

Technical Memorandum

To: Jon Ahlness
From: Cheryl Feigum
Subject: Baseline Wetland Type Evaluation
Date: December 21, 2010
Project: PolyMet - NorthMet Project
c: Mark Jacobson, John Borovsky, Kevin Pylka

The baseline wetland type evaluation was completed as part of the wetland review process for the Environmental Impact Statement (EIS) for the PolyMet Mining Inc. (PolyMet) NorthMet Project. The U.S. Army Corps of Engineers (Corps) determined there was a need to evaluate and classify wetland types in the areas surrounding the Mine Site and the Tailings Basin with the potential for indirect hydrologic wetland impacts (Figure 1). The information in this Technical Memorandum supplements the draft *NorthMet Project Baseline Wetland Type Evaluation* report initially prepared in March 2010.

The purpose of this Technical Memorandum is to provide additional baseline wetland type evaluation data regarding the classification and acreages of wetlands within two areas: a 23,927-acre area including and surrounding the Mine site (referred to as the Mine Site Area; Figure 2) and a 19,397-acre area around the Tailings Basin (referred to as the Tailings Basin Area; Figure 3). There were 11,195 acres and 8,605 acres of wetlands identified within the Mine Site Area and Tailings Basin Area, respectively.

Wetland Classification

The wetlands were classified using the Eggers & Reed (1997) community classification system, which classifies the wetlands into 15 different plant communities. The acreages and percent of wetland area represented by each Eggers & Reed community classification are summarized for the Mine Site Area (Table 1) and the Tailings Basin Area (Table 2). Each wetland is identified by an ID number, Eggers & Reed community classification type and area (acres) for the Mine Site Area (Table 3) and the Tailings Basin Area (Table 4).

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Additional Site Visits

The wetlands within the evaluation area were initially classified as described in the *NorthMet Project Baseline Wetland Type Evaluation* (Barr, March 2010). Additional site visits were conducted on the ground by Barr and the Wetland Workgroup from April through October 2010. In addition, Barr reviewed the wetlands in the valuation area by helicopter (with doors off) on October 14, 2010. During the aerial review, photographs were taken using a GPS-equipped digital camera to provide different viewpoints of the wetlands from a distance of 20 to 100 feet above the ground. Based the information from the site visits, the wetland boundaries and classifications were reviewed and refined as presented in this Technical Memorandum.

Additional Wetland Data

Based on the additional site visits, we prepared a package of information for this Technical Memorandum that includes:

1. Background image (jpeg) which is the 2008 FSA color infrared (CIR) aerial photograph.
2. Boundary shapefiles for the Mine Site Area and Tailings Basin Area. The attribute table for the shapefiles includes location (Location) and area (ACRES).
3. Boundary shapefile for the Mine Site. The attribute table for the shapefile includes the area (ACRES).
4. Boundary shapefile for the wetlands. For each wetland in the shapefile, the attribute table includes the location (Location), wetland ID number (UniqueID), Eggers & Reed community classification type (EggersReed), and area (ACRES).
5. Point shapefile for the wetland observation points. The attribute table for the shapefile includes the wetland observation point ID (PointID). The datasheets are provided in pdf format for each wetland observation point and includes the date the point was field reviewed, point ID, wetland ID, UTM coordinates, vegetation data, etc.
6. Lidar data (Lidar_2ft) for portions of the Mine Site Area and Tailings Basin Area. The attribute table for the shapefile includes the elevation for the contours in feet.

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7. Photographs from the helicopter flight on October 14, 2010 which are hyperlinked in GIS. You are able to find the location and view the photograph in GIS.

There are two options available for your review of the above information:

- 1) If you have ArcMap on your computer, you can open the .mxd on the enclosed CD.
- 2) If you do not have ArcMap on your computer, we have provided an ArcReader document that is already set up for you to load onto your computer. Follow the instructions that will pop up when you open the CD on your computer. NOTE: If the instruction page does not pop up when you put the CD in your computer, you will need to open the folder on the CD and double-click on the "intro.html" file.

After you have selected which option to use, we have provided information to help you interpret the photographs. Table 5 provides a set of photographs that should be initially viewed to help orient you while reviewing background images, wetland boundaries and photographs. For each photograph, the table provides the photograph number, ID numbers for some of the wetlands that you view in the photograph, the direction that photograph was taken, comments about the various vegetation visible in the photograph (black spruce, tamarack, pine, cedar, aspen, black ash, maple, alder, etc.) and other general information.

Conclusion

The purpose of providing the additional wetland information in this Technical Memorandum is to provide information to the COE for distribution to the Wetland Workgroup in order to facilitate a final determination of the wetland classification in the Mine Site Area and Tailings Basin Area. Once the wetland classification is deemed complete, the wetland impact analysis will be conducted as required for the Section 404 permitting process.

Tables

Table 1
Summary of Wetland Resources within the Mine Site Area
NorthMet Project
PolyMet Mining

Eggers & Reed Wetland Type	Wetland Area (ac)¹	% of Total Wetland Area
Coniferous bog	4669	41.7
Coniferous swamp	1984	17.7
Deep marsh	220	2.0
Harwood swamp	27	0.2
Open bog	280	2.5
Open water (includes shallow, open water and lakes)	245	2.2
Sedge/wet meadow	46	0.4
Shallow marsh	359	3.2
Shrub-carr	66	0.6
Alder thicket	1238	11.1
Alder thicket or Shrub-carr	2061	18.4
<i>Total Wetland Area</i>	11195	100

¹Total acres have been rounded to the nearest acre.

Table 2
Summary of Wetland Resources within the Tailings Basin Area
NorthMet Project
PolyMet Mining

Eggers & Reed Wetland Type	Wetland Area (ac)¹	% of Total Wetland Area
Coniferous bog	1329	15.4
Coniferous swamp	2225	25.9
Deep marsh	507	5.9
Harwood swamp	157	1.8
Open bog	353	4.1
Open water (includes shallow, open water and lakes)	286	3.3
Sedge/wet meadow	138	1.6
Shallow marsh	654	7.6
Shrub-carr	250	2.9
Alder thicket	94	1.1
Alder thicket or Shrub-carr	2611	30.3
<i>Total Wetland Area</i>	8605	100

¹Total acres have been rounded to the nearest acre.

