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Technical Memorandum

To: Stuart Arkley, MDNR
From: Tina Pint, Mark Hagley, Jeré Mohr, Leah Gruhn, and Ryan Erickson
Subject: Results of Tailings Basin Hydrogeological Investigation
Date: June 2, 2009
Project: 23/69-0862 006 001
c: Jim Scott, PolyMet Mining, Inc.

I. Overview

During the week of May 4, 2008, Barr conducted field activities north of the existing LTV Steel Mining Company (LTVSMC) Tailings Basin to further characterize the geology and hydrogeology of the area, as well as collect additional groundwater quality data. The work was conducted to gather additional data to be used in the environmental review and permitting of the PolyMet NorthMet project. This investigation was initiated at the request of the State's EIS team, which includes the MPCA, the MDNR, ERM and Knight Piésold. Due to time limitations, a formal work plan was not prepared. Instead, the scope of work was discussed during conference call on April 17, 2009. The State provided additional comments on the proposed scope of work in a memorandum dated May 30, 2009.

This technical memorandum provides a summary of the field activities and the results from the aquifer performance testing and water quality analyses. An evaluation of these data will be included in a forthcoming document.

II. Rotasonic Drilling and Monitoring Well Installation

Six soil borings (RS-25 through RS-30) were advanced using rotasonic drilling methods to characterize the unconsolidated glacial deposits and to determine the depth to bedrock at each drilling location. Soil boring locations are shown on Figure 1. In general, the soil encountered in the borings was variable; boring RS-27 was primarily comprised of silty sand with gravel, while the other borings were primarily comprised of sand and silty sand. Borings that were advanced near the tailings basin (RS-27 through RS-30) contained from 5 to 25 feet of tailings. All six borings were advanced into bedrock, which consisted

of the granitic Giants Range Batholith. The depth to bedrock ranged from 19 to 65 feet below ground surface (greater depths in areas where boring went through tailings). The bedrock elevation at the boring locations ranges from 1,444 to 1,480 feet above mean sea level. Boring logs are included as Attachment A.

Monitoring wells GW-010, GW-011, and GW-012 were installed within approximately 50 feet of borings RS-25, RS-26, and RS-27, respectively. Monitoring well locations are shown on Figure 1. The monitoring wells were constructed using 2-inch diameter 10-slot schedule 40 PVC screens and risers and completed above grade with steel protective casings and steel bumper posts. The screens were placed to intersect either the most permeable zone based on observed soil types if identified or the water table. Specifications of the three new monitoring wells are provided on the well construction logs in Attachment A.

Following well installation, well casings were surveyed and groundwater elevations determined. Groundwater elevations (shown in Table 1) and well locations (shown on Figure 1) were used to determine groundwater gradients, in terms of both direction and magnitude, using a three-point problem solver (Fienen, 2005). Table 2 includes a list of the calculated gradients for five different sets of three wells. Calculated gradients range in magnitude from 0.0029 to 0.0044, with an average of 0.0039 and direction from 338° to 355°, with an average of 344° (directions presented as degrees clockwise from north).

III. Single-well Aquifer Performance Tests

Single-well aquifer performance tests were completed at monitoring wells GW-001, GW-006, GW-007, GW-009, GW-010, GW-011, and GW-012. Well locations are shown on Figure 1. Table 1 summarizes well depth and groundwater and bedrock elevation information. Each aquifer test was conducted by pumping the well at a constant rate until the water level in the well stabilized and then turning the pump off and allowing the water level in the well to return to the pre-pumping level. A stainless steel GeoTech GeoSub submersible pump with a low-flow controller was used for the tests, allowing for pumping rates ranging from approximately 0.1 gallons per minute (gpm) to 3.5 gpm.

Prior to installing any equipment in a well, the static water level and total depth of the well were measured manually and recorded. To monitor and record water levels during each aquifer test, an In-Situ LevelTroll 700 pressure transducer/datalogger was installed in the well concurrently with the pump. To

prevent the pump from damaging the monitoring equipment, the LevelTroll was attached with cable ties to the pump discharge line several inches above the pump. A check valve was installed in the pump discharge line just above the pump to prevent water in the discharge line from re-entering the well once the pump was turned off. The pump was lowered to a depth of several inches above the bottom of the well, which allowed for maximum drawdown while maintaining the water column above the pump and LevelTroll. The water level in the well was allowed to return to the static water level after the pump and monitoring equipment were installed and prior to starting the aquifer test.

The LevelTroll was programmed to record data on a logarithmic frequency, with a maximum data collection frequency of two minutes. After the water level in the well returned to static, the pump was turned on and the drawdown monitored. During early portions of the pumping phase, the pumping rate was adjusted as necessary to attain adequate drawdown while maintaining the water level above the LevelTroll and pump intake. Once an acceptable pumping rate was attained, the aquifer test continued at the established pumping rate until the water level in the well stabilized (generally defined as less than 0.01 feet of water level change over a five minute period) or for a minimum of one hour. The pumping rate and water levels were monitored and measured manually throughout the test.

At the end of the pumping phase, the LevelTroll was programmed to re-commence logarithmic data collection (with a maximum data collection frequency of two minutes). The pump was then turned off and left undisturbed in the well until the water level recovered to at least 95% of the pre-pumping static level.

IV. Analysis and Results of Aquifer Performance Tests

Drawdown data collected during the single-well aquifer performance tests were imported into AQTESOLV Pro version 4.5 (HydroSOLVE, 2007) for analysis using curve-matching methods. Data collected during both the pumping and recovery phase of each test were analyzed using the Moench (1997) solution for a pumping test in an unconfined aquifer. The Moench solution is an analytical solution for unsteady flow to a fully or partially penetrating, finite-diameter well with wellbore storage and wellbore skin in a homogeneous, anisotropic unconfined aquifer with delayed gravity response. The Moench solution provides estimates of the following parameters:

- T (transmissivity);
- S (storativity);

- β (parameter related to aquifer anisotropy, defined as $(r_w^2 * K_z)/(b^2 * K_r)$, where K_z is the vertical hydraulic conductivity, K_r is the horizontal hydraulic conductivity, and b is the aquifer thickness);
- Sy (specific yield);
- Sw (dimensionless wellbore skin factor);
- r(w) (well radius);
- r(c) (nominal casing radius); and
- α_1 (Moench's empirical constant for noninstantaneous drainage at the water table).

During the parameter estimation process, the values of Sw, r(w), and α_1 were held fixed. Because the data collected during the aquifer tests did not allow for quantification of well skin effects, Sw was set to 0 (i.e. it was assumed that no well skin was present). The parameter r(w) was set equal to the borehole diameter. Finally, since delayed drainage effects were assumed to be negligible, the parameter α_1 was held fixed at a value of 1E+30 (the default value in AQTESOLV) to allow for instantaneous drainage at the water table. The solution was fit to the field data using a combination of the automatic curve matching features in AQTESOLV and manual adjustment. In addition to analyzing the pumping and recovery data using the Moench solution, the recovery data were analyzed in AQTESOLV using the Theis (1935) solution for a recovery test in a confined aquifer to obtain a second estimate of aquifer transmissivity. The Theis recovery solution also provides an estimate of the parameter S/S', the ratio of storativity during pumping to storativity during recovery. The Theis recovery method can be used for unconfined aquifers as long as late time data are used for the analysis (Kruseman and deRidder, 2000). Finally, the spreadsheet tool TGuess was used to analyze the specific capacity data from each test following the method of Bradbury and Rothschild (1985) to obtain a third estimate of aquifer transmissivity. Storativity (S) is an input parameter to TGuess and the estimates of storativity obtained from the Moench analysis were used in TGuess.

Table 3 provides a summary of results obtained from analyzing the aquifer test data from each well using the three methods described above. AQTESOLV plots and TGuess output are included as Attachment B. Figure 2 shows a comparison between the estimated hydraulic conductivity values obtained using the three methods described above. Hydraulic conductivity is calculated by dividing the estimated transmissivity by the estimated aquifer thickness. In general, there is good agreement between the estimates obtained using the different methods, although the estimates from the Moench solution tend to

be slightly lower than the estimates obtained using the other two methods. Estimates of hydraulic conductivity ranged from 0.4 feet/day at GW-009 to 64.8 feet/day at GW-010. The hydraulic conductivity estimates fall within the expected range for the types of geologic material present in the screened interval of the wells.

V. Groundwater Sampling

Following the recovery phase of each aquifer test, the pump was turned back on and the pumping rate was reduced to conduct low-flow purging and sampling at each well. Pumping rates during low-flow purging ranged from approximately 0.1 to 0.25 gpm and were selected to minimize sample turbidity and drawdown in the well during purging and sampling. Purge water was routed through a flow-through cell closed to the atmosphere and stabilization parameters (temperature, pH, specific conductance, oxidation-reduction potential, and dissolved oxygen) were measured using a YSI 556 MPS water quality meter. Low-flow purging continued until three consecutive sets of field parameter measurements indicated that the well had stabilized or for a minimum of 15 minutes. Following stabilization, groundwater samples were collected from the well for analysis of general parameters and total and dissolved metals. Samples were submitted to Northeast Technical Services (NTS) in Virginia, Minnesota and Columbia Analytical Services (CAS) in Kelso, Washington. A field-filtered sample from each well was analyzed in the field for total iron concentrations using a Hach colorimeter. In addition to total iron analysis, field measurements of ferrous iron concentrations were collected at GW-011 and GW-012 (problems with sampling equipment prohibited the analysis of additional samples for ferrous iron concentrations). At GW-009 and GW-012, low-flow sampling was completed at the end of the aquifer test pumping phase rather than following the recovery because the pumping rates used for these tests were sufficiently low for low-flow sampling (0.1 and 0.2 gpm, respectively). In addition to the groundwater samples collected by Barr during this investigation, NTS collected a groundwater sample from GW-005, located within the tailings basin area, which was submitted to CAS for arsenic speciation. This additional sample was collected because there was uncertainty as to whether the samples collected at GW-006 and GW-007 would have measurable amounts of arsenic and, based on past sampling, it was anticipated that GW-005 would have measurable arsenic.

VI. Groundwater Sampling Results

Table 4 provides a summary of field data collected during sampling; Tables 5 and 5 provide a summary of laboratory analytical results. Evaluation of these data will be included in subsequent submittals.

VII. References

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Kruseman, G.P. and N.A. deRidder, 2000. Analysis and Evaluation of Pumping Test Data (2nd ed.), Publication 47, Intern. Inst. for Land Reclamation and Improvement, Wageningen, The Netherlands, 370p.

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Theis, C.V., 1935. The Relation Between Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage, Trans. Amer. Geophys. Union, vol. 16, pp. 519-524.

Table 1 - Tailings Basin Area Monitoring Well Constuction Details and Bedrock Elevation Data
PolyMet Mining, Inc. - NorthMet Project

Well	Boring	Boring Ground Elevation (ft)	Well Ground Elevation (ft)	Riser Elevation (ft)	Screen Length (ft)	Static Depth to Groundwater (ft TOR)	DTGW Measurement Date	Well Depth (ft TOR)	Groundwater Elev (ft)	Top Screen Elevation (ft)	Bottom Screen Elevation (ft)	Depth to Bedrock (ft bgs)	Bedrock Elevation (ft)	Saturated Overburden Thickness (ft)
GW-001	RS-28	1492.3	1485.7	1488.30	10	2.00	5/6/2009	17.9	1486.30	1480.4	1470.4	27	1465.3	21.0
GW-006	RS-29	1509.1	1496.4	1498.48	10	10.50	5/4/2009	16.9	1487.98	1491.6	1481.6	65	1444.1	43.9
GW-007	RS-30	1515.8	1511.2	1512.96	10	7.45	5/5/2009	16.6	1505.51	1506.4	1496.4	36	1479.8	25.7
GW-009		1470.8	1470.8	1473.89	10	3.31	5/5/2009	15.2	1470.58	1468.7	1458.7	12.5	1458.3	12.3
GW-010	RS-25	1473.5	1473.7	1475.90	5	2.33	5/6/2009	20.3	1473.57	1460.6	1455.6	19	1454.5	19.1
GW-011	RS-26	1487.5	1487.5	1489.92	10	18.20	5/8/2009	23.4	1471.72	1476.5	1466.5	30.5	1457.0	14.7
GW-012	RS-27	1494.2	1492.8	1495.15	10	4.41	5/8/2009	17.9	1490.74	1487.3	1477.3	30	1464.2	26.5

Table 2
Hydraulic Gradient
North of the Tailings Basin
Polymet Mining Company

Wells			Azimuth	Gradient
GW-006	GW-010	GW-012	342.78	0.0044
GW-001	GW-006	GW-010	355.26	0.0036
GW-012	GW-009	GW-010	338.70	0.0043
GW-001	GW-009	GW-010	342.41	0.0029
GW-006	GW-010	GW-011	343.22	0.0044
		Average	344.47	0.0039

Table 3 - Summary of Hydraulic Conductivity Estimates, Tailings Basin Area Monitoring Wells
PolyMet Mining, Inc. - NorthMet Project

Location	Saturated thickness, b (ft)	Moench (1997) Solution									Theis (1935) Recovery Solution		Estimate From Specific Capacity Data		Summary of K Estimates		
		T (ft^2/d)	S (-)	Sy (-)	β (-)	Sw (-)	r(w) (ft)	r(c) (ft)	alpha (s^{-1})	K (ft/d)	T (ft^2/d)	K (ft/d)	T (ft^2/d)	K (ft/d)	Min (ft/d)	Max (ft/d)	Mean (ft/d)
GW-001	21.0	27.3	5.0E-05	1.5E-01	6.6E-06	0	0.42	0.055	1.0E+30	**1.3**	36.8	**1.8**	33.9	**1.6**	**1.3**	**1.8**	**1.6**
GW-006	43.9	422.3	6.6E-03	4.2E-02	9.0E-07	0	0.42	0.042	1.0E+30	**9.6**	252.2	**5.7**	467.7	**10.7**	**5.7**	**10.7**	**8.7**
GW-007	25.7	294.8	6.4E-04	2.4E-02	4.4E-06	0	0.42	0.083	1.0E+30	**11.5**	782.0	**30.4**	381.5	**14.8**	**11.5**	**30.4**	**18.9**
GW-009	12.3	5.0	8.3E-06	1.3E-02	1.4E-05	0	0.25	0.13	1.0E+30	**0.4**	6.2	**0.5**	7.0	**0.6**	**0.4**	**0.6**	**0.5**
GW-010	19.1	993.7	1.0E-03	2.9E-01	1.9E-06	0	0.25	0.083	1.0E+30	**52.0**	608.6	**31.9**	1237.7	**64.8**	**31.9**	**64.8**	**49.6**
GW-011	14.7	126.9	8.4E-04	1.0E-01	9.5E-06	0	0.25	0.17	1.0E+30	**8.6**	234.0	**15.9**	168.2	**11.4**	**8.6**	**15.9**	**12.0**
GW-012	26.5	17.3	2.0E-06	3.0E-01	8.9E-07	0	0.25	0.056	1.0E+30	**0.7**	64.5	**2.4**	19.2	**0.7**	**0.7**	**2.4**	**1.3**

