This document is made available electronically by the Minnesota Legislative Reference Library
as part of an ongoing digital archiving project. http://www.leg.state.mn.us/lrl/lrl.asp

NorthMet Project

DRAFT

Environmental Impact Statement

OCTOBER 2009

Carrol Henderson

VOLUME II: FIGURES

Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

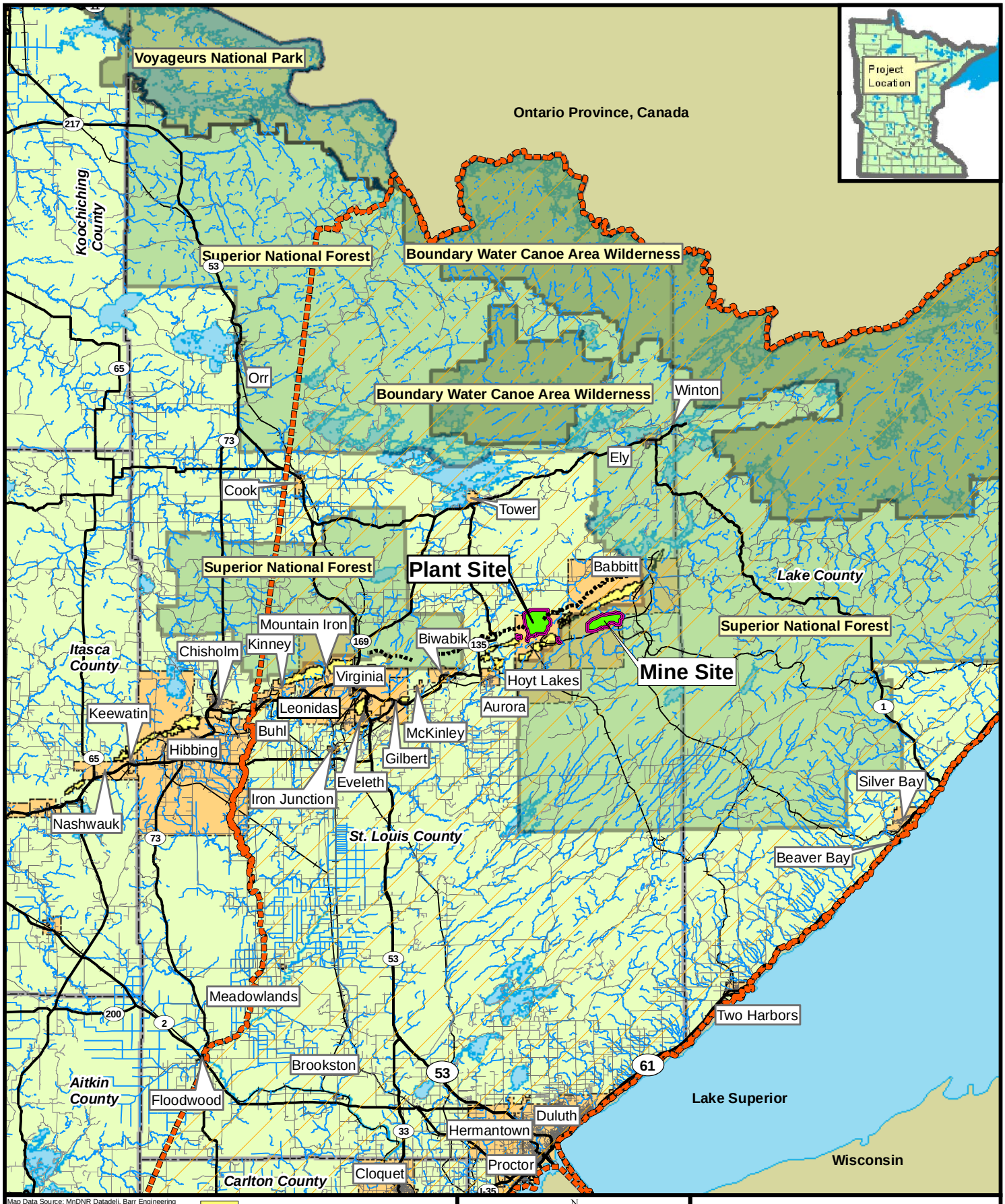
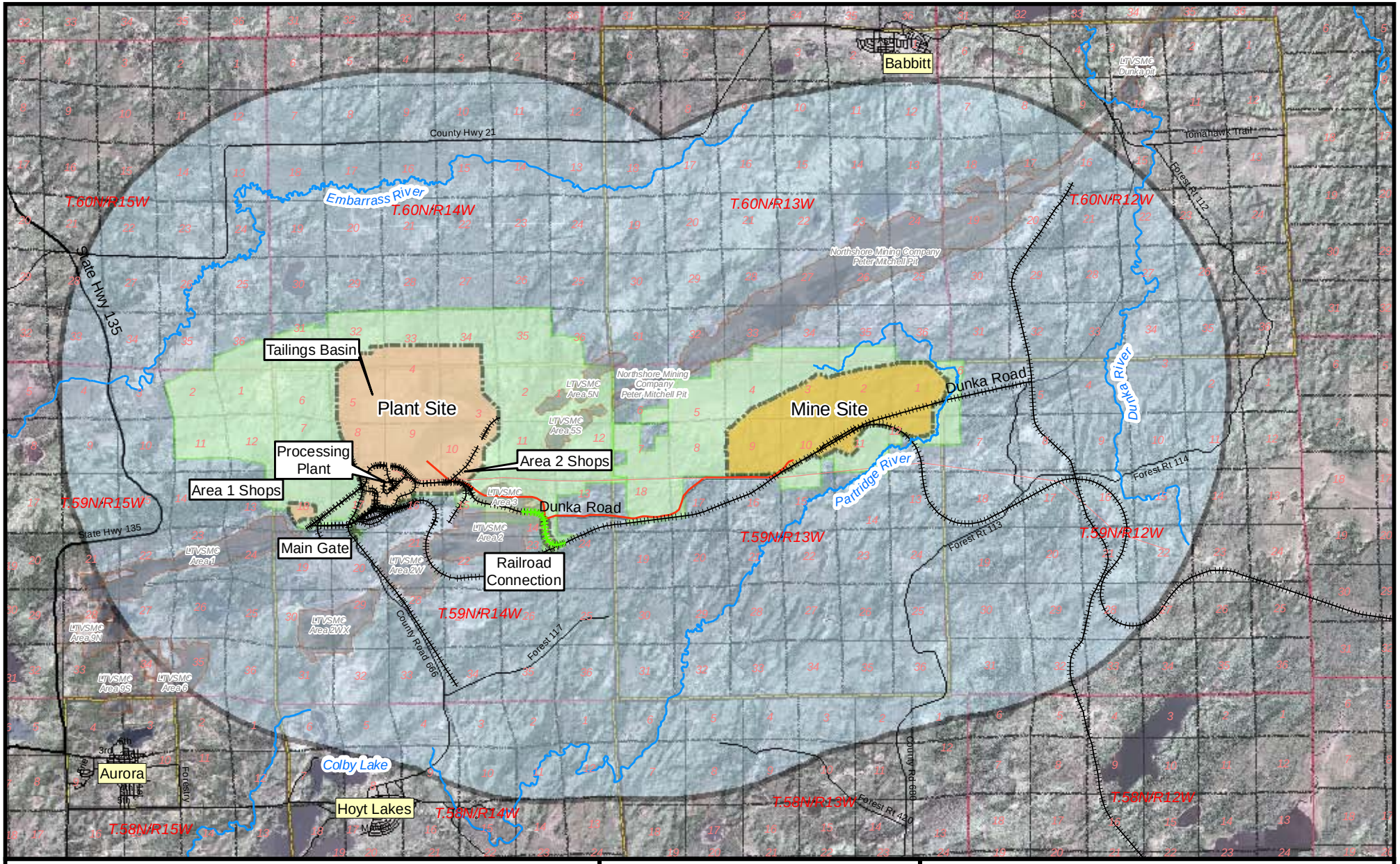


Figure S-1
Project Vicinity Map

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Rivers
- County Roads
- State/Federal Roads
- Mine to Plant Pipeline
- 138 KV Transmission Line
- Existing Railroad
- Proposed Railroad Connection
- Public Land Survey Section
- Incorporated Limits of Cities/Villages
- Taconite Pits (Existing)
- Existing and Proposed Plant Site
- Proposed Mine Site
- Proposed PolyMet Land Control
- Project Area

N

0 1 2 4 Miles

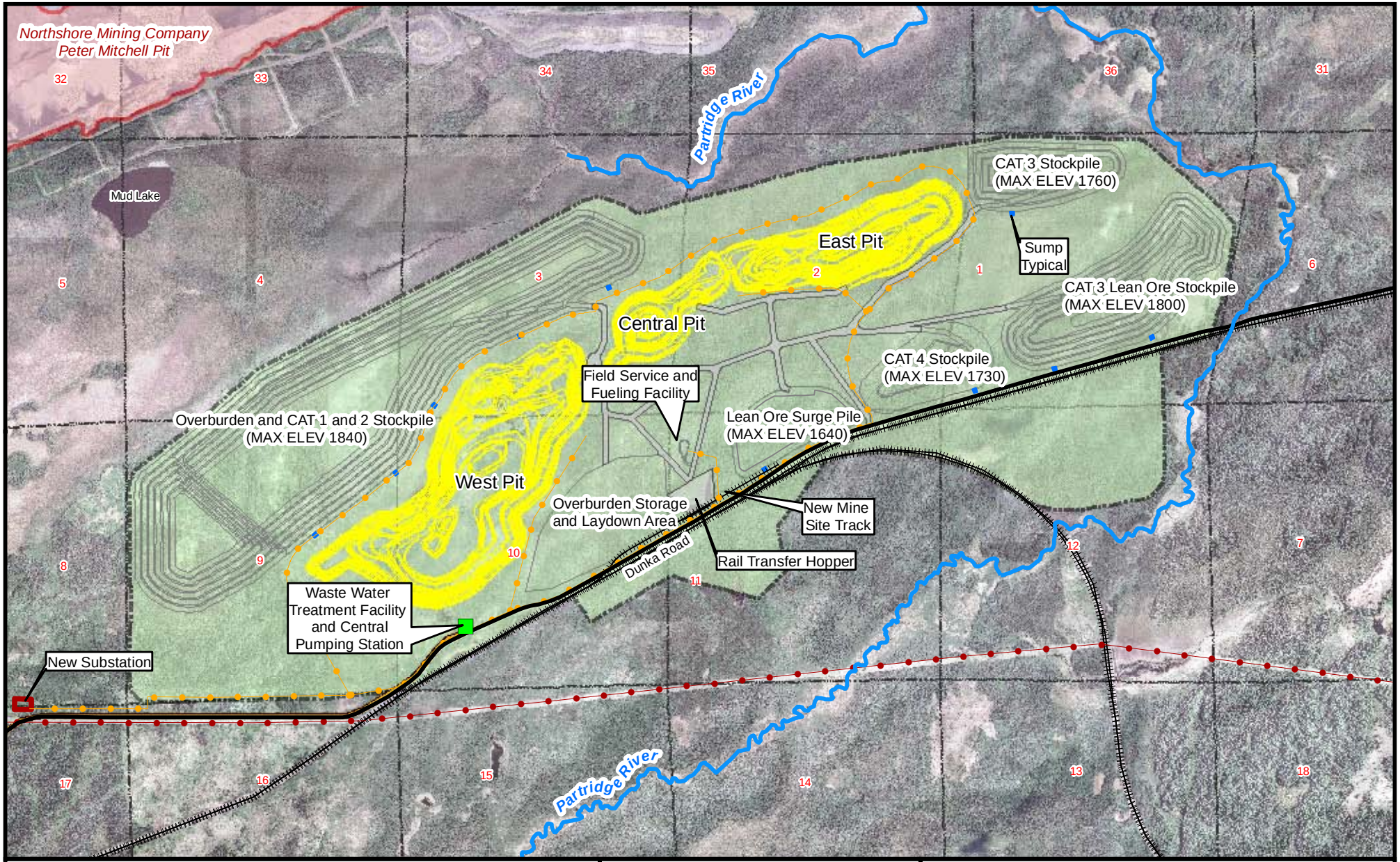
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure S-2
Project Area Map

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- **Dunka Road**
- **Railroad**
- **Mine to Plant Pipeline**
- **Pit Contours**
- **Stockpile Contours**

Powerlines

- **New 13.8KV Mine Power Distribution**
- **Existing 138KV Transmission Line**
- Public Land Survey Section
- **Stockpile Sumps**
- Mine Site

N

0 1,000 2,000 4,000 Feet

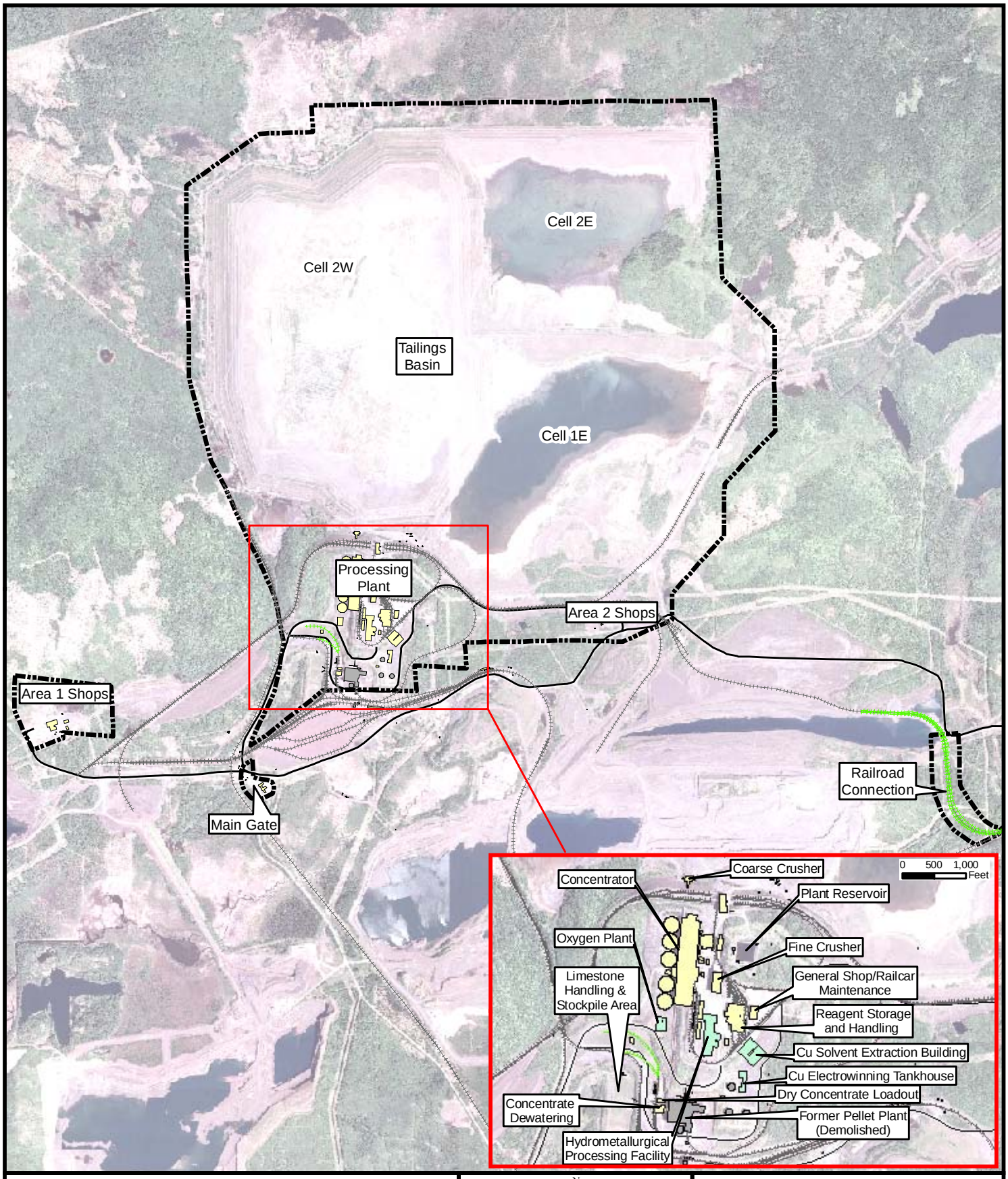
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure S-3
Mine Site Layout Map (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Private Roads
- New Railroad
- Existing Railroad
- Plant Site

Buildings

- Proposed Plant Structures (Reuse of Existing)
- Proposed Plant Structures
- Demolished Structures

N

0 1,150 2,300 4,600 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure S-4
Plant Site Layout (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Project Location

Voyageurs National Park

Ontario Province, Canada

Koochiching County

Superior National Forest

Boundary Water Canoe Area Wilderness

Boundary Water Canoe Area Wilderness

Superior National Forest

Plant Site

Mine Site

Lake County

Superior National Forest

Itasca County

St. Louis County

Carlton County

Aitkin County

Lake Superior

Wisconsin

11 217 53 65 73 169 135 1 200 2 33 I-35

Orr Cook Tower Ely Winton Babbitt Mountain Iron Kinney Chisholm Virginia Biwabik Hoyt Lakes Aurora Leonidas Keewatin Buhl Hibbing McKinley Gilbert Eveleth Iron Junction Nashwauk Silver Bay Beaver Bay Meadowlands Two Harbors Brookston Floodwood Duluth Hermantown Proctor Cloquet

Map Data Source: MnDNR Datadeli, Barr Engineering

Rivers/Streams/Drains
State/Federal Roads
County Roads
Giants Range Formation
County Boundary
Incorporated Limits of Cities/Villages
Taconite Mines
National Forest Lands
National Parks and Wilderness Areas
1854 Ceded Territory
NorthMet Project Features

N

0 4 8 16 Miles

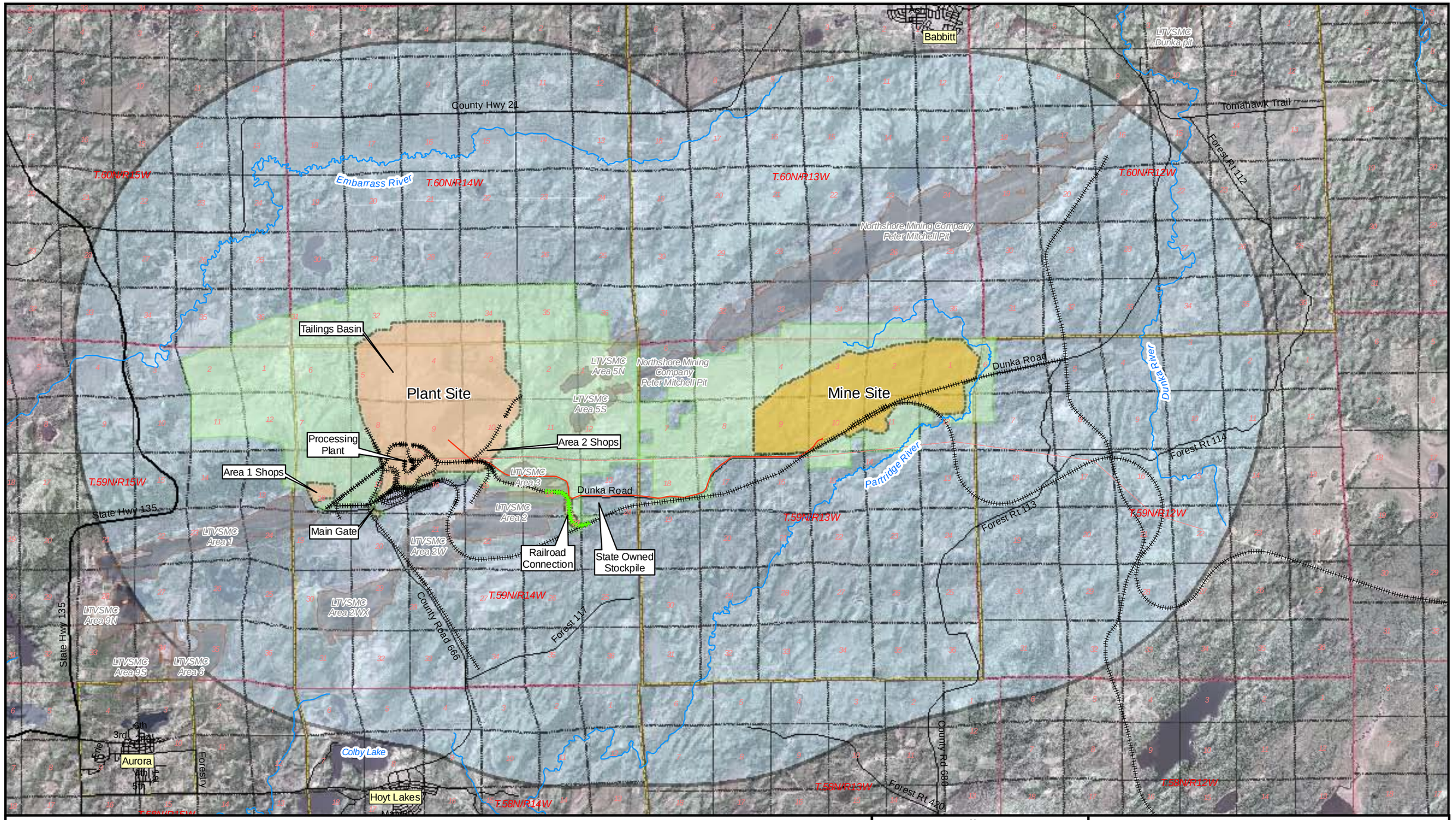
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 1.1-1
Project Vicinity Map

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Rivers
- County Roads
- State/Federal Roads
- Existing Railroad
- Mine to Plant Pipeline
- 138 KV Transmission Line
- Proposed Railroad Connection
- 12 Public Land Survey Section
- Existing and Proposed Plant Site
- Taconite Pits (Existing)
- Incorporated Limits of Cities/Villages
- Proposed PolyMet Land Control
- Proposed Mine Site
- Project Area

N

0 0.5 1 2 Miles

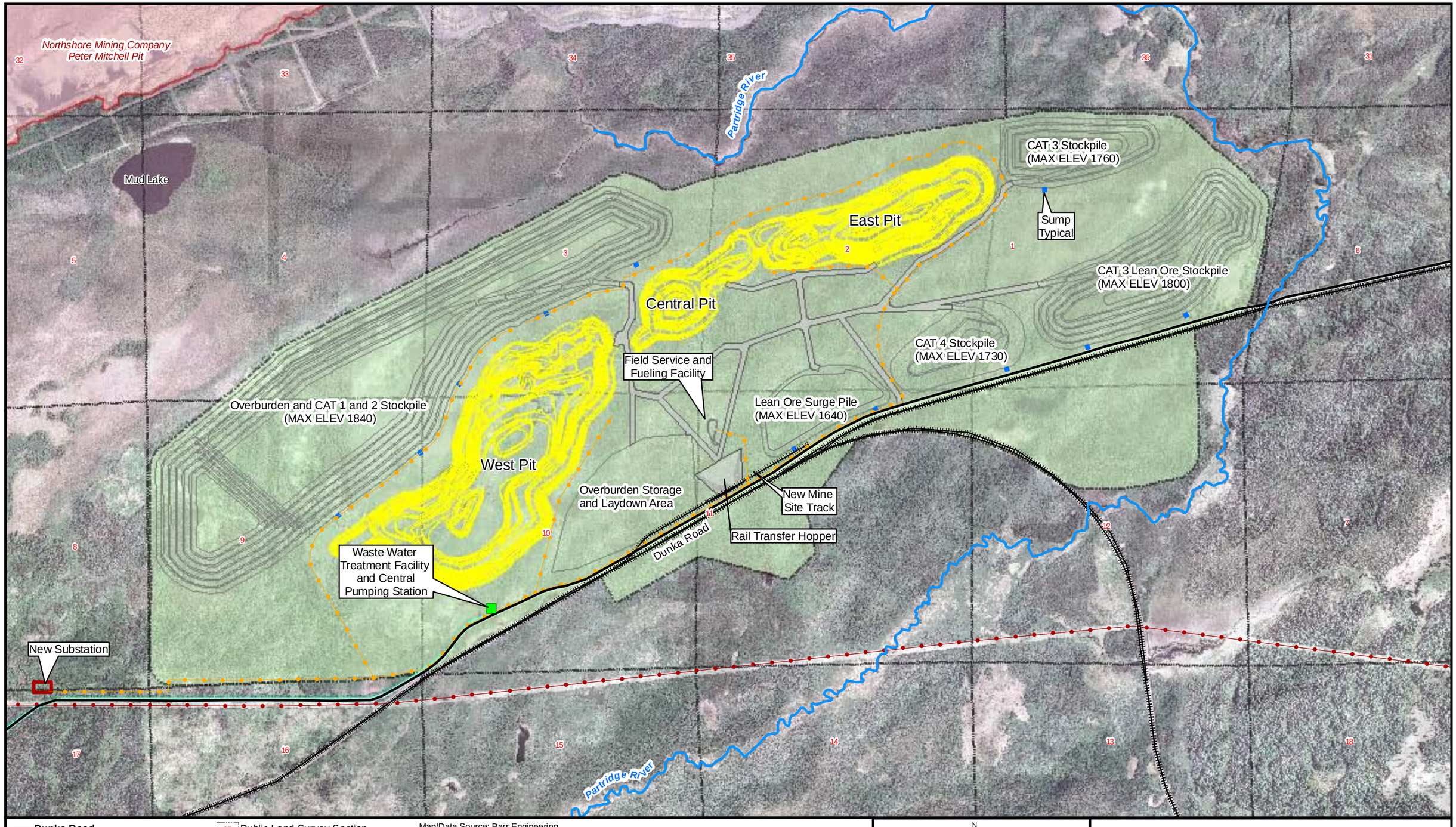
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 1.1-2
Project Area Map

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Dunka Road
Railroad
Mine to Plant Pipeline
Pit Contours
Stockpile Contours
Powerlines
New 13.8KV Mine Power Distribution
Existing 138KV Transmission Line

16 Public Land Survey Section
Stockpile Sumps
Mine Site

Map/Data Source: Barr Engineering

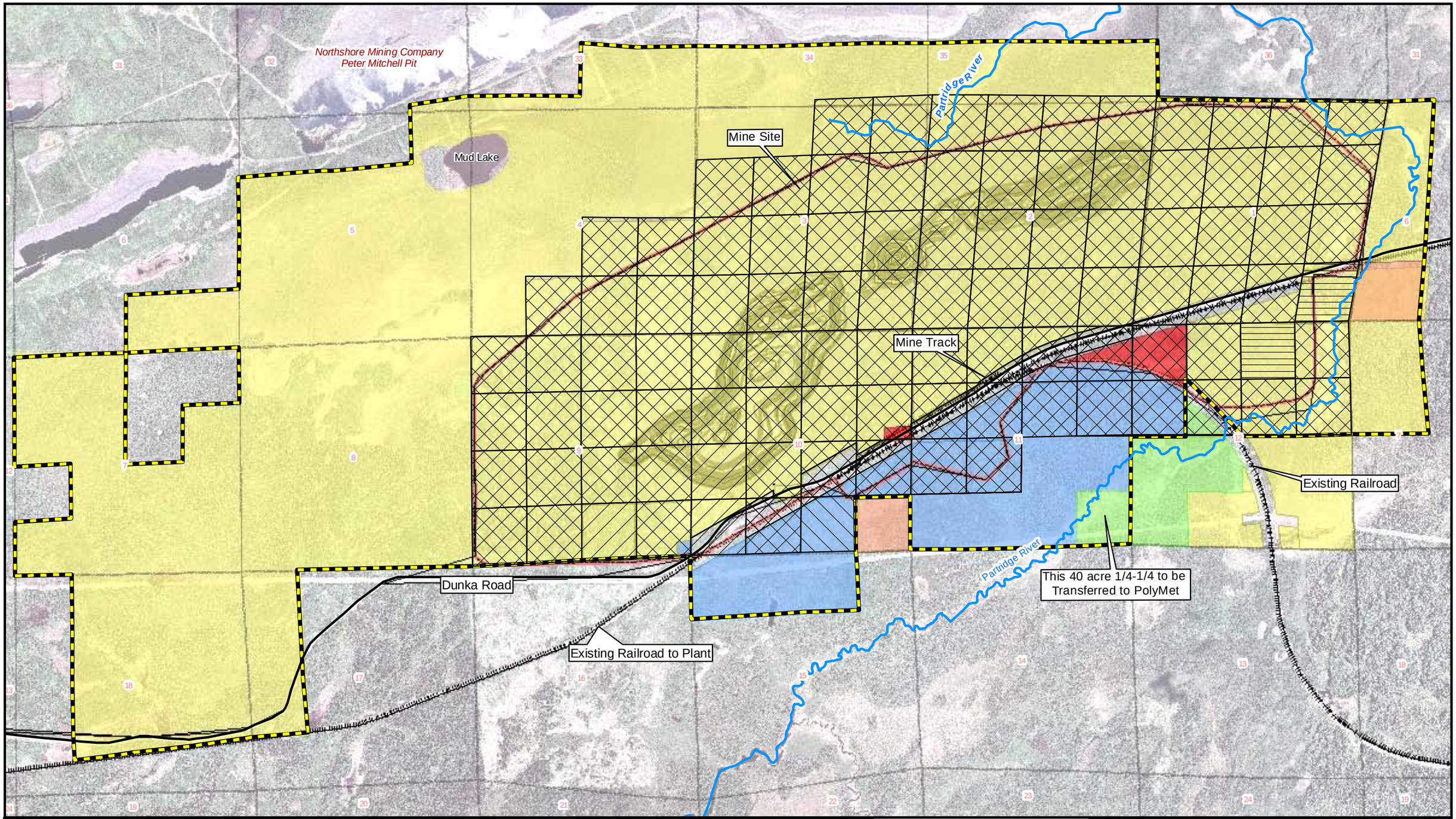
N

0 750 1,500 3,000 Feet

Figure 3.1-1
Mine Site Layout Map (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Railroad
Partridge River
Dunka Road
Section Lines

Mineral Ownership
Longyear Mesaba
RGGS
State of MN
USA

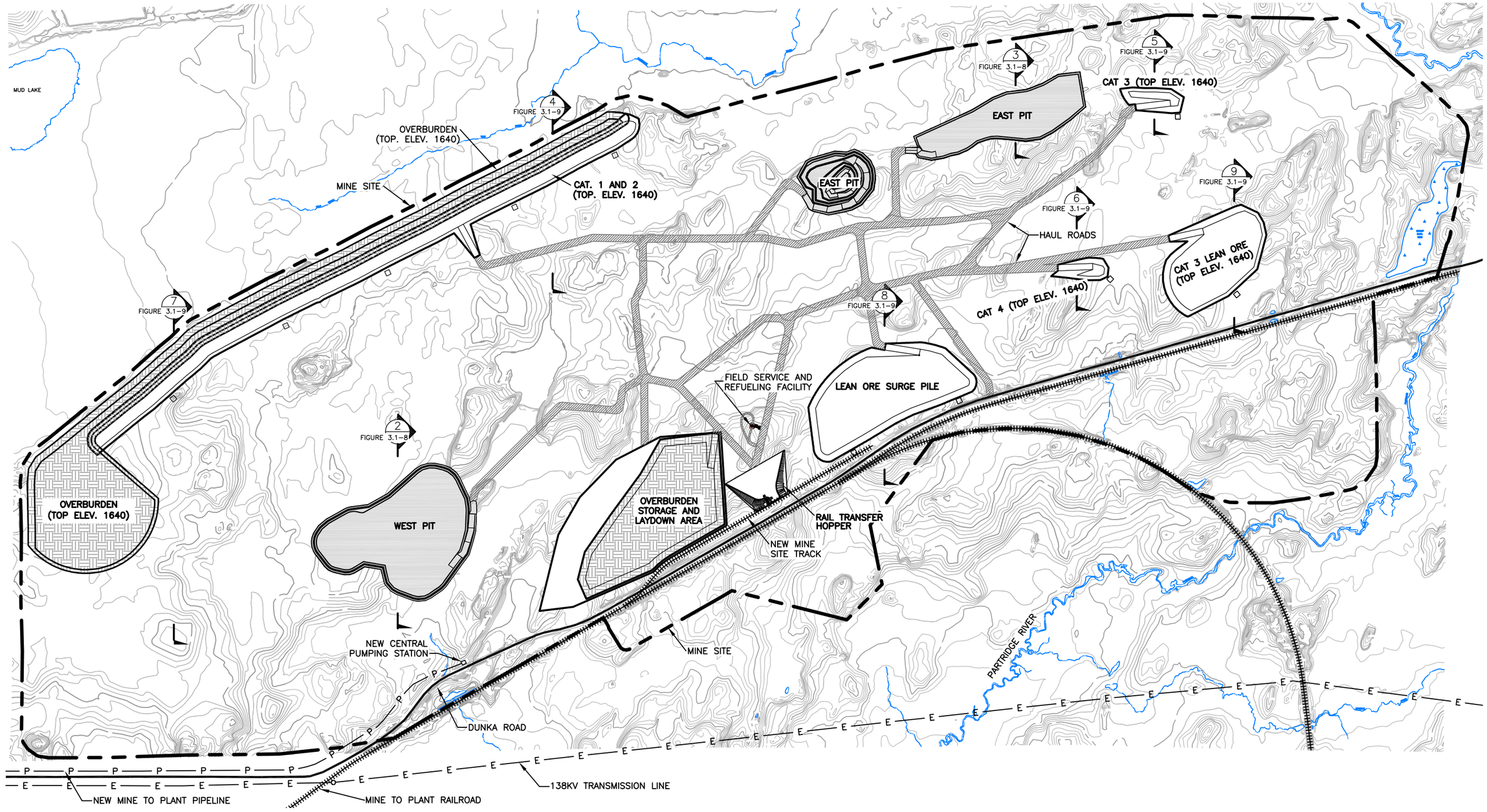
Surface Ownership
To be Transfer From USFS to PolyMet
PolyMet
Cliffs Erie
SKCG,LLC
State of Minnesota
PolyMet Owned or Obtained

N

0 1,000 2,000 4,000 Feet

Figure 3.1-2
Mine Site Surface and Mineral Ownership (All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

SUMP
RIVER
MINE TO PLANT PIPELINE
RAILROAD
OVERBURDEN
PIT CONTOURS (20 FOOT INTERVAL)

N

0 625 1250 2500 FEET

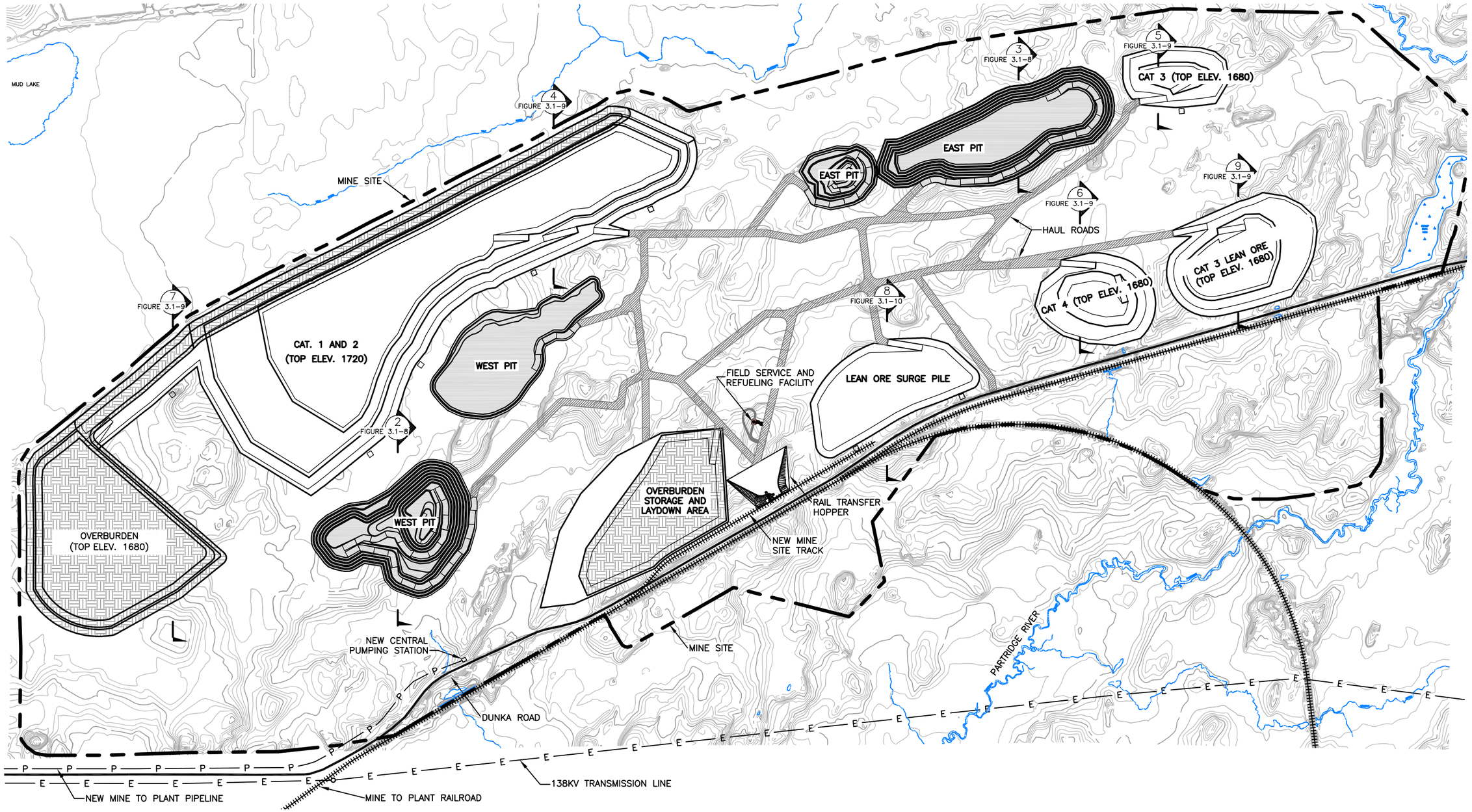
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-3
Mine Plan Map - Year 1 (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

SUMP
RIVER
MINE TO PLANT PIPELINE
RAILROAD
OVERBURDEN
PIT CONTOURS (20 FOOT INTERVAL)

N

0 625 1250 2500 FEET

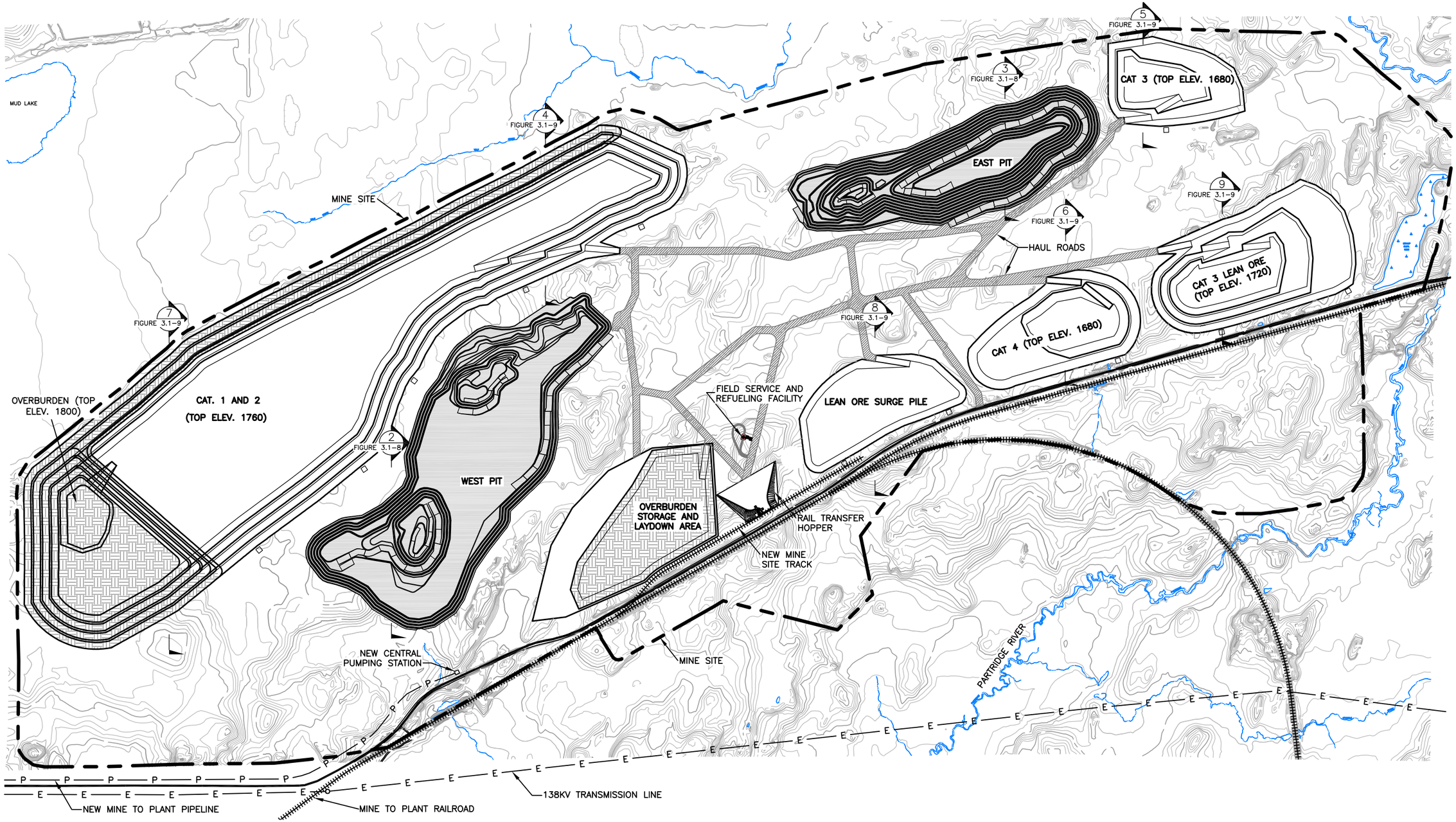
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-4
Mine Plan Map - Year 5 (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

SUMP
RIVER
MINE TO PLANT PIPELINE
RAILROAD
OVERBURDEN
PIT
CONTOURS
(20 FOOT INTERVAL)

N

0 625 1250 2500 FEET

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-5
Mine Plan Map - Year 10 (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

MUD LAKE

MINE SITE

OVERBURDEN
(TOP ELEV. 1720)

CAT. 1 and 2
(TOP ELEV. 1840)

OVERBURDEN
(TOP ELEV.1840)

WEST PIT

CENTRAL PIT

EAST PIT

CAT 3 (TOP ELEV. 1680)

CAT 3 LEAN ORE (TOP ELEV. 1720)

CAT 4 (TOP ELEV. 1680)

HAUL ROADS

FIELD SERVICE AND
REFUELING FACILITY

LEAN ORE SURGE PILE

OVERBURDEN
STORAGE AND
LAYDOWN AREA

RAIL TRANSER
HOPPER

NEW MINE
SITE TRACK

NEW CENTRAL
PUMPING STATION

DUNKA ROAD

MINE SITE

PARTRIDGE RIVER

NEW MINE TO PLANT PIPELINE

MINE TO PLANT RAILROAD

138KV TRANSMISSION LINE

FIGURE 3.1-8 (1)
FIGURE 3.1-8 (2)
FIGURE 3.1-8 (3)
FIGURE 3.1-9 (4)
FIGURE 3.1-9 (5)
FIGURE 3.1-9 (6)
FIGURE 3.1-9 (7)
FIGURE 3.1-9 (8)
FIGURE 3.1-9 (9)

Map Source: Barr Engineering

SUMP
RIVER
MINE TO PLANT PIPELINE
RAILROAD
OVERBURDEN
PIT
CONTOURS
(20 FOOT INTERVAL)

Note:
Figure shows maximum size of each pit at Year 15. In reality the East Pit would reach maximum by Year 11, and backfilling with waste rock and water would have been occurring since Year 12. The Central Pit reaches maximum capacity by Year 13, with backfilling occuring since Year 14.

N

0 625 1250 2500 FEET

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-6
Mine Plan Map - Year 15 (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

MUD LAKE

MINE SITE

4 FIGURE 3.1-9

1 FIGURE 3.1-8

3 FIGURE 3.1-8

5 FIGURE 3.1-9

CAT 3 (TOP ELEV. 1760)

EAST PIT

CENTRAL PIT

6 FIGURE 3.1-9

HAUL ROADS

9 FIGURE 3.1-9

CAT 3 LEAN ORE(TOP ELEV. 1800)

7 FIGURE 3.1-9

8 FIGURE 3.1-9

CAT 4 (TOP ELEV. 1730)

CAT. 1 AND 2
(TOP ELEV. 1840)

2 FIGURE 3.1-8

FIELD SERVICE AND REFUELING FACILITY

LEAN ORE SURGE PILE
(REMOVED AT END OF YEAR 20)

WEST PIT

OVERBURDEN STORAGE AND LAYDOWN AREA
(REMOVED AT END OF YEAR 20)

RAIL TRANSFER HOPPER

NEW MINE SITE TRACK

OVERBURDEN
(TOP ELEV.1840)

NEW CENTRAL PUMPING STATION

MINE SITE

PARTRIDGE RIVER

NEW MINE TO PLANT PIPELINE

MINE TO PLANT RAILROAD

138KV TRANSMISSION LINE

Map Source: Barr Engineering

SUMP
RIVER
MINE TO PLANT PIPELINE
RAILROAD
OVERBURDEN
PIT CONTOURS (20 FOOT INTERVAL)

Note:
Figure shows maximum size of the East and Central Pit prior to filling with water and waste rock.

