Appendix 6.6-D

Numerical Groundwater Flow Model

AJAX PROJECT

Environmental Assessment Certificate Application / Environmental Impact Statement for a Comprehensive Study

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

KGHM AJAX MINING INC.

AJAX PROJECT ENVIRONMENTAL ASSESSMENT

NUMERICAL GROUNDWATER FLOW MODEL

FINAL

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August 21, 2015
Project No: 1125007-04

Nettie Ore
KGHM Ajax Mining Inc.
Suite 200-124 Seymour Street
Kamloops, BC V2C 2E1

Dear Ms. Ore,

Re: Ajax Project EA – Numerical Groundwater Flow Model

Please find attached a copy of the above referenced FINAL report. BGC appreciates the opportunity to be involved in this world class mining project. We look forward to providing continued support to KGHM Ajax Mining Inc.

Should you have any questions or comments, please do not hesitate to contact the undersigned.

Yours sincerely,

BGC ENGINEERING INC.
per:

ORIGINAL SIGNED
[redacted]

Cassandra Koenig, M.Sc., P.Geo.
Hydrogeologist

EXECUTIVE SUMMARY

BGC Engineering Inc. (BGC) was retained by KGHM Ajax Mining Inc. (KAM) to develop a three-dimensional (3D) groundwater flow model for the Ajax Project (the Project) near Kamloops, British Columbia. The model is based on the conceptual understanding of the hydrogeologic setting of the Ajax Project described in the companion baseline groundwater hydrology report (BGC 2015a).

The overall objective of the groundwater model developed for this scope of work was to provide predictive simulations to evaluate potential effects of the Project (i.e., the open pit, mine rock storage facilities (MRSFs), ore stockpiles, the Tailings Storage Facility (TSF) and Project site water management facilities) on the physical groundwater system (i.e., groundwater quantity, hydraulic gradient magnitude and flow directions, and changes to groundwater elevations) during the Construction, Operation, Decommissioning and Closure, and Post Closure phases of mining. This report documents the groundwater model development and calibration, and describes its use to meet the following objectives:

- Estimate potential changes to surface water baseflows during Construction, Operation, Decommissioning and Closure, and Post Closure as a result of the Project (i.e., Jacko Lake and creeks within the Peterson Creek, Anderson Creek, and Cherry Creek watersheds).
- Estimate potential seepage quantities, travel times, and groundwater migration pathways from the Project to surface water receptors to support the Water Balance Model (WBM), developed separately (BGC 2015b), and surface water quality assessment completed by others.
- Evaluate the potential effects of the Project on the Post Closure groundwater elevations in the Aberdeen subdivision area.
- Estimate groundwater inflows to the open pit, time required for the pit lake to fill, and the maximum stable pit lake elevation Post Closure.
- Perform sensitivity analyses to identify key parameters influencing system behavior and provide an evaluation of prediction uncertainty.
- Estimate groundwater travel times from mine facility sources (i.e., EMRSF, EMRSF Pond and Peterson Creek Downstream Pond) to RES-2, the nearest down-gradient well to the Mine Site completed in the Peterson Creek Aquifer, for the Project human health and ecological risk assessment (HHERA) completed by others.

The scope of this assessment was developed to meet the Application Information Requirements / Environmental Impact Statement Guidelines (AIR/EIS Guidelines) for the Ajax Project as outlined in EAO (2015). This report has also considered information requirements outlined in Section 4.1 of the document Framework for a Hydrogeologic Study in support of an application for an Environmental Assessment Certificate under the Environmental Assessment Act and Regulations for groundwater extraction projects (BC MOE 2013). In addition, the groundwater flow model development considered guidance provided by the Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities (BC MOE 2012).

Model Development and Calibration

The groundwater flow model for the site was developed using MODFLOW-SURFACT (Version 3.0) and the graphical user interface Groundwater Vistas (Version 6.59, Build 11; ESI 2011). Groundwater sources and surface water receptors were identified and designated as sub-regions of the model to permit computation of separate water budgets using Zone Budget (Version 3.01; USGS 2009). MODPATH, a commonly-used particle tracking program developed for MODFLOW (Version 3; Pollock, 1994), was used to simulate the forward migration pathways of groundwater seepage originating from specific Project facilities.

The conceptual hydrogeologic model, as described in the Baseline Groundwater Hydrology Assessment (BGC 2015a), forms the basis for the numerical hydrogeologic model. The groundwater flow model was calibrated to average groundwater elevations (418 monitoring locations including 126 Mine Site stations and 292 regional stations), seasonal groundwater fluctuations (45 monitoring locations with data records varying from six months to five years), and data collected during an 8-day pumping test from a well completed in bedrock between the open pit and Jacko Lake (BGC 2011a).

Calibration statistics for Mine Site data (126 of 418 locations) resulted in a mean error in simulated hydraulic head of -2.1 m and a normalized root mean square error (NRMSE) of 3.5%. The correlation coefficient for the entire dataset is 0.995, indicating a good match between observed and simulated hydraulic heads. The calibrated existing conditions model formed the basis for the Construction, Operation, Decommissioning and Closure, and Post Closure models which were used to evaluate Project effects on the existing groundwater conditions.

The simulated impacts to the groundwater flow system as a result of the Project are summarized below:

Impacts to Jacko Lake Flows

- Jacko Lake was predicted to be a groundwater sink (i.e., a groundwater discharge zone) in existing conditions and during Construction.
- During Operation, Decommissioning and Closure, and Post Closure, seepage from Jacko Lake into the open pit was predicted to range from 49 m^3/day (0.6 L/s) at the beginning of Operation to a maximum of 131 m^3/day (1.5 L/s) in Post Closure, with an average seepage rate of 112 m^3/day (1.3 L/s) over the same period.

Impacts to Creek Flows

- The groundwater model predicted a 3% decrease in Lower Peterson Creek baseflow from existing conditions to the end of Operation, followed by an additional 6% decrease in baseflow from the end of Operation to Post Closure with best estimate model parameters.
- Sensitivity simulations suggest that baseflows to Lower Peterson Creek may increase by approximately a factor of 4 at the end of Operation and Post Closure in the scenario where the hydraulic conductivity of the Peterson Creek Aquifer is increased by a factor of 10. This indicates that predicted baseflows to Lower Peterson Creek are relatively sensitive to this parameter.
- Sensitivity simulations suggest that baseflows to Lower Peterson Creek may decrease by approximately a factor of 5 at the end of Operation and Post Closure in the scenario where the hydraulic conductivity of all units are increased by a factor of 5.
- Baseflows to Humphrey Creek, Cherry Creek and Anderson Creek were predicted to remain unchanged throughout Construction, Operation, Decommissioning and Closure, and Post Closure.

Impacts to Groundwater Levels and Seepage from Project Facilities

- Groundwater elevations were predicted to increase by more than 100 m below the TSF.
- The majority of seepage from the TSF was predicted to report to the open pit or be lost to evapotranspiration.
- Smaller amounts of TSF seepage were predicted to report to water management ponds surrounding the TSF (North Embankment Pond 1 and 2, South and Southeast Embankment Ponds, and SMRSF Pond).
- The majority of seepage from the EMRSF was predicted to report to the open pit, Lower Peterson Creek, and EMRSF Pond.
- The majority of seepage from the SMRSF was predicted to report to the open pit.
- Smaller amounts of SMRSF seepage were predicted to report to the SMRSF Pond, Humphrey Creek and Peterson Creek Downstream Pond (PCDP).
- The majority of seepage from the WMRSF was predicted to report to Jacko Lake and the open pit.

Impacts to Hydraulic Heads in the Aberdeen Subdivision Area

- Groundwater elevations in Aberdeen were not predicted to change due to the Project under Construction, Operation, Decommissioning and Closure, or Post Closure phases of mining under base case conditions, and were predicted to decline by 0 to approximately 2 m under the range of sensitivity simulations considered.

Pit Lake Formation

- The open pit / pit lake was predicted to be a permanent groundwater sink under Construction, Operation, Decommissioning and Closure, and Post Closure conditions.
- The excavation of the open pit will reach approximately 450 masl and is predicted to form a pit lake that will stabilize at an approximate maximum stable pit lake elevation of approximately 760 masl, approximately 300 years Post Closure.
- Groundwater elevations surrounding the open pit were predicted to be lowered by more than 100 m from existing conditions to the end of Operation and through Post Closure.

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AIR/EIS Guidelines	Application Information Requirements/Environmental Impact Statement
Application/EIS	Application for an Environmental Assessment Certificate/Environmental Impact Statement for a Comprehensive Study
AME	Abacus Mining and Exploration Corporation
BC	British Columbia
BC EAO	British Columbia Environmental Assessment Office
BCGS	British Columbia Geological Survey
BC MOE	British Columbia Ministry of Environment
BGC	BGC Engineering Inc.
CEA Agency	Canadian Environmental Assessment Agency
DRN	MODFLOW Drain Package
DWMS	Aberdeen Dewatering and Monitoring System
EA	Environmental Assessment
EAO	Environmental Assessment Office
EIS	Environmental Impact Statement
ELFZ	Edith Lake Fault Zone
EMRSF	East Mine Rock Storage Facility
ESI	Environmental Simulations Inc.
ET	Evapotranspiration
FS	Feasibility Study
GA	General Arrangement
GHB	MODFLOW General Head Boundary Package
HDPE	High Density Polyethylene
HFB	MODFLOW Hydraulic Flow Barrier Package
HHERA	Human Health and Ecological Risk Assessment
IMH	Iron Mask Hybrid
IPMRSF	In-Pit Mine Rock Storage Facility
KAM	KGHM Ajax Mining Inc.
KCB	Klohn Crippen Berger Ltd.
Keystone	Keystone Wildlife Research Ltd.
KP	Knight Piesold
LG	Low Grade

LSA	Local Study Area
MG	Medium Grade
MRSF	Mine Rock Storage Facility
NPAG	Non Potentially Acid Generating
NRMSE	Normalized Root Mean Square Error
PCDP	Peterson Creek Downstream Pond
RIV	MODFLOW River Package
RMS	Root Mean Square
PEA	Preliminary Economic Analysis
RSA	Regional Study Area
SFR	MODFLOW Streamflow-Routing Package
SI	Site Investigation
SLD	Sugarloaf Diorite
SMRSF	South Mine Rock Storage Facility
SSN	Stk'emlupsemc te Secwepemc Nation
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
USGS	United States Geological Survey
uTrN	Nicola Volcanics
uTRNop	Picrite Unit
VC	Valued component
VWP	Vibrating Wire Piezometer
WBM	Water Balance Model
WRBC	Water Resources of British Columbia
WMRSF	West Mine Rock Storage Facility

1.0 INTRODUCTION

BGC Engineering Inc. (BGC) was retained by KGHM Ajax Mining Inc. (KAM) to develop a three-dimensional (3D) groundwater flow model for the Ajax Project (the Project) near Kamloops, British Columbia. The work was conducted under BGC KAM Contract Number KA39-CON-000004 and is based on a proposed scope of work provided by BGC in September 2014 and subsequent discussions. The scope of work for this study is described in Section 2.0.

This report describes the numerical groundwater flow model development, simulation results, and sensitivity analysis results for predictive groundwater modelling completed to address the requirements for the Environmental Assessment (EA) of the Ajax Project as documented in the Application Information Requirements (AIR) and Environmental Impact Statement (EIS) Guidelines (EAO 2015).

This report will support the provincial Application for an Environmental Assessment (EA) Certificate and the federal EIS for the Project, to be submitted in 2015. The provincial Application and the federal EIS will be referred to as the Application/EIS throughout this document.

The numerical groundwater flow model was developed based on the conceptual understanding of the hydrogeologic setting of the Ajax Project described in the Baseline Groundwater Hydrology Assessment (BGC 2015a). The baseline report was based on the review and compilation of site investigation (SI) data and results from geological, hydrogeological, geotechnical and groundwater quality field programs conducted by BGC and others on behalf of KAM, as well as publicly available hydrogeologic data for the region.

1.1. Background and Project Description

KGHM Ajax Mining Inc. proposes to develop the Ajax Project, an open pit copper-gold mine at the historic Afton Mining Camp, south of the City of Kamloops, British Columbia (BC). The Project is located in the South-Central Interior of British Columbia, southeast of the junction of the Trans-Canada Highway No. 1 and the Coquihalla Highway (No. 5), within the Thompson Nicola Regional District.

The Project lies in the traditional territory of the Secwepemc Nation. Within the Secwepemc Nation, the Tk’emlúps te Secwepemc and the Skeetchestn Indian Band are the Aboriginal groups in closest proximity to the Project. In a cooperative effort, the Tk’emlúps te Secwepemc and Skeetchestn Indian Bands have formed the Stk’emlupsemc te Secwepemc Nation (SSN), as a division of the greater Secwepemc Nation. The Ashcroft Indian Band and Lower Nicola Indian Band, whose members are part of the Nlaka’pamux Nation also assert their Aboriginal rights to the Project area- an area of common interest with the SSN.

The Ajax property includes three historic pits: the Ajax West E Pit, the Ajax West W Pit, and the Ajax East Pit. The pits were formerly mined in the 1980s and 1990s. As many as 25 rock types have been recognized in the Project area, some of which are "hybrid" units resulting from the intermixing of multiple rock types.

Key Project facilities include the Tailings Storage Facility (TSF), which is planned as a conventional tailings storage facility; water management ponds; Peterson Creek diversion, and the Tailings Embankments, which will be constructed using mine rock; and four mine rock storage facilities (MRSFs). The four MRSFs include:

- The South Mine Rock Storage Facility (SMRSF)
- East Mine Rock Storage Facility (EMRSF)
- West Mine Rock Storage Facility (WMRSF)
- The In-Pit Mine Rock Storage Facility (IPMRSF).

Several facilities that will be part of the operation phase but will not remain after project closure include the:

- Plant facilities and administration buildings
- Reclamation stockpiles
- Explosives facility
- Truck shop and fuel storage
- Power lines
- Access roads.

The mine plan for the Project predicts an operation based on a mill throughput of 65,000 tonnes of ore per day from the Ajax Pit with up to a 23 year mine life. The construction phase of the Project will be approximately two and a half years, and following the 23 year operation the decommissioning and closure phase is expected to take up to 5 years. Over the mine life the Project will produce approximately 140 million pounds of copper and 130,000 ounces of gold annually with the concentrate shipped by truck to the Port of Vancouver. The General Arrangement (GA) of the Project is shown on Drawing 01.

The Project is located south of the City of Kamloops. The Aberdeen area of the City of Kamloops (Aberdeen) is approximately 3 km north of the Project (Drawing 01), across a topographic divide. The Aberdeen area has been the focus of geotechnical studies to support subdivision development since the 1970s. In 1995, several homes were affected by ground movement near the intersection of Van Horne Dr. and Howe Rd, an event now referred to as the "Van Horne Slide". As part of an emergency mitigation plan, pumping wells were installed to dewater the affected area, effectively stopping the Van Horne Slide in 1996 (City of Kamloops 2008). Potential effects of the Project on piezometric elevations at Aberdeen are of interest to KAM and other stakeholders.

2.0 SCOPE OF WORK

2.1. Project Objectives

The overall objective of the groundwater model developed for this scope of work was to provide predictive simulations to evaluate potential effects of the Project (i.e., the open pit, MRSFs, ore stockpiles, the TSF and Project site water management facilities) on the physical groundwater system (i.e., seepage quantities, magnitude and flow direction, and changes to groundwater elevations) during Construction, Operation, Decommissioning and Closure, and Post Closure. This report documents the groundwater model development and describes its use to meet the following primary objectives:

- Estimate potential changes to surface water baseflows during Construction, Operation, Decommissioning and Closure, and Post Closure as a result of the Project (i.e., Creeks within the Peterson Creek, Anderson Creek, and Cherry Creek watersheds).
- Identify surface water receptors (i.e., Jacko Lake, Peterson Creek, water management ponds) of contact water (i.e., water originating from the TSF and MRSFs) using particle tracking.
- Estimate potential seepage quantities, travel times, and groundwater migration pathways from mine facility sources to surface water receptors to support Water Balance Model (WBM) development (BGC 2015b), and surface water quality modeling completed by Knight Piesold (KP) (2015a).
- Evaluate the potential effects of the Project on the groundwater elevations in the Aberdeen subdivision area Post Closure.
- Estimate groundwater inflows to the open pit, time required for the pit lake to fill, and the maximum stable pit lake elevation during the Post Closure phase of the Project.
- Perform a sensitivity analysis to identify key parameters influencing system behavior and provide an evaluation of prediction uncertainty.

The scope of work also included the following secondary objective:

- Estimate groundwater travel times from mine facility sources (i.e., EMRSF, EMRSF Pond, and Peterson Creek Downstream Pond(PCDP)) to RES-2, the nearest down-gradient well to the Mine Site completed in the Peterson Creek Aquifer, for the Project human health and ecological risk assessment (HHERA) completed by others.

The scope of work described in Section 2 of this report is consistent with our understanding of the AIR/EIS Guidelines for the Ajax Project as outlined in (EAO 2015). This report also considered information requirements outlined in Section 4.1 of the document Framework for a Hydrogeologic Study in Support of an Application for an Environmental Assessment Certificate under the Environmental Assessment Act and Regulations for Groundwater Extraction Projects (BC MOE 2013). In addition, the groundwater flow model development considered the Guidelines for Groundwater Modelling to Assess Impacts of Proposed Natural Resource Development Activities (BC MOE 2012).

The Groundwater Quantity effects assessment, completed separately, will rely on the results from the 3D groundwater flow model predictions presented in this report and baseline hydrogeology characteristics provided in BGC (2015a). Groundwater Quantity is defined as a valued component (VC) by EAO (2015) "for its importance to humans for drinking water, and livestock and irrigation water." EAO (2015) describes the Groundwater Quantity effects assessment requirements as follows:

- *"Identify and analyze potential adverse effects resulting from the Project, including potential for increases in piezometric levels in the Aberdeen Hills area that may adversely impact slope stability in that area, and potential impacts on Jacko Lake and Peterson Creek. It will include effects of construction, operation, decommissioning and closure, and Post Closure activities*
- *Describe measures the Proponent will commit to undertaking to mitigate any potential adverse effects."*

The groundwater flow model developed for the present scope of work was a watershed scale 3D numerical model calibrated to baseline hydrogeologic and hydrologic data. The EAO (2015) described the 3D numerical groundwater flow model for the Ajax Project as the *"primary tool"* for the Groundwater Quantity assessment, and indicated that the following inputs were to be considered:

- *"Water levels at measured well sites, in streams, wetlands, springs and ponds*
- *Available groundwater pumping test data*
- *Stream flow measurements to identify gaining and losing stream reaches as well as base flow contributions*
- *Meteorological data to address net precipitation available for groundwater recharge and runoff*
- *Where long-term surface and groundwater data are available for the Aberdeen neighbourhood, they will be utilized in the [3D groundwater flow] model."*

2.2. Project Tasks

The following main tasks were completed to meet the project objectives described in Section 2.1:

1. Review baseline hydrology conditions and conceptual hydrogeological model developed by BGC (2015a).
2. Develop a 3D numerical groundwater flow model consistent with conceptual hydrogeological model.
3. Calibrate the 3D numerical groundwater flow model to steady state and transient existing conditions.
4. Apply the model to Construction, Operation, Decommission and Closure conditions.
5. Apply the model to Post Closure conditions.

Additional details on the tasks completed are provided in subsequent sections of this report. Section 3 provides a summary of the baseline hydrogeology conditions. Section 4 provides an overview of the groundwater flow model. Section 5 describes model calibration and simulation of existing conditions. Section 6 describes model application to Construction, Operation, Decommissioning and Closure. Section 7 describes model application to Post Closure.

2.3. Temporal Boundaries

Hydrogeological data specific to the Project that were considered for this assessment have been collected since 2007 by BGC and others through site investigations associated with a Preliminary Economic Assessment (PEA), a Feasibility Study (FS) and the EA. Historical data from regional and nearby sources were also used in this study, including data from monitoring wells in the Aberdeen area collected on behalf of the City of Kamloops (the City), data from geotechnical investigations at the nearby New Afton site for New Gold Inc. and publicly available well records and aquifer data from the online Water Resources of BC (WRBC) atlas compiled and maintained by the British Columbia Ministry of Environment (BC MOE 2014). WRBC aquifer data (BC MOE 2014) were collected by third parties for other purposes and are therefore of lower confidence than data collected to assess groundwater conditions for the Project.

Further discussion on data sources considered in the groundwater flow model development is provided in BGC (2015a).

The 3D numerical groundwater flow model was calibrated to existing conditions and used for predictive simulations during the Construction, Operation, Decommissioning and Closure, and Post Closure phases of the Project. Existing conditions, Construction (2 years), Operation (23 years), and Decommissioning and Closure (5 years) phases were considered using transient simulations (annual stress periods) to simulate development of the mine.

The open pit will become a pit lake as part of the mine closure and reclamation plan, and is anticipated to require approximately 300 years to reach an equilibrium lake elevation. As such, the Post Closure phase was considered using steady state simulations with pit lake elevations set between 500 and 700 masl. The time that each of these simulations occurred was evaluated using the results of the Project site wide WBM documented in BGC (2015b).

2.4. Spatial Boundaries

The Application/EIS included criteria to determine the extents of spatial boundaries for Project impacts on groundwater. In accordance with the Application/EIS, the following definitions were used to define the groundwater study areas:

- Local study area (LSA) is defined as the Project footprint and surrounding area within which there is a reasonable potential for immediate impacts to occur to groundwater due to project components or activities.

- Regional Study Area (RSA) is defined based on the Cumulative Effects Assessment Practitioners Guide (CEA 1999):

  "*the spatial area within which cumulative effects are assessed (i.e., extending a distance from the project footprint in which both direct and indirect effects are anticipated to occur)*."

For the purposes of the environmental assessment cumulative Project effects on the groundwater flow system may include changes to groundwater elevations, groundwater recharge and discharge patterns, and groundwater flow rate and direction in the Mine Site area in response to construction of Mine Site facilities (i.e., the open pit, TSF, and MRSFs) and associated water management facilities.

The RSA and LSA boundaries for groundwater have been delineated to coincide with mapped watersheds (iMapBC 2013), and the limits of the underlying regionally mapped aquifers documented within the online Water Resources of BC (WRBC) atlas (BC MOE 2014). The limits of the RSA and LSA are shown on Drawing 02. The basis for the delineation of these boundaries is provided in the following sections.

2.4.1. Regional Study Area Limits

The south western and western limits of the RSA for groundwater have been delineated to coincide with limits of the Cherry Creek, Peterson Creek and Anderson Creek Watersheds (iMapBC 2013), and the limits of the underlying mapped aquifers 0727 and 0728 documented within the WRBC atlas (BC MOE 2014). In the north, the RSA is bounded by Kamloops Lake / Thompson River, and the limits of mapped aquifers 0283, 0284, and 0286. The RSA is bounded by Campbell Creek in the east, and the southeast limit of the RSA was set to coincide with mapped aquifer 0275. The limits of the RSA are shown on Drawing 02. The characteristics of these aquifers are summarized in Section 6.0 of the Baseline Groundwater Hydrology Assessment (BGC 2015a).

2.4.2. Local Study Area Limits

The preliminary LSA boundaries were set to coincide with the expected area of potential Project effects to the underlying and the interpreted down-gradient groundwater flow system. The limits of the LSA are shown on Drawing 02 and include the extents of two down-gradient mapped sand and gravel aquifers (Peterson Creek, No. 0278 and Davidson Creek, No. 0277) and the majority (i.e., down- and cross-gradient extent) of an underlying mapped bedrock aquifer (Sugarloaf Hill, No. 0276). The majority of the northern and eastern extents of the LSA are constrained by the limits of the aforementioned aquifers. The boundary south of the Davidson Creek aquifer, (i.e., the eastern and southern limit of the LSA) was set to coincide with the limits of the Anderson Creek and Peterson Creek watersheds (iMapBC 2013). West of the Sugarloaf Hill Aquifer, the northern limit of the LSA was set to coincide with Hughes Lake. The western limit of the LSA was delineated based on an inferred groundwater flow path between Chuwhels Mountain and Hughes Lake.

3.0 CONCEPTUAL HYDROGEOLOGIC MODEL

3.1. Overview

A conceptual hydrogeologic model was developed as part of the Baseline Groundwater Hydrology Assessment (BGC 2015a) and this section provides a summary. Data sources and interpretation to support the conceptual hydrogeologic model were provided in the Baseline Groundwater Hydrology Assessment (BGC 2015a). A schematic of the conceptual hydrogeologic model is shown on Figure 01.

The topography of the RSA ranges from an elevation of approximately 1,900 masl at Chuwhels Mountain, approximately 20 km southwest of the planned open pit, to about 340 masl at Kamloops Lake / Thompson River, approximately 7 km north of the planned open pit. Thus, overall topographic relief considered in the RSA is approximately 1,600 m (Drawing 02).

The region has a semi-arid steppe climate. Precipitation is limited, especially at lower elevations, and evaporation rates are high (KP 2014b), limiting groundwater recharge rates. Groundwater recharge rates are interpreted to be less than 10 mm/year as a regional average (Golder 2008). Groundwater recharge is primarily from infiltration of precipitation and snowmelt in uplands, irrigation in developed areas, with lesser components supplied by surface water infiltration at ponds, lakes, creeks, and gullies, where groundwater elevations are below creek beds. Groundwater discharge zones are generally restricted to streams, rivers and seeps that often occur at breaks in slope. A significant amount of groundwater discharge is interpreted to occur by evapotranspiration along valley bottoms and depressions, particularly where the water table is close to ground surface. Flowing artesian conditions have been encountered during drilling in local low areas and on the lower portions of slopes.

3.2. Bedrock Hydrogeology

The bedrock within the RSA consists of the low permeability Triassic Nicola Group (volcanics, volcaniclastics, and picrite); the Late Triassic to Early Jurassic Iron Mask Batholith (dioritic intrusive rocks); and the Eocene Kamloops Group (volcanics and sedimentary rocks). The moderately permeable Kamloops Group overlies the Nicola Group and can be greater than 250 m thick in the RSA. The Kamloops Group sedimentary rocks form sub-horizontal layers, resulting in macroscale anisotropy, potentially magnified by the presence of swelling clays in localized areas (e.g., as mapped in Aberdeen and noted above). The Iron Mask Batholith is a composite dioritic intrusion that includes phases known as the Iron Mask Hybrid (IMH) and Sugarloaf Diorite (SLD) near the Mine Site. The SLD occurs in faulted contact with the Nicola Group and IMH near the Mine Site. Serpentinized picritic basalts occur as wedges or slivers in major fault-related structural corridors within the Batholith. Picrite zones are typically weaker and more altered than surrounding rocks, and could potentially provide a conduit for enhanced localized groundwater flow where the unit is encountered. Figure 03 depicts estimated hydraulic conductivity versus depth for bedrock.

Numerous fault systems have been noted within the RSA. These include the major basement faults of the Nicola Group and younger faults within the Iron Mask Batholith. The Edith Lake Fault Zone (ELFZ) is a regionally mapped northwest-southeast trending structure to the south of the Mine Site. Based on site investigations by BGC (2015d), the ELFZ exhibits locally higher hydraulic conductivity compared to the surrounding country rock within the LSA. The Hugh Allen and Versatile faults in the Aberdeen area have been identified by others as hydrogeologically significant (Golder 2008), potentially acting as barriers to northward groundwater flow and contributing to the development of upward hydraulic gradients observed within the some areas of the subdivision (Golder 2008).

Shallow bedrock (i.e., up to approximately 200 m deep) is interpreted to be heterogeneous, with hydraulic conductivity influenced by rock type, weathering, faults, joints, and fractures. Deeper bedrock (i.e., greater than 200 m deep) is generally of low hydraulic conductivity due to less weathering, higher confining stresses that close joints and fractures, combined with the rock types that occur in the region.

3.3. Surficial Deposits Hydrogeology

Quaternary glacial and post-glacial deposits of variable thickness (i.e., from less than 5 m to 120 m thick) comprise the surficial materials of the RSA. The Cordilleran ice sheet that covered the RSA between 10,000 to 13,000 years ago decayed by regional stagnation, depositing a thin till blanket in uplands (5 to 15 m thick near the Mine Site) and thicker (up to 80 m near the Mine Site) accumulations of permeable glaciofluvial sediments and low-permeability glaciolacustrine sediments (i.e., diamicton) in valleys and former bedrock troughs. These thicker sediment accumulations occur in the present-day Peterson Creek valley and other low lying areas throughout the RSA, and comprise the main sand and gravel aquifers mapped by the BC MOE within the LSA (e.g., Peterson Creek and Davidson Creek Aquifers). These aquifers are conceptualized as highly heterogeneous due to their complex depositional history, as demonstrated by laterally discontinuous stratigraphy over short distances (i.e., less than 10 m near the Project). The Peterson Creek Aquifer is an unconfined to discontinuously confined, heterogeneous, channel aquifer bounded by lower hydraulic conductivity materials and infiltration (e.g., recharge from an overlying saturated lower permeability unit, or from an underlying bedrock aquifer, or both (BGC 2015c).

Post-glacial sediments mapped within the RSA consist of lacustrine, fluvial, eolian, colluvial and bog/organic deposits. Post-glacial materials are generally restricted to the Kamloops Lake / Thompson River and Campbell Creek areas, although occurrences of all deposits have been mapped around the Mine Site. Within Aberdeen, an area of bedded gypsum (referred to as “gypsum spring” by Golder (2008)) includes an assemblage of swelling clays/bentonite and montmorillonite that is inferred to have developed due to alteration of tills along the contact with the underlying bedrock (Golder 2008).

Surficial materials within areas of the RSA that have been modified by human activity (e.g., gravel pits, construction fill, historic mine rock and tailings areas, and mining haul roads) have been classified as “anthropogenic” materials. These materials have been mapped in areas around the Mine Site, Aberdeen, the New Afton Mine and the City of Kamloops. Figure 02 depicts estimated hydraulic conductivity versus depth for surficial materials.

3.4. Groundwater Flow Conditions

The potentiometric surface (water table) is interpreted as a subdued replica of topography, with depths to groundwater typically being greater in the uplands than in local valleys or the Thompson River valley. Regional scale groundwater flow is generally directed from south to north from Chuwhels Mountain to Kamloops Lake / Thompson River, but with local variations due to topography and geological conditions (Figure 04).

The ridge system that trends northwest-southeast and located immediately north of the Mine Site is interpreted to coincide with a groundwater divide between northward (i.e., towards Aberdeen) and southward (i.e., towards the Mine Site) flowing groundwater. Project-scale groundwater flow is predicted to be dominated shallow groundwater flow primarily within glacial sediments. Principal discharge zones near the Mine Site include reaches of Peterson Creek, Goose Lake/Edith Lake and Jacko Lake, the existing Ajax West Pit lakes as well as other local ephemeral streams, sloughs and ponds (Figure 05). Groundwater flow patterns in bedrock are generally similar to the shallow groundwater flow conditions, although more subdued (Figure 06).

Near the Mine Site, groundwater flow paths converge locally towards the existing Ajax West Pits. Groundwater flow paths also converge towards the topographic saddle that occurs near the confluence of Peterson Creek with Jacko Lake, and then diverge northwestward from Jacko Lake beyond the Mine Site and eastward following the Peterson Creek drainage.

Seasonal fluctuations in the Mine Site groundwater elevations range from less than 0.1 m to approximately 4.0 m, annually. Groundwater elevations monitored near the Mine Site typically decline through the winter and spring (i.e., September to March), and are highest during the period from June to September. The seasonal variation in groundwater levels is consistent with climate trends. Some monitoring locations near the Mine Site also show rapid water level recoveries (i.e., within a month) following precipitation events. These locations are interpreted to receive localized sources of recharge due to higher permeability near-surface sediments or fractured bedrock. Groundwater at locations where groundwater levels appear to reach seasonal maxima in September or October likely receive recharge from more distal sources in addition to delayed infiltration from surface recharge caused by near surface lower permeability sediments.

4.0 NUMERICAL MODEL OVERVIEW

A numerical groundwater flow model was developed to meet the objectives described in Section 2.0. The conceptual hydrogeological model summarized in Section 3.0 was used to guide the development of a 3D numerical groundwater flow model. The numerical model was calibrated to available site data for steady-state and transient conditions; steady state and transient model phases were developed to reflect the current mine plan. The groundwater model software and study methods are described below.

4.1. Groundwater Model Software

The groundwater flow model for the site was developed using MODFLOW-SURFACT (Version 3.0) and the graphical user interface Groundwater Vistas, (Version 6.59, Build 11; ESI 2011). MODFLOW is an industry standard three-dimensional finite difference groundwater flow model developed by the U.S. Geological Survey (Harbaugh et al. 2000). MODFLOW-SURFACT is a proprietary code developed by Hydrogeologic Inc. (1996) that provides additional simulation modules for MODFLOW that allow for improved treatment of partially saturated conditions and alternate numerical solvers.

Zone Budget (Version 3.01; USGS 2009) is a computer program that computes water budgets for specified sub-regions from 3D numerical groundwater flow model results produced by MODFLOW. Groundwater sources and receiving water bodies were identified and designated as sub-regions of the model to permit computation of separate water budgets using Zone Budget.

MODPATH, a commonly-used particle tracking program developed for MODFLOW (Version 3; Pollock 1994), was used to simulate the forward migration pathways of groundwater seepage originating from specific Project facilities (i.e., the open pit, TSF and MRSFs). Particles were specified to be released from facility footprints from saturated grid blocks (i.e., at the water table without considering migration through the unsaturated zone). MODPATH was also used to simulate reverse migration pathways from receiving water bodies (groundwater discharge zones) to identify travel times from potential recharge areas.

4.2. Model Domain

The 3D numerical groundwater flow model simulates groundwater flow conditions for the LSA and the RSA. The model domain generally corresponds to the limits of the RSA (Drawing 02). The model domain is bounded by Kamloops Lake / Thompson River along the north edge and by Campbell Creek to the east. The southwest boundary of the domain was set to coincide with a combination of inferred groundwater flow divides (i.e., flowlines across which no groundwater movement was inferred to occur), and the south and northwest boundaries were aligned with principal groundwater flow directions inferred from available groundwater elevation measurements to be 7° clockwise from North (BGC 2015a). The 3D groundwater flow model domain encompasses the area shown in Figure 06.

4.3. Spatial Discretization Overview

The horizontal discretization of the model was finest around the limits of the mine facility footprints and within Aberdeen, as the simulation of Project effects on the groundwater flow system in these areas was of greatest interest for this study. Similarly, vertical discretization was finest for shallow portions of the model within the zone of active groundwater. Section 5.1 describes the model grid geometry for existing conditions. Section 6.1 describes modifications to the model grid to represent Construction, Operation, and Decommissioning and Closure. Section 7.1 describes modifications to the model grid to represent Post Closure.

4.4. Temporal Discretization Overview

The model simulates groundwater flow for existing conditions, Construction, Operation, Decommissioning and Closure, and Post Closure. Section 5 describes model development, calibration methods, and calibration results for existing conditions. Section 6 describes Construction, Operation, and Decommissioning and Closure simulation methods. Section 7 describes Post Closure simulation methods.

5.0 SIMULATION OF EXISTING CONDITIONS

5.1. Model Geometry and Grid

For existing conditions, the 3D numerical groundwater flow model consists of 255 rows and 243 columns, and covers an approximate area of 900 km^2. Fifteen model layers were used to discretize the domain in the vertical dimension for a total of 929,475 grid blocks (842,985 that are active). Uniform 50 m by 50 m grid blocks were defined in the Project and Aberdeen areas. The horizontal dimensions of grid blocks were expanded away from the Mine Site by a factor of 1.2 to a maximum of 500 m by 500 m in the outer limits.

Three key control surfaces were used to define the model geometry: topography, the top of bedrock surface, and the base of the model. Topography was compiled from four sources (in order of decreasing reliability):

1. LiDAR (Airborne Imaging 2013).
2. Topographic information (City of Kamloops 2008).
3. Aerial photos (Abacus Mining and Exploration Corp. 2006).
4. Terrain Resource Information Management (BC GeoBC 1992).

The elevation of the base of Jacko Lake was represented using results from the most recent bathymetric survey of the lake, completed by Frontier Geoscience (2014). The bedrock surface was interpreted from site borehole and geophysical data as described in BGC (2015a). The base of the model was defined as -150 masl (i.e., 150 metres below sea level), corresponding to 600 m below the planned pit bottom of approximately 450 masl and 95 m below the Kamloops Lake surface of 335 masl.

The top four model layers were used to represent the surficial deposits and the base of model layer 4 was set to the top of bedrock surface. Surficial deposits range from 0 m to approximately 80 m thick. Stratification of surficial sediments was not explicitly represented in the groundwater flow model. Each surficial model layer (1 to 4) was the same thickness (i.e., 25% of the total interpreted thickness of surficial sediments). A minimum layer thickness of 0.75 m was imposed for the model, resulting in a minimum surficial sediment thickness of 3.0 m (i.e., 0.75 m times 4) in the model. Model grid cells in layers 1 to 4 that were below the bedrock control surface as the result of the minimum layer thickness limitation were assigned “weathered bedrock” hydraulic properties. Model layers 5 to 15 were used to represent bedrock below surficial deposits and to the base of the model domain. Model layer thickness increased with model layer depth.

The resulting distribution of approximate model layer thickness in the LSA is as follows:

Layers 1, 2, 3, and 4	0.75 m to 20 m thick
Layers 5 and 6	20 m thick
Layer 7	30 m thick
Layer 8	70 m thick

Layers 9, 10, and 11	80 m thick
Layers 12, 13, and 14	160 m thick
Layer 15	240 m thick.

The model grid was designed to meet the project objectives described in Section 2. The resolution of the groundwater model discretization is suitable to represent large scale mining structures on the order of hundreds of metres in size (i.e., the TSF, MRSFs, and open pit) and catchment scale to regional scale groundwater flows. The model is not designed to resolve details of groundwater flow at spatial scales smaller than approximately 100 m.

5.2. Hydrostratigraphic Units and Parameters

Hydrostratigraphic units included in the groundwater model are shown in Figures 08 (surficial deposits) and 09 (bedrock). The model grid cells representing surficial deposits (Figure 08) were assigned hydrostratigraphic units based on the regional surficial geology mapped by Fulton (1975) and local mapping completed for the Ajax Project by Keystone (2008) and Knight Piesold (2014a). The model grid cells representing bedrock deposits (Figure 09) were assigned hydrostratigraphic units corresponding to rock types according to the classification described by the BCGS (Massey et al. 2005), except near the open pit area, where hydrostratigraphic units were assigned based on the geologic model developed KAM as provided to BGC on September 22, 2014.

The fractured bedrock was approximated as an equivalent porous medium, which is suitable for this scale of modelling (Beale 2013) and is consistent with provincial modeling guidance (BC MOE 2012, Section 5.2.3).

Storage parameters (i.e., specific yield and specific storage) for bedrock and unconsolidated materials were specified based on results obtained from aquifer testing and modified during model calibration with guidance from literature (Maidment 1993). Hydraulic conductivity values within model zones were specified based on hydrogeologic testing and modified within measured and expected ranges during model calibration as discussed in Section 5.4. Model calibrated hydraulic conductivity and storage parameters (i.e., specific storage and specific yield) are summarized by material type in Tables 01 and 02 for surficial deposits and bedrock, respectively. Model calibration is discussed further in Section 5.4.

The rationale behind the assignment of hydrostratigraphic units within the groundwater model is developed in BGC 2015a, and is also summarized below.

5.2.1. Surficial Deposits

The surficial deposits within model layers 1 to 4 were divided into hydrostratigraphic units discussed in Section 7.1.1 of the Baseline Groundwater Hydrology Assessment (BGC 2015a). These include:

- Fluvial / glaciofluvial deposits
- Glacial till deposits

- Lacustrine / glaciolacustrine deposits
- Mine rock / anthropogenic materials
- Colluvial, eolian and organic materials.

Regions of mapped outcrop were also represented within model layers 1 to 4, and were defined as a single hydrostratigraphic unit for shallow bedrock. The spatial distribution of surficial deposits and bedrock outcrop is depicted in Figure 08 and is based on the regional surficial geology mapped by Fulton (1975), local mapping by Keystone (2008), and Knight Piesold (2014a). The surficial hydrostratigraphic units and assigned hydraulic properties are summarized in Table 01.

The hydraulic properties of surficial sediments were represented as being uniform with depth, and the effects of stratification were approximated by anisotropy. Ranges in anisotropy ratios used to represent surficial sediments are consistent with the guidance from Section 6.4.4 of BC MOE (2012) and are further discussed in Section 5.4.1 of this report.

5.2.2. Bedrock

The bedrock within Model layers 5 to 10 (Figure 09) were divided into bedrock hydrostratigraphic units described in Section 7.1.2 of the Baseline Groundwater Hydrology Assessment (BGC 2015a). These include:

- Nicola Group volcanics
- Picrite
- Iron Mask Hybrid
- Sugarloaf Diorite
- Kamloops Group volcanics and sediments.

The bedrock hydrostratigraphic units and assigned hydraulic properties are summarized in Table 02. Bedrock units were assumed to be isotropic. The 3D geologic model from KAM for the pit area was used to assign bedrock material zones in layers 5 to 14 of the groundwater flow model (Figure 09). The bedrock units depicted in the 3D geologic model include the: Iron Mask Hybrid (IMH), Sugarloaf Diorite (SLD), Nicola Volcanics (uTrN), and Picrite (uTRNop) units.

Model cells representing bedrock in layers 10 through 15 and beyond the limits of the 3D geologic model were assigned uniform hydraulic properties. Uniform bulk hydraulic properties were used for each hydrostratigraphic unit.

5.2.3. Structure

The structural model for the pit area, created by Abacus Mining and Exploration Corporation (AME) and updated by KAM, was received on February 2, 2011. The structural model provided a three dimensional interpretation of faulting in the pit area, but was not implemented in the groundwater flow model because hydraulic testing data did not indicate a general trend towards significantly higher or lower conductivity in faulted or sheared zones within the pit area.

Golder (2008) has suggested that two mapped faults in the Aberdeen area (i.e., the Hugh Allen and Versatile faults; BGC 2015a, Drawing 05) are hydrologically significant, acting as a barrier to northward groundwater flow (Figure 01). Numerical modelling studies completed by Golder (2008) required the Hugh Allen and Versatile Faults to be simulated with significantly lower hydraulic conductivities than adjacent rock types. These faults were not simulated in the groundwater flow model developed for the Project because they were outside of the LSA and close to the limits of the RSA, thus simulation results would not be sensitive to their presence.

The Edith Lake Fault Zone was investigated as part of hydrogeological site investigations for the Project (BGC 2015d). Results from this investigation suggest that portions of this fault may possess hydraulic conductivity that is locally on the order of one to two orders of magnitude greater than host rocks. The potential significance of these results and the associated influence on the groundwater flow system was considered in the sensitivity analysis discussed in Section 8.3.

5.3. Boundary Conditions

5.3.1. Recharge

Variable groundwater recharge rates ranging from 0.5 mm/year to 10.6 mm/year were assigned to model Layer 1 in the RSA (Table 03). Six recharge zones were specified to simulate the orographic influence on precipitation observed in the region and the interpreted relationship between recharge and elevation (Figure 10). Climate normals in the geospatial dataset compiled by the BC Ministry of Forests and Range (2007) were averaged within areas encompassed by a given biogeoclimatic zone (Lloyd et al., 1990) and used as the basis for applying recharge to corresponding areas within the model domain as follows:

- Bunchgrass (low elevation), elevation less than 600 masl with an assigned recharge rate of 0.5 mm/year
- Bunchgrass (high elevation), elevation range from 600 to 900 masl with an assigned recharge rate of 4.9 mm/year
- Ponderosa Pine, elevation of 600 to 900 masl with an assigned recharge rate of 4.9 mm/year
- Interior Douglas Fir, elevation of 900 to 1400 masl with an assigned recharge rate of 8.4 mm/year
- Montane Spruce Elevation 1400 to 1600 masl with an assigned recharge rate of 9.9 mm/year
- Egleman Spruce – Subalpine Fir Elevation greater than 1600 masl with an assigned recharge rate of 10.6 mm/year.

The model recharge rates are within the range of independent recharge estimates made based on site data (i.e., between 0.3 and 8.0 mm/yr near the Mine Site (BGC, 2015a)) and based on regional data (i.e., between 0.1 and 58.5 mm/yr for elevations between 350 and 1,828 masl (Golder, 2008)).

A recharge rate of 0.5 mm/year was assigned to the Aberdeen area which is consistent with estimated natural recharge rates for the area (Golder 2008). The recharge rate assigned to the Aberdeen area does not include anthropogenic recharge from irrigation water (lawns, playing fields, golf course), which was estimated to potentially locally increase recharge rates by up to two orders of magnitude and was believed to be the cause of slope instabilities in the Aberdeen area. While the model is not designed to simulate details of local groundwater flow conditions in the Aberdeen area, the model is designed to predict changes to groundwater levels in the Aberdeen area due to Project activities.

The potential seepage face option was active in order to assist with model convergence, with a permissible ponding depth of 20 m chosen to avoid active seepage faces in the model.

5.3.2. Evapotranspiration

Potential evapotranspiration (ET) rates estimated by KP (2014b) range from approximately 525.0 mm/year to 584.0 mm/year using data collected from the AJAXMET climate station at elevation 950 masl at the Mine Site between 2011 and 2012. KP (2014b) also estimated an average annual ET of 579.0 mm/yr using a long-term synthetic temperature data. An ET rate of 547.5 mm/year was assigned uniformly to the top of model Layer 1 (Figure 11).

The predominant land cover type in the RSA is grass and the average soil type was assumed to be best represented as a loam based on textural classification of samples from test pitting (BGC 2011c, KP 2015b) according to the USDA soil classification system (BGC 2015e). The extinction depth (i.e., the depth below the top of grid cell where ET is negligible) was set at 5.5 m, which is a representative value for a silty-clay loam vegetated with grass (Shah et al. 2007).

Actual evapotranspiration was calculated by the model and varied linearly from 547.5 mm/year for cells where the water table was at or above the land surface, to 0 mm/year for cells where the water table was at or below the extinction depth.

Due to model discretization limitations, the model was not able to accurately simulate surface water exchange between stream reaches and the atmosphere. Therefore, evapotranspiration was not simulated within streams or in the adjacent grid cells representing the surrounding hyporheic zone (i.e., the area of interaction between groundwater and surface water adjacent to the stream bed). Water that would normally be lost to evaporation from streams and the hyporheic zone was instead included in the stream cell boundary condition water balances (Section 5.3.4). This is considered a reasonable assumption for the scale of the modelling because the lateral discretization (50 m by 50 m grid cell) cannot accurately represent the groundwater/surface water interactions within streams approximately 1 to 3 metres wide. This assumption will likely lead to a slight overestimation in total streamflows.

5.3.3. Kamloops Lake / Thompson River

Kamloops Lake and Thompson River were simulated using the MODFLOW river package (RIV). This package calculates water fluxes to/from the river cells based on the hydraulic head difference between the assigned water elevation at the boundary and the simulated hydraulic head within the grid block modified by a specified conductance. In grid blocks where the simulated hydraulic head falls below the elevation of the specified base of the river bed, the hydraulic head difference used to calculate seepage to the underlying subsurface is limited by the river bed thickness.

For each river cell, the water elevation was estimated from surface topography (338.2 masl to 334.3 masl from east to west). The conductance was calculated based on the average horizontal dimensions of the grid block and an assumed hydraulic conductivity value for the river bed of 1.0×10^{-7} m/s. The model cells set as river boundaries are shown in Figure 12.

5.3.4. Streams and Creeks

Streams within the Mine Site (i.e., within the Peterson Creek watershed) were represented using the streamflow-routing (SFR) package (Prudic et al. 2004, Niswonger and Prudic 2005), which keeps track of surface water flows along streams as well as infiltration into and leakage out of the groundwater flow system. Stream bed elevations and surface water stages for each stream segment were estimated from surface topography.

The volumetric runoff rates assigned to Upper Peterson Creek, Lower Peterson Creek, and Humphrey Creek stream segments were computed using the average annual rate predicted by the WBM (BGC 2015b) weighted by the sub-watershed area; the total rate calculated per sub-watershed area was divided equally among the stream segments. Linkages between the groundwater flow model and WBM were iterative. Net groundwater flows to streams and creeks from the groundwater flow model were inputs for the WBM, while volumetric runoff rates from the WBM were inputs to the groundwater model.

Figure 12 shows the distribution of streams and creeks in the model within the associated sub-watersheds that were defined for the model.

Stream segment conductance was based on model grid cell dimensions, an assumed 1 m wide stream, a 1 m thick stream bed, and a hydraulic conductivity of 1.0×10^{-7} m/s, consistent with the finer grained texture of surficial materials mapped near the Mine Site (i.e., glacial till, BGC 2015a). The stream bed hydraulic conductivity of a 1-km portion of the stream boundary extending east from the southeast arm of Jacko Lake (Figure 13) was set to 1.0×10^{-7} m/s to represent a compacted till liner installed under this water course in 1990 to minimize water losses due to infiltration (Price 1991).

Streams and creeks outside of the Peterson Creek watershed were simulated using the MODFLOW drain package (DRN). The drain package is similar to the river package except that only outflow of groundwater from the model is simulated. Where the simulated hydraulic head in a grid block falls below the specified water elevation, no water is removed at the boundary cell. The water elevation for the drain cells was estimated from surface topography. The conductance of drain boundary cells was calculated based on the average horizontal dimensions of the grid block, with an assumed channel width of 3 m and a creek bed hydraulic conductivity of 1.0×10^{-7} m/s.

5.3.5. Lakes and Ponds

Lakes and ponds within the model domain were simulated using the MODFLOW general head boundary (GHB) package with hydraulic head set equal to the average grid cell elevation (Table 04). Recharge throughout the footprints of natural lakes and ponds was set to zero. Model cells representing lakes are also shown on Figure 12. The purpose of using this boundary condition as opposed to a constant head boundary is to limit the exchange between groundwater and surface water bodies by a conductance term. This boundary condition is mathematically similar to the river and drain packages, where flow into or out of a cell is calculated in proportion to the difference between the simulated head in the cell and the assigned boundary head.

Lake bed conductance in all GHB cells was calculated using the dimensions of the grid block and a lake bottom hydraulic conductivity of 1.0×10^{-8} m/s for lake bed sediments (clayey silt and organic debris) in the area (Klohn Leonoff 1988). Existing lakes that will be altered due to mining are discussed further in Section 6.4.5. The elevation of Jacko Lake was set to 892 masl based on preliminary LiDAR surveys completed in 2014 for Jacko Lake (KCB 2014).

The existing Ajax West pits were represented in the model using MODFLOW GHB package (Figure 13). The water elevations for these boundaries were estimated from surface topography (i.e., 881.2 masl in the Ajax West West pit and 841.7 masl in the Ajax West East pit). Conductance values within these boundaries were calculated based on the average dimensions of the grid block and the hydraulic conductivity of the bedrock grid cells intercepted by the pits (1.0×10^{-8} m/s). The Ajax East Pit has no lake and therefore no GHB was set.

5.3.6. Inactive Areas and No Flow Boundaries

Grid blocks lying outside the active model domain were specified as no flow boundaries. Groundwater divides are interpreted to exist along the south and south-west extents of the domain and were set as no flow boundaries (Figure 07). A no flow boundary was applied to the north-west extent of the domain to coincide with the interpreted principal direction of groundwater flow. A no flow boundary was also applied along the base of the model (i.e., approximately 300 m below the deepest zones in the planned pit), reflecting the low hydraulic conductivity, small hydraulic gradients, and corresponding slow groundwater flow rates conceptualized near the base of the model domain.

5.4. Model Calibration

The groundwater flow model was calibrated to steady-state and transient conditions. Model calibration proceeded as follows:

1. Calibrate to steady-state conditions using average annual groundwater elevations.
2. Calibrate to seasonal fluctuations in groundwater elevations using average seasonal precipitation and evapotranspiration estimates for spring, summer, and winter (three stress periods per year).
3. Calibrate to the BGC (2011a) pumping test conducted in the bedrock near Jacko Lake.

The calibration methods and results are described in more detail in the following subsections.

5.4.1. Steady-State Model Calibration Methods

A total of 432 of the 445 groundwater monitoring locations with groundwater elevations compiled as part of the hydrogeology baseline study (BGC 2015a) were considered for the steady state calibration dataset (Figure 14). Thirteen monitoring locations in the baseline study were outside the model domain boundaries. Fourteen groundwater monitoring locations (3% of the total) observed groundwater elevations unusually high or low compared to nearby observations. These monitoring locations were predominantly from the WRBC database which are interpreted to be data of lower quality and poor representations of the general groundwater regime. They were subsequently removed from the calibration dataset. As a result, the model was calibrated to average groundwater elevations at 418 locations, as follows:

- 57 shallower (surficial sedimentary deposits) locations within the Mine Site
- 69 deeper (bedrock) locations within the Mine Site
- 18 locations near the New Afton Mine
- 42 locations in the Aberdeen subdivision area
- 232 locations from the Water Resources of BC (WRBC) database across the regional study area.

The resulting dataset provided good spatial coverage within the Mine Site, both horizontally and vertically. The regional coverage between the Mine Site and Kamloops Lake / Thompson River was also good. Spatial well coverage in the higher elevation areas west of the Mine Site was limited.

The parameter estimation software PEST, Version 13.0 (Doherty 1994) was used to facilitate model calibration. Prior to model calibration, PEST was used to conduct a sensitivity analysis to evaluate which model parameters influenced the fit between simulated and observed groundwater elevations. The following parameters were evaluated as part of the calibration process:

- Hydraulic conductivity for surficial sand and gravel, fine-grained glacial deposits, and each bedrock hydrostratigraphic unit
- Lake-bed conductance (leakiness)

- Groundwater recharge rate(s)
- Evapotranspiration rate
- Extinction depth for evapotranspiration.

Sensitive parameters were permitted to vary during model calibration, within reasonable ranges that were based on available data (Table 05). Sensitivity analysis results are discussed in Section 8.3. Non-sensitive parameters were set to reasonable values based on available data, calibrated values of sensitive parameters, and professional judgement. Horizontal and vertical hydraulic conductivity were kept equal for bedrock units (i.e., anisotropy ratio of 1.0). Horizontal hydraulic conductivity for surficial deposits was maintained to be greater than or equal to the vertical hydraulic conductivity (i.e., anisotropy ratio less than or equal to 1.0).

5.4.2. Transient Model Calibration Methods

Once the model was calibrated to steady-state conditions, a transient calibration was performed. The model was calibrated to transient groundwater elevations at monitoring wells in the Mine Site with several years of seasonal data. Up to 5 years (2010 to 2014) of transient groundwater elevation data were used for the model calibration. The transient model calibration dataset included 45 groundwater elevation monitoring locations, distributed as follows:

- 14 shallower (surficial sediments) locations within the Mine Site (Figure 15)
- 31 deeper (bedrock) locations within the Mine Site (Figure 16).

At the time of transient model calibration, detailed climate data for the Mine Site were not available for the full groundwater monitoring period. Therefore, average monthly climate data trends were reviewed and each year was divided into three periods with constant recharge and potential evapotranspiration, specifically:

- Fall and Winter, from October 1 to March 31 (182 days)
- Spring, from April 1 to May 31 (61 days)
- Summer, from June 1 to September 30 (122 days).

The transient simulation was run for the period between October 1, 2009 and September 30, 2014. The following parameters were adjusted within reasonable limits based on professional judgement during transient model calibration:

- Specific yield for surficial sedimentary deposits
- Specific yield for bedrock
- Specific storage coefficients for bedrock.

The transient climate dataset reflected average climate conditions rather than the specific conditions for a particular year. Therefore, the simulated and observed groundwater elevations were compared for general magnitude and timing of changes, and not for close agreement with recorded seasonal groundwater elevations.

5.4.3. Pumping Test Model Calibration Methods

The purpose of the bedrock pumping test (BGC 2011a) was to collect hydrogeological data from the upper 200 m of bedrock near the western limit of the planned open pit in order to assess the significance of Jacko Lake as a potential recharge boundary to the groundwater system. A constant-rate discharge test of 8.5 US gpm was conducted over approximately 8 days with BGC10-PW01 as the pumping well. The maximum radius of influence for the prototype pumping well was estimated to be between 545 m and 554 m at the end of the 8-day constant-rate discharge test. The pumping test indicated barrier boundary conditions from residual drawdown analyses, suggesting that Jacko Lake may not contribute significant recharge to dewatered bedrock zones (Nicola Volcanics, Picrite, and Sugarloaf).

The calibrated steady-state model was compared to the BGC (2011a) bedrock pumping test as an additional model calibration step. The model grid was locally refined near the pumping well to resolve large lateral hydraulic gradients, with a minimum grid spacing of 6.25 m at the pumping well, expanding to 50 m grid spacing across the Mine Site as part of this additional model calibration step.

The following parameters were permitted to vary within the range of observed values (Figure 02 and 03) for the pumping test model calibration:

- Hydraulic conductivities for hydrostratigraphic units within the pumping test zone of influence
- Specific storage coefficients for hydrostratigraphic units within the pumping test zone of influence.

Horizontal and vertical hydraulic conductivity were kept equal during model calibration (i.e., anisotropy ratio of 1.0). PEST Version 13.0 (Doherty 1994) was used to calibrate the model. The refined model parameters were used to adjust the steady-state model calibration.

5.4.4. Steady-State Calibration Results

Simulated and observed hydraulic heads for the refined steady state calibration are shown in Table 06. Simulated versus observed hydraulic heads are shown on Figure 14 together with calibration statistics.

The correlation coefficient for the entire dataset is 0.995, indicating a good match between observed and simulated heads. The overall range in measured groundwater elevations is 747.7 m. The overall mean error of -4.8 m is -0.6% of the observed range, the root mean square (RMS) error is 18.3 m and the normalized root mean square error (NRMSE) is 2.4%.

For the data collected in the Mine Site for KAM by BGC, KP, KCB and Golder (BGC 2015a) the range in observed groundwater elevations is 250.0 m. The Mine Site mean error of -2.1 m is -0.8% of the observed range and the RMS error of 8.7 m and the NRMSE is 3.5%. An NRMSE of 10% is generally suggested as a guideline for the difference between simulated and measured target values (NBLM 2006). Therefore, the model calibration to hydraulic heads was considered to be acceptable from a statistical perspective, both regionally and at the Mine Site.

Figures 15 and 16 illustrate the spatial distribution of residual errors between observed and simulated groundwater elevations for surficial and bedrock geology, respectively. No spatial bias is suggested by the distribution of residuals. The map also illustrates that the areas within the RSA to the southwest and southeast of the Mine Site have limited groundwater elevation data.

Figure 17 illustrates the correlation between observed and simulated depth to groundwater. Depth to groundwater is a secondary result of the groundwater flow model and was not directly calibrated. The Mine Site data indicate moderately good correlation between observed and simulated depth to groundwater, with 120 of 126 data points matching within 10 m and a correlation coefficient of 0.725. Correlation between observed and simulated depth to groundwater for the regional WRBC data is poor (correlation coefficient of 0.300); however, confidence in these data is lower because the data were collected by third parties for other purposes, well coordinates are approximate, collar elevations and depth to water were estimated based on topographic maps for the well coordinate listed, water levels recorded on the well records were likely affected by drilling and well installation activities and/or reflect water levels that may be several years to several decades old. Nevertheless, the model approximates depth to water within the same order of magnitude recorded in the WRBC dataset.

The Baseline Groundwater Hydrology Assessment summarizes the interpreted vertical component of hydraulic gradient in the LSA based on observed groundwater elevations at 32 well pairs (Table 06 of BGC 2015a). Of these 32 well pairs:

- 7 pairs installed in low hydraulic conductivity materials had groundwater elevations that had not yet stabilized
- 2 pairs had insufficient vertical separation to resolve in the groundwater flow model (both monitoring elevations in the same model layer)
- 23 pairs produced gradients with results suitable for comparison between observed and simulated results.

Figure 18 illustrates the comparison for the vertical component of the gradients. The model reasonably reproduced observed vertical gradients for the majority of well pairs, which is important for accurate representation of groundwater recharge and discharge areas.

5.4.5. Transient Seasonal Calibration Results

Hydrographs comparing observed and simulated water levels for the 45 groundwater monitoring locations considered in the seasonal calibration are provided in Appendix A. Maximum, minimum and ranges of observed and simulated groundwater elevations for these locations are summarized in Table 07. In Appendix A, y-axes for observed and simulated groundwater elevations were offset to allow for easier comparison of the amplitudes and timing of groundwater elevation fluctuations. The offset is comparable to the observed vs. simulated hydraulic head match discussed in Section 5.4.4. The observed hydrographs demonstrate seasonal fluctuations ranging from approximately 0.1 m to 4.0 m from typical lowest to highest groundwater elevations. Simulated responses were generally in the same range. Overall, the amplitude of the simulated responses were somewhat lower than the observed responses. The cause of the differences is uncertain, however, the observed variations may be larger than simulated due to processes not represented in the model, such as seasonal pumping and surface water diversions related to agricultural land uses, fluctuations in surface water elevations in the ungauged Mine Site ponds, pumping and drilling activities in the Mine Site, and vadose zone (i.e. unsaturated) flow.

5.4.6. Pumping Test Calibration Results

Appendix B illustrates simulated and observed plots of drawdown (BGC 2011a) versus time, in order of decreasing drawdown, at the pumping well and observation wells. The magnitude and timing of drawdown compares well for many of the observation locations. For some of the locations, the simulated response does not compare as well. The causes of the discrepancies are not certain, however, likely causes include the 50 m x 50 m resolution of the geology block model as implemented in the 3D groundwater flow model, locally conductive or non-conductive (i.e., barrier) structures, uncertainty in geological boundaries and local-scale heterogeneity not captured by the model.

Figure 19 illustrates observed versus simulated drawdown at the end of the pumping period. The correlation coefficient is 0.934, the residual mean is -7.2 m, and the residual standard deviation is 21.6 m. The pumping test calibration process resulted in adjustments to hydraulic conductivity and specific storage coefficients within the bedrock hydrostratigraphic units of the 3D geologic model.

5.5. Existing Conditions Groundwater Model Results

Table 01 (surficial deposits) and Table 02 (bedrock) summarize calibrated hydraulic conductivity, specific yield, and specific storage coefficients. The calibrated values are generally within the observed ranges of values as shown on Figure 20. The preferred values for calibrated hydraulic conductivity in several of the hydrostratigraphic units were at the lower limit of what was considered a reasonable range of values, based on available test data. It may be that the hydraulic conductivity dataset potentially is biased to larger values than the actual bulk hydraulic properties due to:

- Completing more packer tests in heavily fracture zones than non-fractured zones
- The need to complete monitoring well screens in zones that will recharge relatively quickly to facilitate groundwater well development and groundwater sampling.

Sensitivity analysis simulations were used to evaluate the effects of higher overall hydraulic conductivity on model calibration and model predictions (Section 9).

5.5.1. Existing Conditions Groundwater Flow System

A regional study area plot of the simulated water table is provided in Figure 21. In general, the simulated water table is a subdued replica of surface topography, consistent with the conceptual model of the hydrogeologic system. Recharge is predicted to be highest in elevated terrain, and groundwater discharge areas are predicted to occur within local drainages and lakes. Drawing 03 depicts the existing conditions net groundwater recharge and discharge.

Groundwater is predicted to flow from local uplands to the surrounding drainage channels in the shallow (model layer 4) groundwater flow system (Figure 22). Flow in the shallow surficial deposits is generally oriented parallel to the channel alignment that hosts the permeable zones (i.e., the surficial aquifers). Flow in the upper portion of the bedrock (model layer 6) groundwater flow system is northward towards Kamloops Lake / Thompson River (Figure 23).

Model results indicate that, under existing conditions, groundwater flow converges from the north and south of the Project site towards the existing pits and Peterson Creek, and that Jacko Lake, the existing west pit lakes and Peterson Creek are groundwater discharge zones. The results are consistent with interpretations from field data (Figures 04 and 05 and Section 3).

Groundwater within the Peterson Creek Watershed is predicted to be contained within the watershed, discharging to Jacko Lake, Peterson Creek, and Humphrey Creek. Groundwater flow to the west of Jacko Lake and in the area of the planned TSF converges towards a topographic saddle zone that trends northwestward away from the Mine Site. From this zone of convergence, flow continues in a northwest direction away from the Mine Site.

Higher groundwater elevations are expected to occur in both surficial deposits and within bedrock below a series of ridges to the north of the planned pit. Recharge in this area produces a northwest-southeast trending groundwater flow divide coincident with elevated topography. Groundwater flow is to the north towards Kamloops Lake / Thompson River on the north side of this groundwater divide. Groundwater flow is to the south on the south side of the divide. This is consistent with interpretations made based on available water level data within the RSA (BGC 2015a).

5.5.2. Groundwater Balance

Table 03 provides a summary of the calibrated groundwater recharge values applied in the model. Figure 24 provides an overall water balance for the groundwater model. A total of 85% of the net inflows to the model are simulated to be from groundwater recharge, with focused recharge from ponds and small lakes (i.e., natural lakes) providing another 8% of input to the model. Streams in the Mine Site (Peterson and Humphrey Creeks) are predicted to provide both inflow (7%) to and outflow (7%) from the groundwater system along gaining and losing reaches, and are minor groundwater sources overall. Baseflow to natural lakes in the Mine Site (6% of net inflow) represent most of the remaining modelled inflow.

A total of 73% of net outflow from the groundwater flow system is predicted to be lost to evapotranspiration, which is consistent with high potential evapotranspiration estimates for the area (KP 2014b). Groundwater discharge to Cherry Creek Watershed, Anderson Creek Watershed, and other RSA streams (i.e., drain boundaries as presented in Figure 12) represent an additional, 9%, 3%, and 4% of net groundwater outflow, respectively. Baseflow to Kamloops Lake / Thompson River (approximately 3% of net outflow) represent most of the remaining modelled outflow. The water balance error is 0.01%, which reflects good model convergence.

Pumping from domestic water wells was not simulated because of the poor data record (i.e., information such as average daily pumping rates, well screen completion intervals, recent groundwater elevations, abandoned or active wells were unavailable). However, it is estimated that the total extraction from all registered domestic water wells within the RSA would range from approximately 159 m^3/day to 317 m^3/day (BGC 2015a). This would account for approximately 1% to 3% of the groundwater outflows.

If pumping from domestic water wells was incorporated into the model, simulated groundwater elevations in the vicinity of the wells would be lowered, possibly improving the calibration to WRBC groundwater elevations. There are comparatively few domestic water wells in the Mine Site area. Furthermore, potential groundwater abstractions would make up a small percentage of total groundwater outflows. Therefore, domestic water well abstraction was not expected to affect predictive model results.

6.0 SIMULATION OF MINE CONSTRUCTION, OPERATION, AND DECOMMISSIONING AND CLOSURE

Transient simulations were completed to predict changes to the groundwater flow system during the Construction, Operation, and Decommissioning and Closure mine life phases. Phased pit shells and facility layouts during Operation were incorporated into the groundwater flow model.

To simulate groundwater flow during Operation, the model grid and boundary conditions were modified from existing conditions using information from the following sources (Table 08):

- Phased expansion of the open pit and dewatering, stockpiles and MRSFs provided by KAM in May 2014
- Phased expansion for the TSF provided by Knight Piesold in October 2014
- Water management for Jacko Lake and Peterson Creek south of the planned pit based on preliminary design specifications (Norwest 2015)
- Construction of seepage and runoff collection ponds and conceptual water management as discussed in KP (2014c).

6.1. Model Geometry and Grid

Five model layers were added to the model above the existing conditions topography to represent the topography during Operation. The cells active in the five additional model layers were used to represent the tailings and TSF embankments.

The MRSFs were not explicitly represented in 3D during the Construction, Operation, and Decommissioning and Closure model, but were represented through changes in recharge over their footprints (described in Section 6.4.1). The horizontal grid discretization was unchanged from the existing conditions model as described in Section 5.1.

6.2. Model Stress Periods

The observed seasonal groundwater elevation fluctuations of 0.1 to 4.0 m per year (BGC 2015a) were considered to be negligible compared to expected mining-induced groundwater elevation changes of greater than 100 m over the 20-year mine life. Therefore, annual stress periods were assigned and seasonal variations in groundwater elevations were not simulated. A summary of the timing of feature activation in the groundwater model is provided in Table 09 and is based on the mine plan provided by KAM (Table 08). Modifications to the model grid and boundary conditions are discussed below.

6.3. Hydrostratigraphic Units and Parameters

Two additional hydrostratigraphic units were introduced to the five additional model layers:

1. Tailings (K_{xy}= 2.0x10^{-7} m/s, K_z= 3.0x10^{-8} m/s, S_s= 1.0x10^{-4} m^{-1}, S_y= 0.3) (KP 2014d)
2. Tailings Embankment Material (K_{xyz}= 3.5x10^{-4} m/s, S_s= 1.0x10^{-6} m^{-1}, S_y= 0.2) (KP 2014d).

6.4. Boundary Conditions

Figure 25 shows the changes in the model boundary conditions for Construction, Operation, and Decommissioning and Closure mine life phases within the Mine Site. Outlines of the facilities, as shown on Figure 25, depict the planned facility extents. The following subsections describe the changes that were made to the existing conditions model to simulate the Construction, Operation, and Decommissioning and Closure mine life phases.

6.4.1. Recharge

The effects on groundwater recharge resulting from the development of the East, South and West MRSFs as well as the ore stockpiles north of the open pit are shown in Figure 26 and discussed in Section 6.4.8. Outside of the planned mine development area, the distribution of recharge and specified rates were unmodified from the existing conditions model described in Section 5.3.1.

6.4.2. Evapotranspiration

Evapotranspiration was set to 0 mm/year for areas within the expanding TSF and MRSF footprints. Tailings within the TSF were represented using a GHB and net recharge was specified directly for MRSF footprints. In areas outside of the planned mine development area, the distribution of evapotranspiration and specified rates and extinction depths were unmodified from the existing conditions model described in Section 5.3.2.

6.4.3. Kamloops Lake / Thompson River

Kamloops Lake and Thompson River were unmodified from the existing conditions model as described in Section 5.3.3.

6.4.4. Streams and Creeks

Streams and creeks outside of the Peterson Creek watershed were unmodified from the existing conditions model as described in Section 5.3.4. Changes to Peterson Creek watershed are described in Section 6.4.10.

6.4.5. Lakes and Ponds

Lakes and seasonal ponds were conceptualized as groundwater discharge zones in endorheic basins (a closed drainage basin that retains water and allows no outflow to external surface water bodies). Recharge throughout the footprints of natural lakes and ponds was set to zero.

GHBs were used to represent natural lakes and ponds with hydraulic head set equal to the average grid cell elevation (as discussed in Section 5.3.5 and Table 04). GHB conductance was set to 1.0×10^{-8} m/s as discussed in Section 5.3.5. Boundary conditions for lakes beneath the expanding mine infrastructure were removed (i.e., Goose Lake, the unnamed lake formed in the historic waste dump north of the proposed pit).

6.4.6. Open Pit

Open pit shells were represented in the model using six CAD package (.dwg) files provided by KAM in May 2014 for mining years 2, 5, 8, 10, 15, and 20 (KAM 2014b). The open pit mining sequence will start with mining in the historical pits which merge into one pit at phase four (end of Mine Year 5). The Mine Years to follow show that mining of the open pit will progress from West to East until the final pit elevation of approximately 450 masl is reached in Mine Year 20.

Waste rock will be placed in the open pit beginning at about Mine Year 13 and terminating at about Mine Year 18. The placement of the IPMRSF is detailed in Section 3.9.1.4 of the EAO (2015). The IPMRSF will be placed in the western most portion of the pit, buttressing the highwall between the pit and Jacko Lake (KAM 2014b). The backfill is assumed to be high hydraulic conductivity and thus would drain immediately when placed. Therefore, backfill was not physically represented in the model.

The expanding open pit was simulated using the MODFLOW drain package for each available pit phase (Figure 25). Water elevations within the drain cells were specified at the depth of the active pit base. Drains representing each pit phase became active (i.e., were turned on) at the beginning of the Mine Year and remained active until the next phase was introduced (i.e., pit phases were implemented at the beginning of Mine Years 2, 5, 8, 10, 15 and 20). The pit phases were implemented in the time sequence provided and were not interpolated between intermediary times. This assumption results in groundwater outflow spikes when pit phases are first implemented. The timing of pit shell implementation is summarized in Table 09.

The conductance of the drains was set to a high value to allow water to freely drain into the simulated open pit. Precipitation entering the pit is handled as part of the surface water management plan; therefore, recharge rates within the expanding footprint of the pit were specified to be 0 mm/year. Evapotranspiration rates within the expanding footprint of the pit was also specified to be 0 mm/year. The footprint of the open pit was increased as mining operations progressed.

6.4.7. Tailings Storage Facility

Tailing Storage Facility (TSF) design drawings (Drawings No. C0002-KA39-5100-10-001 to C0002-KA39-5100-10-007, Revision D) for Mine Years -2, -1, 1, 2, 5, 10, and 20 (seven phases) were provided by Knight Piesold (KP 2014d). Starter embankment construction will take place during Mine Years -2, and -1, with staged expansion of the embankments commencing in Mine Years 1 to 20 (Figure 25).

The West Mine Rock Storage Facility (WMRSF) will abut the North Embankment of the TSF. Tailings will be actively discharged to the TSF during Operation, with reclaim water being pumped from the TSF pond to the mill. Runoff collection ditches will route water to local ponds, which will be routed to the central collection pond.

As with the open pit, 0 mm/year of recharge and evapotranspiration was applied to the expanding area overlain by tailings within the TSF footprint. Both the tailings beach and supernatant pond areas within the TSF were represented in the model as a single GHB (i.e., a constant head value equal to the pond elevation was specified within model cells comprising the pond and beach areas). This implementation therefore leads to a conservative (i.e., over estimation) of groundwater seepage caused by the TSF. The conductance of the GHB was set to 2.0×10^{-7} m/s based on tailings geotechnical characterization work completed by KP in 2015b (i.e., pumping tests and seismic cone penetrometer pore dissipation tests). The hydraulic head within the TSF GHB was set based on pond levels from the preliminary facility design (KP 2014d).

For Mine Years -2, -1, 1, 2, 5, 10, and 20, the corresponding GHB hydraulic head elevations assigned were 947 masl, 960 masl, 973 masl, 982 masl, 1,002 masl, 1,024 masl, and 1,057 masl, respectively. The TSF GHB was progressively moved higher in the active model layers (representing the increase in pond elevation) and expanded laterally within the TSF footprint (i.e., both tailings beach and supernatant pond) with the progression through the Mine Years. The TSF GHB was introduced at the beginning of each Mine Year for which design drawings were available, and remained active until the next phase was introduced. Similar to the open pit, the TSF GHB was not interpolated between the time sequences provided, as a consequence groundwater inflow spikes occurred when GHB boundaries were first introduced.

The TSF and embankments were represented in 3D by modifying the model grid as discussed in Section 5.1. The TSF embankments were represented in 3D by setting grid cell elevations to the maximum embankment height (KAM 2014a). Hydraulic conductivity of the TSF embankment material was set to the calibrated hydraulic conductivity of mine rock $K_{xyz} = 3.5 \times 10^{-4}$ m/s (Figure 20). A vertical, low-permeability ($K_{xyz} = 4.0 \times 10^{-14}$ m/s) hydraulic flow barrier (HFB) boundary was set within the TSF embankments to represent the lined faces of the embankments.

The hydraulic conductivity of the model cells within the ultimate footprint of the TSF were set to a horizontal hydraulic conductivity, $K_{xy} = 2.0 \times 10^{-7}$ m/s and vertical hydraulic conductivity, $K_z = 3.0 \times 10^{-8}$ m/s based on tailings test work completed by KP (2014d).

6.4.8. Mine Rock Storage Facilities and Ore Stockpiles

Expanding MRSF footprints were provided by KAM for Mine Years 2, 5, 8, 10, 15, and 20 (six phases) and were based on the June 2014 Mine Site General Arrangement (Table 08). The EMRSF is planned to reach its maximum elevation (1,020 masl) in Mine Year 2. Soil and reclamation piles will be constructed on top of this MRSF.

The MRSFs are assumed to be free draining and no perched water tables are assumed to develop within them. Foundation materials are comprised of glacial till ranging from stiff to hard sandy silts, to compact dense silty gravels (surficial sedimentary deposits).

Recharge was applied to the MRSF footprints in the upper most active model cell to simulate infiltration through the piles. The recharge rate was assumed to be 10% of the predicted infiltration value estimated for the MRSFs using HYDRUS-1D (Šimůnek et al., 2008) as part of a preliminary version of the WBM completed in October 2014.

The HYDRUS-1D calculations produced a net infiltration value of 27.0 mm/year applied to the top of the MRSFs; therefore, 2.7 mm/year was applied as the net recharge rate in the expanding MRSF footprints. ET was set to 0 mm/year in the MRSF footprints because a net recharge value was specified (Figure 26).

The Low Grade (LG) and Medium Grade (MG) ore stockpiles will be located directly south of the pit and in between the WMRSF and SMRSF, and the boundary conditions for these facilities are the same as for the MRSFs.

6.4.9. Water Management Ponds

In total, seven water management ponds will be constructed downstream of the TSF and MRSF embankments to collect contact runoff from mine rock and embankment fill materials and seepage. These include the:

- Central Collection Pond
- North Embankment Pond 1
- North Embankment Pond 2
- South Embankment Pond
- Southeast Embankment Pond
- EMRSF Pond
- SMRSF Pond.

Water management ponds will be constructed in Mine Year -2, except for the South and Southeast Embankment Ponds, which will be constructed in Mine Year 21.

For the predictive simulations, North Embankment Ponds 1 and 2, the Central Collection Pond, and the EMRSF Pond were considered to be lined with a smooth high density polyethylene (HDPE) geomembrane. These ponds were simulated using the RIV package with hydraulic head set equal to the average grid cell elevation in the pond footprint. Conductance for the ponds was calculated based on the cell dimensions and an effective hydraulic conductivity for HDPE membrane underlain by 1 m of compacted till with an average hydraulic conductivity of $K = 5.0 \times 10^{-7}$ m/s. The effective hydraulic conductivity for the geomembrane was calculated to be 2.1×10^{-9} m/s (Appendix C) based on a liner defect criterion of 1 cm^2 per 4 ha of geomembrane (Giroud 1997).

The SMRSF Pond, South and Southeast Embankment Ponds were simulated without a synthetic lining. These ponds were simulated with a GHB boundary. The conductance for the ponds was calculated based on the cell dimensions and an effective average hydraulic conductivity for compacted till of 5.0×10^{-7} m/s.

A summary of the water management pond elevations and lining type simulated in the model and depth to groundwater are included in Table 10.

6.4.10. Jacko Lake and Peterson Creek

As mining progresses, dams will be required at Jacko Lake to preserve habitat and existing water licenses, for fish conservation and downstream irrigation and to avoid flooding the open pit. Water elevations in Jacko Lake will be managed to meet dam design requirements and surplus water will be transferred to a downstream pond. Currently, the planned average operating water elevation for Jacko Lake is 892.0 masl and the overflow elevation is 895.0 masl (Norwest 2015).

As noted above, Peterson Creek will be diverted to accommodate the expanding open pit. Water from Jacko Lake will be pumped through a temporary pipeline along the main haul road to the north of the pit and discharged to a location designated as the “Peterson Creek Diversion Discharge” area to flow into the PCDP (Drawing 01). The planned average operating level for the PCDP (PCDP) is 865.5 masl (Norwest 2015). BGC understands that construction of the Jacko Lake dams, the PCDP and dam are to be completed during the first year of Construction (Mine Year -2).

Jacko Lake was represented as a GHB using a drawing exchange format (Bathymetry_Contours_prelim.dxf) file provided by KAM on October 6, 2014 (Aconex Transmittal No. 002917). The hydraulic head within model cells representing Jacko Lake was set to 892.0 masl to represent the existing and planned average operating conditions. The GHB conductance values are the same as the ones used in the existing conditions model, as described in Section 5.3.5.

Streams and creeks represented by the SFR package were unmodified from the existing conditions model (Section 5.3.4), with the exception of the reach of Peterson Creek that extends from the southeast arm of Jacko Lake to the planned location of the PCDP, located south of the open pit (Figure 25). This stream reach was removed from the model at Mine Year -2 to represent a planned diversion via the temporary pipeline. The diversion was simulated by transferring stream flows from the upstream model boundary cell directly downstream to the model boundary cell representing the diversion outlet designated as the “Peterson Creek Diversion Discharge” assuming no losses (i.e., no leakage and no evaporation).

At closure, the diverted Peterson Creek flows between Jacko Lake and the PCDP will be re-established to a gravity driven flow system (KP 2014c). The model boundary conditions representing the diversion remained unchanged at Closure and into Post Closure, consistent with the assumption that the reinstated creek bed will be lined to minimize leakage. This implementation of the reinstated creek in the model neglects evaporative losses, which are considered to be comparatively minor. If the reinstated creek is not lined, this assumption will under estimate leakage from the creek bed to the underlying groundwater system.

The Peterson Creek downstream dam will be constructed during the first year of Construction (Mine Year -2), leading to the formation of the PCDP. Stream flows are routed into and out of the PCDP. The PCDP was represented as a GHB, and limits of the PCDP were defined in the groundwater model using the CAD package (Year -1, -2, 1, 2, 5, 10, 20.dwg) provided by KAM on May 11, 2014 (Aconex Transmittal No. 003282). The hydraulic head within model boundary cells representing the PCDP was set to the average operating elevation of 865.5 masl. The conductance for the GHB was calculated using the dimensions of the grid cells and assumed to be lined by 1 m of compacted till with a hydraulic conductivity of 5.0×10^{-7} m/s.

7.0 SIMULATION OF POST CLOSURE

7.1. Model Geometry and Grid

The five model layers added to the existing conditions topography to represent the topography during Construction, Operation, and Decommissioning and Closure (Section 6.1) were expanded to represent mine rock storage facilities in 3D for the Post Closure period (Mine Year 24 to 300). The grid elevation for the mine rock was set to the ultimate design elevation and includes the EMRSF, SMRSF, WMRSF, TSF and embankments. Final elevations for the reclaimed EMRSF, SMRSF, and WMRSF are 1,020 masl, 1,235 masl, and 1,095 masl, respectively. The LG/MG stockpiles will be mined out during operations and are not considered in Post Closure. The IPMRSF will be placed in the western most portion of the pit, buttressing the highwall between the pit and Jacko Lake (KAM 2014b). The backfill is assumed to be high hydraulic conductivity and thus would drain immediately when placed. Therefore, backfill was not physically represented in the Post Closure model. The horizontal grid discretization remained the same as the existing conditions model described in Section 4.1.

7.2. Hydrostratigraphic Units and Parameters

Hydraulic properties assigned to hydrostratigraphic units at Post Closure were unchanged from the Construction, Operation, Decommissioning and Closure model described in Section 6.2.

7.3. Boundary Conditions

With the exception of groundwater recharge, the open pit lake, and TSF, model boundary conditions were unchanged from those described in Section 6.4. Boundary condition considerations for Post Closure simulations are described in Table 10 and the following sections. Post Closure boundary conditions and recharge areas are shown on Figures 27 and 28, respectively.

7.3.1. Recharge

Groundwater recharge applied to MRSFs and ore stockpiles during Post Closure are shown in Figure 28 and discussed in Section 7.3.8. Outside of the planned mine development area, the distribution of recharge and specified rates were unmodified from the existing conditions model described in Section 5.3.1.

7.3.2. Evapotranspiration

Evapotranspiration was set to 0.0 mm/year for areas within the TSF, MRSF, open pit and ore stockpile footprints during Post Closure (Figure 28). In areas outside of the planned mine development area, the distribution of evapotranspiration and specified rates were unmodified from the existing conditions model described in Section 5.3.2.

7.3.3. Kamloops Lake / Thompson River

Kamloops Lake and the Thompson River were unmodified from the existing conditions model described in Section 5.3.3.

7.3.4. Streams and Creeks

Streams and creeks outside of the Peterson Creek watershed were unmodified from the existing conditions model described in Section 5.3.4.

7.3.5. Lakes and Ponds

Lakes and ponds outside of the Peterson Creek watershed were unmodified from the Construction, Operation, Decommissioning and Closure model described in Section 6.4.5.

7.3.6. Open Pit

The open pit will be actively filled with groundwater seepage from the TSF, runoff from the MRSFs, gravity drainage from the SMRSF Pond, as well as passive seasonal surficial runoff and groundwater discharge. The elevation and timing of the maximum stable pit lake elevation was estimated iteratively between the groundwater model and the WBM (BGC 2015b). The pit lake was estimated to reach a maximum stable elevation of about 760 masl approximately 300 years Post Closure, when open pit inflows (predominantly groundwater seepage) become equal to pit lake evaporative losses (BGC 2015b). A series of steady-state simulations were used to represent the varying pit lake elevations during Post Closure. The pit lake was simulated using a GHB with lake elevations of 500 masl, 600 masl, and 700 masl, the approximate maximum stable pit lake elevation predicted for Mine Year 24, 35 and 300, respectively (BGC 2015b and Table 09). The conductance of the GHB was calculated based on the grid cell geometry and the hydraulic conductivity of the surrounding host bedrock.

7.3.7. Tailings Storage Facility

During the Closure and Decommissioning mine life phase the TSF area will be progressively capped with crushed mine rock and soil to support revegetation. Seasonal runoff will be directed to a collection pond in the southeast area of the TSF and released to Humphrey Creek if compliant with discharge criteria. If water is non-compliant, treatment may be necessary or alternatively water may be pumped to the open pit (KP 2014c).

The GHB representing the TSF was set to 1057.8 masl, the predicted average TSF saturation level Post Closure (KAM 2014a). The conductance remained unchanged from the Construction, Operation, Decommissioning and Closure model and the ET over the expanding TSF footprint was set to zero (Section 6.4.7). These assumptions will likely over estimate groundwater inflows from the TSF at Post Closure and should be updated as TSF designs progress.

7.3.8. Mine Rock Storage Facilities

Mine rock storage facilities will be recontoured and capped with NPAG mine rock and soil to support revegetation. Recharge and ET for the MRSFs remained unchanged from the Construction, Operation, Decommissioning and Closure model described in Section 6.4.8.

7.3.9. Water Management Ponds

The central collection pond will be decommissioned Post Closure with runoff routed directly to the open pit. Water in TSF and MRSF water management ponds will be stored and allowed to evaporate. Surface runoff will be released after water quality standards are achieved. The water management ponds were represented with the same RIV and GHB packages in the Construction, Operation, Decommissioning and Closure model as described in Section 6.4.9.

7.3.10. Jacko Lake and Peterson Creek

Natural drainage pathways from Jacko Lake to Peterson Creek will be re-established to a gravity driven flow system for Post Closure (KP 2014c). The diversion system will be maintained and operated during the re-establishment of Peterson Creek to maintain downstream flows from Jacko Lake. The SFR package simulating Peterson Creek remained unchanged from the end of the Construction, Operation, Decommissioning and Closure model (Section 6.4.10).

The Peterson Creek downstream dam will remain in place Post Closure for habitat compensation. Jacko Lake and the PCDP were represented with the same GHBs in the Construction, Operation, Decommissioning and Closure model described in Section 6.4.10, with operating elevations of 892.0 masl and 865.5 masl for Jacko Lake and the PCDP, respectively.

8.0 MODEL RESULTS

The model was used to simulate transit groundwater flow conditions for Construction, Operation, Decommissioning and Closure, followed by simulation of long-term steady state Post Closure groundwater flow conditions at varying pit lake elevations. Section 8.1 describes the simulation results for Construction, Operation, Decommissioning and Closure. Section 8.2 describes simulation results for Post Closure.

8.1. Construction, Operation, Decommissioning and Closure

8.1.1. Construction, Operation, Decommissioning and Closure Groundwater Flow System

Simulated potentiometric surface contours for the Mine Site during several stages of mine development are shown on Figure 29. Changes to the water table are indistinguishable during Construction and the beginning of Operation (i.e., Mine Years -2, -1, 1 and 2). As mining progresses, the water table begins to be drawn down in the area surrounding the open pit, which can be seen in Mine Years 5, 10, 15, and 20. At the same time, a groundwater mound develops below the footprint of the TSF.

The simulated change in groundwater elevations from existing conditions to end of Operation as a result of the Project is shown on Drawing 05. As shown, the simulated changes to groundwater elevations during Operation do not extend to the Aberdeen area. Simulation results indicate that dewatering of the open pit during Operation will lower the potentiometric surface in the vicinity of the open pit and an area extending north of the open pit, however the area of influence is not simulated to reach the Aberdeen area.

The change in groundwater elevations in surficial deposits and bedrock are depicted in Figure 30 at select monitoring locations. These monitoring locations are shown on Drawing 03 from the Baseline Groundwater Hydrology Assessment (BGC 2015a). The following select monitoring locations were chosen for their proximity to mining structures:

- BGC14-003, located between Jacko Lake, the open pit, and TSF, groundwater levels decrease due to open pit dewatering and depressurization.
- AJGW06-D, located between the open pit and the PCDP, groundwater levels decrease due to open pit dewatering and depressurization.
- MW11-05, located within the north end of EMRSF footprint, groundwater levels decrease due to lower EMRSF recharge rates.
- BGC14-010, located to the West of the TSF and WMRSF, groundwater levels increase due to TSF seepage.

8.1.2. Groundwater Balance

Potential groundwater sources and receiving water bodies in the Mine Site were identified and are shown in Table 10 and Drawing 01. A groundwater zone budget was run on each source and sink for two pre-mining years (Mine Years -4 and -3), Construction (Mine Years -2 and -1) and throughout Operation (Mine Years 1 to 23) to identify the total groundwater inflows, outflows, and net flows (Tables 11, 12, and 13).

Tables 11 and 12 summarize the total amount of water expected to enter and exit the groundwater system at the different mine facilities, respectively. The difference in these values is the net groundwater flow (Table 13). Positive values represent volumes of water entering the groundwater system and negative values represent volumes of water leaving the groundwater system.

Tables 11, 12, and 13 summarize rates for the following:

- Groundwater discharge to the open pit
- Groundwater seepage from the TSF
- Groundwater seepage from MRSFs
- Groundwater seepage from the ore stockpiles
- Groundwater discharge/seepage at water management ponds, including the PCDP
- Groundwater gain/loss for Jacko Lake and Unnamed Lake
- Gains/losses for Humphrey Creek and Lower Peterson Creek along their entire reaches.

Transitory increases in predicted groundwater discharge to the open pit (Table 12) correspond to periods when a new pit shell was introduced within the model. In reality, pit flows will increase more gradually as mining progresses. The groundwater discharge rate into the open pit is predicted to range from approximately 57 m^3/d in Mine Year 1, to approximately 4,416 m^3/d, in Mine Year 2. At the end of mining, the inflows to the pit are predicted to be approximately 723 m^3/d.

TSF seepage reaches a maximum in Mine Year 20 (4,992 m^3/d) when the TSF reaches its maximum extents. Less than 10 m^3/d of seepage was simulated to report to the water management ponds surrounding the TSF (North Embankment Ponds 1 and 2, and South and Southeast Embankment ponds) during Construction and Operation. The majority of TSF seepage is predicted to flow into the open pit or will be lost to evapotranspiration during Operation under the simulated conditions.

8.1.3. Changes to Jacko Lake Flows

As seen from Table 13, net groundwater flows to Jacko Lake are expected to reverse from being a net groundwater sink (discharge zone) during Construction to a net groundwater source (recharge zone) throughout Operation due to the hydraulic gradients created by the open pit. Net groundwater discharge to Jacko Lake was simulated to be approximately 4 m^3/day during Construction. During Operation, Jacko Lake was simulated to produce groundwater infiltration rates of 49 m^3/day at the start of Operation to 127 m^3/d at the end of Operation.

8.1.4. Changes to Creek Flows

Simulation results for Lower Peterson Creek predict a pattern of gaining and losing reaches between Jacko Lake and PC02 as depicted in Drawing 04. Lower Peterson Creek is a gaining stream (net groundwater sink) before Construction (existing conditions), during Construction, and throughout Operation. Lower Peterson Creek is predicted to gain approximately 268 m^3/d from groundwater seepage on average before and during Construction. During Operation Lower Peterson Creek is predicted to gain 259 m^3/d. The slight (i.e., 3%) decrease in baseflows is due to three factors:

1. Lower MRSF recharge.
2. Lower Peterson Creek diversion.
3. Open pit dewatering.

Humphrey Creek is predicted to be a losing stream (net groundwater source) before and during Construction, losing an average of 34 m^3/d to groundwater. No changes to Humphrey Creek, Cherry Creek, and Anderson Creek baseflows are expected during Construction, Operation, and Decommissioning and Closure.

8.2. Post Closure

8.2.1. Post Closure Groundwater Flow System

Simulated Post Closure regional water table contours are shown on Figure 31. Simulated Mine Site Post Closure water table and bedrock groundwater elevations contours near the Mine Site are shown on Figures 32 and 33, respectively for Mine Year 24. Significant changes to the flow system within the Mine Site include drawdown at the open pit and groundwater mounding below the TSF.

Drawing 06 shows the difference in groundwater elevations between the existing conditions and Post Closure model (Mine Year 300) in the Mine Site. Cool colours indicate areas with higher Post Closure groundwater elevations compared to existing conditions, while warm colours indicate areas with lower groundwater elevations. Groundwater elevation changes of greater than 100 m are predicted. Groundwater elevations are predicted to be lower near the open pit and beneath the closed MRSFs. Conversely, groundwater elevations are predicted to be higher beneath the TSF. Drawing 06 indicates no predicted groundwater elevation changes at Aberdeen due to the Project.

8.2.2. Groundwater Balance

Figure 34 provides an overall water balance for the Post Closure groundwater model for one year into Post Closure (Mine Year 24) for the full model domain. A total of 73% of the net inflows to the model are simulated to be from groundwater recharge. Focused groundwater inflows from ponds and small lakes (i.e., natural lakes) are predicted to provide 7% of net inflow. Peterson Creek and its tributaries provide both inflow (6%) to and outflow (6%) from the groundwater system along gaining and losing reaches.

A total of 63% of net outflow from the groundwater flow system is lost to evapotranspiration, with groundwater discharge to Cherry Creek Watershed, Anderson Creek Watershed, and other RSA streams (i.e., streams within the model domain that were represented as drain boundaries) representing an additional 8%, 2%, and 3% of net outflow, respectively. Seepage to the Ajax open pit accounts for 12% of net outflow. Groundwater seepage collected by natural lakes (1%), and water management ponds (2%) make up 3% of the net outflow. Baseflow to Kamloops Lake and the Thompson River represent the remaining 3% of net outflow.

A groundwater zone budget was run on each Post Closure source and sink (Table 10) to identify the Post Closure total groundwater inflows, outflows, and net flows (Tables 11, 12, and 13). In addition, travel time and seepage rates from potential sources to sinks were estimated using both forward and reverse particle tracking (Appendix D). Particles starting from groundwater sinks were allowed to travel in reverse for 20, 200, and 300 years. When a particle intercepted a groundwater source, the sink cell from which the particle originated was identified as receiving water from that source. A corresponding zone budget was run with source cells identified using reverse particle tracking.

A “strong sink” extracts water from the entire aquifer depth, while a “weak sink” lets some water pass underneath the sink in the case of a surface water feature (Abrams et al. 2013). For reverse particle tracking, a weak sink would act as a weak source and, consequently, reverse particles would fail to arrive at weak sources (i.e., MRSFs and seepage ponds) when travelling from strong sinks, such as the open pit. Forward particle tracking results predicted that water originating from the MRSFs would migrate to the open pit, while reverse particle tracking results did not. For this reason, the methodology to estimate travel time and seepage rate from weak sources to strong sinks required additional forward particle tracking analysis.

Forward particle tracking results showed that the open pit received water from the following weak sources after 20, 200 and 300 years of simulation: EMRSF, SMRSF, LG Stockpile, MG Stockpile, and Central Collection Pond. Although, seepage to the pit will originate from the LG Stockpile, MG Stockpile, and Central Collection Pond for the 200 and 300 year particle tracks, these three sources are planned to be decommissioned by that time. These results were used to allocate the net groundwater flows from weak sources to the open pit.

Forward particle tracking was used to investigate whether specific mine facilities may contribute seepage to surface water. Forward particle tracking results predicted that Lower Peterson Creek could receive seepage from the EMRSF, EMRSF Pond, and the PCDP, and that Humphrey Creek could receive seepage from the SMRSF. These results were used to allocate the net groundwater flows from the weak sources to the creeks.

8.2.3. Forward Particle Tracking Results

Forward particle tracking results are shown in Drawings 07 to 19. The drawings show short (0-20 year), medium (20-200 year) and long travel times (200-1000 year). Forward particle tracking results show that RES-2, the closest down gradient groundwater drinking well, is within the 200 year travel path of seepage affected water from the PCDP. Additional analysis of predicted water quality changes at RES-2 from mining activity is summarized in The Plume Migration Analysis to RES-2 Memorandum (BGC 2015f).

8.2.4. Changes to Jacko Lake Flows

As seen from Table 13, seepage from Jacko Lake to the open pit decreases from 131 m^3/d to 127 m^3/d during post closure. As the pit lake elevation rises the hydraulic gradients driving seepage from Jacko Lake to the open pit decreases. The predicted lake seepage declines by 4 m^3/d, or 3%, as the open pit lake elevation increases from 500 masl to 700 masl.

8.2.5. Changes to Creek Flows

Baseflows to Lower Peterson Creek are predicted to decrease by approximately 6% between the end of Operation and Post Closure, decreasing from an average of 259 m^3/d to 244 m^3/d. The predicted baseflows are not sensitive to the simulated open pit lake elevation (Table 13).

Groundwater infiltration rates from Humphrey Creek are predicted to increase by 3% from the end of mining Operation to Post Closure conditions. Humphry Creek is simulated to be a losing stream (net groundwater source) at Post Closure, losing an average of 35 m^3/d to groundwater.

No changes to Cherry Creek or Anderson Creek baseflows were predicted to occur from existing conditions through the Post Closure phase.

8.2.6. Pit Lake Formation

The maximum stable pit lake elevation was estimated using the WBM to be approximately 760 masl assuming ambient climate conditions (BGC 2015b) and estimated seepage rates from the groundwater flow model for varying Post Closure pit lake elevations (Table 13). The pit lake was estimated to reach this elevation approximately 300 years Post Closure (BGC 2015b). For comparison, the stable maximum pit lake elevation will be approximately 124 m below the natural spillway elevation of 884 masl around the pit perimeter.

The WBM (BGC 2015b) and groundwater flow model results indicate that the open pit will be a permanent groundwater sink in the Post Closure landscape. Once the equilibrium pit lake elevation is reached, open pit inflow rates will be equal to evaporative losses.

8.3. Sensitivity Analysis

Sensitivity simulations were performed to evaluate changes to predicted pit inflows, TSF seepage rates, baseflows from Jacko Lake as well as discharge to Peterson Creek for a reasonable range of input parameters during Operation and Post Closure. The following sensitivity simulations were performed, varying one parameter independently for each run while keeping all other parameters unchanged:

- Hydraulic conductivity of all materials increased by a factor of 5
- Hydraulic conductivity of all materials decreased by a factor of 5

- Hydraulic conductivity of the model cells within the TSF footprint and conductance of the TSF pond and beach GHB increased by a factor of 10
- Recharge applied to the MRSFs increased by a factor of 10
- All recharge zones increased by a factor of 10
- Specific storage of all materials increased by a factor of 10 (Construction, Operation, Decommissioning and Closure model only)
- Hydraulic conductivity of the Peterson Creek Aquifer increased by a factor of 10
- Introduced Edith Lake Fault Zone as a 50 metre wide (model discretization limitation) vertical zone through the bedrock layers, with hydraulic conductivity increased by a factor of 10 compared to the surrounding bedrock.

Results of the sensitivity simulations are provided in Appendix E, which includes:

- Forward particle tracking results for each source facility with particle tracks overlain for each sensitivity simulation
- Mine Year versus net groundwater flow figures for each groundwater source and receiving water body listed in Table 10
- Changes in water table for each sensitivity simulation, including the minimum and maximum water table change based on results from all sensitivity simulations.

Table 14 summarizes the effect of each the sensitivity scenario on model calibration at regional and local scales. Table 14 indicates that the variations in hydraulic parameters, recharge, and the introduction of the Edith Lake Fault Zone (ELFZ) considered as part of the sensitivity analysis each produced acceptable steady-state calibration statistics. Increasing specific storage by a factor of 10, introducing ELFZ, and increasing the Peterson Creek Aquifer hydraulic conductivity by a factor of 10 produced calibration statistics similar to the base case model. Increasing and decreasing hydraulic conductivity by a factor of 5 noticeably degraded the quality of the steady-state model calibration, but the statistics were still within the limits of an acceptable calibration. The scenario where recharge applied to the MRSFs was increased by a factor of 10 is strictly a predictive simulation and is therefore not included in Table 14.

Table 15 summarizes the net groundwater flow rates and results from the forward particle tracking simulations including a summary of the maximum and minimum flow rates from the sensitivity analyses completed. Flow rates are presented for the end of Operation and for steady-state Post Closure conditions. The simulated baseflows to Lower Peterson Creek ranged from 49 to 1,077 m^3/day (0.6 to 12 L/s), which reasonably reflects uncertainty in Lower Peterson Creek baseflows, as represented by the measured winter (November to February) baseflow range of 552 to 600 m^3/day at PC02 in the WBM (BGC 2015b).

9.0 SUMMARY AND CONCLUSIONS

A 3D numerical groundwater flow model was developed for the Ajax Project in support of a provincial Application (the Application) for an Environmental Assessment (EA) Certificate and the federal Environmental Impact Statement (EIS), currently being completed by KGHM Ajax Mining Inc. (KAM). The numerical groundwater flow model was developed based on the conceptual model presented in the Baseline Groundwater Hydrology Assessment (BGC 2015a) for the Ajax Project. The Baseline Groundwater Hydrology Assessment was based on information available from hundreds of boreholes and groundwater monitoring locations, thousands of groundwater elevation measurements, and two pumping tests conducted in the LSA. In addition to the geological and hydrogeological dataset, the Baseline Groundwater Hydrology Assessment considered engineering studies completed by others and publicly available data in the region.

The numerical groundwater flow model was calibrated to the existing hydrogeological conditions within the RSA and LSA. The calibrated model is consistent with the interpreted conceptual hydrogeological model that was developed based on the available local and regional scale data (BGC 2015a). The groundwater flow model was used to simulate the effects of major mine and water management facilities of the Project on the groundwater flow system during Construction, Operation, Decommissioning and Closure, and Post Closure mine phases for best estimate (i.e., calibrated) hydraulic parameters. Results from the groundwater flow model were used to support WBM development (BGC 2015b), surface water quality modeling (KP 2015a), and the HHERA (completed by others). Sensitivity analyses demonstrated the range of model predictions resulting from reasonable changes to the hydraulic parameters (as judged based on the site data collected) and changes to the conceptual hydrogeological model (i.e., the ELFZ).

The following conclusions were drawn from the groundwater modelling study:

- The open pit was predicted to be a permanent groundwater sink Post Closure, reaching a maximum stable pit lake elevation of approximately 760 masl in about 300 years. This simulated stable elevation for the pit lake is more than 200 m lower than observed groundwater elevations near the open pit under existing conditions.
- Groundwater elevations near the open pit were predicted to be greater than 100 m lower than baseline conditions at Decommissioning and Closure and into the Post Closure phase of mining as a result of groundwater flow towards the open pit lake.
- Groundwater elevations in Aberdeen were not predicted to change due to the Project under Construction, Operation, Decommissioning and Closure, or Post Closure phases of mining under base case conditions, and were predicted to decline by 0 to approximately 2 m under the range of sensitivity simulations considered.
- Jacko Lake was predicted to be a groundwater sink under existing conditions and Construction. During Operation, Decommissioning and Closure, and Post Closure, Jacko Lake was predicted to become a groundwater source, providing seepage to the

open pit. Seepage from Jacko Lake into the open pit is predicted to be 112 m^3/day (1.3 L/s) on average from the start of Operation to the end of Closure.