Table 4
Field Parameters
Polymet Mining Company

Location/Sample ID	Units	GW-001	GW-005	GW-006	GW-007	GW-009	GW-010	GW-011	GW-012
Temperature	**deg C**	7.07	10.70	5.98	6.27	6.05	6.93	6.10	6.40
Specific Conductance	**ms/cm**	0.677	0.885	1.552	0.711	0.543	0.465	0.112	1.107
pH	**standard units**	6.80	8.47	6.99	7.43	7.05	6.76	6.41	6.88
ORP	**mV**	-92.6	53.0	-61.6	-31.8	-37.3	-14.2	81.7	4.2
Dissolved Oxygen	**mg/L**	0.47	1.39	1.37	1.62	0.60	0.38	9.29	1.41
Fe (total)	**mg/L**	3.30	NM	2.34	0.00	2.69	1.11	0.03	0.09
Fe (II)	**mg/L**	NM	NM	NM	NM	NM	NM	0.01	0.00

Table 5
General Chemistry
Analytical Data Summary
Polymet Mining Company

Location Date Lab Dup	Units	GW-001 5/6/2009 NTS	GW-006 5/4/2009 NTS	GW-007 5/5/2009 NTS	GW-009 5/5/2009 NTS	GW-010 5/6/2009 NTS	GW-010 5/6/2009 NTS DUP	GW011 5/8/2009 NTS	GW012 5/8/2009 NTS
General Parameters									
Alkalinity, total	**mg/L**	**379**	**736**	**295**	**189**	**259**	**259**	**49.3**	**504**
Chemical Oxygen Demand	**mg/L**	**24.1**	**11.2**	**6.75**	**39.5**	**16.6**	**16.3**	<10	**14.1**
Chloride	**mg/L**	**26.9**	**17.7**	**28.4**	**9.94**	**18.4**	**18.4**	**2.78**	**23**
Fluoride	**mg/L**	**0.15**	**2.08**	**1.93**	**0.23**	**0.12**	**0.12**	**0.11**	**0.2**
Hardness, total	**mg/L**	**371**	**1240**	**438**	**250**	**277**	**271**	**67.6**	**685**
Nitrate + Nitrite as N	**ug/L**	<100	<100	<100	<100	<100	<100	**150**	<100
Nitrogen, ammonia as N	**ug/L**	**100**	**110**	<100	<100	<100	<100	<100	<100
Phosphorus total	**mg/L**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	**mg/L**	**34.3**	**513**	**167**	**148**	**31.7**	**31.6**	**20.8**	**291**
pH	**standard units**	**7.1**	**7.1**	**7.4**	**6.6**	**6.6**	**6.8**	**6.4**	**7.1**
Carbon, total organic	**mg/L**	**8.6**	**2.8**	**1.8**	**12.2**	**5.4**	**5.4**	**1.4**	**5.0**
Metals									
Aluminum	**ug/L**	**42.6**	<25	<25	**228**	**25.3**	<25	**52.8**	**88.9**
Antimony	**ug/L**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic	**ug/L**	<2	**2.1**	<2	<2	<2	<2	<2	<2
Barium	**ug/L**	**260**	**124**	<10	**97.1**	**442**	**446**	**37.9**	**156**
Beryllium	**ug/L**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Boron	**ug/L**	**297**	**472**	**401**	**114**	**150**	**145**	<50	**351**
Cadmium	**ug/L**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Calcium	**mg/L**	**74.7**	**124**	**52.6**	**47**	**58.1**	**56.6**	**15.8**	**132**
Chromium	**ug/L**	<1	<1	**2.5**	<1	<1	<1	<1	<1
Cobalt	**ug/L**	**0.32**	**3.1**	**0.92**	**5.6**	**4.3**	**4.4**	**1.2**	**2.1**
Copper	**ug/L**	**0.96**	**2.8**	**0.82**	**2.4**	**2.6**	**2.8**	**1.2**	**2.1**
Iron	**ug/L**	**10800**	**2280**	**128**	**3060**	**1150**	**1210**	**63.2**	**92.6**
Lead	**ug/L**	<0.5	<0.5	<0.5	**0.81**	<0.5	<0.5	<0.5	<0.5
Magnesium	**mg/L**	**44.7**	**226**	**74.4**	**32.2**	**32**	**31.6**	**6.83**	**86.4**
Manganese	**ug/L**	**2740**	**1340**	**1270**	**2690**	**641**	**639**	**226**	**776**
Molybdenum	**ug/L**	**9.3**	**32.3**	**30.4**	**9.2**	**1.2**	**1.2**	**1.6**	**26.3**
Nickel	**ug/L**	**2.1**	**5.9**	**4.0**	**6.9**	**6.6**	**6.8**	**4.6**	**8.2**
Potassium	**ug/L**	**3460**	**11600**	**8010**	**3770**	**2350**	**2540**	**1270**	**3970**
Selenium	**ug/L**	<1	<1	<1	<1	<1	<1	<1	<1
Silver	**ug/L**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sodium	**ug/L**	**50100**	**57000**	**47800**	**55700**	**30400**	**29900**	**4420**	**106000**
Strontium	**ug/L**	**258**	**685**	**324**	**183**	**212**	**208**	**76**	**707**
Thallium	**ug/L**	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Titanium	**ug/L**	<10	<10	<10	**11**	<10	<10	<10	<10
Zinc	**ug/L**	<6	<6	<6	<6	<6	**6.1**	<6	<6
Dissolved Metals									
Aluminum, dissolved	**ug/L**	<25	<25	<25	<25	<25	<25	<25	<25
Arsenic, dissolved	**ug/L**	<2	**2.0**	<2	<2	<2	<2	<2	<2
Cadmium, dissolved	**ug/L**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium, dissolved	**ug/L**	<1	<1	<1	<1	<1	<1	<1	<1
Copper, dissolved	**ug/L**	**0.83**	**1.6**	**0.76**	**1.7**	**3.5**	**2.5**	<0.7	**2.3**
Molybdenum dissolved	**ug/L**	**8.9**	**31.3**	**29.7**	**9.0**	**1.2**	**1.1**	**1.4**	**26.5**
Nickel, dissolved	**ug/L**	**2.2**	**6.0**	**2.2**	**6.4**	**6.9**	**6.8**	**4.4**	**8.1**
Selenium, dissolved	**ug/L**	<1	<1	<1	<1	<1	<1	<1	<1
Silver, dissolved	**ug/L**	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Zinc, dissolved	**ug/L**	<6	<6	<6	<6	<6	**6**	<6	<6

Detections are presented in **bold**.

DUP Duplicate sample.

Table 6
Arsenic and Sulfate/Sulfide
Analytical Data Summary
Polymet Mining Company

Location Date Lab Dup	Units	GW-005 5/7/2009 CAS	GW-005 5/13/2009 CAS DUP	GW-006 5/4/2009 CAS	GW-007 5/5/2009 CAS
Sulfate	**mg/L**	**259**	**265**	**496**	**183**
Sulfide	**mg/L**	**8 ***	**17 ***	<2	<2
Arsenic, Total	**ug/L**	**1.18**	**1.16**	**3.57**	**2.76**
Arsenic, Total Inorganic	**ug/L**	**0.81**	**0.90**	**3.19**	**2.34**
Arsenic III	**ug/L**	**0.22**	**0.57**	**0.99**	**0.32**
Arsenic V	**ug/L**	**0.60**	**0.33**	**2.21**	**2.02**

Detections are presented in **bold**.

DUP Duplicate sample.

All arsnic samples were field filtered.

* Estimated value, QA/QC criteria not met.

Barr Footer: Date: 6/2/2009 6:31:08 PM File: I:\Client\PolyMet\Workorders\CPDEIS_Data_Review\Maps\Reports\TechMemo\Figure 1 Tailings Basin Well and Boring Locations.mxd User: arm2

Monitoring Well

Boring

N

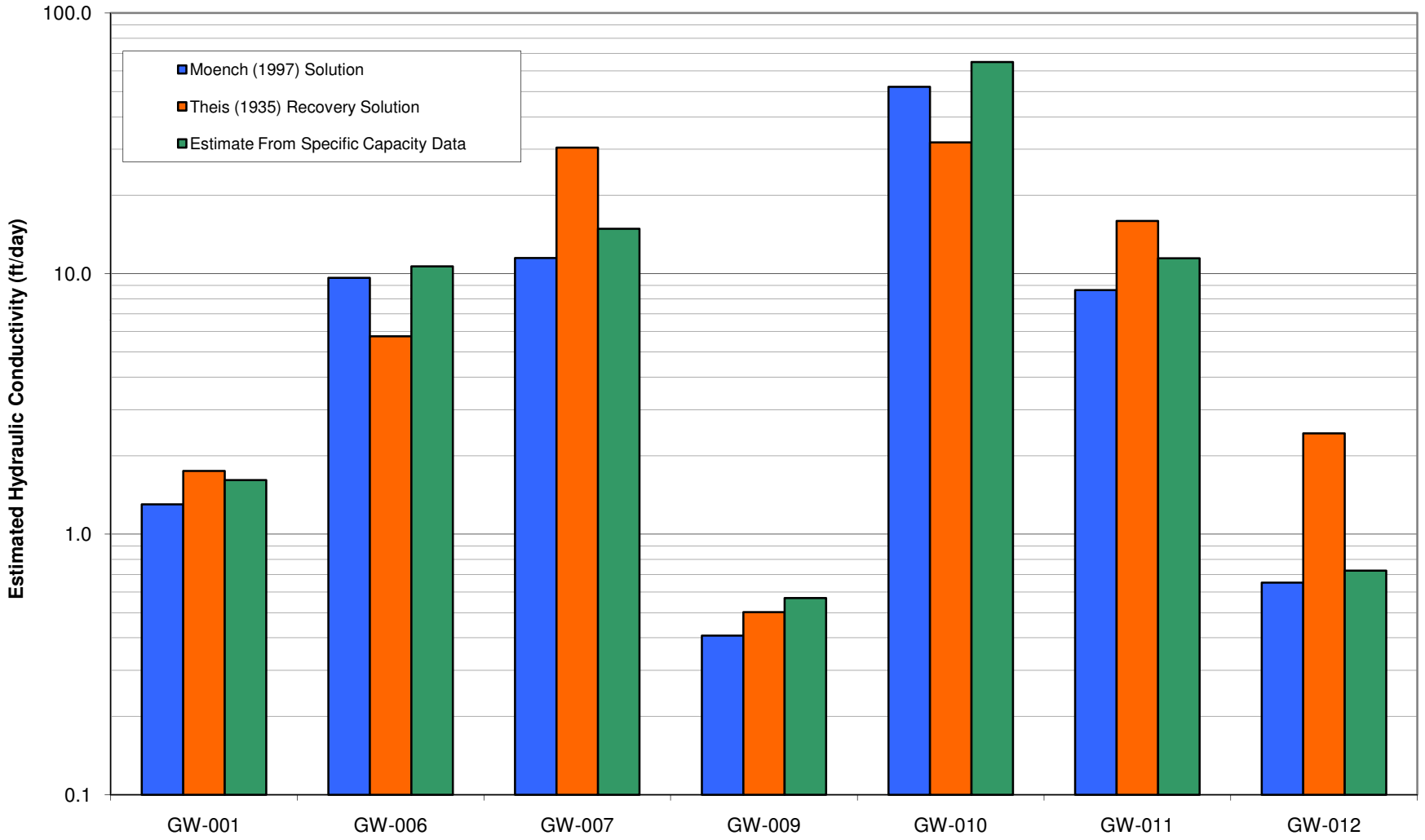
Feet

2,000 0 2,000

Figure 1

TAILINGS BASIN
WELL AND BORING LOCATIONS
NorthMet Project
PolyMet Mining Inc.
Hoyt Lakes, MN

Figure 2
Comparison of Hydraulic Conductivity Estimates, Tailings Basin Area Monitoring Wells
PolyMet Mining, Inc. - NorthMet Project



5/27/2009
P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\Aq test results summary.xls

Attachment A

LOG OF Boring RS-25

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/4/09 Ended 5/4/09
Logged By LMG

Elevation 1473.5
Total Depth 23.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
					0/80/20	Moist	10YR 2/2 Very dark brown	PT			0-0.5': Peat; contains grass, roots, sphagnum moss.	
											0.5-3.5': Silty sand, mostly fine to medium-grained sand, few subrounded gravel; road base.	
					10/75/15	Moist	10YR 2/3 Dark brown	FL				
												1470
											3.5-8': Hemic peat; contains wood fragments throughout.	
5					0/Tr/100	Moist	5YR 2.5/1 Black	PT				
											7.5-8': Contains abundant wood fragments.	
											8-10': Poorly graded sand; mostly fine to medium-grained sand, few fine subrounded gravel.	1465
					5/90/5	Moist	2.5Y 3/1 Very dark gray	SP				
10											10-14': Silty sand; mostly fine to coarse-grained sand, few fine to coarse subangular gravel.	
					5/70/25	Moist	5Y 4/1 Dark gray	SM				
												1460
					0/25/75	Moist	2.5Y 3/1 Very dark gray	CL			14-15': Lean clay with sand; little fine-grained sand.	
15				Soil pH= 5-6							15-19': Poorly graded sand with gravel; mostly fine to coarse-grained sand, with a little fine to coarse subrounded gravel.	
					20/75/5	Moist	10YR 4/4 Dark yellowish brown	SP				
												1455
										Giants Range Batholith	19-23': Granite bedrock.	
											(continued)	

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Remarks: Soil adsorption sample collected: RS-25 13-18'. GW-010 is located approximately 15 feet north of RS-25.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-25

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/4/09 Ended 5/4/09
Logged By LMG

Elevation 1473.5
Total Depth 23.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
											19-23': Granite bedrock.*(continued)*	
										Giants Range Batholith		
											End of Boring - 23 feet	1450
25												1445
30												1440
35												1435

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Remarks: Soil adsorption sample collected: RS-25 13-18'. GW-010 is located approximately 15 feet north of RS-25.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-26

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/5/09 Ended 5/5/09
Logged By LMG