Table 3
Summary of Each Wetland within the Mine Site Area
NorthMet Project
PolyMet Mining

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1	Shallow marsh	0.42
3	Shallow marsh	0.35
5	Wet meadow	0.61
6	Shallow marsh	0.62
7	Wet meadow	0.07
8	Sedge meadow	6.80
9	Shallow marsh	1.80
10	Sedge meadow	1.17
11	Coniferous bog	8.88
12	Alder thicket	0.13
13	Deep marsh	5.03
14	Wet meadow	0.33
16	Shallow marsh	0.31
18	Shallow marsh	18.89
19	Shallow marsh	1.68
20	Sedge meadow	17.05
22	Shallow marsh	1.43
24	Alder thicket	0.80
25	Coniferous bog	1.95
27	Coniferous bog	1.07
29	Shallow marsh	12.01
32	Coniferous bog	73.32
37	Shrub-carr	2.39
43	Alder thicket	8.28
44	Alder thicket	3.27
45	Alder thicket	37.53
47	Open bog	0.54
48	Coniferous bog	89.11
51	Alder thicket	7.47
52	Alder thicket	3.88
53	Alder thicket	18.58
54	Coniferous swamp	4.10
55	Alder thicket	3.91
56	Coniferous bog	2.79
57	Coniferous swamp	78.02
58	Alder thicket	34.57
60	Alder thicket	6.71
61	Coniferous swamp	0.45
62	Coniferous bog	12.13
64	Hardwood swamp	0.31
68	Coniferous swamp	23.80
72	Coniferous swamp	1.38
74	Hardwood swamp	6.12
76	Coniferous bog	3.92
77	Coniferous bog	13.00
78	Coniferous bog	1.75
79	Coniferous bog	2.39
80	Coniferous bog	0.29

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
80	Coniferous bog	0.29
81	Coniferous swamp	1.68
82	Coniferous bog	62.37
83	Open bog	3.99
84	Coniferous bog	1.33
85	Coniferous bog	1.41
86	Coniferous bog	2.47
88	Coniferous bog	5.57
90	Coniferous bog	176.00
95	Coniferous bog	2.54
96	Coniferous bog	17.29
97	Coniferous bog	4.45
98	Coniferous bog	15.49
99	Coniferous bog	1.40
100	Coniferous bog	176.11
101	Coniferous bog	14.20
103	Coniferous bog	118.78
104	Coniferous bog	3.57
105	Coniferous bog	15.47
107	Coniferous bog	40.90
114	Coniferous bog	0.73
120	Shallow marsh	0.58
200	Hardwood swamp	6.36
201	Wet meadow	13.48
202	Open bog	3.11
552	Coniferous bog	8.72
567	Shallow marsh	1.40
100A	Alder thicket	1.66
107A	Coniferous swamp	1.74
107B	Shallow marsh	4.50
107C	Alder thicket	27.59
22A	Coniferous swamp	0.89
33A	Alder thicket	18.45
33B	Coniferous swamp	4.55
48A	Coniferous swamp	2.65
53A	Coniferous swamp	2.35
53B	Coniferous swamp	0.43
53C	Coniferous swamp	2.88
54C	Alder thicket	0.74
90A	Open bog	7.90
4	Wet meadow	0.49
17	Shallow marsh	1.12
46	Shrub-carr	3.95
106	Coniferous bog	83.54
315	Alder thicket or Shrub-carr	322.69
390	Alder thicket or Shrub-carr	12.59
391	Coniferous swamp	22.31
392	Alder thicket or Shrub-carr	1.16

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Wetland ID	Eggers & Reed Wetland Type	Area (acres)
393	Shallow marsh	84.40
394	Coniferous swamp	194.92
395	Coniferous swamp	1.30
396	Alder thicket or Shrub-carr	5.34
397	Coniferous swamp	589.18
400	Coniferous bog	3.93
404	Coniferous swamp	12.78
406	Coniferous bog	2.43
407	Alder thicket or Shrub-carr	14.57
408	Alder thicket or Shrub-carr	107.70
409	Coniferous bog	98.65
410	Alder thicket or Shrub-carr	2.03
413	Deep marsh	10.94
414	Shallow marsh	1.26
415	Coniferous bog	53.17
416	Shallow, open water	11.88
417	Alder thicket or Shrub-carr	9.82
418	Coniferous bog	19.81
419	Coniferous bog	7.04
420	Deep marsh	17.60
421	Alder thicket or Shrub-carr	5.11
422	Coniferous bog	6.20
423	Coniferous bog	9.14
424	Shallow, open water	0.49
425	Coniferous bog	21.75
426	Deep marsh	11.76
427	Alder thicket or Shrub-carr	2.61
428	Deep marsh	1.02
429	Alder thicket or Shrub-carr	6.68
430	Deep marsh	0.50
431	Alder thicket or Shrub-carr	1.24
432	Alder thicket or Shrub-carr	0.16
433	Alder thicket or Shrub-carr	1.83
434	Alder thicket or Shrub-carr	2.17
435	Coniferous bog	39.29
436	Alder thicket or Shrub-carr	23.39
437	Coniferous bog	24.19
438	Coniferous bog	10.94
439	Coniferous bog	1.08
441	Coniferous bog	1.26
442	Coniferous bog	2.63
443	Alder thicket or Shrub-carr	17.95
444	Alder thicket or Shrub-carr	3.53
445	Alder thicket or Shrub-carr	16.98
447	Coniferous swamp	2.60
448	Deep marsh	1.69
449	Shallow, open water	5.50
450	Alder thicket or Shrub-carr	175.46
451	Coniferous bog	47.76