N

0 625 1250 2500 FEET

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-7
Mine Plan Map - Year 20 (Proposed Action)

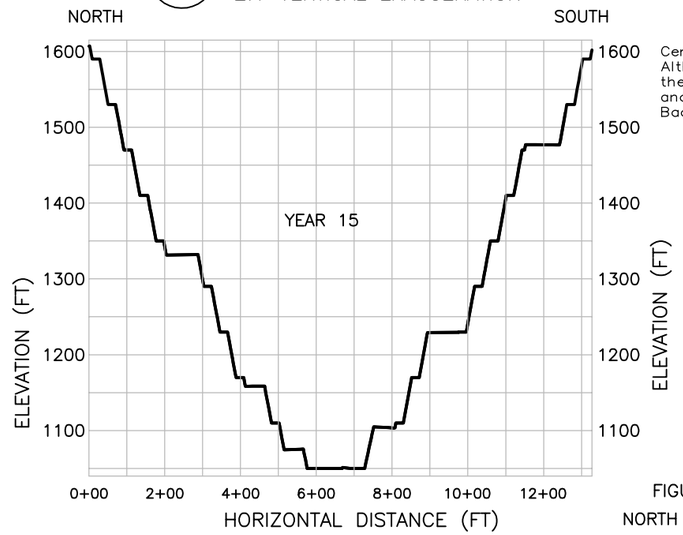
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

1 SECTION: CENTRAL PIT

FIGURE 3.1–6 to 3.1–7

2:1 VERTICAL EXAGGERATION

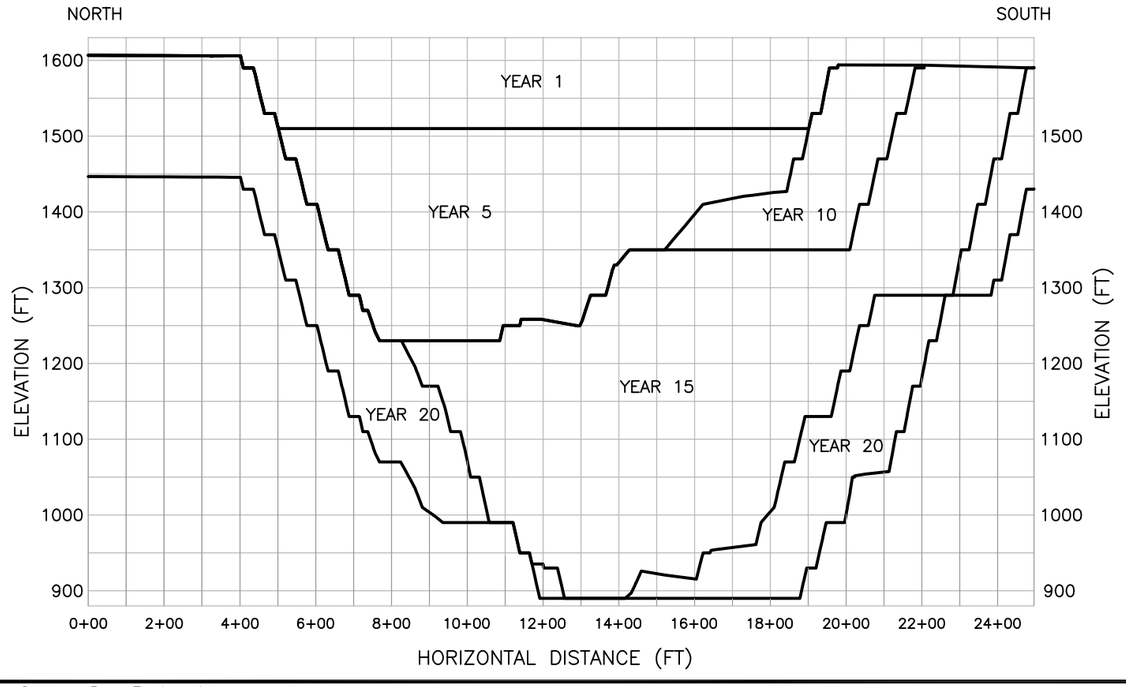


Central Pit Note:
Although the maximum depth is shown in year 15, the maximum depth is to be reached by Year 13, and backfilling with waste rock and water will begin. Backfill is not shown in cross–section

2 SECTION: WEST PIT

FIGURE 3.1–3 to 3.1–7

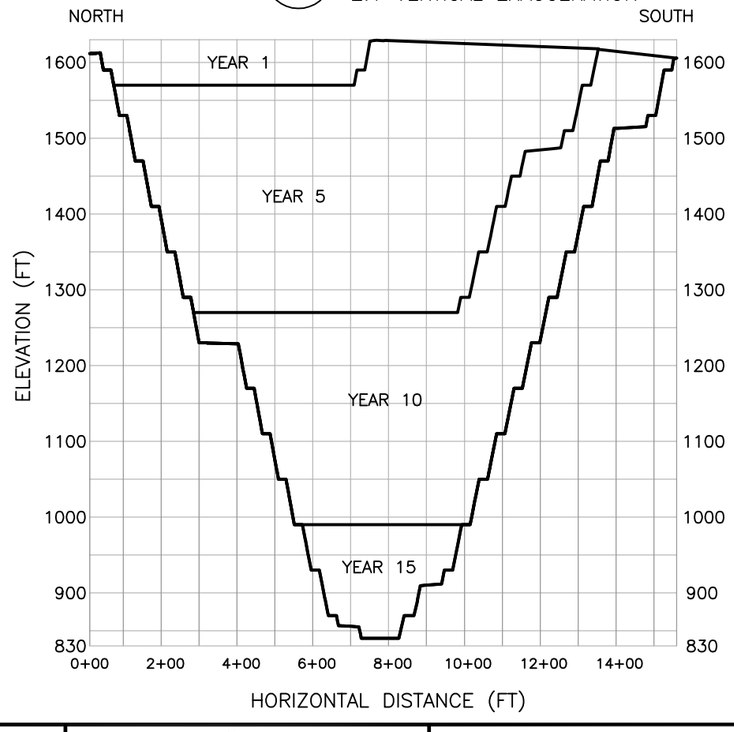
2:1 VERTICAL EXAGGERATION



3 SECTION: EAST PIT

FIGURE 3.1–3 to 3.1–7

2:1 VERTICAL EXAGGERATION



East Pit Note:
Although the maximum depth is shown in year 15, the maximum depth is to be reached by Year 11, and backfilling with waste rock and water will begin. Backfill is not shown in cross–section

Map Source: Barr Engineering

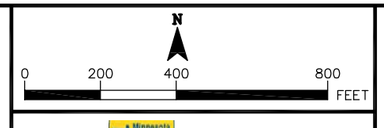
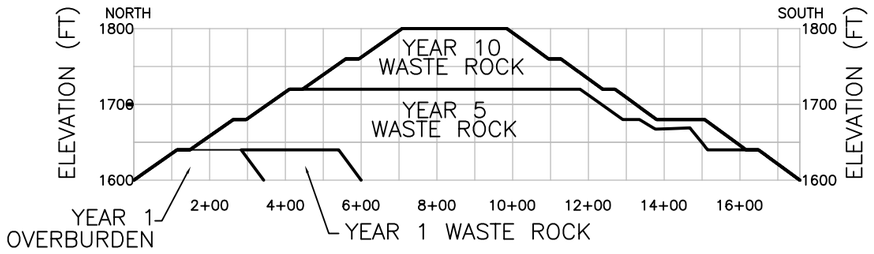


Figure 3.1-8
Pit Cross Sections (Proposed Action)

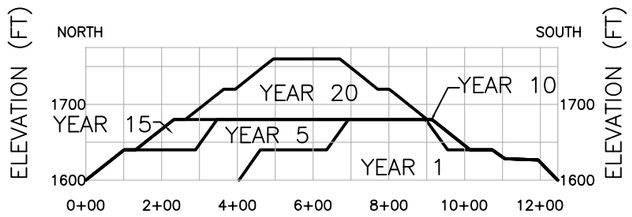
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



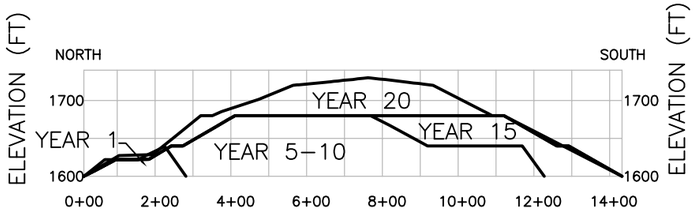
4 SECTION: CATEGORY 1 and 2 STOCKPILE

FIGURE 3.1–3 to 3.1–7 2:1 VERTICAL EXAGGERATION



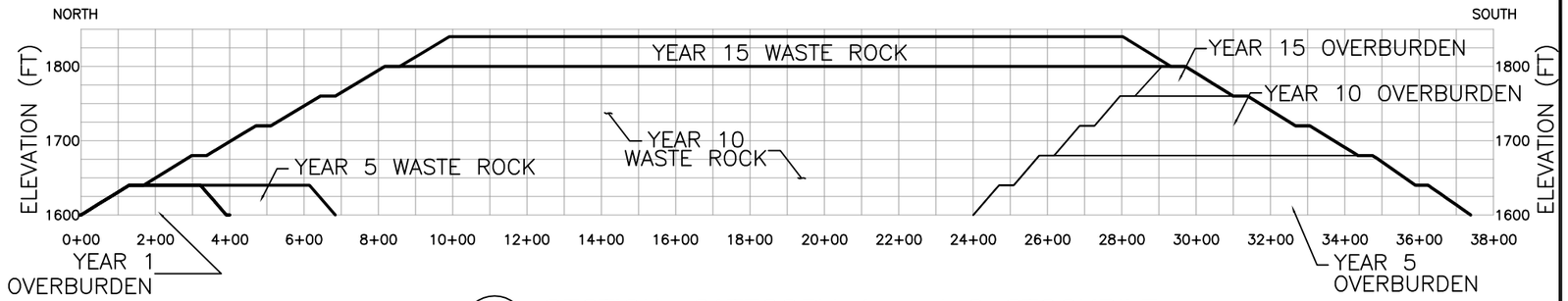
5 SECTION: CATEGORY 3 STOCKPILE

FIGURE 3.1–3 to 3.1–7 2:1 VERTICAL EXAGGERATION



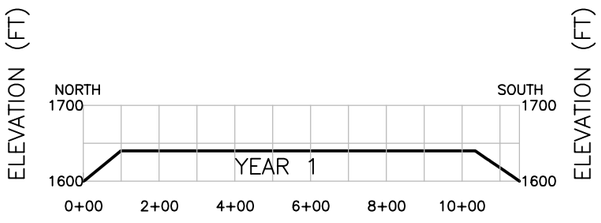
6 SECTION: CATEGORY 4 STOCKPILE

FIGURE 3.1–3 to 3.1–7 2:1 VERTICAL EXAGGERATION



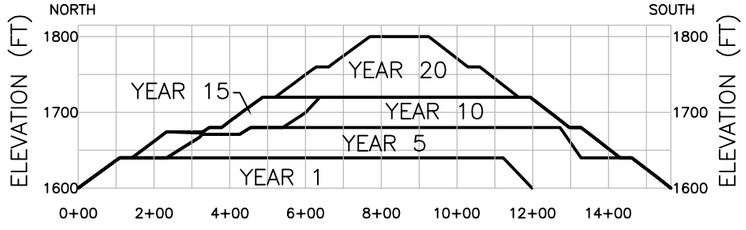
7 SECTION: CATEGORY 1 and 2 STOCKPILE

FIGURE 3.1–3 to 3.1–7 2:1 VERTICAL EXAGGERATION



8 SECTION: LEAN ORE SURGE PILE

FIGURE 3.1–5 to 3.1–7 2:1 VERTICAL EXAGGERATION



9 SECTION: CATEGORY 3 LEAN ORE STOCKPILE

FIGURE 3.1–3 to 3.1–7 2:1 VERTICAL EXAGGERATION

Map Source: Barr Engineering

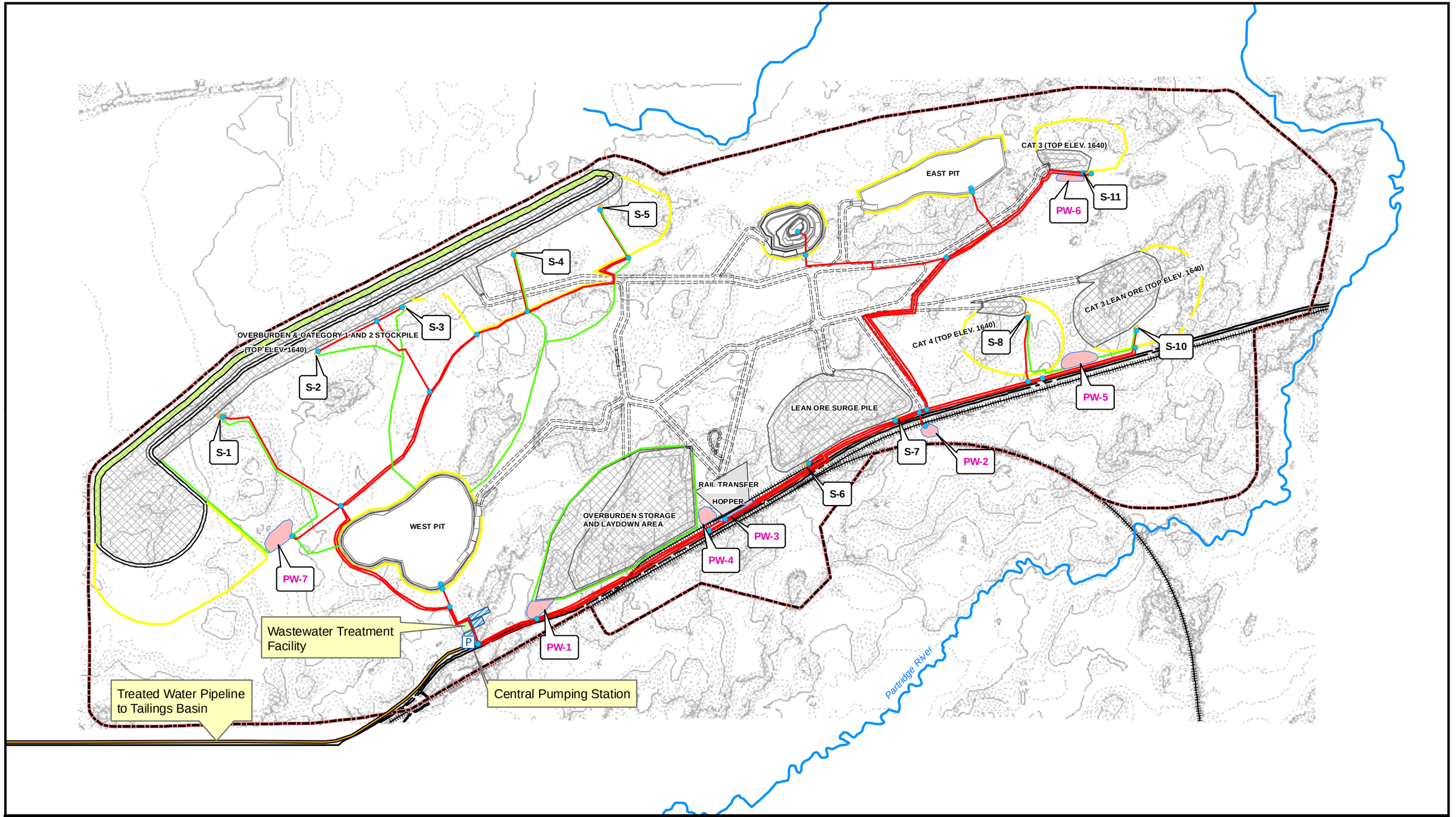
N

0 200 400 800 FEET

Figure 3.1-9
Stockpile Cross Sections (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Year 1 Pumps
- Railroad
- Dunka Road
- Mine Site

Year 1 Process Water

- Ditches
- Pipes
- Pit Rim and Stockpile Prep Dikes
- Process Water Sedimentation Ponds (PW-#)

Year 1 Stockpile Layout

- Stockpile Contours (40' Interval)
- Stockpile Breaklines
- Category 1/2 Overburden
- Stockpile Sumps (S-#)
- Haul Roads
- Covered - Year 1
- Stockpile Footprint

Year 1 Mine Plan

- Index Contours (100' Interval)
- Intermediate Contours (20' Interval)

Mine Site Contours

- Index Contours (10' Interval)
- Intermediate Contours (2' Interval)

Callouts depict the following:
Pink = Process Water Ponds
Black = Stockpile Sumps

Pipeline alignments have been exaggerated for illustration purposes.

N

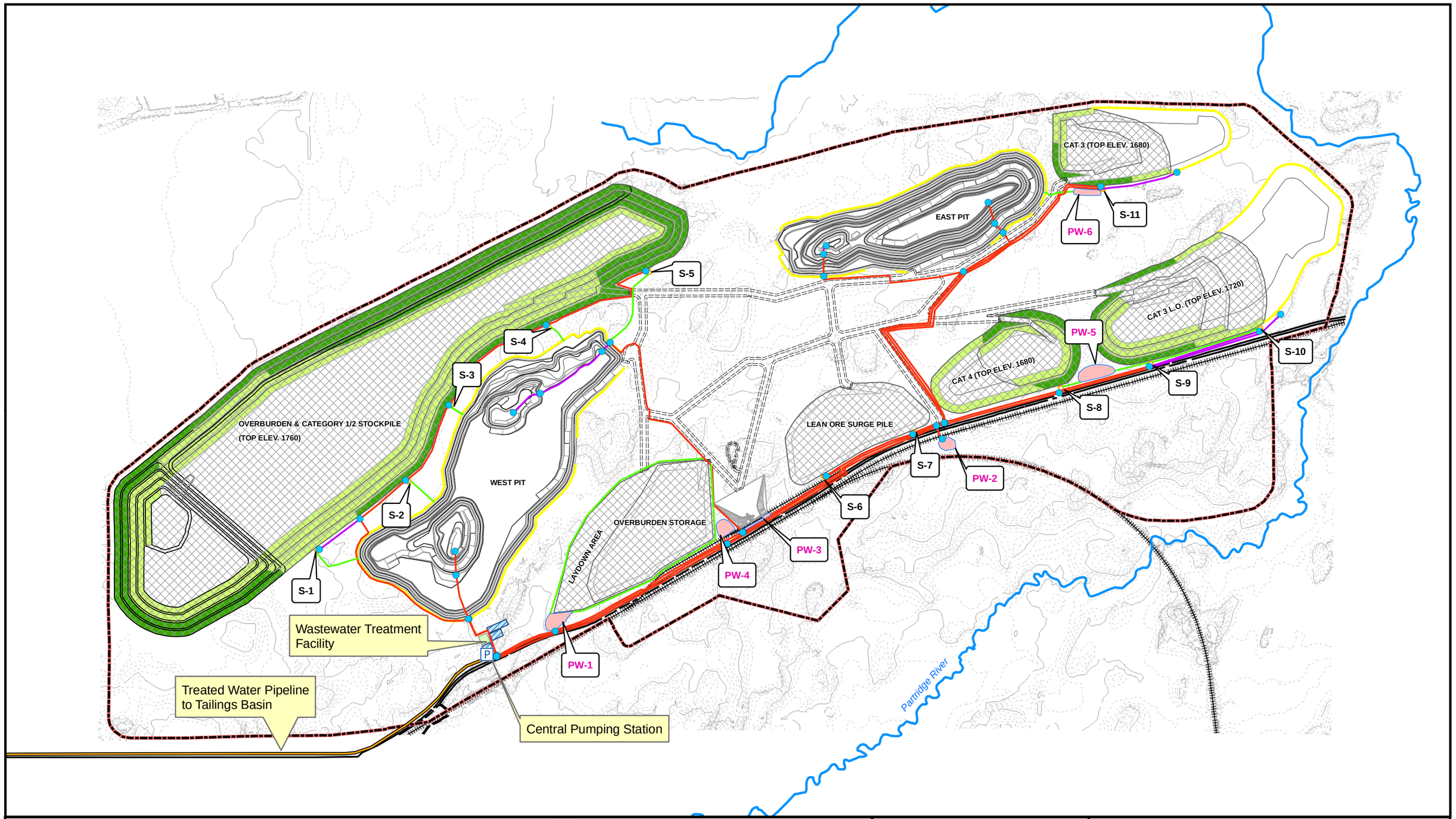
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St Paul District

Figure 3.1-10
Process Water Management - Year 1 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Layer
- Ditch
- Pipe
- Pipe- New Year 10
- Pit Rim and Stockpile Prep Dikes
- Year 10 Pumps
- Process Water Sediment Pond(PW-#)

Year 10 Stockpile Layout
- Stockpile Contours (40' Interval)
- Stockpile Breaklines
- Stockpile Sumps (S-#)
- Category 1/2 Overburden
- Haul Roads
- Rail Transfer Hopper

Year 10 Stockpile Covers
- Not Yet Covered
- Covered - Year 10
- Covered Previous Years
- Stockpile Footprint

Year 10 Mine Plan
- Index Contours (100' Interval)
- Intermediate Contours (20' Interval)
- Mine Site
- Railroad
- Dunka Road

Mine Site Contours
- Index Contours (10' Interval)
- Intermediate Contours (2' Interval)

Map/Data Source: Barr Engineering

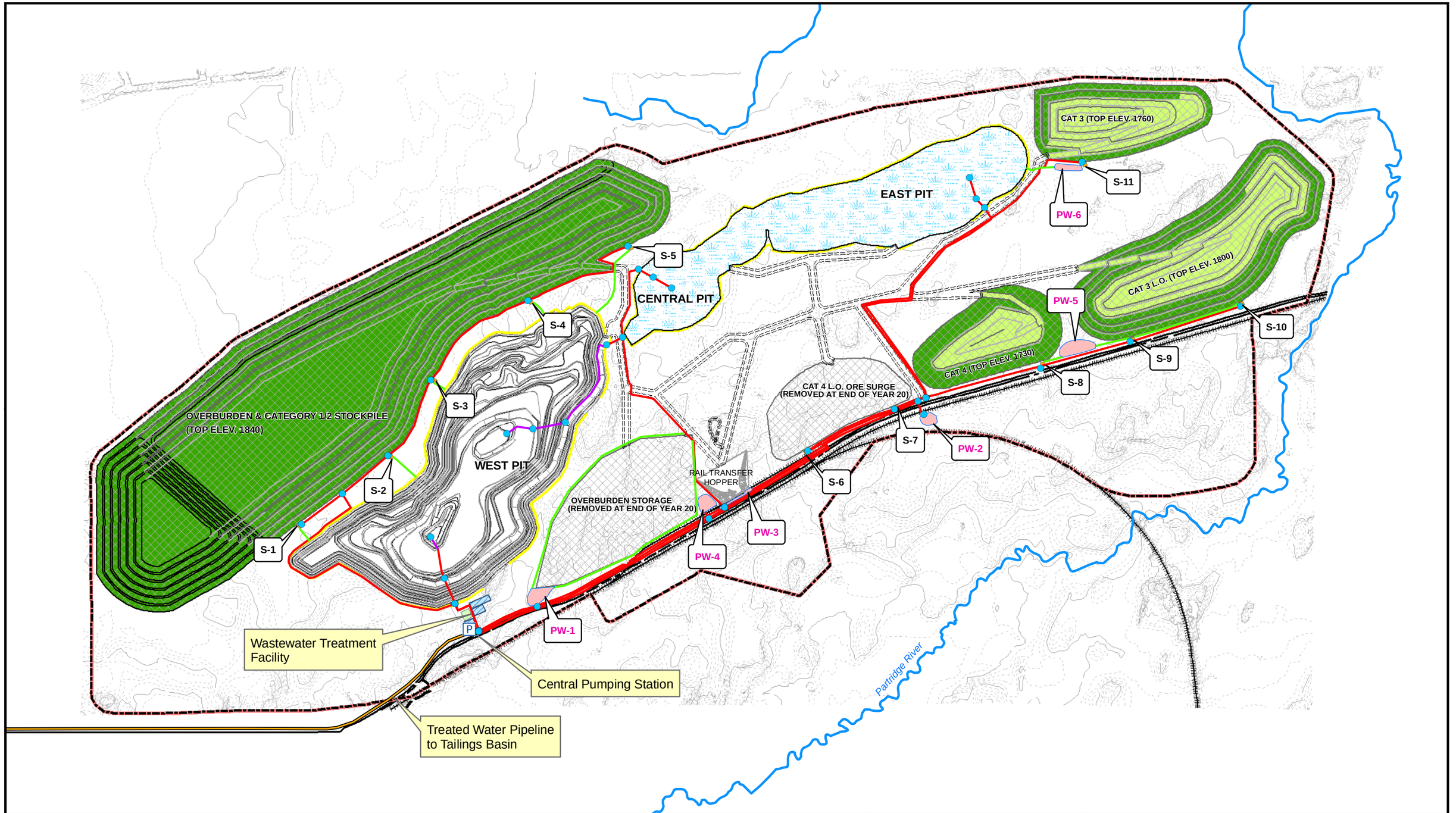
Callouts depict the following:
Pink = Process Water Ponds
Black = Stockpile Sumps
Pipeline alignments have been exaggerated for illustration purposes.

N

0 750 1,500 3,000 Feet

Figure 3.1-11
Process Water Management - Year 10 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Year 20 - Process Water
- Ditch
- Pipe
- Pipe - New Year 20
- Pit Rim Dikes
- Year 20 Pumps
- Process Water Sedimentation Pond(PW-#)

Year 20 Stockpile Layout
- Stockpile Contours (40' Interval)
- Stockpile Breaklines
- Stockpile Sumps (S-#)
- Category 1/2 Overburden
- Haul Roads
- Rail Transfer Hopper

Year 20 Stockpile Covers
- Covered - Year 20
- Covered Previous Years
- Stockpile Footprint

Year 20 Mine Plan
- Index Contours (100' Interval)
- Intermadiate Contours (20' Interval)
- Mine Site
- Railroad
- Dunka Road

Mine Site Contours
- Index Contours (10' Interval)
- Intermediate Contours (2' Interval)
- Constructed Wetland

Map Source: Barr Engineering

Callouts depict the following:
Pink = Process Water Ponds
Black = Stockpile Sumps
Pipeline alignments have been exaggerated for illustration purposes.

N

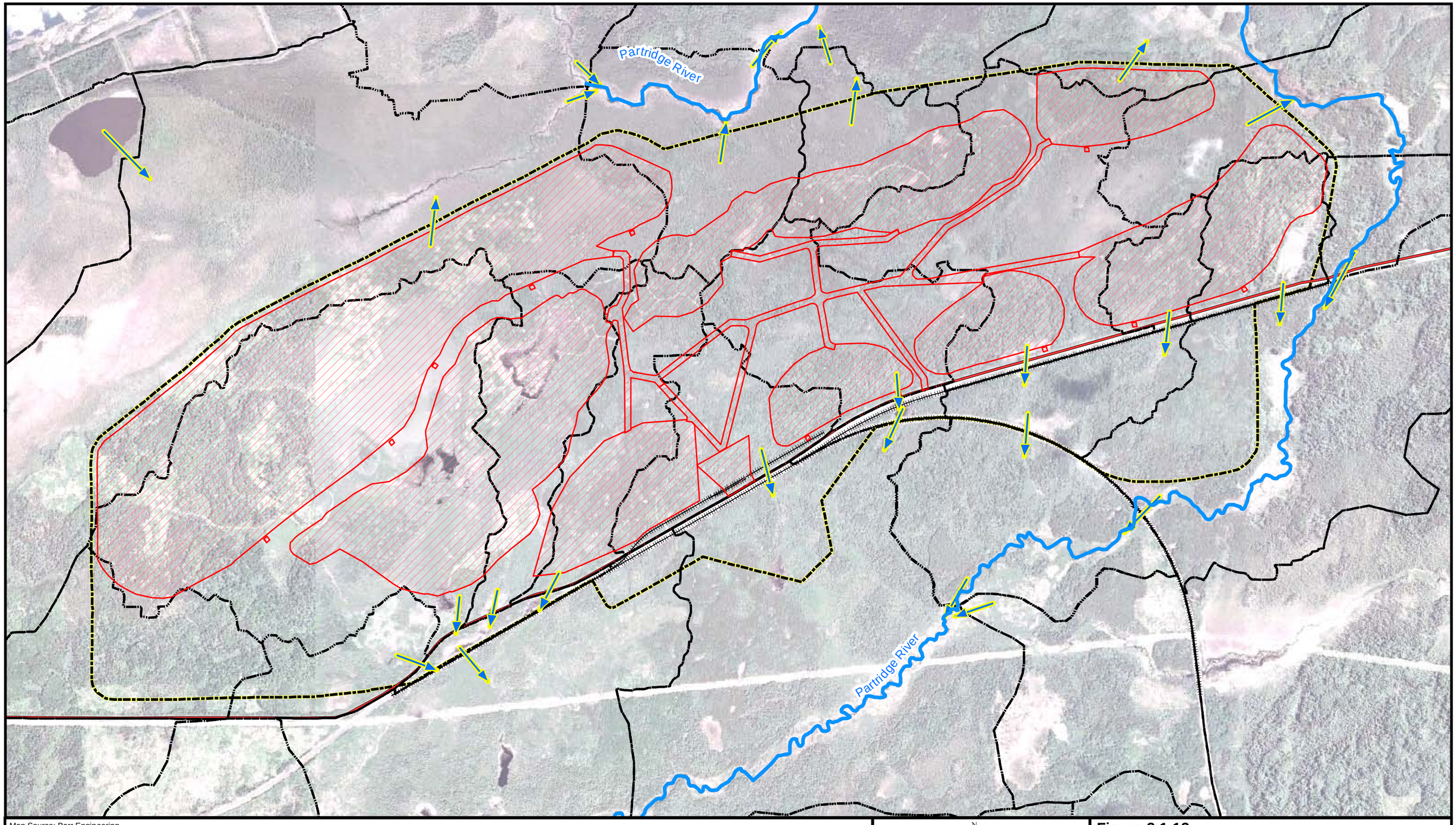
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-12
Process Water Management - Year 20 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Partridge River
- Flow Direction
- Dunka Road
- Railroad
- Mine Site
- Year 20 Mine Facilities
- Existing Sub Watersheds

N

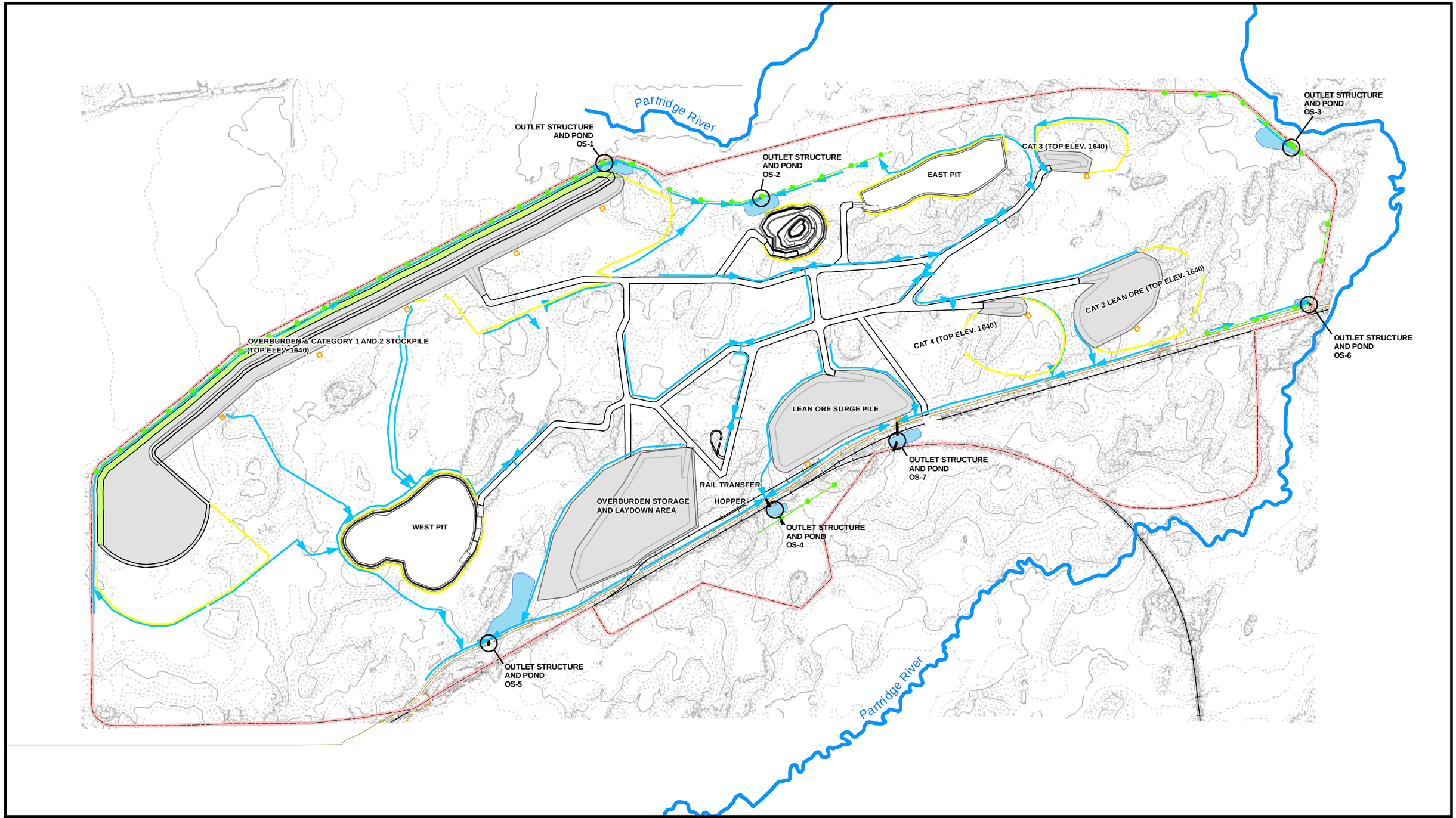
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-13
Existing Drainage Subwatersheds at the Mine Site (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Year 1 Stormwater
- Stormwater Culverts
- Ditches
- Pit Rim and Stockpile Prep Dike
- Perimeter Dike
- Stormwater Sedimentation Pond

Year 1 Stockpile Layout
- Stockpile Contours (40' Interval)
- Stockpile Breaklines
- Category 1/2 Overburden
- Stockpile Sumps
- Haul Roads

Year 1 Mine Plan
- Index Contours (100' Interval)
- Intermediate Contours (20' Interval)
- Index Contours (10' Interval)
- Intermediate Contours (2' Interval)

Year 1 Stockpile Covers
- Not Yet Covered
- Covered - Year 1

- Mine Site
- Railroad
- Dunka Road
- Partridge River

N

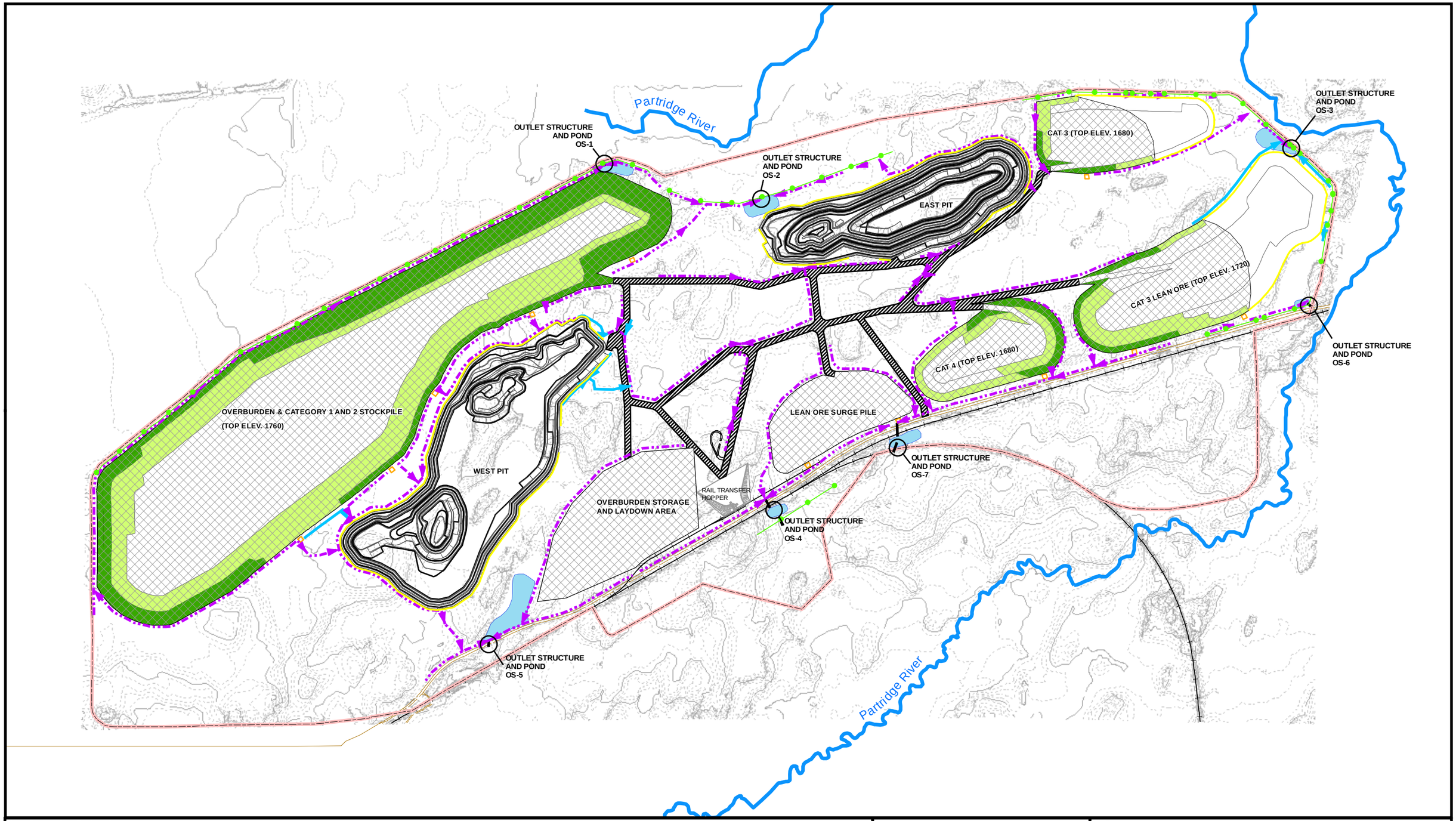
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-14
Year 1 Stormwater Management (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Year 10 Stormwater
- Culverts
- Ditches-New Year 10
- Ditches
- Pit Rim & Stockpile Prep Dikes
- Perimeter Dike
- Stormwater Sedimentation Pond

Year 10 Stockpile Layout
- Stockpile Contours (40' Interval)
- Stockpile Breaklines
- Stockpile Sumps
- Category 1/2 Overburden
- Haul Roads
- Rail Transfer Hopper

Year 10 Mine Plan
- Index Contours (100' Interval)
- Intermediate Contours (10' Interval)

Mine Site Contours
- Index Contours (10' Interval)
- Intermediate Contours (2' Interval)

- Mine Site
- Railroad
- Dunka Road
- Partridge River

Year 10 Stockpile Covers
- Not Yet Covered
- Covered - Year 10
- Covered Previous Years
- Stockpile Footprint

N

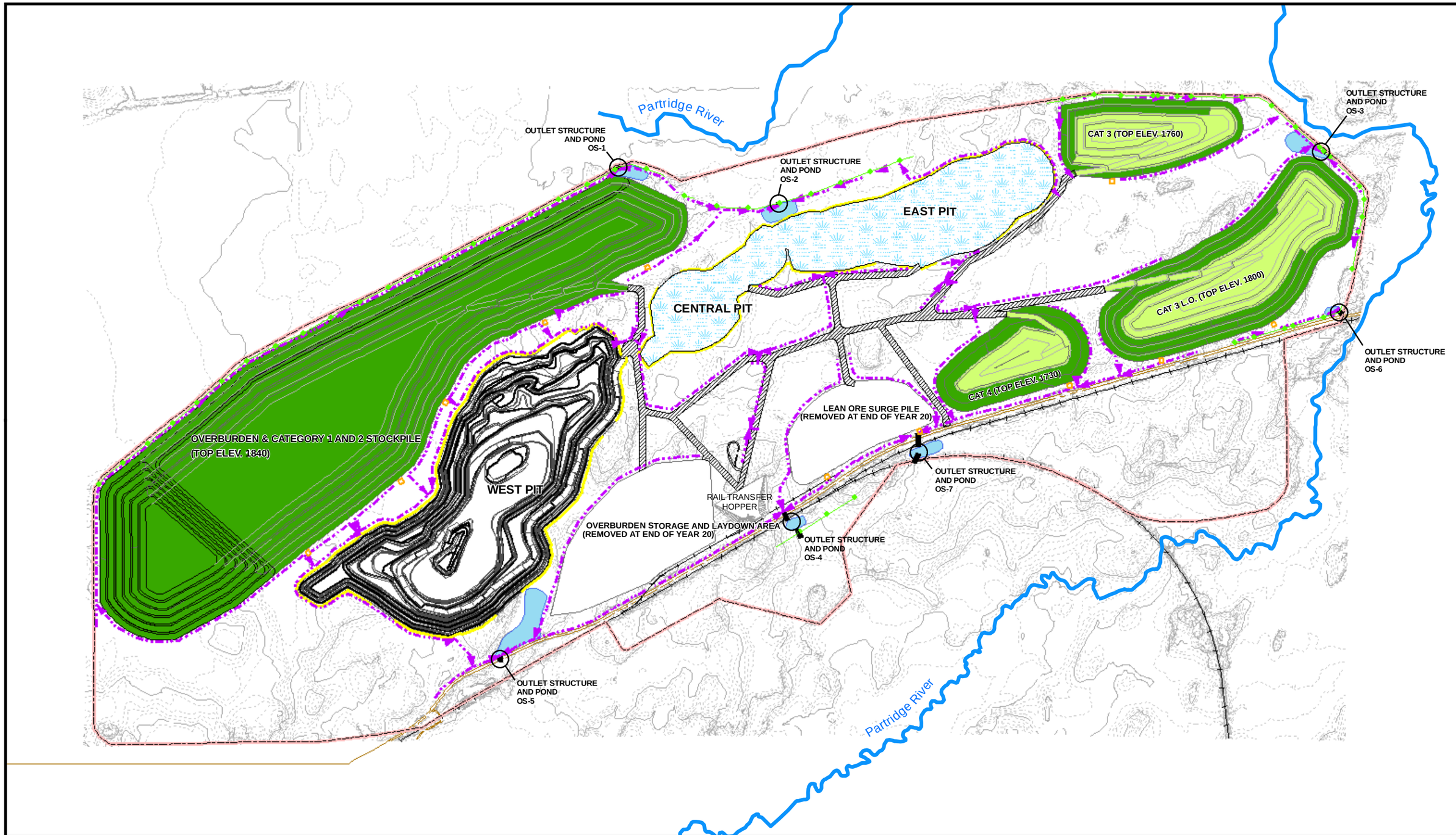
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 3.1-15
Year 10 Stormwater Management (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Year 20
- Stormwater Ditches
- Perimeter Dike
- Stormwater Culverts
- Pit Rim and Stockpile Prep Dikes
- Stormwater Sedimentation Pond
- Stockpile Sumps

Year 20 Stockpile Layout
- Stockpile Contours (40' Interval)
- Stockpile Breaklines
- Category 1/2 Overburden
- Haul Roads
- Rail Transfer Hopper

Year 20 Stockpile Covers
- Removed
- Covered - Year 20
- Covered Previous Years

Year 20 Mine Plan
- Index Contours (100' Interval)
- Intermediate Contours (20' Interval)
- Mine Site
- Railroad
- Dunka Road

Mine Site Contours
- Index Contours (10' Interval)
- Intermediate Contours (2' Interval)
- Constructed Wetland

N

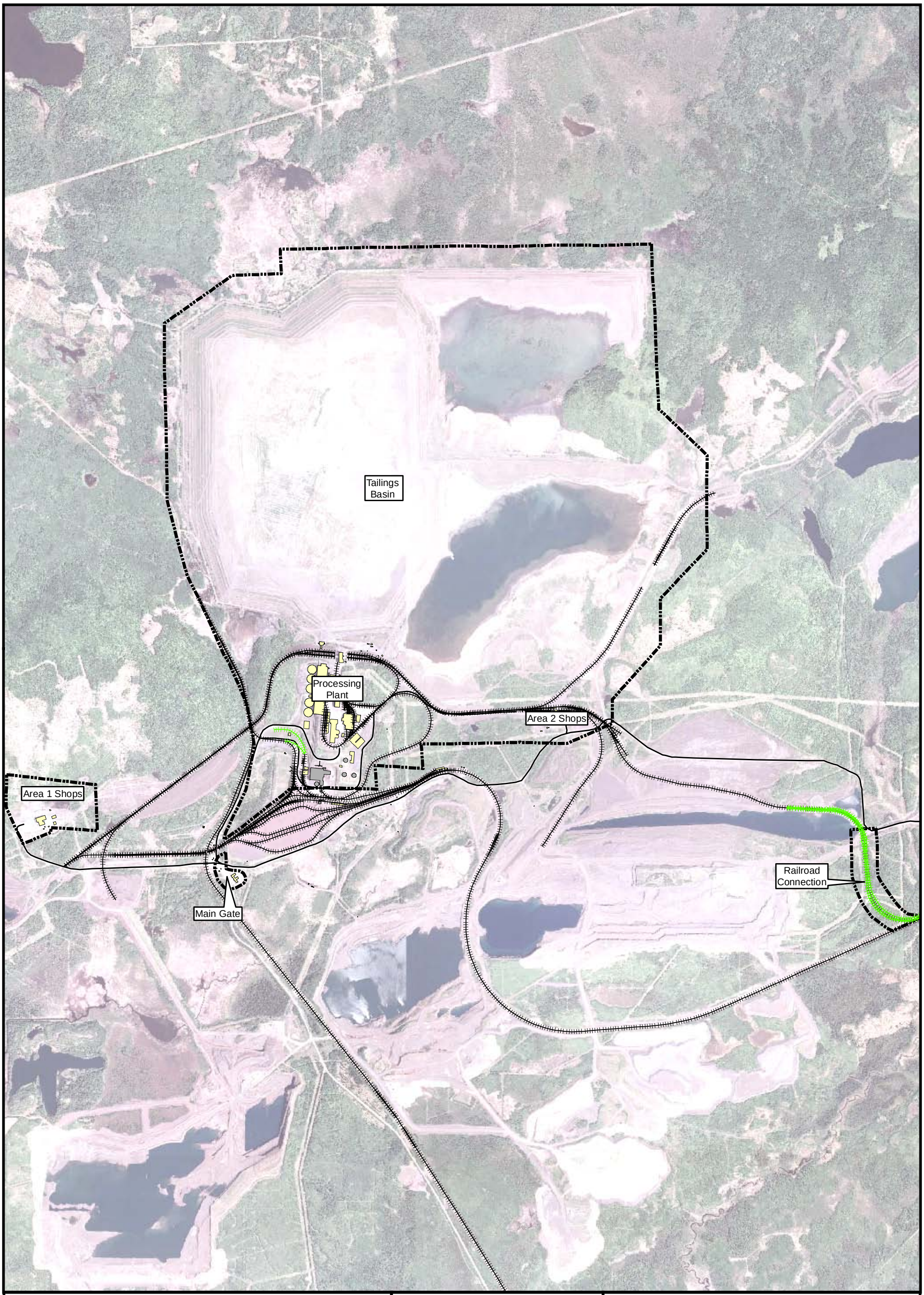
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-16
Year 20 Stormwater Management (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Private Roads

New Railroad

Existing Railroad

Plant Site

Buildings

Proposed Plant Structures (Reuse of Existing)

Demolished Structures

N

0 1,000 2,000 4,000 Feet

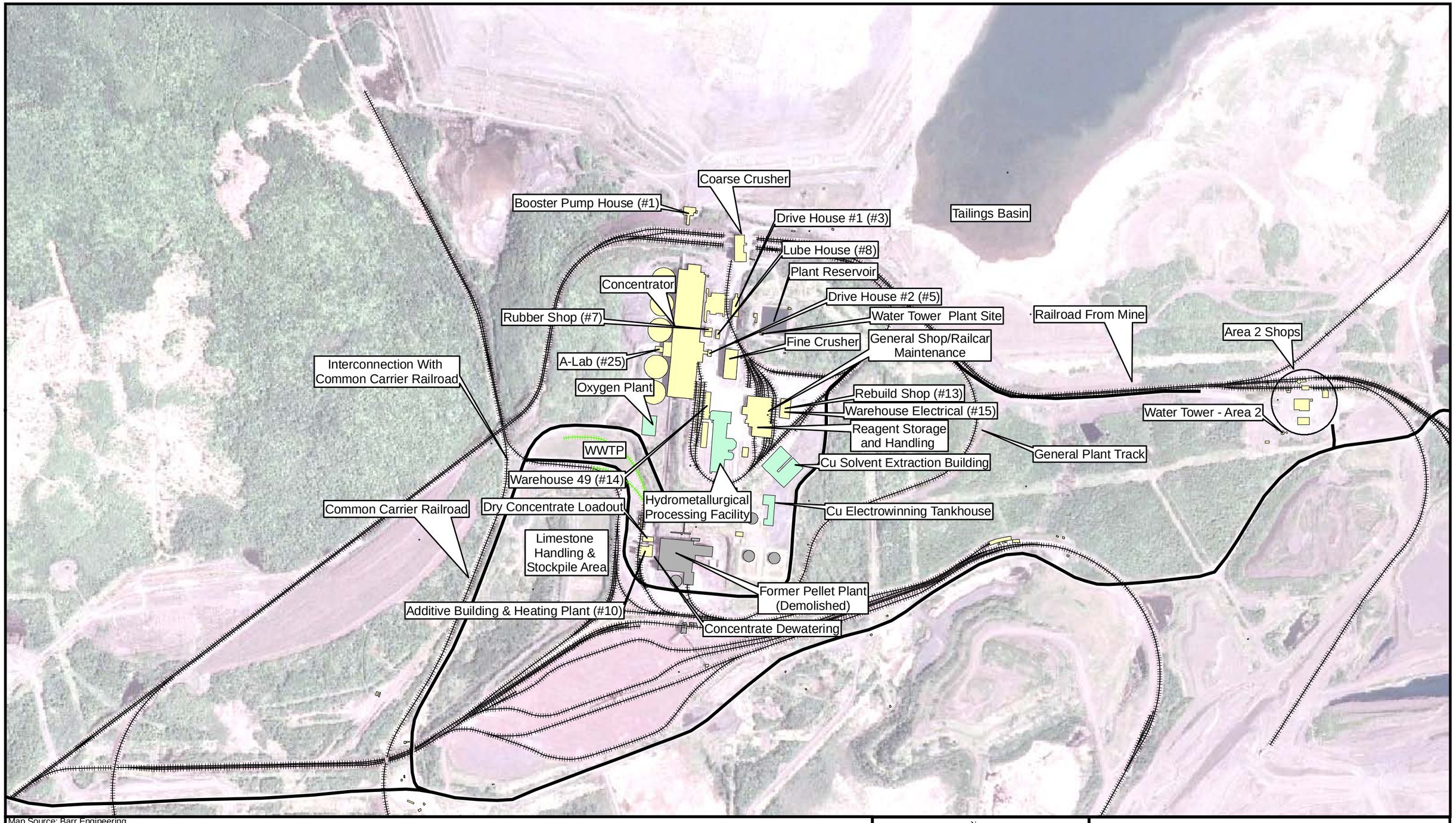
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-17
Plant Site Layout (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Private Roads

Existing Railroad

New Railroad

Buildings

Proposed Plant Structures (Reuse of Existing)

Proposed Plant Structures (New Buildings)

Demolished Structures

N

0 500 1,000 2,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-17a
Processing Plant (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Embarrass River

Tailings Basin Area

Area 2 Shops

Plant Area

Area 1 Shops

Main Gate

Railroad Connection

Partridge River

Map/Data Source: Barr Engineering

- Partridge River
- Existing Railroads
- New Railroad
- Dunka Road
- Superior National Forest
- Plant Site
- 6 Public Land Survey Section Lines

Surface Ownership

- Alam Gould et al.-Owned
- State of Mn.-Owned: Lease to Cliffs Erie
- Polymet-Owned
- Du Nord Land Company-Owned: Lease to Polymet

N

0 2,000 4,000 8,000 Feet

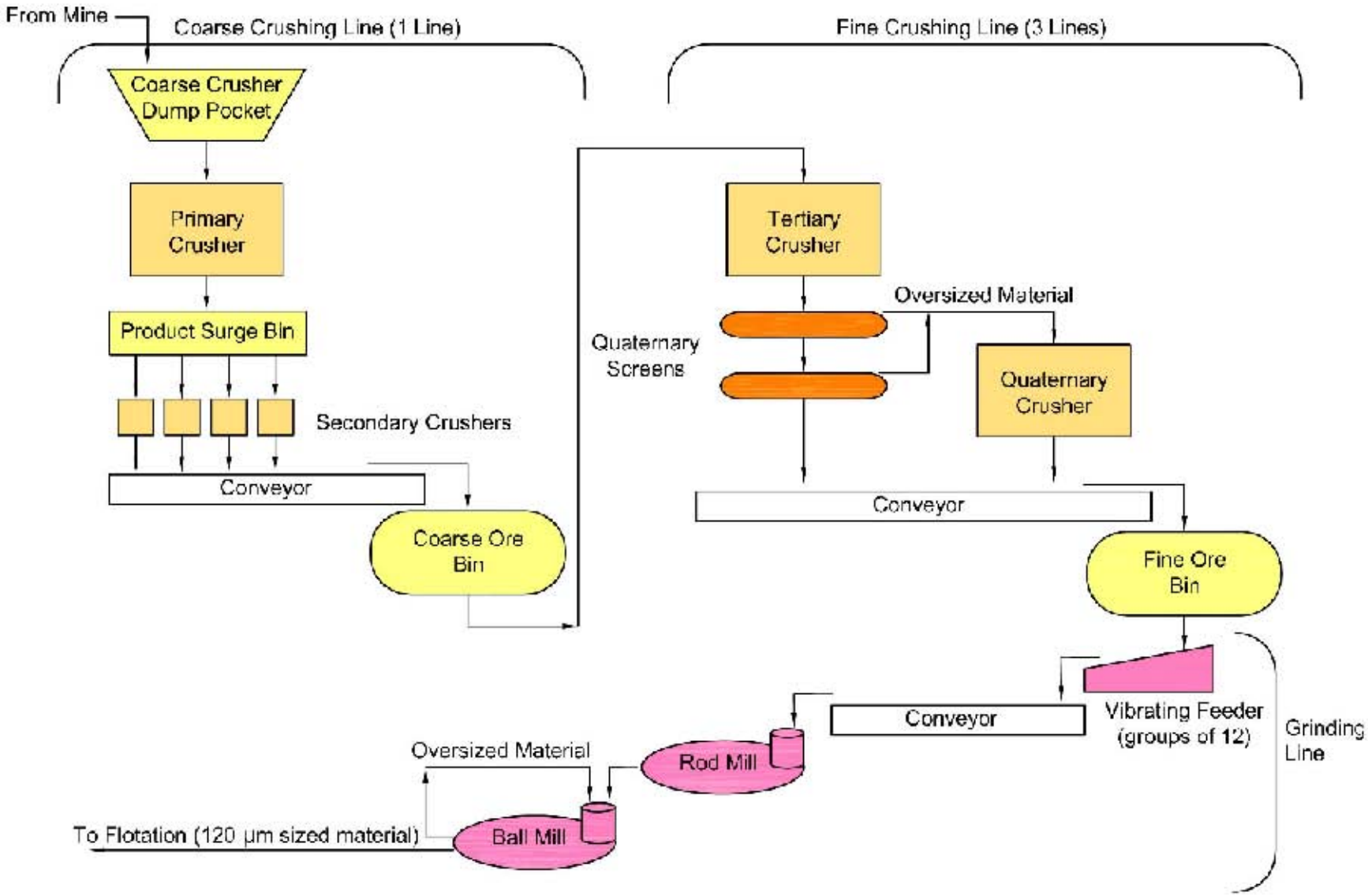
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-18
Plant Site Surface Ownership (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Information Source: PolyMet

No Scale Applicable

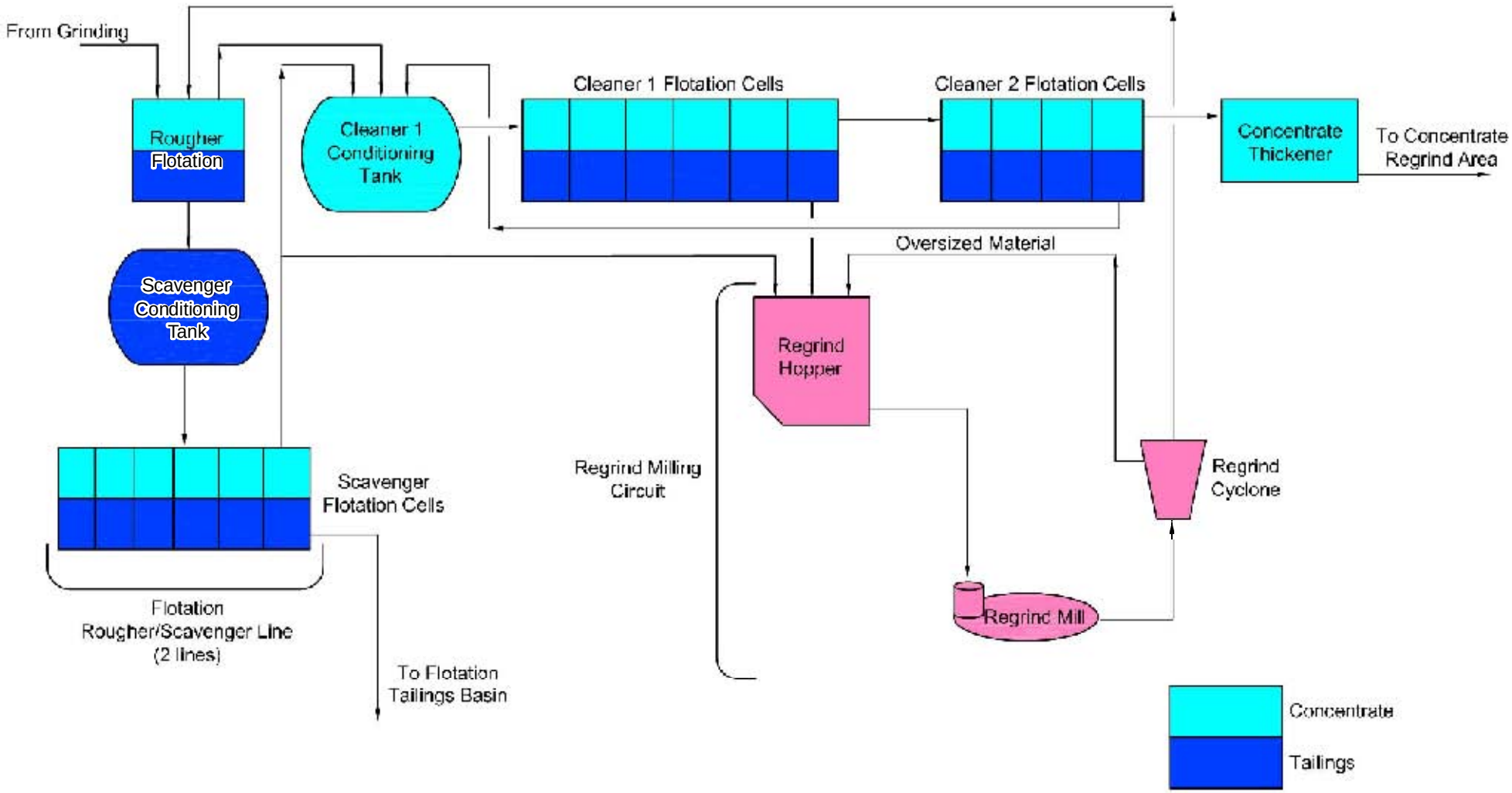
Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 3.1-19
Ore Crushing and Grinding (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



