Appendix 12-B

Watershed Modelling

HARPER CREEK PROJECT

Application for an Environmental Assessment Certificate / Environmental Impact Statement

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT



WATERSHED MODELLING

PREPARED FOR:

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VA101-458/14-1
Rev 1
October 10, 2014

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

WATERSHED MODELLING
VA101-458/14-1

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EXECUTIVE SUMMARY

The Harper Creek Project (the Project) is a proposed open pit copper mine located in south-central British Columbia (BC), approximately 150 km northeast by road from Kamloops. The Project has an estimated 28-year mine life based on a process plant throughput of 70,000 tonnes per day. The Proponent, Harper Creek Mining Corporation, is a wholly owned subsidiary of Yellowhead Mining Inc., which is a public BC junior mineral development company trading on the Toronto Stock Exchange.

Knight Piésold Ltd. (KP) has completed engineering studies to provide estimates of surface water and groundwater flows in the vicinity of the proposed Harper Creek Project (the Project). A Baseline watershed model was developed for the Project to assess pre-Project surface and groundwater flows within surrounding watersheds. The Baseline model was then modified to develop a Life of Mine (LOM) model that was used to assess potential effects of the mine development on hydrologic conditions during five phases of mine development: Construction, Operations I, Operations II, Closure, and Post-Closure. The LOM model also includes a Pre-Mine phase, which is the Baseline model with sub-watershed delineation to accept mine infrastructure. Results of the watershed modelling were used to support hydrogeological modelling, water quality modeling, engineering design, and the Environmental Assessment (EA) of the Project.

The watershed models included estimates of precipitation, evapotranspiration, and sublimation, which were used to determine the net water available for groundwater recharge and surface water runoff within the modelled area. The division of available water between groundwater recharge and runoff was determined by calibrating the Baseline model to available long-term streamflow values between 1973 and 2012. The calibration took into consideration characteristics of the streamflow response during both wet periods and low flow conditions. Monthly streamflow, groundwater flow, and the groundwater component of streamflow (baseflow) leaving each catchment were estimated by the model. Monthly streamflows for the 1914-2012 period were estimated using the baseline model at 10 node locations surrounding the Project site. These node locations were selected to coincide with EA assessment sites and locations where measured streamflow data are available, including one node that corresponds to the location of a regional Water Survey of Canada (WSC) hydrology station. The Baseline model results were compared to pre-mine LOM results. Modest changes occur due to the inclusion of sub-watersheds to accommodate the project infrastructure.

Monthly and annual streamflows were estimated during different phases of the mine life using the LOM watershed model. Surface water and groundwater flows were estimated for each of the six phases of mine development for the same time period and at the same node locations considered in the baseline model. Quantitative comparisons of streamflow during each mine phase were completed relative to Pre-Mine flows. Flows were generally reduced from Pre-Mine conditions in the receiving watercourses during Operations I and Operations II. Flows in T-Creek, Harper Creek downstream of T-Creek and Jones Creek recover during the Closure and Post-Closure phases of the project, but are not equal to Pre-Mine conditions. Flows in P-Creek, Harper Creek above T-Creek, and Baker Creek remain reduced during the Closure and Post-Closure phases. The monthly distribution of flows is modified by Project operations, as are annual mean flows, due to changes in surface water management and groundwater conditions.

Baseline and mine affected flows were also estimated for three nodes outside of the watershed model footprint. These three nodes correspond to regional hydrology stations operated by WSC. Monthly pre-Project streamflows were estimated using data collected by WSC to represent Pre-Mine conditions. Project effects were estimated using results from the LOM model to calculate potential changes to streamflows for each of the five phases of mine development at the three regional nodes.

Return period wet and dry monthly and annual flows and instantaneous peak flow statistics were developed for each of the watershed model and regional nodes in order to better understand the potential hydrologic and environmental effects of the Project during each phase. Wet and dry monthly and annual flows were developed for return periods from 2 to 50 years and instantaneous peak flow estimates were generated for return periods between 5 and 200 years. Statistics were calculated for Pre-Mine conditions and the five phases of mine life.

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ABBREVIATIONS

Actual evapotranspiration	AET
Association of Professional Engineers and Geoscientists of British Columbia	APEGBC
British Columbia	BC
Cubic metre per second	m^3/s
Dillon Consulting Limited	DCL
Discharge	Q
Drainage Area	DA
El Nino Southern Oscillation	ENSO
Elevation	EL
Empirical frequency pairing	EFP
Environmental Assessment	EA
Environment Canada	EC
Harper Creek Mining Corporation	HCMC
Harper Creek Project	the Project
hectare	ha
Intergovernmental Panel on Climate Change	IPCC
kilometre	km
Knight Piésold Ltd.	KP
Life of mine	LOM
Low-grade ore	LGO
Mean annual discharge	MAD
Mean annual unit runoff	MAUR
metres above sea level	masl
National Topographic System	NTS
Nash-Sutcliffe efficiency	NSE
Pacific Decadal Oscillation	PDO
Pacific Climate Impacts Consortium	PCIC
Potentially acid generating	PAG
Potential evapotranspiration	PET
Pounds per square inch	psi
Tailings management facility	TMF
Toronto Stock Exchange	TSX
Water Survey of Canada	WSC
Water Treatment Plant	WTP
Yellowhead Mining Inc.	YMI

1 – INTRODUCTION

1.1 PROJECT DESCRIPTION

Harper Creek Mining Corporation (HCMC) proposes to construct and operate the Harper Creek Project, an open pit copper mine near Vavenby, British Columbia (BC). The Project has an estimated 28-year mine life based on a process plant throughput of 70,000 tonnes per day (25 million tonnes per year). Ore will be processed on site through a conventional crushing, grinding and flotation process to produce a copper concentrate, with gold and silver by-products, which will be trucked from the Project site along approximately 24 km of existing access roads to a rail load-out facility located at Vavenby. The concentrate will be transported via the existing Canadian National Railway network to the existing Vancouver Wharves storage, handling and loading facilities located at the Port of Vancouver, for shipment to overseas smelters.

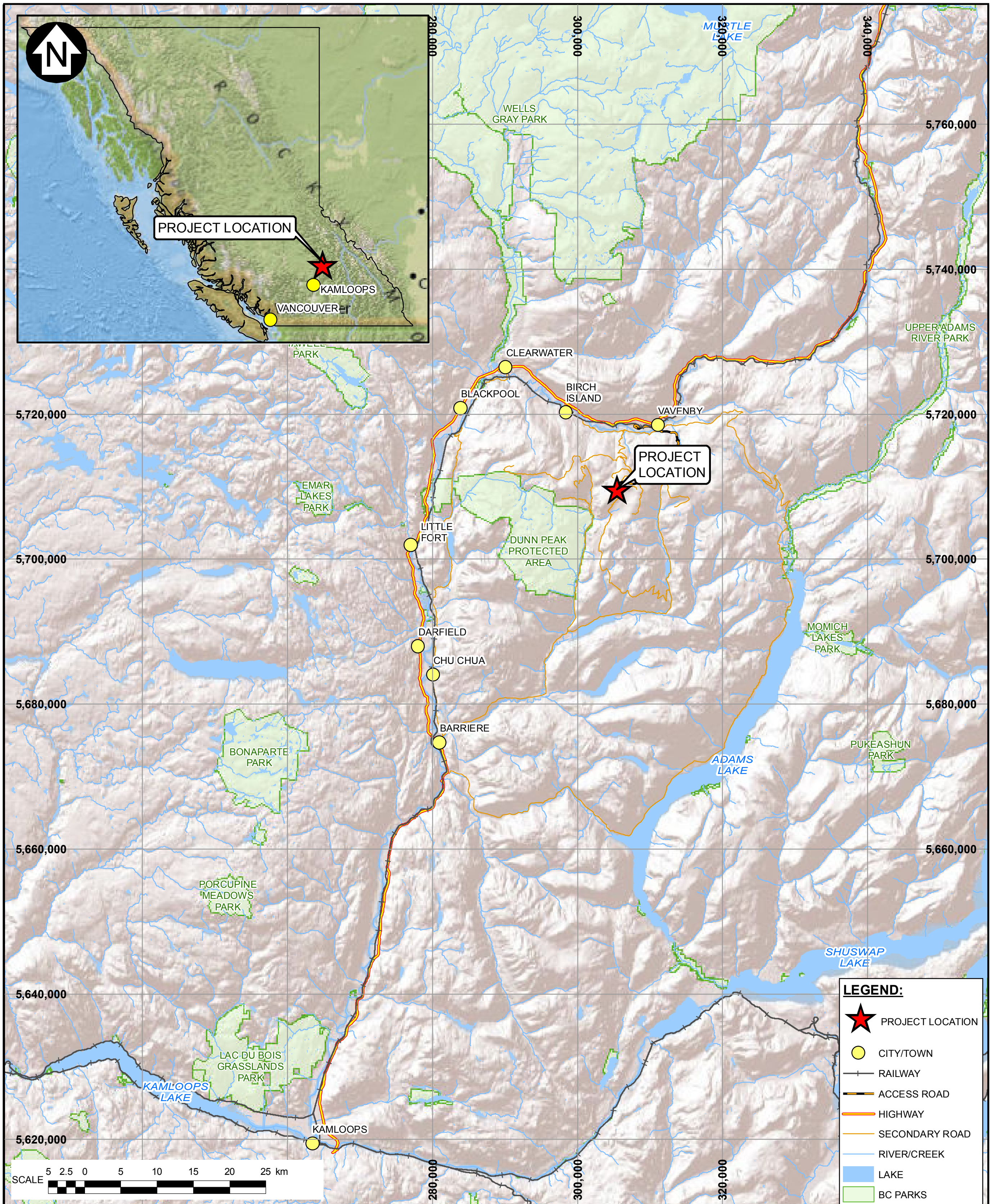
The Project consists of an open pit mine, on-site processing facility, tailings management facility (TMF) (for tailings solids, subaqueous storage of potentially acid generating (PAG) waste rock, and recycling of water for processing), waste rock stockpiles, low grade and overburden stockpiles, a temporary construction camp, ancillary facilities, mine haul roads, sewage and waste management facilities, a 24 km access road between the Project site and a rail load-out facility located on private land owned by HCMC in Vavenby, and a 12 km power line connecting the Project site to the BC Hydro transmission line corridor in Vavenby.

1.2 PROJECT LOCATION

The Project is located in the Thompson-Nicola area of BC, approximately 150 km northeast of Kamloops along Yellowhead Highway #5, approximately 10 km southwest of the unincorporated municipality of Vavenby, BC. The Project is located within National Topographic System (NTS) map sheets 82M/5 and 82M/12, is geographically centred at 51º30'N latitude and 119º48'W longitude, and is situated at approximately 1800 m above sea level (masl). The mineral claims comprising the Project cover an area of 42,640 ha. The Project location is shown on Figure 1.1.

1.3 PROJECT PROPONENT

The Proponent of the Project is HCMC, a wholly owned subsidiary of Yellowhead Mining Inc. (YMI). YMI was formed in 2005 as a private BC company specifically to acquire, explore and, if feasible, develop the Project. YMI is now a publicly owned BC based mineral development company trading on the Toronto Stock Exchange in Canada. HCMC's strategy is to engineer, permit, finance, construct, and operate the Project.



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HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PROJECT LOCATION

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FIGURE 1.1

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1.4 SCOPE OF WORK

Knight Piésold Ltd. (KP) was retained by HCMC to complete hydrogeologic and hydrologic modelling to support an Environmental Assessment (EA) submission for the Harper Creek Project. The modeling work includes development of a Baseline watershed model and a Life of Mine (LOM) watershed model.

The Baseline watershed model was developed for the Project to: 1) improve the understanding of the site baseline hydrologic parameters and the hydrogeological setting surrounding the project area, and 2) to provide the basis for assessing potential effects of the planned mine development and operations on surface water and groundwater in the project area. The Baseline watershed model was calibrated to available streamflow records.

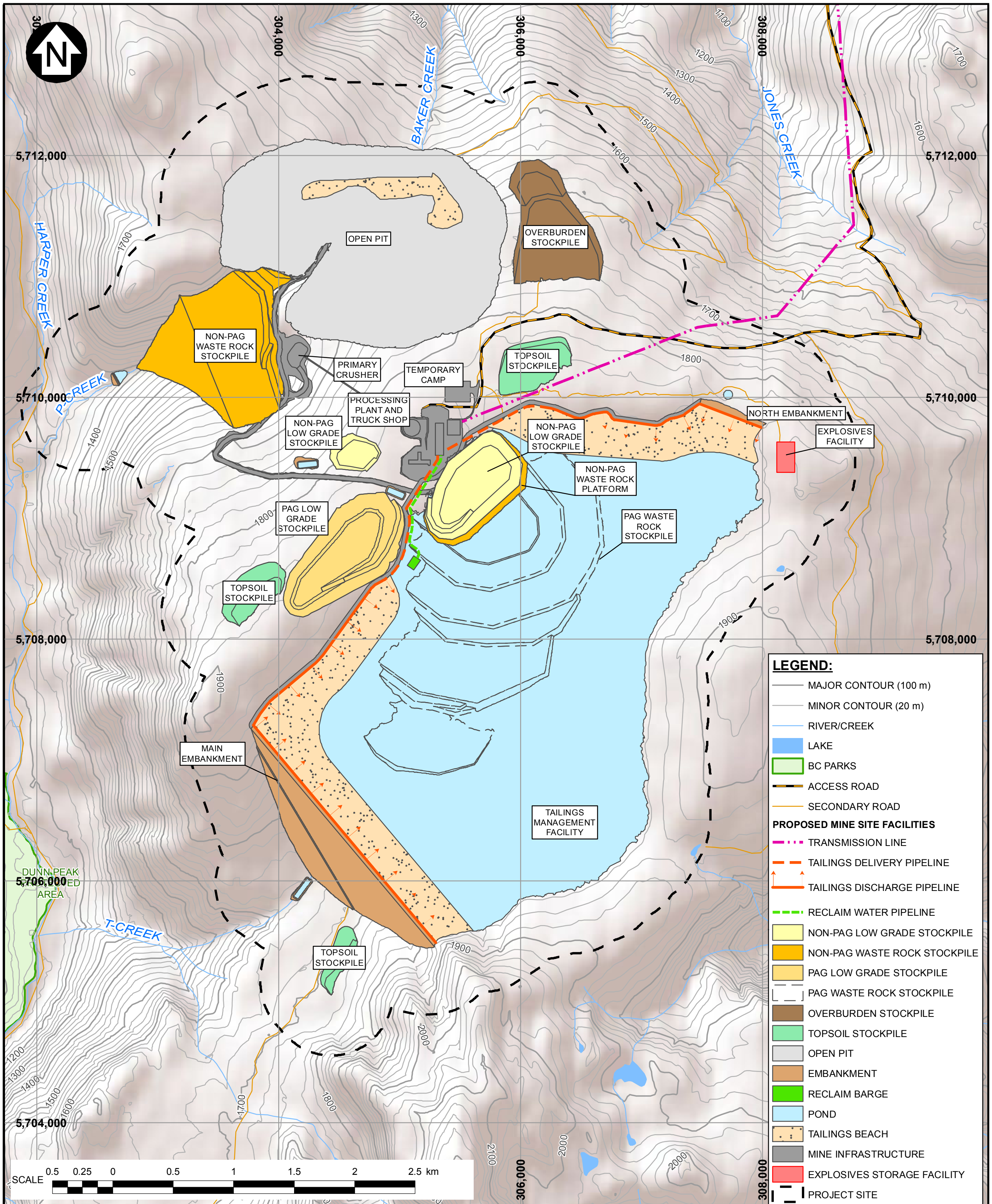
The LOM watershed model was developed by modifying the Baseline watershed model to simulate the effects of proposed mine development and operation on the surface water and groundwater quantity and quality in the project area. The LOM model includes the proposed infrastructure and operational water management practices for all phases of the Project, as described in the Mine Waste and Water Management Design Report (KP, 2014d). A comparison of the Baseline and LOM models' results allows for an assessment of the impact of mining activities on surface water and groundwater systems.

1.5 STUDY AREA

The Project is located in the North Thompson River watershed on the sub-watershed divide between two small tributaries that flow north directly into the North Thompson River (Baker and Jones Creeks) and Harper Creek that drains south into the Barriere River, which in turn drains into the North Thompson River. The North Thompson River is a tributary of the Thompson River. The Thompson River flows southwest to join the Fraser River, which flows to the ocean at Richmond, BC. The topographic relief at the site is steep to moderate, with elevations on the property ranging from 450 m in the Northern Thompson River valley to highs of 2000 m.

The study area and a general arrangement of the proposed mine infrastructure as currently anticipated are shown in Figure 1.2. The study area focuses on the locations of key proposed mine facilities including the following:

- An open pit in the headwaters of P-Creek and Baker Creek
- Waste rock stockpiles in the headwaters of the Harper Creek, Baker Creek and Jones Creek catchments
- Topsoil and overburden stockpiles in the Harper Creek, Baker Creek, and Jones Creek catchments, and
- A tailings management facility (TMF) in the T-Creek drainage in the headwaters of the Harper Creek catchment.



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HARPER CREEK PROJECT

HARPER CREEK PROJECT
GENERAL ARRANGEMENT (YEAR 24)

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FIGURE 1.2 REV 0

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1.6 REFERENCE REPORTS

The following KP reports were considered in the preparation of this report.

- **Surface Hydrology** – KP report *Surface Hydrology Baseline*, Ref No. VA101-458/15-1 Rev 0.
- **Project Description –** KP report *Mine Waste and Water Management Design Report*, Ref No. VA101-458/11-1 Rev 0.
- **2011 Site Investigation** – KP report *2011 Geotechnical Site Investigation Factual Report*, Ref. No. VA101-458/3-1 Rev 0.
- **2012 Site Investigation** – KP report *2012 Geotechnical Site Investigation Factual Report*, Ref. No. VA101-458/7-1 Rev 0.
- **Terrain Mapping** – KP report *Reconnaissance Terrain Mapping*, Ref. No. VA101-458/4-4 Rev 0.
- **Numerical Groundwater Modelling** – KP report *Numerical Groundwater Modelling*, Ref No. VA101-458/14-2 Rev 0.
- **Seepage Modelling –** KP letter report, *Harper Creek Project – Seepage and Stability Modelling*, Ref No. VA14-00865.
- **Mine Site Water Balance –** KP letter report, *Harper Creek Project – Updated Feasibility Study Water Balance Model*, Ref No. VA14-00700.

2 – MINE DEVELOPMENT SEQUENCE

2.1 GENERAL

The sequence of mine development, mine waste production and management, and associated mine water management is essential to the design of water management systems and the modelling of predicted water quantity and quality effects. The project design and water management plans were presented previously in the Mine Waste and Water Management Design Report (KP, 2014d). There were five stages of mine development that were considered:

- Construction (two preproduction years, referred to as Year -2 and Year -1)
- Operations I (during active mining in the open pit, Year 1 through 23)
- Operations II (during low-grade ore processing, from end of active mining through Year 28)
- Closure (during active closure and reclamation phase while open pit and TMF are filling), and
- Post Closure (steady-state long-term closure condition following active closure).

A water management plan indicating water movement strategies for each of the five stages of mine development are shown on Figures 2.1 to 2.5. A summary of the mine development sequence and mine water management plans are described in the following sections.

2.2 CONSTRUCTION

The project begins with two years of construction prior to mine operation. The construction phase includes the following development activities:

- Runoff collection channels and water management ponds are constructed downstream of key development areas.
- Topsoil is stripped from the open pit and key areas of the TMF, and is stored in topsoil stockpiles.
- Overburden and non-PAG waste rock are stripped from the open pit and used in construction of mine facilities (roads, crusher pad, plant site grading, TMF embankments), or stored in the overburden or non-PAG waste rock stockpiles.
- PAG waste rock is stripped from the open pit and placed in the TMF for long-term storage or used in construction of the upstream zone of the main embankment (upstream of core zone).
- Low-grade ore (LGO) encountered during pit pre-stripping is stored in one of three surface stockpiles, depending on the geochemical classification and grade of the material.
- The cofferdam for the TMF main embankment is constructed to EL. 1683 m, followed immediately by construction of the Stage 1 embankment to EL. 1720 m.
- The tailings distribution system to the main embankment is constructed, but inactive.
- The water reclaim system from the TMF to the process plant is constructed, but inactive.
- Runoff diversion channels are constructed to route non-contact water to the downstream receiving environment.
- Water management ponds are constructed and function as sediment control ponds with surface water discharge to receiving environment when it meets federal and provincial water quality discharge standards.
- Water management pump systems and pipelines are installed at all water management ponds.

2.3 OPERATIONS I – ACTIVE MINING

The first operational phase includes the active mining and ore processing period that continues for just over 23 years. This period includes the following activities:

- Overburden and non-PAG waste rock is stripped from the open pit and used in construction of the TMF embankments or stored in the overburden or non-PAG waste rock stockpiles.
- PAG waste rock is stripped from the open pit and placed in the TMF for long-term storage, or used in construction of the upstream zone of the main embankment (first five years only) and subsequently buried with non-PAG waste and flooded.
- LGO encountered during mining is stored in one of three surface stockpiles, depending on the geochemical classification and grade of the material. Stockpiled LGO is used periodically to supplement the volume and grade of ore processing.
- Crushing and milling of ore is underway at the crusher pad and process plant, respectively.
- Tailings from ore processing are conveyed as slurry to the TMF for long-term storage.
- Supernatant water from the TMF is reclaimed and reused to supply process water used for ore processing. There is no requirement for additional make-up water from outside of the system.
- A portion of the supernatant water is separated, treated, and used as fresh water in the mill for reagent makeup, gland seals, and most purposes other than potable water.
- Diversion channels continue to route non-contact water to the downstream receiving environment and are adjusted as required to service the expanding mine site.
- Seepage and surface runoff from the non-PAG waste rock stockpile, the PAG LGO stockpile, and the non-PAG LGO stockpile outside the TMF are collected in water management ponds and pumped to the TMF for long-term storage and reuse.
- Surface runoff from the overburden stockpile is conveyed by collection ditch to the open pit until approximately Year 10, and then from Year 10 onwards it is routed through a sediment control pond then discharged to the receiving environment if water quality meets federal and provincial discharge standards.
- Pit wall seepage and surface runoff from the open pit is conveyed to the TMF for long-term storage and reuse.

2.4 OPERATIONS II – LOW GRADE ORE PROCESSING

The second operational phase commences when active mining is complete in the open pit and lasts for nearly five years. This phase consists of LGO processing and includes the following activities:

- Crushing and milling of the LGO is underway at the crusher pad and process plant, respectively.
- Concurrent reclamation activities begin in key areas around the Project including the non-PAG waste rock stockpile, the TMF tailings beaches, and the TMF embankments.
- Tailings from LGO processing conveyed as slurry to the open pit for long-term storage.
- Water from the TMF is reclaimed and reused in ore processing for first 18 months as the open pit begins to fill, and then water is reclaimed from the open pit for the remainder of operations.
- The open pit water management system is partially decommissioned and removed. Pit inflows from seepage and surface runoff are allowed to accumulate in the pit.
- Seepage and surface runoff from the non-PAG waste rock stockpile and PAG LGO stockpile are collected in water management ponds and pumped to the TMF for long-term storage.

- The TMF is allowed to fill with surface runoff and inflows from site water management systems, thereby diluting concentrations of key parameters in the TMF pond.
- The closure spillway is constructed at the southeastern end of the TMF, but remains inactive until TMF pond has filled.

