POLYMET
MINING

NorthMet Project

Wetland Management Plan

Version 7

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Acronyms, Abbreviations and Units

Acronym, Abbreviation or Unit	Description
MDNR	Minnesota Department of Natural Resources
USACE	U.S. Army Corps of Engineers
WCA	Wetland Conservation Act

1.0 Introduction

This document describes the Wetland Management Plan for the Poly Met Mining Inc. (PolyMet) NorthMet Project (Project). The Project is located in St. Louis County in the St. Louis River major watershed within the Lake Superior basin (watershed #3 in Bank Service Area #1) northeast of Hoyt Lakes, Minnesota, as shown in Large Figure 1.

The Project will result in direct and potential indirect wetland impacts, as described in Reference (1).

Three off-site wetland mitigation sites are planned that will provide wetland mitigation credits to mitigate direct and indirect Project wetland impacts:

- Zim wetland mitigation site (Zim)
- Hinckley wetland mitigation site (Hinckley)
- Aitkin wetland mitigation site (Aitkin)

On-site wetland restoration may take place, but it will not generate wetland mitigation credits at this time. Wetland monitoring will be conducted on and near the Project Mine Site and Plant Site to assess potential indirect wetland impacts.

1.1 Objective

The objective of the NorthMet Wetland Management Plan is to maintain compliance with wetland permit conditions. Information may change during wetland permitting. Permitting decisions will not be made until the upcoming permitting process.

1.2 Outline

The outline of this document is:

Section 2.0 Description of the mitigation that will be implemented, including the design of mitigation wetlands

Section 3.0 Description of mitigation outcomes

Section 4.0 Description of wetland monitoring

Section 5.0 Description of wetland reporting

This document is intended to evolve through the environmental review, permitting, operating, reclamation, and long-term closure phases of the Project. A Revision History is included at the end of the document.

2.0 Wetland Mitigation Design

PolyMet developed the overall compensatory wetland mitigation plan to comply with Minnesota Wetland Conservation Act (WCA) rules (Minnesota Rules, chapter 8420) as administered by the Minnesota Department of Natural Resources (MDNR) Division of Lands and Minerals, Section 404 of the Clean Water Act as administered by the U.S. Army Corps of Engineers (USACE), and Minnesota Rules, part 7050.0186 (wetland mitigation) as administered by the Minnesota Pollution Control Agency.

The overall compensatory wetland mitigation plan is designed to produce the number of mitigation credits, as required by the USACE and MDNR. The number of mitigation credits that are required is based on the types, sizes, and locations of wetlands that will be subject to direct and fragmentation impacts from the Project, and on the types, sizes, and locations of the wetlands that will be constructed to replace them (Large Table 1).

The formulas for calculating the number of required mitigation credits are complex, using ratios established by the USACE (base ratios) and the WCA (replacement ratios). The USACE and the WCA use slightly different ratios, but generally, the ratios they use to determine the number of mitigation credits vary depending on whether the replacement wetland will be in-kind (same wetland type as impacted wetland), in-place (same watershed as impacted wetland), or in-advance.

In accordance with USACE guidance, they will require that all non-forested, non-bog, and low or medium quality wetlands have a base ratio of 1.5:1. All forested, bog, and high quality wetlands will have a base ratio of 2:1 (Large Table 2). The USACE provides incentives to reduce the base ratios by 0.25 (e.g., from 1.5:1 to 1.25:1) if the replacement wetland is in-kind (same wetland type as impacted wetland), in-place (same watershed as impacted wetland), or in-advance (at least one year ahead of the wetland impact).

Under the Minnesota WCA, the replacement ratio that will likely be required is 1:1 for those wetlands that are replaced with the same wetland type and in the same watershed. For wetlands that are replaced outside of the watershed, the ratio will increase to 1.5:1 (Large Table 2

The number of mitigation credits to be earned by replacement wetlands will be set during permitting by the agencies approving the wetland mitigation plan, and expressed in terms of percent mitigation credit based on each different type of restored wetland. Details on calculations of the wetland mitigation credits, for planning purposes, are presented in Reference (2), and summarized on Large Table 1. Large Tables 2 and 3 summarize the mitigation credit calculations based on the USACE base ratios and the WCA replacement ratios, respectively.

Off-site wetland mitigation projects will be implemented to fulfill the requirements for compensatory mitigation. The types of wetland impacts are detailed in Reference (1):

- Direct Impacts – mining-related activities that result in filling or excavation within the boundaries of a wetland.

- Potential Indirect Impacts – potential changes in wetland watershed area, groundwater drawdown resulting from open pit mine dewatering or operation of the FTB, changes in stream flow and associated changes to wetlands abutting these streams near the Mine Site or FTB, fragmentation, and changes in wetland water quality associated with dust deposition or railcar spillage. Wetlands identified as potentially indirectly impacted will be monitored to assess if an impact occurs.

- Fragmentation – potential indirect impacts to remaining remnants of a directly impacted wetland. The determination is based on an analysis of wetland type, source of hydrology, size of remaining wetland, location in the current watershed, location in the future watershed, connectivity to other wetlands, and direction of flow in the area.

- Indirect Impacts – potential indirect impacts that are documented by monitoring.

There will be 914 acres of direct wetland impacts and 27 acres of fragmented wetlands, for a total of 940 acres of wetland impacts for the Project that will be mitigated by off-site mitigation projects. Compensatory mitigation includes the off-site restoration and preservation of 1,603 acres of wetlands and the establishment of 197 acres of upland buffer at the three mitigation sites (Large Table 1). In addition, approximately 102 acres of wetland may be restored at the Project site; however, this would not result in mitigation credits at this time (Reference (1) and Reference (2)).

2.1 Off-Site Mitigation

Three off-site wetland restoration projects will provide the required mitigation credits for Project direct and potential indirect wetland impacts. The Zim site is located in the same watershed as the Project. The Hinckley site and the Aitkin site are located in watersheds adjacent to the Project watershed.

Detailed wetland mitigation plans have been developed for each site (Reference (3), Reference (4), Reference (5)). These three plans, collectively referred to as the Wetland Mitigation Plan, include information regarding existing conditions at the sites, construction activities, management activities, and wetland restoration activities.

2.1.1 Zim Site

The proposed Zim wetland mitigation site has been drained by ditches and sub-surface drain tiles. This site is located in two separate units on approximately 569 acres of land, southwest of the city of Eveleth, Minnesota, on the east side of County Road 7 (Large Figure 2 and Large Figure 3). The site is located in St. Louis County in the St. Louis River major

watershed (#3) within the Lake Superior basin (Bank Service Area #1) the same Bank Service Area in which the Project is located (Large Figure 1),

Wetland restoration plans are detailed in Reference (3). Restoration methods are designed to restore a Type 8 coniferous bog community; however, developing a bog community is highly dependent on soil and groundwater parameters that are difficult to control. Therefore, a coniferous swamp community will be the contingent community if the soil and groundwater conditions are not adequate for bog regeneration. Coniferous bog or swamp is the target for the whole site, however, where trees do not successfully establish, the target community will be a shallow, open water wetland.