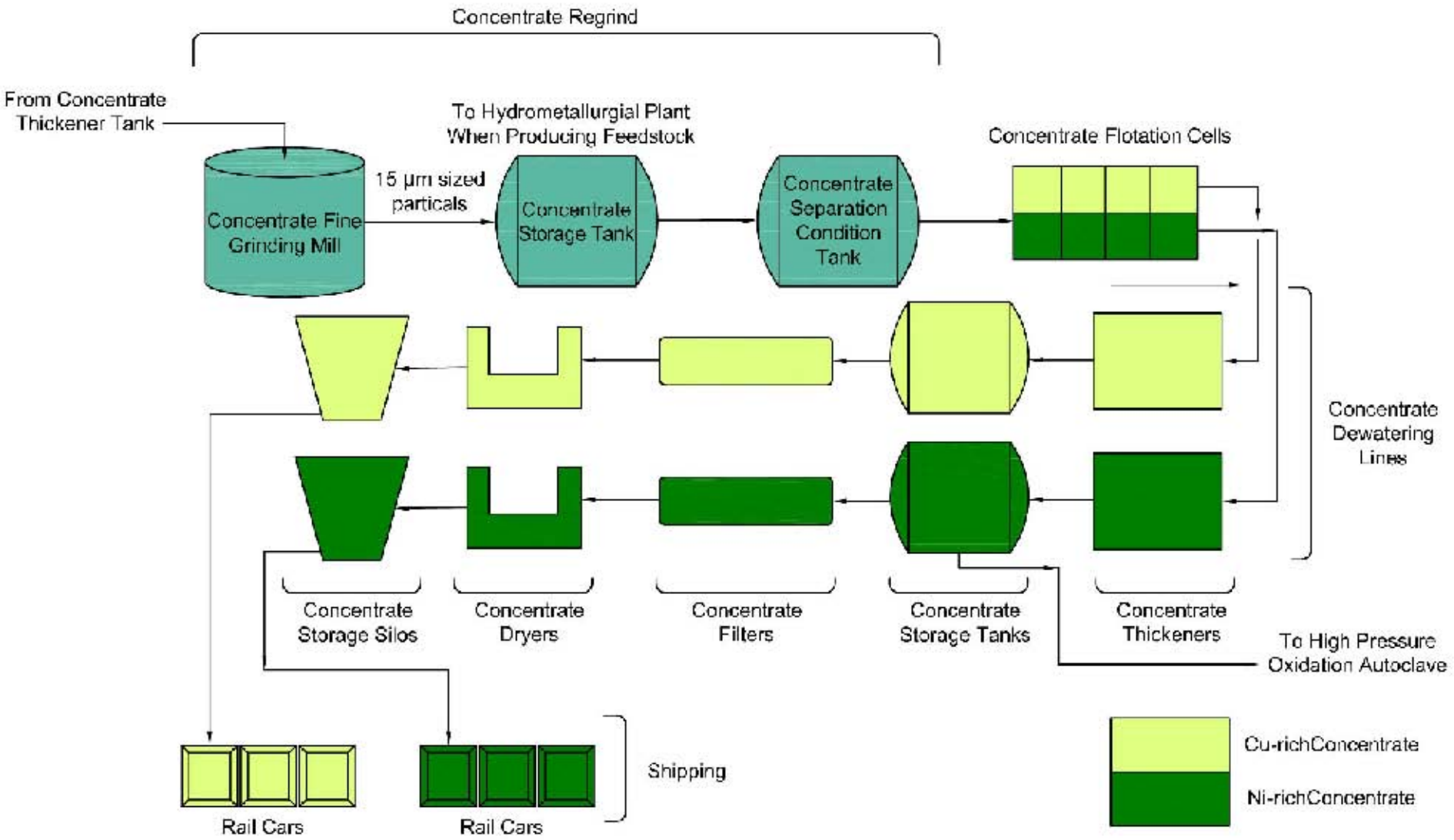
Information Source: PolyMet

No Scale Applicable

Figure 3.1-20
Flotation (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

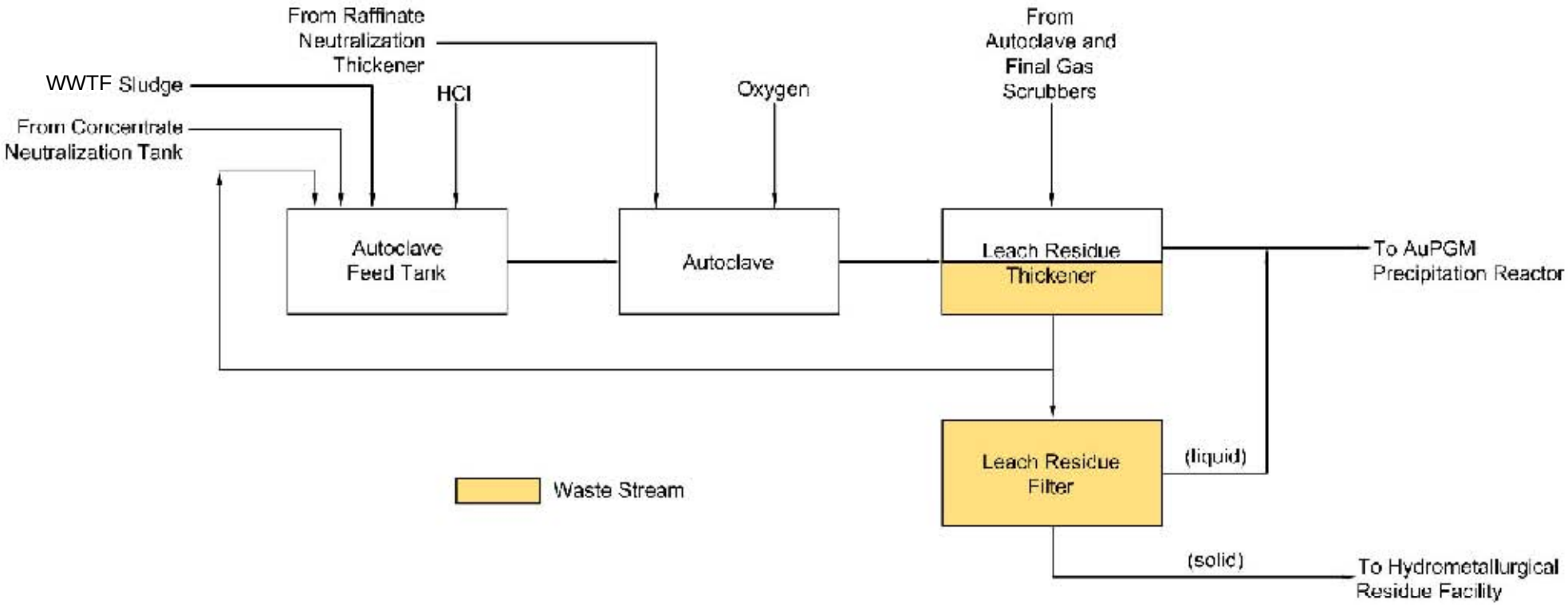


Information Source: PolyMet

No Scale Applicable

Figure 3.1-21
Concentrate Regrind, Separation & Dewatering, and Shipping (All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

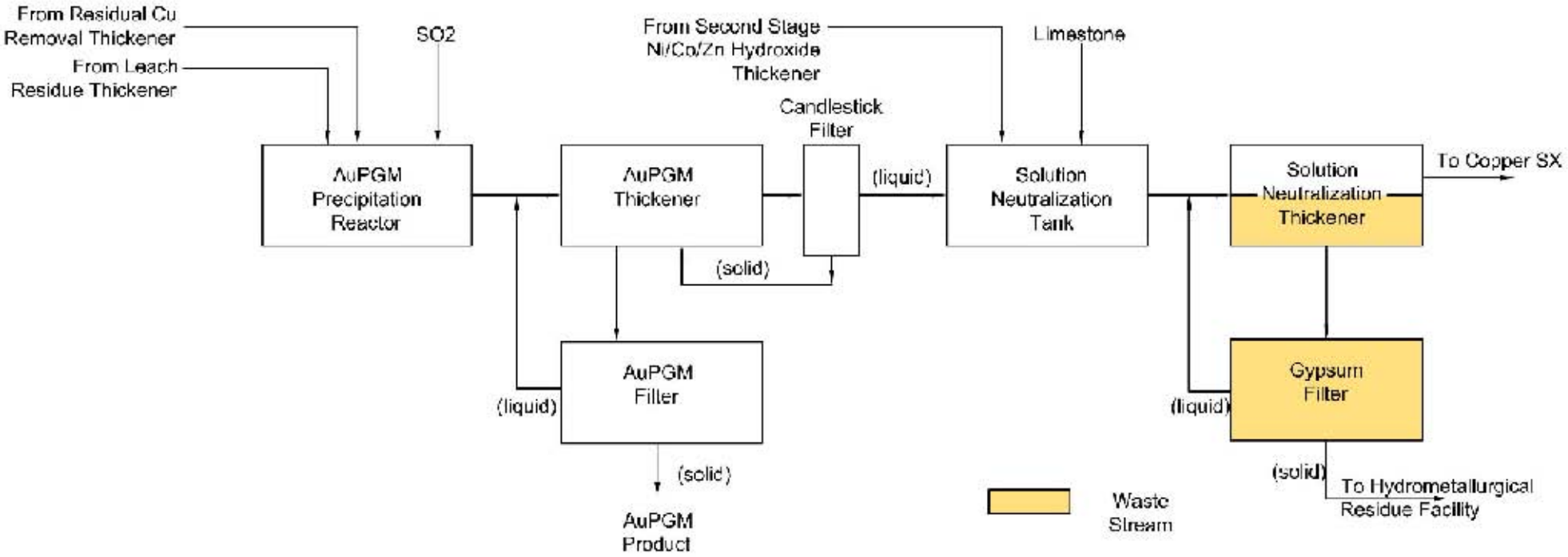


Information Source: PolyMet

No Scale Applicable

Figure 3.1-22
High Pressure Oxidation Autoclave
(All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

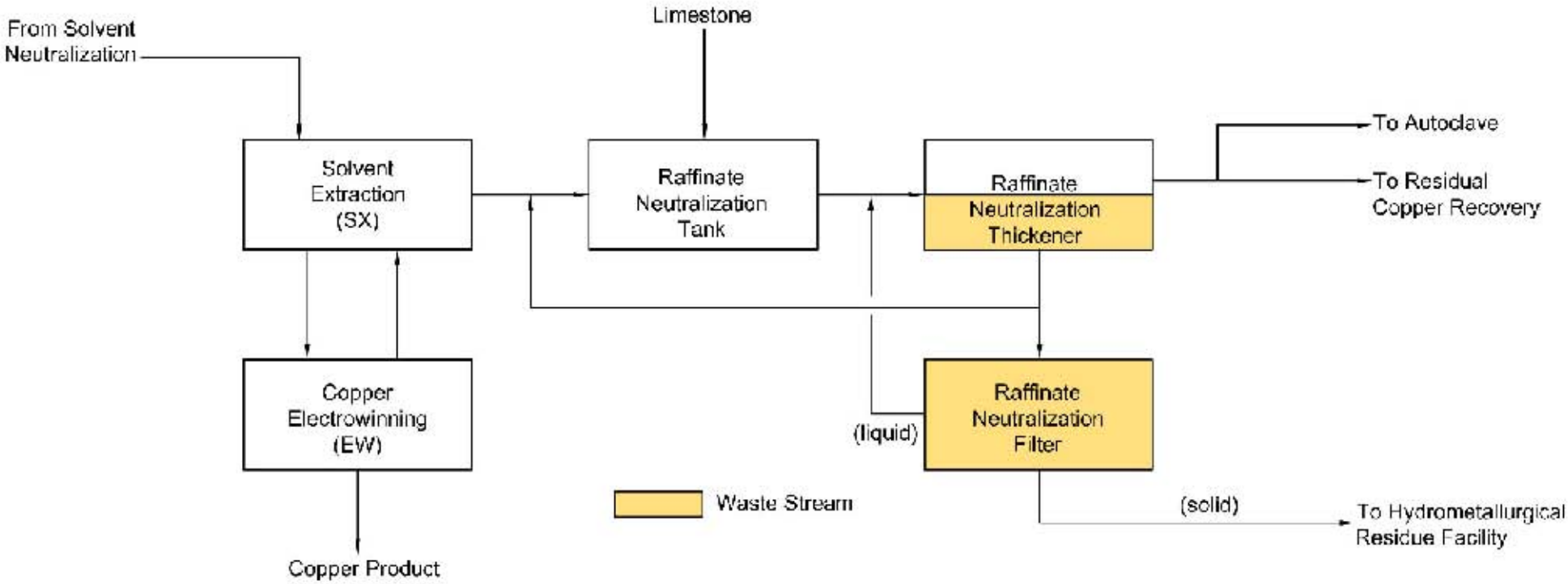


Information Source: PolyMet

No Scale Applicable

Figure 3.1-23
Gold and Platinum Group Metals (AuPGM) Precipitation Reactor (All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

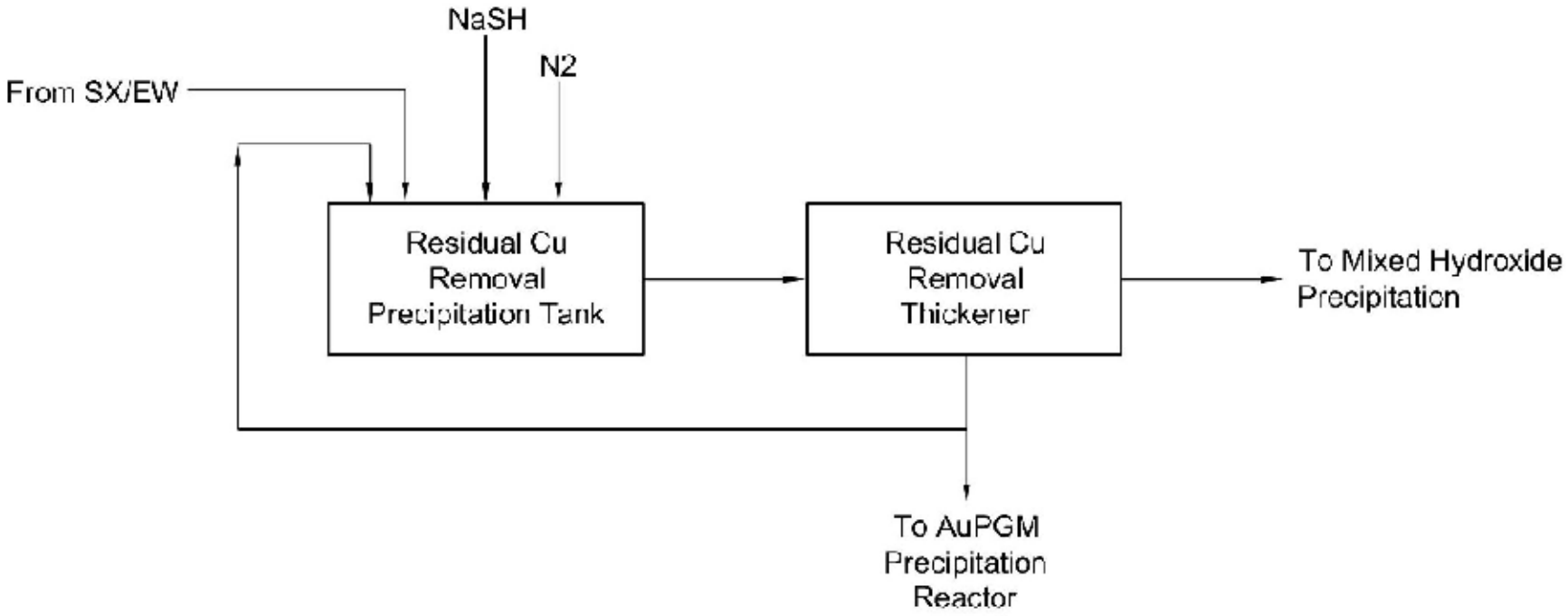


Information Source: PolyMet

No Scale Applicable

Figure 3.1-24
Copper Solvent Extraction/Electrowinning (SX/EW) and Raffinate Neutralization (All Actions)
NorthMet Project
PolyMet Mining, Inc.

October 2009



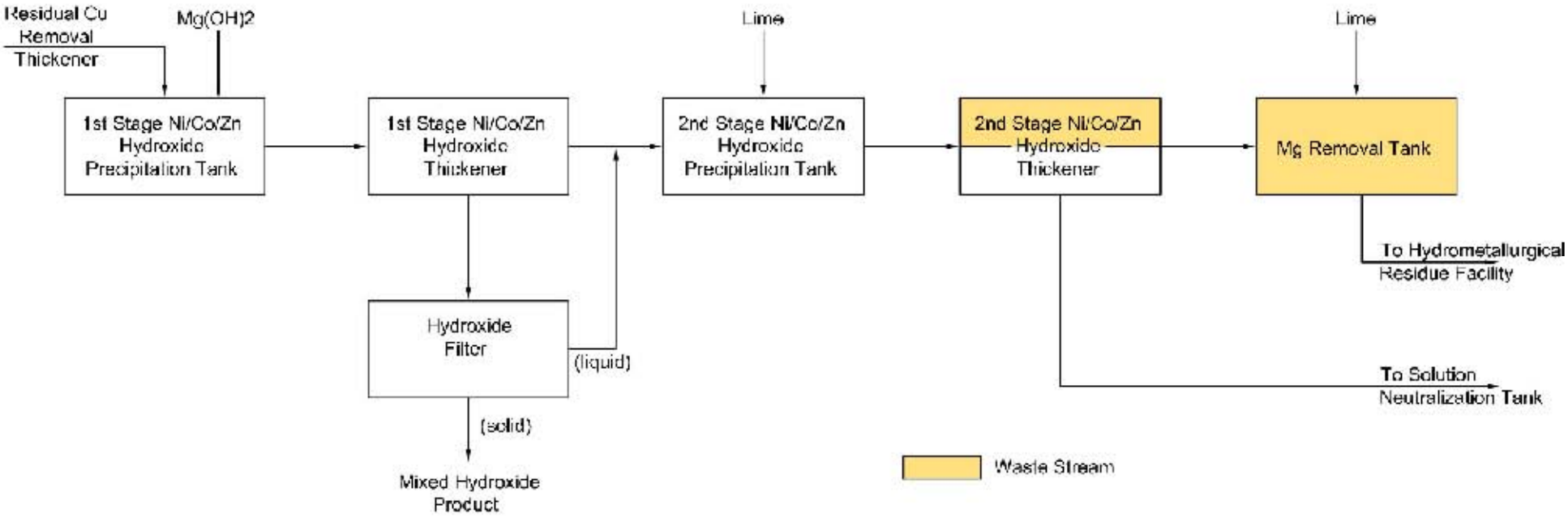
Information Source: PolyMet

No Scale Applicable

Figure 3.1-25
Residual Copper Recovery (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Information Source: PolyMet

No Scale Applicable

Figure 3.1-26
Mixed Hydroxide Precipitation (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Map Source: Barr Engineering

N

0 750 1500 3000 FEET

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-27
Existing Tailings Basin

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Source: Barr Engineering

- Embankment
- LTV Beach
- NorthMet Beach
- Pond

N

0 500 1,000 2,000 Feet

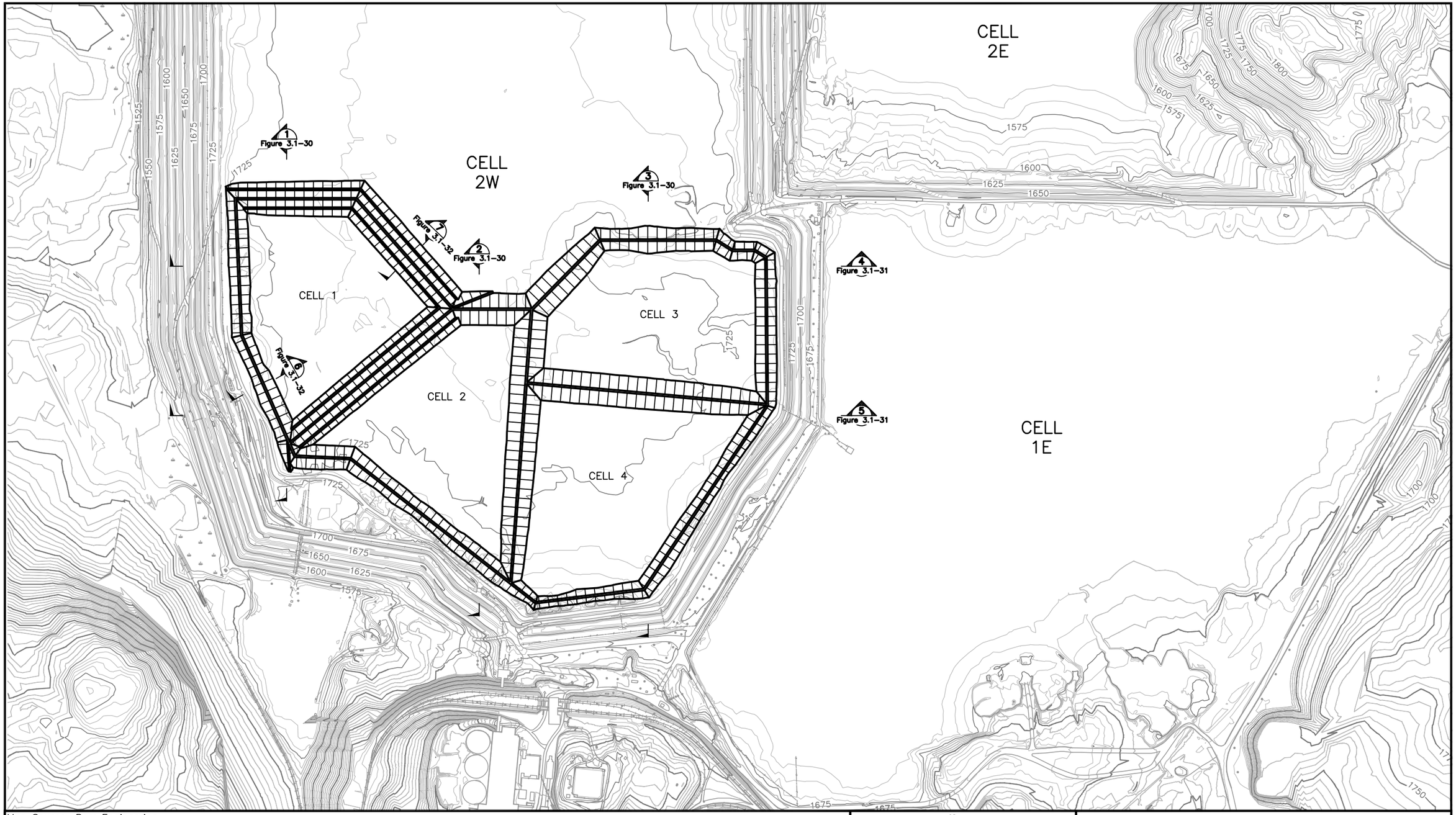
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-28
Proposed Tailings Basin Layout (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

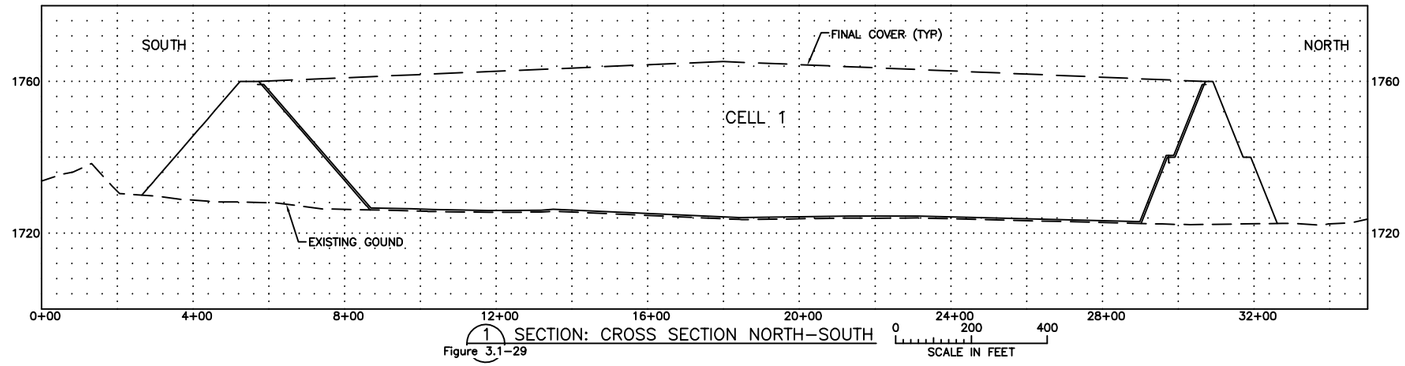
- INDEX CONTOURS (10')
- INTERMEDIATE CONTOURS (2')
- ROAD
- RAILROAD
- PIPELINE
- WETLAND
- BUILDING
- POWER POLE

N

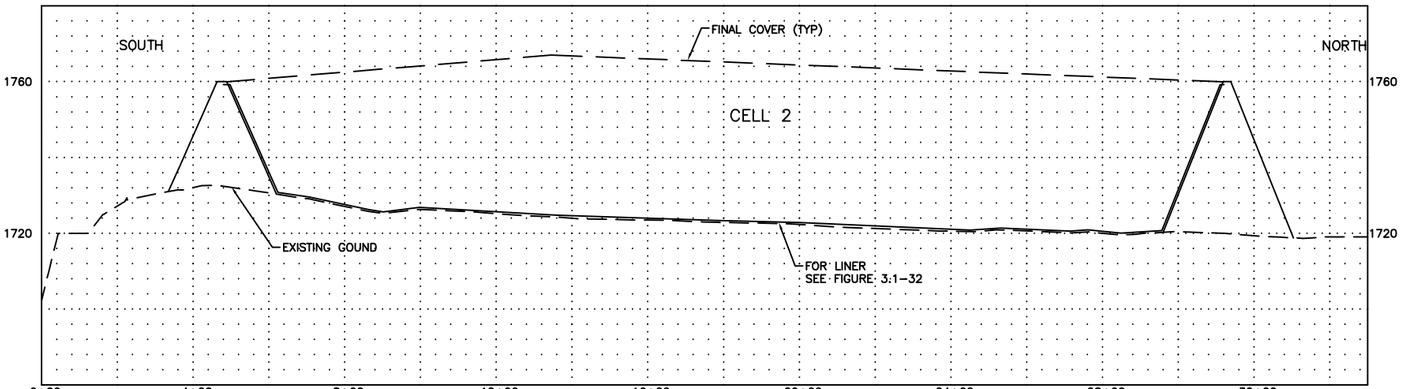
0 500 1000 2000 FEET

Figure 3.1-29
Hydrometallurgical Residue Facility - Cell Layout (All Actions)

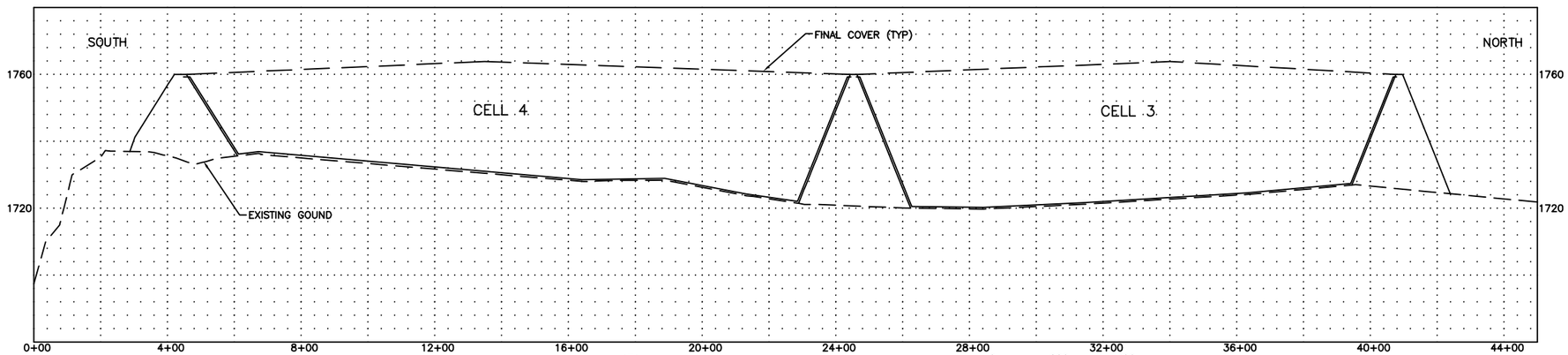
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota
October 2009



1 SECTION: CROSS SECTION NORTH–SOUTH
Figure 3.1–29



2 SECTION: CROSS SECTION NORTH–SOUTH
Figure 3.1–29



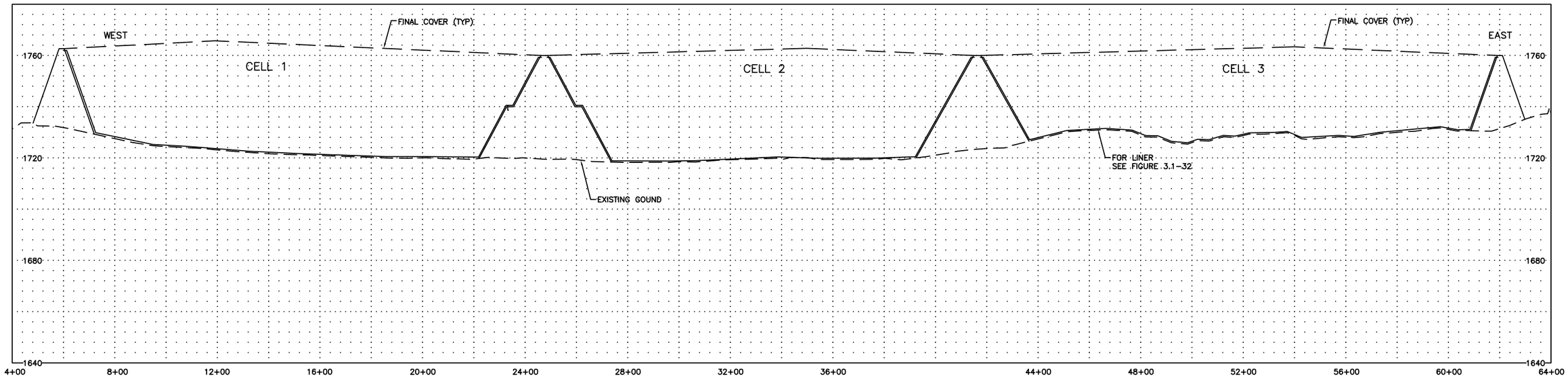
3 SECTION: CROSS SECTION NORTH–SOUTH
Figure 3.1–29

Map Source: Barr Engineering

Figure 3.1-30
Hydrometallurgical Residue Facility
North/South Cross Sections (All Actions)

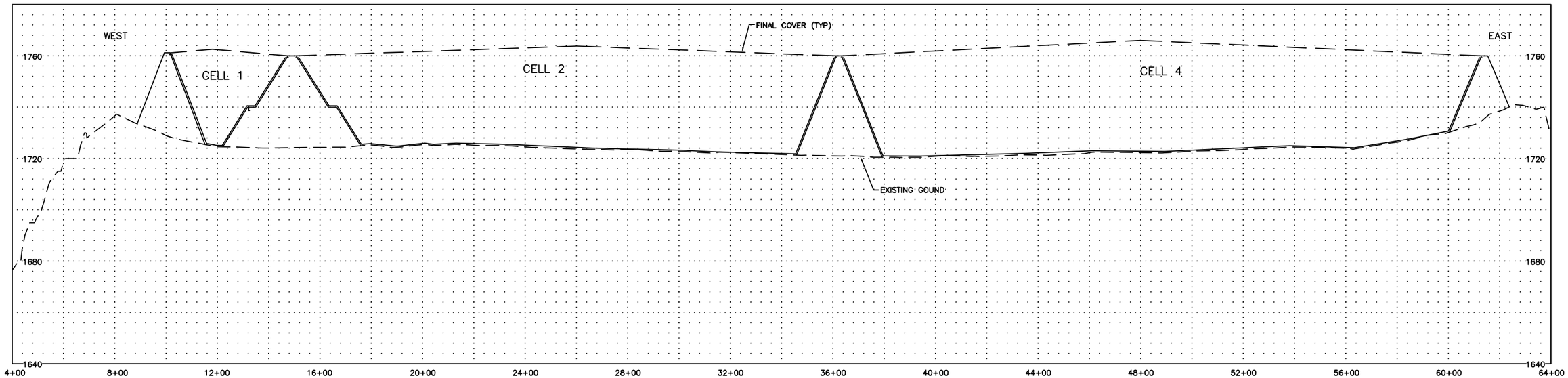
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



4 SECTION: CROSS SECTION EAST–WEST
Figure 3.1–29

0 200 400
SCALE IN FEET



5 SECTION: CROSS SECTION EAST–WEST
Figure 3.1–29

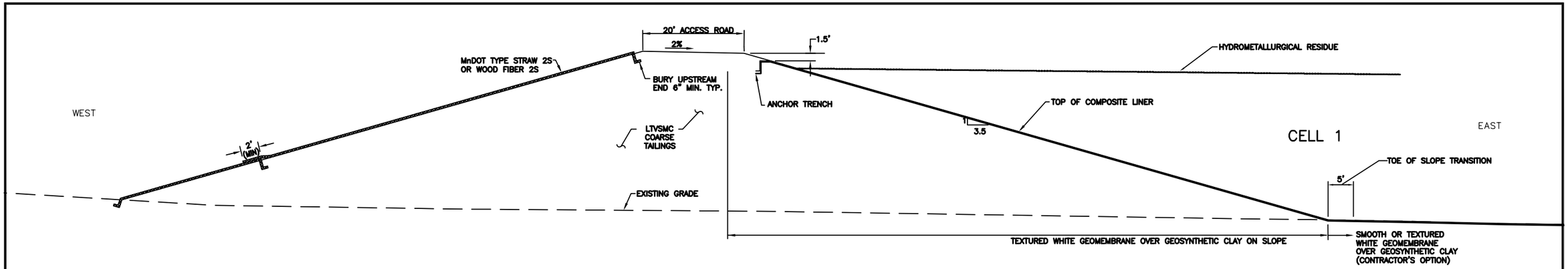
0 200 400
SCALE IN FEET

Map Source: Barr Engineering

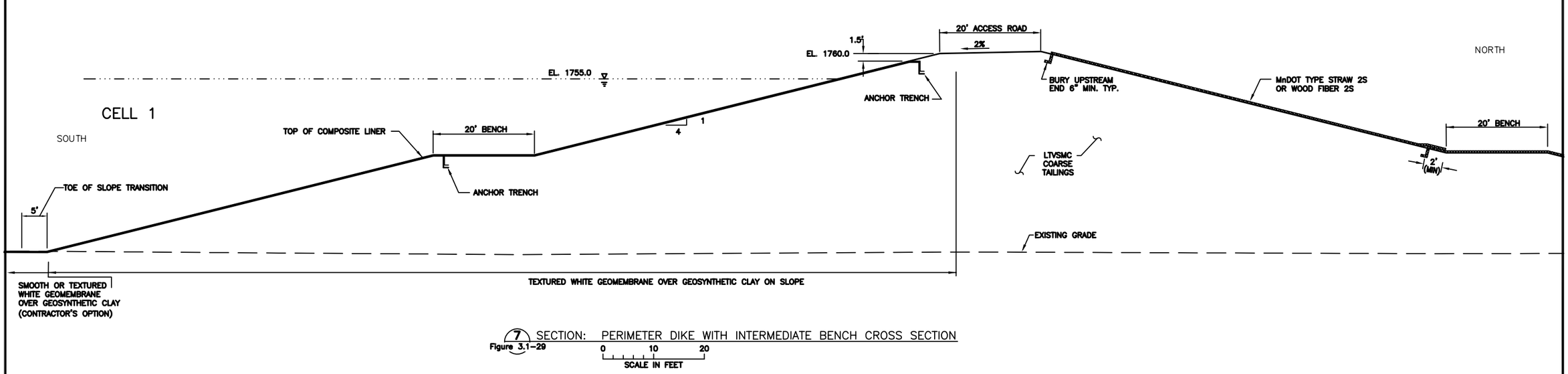
Figure 3.1-31
Hydrometallurgical Residue Facility
East/West Cross Sections (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



6 SECTION: PERIMETER DIKE CROSS SECTION
Figure 3.1-29
0 10 20
SCALE IN FEET



7 SECTION: PERIMETER DIKE WITH INTERMEDIATE BENCH CROSS SECTION
Figure 3.1-29
0 10 20
SCALE IN FEET

Map Source: Barr Engineering

Figure 3.1-32
Hydrometallurgical Residue Facility - Dike Sections (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota
October 2009

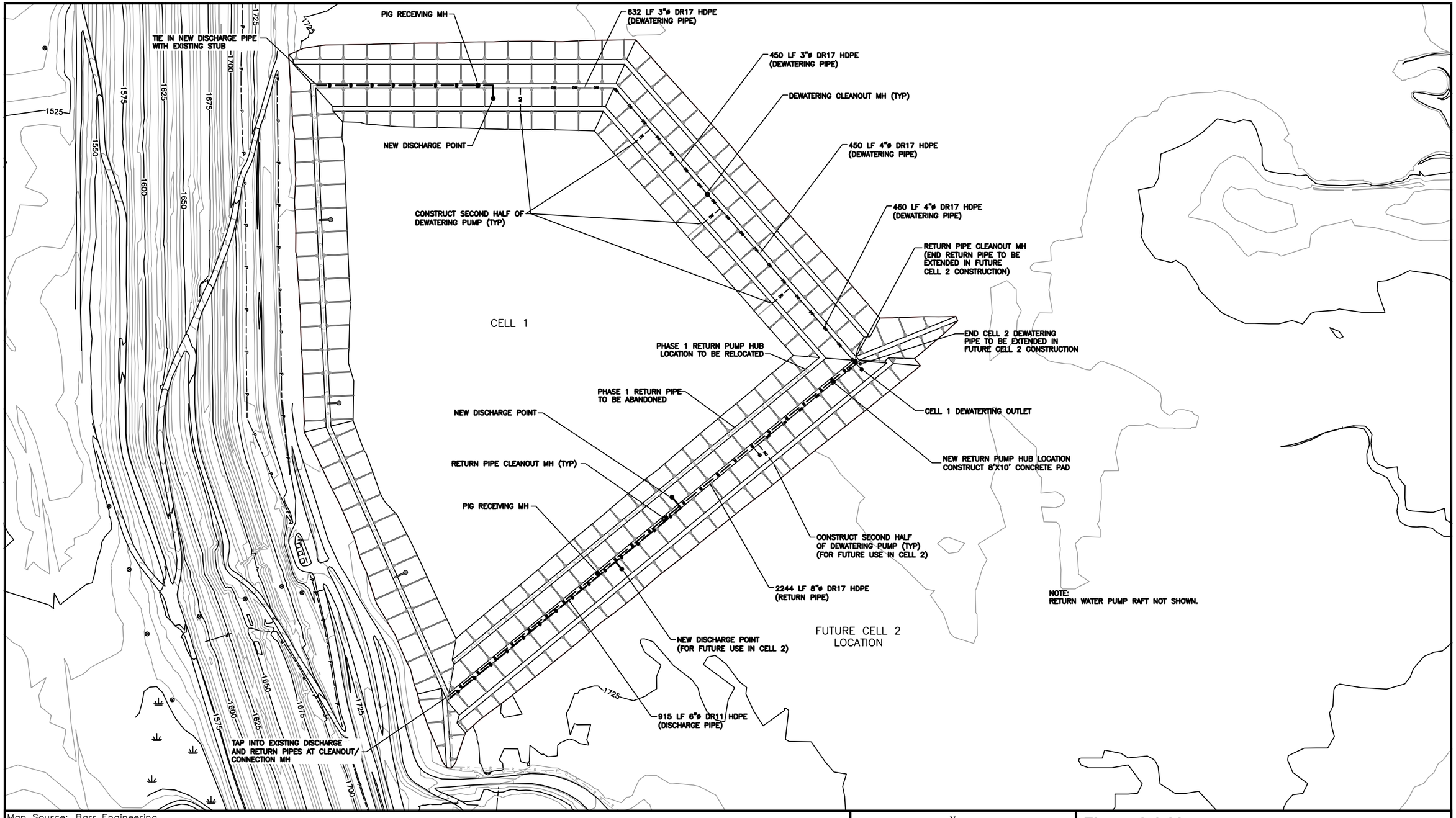
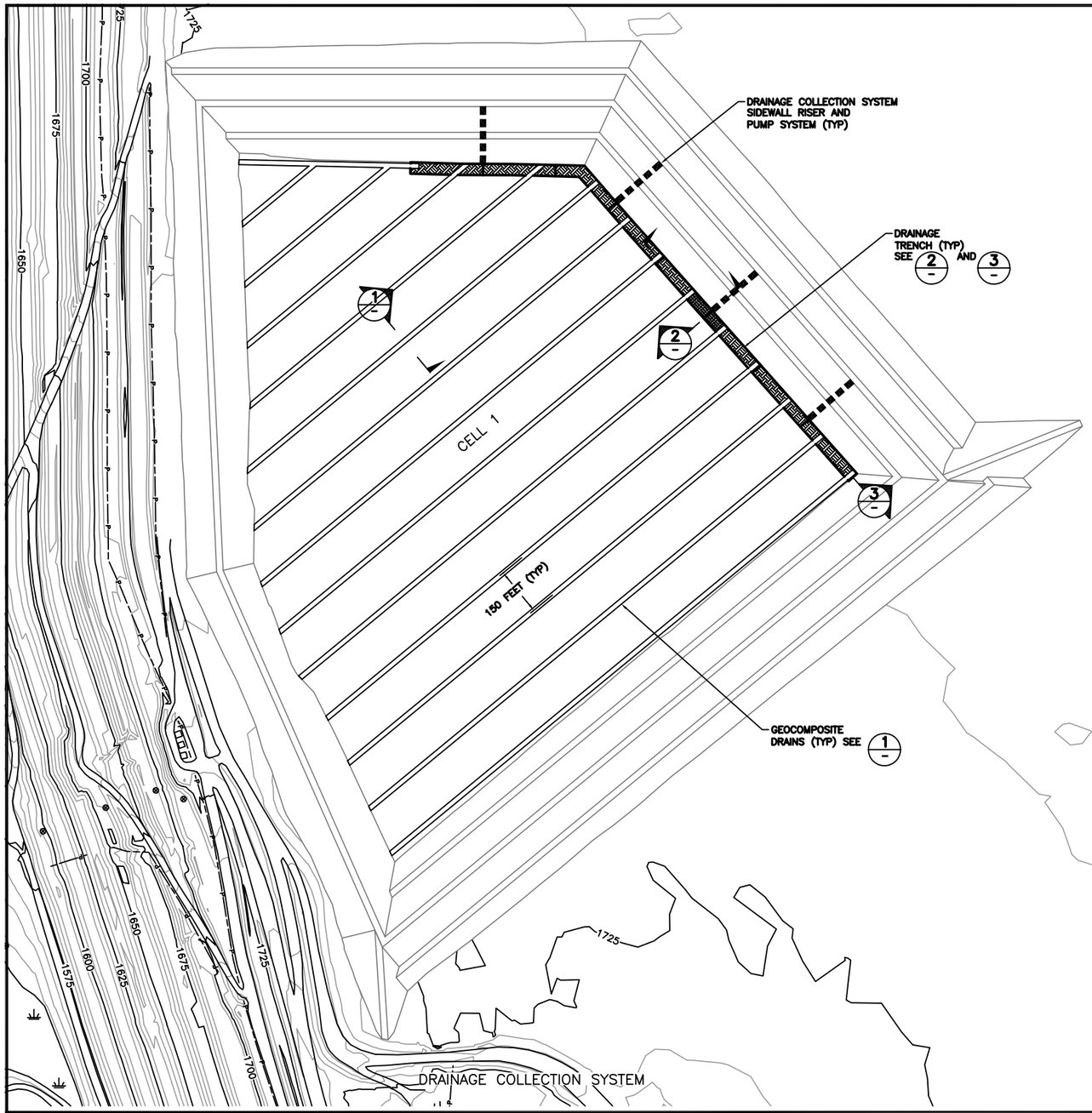
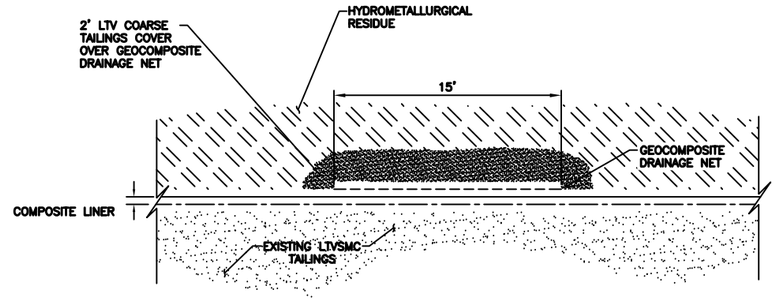


Figure 3.1-33
Hydrometallurgical Residue Discharge and Water Return Pipelines (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

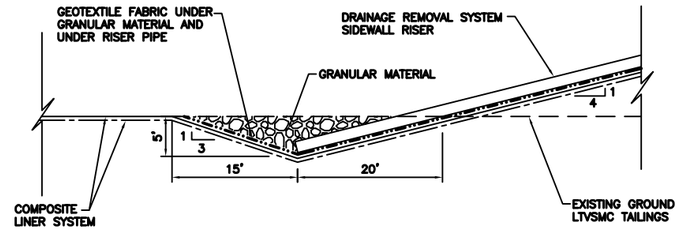




1 SECTION: GEOCOMPOSITE DRAINS

0 5 10

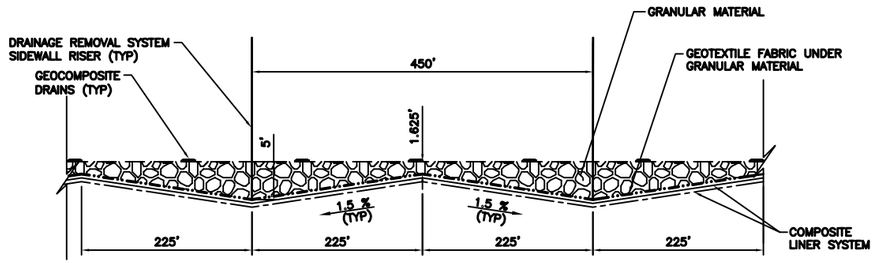
SCALE IN FEET



2 SECTION: DRAINAGE COLLECTION TRENCH

0 10 20

SCALE IN FEET



3 SECTION: DRAINAGE COLLECTION TRENCH

0 100 200

SCALE IN FEET

0 10 20

SCALE IN FEET

Map Source: Barr Engineering

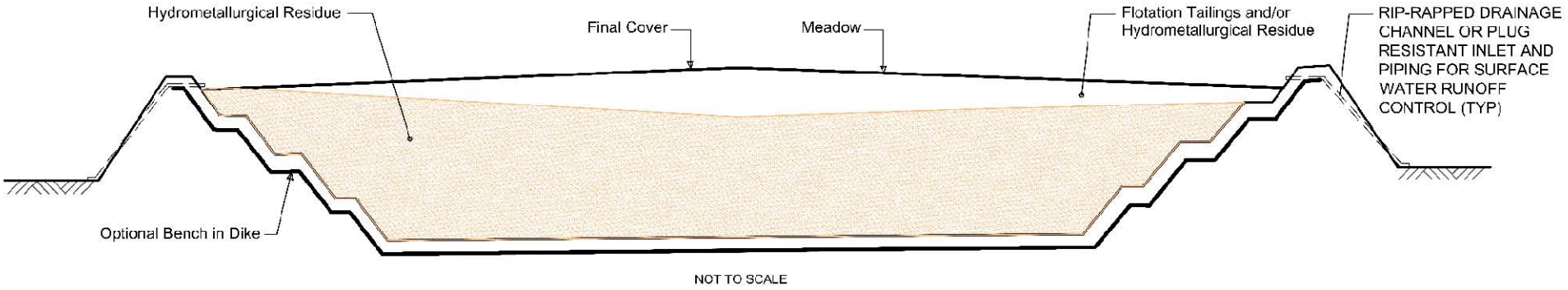
N

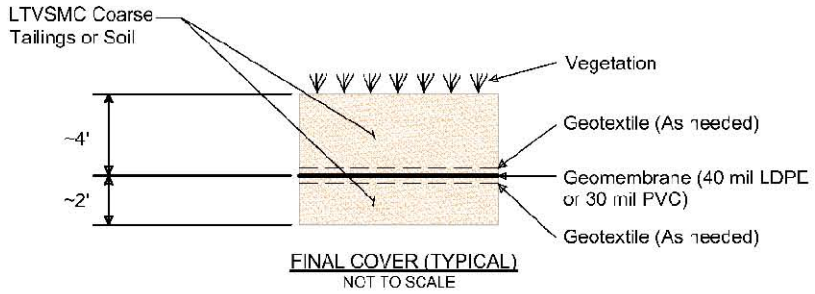
0 200 400 800 FEET

Figure 3.1-34
Hydrometallurgical Residue Drainage Collection System

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



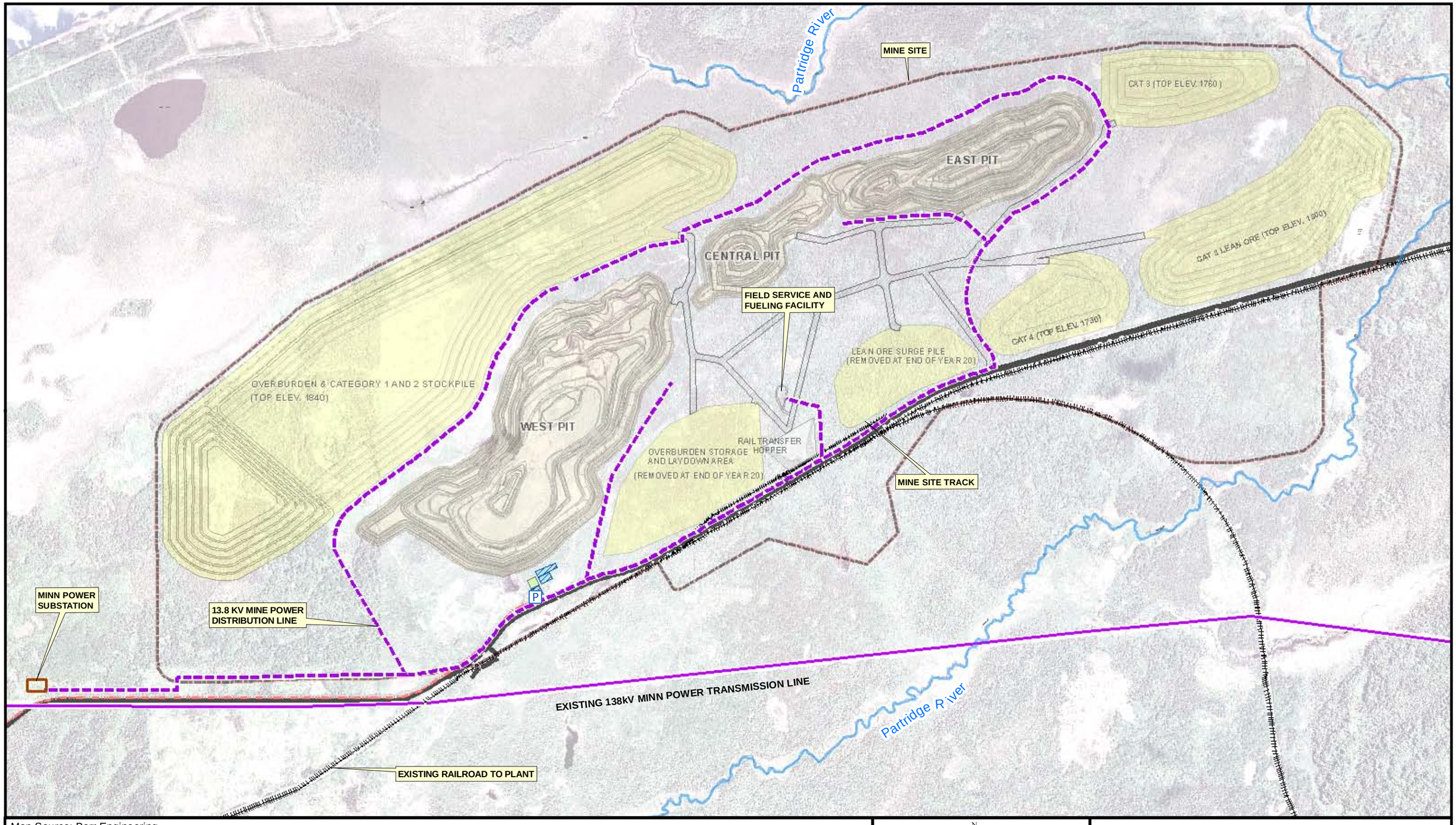


Data Source: Barr Engineering/PolyMet

No Scale

Figure 3.1-35
Hydrometallurgical Residue Facility Cell Closure Approach (All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Partridge River System
- 138KV Transmission Line
- 13.8KV Mine Power Distribution
- Dunka Road
- Mine Site Impact Area
- Mine to Plant Pipeline
- Stockpiles
- Pits
- Wastewater Treatment Facility
- Equilization Ponds
- P Central Pumping Station

