Special Purpose Monitoring Plan

NorthMet Mine Site

Prepared for
Poly Met Mining, Inc.

August 2017

Revision 0

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Acronyms and Abbreviations

Abbreviation or Acronym	Description
LTVSMC	LTV Steel Mining Company
FEIS	Final Environmental Impact Statement
FEC	Fugitive Emission Control Plan
NAAQS	National Ambient Air Quality Standards
MAAQS	Minnesota Ambient Air Quality Standards
PM_{10}	particles less than 10 micrometers in diameter
$PM_{2.5}$	particles less than 2.5 micrometers in diameter
USEPA	U.S. Environmental Protection Agency
MSL	mean sea level
QA/QC	quality assurance/quality control
MPCA	Minnesota Pollution Control Agency
TSP	Total Suspended Particulate

1.0 Introduction

1.1 Background Information

Poly Met Mining, Inc. (PolyMet) intends to construct and operate an open-pit copper, nickel, and gold/platinum group metal mine near the town of Babbitt, MN, to reactivate portions of the LTV Steel Mining Company (LTVSMC) taconite processing plant and tailing basin near Hoyt Lakes, MN and to build an ore process facility at the former LTVSMC site. The Mine Site is located approximately six miles south of the city of Babbitt and directly south of the Northshore Mining Company's Northshore Mine, which is an active taconite mine. The project is referred to as the NorthMet Project (Project).

A Final Environmental Impact Statement (FEIS) was prepared during the course of the Project's environmental review (Reference (1)). The FEIS included a detailed assessment of potential impacts to air quality from the Mine Site and other elements of the Project. In order to reduce potential impacts, PolyMet agreed to adopt site-specific fugitive emission control procedures for the Haul Roads at the Mine Site that result in a 90% reduction from uncontrolled emissions. These procedures are described in the Mine Site Fugitive Emission Control Plan (FEC Plan; Reference (2)). An element of the Haul Road fugitive emission control procedures is PM_{10} monitoring within the effective fenceline to verify the fugitive emission control procedures performance and to provide data to support improvements to fugitive emission control procedures at the site.

Specifically, if monitored results are above agreed-upon action levels, the cause will be investigated and corrective action will be undertaken, if warranted. In addition, the PM_{10} monitoring results will be considered along with the Mine Management System electronic history (meteorological data, water/chemical application, road usage, observed fugitive emission notifications) and the daily fugitive emission check forms during the semi-annual review of the Mine Site FEC Plan (Reference (2)) to evaluate the performance of control measures and make necessary adjustments. The monitoring will also allow for notification to be provided to Minnesota Pollution Control Agency (MPCA) of any potential ambient air quality issues at the Mine Site (i.e., monitoring results above ambient air quality standards) in a timely manner, subject to the usage limitations below.

While typical monitoring equipment and procedures will be used to conduct the monitoring described in this plan, the purpose will not be to demonstrate compliance with ambient air quality standards and therefore, the monitors that will be operated will be considered "Special Purpose" monitors by MPCA.

MPCA will provide oversight for selection of the monitoring locations and development of operating procedures, and will monitor performance evaluations (i.e., audits). This will provide assurance that the monitoring will produce accurate, representative data to help maximize the performance of the Mine Site FEC Plan (Reference (2)).

1.2 Monitoring Objectives

The primary objective of the Special Purpose Monitoring Program is to provide a demonstration of the performance of the Mine Site FEC Plan and/or provide data to aid in improving the performance of the Mine Site FEC Plan (Reference (2)). As noted in the Mine Site FEC Plan (Reference (2)), the purpose of that Plan and related monitoring is not to eliminate all fugitive emissions, but to support a system to prevent or reduce fugitive emissions and to respond to dusty conditions in a timely manner.

The monitors can be used both to potentially identify the need to modify fugitive emission controls on a short term basis to address elevated monitored concentrations and to provide documentation of the historic PM_{10} concentrations such that elevated readings can be correlated with operating conditions to allow for improvements to operating procedures at the Mine Site.

In addition, the monitors provide some data relevant to understanding the status of National Ambient Air Quality Standards (NAAQS) and Minnesota Ambient Air Quality Standards (MAAQS) levels for PM_{10} at the Mine Site. Monitored results above the PM_{10} NAAQS/MAAQS levels will be reported to the MPCA. The "Effective Fenceline" is a boundary established by PolyMet at which access can be controlled consistent with the U.S. Environmental Protection Agency (USEPA) definition of "ambient air." Because these Special Purpose monitors are located within the Effective Fenceline and, therefore, are not intended to monitor compliance with ambient air quality standards, such levels will not, by themselves, constitute sufficient evidence of a violation of applicable ambient air quality standards but rather will be used as described above to address fugitive emission control performance.

Monitoring will be conducted for PM_{10} because the majority of particulate emissions from the Mine Site will be associated with fugitive emissions (material handling and unpaved roads) for which PM_{10} is the primary pollutant of interest. For example, PM_{10} emissions are 10 times higher than $PM_{2.5}$ emissions from unpaved roads based on USEPA emission factors. Total Suspended Particulate (TSP) NAAQS have been replaced by PM_{10} and $PM_{2.5}$ standards, so TSP emissions are of less interest than the finer particulate fractions. In addition, TSP emissions tend to settle out near the emission sources and are less likely to impact off-site air quality. In addition, given the geographical scale of the emission sources at the Mine Site, PM_{10} is likely to be a better indicator of the overall effectiveness of fugitive emission controls (see Large Figure D1).

Conversely, $PM_{2.5}$ particles can travel longer distances than TSP and PM_{10} emissions and local concentrations of $PM_{2.5}$ may be greatly influenced by off-site sources. Furthermore, PM_{10} modeling was conducted as part of the environmental review process and was included with the air permit application and supplemental submittals. The enhanced FEC plan was proposed to provide additional PM_{10} control to support the factors used in that modeling. Therefore, PM_{10} has been the primary factor leading to the proposed special purpose monitoring program. In summary, PM_{10} is the appropriate pollutant to monitor because it represents a size fraction with significant contributions from fugitive dust, the Permittee has been required to model compliance with PM_{10} NAAQS, and it offers a reasonable balance between transportability and local impacts.

This plan was prepared to address monitoring to be conducted to evaluate the performance of fugitive emission control procedures at the Mine Site and to support the 90% control efficiency assumed for the Mine Haul Roads in the emission inventory (Reference (3)) and modeling and not to address any other monitoring that may be performed for other purposes.