A total of 479 acres of wetland restoration, 29 acres of wetland preservation, and 23 acres of upland preservation are proposed for the Zim site, worth 453.9 wetland mitigation credits (Large Table 1, with details provided in Reference (3)). The site-specific mitigation design includes the following methods:

- restoration of 401.5 acres of drained wetland to receive 100% mitigation credit or 401.5 credits
- restoration of 8.3 acres of excavated ponds to receive 100% mitigation credit or 8.3 credits
- restoration of 69.6 acres of partially-drained wooded wetlands to receive 50% mitigation credit or 34.8 credits
- restoration of native vegetation on 22.7 acres of drained fields and filled ditches, each of which will remain drained due to open ditches that cannot be filled, to receive 25% mitigation credit for upland buffer or 5.7 credits
- easement protection of 28.8 acres of native coniferous bog communities to receive 12.5% mitigation credit for preservation or 3.6 credits

The vegetation and hydrology will be restored over a one- to two-year construction period followed by up to 20 years of management. Performance standards have been developed for the mitigation site to guide the restoration activities and to monitor whether vegetation and hydrology are meeting the design goals (Reference (3)). To protect the site, a permanent conservation easement or deed recording will be prepared and recorded at approval of permit or prior to impact, as required by the permitting agency. The wetland restoration area will be monitored for up to 20 years beginning in the first full growing season after completing hydrology restoration and ending upon certification by the USACE and MDNR that the wetland is sustainable.

2.1.2 Hinckley Site

The proposed Hinckley wetland mitigation site has been drained by ditches and sub-surface drain tiles. The site encompasses approximately 530 acres and is located southwest of the city of Hinckley, Minnesota at the intersection of Township Road 56 and Highway 107 as shown in Large Figure 4. The mitigation site is located in Pine County in the Snake River major watershed (#36) within Bank Service Area #6, adjacent to Bank Service Area #1 where the Project is located (Large Figure 1).

Wetland restoration plans are detailed in Reference (4) Restoration methods are designed to restore Type 2 fresh wet meadow, Type 2 sedge meadow, Type 6 shrub-carr, Type 6 alder thicket, and Type 7 hardwood swamp.

A total of 286 acres of wetland restoration and 91 acres of upland buffer preservation are proposed for the Hinckley site, worth a total of 304.6 wetland mitigation credits Large Table 1 with details provided in Reference (4). The site-specific mitigation design includes the following methods:

- restoration of drained wetland on 277.4 acres for 100% mitigation credit or 277.4 credits
- restoration of 8.7 acres of partially-drained wetlands to receive 50% mitigation credit or 4.4 credits
- restoration of native vegetation on 91.2 acres of drained fields and filled ditches, to receive 25% mitigation credit for upland buffer or 22.8 credits

The vegetation and hydrology will be restored to the site over a one- to two-year construction period followed by up to 20 years of management. Performance standards have been developed for the mitigation site to guide the restoration activities and to monitor whether vegetation and hydrology are meeting the design goals (Reference (4)). To protect the site, a permanent conservation easement or deed recording will be prepared and recorded at approval of permit or prior to impact, as required by the permitting agency. The wetland restoration area will be monitored for up to 20 years beginning in the first full growing season after completing hydrology restoration and ending upon certification by the USACE and MDNR that the wetland is sustainable.

2.1.3 Aitkin Site

The proposed Aitkin wetland mitigation site has been drained by ditches and sub-surface drain tiles. The 1,070 acre site is located north of the city of Aitkin, Minnesota, on either side of County Road 1 as shown in Large Figure 5. The mitigation site is located in Aitkin County in the Elk-Nokasippi major watershed within Bank Service Area #5, adjacent to Bank Service Area #1 where the Project is located (Large Figure 1).

Wetland restoration plans are detailed in Reference (5). Restoration methods are designed to restore Type 3 shallow marsh, Type 6 shrub-carr, Type 7 hardwood swamp, and Type 7 coniferous swamp.

The proposed wetland mitigation area includes 808 acres of wetland restoration and 83 acres of upland buffer preservation, worth a total of 804.1 wetland mitigation credits (Large Table 1, with details provided in Reference (5). The site-specific mitigation design includes the following methods:

- restoration of drained wetland on 758.3 acres to receive 100% mitigation credit or 758.3 credits
- restoration of 50.1 acres of partially-drained wetland to receive 50% mitigation credit or 25 credits
- restoration of native vegetation on 83.2 acres of drained fields and filled ditches, to receive 25% mitigation credit for upland buffer or 20.8 credits

The vegetation and hydrology will be restored to the site over a one- to two-year construction period followed by up to 20 years of management. Performance standards have been developed for the mitigation site to guide the restoration activities and to monitor whether vegetation and hydrology are meeting the design goals (Reference (6)). To protect the site, a permanent conservation easement or deed recording will be prepared and recorded at approval of permit or prior to impact, as required by the permitting agency. The wetland restoration area will be monitored for up to 20 years beginning in the first full growing season after completing hydrology restoration and ending upon certification by the USACE and MDNR that the wetland is sustainable.

2.2 On-Site Restoration

During reclamation, wetlands may be established on-site at the former locations of the Category 2/3 Waste Rock Stockpile and the Overburden Storage and Laydown Area (Large Figure 6). Some haul roads and adjacent ditches and the Waste Water Treatment Facility (WWTF) ponds and process water ponds may also provide minor acreages of land for wetland restoration (Reference (7)). Approximately 102 acres of on-site wetlands may be restored at the Project site; however, this would not result in mitigation credits at this time (Reference (1)).

3.0 Wetland Mitigation Outcomes

This section summarizes the implementation of the Wetland Mitigation Plans (Reference (3), Reference (4), Reference (5)). Full details on vegetative and hydrology outcomes, compared to the performance standards laid out in the Wetland Mitigation Plans, will be reported as described in the Mitigation Plans, and summarized in Section 5.0.

3.1 Restored Off-Site Wetlands

3.1.1 Zim Site [PLACEHOLDER]

3.1.2 Hinckley Site [PLACEHOLDER]

3.1.3 Aitkin Site [PLACEHOLDER]

3.2 Restored On-Site Wetlands [PLACEHOLDER]

4.0 Monitoring

This section describes monitoring to demonstrate performance of wetland mitigation and to assess potential indirect wetland impacts at the Mine Site and Plant Site. Monitoring results will be reported as described in Section 5.0.

4.1 Wetland Mitigation Site Monitoring

Wetland mitigation site monitoring will assess pre-project hydrology conditions at the three mitigation sites. It will continue after hydrology restoration is completed to evaluate the progress and condition of the restored wetlands. Results will be used to assess whether restored wetlands are in conformance with performance standards and determine whether continued monitoring is required (Reference (3), Reference (4), Reference (5)).

4.1.1 Pre-Project Hydrology Monitoring

Pre-project monitoring for the wetland mitigation sites assesses the existing hydrology at the sites, to provide a baseline to evaluate wetland restoration outcomes. Pre-project hydrology monitoring has been conducted in accordance with Reference (3), Reference (4), Reference (5).

