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2017 Physical Environment Baseline Study
Inventus Mining Corporation
Pardo Gold Project

FINAL REPORT

May 4, 2018

DST File No.: TS-NO-030045

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1 *INTRODUCTION*

DST Consulting Engineers Inc. (DST) was retained by Inventus Mining Corporation (Inventus; also referred to as 'the Client') to conduct environmental baseline studies at the Pardo Gold Project, located approximately 65 km northeast of Sudbury and 25 km north-northwest of River Valley, Ontario. The Project location is shown in Figure 1.

Inventus is currently exploring the Pardo Gold Project and is proposing to proceed to advanced exploration with the extraction of a bulk sample from a paleo-placer gold deposit hosted in conglomerate rocks of the Huronian Supergroup. An area including four bulk sample sites has been identified as the likely project area for the advanced exploration project. The Project area is shown in Figure 2.

In anticipation of the advanced exploration project, environmental baseline studies have been completed by DST to describe the current environmental conditions at the proposed Project and surrounding area. The environmental baseline study field work, completed in 2017, include the following components, provided as separate reports:

1) Geochemistry for acid rock drainage and metal leaching prediction

2) Physical Environment Baseline Study
   - Hydrogeology
   - Hydrology
   - Climate

3) Aquatic Environment Baseline Study
   - Surface Water Quality
   - Sediment Quality
   - Benthic Invertebrate Community
   - Fish Habitat and Community

4) Terrestrial Environment Baseline Study
   - Vegetation and Soils
   - Species at Risk
   - Wildlife (including mammals, avifauna, bats and herpetofauna).

This 2017 physical environment baseline study has been completed to describe the pre-development baseline physical and hydrogeological condition including the geological setting, topography, climate, physical hydrology and local hydrogeology, and provides a conceptual model of the local hydrogeological system.

The data presented in this report will be used to support the environmental approval process in the advancement on the Pardo Project.

1.1 Background

The Pardo Gold Project is located within the Pardo and Clement Townships, centered at Universal Transverse Mercator (UTM) 556100 mE, 5183200 mN (North American Datum NAD83 Zone 17 North). The Project is accessed from the all-weather gravel Highway 805, which crosses through the western portion of the property. A network of logging roads east of Highway 805 provides additional access to the Property.

Inventus proposes to commence an advanced exploration phase at the Pardo Project for the purpose of extracting a bulk sample from a paleo-placer gold deposit hosted in conglomerate rocks. The advanced exploration plan is understood to include drilling, blasting and excavation of approximately 50,000 tonnes of ore from the four targeted areas. It is estimated that an additional 40,000 to 50,000 tonnes of waste rock may be generated.

1.2 Approach

DST personnel conducted field investigations in 2017 to characterize the pre-development groundwater quality and quantity conditions in the proposed project area, and to determine basic hydrogeological parameters for the shallow bedrock units that are proposed to be excavated as part of the advanced exploration project. Additional pertinent information to characterize the physical environment at the project area was obtained through a literature review of publicly available sources and from Inventus.

1.2.1 Baseline Groundwater Monitoring Program

The purpose of the baseline groundwater monitoring program was to establish existing groundwater quality and quantity conditions. This was achieved through the collection and analysis of groundwater samples, the monitoring of water levels and the assessment of groundwater flow within the Pardo Project boundaries. A hydrogeological assessment of the

proposed bulk sample areas was completed by assessing bedrock groundwater data that was obtained from existing exploration drill holes at the site subsequently outfitted as monitoring wells.

1.3 Scope of Work

The scope of work included the following items:

- Prepare a detailed site-specific Health and Safety Plan;
- Install four monitoring wells in existing bedrock exploration boreholes;
- Collect four groundwater samples from the installed monitoring wells for laboratory analysis of metals and general chemistry parameters;
- Perform four rising head tests; and,
- Compile the data obtained through the field investigation and literature review, and provide a report that includes a conceptual hydrogeological model and baseline physical environment conditions.

2 *FIELD INVESTIGATION METHODOLOGY*

The activities and the associated methodologies to complete the 2017 physical environment baseline study are presented in the following subsections.

2.1 Monitoring Well Installation Methodology

Monitoring wells were installed into bedrock in existing exploration diamond drill holes on August 24th, 2018. The monitoring wells were constructed of 51 mm, schedule 40 PVC riser pipe and 0.254 mm slotted screen. The bottom cap was threaded 51 mm schedule 40 PVC and the top of the riser was capped with a 51 mm j-plug. Well screen sections were installed at the bottom portion of the boreholes to the selected depth and solid PVC riser was extended from the top of the screen to approximately 0.8 m above ground surface. A sand pack consisting of washed silica sand was backfilled in the annular space around the screened portion of the wells and to approximately 0.2 m above the top of the screen. On top of the sand pack, hydrated bentonite chips were used to backfill the annulus around the riser portion of the well up to surface to prevent surface water from infiltrating into the well.

The wells were completed with steel, black-coloured monument style casing protectors that extend approximately 1 m above ground surface.

Details of the borehole drilling and monitoring well installations are provided in the table below.

Table 2-1: Groundwater Monitoring Wells Installation Specifications

Location ID	GPS Coordinates (17T)		Vertical Depth of Monitoring Well (m bgs) (3)	Schedule 40 PVC riser (1) (m bgs)	Schedule 40 PVC slotted screen (2) (m bgs)	Sand Pack (m bgs)	Bentonite (m bgs)	Annulus (mm.)
	Easting	Northing						
MW-01	556146	5183341	16.0	0-1	1.0 to 16	0.7 to 16	0.8	95.3
MW-02	556420	5183443	5.6	0-0.6	0.58 to 5.6	0.5 to 5.6	0.5	76.2
MW-03	556577	5183417	5.2	0-0.7	0.7 to 5.2	0.6 to 5.2	0.6	76.2
MW-04	556170	5182969	4.5	0-0.6	0.6 to 4.5	0.5 to 4.5	0.5	152.4

Notes:
1) 51 mm Schedule 40 PVC riser pipe
2) 51 mm, Schedule 40 PVC with 0.254 mm slotted screen
3) "m bgs" means metres below ground surface.

The horizontal coordinates of each monitoring well location were measured using a global positioning system (GPS) device.

Each monitoring well was equipped with dedicated 16 mm ID low-density polyethylene (LDPE) tubing and inertial foot valve for well development purposes. Each monitoring well was developed by purging a minimum of three well casing volumes of groundwater from each well (or until the monitoring well was dry) shortly after well installation.

2.2 Groundwater Sampling Methodology

To establish baseline groundwater quality, groundwater samples were collected from the four installed monitoring wells. The locations of the monitoring wells are shown on Figure 2 attached to the report.

Groundwater sampling was conducted in accordance with industry standard sampling methodologies. Prior to removing any water from the wells, static groundwater levels were obtained using a Heron Instruments™ water level tape. The groundwater was purged a minimum three casing volumes prior to collections and was sampled using LDPE tubing and a foot valve, and the samples were transferred directly into laboratory supplied bottles.

All groundwater samples were stored and transported in ice packed coolers to maintain a temperature of less than 10 ºC and were submitted under chain of custody protocols to AGAT Laboratories (AGAT) for chemical analysis of general chemistry, nutrients and metals parameters. Samples requiring filtration (i.e. metals) were field filtered and submitted to AGA.. AGAT is ISO/IEC 17025 certified, and is accredited by the Standards Council of Canada and the Canadian Association for Laboratory Accreditation Inc. All samples were analyzed within a regular turnaround time.

Analytical results were compared to the Ministry of the Environment and Energy (1999) document entitled *Water Management, Policies, Guidelines, Provincial Water Quality Objectives* (PWQO, 1994, reprinted 1999).

2.3 Rising Head Tests

Rising head tests were completed at the four monitoring wells to obtain approximate hydraulic conductivity values and estimate shallow groundwater flow rates. Rising head tests were completed by quickly removing a volume of water from the well to draw down the water level. During recovery of the water level in the well, water levels were recorded at regular time intervals until the water level recovered to greater than 75% of the static water level. Rising test data was

processed using AQTESOLV™ software to estimate hydraulic conductivities of the tested hydrogeological unit.

2.4 Water Level Monitoring

Long-term water level measurements at MW1 were obtained by using a Solinst water level data logger installed at the bottom of the monitoring well. The level logger records water levels based on pressure transducer measurements, which are translated to water depths. The level logger was installed at monitoring well MW1 on September 11, 2017, and was retrieved for approximately one week on December 20, 2017 to download the data. The level logger was subsequently returned to monitoring well MW1, and water level monitoring is ongoing.

Depths to water in the remaining three monitoring wells were measured using a water level tape from the top of the well casing. The length of collar 'stick-up' above ground water also noted, to calculate the depth to water below the ground surface.

2.5 Quality Assurance and Quality Control Measures

DST maintains a standard Quality Assurance/Quality Control (QA/QC) program for all projects. The field sampling and QA/QC program was completed in accordance with industry best practices and provincial and federal standards as appropriate. All project documentation was maintained and controlled by the appointed site supervisor. All monitoring well installations and groundwater sampling was completed in accordance with industry standards, and applicable provincial standards/guidance. DST operates under Certificates of Authorization issued by the Professional Engineers of Ontario (PEO) and the Association of Professional Geoscientists of Ontario (APGO) and our work was carried out with due regard to PEO and APGO standards for professional practice.

3 *PHYSICAL ENVIRONMENT DESCRIPTION*

3.1 Topography

The Pardo Gold Project is situated on the Precambrian Shield at an elevation of approximately 300 to 330 metres above sea level. The topography is generally rugged with modest topographic relief. Low lying areas consisting of wetlands and forested areas also surround the proposed bulk sample area.

The landforms in the project area are characterized by bedrock knobs with an estimated 15% outcrop exposure. The project area is dominated by thin layers of discontinuous drift (Bajc, 1997) with thicknesses from one to several metres. Based on DST filed investigation of the Project site soils are thin, generally less than 35 cm in thickness, overlying coarse fragmented regolith and bedrock.

The topography of the project area with local drainage basins is shown in Figure 3.

3.2 Climate

A search of the Environment Canada and Climate Change Canada (ECCC) weather website reveals that the active weather station nearest the Project is located at the Sudbury Airport approximately 48 km southwest of the Project site. This station provides a largely continuous set of hourly data since 1954, and currently records temperature, relative humidity, wind speed and direction, visibility, barometric pressure, rain, snow, total precipitation and snow depth.

The climate at the Pardo Gold Project, located within the Sudbury area, is described as per the Koppen climate classification as a humid continental climate. Long term climate data (1981- 2010) from the Sudbury A weather station reports an average temperature of 4.1 °C (ECCC, 2016); additional climate data is shown on Table 3-1.

Table 3-1: Canadian Climate Normals 1981-2010 for 'Sudbury A' Weather Station

	Temperature			Precipitation			
	Daily Average (°C)	Daily Maximum (°C)	Daily Minimum (°C)	Rainfall (mm)	Snowfall (cm)	Precipitation (mm)	Average Snow Depth (cm)
Jan	-13.0	-8.0	-17.9	11.9	59.5	62.2	30
Feb	-10.8	-5.5	-16.0	7.2	51.7	51.1	38
Mar	-4.9	0.4	-10.2	27.9	34.9	60.5	27
Apr	3.8	9.2	-1.7	49.7	16.9	65.7	2
May	11.1	17.0	5.2	81.4	1.9	83.4	0
Jun	16.5	22.2	10.7	80.3	0	80.3	0
Jul	19.1	24.8	13.4	76.9	0	76.9	0
Aug	18.0	23.4	12.4	85.5	0	85.4	0
Sep	13.0	18.1	7.8	101	0.1	101.1	0
Oct	6.0	10.3	1.7	84.9	5.7	90.9	0
Nov	-1.0	2.6	-4.7	52.3	29.6	78.5	3
Dec	-8.6	-4.4	-12.7	16.6	63	67.5	16
Year	4.1	9.2	-1.0	675.7	263.4	903.3	10

Mean temperatures below freezing are reported from November to March, with the coldest monthly temperatures in January with a mean of approximately -13 °C. The warmest temperatures are reported in July with an average value of 19.1 °C. The area receives an average total rainfall of approximately 675.7 mm and 263.4 cm of snowfall a year. The majority of the annual precipitation occurs from May to October, with the highest mean precipitation occurring in September and October. Mean monthly wind speeds range from 11.3 km/h to 15.9 km/h, with the dominant direction coming from the southwest in the summer and from the north in the winter (ECCC, 2016).