2.0 Mine Site Description

2.1 General Site Description

2.1.1 Mine Site Emission Sources

An open-pit mine will be operated at the site. This operation will include the West Pit, the East/Central Pit, the Ore Surge Pile, the Overburden Storage and Laydown Area, the Category 1 Waste Rock Stockpile, and the Rail Transfer Hopper, where ore will be loaded into railcars for transportation to the Plant Site for processing. Two temporary stockpiles will also be located at the Mine Site: the Category 4 Waste Rock Stockpile (on top of what later will become the Central Pit) and the Category 2/3 Waste Rock Stockpile. Large Figure D1 shows the Mine Site layout. Rock will be transported to and from the mine pits and to the Rail Transfer Hopper via the Haul Roads, as also shown on Large Figure D1.

The Mine Site will operate in two primary modes: the temporary stockpile phase (Mine Years 1 through 11) and the in-pit disposal/stockpile reclaim phase (Mine Years 12 through 20).

2.1.2 Neighboring Sources

The Plant Site is about eight miles to the west of the Mine Site. The Mesabi Nugget operations to the west and the Cliffs Erie Pellet Yard to the south are located adjacent to the Plant Site. The Northshore Mine (taconite) is located immediately to the north of the Mine Site. The operations at the Cliffs Erie Pellet Yard have been reduced significantly and the facility now operates under a registration permit. The facility is no longer included as a nearby source in the Project modeling because of low actual emissions consistent with MPCA guidance. The Mine Site PM_{10} emission sources, along with the current nearby sources, modeled for the Class II modeling supplement, show compliance with the NAAQS and MAAQS (Reference (4)). The maximum Class II PM_{10} modeling results, including background, were approximately 60% of the 24-hour PM_{10} NAAQS and the annual PM_{10} MAAQS. Based on air dispersion modeling results, the only nearby source expected to potentially have significant overlapping impacts with the Mine Site is the Northshore Mine.

2.1.3 Location of Maximum Modeled Impacts

The Class II PM_{10} NAAQS modeling results (Reference (4)) can be used to guide placement of the monitors based on the locations where the maximum impacts were modeled. Large Figure D2 shows the maximum modeled 24-hour PM_{10} NAAQS results for Mine Year 8 (representative for worst case during temporary stockpile phase) and Large Figure D3 shows the maximum modeled 24-hour PM_{10} concentration for Mine Year 13 (representative for worst case during in-pit disposal phase). The maximum result for Mine Year 8 was 85 and the maximum result for Mine Year 13 was 77. As shown in Large Figure D2 and Large Figure D3, the maximum modeled result during both modeled Mine Years was approximately south of the Rail Transfer Hopper and does not vary significantly between the two operating phases. The temporary stockpile phase (Mine Year 8) results were used to establish the proposed monitoring sites because: 1) results are similar for the two mine phases and 2) the temporary stockpile phase occurs first, so it is the most relevant for establishing the initial monitoring sites.

2.2 Topographical Description

Large Figure D1 illustrates the site location and the surrounding land features. The land on the east side of the Mine Site generally slopes down towards the east to the Partridge River. The land on the west side of the Mine Site generally slopes down to the south, again towards the Partridge River. The headwaters of the Partridge River surround the Mine Site on the north, east, and south sides. The Dunka Road is a mining road constructed by Erie Mining Company (now Cliffs Erie) for access to the Dunka Mine, which is about nine miles to the northeast. The Dunka Road crosses the southeastern corner of the Mine Site, as does the Cliffs Erie rail line formerly used to transport pellets to the shipping facility at Taconite Harbor and ore from the Dunka Mine to the former LTVSMC taconite processing plant.

Elevations north of the Dunka Road range from 1,635 feet above mean sea level (MSL) along the western boundary to 1,545 feet MSL near the southeastern boundary. Elevations south of the Dunka Road range from 1,580 feet MSL in the north to 1,540 feet MSL along the Partridge River in the south.

2.3 Climatological Description

The Project is located in northeastern Minnesota near the headwaters of the Partridge and Embarrass Rivers. The climate classification in Minnesota is defined as continental. The northeastern region of Minnesota is subject to continental polar air masses throughout most of the year and during the cold season is subject to occasional Arctic air masses. During summer months, warm air moves northward from the Gulf of Mexico that occasionally pushes toward the northern portion of Minnesota.

Mean annual temperatures in northeastern Minnesota range from 36 degrees Fahrenheit (°F) in the extreme north to approximately 40° F near Duluth, Minnesota. Temperature extremes in the northeastern portion of the state range from approximately -60 to 100° F. Monthly mean temperatures in the Arrowhead Region vary from approximately 4° F during the coldest month (January) to approximately 68° F in the warmest month of the year (July).

The majority of precipitation in the region (approximately two-thirds) occurs between May and September, with annual precipitation ranging from approximately 23 inches in the extreme north and gradually increasing southeastward across the northeastern portion of the state to approximately 32 inches near Lake Superior. Northeastern Minnesota generally receives approximately 70 inches of snow per year in the northeast highlands, with annual snowfall decreasing to 45 inches per year near the western end of the Arrowhead Region. Northern Minnesota averages 140 days of snow cover each year.

Large Figure D4 includes a wind rose based on data collected at the Hibbing airport from 2009 to 2013. This is the same data set that was used for the Mine Site near field (i.e., Class II) air dispersion modeling completed for the FEIS. The prevailing wind directions are northwest in the winter and southeast in the summer.

3.0 Monitor Siting

3.1 Number of Monitoring Locations

There will be no less than two monitoring locations. One site will be located near the location of the maximum modeled PM_{10} concentration in the NAAQS demonstration (Large Figure D2) and the other will be located "upwind" based on the prevailing wind direction, which will place it toward the northern end of the Mine Site emissions generating activities, within the Effective Fenceline. Large Figure D4 shows the proposed monitoring sites near the maximum modeled concentration and the upwind sites. The figure also shows the Mine Year 8, 24-hour, PM_{10} NAAQS modeling results and the wind rose to support the locations for the proposed monitoring sites. In addition, based on seasonal variation of the prevailing wind direction, the monitoring location considered "upwind" and the location considered "downwind" may vary as conditions dictate. It should be noted that Large Figure D2 shows two areas of elevated concentrations, one due south of the Rail Transfer Hopper (RTH) and one south of the Overburden Storage and Laydown Area (the reader can consult Large Figure D1 to confirm the location of these Mine Site features). Additional modeling was completed to set the effective fenceline, which included receptors inside the final effective fenceline. From this modeling, it is known that a "plume" extends south form the RTH with further elevated modeled concentrations. The effective fenceline is much closer to the emission sources by the Overburden Laydown and Storage Area, so there was less increase in monitored concentration north of the effective fenceline in this area. Based on this additional information, the monitoring locations south of the RTH were selected based on the highest overall modeled concentrations.