- Under existing conditions, Lower Peterson Creek was interpreted to have a pattern of gaining and losing reaches between Jacko Lake and PC02 resulting from varying topography and interactions with the Peterson Creek Aquifer.
- The base case model predicted a 3% decrease (i.e., from 268 m^3/d to 259 m^3/d) in Lower Peterson Creek baseflow from existing conditions to the end of Operation, followed by an additional 6% decrease in baseflow (i.e., from 259 m^3/d to 244 m^3/d) from the end of Operation to Post Closure (i.e., a total of 9% reduction in baseflow).
- Sensitivity simulations suggest that baseflows to Lower Peterson Creek may increase by approximately a factor of 4 at the end of Operation and Post Closure in the scenario where the hydraulic conductivity of Peterson Creek Aquifer is increased by a factor of 10, indicating that simulated Lower Peterson Creek baseflows are relatively sensitive to this parameter.
- Sensitivity simulations suggest that baseflows to Lower Peterson Creek may decrease by approximately a factor of 5 at the end of Operation and Post Closure in the scenario where the hydraulic conductivity of all units are increased by a factor of 5.
- Groundwater elevations were predicted to increase by more than 100 m above baseline conditions below the TSF.
- Groundwater seepage from the TSF was predicted to mainly discharge to the open pit or be lost to evapotranspiration. Smaller amounts of groundwater seepage were predicted to discharge to water management ponds surrounding the TSF (North Embankment Pond 1 and 2, South and Southeast Embankment Ponds, and SMRSF Pond).
- Groundwater seepage from the EMRSF was predicted to mainly discharge to the open pit, Lower Peterson Creek, and EMRSF Pond.
- Groundwater seepage from the SMRSF was predicted to mainly discharge to the open pit. Smaller amounts of groundwater seepage were expected to discharge to the SMRSF Pond, Humphrey Creek and the PCDP.
- Groundwater seepage from the WMRSF was predicted to mainly discharge to Jacko Lake and the open pit.
- Baseflows to Humphrey Creek, Cherry Creek and Anderson Creek were predicted to remain unchanged as a result of the Project.

10.0 CLOSURE

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per:

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TABLES

Table 01. Summary of surficial hydraulic parameters in the Calibrated Numerical Groundwater Flow Model.

Hydrostratigraphic Unit	Kx,y (m/s)	Kz (m/s)	Ss (m^{-1})	Sy (-)	Porosity (-)
Fluvial/Glaciofluvial Sands and Gravels	1.4E-05	1.4E-06	1.0E-03	2.0E-01	0.25
Glacial Till	1.7E-07	1.7E-08	1.0E-03	1.0E-01	0.25
Lacustrine/Glaciolacustrine Deposits	5.8E-07	5.8E-07	1.0E-03	1.0E-01	0.25
Colluvium	4.6E-08	4.6E-08	1.0E-03	5.0E-02	0.25
Eolian Deposits	3.5E-06	3.5E-06	1.0E-03	2.0E-01	0.25
Organic Materials	5.0E-07	1.0E-07	1.0E-03	1.0E-01	0.25
Anthropogenic Materials	5.0E-07	1.0E-07	1.0E-03	1.0E-01	0.25
Bedded Gypsum[1]	4.4E-09	1.1E-09	1.0E-03	2.0E-02	0.25
Undivided Overburden	5.8E-07	5.8E-07	1.0E-03	1.0E-01	0.25
MRSFs[2]	3.5E-04	3.5E-04	1.0E-06	2.0E-01	0.05
TSF Footprint[2]	2.0E-07	3.0E-08	1.0E-04	3.0E-01	0.25

Note:

1. Area of Bedded Gypsum referred to as "Gypsum Spring" in Golder 2008.
2. Hydraulic parameters for the MRSFs and TSF were assigned in predictive simulations only and therefore were not included in the model calibration.
3. Porosity estimates are based on professional judgment.

Table 02. Summary of bedrock hydraulic parameters in the Calibrated Numerical Groundwater Flow Model.

Main Rock Type	Age (Epoch)	Stratigraphic Unit: Group	Stratigraphic Unit: Formation	Rock Type	K (m/s)	Ss (m^{-1})	Sy (-)	Porosity (-)
Sedimentary and Volcanic	Miocene	-	-	Basaltic volcanic rocks	3.5E-09	1.0E-03	2.0E-02	0.25
	Eocene	Kamloops Group	-	Undivided volcanic rocks	1.0E-09	1.0E-06	5.0E-03	0.05
			Tranquille Formation	Mudstone, siltstone, shale fine clastic sedimentary rocks	1.0E-09	1.0E-06	5.0E-03	0.05
	Upper Triassic	Nicola Group	Eastern Volcanic Facies	Basaltic volcanic rocks	3.2E-09	1.0E-06	5.0E-03	0.05
			-	Mudstone, siltstone, shale fine clastic sedimentary rocks	1.0E-09	1.0E-06	5.0E-03	0.05
			-	Lower amphibolite/kyanite grade metamorphic rocks	3.5E-09	1.0E-06	5.0E-03	0.05
	Devonian to Permian	Harper Ranch Group	-	Mudstone, siltstone, shale fine clastic sedimentary rocks	1.0E-09	1.0E-06	5.0E-03	0.05
Intrusive	Eocene	-	Battle Bluff Plutonic Complex	Diabase, basaltic intrusive rocks	3.5E-09	1.0E-06	5.0E-03	0.05
			-	Feldspar porphyritic intrusive rocks	3.5E-09	1.0E-06	5.0E-03	0.05
	Late Triassic to Early Jurassic	Iron Mask Batholith	Cherry Creek Unit	Dioritic intrusive rocks	1.9E-08	1.0E-06	5.0E-03	0.05
			Sugarloaf Unit	Dioritic intrusive rocks	1.0E-09	1.0E-06	5.0E-03	0.05
			Pothook Unit	Dioritic intrusive rocks	5.9E-09	1.0E-06	5.0E-03	0.05
			Hybrid Unit	Dioritic intrusive rocks	1.5E-09	1.0E-06	5.0E-03	0.05
		-	-	Granodioritic intrusive rocks	3.5E-09	1.0E-06	5.0E-03	0.05
			-	Ultramafic rocks	3.5E-09	1.0E-06	5.0E-03	0.05
3D Geologic Model	NA			Mafic volcanics - Nicola Group	1.0E-09	8.2E-06	5.0E-03	0.05
				Picrite unit	1.0E-09	2.0E-07	5.0E-03	0.05
				Sugarloaf Diorite	2.6E-08	1.0E-07	5.0E-03	0.05
				Sugarloaf Volcanic Hybrid	1.8E-08	6.3E-07	5.0E-03	0.05
				Iron mask hybrid	1.0E-09	9.1E-06	5.0E-03	0.05
				Pyroxene Plagioclase Porphyry	1.2E-09	1.0E-06	5.0E-03	0.05
Undifferentiated Bedrock				Outcrop	4.6E-08	1.0E-03	5.0E-02	0.25
				Shallow	5.8E-08	1.0E-04	5.0E-02	0.25
				Deep	4.6E-10	1.0E-06	5.0E-03	0.05
Fault Zone[2]				Fault	3.2E-08	1.0E-06	5.0E-03	0.05

Notes:

1. Compiled from Massesey et al. (2005).
2. Edith Lake Fault Zone included in sensitivity analysis as 50 m wide zone.
3. Porosity estimates are based on professional judgment.

Table 03. Summary of recharge rates applied in the Calibrated Numerical Groundwater Flow Model.

Existing Conditions Recharge Zones

Recharge Zone[1]	Elevation (masl)	Recharge (mm/yr)	Precipiation (mm/yr)	Recharge (% of PPT)
Bunchgrass	<600	0.5	326.0	0.2%
Bunchgrass	600 - 900	4.9	326.0	1.5%
Ponderosa Pine	600 - 900	4.9	336.9	1.5%
Interior Douglas Fir	900 - 1400	8.4	416.0	2.0%
Montane Spruce	1400 - 1600	9.9	454.9	2.2%
Engleman Spruce - Subalpine Fir	>1600	10.6	490.6	2.2%

Construction, Operation, Decommissioning and Closure, and Post Closure Recharge Zones

Recharge Zone	Maximum Planned Elevation (masl)	Recharge (mm/yr)	Infiltration (mm/yr)[3]	Recharge (% of Infiltration)
TSF Pond	1057	0	0	0%
TSF Beach	NA	0	0	0%
TSF Dams	1060	2.7	27	10%
West MRSF	1095	2.7	27	10%
South MRSF	1235	2.7	27	10%
East MRSF	1020	2.7	27	10%
LG Stockpile (Pile 1)	NA	2.7	27	10%
MG Stockpile (Pile 2)		2.7	27	10%
Open Pit	450	0	0	0%

Notes:

1. Recharge zones specified based on biogeoclimatic zones (Lloyd et al., 1990) which generally correspond to elevation bands in the region.
2. TSF= Tailings Storage Facility, MRSF= Mine Rock Storage Facility, LG= Low Grade, MG= Medium Grade.
3. Infiltration value estimated from preliminary Water Balance Model HYDRUS calculations (BGC 2015b).
4. NA - Not Available.

Table 04. Water elevations of lakes and ponds for GHB boundary conditions in Existing Conditions Model.

Water Body Name	Water Elevation in GW Model (masl)	Approximate Centroid	
		Northing (m)	Easting (m)
Ajax West East Pit	841.7	5609543	683882
Ajax West West Pit	881.2	5609710	683586
Alkali Lake	702.2	5613613	674354
Bowers Lake	711.5	5615667	681323
Edith Lake	1026.5	5605654	687615
Galaxy Lake	935.1	5613227	682042
Gambles Pond	690.2	5613598	687651
Goose Lake	969.1	5606798	684690
Guerin Lake	959.5	5611666	685429
Inks Lake	853.7	5610626	680677
Iron Mask Lake	712.0	5615432	680096
Jacko Lake	892.0	5609712	682531
Lockie Lake	935.1	5612803	683482
Makaoo Lake	959.3	5612173	685249
Nelson Lake	940.6	5612608	681964
Rush Lake	949.6	5608617	678994
Timber Lake	1066.2	5606021	679402
Wallender Lake	867.6	5611965	680882
Unnamed Lake	946.2	5610535	683956

Notes:

1. Lake bed conductance in GHB cells was calculated using the dimensions of the grid block and a lake bottom hydraulic conductivity of 1.0×10^{-8} m/s for lake bed sediments (clayey silt and organic debris) in the area (Klohn Leonoff 1988).

2. GHB = Modflow General Head Boundary Package.

3. Lakes and ponds water elevations within the model domain were set equal to the average grid cell elevation.

4. The elevation of Jacko Lake was based on preliminary LiDAR surveys completed in 2014 for Jacko Lake (KCB 2014).

Table 05. Summary of calibration ranges.

Parameter	Range	Reference
Hydraulic conductivity of surficial deposits	$1.0x10^{-10}$ to $9.3x10^{-4}$ m/s	BGC 2015a
Specific storage coefficient of surficial deposits	$2x10^{-6}$ to $2x10^{-2}$ m^{-1}	BGC 2015a, Maidment 1993
Anisotropy Ratio K_z:K_{xy} (Surficial Sediments)	0.1 to 1	BC MOE 2012
Hydraulic conductivity of bedrock units	$2.0x10^{-11}$ to $8.8x10^{-5}$ m/s	BGC 2015a
Specific storage of bedrock units	$1x10^{-7}$ to $9x10^{-4}$ m^{-1}	BGC 2015a, Maidment 1993
Lake-bed conductance (leakiness)	$1x10^{-8}$ m/s	Klohn Leonoff 1988
Groundwater recharge rate(s)	0.3 to 58.5 mm/year	BGC 2015a
Evapotranspiration rate	525 to 584 mm/year	KP 2014b
Extinction depth for evapotranspiration	3.0 to 5.5 m	Shah et al. 2007, CNGM 2012

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
AJGW02-S	5609337.0	683581.0	1	894.0	888.9	5.1
BGC13-012	5610699.0	683129.0	1	918.0	921.5	-3.5
BGC13-021	5609524.0	687756.0	1	862.8	860.1	2.7
DH-BGC11-ND-09	5612246.0	681170.0	1	876.1	878.6	-2.5
BGC13-022	5609516.0	687168.0	2	863.2	866.2	-3.0
BGC14-008S	5608923.0	686107.0	2	874.3	874.6	-0.3
MW11-10S	5609465.0	687492.0	2	866.7	863.8	2.9
AJGW01-D	5609473.0	683381.0	3	891.9	891.1	0.8
AJGW03-D	5609277.0	684045.0	3	888.4	888.2	0.2
AJGW04-D	5609265.0	684191.0	3	887.9	887.6	0.3
AJGW05-S	5609348.0	684584.0	3	885.8	887.2	-1.4
BGC13-001	5612351.0	683266.0	3	945.7	941.4	4.3
BGC13-006	5610683.0	686890.0	3	945.2	945.2	0.0
BGC13-007	5609676.0	687303.0	3	872.0	877.1	-5.1
BGC14-012S	5608373.0	681950.0	3	923.2	919.0	4.2
BH10-12	5610893.0	680849.0	3	859.7	862.3	-2.6
DH-BGC11-ED-15	5610569.0	685999.0	3	961.7	960.0	1.7
DH-BGC11-ND-05	5612090.0	683224.0	3	940.2	940.7	-0.5
DH-BGC11-WC-18	5610556.0	684240.0	3	956.9	955.8	1.1
BGC13-011	5610639.0	682911.0	4	903.5	902.3	1.2
BGC13-015	5610990.0	683850.0	4	957.7	952.0	5.7
BGC13-016	5610949.0	683791.0	4	958.6	951.1	7.5
BGC14-003S	5608858.0	683544.0	4	893.5	890.4	3.1
BGC14-006S	5610779.0	687288.0	4	932.2	933.8	-1.6
BGC14-007S	5608722.0	685324.0	4	909.3	911.5	-2.2
BGC14-014S	5607810.0	686672.0	4	966.8	971.2	-4.4
BGC14-015S	5606920.0	686773.0	4	976.6	972.5	4.1
DH-BGC11-ED-14	5609281.0	686721.0	4	868.3	871.9	-3.6
DH-BGC11-ND-04	5611331.0	683170.0	4	942.3	941.8	0.5
DH-BGC11-ND-06	5610624.0	682152.0	4	930.7	935.4	-4.7
DH-BGC11-ND-08	5611360.0	681087.0	4	882.7	891.3	-8.6
MW11-10D	5609465.0	687492.0	4	860.3	863.7	-3.4
AJGW07-D	5609634.0	683278.0	5	902.0	903.9	-1.9
AJGW07-S	5609634.0	683278.0	5	902.0	903.9	-1.9
BGC13-002	5612048.0	683381.0	5	941.3	943.8	-2.5
BGC13-003	5611693.0	683382.0	5	944.9	946.4	-1.5
BGC13-004	5612087.0	683599.0	5	949.2	950.1	-0.9
BGC13-009	5610806.0	683447.0	5	928.2	932.1	-3.9
BGC13-010	5610751.0	683317.0	5	924.5	927.4	-2.9
BGC13-014	5611053.0	683791.0	5	958.1	951.1	7.0
BGC13-017	5610940.0	683991.0	5	959.7	952.8	6.9
BGC13-020	5610397.0	682640.0	5	898.2	900.7	-2.5

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
BGC14-002S	5608900.0	682756.0	5	918.9	918.8	0.1
BGC14-003I	5608858.0	683544.0	5	893.6	892.3	1.3
BGC14-017S	5605928.0	685540.0	5	1040.0	1040.5	-0.5
BH10-11	5610537.0	680877.0	5	845.4	853.8	-8.4
DH-BGC11-ED-11	5609914.0	685639.0	5	912.1	920.2	-8.1
DH-BGC11-ES-16	5608160.0	686295.0	5	975.5	978.1	-2.6
DH-BGC11-ND-07	5610715.0	681095.0	5	894.7	891.9	2.8
DH-BGC11-PS-19	5610849.0	683158.0	5	914.5	917.7	-3.2
DH-BGC11-PS-23	5610859.0	683245.0	5	919.6	924.6	-5.0
DH-BGC11-WC-17	5610507.0	684321.0	5	960.1	962.7	-2.6
MW11-03S	5611179.0	678891.0	5	795.0	817.6	-22.6
MW11-08S	5608940.0	681471.0	5	882.3	897.8	-15.5
BGC10_MWA-075	5609556.0	683365.0	7	888.8	892.9	-4.1
BGC10_MWB-075	5609533.0	683326.0	7	891.1	893.3	-2.2
MW11-01S	5612279.0	679814.0	7	924.8	922.7	2.1
BGC13-013	5610788.0	682860.0	3	925.6	926.8	-1.2
AJGW02-D	5609337.0	683581.0	4	888.3	888.8	-0.5
BGC14-005	5609519.0	687161.0	4	862.8	866.3	-3.5
BH10-10	5610334.0	680972.0	4	864.4	857.4	7.0
DH-BGC11-PS-03	5611393.0	684007.0	4	964.0	964.6	-0.6
DH-BGC11-PS-24	5610788.0	682957.0	4	910.8	913.4	-2.6
MW11-05S	5610502.0	686804.0	4	955.0	941.7	13.3
MW11-07S	5612830.0	681620.0	4	939.6	908.8	30.8
BGC13-005	5611699.0	683644.0	5	956.5	954.9	1.6
BGC13-008	5609618.0	686560.0	5	893.1	892.3	0.8
BGC13-018	5610651.0	683013.0	5	908.5	912.4	-3.9
BGC13-019	5610467.0	682670.0	5	900.1	900.1	0.0
BGC14-001D	5608796.0	682286.0	5	925.3	929.6	-4.3
BGC14-002D	5608900.0	682756.0	5	919.0	918.8	0.2
BGC14-006D	5610779.0	687288.0	5	933.2	933.8	-0.6
BGC14-007D	5608722.0	685324.0	5	901.6	913.9	-12.3
BGC14-008D	5608923.7	686101.2	5	861.1	875.1	-14.0
BGC14-014D	5607810.0	686672.0	5	964.7	971.4	-6.7
BGC14-015D	5606920.0	686773.0	5	977.5	973.8	3.7
DH-BGC11-ND-26	5611044.0	683023.0	5	934.7	935.4	-0.7
DH-BGC11-PS-20	5610729.0	683109.0	5	910.8	918.3	-7.5
DH-BGC11-PS-21	5610769.0	683279.0	5	923.3	926.5	-3.2
DH-BGC11-PS-22	5610792.0	683394.0	5	926.0	930.6	-4.6
DH-BGC11-PS-25	5610906.0	683091.0	5	915.4	917.1	-1.7
MW11-04S	5610360.0	682620.0	5	896.2	900.1	-3.9
MW11-05D	5610502.0	686804.0	5	952.3	941.6	10.7
MW11-09S	5608898.0	679938.0	5	906.6	908.9	-2.3

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
AJGW06-D	5609448.0	685013.0	6	899.6	900.0	-0.4
BGC14-003D	5608858.0	683544.0	6	894.1	895.4	-1.3
BGC14-011D	5605945.0	682796.0	6	1025.5	1033.0	-7.5
BGC14-011S	5605945.0	682796.0	6	1025.4	1033.0	-7.6
BGC14-012D	5608373.0	681950.0	6	923.6	922.3	1.3
BGC14-013	5606777.0	686466.0	6	984.9	984.6	0.3
BGC14-016	5607041.0	685348.0	6	1034.4	1024.0	10.4
BGC14-017D	5605928.0	685540.0	6	1041.2	1042.7	-1.5
MW11-02	5610272.0	680578.0	6	842.9	853.6	-10.7
MW11-04D	5610360.0	682620.0	6	899.8	903.3	-3.5
MW11-08D	5608940.0	681471.0	6	873.7	899.2	-25.5
MW11-09D	5608898.0	679938.0	6	908.2	909.7	-1.5
AW-09-103-S	5609357.9	683502.7	7	882.0	889.6	-7.6
BGC14-004	5609526.0	687746.0	7	863.6	860.8	2.8
BGC14-009	5608547.0	686799.0	7	904.0	916.8	-12.8
BGC14-010	5607414.0	681730.0	7	970.6	967.3	3.3
KAX-13-004-S	5609302.3	683342.9	7	888.8	892.2	-3.4
MW11-03D	5611179.0	678891.0	7	791.2	819.2	-28.0
MW11-07D	5612830.0	681620.0	7	940.4	908.5	31.9
BGC10_MWA-125	5609556.0	683365.0	8	886.0	892.6	-6.6
BGC10_MWB-125	5609533.0	683326.0	8	888.8	893.4	-4.6
BGC10-PW01	5609531.0	683365.0	8	887.3	892.2	-4.9
KAX-13-007-S	5609783.4	683152.4	8	915.5	919.3	-3.8
MW11-01D	5612279.0	679814.0	8	923.2	918.3	4.9
AM-10-061S	5609917.5	685117.5	9	906.9	908.6	-1.7
AW-10-105-S	5609662.6	683406.8	9	906.6	895.4	11.2
BGC10_MWA-175	5609556.0	683365.0	9	883.3	892.1	-8.8
BGC10_MWB-175	5609533.0	683326.0	9	884.2	892.6	-8.4
KAX-13-005-D	5609491.7	683260.6	9	884.7	893.7	-9.0
AM-10-067	5609662.4	685119.9	10	904.5	902.4	2.1
AN-10-075	5609290.1	684507.3	10	879.8	896.7	-16.9
AW-09-104	5609345.2	683882.1	10	874.8	884.6	-9.8
AW-10-118	5609898.6	684070.8	10	896.7	916.1	-19.4
KAX-13-007-D	5609787.3	683101.2	10	910.4	911.3	-0.9
AM-10-061-D	5609924.8	685202.0	11	890.9	905.5	-14.6
AW-09-103-D	5609294.1	683430.2	11	874.4	897.6	-23.2
AW-10-105-D	5609672.3	683341.5	11	893.4	897.2	-3.8
KAX-13-004-D	5609255.0	683271.7	11	881.8	902.6	-20.8
AE-10-064-D	5610067.6	684798.9	12	923.1	907.6	15.5
AE-10-065	5609853.0	684385.2	12	897.2	905.5	-8.3
AM-10-054	5609772.6	684800.4	12	896.5	905.5	-9.0
AW-10-106	5609916.9	683582.8	12	919.1	903.6	15.5

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
BH-V4	5613595.1	675833.2	5	715.1	724.8	-9.7
BH-V6-P2	5613428.6	676310.3	5	726.7	735.1	-8.4
PA-1-P2	5613440.8	676817.8	5	744.5	751.6	-7.1
PA-2-P2	5614022.5	676901.1	5	736.5	739.0	-2.5
BH-V1-P1	5614264.6	676147.4	6	710.4	687.7	22.7
BH-V1-P2	5614264.6	676147.4	6	711.2	687.7	23.5
BH-V3-P2	5613915.4	675665.1	6	698.7	711.6	-12.9
BH-V5	5613267.3	675569.1	6	724.0	727.4	-3.4
BH-V6-P1	5613428.6	676310.3	6	726.6	736.0	-9.4
PA-1-P1	5613440.8	676817.8	6	743.3	752.7	-9.4
PA-3-P2	5615548.6	676628.2	6	654.6	660.3	-5.7
BH-V2-P1	5614155.9	675751.0	7	675.1	686.1	-11.0
BH-V2-P2	5614155.9	675751.0	7	675.5	686.1	-10.6
BH-V3-P1	5613915.4	675665.1	7	690.0	709.9	-19.9
PA-2-P1	5614022.1	676900.7	7	737.0	738.8	-1.8
PA-3-P1	5615548.6	676628.2	7	654.9	660.3	-5.4
BH-V8-P1	5614135.5	675201.0	8	663.9	677.4	-13.5
BH-V8-P2	5614135.5	675201.0	8	664.6	677.4	-12.8
1322	5609299.0	688315.0	1	851.2	846.3	4.9
2459	5611444.0	688867.0	1	777.2	776.6	0.6
13490	5606369.0	690921.0	1	913.8	912.8	1.0
18204	5619548.0	669439.0	1	497.8	464.4	33.4
24466	5617076.0	691130.0	1	348.7	353.0	-4.3
33471	5608377.0	694503.0	1	950.7	957.4	-6.7
34165	5610939.0	691434.0	1	960.1	962.5	-2.4
35522	5610495.0	691408.0	1	950.5	946.1	4.4
37047	5612972.0	700241.0	1	706.3	696.7	9.6
38906	5617729.0	670266.0	1	539.2	529.9	9.3
42328	5617170.0	670987.0	1	577.5	553.1	24.4
4240	5618579.0	683072.0	2	343.2	340.2	3.0
4253	5611578.0	688619.0	2	784.6	778.9	5.7
21830	5615400.0	699037.0	2	505.6	499.7	5.9
34846	5613322.0	699749.0	2	676.0	699.3	-23.3
36863	5617221.0	694382.0	2	353.9	364.0	-10.1
41451	5617800.0	670259.0	2	524.9	528.9	-4.0
43097	5612088.0	702824.0	2	575.4	572.1	3.3
44547	5620024.0	668186.0	2	457.6	453.5	4.1
49022	5610405.0	689077.0	2	818.3	814.7	3.6
49048	5610435.0	689078.0	2	817.1	813.9	3.2
58934	5609644.0	688973.0	2	824.2	825.4	-1.2
76292	5619253.0	669312.0	2	483.3	471.0	12.3
85768	5619351.0	668260.0	2	453.9	469.2	-15.3

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
97709	5613684.0	702112.0	2	552.6	578.9	-26.3
4333	5614130.0	700037.0	3	588.2	596.8	-8.6
4389	5610054.0	690511.0	3	875.6	871.2	4.4
16792	5611473.0	688800.0	3	775.1	776.0	-0.9
18233	5619266.0	669445.0	3	479.5	471.4	8.1
21049	5615155.0	699348.0	3	497.4	507.3	-9.9
23668	5614895.0	701833.0	3	526.4	532.3	-5.9
27375	5615780.0	699429.0	3	425.8	403.8	22.0
29635	5615588.0	699386.0	3	449.4	427.0	22.4
35496	5610934.0	691366.0	3	949.2	952.4	-3.2
37262	5613340.0	699783.0	3	665.4	692.3	-26.9
40385	5613317.0	699747.0	3	669.4	699.9	-30.5
45331	5619243.0	669370.0	3	476.8	471.3	5.5
46334	5612131.0	702834.0	3	575.3	570.0	5.3
46577	5609588.0	689120.0	3	823.7	825.4	-1.7
58689	5619426.0	669378.0	3	474.2	468.2	6.0
59081	5610414.0	689092.0	3	813.3	814.1	-0.8
59107	5610440.0	689085.0	3	813.3	813.9	-0.6
59953	5608687.0	690395.0	3	862.9	864.7	-1.8
61271	5609026.0	690015.0	3	860.9	857.6	3.3
61617	5610194.0	689289.0	3	812.0	812.0	0.0
99031	5619590.0	668700.0	3	461.4	463.7	-2.3
17999	5614130.0	671361.0	4	748.6	720.7	27.9
27653	5610177.0	690752.0	4	878.9	881.9	-3.0
29076	5607444.0	681238.0	4	980.2	976.7	3.5
29259	5610634.0	690713.0	4	878.7	880.9	-2.2
34829	5612679.0	700298.0	4	731.5	724.5	7.0
35463	5610597.0	691656.0	4	976.9	971.5	5.4
42648	5613381.0	699871.0	4	654.8	676.6	-21.8
54947	5610165.0	698691.0	4	698.5	715.4	-16.9
61245	5608622.0	690418.0	4	865.3	865.4	-0.1
99251	5610454.0	689670.0	4	815.8	813.1	2.7
105174	5619590.0	668361.0	4	434.9	462.1	-27.2
71	5613474.0	703483.0	5	543.4	562.8	-19.4
4274	5614546.0	701695.0	5	538.5	543.6	-5.1
4321	5618324.0	682957.0	5	341.7	341.5	0.2
4381	5612014.0	688530.0	5	751.6	750.9	0.7
13871	5618405.0	682985.0	5	341.5	341.1	0.4
23482	5611329.0	689878.0	5	798.9	801.1	-2.2
25869	5613038.0	702777.0	5	567.7	584.9	-17.2
29197	5611384.0	678068.0	5	798.9	801.0	-2.1
31543	5610214.0	691297.0	5	921.4	921.7	-0.3

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
31561	5610300.0	690910.0	5	896.4	894.7	1.7
31621	5610238.0	690909.0	5	890.2	890.2	0.0
31901	5610374.0	690927.0	5	904.1	898.3	5.8
31907	5610369.0	690911.0	5	897.3	896.8	0.5
33452	5610213.0	691366.0	5	921.5	929.1	-7.6
35341	5612697.0	675196.0	5	739.7	740.1	-0.4
35358	5610635.0	691193.0	5	932.5	925.0	7.5
35485	5610203.0	690657.0	5	871.9	877.3	-5.4
35667	5610594.0	691466.0	5	964.5	951.3	13.2
36441	5614084.0	700067.0	5	588.9	596.8	-7.9
39499	5618363.0	667180.0	5	596.5	592.1	4.4
42348	5605180.0	695181.0	5	925.8	927.8	-2.0
42402	5605297.0	695305.0	5	931.8	936.6	-4.8
43155	5617572.0	670686.0	5	521.9	536.9	-15.0
43320	5608013.0	689627.0	5	903.3	902.0	1.3
44663	5618145.0	668104.0	5	585.6	584.7	0.9
45110	5612799.0	702848.0	5	533.0	564.9	-31.9
45285	5618128.0	668163.0	5	584.6	584.3	0.3
45329	5613367.0	703500.0	5	541.6	559.5	-17.9
45762	5610323.0	691379.0	5	923.8	938.9	-15.1
48221	5617182.0	668940.0	5	656.2	652.4	3.8
49000	5613446.0	699440.0	5	736.2	760.1	-23.9
49694	5610210.0	691008.0	5	890.0	896.6	-6.6
56260	5613348.0	703493.0	5	541.3	560.2	-18.9
56377	5613127.0	703263.0	5	574.5	589.3	-14.8
57033	5607218.0	689643.0	5	974.9	938.8	36.1
57238	5613379.0	673207.0	5	656.3	672.7	-16.4
57574	5613322.0	703483.0	5	542.3	561.4	-19.1
57812	5613236.0	703374.0	5	558.1	575.3	-17.2
60191	5618466.0	669380.0	5	509.5	515.5	-6.0
61027	5609323.0	693341.0	5	944.0	949.1	-5.1
61255	5610455.0	689457.0	5	794.8	803.4	-8.6
61266	5609719.0	689808.0	5	845.0	850.3	-5.3
76289	5618584.0	669140.0	5	510.2	513.1	-2.9
76290	5618576.0	669146.0	5	504.1	513.4	-9.3
76429	5619451.0	669708.0	5	488.2	468.0	20.2
97722	5613390.0	702143.0	5	551.8	585.0	-33.2
97723	5613571.0	702088.0	5	541.7	577.8	-36.1
97724	5613478.0	702117.0	5	547.7	581.7	-34.0
97772	5617233.0	669447.0	5	627.2	629.6	-2.4
99138	5604876.0	692646.0	5	911.9	902.8	9.1
105917	5618336.0	670191.0	5	504.4	509.9	-5.5

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
4438	5614277.0	676958.0	6	753.2	729.2	24.0
14873	5617765.0	683701.0	6	405.4	425.2	-19.8
18768	5618620.0	682385.0	6	341.5	357.6	-16.1
25283	5613381.0	700539.0	6	612.9	643.2	-30.3
25299	5611640.0	700432.0	6	760.2	760.7	-0.5
25865	5614464.0	701781.0	6	541.2	550.2	-9.0
26627	5614246.0	700920.0	6	587.1	584.9	2.2
29638	5611370.0	689941.0	6	796.4	809.2	-12.8
31169	5608497.0	689306.0	6	898.7	886.5	12.2
31517	5616055.0	671893.0	6	594.6	625.1	-30.5
32352	5608129.0	689623.0	6	895.9	895.6	0.3
32381	5608480.0	689768.0	6	875.8	881.0	-5.2
32831	5617220.0	670127.0	6	540.4	561.9	-21.5
34767	5613436.0	699513.0	6	721.4	740.0	-18.6
37058	5612342.0	700081.0	6	760.2	770.4	-10.2
41436	5610206.0	690801.0	6	875.0	884.5	-9.5
41445	5617999.0	667280.0	6	615.5	617.3	-1.8
44743	5618369.0	668237.0	6	565.0	563.5	1.5
47760	5604770.0	692690.0	6	920.3	913.2	7.1
48188	5612618.0	675085.0	6	731.0	736.0	-5.0
48349	5615447.0	673540.0	6	641.8	654.6	-12.8
51615	5618527.0	667387.0	6	583.0	581.5	1.5
56376	5613118.0	703254.0	6	572.8	589.2	-16.4
57122	5617787.0	670717.0	6	541.8	556.8	-15.0
57135	5618472.0	668119.0	6	559.8	559.0	0.8
58118	5618432.0	683926.0	6	340.6	345.7	-5.1
58120	5615404.0	673331.0	6	656.2	649.6	6.6
58610	5619918.0	668219.0	6	450.4	455.6	-5.2
59550	5618610.0	670317.0	6	491.0	508.6	-17.6
59889	5611934.0	695576.0	6	1068.3	1076.1	-7.8
61028	5609162.0	694265.0	6	950.7	949.8	0.9
61030	5611749.0	692388.0	6	1011.5	1007.7	3.8
61269	5609152.0	689769.0	6	862.7	858.0	4.7
61750	5620105.0	670451.0	6	522.1	437.5	84.6
61751	5620157.0	670325.0	6	518.7	434.2	84.5
76287	5619479.0	670880.0	6	583.6	502.2	81.4
76443	5610850.0	690750.0	6	887.1	883.1	4.0
80509	5610424.0	691664.0	6	966.4	971.8	-5.4
97753	5609311.0	696929.0	6	934.1	934.9	-0.8
98958	5610172.0	691147.0	6	908.8	905.7	3.1
101478	5618491.0	669082.0	6	500.3	519.2	-18.9
104261	5610584.0	699261.0	6	636.2	654.8	-18.6

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
10	5612340.0	687309.0	7	837.7	836.8	0.9
28	5618802.0	667170.0	7	567.2	567.2	0.0
4248	5612794.0	687456.0	7	753.8	761.8	-8.0
21031	5614694.0	699643.0	7	544.7	555.3	-10.6
24291	5614741.0	701324.0	7	476.0	530.0	-54.0
25864	5614753.0	701501.0	7	496.5	531.5	-35.0
25866	5614692.0	701614.0	7	482.2	536.1	-53.9
30304	5605184.0	694950.0	7	924.8	925.0	-0.2
30692	5617351.0	669294.0	7	644.3	624.1	20.2
32853	5617955.0	668852.0	7	558.7	565.7	-7.0
34845	5614280.0	699508.0	7	612.8	662.5	-49.7
35108	5612932.0	698357.0	7	919.9	951.8	-31.9
35462	5611199.0	690766.0	7	865.1	873.0	-7.9
36652	5613623.0	699730.0	7	683.8	696.8	-13.0
39498	5617444.0	670225.0	7	509.9	547.4	-37.5
40544	5613312.0	699594.0	7	685.0	738.8	-53.8
41656	5616883.0	700519.0	7	320.6	337.7	-17.1
44739	5618557.0	668028.0	7	545.6	553.9	-8.3
44792	5613354.0	678882.0	7	943.4	936.6	6.8
44916	5618757.0	667196.0	7	527.7	570.3	-42.6
48346	5616709.0	672261.0	7	724.5	710.2	14.3
49883	5613866.0	703755.0	7	555.0	556.0	-1.0
51160	5608153.0	689438.0	7	907.0	900.7	6.3
51632	5613434.0	699935.0	7	632.5	667.8	-35.3
51660	5616691.0	672085.0	7	697.1	692.5	4.6
57809	5613122.0	703140.0	7	577.7	591.9	-14.2
58128	5615334.0	673334.0	7	630.2	647.1	-16.9
58188	5620125.0	668263.0	7	437.3	451.6	-14.3
58648	5613427.0	678831.0	7	923.1	927.3	-4.2
59126	5618483.0	670969.0	7	536.2	577.2	-41.0
59289	5610914.0	701031.0	7	608.0	633.9	-25.9
59480	5615334.0	672830.0	7	629.9	638.2	-8.3
59528	5610820.0	699902.0	7	612.5	648.6	-36.1
59556	5610215.0	691243.0	7	902.8	915.1	-12.3
60440	5610248.0	698641.0	7	683.8	722.9	-39.1
61024	5608672.0	694229.0	7	934.2	945.2	-11.0
61029	5611770.0	692354.0	7	1011.4	1005.7	5.7
61031	5611395.0	692497.0	7	1009.5	1012.3	-2.8
61035	5608353.0	697128.0	7	910.9	911.0	-0.1
61037	5608387.0	697083.0	7	911.9	912.9	-1.0
61729	5618089.0	668319.0	7	549.9	580.1	-30.2
67887	5608006.0	690145.0	7	871.6	891.3	-19.7

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
67889	5608276.0	689483.0	7	896.1	894.1	2.0
71444	5614883.0	700060.0	7	499.0	512.5	-13.5
76293	5618567.0	669144.0	7	485.5	514.0	-28.5
76340	5617957.0	671141.0	7	592.3	602.4	-10.1
77838	5618628.0	668967.0	7	488.6	512.4	-23.8
80436	5618551.0	669135.0	7	512.2	515.0	-2.8
80508	5610421.0	691645.0	7	966.6	968.5	-1.9
80510	5610435.0	691614.0	7	976.2	966.4	9.8
82682	5611998.0	702906.0	7	566.0	576.1	-10.1
82702	5612259.0	702495.0	7	573.7	613.2	-39.5
82913	5612410.0	702469.0	7	569.2	608.9	-39.7
89963	5610853.0	699893.0	7	635.2	653.2	-18.0
97388	5606883.0	689686.0	7	968.0	949.0	19.0
101665	5618979.0	668683.0	7	455.9	484.6	-28.7
105145	5617519.0	669123.0	7	604.3	611.9	-7.6
105954	5609697.0	693724.0	7	957.2	962.7	-5.5
23765	5614818.0	701277.0	8	443.7	525.9	-82.2
32852	5611783.0	700608.0	8	782.8	767.1	15.7
38001	5616620.0	702124.0	8	346.3	351.2	-4.9
38583	5613428.0	699638.0	8	664.1	729.4	-65.3
40144	5618553.0	667449.0	8	514.2	576.4	-62.2
44975	5618648.0	667578.0	8	543.9	564.7	-20.8
45230	5618656.0	667490.0	8	492.2	567.5	-75.3
51656	5619197.0	670236.0	8	496.0	495.0	1.0
61347	5608131.0	690087.0	8	878.2	885.9	-7.7
61348	5608012.0	690228.0	8	883.1	889.6	-6.5
76288	5619476.0	670884.0	8	553.5	501.1	52.4
76339	5617951.0	671126.0	8	533.9	600.4	-66.5
76341	5617946.0	671134.0	8	544.0	601.0	-57.0
76475	5613801.0	691334.0	8	844.9	839.3	5.6
76521	5610596.0	690804.0	8	891.0	888.0	3.0
77837	5619850.0	671152.0	8	524.8	461.4	63.4
80489	5617972.0	667314.0	8	617.4	615.7	1.7
80504	5610412.0	691601.0	8	975.6	960.8	14.8
80505	5610389.0	691659.0	8	966.1	964.1	2.0
82671	5612312.0	702494.0	8	572.7	611.3	-38.6
97235	5618401.0	669702.0	8	491.9	517.3	-25.4
98093	5610171.0	690934.0	8	879.5	892.7	-13.2
99028	5614785.0	691724.0	8	647.1	683.1	-36.0
76332	5610686.0	698870.0	9	692.6	760.0	-67.4
804(55)	5613416.9	686152.7	2	787.1	784.5	2.6
805(15)	5613908.4	686336.1	2	720.2	719.3	0.9

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 06. Summary of observed and simulated hydraulic heads during steady-state model calibration.

Well ID	Northing[1]	Easting[1]	Model Layer	Observed Head (masl)	Simulated Head (masl)	Residual (m)
MW-4A	5613063.1	686838.7	2	792.6	790.4	2.2
78-16(100)	5613624.2	686212.3	3	751.3	752.9	-1.6
810(65)	5613460.8	686050.5	3	796.6	781.3	15.3
MW-1B	5612926.4	686839.6	3	801.1	798.5	2.6
MW-5A	5613049.9	687042.3	3	786.0	783.2	2.8
MW94-2	5612502.8	686644.0	3	864.1	860.1	4.0
MW94-7	5612852.6	686955.1	3	804.9	798.8	6.1
MW94-8	5612496.2	686816.3	3	854.1	851.2	2.9
78-17(105)	5613271.6	686091.6	4	800.7	801.1	-0.4
MW-3	5612829.8	687172.3	4	782.8	778.6	4.2
MW-5B	5613049.9	687042.3	4	785.8	783.2	2.6
MW94-1	5612431.1	686254.4	4	880.7	877.0	3.7
MW94-6	5612960.2	686540.1	4	829.0	818.9	10.1
P96-9	5613750.0	686661.0	4	714.1	723.5	-9.4
78-14	5613520.1	685466.5	5	794.6	795.5	-0.9
78-15	5613906.3	686334.0	5	720.7	718.4	2.3
801	5614079.3	686386.0	5	686.9	684.9	2.0
802	5614085.0	686388.0	5	686.4	684.5	1.9
810(130)	5613460.8	686050.5	5	796.8	781.6	15.2
MW-1A	5612926.4	686839.6	5	799.8	799.5	0.3
MW-2A	5612873.7	687075.1	5	787.6	786.8	0.8
MW-2B	5612873.7	687075.1	5	787.1	786.8	0.3
MW94-3	5612912.6	686079.0	5	827.1	836.7	-9.6
MW94-4	5612881.4	686329.0	5	838.3	839.5	-1.2
MW94-5	5612951.6	686530.1	5	825.6	821.4	4.2
P96-2	5613549.4	685990.4	5	779.9	779.6	0.3
P96-3	5613543.0	685816.0	5	788.1	792.1	-4.0
P96-6	5613285.0	685730.0	5	821.1	817.0	4.1
P96-7	5612892.0	685581.0	5	855.5	852.3	3.2
P96-8	5612991.0	685365.0	5	861.9	856.6	5.3
P99-1s	5613868.6	686080.5	5	720.6	724.4	-3.8
804(163)	5613416.9	686152.7	6	772.9	782.7	-9.8
805(104)	5613908.4	686336.1	6	700.5	716.8	-16.3
P99-7	5613783.0	686003.0	6	736.1	736.4	-0.3
78-16(180)	5613637.0	686207.7	7	752.4	751.7	0.7
DW92-4(165)	5613370.3	686058.8	7	803.4	790.9	12.5
P99-3d	5613848.2	686308.5	7	699.3	723.4	-24.1
P99-4d	5613716.5	686266.2	7	724.8	739.9	-15.1
P99-5d	5613539.9	686302.6	7	760.2	762.0	-1.8
DW92-4(305)	5613370.3	686058.8	8	801.4	791.9	9.5

Notes:

1. Coordinate system NAD83 Datum UTM Zone 10N

Table 07. Summary of observed and simulated hydraulic heads during transient model calibration to seasonal groundwater elevation data.

Well ID	Observed Groundwater Elevations			Simulated Groundwater Elevations		
	Minimum (masl)	Maximum (masl)	Range (m)	Minimum (masl)	Maximum (masl)	Range (m)
MW11-08D	873.56	873.81	0.25	899.16	899.23	0.07
MW11-07S	939.01	940.21	1.20	908.31	910.30	1.99
MW11-07D	939.92	941.16	1.24	908.16	908.97	0.81
MW11-05S	954.57	955.63	1.06	941.39	943.42	2.04
MW11-05D	951.92	952.93	1.01	941.39	942.76	1.38
MW11-04S	895.71	896.77	1.06	900.04	900.39	0.35
MW11-04D	899.53	900.13	0.61	903.24	903.53	0.29
MW11-03S	794.83	795.70	0.87	817.57	817.59	0.03
MW11-02	842.99	843.39	0.40	853.61	853.88	0.27
MW11-01S	924.68	925.06	0.38	922.13	922.75	0.62
DH-BGC11-ND-09	875.47	876.61	1.14	878.60	878.84	0.24
DH-BGC11-ND-08	882.13	882.99	0.86	890.89	892.54	1.65
DH-BGC11-ND-05	938.58	941.17	2.59	940.71	940.80	0.08
DH-BGC11-ED-15	961.49	962.75	1.26	959.95	960.06	0.10
DH-BGC11-ED-14	866.97	868.51	1.54	872.06	874.35	2.29
DH-BGC11-ED-11	911.85	912.45	0.60	920.28	920.35	0.07
AJGW07-S	901.13	902.30	1.18	903.02	903.82	0.80
AJGW07-D	901.37	902.45	1.07	903.02	903.82	0.80
AJGW06-D	898.84	900.89	2.05	899.95	900.42	0.47
AJGW05-S	879.42	886.44	7.02	887.74	888.63	0.89
AJGW04-D	887.57	888.21	0.64	888.10	889.02	0.92
AJGW03-D	888.09	888.82	0.74	888.43	888.77	0.34
AJGW02-S	892.88	894.88	2.01	888.75	889.09	0.34
AJGW02-D	886.91	889.06	2.15	888.70	888.88	0.19
AJGW01-D	891.23	892.26	1.03	890.57	890.90	0.33
KAX-13-007-S	915.01	917.29	2.28	918.45	919.00	0.55
KAX-13-007-D	910.07	911.70	1.62	910.94	911.01	0.07
KAX-13-005-D	880.92	885.41	4.49	893.12	893.49	0.37
KAX-13-004-S	888.61	889.46	0.85	891.56	892.04	0.48
KAX-13-004-D	881.04	881.96	0.92	902.26	902.37	0.11
BGC10-MWB-175	882.98	888.75	5.77	892.04	892.46	0.42
BGC10-MWB-125	888.64	891.35	2.72	893.08	893.38	0.30
BGC10-MWB-075	890.98	892.62	1.64	892.63	893.00	0.36
BGC10-MWA-175	890.98	892.62	1.64	892.63	893.00	0.36
BGC10-MWA-125	884.59	888.97	4.38	892.04	892.42	0.39
BGC10-MWA-075	887.81	914.11	26.30	892.19	892.58	0.40
AW-09-103-S	880.63	882.95	2.33	889.25	889.60	0.35
AW-09-103-D	872.91	885.68	12.77	897.20	897.42	0.21
AM-10-061-S	906.88	908.12	1.23	908.40	908.81	0.40
AM-10-061-D	890.37	894.16	3.79	905.45	905.82	0.37
AM-10-064-D	922.78	923.32	0.54	907.59	907.83	0.23
MW11-10D	860.17	860.54	0.37	863.73	865.03	1.30
MW11-09S	905.73	908.49	2.76	908.85	908.90	0.04
MW11-09D	907.25	909.19	1.93	909.65	909.70	0.05
MW11-08S	882.16	882.49	0.32	897.77	897.81	0.04

Table 08. Ajax general arrangement data files used in the Numerical Groundwater Flow Model.

File Description	Mine Year	Filename	Date Received	Aconex Transmittal No.
East Mine Rock Storage Facility (EMRSF)	24 / Post Closure	EWRSF_Outline-2014MAR06.shp	27-Mar-14	KGHM-Transmit-000541
Ore Stockpiles	23 / End of Operation	OreStockpile_Outline-2014MAR06.shp	27-Mar-14	KGHM-Transmit-000541
Peterson Creek Downstream Pond	23 / End of Operation	809-3 DBM Peterson Creek DAC Figure_Rev B.pd	17-Mar-15	KGHM-GC-005899
Peterson Creek Diversion	23 / End of Operation	PetersonCkDiversion-2014JAN08.shp	27-Mar-14	KGHM-Transmit-000541
South Mine Rock Storage Facility (SMRSF)	24 / Post Closure	SouthWRSF_Outline-2014MAR06.shp	27-Mar-14	KGHM-Transmit-000541
West Mine Rock Storage Facility (WMRSF)	24 / Post Closure	TSF-WRSF_Outline-2014MAR06.shp	27-Mar-14	KGHM-Transmit-000541
Causeway and Berms	23 / End of Operation	Causeway & Berms.dwg	11-May-14	KGHM-Transmit-003282
Mine Infrastructure	23 / End of Operation	Mine Infrastructures.dwg	11-May-14	KGHM-Transmit-003282
Pit and Stockpiles	2, 5, 8, 10, 15, and 20	Pit & Stockpiles_Yr2(5,8,10,15,20).dwg	11-May-14	KGHM-Transmit-003282
Tailings Storage Facility (TSF) and Water Management Ponds	-1, -2, 1, 2, 5, 10, and 20	Year -1(-2, 1, 2, 5, 10, 20).dwg	11-May-14	KGHM-Transmit-003282
Jacko Lake Bathemetry	Existing Conditions	Bathymetry_Contours_prelim.dxf	6-Oct-14	KGHM-Transmit-002917

Note:

1. Files received from KGHM Ajax Mining Inc. through Aconex.

Table 09. Mine sequence for Construction, Operation, Decommissioning and Closure, and Post Closure Models.

<table>
<tr><th>Mining Year</th><th>Model Year</th><th>Phase of Mining</th><th>Model Type[1,2]</th><th>Active Cells in Layers 1 to 5[1,2]</th><th>Pit Phase (Mining Year)</th><th>Pit Lake Elevation (masl)</th><th>MRSF (Mining Year)</th><th>TSF (Mining Year)</th><th>Jacko Lake</th><th>Peterson Creek</th><th>S. and SE. Emb. Pond</th><th>Other Water Management Ponds[4]</th></tr>
<tr><td>NA</td><td>NA</td><td rowspan="3">Existing Conditions</td><td>Steady State</td><td>NA - model is 15 layers</td><td rowspan="6">Existing Pit Based on Topography</td><td rowspan="28">None</td><td rowspan="6">None</td><td rowspan="3">None</td><td rowspan="3">Existing Lake</td><td rowspan="3">Existing Creek</td><td rowspan="25">None</td><td rowspan="3">None</td></tr>
<tr><td>-4</td><td>1</td><td rowspan="27">Transient (Predictive)</td><td rowspan="27">TSF and Embankments</td></tr>
<tr><td>-3</td><td>2</td></tr>
<tr><td>-2</td><td>3</td><td rowspan="2">Construction</td><td>-2</td><td rowspan="28">Modified Lake w/ Dam</td><td rowspan="28">Diverted Creek and PCDP</td><td rowspan="28">Ponds Exist</td></tr>
<tr><td>-1</td><td>4</td><td>-1</td></tr>
<tr><td>1</td><td>5</td><td rowspan="23">Operation, Decommissioning and Closure</td><td>1</td></tr>
<tr><td>2</td><td>6</td><td rowspan="3">2</td><td rowspan="3">2</td><td rowspan="3">2</td></tr>
<tr><td>3</td><td>7</td></tr>
<tr><td>4</td><td>8</td></tr>
<tr><td>5</td><td>9</td><td rowspan="3">5</td><td rowspan="3">5</td><td rowspan="5">5</td></tr>
<tr><td>6</td><td>10</td></tr>
<tr><td>7</td><td>11</td></tr>
<tr><td>8</td><td>12</td><td rowspan="2">8</td><td rowspan="2">8</td></tr>
<tr><td>9</td><td>13</td></tr>
<tr><td>10</td><td>14</td><td rowspan="5">10</td><td rowspan="5">10</td><td rowspan="10">10</td></tr>
<tr><td>11</td><td>15</td></tr>
<tr><td>12</td><td>16</td></tr>
<tr><td>13</td><td>17</td></tr>
<tr><td>14</td><td>18</td></tr>
<tr><td>15</td><td>19</td><td rowspan="5">15</td><td rowspan="5">15</td></tr>
<tr><td>16</td><td>20</td></tr>
<tr><td>17</td><td>21</td></tr>
<tr><td>18</td><td>22</td></tr>
<tr><td>19</td><td>23</td></tr>
<tr><td>20</td><td>24</td><td rowspan="7">20+15</td><td rowspan="7">20</td><td rowspan="7">20</td></tr>
<tr><td>21</td><td>25</td><td rowspan="6">Ponds Exist</td></tr>
<tr><td>22</td><td>26</td></tr>
<tr><td>23</td><td>27</td></tr>
<tr><td>24</td><td>NA</td><td rowspan="3">Post Closure</td><td rowspan="3">Steady State (Predictive)</td><td rowspan="3">TSF and Embankments, MRSFs</td><td>500</td></tr>
<tr><td>35</td><td>NA</td><td>600</td></tr>
<tr><td>300</td><td>NA</td><td>700</td></tr>
</table>

Notes:

1. Model grid for predictive simulations consisted of 20 layers and included the final topography for facilities indicated.
2. Model grid for steady state simulations of existing conditions consisted of 15 layers and was based on the existing Mine Site topography.
3. Predictive simulations included a vertical hydraulic flow barrier at the centres of the TSF embankments to represent lined faces.
4. Includes the central collection, EMRSF, and SMRSF ponds; and North Embankment ponds 1 and 2.
5. Abbreviations: MRSF= Mine Rock Storage Facility, TSF= Tailings Storage Facility, S.= South, SE.= Southeast, Emb.= Embankment

Table 10. Groundwater source/receiving water body and water management pond elevations.

Groundwater	Source / Receiving WB[1]	Water Elevation in GW Model[2] (masl)	Water Elevation from KP Design (masl)	Simulated as Lined Pond[4] Y/N
Open Pit	R	500, 600, 700	NA	NA
EMRSF	S	NA	NA	NA
SMRSF	S	NA	NA	NA
WMRSF	S	NA	NA	NA
TSF	S	1057.8	NA	NA
Low Grade Stockpile	S	NA	NA	NA
Medium Grade Stockpile	S	NA	NA	NA
Jacko Lake	S/R	892.0	NA	NA
Central Collection Pond	S/R	893.0	896	Y
N. Emb Pond 1	S/R	925.0	928*	Y
N. Emb Pond 2	R	923.7	932*	Y
S. Emb Pond	R	1017.9	NA	N
SE. Emb pond	R	1048.7	NA	N
EMRSF Pond	S/R	879.8	884	Y
SMRSF Pond	R	975.3	977	N
Humphrey Creek	S/R	NA	NA	NA
Lower Peterson Creek	S/R	NA	NA	NA
Peterson Creek DS Pond	S/R	865.5	NA	N
Unnamed Lake	S	946.2	NA	NA

Notes:

1. S= Source water body of seepage to groundwater flow system, R= Receiving water body of seepage from groundwater flow system, S/R=Both source and receiving water body.
2. Open pit water levels represent pit lakes elevations simulated for Post Closure conditions.
3. *Assumes 2 m of freeboard, dam crest 2 m higher than water elevation.
4. Lined ponds within the groundwater model were simulated using the RIV package with an effective hydraulic conductivity for the geomembrane cacluated to be 2.1×10^{-9} m/s (Appendix C).
5. NA - not applicable.

Table 11. Model predicted total groundwater inflows at the mine site.

Phase of Mining	Mining Year	Model Year	Closure Pit Lake Level	Total Groundwater Inflows to (m^3/day)																			
				Open Pit	TSF	WMRSF DS	WMRSF US	EMRSF	SMRSF	N. Emb Pond 1	N. Emb Pond 2	Jacko Lake	Central Coll. Pond	S. Emb Pond	SE. Emb Pond	EMRSF Pond	SMRSF Pond	Lower Peterson Creek	Humphry Creek	Peterson Creek DS Pond	Unnamed Lake	MG Stockpile	LG Stockpile
Existing Conditions	-4	1	NA	0	0	0	0	0	0	0	0	10	0	0	0	0	0	136	60	0	0	0	0
	-3	2	NA	0	0	0	0	0	0	0	0	10	0	0	0	0	0	136	60	0	0	0	0
Construction	-2	3	NA	0	63	0	0	0	0	0	0	10	0	0	0	0	0	136	60	0	0	0	0
	-1	4	NA	0	612	0	2	0	0	0	0	10	0	0	0	0	0	136	60	0	0	0	0
Operation, Decommissioning and Closure	1	5	NA	0	832	0	4	0	0	5	1	10	0	0	0	15	52	137	60	0	0	0	0
	2	6	NA	0	1271	25	3	9	13	5	1	62	11	0	0	15	4	129	60	417	0	3	3
	3	7	NA	0	897	25	3	9	13	5	1	90	11	0	0	15	1	131	60	298	0	3	3
	4	8	NA	0	731	25	3	9	13	5	1	106	11	0	0	15	1	132	60	287	0	3	3
	5	9	NA	0	2734	16	3	10	15	4	1	116	11	0	0	15	1	133	60	267	0	3	3
	6	10	NA	0	1844	16	3	10	15	4	1	122	11	0	0	15	1	134	60	261	0	3	3
	7	11	NA	0	1491	16	3	10	15	3	1	127	11	0	0	15	1	134	60	257	0	3	3
	8	12	NA	0	1287	16	3	10	15	3	1	129	11	0	0	15	1	135	60	254	0	3	3
	9	13	NA	0	1130	16	3	10	15	3	1	131	11	0	0	15	1	135	60	252	0	3	3
	10	14	NA	0	3886	15	3	10	15	3	1	132	11	6	0	15	1	135	60	251	0	3	3
	11	15	NA	0	2471	15	3	10	15	3	1	133	11	0	0	15	1	135	60	250	0	3	3
	12	16	NA	0	2008	15	3	10	15	3	1	134	11	0	0	15	1	135	60	249	0	3	3
	13	17	NA	0	1785	15	3	10	15	3	1	135	11	0	0	15	1	136	60	248	0	3	3
	14	18	NA	0	1607	15	3	10	15	2	1	135	11	0	0	15	1	136	60	247	0	3	3
	15	19	NA	0	1461	15	3	10	15	2	1	136	11	0	0	15	1	137	60	247	0	3	3
	16	20	NA	0	1338	15	3	10	15	2	1	136	11	0	0	15	1	137	60	247	0	3	3
	17	21	NA	0	1225	15	3	10	15	2	1	136	11	0	0	15	1	138	60	247	0	3	3
	18	22	NA	0	1136	15	3	10	15	2	1	136	11	0	0	15	1	139	60	246	0	3	3
	19	23	NA	0	1066	15	3	10	15	2	0	137	11	0	0	15	1	139	60	246	0	3	3
	20	24	NA	0	4992	9	0	10	17	2	0	137	11	0	53	15	1	140	60	246	0	3	3
	21	25	NA	0	3457	9	0	10	17	2	0	137	11	0	35	15	1	142	60	246	0	3	3
	22	26	NA	0	2706	9	0	10	17	2	0	137	11	0	29	15	1	142	60	246	0	3	3
	23	27	NA	0	2545	9	0	10	17	2	0	137	11	0	23	15	1	143	60	247	0	3	3
Post Closure	24	NA	500	0	1603	18	0	9	17	1	0	138	11	0	0	15	1	151	60	258	5	2	1
	35	NA	600	0	1602	18	0	9	17	1	0	135	11	0	0	17	0	151	60	255	3	2	1
	300	NA	700	0	1608	18	0	9	17	1	0	135	11	0	0	17	1	151	60	254	2	2	1

Notes:

1. Sign Convention: Positive for flows entering groundwater system, negative for flows leaving groundwater system.
2. Model Years 3, 4, 5, 6, 9, 14, 24 have sudden increase in TSF groundwater inflows because boundary conditions are instaneously introduced.
3. Abbreviations: TSF= Tailings Storage Facility, WMRSF= West Mine Rock Storage Facility, EMRSF= East Mine Rock Storage Facility, SMRSF= South Mine Rock Storage Facility, N.= North , Coll.= Collection, S.= South, SE.= Southeast, Emb.= Embankment, DS= Downstream, US= Upstream, MG= Medium Grade, LG= Low Grade.

Table 12. Model predicted total groundwater outflows at the mine site.

Phase of Mining	Mining Year	Model Year	Closure Pit Lake Level	Total Groundwater Outflows to (m^3/day)																			
				Open Pit	TSF	WMRSF DS	WMRSF US	EMRSF	SMRSF	N. Emb Pond 1	N. Emb Pond 2	Jacko Lake	Central Coll. Pond	S. Emb Pond	SE. Emb Pond	EMRSF Pond	SMRSF Pond	Lower Peterson Creek	Humphrey Creek	Peterson Creek DS Pond	Unnamed Lake	MG Stockpile	LG Stockpile
Existing Conditions	-4	1	NA	-57	0	0	0	0	0	0	0	-14	0	0	0	0	0	-404	-26	0	-5	0	0
	-3	2	NA	-57	0	0	0	0	0	0	0	-14	0	0	0	0	0	-404	-26	0	-5	0	0
Construction	-2	3	NA	-57	0	0	0	0	0	0	0	-14	0	0	0	0	0	-404	-26	0	-5	0	0
	-1	4	NA	-57	0	0	0	0	0	0	0	-14	0	0	0	0	0	-403	-26	0	-5	0	0
Operation, Decommissioning and Closure	1	5	NA	-57	0	0	0	0	0	0	0	-14	0	0	0	0	0	-403	-26	0	-5	0	0
	2	6	NA	-4416	0	0	0	0	0	0	0	-13	0	0	0	0	-1	-392	-26	-548	-5	0	0
	3	7	NA	-1286	0	0	0	0	0	0	0	-13	0	0	0	0	-2	-390	-26	-281	-5	0	0
	4	8	NA	-926	0	0	0	0	0	0	0	-13	0	0	0	0	-4	-389	-26	-236	-5	0	0
	5	9	NA	-3126	0	0	0	0	0	0	0	-13	0	0	0	0	-5	-389	-26	-228	-5	0	0
	6	10	NA	-1189	0	0	0	0	0	0	0	-13	0	0	0	0	-6	-389	-26	-218	-5	0	0
	7	11	NA	-957	0	0	0	0	0	0	0	-13	0	0	0	0	-6	-390	-26	-211	-5	0	0
	8	12	NA	-3978	0	0	0	0	0	0	0	-13	0	0	0	0	-7	-391	-26	-206	-5	0	0
	9	13	NA	-1113	0	0	0	0	0	0	0	-13	0	0	0	0	-8	-392	-26	-202	-5	0	0
	10	14	NA	-1765	0	0	0	0	0	0	0	-12	0	-1	0	0	-8	-393	-26	-199	-5	0	0
	11	15	NA	-905	0	0	0	0	0	0	0	-12	0	-2	0	0	-9	-394	-26	-196	-5	0	0
	12	16	NA	-777	0	0	0	0	0	0	0	-12	0	-2	0	0	-9	-394	-26	-194	-5	0	0
	13	17	NA	-703	0	0	0	0	0	0	0	-12	0	-2	0	0	-9	-395	-26	-191	-5	0	0
	14	18	NA	-650	0	0	0	0	0	0	0	-12	0	-2	0	0	-10	-396	-26	-189	-5	0	0
	15	19	NA	-1971	0	0	0	0	0	0	0	-12	0	-2	0	0	-10	-397	-26	-187	-5	0	0
	16	20	NA	-792	0	0	0	0	0	0	0	-12	0	-2	0	0	-10	-398	-26	-185	-5	0	0
	17	21	NA	-716	0	0	0	0	0	0	0	-11	0	-2	0	0	-10	-399	-26	-183	-5	0	0
	18	22	NA	-672	0	0	0	0	0	0	0	-11	0	-2	0	0	-11	-399	-26	-181	-5	0	0
	19	23	NA	-635	0	0	0	0	0	0	0	-11	0	-2	0	0	-11	-400	-26	-179	-5	0	0
	20	24	NA	-1241	0	0	0	0	0	0	0	-11	0	-3	0	0	-11	-400	-26	-176	-5	0	0
	21	25	NA	-824	0	0	0	0	0	0	0	-11	0	-5	0	0	-11	-401	-26	-174	-5	0	0
	22	26	NA	-773	0	0	0	0	0	0	0	-11	0	-26	0	0	-11	-401	-26	-172	-4	0	0
	23	27	NA	-723	0	0	0	0	0	0	0	-10	0	-36	0	0	-12	-402	-26	-169	-4	0	0
Post Closure	24	NA	500	-1635	0	0	0	0	0	0	-2	-7	0	-88	-9	0	-17	-394	-26	-108	0	0	-8
	35	NA	600	-1603	0	0	0	0	0	0	-2	-7	0	-88	-9	0	-17	-395	-26	-115	0	0	-8
	300	NA	700	-1558	0	0	0	0	0	0	-2	-8	0	-95	-9	0	-17	-395	-26	-132	-1	0	-8

Notes:

1. Sign Convention: Positive for flows entering groundwater system, negative for flows leaving groundwater system.

2. Model Years 6, 9, 12, 14, 19, 24 have sudden increase in open pit groundwater outflows because boundary conditions are instaneously introduced.

3. Abbreviations: TSF= Tailings Storage Facility, WMRSF= West Mine Rock Storage Facility, EMRSF= East Mine Rock Storage Facility, SMRSF= South Mine Rock Storage Facility, N.= North , Coll.= Collection, S.= South, SE.= Southeast, Emb.= Embankment, DS= Downstream, US= Upstream, MG= Medium Grade, LG= Low Grade.

Table 13. Model predicted net groundwater flows at the mine site.

Phase of Mining	Mining Year	Model Year	Closure Pit Lake Level	Net Groundwater Flows to (m^3/day)																			
				Open Pit	TSF	WMRSF DS	WMRSF US	EMRSF	SMRSF	N. Emb Pond 1	N. Emb Pond 2	Jacko Lake	Central Coll. Pond	S. Emb Pond	SE. Emb pond	EMRSF Pond	SMRSF Pond	Lower Peterson Creek	Humphrey Creek	Peterson Creek DS Pond	Unnamed Lake	MG Stockpile	LG Stockpile
Existing Conditions	-4	1	NA	-57	0	0	0	0	0	0	0	-4	0	0	0	0	0	-268	34	0	-5	0	0
	-3	2	NA	-57	0	0	0	0	0	0	0	-4	0	0	0	0	0	-268	34	0	-5	0	0
Construction	-2	3	NA	-57	63	0	0	0	0	0	0	-4	0	0	0	0	0	-268	34	0	-5	0	0
	-1	4	NA	-57	612	0	2	0	0	0	0	-4	0	0	0	0	0	-267	34	0	-5	0	0
Operation, Decommissioning and Closure	1	5	NA	-57	832	0	4	0	0	5	1	-4	0	0	0	15	52	-266	34	0	-5	0	0
	2	6	NA	-4416	1271	25	3	9	13	5	1	49	11	0	0	15	3	-263	34	-130	-5	3	3
	3	7	NA	-1286	897	25	3	9	13	5	1	77	11	0	0	15	-1	-259	34	18	-5	3	3
	4	8	NA	-926	731	25	3	9	13	5	1	92	11	0	0	15	-3	-256	34	51	-5	3	3
	5	9	NA	-3126	2734	16	3	10	15	4	1	103	11	0	0	15	-4	-256	34	39	-5	3	3
	6	10	NA	-1189	1844	16	3	10	15	4	1	109	11	0	0	15	-5	-255	34	43	-5	3	3
	7	11	NA	-957	1491	16	3	10	15	3	1	114	11	0	0	15	-6	-256	34	46	-5	3	3
	8	12	NA	-3978	1287	16	3	10	15	3	1	117	11	0	0	15	-7	-256	34	48	-5	3	3
	9	13	NA	-1113	1130	16	3	10	15	3	1	119	11	0	0	15	-7	-257	34	50	-5	3	3
	10	14	NA	-1765	3886	15	3	10	15	3	1	120	11	5	0	15	-8	-258	34	52	-5	3	3
	11	15	NA	-905	2471	15	3	10	15	3	1	121	11	-2	0	15	-8	-259	34	53	-5	3	3
	12	16	NA	-777	2008	15	3	10	15	3	1	122	11	-2	0	15	-8	-259	34	55	-5	3	3
	13	17	NA	-703	1785	15	3	10	15	3	1	123	11	-2	0	15	-9	-260	34	56	-5	3	3
	14	18	NA	-650	1607	15	3	10	15	2	1	123	11	-2	0	15	-9	-260	34	58	-5	3	3
	15	19	NA	-1971	1461	15	3	10	15	2	1	124	11	-2	0	15	-9	-260	34	60	-5	3	3
	16	20	NA	-792	1338	15	3	10	15	2	1	124	11	-2	0	15	-10	-260	34	62	-5	3	3
	17	21	NA	-716	1225	15	3	10	15	2	1	125	11	-2	0	15	-10	-260	34	64	-5	3	3
	18	22	NA	-672	1136	15	3	10	15	2	1	125	11	-2	0	15	-10	-260	34	66	-5	3	3
	19	23	NA	-635	1066	15	3	10	15	2	0	125	11	-2	0	15	-10	-260	34	68	-5	3	3
	20	24	NA	-1241	4992	9	0	10	17	2	0	126	11	-3	53	15	-11	-260	34	70	-5	3	3
	21	25	NA	-824	3457	9	0	10	17	2	0	126	11	-5	35	15	-11	-259	34	72	-5	3	3
	22	26	NA	-773	2706	9	0	10	17	2	0	126	11	-26	29	15	-11	-259	34	75	-4	3	3
	23	27	NA	-723	2545	9	0	10	17	2	0	127	11	-36	23	15	-11	-259	34	78	-4	3	3
Post Closure	24	NA	500	-1635	1603	18	0	9	17	1	-2	131	11	-88	-9	15	-16	-243	35	151	5	2	-6
	35	NA	600	-1603	1602	18	0	9	17	1	-2	128	11	-88	-9	17	-16	-244	35	140	3	2	-6
	300	NA	700	-1558	1608	18	0	9	17	1	-2	127	11	-95	-9	17	-17	-244	35	121	1	2	-6

Notes:

1. Sign Convention: Positive for flows entering groundwater system, negative for flows leaving groundwater system.
2. Model Years 3, 4, 5, 6, 9, 14, 24 have sudden increase in TSF groundwater inflows because boundary conditions are instaneously introduced.
3. Model Years 6, 9, 12, 14, 19, 24 have sudden increase in open pit groundwater outflows because boundary conditions are instaneously introduced.
4. Differences in net groundwater flow for the WMRSF DS, SMRSF, and LG Stockpile between End of Operation and Post Closure reflect differences in how recharge and ET are represented in the Construction, Operation, Decommissioning and Closure model compared with the Post Closure model.
5. Abbreviations: TSF= Tailings Storage Facility, WMRSF= West Mine Rock Storage Facility, EMRSF= East Mine Rock Storage Facility, SMRSF= South Mine Rock Storage Facility, N.= North , Coll.= Collection, S.= South, SE.= Southeast, Emb.= Embankment, DS= Downstream, US= Upstream, MG= Medium Grade, LG= Low Grade.

Table 14. Impact of sensitivity scenarios on model calibration statistics.

		Base Case	Kx5	K÷5	RCHx10	PCA Kx10	ELFZ[4]
Regional Calibration Statistics	Residual Mean (m)	-4.8	7.5	-9.5	-11.4	-4.7	-4.7
	Absoluate Residual Mean (m)	11.2	16.1	12.0	13.0	11.3	11.2
	RMS Error (m)	18.3	25.3	18.6	19.5	18.3	18.3
	Number of Observations	418					
	Range in Observations (m)	747.7					
	Normalized RMS Error	2.4%	3.4%	2.5%	2.6%	2.5%	2.5%
Local Calibration Statisics	Residual Mean (m)	-2.1	3.8	-5.0	-7.0	-1.8	-1.8
	Absolute Residual Mean (m)	5.8	8.8	7.0	8.2	5.9	6.0
	RMS Error (m)	8.7	13.8	9.6	10.8	8.8	8.9
	Number of Observations	126					
	Range in Observations (m)	250.0					
	Normalized RMS Error	3.5%	5.5%	3.8%	4.3%	3.5%	3.6%

Notes:

1. K = Hydraulic Conductivity, RCH = Recharge, PCA = Peterson Creek Aquifer, ELFZ = Edith Lake Fault Zone.

2. RMS = Root Mean Square.

3. Sensitivity scenario with specific storage increased by a factor of 10 produced the same calibration statistics as the base case scenario.

4. Edith Lake Fault Zone was introduced into the model as a 50 metre wide vertical zone through the bedrock layers with hydraulic conductivity increased by a factor of 10 compared to the model cells of the surrounding bedrock (K= 3.2 x10^{-8} m/s).

5. Sensitivity scenario with MRSF recharge increased by a factor of 10 is a predictive simulation only and does not have calibration statistics for comparison.

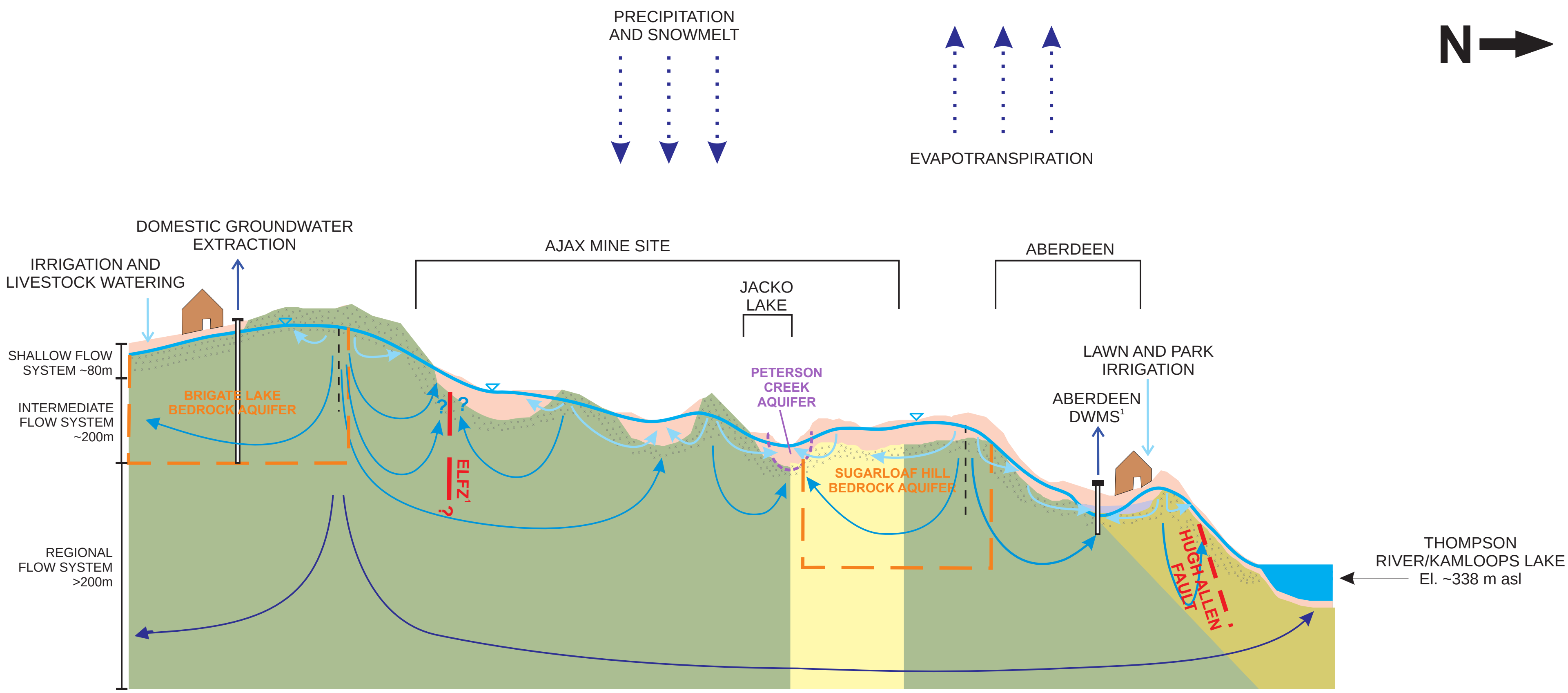
Table 15. Sensitivity analysis summary.

	Net Groundwater Flows (m^3/d)						
	End of Operations			Post Closure			Forward Particle Tracking Sensitivity
Mine Facility	**Minimum**	**Base Case**	**Maximum**	**Minimum**	**Base Case**	**Maximum**	
Open Pit	-2011	-727	-356	-7964	-1633	-157	More seepage from Jacko Lake, Ore Stockpiles, Peterson Cr. DS Pond, Peterson Creek, SMRSF, TSF, and Unnamed Lake when K is increased by a factor of 5 or ELFZ is introduced.
TSF	1273	2542	6186	356	1600	7934	Generates more seepage when K is increased by a factor of 5.
N. Emb. Pond 1	1	2	2	-17	1	1	Collects more groundwater seepage from TSF when TSF K and conductance are increased by a factor of 10 or ELFZ is introduced.
N. Emb. Pond 2	-0.6	0	0.5	-7	-2	-0.3	Collects more groundwater seepage from TSF when K is increased by a factor of 5 or recharge is increased by a factor of 10.
Jacko Lake	54	127	270	60	131	272	Jacko Lake receives more groundwater seepage from West MRSF when K is increased by a factor of 5 or ELFZ is introduced.
CCP	9	9	9	6	9	9	Generates seepage to Open Pit under the range of conditions evaluated.
S. Emb. Pond	-383	-35	-0.4	-429	-87	-21	Collects TSF seepage under the range of conditions evaluated.
SE. Emb. Pond	5	23	48	-42	-9	-3	Collects TSF seepage under the range of conditions evaluated.
EMRSF Pond	14	14	14	9	14	14	Pathlines generated when recharge is increased by a factor of 10 intercepts RES-2.
SMRSF Pond	-26	-11	-2	-83	-16	-10	Collects SMRSF seepage under the range of conditions evaluated.
Lower Peterson Creek	-979	-243	-70	-1077	-243	-53	Receives more groundwater seepage from EMRSF when K is increased by a factor of 5. Receives groundwater seepage from SMRSF when ELFZ is introduced.
Humphrey Creek	18	34	72	-47	35	86	Receives more SMRSF seepage when recharge is increased by a factor of 10.
Peterson Creek DS Pond	-82	78	1491	-270	152	1315	Generates groundwater seepage to the open pit when K is increased by a factor of 5. Collects seepage from SMRSF when ELFZ is introduced and when TSF K and conductance or increased by a factor of 10. Pathlines intercepted by RES-2 under all sensitivity cases.
Unnamed Lake	-12	-4	24	-24	5	66	Generates seepage to the Open Pit when K is increased by a factor of 10.

Notes:

1. Sign Convention: Positive for flows entering groundwater system, negative for flows leaving groundwater system.
2. Abbreviations: N.= North, Emb.= Embankment, CCP= Central Collection Pond, S.= South, SE.= Southeast, EMRSF= East Mine Rock Storage Facility, SMRSF= South Mine Rock Storage Facility, DS= Downstream, K= Hydraulic Conductivity, TSF= Tailings Storage Facility, ELFZ= Edith Lake Fault Zone

FIGURES



ESTIMATED LIMITS OF MAPPED AQUIFERS[2]

- SAND AND GRAVEL
- BEDROCK

STRUCTURE AND ALTERATION

- FAULT
- SWELLING CLAYS (BENTONITE AND MONTMORILLONITE)

GEOLOGY

OVERBURDEN

- TILL, DIAMICTION, GLACIOFULVIAL, AND GLACIOLACUSTIRINE DEPOSITS

BEDROCK

- SHALLOW BEDROCK
- KAMLOOPS GROUP
- IRON MASK BATHOLITH
- NICOLA GROUP

- INTERPRETED WATER TABLE
- INTERPRETED GROUNDWATER FLOW DIVIDE
- GROUNDWATER INFILTRATION
- GROUNDWATER ABSTRACTION

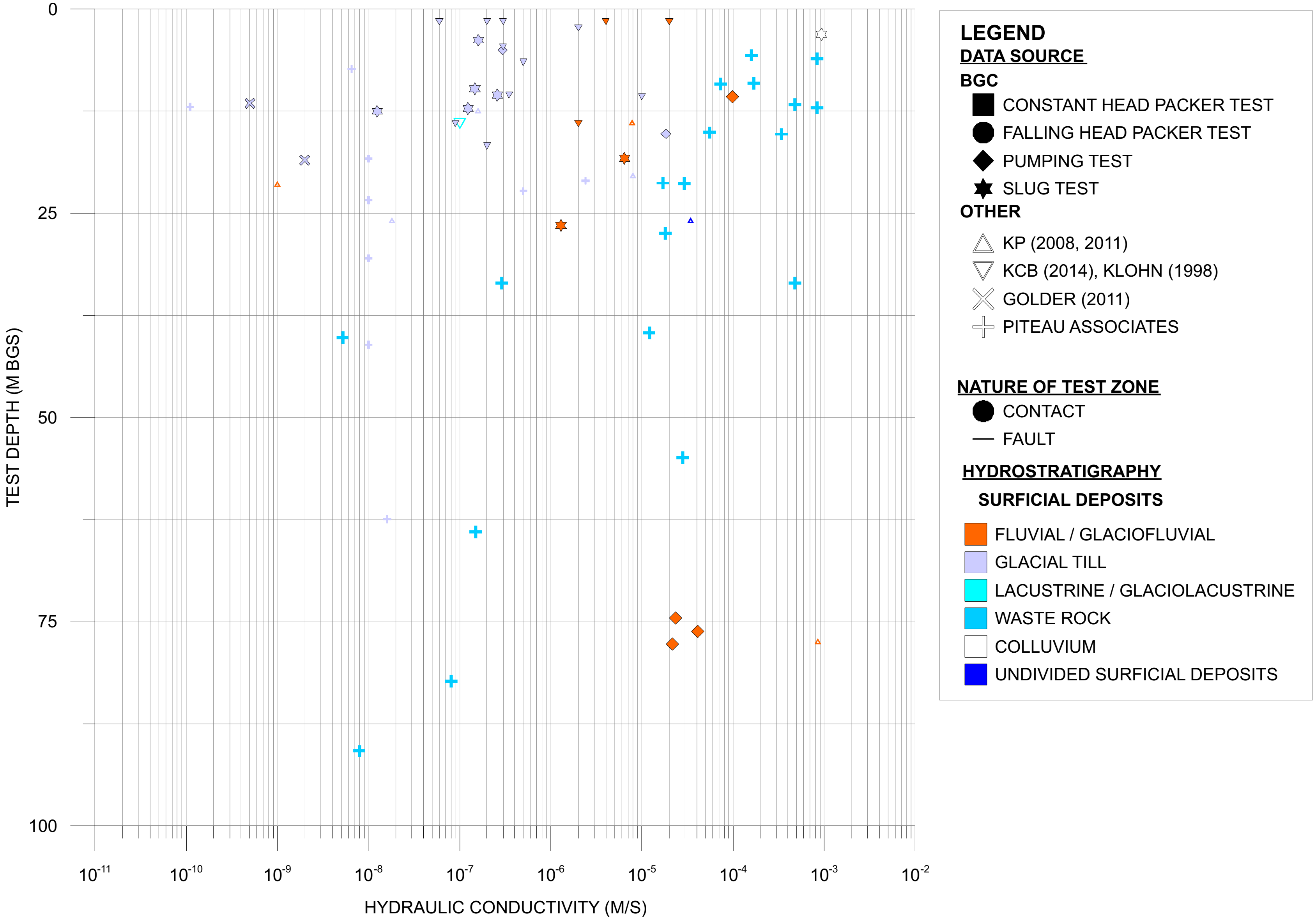
GROUNDWATER FLOW SYSTEM SCALES

- LOCAL (TENS TO HUNDRED OF METRES)
- INTERMEDIATE (HUNDRED OF METRES TO KILOMETRES)
- REGIONAL (KILOMETRES TO TENS OF KILOMETRES)

NOTE:
1. ELFZ = EDITH LAKE FAULT ZONE; DWMS = DEWATERING AND MONITORING SYSTEM
2. ESTIMATED BASED ON WRBC AQUIFER LIMITS AND MAXIMUM PRACTICAL DEPTH OF GROUNDWATER ABSTRACTION IN REGISTERED WATER WELLS.

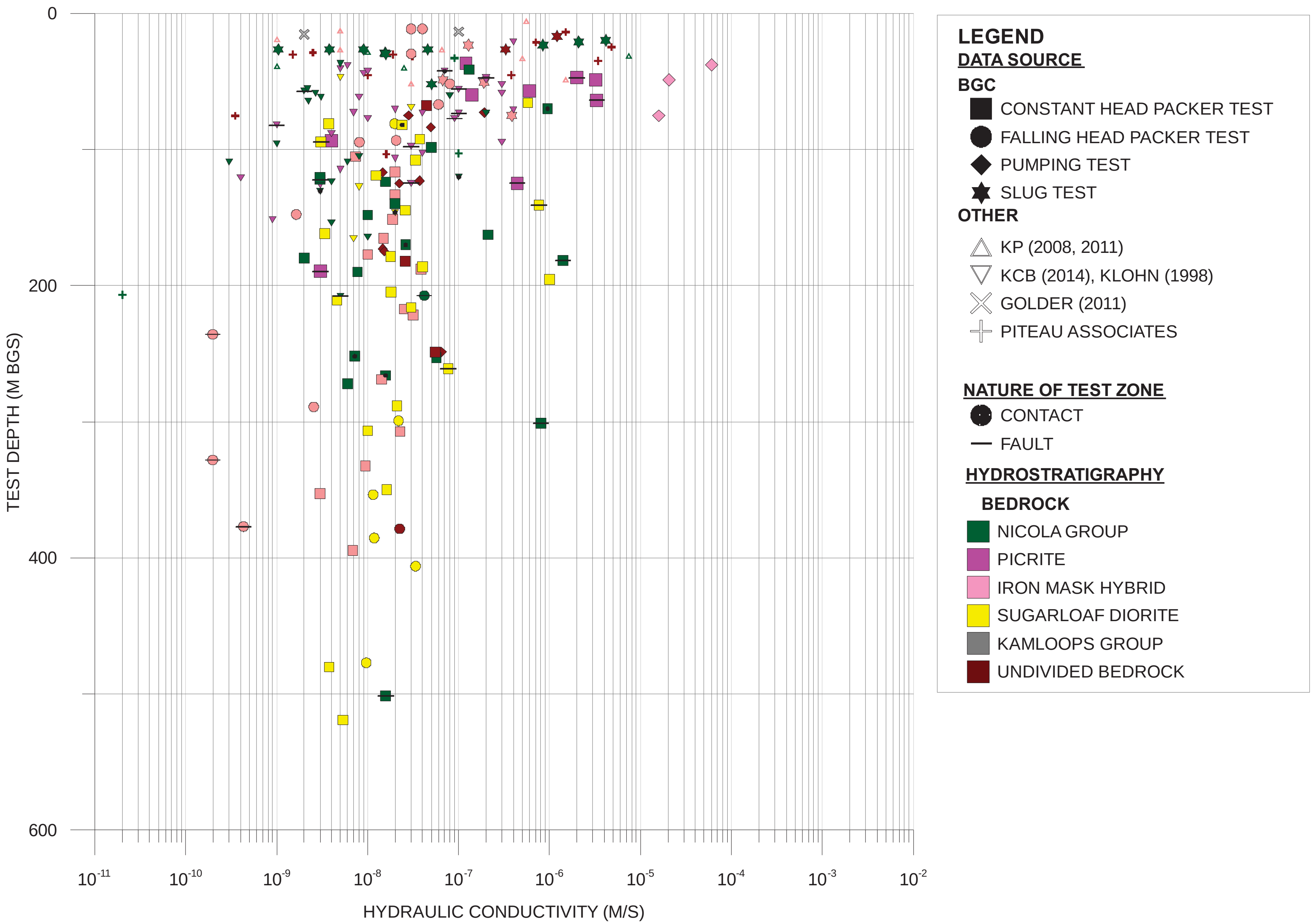
SCALE: NOT TO SCALE	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: CONCEPTUAL HYDROGEOLOGIC MODEL (REGIONAL STUDY AREA)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 01

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 01 - Conceptual Hydrogeological Model



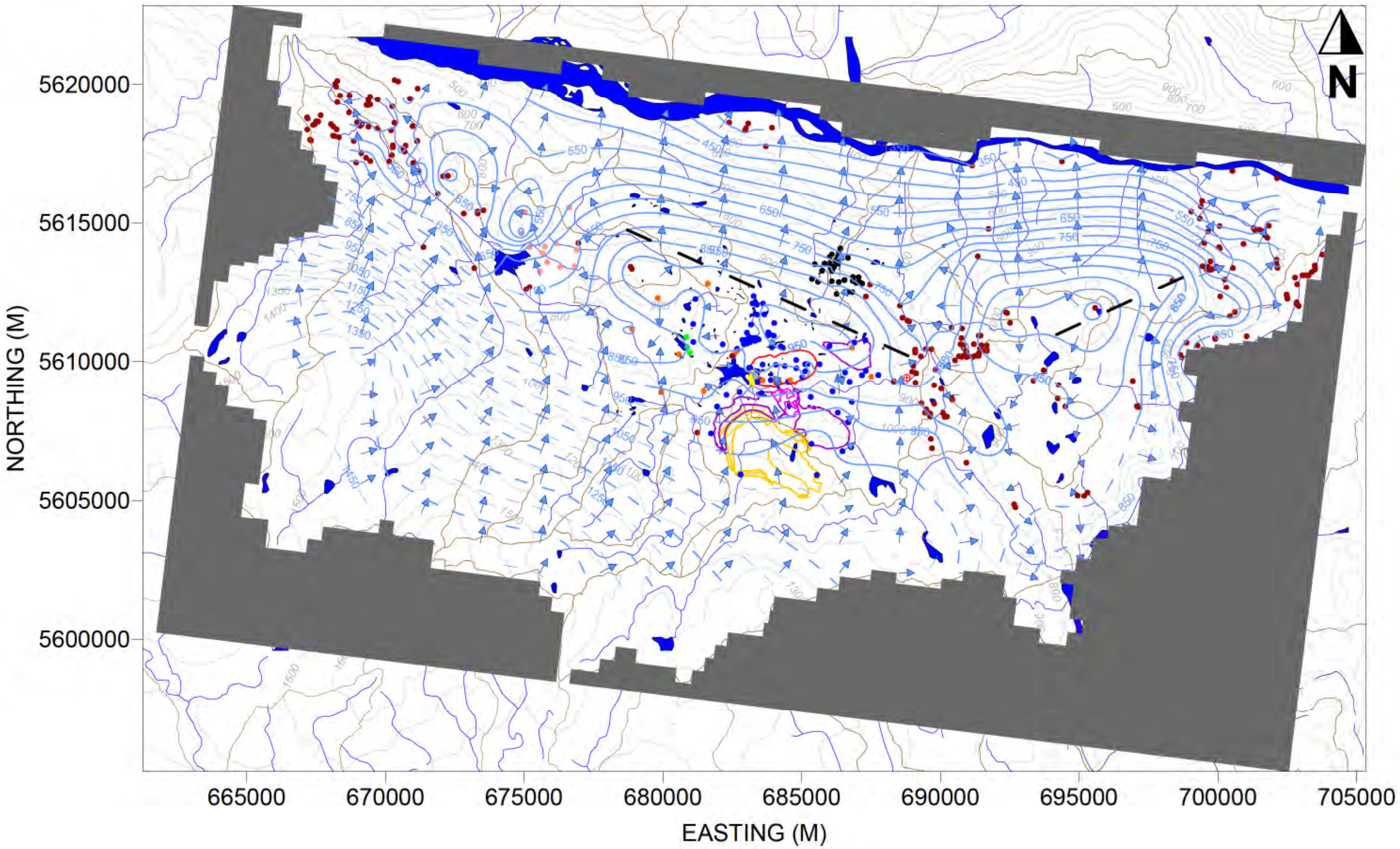
SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: ESTIMATED HYDRAULIC CONDUCTIVITY VS. DEPTH WITHIN SURFICIAL DEPOSITS	FIG No.: 02
PROJECT No.: 1125007-04	APPROVED: TWC			

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Fig 29 - Closure Water Balance



SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: ESTIMATED HYDRAULIC CONDUCTIVITY VS. DEPTH WITHIN BEDROCK
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 03

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Fig 29 - Closure Water Balance



WATER LEVEL DATA SOURCE

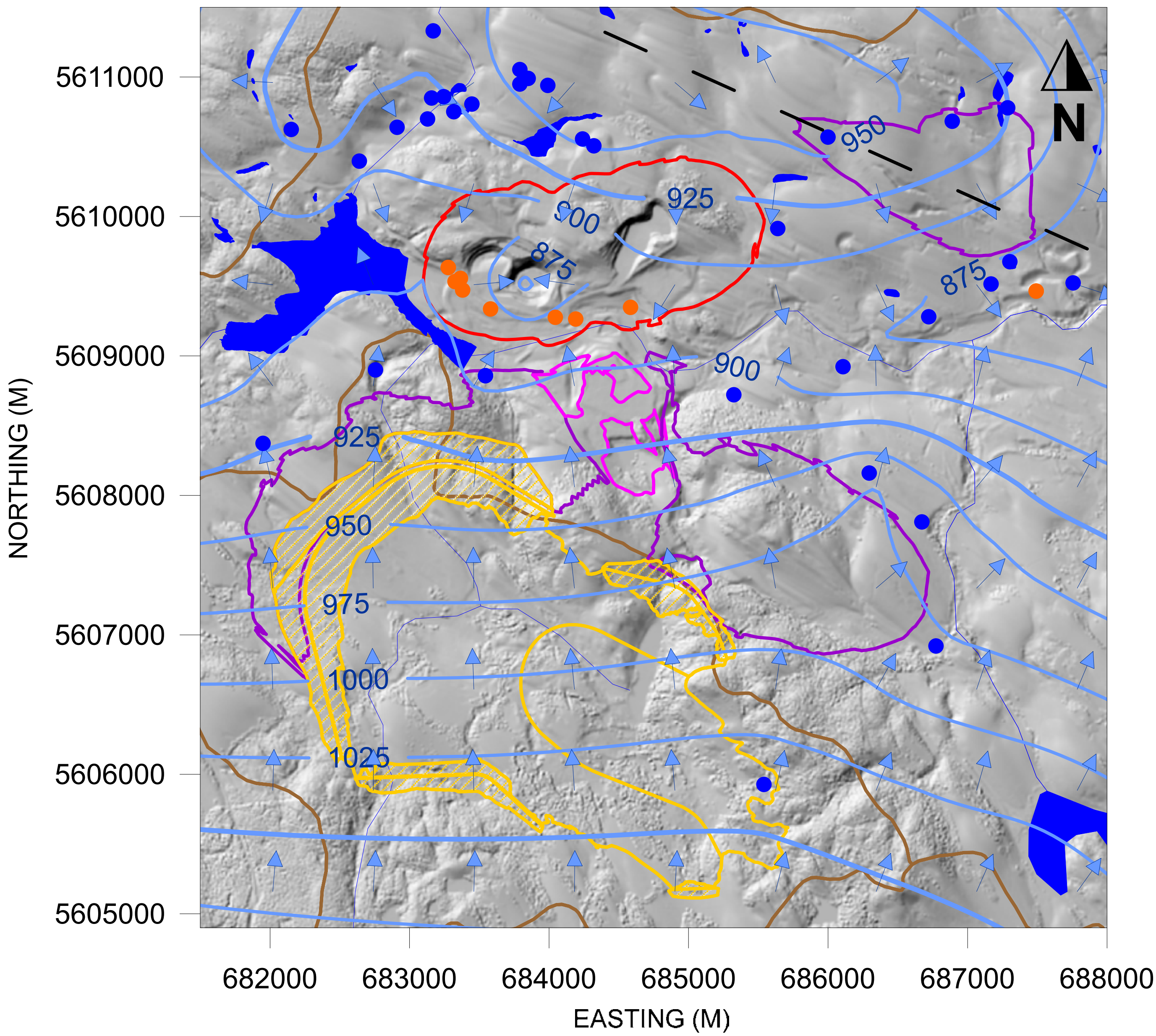
- BGC
- KNIGHT PIESOLD
- KCB
- GOLDER
- PITEAU
- CITY OF KAMLOOPS (ABERDEEN)
- WRBC DATABASE

LEGEND

- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- EMBANKMENT
- INACTIVE MODEL CELLS
- WATERSHED BOUNDARIES[5]
- WATER BODIES
- SURFACE WATER HYDROLOGY
- POTENTIOMETRIC CONTOUR INTERPRETED FROM WATER LEVEL DATA (M ASL)
- POTENTIOMETRIC CONTOUR INTERPRETED FROM REGIONAL TOPOGRAPHY (M ASL)
- INTERPRETED GROUNDWATER FLOW DIRECTION (NOT TO SCALE)
- TOPOGRAPHIC CONTOUR (m asl)
- INTERPRETED GROUNDWATER FLOW DIVIDE
- RES-2 (WELL)

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. HYDRAULIC HEAD CONTOUR INTERVAL IS 50 M.
4. TOPOGRAPHIC CONTOUR INTERVAL IS 100 M.
5. WATERSHED BOUNDARIES FROM iMapBC (2013).
6. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.
7. STATIC GROUNDWATER ELEVATIONS FOR DH14-SERIES GEOTECHNICAL DRILLHOLES WITH STANDPIPE PIEZOMETERS WERE NOT AVAILABLE DURING THIS ASSESSMENT.
8. REFER TO BGC (2015a) FOR INSTRUMENTS USED IN INTERPRETATION OF PIEZOMETRIC SURFACE AND ALL AVAILABLE INSTRUMENTATION LOCATIONS TO MONITOR GROUNDWATER ELEVATIONS.

SCALE: 1:200,000	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: INTERPRETED REGIONAL SCALE FLOW SYSTEM (EXISTING CONDITIONS)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 04



LEGEND

MINE ROCK STORAGE FACILITY	INTERPRETED GROUNDWATER FLOW DIVIDE
OPEN PIT	INTERPRETED POTENTIOMETRIC CONTOUR (M ASL)
ORE STOCKPILE	INTERPRETED GROUNDWATER FLOW DIRECTION (NOT TO SCALE)
TAILINGS STORAGE FACILITY	WATERSHED BOUNDARIES
EMBANKMENT	**WATER LEVEL DATA SOURCE**
WATER BODIES	BGC
SURFACE WATER HYDROLOGY	KNIGHT PIESOLD

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. HYDARULIC HEAD CONTOUR INTERVAL IS 50 M
4. HILLSHADE SOURCED FROM AIRBORNE IMAGING (2013).
5. WATERSHED BOUNDARIES FROM iMapBC (2013).
7. STATIC GROUNDWATER ELEVATIONS FOR DH14-SERIES GEOTECHNICAL DRILLHOLES WITH STANDPIPE PIEZOMETERS WERE NOT AVAILABLE DURING THIS ASSESSMENT.
8. REFER TO BGC (2015a) FOR INSTRUMENTS USED IN INTERPRETATION OF PIEZOMETRIC SURFACE AND ALL AVAILABLE INSTRUMENTATION LOCATIONS TO MONITOR GROUNDWATER ELEVATIONS.

SCALE: AS SHOWN	DRAWN: LM
DATE: AUG 2015	CHECKED: RC/BM
PROJECT No.: 1125007-04	APPROVED: TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

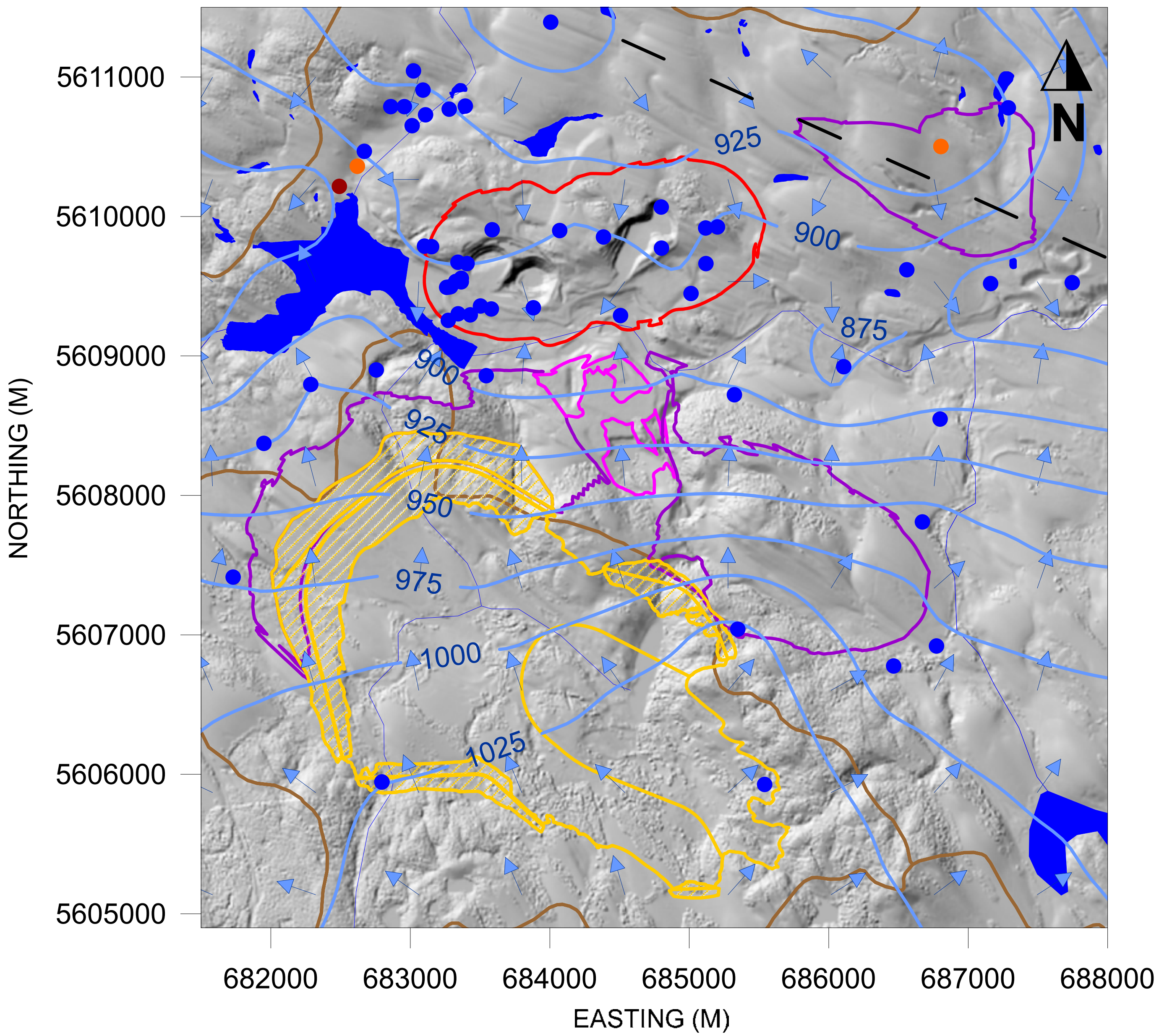
PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

CLIENT: KGHM AJAX MINING INC.

TITLE: INTERPRETED MINE SITE WATER TABLE AND GROUNDWATER FLOW DIRECTIONS (EXISTING CONDITIONS)

FIG No.: 05

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 03 04 05



LEGEND

MINE ROCK STORAGE FACILITY	INTERPRETED GROUNDWATER FLOW DIVIDE
OPEN PIT	INTERPRETED POTENTIOMETRIC CONTOUR (M ASL)
ORE STOCKPILE	INTERPRETED GROUNDWATER FLOW DIRECTION (NOT TO SCALE)
TAILINGS STORAGE FACILITY	WATERSHED BOUNDARIES
EMBANKMENT	
WATER BODIES	
SURFACE WATER HYDROLOGY	

WATER LEVEL DATA SOURCE

- BGC
- KNIGHT PIESOLD
- WRBC DATABASE

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. HYDARULIC HEAD CONTOUR INTERVAL IS 50 M
4. HILLSHADE SOURCED FROM AIRBORNE IMAGING (2013).
5. WATERSHED BOUNDARIES FROM iMapBC (2013).
7. STATIC GROUNDWATER ELEVATIONS FOR DH14-SERIES GEOTECHNICAL DRILLHOLES WITH STANDPIPE PIEZOMETERS WERE NOT AVAILABLE DURING THIS ASSESSMENT.
8. REFER TO BGC (2015a) FOR INSTRUMENTS USED IN INTERPRETATION OF PIEZOMETRIC SURFACE AND ALL AVAILABLE INSTRUMENTATION LOCATIONS TO MONITOR GROUNDWATER ELEVATIONS.

