APPENDIX J

GROUNDWATER MODELING SUMMARY REPORT

MGI

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MGI Limited
31 Gloster Court
Dartmouth, Nova Scotia
Canada B3B 1X9
Tel. 902.468.1248
Fax 902.468.2207
Email mgi.ns@mgi-limited.com
Web www.mgi-limited.com
www.CRAworld.com

August 9, 2002

Black Bull Resources Inc.
548 Beatty Street
Vancouver, B.C.
V6B 2L3

MGI File: 20232G

Attention: Mr. John Keating, President, Black Bull Resources

Re: Hydrogeologic Baseline Study, White Rock Mine

Dear Mr. Keating:

This report summarizes the work completed for a hydrogeological baseline study at the proposed quartz mineral development project known as the White Rock Mine located at Flintstone Rock in Yarmouth County, Nova Scotia.

The investigation was implemented to provide hydrogeologic baseline data in the vicinity of the proposed mine. The objectives of this evaluation were as follows:

- To better define the bedrock and surficial aquifers at the site in terms of hydraulic characteristics; and
- To use the resulting data to carry out predictive groundwater modeling under various mine plan scenarios. Desirable information included an estimate of the pumping rate that would be required to dewater the proposed quarry during active mining operations and what effects dewatering may have on the local groundwater and/or surface water (East Barclay Brook and the Clyde River) systems.

The following briefly summarizes the work that was carried out under MGI Limited's (MGI) direction to meet these objectives.

Field Activities

Test Well Construction

Between May 23 and 24, 2002, two test wells (DW-02-01 and DW-02-02) were installed at the site in order to provide additional details on the local hydrogeology. The location of the wells is shown on the site plan, Figure 1. The wells were installed by Clearwater Well Drilling, a qualified water well construction contractor, using an air rotary well drilling rig. MGI personnel directly supervised all well construction activities. The wells are 150 mm diameter wells with steel casing installed through the unconsolidated surficial deposits and weathered upper bedrock and open boreholes within the more competent bedrock. Each well was completed to a depth of approximately 150 feet (45.7 m), based on an anticipated final quarry depth of approximately 35-40 m for Pit A. Well logs, showing specific details of the geologic conditions encountered, estimated rates of groundwater movement into the well, groundwater conditions with respect to pH, temperature and electrical conductivity and other pertinent details are attached. The drilled well reports provided by the drilling contractor are also attached. The results of the well drilling program are summarized below.

DW-02-01: Test well completed to a depth of 150 feet (45.7 m) through 12.2 feet (3.7 m) of unconsolidated sand, gravel and cobbles and 137.8 feet (42.0 m) of variably fractured granite. Thirty (30) feet (9.1 m) of six inch steel casing, fitted with a drive shoe, was installed in the well. No grout was used. The static groundwater level was observed to be 70 feet (21.3 m) below grade at the time of well completion, and had stabilized at 8 feet (2.42 m) below grade by May 27, 2002. Estimated well yield, based on airlift testing method, was observed to be approximately 12 imperial gallons per minute (igpm).

DW-02-02: Test well completed to a depth of 160 feet (48.8 m) through 60 feet (18.3 m) of unconsolidated sand, gravel and cobbles and 100 feet (30.5 m) of variably fractured granite. Sixty (60) feet (18.3 m) of steel casing, fitted with a drive shoe, was installed in the well. No grout was used. The well was observed to be dry at the time of completion. However, a static groundwater level of 23.5 feet (7.17 m) below grade was observed on May 27, 2002, indicating that groundwater appears to entering the well at a very slow rate. Due to the fact that the well was dry immediately following completion, no estimate of well yield could be determined.

As per our discussions, we note that Black Bull anticipates using all available wells, including the recently drilled wells and the existing monitoring wells, for data collection purposes. Therefore, the wells will be maintained until such time as abandonment is deemed necessary. When necessary, well abandonment will be carried out using qualified contractors in accordance with applicable regulations and industry practices.

Aquifer Testing

The aquifer testing portion of the project was designed to provide information necessary for the predictive modeling exercise and to attempt to verify the modeling results. Aquifer testing provides information pertaining to the transmissivity and storativity of an aquifer and can also provide additional information, such as the presence of nearby zones of lower groundwater permeability, groundwater recharge zones or the relationship between groundwater and surface water. In this case, aquifer testing included both step drawdown and constant yield pump tests.

Step drawdown testing involves a series of short duration pumping episodes carried out in quick succession, with the pumping rate increased between each successive step. The steps are performed consecutively and the well is not allowed to recover between each step. The purpose of step drawdown testing is to attempt to determine a pumping rate for the longer term constant yield pump testing. This objective is to determine a pumping rate that will adequately stress the aquifer but not cause the pumping well to go dry during the pump test. Longer term, constant yield testing is then performed using the pumping rate established during the step drawdown test and for a period of time sufficient to ensure that the aquifer is adequately stressed. Depending on the objectives of the pump testing and the intended purpose of the resulting data, constant yield tests can range in duration from 12 hours to a few weeks or more. In addition to the information obtained during the pumping portion of a pump test, the rate at which the groundwater level in a well recovers following a pump test can also be measured and used to determine local hydrogeologic conditions.

The initial project design called for step drawdown and 72-hour constant yield testing of both of the newly installed water wells (DW-02-01 and DW-02-02) and step drawdown and 20-hour constant yield testing of an existing monitoring well (MW-91-01). Testing of DW-02-01 and

DW-02-02 was performed by Aquaterra Resource Services Ltd. (Aquaterra), a qualified pump testing firm, while testing of monitoring well 91-01-01 was performed by qualified MGI personnel. The 72-hour constant yield tests of DW-02-01 and DW-02-02 were originally designed to proceed almost simultaneously, with an offset of approximately 4 hours for logistical purposes. However, developments during the well construction and aquifer testing phases of the program required modifications to the project design as summarized below. Details of the various pump tests are also provided as attachments.

Prior to initiating the pump testing program, water levels were recorded in the available monitoring wells (MW-91-01, MW-99-20, MW –01-40 and MW-01-41). In addition, the level of water in two pits created during a previous bulk sampling program at the site were also measured relative to a fixed point, as were the water levels in the East Barclay Brook and Clyde River. Drilled well DW-02-02, observed to be dry at the time of drilling, also contained water at this time. Therefore, the static water level in this well was included in the data set. These measurements were recorded to establish groundwater and surface water conditions prior to the initiation of pump testing. This would allow for the quantification of any changes in these water levels as a result of groundwater pumping.

Based on a well yield of 12 igpm at DW-02-01, as estimated by air lift testing during well construction, step drawdown testing at this well consisted of two 1-hour pumping steps and one 10-minute step at rates of 6, 8 and 10 igpm. The results of the step drawdown test at DW-02-01 indicated that pumping at a rate of 10 igpm had little effect on the water level in the well, suggesting that the sustainable pumping rate was much higher and in excess of the well yield estimated during well construction. A possible reason for this discrepancy is presented below in the discussion of the long term pump test at DW-01-01. The water level in the well was the allowed to return to the pre-testing level prior to initiating the constant yield test.

The long term pump test at DW-02-01 proved to be problematic, due to the well's unexpected high yield rate and the quality of the water being discharged. The constant yield test was initiated at a pumping rate of approximately 12-13 igpm. After approximately 100 minutes of pumping, it became apparent that the well was not being adequately stressed and the pumping rate was increased to approximately 20 igpm. After approximately 1440 hours of pumping, the water level in the pumping well had stabilized at 28 feet (8.5 m) below grade. Therefore, the rate was increased again, to 30 igpm. It should be noted that the selection of pumping equipment deployed to the site was based on the anticipated well yield estimated at the time of well construction. A pumping rate of 30 igpm represents the maximum capacity of the pump initially deployed at the site, which was in excess of the expected well yield rate. In addition, the water was observed to be extremely silty throughout the constant yield test and showed no evidence of improving as the well was developed. Unfortunately, sustained pumping at the pump's maximum rate and the high sediment loads in the discharge water resulted in a failure of the pump after 1970 minutes of pumping. In addition, no changes had been noted in the water levels in the monitoring wells, DW-02-02, the bulk sample pits or the surface watercourses during the constant yield test.

A larger capacity pump was deployed to the site and a rate of 30 igpm used. After approximately 2 hours of pumping at 30 igpm, the water level was again observed to stabilize at approximately 31 feet (9.5 m) metres below grade, with no observed effects in the water levels in the monitoring wells, DW-02-02, the bulk sample pits or the surface watercourses. Discussions with the pump test contractor indicated that further pumping of the well, at discharge rates that were achievable using the available equipment, would not provide any additional information. Therefore, a decision was made to stop the second constant yield discharge test after 2 hours. This information is presented as 'Step 4' in the attached Step Drawdown Test for well DW-02-01. It should also be noted that the water level was observed to recover to the pre-pumping level after only a few minutes each time pumping was halted, therefore, the measurement of well recovery rates was deemed to be impractical.

Observations made during both of the constant yield pump tests performed at DW-02-01 indicated that a significant flow of water was entering the well at a depth of approximately 11-11.5 m below grade. Therefore, it is possible that a highly fractured bedrock zone at this depth acts as a preferred groundwater flow pathway. The presence of fine grain, unconsolidated material present in this facture may have initially inhibited the movement of groundwater into the well at the time of well construction. However, pumping of the well may have been removing this fine material, thereby developing the well and significantly increasing its yield. The fact that the discharge water was observed to contain an abundance of sediment throughout the pump test, with no evidence of clearing up, further supports this conclusion.

The testing program at DW-02-01 began with a step drawdown test. The first step of the step drawdown test consisted of 1 hour of pumping at 2 igpm. Immediately following the first step, a second step was initiated at 4 igpm, however, the well was observed to go dry approximately 20 minutes into the second step. At this point, pumping was halted and the rate at which the groundwater level in the well recovered was measured. A preliminary review of the recovery data indicated a maximum estimated yield of 0.4 igpm for DW-02-02, a rate that could not be practically achieved using the available equipment. Therefore, no further testing was carried out on this well.

As noted above, aquifer testing was also performed at MW-91-01. In this case, testing consisted of a step drawdown and 18-hour constant yield testing, performed by MGI personnel on May 29, 2002. The design of monitoring well MW-91-01 restricted the pumping equipment that could be utilized for this purpose. This monitoring well consists of an exploration borehole constructed during a geologic mapping and mineral exploration program carried out by the Nova Scotia Department of Natural Resources. As the borehole was drilled for another intended purpose, the final borehole diameter is only approximately 76 mm (3 inches). The size of the borehole resulted in the need to carry out this pump test using a 2 inch Grundfos™ pump, with a maximum discharge rate of approximately 5-7 igpm.

The constant yield test on well MW-91-01was initiated at a rate of 5.3 igpm. The resulting pump test data indicates that the water level in the well was quickly drawn down approximately 4.7 m, where it then stabilized for the duration of the pump test. After 18 hours, pumping was halted and the rate at which the water level recovered was measured.

Groundwater Quality

Groundwater samples were also collected from DW-02-01 and MW-91-01 over the duration of the constant yield tests. In each case, samples were collected after 1 hour of pumping and again just prior to the end of pumping. The samples collected from MW-91-01 were submitted for general chemistry and metal analyses, while those collected from DW-02-01 were submitted for general chemistry analysis only. The analytical results are summarized in Tables 1 and 2 and laboratory certificates of analysis are attached.

TABLE 1: GROUNDWATER ANALYTICAL RESULTS - GENERAL CHEMISTRY

ANALYTE	Units	DW-1 / 29 May 02 / 60 min.	DW-1 / 27 May 02 / 2212 min.	MW-99-01 / 29 May 02 / 60 min.	MW-99-01 / 29 May 02 / 1020 min.	CDWQ	FWAL	DL
Sodium	mg/L	4.5	4.5	3.0	3.0	200[3]	---	0.1
Potassium	mg/L	1.2	0.9	0.4	0.4	---	---	0.1
Calcium	mg/L	1.5	1.4	1.6	1.8	---	---	0.1
Magnesium	mg/L	0.8	0.7	0.3	0.3	---	---	0.1
Alkalinity (as CaCo3)	mg/L	nd	nd	nd	nd	---	---	5
Sulfate	mg/L	nd	nd	nd	nd	500[3]	---	2
Chloride	mg/L	4.0	5.0	4	4	250[3]	---	1
Reactive Silica (as SiO2))	mg/L	8.6	8.2	5.7	6.1	---	---	0.5
Ortho Phosphorous (as P)	mg/L	0.03	0.03	nd	0.02	---	---	0.01
Phosphorus	mg/L	---	---	nd	nd	---	---	0.1
Nitrite	mg/L	---	---	nd	nd	3.2[2]	0.018	0.01
Nitrate + Nitrite(as N)	mg/L	0.35	0.28	nd	nd	---	---	0.05
Nitrate (as N)	mg/L	---	---	nd	nd	10[2]	---	0.05
Ammonia (as N)	mg/L	nd	nd	nd	nd	---	85	0.05
Colour	TCU	11	nd	nd	nd	15[3]	---	5.0
Total Org. Carbon	mg/L	nd	0.6	nd	nd	---		0.5
Turbidity	NTU	4.5	2.5	0.3	0.1	1 – 4[4]	---	0.1
Specific Conductance	us/cm	42	39	22	24	---	---	1.0
pH	Units	5.5	5.5	5.5	5.6	6.5-8.5[3]	6.5-9.0	---
Hardness (as CaCO3)	mg/L	7.0	6.4	5.2	5.7	---	---	0.1
Bicarbonate (as CaCO3)	mg/L	nd (5)	nd (5)	nd (5)	nd (5)	---	---	1.0
Carbonate (as CaCO3)	mg/L	nd (5)	nd (5)	nd (5)	nd (5)	---	---	1.0
TDS (Calculated)	mg/L	27	27	20	21	500[3]	---	1.0
Cation Sum	meq/L	0.37	0.35	0.25	0.26	---	---	0.10
Anion Sum	meq/L	0.28	0.30	0.26	0.26	---	---	0.10
Ion Balance	%	14.5	7.69	1.17	0.65	---	---	---
Langlier Index @ 4C	---	-5.44	-5.47	-5.41	-5.26	---	---	---
Langlier Index @ 20C	---	-5.04	-5.07	-5.01	-4.86	---	---	---
Saturation pH @ 4C	Units	10.9	11.0	10.9	10.9	---	---	---
Saturation pH @ 20C	Units	10.5	10.6	10.5	10.5	---	---	---

Notes:

---	Not Applicable
nd	Not Detected
DL	Detection Limit
Shading	Denotes Guideline Exceedence
CDWQ	Canadian Drinking Water Quality Guidelines (2001)
FWAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 2001)
1	Interim Maximum Acceptable Concentration
2	Maximum Acceptable Concentration
3	Aesthetic Objective
4	Turbidity guideline of 1 NTU applies to treated water only. Aesthetic objective of 5 NTU can be used for untreated supplies (Health Canada)

TABLE 2: GROUNDWATER ANALYTICAL RESULTS - METALS (mg/L)

ANALYTE	MW-99-01 / 29 May 02 / 60 min.	MW-99-01 / 29 May 02 / 1020 min.	CDWQ	FWAL	DL
Aluminum	0.21	0.2	---	0.005-0.1	10
Antimony	nd	nd	0.006[1]	---	2
Arsenic	nd	nd	0.025[1]	0.005	2
Barium	nd	nd	1.0[2]	---	5
Beryllium	nd	nd	---	---	5
Bismuth	nd	nd	---	---	2
Boron	nd	nd	5[1]	---	5
Cadmium	0.0003	nd	0.005[2]	0.000017	0.3
Chromium	nd	nd	0.05[2]	0.001-0.0089	2
Cobalt	nd	nd	---	---	1
Copper	nd	nd	1.0[3]	0.002-0.004	2
Iron	0.05	0.04	0.3[3]	0.3	20
Lead	nd	nd	0.010[2]	0.001-0.007	0.5
Manganese	0.009	0.009	0.05[3]	---	2
Molybdenum	nd	nd	---	0.073	2
Nickel	nd	nd	---	0.025-0.15	2
Selenium	nd	nd	0.01[2]	0.001	2
Silver	nd	nd	---	0.0001	0.5
Strontium	nd	nd	---	---	5
Thallium	nd	nd	---	0.0008	0.1
Tin	nd	nd	---	---	2
Titanium	nd	nd	---	---	2
Uranium	0.0017	0.0019	0.02[1]	---	0.1
Vanadium	nd	nd	---	---	2
Zinc	0.013	0.011	5.0[3]	0.03	2

Notes:

---	Not Applicable
nd	Not Detected
DL	Detection Limit
Shading	Denotes Guideline Exceedence
CDWQ	Canadian Drinking Water Quality Guidelines (2001)
FWAL	Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life (CCME 2001)
1	Interim Maximum Acceptable Concentration
2	Maximum Acceptable Concentration
3	Aesthetic Objective

The groundwater quality was compared to the CCME Freshwater Aquatic Life (FWAL) guidelines, due to the fact that there may need to be a discharge the groundwater to the local surface water systems during the quarry dewatering activities. In addition, comparisons were also made against the Canadian Drinking Water Quality (CDWQ) guidelines in light of the possibility that groundwater could be used as a potable supply for the site.

The laboratory analysis indicated that the groundwater quality meets the Canadian Drinking Water Quality (CDWQ) guidelines, with the exception of CDWQ and FWAL exceedences for pH, minor FWAL exceedences for aluminum in both samples collected from MW-91-01 and a minor cadmium FWAL exceedence in the sample collected from MW-91-01 after 1 hour of pumping. It is noted that cadmium was reported as non-detect in the sample collected from this well after 17 hours (1020 minutes). Low pH and minor aluminum exceedences have been established in the local surface and groundwater systems through ongoing baseline water quality studies at the site. The initial cadmium exceedence at MW-91-01, followed by a reduction to non-detectable levels after continued pumping, may indicate an improvement in water quality as the well was developed or as standing water previously in the well was replaced by groundwater from the local aquifer. However, cadmium has also been detected at levels varying between non-detect and a concentration similar to that observed here in another monitoring well at the site during ongoing baseline water quality studies. Therefore, low levels of cadmium may occur naturally in groundwater at the site. Ongoing sampling will be carried out as part of the baseline water quality study to attempt to determine trends in groundwater cadmium concentrations.

Overall, the analytical results for the samples collected at DW-02-01 and MW-91-01 appear to indicate the effects of surface water or shallow groundwater on the groundwater system at these locations. The relatively low pH, total dissolved solid concentrations, conductivity and ionic strength observed in all of the samples collected during the various pump tests are generally indicative of groundwater under the influence of surface water. This surface water influence appears to be related to the movement of surface water, at shallow depths, into the wells in question. This is most likely caused by the fact that these wells may have poor seals at the base of the casing. Well MW-91-01 was originally drilled for geologic exploration purposes and it is anticipated that the casing would have been terminated at the base of the overburden or slightly below it. As previously noted, an apparent zone of highly fractured bedrock became apparent just below the base of the casing in well DW-02-01 during the initial step drawdown testing.

Groundwater Modelling

As part of the hydrogeologic baseline study a regional three-dimensional numerical model was developed to simulate groundwater flow at the site of the proposed quarry. The groundwater model was completed in order to:

- Incorporate monitoring and pump test hydrogeologic data from existing and newly installed wells;
- Develop a baseline view of regional groundwater flow;
- Provide a method of estimating the extent of potential groundwater flow pattern change due to the construction and operation of the mine; and
- Develop estimates of the volume of seepage that will flow into the quartz extraction areas to assist in the development of pumping and groundwater usage strategies.

The model inputs and results are discussed in detail in the attached Groundwater Modeling Summary Report and briefly summarized here. In summary, the scenario using median conductivity values, from the range of collected data, the equipotential head lines along East Barclay Brook and Clyde River remain essentially unchanged, areas immediately north of the quartz extraction area show a 4 m reduction in head levels decreasing to 1m at MW91-01 (approximately 400m distance). Areas immediately south of the quartz extraction areas show a 6 m reduction in head levels, which decreases with distance from the quartz extraction areas. Calculated total groundwater seepage flow into the two quartz extraction areas ranged from approximately 990 m^3/day (151.5s igpm) for a high conductivity scenario to approximately 275 m^3/day (42 igpm) for the low conductivity scenario.

Summary and Conclusions

The goal of the aquifer testing program was to provide information pertaining to the local hydrogeology that can then be used for predictive modelling purposes. Based on the results of the various pump tests, the hydraulic conductivity of the local granite aquifer appears to vary from $1x10^{-4}$ to $2x10^{-5}$ cm/sec. The variation in hydraulic conductivities between the wells appears to be directly related to the local geology, which is known to consist of granite that has been subjected to varying degrees of fracturing associated with the Tobeatic Shear Zone. Based on the results of the well drilling and pump testing, it appears that well DW-02-01 and, possibly, MW-91-01 have been constructed within zones that have been more highly fractured than the area immediately surrounding DW-02-02. The relatively low hydraulic conductivity observed at the latter suggests that this well intersects few, if any, significant fractures.

Based on a limited number of samples, it appears that groundwater quality at DW-02-01 meets the Canadian Drinking Water Quality guidelines, with the exception of pH. In addition, the groundwater quality appears to be very similar to the surface water quality, as established through baseline water quality studies carried out at the site, thereby minimizing any concerns associated with the release of mine dewatering discharges.

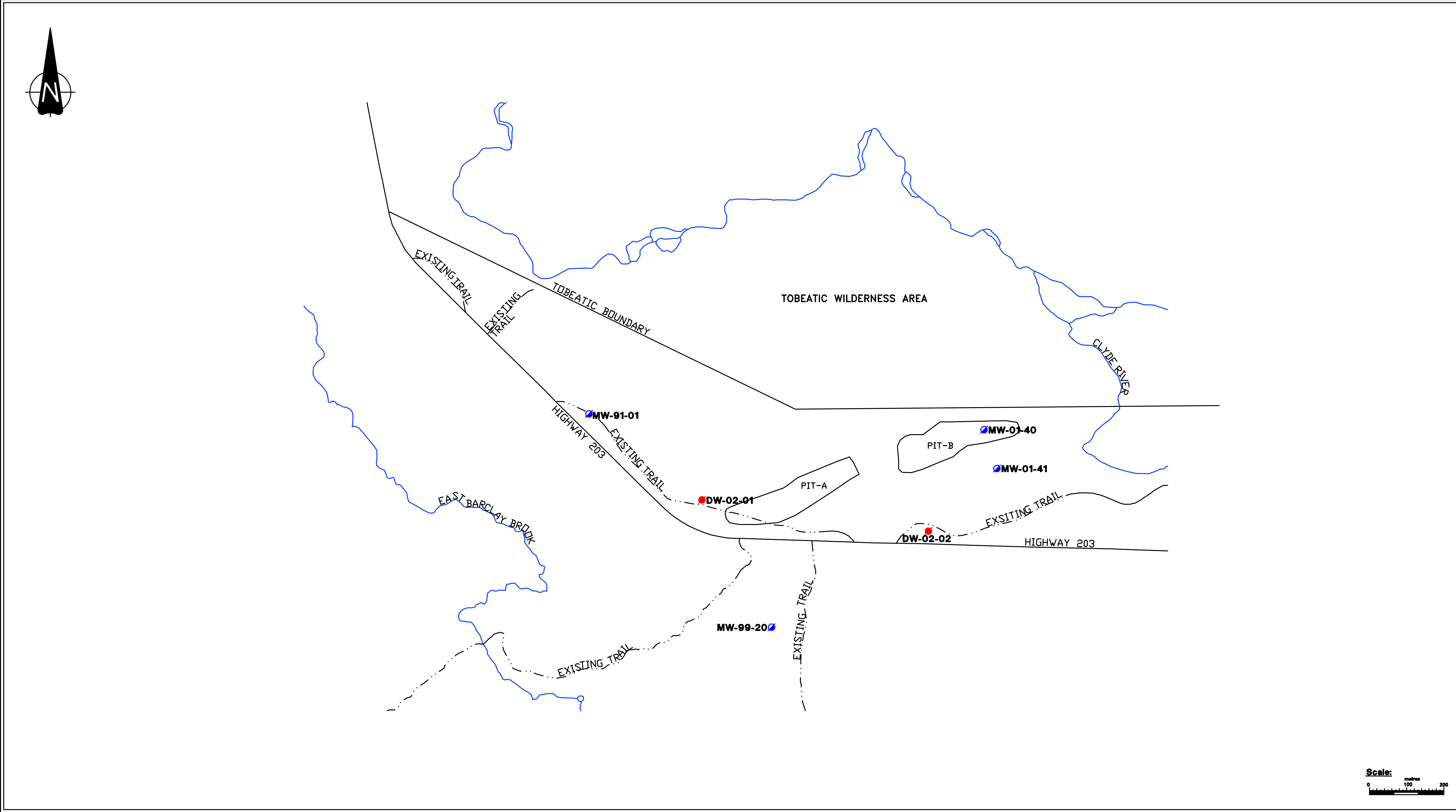
We trust that this information is sufficient for your reference at this time. Please contact the undersigned should any questions arise.

Sincerely,
MGI LIMITED

Peter G. Oram, P.Geo.
Senior Project Manager/Geologist

Steve Sauveur. M.A.Sc., P.Geo.
Project Manager

Attachments



LEGEND:

- MW-91-01 Exiting Monitoring Well
- DW-02-01 Drilled Test Well

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TITLE	Site Plan
PROJECT	Hydrogeologic Baseline Study White Rock Mine Flinstone Rock, Nova Scotia
DATE	Aug. 2002
PROJECT NO.	20232G
SCALE	1:10000
FIGURE NO.	1
DRAWN	SYC

APPENDIX I

WELL LOGS

Log of Testwell: *DW-02-01*

Project No. 20232-G
Client: Black Bull Resources
Location: Flintstone Rock, Yarmouth Country
Logged By: NB

MGI

SUBSURFACE PROFILE

Depth (m)	Strata Plot	Description	Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Well Data	Comments
0		Ground Surface						
		Top Soil						Stickup height 0.21m
1		Very fine sand, light brown						
2		Fine sand with some cobbles and gravel. Light brown						
3		Sand and cobbles. Light brown.						
4		Granite						
5–8		Fractured Granite. Light Buff. Cavity at 8.2m to 9.1m						
9–11		Fractured Granite. Light buff-pink.						
12–13		Fractured Granite. Greyish-white to light pink-orange.						

Drilled By: Clearwater Well Drilling
Drill Method: Air Rotary Drill Rig
Drill Date: May 23, 2002

Hole Size: 0.15m
TOC Elevation: 132.11 masl

MGI Limited
31 Gloster Court
Dartmouth, N.S. B3B 1X9

Log of Testwell: DW-02-01

Project No: 20232-G

Client: Black Bull Resources

Location: Flintstone Rock, Yarmouth Country

Logged By: NB

MGI

Depth (m)	Strata Plot	SUBSURFACE PROFILE	Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Well Data	Comments
13–18.3		Fractured Granite. Greyish-white to light pink-orange.						
18.3–24.4		Fractured Granite. Yellow-brown. Soft (easy drilling).	5	7.6	8	77		
24.4–26		Fractured Granite. Soft zone continues. Dark grey.						

Drilled By: Clearwater Well Drilling

Drill Method: Air Rotary Drill Rig

Drill Date: May 23, 2002

Hole Size: 0.15m

TOC Elevation: 132.11 masl

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Log of Testwell: DW-02-01

Project No: 20232-G
Client: Black Bull Resources
Location: Flintstone Rock, Yarmouth Country
Logged By: NB

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Depth (m)	Description (Subsurface Profile)	Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Comments
26 – 27.4	Fractured Granite. Soft zone continues. Dark grey.					
27.4 – 29	Fractured Granite. Becoming harder with depth					
29 – 39	Fractured Granite. Very dark grey. Harder than above					
~33.8		8	7.2	6	47	

Drilled By: Clearwater Well Drilling
Drill Method: Air Rotary Drill Rig
Drill Date: May 23, 2002

Hole Size: 0.15m
TOC Elevation: 132.11 masl

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Log of Testwell: DW-02-01

Project No: 20232-G
Client: Black Bull Resources
Location: Flintstone Rock, Yarmouth Country
Logged By: NB

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Depth (m)	Subsurface Profile	Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Comments
39–41.1	Fractured Granite. Very dark grey. Harder than above					
41.1–42.7	Fractured Granite. Lighter colour, white/grey.					
42.7–45.7	Fractured Granite. Darker grey colour.	12	7.1	6	47	
45.7	End of Hole					Drive shoe

Drilled By: Clearwater Well Drilling
Drill Method: Air Rotary Drill Rig
Drill Date: May 23, 2002

Hole Size: 0.15m
TOC Elevation: 132.11 masl

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WELL DW-02-01

NOVA SCOTIA
Department of the Environment

Drilled Well Report

N.S.D.O.E.
Well #
FOR DEPARTMENTAL USE ONLY

WELL DRILLING CONTRACTOR	WELL OWNER	CONTRACTOR
NAME: Clearwater Well Drilling (1991) Ltd	NAME: MGI Ltd	NAME:
LICENSE NUMBER 170	ADDRESS: White Rock Mine South Ohio	ADDRESS: 31 Glester Court Dartmouth
DATE WELL COMPLETED May 24/02	POSTAL CODE	POSTAL CODE B3B 1X9

STRATIGRAPHIC LOG

DEPTH IN FEET GROUND LEVEL	TO	COLOR	GENERAL DESCRIPTION OF OVERBURDEN AND/OR BEDROCK	WELL SKETCH
0	12		Boulders, gravel & sand	
12	150		granite	

MAP REFERENCE
Page Number 77
Reference Letter Y
Reference Number 4
Roamer Letter H
Roamer Number 1

E. ____
N. ____
DEPARTMENTAL USE
Location Within Roamer Square

WELL LOCATION SKETCH

WELL INFORMATION

Total Depth Below Surface 150 Ft

Casing 6 In. to 30 Ft.; ____ In. to ____ Ft.