N

0 750 1,500 3,000 Feet

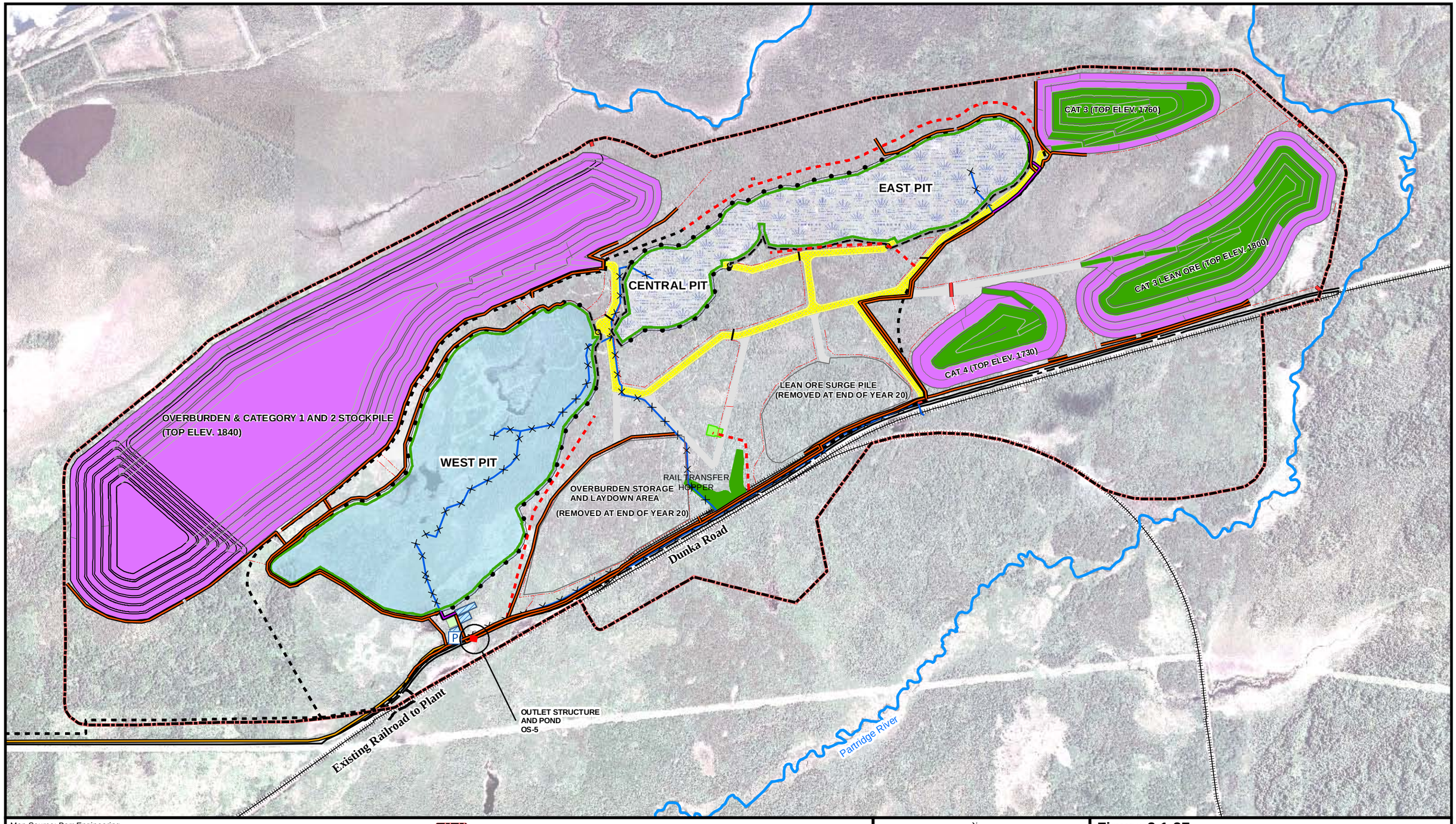
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-36
Mine Site Power Distribution (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Culverts To Remain
- Removed Culverts
- Removed 13.8KV Mine Powerline
- Remaining 13.8KV Mine Powerline
- Barbed Wire Fencing
- Non-Climbable Fencing
- Filled Ditch
- Removed Pipe
- Pipeline to be Demolished
- New Pipe
- Pipes to Remain
- Fencing Gates
- Mine Site
- Previously Reclaimed Areas
- Year 20 Reclamation Area
- Cover and Revegetation of Building Areas
- Haul Roads Closed and Reclaimed
- Haul Roads to Remain
- West Pit - Lake
- East and Central Pits - Wetland
- Wastewater Treatment Facility
- Equilization Ponds
- P Central Pumping Station

Note: Some Powerlines to be Removed at Closure

N

0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-37
Mine Closure Activities at Year 20 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

CAT 3 (TOP ELEV. 1760)

EAST PIT

CAT 3 LEAN ORE (TOP ELEV. 1800)

CENTRAL PIT

CAT 4 (TOP ELEV. 1730)

LEAN ORE SURGE PILE
(REMOVED AT END OF YEAR 20)

OVERBURDEN & CATEGORY 1 AND 2 STOCKPILE
(TOP ELEV. 1840)

WEST PIT

RAIL TRANSFER
HOPPER

OVERBURDEN STORAGE
AND LAYDOWN AREA
(REMOVED AT END OF YEAR 20)

Dunka Road

P

OUTLET STRUCTURE
AND POND
OS-5

Existing Railroad to Plant

Partridge River

Map Source: Barr Engineering

- 13.8KV Mine Powerline to Remain
- 13.8KV Mine Powerline to be Removed
- Culverts to Remain
- Fencing Gates
- Barbed Wire Fencing
- Non-Climbable Fencing
- Modified Ditch
- New Ditch
- Ditch to Remain Open
- New Pipe
- Pipes to Remain
- Mine Site
- Cover and Revegetation of Building Areas
- Haul Roads to Remain
- Year 20 Reclamation Area
- Previously Reclaimed Areas
- East and Central Pits - Wetland
- West Pit - Lake
- Equilization Ponds
- Wastewater Treatment Facility
- P Central Pumping Station

N

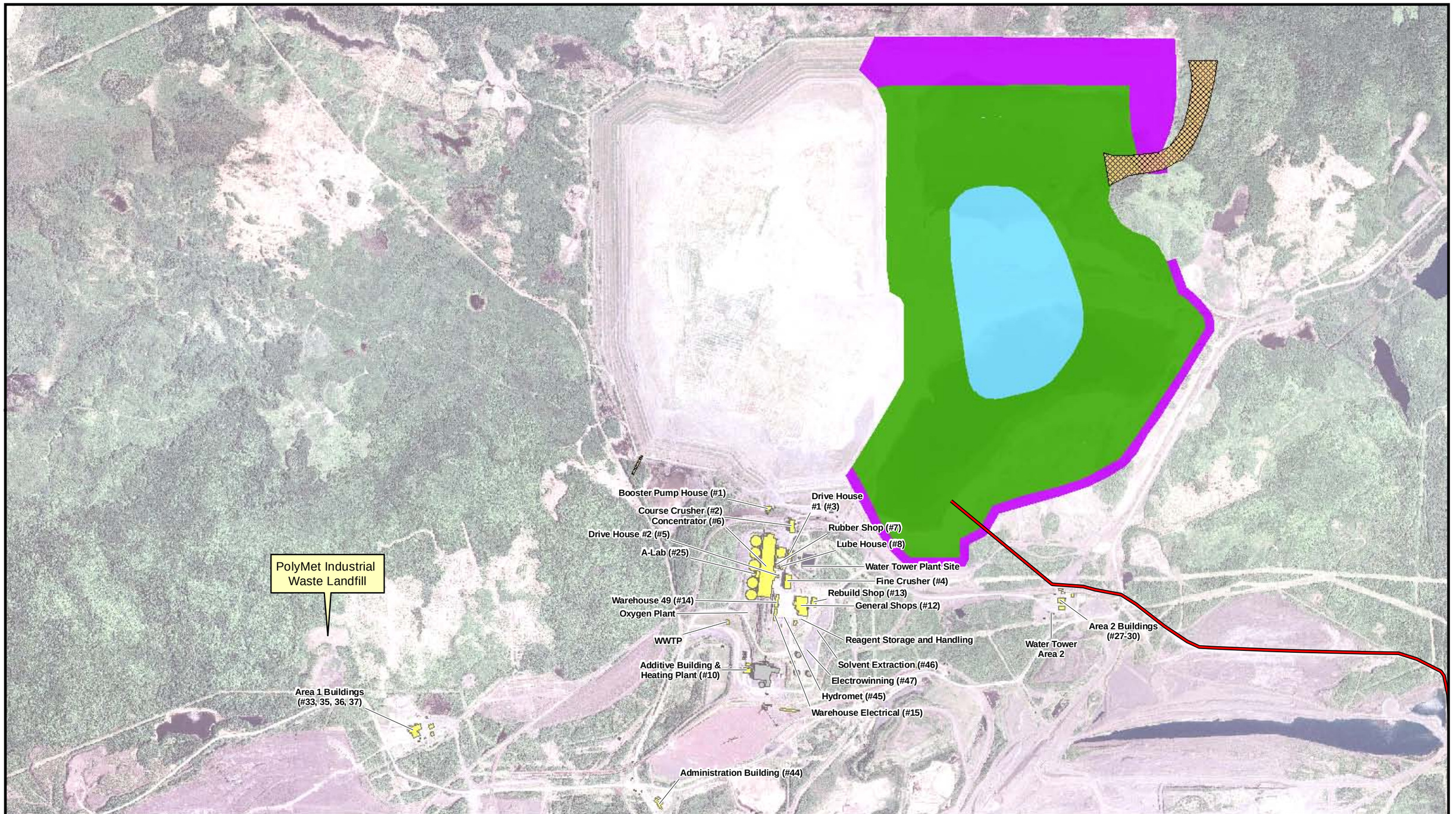
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 3.1-38
Features to Remain After Mine Closure (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Pipeline to be Removed After Completion of Tailings Basin Operations

Buildings

- Building to be Demolished
- Not PolyMet Building

Tailings Basin Reclamation

- Pond-Final Size May Vary
- Previous Reclamation
- Year 20 Reclamation
- Emergency Spillway

N

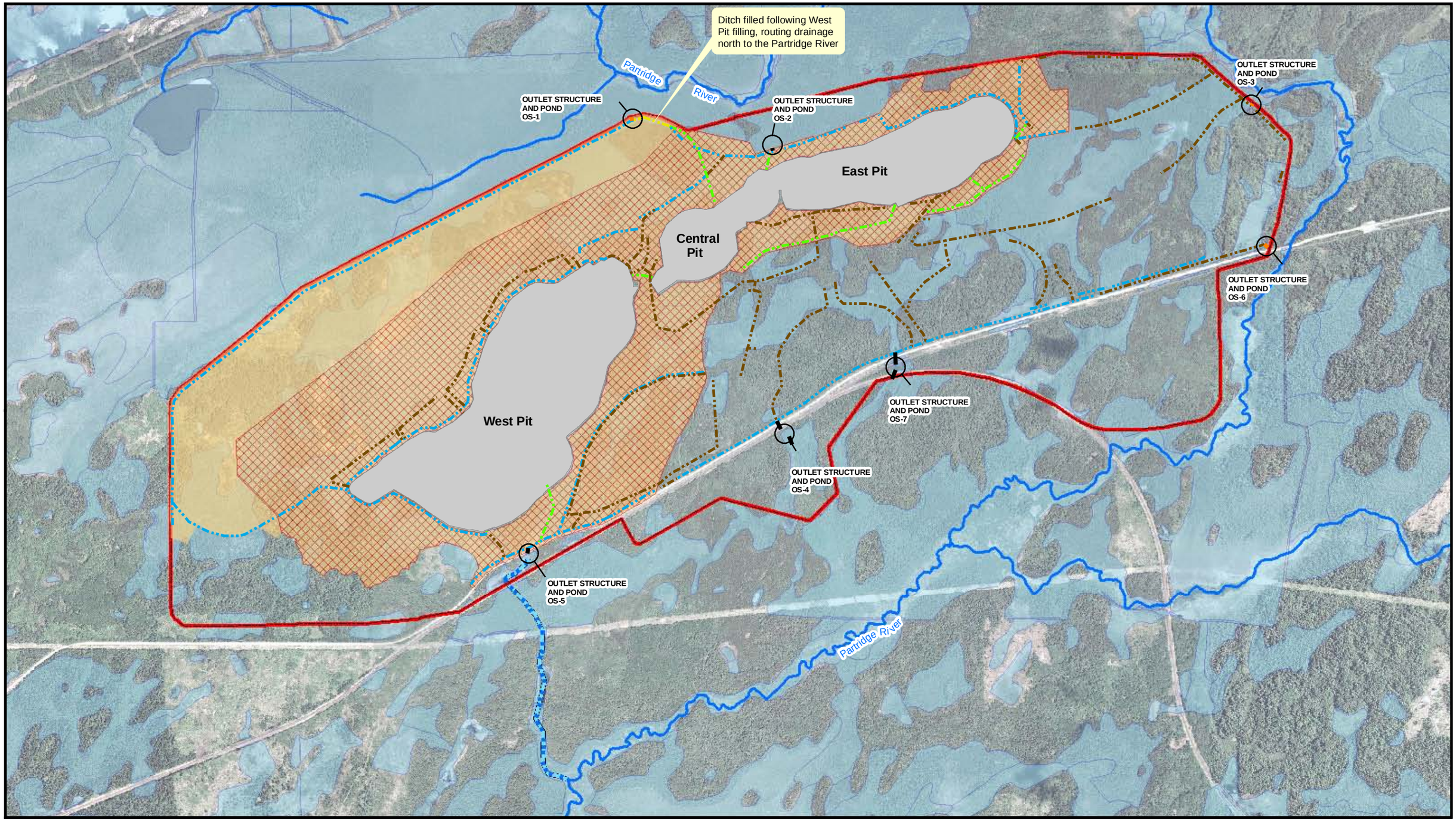
0 1,000 2,000 4,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-39
Plant Site Closure Activities at Year 20 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Outlet Structure to Remain in Place
- Outlet Structure to be Removed
- Filled Ditch
- Rerouted Ditch
- New Ditch
- Existing Ditch
- Mine Pits
- West Pit Drainage Area - During Flooding
- West Pit Drainage Area - After Flooding
- Mine Site
- Mine Site Drainage Channel
- Wetland Delineations

N

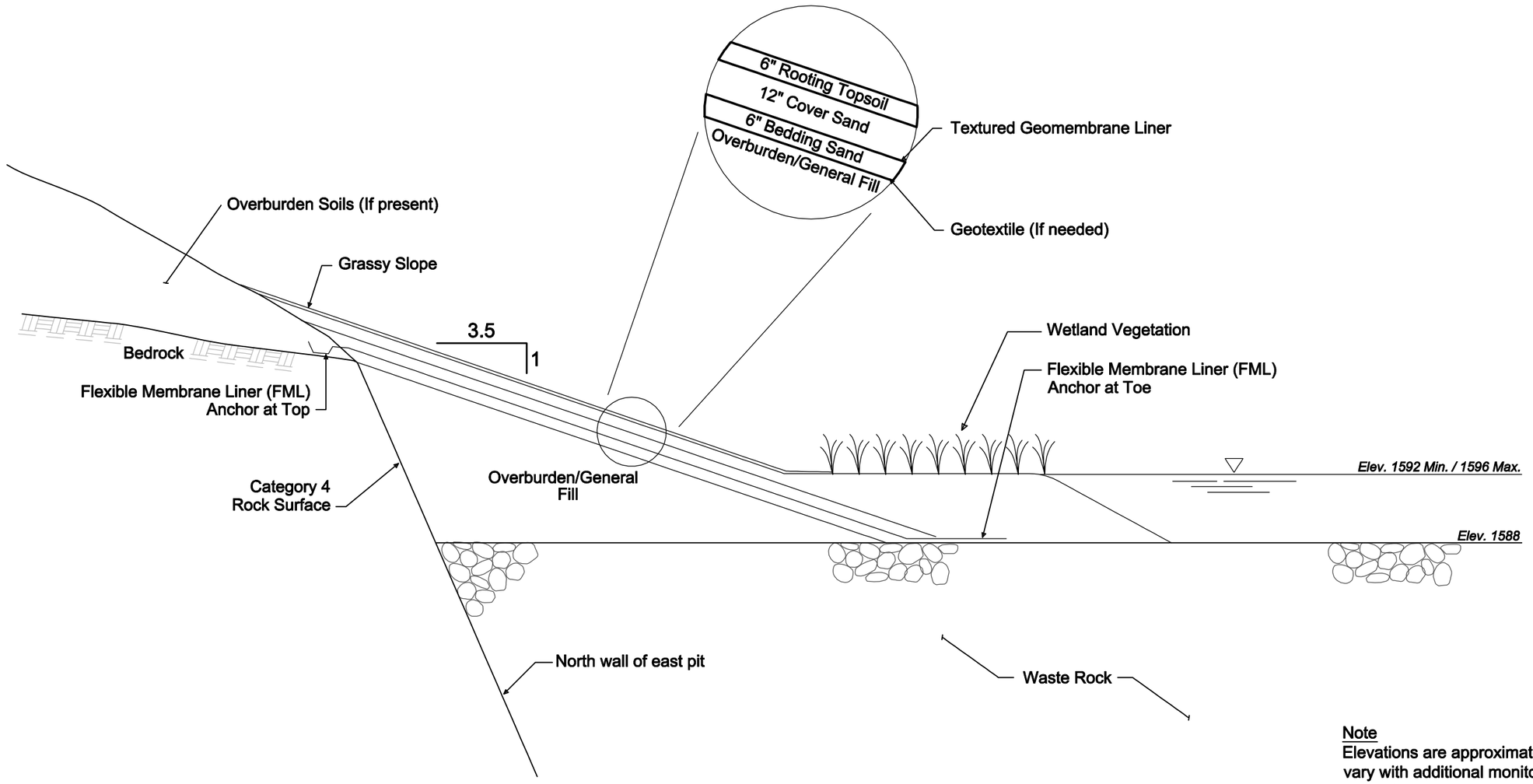
0 500 1,000 2,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-40
Ditches to be Blocked, Rerouted or Constructed During Closure (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Note
Elevations are approximate - may vary with additional monitoring or actual flows.

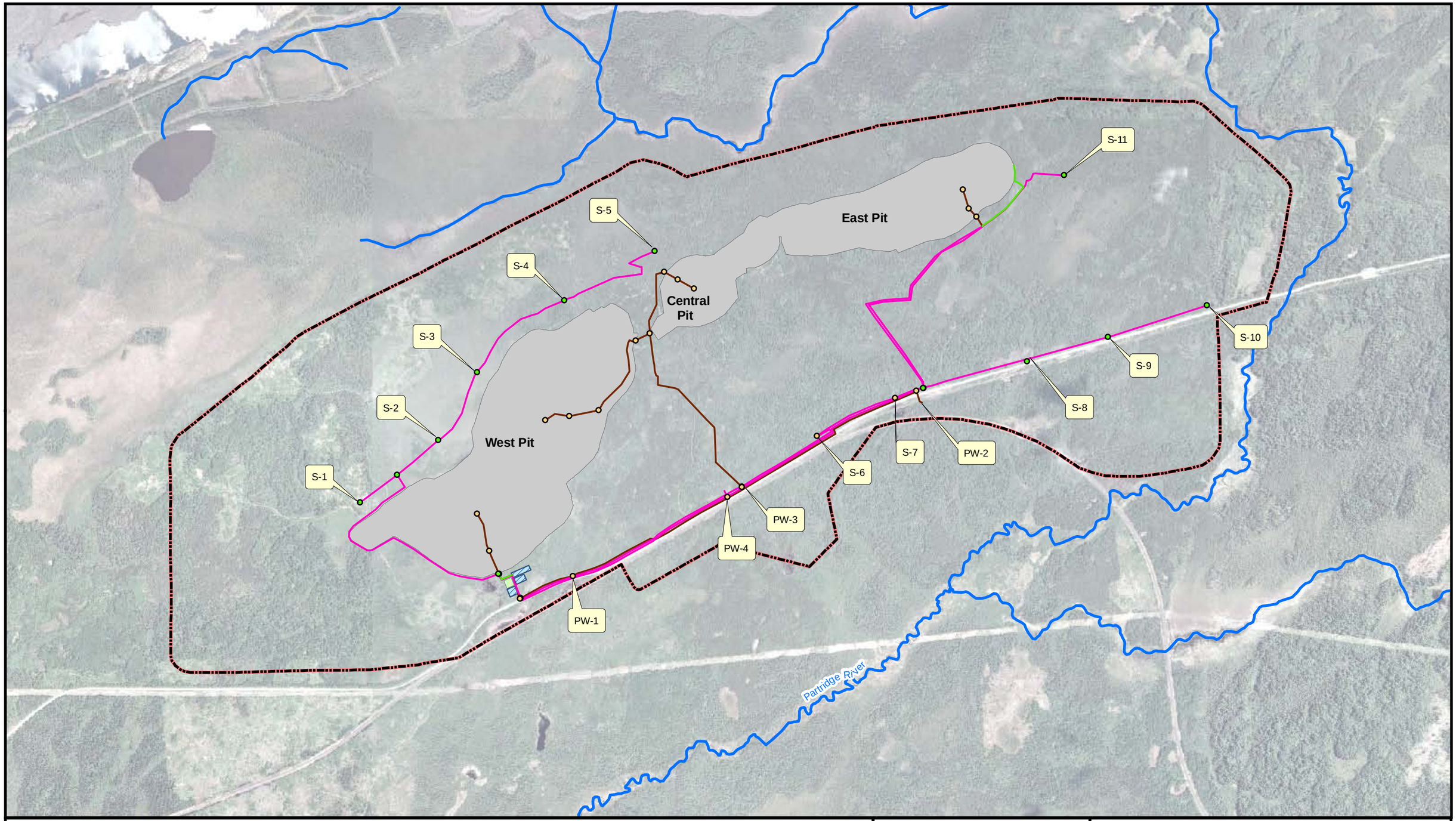
NORTH WALL - EAST PIT DETAIL

Drawing Source: Barr Engineering

No Scale Applicable

Figure 3.1-41
North Wall - East Pit Category 4 Existing Rock Face (All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Mine Site
- Year 20 Mine Pits
- Wastewater Treatment Facility
- Equilization Ponds
- Streams/Rivers
- Maintained Pump
- Removed Pump
- New Pipe
- Maintained Pipe
- Removed Pipe (if Water Quality Meets Discharge Limits)

N

0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-42
Pumps and Pipes to be Maintained or Removed in Closure (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

East Pit

Central Pit

West Pit

Map Source: Barr Engineering

- Mine Site
- Mine Pits
- Dikes During Closure
  - Maintained Dikes
  - Removed Dikes (As Appropriate)
- West Pit Drainage Area-After Flooding
- West Pit Drainage Area-During Flooding
- Rivers/Streams

N

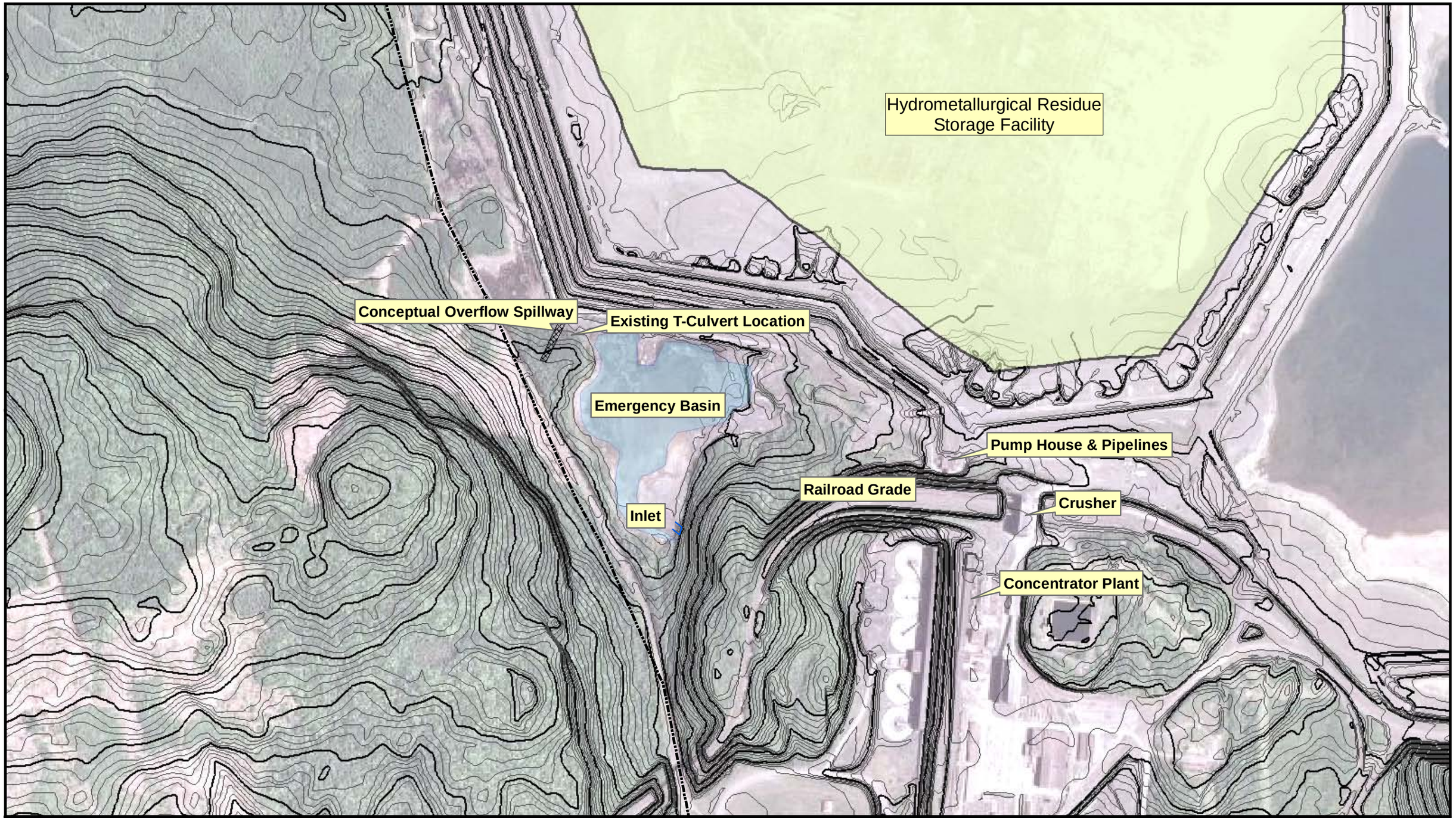
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-43
Dikes to be Removed and Maintained During Closure (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

N

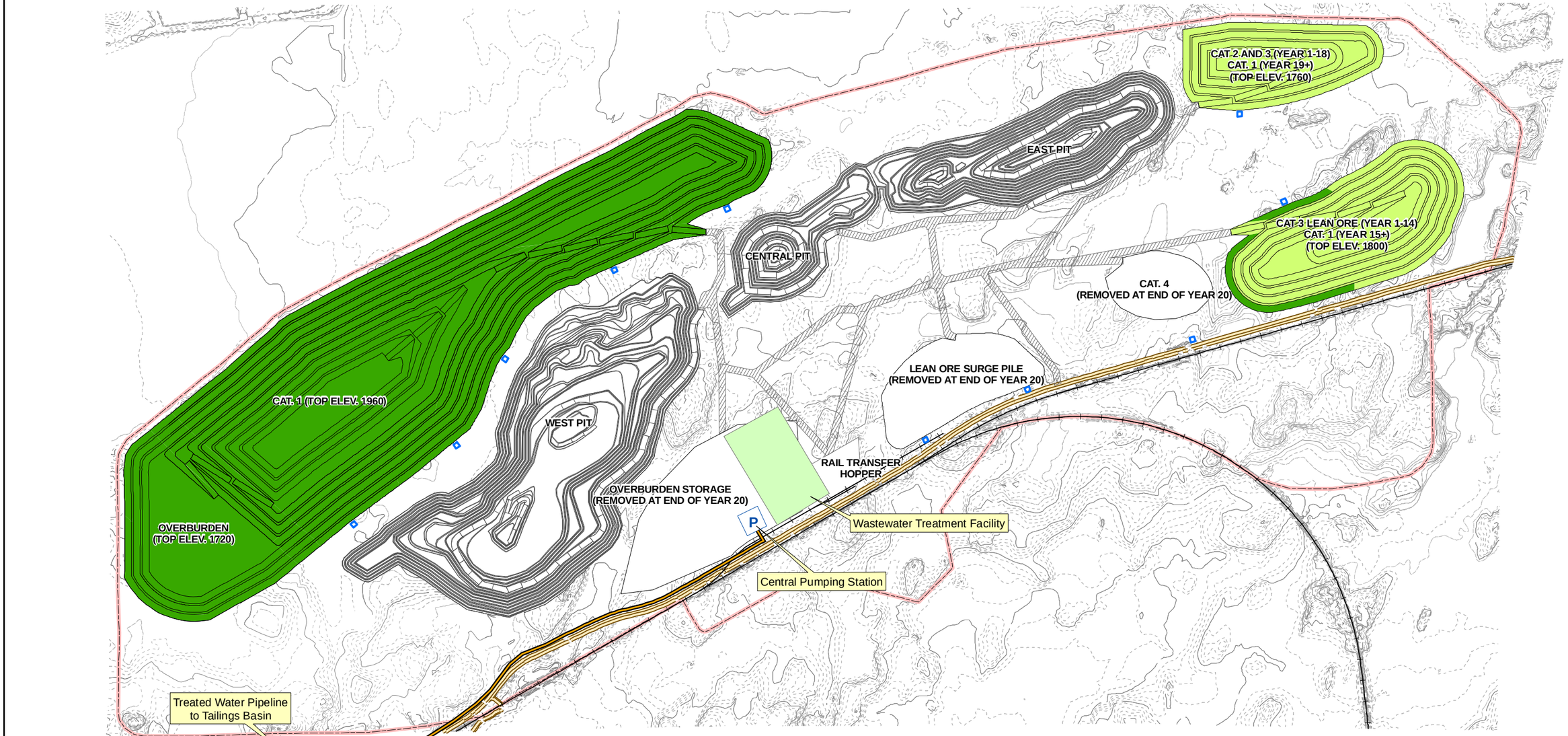
0 250 500 1,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.1-44
Overflow Spillway and Emergency Basin (All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Mine Site
- Railroad
- Dunka Road
- Mine to Plant Pipeline
- Stockpile Covered in Previous Years
- Stockpile Covered in Year 20

N

0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 3.2-1
Proposed Facility Locations
(Mine Site Alternative)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Source: Barr Engineering

Approximate Extent of Extraction Wells

N

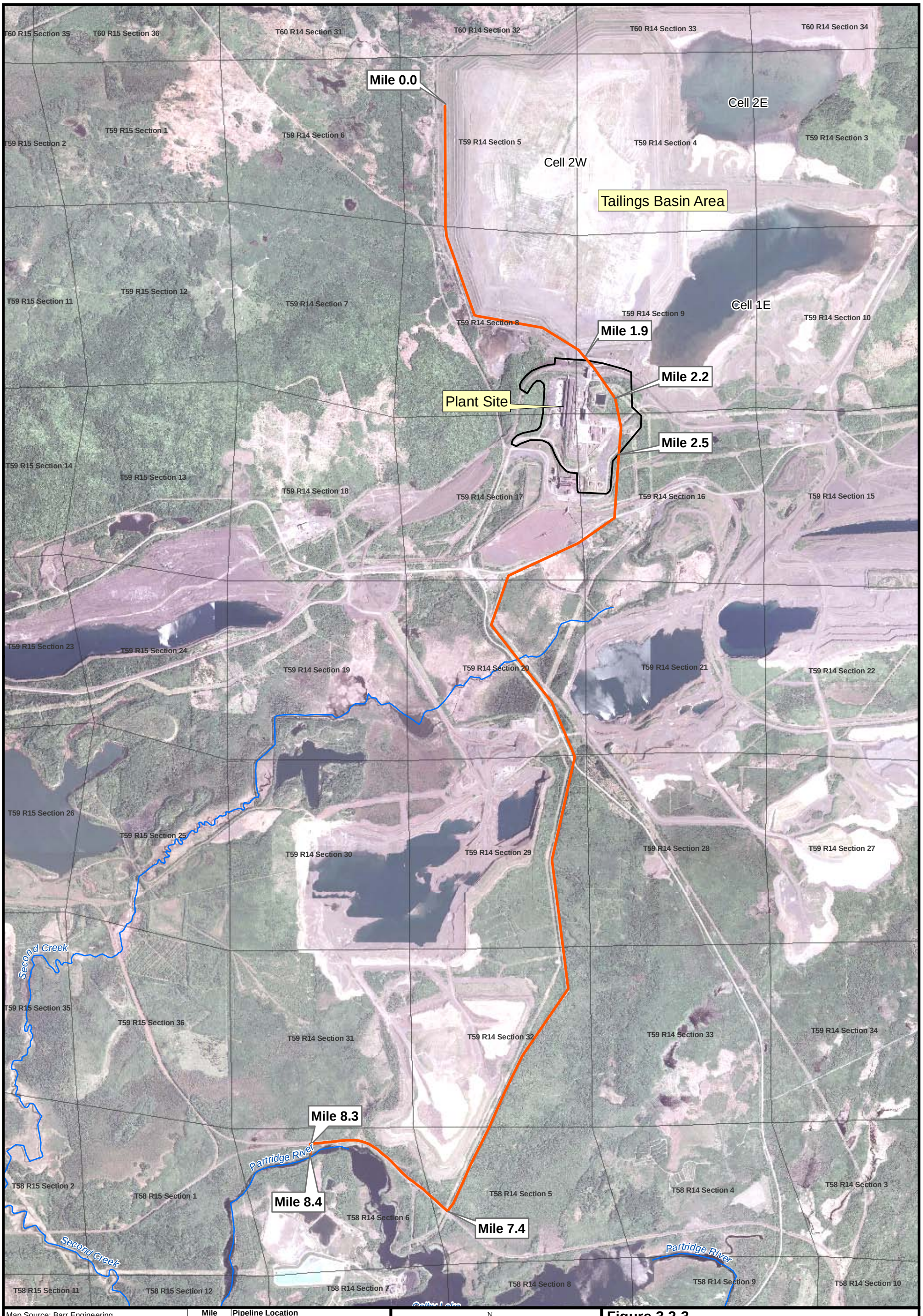
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.2-2
Proposed Extraction Well Locations (Tailings Basin Alternative)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Mile	Pipeline Location
0.0	Crosses Tailings Basin Site
1.9	Enters at North Edge of Plant Site
2.2	Begins to Parallel Plant Water Supply Pipeline
2.5	Exits at South Edge of Plant Site
7.4	End of Parallel of Plant Water Supply Pipeline
8.3	Parallels Edge of CN Railroad Right-of-Way
8.4	Crosses Minnesota Power Easement to Partridge River Discharge Site

Map Source: Barr Engineering

Proposed Pipeline

N

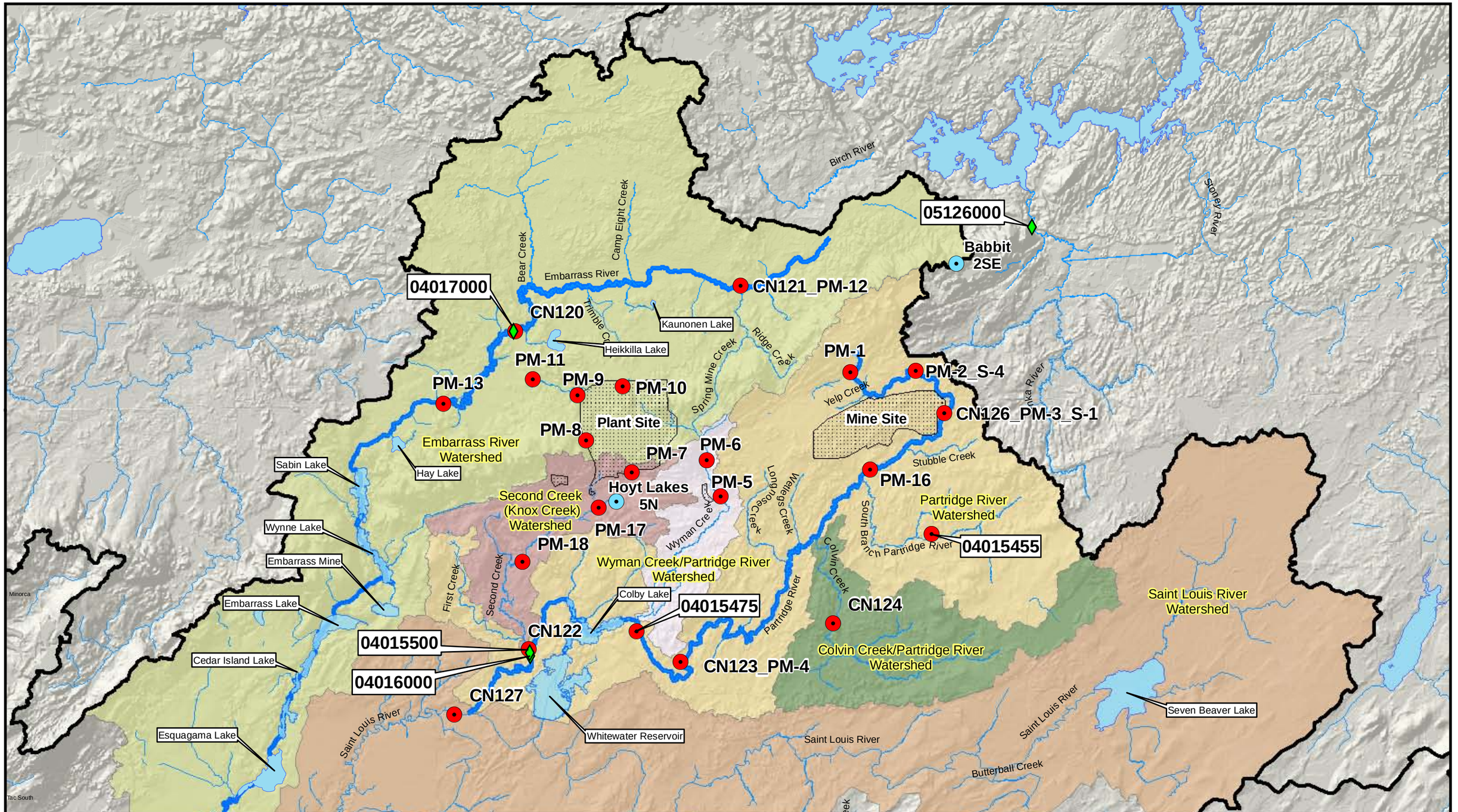
0 1,000 2,000 4,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 3.2-3
Proposed Pipeline to Partridge River (Tailings Basin Alternative)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Basemap source: Barr Engineering

- USGS Gauging Station
- Historic Weather Station
- Historic Surface Water Quality Data Locations
- Major Rivers
- St. Louis River Basin
- Project Boundaries

N

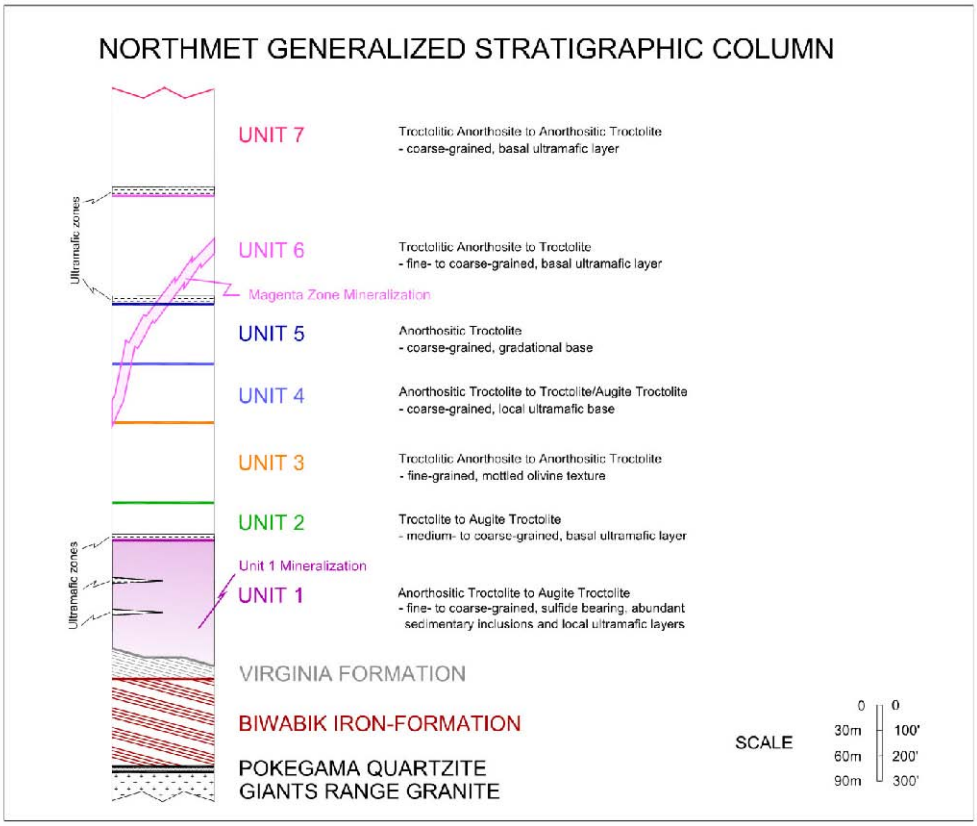
0 1 2 4 Miles

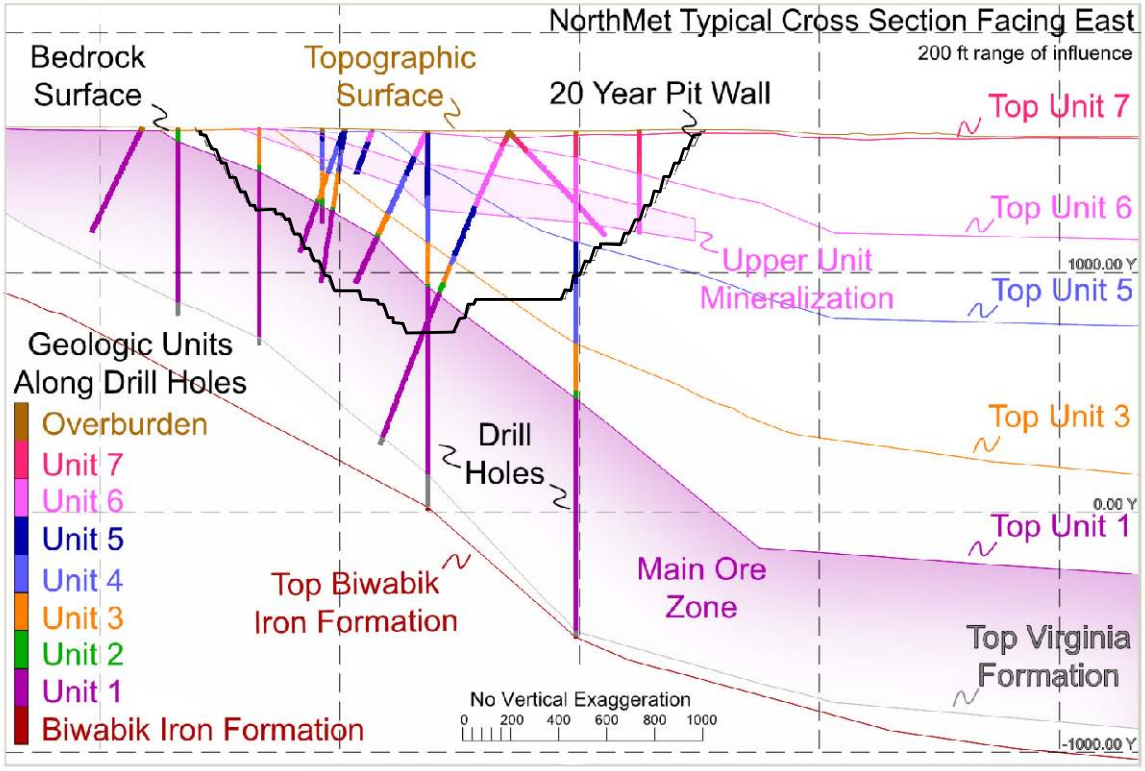
Minnesota Department of Natural Resources

US Army Corps of Engineers, St. Paul District

Figure 4.1-1
Watersheds, Streams and Historical Data Collection Sites
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

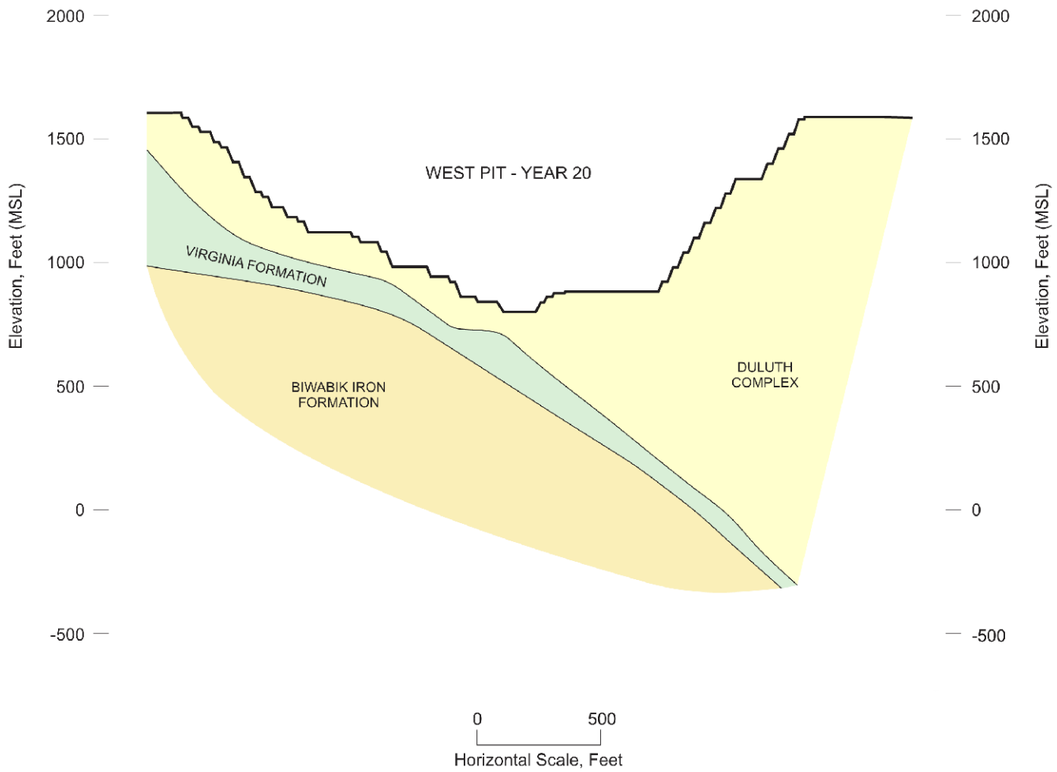


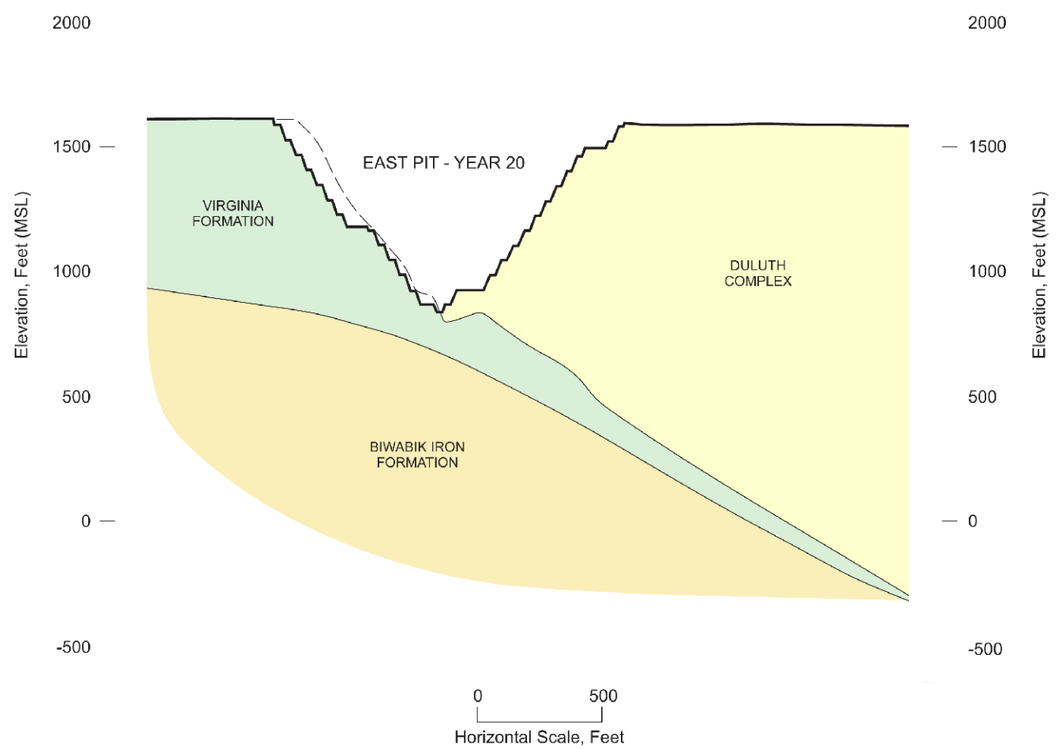


Images Provided by: PolyMet

Figure 4.1-2
Geologic Cross-Section and Stratigraphic Column at Mine Site
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009





Data Source: Barr Engineering

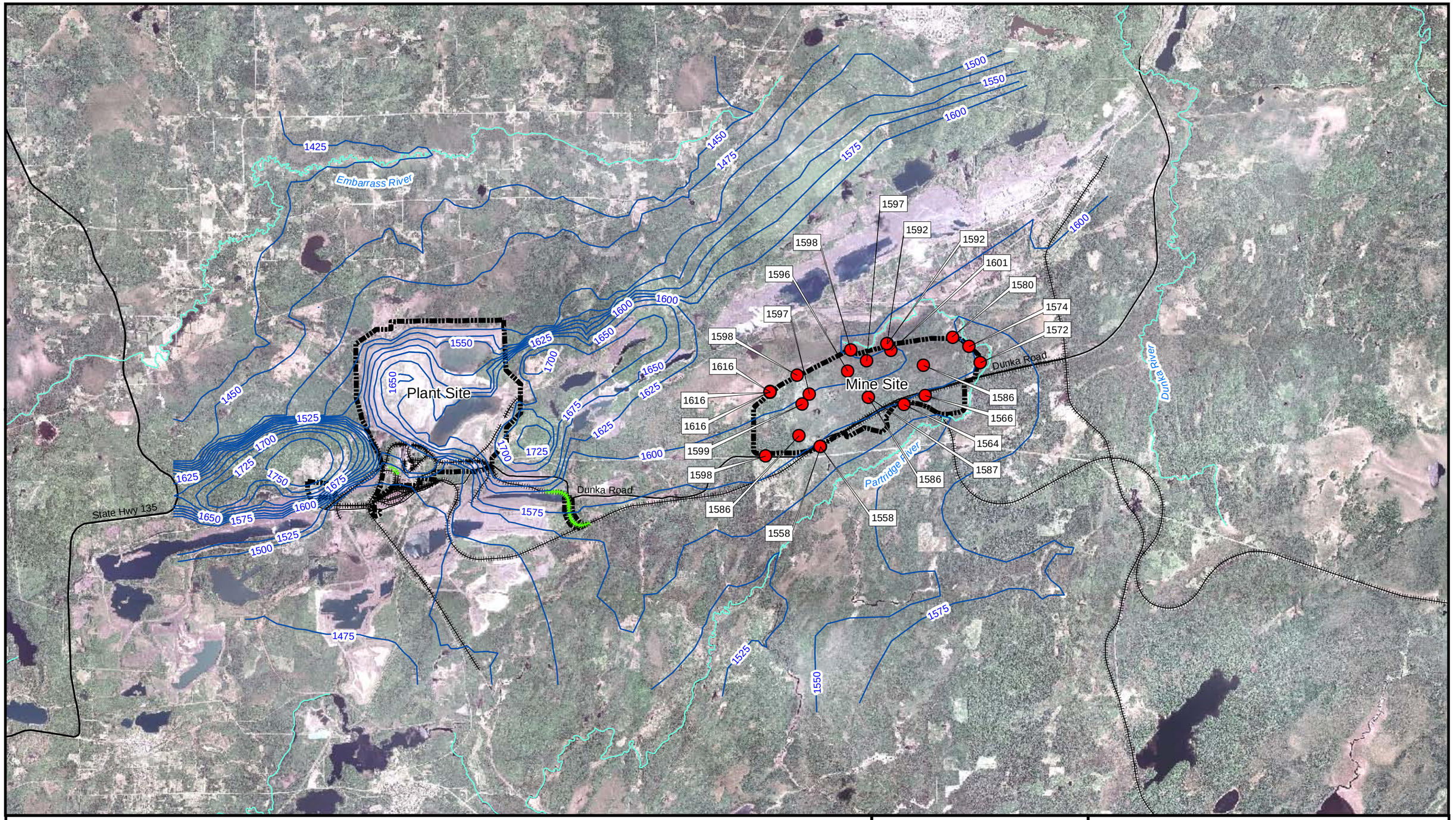
Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.1-3
Geologic Cross Sections (Looking East)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Rivers/Streams
- State/Federal Roads
- Existing Railroads
- NEW RAILROAD
- GroundwaterContour* (Contour Interval=25FT.)
  *Water table elevation are in feet MSL
- Monitoring Wells
- 1612 Groundwater Elevation