3.2.1 Rainfall Intensity-Duration-Frequency (IDF)

The Ontario Ministry of Transportation provides an online tool to interpolate probabilistic projections of intensity, duration and frequency of extreme rainfall events for any location in Ontario, based on historical precipitation data from ECCC. An Intensity-Duration-Frequency (IDF) curve and dataset for the Project, centred on 46° 48' 15" N, 80° 15' 45" W, is included in Appendix A of the report.

3.3 Hydrology

The Pardo Gold Project is located in the Great Lakes – St. Lawrence Basin, within the secondary watershed of the Wanapitei and French Rivers. The regional, tertiary-level watershed of the Project area is the Sturgeon. On a local level, the Pardo Gold Project is located in the vicinity of

a local drainage divide, with surface runoff from the advanced exploration Project area expected to flow south into a low-lying area that drains southward approximately 2.5 km into Tee Lake, or west approximately 1.5 km into the south-flowing McNish Creek system. Drainage from Tee Lake flowssouth via Silver Lake into Silver Creek, which also receives McNish Creek approximately 8 km downstream from the Pardo Project, and subsequently joins the Sturgeon River approximately 4 km further south. The locations of each of these waterbodies and corresponding local drainage basins are illustrated in Figure 3

The Ontario Ministry of Natural Resources and Forestry (MNRF, 2014) *Ontario Flow Assessment Tool* (OFAT) was accessed to obtain hydrologic information for the local watersheds encompassing the Pardo Gold Project. Using this tool, watersheds were drawn for the outlets of the closest lakes in each watershed to the Project: for the McNish Creek system, the unnamed 'gooseneck'-shaped lake ('Watershed 1'); and Tee Lake ('Watershed 2'). The resultant watersheds are shown in the drawing provided in Appendix A. Characteristics of the watersheds, as calculated by the OFAT, are provided in Table 3-2.

Table 3-2: Hydrologic Characteristics of Local Watersheds using OFAT Tool (source: MNRF OFAT, 2014)

ID	**'Watershed 1'**	**'Watershed 2'**
Outlet Location **Parameter**	Unnamed "Gooseneck Lake"	Tee Lake
Mean Annual Flow (m^3/s)	0.066933	0.838245
Drainage Area (km^2)	4.700	58.859
Shape Factor ()	4.324	10.397
Length of Main Channel (km)	4.508	24.738
Maximum Channel. Elevation (m)	329.92	353.82
Minimum Channel Elevation (m)	271.61	263.92
Slope of Main Channel (m/km)	12.93	3.63
Slope of Main Channel (%)	1.293	0.363
Area Lakes/Wetlands (km^2)	0.502	10.054
Area - Lakes (km^2)	0.302	6.138
Area • Wetlands (km^2)	0.200	3.916
Mean Elevation (m)	297.404	310.253
Maximum Elevation (m)	339.976	400.510
Mean Slope (%)	7.505	7.873
Annual Mean Temperature (°C)	3.9	3.8
Annual Precipitation (mm)	911	921

Although no permanent natural waterbodies are located within the immediate area of the proposed advanced exploration project, baseline studies of the lakes and streams located downgradient of the project area were completed to provide documentation of their current conditions. These studies are presented in the 2017 Aquatic Baseline Study (DST, 2018a).

4 BASELINE HYDROGEOLOGICAL INFORMATION

The following sections summarize baseline hydrogeological information for the Pardo Gold Project.

4.1 Geological Setting

4.1.1 Overburden and Soils

Overburden in the project area is described as discontinuous glacial drift with thicknesses from one metre up to several metres. The glacial drift texture is silt to sand (DST, 2018b). Bedrock is exposed in multiple areas throughout the Project area, predominantly in areas of higher relief.

Based on field work completed by Inventus and DST in 2017, thicker overburden coverage was observed in low-lying areas surrounding the site and was made up of organic terrain, with the primary material being peat and muck over mineral soil. Soils are thin within the Project area, generally less than 35 cm in thickness, overlying coarse fragmented regolith and bedrock. Soils in forested areas surrounding the proposed advanced exploration areas range from thin mineral soils (under 0.5 m thick) with shallow litter layers to deep mineral soils with well-developed topsoil horizon (DST, 2018b).

4.1.2 Geology

The Pardo Gold Project area is located in the Southern Province of the Canadian Shield, characterized by metasediments of the Paleoproterozoic Huronian Supergroup that unconformably overlie Archean metavolcanic and metasedimentary basement rocks containing granitic and mafic intrusions (Bennett et al., 1991).

The gold mineralization on the Pardo property is associated with basal pyrite-quartz-pebble-conglomerate and/or within the pyrite-bearing polymictic boulder / cobble conglomerate of the Mississagi and Matinenda Formations of the Huronian Supergroup.

The structural geology of the property includes block faulting that strikes roughly north-south to about 20°, with a dip to the west 15-20° (McKracken, 2015). This faulting is depicted on Figure 4-1, below.

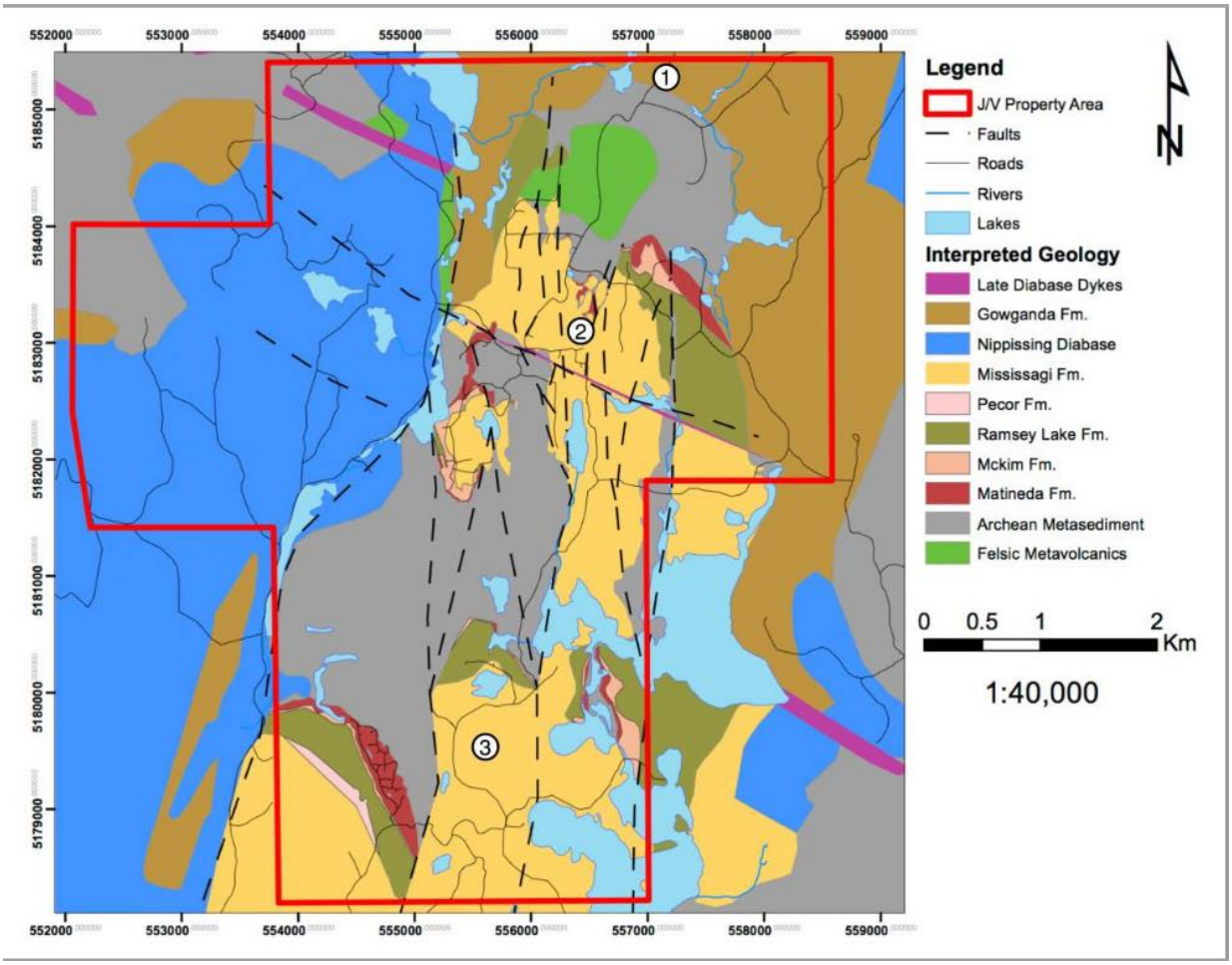

Figure 4.1. Project Geology.

4.2 Water Levels

Groundwater levels at the Pardo Project site were measured in the four monitoring wells on September 11, 2017 by DST personnel. Groundwater within shallow bedrock was found to range from 1.04 m to 3.66 m below ground surface (bgs), as shown in Table 4-1.

Table 4-1: Groundwater Levels in Monitoring Wells, September 11, 2018

Monitoring Well ID	Groundwater Level (m bgs)
MW1	2.47
MW2	3.66
MW3	1.50
MW4	1.04

DST also collected long-term groundwater static levels at MW1 using a Solinst Level Logger. The data retrieved from the level logger is presented below in Figure 4-2. Between September 11,

2017 and December 20, 2017, groundwater levels ranged from approximately 1.91 to 3.16 m bgs. Throughout the autumn, abrupt changes in water levels correlate closely with precipitation events (Figure 4-2), suggesting that precipitation is entering the shallow bedrock via fractures. This water level-precipitation correlation becomes less apparent into December, when most precipitation occurred as snow.

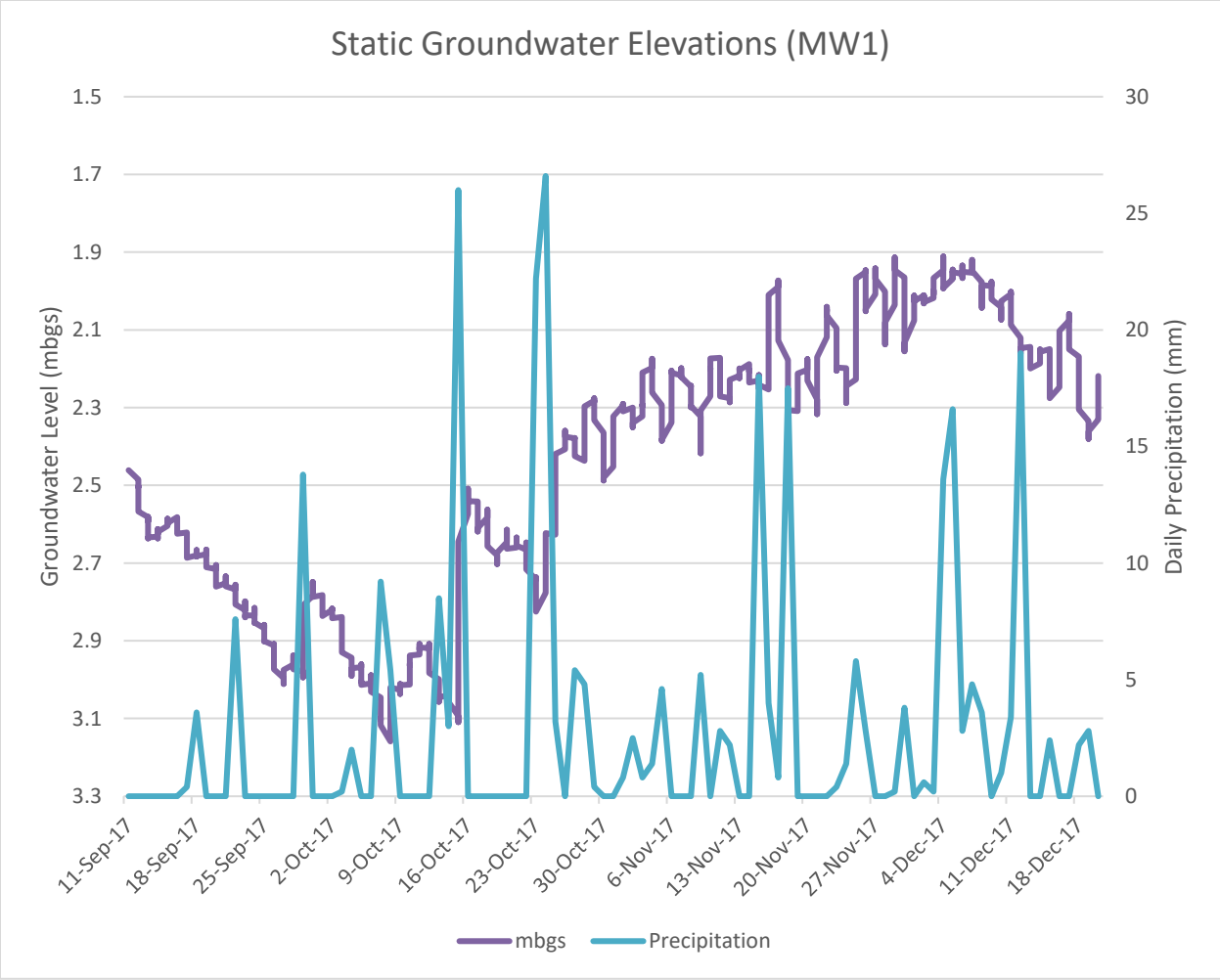

Figure 4.2 Groundwater levels at monitoring well MW1

4.3 Hydraulic Testing Results

4.3.1 Monitoring Well Slug Tests

The hydraulic conductivity of the shallow bedrock was estimated based on rising head tests completed at the four monitoring wells. The complete results of the rising tests are provided in the generated AQTESOLV™ reports in Appendix B and are summarized in Table 4-2 below.

