implementation would be by local / regional contractor direct hire and competitive bidding as determined by TMM.

7.0 VARIANCE FROM RULES

TMM does not currently anticipate the need for rules variances to implement this Plan. As Project definition and design progress, variances from rules may be identified and would be added to future Plan updates. Requests for variance from Minn. R., part 6132.3200 Closure and Post-closure Maintenance requirements would be formally prepared and submitted per requirements of Minn. R., part 6132.4100 at the time application is made for a PTM.

8.0 CLOSURE TIMELINE

8.1 Planned Closure

Per Minn. R., part 6132.0100, closure means the process of terminating and completing final steps in reclaiming any specific portion of a mining operation. Closure begins when there would be no renewed use or activity by the permittee. In this Plan, concurrent reclamation is reclamation that occurs during the operations

stage of the Project. Other reclamation activities would take place during the Closure stage of the Project.

Planning for closure and reclamation would be an on-going process that results in progressive updates to this Plan based on environmental review, permitting, design, construction, and operations. Closure planning studies would start well before the end of the operations stage of the Project in order to provide the necessary information to inform reclamation approaches that would successfully achieve reclamation requirements, including requirements of Minn. R., part 6132.3200 (for brevity, rules are not repeated herein). During the closure stage, a closure team would be required to manage reclamation and closure activities within the Project.

A summary of the reclaimed Project components, the general reclamation approach for each component, and an estimated schedule for the closure and post-closure maintenance stages of the Project is provided in Attachment B.1. The schedule is provided in terms of closure years (i.e., closure year 1) and is not assigned a calendar year at this time. This schedule would be updated when the permitting process is sufficiently advanced to estimate a beginning date for the operations stage of the Project.

8.2 Temporary Closure

In the event continuous, full-scale production is interrupted due to economic considerations or unforeseen circumstances, temporary closure and interim reclamation may be initiated. Temporary closure would be implemented in accordance with requirements of Minn. R., part 6132.3200, subpart 2.

Several approaches may be necessary to plan for temporary closure. There are differences between long-term and mid-term plans, with a mid-term plan utilizing a strategy assuming commodity prices or other issues would recover reasonably quickly. However, commodity price movements cannot be accurately predicted with certainty. Therefore, even with the mid-term closure scenario, it is prudent to plan for the possibility prices do not recover quickly and long-term closure may eventually be the best option.

Some temporary closure actions may be similar to final closure actions, while others would be different based on an objective to maintain the mine in a state suitable for resumption of operation at a later date. These various objectives would be carefully considered and reevaluated as necessary or if new information arose.

Interim reclamation for various categories of infrastructure would include:

- Mine Ventilation and Access – mine ventilation would continue only as may be needed for temperature and humidity control to protect in-mine infrastructure. The mine portal and declines would be secured as necessary to prevent unauthorized access;

- Process Facilities – applicable process facilities and support systems would be maintained in a condition conducive to reasonably rapid restart;
- Power Lines – power lines would be inspected regularly and maintained as necessary;
- Roads – the access road and service roads would receive maintenance, as necessary;
- Erosion Control Measures – erosion control measures and BMPs would be regularly inspected and maintained;
- Buildings – buildings, equipment, and support facilities would be protected from public access and maintained as necessary;
- Pipelines – pipelines would be drained of contents to the extent feasible and placed in an idle operating condition;
- Lined Dry Stack Facility – the lined dry stack facility would remain open and available to restart, with liquids collection and dust control continued as needed until routine operations resume – some areas may receive temporary cover; and
- Environmental Monitoring – required environmental monitoring would continue.

Infrastructure would undergo routine drive-by inspection, with on-ground detailed inspection as needed, to confirm systems remained in their intended temporarily closed condition, and no vandalism or unauthorized access had occurred.

8.3 Contingency Closure

If operations ceased prior to the planned closure date, some of the actions included in this Plan could require modification appropriate to the conditions existing at the time of unplanned closure. These modifications would be documented in a final closure plan prepared at that time.

The first-year Reclamation Plan would require establishment of financial assurance commensurate with the liabilities existing at the time of Plan issuance and anticipated to accrue through the first year of Project implementation. Financial assurance obligations would be tabulated and costs estimated at the time project permitting has progressed to the point where the final project has been confirmed and generally accepted, though not yet fully permitted, by the appropriate regulatory agencies. For this Plan the BLM and the MDNR are anticipated to have primary responsibility for Plan approval, with the MDNR having primary responsibility through their PTM process for establishment of financial assurance mechanisms and dollar amounts. Adequacy of financial assurance would be reviewed and updated on an annual basis in conjunction with preparation of the annual report required by the MDNR PTM.

9.0 CLOSURE DOCUMENTATION AND REPORTING

Concurrent with preparation of the application for MDNR PTM, TMM would update this Plan as needed to account for the Planned Closure, Temporary Closure, and Contingency Closure of the final project design and infrastructure. Implicit within the Plan would be compliance with Minn. R., part 6132.3200 for Closure and Post-closure Maintenance. A tabular summary of infrastructure and equipment and corresponding closure requirements would be prepared to support permitting and establishment of financial assurance. Closure documentation and reporting would be to the MDNR, with a completed tabular summary, photographic documentation, and cost accounting for planned, temporary, and contingency closure required. A written summary of any special closure conditions and maintenance requirements and listing of responsible parties would accompany the closure documentation and reporting. The report would generally be submitted consistent with the established annual report submittal timeline, unless an alternate timeline were established by conditions of the PTM.

10.0 POST-CLOSURE MAINTENANCE, MONITORING, AND REPORTING

Objectives for closure incorporated in this Plan include restoration to pre-mining conditions to the extent practicable and desirable, continued protection of human health and the environment, and the minimization of post-closure maintenance and monitoring requirements. During the post-closure period, personnel would be retained, or subcontracted as required, to manage reclamation maintenance and monitoring activities within the Project.

10.1 Maintenance and Monitoring

Anticipated post-closure maintenance activities are listed in Table 10-1. Content in this table would be updated as Project definition is refined through environmental review, design, and permitting. The Project would be closed with the objective of minimizing post-closure inspection, maintenance, and monitoring activities. Closure objectives would vary between different sites encompassing the overall Project footprint.

1195 Table 10-1 Post-Closure Maintenance and Inspection

Site	Maintenance Item / Activity	Duration	Reference Section(s)
Underground Mine Area	Vegetation monitoring (at ventilation raise site reclaim areas)	Until success criteria are satisfied	5.4
	Ventilation raise site closures – confirmation of closure integrity and absence of ground subsidence	Twice annually – post-closure stage years 1 through 3	n/a
Plant Site	Vegetation monitoring	Until success criteria are satisfied	5.4
	Confirmation of surface runoff and erosion control performance	Twice annually during post-closure stage years 1 through 3, plus following severe rain events	n/a
Non-Contact Water Diversion Area	None planned as the non-contact water diversion area would be reclaimed during the operations stage of the Project	n/a	n/a
Corridors	Vegetation monitoring	Until success criteria are satisfied	5.4
	Confirmation of surface runoff and erosion control performance	Twice annually during post-closure stage years 1 through 3, plus following severe rain events	n/a

Site	Maintenance Item / Activity	Duration	Reference Section(s)
Tailings Management Site	Vegetation monitoring	Until success criteria are satisfied	5.4
	Confirmation of surface runoff and erosion control performance, with runoff and erosion repair until erosion no longer occurs	Twice annually during post-closure stage years 1 through 3, plus following severe rain events, once annually thereafter plus following severe rain events through duration of post-closure stage	n/a
	Lined dry stack facility draindown and seepage water management	Until draindown and seepage (if they occur) ceases or applicable water quality standards are met	n/a
	Confirmation of dry stack facility cover system integrity	Initiated if, post-closure, there is initiation of and / or an increasing trend in quantity of draindown and seepage at the lined dry stack facility	n/a
	Water quality monitoring (wells and surface water stations)	Until applicable water quality standards are met without treatment (e.g., treatment for removal of suspended solids)	n/a
	Piezometers and inclinometers	As specified by dry stack facility geotechnical engineer	n/a

The dry stack facility cover system would mitigate the generation of dry stack facility draindown and seepage. If post-closure draindown and / or seepage did occur, it would be managed using approaches described in Section 3.5.3.

10.2 Reporting

Anticipated post-closure reporting activities are listed in Table 10-2. Because the Project would be closed with the objective of minimizing post-closure inspection, maintenance, and monitoring activities, post-closure reporting obligations would also be minimized.

Table 10-2 Post-Closure Reporting

Site	Documentation and Reporting	Frequency of Reporting
Underground Mine Area	Vegetation density, condition, and type	Post-closure years 1 - 5
	Surface runoff controls	Post-closure years 1 - 5
	Ventilation raise sites closure condition	Post-closure years 1 - 3, 5-year increments thereafter to year 25
Plant Site	Vegetation density, condition, and type	Post-closure years 1 - 5
	Surface runoff controls	Post-closure years 1 - 5
	Portal closure condition	Post-closure years 1 - 3, 5-year increments thereafter to year 25
Non-Contact Water Diversion Area	None planned as the non-contact water diversion area would be reclaimed during the operations stage of the project	n/a
Corridors	Vegetation density, condition, and type	Post-closure years 1 - 5
	Surface runoff controls	Post-closure years 1 - 3
Lined Dry Stack Facility Site	Vegetation density, condition, and type	Post-closure years 1 - 5
	Water quality1	Post-closure years 1 - 25
	Surface runoff controls	Post-closure years 1 - 25

[1] In compliance and coordination with NPDES and other applicable permits.

Findings from post-closure inspections would be incorporated into annual reporting as required by the PTM.

11.0 FUTURE LAND USE RESTRICTIONS

Future land uses would be restricted in the following primary areas:

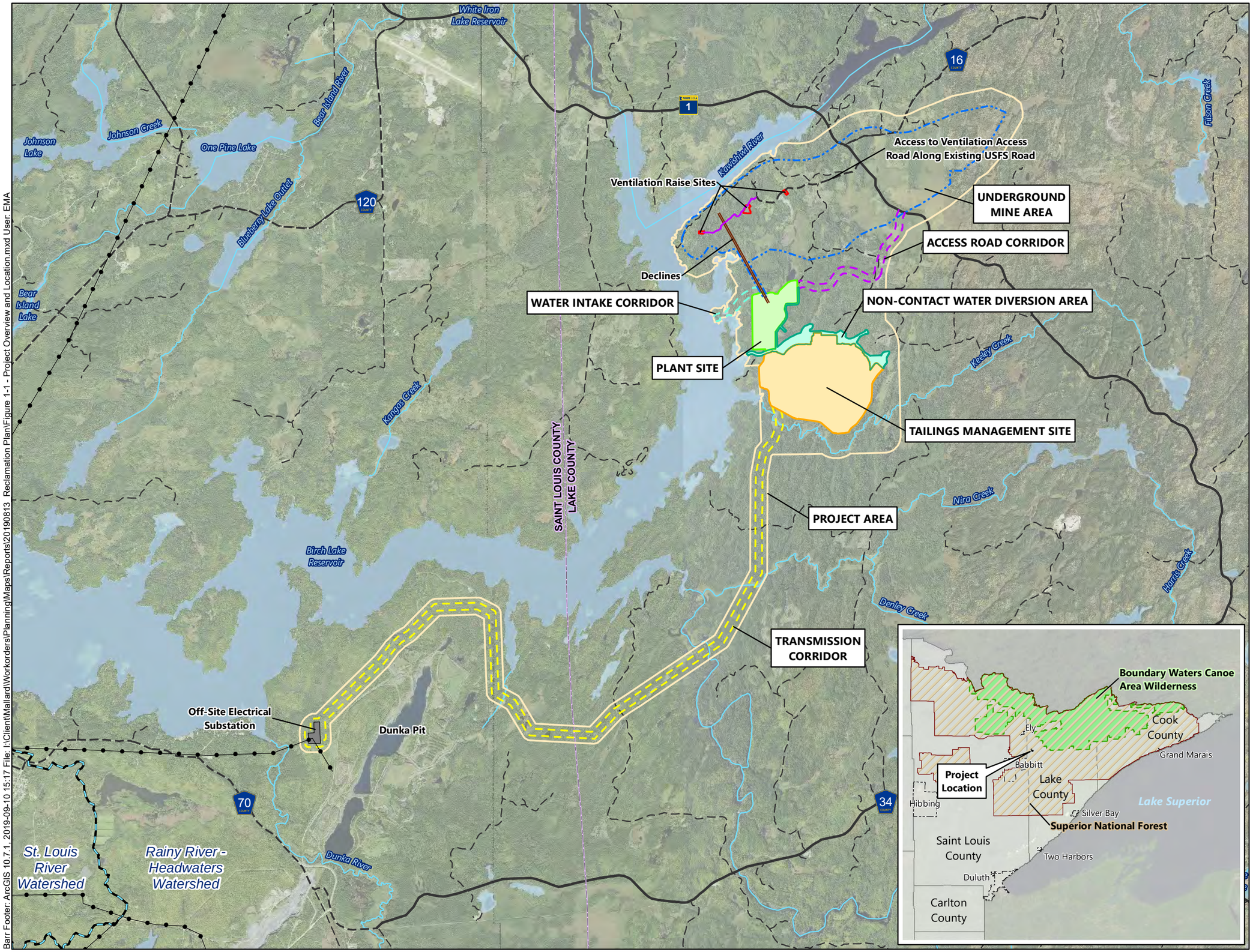
- Closed ventilation raise site locations;
- Closed mine portal location; and
- Closed dry stack facility.

At the ventilation raise sites and mine portal locations, the proposed land use presented in Section 2.2 would be matched to the anticipated final ground condition at the Closure stage of the Project. At the ventilation raise sites and mine portal locations, heavy loads from large structures would be prohibited. Such loads could, in an extreme case, cause subsidence of the ventilation raise closure systems and, though highly unlikely, the mine portal closure. At ventilation raise sites and mine portal access locations the near-surface closure systems would be of high strength and durability, but subsurface excavations even at these locations by large construction equipment as might occur for a large-scale structure could damage the

closure systems. Deed restrictions would be established to ensure future land owners were informed of these land use constraints.

The tailings stored at the lined dry stack facility, though compacted during placement, could have some potential for post-closure differential settlement, and further, may have insufficient bearing capacity to support sizeable structures. Therefore, placement of infrastructure atop the closed dry stack facility would likely be limited to relatively low ground pressure, settlement tolerant structures.

FIGURES



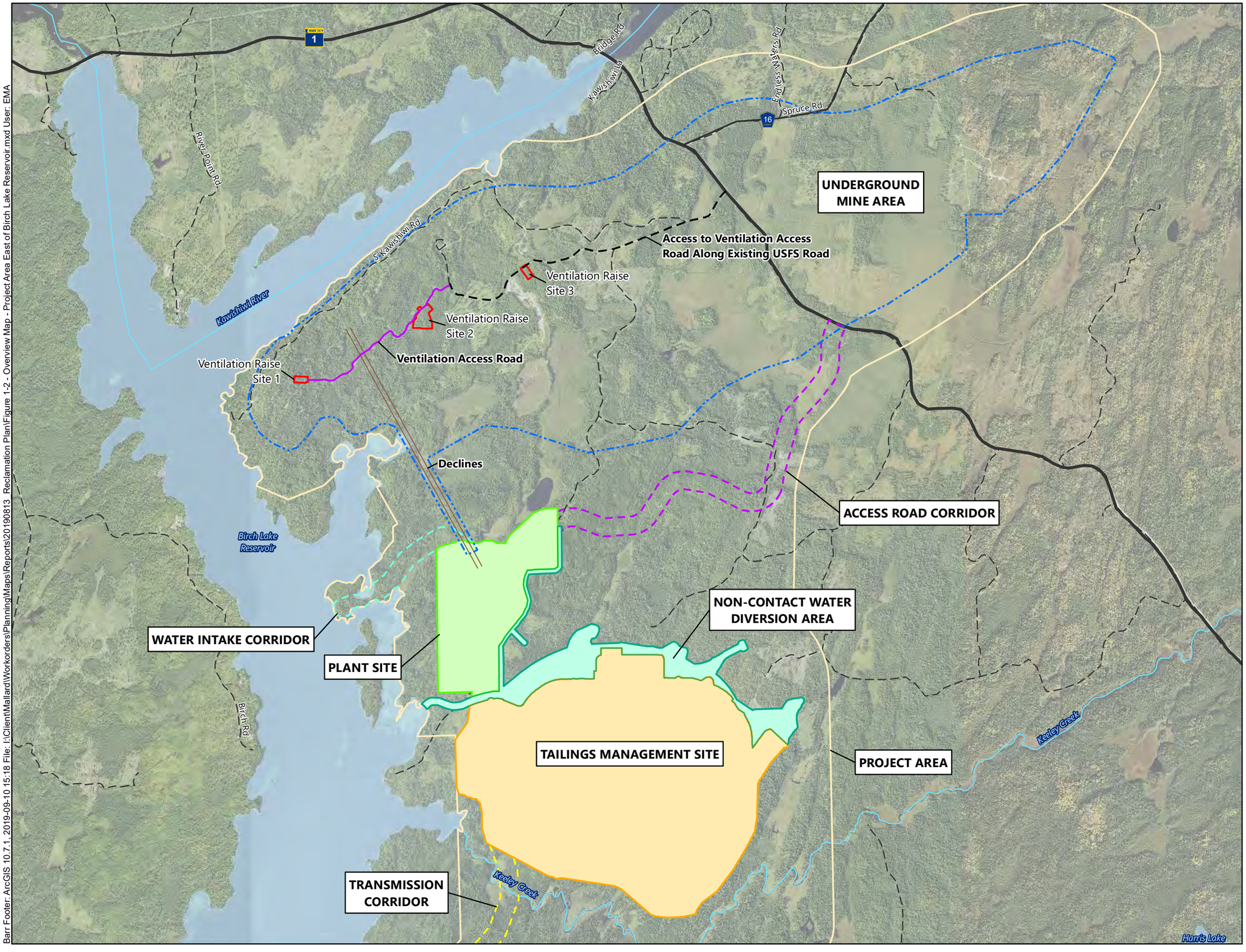
Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Transmission Corridor
Water Intake Corridor
Ventilation Raise Site
Electric Substation
Declines
Ventilation Raise Access Road
Existing Powerline
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
Watershed - DNR Level 4
County Boundary
USFS Roads (2013)
Streets and Highways (MnDOT)
State Trunk Highway
County State-Aid Highway

N

0 0.5 1 2
Miles
0 0.5 1 2
Kilometers

Figure 1-1
PROJECT OVERVIEW AND LOCATION
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:17 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 1-1 - Project Overview and Location.mxd User: EMA



Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Transmission Corridor
Water Intake Corridor
Ventilation Raise Site
Declines
Ventilation Raise Access Road
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
USFS Roads (2013)

Streets and Highways (MnDOT)

State Trunk Highway
County State-Aid Highway

Note: The underground mine area is roughly 3.9 miles long by 1.2 miles wide. The initial haulage tie-in point to the mine decline is approximately 1,170 feet below the portal collar elevation while the lowest stope centerline development is approximately 4,470 feet below the portal collar elevation.

N

0 1,000 2,000 4,000
Feet

0 300 600 1,200
Meters

Figure 1-2
OVERVIEW MAP - PROJECT AREA EAST OF BIRCH LAKE RESERVOIR
Twin Metals Minnesota
Lake and St. Louis Counties, MN

ACCESS ROAD CORRIDOR
Access Road
Security/Guard Shack
Snow Storage
Reclamation Material Stockpile 1
NON-CONTACT WATER DIVERSION AREA
TAILINGS MANAGEMENT SITE
Waste Storage Area
Tire Wash
Parking
Propane Storage Tank
Bus Loop
Mine Services Building
Site Road
PLANT SITE
Overhead power-line from the off-site substation to plant site substation and from plant site substation to the TMS.
North Contact Water Pond
Snow Storage
Diesel Fuel
Reclamation Material Stockpile 2
Shotcrete Plant & Aggregate Stockpile
Engineered Tailings Backfill Pipeline
Substation
Propane Storage Tank
Ball Storage
Mine Water Tank
Portals
Coarse Ore Stockpile
Conveyor
Concentrator
Tailings Pipeline
UNDERGROUND MINE AREA
Sediment Pond
Service Building
Process Water Tank
Fresh Water and Fire Water Tank
Snow Storage
Overflow Ore Stockpile
Process Water Pond
South Contact Water Pond
Storage
Access Decline
Conveyor Decline
TRSF Lined Area and Ditches
Explosive Magazine
Central Contact Water Pond
Reagent Storage
Concentrator Services Building
Bus Loop/Parking
WATER INTAKE CORRIDOR
Water Intake Pipeline, Maintenance Access Road, Underground Power, and Communication
Birch Lake Reservoir

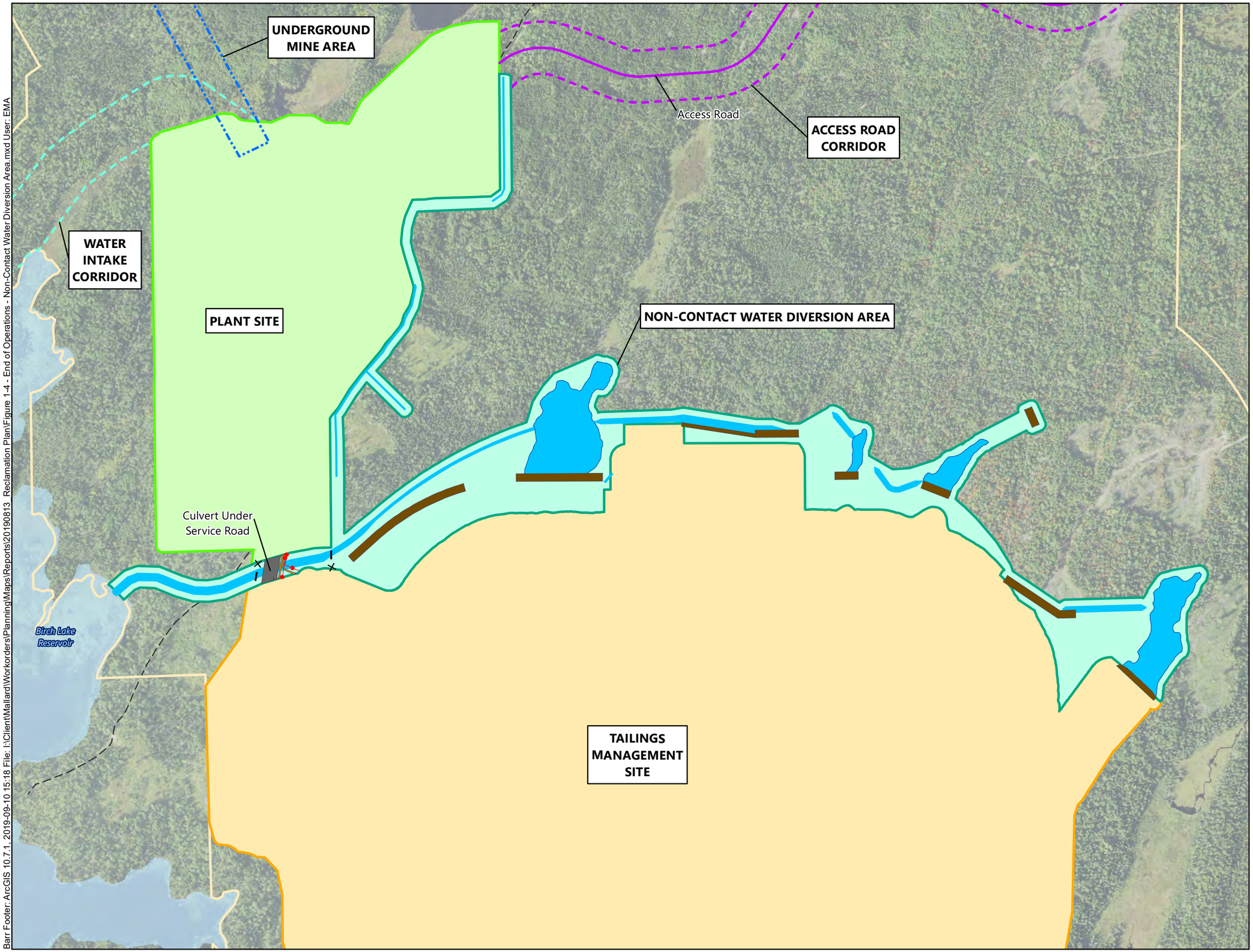
Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Road
Transmission Line
Equipment/Infrastructure
Fenceline
Water Intake Pipeline
Project Contours
Building
Contact Water Pond
Electrical/Power
Equipment/Infrastructure
Fuel Storage
Laydown/Pad/Storage
Reclamation Material Stockpile
Service Road/Parking
Stockpile
Tailings Pipeline
PWI Basin (MNDNR 2017)
USFS Roads (2013)

N

0 175 350 700
Feet
0 50 100 200
Meters

Figure 1-3
END OF OPERATIONS - PLANT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1 2019-09-13 10:53 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Reclamation Plan\Figure 1-3 - End of Operations - Plant Site.mxd User: EMA



Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Road
Transmission Line
Fenceline
Dike
Non-Contact Water Ditch (NWD)
Non-Contact Water Pond (NWP)
Service Road/Parking
Tailings Pipeline
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
USFS Roads (2013)

N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 1-4
END OF OPERATIONS -
NON-CONTACT
WATER DIVERSION AREA
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:18 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 1-4 - End of Operations - Non-Contact Water Diversion Area.mxd User: EMA

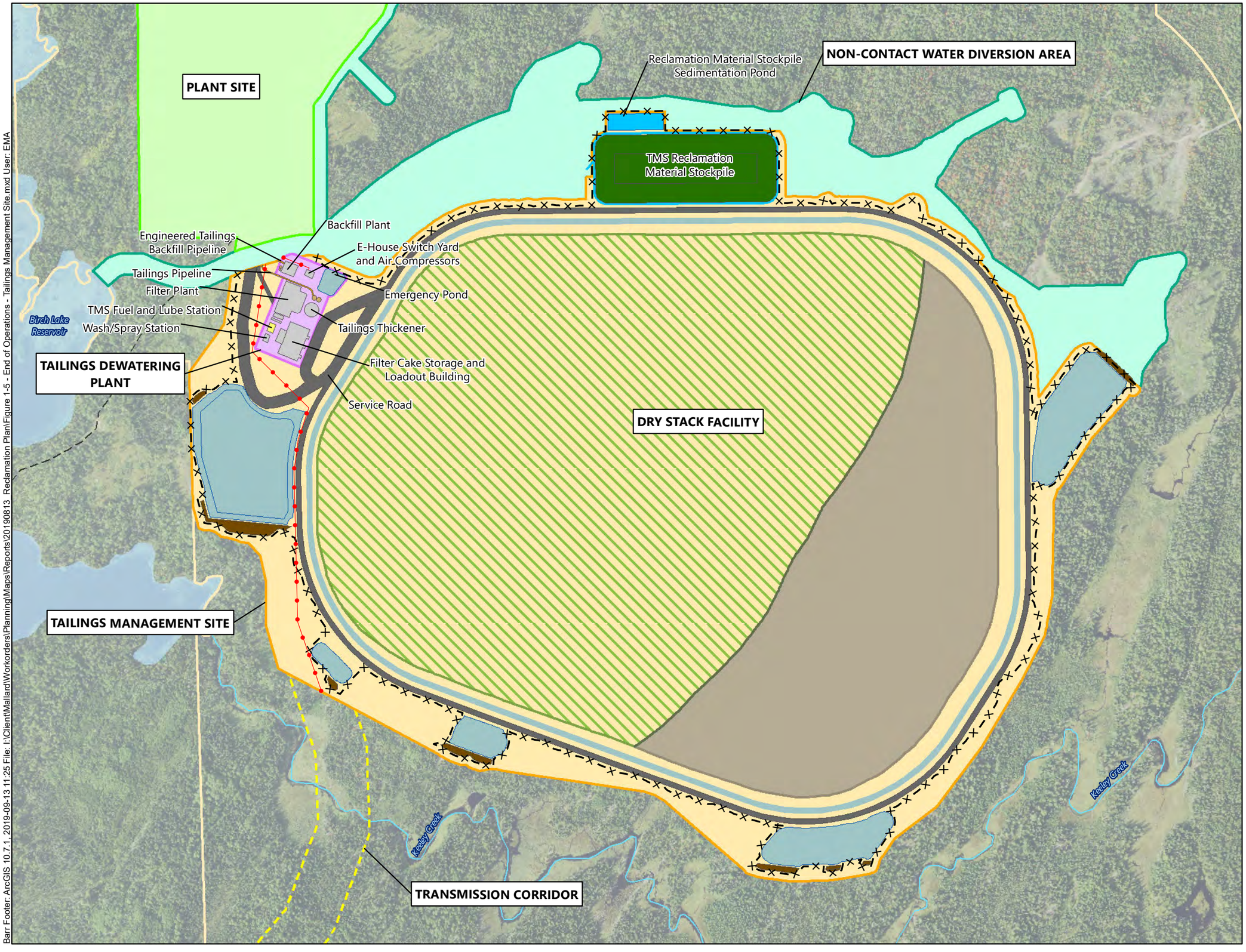
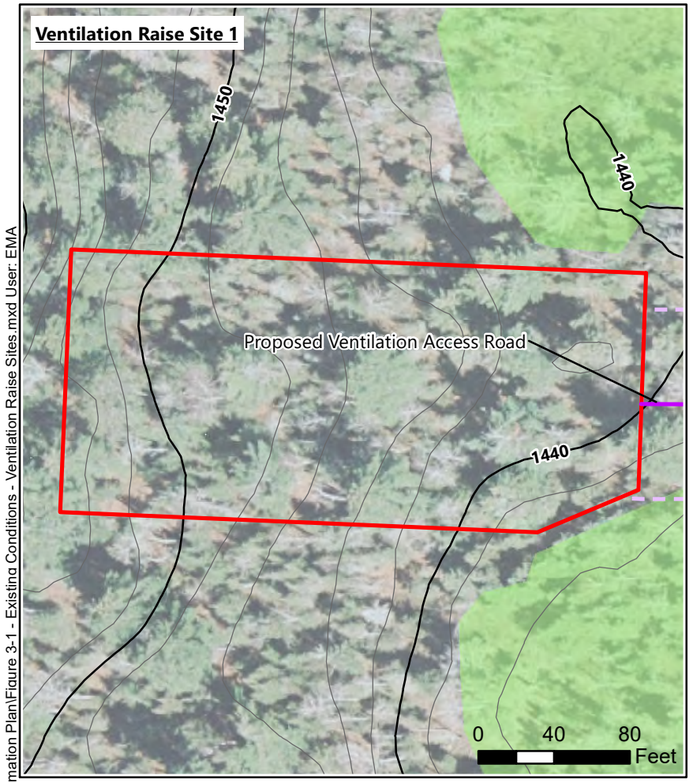
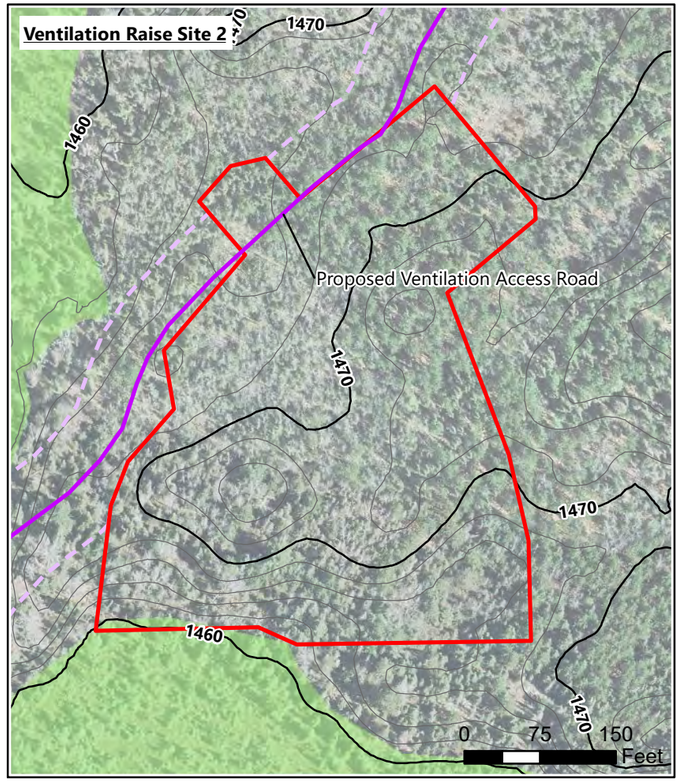


Figure 1-5
END OF OPERATIONS - TAILINGS MANAGEMENT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

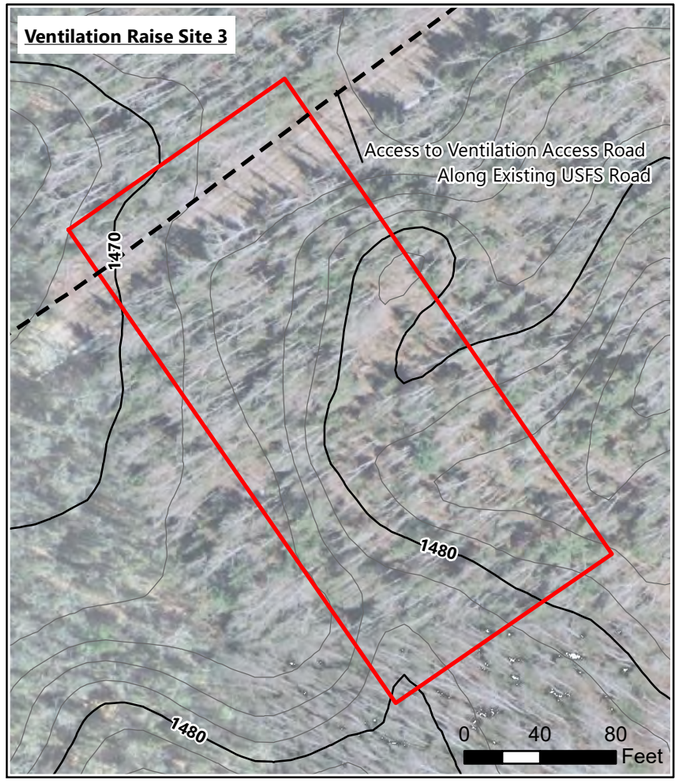
Ventilation Raise Site 1



Ventilation Raise Site 2

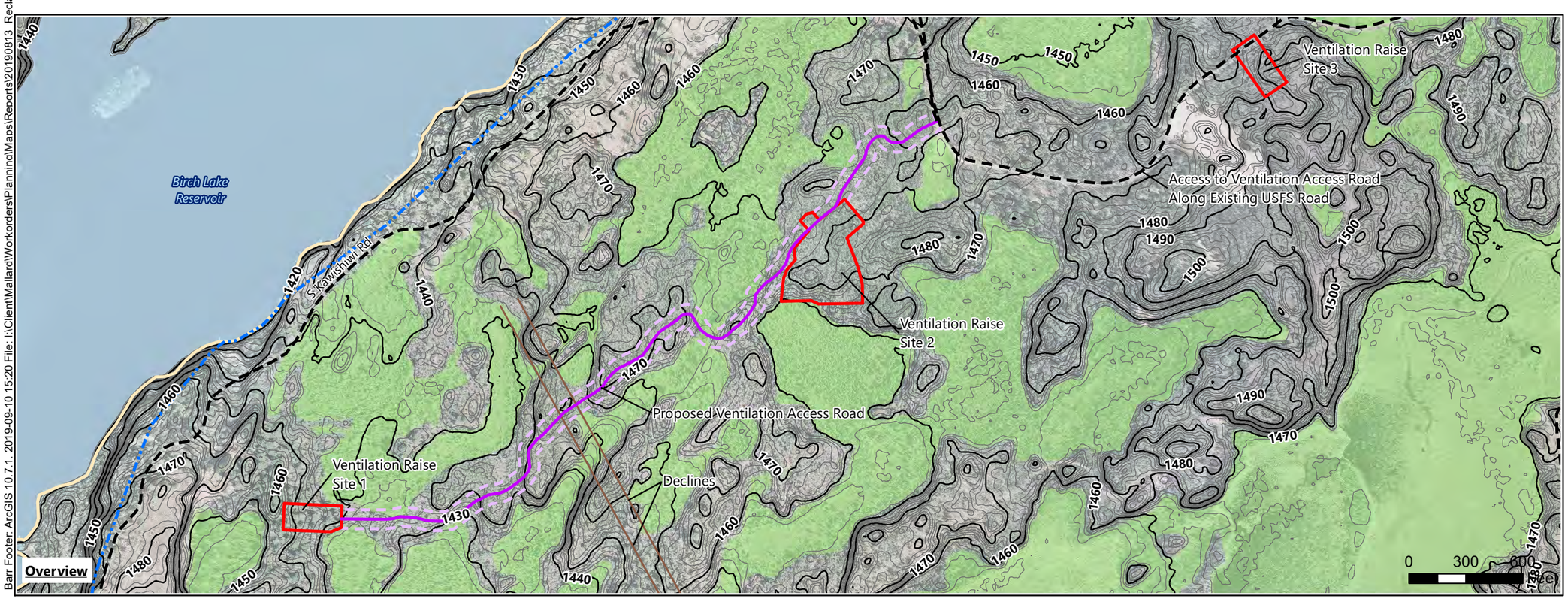


Ventilation Raise Site 3



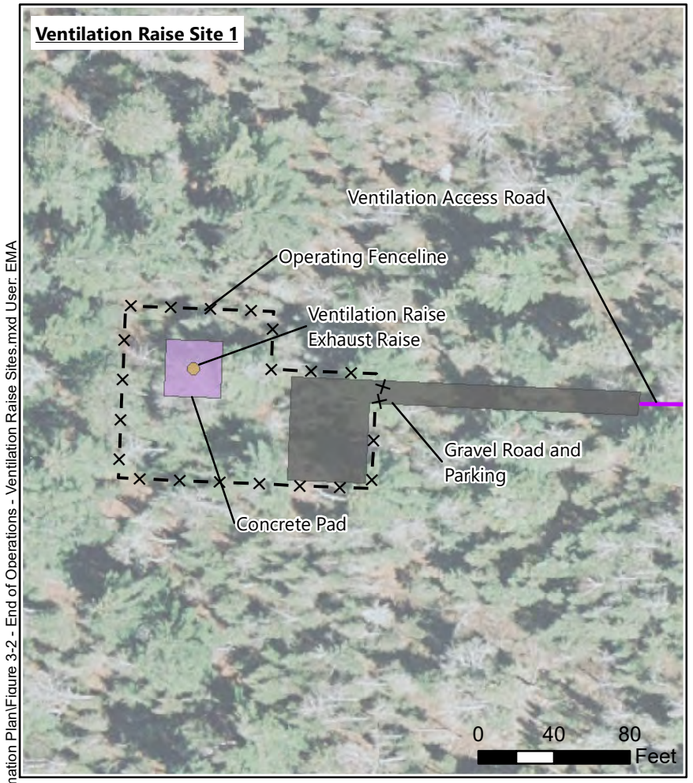
- Project Area
- Underground Mine Area (Surface Projection)
- Ventilation Raise Site
- Ventilation Raise Access Road Corridor
- Road
- Declines
- PWI Basin (MNDNR 2017)
- Wetlands
- Existing 2 ft Contour (0.61 meters)
- Existing 10 ft Contour (3.0 meters)
- USFS Roads (2013)

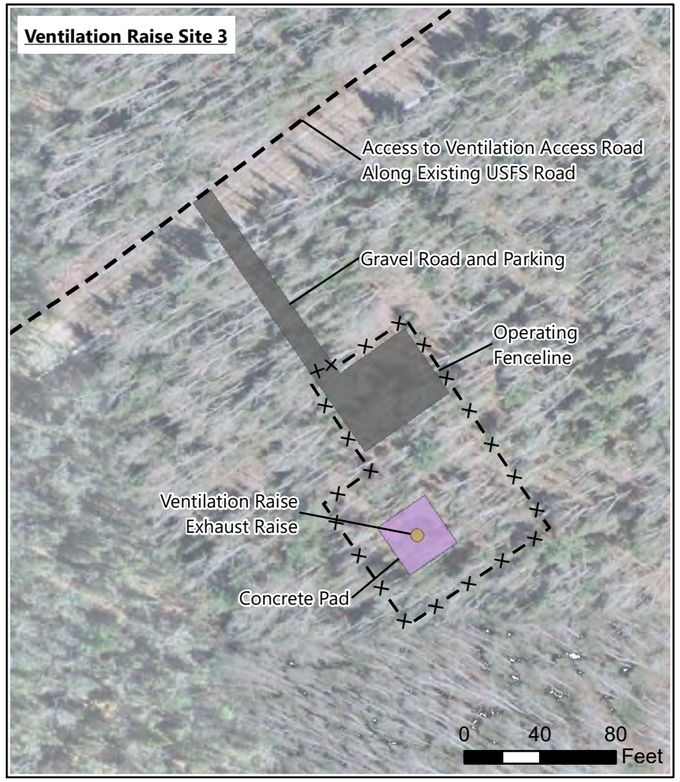
Note: Proposed Project footprints are shown relative to existing site conditions for context.