Reference wetlands were selected for each mitigation site. It is presumed that the reference wetlands represent the natural hydrology for typical, undisturbed wetlands comparable to the landscape at the site. The reference wetland monitoring data will provide information on the expected hydrology regime of an undisturbed wetland under the same climatic conditions as the monitoring site. These data may also help to clarify the presence of partial drainage in areas where wetland hydrology may still be present.

4.1.1.1 Zim Site

Pre-project hydrology monitoring at the Zim site began in 2012, and continued in 2013 and 2014. There are 13 monitoring locations for the Zim site, as shown on Large Figure 2 and Large Figure 3. Reference (3) summarizes the hydrology monitoring at the Zim site during the 2012 and 2013 growing seasons.

The shallow monitoring wells were initially installed throughout the Zim site in 2012. In 2013, monitoring locations were adjusted to gather additional data on wetland hydrology. The monitoring locations in 2014 were the same as in 2013.

In 2012, a reference wetland was selected that is approximately six miles northeast of the North Unit, to represent the natural hydrology for a typical conifer bog community within this landscape (Large Figure 2 and Large Figure 3). One shallow monitoring well was installed in the reference wetland. The reference wetland was monitored for comparison to the hydrology at the Zim site, which has been altered by ditches and drain tiles.

4.1.1.2 Hinckley Site

Pre-project hydrology monitoring at the Hinckley site began in 2014, when 15 shallow monitoring wells were initially installed at the Hinckley site, as shown on Large Figure 4. Monitoring locations were selected throughout the Hinckley site to collect data representative of all expected hydrology conditions.

In 2014, two reference wetlands were selected that are approximately 0.2 miles northwest and 3.2 miles north of the Hinckley site (Large Figure 4). One shallow monitoring well was installed in each reference wetland. The reference wetland was monitored for comparison to the hydrology at the Hinckley site, which has been altered by ditches.

4.1.1.3 Aitkin Site

Pre-project hydrology monitoring at the Aitkin site began in 2012, and continued in 2013 and 2014. There are 15 monitoring locations for the Aitkin site, as shown on Large Figure 5. Reference (5) summarizes the hydrology monitoring at the Aitkin site during the 2012 and 2013 growing seasons.

The shallow monitoring wells were initially installed throughout the Aitkin site in 2012. The monitoring locations in 2013 were the same as 2012. In 2014 three additional monitoring locations were added on the site to document relatively unique conditions on the site including: lower areas on the site and an area where topsoil has been removed.

In 2012, a reference wetland was selected that is 2.5 miles east of the site (Large Figure 5). In 2014 a second reference wetland location was selected, located approximately 3 miles northwest of the site (Large Figure 5). One shallow monitoring well was installed in each reference wetland. The reference wetlands are monitored for comparison to the hydrology at the Aitkin site, which has been altered by ditches.

4.1.2 Wetland Mitigation Site Monitoring

Wetland mitigation site monitoring will begin during the first full growing season after completing hydrology restoration. In addition to monitoring of constructed wetlands, one reference wetland of each wetland restoration community type (if available) will be monitored within the general area of the restoration site, in areas with relatively natural hydrology conditions. A monitoring plan will be submitted for review and approval that will include proposed locations of reference wetlands prior to implementing the monitoring program.

Wetland mitigation site monitoring will include both vegetation monitoring and hydrology monitoring. Vegetation monitoring will entail conducting a detailed vegetation survey once per year (typically July-August) in each wetland mitigation community, as well as the reference wetland communities, to evaluate the success of the restoration during the appropriate monitoring period for each community type. Hydrology monitoring will involve

the installation and periodic monitoring of shallow recording wells. Continuous recording wells will be utilized to the extent feasible and will be placed throughout the sites sufficient to characterize hydrology. Water elevations will be recorded at least once per week from May through mid-July and monthly thereafter until the end of the growing season.

4.1.2.1 Zim Site

The proposed monitoring plan for the Zim site is presented in Section 8 of Reference (3).

4.1.2.2 Hinckley Site

The proposed monitoring plan for the Hinckley site is presented in Section 8 of Reference (4).

4.1.2.3 Aitkin Site

The proposed monitoring plan for the Aitkin site is presented in Section 8 of Reference (5).

4.2 Mine Site Area Wetland Monitoring

The objective of Mine Site wetland monitoring is to document pre-project hydrology conditions, and, during Project operations, assess whether the wetlands have been potentially indirectly impacted by the mechanisms discussed in the Reference (1) and Reference (2)).

4.2.1 Pre-Project Hydrology Monitoring

The pre-project wetland hydrology monitoring study has followed the protocols described in Reference (8), Reference (9), and Reference (10). The objectives of the Mine Site wetland hydrology monitoring study are to:

1. Gain a better understanding of the wetland hydrology at the Project site, i.e., defining whether specific wetlands are recharging the surficial deposits aquifer or are discharging to surface waters.
2. Collect baseline hydrology data that could be used to assess the effect of the Project on wetland hydrology.
3. Determine the potential for indirect wetland impacts resulting from the Project.

Pre-project hydrology monitoring began in 2005, and continued yearly through 2014. There are 43 wetland hydrology monitoring wells in the Mine Site area (Large Figure 7). Wells were installed in 2005, 2008, 2010 and 2014.

There were 20 shallow manual wells and 4 recording wells initially installed at 19 locations in the Mine Site area in 2005 (Reference (11)). In 2008, two wells were removed because they were located within future stockpile footprints, two new wells were added and one well was relocated out of the potential direct impact area (Reference (9)). Starting in 2008, all

monitoring locations were instrumented with recording wells so water levels could be recorded every 2 to 4 hours. The monitoring wells were typically placed to a depth of 2 to 5 feet below the ground surface.

In 2010, two wells were relocated because they were determined to be in areas that will be directly impacted by the Project (Reference (10)). During 2008 through 2010, there were 21 locations monitored at the Mine Site (Large Figure 7 and References (11) and Reference (12)). In 2014, wetland monitoring wells were installed at 25 additional locations at the Mine Site and Transportation and Utility Corridors, as shown on Large Figure 7. All wells were installed following the protocols described in Reference (8).

Two reference wetlands were selected in 2008, located west of the Mine Site (Reference (9)). In 2014, a third reference wetland was selected, located to the southwest of the Mine Site (Reference (1)). One shallow monitoring well was installed in each reference wetland. The purpose of monitoring the reference wetlands is to document the natural hydrology fluctuations in wetlands that will not be affected by the Project to facilitate interpretation of the Project data in relation to climatic fluctuations.

4.2.2 Hydrology Monitoring

Wetland hydrology monitoring will be conducted during operation of the Mine Site to document potential indirect wetland impacts. The monitoring plan has been developed as described in the draft wetland permit application (Reference (2)). The plan was developed with the purpose of meeting the Section 404 and WCA permit conditions, which will describe the purpose, methods, and criteria to be implemented to document potential indirect wetland impacts.

4.2.3 Vegetation Monitoring

Wetland vegetation monitoring will be conducted during operation of the Mine Site. The monitoring plan has been developed as described in the draft wetland permit application (Reference (2)). The plan was developed with the purpose of meeting the Section 404 and WCA permit conditions, which will describe the purpose, methods, and criteria to be implemented to document potential indirect wetland impacts.