Under most conditions, a single, downwind monitor will be used to evaluate the monitored concentration to the action levels described in Section 4.6. If a result above an action level is recorded, the upwind monitor can be used to aid in assessing the culpability for the elevated monitoring concentration. If the upwind monitor indicates that off-site emissions are culpable, this can be recorded with documentation demonstrating how the results above the action level were addressed. PolyMet may elect to add additional monitors or periodically relocate monitors to further address seasonal variation in the prevailing wind direction and/or to address differences in the monitored PM_{10} concentrations versus that were estimated by modeling. Periodic relocation of the monitors will be permissible because of their status as Special Purpose monitors (i.e., they are not intended to demonstrate compliance with the NAAQS). A number of options are shown for the "upwind" location and the final site selection will also consider conditions encountered in the field. MPCA will review the proposed monitoring sites and approve them or suggest alternative sites or alternative site selection criteria, as appropriate.

PolyMet will be preauthorized to relocate or add monitors to other approved sites. Notice will be provided to MPCA within seven working days of a monitor being relocated or added to an approved site.

PolyMet shall notify the MPCA of plans to relocate or add a monitor to a site that has not been pre-approved at least 60 calendar days in advance of the monitor placement to allow the MPCA to review the location's benefits and to allow the MPCA the opportunity to perform a site visit. PolyMet shall also

comply with any provisions in its air emission permit related to relocating monitors to sites not previously approved by MPCA.

3.2 Siting Criteria

Candidate monitoring and meteorological tower locations will be identified using GIS tools (aerial photos, land use, terrain maps) prior to conducting a site visit. During the site visit, assessment of the candidate monitoring station locations will be conducted with the purpose of identifying the best monitoring sites based on a combination of logistical considerations (access, availability of power, presence of wetlands) and data representativeness goals.

USEPA guidance for background pollutant monitoring (Reference (5)) and for meteorological tower (Reference (6)) will be followed during the site selection process.

MPCA will be given the opportunity to visit the site and inspect the proposed monitoring locations prior to the commencement of monitoring.

3.2.1 Data Representativeness Goals

Data representativeness goals will be used to site and operate the proposed monitors. If there is a need to vary from the goals, PolyMet shall notify MPCA of plans and rationale to employ methods that deviate from the goal guidance at least 60 calendar days in advance of the monitor placement. If the MPCA does not provide written objection by the planned installation date, PolyMet may proceed with the proposed siting and operation of the monitor.

Specific considerations for the siting and operating of the monitoring equipment include:

- Meteorological Tower
    - unobstructed by terrain and vegetation – sited at a downwind distance at least 10 times the height of the obstruction
    - representative of facility location (elevation, wind flow, exposure)
    - measure meteorological variables at the heights of facility source types (surface fugitive sources at Mine Site)
- Pollutant Monitoring
    - potential influence from nearby sources (e.g., Northshore Mine; Large Figure D5)
    - exposure – relatively open to minimize potential vegetation effects
    - ground vegetation to avoid entrained dust
    - removed from roadway

- Logistical Considerations
    - availability of power
    - on property that is (or will be) controlled by PolyMet
    - road access
    - ability to secure location

4.0 Sampling Program Description

4.1 PM_{10} Monitors

The installed upwind/downwind monitors will be automated semi-continuous beta attenuation monitors. This type of instrument measures PM_{10} on spooled glass fiber filter media and is capable of producing hourly PM_{10} concentration results. The use of this type of monitor will provide a relatively rapid indication of changes in the monitored PM_{10} concentration, which can be used to identify the need for changes to fugitive emission control procedures. In addition, having semi-continuous monitors on opposite sides of the site will allow downwind sampling based on prevailing wind direction on a yearlong basis without relocating monitors. These monitors will be operated 24 hours per day, seven days per week except for maintenance, audits, and malfunctions.

An additional monitor or monitors may also be installed at PolyMet's discretion. Such monitors may be of the same type, or some or all of the additional monitors may be single filter models to accommodate specific sampling locations and/or data needs. The single filter monitors require filter recovery and replacement between sampling events. The recovered filters must be equilibrated and weighed in a laboratory and 24-hour average results will be produced.

4.2 Meteorological Monitoring

Meteorological data will be collected at a site representative of the meteorological conditions at the Mine Site. This will likely be at a location near one of the PM_{10} monitoring sites. Meteorological data will be collected to allow for interpretation of the PM_{10} monitoring data and to help guide fugitive emission control practices. The parameters monitored will include wind speed, wind direction, temperature, and precipitation. A tower, approximately 10 meters in height, will be erected at the site with the meteorological data instruments affixed to the tower.

Mechanical or sonic instruments can be used to obtain accurate wind speed and direction data. Capital and operating cost, data quality, and reliability will be considered when selecting the technology employed.

Air temperature will be measured with a resistance temperature device accurate to ±1.0 degrees Celsius over -30 to +50 degrees Celsius (Table 0.5 and Table 0.6 of Reference (5)). The temperature probe will be housed in a radiation shield to minimize the effects of solar radiation on the probe.

An electrically heated rain and snow gage incorporating a tipping bucket mechanism will be used to measure precipitation with a resolution of 1 millimeter with +/-2% accuracy up to 25 mm/hour and 3% up to 50 mm/hour in a temperature range of -20 degrees Celsius to 50 degrees Celsius.

4.3 Sampling Frequency

Hourly values will be obtained from semi-continuous PM_{10} analyzers (primary upwind and downwind monitors). The hourly values will be used to calculate 24-hour (i.e., standard time calendar day)

concentrations. Both hourly and 24-hour average results will be recorded. Data completeness objectives are 23 hours of sampling per calendar day and 75% of sampling days in a calendar quarter.

Single filter analyzers will collect 24-hour samples at least once every six calendar days, corresponding to the national one-in-six-day sampling schedule (additional monitors added at the Permittee's discretion). A more frequent sampling schedule may be adopted if PolyMet determines that the additional data is useful for isolating impacts from Mine Site activities (e.g., one-in-three-day sampling schedule).