N

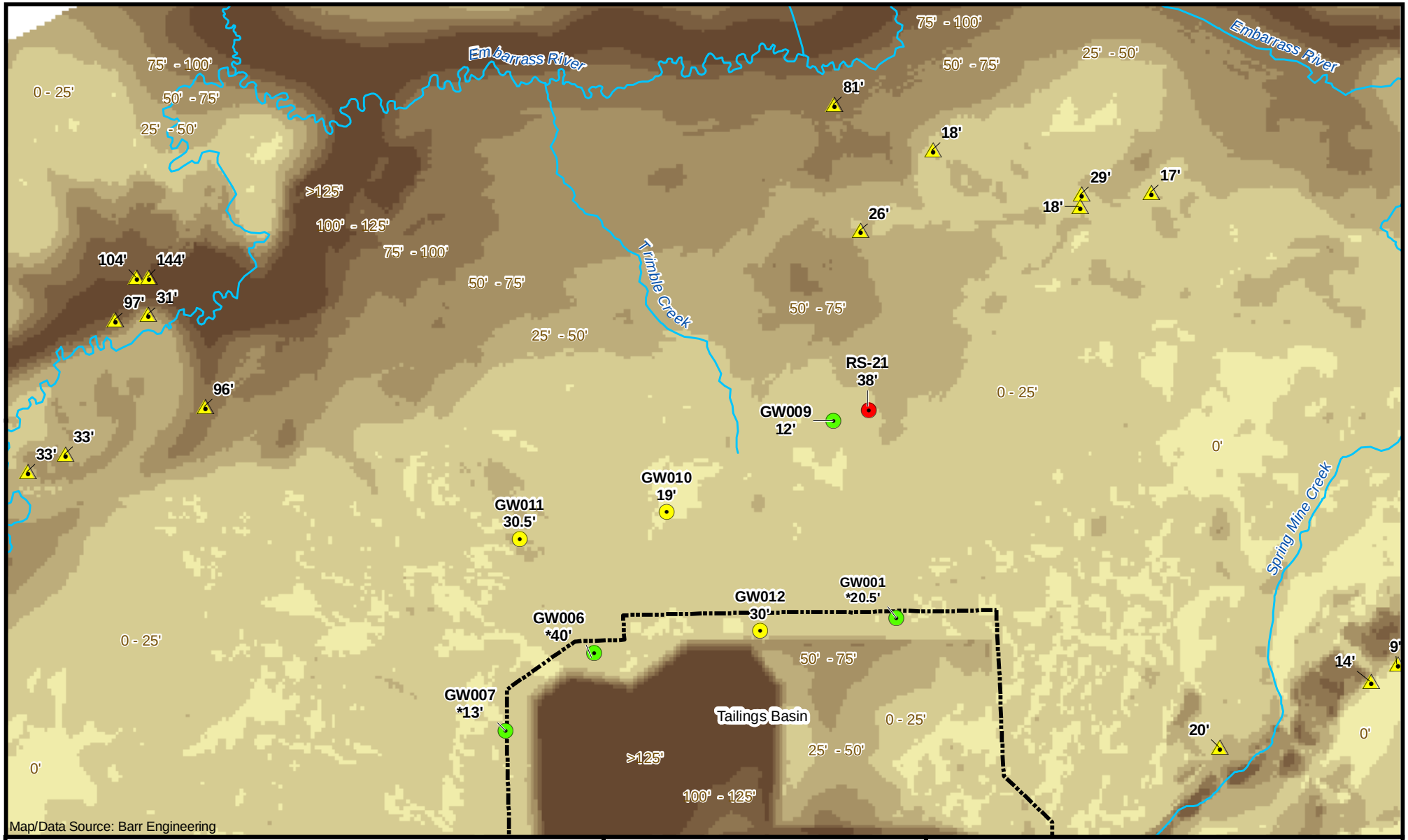
0 0.5 1 2 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-4
Estimated Existing Groundwater Contours
NorthMet Project Area
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Residential Wells from County Well Index with Depth to Bedrock

Monitoring Wells

Groundwater Well - Existing

Soil Borings

Depth to Bedrock

- 0 - 25
- 25' - 50'
- 50' - 75'
- 75' - 100'
- 100' - 125'
- >125'

***Depth represents thickness of native unconsolidated material encountered in boring drilled near the well location**

N

0 1,500 3,000 6,000 Feet

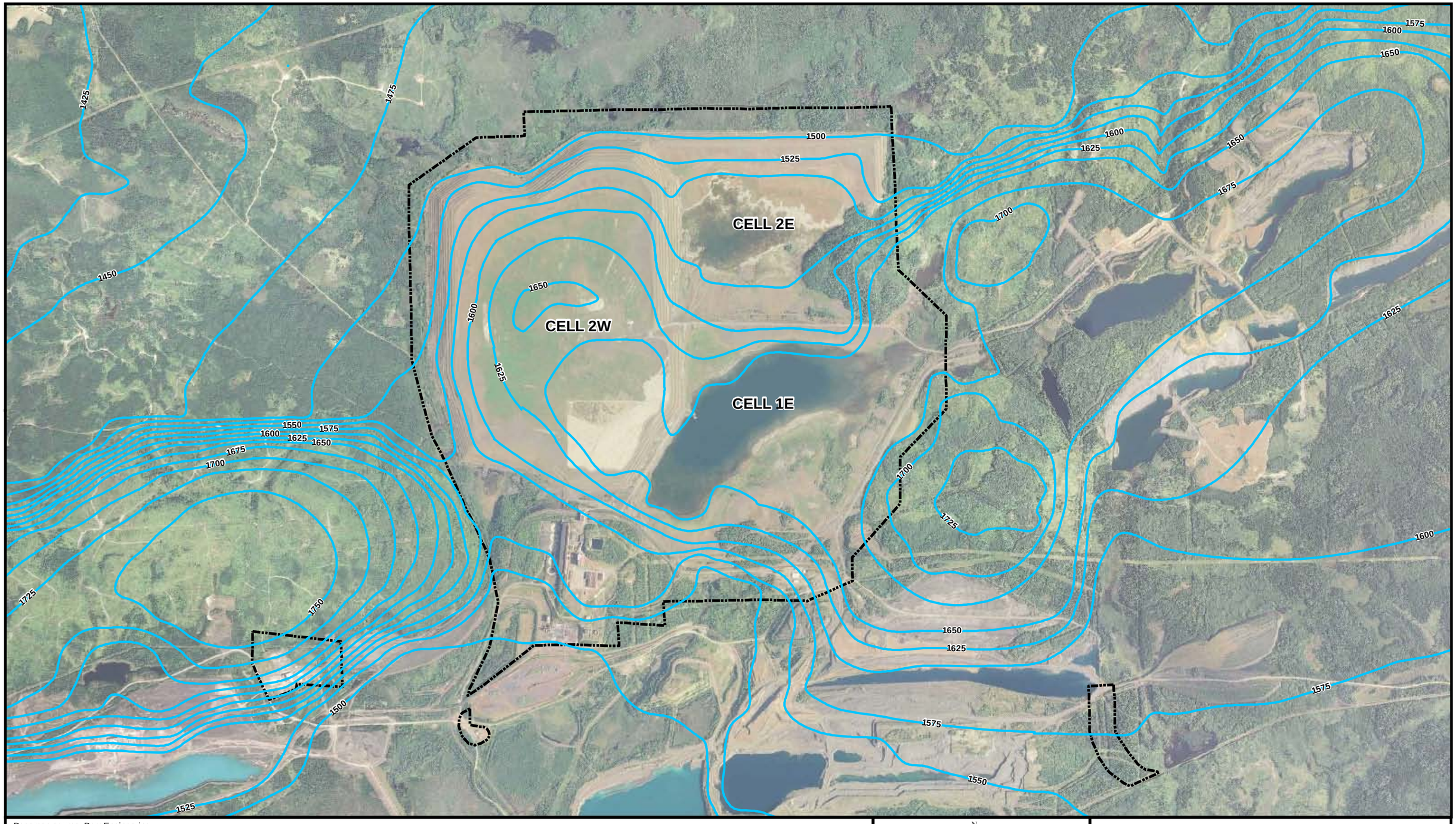
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-5
Depth to Bedrock at Tailings Basin Area

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Basemap source: Barr Engineering

Groundwater contours based on modeling results presented in RS13, elevation data for surface water features, and data presented in Siegel and Ericson, 1980.

Plant Site

Groundwater Elevation (Contour Interval = 25ft) Elevations are in feet MSL

N

0 1,000 2,000 4,000 Feet

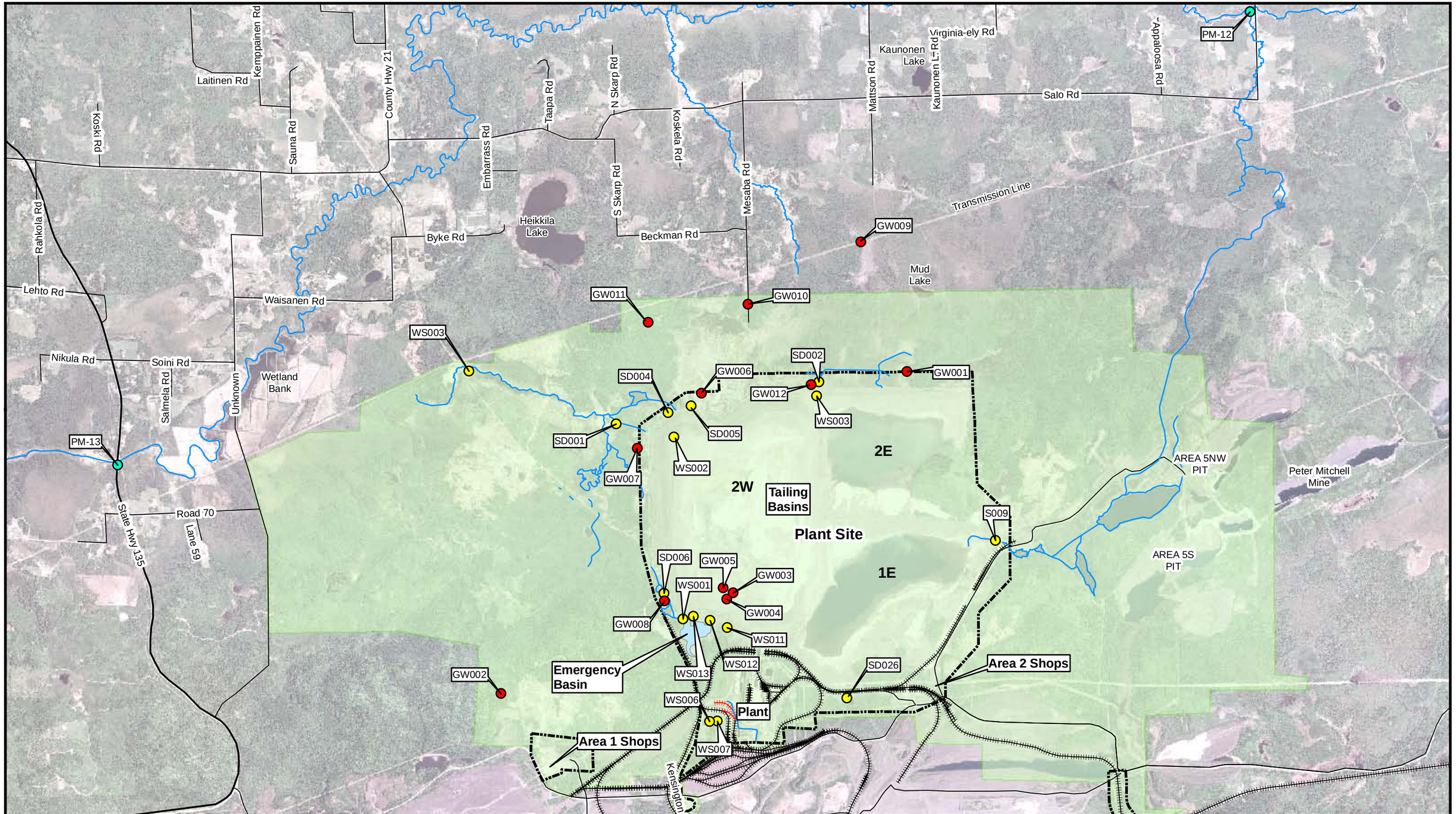
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-6
Generalized Groundwater Elevations at Plant Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Basemap source: Barr Engineering

- NPDES Surface Discharge Monitoring Stations
- Surface Water Monitoring Station (not NPDES)
- Groundwater Monitoring Wells
- Rivers/Streams/Drains
- County Roads
- State/Federal Roads
- Dunka Road
- Existing Railroad
- Proposed Railroad
- Plant Site
- Proposed PolyMet Land Control - Plant Site

Sample Designations:
SD = Surface Discharge Sample
S = Seep
WS = Waste Stream
GW = Groundwater Sample

N

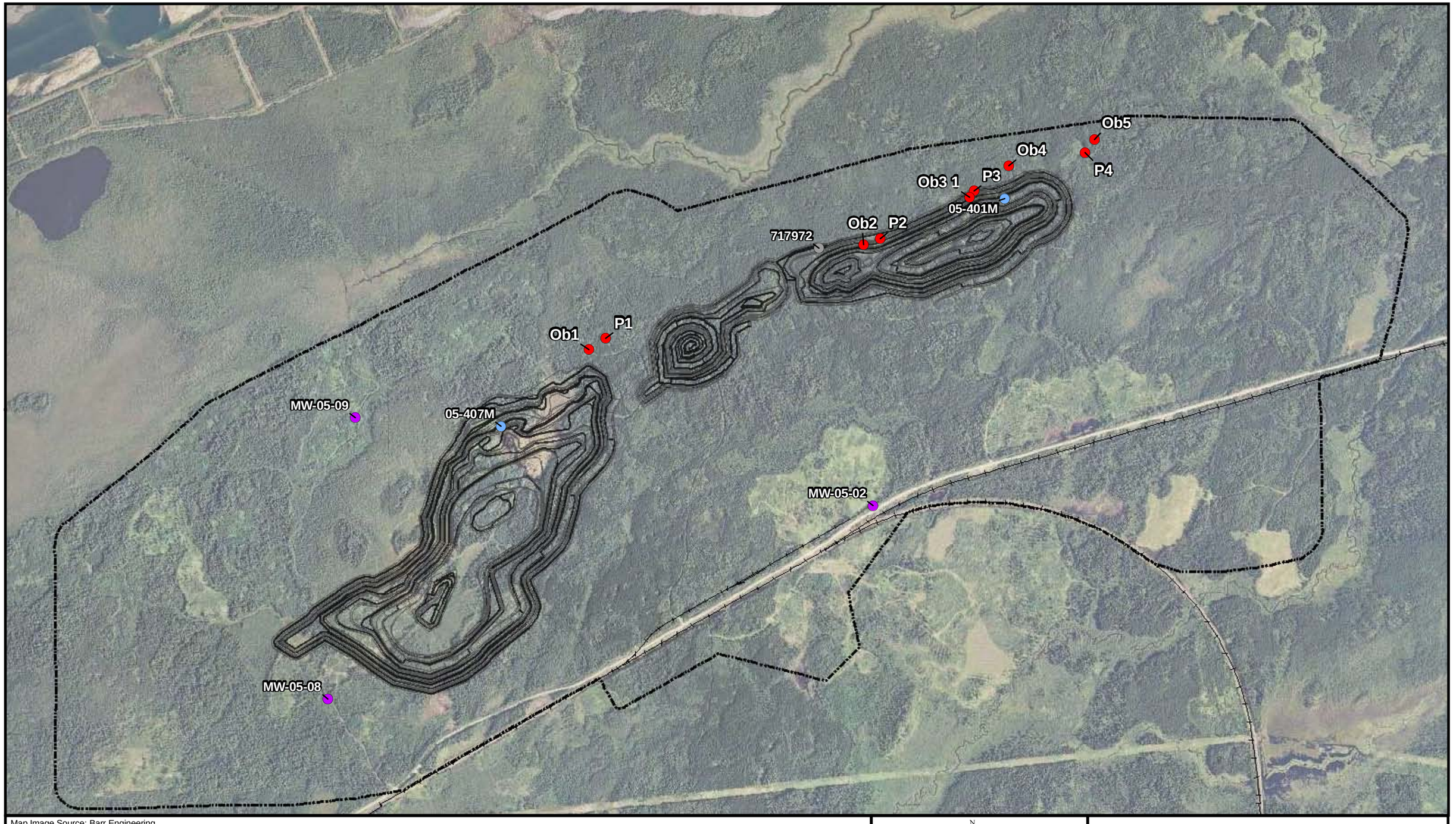
0 0.25 0.5 1 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-7
Monitoring Locations Near Existing Tailings Basins
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Image Source: Barr Engineering

- Bedrock Monitoring Well
- Exploratory Borehole
- Surficial Aquifer Monitoring Well
- Water Well
- Mine Site

N

0 500 1,000 2,000 Feet

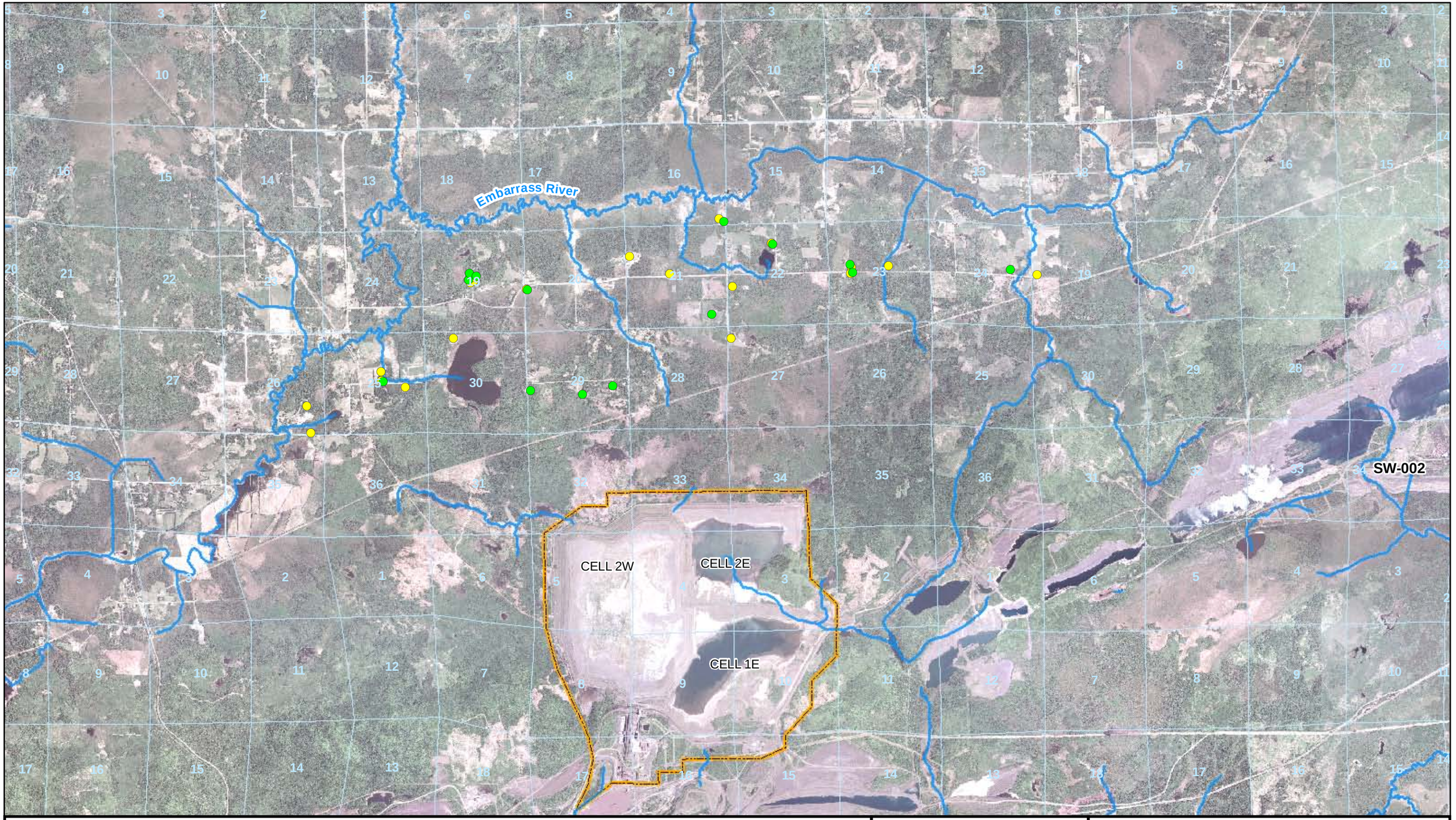
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-8
Groundwater Sampling Locations at the Mine Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- NorthMet Tailings Basin
- River/stream
- PLS sections
- Residential Wells - Sampled
- Other Residential Wells - Not Sampled

N

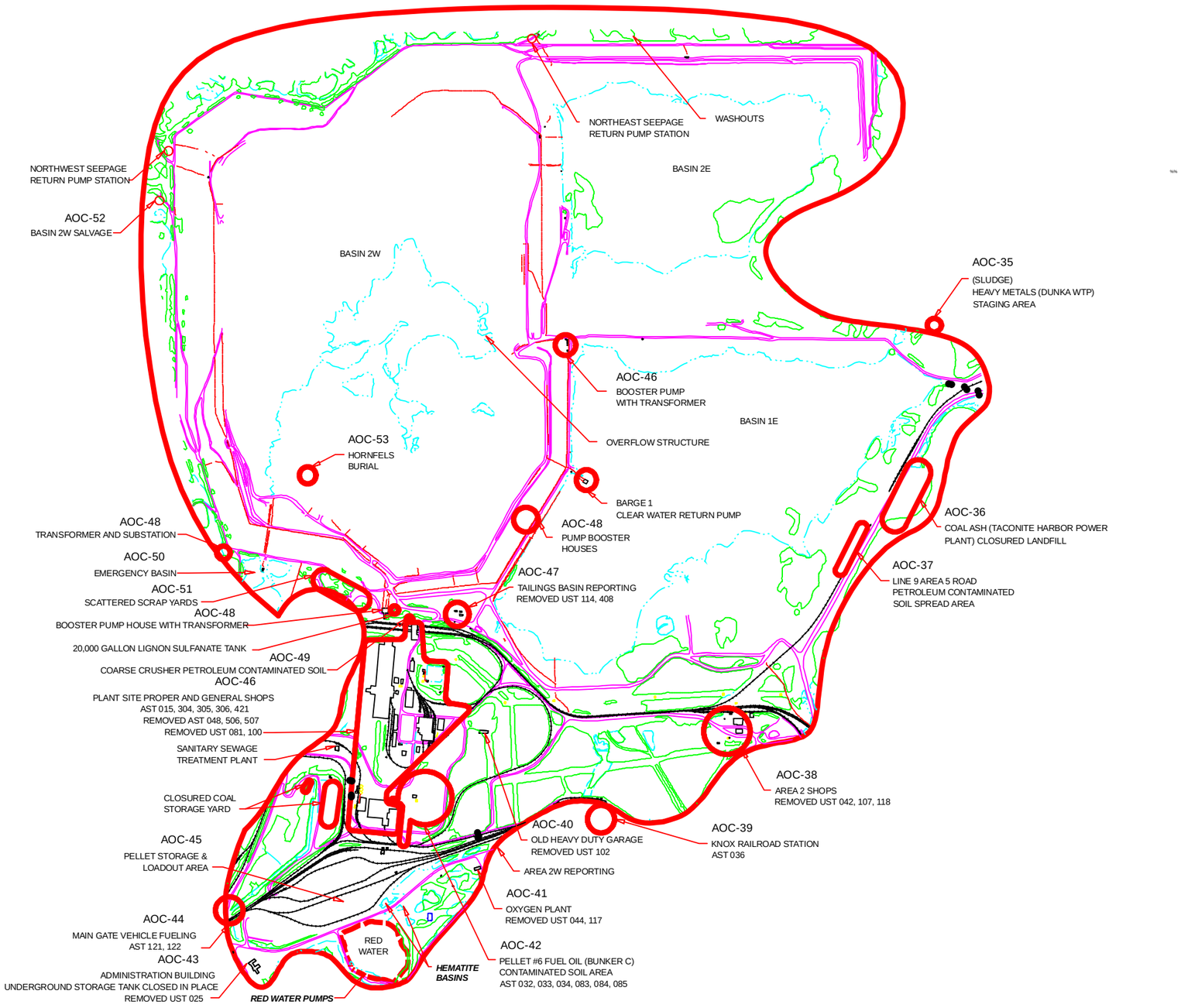
0 0.25 0.5 1 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-9
Residential Well Locations Between the Tailings Basin and the Embarrass River
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



LEGEND

- RAILROAD TRACKS
- ROAD
- ROAD UNDER-CONSTRUCTION
- DRAIN OR SHORELINE
- SWAMP
- PIPELINE
- FOUNDATION OR SLAB
- WOODS OUTLINE
- CULVERT
- END OF CULVERT

NOTE

HORIZONTAL AND VERTICAL CONTROL FURNISHED BY BENCHMARK ENGINEERING.
MAP ACCURACY IS RELATED DIRECTLY TO THE CONTROL FURNISHED.
THIS MAP HAS BEEN DESIGNED TO MEET NATIONAL MAP ACCURACY STANDARDS AT ITS ORIGINAL BASIC SCALE OF 1"=200' AND CONTOUR INTERVAL OF 5 FT.
MARKHURD'S LIABILITY FOR ANY INACCURACIES FOUND IN THIS MAP SHALL BE LIMITED TO THE CORRECTION OF ANY SUCH INACCURACIES FOUND DUE TO THE PHOTOGRAMMETRIC PROCESS, AND SHALL NOT EXCEED THE CONTRACT VALUE OF THE MAP. IT IS THE RESPONSIBILITY OF THE MAP USER TO ASCERTAIN WHETHER OR NOT THE ABOVE SCALE, CONTOUR INTERVAL AND ACCURACY ARE SATISFACTORY FOR WHATEVER PURPOSE THE MAP IS TO BE USED.

CONTOUR INTERVAL = 5 FEET

TOPOGRAPHY BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHS TAKEN ON MAY 18, 2001.

HORIZONTAL DATUM IS MINNESOTA STATE PLANE 27, NORTH ZONE 2201.
VERTICAL DATUM IS NGVD 29, U.S. SURVEY FOOT.
GRID SHOWN AT A 1000 FOOT INTERVAL.

Basemap source: Barr Engineering

N

Not to Scale

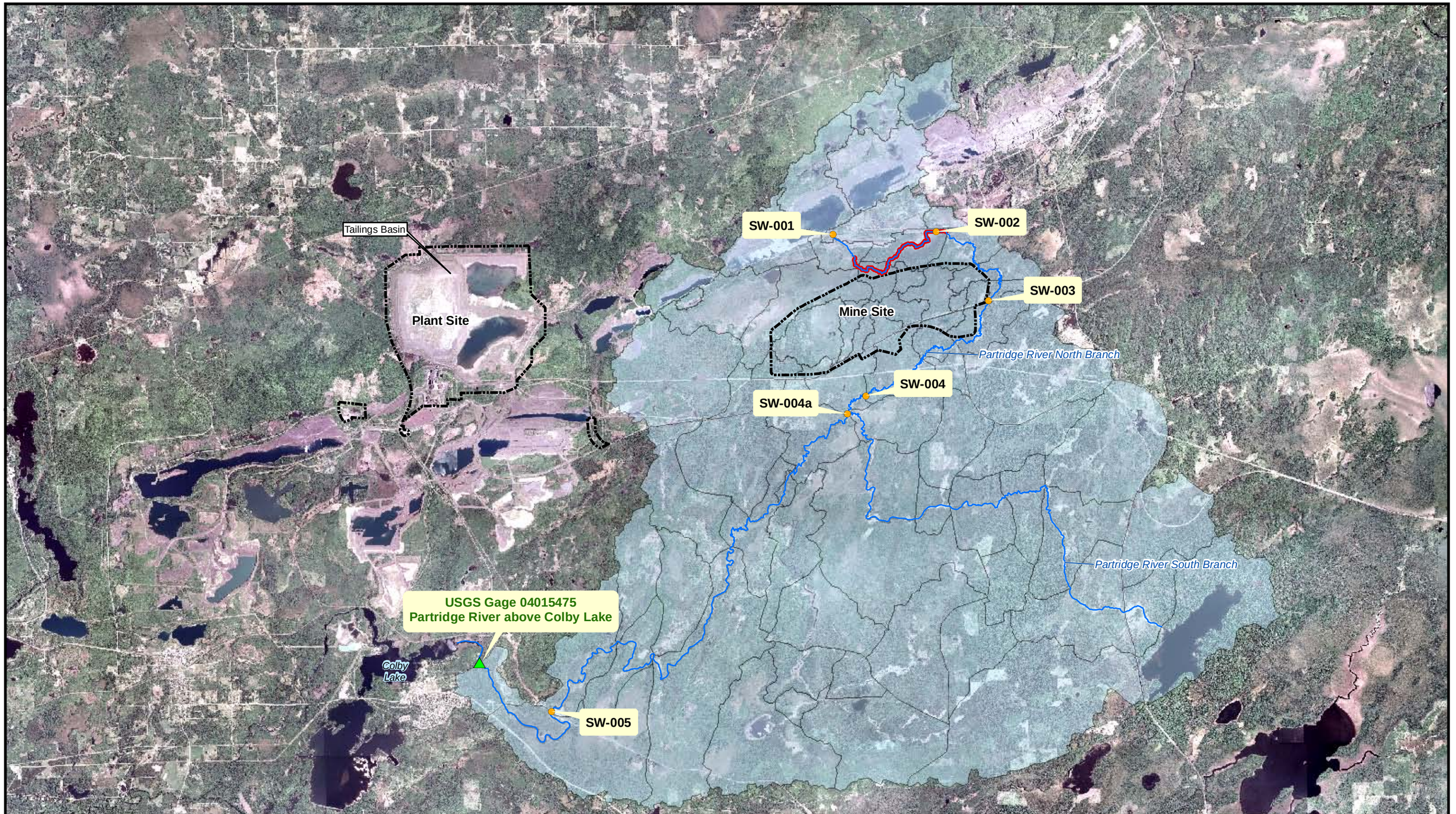
Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.1-10
Plant Site Areas of Concern

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Basemap source: Barr Engineering

- Surface Water Monitoring Stations
- USGS Gage Stations
- Rivers/Streams
- Area of Streambank Erosion/Channel Widening
- Watersheds - Existing Conditions

N

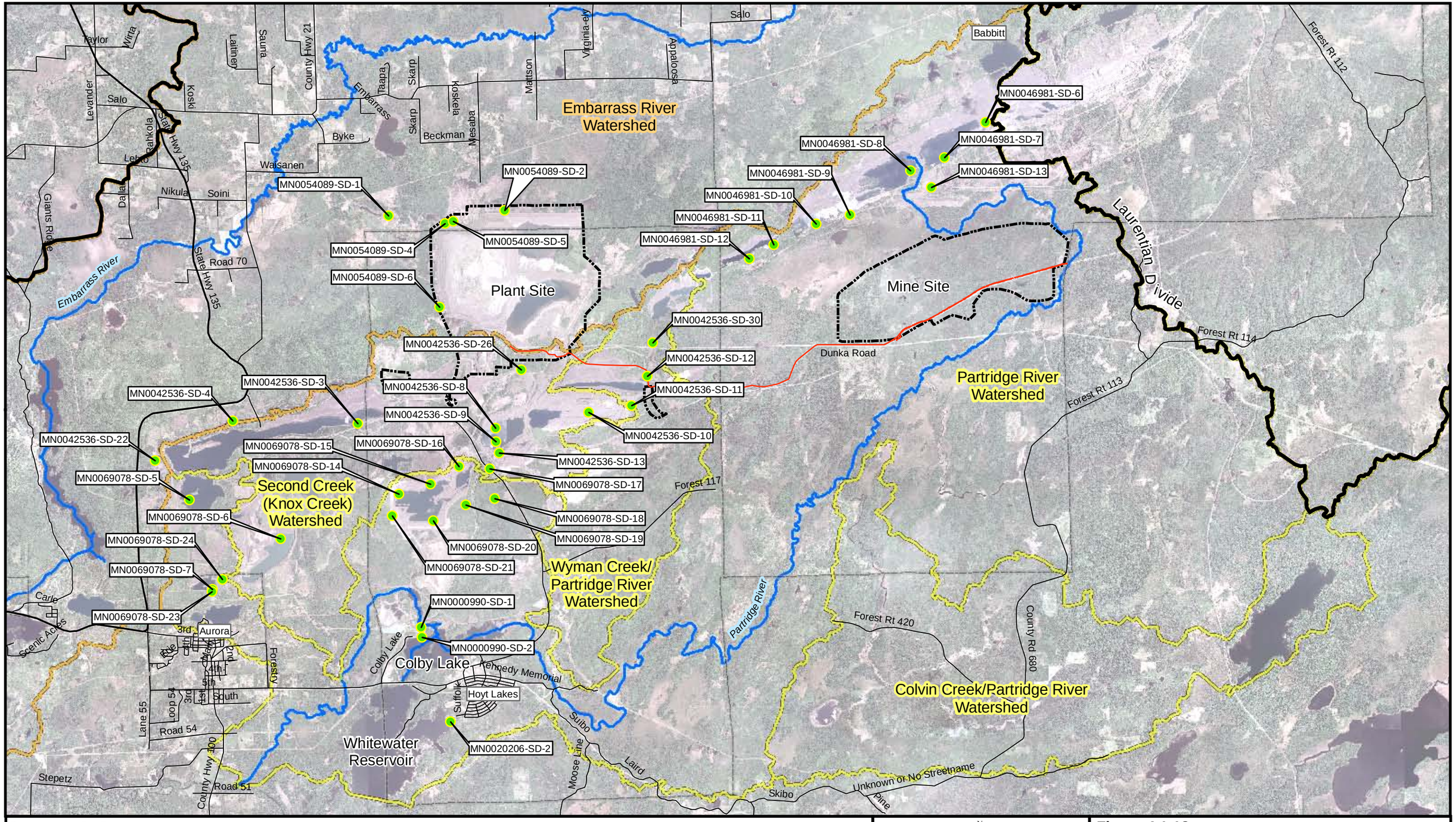
0 0.5 1 2 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-11
Locations of Surface Water Modeling/ Monitoring Stations in the Partridge River
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Basemap source: Barr Engineering

MPCA Water Quality Stations or NPDES Discharge Points

Rivers/Streams

Dunka Road

County Roads

State/Federal Roads

Site Boundaries

Partridge River Watershed

Embarrass River Watershed

N

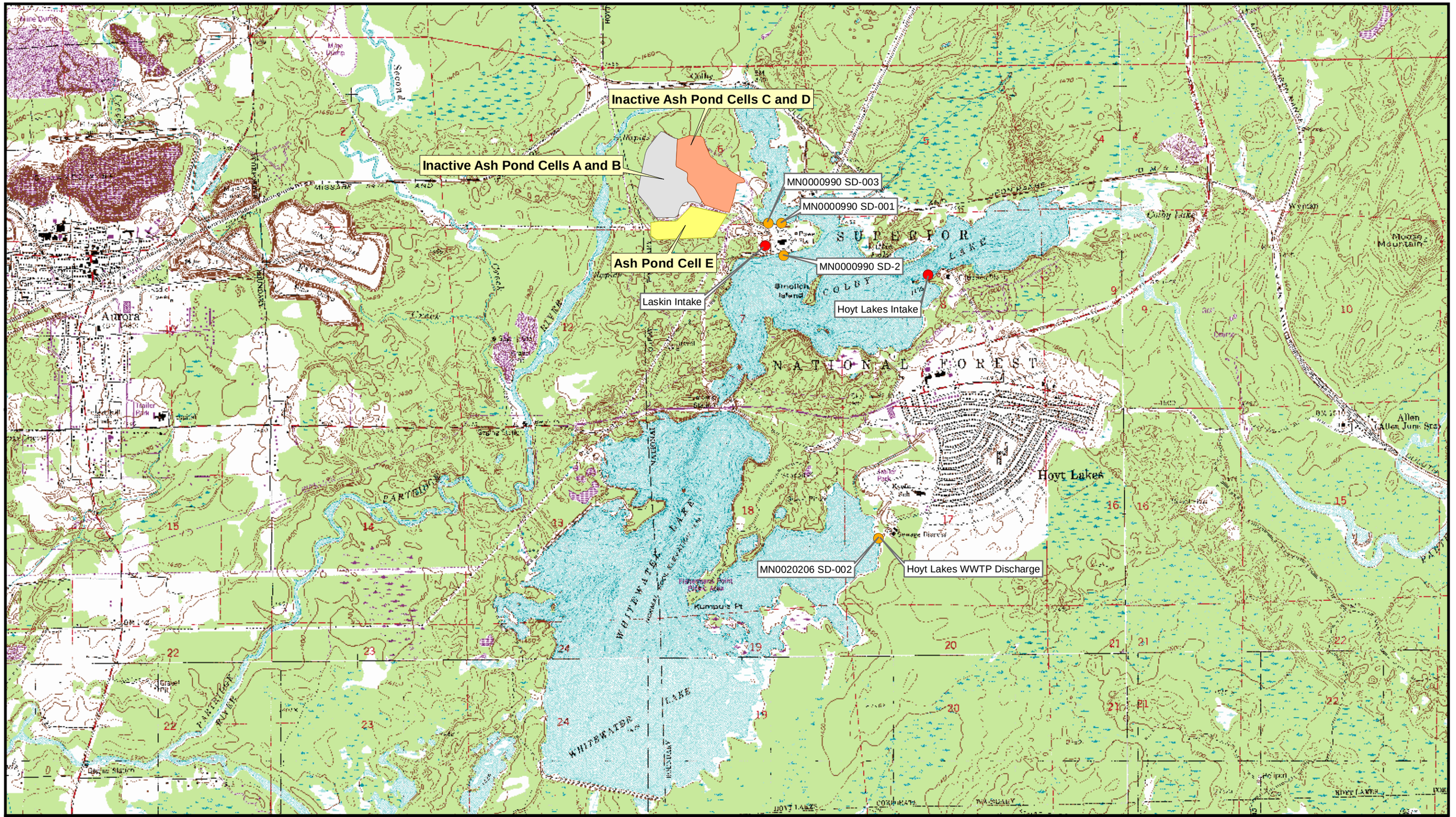
0 0.5 1 2 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-12
Past and Current NPDES Discharges into the Partridge and Embarrass Rivers
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

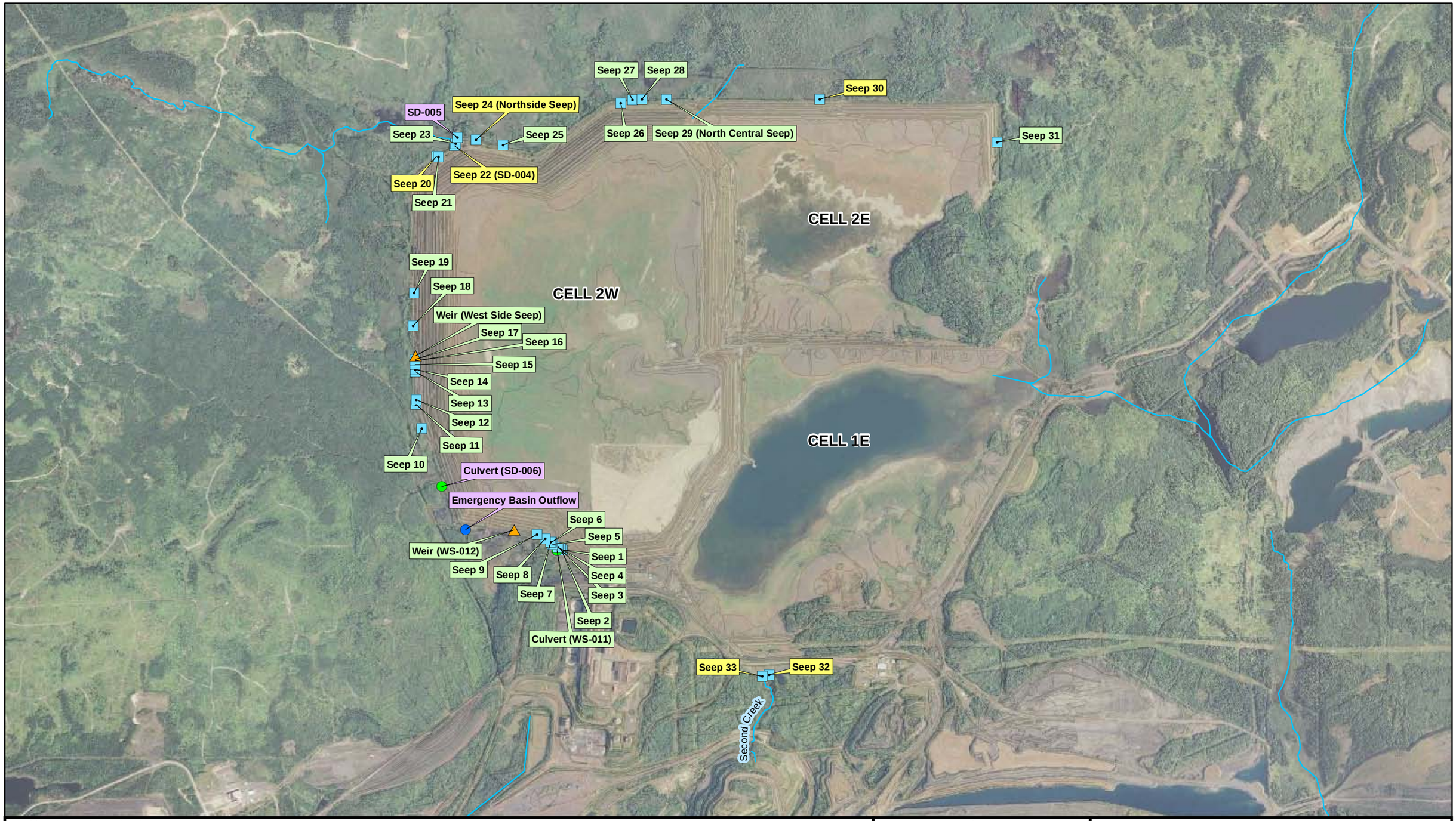
- Water Withdrawls from Colby Lake
- MPCA Water Quality Stations 2006/ Discharges to Surface Waters NPDES Discharges

N

0 1,000 2,000 4,000 Feet

Figure 4.1-13
Map of Colby Lake and Whitewater Reservoir Area
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

Historical Seeps

- Culvert
- Emergency Basin Outflow
- Seeps
- Weirs
- Streams

Seep — Surface Discharge

Seep — Flow Not Measurable or No Flow

Seep — Active Seep

N

0 750 1,500 3,000 Feet

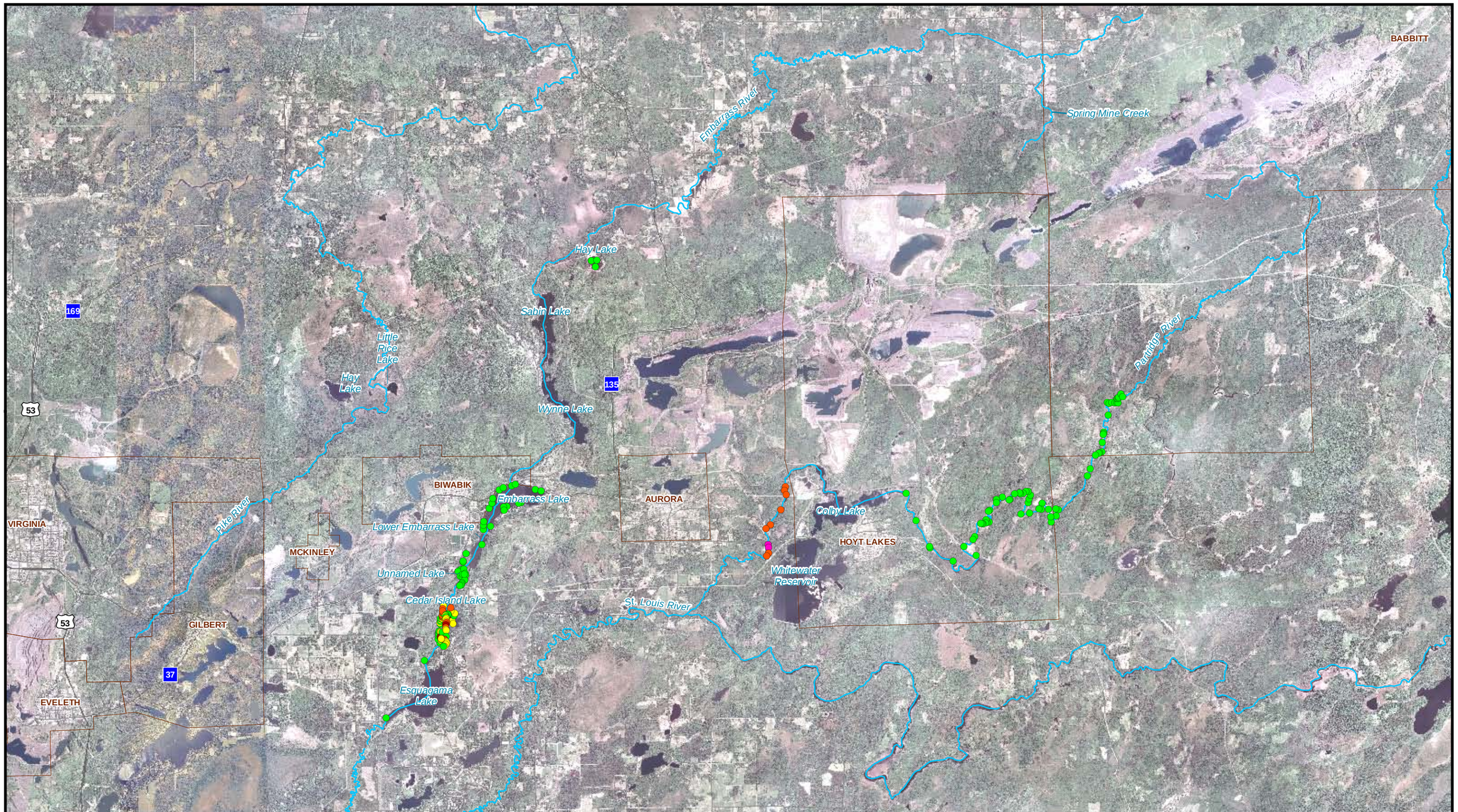
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-14
Seep Locations

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

Rivers and Streams

City Boundaries

Wild Rice Densities

- 1 < 10% Wild Rice Coverage
- 2
- 3
- 4
- 5 > 75% Wild Rice Coverage

N

0 0.75 1.5 3 Miles

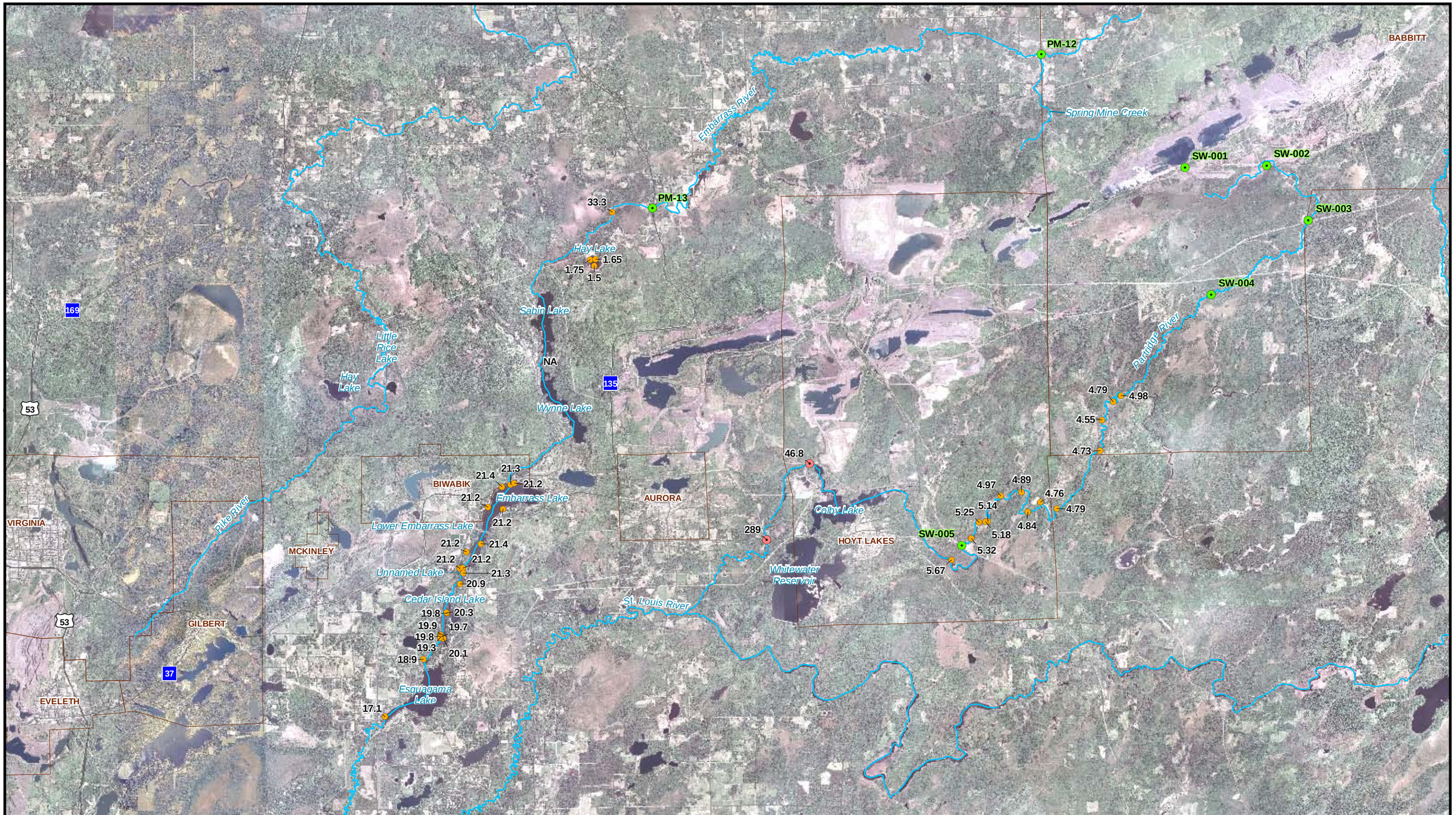
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-15
Wild Rice Field Survey Results

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Surface Water Monitoring Stations
- 2009 Sulfate Sampling Locations with Sulfate Listed in mg/L
- Mesabi Nugget Surface Water Monitoring Data - Aug. 19, 2009
- Rivers and Streams
- City Boundaries

N

0 0.75 1.5 3 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-16
Wild Rice and Sulfate Sampling Locations