4.3 Plant Site Area Wetland Monitoring

The objective of Plant Site area wetland monitoring is to document pre-project hydrology conditions, and, during Project operations, assess whether the wetlands have been impacted by the potential indirect impacts discussed in the draft wetland permit application (Reference (2)).

4.3.1 Pre-Project Hydrology Monitoring

Pre-project monitoring of Plant Site area wetlands started in 2010, following the protocols described in Reference (10). The objectives of the Plant Site wetland hydrology monitoring study are to:

1. Gain a better understanding of the wetland hydrology at the Project site, i.e., defining whether specific wetlands are recharging the surficial deposits aquifer or are discharging to surface waters.
2. Collect baseline hydrology data that could be used to assess the effect of the Project on wetland hydrology.
3. Determine the potential for indirect wetland impacts resulting from the Project.

Pre-project hydrology monitoring began in 2010, and continued through 2014. There are 13 wetland hydrology monitoring wells in the Plant Site area (Large Figure 8). Wells were installed in 2010 and in 2014, following the protocols described in Reference (8). Electronic water level data were collected every 4 hours during the five growing seasons. The monitoring wells were typically placed to a depth of 2 to 5 feet below the ground surface.

Shallow monitoring wells were initially installed at 8 locations near the Plant Site in 2010, primarily north and west of the Tailings Basin (Reference (10)). In 2014, shallow monitoring wells were installed at seven additional locations in the Plant Site area (Large Figure 8).

One reference wetland was selected in 2010, located approximately 2.2 miles north of the Plant Site (Large Figure 8). In 2014, a second reference wetland was selected was installed approximately 2.2 miles northeast of the Tailings Basin (Large Figure 8). One shallow monitoring well was installed in each reference wetland. The purpose of monitoring the reference wetlands is to document the natural hydrology fluctuations in wetlands that will not be affected by the Project to facilitate interpretation of the Project data in relation to climatic fluctuations.

4.3.2 Hydrology Monitoring

Wetland hydrology monitoring will be conducted during operation of the Plant Site to document potential indirect wetland impacts. The monitoring plan has been developed as described in the draft wetland permit application (Reference (2)). The plan was developed with the purpose of meeting the Section 404 and WCA permit conditions, which will describe the purpose, methods, and criteria to be implemented to document potential indirect wetland impacts.

4.3.3 Vegetation Monitoring

Wetland vegetation monitoring will be conducted during operation of the Plant Site. The monitoring plan has been developed as described in the draft wetland permit application (Reference (2)). The plan was developed with the purpose of meeting the Section 404 and

WCA permit conditions, which will describe the purpose, methods, and criteria to be implemented to document potential indirect wetland impacts.

5.0 Reporting

Wetland reporting includes reports on pre-project hydrology conditions and restoration outcomes at the wetland mitigation sites, as well as reports on hydrology monitoring in wetlands near the Mine Site and Plant Site.

5.1 Wetland Mitigation Site Reporting

Wetland mitigation site reports will document activities implemented to fulfill the requirements for compensatory mitigation.

5.1.1 Pre-Project Hydrology Monitoring Reports

Pre-project monitoring reports describe the existing hydrology at the wetland mitigation sites, and document whether existing conditions meet the criteria for wetland hydrology.

5.1.1.1 Zim Site

Pre-project hydrology monitoring at the Zim site began in 2012 (Section 4.1.1). Monitoring results from the 2012 and 2013 growing seasons are presented in Reference (3). Based on two years of monitoring data, the majority of the sod fields on the site no longer have wetland hydrology. The forested locations on the site exhibit hydrology representative of partially-drained wetlands. Results of 2014 monitoring will be submitted to the USACE and the MDNR in 2015. Concurrence of the monitoring results will be conducted by permitting agencies during the permitting process.

5.1.1.2 Hinckley Site

Pre-project hydrology monitoring at the Hinckley site began in 2014 to verify the lack of hydrology at the site (Section 4.1.1.2). Results of 2014 monitoring will be submitted to the USACE and the MDNR in 2015. Concurrence of the monitoring results will be conducted by permitting agencies during the permitting process.

5.1.1.3 Aitkin Site

Pre-project hydrology monitoring at the Aitkin site began in 2012 (Section 4.1.1.3). Monitoring results from the 2012 and 2013 growing seasons are presented in Reference (5). These two years of monitoring data indicate that the majority of the site no longer has wetland hydrology. Results of 2014 monitoring will be submitted to the USACE and MDNR in 2015. Concurrence of the monitoring results will be conducted by permitting agencies during the permitting process.

5.1.2 Wetland Mitigation Site Progress Monitoring Reports

Progress monitoring reports for the wetland mitigation sites, to document restoration

outcomes, will be prepared and submitted in years 1, 2, 3, 5, 10, and 20. Wetland restoration construction progress will be tracked along with compliance with permit conditions. The reports will describe the status of the wetland mitigation, summarize the results of the vegetation and hydrology monitoring, discuss management activities and corrective actions conducted during the previous year, and discuss activities planned for the following year. The monitoring report completed after the tenth growing season will assess whether or not the restoration is sufficiently complete and if additional monitoring and reporting are warranted.

5.1.2.1 Zim Site

Progress reporting for the Zim Site is presented in Section 7.0 of Reference (3).

5.1.2.2 Hinckley Site

Progress reporting for the Hinckley Site is presented in Section 8.0 of Reference (4).

5.1.2.3 Aitkin Site

Progress reporting for the Aitkin Site is presented in Section 8.0 of Reference (5).

5.2 Mine Site Wetland Reporting for Direct and Potential Indirect Impacts

Wetland reporting will document conditions in wetlands that are subject to direct or potential indirect impacts from Project activities at the Mine Site.

5.2.1 Pre-Project Hydrology Monitoring Reports

Pre-project Mine Site wetland hydrology monitoring began in 2005 (Section 4.2.1). Reports have been submitted to the USACE and the MDNR that document monitoring from 2005 to 2009 (Reference (11) and Reference (12)). Pre-project wetland hydrology monitoring has been conducted for an additional five years (2010-2014). The results of this monitoring are available for comparison to Mine Site conditions once construction and production begin. However reports presenting this data have not yet been submitted.

The 2005-2009 data show the presence of wetland hydrology in all monitored wetlands (Reference (11)). The water table within the wetlands was generally within 12 inches of the ground surface for the majority of each growing season.

Climatic conditions were assessed in order to further evaluate the hydrology monitoring data. The three years prior to the start of the wetland hydrology monitoring were below the normal range for annual precipitation (Reference (11)). The climatic conditions during 2005-2009 included 2 years with annual precipitation above the normal range and 3 years with annual precipitation below the normal range.

Water levels have been relatively stable from year-to-year and generally fluctuate in response to precipitation events. Throughout the 2005-2009 monitoring period, the hydrology regimes have been consistent throughout the wetland complexes with water levels fluctuating less than 18 inches (Reference (11)).