Elevation 1487.5
Total Depth 34.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH-ORP-Specific Cond.	%GR/SA/FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
					0/10/90	Moist	10YR 2/1 Black	PT			0-0.5': Peat; contains moss and rootlets, fine-grained sand.	
					5/65/30	Moist	10YR 3/3 Dark brown	SC			0.5-1.5': Clayey sand; mostly fine-grained sand, few fine to coarse angular gravel.	
											1.5-3.5': Silt.	
					0/0/100	Moist	2.5Y 6/3 Light yellowish brown	ML				1485
					30/65/5	Moist	10YR 4/4 Dark yellowish brown	SP			3.5-5': Poorly graded sand with gravel; mostly fine to medium-grained sand, with some fine to coarse subangular to subrounded gravel.	
5											5-20': Poorly graded sand with silt and gravel; mostly sand with some fine to coarse subrounded gravel.	
												1480
10												
					30/60/10	Moist	10YR 4/4 Dark yellowish brown	SP-SM			12-15': Granite boulder, pulverized by drilling.	1475
15				Soil pH= 5								1470
											(continued)	

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Remarks: Soil adsorption sample collected: RS-26 15-20'. GW-011 is located approximately 8 feet west of RS-26.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-26

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/5/09 Ended 5/5/09
Logged By LMG

Elevation 1487.5
Total Depth 34.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
											20-30.5': Silty sand, mostly fine to medium-grained sand, with few fine to coarse subrounded gravel and cobbles.	
												1465
25					5/80/15	Wet	2.5Y 4/3 Olive brown	SM			25-30': No sample recovery; core barrel plugged with cobble.	
												1460
30											30-30.5': No sample recovery.	
											30.5-34': Granite bedrock.	
										Giants Range Batholith		1455
											End of Boring - 34 feet	
35												1450

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Remarks: Soil adsorption sample collected: RS-26 15-20'. GW-011 is located approximately 8 feet west of RS-26.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-27

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/6/09 Ended 5/6/09
Logged By LMG

Elevation 1494.2
Total Depth 33.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH-ORP-Specific Cond.	%GR/SA/FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
					0/95/5	Moist	10YR 2/2 Very dark brown	FL			0-5': Tailings; silt to medium-grained sand size, upper 0.1' consists of soil with rootlets.	1490
5											5-30': Silty sand with gravel; mostly fine to coarse-grained sand, with a little fine to coarse subangular to subrounded gravel.	
				Soil pH= 6								1485
10								SM				
												1480
15					20/60/20	Moist	10YR 4/3 Brown					
												1475

(continued)

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Fax: 952-832-2601

Remarks: Soil adsorption sample collected: RS-27 7-9'. GW-012 is located approximately 24 feet northeast of RS-27.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-27

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/6/09 Ended 5/6/09
Logged By LMG

Elevation 1494.2
Total Depth 33.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
											5-30': Silty sand with gravel; mostly fine to coarse-grained sand, with a little fine to coarse subangular to subrounded gravel.*(continued)*	
25								SM				1470
												1465
30										Giants Range Batholith	30-33': Granite bedrock	
											End of Boring - 33 feet	1460
35												1455

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Remarks: Soil adsorption sample collected: RS-27 7-9'. GW-012 is located approximately 24 feet northeast of RS-27.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-28

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/6/09 Ended 5/6/09
Logged By LMG

Elevation 1492.3
Total Depth 29.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH-ORP-Specific Cond.	%GR/SA/FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
					0/100/Tr	Moist	10YR 2/2 Very dark brown	FL			0-3': Tailings; medium-grained sand size, upper 0.1' consists of soil with rootlets.	1490
5					90/10/Tr	Moist	10YR 2/1 Black	FL			3-6': Waste rock; angular and fine to coarse gravel size.	
								FL			6-6.5': Wood fragments.	
					10/80/10	Moist	10YR 3/3 Dark brown	SP-SM			6.5-10': Poorly graded sand with silt; mostly fine to coarse-grained sand, few fine angular to subrounded gravel.	1485
10											10-16': Poorly graded sand; mostly fine to coarse-grained sand, trace fine subrounded gravel.	1480
					Tr/95/5	Wet	10YR 4/2 Dark grayish brown	SP				
15				Soil pH= 5-6							16-19.5': Poorly graded sand; mostly fine to coarse-grained sand.	1475
					0/100/0	Wet	10YR 4/2 Dark grayish brown	SP				
					0/100/Tr	Wet	5Y 5/1 Gray	SP			19.5-20': Poorly graded sand; mostly fine sand.	
											(continued)	

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Remarks: Soil adsorption sample collected: RS-28 17'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-28

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/6/09 Ended 5/6/09
Logged By LMG

Elevation 1492.3
Total Depth 29.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
											20-27': Poorly graded sand with gravel; mostly fine to coarse-grained sand, with little fine to coarse subangular to subrounded gravel.	
					20/80/Tr	Wet	2.5Y 5/3 Light olive brown	SP				1470
25												
												1465
										Giants Range Batholith	27-29': Granite bedrock.	
											End of Boring - 29 feet	
30												1460
35												1455

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Remarks: Soil adsorption sample collected: RS-28 17'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-29

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/7/09 Ended 5/7/09
Logged By LMG

Elevation 1509.1
Total Depth 68.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
											0-7': Tailings; fine to medium-grained sand size.	
					0/100/Tr	Moist	10YR 2/2 Very dark brown	FL				1505
5												
											7-13': Tailings; mostly fine to coarse angular gravel size, with some fine to medium-grained sand size.	
												1500
10					65/35/Tr	Moist	10YR 2/2 Very dark brown	FL				
											13-15': Tailings; fine to medium-grained sand size.	
					0/95/5	Moist	10YR 4/2 Dark grayish brown	FL				1495
15											15-25': Tailings; fine-grained sand size.	
								FL				1490
							GLEY 1 4/5GY				*(continued)*	

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Remarks: Soil adsorption sample collected: RS-29 35-38.5'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-29

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/7/09 Ended 5/7/09
Logged By LMG

Elevation 1509.1
Total Depth 68.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
					0/95/5	Wet	Dark greenish gray	FL			15-25': Tailings; fine-grained sand size.*(continued)*	
												1485
25											25-30': Silty sand; mostly fine to medium-grained sand, with a few fine to coarse gravel.	
					10/50/40	Wet	10YR 3/2 Very dark grayish brown	SM				
												1480
30											30-35': Poorly graded sand; mostly fine to medium-grained sand.	
					0/100/0	Moist	2.5Y 4/1 Dark gray	SP				
												1475
35											35-38.5': Poorly graded sand with gravel; mostly fine to coarse-grained sand, with a little fine to coarse subangular gravel.	
					15/85/0	Wet	2.5Y 3/2 Very dark grayish brown	SP				
											38.5-40': Poorly graded sand with silt; mostly fine to medium-grained sand.	1470
					0/90/10	Wet	2.5Y 3/2 Very dark grayish brown	SP-SM				
											(continued)	

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Remarks: Soil adsorption sample collected: RS-29 35-38.5'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-29

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/7/09 Ended 5/7/09
Logged By LMG

Elevation 1509.1
Total Depth 68.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
											40-52': Silty sand; mostly fine-grained sand.	
											42': 4" thick seam of medium-grained sand.	1465
45											44.5': 4" thick seam of medium-grained sand.	
					0/55/45	Wet	2.5Y 4/1 Dark gray	SM				1460
50												
											52-55': Sandy silt; some fine-grained sand.	
					0/40/60	Wet	2.5Y 5/1 Gray	ML				1455
55											55-59': Silty sand; mostly fine-grained sand, contains silt lenses.	
					0/85/15	Wet	2.5Y 5/1 Gray	SM				
								ML			59-65': Sandy silt; some fine-grained sand.	1450
											(continued)	

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Remarks: Soil adsorption sample collected: RS-29 35-38.5'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-29

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/7/09 Ended 5/7/09
Logged By LMG

Elevation 1509.1
Total Depth 68.5

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH-ORP-Specific Cond.	%GR/SA/FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
					0/40/60	Wet	2.5Y 5/1 Gray	ML			59-65': Sandy silt; some fine-grained sand.*(continued)*	1445
65										Giants Range Batholith	65-68.5': Granite bedrock.	
											End of Boring - 68.5 feet	1440
70												1435
75												1430

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Remarks: Soil adsorption sample collected: RS-29 35-38.5'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-30

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/7/09 Ended 5/7/09
Logged By LMG

Elevation 1515.8
Total Depth 41.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH- ORP- Specific Cond.	%GR/SA/ FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
											0-22': Tailings; fine to medium-grained sand size, upper 0.5' consists of soil with rootlets.	1515
5					0/100/Tr	Moist	10YR 2/2 Very dark brown					1510
10								FL				1505
											12-15': No sample recovered.	
15												1500
					0/95/5	Wet	10YR 3/2 Very dark grayish brown					

(continued)

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Telephone: 952-832-2600
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Remarks: Soil adsorption sample collected: RS-30 28.5-30'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-30

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/7/09 Ended 5/7/09
Logged By LMG

Elevation 1515.8
Total Depth 41.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH-ORP-Specific Cond.	%GR/SA/FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
								FL			0-22': Tailings; fine to medium-grained sand size, upper 0.5' consists of soil with rootlets.*(continued)* 21-22': Black (2.5Y 2.5/1).	1495
					15/70/15	Moist	2.5Y 3/2 Very dark grayish brown	FL			22-23': Tailings; fine to coarse-grained sand size and fine to coarse gravel size; contains wood fragments.	
					0/10/90	Moist	10YR 2/2 Very dark brown to 2.5Y 4/1 Dark gray	PT			23-25': Sapric peat; contains fine sand lenses at 24-25' and wood fragments.	
25												
					0/70/30	Wet	2.5Y 3/1 Very dark gray	SM			25-28': Silty sand; mostly fine-grained sand.	1490
					0/40/60	Wet	2.5Y 3/1 Very dark gray	ML			28-28.5': Silt; some fine-grained sand.	
					0/90/10	Wet	2.5Y 3/2 Very dark grayish brown with brown staining at 32'	SP-SM			28.5-32': Poorly graded sand with silt; mostly fine to medium-grained sand.	1485
30												
					15/65/15	Moist	10YR 5/2 Grayish brown	SM			32-36': Silty sand with gravel; mostly fine to coarse-grained sand, with a little fine to coarse subangular gravel.	1480
35										Giants Range Batholith	36-41': Granite bedrock.	
											(continued)	

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Remarks: Soil adsorption sample collected: RS-30 28.5-30'.

Additional data may have been collected in the field which is not included on this log.

LOG OF Boring RS-30

Client PolyMet Mining Corporation
Project Name NorthMet
Number 23/69-0862
Location North of Tailings Basin

Drill Contractor Boart Longyear
Drill Method Rotosonic
Drilling Started 5/7/09 Ended 5/7/09
Logged By LMG

Elevation 1515.8
Total Depth 41.0

DEPTH FEET	SAMP. LENGTH & RECOVERY	SAMP. NUMBER	Matrix Effervescence	Soil pH-ORP-Specific Cond.	%GR/SA/FINES	Moisture	Matrix Color	ASTM	LITHOLOGY	Stratigraphic Unit	DESCRIPTION	ELEV. FEET
										Giants Range Batholith	36-41': Granite bedrock.*(continued)*	1475
											End of Boring - 41 feet	
45												1470
50												1465
55												1460

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Remarks: Soil adsorption sample collected: RS-30 28.5-30'.

Additional data may have been collected in the field which is not included on this log.

Barr Engineering Company
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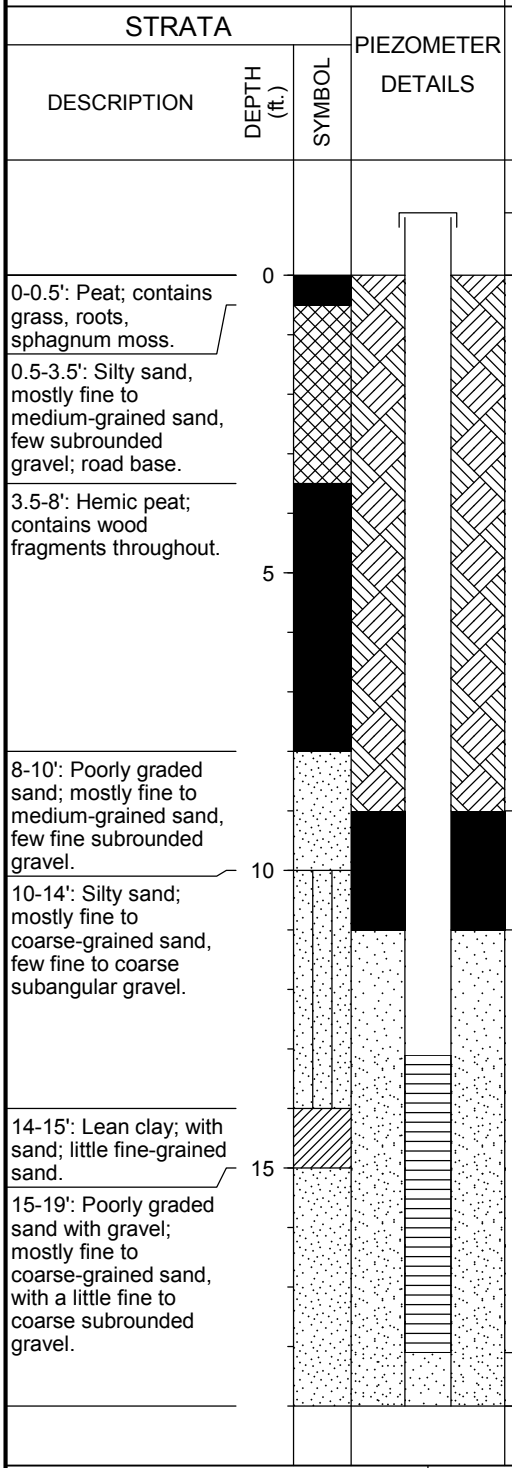
Completion Diagram GW-010 (Unique Well No. 767967)
(Reference Boring No. RS-25)

Project: NorthMet	Location: North of Tailings Basin	Client: PolyMet Mining Corporation
Barr Project Number: 23/69-0862	Surface Elevation: 1473.7	Top of Casing Elevation: 1475.90



DEPTH (ft.)		ELEVATION (ft.)
-2.20	TRC	**1475.90**
0.0	GS	**1473.7**
9.0		1464.70
11.0		1462.70
18.1		1455.60
19.0		1454.70

PIEZOMETER CONSTRUCTION DETAILS FOR STANDPIPE PIEZOMETER

PROTECTIVE CASING
Diameter: **6"**
Type: **Sch 40 Steel Pipe**
Interval: **+3-5'**

RISER CASING
Diameter: **2"**
Type: **Sch 40 PVC**
Interval: **0-13.1'**

GROUT
Type: **Neat Cement**
Interval: **0-9'**

SEAL
Type: **Hydrated Bentonite Chips**
Interval: **9-11'**

SANDPACK
Type: **Red Flint Sand #30**
Interval: **11-19'**

SCREEN
Diameter: **2"**
Type: **Sch 40 5' Long PVC Screen**
Interval: **13.1-18.1'**

Monitoring Well Diagram

Completion Depth:	19.0
Date Started:	5/4/09
Date Completed:	5/4/09
Logged By:	LMG
Drilling Contractor:	Boart Longyear
Drilling Method:	Rotosonic
Coordinates	
North:	746437.9
East:	2861582.2

LEGEND
- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL

TPC	TOP OF PROTECTIVE CASING
TRC	TOP OF RISER CASING
BC	BASE PROTECTIVE CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH

The stratification lines represent approximate boundaries. The transition may be gradual.