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

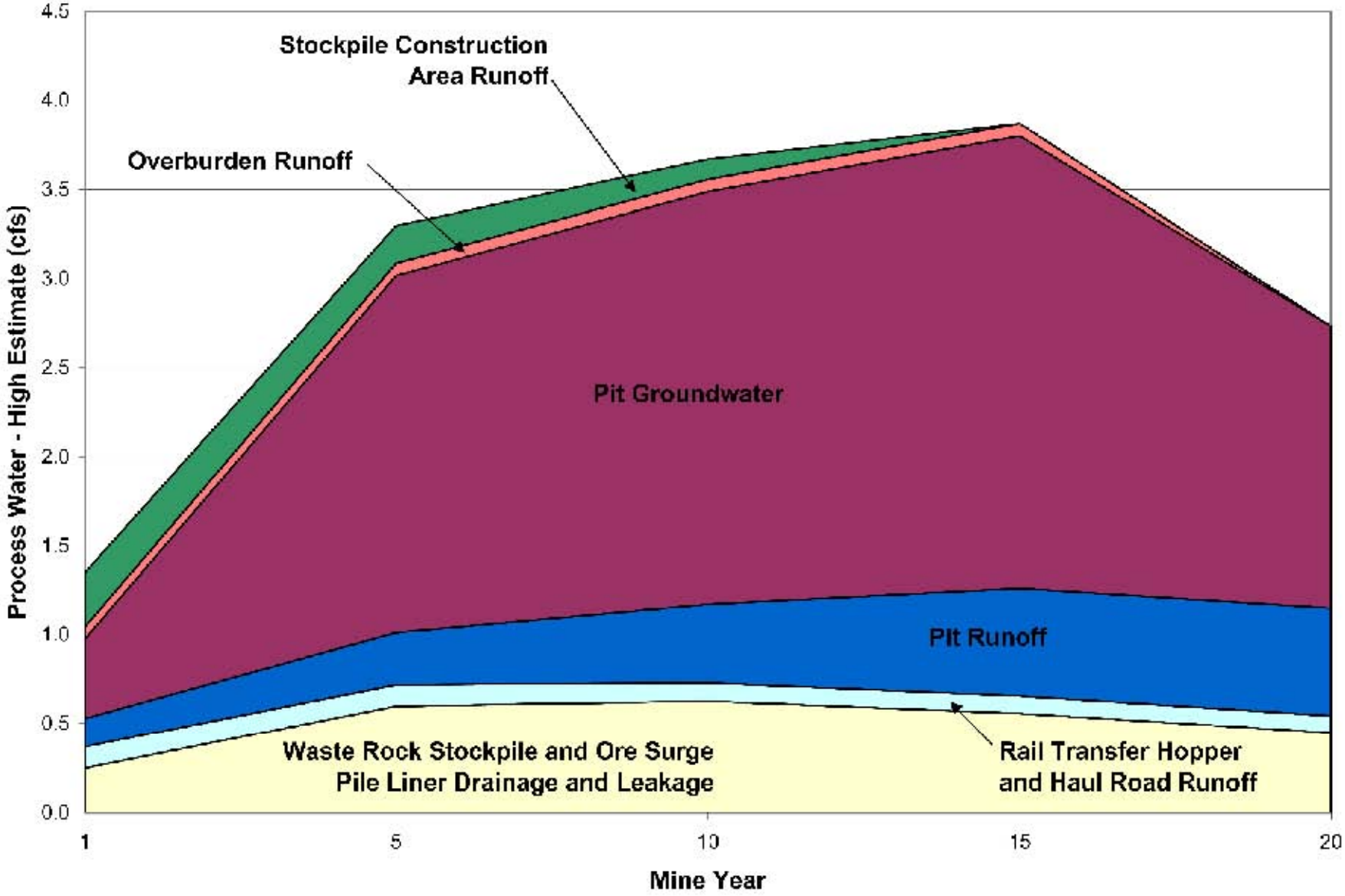
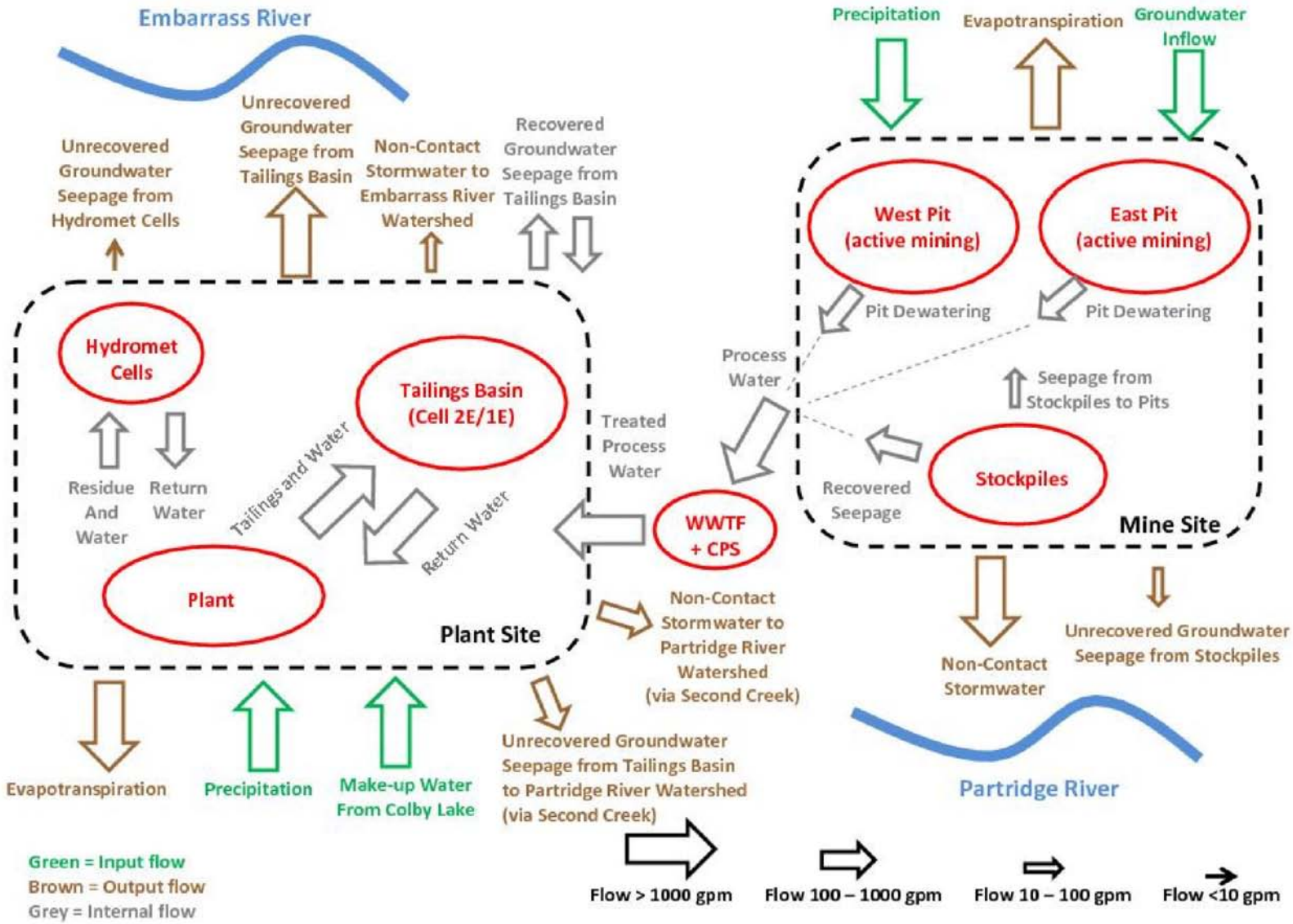


Image Source: Barr Engineering

Figure 4.1-17
Process Water Produced at Mine Site (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

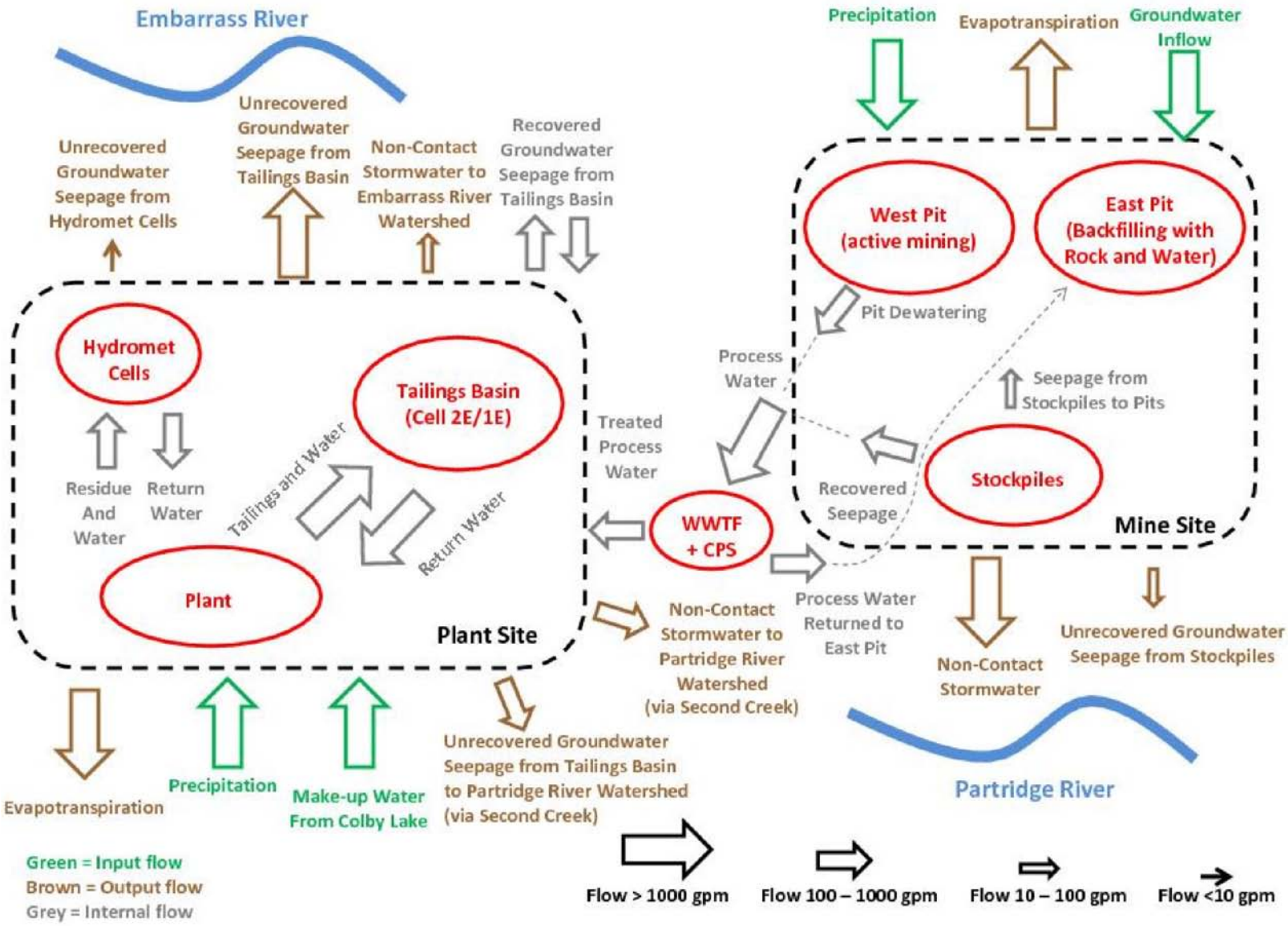


Information Source:Barr Engineering

No Scale Applicable

Figure 4.1-18
Estimated Project Water Balance
Years 1-11 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

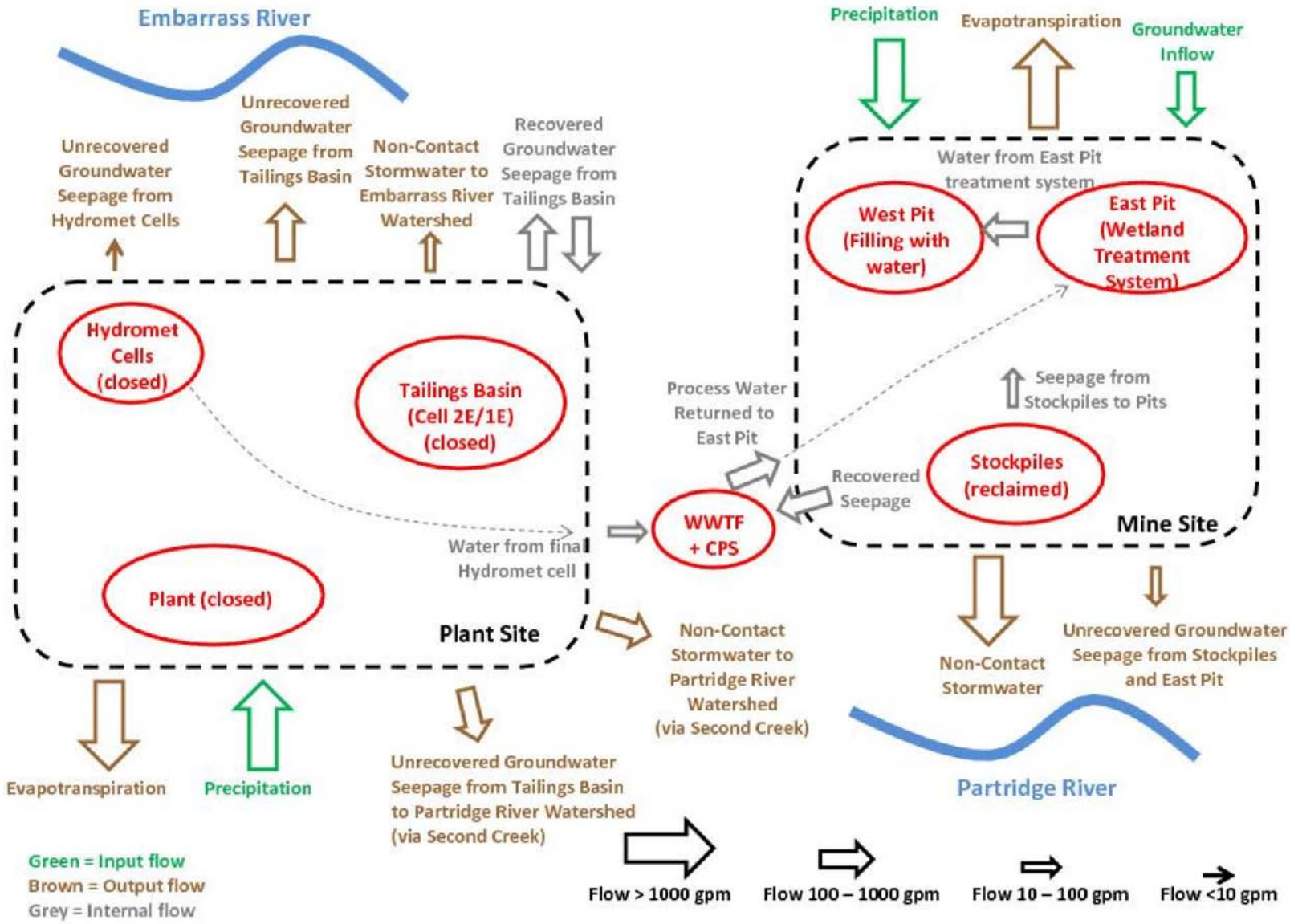


Information Source:Barr Engineering

No Scale Applicable

Figure 4.1-19
Estimated Project Water Balance
Years 12-20 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

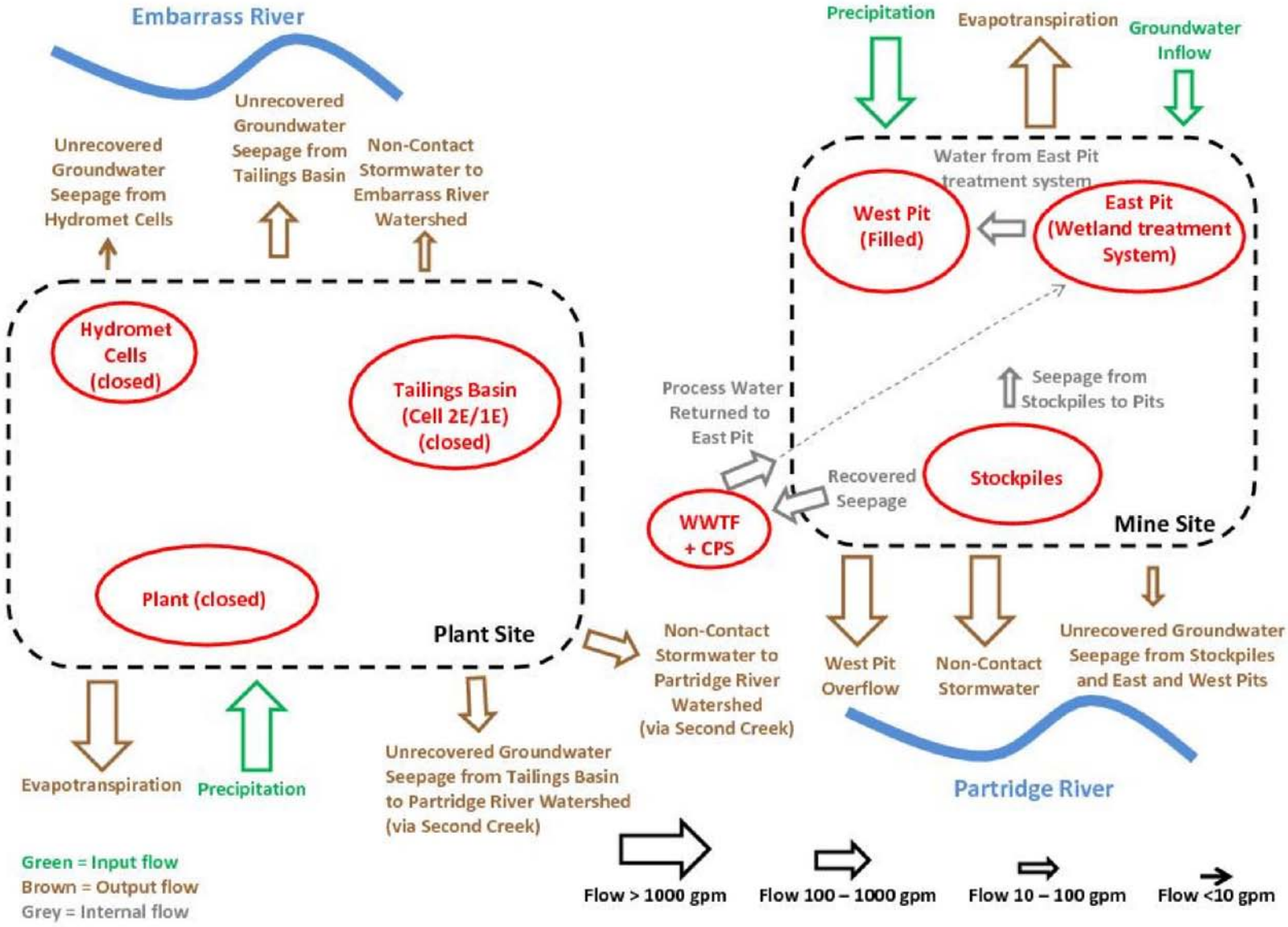


Information Source:Barr Engineering

No Scale Applicable

Figure 4.1-20
Estimated Project Water Balance
Years 21- Approx. 65 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Information Source:Barr Engineering

No Scale Applicable

Figure 4.1-21
Estimated Project Water Balance
After Approx. Year 65 (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

CAT 3 (TOP ELEV. 1760)

EAST PIT

CAT 3 LEAN ORE (TOP ELEV. 1800)

CENTRAL PIT

CAT 4 (TOP ELEV. 1730)

LEAN ORE SURGE PILE
(REMOVED AT END OF YEAR 20)

OVERBURDEN & CATEGORY 1 AND 2 STOCKPILE
(TOP ELEV. 1840)

WEST PIT

RAIL TRANSFER
HOPPER

OVERBURDEN STORAGE
AND LAYDOWN AREA
(REMOVED AT END OF YEAR 20)

Dunka Road

P

OUTLET STRUCTURE
AND POND
OS-5

Existing Railroad to Plant

Unnamed Stream

Partridge River

Map Source: Barr Engineering

- Culverts to Remain
- 13.8KV Mine Powerline to Remain
- Fencing Gates
- Barbed Wire Fencing
- Non-Climbable Fencing
- West Pit Drainage Channel
- Modified Ditch
- New Ditch
- Ditch to Remain Open
- New Pipe
- Pipes to Remain
- Mine Site
- Cover and Revegetation of Building Areas
- Haul Roads to Remain
- Year 20 Reclamation Area
- Previously Reclaimed Areas
- East and Central Pits -Treatment Wetland
- West Pit - Lake
- Wetland Delineations
- Equilization Ponds
- Wastewater Treatment Facility
- P Central Pumping Station

N

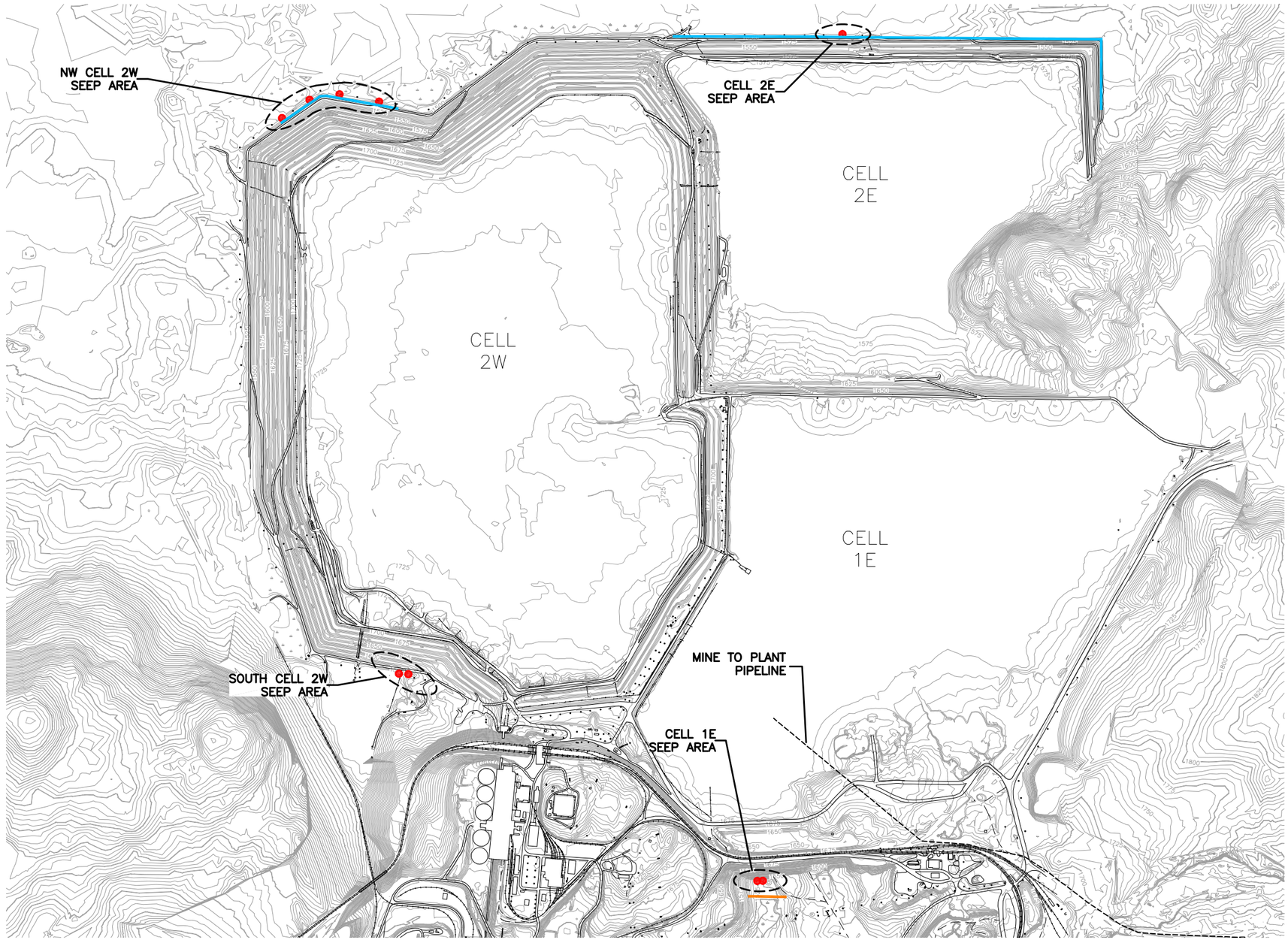
0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-22
West Pit Overflow to Partridge River (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



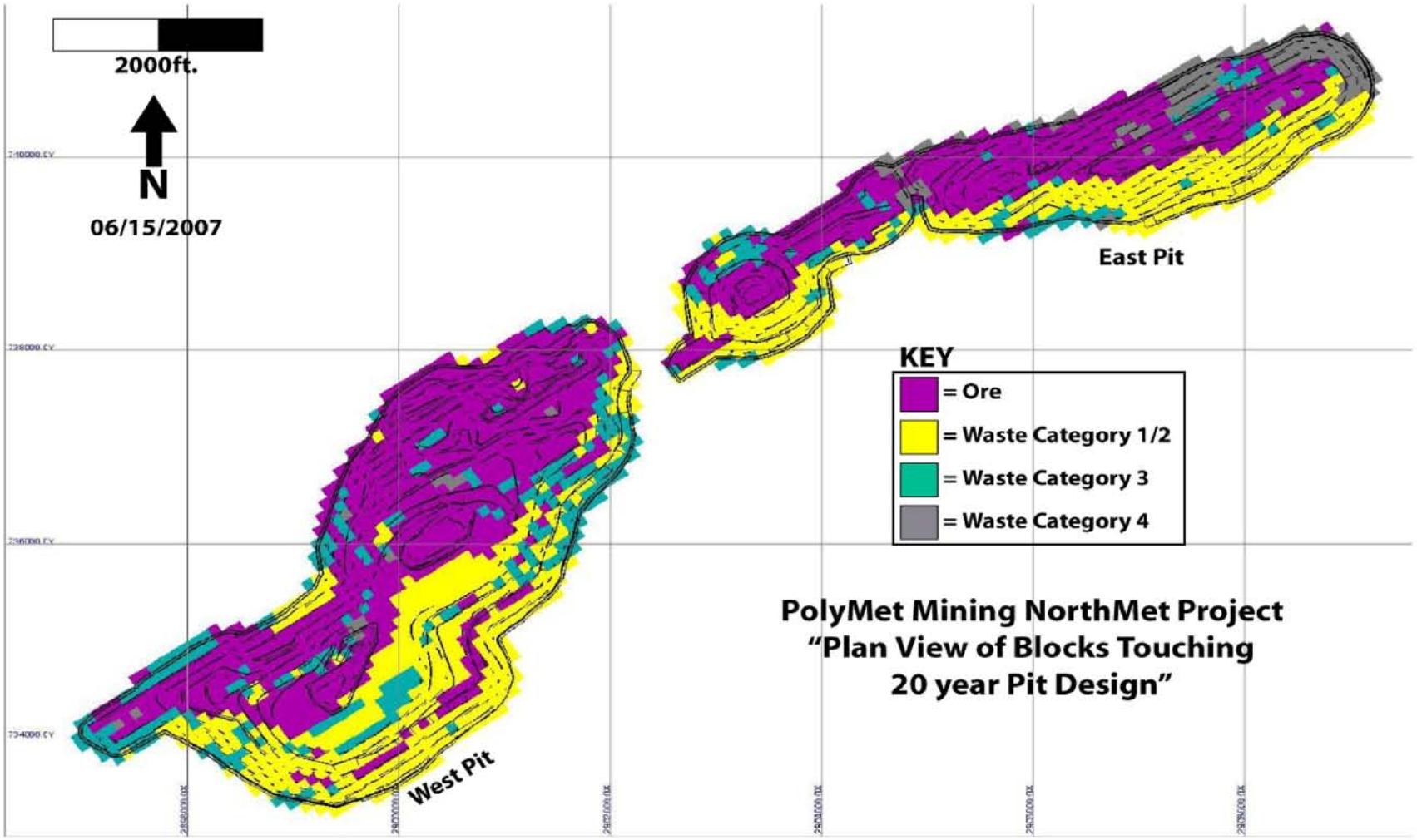
SEEP LOCATIONS
EXISTING 25' MAJOR CONTOUR
EXISTING 5' MINOR CONTOUR
SEEPAGE COLLECTION SYSTEM
SEEPAGE BARRIER

N
0 800 1600 3200
FEET

Minnesota Department of Natural Resources
US Army Corps of Engineers St. Paul District

Figure 4.1-23
Tailings Basin Seepage Collection System (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

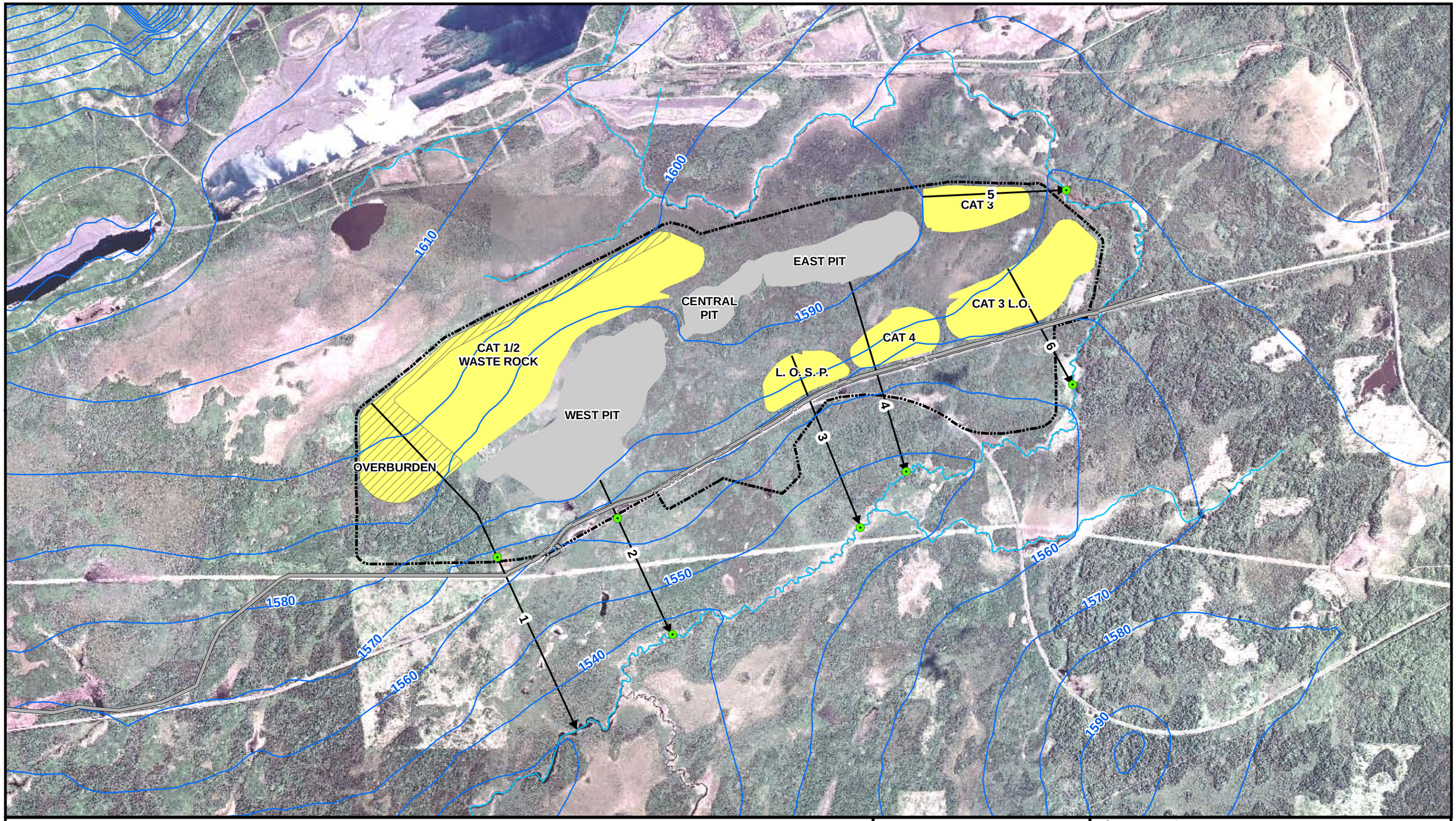
October 2009



Source: SRK Consulting

Figure 4.1-24
Composition of the Final Pit Walls Predicted by Block Modeling (Provided by PolyMet)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Groundwater Evaluation Points
- Groundwater Flow Path
- Head Contour (ft) at Closure
  Contour Interval = 10 ft
- Partridge River
- Dunka Road
- Mine Site
- Stockpile Footprints - Year 20
- Mine Pit Footprints - Year 20
- Overburden (Top Elev. 1840)

N

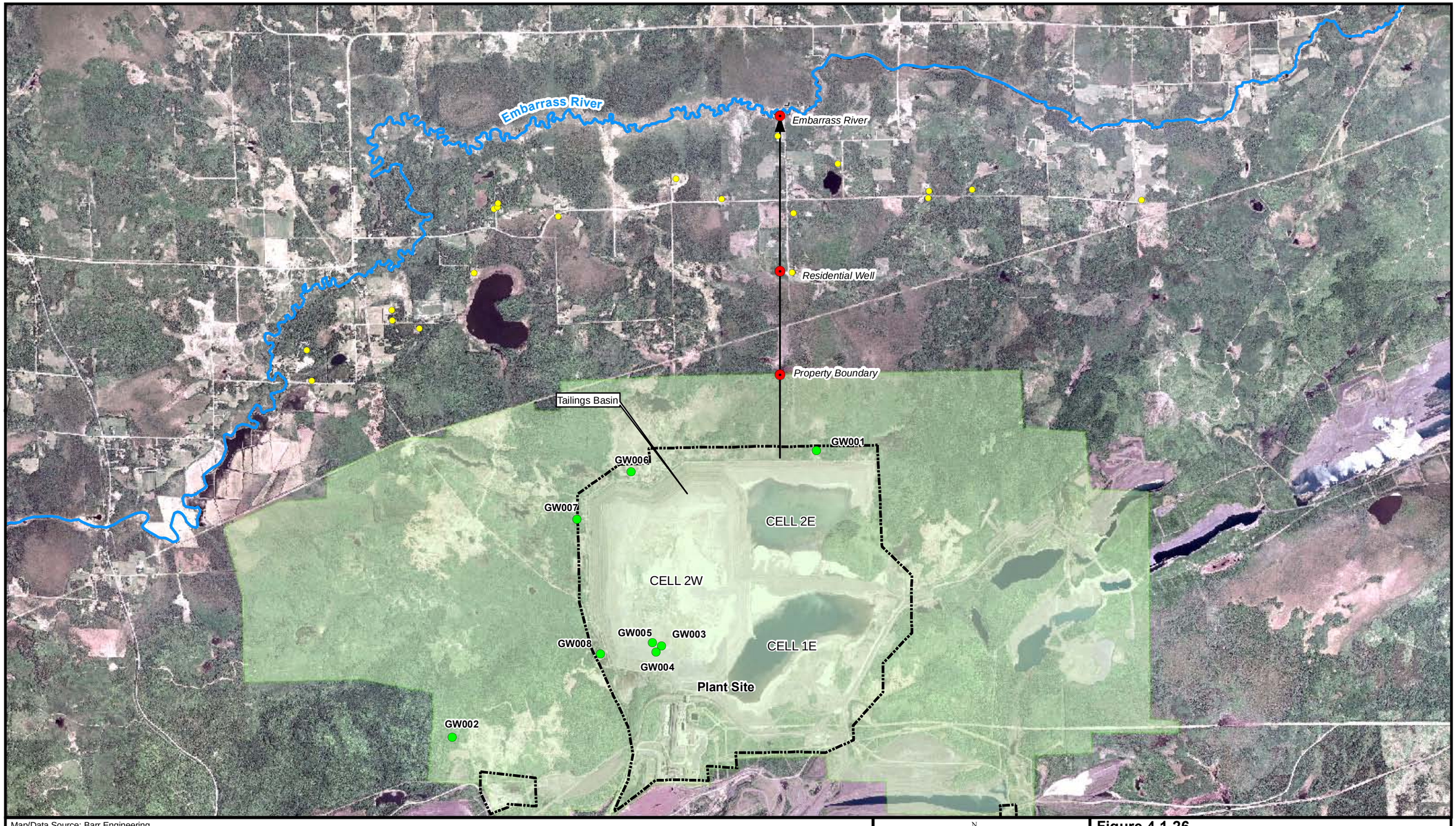
0 1,250 2,500 5,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.1-25
Flow Paths for Groundwater Evaluation (Proposed Action) - Mine Site
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Existing Monitoring Well
- Domestic Well
- Evaluation Location
- Evaluation Flow Path
- Embarrass River
- Plant Site
- Proposed PolyMet Land Control - Plant Site

N

0 1,250 2,500 5,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-26
Flow Path for Groundwater Evaluation (Proposed Action) – Plant Site
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

CR 110

Patriot's Point Subdivision

Whitewater Reservoir

Fisherman's Point Campground

Data Provided by: Barr Engineering

- Average Water Level, 50 Year Low Flow, 0 gpm Demand (1439.2')
- Minimum Water Level, 50 Year Low Flow, 0 gpm Demand (1437.4')
- Minimum Water Level, 50 Year Low Flow, 3500 gpm Demand (1434.3')
- Minimum Water Level, 50 Year Low Flow, 5000 gpm Demand (1430.3')

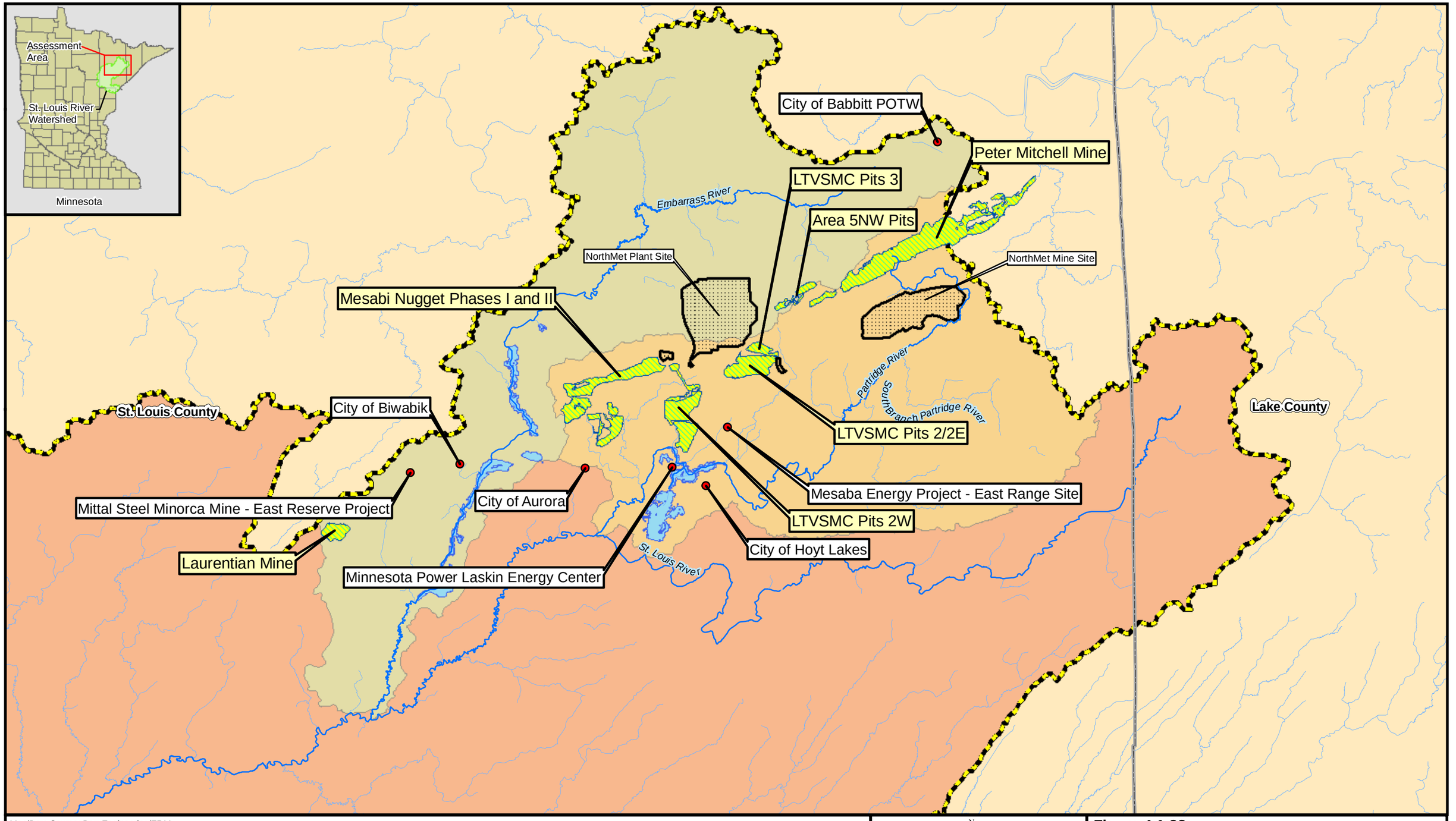
N

0 300 600 1,200 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-27
Water Level Drawdown for 50 Year Low Flow Conditions in Whitewater Reservoir (Proposed Action)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota
October 2009



Map/Data Source: Barr Engineering/ERM

- Other Activities
- Rivers/Streams
- County Boundary
- NorthMet Mine and Plant Sites
- Lakes
- Cumulative Impact Project Mine Features
- Embarrass River Watershed
- Partridge River Watershed
- St. Louis River Watershed

N

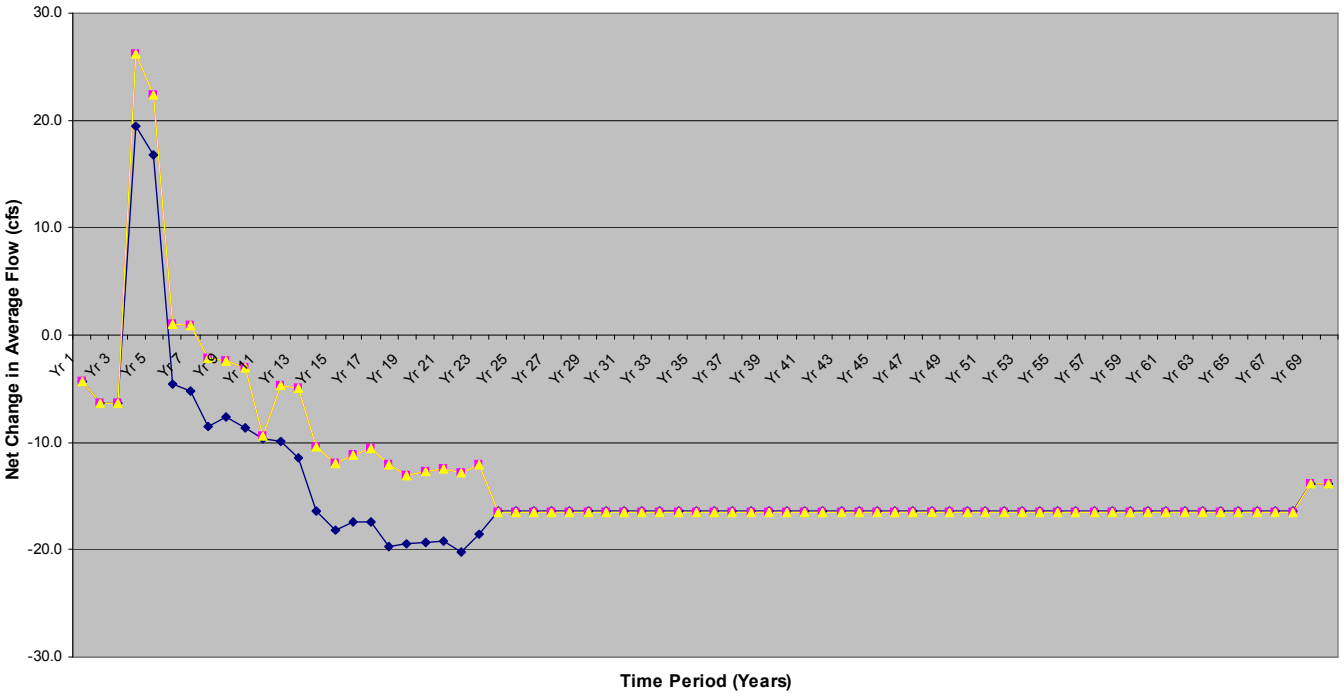
0 75 150 300 Miles

Minnesota Department of Natural Resources

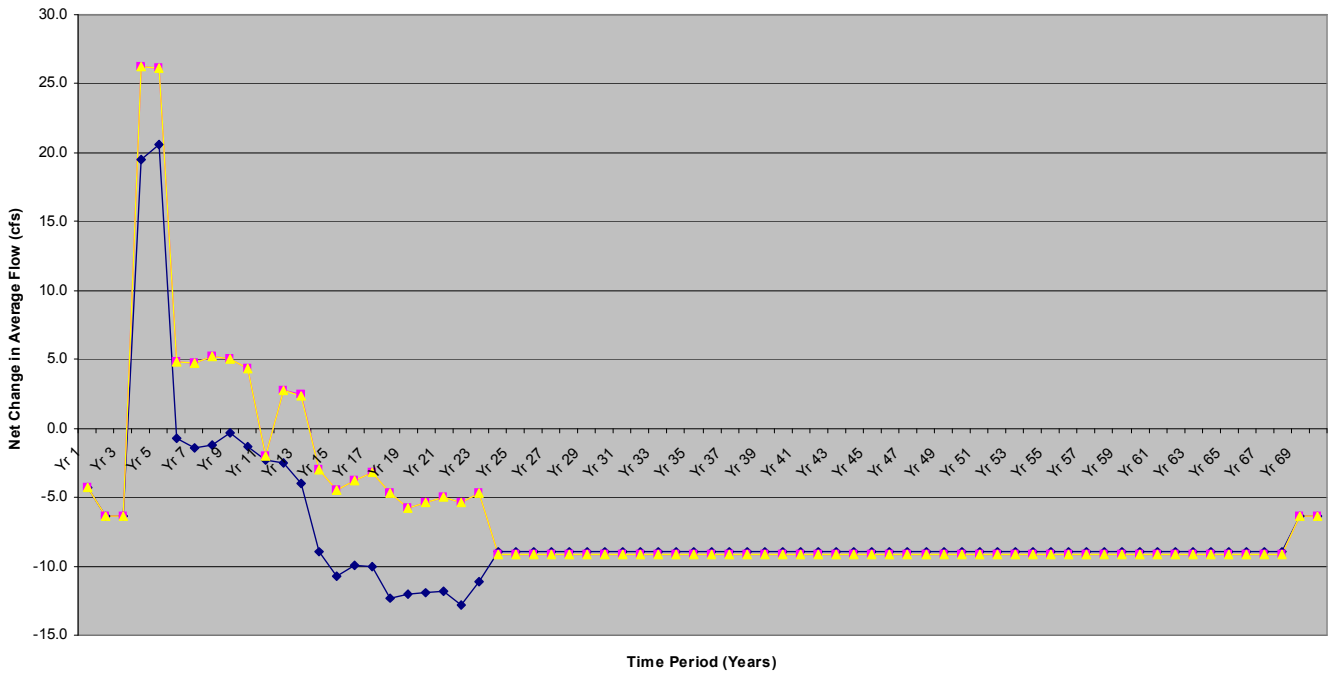
US Army Corps of Engineers St. Paul District

Figure 4.1-28
Activities included in the Cumulative Effects Assessment
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



With Mesaba Energy Project



Without Mesaba Energy Project

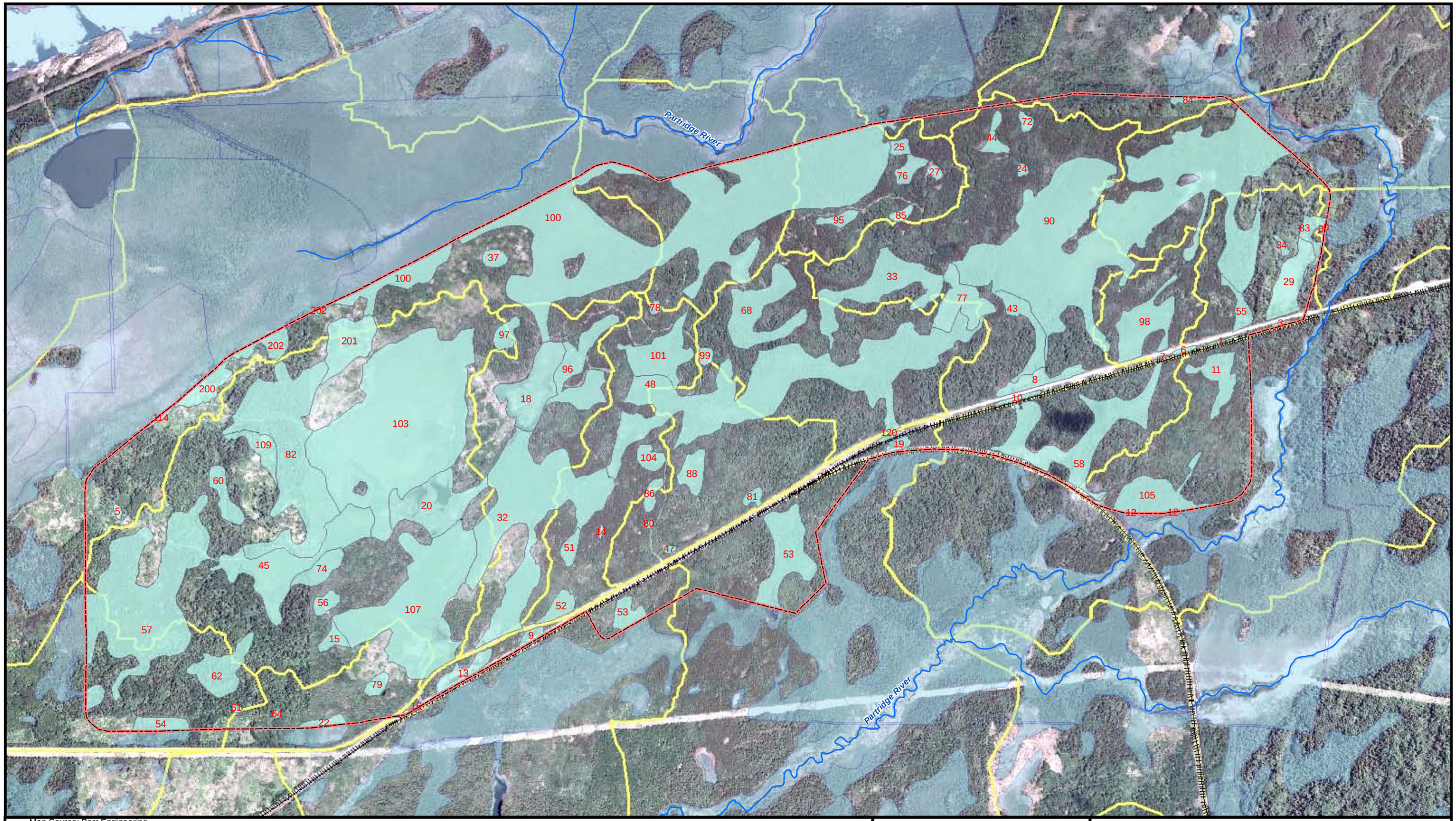
Images Provided by: Barr

Proposed Action — No Recycle Option — Maximum Recycle Option

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.1-29
70 Year Cumulative Effects on Partridge River Hydrology
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota
October 2009



Map Source: Barr Engineering

- Mine Area
- Existing Railroad
- Watersheds
- Rivers/Streams
- Mine Area Wetland Delineations
- Wetland Delineations

N

0 750 1,500 3,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-1
Delineated Wetlands - Mine Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Map Source: Barr Engineering

Impacted Wetland

Evaluation Area

Wetland

N

0 500 1,000 2,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-2
Predicted Tailings Basin Area Wetland Impacts
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Map/Data Source: Barr Engineering

- Railroad Centerline
- Railroad Footprint
- Dunka Road
- Non-Impacted Wetland
- Impacted Wetland

N

0 250 500 1,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-3
Predicted Railroad Connection Wetland Impacts

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Tailings Basin Area

Plant Site

Mine Site

Plant Area

Area 1 Shops

Area 2 Shops

Main Gate

Railroad Connection

Map/Data Source: Barr Engineering

Dunka Road and Access Roads

Dunka Road and Pipeline Impact Area (200 ft. centered on the Center of Dunka Road)