Casing Wall Thickness .188 In. Casing Type ____

Length of Casing Above Ground ____ Ft. ____ In.

☑ Driveshoe ☐ Grout ☐ Packer

WELL FINISH: ☑ Open Hole ☐ Slotted Casing

☐ Screen Make: ____

Slot Size: ____ Length ____ Ft.

Water Bearing Fractures Encountered 75 Ft.
110 Ft. 140 Ft ____ Ft. ____ Ft.

DRILLER'S COMMENTS: 5 gpm @ 75 ft
8 gpm @ 110 ft, 12 gpm @ 140 ft.
NO WELL CAP

PUMPING TEST

METHOD	RATE	DURATION
☑ Air ☐ Bailer ☐ Pump	15 G.P.M.	1 Hours ____ Mins.

STATIC LEVEL	WATER LEVEL END OF TEST	TEST DEPTH	DRAW DOWN
7 Ft.	____ Ft.	____ FT.	____ FT.

WATER COLOR

WATER LEVEL RECOVERED
To ____ Feet by ____ Hr. ____ Min. After Test

FINAL STATUS OF WELL: ☐ Water Supply ☐ Observation Well ☑ Test Hole ☐ Recharge Well ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Quality ☐ Abandoned, Saltwater ☐ Unfinished

WATER USE: ☐ Domestic ☐ Industrial ☐ Commercial ☐ Municipal ☑ Other ☐ Irrigation ☐ Public Supply ☐ Agricultural ☐ Heat Pump

METHOD OF DRILLING: ☐ Cable Tool ☑ Rotary ☐ Jet ☐ Other ☐ Drilling Fluids Type: ____

I Certify that the Well herein described has been constructed in accordance with the Nova Scotia Environment Act.

Signature: for: George Stevens   Date May 24/02

MAIL TO:
Nova Scotia Department of the Environment
PO Box 2107
Halifax, Nova Scotia
B3J 3B7

COPY DISTRIBUTION: WHITE - N.S.D.O.E. PINK - Customer BLUE - Driller

Log of Testwell: DW-02-02

Project No: 20232-G
Client: Black Bull Resources
Location: Flintstone Rock, Yarmouth Country
Logged By: NB

MGI

SUBSURFACE PROFILE (Depth (m))	Strata Plot	Description	Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Well Data	Comments
0		Ground Surface						Stickup height 0.33m
0 – ~0.7		Top Soil						
~0.7 – ~1.9		Fine sand with some cobbles. Brownish-grey colour.						
~1.9 – ~3.1		Fine sand and cobbles. Brownish-grey colour.						
~3.1 – ~7.6		Sand and cobbles. Light grey.						
~7.6 – ~9.1		Sand and gravel. Light grey colour.						
~9.1 – 13		Sand and gravel. Dark grey.						

Drilled By: Clearwater Well Drilling
Drill Method: Air Rotary Drill Rig
Drill Date: May 24, 2002

Hole Size: 0.15m
TOC Elevation: 133.22 masl

MGI Limited
31 Gloster Court
Dartmouth, N.S. B3B 1X9

Log of Testwell: DW-02-02

Project No: 20232-G
Client: Black Bull Resources
Location: Flintstone Rock, Yarmouth Country
Logged By: NB

MGI

SUBSURFACE PROFILE			Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Well Data	Comments
Depth (m)	Strata Plot							
13–15		Sand and gravel. Dark grey.						
15–18		Sand and gravel. Very dark grey. Very soft. Borehole collapsed						
18–20		Fractured Granite. Soft.						
20–26		Fractured Granite. Dark grey with some whitish, reddish and orange colouring.						

Drilled By: Clearwater Well Drilling
Drill Method: Air Rotary Drill Rig
Drill Date: May 24, 2002

Hole Size: 0.15m
TOC Elevation: 133.22 masl

MGI Limited
31 Gloster Court
Dartmouth, N.S. B3B 1X9

Log of Testwell: DW-02-02

Project No: 20232-G

Client: Black Bull Resources

Location: Flintstone Rock, Yarmouth Country

Logged By: NB

MGI

SUBSURFACE PROFILE								
Depth (m)	Strata Plot		Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Well Data	Comments
26–33.5		Fractured Granite. Dark grey with some whitish, reddish and orange colouring.						
33.5–39+		Fractured Granite. Lighter colouring.						

Drilled By: Clearwater Well Drilling

Drill Method: Air Rotary Drill Rig

Drill Date: May 24, 2002

Hole Size: 0.15m

TOC Elevation: 133.22 masl

MGI Limited
31 Gloster Court
Dartmouth, N.S. B3B 1X9

Log of Testwell: DW-02-02

Project No: 20232-G
Client: Black Bull Resources
Location: Flintstone Rock, Yarmouth Country
Logged By: NB

MGI

SUBSURFACE PROFILE	Estimated Yield (gpm)	pH	Temp. (C)	Cond.(mhos)	Well Data	Comments
Fractured Granite. Lighter colouring.						
Fractured Granite. Light grey with orange and red colouring.						
Fractured Granite. Light grey colour.						
Fractured Granite. Darker grey colour.						Drive shoe
End of Hole						Well dry at time of completion.

Depth (m): 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52

Drilled By: Clearwater Well Drilling
Drill Method: Air Rotary Drill Rig
Drill Date: May 24, 2002

Hole Size: 0,15m
TOC Elevation: 133.22 masl

MGI Limited
31 Gloster Court
Dartmouth, N.S. B3B 1X9

WELL DW-02-02

NOVA SCOTIA
Department of the Environment

Drilled Well Report

N.S.D.O.E.
Well #
FOR DEPARTMENTAL USE ONLY

WELL DRILLING CONTRACTOR	WELL OWNER	CONTRACTOR
NAME: Clearwater Well Drilling (1991) Ltd	NAME: MGI Ltd	NAME:
LICENSE NUMBER: 170	ADDRESS: White Rock Mine, South Ohio	ADDRESS: 31 Gloster Court, Dartmouth
DATE WELL COMPLETED: May 24/02	POSTAL CODE:	POSTAL CODE: B3B 1X9

STRATIGRAPHIC LOG

DEPTH IN FEET: GROUND LEVEL	TO	COLOR	GENERAL DESCRIPTION OF OVERBURDEN AND/OR BEDROCK	WELL SKETCH
			WELL #2	
0	42		boulders, gravel & sand	
42	160		granite	

MAP REFERENCE

Page Number: 77
Reference Letter: Y
Reference Number: 4
Roamer Letter: H
Roamer Number: 1

E. ____
N. ____
DEPARTMENTAL USE

Location Within Roamer Square: ✓

WELL LOCATION SKETCH

WELL INFORMATION

Total Depth Below Surface: 160 Ft.

Casing: 6 In. to 60 Ft.: ____ In. to ____ Ft.

Casing Wall Thickness: .188 In. Casing Type: ____

Length of Casing Above Ground: ____ Ft. ____ In.

☑ Driveshoe ☐ Grout ☐ Packer

WELL FINISH: ☑ Open Hole ☐ Slotted Casing

☐ Screen Make: ____

Slot Size: ____ Length ____ Ft.

Water Bearing Fractures Encountered ____ Ft.

____ Ft. ____ Ft. ____ Ft. ____ Ft.

PUMPING TEST

METHOD	RATE	DURATION
☑ Air ☐ Bailer ☐ Pump	8 G.P.M.	____ Hours ____ Mins.

STATIC LEVEL	WATER LEVEL END OF TEST	TEST DEPTH	DRAW DOWN
____ Ft.	____ Ft.	____ Ft.	____ Ft.

WATER COLOR: ____

WATER LEVEL RECOVERED: To ____ Feet by ____ Hr. ____ Min. After Test

FINAL STATUS OF WELL

☐ Water Supply
☐ Observation Well
☑ Test Hole
☐ Recharge Well
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Quality
☐ Abandoned, Saltwater
☐ Unfinished

WATER USE

☐ Domestic
☐ Industrial
☐ Commercial
☐ Municipal
☑ Other
☐ Irrigation
☐ Public Supply
☐ Agricultural
☐ Heat Pump

COPY DISTRIBUTION: WHITE - N.S.D.O.E. PINK - Customer BLUE - Driller

APPENDIX II

AQUIFER YIELD TESTS – RAW DATA

AQUATERRA RESOURCE SERVICES LTD.
PO BOX 310, WAVERLEY, NS
BON 2S0
TEL (902) 861-3866 FAX (902) 860-0869

WELL AND PUMP DATA

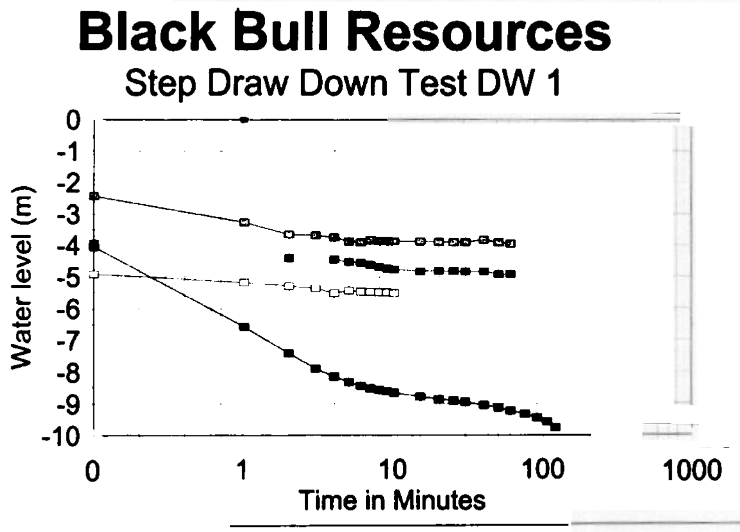
WELL DEPTH	45.7 m	150 ft
SCREEN INTERVAL		
STATIC LEVEL	2.42 M	8 FT

PUMP MODEL	Jacuzzi 3/4 hp, 10 gpm series	
PUMP SETTING	43.8m	144 ft

STEP DRAW DOWN DATA DW 1

TIME IN MINUTES	STEP 1 - 6 GPM		STEP 2 - 8 GPM		STEP 3 - 10 GPM		STEP 4 - 30 GPM	
	DD	METERS	DD	METERS	DD	METERS	DD	METERS
0.1	0.00	-2.42	0.00	-3.94	0.00	-4.9	0.00	-4.05
1	0.84	-3.26			0.27	-5.17	2.52	-6.57
2	1.23	-3.65	0.46	-4.4	0.38	-5.28	3.35	-7.40
3	1.26	-3.68			0.45	-5.35	3.83	-7.88
4	1.32	-3.74	0.51	-4.45	0.61	-5.51	4.09	-8.14
5	1.45	-3.87	0.58	-4.52	0.53	-5.43	4.26	-8.31
6	1.48	-3.9	0.61	-4.55	0.56	-5.46	4.38	-8.43
7	1.41	-3.83	0.67	-4.61	0.57	-5.47	4.46	-8.51
8	1.43	-3.85	0.74	-4.68	0.58	-5.48	4.51	-8.56
9	1.43	-3.85	0.79	-4.73	0.59	-5.49	4.55	-8.60
10	1.44	-3.86	0.81	-4.75	0.60	-5.5	4.60	-8.65
15	1.44	-3.86	0.88	-4.82			4.72	-8.77
20	1.46	-3.88	0.86	-4.8			4.80	-8.85
25	1.47	-3.89	0.87	-4.81			4.85	-8.90
30	1.47	-3.89	0.88	-4.82			4.89	-8.94
40	1.39	-3.81	0.88	-4.82			4.99	-9.04
50	1.48	-3.9	0.96	-4.9			5.07	-9.12
60	1.48	-3.94	0.96	-4.9			5.17	-9.22
75							5.27	-9.32
90							5.39	-9.44
105							5.51	-9.56
120							5.70	-9.75

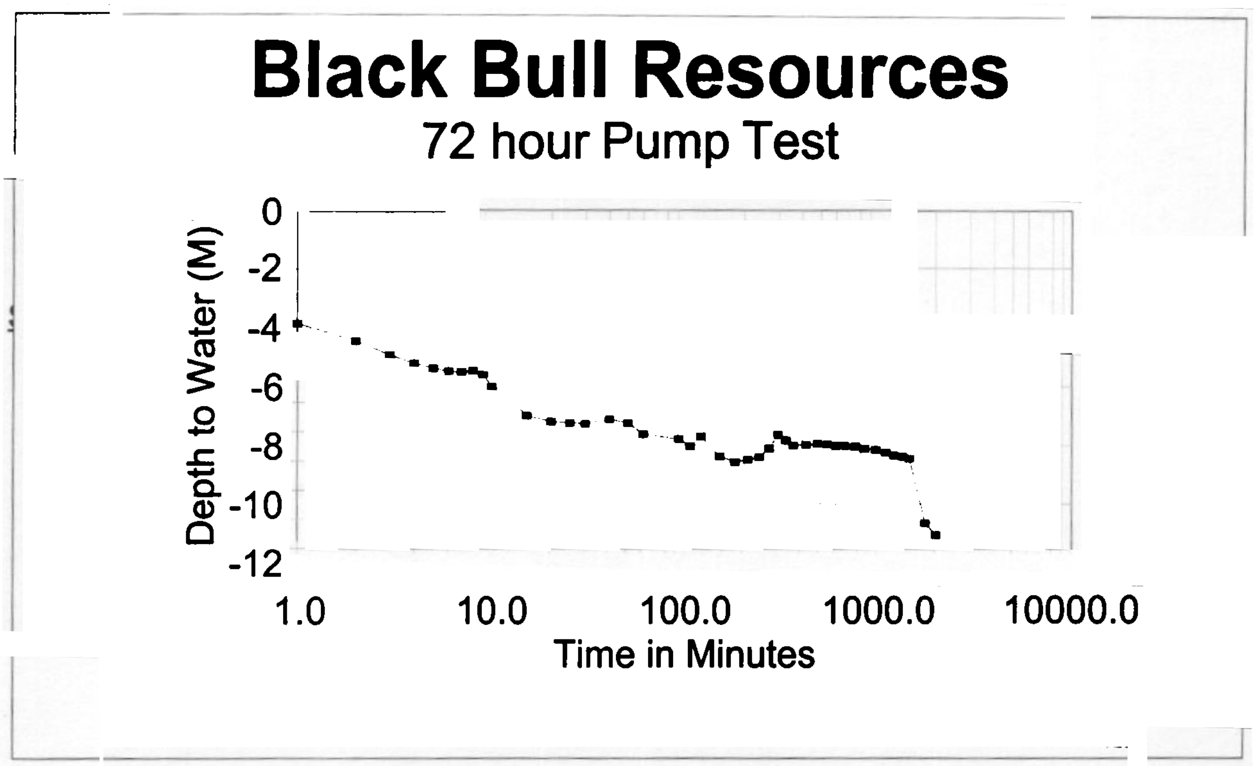
Step Test 1 to 3 completed on May 27th prior to start of long term test.
Step Test 4 completed on May 29th after higher flow pump installed in well and test terminated by MGI personnel due to insufficient draw down in well.