5.2.2 Mine Site Monitoring Reports

Project reporting for the Mine Site wetlands will follow requirements established in the monitoring plan during permitting (Section 4.2.2).

5.3 Plant Site Area Wetland Reporting for Direct and Potential Indirect Impacts

Wetland reporting will document conditions in wetlands that are subject to direct and potential indirect impacts from Project activities at the Plant Site.

5.3.1 Pre-Project Hydrology Monitoring Reports

Pre-project Plant Site wetland hydrology monitoring began in 2010 (Section 4.3.1), however reports have not yet been submitted.

5.3.2 Plant Site Monitoring Reports

Project reporting for the Plant Site wetlands will follow requirements established in the monitoring plans during permitting (Section 4.3.2).

Revision History

Date	Version	Description
11/30/2011	1	Initial release to provide requested information
04/13/2012	2	Provide Haywire Point Site information
01/24/2013	3	Revisions based on agency information regarding mitigation requirements
3/19/2013	4	Revisions based on agency comments provided for v3.
11/17/2014	5	Revisions to conform with other Project Management Plans, and revisions based on Project changes.
12/24/14	6	Revisions based on agency comments provided for v5.
1/28/2015	7	Revisions based on agency comments provided for v6.

References

1. **Poly Met Mining Inc.** NorthMet Project Wetland Data Package (v10). January 2015.

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Large Table 1 Wetland Mitigation Credit Summary[1]

Community / Credit Type	Within Project Watershed			Outside Project Watershed[1]						Total Wetland Mitigation[1] (acres)	Credit Percent	Total Wetland Mitigation Credits[1]
	Zim Sod Wetland Mitigation (acres)	Credit Percent	Total Wetland Mitigation Credits	Aitkin Wetland Mitigation (acres)	Aitkin Wetland Mitigation Credits	Hinckley Wetland Mitigation (acres)	Hinckley Wetland Mitigation Credits	Credit Percent	Total Wetland Mitigation Credits			
Off-Site Restoration of drained wetland [2]												
Type 2 Fresh (Wet) Meadow	0		0	0	0	0	0		0.0	0		0.0
Type 2 Sedge Meadow	0		0	0	0	51.0	51.0		51.0	51.0		51.0
Type 3 Shallow Marsh	0		0	25.7	25.7	0	0		25.7	25.7		25.7
Type 4 Deep Marsh	0		0	0	0	0	0		0.0	0		0.0
Type 5 Shallow, Open Water	8.3		8.3	0	0	0	0		0.0	8.3		8.3
Type 6 Shrub-Carr	0	100%	0	0	0	113.2	113.2	100%	113.2	113.2	100%	113.2
Type 6 Alder Thicket	0		0	0	0	113.2	113.2		113.2	113.2		113.2
Type 7 Hardwood Swamp	0		0	171.0	171.0	0	0		171.0	171.0		171.0
Type 7 Coniferous Swamp	0		0	561.6	561.6	0	0		561.6	561.6		561.6
Type 8 Open Bog	0		0	0	0	0	0		0.0	0		0.0
Type 8 Coniferous Bog	401.5		401.5	0	0	0	0		0.0	401.5		401.5
Off-Site Restoration of partially-drained wetland [3]												
Type 2 Sedge Meadow	0		0	0	0	0.8	0.4		0.4	0.82		0.41
Type 3 Shallow Marsh	0		0	13.6	6.8	0	0		6.8	13.58		6.8
Type 6 Shrub-Carr	0	50%	0	36.5	18.2	0	0	50%	18.2	36.47	50%	18.2
Type 7 Hardwood Swamp	0		0	0	0	7.9	4.0		4.0	7.93		4.0
Type 8 Coniferous Bog	69.6		34.8	0	0	0	0		0.0	69.6		34.8
Off-Site Site Preservation [4]												
Type 8 Coniferous Bog	28.8	12.5%	3.6	0	0	0	0	12.5%	0.0	28.8	12.5%	3.6
Off-Site Upland Buffer [5]	22.7	25%	5.7	83.2	20.8	91.2	22.8	25%	43.6	197.0	25%	49.3
On-Site Upland Buffer	---	---	---	---		---		---	---	---	---	---
Upland Buffer Total	**22.7**	---	**5.7**	**83.2**	**20.8**	**91.2**	**22.8**	---	**43.6**	**197.0**	---	**49.3**
Wetland Total	**508.2**	---	**448.2**	**808.3**	**783.3**	**286.2**	**281.8**	---	**1,065.1**	**1,602.7**	---	**1,513.3**
Total	**530.9**	---	**453.9**	**891.5**	**804.1**	**377.3**	**304.6**	---	**1,108.7**	**1,799.7**	---	**1,562.5**

(1) Totals may not add exactly due to rounding.

(2) Credits for restoration of completely drained wetlands are worth 100% of the acreage restored based on USACE St. Paul District Policy (Restoration via re-establishment) and the Minnesota WCA Chap. 8420.0526 Subp. 3

(3) Credits for restoration of partially-drained wetlands are worth 50% of the acreage restored based on USACE St. Paul District Policy (Restoration via rehabilitation) and the Minnesota WCA Chap. 8420.0526 Subp. 4

(4) Credits for wetland preservation are worth 12.5% of the acreage protected under a conservation easement based on USACE St. Paul District Policy (Preservation) and the Minnesota WCA Chap. 8420.0526 Subp. 9 (per Minnesota Statute 103G.2251 modified August 1, 2011.)

(5) Credits for upland buffers are worth 25% of the acreage of native, noninvasive vegetation established or maintained adjacent to the wetland based on USACE St. Paul District Policy (Preservation) and the Minnesota WCA Chap. 8420.0526 Subp. 1

Large Table 2 Wetland Mitigation Utilizing USACE Credits [1]