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
452	Alder thicket or Shrub-carr	40.88
453	Shallow, open water	20.25
454	Deep marsh	11.19
455	Alder thicket or Shrub-carr	10.20
456	Coniferous bog	17.17
457	Alder thicket or Shrub-carr	79.57
458	Alder thicket or Shrub-carr	7.13
459	Coniferous bog	35.03
460	Coniferous bog	6.73
461	Alder thicket or Shrub-carr	9.41
462	Alder thicket or Shrub-carr	8.83
463	Shallow marsh	2.12
464	Alder thicket or Shrub-carr	3.66
465	Coniferous bog	21.75
466	Coniferous swamp	24.87
467	Coniferous bog	29.58
468	Alder thicket or Shrub-carr	19.67
469	Coniferous bog	10.24
470	Shallow marsh	1.33
471	Shallow, open water	2.27
472	Coniferous swamp	1.04
473	Coniferous bog	5.66
474	Coniferous bog	18.43
477	Coniferous bog	8.17
478	Coniferous bog	1.99
479	Coniferous bog	36.88
480	Alder thicket or Shrub-carr	8.86
481	Alder thicket or Shrub-carr	2.03
482	Coniferous swamp	30.06
483	Alder thicket or Shrub-carr	2.83
484	Alder thicket or Shrub-carr	18.27
485	Deep marsh	18.07
486	Alder thicket or Shrub-carr	1.97
487	Alder thicket or Shrub-carr	23.58
489	Coniferous bog	178.72
490	Coniferous bog	13.80
491	Coniferous swamp	4.46
492	Coniferous bog	7.41
493	Open bog	49.59
494	Coniferous bog	6.62
495	Shallow marsh	17.35
496	Coniferous bog	125.92
497	Alder thicket or Shrub-carr	20.63
498	Coniferous bog	46.01
499	Coniferous bog	53.51
501	Coniferous swamp	22.51
502	Coniferous bog	3.10
503	Coniferous bog	56.77
504	Coniferous swamp	36.58

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Wetland ID	Eggers & Reed Wetland Type	Area (acres)
505	Alder thicket or Shrub-carr	4.41
506	Alder thicket or Shrub-carr	3.52
507	Coniferous bog	7.92
508	Coniferous bog	2.10
509	Shrub-carr	0.79
510	Coniferous bog	51.96
511	Shallow marsh	0.24
512	Alder thicket or Shrub-carr	20.34
513	Coniferous bog	10.37
514	Coniferous bog	12.31
515	Sedge meadow or Wet mead	0.30
516	Sedge meadow or Wet mead	1.78
517	Sedge meadow or Wet mead	0.74
518	Sedge meadow or Wet mead	1.10
519	Coniferous bog	2.20
520	Coniferous bog	1.42
521	Alder thicket or Shrub-carr	11.34
522	Alder thicket or Shrub-carr	1.95
523	Shallow marsh	1.06
524	Shallow marsh	5.88
525	Alder thicket or Shrub-carr	10.96
526	Coniferous bog	1.14
527	Shallow marsh	0.16
528	Coniferous bog	32.99
530	Coniferous bog	276.75
531	Coniferous bog	70.47
532	Coniferous swamp	23.23
533	Deep marsh	7.80
534	Alder thicket or Shrub-carr	34.22
535	Coniferous bog	104.73
536	Alder thicket or Shrub-carr	171.55
537	Deep marsh	49.98
538	Coniferous bog	3.96
539	Deep marsh	9.38
540	Coniferous bog	21.45
541	Coniferous bog	15.06
542	Alder thicket or Shrub-carr	0.28
543	Alder thicket or Shrub-carr	13.42
544	Coniferous swamp	1.82
545	Alder thicket or Shrub-carr	12.86
546	Coniferous bog	350.92
547	Coniferous bog	12.32
548	Coniferous bog	13.57
550	Open bog	23.43
551	Shallow marsh	3.58
553	Coniferous swamp	2.55
554	Coniferous swamp	2.16
555	Alder thicket or Shrub-carr	131.62
556	Alder thicket or Shrub-carr	1.84

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
557	Alder thicket or Shrub-carr	2.92
558	Coniferous bog	16.07
559	Coniferous bog	34.13
560	Coniferous bog	5.01
561	Coniferous bog	18.54
562	Coniferous bog	5.27
564	Coniferous bog	3.58
565	Alder thicket or Shrub-carr	1.91
566	Alder thicket or Shrub-carr	5.87
568	Deep marsh	0.42
569	Alder thicket or Shrub-carr	8.99
570	Alder thicket or Shrub-carr	48.54
571	Coniferous swamp	44.02
583	Alder thicket or Shrub-carr	0.13
658	Shallow marsh	1.54
678	Alder thicket	58.39
679	Coniferous bog	0.50
681	Coniferous bog	2.09
682	Open bog	2.16
688	Coniferous swamp	2.01
689	Coniferous swamp	4.62
691	Alder thicket	6.23
693	Coniferous bog	12.33
695	Coniferous bog	3.30
697	Coniferous bog	4.54
699	Coniferous bog	2.20
700	Open bog	0.63
701	Coniferous swamp	152.94
708	Shallow marsh	3.92
709	Shallow marsh	8.13
713	Coniferous bog	7.91
714	Coniferous bog	194.63
716	Alder thicket	1.06
724	Alder thicket	1.48
725	Coniferous swamp	8.00
726	Coniferous swamp	6.82
727	Open bog	0.26
728	Open bog	0.25
729	Sedge meadow	0.77
730	Open bog	0.27
731	Shallow, open water	0.15
732	Open bog	0.10
733	Open bog	0.25
734	Open bog	0.26
735	Coniferous bog	0.91
736	Alder thicket	0.57
737	Coniferous bog	0.42
738	Open bog	0.59
739	Open bog	0.26

Table 3
Summary of Each Wetland within the Mine Site Area
NorthMet Project
PolyMet Mining