Meteorological data will be recorded continuously as 1-minute, 15-minute, and 1-hour averages. Data completeness objectives will be 45 1-minute values per hour and 75% of the hourly values per calendar quarter.

Data collection may occasionally be interrupted due to electrical or equipment failures or due to maintenance or audits being conducted.

4.4 Data Storage and Availability

Meteorological data and data from semi-continuous PM_{10} monitors will be stored locally. Cellular modems or equivalent technology will also be used to acquire data remotely to a secure data storage server. The data can be readily available to the mine operations and environmental staff to potentially identify any conditions that indicate the need to alter operations or fugitive emission control procedures. Notification of specific monitored conditions can be provided to appropriate PolyMet staff via two-way radio, text message, e-mail, alarm indicators, or similar means.

Data will be stored in data files that can be exported to a number of different formats for post processing for data quality assurance and reporting.

4.5 Duration of Monitoring Program

The Special Purpose monitoring program described in this document will be commenced no later than the start of mining operations at the Mine Site (defined as the commencement of blasting of waste rock or ore). PolyMet may elect to conduct monitoring prior to the commencement of operations to establish "background" levels due to impacts from off-site sources. If PolyMet elects to collect pre-operation data to analyze monitoring results, set action levels or for similar purposes, the data will be made available to MPCA upon request.

The Special Purpose monitoring program will continue until such time as the MPCA issues a permit amendment allowing the discontinuation of the monitoring program.

4.6 Proposed Action Levels

If monitoring results, from either or both of the primary monitors, are above the agreed-upon criteria, PolyMet will review available monitoring and process data to evaluate the cause of the elevated monitoring results and take additional actions if warranted (i.e. if sources operated on the Permittee's property are contributing to the elevated monitoring results). Interim action levels have been established

for the initial operation of the Mine Site. As per the terms of the facility air emission permit, within 180 calendar days after the commencement of mining operations, PolyMet will either: 1) propose to MPCA that the interim action levels continue to apply to mining operations; or 2) submit proposed revised actions levels if PolyMet determines the interim action levels are not serving their intended purpose of assessing Mine Site FEC Plan (Reference (2)) performance and alternate action levels will be more appropriate. If revised action levels are proposed, supporting information, including, but not limited to, monitoring results, meteorological data, fugitive emission check forms, and operating records, will be included to support the proposed action levels. PolyMet may also subsequently propose revised action levels, subject to the procedures of the facility air emission permit, at any time during the term of the air emission permit. The proposed interim action levels and associated responses are summarized in Table D4-1.

This approach will allow PolyMet and MPCA to make use of knowledge gained from actual mine operations and the associated collection of monitoring data prior to either making the interim action levels "final" or setting alternate "final" action levels. The interim action levels will allow for the implementation of the fugitive emission control procedures prior to the setting of the "final" action levels.

Table D4-1 Interim Action Levels and Triggered Actions

Interim Action Level	Numerical Value(s)	Timing of Required Response	Action
AL1: 1-hour average results, greater than 60% of the 24-hour PM_{10} NAAQS for three consecutive hours	90 µg/m^3	Within one hour after becoming aware of monitoring results triggering action level	Mine management and/or environmental staff will review operating records and meteorological data to determine if operations can be varied or fugitive emission control procedures can be improved to reduce monitored PM_{10} concentrations. Appropriate corrective action will be implemented if warranted. PolyMet will have fulfilled this requirement either if monitored concentrations have been reduced to less than 60% of the NAAQS, all practical measures to reduce fugitive emissions believed to be contributing to the monitored levels have been implemented, or if PolyMet documents that emissions from the Mine Site were not responsible for the monitored concentration above the action level. In any event, the response to the monitoring results above the action level shall be documented. The Permittee shall also recalculate the total action level events for the most culpable source type, if it is a source operated by the Permittee.
AL2: 1-hour average result, greater than 100% of the 24-hour PM_{10} NAAQS value for a single hour	150 µg/m^3	Within one hour after becoming aware of monitoring results triggering action level	PolyMet shall investigate the cause of the monitoring result above the action level and implement corrective action if warranted. The Permittee shall also recalculate the total action level events for the most culpable source type, if it is a source operated by the Permittee.
AL3: 24-hour average concentration of PM_{10} calculated from midnight to midnight > 24-houtr NAAQS	PM_{10} 24 hour NAAQS/MAAQS = 150 µg/m^3	Within three business days following the date of becoming aware of monitoring results triggering action level	Notify MPCA of monitoring results in writing or via facsimile or e-mail at the addresses/numbers specified in the air emission permit (i.e., Air Compliance Tracking Coordinator and local enforcement person assigned to the facility).
		Within 60 calendar days of becoming aware of monitoring results triggering action level	The Permittee shall conduct a root cause analysis to identify the cause of the elevated monitoring result and submit a report to MPCA. The report shall include a review of culpable sources and a discussion of any corrective measures taken in response to the monitoring result above the action level and their effectiveness. If sources operated by the Permittee are found to have significantly contributed to the elevated monitored concentration, the Permittee shall propose revisions to the FEC Plan and/or this monitoring plan to address the cause of the elevated monitoring results as part of the root cause analysis report. If the Permittee determines that off-site sources are primarily culpable for the elevated results, the permittee shall provide support for this conclusion in the root cause analysis report.

If action levels above are triggered, mine management and/or environmental staff will determine appropriate fugitive emission control measures based on their knowledge and experience. Example measures are specifically outlined in the Mine Site FEC Plan (Reference (2)). Responses to monitoring results above action levels may include increased intensity of primary control measures (e.g., additional water applied to haul roads), implementation of contingency measures described in the Mine Site FEC Plan, changes to mining operations, or a combination of the above. The action taken in response to monitoring results above the action level shall be documented.

Subsequent to the establishment of the final action levels, further revisions to the action levels will be accomplished per the terms of the facility air emission permit.