SCALE: AS SHOWN	DRAWN: LM
DATE: AUG 2015	CHECKED: RC/BM
PROJECT No.: 1125007-04	APPROVED: TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

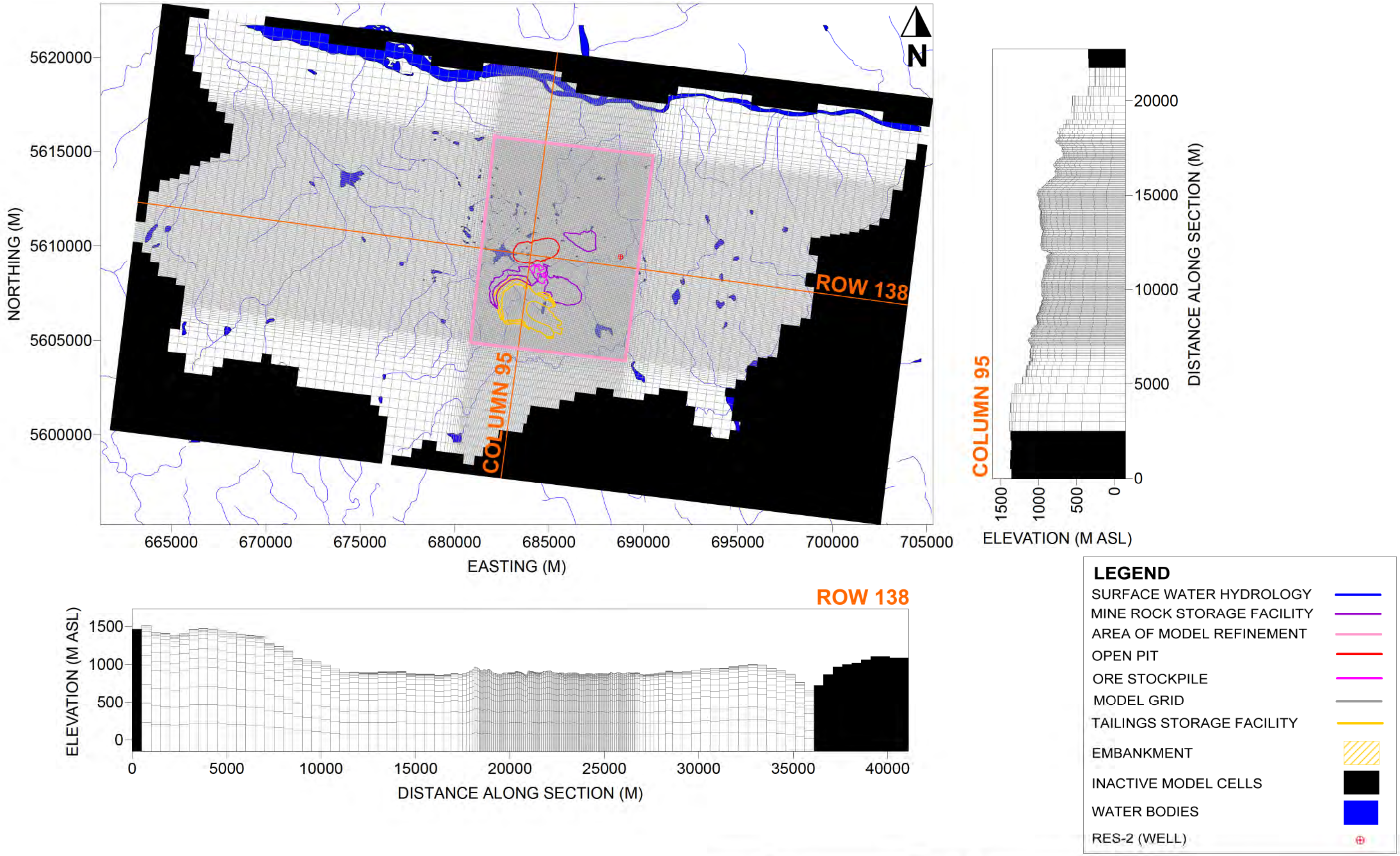
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: INTERPRETED MINE SITE BEDROCK POTENTIOMETRIC SURFACE AND FLOW DIRECTIONS (EXISTING CONDITIONS)

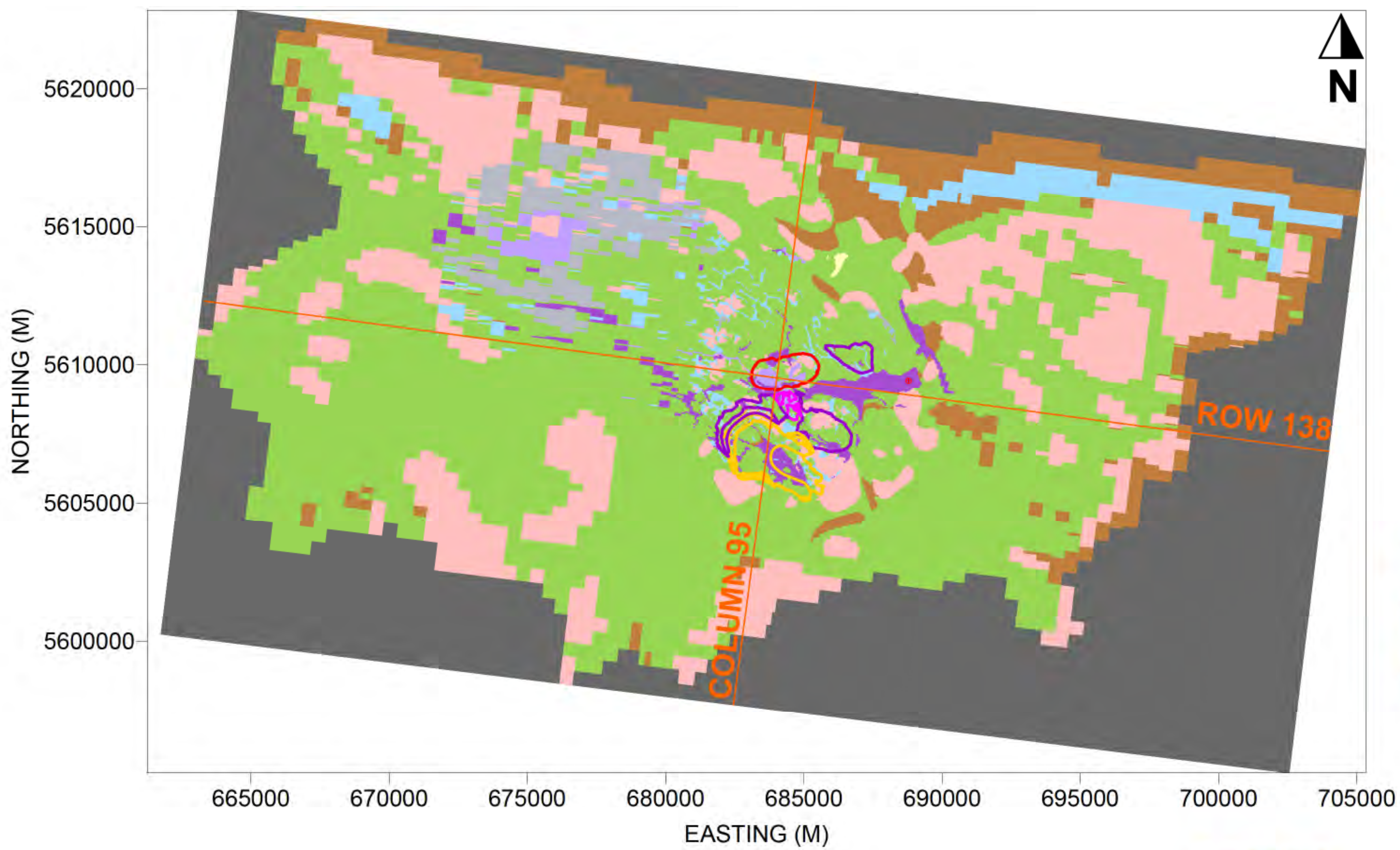
FIG No.: 06

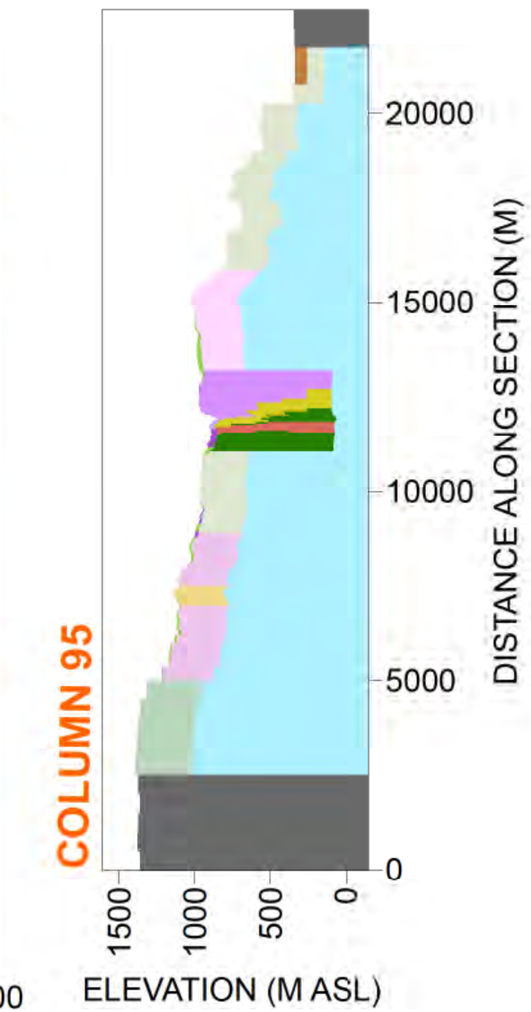
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 03 04 05

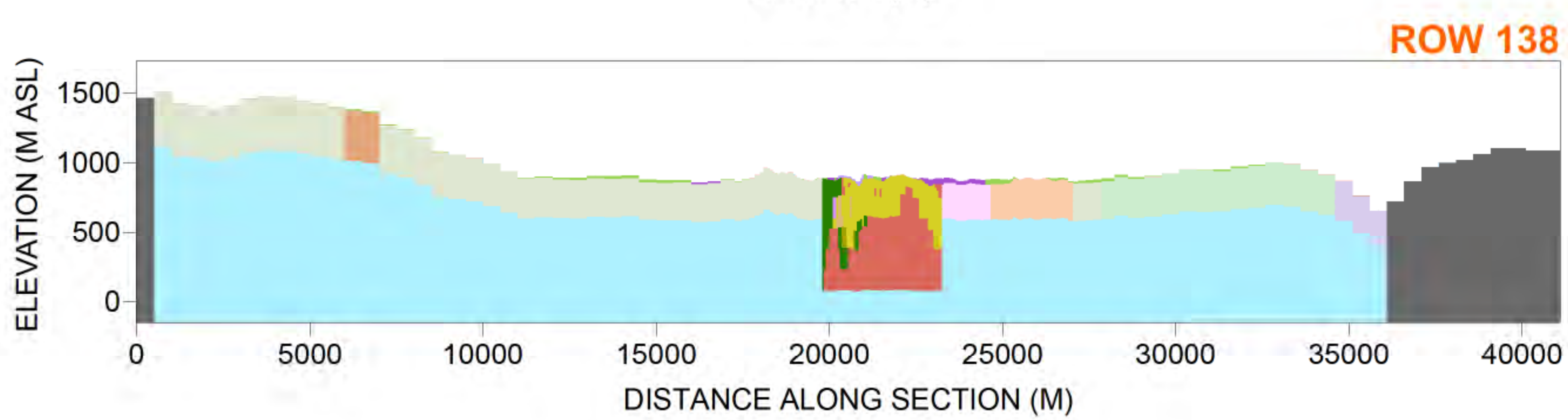


NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. CROSS SECTIONS HAVE 4X VERTICAL EXAGGERATION.
4. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.
5. DISTANCE ALONG CROSS-SECTIONS ARE TRUE LENGTH.

SCALE: 1:200,000	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL GRID
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 07







LEGEND

- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- EMBANKMENT
- INACTIVE MODEL CELLS
- RES-2 (WELL)

SURFICIAL GEOLOGY

- ANTHROPOGENIC MATERIAL[8]
- FLUVIAL / GLACIOFLUVIAL DEPOSITS
- EOLIAN DEPOSITS
- UNDIVIDED, POST-GLACIAL DEPOSITS
- COLLUVIUM
- GLACIAL TILL
- LACUSTRINE DEPOSITS

BEDROCK GEOLOGY

3D GEOLOGIC MODEL GEOLOGY

UPPER TRIASSIC

NICOLA GROUP

- EASTERN VOLCANIC FACIES
- PICRITE UNIT

LATE TRIASSIC TO EARLY JURASSIC

IRON MASK BATHOLITH

- SUGARLOAF UNIT (SLD)
- IRON MASK HYBRID (IMH)
- SUGARLOAF VOLCANIC HYBRID
- PYROXENE PLAGIOCLASE PORPHYRY

REGIONAL GEOLOGY

MIOCENE

- OLIVINE BASALT

EOCENE

KAMLOOPS GROUP

- TRANQUILLE FINE CLASTIC SEDIMENTS
- UNDIVIDED VOLCANICS

UNNAMED

- BATTLE BLUFF PLUTONIC COMPLEX
- UNNAMED FELDSPAR PORHYRITIC ROCKS

UPPER TRIASSIC

NICOLA GROUP

- EASTERN VOLCANIC FACIES
- SEDIMENTARY FACIES
- METAMORPHIC ROCKS

LATE TRIASSIC TO EARLY JURASSIC

IRON MASK BATHOLITH

- CHERRY CREEK UNIT
- SUGARLOAF UNIT (SLD)
- POTHOOK UNIT
- HYBRID UNIT (IMH)

UNNAMED

- GRANODIORITIC INTRUSIVE ROCKS
- ULTRAMAFIC ROCKS

QUATERNARY

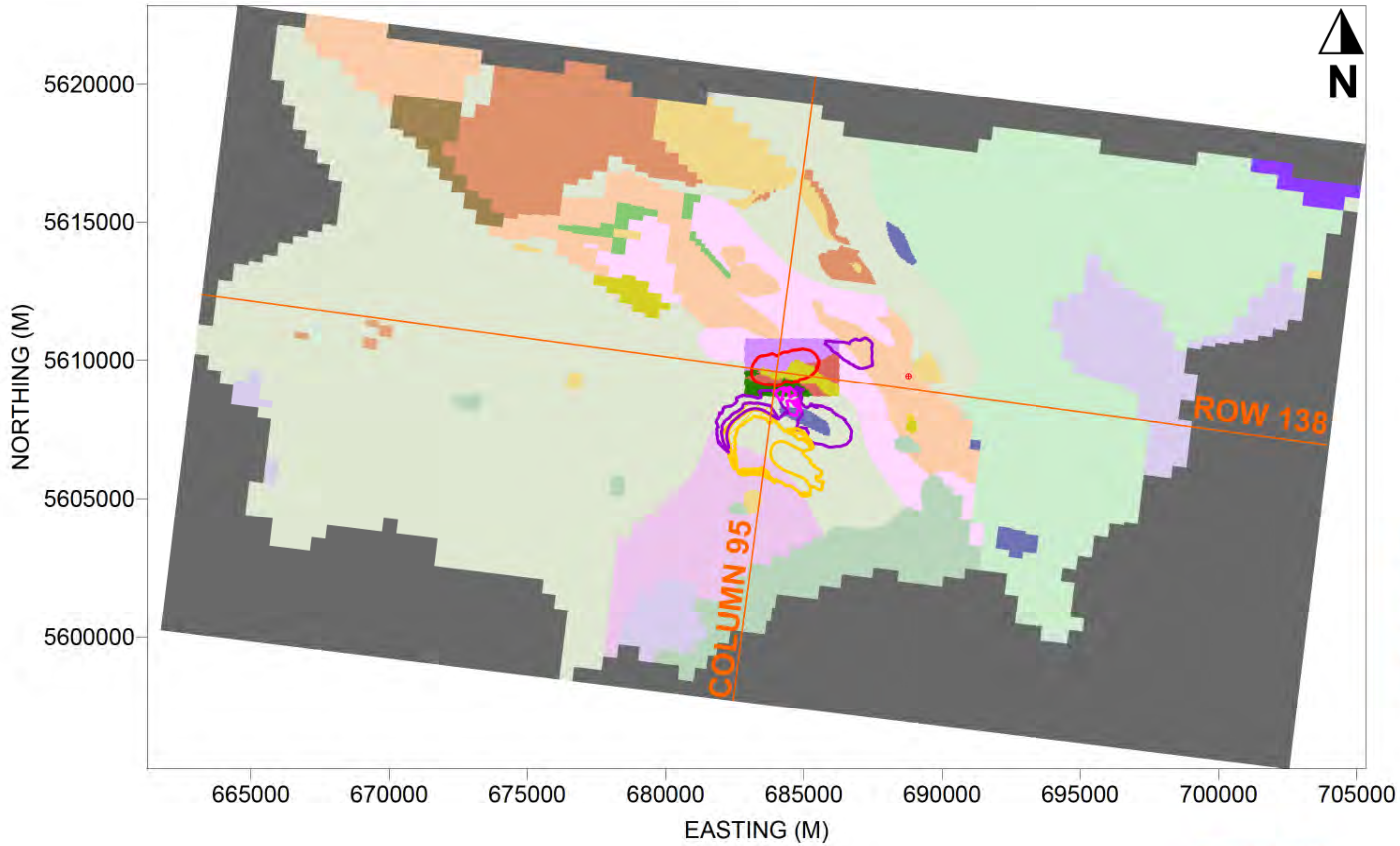
- BEDDED GYPSUM

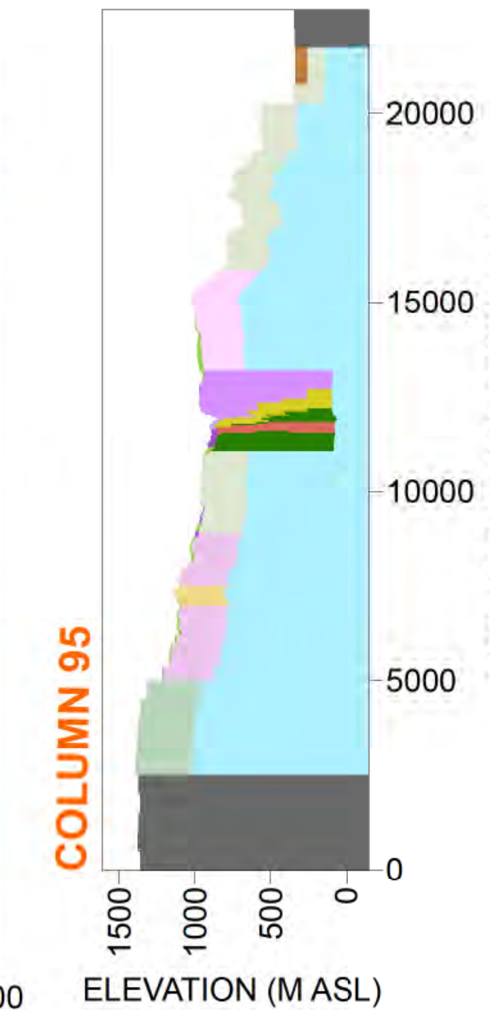
UNDIFFERENTIATED BEDROCK

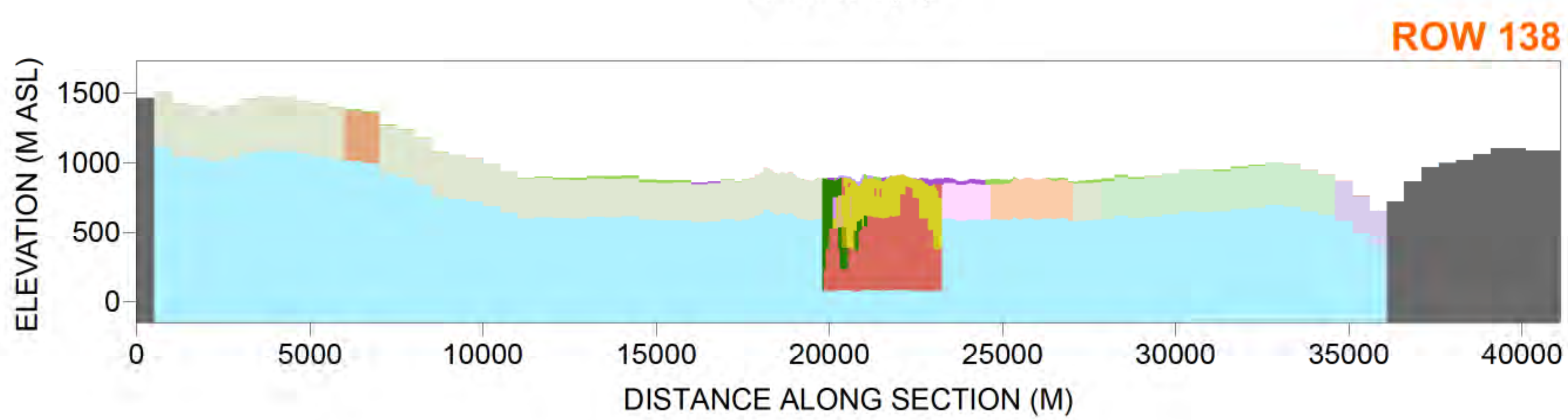
- SHALLOW
- DEEP

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. CROSS SECTIONS HAVE 4X VERTICAL EXAGGERATION.
4. REFER TO TABLES 4 AND 5 FOR HYDROSTRATIGRAPHIC UNIT PARAMETERS.
5. MODEL LAYER 1 SHOWN IN PLAN VIEW.
6. DISTANCE ALONG CROSS SECTIONS IS TRUE LENGTH.
7. SHALLOW BEDROCK HYDROSTRATIGRAPHIC UNITS REPRESENTS AREAS WHERE DEPTH TO BEDROCK IS LESS THAN 3M.
8. ANTHROPOGENIC MATERIALS INCLUDES MINE ROCK

SCALE: 1:200,000	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL HYDROSTRATIGRAPHIC UNITS - SURFICIAL DEPOSITS
PROJECT No: 1125007-04	APPROVED: TWC		FIG No.: 08







LEGEND

- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- EMBANKMENT
- INACTIVE MODEL CELLS
- RES-2 (WELL)

SURFICIAL GEOLOGY

- ANTHROPOGENIC MATERIAL[8]
- FLUVIAL / GLACIOFLUVIAL DEPOSITS
- EOLIAN DEPOSITS
- UNDIVIDED, POST-GLACIAL DEPOSITS
- COLLUVIUM
- GLACIAL TILL
- LACUSTRINE DEPOSITS

BEDROCK GEOLOGY

3D GEOLOGIC MODEL GEOLOGY

UPPER TRIASSIC

NICOLA GROUP

- EASTERN VOLCANIC FACIES
- PICRITE UNIT

LATE TRIASSIC TO EARLY JURASSIC

IRON MASK BATHOLITH

- SUGARLOAF UNIT (SLD)
- IRON MASK HYBRID (IMH)
- SUGARLOAF VOLCANIC HYBRID
- PYROXENE PLAGIOCLASE PORPHYRY

REGIONAL GEOLOGY

MIOCENE

- OLIVINE BASALT

EOCENE

KAMLOOPS GROUP

- TRANQUILLE FINE CLASTIC SEDIMENTS
- UNDIVIDED VOLCANICS

UNNAMED

- BATTLE BLUFF PLUTONIC COMPLEX
- UNNAMED FELDSPAR PORHYRITIC ROCKS

UPPER TRIASSIC

NICOLA GROUP

- EASTERN VOLCANIC FACIES
- SEDIMENTARY FACIES
- METAMORPHIC ROCKS

LATE TRIASSIC TO EARLY JURASSIC

IRON MASK BATHOLITH

- CHERRY CREEK UNIT
- SUGARLOAF UNIT (SLD)
- POTHOOK UNIT
- HYBRID UNIT (IMH)

UNNAMED

- GRANODIORITIC INTRUSIVE ROCKS
- ULTRAMAFIC ROCKS

QUATERNARY

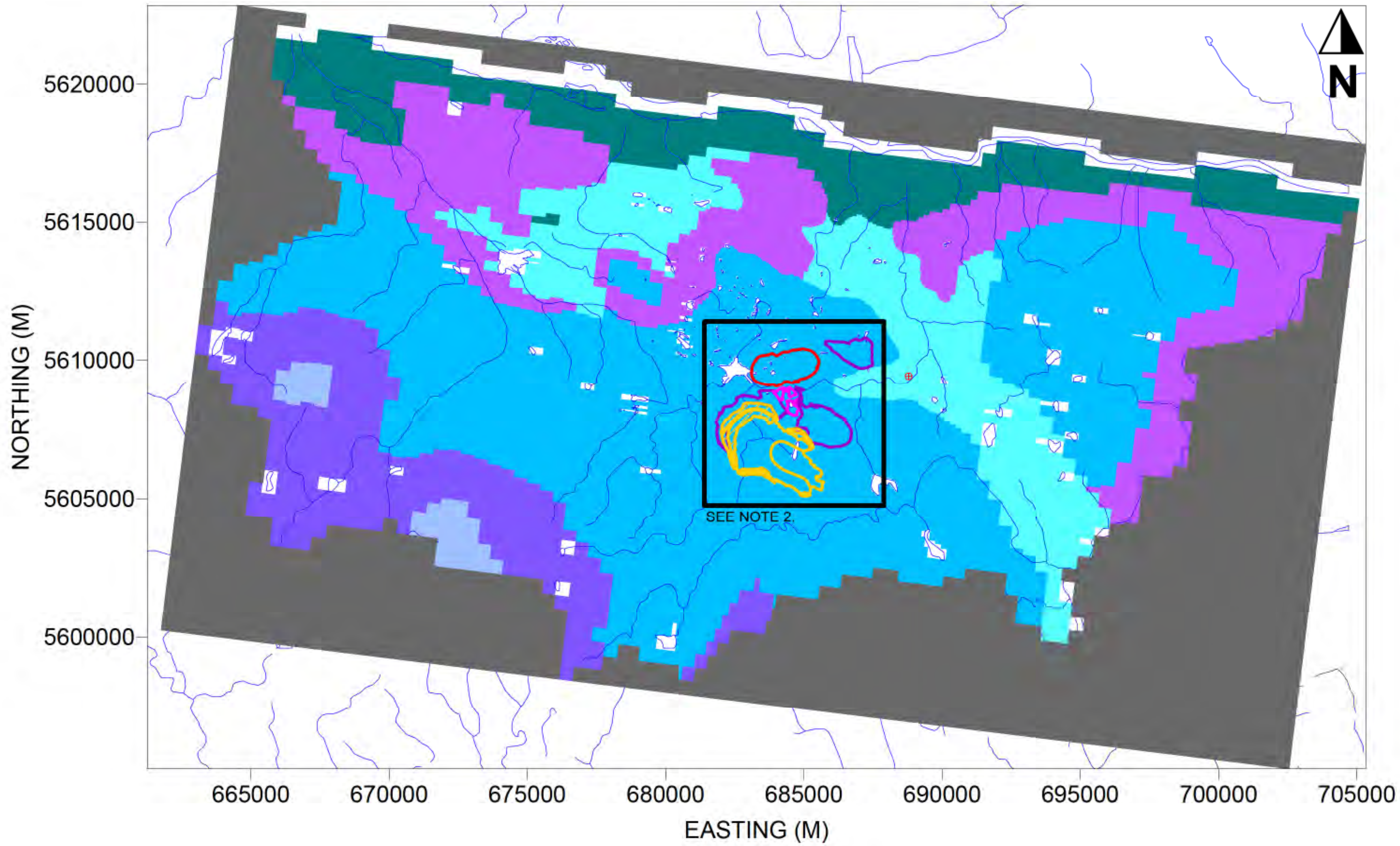
- BEDDED GYPSUM

UNDIFFERENTIATED BEDROCK

- SHALLOW
- DEEP

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. CROSS SECTIONS HAVE 4X VERTICAL EXAGGERATION.
4. REFER TO TABLES 4 AND 5 FOR HYDROSTRATIGRAPHIC UNIT PARAMETERS.
5. HYDROSTRATIGRAPHIC UNITS SHOWN IN PLAN VIEW MAP REPRESENT MODEL LAYER 5, APPROXIMATELY 250 MBGS.
6. MODEL LAYER 5 SHOWN IN PLAN VIEW.
7. DISTANCE ALONG CROSS SECTIONS IS TRUE LENGTH.
8. ANTHROPOGENIC MATERIALS INCLUDES MINE ROCK

SCALE: 1:200,000	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL HYDROSTRATIGRAPHIC UNITS - BEDROCK
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 09



LEGEND

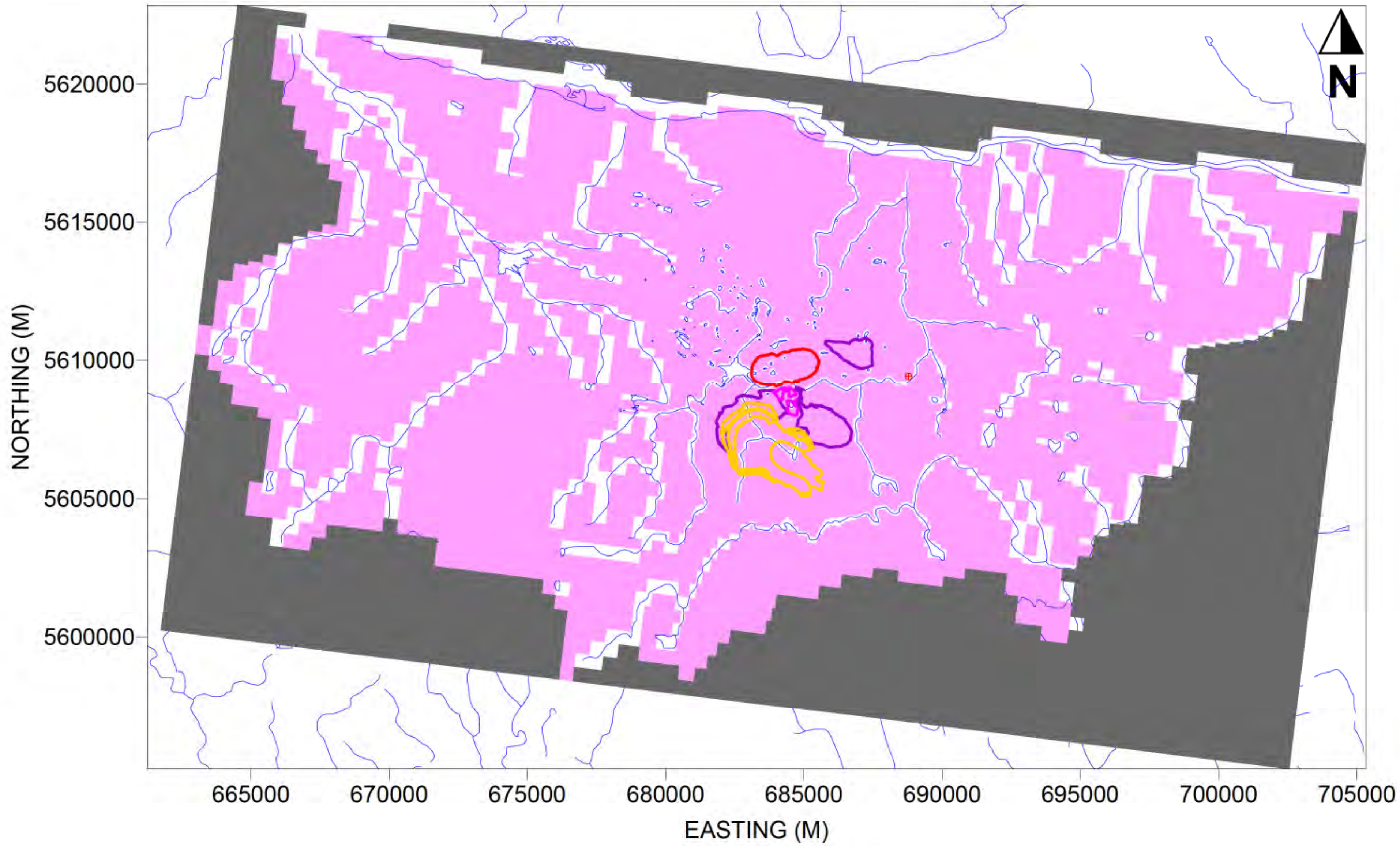
SURFACE WATER HYDROLOGY
MINE ROCK STORAGE FACILITY
OPEN PIT
ORE STOCKPILE
TAILINGS STORAGE FACILITY
EMBANKMENT
INACTIVE MODEL CELLS
RES-2 (WELL)

RECHARGE

BUNCHGRASS (El. < 600 m asl) (0.5 mm/yr)
BUNCHGRASS (El. 600 - 900 m asl) (4.9 mm/yr)
PONDEROSA PINE (El. 600 - 900 m asl) (4.9 mm/yr)
INTERIOR DOUGLAS FIR (El. 900 - 1400 m asl) (8.4 mm/yr)
MONTANE SPRUCE (El. 1400 - 1600 m asl) (9.9 mm/yr)
EGLEMAN SPRUCE - SUBALPINE FIR (EL. >1600 m als) (10.6 mm/yr)
SURFACE WATER FEATURE (NO RECHARGE APPLIED) (0 mm/yr)

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. INSET BOX FOR FIGURE 26 AND 28. SEE FIGURES 26 AND 28 FOR RECHARGE DURING OPERATIONS AND CLOSURE.
3. REFER TO DRAWING 01 FOR FACILITY LABELS.

SCALE: 1:200,000	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL RECHARGE DISTRIBUTION (EXISTING CONDITIONS)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 10



LEGEND

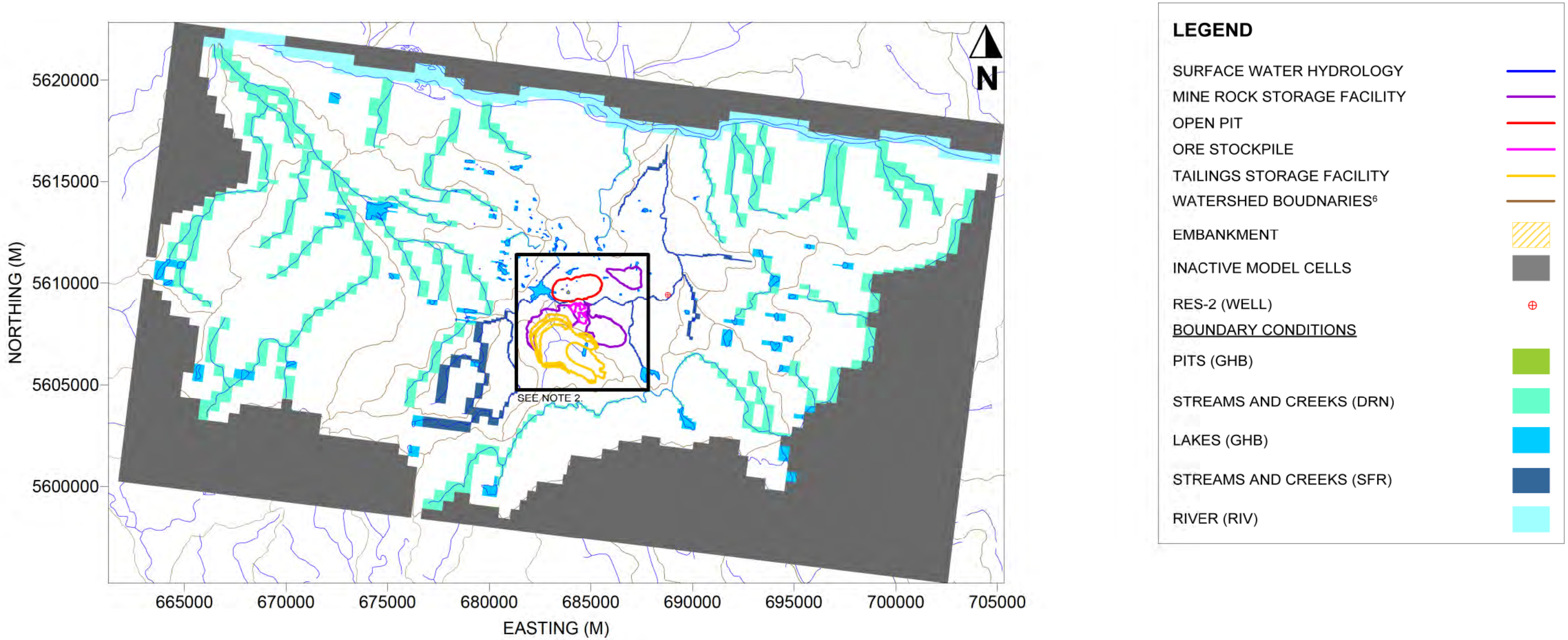
- SURFACE WATER HYDROLOGY
- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- EMBANKMENT
- INACTIVE MODEL CELLS
- RES-2 (WELL)

EVAPOTRANSPIRATION

- POTENTIAL EVAPOTRANSPIRATION 547.5 mm/yr (EXTINCTION DEPTH 5.5 m)
- NO EVAPOTRANSPIRATION

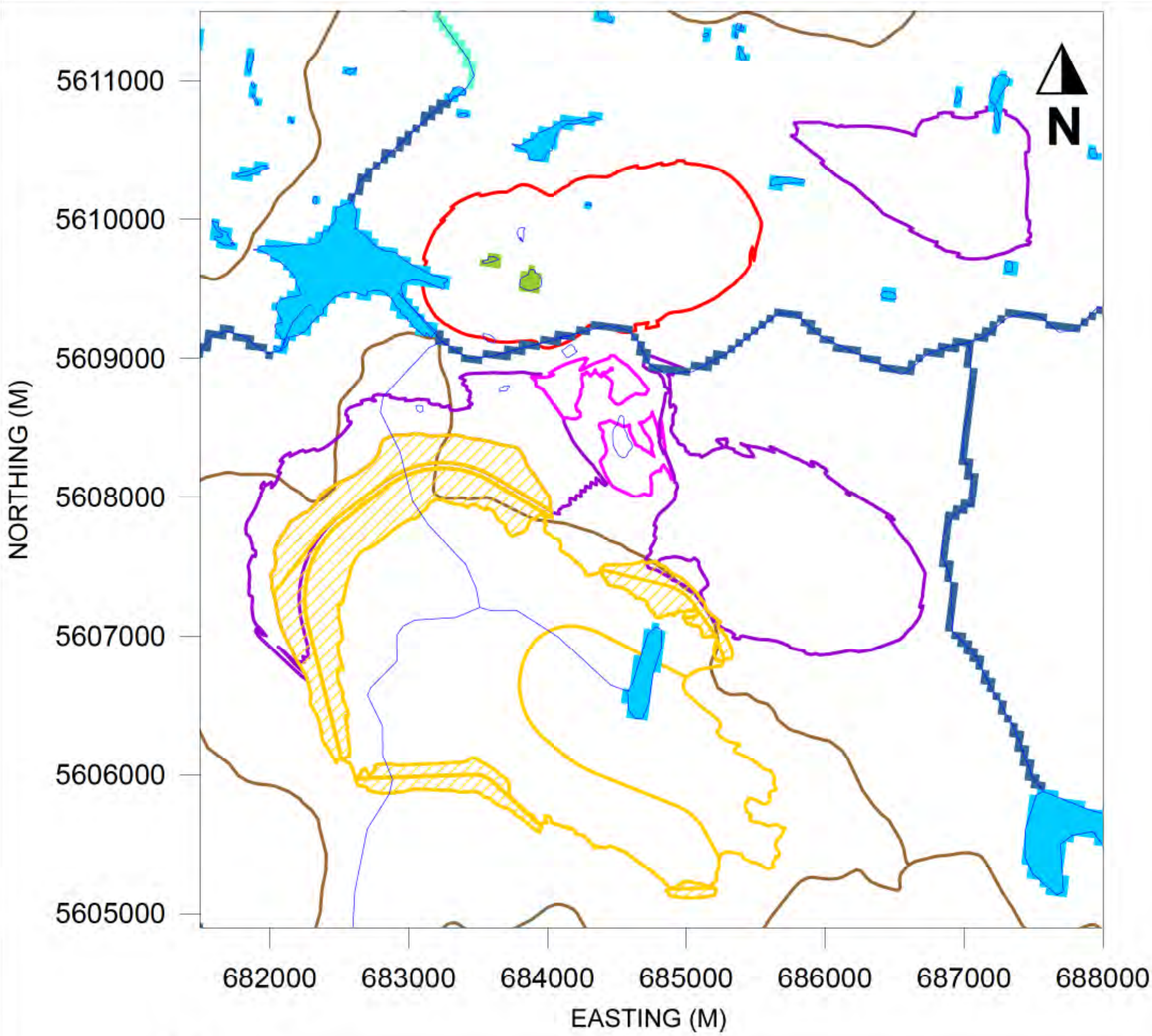
NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.

SCALE: 1:200,000	DRAWN: LM/TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL		
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL EVAPOTRANSPIRATION DISTRIBUTION (EXISTING CONDITIONS)	FIG No.: 11	
PROJECT No.: 1125007-04	APPROVED: TWC				



NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. INSET BOX FOR FIGURE 13 AND 25. SEE FIGURE 25 FOR BOUNDARY CONDITIONS DURING OPERATIONS.
3. WHITE AREAS REPRESENT NO BOUNDARY CONDITION APPLIED IN MODEL.
4. SEE DRAWING 01 FOR FACILITY LABELS.
5. MODFLOW PACKAGES: DRN = DRAINS, GHB = GENERAL HEAD, SFR = STREAM, RIV = RIVER.
6. WATERSHED BOUNDARIES FROM iMapBC (2013)

SCALE: 1:200,000	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: REGIONAL MODEL BOUNDARY CONDITIONS (EXISTING CONDITIONS)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 12



LEGEND

- SURFACE WATER HYDROLOGY
- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- WATERSHED BOUNDARIES
- EMBANKMENT

BOUNDARY CONDITIONS

- EXISTING AJAX WEST PITS (GHB)
- STREAMS AND CREEKS (DRN)
- LAKES (GHB)
- STREAMS AND CREEKS (SFR)

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. WHITE AREAS REPRESENT NO BOUNDARY CONDITION APPLIED IN MODEL.
3. REFER TO DRAWING 01 FOR FACILITY LABELS.
4. MODFLOW PACKAGES: DRN = DRAINS, GHB = GENERAL HEAD, SFR = STREAM.
5. WATERSHED BOUNDARIES FROM iMapBC (2013).

SCALE: AS SHOWN	DRAWN: LM/TCC
DATE: AUG 2015	CHECKED: RC/BM
PROJECT No.: 1125007-04	APPROVED: TWC

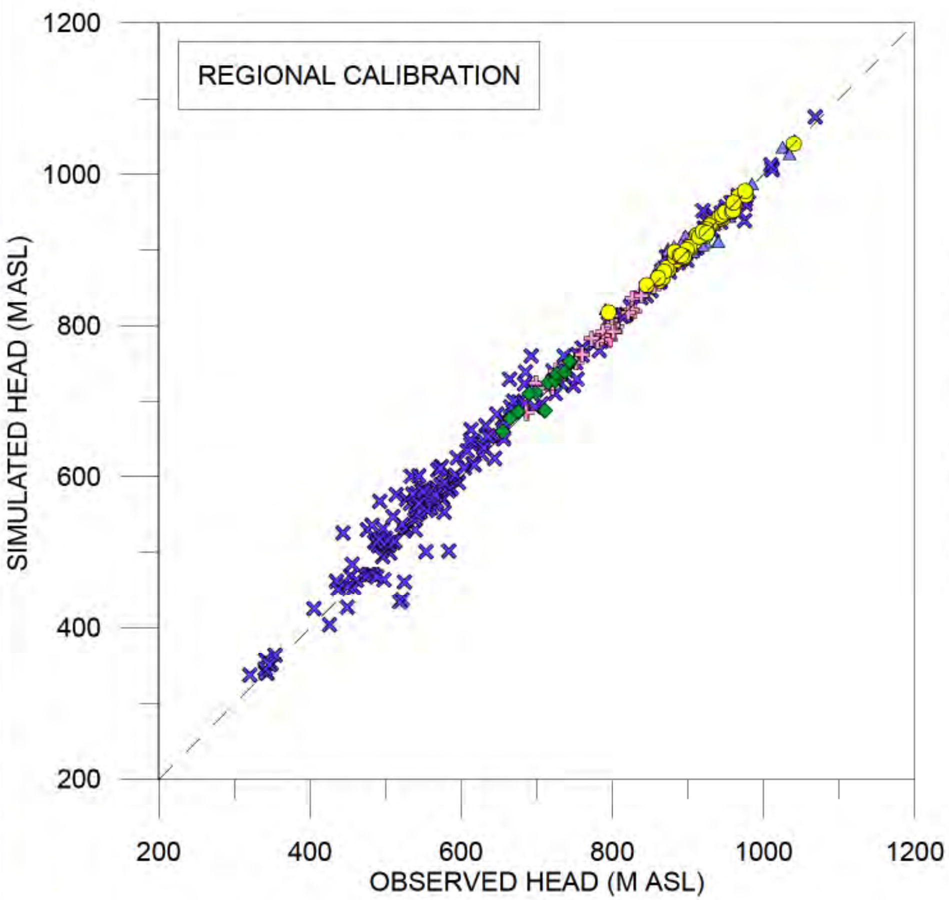
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

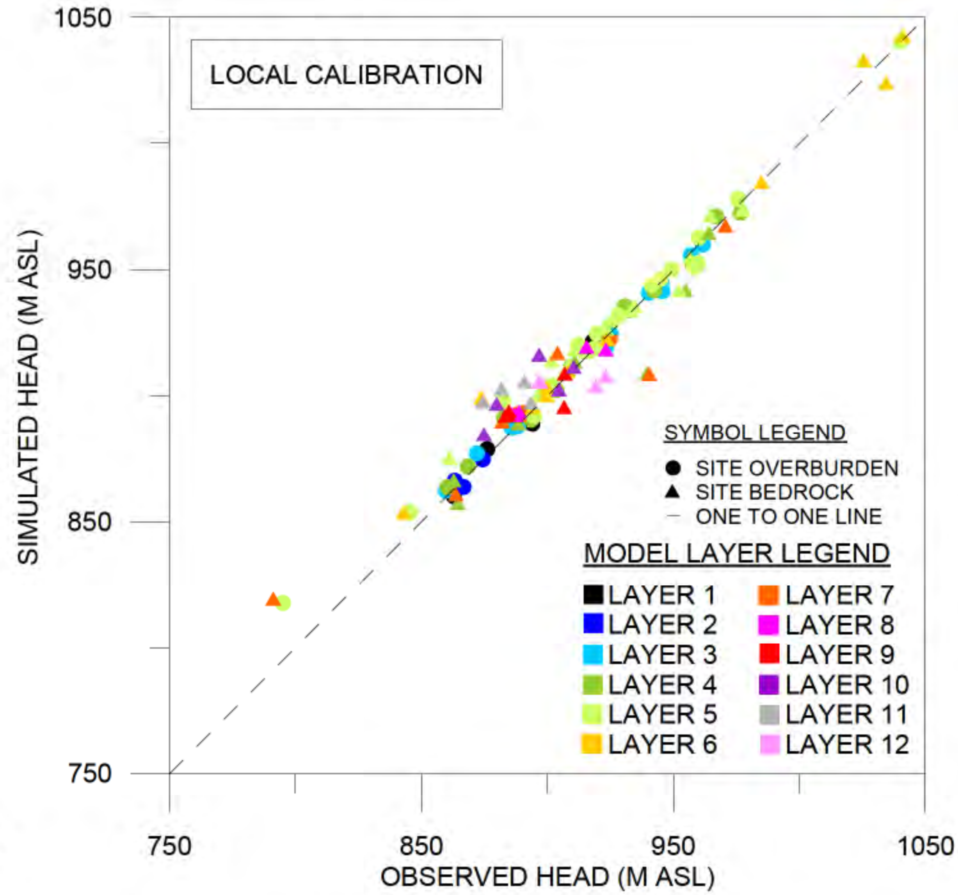
CLIENT: KGHM AJAX MINING INC.

TITLE: MINE SITE MODEL BOUNDARY CONDITIONS (EXISTING CONDITIONS)

FIG No.: 13



SYMBOL LEGEND
- AJAX MONITORING LOCATION WITHIN SURFICIAL DEPOSITS
- AJAX MONITORING LOCATION WITHIN BEDROCK
- ABERDEEN
- NEW AFTON
- REGIONAL BC GOVERNMENT DATABASE
- ONE TO ONE LINE

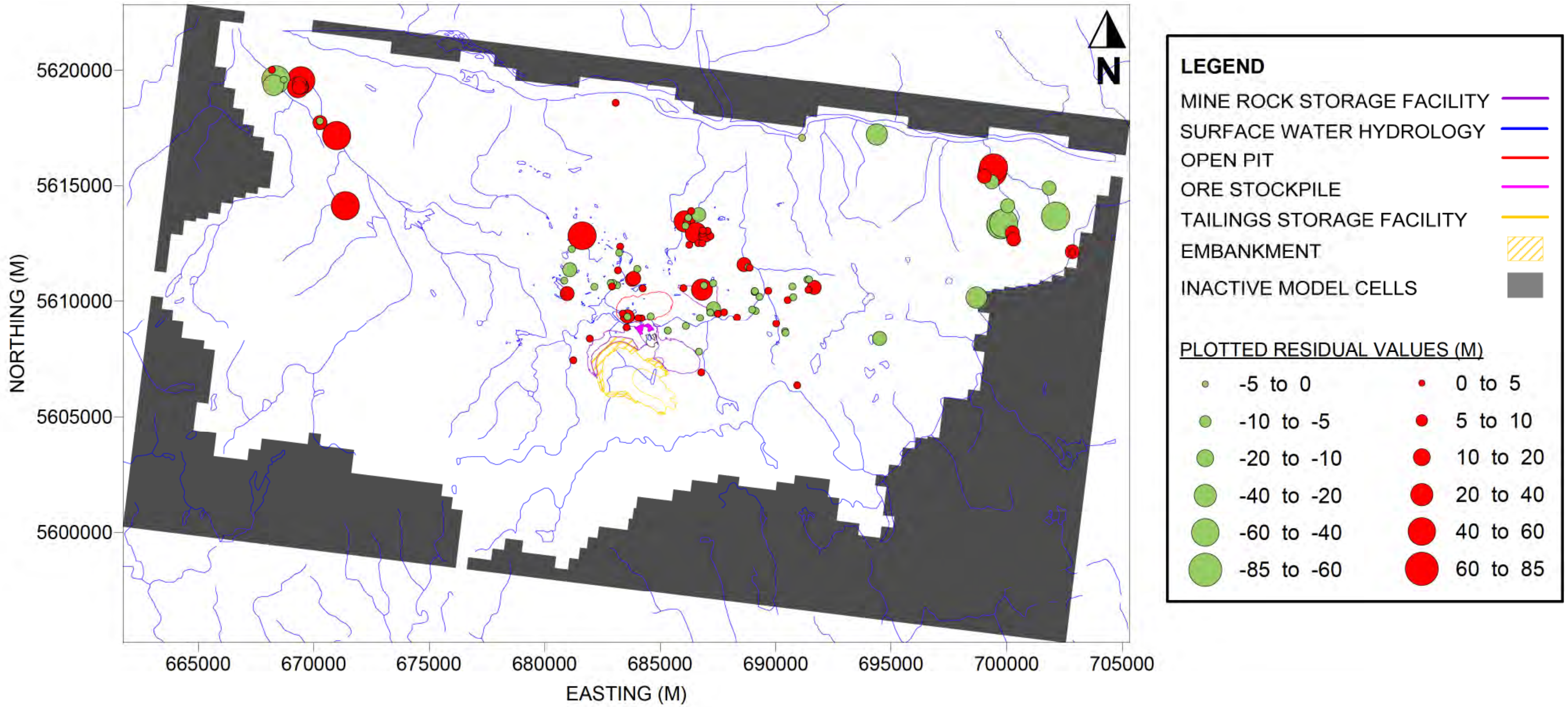


CALIBRATION STATISTICS SUMMARY

	REGIONAL CALIBRATION	LOCAL CALIBRATION
RESIDUAL MEAN	-4.8	-2.1
ABSOLUTE RESIDUAL MEAN	11.2	5.8
RMS ERROR	18.3	8.7
NO. OF OBSERVATIONS	418	126
OBSERVATIONS RANGE	747.7	250.0
NORMALIZED RMS ERROR	2.4%	3.5%
CORRELATION COEFFICIENT	0.995	0.981

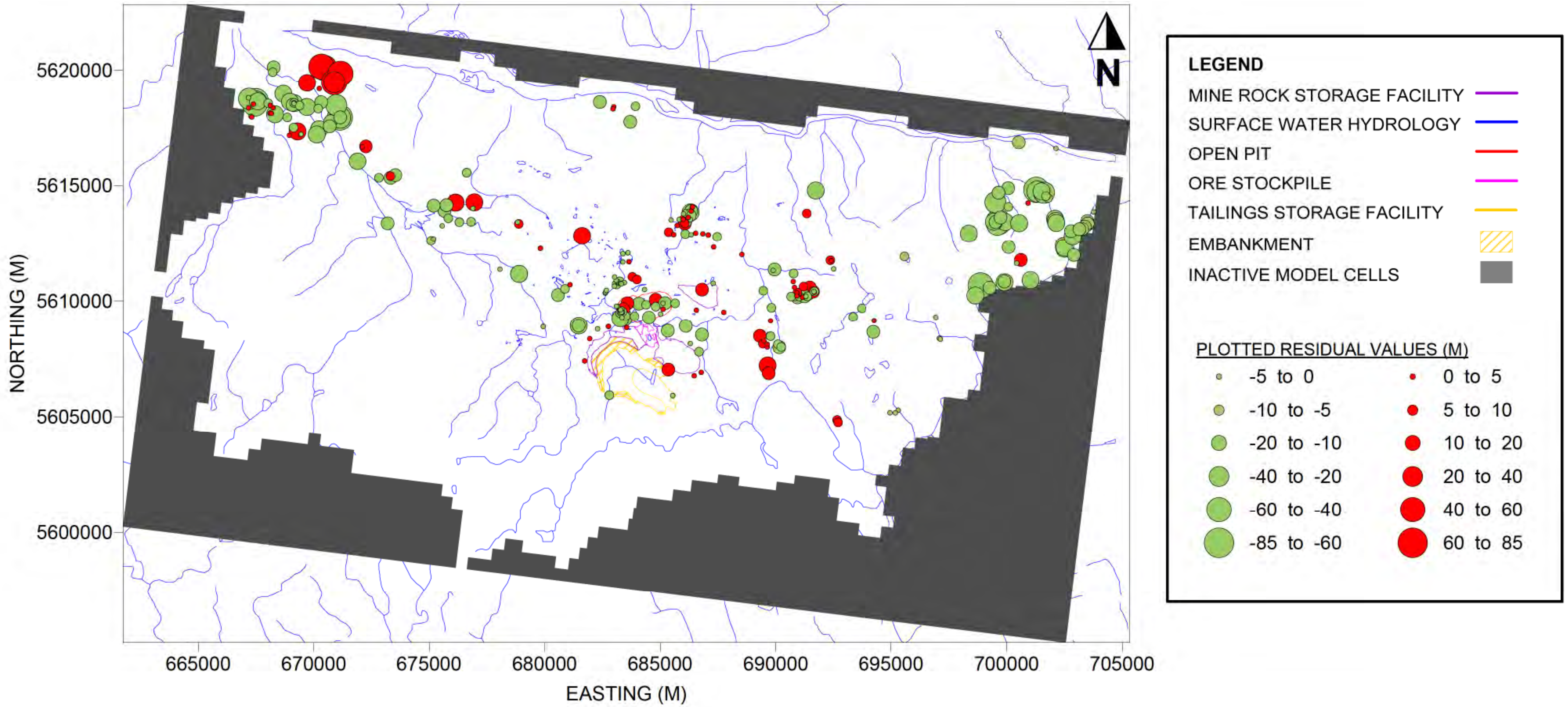
SCALE: NA	DRAWN: RC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: STEADY STATE CALIBRATION RESULTS
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 14

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 11 - Steady State Calibration Results



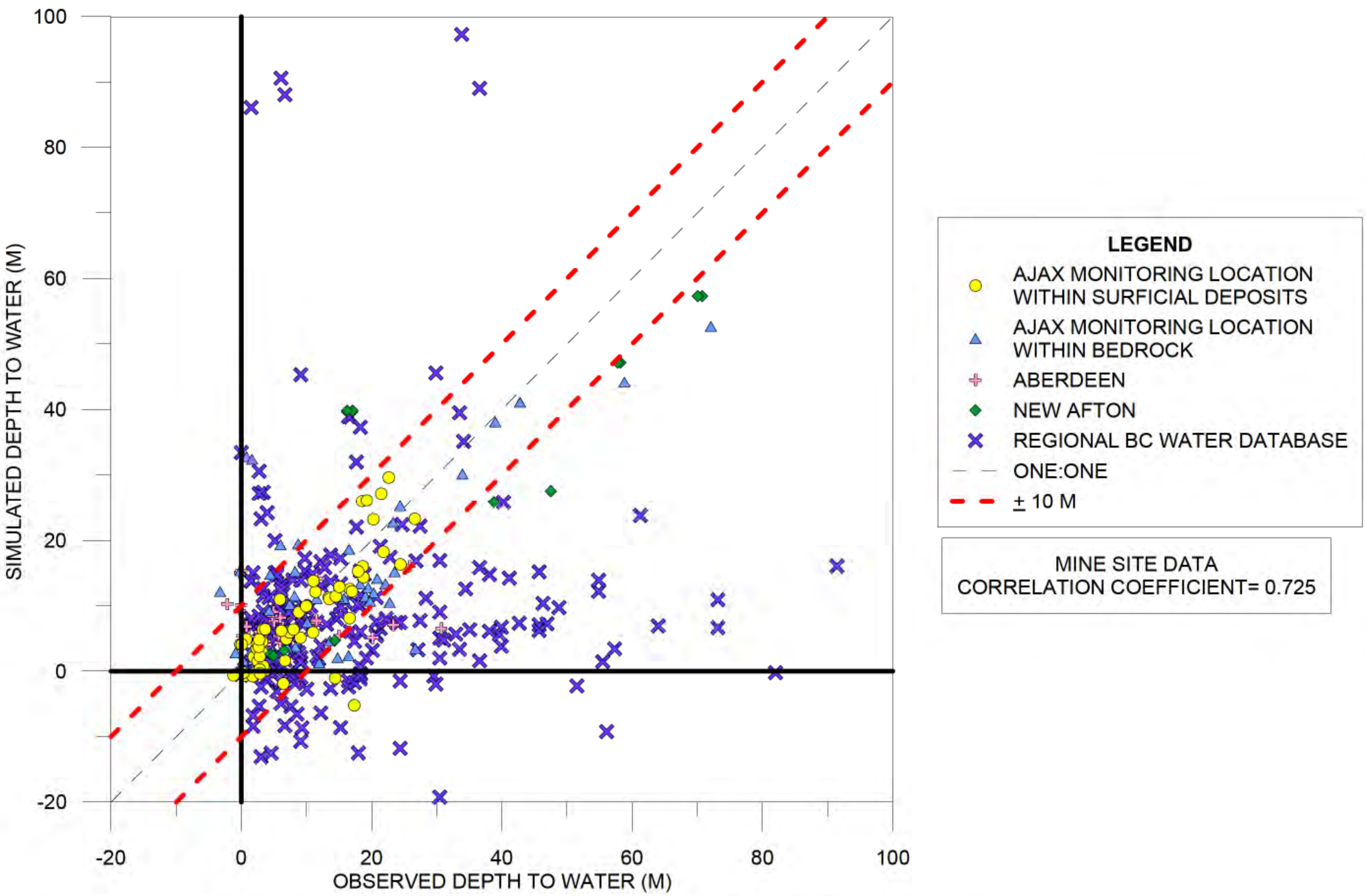
NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. RESIDUAL VALUES REPRESENT THE DIFFERENCE BETWEEN OBSERVED AND SIMULATED HYDRAULIC HEADS.
4. NEGATIVE VALUES INDICATE THAT OBSERVED HYDRAULIC HEAD < SIMULATED HYDRAULIC HEAD
5. POSITIVE VALUES INDICATE THAT OBSERVED HYDRAULIC HEAD > SIMULATE HYDRAULIC HEAD.

SCALE: 1:200,000	DRAWN: LM/TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SPATIAL DISTRIBUTION OF HEAD RESIDUALS IN SURFICIAL DEPOSITS (LAYERS 1-4)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 15



NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. RESIDUAL VALUES REPRESENT THE DIFFERENCE BETWEEN OBSERVED AND SIMULATED HYDRAULIC HEADS.
4. NEGATIVE VALUES INDICATE THAT OBSERVED HYDRAULIC HEAD < SIMULATED HYDRAULIC HEAD
5. POSITIVE VALUES INDICATE THAT OBSERVED HYDRAULIC HEAD > SIMULATE HYDRAULIC HEAD.

SCALE: 1:200,000	DRAWN: LM/TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SPATIAL DISTRIBUTION OF HEAD RESIDUALS IN BEDROCK (LAYERS 5-12)	FIG No.: 16
PROJECT No.: 1125007-04	APPROVED: TWC			

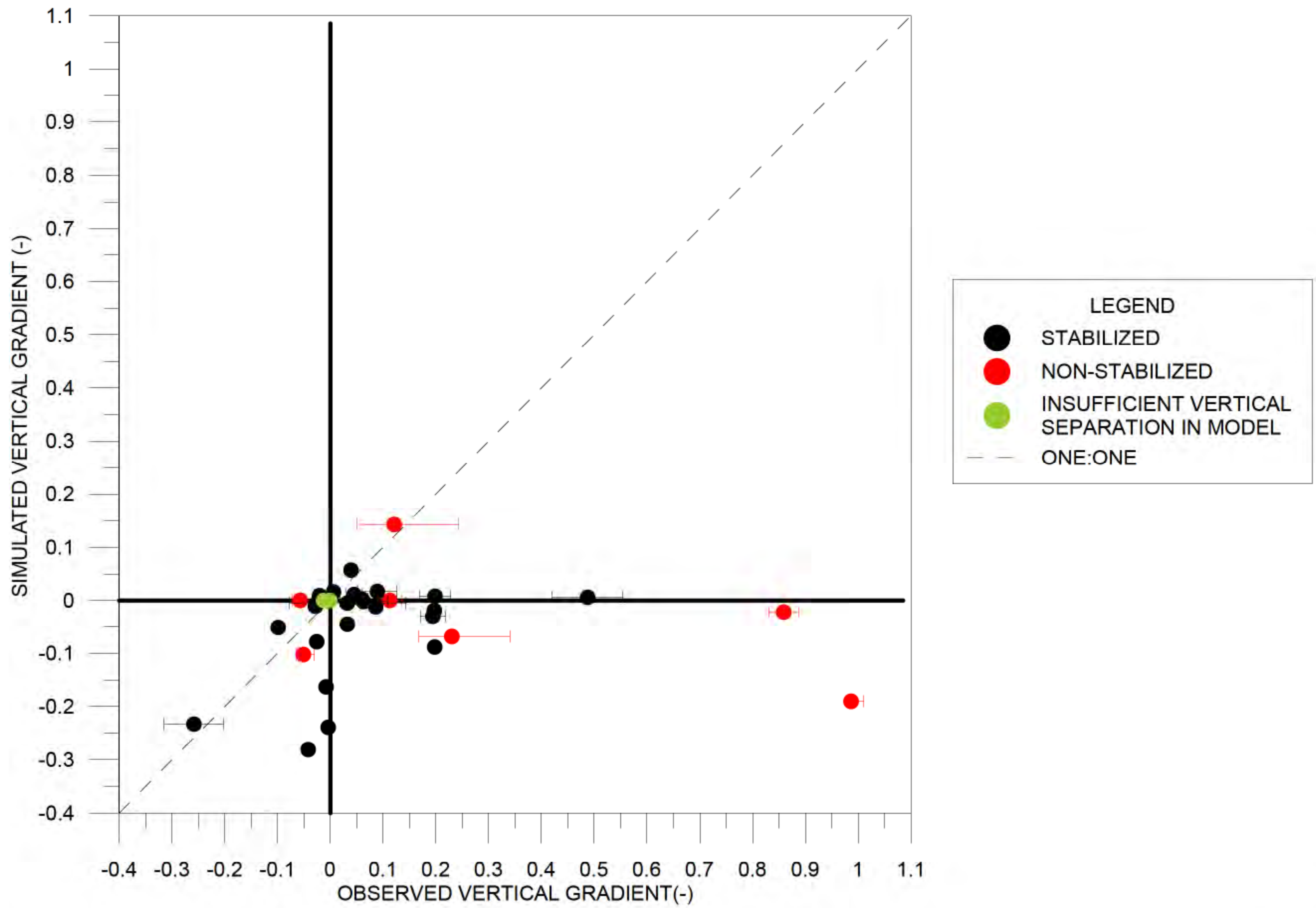


NOTES:

1) OUTLIER FROM WELL 76332 NOT PLOTTED, OBSERVED AND SIMULATED DEPTH TO WATER WERE 21.3 M AND -46.0 M, RESPECTIVELY

SCALE: NA	DRAWN: RC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: OBSERVED VS. SIMULATED DEPTH TO GROUNDWATER	FIG No.: 17
PROJECT No.: 1125007-04	APPROVED: TWC			

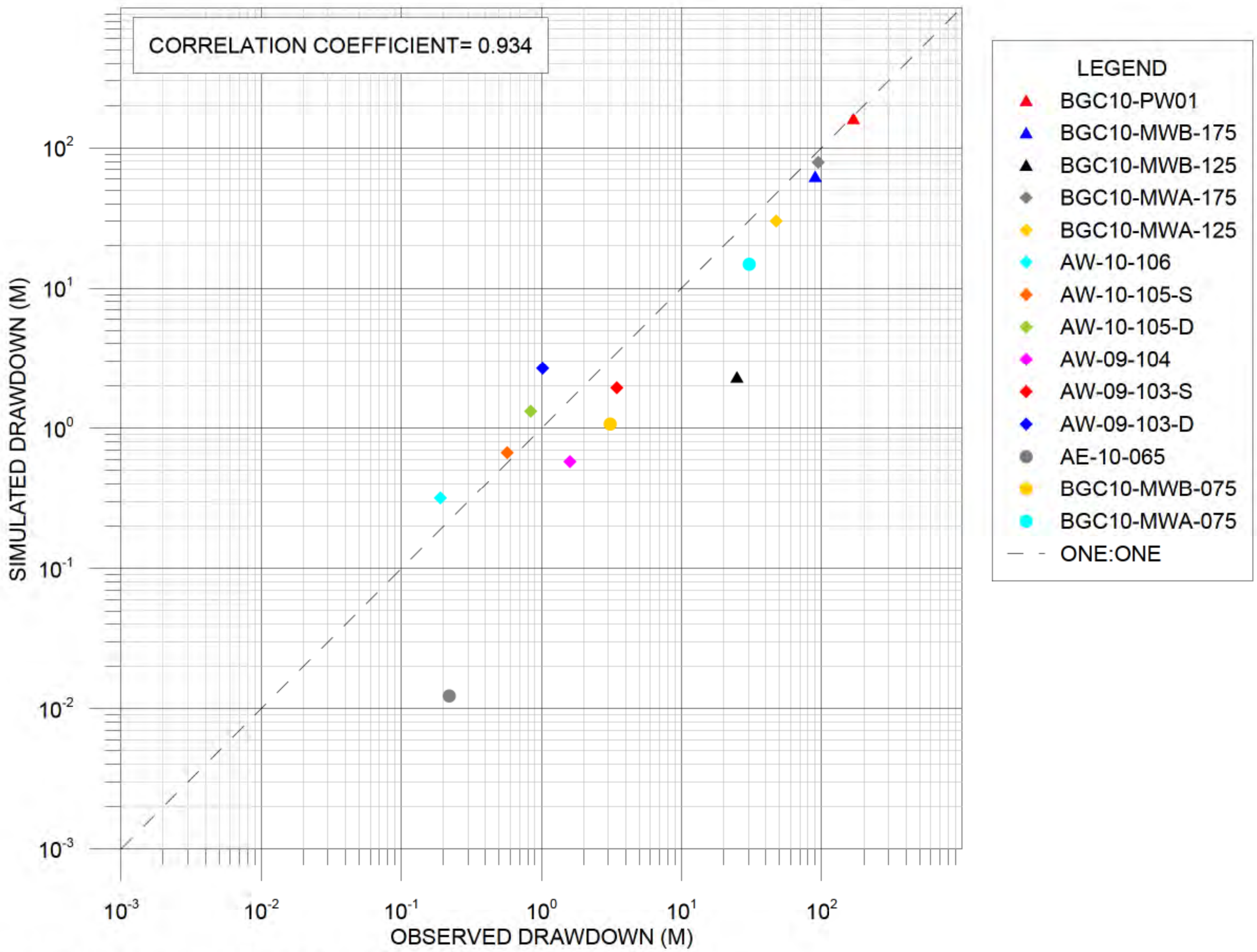
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 13 - Observed vs. Simulated Depth to Groundwater



NOTES:
1. AVERAGE OBSERVED VERTICAL HYDRAULIC GRADIENT IS DEPICTED WITH MINIMUM AND MAXIMUM RANGE

SCALE: NA	DRAWN: RC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: OBSERVED VS. SIMULATED VERTICAL HYDRAULIC GRADIENT
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 18

\\BGC-HV-FILE2\Data\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 14 - Observed vs. Simulated Vertical Hydraulic Gradient

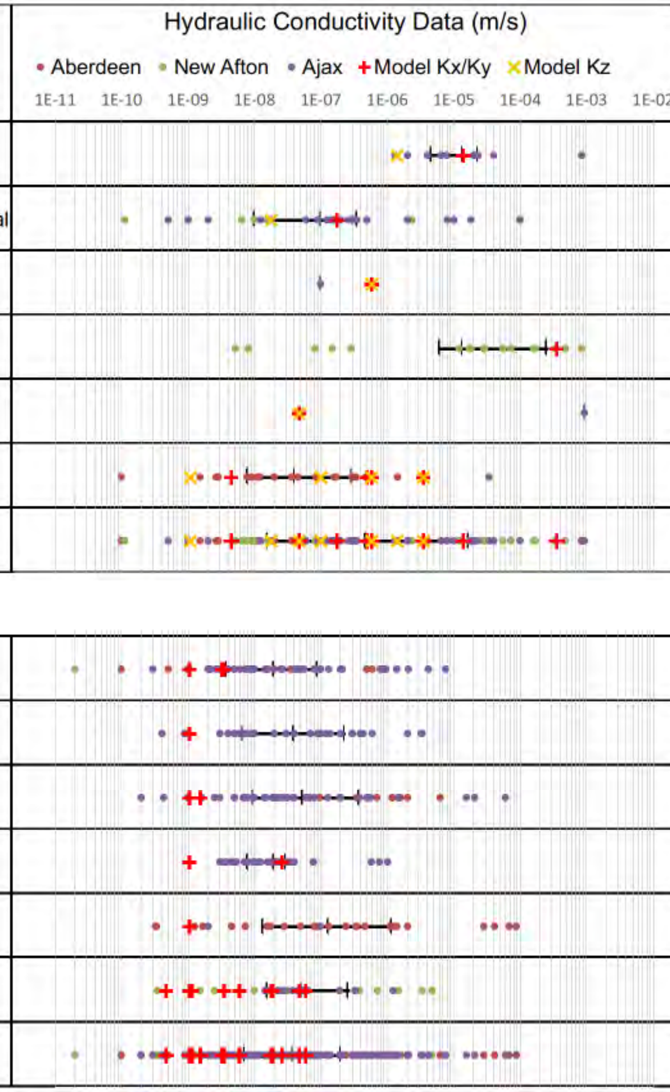


NOTES:
1. OBSERVED VS. SIMULATED DRAWDOWN IS PLOTTED FOR THE END OF THE PUMPING PERIOD.
2. OBSERVED VS. SIMULATED DRAWDOWN VALUES LESS THAT 1 CM HAVE NOT BEEN PLOTTED.

SCALE: NA	DRAWN: RC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: OBSERVED VS. SIMULATED DRAWDOWN - PUMPING TEST CALIBRATION	FIG No.: 19
PROJECT No.: 1125007-04	APPROVED: TWC			

\\BGC-HV-FILE2\Data\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 15 - Observed vs. Simulated Drawdown - Pumping Test Calibration

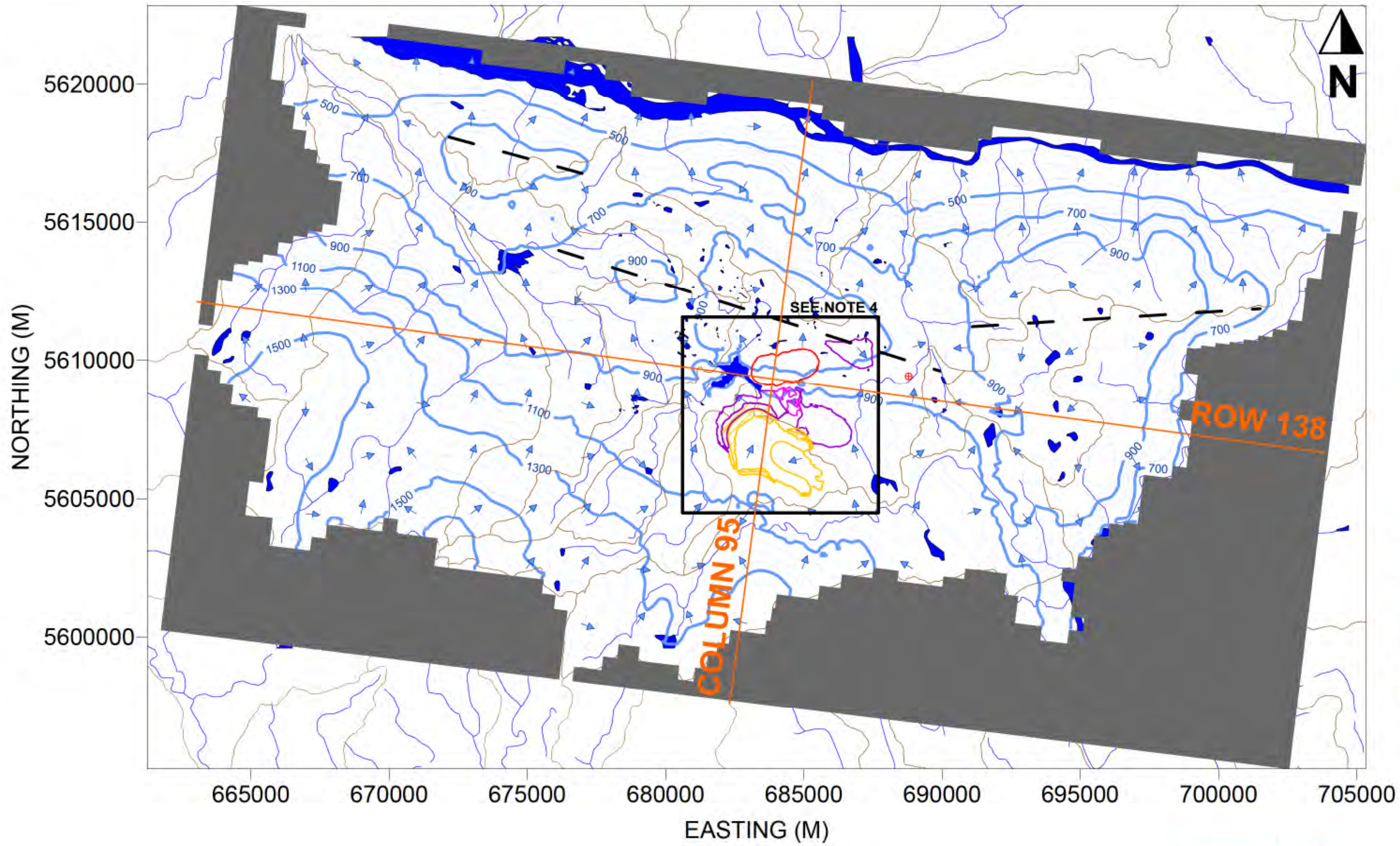
	Hydrostratigraphic Unit	Geometric Mean K (m/s)[1]	Specific Storage (1/m)
SURFICIAL DEPOSITS	Fluvial and Glaciofluvial Sands and Gravels	1 E-05	1E-05- 2E-03
	Glacial Till, Diamicton and Undivided Glacial Material	1 E-07	2E-06 - 2E-02
	Lacustrine and Glaciolacustrine Deposits and Undivided Recent Lake Sediments	1 E-07	1E-03[1]
	Mine Rock and Anthropogenic Materials	1 E-05	1E-03[1]
	Colluvium	9 E-04	1E-03[1]
	Undivided Surficial Deposits	4 E-08	1E-03[1]
	All Surficial Deposits	**5 E-07**	**2E-06 - 2E-02**
BEDROCK	Nicola Group Volcanics and Sediments	2 E-08	5E-07 - 4E-03
	Picrite	4 E-08	2E-07[1]
	Iron Mask Hybrid	5 E-08	4E-07 - 9E-04
	Sugarloaf Diorite	2 E-08	1E-06 -1E-07[1]
	Kamloops Group	1 E-07	1E-06[1]
	Unndivided Bedrock	5 E-08	1E-07 - 2E-03
	All Bedrock	**4 E-08**	**1E-07 - 9E-04**

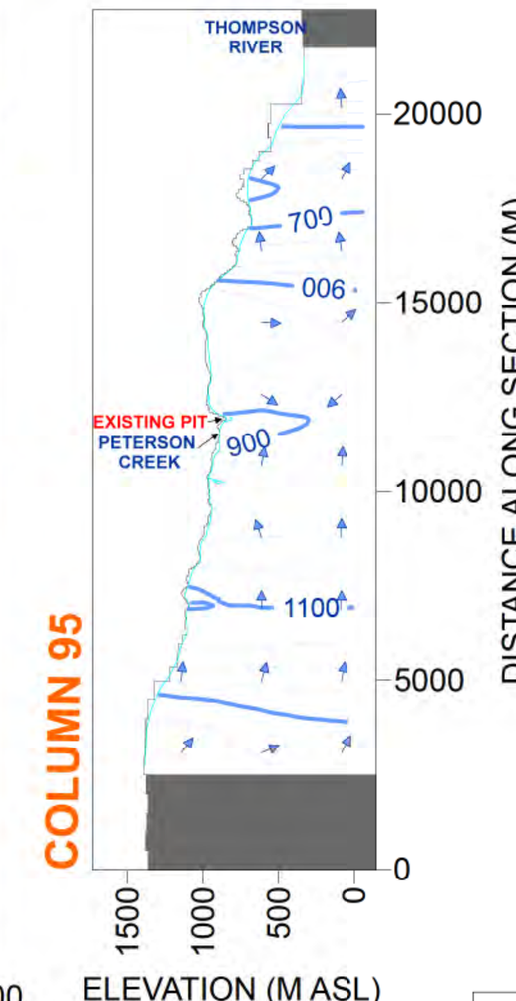


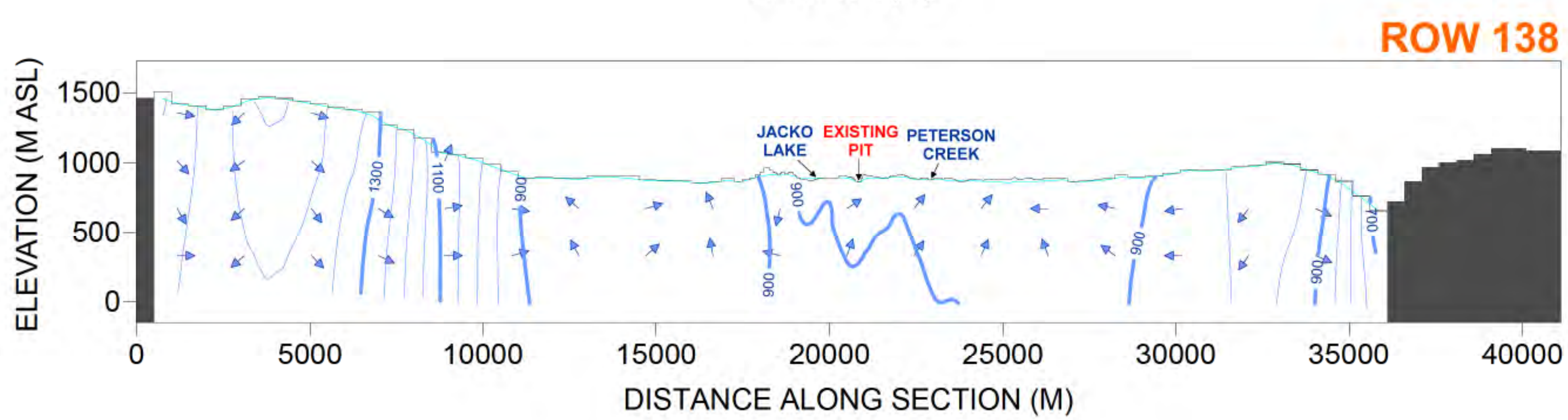
NOTES: 1. STORAGE PARAMETERS WERE SPECIFIED BASED ON RESULTS OBTAINED FROM AQUIFER TESTING, GUIDED BY REPRESENTATIVE PARAMETER VALUES FROM BEDROCK AND UNCONSOLIDATED MATERIALS IN LITERATURE (MAIDMENT 1993).
2. I - DENOTES FIRST QUARTILE, GEOMETRIC MEAN, AND THIRD QUARTILE VALUES FOR HYDRAULIC CONDUCTIVITY ESTIMATED FROM SITE INVESTIGATION DATA.
3. BEDROCK UNITS WERE ASSUMED TO BE ISOTROPIC, THEREFORE VERTICAL HYDRAULIC CONDUCTIVITY (Kz) IS NOT SHOWN.
4. REFER TO TABLES 4 AND 5 FOR CALIBRATED HYDRAULIC CONDUCTIVITY VALUES.

SCALE: AS SHOWN	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: COMPARISON OF CALIBRATED HYDRAULIC CONDUCTIVITY WITH ESTIMATES MADE FROM TEST DATA
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 20

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 16 - Calibrated K Comparison





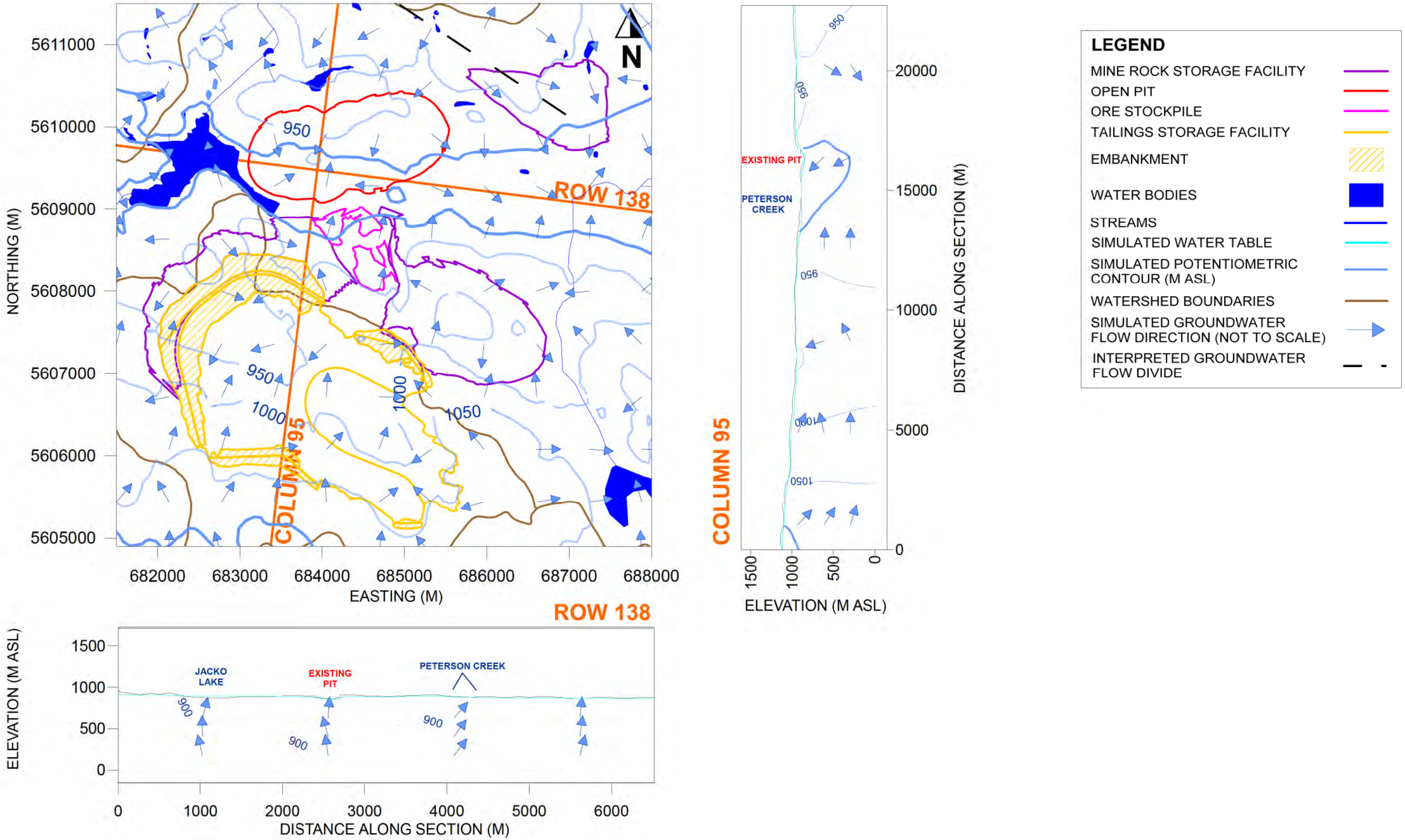


LEGEND

- SURFACE WATER HYDROLOGY
- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- EMBANKMENT
- INACTIVE MODEL CELLS
- WATER BODIES
- SIMULATED WATER TABLE
- SIMULATED POTENTIOMETRIC CONTOUR (M ASL)
- SIMULATED GROUNDWATER FLOW DIRECTION (NOT TO SCALE)
- WATERSHED BOUNDARIES
- INTERPRETED GROUNDWATER FLOW DIVIDE
- RES-2 (WELL)

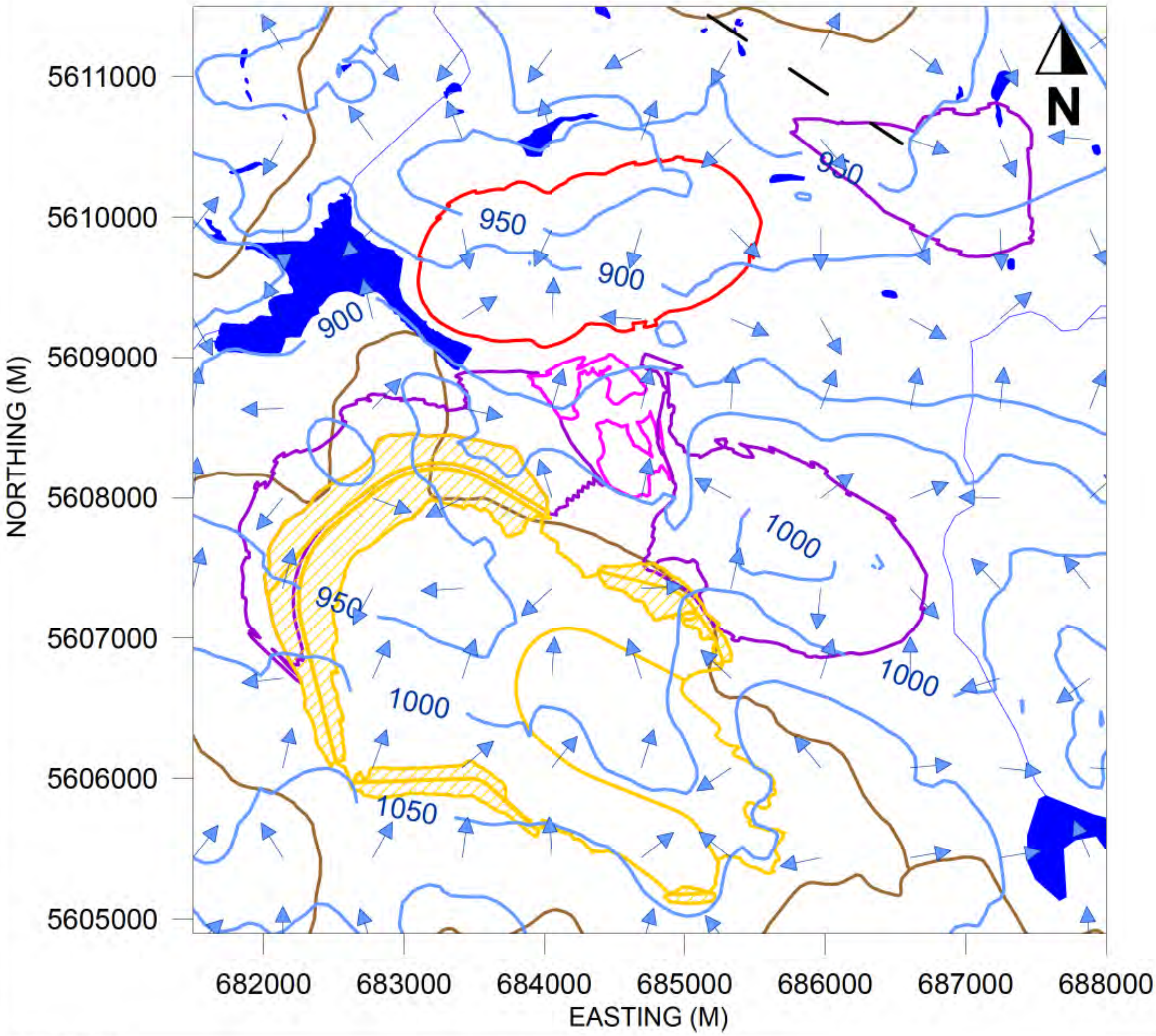
NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. ROW 138 AND COLUMN 95 CROSS SECTIONS HAVE 4X VERTICAL EXAGGERATION.
4. INSET BOX FOR FIGURE 22.
5. HYDRAULIC HEAD CONTOUR INTERVAL IS 50 M.
6. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.
7. DISTANCE ALONG CROSS-SECTIONS IS TRUE LENGTH.
8. WATERSHED BOUNDARIES FROM iMapBC (2013)

SCALE: 1:200,000	DRAWN: LM/TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SIMULATED REGIONAL STUDY AREA WATER TABLE AND GROUNDWATER FLOW DIRECTIONS (EXISTING CONDITIONS)
PROJECT No: 1125007-04	APPROVED: TWC		FIG No.: 21



NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO FIGURE 01 FOR FACILITY LABELS.
3. ROW 138 AND COLUMN 95 CROSS SECTIONS HAVE 4X VERTICAL EXAGGERATION.
4. HYDRAULIC HEAD CONTOUR INTERVAL IS 50 M.
5. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.
6. DISTANCE ALONG CROSS-SECTIONS IS TRUE LENGTH.
7. WATERSHED BOUNDARIES FROM iMapBC (2013).

SCALE: AS SHOWN	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SIMULATED MINE SITE WATER TABLE AND FLOW DIRECTIONS (EXISTING CONDITIONS)
PROJECT No.: 1125007	APPROVED: TWC		FIG No.: 22



LEGEND

MINE ROCK STORAGE FACILITY
OPEN PIT
ORE STOCKPILE
TAILINGS STORAGE FACILITY
EMBANKMENT
WATER BODIES
SURFACE WATER HYDROLOGY
INTERPRETED GROUNDWATER FLOW DIVIDE
SIMULATED POTENTIOMENTRIC COUNTOUR (M ASL)
SIMULATED GROUNDWATER FLOW DIRECTION (NOT TO SCALE)
WATERSHED BOUNDARIES

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. HYDRAULIC HEAD CONTOUR INTERVAL 50 M.
4. WATERSHED BOUNDARIES FORM iMapBC (2013).

SCALE: AS SHOWN	DRAWN: LM/TCC
DATE: AUG 2015	CHECKED: RC/BM
PROJECT No.: 1125007-04	APPROVED: TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

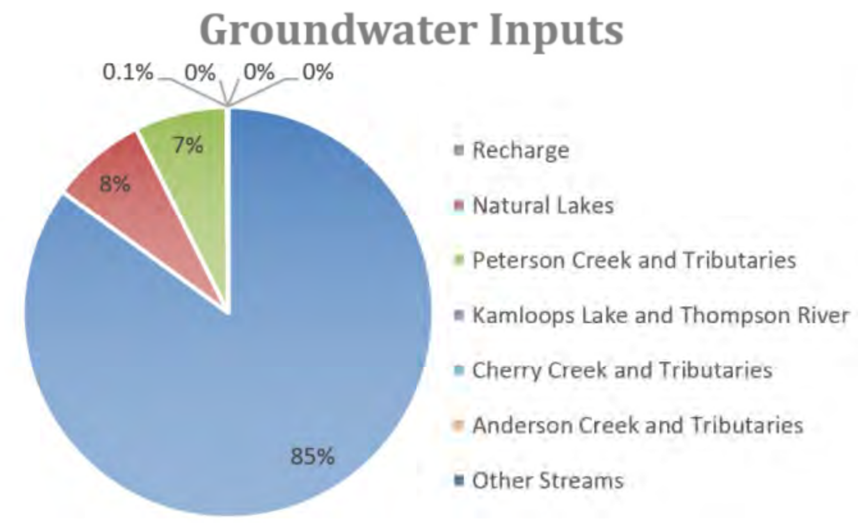
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

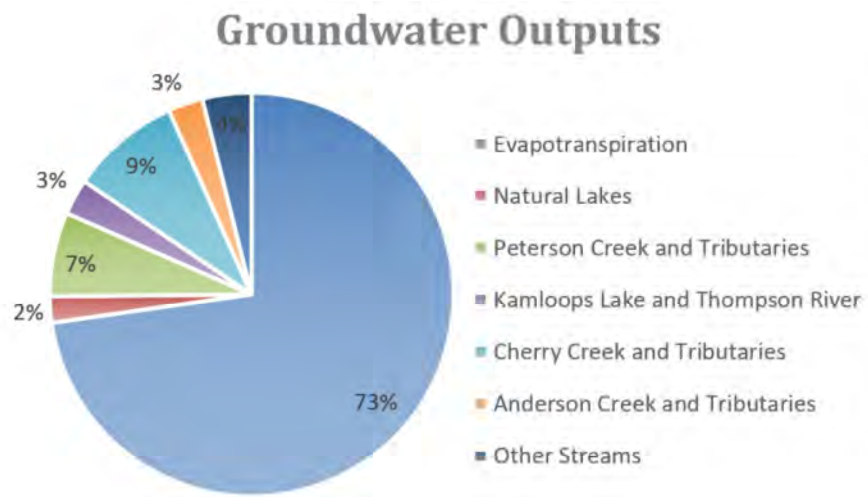
TITLE: SIMULATED MINE SITE BEDROCK GROUNDWATER ELEVATIONS AND FLOW DIRECTIONS (EXISTING CONDITIONS)

FIG No.: 23

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW\scope\09 GW Model\13 Report\23 Figures\Figure 19 - Simulated Project Area Bedrock Groundwater Levels and GW Flow Directions - Existing Conditions



Groundwater Inputs	m³/d	Percent Total
Recharge	10669	85%
Natural Lakes	949	8%
Peterson Creek and Tributaries	913	7%
Kamloops Lake and Thompson River	15	0.1%
Cherry Creek and Tributaries	0	0%
Anderson Creek and Tributaries	0	0%
Other Streams	0	0%
Total In	**12546**	**100%**

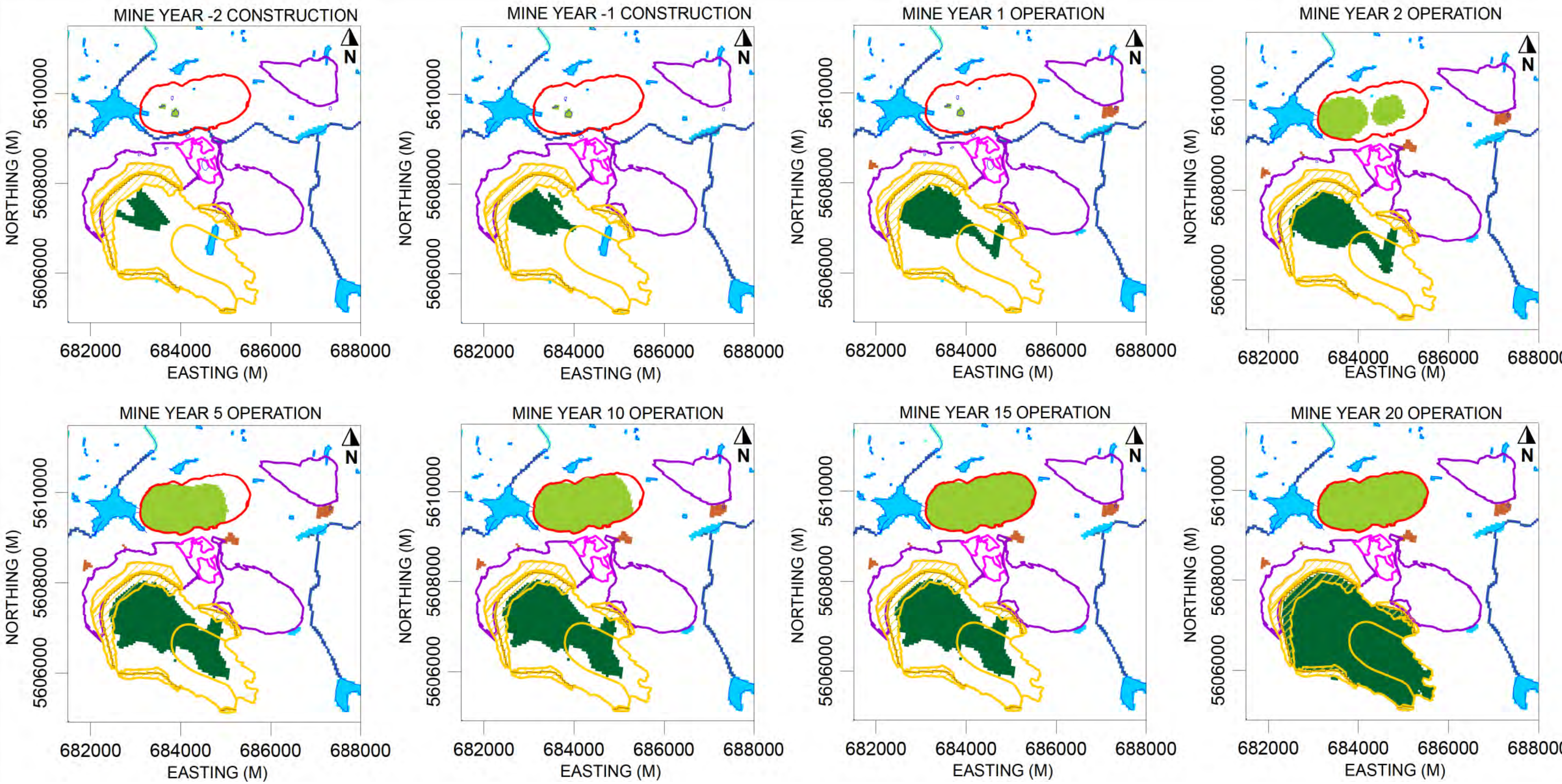


Groundwater Outputs	m³/d	Percent Total
Evapotranspiration	9123	73%
Natural Lakes	266	2%
Peterson Creek and Tributaries	846	7%
Kamloops Lake and Thompson River	361	3%
Cherry Creek and Tributaries	1107	9%
Anderson Creek and Tributaries	350	3%
Other Streams	493	4%
Total Out	**12545**	**100%**

NOTE:
1. PETERSON CREEK AND TRIBUTARIES WERE REPRESENTED WITH MODFLOW STREAM FLOW ROUTING (SFR) PACKAGE.

SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: EXISTING CONDITIONS RSA WATER BALANCE	FIG No.: 24
PROJECT No.: 1125007-04	APPROVED: TWC			

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Fig 20 - Existing Water Conditions Balance



LEGEND

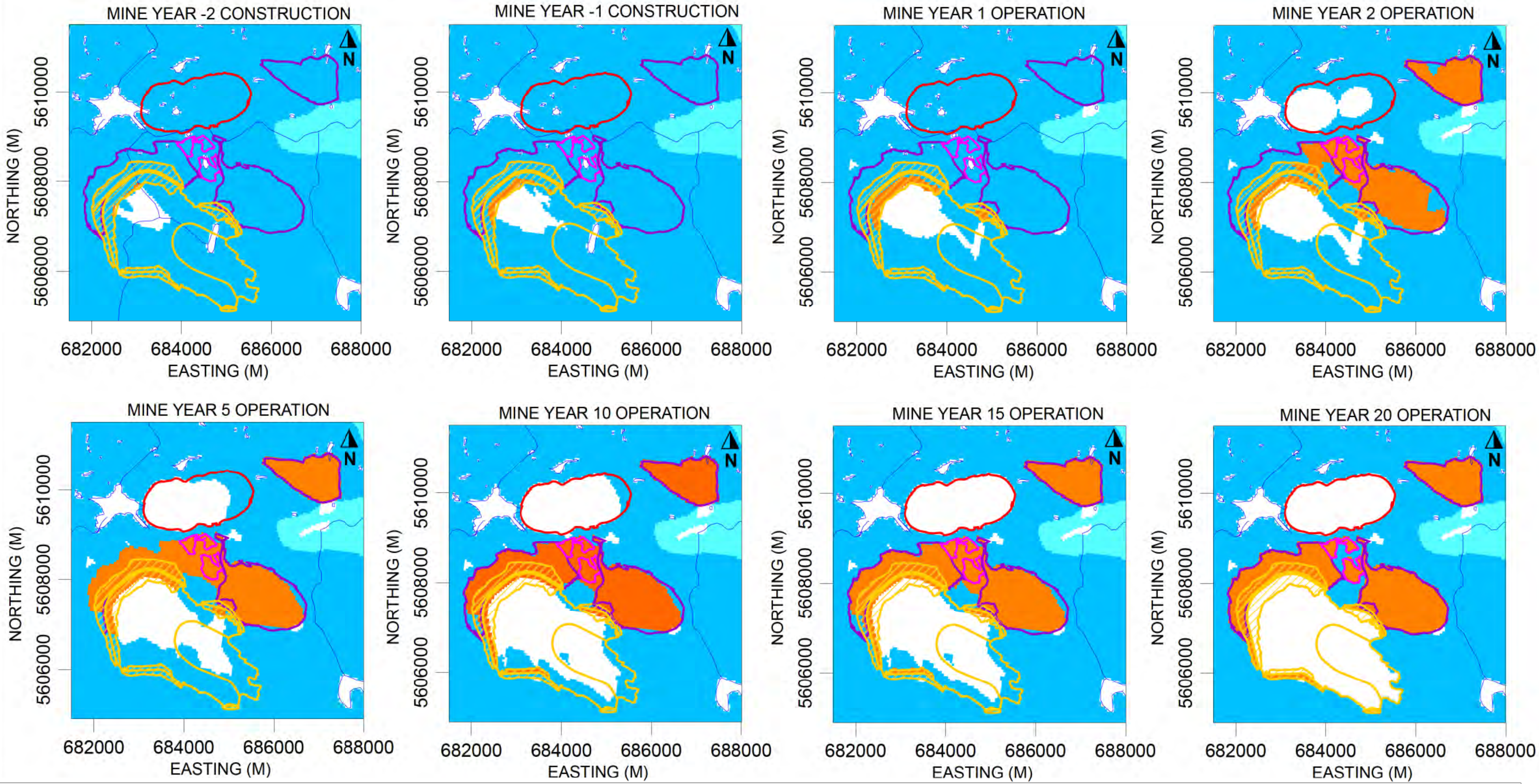
- SURFACE WATER HYDROLOGY
- MINE ROCK STORAGE FACILITY
- OPEN PIT
- TAILINGS STORAGE FACILITY
- ORE STOCKPILE
- EMBANKMENT

BOUNDARY CONDITIONS

- OPEN PIT (DRN)
- TAILINGS STORAGE FACILITY (GHB)
- LAKES AND PONDS (GHB)
- EMBANKMENT LINER (HFB)
- STREAMS AND CREEKS (SFR)
- STREAMS AND CREEKS (DRN)
- LINED WATER MANAGEMENT PONDS (RIV)

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. WHITE AREAS REPRESENT AREAS WITH NO BOUNDARY CONDITIONS APPLIED WITHIN MODEL.
3. SEE DRAWING 01 FOR FACILITY LABELS.
4. MODFLOW BOUNDARY CONDITION PACKAGES: DRN = DRAIN, GHB = GENERAL HEAD, SFR = STREAM, RIV = RIVER, HFB = HORIZONTAL FLOW BARRIER.