N

Figure 3-1
EXISTING CONDITIONS - VENTILATION RAISE SITES
Twin Metals Minnesota
Lake and St. Louis Counties, MN





Project Area

Underground Mine Area (Surface Projection)

Ventilation Raise Site

Ventilation Raise Access Road Corridor

Road

Declines

Fenceline

Building

Electrical/Power

Equipment/Infrastructure

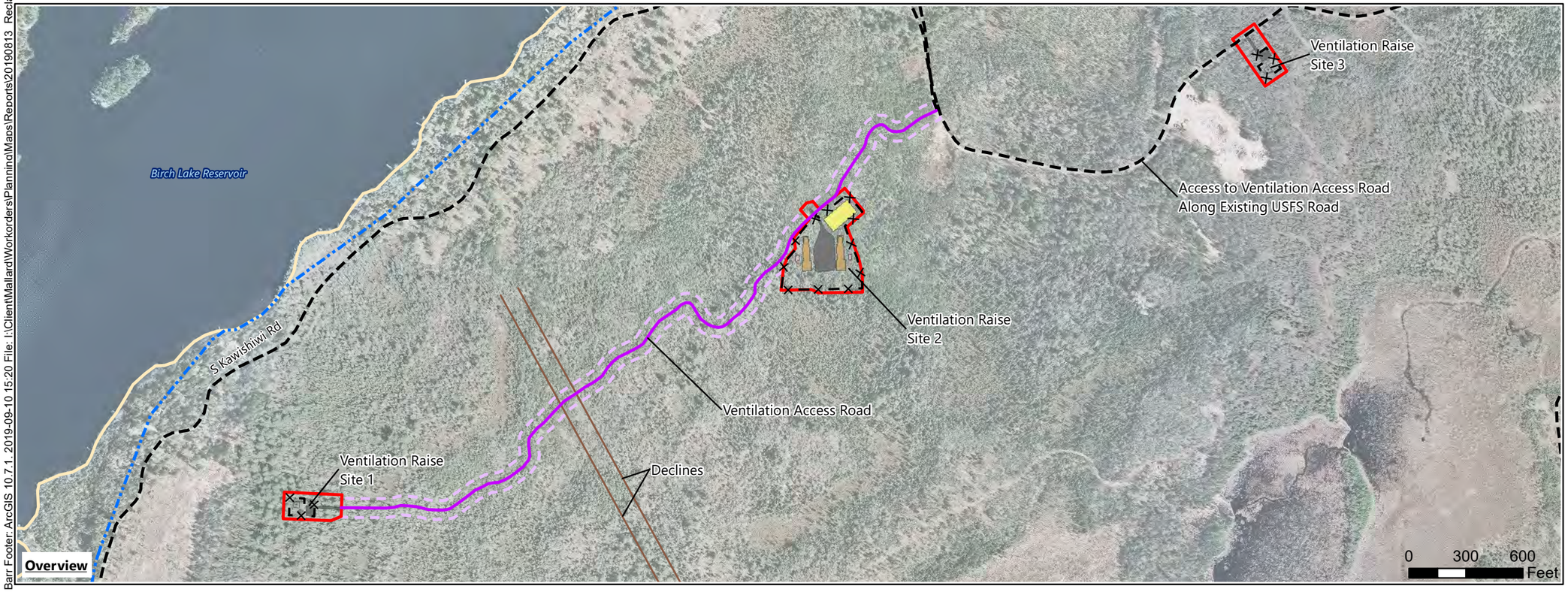
Fuel Storage

Laydown/Pad

Service Road/Parking

USFS Roads (2013)

Note: The underground mine area extent is roughly 3.9 miles long by 1.2 miles wide. The initial haulage tie-in point to the mine decline is approximately 1,170 feet below the portal collar elevation while the lowest stope centerline development is approximately 4,470 feet below the portal collar elevation.

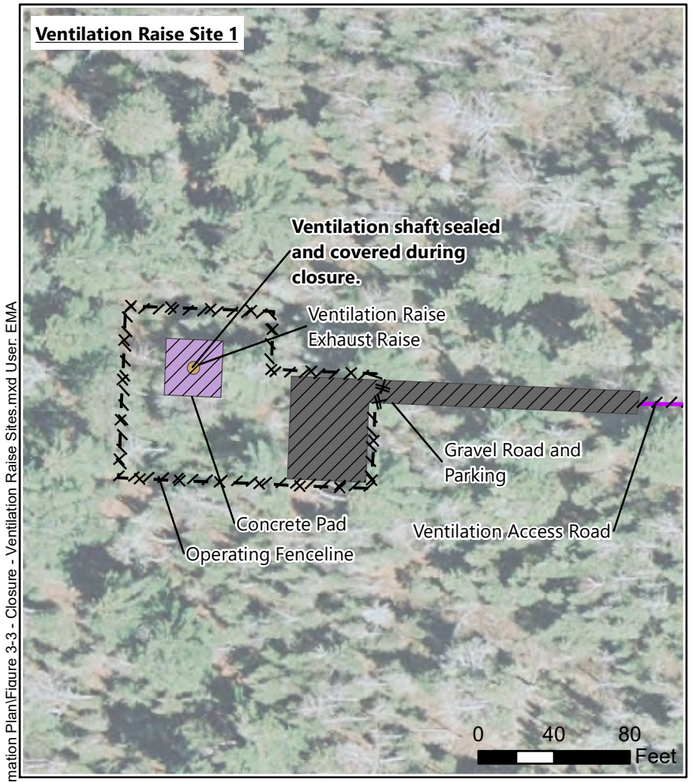


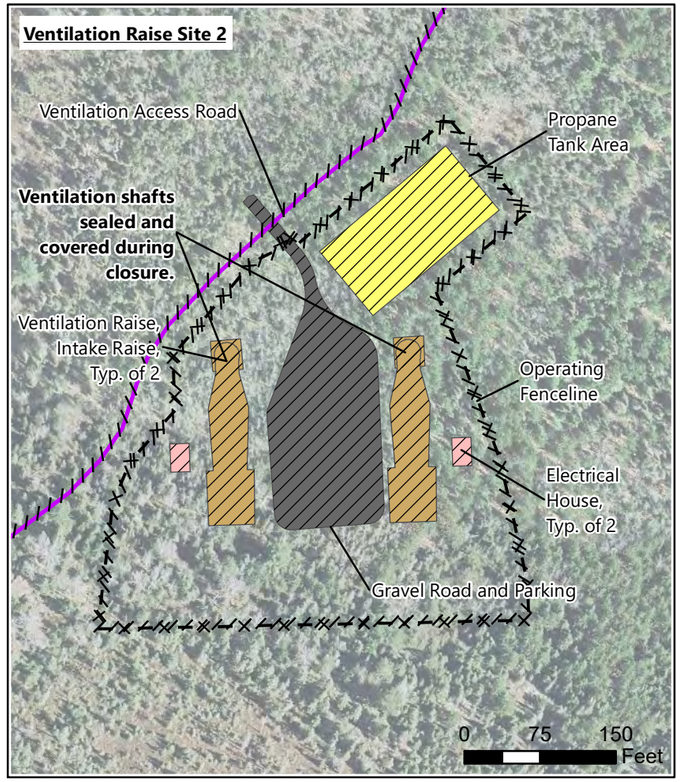
N

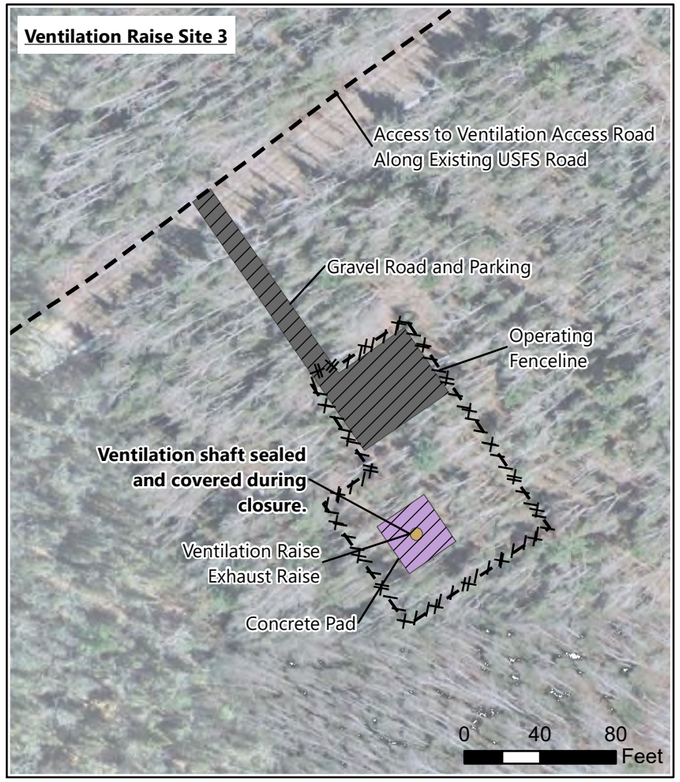
Figure 3-2
END OF OPERATIONS -
VENTILATION RAISE SITES
Twin Metals Minnesota
Lake and St. Louis Counties, MN

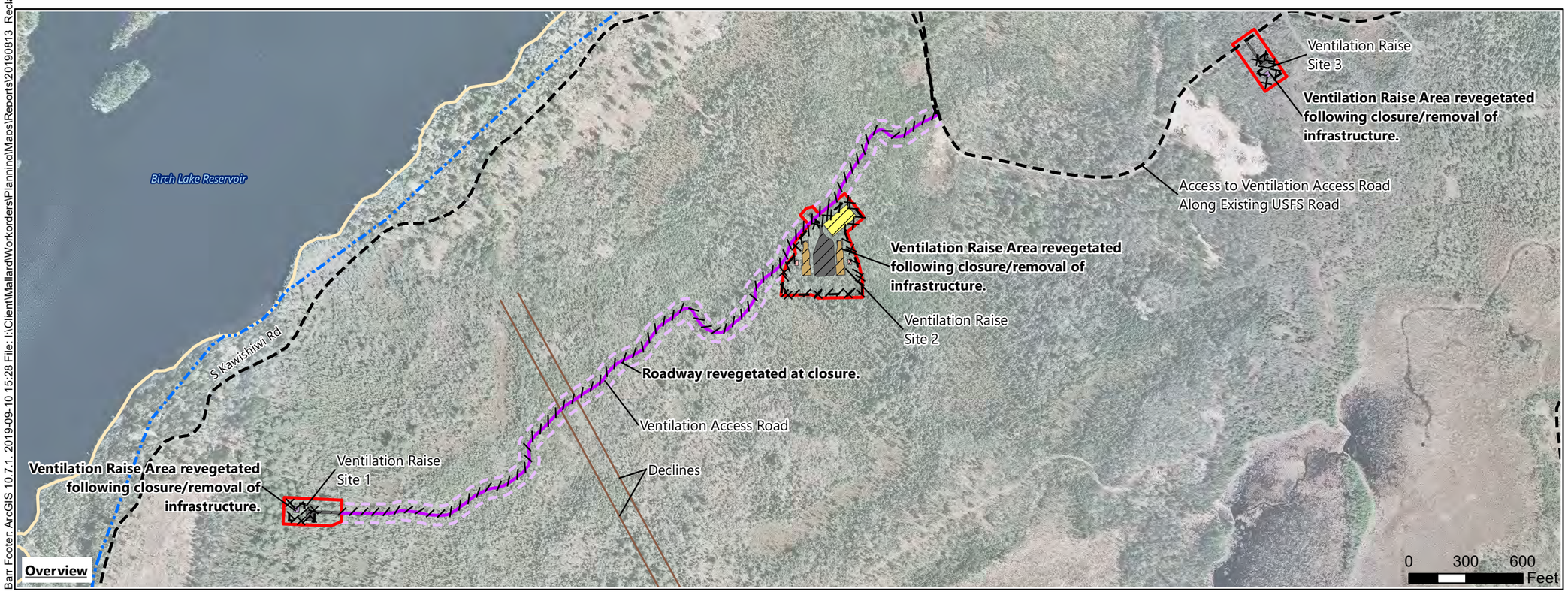
Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:20 File: I:\Client\Mallard\Workorders\PlanningMaps\Reports\20190813_Recl

mation Plan\Figure 3-2 - End of Operations - Ventilation Raise Sites.mxd User: EMA









Project Area
Underground Mine Area (Surface Projection)
Ventilation Raise Site
Ventilation Raise Access Road Corridor
Remove at Closure
Road
Declines
Fenceline
Building
Electrical/Power
Equipment/Infrastructure
Fuel Storage
Laydown/Pad
Service Road/Parking
USFS Roads (2013)

N

Figure 3-3
CLOSURE -
VENTILATION RAISE SITES
Twin Metals Minnesota
Lake and St. Louis Counties, MN

ACCESS ROAD CORRIDOR

PLANT SITE

TAILINGS MANAGEMENT SITE

NON-CONTACT WATER DIVERSION AREA

UNDERGROUND MINE AREA

WATER INTAKE CORRIDOR

Birch Lake Reservoir

- Project Area
- Underground Mine Area (Surface Projection)
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Access Road Corridor
- Water Intake Corridor
- Approximate Existing Watershed Divides
- Approximate Existing Runoff Flow Direction
- PWI Basin (MNDNR 2017)
- Wetlands
- Existing 2 ft Contour (0.61 meters)
- Existing 10 ft Contour (3.0 meters)
- USFS Roads (2013)

Note: Proposed Project footprints are shown relative to existing site conditions for context.

N

0 175 350 700
Feet

0 50 100 200
Meters

Figure 3-4
EXISTING CONDITIONS - PLANT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-13 10:37 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-4 - Existing Conditions - Plant Site.mxd User: EMA

ACCESS ROAD CORRIDOR
Access Road
Security/Guard Shack
Snow Storage
Reclamation Material Stockpile 1
NON-CONTACT WATER DIVERSION AREA
TAILINGS MANAGEMENT SITE
Waste Storage Area
Parking
Tire Wash
Propane Storage Tank
Bus Loop
Mine Services Building
Site Road
PLANT SITE
Overhead power-line from the off-site substation to plant site substation and from plant site substation to the TMS.
North Contact Water Pond
Snow Storage
Diesel Fuel
Reclamation Material Stockpile 2
Shotcrete Plant & Aggregate Stockpile
Engineered Tailings Backfill Pipeline
Substation
Propane Storage Tank
Ball Storage
Mine Water Tank
Portals
Coarse Ore Stockpile
Conveyor
Concentrator
Tailings Pipeline
UNDERGROUND MINE AREA
Sediment Pond
Service Building
Process Water Tank
Fresh Water and Fire Water Tank
Snow Storage
Overflow Ore Stockpile
Process Water Pond
South Contact Water Pond
Storage
Access Decline
Conveyor Decline
TRSF Lined Area and Ditches
Explosive Magazine
Central Contact Water Pond
Reagent Storage
Concentrator Services Building
Bus Loop/Parking
WATER INTAKE CORRIDOR
Water Intake Pipeline, Maintenance Access Road, Underground Power, and Communication
Birch Lake Reservoir

Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Road
Transmission Line
Equipment/Infrastructure
Fenceline
Water Intake Pipeline
Project Contours
Building
Contact Water Pond
Electrical/Power
Equipment/Infrastructure
Fuel Storage
Laydown/Pad/Storage
Reclamation Material Stockpile
Service Road/Parking
Stockpile
Tailings Pipeline
PWI Basin (MNDNR 2017)
USFS Roads (2013)

N

0 175 350 700
Feet
0 50 100 200
Meters

Figure 3-5
END OF OPERATIONS - PLANT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1 2019-09-13 11:02 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-5 - End of Operations - Plant Site.mxd User: EMA

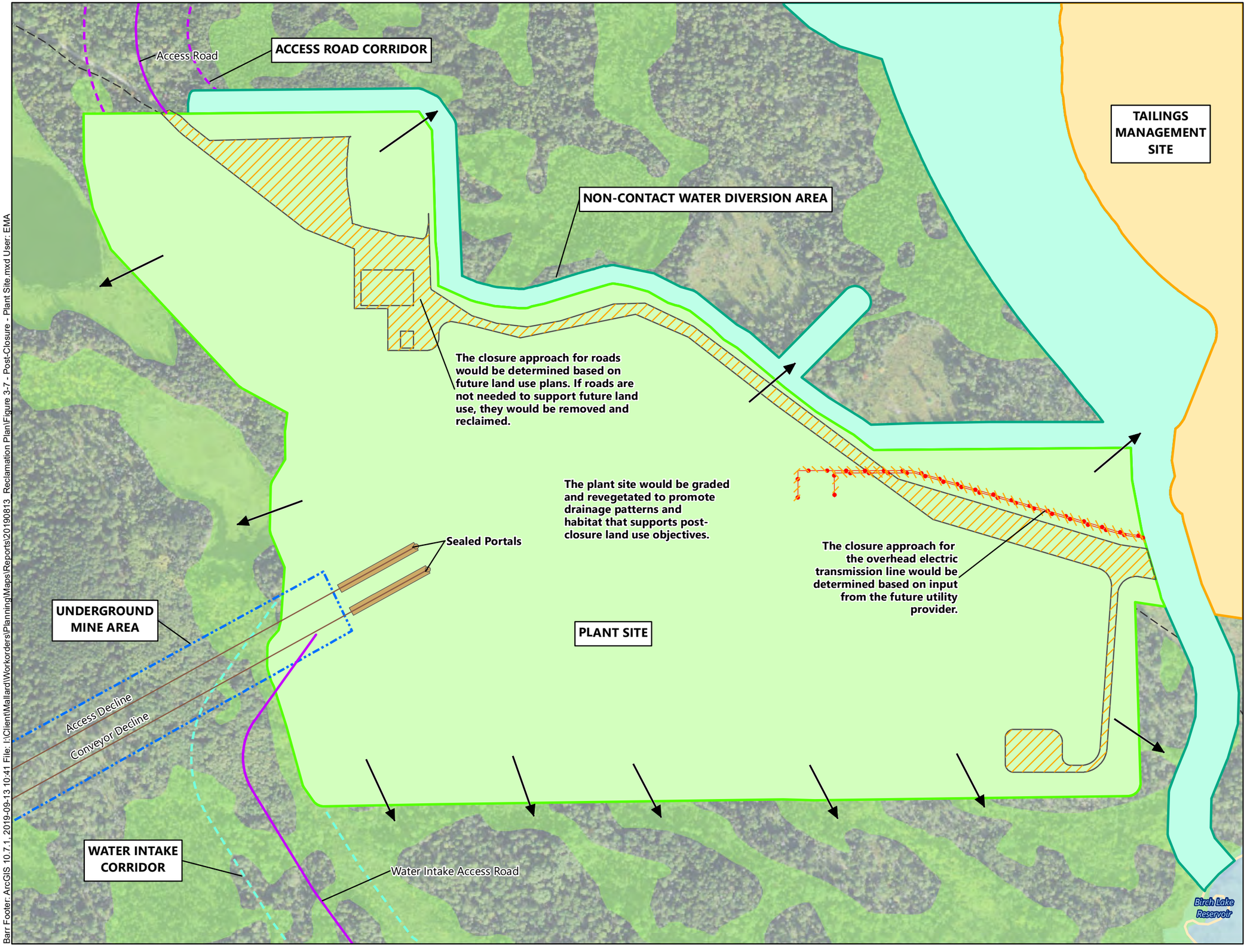
ACCESS ROAD CORRIDOR
Access Road
Security/Guard Shack
Snow Storage
Reclamation Material Stockpile 1
The closure approach for roads would be determined based on future land use plans. If roads are not needed to support future land use, they would be removed and reclaimed.
NON-CONTACT WATER DIVERSION AREA
TAILINGS MANAGEMENT SITE
Waste Storage Area
Parking
Tire Wash
Propane Storage Tank
Bus Loop
Site Road
Mine Services Building
PLANT SITE
Diesel Fuel
North Contact Water Pond
Snow Storage
Overhead power-line from the off-site substation to plant site substation and from plant site substation to the TMS.
Reclamation Material Stockpile 2
Shotcrete Plant & Aggregate Stockpile
Engineered Tailings Backfill Pipeline
Substation
Propane Storage Tank
Ball Storage
Mine Water Tank
Portals
Coarse Ore Stockpile
Conveyor
Tailings Pipeline
Concentrator
UNDERGROUND MINE AREA
Sediment Pond
Service Building
Process Water Tank
Fresh Water and Fire Water Tank
Snow Storage
Overflow Ore Stockpile
Process Water Pond
South Contact Water Pond
Storage
Access Decline
Conveyor Decline
TRSF Lined Area and Ditches
Explosive Magazine
Central Contact Water Pond
Reagent Storage
Concentrator Services Building
Bus Loop/Parking
WATER INTAKE CORRIDOR
Water Intake Pipeline, Maintenance Access Road, Underground Power, and Communication
Birch Lake Reservoir

Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Remove at Closure
To Be Determined Based on Future Land Use
Road
Transmission Line
Equipment/Infrastructure
Fenceline
Water Intake Pipeline
Project Contours
Building
Contact Water Pond
Electrical/Power
Equipment/Infrastructure
Fuel Storage
Laydown/Pad/Storage
Reclamation Material Stockpile
Service Road/Parking
Stockpile
Tailings Pipeline
PWI Basin (MNDNR 2017)
USFS Roads (2013)

N
0 175 350 700
Feet
0 50 100 200
Meters

Figure 3-6
CLOSURE - PLANT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1 2019-09-13 11:14 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-6 - Closure - Plant Site.mxd User: EMA



Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Road
Transmission Line
Equipment/Infrastructure
To Be Determined Based on Future Land Use
Equipment/Infrastructure
Service Road/Parking
Approximate Runoff Flow Direction Following Closure
Wetlands
PWI Basin (MNDNR 2017)
USFS Roads (2013)

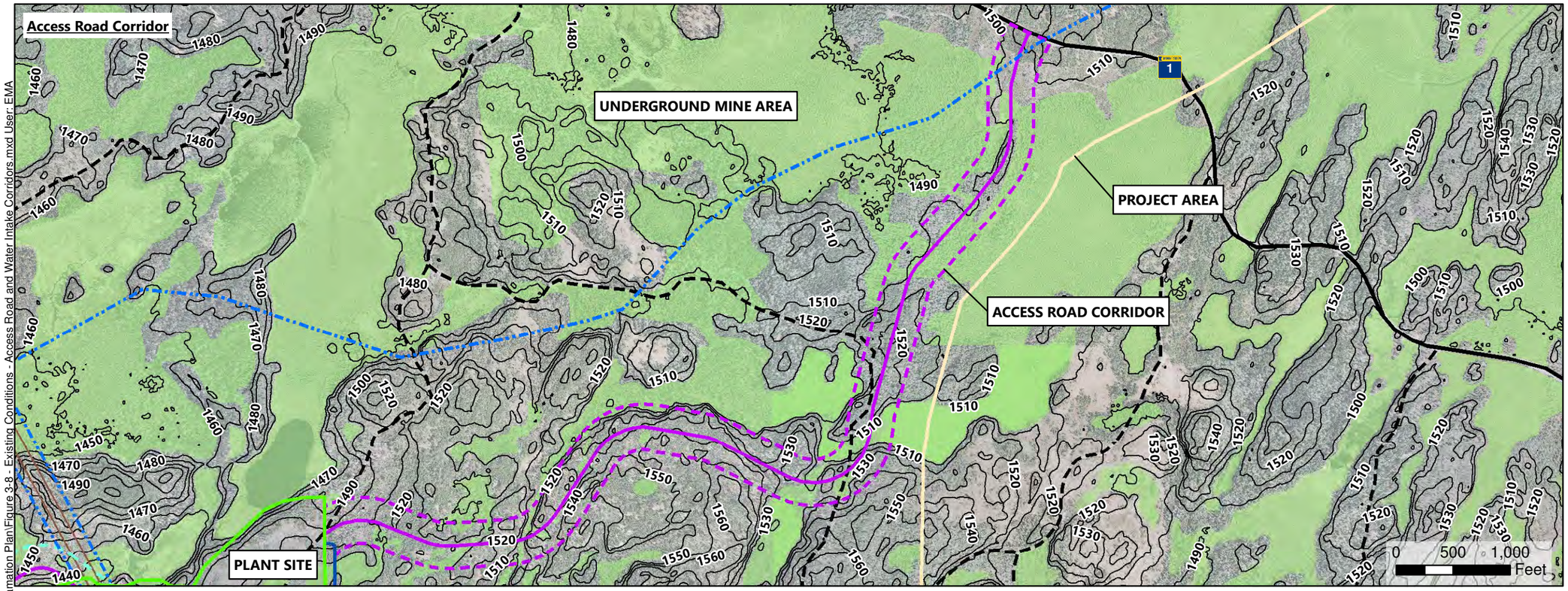
N

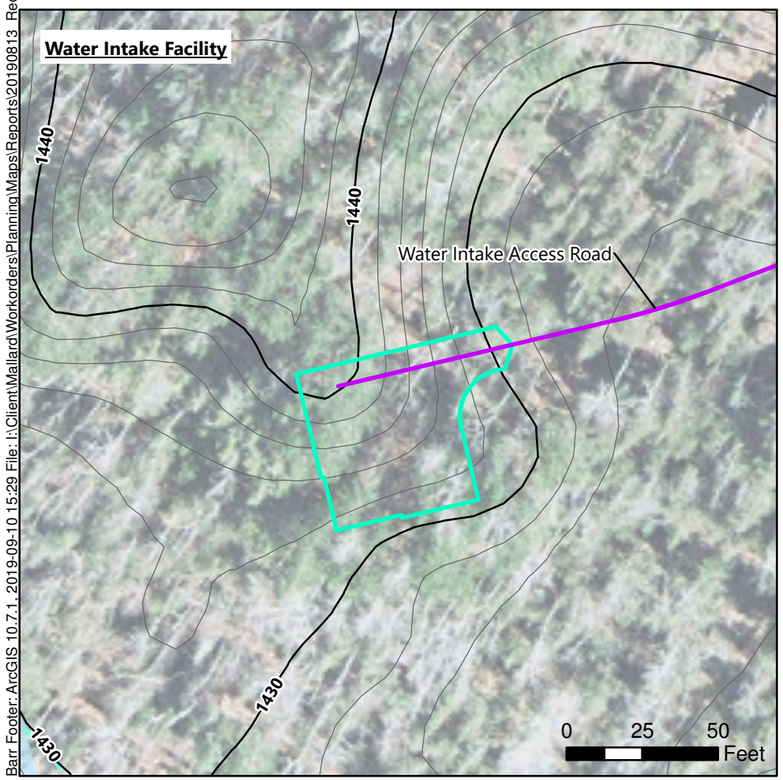
0 175 350 700
Feet

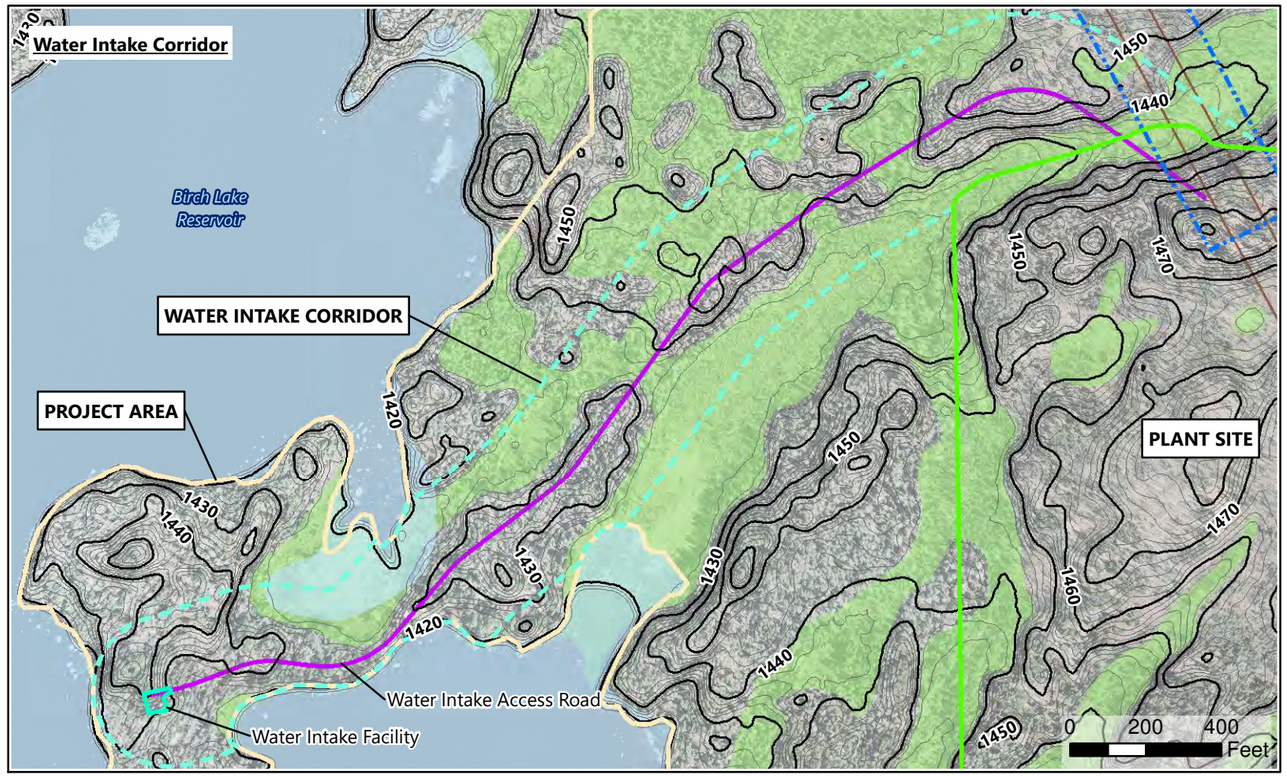
0 50 100 200
Meters

Figure 3-7
POST-CLOSURE - PLANT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-13 10:41 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-7 - Post-Closure - Plant Site.mxd User: EMA





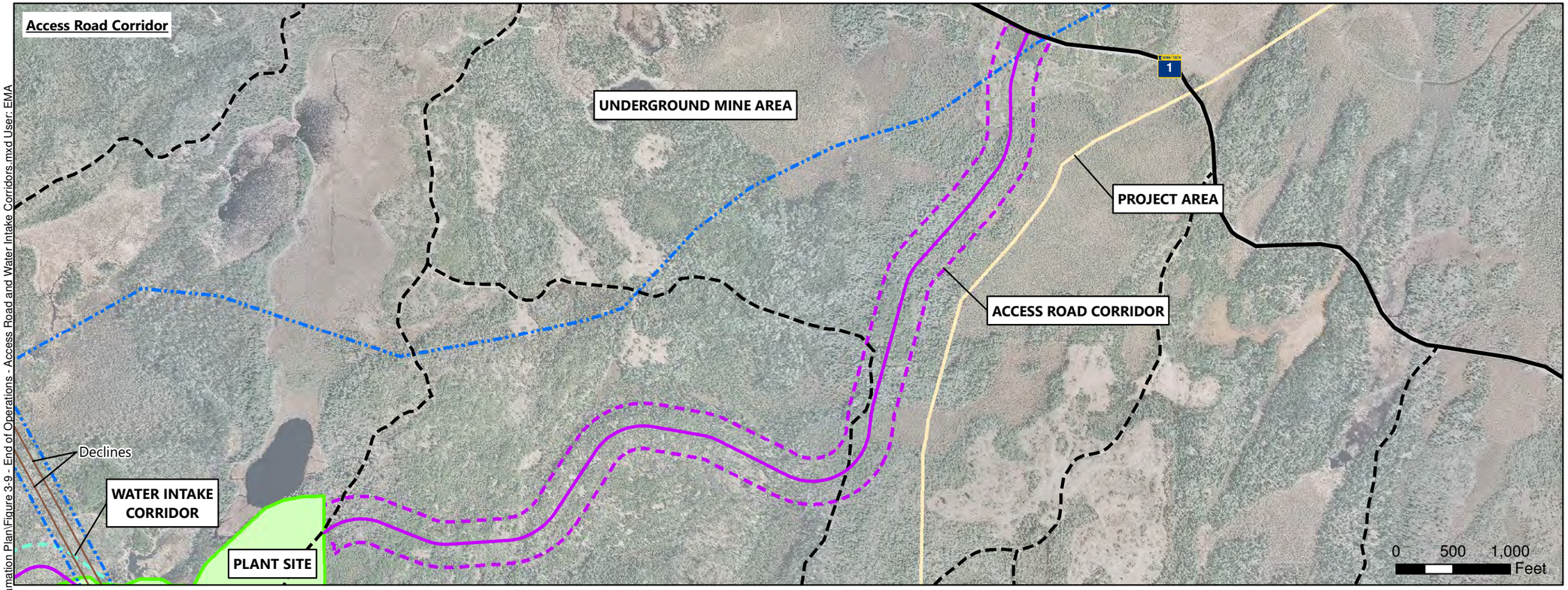


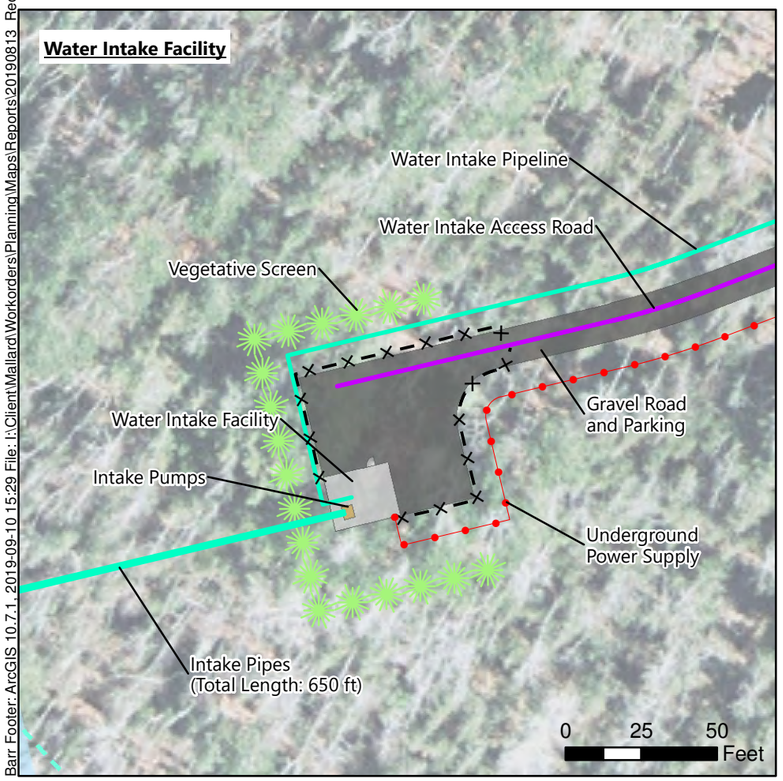
Project Area
Underground Mine Area (Surface Projection)
Plant Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Water Intake Facility
Road
Declines
PWI Basin (MNDNR 2017)
Wetlands
Existing 2 ft Contour (0.61 meters)
Existing 10 ft Contour (3.0 meters)
USFS Roads (2013)
Streets and Highways (MnDOT)
State Trunk Highway

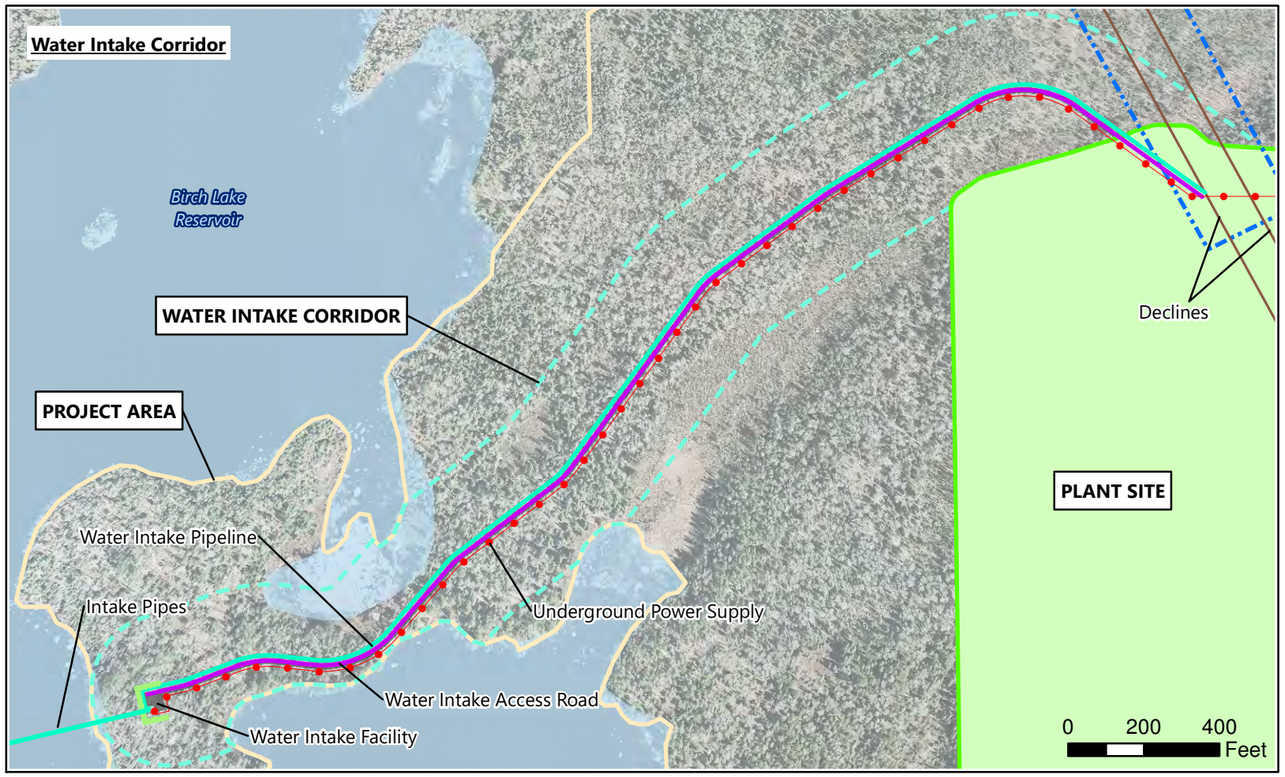
Note: Proposed Project footprints are shown relative to existing site conditions for context.