2.5 CLOSURE

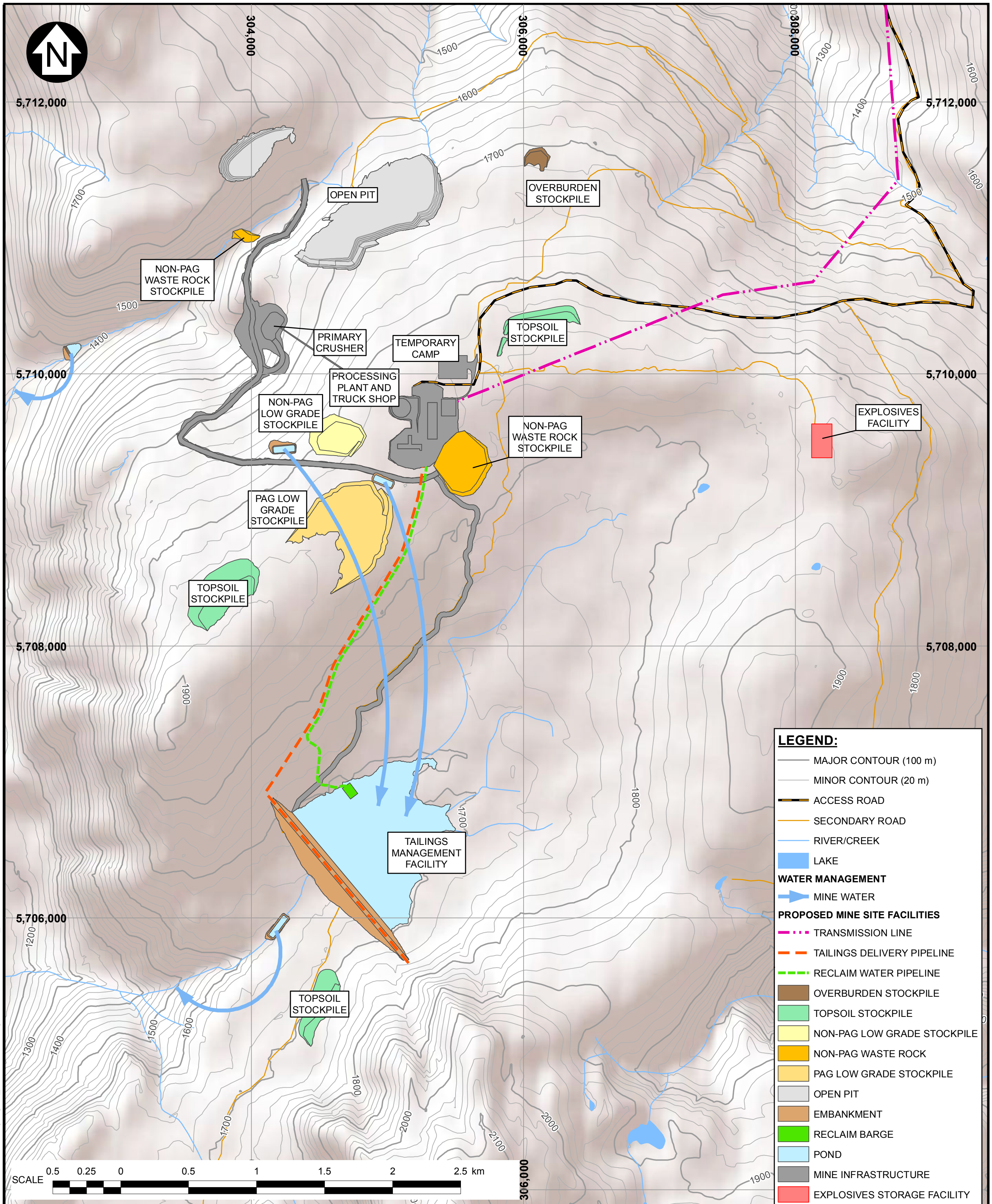
There is a period of time following completion of LGO processing when the mine site is being actively reclaimed and has not yet reached end land use objectives. The following activities are occurring during the closure phase:

- Final reclamation activities occur for the plant site, tailings distribution system, LGO stockpiles and associated water management ponds and pipelines.
- Seepage and surface runoff from the non-PAG waste rock stockpile are collected in the water management pond and pumped to the TMF.
- Pit inflows from seepage and surface runoff are allowed to accumulate in the pit, thereby diluting concentrations of key parameters in the pond.
- The open pit water management system for closure is commissioned, but remains inactive.
- The TMF closure spillway becomes active and excess site water is discharged via the spillway to the downstream receiving environment.

2.6 POST CLOSURE

The active closure period continues until the open pit pond reaches the final design elevation (EL. 1530 m) and the final arrangement of the mine site for closure has been reached. The following activities for mine water management will occur in perpetuity during the post closure period:

- Excess pit inflows from seepage and surface runoff are pumped to the TMF for long-term storage and discharge management.
- Seepage and surface runoff from the non-PAG waste rock stockpile are collected in the water management pond and pumped to the TMF.
- The open pit water management system is active and maintains the open pit pond at EL. 1530 by pumping excess inflows to the TMF for temporary storage before discharge through the TMF spillway.
- The TMF closure spillway remains active and excess site water is discharged via the spillway to the downstream receiving environment.



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HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

MINE WATER MANAGEMENT PLAN CONSTRUCTION

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FIGURE 2.1 REV 1

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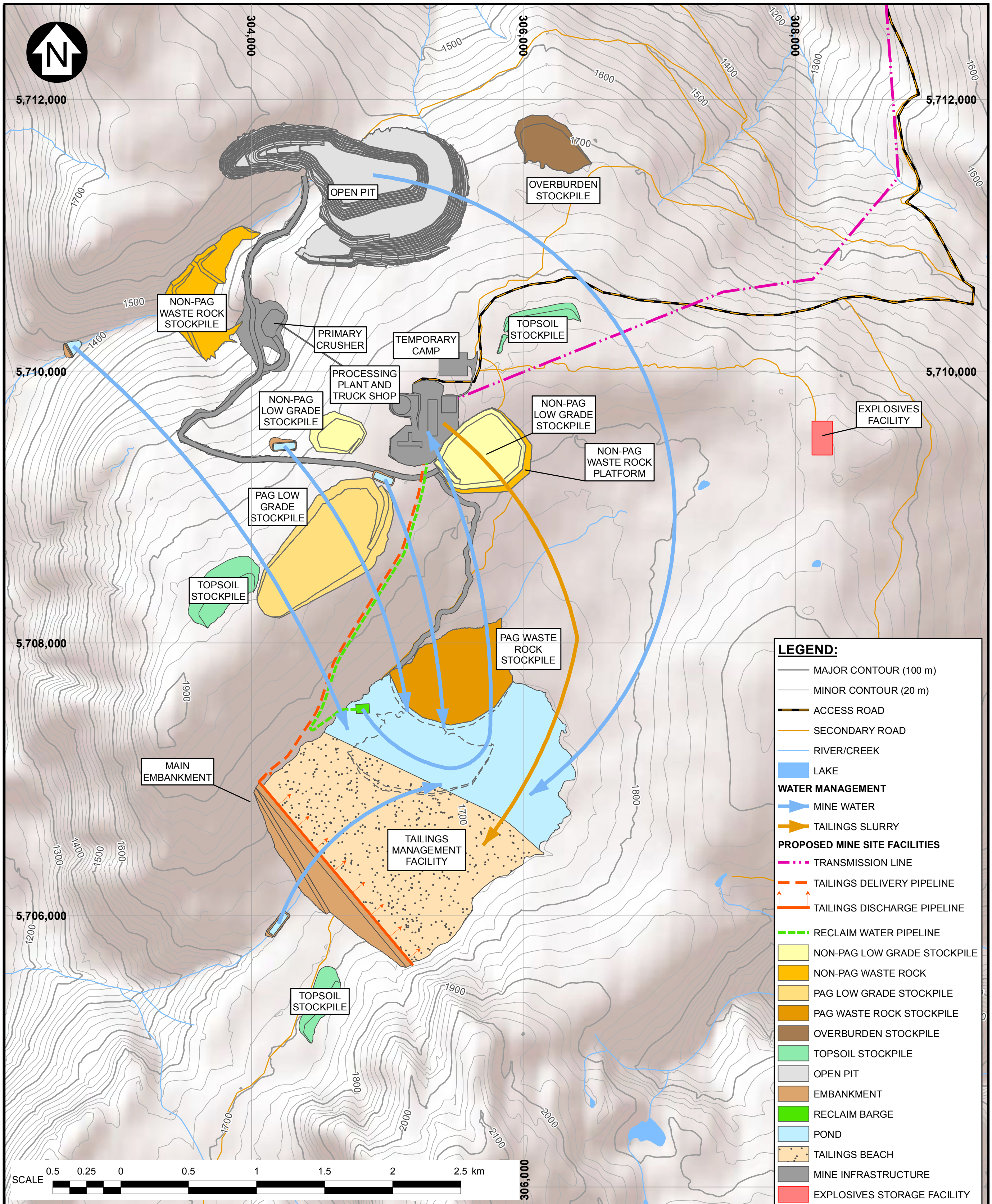

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MINE WATER MANAGEMENT PLAN
OPERATIONS I

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FIGURE 2.2 REV 1

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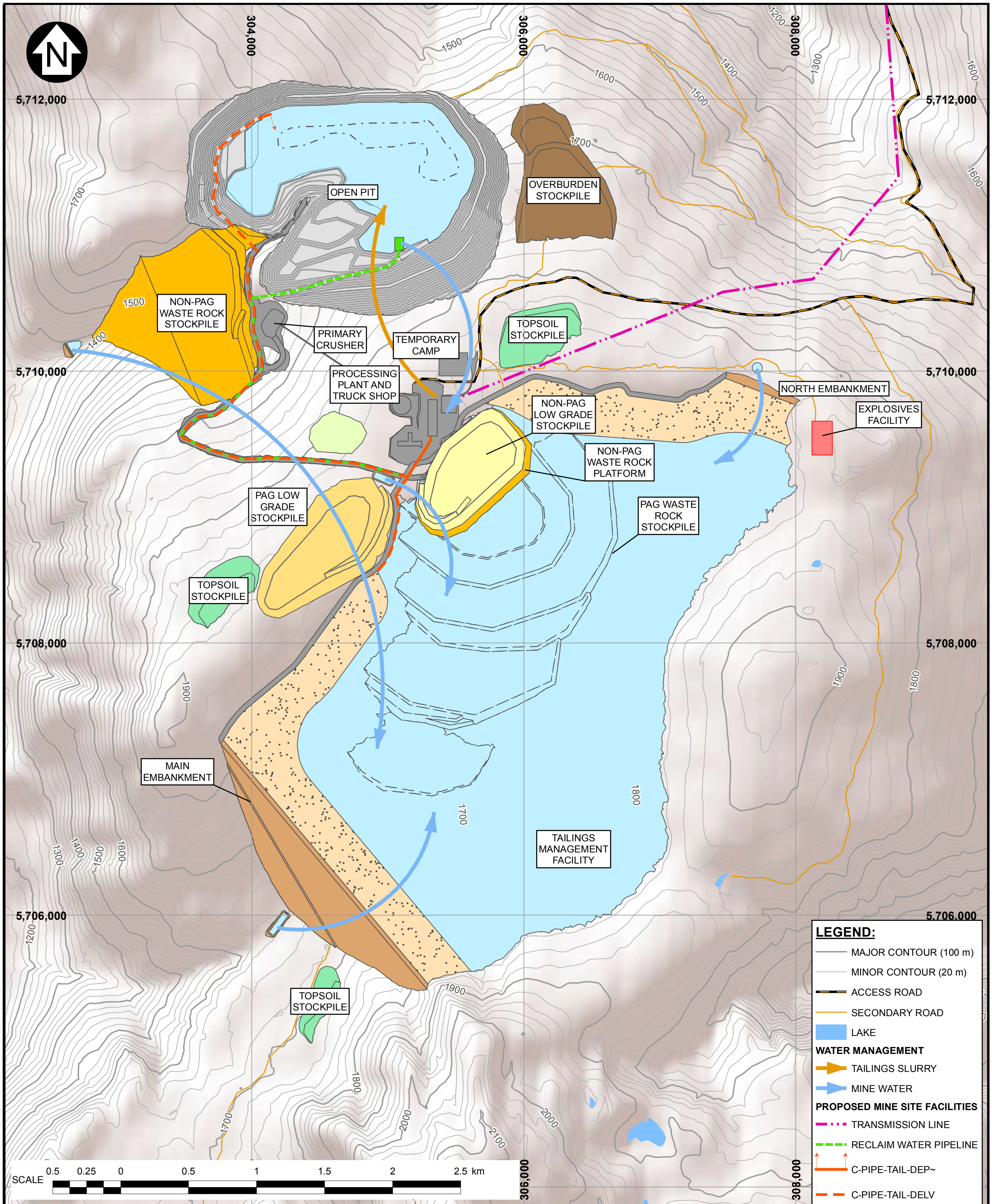

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HARPER CREEK MINING CORP.

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MINE WATER MANAGEMENT PLAN
OPERATIONS II

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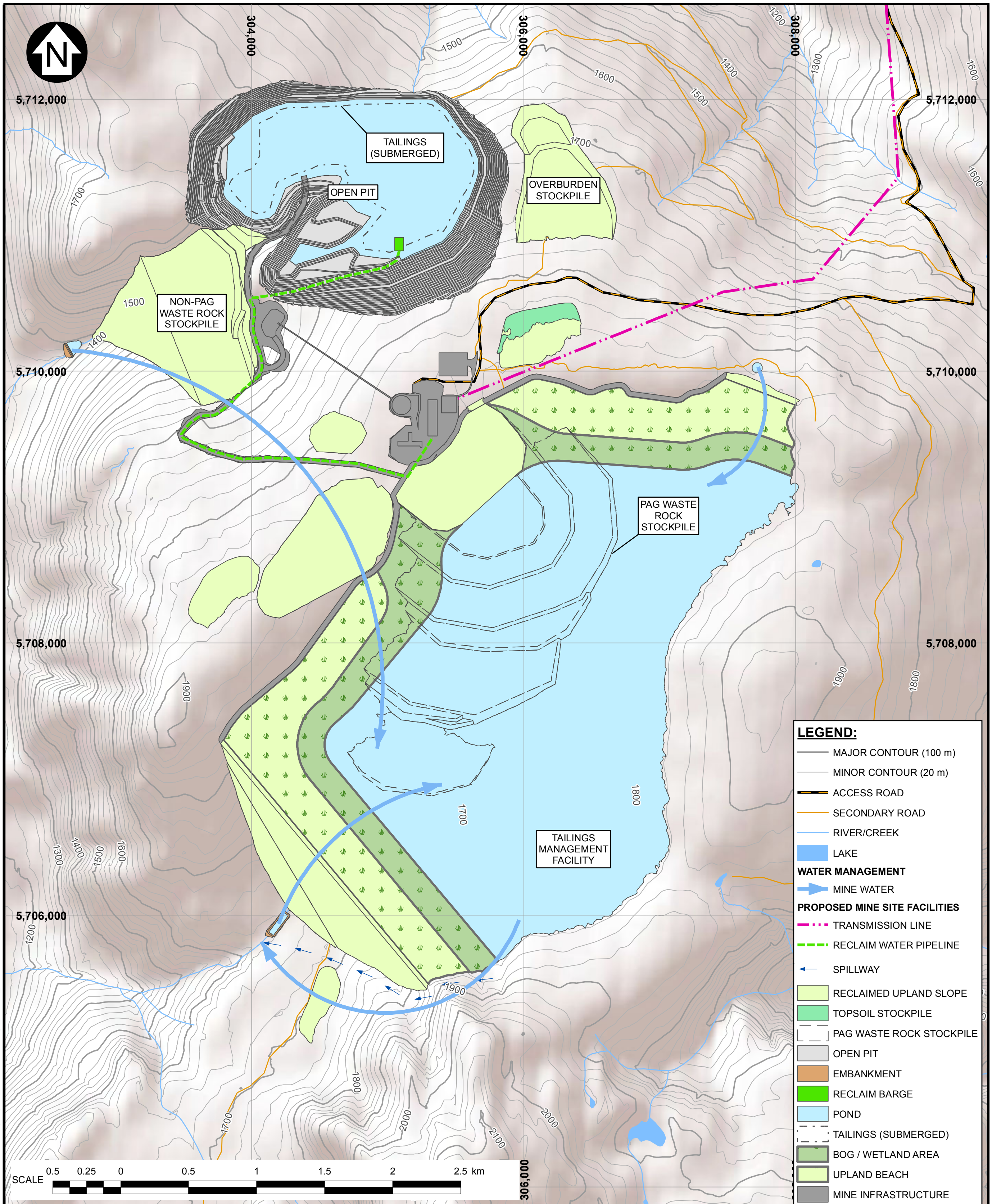
FIGURE 2.3 REV 1



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HARPER CREEK MINING CORP.

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MINE WATER MANAGEMENT PLAN CLOSURE

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FIGURE 2.4

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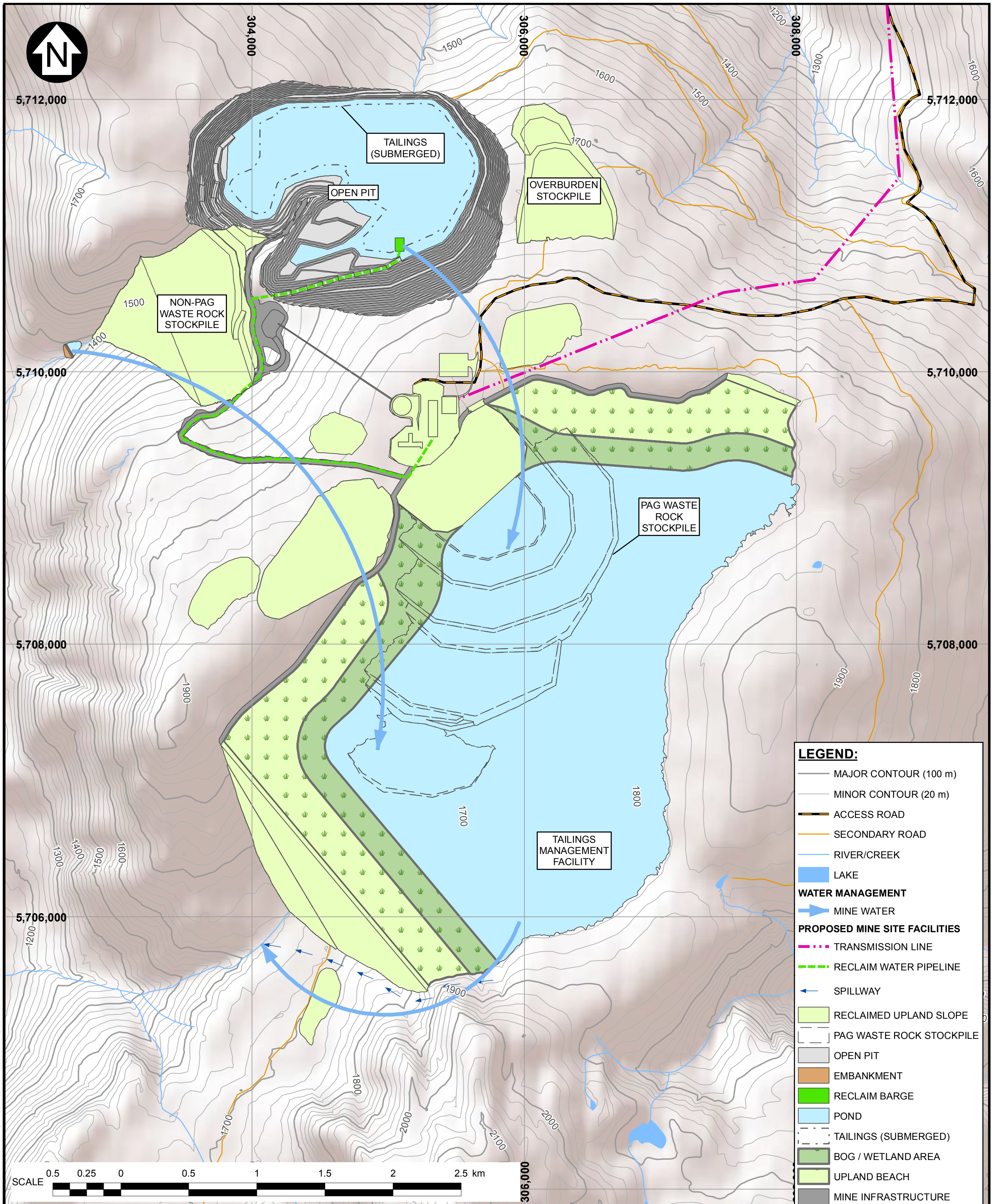

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HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

**MINE WATER MANAGEMENT PLAN
POST CLOSURE**

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FIGURE 2.5 | REV 1

3 – MODELLING APPROACH

3.1 GENERAL

A month-to-month water balance modelling approach (see Alley, 1984; Steenhuis and Van der Molen, 1986), is commonly used for hydrologic evaluations and was selected to evaluate surface water and groundwater flows in the Project area. The watershed model was developed in a spreadsheet format, which provided a simple and transparent platform that facilitated, input and output flexibility in process selection and representation of mine facilitates. The watershed model is a semi-distributed (or quasi-distributed) parameter model; the study area was divided into sub-catchments within which groundwater and surface water flows were modelled. Spatial variability of climate due to differences in elevation was provided within each sub-catchment. Adjacent sub-catchments were linked together to allow surface and groundwater flows to be routed to downstream sub-catchments. Model calculations are undertaken at a monthly time step.

The watershed model included representation of all aspects of the hydrologic cycle. The hydrologic processes considered in the model are presented in the schematic diagram shown on Figure 3.1, and include:

- Precipitation, which was distributed between rainfall and snowfall according to monthly air temperature
- Snow accumulation and melt
- Sublimation, which was modelled at a specified rate during snow accumulation
- Rainfall and snowmelt, which were distributed amongst:
  - Surface runoff
  - Recharge to groundwater, and
  - Evapotranspiration, which was modelled after the Thornthwaite Method (1948).
- Groundwater recharge (a combination of meteoric recharge and stream leakage), which was accumulated in groundwater storage
- Groundwater storage
- Groundwater discharge, which was determined according to a linear relationship based on the amount of water in storage
- Surface water detention in small ponds and wetlands, which was modelled using a linear reservoir assumption, and
- Inflow from up-gradient sub-catchments, including surface runoff and groundwater flow.

The primary model inputs were monthly precipitation and temperature values for each sub-watershed. The baseline watershed model was calibrated to match to low flows, which represent the groundwater contribution to streamflows (baseflows), while still providing a good match to high flows, the long-term streamflow mass balance, and the seasonal distribution of streamflow. Further details on model inputs, conceptualization of hydrologic processes, and model calibration are provided in the following sections.