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
740	Open bog	0.15
741	Alder thicket	0.57
742	Coniferous bog	3.49
743	Alder thicket	0.64
744	Alder thicket	0.96
745	Coniferous swamp	13.32
746	Alder thicket	0.33
747	Alder thicket	0.93
748	Alder thicket	0.47
749	Alder thicket	9.44
752	Alder thicket	3.60
753	Alder thicket	2.52
754	Hardwood swamp	0.98
755	Alder thicket	0.64
756	Shrub-carr	0.54
757	Open bog	0.30
759	Open bog	10.08
760	Hardwood swamp	0.57
761	Alder thicket	0.77
764	Shrub-carr	57.84
765	Alder thicket	1.15
766	Alder thicket	1.88
768	Hardwood swamp	4.65
769	Hardwood swamp	0.85
770	Alder thicket	0.76
773	Coniferous bog	8.12
774	Coniferous bog	8.22
775	Hardwood swamp	3.06
776	Coniferous bog	3.89
777	Open bog	0.04
778	Coniferous swamp	0.48
779	Alder thicket	1.58
780	Coniferous bog	1.44
781	Coniferous bog	0.62
782	Coniferous bog	2.10
783	Coniferous bog	1.91
784	Coniferous bog	1.65
785	Alder thicket	1.33
789	Alder thicket or Shrub-carr	1.90
790	Shallow marsh	16.11
791	Lake	30.59
792	Alder thicket or Shrub-carr	7.10
793	Coniferous swamp	9.75
795	Coniferous bog	332.22
796	Alder thicket or Shrub-carr	26.22
797	Alder thicket or Shrub-carr	51.37
799	Coniferous bog	8.41
802	Coniferous swamp	46.34
805	Deep marsh	7.65

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
806	Shallow marsh	52.96
807	Coniferous swamp	84.81
808	Coniferous swamp	20.31
812	Coniferous swamp	6.46
813	Alder thicket	81.25
814	Coniferous bog	14.79
856	Coniferous swamp	9.64
862	Alder thicket or Shrub-carr	47.27
864	Coniferous swamp	112.48
882	Deep marsh	22.54
885	Open bog	139.24
887	Coniferous bog	557.81
888	Coniferous bog	192.87
889	Shallow marsh	36.97
890	Alder thicket or Shrub-carr	37.28
891	Coniferous swamp	14.78
897	Alder thicket	2.02
899	Open bog	30.14
900	Coniferous bog	9.57
901	Shrub-carr	0.48
903	Shallow marsh	9.70
904	Coniferous swamp	2.33
906	Alder thicket or Shrub-carr	4.25
924	Coniferous swamp	0.61
925	Open bog	4.38
930	Open bog	2.23
931	Coniferous bog	4.31
949	Coniferous bog	1.81
972	Hardwood swamp	0.90
973	Alder thicket or Shrub-carr	10.99
984	Coniferous bog	15.05
997	Shallow marsh	1.51
999	Shallow marsh	0.71
1004	Shallow marsh	0.94
1005	Alder thicket or Shrub-carr	1.41
1029	Alder thicket or Shrub-carr	2.04
1030	Alder thicket or Shrub-carr	2.01
1031	Deep marsh	2.06
1032	Hardwood swamp	2.96
1033	Shallow, open water	77.54
1034	Alder thicket or Shrub-carr	0.04
1035	Alder thicket or Shrub-carr	0.46
1036	Shallow, open water	0.40
1037	Shallow, open water	6.59
1038	Coniferous swamp	1.75
1039	Shallow, open water	6.56
1040	Alder thicket or Shrub-carr	42.97
1041	Alder thicket or Shrub-carr	158.22
1042	Sedge meadow or Wet meadow	0.69

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PolyMet Mining

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1044	Coniferous bog	123.17
1045	Sedge meadow or Wet meadow	0.39
1046	Coniferous swamp	18.44
1047	Alder thicket or Shrub-carr	0.32
1048	Coniferous swamp	13.74
1049	Coniferous swamp	86.28
1050	Shallow, open water	47.06
1051	Coniferous swamp	20.34
1052	Alder thicket or Shrub-carr	2.07
1053	Sedge meadow or Wet meadow	0.22
1054	Alder thicket or Shrub-carr	3.01
1055	Shallow, open water	11.40
1061	Alder thicket or Shrub-carr	1.00
1062	Shallow, open water	24.20
1063	Shallow marsh	0.00
1118	Alder thicket or Shrub-carr	43.80
1119	Coniferous swamp	7.92
1120	Shallow marsh	16.36
1121	Alder thicket or Shrub-carr	30.01
1122	Alder thicket or Shrub-carr	3.47
1123	Shallow marsh	5.50
1124	Alder thicket or Shrub-carr	74.20
1127	Coniferous swamp	3.80
1128	Coniferous swamp	15.12
1131	Coniferous bog	4.55
1132	Shallow marsh	0.16
1136	Deep marsh	40.51

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1137	Alder thicket or Shrub-carr	12.09
1138	Deep marsh	2.23
1144	Coniferous swamp	52.79
1145	Coniferous swamp	80.54
1146	Coniferous swamp	6.16
1149	Coniferous bog	1.80
1153	Coniferous swamp	15.92
1154	Coniferous swamp	17.11
105A	Coniferous bog	0.12
106A	Coniferous bog	0.00
106B	Coniferous bog	21.33
106C	Coniferous bog	19.93
106D	Coniferous bog	22.80
22B	Shallow marsh	2.71
22C	Alder thicket or Shrub-carr	2.83
53D	Alder thicket	885.55
53E	Coniferous swamp	1.92
54A	Coniferous swamp	3.20
54B	Alder thicket	0.56
54D	Coniferous swamp	1.63
84A	Coniferous bog	8.21
R-1	Alder thicket or Shrub-carr	1.05
R-2	Alder thicket or Shrub-carr	1.65
R-3	Alder thicket or Shrub-carr	0.63
R-5	Shallow marsh	26.67
R-6	Alder thicket or Shrub-carr	13.95
R-7	Shallow marsh	12.23

Table 4
Summary of Each Wetland within the Tailings Basin Area
NorthMet Project
PolyMet Mining