POLYMET WELL REPORT 23690862.GPJ BARRLOG.GDT 6/2/09

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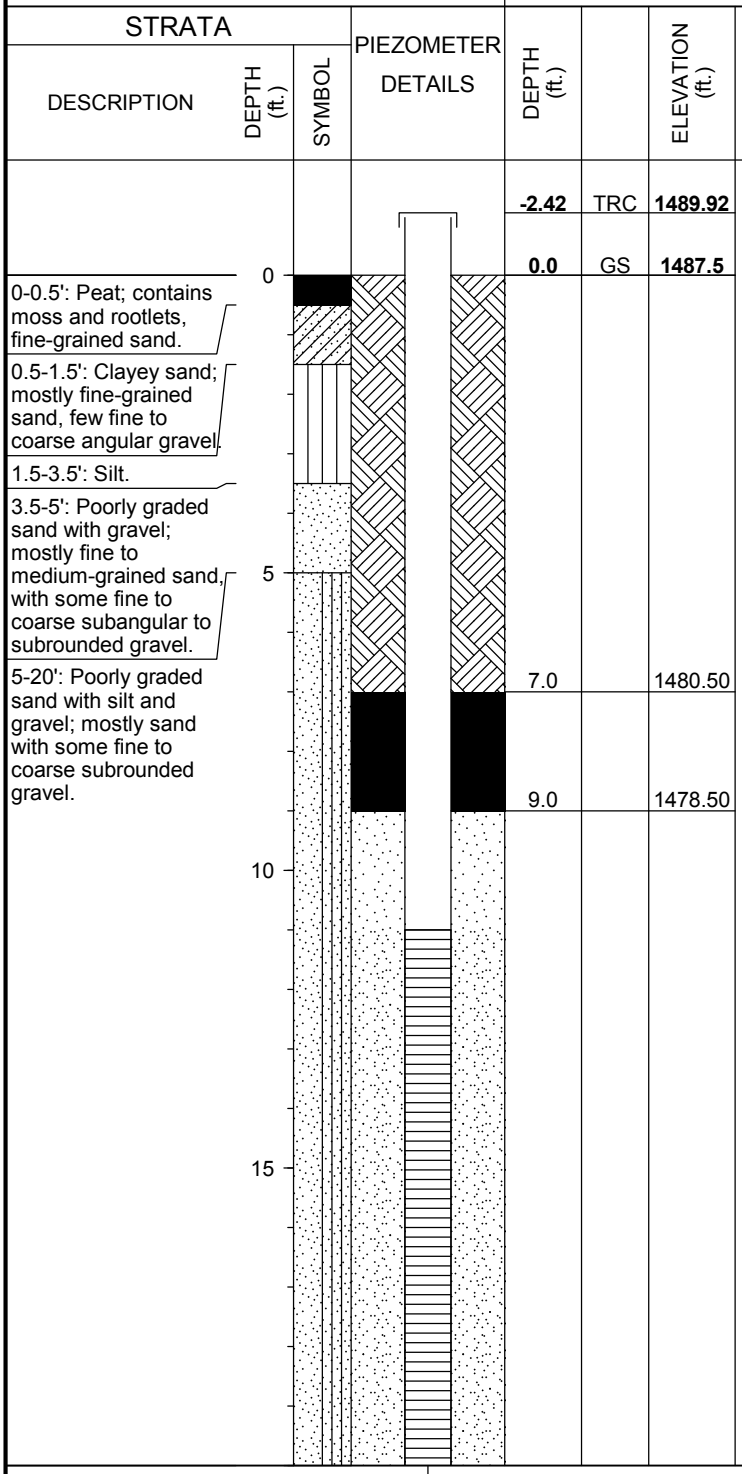
Completion Diagram GW-011 (Unique Well No. 767966)
(Reference Boring No. RS-26)

Project: NorthMet	Location: North of Tailings Basin	Client: PolyMet Mining Corporation
Barr Project Number: 23/69-0862	Surface Elevation: 1487.5	Top of Casing Elevation: 1489.92



PIEZOMETER CONSTRUCTION DETAILS FOR STANDPIPE PIEZOMETER

PROTECTIVE CASING
Diameter: **6"**
Type: **Sch 40 Steel Pipe**
Interval: **+3-5'**

RISER CASING
Diameter: **2"**
Type: **Sch 40 PVC**
Interval: **0-11'**

GROUT
Type: **Neat Cement Grout**
Interval: **0-7'**

SEAL
Type: **Hydrated Bentonite Chips**
Interval: **7-9'**

SANDPACK
Type: **Red Flint Sand #30**
Interval: **9-22'**

SCREEN
Diameter: **2"**
Type: **Sch 40 10' Long PVC Screen**
Interval: **11.0-21.0'**

Monitoring Well Diagram

Completion Depth:	22.0
Date Started:	5/5/09
Date Completed:	5/5/09
Logged By:	LMG
Drilling Contractor:	Boart Longyear
Drilling Method:	Rotosonic
Coordinates	
North:	745687.5
East:	2857513.7

LEGEND
- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL

TPC	TOP OF PROTECTIVE CASING
TRC	TOP OF RISER CASING
BC	BASE PROTECTIVE CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH

The stratification lines represent approximate boundaries. The transition may be gradual.

POLYMET WELL REPORT 23690862.GPJ BARRLOG.GDT 6/2/09

Barr Engineering Company
4700 W. 77th St. Suite 200
Edina, MN 55435

Completion Diagram GW-011 (Unique Well No. 767966)
(Reference Boring No. RS-26)

Project: NorthMet	Location: North of Tailings Basin	Client: PolyMet Mining Corporation
Barr Project Number: 23/69-0862	Surface Elevation: 1487.5	Top of Casing Elevation: 1489.92

STRATA DESCRIPTION	DEPTH (ft.)	SYMBOL	PIEZOMETER DETAILS	DEPTH (ft.)		ELEVATION (ft.)
	20					
20-22': Silty sand, mostly fine to medium-grained sand, with few fine to coarse subrounded gravel and cobbles.				21.0		1466.50
				22.0		1465.50

PIEZOMETER CONSTRUCTION DETAILS

Completion Depth:	22.0
Date Started:	5/5/09
Date Completed:	5/5/09
Logged By:	LMG
Drilling Contractor:	Boart Longyear
Drilling Method:	Rotosonic
Coordinates	
North:	745687.5
East:	2857513.7

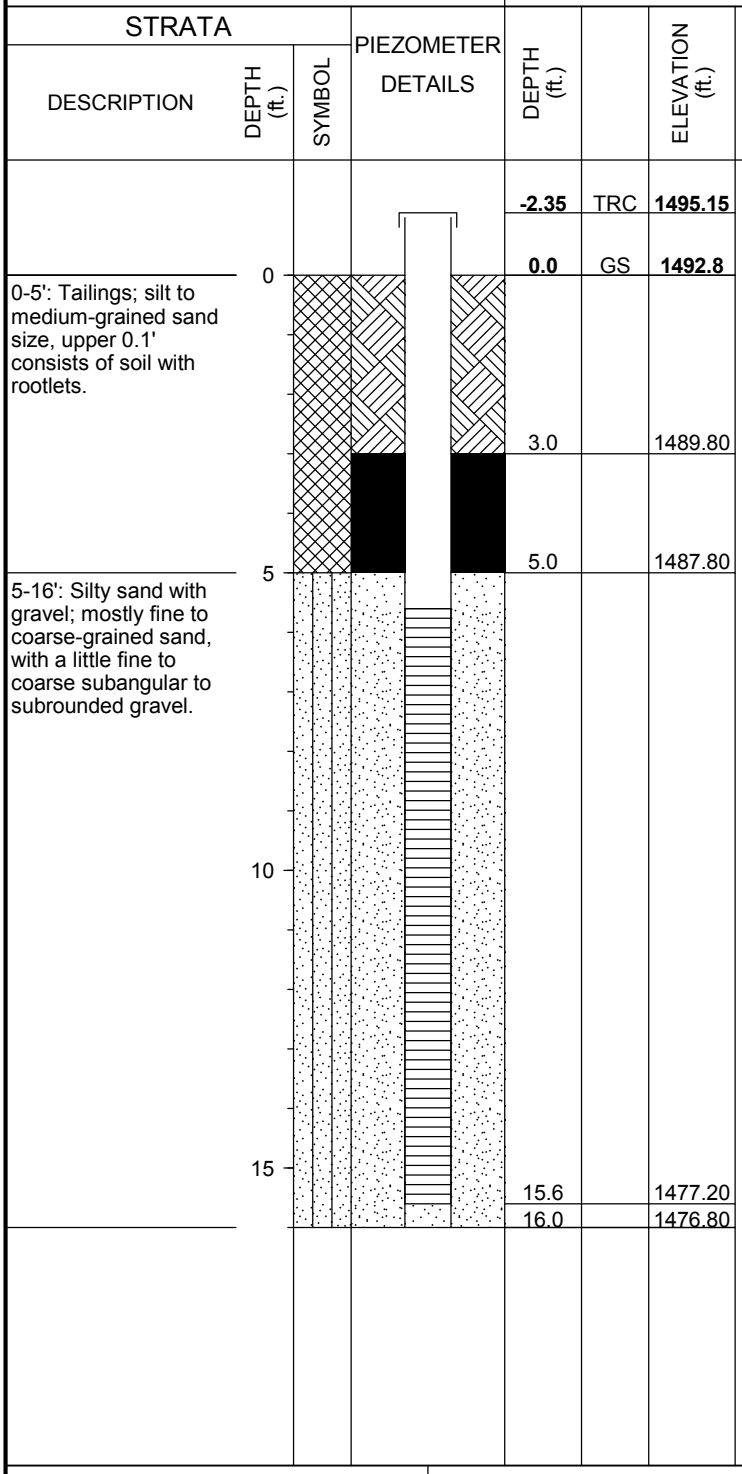
LEGEND
- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL

The stratification lines represent approximate boundaries. The transition may be gradual.

Barr Engineering Company
4700 W. 77th St. Suite 200
Edina, MN 55435

Completion Diagram GW-012 (Unique Well No. 767968)
(Reference Boring No. RS-27)

Project: NorthMet	Location: North of Tailings Basin	Client: PolyMet Mining Corporation
Barr Project Number: 23/69-0862	Surface Elevation: 1492.8	Top of Casing Elevation: 1495.15



PIEZOMETER CONSTRUCTION DETAILS FOR STANDPIPE PIEZOMETER

PROTECTIVE CASING
Diameter: **6"**
Type: **Sch 40 Steel Pipe**
Interval: **+3-5'**

RISER CASING
Diameter: **2"**
Type: **Sch 40 PVC**
Interval: **0-5.6'**

GROUT
Type: **Neat Cement**
Interval: **0-3'**

SEAL
Type: **Hydrated Bentonite Chips**
Interval: **3-5'**

SANDPACK
Type: **Red Flint Sand #30**
Interval: **5-16'**

SCREEN
Diameter: **2"**
Type: **Sch 40 10' Long PVC Screen**
Interval: **5.6-15.6'**

Monitoring Well Diagram

Completion Depth:	16.0
Date Started:	5/7/09
Date Completed:	5/7/09
Logged By:	LMG
Drilling Contractor:	Boart Longyear
Drilling Method:	Rotosonic
Coordinates	
North:	743154.3
East:	2864174.4

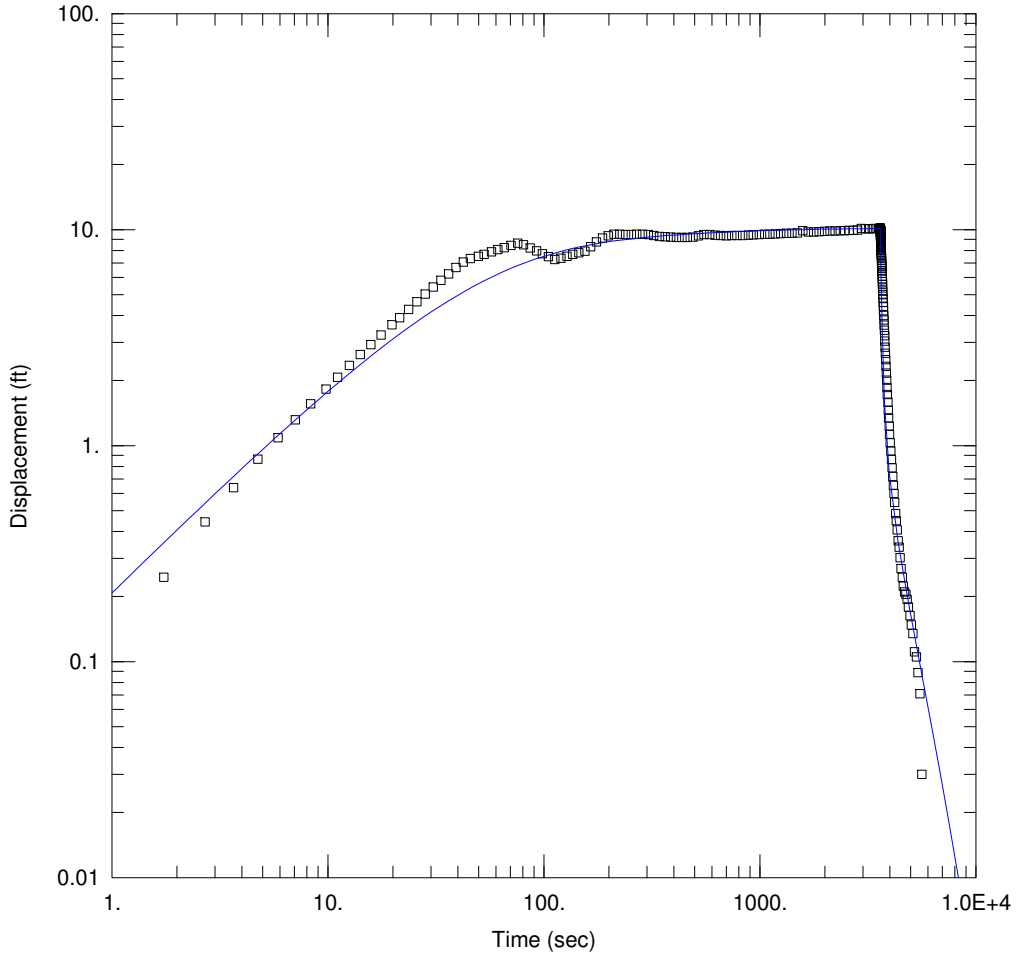
LEGEND
- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS / BACKFILL

TPC	TOP OF PROTECTIVE CASING
TRC	TOP OF RISER CASING
BC	BASE PROTECTIVE CASING
GS	GROUND SURFACE
BS	BENTONITE SEAL
FP	FILTER PACK
TSC	TOP OF SCREEN
BSC	BOTTOM OF SCREEN
TD	TOTAL DEPTH

The stratification lines represent approximate boundaries. The transition may be gradual.