As noted in Table D4-1, after each action level event based on AL1 or AL2, the Permittee shall determine the most culpable source type, when the monitoring result above the action level is found to be, in whole or in part, due to one or more emissions sources operated by the Permittee. The rolling 12-month sum of days with action level events due to the most culpable source will then be recalculated. Source types include:

1. Drilling and Blasting (FUGI 25)
2. Truck Loading and Unloading at Mine Site (FUGI 10, 11, 12, 13, 14, 15, 16, 17, 19, 20 and 21)
3. Mine Site Haul Roads (FUGI 26)
4. Mine Site Service Roads (FUGI 1 and 2)
5. Ore Railcar Loading (FUGI 18)
6. Mine Site Portable Crushing/Screening Equipment (FUGI 22, 23, 24, 32, 33-36, 37-54, 49, 55, 56)
7. Uncertain

If the 12-month rolling sum number of days with action level events for a source type equals eight, the Permittee shall conduct a root cause analysis to identify the cause of the elevated monitoring result and submit a report to MPCA. The Permittee shall propose revisions to the FEC Plan and/or this monitoring plan relevant to the culpable source type to address the cause of the elevated monitoring results as part of the root cause analysis report. The report shall be submitted within 60 calendar days of the monitoring result above the action level that triggers the root cause analysis requirement.

Eight days with action level events with "Uncertain" culpability will trigger the root cause analysis requirement the same as any of the named source categories. Part of the analysis may include improving the methods used to identify the primary culpable source.

4.7 Recordkeeping and Reporting

In addition to the records of monitoring data, PolyMet will keep records for a minimum of five years of any action taken as a result of the monitoring results. The records will be made available to MPCA upon request or during an inspection.

As noted in Table D4-1, PolyMet will report any monitored values greater than the ambient air quality standards (NAAQS or MAAQS) within three calendar days of becoming aware of any such monitoring results. The root cause analysis will be submitted within 60 calendar days also as described in Table D4-1.

Any root cause analysis report required based on eight days with action level events for a source type will be submitted within 60 calendar days as described in Section 4.6.

Because of the intended purpose of the monitoring described in this document, detailed reports on monitoring results will not be submitted routinely. PM_{10} monitoring data and meteorological data will be provided to MPCA upon request. Collected data may also be submitted in support of revisions of the Mine Site FEC Plan (Reference (2)) and/or other submittals to MPCA.

PolyMet will include the following with each semi-annual report required by the facility air emission permit:

- Date and time of any monitoring results that are greater than the NAAQS or MAAQS.
- Date and time of any deviations from the terms of the NorthMet air emission permit. A deviation will occur when monitored results are above the action levels and the procedures specified in the Mine Site FEC Plan (Reference (2)) are not implemented.
- The results of any audits to assess monitor performance conducted during the reporting period.
- Reference to any root cause analysis reports submitted during the reporting period.

5.0 Quality Assurance/Quality Control (QA/QC) Procedures

A quality assurance/quality control (QA/QC) program will be developed to be consistent with MPCA and USEPA guidance. The program will be based on the quality assurance requirements for monitoring described in 40 CFR Part 58 Appendix A and in the USEPA Quality Assurance Handbook for Air Pollution Measurement Systems: Volume II, Ambient Air Quality Monitoring Program (Reference (7)).

The QA/QC program will include such elements as data acceptance criteria and auditing and calibration frequency and procedures. A description of the QA/QC program will be added to this plan when the monitoring equipment has been specified and the monitoring sites finalized.

MPCA will be given the opportunity to review and comment on the proposed QA/QC program. Notification will also be provided to MPCA of when PolyMet plans to conduct the first performance audit on the monitoring equipment, so that MPCA can participate in or witness the audit if it so chooses. MPCA may also choose to observe or participate in subsequent periodic audits at its discretion.

6.0 References

1. **Minnesota Department of Natural Resources, U.S. Army Corps of Engineers and U.S. Forest Service.** Final Environmental Impact Statement: NorthMet Mining Project and Land Exchange. November 2015.

2. **Barr Engineering Co.** Mine Site Fugitive Emission Control Plan prepared for Poly Met Mining, Inc. NorthMet Project. April 2017.

3. —. Mine Site Emission Inventory spreadsheet for Air Permitting (UpdatedCalcsMine Permitting.xlsx) (v2) submitted to MPCA for the NorthMet Project. August 24, 2016.

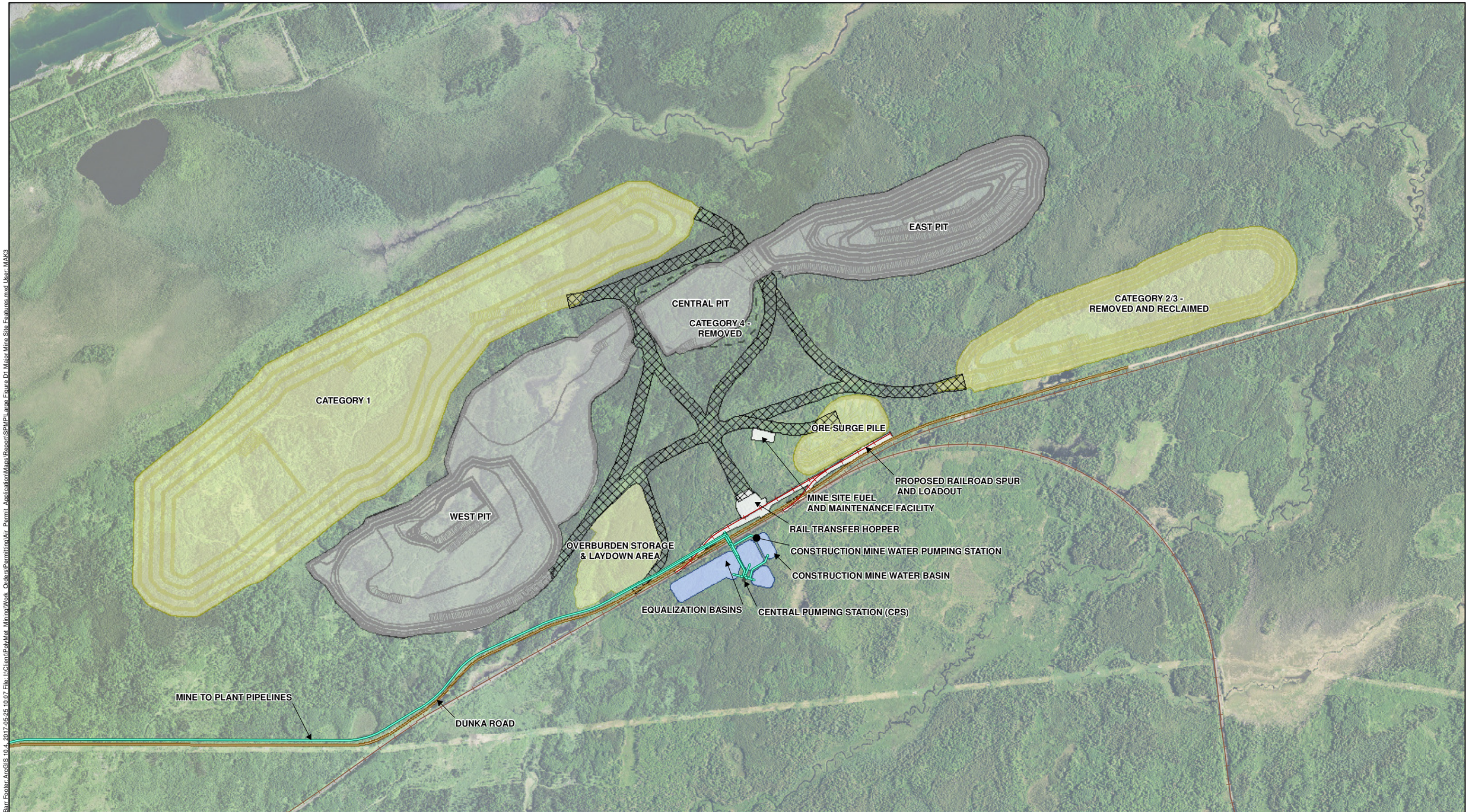
4. **Poly Met Mining, Inc.** Class II Air Dispersion Modeling Report Supplement. May 9, 2017.