Plant Site

Mine site

Wetlands

Taconite Pit Water

N

0 0.25 0.5 1 Miles

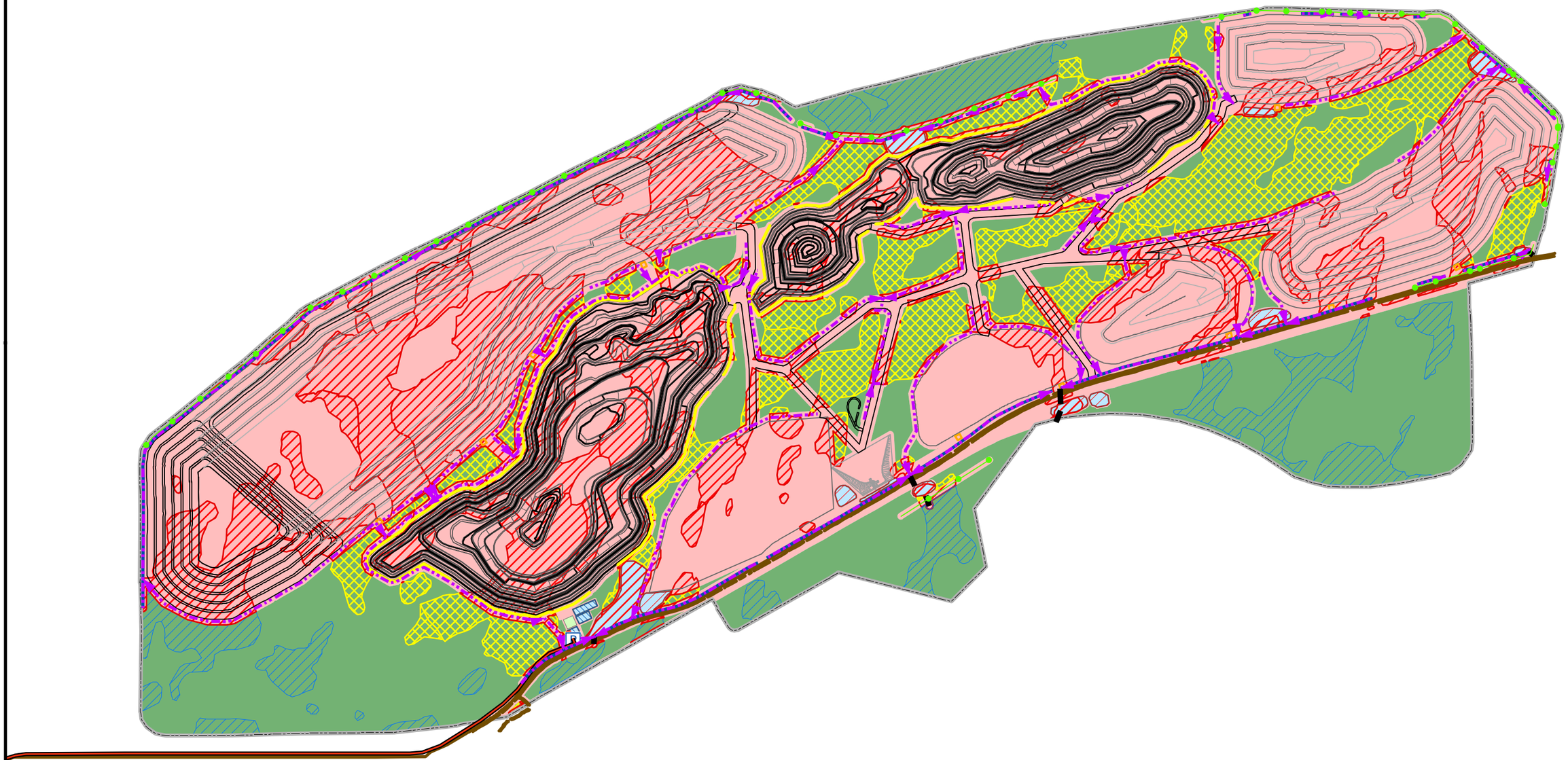
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-4
Wetlands - Dunka Road and Pipeline

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Mine Site
Equilization Ponds
Wastewater Treatment Facility
Stockpile Sumps
Disturbed Area
Undisturbed Area

Stormwater Ditches
Process Water Ditches
Culverts
Pit Rim and Stockpile Prep Dikes
Perimeter Dike
Mine to Plant Pipeline
Dunka Road

Wetland Impacts
Direct
Indirect
None

Sedimentation Ponds
Direct Wetland Impact
No Impact

Map/Data Source: Barr Engineering

N

0 750 1,500 3,000 Feet

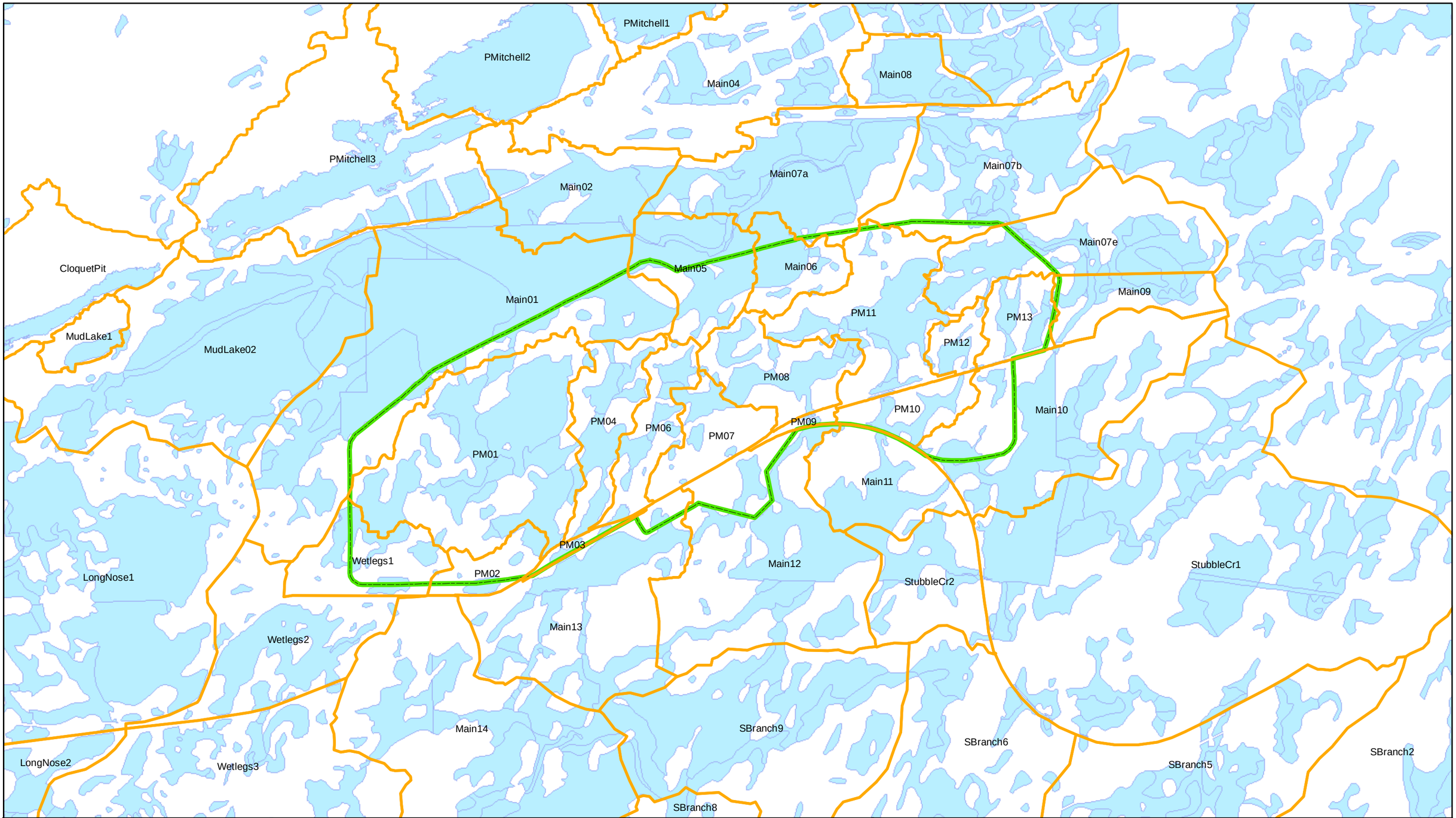
Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.2-5
20 Year Wetland Impacts - Mine Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Watersheds - existing conditions
Mine Site
Wetlands

N

0 1,000 2,000 4,000 Feet

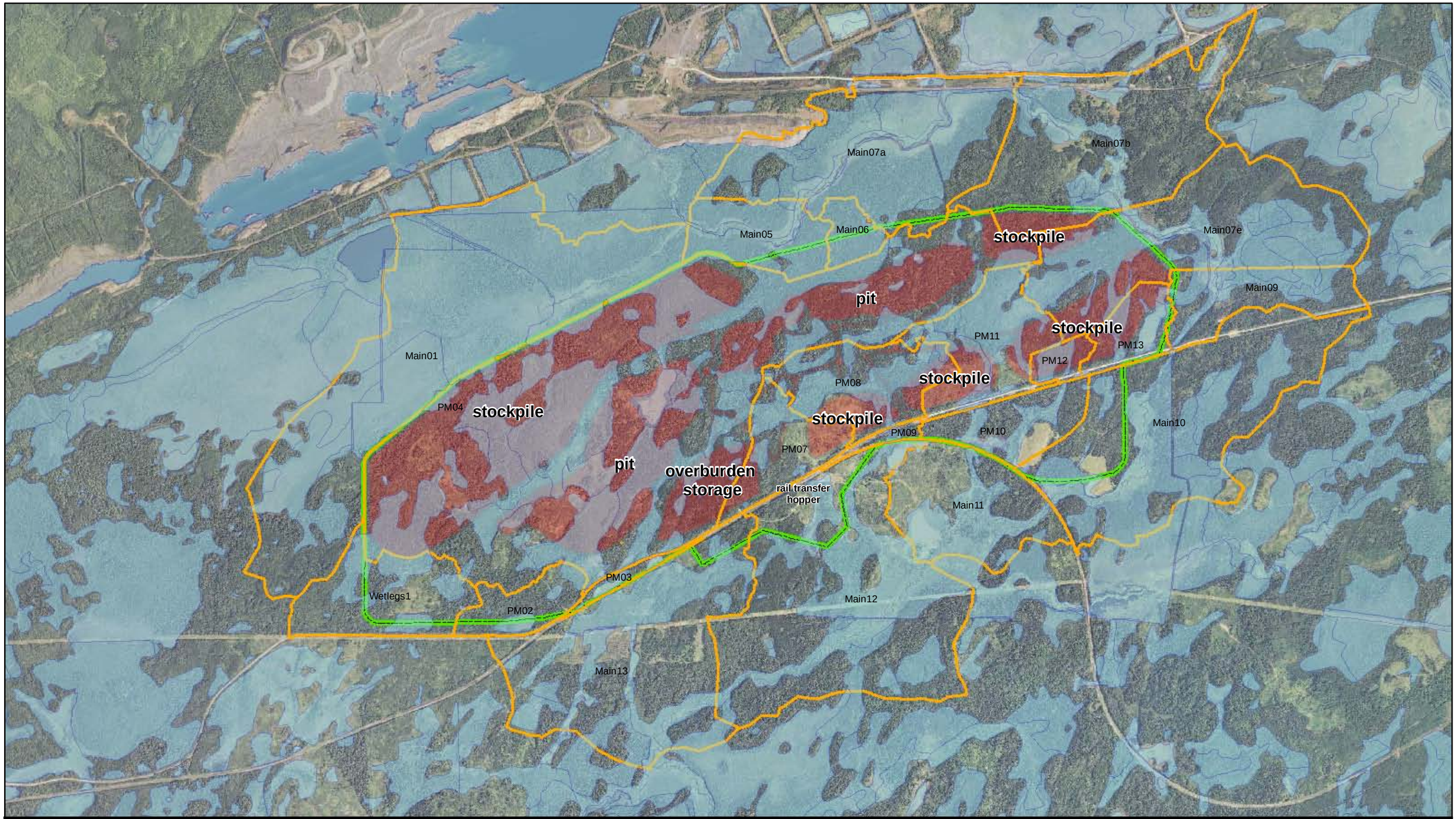
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-6
Watersheds - Existing Conditions

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- Watersheds - After Closure
- Wetlands
- Proposed Project Impact Areas
- Mine Site

N

0 1,000 2,000 4,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-7
Watersheds - After Closure (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Cell 2W

Cell 2E

Source: ERM

- Buttress Area
- Evaluation Area North of Tailings Basin
- Historic Wetland Impacts
- Wetlands North of Tailings Basin

Estimated Impacts (approximate):
Potential Indirectly Impacted Wetlands within the Evaluation Area: 546.2 acres
Historic Wetland Impacts: 197 acres
Potential Indirect Cell 2E Wetland Impacts: 349.2 acres

N

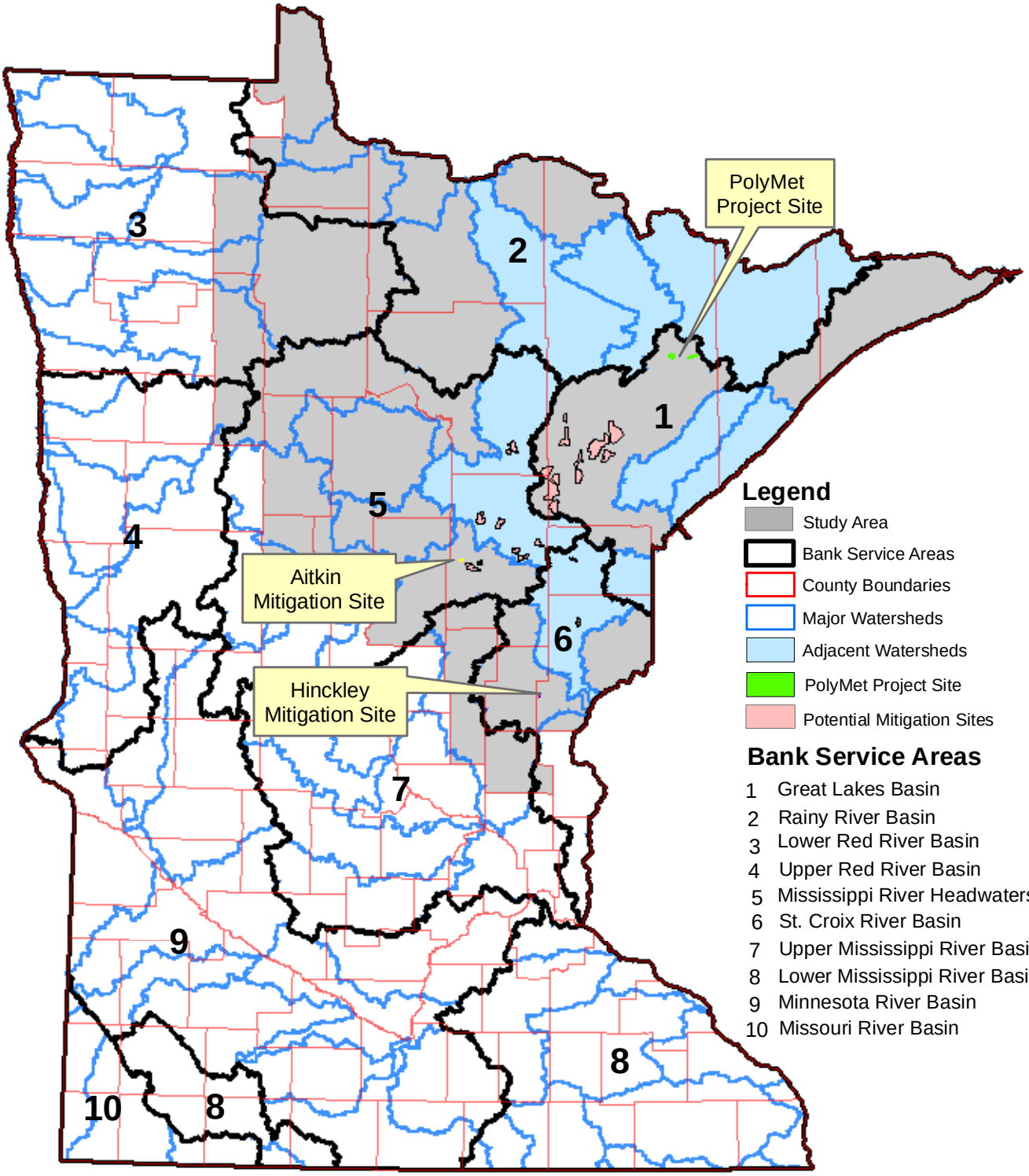
0 500 1,000 2,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-8
Potential Indirect Wetland Impacts at Tailings Basin (All Actions)
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

N

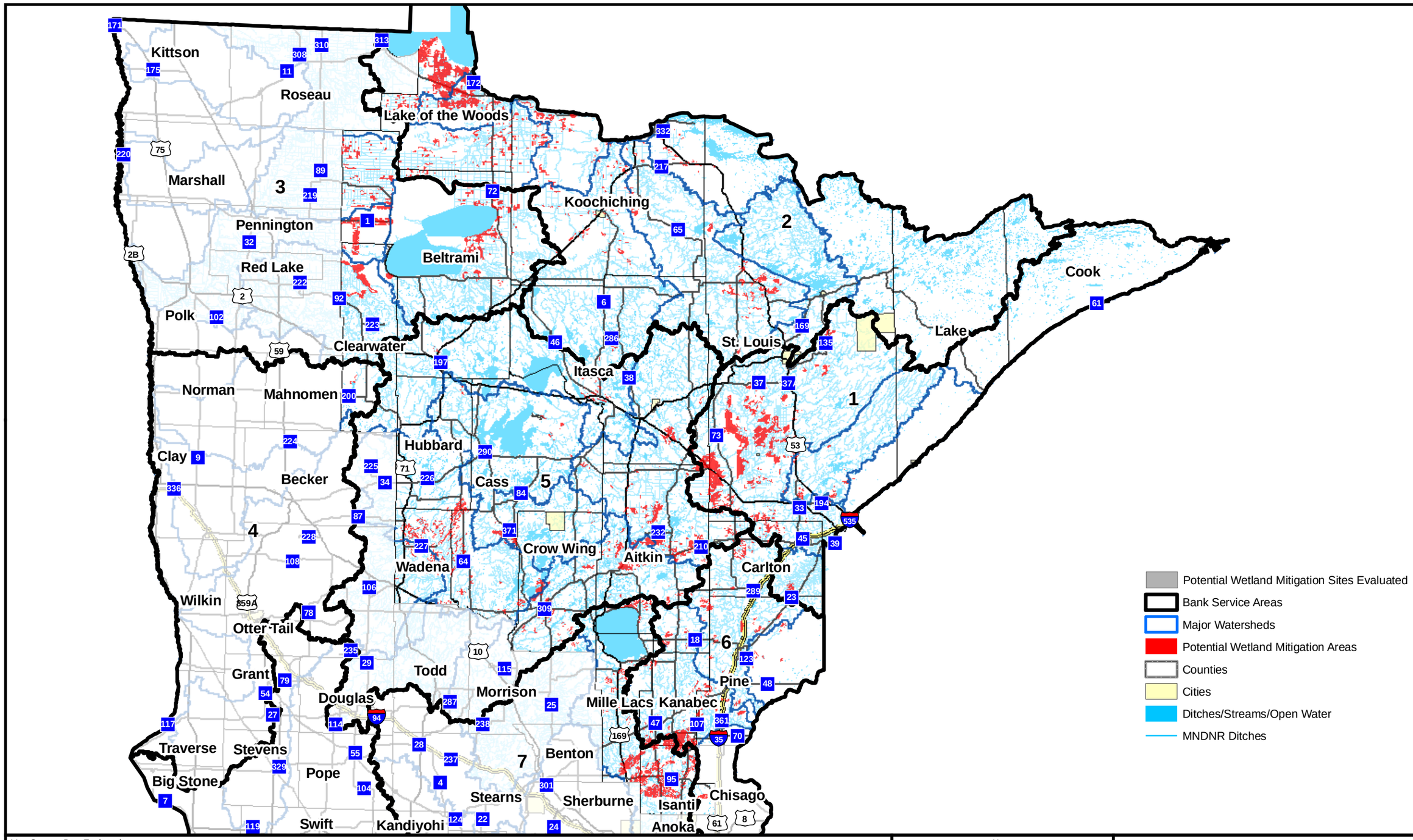
0 25 50 100 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-9
Wetland Mitigation Study Area and Bank Service Areas
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

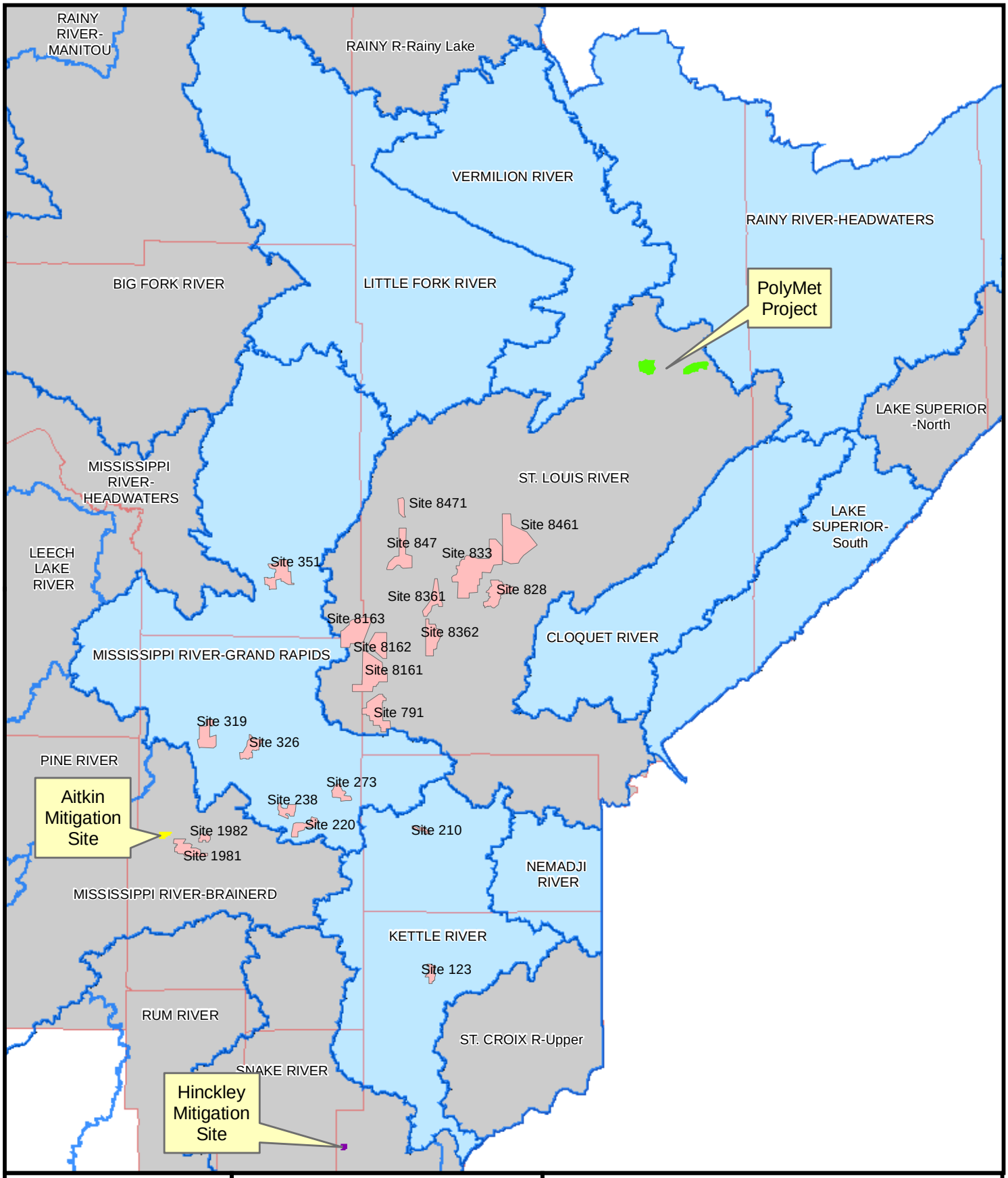
N

0 12.5 25 50 Miles

Figure 4.2-10
Potential Wetland Mitigation Areas

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

Legend

- Study Area
- County Boundaries
- Adjacent Watersheds
- Potential Mitigation Sites
- PolyMet Project Site

N

0 7.5 15 30 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.2-11
Wetland Mitigation Study Area And Watersheds
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

#1
21.6 ac

#2
36.2 ac

#3
81.7 ac

#4
14.7 ac

#5
23.4 ac

#6
105.8 ac

#7
74.2 ac

#8
159.6 ac

#9
88 ac

#10
12.8 ac

#11
7.1 ac

#12
89.1 ac

#13
71.4 ac

#14
12 ac

#15
50.7 ac

#16
52.6 ac

#17
27.2 ac

#18
1.4 ac

#19
3.8 ac

Map Source: Barr Engineering

Wetland Restoration Areas
Eggers & Reed Classification

- Alder Thicket
- Coniferous Bog
- Coniferous Swamp
- Deep Marsh
- Hardwood Swamp
- Open Bog
- Sedge Meadow
- Shallow Marsh
- Shrub Carr
- Upland
- Wet Meadow

Approximate Property Boundaries

Elevation Contours

1188 1194 1200 1206 1212
1189 1195 1201 1207 1213
1190 1196 1202 1208
1191 1197 1203 1209
1192 1198 1204 1210
1193 1199 1205 1211

N

0 500 1,000 2,000 Feet

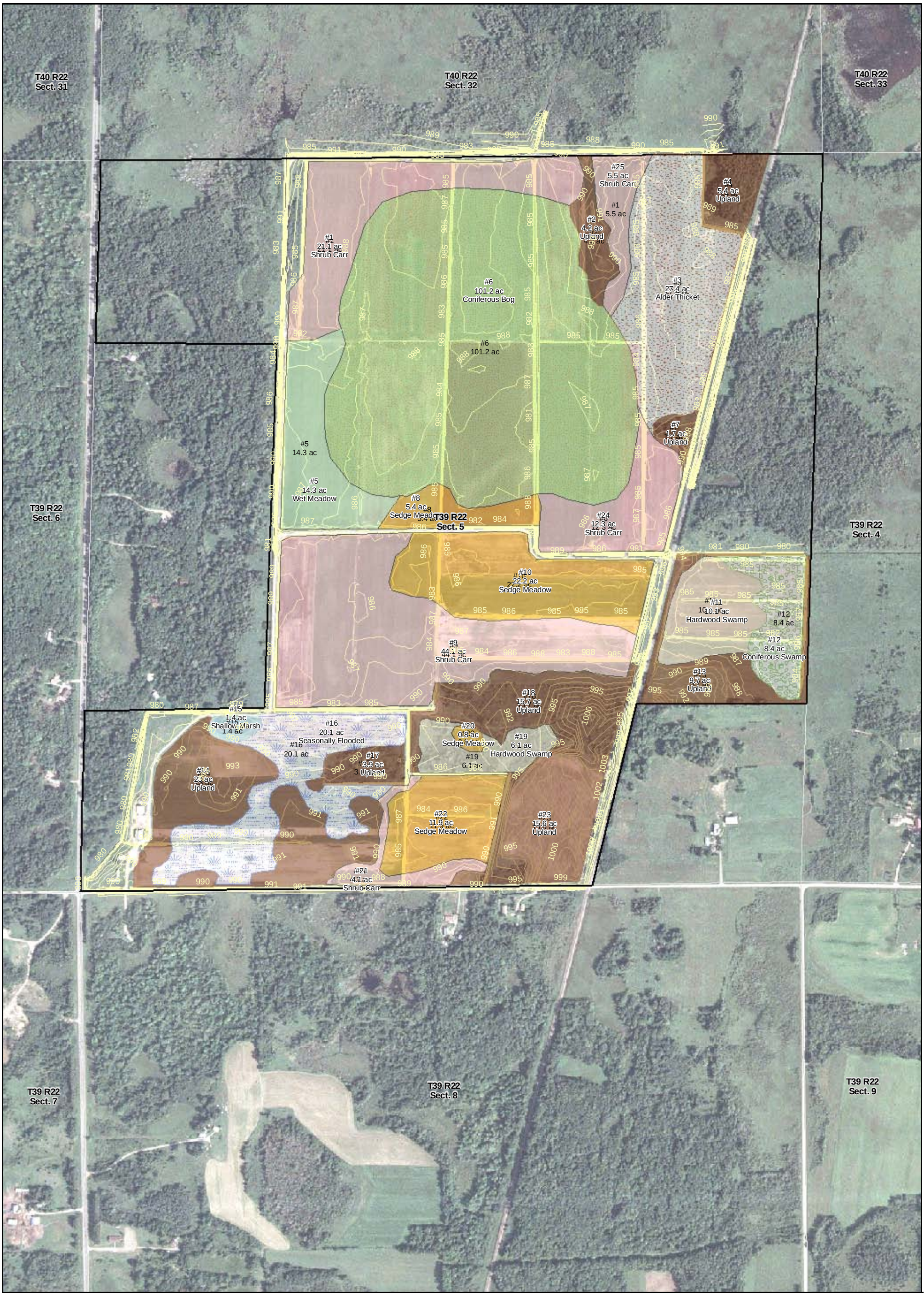
Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.2-12
Aitkin Wetland Mitigation Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source:
Barr Engineering

Approximate Property Boundaries
1-Foot Topography
Public Land Survey

Wetland Restoration Types
Eggers & Reed Classification

- Alder Thicket
- Coniferous Bog
- Coniferous Swamp
- Deep Marsh
- Hardwood Swamp
- Open Bog
- Seasonally Flooded
- Sedge Meadow
- Shallow Marsh
- Shrub Carr
- Upland
- Wet Meadow

N

0 250 500 1,000 Feet

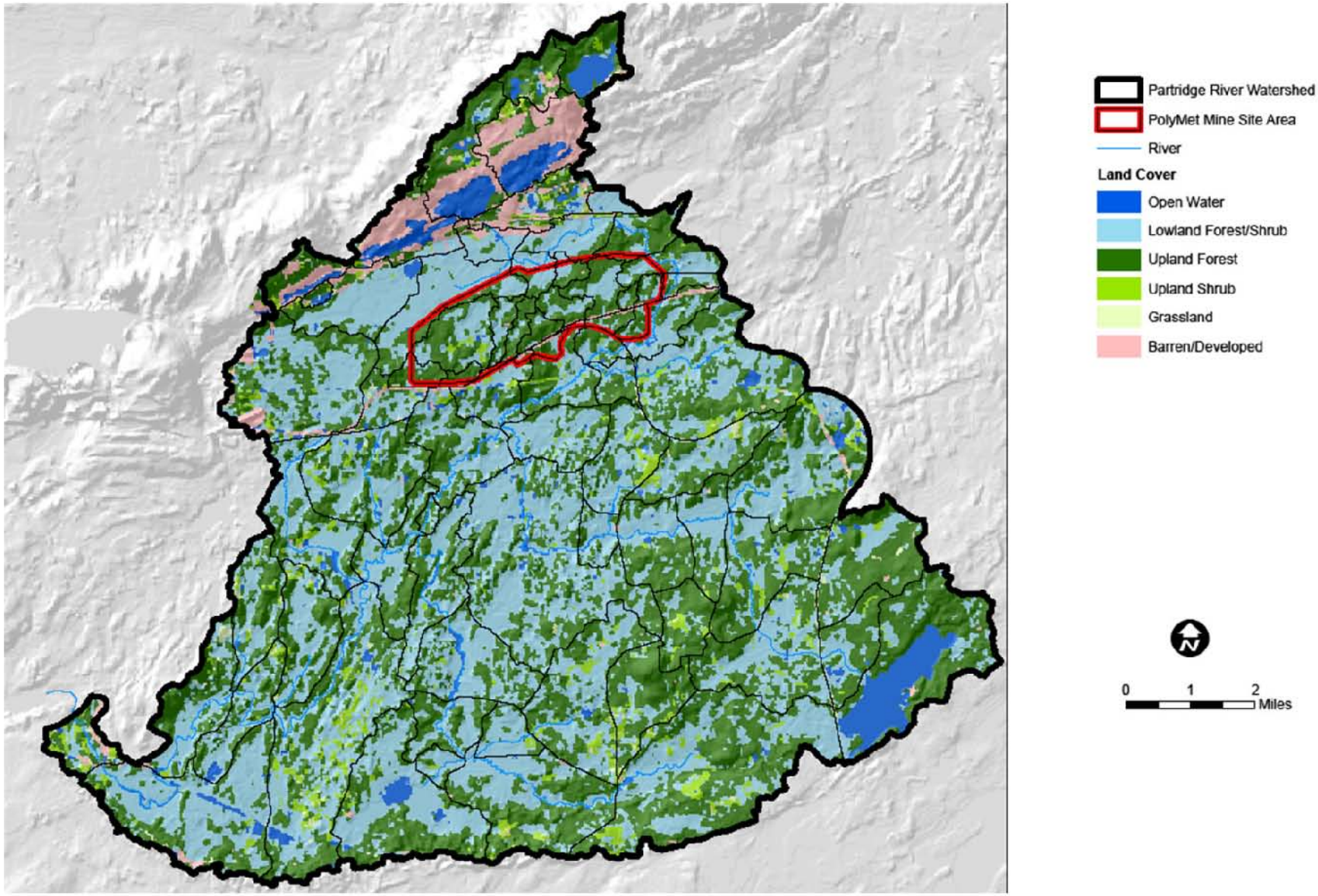
Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.2-13
Hinckley Wetland Mitigation Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

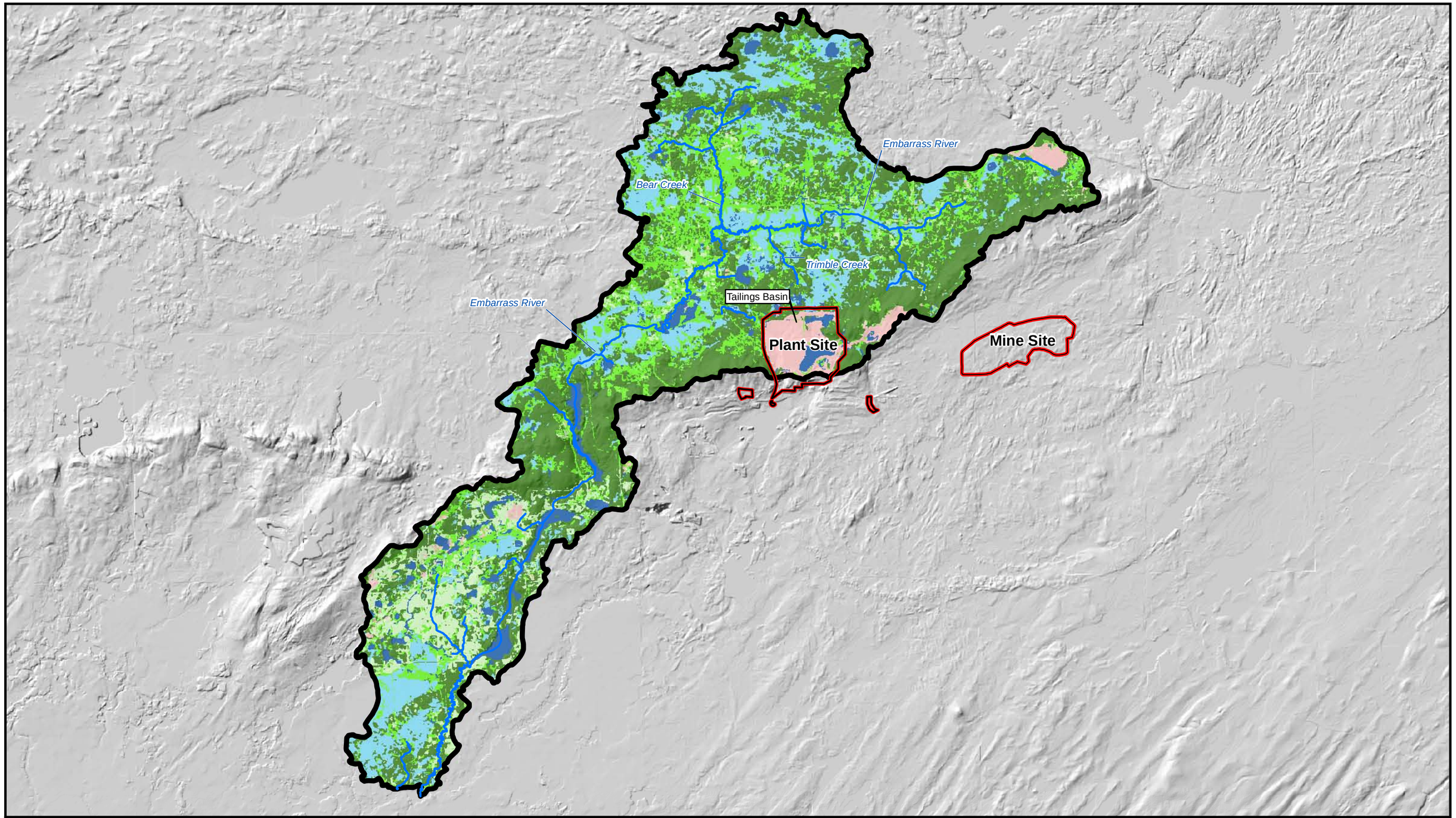
October 2009



Map Image Source: Barr Engineering

Figure 4.2-14
Partridge River GAP Analysis Coverage of Mine Site
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Basemap source: Barr Engineering

Rivers/Streams
Embarrass River Watershed
NorthMet Project Sites

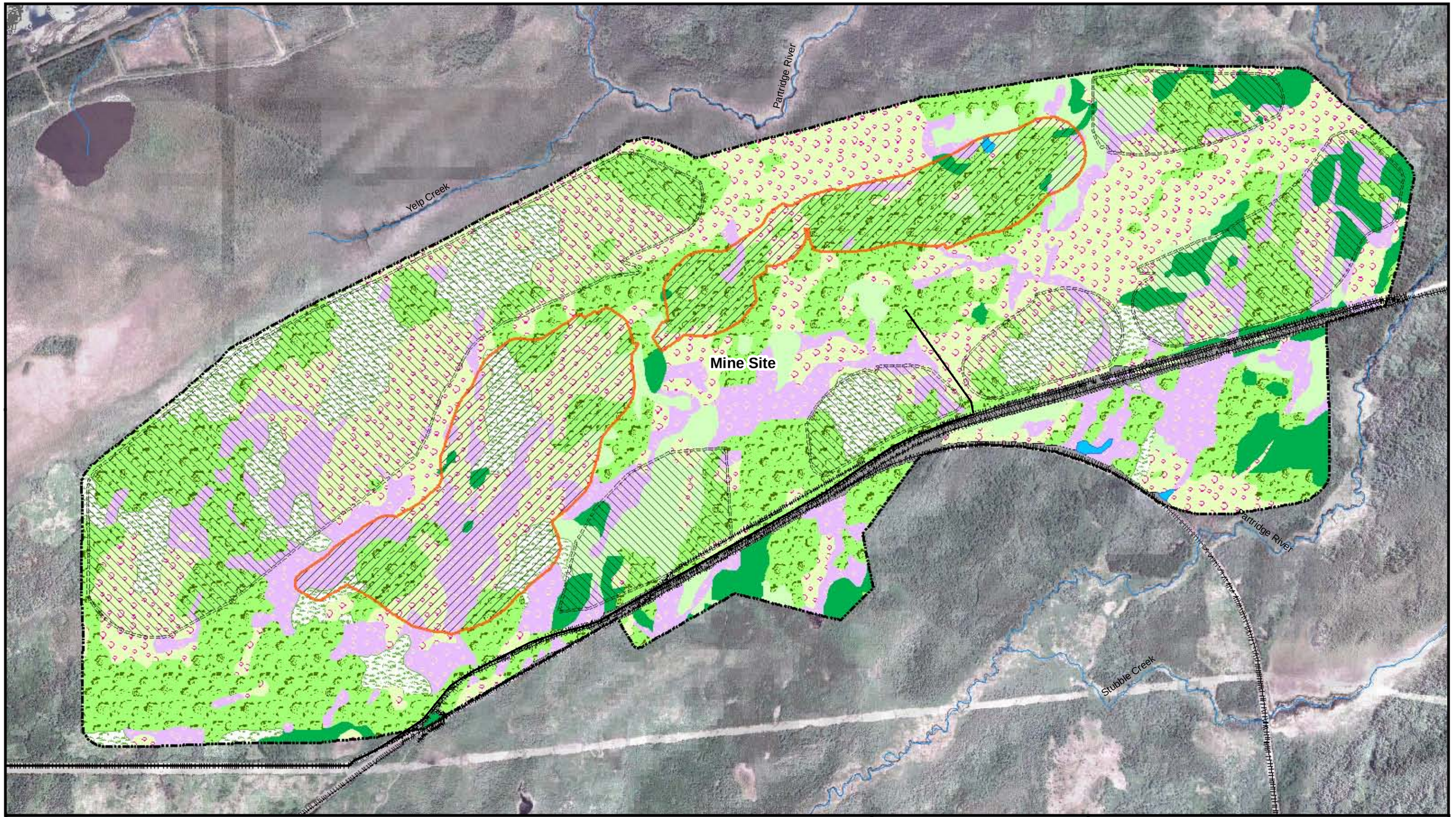
Land Cover
Open Water
Lowland Forest
Upland Forest
Upland Shrub
Grassland
Barren/Developed

N
0 1 2 4 Miles

Minnesota Department of Natural Resources
US Army Corps of Engineers St. Paul District

Figure 4.2-15
Embarrass River GAP Analysis Coverage of the Plant Site
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Rivers/Streams/Drains
- Dunka Road
- Existing Railroad
- Mine Pit Impact Areas
- Stockpile Impact Areas

Land Cover

- Disturbed
- Grass/Brushland
- Aspen Forest/Aspen-Birch Forest
- Jack Pine Forest
- Mixed Pine-Hardwood Forest
- Mixed Hardwood Swamp
- Black Spruce Swamp/Bog
- Open Water

N

0 500 1,000 2,000 Feet

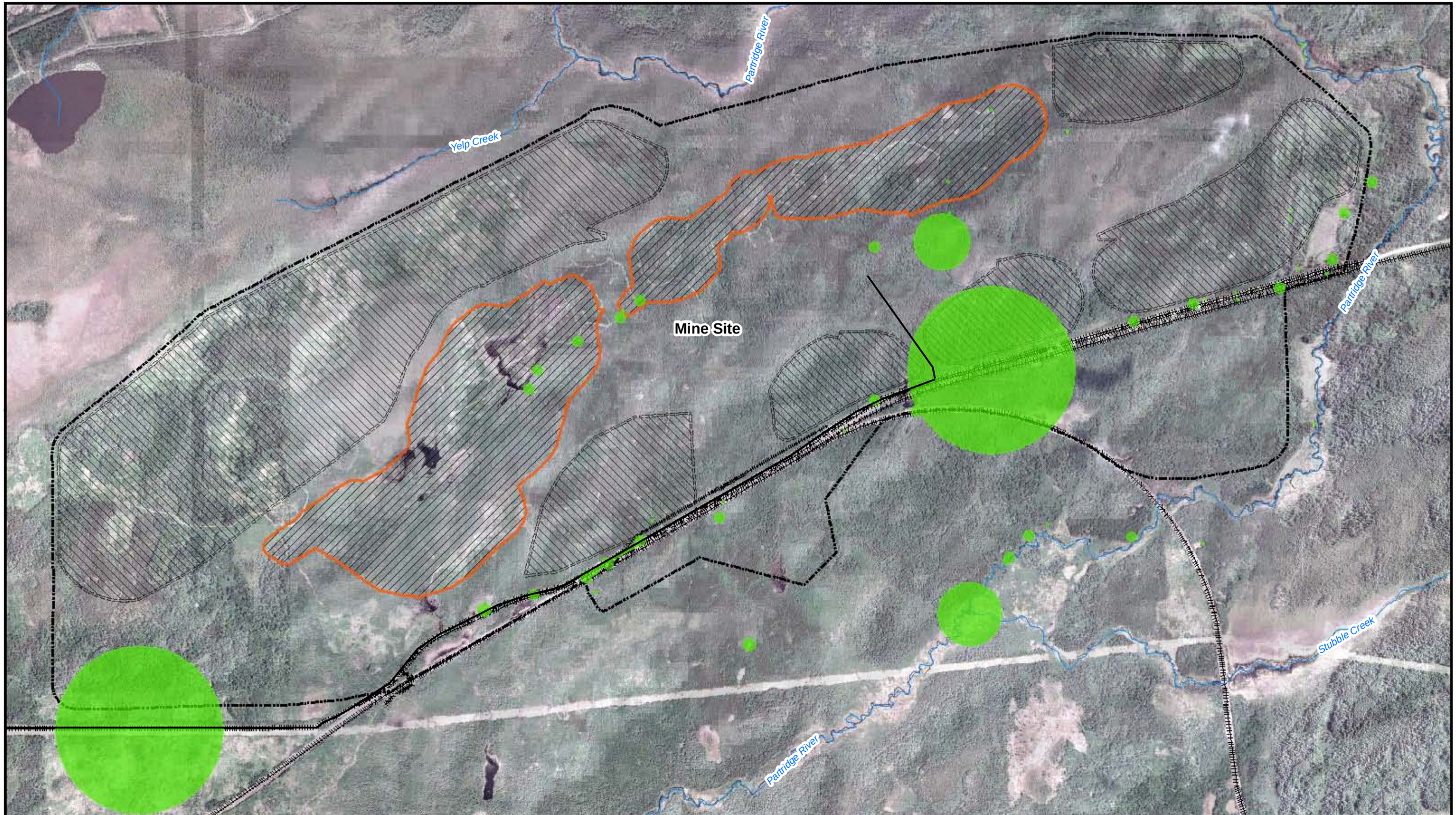
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.3-1
Land Cover at the Mine Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: 2009 MnDNR and Barr Engineering

- Rivers/Streams/Drains
- Existing Railroad
- Mine Pit Impact Areas
- Stockpile Impact Areas
- Endangered, Threatened, and Special Concern Vegetation Species

N

0 500 1,000 2,000 Feet

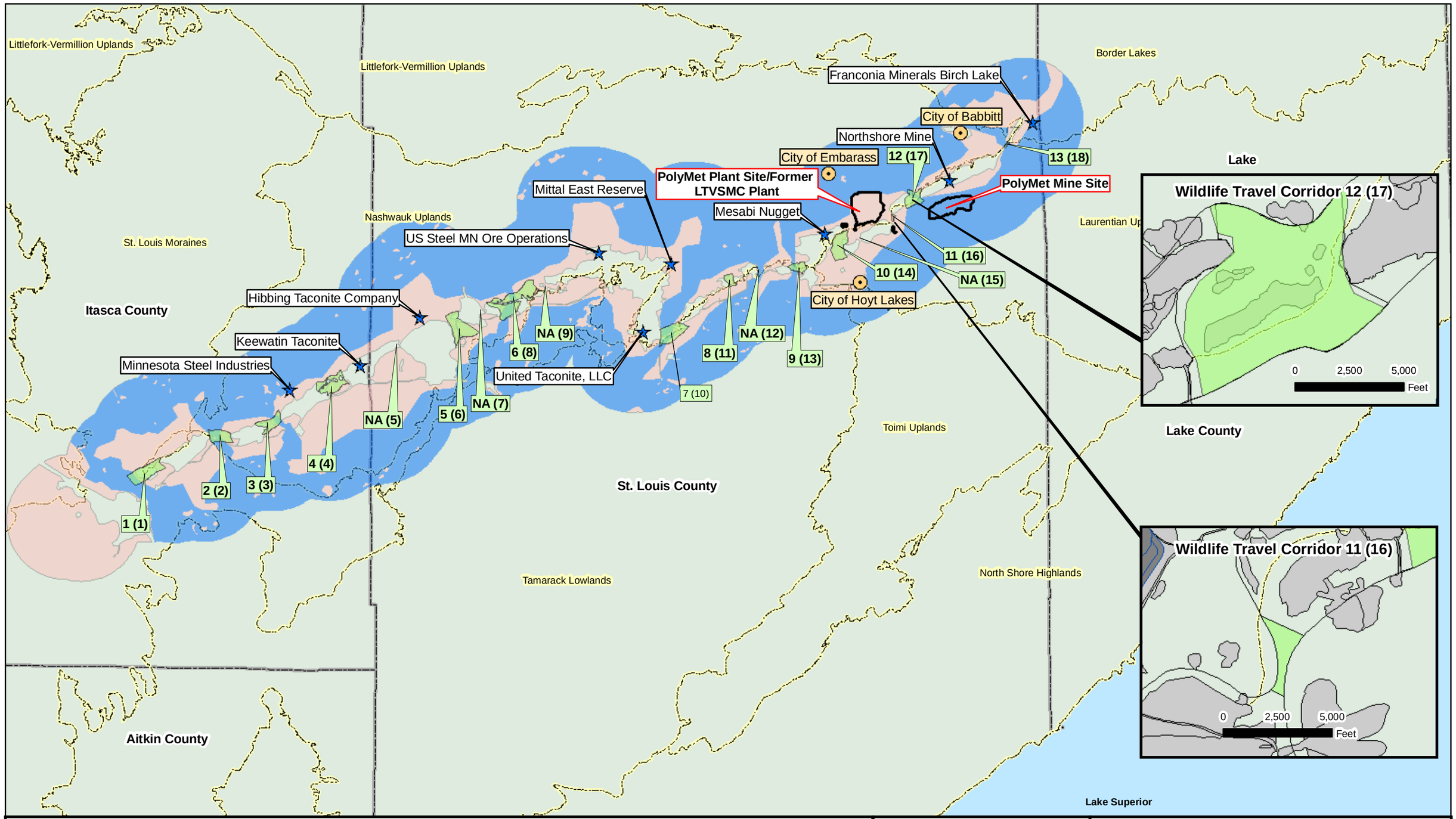
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.3-2
ETSC Vegetation Species at the Mine Site

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Sources: Barr Engineering (2009), MnDNR (2006), Emmons and Olivier (2006)

- Cities
- Other Regional Projects
- Counties
- Project Boundaries
- Ecosystem Subsections
- Wildlife Travel Corridors (Emmons and Olivier 2006)
- Wildlife Travel Corridors (Barr Engineering 2009)
  - Moderate Quality Corridor
  - High Quality Corridor

Wildlife Travel Corridor Key

Emmons and Olivier 2006 — 7 (10) — Barr Engineering 2009

NA = Not Identfied in Emmons and Olivier 2006

N

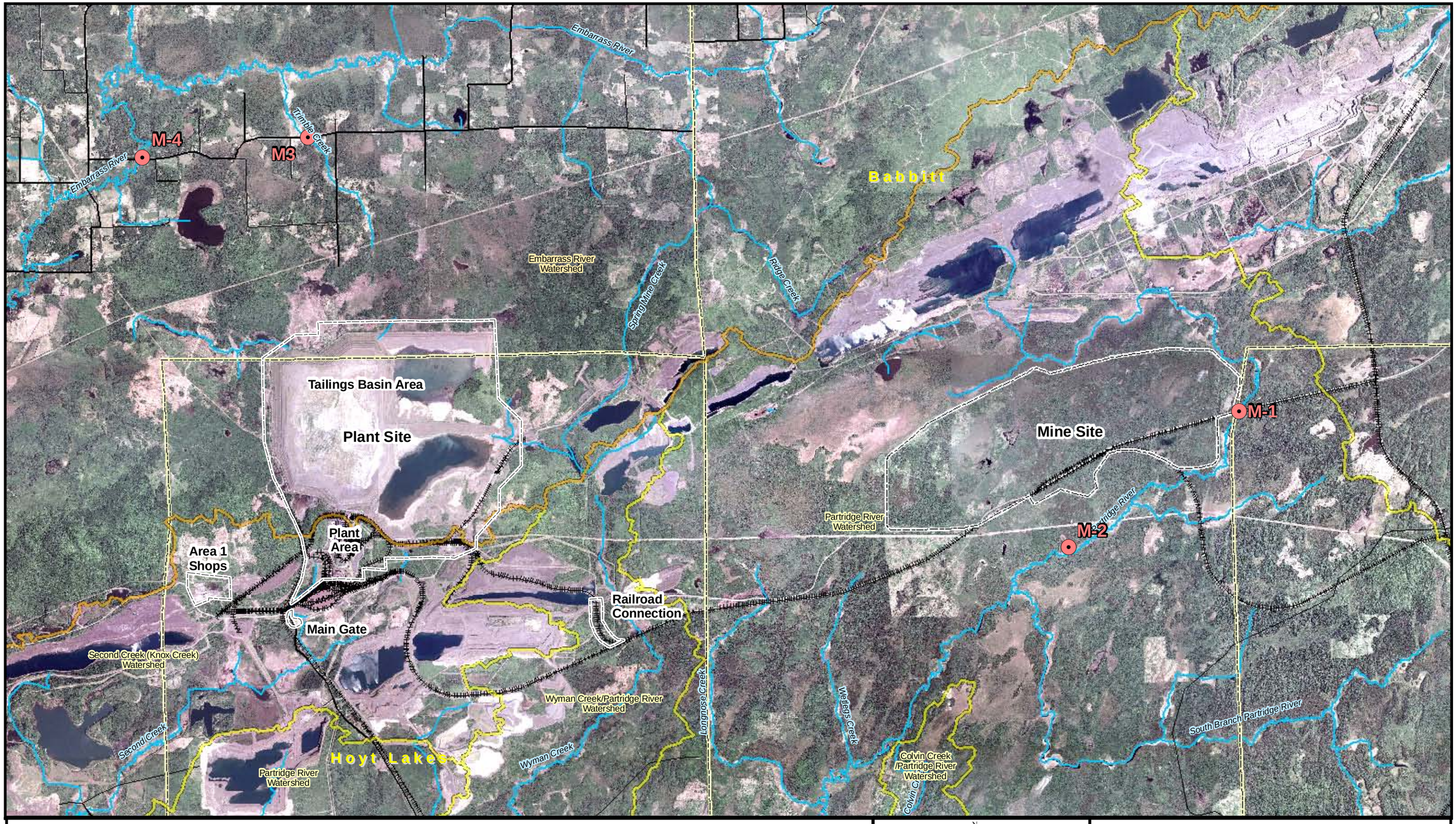
0 2.5 5 10 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers, St. Paul District