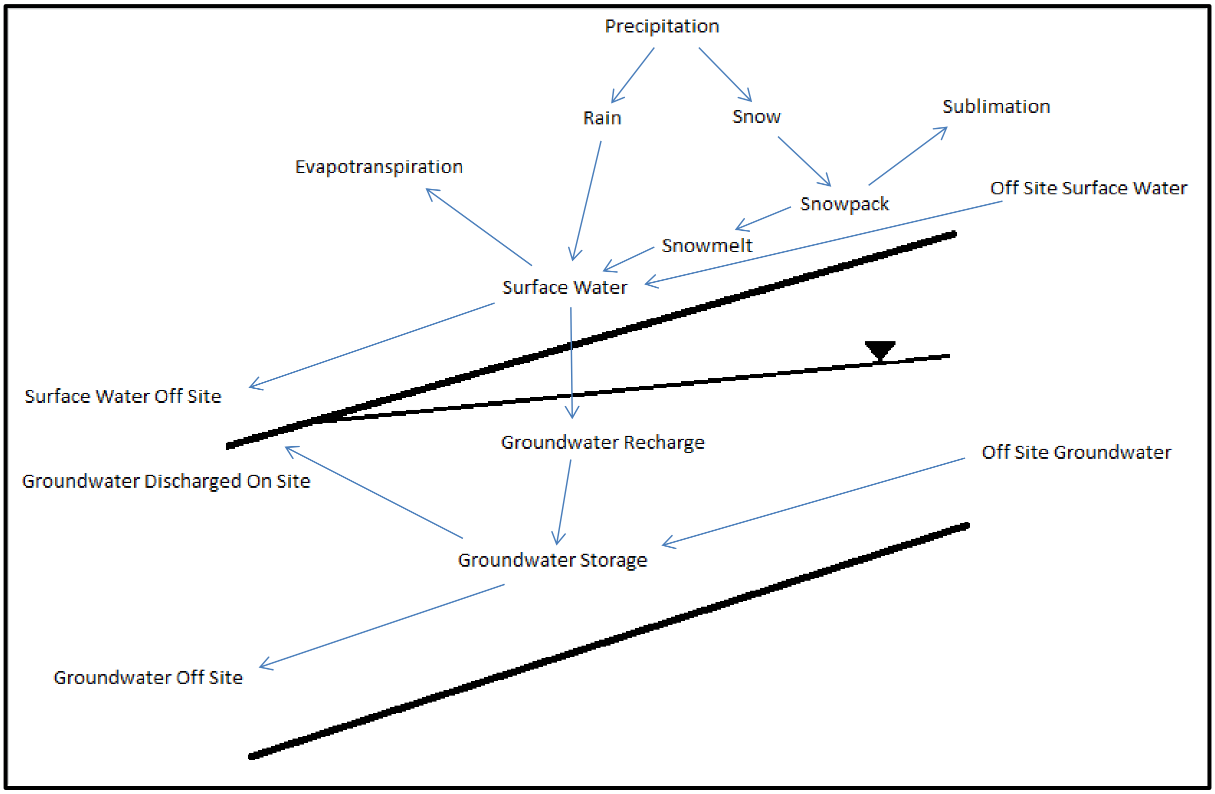


Figure 3.1 Water Balance Component Diagram

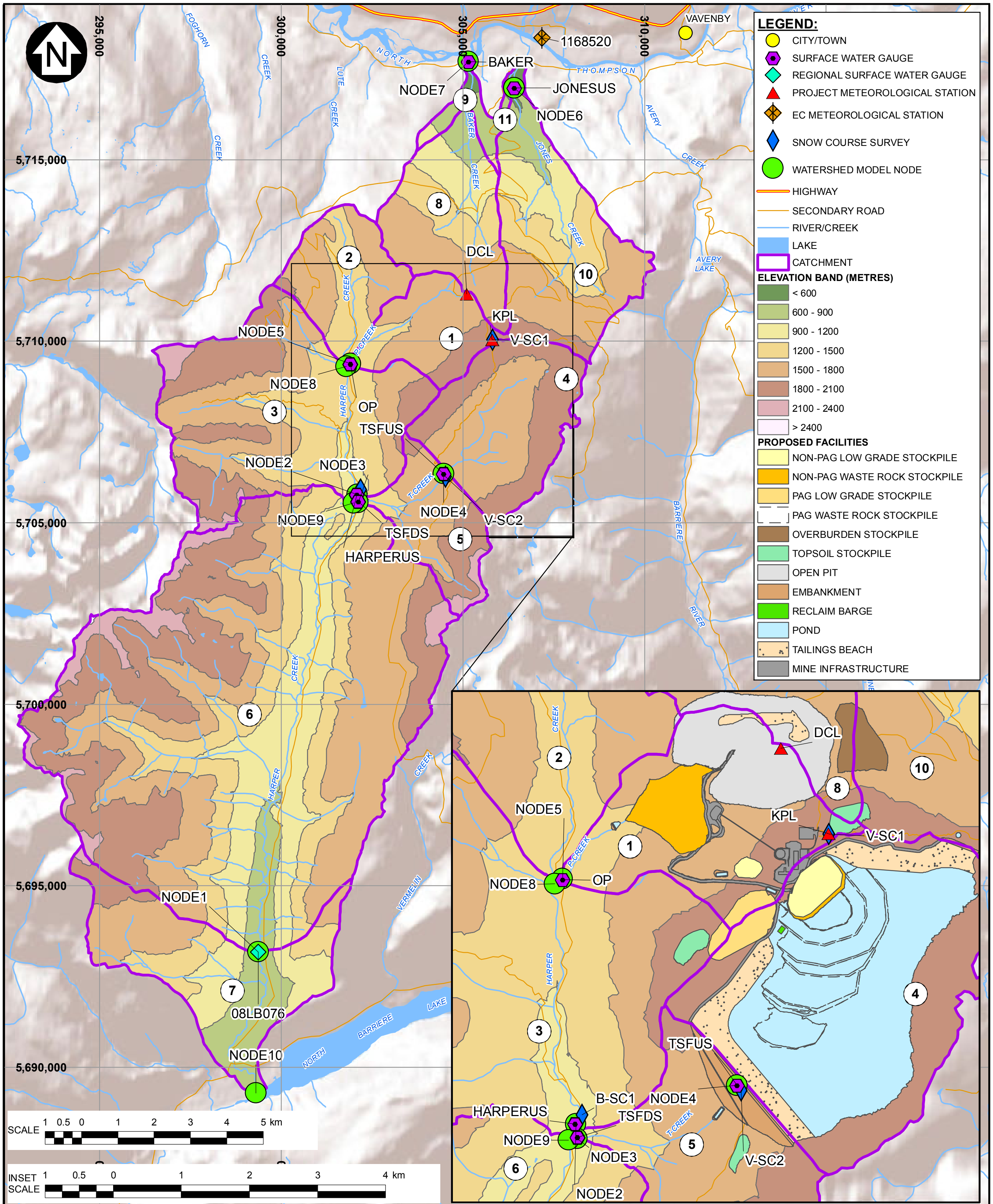
3.2 MODELLED SITE LOCATIONS

3.2.1 Watershed Modelling Nodes

The watershed model was discretized into sub-catchment areas. Simulated streamflow and groundwater flow were modelled at the downstream extent of each sub-catchment area, referred to as a "Node". Model results at several stages through the Project life are presented for the following 10 model nodes:

- Node 1: Harper Creek near the Mouth (WSC 08LB076)
- Node 2: Harper Creek above T-Creek confluence (at the HARPERUS Gauge)
- Node 3: T-Creek at Harper Creek confluence (at the TSFDS Gauge)
- Node 4: T-Creek upstream of Harper Creek confluence (at the TSFUS Gauge)
- Node 5: P-Creek at Harper Creek confluence (at the OP Gauge)
- Node 6: Jones Creek above North Thompson River confluence (at the JONESUS Gauge)
- Node 7: Baker Creek at North Thompson River confluence (at the BAKER Gauge)
- Node 8: Harper Creek below P-Creek confluence
- Node 9: Harper Creek below T-Creek confluence, and
- Node 10: Harper Creek at Barriere River confluence.

The model node locations and the corresponding sub-catchment areas along with the locations of Water Survey of Canada (WSC) and HCMC surface hydrology gauges are presented on Figure 3.2.



NOTES:

1. BASE MAP: TRIM AND NTS MAPPING, ESRI ARCGIS ONLINE SHADED RELIEF.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:150,000 FOR 8.5x11 (LETTER) PAPER.

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HARPER CREEK PROJECT

BASELINE WATERSHED MODEL SURFACE WATER NODES AND CATCHMENTS

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FIGURE 3.2 | REV 0

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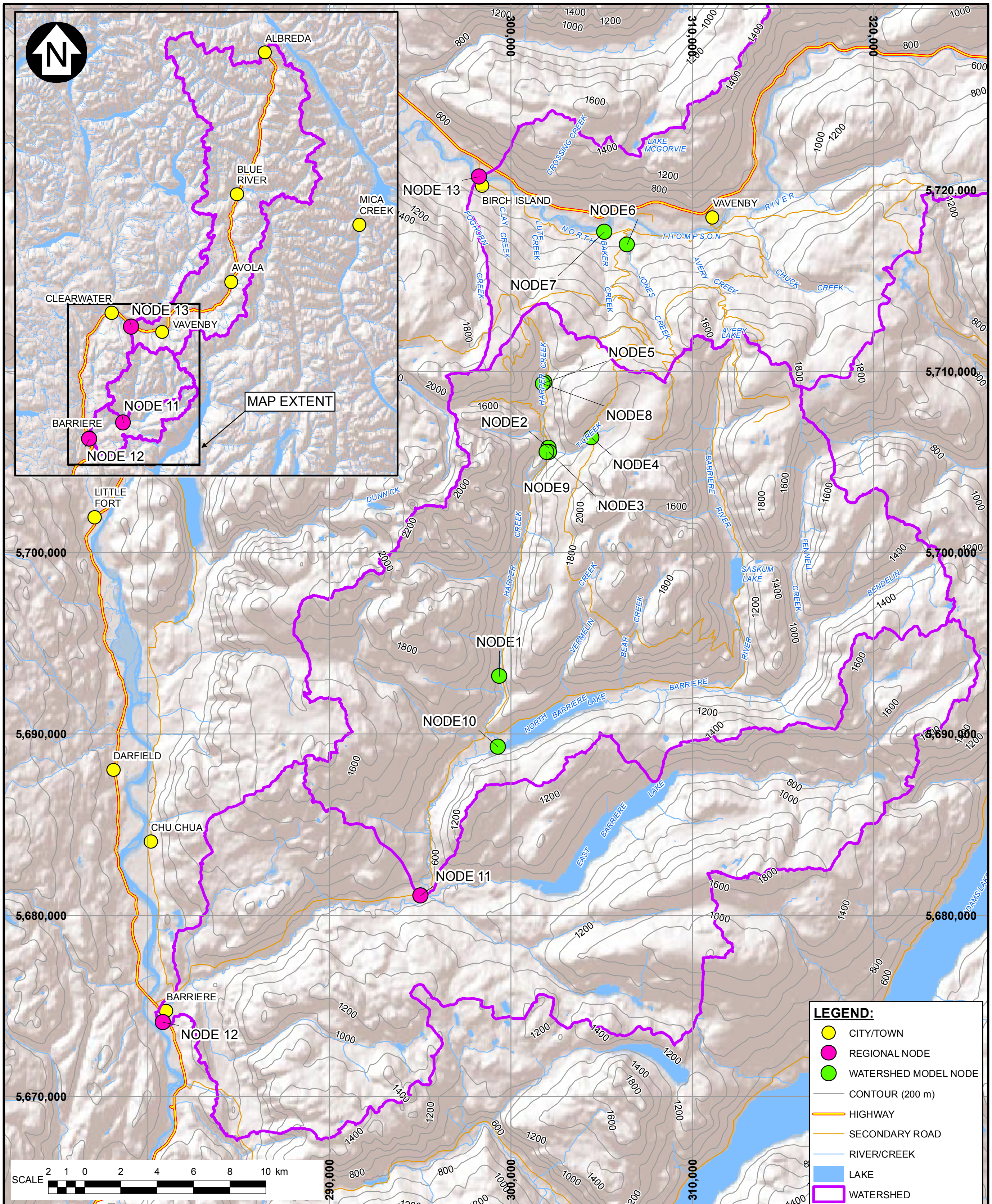
3.2.2 Regional Modelling Nodes

The regional modelling nodes were selected to help assess Project impacts on a regional scale. Nearby WSC gauges with relatively long historical records overlapping the modeled period were selected as “Nodes”. These nodes were not modelled in the watershed models, but watershed model outputs in conjunction with the WSC data were used to predict flow conditions at several stages through the Project life. This analysis was completed for the following 3 nodes:

- Node 11: Barriere River below Sprague Creek (WSC 08LB069)
- Node 12: Barriere River at the Mouth (WSC 08LB020), and
- Node 13: North Thompson River at Birch Island (WSC 08LB047).

The node locations and corresponding catchment areas are presented on Figure 3.3.



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NOTES:

1. BASE MAP: TRIM AND NTS MAPPING, ESRI ARCGIS ONLINE SHADED RELIEF.
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HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

REGIONAL MODELLING NODES AND CATCHMENTS

Knight Piésold CONSULTING

P/A NO. VA101-458/14 | REF NO. 1

FIGURE 3.3 | REV 0

3.3 CATCHMENT DISCRETIZATION

The Harper Creek Project study area was divided into sub-catchment areas corresponding to the major surface drainages within the model domain. Each of the sub-catchment areas were further discretized by elevation using 300 m elevation bands, starting at 300 m above sea level (masl) and ending at 2400 masl. Representative climate conditions (temperature and precipitation) were calculated based on the average elevation for each band. The primary data inputs for each sub-catchment in the model are:

- Sub-catchment area (discretized into 300 m elevation bands)
- Monthly precipitation (falling as both rain and snow)
- Monthly average temperature, and
- Aquifer transmissivity, width and hydraulic gradient.

The sub-catchment areas and elevations bands used in the baseline and LOM models are presented in Sections 4 and 5, respectively.

3.4 CLIMATE INPUTS

Meteorological data have been collected by on-site meteorological stations since December 2007. Data were collected at the Dillon Consulting Limited (DCL) climate station from December 2007 through April 2011. In August 2011, KP installed the KP automated meteorological station at the proposed open pit site at elevation 1837 m. The KP station has collected meteorological data since September 2011 (KP 2011a). Three snow courses were surveyed to quantify snow accumulation. The locations of the Project and Environment Canada (EC) stations are shown on Figure 3.2.

The use of on-site data in the watershed model is limited by its short period of record. Therefore, meteorological data from regional stations operated by Environment Canada (EC) were used to simulate an extended site climate record.

The meteorology data collected at the Project site were compared with the temperature and precipitation records from three regional climate stations. Of these stations, the EC operated meteorological station at Vavenby (Station ID: 1168520) was found to be most strongly correlated to site conditions. The Vavenby data were therefore selected to provide the basis for generating a long-term Project climate time series necessary for watershed modelling.

3.4.1 Temperature

Temperature data from the Vavenby EC station were used to generate a long-term record of site temperature conditions. A linear regression analysis between Vavenby and site data indicates a strong correlation between temperature data sets ($R^2 = 0.96$). Using this correlation, a synthetic long term temperature record for at the Harper Creek meteorological station location was generated by applying the linear regression equation to the temperature record for Vavenby. Climate normal data for Vavenby were used in the few instances where data gaps were present in the Vavenby temperature record. The resulting baseline site temperature series was then adjusted by applying an adiabatic lapse rate of -6.5°/1000 m elevation increase in order to calculate temperature in each elevation band in the model domain.

3.4.2 Precipitation

A long-term precipitation record for the Harper Creek site was simulated using data from the DCL and KP on-site climate stations, the B-SC01, V-SC01 and V-SC02 on-site snow course stations, and the EC operated Vavenby regional meteorological station. The cumulative Vavenby and on-site dataset were found to have a high degree of linear correlation ($R^2 = 0.96$) for the non-freeze months of May through September and the shoulder months of April and October. A double mass curve analysis indicated a summer orographic relationship between Vavenby and the project site of approximately 4% per 100 m increase in elevation. Use of this relationship produced the mean monthly precipitation values from May through September shown in Table 3.1.

Table 3.1 Average Temperature and Precipitation Input

	January	February	March	April	May	June	July	August	September	October	November	December
Temperature	-11.45	-8.34	-3.77	0.88	4.72	7.60	9.81	9.04	4.98	-0.25	-5.62	-9.66
Precipitation	132	76	68	37	57	82	69	64	57	122	122	137

NOTES:
1. TEMPERATURE UNITS ARE DEGREES CELSIUS.
2. PRECIPITATION UNITS ARE MILLIMETERS OF WATER.
3. DATA IS REFERENCED TO AN ELEVATION OF 1680 MASL.

A winter orographic factor was developed using data from the B-SC01, V-SC01 and V-SC02 on-site snow course stations. This analysis showed that a winter orographic factor of 10% per 100 m was appropriate for the Harper Creek site, and this factor was applied to the precipitation recorded at the Vavenby station for the months of October through April, inclusive. The resulting mean monthly site precipitation values for October through April are shown in Table 3.1. The mean annual precipitation data input to the watershed model, discretized by sub-catchment and elevation band are shown in Table 3.2.

Table 3.2 Average Annual Model Inputs and Parameters by Elevation Band

Lower Bound Elevation (m)	300	600	900	1,200	1,500	1,800	2,100
Upper Bound Elevation (m)	600	900	1,200	1,500	1,800	2,100	2,400
Average Elevation (m)	**450**	**750**	**1,050**	**1,350**	**1,650**	**1,950**	**2,250**
Rainfall (mm/year)	332	347	369	385	389	399	417
Snowfall (mm/year)	230	303	384	487	620	769	935
Precipitation (mm/year)	562	650	753	872	1009	1168	1352
Sublimation (mm/year)	42	48	54	61	69	76	86
Potential Evapotranspiration (mm/year)	554	514	478	444	412	383	360
Actual Evapotranspiration (mm/year)	304	306	303	292	278	264	251
Surplus Water (mm/year)	216	296	396	519	662	828	1015

NOTES:
1. ACTUAL EVAPOTRANSPIRATION VALUE PRESENTED IS FOR BASELINE CONDITIONS.
2. SURPLUS WATER IS THE WATER AVAILABLE FOR GROUNDWATER RECHARGE AND SURFACE WATER RUNOFF (SUM OF RAINFALL AND SNOWMELT LESS THE EVAPOTRANSPIRATION AND SOIL MOISTURE CHANGE).

3.5 WATER BALANCE

3.5.1 Snow and Rain

Precipitation was assumed to fall as rain if the average monthly temperature was greater than 2°C and as snow if the average monthly temperature was below -1°C. The proportion of precipitation falling as rain or snow varied linearly for average monthly temperatures between -1°C and 2°C.

3.5.2 Sublimation

In this analysis, sublimation was modelled at an assumed rate of 0.25 mm/day, which is consistent with KP's experience for estimating sublimation for numerous locations throughout British Columbia and the Yukon. The snowpack was assumed to sublimate at the set rate until no snow remained on the ground.

3.5.3 Snowpack and Snowmelt

A simple temperature index method was adopted for this model. The first order estimate of the potential snowmelt was calculated using the equation (U.S. Department of Agriculture, 2004):

Monthly snowmelt (mm) = (Snowmelt Factor) x (T-1)

where, T is the monthly average temperature in degrees Celsius.

The actual monthly snowmelt was calculated as the lesser of the potential snowmelt and the available snow after considering losses to sublimation.

3.5.4 Evapotranspiration

Potential evapotranspiration (PET) was calculated following the Thornthwaite (1948) method. First, the PET for each month was estimated based on the corresponding average monthly temperature. Next, the unadjusted rate was adjusted to account for the number of days in the month and the number of hours in a day between sunrise and sunset, which varies by latitude. Typically, PET represents the evapotranspiration for a full vegetation cover on relatively flat tilled ground with no shortage of water. The Actual evapotranspiration (AET) was calculated by adjusting the PET by a factor to account for the distribution of available water over the month. For example, if the sum of snowmelt and rainfall in a given month was less than the PET, then the AET was less than the PET. Evapotranspiration was also limited by the soil moisture condition. Below the soil moisture capacity of the soil, the adjusted PET was reduced linearly with soil moisture as follows:

$$AET = (S_2 + S_1)\ f\ (PET)/(2S_m)$$

Where, S_m is soil moisture capacity (assigned as 200 mm across the site)

S_1 is soil moisture at the beginning of the month

S_2 is soil moisture at the end of the month

PET is the calculated full PET, and

f is the PET adjustment factor for non-ideal conditions for evapotranspiration (assigned as 0.7 for natural catchments).

Open water was assumed to evaporate at the full PET. Mined surfaces with exposed bedrock and exposed waste rock dumps do not have a soil cover and were specified with limited soil moisture capacity (1 mm) and a low PET adjustment factor (0.4).

3.5.5 Soil Moisture

The monthly soil water balance was calculated assuming the soil profile could retain moisture from month to month. A maximum soil moisture retention of 200 mm was assumed to represent average site conditions. Consideration of sublimation, snowmelt, rainfall, and AET allowed for an estimation of the water available for infiltration and runoff. The soil moisture was calculated for the end of each month (S_2) based on the following formula:

$$S_2 = W + S_1 - (S_2 + S_1)\ f\ (PET)/(2S_m)$$

where, W is sum of rainfall and snowmelt for the month

(other terms defined previously)

Solving for S_2

$$S_2 = (W + S_1(1 - f\ (PET)/(2S_m))/(1 + f\ (PET)/(2S_m))$$

Knowing the soil moisture at the beginning and the end of the month provided an estimate of the soil moisture change.

3.5.6 Water Available for Recharge and Runoff

The water available for groundwater recharge and runoff (V) was calculated by subtracting monthly evapotranspiration and soil moisture change from the sum of rainfall and snowmelt (W):

$$V = W - f(PET)(S_2 + S_1)/\ (2S_m) - (S_2 - S_1)$$

This unit value of available water was multiplied by the area for each elevation band in each sub-catchment to provide input to the water balance calculation.

3.6 SUB-CATCHMENT FLOW DISTRIBUTION

3.6.1 Groundwater Recharge

Groundwater recharge of the water available for runoff and recharge was estimated to account for the effects of variable surface conditions, soil permeability, and available storage capacity on recharge rates. Groundwater recharge was only allowed when evaporation and soil moisture requirements were met. Recharge therefore did not occur during the summer when the soil was not fully saturated or in the winter when the ground was covered by snow. The infiltration rate (I) within a sub-catchment was a specified parameter that was varied during calibration and was set equal to the available water up to a volume equal to the product of an infiltration rate (k_1) and the sub-catchment area (A). For wetter months, a fraction (k_2) of the remaining available water was also infiltrated ($k_2(V - k_1A)$). Therefore:

For precipitation less than or equal to k_1A

$$I\ (m^3/month) = V$$

For precipitation greater than k_1A

$$I\ (m^3/month) = k_1A + k_2(V - k_1A)$$

$$= k_2V + k_1A(1 - k_2)$$

This procedure provided an estimate of groundwater recharge that is relevant at the time scale of the monthly water balance. Interflow and groundwater flow along very short paths was considered to be part of the surface water component with this monthly time increment. The surplus water that was not recharged remained as surface water to be either stored or run-off.

3.6.2 Groundwater Storage and Discharge

Groundwater storage and discharge within each sub-catchment were represented using a linear reservoir model. Water was released from groundwater storage at a rate determined by the product of the average volume of water in storage ($Z_1/2 + Z_2/2$) and a discharge factor (j). Monthly discharge (D) was set equal to:

$$D = j(Z_1/2 + Z_2/2).$$

Month-to-month storage was accounted within each sub-catchment and groundwater discharge increased with increasing storage. The volume of water in storage was the sum of the storage in the preceding month (Z_1) plus the volume of water entering the system (I) minus the quantity discharged:

$$Z_2 = Z_1 + I – D$$

$$= Z_1 + I – j(Z_1/2 + Z_2/2)$$

Solving for Z_2:

$$Z_2 = (I + Z_1(1\text{-}jZ_1/2))/(1 + jZ_1/2)$$

The water entering the system included groundwater recharge (meteoric recharge and channel leakage) and groundwater flow contributed from the upstream sub-catchment. Water released from groundwater storage within the sub-catchment was either routed to the next sub-catchment downstream as groundwater or discharged within the sub-catchment and routed downstream as surface water flow.

The maximum allowable groundwater flow leaving the sub-catchment as subsurface flow was estimated using Darcy's Law, which calculates groundwater flow as the product of transmissivity, width, and hydraulic gradient values estimated at a location beneath the hydrology station.

The volume of groundwater released from storage in excess of the groundwater flow offsite was added to the surface water leaving the catchment. Groundwater storage and flow rates were calibrated primarily using streamflows during the low flow season. For a given volume of recharge, a discharge factor lower in value resulted in larger accumulated storage and a more uniform groundwater discharge rate.

3.6.3 Surface Water Detention and Storage

The volume of water reporting to the surface water component was estimated as the difference between water available for runoff and recharge and the volume of groundwater recharge. Some of the surface water component was manifested as runoff during a month and the remainder was detained as surface storage in small-scale detention features, such as small ponds or as interflow. Within this watershed methodology, surface water detention features were managed using the same linear reservoir model as groundwater storage and discharge. However, the discharge factor for release from surface water storage was typically higher than for release from groundwater storage.

3.6.4 Waste Rock Stockpile Infiltration, Storage and Discharge

Available water (V) applied to a waste rock dump was proportioned as runoff or as infiltration into the waste rock dump as storage in the saturated and unsaturated rock mass. Water that infiltrated into exposed waste rock dumps was managed in the same way as groundwater recharge on natural ground, but with a lower value specified for soil moisture capacity (1 mm). Waste rock dump surfaces that are reclaimed with a soil cover were assumed to have the same soil moisture retention capacity as the natural catchment.

Water was specified to discharge from a waste rock dump as toe discharge (either as seeps or broad discharge over an area) or as groundwater recharge to the footprint beneath the dump. The relationship between toe discharge and groundwater recharge was dependent on the surface properties of the underlying ground.

3.7 CALIBRATION METHOD

The Baseline watershed model was calibrated to long-term flows series for the following HCMC and WSC hydrology stations.

- Harper Creek (HARPERUS)
- T-Creek Downstream (TSFDS)
- P-Creek (OP)
- Harper Creek near the mouth (WSC-08LB076), and
- Jones Creek (JONESUS).

The locations of the gauging stations are shown on Figure 3.2. There are 38 complete years of measured data available for the WSC Harper Creek station. At the HCMC gauges, 38 years of synthetic flow data were generated from correlation between the Harper Creek WSC station and approximately 2 years of data collected at each HCMC station (KP, 2014a).

The objective of the model calibration was to ensure that the model could reasonably simulate measured flows on the basis of inputs of precipitation and temperature. The primary graphical methods used to guide and assess the calibration were monthly streamflow hydrographs, plots of cumulative streamflow volumes, and flow seasonal distribution plots comparing measured and simulated streamflows over the available period of record. In addition, Nash-Sutcliffe and Log-Based Nash Sutcliffe calibration statistics for each were used to quantitatively assess the model calibration at each streamflow gauge. Once the model calibration was completed, long-term monthly historical flow values were estimated for each of the gauging locations based on long-term precipitation and temperature inputs.