N

Figure 3-8
EXISTING CONDITIONS - ACCESS ROAD & WATER INTAKE CORRIDORS
Twin Metals Minnesota
Lake and St. Louis Counties, MN







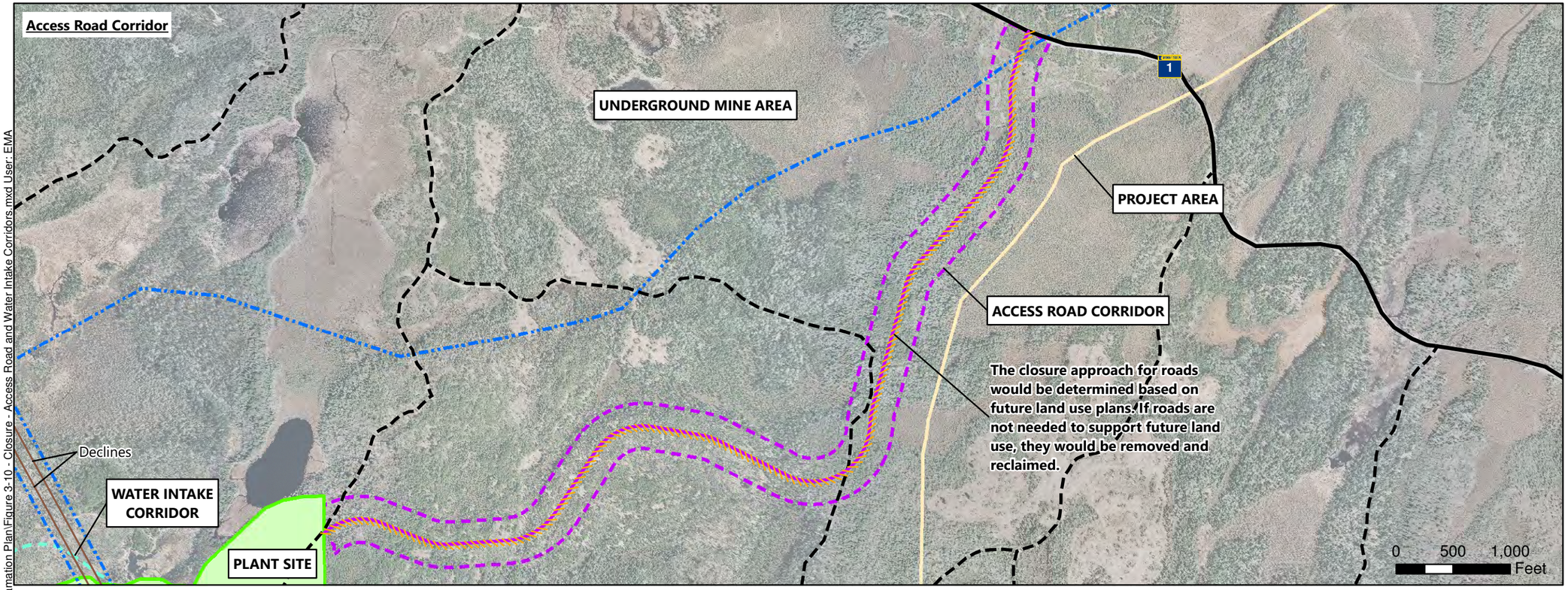
- Project Area
- Underground Mine Area (Surface Projection)
- Plant Site
- Access Road Corridor
- Water Intake Corridor
- Road
- Declines
- Water Intake Pipeline
- Vegetative Screen
- Transmission Line
- Fenceline
- Building
- Equipment/Infrastructure
- Service Road/Parking
- PWI Basin (MNDNR 2017)
- USFS Roads (2013)

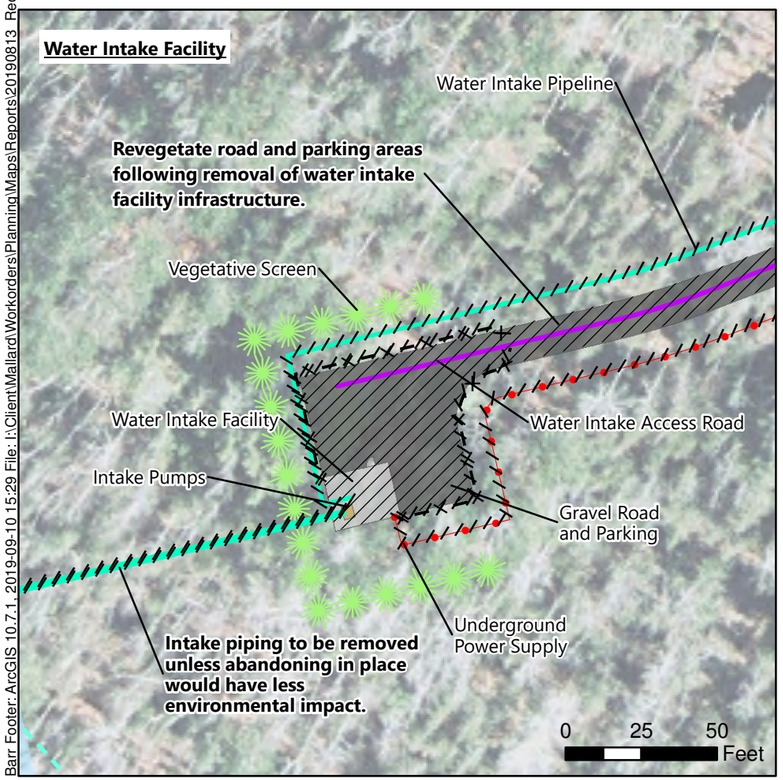
Streets and Highways (MnDOT)

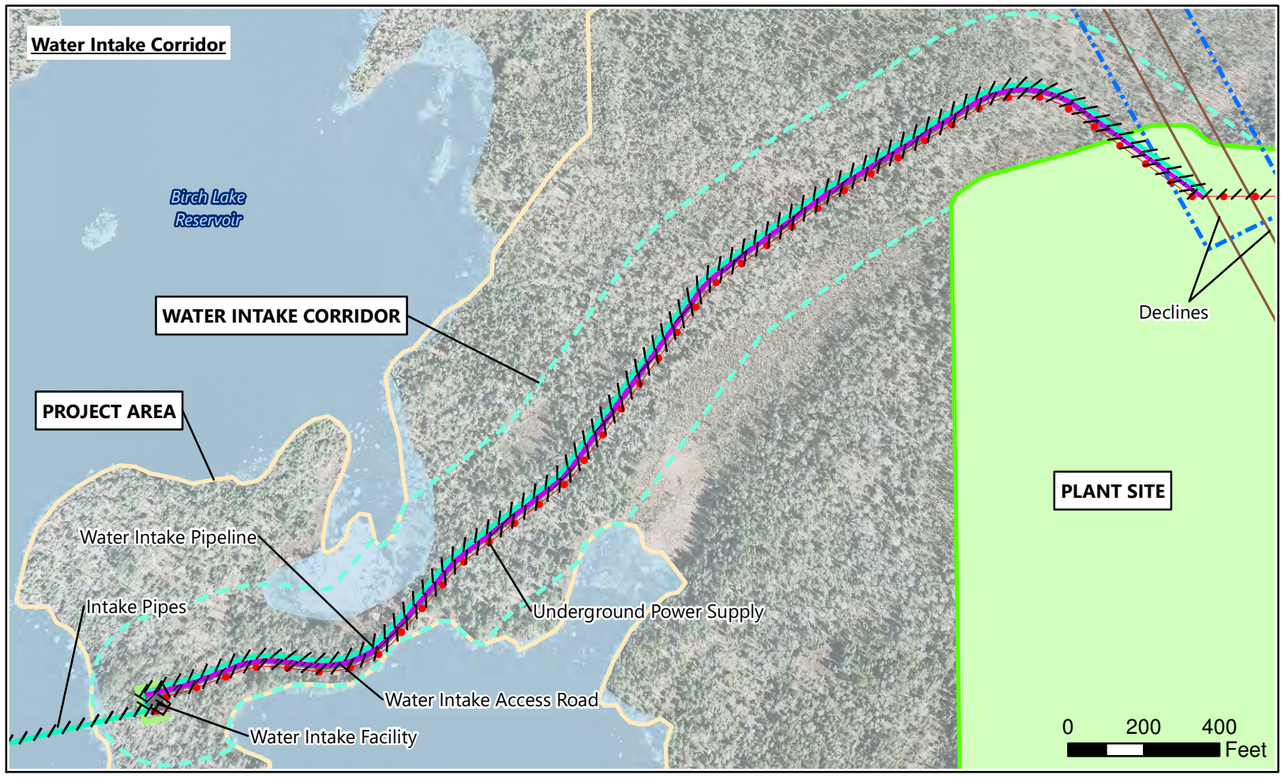
- State Trunk Highway

N

Figure 3-9
END OF OPERATIONS - ACCESS ROAD & WATER INTAKE CORRIDORS
Twin Metals Minnesota
Lake and St. Louis Counties, MN







Project Area
Underground Mine Area (Surface Projection)
Plant Site
Access Road Corridor
Water Intake Corridor
Remove at Closure
To Be Determined Based on Future Land Use
Road
Declines
Water Intake Pipeline
Vegetative Screen
Transmission Line
Fenceline
Building
Equipment/Infrastructure
Service Road/Parking
PWI Basin (MNDNR 2017)
USFS Roads (2013)
Streets and Highways (MnDOT)
State Trunk Highway

N

Figure 3-10
CLOSURE -
ACCESS ROAD & WATER
INTAKE CORRIDORS
Twin Metals Minnesota
Lake and St. Louis Counties, MN

TAILINGS MANAGEMENT SITE

TRANSMISSION CORRIDOR

PROJECT STUDY AREA

Off-Site Electrical Substation

Kangas Lake

Kangas Creek

Birch Lake Reservoir

Keeley Creek

Denley Creek

Stony River

Unnamed Stream

Unnamed Creek

Dunka Pit

Dunka River

Project Area

Tailings Management Site

Transmission Corridor

Electric Substation

PWI Watercourse (MNDNR 2017)

PWI Basin (MNDNR 2017)

Wetlands

Existing 10 ft Contour (3.0 meters)

USFS Roads (2013)

N

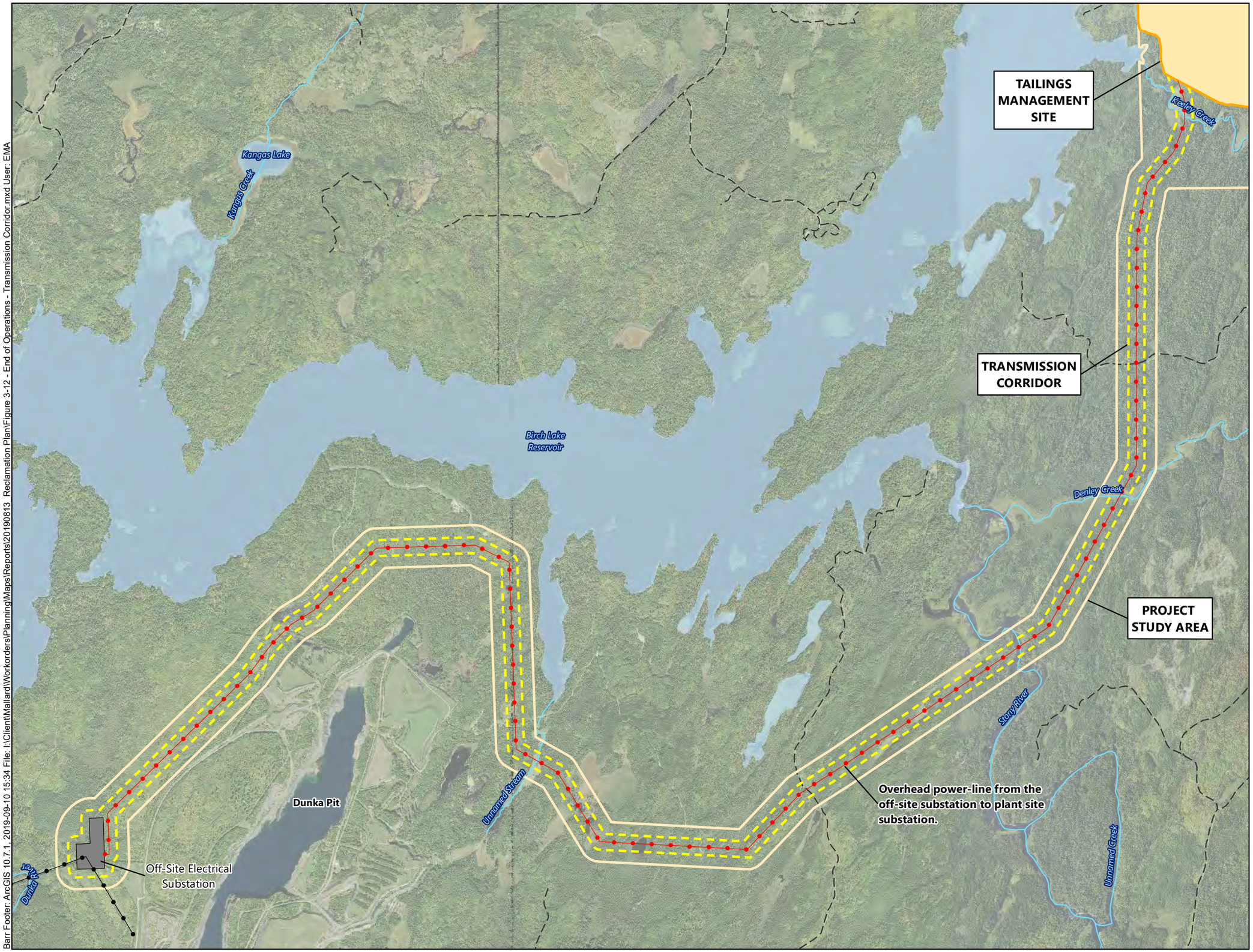
0 1,000 2,000 4,000

Feet

0 250 500 1,000

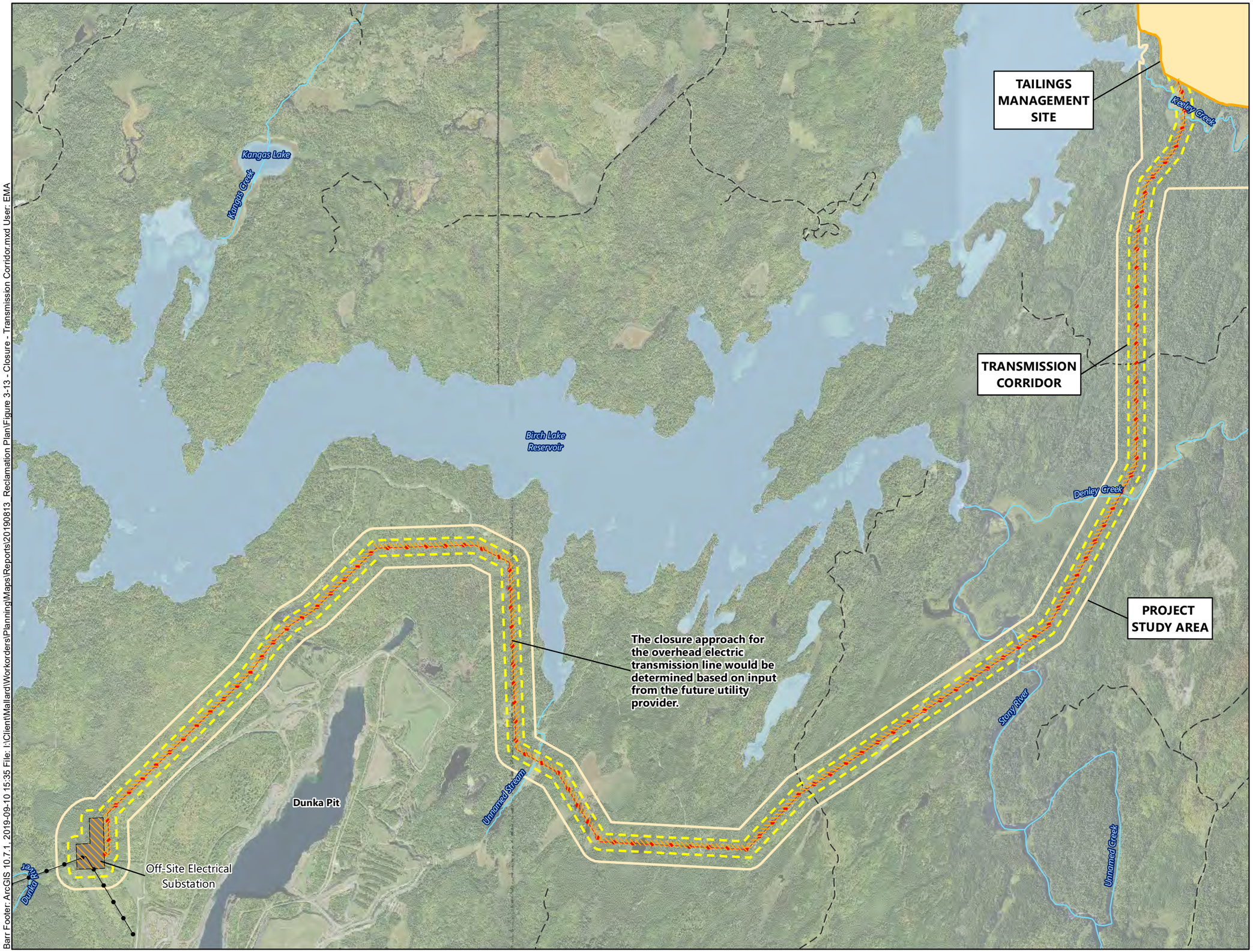
Meters

Figure 3-11
EXISTING CONDITIONS - TRANSMISSION CORRIDOR
Twin Metals Minnesota
Lake and St. Louis Counties, MN



Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:34 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-12 - End of Operations - Transmission Corridor.mxd User: EMA

Figure 3-12
END OF OPERATIONS - TRANSMISSION CORRIDOR
Twin Metals Minnesota
Lake and St. Louis Counties, MN



Project Area
Tailings Management Site
Transmission Corridor
Electric Substation
To Be Determined Based on Future Land Use
Transmission Line
Existing Powerline
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
USFS Roads (2013)

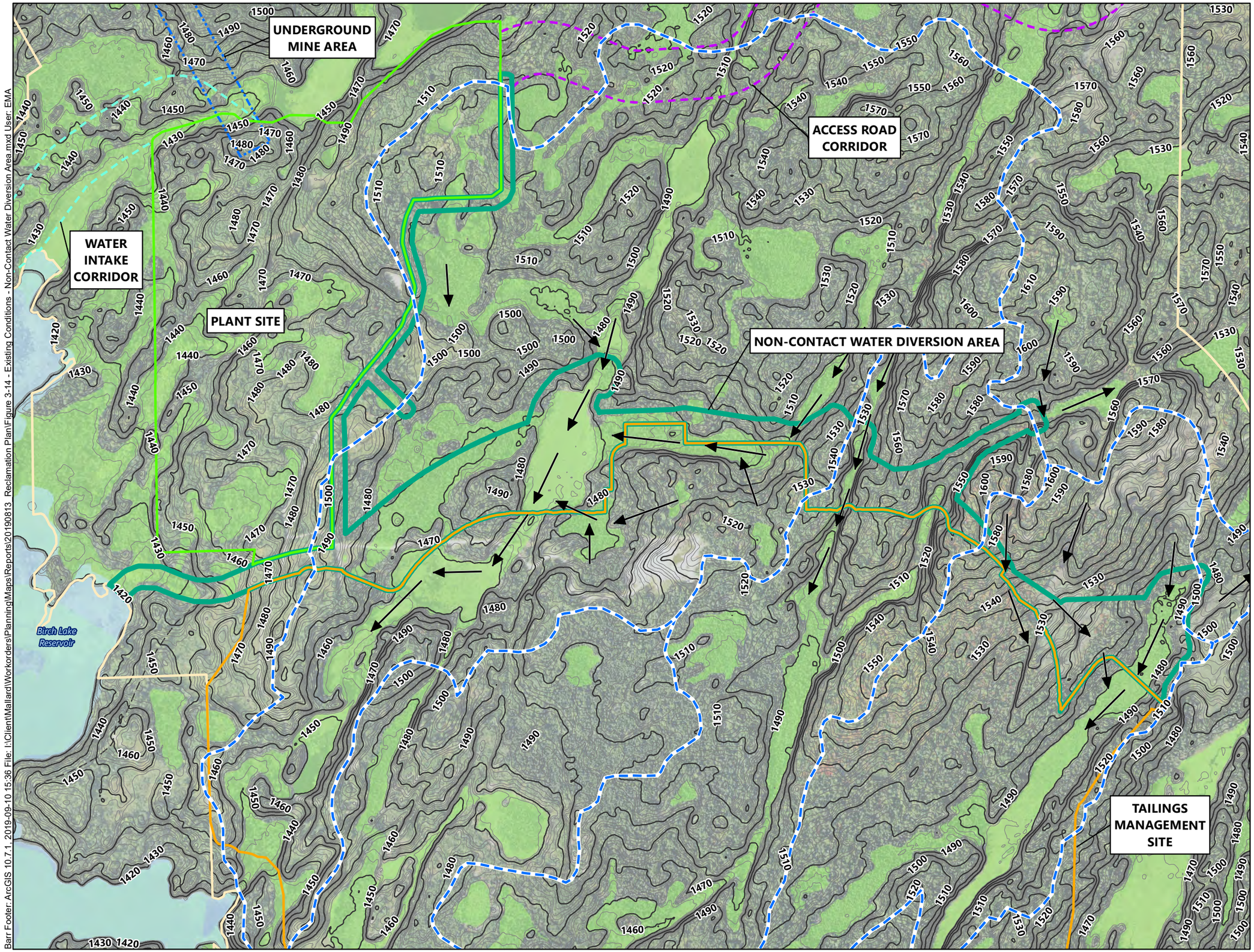
N

0 1,000 2,000 4,000
Feet

0 250 500 1,000
Meters

Figure 3-13
CLOSURE -
TRANSMISSION CORRIDOR
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:35 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-13 - Closure - Transmission Corridor.mxd User: EMA



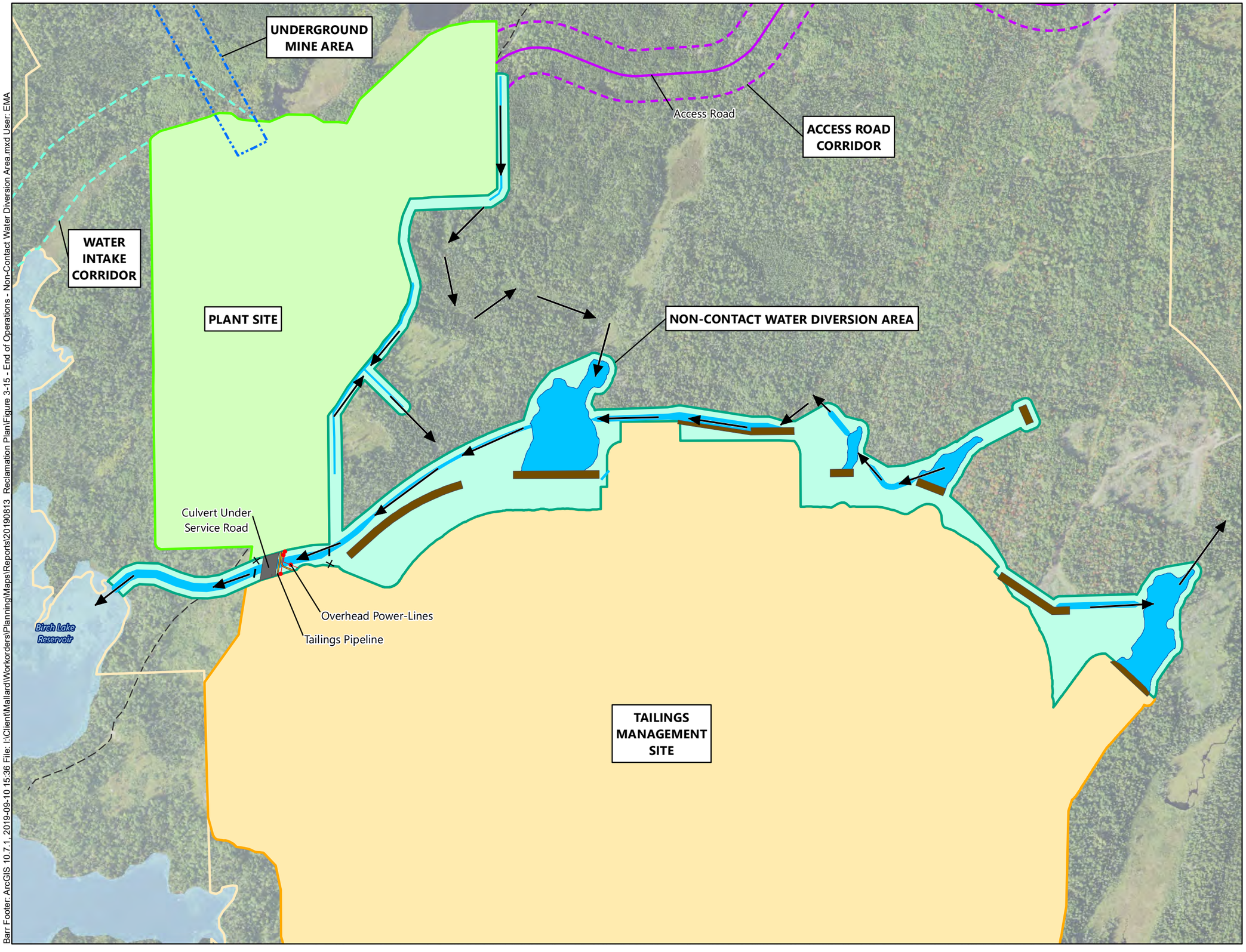
Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Approximate Existing Watershed Divides
Approximate Existing Runoff Flow Direction
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
Wetlands
Existing 10 ft Contour (3.0 meters)
Existing 2 ft Contour (0.61 meters)
USFS Roads (2013)

N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 3-14
EXISTING CONDITIONS - NON-CONTACT WATER DIVERSION AREA
Twin Metals Minnesota
Lake and St. Louis Counties, MN



Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Road
Transmission Line
Fenceline
Dike
Non-Contact Water Ditch (NWD)
Non-Contact Water Pond (NWP)
Service Road/Parking
Tailings Pipeline
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
Approximate Flow Direction
USFS Roads (2013)

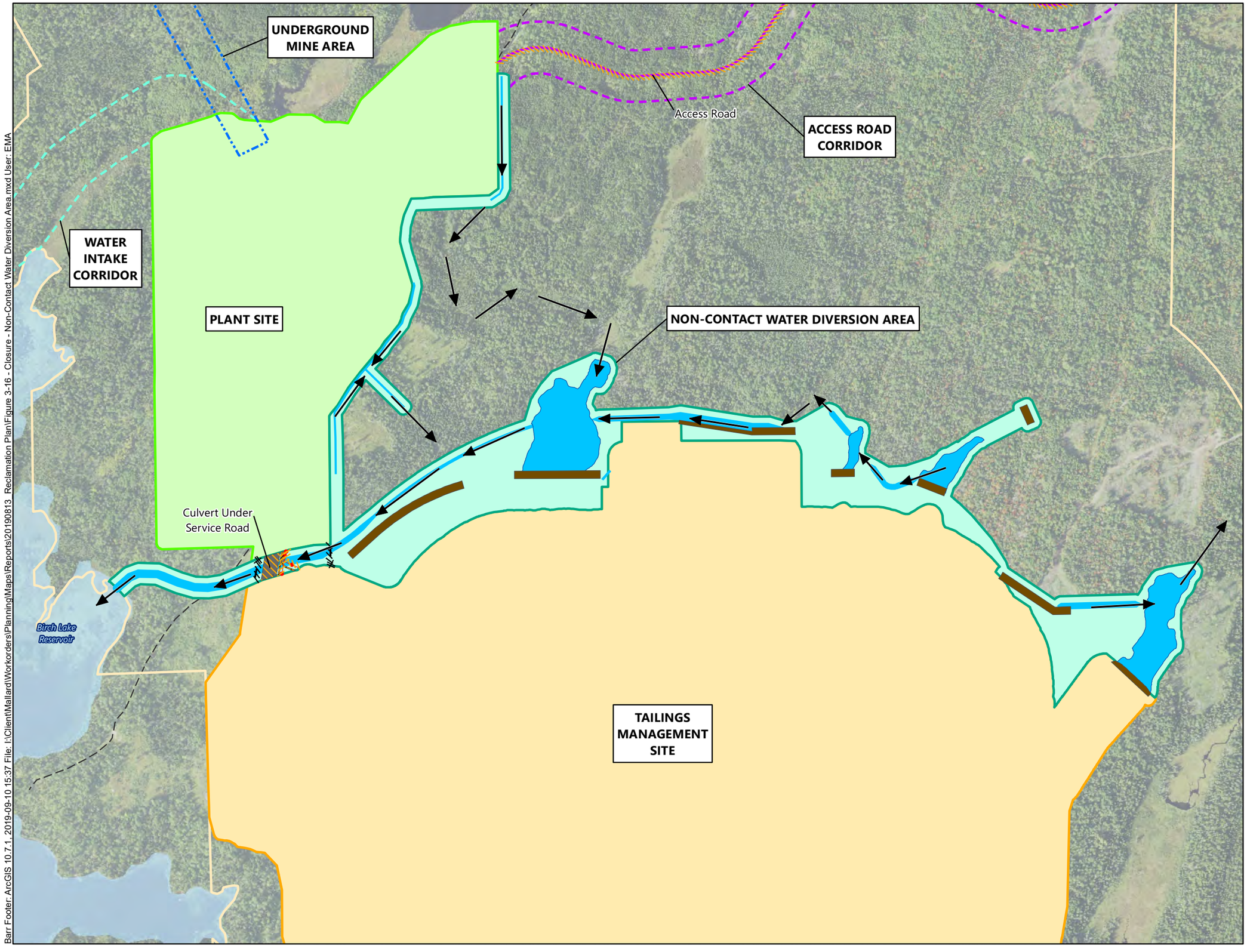
N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 3-15
END OF OPERATIONS - NON-CONTACT WATER DIVERSION AREA
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:36 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-15 - End of Operations - Non-Contact Water Diversion Area.mxd User: EMA



Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Water Intake Corridor
Remove at Closure
To Be Determined Based on Future Land Use
Road
Transmission Line
Fenceline
Dike
Non-Contact Water Ditch (NWD)
Non-Contact Water Pond (NWP)
Service Road/Parking
Tailings Pipeline
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
Approximate Flow Direction
USFS Roads (2013)

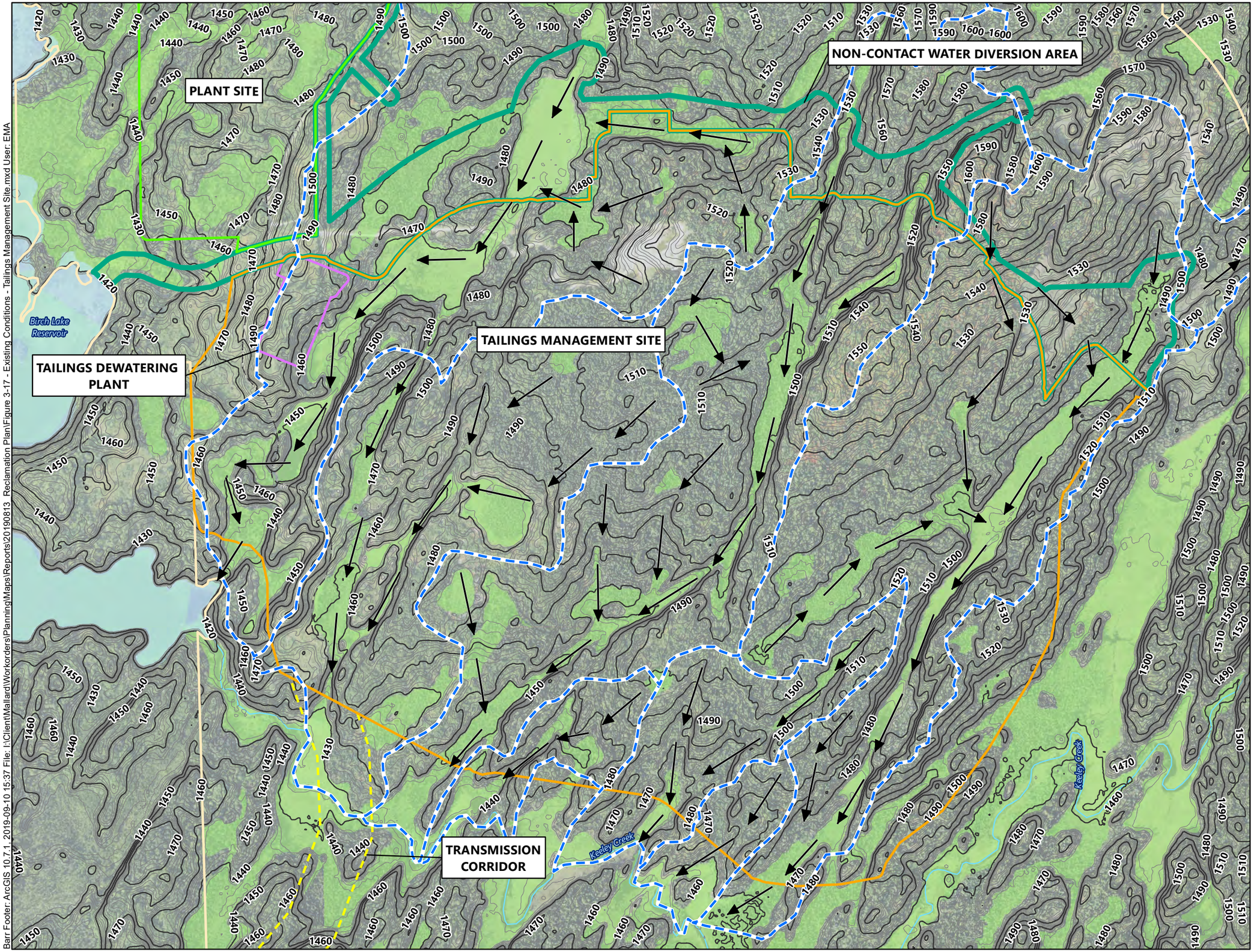
N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 3-16
CLOSURE -
NON-CONTACT WATER
DIVERSION AREA
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:37 File: i:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-16 - Closure - Non-Contact Water Diversion Area.mxd User: EMA



Project Area
Plant Site
Tailings Management Site
Tailings Dewatering Plant
Non-Contact Water Diversion Area
Transmission Corridor
Approximate Existing Watershed Divides
Approximate Existing Runoff Flow Direction
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
Wetlands
Existing 10 ft Contour (3.0 meters)
Existing 2 ft Contour (0.61 meters)
USFS Roads (2013)