72 HOUR PUMP TEST DATA DW 1

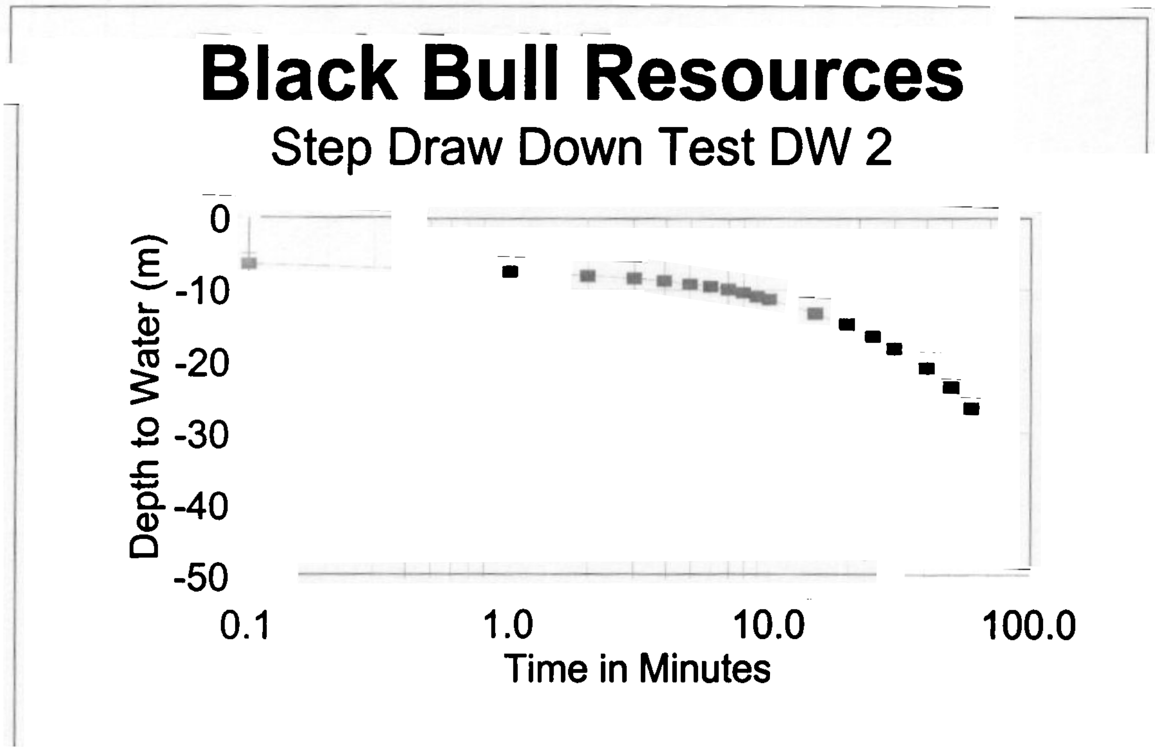
TIME IN MINUTES	WATER LEVEL FEET	METERS	DRAW DOWN	FLOW RATE	MW-01-01 M	MW-99-00 M	DW2 M	MW01-40 M	MW01-41 M	PIT A IN
0.1	-8.59	-2.62	0.00		1.36	7.18	7.17	4.53	1.63	15"
1	-12.53	-3.82	1.20							
2	-14.46	-4.41	1.79							
3	-15.97	-4.87	2.25							
4	-16.89	-5.15	2.53							
5	-17.45	-5.32	2.70							
6	-17.78	-5.42	2.80							
7	-17.88	-5.45	2.83							
8	-17.74	-5.41	2.79							
9	-18.17	-5.54	2.92							
10	-19.48	-5.94	3.32	10.74 GPM						
15	-22.96	-7	4.38	13.2						
20	-23.62	-7.2	4.58	13.5						
25	-23.78	-7.25	4.63	13.6						
30	-23.88	-7.28	4.66	13.5						
40	-23.32	-7.11	4.49	13.1						
50	-23.78	-7.25	4.63	13.5						
60	-24.99	-7.62	5.00	13.5						
92	-25.52	-7.78	5.16							
105	-26.37	-8.04	5.42	17.3						
120	-25.26	-7.7	5.08	17.5						
150	-27.45	-8.37	5.75	20						
180	-28.08	-8.56	5.94	19.8						
210	-27.81	-8.48	5.86	19.3						
240	-27.55	-8.4	5.78	19.7						
270	-26.63	-8.12	5.50	19						
300	-25.06	-7.64	5.02	18.8						
330	-25.68	-7.83	5.21	19.3	1.36					
360	-26.24	-8	5.38	19.3						
420	-26.17	-7.98	5.36	19.3						
480	-26.04	-7.94	5.32	19.2						
540	-26.14	-7.97	5.35	19.3						
600	-26.27	-8.01	5.39	19.3						
660	-26.31	-8.02	5.40	19.7						
751	-26.37	-8.04	5.42	19.7						
840	-26.63	-8.12	5.50	19.7						
960	-26.73	-8.15	5.53	19.5	1.36	7.135	7.17	4.53	1.63	15.5
1080	-27.06	-8.25	5.63	18.9						
1200	-27.36	-8.34	5.72	18.5						
1320	-27.49	-8.38	5.76	18.3						
1440	-27.72	-8.45	5.83	18.5						
1730	-34.90	-10.64	8.02	30	no	changes	in	obs	wells	during
1970	-36.24	-11.05	8.43	30						

Flow rates changed at T= 10 min, 92 min and 1730 min
Waters meter silted up at T=105 min, 207 min and 1680 min, due to fine silt in water supply.
Test terminated after 2 hp 30 gpm pump failed. Pump silt bound.
Recovery not taken at request of consultant due to well conditions.
Well did recover close to static within 2-3 min of termination of pumping.
Water quality remained poor thorough out the test, characterized by a grey fine sediment.
A high flow inflow zone was observed at the 11 m interval, very close to the casing drive shoe.
The area around the production well was marshy.


Black Bull Resources
72 hour Pump Test
Depth to Water (M)
0
-2
-4
-6
-8
-10
-12
1.0
10.0
100.0
1000.0
10000.0
Time in Minutes

STEP DRAW DOWN DATA DW 2

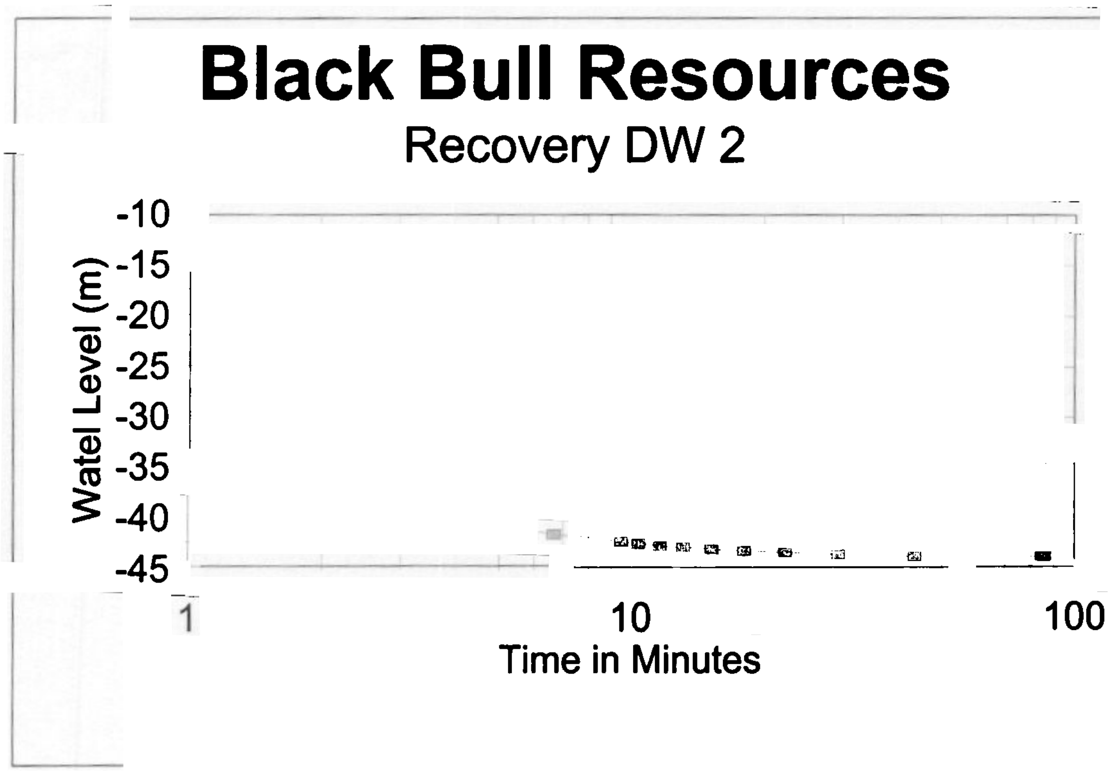
TIME IN MINUTES	STEP 1 - 2 GPM		STEP 2 - 4 GPM	
	DD	METERS	DD	METERS
0.1	0.00	-6.45	0.00	-26.55
1	1.10	-7.55	0.90	-27.45
2	1.59	-8.04	1.41	-27.96
3	1.93	-8.38	2.10	-28.65
4	2.27	-8.72	2.80	-29.35
5	2.69	-9.14	3.45	-30.00
6	3.01	-9.46	4.12	-30.67
7	3.38	-9.83	4.80	-31.35
8	3.86	-10.31	5.43	-31.98
9	4.38	-10.83	6.09	-32.64
10	4.80	-11.25	6.71	-33.26
15	6.81	-13.26	10.07	-36.62
20	8.49	-14.94	13.67	-40.22
25	10.16	-16.61	17.22	43.99
30	11.78	-18.23		
40	14.53	-20.98		
50	17.26	-23.71		
60	20.10	-26.55		



T/T1 Min	WATER LEVEL	TIME MIN
85	-43.99	0
86	-43.99	1
43.5	-43.99	2
29.3	-43.80	3
22.2	-43.6	4
18	-43.44	5
15.2	-43.27	6
13.1	-43.1	7
11.6	-42.99	8
10.4	-42.75	9
9.5	-42.55	10
6.7	-41.72	15
5.2	-40.92	20
4.4	-40.06	25
3.8	-39.21	30
3.1	-37.5	40
2.7	-35.6	50
2.4	-33.55	60
2.1	-30.28	78
1.7	-24	114
1.6	-22	125
1.4	-13.1	190

Total Recovery	30.89 m	101 ft
Percent of draw down	82%	

TIME RATIO - Time since pumping started/Time since pumping stopped.



WATER QUALITY

BACTERIOLOGY

The bacteria analysis indicated both total Cominform and faecal Cominform prese
sample taken on October 25, 1999 to determine the extend of bacteria contamination
indicated a total and faecal count of less than 2 MAN/100 ml.