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
251	Alder thicket or Shrub-carr	1.43
252	Coniferous swamp	45.71
253	Deep marsh	5.89
254	Shallow marsh	36.70
255	Shallow marsh	6.12
256	Alder thicket or Shrub-carr	23.43
257	Coniferous bog	84.73
259	Alder thicket or Shrub-carr	0.34
260	Shallow marsh	149.52
261	Alder thicket or Shrub-carr	0.84
262	Shallow marsh	1.86
263	Alder thicket or Shrub-carr	0.74
264	Coniferous swamp	10.85
265	Alder thicket or Shrub-carr	4.79
267	Alder thicket or Shrub-carr	1.09
268	Alder thicket or Shrub-carr	15.43
270	Shallow marsh	87.23
271	Coniferous bog	18.07
272	Deep marsh	1.11
275	Coniferous bog	30.57
276	Coniferous swamp	5.79
277	Alder thicket or Shrub-carr	14.45
278	Alder thicket or Shrub-carr	1.72
279	Alder thicket or Shrub-carr	3.58
280	Sedge meadow	17.12
281	Alder thicket or Shrub-carr	1.46
282	Shallow marsh	32.51
283	Deep marsh	8.89
284	Alder thicket or Shrub-carr	5.09
285	Coniferous swamp	364.68
286	Shallow, open water	7.44
287	Alder thicket or Shrub-carr	5.93
288	Deep marsh	4.51
289	Alder thicket or Shrub-carr	2.93
290	Coniferous swamp	0.48
292	Deep marsh	1.78
293	Deep marsh	5.74
307	Shallow marsh	0.77
308	Deep marsh	82.70
309	Wet meadow	0.02
312	Alder thicket or Shrub-carr	1.98
314	Shallow marsh	45.78
475	Coniferous swamp	16.73
476	Alder thicket or Shrub-carr	0.82
529	Wet meadow	0.30
549	Alder thicket or Shrub-carr	2.21
572	Deep marsh	7.33
573	Shallow marsh	13.89

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
574	Deep marsh	12.81
575	Alder thicket or Shrub-carr	0.49
576	Sedge meadow or Wet meadow	0.35
577	Alder thicket or Shrub-carr	13.47
578	Deep marsh	17.49
579	Deep marsh	2.14
580	Alder thicket or Shrub-carr	1.71
581	Coniferous swamp	20.61
582	Deep marsh	48.20
584	Alder thicket or Shrub-carr	52.97
585	Alder thicket or Shrub-carr	4.35
586	Deep marsh	1.89
587	Shallow marsh	0.97
588	Alder thicket or Shrub-carr	18.21
589	Deep marsh	40.03
590	Shallow marsh	5.42
591	Deep marsh	5.45
592	Alder thicket or Shrub-carr	1.78
593	Deep marsh	30.37
594	Deep marsh	1.56
596	Alder thicket or Shrub-carr	0.24
597	Coniferous bog	4.45
598	Alder thicket or Shrub-carr	6.31
599	Alder thicket or Shrub-carr	2.79
600	Shallow marsh	8.79
601	Alder thicket or Shrub-carr	1.34
602	Alder thicket or Shrub-carr	0.60
603	Shallow marsh	0.10
604	Shallow marsh	0.12
605	Shallow marsh	0.13
606	Shallow marsh	0.19
607	Alder thicket or Shrub-carr	0.09
608	Shallow, open water	0.44
609	Coniferous swamp	38.77
610	Shallow marsh	0.16
611	Coniferous bog	0.58
612	Coniferous bog	2.19
613	Alder thicket or Shrub-carr	1.59
614	Shallow marsh	1.23
615	Shallow marsh	0.44
616	Deep marsh	5.97
617	Shallow marsh	2.08
618	Alder thicket	1.46
619	Alder thicket or Shrub-carr	0.88
620	Shallow marsh	0.28
621	Alder thicket or Shrub-carr	0.52
622	Alder thicket or Shrub-carr	0.37
623	Alder thicket or Shrub-carr	0.88

Table 4
Summary of Each Wetland within the Tailings Basin Area
NorthMet Project
PolyMet Mining

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
624	Alder thicket or Shrub-carr	4.84
625	Coniferous swamp	3.70
626	Coniferous bog	258.80
627	Alder thicket or Shrub-carr	186.99
628	Deep marsh	10.52
629	Alder thicket or Shrub-carr	10.66
630	Coniferous bog	8.05
631	Coniferous swamp	10.05
632	Alder thicket or Shrub-carr	11.12
633	Alder thicket or Shrub-carr	1.07
634	Alder thicket or Shrub-carr	0.51
635	Alder thicket or Shrub-carr	1.76
636	Coniferous bog	2.25
637	Lake	132.01
638	Shallow marsh	9.39
639	Shallow marsh	4.04
640	Coniferous bog	25.97
641	Coniferous swamp	16.15
642	Shallow, open water	8.34
643	Alder thicket or Shrub-carr	1.59
644	Coniferous swamp	14.34
645	Shallow marsh	1.04
646	Alder thicket or Shrub-carr	23.43
647	Alder thicket or Shrub-carr	6.54
648	Alder thicket	45.96
649	Sedge meadow or Wet meadow	10.62
650	Sedge meadow or Wet meadow	7.86
651	Alder thicket	2.10
652	Coniferous swamp	109.39
653	Coniferous bog	5.23
654	Shrub-carr	15.17
655	Alder thicket or Shrub-carr	5.71
656	Alder thicket or Shrub-carr	1.94
657	Alder thicket or Shrub-carr	99.91
659	Coniferous swamp	6.07
660	Hardwood swamp	2.90
662	Coniferous swamp	26.36
663	Coniferous swamp	13.12
664	Coniferous swamp	13.28
665	Shallow, open water	20.70
667	Coniferous swamp	17.34
669	Shallow marsh	21.38
670	Coniferous swamp	30.09
671	Coniferous bog	0.00
672	Coniferous swamp	9.05
673	Coniferous swamp	129.63
674	Open bog	2.35
675	Open bog	9.67
676	Deep marsh	9.48