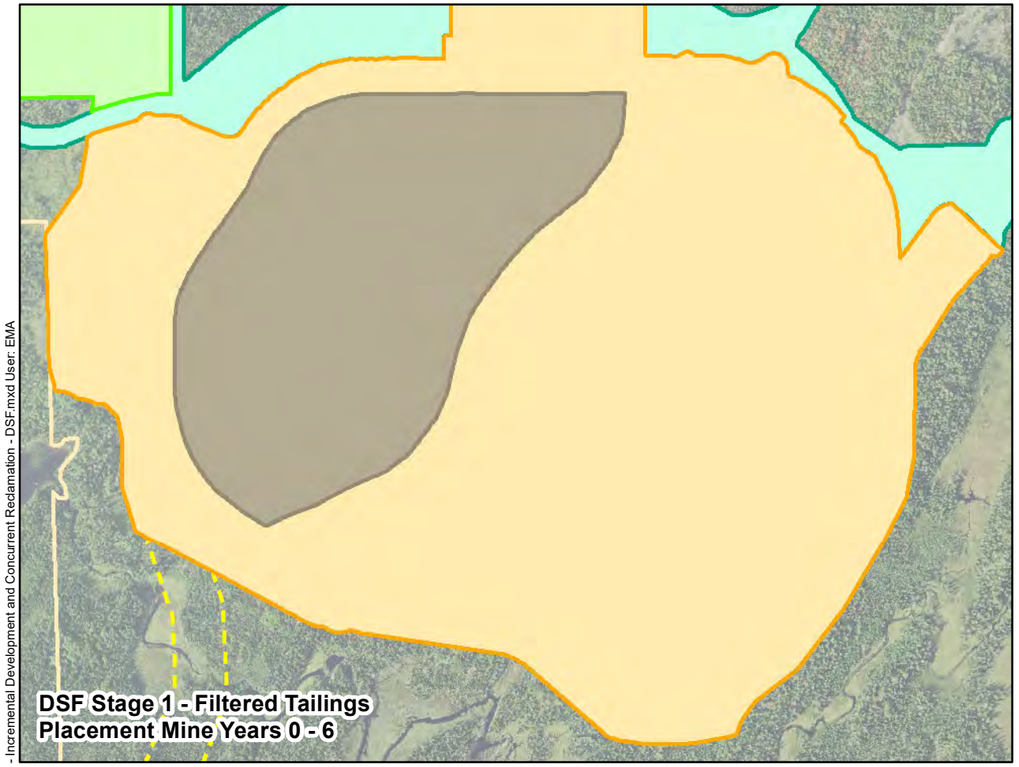
N

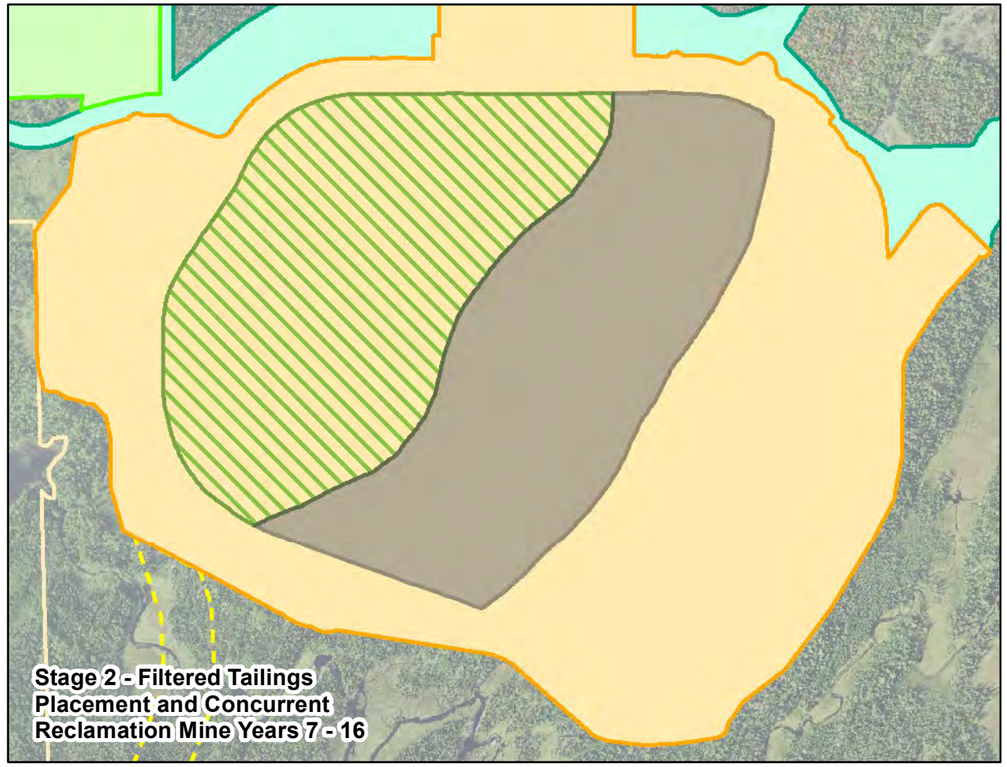
0 350 700 1,400
Feet

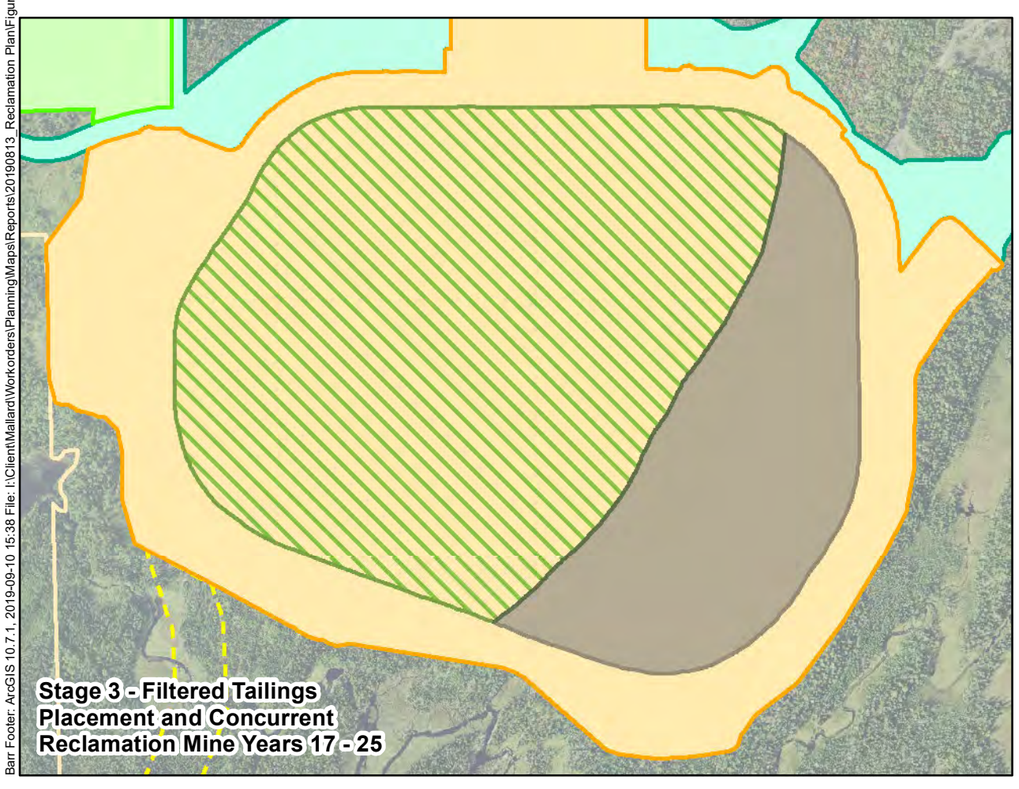
0 100 200 400
Meters

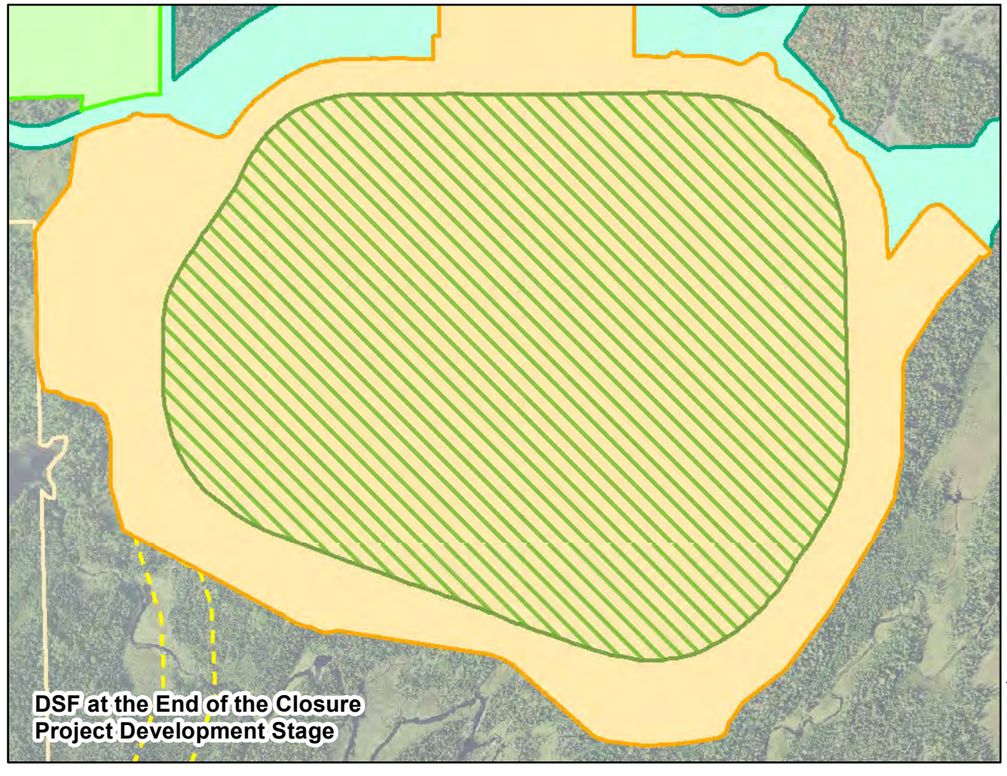
Figure 3-17
EXISTING CONDITIONS -
TAILINGS MANAGEMENT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:37 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-17 - Existing Conditions - Tailings Management Site.mxd User: EMA









Project Area
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Transmission Corridor
DSF Footprint Development
Approximate Reclaimed DSF Area

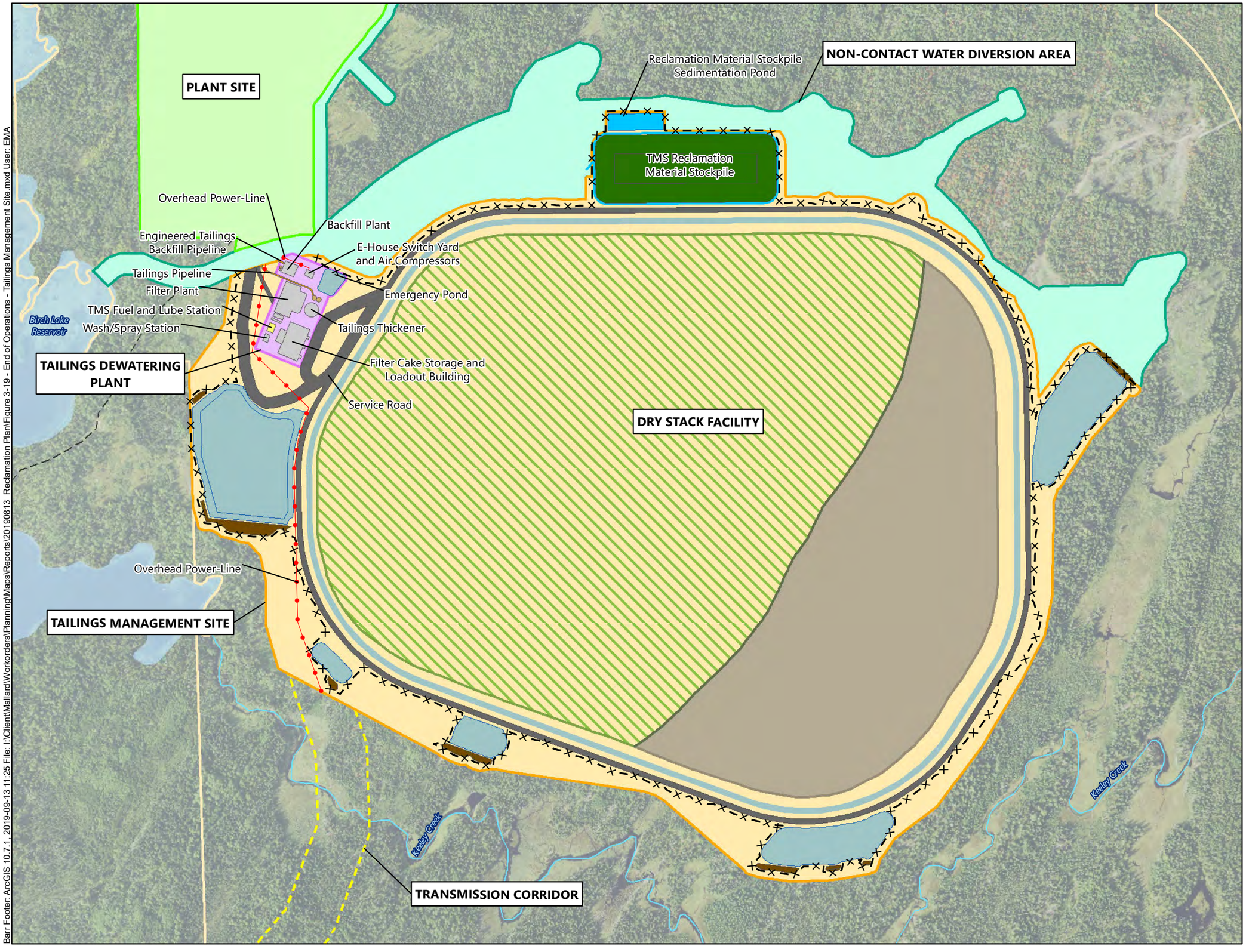
N

0 500 1,000 2,000
Feet

0 125 250 500
Meters

Figure 3-18
INCREMENTAL DEVELOPMENT AND CONCURRENT RECLAMATION - DRY STACK FACILITY
Twin Metals Minnesota LLC
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:38 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 3-18 - Incremental Development and Concurrent Redamation - DSF.mxd User: EMA



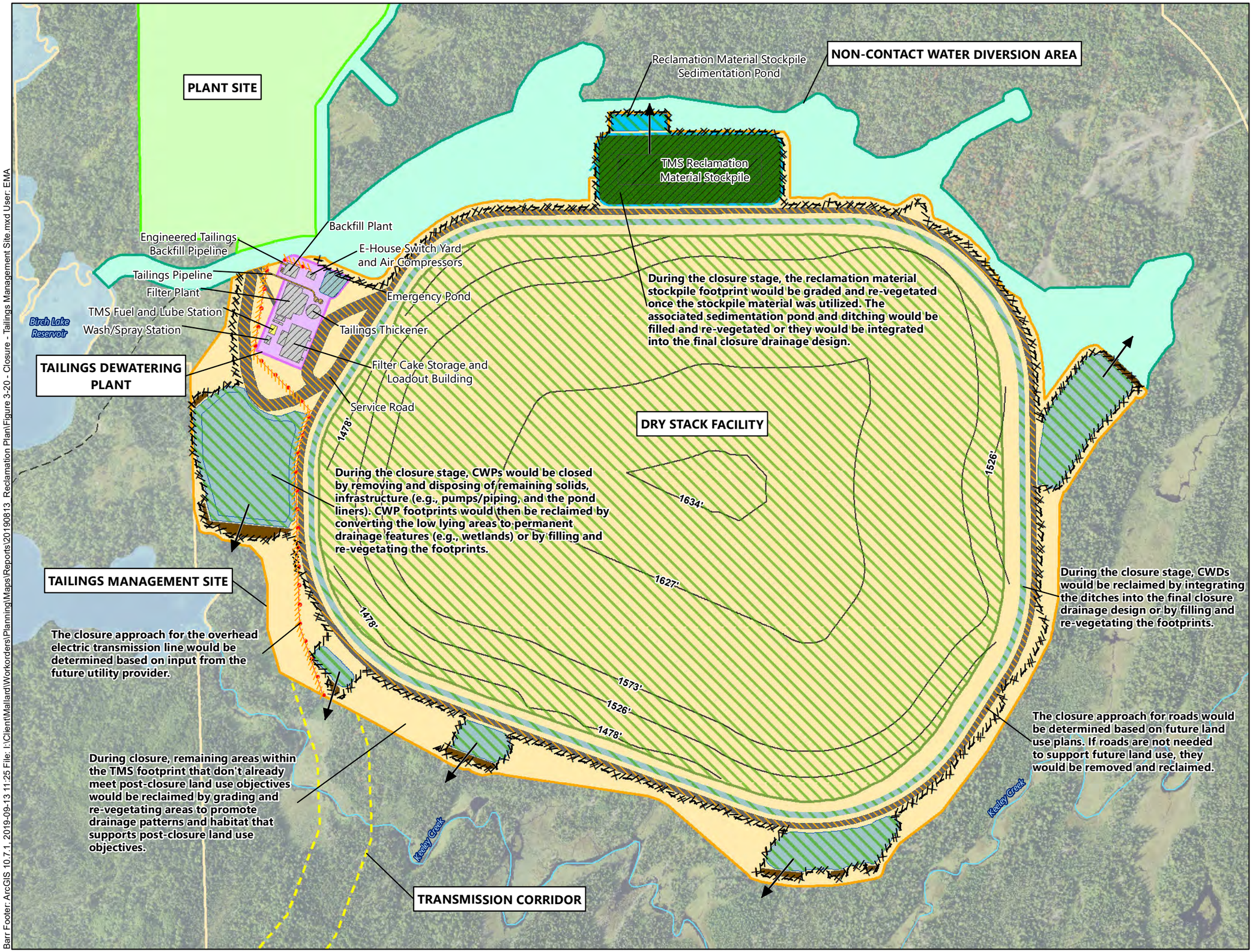
Project Area
Plant Site
Tailings Management Site
Tailings Dewatering Plant
Non-Contact Water Diversion Area
Transmission Corridor
DSF Footprint Development
Approximate Reclaimed DSF Area
Transmission Line
Fenceline
Building
Contact Water Ditch (CWD)
Contact Water Pond (CWP)
Dike
Equipment/Infrastructure
Fuel Storage
Non-Contact Water Ditch (NWD)
Non-Contact Water Pond (NWP)
Reclamation Material Stockpile
Service Road/Parking
Tailings Pipeline
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
USFS Roads (2013)

N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 3-19
END OF OPERATIONS - TAILINGS MANAGEMENT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN



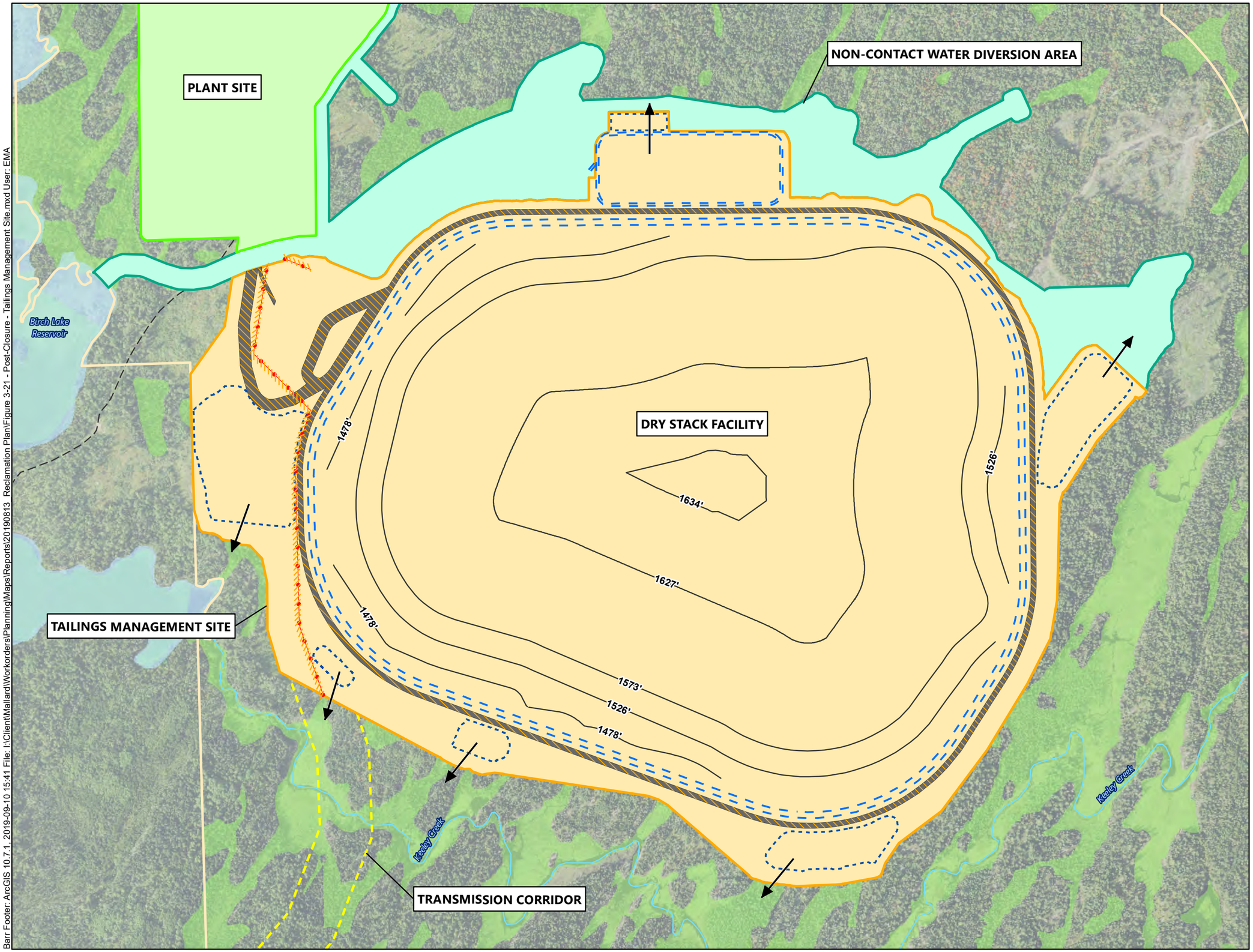
Project Area
Plant Site
Tailings Management Site
Tailings Dewatering Plant
Non-Contact Water Diversion Area
Transmission Corridor
Remove at Closure
To Be Determined Based on Future Land Use
Reclaimed Feature
Dry Stack Facility Contours
Transmission Line
Fenceline
Building
Contact Water Ditch (CWD)
Contact Water Pond (CWP)
Dike
Equipment/Infrastructure
Fuel Storage
Non-Contact Water Ditch (NWD)
Non-Contact Water Pond (NWP)
Reclamation Material Stockpile
Service Road/Parking
Tailings Pipeline
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
Approximate Runoff Flow Direction Following Closure
USFS Roads (2013)

N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 3-20
CLOSURE - TAILINGS MANAGEMENT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN



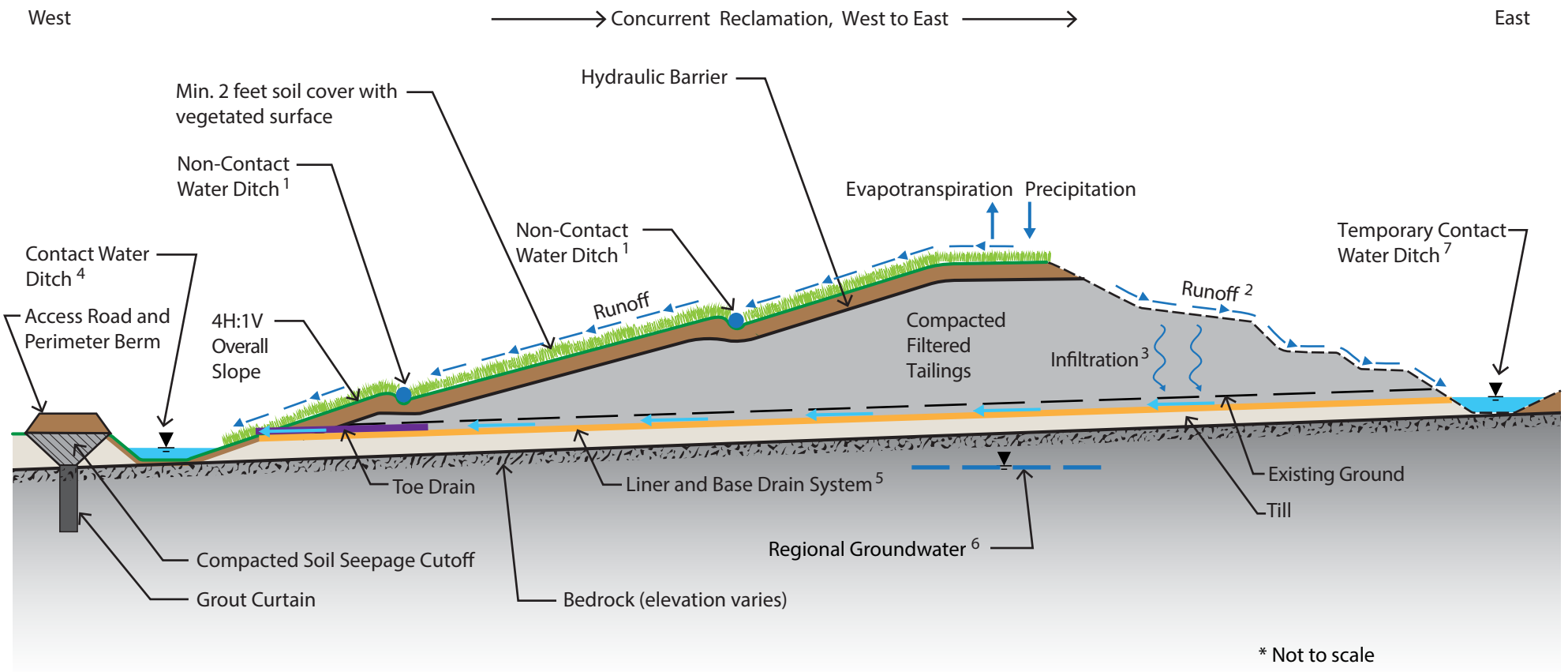
Project Area
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Transmission Corridor
To Be Determined Based on Future Land Use
Reclaimed Ditch
Reclaimed Pond Area
Service Road/Parking
Dry Stack Facility Contours
Transmission Line
PWI Watercourse (MNDNR 2017)
PWI Basin (MNDNR 2017)
Wetlands
Approximate Runoff Flow Direction Following Closure
USFS Roads (2013)

N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 3-21
POST-CLOSURE - TAILINGS MANAGEMENT SITE
Twin Metals Minnesota
Lake and St. Louis Counties, MN

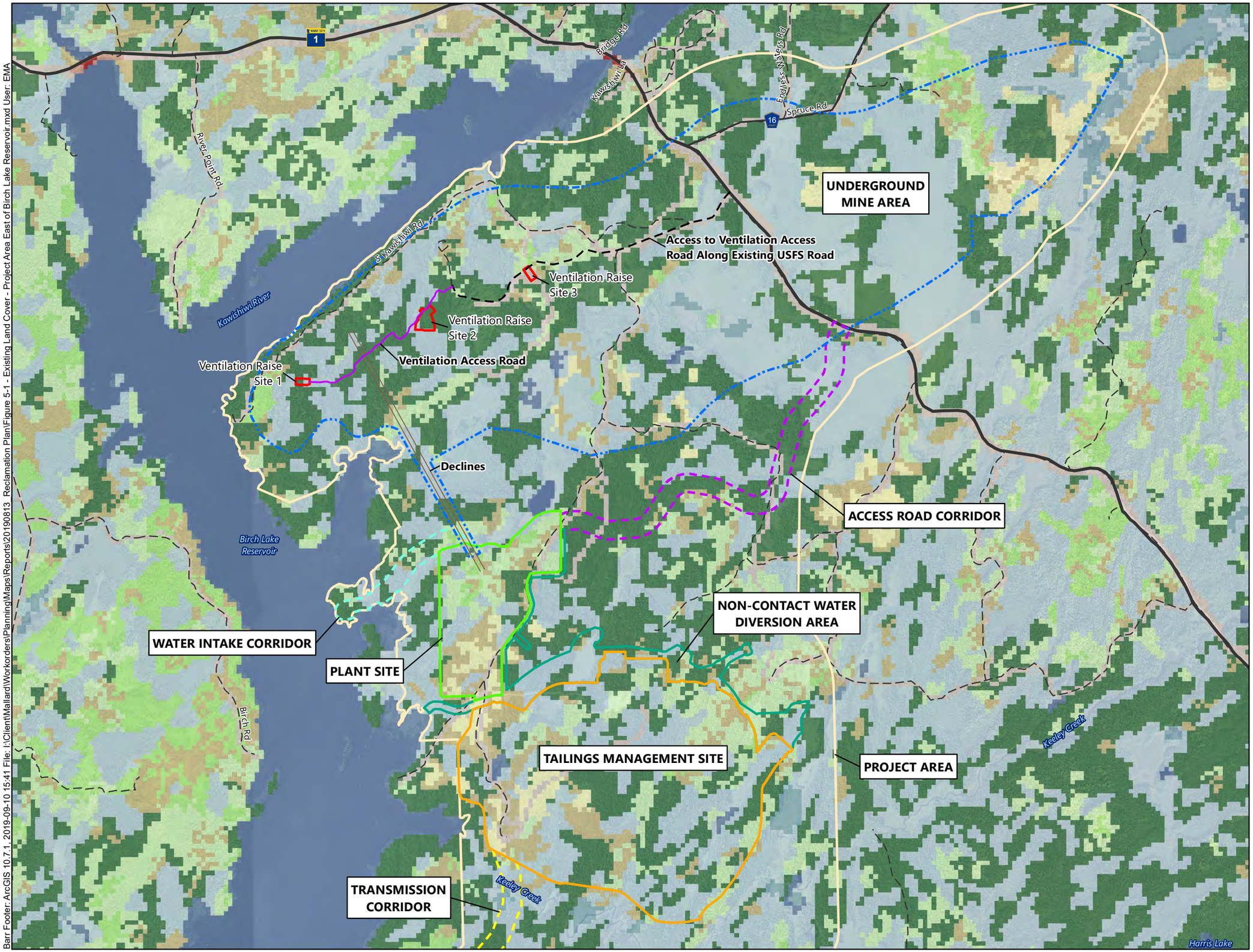


Notes

1. Non-contact water runoff would be collected in non-contact water ditches (NCWDs) on the exterior slope of the DSF to convey water toward the toe of DSF perimeter embankment. Initially (including during concurrent reclamation) the NCWDs on the DSF would drain to controls for removal of suspended solids (e.g., dedicated settling / detention ponds, not shown on this concept figure). Water from non-contact water controls would drain to the environment following removal of suspended solids.
2. Within the active area of the DSF where placed tailings are not covered, surface water that contacts tailings would be collected and routed to contact water ditches (CWDs).
3. Water that infiltrates into the tailings must resaturate the tailings along a vertical preferential flow path to the base of the DSF. Only then will water reach the drain system. Water that infiltrates into the tailings and fully flows through the tailings would be collected in the over-liner drain system (part of the base drain system) that would also drain to CWDs around the perimeter of the DSF.
4. CWDs would drain to lined contact water ponds (CWPs, not shown on this concept figure). Water in CWPs would be returned to the plant site process water circuit, used for tailings conditioning and particulate emissions control within the DSF, and/or be used for preparation of cemented tailings backfill. Once the DSF surface was fully revegetated and vegetation growth is dense and well established, runoff may no longer require suspended solids removal to meet water quality standards. Once suspended solids removal is no longer necessary, runoff would be discharged directly to the environment.
5. The DSF liner and base drain system would include a geomembrane and compacted soil liner and a two-part drainage system consisting of 1) over-liner gravel drains to aid removal of any seepage that would occur through the tailings and otherwise pond on the geomembrane liner and 2) under-liner gravel drains to control soil pore-water below the geomembrane liner.
6. Locally depressed regional groundwater resulting from reduced recharge and perimeter grout curtain.
7. Temporary ditching would be provided to convey runoff from the open face of the DSF to the perimeter of the CWDs.

Figure 3-22

TMS SITE
CONCEPTUAL MODEL -
DRY STACK FACILITY
Twin Metals Minnesota LLC
Lake and St. Louis Counties, MN



Project Area
Underground Mine Area (Surface Projection)
Plant Site
Tailings Management Site
Non-Contact Water Diversion Area
Access Road Corridor
Transmission Corridor
Water Intake Corridor
Ventilation Raise Site
Declines
Ventilation Raise Access Road
USFS Roads (2013)

Streets and Highways (MnDOT)
State Trunk Highway
County State-Aid Highway

National Land Cover Data (USGS 2011)
Woody Wetlands
Shrub/Scrub
Open Water
Mixed Forest
Herbaceuous
Evergreen Forest
Emergent Herbaceuous Wetlands
Developed, Open Space
Developed, Low Intensity
Developed, High Intensity
Deciduous Forest

N

0 1,000 2,000 4,000
Feet

0 300 600 1,200
Meters

Figure 5-1
EXISTING LAND COVER - PROJECT AREA EAST OF BIRCH LAKE RESERVOIR
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-09-10 15:41 File: I:\Client\Mallard\Workorders\Planning\Maps\Reports\20190813_Reclamation Plan\Figure 5-1 - Existing Land Cover - Project Area East of Birch Lake Reservoir.mxd User: EMA

ATTACHMENT B.1

TMM PROJECT RECLAMATION PLAN SUMMARY

Table A1 TMM Project Reclamation Plan Summary

Project Area and Feature	General Reclamation Approach[1]	RECLAMATION					
		Operations	Closure Year			Post-Closure Maintenance and Monitoring Year	
Underground Mine Area		25 year LOM	1	2	3	Years 1 through 5	Years 5 through 25
- Underground mobile equipment and infrastructure	Remove						
- Underground fixed equipment and infrastructure	Abandon in place						
- Mine decline and underground mine[2]	Backfill[3], passively flood unfilled portions						
- Ventilation shafts and surface ventilation structures[2]	Remove infrastructure, bulkhead/seal shafts						
- Disturbed land surface at surface ventilation structures	Regrade and revegetate[4]						Through Year 10
Plant Site			1	2	3	Years 1 through 5	Years 5 through 25
- Portals to the underground mine[2]	Permanently seal to prevent access						
- Buildings	Remove[5] and regrade/revegetate footprint						
- Electrical/power	Remove general items, leave the substation and power-line from the offsite substation in place[6,7]						
- Supporting equipment and infrastructure	Remove[5] and regrade/revegetate footprint						
- Fuel storage	Remove and regrade/revegetate footprint						
- Pipelines	Remove						
- Laydown and storage areas	Remove and regrade/revegetate footprint						
- Ponds	Remove, regrade and/or fill, and revegetate footprint						
- Service roads and parking areas	Retain if needed to support future land use, otherwise remove and regrade/revegetate footprint						
- Stockpiles (including liners if present)	Remove and regrade/revegetate footprint						
- Sanitary management systems	Pump out and remove tanks						
- Surface water management features	Regrade and revegetate[5]						
- Ancillary disturbed land surface at Plant Site	Regrade and revegetate[4]						Through Year 10
Corridors			1	2	3	Years 1 through 5	Years 5 through 25
- Access road	Retain/maintain						
- Water intake pipeline (from Birch Lake reservoir)	Remove (or abandon in place if approved)						
- Water intake facility	Remove and regrade/revegetate footprint						
- Water intake pipelines (intake facility to plant site)	Flush, remove						
- Water intake communications and power supply	Abandon in place						
- Water intake maintenance access roads	Regrade and revegetate[5]						
- Transmission corridor power-lines and off-site substation	Leave in place[6,7]						
- Surface water management	Regrade and revegetate[5]						
- Ancillary disturbed land surface along corridors	Regrade and revegetate[4]						Through Year 10
Non-contact Water Management Area (NWDA)			1	2	3	Years 1 through 5	Years 5 through 25
- Dikes	Revegetate and leave in place[6]						
- Native soil fill areas	Revegetate and leave in place[6]						
- Non-contact water ponds	Leave in place[6]						
- Non-contact water ditches	Revegetate and leave in place[6]						
- Culverts	Leave in place[6]						
- Ancillary disturbed land surface in NWDA	Regrade and revegetate[4]						
Tailings Management Site (TMS)			1	2	3	Years 1 through 5	Years 5 through 25
- Buildings at the tailings dewatering plant	Remove[5] and regrade/revegetate footprint						
- Pipelines	Remove						
- Dry stack facility (including ditches)	Revegetate and leave in place[6,7]						
- Contact water ponds and ditches[8]	Drawdown, stabilize, reclaim footprint						
- Electrical/power	Remove general items, leave the power-line from the plant site to the TMS in place[6,7]						
- Stockpiles	Remove and regrade/revegetate footprint						
- Service roads and parking	Retain if needed to support future land use, otherwise remove and regrade/revegetate footprint						
- Laydown and storage areas	Remove and regrade/revegetate footprint						
- Ancillary disturbed land surface at TMS	Regrade and revegetate[4]						Through Year 10
Other Supporting Infrastructure and Activities [9]			1	2	3	Years 1 through 5	Years 5 through 25
- Groundwater monitoring wells and monitoring	Reclaim when no longer needed						
- Surface water monitoring stations and monitoring	Remove when no longer needed						

Notes:

1) See written Reclamation Plan for additional location-specific reclamation approach and requirements.

2) Monitor for ground subsidence at portal and ventilation raise site reclaim areas, and above first 2,000 feet of mine decline through Post-Closure Year 5.

3) During the operations Project stage, the underground workings would be progressively backfilled with an engineered tailings backfill (ETB) produced at the surface and distributed via the declines through the underground workings using a system of pipes and lines secured within the stopes and drifts. Generally establish conditions to minimize concentrated flow and limit flow velocities such that, together with the vegetated cover, the resulting site will be stabilized, with peak discharge rates not exceeding pre-mining conditions.

4) Regrade footprint and revegetate to promote drainage patterns and habitat that support post-closure land use objectives (e.g., range of mixed hardwood pine forest to jack pine barrens except at TMS which will be a diverse grasslands with pollinator species).

Legend:

- Concurrent reclamation (reclamation performed during the operations stage).
- Closure activity during primary closure period (closure years 1 through 3).
- Closure activity during post-closure maintenance.
- Post-closure maintenance and monitoring (higher intensity level).
- Post-closure maintenance and monitoring (lower intensity level).
- To be determined based on future land use needs
- No activity/action planned or required.

5) Foundation walls two feet and greater below final grade, abandoned in place.

6) "Leave in place" means that infrastructure is maintained for use (or potential future use) (whereas "abandon in place" means the infrastructure is no longer in use and will not be maintained for future use).

7) Future use to be determined based on input the from the utility provider.

8) Generally re-establish pre-mining runoff flow directions and discharge locations.

9) Groundwater and surface water monitoring requirements to be reviewed and updated periodically.

ATTACHMENT B.2

RECLAMATION PLANS – SYNOPSIS OF RULES

This synopsis of rules is intended to help the reader understand potential rules pertaining to Project reclamation that Twin Metals Minnesota LLC would need to comply with. The synopsis is not intended to be a comprehensive description of all applicable rules. Rather, as context for the reader, the synopsis provides general background related to potential reclamation rules. As discussed in Section 1.2 of the Reclamation Plan, TMM would need to comply with all applicable reclamation requirements set forth in federal or state surface authorizations, mineral leases, permits, and applicable land management plans. TMM expects that specific reclamation requirements will be developed during the environmental review and permitting process.

Minnesota Rules Part 6132.1100 Permit Applications

Subp.6. Mining and Reclamation Plan, Item C requires inclusion of "the engineering design, methods, sequence, and schedules of reclamation including closure and postclosure maintenance that address the goals and meet the requirements of parts 6132.2000 to 6132.3200, including anticipated reclamation research…"

Subp.7.Mining and Reclamation Maps, Item D(3) requires maps showing construction, including shape, extent, and content, and reclamation, including contouring, covering, temporary stabilization, vegetation, closure, and post-closure maintenance, of each of the following: storage pile, tailings basin, mine reservoir, dam, diversion channel, drainage control, settling basin, heap and dump leaching facility, and auxiliary facility.

Minnesota Rules Part 6132.1200 Financial Assurance

Requirements of 6132.1200 are not repeated herein. In summary, financial assurance must be provided and is to assure that there are sufficient funds to be used by the MDNR commissioner if the permittee fails to perform:

A. reclamation activities including closure and post-closure maintenance needed if operations cease; and
B. corrective action as required by the commissioner if noncompliance with design and operating criteria in the permit to mine occurs.

A Plan on which financial assurance cost estimates are based must be prepared.

Minnesota Rules Part 6132 Reclamation Standards

- 6132.2000 Siting – not applicable to Reclamation Plan.
- 6232.2100 Buffers – requires visual buffers to diminish visual impacts of mining.
- 6132.2200 Reactive Mine Waste – must be reclaimed to prevent the release of substances that result in the adverse impacts on natural resources.

- 6132.2300 Overburden Portion of Pit Walls – underground mine proposed; not applicable.
- 6132.2400 Storage Pile Design – permanent storage piles not proposed; not applicable.
- 6132.2500 Tailings Basins – must be designed to be structurally sound, control air emissions, minimize hydrogeologic impacts, promote progressive reclamation, and enhance the survival and propagation of vegetation, and include provisions for closure and postclosure maintenance.
- 6132.2600 Heap and Dump Leaching Facilities – none proposed; not applicable.
- 6132.2700 Vegetation – must be established to control erosion, screen mining areas from noncompatible uses, and provide for subsequent land uses such as wildlife habitat or timber production.
    - After three growing seasons following initiation of vegetation, a 90 percent ground cover within a 90 percent statistical confidence interval, consisting of living vegetation and its litter, must exist on all areas, except slopes that primarily face south and west. Such slopes shall attain the 90 percent ground cover in 5 growing seasons.
    - Within ten growing seasons following initiation of vegetation, an area shall have a vegetative community with characteristics similar to those of an approved reference area. The vegetation on a reference area may be either planted or naturally occurring……Reference areas must be representative of the site conditions and possible uses that might exist on mining land forms.
- 6132.2800 Dust Suppression – areas disturbed by mining shall be managed to control dust.
- 6132.2900 Air Overpressure and Ground Vibration From Blasting – not applicable to reclamation.
- 6132.3000 Subsidence – areas affected by subsidence shall be contoured or filled to protect public health and safety or natural resources.
- 6132.3100 Corrective Action – corrective action required if non-compliance with permit occurs and in the event of a threat to human safety or natural resources resulting from the mining operation.
- 6132.3200 Closure and PostClosure Maintenance – the mining area shall be closed so that it is stable, free of hazards, minimizes hydrologic impacts, minimizes the release of substances that adversely impact other natural resources, and is maintenance free.

Minnesota Rules Part 6132.3200 Closure and Post-closure Maintenance

Requirements of 6132.3200 are not repeated herein. In summary, 6132.3200 outlines specific closure and post-closure actions and schedule requirements.

FSM Chapter 2840 – Reclamation

Reclamation is defined as "Those actions performed during or after mineral activities (defined as any aspect of mineral exploration, development, or production) to shape, stabilize, revegetate, or otherwise treat the affected lands in order to achieve a safe and ecologically stable condition and land use that is consistent with long-term forest land and resource management plans and local environmental conditions."

Administrative and Environmental Reclamation components required for Plans of Operations include:

1. Administrative Components
    a. Timing, kind, and amount of reclamation to be accomplished concurrently with mineral activities.
    b. Reclamation requirements for interim shutdown, including seasonal shutdown.
    c. The maximum allowable time in the event of interim shutdown before final reclamation measures will be required.
    d. Concurrent and final reclamation of transportation facilities, such as roads, railways, tramways, power line corridors, and pipelines.
    e. Removal of facilities and reclamation of the site.
    f. Timeframes for periodic review and updating of the Plan of Operations, including reclamation performance requirements and financial guarantees. Procedures for ensuring interim and final stability of waste embankments, including dumps, tailings dams, or impoundments.

2. Environmental Components
    a. Final configuration of the disturbed areas, including such items as roads, pits, waste embankments, ponds, leach pads, drill holes, and facility sites.
    b. Revegetation of disturbed areas, including timing, kind, and amount.
    c. Topsoil management, including soil salvage and reapplication.
    d. Air quality management during and after operations.
    e. Watershed management, including runoff and erosion control, and riparian and wetland protection.
    f. Water quality management, including physical and chemical characteristics of surface and subsurface water during and after operations.
    g. Visual resource management during and after operations.
    h. Potential for the occurrence and control of hazardous or toxic substances, including acid mine drainage, that may contaminate air, water or soil.
    i. Fish and wildlife habitat reclamation or mitigation.
    j. Tailings and associated tailings facilities.
    k. Stream diversions, reservoirs, ditches, or canals.