4 – BASELINE WATERSHED MODEL

4.1 WATERSHED MODEL DESCRIPTION

A Baseline watershed model was developed for the Harper Creek Project to improve the understanding of local baseline hydrologic and hydrogeological conditions, and to provide a pre-Project condition from which to assess potential effects of the planned mine development and operations on surface water and groundwater systems in the project area.

The study area was divided into 11 sub-catchments that corresponded with the catchments of established stream gauging and water quality stations. Sub-catchment locations are discussed in Section 4.3. A description of the site specific calibration process for the Baseline watershed model is provided below.

4.2 BASELINE HYDROLOGY SYNTHETIC FLOW SERIES

Long-term synthetic streamflow series were generated for the four HCMC gauging stations that had the most complete records: JONESUS, OP, HARPERUS, and TSFDS. These flow series were generated primarily for use in calibrating the watershed model and for fish habitat modelling. They are not intended to specifically replicate the precise chronology of historical daily streamflows, but rather to represent the magnitude, distribution and variability of daily, monthly and annual flows that would likely be experienced over the Project life. Development of these synthetic flow series are presented in the Surface Hydrology Baseline report (KP, 2014a).

4.3 CATCHMENT DISCRETIZATION

The baseline watershed model made use of 11 sub-catchment areas corresponding to the major surface drainages within the model domain. Each of the sub-catchment areas were further discretized by elevation using 300 m elevation bands, starting at 300 m above sea level (masl) and ending at 2400 masl. The sub-catchment areas are presented on Figure 3.2 and in Table 4.1.

Table 4.1 Baseline Watershed Model Surface Water Nodes and Catchments

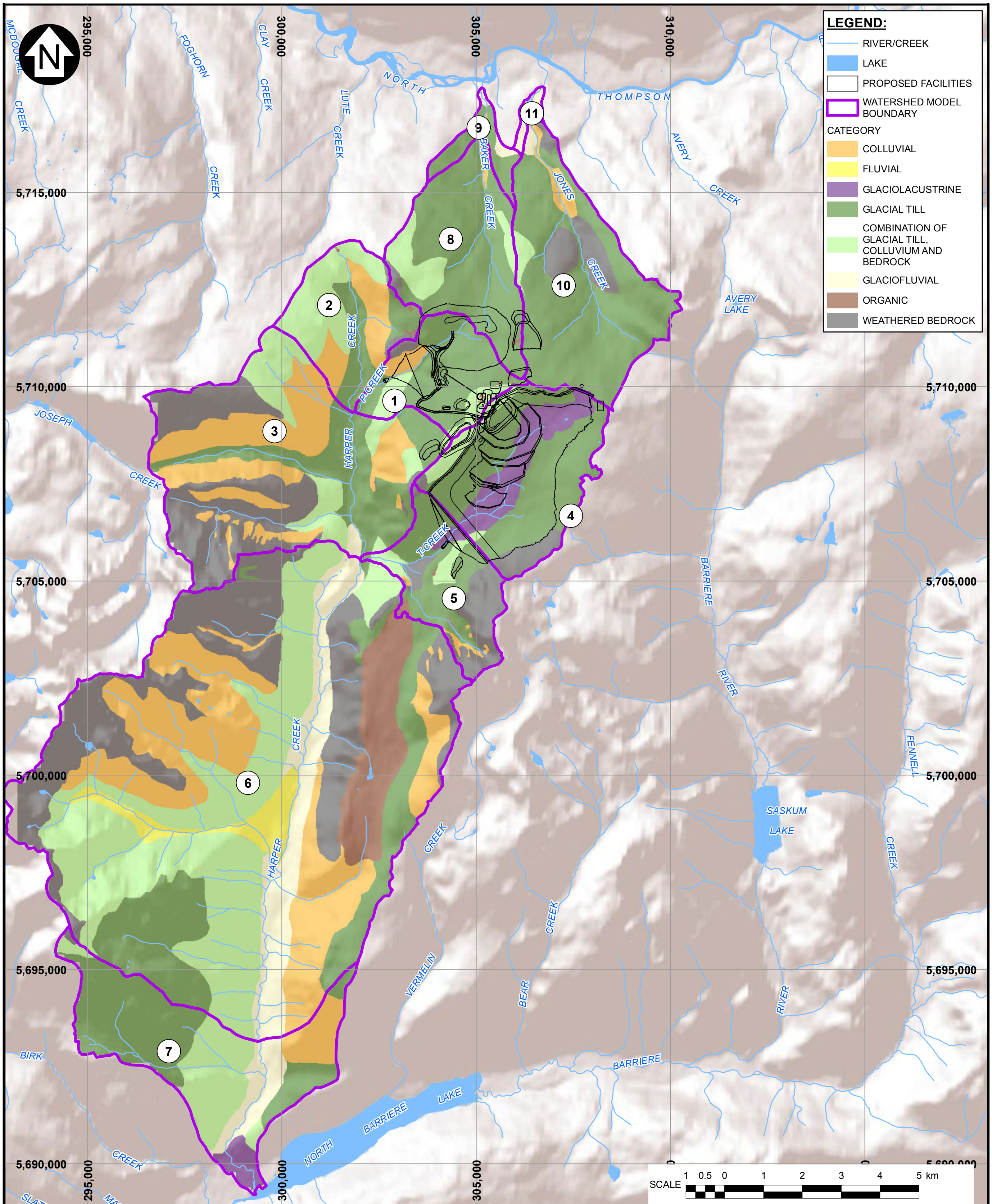
		Area (km^2)								
Lower Bound Elevation (m)	Streamflow Gauge	300	600	900	1200	1500	1800	2100	Sub Catchment Area	Total Catchment Area
Upper Bound Elevation (m)		600	900	1200	1500	1800	2100	2400		
Average Elevation (m)		**450**	**750**	**1050**	**1350**	**1650**	**1950**	**2250**		
Area 1	**OP**	0	0	0	0.98	5.13	1.51	0	7.62	7.62
Area 2	-	0	0	0	3.45	5.34	0.18	0	8.97	8.97
Area 3	**HARPER US**	0	0	1.11	8.87	10.38	8.99	1.10	30.45	47.03
Area 4	**TSFUS**	0	0	0	0	7.51	7.50	0	15.02	15.02
Area 5	**TSFDS**	0	0	0.06	0.56	4.67	2.45	0.65	8.39	23.40
Area 6	**WSC 08LB076**	0	2.53	15.48	16.83	32.14	24.25	4.70	95.93	166.36
Area 7	-	0	5.28	4.60	3.26	4.70	1.26	0.13	19.23	185.60
Area 8	-	0	1.12	2.71	3.18	5.12	0.23	0	12.35	12.35
Area 9	**BAKER**	0.28	1.32	0.32	0	0	0	0	1.93	14.28
Area 10	**JONES US**	0.11	1.95	3.36	4.77	6.34	1.06	0	17.58	17.58
Area 11	-	0.38	0.18	0	0	0	0	0	0.56	18.13

4.4 MODEL DEVELOPMENT

Development of the Baseline model was a multi-step process, which included the following:

- Calibration to long-term regional streamflows. The model was initially calibrated to match measured streamflows at the WSC Harper Creek gauging station (WSC 08LB076). The Harper Creek station has an available streamflow record from July 1973 to June 2012, and is located within the watershed model domain.
- Refinement of parameter values within the Project area to improve the match between modelled streamflows and long-term synthetic streamflows at hydrologic stations HARPERUS, OP, TSFDS, and JONESUS.
- Specification of model parameters for sub-catchments without long-term synthetic streamflow records. The remaining sub-catchments were assigned suitable parameter values based on the results of the model calibration and considering sub-catchment specific characteristics such as the relative surface exposure of glaciofluvial sand and gravel deposits and the proportion of area with moderate to steep slopes, as well as estimates of the transmissivity, hydraulic gradient, and width of the aquifer beneath each hydrology station. Measured streamflow data were available at hydrologic stations BAKER and TSFUS for portions of 2011 and 2012, which were used to help validate the selected model parameter values.

Site investigations were conducted in the project area in 2011 (KP, 2011) and 2012 (KP, 2012a and 2012b) to evaluate geotechnical and hydrogeological conditions. A summary of the characterization of the site was provided previously (KP, 2014c). The characterization of the site included mapping of the surficial geology within the boundaries of the watershed model, and the extents of surficial materials are shown on Figure 4.1. Information obtained during site investigations was also used to estimate the extent of permeable deposits and the ability of the subsurface to convey groundwater flow. Surficial geology across the Project site consists primarily of glacial till and glaciofluvial deposits, with the surface area of permeable deposits generally increasing with distance downstream. Where mapped glaciofluvial deposits cross sub-catchment boundaries at locations other than beneath the gauging station, the potential for groundwater flow between sub-catchments was evaluated. In those cases, the potential for groundwater flow across sub-catchment boundaries was determined based on the difference in topography between the two adjacent sub-catchments.



NOTES:
1. BASE MAP: TRIM AND NTS MAPPING, ESRI ARCGIS ONLINE SHADED RELIEF.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:140,000 FOR 8.5x11 (LETTER) PAPER.

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HARPER CREEK PROJECT

SURFICIAL GEOLOGY

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P/A NO. VA101-458/14 | REF NO. 1

FIGURE 4.1 REV 1

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
1	09OCT'14	ISSUED WITH REPORT	JS	CAC	RS	KJB

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Groundwater and surface water recharge and discharge parameters were adjusted to obtain a match between the monthly simulated and measured (or synthetic) streamflow records. The fit between modelled and observed streamflows was optimized to provide a good match to:

- Monthly mean streamflows
- Long-term mean monthly streamflows
- Cumulative mass balances, and
- Flow duration curves.

A discussion of model calibration to streamflows in Harper Creek and at hydrologic stations HARPERUS, OP, TSFDS AND JONESUS is presented below. Figures showing the matches between watershed modelled (referred to as simulated) and measured (or synthetic) streamflows are provided in Appendix A. Model calibrated groundwater recharge parameters including groundwater recharge coefficients, unit discharge, transmissivity, transmissive width and hydraulic gradient beneath gauging stations are provided in Appendix A1 Table A1-1 for all sub-catchments.

4.4.1 Harper Creek WSC Sub-Catchment (08LB076 Gauge)

Mapped surficial geology in the Harper Creek catchment consists largely of till with glaciofluvial deposits primarily limited to the creek valley. The match between simulated and measured streamflows at the Harper Creek gauging station is shown on Figure A1.1 through Figure A1.3. In general, modelled streamflows provide a good match to synthetic mean monthly streamflows, cumulative streamflows, and the flow duration curves. The good calibration to the regional data reflected by these plots indicates that the input parameters such as precipitation and temperature are well constrained in terms of total volumes and distribution.

In addition to evaluating the goodness of fit between the long-term synthetic and simulated streamflows using visual inspection, the fit to data at the regional station was also assessed using the statistical Nash-Sutcliffe efficiency (1970) method (NSE). Visual inspection provides useful insight into the adequacy of the results; however, statistical measures provide a more objective approach that complements the visual inspection. The NSE is a commonly adopted statistical measure used in hydrology and was considered appropriate for this analysis. A NSE value of 0.69 was calculated based on monthly synthetic and calculated streamflows for the Harper Creek catchment.

The performance rating for NSE values (Moriaisi et al, 2006) is defined below:

Very good: 0.75 < NSE < 1.00

Good: 0.65 < NSE < 0.75

Satisfactory: 0.50 < NSE < 0.65, and

Unsatisfactory: NSE < 0.50.

The NSE performance rating is considered good for the model calibration to the Harper Creek recorded hydrograph.

4.4.2 Harper Creek Upstream Sub-Catchment (HARPERUS Gauge)

The HARPERUS streamflow gauge is located on Harper Creek just above the confluence with T-Creek. Surficial geology across the HARPERUS sub-catchment consists primarily of till and colluvium with bedrock outcrops in higher elevations and a band of glaciofluvial sediments adjacent to the stream in the lowland portions of the sub-catchment. The match between simulated (watershed model) and synthetic streamflows at the HARPERUS gauging station is shown on Figure A1.4 through Figure A1.6. In general, modelled streamflows provide a satisfactory match to synthetic mean monthly streamflows, cumulative streamflows, and the flow distribution. A NSE value of 0.63 was calculated based on monthly measured and calculated streamflows for the HARPERUS catchment, indicating satisfactory model performance at this node.

4.4.3 P-Creek Sub-Catchment (OP Gauge)

The OP streamflow gauge is located on P-Creek just upstream from its confluence with Harper Creek. Surficial materials within the catchment consist predominantly of glacial till and colluvium. Simulated streamflow at the OP gauge provide a good match to the long-term synthetic streamflow series and a NSE efficiency of 0.67 indicates a good quality match. The match between simulated (watershed model) and synthetic streamflows at the OP gauging station is shown on Figure A1.7 through Figure A1.9.

4.4.4 Jones Creek Sub-Catchment (JONESUS Gauge)

The JONESUS gauging station is located on Jones Creek approximately 2 km upstream of the confluence with the North Thompson River. Surficial materials in the Jones Creek Watershed include predominantly glacial till with the occurrence of bedrock outcrops at higher elevations and glaciofluvial and colluvial materials along valley bottoms in the lowland portions of the sub-catchment. The calibrated baseline model exhibits a good match between synthetic long-term and simulated streamflow as JONESUS with a NSE value of 0.69. The match between simulated (watershed model) and synthetic streamflows at the JONESUS gauging station is shown on Figure A1.10 through Figure A1.12.

4.4.5 T-Creek Creek Sub-Catchment (TSFDS Gauge)

The TSFDS gauging station is located on T-Creek upstream of the confluence with Harper Creek. Surficial materials in the T-Creek Creek Watershed include predominantly glacial till with the occurrence of bedrock outcrops at higher elevations. The calibrated baseline model exhibits a good match between synthetic long-term and simulated streamflow as TSFDS with a NSE value of 0.67. The match between simulated (watershed model) and synthetic streamflows at the TSFDS gauging station is shown on Figure A1.13 through Figure A1.15.

4.5 CALIBRATED BASELINE MODEL RESULTS

4.5.1 Climate Results

The long-term temperature time series used in the watershed model has a mean annual value of 1.4°C. The mean annual precipitation from 1914 to 2012 was estimated to be about 1025 mm at the Project site elevation (1680 masl), with approximately 55% of precipitation falling as snow and 45% as rain. The calculated mean annual potential evapotranspiration (PET) over the same period was estimated at 445 mm. The calculated average actual evapotranspiration (AET) was estimated to be approximately 290 mm at an elevation of 1680 masl. Average groundwater recharge across the modelled areas was estimated as 15% of total precipitation. A summary of the calibrated flow distribution factors is presented in Table A1-1 in Appendix A1.

4.5.2 Streamflow Results

Mean monthly surface water flows were calculated for each sub-catchment from January 1914 to June 2012 using the calibrated baseline watershed model. Mean monthly surface and groundwater flow rates within each sub-catchment and leaving each sub-catchment are summarized in Tables A1-2 and A1-3, presented in Appendix A1. Sample results from the Baseline model are provided for the most downstream node in each modelled watershed, as follows:

- The mean annual streamflow for Harper Creek near the mouth at WSC 08LB076 was estimated to be 3,433 L/s (3.43 m^3/s). Mean monthly high and low flows ranged from 11,495 L/s (11.5 m^3/s) in June to 541 L/s (0.54 m^3/s) in March.
- The mean annual streamflow for Jones Creek above the confluence with the North Thompson River was estimated to be 243 L/s (0.24 m^3/s). Mean monthly high and low flows ranged from 810 L/s (0.81 m^3/s) in June to 30 L/s (0.03 m^3/s) in February.
- The mean annual streamflow for Baker Creek at the confluence with the North Thompson River was estimated to be 177 L/s (0.17 m^3/s). Mean monthly high and low flows ranged from 788 L/s (0.79 m^3/s) in May to 3 L/s (0.00 m^3/s) in February.

Additional discussion of simulated pre-development streamflows within the model domain is included in Section 6.

5 – LIFE OF MINE WATERSHED MODEL

5.1 GENERAL

The calibrated Baseline watershed model was modified by further subdividing baseline catchment areas to allow for integration of proposed mine infrastructure and surface water diversions. This revision to the Baseline watershed model created a Pre-Mine model. The Pre-Mine model was run in order to simulate pre-development hydrologic conditions using the revised sub-catchment layout (discussed in Section 5.2) prior to incorporating the proposed mine facilities. The results from the Pre-Mine model were used as the basis for the comparison between pre-development hydrological conditions and the Project affected flows.

The Life of Mine (LOM) watershed model was then developed to determine Project affected flows due to the construction of the mine facilities and proposed water management strategies described in Section 2. Modelling included two years before mine production and was run for a period of one hundred years following the commencement of mining. The LOM model was used to estimate the change from natural surface water and groundwater flows during the key stages of mine development including:

- Construction (two preproduction years, referred to as Year -2 and Year -1)
- Operations I (during active mining in the open pit, Year 1 through Year 23)
- Operations II (during low-grade ore processing, from end of active mining through Year 28)
- Closure (during active closure and reclamation phase while open pit and TMF are filling), and
- Post Closure (steady-state long-term closure condition following active closure).

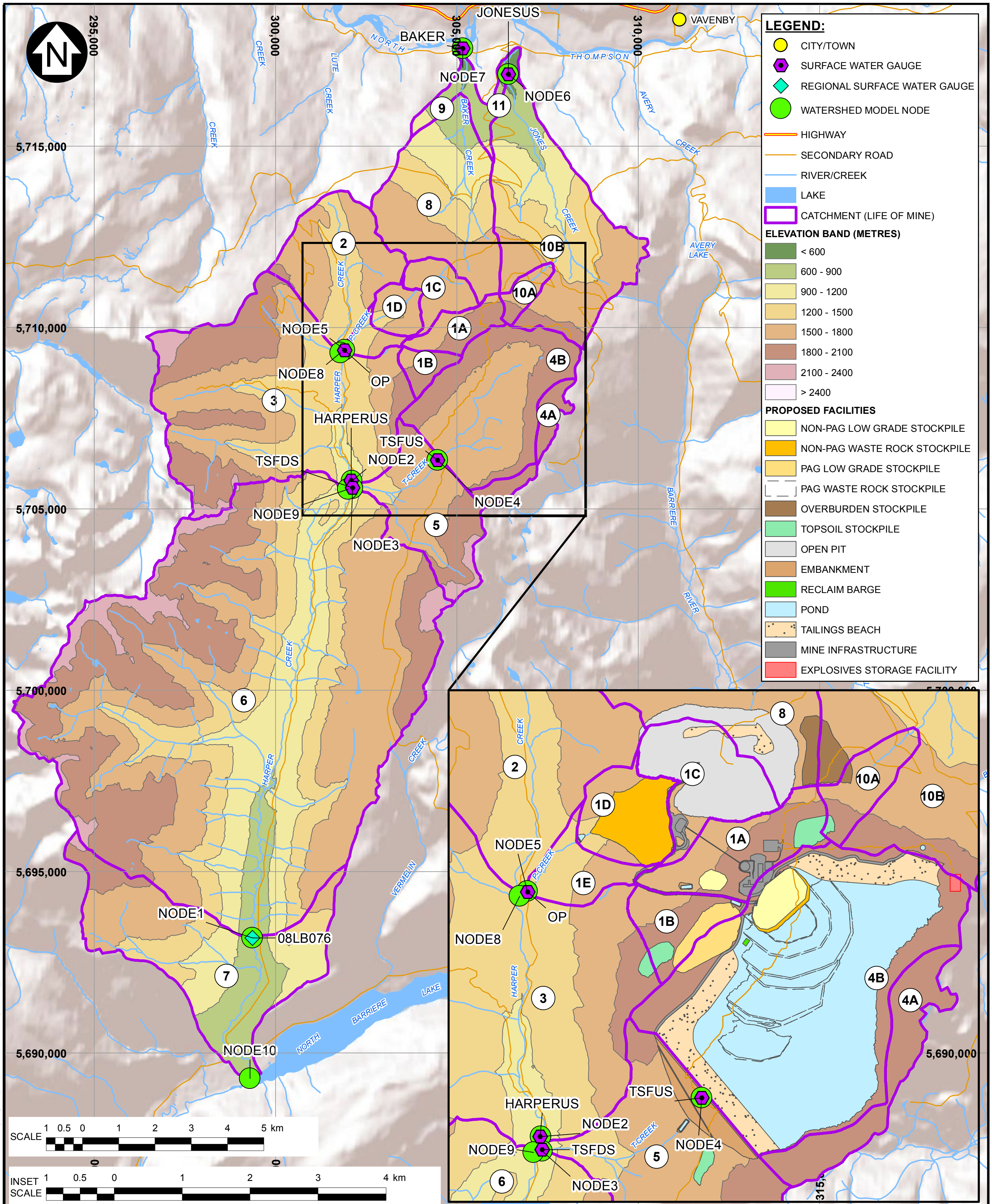
Results from the Pre-Mine model and LOM model, along with the methodology and assumptions used to develop the models are presented in the sections that follow.

5.2 CATCHMENT DISCRETIZATION

The sub-catchment areas of the calibrated Baseline model were further sub-divided where necessary to allow for integration of proposed mine infrastructure and surface water diversions. An additional six sub-catchments were added to the model in the P-Creek and T-Creek watersheds for a total of 17 sub-catchments, as shown on Figure 5.1. The area of each of the 17 sub-catchment areas is summarized in Table 5.1.

Table 5.1 Life of Mine Watershed Model Sub-Catchment Watershed Areas

		Area (km^2)								
Lower Bound Elevation (m)	Streamflow Gauge	300	600	900	1200	1500	1800	2100	Sub Catchment Area	Total Catchment Area
Upper Bound Elevation (m)		600	900	1200	1500	1800	2100	2400		
Average Elevation (m)		**450**	**750**	**1050**	**1350**	**1650**	**1950**	**2250**		
Area 1A	-	0	0	0	0	0.82	1.15	0	1.97	1.97
Area 1B	-	0	0	0	0	0.30	0.80	0	1.10	1.10
Area 1C	-	0	0	0	0	2.09	0.00	0	2.09	5.16
Area 1D	-	0	0	0	0.31	1.19	0	0	1.50	6.66
Area 1E	**OP**	0	0	0	0.55	0.40	0.00	0	0.96	7.62
Area 2	-	0	0	0	3.45	5.34	0.18	0	8.97	8.97
Area 3	**HARPER US**	0	0	1.11	8.87	10.38	8.99	1.10	30.45	47.03
Area 4A	-	0	0	0	0	0	2.01	0	2.01	2.01
Area 4B	**TSFUS**	0	0	0	0	7.50	5.51	0	13.01	15.02
Area 5	**TSFDS**	0	0	0.06	0.56	4.67	2.45	0.65	8.39	23.40
Area 6	**WSC 08LB076**	0	2.53	15.48	16.83	32.14	24.25	4.70	95.93	166.36
Area 7	-	0	5.28	4.60	3.26	4.70	1.26	0.13	19.23	185.60
Area 8	-	0.00	1.12	2.71	3.18	5.12	0.23	0	12.35	12.35
Area 9	**BAKER**	0.28	1.32	0	0	0	0	0	1.93	14.28
Area 10A	-	0	0	0	0.02	0.83	0.25	0	1.10	1.10
Area 10B	**JONESUS**	0.11	1.95	3.36	4.75	5.51	0.80	0	16.48	17.58
Area 11	-	0.38	0.18	0	0	0	0	0	0.56	18.13



NOTES:

1. BASE MAP: TRIM AND NTS MAPPING, ESRI ARCGIS ONLINE SHADED RELIEF.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 UTM ZONE 11N.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:150,000 FOR 8.5x11 (LETTER) PAPER.

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE WATERSHED MODEL SURFACE WATER NODES AND CATCHMENTS

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-458/14	1

FIGURE 5.1 REV 1

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
1	09OCT'14	ISSUED WITH REPORT	ACA	CAC	TJP	KJB

5.3 PRE-MINE MODEL CALIBRATION

The Pre-Mine model was run using the historical climate data and calibration parameters used in the Baseline model in order to verify the performance of the revised sub-catchment layout as compared to the baseline model. Baseline model calibrated groundwater recharge parameters including groundwater recharge coefficients, unit discharge, transmissivity, transmissive width and hydraulic gradient beneath gauging stations were unchanged from the in the Pre-Mine watershed model.