SCALE: AS SHOWN	DRAWN: LM/TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL BOUNDARY CONDITIONS (CONSTRUCTION, OPERATION, DECOMMISSIONING AND CLOSURE) - MINE SITE
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 25



LEGEND

- SURFACE WATER HYDROLOGY
- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- EMBANKMENT

RECHARGE

- BUNCHGRASS ENHANCED (4.9 mm/yr) (El. 600 - 900 m asl)
- INTERIOR DOUGLAS FIR (8.4 mm/yr) (El. 900 - 1400 m asl)
- NO RECHARGE APPLIED (0 mm/yr)
- MINE ROCK STORAGE FACILITY AND ORE STOCKPILE (2.7 mm/yr)

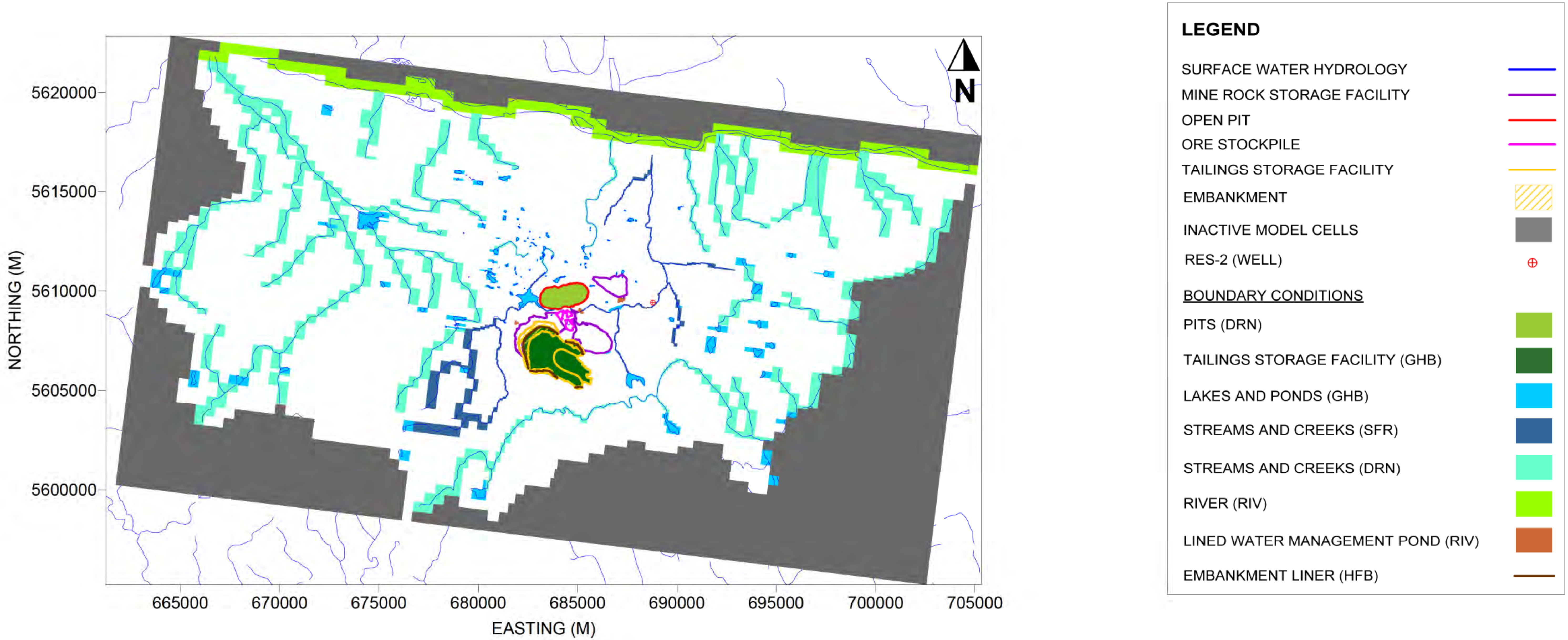
NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.

SCALE: AS SHOWN	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.
PROJECT No.: 1125007-04	APPROVED: TWC	

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: MODEL RECHARGE DISTRIBUTION (CONSTRUCTION, OPERATION, DECOMMISSIONING AND CLOSURE) - MINE SITE

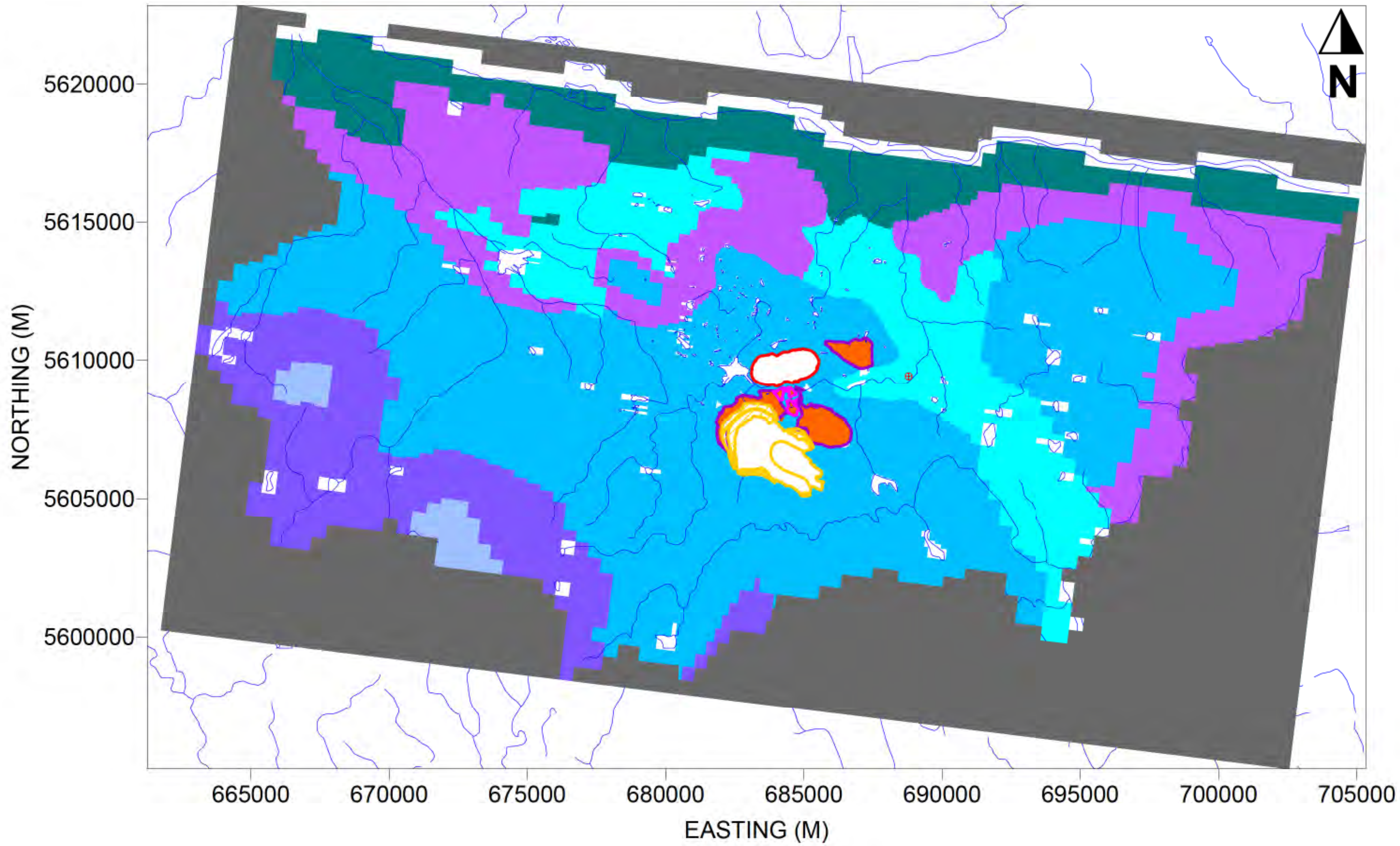
FIG No.: 26



NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. WHITE AREAS REPRESENT NO BOUNDARY CONDITION APPLIED WITHIN MODEL.
3. REFER TO DRAWING 01 FOR FACILITY LABELS.
4. MODFLOW BOUNDARY CONDITION PACKAGES: DRN = DRAINS, GHB = GENERAL HEAD, SFR = STREAM, RIV = RIVER, HFB = HORIZONTAL FLOW BARRIER.
5. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.

SCALE: 1:200,000	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL BOUNDARY CONDITIONS (POST CLOSURE)
PROJECT No: 1125007-04	APPROVED: TWC		FIG No.: 27

N:\BGC\Projects\1125 KGHM Ajax\005 EA GW scope\09 GW Model\03 Report\03 Figures\Figure 23 and 24 - Model BC and Recharge - Closure



LEGEND

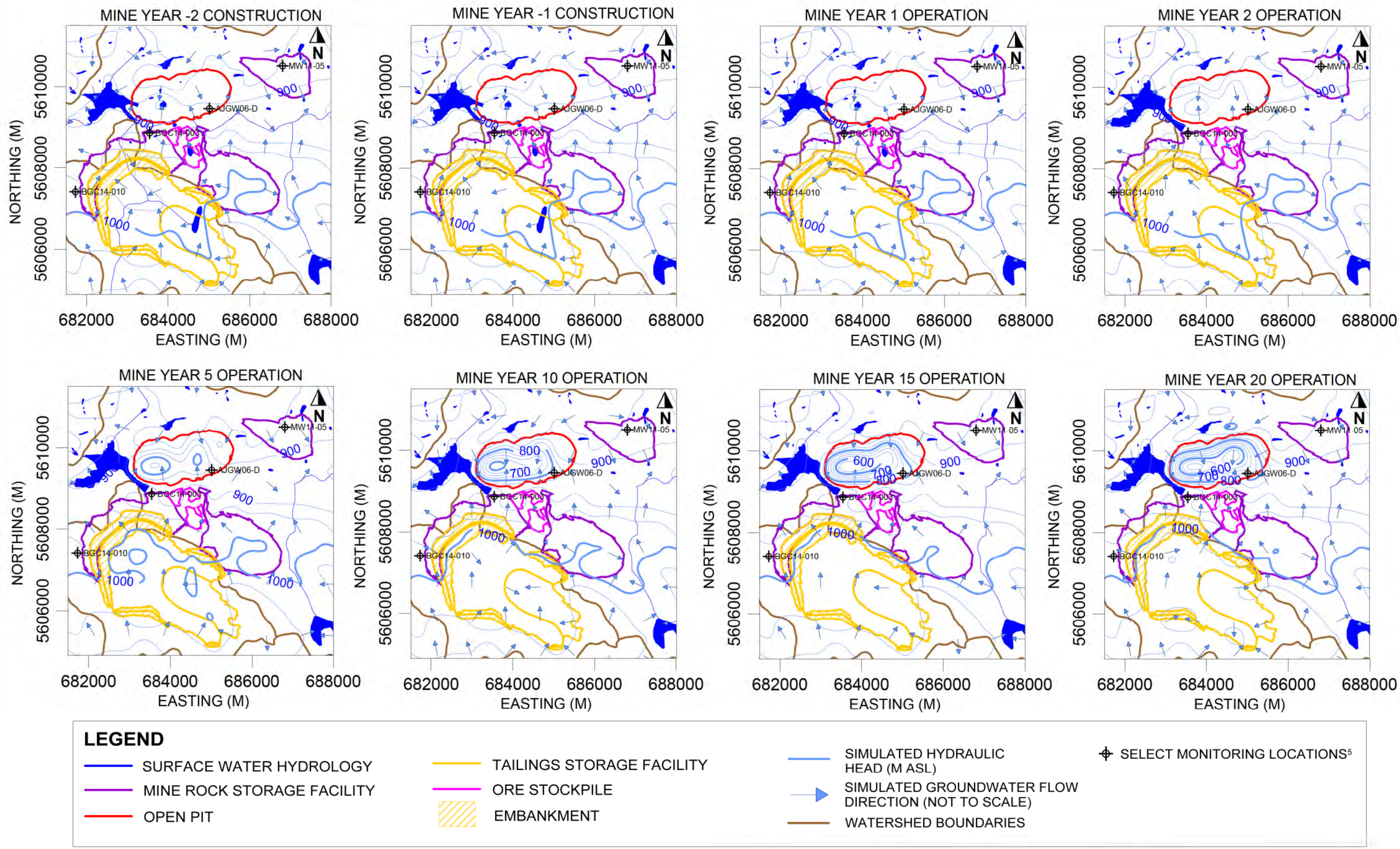
SURFACE WATER HYDROLOGY	
MINE ROCK STORAGE FACILITY	
OPEN PIT	
ORE STOCKPILE	
TAILINGS STORAGE FACILITY	
EMBANKMENT	
INACTIVE MODEL CELLS	
RES-2 (WELL)	

RECHARGE

- BUNCHGRASS (El. <400 - 600 m asl) (0.5 mm/yr)
- BUNCHGRASS - ENHANCED RECHARGE (El. 600 - 900 m asl) (4.9 mm/yr)
- PONDEROSA PINE (El. 600 - 900 m asl) (4.9 mm/yr)
- INTERIOR DOUGLAS FIR (El. 900 - 1400 m asl) (8.4 mm/yr)
- MONTANE SPRUCE (El. 1400 - 1600 m asl) (9.9 mm/yr)
- EGLEMAN SPRUCE - SUBALPINE FIR (EL. >1600 m als) (10.6 mm/yr)
- NO RECHARGE APPLIED (0 mm/yr)
- MINE ROCK STORAGE FACILITY AND ORE STOCKPILE (2.7 mm/yr)

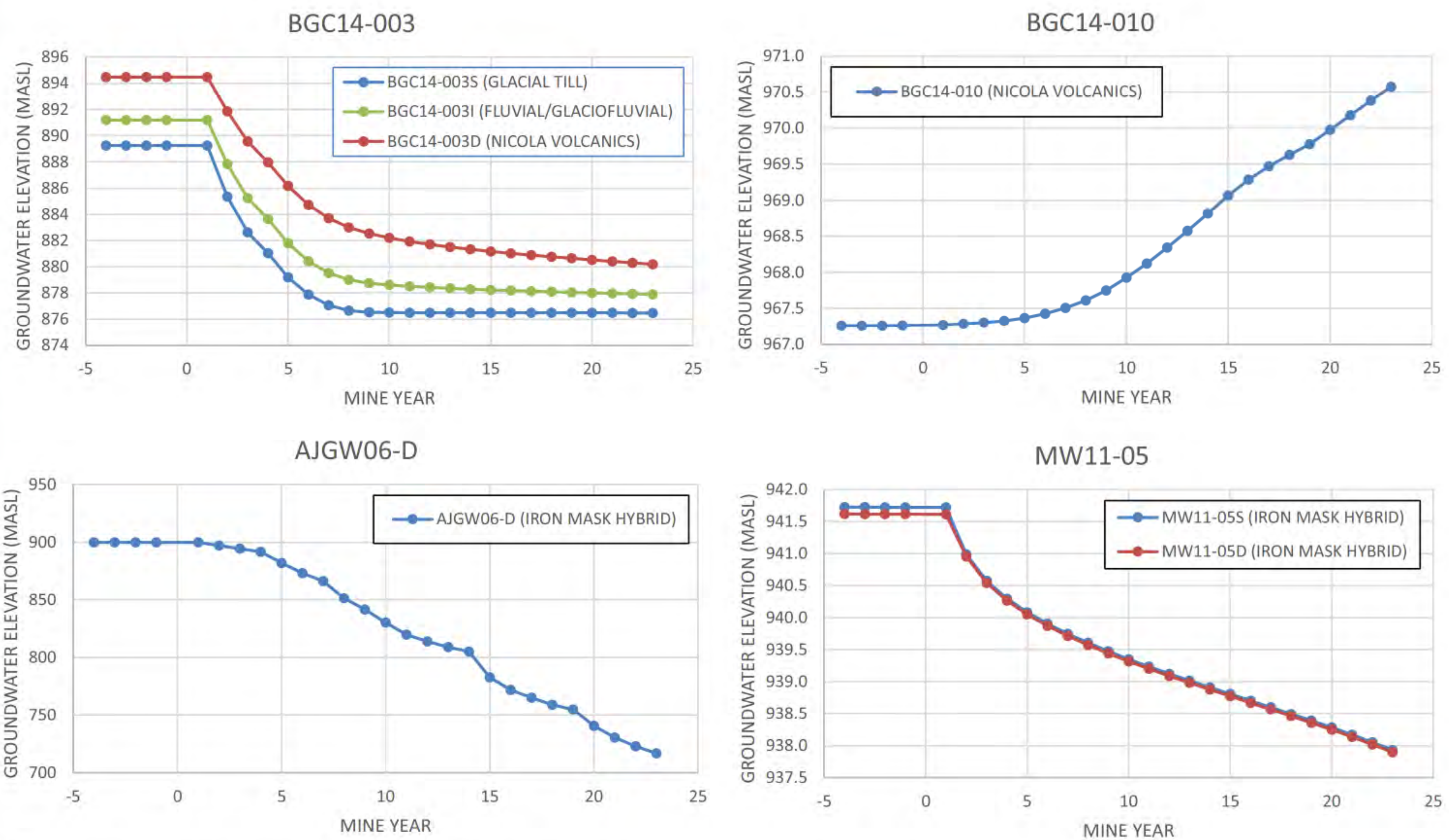
NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.

SCALE: 1:200,000	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MODEL RECHARGE DISTRIBUTION AREAS (POST CLOSURE)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 28



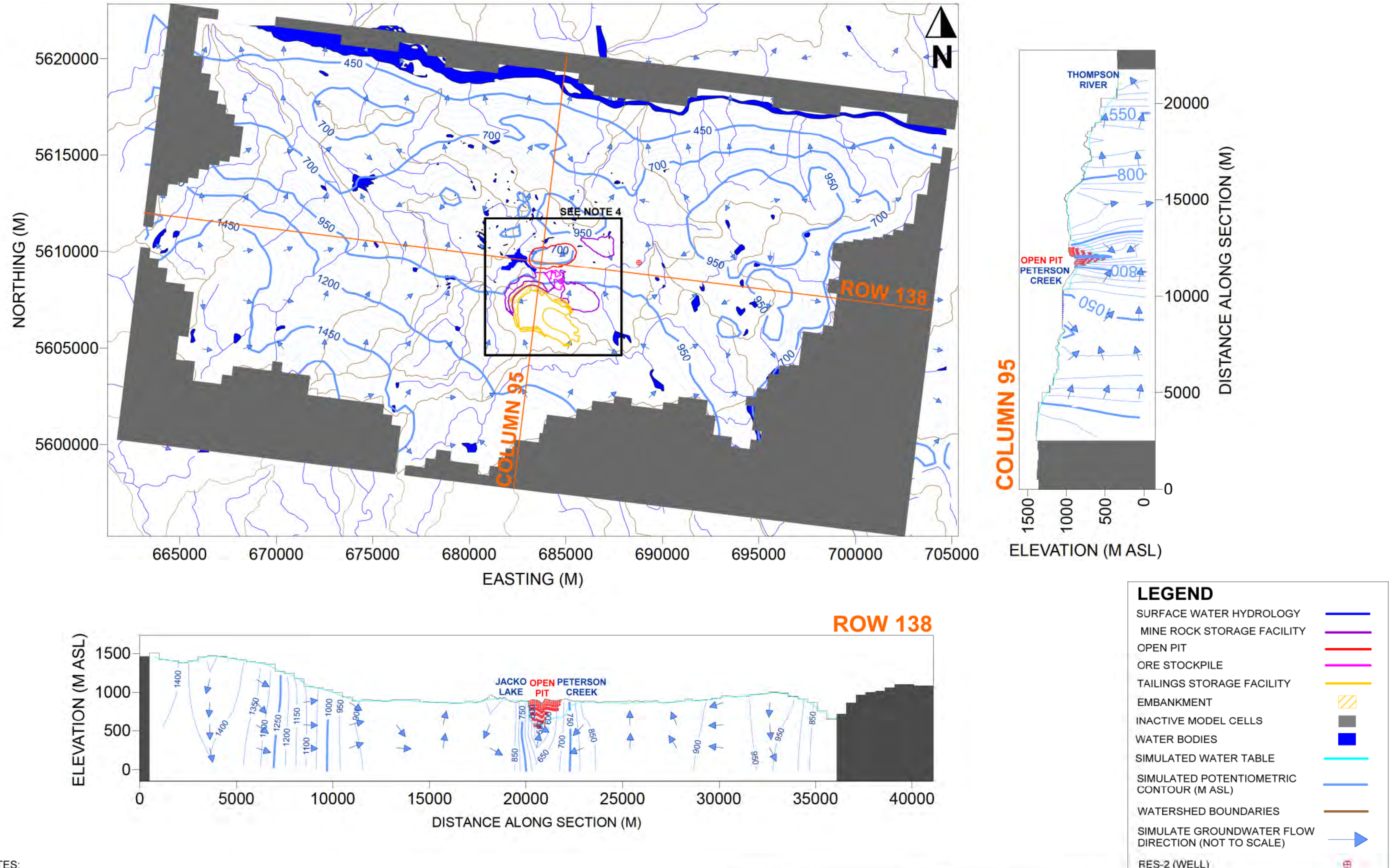
NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. HYDRAULIC HEAD CONTOUR INTERVAL IS 50 M.
4. WATERSHED BOUNDARIES FROM iMapBC (2013).
5. SELECT MONITORING LOCATIONS FOR SIMULATED GROUNDWATER ELEVATIONS SHOWN IN FIGURE 30.

SCALE:	AS SHOWN
DATE:	AUG 2015
PROJECT No.:	1125007-04
DRAWN:	LM
CHECKED:	RC/BM
APPROVED:	TWC
	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY
CLIENT:	KGHM AJAX MINING INC.
PROJECT:	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
TITLE:	SIMULATED MINE SITE WATER TABLE AND GROUNDWATER FLOW DIRECTIONS (CONSTRUCTION, OPERATION, DECOMMISSIONING AND CLOSURE)
FIG No.:	29



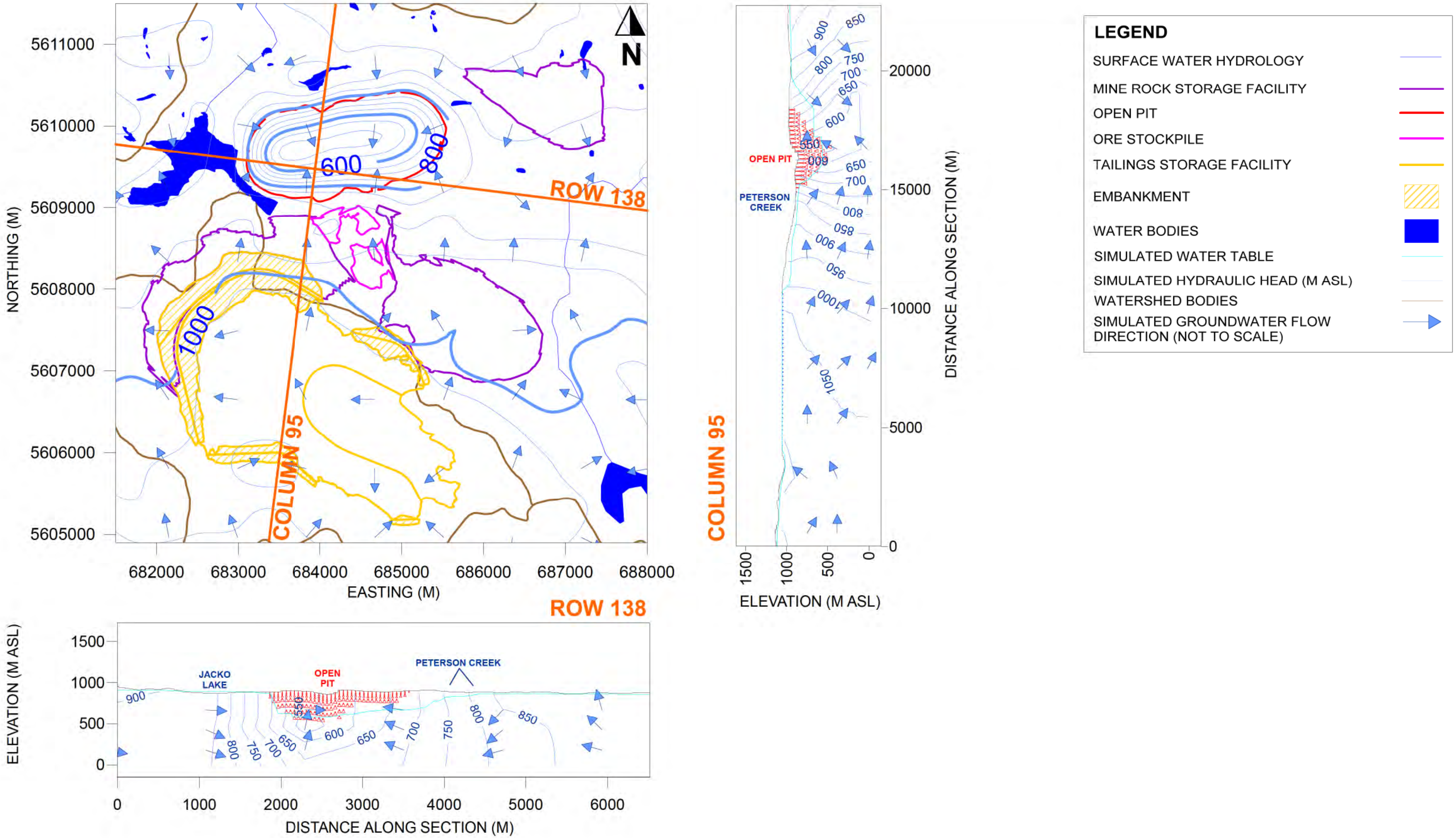
NOTE:
1. SIMULATED GROUNDWATER ELEVATIONS ARE FROM CONSTRUCTION, OPERATION, DECOMMISSIONING AND CLOSURE MODEL.
2. MONITORING LOCATIONS SHOWN ON FIGURE 29.

SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SIMULATED GROUNDWATER ELEVATIONS AT SELECT MONITORING LOCATIONS	FIG No.: 30
PROJECT No.: 1125007-004	APPROVED: TWC			



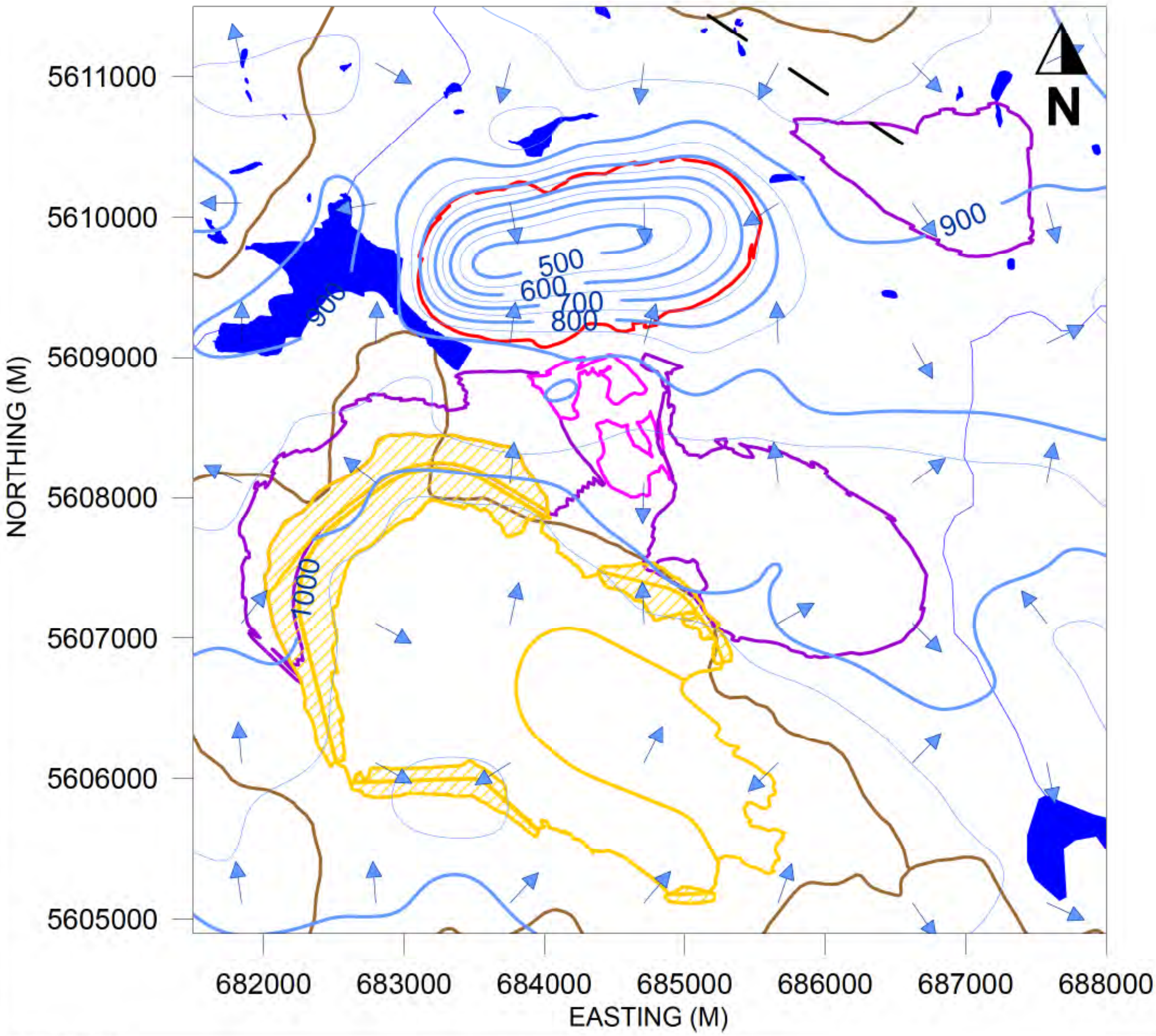
NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. ROW 138 AND COLUMN 95 CROSS SECTIONS HAVE 4X VERTICAL EXAGGERATION.
4. INSET BOX FOR FIGURE 32.
5. HYDRAULIC HEAD CONTOUR INTERVAL IS 50 M.
6. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.
7. DISTANCE ALONG CROSS-SECTIONS IS TRUE LENGTH.
8. WATERSHED BOUNDARIES FROM iMapBC (2013).

SCALE: 1:200,000	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SIMULATED REGIONAL WATER TABLE AND GROUNDWATER FLOW DIRECTIONS (POST CLOSURE)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 31



NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N.
2. REFER TO FIGURE 01 FOR FACILITY LABELS.
3. ROW 138 AND COLUMN 95 CROSS SECTIONS HAVE 4X VERTICAL EXAGGERATION.
4. HYDRAULIC HEAD CONTOUR INTERVAL IS 50 M.
5. GRID IS SEVEN DEGREES OFFSET FROM NORTH TO ALIGN MODEL AXIS TO PRINCIPAL GROUNDWATER FLOW DIRECTION.
6. DISTANCE ALONG CROSS-SECTIONS IS TRUE LENGTH.
7. WATERSHED BOUNDARIES FROM iMapBC (2013).

SCALE: AS SHOWN	DRAWN: LM	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SIMULATED MINE SITE WATER TABLE AND GROUNDWATER FLOW DIRECTIONS (POST CLOSURE)
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: 32



LEGEND

- MINE ROCK STORAGE FACILITY
- OPEN PIT
- ORE STOCKPILE
- TAILINGS STORAGE FACILITY
- EMBANKMENT
- WATER BODIES
- SURFACE WATER HYDROLOGY
- INTERPRETED GROUNDWATER FLOW DIVIDE
- SIMULATED POTENTIOMENTRIC COUNTOUR (M ASL)
- SIMULATED GROUNDWATER FLOW DIRECTION (NOT TO SCALE)
- WATERSHED BOUNDARIES

NOTES:
1. PROJECTION IS NAD 1983 UTM ZONE 10N
2. REFER TO DRAWING 01 FOR FACILITY LABELS.
3. HYDRAULIC HEAD CONTOUR INTERVAL 50 M.
4. WATERSHED BOUNDARIES FORM iMapBC (2013).

SCALE: AS SHOWN	DRAWN: LM/TCC
DATE: AUG 2015	CHECKED: RC/BM
PROJECT No.: 1125007-04	APPROVED: TWC

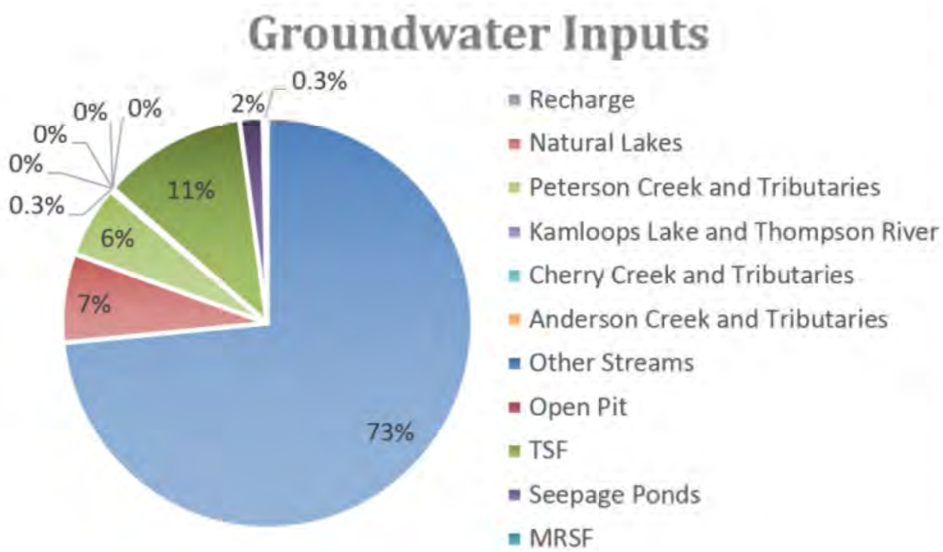
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

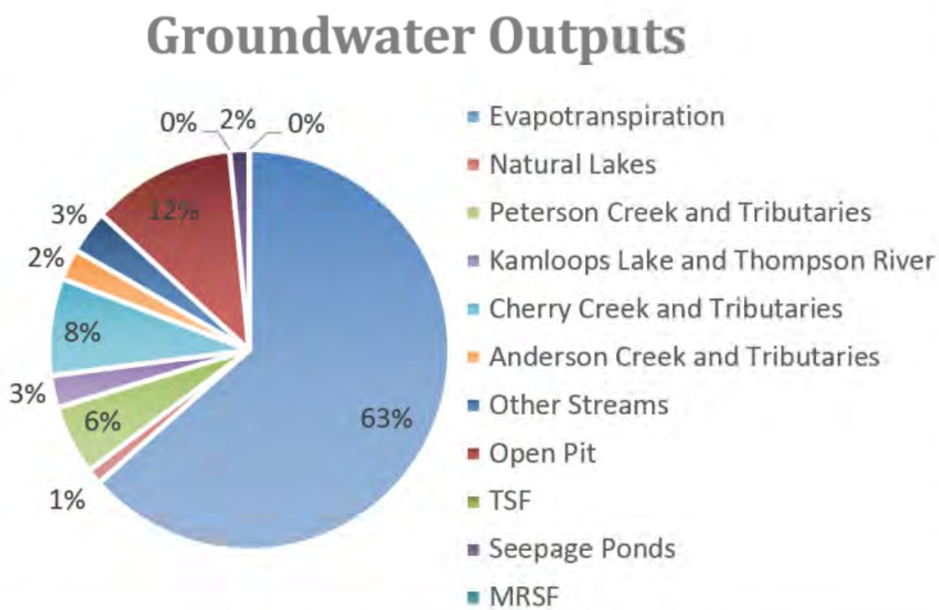
PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT
NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED MINE SITE BEDROCK GROUNDWATER ELEVATIONS AND FLOW DIRECTIONS (POST CLOSURE)

FIG No.: 33



Groundwater Inputs	m^3/d	Percent Total
Recharge	10318	73%
Natural Lakes	988	7%
Peterson Creek and Tributaries	791	6%
Kamloops Lake and Thompson River	39	0.3%
Cherry Creek and Tributaries	0	0%
Anderson Creek and Tributaries	0	0%
Other Streams	0	0%
Open Pit	0	0%
TSF	1602	11%
Seepage Ponds	259	2%
MRSF	47	0.3%
Total In	**14044**	**100%**



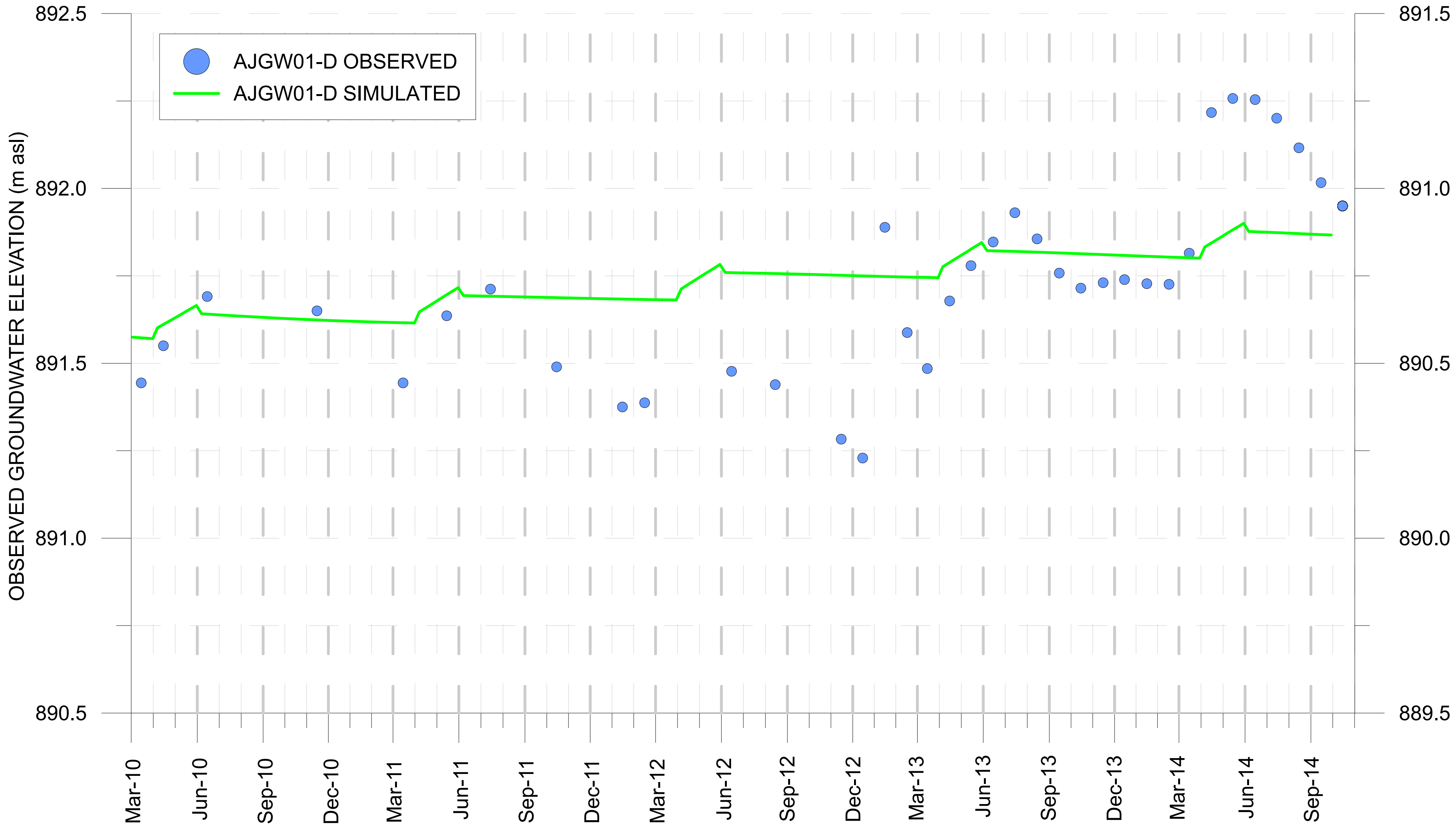
Groundwater Outputs	m^3/d	Percent Total
Evapotranspiration	8916	63%
Natural Lakes	175	1%
Peterson Creek and Tributaries	786	6%
Kamloops Lake and Thompson River	363	3%
Cherry Creek and Tributaries	1107	8%
Anderson Creek and Tributaries	350	2%
Other Streams	491	3%
Open Pit	1633	12%
TSF	0	0%
Seepage Ponds	220	2%
MRSF	0	0%
Total Out	**14042**	**100%**

NOTES:
1. PETERSON CREEK AND TRIBUTARIES WERE REPRESENTED WITH MODFLOW STREAM FLOW ROUTING (SFR) PACKAGE.
2. TSF= TAILINGS STORAGE FACILITY, MRSF= MINE ROCK STORAGE FACILITIES.

SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: POST CLOSURE RSA WATER BALANCE	FIG No.: 34
PROJECT No.: 1125007-04	APPROVED: TWC			

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\03 Figures\Fig 29 - Closure Water Balance

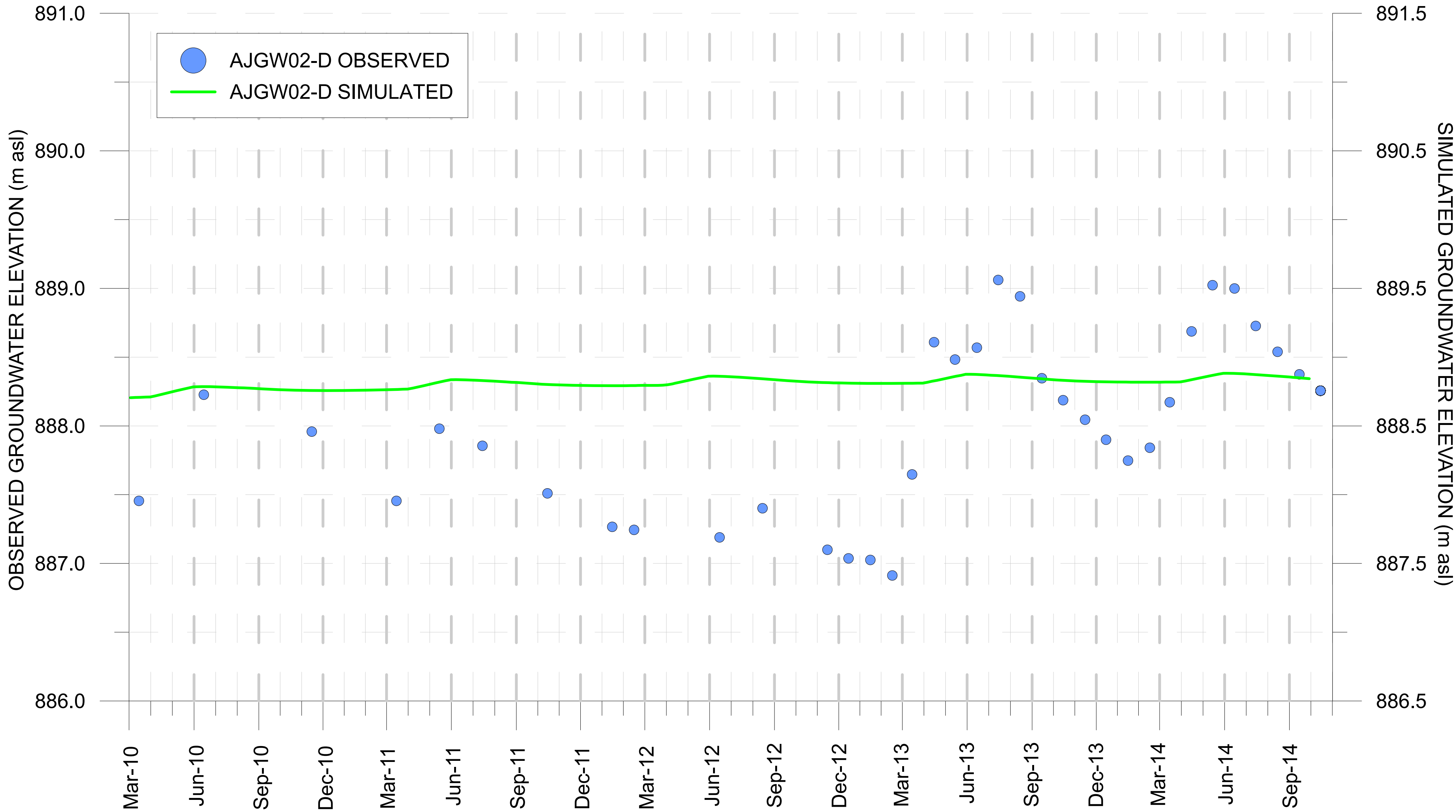
APPENDIX A
TRANSIENT MODEL CALIBRATION HYDROGRAPHS



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW01-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-1
PROJECT No.: 1125007-04	APPROVED: TWC			

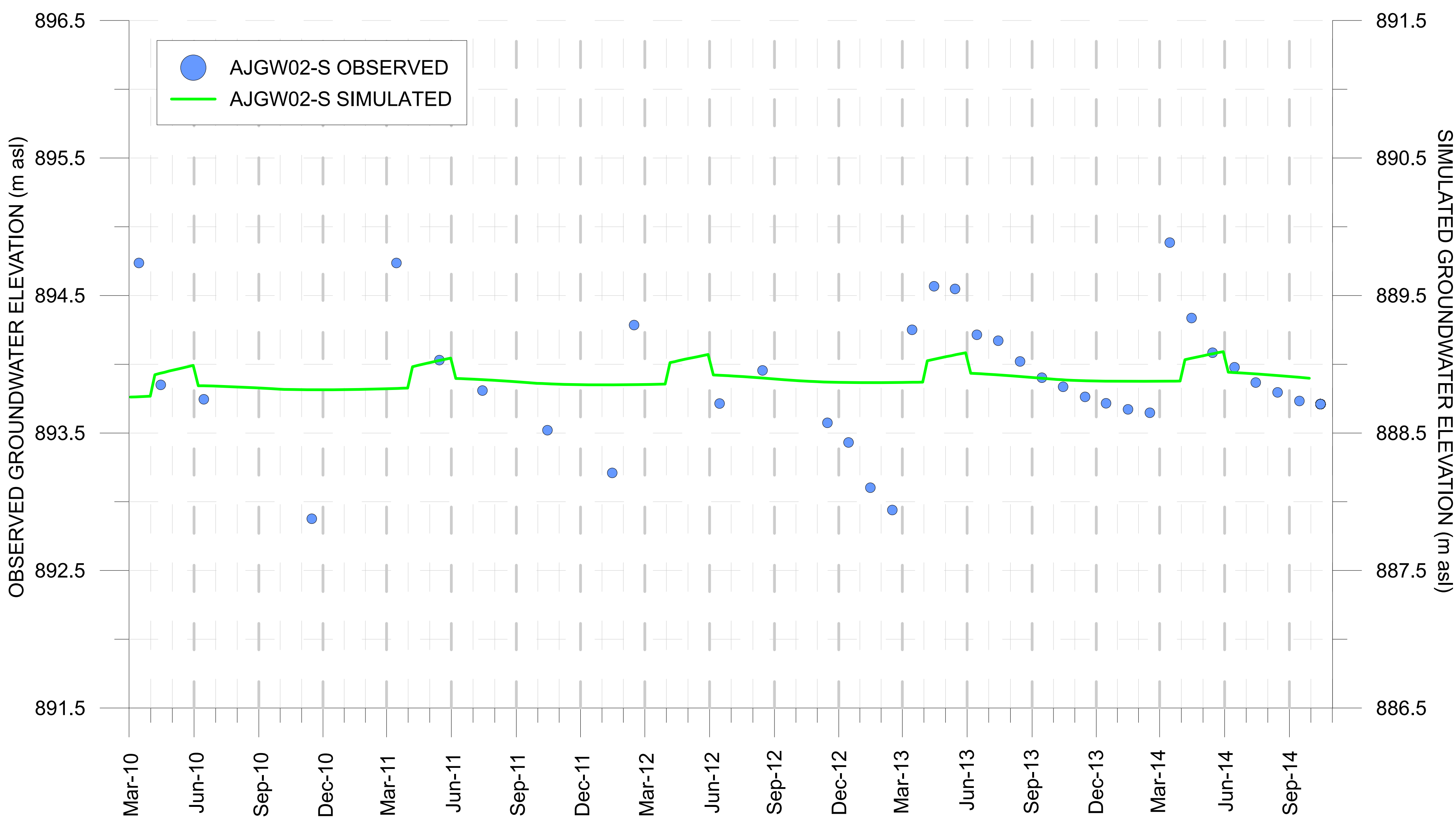
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 0.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW02-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-2

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW02-S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-3
PROJECT No.: 1125007-04	APPROVED: TWC			

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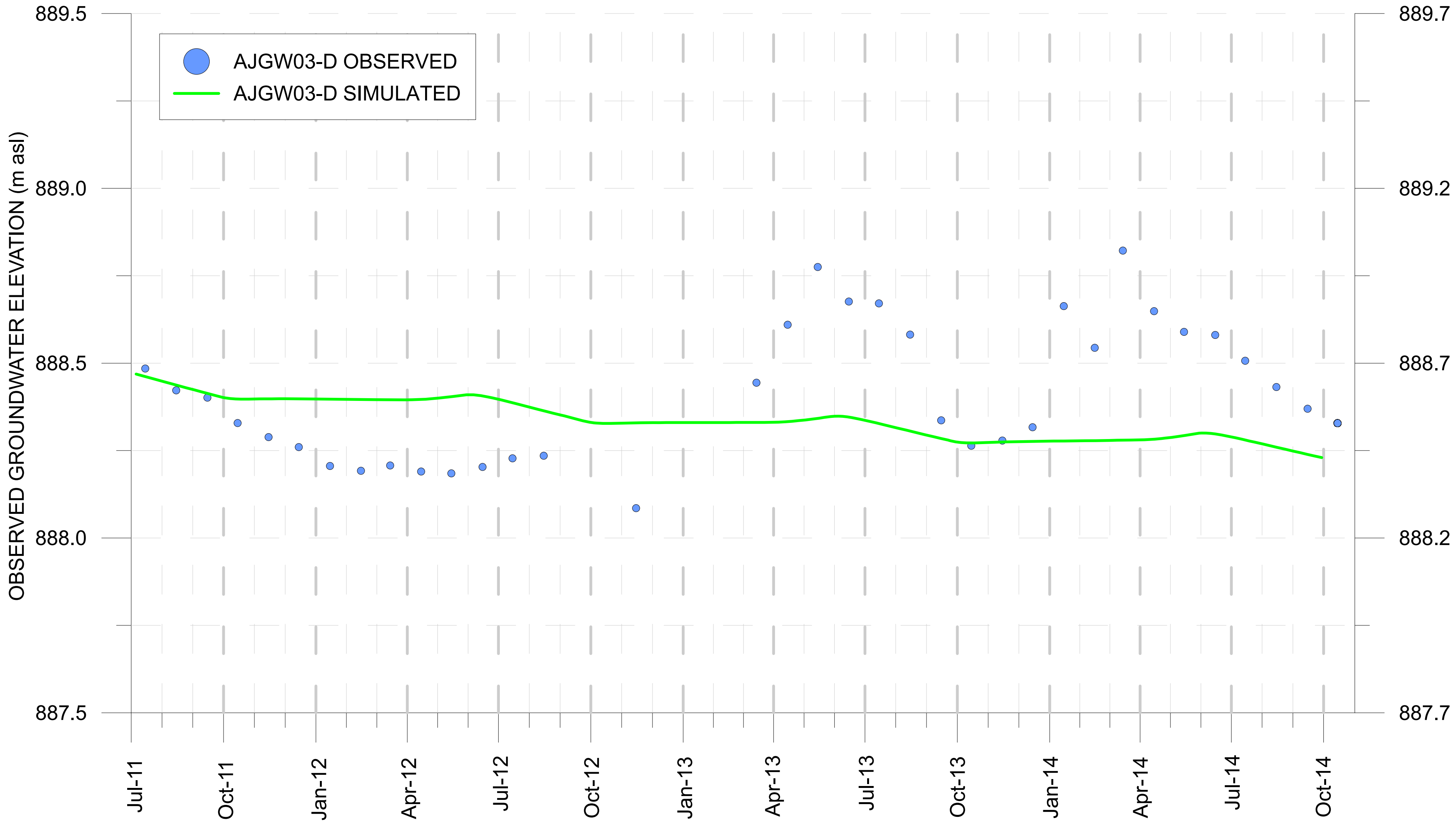
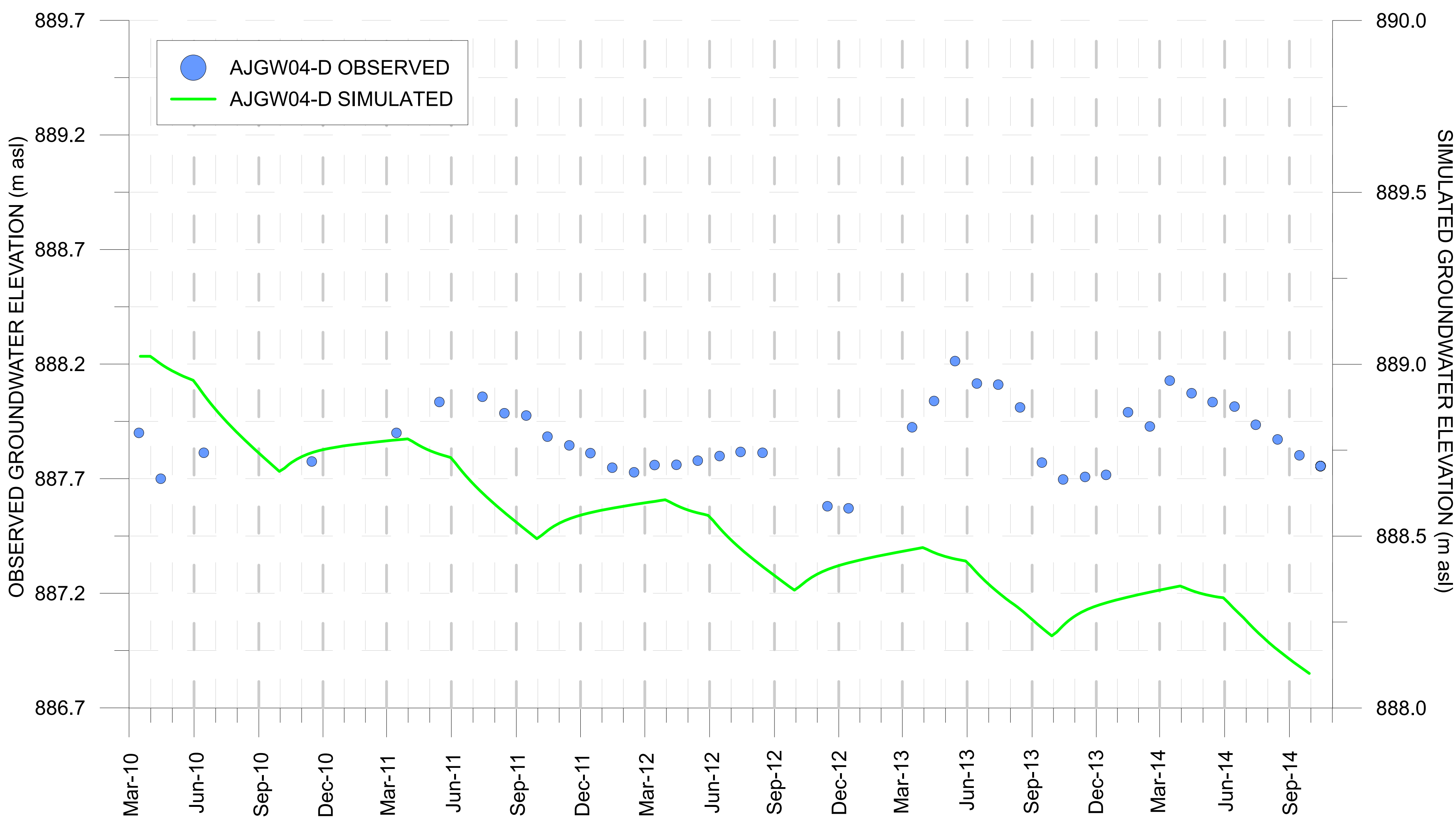


NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 0.2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW03-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-4

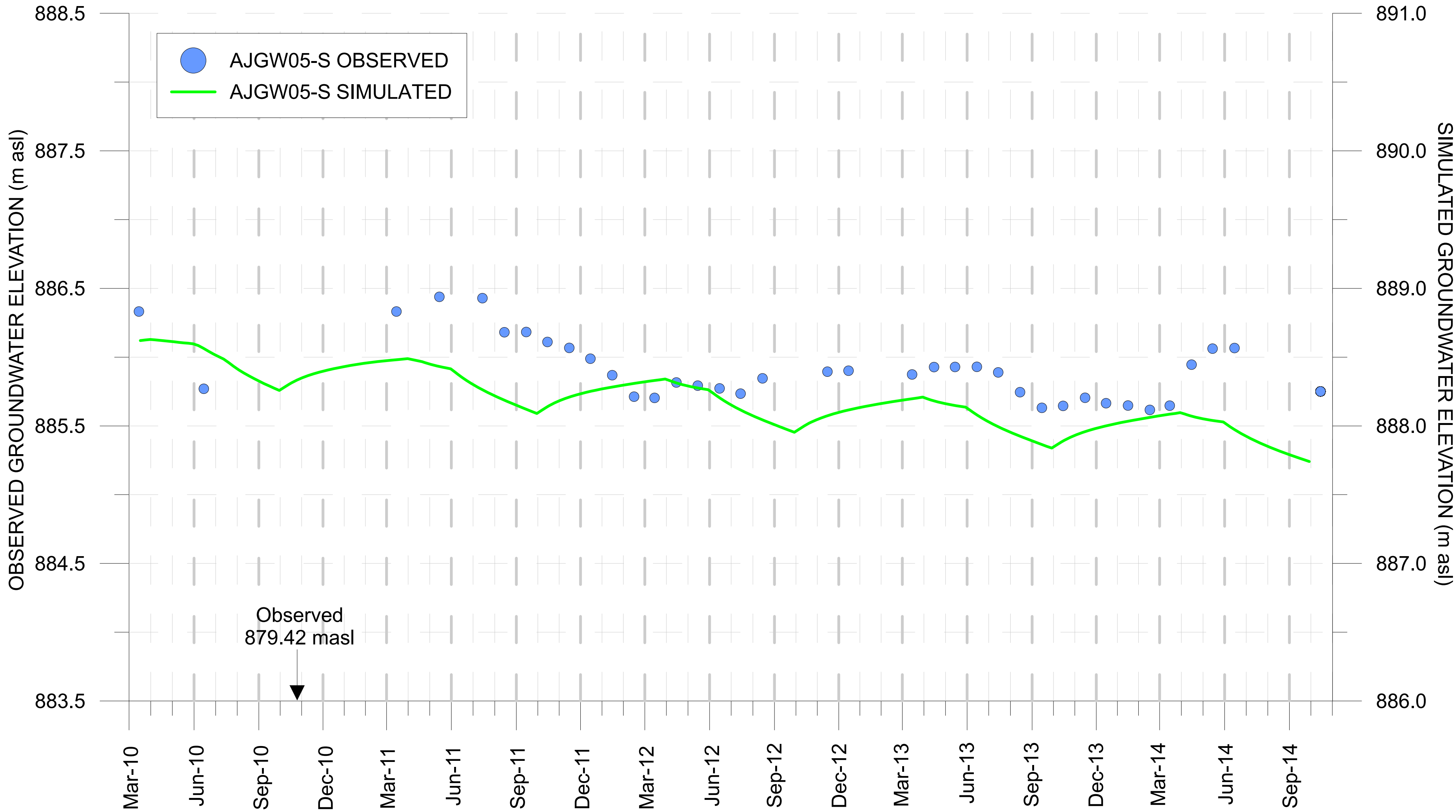
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1.3m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW04-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-5
PROJECT No.: 1125007-04	APPROVED: TWC			

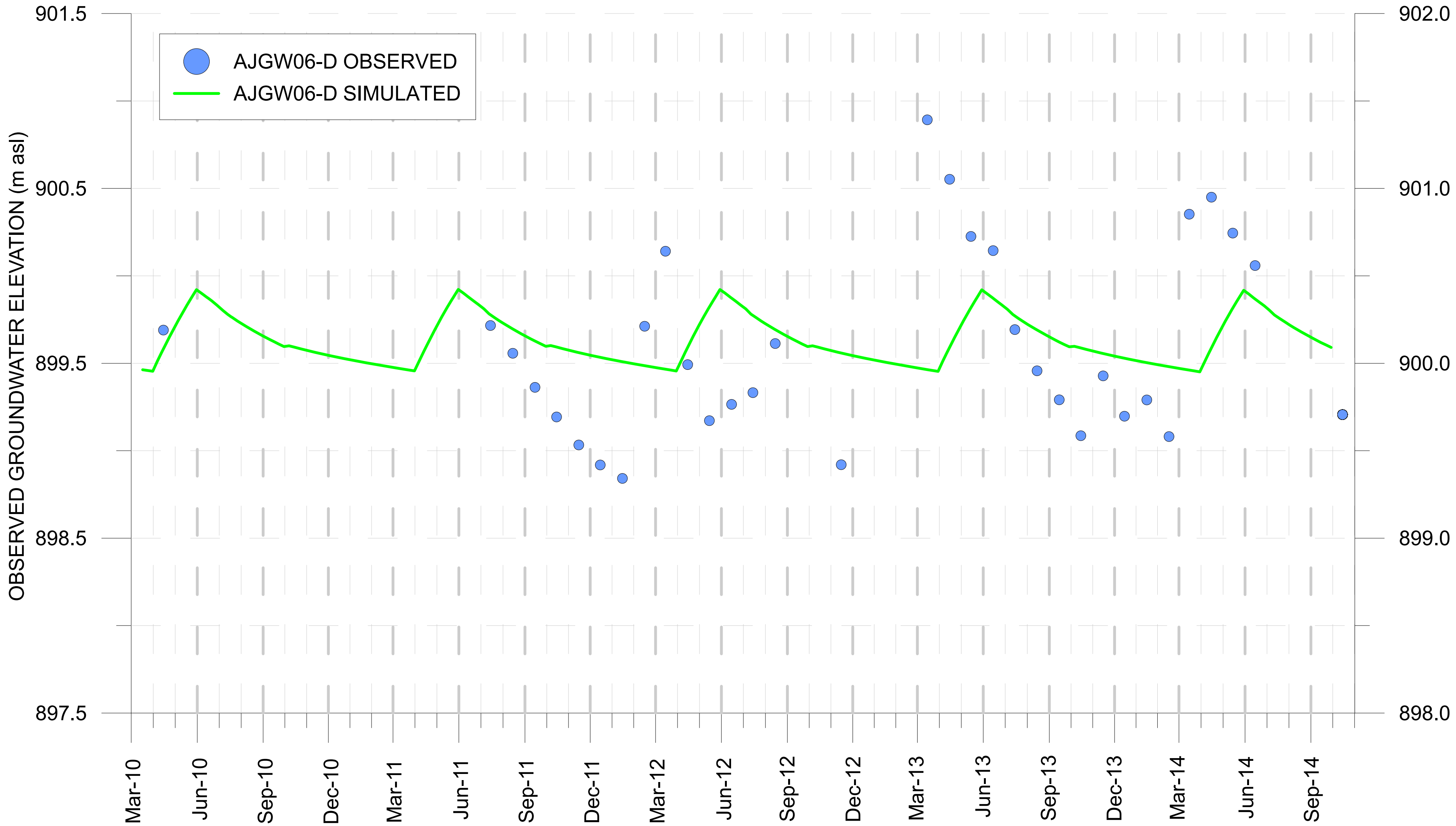
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 2.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW05-S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-6

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 0.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW06-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-7

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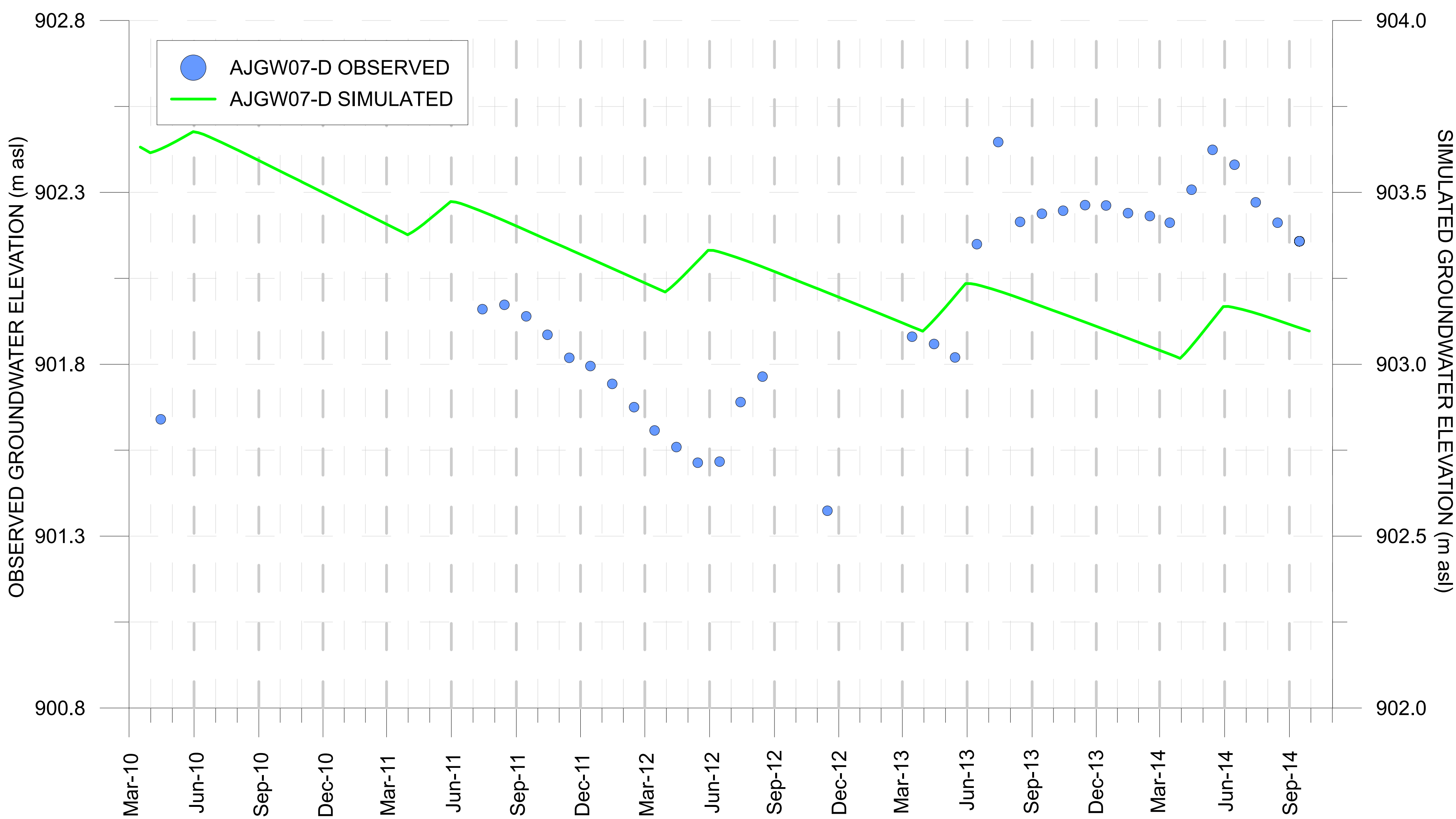
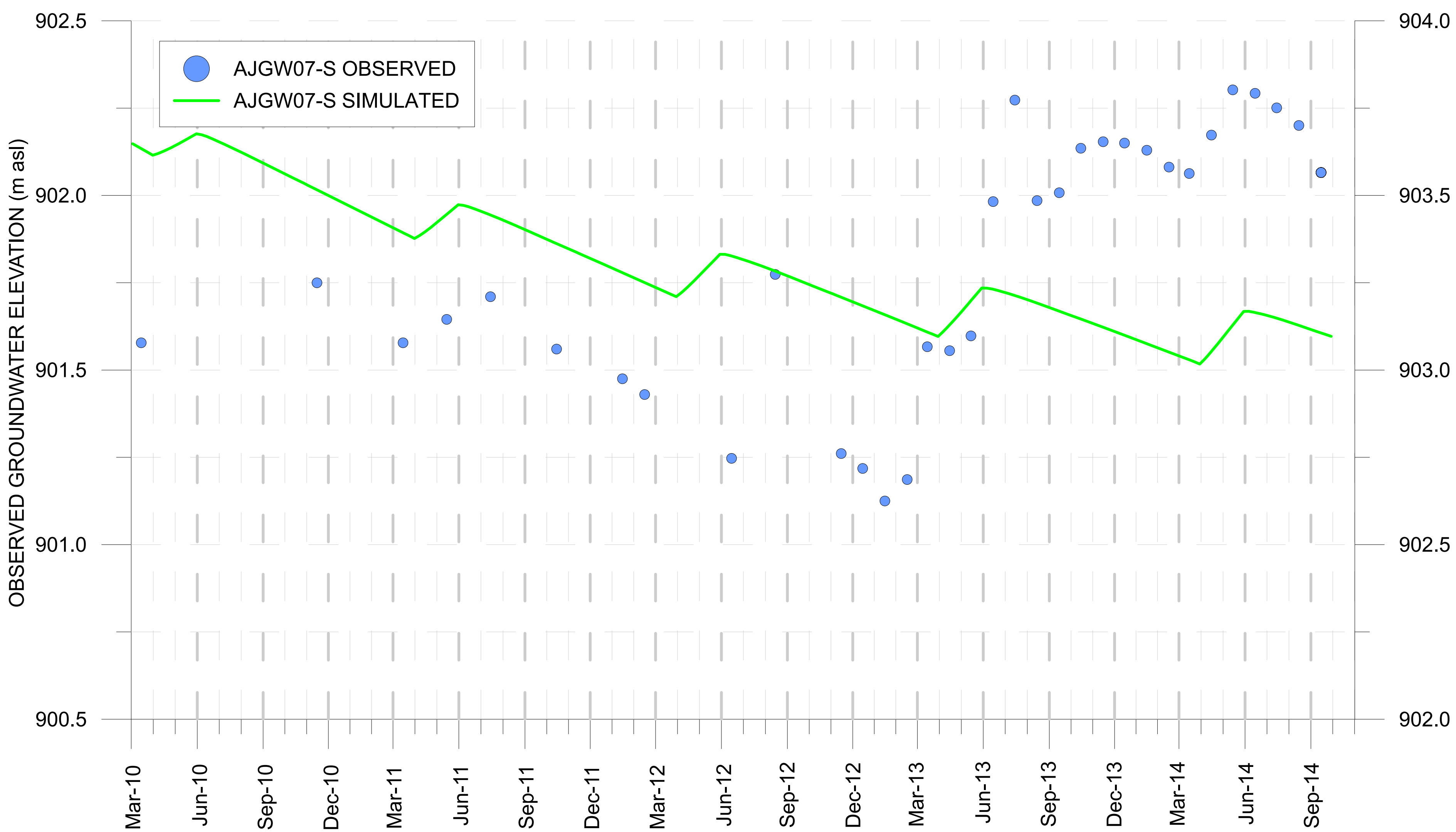


NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1.2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW07-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-8



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW07-S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-9

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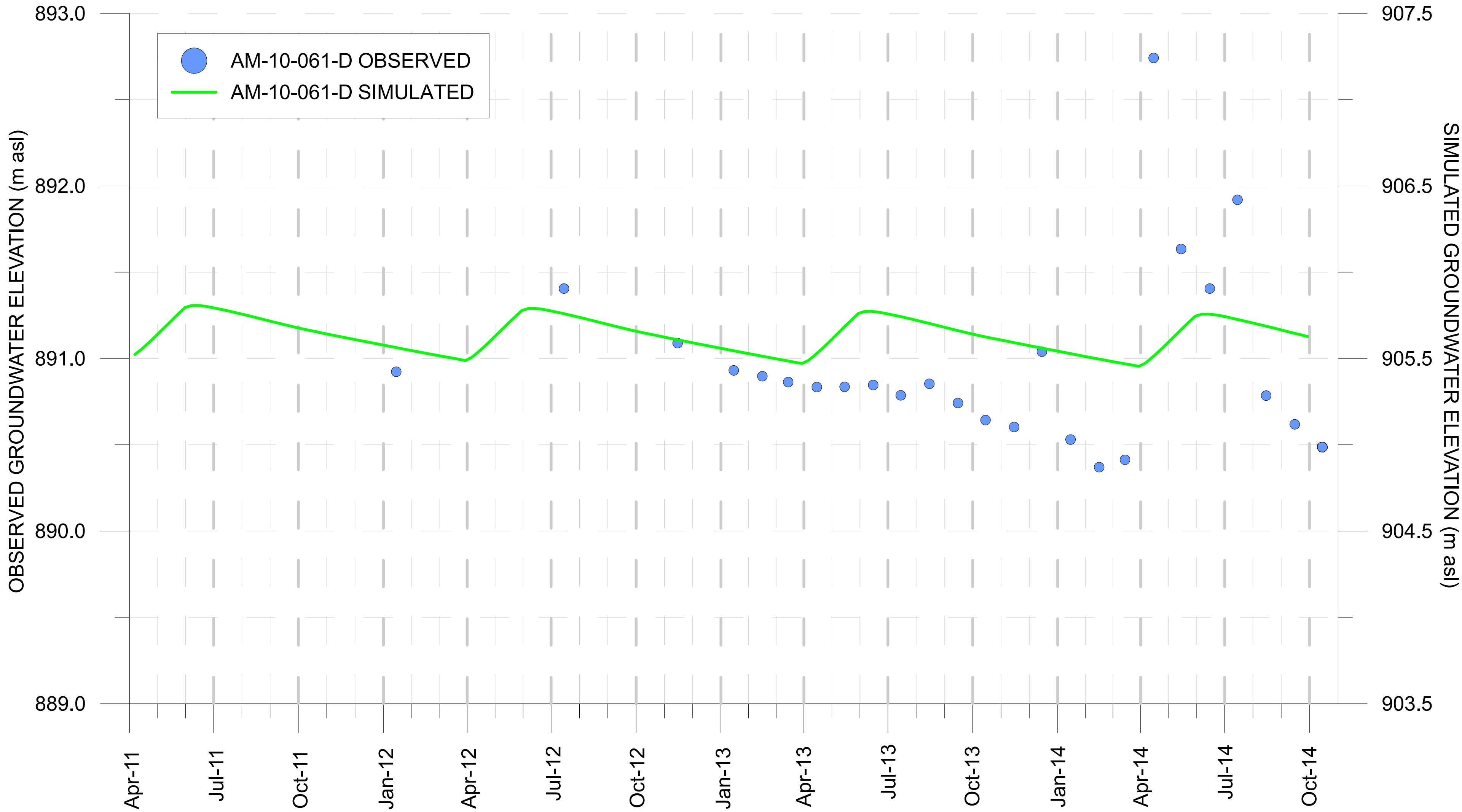
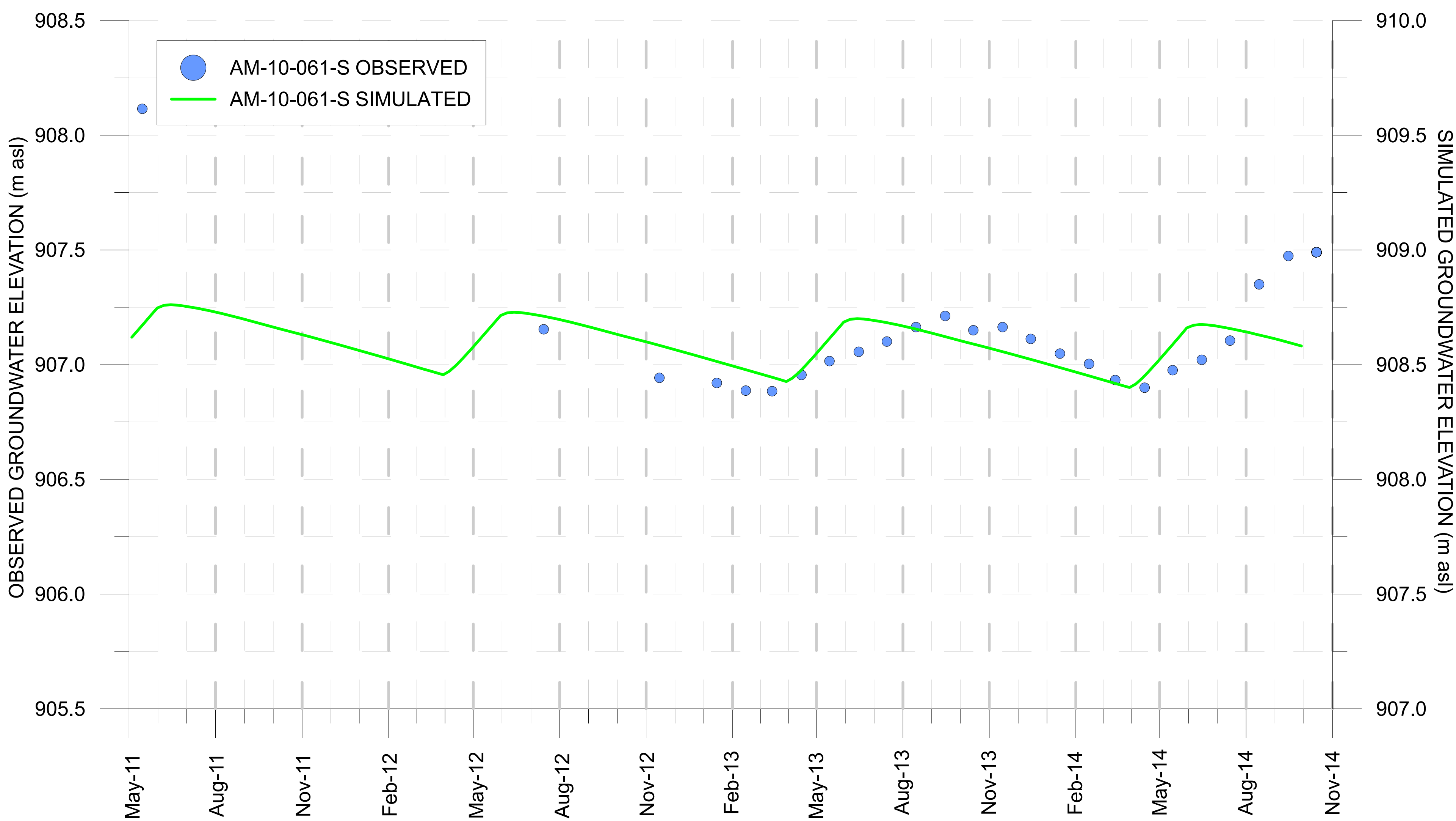


NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 14.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AM-10-061-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-10



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AM-10-061-S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-11

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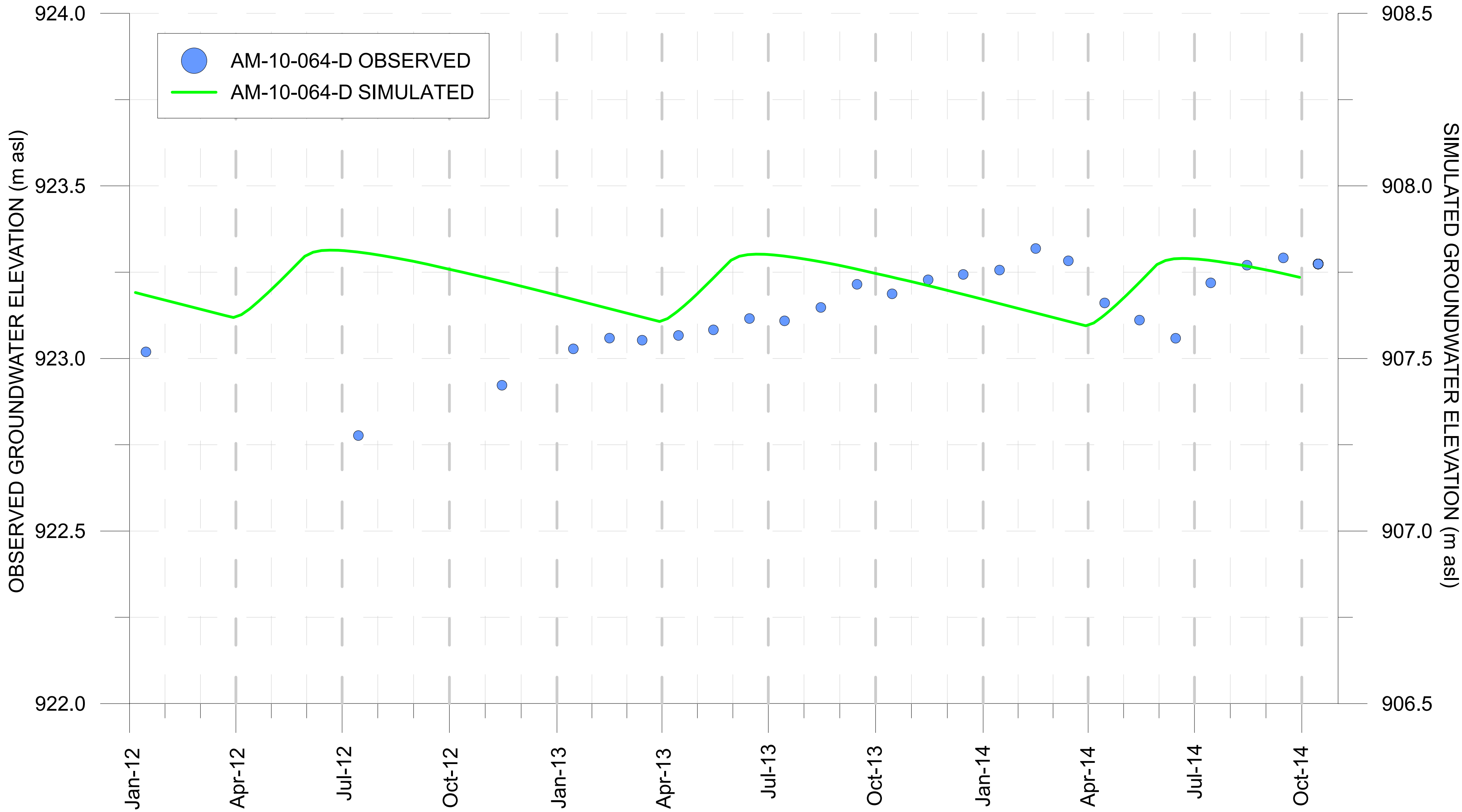
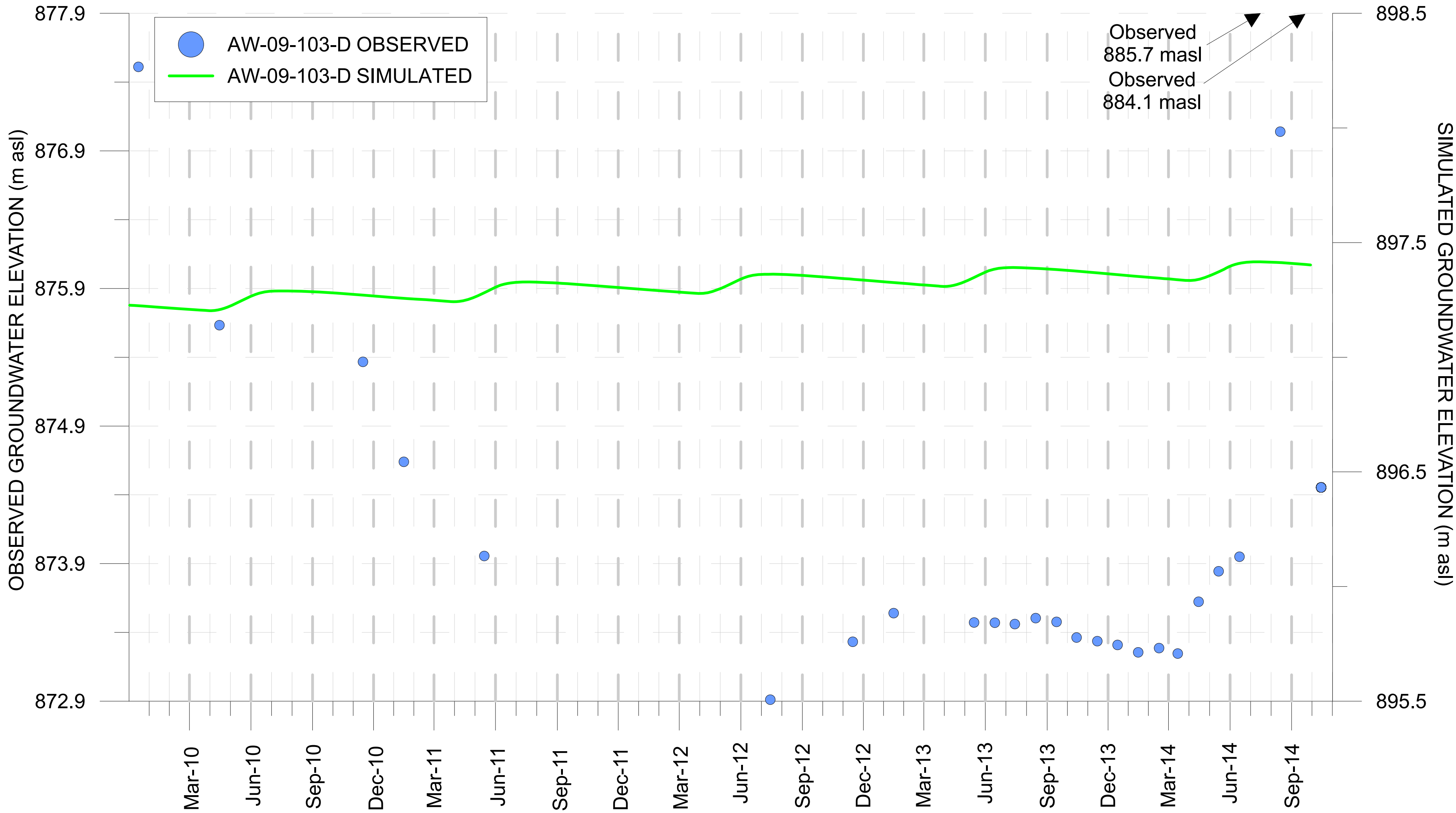


NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 15.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AM-10-064-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-12



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 22.6m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AW-09-103-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-13

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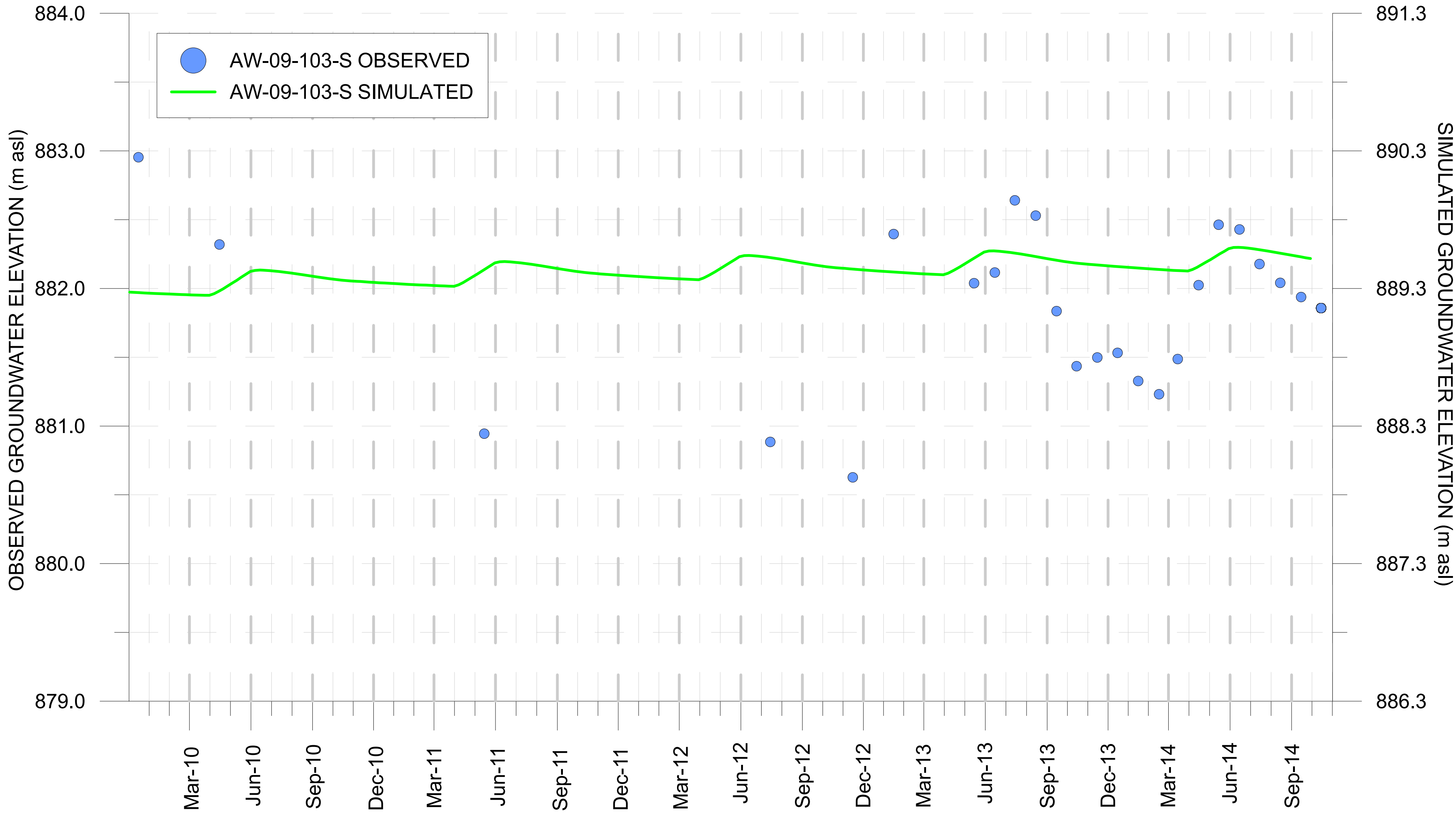

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 7.3m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AW-09-103-S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-14

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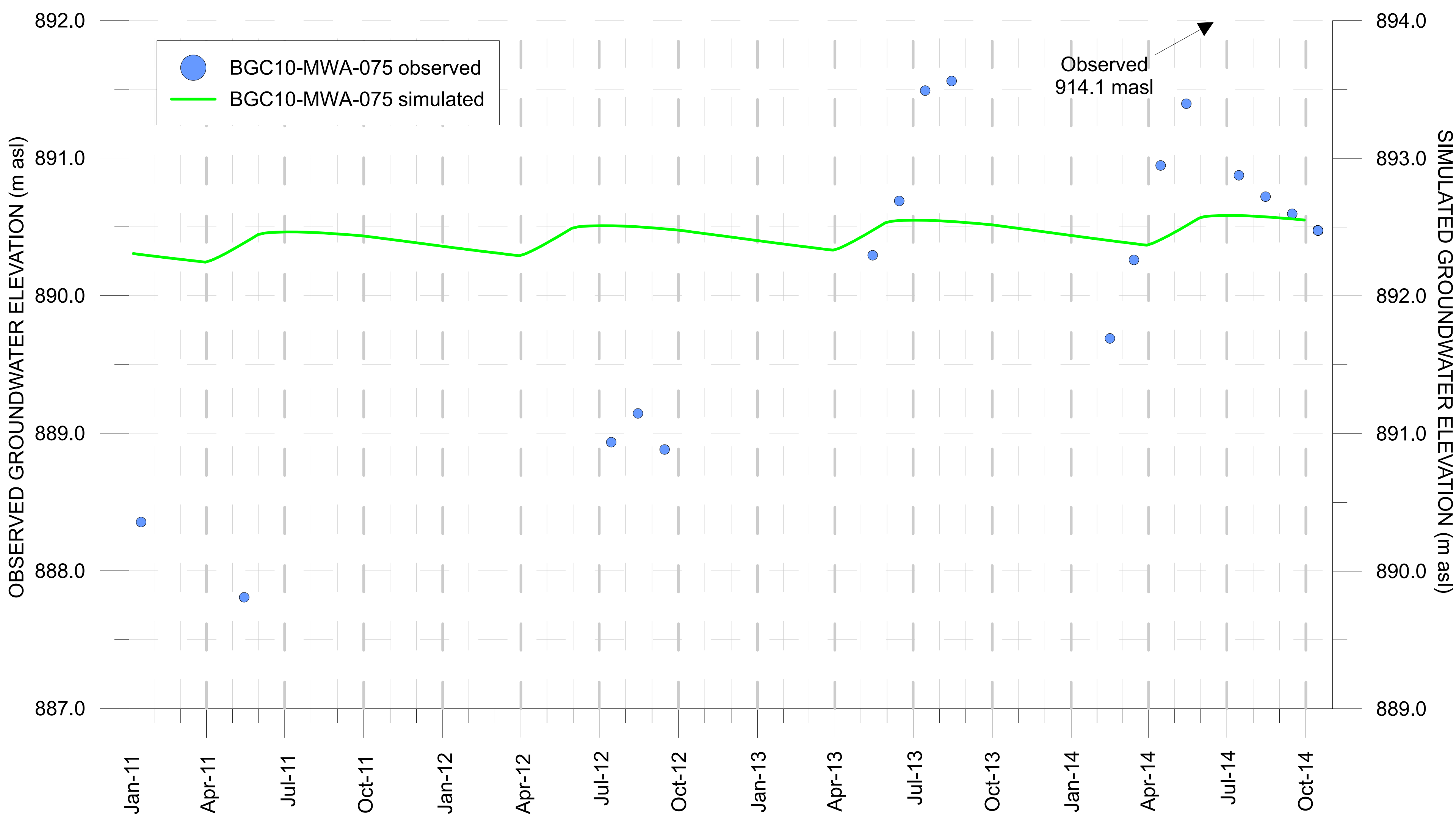

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWA-075: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-15

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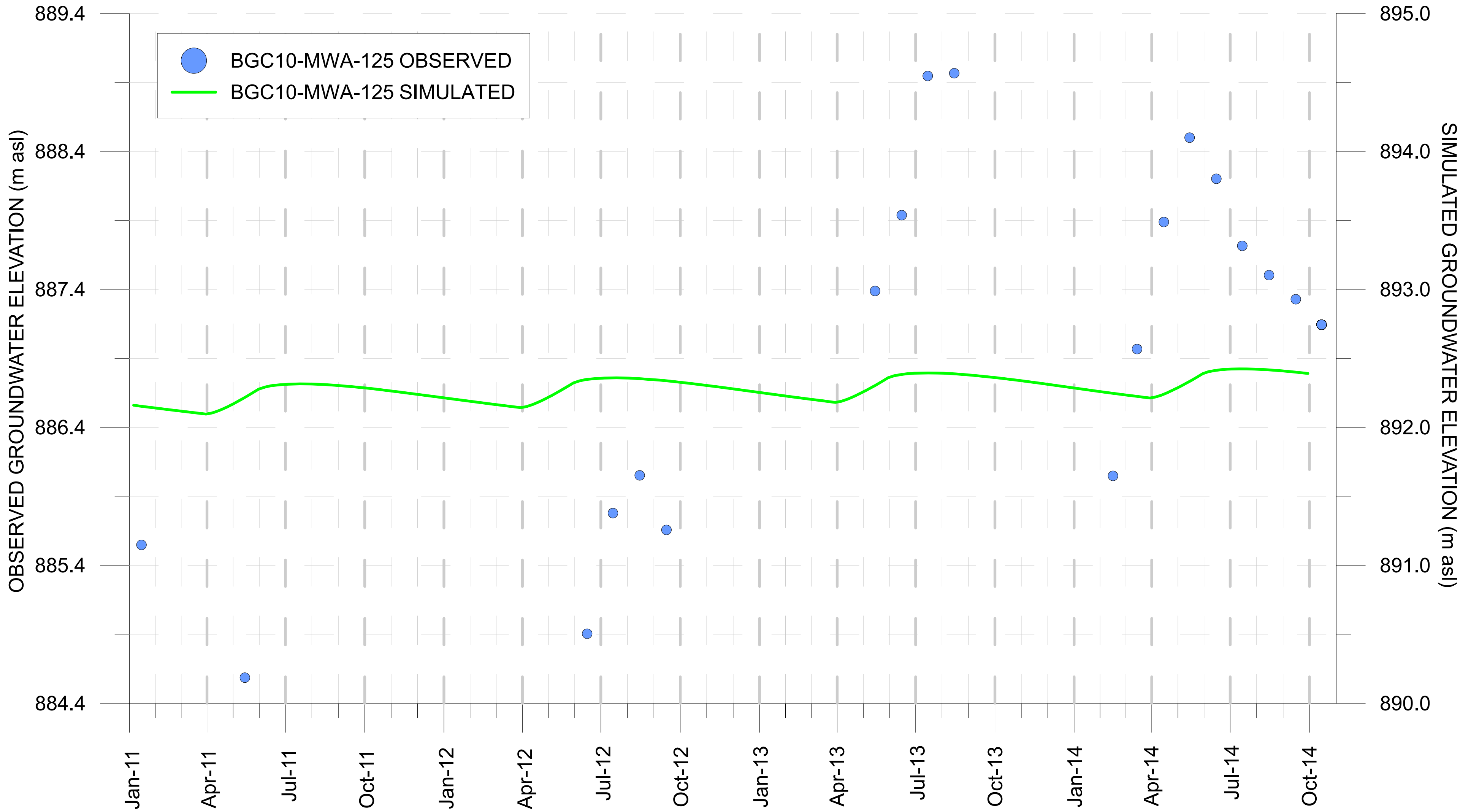

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 5.6m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWA-125: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-16
PROJECT No.: 1125007-04	APPROVED: TWC			

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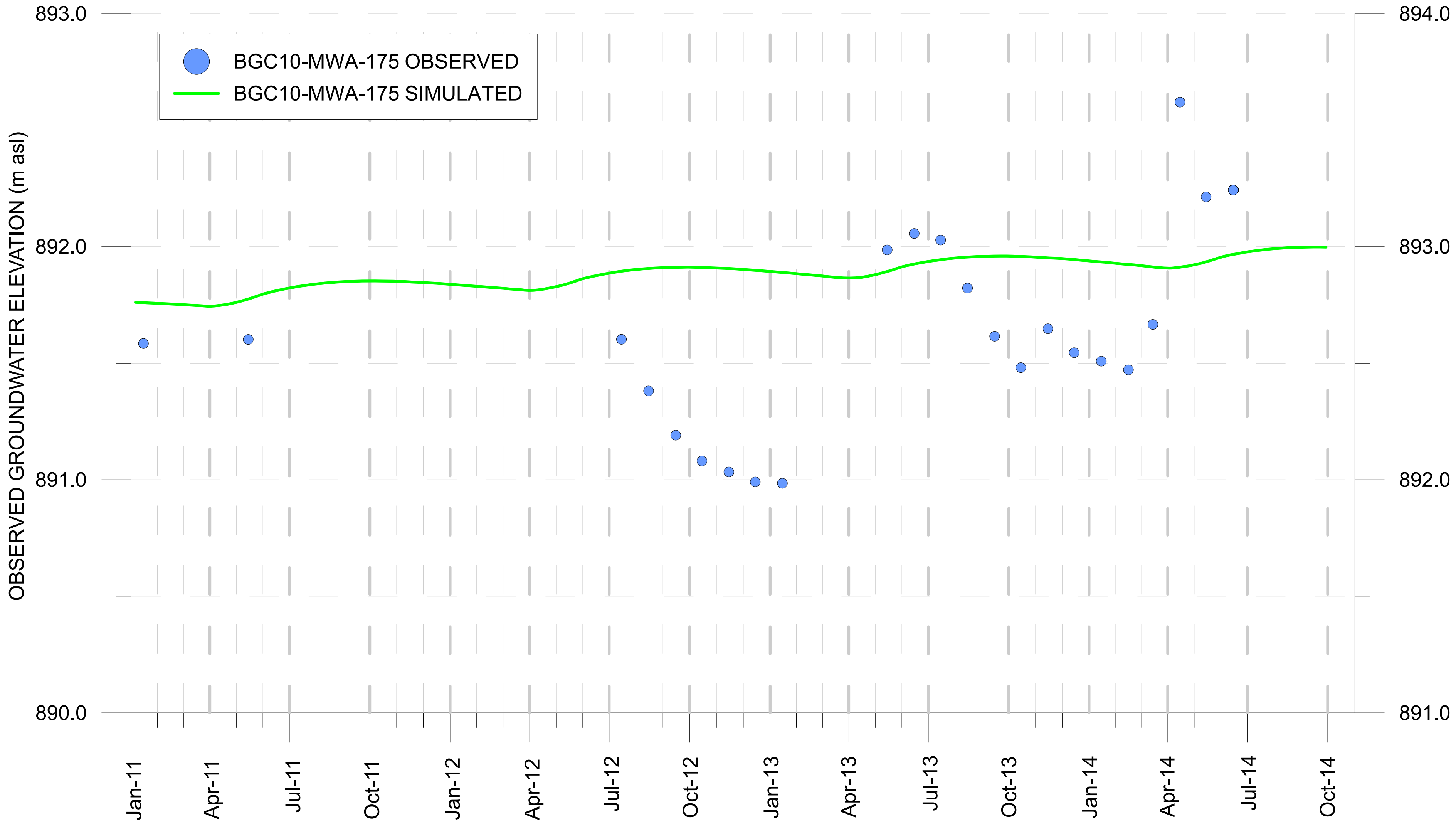

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWA-175: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-17

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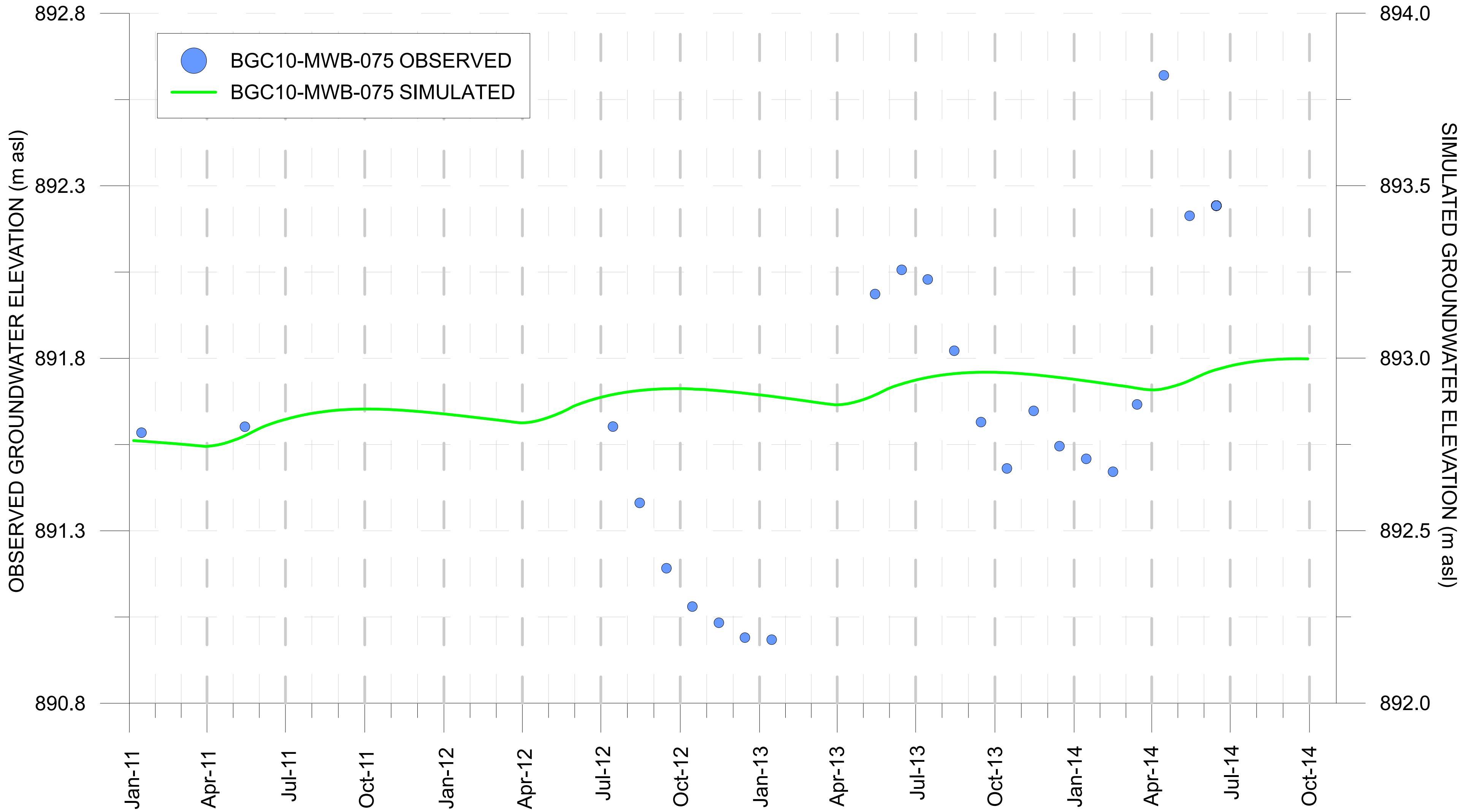