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
677	Alder thicket or Shrub-carr	165.65
786	Open bog	266.84
787	Alder thicket or Shrub-carr	16.22
788	Hardwood swamp	98.08
810	Alder thicket or Shrub-carr	11.74
811	Coniferous swamp	0.20
816	Deep marsh	15.46
817	Deep marsh	10.03
818	Deep marsh	7.13
819	Deep marsh	0.97
820	Deep marsh	26.90
821	Shallow marsh	9.18
822	Shallow marsh	4.46
823	Shallow marsh	6.22
824	Shallow marsh	5.74
825	Wet meadow	1.79
826	Wet meadow	8.93
827	Wet meadow	2.84
828	Wet meadow	4.25
829	Wet meadow	6.81
830	Shallow marsh	4.88
831	Wet meadow	13.66
832	Wet meadow	9.37
833	Shallow marsh	15.13
834	Wet meadow	8.26
835	Wet meadow	12.66
836	Shrub-carr	11.49
837	Shrub-carr	13.49
838	Shrub-carr	18.99
839	Shrub-carr	13.06
840	Shrub-carr	31.29
841	Shrub-carr	9.24
842	Shrub-carr	8.30
843	Shrub-carr	12.56
844	Shrub-carr	28.52
845	Coniferous swamp	12.63
846	Shrub-carr	7.63
847	Shallow marsh	17.86
848	Shrub-carr	16.02
849	Shrub-carr	10.87
850	Shrub-carr	29.73
851	Shrub-carr	19.73
852	Shrub-carr	3.68
854	Coniferous swamp	14.56
866	Hardwood swamp	31.02
867	Alder thicket or Shrub-carr	79.45
868	Hardwood swamp	9.87
869	Alder thicket or Shrub-carr	16.50
870	Coniferous bog	66.71

Table 4
Summary of Each Wetland within the Tailings Basin Area
NorthMet Project
PolyMet Mining

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
871	Alder thicket or Shrub-carr	41.11
872	Coniferous swamp	42.28
873	Coniferous swamp	10.00
874	Coniferous swamp	5.80
875	Alder thicket or Shrub-carr	27.01
876	Alder thicket	39.11
877	Alder thicket or Shrub-carr	12.64
878	Alder thicket or Shrub-carr	35.54
908	Shallow marsh	8.70
915	Alder thicket	5.48
917	Coniferous bog	19.87
918	Coniferous swamp	9.44
921	Alder thicket or Shrub-carr	0.38
923	Wet meadow	0.69
942	Deep marsh	2.96
943	Deep marsh	14.03
944	Hardwood swamp	2.61
945	Alder thicket or Shrub-carr	2.32
946	Alder thicket or Shrub-carr	6.95
947	Alder thicket or Shrub-carr	20.37
950	Alder thicket or Shrub-carr	3.13
951	Coniferous bog	165.78
952	Alder thicket or Shrub-carr	108.49
953	Alder thicket or Shrub-carr	614.02
954	Coniferous swamp	175.53
955	Alder thicket or Shrub-carr	39.22
956	Wet meadow	17.39
957	Coniferous swamp	6.87
958	Alder thicket or Shrub-carr	3.58
963	Alder thicket or Shrub-carr	50.53
964	Coniferous swamp	42.86
965	Coniferous swamp	11.22
966	Alder thicket or Shrub-carr	8.15
968	Coniferous swamp	13.76
974	Coniferous bog	69.18
975	Coniferous swamp	26.32
976	Coniferous swamp	99.56
977	Coniferous swamp	53.69
978	Hardwood swamp	2.80
979	Alder thicket or Shrub-carr	5.75
980	Alder thicket or Shrub-carr	2.82
981	Alder thicket	0.38
982	Alder thicket or Shrub-carr	103.22
983	Hardwood swamp	1.68
985	Alder thicket or Shrub-carr	55.25
986	Alder thicket or Shrub-carr	22.19
987	Shallow, open water	1.79
988	Alder thicket or Shrub-carr	20.50
989	Coniferous swamp	130.24

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
990	Alder thicket or Shrub-carr	42.20
991	Coniferous swamp	55.67
992	Alder thicket or Shrub-carr	14.99
993	Alder thicket or Shrub-carr	7.05
994	Coniferous bog	26.76
995	Coniferous swamp	18.29
996	Alder thicket or Shrub-carr	4.10
1000	Coniferous swamp	12.94
1001	Coniferous bog	77.35
1002	Coniferous swamp	5.81
1003	Alder thicket or Shrub-carr	0.50
1006	Alder thicket or Shrub-carr	5.55
1008	Alder thicket or Shrub-carr	28.89
1009	Alder thicket or Shrub-carr	5.69
1010	Coniferous bog	28.86
1011	Alder thicket or Shrub-carr	2.08
1012	Coniferous swamp	2.79
1013	Coniferous bog	10.76
1014	Alder thicket or Shrub-carr	0.18
1015	Coniferous bog	99.29
1016	Sedge meadow or Wet meadow	0.73
1017	Alder thicket or Shrub-carr	1.17
1018	Coniferous bog	8.99
1019	Coniferous bog	2.70
1020	Sedge meadow or Wet meadow	1.26
1021	Coniferous bog	5.09
1022	Deep marsh	20.22
1023	Alder thicket or Shrub-carr	2.35
1024	Coniferous swamp	10.81
1025	Hardwood swamp	1.55
1026	Shallow, open water	12.76
1027	Alder thicket or Shrub-carr	0.99
1056	Alder thicket or Shrub-carr	2.04
1057	Shallow, open water	4.86
1058	Shallow, open water	2.85
1059	Shallow, open water	4.55
1060	Shallow, open water	16.43
1065	Coniferous swamp	162.40
1066	Alder thicket or Shrub-carr	108.35
1067	Alder thicket or Shrub-carr	57.07
1069	Shallow marsh	19.92
1070	Alder thicket or Shrub-carr	3.80
1071	Alder thicket or Shrub-carr	29.17
1072	Alder thicket or Shrub-carr	8.62
1073	Alder thicket or Shrub-carr	3.78
1074	Coniferous bog	146.22
1076	Coniferous swamp	50.70
1077	Alder thicket or Shrub-carr	51.50
1078	Shallow marsh	29.22