POLYMET WELL REPORT 23690862.GPJ BARRLOG.GDT 6/2/09

Attachment B



GW001 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW001.aqt
Date: 05/27/09 Time: 11:59:50

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW001
Test Date: 5/6/09

AQUIFER DATA

Saturated Thickness: 21. ft
Anisotropy Ratio (Kz/Kr): 0.01664

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW001	0	0

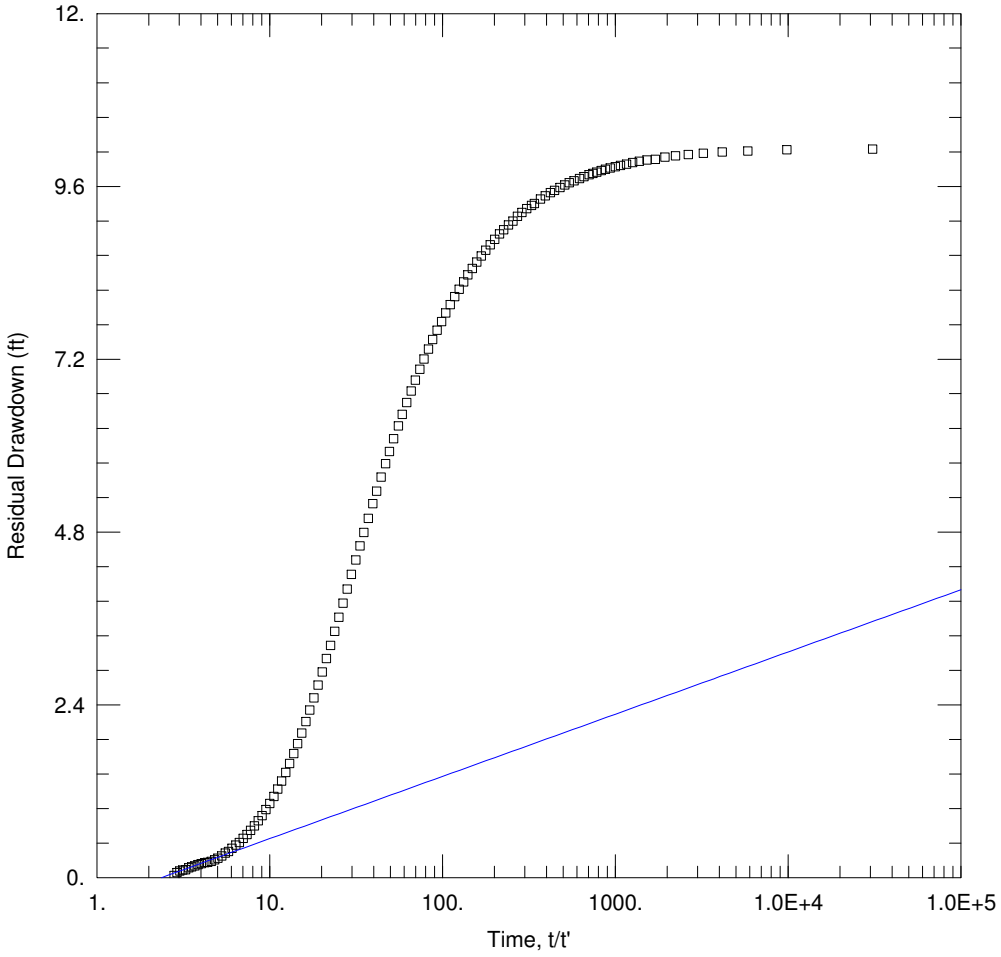
Observation Wells

Well Name	X (ft)	Y (ft)
□ GW001	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 27.31 ft^2/day
Sy = 0.1452
Sw = 0.
r(c) = 0.05461 ft
S = 5.017E-5
ß = 6.553E-6
r(w) = 0.4167 ft
alpha = 1.0E+30 sec^{-1}



GW001 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW001 recovery.aqt
Date: 05/27/09 Time: 12:23:02

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW001
Test Date: 5/6/09

AQUIFER DATA

Saturated Thickness: 21. ft
Anisotropy Ratio (Kz/Kr): 0.01664

WELL DATA

Pumping Wells

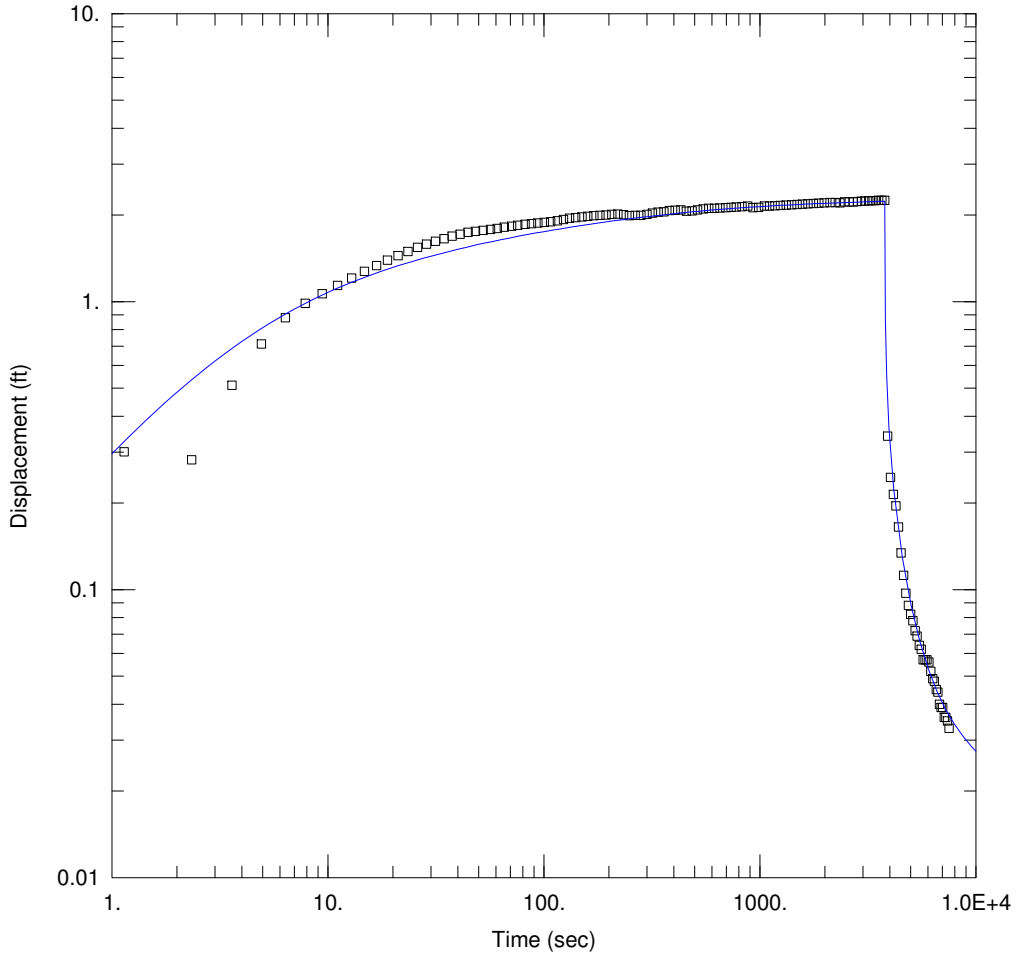
Well Name	X (ft)	Y (ft)
GW001	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ GW001	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)
T = 36.75 ft^2/day
S/S' = 2.367



GW006 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW006.aqt
Date: 05/27/09 Time: 11:44:53

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW006
Test Date: 5/4/09

AQUIFER DATA

Saturated Thickness: 43.9 ft
Anisotropy Ratio (Kz/Kr): 0.01

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW006	0	0

Observation Wells

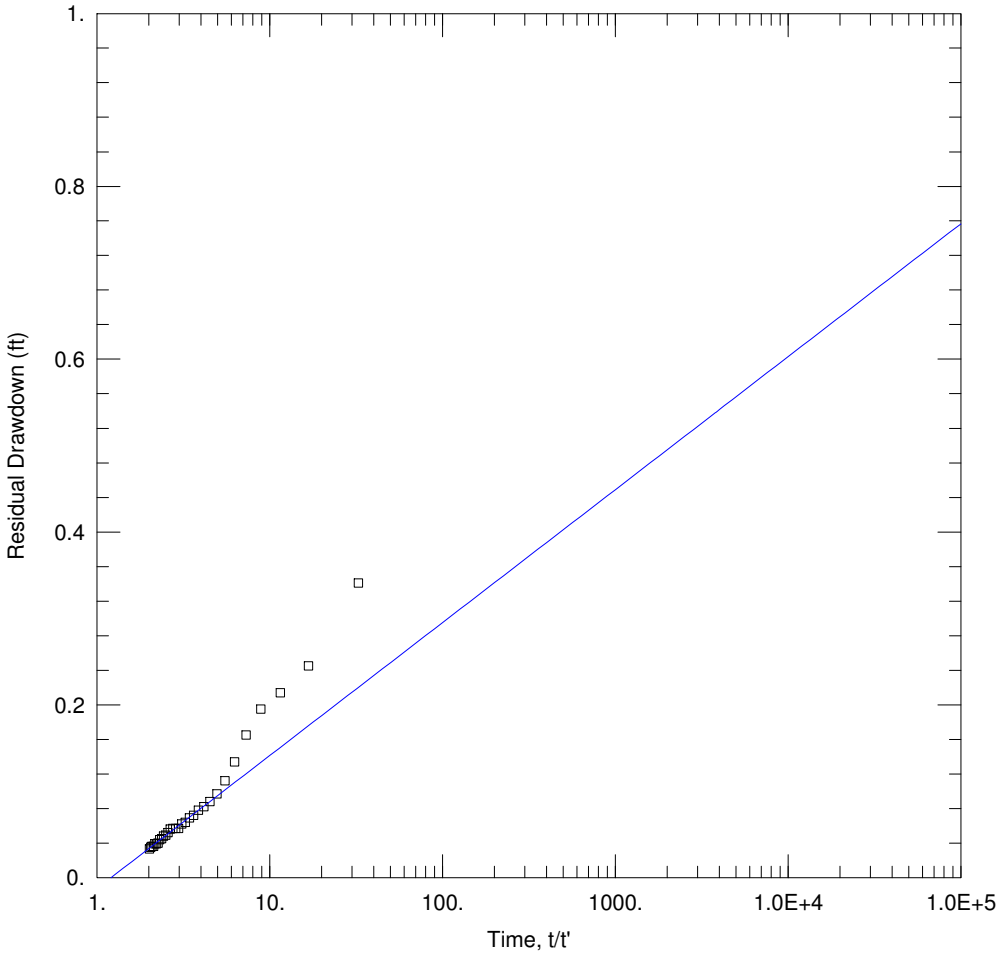
Well Name	X (ft)	Y (ft)
□ GW006	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 422.3 ft^2/day
Sy = 0.04189
Sw = 0.
r(c) = 0.04189 ft

S = 0.00657
ß = 9.01E-7
r(w) = 0.4167 ft
alpha = 1.0E+30 sec^{-1}



GW006 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW006 recovery.aqt
Date: 05/27/09 Time: 12:24:59

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW006
Test Date: 5/4/09

AQUIFER DATA

Saturated Thickness: 43.9 ft Anisotropy Ratio (Kz/Kr): 0.01

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW006	0	0

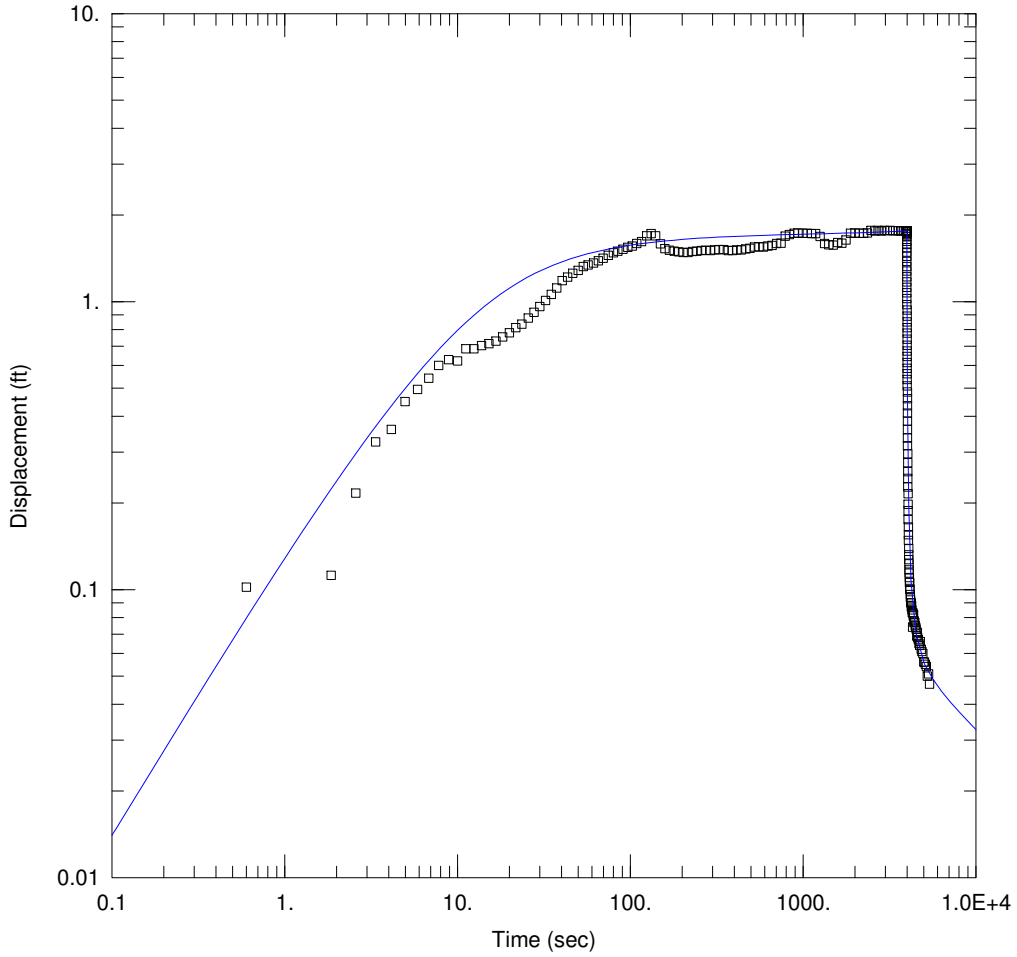
Observation Wells

Well Name	X (ft)	Y (ft)
□ GW006	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 252.2 ft^2/day S/S' = 1.208