Wetland or Credit Type	Mitigation Credits Available				NorthMet Project Proposed Direct Wetland Impacts in Acres[1,2]			Total Credits Required for Mitigation at Base Ratio	No More Than 2 Apply			Total Applied Mitigation Credits [6], [7]	Applied Mitigation Ratio [8]
	Zim	Aitkin	Hinckley	Total	Non-forested, Non-bog, and Low or Medium Quality (Base Ratio 1.5:1) [3]	Bogs, Forested, and High Quality (Base Ratio 2:1) [4]	Total Impact Acres		Incentive for in-kind -0.25:1	Incentive for credits in-place -0.25:1	Incentive for credits in-advance [5] -0.25:1		
Type 2 Fresh (Wet) Meadow	0	0	0	**0**	1.4	14.4	**15.8**	30.9	---	---	---	**30.9**	1.96
Type 2 Sedge Meadow	0	0	51.4	**51.37**	6.9	17.1	**23.9**	44.4	(6.0)	---	---	**38.4**	1.61
Type 3 Shallow Marsh	0	32.5	0	**32.45**	53.1	23.9	**77.0**	127.5	(8.1)	---	(8.1)	**111.3**	1.44
Type 4 Deep Marsh	0	0	0	**0**	74.2	0.1	**74.3**	111.5	---	---	---	**111.5**	1.50
Type 5 Shallow, Open Water	8.3	0	0	**8.3**	0	0	**0.0**	0.0	---	---	---	**0.0**	---
Type 6 Shrub-Carr	0	18.2	113.2	**131.5**	1.4	2.5	**3.9**	7.1	(1.0)	---	---	**6.1**	1.57
Type 6 Alder Thicket	0	0	113.2	**113.22**	7.5	103.1	**110.6**	217.4	(27.6)	---	---	**189.8**	1.72
Type 7 Hardwood Swamp	0	171.0	4.0	**175.0**	0.7	12.5	**13.2**	26.0	(3.3)	---	---	**22.7**	1.72
Type 7 Coniferous Swamp	0	561.6	0	**561.6**	0	84.4	**84.4**	168.9	(21.1)	---	---	**147.8**	1.75
Type 8 Open Bog	0	0	0	**0**	0	7.6	**7.6**	15.3	---	---	---	**15.3**	2.00
Type 8 Coniferous Bog	439.9	0	0	**439.9**	0	530.0	**530.0**	1060.0	(110.0)	(110.0)	---	**840.0**	1.58
Wetland Total	*448.2*	*783.3*	*281.8*	***1,513.3***	*145.2*	*795.6*	***940.7***	*1,808.9*	---	---	---	***1,513.7***	1.61
Upland Buffer	5.7	20.8	22.8	**49.3**	---	---	---	---	---	---	---	---[9]	---
Total	**453.9**	**804.1**	**304.6**	**1,562.5**	**940.7**			**1,808.9**	**(177.1)**	**(110.0)**	**(8.1)**	**1,513.7**	1.61
									(295.2)				
Total Surplus Wetland Mitigation Credits for Project (Total Credit minus Total Applied Mitigation Credit)				**48.8**									

(1) Totals may not add exactly due to rounding.

(2)The total includes fragmentation of wetlands (26.9 acres).

(3) Base ratio 1.5:1 per USACE St. Paul District Policy for wetlands that are not considered High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

(4) Base ratio 2:1 per USACE May 29, 2013 Draft Memorandum for wetlands that are High quality or Difficult-to-Replace, which includes forested wetland and bog communities.

(5) Based on USACE May 29, 2013 Draft Memorandum guidance for in-advance qualification assuming all mitigation will be constructed one full growing season before wetland impacts occur.

(6) Total Applied Mitigation Credits = Total Credits Required for Mitigation at Base Ratio minus Incentive Credits.

(7) Credits applied may include surplus credits from different wetland types.

(8) The ratio of applied credits to project impacts (not including the surplus credits).

(9) Includes 0.5 credit of upland buffer, applied from totals listed above.

Large Table 3 Wetland Mitigation Utilizing WCA Credits[1]

Wetland or Credit Type	Mitigation Credits				NorthMet Project Proposed Direct Wetland Impacts (acres)[1,2]	Credits Applied for 1:1 Replacement	Additional Mitigation Required[3] +0.5:1	Total Mitigation Credits Applied	Total Mitigation Ratio
	Zim Sod	Aitkin	Hinckley	Total					
Type 2 Fresh (Wet) Meadow	0	0	0	0	15.8	15.8	7.9	23.7	1.5:1
Type 2 Sedge Meadow	0	0	51.37	51.37	23.9	23.9	12.0	35.9	1.5:1
Type 3 Shallow Marsh	0	32.5	0	32.45	77.0	77.0	38.5	115.5	1.5:1
Type 4 Deep Marsh	0	0	0	0	74.3	74.3	37.1	111.4	1.5:1
Type 5 Shallow, Open Water	8.3	0	0	8.3	0	0.0	0.0	0.0	1.5:1
Type 6 Shrub-Carr	0	18.2	113.2	131.5	3.9	3.9	1.9	5.8	1.5:1
Type 6 Alder Thicket	0	0	113.22	113.22	110.6	110.6	55.3	165.9	1.5:1
Type 7 Hardwood Swamp	0	171.02	4.0	175.0	13.2	13.2	6.6	19.7	1.5:1
Type 7 Coniferous Swamp	0	561.6	0	561.6	84.4	84.4	42.2	126.6	1.5:1
Type 8 Open Bog	0	0	0	0	7.6	7.6	3.8	11.5	1.5:1
Type 8 Coniferous Bog	439.9	0	0	439.9	530.0	530.0	45.0	575.0	1:1[4]
Wetland Total	*448.2*	*783.3*	*281.8*	*1,513.3*	*940.7*	*940.7*	*250.4*	1191.2	---
Upland Buffer	5.7	20.8	22.8	49.3	---	---	---	---	---
Total	**453.9**	**804.1**	**304.6**	**1,562.5**	**940.7**	**940.7**	**250.4**	**1,191.2**	1.27:1 [5]
Total Surplus Wetland Mitigation Credits for Project (Total credits minus 1:1 credits minus additional mitigation required)						**371.4**			
Total Wetland Mitigation Credits Used for Project						**1,191.2**			

(1) Totals may not add exactly due to rounding.

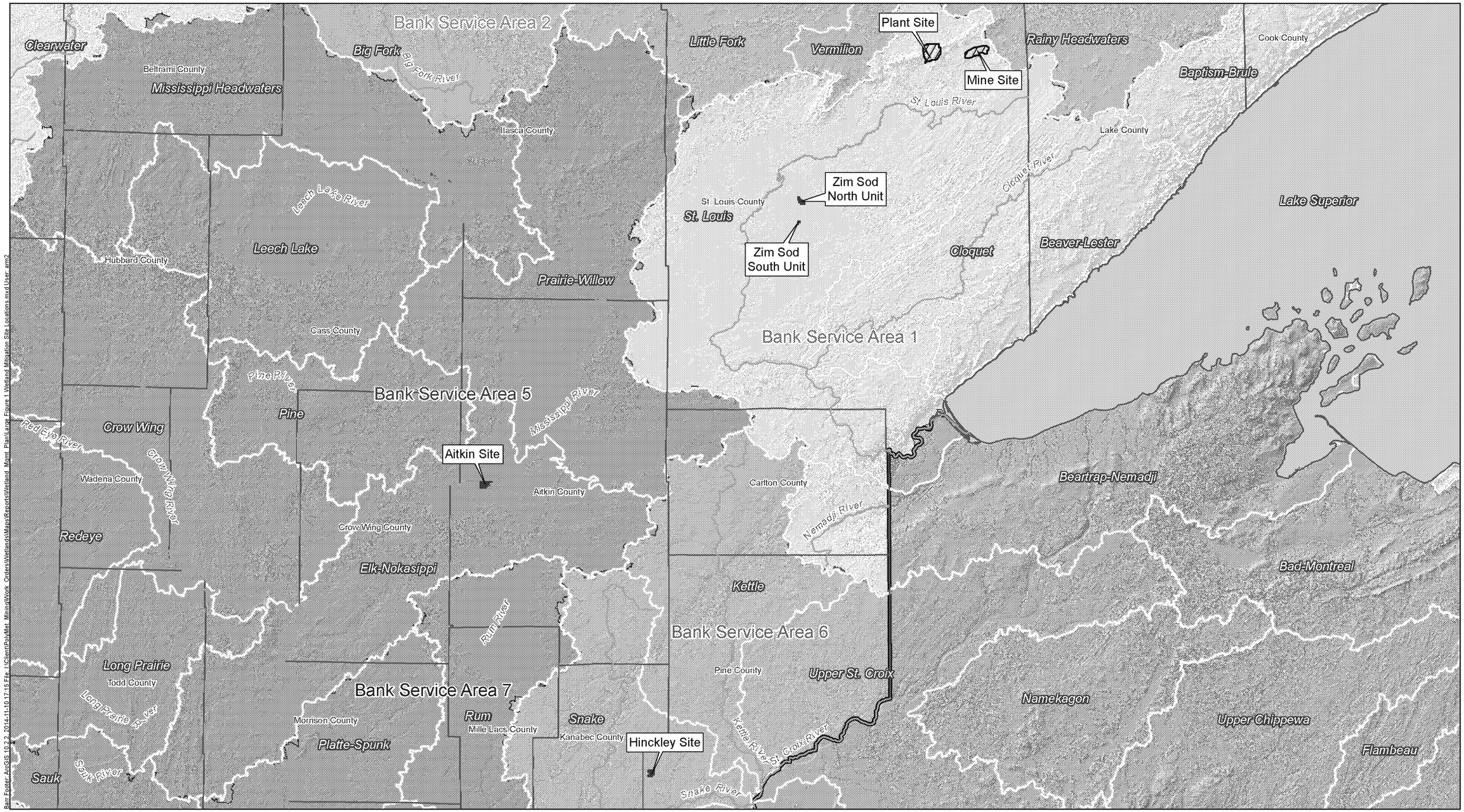
(2) The total includes fragmentation of wetlands (26.9 acres).