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1.2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWB-075: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-18

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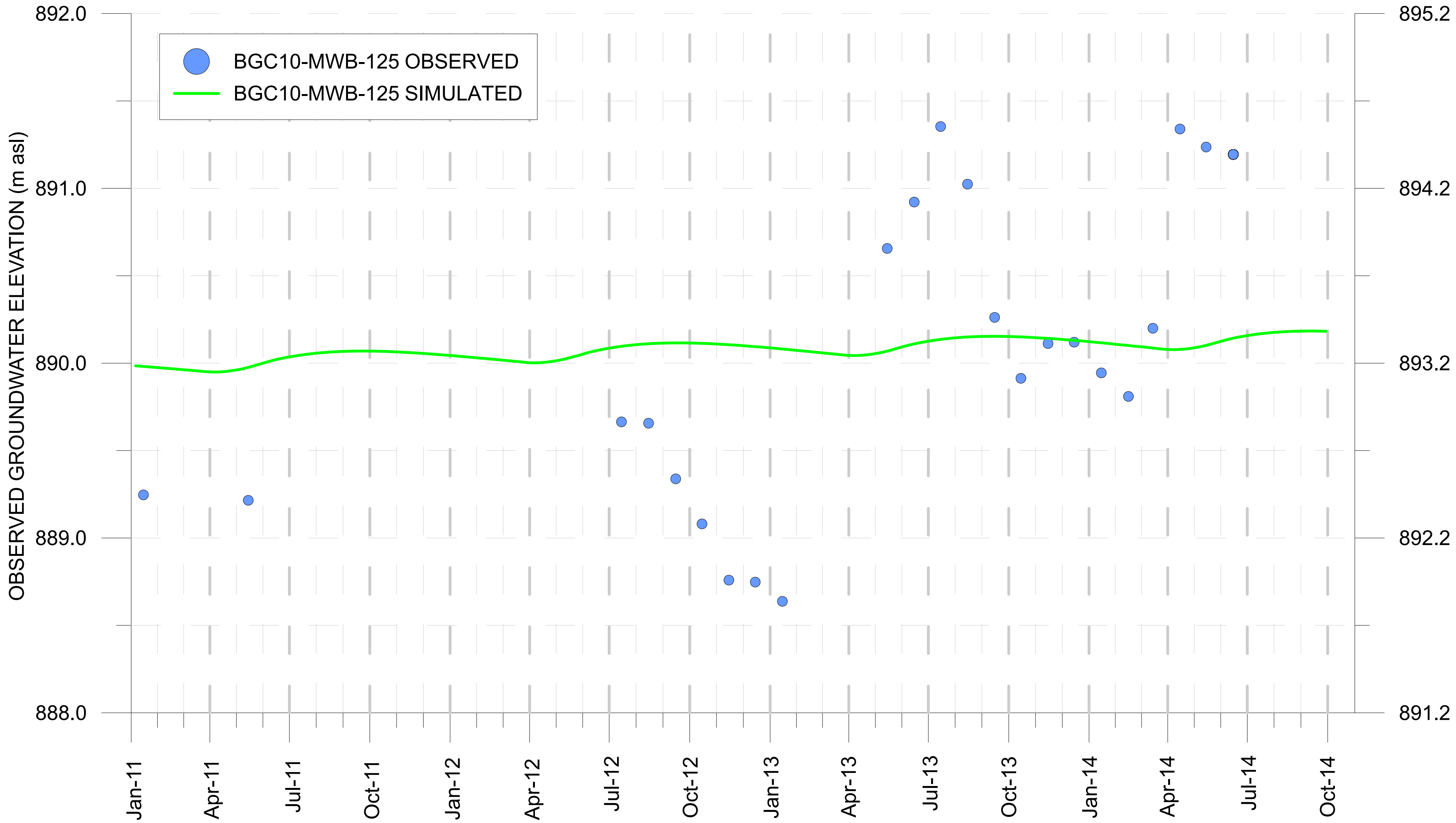

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 3.2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWB-125: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-19

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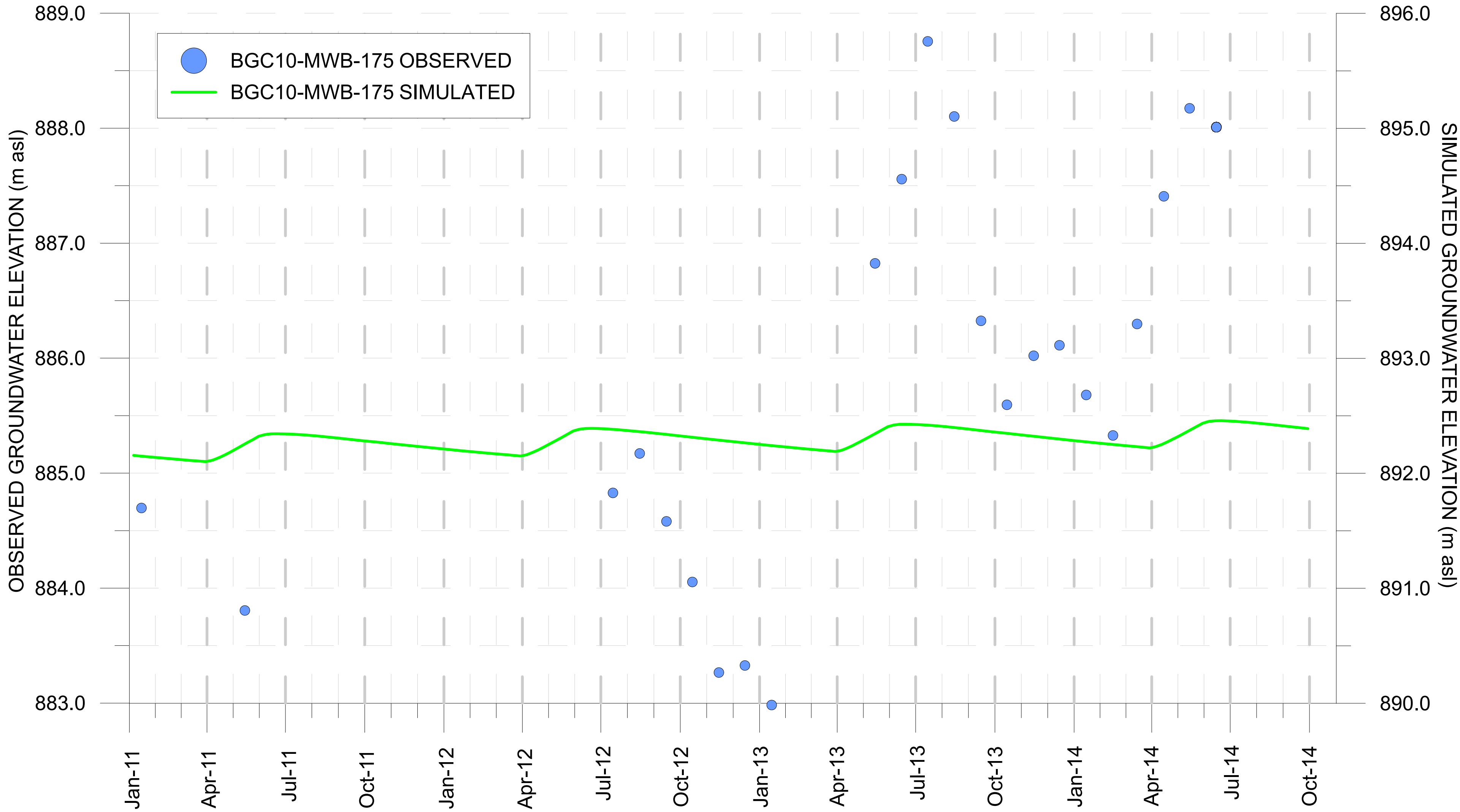

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 7m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWB-175: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-20

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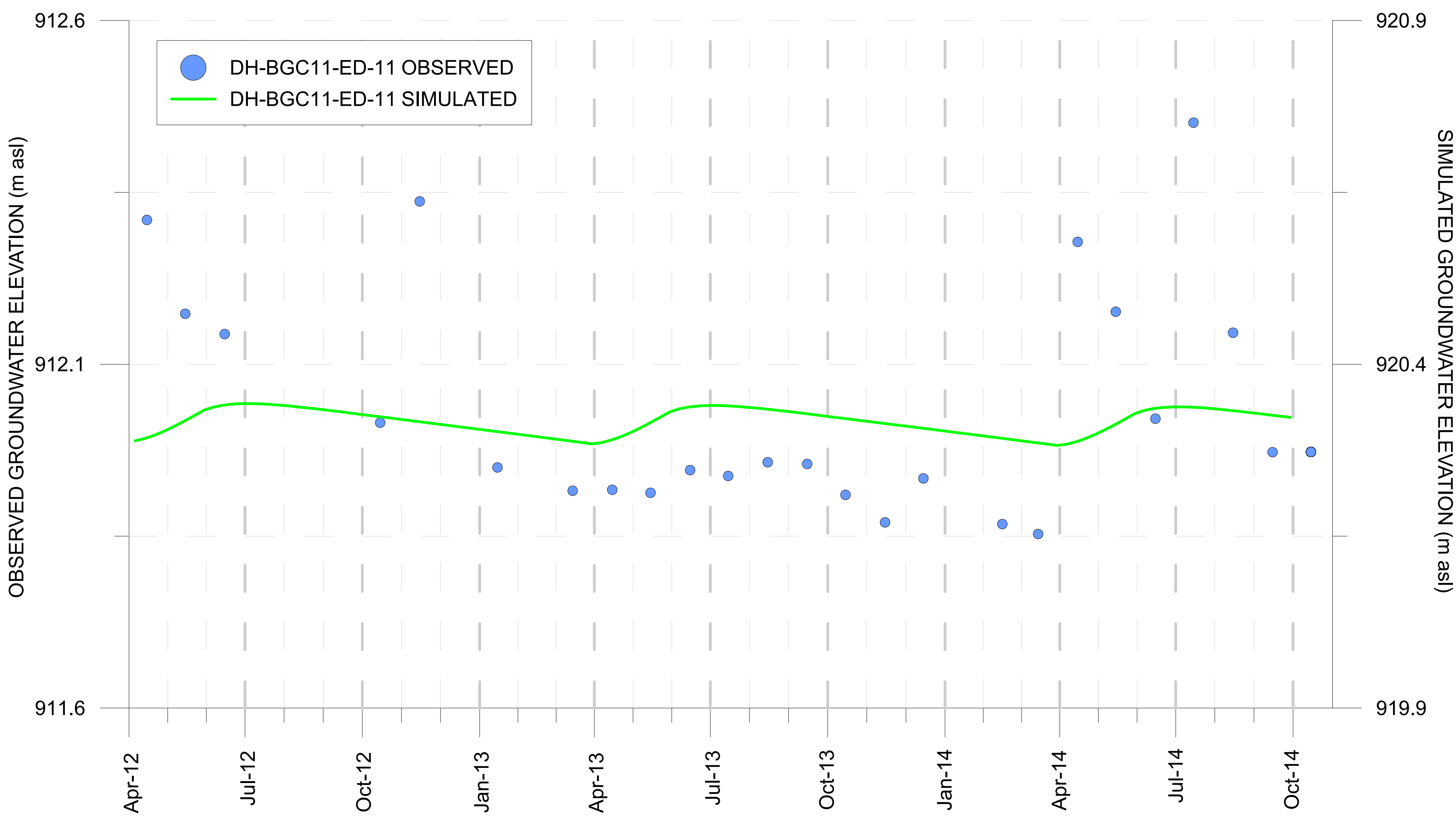

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 8.3m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: DH-BGC11-ED-11: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-21

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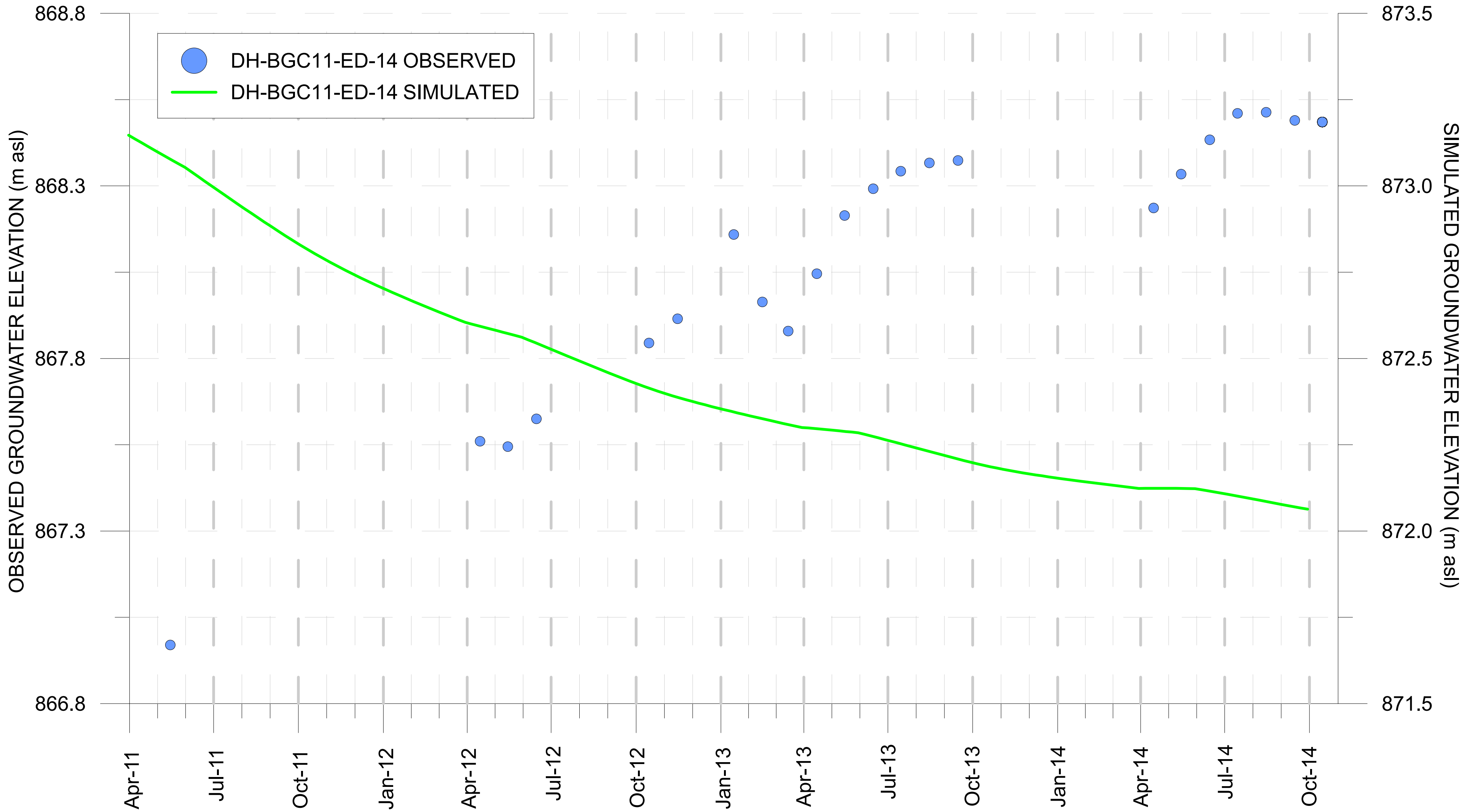
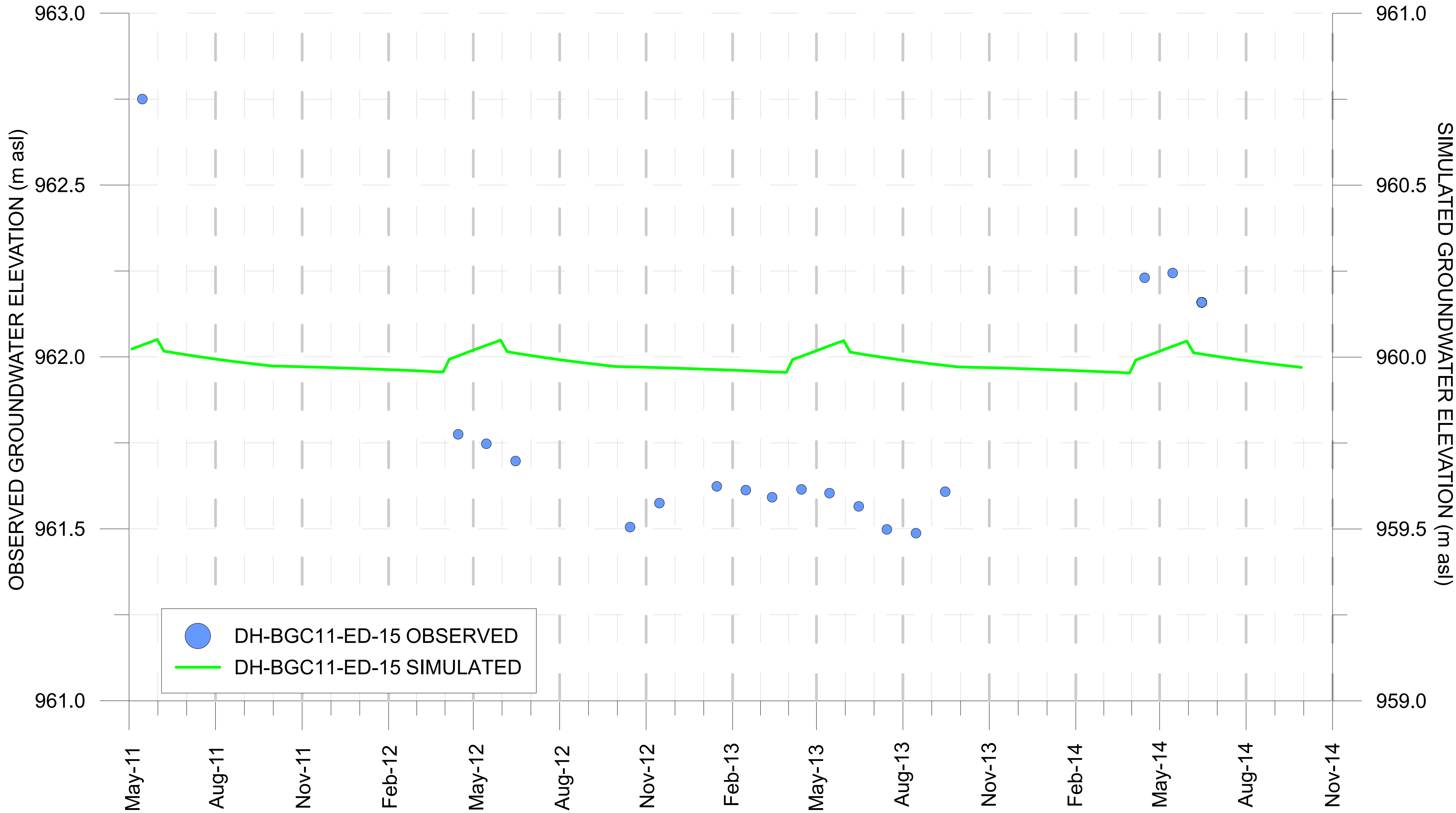


NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 4.7m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: DH-BGC11-ED-14: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-22



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: DH-BGC11-ED-15: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-23

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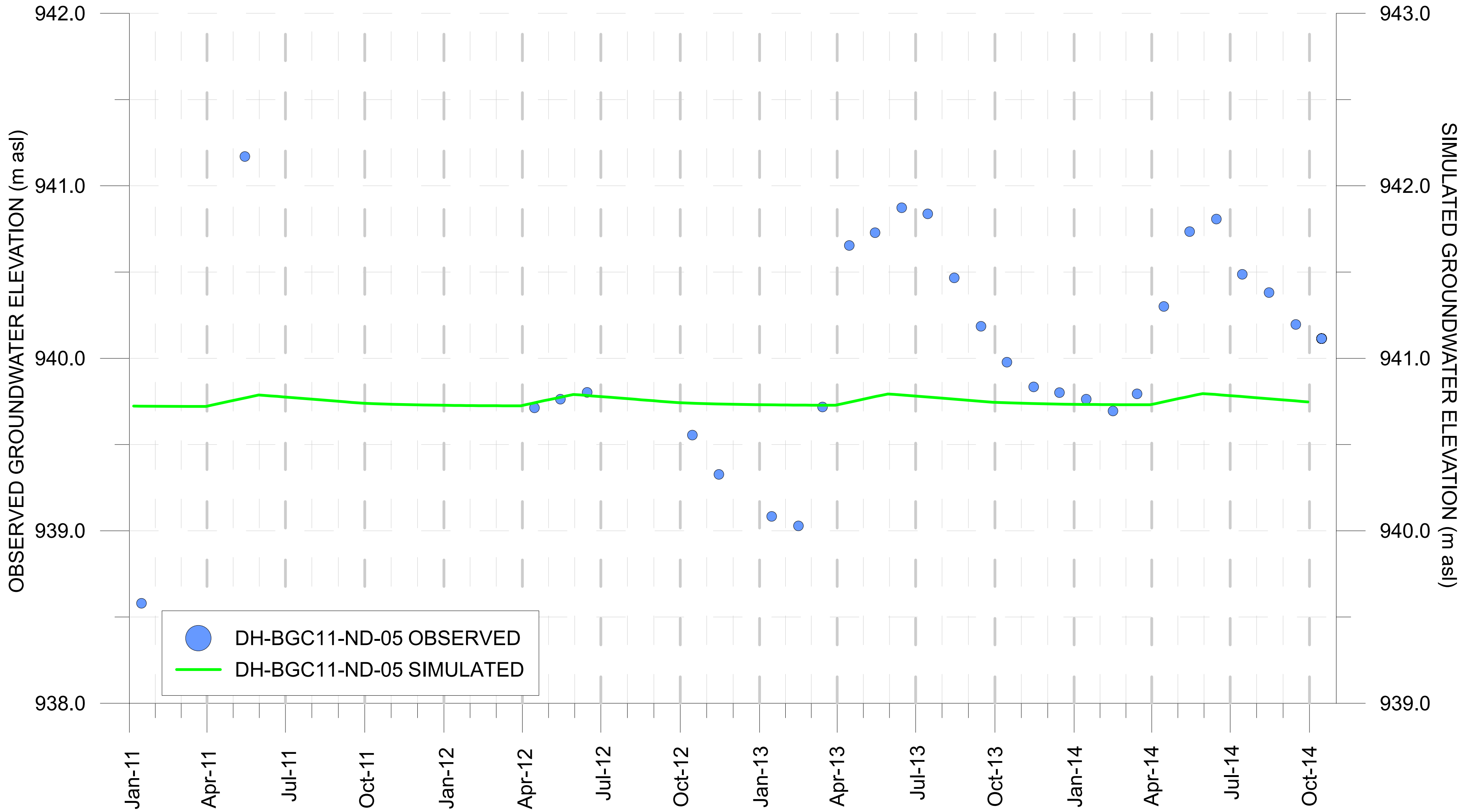

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: DH-BGC11-ND-05: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-24

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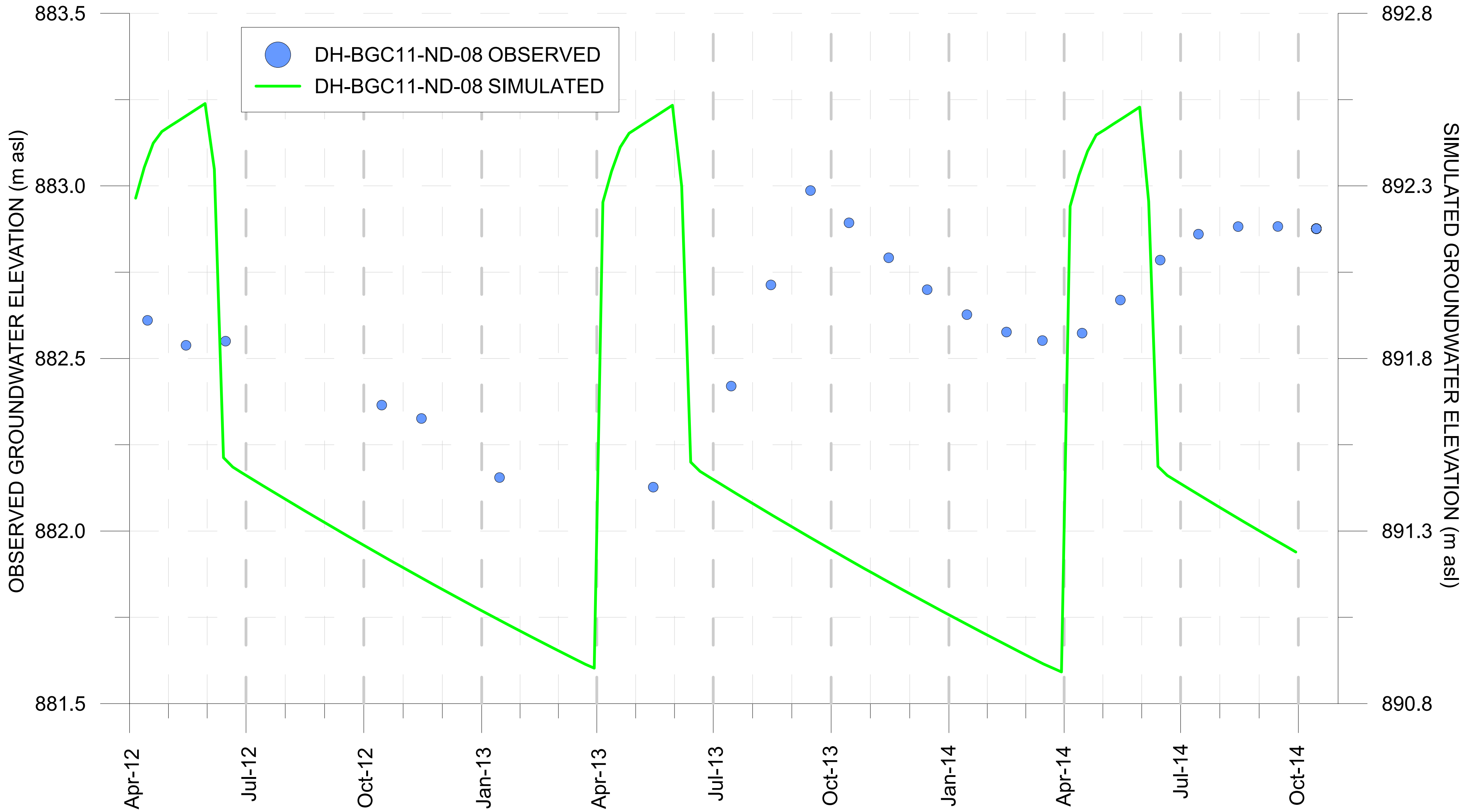

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 9.3m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: DH-BGC11-ND-08: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-25

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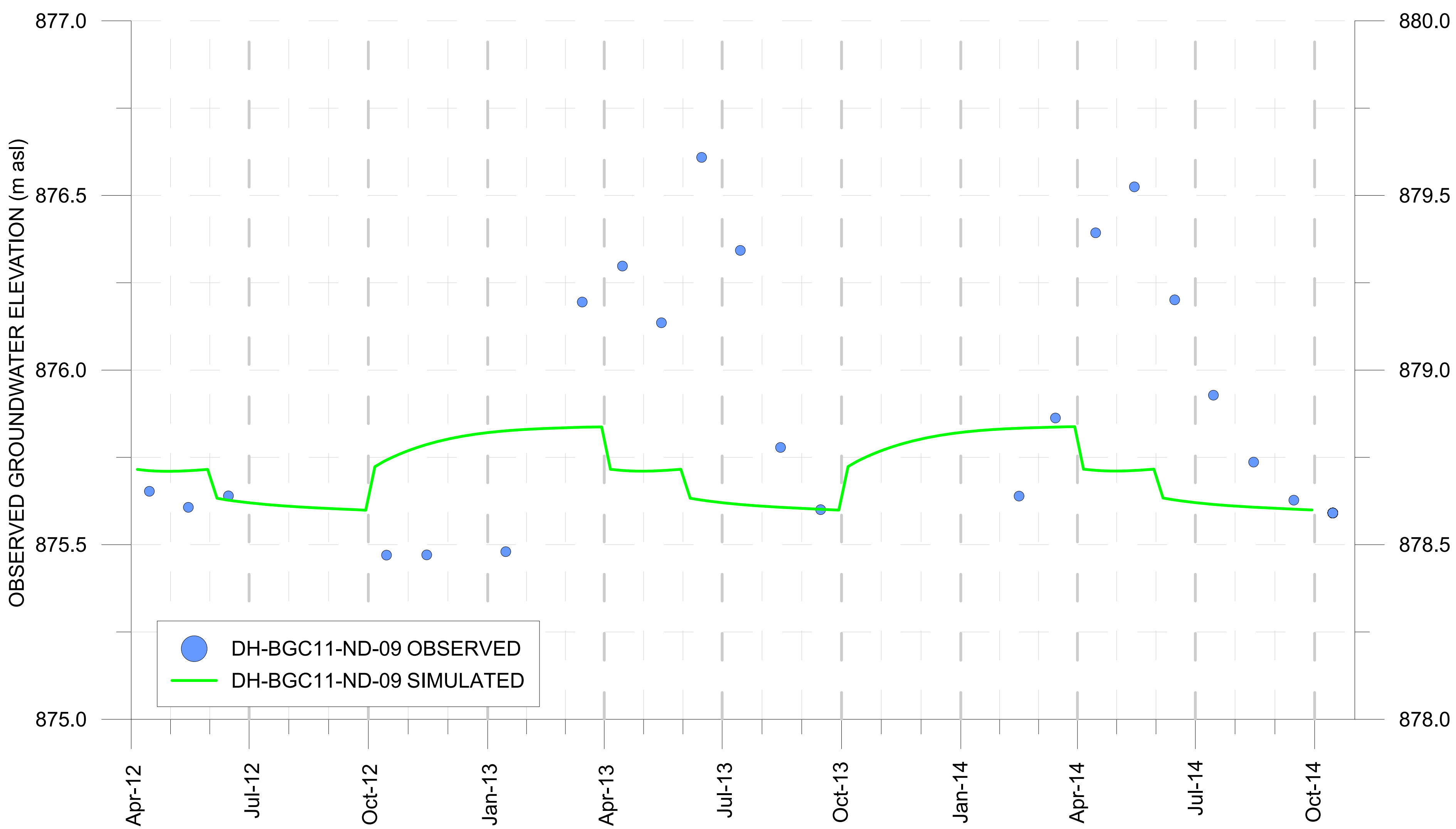

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 3m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: DH-BGC11-ND-09: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-26

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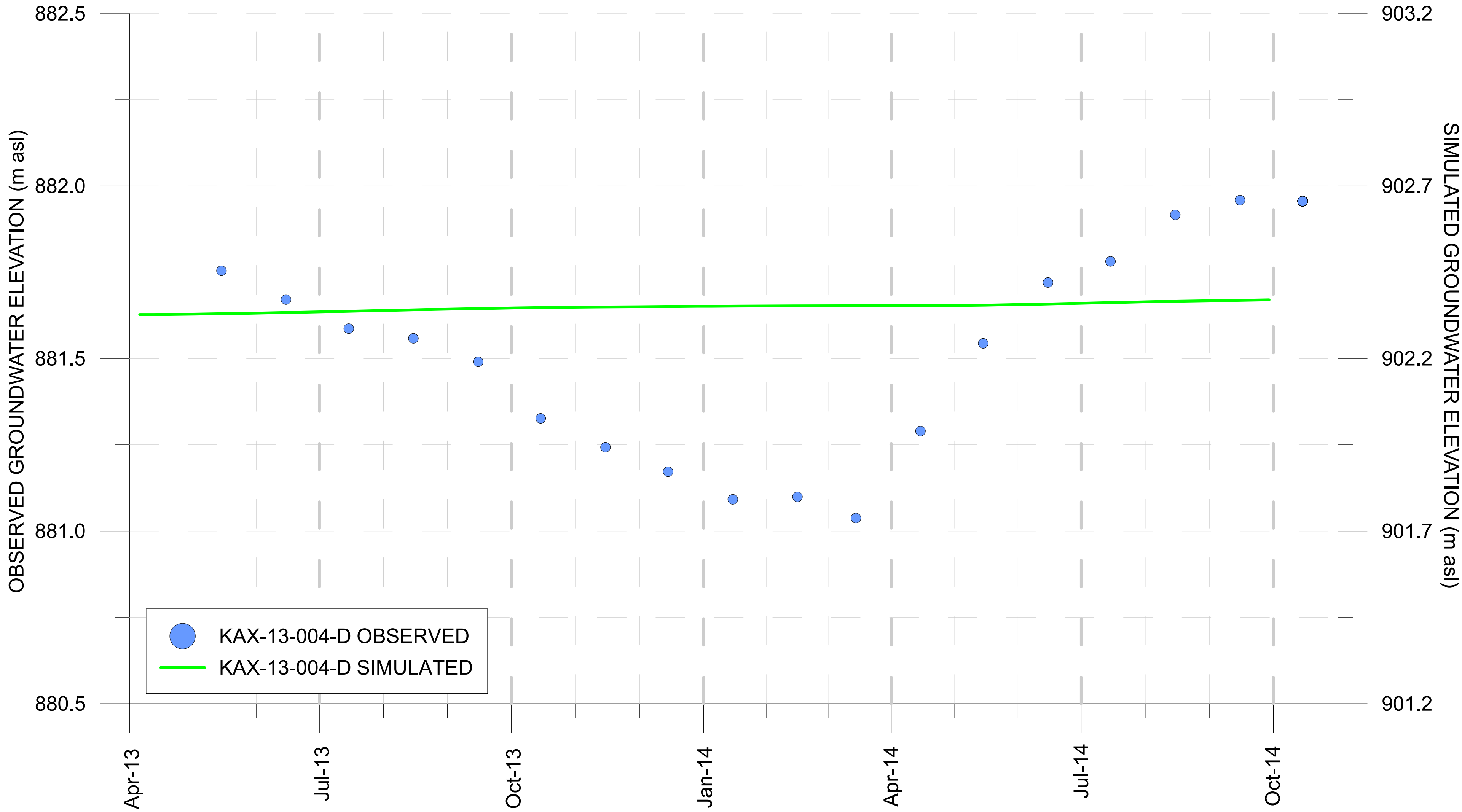

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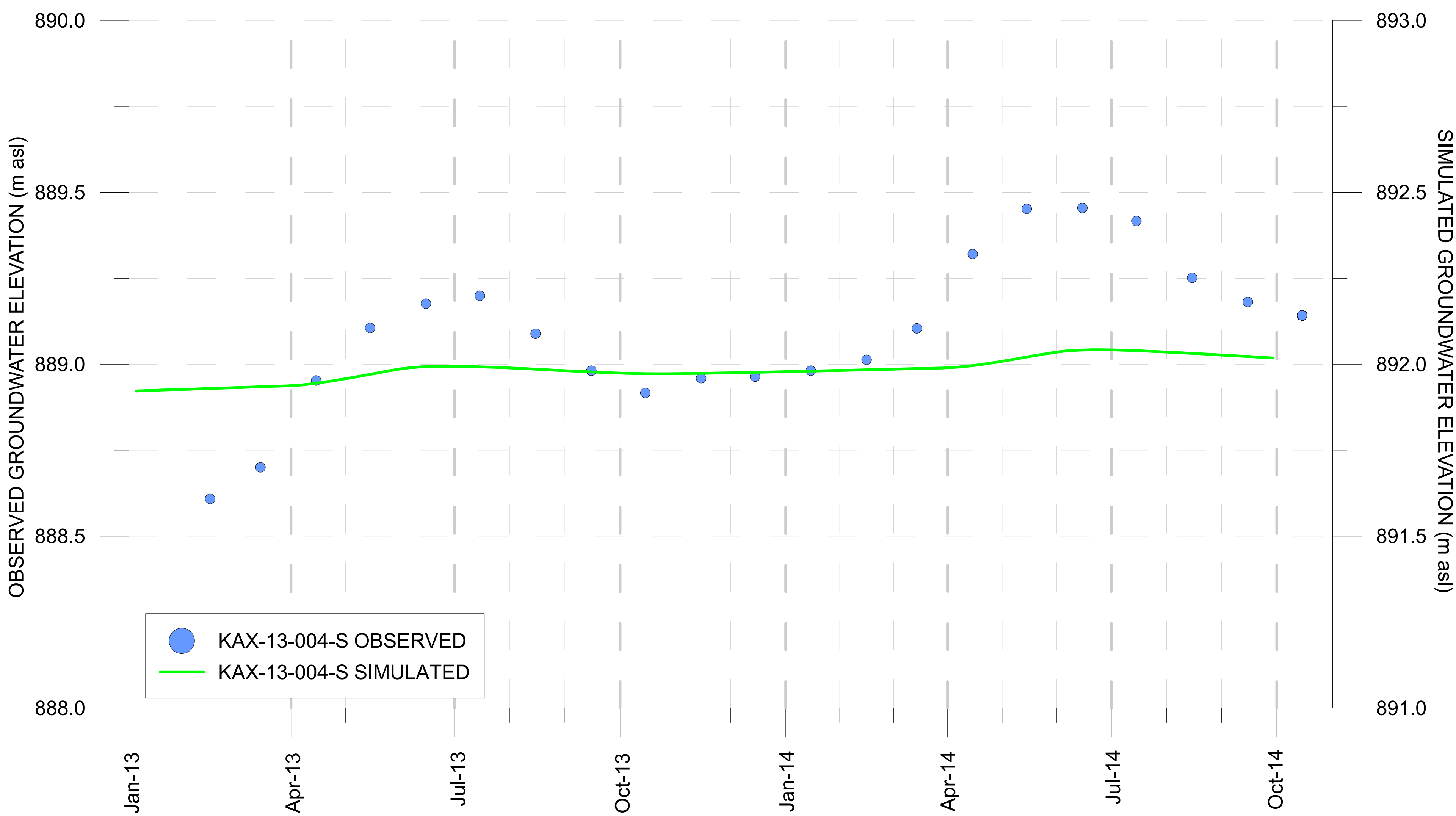
NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 20.7m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: KAX-13-004-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-27



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 3m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: KAX-13-004-S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-28

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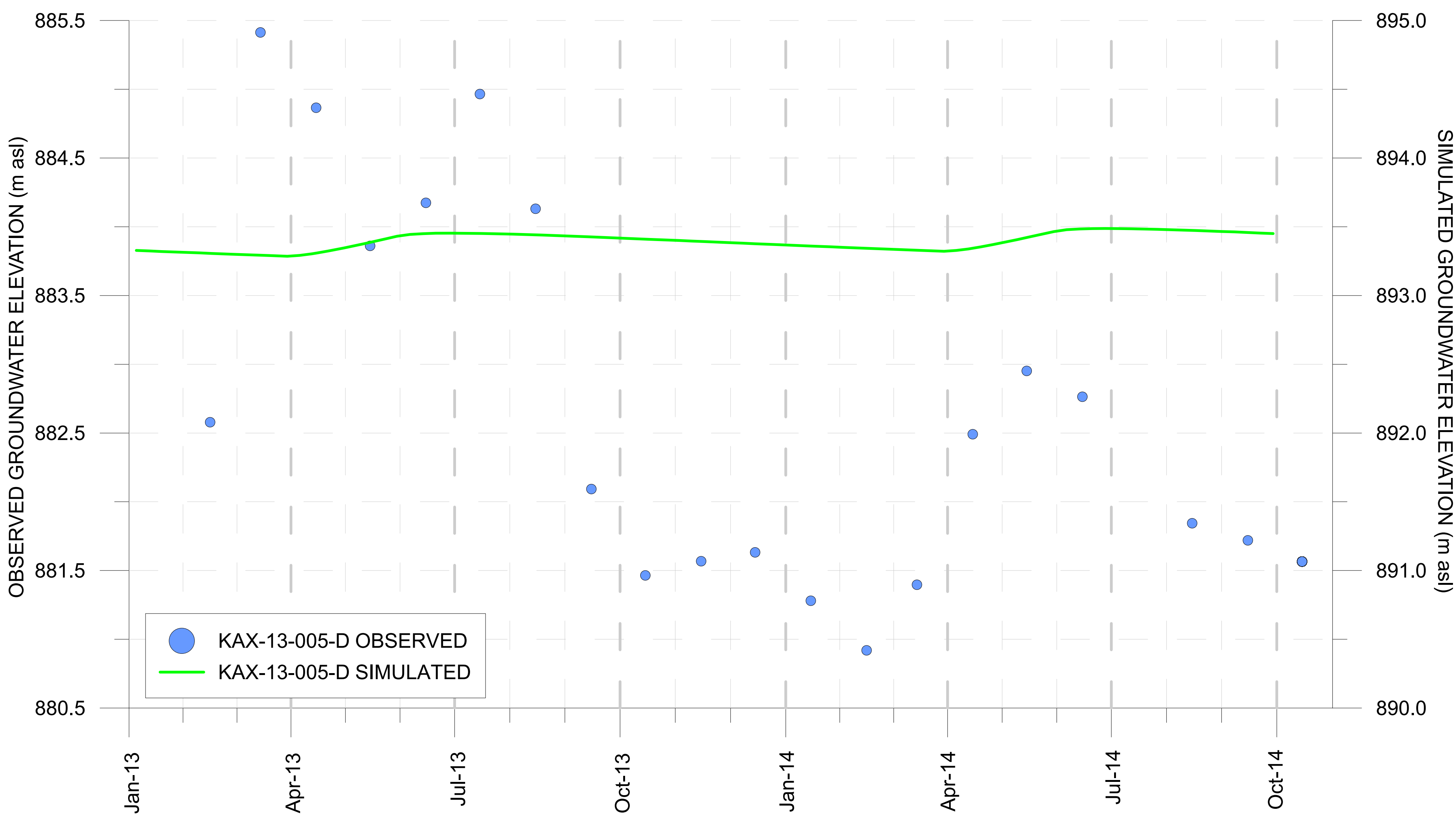

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 9.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: KAX-13-005-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-29
PROJECT No.: 1125007-04	APPROVED: TWC			

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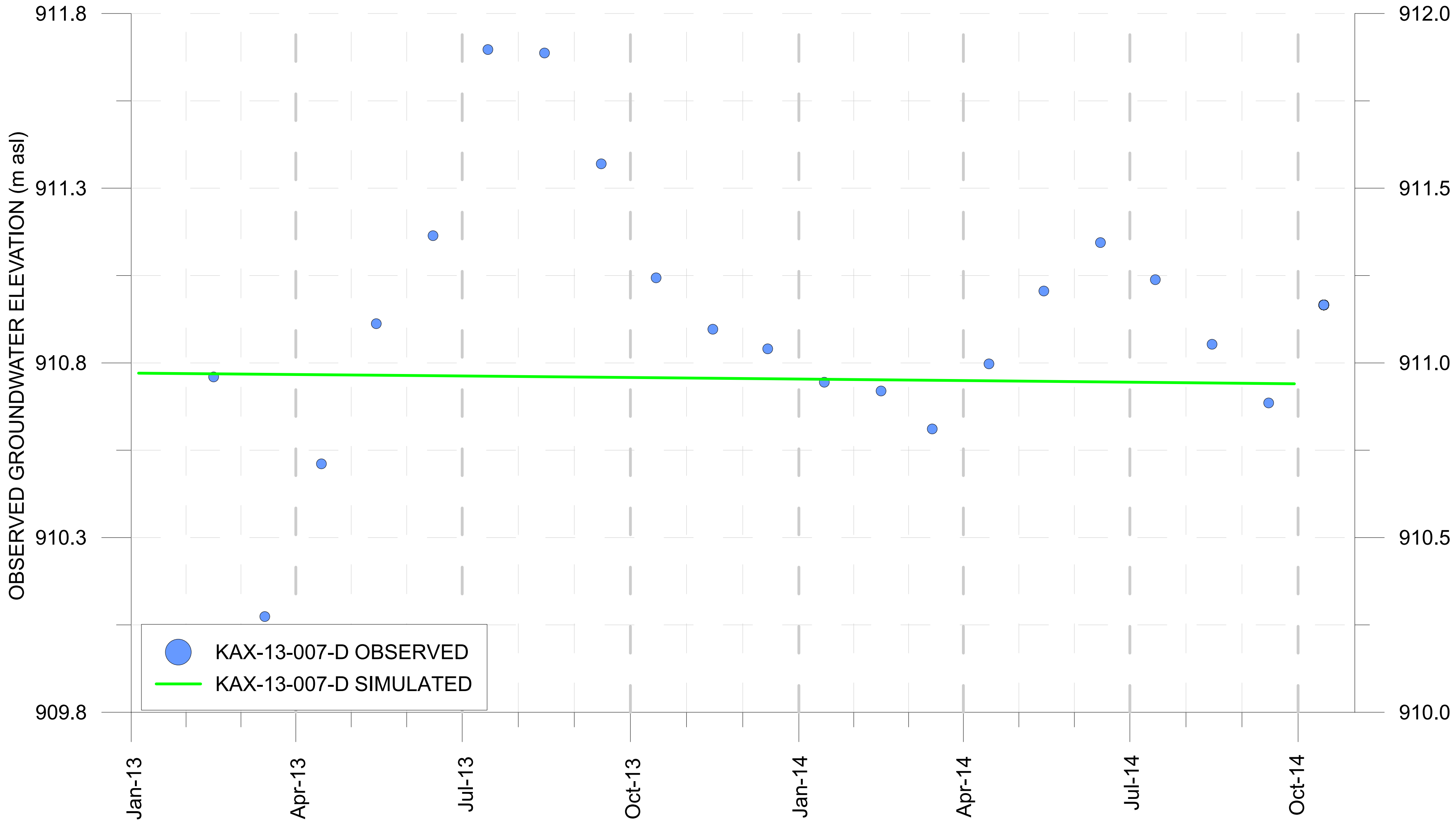

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 0.2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: KAX-13-007-D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-30

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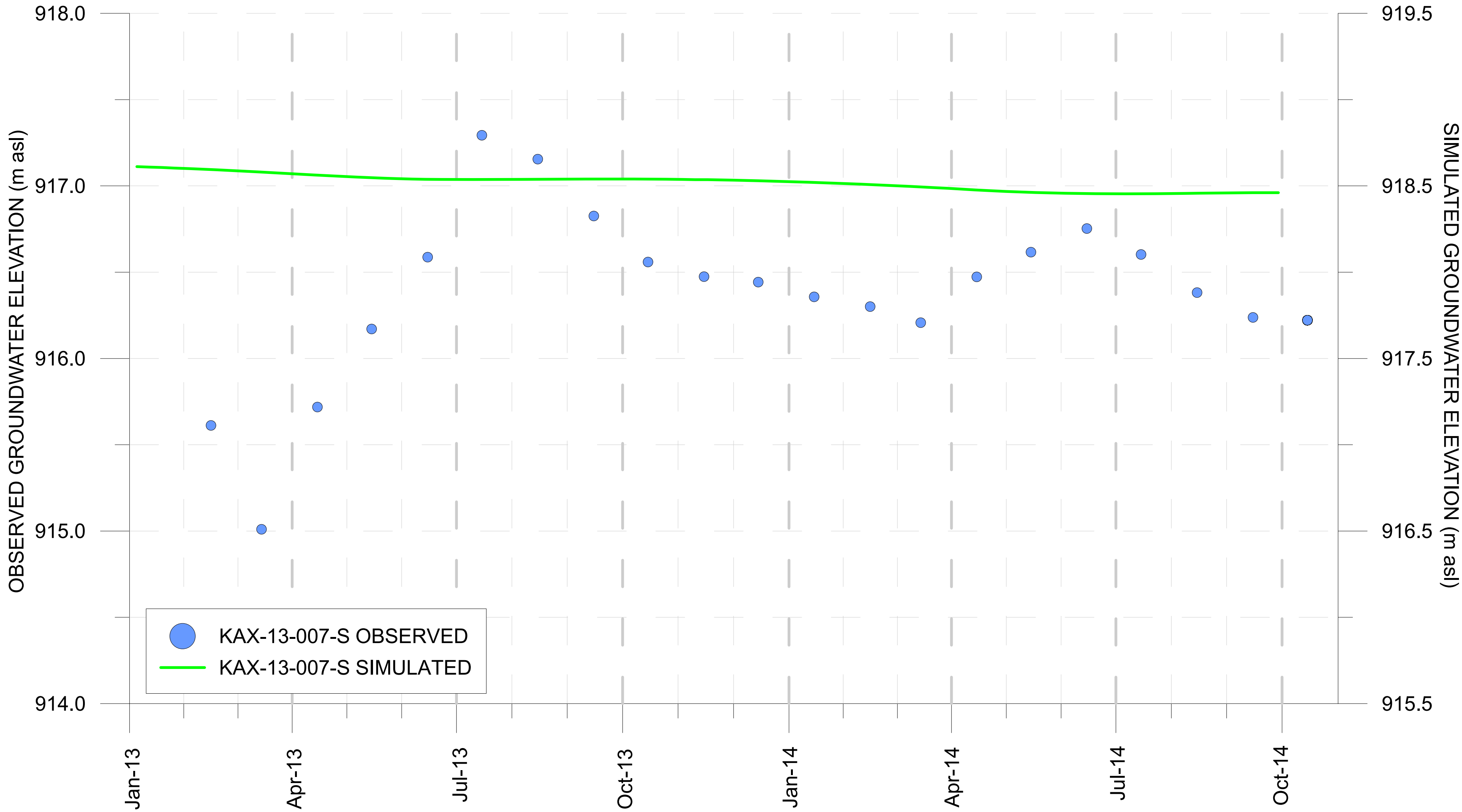

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: KAX-13-007-S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-31

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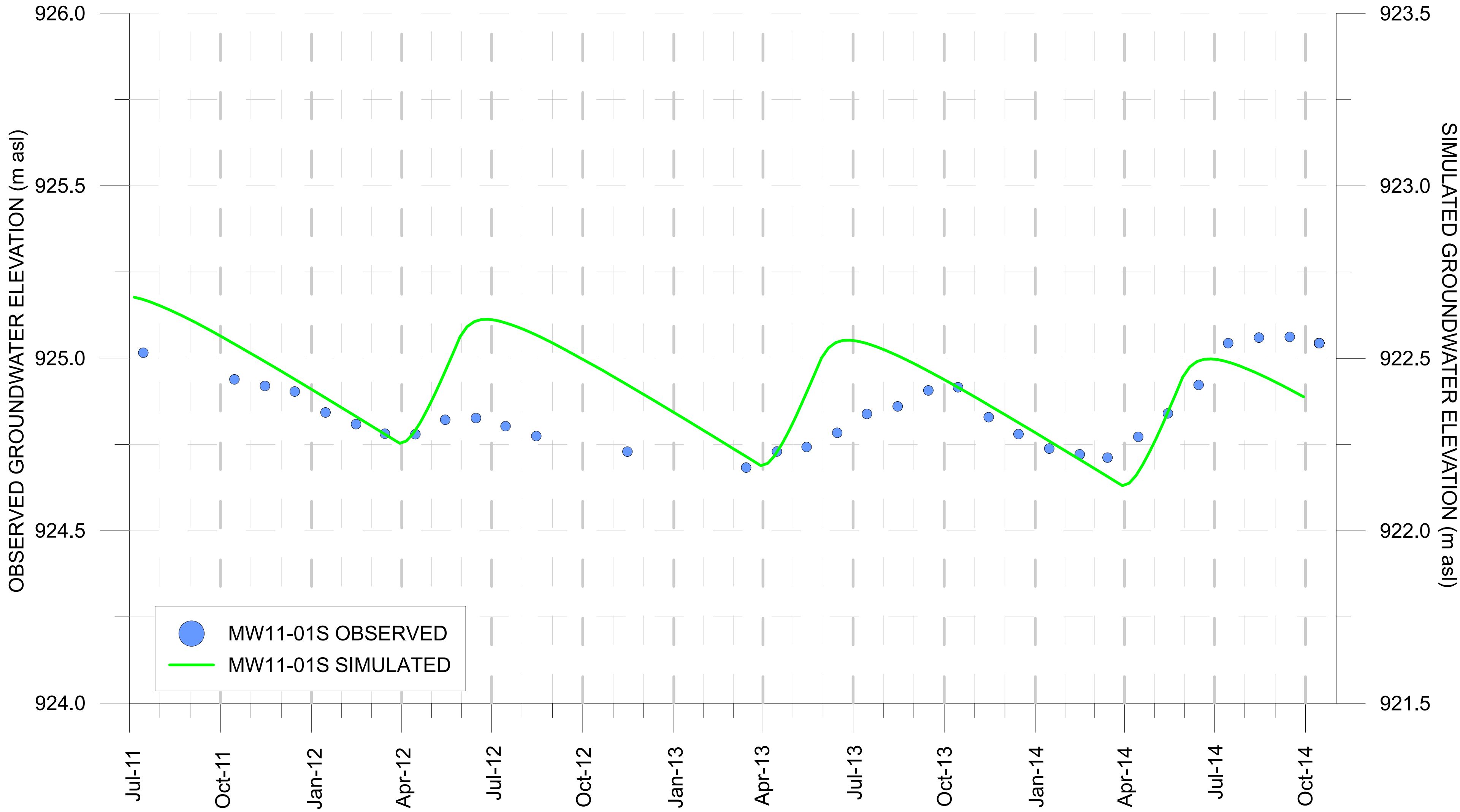

NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 2.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-01S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-32

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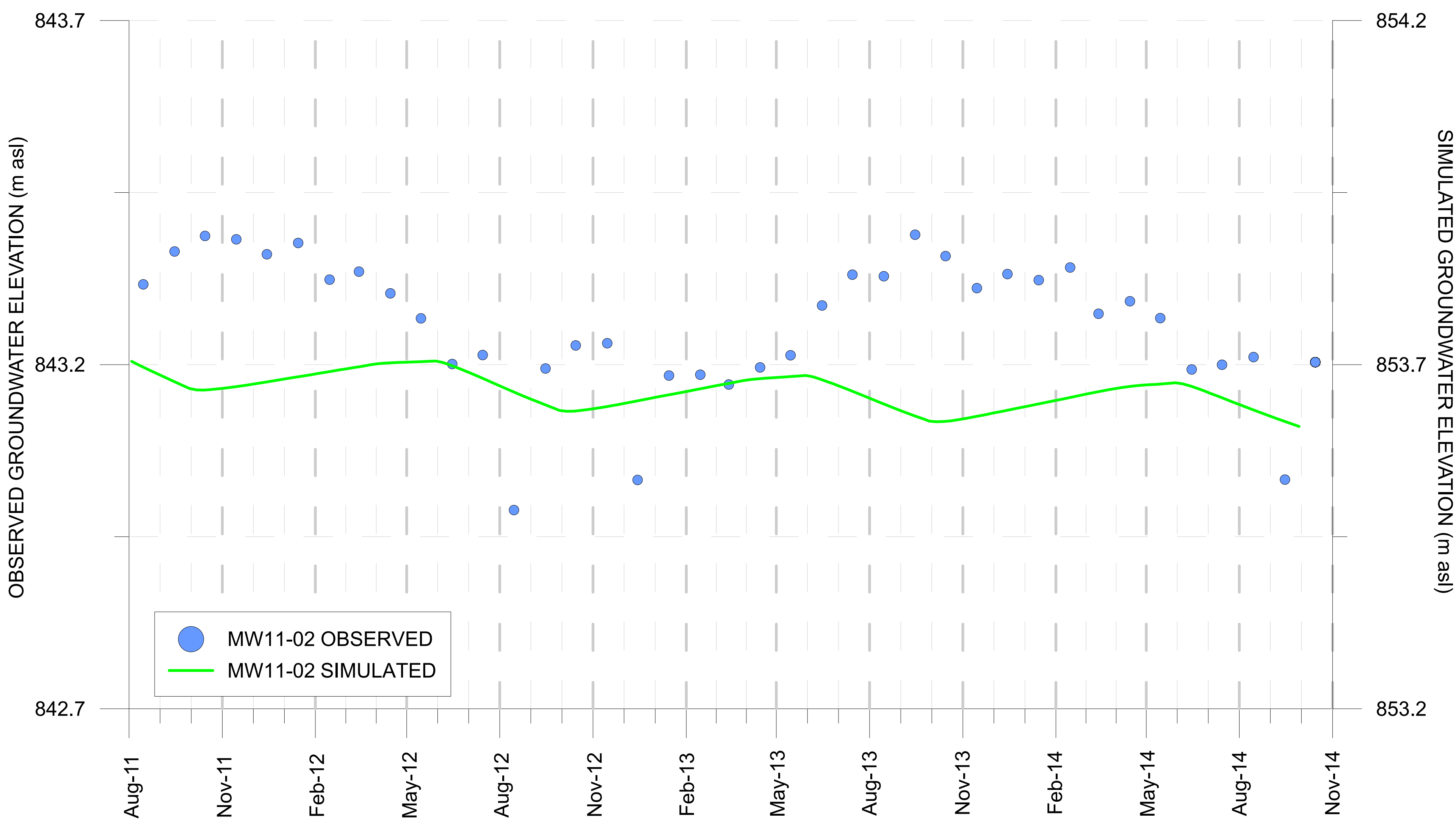
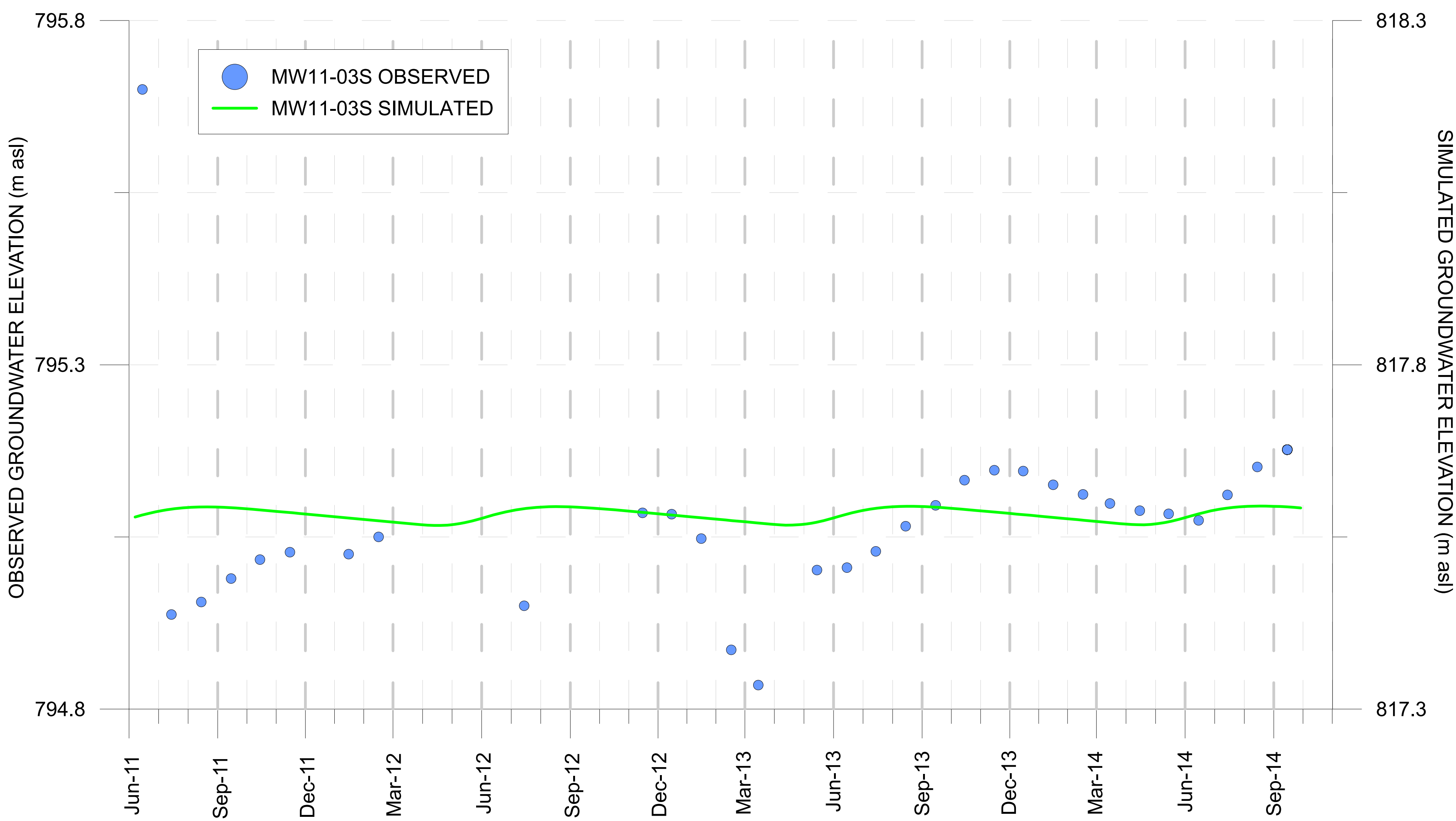


NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 10.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-02: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-33

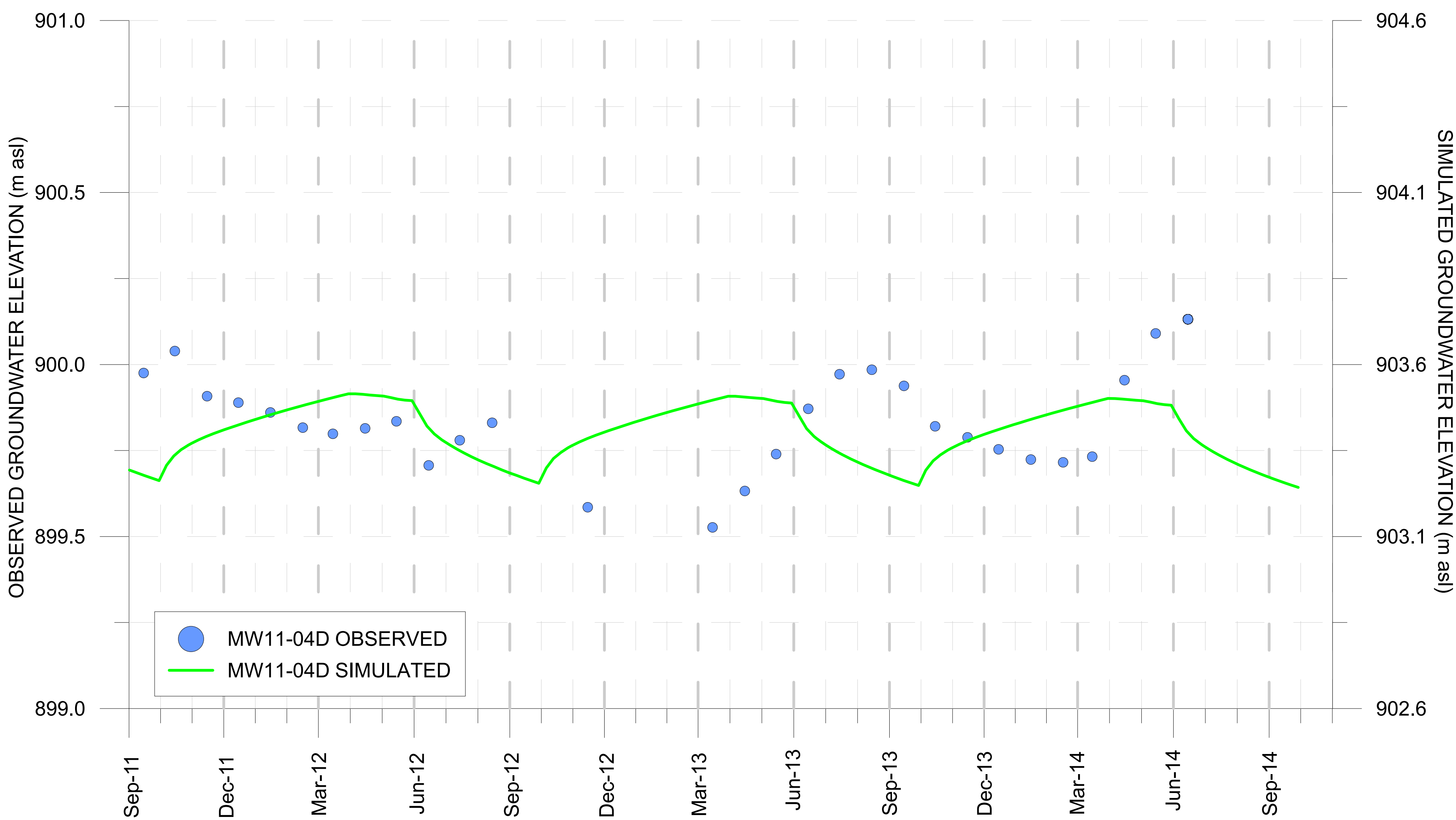
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 22.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-03S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-34

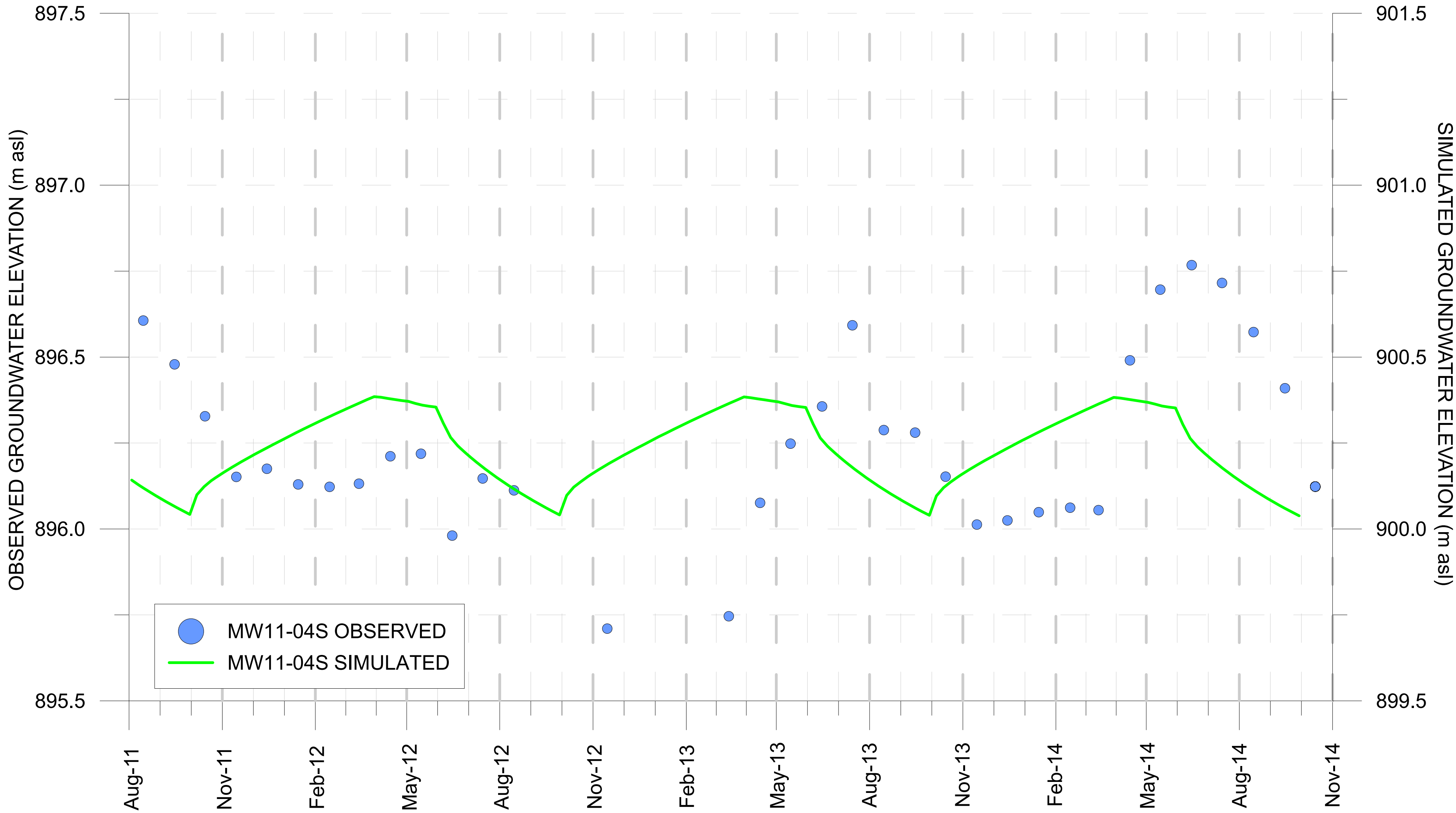
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 3.6m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-04D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-35
PROJECT No.: 1125007-04	APPROVED: TWC			

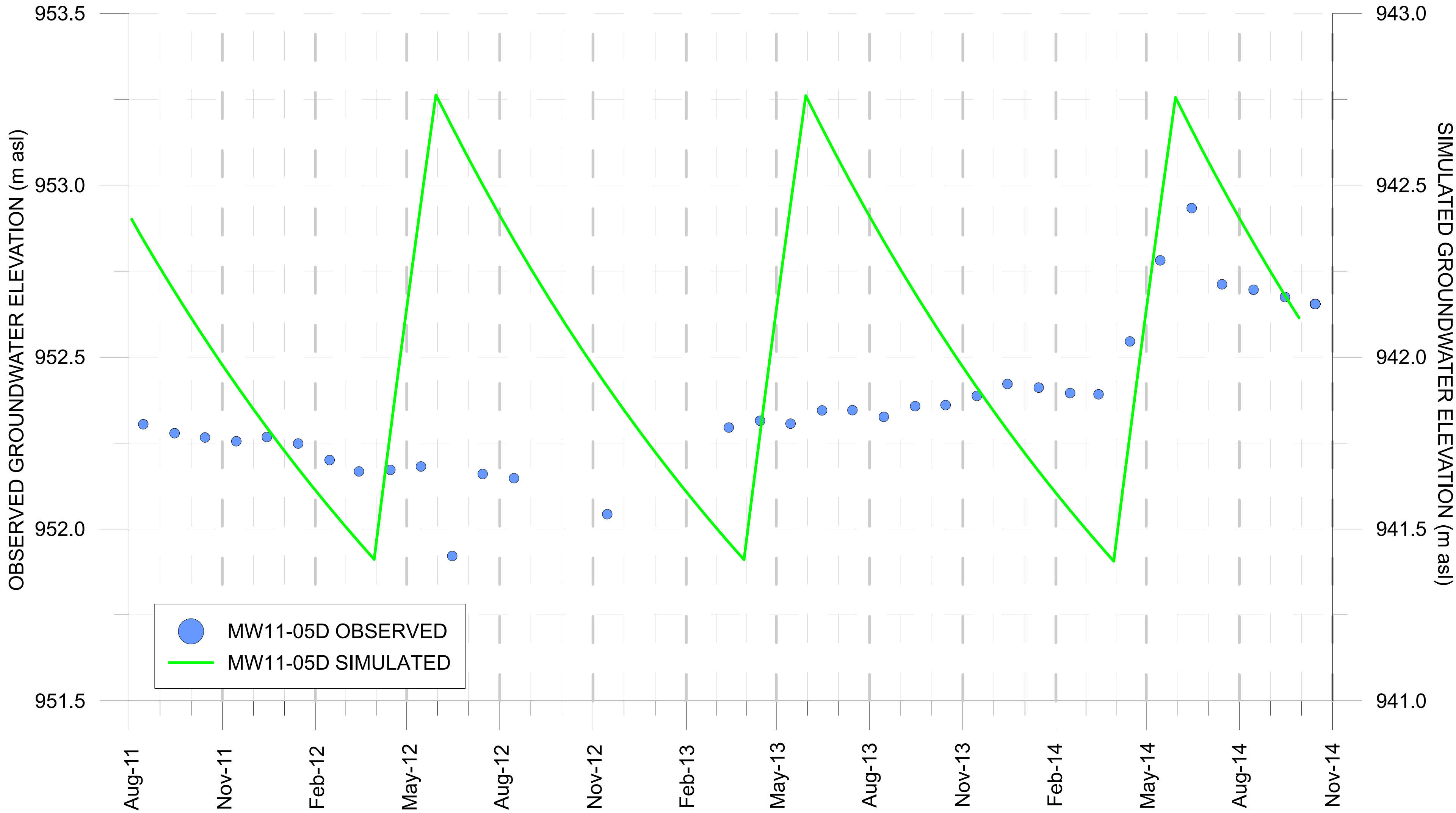
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 4m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-04S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-36
PROJECT No.: 1125007-04	APPROVED: TWC			

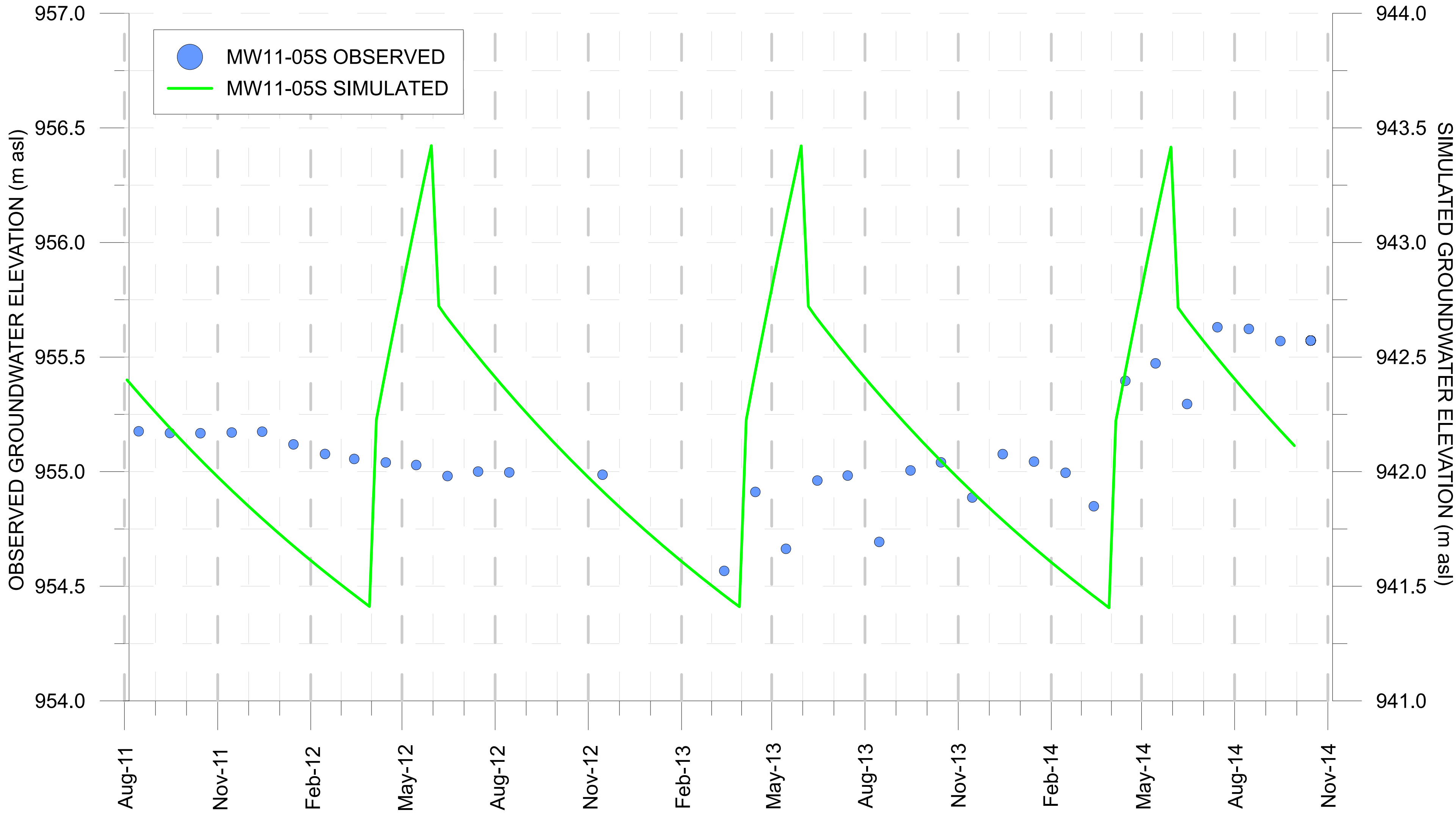
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 10.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-05D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-37

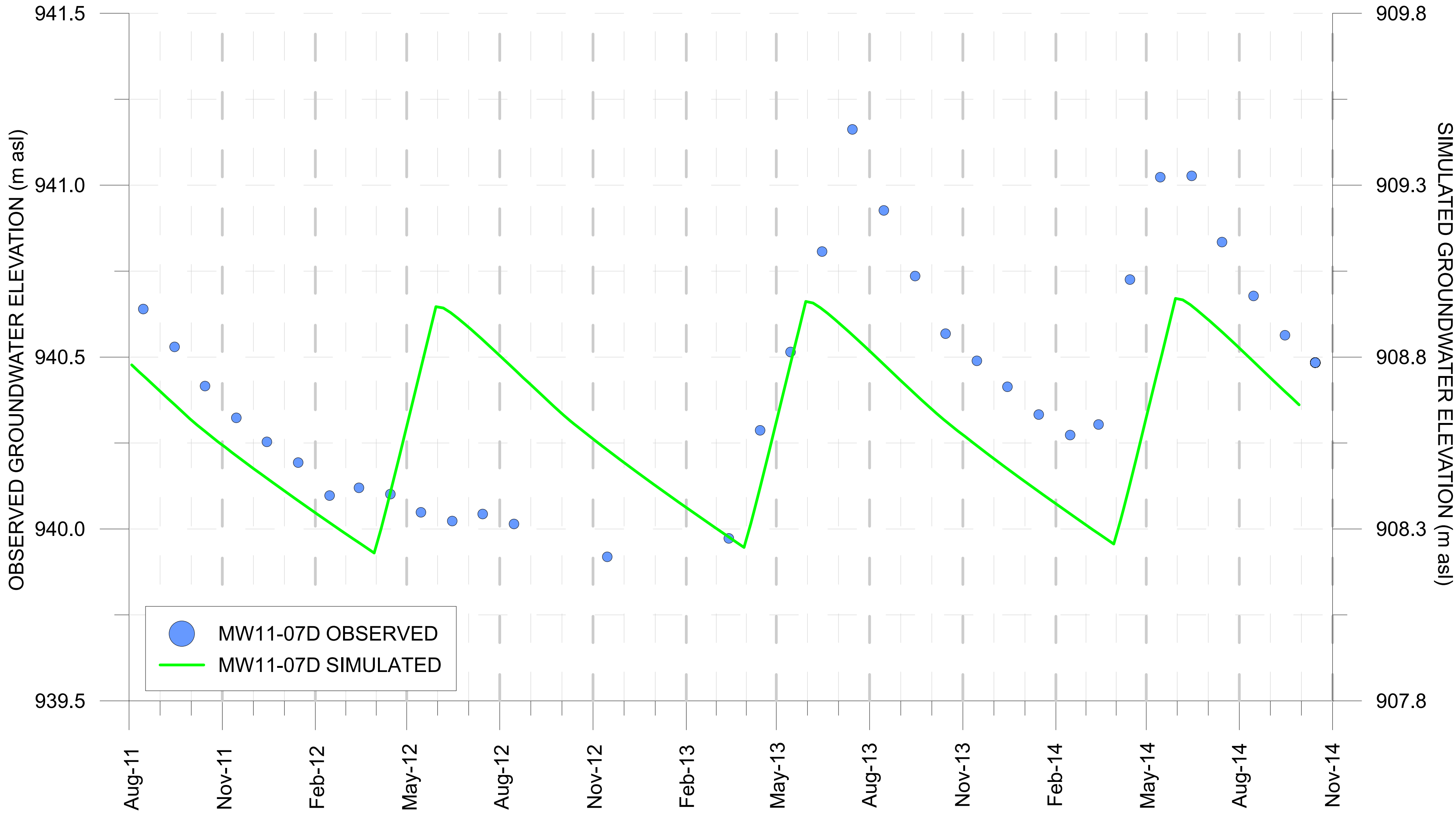
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 13m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-05S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-38

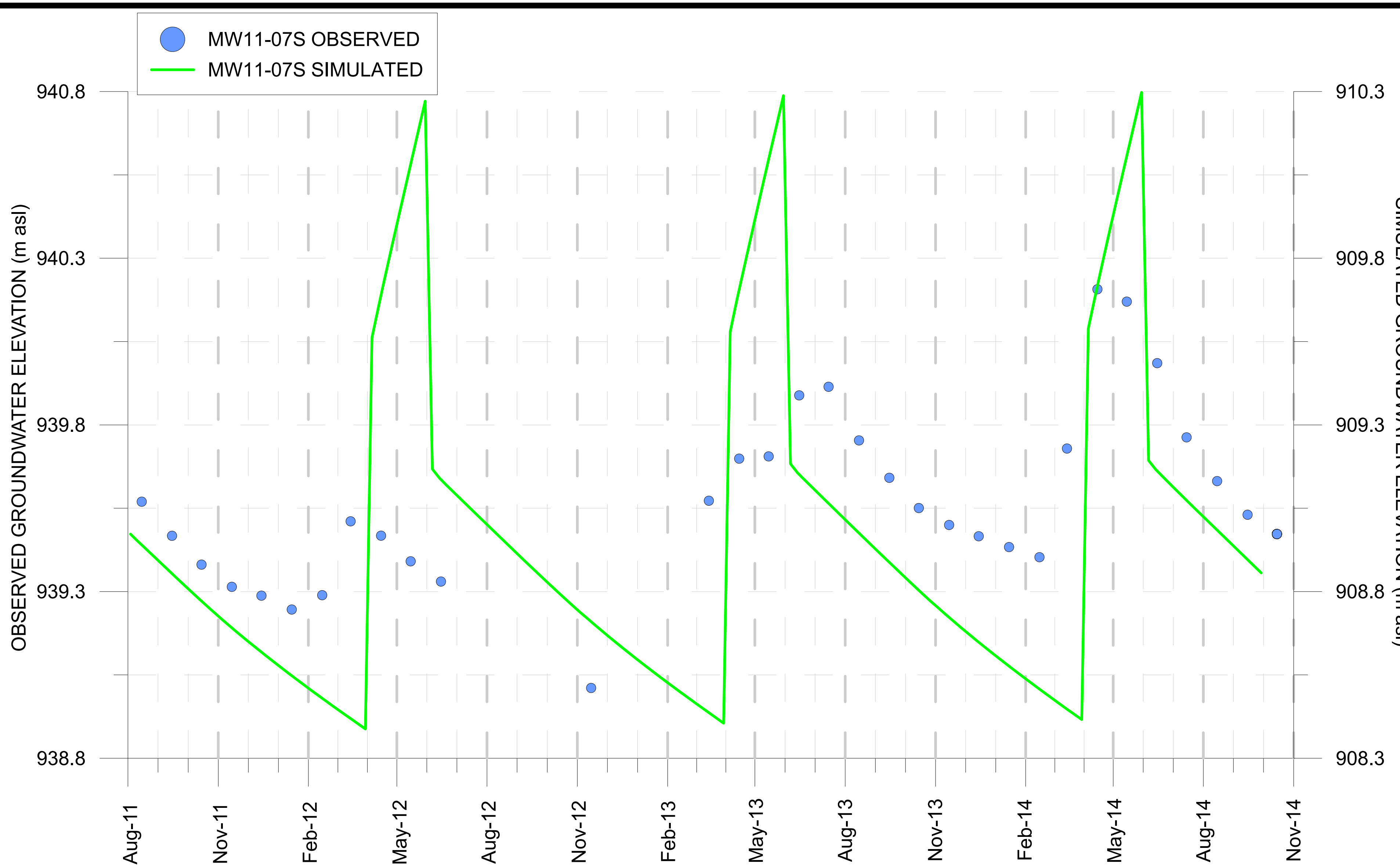
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 31.7m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-07D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-39
PROJECT No.: 1125007-04	APPROVED: TWC			

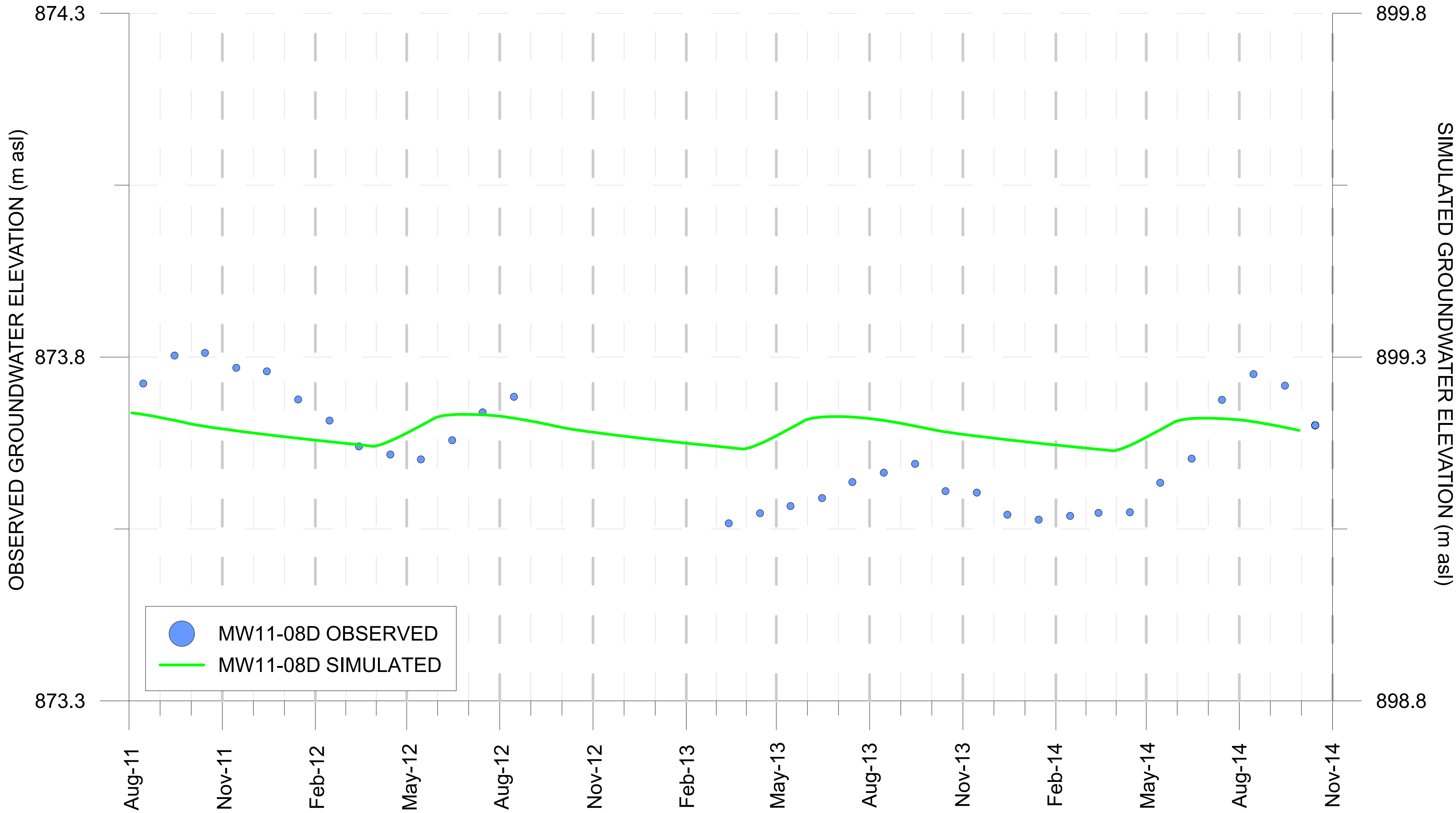
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 30.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-07S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-40

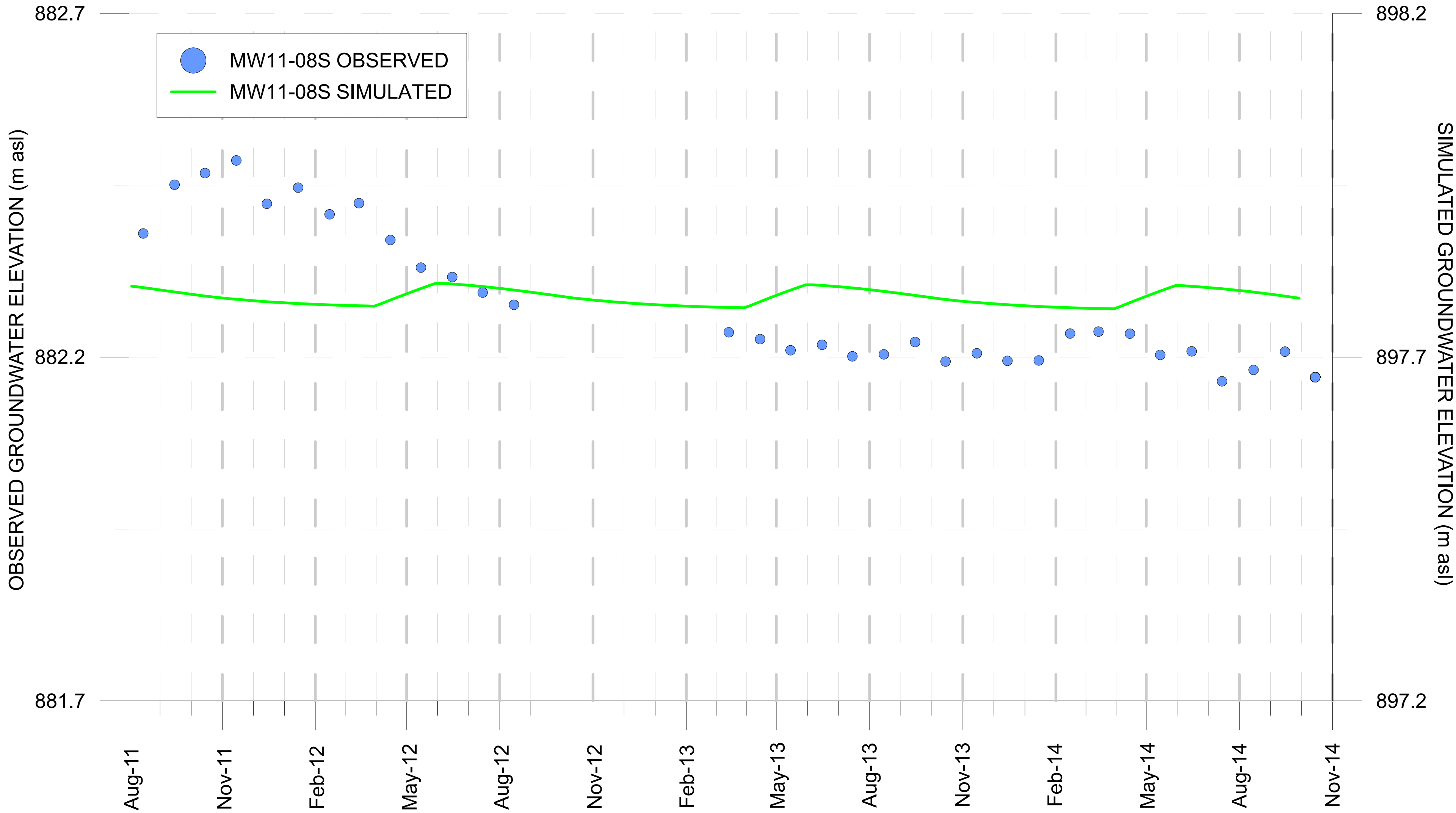
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 25.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-08D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH	FIG No.: A-41
PROJECT No.: 1125007-04	APPROVED: TWC			

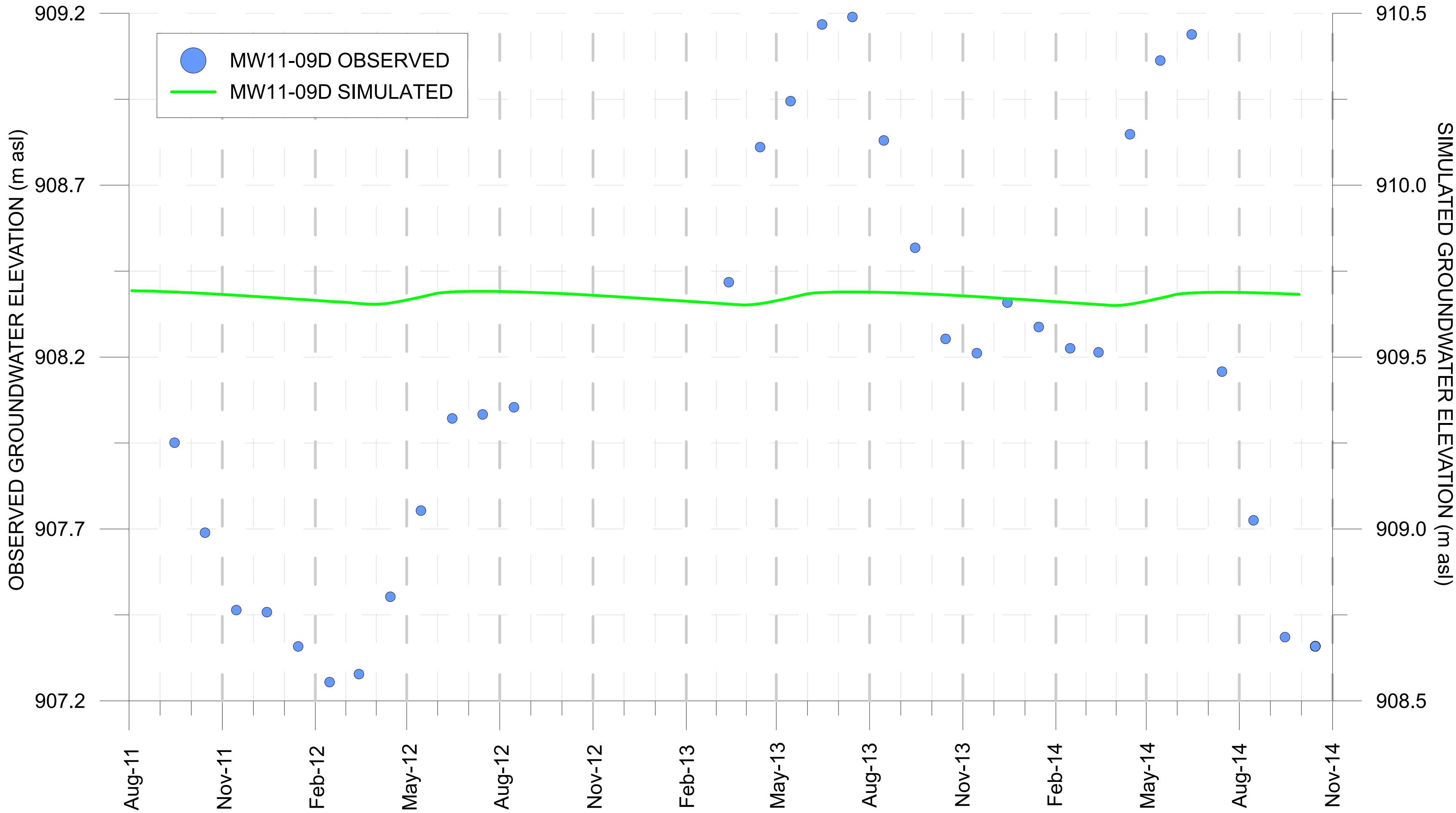
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 15.5m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-08S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-42

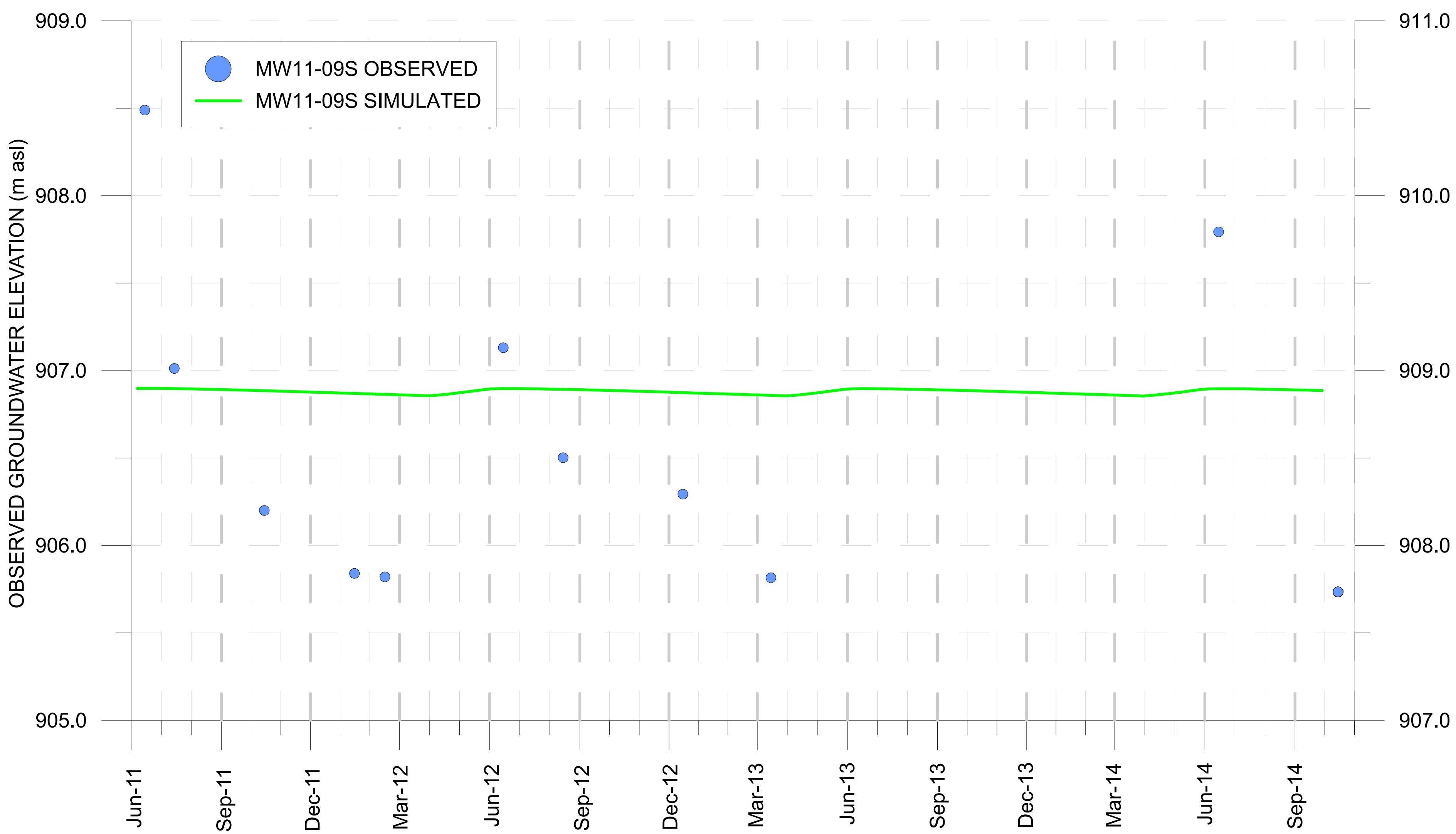
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 1.3m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-09D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-43

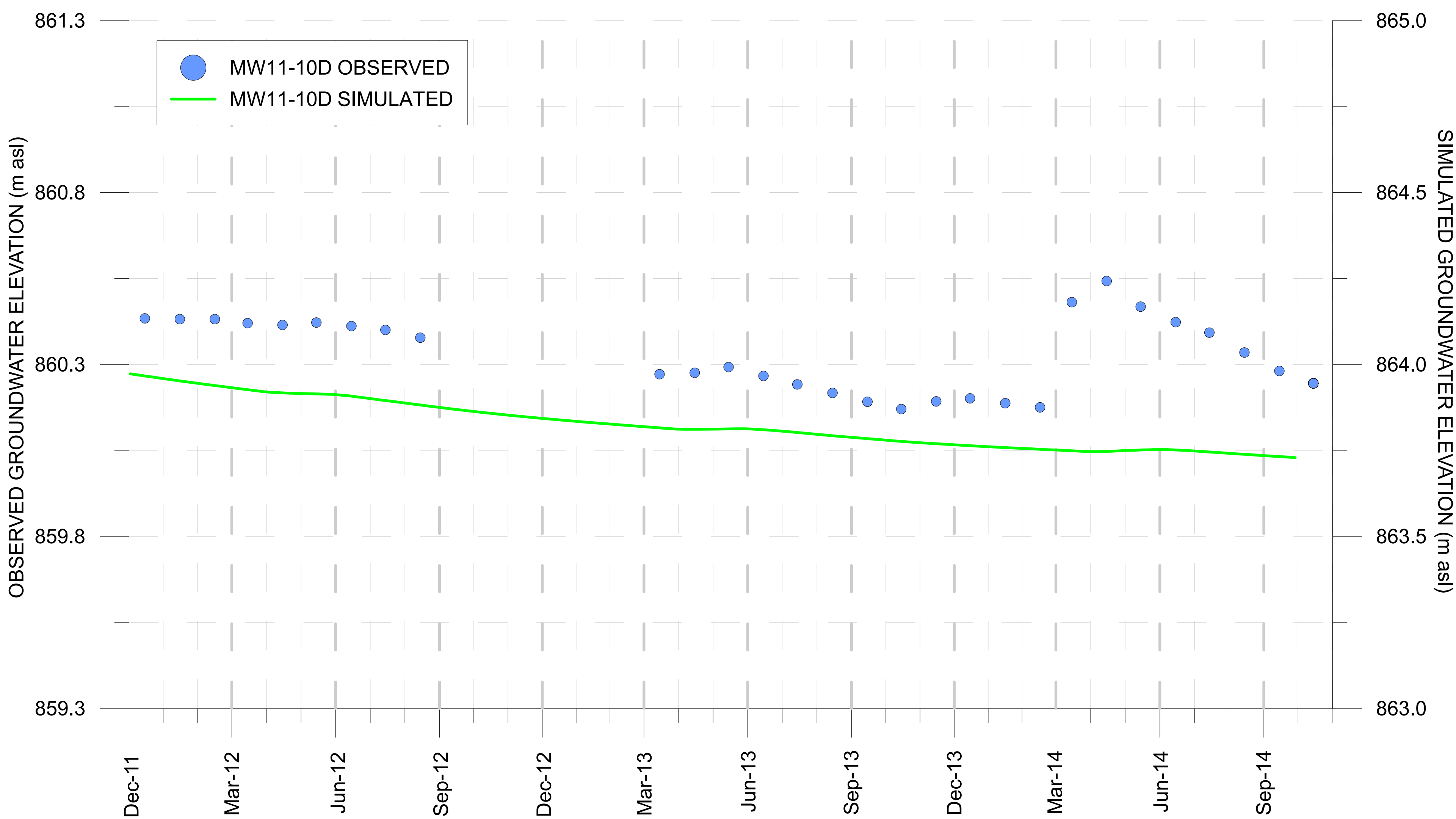
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 2m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-09S: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-44

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix A - Transient Model Calibration Hydrographs\grapher



NOTES:
OBSERVED AND SIMULATED VERTICAL AXIS OFFSET IS 3.7m.