5. **U.S. Environmental Protection Agency.** Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements Version 2.0. March 2008. EPA-454/B-08-002.

6. —. Ambient Monitoring Guidelines for Prevention of Significant Deterioration (PSD). May 1987. EPA-450/4-87-07.

7. —. Quality Assurance Handbook for Air Pollution Measurement Systems, Volume II: Ambient Air Quality Monitoring Program. December 2008. Vols. EPA-454/B-08-003.

Large Figures



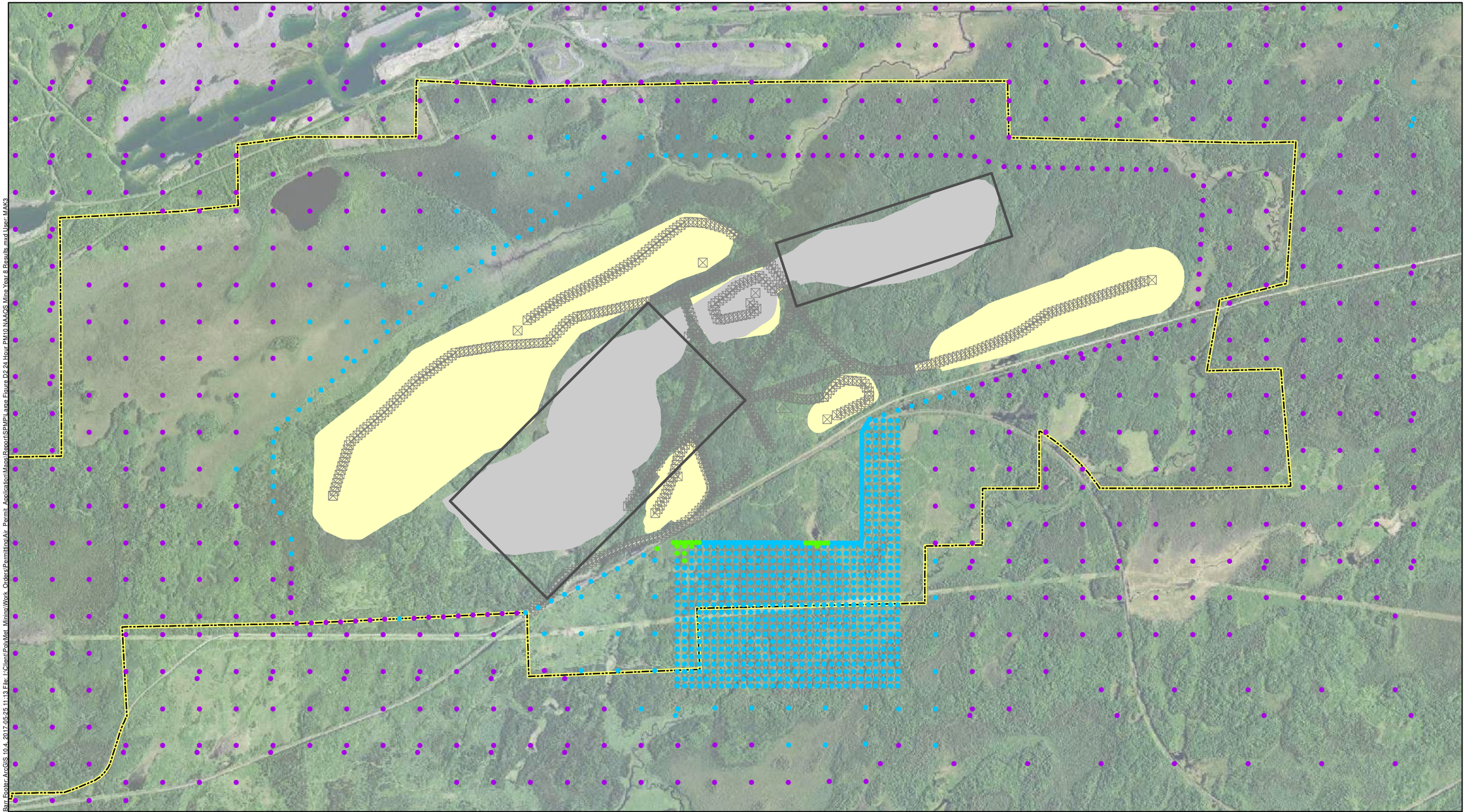
Mine Layout Year 11
- Mine Pit
- Haul Roads
- Active Stockpile
- Removed Stockpile
- Waste Wate Treatment Equalization Basins
- Splitter/Pump Building
- Dunka Road
- Mine to Plant Pipelines
- Existing Private Railroad
- Proposed Railroad Track