(3) Additional required for mitigation out of the watershed at Aitkin and Hinckley sites.

(4) Assumes 1:1 replacement for 439.9 acres compensated in-kind and in the watershed and 1.5:1 for the remaining 90.1 acres replaced out of the watershed.

(5) The ratio of applied credits to project impacts (not including the total surplus credits).

Large Figures



Large Figure 1
WETLAND MITIGATION SITE LOCATIONS
NorthMet Project
Poly Met Mining, Inc
St. Louis County, Minnesota

Hydrology Monitoring Location
North Unit Boundary
Ditches
County Ditches
Estimated Drain Tiles

Restoration Method
Restore Drained Fields - 100% Credit
Excavated Ponds - 100% Credit
Filled Ditches - 50% Credit
Restore Partial Drainage - 50% Credit

Upland Buffer/Ditch Lateral Effect - 25% Credit
Preservation - 12.5% Credit
Open Ditches - 0% Credit
Roads - 0% Credit
0% Credit

0 400 800 1,600
Feet

Large Figure 2
ZIM SOD WETLAND MITIGATION SITE
NORTH UNIT
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Hydrology Monitoring Location
South Unit Boundary
Ditches
County Ditches
Estimated Drain Tiles

Restoration Method
Restore Drained Fields - 100% Credit
Excavated Ponds - 100% Credit
Filled Ditches - 50% Credit
Restore Partial Drainage - 50% Credit
Upland Buffer/Ditch Lateral Effect - 25% Credit
Preservation - 12.5% Credit
Open Ditches - 0% Credit
Roads - 0% Credit
0% Credit

0 200 400 800
Feet

Large Figure 3
ZIM SOD WETLAND MITIGATION SITE
SOUTH UNIT
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Barr Footer: ArcGIS 10.2.2, 2014-11-10 10:37 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetland_Mgmt_Plan\Large Figure 3 Zim Sod Wetland Mitigation Site - South Unit mxd\User.aml

Barr Footer: ArcGIS 10.2.2, 2014-11-10 17:27 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetland_Mgmt_Plan\Large Figure 4 Hinckley Wetlnd Mitigation Site.mxd User: amr2

Wetland Hydrology Wells Installed May 2014

Property Boundary

Wetland Mitigation Plan Types

- Hardwood Swamp
- Shrub-carr/Alder thicket
- Sedge/Wet Meadow
- Upland Buffer
- Ditch
- None

0 350 700 1,400
Feet

Large Figure 4
HINCKLEY WETLAND MITIGATION SITE
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

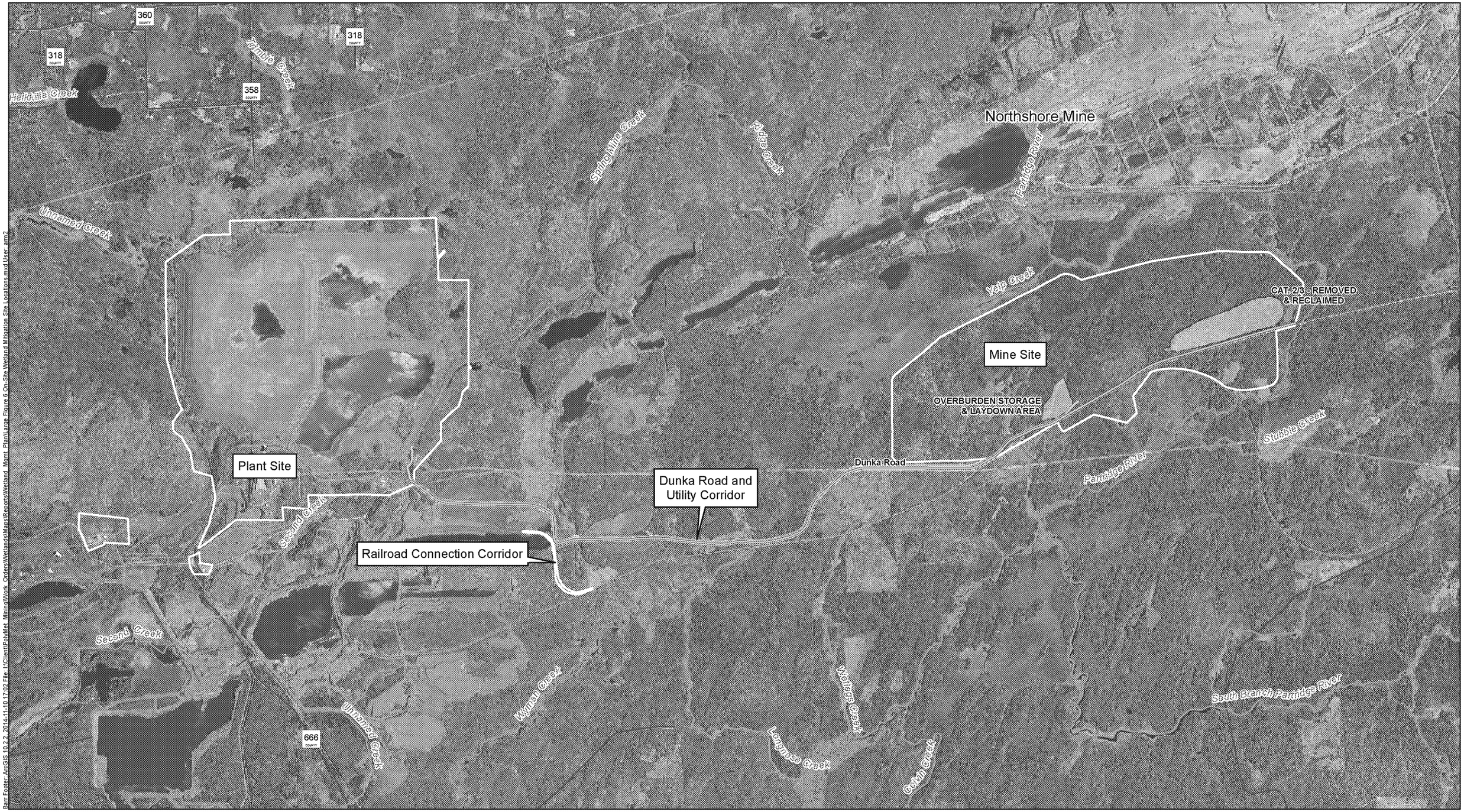
Hydrology Monitoring Wells
- Installed 2012
- Installed 2014
- Property Boundary