SCALE: NA	DRAWN: TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: MW11-10D: OBSERVED VS SIMULATED GROUNDWATER HYDROGRAPH
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: A-45

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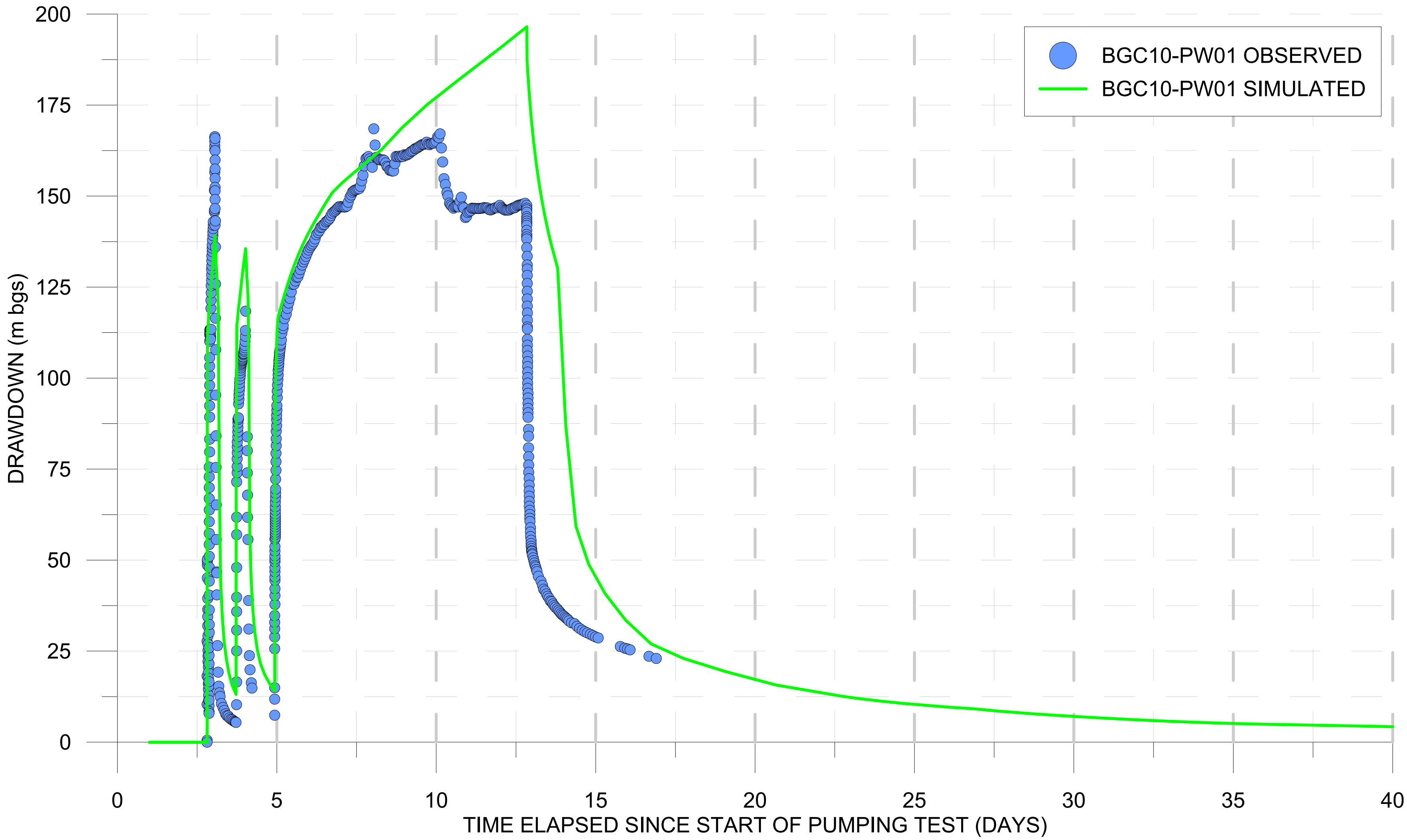
APPENDIX B
PUMPING TEST CALIBRATION RESULTS



NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-PW01: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-1

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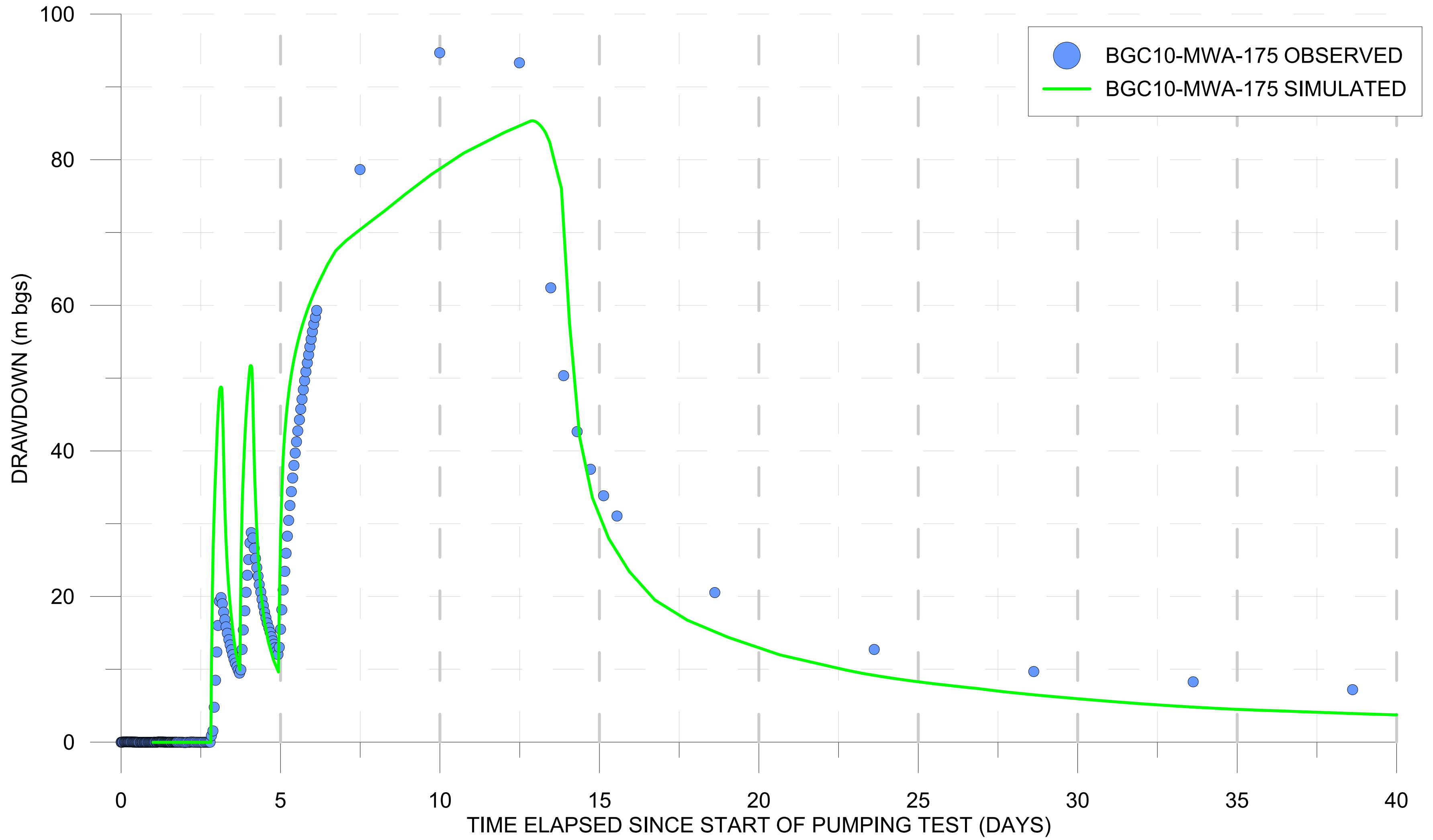

NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWA-175: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-2

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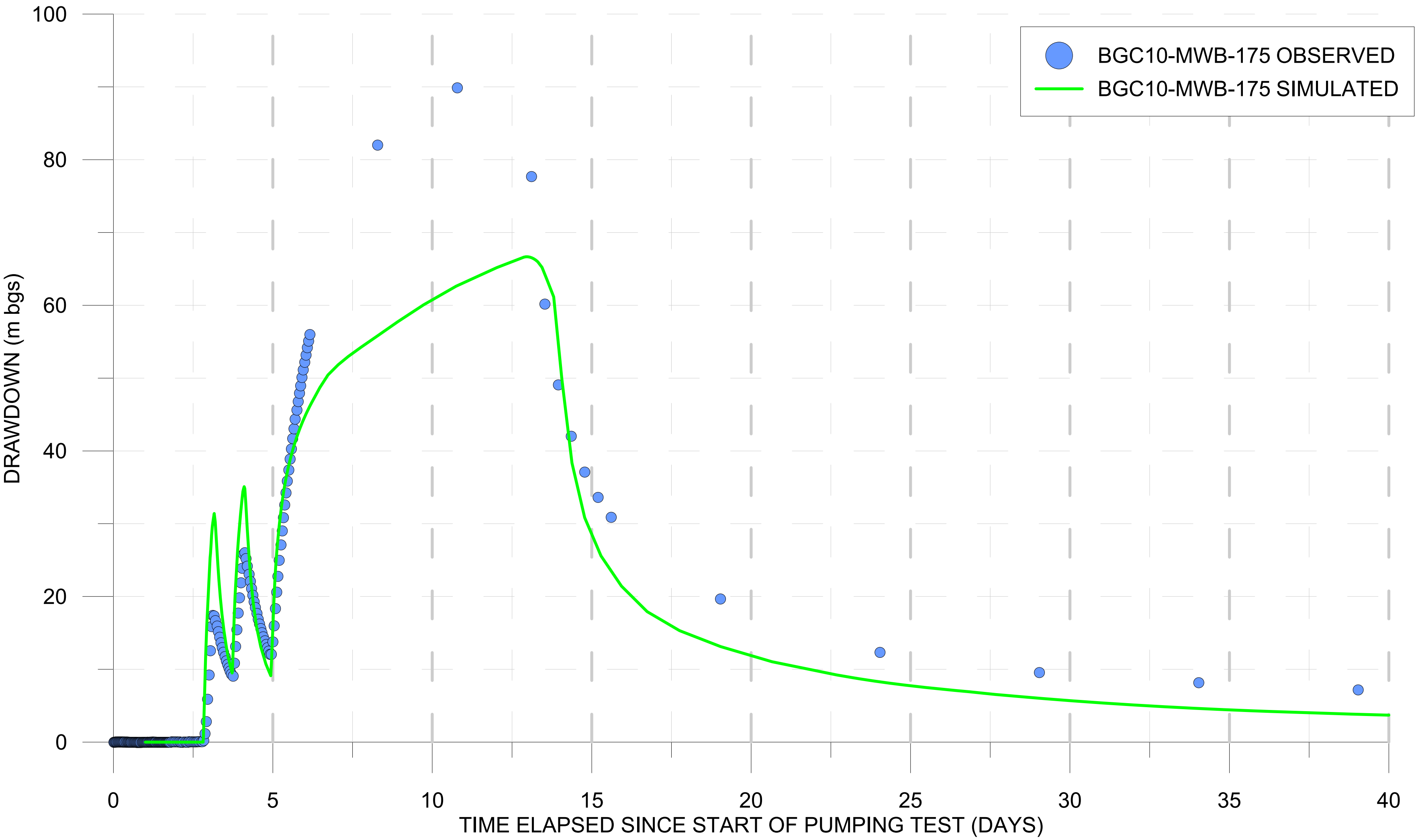

NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWB-175: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN	FIG No.: B-3
PROJECT No.: 1125007-04	APPROVED: TWC			

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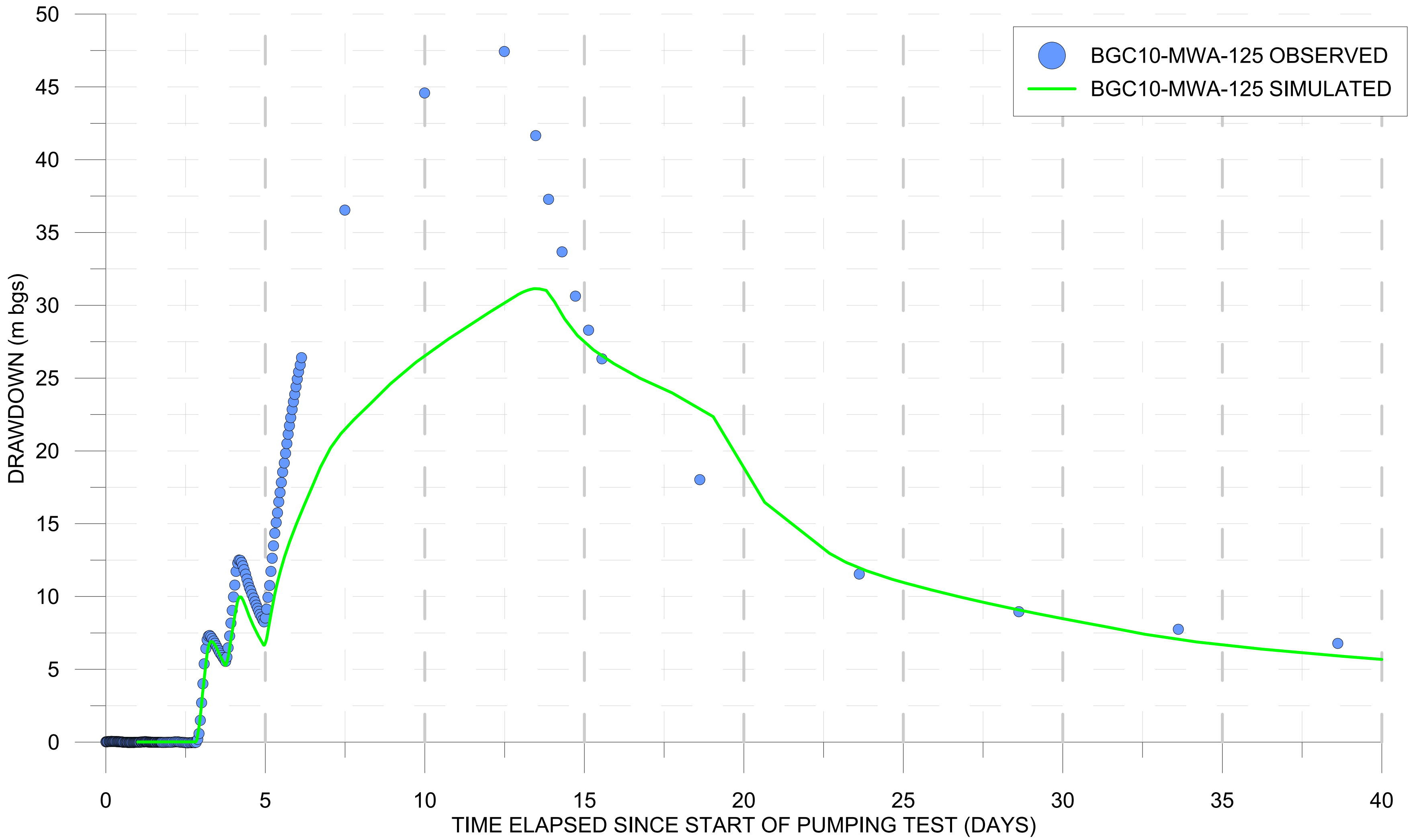

NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWA-125: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-4

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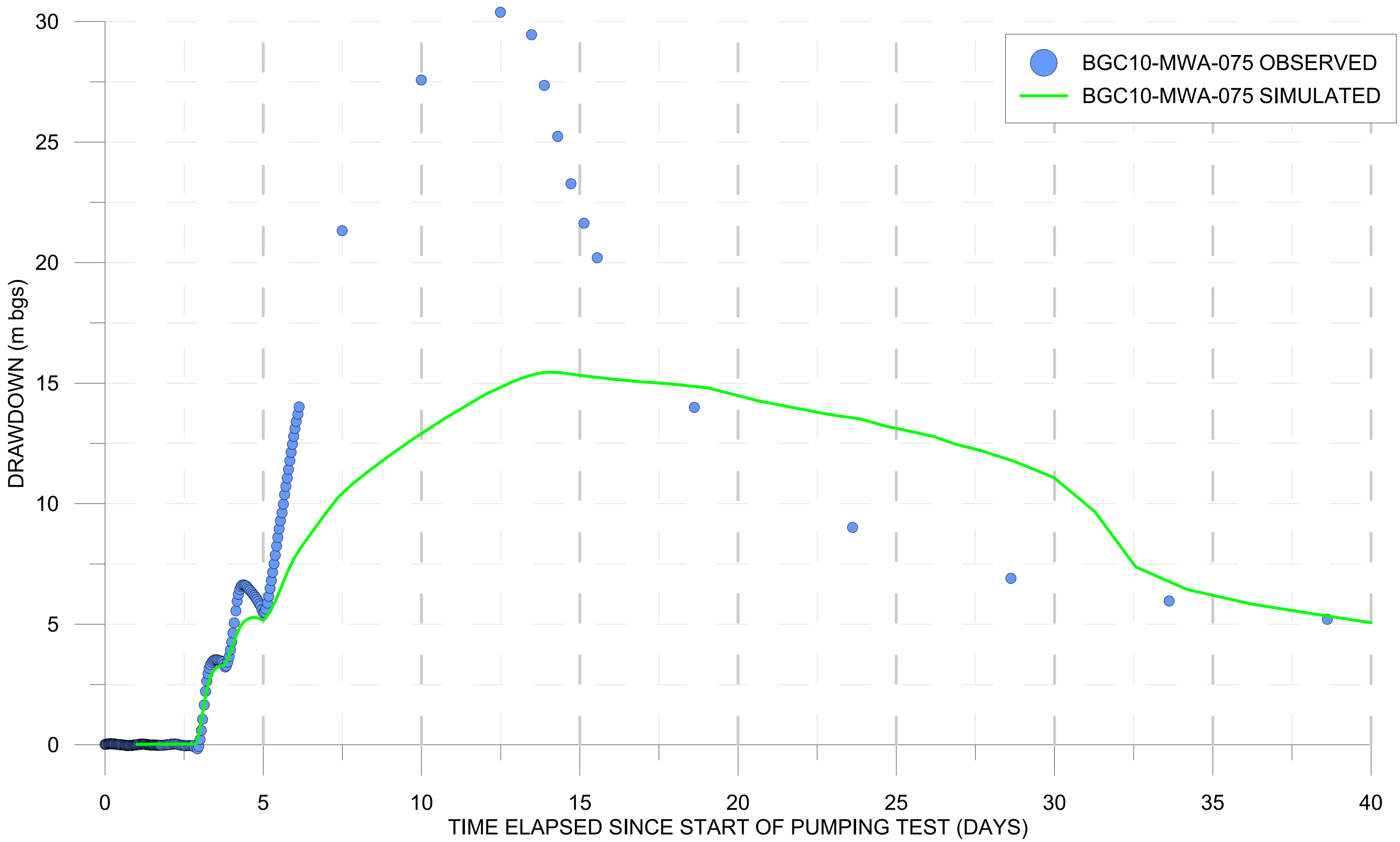

NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWA-075: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN	FIG No.: B-5
PROJECT No.: 1125007-04	APPROVED: TWC			

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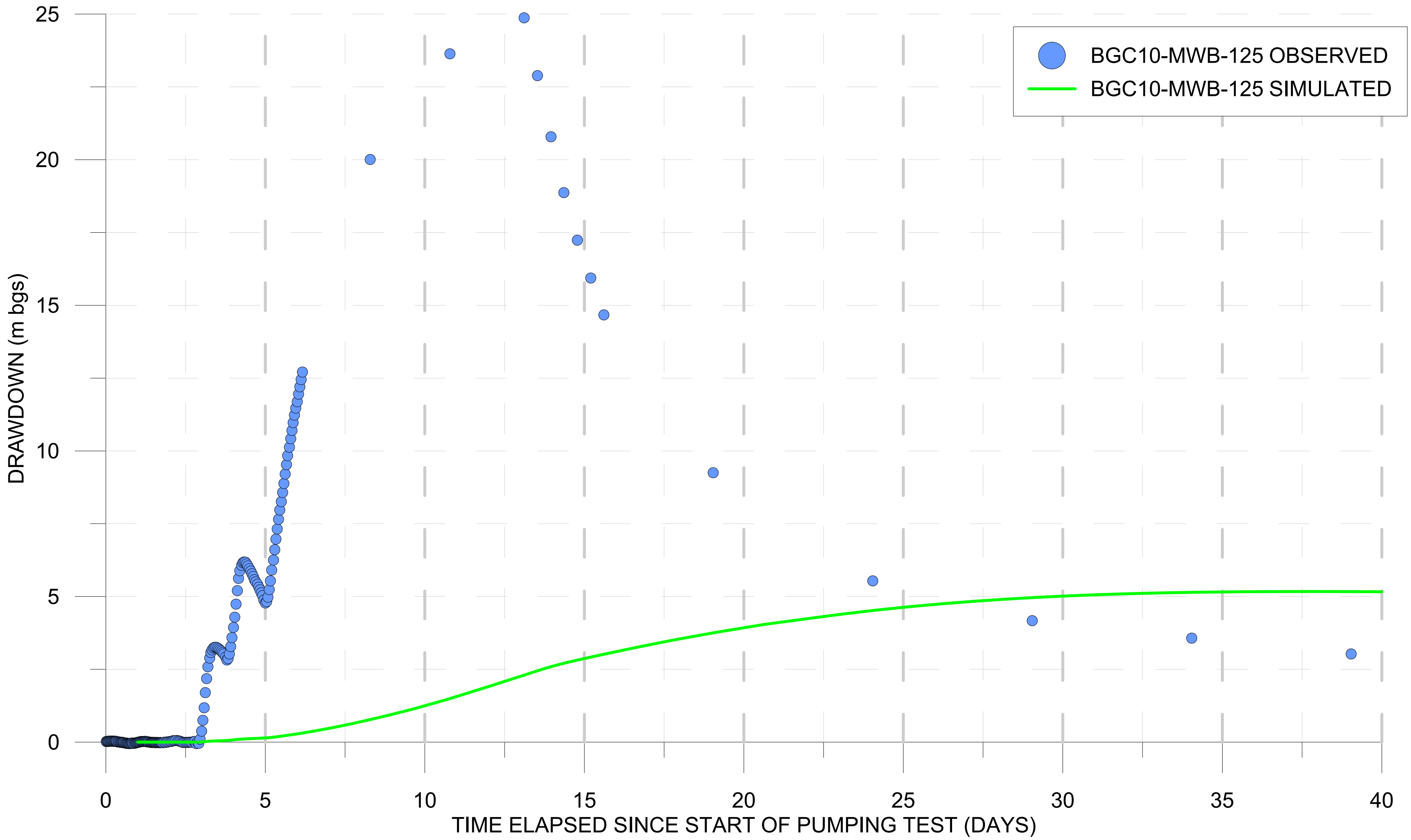
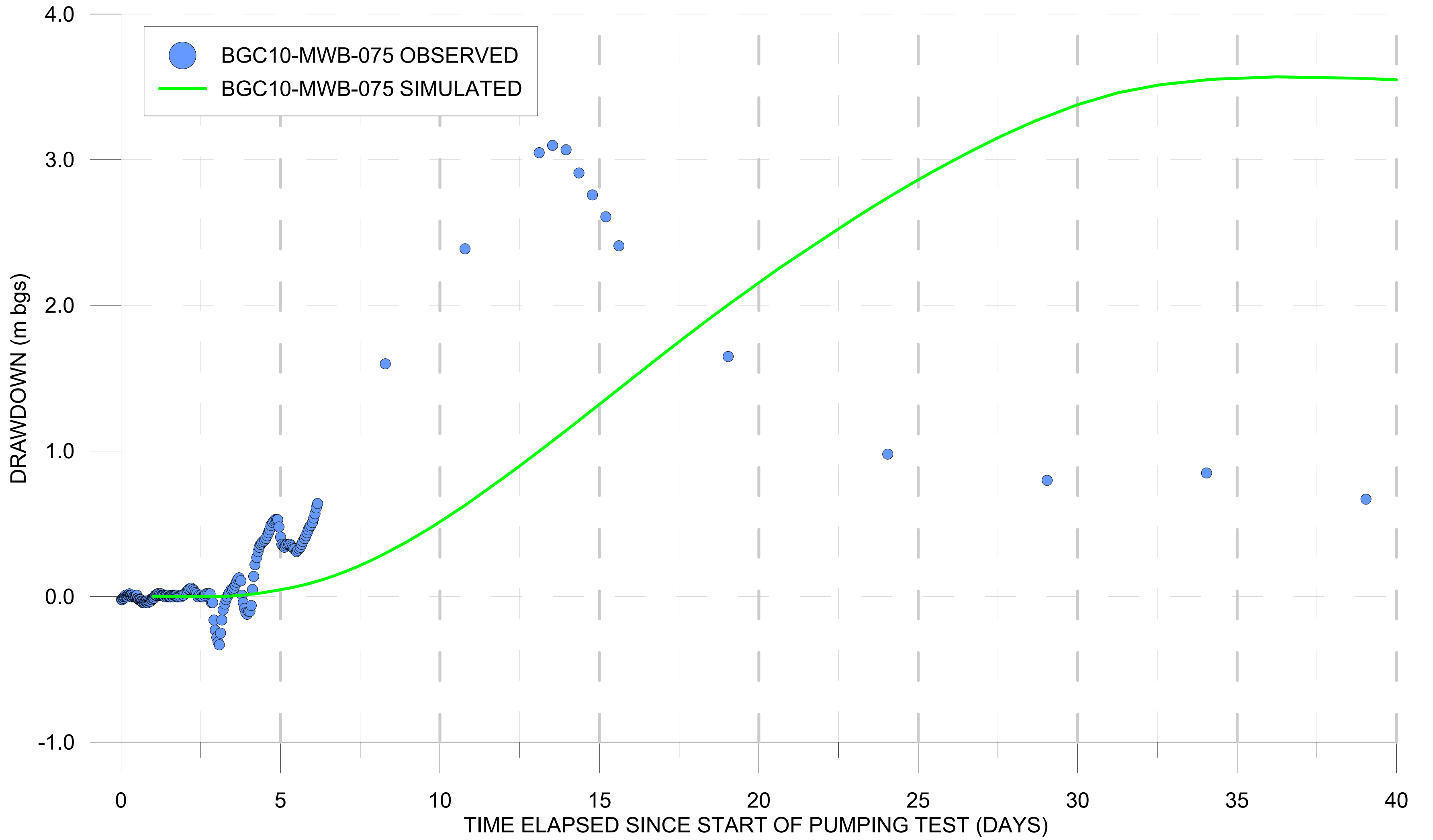


NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWB-125: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-6

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix B - Pumping Test Calibration Results\grapher



NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: BGC10-MWB-075: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-7

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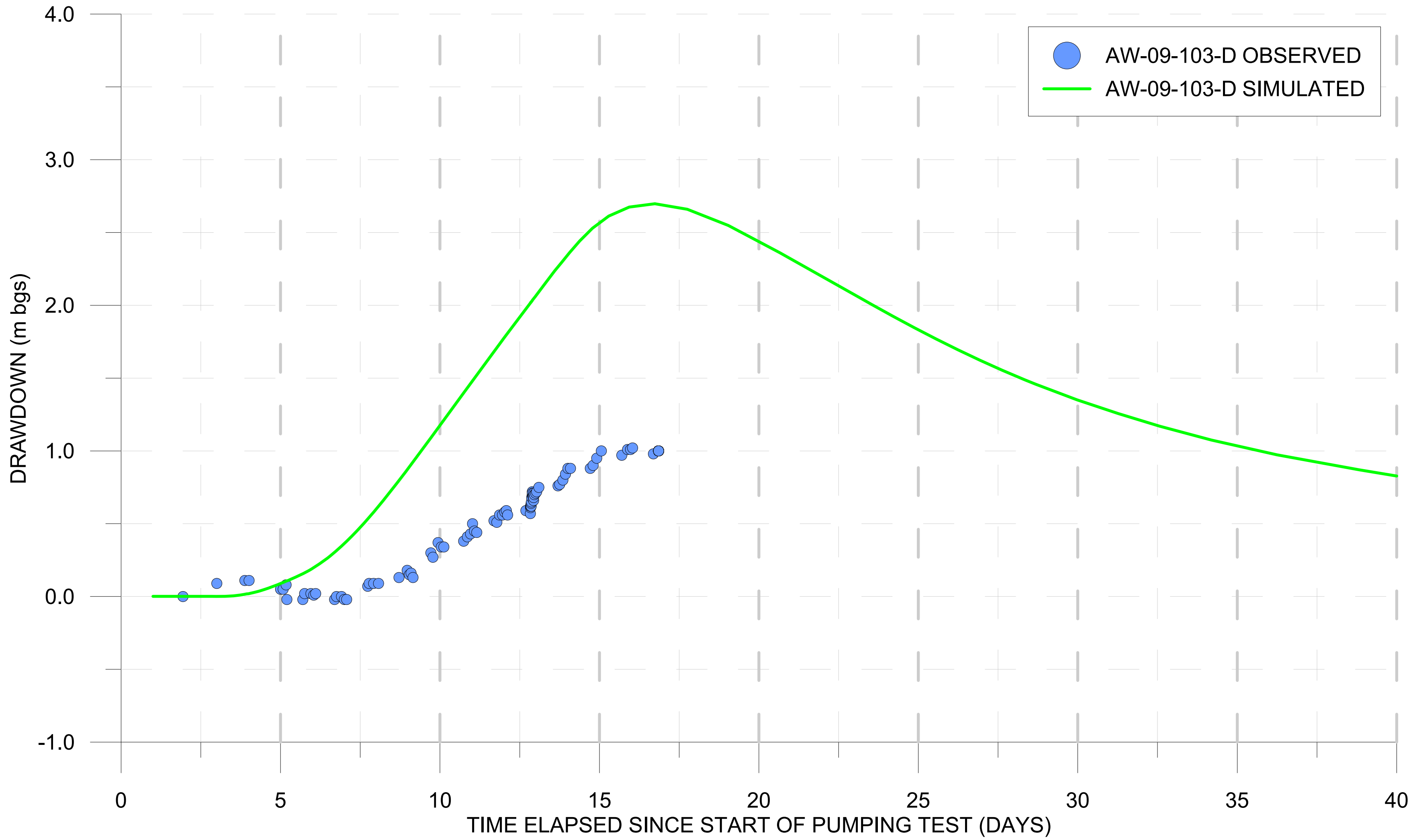

NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AW-09-103-D: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN	FIG No.: B-8
PROJECT No.: 1125007-04	APPROVED: TWC			

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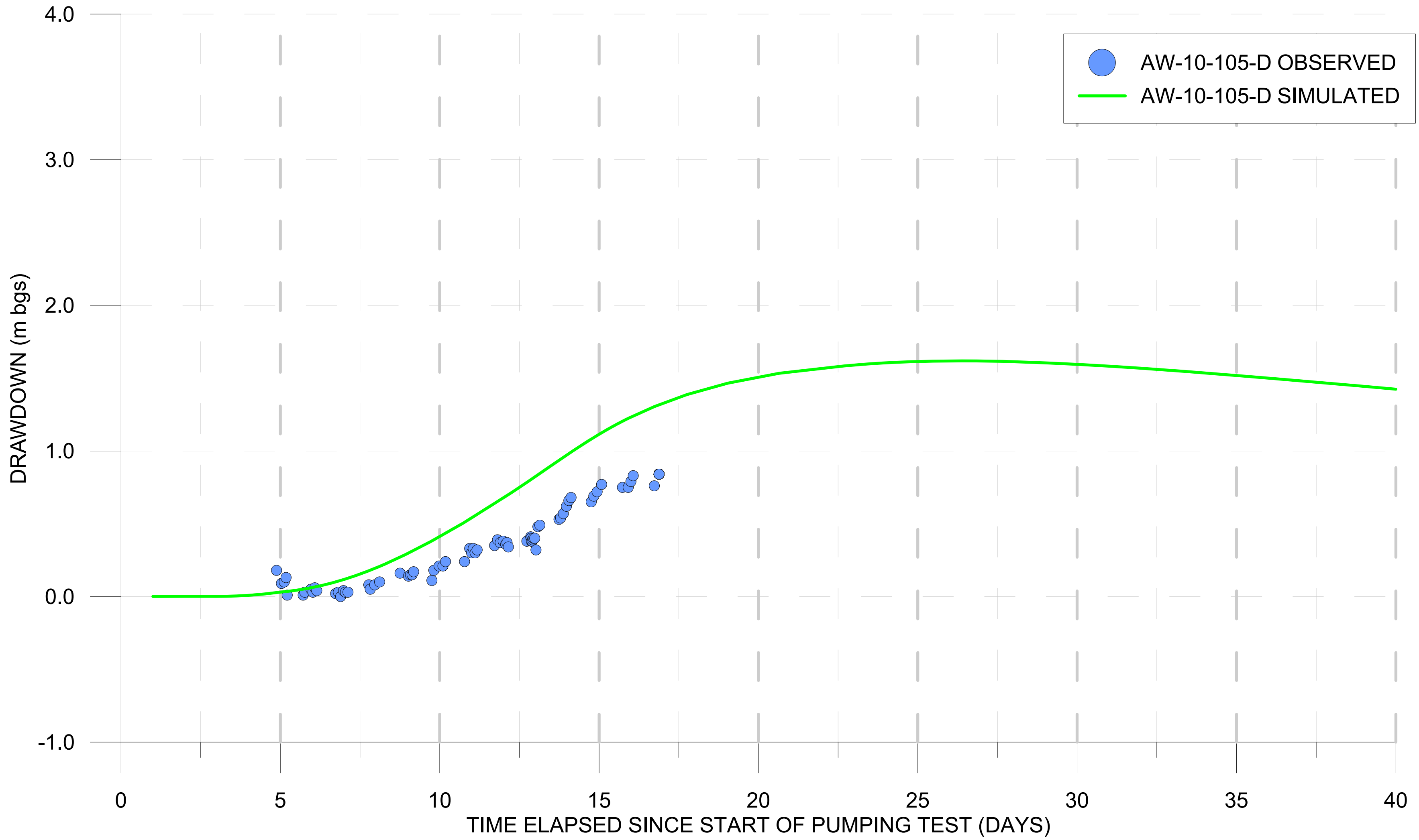

NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AW-10-105-D: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-9

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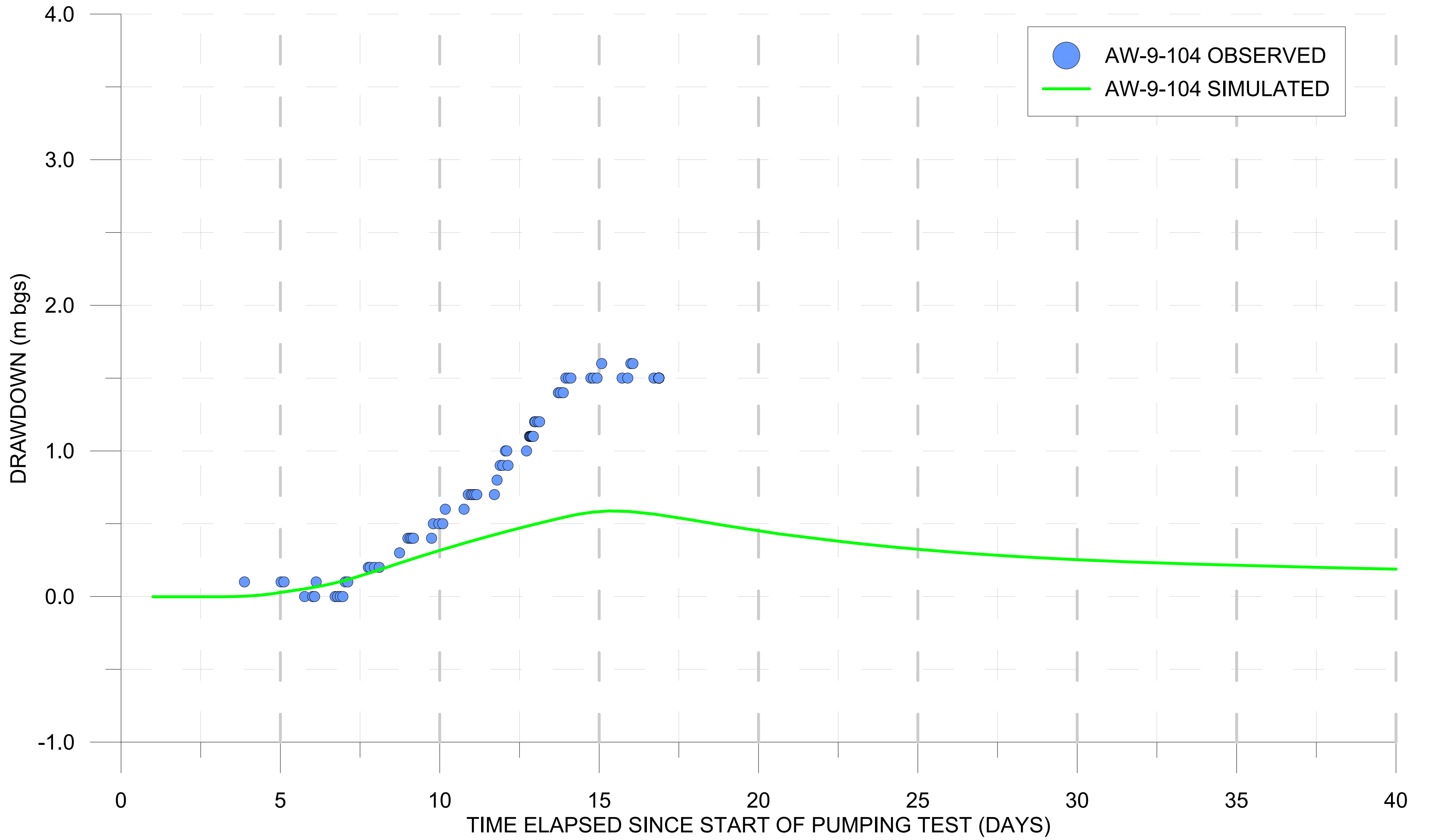

NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AW-9-104: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-10

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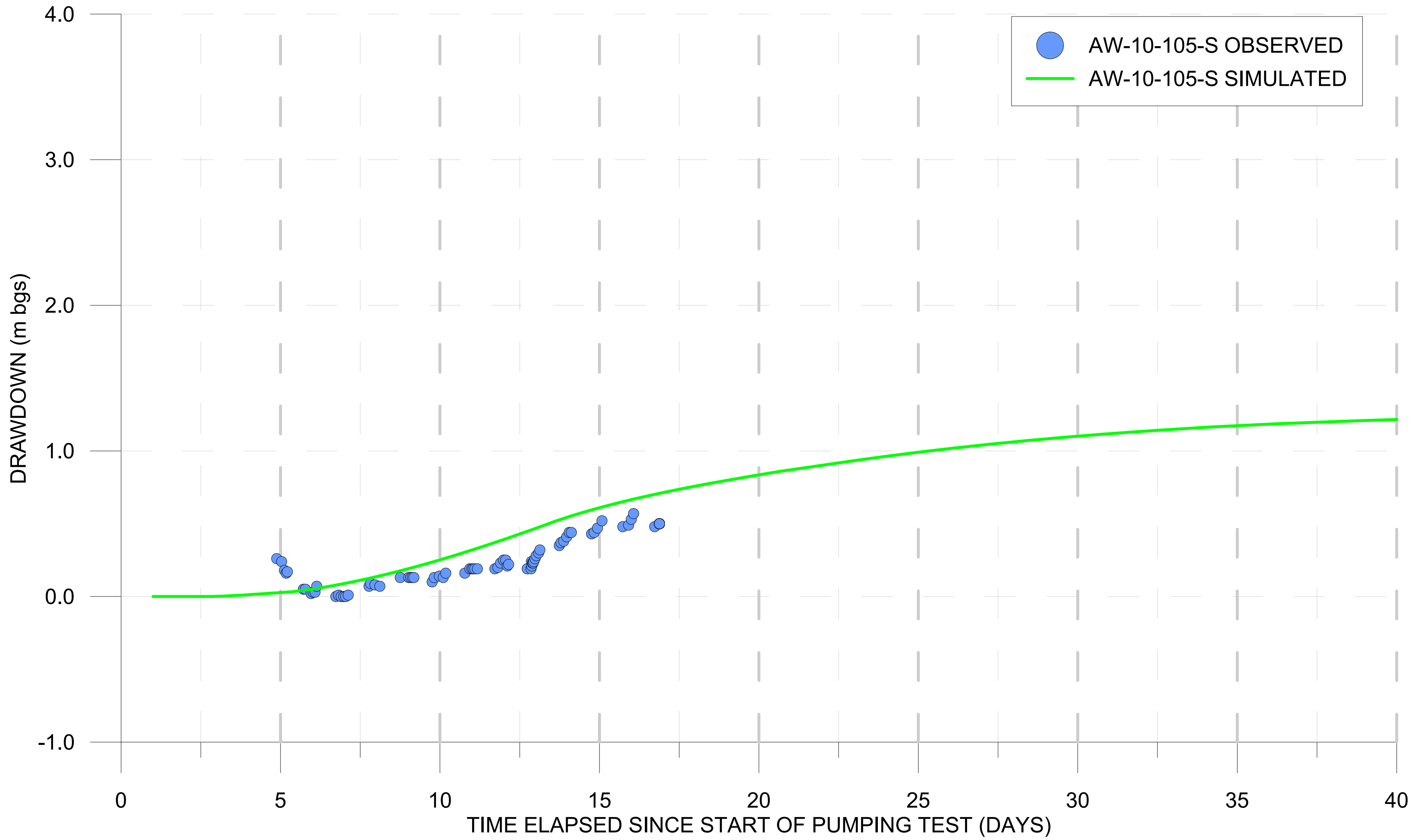
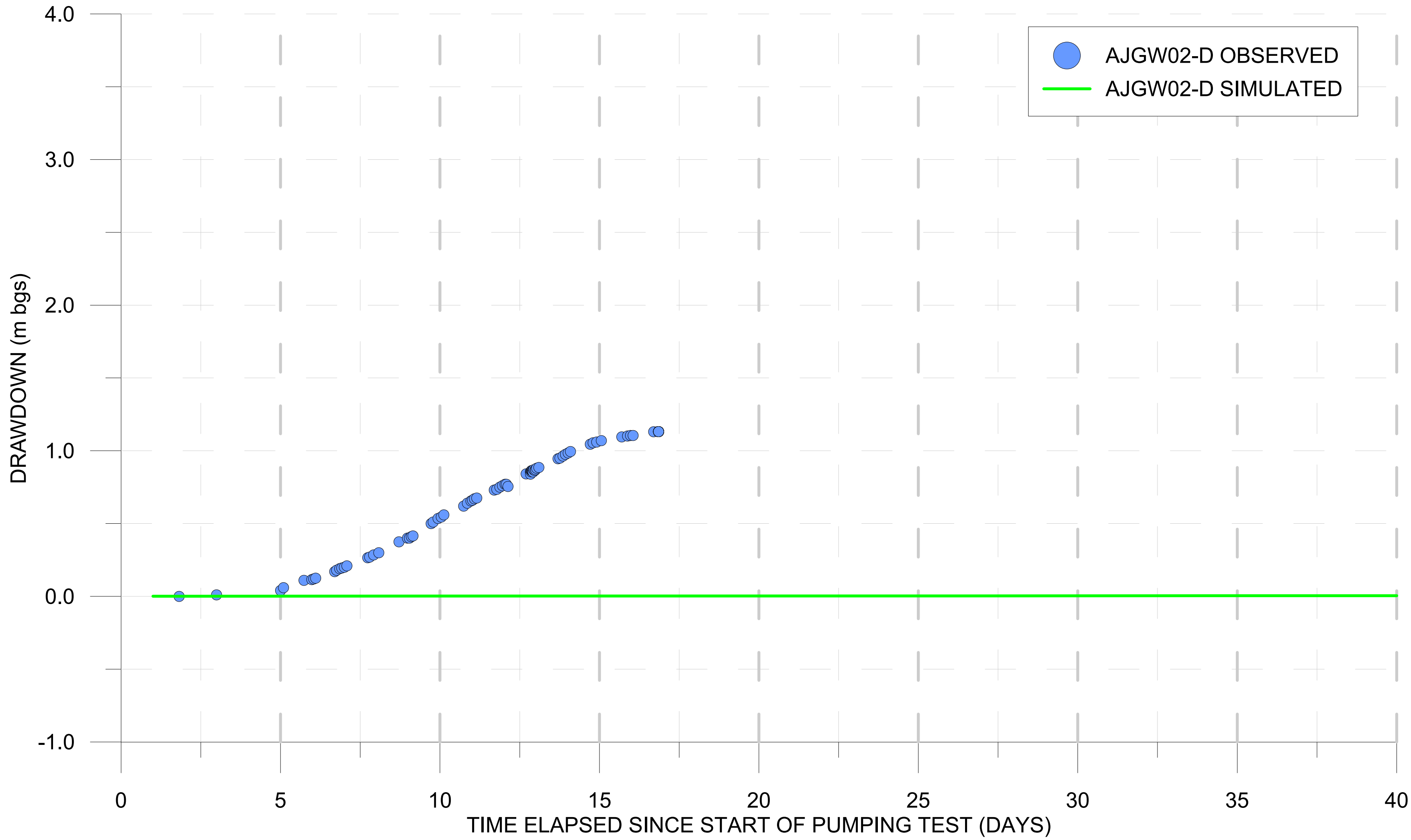


NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AW-10-105-S: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-11

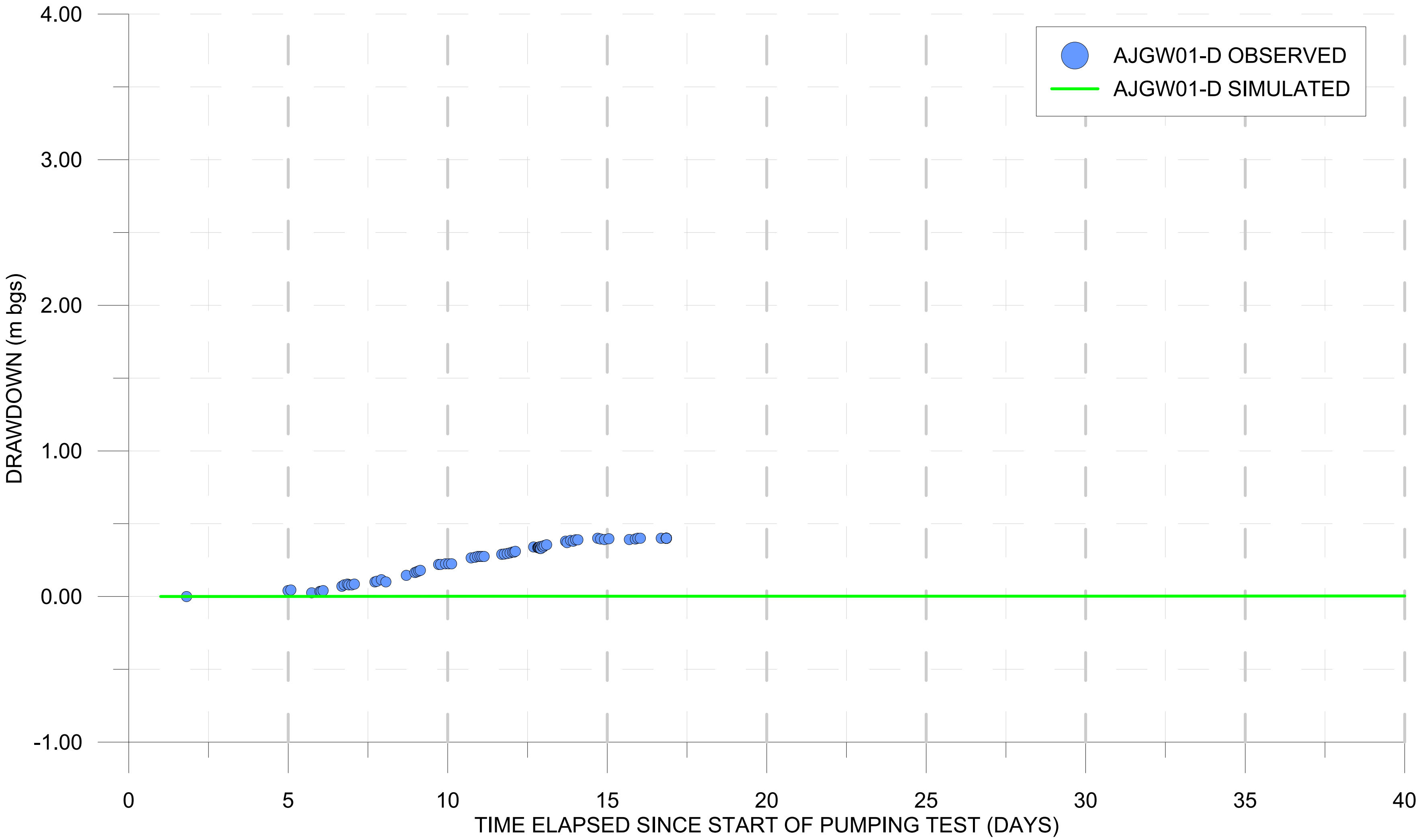
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix B - Pumping Test Calibration Results\grapher



NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW02-D: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-12

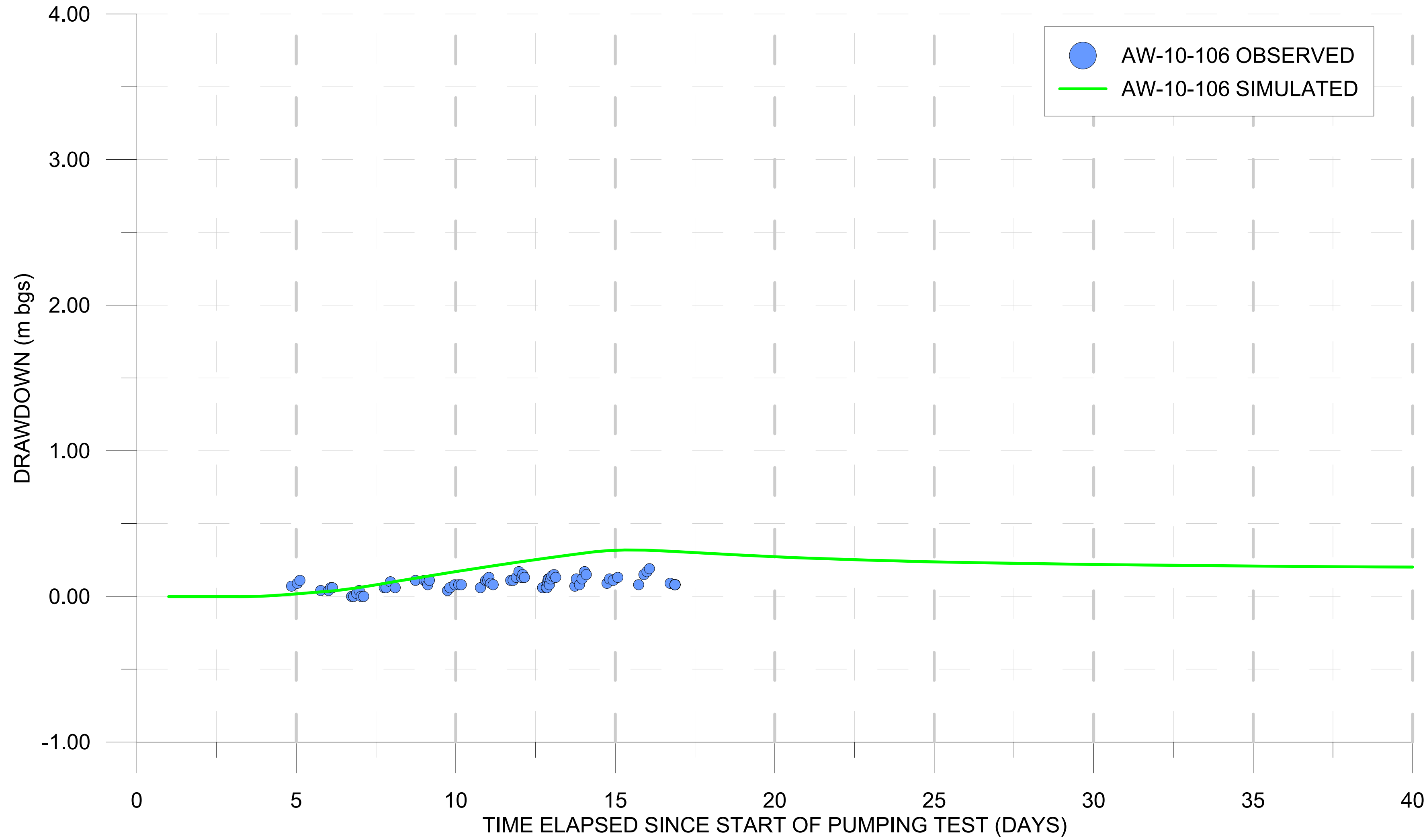
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix B - Pumping Test Calibration Results\grapher



NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW01-D: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-13

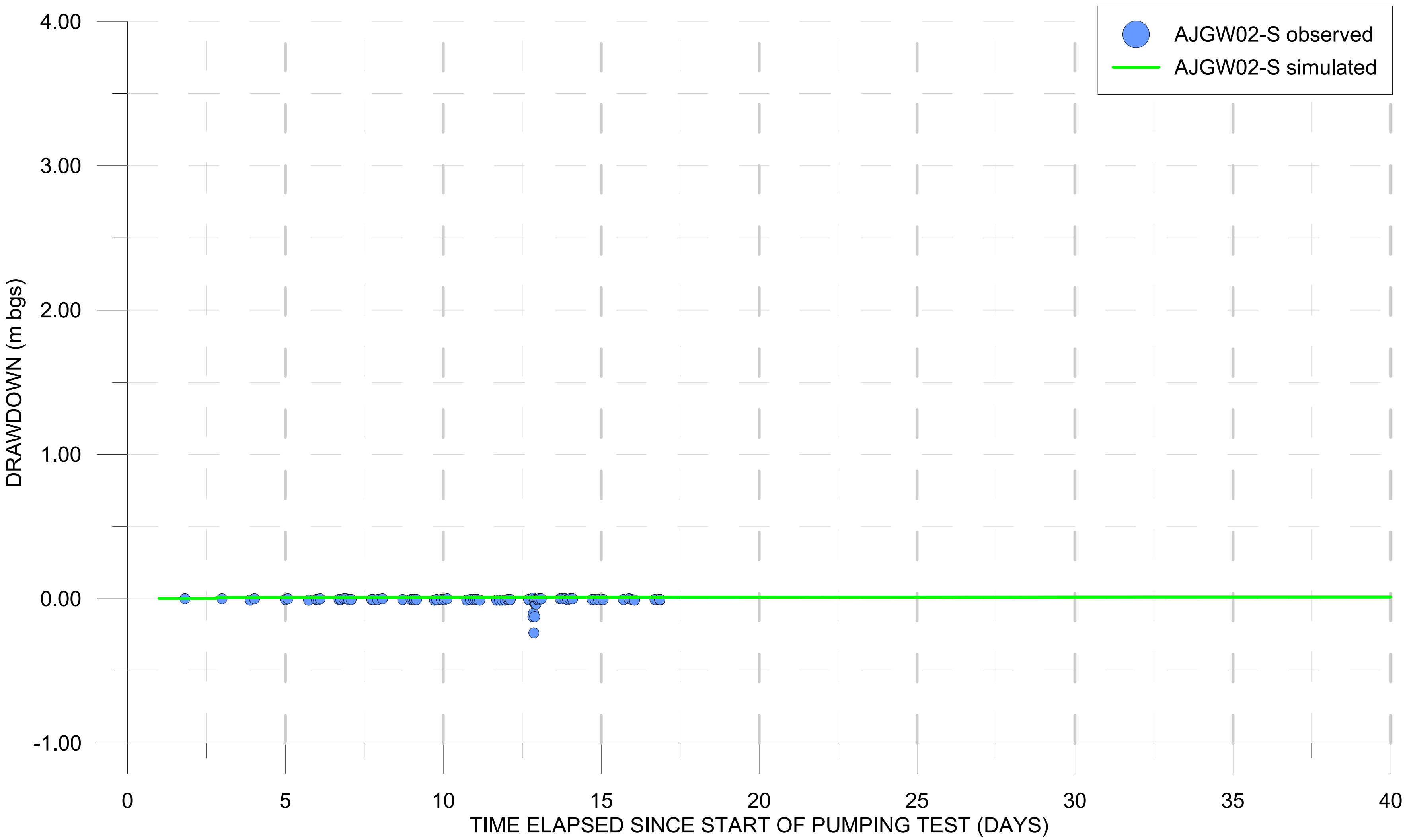
N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix B - Pumping Test Calibration Results\grapher



NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AW-10-106: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-14

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix B - Pumping Test Calibration Results\grapher



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NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW02-S: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-15

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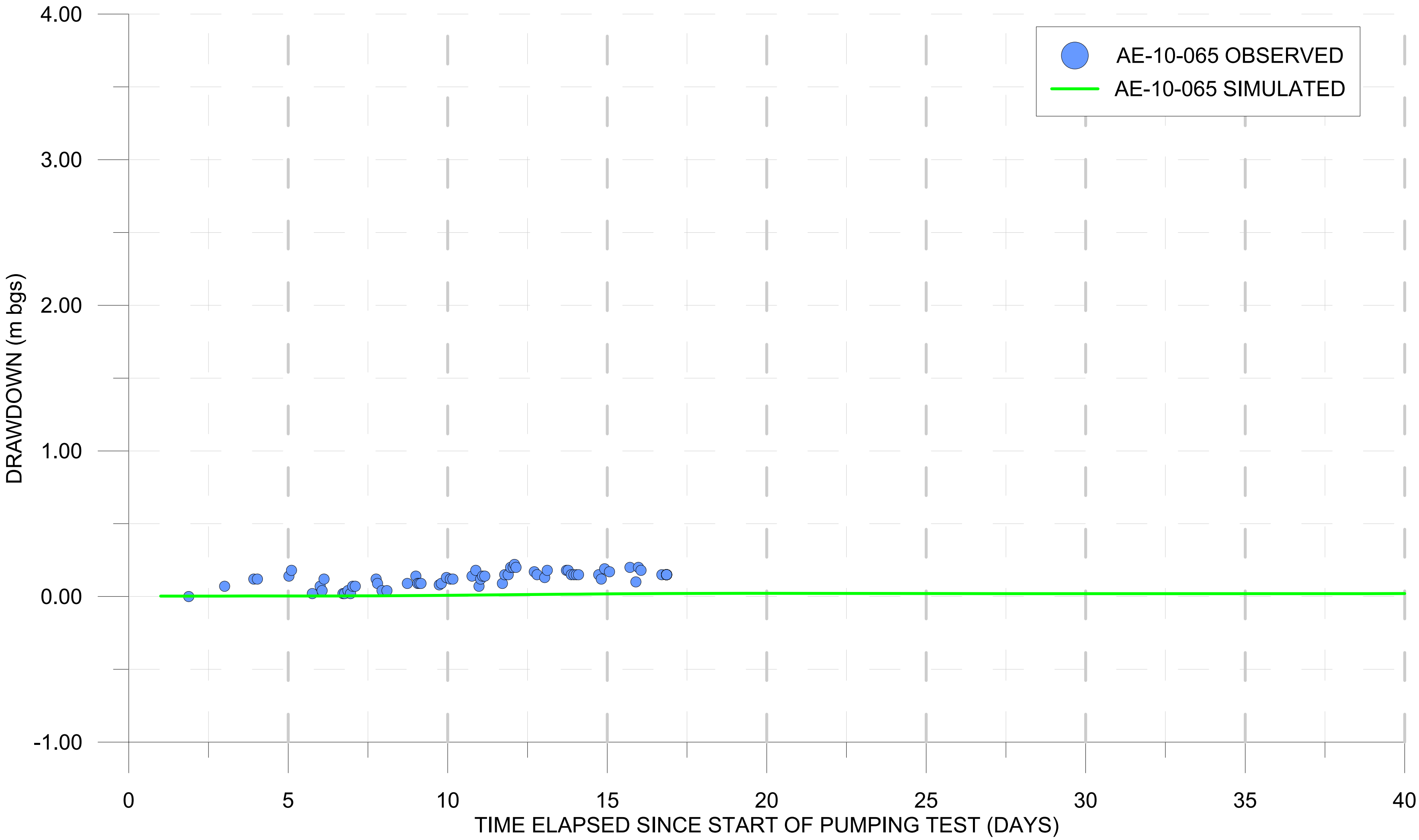

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NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AE-10-065: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-16

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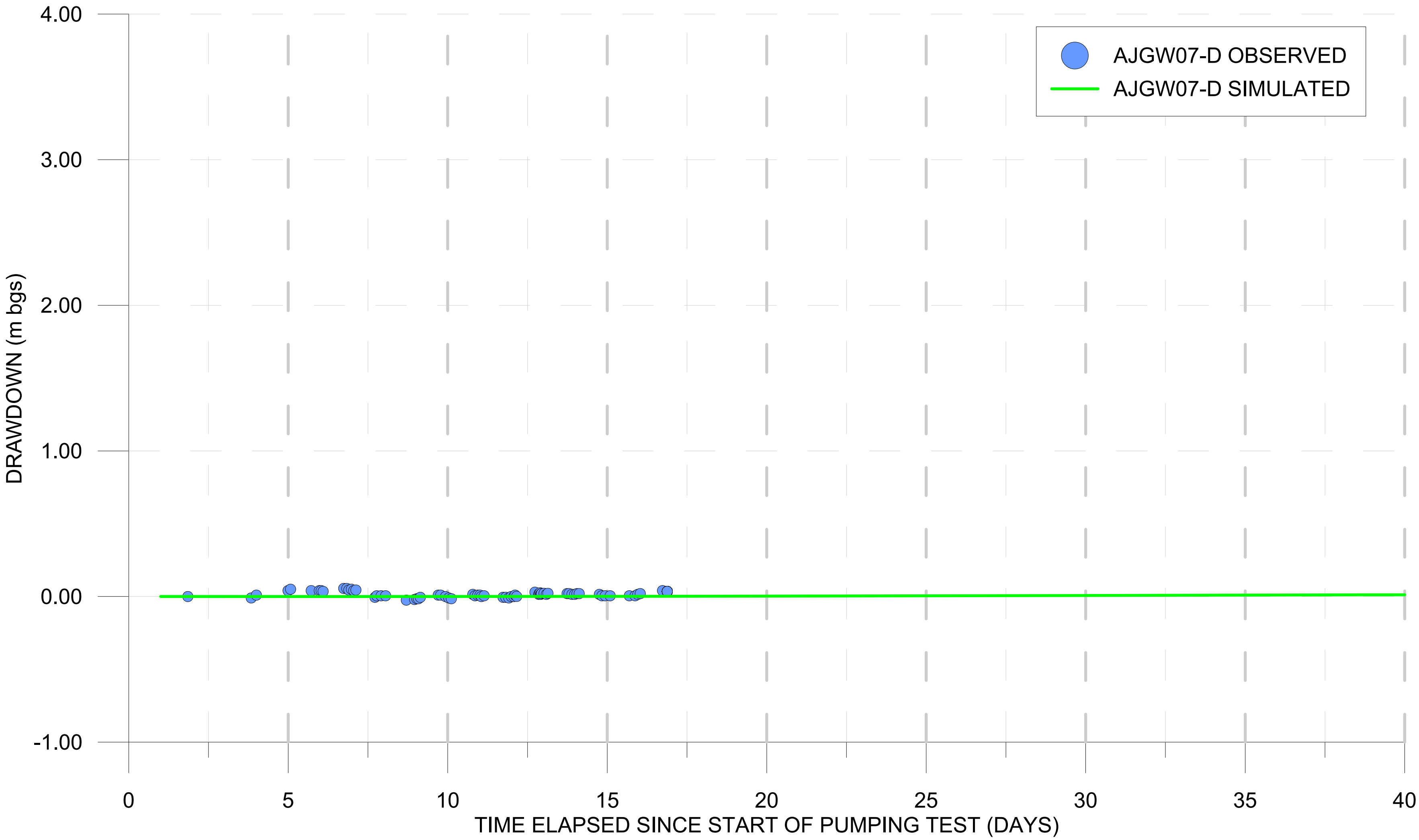

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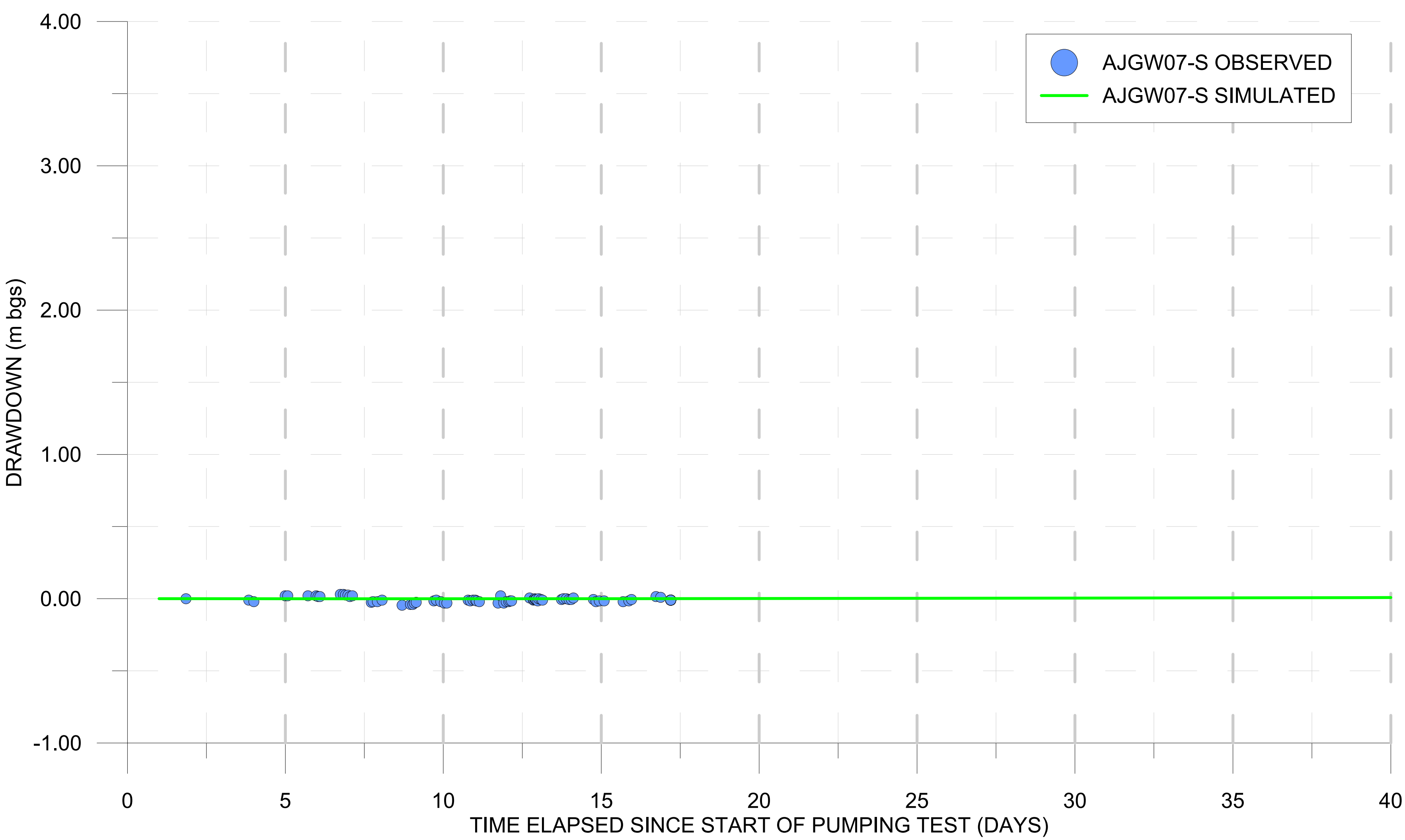
NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW07-D: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-17

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix B - Pumping Test Calibration Results\grapher



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NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW07-S: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-18

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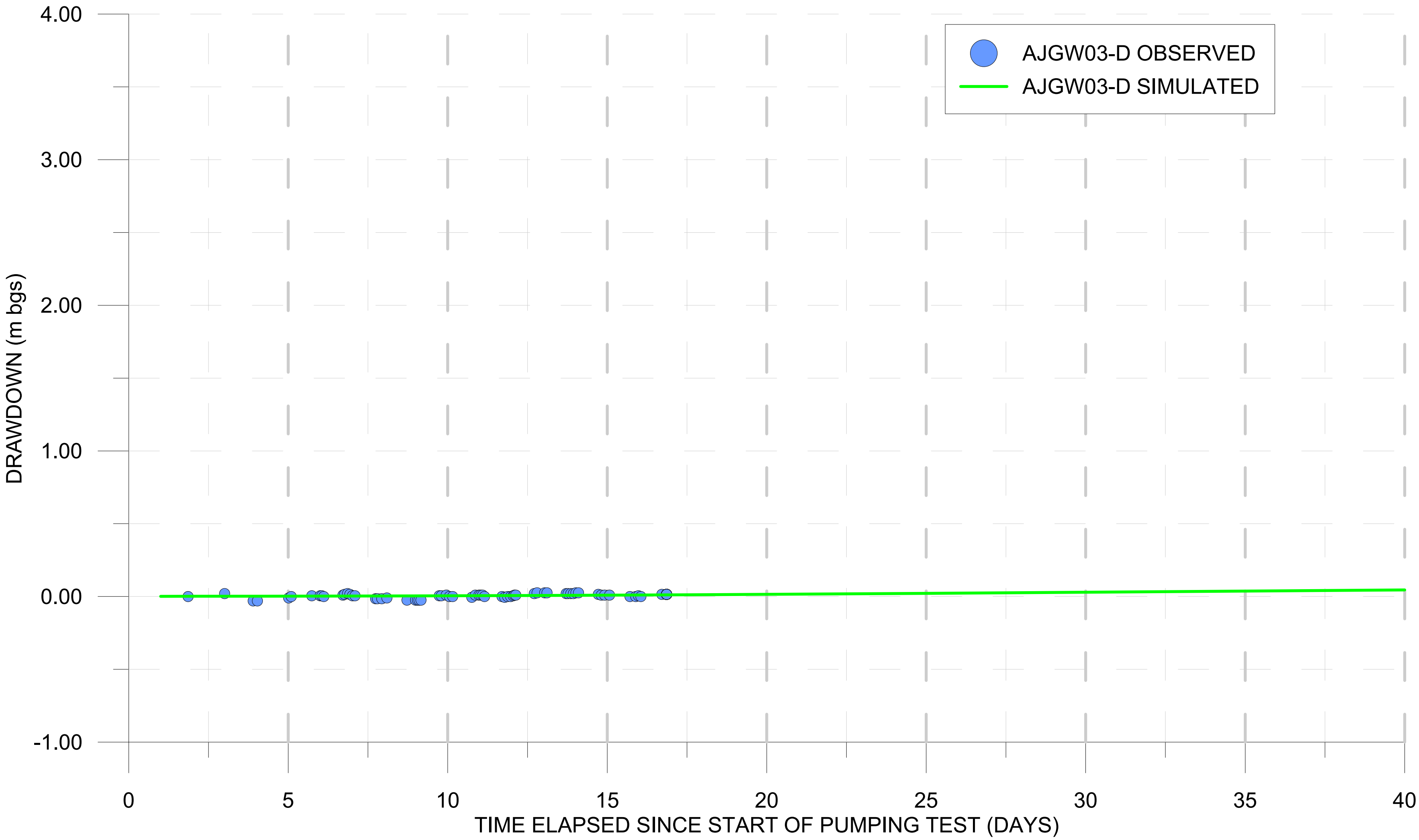
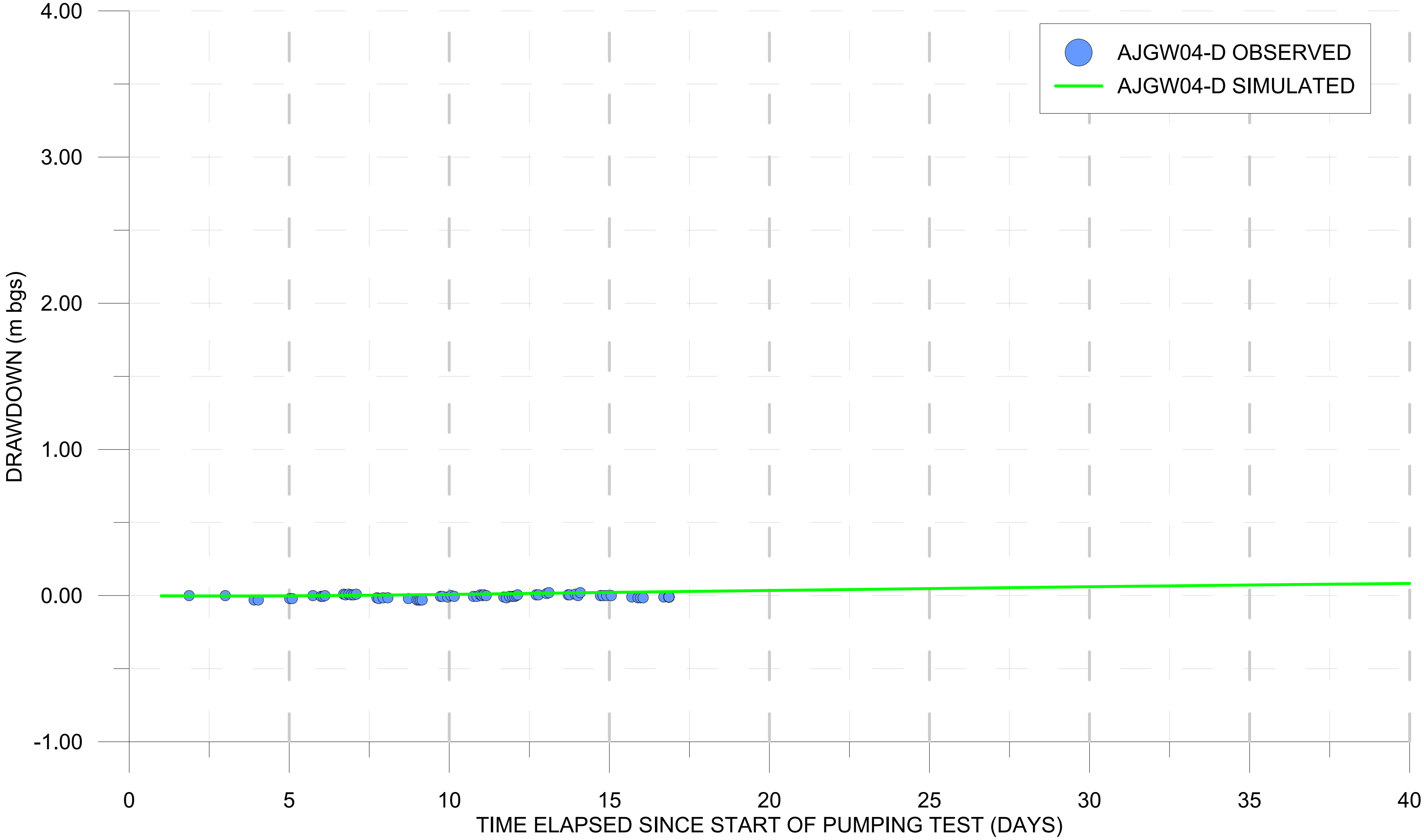


NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW03-D: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-19

N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix B - Pumping Test Calibration Results\grapher



NOTES: 1. DATA FROM: BGC (2011a), AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST, REPORT PREPARED BY BGC ENGINEERING INC. FOR ABACUS MINING AND EXPLORATION CORPORATION, DATED SEPTEMBER 10, 2011, DOC. NO.:0712-003-M01-2011

NA	TCC	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: AJGW04-D: OBSERVED VS SIMULATED PUMPING TEST DRAWDOWN
PROJECT No.: 1125007-04	APPROVED: TWC		FIG No.: B-20

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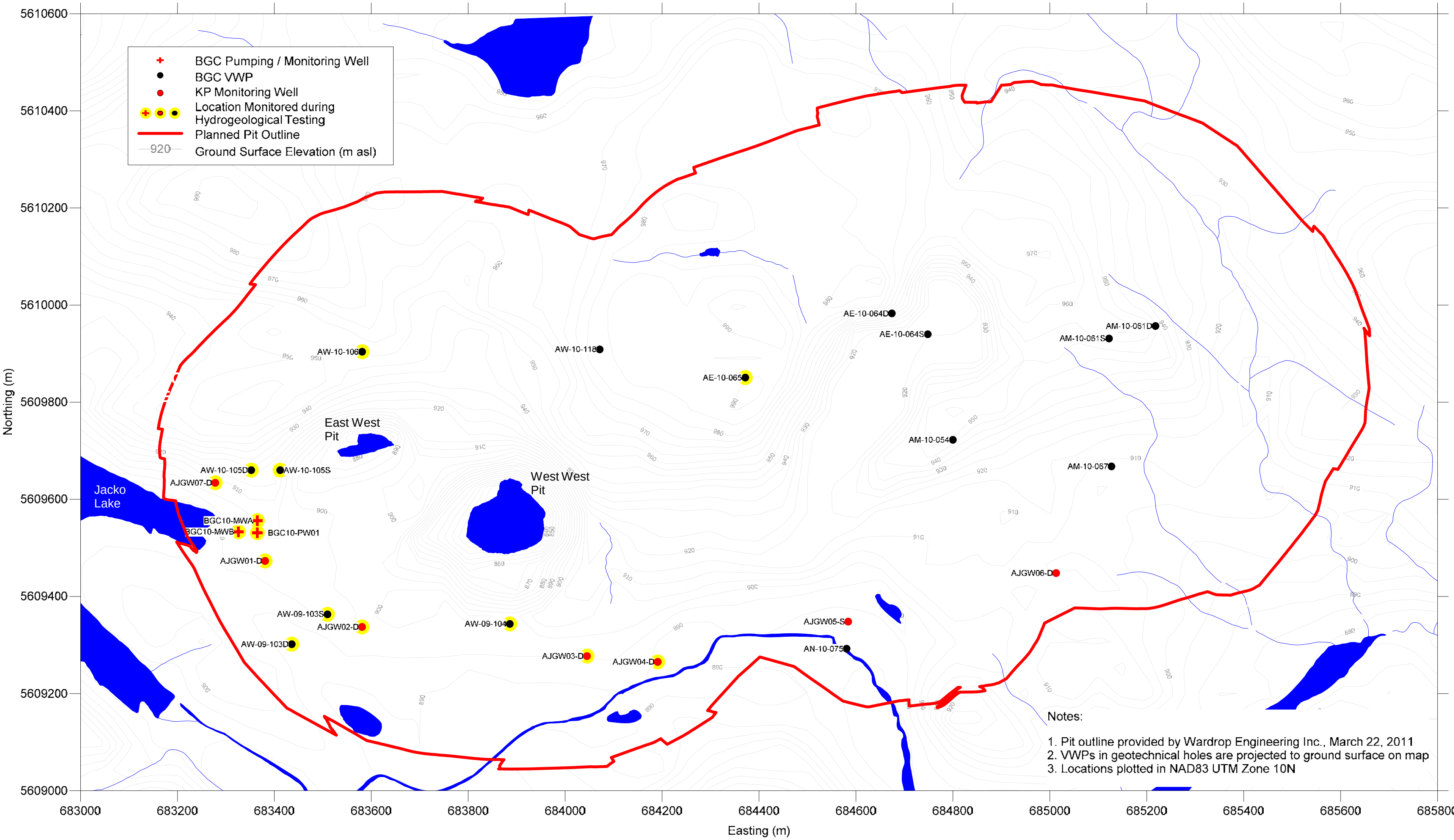


Notes:

1. Pit outline provided by Wardrop Engineering Inc., March 22, 2011
2. VWPs in geotechnical holes are projected to ground surface on map
3. Locations plotted in NAD83 UTM Zone 10N

N:\BGC\Projects\0712 Abacus\003 AJAX FS\Hydrogeology\03 Pumping Test Program\03 Report\03 Figures\0712003_PTEST_LOCATION.srf

SCALE: AS SHOWN	DESIGNED: CK	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT FEASIBILITY STUDY PROTOTYPE DEWATERING WELL AND PUMPING TEST
DATE: APRIL 2011	CHECKED: TWC		TITLE: LOCATION OF PUMPING WELL AND MONITORING NETWORK
DRAWN: CK	APPROVED: TWC	CLIENT: ABACUS MINING AND EXPLORATION CORP.	PROJECT No. 0712-003-03 / FIG No. 01 / REV. 0

FIG. TO BE READ WITH BGC MEMO TITLED "AJAX PROJECT FEASIBILITY STUDY - PROTOTYPE DEWATERING WELL AND PUMPING TEST" DATED APRIL 2011

APPENDIX C
SEEPAGE POND GEOMEMBRANE LEAKAGE CALCULATION

Appendix C - Seepage Pond Geomembrane Leakage Calculation

The Giruoud (1997) Equation :

$$q = \beta_c \left[1 + 0.1 \left(\frac{h_w}{L_s} \right)^{0.95} \right] a_d^{\ 0.1} h_w^{\ 0.9} K_s^{\ 0.74}$$

q =	leakage through a circular defect in composite liner (m^3/sec)
β_c =	coefficient relating to liner contact (0.21 for good and 1.15 for poor)
h_w =	depth of water above the geomembrane (m)
L_s =	thickness of soil liner (m)
a_d =	area of defect (m^2)
K_s =	saturated hydraulic conductivity of soil liner (m/s)

Beta	0.21	Assuming a good liner
hw (m)	4	EMRSF Average head
L_s (m)	1	Till Thickness
ad (m^2)	0.0001	1 cm^2 average defect size
K_s (m/s)	5.0E-07	Average Compacted Till Hydraulic Conductivity (K)
Q (m^3/s)	8.7E-06	Volumetric Discharge
Defect per Acre	1	
Defect per m^2	2.47E-04	
q (m/s)	2.1E-09	Noramalized Seepage Rate
River conductance (m^3/s)	5.37E-06	
River conductance (m^3/d)	0.46	

Notes:

1. Ponds providing net groundwater inflows are assumed to be lined with a smooth high density polyethylene (HDPE) geomembrane.
2. Ponds providing net groundwater inflows have been identified as: EMRSF Pond, Central Collection Pond, North Embankment Pond 1, and North Embankment Pond 2.
3. Ponds providing net groundwater inflows were represented with the river (RIV) boundary package with hydraulic head set to the average grid cell elevation and the river bed elevation 1.0 m below the hydraulic head.
4. The effective hydraulic conductivity for the geomembranes was set to coincide with the maximum normalized seepage rate calculated to be 2.1×10^{-9} m/s.
5. The river boundary conductance calculated for the model was based on a 50 x 50 m grid cell.

Reference:

Giroud, J.P, M.V. Khire, and K.L. Soderman, 1997, Liquid Migration Through Defects in a Geomembrane Overlain and Underlain by Permeable Media, Geosynthetics International, Vol. 4, Nos. 3-4, pp. 293-321.

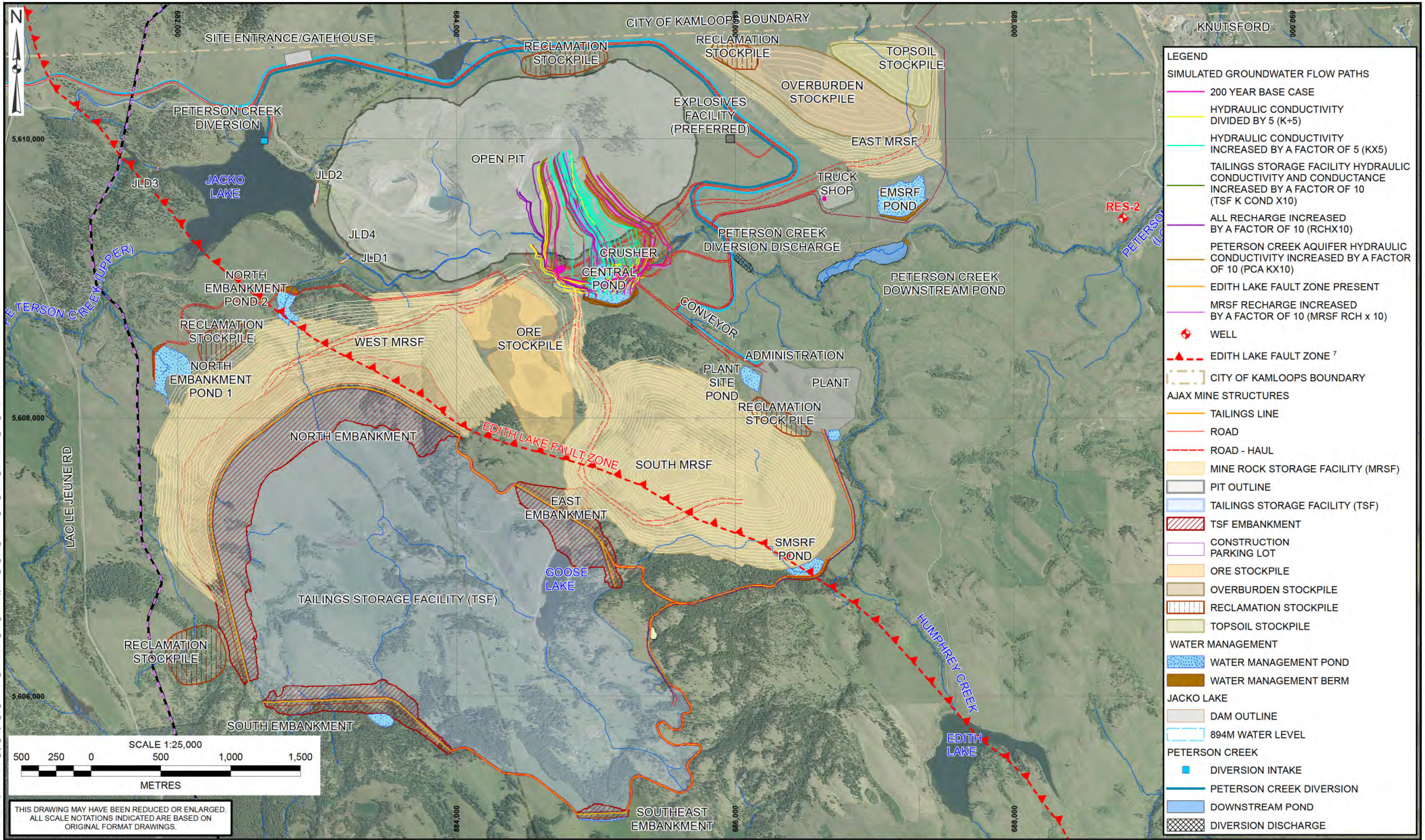
APPENDIX D
SOURCE AND RECEIVING FACILITY POST CLOSURE WATER BALANCE RESULTS

Appendix D - Source and Receiving Facility Post Closure Water Balance Results

		Fast (no delay)		Medium		Slow	
Source Facility	Receiving Facility	%	delay (yrs)	%	delay (yrs)	%	delay (yrs)
Jacko Lake	Open Pit	100	<20	0	>20 and <200	0	>200
Central Collection Pond[4]	PC03	NA	<20	NA	>20 and <200	NA	>200
	Open Pit	100	<20	0	>20 and <200	0	>200
Unnamed Lake North of Pit	Open Pit	NA	<20	NA	>20 and <200	NA	>200
Low and Medium Grade Ore Stockpile	Central Collection Pond	NA	<20	NA	>20 and <200	NA	>200
TSF	PC03	NA	<20	NA	>20 and <200	NA	>200
	Jacko Lake	NA	<20	NA	>20 and <200	NA	>200
	Central Collection Pond	NA	<20	NA	>20 and <200	NA	>200
	Open Pit	13	<20	87	>20 and <200	0	>200
WMRSF	PC03	NA	<20	NA	>20 and <200	NA	>200
	Open Pit	98	<20	2	>20 and <200	0	>200
North Embankment Seepage Pond 1	Jacko Lake	NA	<20	NA	>20 and <200	NA	>200
EMRSF	PC02.5	2	<20	14	>20 and <200	84	>200
	PC02.3	2	<20	14	>20 and <200	84	>200
	Open Pit	84	<20	10	>20 and <200	6	>200
EMRSF Pond	PC02.5	2	<20	98	>20 and <200	0	>200
	PC02.3	2	<20	98	>20 and <200	0	>200
	Open Pit	NA	<20	NA	>20 and <200	NA	>200
SMRSF	PC03	NA	<20	NA	>20 and <200	NA	>200
	PC02.5	NA	<20	NA	>20 and <200	NA	>200
	Humphrey Creek	0	<20	44	>20 and <200	56	>200
	Open Pit	NA	<20	NA	>20 and <200	NA	>200
Peterson Creek Downstream Pond	PC03	86	<20	14	>20 and <200	0	>200

Notes:
1. Seepage delays apply to Post Closure model conditions with pit lake elevation at 500 masl.
2. NA denotes "not available" or "not applicable".
3. Jacko Lake receives no seepage discharge.
4. As simulated, the Central Collection Pond is a losing water body that receives no seepage.

APPENDIX E
SENSITIVITY ANALYSES FOR CONSTRUCTION, OPERATION, DECOMMISSIONING AND CLOSURE, AND POST CLOSURE MODELS



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NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. ORTHOPHOTO PROVIDED BY KAM FROM EAGLE MAPPING AERIAL PHOTOGRAPHY DATED JUNE 26, 2006, PUBLISHED SEPTEMBER 29, 2006.
5. PROJECTION IS NAD 1983 UTM ZONE 10N.
6. HYDRAULIC CONDUCTIVITY TIMES 5 (KX5) FOR SMSRF NOT DISPLAYED.
7. LOGAN AND MIHALYNUK, 2006.
8. PARTICLE FLOW LINES ARE FROM CLOSURE CONDITION GROUNDWATER MODEL SIMULATIONS WITH OPEN PIT LAKE LEVEL OF 500 MASL.
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AN APPLIED EARTH SCIENCES COMPANY

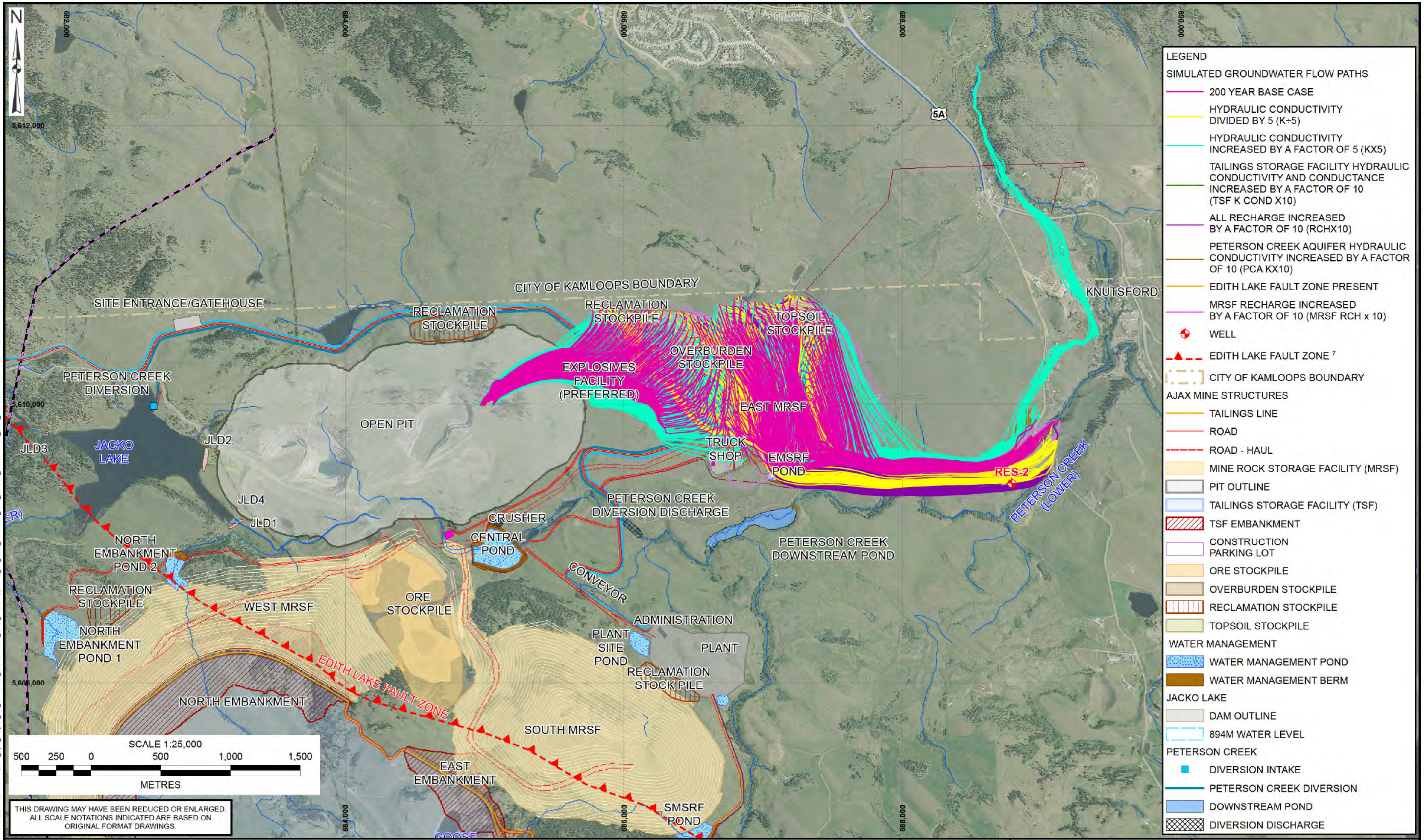
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS CENTRAL COLLECTION POND

PROJECT No.: 1125007-04

DWG No.: E-1



NOTES:

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3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. ORTHOPHOTO PROVIDED BY KAM FROM EAGLE MAPPING AERIAL PHOTOGRAPHY DATED JUNE 26, 2006, PUBLISHED SEPTEMBER 29, 2006.
5. PROJECTION IS NAD 1983 UTM ZONE 10N.
6. HYDRAULIC CONDUCTIVITY TIMES 5 (KX5) FOR SMSRF NOT DISPLAYED.
7. LOGAN AND MIHALYNUK, 2006.
8. PARTICLE FLOW LINES ARE FROM CLOSURE CONDITION GROUNDWATER MODEL SIMULATIONS WITH OPEN PIT LAKE LEVEL OF 500 MASL.
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS EAST MRSF

PROJECT No.: 1125007-04

DWG No.: E-2

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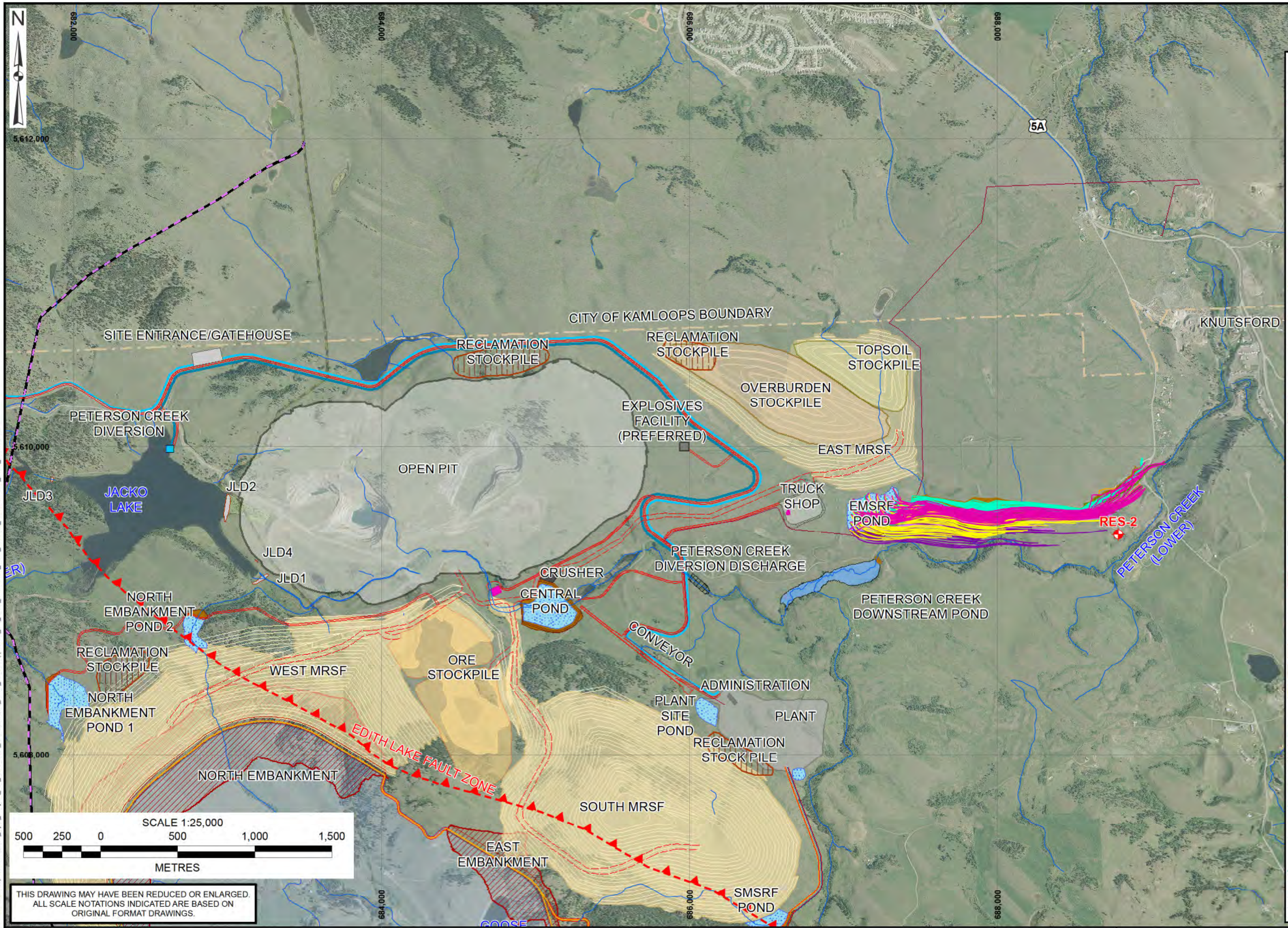

LEGEND

SIMULATED GROUNDWATER FLOW PATHS
- 200 YEAR BASE CASE
- HYDRAULIC CONDUCTIVITY DIVIDED BY 5 (K÷5)
- HYDRAULIC CONDUCTIVITY INCREASED BY A FACTOR OF 5 (KX5)
- TAILINGS STORAGE FACILITY HYDRAULIC CONDUCTIVITY AND CONDUCTANCE INCREASED BY A FACTOR OF 10 (TSF K COND X10)
- ALL RECHARGE INCREASED BY A FACTOR OF 10 (RCHX10)
- PETERSON CREEK AQUIFER HYDRAULIC CONDUCTIVITY INCREASED BY A FACTOR OF 10 (PCA KX10)
- EDITH LAKE FAULT ZONE PRESENT
- MRSF RECHARGE INCREASED BY A FACTOR OF 10 (MRSF RCH x 10)
- WELL
- EDITH LAKE FAULT ZONE [7]
- CITY OF KAMLOOPS BOUNDARY

AJAX MINE STRUCTURES
- TAILINGS LINE
- ROAD
- ROAD - HAUL
- MINE ROCK STORAGE FACILITY (MRSF)
- PIT OUTLINE
- TAILINGS STORAGE FACILITY (TSF)
- TSF EMBANKMENT
- CONSTRUCTION PARKING LOT
- ORE STOCKPILE
- OVERBURDEN STOCKPILE
- RECLAMATION STOCKPILE
- TOPSOIL STOCKPILE

WATER MANAGEMENT
- WATER MANAGEMENT POND
- WATER MANAGEMENT BERM

JACKO LAKE
- DAM OUTLINE
- 894M WATER LEVEL

PETERSON CREEK
- DIVERSION INTAKE
- PETERSON CREEK DIVERSION
- DOWNSTREAM POND
- DIVERSION DISCHARGE

THIS DRAWING MAY HAVE BEEN REDUCED OR ENLARGED. ALL SCALE NOTATIONS INDICATED ARE BASED ON ORIGINAL FORMAT DRAWINGS.