Table 4
Summary of Each Wetland within the Tailings Basin Area
NorthMet Project
PolyMet Mining

Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1079	Coniferous swamp	2.63
1080	Coniferous swamp	8.12
1081	Alder thicket or Shrub-carr	144.31
1082	Coniferous swamp	43.40
1083	Coniferous swamp	14.45
1084	Deep marsh	13.99
1085	Sedge meadow or Wet meadow	4.32
1086	Alder thicket or Shrub-carr	1.94
1091	Shallow marsh	1.79
1092	Alder thicket or Shrub-carr	11.10
1093	Shallow marsh	6.48
1094	Sedge meadow or Wet meadow	1.06
1095	Coniferous swamp	4.79
1096	Shallow, open water	74.11
1105	Sedge meadow or Wet meadow	5.42
1106	Coniferous swamp	35.61
1107	Alder thicket or Shrub-carr	0.83
1108	Alder thicket or Shrub-carr	2.51
1109	Alder thicket or Shrub-carr	0.76
1110	Sedge meadow or Wet meadow	0.28
1111	Alder thicket or Shrub-carr	0.63
1112	Coniferous swamp	2.27
1113	Coniferous bog	81.83
1114	Hardwood swamp	5.49
1115	Shallow marsh	1.09
1116	Deep marsh	6.02
1117	Deep marsh	14.02
1125	Sedge meadow	0.07
1126	Hardwood swamp	0.69

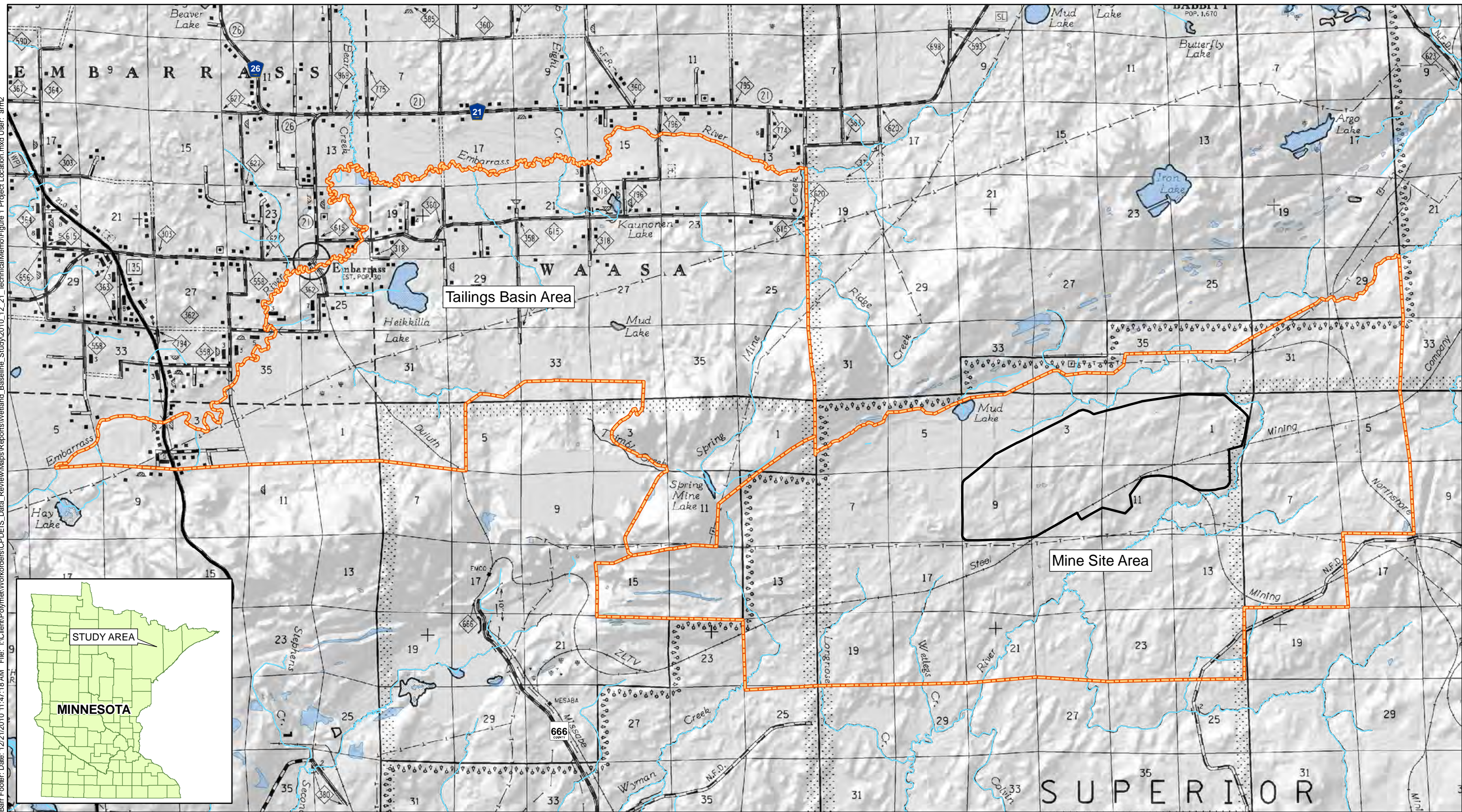
Wetland ID	Eggers & Reed Wetland Type	Area (acres)
1129	Coniferous swamp	9.79
1130	Coniferous swamp	32.28
1133	Coniferous swamp	70.50
1134	Shallow marsh	16.26
1135	Deep marsh	7.42
1139	Shallow marsh	70.13
1140	Coniferous bog	78.98
1141	Alder thicket or Shrub-carr	9.41
1142	Alder thicket or Shrub-carr	20.34
1143	Coniferous swamp	7.65
1147	Alder thicket or Shrub-carr	13.46
1148	Open bog	74.52
1150	Shallow marsh	3.92
1151	Coniferous swamp	117.25
T1	Deep marsh	1.93
T10	Deep marsh	1.48
T11	Deep marsh	0.95
T12	Shallow marsh	0.39
T13	Deep marsh	13.77
T14	Deep marsh	45.18
T15	Shallow marsh	1.70
T2	Deep marsh	0.90
T3	Wet meadow	0.09
T4	Wet meadow	1.02
T5	Wet meadow	0.24
T6	Alder thicket or Shrub-carr	0.07
T7	Shallow marsh	0.92
T8	Wet meadow	0.04
T9	Wet meadow	0.38

Table 5
Set of Photographs for Initial Review
NorthMet Project
PolyMet Mining Inc.