Table 4-2: Estimated Hydraulic Conductivity Values in Monitoring Wells

Monitoring Well ID	Hydraulic Conductivity (m/s)
MW1	1.4×10^{-7}
MW2	1.4×10^{-6}
MW3	4.0×10^{-7}
MW4	2.7×10^{-7}

4.4 Groundwater Quality

4.4.1 Groundwater Sampling Results

Groundwater sampling was completed on September 11, 2017 by DST personnel from the four groundwater monitoring wells. Groundwater samples were submitted to AGAT for analysis of general chemistry and metal parameters. For the purpose of characterizing background conditions, and since it is possible that shallow groundwater eventually discharges to a surface water body, the groundwater analytical results were compared to the PWQO (MOEE, 1999). The analytical results for general chemistry and metals are summarized in Table 1.

Groundwater quality at the four monitoring wells is characterized by neutral pH with low buffering capacity due to low levels of alkalinity (11 to 52 mg/L $CaCO_3$ equivalent). Compared to the PWQO, the overburden groundwater samples are elevated in phosphorus (PWQO = 0.03 mg/L to avoid excessive plant growth in streams), with concentrations of 0.080 mg/L, 0.46 mg/L, 0.14 mg/L, and 0.19 mg/L at MW-1, MW-2, MW-3 and MW-4 respectively.

Samples collected from all four groundwater monitoring wells were noted to contain elevated concentrations of cobalt (0.0049 mg/L to 0.0139 mg/L compared to PWQO of 0.0009 mg/L) and iron (0.36 mg/L to 27.9 mg/L compared to PWQO 0.3 mg/L). Samples MW-1 and MW-3 were additionally elevated in aluminum, at concentrations of 0.237 mg/L and 0.567 mg/L, respectively. One sample, from MW-4, was found to be marginally elevated in zinc (0.026 mg/L compared to PWQO of 0.02 mg/L).

The laboratory Certificate of Analysis for the analytical data is provided in Appendix C.

4.4.2 Quality Assurance and Quality Control

A review of the laboratory Certificate of Analysis indicates that no laboratory quality control issues were identified that would affect the conclusions provided in this report. Unionized ammonia was reported by the laboratory, calculated using the pH and temperature of the water at the time of analysis. As this result is not reflective of the actual groundwater condition, unionized ammonia was excluded from the groundwater analytical results provided in Table 1.

5 CONCEPTUAL HYDROGEOLOGICAL MODEL

5.1 Overburden Hydrogeological Unit

The overburden hydrogeological unit at the Pardo Project is a thin, discontinuous unit broken by areas of exposed bedrock, particularly in the upland areas. The overburden in the Project area consists of discontinuous silt to sand glacial drift and soil, which in low-lying areas, is overlain by organic layers. The thickness of this unit is generally less than 1 m to several metres, where present; however, overburden is thicker in low-lying areas.

5.2 Shallow Bedrock Hydrogeological Unit

The shallow bedrock hydrogeological unit is defined as the zone of upper bedrock that receives recharge from meteoric and/or overburden waters. Groundwater within this unit is interpreted to be controlled by limited open joints/fractures. Hydraulic conductivities of the shallow bedrock estimated from the slug test data are 3.9×10^{-7} m/s.

It is interpreted that there is a high level of hydraulic connectivity between the ground surface, overburden (where present), and shallow bedrock hydrogeological units; particularly in areas of shallow overburden (i.e. less so in low-lying areas where overburden is interpreted to be thicker). The shallow bedrock unit is interpreted to be connected to the overburden or ground surface via the joints/fractures in the bedrock, as evidenced by the effect of rainfall events on water levels at MW-1.

5.3 Deeper Bedrock Hydrogeological Unit (Inferred)

Although bedrock was not investigated below a vertical depth of approximately 14.5 m during the current investigation, it is interpreted, as is typical in a northern Ontario Archaean bedrock setting, that a deeper bedrock hydrogeological unit can be inferred below the depth of influence/recharge from ‘fresh’ meteoric waters. Fractures at these depths may be relatively mineralized, impeding groundwater flow as acidity of meteoric waters does not reach to dissolve calcite filled fractures. With little recharge, water quality may contain higher concentrations of dissolved ions. This zone is not expected to be encountered during advanced exploration; however, it may need to be considered with respect to water quality and hydraulic parameters for potential future mine development.

5.4 Groundwater Flow Regime

Groundwater flow is expected to be driven by recharge into low-lying overburden deposits that occur discontinuously across the project area, with flow generally following local topography along the bedrock surface to eventually discharge into the surface water features surrounding the Project area (i.e. McNish Creek and Tee Lake systems). Shallow bedrock groundwater flow is also expected to follow local topography; however, the presence, connectivity and orientation of fractures will also influence the flow regime, as will the thickness of the overlying overburden.

Groundwater flow in bedrock is generally restricted to flow through the open joints/fractures, and is expected to be increasingly limited with increasing depth into the inferred mineralized zone.

Groundwater contributions to baseflow in the surface waterbodies surrounding the Project area have been not been quantified as part of this assessment; they are expected to occur largely through discharge from the overburden into the surrounding wetland areas and lakes. The groundwater discharge contribution from the bedrock is expected to be relatively small due to limited fracturing providing pathways for groundwater flow.

5.5 Local Groundwater Use

The community of River Valley is the closest community to the Pardo Gold Project, located approximately 25 km southeast of the Project. River Valley relies on wells as a source of water supply to the community.

Information regarding water supply wells in the area of the Project was gathered from the Ministry of the Environment and Climate Change (MOECC) water well record database. The review of the MOECC water well records (MOECC, 2018) does not identify any wells within the Project area. The closest water well is located approximately 15 km south of the Site. The well located at the property 15 km south of the site is an observation well (Well ID #A041733). Due to the distance from the Project area, it is not expected that this well, or any groundwater supplies for River Valley, will receive groundwater originating from the Pardo Project site.

6 *LIMITATIONS OF REPORT*

The information, conclusions, recommendations and opinions given herein are specific to this project and this Client (Inventus) only; and for the scope of work described herein. This report may not be relied upon, in whole or in part, by other parties for any purposes whatsoever. Any use which a third party makes of this report, or any part thereof, or any reliance on or decisions made based on it, are the responsibility of such third parties. DST does not accept responsibility for damages, if any, suffered by any third party due to decisions or actions made based on this report.

The data, conclusions and recommendations which are presented in this report, and the quality thereof, are based on a scope of work authorized by the Client. This report cannot warranty that all conditions on, or off, the Site are represented in this study. For example, conditions between sampling or testing locations may differ from those encountered in the investigation and observed or measured conditions may change with time.

Any recommendations, conclusions and opinions provided, that are based on conditions or assumptions reported herein, will inherently include any uncertainty associated with those conditions or assumptions as stated herein. Many aspects involving professional judgment such as subsurface models and groundwater flow contain a degree of uncertainty that cannot be eliminated. This uncertainty should be managed by periodic review and refinement as additional information becomes available and/or the collection of additional data.

Any results from an analytical laboratory or other subcontractors reported, data from provincial and federal agencies or other consultant reported herein have been carried out by others, and DST cannot warranty their accuracy. Similarly, DST cannot warrant the accuracy of information supplied by the Client or others.

Note also that standards, guidelines and practices related to environmental investigations may change with time. Those which were applied at the time of this investigation may be obsolete or unacceptable at a later date.

Any topographic benchmarks and elevations documented in this report are primarily used to establish relative elevation differences between test locations and should not be used for other purposes such as grading, excavation, planning, development, etc.

The scope of work may not be sufficient to determine all the factors that may affect construction or construction methods and costs. Any comments given in this report on potential problems and possible methods are intended only for the guidance of the designer. Contractors bidding on this project or any party undertaking the design of project systems must, therefore, make their own interpretation of the information presented and draw their own conclusions as to how the conditions may affect their work.

7 CLOSURE

We trust this report meets your present requirements and appreciate this opportunity to provide environmental consulting services to you. If you have any questions or comments, please contact the undersigned.

For **DST CONSULTING ENGINEERS INC.**

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Figures

Document Name: 20180411_InventusPE_Figure1_SiteLocation Document Path: A:\GIS\TS-NO-030045 Inventus Mining Pardo Gold Project\Map Documents\Physical Environment\20180411_InventusPE_Figure1_SiteLocation.mxd

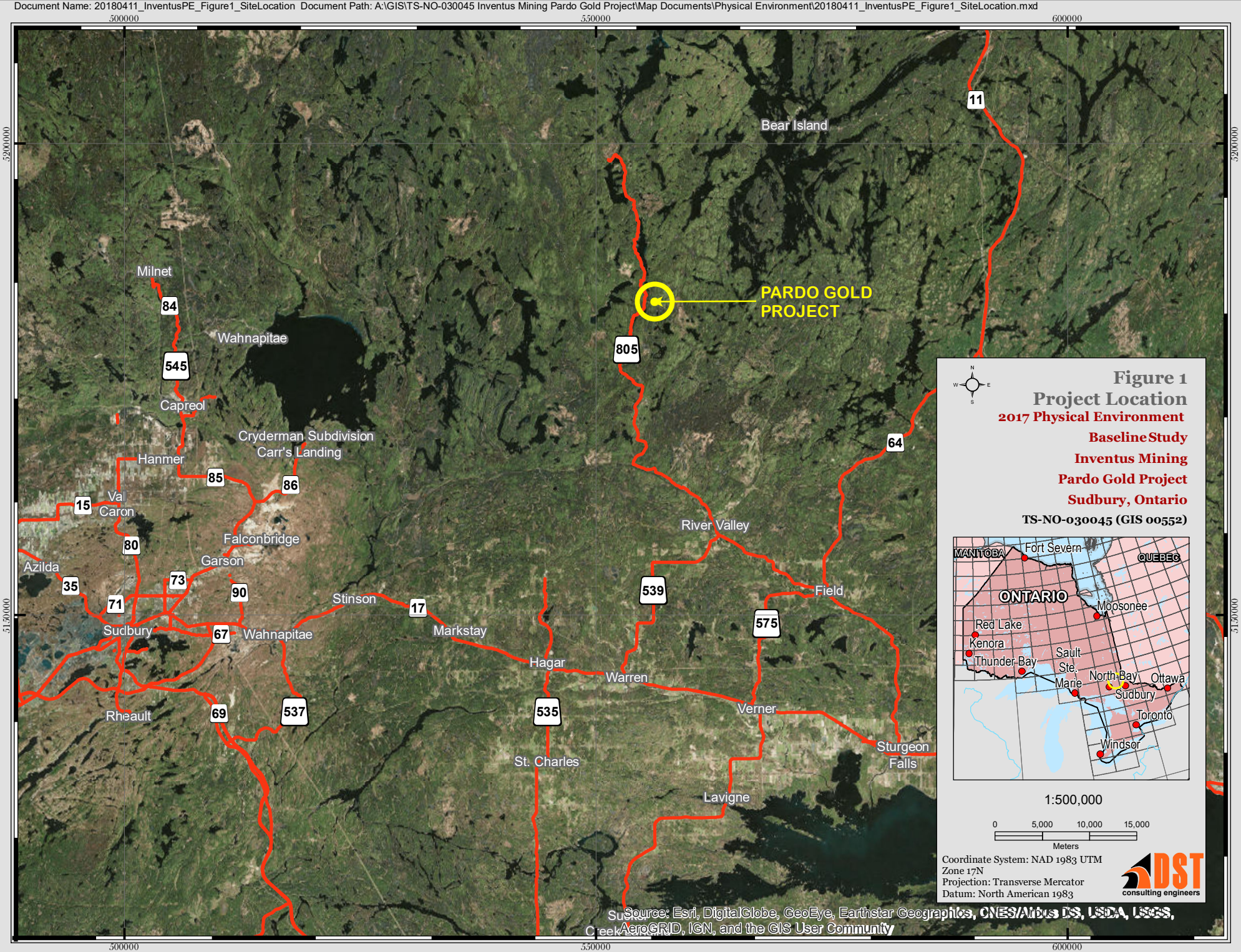

Figure 1
Project Location
2017 Physical Environment Baseline Study
Inventus Mining
Pardo Gold Project
Sudbury, Ontario
TS-NO-030045 (GIS 00552)