NOTES:
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3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
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6. HYDRAULIC CONDUCTIVITY TIMES 5 (KX5) FOR SMSRF NOT DISPLAYED.
7. LOGAN AND MIHALYNUK, 2006.
8. PARTICLE FLOW LINES ARE FROM CLOSURE CONDITION GROUNDWATER MODEL SIMULATIONS WITH OPEN PIT LAKE LEVEL OF 500 MASL.
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CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS EAST MRSF POND

PROJECT No.: 1125007-04

DWG No.: E-3

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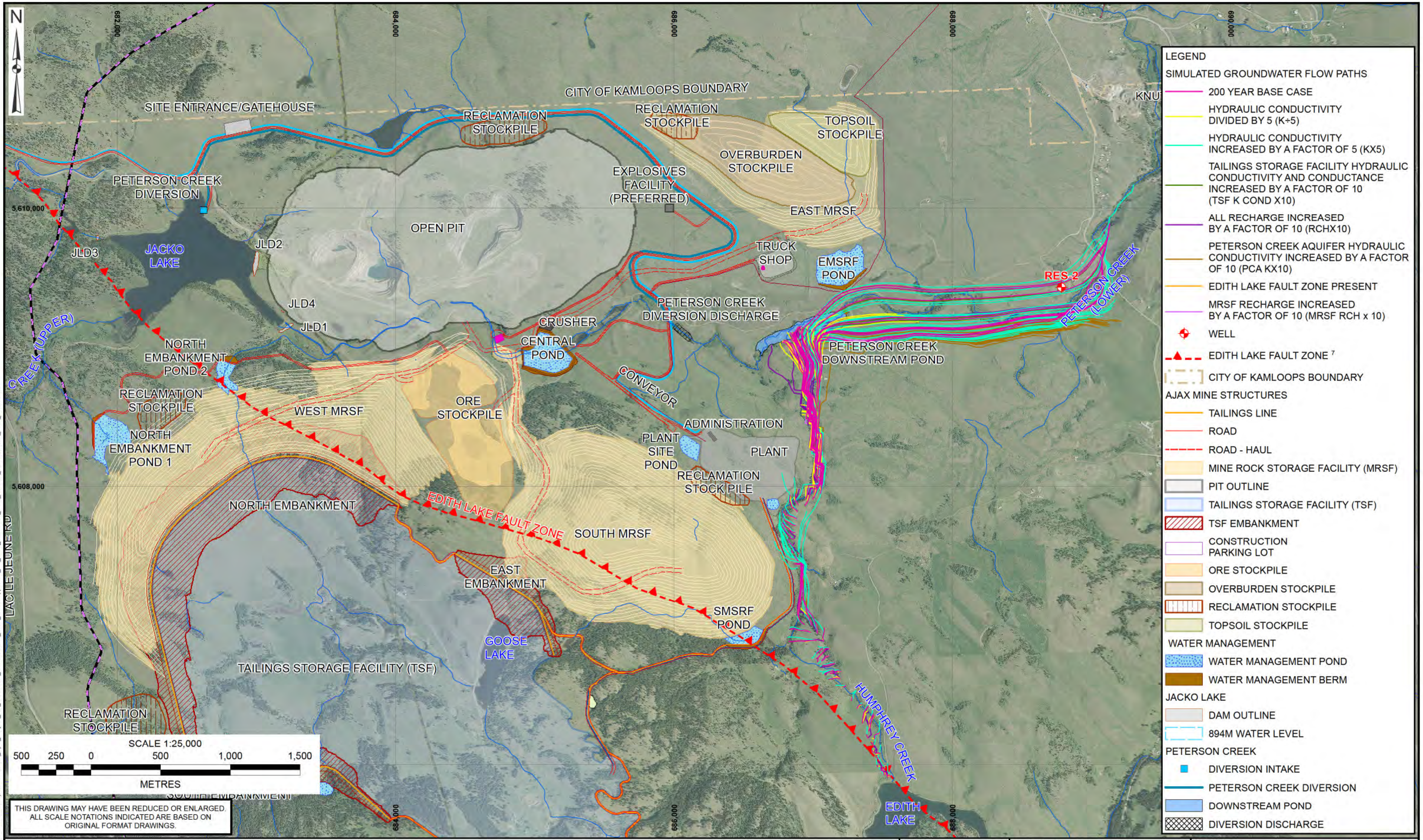

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5. PROJECTION IS NAD 1983 UTM ZONE 10N.
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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS HUMPHREY CREEK

PROJECT No.: 1125007-04

DWG No.: E-4

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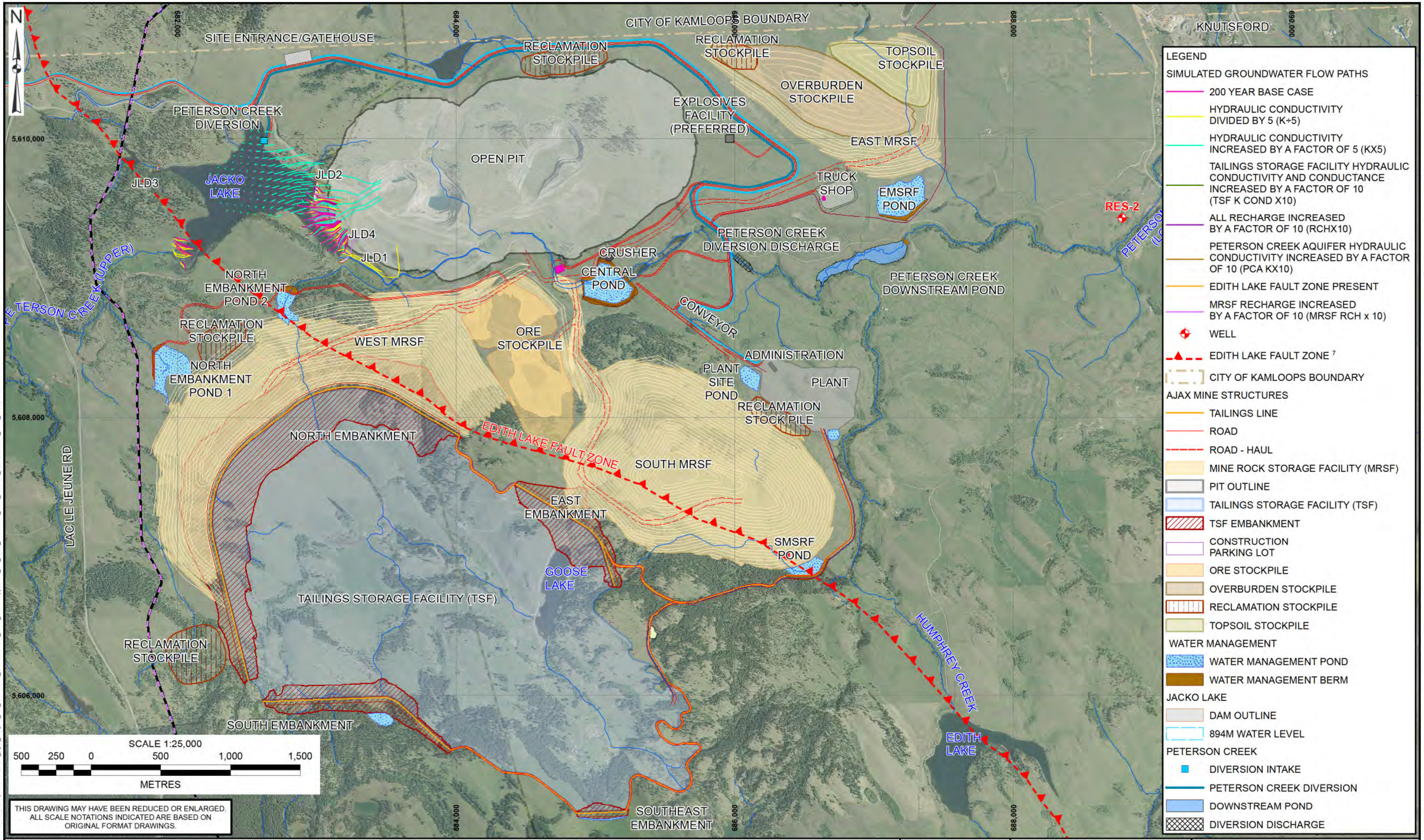

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS JACKO LAKE

PROJECT No.: 1125007-04

DWG No.: E-5

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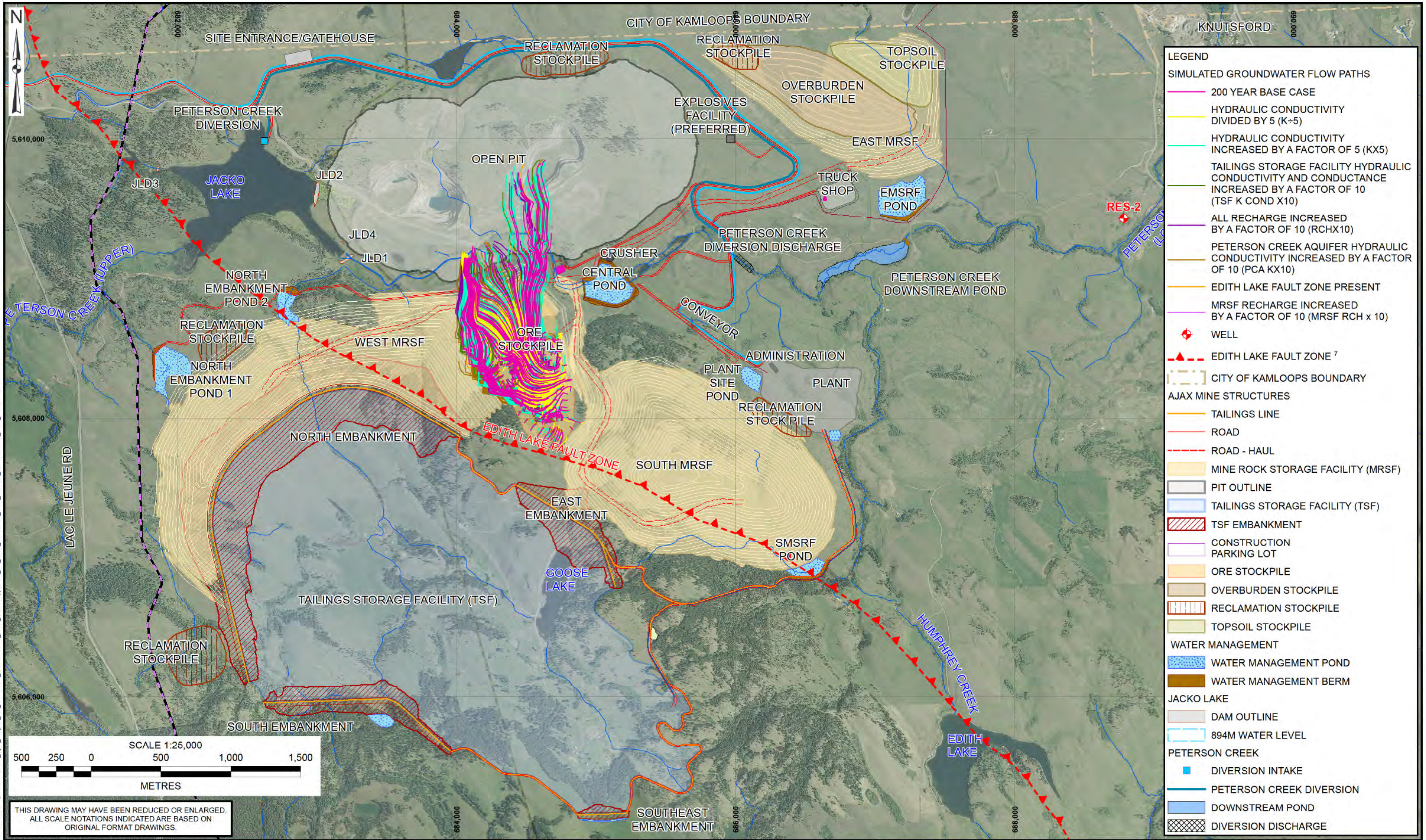

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

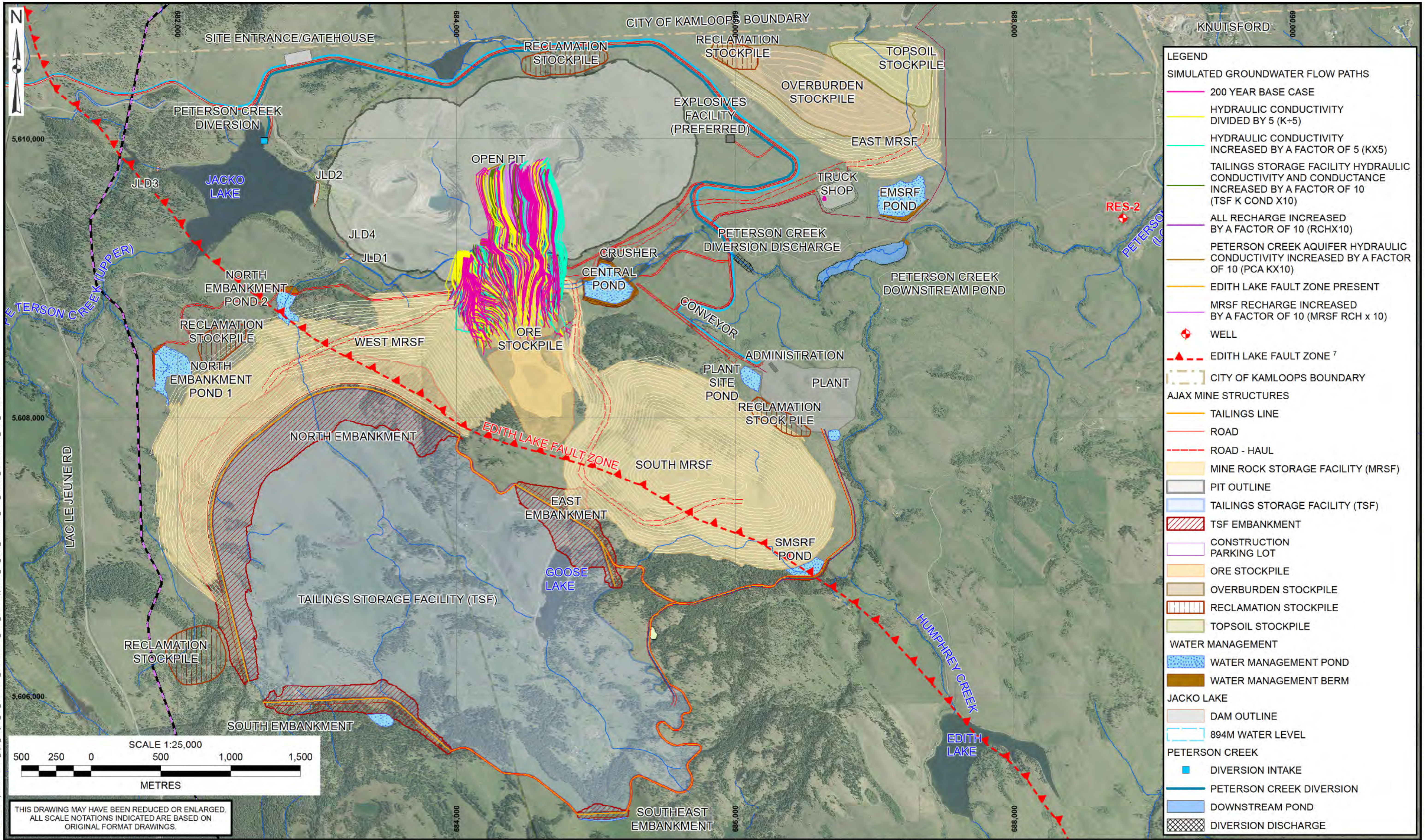
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS LOW GRADE STOCKPILE

PROJECT No.: 1125007-04

DWG No.: E-6



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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS MEDIUM GRADE STOCKPILE

PROJECT No.: 1125007-04

DWG No.: E-7

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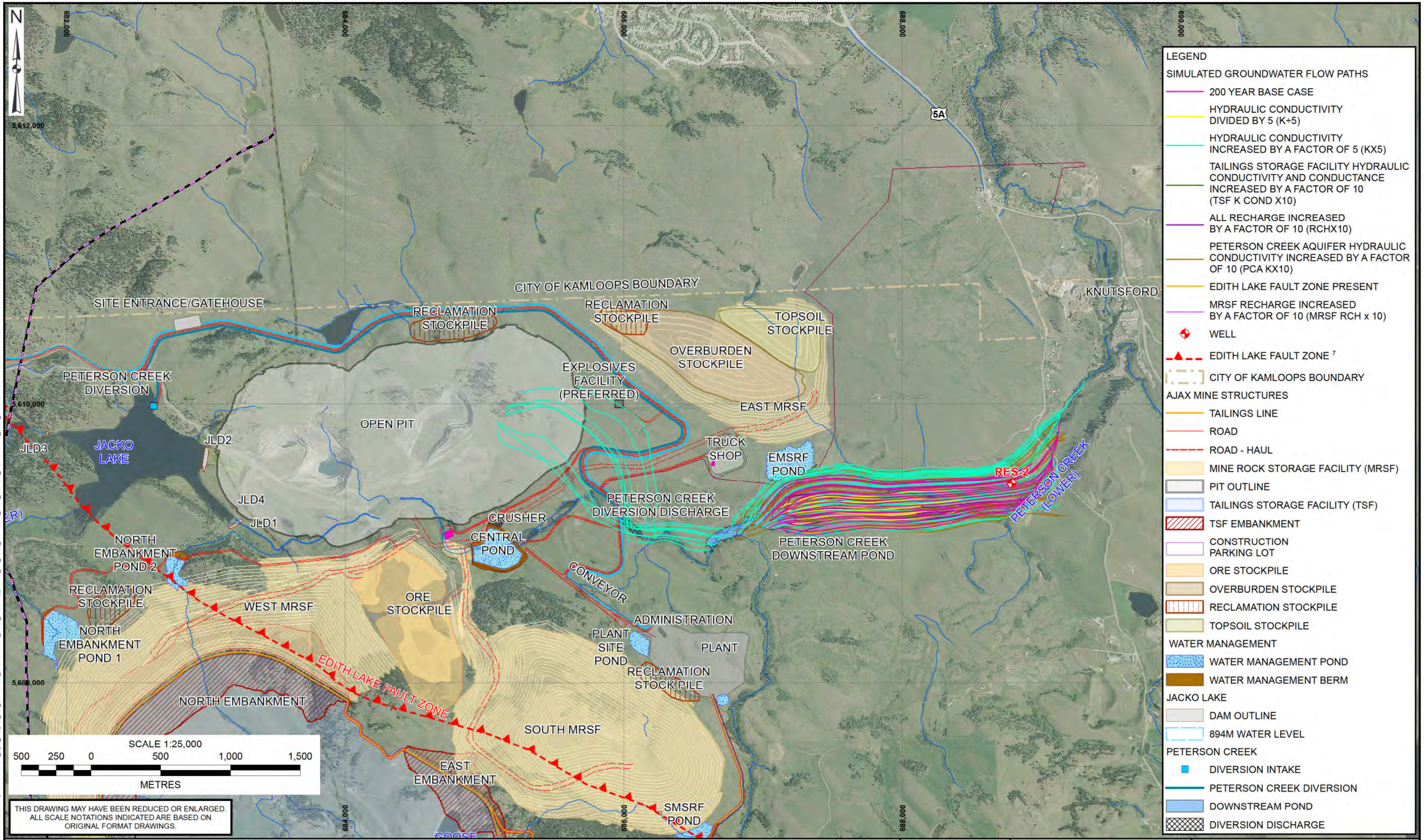

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS PETERSON CREEK DOWNSTREAM POND

PROJECT No.: 1125007-04

DWG No.: E-8

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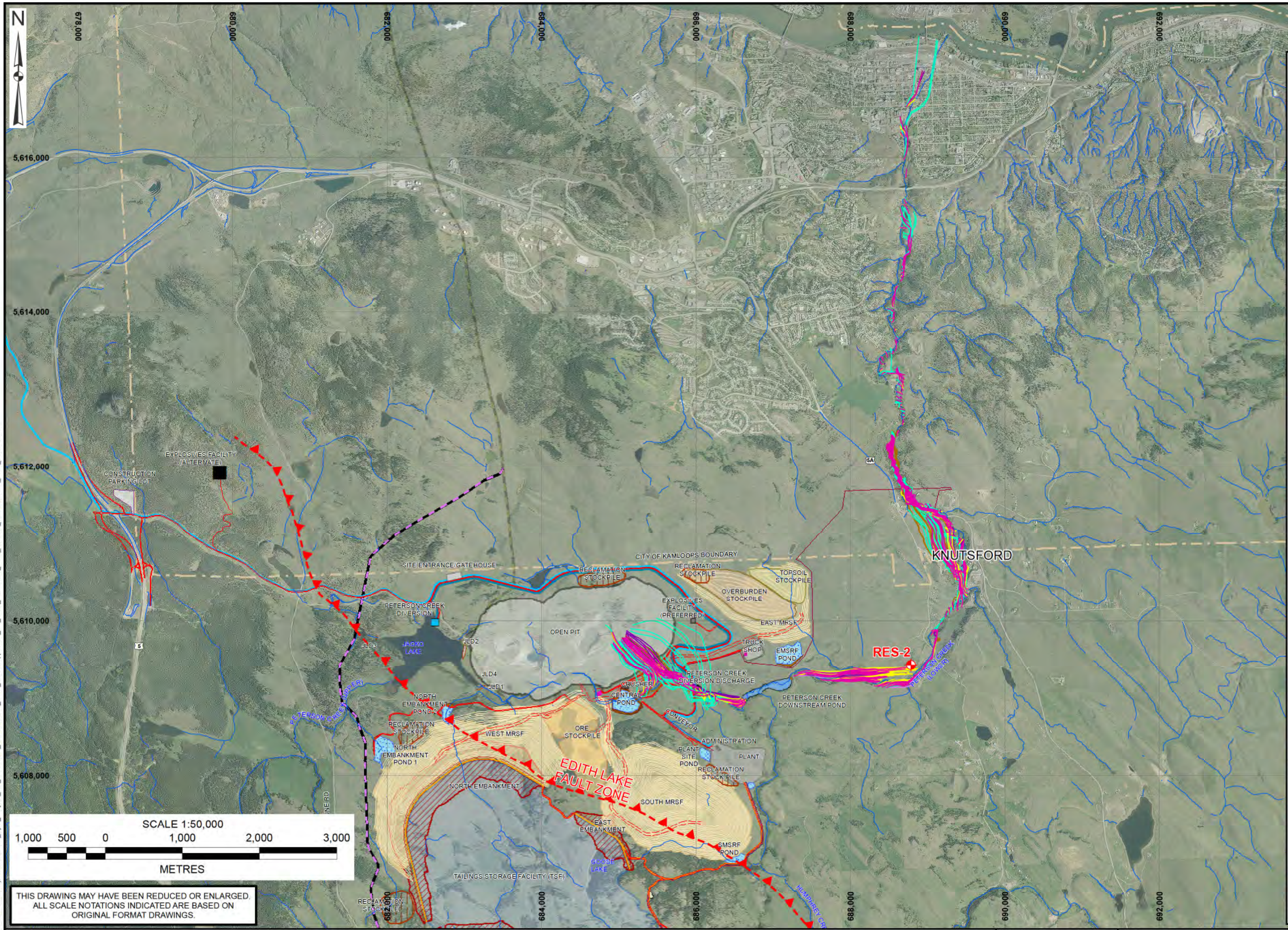

LEGEND

SIMULATED GROUNDWATER FLOW PATHS
- 200 YEAR BASE CASE
- HYDRAULIC CONDUCTIVITY DIVIDED BY 5 (K÷5)
- HYDRAULIC CONDUCTIVITY INCREASED BY A FACTOR OF 5 (KX5)
- TAILINGS STORAGE FACILITY HYDRAULIC CONDUCTIVITY AND CONDUCTANCE INCREASED BY A FACTOR OF 10 (TSF K COND X10)
- ALL RECHARGE INCREASED BY A FACTOR OF 10 (RCHX10)
- PETERSON CREEK AQUIFER HYDRAULIC CONDUCTIVITY INCREASED BY A FACTOR OF 10 (PCA KX10)
- EDITH LAKE FAULT ZONE PRESENT
- MRSF RECHARGE INCREASED BY A FACTOR OF 10 (MRSF RCH x 10)
- WELL
- EDITH LAKE FAULT ZONE [7]
- CITY OF KAMLOOPS BOUNDARY

AJAX MINE STRUCTURES
- TAILINGS LINE
- ROAD
- ROAD - HAUL
- MINE ROCK STORAGE FACILITY (MRSF)
- PIT OUTLINE
- TAILINGS STORAGE FACILITY (TSF)
- TSF EMBANKMENT
- CONSTRUCTION PARKING LOT
- ORE STOCKPILE
- OVERBURDEN STOCKPILE
- RECLAMATION STOCKPILE
- TOPSOIL STOCKPILE

WATER MANAGEMENT
- WATER MANAGEMENT POND
- WATER MANAGEMENT BERM

JACKO LAKE
- DAM OUTLINE
- 894M WATER LEVEL

PETERSON CREEK
- DIVERSION INTAKE
- PETERSON CREEK DIVERSION
- DOWNSTREAM POND
- DIVERSION DISCHARGE

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CLIENT:
KGHM AJAX MINING INC.

PROJECT:
AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE:
SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS PETERSON CREEK

PROJECT No.: 1125007-04
DWG No.: E-9

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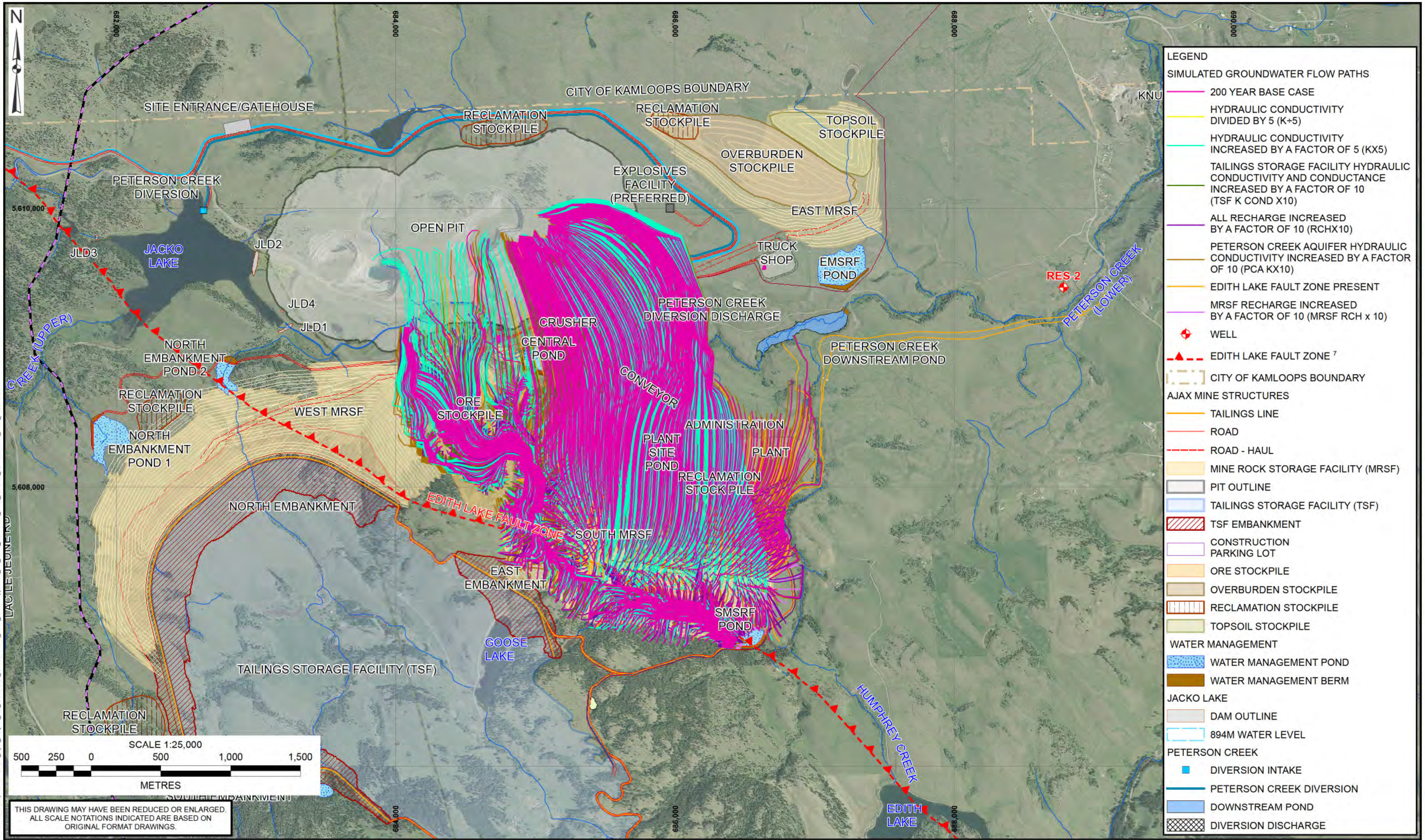

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BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS SOUTH MRSF

PROJECT No.: 1125007-04

DWG No.: E-10

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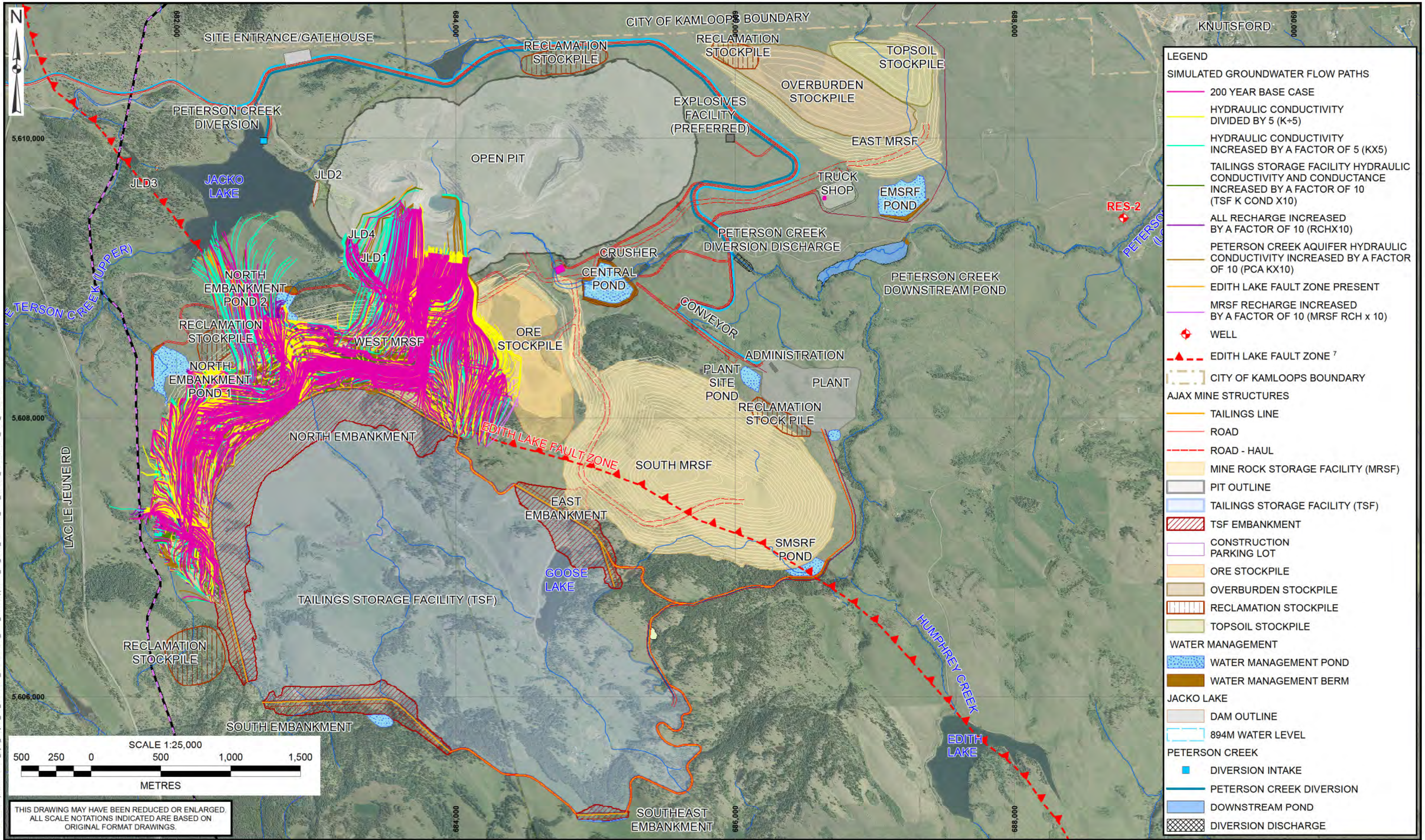

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CLIENT:
KGHM AJAX MINING INC.

PROJECT:
AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE:
SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS WEST MRSF

PROJECT No.: 1125007-04
DWG No.: E-11

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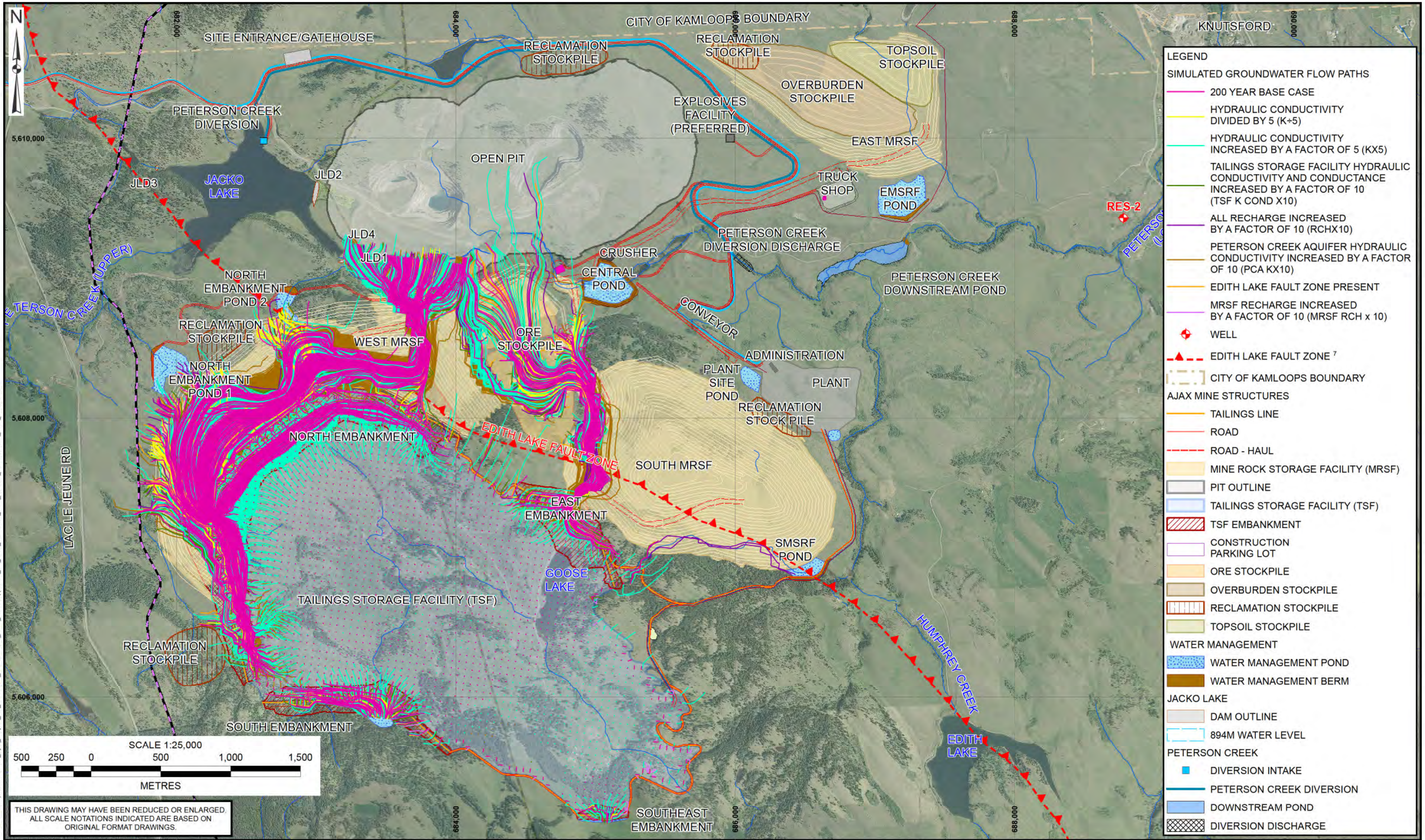

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS TAILINGS STORAGE FACILITY

PROJECT No.:	DWG No.:
1125007-04	E-12

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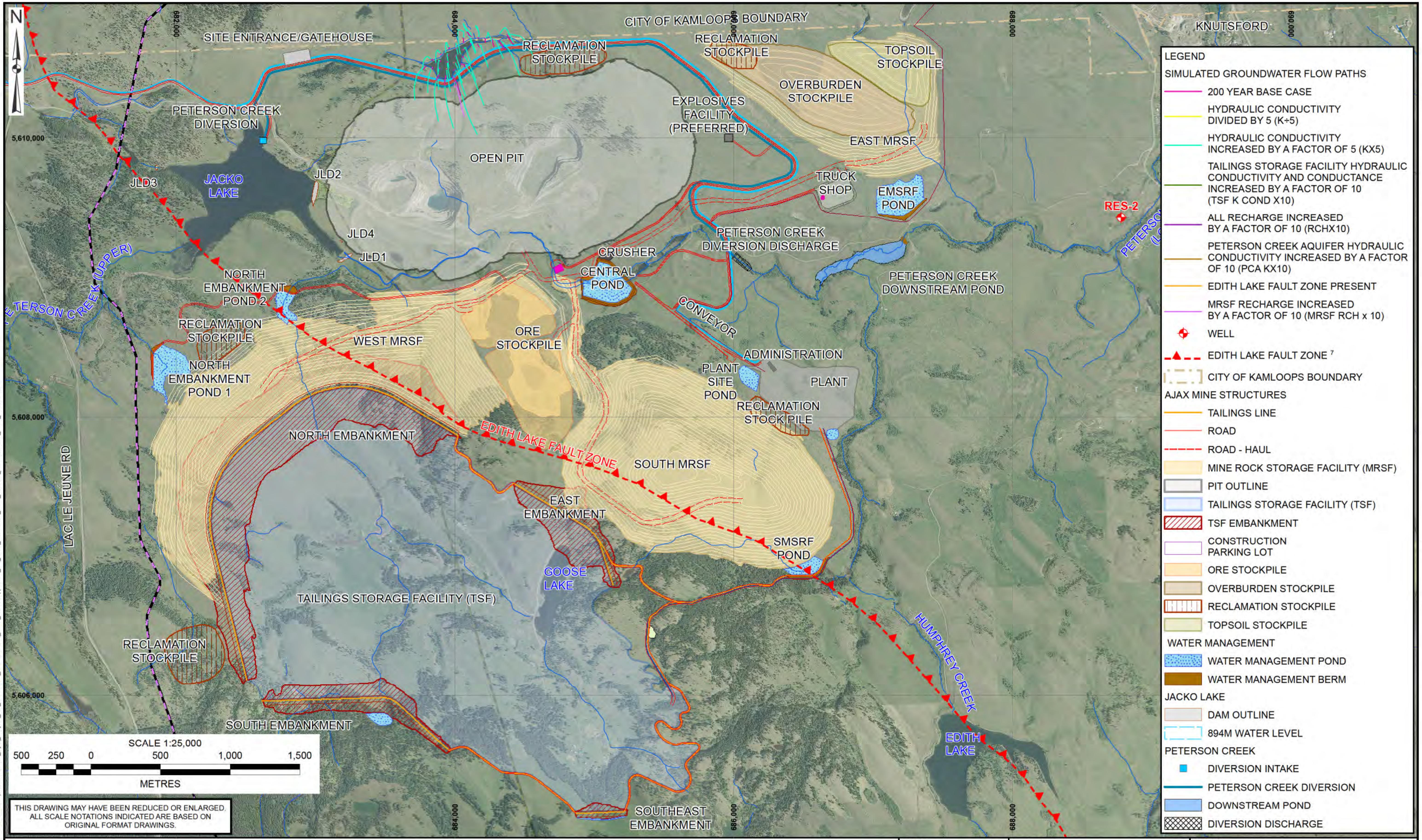

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

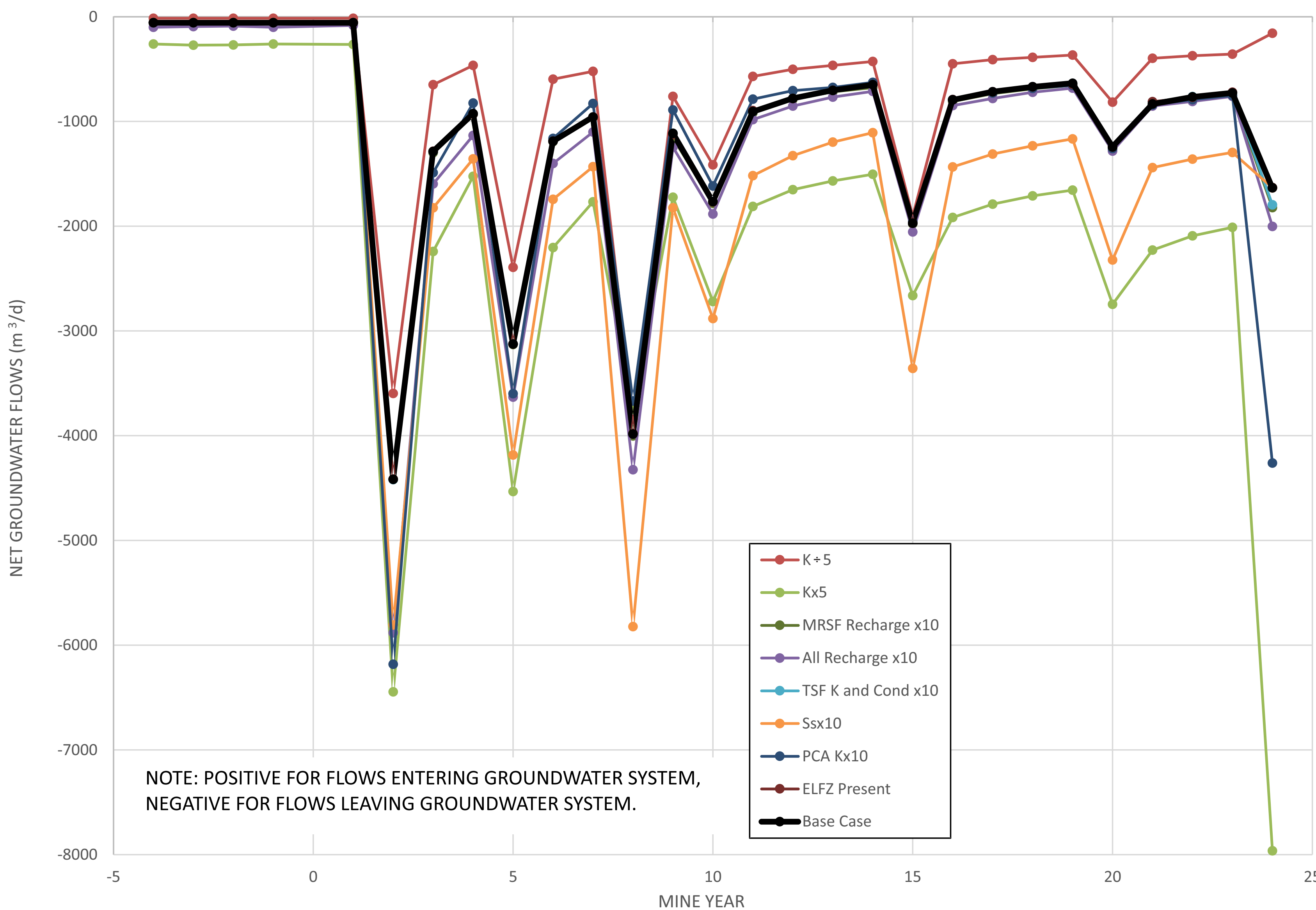
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS UNNAMED LAKE

PROJECT No.: 1125007-04

DWG No.: E-13



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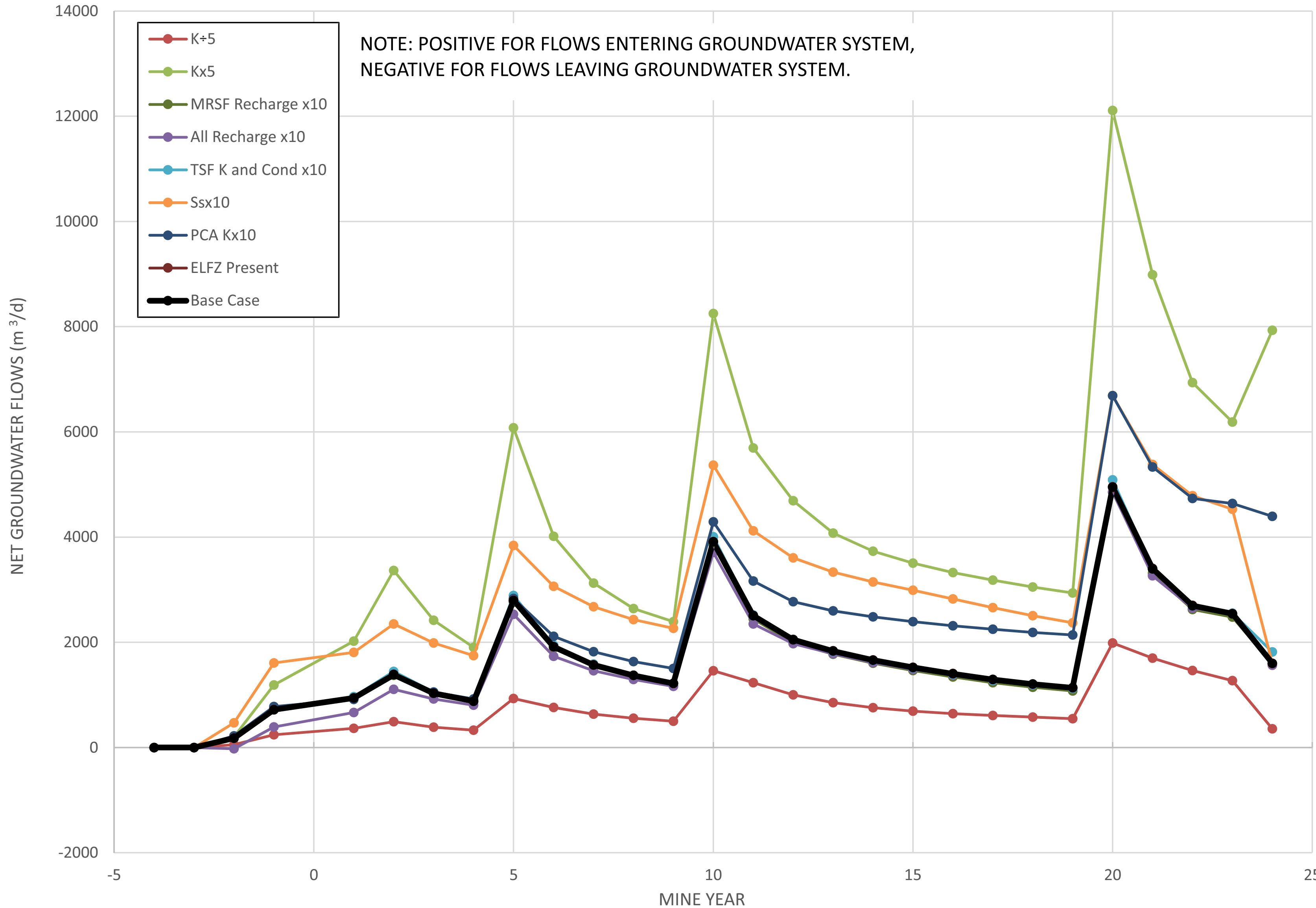
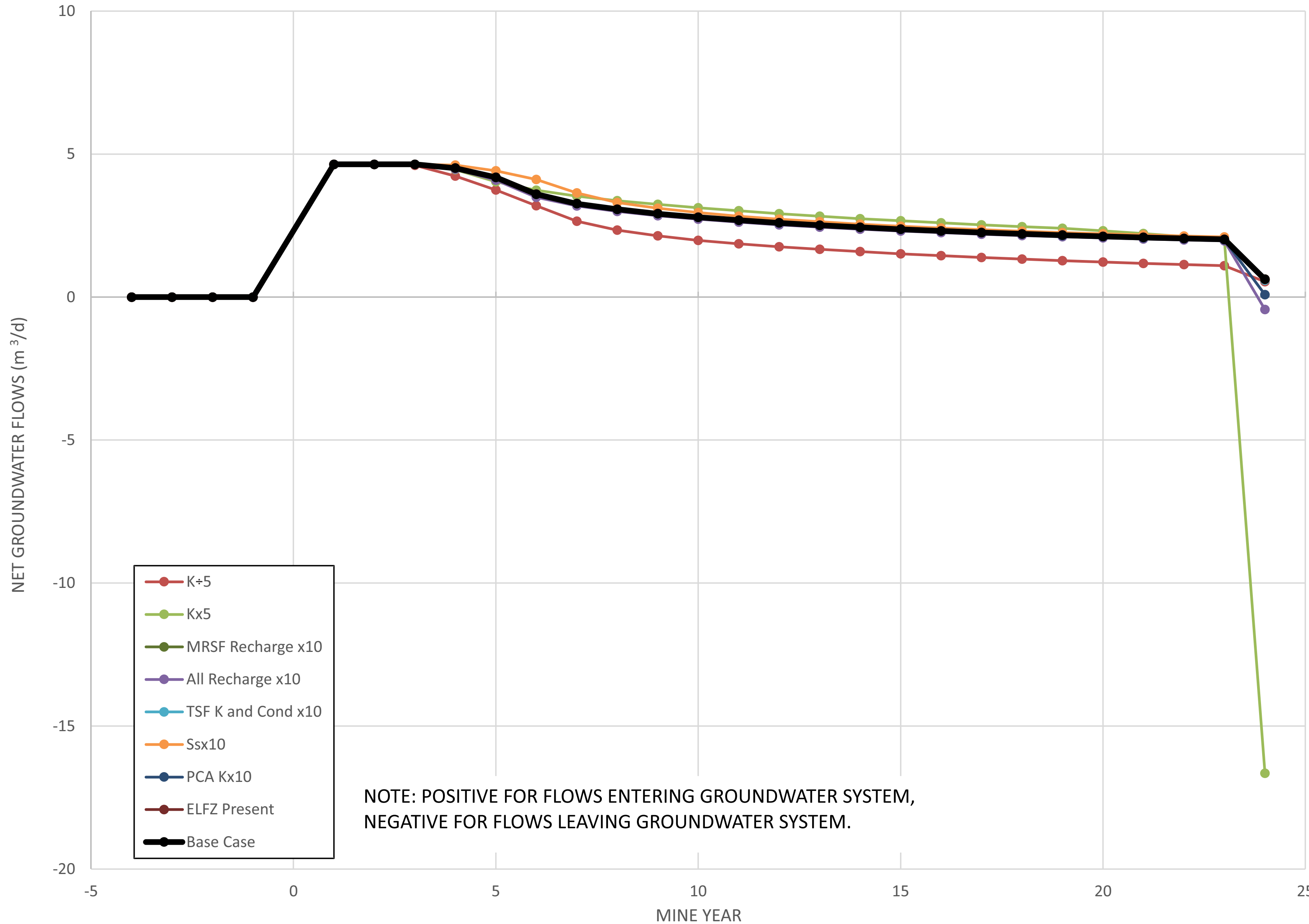
SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN THE OPEN PIT AND GROUNDWATER SYSTEM
PROJECT No.: 1125007-004	APPROVED: TWC		FIG No.: E-14

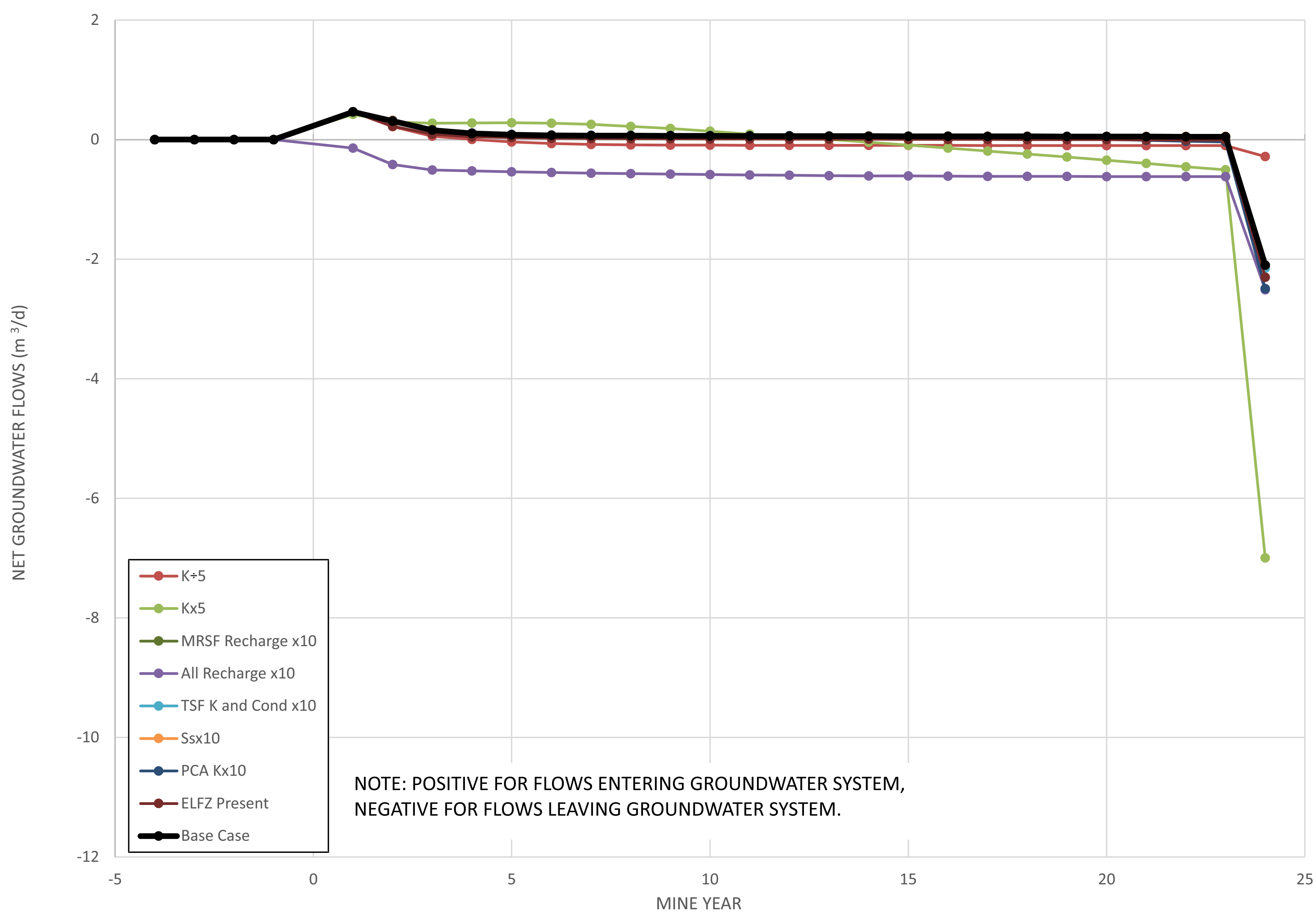


SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN THE TSF AND GROUNDWATER SYSTEM
PROJECT No.: 1125007-004	APPROVED: TWC		FIG No.: E-15

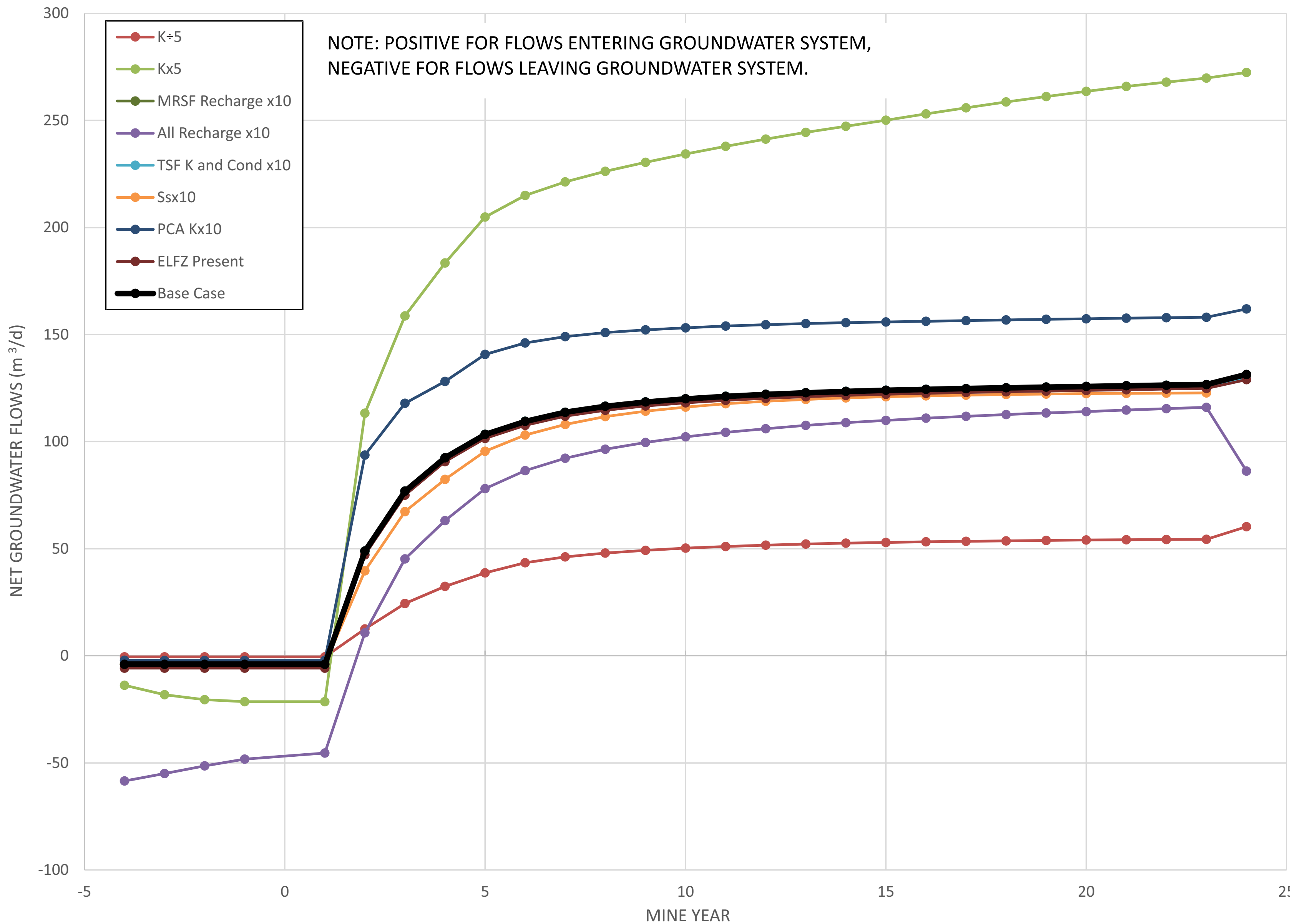
N:\BGC\PROJECTS\N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix F - Sensitivity Analyses for Operations and Closure\Fig 15 - Sensitivity Analysis - TSF Net Flows



SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN NORTH EMBANKMENT POND 1 AND GROUNDWATER SYSTEM	FIG No.: E-16
PROJECT No.: 1125007-004	APPROVED: TWC			

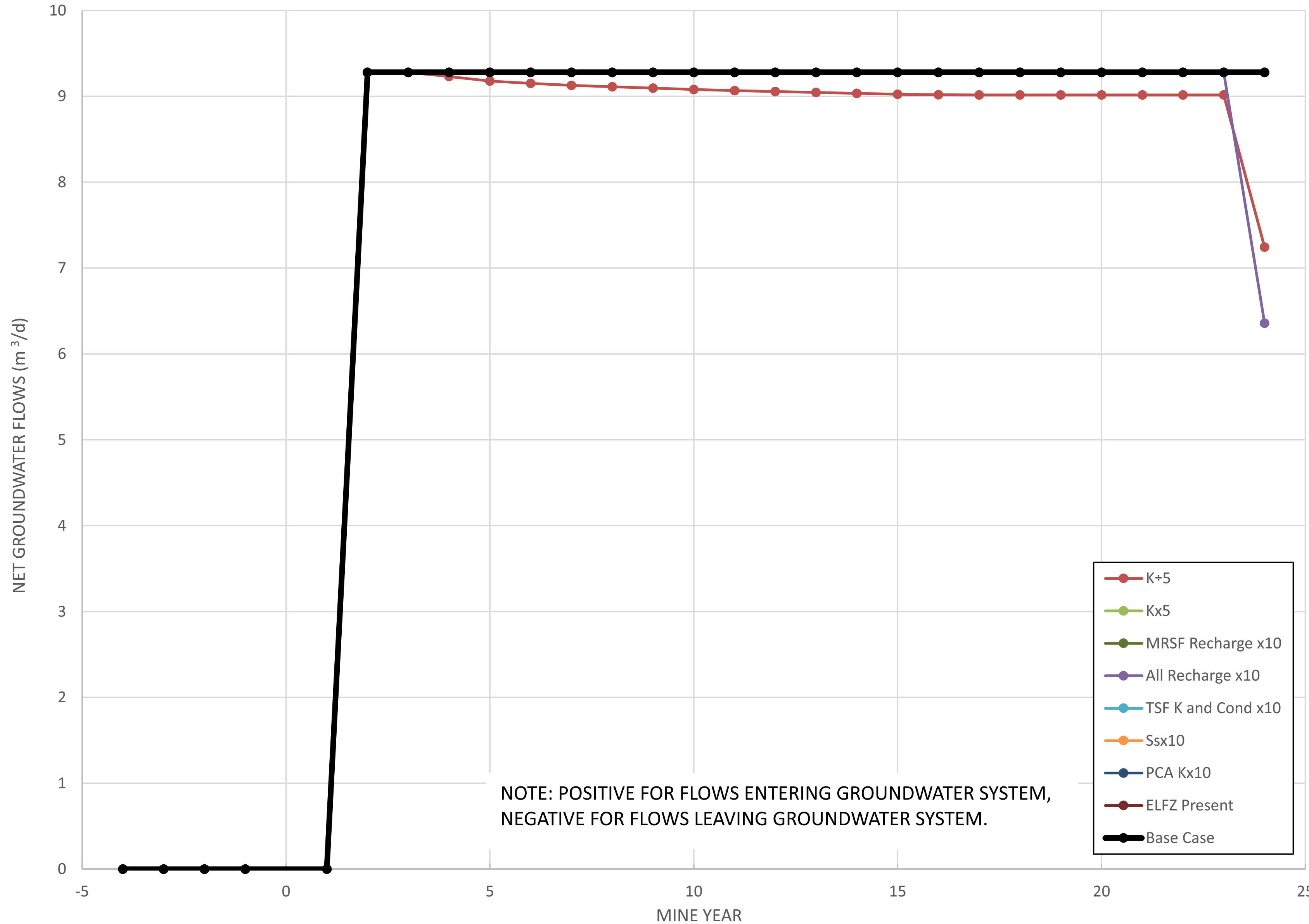


SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN NORTH EMBANKMENT POND 2 AND GROUNDWATER SYSTEM	FIG No.: E-17
PROJECT No.: 1125007-004	APPROVED: TWC			



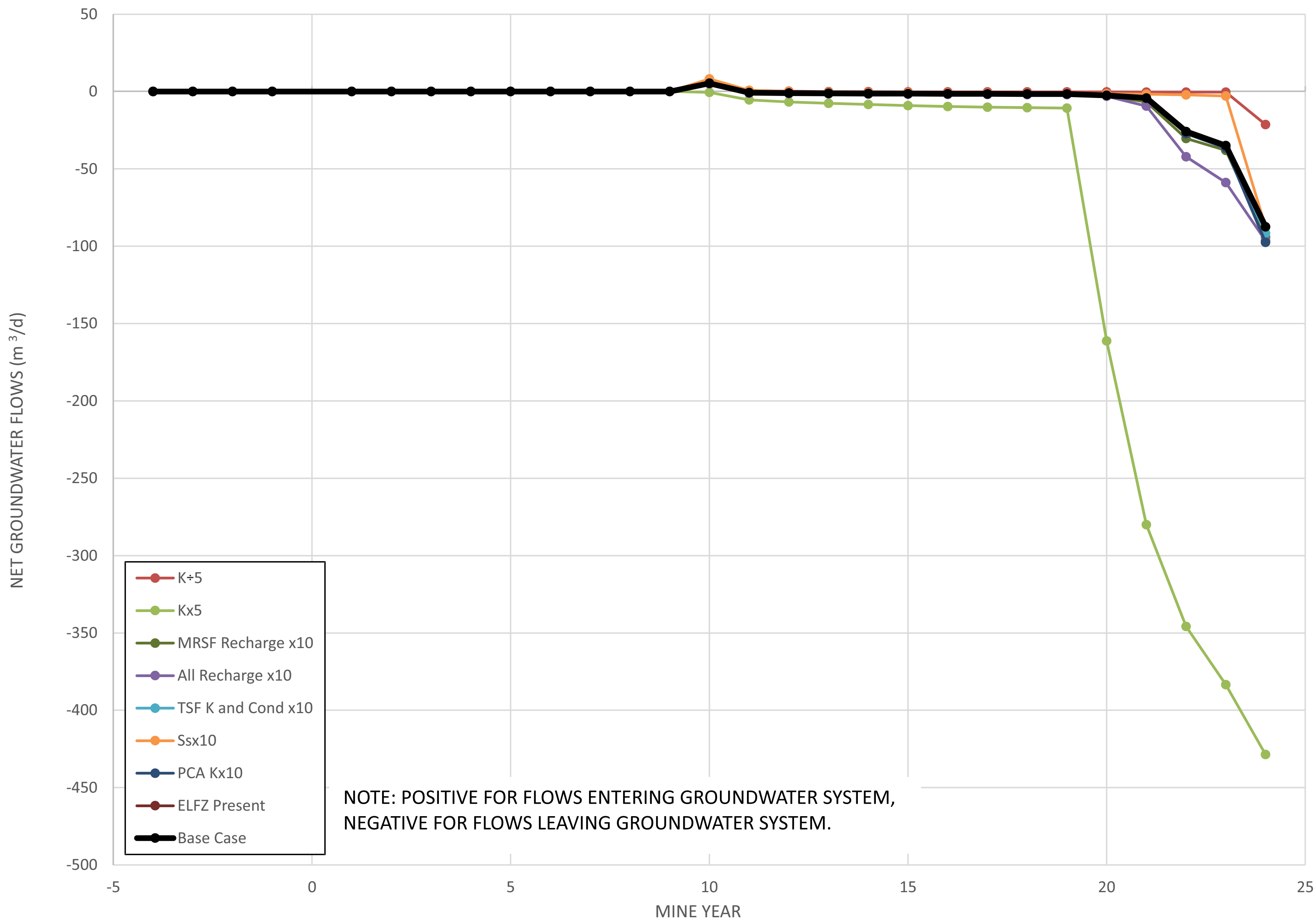
SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN JACKO LAKE AND GROUNDWATER SYSTEM	FIG No.: E-18
PROJECT No.: 1125007-004	APPROVED: TWC			

N:/BGC/PROJECTS/N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix F - Sensitivity Analyses for Operations and Closure\Fig 18 - Sensitivity Analysis - Jacko Lake Net Flows



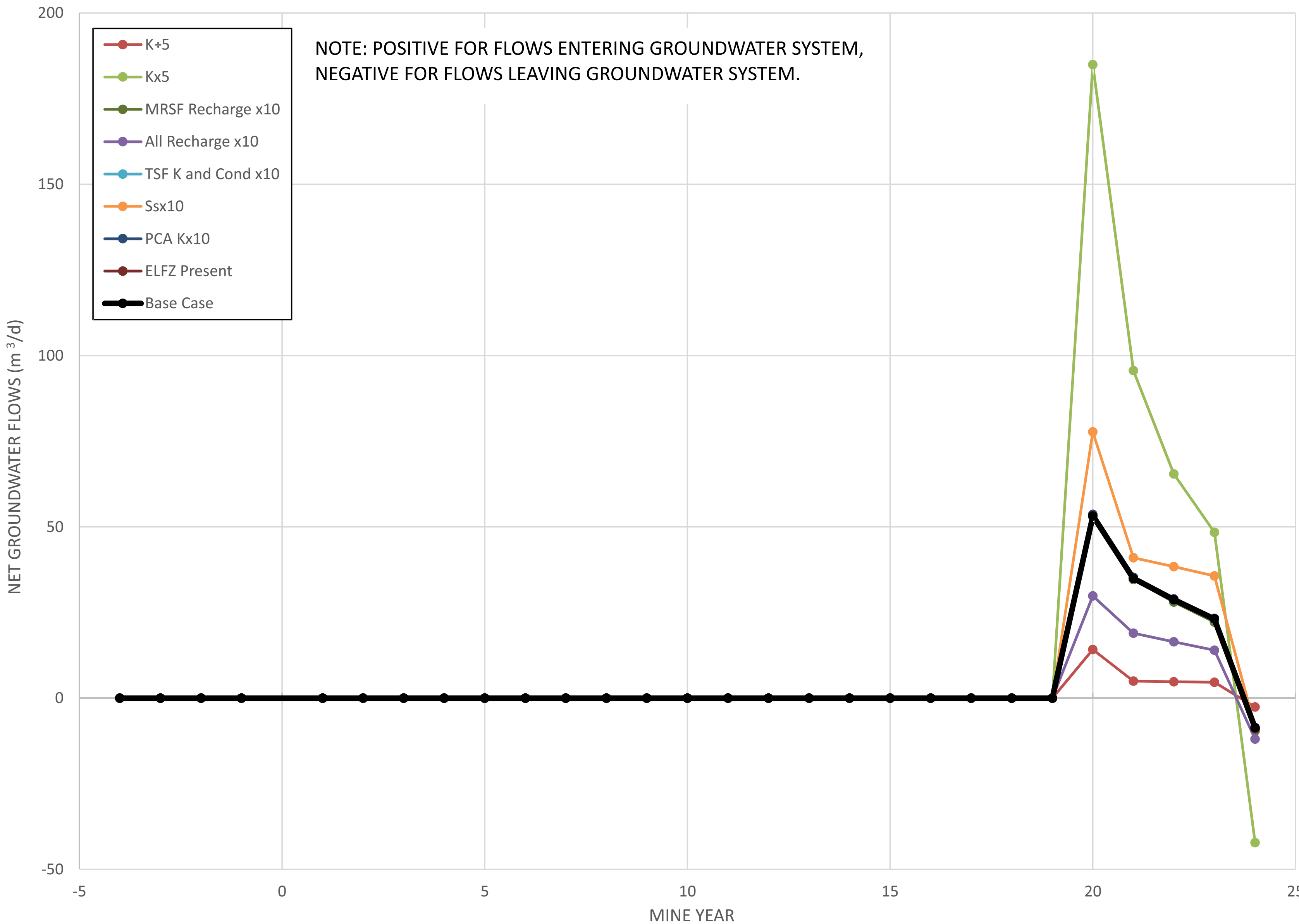
SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN CENTRAL COLLECTION POND AND GROUNDWATER SYSTEM
PROJECT No.: 1125007-004	APPROVED: TWC		FIG No.: E-19

N:/BGC/PROJECTS/N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix E - Sensitivity Analyses for Operations and Closure\Fig 19 - Sensitivity Analysis - Central Collection Pond Net Flows



SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN SOUTH EMBANKMENT POND AND GROUNDWATER SYSTEM
PROJECT No.: 1125007-004	APPROVED: TWC		FIG No.: E-20

N:/BGC/PROJECTS/N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix F - Sensitivity Analyses for Operations and Closure\Fig 19 - Sensitivity Analysis - South Embankment Pond Net Flow



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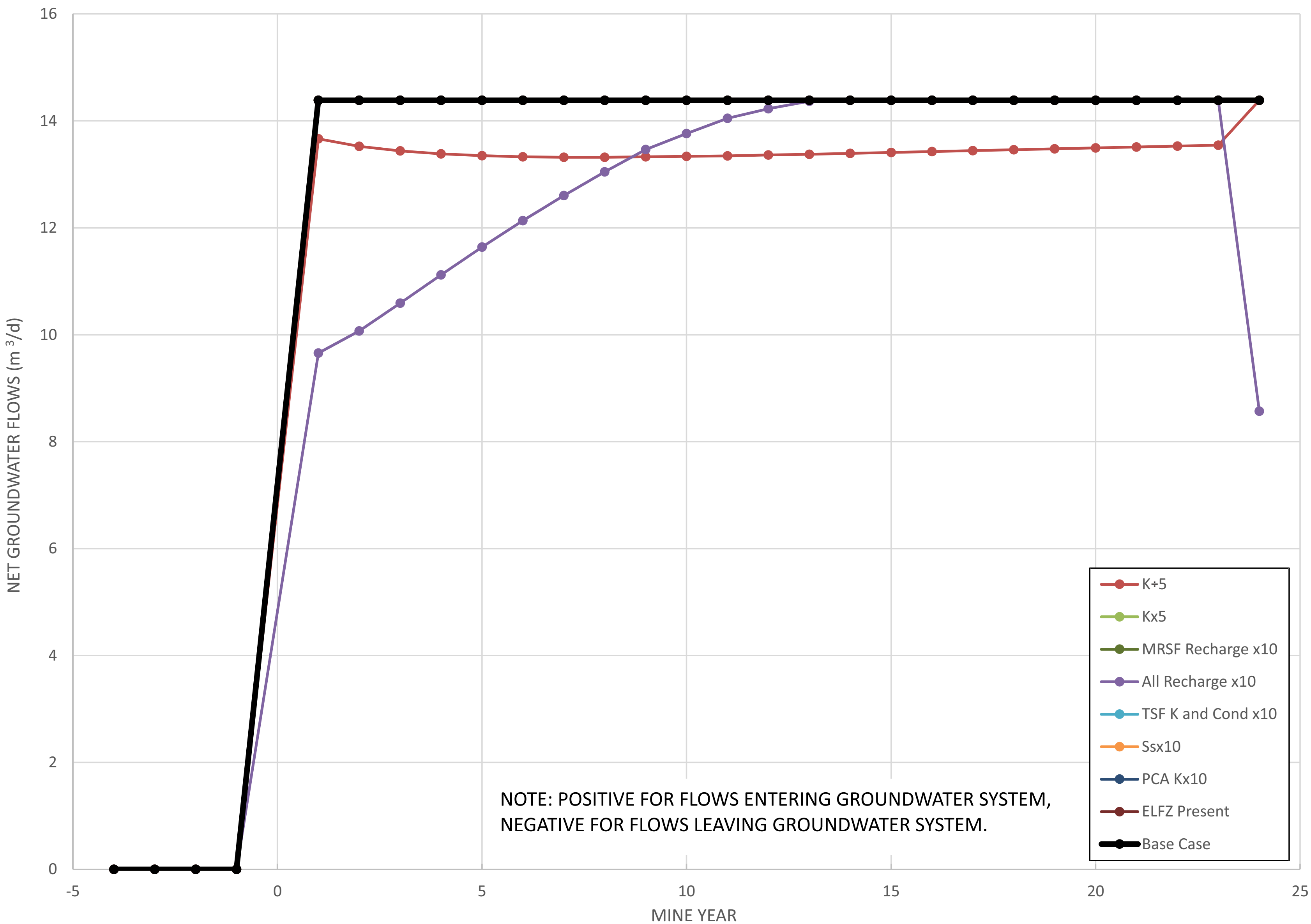
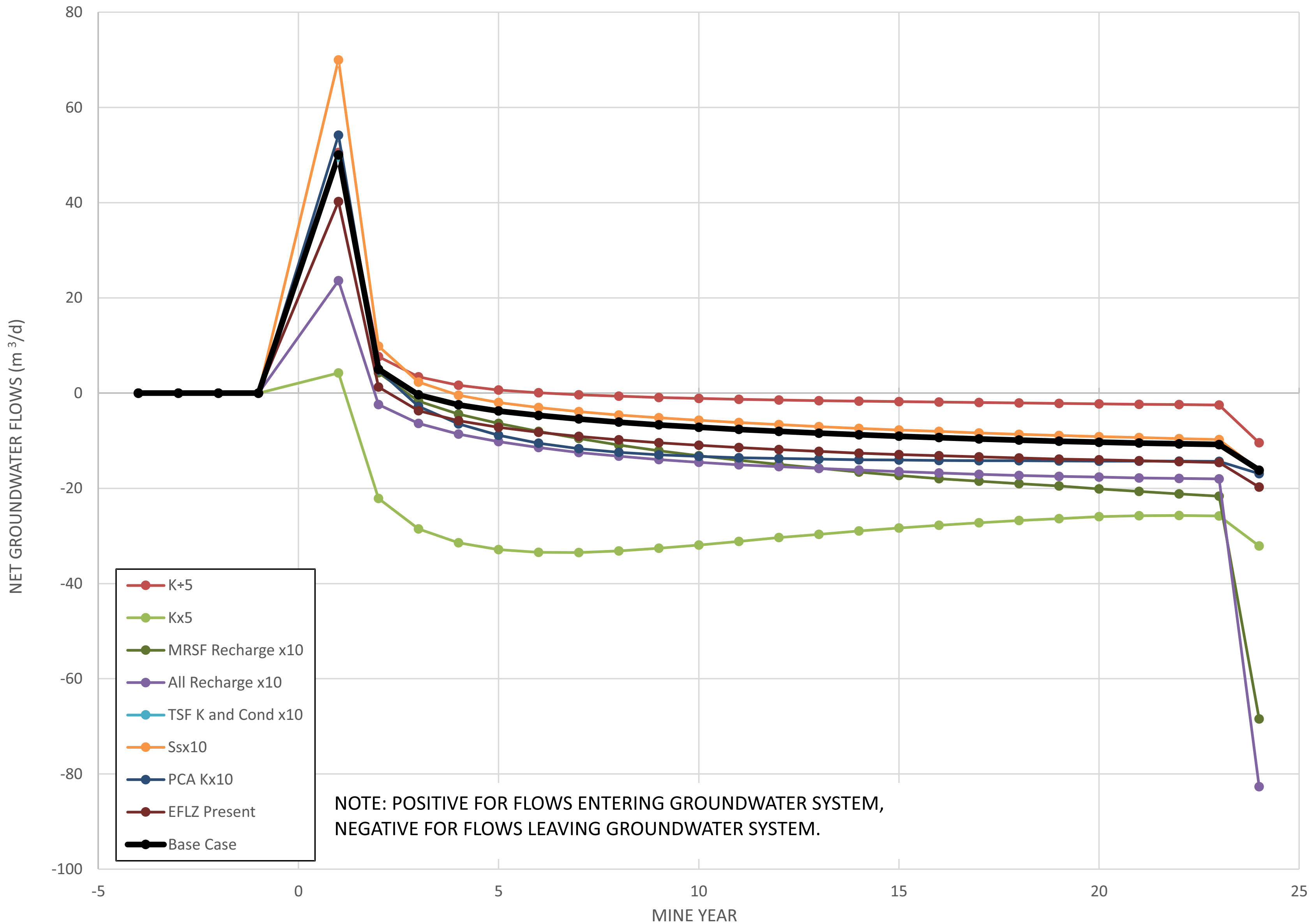
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN SOUTHEAST EMBANKMENT POND AND GROUNDWATER SYSTEM	FIG No.: E-21
PROJECT No.: 1125007-004	APPROVED: TWC			



SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN EMRSF POND AND GROUNDWATER SYSTEM
PROJECT No.: 1125007-004	APPROVED: TWC		FIG No.: E-22



SCALE: NOT TO SCALE
DATE: AUG 2015
PROJECT No.: 1125007-004
DRAWN: JW
CHECKED: RC/BM
APPROVED: TWC

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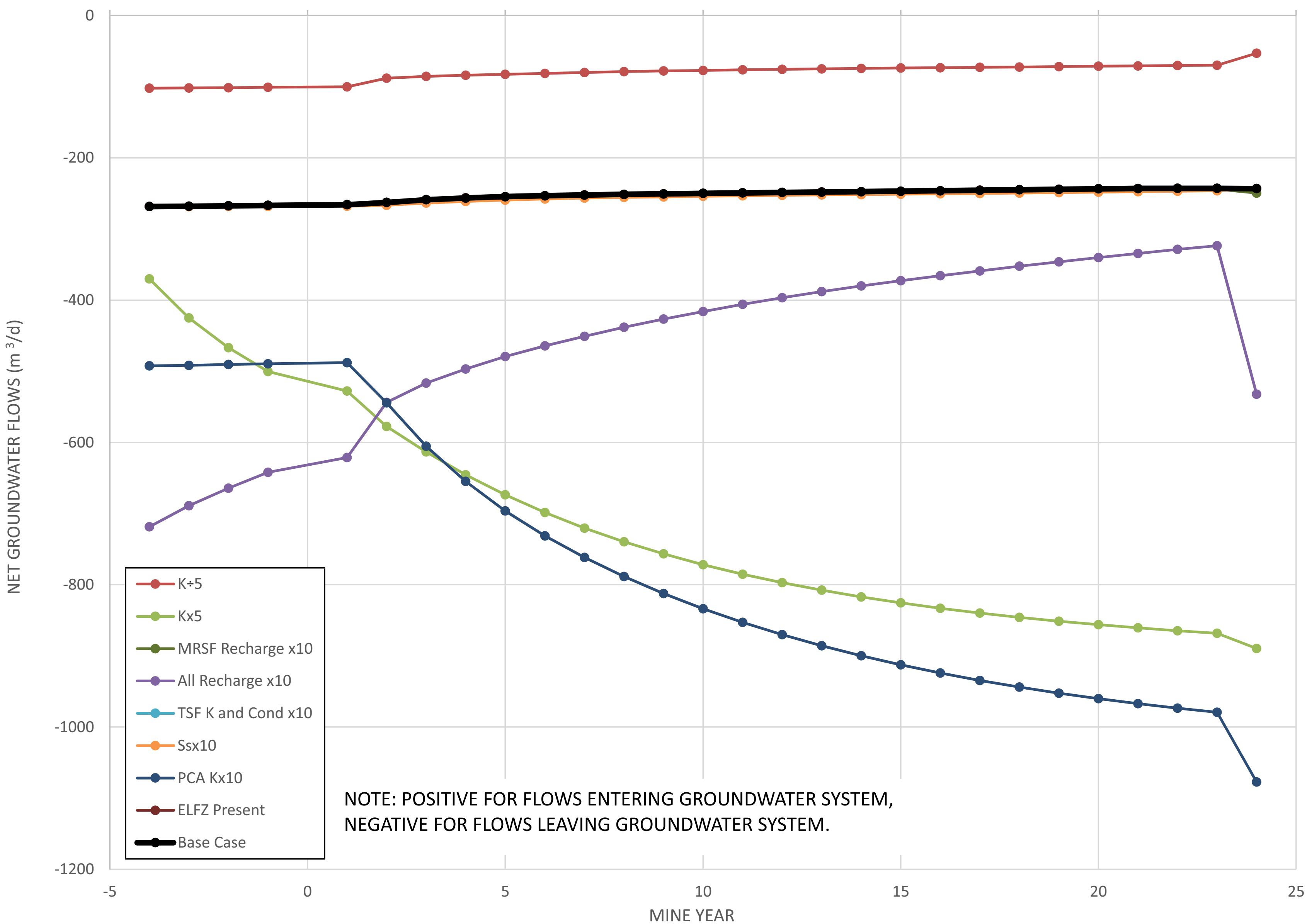
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

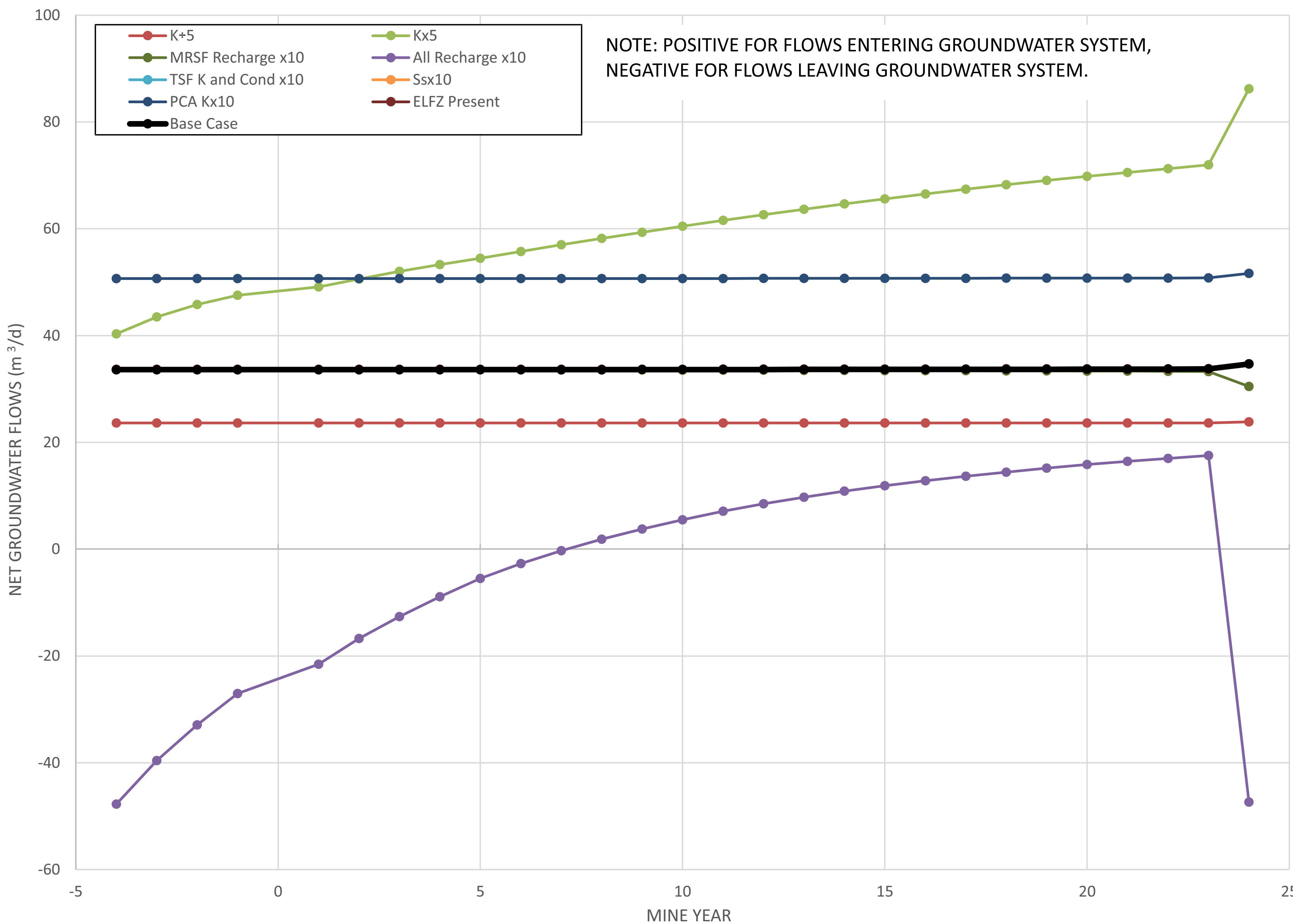
PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT
NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SENSITIVITY ANALYSIS
SIMULATED NET GROUNDWATER FLOWS BETWEEN
SMRSF POND AND GROUNDWATER SYSTEM

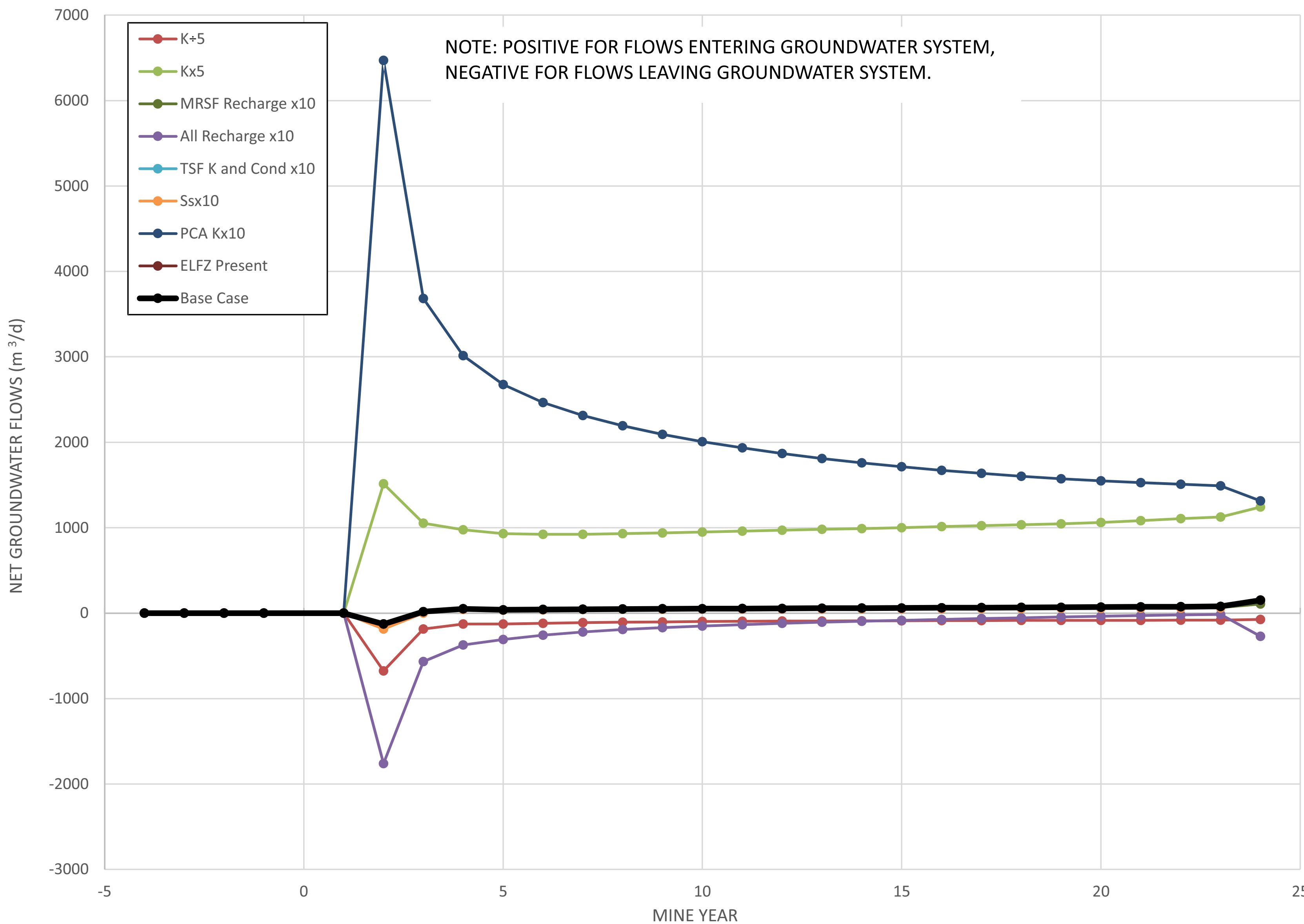
FIG No.: E-23



SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN LOWER PETERSON CREEK AND GROUNDWATER SYSTEM
PROJECT No.: 1125007-004	APPROVED: TWC		FIG No.: E-24

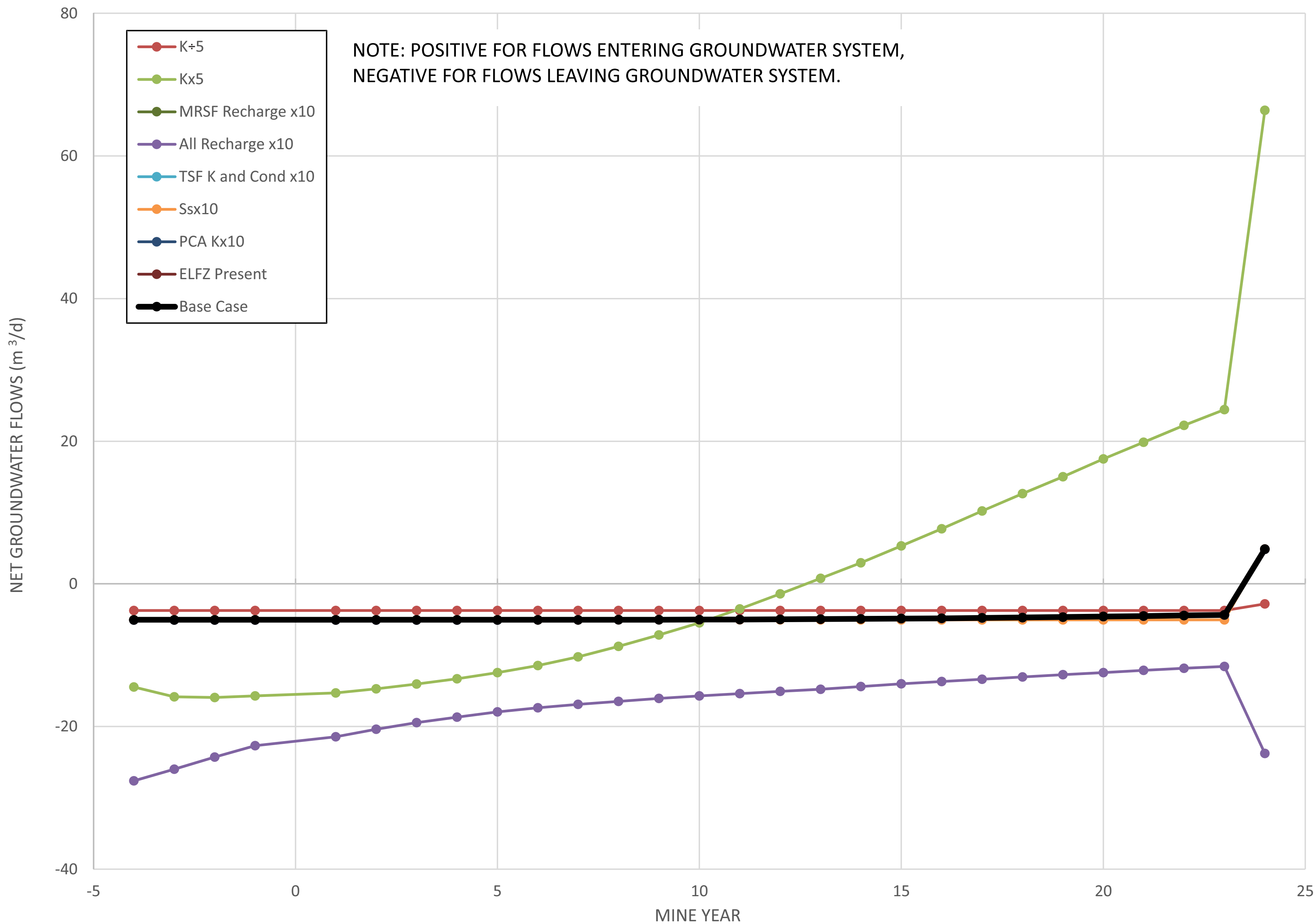


SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN HUMPHREY CREEK AND GROUNDWATER SYSTEM
PROJECT No.: 1125007-004	APPROVED: TWC		FIG No.: E-25

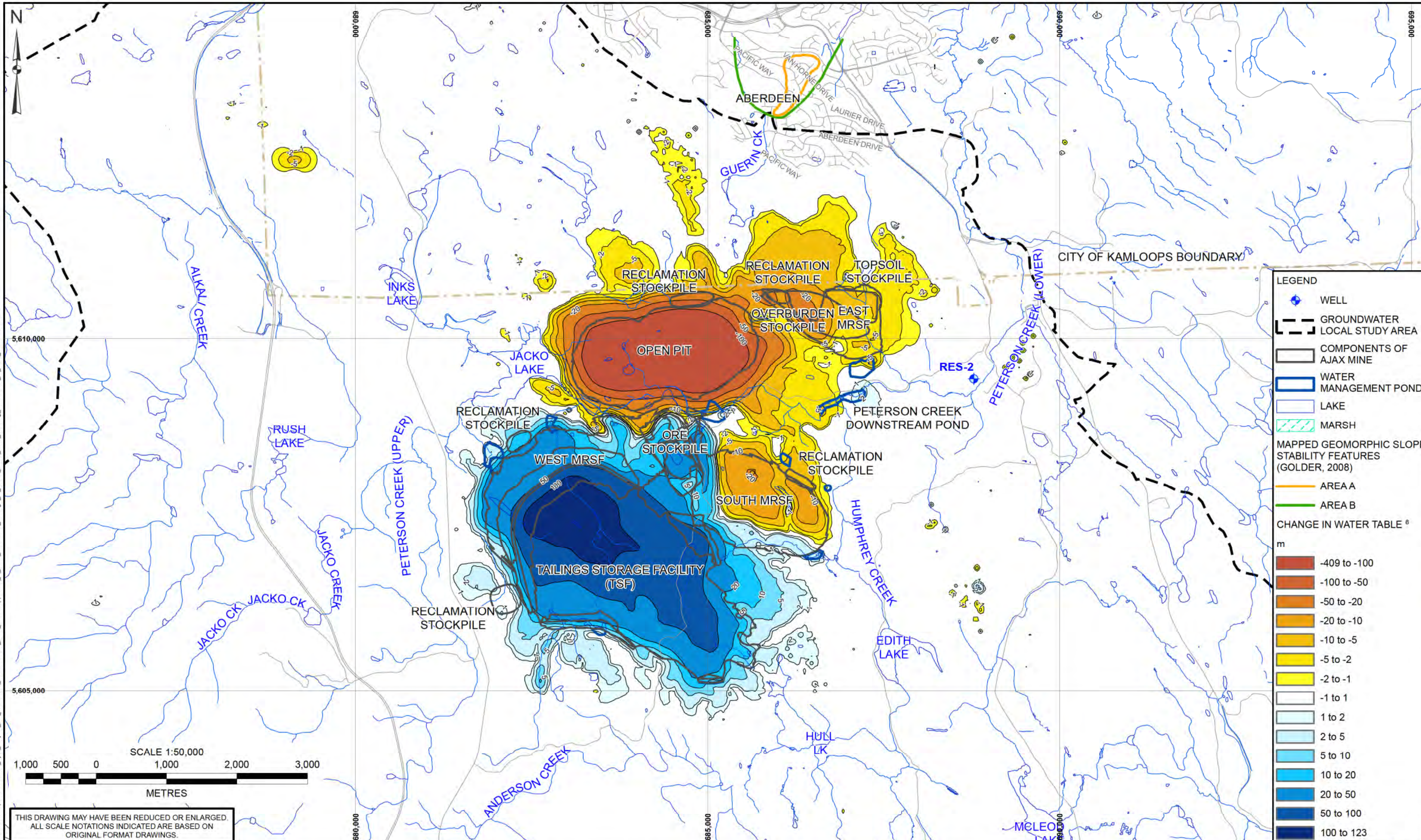


SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN PETERSON CREEK DOWNSTREAM POND AND GROUNDWATER SYSTEM	FIG No.: E-26
PROJECT No.: 1125007-004	APPROVED: TWC			

N:/BGC/PROJECTS/N:\BGC\Projects\1125 KGHM Ajax\006 EA GW scope\09 GW Model\03 Report\05 Appendices\Appendix F - Sensitivity Analyses for Operations and Closure\Fig 27 - Sensitivity Analysis - Unnamed Lake Net Flows



SCALE: NOT TO SCALE	DRAWN: JW	BGC ENGINEERING INC. AN APPLIED EARTH SCIENCES COMPANY	PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL	
DATE: AUG 2015	CHECKED: RC/BM	CLIENT: KGHM AJAX MINING INC.	TITLE: SENSITIVITY ANALYSIS SIMULATED NET GROUNDWATER FLOWS BETWEEN UNNAMED LAKE AND GROUNDWATER SYSTEM	FIG No.: E-27
PROJECT No.: 1125007-004	APPROVED: TWC			



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NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

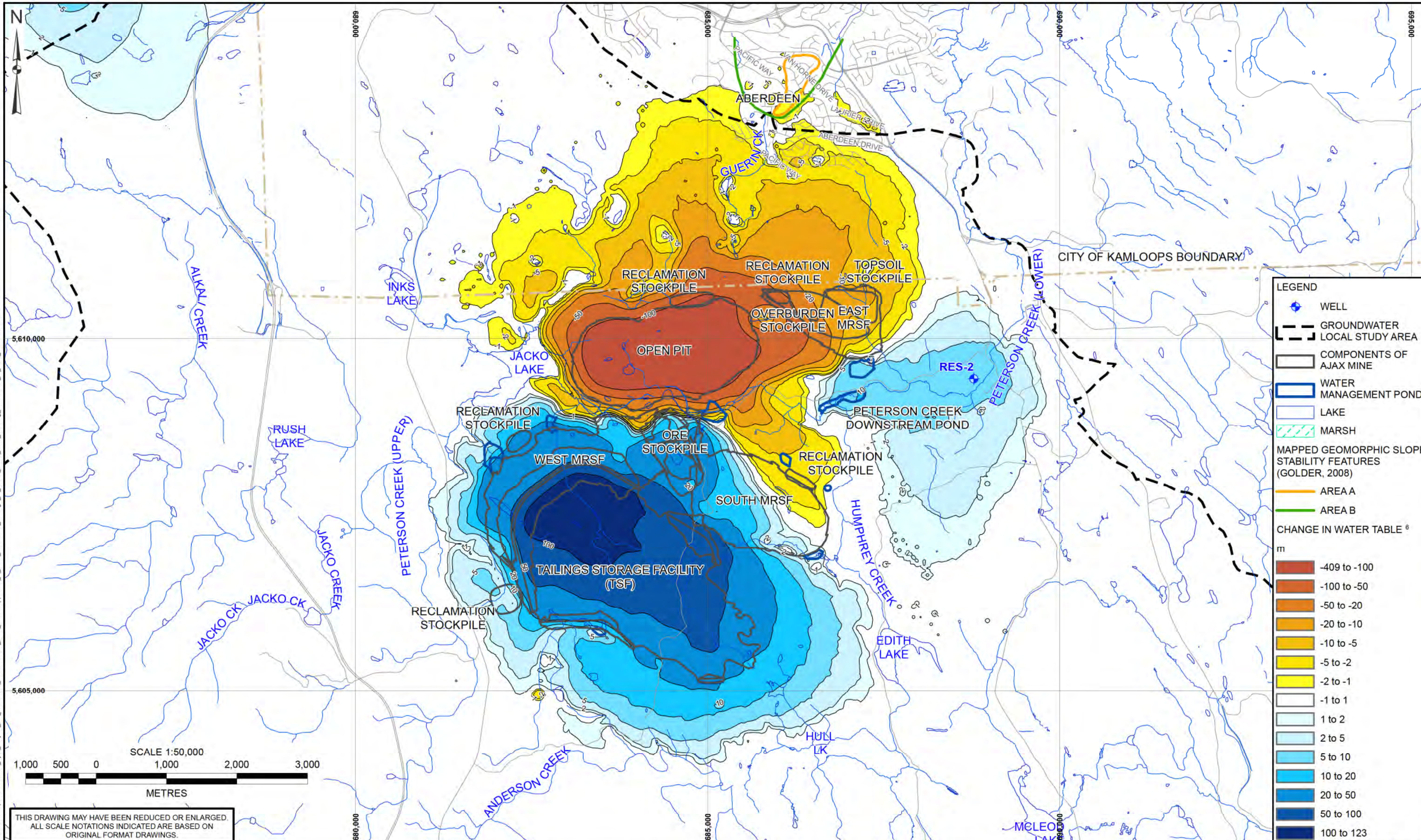
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (BASE CASE)

PROJECT No.: 1125007-04

DWG No: E-28



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NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
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3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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BGC ENGINEERING INC.
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CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (ALL K x5)

PROJECT No.: 1125007-04

DWG No: E-29

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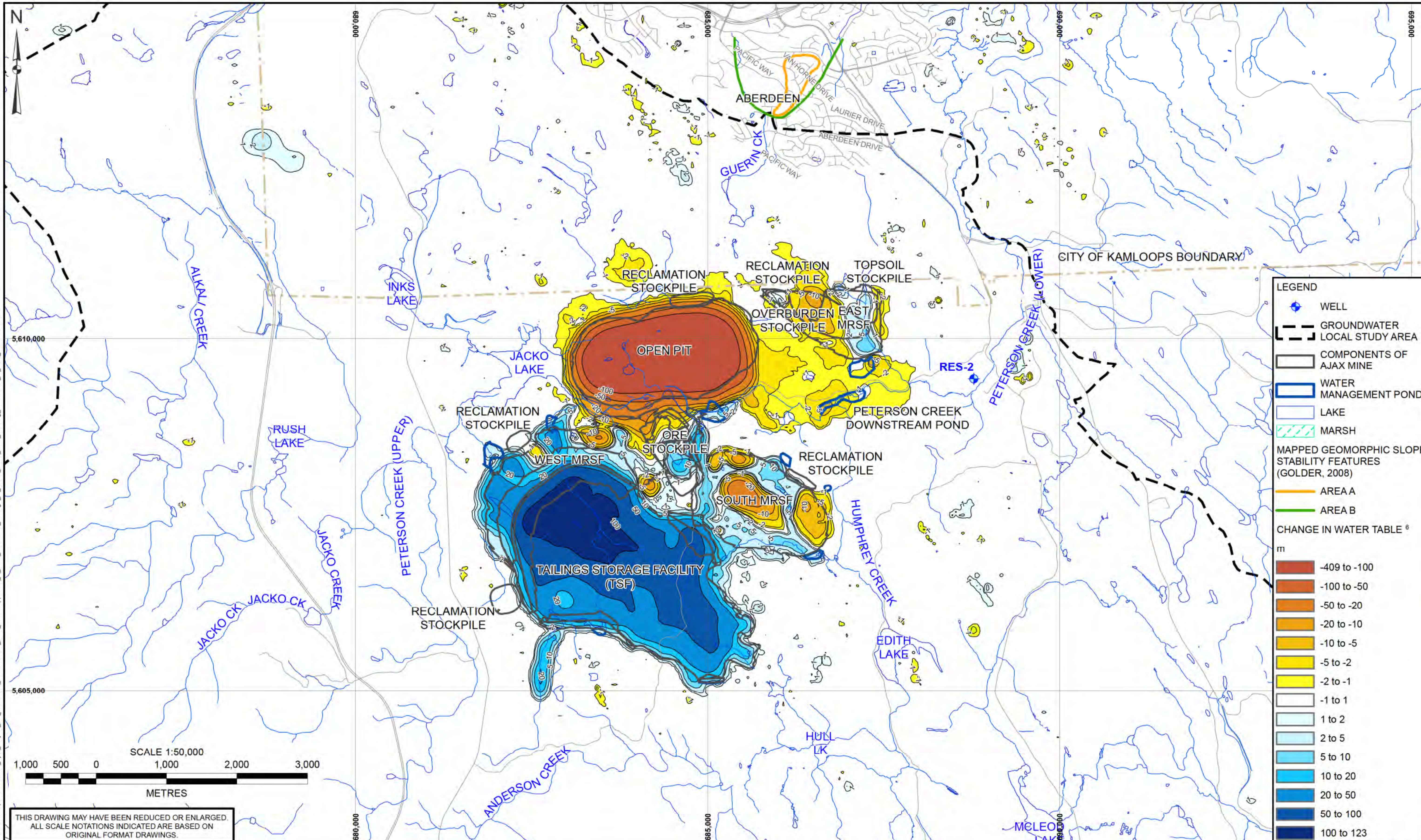

NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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CLIENT:
KGHM AJAX MINING INC.