CHEMICAL

ELEMENT	UNIT	SAM #1	SAM #2	SAM #3	ACCEPT LIMIT
SODIUM	mg/l	5	5	4.9	200
POTASSIUM	mg/l	0.6	0.6	0.6	
CALCIUM	mg/l	18.2	19.9	21.4	
MAGNESIUM	mg/l	2.14	2.32	2.5	
HARDNESS	mg/l	54.2	59.1	63.6	
ALKALINITY(CaCO3)	mg/l	57	58	60	30 - 300
CARBONATE(CaCO3)	mg/l	0.16	0.17	0.25	
BICARBONATE (CaCO3)	mg/l	56.8	57.8	59.7	
SULFATE	mg/l	6	6.5	6	500
CHLORIDE	mg/l	4	3.6	8	250
SILICA	mg/l	12.9	13.5	13.5	
ORTHO PHOSPHORUS (P)	mg/l	<0.01	<0.01	<0.01	
NITRATE + NITRITE (N)	mg/l	<0.05	<0.05	<0.05	10
AMMONIA (N)	mg/l	<0.05	<0.05	<0.05	
ARSENIC	mg/l	0.003	0.004	0.004	0.025
IRON	mg/l	0.16	<0.02	<0.02	0.3
MANGANESE	mg/l	0.03	0.04	0.1	0.05
COPPER	mg/l	0.1	0.17	<0.01	1
ZINC	mg/l	0.16	0.15	0.06	5
COLOUR	TCU	5	<2.5	<2.5	15
TURBIDITY	NTU	3	0.47	0.18	
CONDUCTIVITY	umho/cm	144	152	170	
pH		7.5	7.5	7.7	6.5 - 8.5
TOTAL ORGANIC CARBON	mg/l	1.2	1.7	2.1	
CATION SUM		1.32	1.42	1.5	
ANION SUM		1.38	1.4	1.55	
% DIFFERENCE		2.26	0.66	1.63	
STD DEVIATION		0.13	13	0.13	
ION SUM		83	86.2	92.9	
THEO CONDUCTIVITY		135	141	156	
SATURATION pH @ 5 DEG C		8.8	8.8	8.7	
LANGELIER INDEX 5 DEG C		-1.3	-1.3	-1.1	
LANGELIER INDEX 20 DEG C		-0.9	-0.9	-0.7	
LANGELIER INDEX 50 DEG C		-0.4	-0.3	-0.1	

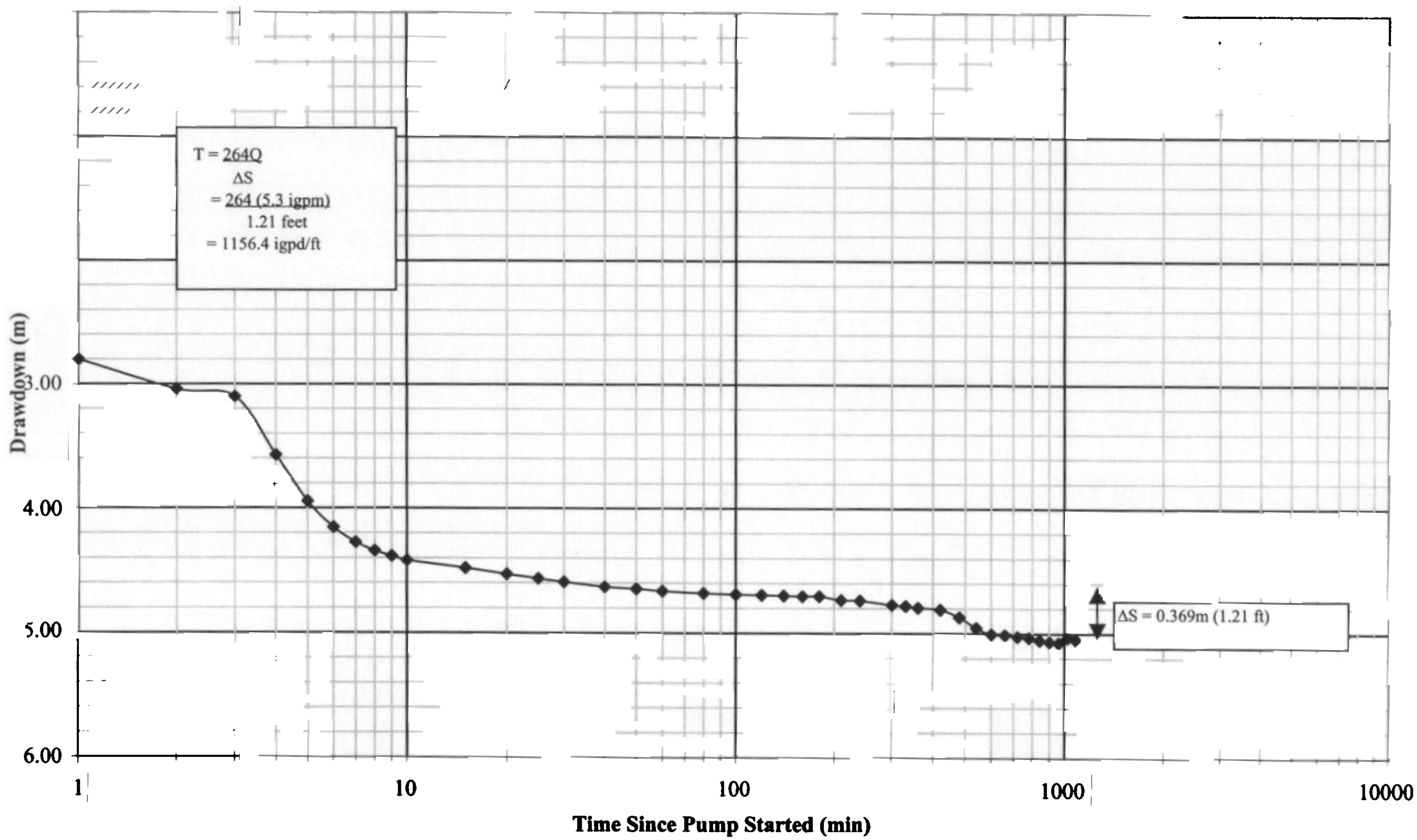
MW91-01 Pump Test - Drawdown
May 29, 2002

Time Elapsed (min)	Depth (mbtoc)
0	1.403
1	2.801
2	3.041
3	3.102
4	3.572
5	3.945
6	4.155
7	4.275
8	4.344
9	4.385
10	4.42
15	4.481
20	4.529
25	4.565
30	4.592
40	4.631
50	4.647
60	4.665
80	4.682
100	4.691
120	4.695
140	4.7
160	4.705
180	4.705
210	4.734
240	4.738
300	4.772
330	4.781
360	4.795
420	4.81
480	4.871
540	4.955
600	5.005
660	5.012
720	5.025
780	5.034
840	5.054
900	5.065
960	5.074
1020	5.035
1080	5.047

Pumping at 5.3 igpm

Q =	5.3	igpm
ΔS =	0.369	m
ΔS =	1.21	ft
T=	1156	gpd/ft2
T=	0.00924	m2/day

FIGURE 2: MW 91-01 - DRAWDOWN CURVE



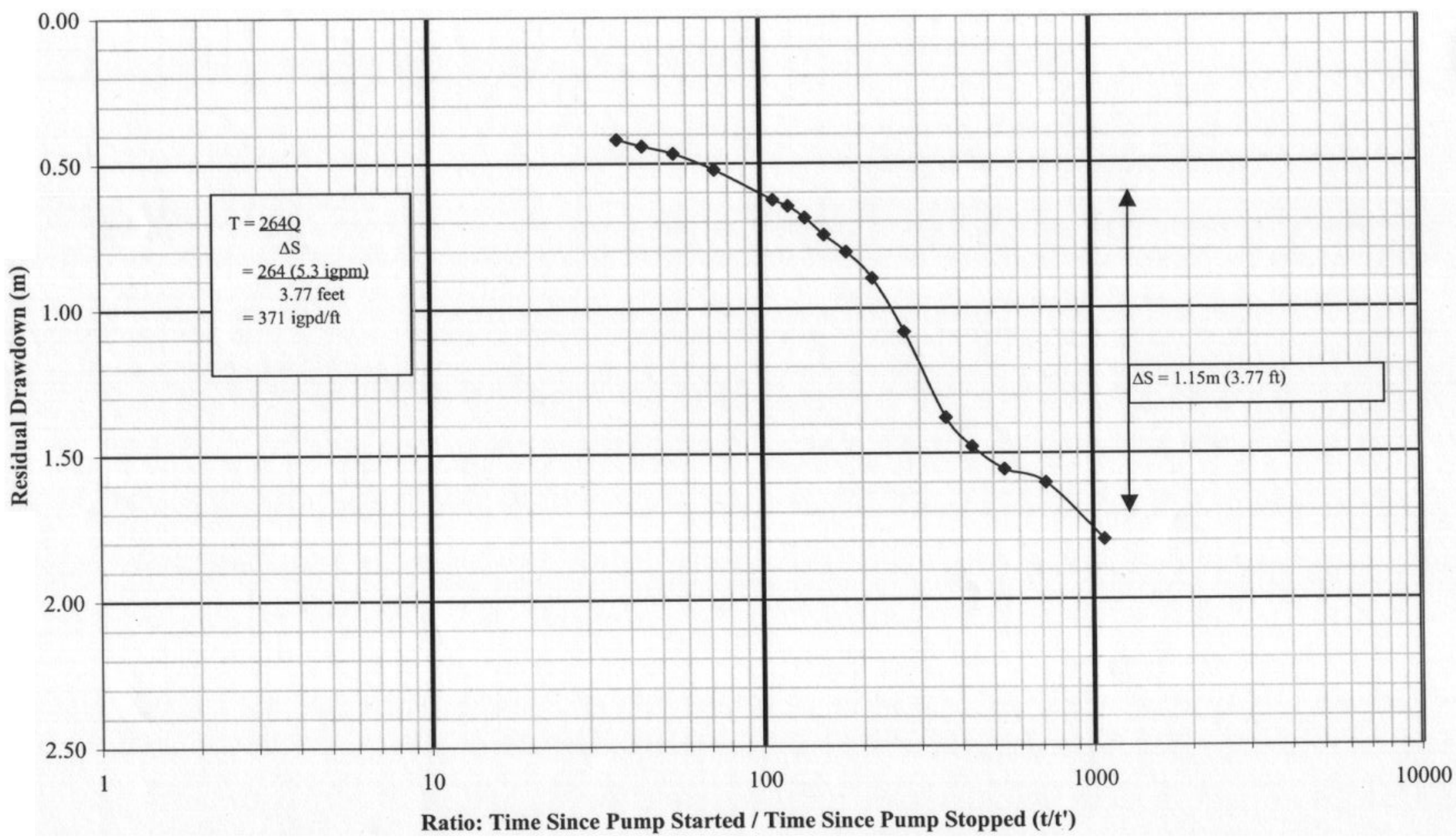
MW91-01 Pump Test - Recovery
May 29, 2002

1.403 static level

Time Since Pump Started, t (min)	Time Since Pump Stopped, t' (min)	Ratio t/t'	Depth (mbtoc)	Residual Drawdown (m)
1080	0		5.047	
1081	1	1081	3.2	1.80
1081.5	1.5	721	3.005	1.60
1082	2	541	2.959	1.56
1082.5	2.5	433	2.881	1.48
1083	3	361	2.781	1.38
1084	4	271	2.485	1.08
1085	5	217	2.3	0.90
1086	6	181	2.209	0.81
1087	7	155	2.15	0.75
1088	8	136	2.091	0.69
1089	9	121	2.05	0.65
1090	10	109	2.029	0.63
1095	15	73	1.925	0.52
1100	20	55	1.87	0.47
1105	25	44	1.844	0.44
1110	30	37	1.821	0.42

Q =	5.3 igpm
ΔS =	1.15 m
ΔS =	3.77 ft
T=	371 gpd/ft2
T=	0.0032 m2/day

FIGURE 3: MW 91-01 - RECOVERY CURVE



APPENDIX III

LABORATORY ANALYTICAL RESULTS – GROUNDWATER

ANALYTICAL SERVICES

Inorganic Parameters

Client : MGI Limited
31 Gloster Court
Dartmouth
NS B3B 1X9

SAUVEUR, STEVE

PSC Project Number : 0207472H
Client Project Number : 20232-G

FAX # : 468-2207
Printed : 2002/06/07
Reported : 2002/06/07

Matrix			Water	Water	Water	Water
Philip ID			02-H027940	02-H027941	02-H027942	02-H027943
Client ID			DW-1/27May '02/60min	DW-1/29May '02/2212min	MW99-01/29 May'02/60min	MW99-01/29 May'02/1020
Date Sampled (y/m/d)			02/05/27	02/05/27	02/05/27	02/05/27
Date Received (y/m/d)			02/05/30	02/05/30	02/05/30	02/05/30
Analyte	**Units**	**EQL**				
Total Water Digest			20020603-D	20020603-D	-	
Sodium	mg/L		4.5	4.5	3.0	3.0
Potassium	mg/L		1.2	0.9	0.4	0.4
Calcium	mg/L	0.1	1.5	1.4	1.6	1.8
Magnesium	mg/L	0.1	0.8	0.7	0.3	0.3
Alkalinity (as CaCO3)	mg/L	5.	nd	nd	nd	nd
Sulfate	mg/L	2.	nd	nd	nd	nd
Chloride	mg/L	1.	4.	5.	4.	4.
Reactive Silica (as SiO2)	mg/L	0.5	8.6	8.2	5.7	6.1
Ortho Phosphate (as P)	mg/L	0.01	0.03	0.03	nd	0.02
Phosphorus	mg/L			-	nd	nd
Nitrate + Nitrite (as N)	mg/L	0.05	0.35	0.28	nd	nd
Nitrate (as N)	mg/L	0.05	-		nd	nd
Nitrite	mg/L	0.01	-	-	nd	nd
Ammonia (as N)	mg/L	0.05	nd	nd	nd	nd
Iron	mg/L	0.02	0.65	0.16	0.06	0.05
Manganese	mg/L	0.01	0.24	0.36	0.01	0.01
Copper	mg/L	0.01	nd	nd	nd	nd
Zinc	mg/L	0.05	nd	nd	nd	nd
Color	TCU	5.	11.	nd	nd	nd
Total Org. Carbon (by UV)	mg/L	0.5	nd	0.6	nd	nd
Turbidity	NTU	0.1	4.5	2.5	0.3	0.1
Conductance (RCAp)	uS/cm	1.	42.	39.	22.	24.
pH	Units	-	5.5	5.5	5.5	5.6

Legend:

EQL = Estimated Quantitation Limit for routine analysis
nd = not detected above standard EQL
nd() = not detected at the elevated EQL specified due to matrix interferences or sample pre-dilution
\- = Parameter not requested in Sample

Note : Soil results are expressed as air dry weight basis. Biota results are expressed on a wet weight basis unless otherwise stated.

page verified OB

200 BLUEWATER ROAD, BEDFORD, NOVA SCOTIA, CANADA B4B 1G9 TEL (902) 420-0203 FAX: (902) 420-8612

PSC Analytical Services
200 Bluewater Road
Bedford, NS Canada B4B 1G9
Tel (902) 420-0203
Toll free (800) 565-7227
Fax (902) 420-8612

Client : MGI Limited
31 Gloster Court
Dartmouth
NS B3B 1X9
PSC Project Number : 0207472H
Client Project Number : 20232-G

SAUVEUR, STEVE

FAX # : 468-2207
Printed : 2002/06/07
Reported : 2002/06/07

Matrix			Water	Water	Water	Water
Philip ID			02-H027940	02-H027941	02-H027942	02-H027943
Client ID			DW-1/27May '02/60min	DW-1/29May '02/2212min	MW99-01/29 May'02/60min	MW99-01/29 May'02/1020
Date Sampled (y/m/d)			02/05/27	02/05/27	02/05/27	02/05/27
Date Received (y/m/d)			02/05/30	02/05/30	02/05/30	02/05/30
Analyte	**Units**	**EQL**	(Continued from previous page)			
Hardness (as CaCO3)	mg/L	0.1	7.0		5.2	5.7
Bicarbonate (as CaCO3)	mg/L	1.	nd(5.)	nd(5.)	nd(5.)	nd(5.)
Carbonate (as CaCO3)	mg/L	1.	nd(5.)	nd(5.)	nd(5.)	nd(5.)
TDS (Calculated)	mg/L	1.	27.	27.	20.	21.
Cation Sum	meq/L	0.10	0.37	0.35	0.25	0.26
Anion Sum	meq/L	0.10	0.28	0.30	0.26	0.26
Ion Balance	%	-	14.5	7.69	1.17	0.65
Langlier Index @ 4C		-	-5.44	-5.47	-5.41	-5.26
Langlier Index @ 20C		-	-5.04	-5.07	-5.01	-4.86
Saturation pH @ 4C	Units	-	10.9	11.0	10.9	10.9
Saturation pH @ 20C	Units	-	10.5	10.6	10.5	10.5
Aluminum	ug/L	10	-	-	210	200
Antimony	ug/L	2.	-	-	nd	nd
Arsenic	ug/L	2.	-	-	nd	nd
Barium	ug/L	5.	-	-	nd	nd
Beryllium	ug/L	5.	-	-	nd	nd
Bismuth	ug/L	2.	-	-	nd	nd
Boron	ug/L	5.	-	-	nd	nd
Cadmium	ug/L	0.3	-	-	0.3	nd
Chromium	ug/L	2.	-	-	nd	nd
Cobalt	ug/L	1.	-	-	nd	nd
Copper	ug/L	2.	-	-	nd	nd
Iron	ug/L	20	-	-	50	40