1:500,000

0 5,000 10,000 15,000
Meters

Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

DST consulting engineers

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

NOTES: 1.THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ASSOCIATED REPORT 2. DO NOT SCALE DRAWING

DATE: 2018-04-13 AUTHOR: CHRISTOPHER MITCHELL

DATE OF IMAGERY: 2014 - 5/11/2016

885 Regent Street, Suite 3-1B. Sudbury, Ontario, Canada P3E 5M4 Phone: (705) 523-6680 Fax: (705) 523-6690 Toll Free: (866) 432-5554 E-mail: sudbury@dstgroup.com Website: www.dstgroup.com

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DATE: 2018-04-27 AUTHOR: CHRISTOPHER MITCHELL

DOCUMENT NAME: 20180413_INVENTUSPE_FIGURE2_GROUNDWATERMONITORINGWELLLOCATIONS DOCUMENT PATH: A:\GIS\TS-NO-030045 INVENTUS MINING PARDO GOLD PROJECT 20180413_INVENTUSPE_FIGURE2_GROUNDWATERMONITORINGWELLLOCATIONS.MXD

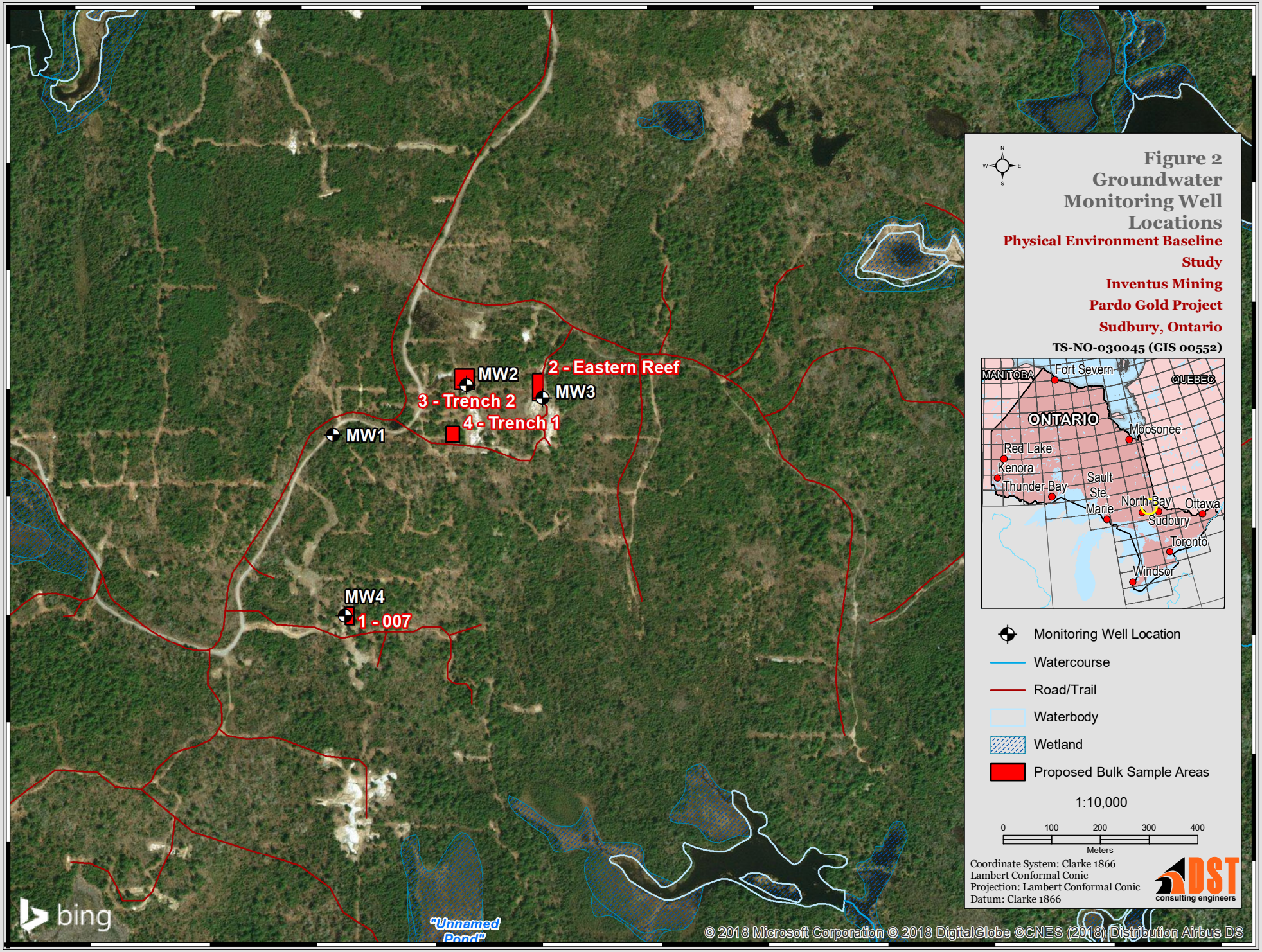


Figure 2 Groundwater Monitoring Well Locations

Physical Environment Baseline Study

Inventus Mining

Pardo Gold Project

Sudbury, Ontario

TS-NO-030045 (GIS 00552)

- Monitoring Well Location
- Watercourse
- Road/Trail
- Waterbody
- Wetland
- Proposed Bulk Sample Areas

1:10,000

0 100 200 300 400

Meters

Coordinate System: Clarke 1866
Lambert Conformal Conic
Projection: Lambert Conformal Conic
Datum: Clarke 1866

DST consulting engineers

885 Regent Street, Suite 3-1B. Sudbury, Ontario, Canada P3E 5M4 Phone: (705) 523-6680 Fax: (705) 523-6690 Toll Free: (866) 432-5554 E-mail: sudbury@dstgroup.com Website: www.dstgroup.com

NOTES: 1.THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE ASSOCIATED REPORT 2. DO NOT SCALE DRAWING
3. DATA SOURCES: LAND INFORMATION ONTARIO (ONTARIO HYDRO NETWORK; ONTARIO ROAD NETWORK; WETLAND; LAND CONTOUR) HTTPS://WWW.ONTARIO.CA/PAGE/LAND-INFORMATION-ONTARIO. DRAINAGE BASINS DERIVED FROM ABOVE LAND CONTOUR DATASET.

DOCUMENT NAME: 20190427_INVENTUSPE_FIGURE3_DRAINAGEBASINS DOCUMENT PATH: A:\GIS\TS-NO-330045 INVENTUS MINING PARDO GOLD PROJECT 2020\80427_INVENTUSPE_FIGURE3_DRAINAGEBASINS.MXD

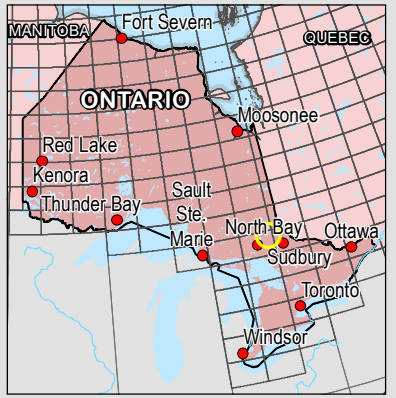
DATE: 2018-04-27 AUTHOR: CHRISTOPHER MITCHELL

554000 556000 558000 560000

5184000 5182000 5180000

Wawiashkashi Lake
Manitou Lake
Brightwater Lake
North Silver Creek
CLEMENT RD
HWY 805
"Unnamed Lake" (Gooseneck)
"Unnamed Pond"
McNish Lake
McNish Creek
Apple Lake
Tee Lake
Silver C

Figure 3
Local Drainage Basins
2017 Physical Environment
Baseline Study
Inventus Mining
Pardo Gold Project
Sudbury, Ontario
TS-NO-030045 (GIS 00550)



Local Drainage Boundary
Contour (10 m Interval)
Road
Watercourse
Waterbody
Wetland

1:30,000

0 250 500 750
Meters

Coordinate System: NAD 1983 UTM Zone 17N
Projection: Transverse Mercator
Datum: North American 1983

DST consulting engineers

bing

885 Regent Street, Suite 3-1B Sudbury, Ontario, Canada P3E 5M4 Phone: (705) 523-6680 Fax: (705) 523-6690 Toll Free: (866) 432-5554 E-mail: sudbury@dstgroup.com

Tables

Table 1
Groundwater Analytical Results

		Sample ID	MW-1	MW-2	MW-3	MW-4
		Sample Date (dd-mmm-yr)	09/11/2017	09/11/2017	09/11/2017	09/11/2017
Parameter	**Units**	**PWQO [1]**				
General Chemistry						
Electrical Conductivity	uS/cm	NV [2]	97	82	49	150
pH	pH Units	6.5-8.5	7.21	7.11	**6.43 [3]**	7.62[2]
Total Hardness (as CaCO3)	mg/L	NV	35.1	27.1	12.5	57.1
Total Suspended Solids (Low)	mg/L	NV	69	17	111	396
Alkalinity (as CaCO3)	mg/L	NV	36	30	11	52
Bicarbonate (as CaCO3)	mg/L	NV	36	30	11	52
Carbonate (as CaCO3)	mg/L	NV	<5	<5	<5	<5
Chloride	mg/L	NV	3.02	0.39	0.42	1.19
Nitrate as N	mg/L	NV	<0.05	<0.05	<0.05	0.08
Nitrite as N	mg/L	NV	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L	NV	7.03	9.72	7.22	18.30
Ammonia as N	mg/L	NV	0.07	0.93	1.50	0.03
Total Phosphorus	mg/L	0.03 [4]	**0.08**	**0.46**	**0.14**	**0.19**
Total Phosphorus, Dissolved	mg/L	NV	0.04	0.04	0.07	0.02
Dissolved Organic Carbon	mg/L	NV	3.1	4.0	23.3	4.2
Dissolved Metals						
Calcium	mg/L	NV	8.91	7.08	3.41	15.80
Magnesium	mg/L	NV	3.11	2.28	0.97	4.29
Sodium	mg/L	NV	1.61	1.22	0.87	2.34
Potassium	mg/L	NV	1.59	1.16	0.64	3.78
Aluminum	mg/L	0.075 [5]	**0.237**	0.071	**0.567**	0.063
Antimony	mg/L	0.02	<0.003	<0.003	<0.003	<0.003
Arsenic	mg/L	0.005	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	NV	0.007	0.022	0.006	0.006
Beryllium	mg/L	1.1 [6]	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L	NV	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	0.2	0.106	0.078	0.049	0.071
Cadmium	mg/L	0.0005 [6]	<0.0001	<0.0001	<0.0001	0.0001
Chromium	mg/L	NV	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L	0.0009	**0.0139**	**0.0058**	**0.0049**	**0.0053**
Copper	mg/L	0.005 [6]	0.002	0.002	0.003	0.005
Iron	mg/L	0.3	**1.43**	**4.76**	**27.90**	**0.36**
Lead	mg/L	0.005 [6]	0.004	<0.001	<0.001	<0.001
Manganese	mg/L	NV	0.520	0.231	0.128	0.315
Mercury	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L	0.04	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L	0.025	0.011	0.018	0.017	0.015
Selenium	mg/L	0.1	<0.004	0.007	<0.004	<0.004
Silicon	mg/L	NV	5.04	4.90	4.43	4.87
Silver	mg/L	0.0001	<0.0001	0.0002	<0.0001	<0.0001
Strontium	mg/L	NV	0.026	0.019	0.011	0.020
Thallium	mg/L	0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin	mg/L	NV	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L	NV	0.0060	<0.002	0.0060	<0.002
Uranium	mg/L	0.005	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L	0.006	<0.002	<0.002	0.0040000	<0.002
Zinc	mg/L	0.02	0.0120	0.0140	0.0180	**0.0260**
Zirconium	mg/L	0.004	<0.004	<0.004	<0.004	<0.004

Notes:

1) PWQO - Ministry of Environment and Energy (MOEE),1994, reprinted February 1999. Water Management, Policies, Guidelines, Provincial Water Quality Objectives (PWQO) of the MOEE. Where interim values exist, the interim value is used.

2) "NV" means no value for that parameter was presented in the associated guidance document.