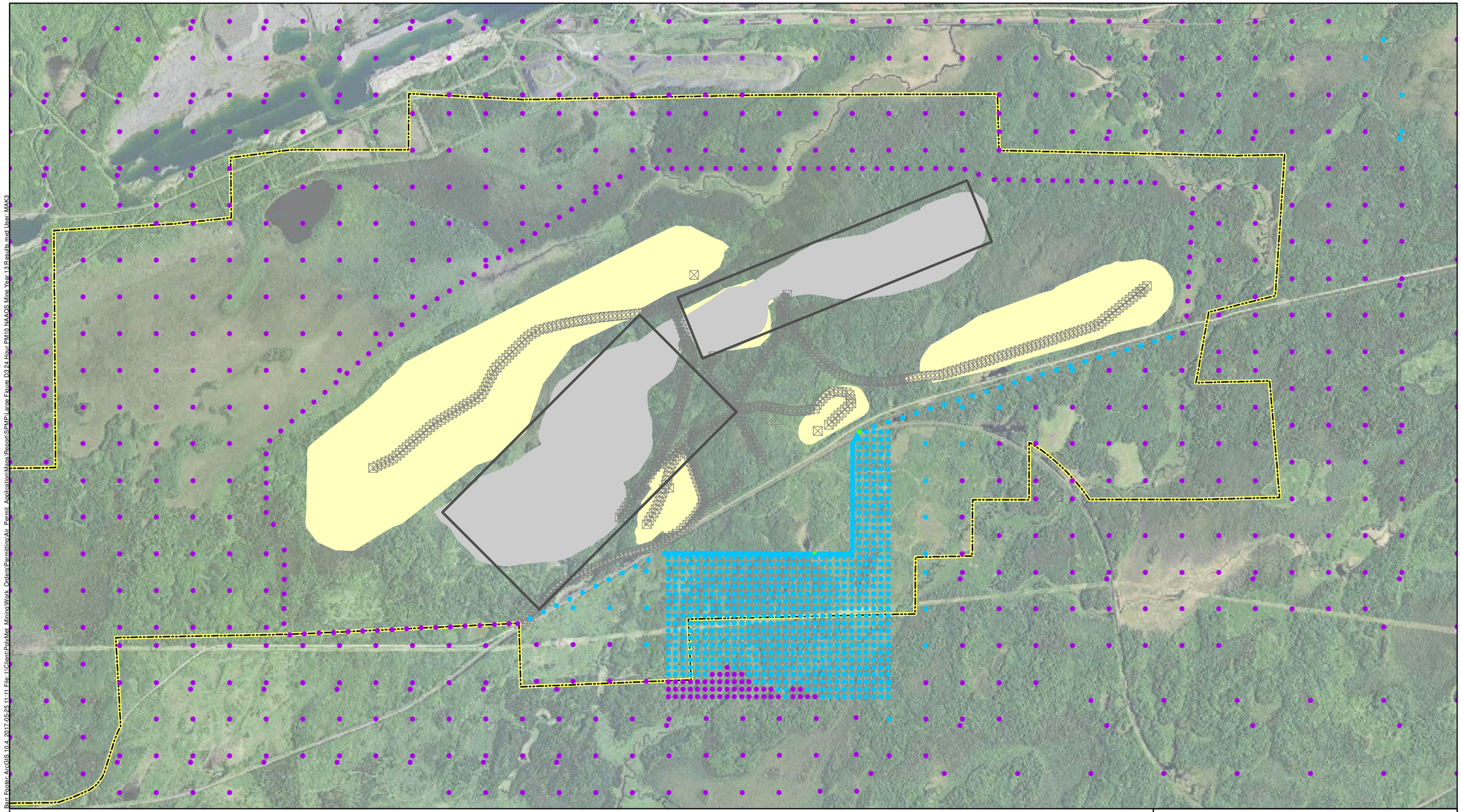
0 750 1,500 3,000
Feet

BARR

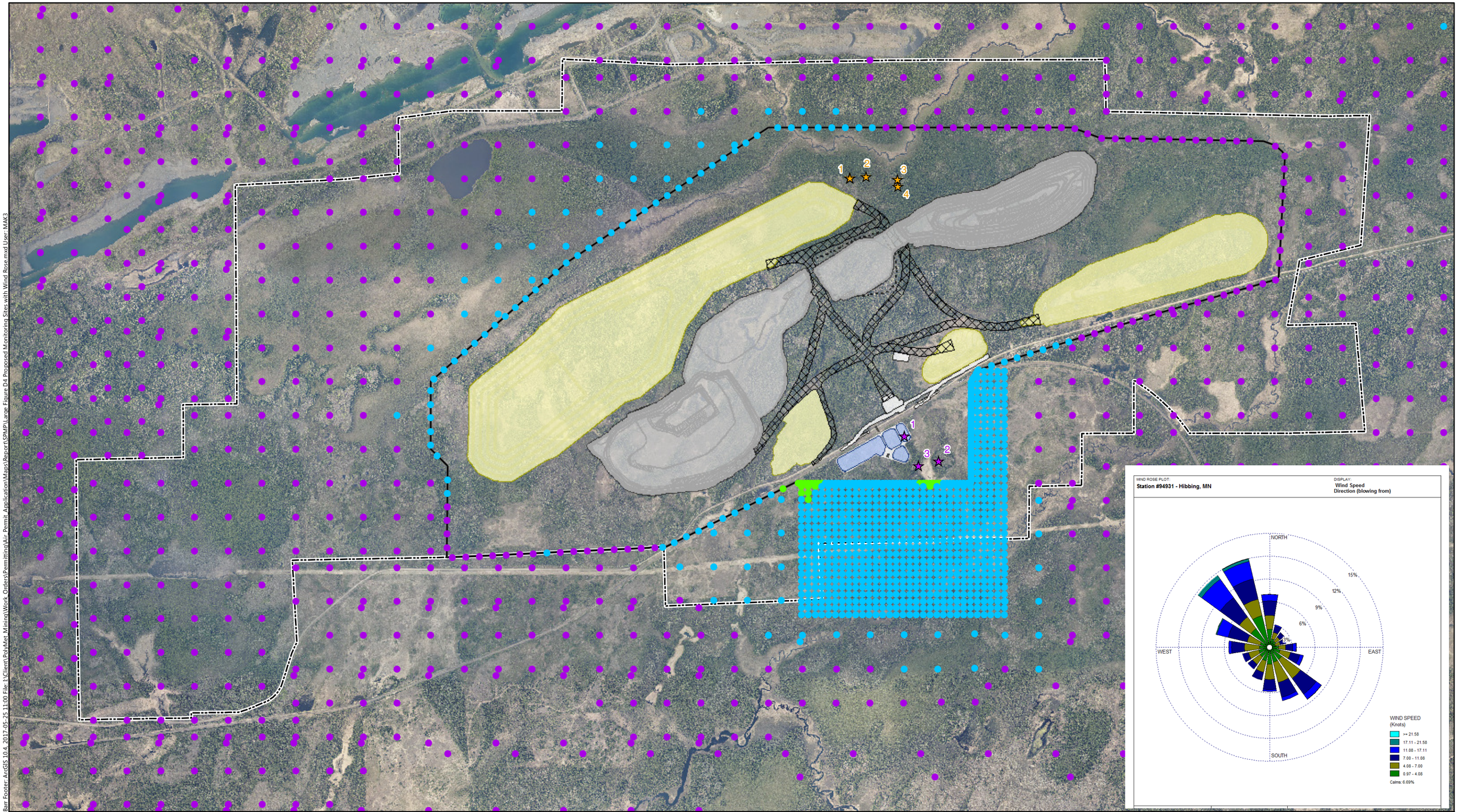
MAJOR MINE SITE FEATURES
NorthMet Project
Poly Met Mining, Inc.