In addition to the components summarized above, measurable Reclamation Performance Standards must be included for at least the following:

1. Revegetation
2. Soil and water conservation measures.
3. Mass stability of overburden and other waste embankments.
4. Concurrent reclamation.
5. Post-mining and configuration.

43 CFR Part 3800, Subpart 3809.420 – Reclamation performance standards are described in 3809.420 part a. General Performance Standards and part b3. Specific Standards – Reclamation

(a) General performance standards -

(1) Technology and practices. You must use equipment, devices, and practices that will meet the performance standards of this subpart.

(2) Sequence of operations. You must avoid unnecessary impacts and facilitate reclamation by following a reasonable and customary mineral exploration, development, mining and reclamation sequence.

(3) Land-use plans. Consistent with the mining laws, your operations and post-mining land use must comply with the applicable BLM land-use plans and activity plans, and with coastal zone management plans under 16 U.S.C. 1451, as appropriate.

(4) Mitigation. You must take mitigation measures specified by BLM to protect public lands.

(5) Concurrent reclamation. You must initiate and complete reclamation at the earliest economically and technically feasible time on those portions of the disturbed area that you will not disturb further.

(6) Compliance with other laws. You must conduct all operations in a manner that complies with all pertinent Federal and state laws.

(b3) Specific standards - Reclamation

(i) At the earliest feasible time, the operator shall reclaim the area disturbed, except to the extent necessary to preserve evidence of mineralization, by taking reasonable measures to prevent or control on-site and off-site damage of the Federal lands.

(ii) Reclamation shall include, but shall not be limited to:

A. Saving of topsoil for final application after reshaping of disturbed areas have been completed;

B. Measures to control erosion, landslides, and water runoff;

C. Measures to isolate, remove, or control toxic materials;

D. Reshaping the area disturbed, application of the topsoil, and revegetation of disturbed areas, where reasonably practicable; and

E. Rehabilitation of fisheries and wildlife habitat.

(iii) When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the authorized officer shall be notified so that an inspection of the area can be made.

Per the BLM Surface Management Handbook (H-3809-1) Section 3.2.1.2.3 Reclamation Plan:

The operator must provide sufficient information for the BLM to assess the adequacy of the proposed reclamation plan. This may involve the operator providing a description of the equipment, devices, or practices they propose to use during reclamation to meet the performance standards. The reclamation plan must provide for the regrading and reshaping of disturbed areas, where applicable. Typical reclamation plans should include a description of the equipment to be used, slope grade, location and size of runoff controls, cross-sections, etc. A post-grading topographic map showing the planned regrading, though not required, can be the best way to illustrate the regrading plan. The reclamation plan needs to describe the location, plant species, seeding or planting rates, and treatment methods proposed to re-establish vegetation over disturbed areas. Also, the plan must propose the criteria for what would constitute successful revegetation and describe additional measures, such as temporary fencing or noxious weed control, which might be used on the reclaimed area. Where applicable, the reclamation plan must describe how drill holes are going to be plugged. The District/Field Office's review must verify that plugging procedures will be in compliance with applicable state drill-hole plugging requirements.

Title 43 of Code of Federal Regulations (CFR) Part 3500, Subpart 3592.1 – Operating Plans

(a) Before conducting any operations under any lease(s), license(s), or permit(s), the operator shall submit to the authorized officer an exploration or mining plan which shall show in detail the proposed exploration, prospecting, testing, development or mining operations to be conducted. Exploration and mining plans shall be consistent with and responsive to the requirements of the lease, license or permit for the protection of non-mineral resources and for the reclamation of the surface of the lands affected by the operations on Federal or Indian lease(s), license(s), or permit(s). The authorized officer shall consult with any other agency involved, and shall promptly approve the plans or indicate what additional information is necessary to conform to the provisions of the established requirements. No operations shall be conducted except as provided in an approved plan……

(9) A reclamation schedule and the measures to be taken for surface reclamation of the Federal or Indian lease(s), license(s), or permit(s) that will ensure compliance with the established requirements. In those instances in

which the lease requires the revegetation of an area affected by operations, the mining plan shall show:

(i) Proposed methods of preparation and fertilizing the soil prior to replanting;

(ii) Types and mixtures of shrubs, trees or tree seedlings, grasses or legumes to be planted; and

(ii) Types and methods of planting, including the amount of grasses or legumes per acre, or the number and spacing of trees or tree seedlings, or combinations of grasses and trees;

(10) The method of abandonment of operations on Federal or Indian lease(s), license(s), and permit(s) proposed to protect the unmined recoverable reserves and other resources, including the method proposed to fill in, fence or close all surface openings which are a hazard to people or animals. Abandonment of operations also is subject to the provisions of subpart 3595 of this title; and

(11) Any additional information that the authorized officer deems necessary for approval of the plan.

Title 43 CFR Part 3500, Subpart 3595.1 – Surface Openings

(a) The operator/lessee shall substantially fill in, fence, protect or close all surface openings, subsidence holes, surface excavations or workings which are a hazard to people or animals. Such protective measures shall be maintained in a secure condition during the term of the lease, license or permit. Before abandonment of operations, all openings, including water discharge points, shall be closed to the satisfaction of the authorized officer.

(b) Reclamation or protection of surface areas no longer needed for operations will commence without delay. The authorized officer shall designate such areas where restoration or protective measures, or both shall be taken.

Title 43 CFR Part 3500, Subpart 3595.2 – Abandonment of Underground Workings

No underground workings or part thereof shall be permanently abandoned and rendered inaccessible with-out the advance, written approval of the authorized officer.

CFR Title 36 Parks, Forests and Public Property, Part 228 Minerals *(applicable to operations on National Forest System lands under the jurisdiction of the Secretary of Agriculture)*

Reclamation requirements outlined in Subpart 228.8 (g) are stated as follows:

Upon exhaustion of the mineral deposit or at the earliest practicable time during operations, or within one year of the conclusion of operations, unless a longer time is allowed by the authorized officer, operator shall, where practicable, reclaim the surface disturbed by taking such measures as will prevent or control onsite and off-site damage to the environment and the forest surface resources including:

1. Control of erosion and landslides;
2. Control of water runoff;
3. Isolation, removal or control of toxic materials;
4. Reshaping and revegetation of disturbed areas, where reasonably practicable; and
5. Rehabilitation of fisheries and wildlife habitat.

Reclamation requirements outlined in Part 228.10 are stated as follows:

> Unless otherwise agreed to by the authorized officer, operator shall remove within a reasonable time following cessation of operations all structures, equipment and other facilities and clean up the site of operations.

APPENDIX C

NON-CONTACT WATER MANAGEMENT PLAN

NON-CONTACT WATER MANAGEMENT PLAN

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared by Twin Metals Minnesota LLC

Document No. TMM-EG-115-0003
Revision 0A
12-18-2019

REVISION RECORD

Revision	Date	Description	EDMS Download Date	Project Configuration Version
0A	12-18-2019	Issued for Agency Review	N/A	1.0

REVISION NARRATIVE

Not Applicable

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.

TABLE OF CONTENTS

FIGURES

Located in Figures section at end of document:

LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

BMP Best Management Practice

e.g.	Latin phrase *exemplis gratia* meaning “for example”
etc.	abbreviation for the Latin phrase et cetera meaning "and other similar things" or "and so forth"
ft	foot
km	kilometer
m	meter
Project	Twin Metals Minnesota Project
TMM	Twin Metals Minnesota LLC

1.0 INTRODUCTION

The Twin Metals Minnesota LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, cobalt, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of the city of Ely, Minnesota, and 11 miles (18 km) northeast of the city of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at http://www.twin-metals.com/.

The purpose of this document is to provide necessary information for the environmental review and permitting process.

1.1 Purpose

The following Non-contact Water Management Plan has been prepared as part of the Project's mine plan of operations to inform management of non-contact water. The contents of this Non-contact Water Management Plan include monitoring and management guidance for the following:

- Non-contact water diversion area:
  - non-contact water ditches;
  - non-contact water ponds;
- Plant site non-contact area; and
- Tailings management site non-contact area.

The overall Project layout is presented in Figure 1-1 and a more detailed Project layout of non-contact water management features is presented in Figure 1-2. This is intended to be a living document and would be updated as necessary, during the Project's environmental review process. Updates would be submitted to the lead agency prior to construction.

2.0 NON-CONTACT WATER MANAGEMENT

Non-contact water would be managed in the following areas:

- Non-contact water diversion area;
- Plant site non-contact area;
- Tailings management site non-contact area;
- Underground Mine Area non-contact area; and

- Corridors.

Best Management Practices (BMPs) would be used across the Project to manage non-contact water. BMPs may include, but are not limited to, mulching and biodegradable erosion control blankets, establishing and maintaining vegetation, collection and conveyance structures (e.g., swales, ditches, and culverts), non-vegetative soil stabilization such as rock armoring and sediment barriers or basins.

2.1 Non-Contact Water Diversion Area

Non-contact water from the adjacent watersheds would be intercepted and diverted around the plant site and the tailings management site to prevent non-contact water from co-mingling with contact water and to protect infrastructure. Figure 2-1 illustrates the surface water flow direction within the non-contact water diversion area.

To divert non-contact water around the plant site, two non-contact water ditches would be constructed to intercept and divert water to the south. To divert non-contact water around the tailings management site, non-contact water ditches and diversions dikes would be constructed in stages, corresponding to the staged development of the dry stack facility.

The five diversion dikes around the north side of the tailings management site would be offset at least 328 ft (100 m) from the outer edge of the perimeter haul road. These diversion dikes would be staged concurrently with the dry stack facility construction stages. They would be constructed by placing and compacting fill across drainage depressions, as required, and armoring the upstream side with riprap. These dikes would result in ponding of non-contact water from adjacent surface flows resulting in non-contact water ponds. Four non-contact water ditches would be built to drain ponded water from the diversion dikes on the north side of the tailings management site to Birch Lake reservoir.

Three diversion dikes and a non-contact water ditch on the northeast side of the tailings management site would intercept and divert water to the east. Water impounded on the east side of the most eastern diversion dike would eventually overtop a “saddle” and flow out of the drainage course into a tributary of Keeley Creek.

The diversion dikes would be designed to hold back the runoff from a 100-year, 24-hour storm event while maintaining a minimum 3.3 feet (ft) ft (1 meter [m]) of freeboard. The non-contact water ditches would be designed to convey the peak flow from a 10-year, 24-hour storm event with no erosion. The overflow weirs and non-contact water ditches would be designed to convey the 100-year, 24-hour storm event with a minimum freeboard of 1 ft (0.3 m). The diversion ditches would be designed with the appropriate slope to control suspended sediment. The non-contact

water ditches would discharge to existing drainage ways or other diversions ditches through energy dissipation devices (e.g., rip-rap, erosion control mats, etc.).

2.1.1 Monitoring

The non-contact water ponds, non-contact water ditches, and diversion dikes would be inspected on a regular basis at a frequency determined necessary by regulatory authorities. The non-contact water ponds, non-contact water ditches, and diversion dikes would be inspected monthly and during and after significant precipitation events. The inspections would look for ongoing erosion or sedimentation in the ditches which could impede their function.

2.1.2 Maintenance

When sediment deposits in the non-contact water ditches reach levels that could adversely affect flow capacity, the sediments would be excavated and deposited onto the reclamation material stockpile to re-establish flow capacity. If the base or side slopes of the non-contact water ditches experience erosion or slumping after a significant runoff event, the ditch profile would be restored, and the ditch would be reseeded with grass vegetation or riprap armoring would be placed/replaced.

2.2 Plant Site

A portion of the plant site would be managed as a non-contact area to allow flexibility for water management during extreme storm events. During extreme storm events, stormwater on the non-contact area at the plant site would be routed through appropriate discharge controls. However, during typical precipitation years, stormwater from the non-contact area at the plant site would be routed to and collected by the contact water collection system and used in the process. The collection of stormwater managed as contact water at the plant site is discussed in the Contact and Process Water Management Plan.

The non-contact area at the plant site would include, the security gatehouse, reclamation material stockpile 1 and 2, the plant site electrical substation, the ball storage bunker, the concentrator, the concentrator services building, the reagent storage building, and the areas surrounding and connecting these facilities that are not directly involved in transport of ore or tailings by truck. The slopes of the working pad at the plant site would be a non-contact area and designed to limit erosion so stormwater from the slopes would be routed through appropriate discharge controls. Based on the operational water needs for the process at the time of storm events, water from the non-contact area would be either diverted away from the plant site to minimize the amount of contact water collected from the plant site or collected by the contact water collection system.

During clearing and grubbing, non-saleable lumber would be chipped and used to cover reclamation material stockpile 1 and 2 to prevent wind and water erosion. Other sediment control features would be installed as needed.

2.2.1 Monitoring

The plant site non-contact zone would be inspected on a regular basis at a frequency determined necessary by regulatory authorities.

2.2.2 Maintenance

Erosion features in reclamation material stockpiles 1 and 2 would be repaired and the surface would be reseeded as needed. If necessary, the areas would be treated with a temporary erosion control measure (e.g., erosion control mat). If sediment accumulates in the reclamation material stockpile perimeter ditch and impedes flow, the sediment would be excavated from the ditch and deposited on the reclamation material stockpile. If sediment accumulates in the reclamation material stockpile sedimentation pond to the point where it restricts flow through the pond or significantly limits the detention capacity of the pond, the sediment would be excavated and deposited on the reclamation material stockpile.

2.3 Tailings Management Site

The tailings management site would manage the following five main non-contact areas:

1. Tailings management site reclamation material stockpile;
2. Undeveloped portions of the tailings management site prior to development of stage 2 and 3;
3. Portion of the exposed dry stack facility liner prior to tailings filter cake placement;
4. Portion of the tailings dewatering plant; and
5. Reclaimed portion of the dry stack facility.

2.3.1 Tailings Management Site Reclamation Material Stockpile

The tailings management site reclamation material stockpile would be classified as a non-contact area. Stormwater would be captured in perimeter ditches which would discharge into the reclamation material stockpile sediment pond. The tailings management site reclamation material stockpile sedimentation pond outlet would be to the north, with an ultimate outlet through the non-contact water ditch to the west. Erosion of the reclamation material stockpile would be limited through seeding of the stockpile surface with grass and temporary erosion control measures (e.g. silt fencing) until vegetation is established.

2.3.2 Undeveloped Portion of the Tailings Management Site

Prior to development of the dry stack facility stage 2 and stage 3, the footprint of stage 2 and stage 3 would be undeveloped. Stormwater on the undeveloped land would be non-contact water and would continue to flow around the dry stack facility footprint unaffected by dry stack facility development and tailings filter cake placement on stage 1. The footprint of dry stack facility stage 3 would be managed as non-contact water during operations when tailings filter cake is placed on stage 2.

2.3.3 Exposed Dry Stack Facility Liner

Development of the dry stack facility would result in exposed sections of the dry stack facility liner prior to tailings filter cake being placed and compacted. Portions of the exposed dry stack facility liner would be managed as non-contact areas. These non-contact areas would be identified and managed with a separation between contact water and non-contact water. Water from the non-contact areas of the exposed dry stack facility liner would be continually updated as the placement of tailings filter cake progresses eastward.

2.3.4 Portion of the Tailings Dewatering Plant

A portion of the tailings dewatering plant would be managed as a non-contact area to allow flexibility for water management during extreme storm events. During extreme storm events, stormwater on the non-contact area at the tailings dewatering plant would be routed through appropriate discharge controls. However, during typical precipitation years, stormwater from the non-contact area at the tailings dewatering plant would be routed to and collected by the contact water collection system and used in the process.

2.3.5 Reclaimed Portion of the Dry Stack Facility

During concurrent reclamation of the dry stack facility, a cover system would be installed. The final dry stack facility cover system would consist of a cover soil underlain by a hydraulic barrier. The cover system would be designed to function as a growth medium to support revegetation, reclassify the covered area of the dry stack facility as a non-contact water area and acting as a hydraulic barrier to mitigate the generation of draindown and / or seepage during closure.

Tailings filter cake would be preferentially placed to promote runoff and inhibit infiltration as part of operations. It would likely require relatively little grading to establish a finished slope towards the perimeter of the dry stack facility. The contouring of the dry stack facility surface required for reclamation and placement of cover material would be continued in a manner that promotes runoff and inhibits infiltration.

Portions of the dry stack facility which have been concurrently reclaimed would no longer generate contact water and stormwater runoff would be managed as non-contact water. In these areas, a temporary non-contact water ditch would be constructed near the toe of the dry stack facility inside and above the contact water ditches. These non-contact water ditches would drain to sediment control features to remove suspended solids. Controls for suspended solids removal may include but are not limited to temporary dedicated settling / detention ponds. Control features would drain to the surrounding areas following removal of suspended solids.

The post-closure surface of the dry stack facility would be graded to drain toward its perimeter. Reclamation design would aim to create conditions where runoff rates and volumes are similar to runoff reaching downstream surface water receptors for pre-Project site conditions. When the dry stack facility surface is fully revegetated and vegetation growth is dense and well established, runoff may no longer require suspended solids removal to meet water quality standards. Once suspended solids removal is no longer necessary, runoff would be discharged directly to the surrounding area and the collection ditches and ponds (both contact and non-contact) would be reclaimed and revegetated.

2.3.6 Monitoring of Tailings Management Site Non-Contact Area

The tailings management site reclamation material stockpile, perimeter ditch, and sediment pond would be inspected on a regular basis at a frequency determined necessary by regulatory authorities.

2.3.7 Maintenance of Tailings Management Site Non-Contact Area

Erosion features on the tailings management site reclamation material stockpile would be repaired. The surface would be reseeded and if necessary, treated with a temporary erosion control measure (e.g., erosion control mat). If sediment accumulates in the tailings management site reclamation material stockpile perimeter ditch and impedes flow, the sediment would be excavated and deposited on the tailings management site reclamation material stockpile. If sediment accumulates in the tailings management site reclamation material stockpile sedimentation pond to the point where it restricts flow through the pond or significantly limits the detention capacity of the pond, then the sediment would be excavated and deposited on the tailings management site reclamation material stockpile.

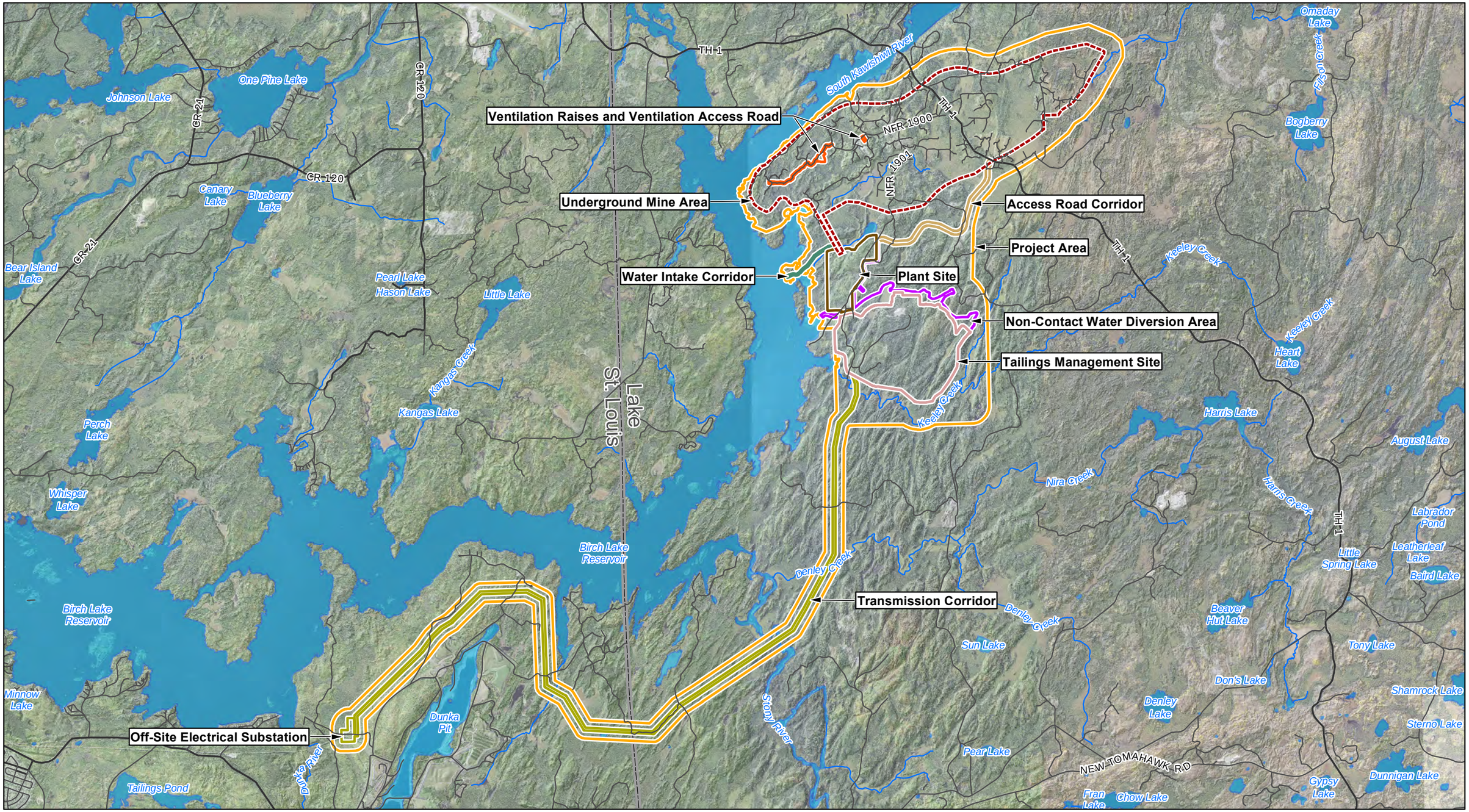
2.4 Underground Mine Area

Direct precipitation and stormwater would generate non-contact water on the ventilation raise sites and the ventilation raise access road. Non-contact water from these areas would be routed through appropriate discharge and would be managed to meet applicable surface water quality standards. BMPs would be implemented to meet erosion control and stormwater management requirements.

2.5 Corridors

The corridors include the access road, water intake corridor, and transmission corridor. Direct precipitation and stormwater would generate non-contact water within the corridors. Non-contact water from these areas would be directed through appropriate discharge controls and would be managed to meet applicable surface water quality standards. BMPs would be implemented to meet erosion control and stormwater management requirements.

FIGURES



NOTES:

1. Base air photo from the U.S. Department of Agriculture Farm Service Agency, Aerial Photography Field Office.
2. Hydrographic data from Minnesota Department of Natural Resources.
3. Horizontal datum based on NAD 1983. Horizontal coordinates based on Minnesota State Plane North (feet).

LEGEND

- Primary Road
- Secondary Road
- River/Stream
- Lake/Pond
- County Boundary
- Project Area
- Underground Mine Area
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Transmission Corridor
- Water Intake Corridor
- Ventilation Raises and Ventilation Raise Access Road
- Access Road Corridor

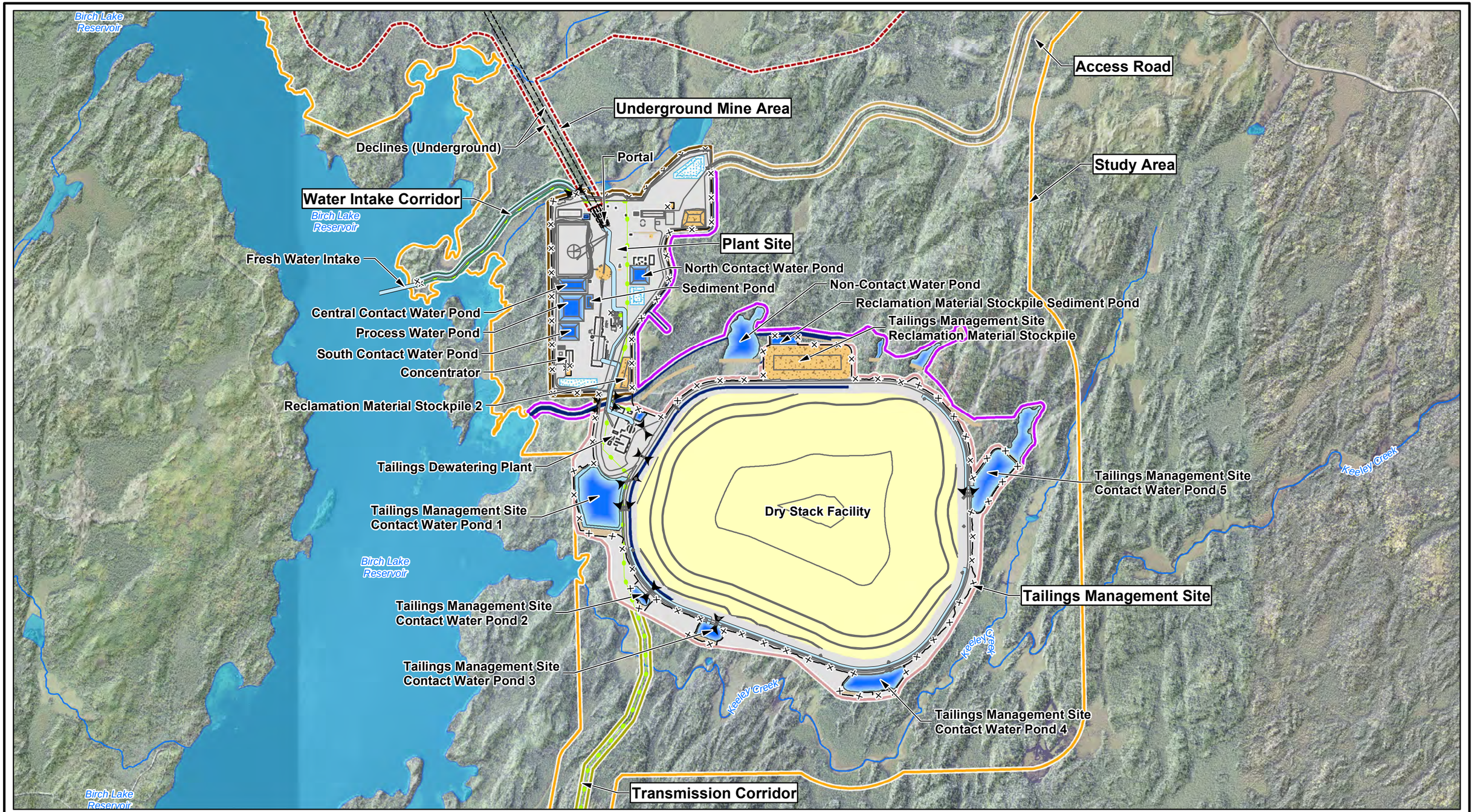
TWIN METALS MINNESOTA

FIGURE 1-1

GENERAL PROJECT LAYOUT

Scale: 0 2,500 5,000 Feet

Date: SEPTEMBER 2019



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2. Hydrographic data from Minnesota Department of Natural Resources.
3. Horizontal datum based on NAD 1983. Horizontal coordinates based on Minnesota State Plane North (feet).

LEGEND

- Facility
- Decline
- Piping
- Culvert
- Electrical Transmission Line
- Fence
- Vegetative Screen
- River/Stream
- Lake/Pond
- Project Area
- Underground Mine Area
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Transmission Corridor
- Water Intake Corridor
- Access Road

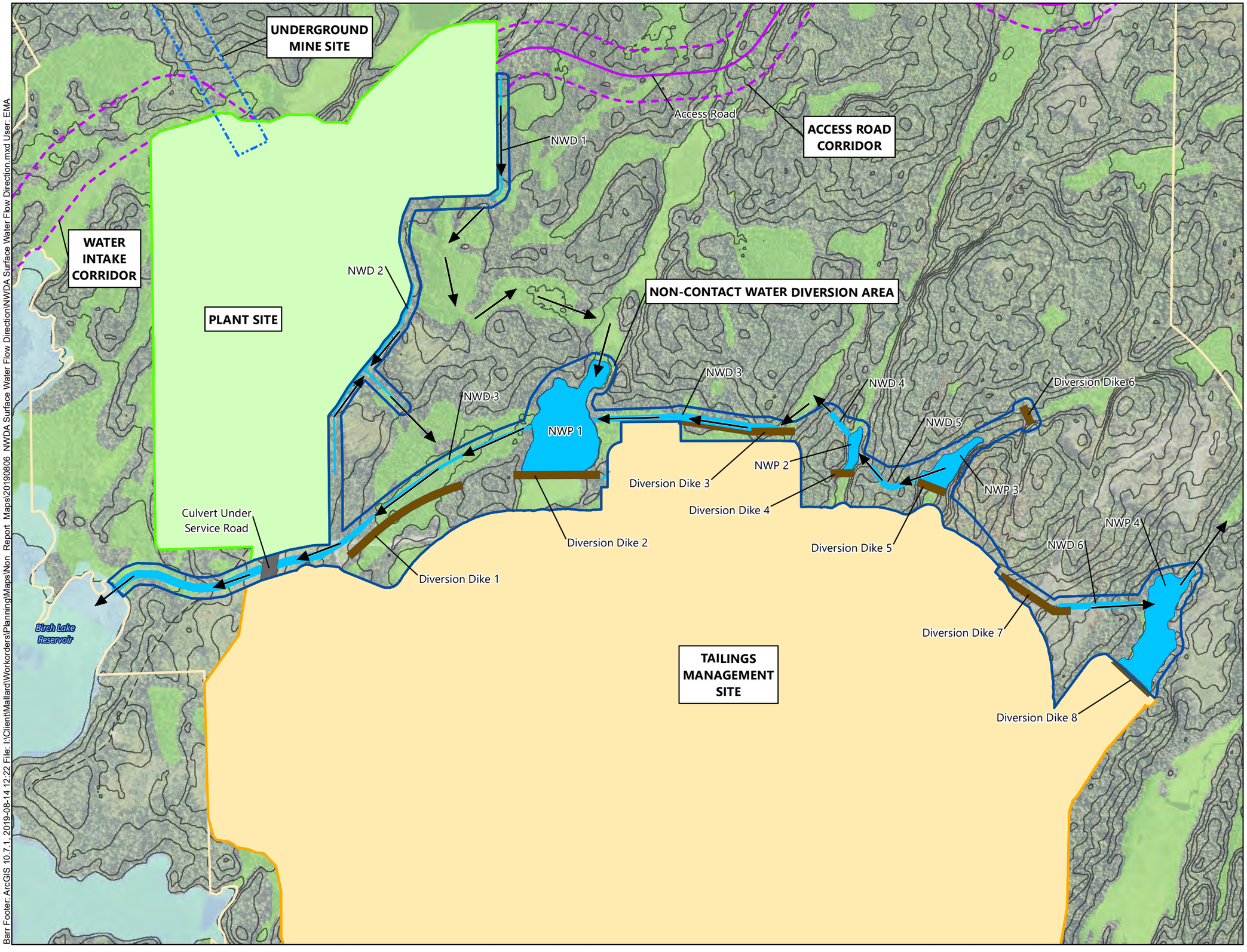
TWIN METALS MINNESOTA

FIGURE 1-2

PLANT SITE AND TAILINGS MANAGEMENT SITE OPERATIONS GENERAL ARRANGEMENT PLAN

Scale: 0 750 1,500 Feet

Date: SEPTEMBER 2019



- Project Area
- Underground Mine Area (Surface Projection)
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Access and Utility Corridor
- Road
- Dike
- Non-Contact Water Ditch (NWD)
- Non-Contact Water Pond (NWP)
- Service Road/Parking
- PWI Watercourse (MNDNR 2017)
- PWI Basin (MNDNR 2017)
- Wetlands
- Approximate Flow Direction
- Existing 10 ft Contour (Approx. 3m)
- USFS Roads (2013)

APPROVED

N

0 350 700 1,400
Feet

0 100 200 400
Meters

Figure 2-1

NON-CONTACT WATER DIVERSION AREA SURFACE WATER FLOW DIRECTION
Twin Metals Minnesota
Lake and St. Louis Counties, MN

Barr Footer: ArcGIS 10.7.1, 2019-08-14 12:22 File: I:\Client\Mallard\Workorders\Planning\Maps\Non_Report_Maps\20190806_NWDA Surface Water Flow Direction\NWDA Surface Water Flow Direction.mxd User: EMA

APPENDIX D

CONTACT AND PROCESS WATER MANAGEMENT PLAN

CONTACT AND PROCESS WATER MANAGEMENT PLAN

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared by Twin Metals Minnesota LLC

Document No. TMM-EG-115-0002
Revision 0A
12-18-2019

REVISION RECORD

Revision	Date	Description	EDMS Download Date	Project Configuration Version
0A	12-18-2019	Issued for Agency Review	N/A	1.0

REVISION NARRATIVE

Not Applicable

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.

TABLE OF CONTENTS

FIGURES

Located in Figures section at end of document:

LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

BMP	Best Management Practice
cm	centimeter
cm/sec	centimeters per second
e.g.	Latin phrase *exempli gratia* meaning “for example”
ft	foot
HDPE	high density polyethylene
i.e.	Latin phrase *id est* meaning “That is (to say)…”
in	inch
km	kilometers
LLDPE	linear low-density polyethylene
mm	millimeter
MPO	Mine Plan of Operations
Project	Twin Metals Minnesota Project
sec	second
TMM	Twin Metals Minnesota LLC

1.0 INTRODUCTION

The Twin Metals Minnesota LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, cobalt, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of the city of Ely, Minnesota, and 11 miles (18 km) northeast of the city of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at http://www.twin-metals.com/.

The purpose of this document is to provide necessary information for the environmental review and permitting process.

2.0 SUMMARY

The following Contact and Process Water Management Plan has been prepared as part of the Project's mine plan of operations (MPO) to inform management of contact and process waters. The Non-contact Water Management Plan has been prepared separately as part of the Project's MPO to inform management of non-contact water. The contents of this Contact and Process Water Management Plan include monitoring and management guidance for the following:

- Process water management for the:
  - underground mine;
  - process water pond;
  - concentrator; and
  - tailings dewatering plant.
- Contact water management for the:
  - plant site (contact water ponds); and
  - tailings management site.

The overall Project layout is presented in Figure 2-1 and a more detailed Project layout relating to contact water management features is presented in Figure 2-2. This Contact and Process Water Management Plan is intended to be a living document and would be updated as necessary during the Project's environmental review process. Updates would be submitted to the lead agency prior to construction.

3.0 PROCESS WATER MANAGEMENT

The Project would aim to maximize reuse of water in the process circuit while collecting and utilizing mine inflow and precipitation which would occur on contact

zones at both the plant site and tailings management site. Consumptive uses of water would be as follows:

- Residual water which would remain in the tailings filter cake placed on the dry stack facility;
- Residual water which would be consumed in the engineered tailings backfill;
- Residual water which would remain in the filtered concentrates shipped to market; and
- Evaporation which would occur from multiple sources.

These consumptive uses would be greater than make-up water expected from the reuse of process water, the use of mine flow, and the use of contact water. Therefore, the Project would expect intermittent use of make-up water from Birch Lake reservoir on an as-needed basis when the three other water sources would not meet process requirements from a quantity perspective.

The process water management strategy would be to prioritize water use for processing by the following list:

1. Reuse of process water;
2. Use of mine inflow (classified as process water as it would mix in the underground mine water dewatering system);
3. Use of contact water; and
4. Make-up water from Birch Lake reservoir.

As a part of the water management strategy, make-up water from Birch Lake reservoir and contact water from the contact water ponds would have raw water uses prioritized throughout the underground mine, plant site, and tailings management site. These prioritized water areas include, but are not limited to:

- Pressure filter cloth wash;
- Reagent make-up;
- Pump gland water; and
- Mine supply water.

The discussion presented in the contact water management section of this plan simplifies some aspects of process water management by saying that all make-up water from Birch Lake reservoir and all contact water from the contact water ponds would be routed to the process water pond, and that all process water demands would be fulfilled from the process water pond. This is accurate in terms of the water balance and the ultimate water destination. However, raw water priority uses would draw water directly from the Birch Lake reservoir source or from a contact water pond (when available) before that water would be routed to the process water pond. TMM anticipates that additional data collection and modeling would show the appropriation of this water as consistent with applicable standards.

3.1 Underground Mine

Management of water in the underground mine would play a key role in the overall Project water management strategy. Water management for the underground mine includes the following operations:

- The underground mine and underground mining activities;
- Underground mine dewatering;
- Engineered tailings backfill placement; and
- Ore conveyance.

Based on the current understanding of the overall water balance and the need for makeup water, the underground mine would have one dewatering system. While individual sources of water from the underground mine could initially be classified as contact water, mixing may occur with process water. Therefore, water removed from the underground mine (underground mine water) would be classified as process water.

Major inflows of water into the underground mine would include:

- Groundwater inflow into the mine (mine inflow);
- Process water used to transport the engineered tailings backfill;
- Process water used to flush the engineered tailings backfill lines; and
- Process water used as mine supply water for dust suppression and equipment requirements.

Groundwater would flow into the mine and would be collected in underground sumps prior to dewatering. During the process of engineered tailings backfill placement, process water would be used to pump the engineered tailings backfill as a thickened slurry to the empty stopes for disposal. The thickened slurry contains excess water which would also report to the underground sumps after the engineered tailings backfill has settled and solidified (engineered tailings backfill bleed water). engineered tailings backfill lines would be flushed with process water (engineered tailings backfill line flush water) which would also report to the underground sumps.

Mine supply water requirements would include dust suppression and equipment requirements such as drill water. Often, mine supply water needs would not be consumptive, meaning that while the water must be available during operations, excess water would report to the underground sumps and would be available for reuse.

Major outflows of water from the underground mine area would include:

- Pumping of underground mine water;

- Evaporation losses leaving the mine through the exhaust raises (ventilation losses); and
- Moisture contained in ore conveyed out of the mine (ore moisture).

Water in the underground mine would be collected in underground sumps before being pumped to the surface. Mine inflow, engineered tailings backfill bleed water, engineered tailings backfill line flush water, dust suppression water, and non-consumption mine equipment water would report to underground sumps. Using collection sumps, face pumps, skid pumps, tank pumping stations, and primary and secondary pump stations, water would be pumped from the underground mine. This stream would be the underground mine water. The underground mine water would be de-oiled on the surface and clarified in the single-lined sediment pond at the plant site. Clarified water may be reused in the underground mine as mine supply water. Excess clarified water from the sediment pond would report to the process water pond.

Underground roads, stockpiles, and muck piles would be watered for dust suppression and the ore conveyor system would be fitted with dust sprays, as necessary. Evaporation from these areas would result in water loss through the ventilation raises (ventilation losses). Water, in the form of ore moisture, would also leave the underground mine area when ore is conveyed to the surface and to the coarse ore stockpile.

3.2 Process Water Pond

The process water pond would be the central collection and distribution point for process water.

Major inflows to the process water pond would include:

- Underground mine water, described in Section 3.1;
- Separated water from the concentrator;
- Removed water from the tailings dewatering plant;
- Direct precipitation on the process water pond;
- Contact water from the plant site;
- Contact water from the tailings management site; and
- Make-up water from Birch Lake reservoir.

Underground mine water not reused as mine supply water would be directed to the process water pond from the sediment pond. Process water would ultimately be returned to the process water pond as a result of reducing water contents in various slurry streams through the use of thickeners and filter presses.

Stormwater runoff from the plant site (contact water) would report to the plant site contact water ponds. The plant site contact water ponds would be pumped to the

process water pond for use as process makeup water. Contact water collected from the tailings management site would eventually report to tailings management site contact water pond 1 where it would be pumped to the contact water tank at the tailings dewatering plant before being pumped to the process water pond through the return water pipeline.