3) Parameter concentrations that do not meet PWQOs are indicated by **bold, underlined and red** typeface.

4) Excessive plant growth in rivers and streams should be eliminated at a total phosphorus concentration below 0.03 mg/L.

5) The PWQO of 0.075 mg/L is based on pH of >6.5 to 9.0, in a clay-free sample.

6) The PWQO is dependent on hardness; maximum PWQO value is shown.

Appendix A

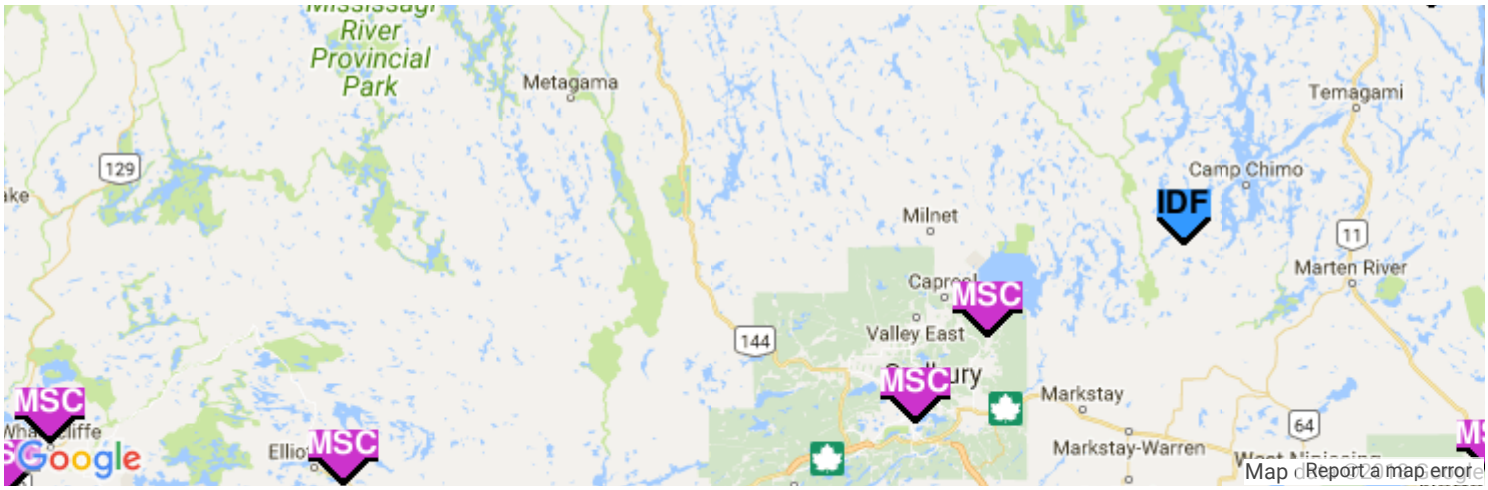
IDF Curve and Watershed Flow Assessment Drawing

Ontario IDF CURVE LOOKUP

Active coordinate

46° 48' 15" N, 80° 15' 45" W (46.804167,-80.262500)

Retrieved: Thu, 12 Apr 2018 14:55:39 GMT



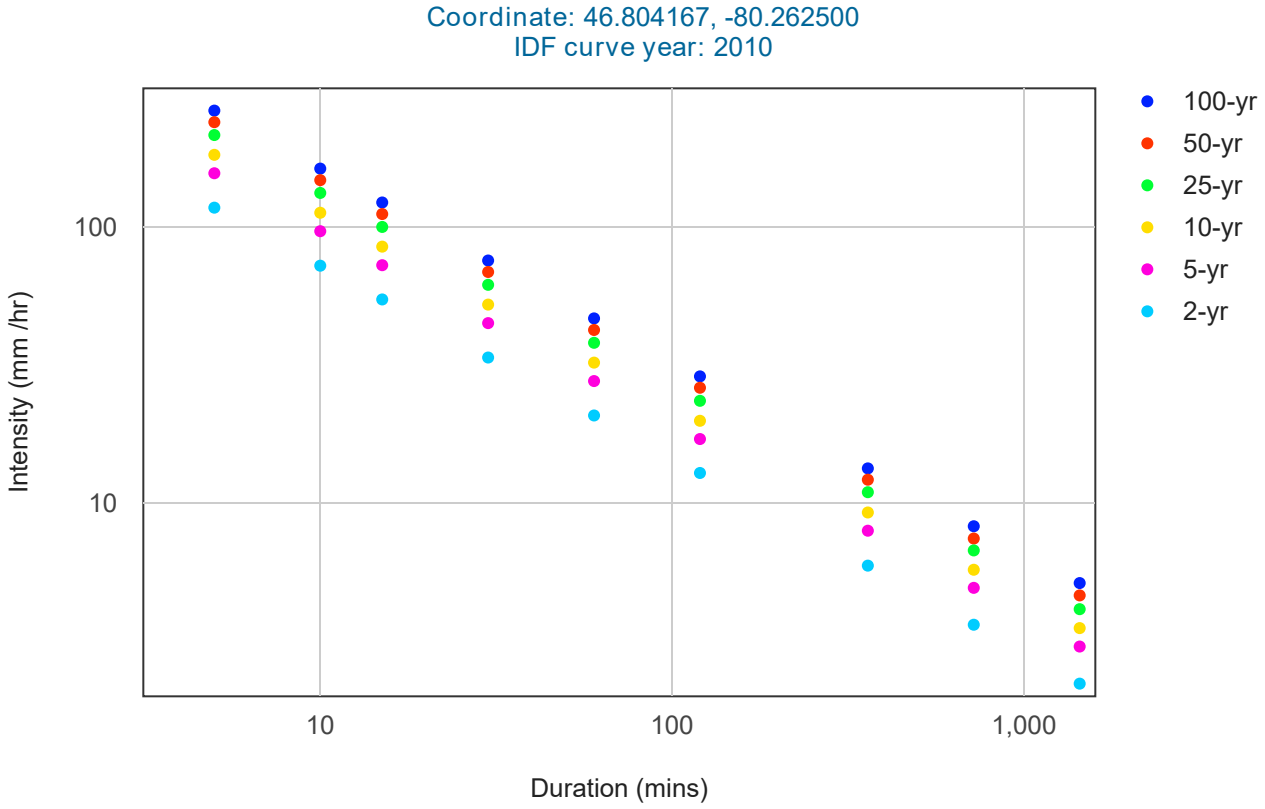
Location summary

These are the locations in the selection.

IDF Curve: 46° 48' 15" N, 80° 15' 45" W (46.804167,-80.262500)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 46° 48' 15" N, 80° 15' 45" W (46.804167,-80.262500)

Retrieved: Thu, 12 Apr 2018 14:55:39 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	20.7	27.6	32.2	38.0	42.3	46.6
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	117.6	72.4	54.6	33.6	20.7	12.8	5.9	3.6	2.2
5-yr	156.8	96.6	72.7	44.8	27.6	17.0	7.9	4.9	3.0
10-yr	182.9	112.7	84.9	52.3	32.2	19.8	9.2	5.7	3.5
25-yr	215.8	133.0	100.1	61.7	38.0	23.4	10.9	6.7	4.1
50-yr	240.3	148.0	111.5	68.7	42.3	26.1	12.1	7.4	4.6
100-yr	264.7	163.0	122.8	75.6	46.6	28.7	13.3	8.2	5.1

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	9.8	12.1	13.6	16.8	20.7	25.5	35.5	43.7	53.9
5-yr	13.1	16.1	18.2	22.4	27.6	34.0	47.3	58.3	71.8
10-yr	15.2	18.8	21.2	26.1	32.2	39.7	55.2	68.0	83.8
25-yr	18.0	22.2	25.0	30.8	38.0	46.8	65.2	80.3	98.9
50-yr	20.0	24.7	27.9	34.3	42.3	52.1	72.5	89.4	110.1
100-yr	22.1	27.2	30.7	37.8	46.6	57.4	79.9	98.5	121.3

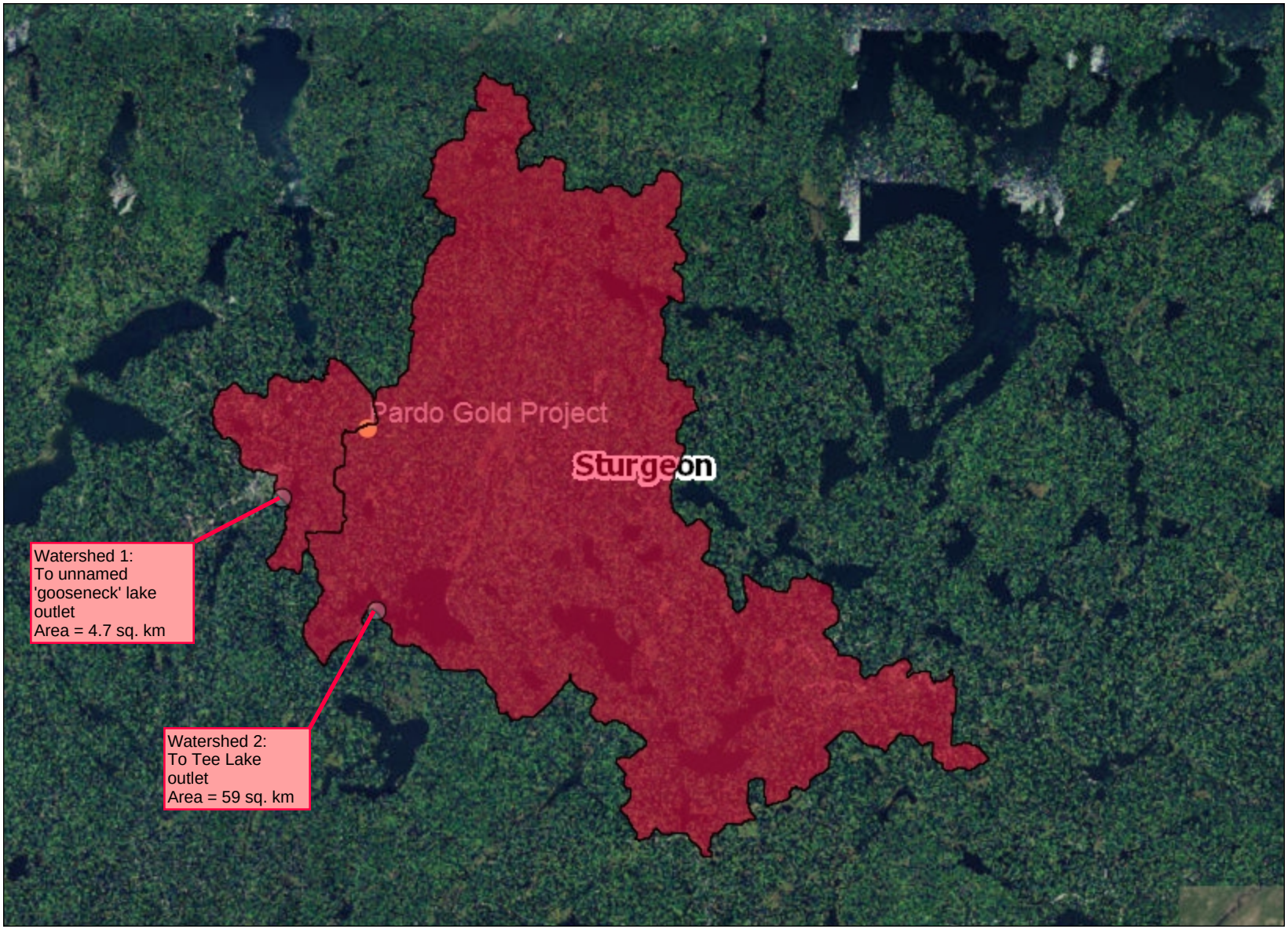
Terms of Use

MINISTRY OF NATURAL RESOURCES AND FORESTRY

Ontario Flow Assessment Tools

Pardo Gold Project - Local Watersheds

Notes:



Legend

- Assessment Parcel
- Secondary Watershed
- Tertiary Watersheds
- Great Lakes - St. Lawrence Basin
- Hudson - James Bay Basin
- Nelson River Basin
- Diversions
- Waterbody Outlet
- Conservation Authority Dam
- Provincial Dam
- Federal Dam
- OPG Dam
- Other Dam
- HYDAT Gauge
- HYDAT Gauge (RHBN)

Land Cover Compilation

- Other
- Cloud/Shadow
- Clear Open Water
- Turbid Water
- Shoreline
- Mudflats
- Marsh
- Swamp
- Fen
- Bog
- Heath
- Sparse Treed
- Treed Upland
- Deciduous Treed
- Mixed Treed
- Coniferous Treed
- Plantations - Treed Cultivated
- Hedge Rows
- Disturbance
- Open Cliff and Talus
- Alvar
- Sand Barren and Dune
- Open Tallgrass Prairie
- Tallgrass Savannah
- Tallgrass Woodland
- Sand/Gravel/Mine Tailings/Extraction
- Bedrock
- Community/Infrastructure
- Agriculture and Undifferentiated Rural Land Use