A comparison between modelled and long-term synthetic baseline streamflows was completed using the same methodology used for the Baseline watershed model, as discussed in Section 4.4. The comparison demonstrates the match between modelled and synthetic baseline flows using the following metrics:

- Monthly mean streamflows
- Long-term mean monthly streamflows
- Cumulative mass balances, and
- Flow duration curves.

Cumulative mass plots and monthly hydrographs showing the comparison of the Pre-Mine model calibration to streamflows in Harper Creek (WSC 08LB076 Gauge) and at hydrologic stations (HARPERUS, OP, TSFDS and JONESUS) are presented in Appendix A2. In addition to evaluating the goodness of fit between the long-term synthetic and watershed modelled streamflows using visual inspection, the fit to data at the measured or synthetic gauge data was also assessed using the statistical Nash-Sutcliffe efficiency (1970) method (NSE). The NSE is a commonly adopted statistical measure used in hydrology and was considered appropriate for this analysis.

The performance rating for NSE values (Moriaisi et al, 2006) is defined below:

Very good: $0.75 < NSE < 1.00$

Good: $0.65 < NSE < 0.75$

Satisfactory: $0.50 < NSE < 0.65$, and

Unsatisfactory: $NSE < 0.50$.

The comparison between NSE values for the Baseline watershed model and Pre-Mine model are included in Table 5.2.

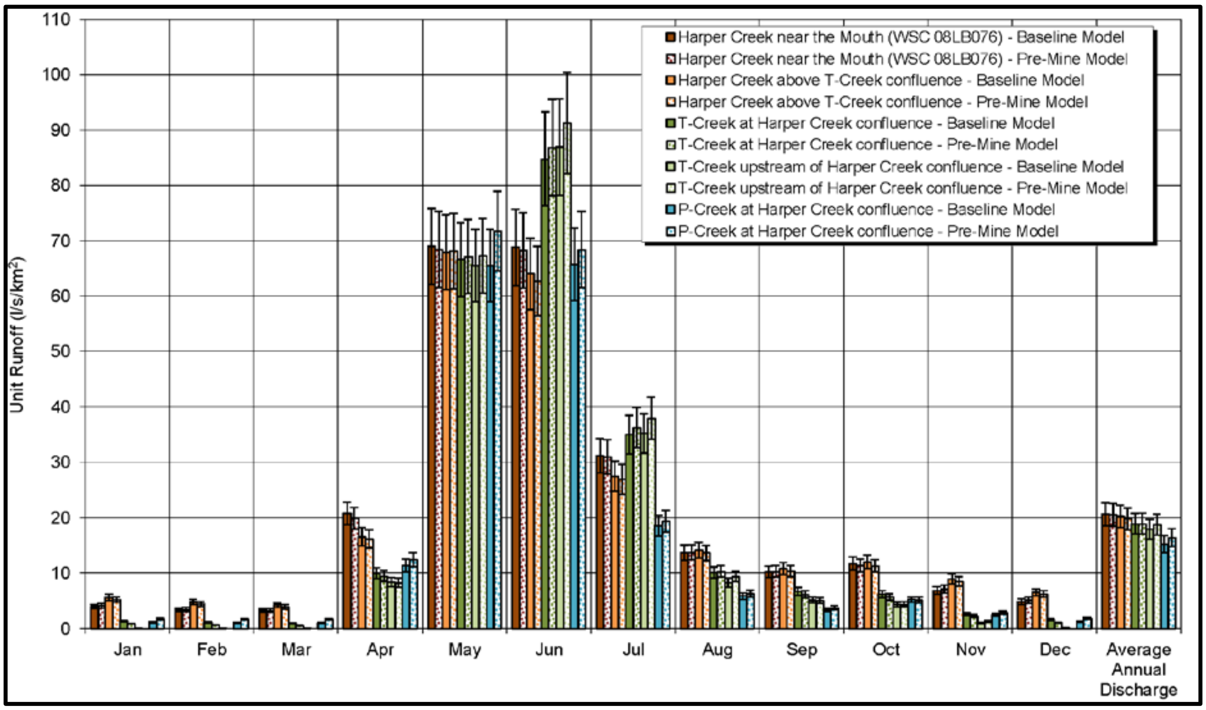
Table 5.2 Comparison of Baseline and Pre-Mine Watershed Model Calibration

CREEK	GAUGE	BASELINE MODEL NSE	PRE-MINE MODEL NSE
HARPER CREEK	WBS 08LB076	0.69	0.70
HARPER CREEK	HARPERUS	0.63	0.64
P-CREEK	OP	0.67	0.64
JONES CREEK	JONESUS	0.69	0.67
T-CREEK	TSFDS	0.67	0.66

Mean monthly surface water flows were calculated for each sub-catchment from January 1914 to June 2012 using the calibrated Pre-Mine model. Comparisons between the Pre-Mine model results and the LOM mine model results, within this document use the historical climate Pre-Mine results to determine flow effects. A comparison between the mean monthly flows in the Baseline watershed model and Pre-Mine model is included as Figure 5.2 for Nodes 1 to 5 and Figure 5.3 for Nodes 6 to 10.

In addition to the calibration comparison, a version of the Pre-Mine model was run using average monthly temperature and precipitation inputs in order to serve as an initial condition from which to develop the LOM model. The resulting monthly average flows were used to generate baseline water quality for the Project and for comparison to the LOM flow-series within the predictive Water Quality Model.

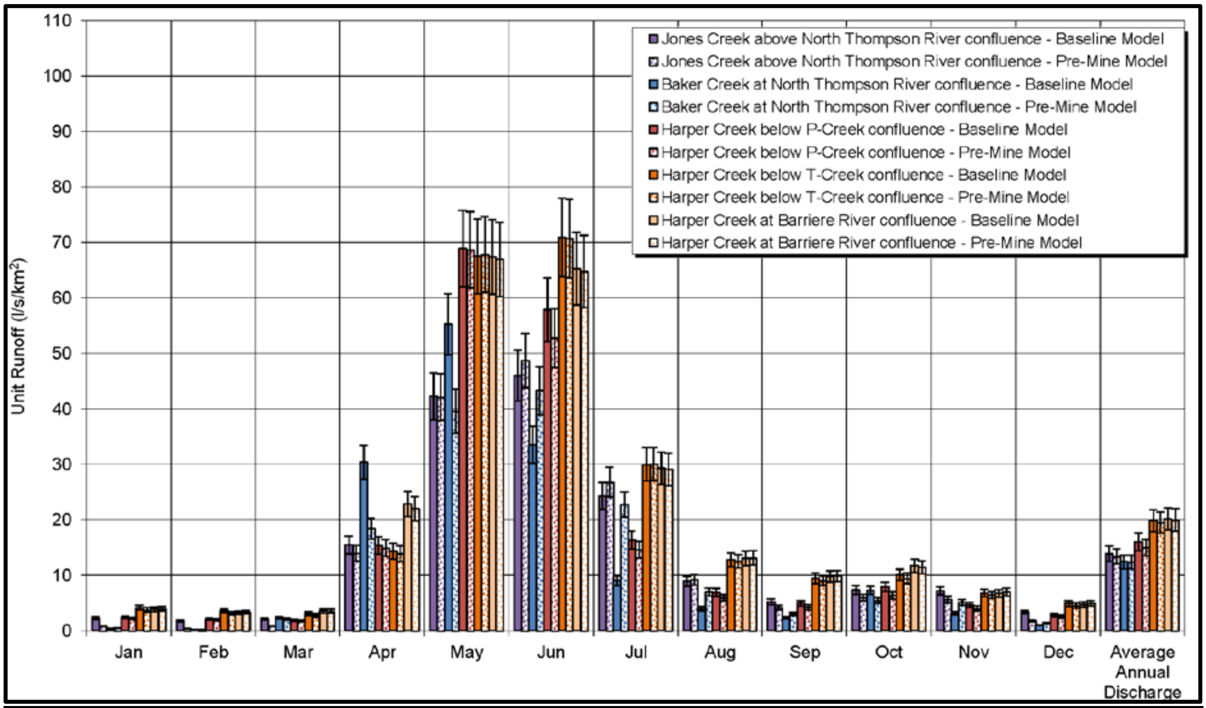
Mean monthly surface and groundwater flow rates within each sub-catchment and leaving each sub-catchment are summarized in Table A2-1 presented in Appendix A2. The results of the Pre-Mine model along with comparison of the Pre-Mine and LOM model results are presented in Section 6.



NOTES:

1. ERROR BARS SHOW 10% ON EITHER SIDE OF THE BASELINE AND PRE-MINE WATERSHED MODEL RESULTS.

Figure 5.2 Comparison of Mean Monthly Streamflows from Baseline and Pre-Mine Watershed Models – Nodes 1 to 5



NOTES:
1. ERROR BARS SHOW 10% ON EITHER SIDE OF THE BASELINE AND PRE-MINE WATERSHED MODEL RESULTS.

Figure 5.3 Comparison of Mean Monthly Streamflows from Baseline and Pre-Mine Watershed Models – Nodes 6 to 10

5.4 LIFE OF MINE MODEL DEVELOPMENT

The LOM model was developed to simulate key mine infrastructure and water management practices during all phases of the project. The LOM model made use of the same sub-catchment areas as in the Pre-Mine model, and includes the development of the following mine infrastructure:

- Open Pit
- Tailings Management Facility (TMF)
- Potentially acid generating (PAG) and non-potentially acid generating (non-PAG) waste rock stockpiles
- PAG and non-PAG low-grade ore stockpiles
- Topsoil stockpiles, overburden stockpile, and rock quarry
- Water management infrastructure (ditches, ponds etc.), and
- Plant site, live ore pad and crusher pad.

The sections that follow present the key assumptions and methodology used to integrate each of the major mine facilities into the watershed model. A summary of the sources of water to each facility and outflows of water from the facility is provided along with a description of the pertinent water management practices.

5.4.1 Open Pit

The open pit was included in the LOM model in order to simulate inflow, storage and outflow of water from the open pit during all phases of the project.

The open pit sub-model considered the following stages of open pit development:

- Pit dewatering during Operations I (Year 1 until Year 24)
- Filling of the pit lake with slurry water and low-grade ore tailings during Operations II (Year 24 through 28), and
- Pumping of discharge from the pit lake to the TMF (Year 36 to 100+).

The sources of inflow and outflow from the open pit model are listed below.

- Sources of water to the open pit model:
  - Surface water and groundwater inflow from up-gradient, undisturbed catchment areas
  - Slurry water and low-grade tailings from the mill (Operations II)
  - Precipitation directly on the pit walls and floor
  - Precipitation directly to the pit lake (Operations II, Closure and Post-Closure), and
  - Consolidation seepage from the low-grade tailings into the Pit Lake (Post-Closure).
- Water losses from the open pit model:
  - Pit dewatering (Operations I)
  - Reclaim water from the pit lake to the mill (Operations II)
  - Evaporation from the pit lake (Operations II, Closure and Post-Closure)
  - Groundwater seepage from the pit lake (Operations II, Closure and Post-Closure), and
  - Pumped discharge from the open pit to the TMF (Closure and Post-Closure).

The pit will be dewatered during Operations I at a rate equal to the net inflow from sources including pit wall runoff, undisturbed pit catchment runoff and groundwater inflow. Active dewatering was simulated during all years of open pit mining (Years 1 through Year 24). Groundwater inflow to the pit is expected to increase throughout the Operations I period to a maximum when the ultimate extents and depth of the open pit are reached. The maximum rate of inflow to the open pit was estimated to be approximately 30 L/s based on analytical methods and the results of numerical groundwater modelling (KP, 2014c).

Active dewatering of the pit will be discontinued during Operations II and low-grade tailings and slurry water from the mill will be sent to the pit for disposal and to begin filling of a pit lake. Slurry water and approximately 100 million cubic metres of low-grade ore tailings will be deposited in the pit during this period. Additional inflow to the pit lake will includes pit wall runoff, precipitation on the pit lake and groundwater inflow.

A significant quantity of slurry water will be retained in the void space of the tailings deposit during discharge of low-grade tailings to the pit. Consolidation of the tailings materials is expected to occur as additional tailings are deposited, which will result in consolidation seepage from the tailings deposit into the pit lake. Consolidation seepage rates were estimated using tailings material properties. Consolidation seepage rates in the pit are expected to reach a maximum of approximately 9 L/s during Year 29 after the cessation of tailings deposition. Consolidation seepage was predicted to gradually decrease after Year 29 and was predicted to reduce to rates less than 0.1 L/s in closure of the open pit.

Groundwater seepage from the pit lake is expected starting during Operations II and through the entire Post-Closure period. Seepage rates are expected to increase as the pit lake is filled. Seepage rates from the pit lake and low-grade tailings were estimated using the finite element computer program SEEP/W. Rates were estimated for various water surface and tailings elevations as the pit lake was filled. The maximum seepage rate from the pit lake was predicted to be approximately 8 L/s, and was predicted to occur when the pit lake reaches its maximum volume in Year 35.

When filling of the pit lake is complete, the water surface elevation will be maintained at a maximum elevation of 1530 masl (25 metres below the pit rim) in order to reduce seepage rates from the tailings and pit lake into the downstream receiving environment. Excess water will be pumped and released to the TMF pond, and subsequently flow through the TMF spillway to the downstream receiving environment (KP, 2014d).

Pumping of excess water from the pit was simulated using a 7-month, dual-rate pumping strategy to mitigate effects on downstream water quality. Water is pumped at a rate such that the average annual excess water volume is removed from the pit lake during the 7 months of active pumping. Within the 7-month active period, two pumping rates were used to better match the natural hydrograph of the downstream environment. The pumping strategy was applied in the watershed model from February through August each year, in perpetuity. Low-rate pumping of approximately 60 L/s was implemented in February and August and higher rate pumping of 125 L/s was assigned to March through July.

5.4.2 Tailings Management Facility

The TMF model simulated the development and water management of the TMF, including the following sub-components:

- TMF supernatant pond
- Tailings beaches
- PAG waste rock stockpile (situated within the TMF)
- TMF main and north embankments, and
- Associated water management ponds.

The TMF model considered the following stages of TMF development:

- Staged construction of the TMF embankments
- Filling of the TMF with tailings slurry, PAG waste rock, and process water (Operations I)
- Drawdown of the TMF supernatant pond as reclaim water is used in the process and conveyed as tailings slurry to the open pit (Operations II)
- Construction of a TMF spillway (Closure I)
- Reclamation of tailings beaches and embankments (Closure),and
- Decommissioning of water management ponds (Post-Closure).

The sources of inflow and outflow from the TMF are listed below.

Sources of water to the TMF:

- Surface water and groundwater from up-gradient, undisturbed catchment areas
- Surface water and groundwater from PAG low-grade stockpile (Operations I)
- Precipitation on the TMF supernatant pond

- Runoff from the PAG waste rock stockpile (Operations I)
- Runoff from the tailings beaches
- Consolidation seepage into the supernatant pond
- Recycle seepage from TMF water management ponds (Operations I & II, Closure), and
- Tailings and slurry water from the mill (Operations I).

Water losses from the TMF:

- Unrecovered foundation seepage from the TMF
- Unrecovered seepage from the water management ponds (Operations I & II, Closure)
- Reclaim water to the mill (Operations I & II)
- Evaporation from the TMF supernatant pond, and
- TMF spillway discharge (Closure and Post-Closure).

The TMF sub-model during Operations I simulated water sources and demands associated with ore extraction and processing. Tailings slurry conveyed to the TMF will contain a significant portion of water, which will be subsequently reclaimed and reused as process water in the mill. The process water quantities used in the LOM model were determined from a GoldSim water balance model that was completed as part of feasibility engineering for the Project. Detailed discussion of the GoldSim water balance is provided in Appendix P.

Reclaim water during the initial 18 months of Operations II was sourced from the TMF supernatant pond to provide process water for low-grade ore milling and to draw down the TMF pond from its maximum volume to approximately 125 million m^3. The TMF will naturally fill to a spillway elevation of 1834.5 masl at which point discharge from the spillway will occur. Initial discharge from the spillway is predicted to occur during Year 29, after the conclusion of low-grade ore processing.

Seepage losses from the TMF were estimated using SEEP/W finite element modelling (KP, 2014b). Seepage rates from the main embankment are expected to increase throughout Operations I to a maximum of approximately 14 L/s in Year 24. Seepage from the facility includes an embankment seepage component (approximately 12 L/sec) that is recovered in the downstream water management pond and a foundation seepage component (approximately 2 L/sec) that bypasses the water management pond and discharges to the T-Creek watershed.

A significant quantity of slurry water will be retained in the void space of the tailings deposit in the TMF. Consolidation of the tailings materials will occur as additional tailings are placed resulting in consolidation seepage from the tailings deposit into the supernatant pond. Consolidation seepage rates were estimated using tailings material properties. Consolidation seepage rates in the TMF are expected to reach a maximum of approximately 80 L/s at the end of tailings deposition during Year 24. Consolidation seepage was predicted to gradually decrease after Year 24 to approximately 0.2 L/s during closure of the TMF.

The water management ponds were assumed to be decommissioned in Year 40. In addition, soil/vegetative covers were applied to the TMF embankments and to the tailings beaches during years 29 through 35 to reduce infiltration.

5.4.3 Mill Process

The LOM model included a water balance of the process water used in the mill during ore processing. The process and reclaim water quantities used in the LOM model were determined from an operational water balance model that was completed as part of feasibility engineering for the Project (Appendix P). The sources of inflow and outflow from the Mill are listed below.

Sources of water to the Mill:

- Surface water from the plant site and live ore pad (Operations I and II)
- Reclaim water from the TMF (Operations I and II) , and
- Reclaim water from the Open Pit (Operations II).

Water output from the Mill:

- Tailings slurry water to the TMF (Operations I), and
- Low-grade tailings slurry water to the Open Pit (Operations II).

5.4.4 Non-PAG Waste Rock Stockpile

The non-PAG waste rock stockpile model simulated the proposed mine water management for this stockpile. The model includes the collection of surface water runoff and stockpile toe discharge in a water management pond and the recharge/seepage groundwater to the local groundwater system.

Sources of water to the non-PAG waste rock stockpile and water management pond include:

- Precipitation on the stockpile
- Precipitation on the water management pond
- Precipitation on the water management pond dam, and
- Surface water runoff from the crusher pad.

Water losses from the non-PAG waste rock stockpile and water management pond:

- Unrecovered seepage from the stockpile and water management pond
- Evaporation from the water management pond, and
- Recycle water pumped to the TMF.

The area of the stockpile was assumed to grow linearly from the start of Operations I through year 23. The water management pond at the non-PAG waste rock stockpile will remain in post-closure and excess water will be pumped to the TMF in perpetuity.

5.4.5 P-Creek Non-PAG Low-Grade Ore Stockpile

The P-Creek Non-PAG LGO stockpile model simulated the mine water management proposed for this stockpile. The model included collection of surface water runoff and stockpile toe discharge in a water management pond and the recharge/seepage of groundwater to the local groundwater system.

Sources of water to the P-Creek non-PAG LGO stockpile water management pond include:

- Precipitation on the P-Creek non-PAG Low Grade stockpile, and
- Precipitation on the water management pond.

Water losses from the LGO stockpile and water management pond include:

- Seepage from the stockpile
- Evaporation from the water management pond, and
- Recycle water pumped to the TMF.

Non-PAG LGO will be processed during the first five years of Operations I. The P-Creek non-PAG LGO stockpile will be removed from the model incrementally as milling occurs from Year 1 to Year 5. The water management pond will be removed at the end of Year 5.

5.4.6 TMF Non-PAG Low-Grade Ore Stockpile

The TMF non-PAG LGO stockpile model simulated the mine water management proposed for this stockpile, which is situated within the TMF. The model included collection of surface water runoff and stockpile toe discharge in the TMF pond and the recharge/seepage of groundwater to the local groundwater system.

Sources of water to the TMF Non-PAG LGO stockpile include:

- Precipitation on the stockpile.

Water losses from the LGO stockpile include:

- Seepage from the stockpile into the TMF pond.

Non-PAG LGO will be processed during Operations II. As a result, the TMF Non-PAG LGO stockpile was removed from the model incrementally as milling will occur from Year 23.5 throughYear 28. The stockpile area was assumed to follow the staged general arrangements presented in the Mine and Water Management Design Report (KP 2014d).

5.4.7 PAG Low-Grade Ore Stockpile

The PAG LGO stockpile model included the collection of surface water runoff and stockpile toe discharge in a water management pond and the discharge of groundwater seepage into the local groundwater system.

Sources of water to the PAG LGO stockpile include:

- Precipitation on the stockpile, and
- Precipitation on the collection pond.

Water losses from the PAG LGO stockpile include:

- Unrecovered seepage from the stockpile
- Water pumped to the TMF from the water management pond
- Evaporation from the water management pond, and
- Seepage from the water management pond.

The stockpile was assumed to grow linearly from Year 1 to the end of Operations I. PAG LGO will be processed after the cessation of open pit mining (Year 24), and the stockpile was removed incrementally from the model during Years 24 through 28.

5.4.8 North, West and South Topsoil Stockpiles

The LOM model included four topsoil stockpiles as shown on Figure 5.1. The sources of inflow and outflow to the topsoil stockpiles are listed below.

Sources of water to the Topsoil Stockpiles include:

- Precipitation on the stockpiles.

Water losses from the Topsoil Stockpiles include:

- Groundwater seepage from the base of the stockpile, and
- Surface water runoff.

The stockpiles are assumed to grow linearly during the Construction period. The topsoil from the four stockpiles will be removed for use in closure and remediation activities. As such, the topsoil stockpiles were removed from the model linearly during Years 23 through 33.

5.4.9 Overburden Stockpile

The LOM model included an overburden stockpile as shown on Figure 5.1. The model considered the diversion of surface water runoff from the stockpile to the west via a diversion channel and the discharge of groundwater seepage into the local groundwater system of Jones Creek.

Sources of water to the overburden stockpile include:

- Precipitation on the stockpile.

Water losses from the overburden stockpile include:

- Groundwater seepage from the stockpile
- Surface water runoff via a diversion channel, and
- Leakage from the diversion channel.

5.4.10 Rock Quarry

A rock quarry was included in the model to the southwest of the TMF facility. The sources of inflow and outflow to the rock quarry in the watershed model are listed below.

Sources of water to the rock quarry include:

- Precipitation on the rock quarry.

Water losses from the rock quarry include:

- Groundwater seepage from the base of the Rock Quarry, and
- Surface water runoff.

5.4.11 Crusher Pad and Crusher

A crusher pad and a crusher facility were modeled to the southwest of the open pit. The sources of inflow and outflow to the crusher in the watershed model are listed below.

Sources of water to the crusher pad include:

- Precipitation on the crusher pad.

Water losses from the crusher pad include:

- Groundwater seepage from the crusher pad, and
- Surface water runoff.

5.4.12 Plant Site

The plant site is to be constructed to the north of the TMF. Sources of inflow and outflow from the plant site in the model are listed below.

Sources of water to the plant site include:

- Precipitation.

Water losses from the Plant Site include:

- Groundwater seepage, and
- Surface water runoff.

5.5 MODELLED SCENARIOS

5.5.1 Variable Case

To assess potential effects of climatic variability on streamflow and groundwater flow during all phases of the Project, the LOM model was run iteratively through the same long-term temperature and precipitation records used in the Baseline watershed model. An Excel macro was written using visual basic computer code to iteratively cycle the temperature and precipitation input strings through the model and to export streamflows for the 10 analysis nodes between each iteration.

- Each climate iteration consists of the following steps:
  - o The temperature input time-series is cycled forward by one year
  - o The precipitation input time-series is cycled forward by one year
  - o The model file is updated and re-run, and
  - o Simulated streamflows from the re-run are exported to a results element.

The above cycle was repeated until the entire historical climate record was cycled through every position of the 100-year LOM Model. This resulted in 100 climate iterations, each producing simulated streamflow time-series at the 10 analysis nodes for all phases of the Project.

This iterative, variable climate approach generates variability in the simulated streamflow records during all years of Project life. This allows for the assessment of return period wet and dry flows. Results of the Variable Case LOM modelling are discussed in Section 6.

5.5.2 Average Case

In order to verify the performance of the Variable Case modelling and to provide input for predictive water quality modelling (KP, 2014e), the LOM model was run using the average monthly temperature and precipitation inputs shown in Table 3.1. The results of the Average Case were compared with the Variable Case results to verify model performance. Comparison of the Average and Variable Case LOM results is provided in Section 5.6.