Makeup water from Birch Lake reservoir would only be used when other process water pond inflows cannot meet the process water pond outflow demand.

Major outflows from the process water pond would include:

- Processing water supply, needed to increase the water content of ore slurries at various points within the process, including the comminution circuit, flotation circuit, tailings dewatering plant, and flushing requirements;
- Underground mine supply water; and
- Pond evaporation.

To aid the distribution of process water, the process water pond water would be pumped to a process water tank at the concentrator and a process water tank at the tailings dewatering plant. Each process water tank would act as the main distribution point for process water through their respective areas.

In the event that the underground mine supply water cannot be met by underground mine water (post oil / water separation and sediment removal) the demand would be met by water from the process water pond.

The process water pond liner system would consist of a 60 mil high density polyethylene (HDPE) or engineer-approved alternate geomembrane liner underlain by a geocomposite drainage layer, a 40 mil HDPE or engineer-approved alternate geomembrane liner, and a 1-foot (ft) (30.5 centimeter [cm]) layer of compacted material. The process water pond volume would be approximately 18,500,000 gallons (70,000 cubic meters). The process water pond would be sized to contain direct precipitation from the probable maximum precipitation, 24-hour storm event.

3.3 Concentrator

The concentrator is a subset of the process related to the recovery of target metals. A complete description of the concentrator (which includes the comminution circuit, flotation circuit, concentrate dewatering and storage, and reagent makeup) is included in the MPO.

Major inflows to the concentrator would include:

- Moisture contained in ore conveyed out of the mine (ore moisture); and
- Process water demand for the comminution and flotation circuits.

During the mining and ore conveying process, ore would be wetted down through dust control procedures. This water would enter the concentrator as ore moisture together with a minimal amount of naturally occurring moisture. The comminution and flotation circuits would process the ore as slurries. Makeup water from the process water pond would be added at various points in the process to increase the water content of the slurries for optimal processing.

Major outflows from the concentrator would include:

- Process water separated from the three concentrate products;
- Moisture contained in the three filtered concentrates; and
- Process water used to transport tailings slurry to the tailings dewatering plant.

After the copper, nickel, and gravity concentrates are separated from the tailings, thickeners and filters would be used to separate water from the concentrate products. The separated water would be returned to the process water pond for reuse. A small amount of moisture would remain in the concentrate products after filtering.

Process water would be used to transport the tailings slurry through the tailings supply line from the concentrator to the tailings thickener at the tailings dewatering plant.

The following operational controls would apply to facilities in the concentrator building for secondary containment:

- Containment areas, as necessary, would provide a minimum of 110 percent of the volume of the largest vessel in that area;
- Containment within the concentrator building would include sealed concrete floor slabs and walls to prevent leakage outside of the containment footprint;
- Floor drainage would lead into a sump from which water would be pumped to the process water pond; and
- Containment areas would have water stop or joint sealer in expansion, control, and construction joints.

3.4 Tailings Dewatering Plant

The tailings dewatering plant would process the tailings produced from the concentrator to create filtered tailings cake for placement on the dry stack facility and engineered tailings backfill for placement in mined out stopes. The tailings dewatering plant would consist of the tailings thickener, filter plant, backfill plant, and the filter cake storage and loadout building.

Major inflows of water into the tailings dewatering plant would include:

- Process water used to transport the tailings to the tailings dewatering plant as a slurry;
- Contact water from the tailings management site to meet filter cloth wash water needs; and
- Process water from the process water pond to meet binder and thickener dilution requirements.

Tailings from the concentrator would be pumped to the tailings dewatering plant where a tailings thickener would increase the percent solids content of the slurry by removing process water. The thickened slurry would be pumped to the filter plant where filter presses would further dewater the tailings to produce a tailings filter cake. In an operating scenario when engineered tailings backfill would be produced for placement in mined out stopes, a portion of the thickened tailings would bypass the filter plant and would be pumped to the backfill plant. At the backfill plant, the thickened slurry would be combined with tailings filter cake and a binder to produce an engineered tailings backfill for placement in mined out stopes.

Contact water from the tailings management site contact water ponds would be utilized for filter plant cloth washes and for mixing with the tailings to form the engineered tailings backfill. Process water from the process water pond would be utilized as necessary for makeup water in the tailings dewatering plant in the event that contact water is not available from the tailings management site contact water ponds.

Major outflows of water from the tailings dewatering plant include the following:

- Process water used to transport the engineered tailings backfill;
- Contact water pumped to the process water pond;
- Process water contained as moisture in the tailings filter cake; and
- Excess process water returned to the process water pond.

Process water would be removed from the tailings in the tailings thickener and filter plant and returned to the process water pond for reuse. Process water contained in the engineered tailings backfill would be transported underground for placement in mined out stopes. This contains contact water added to the binder prior to mixing with the tailings to form the engineered tailings backfill. After filtering, some water would remain as moisture in the filtered tailings cake which gets transported to the dry stack facility for placement.

The tailings thickener would be a steel supported above-ground structure. Should a loss of containment occur, slurry would flow to an emergency pond located adjacent to the tailings thickener.

3.5 Dry Stack Facility

The tailings filter cake would have free water removed before being loaded from the filter cake storage and loadout building into a haul trucks for transport to the dry stack facility for permanent placement. No process water would be required for the dry stack facility. Precipitation which falls on the dry stack facility would be classified as contact water. Contact water management for the dry stack facility is discussed in Section 4.3.2.

3.6 Process Water Monitoring and Management

A monitoring plan would be developed for the Project. The following section outlines high-level monitoring and management plans for the process water system.

3.6.1 Monitoring

Inspection of the underground mine water system would be performed monthly and following planned or unplanned maintenance.

Pond leak detection ports at the process water pond would be monitored weekly. The process water pond freeboard would be monitored continuously and the daily average flow rate of water from the process water pond would be monitored from the plant control system or other appropriate methods.

Inspections would be performed on the concentrator and tailings dewatering plant on a regular basis at a frequency determined necessary by regulatory authorities. Operators would report if leaks are discovered. Secondary containments would be inspected and material buildup would be removed on a regular basis as part of routine maintenance practices. Operating personnel would perform routine inspections at a frequency determined necessary by regulatory authorities to ensure that the floor drainage is effectively maintained and that the sumps and pumps are fully operational.

3.6.2 Management

Observations of potential integrity issues to the underground mine water system would be reviewed with the underground department and corrective actions would be taken pursuant to staff recommendations as necessary.

To maintain storage volume, a portable slurry pump would be used to periodically sluice sediment from the sediment pond to the tailings thickener or other appropriate location. If the process water pond is at risk of exceeding a maximum operational volume threshold due to the inflow of underground mine water, excess water would be directed to the concentrator where it would be used for processing makeup water.

Adequate freeboard would be maintained in the process water pond by controlling inflow from Birch Lake reservoir. If the process water pond is at risk of exceeding a maximum operational volume threshold based on freeboard requirements, excess

water would be directed to the process circuit where it would be included in the tailings stream sent to the tailings dewatering plant. In upset conditions, excess process water at the tailings dewatering plant could be routed to the tailings management site contact water pond 1. This pond would be required to maintain sufficient capacity for the 100-year spring snow melt event but would have excess capacity during other times of the year.

Observations of potential integrity issues to containment controls within the concentrator and tailings dewatering plant would be reviewed with the processing department and corrective actions (if any) would be taken pursuant to staff recommendations.

4.0 CONTACT WATER MANAGEMENT

4.1 Underground Mine Area

Surface components of the underground mine area would be the three ventilation raise sites and the ventilation access road. These surface components would be separated from the plant site and the handling of ore and tailings. Therefore, there would not be a contact water management area associated with the underground mine surface facilities.

4.2 Plant Site

The plant site would be divided into non-contact water areas and water contact areas. The contact water areas at the plant site would be associated with ore flow from the mine and would include the portals, the mine services buildings, the temporary rock storage facility, and the connecting internal site roads. The contact water area of the plant site would be graded to collect stormwater into three contact water ponds (north, central, and south). These ponds are shown on Figure 2-2.

The plant site contact water ponds would be sized to contain a 100-year, 24-hour storm event. The contact water ponds would be lined with a 60 mil HPDE or engineer-approved alternate geomembrane liner over a 1-ft (300-millimeter [mm]) thick, low-permeability, compacted soil liner; the soil layer would be compacted to meet maximum hydraulic conductivity requirements of not more than 1×10^{-6} centimeters per second (cm/sec). Stormwater from the surface near the mine portals would flow by gravity to the north contact water pond before being pumped to the central contact water pond. The catchment area for the central contact water pond would include the temporary rock storage facility. The central and south contact water ponds would be pumped into the process water pond and used as process water. The contact water ponds would be normally kept at a minimal level and water would be pumped to the process water pond.

The temporary rock storage facility would be lined with an 80 mil linear low-density polyethylene (LLDPE) or engineer-approved alternate geomembrane liner, overlain

by 12 inches (in) (300 mm) of compacted low permeability soil and 12 in (300 mm) of sand. All surface runoff stormwater from the temporary rock storage facility would be collected in a perimeter ditch designed for a 10-year, 24-hour storm event and conveyed to the central contact water pond. The coarse gradation of the ore stockpiles placed on the temporary rock storage facility would provide good drainage to limit build-up of pore-pressure. The rock and underlying sand protection layer would have a sufficiently high permeability to drain towards the perimeter ditches.

To facilitate separation of contact stormwater water from non-contact stormwater, the plant site roads would be divided into contact roads and non-contact roads. Contact roads would be confined to use by vehicles used for mine operations and non-contact roads would be for vehicles which are not directly related to production or maintenance. Any vehicle which uses a contact road would go through the tire wash before exiting back to the non-contact roads. Drainage from contact roads would be routed to the contact water ponds.

Snowmelt would also be managed as contact stormwater. There would be three designated snow storage areas. These snow storage areas have been designed to accommodate a snow water equivalent of between 7.3 to 11.9 in (185 to 301 mm).

4.3 Tailings Management Site

4.3.1 Tailings Dewatering Plant

The tailings management site would be classified as a contact zone with three exceptions: the reclamation material stockpile; portions of exposed liner prior to tailings filter cake being placed; and concurrently reclaimed portions of the dry stack facility which have the cover installed. Tailings management site contact water systems would collect stormwater in the contact zone and route it to contact water ponds. Water collected in the contact water ponds would be used for dust control at the tailings management site with excess water pumped to the process water pond at the plant site for use as process water.

Contact water management is discussed as related to the tailings dewatering plant or the dry stack facility. At the tailings dewatering plant, surfaces would be graded so stormwater would flow to the south and into the tailings management site contact water pond 1. The dry stack facility contact water management system would include a liner system (including over-liner and under-liner drains), contact water ditch, seepage cutoff wall with grout curtain (groundwater cutoff wall), and contact water ponds.

Tailings filter cake would be transported by haul truck from the filter cake storage and loadout building to the dry stack facility. The tailings filter cake would be placed and compacted over a lined foundation with interior base drains and perimeter ditches to collect precipitation as draindown or runoff that has been in contact with the tailings

(contact water). Project water management components to which contact water from the dry stack facility report are described below.

4.3.2 Dry Stack Facility

The dry stack facility would be constructed as a compacted fill embankment slope with no internal pond. Stormwater from the exposed tailings would be shed to the outer edges of the dry stack facility. The dry stack facility crest and embankments slopes would be provided with swales, ditches, and erosion protection in the ditches to prevent formation of gullies and uncontrolled erosion. The dry stack facility swales and ditches that direct water off the dry stack facility would discharge into the contact water ditch that extends around the full perimeter of the dry stack facility.

Until the dry stack facility is covered during concurrent reclamation, some of the precipitation that falls on the tailings may infiltrate and percolate vertically through the tailings. The infiltrating portion of precipitation which would infiltrate the tailings and seep through the tailings would be intercepted by the dry stack facility liner system. The liner system includes an over-liner drain, a geomembrane liner, and an under-liner drain.

The first step in construction of the liner system would be to install a network of gravel under-liner drains along the natural drainage courses (i.e. low points in the topography to which water would naturally drain) that cross the dry stack facility footprint. The gravel drains would be created by excavating ditches into the foundation soils at the base of these drainage courses. The excavated ditches would be backfilled with gravel. The under-liner drain would discharge to the contact water ditch. The purpose of the under-liner drains would be to limit the phreatic head in the foundation soils under the geomembrane liner to prevent uplift of the liner prior to tailings placement. The under-liner drain is also considered a Best Management Practice (BMP) and would also be a secondary control to capture potential seepage through the dry stack facility liner. Seepage through the membrane to the under-liner drain is expected to be insignificant due the design of the dry stack facility, quality assurance / quality control during construction, and documented performance history of other dry stack facilities. Seepage from the dry stack facility would be further controlled by the construction of the groundwater cutoff wall. The potential magnitude of seepage has not yet been quantified and would be addressed as a future scope of work.

The dry stack facility geomembrane liner would be a 60-mil LLDPE or engineer-approved alternate geomembrane liner. The LLDPE liner would be installed over the prepared foundation and over the network of gravel under-liner drains. The liner would be protected by a minimum 1 ft (0.3 m) -thick layer of compacted tailings which would be pushed into place by dozers and compacted prior to truck traffic being allowed over the liner.

The intercepted precipitation that would infiltrate through the tailings – referred to as draindown – would be intercepted by the liner and collected by a network of gravel finger drains constructed above the liner extending across the dry stack facility footprint in the same location as the under-liner drains (i.e. natural drainage courses). A gravel blanket drain would also be constructed around the full perimeter of the dry stack facility at the toe, having a width of 160 ft (50 m). The over-liner drains - both finger drains and blanket toe drain - would discharge to the perimeter contact water ditch. The potential magnitude of draindown has not yet been quantified and would be addressed as a future scope of work.

At the dry stack facility, stormwater, seepage from the under-liner drain, and draindown from the over-liner drain would all be captured in contact water ditches installed around the perimeter toe of the dry stack facility. Compacting the tailings after placement would increase the amount of runoff and decrease the amount of draindown compared to non-compacted tailings. The crest of the dry stack facility would be graded to shed stormwater to the perimeter of the dry stack facility, limiting ponding of precipitation

The contact water ditch would route the water to the closest contact water pond. For greater portions of the perimeter length, the contact water ditch would be excavated into bedrock. The contact water ditch side slopes and base of the ditch would be a compacted low permeability soil. In locations where the ditches would be excavated into soil, the side slopes and base of the ditch would be protected against erosion with grass vegetation or armoring with riprap or alternate permanent erosion control measures.

The groundwater cutoff wall would be on the outer edge of the contact water ditches beneath the perimeter haul road to encompass the dry stack facility and contact water ditch. The groundwater cutoff wall would include a seepage cutoff trench with a grout curtain installed as necessary depending on bedrock condition. The seepage cutoff trench would consist of an excavated trench from ground surface to the top of bedrock that would be backfilled with compacted, low permeability soil. In locations where the bedrock has been identified as fractured, faulted, or weathered, a grout curtain would be installed, consisting of pressure grouted boreholes to a depth that would be determined based on geotechnical investigations. The seepage cutoff trench and grout curtain would serve two purposes: reduce flow of regional groundwater from outside the dry stack facility footprint into the foundation soils below the dry stack facility, minimizing the need to manage additional non-contact water volumes; and restrict the flow of any contact water out of the contact water ditch and dry stack facility footprint.

Five permanent tailings management site contact water ponds would be constructed in addition to two interim contact water ponds that would be installed to manage water during stage 1 and stage 2 of the dry stack facility before the facility is at the full footprint. The tailings management site contact water ponds would be sized to

contain the 100-year, 24-hour storm events, for their respective catchment areas. In addition, the collective storage capacity of the tailings management site contact water ponds for the dry stack facility during operation would be sized to meet the runoff requirements from a 100-year snowpack. The tailings management site contact water ponds would be single lined with the same liner design as the plant site contact water ponds. The dry stack facility contact water management system (liner, over-liner and under-liner drains, contact water ditch, seepage cutoff wall with grout curtain, and contact water pond) would be constructed concurrently with the dry stack facility stages. Two interim contact water ponds would be constructed along the stage 1 and stage 2 interim toes of the dry stack facility. Stage 1 of the dry stack facility would include construction of tailings management site contact water pond 1, tailings management site contact water pond 2, and interim contact water pond 1. Stage 2 would include construction of tailings management site contact water pond 3 and interim contact water pond 2. Stage 3 would include construction of tailings management site contact water pond 4 and tailings management site contact water pond 5.

The dry stack facility would be concurrently reclaimed during the operation phase. As portions of the slope and crest of the dry stack facility are constructed, the completed surfaces would be graded and covered to promote runoff and inhibit infiltration. The cover would consist of at least 2 ft (60 cm) of cover soil underlain by a hydraulic barrier. Cover soil would be sourced from the reclamation material stockpile and seeded to establish grasslands.

Portions of the dry stack facility that have been concurrently reclaimed would no longer generate contact water, and stormwater runoff would be collected in a temporary non-contact water ditch and managed as non-contact water, as described in the Non-contact Water Management.

4.3.3 Contact Water Ditches

The perimeter contact water ditches would collect surface water runoff that has been in contact with tailings as well as draindown collected and discharged by the base drains and toe drain. The contact water ditches would discharge to the contact water ponds. The contact water ditches would be sized for the peak flow from a 100-year, 24-hour rainfall event. For greater portions of the perimeter length, the ditches would be excavated into bedrock. In locations where the ditches are excavated into soil, the side slopes and base of the ditch would be protected against erosion with grass vegetation or armoring with riprap or alternate permanent erosion control measures, depending on the estimated peak flow rate and imposed fluid shear stress.

On the outer edge of the contact water ditch (side of contact water ditch opposite the tailings), a compacted soil seepage cutoff wall through the overburden soil would be installed with the additional construction of a grout curtain through zones of fractured or weathered upper bedrock as required. This cutoff wall would serve as a secondary

form of containment when routing the contact water through the contact water ditches to the contact water ponds.

4.3.4 Contact Water Ponds

Major inflows for each contact water pond would include runoff from their corresponding catchment area (precipitation and snowmelt), drain down collected by the base drains and discharged to the contact water ditches, and direct precipitation and snowmelt on the contact water pond surfaces. The tailings management site contact water ponds would be designed to allow for the transfer of contact water to the tailings management site contact water pond 1 either through piping or through the pumping of water to contact water ditch divide points. In order to get from the east to the west side of the dry stack facility, the water could end up in multiple ponds and could be pumped multiple times. Transfers from one tailings management site contact water pond to another would include:

- Tailings management site contact water pond 5 would transfer water to tailings management site contact water pond 4;
- Tailings management site contact water pond 4 and tailings management site interim contact water pond 2 would transfer water to tailings management site contact water pond 3;
- Tailings management site contact water pond 3 and tailings management site interim contact water pond 1 would transfer water to tailings management site contact water pond 2; and
- Tailings management site contact water pond 2 would transfer water to tailings management site contact water pond 1.

Major outflows from the contact water ponds would include, in order of magnitude: processing water requirements (i.e. transfer to the process water pond), evaporation from the pond, and local dry stack facility uses (e.g., dust suppression). Water for processing would only be withdrawn from tailings management site contact water pond 1. Water would be pumped from tailings management site contact water pond 1 to the contact water tank at the tailings dewatering plant.

During periods of high inflow (e.g. spring snowmelt) there would potentially be insufficient room in tailings management site contact water pond 1 to pump all of the water out of the smaller contact water ponds. During these design inflow periods, some water may need to be held temporarily in the smaller ponds until the water level of tailings management site contact water pond 1 is sufficiently drawn down through process needs, at which point the smaller ponds would be fully pumped out.

4.4 Contact Water Monitoring and Management

A monitoring plan would be developed for the Project. The following section outlines high-level monitoring and management plans for the contact water system.

4.4.1 Monitoring

Dry Stack Facility Slope and Base Drains

The dry stack facility slope would be monitored in accordance with the mine permit. Constructed portions of the dry stack facility would be monitored on a regular basis at a frequency determined by regulators for sloped stability, erosion, and general site safety. Visual inspections of the discharge outlets of the base drains would be performed to ensure that the drains are in working order and are not obstructed at the outlets. Changes in the condition of the drain or observed flow rates would be noted and dry stack facility operations staff would be notified.

Additionally, sediment discharge prevention BMPs would be inspected on a weekly basis to document efficacy and physical condition.

Contact Water Ditch

Visual inspections of the contact water ditches would be performed to ensure that the facilities are in good operating condition (e.g. no major sediment accumulation or other obstructions). More thorough inspections of the contact water ditches would be performed to investigate for erosion and/or sediment deposition following major precipitation events.

Culverts would also be monitored on a weekly basis to ensure their inlet, outlet, and full cross sections remain free of obstructions to flow. Culverts would also be inspected on a bi-annual basis to confirm their physical integrity, documenting any deflections, buckling, erosion, and abrasion.

Contact Water Ponds

Inspection of the operating depth and freeboard within the contact water ponds would be performed daily as well as during and after major precipitation events. Water levels would normally be kept at a minimal level as informed by the water balance. Sediment accumulation would be monitored on a bi-annual basis. These inspections would also monitor for the general condition of the interior and exterior side slopes. Inspection of the pumps and pipelines between the contact water ponds would be performed monthly and following planned or unplanned maintenance.

During sediment removal activities, the excavated sediment would be inspected for gravel which may be part of the protective layer of granular material. After completion of sediment removal activities, the protective layer of granular material would be inspected to identify any major deficiencies.

4.4.2 Management

Dry Stack Facility Slope and Base Drains

The dry stack facility would be monitored and managed in accordance with TMM's mine permit. BMPs would be reconfigured and / or replaced as required.

Contact Water Ditch

When sediment deposits in the contact water ditch reach levels which could adversely affect conveyance capacity, the sediments would be excavated and deposited onto the dry stack facility to restore conveyance capacity. If the base or side slopes of the contact water ditch experience erosion after a major runoff event, the ditch profile would be restored and the ditch would be reseeded with vegetation or riprap armoring would be placed/replaced.

Culverts would be flushed if required. If physical integrity issues are identified, these would be discussed with the engineer of record to determine the best corrective actions.

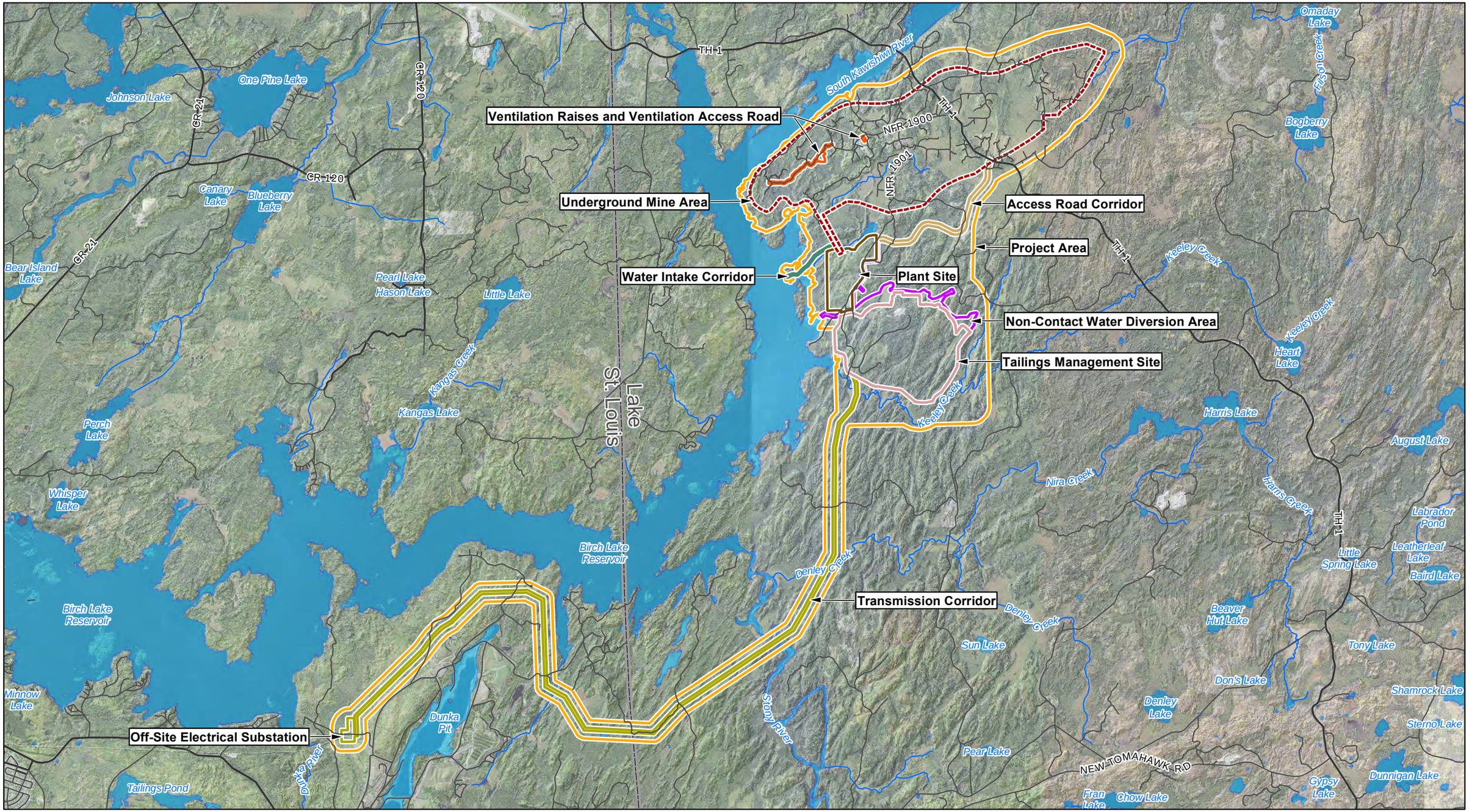
Contact Water Ponds

Sediment from the contact water ponds would be removed when it exceeds a depth of one meter. The excavated sediment would be deposited on the dry stack facility. Erosion, settlement, or cracking of the pond berms observed during inspections would be immediately repaired, reshaping the side slopes as required. Where the protective layer of granular material has been removed or displaced, it would be restored. The portable pumps would be removed each winter and then repositioned every spring.

To ensure that capacity for the design storm event is maintained, excess standing water would be routinely evacuated from the smaller contact water ponds during the summer, provided there is sufficient storage capacity in the process water pond and tailings management site contact water pond 1.

In the event of that wet spots are observed on the downstream slope and toe of the dike, these would be immediately reported to the primary permitting agency and the engineer of record for assessment and issuance of recommendations for corrective activities.

FIGURES



NOTES:

1. Base air photo from the U.S. Department of Agriculture Farm Service Agency, Aerial Photography Field Office.
2. Hydrographic data from Minnesota Department of Natural Resources.
3. Horizontal datum based on NAD 1983. Horizontal coordinates based on Minnesota State Plane North (feet).

LEGEND

- Primary Road
- Secondary Road
- River/Stream
- Lake/Pond
- County Boundary
- Project Area
- Underground Mine Area
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Transmission Corridor
- Water Intake Corridor
- Ventilation Raises and Ventilation Raise Access Road
- Access Road Corridor

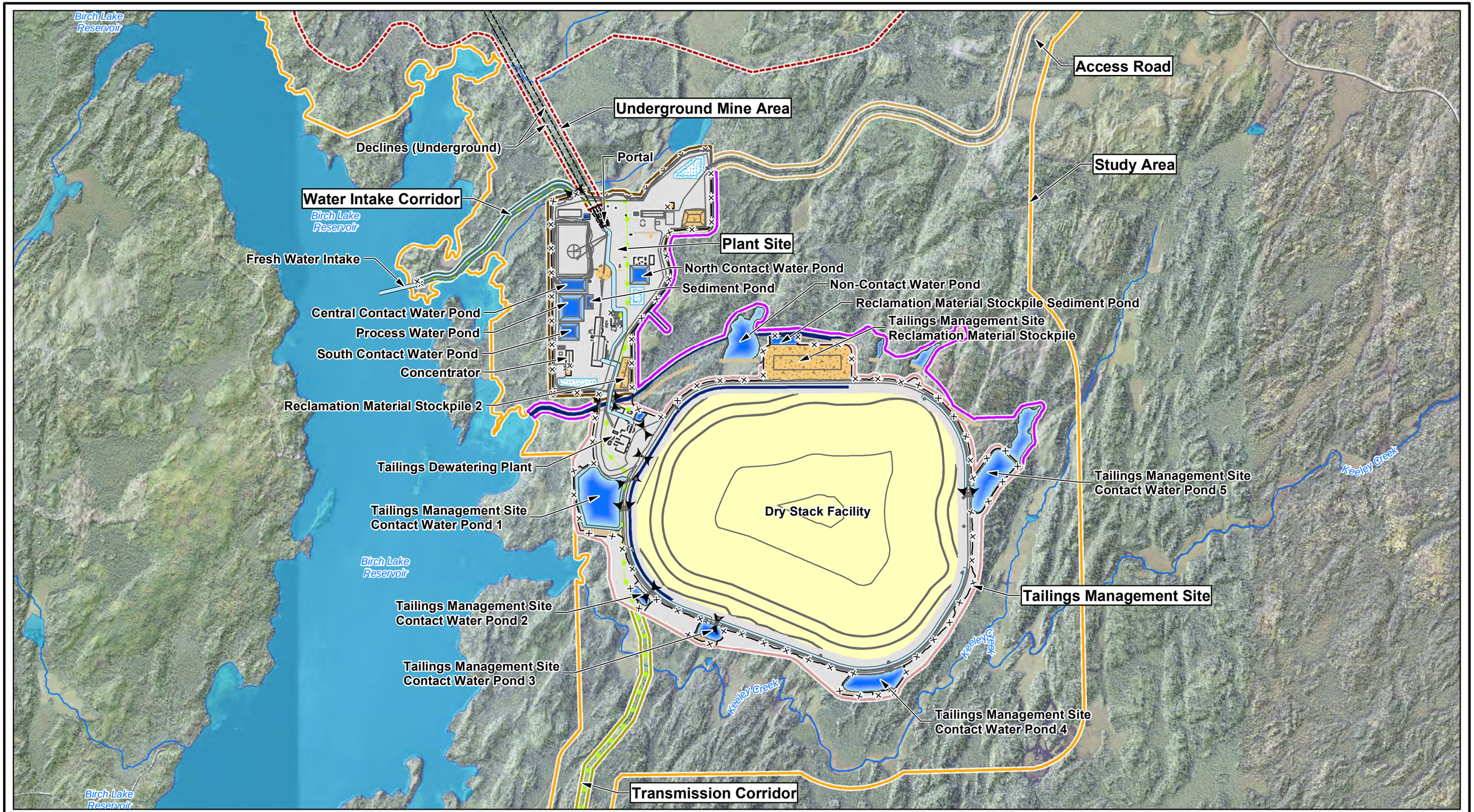
TWIN METALS MINNESOTA

FIGURE 2-1

GENERAL PROJECT LAYOUT

Scale: 0 2,500 5,000 Feet

Date: SEPTEMBER 2019



NOTES:

1. Base air photo from the U.S. Department of Agriculture Farm Service Agency, Aerial Photography Field Office.
2. Hydrographic data from Minnesota Department of Natural Resources.
3. Horizontal datum based on NAD 1983. Horizontal coordinates based on Minnesota State Plane North (feet).

LEGEND

- Facility
- Decline
- Piping
- Culvert
- Electrical Transmission Line
- Fence
- Vegetative Screen
- River/Stream
- Lake/Pond
- Project Area
- Underground Mine Area
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Transmission Corridor
- Water Intake Corridor
- Access Road

TWIN METALS MINNESOTA

FIGURE 2-2

PLANT SITE AND TAILINGS MANAGEMENT SITE OPERATIONS GENERAL ARRANGEMENT PLAN

Scale: 0 750 1,500 Feet

Date: SEPTEMBER 2019

APPENDIX E

TRANSPORTATION PLAN

TRANSPORTATION PLAN

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared for Twin Metals Minnesota LLC
Prepared by SRK Consulting (U.S.), Inc.

Document No. TMM-ES-115-0006
Revision 0A
12-18-2019

REVISION RECORD

Revision	Date	Description	EDMS Download Date	Project Configuration Version
0A	12-18-2019	Issued for Agency Review	N/A	1.0

REVISION NARRATIVE

Not Applicable

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.

TABLE OF CONTENTS

TABLES

Located in Tables section at end of document:

FIGURES

Located in Figures section at end of document:

LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

§	section
AADT	average annual daily traffic
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CR	county road
e.g.	abbreviation for the Latin phrase *exempli gratia* meaning "for example"
etc.	abbreviation for the Latin phrase *et cetera* meaning "and other similar things" or "and so forth"
FHWA	Federal Highway Administration
GVWR	gross vehicle weight rating
HWY	highway
km	kilometer
L	liter
LOS	level of service
MnDOT	Minnesota Department of Transportation
NFR	National Forest Road
Project	Twin Metals Minnesota Project
st	short ton
TMM	Twin Metals Minnesota LLC
USFS	United States Forest Service

1.0 INTRODUCTION

The Twin Metals Minnesota LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of the city of Ely, Minnesota, and 11 miles (18 km) northeast of the city of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at http://www.twin-metals.com/.

The purpose of this document is to provide necessary information to federal and state agencies for the environmental review and permitting process. TMM retained SRK Consulting (U.S.), Inc. to assist with this Transportation Plan.

2.0 SUMMARY

This Transportation Plan addresses traffic and road use associated with the proposed Project. This document:

- Describes existing roads;
- Identifies site access;
- Identifies the parties responsible for road maintenance; and
- Estimates traffic levels associated with construction, operation, and closure of the Project.

The Project area includes portions of Saint Louis County and Lake County, Minnesota, and would be accessed using existing county, state, and federal (e.g., U.S. Forest Service or USFS) roads as well as newly constructed roads specific to operations. In accordance with the Bureau of Land Management (BLM) recommended operating procedures (BLM, 2012), TMM is proposing access routes which are the most direct and safe with the least amount of new surface disturbance.

TMM conducted a transportation analysis of the Project area to analyze existing and future traffic conditions associated with the Project. Relevant information developed has been incorporated into this Transportation Plan.

3.0 TRANSPORTATION PLAN

3.1 Key Regional Transportation Corridors

Principal arterial roads, such as federal interstates and state highways, accommodate high traffic volumes and have limited access. Minor arterial roads include county roads that connect population centers with principal arterial roads. Collector roads include county and USFS roads that provide primary access to large blocks of land and are generally two lanes wide.

Local and resource roads include USFS and private roads that link areas with low traffic volumes to higher classification roads. Local roads connect to collector roads and serve a smaller area than collector roads and may be one or two lanes with lower traffic volumes. Resource roads are USFS roads that provide point access, connecting to local or collector roads, and are generally single lanes.

Figure 3-1, located in the figures section at the end of this report, depicts the identified key regional transportation corridors which are further described below.

3.1.1 Highway (HWY) 1 – Principal Arterial Road

The section of HWY 1 (also known as Trunk Highway 1) between the Project and Ely, Minnesota is a paved two-lane roadway with an average annual daily traffic (AADT) volume of 1,150 daily trips. HWY 1 to southeast of the Project is also a paved two-lane roadway with an AADT volume ranging between 375 to 930 daily trips.

3.1.2 County Road (CR) 21 and CR 120 – Principal Arterial Road to Minor Arterial Road

The section of Saint Louis CR 21 and CR 120 (Virginia Ely Road) between Babbitt, Minnesota and HWY 1 is a paved, two-lane roadway with an AADT volume ranging from 360 daily trips on CR 120 to 1,400 daily trips on CR 21. East of Salo Road toward the City of Babbitt, CR 21 has an existing AADT volume of 2,000 daily trips.

3.1.3 New Tomahawk Road – Minor Arterial Road

The New Tomahawk Road, located south of the Project, is a rural unpaved, two-lane roadway with an AADT of 130 daily trips.

3.1.4 National Forest Road (NFR) 1900 – Collector Road

NFR 1900 is currently an unpaved rural roadway which intersects HWY 1 north of the Project. No AADT information is available for this road.

3.1.5 NFR 1901 – Collector Road

NFR 1901 is currently an unpaved rural roadway located north and west of the Project. No AADT information is available for this road.

3.2 Site Access

Initial construction access to the Project area would be from NFR 1900 and NFR 1901, via TH 1. Once constructed, the access road to the Project area would extend from TH 1 to the plant site, as illustrated in Figure 3-1. The access road would be a two-lane gravel road with 14 foot (4.3 meter) -wide lanes. Ditches would be provided for stormwater runoff control, and culverts would be sized to accommodate a 100-year, 24-hour storm event. A staffed gatehouse would be located on the northern edge of the plant site to provide controlled access to the Project from the access road.

3.2.1 Ventilation Raise Sites

Access to the ventilation raise sites would be from NFR 1900 and existing drill roads (Figure 3-1). These roads would be extended or upgraded to one-lane gravel roads sufficient for construction and propane delivery truck access.

3.2.2 Water Intake Corridor

Access to the water intake corridor would originate from the plant site. The access road within the water intake corridor would be a gravel, single-lane access road which would end at the water intake facility, as illustrated on Figure 3-1.

3.2.3 Transmission Corridor

The transmission corridor would be accessed by a two-track, unpaved maintenance road. The maintenance road would originate at the plant site electrical substation and would terminate at an off-site electrical substation, as illustrated on Figure 3-1.

3.3 Road Maintenance Plan

Maintenance of access roads would be conducted in cooperation with the responsible government entity (e.g., USFS, Saint Louis County, and/or Lake County). A cooperative maintenance agreement would be developed between TMM and the USFS defining the responsibilities and services to be provided. A similar agreement would be developed with each county to ensure maintenance of the access road between TH 1 and the Project. TMM would provide supplemental resources, as required, to support government agencies in maintaining the roads and ensuring safe access to and from the Project.

Roads would be maintained as-required. Daily inspections of the access road would be made during work-days by site personnel. If the roads are inactive for a period of time, they would be inspected prior to use. Control, warning, and directional traffic signs

would be installed and used as necessary. Speed limits, directional traffic signs, or control signs would be posted at all entrances to the access road and Project area.

TMM maintenance and snow removal equipment (for maintenance work and snow removal on Project roads) would include, but not be limited to: graders, loaders, and/or bulldozers. Road watering activities may include ripping the surface to a depth of two inches, blading the road smooth, and then applying dust suppressants which would reduce the required number of passes with a water truck.

3.4 Transport of Construction Materials

Materials necessary for the construction of the Project facilities (administrative, maintenance, storage, utility, process, etc.), would need to be transported to the Project area via the access routes identified above. For the most part, these materials would be delivered by semi-tractor trailer and/or large delivery trucks and would include, but not be limited to:

- Mobile construction equipment (e.g. bulldozers, scissor lifts, cranes, compactors, etc.);
- Concrete productions systems and supplies (incl. aggregate, cement, binders, and water);
- Structural metal (e.g., I-beam, rebar, joists, frames, grating, etc.);
- Building insulation and waterproofing materials;
- Electrical systems and equipment;
- Surface finishing materials (e.g., plaster, sheet rock, tile, paint, carpet, etc.);
- Roofing materials;
- Fire suppression systems and equipment;
- Interior furnishings;
- Heating, ventilation, and air conditioning systems;
- Plumbing fixtures and equipment;
- Security systems and equipment; and
- Telecommunications equipment.

3.5 Transport of Equipment

The following mining equipment would be utilized for the duration of the Project and would need to be delivered to the site. For the most part, these would be one-off deliveries during the initial years of construction and operation, followed by equipment replacement every three to seven years, depending on use.