Figure 4.4-1
North-South Wildlife Travel Corridors in the Mesabi Iron Range
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Sampling Locations (Heath 2004)
- River/Stream
- Railroad
- Watershed Boundary
- Embarrass River Watershed Boundary

N

0 0.5 1 2 Miles

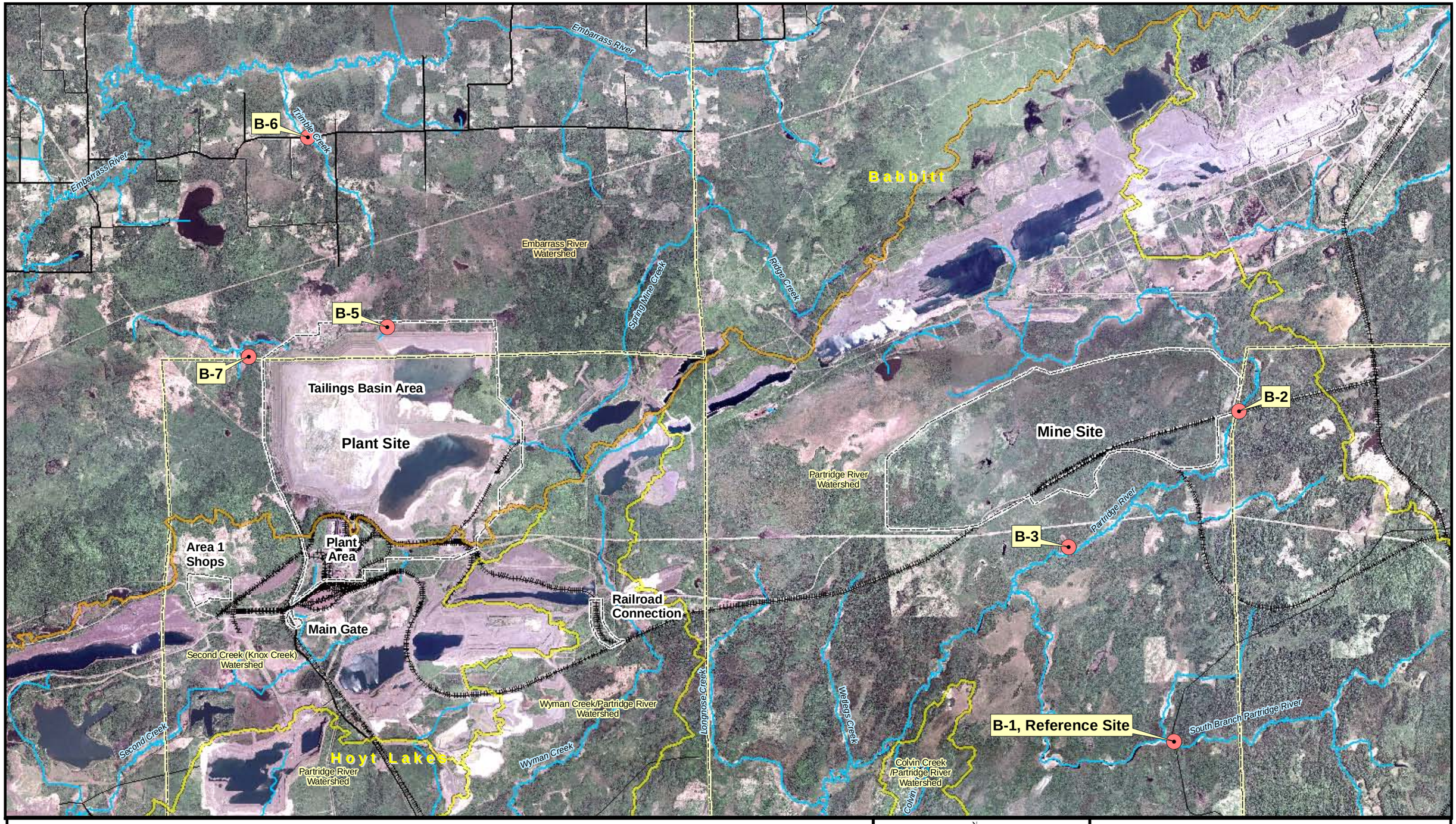
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.5-1
Freshwater Mussel Sampling Locations

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: Barr Engineering

- Sampling Locations (Breneman, 2005)
- River/Stream
- Railroad
- Watershed Boundary
- Embarrass River Watershed Boundary

N

0 0.5 1 2 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.5-2
Biological Sampling Points

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

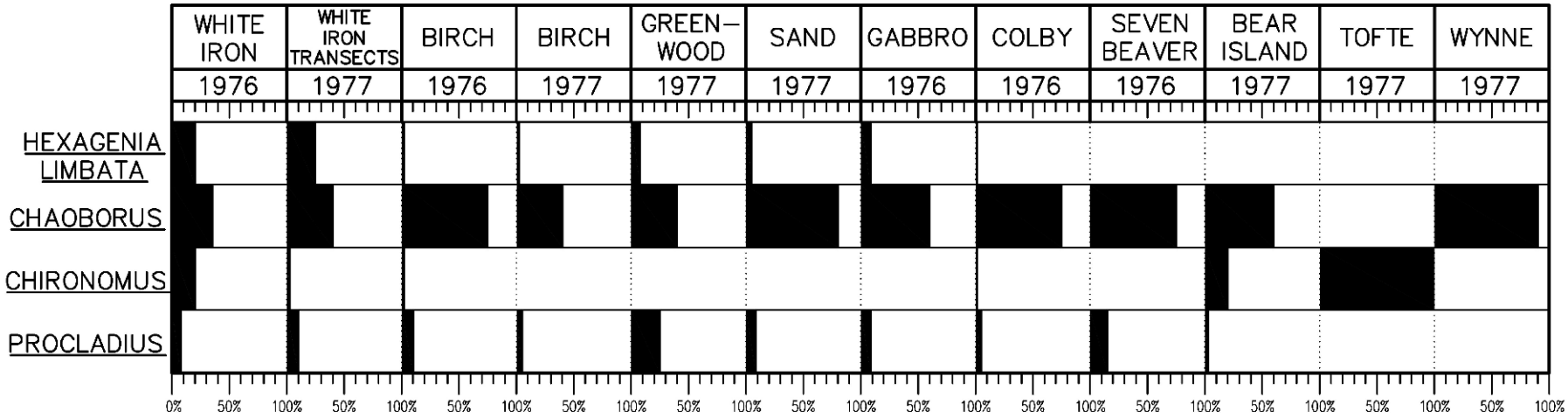
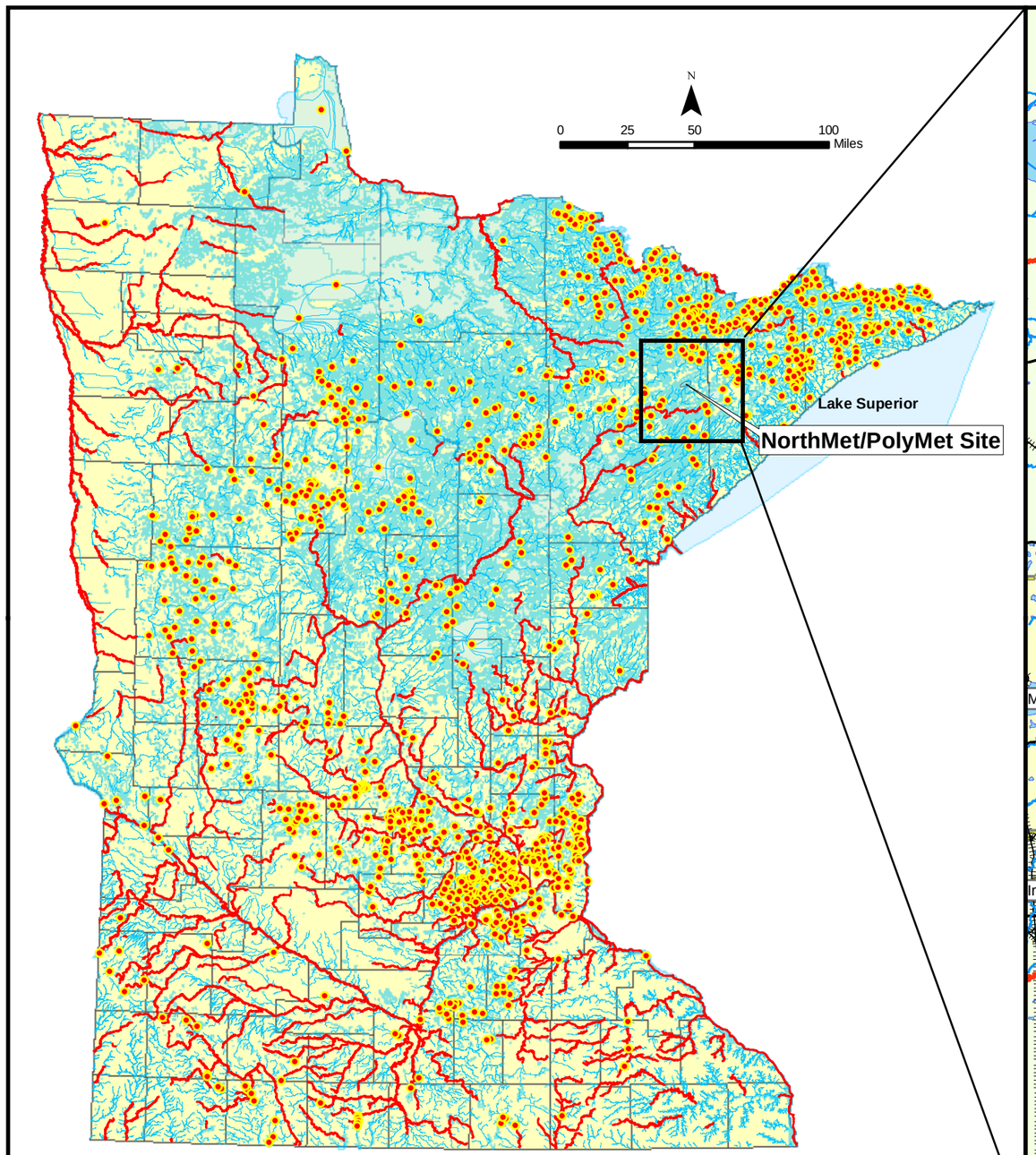


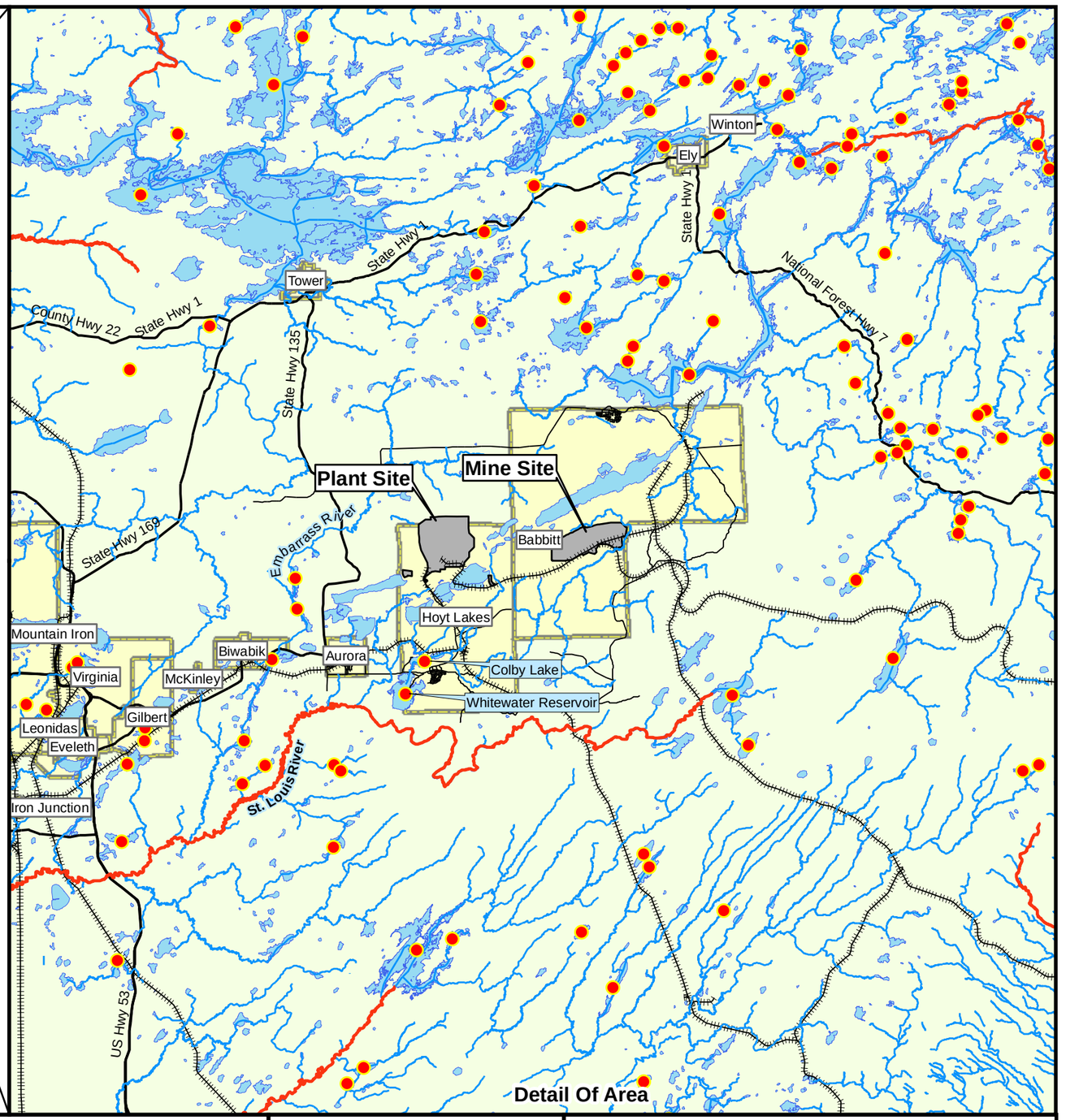
Figure Source: Barr Engineering

No Scale

Figure 4.5-3
Mean Percent Composition of Dominant Taxa in Lakes
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009





Data Source: MnDNR

- Mercury Impaired Lake/Reservior
- Mercury Impaired River/Stream
- PWI Rivers and Streams
- PWI Lakes
- Area Roads
- Existing Railroads
- Incorporated Limits of Cities/Villages

N
0 2.5 5 10
Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.5-4
Mercury Impaired Waters of Minnesota

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

Methylmercury Enrichment at 0 cm, 5 cm, and 10 cm Depth Resulting from Experimental 2X and 20X Enrichment of Average Monthly Sulfate Deposition to the Surface of a Pristine Peatland in Northwestern Ontario

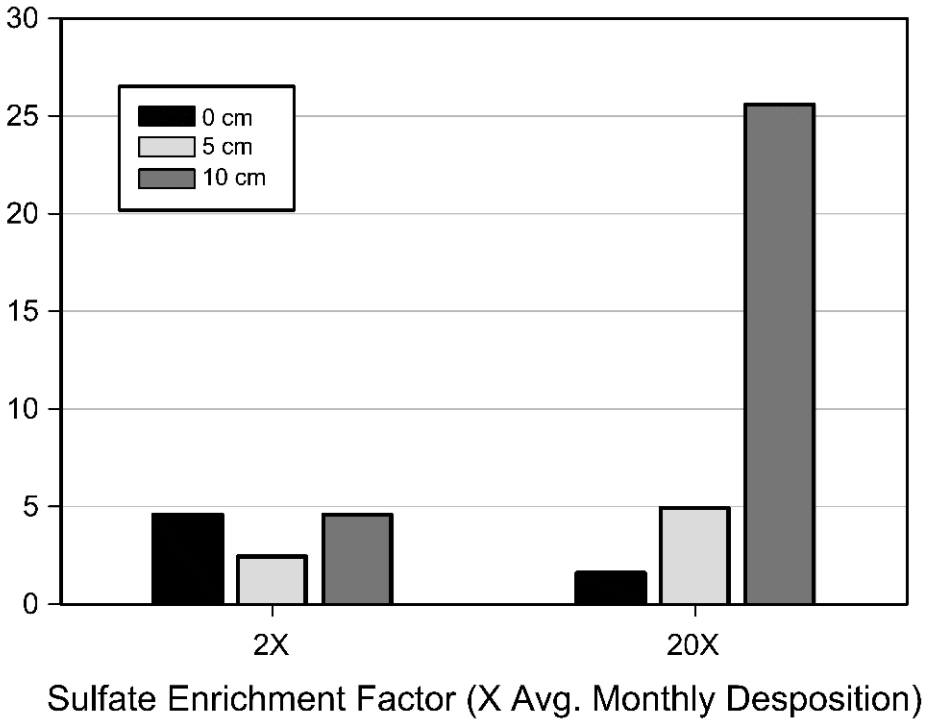


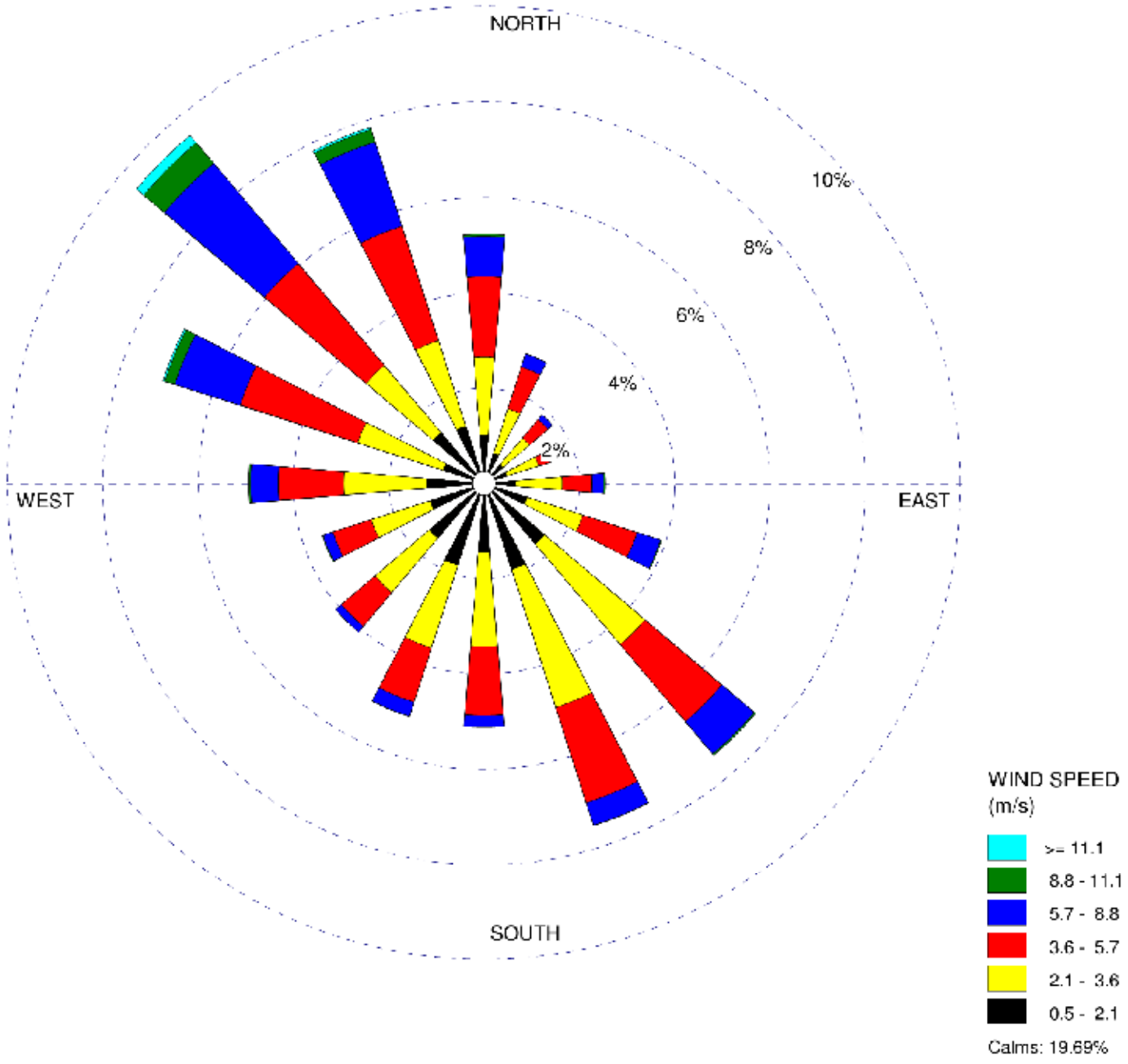
Figure Source: Barr Engineering

No Scale

Figure 4.5-5
MeHg Response to Sulfate Addition

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Source: Barr Engineering

N

No Scale

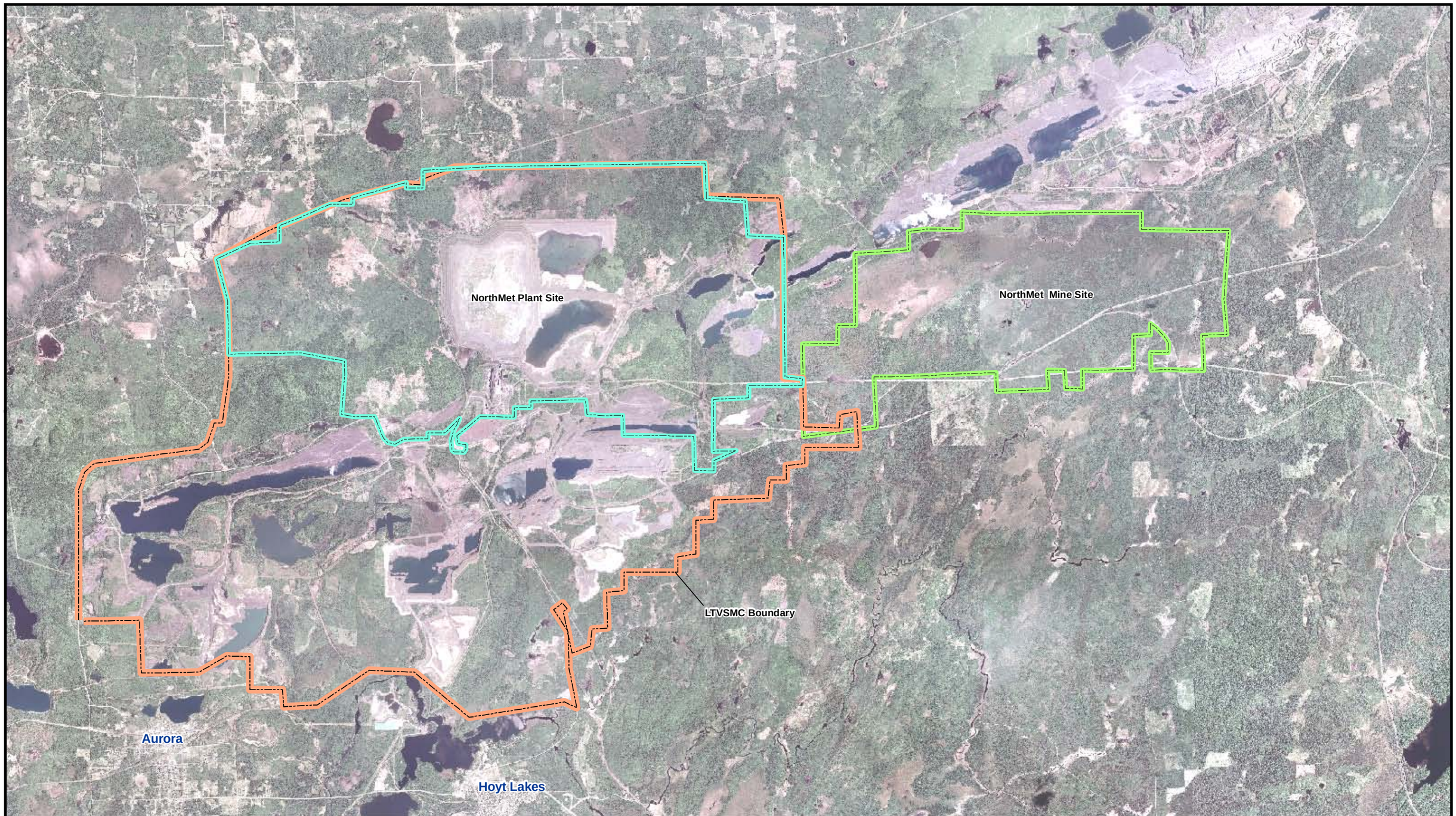
Minnesota Department of Natural Resources

US Army Corps of Engineers
St. Paul District

Figure 4.6-1
Wind Frequency Distribution Plot for Hibbing, Minnesota (2001 - 2005)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map Source: Barr Engineering

- LTVSMC Modeling Boundary
- NorthMet Plant Site Modeling Boundary
- NorthMet Mine Site Modeling Boundary

N

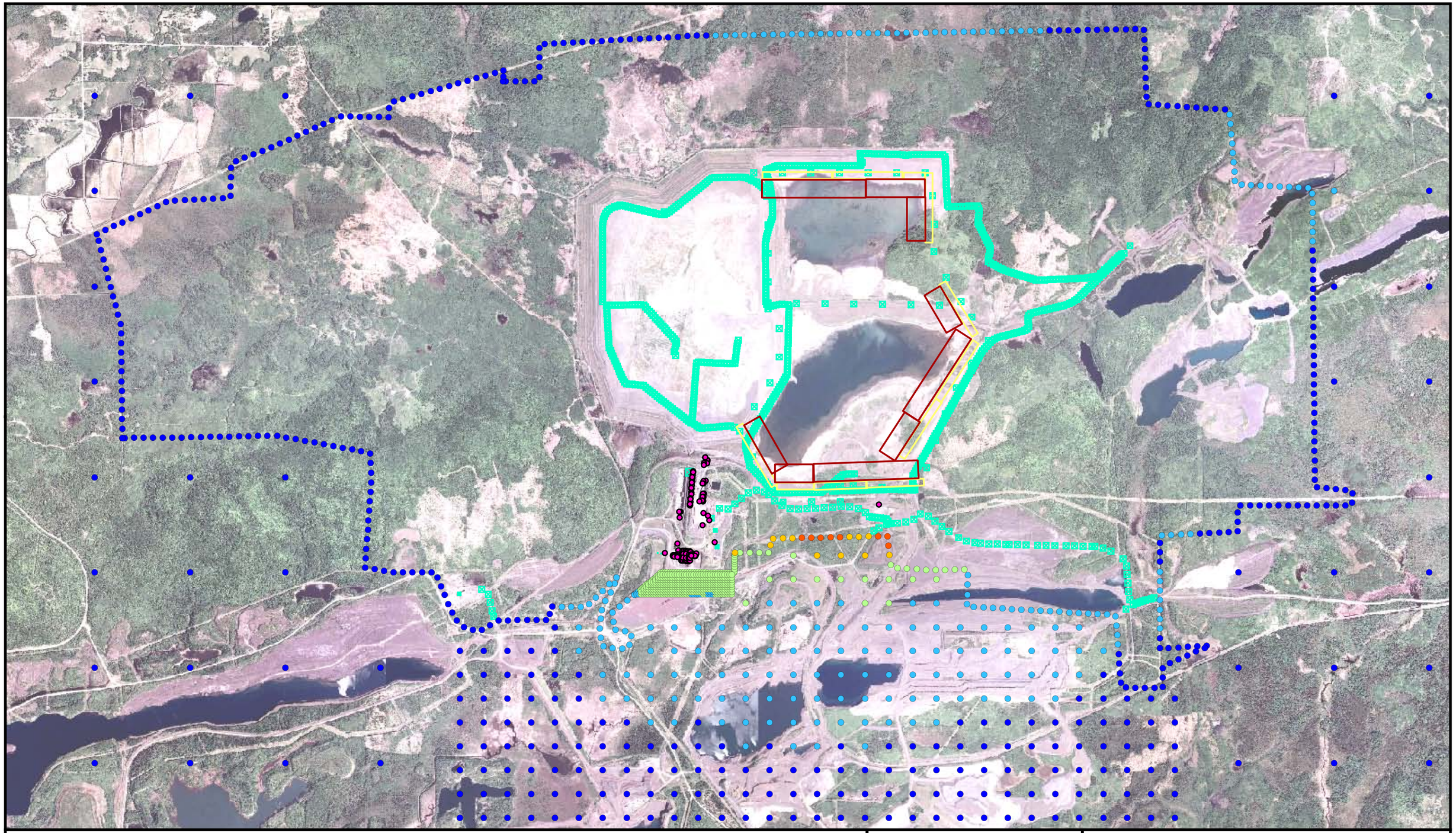
0 0.5 1 2 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.6-2
NorthMet and LTVSMC Modeling Boundary Locations
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



24 Hour H6H Results (ug/m3)

- 34 - 45
- 46 - 65
- 66 - 85
- 86 - 100
- 101 - 119

- Point Sources
- LTV Coarse Tailings
- PolyMet Bulk Tailings
- Volume Sources

PM10 24 hour NAAQS = 150 ug/m3
Background Concentration of 33 ug/m3 Included

N

0 1,250 2,500 5,000 Feet

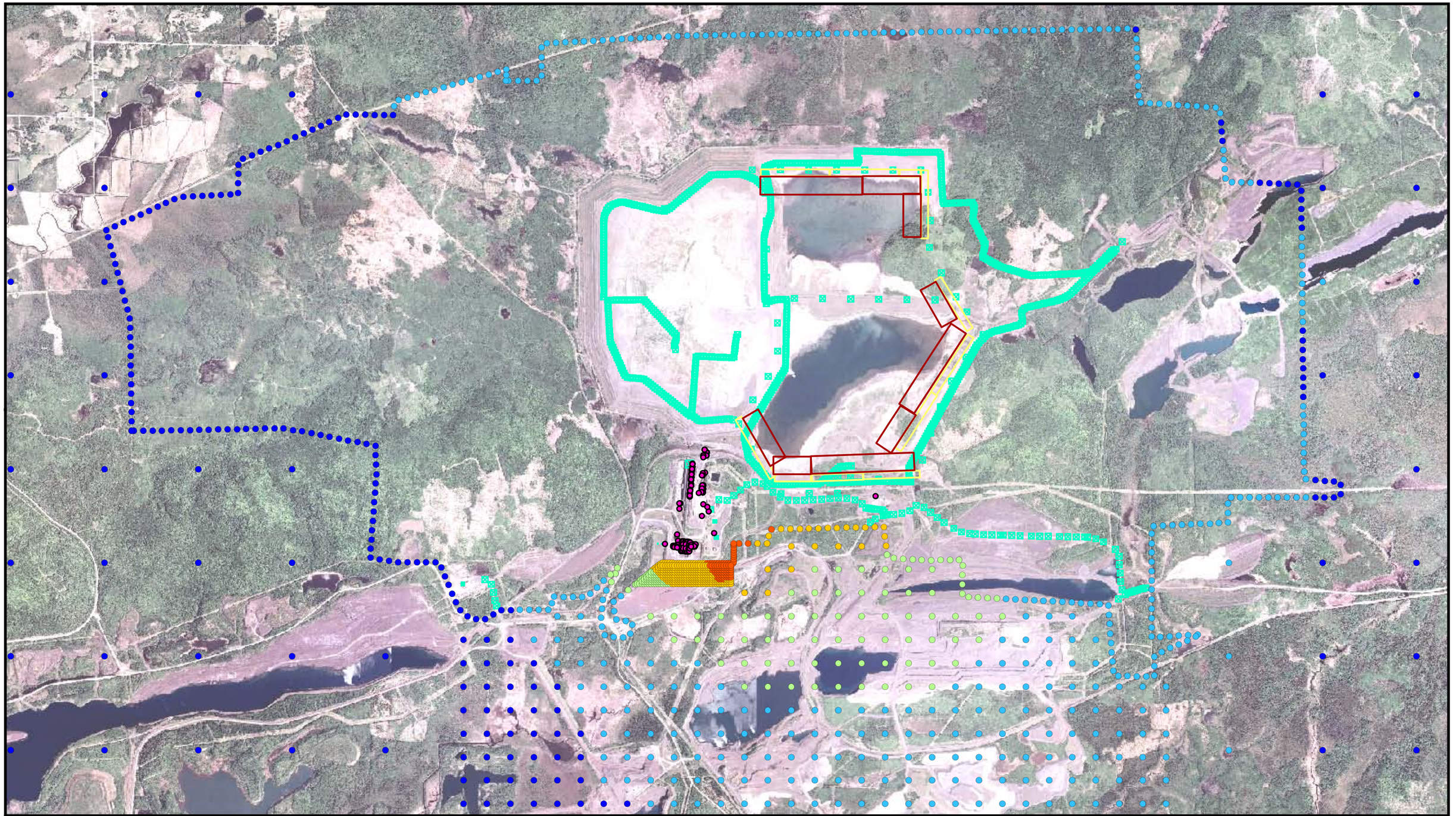
Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.6-3
Plot of PM10 NAAQS 24 hour Highest Sixth High Concentrations at Plant Site (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



24 Hour H8H Results (ug/m3)

- 18 - 20
- 21 - 23
- 24 - 26
- 27 - 30
- 31 - 34

- Point Sources
- LTV Coarse Tailings
- PolyMet Bulk Tailings
- Volume Sources

PM2.5 24 hour NAAQS = 35 ug/m3
Background Concentration of 17 ug/m3 Included

N

0 1,250 2,500 5,000 Feet

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.6-4
Plot of PM2.5 NAAQS 24 hour Highest Eigth High Concentrations at Plant Site (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota
October 2009

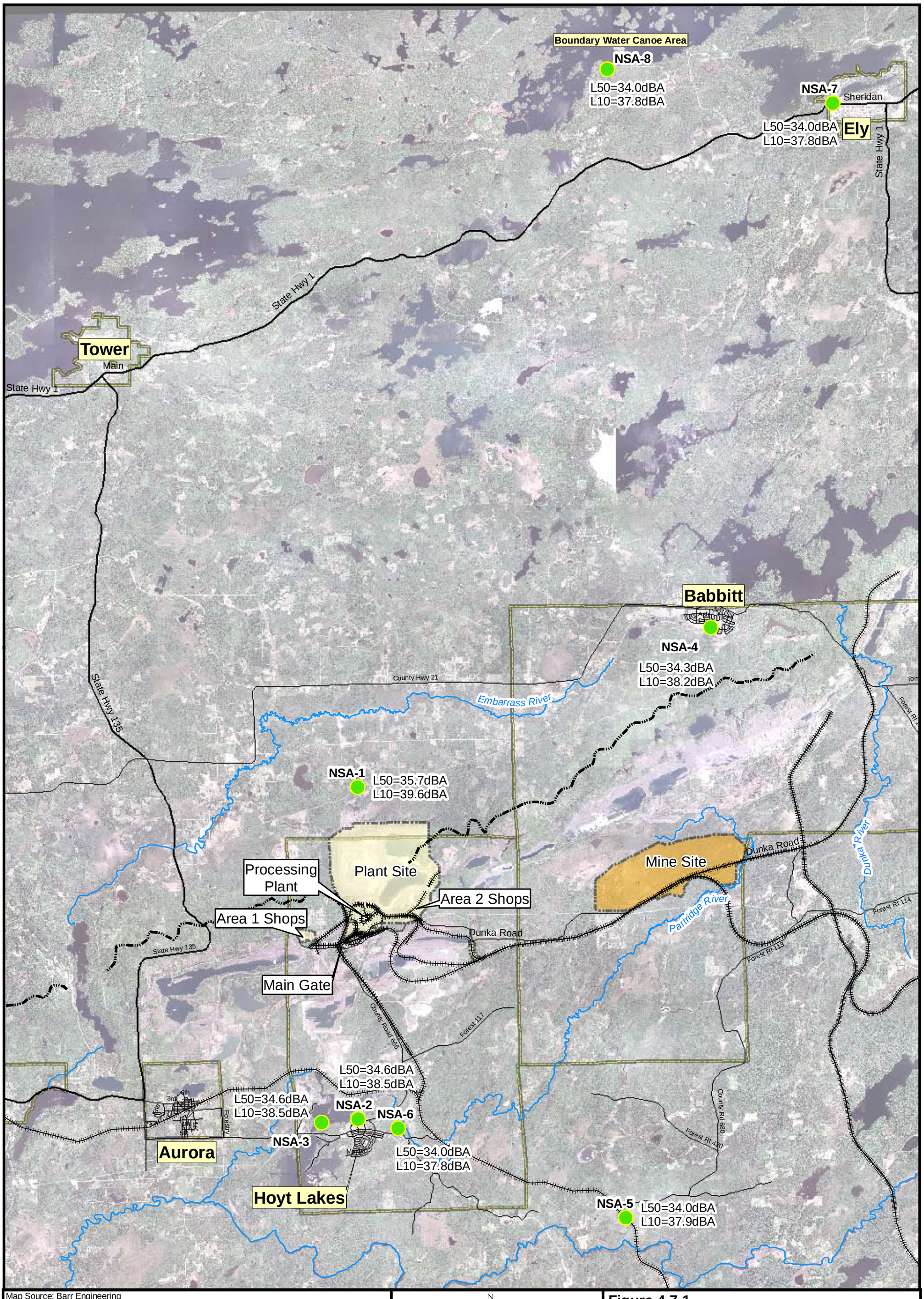


Figure 4.7-1
Predicted Nighttime Noise Levels for the Proposed Action
NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

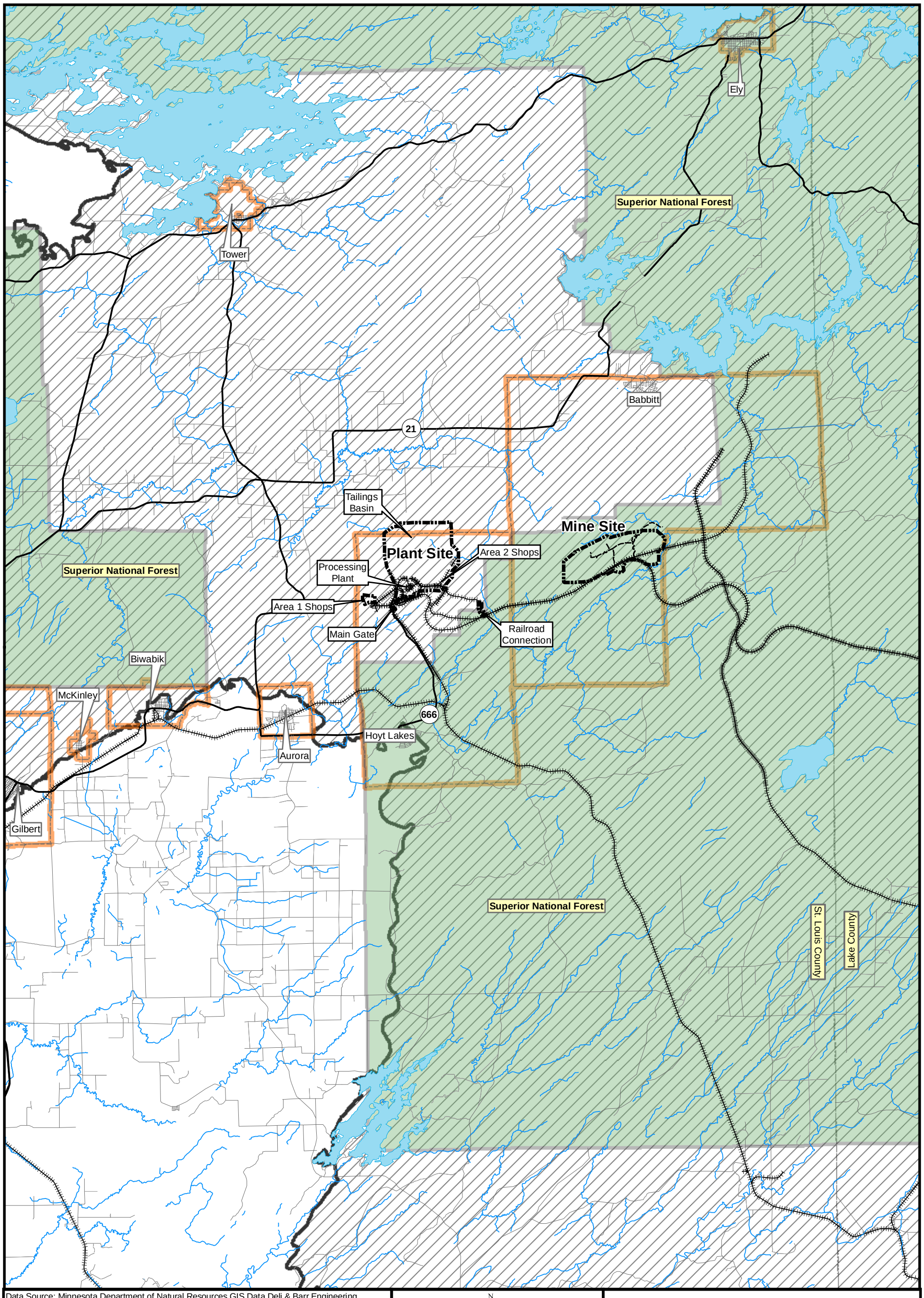


Figure 4.9-1
Land Use Jurisdiction Map

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

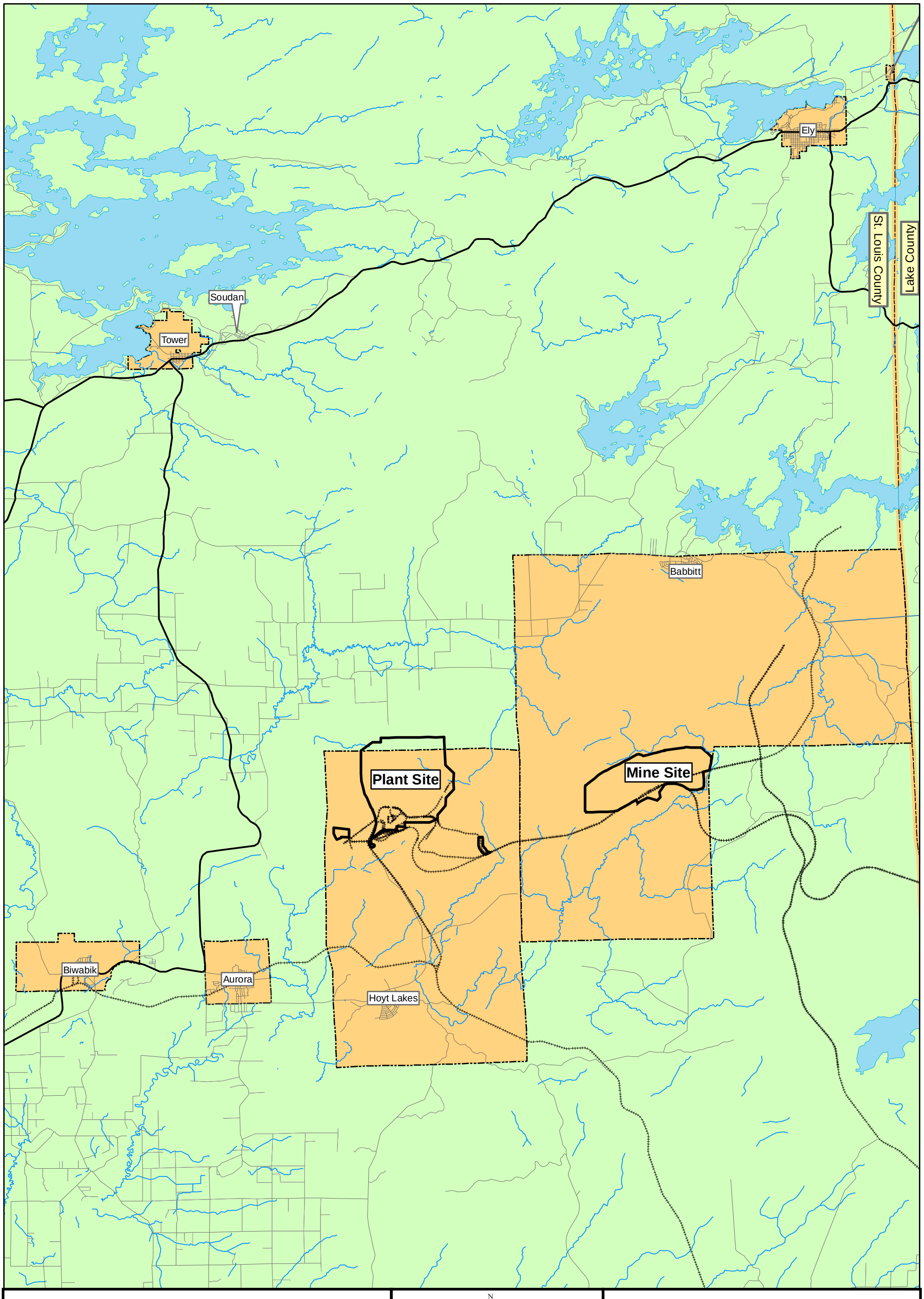


Figure 4.10-1
Area Municipalities Map (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009

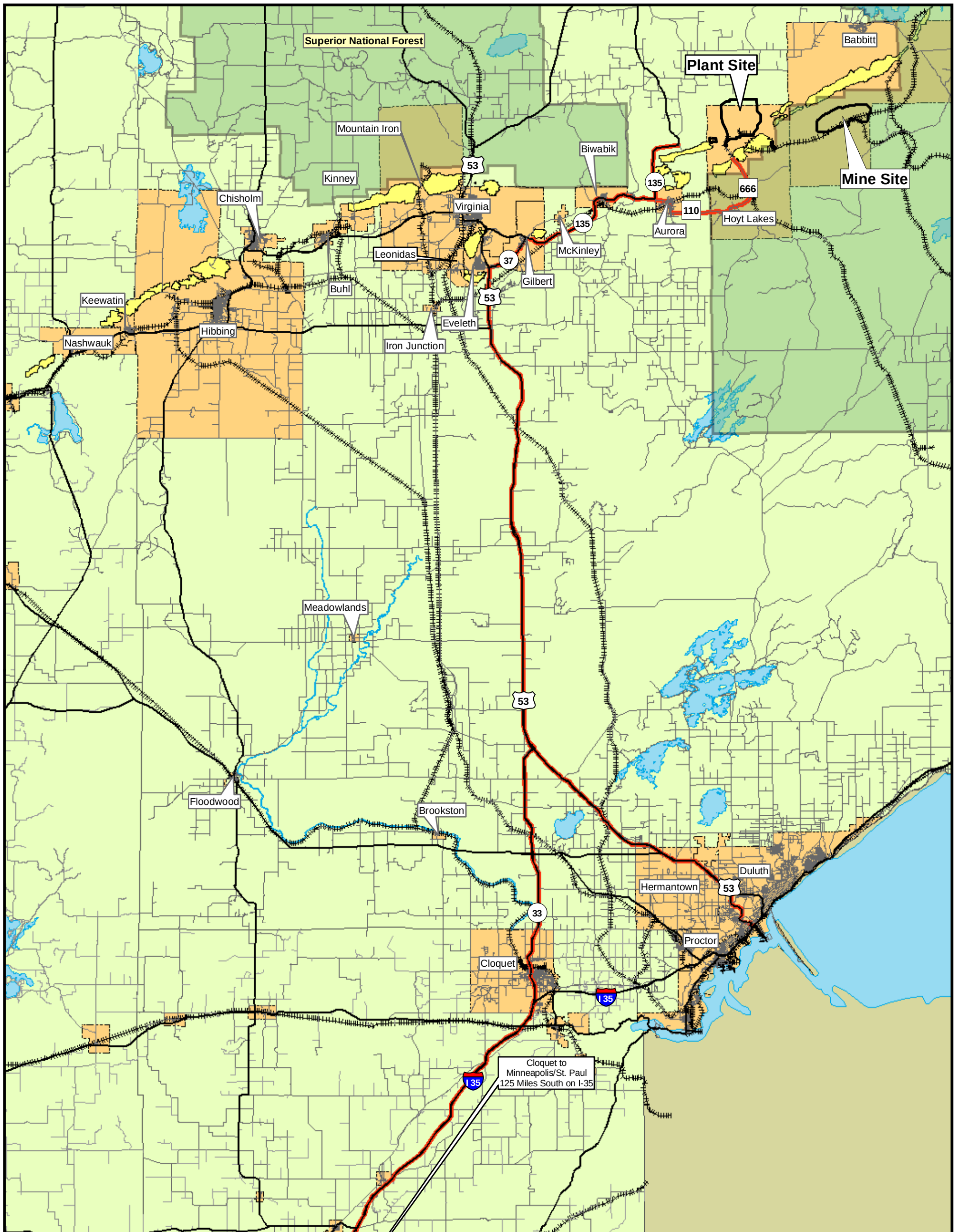
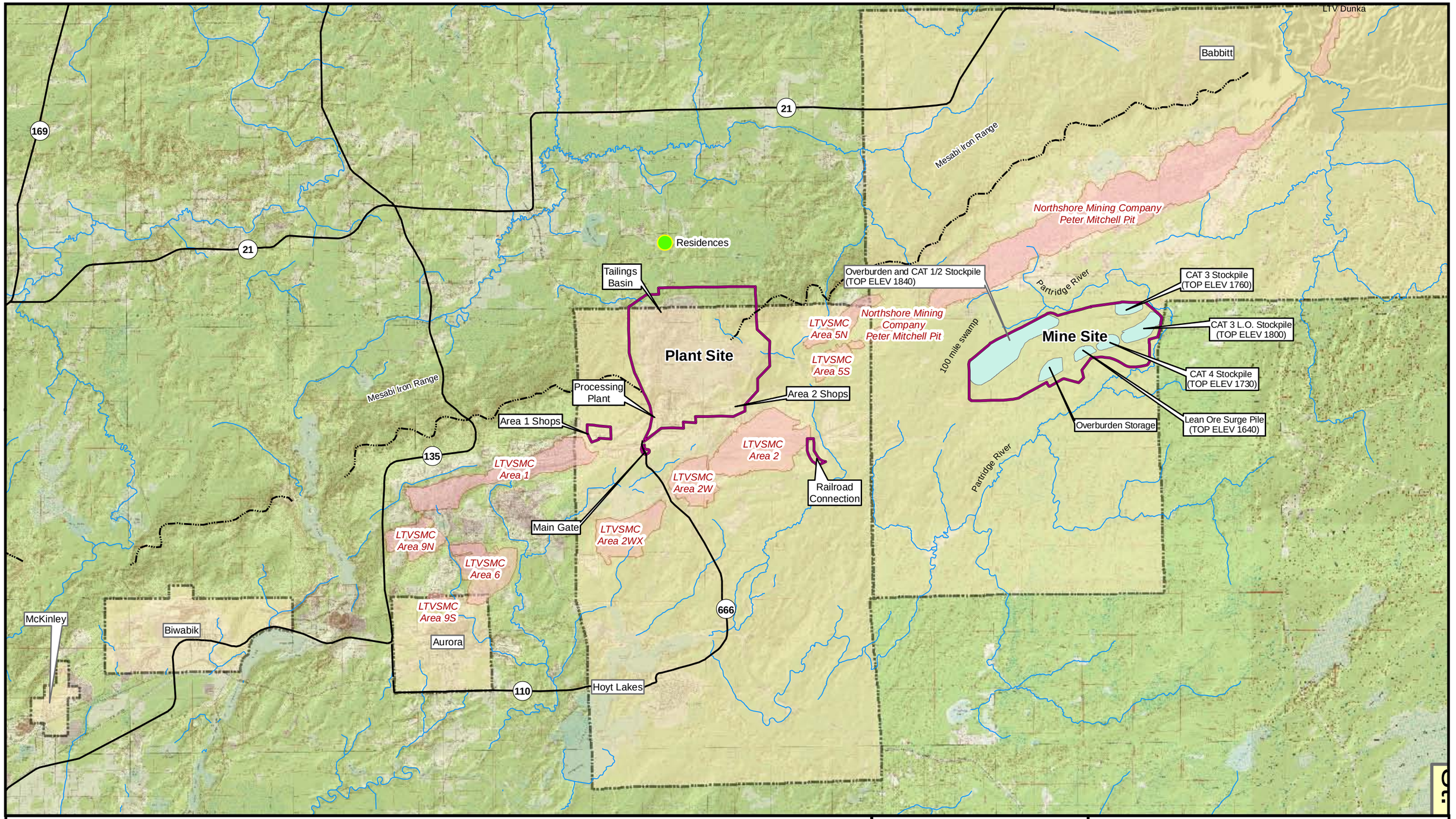


Figure 4.10-2
Transportation Route Map (All Actions)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009



Map/Data Source: MN DataDeli, Barr Engineering

- Residences
- Rivers/Streams/Drains
- Giants Range Formation Ridgeline
- State/County Highway
- 20-year Stockpiles
- Taconite Pits
- Incorporated Limits of Cities/Villages

N

0 0.5 1 2 Miles

Minnesota Department of Natural Resources

US Army Corps of Engineers St. Paul District

Figure 4.11-1
Visual Resources Map (Proposed Action)

NorthMet Project
PolyMet Mining, Inc.
St. Louis County, Minnesota

October 2009