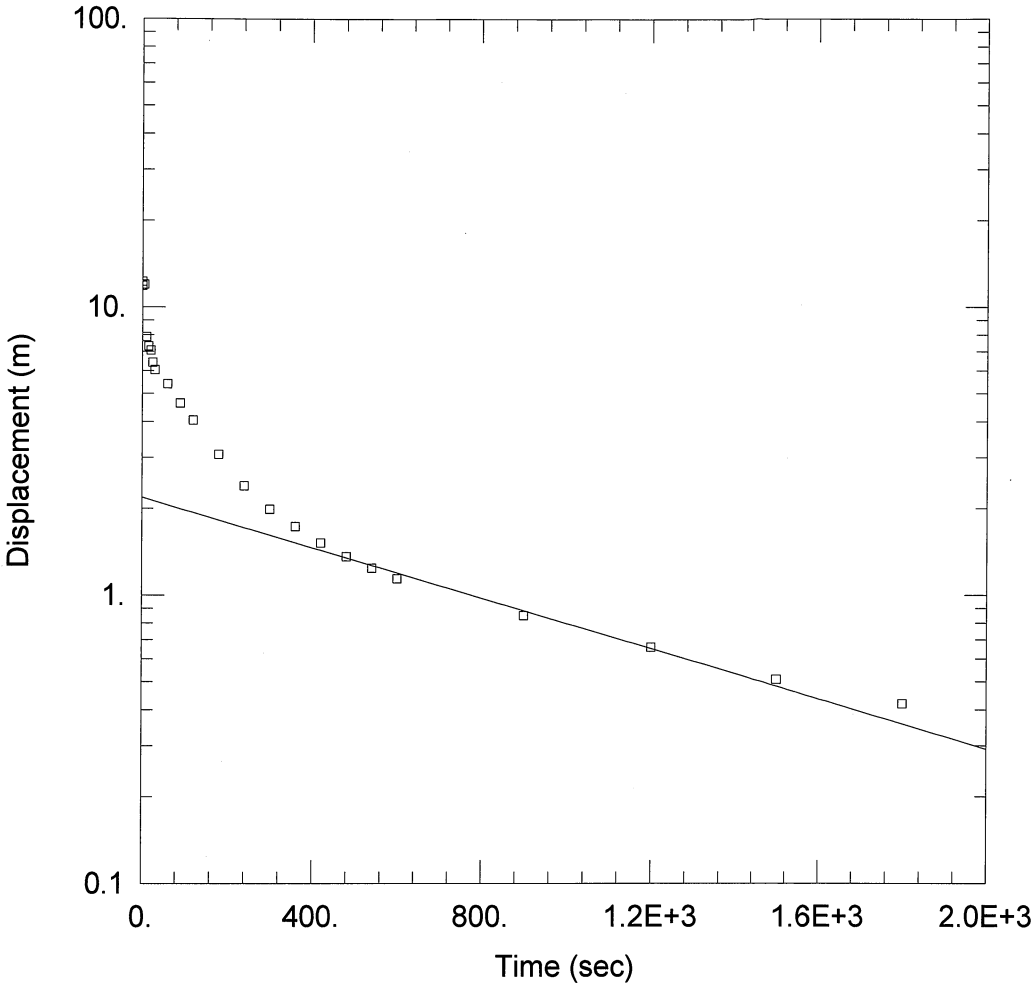
5.0 0 km 2.51 5.0

Scale: 1 : 98,887

Projection: Web Mercator

Appendix B

AQTESOLV Reports and Slug Test Data



WELL TEST ANALYSIS

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Well: MW1
Test Date: September 11, 2017

AQUIFER DATA

Saturated Thickness: 12.26 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW1)

Initial Displacement: 11.84 m
Total Well Penetration Depth: 14.5 m
Casing Radius: 0.02625 m
Static Water Column Height: 12.26 m
Screen Length: 14.5 m
Well Radius: 0.02625 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.44E-7 m/sec
y0 = 2.184 m

Data Set: L:\TS\Projects\TS-NO-030045 Inventus Mining Pardo Gold Project\Reporting\Physical Baseline\AQTES
Date: 04/30/18
Time: 16:28:10

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Date: September 11, 2017
Test Well: MW1

AQUIFER DATA

Saturated Thickness: 12.26 m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW1

X Location: 556146. m
Y Location: 5183341. m

Initial Displacement: 11.84 m
Static Water Column Height: 12.26 m
Casing Radius: 0.02625 m
Well Radius: 0.02625 m
Well Skin Radius: 0.047 m
Screen Length: 14.5 m
Total Well Penetration Depth: 14.5 m
Corrected Casing Radius (Bouwer-Rice Method): 0.02625 m
Gravel Pack Porosity: 0.3

No. of Observations: 22

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	12.26	240.	2.395
5.	11.97	300.	1.99
10.	7.88	360.	1.73
15.	7.31	420.	1.52
20.	7.07	480.	1.36
25.	6.41	540.	1.24
30.	6.05	600.	1.14
60.	5.41	900.	0.85
90.	4.63	1200.	0.66
120.	4.05	1500.	0.51
180.	3.08	1800.	0.42

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 5.155

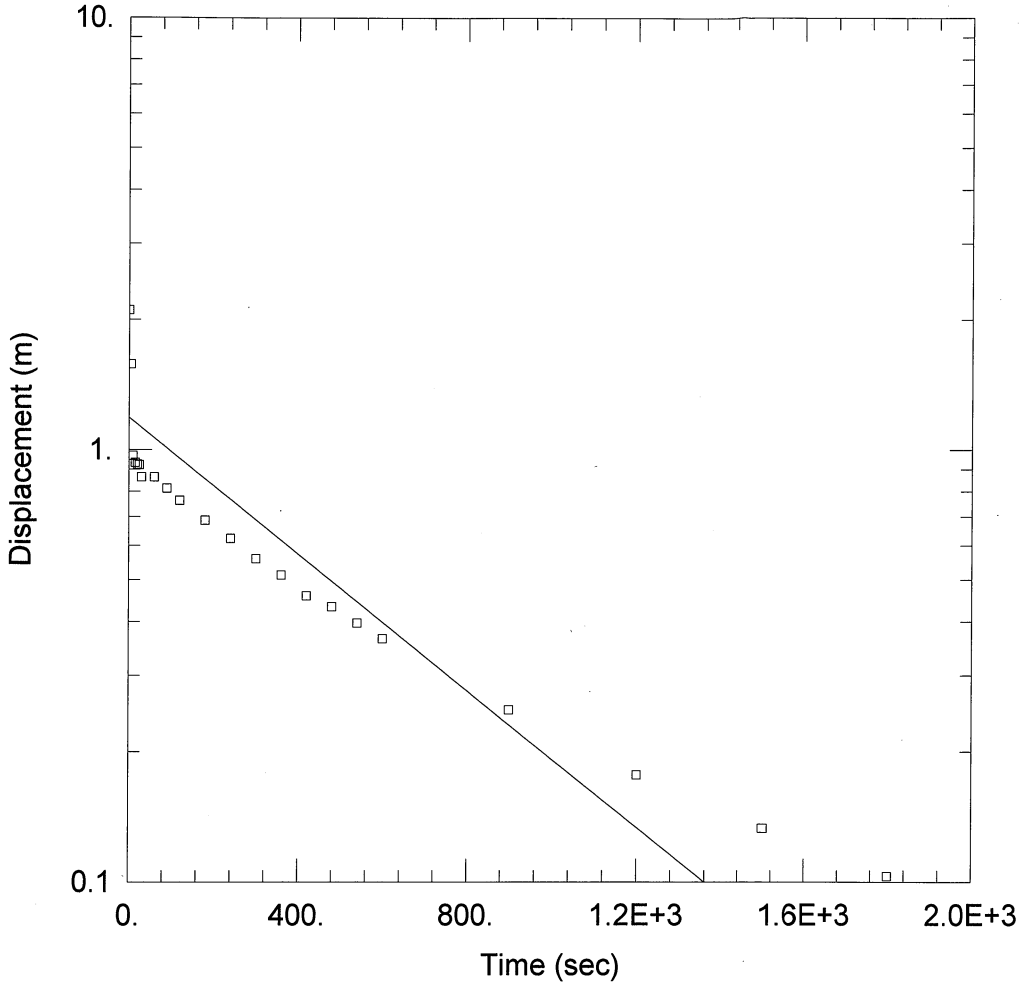
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.44E-7	m/sec

y0	2.184	m

K = 1.44E-5 cm/sec
T = K*b = 1.765E-6 m²/sec (0.01765 sq. cm/sec)



WELL TEST ANALYSIS

Data Set: L:\...\MW2.aqt
Date: 04/30/18 Time: 16:29:29

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Well: MW2
Test Date: September 11, 2017

AQUIFER DATA

Saturated Thickness: 2.109 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW2)

Initial Displacement: 2.105 m
Total Well Penetration Depth: 5. m
Casing Radius: 0.02625 m
Static Water Column Height: 2.105 m
Screen Length: 5. m
Well Radius: 0.0381 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 1.431E-6 m/sec
y0 = 1.187 m

Data Set: L:\TS\Projects\TS-NO-030045 Inventus Mining Pardo Gold Project\Reporting\Physical Baseline\AQTES
Date: 04/30/18
Time: 16:29:23

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Date: September 11, 2017
Test Well: MW2

AQUIFER DATA

Saturated Thickness: 2.109 m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW2

X Location: 556420. m
Y Location: 5183443. m

Initial Displacement: 2.105 m
Static Water Column Height: 2.105 m
Casing Radius: 0.02625 m
Well Radius: 0.0381 m
Well Skin Radius: 0.0381 m
Screen Length: 5. m
Total Well Penetration Depth: 5. m
Corrected Casing Radius (Bouwer-Rice Method): 0.0303 m
Gravel Pack Porosity: 0.3

No. of Observations: 22

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	2.105	240.	0.623
5.	1.578	300.	0.559
10.	0.969	360.	0.513
15.	0.934	420.	0.459
20.	0.925	480.	0.433
25.	0.922	540.	0.397
30.	0.864	600.	0.365
60.	0.864	900.	0.25
90.	0.814	1200.	0.177
120.	0.763	1500.	0.133
180.	0.686	1800.	0.103

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.765

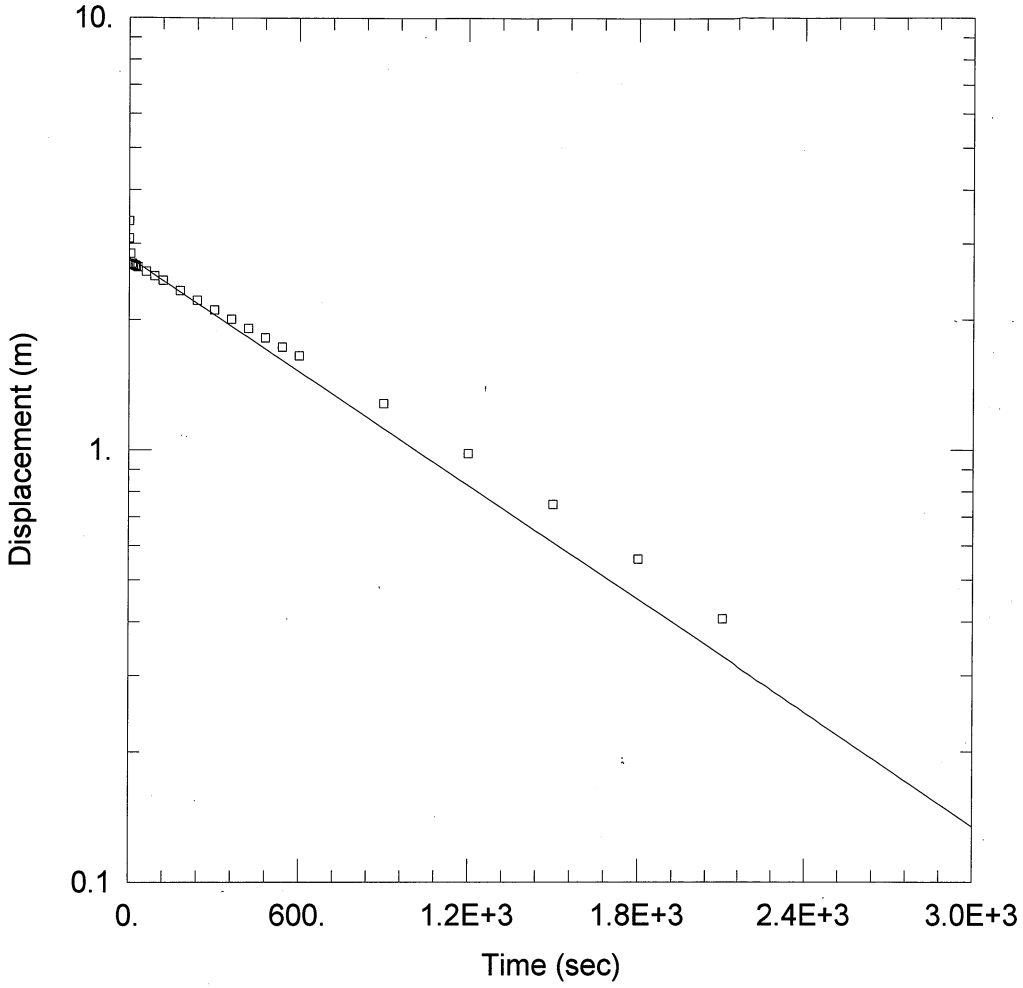
VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	1.431E-6	m/sec

y0	1.187	m

K = 0.0001431 cm/sec
T = K*b = 3.018E-6 m²/sec (0.03018 sq. cm/sec)