- Development jumbos;
- Bolters;
- Powder trucks;

- Utility cassette carriers;
- Loaders;
- Easers;
- Haul trucks;
- Shotcrete transmixers and sprayers;
- Graders;
- Water trucks;
- Load-haul-dump vehicles;
- Scissor lifts;
- Boom trucks;
- Crane;
- Vibratory packer;
- Ambulance;
- Fire truck;
- Buses; and
- A light vehicle fleet.

With the exception of the service equipment, buses, and the light vehicle fleet, which would be driven to the Project, pieces of equipment would be transported on highway-certified, flatbed semi-tractor trailers. Some equipment, such as the mining haul trucks and water trucks, may represent an oversize or overweight load which exceeds the standard or ordinary legal size and/or weight limits for a specified portion of the road or highway. In these cases, delivery may require a special permit (with a fee) specifying a route the load must follow, as well as the dates and times during which the load may travel. Special signals and/or pilot cars may also be required.

3.6 Chemical Reagents

Bulk processing reagents (exclusive of small-quantity laboratory reagents) would be delivered to the site in totes or by tanker trucks. Table 3-1 lists the amounts of bulk processing reagents anticipated to be used at the Project, as well as the number of delivery trucks anticipated to deliver bulk processing reagents to the Project per year. Once delivered to the Project, bulk processing reagents would be stored in bulk tanks while smaller quantities of reagents would be stored in the process plant, warehouse, and/or laboratory.

3.7 Transport of Fuel

The underground mining fleet and most support vehicles would use diesel fuel. A diesel-powered generator system would provide emergency standby power in the event of a utility line power failure. Total diesel fuel requirements for all mining activities, including standby power generation, is the largest consumable at the Project. Diesel for the Project would be transported to the Project by tanker trucks and stored within the

fuel storage area at the plant site or within the tailings management site fuel and lube station at the tailings management site.

Gasoline use would be limited to pick-up trucks and various small equipment engines, and propane would be used for heating buildings and the underground mine. Gasoline and propane would be delivered to the site by tanker trucks.

Table 3-2 includes fuel product usage at the Project and the number of delivery trucks anticipated to deliver petroleum products to the Project per month.

3.8 Transport of Explosives

Explosives would be delivered to the Project in totes or by tanker trucks. Primary explosives products would include the following:

- Sensitized bulk emulsion;
- Electronic detonators;
- Primers, boosters, detonation cord; and
- Stemming.

Anticipated quantities of emulsion to be used during Project operations, and the number of delivery trucks anticipated to deliver emulsion to the Project per month, are provided in Table 3-3.

3.9 Transport of Work Force

The main work force would be transported to the Project via bus (Class 6) from embarkation points in both Ely and Babbitt, thus reducing traffic volumes on access routes. Current plans assume three buses would transport employees from the Babbitt embarkation point (12 total vehicles per day, or six round-trips) and one bus would transport employees to and from the Ely embarkation point (four total vehicles per day, or two round-trips). The Class 6 buses would run seven days per week, 52 weeks per year. Vehicle classifications are shown on Table 3-4.

3.10 Transportation Vehicles

In the United States, commercial truck classification is determined based on the vehicle's gross vehicle weight rating (GVWR). The classes range from 1–8. Trucks are also classified more broadly by the Department of Transportation's Federal Highway Administration (FHWA) which groups classes 1–3 as light duty, 4–6 as medium duty, and 7–8 as heavy duty. It is anticipated that all classes of vehicles would be used to transport materials and personnel to the Project. Vehicle classifications are shown on Table 3-4.

4.0 PRODUCT SHIPMENTS

Concentrate product would be loaded into sealed containers within a negative pressure building prior to being transported off-site. Concentrates would be transferred off-site daily via semi tractor-trailer (Class 7 or 8), bound for a port in the Duluth area for storage and transloading to either rail or vessel for transport to the appropriate market. There would be approximately 16,000 concentrate transport trucks per year. These trucks would run seven days per week during daylight hours. This would result in 40 trucks per day during normal operating conditions, and up to 80 trucks per day during springtime road conditions (additional trips occur when spring weight restrictions are placed on area roadways because trucks would be required to haul lighter loads, thereby resulting in more trucks per day).

5.0 DELIVERY/CONTRACTOR TRUCK TRIPS

The Project would generate approximately 5,400 delivery / contractor trucks per year. Approximately 5,000 of these trucks are assumed to visit the Project throughout the year, which equates to an average of 14 trucks per day. Approximately 400 trucks are expected to visit the Project during winter months to deliver propane. Winter months are assumed to have 150 total days, equating to an additional three trucks per day, seven days a week.

6.0 HAZARDOUS MATERIALS AND SOLID WASTE

6.1 Hazardous Materials

6.1.1 Transportation of Hazardous Materials

Hazardous materials would be transported in accordance with all applicable laws and regulations, including, but not limited to, the following requirements:

- Containers would be prepared for shipment according to the requirements of 49 Code of Federal Regulations (CFR) section (§) 172 for the preparation of shipping papers, marking, labeling, and placarding;
- Materials would be packaged according to 49 CFR § 173, § 178 and § 179;
- Emergency response information would be provided and maintained according to 49 CFR § 172 (Subpart G);
- Personnel involved in the transportation of hazardous materials would be trained according to 49 CFR § 172 (Subpart H); and
- Where applicable, safety and security plans would be developed and implemented in accordance with 49 CFR § 172 (Subpart I).

The Federal Hazardous Materials Regulations found in 49 CFR §171-180 (noted above), govern the transportation of hazardous materials in interstate and intrastate commerce. Minnesota has adopted the Federal Motor Carrier Safety Regulations governing hazardous materials transportation under Minnesota Statutes § 221.033.

6.1.2 Blasting Agents

Blasting agents would be prepared on site by the explosives supplier. With the exception of primers, detonation cord, and stemming, components used to produce the blasting agents (emulsion and boosters) are inert and are classified as hazardous, but not dangerous goods for the purposes of their transport. Bulk emulsion would be transported in cassettes specifically designed and designated for use only for this commodity. These containers would be handled, stored, and labeled in accordance with 49 CFR § 1910.109 in addition to applicable state and local regulations. Bulk emulsion cassettes would not, however, be segregated during transport, but would be shipped along with the rest of the general materials destined for the site. Primers and detonators would be shipped separately under the control of the explosives supplier. Transport companies which handle these materials would require appropriate certifications and licenses.

6.1.3 Acids

Acids would be shipped to the Project area in totes or highway-certified tanker trucks by an experienced and appropriately licensed carrier. The containers would be prominently marked with warning labels and hazard markings as per the applicable regulations. Acid handling and storage practices and processes would comply with 49 CFR § 171 to 179 in addition to applicable state and local regulations.

7.0 SOLID WASTE

All non-hazardous solid waste, including, but not limited to, construction debris, office waste, domestic garbage, and sanitary waste, would be transported off-site for disposal by a licensed third-party contractor. Signs would be installed reminding employees of appropriate disposal practices.

8.0 PROJECT CLOSURE

Following cessation of mining and beneficiation operations, select mining equipment would be shipped off-site for sale or salvage. However, some of the heavy equipment, including loaders and trucks, would remain temporarily onsite and would be used for reclamation purposes. Once completed, these larger pieces of equipment would be disassembled, as needed, and shipped off-site using heavy semi-tractors with flatbed and/or flatbed, low-boy trailers (Class 7 or 8).

Salvageable equipment and construction material from the buildings and process plant facilities would also be shipped off-site using semi-tractor trailer rigs. Non-salvageable demolition debris would likely be transported off-site using highway-certified dump trucks to deliver those materials to the closest municipal landfill or other disposal destination.

The number of trips to remove materials from the site should be roughly equivalent to the number of trips needed to deliver the same materials during the construction period. However, given the extended need for some of the facilities, and thus a staggered closure schedule for the site, traffic associated with closure would be spread out over a longer period than that experienced during the construction phase of the Project.

9.0 POTENTIAL TRANSPORTATION-RELATED IMPACTS

Traffic forecasts were developed for each of the identified key regional corridors as well as the local and USFS roads. The forecasts were determined based on historical AADT trends provided by the Minnesota Department of Transportation (MnDOT) through their Traffic Mapping Application. Based on the estimated generated traffic, a summary of the total number of new daily trips added to the roadway network traveling to and from the Project and the Babbitt and Ely parking lots, as shown in Table 9-1.

The traffic analysis found that, under multiple scenarios, the addition of the proposed mining traffic does not have adverse impacts on the existing roadway network. The roadways along the routes currently operate at an “A” level of service (LOS) both under existing and future (2040) anticipated conditions. LOS “A” is described as having traffic flows at, or above, the posted speed limit and motorists having complete mobility between lanes. LOS “A” generally occurs late at night in urban areas and frequently in rural areas.

10.0 OPERATING PRACTICES

TMM is developing a transportation policy, comprised of a series of operating practices, which would govern general transportation and the transport of chemicals and petroleum products to the Project. These operating practices would also govern personnel transport to and from the site. These operating practices are designed to prevent unnecessary and undue degradation during construction, operation, and reclamation of the Project and are derived from the general requirements established by the BLM, current industry best practices, as well as water, air quality, and other environmental protection regulations.

The operating practices would be considered TMM policy. They would be adhered to by the company, and contractual commitments for compliance would be required of all chemical and petroleum suppliers. These operating practices also describe major

preventive response procedures and future inspections and training programs, to be implemented by TMM.

Operating practices include, but are not limited to, those listed below.

10.1 Operating Practice #1

TMM would utilize current best management practices and dust abatement techniques on unpaved roads to minimize the generation of fugitive dust. This may not only include the application of water and / or dust suppression reagents, but also include reducing vehicle speeds below 30 miles per hour to reduce fugitive dust.

10.2 Operating Practice #2

Contract and full-time workers would be required to adhere to all Minnesota traffic laws and driving rules as specified under Minnesota Statutes, including, but not limited to: driving while impaired (169A); accidents (169.09); reckless or careless driving (169.13); and speed limits, zones, and radar (169.14), etc. Additional attention would be focused on safe driving habits, such as the use of seat belts, restrictions on texting, accessing the internet, hand-held cell phone use during vehicle operation, and driving while fatigued or tired.

10.3 Operating Practice #3

Management, administrative, technical staff, and a limited number of employees that do not work 12-hour shifts, would be responsible for their own transportation to the Project. Contractors would also be responsible for their own transportation to the Project but would be encouraged to take the employee bus from either the Ely or Babbit embarkation points.

Employees using company vehicles would also make occasional trips to and from Babbitt, Ely, Duluth, and Minneapolis-St. Paul.

10.4 Operating Practice #4

Maximum speed over the unpaved portions of transportation routes would be 30 miles per hour. When road conditions are poor, drivers would be required to travel at reduced speeds (below 25 miles per hour) to ensure safe passage to and from the site.

10.5 Operating Practice #5

Orders of supplies and consumables would be made at the TMM purchasing office in Babbitt. No solicitors would be permitted at the Project site. This practice would reduce the volume of vehicles to and from the Project during normal business hours.

10.6 Operating Practice #6

Shipping of petroleum products (gasoline and diesel fuels) and other hazardous chemicals to the site would be by a licensed transport company on a regular schedule using a predetermined route and pilot guide vehicles (as per applicable MnDOT regulations), as necessary.

10.7 Operating Practice #7

Onsite equipment and supplies, including bagged absorbent, booms, weirs, and tools would be readily available for timely deployment by trained TMM personnel and applicable regulations posted conspicuously regarding reporting spills and emergency procedures.

10.8 Operating Practice #8

Employees involved in the transport or use of petroleum products at the Project, or involved in maintenance of petroleum storage and dispensing systems, would receive training and instruction in the areas of:

- Operation and maintenance of equipment necessary to prevent unintended discharges;
- Location and use of spill containment and cleanup supplies;
- Applicable pollution control laws, rules, and regulations;
- The Project Spill Contingency Plan and the forthcoming Spill Prevention, Control, and Countermeasures Plan;
- Discharge prevention; and
- Changes pertaining to the above item.

11.0 REFERENCES

Bureau of Land Management (BLM), 2012. Travel and Transportation Management Handbook. BLM Handbook H-8342-1.

Peterbilt, 2019. Accessed online at https://peterbilt.cummins.com/on-highway-truck-weight-rating-class. June 20, 2019.

TABLES

371 Table 3-1: Bulk Processing Reagents

Reagent	Annual Consumption (short tons [st] per year)	Transport Loads (st per delivery)	Deliveries per year (approximate)	Storage Capacity (st / type)
Triethylenetetramine	650	19.6	34	25 / Bulk Solution
Sodium Sulphite	610	15.4	40	25 / Bags
Aerophine 3418A	60	20.0	3	20 / Bulk Solution
Sodium Isopropyl Xanthate	1,400	15.4	91	25 / Bags
Methyl Isobutyl Carbinol	800	16.2	50	30 / Bulk Solution
Lime	10,500	15.4	680	140 / Bulk
Copper Sulphate	600	15.4	39	25 / Bags
Sulfuric Acid	840	20.0	42	32 / Bulk Solution
Flocculant (Concentrate)	3	15.4	8	5 / Bags
Flocculant (Tails)	120	15.4	8	5 / Bags
Binder (Slag-Cement Mix)	34,000	15.4	2,210	450 / Bulk

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373 Table 3-2: Primary Fuels and Lubricants

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Fuel or Lubricant	Annual Consumption (L [liter] per year)	Storage (m^3)	Amount per Delivery (L / st)	Anticipated Trucks per Month	Approximate Consumption per Day (L per day)	Storage Time (days)
Diesel (For Underground)	15,000,000	200	30,000 L / 25 st	44.7	41,096	5
Diesel (For Surface)	300,000	Included with above	Included with above	Included with above	822	Included with Above
Gasoline	300,000	20	20,000 L / 14.4 st	1.3	822	24
Diesel (For Dry Stack Facility)	678,000	20	7,000 L / 6 st	8.5	1,858	11
Propane	12,720,000	160	10 st	53.1	34,849	5

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376 Table 3-3: Anticipated Emulsion Quantities

Reagent	Annual Consumption	Delivered Form	Storage	Amount/ Delivery	Anticipated Trucks/ Month	Approximate Consumption per day
Emulsion (Titan® 7000)	5,475 st	Tanker	20 st insulated silo	15 st	30	15 st

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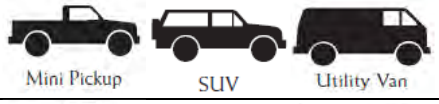
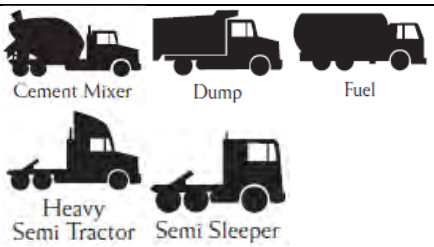
Table 3-4: Vehicle Classifications

FHWA Group	Class	GVWR (pounds)	Typical Mine Site Examples
Light Duty	1	0–6,000	
Light Duty	2	6,001–10,000	
Light Duty	3	10,001–14,000	
Medium Duty	4	14,001–16,000	
Medium Duty	5	16,001–19,500	
Medium Duty	6	19,501–26,000	
Heavy Duty	7	26,001–33,000	
Heavy Duty	8	Over 33,000	

(Peterbilt, 2019)

382 Table 9-1: Traffic Forecasts

Trip Type	Number of Trips (per day)
Trip Type by Vehicle	
Truck Trips	194
Bus Trips	16
Employee Vehicle Trips	664
Trip Destination	
Total Trips Travelling to and from the Project	874
Personal Trips to and from Babbitt Parking Lot	490
Personal Trips to and from Ely Parking Lot	144

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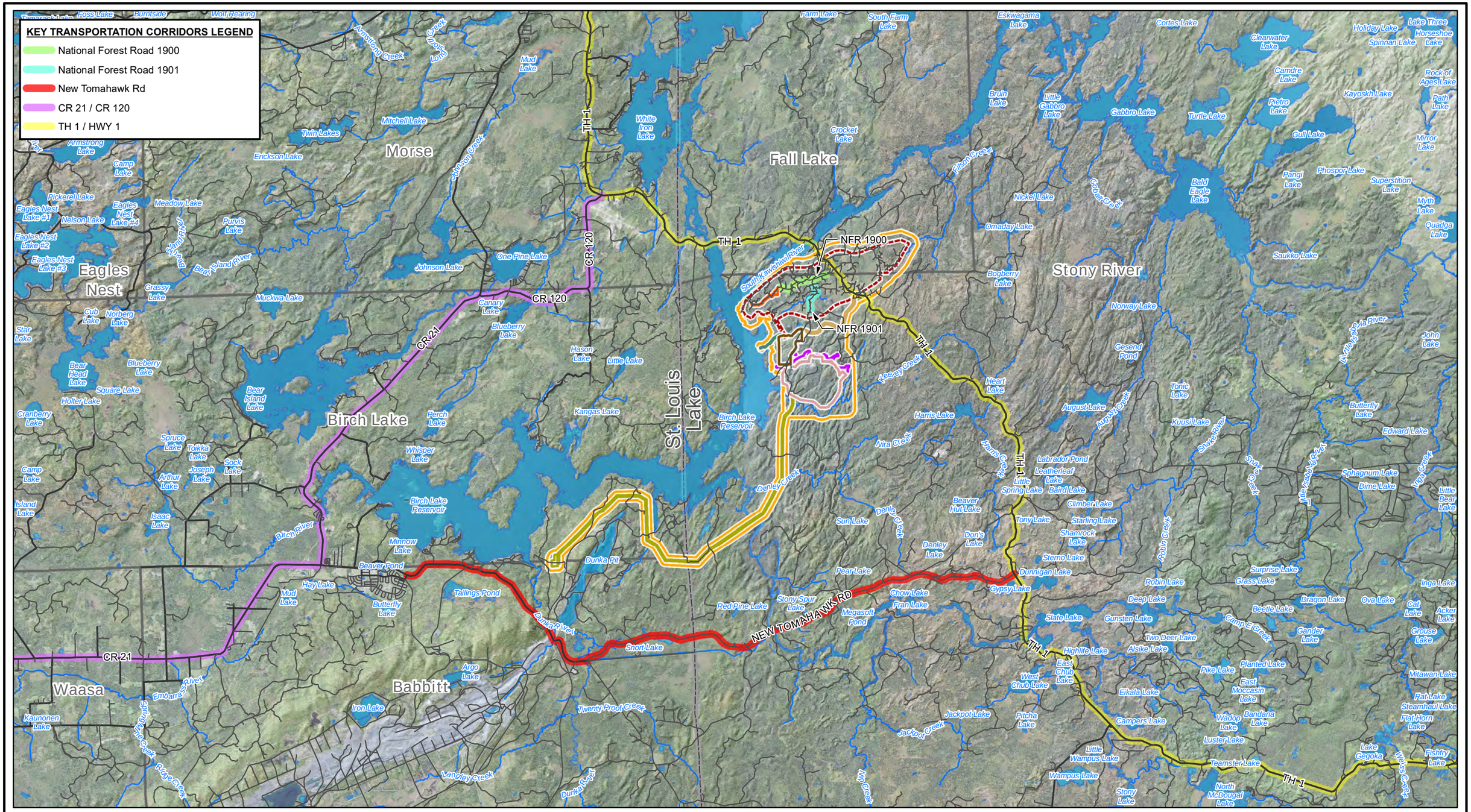
FIGURES



NOTES:

1. Base air photo from the USDA Farm Service Agency, Aerial Photography Field Office.
2. Project related facilities and road data supplied by Twin Metals Minnesota
3. Hydrographic data from MDNR.
4. Horizontal datum based on NAD 1983. Horizontal coordinates based on Minnesota State Plane North (feet).

LEGEND

- Primary Road
- Secondary Road
- River/Stream
- Lake/Pond
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Transmission Corridor
- Water Intake Corridor
- Ventilation Raises and Ventilation Raise Access Road
- Access Road Corridor
- Municipal Boundary
- County Boundary
- Project Area
- Underground Mine Area

TWIN METALS MINNESOTA

FIGURE 3-1

KEY TRANSPORTATION CORRIDORS

Scale: 0 1 2 Miles

Date: SEPTEMBER 2019

APPENDIX F

SPILL CONTINGENCY PLAN

SPILL CONTINGENCY PLAN

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared for Twin Metals Minnesota LLC
Prepared by SRK Consulting (U.S.), Inc.

Document No. TMM-ES-115-0005
Revision 0A
12-18-2019

REVISION RECORD

Revision	Date	Description	EDMS Download Date	Project Configuration Version
0A	12-18-2019	Issued for Agency Review	N/A	1.0

REVISION NARRATIVE

Not Applicable

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.

TABLE OF CONTENTS

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FIGURES

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ATTACHMENTS

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LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

§	section
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
etc.	abbreviation for the Latin phrase et cetera meaning "and other similar things" or "and so forth"
i.e.	abbreviation for the Latin phrase *id est* meaning “that is (to say)”
km	kilometer
MSHA	Mine Safety and Health Administration
Project	Twin Metals Minnesota Project
SCP	Spill Contingency Plan
SDS	Safety Data Sheets
SOP	standard operating procedures
TMM	Twin Metals Minnesota LLC

1.0 INTRODUCTION

The Twin Metals Minnesota LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of the city of Ely, Minnesota, and 11 miles (18 kilometers) northeast of the city of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at: http://www.twin-metals.com/.

The purpose of this document is to provide necessary information for the environmental review and permitting process. TMM retained SRK Consulting (U.S.), Inc. to complete this Spill Contingency Plan (SCP).

2.0 SUMMARY AND OBJECTIVES

This SCP establishes responsibilities and guidelines for actions to be taken by mine personnel in the event of a spill. Additionally, this SCP would inform the development of a Spill Prevention, Control, and Countermeasures plan, as per Minnesota Statutes section (§) 115E. These guidelines are intended to assist personnel and responsible parties in making timely decisions and taking positive actions toward a successful resolution of the problem.

This SCP identifies potential sources of spills, establishes measures of prevention, and defines control, cleanup, and reporting procedures in the event of a reportable spill. A “reportable spill” is a spill that is greater than or equal to the reportable quantity for a material. The reportable quantity for petroleum products is five gallons as per Minnesota Statutes § 115.061. Reportable quantities for other hazardous materials are defined in 49 Code of Federal Regulations (CFR) § 172.101.

More specifically, the objectives of the SCP are to:

- Reduce the potential for accidental spills and environmental degradation by taking precautionary measures and being prepared for potential emergencies;
- Provide the operating facility with the necessary information to properly respond to a hazardous material emergency situation;
- Define personnel roles for emergencies involving hazardous conditions; and
- Include a self-audit program to ensure that the plan and related response activities meet environmental protection objectives.

This SCP has been prepared as an attachment to the Mine Plan of Operations but is also maintained as a stand-alone document assigned to personnel and to individuals on the distribution list provided in Attachment F.1.

2.1 Spill Contingency Plan Review

This SCP is preliminary. As the Project proceeds and final information concerning permit requirements, construction, and operations is developed, this SCP would be revised. This SCP would also be reviewed and updated on a regular basis during Project operations to ensure it remains applicable. Modifications or changes would be made if and when conditions pertaining to this SCP change at the Project. Modifications would be issued to SCP-holders as recorded in the distribution table (Attachment F.1).

3.0 FACILITY AND OPERATIONS OVERVIEW

TMM plans to operate an underground mine and beneficiation plant to extract copper, nickel, and platinum group metals over the Project's active mine life. As part of mining and processing operations, a number of reagents and hazardous materials would be transported and stored for use at the Project area. In addition, chemicals would also be used on a day-to-day basis during normal mining and processing activities.

3.1 Facilities

The proposed Project developments would occur within the Project area, shown on Figure 3-1 and would consist of the following:

- Underground mine area, including portals and declines, mine ventilation system infrastructure, and underground facilities;
- Plant site, including the ore stockpiles, process plant, and plant site surface infrastructure;
- Tailings management site, including a dry stack facility;
- Transmission corridor;
- Water intake pipeline; and
- Access road.

3.2 Chemical Usage

TMM would transport, store, and use a variety of fuels and reagents for the Project. A summary of these materials is included in Section 6.3. These fuels and reagents would be transported, used, and stored in accordance with applicable federal, state, and local regulations and guidelines overseen and / or enforced by U.S. Department of Transportation, Minnesota Department of Transportation, Bureau of Alcohol,

Tobacco, Firearms, and Explosives, Department of Homeland Security, and the Mine Safety and Health Administration (MSHA).

3.3 Organization and Personnel

The Project is operated by TMM. The primary contact for the Project would be the General Manager. Contact information is included in Section 7.0.

4.0 SPILL PREVENTION

4.1 Inspections

Tanks, pipelines, and process components would be inspected for leaks and/or damage on a daily basis. Employees, contractors, and other workers on-site would be directed to immediately report observed leaks and facility/equipment damage to the working supervisor and TMM's Environmental Department for assessment. The working supervisor would be responsible for scheduling and implementing necessary repairs as soon as possible. If leaks or damages are found, the working supervisor would be required to inform the Environmental Department, in writing, of the intended schedule and manner of repair.

4.2 Transfer of Petroleum Products

Employees, contractors, and other workers responsible for the transfer of petroleum products would remain at the fill point until fill procedures are completed and the transfer line is placed back in the proper storage location. Spillage would be reported to the maintenance supervisor and the Environmental Department, and cleanup would be planned and scheduled. Agencies would be verbally notified of the spill if the amount is greater than or equal to five gallons, which is the reportable quantity for petroleum products as per Minnesota Statutes § 115.061. TMM policy would be to start remediation of spills within 24 hours.

4.3 Preventive Maintenance

Preventive maintenance would be performed to maintain the integrity of systems. Faulty valves, joints, elbows, etc. that could cause the release of possible contaminants outside a containment structure would be repaired or replaced immediately upon identification.

4.4 Spill Containment Structures

Containment structures would be provided for petroleum, liquid reagents, and processing fluid storage tanks. As per 40 CFR § 267.197, containment structures would have the capacity to contain at least 110 percent of the largest tank or series of tanks (i.e., multiple tanks connected by pipes) within the structure, plus the 25-

year, 24-hour storm event if the structure is located outdoors. Pipes containing petroleum products, liquid reagents, or processing fluids would be double-walled and/or would have a system of leak detection and secondary containment, as determined to be necessary.

5.0 EMERGENCY PREPAREDNESS

5.1 Personal Protective Equipment

Mine and process personnel would be required to wear personal protective equipment including hardhats, steel-toed and steel-shanked boots, leather gloves, eye protection, safety vests, and hearing protection (where necessary), as required by MSHA. Process personnel would also be provided with chemical-resistant gloves, coats, pants, face shields, and dust masks or air-purifying respirators, depending on the particular task being performed at a given time.

5.2 Hazardous Materials Identification

A variety of chemicals and reagents would be used for mining and ore processing activities. Hazardous materials are defined by 49 CFR § 172 according to the following characteristics:

- Toxicity;
- Explosive properties;
- Corrosiveness;
- Flammability;
- Oxidizing properties; and
- Potential for violent or other chemical reaction when mixed.

Safety Data Sheets (SDS) would be maintained in strategic locations at the mine for hazardous materials. The SDS provides relevant information on physical characteristics including: hazardous reactivity; fire and explosion data; and health hazard information including safety precautions and first aid/medical treatment. Tanks and other containers would be clearly labeled as to their contents.

5.3 Hazardous Material Spill Prevention and Countermeasures

Chemicals would be stored at the most efficient location according to their place of use. Small quantities of chemicals would be stored in secure, fire-proof cabinets adjacent to their area of use. In areas where corrosive materials are stored or used, the concrete would be covered with an impermeable compound, resistant to corrosive chemicals. Only chemical groups compatible with one another would be stored together. Incompatible materials would not be stored in proximity to one another (i.e., same room or cabinet).

Reagent tanks would be located within secondary containment. The secondary containment would hold 110 percent of the largest volume tank or tanks in series and if out of doors, additional capacity to hold the 100-year, 24-hour storm event. The floor of the reagent areas would be sealed to prevent spills from entering cracks or permeating the concrete and being released to the environment.

Smaller quantities of hydrocarbons and regulated materials would be located at the mine services building and the concentrator services building. These materials would be kept in their original containers or in containers clearly labeled to indicate their contents. The containers would be stored in storage cabinets or placed within secondary containment.

Spill containment and cleanup equipment would be maintained at strategic locations throughout the mine including:

- Oil absorbent rolls;
- Oil absorbent pads;
- Oil absorbent booms;
- Oil absorbent pillows;
- Spill kits;
- Front-end loader;
- Backhoe or excavator;
- Graders; and
- Dozers.

If the spill is of significant size and/or duration, special cleanup efforts, such as those provided by environmental contractors, may be deemed necessary.

6.0 SPILL RESPONSE ACTIVITIES

6.1 Emergency Response Procedures

The following are the standard operating procedures (SOPs) that would be used in the event of a hazardous material release:

1. First responder reports incident and notifies their supervisor;
2. Supervisor notifies the General Manager and Environmental Manager;
3. Environmental Manager will be responsible for contacting off-site emergency response teams at the General Manager's direction (discussed further in Section 7.0);
4. Gather information about the incident;
5. Complete preliminary information on incident report form;
6. Contact and transmit information to emergency response team;
7. Emergency response team dispatched to incident;
8. Contact additional emergency units if necessary;

9. Contain spill material and control release;
10. Contact off-site specialists/contractors as required by the circumstances;
11. Remove and secure contaminated material;
12. Arrange for proper disposal of contaminated material;
13. Supervisor completes incident report form;
14. After stabilization of the release, verbally notify agencies of the spill if amount is greater than or equal to the reportable quantity as per Minnesota Statutes § 115.061 for petroleum products or as per 40 CFR § 172.101 for other hazardous materials (notification procedures are discussed further in Section 8.0);
15. Follow incident up with a debriefing; and
16. Evaluate emergency response procedures and modify as necessary.

6.2 Duties of Mine Personnel

General Manager

The General Manager would be notified as soon as possible when a reportable spill or release occurs. The General Manager would direct public statements to the media, if required.

Emergency Response Team

The Emergency Response Team would include employees who have been specially trained to work with hazardous materials in a safe and orderly manner. The team would be trained in the use of safety gear and would promote and demonstrate safe remediation practices. The prime responsibility of the team would be to assess a scene for hazards, act professionally, and conduct cleanup procedures as outlined in the previous section.

Environmental Manager

The Environmental Manager would determine or verify pertinent facts about the incident, including the amount and location of the spill or release, probable direction and time of travel of the spill, resources required at the scene, and the property that may be affected. The Environmental Manager may advise, instruct, and / or direct containment, countermeasures, and cleanup of the release. The Environmental Manager would assess the area to determine the effect and extent of the spill or release and report the information to the General Manager.

Safety Officer

The Safety Officer would ensure the safety of persons involved with a spill or release. Once on the scene, the Safety Officer would evaluate the area for dangers and would ensure that persons involved are equipped with the appropriate safety gear and have received the proper training. The Safety Officer would also determine if tests for toxic gases are required prior to handling of the spilled material.

Supervisor

The foreman of an area where a spill or release occurs would be responsible for coordinating the initial containment. The supervisor would be responsible for determining if the spill requires the Emergency Response Team. Once the spill or release is controlled, the supervisor would verify if the spill is or is not a reportable spill (i.e. a spill is reportable if the volume of the spill is greater than or equal to the reportable quantity identified for the material as per 40 CFR § 302) and notify the Environmental and Safety departments. Reporting of reportable spills would be further handled as discussed in Section 8.0.

6.3 Emergency Response for Chemical Spills

TMM would receive, store, use, and transport a variety of chemicals at the Project. These chemicals would be handled according to standard industry practices which would include the use of personal protection equipment, task training, and preventive maintenance. In spite of training and precautions, unplanned events may occur that require rapid response to protect worker health, prevent or reduce releases to the environment, and reduce damage to equipment.

6.3.1 Lime – Calcium Oxide

Specifications

Lime would be shipped by trailer truck and consists of white, odorless solid pebbles or powder that would be pneumatically transferred from the truck to a lime silo.

Personal Safety

1. Wear an approved dust respirator, work gloves, goggles, and a full covering of clothing.
2. Do not use water.

Immediate Response

1. Follow SOPs as outlined in Section 6.1.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Scoop or sweep up spilled lime and place in a suitable container.
3. Excavate the contaminated soil and place within a secured area.
4. The reclaimed lime may be placed into the process circuit with approval from the Process Supervisor.

6.3.2 Sulfuric Acid

Specifications

Sulfuric acid would be shipped to the site in totes or a tanker truck. Sulfuric acid is a colorless, odorless, syrupy liquid.

Personal Safety

1. Wear a self-contained breathing apparatus or an approved respirator, goggles, rubber suit, rubber gloves, and boots.
2. Avoid contact with organics, metals, chlorates, alkalines, carbides, fulminates, reducing agents, nitrates, acetic acid, and oxidizing agents.

Immediate Response

1. Notify the Environmental and Safety departments of the spill and request special instructions for personnel safety during cleanup.
2. Follow the SOPs as outlined in Section 6.1 above.
3. Evacuate and isolate the immediate 50-foot (15.2-meter) area to avoid personnel exposure.
4. For a pipeline leak, adjust appropriate valves to isolate the system and stop the leak.
5. Dike the area to contain the spill.

Containment, Countermeasures, and Cleanup

1. Neutralize pooled solution with soda ash or lime. Verify that the solution is neutralized with a pH tester.
2. If possible, place neutralized solution back in the process circuit.
3. Excavate the contaminated soil and mix with lime. Contact the Environmental or Safety department for disposal options.
4. Neutralized material may be placed in previously approved areas.

6.3.3 Triethylenetetramine

Specifications

Triethylenetetramine would be shipped to the site in totes or a tanker truck. It is a colorless oily liquid which may be yellowish due to impurities from air-oxidation and that has a fishy or ammoniacal odor.

Personal Safety

1. Wear an approved respirator for vapors and dust, goggles, faceshield, overalls/polyvinyl chloride apron, rubber gloves, and rubber boots. A self-contained breathing apparatus should be worn in the case of large spills.

2. Eliminate ignition sources and use water spray to reduce vapors.
3. Avoid contact with organic absorbents during spills.

Immediate Response

1. Notify the Environmental and Safety departments of the spill and request special instructions for personnel safety during cleanup.
2. Follow the SOPs as outlined in Section 6.1 above.
3. Evacuate and isolate the immediate 50-foot (15.2-meter) area to avoid personnel exposure.
4. Dike the area to contain the spill. Prevent entry into confined areas.
5. In the case of a small spill, dilute with water and mop up or absorb with inert dry material and place in an appropriate waste disposal container.
6. In the case of a large spill stop leak if risk free, absorb with dry earth/sand/other non-combustible, do not get water inside container, do not touched spilled material, use water spray curtain to divert vapor drift, prevent entry into sewers/basements/confined spaces, and eliminate ignition sources.

Containment, Countermeasures, and Cleanup

1. Use appropriate tools to put the spilled solid in a waste disposal container.
2. Follow SOPs as outlined in Section 6.1 above.
3. Excavate the contaminated soil. Contact the Environmental or Safety department for disposal options.

6.3.4 Sodium Sulfite

Specifications

Sodium sulfite would be shipped to the site in bulk bags or barrels. It is a white crystal or odorless to sulfurous white powder.

Personal Safety

1. Wear an approved dust respirator, safety glasses, gloves, and lab coat. A self-contained breathing apparatus should be worn in the case of large spills, as well as splash goggles, full suit, boots, and gloves.
2. Provide ventilation to the area.
3. Avoid heating, contact with acids, and contact with oxidants.

Immediate Response

1. In the case of a small spill dilute with water and mop up or absorb with inert dry material.
2. In the case of a large spill absorb with dry earth, sand, or other non-combustible material.

3. Stop leak if safe and dike if needed.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Use appropriate tools to put the spilled solid in a waste disposal container.
3. Neutralize residue with a dilute solution of acetic acid.
4. Excavate the contaminated soil. Contact the Environmental or Safety department for disposal options.

6.3.5 Aerophine 3418A

Specifications

Aerophine 3418A would be shipped to the site in containers or tanks. The liquid is clear to yellowish and odorless.

Personal Safety

1. Wear an approved respirator, face shield, apron, work pants, long sleeve shirt, gloves, and boots. A self-contained breathing apparatus should be worn in the case of large spills.
2. Provide ventilation to the area.
3. Use water spray to divert or reduce vapors.

Immediate Response

1. In the case of spill, cover with inert absorbent material, sweep up, and place in waste disposal container. Flush area with water.
2. Stop leak if safe and dike if needed.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Use appropriate tools to put the spilled solid in a waste disposal container.
3. Neutralize residue with a dilute solution of acetic acid.
4. Excavate the contaminated soil. Contact the Environmental or Safety department for disposal options.

6.3.6 Sodium Isopropyl Xanthate

Specifications

Sodium isopropyl xanthate would be shipped to the site as powder or pellets. The powder is yellowish, with a pungent odor.

Personal Safety

1. Wear an approved respirator, face shield, suit, gloves, and boots. A self-contained breathing apparatus should be worn in the case of large spills.
2. Provide ventilation to the area.
3. Keep dry, do not get wet.
4. Avoid contact with acids, oxidizing agents, and moisture.

Immediate Response

1. In the case of a spill, shut off sources of ignition, clear area of unprotected personnel, do not allow in drains/sewers, do not allow to get wet, wear a self-contained breathing apparatus, and vacuum solid spills instead of sweeping.
2. Stop leak if safe and dike if needed.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Use appropriate tools to put the spilled solid in a waste disposal container.
3. Excavate the contaminated soil. Contact the Environmental or Safety department for disposal options.

6.3.7 Methyl Isobutyl Carbinol

Specifications

Methyl isobutyl carbinol would be shipped to the site in containers or tanks. The liquid is clear with an alcohol odor.

Personal Safety

1. Wear an approved respirator, face shield, suit, gloves, and boots. A self-contained breathing apparatus should be worn in the case of large spills.
2. Provide ventilation to the area.
3. Use water spray to divert or reduce vapors.
4. Avoid contact with acids and oxidizers.
5. Eliminate ignition sources.

Immediate Response

1. In the case of a spill, contain released product, pump into suitable containers, use absorbent material to clean up.
2. Stop leak if safe and dike if needed.
3. Dilute vapors with water curtain.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Use appropriate tools to put the spilled solid in a waste disposal container.
3. Excavate the contaminated soil. Contact the Environmental or Safety department for disposal options.

6.3.8 Copper Sulfate

Specifications

Copper sulfate would be shipped to the site in bulk. Copper sulfate is a grey odorless powder or liquid solution.

Personal Safety

1. Wear protective gloves, clothing, safety glasses, respirator if necessary, and face shield. A self-contained breathing apparatus should be worn in the case of large spills.
2. Provide ventilation to the area.
3. Avoid dust, excess heat, exposure to moisture, strong bases, metals, alkali metals, and powdered metals.

Immediate Response

1. In the case of a spill sweep up or vacuum up spillage and collect in suitable container for disposal, avoid dust formation, do not flush into surface water or sewer system.
2. Stop leak if safe and dike if needed.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Use appropriate tools to put the spilled solid in a waste disposal container.
3. Excavate the contaminated soil. Contact the Environmental or Safety department for disposal options.

6.3.9 Hydraulic Fluid

Specifications

Hydraulic fluid is a blend of ingredients which may vary slightly by manufacturer. It is a clear fluid with a slight odor. Shipments would be delivered to the site in containers or tanks.

Personal Safety

1. No particular safety equipment is required, although gloves are recommended.

Immediate Response

1. Dike area if needed.
2. Remove contaminated soils and use dry materials to soak up spills.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Use appropriate tools to put the spilled solid in a waste disposal container.
3. Excavate the contaminated soil. Contact the Environmental or Safety department for disposal options.

6.3.10 Emulsion (Titan® 7000)

Specifications

Emulsion would be shipped to the site by tanker truck.

Personal Safety

1. Stay upwind, out of fumes, and keep out of low areas.
2. Wear rubber gloves and boots, eye protection, and face protection.
3. No smoking or open flames near gasoline or diesel fuel.