Large Figure D1
Special Purpose Monitoring Plan





Plot Footer:ArcGIS 10.4 2017.05.25 11:11 File: I:\Client\PolyMet_Mining\Work_Orders\Permitting\Air_Permit_Application\Maps\Report\SPMP\Large Figure D3 24 Hour PM10 NAAQS Mine Year 13 Results.mxd User: MAK3



24-hour PM_{10} NAAQS (µg/m³)
- 33.5 - 50.0
- 50.0 - 75.0
- 75.0 - 100.0
- 100.0 - 125.0
- 125.0- 134.8

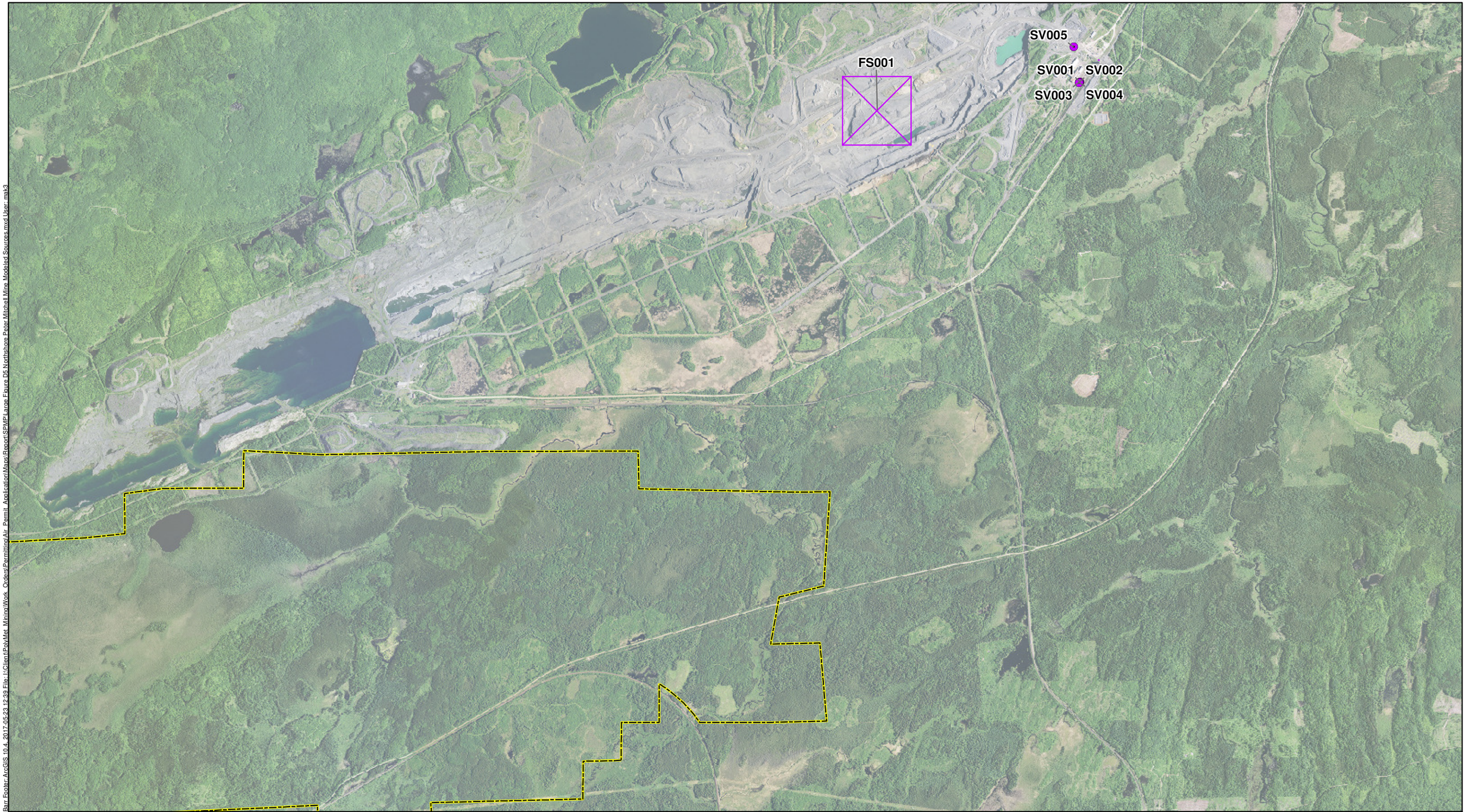
- Potential Ambient Air Montioring North
- Potential Ambient Air Montioring South
- Proposed Effective Fenceline (Mine Site)
- Area PolyMet Controls
- Active Stockpile
- Removed Stockpile
- Mine Pit
- Haul Roads

0 0.25 0.5 1
Kilometers

BARR

PROPOSED MONITORING SITES WITH WIND ROSE
NorthMet Project
Poly Met Mining, Inc.

Large Figure D4
Special Purpose Monitoring Plan



NSM Babbitt Point Sources
NSM Babbitt Volume Sources
Area PolyMet Controls

0 1,500 3,000 6,000
Feet

BARR

NORTHSHORE MINE MODELED SOURCES
NorthMet Project
Poly Met Mining, Inc.

Large Figure D5
Special Purpose Monitoring Plan