Wetland Restoration Plan
- Conifer swamp
- Hardwood swamp
- Shallow marsh
- Shrub-carr
- Ditch
- Upland Buffer
- None

0 500 1,000 2,000
Feet

Large Figure 5
AITKIN WETLAND MITIGATION SITE
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

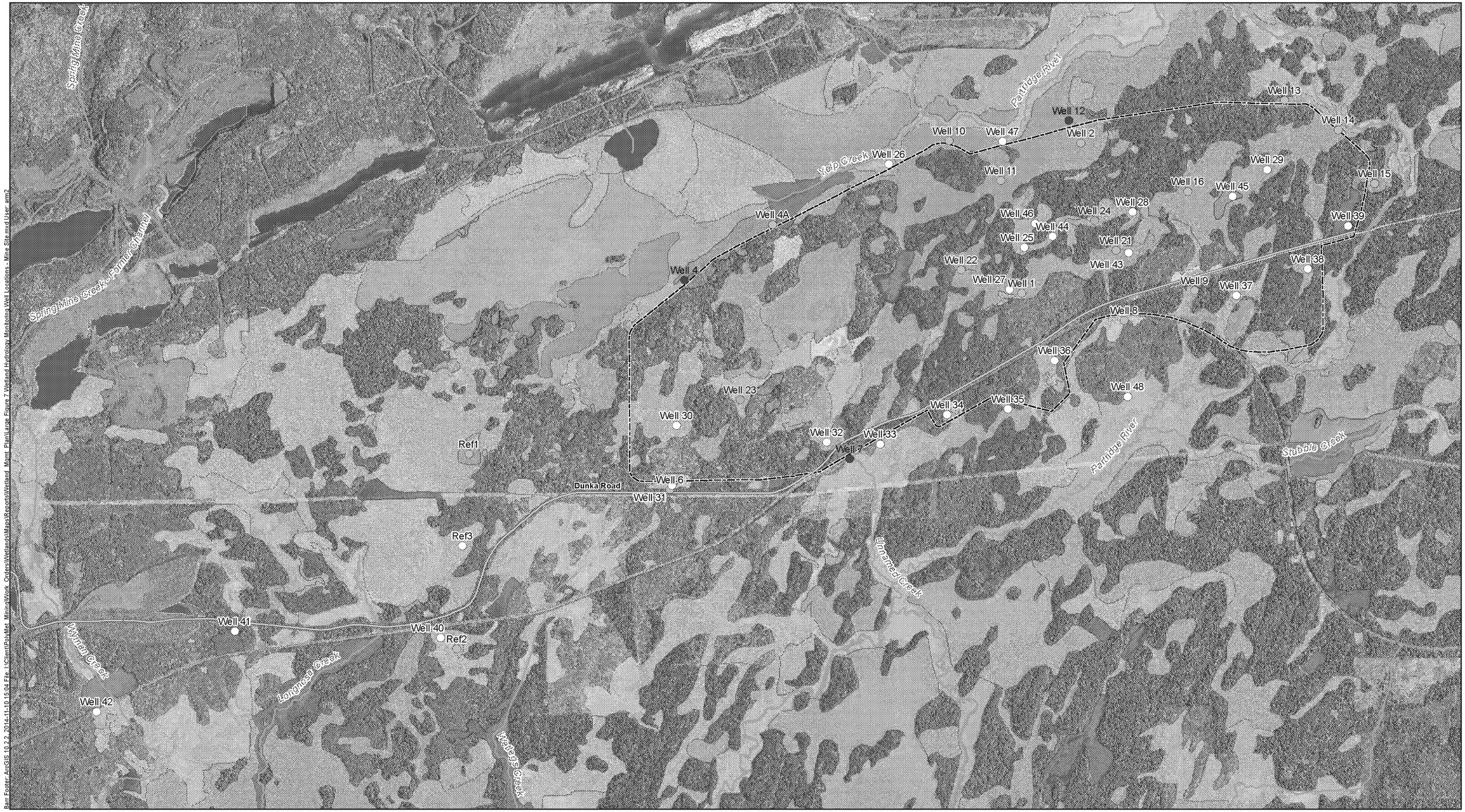
Barr Footer: ArcGIS 10.2.2, 2014-11-10 14:37 File: I:\Client\PolyMet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetland_Mgmt_Plan\Large Figure 5 Aitkin Wetland Mitigation Site mxd \User: amr2



Project Areas
Dunka Road
Treated Water Pipeline
Rivers & Streams

0 2,250 4,500 9,000
Feet

Large Figure 6
ON-SITE WETLAND RESTORATION AREAS
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN



Wetland Hydrology Monitoring Wells
- Installed in 2005
- Installed in 2008
- Installed in 2010
- Installed in 2014
- Rivers & Streams

Mine Site

Eggers & Reed Wetland Types
- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

N

0 1,250 2,500 5,000
Feet

Large Figure 7
WETLAND HYDROLOGY MONITORING WELL LOCATIONS - MINE SITE
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN

Barr Foster ArcGIS 10.2.2 2014-11-10 15:04 File: H:\Client\Polymet_Mining\Work_Orders\Wetlands\Maps\Reports\Wetland_Mon_PlanLarge Figure 7 Wetland Hydrology Monitoring Well Locations - Mine Site.mxd User: amr2

Wetland Hydrology Monitoring Wells
- Installed in 2005
- Installed in 2008
- Installed in 2010
- Installed in 2014
- Rivers/Streams

Tailings Basin Area

Eggers & Reed Wetland Types
- Shrub Swamps (Alder thickets & Shrub-carrs)
- Coniferous bog
- Coniferous swamp
- Deep marsh; Shallow marsh
- Hardwood swamp
- Open water (Shallow, open water & lakes)
- Open bog
- Sedge meadow; Wet meadow

0 1,750 3,500 7,000
Feet

Large Figure 8
WETLAND HYDROLOGY MONITORING WELL LOCATIONS - TAILINGS BASIN
NorthMet Project
Poly Met Mining Inc.
Hoyt Lakes, MN