GW007 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW007.aqt
Date: 05/27/09 Time: 12:02:56

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW007
Test Date: 5/5/09

AQUIFER DATA

Saturated Thickness: 25.7 ft
Anisotropy Ratio (Kz/Kr): 0.01664

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW007	0	0

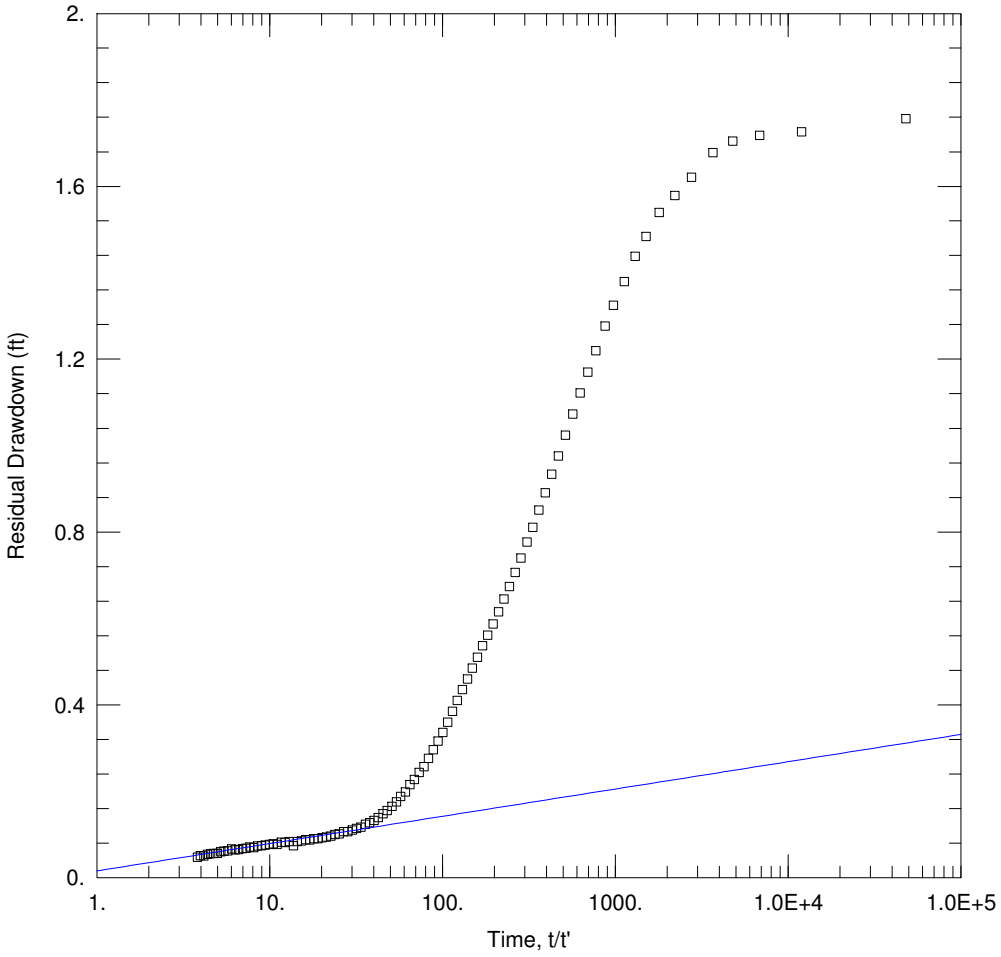
Observation Wells

Well Name	X (ft)	Y (ft)
□ GW007	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 294.8 ft^2/day
Sy = 0.0241
Sw = 0.
r(c) = 0.08333 ft
S = 0.0006371
ß = 4.376E-6
r(w) = 0.4167 ft
alpha = 1.0E+30 sec^{-1}



GW007 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW007 recovery.aqt
Date: 05/27/09 Time: 12:26:21

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW007
Test Date: 5/5/09

AQUIFER DATA

Saturated Thickness: 25.7 ft Anisotropy Ratio (Kz/Kr): 0.01664

WELL DATA

Pumping Wells

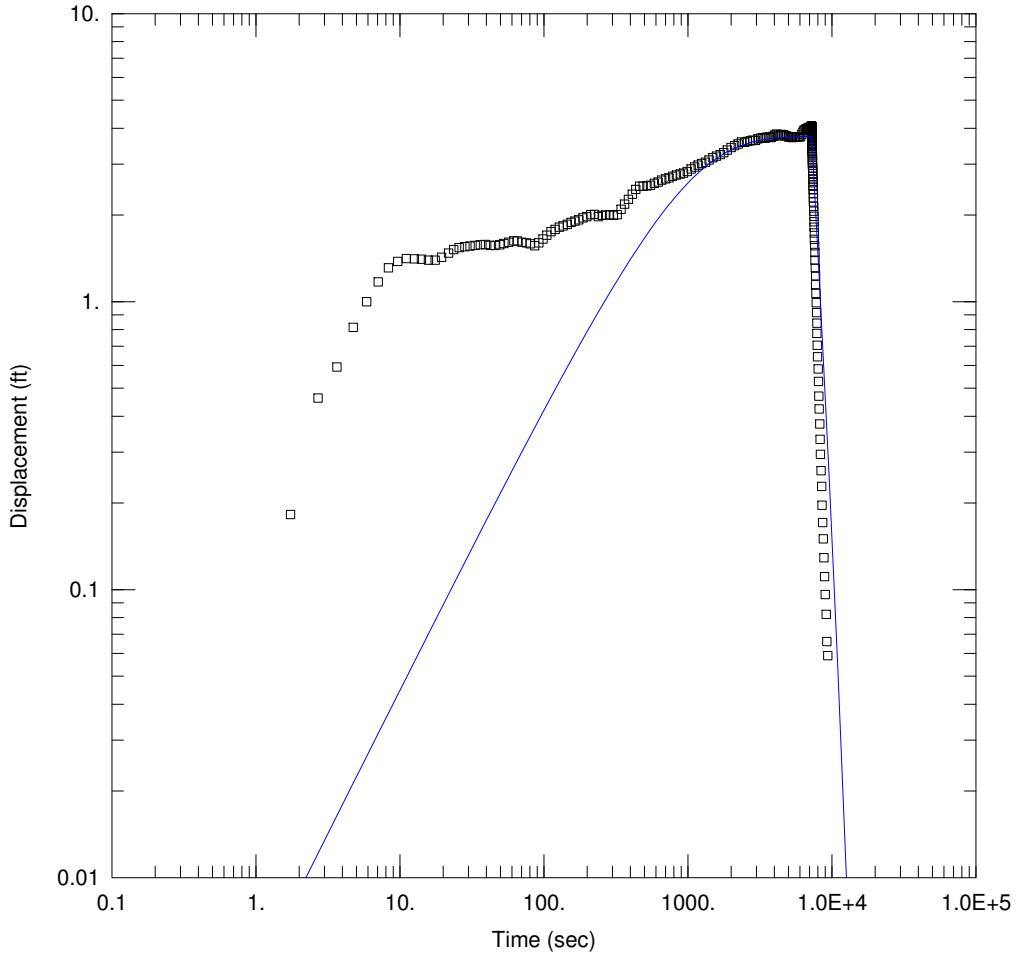
Well Name	X (ft)	Y (ft)
GW007	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ GW007	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)
T = 782. ft^2/day S/S' = 0.5684



GW009 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW009.aqt
Date: 05/27/09 Time: 12:06:43

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW009
Test Date: 5/5/09

AQUIFER DATA

Saturated Thickness: 12.3 ft Anisotropy Ratio (Kz/Kr): 0.0329

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW009	0	0

Observation Wells

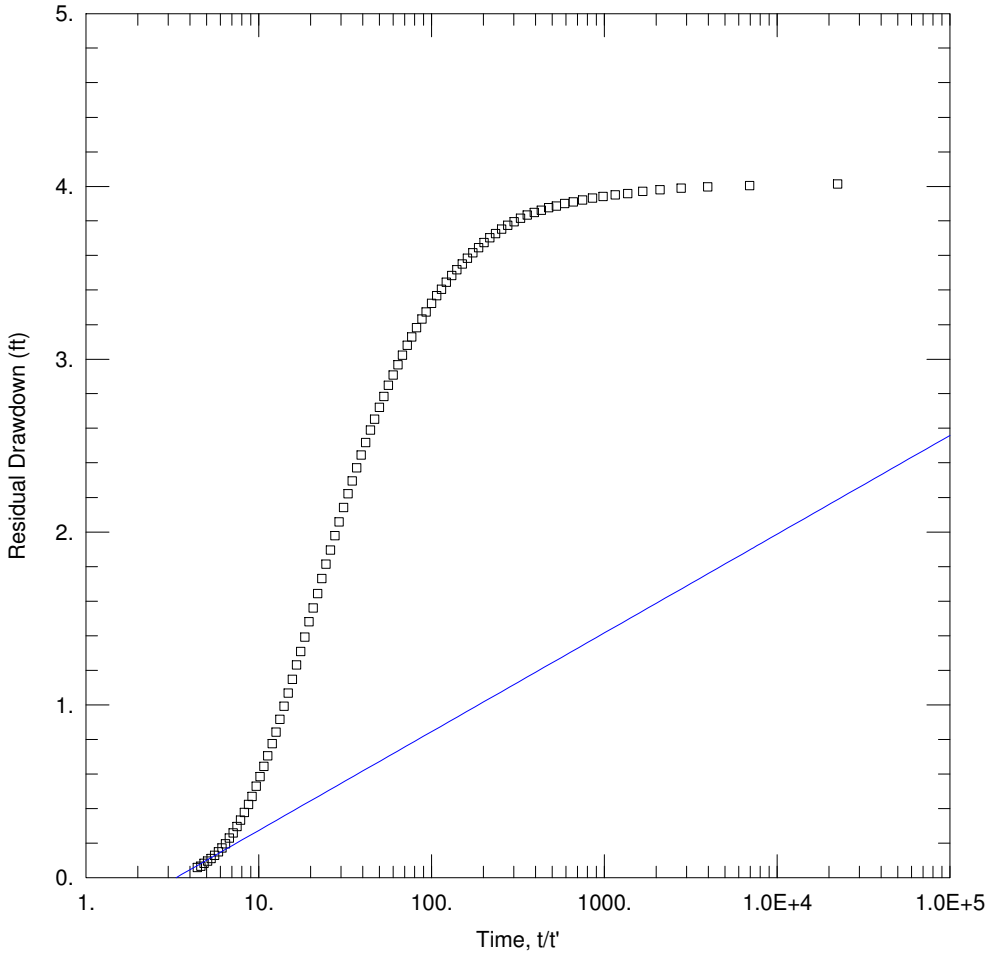
Well Name	X (ft)	Y (ft)
□ GW009	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 5.023 ft^2/day
Sy = 0.01263
Sw = 0.
r(c) = 0.1254 ft

S = 8.293E-6
ß = 1.359E-5
r(w) = 0.25 ft
alpha = 1.0E+30 sec^{-1}



GW009 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW009 recovery.aqt
Date: 05/27/09 Time: 12:27:34

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW009
Test Date: 5/5/09

AQUIFER DATA

Saturated Thickness: 12.3 ft
Anisotropy Ratio (Kz/Kr): 0.0329

WELL DATA

Pumping Wells

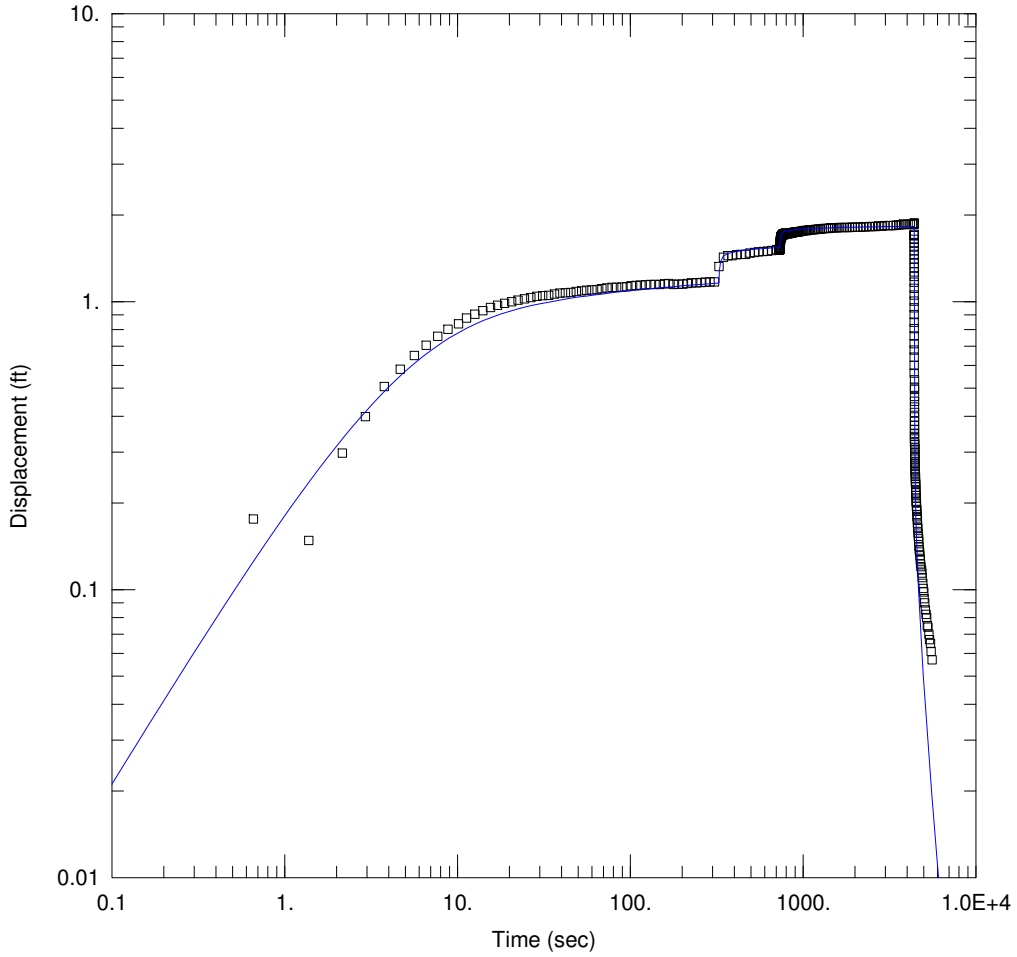
Well Name	X (ft)	Y (ft)
GW009	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ GW009	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)
T = 6.174 ft^2/day
S/S' = 3.331