5.5.3 5th and 95th Percentile Precipitation Case

The LOM model was used to simulate effects of the Project on surface water quality under average climatic conditions. In order to assess the effect of variable climatic conditions on surface water quality, climatic variability was introduced into the LOM model during the following key phases of the Project development:

- Operations I (Years 21 and 22)
- Operations II (Years 27 and 28)
- Closure (Years 29 and 30), and
- Post-Closure (Years 50 and 51).

The above phases were selected to correspond with times when the concentrations of the parameters of concern within the average case water quality model reached their maximum during Operations I, Operations II, Closure and Post-Closure at key receiving environment nodes. Variable climatic conditions were not modeled during the construction phase due to the low predicted concentrations, when compared to subsequent phases. As mine activities affect water quality parameters differently, it was not possible to select key phases that include the maximum concentration for all water quality parameters.

Climatic variability was generated by inserting historical precipitation data from the calibrated baseline model into the climate record of the Average Case LOM model during the timeframes specified above. Six iterations of the LOM model were completed (three wet and three dry), each using monthly data from a different year approximating 5th or 95th percentile conditions. This approach was applied to better represent the range of resultant flows for the long-term wet and dry conditions at the site and reduces potential selection bias from using a single year of data. The range of annual precipitation values in the long-term precipitation record used in the calibrated baseline model is shown on Figure 5.4. The 5th percentile annual precipitation is approximately 730 mm and the 95th percentile annual precipitation is approximately 1392 mm. The monthly and annual precipitation data used for each of the six cases (three 5th and three 95th percentile cases) are shown for an elevation of 1680 masl in Table 5.3.

For each model iteration variable precipitation data were inserted into the average precipitation string during the two-year intervals listed above. This methodology assesses the cumulative effect of two wet or two dry precipitation years in series, which provides additional stress on the hydrological system as opposed to the use of a single wet or dry year.

This analysis produced variable streamflow conditions that were then utilized in the water quality modelling. The water quality predictions resulting from these variable precipitation conditions and additional discussion of the results of 5th and 95th Percentile Precipitation Case modelling are provided in the Water Quality Predictions Report (KP, 2014e).

Table 5.3 5th and 95th Percentile Precipitation Input Data by Case Number

Modelled Scenario	Case No.	Source Year for Climate Data	Precipitation from Long-Term Climate Record (mm)												
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
5th Percentile Cases (Approx 730 mm/yr)	Case 1	2002	28	42	67	28	97	57	41	65	92	45	125	64	750
	Case 2	1952	78	77	35	24	63	75	22	23	49	101	67	125	738
	Case 3	1913	119	49	64	0	53	59	42	23	75	85	81	80	730
95th Percentile Cases (Approx 1391 mm/yr)	Case 1	1982	138	77	30	43	89	180	93	74	10	219	180	259	1,391
	Case 2	1951	216	108	76	9	96	85	33	136	188	194	200	52	1,392
	Case 3	2001	413	242	68	14	41	48	4	9	76	173	148	134	1,371

NOTES:

1. THE PRECIPITATION DATA TABULATED ABOVE IS TAKEN FROM THE CALIBRATED BASELINE WATERSHED MODEL FOR AN ELEVATION OF 1680 (masl).

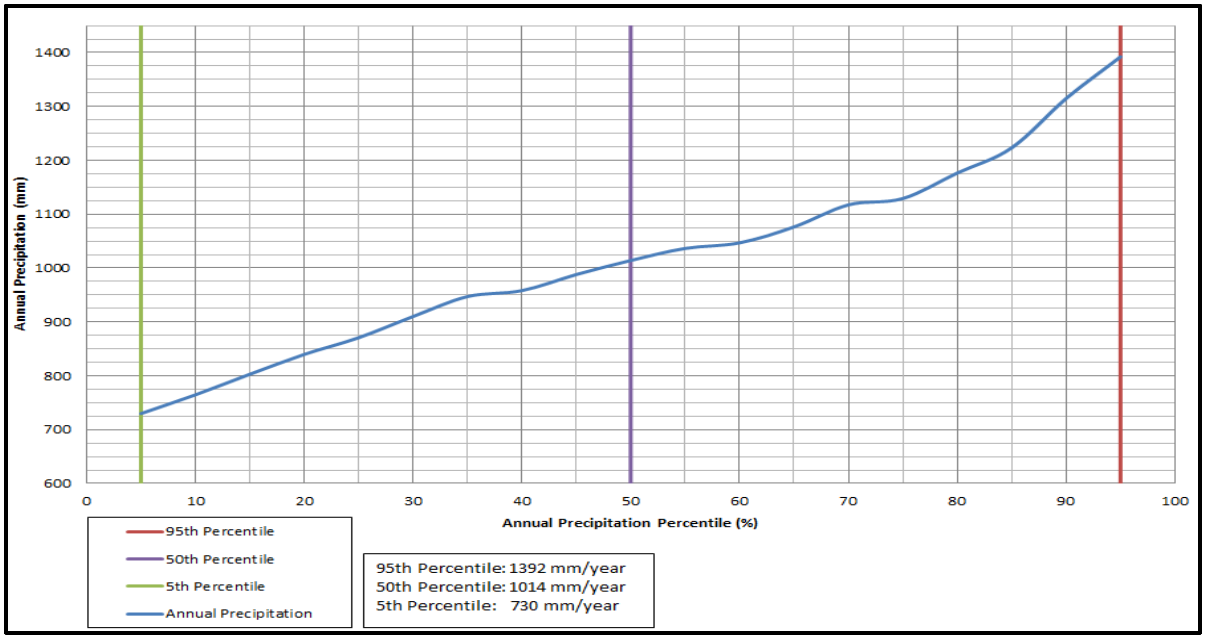


Figure 5.4 Harper Creek Annual Precipitation Distribution for 5th and 95th Percentile Precipitation Case

5.6 COMPARISON OF MODELLED SCENARIOS RESULTS

In order to confirm that running the model using average climate inputs (the Average Case) would produce mean annual discharge (MAD) results similar to the MAD results from running the model through the complete historical climate record (the Variable Case), a comparison of the results from the different scenarios was produced. The Average Case streamflow flow results were compared at each of the ten watershed model nodes with the mean, median, 40th and 60th percentile flow results over the life of the mine. Mean annual flows for the Average and Variable Case are presented for each LOM model node in Appendix B. The MAD from the Average Case tracks the MAD from the Variable Case well as shown on Figure 5.5 for Harper Creek below the confluence of T-Creek (Node 9). A divergence occurs between Year 28 and Year 35, as the TMF spills earlier and gradually during the Variable Case, while the Average Case has the TMF spilling suddenly in Year 32. This difference reflects the range of dates when the TMF spill may begin spilling, depending on preceding climatic conditions.

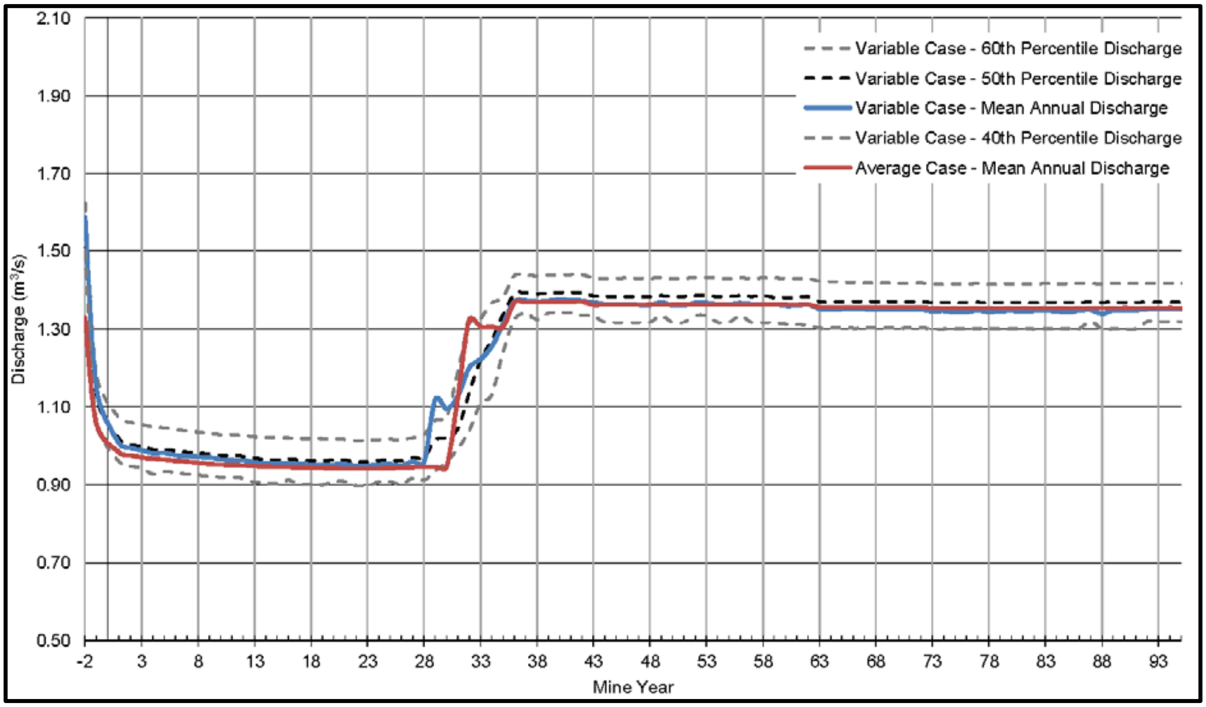


Figure 5.5 Variable and Average Scenarios for Node 9, Harper Creek Below T-Creek Confluence

A comparison of streamflows from the Variable Case and the 5^{th} and 95^{th} Percentile Precipitation Case was completed. Using the 5^{th} and 95^{th} percentile precipitation in the LOM model during specific mine development phases does create variation from the MAD produced by the Average Case. It should be noted that using the 5^{th} and 95^{th} percentile precipitation does not create 5^{th} and 95^{th} percentile streamflows since factors like groundwater storage; temperature and moisture content also play a role in producing streamflows. Streamflow results created by the 5^{th} percentile precipitation vary from 2^{nd} to 50^{th} percentile flows depending on the node and mine year in question. Similarly, streamflow results created by the 95^{th} percentile precipitation vary from 50^{th} to 100^{th} percentile flows depending on the node and mine year.

5.7 COMPARISON WITH OPERATIONAL WATER BALANCE

A monthly Operational Water Balance model was developed using the GoldSim© software package. The intent of the modelling was to verify, by comparison of results, the performance of the watershed model and to estimate the magnitude and extent of any water surplus and/or deficit conditions in the TMF during operations and closure. The Operational Water Balance model was run on average monthly temperature and precipitation data from the Baseline watershed model and provides a simplified surface water balance for the project site.

TMF supernatant pond and pit lake water storage volumes from the LOM and Operational Water Balance were compared to validate model performance. Both models predict the TMF to reach its maximum storage volume of approximately 174 million cubic meters following the end of Operations II, after which discharge from the TMF spillway occurs. The two models predict the TMF to be in surplus conditions on a monthly basis under average precipitation conditions without the need for additional make-up water to support the process water needs of the mill.

Following the end of Operations I, low-grade tailings and slurry water will be deposited in the open pit to begin filling of the Pit Lake. The total pit volume is approximately 139 Mm^3, which includes 102 Mm^3 of stored tailings. Both the GoldSim© water balance and Average Case LOM Model indicate that the pit will require 1.5 years to reach its maximum pond capacity of 37 Mm^3. The first overflow to the TMF from the pit occurs approximately 5 years after the cessation of tailings deposition in Year 30, under median conditions in both models. Both models show that the Pit Lake is able to satisfy all the reclaim water requirements used after the first 18 months of Operations II. Therefore no additional make up water is required. The results of the Operational Water Balance are discussed in detail in Appendix P.

5.8 SEEPAGE INTO STREAMFLOW

The design of the mine waste and water management facilities included mitigation measures to prevent and capture groundwater seepage from the mine facilities to the maximum practical extent (KP, 2014d). The vast majority of seepage will be collected by the mitigation measures. Still, some unrecovered seepage is expected. There are several pathways of unrecovered seepage that are significant to the prediction of water quality for the Project. These pathways include the following:

- Seepage towards T-Creek will result from infiltration of ponded water in the TMF directly through the embankment fill and the natural ground, and from expulsion of pore water as the tailings mass consolidates.
- Seepage towards P-Creek and Harper Creek will result from infiltration on the Non-PAG Waste Rock Stockpile and from seepage from the water management pond bypassing cut-off and collection measures.
- Seepage towards P-Creek and Harper Creek will result from infiltration on the PAG Low-Grade Ore (LGO) Stockpile bypassing collection measures infiltrating through the underlying low-permeability foundation liner.

The location of the discharge of unrecovered seepage from the mine facilities is a key aspect of the prediction of water quality for the project. The unrecovered seepage rates used in the watershed model are included in Table 5.3.

Table 5.4 Unrecovered Seepage Rates for Watershed Modelling

FACILITY	SEEPAGE DIRECTION	UNRECOVERED SEEPAGE RATE (L/S)	SOURCE OF ESTIMATE
TMF	T-CREEK	2 L/s (1)	SEEP/W ANALYSIS
TMF WMP	T-CREEK	0.5 L/s	WATERSHED MODEL
NON-PAG WASTE ROCK STOCKPILE WMP	P-CREEK	1 L/s (2)	WATERSHED MODEL AND SEEP/W ANALYSIS
PAG LOW-GRADE ORE STOCKPILE	P-CREEK AND HARPER CREEK	1 L/s	WATERSHED MODEL

NOTES:

1. UNRECOVERED SEEPAGE RATE WAS SELECTED WITH CONSIDERATION OF BASE CASE SEEPAGE ESTIMATES AND SENSITIVITY ANALYSES. SEEPAGE RATE REPRESENTS CONSERVATIVE ESTIMATE FOR PURPOSE OF WATER QUALITY MODELLING (KP, 2014b).
2. UNRECOVERED SEEPAGE RATE WAS SELECTED TO REPRESENT A CONSERVATIVE SCENARIO WHERE THE WATER MANAGEMENT POND IS ALLOWED TO ACCUMULATE WATER AND IS MAINTAINED AT MAXIMUM CAPACITY. THE WATER MANAGEMENT SYSTEM IS DESIGNED TO REMOVE EXCESS WATER TO THE MINIMUM OPERATING LEVEL FOR PUMP SUBMERGENCE (KP, 2014d).

The unrecovered seepage rates adopted represent a reasonable and conservative scenario for the purposes of water quality prediction. The predicted behavior of groundwater, including both non-contact groundwater and unrecovered seepage from the mine facilities, is inherent to the methodology used in the analysis and will vary depending on the model and the facility being modelled. The remainder of this section describes the methodology used for each of the above facilities to represent groundwater flow within the LOM model.

The TMF is represented in the watershed model as a facility with a low-permeability groundwater cut-off. The watershed model uses transmissivity, transmissive aquifer width and a hydraulic gradient to calculate the amount of groundwater that passes a node in the model with any excess flow routed to surface water. To simulate a low-permeability cut-off, the transmissivity is decreased so that no flow passes the node in the subsurface but instead flows 100% as surface water. The surface water is collected and recycled to the TMF. An unrecovered seepage flow rate is then introduced to the groundwater flow zone immediately downstream of the node. This methodology conservatively assumes that there is no non-contact groundwater bypassing the cut-off node, and the unrecovered seepage flow is the only groundwater flow immediately downstream of the node. The total unrecovered seepage used for the TMF in the LOM model was 2.5 L/s, with 2 L/s coming from the TMF and 0.5 L/s coming from the water management pond. This groundwater flow methodology is represented schematically on Figure 5.7.

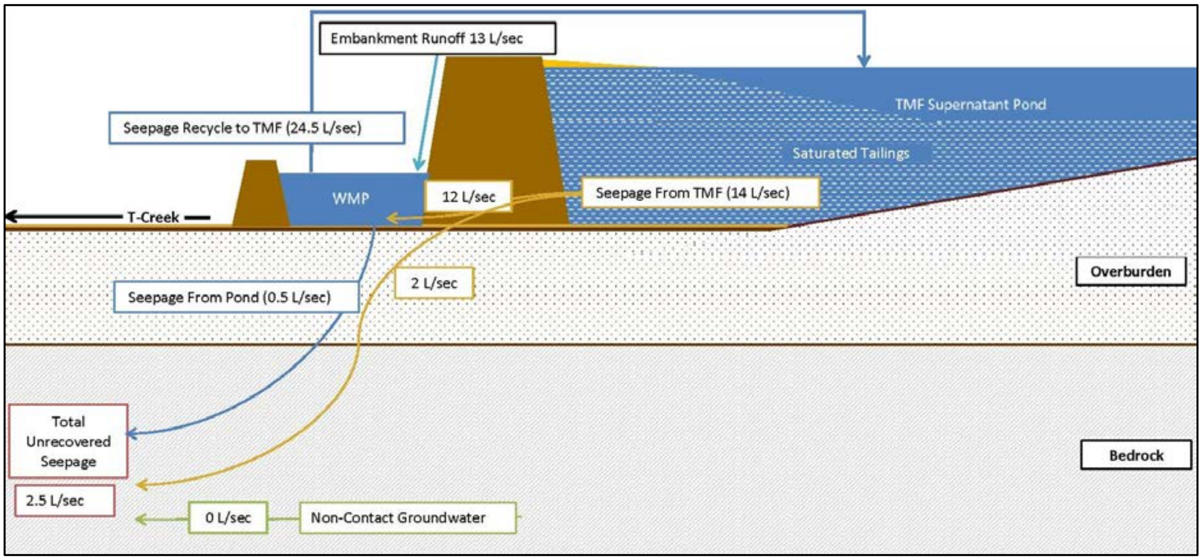


Figure 5.6 Seepage Schematic for TMF

Groundwater flow from up-gradient areas is then allowed to re-enter the groundwater balance downstream and eventually refills the transmissive aquifer. Once the transmissive aquifer is refilled in the model then any excess flow will again be routed to surface water downstream. The groundwater recharge rates depend on the recharge characteristics, catchment area, and topography of the site.

The Non-PAG Waste Rock Stockpile is represented in the watershed model with a similar methodology to the TMF. The total unrecovered seepage used for the Non-PAG Waste Rock Stockpile in the LOM model was 1.0 L/s, and was predicted to come entirely from the water management pond. The groundwater flow methodology for this facility is shown on Figure 5.8.

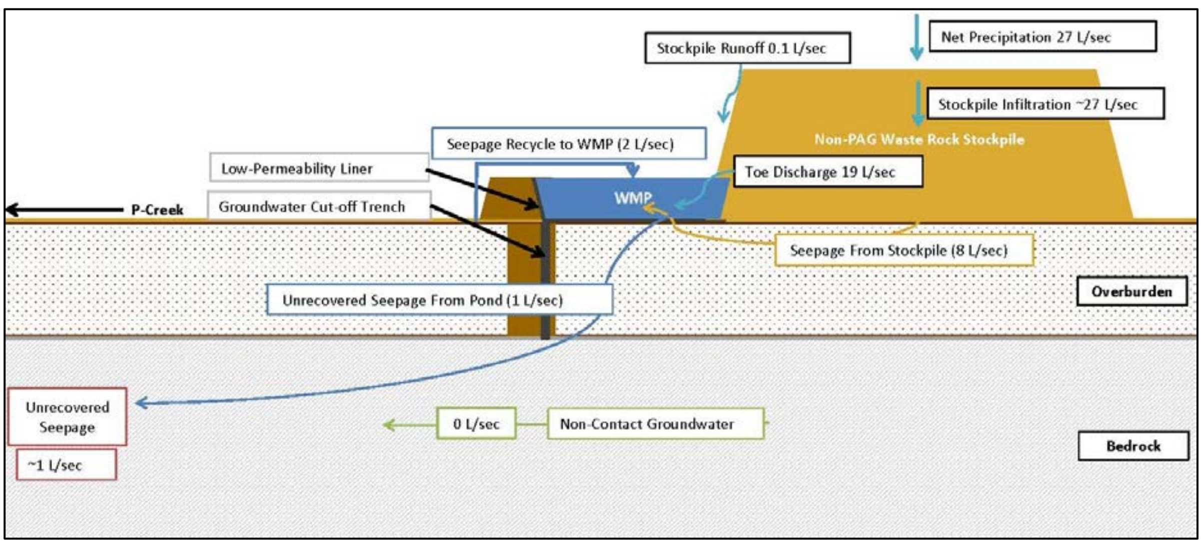


Figure 5.7 Seepage Schematic for Non-PAG Waste Rock Stockpile

The unrecovered seepage from the TMF was predicted by the watershed model to surface prior to the first water quality modelling node at the base of T-Creek. The site is located over 2000 m downstream with an elevation difference in excess of 450 m. The catchment area downstream of the TMF for recharge of the groundwater is approximately 8.4 km^2.

The unrecovered seepage from the waste rock stockpile was predicted by the watershed model to surface within Harper Creek downstream of the confluence of P-Creek and Harper Creek. The first water quality modelling node at the base of P-Creek is located just over 1000 m downstream with an elevation difference of around 100 m. The seepage from the waste rock stockpile was predicted to bypass this first water quality modelling node in the watershed model. The catchment area downstream of the waste rock stockpile for recharge of groundwater is approximately 1.5 km^2 and includes contributing groundwater from unrecovered seepage from the PAG LGO Stockpile.

The PAG LGO Stockpile is near the height of land on the catchment area divide between the T-Creek, P-Creek, and Harper Creek catchments. The stockpile is underlain by a low-permeability overburden liner (KP, 2014d) and includes collection measures to capture infiltration through the stockpile. However, any infiltration passing beyond the liner and collection measures will enter the groundwater system. Seepage entering the groundwater system from the PAG LGO Stockpile is expected to be dispersive towards the three catchment areas. A portion of the seepage was predicted to flow to the TMF and will be collected there. A second portion will flow towards the waste rock stockpile and be collected in the water management pond and conveyed to the TMF for storage. The balance will flow in groundwater as unrecovered seepage towards P-Creek and Harper Creek. The total unrecovered seepage used for the PAG LGO Stockpile in the LOM model was 1.0 L/s. This seepage flows in groundwater pathways towards Harper Creek and contributes to the recharge of groundwater in the P-Creek catchment downstream of the water management pond. The unrecovered seepage from this source is conveyed within groundwater and surfaces in Harper Creek downstream of the confluence of P-Creek once excess groundwater flow begins to discharge again to surface water.

6 – STREAMFLOW CONDITIONS AT THE WATERSHED MODEL NODES

6.1 MEAN MONTHLY FLOWS

6.1.1 Methodology

The effect of the Project on streamflow conditions at the watershed model nodes 1 to 10 was assessed by comparing the mean monthly flows for Pre-Mine conditions to the corresponding flows for mine development conditions at six years through the mine development, namely:

1. Year -1 – End of Construction
2. Year 10 – Operations I
3. Year 22 – Operations I
4. Year 27 – Operations II
5. Year 30 – Closure, and
6. Year 50 – Post Closure.

Mean monthly flows were calculated from the results of the Variable Case model (see Section 5.5.1). These six different years of mine development were selected to characterize how streamflow impacts will vary throughout the Project's development. They were selected to represent conditions during the main phases of development, or to coincide with periods of maximum mine effects, or when changes in effects are most pronounced. Figures in Appendix B present mean annual streamflows for Nodes 1 through 10 for the entire length of the watershed model.

6.1.2 Results

A summary of mean monthly flows is presented for Node 9, Harper Creek below T-Creek confluence, on Figure 6.1. Changes in contributing watershed area and streamflow for the six years listed above are quantified in Table 6.1. It can be noted that changes in streamflow may not be equivalent to changes in watershed area due to the differences in hydrologic conditions in the impacted areas compared to those in the unaffected areas and because of differences in surface water/groundwater interactions caused by the Project. For example, while the reduction in watershed area at Node 9 at Year 22 is 27%, the flow reduction ratios show:

- Larger reductions than the drainage area reduction in May, June and July, when runoff is generated by high elevation snowmelt.
- Smaller reductions than the drainage area reduction in the winter when runoff is largely generated by base flow and is proportionally higher in the low elevation watershed.
- An annual flow reduction that is larger than the drainage area reduction due to the reduction of high flows from May to July.