Immediate Response

1. Notify the Environmental and Safety departments of the spill and request special instructions for personnel safety during cleanup.
2. Follow the SOPs as outline in Section 6.1 above.
3. Remove sources of ignition.
4. Evacuate and isolate the immediate area to avoid personnel exposure.
5. Stop the leak without personal safety risks.
6. Dike the area to contain the spill.

Containment, Countermeasures, and Cleanup

1. Spills should be scraped up for disposal and an inert absorbent material such as sand or vermiculate should be spread over the area. Material should be placed in a clean approved container.
2. Spills should be disposed of according to applicable local and national regulations.

3. Contaminated bulk product recovered from a spill should be passed through a 10 millimeter screen before pumping. The screened material should only then be pumped using a double diaphragm positive displacement pump.

6.3.11 Gasoline and Diesel Fuel

Specifications

Gasoline and diesel fuel would be shipped to the site by tanker truck.

Personal Safety

1. Stay upwind, out of fumes, and keep out of low areas.
2. Wear rubber gloves and boots.
3. No smoking or open flames near gasoline or diesel fuel.

Immediate Response

1. Notify the Environmental and Safety departments of the spill and request special instructions for personnel safety during cleanup.
2. Follow the SOPs as outline in Section 6.1 above.
3. Remove sources of ignition.
4. Evacuate and isolate the immediate area to avoid personnel exposure.
5. Stop the leak without personal safety risks.
6. Dike the area to contain the spill.

Containment, Countermeasures, and Cleanup

1. Remove diesel-contaminated soil and place in a designated area for removal and disposal.
2. Gasoline-contaminated soil would be temporarily stored on a synthetic liner and would be covered to prevent volatilization. Contact the Environmental Department for appropriate disposal options.
3. Diesel or gasoline liquids recovered from a spill would be placed in drums or dumpsters for proper disposal.

6.3.12 Propane

Specifications

Propane would be shipped to the site by tanker truck.

Personal Safety

1. Stay upwind, out of fumes, and keep out of low areas.
2. Wear rubber gloves and boots.
3. No smoking or open flames near propane.

Immediate Response

1. Notify the Environmental and Safety departments of the spill and request special instructions for personnel safety during cleanup.
2. Follow the SOPs as outline in Section 6.1 above.
3. Remove sources of ignition.
4. Evacuate and isolate the immediate area to avoid personnel exposure.
5. Stop the leak without personal safety risks.
6. For a pipeline leak, adjust appropriate valves to isolate the system and stop the leak.
7. Dike the area to contain the spill.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Remove propane-contaminated soil and place in designated area for removal and disposal.
3. Propane liquid recovered from a spill would be placed in drums or dumpsters for proper disposal.

6.3.13 Automatic Transmission Fluid

Specifications

Automatic transmission fluid would be shipped to the site by tanker truck. It is a red, transparent-colored liquid.

Personal Safety

1. Provide adequate ventilation.
2. Wear rubber gloves, goggles, boots, and an approved respirator when necessary.
3. No smoking or open flames in the area.

Immediate Response

1. Notify the Environmental and Safety departments of the spill and request special instructions for personnel safety during cleanup.
2. Follow the SOPs as outlined in Section 6.1 above.
3. Remove sources of ignition.
4. Isolate the spill area and stop the leak without personal safety risks.
5. For a pipeline leak, adjust appropriate valves to isolate the system and stop the leak.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Contact the Environmental Department for appropriate disposal options.
3. Recover free product for recycling or disposal.
4. Use sand, earth, or absorbent material to absorb from spill area.
5. Remove contaminated soil and place in designated area for removal and disposal.

6.3.14 Bulk Oils

Specifications

Bulk oils would be shipped to the site in 55-gallon (208-liter) drums or in bulk by tanker truck.

Personal Safety

1. Wear rubber gloves and boots.

Immediate Response

1. Follow the SOPs as discussed in Section 6.1 above.
2. Remove sources of ignition.
3. Stop the leak.
4. Dike the area if the spill is large.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Pump pooled oil into 55-gallon (208-liter) drums. Contact the Environmental Department for additional instruction.
3. Remove contaminated soil and place in a designated area for removal and disposal.

6.3.15 Ethylene Glycol (Antifreeze)

Specifications

Shipped in tanker trucks at 50 percent ethylene glycol, the material has a distinctive green color and a pH of 9.

Personal Safety

1. Wear rubber gloves, eye protection, and self-contained breathing apparatus.
2. In the event of fire, avoid contact with strong acids, bases, and oxidizers.
3. Thoroughly wash contacted skin and clothing.

Immediate Response

1. Follow the SOPs as discussed in Section 6.1 above.
2. Safely stop the source of a leak or spill and contain.
3. Properly flag and mark the spill area. Isolate the spill from exposure to wildlife.

Containment, Countermeasures, and Cleanup

1. Follow SOPs as outlined in Section 6.1 above.
2. Reclaim free solution.
3. Excavate contaminated soils and place on a synthetic liner. Contact the Environmental Department for appropriate disposal options. Do not mix hydrocarbon and ethylene glycol contaminated soils.

7.0 EMERGENCY SERVICES AND CONTACT INFORMATION

Depending on the nature of the emergency, mine personnel responding would first contact TMM emergency services via two-way radios installed in vehicles and heavy equipment. If determined to be necessary, the Saint Louis County Sheriff's Office and additional regulatory agencies (as required) would be contacted once the immediate threat has been stabilized. Emergency contact information is provided in Table 7-1.

If necessary, additional response may also be provided by the Ely fire department, located approximately 15 miles (24 km) from the Project, or the Morse Fall Lake fire department located approximately 16 miles (26 km) from the Project.

The closest major medical center to the mine is the Ely Bloomenson Community Hospital in Ely, Minnesota, approximately 15 road miles (24 km) from the Project site. This facility has an emergency room and other facilities adequate to handle emergencies that may occur. If immediate care is necessary, the Life Link III Air Service program out of Hibbing, Minnesota (24-hour), or Cloquet, Minnesota (9:00 am – 9:00 pm) is equipped to provide rapid air transportation of critically injured/ill persons.

Emergency response vehicles and a trained mine rescue team would respond to fire and medical emergencies at the site. Mine rescue and fire response teams may be available to assist with off-site response if requested by agency personnel or others. However, TMM anticipates that local and regional agencies would maintain sole responsibility for response to incidents outside of the Project. A separate radio frequency would be established for emergency use, and emergency response and communication protocols would be established.

A helipad would be located next to the mine services building in the event of an emergency requiring medical evacuation.

8.0 REPORTING AND NOTIFICATION

TMM's environmental director or designee would be responsible for incident reporting. If the release is determined to be a reportable quantity, the incident would be reported to the appropriate agency or agencies by telephone immediately after stabilization of the release. Contact information for potentially relevant agencies are as follows:

- Minnesota Duty Officer, Minnesota Pollution Control Agency at 1.651.649.5451 (in-state) or 1.800.422.0798 (out of state);
- Minnesota Department of Natural Resources notification number at 1.888.646.6367 (in-state) or 1.651.296.6157 (out of state);
- Local Emergency Planning Committee – to be determined;
- National Response Center at 1.800.424.8802; and
- Bureau of Land Management (BLM)-Northeastern States Office at 414.297.4400.

Transportation incidents would be reported to 911.

TMM would also be responsible for obtaining special authority for emergency operations where equipment, personnel, or materials are required for the containment of spills or removal of hazardous material.

8.1 Incident Reporting Forms

The following is a list of incident reporting forms and checklists which would be developed prior to initiation of operations and made available to personnel:

- Site Safety Plan;
- Checklist for Person Identifying Emergency;
- Emergency Response Team Leader Checklist;
- Incident Scene Checklist;
- Operator Checklist;
- Safety Specialist Checklist;
- Site Access Control Checklist; and
- Hazardous Materials Checklist.

These forms would be used to document incidents that occur as well as assist mine personnel during an emergency.

9.0 TRAINING

Employees would be trained in the details of this SCP and that of the Health and Safety Management Plan prepared for TMM at least annually. Training records would be retained in employee personnel files and in the facility operating record.

TABLES

614 Table 7-1: Emergency Contact Information

Contact	Position/ Agency	Contact	Location	Phone Number(s)	Radio/Cell Phone Number
TMM Emergency Contacts	General Manager	To be determined	To be determined	To be determined	To be determined
TMM Emergency Contacts	Mine Superintendent	To be determined	To be determined	To be determined	To be determined
TMM Emergency Contacts	Process Superintendent	To be determined	To be determined	To be determined	To be determined
TMM Emergency Contacts	Maintenance Superintendent	To be determined	To be determined	To be determined	To be determined
TMM Emergency Contacts	Environmental Manager	To be determined	To be determined	To be determined	To be determined
TMM Emergency Contacts	Safety Officer	To be determined	To be determined	To be determined	To be determined
Off-site Emergency Contacts	Minnesota Interagency Coordination Center Operations	On Duty Personnel	402 Southeast 11th Street, Grand Rapids, Minnesota	218.327.4175	--
Off-site Emergency Contacts	BLM Northeastern States Office	On Duty Personnel	626 E. Wisconsin Ave., Suite 200 Milwaukee, WI 53202-4617	414.297.4400	--
Off-site Emergency Contacts	St. Louis County Sheriff's Office	On Duty Personnel	209 E Chapman St., Ely, MN 55731	218.726.2340	--
Off-site Emergency Contacts	Ely Fire Department	On Duty Personnel	209 East Chapman Street, Ely, Minnesota	218.365.3224	--
	Morse Fall Lake Fire Department	On Duty Personnel		218.365.7060	--

Contact	Position/ Agency	Contact	Location	Phone Number(s)	Radio/Cell Phone Number
Off-site Emergency Contacts			385 Kawishiwi Trail, Ely, Minnesota		
Off-site Emergency Contacts	Ely Area Ambulance Service	On Duty Personnel	328 West Conan Street, Ely, Minnesota	218.365.6322	--
Off-site Emergency Contacts	Ely Bloomenson Community Hospital	On Duty Personnel	328 West Conan Street, Ely, Minnesota	218.365.3271	--

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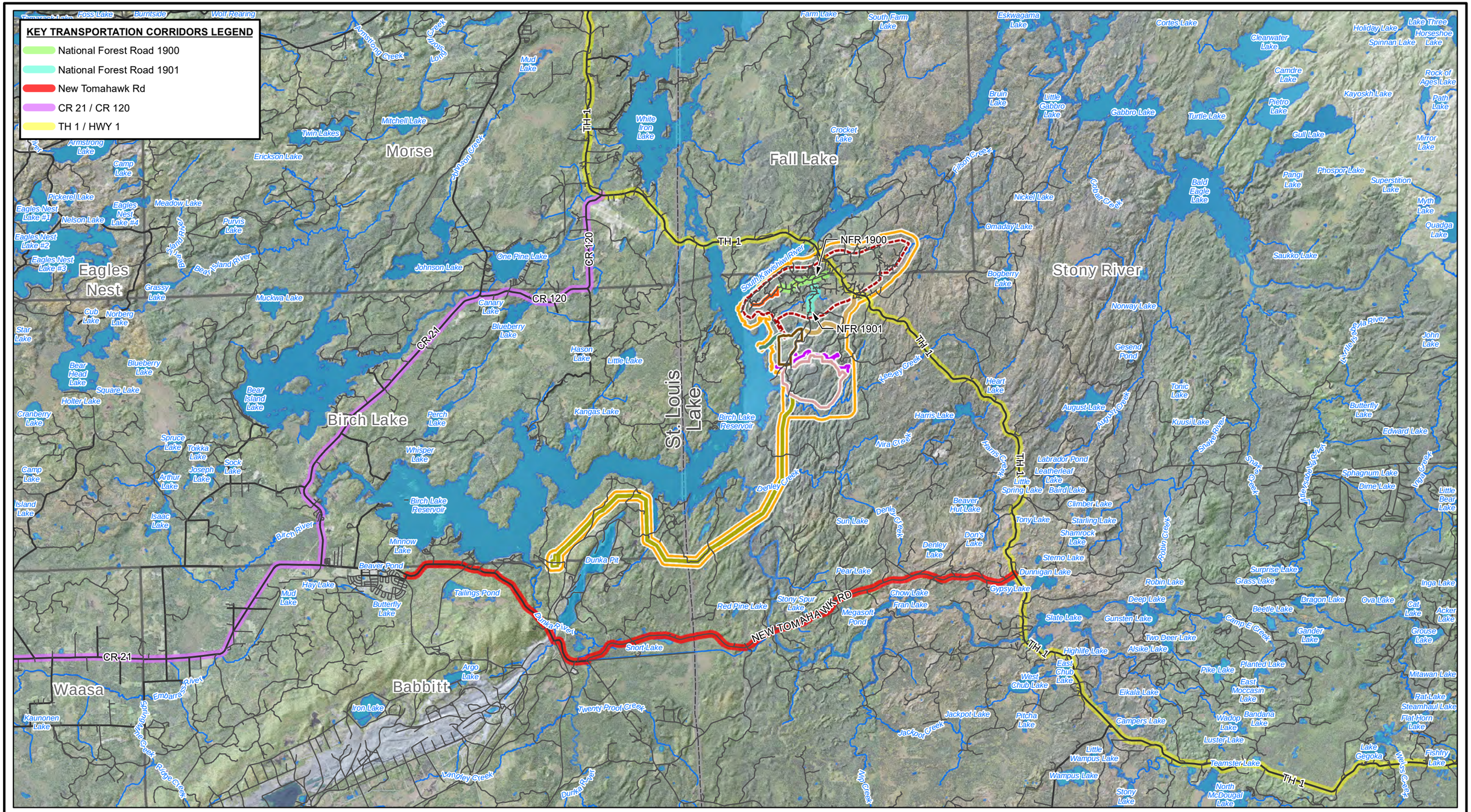
FIGURES



NOTES:

1. Base air photo from the USDA Farm Service Agency, Aerial Photography Field Office.
2. Project related facilities and road data supplied by Twin Metals Minnesota
3. Hydrographic data from MDNR.
4. Horizontal datum based on NAD 1983. Horizontal coordinates based on Minnesota State Plane North (feet).

LEGEND

- Primary Road
- Secondary Road
- River/Stream
- Lake/Pond
- Plant Site
- Tailings Management Site
- Non-Contact Water Diversion Area
- Transmission Corridor
- Water Intake Corridor
- Ventilation Raises and Ventilation Raise Access Road
- Access Road Corridor
- Municipal Boundary
- County Boundary
- Project Area
- Underground Mine Area

TWIN METALS MINNESOTA

FIGURE 3-1

KEY TRANSPORTATION CORRIDORS

Scale: 0 1 2 Miles

Date: SEPTEMBER 2019

ATTACHMENT F.1

DISTRIBUTION TABLE

Number of Copies	Sent To

APPENDIX G

ENVIRONMENTAL QUALITY ASSURANCE PLAN

ENVIRONMENTAL QUALITY ASSURANCE PLAN

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared for Twin Metals Minnesota LLC
Prepared by SRK Consulting (U.S.), Inc.

Document No. TMM-ES-115-0003
Revision 0A
12-18-2019

REVISION RECORD

Revision	Date	Description	EDMS Download Date	Project Configuration Version
0A	12-18-2019	Issued for Agency Review	N/A	1.0

REVISION NARRATIVE

Not Applicable

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

COC	chain-of-custody
DQO	data quality objective
EDMS	Environmental Data Management System
etc.	abbreviation for the Latin phrase *et cetera* meaning "and other similar things" or "and so forth"
i.e.	Latin phrase id est meaning “That is (to say)…”
km	kilometers
Project	Twin Metals Minnesota Project
QA	quality assurance
QAP	Quality Assurance Plan
QC	quality control
RPD	relative percent difference
TMM	Twin Metals Minnesota LLC
USEPA	U.S. Environmental Protection Agency

1.0 INTRODUCTION

The Twin Metals Minnesota LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of the city of Ely, Minnesota, and 11 miles (18 kilometers) northeast of the city of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at http://www.twin-metals.com/.

The purpose of this document is to provide necessary information for the environmental review and permitting process. TMM retained SRK Consulting (U.S.), Inc. to complete this environmental Quality Assurance Plan (QAP).

2.0 SUMMARY

This environmental QAP has been prepared for use in conducting environmental measurements related to Project operations and is intended to ensure that appropriate quality assurance (QA) and quality control (QC) measures are instituted and monitored during data collection activities and sample analyses. This environmental QAP also documents procedures to verify that deviations are appropriately corrected or justified. The use of a centrally managed QA program, as described herein, for environmental sampling and analysis activities ensures that precision, accuracy, representativeness, completeness, and comparability of data are known and documented in a consistent fashion.

If they occur, deviations from this environmental QAP would be documented in the field logbooks and/or Project files (paper and/or electronic) along with justification for changes in the procedure(s), as needed.

Sampling documentation, QA/QC measures, and associated data would ultimately be tracked through TMM's Environmental Data Management System (EDMS). The EDMS would ensure the storage, retrieval, tracking, and validation of environmental data throughout the Project's life.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

The overall QA objective for monitoring data is to ensure that the data collected are sufficient and of adequate quality for their intended uses.

3.1 Indicators of Data Quality

Five parameters are used to evaluate the quality of data measurement:

- Precision;
- Accuracy;
- Representativeness;
- Completeness; and
- Comparability.

The precision and accuracy parameters provide a quantitative measure of the data quality based on evaluation of QC measurements. Completeness provides a method to compare the desired or planned number of results with the number of valid results. The remaining parameters, representativeness and comparability, use field documentation and laboratory procedures to qualitatively evaluate the success achieved in collecting appropriate data for the end uses.

QC samples from the field and laboratory would be used to monitor the precision and accuracy of the data gathered. These samples include blanks, duplicates, matrix spikes, laboratory control samples, etc. Relevant phases of sample collection, shipment preparation, and analysis are monitored through use of QC samples and checks.

Specific quantitative and qualitative objectives for each parameter or characteristic are established to develop sampling protocols and identify applicable documentation, sample handling procedures, and data acquisition procedures. Protocols presented herein are expected to be appropriate for several applications, but should be modified, as appropriate, to support the QA objectives established in each field sampling plan.

3.2 Quantitative Data Quality Objectives

Data quality objectives (DQOs) are qualitative and quantitative statements derived from the DQO planning process that clarify the purpose of the study, define the most appropriate type of information to collect, determine the most appropriate conditions from which to collect the information, and specify tolerable levels of potential decision errors. The DQO would be based on the data requirements of the decision maker who needs to feel confident that the data used to make environmental decisions are of adequate quality. Using the DQO process to plan environmental data collection

can help improve their effectiveness and efficiency and enhance the defensibility of decisions for which the data are used.

Quantitative DQOs typically encountered in environmental sampling programs include detection limits, precision, accuracy, and completeness.

By definition, a detection limit is the lowest amount of a substance that can be distinguished from the absence of that substance (the background) with a reasonable amount of certainty. Laboratories routinely refer to several different "detection limits" including the instrument detection limit, the method detection limit, and the practical quantitation limit. As such, it is imperative the Project work with the analytical laboratory to clearly define the quantitative detection limits for the various environmental media that will be monitored. Each environmental media to be monitored would need to be assessed on a case-by-case basis. In cases where concentrations are less than detection limits, a consistent approach would be used to estimate the concentration.

Precision, accuracy, and completeness QA objectives also need to be evaluated on a case-by-case, media-by-media basis in light of the intended end use of the data. The following sections describe these QA parameters in greater detail.

3.2.1 Precision

Precision is the measure of variability between individual sample measurements under prescribed conditions. Two types of precision are defined as having QA objectives:

- Laboratory precision; and
- Field sampling and analysis precision.

Laboratory and field precision are stated in terms of relative percent difference (RPD) according to the formula:

$$\mathrm{RPD} = \frac{|(\mathrm{S} - \mathrm{D})|}{(\mathrm{S} + \mathrm{D}) \times 0.5} \times 100$$

where, RPD = relative percent difference
S = sample result (first measured value)
D = duplicate sample result (second measured value)

Laboratory Precision

Analytical precision reflects the laboratory's ability to replicate a previously obtained value using identical testing procedures. Precision would be measured as the RPD between these replicate measurements.

The number of samples analyzed for laboratory precision would be in accordance with the method requirements.

Field Sampling and Analysis Precision

Field sampling and analysis precision, and the degree to which a given sample analysis represents the medium being sampled, would be assessed through the analysis of homogenized and/or co-located field duplicate samples submitted blind to the laboratory. The number of blind field duplicates submitted to the laboratory would be equal to 10 percent of the total number of samples submitted for a given monitoring quarter.

Note that field duplicates measure both field and laboratory precision. Results from field duplicates may have more variability than laboratory duplicates which only measure laboratory performance.

3.2.2 Accuracy

Accuracy is the degree of agreement of a measurement to an accepted reference or true value. The accuracy is measured as the percent recovery of a given target analyte relative to its known concentration. The accuracy criterion, expressed as percent recovery, is evaluated by the formula:

$$\text{Accuracy} = \frac{(SS - S_1)}{SA} \times 100$$

where, SS = spiked sample result
S1 = sample result (first measured value, no spike)
SA = spike added (known or true value)

Accuracy would be evaluated through the laboratory QA/QC program.

3.2.3 Completeness

The characteristic of completeness is a quantitative measure of the amount of valid data obtained compared to the amount of valid data that was planned to accomplish the Project objectives. Completeness is evaluated according to the following formula:

$$\text{Percent Completeness} = \frac{TVM}{TM} \times 100$$

where, TVM = total number of valid measurements
TM = total number of measurements requested

The total number of measurements requested value is defined as the total number of analyses for which raw analytical results and corresponding QA/QC results are

requested. The total number of valid measurements value is defined as the number of these analytical results determined to be acceptable (including estimated values) through data validation and evaluation.

Typical analytical completeness objectives for environmental monitoring data are set at 90 percent. If data are rejected (i.e., not a valid measurement), a determination would be made of whether the rejected data are critical in meeting Project objectives. If data are considered critical, corrective action may be required.

3.3 Qualitative Data Quality Objectives

Qualitative DQOs are criteria used to assess the representativeness and comparability of site sample analyses. Qualitative DQO criteria include representativeness and comparability.

3.3.1 Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness would be maintained during sampling efforts by sampling in accordance with a consistent procedure.

Consistent, uniform sample handling protocols, including such tasks as storage, preservation, and transportation, would be used to ensure that the representativeness of the samples gathered meet Project objectives. Proper documentation in the field and laboratory would verify that protocols have been followed and that sample identification as well as integrity have been preserved.

3.3.2 Comparability

Comparability expresses the confidence with which one data set can be compared to another. Comparability can be related to accuracy and precision as these quantities are measures of data reliability. Data are considered comparable if site conditions, collection techniques, and measurement procedures, methods, and reporting are of equivalent quality for the samples within a given sample set.

Comparability implies that the personnel involved in data acquisition and reduction operate measurement systems within the calibrated range of the particular instrument. In addition, analytical methodologies should produce comparable results. Analyses would be conducted using standard U.S. Environmental Protection Agency (USEPA) analytical methods or USEPA recommended methods, and samples would be collected following a consistent methodology in order to maximize the data comparability.

4.0 SAMPLE CUSTODY

Sample and document chain-of-custody (COC) procedures would be strictly adhered to during sample collection, transport, and laboratory handling to assure the identity and quality of samples. Proper COC procedures ensure the credibility and acceptability of analytical results. COC documentation should document the proper processing of samples from the time of collection to the time of analysis. A sample or an evidence file is under custody if, it is:

- In the actual possession or view of an individual;
- Locked or sealed to prevent tampering; or
- Stored in a secure area.

Custody is divided into three parts:

- Sample collection;
- Laboratory sample; and
- Final evidence files.

4.1 Sample Collection

COC records are employed to document custody transfers of samples during transportation or shipment to their intended destination. The possession and proper handling of samples must be traceable from the time the samples are collected until the analytical data have been accepted. The purpose of COC records is to handle all samples according to a properly documented and unbroken COC and to ensure such materials remain in their original state prior to testing.

4.2 Laboratory Sample

Analytical laboratories are responsible for tracking and documenting samples upon receipt of the samples at their facility. The laboratory sample custodian at each laboratory would ensure that the COC records are filled out upon receipt of the samples and would note questions or observations concerning sample integrity, including, but not limited to arrival temperatures, container conditions, and holding times.

4.3 Final Evidence Files

The final Project evidence file would be compiled by the Project Environmental Manager (or qualified representative designated by the Environmental Manager) and would contain the following information:

- Sample and QA/QC analytical data;

- Field laboratory data originals or copies (sample record forms, COC records, equipment calibrations, sample preparation log, etc.);
- Field logs;
- Field measurement data;
- Photographs;
- Calculations and notes; and/or
- Reports and drawings.

5.0 CALIBRATION PROCEDURES

Equipment used during field monitoring would require calibration to assure adherence to QA/QC objectives. Calibration would be performed for on-site equipment used for testing, inspections, and analytical purposes, as required by the manufacturer throughout the Project life. Equipment utilized in the field would be calibrated prior to use each day, unless otherwise specified by the manufacturer. The time and date of instrument calibration, along with other pertinent calibration information, would be documented in the field logbook or calibration log and signed. In some instances, specific pieces of equipment may require multiple calibrations during the day. These specific instances would be noted in the logs.

The instruments used in off-site testing of samples (i.e., laboratory chemical analyses) would be calibrated in accordance with the suggested protocol by the instrument manufacturer, and modified as required to reflect operational experience and, if appropriate, USEPA methodology.

6.0 DATA REDUCTION AND VALIDATION

The primary goal of the QA/QC program is to ensure that environmental-related measurements produce data of known quality and that data are of adequate quality for their intended uses. The quality of data is known when components associated with its derivation are thoroughly documented, with such documentation being verifiable and defensible.

The analytical data review process for analyses under this QAP would consist of two levels of review. The first level of review is performed by the analytical laboratory. The laboratory review program is designed to ensure that analytical data of known and acceptable quality have been provided by the laboratory. The second level of review is performed by TMM. TMM is responsible for conducting reviews of data packages received from the analytical laboratories to ensure compliance with the QA/QC provisions of this environmental QAP.

Data validation would be used to make an overall assessment of the data set and the usability of each analytical result.

6.1 Laboratory Data Reduction and Review

Data reduction is the process of converting measurement system outputs to an expression of the parameter consistent with the comparability objective. The exact equations used to calculate analyte concentrations are described within the analytical methods and procedures.

The first level of review, which may contain multiple sublevels, would be conducted by the analytical laboratory that has initial responsibility for the data correctness and completeness. The laboratory data reviewer would evaluate the quality of the analytical data based on an established set of laboratory guidelines.

The laboratory would perform the in-house analytical data reduction and QA review under the direction of the laboratory director or designee. The laboratory would be responsible for assessing data quality and advising TMM of data which were rated "preliminary" or "unacceptable," or other notations which would caution the data user of possible unreliability.

6.2 Data Validation

The second level of review and validation of the analytical data produced under this QAP would be performed by TMM (or a qualified third-party contractor specifically chosen for data validation). The purpose of this second level of review would be to provide an independent review of the data package, including a review of laboratory performance criteria and sample-specific criteria.

The second level of review would include a review of sample-specific criteria for data packages from each laboratory for each analysis type for parameters which are sample-related such as: holding times, surrogate recoveries, matrix spike recoveries, field duplicates, matrix spike duplicates, laboratory duplicate precision, post digestion (analytical) spike recoveries, inductively coupled plasma serial dilution analysis agreement, and qualification of sample data based on analytes reported as detected in blank analyses.

Variances identified during the second-level review would be reported to the laboratory. Repeated variances of the laboratory performance criteria, which may indicate a systematic problem, would result in immediate corrective action, which may include, but is not limited to the removal of the laboratory from the Project analytical program.

7.0 INTERNAL QUALITY CONTROL

QC procedures are established for laboratory and field activities. The elements of QC fall into three groups:

- Instrument QC;
- Method QC; and
- Field QC.

7.1 Instrument QC Checks

Instrument QC checks ensure that an instrument is calibrated and functioning properly. The frequency and nature of laboratory instrument QC checks are presented in laboratory QAPs. Field instrumentation would be calibrated and utilized in accordance with the manufacturer's instructions.

7.2 Method QC Checks

Method QC checks monitor the precision and accuracy of both sample preparation and analysis. Method QC checks may, in addition, provide information on intra-laboratory reproducibility of a method and of matrix effects. Laboratory QC objectives would be met as specified in method requirements.

7.3 Field QC Checks

Field QC checks monitor sampling by itself and the overall process of sampling, sample preparation, and analysis. Field QC is a qualitative process dependent on the decisions made by personnel while performing individual tasks. Specific field QC procedures include completion of appropriate sampling procedures, including, but not limited to:

- Field document control;
- Decontamination of sampling equipment; and
- Sample custody and shipping procedures.

The review criteria for field QC checks, and results for the above listed samples, would be utilized for providing a professional opinion on the data quality and usability.

8.0 PREVENTIVE MAINTENANCE

Preventive maintenance tasks would be carried out on both field and laboratory equipment to minimize downtime. Preventive maintenance of field equipment would proceed routinely before each sampling event. Additional maintenance would be performed on the basis of hours in use. Laboratory equipment would be maintained

on a regular and scheduled basis. Site visits to third-party laboratories to ensure compliance with preventative maintenance requirements would be executed as necessary.

APPENDIX H

INTERIM MANAGEMENT PLAN

INTERIM MANAGEMENT PLAN

TWIN METALS MINNESOTA PROJECT

Environmental Review Support Document

Prepared for Twin Metals Minnesota LLC
Prepared by
SRK Consulting (U.S.), Inc.

Document No. TMM-ES-115-0004
Revision 0A
12-18-2019

REVISION RECORD

Revision	Date	Description	EDMS Download Date	Project Configuration Version
0A	12-18-2019	Issued for Agency Review	N/A	1.0

REVISION NARRATIVE

Not Applicable

DISCLAIMER

This document is a working document. This document may change over time because of new information, or further analysis or deliberation.

TABLE OF CONTENTS

LIST OF ABBREVIATIONS, ACRONYMS, AND SYMBOLS

§	section
i.e.	Latin phrase id est meaning “That is (to say)…”
MDNR	Minnesota Department of Natural Resources
Minn R.	Minnesota Administrative Rules
MPO	Mine Plan of Operations
Project	Twin Metals Minnesota Project
TMM	Twin Metals Minnesota LLC

1.0 INTRODUCTION

The Twin Metals Minnesota LLC (TMM) Project (Project) is focused on designing, permitting, constructing, and operating an underground copper, nickel, cobalt, platinum, palladium, gold, and silver mining project. Located approximately nine miles (14 kilometers [km]) southeast of the city of Ely, Minnesota, and 11 miles (18 km) northeast of the city of Babbitt, Minnesota, the Project targets valuable state, federal, and private minerals within the Maturi deposit, which is a part of the Duluth Complex geologic formation.

All potential Project infrastructure locations presented herein are considered preliminary and are undergoing further design and engineering evaluations which will dictate final design and locations. Further information about TMM and the Project is located at: http://www.twin-metals.com/.

The purpose of this document is to provide necessary information for the environmental review and permitting process. TMM retained SRK Consulting (U.S.), Inc. to complete this Interim Management Plan.

2.0 SUMMARY

The following Interim Management Plan has been prepared as part of the Project's Mine Plan of Operations (MPO) to inform Project management during periods of unplanned temporary closure to prevent unnecessary and undue degradation to the environment. This Interim Management Plan is necessarily general to cover scenarios of unplanned temporary closure. For the purposes of this Interim Management Plan, unplanned temporary closure is defined as the closure of Project mining and / or processing facilities exceeding 30 calendar days. The contents of this Interim Management Plan include:

- A schedule of anticipated periods of temporary closure during which the Interim Management Plan would be implemented, including provisions for notifying the designated agency of unplanned or extended temporary closures;
- Measures to stabilize excavations and workings;
- Measures to isolate and control toxic or deleterious materials;
- Provisions for the storage or removal of equipment, supplies, and structures;
- Measures to maintain the Project area in a safe and clean condition; and
- Plans for monitoring site conditions during periods of non-operation.

3.0 SCHEDULE OF ANTICIPATED PERIODS OF TEMPORARY CLOSURE

The standard operating schedule for the Project will be 24 hours a day, 365 days a year for mining and processing activities. No unplanned temporary closures or interim closures are currently anticipated. However, it is possible that, due to

mechanical or technical difficulties, unfavorable economic conditions, or other unforeseen events, mining and/or processing facilities may have to be temporarily closed.

In the event of an unplanned temporary closure, the following notification procedures, as per Minnesota Administrative Rules (Minn. R.) section (§) 6132.3200, would be implemented:

- Pursuant to Minn. R. § 6132.3200 Subp. 2 (A) the commissioner (i.e. the commissioner of natural resources or the commissioner's designated representative) would be notified immediately when the permittee is aware of a temporary shutdown.
- Pursuant to Minn. R. § 6132.3200 Subp. 2 (B), notification for a temporary shutdown would include:
    - The reason for temporary shutdown;
    - A projection of when the temporary shutdown will end;
    - A maintenance plan for the temporary shutdown period to ensure that the facilities will remain stable and hazard free;
    - Documentation of how permit standards will be complied with during the shutdown;
    - Maintenance of full financial assurance;
    - Completion of corrective action requirements as scheduled; and
    - Compliance with reporting requirements.
- Pursuant to Minn. R. § 6132.3200 Subp. 2 (C), the commissioner, after review of the requirements, may either:
    - Approve the temporary shutdown;
    - Request more information to make a decision; or
    - Deny the temporary shutdown and direct the permittee to implement a contingency reclamation plan, as stipulated under Minn. R. § 6132.1300.
- Pursuant to Minn. R. § 6132.3200 Subp. 2 (D), in evaluating a request for an extension of a temporary shutdown, the commissioner shall:
    - Evaluate compliance with state and federal permits;
    - Evaluate safety and stability of mining facilities; and
    - Evaluate the need to implement corrective action procedures.

In the event of an unplanned temporary closure, TMM would also:

- Supply the lead agency and the Minnesota Department of Natural Resources (MDNR) with a list of supervisory personnel who would oversee the Project during the unplanned temporary closure period. This list would include the number of support staff required in each department to maintain the facility during the unplanned temporary closure period. Standard security procedures would remain in place for the duration of the unplanned temporary closure period. Access to the site would be allowed for appropriate regulatory agency personnel;

- In the event of an unplanned temporary closure in winter months, the lead agency and the MDNR would be notified when the unplanned temporary closure of Project mining and/or processing facilities exceeds 30 calendar days. The notification would include a description of the procedures and controls that have been or will be carried out to maintain process components during the winter closure period; and
- Following a period of unplanned temporary closure period in the winter months, but prior to startup, elements of the underground mine, plant site, tailings management site, water intake corridor, and associated process water, contact water, and stormwater management systems would be inspected for signs of damage or deterioration.

TMM would evaluate procedures to carry out permanent closure of the Project if and when restart is not feasible.

4.0 MEASURES TO STABILIZE EXCAVATIONS AND WORKINGS

Depending on the length of the unplanned temporary closure, dewatering of the underground mine may be discontinued or continued. If the underground mine would continue to be dewatered during periods of unplanned temporary closure, dewatering water would continue to be sent to the sediment pond, where it would overflow into the process water pond. No additional measures would be necessary to stabilize the underground excavations and workings. Interim reclamation procedures would be implemented, as necessary, to stabilize disturbed sites during the unplanned temporary closure period. These procedures would be coordinated with the lead agency and the MDNR.

5.0 MEASURES TO ISOLATE OR CONTROL TOXIC OR DELETERIOUS MATERIALS

5.1 Reagents

The extent of reagent management would be dependent upon the anticipated length of the unplanned temporary closure. If reasonable, unused reagents would be returned to vendors in the event of an extended period of closure. Partially used process reagents would be stabilized by sealing the containers and ensuring they are stored in an appropriate location where secondary containment is provided. Explosives would continue to be stored and handled according to federal and state regulations. Hazardous materials would continue to be stored, handled, and disposed of according to federal and state regulations and in accordance with applicable Project permits.

5.2 Process Components

Under temporary closure, remaining ore materials would be processed and cleared from the following facilities to ensure that plumbing would not be subjected to freezing during extended cold periods. This action would also prepare the process facilities for the resumption of operations at the end of temporary closure.

5.2.1 Concentrator

Cleared materials from the concentrator (the comminution and flotation circuits, concentrate dewatering, and the storage and loadout circuit) would generally report to the tailings thickener and filter plant. Excess cleared liquids would report to the process water pond. Excess cleared solids from the semi-autogenous mill and ball mill would be transported back to the coarse ore stockpile.

5.2.2 Tailings Thickener and Filter Plant

Cleared solids (tailings) from the tailings thickener and filter plant would report to the filter cake storage and loadout building prior to placement on the dry stack facility and excess cleared liquids would report to the process water pond.

5.2.3 Backfill Plant

Excess tailings remaining in the backfill plant would be blended with a binder for use as engineered tailings backfill. All remaining engineered tailings backfill from the backfill plant would report to the underground mine as backfill, and excess water would report to the process water pond.

5.3 Dry Stack Facility

During unplanned temporary closure, the dry stack facility would be graded to minimize concentrated flow, limit flow velocities, and reduce erosion potential. Progressive reclamation of the dry stack facility would be maximized to the extent practicable to accelerate revegetation of disturbed areas.

5.4 Water Intake Pipeline and Water Intake Facility

During unplanned temporary closure, remaining water in the water intake pipeline and water intake facility would be drained back into Birch Lake reservoir to prevent damage from freezing.

5.5 Non-Contact Water Management Plan

During periods of unplanned temporary closure, non-contact water would continue to be managed in accordance with the Project's Non-contact Water Management Plan, included as Appendix C to the MPO.

5.6 Contact Water Management

During periods of unplanned temporary closure, contact water would continue to be managed in accordance with the Project's Contact and Process Water Management Plan, included as Appendix D to the MPO. Additional details regarding the management of contact water during periods of unplanned temporary closure will be provided in future versions of this Interim Management Plan.

6.0 STORAGE OR REMOVAL OF EQUIPMENT, SUPPLIES, AND STRUCTURES

In the event of an unplanned temporary closure, it is anticipated that equipment, supplies, and structures would not be removed or placed into storage. Some mobile equipment or bulk commodities may be relocated into buildings or covered with tarps to isolate them from the weather, depending on the anticipated duration of the unplanned temporary closure. In addition, the following steps would be undertaken:

- Additional reagents would not be introduced into process components during the unplanned temporary closure period;
- Stored equipment would be clearly identified as having contained process solutions;
- Mine equipment remaining in operation during the unplanned temporary closure, including haul trucks, shovels, loaders, drills, and personal vehicles would continue to be maintained according to standard company procedures and manufacturer's recommendations; and
- Following the unplanned temporary closure period, the integrity of the entire fluid management system would be evaluated before start-up is initiated. Solution tanks, pumps, and piping would be visually inspected and repaired as necessary. The processing circuit would be charged with process solution and reagents and visually inspected for evidence of leaks. Mine equipment would be inspected for compliance with appropriate federal and state mining regulations before mining activities resume. The mine dewatering system would be visually inspected and repaired, as necessary.

7.0 MEASURES TO MAINTAIN THE PROJECT AREA IN A SAFE AND CLEAN CONDITION

Safety provisions would remain in place during an unplanned temporary closure period and would include public access restrictions, applicable personnel safety equipment, and safety protocol.

8.0 MONITORING DURING PERIODS OF NON-OPERATION

Provisions of applicable permits, this Interim Management Plan, and other regulatory requirements would continue to be met during the unplanned temporary closure period. This would include monitoring, notifications, and report submittals. Site monitoring and monitoring of leak detection systems for vessels and piping containing process solution would continue throughout the unplanned temporary closure period.