GW010 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW010.aqt
Date: 05/27/09 Time: 12:11:05

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW010
Test Date: 5/6/09

AQUIFER DATA

Saturated Thickness: 19.1 ft
Anisotropy Ratio (Kz/Kr): 0.01081

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW010	0	0

Observation Wells

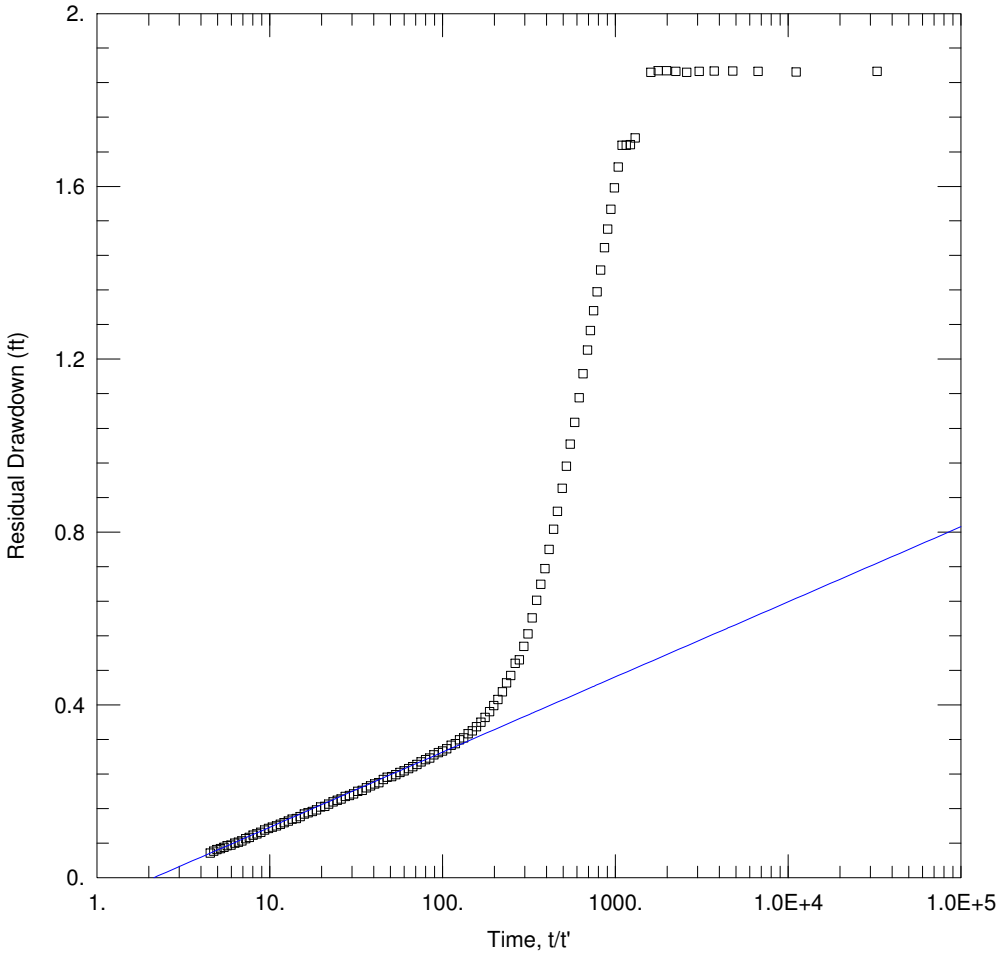
Well Name	X (ft)	Y (ft)
□ GW010	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 993.7 ft^2/day
Sy = 0.2858
Sw = 0.
r(c) = 0.08333 ft

S = 0.001
ß = 1.852E-6
r(w) = 0.25 ft
alpha = 1.0E+30 sec^{-1}



GW010 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW010 recovery.aqt
Date: 05/27/09 Time: 12:29:19

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW010
Test Date: 5/6/09

AQUIFER DATA

Saturated Thickness: 19.1 ft
Anisotropy Ratio (Kz/Kr): 0.01081

WELL DATA

Pumping Wells

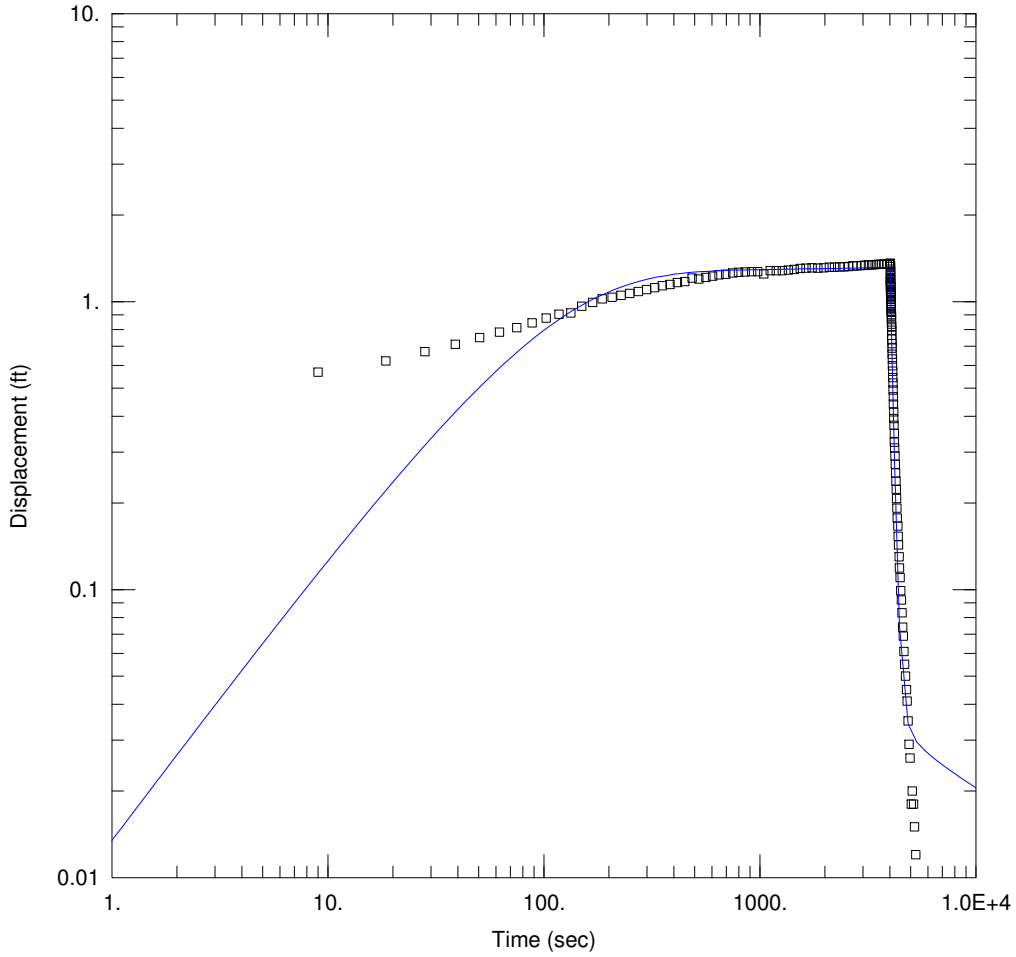
Well Name	X (ft)	Y (ft)
GW010	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ GW010	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)
T = 608.6 ft^2/day
S/S' = 2.141



GW011 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW011.aqt
Date: 05/27/09 Time: 12:15:54

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW011
Test Date: 5/8/09

AQUIFER DATA

Saturated Thickness: 14.7 ft
Anisotropy Ratio (Kz/Kr): 0.03274

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW011	0	0

Observation Wells

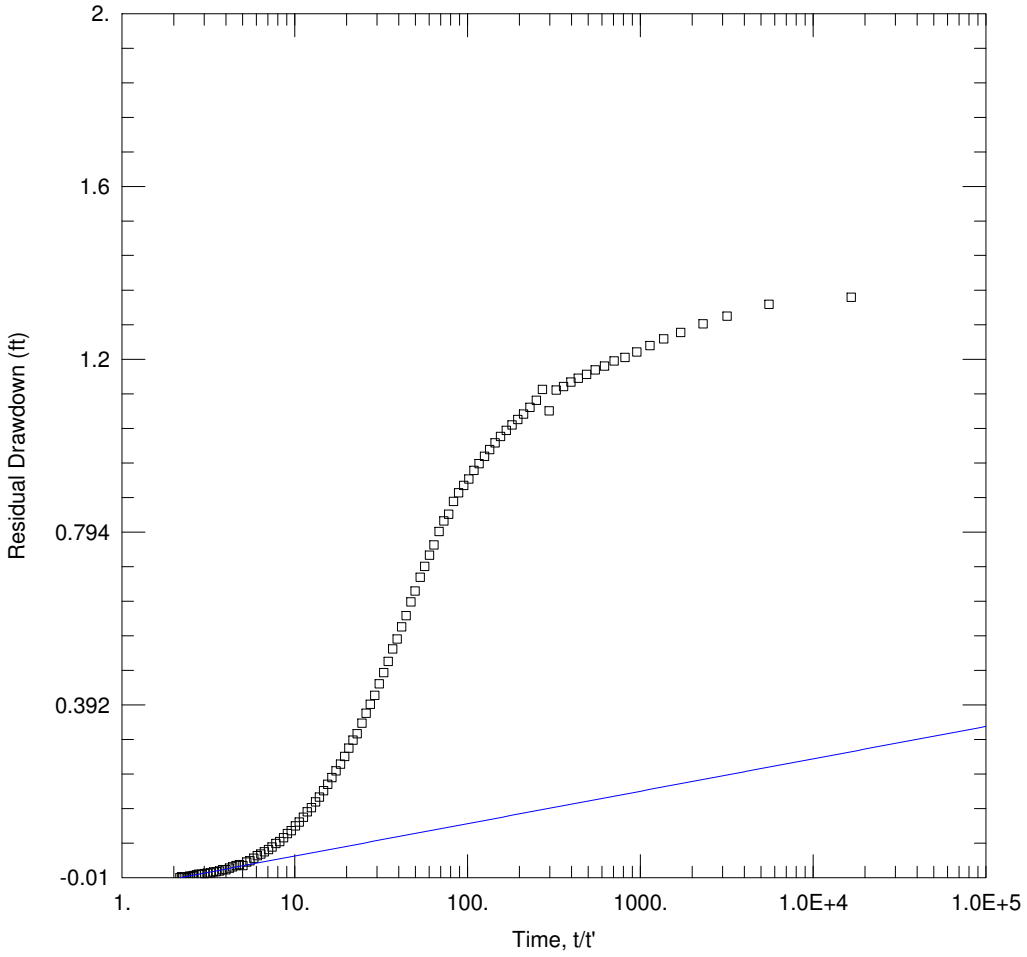
Well Name	X (ft)	Y (ft)
□ GW011	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 126.9 ft^2/day
Sy = 0.1
Sw = 0.
r(c) = 0.1666 ft

S = 0.0008449
ß = 9.468E-6
r(w) = 0.25 ft
alpha = 1.0E+30 sec^{-1}



GW011 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW011 recovery.aqt
Date: 05/27/09 Time: 12:30:37

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW011
Test Date: 5/8/09

AQUIFER DATA

Saturated Thickness: 14.7 ft
Anisotropy Ratio (Kz/Kr): 0.03274

WELL DATA

Pumping Wells

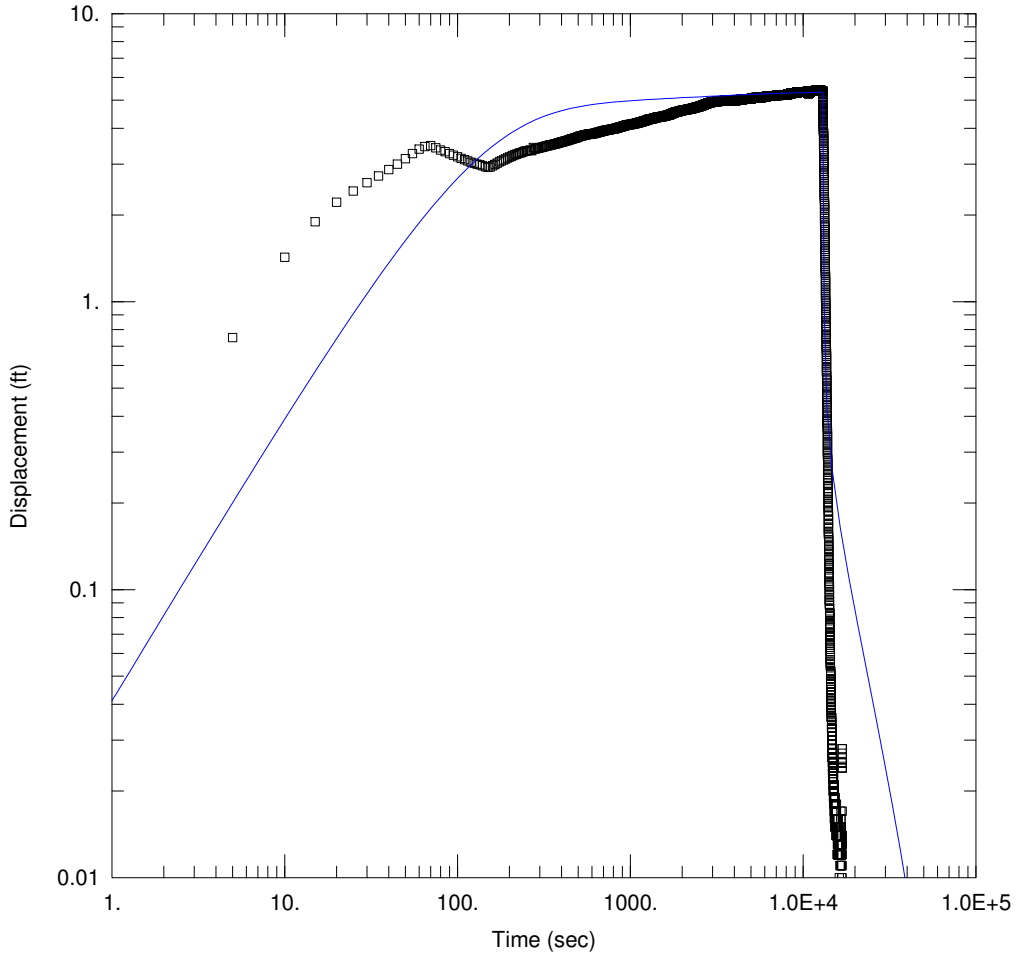
Well Name	X (ft)	Y (ft)
GW011	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ GW011	0	0