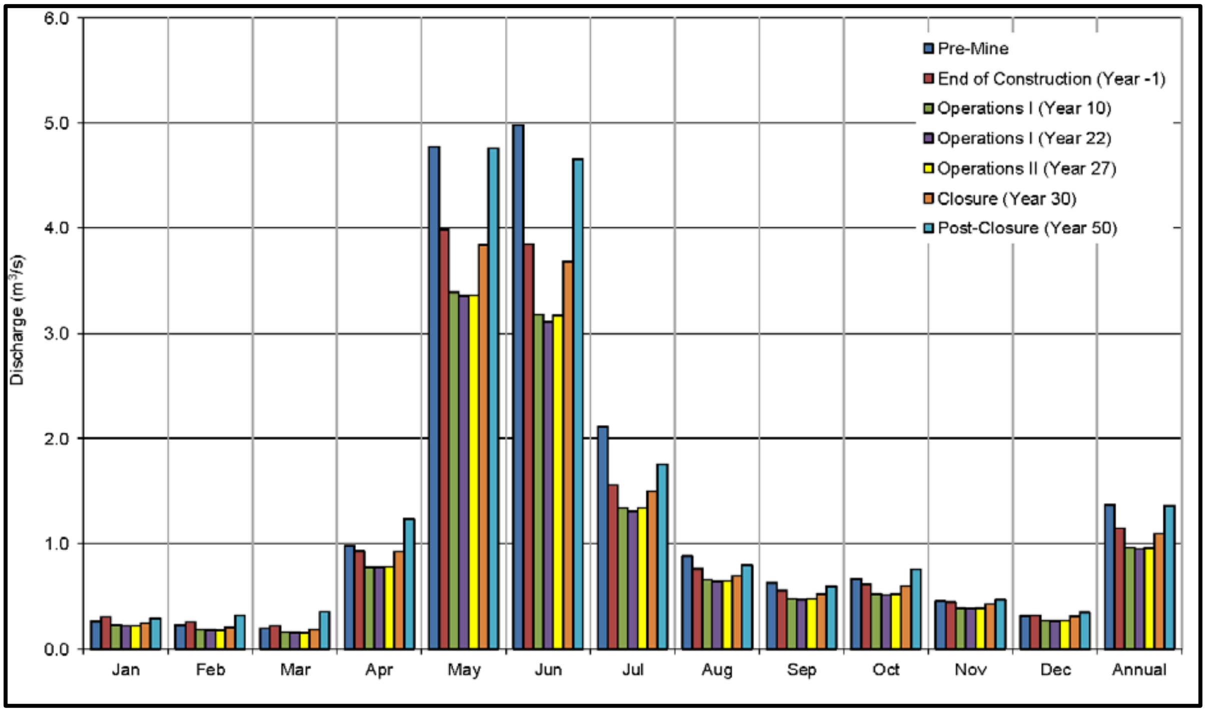


Figure 6.1 Life of Mine Mean Monthly Flows for Node 9, Harper Creek below T-Creek Confluence

Mean monthly and mean annual flow changes are presented for each LOM Watershed Model node in Appendices C through L for Nodes 1 to 10, respectively.

Table 6.1 Mean Monthly Flow Summary for Node 9, Harper Creek below T-Creek Confluence, over Life of Mine

Mine Stage Year	Mine Stage Description	Drainage Area (km^2)	Parameter	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
-	Pre-Mine	70.4	Discharge	m^3/s	0.26	0.22	0.19	0.98	4.77	4.98	2.11	0.88	0.63	0.66	0.45	0.32	1.37
			Unit Runoff	$l/s/km^2$	3.7	3.2	2.8	13.9	67.8	70.7	30.0	12.5	8.9	9.4	6.4	4.5	19.5
-1	End of Construction	54.9	Discharge	m^3/s	0.30	0.26	0.22	0.93	3.98	3.85	1.56	0.76	0.56	0.61	0.45	0.32	1.15
			Unit Runoff	$l/s/km^2$	5.5	4.7	4.0	16.9	72.5	70.1	28.3	13.9	10.1	11.1	8.1	5.8	20.9
			Change from Pre-Mine	m^3/s	0.04	0.04	0.03	-0.05	-0.79	-1.13	-0.56	-0.12	-0.07	-0.05	-0.01	0.00	-0.22
		-22%		%	15%	16%	14%	-5%	-17%	-23%	-26%	-13%	-11%	-8%	-1%	0%	-16%
10	Operations I	52.2	Discharge	m^3/s	0.23	0.19	0.16	0.78	3.39	3.18	1.34	0.66	0.48	0.52	0.39	0.27	0.97
			Unit Runoff	$l/s/km^2$	4.3	3.6	3.2	15.0	65.0	60.9	25.7	12.6	9.1	10.0	7.4	5.3	18.5
			Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.03	-0.20	-1.38	-1.80	-0.77	-0.22	-0.15	-0.14	-0.06	-0.04	-0.41
		-26%		%	-14%	-16%	-15%	-20%	-29%	-36%	-36%	-25%	-24%	-21%	-14%	-13%	-30%
22	Operations I	51.1	Discharge	m^3/s	0.22	0.18	0.16	0.78	3.36	3.11	1.31	0.64	0.47	0.51	0.38	0.27	0.95
			Unit Runoff	$l/s/km^2$	4.3	3.5	3.1	15.2	65.7	60.8	25.5	12.6	9.1	10.0	7.5	5.3	18.6
			Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.04	-0.20	-1.41	-1.87	-0.81	-0.24	-0.16	-0.15	-0.07	-0.05	-0.42
		-27%		%	-16%	-19%	-18%	-20%	-30%	-38%	-38%	-27%	-26%	-23%	-15%	-15%	-31%
27	Operations II	51.5	Discharge	m^3/s	0.22	0.18	0.15	0.79	3.36	3.17	1.34	0.65	0.48	0.52	0.39	0.27	0.96
			Unit Runoff	$l/s/km^2$	4.2	3.5	3.0	15.3	65.4	61.5	26.1	12.6	9.3	10.2	7.6	5.3	18.6
			Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.04	-0.19	-1.41	-1.82	-0.77	-0.23	-0.15	-0.14	-0.06	-0.04	-0.41
		-27%		%	-17%	-19%	-21%	-20%	-30%	-36%	-36%	-26%	-24%	-21%	-14%	-13%	-30%
30	Closure	66.6	Discharge	m^3/s	0.25	0.21	0.19	0.93	3.84	3.68	1.50	0.69	0.52	0.60	0.42	0.31	1.09
			Unit Runoff	$l/s/km^2$	3.7	3.1	2.8	13.9	57.7	55.2	22.5	10.4	7.9	9.0	6.4	4.6	16.4
			Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.05	-0.93	-1.30	-0.61	-0.18	-0.11	-0.06	-0.03	-0.01	-0.28
		-5%		%	-6%	-6%	-4%	-5%	-20%	-26%	-29%	-21%	-17%	-9%	-6%	-3%	-20%
50	Post-Closure	66.7	Discharge	m^3/s	0.29	0.32	0.35	1.24	4.76	4.65	1.75	0.80	0.60	0.76	0.47	0.35	1.36
			Unit Runoff	$l/s/km^2$	4.4	4.8	5.2	18.5	71.3	69.7	26.3	11.9	8.9	11.4	7.0	5.2	20.4
			Change from Pre-Mine	m^3/s	0.03	0.10	0.16	0.26	-0.01	-0.33	-0.36	-0.08	-0.03	0.10	0.02	0.03	-0.01
		-5%		%	11%	43%	80%	26%	0%	-7%	-17%	-10%	-5%	15%	4%	9%	-1%

NOTES:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

6.2 MONTHLY WET AND DRY RETURN PERIOD FLOWS

6.2.1 Methodology

The effect of the Project on monthly and annual wet and dry flow conditions at LOM watershed model nodes 1 to 10 were assessed at 5, 10, 20 and 50 year recurrence intervals for the Pre-Mine and the six selected years.

Probability of exceedance statistics were calculated for each calendar month from the 100 year dataset of monthly streamflow values generated from the Variable Case LOM model. Monthly wet and dry flows were estimated from the corresponding monthly percentile flow, where 5, 10, 20 and 50 year dry conditions are represented by the 80%, 90%, 95% and 98% probability of exceedance values, respectively, and 5, 10, 20 and 50 year wet conditions are represented by the 20%, 10%, 5% and 2% probability of exceedance values, respectively.

6.2.2 Results

A summary of Pre-Mine, Year 22 and Year 50 monthly wet and dry flows are presented for Node 9, Harper Creek below T-Creek confluence, in Table 6.2, Table 6.3 and Table 6.4, respectively. Monthly wet and dry flows are presented for each model node for Pre-Mine and LOM conditions are presented in Appendices C through L for Nodes 1 to 10, respectively. Each table presents the estimated monthly discharge for each recurrence interval along with the change from Pre-Mine in terms of flow and as a percentage. As some of the monthly Pre-Mine streamflow values are small numbers and the streamflow values over the LOM are also small, a small variation in monthly values can create a large percent change from Pre-Mine, but a small absolute change in discharge. This is particularly prevalent at nodes with smaller drainage areas and in the winter.

A general trend of small reductions or even increases in estimated monthly and annual dry flows is shown for most nodes during most months. Typically, reductions are smaller or increases are larger during the greater recurrence intervals within a given month. As an example in Table 6.3, at Node 9 in July of Year 22, the 50 and 5 year monthly dry flows are reduced by 0.09 m^3/s and 0.18 m^3/s respectively, or a percent change from Pre-Mine monthly dry flows of -15% and -21%, respectively. This trend is attributed to increased groundwater recharge from runoff on the stockpiles and seepage from the TMF and varies between nodes depending on the layout of mine infrastructure in the contributing catchment. At nodes whose catchments include the Open Pit, seepage and groundwater recharge influences are muted due to the shift in groundwater storage resulting from dewatering of the Open Pit. As an example in Table 6.4, at Node 5, P-Creek at Harper Creek Confluence, in July of Year 22, the 50 and 5 year monthly dry flows are reduced by 0.03 m^3/s and 0.03 m^3/s respectively or a percent change from Pre-Mine monthly dry flows of -82% and -78% respectively.

A general trend of reductions in estimated monthly wet flows can be seen at most nodes during most months. As an example, Table 6.3 shows at Node 9 in July of Year 22, the 50 and 5 year monthly wet flows are reduced by 3.20 m^3/s and 1.19 m^3/s respectively, or a percent change from Pre-Mine monthly dry flows of -49% and -41% respectively. This is accredited to the reduction in drainage area and the flow attenuation attributable to the collection of runoff from the pit, TMF and stockpiles.

A trend of increasing and then decreasing effects is shown at all nodes as mine infrastructure increases during Operations and is then reclaimed during Closure. By Post-Closure, the effects are smaller than those seen in Operations I, and vary by node depending on the lasting effect on the catchment. For example in Table 6.5, at Node 9 in July of Year 50, the 5 year monthly wet and dry flows are reduced by 0.67 m^3/s and increased by 0.06 m^3/s respectively, or a percent change from Pre-Mine monthly wet and dry flows of -23% and 7% respectively. These values can be compared to a percent change from Pre-Mine for the 5 year monthly wet and dry flows of -41% and -21% respectively for Year 22 at Node 9.

Table 6.2 Pre-Mine Monthly Wet and Dry Flows at Harper Creek below T-Creek confluence, Node 9

Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.14	0.17	0.17	0.21	0.26	0.33	0.35	0.36	0.37
February	0.12	0.14	0.15	0.18	0.22	0.28	0.29	0.31	0.31
March	0.11	0.12	0.13	0.15	0.19	0.24	0.25	0.27	0.28
April	0.13	0.14	0.16	0.20	0.98	1.91	2.28	2.84	3.25
May	2.10	2.67	3.01	3.41	4.77	6.07	6.77	7.38	7.49
June	1.31	1.69	2.44	3.01	4.98	7.08	7.78	8.36	8.79
July	0.58	0.60	0.67	0.85	2.11	2.92	4.05	4.68	6.55
August	0.30	0.31	0.38	0.49	0.88	1.04	1.36	1.91	3.49
September	0.26	0.28	0.31	0.35	0.63	0.75	1.03	1.39	2.09
October	0.24	0.27	0.30	0.34	0.66	0.88	1.15	1.46	2.20
November	0.20	0.24	0.25	0.31	0.45	0.62	0.72	0.75	0.76
December	0.17	0.20	0.21	0.26	0.32	0.39	0.42	0.43	0.44
Annual	0.65	0.76	0.91	1.04	1.37	1.70	1.87	1.99	2.19

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Table 6.3 Operations I (Year 22) Monthly Wet and Dry Flows at Harper Creek below T-Creek confluence, Node 9

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m³/s	0.14	0.15	0.17	0.18	0.22	0.25	0.27	0.28	0.29
	Change from Pre-Mine	m³/s	-0.01	-0.01	0.00	-0.03	-0.04	-0.07	-0.08	-0.08	-0.08
		%	-4%	-8%	0%	-14%	-16%	-22%	-23%	-22%	-21%
February	Discharge	m³/s	0.11	0.12	0.14	0.15	0.18	0.21	0.22	0.23	0.24
	Change from Pre-Mine	m³/s	-0.01	-0.02	-0.01	-0.03	-0.04	-0.07	-0.07	-0.07	-0.07
		%	-8%	-12%	-6%	-16%	-19%	-24%	-25%	-24%	-23%
March	Discharge	m³/s	0.10	0.11	0.12	0.13	0.16	0.18	0.19	0.20	0.23
	Change from Pre-Mine	m³/s	-0.01	-0.02	-0.01	-0.03	-0.04	-0.06	-0.06	-0.06	-0.05
		%	-10%	-14%	-7%	-17%	-18%	-24%	-25%	-24%	-17%
April	Discharge	m³/s	0.12	0.12	0.14	0.17	0.78	1.43	1.80	2.07	2.26
	Change from Pre-Mine	m³/s	-0.01	-0.02	-0.02	-0.04	-0.20	-0.48	-0.48	-0.77	-0.99
		%	-9%	-14%	-15%	-19%	-20%	-25%	-21%	-27%	-30%
May	Discharge	m³/s	1.77	2.08	2.33	2.64	3.36	4.14	4.36	4.67	5.00
	Change from Pre-Mine	m³/s	-0.34	-0.59	-0.67	-0.76	-1.41	-1.93	-2.41	-2.72	-2.49
		%	-16%	-22%	-22%	-22%	-30%	-32%	-36%	-37%	-33%
June	Discharge	m³/s	1.14	1.34	1.62	2.17	3.11	4.12	4.55	4.95	5.62
	Change from Pre-Mine	m³/s	-0.17	-0.34	-0.82	-0.84	-1.87	-2.96	-3.24	-3.41	-3.17
		%	-13%	-20%	-34%	-28%	-38%	-42%	-42%	-41%	-36%
July	Discharge	m³/s	0.49	0.52	0.59	0.67	1.31	1.73	2.24	2.97	3.35
	Change from Pre-Mine	m³/s	-0.09	-0.08	-0.08	-0.18	-0.81	-1.19	-1.82	-1.71	-3.20
		%	-15%	-13%	-12%	-21%	-38%	-41%	-45%	-37%	-49%
August	Discharge	m³/s	0.30	0.32	0.36	0.47	0.64	0.75	0.92	1.13	1.64
	Change from Pre-Mine	m³/s	0.01	0.01	-0.02	-0.02	-0.24	-0.29	-0.44	-0.78	-1.85
		%	2%	3%	-6%	-4%	-27%	-28%	-32%	-41%	-53%
September	Discharge	m³/s	0.27	0.29	0.31	0.33	0.47	0.57	0.63	0.78	1.11
	Change from Pre-Mine	m³/s	0.01	0.01	0.00	-0.02	-0.16	-0.18	-0.41	-0.61	-0.99
		%	3%	3%	0%	-6%	-26%	-24%	-39%	-44%	-47%
October	Discharge	m³/s	0.25	0.28	0.29	0.31	0.51	0.65	0.88	1.11	1.26
	Change from Pre-Mine	m³/s	0.01	0.00	0.00	-0.03	-0.15	-0.24	-0.27	-0.36	-0.94
		%	3%	0%	0%	-9%	-23%	-27%	-23%	-24%	-43%
November	Discharge	m³/s	0.21	0.23	0.26	0.27	0.38	0.51	0.55	0.58	0.61
	Change from Pre-Mine	m³/s	0.00	-0.01	0.01	-0.04	-0.07	-0.12	-0.17	-0.17	-0.15
		%	0%	-3%	3%	-13%	-15%	-19%	-23%	-23%	-20%
December	Discharge	m³/s	0.17	0.19	0.21	0.22	0.27	0.31	0.33	0.34	0.36
	Change from Pre-Mine	m³/s	0.00	-0.01	0.00	-0.03	-0.05	-0.08	-0.09	-0.09	-0.08
		%	0%	-6%	0%	-14%	-15%	-21%	-21%	-21%	-19%
Annual	Discharge	m³/s	0.56	0.63	0.68	0.76	0.95	1.10	1.20	1.31	1.36
	Change from Pre-Mine	m³/s	-0.09	-0.13	-0.23	-0.28	-0.42	-0.60	-0.67	-0.67	-0.83
		%	-14%	-17%	-25%	-26%	-31%	-35%	-36%	-34%	-38%

Table 6.4 Operations I (Year 22) Monthly Wet and Dry Flows at P-Creek at Harper Creek Confluence, Node 5

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00
		%	-100%	-100%	-100%	-100%	-75%	-60%	0%	0%	0%
February	Discharge	m3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-96%	-93%	-87%	-87%	-87%
March	Discharge	m3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
		%	-100%	-100%	-100%	-100%	-49%	-99%	-97%	-97%	-59%
April	Discharge	m3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.04	0.05	0.06
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	-0.08	-0.17	-0.19	-0.27	-0.30
		%	-100%	-100%	-100%	-100%	-84%	-87%	-81%	-83%	-84%
May	Discharge	m3/s	0.09	0.13	0.14	0.16	0.22	0.28	0.30	0.33	0.35
	Change from Pre-Mine	m3/s	-0.15	-0.15	-0.17	-0.22	-0.33	-0.43	-0.48	-0.52	-0.56
		%	-62%	-53%	-54%	-58%	-60%	-60%	-61%	-61%	-62%
June	Discharge	m3/s	0.04	0.04	0.07	0.09	0.16	0.23	0.26	0.27	0.32
	Change from Pre-Mine	m3/s	-0.03	-0.07	-0.11	-0.13	-0.36	-0.59	-0.63	-0.70	-0.73
		%	-47%	-60%	-61%	-59%	-69%	-72%	-71%	-72%	-69%
July	Discharge	m3/s	0.01	0.01	0.01	0.01	0.03	0.04	0.06	0.08	0.10
	Change from Pre-Mine	m3/s	-0.03	-0.03	-0.03	-0.03	-0.12	-0.15	-0.25	-0.27	-0.48
		%	-82%	-79%	-78%	-78%	-81%	-79%	-81%	-77%	-83%
August	Discharge	m3/s	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.03	0.04
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.06	-0.06	-0.26
		%	-91%	-89%	-89%	-91%	-83%	-82%	-82%	-69%	-86%
September	Discharge	m3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.05	-0.07	-0.12
		%	-98%	-98%	-98%	-97%	-91%	-88%	-88%	-90%	-91%
October	Discharge	m3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.06
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.03	-0.05	-0.08	-0.15
		%	-93%	-93%	-93%	-93%	-71%	-55%	-61%	-66%	-72%
November	Discharge	m3/s	0.00	0.00	0.00	0.00	0.05	0.10	0.19	0.19	0.20
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	0.03	0.06	0.14	0.15	0.15
		%	-99%	-98%	-98%	-96%	>100%	>100%	>100%	>100%	>100%
December	Discharge	m3/s	0.00	0.00	0.00	0.00	0.02	0.04	0.08	0.08	0.08
	Change from Pre-Mine	m3/s	-0.01	-0.01	-0.01	-0.01	0.01	0.02	0.06	0.06	0.06
		%	-99%	-99%	-99%	-98%	46%	>100%	>100%	>100%	>100%
Annual	Discharge	m3/s	0.02	0.02	0.03	0.03	0.04	0.06	0.07	0.07	0.07
	Change from Pre-Mine	m3/s	-0.04	-0.04	-0.05	-0.06	-0.08	-0.10	-0.11	-0.11	-0.14
		%	-64%	-65%	-67%	-65%	-65%	-64%	-62%	-62%	-65%

Table 6.5 Post-Closure (Year 50) Monthly Wet and Dry Flows at Harper Creek below T-Creek confluence, Node 9

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.20	0.23	0.23	0.25	0.29	0.33	0.34	0.36	0.37
	Change from Pre-Mine	m^3/s	0.05	0.06	0.06	0.04	0.03	0.00	0.00	0.00	0.00
		%	39%	36%	35%	19%	11%	0%	0%	0%	0%
February	Discharge	m^3/s	0.24	0.26	0.27	0.28	0.32	0.35	0.36	0.38	0.38
	Change from Pre-Mine	m^3/s	0.12	0.12	0.12	0.10	0.10	0.07	0.07	0.07	0.07
		%	94%	85%	82%	59%	43%	26%	24%	23%	23%
March	Discharge	m^3/s	0.27	0.29	0.30	0.31	0.35	0.37	0.39	0.40	0.43
	Change from Pre-Mine	m^3/s	0.17	0.17	0.17	0.16	0.16	0.14	0.13	0.13	0.16
		%	>100%	>100%	>100%	>100%	80%	58%	53%	50%	57%
April	Discharge	m^3/s	0.32	0.32	0.34	0.39	1.24	2.17	2.56	2.94	3.34
	Change from Pre-Mine	m^3/s	0.19	0.18	0.18	0.19	0.26	0.26	0.28	0.10	0.09
		%	>100%	>100%	>100%	92%	26%	13%	12%	4%	3%
May	Discharge	m^3/s	2.99	3.25	3.40	3.94	4.76	5.72	6.03	6.47	7.15
	Change from Pre-Mine	m^3/s	0.89	0.58	0.39	0.53	-0.01	-0.36	-0.74	-0.92	-0.34
		%	42%	22%	13%	16%	0%	-6%	-11%	-12%	-4%
June	Discharge	m^3/s	1.64	1.84	2.39	3.15	4.65	5.86	6.68	7.44	7.94
	Change from Pre-Mine	m^3/s	0.33	0.16	-0.05	0.14	-0.33	-1.21	-1.10	-0.92	-0.84
		%	26%	9%	-2%	5%	-7%	-17%	-14%	-11%	-10%
July	Discharge	m^3/s	0.56	0.64	0.74	0.91	1.75	2.24	3.04	4.29	4.77
	Change from Pre-Mine	m^3/s	-0.02	0.04	0.07	0.06	-0.36	-0.67	-1.01	-0.39	-1.77
		%	-3%	6%	10%	7%	-17%	-23%	-25%	-8%	-27%
August	Discharge	m^3/s	0.34	0.39	0.43	0.54	0.80	0.99	1.24	1.46	1.76
	Change from Pre-Mine	m^3/s	0.05	0.08	0.05	0.05	-0.08	-0.06	-0.12	-0.45	-1.73
		%	17%	25%	13%	10%	-10%	-5%	-9%	-23%	-50%
September	Discharge	m^3/s	0.32	0.35	0.37	0.40	0.60	0.73	0.81	1.21	1.48
	Change from Pre-Mine	m^3/s	0.06	0.07	0.06	0.05	-0.03	-0.02	-0.22	-0.18	-0.61
		%	23%	24%	18%	14%	-5%	-3%	-21%	-13%	-29%
October	Discharge	m^3/s	0.32	0.34	0.38	0.44	0.76	1.04	1.30	1.65	1.90
	Change from Pre-Mine	m^3/s	0.07	0.07	0.08	0.10	0.10	0.16	0.15	0.18	-0.30
		%	31%	25%	28%	29%	15%	18%	13%	12%	-13%
November	Discharge	m^3/s	0.27	0.29	0.32	0.35	0.47	0.60	0.64	0.68	0.72
	Change from Pre-Mine	m^3/s	0.07	0.06	0.08	0.04	0.02	-0.03	-0.07	-0.07	-0.04
		%	34%	24%	31%	12%	4%	-5%	-10%	-10%	-5%
December	Discharge	m^3/s	0.23	0.25	0.27	0.29	0.35	0.39	0.41	0.42	0.44
	Change from Pre-Mine	m^3/s	0.06	0.05	0.07	0.04	0.03	0.00	-0.01	-0.01	0.00
		%	37%	26%	33%	14%	9%	0%	-1%	-2%	0%
Annual	Discharge	m^3/s	0.79	0.93	1.03	1.12	1.36	1.55	1.68	1.80	1.87
	Change from Pre-Mine	m^3/s	0.14	0.16	0.12	0.08	-0.01	-0.15	-0.19	-0.18	-0.33
		%	21%	22%	13%	8%	-1%	-9%	-10%	-9%	-15%

6.3 PEAK FLOWS

6.3.1 Methodology

Peak flows in the Project area occur almost exclusively during the spring and early summer snowmelt freshet, and may result from either snowmelt or from rainfall precipitation events combined with snowmelt (rain-on-snow events). A summary of the peak flow statistics and a Project specific peak flow methodology was presented in the Surface Hydrology Baseline Report (KP, 2014a). This methodology was used to develop Pre-Mine and LOM peak flows.