Legend:
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page verified

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Client Project Number : 20232-G

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Matrix			Water	Water	Water	Water
Philip ID			02-H027940	02-H027941	02-H027942	02-H027943
Client ID			DW-1/27May '02/60min	DW-1/29May '02/2212min	MW99-01/29 May'02/60min	MW99-01/29 May'02/1020
Date Sampled (y/m/d)			02/05/27	02/05/27	02/05/27	02/05/27
Date Received (y/m/d)			02/05/30	02/05/30	02/05/30	02/05/30
Analyte	**Units**	**EQL**	(Continued from previous page)			
Lead	ug/L		-	-	nd	nd
Manganese	ug/L		-	-	9.	9.
Molybdenum	ug/L		-	-	nd	nd
Nickel	ug/L	2.	-	-	nd	nd
Selenium	ug/L	2.	-	-	nd	nd
Silver	ug/L	0.5	-	-	nd	nd
Strontium	ug/L		-	-	nd	nd
Thallium	ug/L		-	-	nd	nd
Tin	ug/L	2.	-	-	nd	nd
Titanium	ug/L	2.	-	-	nd	nd
Uranium	ug/L	0.1	-	-	1.7	1.9
Vanadium	ug/L	2.	-	-	nd	nd
Zinc	ug/L	2.	-	-	13.	11.

Legend:

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page verified [signature]

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SAUVEUR, STEVE

FAX # : 468-2207
Printed : 2002/06/07
Reported : 2002/06/07

Certificate of Analysis

Method Summaries:

- Alkalinity: Roche Cobas Fara/BMC Hitachi 911 Automated Colorimetric Analyser. Ref: USEPA Method #310.2
- Chloride: Roche Cobas Fara/BMC Hitachi 911 Automated Colorimetric Analyser. Ref: USEPA Method #325.1
- Colour: Roche Cobas Fara/BMC Hitachi 911 Automated Colorimetric Analyser. Ref: Standard Methods, 16th Edition, 1985
- Conductance (RCAp): Electrometric @ 25 C, values >300 uS/cm diluted for validation purposes. Ref: Standard Methods 4500-H+, 19th Edition, 1995.
- Total Organic Carbon: UV Digestion/Technicon AA1 Analyser. Ref: Standard Methods, 19th Edition, 1995
- Total Recoverable Metals Digest: Homogenization/Digestion. Ref: USEPA Method #200.2
- NO2/NO3: Roche Cobas Fara/BMC Hitachi 911 Automated Colormetric Analyser. Ref. USEPA Method #353.1
- pH: Electrometric @ 25 C. Ref: USEPA Method #150.3
- Phosphorus: PE Optima 3000 ICP-OES. Ref: USEPA Method #200.7
- Reactive Silica: Roche Cobas Fara/BMC Hitachi 911 Automated Colorimetric Analyser. Ref: USEPA Method #370.1
- Sulfate: Roche Cobas Fara/BMC Hitachi 911 Automated Turbidimetric. Ref: USEPA Method #375.4
- Turbidity: Nephelometric. Ref: USEPA Method #180.1
- Ortho Phosphorus: Roche Cobas Fara/BMC Hitachi 911 Automated Colorimetric Analyser. Ref: USEPA Method #365.2
- Trace Metals in Aqueous Samples: Elan 5000 ICP-MS. Ref: USEPA Method #200.8
- Ammonia (NH3 plus NH4+): Roche Cobas Fara/BMC Hitachi 911 Automated Colorimetric Analyser. Ref: USEPA Method #350.1
- Nitrite. Roche Cobas/BMC Hitachi 911 Automated Colormetric Analyser. Ref: USEPA Method #354.1
- Major Metals in Aqueous Samples: PE Optima 3000 ICP-OES. Ref: USEPA Method #200.7

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Printed : 2002/06/07
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Certificate of Analysis

Conversions: 1 mg/L = 1000 ug/L = 1 part per million (ppm)
1 ug/L = 0.001 mg/L = 1 part per billion (ppb)

All work recorded herein has been done in accordance with normal professional standards using accepted testing technologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Liability for any and all use of these test results shall be limited to the actual cost of the pertinent analysis performed. There is no other warranty expressed or implied. Excess sample will be discarded upon expiry of hold time.

Approval of Inorganic Parameters:

Inorganics Manager : Jerry Arenovick

APPENDIX IV

GROUNDWATER MODELING REPORT

GROUNDWATER RESOURCE STUDY
GROUNDWATER MODELING SUMMARY REPORT
WHITE ROCK MINE SITE
YARMOUTH COUNTY, NOVA SCOTIA

Prepared for:

Black Bull Resources Inc.
Vancouver, British Columbia

by:

MGI Limited
Dartmouth, N.S.

August 2002

MGI

A member of the Family of Companies

MGI Limited
31 Gloster Court
Dartmouth, Nova Scotia
Canada B3B 1X9

Tel. 902.468.1248
Fax 902.468.2207
Email mgi.ns@mgi-limited.com
Web www.mgi-limited.com
www.CRAworld.com

August 9, 2002

Black Bull Resources Inc.
548 Beatty Street
Vancouver, B.C.
V6B 2L3

MGI File: 20232G

Attention: Mr. John Keating, President, Black Bull Resources

Re: Groundwater Modeling Summary Report

Dear Mr. Keating:

MGI Limited (MGI) is pleased to provide our report regarding modeling of the groundwater flow at the proposed White Rock Quartz Mine, located near Flintstone Rock in Yarmouth County, Nova Scotia. This report provides a preliminary method of estimating the extent of potential groundwater flow pattern change due to construction and operation of the mine, provides estimates of the volume of seepage into the quartz extraction areas, and estimates of pit refill times.

We trust this information meets your requirements. Please contact our office should there be questions.

Sincerely,
MGI Limited

for / Jordan Mooers, M.A.Sc., P.Geo.
Project Hydrogeologist

Peter Oram, P. Geo.
Senior Project Manager/Geologist

1.0 INTRODUCTION

This study involved constructing a regional three-dimensional numerical model to simulate groundwater flow at the site of the proposed White Rock Quartz Mine, located near Flintstone Rock in Yarmouth County. The groundwater model was completed in order to:

- Incorporate monitoring and pump test hydrogeologic data from existing and newly installed wells;
- Develop a baseline view of regional groundwater flow;
- Provide a method of estimating the extent of potential groundwater flow pattern change due to the construction and operation of the mine; and
- Develop estimates of the volume of seepage that will flow into the quartz extraction area to assist in the development of pumping and groundwater usage strategies.

2.0 NUMERICAL MODEL REVIEW

Three-dimensional groundwater flow was simulated using Visual MODFLOW (Waterloo Hydrogeologic, 1999). Visual MODFLOW is a fully integrated pre- and post –processor for the United States Geological Survey (USGS) models MODFLOW and ZONEBUDGET. MODFLOW is a three-dimensional groundwater flow package while ZONEBUDGET calculates water balances and fluxes in specified areas of the model domain and across model boundaries.

MODFLOW is a three-dimensional model that uses a finite-difference numerical approximation to represent and solve complex groundwater flow problems. A conceptual flow model is translated into a numerical model by laying a horizontal grid of rectangular blocks called cells over the study area. Each cell is then assigned flow properties such as conductivity values. Regional groundwater inputs and removals are added to the model in the form of boundary conditions such as rivers, streams and precipitation infiltration. The physical equation for groundwater flow is then formulated and solved for flow between each cell in the model, which provides the hydraulic head at the center of every cell. Flow parameters are adjusted until the calculated hydraulic head in the model matches the observed hydraulic head in the observation wells located across the site.

3.0 SITE - GROUNDWATER FLOW MODEL DESCRIPTION

The model study area is approximately 1.5 by 2 kilometers extending from the East Barclay Brook on the western side of the model domain to the Clyde River on the eastern side. The extent of the model area is shown in Figure 1. The base map was rotated slightly toward the east to allow the quartz/kaolinite zone to line along the model grid “east-west” axis. The horizontal grid is refined (additional rows and columns) were added in the vicinity of the proposed quartz extraction areas. In the vertical direction the site hydrostratigraphy is represented by an upper layer of sandy till overburden, underlain by the granites to the north, meta-greywackes to the south, separated by a central quartz/kaolinite zone. The surface elevation of the upper till layer was based on contour data imported into the model. The base of the till layer (top of bedrock) was set at 10 metres below the surface. Bedrock was divided into 5 layers to allow for an accurate representation of the sloping water table in the vicinity of the quartz extraction area and to allow for a simulation of sloping “benched” sides of the quartz extraction area.

Conceptually the flow system is predominately a bedrock groundwater flow system that moves from the higher elevation areas in the northwest toward the lower areas in the south and the east. The nature of the regional groundwater flow is confirmed by water level measurements conducted in monitoring wells across the site. Other water fluxes to the flow system include infiltration due to recharge from precipitation, and interaction with the East Barclay Brook and the Clyde River. Depending on the relative elevation of the surrounding groundwater and the brook and river channels, the East Barclay and Clyde are either groundwater recharging or discharging bodies of water. The low elevation of the Clyde River, south and east of the central quartz/kaolinite zone indicates that groundwater in this area would be recharging the river.

The conceptual hydrostratigraphy consists of the upper layer of sandy till overburden, underlain by the granites to the north, meta-greywackes to the south, separated by a central quartz/kaolinite zone. The overburden layer is of variable to discontinuous thickness and composed of sandy conductive till materials. The highly irregular nature of the local topography will result in overburden flow expressing itself very locally in the numerous small moist/marshy areas observed regionally. Due to the low porosity levels in the granites and the meta-greywackes flow will be predominately in the secondary or fracture porosity. Geologic field observations of the material in the central quartz/kaolinite zone show a highly resilicified material with no staining indicative of fracture flow. This in combination with the zones of kaolinite clay are indicative of a low conductivity flow zone.

Hydraulic conductivities for the hydrostratigraphic units were assigned from bail tests and pump tests conducted in wells constructed in the various geologic units. As there was no direct data as to the vertical conductivities present, a vertical conductivity of 10% of the horizontal conductivity was assigned to each layer. The overburden was assigned a horizontal conductivity of 7.4×10^{-4} cm/sec (based on bail test of MW-01-40). These values are consistent published conductivities of sandy overburden materials (Anderson and Woosner, Applied Groundwater Modeling, 1992). The granites north of the quartz/kaolinite zone and the meta-greywackes south of the quartz/kaolinite zone were assigned a horizontal conductivity of 6×10^{-5} cm/sec (average of recovery data from DW-02-02 and bail test MW-01-41). Based on geologic observations of the quartz/kaolinite zone and the site observations regarding the lack of flow into the test excavation, a horizontal quartz/kaolinite zone conductivity of 6×10^{-6} cm/sec was assigned.

Regional groundwater inputs and removals were simulated using boundary conditions that consisted of constant head cells, river cells, and recharge from precipitation infiltration. The constant head cells, constructed along the northern and southern extent of the model, used to represent the regional groundwater flow, are artificial boundary conditions. The river and recharge boundary conditions are real boundary conditions. Site-specific boundary cells consisting of drain cells were used to represent seepage faces in the immediate vicinity of the quartz extraction areas. During the model runs there was no direct communication between the regional and the site-specific boundary conditions. The groundwater head level reduction due to water removal from the drain cells remained distant from the boundary conditions. Also, head levels adjacent to the simulated quartz extraction areas remained hydraulically above the levels of lateral river nodes and the southern constant head nodes in all of the simulations indicating no flow from these boundaries to the simulated extraction areas.

River nodes, simulating the interaction between surface and groundwater systems, were assigned for the East Barclay Brook and the Clyde River. A conductance is assigned to the cell which governs or limits the rate of vertical flow through the streambed material. The Conductance value (C) was calculated from the length of a reach (L) through a cell, the width of the river (W) in the cell, the thickness of a river bed (M), and the vertical hydraulic conductivity of the river bed material (K) using the formula: $C = (K \times L \times W)/M$. Vertical conductivity values were chosen based on the stream and river descriptions from environmental baseline study work at the site. Streambed elevations were digitized using contour data and site data.

The net groundwater recharge from precipitation was estimated to be 140 mm/year. The 40 year normal precipitation in the region is approximately 1400 mm/year. The precipitation infiltration rate of 10% is a reasonable assumption for this type of terrain in Nova Scotia. Published recharge rates range from 8 to 25% for Nova Scotia groundwater systems (NSDEL).

Regional groundwater flow was simulated using a row of constant head cells placed along the north and south side of the model area to represent the southerly regional flow of groundwater. Constant heads were set at 1 meter below the top of layer 2 (granite layer) along the northern boundary and 0.1 meter below the top of layer 2 (meta-greywacke layer) along the southern boundary.

The quartz extraction areas were simulated using drain and inactive cells. The cells representing the center of the quartz extraction area were designated inactive (no flow cells), while the boundary of the quartz extraction area, the seepage face, was represented using drain cells. Drain cells were also placed across the bottom of the quartz extraction area. When groundwater flow enters a drain cell the quantity of water is calculated and removed from the model domain allowing an estimate of seepage rate into the quartz extraction area. Vertical seepage faces were simulated with drains located at the center of the seepage face. Conductance of the vertical seepage faces was calculated using the formula DY x DZ x KX x 86400 x 2/DX where:

DX = cell spacing in the x direction
DY = cell spacing in the y direction
DZ = cell spacing in the z direction
KX = horizontal conductivity and 86400 converts m/s to m/day to keep units consistent.