PROJECT:
AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE:
SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (ALL K ÷5)

PROJECT No.:	DWG No:
1125007-04	E-30

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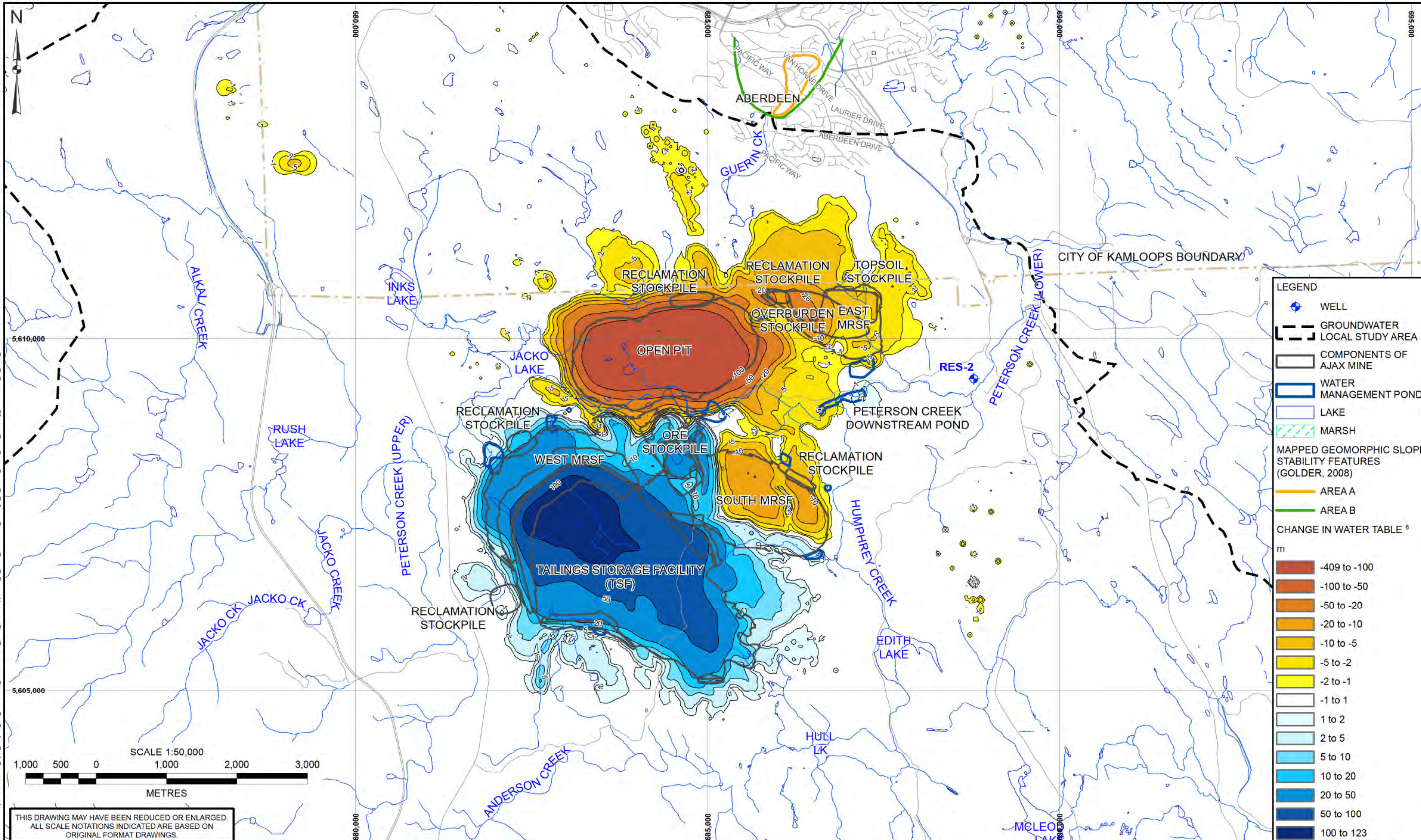

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
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3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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BGC ENGINEERING INC.
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CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (TSF K AND CONDUCTANCE x10)

PROJECT No.: 1125007-04

DWG No: E-31

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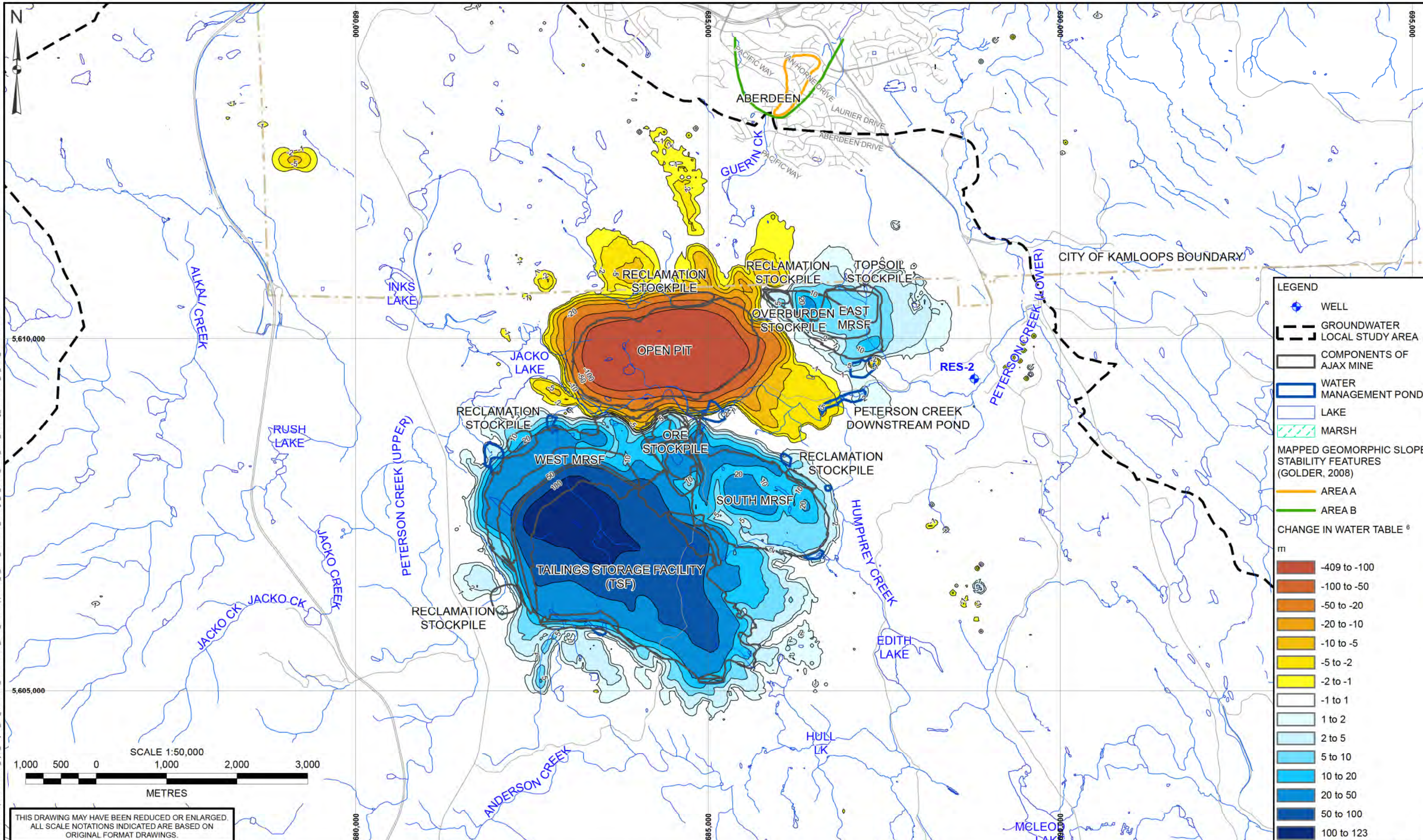

NOTES:
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3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (MRSF RECHARGE x10)

PROJECT No.: 1125007-04

DWG No: E-32

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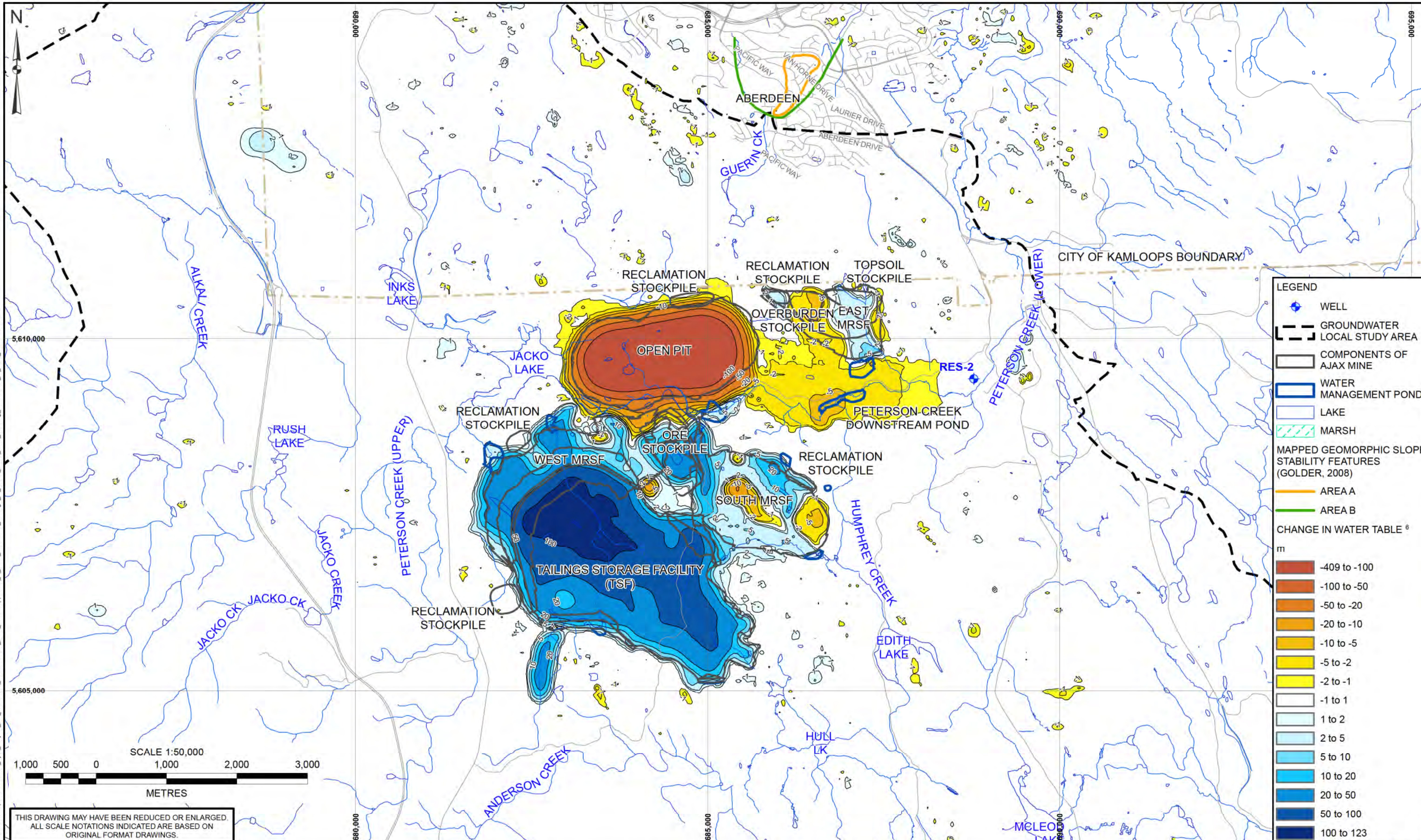

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3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
8. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

SCALE:	1:50,000
DATE:	AUG 2015
DRAWN:	MIB
CHECKED:	RC/BM
APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

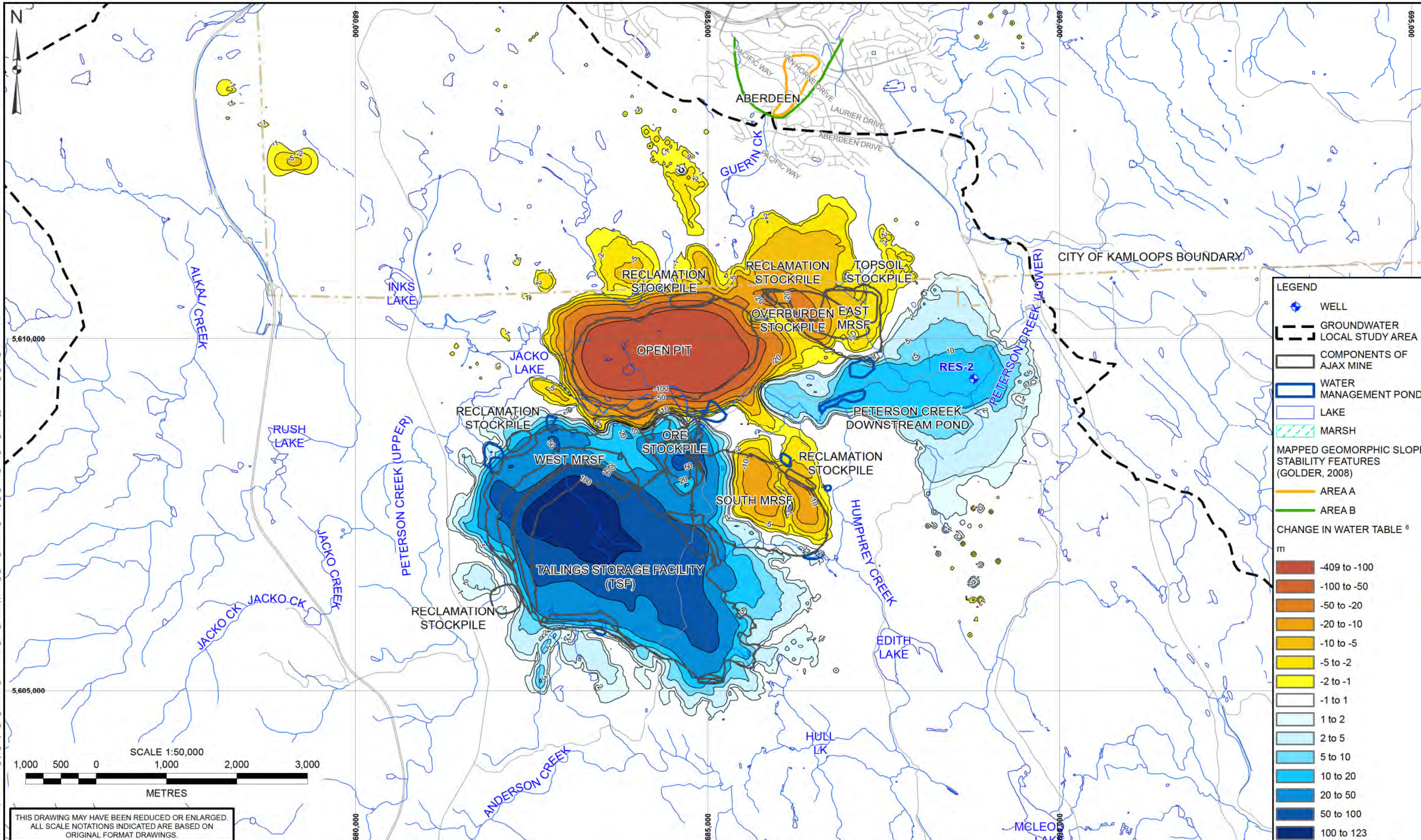
PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (RECHARGE x10)

PROJECT No.: 1125007-04

DWG No: E-33

X:\Projects\1125_AJAX\007\GIS\Production\Report\20150319_Ajax_Project_EA_Numerical_Groundwater_Flow_Model\Appendix_E_DDP_Simulated_Change_in_Water_Table_from_Existing_Conditions_to_Post_Closure.mxd



NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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DATE:	AUG 2015
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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

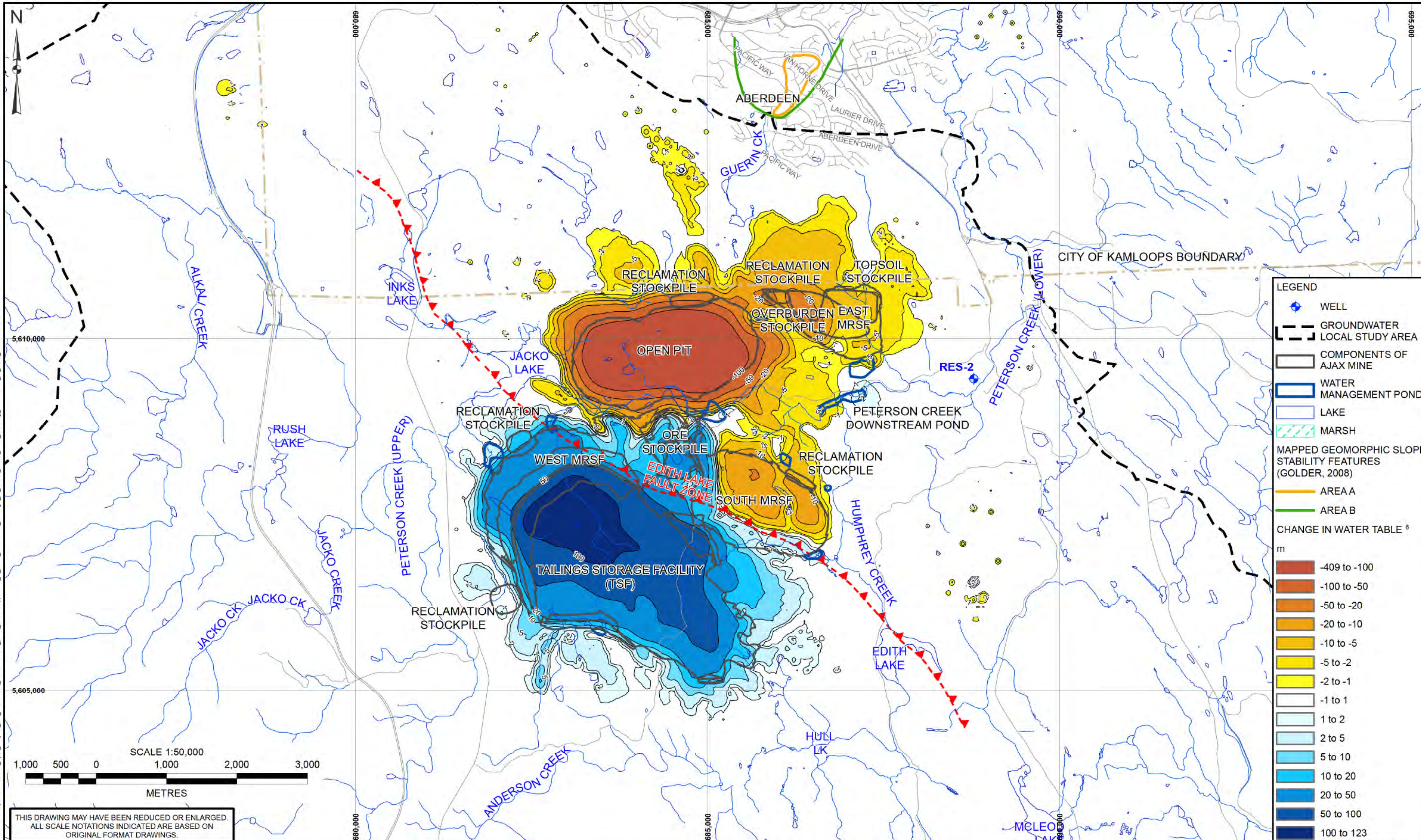
PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (PETERSON CREEK AQUIFER K x10)

PROJECT No.: 1125007-04

DWG No: E-34

X:\Projects\1125_AJAX\007\GIS\Production\Report\20150319_Ajax_Project_EA_Numerical_Groundwater_Flow_Model\Appendix_E_DDP_Simulated_Change_in_Water_Table_from_Existing_Conditions_to_Post_Closure.mxd



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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DATE:	AUG 2015
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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (EDITH LAKE FAULT ZONE)

PROJECT No.: 1125007-04

DWG No: E-35

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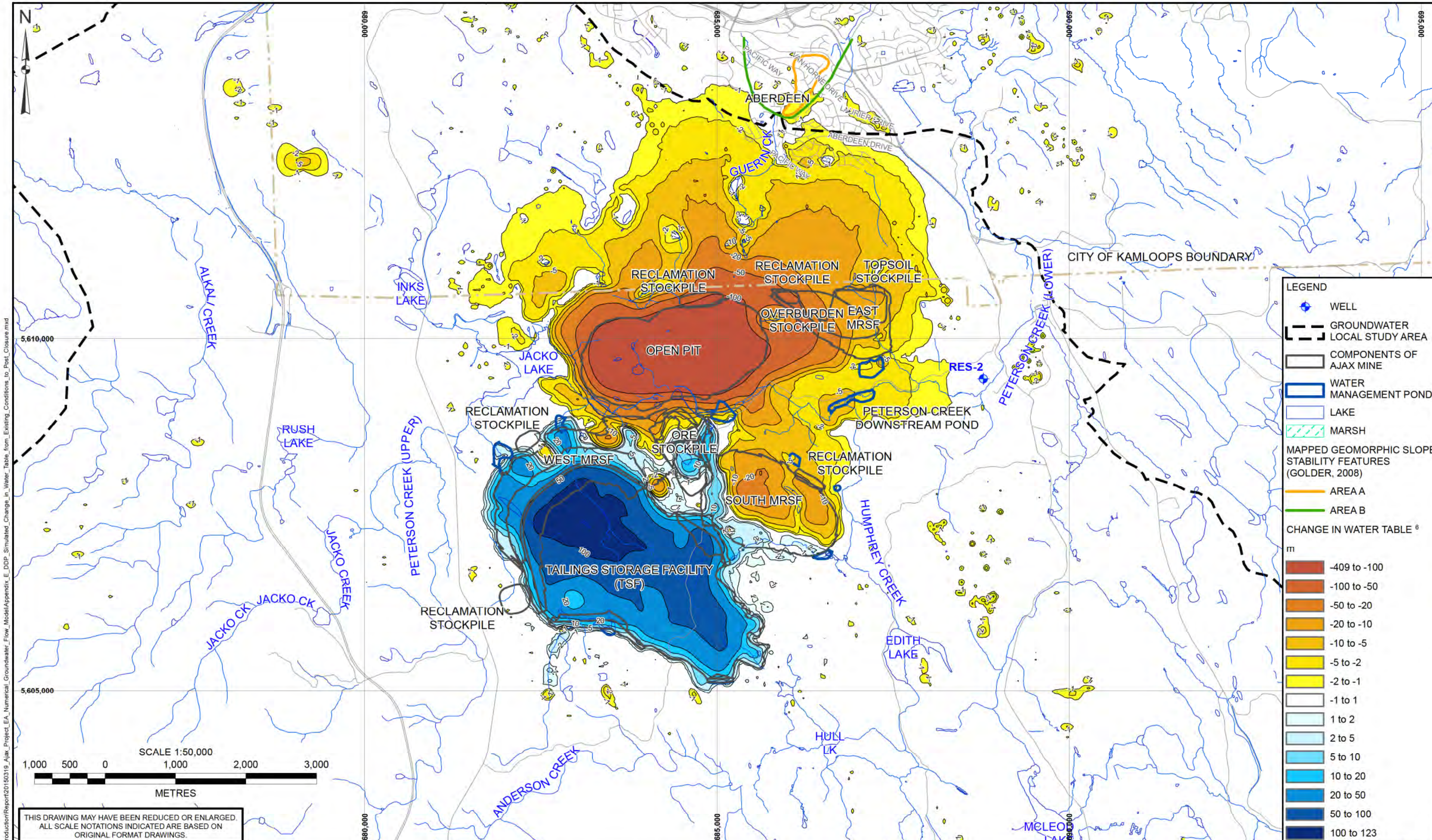

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

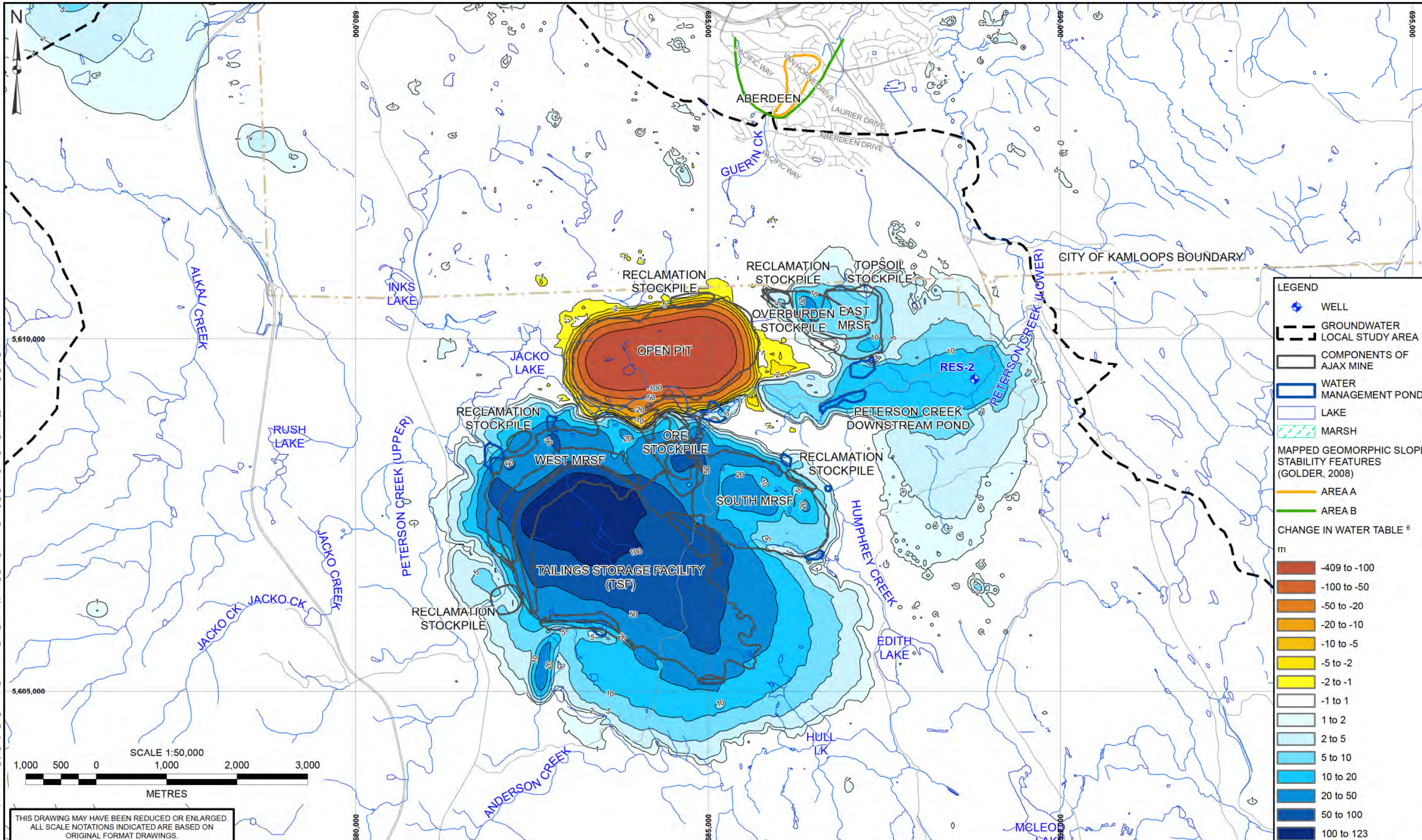
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (MINIMUM OF ALL SENSITIVITIES)

PROJECT No.: 1125007-04

DWG No: E-36



NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 700 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT POST CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE FROM EXISTING CONDITIONS TO POST CLOSURE (MAXIMUM OF ALL SENSITIVITIES)

PROJECT No.: 1125007-04
DWG No: E-37

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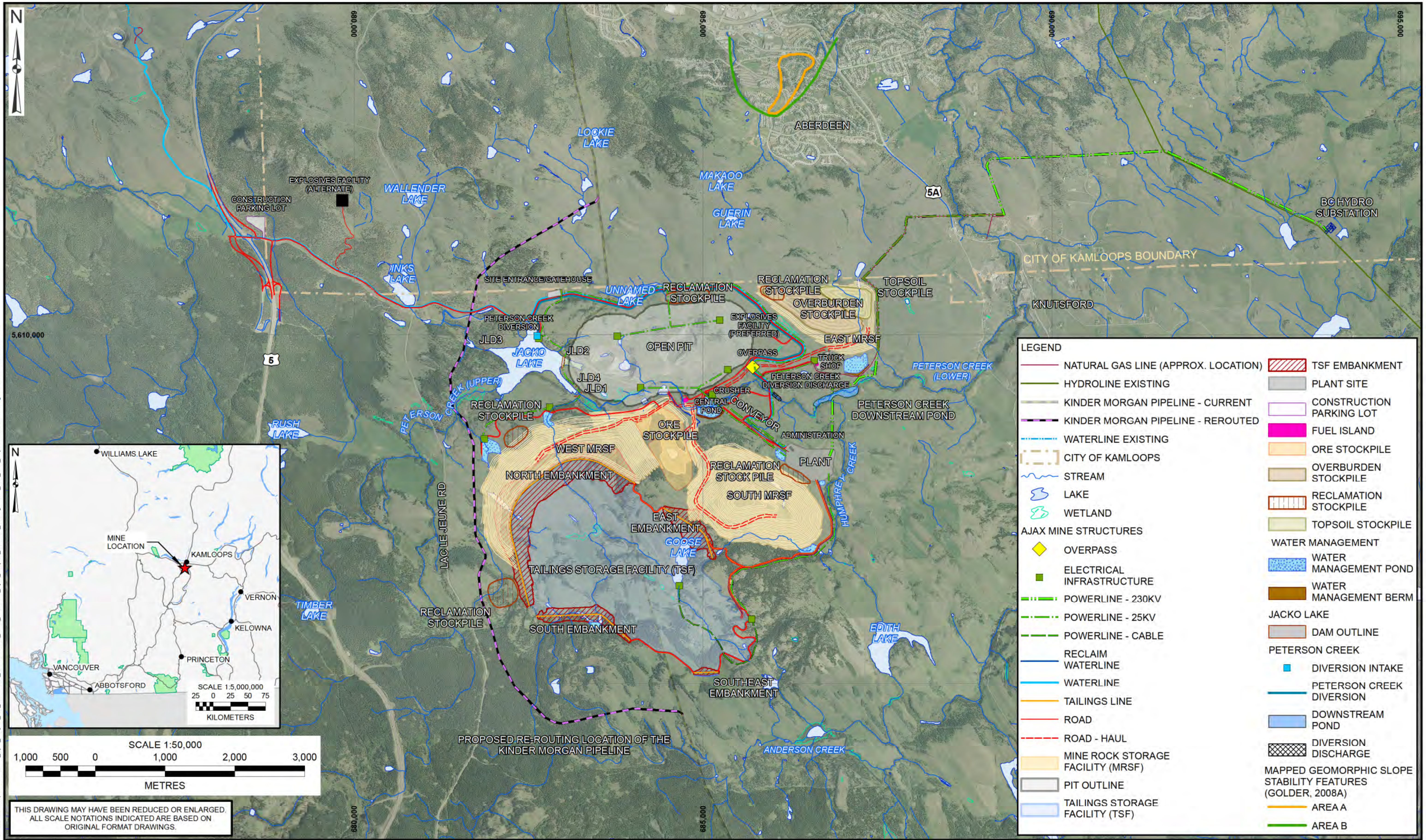
DRAWINGS



THIS DRAWING MAY HAVE BEEN REDUCED OR ENLARGED. ALL SCALE NOTATIONS INDICATED ARE BASED ON ORIGINAL FORMAT DRAWINGS.

NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. ORTHOPHOTO PROVIDED BY KAM FROM EAGLE MAPPING AERIAL PHOTOGRAPHY DATED JUNE 26, 2006, PUBLISHED SEPTEMBER 29, 2006.
5. INSET BASEMAP FROM ESRI TOPOGRAPHIC BASEMAP.
6. PROJECTION IS NAD 1983 UTM ZONE 10N.
7. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

SCALE:	AS SHOWN
DATE:	AUG 2015
DRAWN:	IL, MIB
CHECKED:	RC/BM
APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: AJAX PROJECT GENERAL ARRANGEMENT AND SITE LAYOUT

PROJECT No.: 1125007-04

DWG No.: 01

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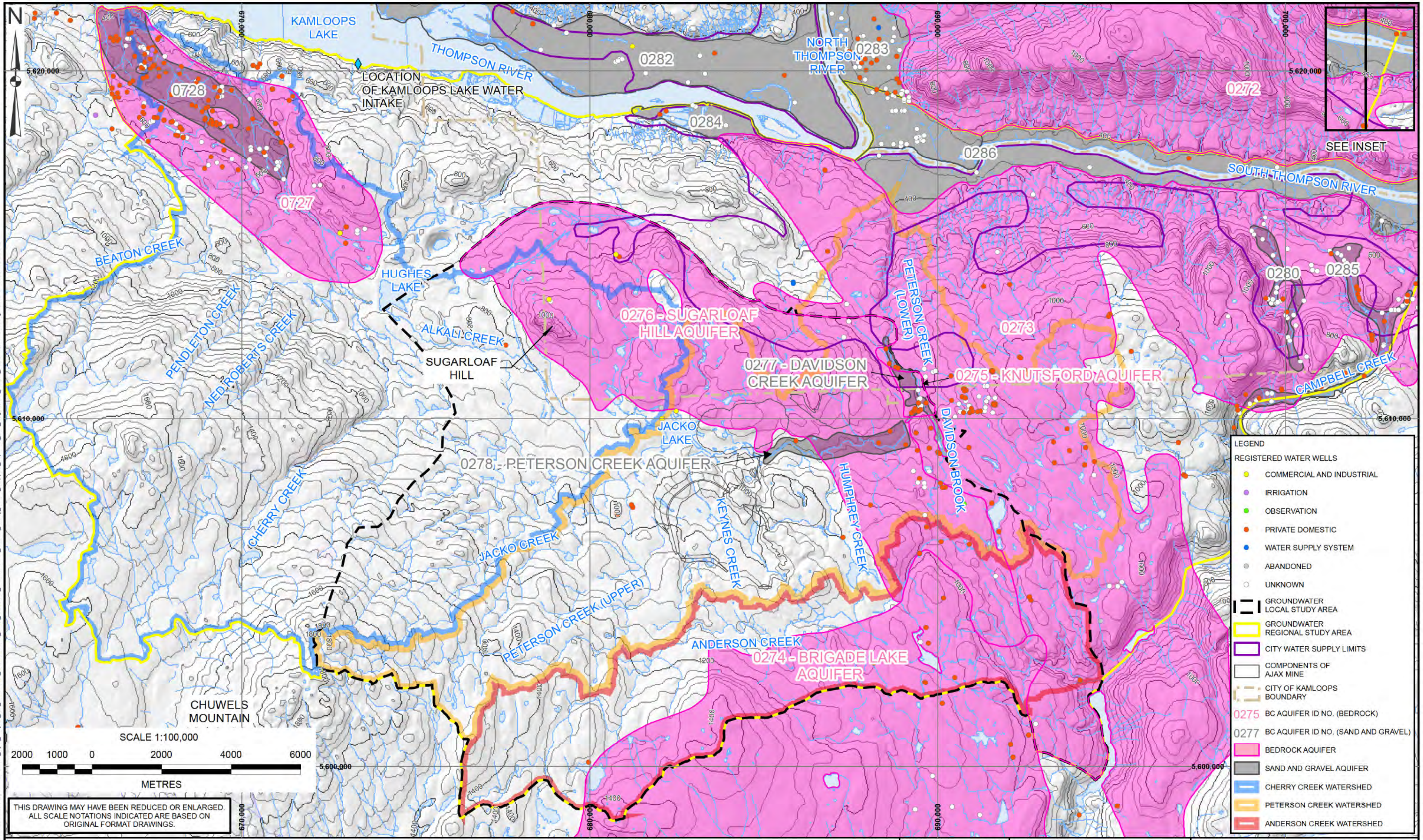


NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. BASE TOPOGRAPHIC DATA FROM NRCAN CANVEC. CONTOUR INTERVAL IS 20 m.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. WATER COMPILED FROM KAM, CITY OF KAMLOOPS AND NATIONAL HYDRO NETWORK.
6. AQUIFER EXTENTS AND ID NUMBERS FROM BC WATER RESOURCES ATLAS, DOWNLOADED IN JANUARY 2015.
7. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

SCALE:	1:100,000
DATE:	AUG 2015
DRAWN:	IL, MIB
CHECKED:	RC/BM
APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

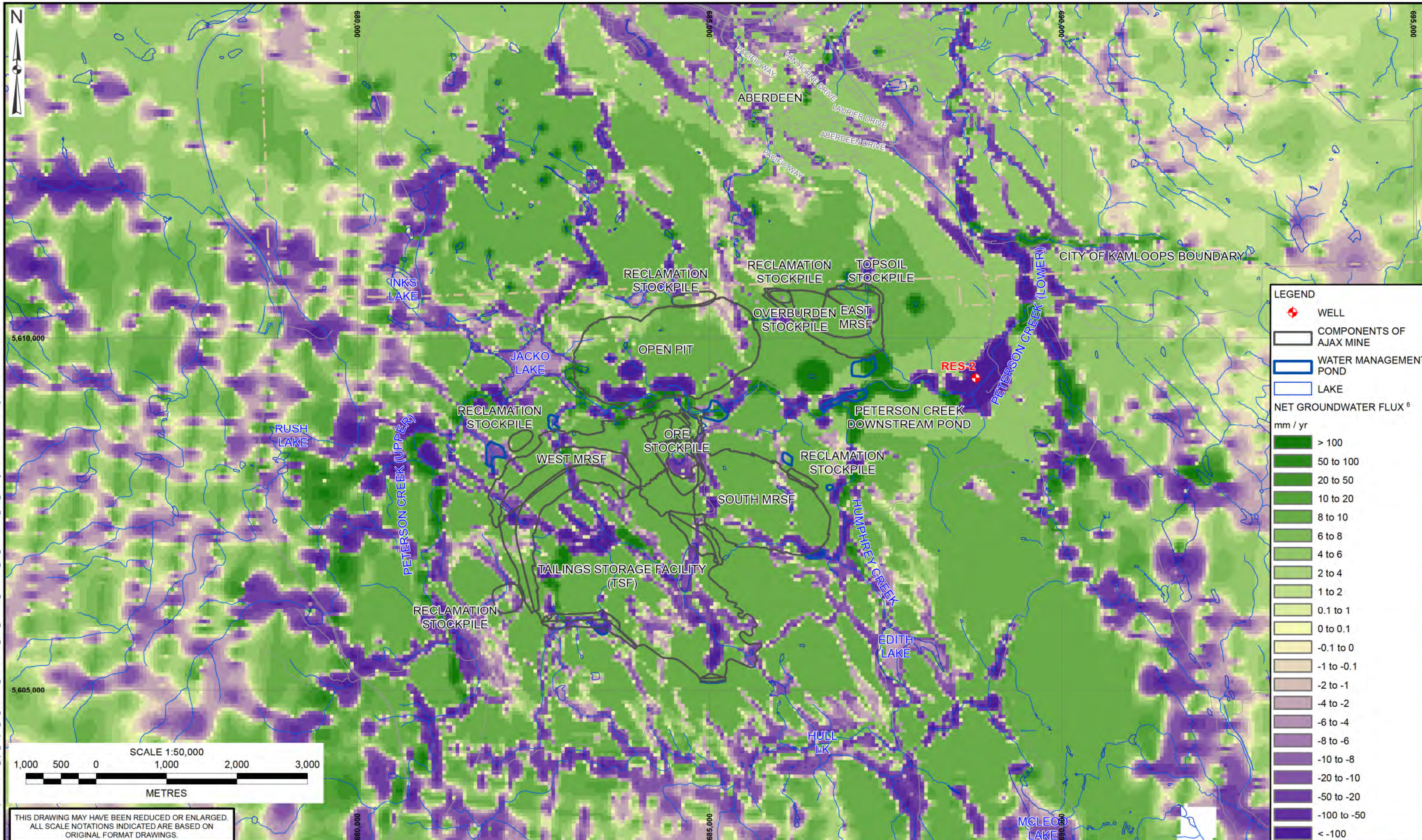
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: GROUNDWATER EFFECTS STUDY AREAS, MAPPED AQUIFERS AND REGISTERED WATER WELLS

PROJECT No.: 1125007-04

DWG No.: 02



THIS DRAWING MAY HAVE BEEN REDUCED OR ENLARGED. ALL SCALE NOTATIONS INDICATED ARE BASED ON ORIGINAL FORMAT DRAWINGS.

X:\Projects\1125_AJAX\007\GIS\Production\Report\20150319_Ajax_Project_EA_Numerical_Groundwater_Flow_Model\03_Simulated_Net_Groundwater_Flux_ExistingConditions.mxd Date: August-18-15 Time: 10:44 PM

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 500 MASL.
6. POSITIVE NUMBERS INDICATE NET GAIN TO THE GROUNDWATER SYSTEM (RECHARGE) AND NEGATIVE NUMBERS INDICATE NET LOSS TO THE GROUNDWATER SYSTEM (DISCHARGE).
7. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

SCALE:	1:50,000
DATE:	AUG 2015
DRAWN:	MIB
CHECKED:	RC/BM
APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

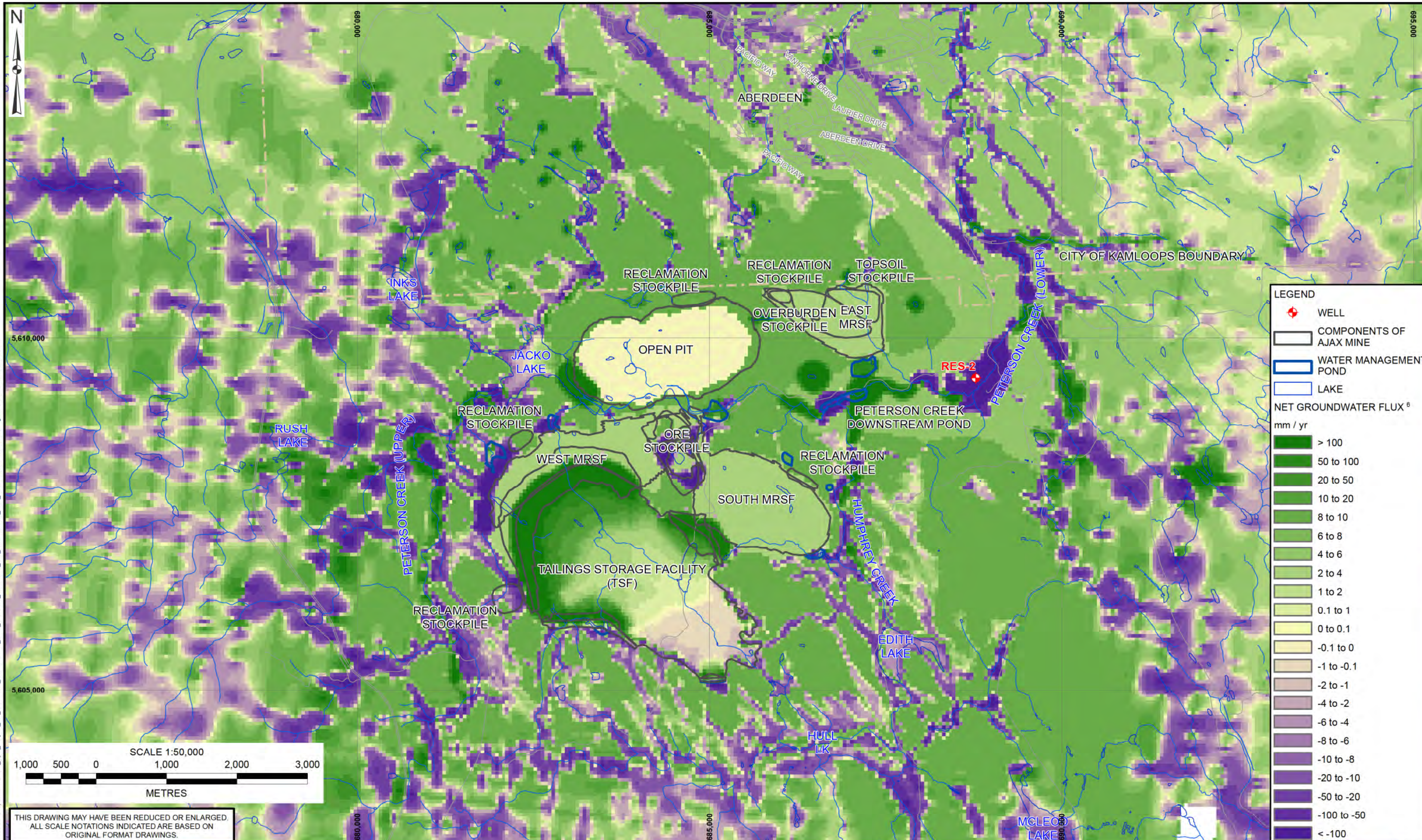
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED NET GROUNDWATER FLUX (EXISTING CONDITIONS)

PROJECT No.: 1125007-04

DWG No: 03



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NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 500 MASL.
6. POSITIVE NUMBERS INDICATE NET GAIN TO THE GROUNDWATER SYSTEM (RECHARGE) AND NEGATIVE NUMBERS INDICATE NET LOSS TO THE GROUNDWATER SYSTEM (DISCHARGE).
7. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

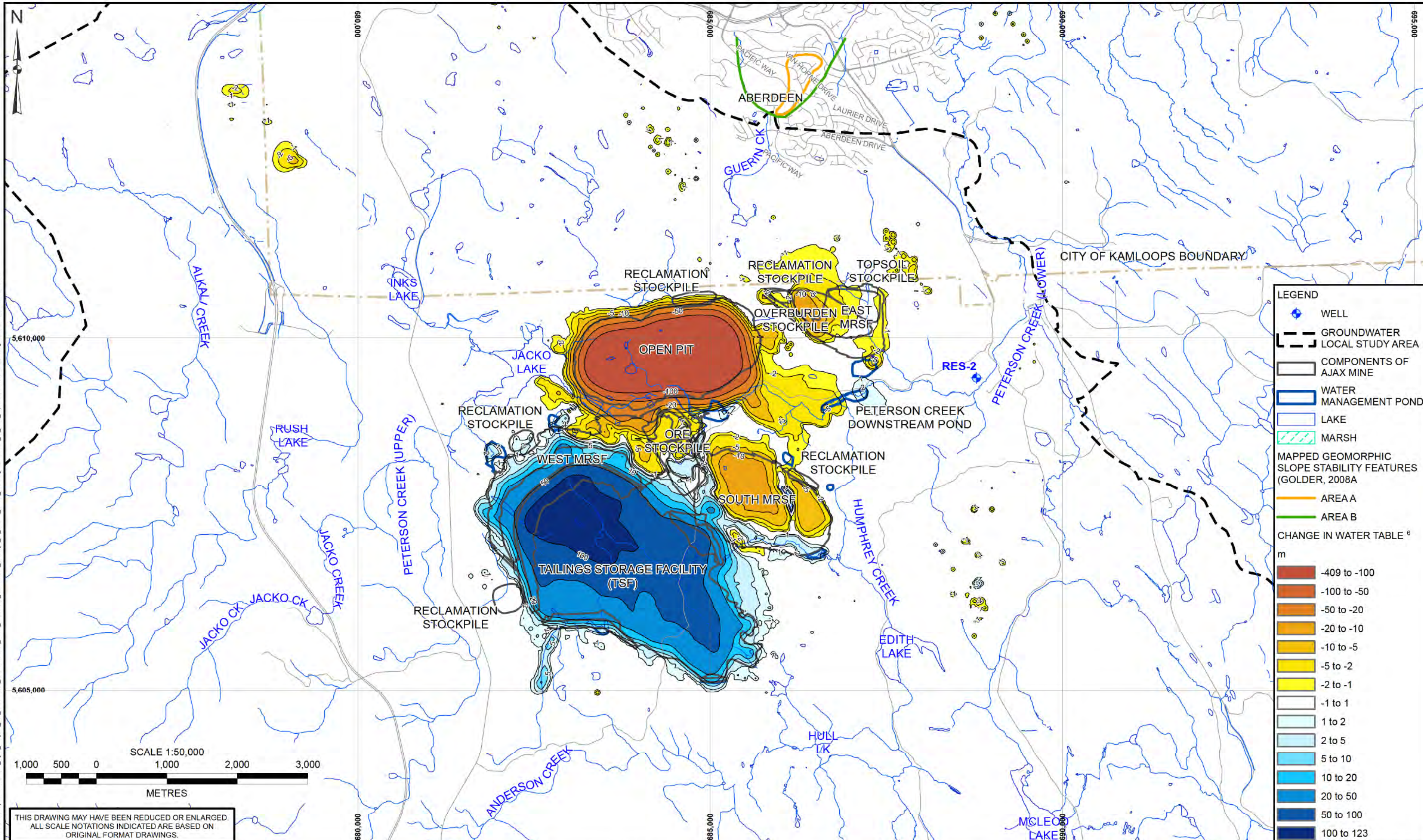
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED NET GROUNDWATER FLUX (POST-CLOSURE)

PROJECT No.: 1125007-04

DWG No: 04



NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON LAST STRESS PERIOD (MINE YEAR 23) OF OPERATION MODEL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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BGC ENGINEERING INC.
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CLIENT:
KGHM AJAX MINING INC.

PROJECT:
AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE:
SIMULATED CHANGE IN WATER TABLE (FROM EXISTING CONDITIONS TO END OF OPERATION)

PROJECT No.: 1125007-04
DWG No: 05

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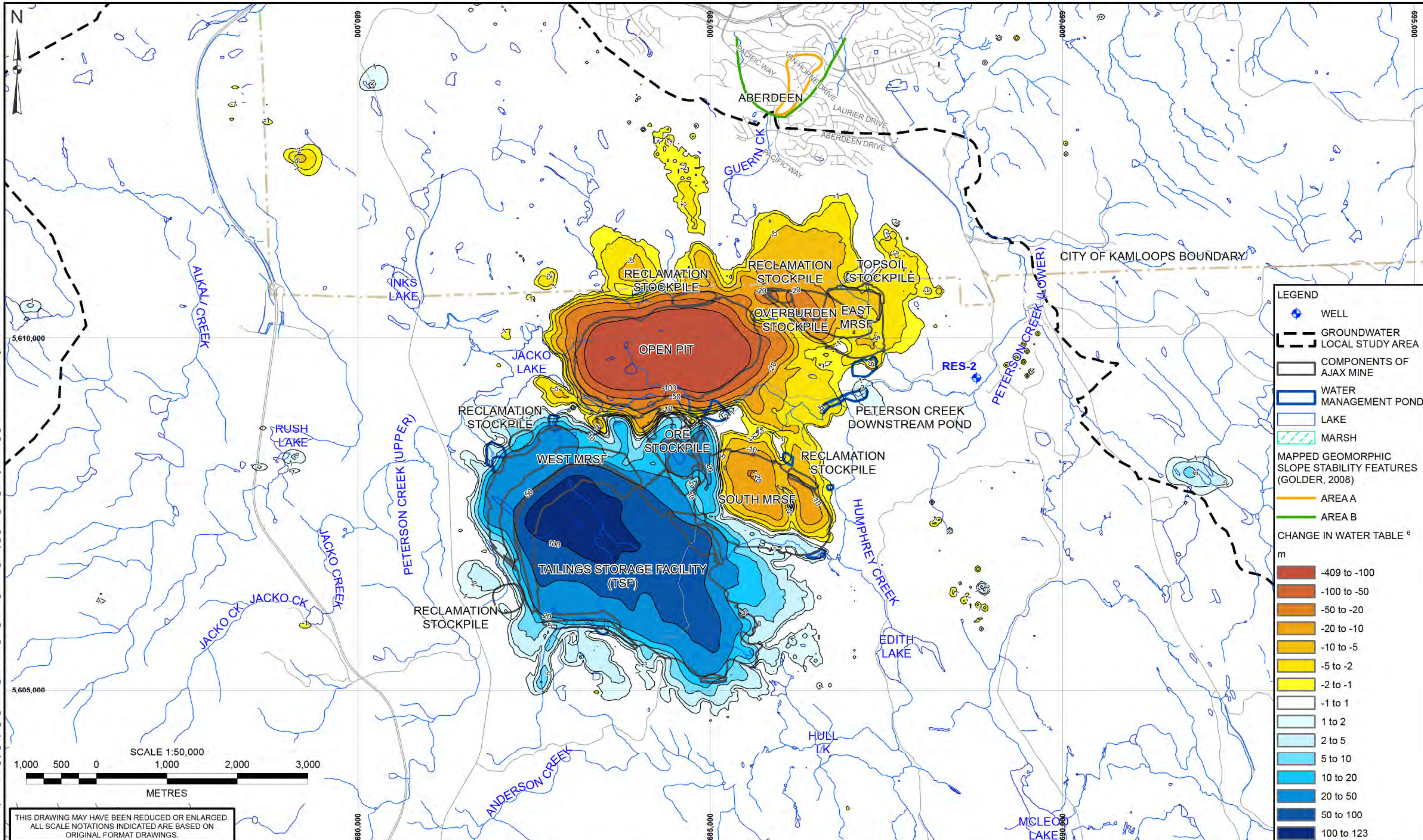

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. PROJECTION IS NAD 1983 UTM ZONE 10N.
5. THESE RESULTS ARE BASED ON CLOSURE MODEL WITH PIT LAKE ELEVATION OF 500 MASL.
6. POSITIVE NUMBERS INDICATE THAT THE WATER TABLE WILL BE GREATER AT CLOSURE COMPARED TO EXISTING CONDITIONS, WHILE NEGATIVE NUMBERS INDICATE THE OPPOSITE.
7. NON-PHYSICAL GROUNDWATER LEVEL DIFFERENCES OUTSIDE THE MINE SITE MAY OCCUR DUE TO DIFFERENCES IN MODEL LAYER FORMULATION BETWEEN THE 15-LAYER EXISTING CONDITIONS MODEL AND THE 19-LAYER CLOSURE CONDITIONS MODEL. THESE DIFFERENCES DO NOT REFLECT PROJECT EFFECTS.
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DATE:	AUG 2015
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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

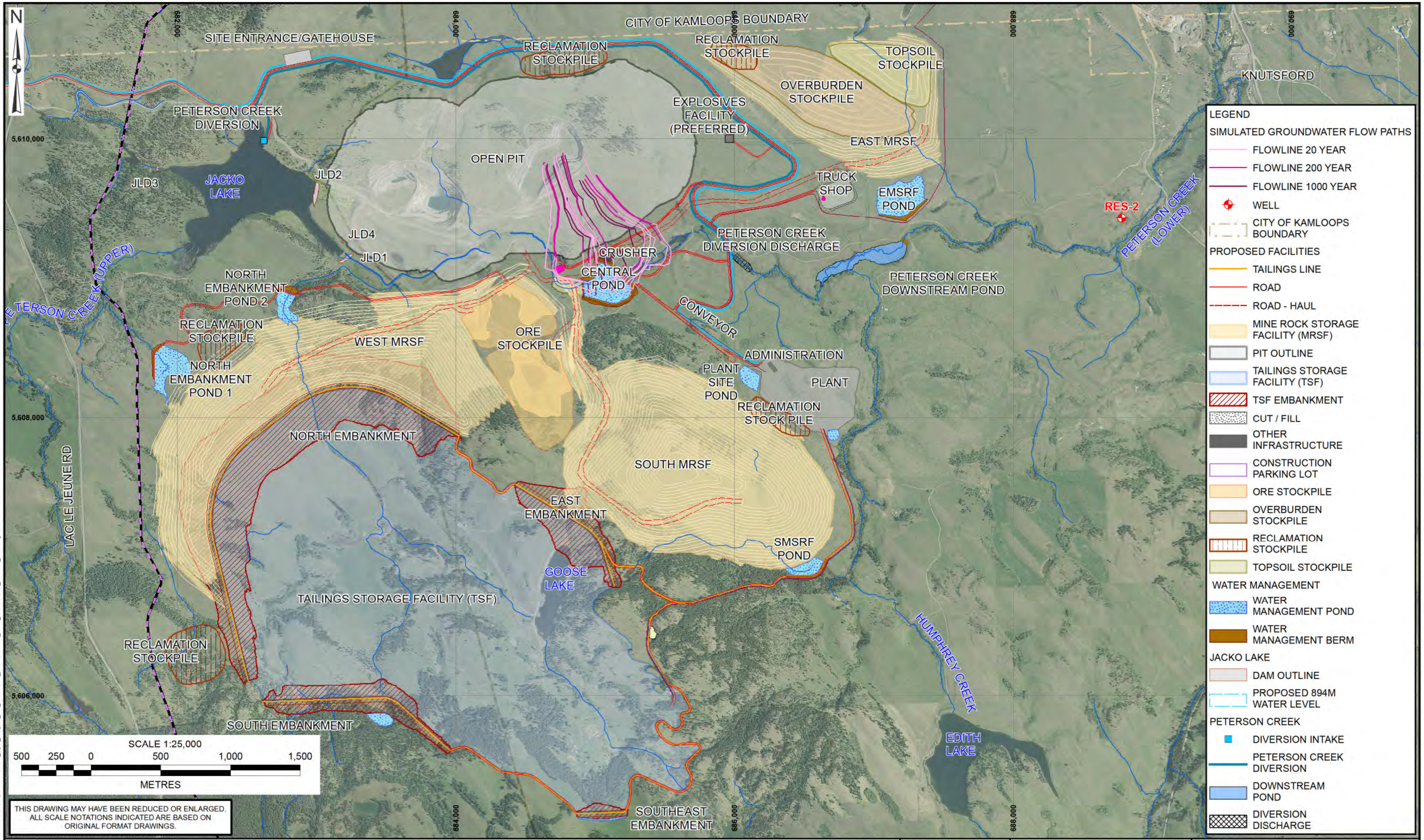
PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED CHANGE IN WATER TABLE (FROM EXISTING CONDITIONS TO POST CLOSURE)

PROJECT No.: 1125007-04

DWG No: 06

X:\Projects\1125_AJAX\007\GIS\Production\Report\20150319_Ajax_Project_EA_Numerical_Groundwater_Flow_Model\06_Simulated_Change_in_Water_Table_ExistingConditions_to_PostClosure.mxd Date: August-18-15 Time: 10:53 PM



NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING MUST BE READ IN CONJUNCTION WITH BGC'S REPORT TITLED "AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL," AND DATED AUGUST 2015.
3. PROPOSED GENERAL ARRANGEMENT OF MINE SITE FACILITIES PROVIDED BY KAM ON APRIL 15, 2015.
4. ORTHOPHOTO PROVIDED BY KAM FROM EAGLE MAPPING AERIAL PHOTOGRAPHY DATED JUNE 26, 2006, PUBLISHED SEPTEMBER 29, 2006.
5. PROJECTION IS NAD 1983 UTM ZONE 10N.
6. PARTICLE FLOW LINES ARE FROM CLOSURE CONDITION GROUNDWATER MODEL SIMULATIONS WITH OPEN PIT LAKE LEVEL OF 500 MASL.
7. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS CENTRAL COLLECTION POND

PROJECT No.: 1125007-04

DWG No.: 07

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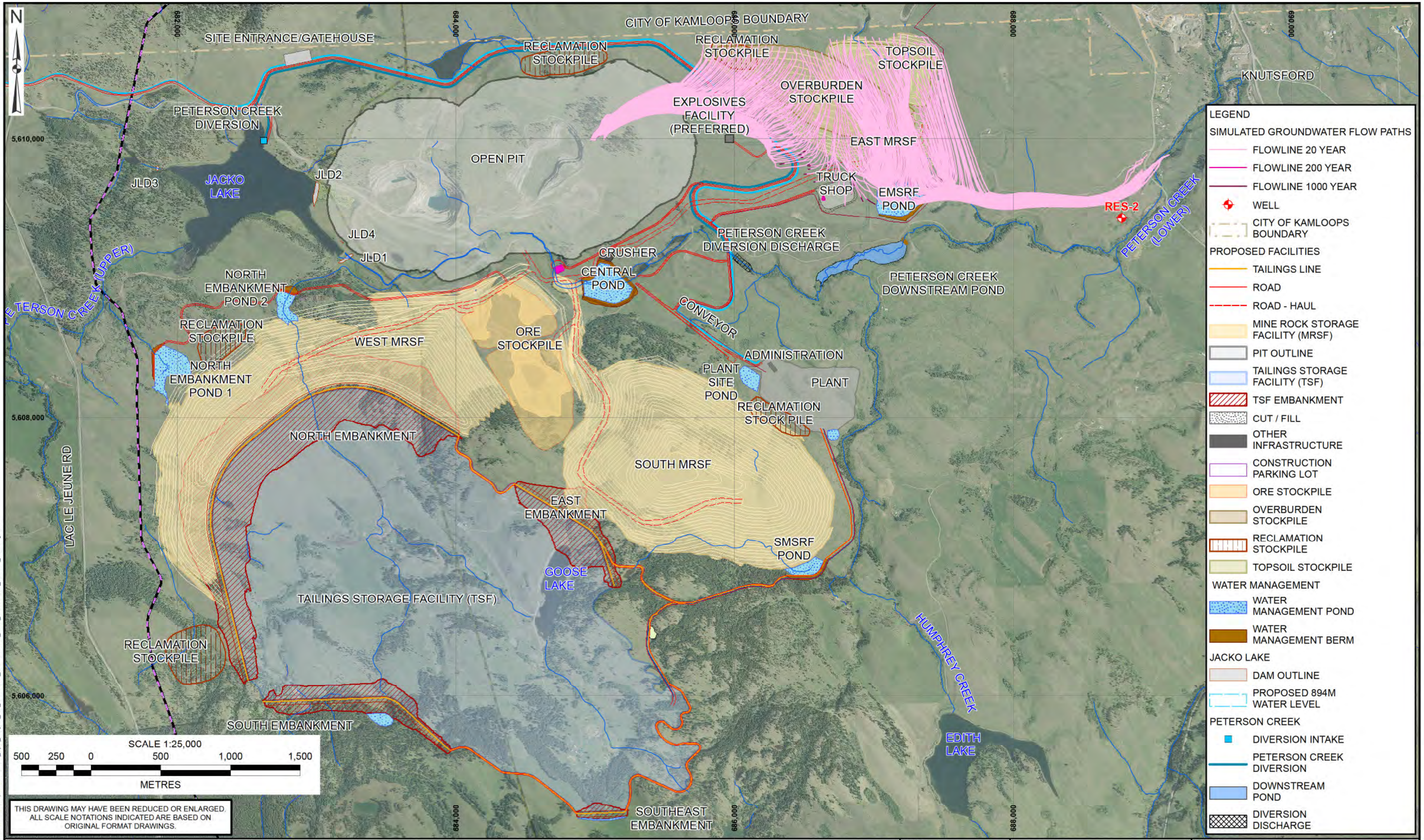

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4. ORTHOPHOTO PROVIDED BY KAM FROM EAGLE MAPPING AERIAL PHOTOGRAPHY DATED JUNE 26, 2006, PUBLISHED SEPTEMBER 29, 2006.
5. PROJECTION IS NAD 1983 UTM ZONE 10N.
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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS EAST MRSF

PROJECT No.: 1125007-04

DWG No.: 08

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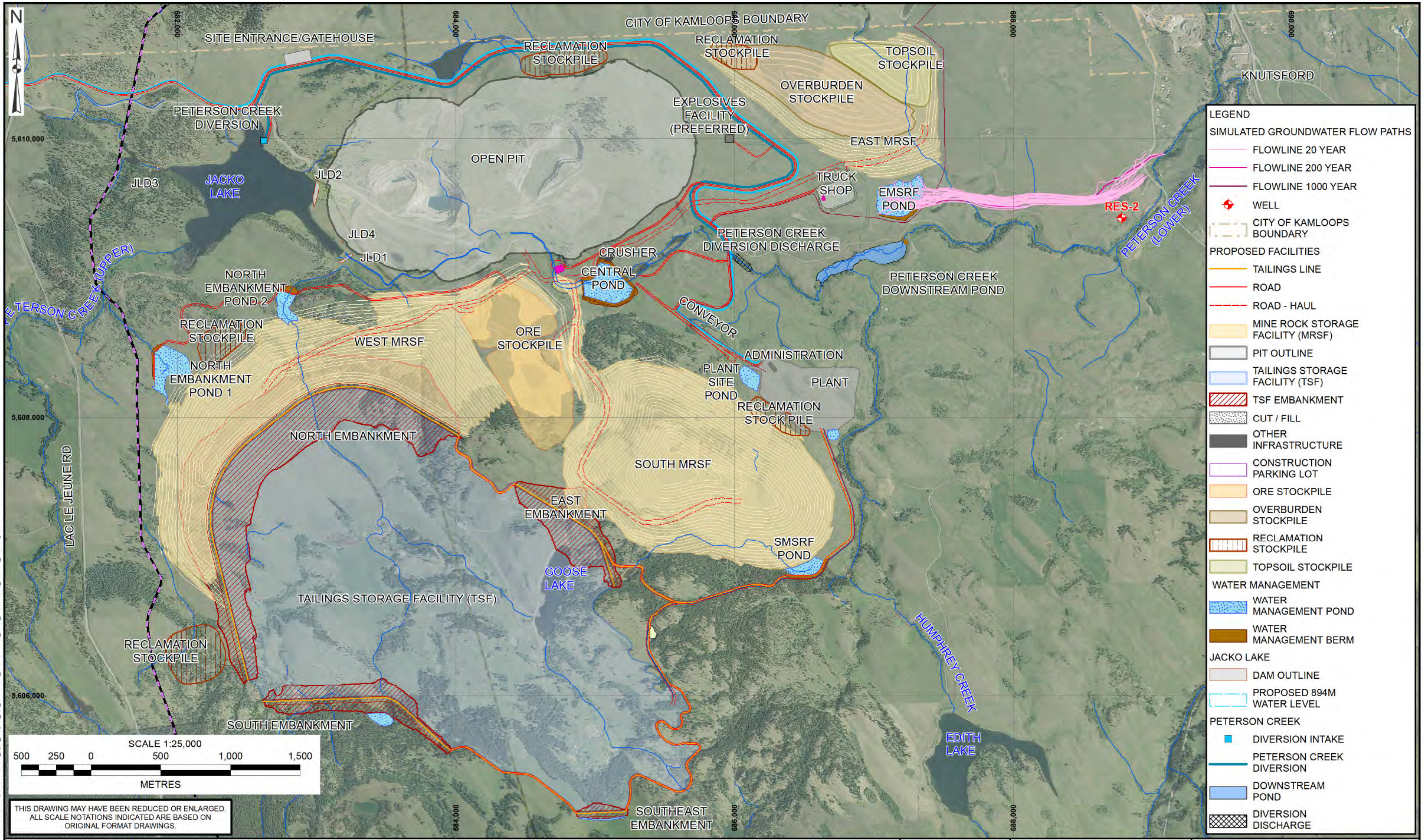

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS EAST MRSF POND

PROJECT No.: 1125007-04

DWG No.: 09

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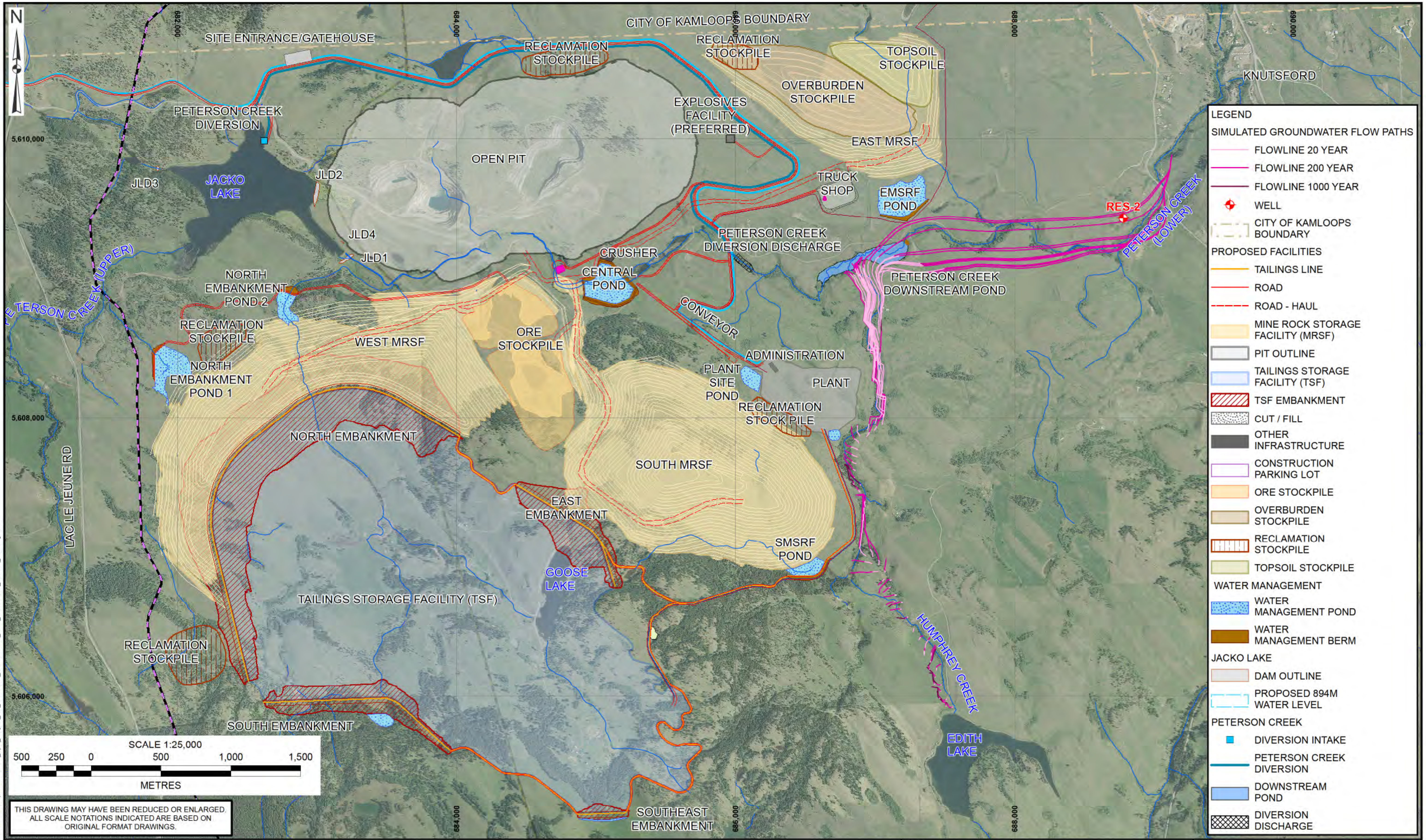

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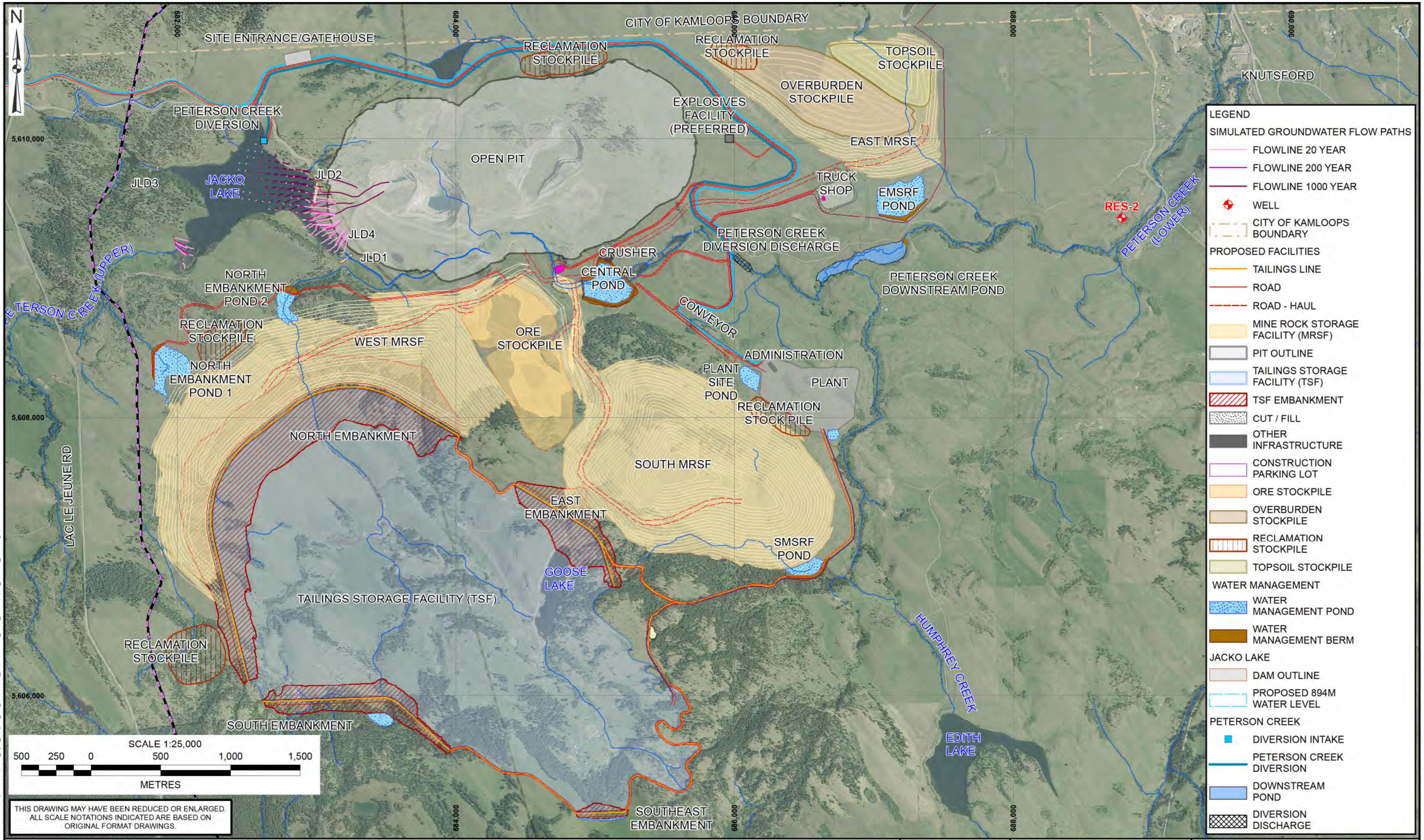
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS HUMPHREY CREEK

PROJECT No.:	DWG No.:
1125007-04	10



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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS JACKO LAKE

PROJECT No.: 1125007-04

DWG No.: 11

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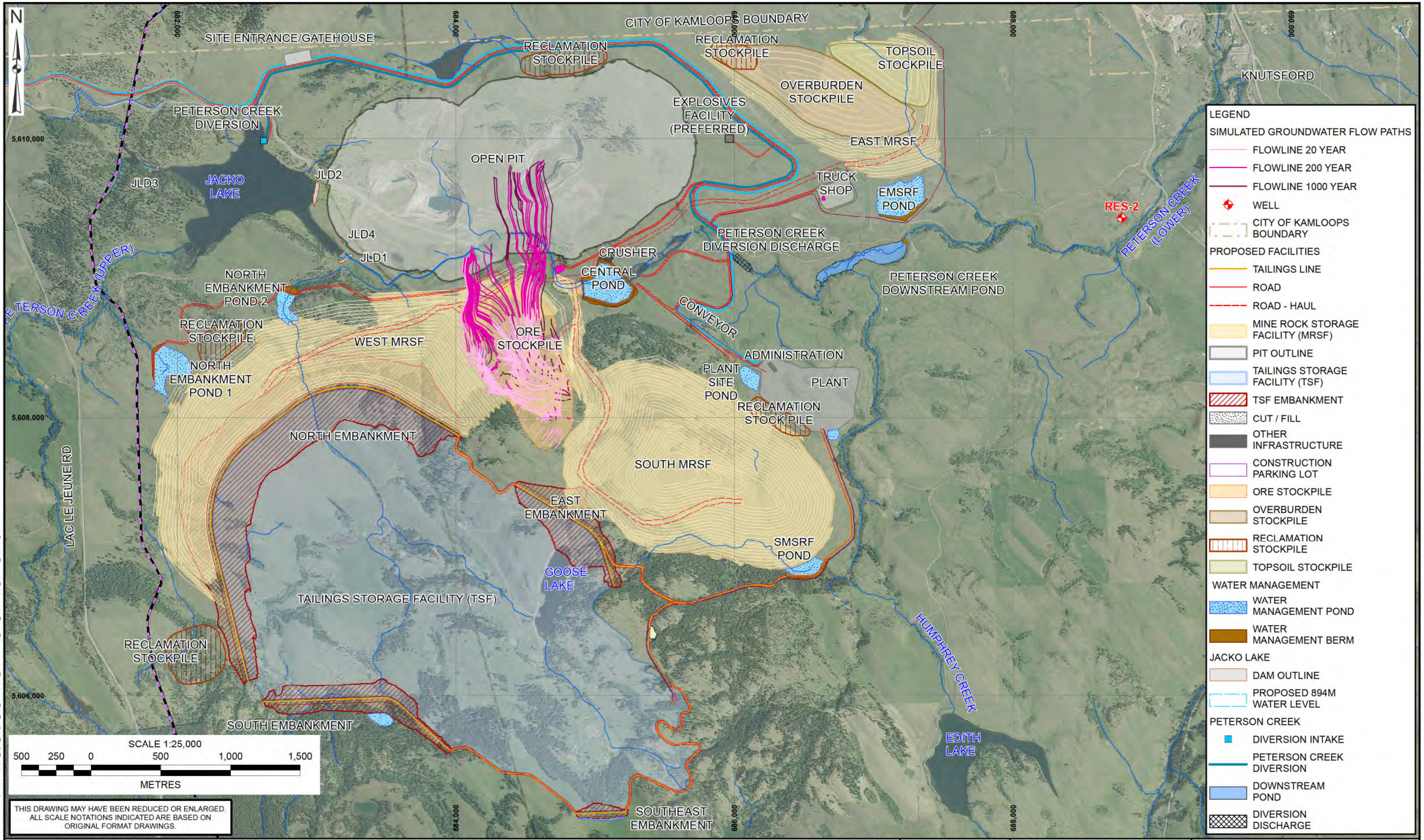

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

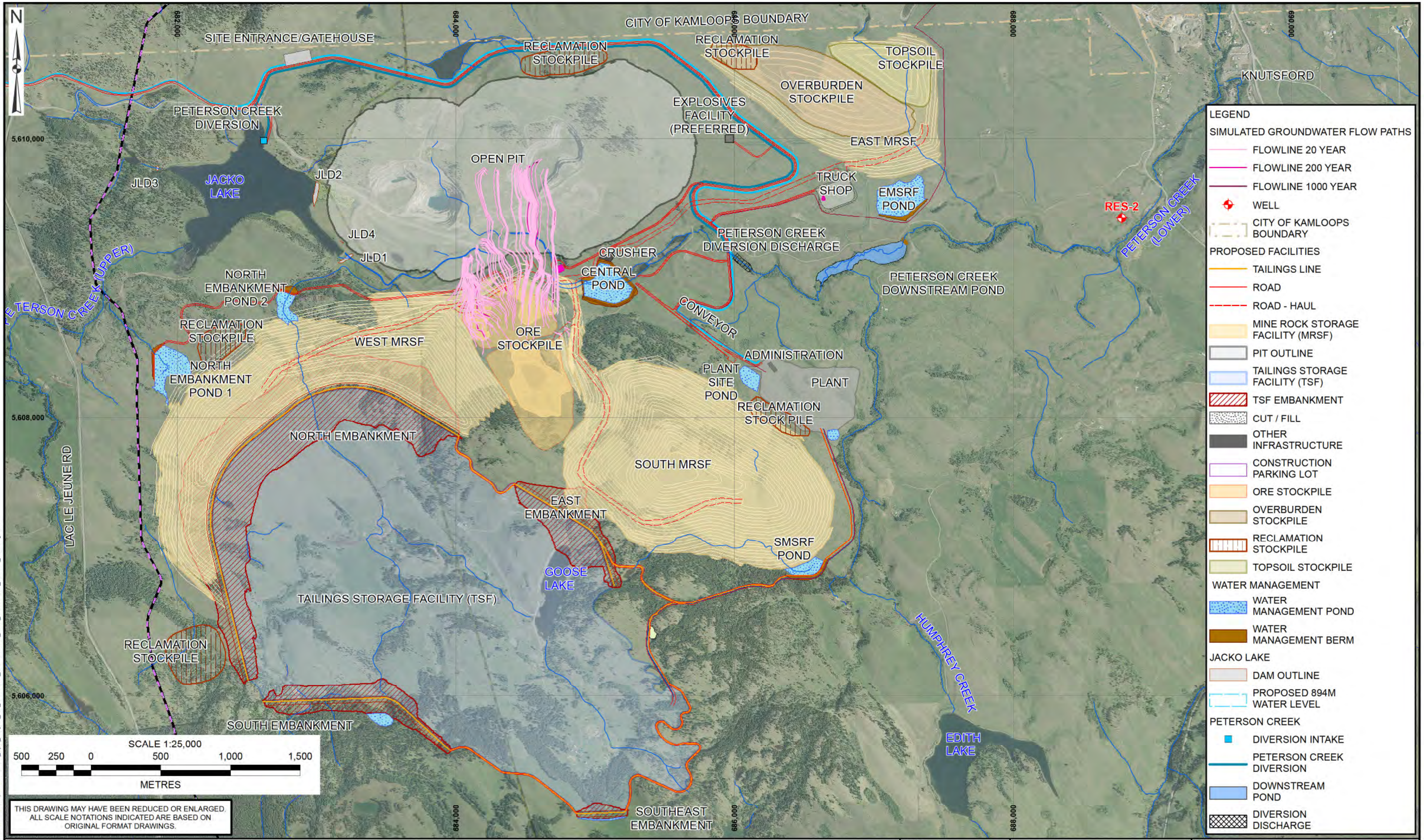
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS LOW GRADE STOCKPILE

PROJECT No.: 1125007-04

DWG No.: 12



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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS MEDIUM GRADE STOCKPILE

PROJECT No.:	DWG No.:
1125007-04	13

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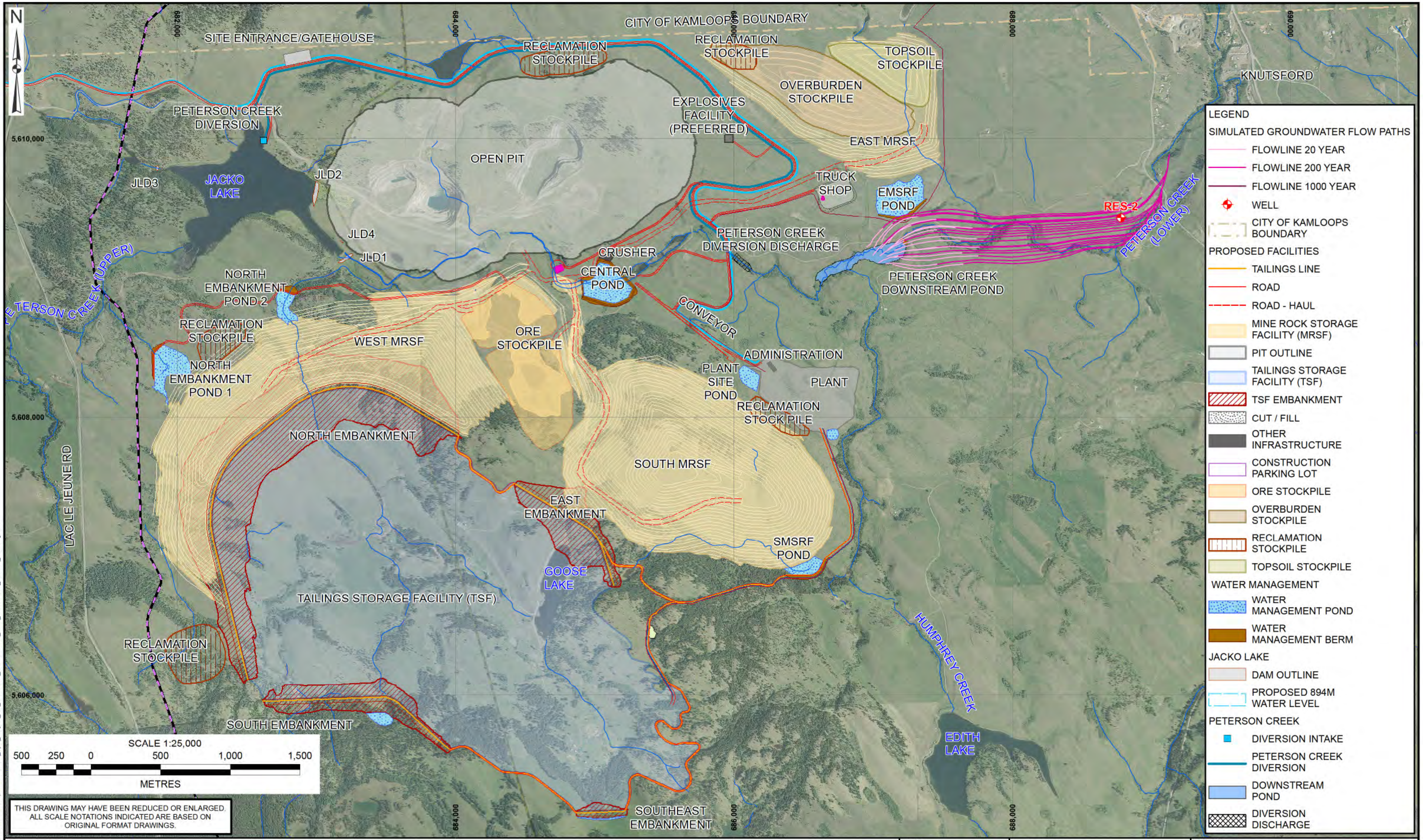

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT:
KGHM AJAX MINING INC.

PROJECT:
AJAX PROJECT ENVIRONMENTAL ASSESSMENT
NUMERICAL GROUNDWATER FLOW MODEL

TITLE:
SIMULATED POST CLOSURE
GROUNDWATER FLOW PATHS
PETERSON CREEK DOWNSTREAM POND

PROJECT No.: 1125007-04
DWG No.: 14

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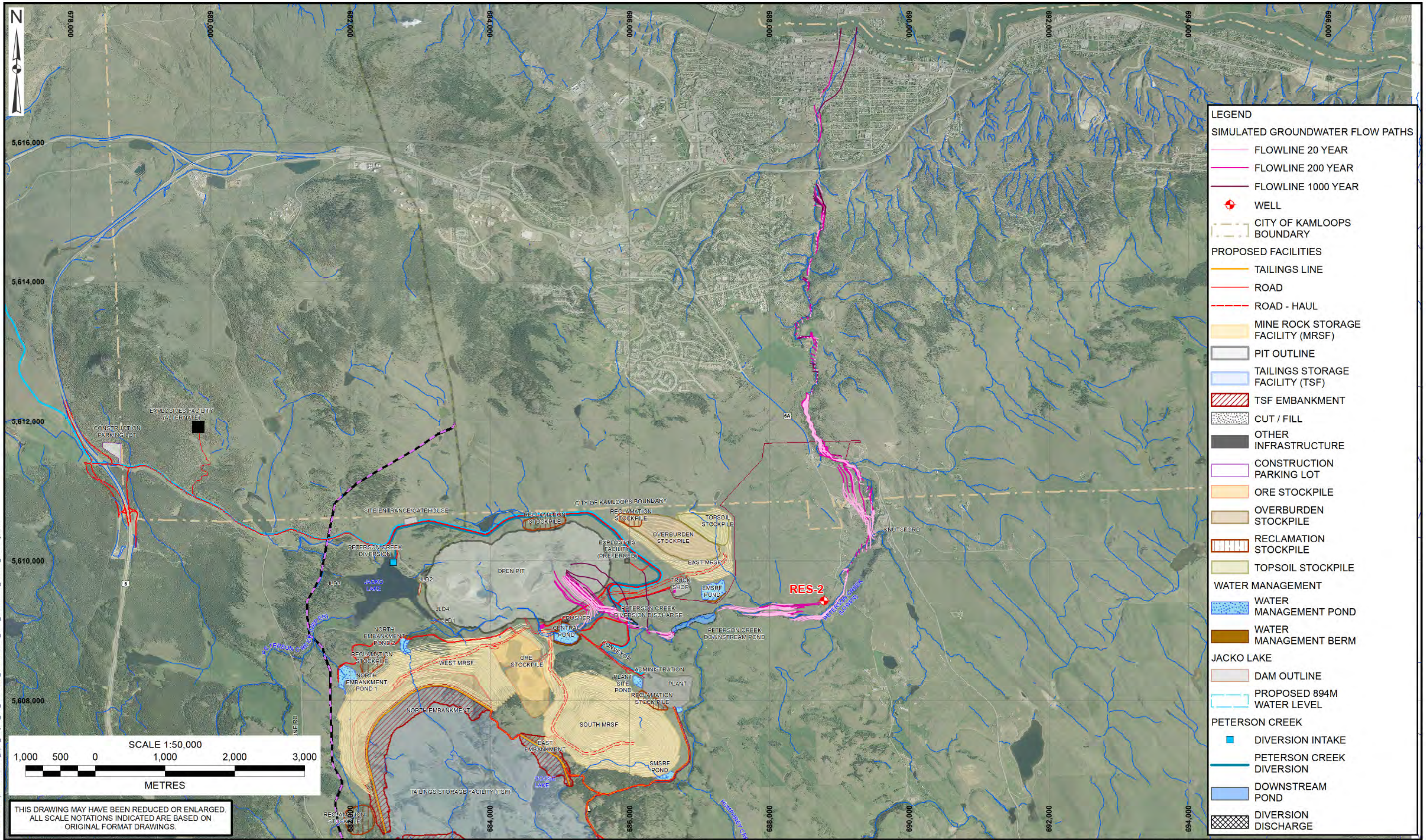

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DATE:	AUG 2015
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APPROVED:	TWC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS LOWER PETERSON CREEK

PROJECT No.: 1125007-04

DWG No.: 15

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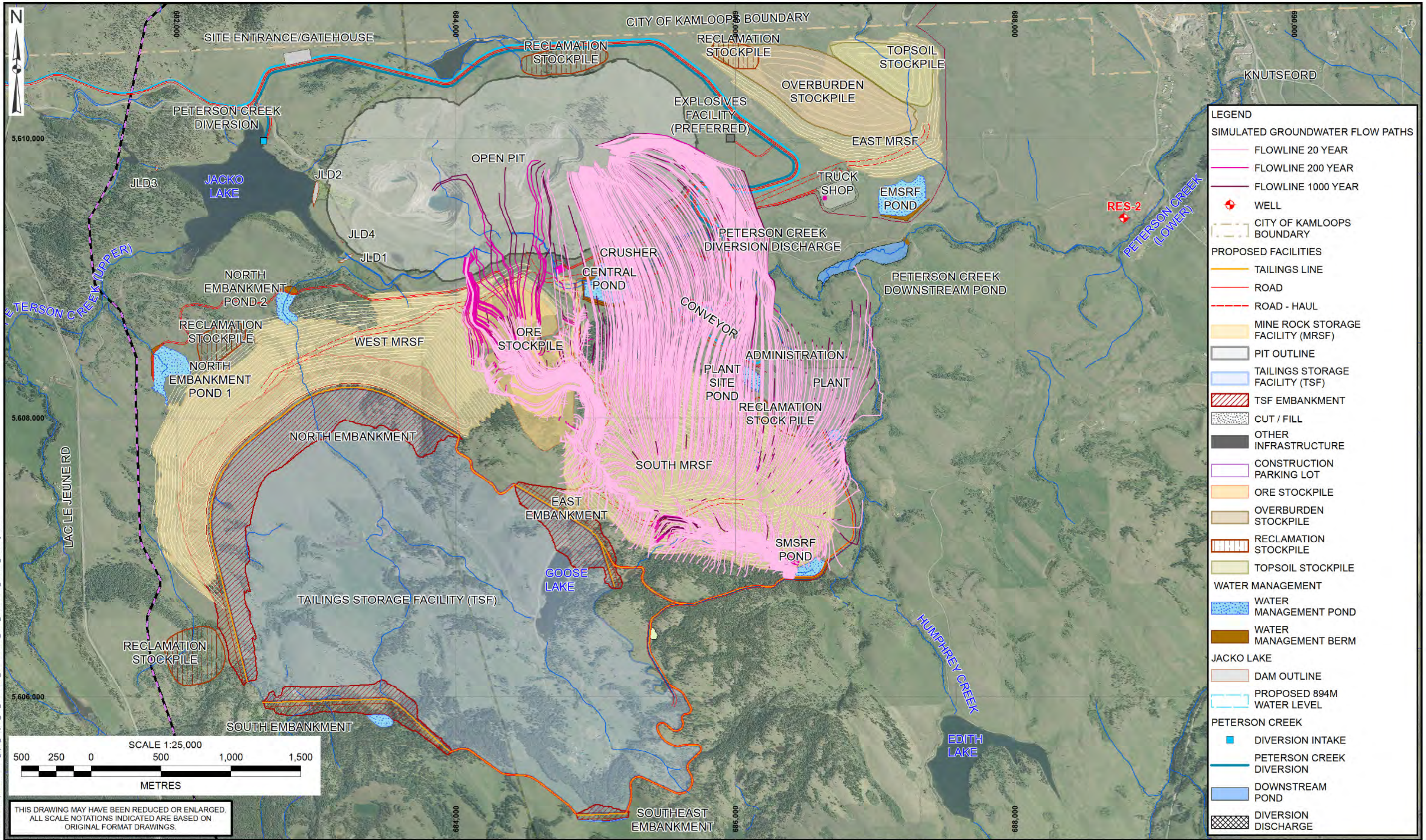

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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

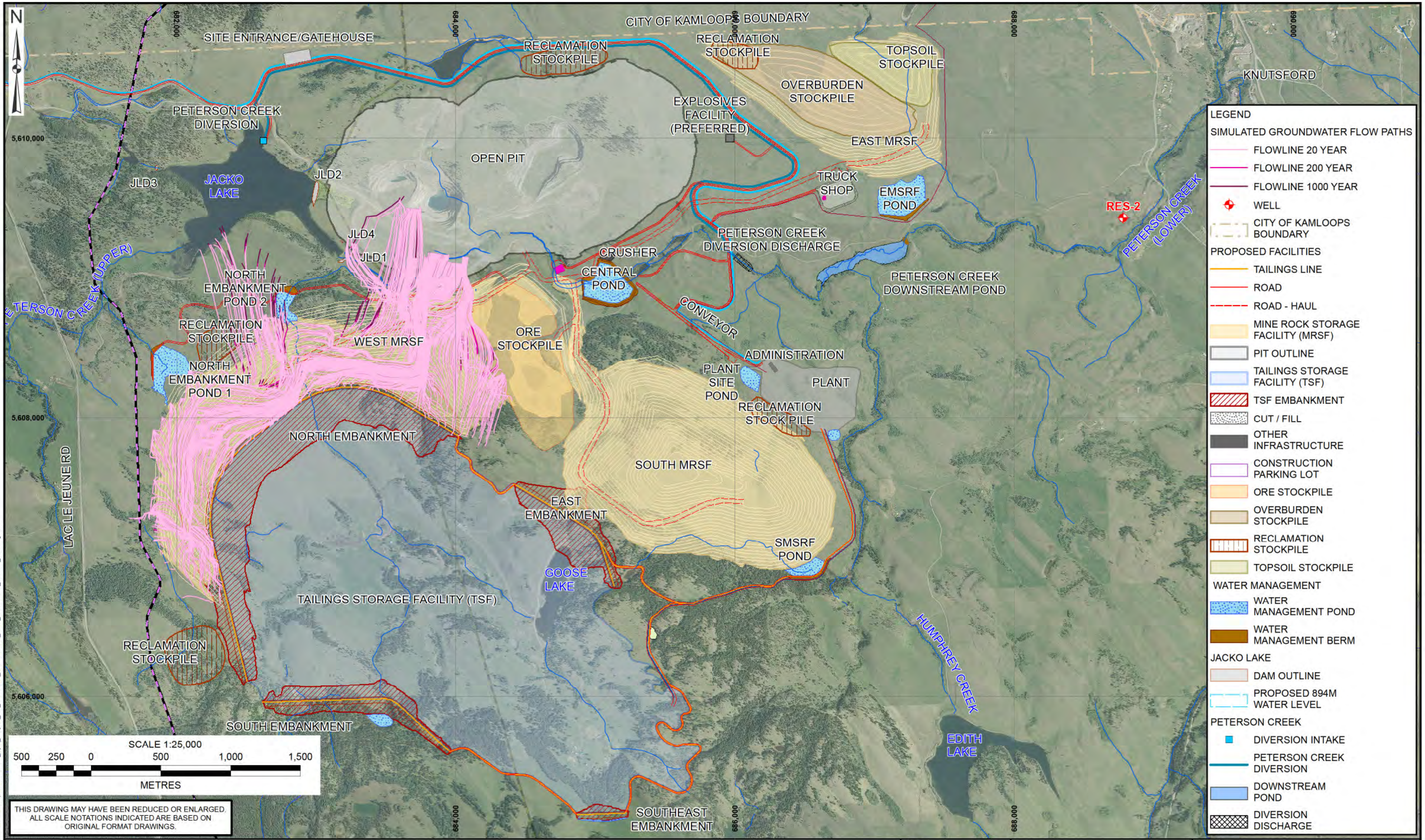
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS SOUTH MRSF

PROJECT No.: 1125007-04

DWG No.: 16



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BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

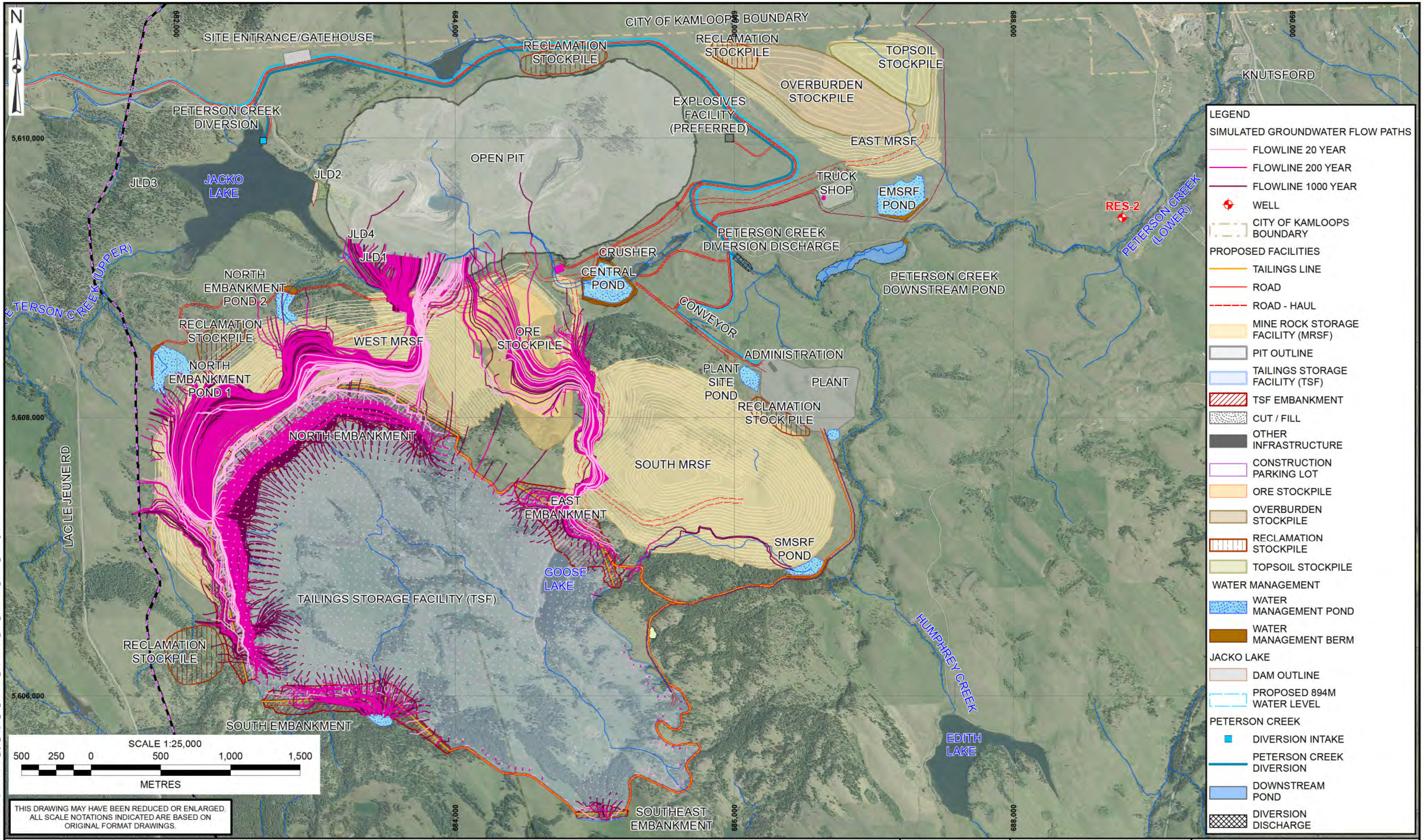
CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS WEST MRSF

PROJECT No.: 1125007-04

DWG No.: 17



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AN APPLIED EARTH SCIENCES COMPANY

CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS TAILINGS STORAGE FACILITY

PROJECT No.: 1125007-04

DWG No.: 18

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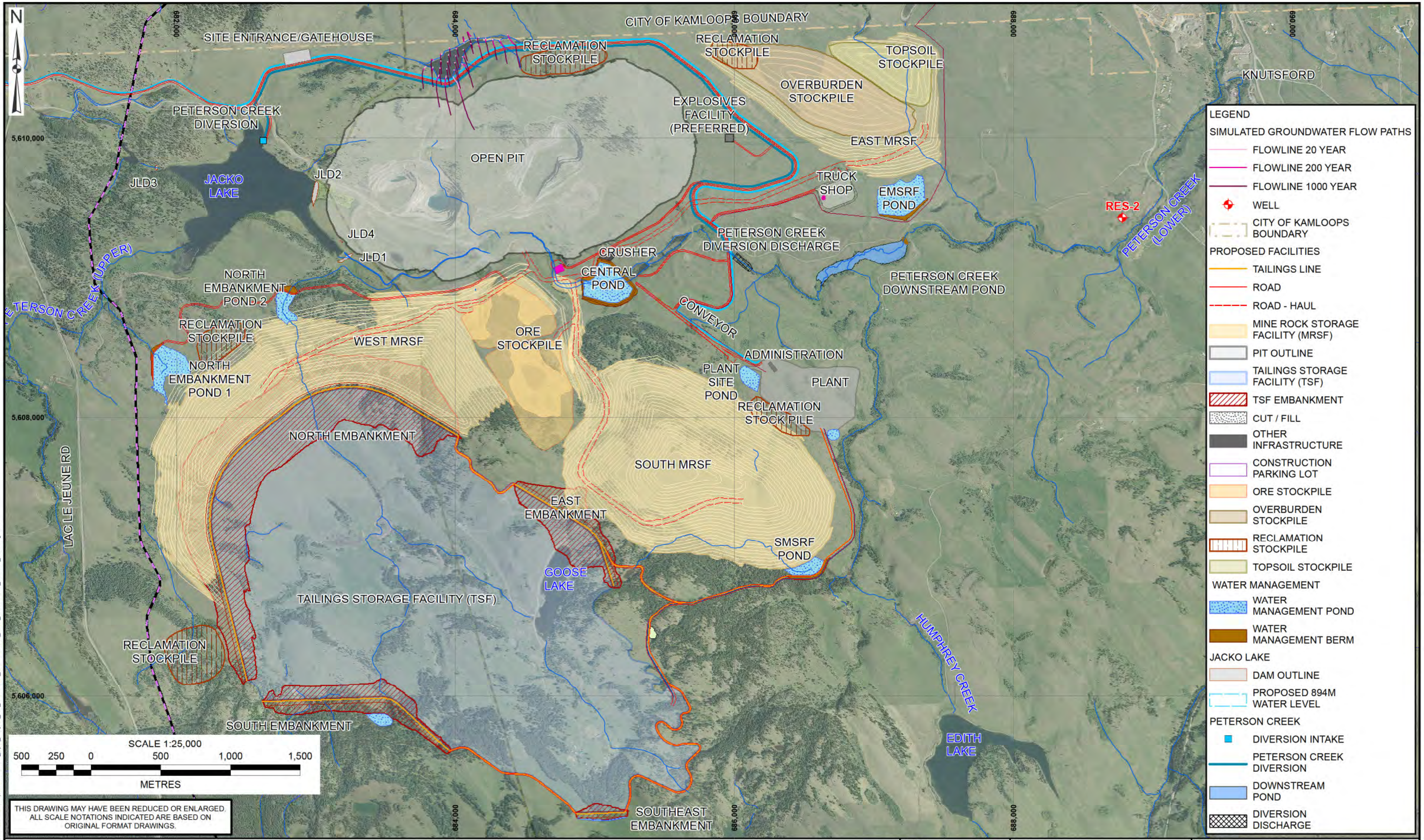

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CLIENT: KGHM AJAX MINING INC.

PROJECT: AJAX PROJECT ENVIRONMENTAL ASSESSMENT NUMERICAL GROUNDWATER FLOW MODEL

TITLE: SIMULATED POST CLOSURE GROUNDWATER FLOW PATHS UNNAMED LAKE

PROJECT No.: 1125007-04

DWG No.: 19

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