Photograph Number	Direction Looking in Photograph	Wetland ID (s)	Comment
770	Northeast	714, 864, 1145	Wetland 1145 is in the left foreground and is dominated by cedar (yellowish green). South of 1145 is Wetland 864 which is a mix of cedar and tamarack (yellow). In the background is Wetland 714 which is dominated by black spruce (dark green with a pointed top). The white colored line is deciduous trees that have dropped their leaves.
773	Southwest	887, 1144, 1154	Cedar in the foreground (Wetland 1145) grading to tamarack, then black spruce (Wetland 887). You can see an area of tamarack to the southwest of Mud Lake (Wetland 1154).
780	Northeast	755, 931	Alder in the center foreground (Wetland 755). Mix of cedar, black spruce, tamarack (Wetland 931). The whitish deciduous trees (aspen) are on upland.
782	East	397	Cedar in foreground with some tamarack and scattered aspen (Wetland 397).The whitish deciduous trees (aspen) are on upland.
785	Northwest	397, 790	The open water in the foreground is Wetland 790. Looking east at a mix of cedar, black spruce and tamarack (Wetland 397). The whitish deciduous trees (aspen) are on upland.
787	North to northeast	397	Photos 787and 790 were taken while flying from southeast to northwest across Wetland 397. Cedar (mixed with other trees) in foreground with black spruce, tamarack and deciduous trees in background. The whitish deciduous trees (aspen) are on upland.
790	Northeast	397, 887	Photos 787 and 790 were taken while flying from southeast to northwest across Wetland 397. Looking across Wetland 397 with Wetland 887 in the background. The whitish deciduous trees (aspen) are on upland.
808	North	570	Looking north across a recently logged area with scattered trees. Wetland 570 is to the northwest (upper left).
828	Northeast	887	Looking northeast with deciduous trees (aspen) in the foreground, northeast of the aspen is a ridge of white/jack pines (brighter green), and further northeast is Wetland 887. Mud Lake is visible to the north (in the background of the photograph).
837	Southeast	885, 887	Open bog (Wetland 885) grading to Wetland 887 with stunted coniferous bog grading to coniferous bog. The whitish deciduous trees (aspen) are on upland.
911	West	489, 678	Looking across Wetland 489 (black spruce and tamarack) toward the Partridge River (Wetland 678). The black spruce and tamarack (Wetland 489) grades to alder with scattered live and dead trees.
914	West to southwest	493, 1136	Looking across open water areas in Wetland 1136, with Wetland 493 located adjacent and to the north containing ericaceous shrubs and dead trees.
938	Northeast	397, 885, 887	Looking across the eastern edge of Wetland 397 with a mix of cedar, black spruce and tamarack in the wetland and aspen in the upland. Wetlands 885 and 887 are the largest wetlands in the background of the photo.
962	North to northeast	1024, T13	On upper left (north) of photograph is Wetland 1024 with a mix of black spruce and tamarack. At the south edge of Wetland 1024 is Wetland T13 which is a narrow wetland located at the toeslope of a hill. Continuing south, there is a logged open upland area. In the foreground, on the left side of photograph is upland with aspen regeneration (note how the logged areas look at different growth stages - see photo 808) and some coniferous trees. On the right side of the photograph there is upland dominated by maple trees with some large aspens.
974	East	upland	Upland area with aspen regeneration and some pines.
1029	Northeast	260, 582,	Wetland 582 (includes open water) wraps around upland in the foreground. In the background, to the north is Wetland 260 (cattails with dead trees). To the south, Wetland 260 continues and is dominated by cattails with some tamarack and dead trees. The whitish deciduous trees (aspen) are on upland.
1113	Southwest	18, 20, 107C	Open water area with a beaver dam at the west end (Wetland 18). Continue to look west along the tamarack and the grey area is Wetland 107C - the alder thicket that we walked through initially. We then followed a logging road to the wet meadow area that included a ponded area behind a beaver dam (Wetland 20)
1312	West	572, 573, 574, 1134, 1135	In these open water area, there are numerous beaver dams. Wetland 572 is located at the northeast corner of the Tailings Basin with open water and dead trees present - note the beaver dam at the north end of the wetland. To the north is Wetland 573 with cattails, then Wetland 574 with open water and dead trees. To the west of Wetland 572 is Wetland 1134 with cattails and to the north is Wetland 1135 with open water and dead trees. The whitish deciduous trees (aspen) are on upland.
1484	South to southwest	626, 628, 788, 877	Wetland 788 is the black ash swamp the Wetland Workgroup walked through on September 7, 2010. Wetland 877 is the alder thicket, located on the south side of the transmission line corridor, that we walked past while entering and leaving this black ash swamp (Wetland 788). Continuing to look south towards the open water area (Wetland 628), you can see Wetland 895 (alder thicket) and Wetland 626 with black spruce and tamarack. There is an upland with the whitish deciduous trees (aspen) on the north side of the open water (Wetland 628)..

Figures

Bar Footer: Date: 12/21/2010 11:47:18 AM File: I:\Client\Polymet\Workorders\CPDEIS_Data_Review\Maps\Reports\Welland_Baseline_Study\2010_12_21_TechnicalMemo\Figure 1 Project Location.mxd User: arm2



- Study Boundary
- Mine Site
- Lakes
- Streams

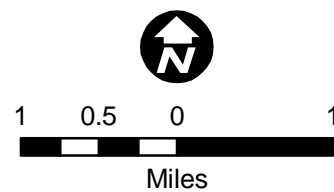


Figure 1
PROJECT LOCATION
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, Minnesota