The horizontal seepage face conductance at the bottom of the pit was calculated using a similar formula DY x DX x KZ x 86400 x 2/DZ.

It should be noted that model parameters have been based, wherever possible, on actual field data. The conditions as entered into the model represent a simplification of the actual flow system. Refining of the geologic and hydrogeologic information is expected to continue as data is received allowing a greater refinement and more accurate representation of the flow system.

Areas of active flow refinement include modeling aquifer stress data (matching the modeled and observed effect of pumping stresses) as such data becomes available and a refinement of the layer thickness/conductivity values.

4.0 MODEL RESULTS

The steady state hydraulic head solution for the current (undisturbed) flow system is shown in Figure 2. Groundwater flow moves from the higher elevation areas in the northwest towards the southeast. The groundwater table elevation is on average less than 5 metres below the surface and closely follows the local topography. A reasonable preliminary match was achieved between the model calculated and the field observed water levels with three of the five observation wells within the 95% confidence level and a residual mean error of 0.17 m. Annual groundwater level fluctuations are expected to be in the 1 to 2 metre range at the site. Pump tests of 10 and 30 igpm, conducted at the site provided no drawdown in the observations wells and therefore did not provide sufficient data for calibration/verification using that approach.

A predictive transient simulation was run to reflect the mining plan. Pit A was progressively deepened using three 10 metre benches and one 5 metre bench, to a total depth of 35 m, over 7 years. Four separate transient simulations were run with the initial head inputs for each run coming from the last time step of the previous run. Initial head conditions for the first transient run were taken from the steady state simulation output file. Literature values were selected for storage and specific yield parameters for the rock and overburden layers which were set at $3E^{-6}$ m^{-1} and 0.25, respectively. The 7 year groundwater head equipotential lines are shown in Figure 3. A comparison of the steady state groundwater equipotentials (lines of equal head) and those from the end of the 7 year period, indicate that the changes in groundwater due to the introduction of Pit A are largely limited to the quartz/kaolinite zone in the immediate vicinity of the pit. Drawdown in Pit A is consistent with the bottom of the Pit at an elevation of 85 masl (approximately 35 metres of drawdown in the bedrock layer). To the east, along the Clyde River, no change in the equipotential lines is observed. Observation well MW-01-41 located 200 metres to west of Pit A shows a 0.6 m reduction in the bedrock equipotentials, from the steady state conditions. Bedrock observation wells MW-91-01, located to the north, and MW-99-20, located to the south showed 0.43 m and 0.81 m reductions, respectively. Groundwater equipotential lines in the direction of the East Barclay Brook show no fluctuation from the steady state conditions.

At the end of the 7-year simulation the drain cells in Pit A were turned off and the inactive cells, that were representing Pit A, were converted to high conductivity – high storage cells to allow for the observation of the water table as Pit A refills. The recharge from precipitation was changed to 1400 mm per year for the area of the pit to account for the complete capture of rainfall entering Pit A. The water table elevation in Pit A at the end of the 6 month period had risen approximately 5 metres to 90 masl. Drawdowns at the observation wells remain essentially unchanged from the previous time step with the exception of DW-02-01, the closest observation well to Pit A which shows an 8 cm rise in head level over the six month period.

A model run was then completed for the Pit B mining plan. Pit B was progressively introduced in two 1.5 year simulations (time frame from 7.5 to 10.5 years). Pit B was simulated as a 10 metre deep pit for the first 1.5 years and was deepened by another 10 metre bench for the second 1.5 years. At the end of the second simulation (10.5 years) the drawdowns from the introduction of Pit B are also restricted to the quartz/kaolinite zone as shown in Figure 4. Equipotential levels at DW-02-01, immediately north of Pit A have increased by 0.44m, a reflection of the gradual infilling of Pit A. Water table elevation in Pit A have risen approximately another 10 metres to 100 masl. Monitor wells MW-91-01, to the north, and MW-99-20, to the south, show only slight changes with drawdowns of 4 cm and 18 cm, respectively, over the 3-year Pit B simulation. Monitor well MW-01-41 located immediately south of Pit B, shows 2.54 m drawdown and DW-02-02, located further south of Pit B shows a 1 m drawdown, over the three simulation period. As can be seen in Figure 5, a cross-section that extends from Pit B to the Clyde River, at the end of the 10.5 year time period, the water table still slopes from Pit B (approximately 118 masl at the eastern edge of Pit B) toward the Clyde River (approximately 114.5 masl at the Clyde River), indicating no reversal of flow conditions due to the presence of Pit B at the full depth extent.

Calculated daily flow into Pits A and B were approximately 170 m^3/day (25 igpm) and 130 m^3/day (20 igpm), respectively. The area of the two pits is approximately 67,500 m^2. Based on approximately 1000mm (70%) of precipitation accumulation in the extraction areas per year a further 183 m^3/day (28 igpm) of inflow could be expected from precipitation, when both pits are open.

Due to uncertainty in the nature of the fracture orientation in the granites, meta-greywackes and the quartz/kaolinite zone, a sensitivity analysis was completed to determine the sensitivity of the model to variation in the ratio of horizontal conductivity to vertical conductivity. The model runs described in this report were completed with a Kv/Kh ratio of Kv = 0.1Kh. A model run of Kv = 10Kh was conducted was conducted as part of this sensitivity analysis. This represents a situation in which the fracture zone, and thus the preferential flow pattern, is vertical. A steady state simulation, with Kv = 10Kh, was calibrated to the observation well data by adjusting the recharge to 200 cm/year. The final Pit B simulation, in which the excavation is closest to the Clyde River, was then run using the Kv = 10Kh ratio and a recharge of 200 cm/year.

In the Kv=0.1Kh steady state simulation the amounts flowing into and out of the river boundary cells is 756 and 750 m^3/day, respectively, representing 40 and 39% of the total model flow. At the end of the Pit B simulation the amounts flowing into and out of the river boundary cells is 544 and 693 m^3/day, respectively, representing 28 and 36% of the total model flow. The amount flowing into Pit B during the final time step of the simulation is 106 m^3/day, representing 5% of the total model flow.

In the Kv=10Kh steady state simulation the amounts flowing into and out of the river boundary cells is 1715 and 856 m^3/day, respectively, representing 48 and 24% of the total model flow. At the end of the Pit B simulation the amount flowing into and out of the river boundary cells is 1024 and 821 m^3/day, respectively, representing 30 and 25% of the total model flow. The amount flowing into Pit B during the final time step of the simulation is 226 m^3/day representing 7% of the total model flow.

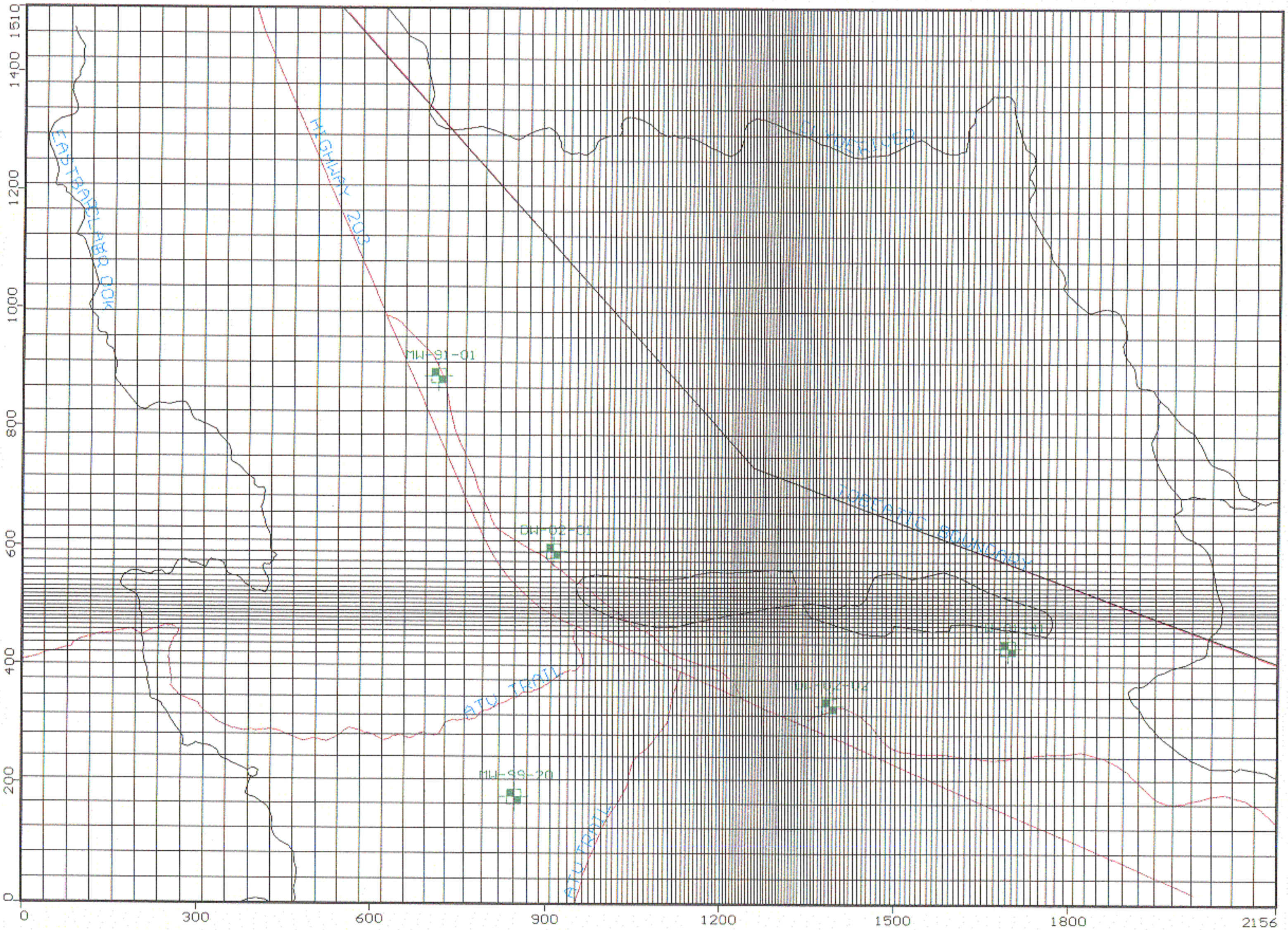
Changing the Kv/Kh ratio from horizontally oriented to vertically oriented flow has resulted in approximately a doubling of the overall flow in the model domain. The potential flow into Pit B is approximately doubled, however, the representative percentage of total flow into Pit B remains unchanged. In the Kv=10Kh scenario, recharge of the river boundaries (baseflow recharge) is greater than discharge for both the no pit and post Pit B model runs. In the Kv=01.Kh scenario baseflow recharge and discharge are balanced for the steady state model run and baseflow discharge (36 m^3/day) is greater than baseflow recharge (28m^3/day) for the post Pit B simulation.

For both of the scenarios above, the zone budget calculations of flow to and from the river boundary cells, was examined to determine if there was a difference between the steady state flow conditions and the conditions at the end of the Pit B simulation. For the Kv=0.1Kh scenario the difference between the steady state and the end of Pit B simulation flow out of and into the river boundary cells (discharge and recharge) is a decrease of 8% and 17%, respectively. For the Kv=10Kh scenario the difference between the steady state and end of Pit B simulation the flow out of and into the river boundary cells is a decrease of 4% and 40%, respectively.

It is anticipated that, based on the geologic conditions observed at the site, the actual Kv:Kh ratio will be closer to 1:1. This is based on the fact that the bedrock fractures do not appear to be oriented in one preferred direction, but, rather, consist of randomly oriented horizontal to vertical fractures. Therefore, it is anticipated that the flow into and out of the river boundary cells will actually be somewhere between the values provided above.

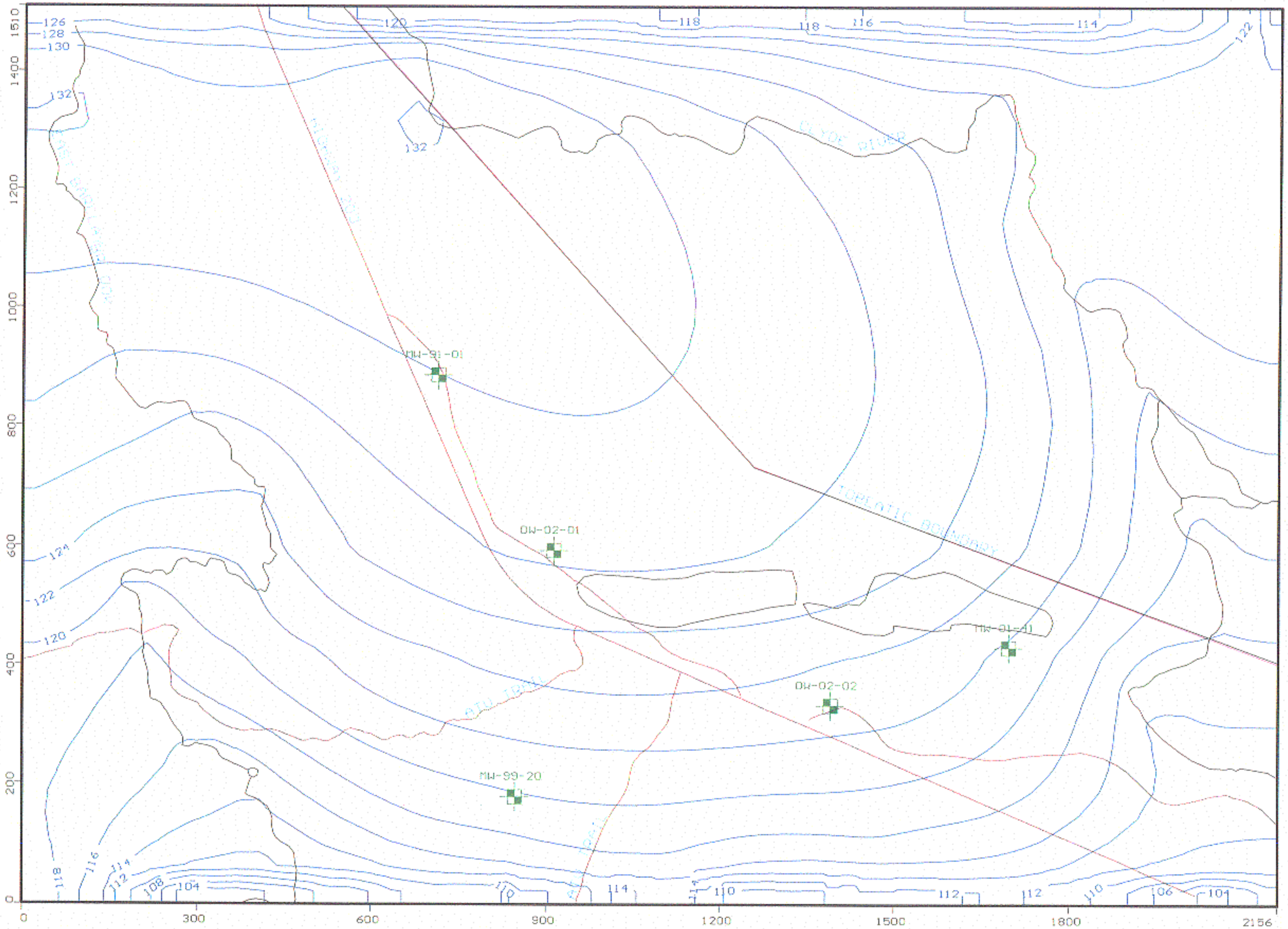
The reduction in recharge to and discharge from baseflow figures presented above are a summary that includes both rivers across the full model domain. The result of this reduction on river stage is beyond the scope of the data collected for this preliminary model to predict. The results point to the need for continued data collection with regard to river recharge/discharge patterns, riverbed conductance, and hydraulic conductivities of the surrounding materials.