WELL TEST ANALYSIS

Data Set: L:\...\MW3.aqt
Date: 04/30/18 Time: 16:29:45

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Well: MW3
Test Date: September 11, 2017

AQUIFER DATA

Saturated Thickness: 3.4 m
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW3)

Initial Displacement: 3.088 m
Total Well Penetration Depth: 4.5 m
Casing Radius: 0.02625 m
Static Water Column Height: 3.388 m
Screen Length: 4.5 m
Well Radius: 0.02625 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 4.031E-7 m/sec
y0 = 2.783 m

Data Set: L:\TS\Projects\TS-NO-030045 Inventus Mining Pardo Gold Project\Reporting\Physical Baseline\AQTES

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Date: September 11, 2017
Test Well: MW3

AQUIFER DATA

Saturated Thickness: 3.4 m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW3

X Location: 556577. m
Y Location: 5183417. m

Initial Displacement: 3.088 m
Static Water Column Height: 3.388 m
Casing Radius: 0.02625 m
Well Radius: 0.02625 m
Well Skin Radius: 0.0381 m
Screen Length: 4.5 m
Total Well Penetration Depth: 4.5 m
Corrected Casing Radius (Bouwer-Rice Method): 0.02625 m
Gravel Pack Porosity: 0.3

No. of Observations: 23

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	3.388	300.	2.109
5.	2.848	360.	2.007
10.	2.703	420.	1.91
15.	2.684	480.	1.818
20.	2.671	540.	1.73
25.	2.663	600.	1.652
30.	2.652	900.	1.281
60.	2.589	1200.	0.983
90.	2.527	1500.	0.749
120.	2.467	1800.	0.559
180.	2.335	2100.	0.407
240.	2.22		

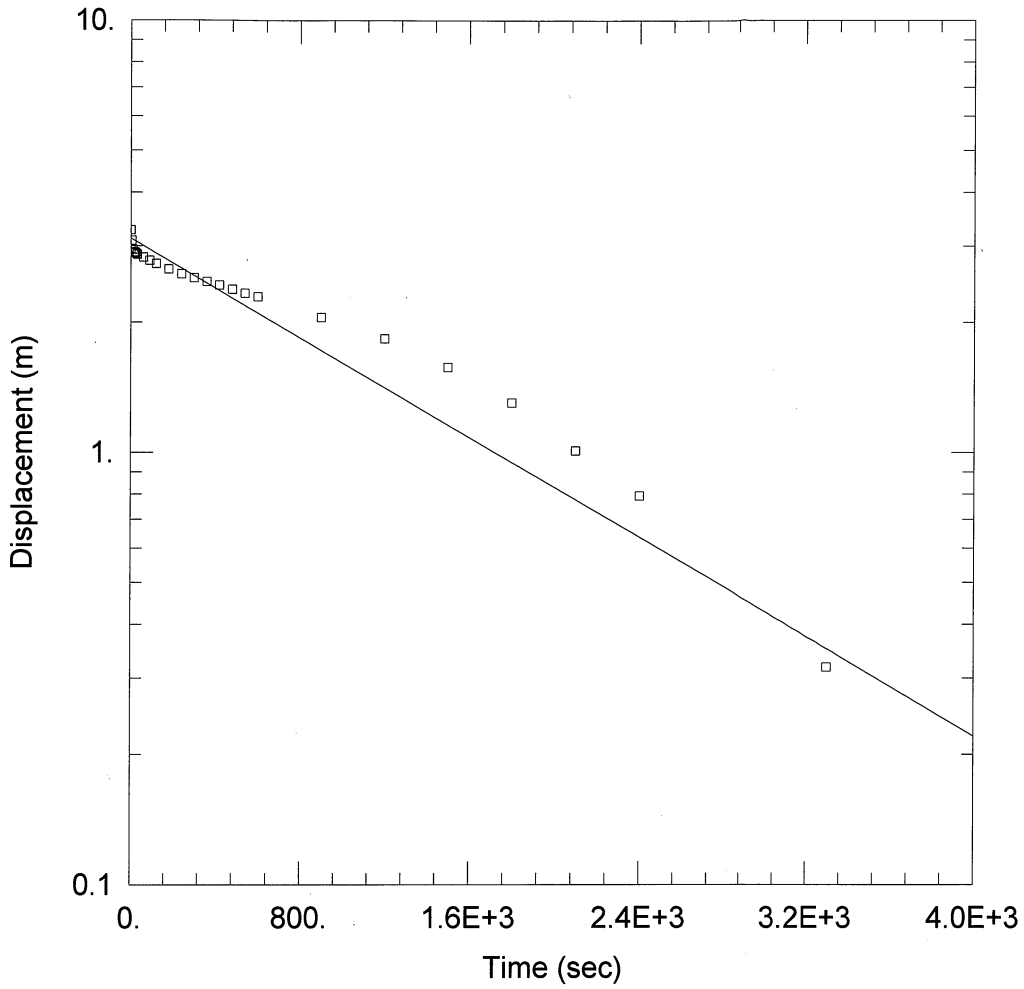
SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.993

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	4.031E-7	m/sec
y0	2.783	m



WELL TEST ANALYSIS

Data Set: L:\...\MW4.aqt
Date: 04/30/18 Time: 16:30:13

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Well: MW4
Test Date: September 11, 2017

AQUIFER DATA

Saturated Thickness: 3.29 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW4)

Initial Displacement: 2.96 m
Total Well Penetration Depth: 3.92 m
Casing Radius: 0.02625 m
Static Water Column Height: 3.26 m
Screen Length: 3.92 m
Well Radius: 0.02625 m
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 2.667E-7 m/sec y0 = 3.128 m

Data Set: L:\TS\Projects\TS-NO-030045 Inventus Mining Pardo Gold Project\Reporting\Physical Baseline\AQTES
Date: 04/30/18
Time: 16:30:23

PROJECT INFORMATION

Company: DST Consulting Engineers
Client: Inventus Mining
Project: TS-NO-030045
Location: Pardo Project
Test Date: September 11, 2017
Test Well: MW4

AQUIFER DATA

Saturated Thickness: 3.29 m
Anisotropy Ratio (Kz/Kr): 1.

SLUG TEST WELL DATA

Test Well: MW4

X Location: 556170. m
Y Location: 5182969. m

Initial Displacement: 2.96 m
Static Water Column Height: 3.26 m
Casing Radius: 0.02625 m
Well Radius: 0.02625 m
Well Skin Radius: 0.0762 m
Screen Length: 3.92 m
Total Well Penetration Depth: 3.92 m
Corrected Casing Radius (Bouwer-Rice Method): 0.02625 m
Gravel Pack Porosity: 0.3

No. of Observations: 25

Observation Data

Time (sec)	Displacement (m)	Time (sec)	Displacement (m)
0.	3.267	360.	2.483
5.	3.094	420.	2.436
10.	2.944	480.	2.384
15.	2.913	540.	2.337
20.	2.903	600.	2.293
25.	2.889	900.	2.054
30.	2.873	1200.	1.835
60.	2.829	1500.	1.576
90.	2.78	1800.	1.303
120.	2.735	2100.	1.01
180.	2.653	2400.	0.794
240.	2.586	3300.	0.318
300.	2.536		

SOLUTION

Slug Test
Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
ln(Re/rw): 3.874

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	2.667E-7	m/sec
y0	3.128	m

K = 2.667E-5 cm/sec
T = K*b = 8.775E-7 m²/sec (0.008775 sq. cm/sec)

Appendix C

Laboratory Certificates of Analysis

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: DST CONSULTING ENGINEERS
885 REGENT SREET, UNIT 3-1B
SUDBURY, ON P3E5M4
(705) 523-6680

ATTENTION TO: Michaela Haring

PROJECT: TS-NO-030045 GW

AGAT WORK ORDER: 17T259411

WATER ANALYSIS REVIEWED BY: Yris Verastegui, Report Reviewer

DATE REPORTED: Sep 19, 2017

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T259411

PROJECT: TS-NO-030045 GW

CLIENT NAME: DST CONSULTING ENGINEERS

ATTENTION TO: Michaela Haring

SAMPLING SITE:

SAMPLED BY:

Ground Water Parameters

DATE RECEIVED: 2017-09-12

DATE REPORTED: 2017-09-19

		SAMPLE DESCRIPTION:		MW 1	MW 2	MW 3	MW 4
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2017-09-11	2017-09-11	2017-09-11	2017-09-11
Parameter	Unit	G / S	RDL	8719715	8719729	8719738	8719747
Electrical Conductivity	uS/cm		2	97	82	49	150
pH	pH Units		NA	7.21	7.11	6.43	7.62
Total Hardness (as CaCO3)	mg/L		0.5	35.1	27.1	12.5	57.1
Total Suspended Solids (Low)	mg/L		1	69	17	111	396
Alkalinity (as CaCO3)	mg/L		5	36	30	11	52
Bicarbonate (as CaCO3)	mg/L		5	36	30	11	52
Carbonate (as CaCO3)	mg/L		5	<5	<5	<5	<5
Chloride	mg/L		0.10	3.02	0.39	0.42	1.19
Nitrate as N	mg/L		0.05	<0.05	<0.05	<0.05	0.08
Nitrite as N	mg/L		0.05	<0.05	<0.05	<0.05	<0.05
Sulphate	mg/L		0.10	7.03	9.72	7.22	18.3
Ammonia as N	mg/L		0.02	0.07	0.93	1.50	0.03
Ammonia-Un-ionized	mg/L		NA	0.0007	0.0074	0.0025	0.00075
Total Phosphorus	mg/L		0.01	0.08	0.46	0.14	0.19
Total Phosphorus, Dissolved	mg/L		0.02	0.04	0.04	0.07	0.02
Dissolved Organic Carbon	mg/L		1.0	3.1	4.0	23.3	4.2
Calcium	mg/L		0.05	8.91	7.08	3.41	15.8
Magnesium	mg/L		0.05	3.11	2.28	0.97	4.29
Sodium	mg/L		0.05	1.61	1.22	0.87	2.34
Potassium	mg/L		0.05	1.59	1.16	0.64	3.78
Aluminum	mg/L		0.004	0.237	0.071	0.567	0.063
Antimony	mg/L		0.003	<0.003	<0.003	<0.003	<0.003
Arsenic	mg/L		0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L		0.002	0.007	0.022	0.006	0.006
Beryllium	mg/L		0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L		0.010	0.106	0.078	0.049	0.071
Cadmium	mg/L		0.0001	<0.0001	<0.0001	<0.0001	0.0001
Chromium	mg/L		0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		0.0005	0.0139	0.0058	0.0049	0.0053

Certified By: Iris Verástegui

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Certificate of Analysis

AGAT WORK ORDER: 17T259411

PROJECT: TS-NO-030045 GW

CLIENT NAME: DST CONSULTING ENGINEERS

ATTENTION TO: Michaela Haring

SAMPLING SITE:

SAMPLED BY:

Ground Water Parameters

DATE RECEIVED: 2017-09-12

DATE REPORTED: 2017-09-19

		SAMPLE DESCRIPTION:		MW 1	MW 2	MW 3	MW 4
		SAMPLE TYPE:		Water	Water	Water	Water
		DATE SAMPLED:		2017-09-11	2017-09-11	2017-09-11	2017-09-11
Parameter	Unit	G / S	RDL	8719715	8719729	8719738	8719747
Copper	mg/L		0.001	0.002	0.002	0.003	0.005
Iron	mg/L		0.01	1.43	4.76	27.9	0.36
Lead	mg/L		0.001	0.004	<0.001	<0.001	<0.001
Manganese	mg/L		0.002	0.520	0.231	0.128	0.315
Mercury	mg/L		0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L		0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.003	0.011	0.018	0.017	0.015
Selenium	mg/L		0.004	<0.004	0.007	<0.004	<0.004
Silicon	mg/L		0.05	5.04	4.90	4.43	4.87
Silver	mg/L		0.0001	<0.0001	0.0002	<0.0001	<0.0001
Strontium	mg/L		0.005	0.026	0.019	0.011	0.020
Thallium	mg/L		0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Tin	mg/L		0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.002	0.006	<0.002	0.006	<0.002
Uranium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.002	<0.002	<0.002	0.004	<0.002
Zinc	mg/L		0.005	0.012	0.014	0.018	0.026
Zirconium	mg/L		0.004	<0.004	<0.004	<0.004	<0.004

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8719715-8719747 The calculation of Un-ionized Ammonia was based on lab measured parameters (pH and temperature) rather than the field parameters, these were not provided to the lab.The temperature is recorded at the time of pH measurement. Values are reported as calculated.