SOLUTION

Aquifer Model: Confined
Solution Method: Theis (Recovery)
T = 234. ft^2/day
S/S' = 2.94



GW012 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW012.aqt
Date: 05/27/09 Time: 12:19:15

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW012
Test Date: 5/8/09

AQUIFER DATA

Saturated Thickness: 26.5 ft
Anisotropy Ratio (Kz/Kr): 0.01

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW012	0	0

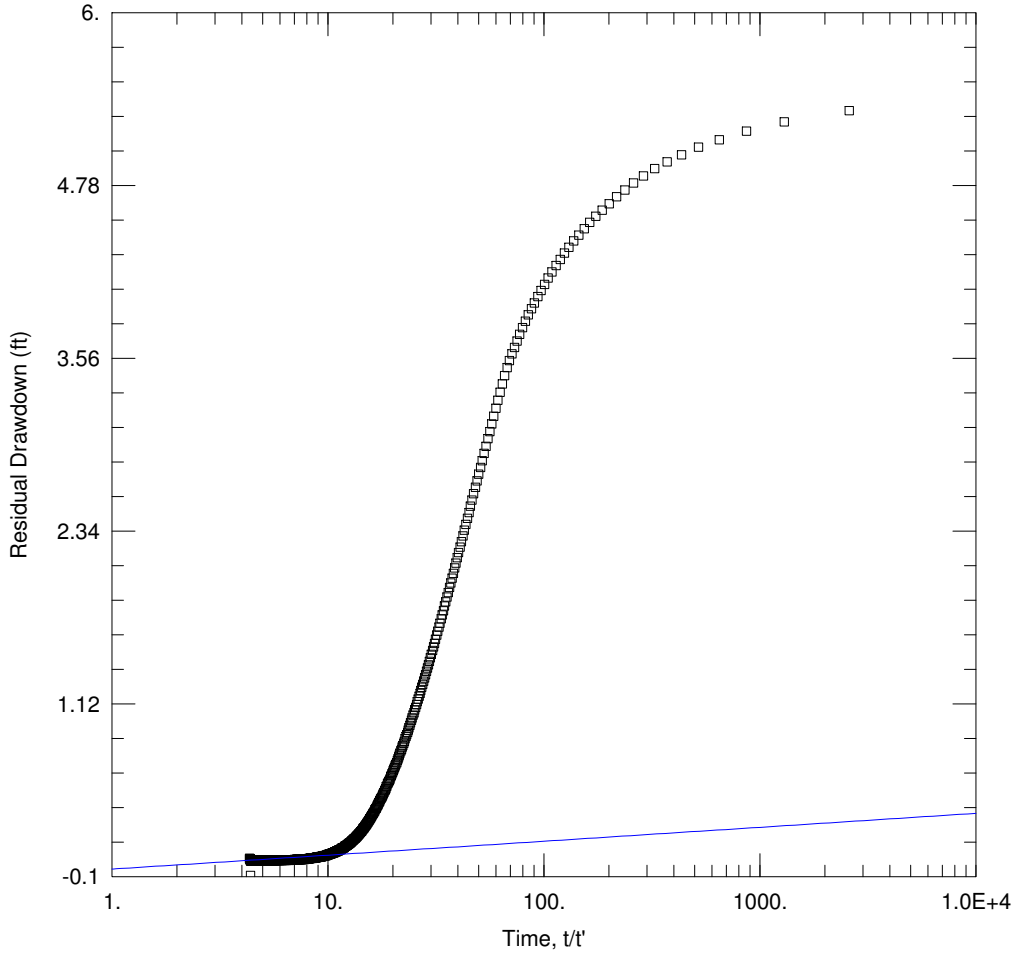
Observation Wells

Well Name	X (ft)	Y (ft)
□ GW012	0	0

SOLUTION

Aquifer Model: Unconfined
Solution Method: Moench

T = 17.27 ft^2/day
Sy = 0.3
Sw = 0.
r(c) = 0.05558 ft
S = 1.954E-6
ß = 8.9E-7
r(w) = 0.25 ft
alpha = 3.955E-10 sec^{-1}



GW012 PUMPING TEST

Data Set: P:\Mpls\23 MN\69\2369862\WorkFiles\WO 006 Env Impact Statement\TB Hydro Investigation\Pumping tests\GW012 recovery.aqt
Date: 05/27/09 Time: 12:31:42

PROJECT INFORMATION

Company: Barr Engineering Company
Client: PolyMet Mining, Inc.
Project: 23690862.00-006-001
Location: NorthMet
Test Well: GW012
Test Date: 5/8/09

AQUIFER DATA

Saturated Thickness: 26.5 ft Anisotropy Ratio (Kz/Kr): 0.01

WELL DATA

Pumping Wells

Well Name	X (ft)	Y (ft)
GW012	0	0

Observation Wells

Well Name	X (ft)	Y (ft)
□ GW012	0	0

SOLUTION

Aquifer Model: Confined Solution Method: Theis (Recovery)

T = 64.54 ft^2/day S/S' = 3.041

Beta Version 1

Worksheet for Estimating Transmissivity and Hydraulic Conductivity from Specific Capacity Test Data

Explanation and notes attached.

Maximum iterations	10
Error tolerance (as drawdown)	0.001 feet

	Field Data							*Estimated Parameters*			*Calculated Results*								*Diagnostics*					
		Depth to Water				Screened Interval													***Solution Integrity***			***Sensitivity of T:***		
Location	Well Diam.	Initial	Final	Test Duration	Mean Pumping Rate	Depth to Top	Depth to Bottom	Storage Coeff. (S)	Well loss Coeff. (C)	Aquifer Thickness (b)	Measured Drawdown (s_m)	Saturated Screen Length (L)	Well loss (s_w)	Partial Penetration Parameter (s_p)	Specific Capacity	**Transmissivity (T)**	**Conductivity (K)**	**Conductivity (K)**	Calculated Drawdown	Error as Drawdown	Well Bore Storage Test	to S at ± 1 factor of 10	to s_w at 10% of s_m	to b at ± 25%
	inches	feet	feet	min.	gpm	feet	feet	-	sec^2/ft^5	feet	feet	feet	feet	-	gpm/ft	**sq ft/sec**	**ft/sec**	**ft/day**	feet			sq ft/sec	sq ft/sec	sq ft/sec
Tailings Basin Monitoring Wells																								
GW-001	2	2.0	12.1	60	0.9	7.9	17.9	5.00E-05	0	21.0	10.10	10.0	0.000	4.40	0.09	**3.9E-04**	**1.9E-05**	**1.61**	10.10	0.00%	pass	3.8E-05	4.6E-05	1.6E-04
GW-006	2	10.5	12.7	63	1.1	6.9	16.9	7.00E-03	0	43.9	2.24	6.5	0.000	24.20	0.49	**5.4E-03**	**1.2E-04**	**10.65**	2.24	0.00%	pass	2.0E-04	6.1E-04	2.7E-03
GW-007	2	7.5	9.2	66	1.4	6.6	16.6	6.00E-04	0	25.7	1.75	9.2	0.000	7.53	0.80	**4.4E-03**	**1.7E-04**	**14.84**	1.75	0.01%	pass	3.4E-04	5.1E-04	1.9E-03
GW-009	2	3.3	7.3	121	0.1	5.2	15.2	8.00E-06	0	12.3	4.02	10.0	0.000	0.69	0.02	**8.1E-05**	**6.6E-06**	**0.57**	4.02	0.00%	pass	1.1E-05	9.5E-06	1.9E-05
GW-010	2	2.3	4.2	73	4.0	15.3	20.3	1.00E-03	0	19.1	1.87	5.0	0.000	10.47	2.14	**1.4E-02**	**7.5E-04**	**64.80**	1.87	0.00%	pass	9.0E-04	1.6E-03	6.0E-03
GW-011	2	18.3	19.6	69	0.5	13.4	23.4	8.00E-04	0	14.7	1.30	5.1	0.000	6.77	0.38	**1.9E-03**	**1.3E-04**	**11.44**	1.30	0.02%	pass	1.6E-04	2.2E-04	8.2E-04
GW-012	2	4.4	9.8	216	0.2	7.9	17.9	2.00E-06	0	26.5	5.40	10.0	0.000	6.95	0.04	**2.2E-04**	**8.4E-06**	**0.73**	5.40	0.01%	pass	1.6E-05	2.6E-05	8.4E-05

Worksheet for Estimating Transmissivity and Hydraulic Conductivity from Specific Capacity Test Data

Explanation

This spreadsheet estimates transmissivity and hydraulic conductivity following the method of Bradbury and Rothschild (1985). The method applies the Cooper-Jacob approximation of the Theis equation, with corrections for partial penetration and well loss, as indicated in equations 1-4.

Equation 1 is the modified Cooper-Jacob approximation of the Theis equation for transient radial flow to a well in a confined aquifer. Equation 2 calculates well loss, based on a correction factor (C), which must be estimated or determined by alternate test methods. Equation 3 calculates a unitless partial penetration correction factor (see assumptions below), employing the function G(L/b), approximated in Equation 4 with a polynomial best-fit.

The estimates of transmissivity and conductivity yielded by this method are imperfect, and presumed to be less realistic than the estimates that can be made from time/drawdown or distance/drawdown tests, if those data are available. This solution method includes several assumptions that should limit the confidence placed in its estimates:

a) the tested aquifer is confined, non-leaky, homogeneous and isotropic;
b) the storage coefficient of the aquifer is known;
c) the well loss is known;
d) the effective aquifer thickness is known.

In most cases, the storage coefficient, well loss, and aquifer thickness can only be estimated. The error introduced is non-negligible, but can be loosely bracketed. The diagnostic section of the worksheet includes a limited sensitivity analysis.

If the user has little control on well loss, or aquifer thickness, the well loss and partial penetration correction terms may be removed, respectively, by setting the well loss coefficient (C) equal to zero, and the aquifer thickness (b) equal to the saturated screen interval. Note that the partial penetration correction factor assumes isotropic conditions ($K_h = K_z$), and gives a value of T extrapolated from the screened interval to the full aquifer thickness. If the aquifer is anisotropic, this correction is inappropriate.

Eq. 1 $$T = \frac{Q}{4\pi(s_m - s_w)}\left[\ln\left(\frac{2.25Tt}{r_w^{\,2}S}\right) + 2s_p\right]$$

Eq. 2 $$s_w = CQ^2$$

Eq. 3 $$s_p = \frac{1 - L/b}{L/b}\left(\ln\frac{b}{r_w} - G(L/b)\right)$$

Eq. 4 $$G(L/b) = 2.948 - 7.363(L/b) + 11.447(L/b)^2 - 4.675(L/b)^3$$

b - aquifer thickness	s_m - measured drawdown
C - well loss coefficient	s_w - well loss
L - screen length	s_p - partial penetration parameter
Q - mean pumping rate	S - storativity
r_w - effective radius	T - transmissivity
	t - pumping duration

Usage Notes

Units
The user may chose any combination of units for field data, estimated parameters and calculated results by changing the units shown in the column headers. Each of these cells has an embedded pull down list from which to chose. Only the listed options will work, because the embedded functions look for specific text strings. The units of the diagnostic columns are linked to the calculated results, and shouldn't be manually changed.

Input
Field data may be pasted in or entered directly. The units header should be changed to agree with the data. All depth values are assumed to be from a common reference point (e.g., ground surface).

Calculated Results
The calculated results cells all make use of user-defined functions written in Visual Basic for Applications. The functions and their arguments are listed to the right. The code may be viewed by opening Excel's Visual Basic Editor. Cells containing these functions may be drag-filled or copied down their respective columns to extend the table. Changing the units in the column header will automatically change the output units.

Diagnostics
The difference between calculated drawdown the measured drawdown is a metric for assessing the convergence of the solution. If the error is unacceptably high, the maximum iterations and error tolerance may be adjusted in the fields above the table. The well bore storage test checks that the specific capacity test rate and duration were adequate to negate the influence of water removed from the well casing on the measured drawdown. The test applies criterion that the test duration be longer than $25*r_w^2/T$ (ASTM, 2004). Note that this check assumes well radius and riser radius are equal.

The worksheet assesses the sensitivity of transmissivity to variation in the storage coefficient (S), to the degree of well loss (s_w), and to the effective isotropic aquifer thickness (b). The resulting values shown indicate the variance of T from the actual estimate, when the target parameter is adjusted as indicated.

Functions and arguments employed in this workbook

CalcDD(TGuess(well diam., diam. units, t, t units, Q, Q units, S, s_w, s_w units, s_p, T, T units, output units)
Returns drawdown calculated from an estimated T.
Getdd(dtw initial, dtw initial units, dtw final, dtw final units, output units)
Returns drawdown calculated from measured depth to water (dtw)
GetK(T, T units, b, b units, output units)
Returns an estimate of hydraulic conductivity calculated by T/b.
Getloss(Q, Q units, C, C units, output units)
Returns the well loss correction factor (s_w).
Getsl(screen top depth, screen top depth units, screen bottom depth, screen bottom depth units, dtw init., dtw units, output units)
Returns the saturated screen length computed from field data.
GetSpCap(Q, Q units, s_m, s_m units, output units)
Returns specific capacity.
ppen(L, L units, b, b units, d, d units)
Returns the partial penetration correction factor (s_p).
TGuess(well diam., diam. units, s_m, s_m units, t, t units, Q, Q units, S, s_w, s_w units, s_p, error tolerance, error units, max. steps, output units)
Return an estimate of transmissivity.
wellstorage(well diam., diam. units, t, t units, T, T units)
Returns the text "pass" or "fail" based on a test for inappropriate effects of well bore storage.

References

1) Bradbury, K.B., and E.R. Rothschild, 1985. A computerized technique for estimating the hydraulic conductivity of aquifer from specific capacity data: Ground Water vol. 23, No. 2, pp. 240-246.
2) ASTM International, 2004. Standard Test Method for Determining Specific Capacity and Estimating Transmissivity at the Control Well, Standard D 5472-93, in Annual Book of ASTM Standards, Vol. 04.08 pp. 1279-1282.

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