In summary, this preliminary model provides a reasonable estimate of expected groundwater flow patterns, extraction area seepage, and pit refill simulation based on field data and current site knowledge. The groundwater flow model also provides a useful collection point for the geologic and hydrogeologic information collected to date and helps to focus and refine future data collection needs.



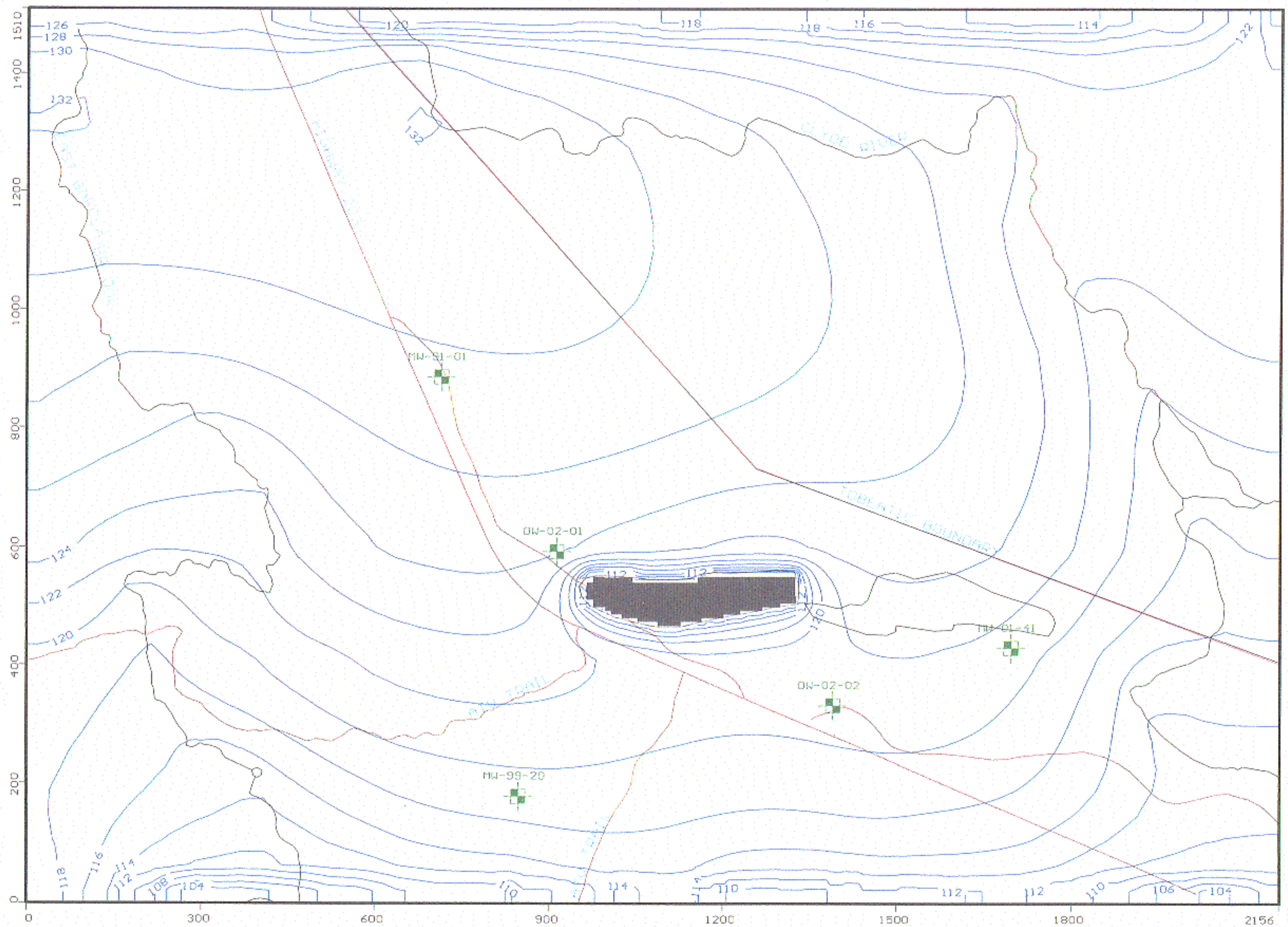
MGI Limited
Project: 20232G – Figure 1
Description: Model Extents
Modeller: Jordan Mooers
16 Jul 02

Visual MODFLOW v.3.0.0, (C) 1995–2002
Waterloo Hydrogeologic, Inc.
NC: 149 NR: 55 NL: 7
Current Layer: 2

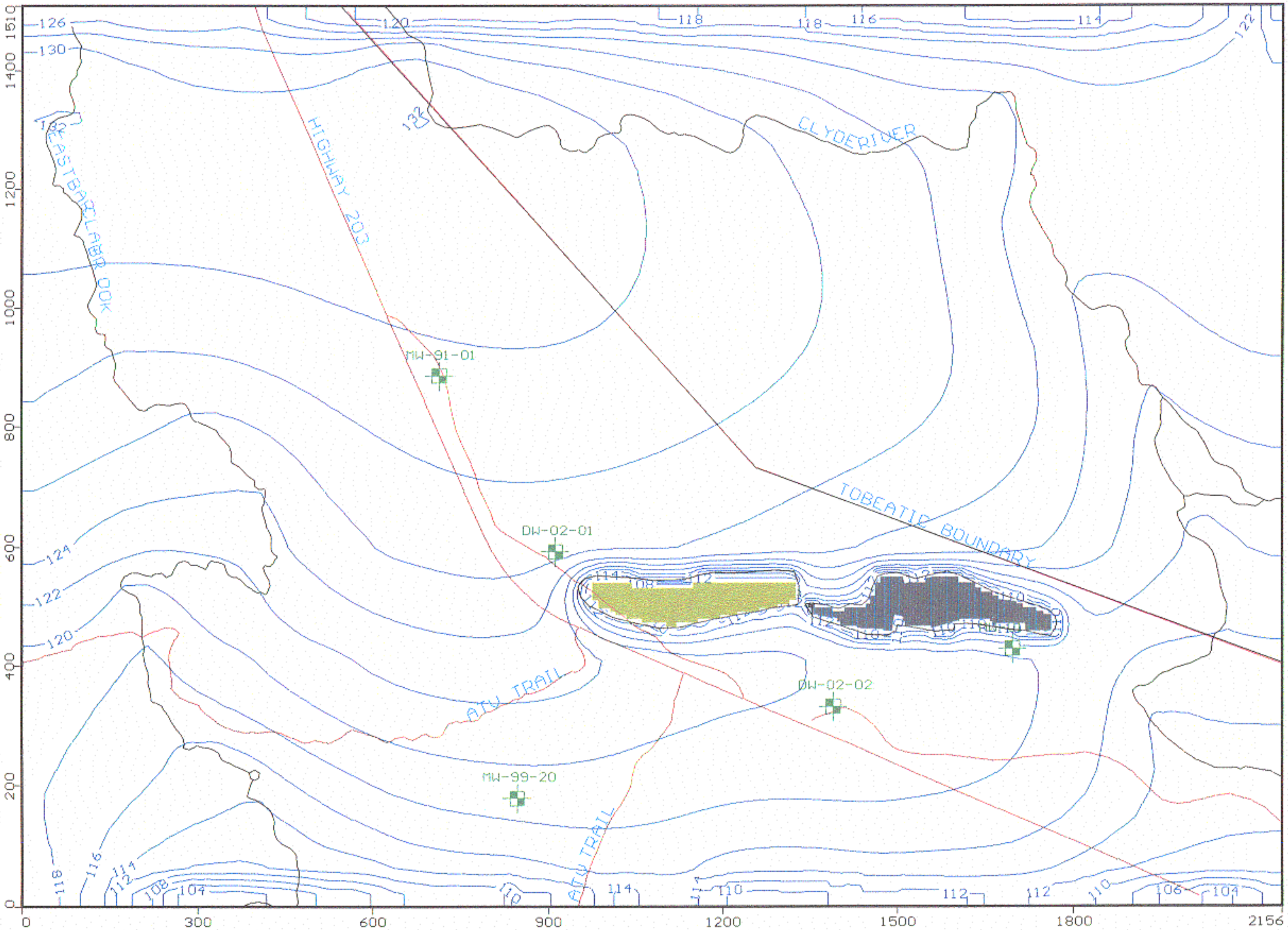


MGI Limited
Project: 20232G – Figure 2
Description: Steady State Heads
Modeller: Jordan Mooers
16 Jul 02

Visual MODFLOW v.3.0.0, (C) 1995–2002
Waterloo Hydrogeologic, Inc.
NC: 149 NR: 55 NL: 7
Current Layer: 2

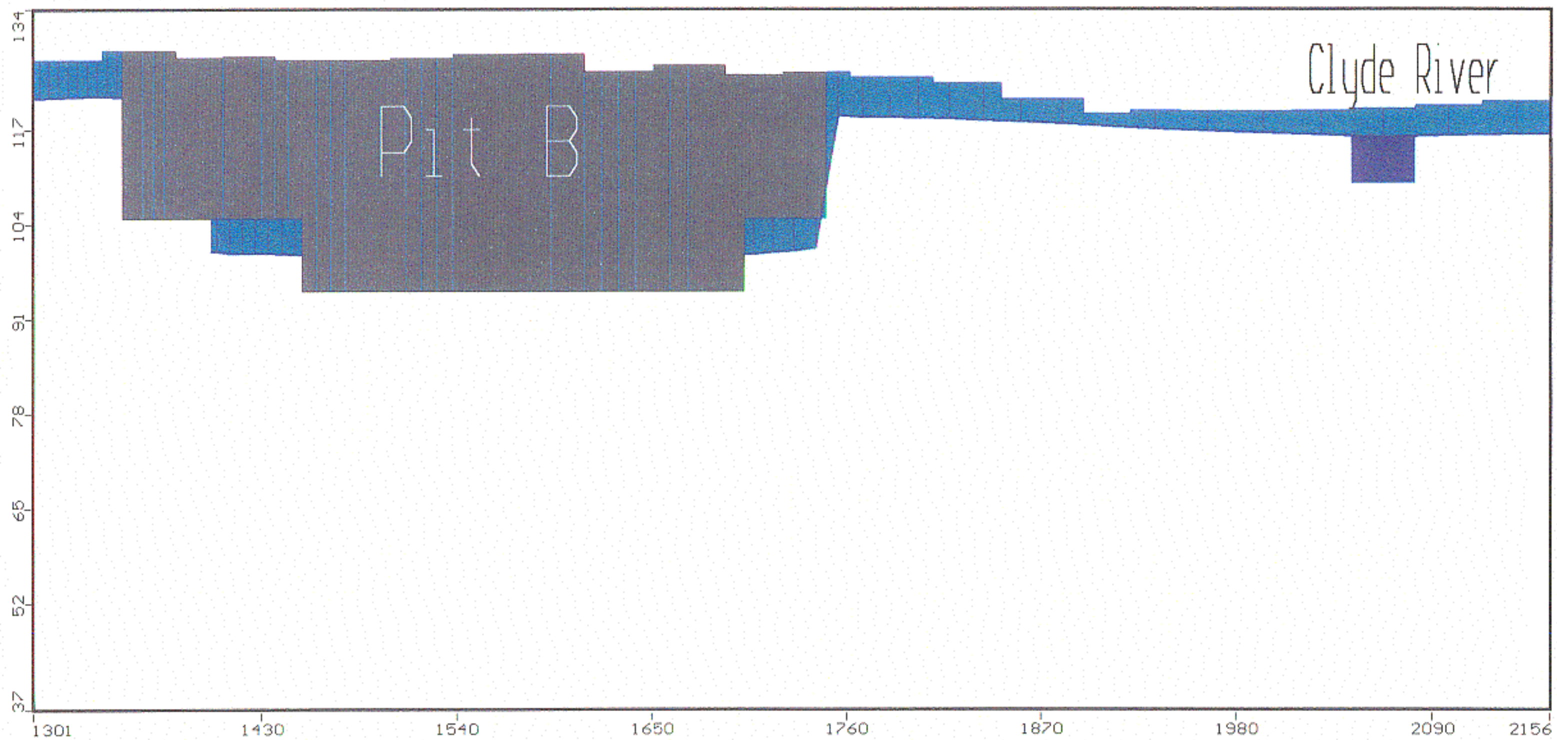


MGI Limited Project: 20232G – Figure 3 Description: 7 Year Equipotentials Modeller: Jordan Mooers 16 Jul 02	Visual MODFLOW v.3.0.0, (C) 1995–2002 Waterloo Hydrogeologic, Inc. NC: 149 NR: 55 NL: 7 Current Layer: 2



MGI Limited
Project: 20232G – Figure 4
Description: 10.5 Year Equipotentials
Modeller: Jordan Mooers
16 Jul 02

Visual MODFLOW v.3.0.0, (C) 1995–2002
Waterloo Hydrogeologic, Inc.
NC: 149 NR: 55 NL: 7
Current Layer: 2



MGI Limited
Project: 20232G – Figure 5
Description: 10.5 Year Water Table
Modeller: Jordan Mooers
16 Jul 02

Visual MODFLOW v.3.0.0, (C) 1995–2002
Waterloo Hydrogeologic, Inc.
NC: 149 NR: 55 NL: 7
Current Row: 36