Certified By: Iris Verástegui

AGAT Laboratories

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: DST CONSULTING ENGINEERS

AGAT WORK ORDER: 17T259411

PROJECT: TS-NO-030045 GW

ATTENTION TO: Michaela Haring

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Sep 19, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Ground Water Parameters															
Electrical Conductivity	8721372		2440	2500	2.4%	< 2	109%	80%	120%	NA			NA		
pH	8721372		7.92	7.91	0.1%	NA	99%	90%	110%	NA			NA		
Total Suspended Solids (Low)	8721317		3	3	NA	< 1	94%	80%	120%	NA			NA		
Alkalinity (as CaCO3)	8721372		386	381	1.3%	< 5	101%	80%	120%	NA			NA		
Bicarbonate (as CaCO3)	8721372		386	381	1.3%	< 5	NA			NA			NA		
Carbonate (as CaCO3)	8721372		<5	<5	NA	< 5	NA			NA			NA		
Chloride	8722422		4.30	4.30	0.0%	< 0.10	91%	90%	110%	108%	90%	110%	104%	80%	120%
Nitrate as N	8722422		<0.05	<0.05	NA	< 0.05	90%	90%	110%	107%	90%	110%	91%	80%	120%
Nitrite as N	8722422		<0.05	<0.05	NA	< 0.05	NA	90%	110%	97%	90%	110%	88%	80%	120%
Sulphate	8722422		0.51	0.46	NA	< 0.10	95%	90%	110%	107%	90%	110%	101%	80%	120%
Ammonia as N	8718439		<0.02	<0.02	NA	< 0.02	105%	90%	110%	107%	90%	110%	108%	80%	120%
Total Phosphorus	8709527		3.84	3.95	2.8%	< 0.01	103%	90%	110%	98%	90%	110%	101%	70%	130%
Total Phosphorus, Dissolved	8709527		3.20	3.40	6.1%	< 0.02	93%	90%	110%	94%	90%	110%	96%	80%	120%
Dissolved Organic Carbon	8719715	8719715	3.1	2.7	NA	< 1.0	93%	90%	110%	105%	90%	110%	95%	80%	120%
Calcium	8713953		15.9	15.8	0.6%	< 0.05	96%	90%	110%	97%	90%	110%	98%	70%	130%
Magnesium	8713953		4.39	4.32	1.6%	< 0.05	97%	90%	110%	98%	90%	110%	98%	70%	130%
Sodium	8713953		51.9	51.5	0.8%	< 0.05	99%	90%	110%	99%	90%	110%	101%	70%	130%
Potassium	8713953		2.10	2.06	1.9%	< 0.05	99%	90%	110%	99%	90%	110%	100%	70%	130%
Aluminum	8722931		0.050	0.050	0.0%	< 0.004	102%	90%	110%	106%	90%	110%	105%	70%	130%
Antimony	8722931		<0.003	<0.003	NA	< 0.003	100%	90%	110%	97%	90%	110%	101%	70%	130%
Arsenic	8722931		<0.003	<0.003	NA	< 0.003	97%	90%	110%	97%	90%	110%	128%	70%	130%
Barium	8722931		0.005	0.005	NA	< 0.002	97%	90%	110%	99%	90%	110%	84%	70%	130%
Beryllium	8722931		<0.001	<0.001	NA	< 0.001	104%	90%	110%	106%	90%	110%	111%	70%	130%
Bismuth	8722931		<0.002	<0.002	NA	< 0.002	102%	90%	110%	106%	90%	110%	88%	70%	130%
Boron	8722931		<0.010	<0.010	NA	< 0.010	99%	90%	110%	108%	90%	110%	108%	70%	130%
Cadmium	8722931		<0.0001	<0.0001	NA	< 0.0001	102%	90%	110%	104%	90%	110%	106%	70%	130%
Chromium	8722931		<0.003	<0.003	NA	< 0.003	101%	90%	110%	103%	90%	110%	96%	70%	130%
Cobalt	8722931		<0.0005	<0.0005	NA	< 0.0005	96%	90%	110%	97%	90%	110%	108%	70%	130%
Copper	8722931		0.024	0.024	0.0%	< 0.001	101%	90%	110%	102%	90%	110%	105%	70%	130%
Iron	8722931		<0.01	<0.01	NA	< 0.01	97%	90%	110%	103%	90%	110%	107%	70%	130%
Lead	8722931		0.002	0.002	NA	< 0.001	101%	90%	110%	105%	90%	110%	95%	70%	130%
Manganese	8722931		0.003	0.003	NA	< 0.002	101%	90%	110%	105%	90%	110%	109%	70%	130%
Mercury	8716155		<0.0001	<0.0001	NA	< 0.0001	102%	90%	110%	102%	90%	110%	94%	80%	120%
Molybdenum	8722931		<0.002	<0.002	NA	< 0.002	93%	90%	110%	95%	90%	110%	104%	70%	130%
Nickel	8722931		0.037	0.037	0.0%	< 0.003	100%	90%	110%	103%	90%	110%	108%	70%	130%
Selenium	8722931		<0.004	<0.004	NA	< 0.004	97%	90%	110%	96%	90%	110%	129%	70%	130%
Silicon	8722931		7.08	7.07	0.1%	< 0.05	103%	90%	110%	104%	90%	110%	95%	70%	130%
Silver	8722931		<0.0001	<0.0001	NA	< 0.0001	98%	90%	110%	107%	90%	110%	93%	70%	130%
Strontium	8722931		0.085	0.086	1.2%	< 0.005	95%	90%	110%	97%	90%	110%	96%	70%	130%

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: DST CONSULTING ENGINEERS

AGAT WORK ORDER: 17T259411

PROJECT: TS-NO-030045 GW

ATTENTION TO: Michaela Haring

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Sep 19, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Thallium	8722931		<0.0003	<0.0003	NA	< 0.0003	105%	90%	110%	106%	90%	110%	96%	70%	130%
Tin	8722931		<0.002	<0.002	NA	< 0.002	104%	90%	110%	102%	90%	110%	108%	70%	130%
Titanium	8722931		<0.002	<0.002	NA	< 0.002	97%	90%	110%	100%	90%	110%	101%	70%	130%
Uranium	8722931		<0.002	<0.002	NA	< 0.002	97%	90%	110%	99%	90%	110%	102%	70%	130%
Vanadium	8722931		<0.002	<0.002	NA	< 0.002	100%	90%	110%	103%	90%	110%	104%	70%	130%
Zinc	8722931		0.382	0.404	5.6%	< 0.005	101%	90%	110%	110%	90%	110%	115%	70%	130%
Zirconium	8722931		<0.004	<0.004	NA	< 0.004	98%	90%	110%	99%	90%	110%	116%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Iris Verástegui

AGAT Laboratories

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Method Summary

CLIENT NAME: DST CONSULTING ENGINEERS

AGAT WORK ORDER: 17T259411

PROJECT: TS-NO-030045 GW

ATTENTION TO: Michaela Haring

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	SM 4500-H+ B	PC TITRATE
Total Hardness (as CaCO3)	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Total Suspended Solids (Low)	INOR-93-6028	SM 2540 D	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Bicarbonate (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Carbonate (as CaCO3)	INOR-93-6000	SM 2320 B	PC TITRATE
Chloride	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Sulphate	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	QuikChem 10-107-06-1-J & SM 4500 NH3-F	LACHAT FIA
Ammonia-Un-ionized		MOE REFERENCE, PWQOs Tab 2	CALCULATION
Total Phosphorus	INOR-93-6022	SM 4500-P B&E	SPECTROPHOTOMETER
Total Phosphorus, Dissolved	INOR-93-6022	SM 4500-P B&E	SPECTROPHOTOMETER
Dissolved Organic Carbon	INOR-93-6049	EPA 415.1 & SM 5310 B	SHIMADZU CARBON ANALYZER
Calcium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Magnesium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Sodium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Potassium	MET-93-6105	EPA SW-846 6010C & 200.7	ICP/OES
Aluminum	MET-93-6103	SW-846 6020A & 200.8	ICP-MS
Antimony	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Barium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Bismuth	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Boron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Chromium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Copper	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Iron	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Lead	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Manganese	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Mercury	MET-93-6100	EPA SW-846 7470 & 245.1	CVAAS
Molybdenum	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Nickel	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Selenium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silicon	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Silver	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Strontium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Thallium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Tin	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Titanium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Uranium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zinc	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS
Zirconium	MET-93-6103	EPA SW-846 6020A & 200.8	ICP-MS

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario; L4Z 1Y2
Phone: 905-712-5100;
Fax: 905-712-5122

CHAIN OF CUSTODY RECORD

LABORATORY USE ONLY
Arrival Condition: [ ] Good [ ] Poor (complete "Notes")
Arrival Temperature: 3.4 4.4.2
AGAT Job Number:
Notes: 17T259411

Client Information

Company: DST Consulting Engineers Inc.
Contact: Michaela Haring
Address: 885 Regent St
Sudbury Ontario P3E 5M4
Phone: 705-523-6680 Fax:
PO#:
Client Project #: TS-NO-030045 GW
AGAT Quotation #: 177549

Report Information

1. Name: Michaela Haring
Email: mharing@dstgroup.com
2. Name: Laura Ritchie
Email: lritchie@dstgroup.com
3. Name:
Email:
4. Name:
Email:

Report Format
(Please "x" those that apply)
[ ] Single sample per page
[x] Multiple samples per page
[ ] Results by Fax

Turnaround Time (TAT)*
(Please "x" the applicable box below)
Regular TAT:
[x] 5 to 7 working days
Rush TAT (Rush Surcharges Apply):
[ ] 3 to 5 days
[ ] 48 to 72 hours
[ ] 24 to 48 hours
Date Required (Rush surcharges may apply)

Regulatory Guideline Required:
(Please "x" those that apply)
[ ] Reg 153 Table (indicate one) [ ] Ind/Com [ ] Res/Park [ ] Ag [ ] Med/Fine [ ] Coarse
[ ] Sewer Use Region (indicate one) [ ] Sanitary [ ] Storm
[ ] PWQO [ ] Reg 558 [ ] CCME [ ] Other (indicate)

Is this a drinking water sample (potable water intended for human consumption)?
[ ] Yes [x] No
If "Yes" please use the Drinking Water Chain of Custody Record

Sample Identification	Date Sampled	Time Sampled	Sample Matrix	# of Containers	Comments - Site/Sample Info, Sample Containment	ALK, PH, COND	Bicarb, Carbonate	Ammonia, unionized NH3	T Phos, dissolved TP	low level TSS, DOC	Hardness	Cl, NO2, NO3, SO4	CA, MG, Na, K	Metals full scan and HG
MW 1	Sept11-17	p.m	GW	7	metals, mercury field filtered	✓	✓	✓	✓	✓	✓	✓	✓	✓
MW 2	↑	↕	↕	↕		✓	✓	✓	✓	✓	✓	✓	✓	✓
MW 3	↓	↓	↓	↓		✓	✓	✓	✓	✓	✓	✓	✓	✓
MW 4	Sept11-17	p.m	GW	7		✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTAL # OF CONTAINERS				0										

* Samples received after 2:00 PM will be logged in for the next business day. TAT is exclusive of weekends and statutory holidays

Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
M.Haring M.Haring	Sept 12-17	R. Lawrence	Sept. 12/17
Sample Relinquished By (print name & sign)	Date/Time	Samples Received By (print name and sign)	Date/Time
		Simon Z	17/9/13 9 26

Special Instructions
15:00

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