Pre-Mine peak flows were calculated for each LOM watershed model node using the formula below to translate the surface hydrology baseline peak flows from a nearby hydrology gauging station. Peak flows at hydrology stations are presented in Table 6.6:

$$Q_1 = Q2*(A1/A2)^{0.75}$$

where:

A1 is the upstream contributing area of the location of interest.

Q1 is the desired return period discharge at the location of interest.

A2 is the upstream contributing area of the closest gauging station.

Q2 is the corresponding return period discharge of the closest gauging station.

For example, the calculation for the Pre-Mine 100 year peak flow for Node 9 would be scaled from the HARPERUS Station, as follows:

$$Q100 = 40*(70.4/47.0)^{0.75} = 54\ m^3/s$$

Table 6.6 Instantaneous Peak Flows at Hydrology Gauging Stations

Station	DA (km^2)	Return Period Flows (m^3/S)						
		2	5	10	20	50	100	200
BAKER	14.3	6	9	11	13	16	18	20
BAKERUS	12.4	6	8	10	12	14	16	18
JONESUS	17.6	7	11	13	15	18	21	23
OP	7.7	4	6	7	8	10	12	13
OP2	7.5	4	6	7	8	10	11	13
HARPER2	16.6	7	10	13	15	18	21	23
HARPERUS	47.0	16	22	26	31	36	40	44
TSFDS	23.4	9	13	16	18	22	25	27
TSFUS	15.0	7	10	12	14	16	19	21
O8LB076	166	43	53	59	63	68	71	74

NOTES:

1. ALL VALUES ASSUME A POTENTIAL FUTURE CLIMATE CHANGE FACTOR OF 15%.
2. SOURCE: KP, 2014a.

LOM peak flows were then calculated for each node for the six selected years: The formula above was used to translate the Pre-Mine peak flows to each of the six years based on the change in upstream contributing area. For example, the calculation for the 100 year peak flow for Year 22 for Node 9 is:

$$Q_{100} = 54*(51.1/70.4)^{0.75} = 42 \text{ m}^3/\text{s}$$

It should be noted that the values have been increased by 15% to account for possible future climate change effects, which is consistent with general practices and APEGBC guidance (APEGBC, 2012).

6.3.2 Results

A summary of LOM peak flows for Node 9, Harper Creek below T-Creek confluence is presented in Table 6.7 along with the change from Pre-Mine values.

Peak flows are reduced by slightly less than the watershed area reduction because peak instantaneous flows are assumed to be governed by contributing watershed area according to a scaling exponent of 0.75.

Instantaneous peak flows are presented for each LOM Watershed Model node in Appendices C through L, for Nodes 1 to 10, respectively.

Table 6.7 Life of Mine Instantaneous Peak Flows for Node 9

Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	70.4	Discharge	m^3/s	21	30	36	41	48	54	59
			Unit Runoff	$l/s/km^2$	305	426	508	588	687	765	840
-1	End of Construction	54.9	Discharge	m^3/s	18	25	30	34	40	45	49
			Unit Runoff	$l/s/km^2$	325	454	541	626	731	814	894
			Change from Pre-Mine	m^3/s	-4	-5	-6	-7	-8	-9	-10
		-22%		%	-17%	-17%	-17%	-17%	-17%	-17%	-17%
10	Operations I	52.2	Discharge	m^3/s	17	24	29	33	39	43	47
			Unit Runoff	$l/s/km^2$	329	460	548	634	741	824	905
			Change from Pre-Mine	m^3/s	-4	-6	-7	-8	-10	-11	-12
		-26%		%	-20%	-20%	-20%	-20%	-20%	-20%	-20%
22	Operations I	51.1	Discharge	m^3/s	17	24	28	33	38	42	47
			Unit Runoff	$l/s/km^2$	330	462	551	637	745	828	910
			Change from Pre-Mine	m^3/s	-5	-6	-8	-9	-10	-12	-13
		-27%		%	-21%	-21%	-21%	-21%	-21%	-21%	-21%
27	Operations II	51.5	Discharge	m^3/s	17	24	28	33	38	43	47
			Unit Runoff	$l/s/km^2$	330	461	550	636	743	827	908
			Change from Pre-Mine	m^3/s	-5	-6	-8	-9	-10	-11	-12
		-27%		%	-21%	-21%	-21%	-21%	-21%	-21%	-21%
30	Closure	66.6	Discharge	m^3/s	21	29	34	40	46	52	57
			Unit Runoff	$l/s/km^2$	309	433	515	596	697	775	852
			Change from Pre-Mine	m^3/s	-1	-1	-1	-2	-2	-2	-2
		-5%		%	-4%	-4%	-4%	-4%	-4%	-4%	-4%
50	Post-Closure	66.7	Discharge	m^3/s	21	29	34	40	46	52	57
			Unit Runoff	$l/s/km^2$	309	432	515	596	697	775	851
			Change from Pre-Mine	m^3/s	-1	-1	-1	-2	-2	-2	-2
		-5%		%	-4%	-4%	-4%	-4%	-4%	-4%	-4%

7 – REGIONAL AFFECTED FLOWS

7.1 MEAN MONTHLY FLOWS

7.1.1 Methodology

The effect of the Project on flow conditions at Regional Nodes 11 to 13 were assessed by comparing the mean monthly flow records provided by the WSC to flows estimated by the LOM model, Variable Case. Monthly flow results were compiled for the Pre-Mine condition and the following six years over the mine's life:

1. Year -1 – End of Construction
2. Year 10 – Operations I
3. Year 22 – Operations I
4. Year 27 – Operations II
5. Year 30 – Closure, and
6. Year 50 – Post Closure.

The three WSC stations that correspond to the regional nodes do not have historical records for all of the year incorporated in the LOM watershed model. A concurrent time period was selected that overlapped with the model and when streamflow data for all three WSC stations were available. Mean monthly values calculated from these WSC data for the period of 1974 to 2010 were used as Pre-Mine streamflows.

In order to assess mine effects at the regional nodes, Pre-Mine flows were reduced or increased by the change from Pre-Mine at the farthest downstream LOM model node contributing the regional node. As an example, Node 10, Harper Creek at Barriere River confluence was used to assess net changes from the Pre-Mine condition for Nodes 11 and 12, which are both on the Barriere River. For Node 13, North Thompson River at Birch Island, the net change from baseline was summed from the values for Nodes 6 and 7, Jones Creek and Baker Creek respectively.

7.1.2 Results

A summary of mean monthly flows are presented for Node 11, Barriere River below Sprague Creek, in Table 7.1 and on Figure 7.1. Mean monthly and mean annual flow changes are presented for each regional node in Appendices M through O for Nodes 11 to 13, respectively.

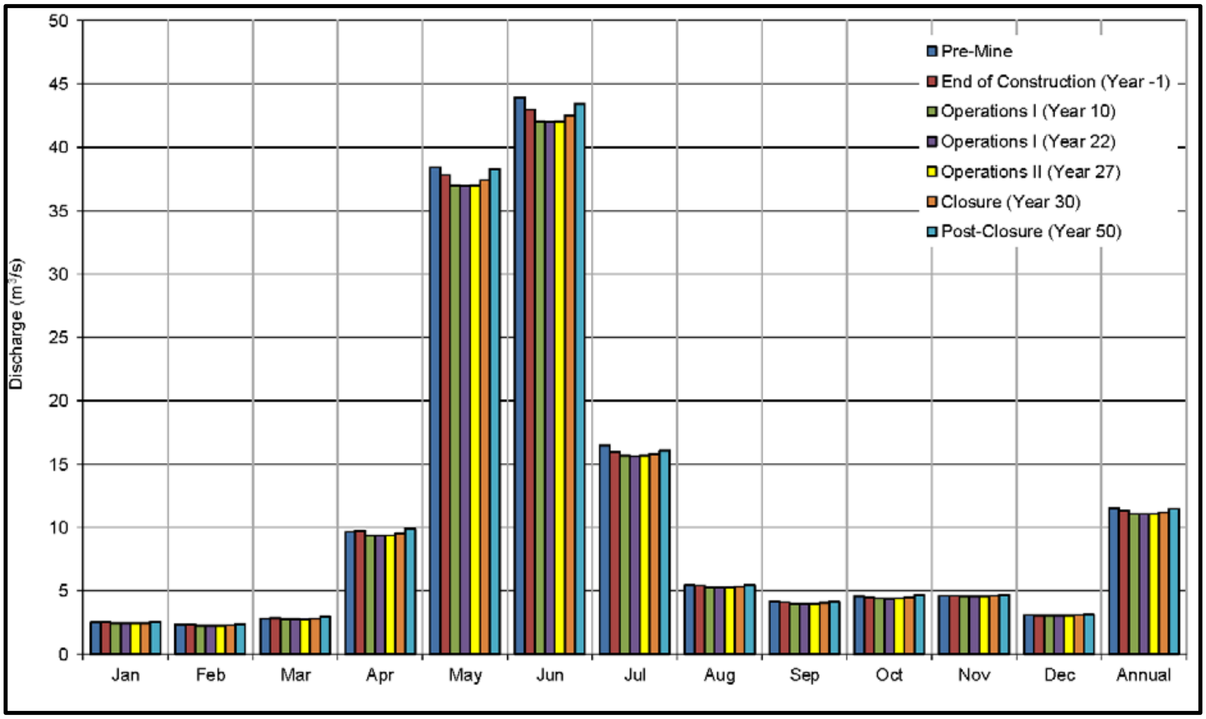

Figure 7.1 Mean Monthly Flow Summary for Node 11, Barriere River below Sprague Creek, Over Life of Mine

As was true for the LOM model nodes, changes in streamflow may not be equivalent to changes in watershed area due to the differences in hydrologic conditions in the impacted areas compared to those in the natural areas and because of differences in surface water/groundwater interactions caused by the Project. For example, while the reduction in watershed area at Node 11 in Year 22 is 3%, the flow reduction ratios show:

- Larger reductions than the drainage area reduction in May, June and July, when runoff is generated by high elevation snowmelt.
- Unit runoff in the Barrier River is lower than Harper Creek during September and October, based on WSC data. This results in reductions larger than the drainage area reduction in these months.
- Flow reductions proportional to the drainage area reduction in winter when runoff is largely generated by base flow and is proportionally higher in the low elevation watershed.
- Smaller reductions than the drainage area reduction in early spring when snowmelt is occurring in the lower regional watershed but not at higher elevation areas where the Project is located.
- An annual flow reduction that is proportional to the drainage area reduction.

Table 7.1 Mean Monthly Flow Summary for Node 11 over Life of Mine

Mine Stage Year	Mine Stage Description	Drainage Area (km^2)	Parameter	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
-	Pre-Mine	624.0	Discharge	m^3/s	2.49	2.32	2.81	9.66	38.41	43.89	16.45	5.45	4.12	4.56	4.61	3.07	11.48
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.5	15.5	61.5	70.3	26.4	8.7	6.6	7.3	7.4	4.9	18.4
-1	End of Construction	608.5	Discharge	m^3/s	2.52	2.35	2.84	9.73	37.81	42.96	15.93	5.40	4.07	4.51	4.58	3.02	11.31
			Unit Runoff	$l/s/km^2$	4.1	3.9	4.7	16.0	62.1	70.6	26.2	8.9	6.7	7.4	7.5	5.0	18.6
			Change from Pre-Mine	m^3/s	0.03	0.03	0.04	0.08	-0.60	-0.92	-0.52	-0.05	-0.04	-0.05	-0.03	-0.04	-0.17
		-2%		%	1%	1%	1%	1%	-2%	-2%	-3%	-1%	-1%	-1%	-1%	-1%	-2%
10	Operations I	605.7	Discharge	m^3/s	2.45	2.27	2.77	9.36	36.96	42.00	15.66	5.28	3.97	4.41	4.57	3.03	11.06
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.6	15.4	61.0	69.3	25.9	8.7	6.6	7.3	7.6	5.0	18.3
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.04	-0.30	-1.45	-1.88	-0.79	-0.16	-0.15	-0.15	-0.04	-0.04	-0.42
		-3%		%	-2%	-2%	-1%	-3%	-4%	-4%	-5%	-3%	-4%	-3%	-1%	-1%	-4%
22	Operations I	604.7	Discharge	m^3/s	2.44	2.26	2.76	9.34	36.94	41.96	15.64	5.26	3.95	4.38	4.56	3.02	11.04
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.6	15.5	61.1	69.4	25.9	8.7	6.5	7.2	7.5	5.0	18.3
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.05	-0.31	-1.47	-1.93	-0.81	-0.19	-0.17	-0.18	-0.05	-0.05	-0.44
		-3%		%	-2%	-3%	-2%	-3%	-4%	-4%	-5%	-3%	-4%	-4%	-1%	-2%	-4%
27	Operations II	605.0	Discharge	m^3/s	2.44	2.26	2.74	9.38	36.96	42.01	15.67	5.28	3.97	4.41	4.58	3.03	11.06
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.5	15.5	61.1	69.4	25.9	8.7	6.6	7.3	7.6	5.0	18.3
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.06	-0.28	-1.45	-1.88	-0.78	-0.17	-0.14	-0.14	-0.03	-0.04	-0.42
		-3%		%	-2%	-3%	-2%	-3%	-4%	-4%	-5%	-3%	-3%	-3%	-1%	-1%	-4%
30	Closure	620.2	Discharge	m^3/s	2.47	2.29	2.79	9.54	37.39	42.46	15.80	5.33	4.02	4.49	4.61	3.06	11.19
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.5	15.4	60.3	68.5	25.5	8.6	6.5	7.2	7.4	4.9	18.0
			Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.02	-0.12	-1.01	-1.43	-0.65	-0.12	-0.09	-0.06	0.00	0.00	-0.30
		-1%		%	-1%	-1%	-1%	-1%	-3%	-3%	-4%	-2%	-2%	-1%	0%	0%	-3%
50	Post-Closure	620.3	Discharge	m^3/s	2.51	2.40	2.95	9.87	38.27	43.39	16.05	5.43	4.09	4.65	4.66	3.10	11.45
			Unit Runoff	$l/s/km^2$	4.1	3.9	4.8	15.9	61.7	70.0	25.9	8.7	6.6	7.5	7.5	5.0	18.5
			Change from Pre-Mine	m^3/s	0.02	0.08	0.15	0.22	-0.13	-0.49	-0.40	-0.02	-0.02	0.09	0.04	0.03	-0.04
		-1%		%	1%	3%	5%	2%	0%	-1%	-2%	0%	-1%	2%	1%	1%	0%

NOTES:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

7.2 MONTHLY WET AND DRY FLOWS

7.2.1 Methodology

The effects of the Project on monthly wet and dry flow conditions at regional Nodes 11 to 13 were assessed at 5, 10, 20 and 50 year recurrence intervals, for Pre-Mine conditions and for the selected six years of the Project.

The Pre-Mine monthly return period values were estimated using the distribution fitting application provided in Palisade Decision Tools @RISK statistical software program, which was applied to the mean monthly WSC values from concurrent regional modeling period. The best fitting distribution type, which was Log-logistic for Nodes 11 and 12, and Inverse Gaussian for Node 13, was selected for each month and the distribution was used to estimate the corresponding monthly recurrence interval flows.

In order to assess the monthly mine effects during wet and dry conditions at the regional nodes, Pre-Mine monthly wet and dry flows were reduced or increased by the change from Pre-Mine conditions, for each year and each return period at the farthest downstream LOM Watershed node contributing the regional node. As an example, to calculate the Year 22, January 5 year monthly wet flow for Node 11, the change in discharge from Pre-Mine at Node 10, for the corresponding year, month and recurrence interval was applied to the Pre-Mine January 5 year monthly wet flow.

7.2.2 Results

A summary of Pre-Mine, Year 22 and Year 50 monthly wet and dry flows are presented for Node 11, Barriere River below Sprague Creek, in Table 7.2, Table 7.3 and Table 7.4, respectively. Each table presents the estimated monthly discharge for each recurrence interval, along with the change from Pre-Mine in terms of flow and as a percentage.

The methodology used creates the same trends that were observed in the LOM watershed model node wet and dry results in the regional node wet and dry results. Smaller reductions or increases are seen in estimated monthly dry flows, while larger reductions are seen in estimated monthly wet flows. Additionally, larger changes from Pre-Mine are observed as the LOM progresses through Operations I. During Operations II through Closure, changes from Pre-Mine generally decrease with the smallest changes occurring in Post-Closure.

Monthly wet and dry flows are presented for each regional node for Pre-Mine and LOM in Appendices M through O, for Nodes 11 to 13, respectively.

Table 7.2 Pre-Mine Monthly Wet and Dry Flows at Barriere River below Sprague Creek, Node 11

Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	1.2	1.3	1.5	1.7	2.5	3.0	3.8	4.8	6.4
February	1.2	1.3	1.4	1.5	2.3	2.9	3.8	5.0	7.4
March	1.4	1.4	1.5	1.7	2.8	3.6	4.9	6.9	10.9
April	2.2	3.5	4.7	6.1	9.7	12.9	15.6	18.4	22.5
May	20.2	23.9	27.0	30.7	38.4	45.6	50.8	55.9	63.0
June	18.1	22.4	26.4	31.4	43.9	55.4	65.0	75.2	90.3
July	5.3	6.1	7.1	8.6	16.5	22.9	32.4	45.5	70.9
August	1.8	2.1	2.5	3.0	5.4	7.1	9.4	12.4	17.7
September	1.3	1.5	1.8	2.3	4.1	5.5	7.3	9.6	13.7
October	1.3	1.6	2.0	2.5	4.6	6.0	7.9	10.3	14.5
November	1.8	2.0	2.2	2.6	4.6	6.4	9.1	13.0	20.9
December	1.6	1.7	1.8	2.0	3.1	3.8	5.2	7.2	11.3
Annual	6.9	7.7	8.4	9.3	11.5	13.5	15.1	16.8	19.3

Table 7.3 Operations I (Year 22) Monthly Wet and Dry Flows at Barriere River below Sprague Creek, Node 11

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.2	1.4	1.5	1.6	2.4	2.9	3.7	4.6	6.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-3%	-2%	-3%	-3%	-2%	-2%
February	Discharge	m^3/s	1.2	1.3	1.4	1.5	2.3	2.8	3.7	4.9	7.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-4%	-3%	-3%	-3%	-2%	-2%
March	Discharge	m^3/s	1.3	1.4	1.5	1.7	2.8	3.5	4.9	6.8	10.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.2
		%	0%	0%	0%	0%	0%	-3%	0%	0%	-1%
April	Discharge	m^3/s	2.1	3.4	4.5	6.0	9.3	11.8	15.1	17.9	21.3
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	-0.1	-0.3	-1.1	-0.5	-0.5	-1.2
		%	0%	-3%	-3%	-2%	-3%	-9%	-3%	-3%	-5%
May	Discharge	m^3/s	19.8	23.2	27.1	30.4	36.9	42.7	48.2	53.1	59.1
	Change from Pre-Mine	m^3/s	-0.4	-0.7	0.1	-0.3	-1.5	-2.9	-2.6	-2.8	-3.9
		%	-2%	-3%	0%	-1%	-4%	-6%	-5%	-5%	-6%
June	Discharge	m^3/s	18.4	22.7	26.0	31.2	42.0	51.7	60.9	69.9	84.6
	Change from Pre-Mine	m^3/s	0.3	0.3	-0.4	-0.2	-1.9	-3.7	-4.1	-5.2	-5.7
		%	1%	1%	-2%	0%	-4%	-7%	-6%	-7%	-6%
July	Discharge	m^3/s	5.3	6.2	7.1	9.0	15.6	21.4	29.7	43.6	66.5
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.8	-1.5	-2.7	-1.9	-4.4
		%	0%	2%	1%	4%	-5%	-6%	-8%	-4%	-6%
August	Discharge	m^3/s	2.0	2.4	2.6	3.1	5.3	7.0	9.1	11.4	13.9
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.2	0.0	-0.3	-1.0	-3.8
		%	11%	12%	7%	2%	-3%	0%	-3%	-8%	-21%
September	Discharge	m^3/s	1.4	1.6	1.9	2.4	3.9	5.3	6.4	8.7	11.9
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.2	-0.1	-0.9	-0.9	-1.8
		%	13%	7%	5%	4%	-4%	-2%	-12%	-9%	-13%
October	Discharge	m^3/s	1.4	1.7	2.1	2.5	4.4	5.4	7.3	9.8	12.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	-0.2	-0.5	-0.6	-0.5	-2.1
		%	9%	7%	5%	0%	-4%	-9%	-7%	-4%	-15%
November	Discharge	m^3/s	1.8	2.0	2.2	2.5	4.6	6.2	8.9	12.8	20.7
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.2	-0.2	-0.2	-0.2
		%	3%	4%	3%	0%	0%	-2%	-3%	-2%	-1%
December	Discharge	m^3/s	1.6	1.7	1.8	1.9	3.0	3.7	5.1	7.1	11.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	-2%	-2%	-1%
Annual	Discharge	m^3/s	7.0	7.7	8.3	9.1	11.1	12.7	14.2	15.8	18.0
	Change from Pre-Mine	m^3/s	0.1	0.0	-0.1	-0.2	-0.4	-0.7	-0.9	-1.0	-1.4
		%	1%	0%	-1%	-2%	-4%	-6%	-6%	-6%	-7%

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Table 7.4 Post-Closure (Year 50) Monthly Wet and Dry Flows at Barriere River below Sprague Creek, Node 11

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.3	1.4	1.5	1.7	2.5	3.0	3.8	4.7	6.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		%	5%	7%	5%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	1.3	1.4	1.5	1.6	2.4	2.9	3.8	5.0	7.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
		%	9%	10%	9%	5%	3%	0%	0%	0%	0%
March	Discharge	m^3/s	1.5	1.6	1.7	1.9	3.0	3.6	5.1	7.0	11.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1
		%	10%	11%	10%	9%	5%	3%	4%	2%	1%
April	Discharge	m^3/s	2.4	3.6	4.7	6.2	9.9	12.7	16.0	18.9	22.4
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	0.2	-0.2	0.4	0.5	-0.1
		%	9%	4%	2%	2%	2%	-1%	3%	3%	0%
May	Discharge	m^3/s	21.2	24.3	28.1	31.4	38.3	44.3	49.7	54.7	61.1
	Change from Pre-Mine	m^3/s	1.0	0.4	1.1	0.7	-0.1	-1.3	-1.0	-1.3	-1.9
		%	5%	2%	4%	2%	0%	-3%	-2%	-2%	-3%
June	Discharge	m^3/s	18.8	23.1	26.6	32.4	43.4	53.4	62.5	72.6	86.7
	Change from Pre-Mine	m^3/s	0.7	0.7	0.2	1.0	-0.5	-2.0	-2.5	-2.6	-3.6
		%	4%	3%	1%	3%	-1%	-4%	-4%	-3%	-4%
July	Discharge	m^3/s	5.4	6.2	7.3	9.2	16.0	21.9	30.6	44.3	67.5
	Change from Pre-Mine	m^3/s	0.1	0.2	0.2	0.6	-0.4	-1.0	-1.8	-1.1	-3.4
		%	3%	3%	3%	7%	-2%	-4%	-6%	-2%	-5%
August	Discharge	m^3/s	2.0	2.4	2.7	3.1	5.4	7.3	9.5	11.8	14.0
	Change from Pre-Mine	m^3/s	0.2	0.3	0.2	0.1	0.0	0.3	0.1	-0.5	-3.7
		%	13%	14%	9%	3%	0%	4%	1%	-4%	-21%
September	Discharge	m^3/s	1.4	1.7	2.0	2.5	4.1	5.6	6.6	9.2	12.3
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.2	0.0	0.1	-0.7	-0.4	-1.4
		%	14%	14%	10%	8%	0%	2%	-9%	-4%	-10%
October	Discharge	m^3/s	1.5	1.8	2.2	2.7	4.7	5.9	7.9	10.3	13.0
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.1	-1.5
		%	15%	12%	9%	7%	2%	0%	0%	1%	-10%
November	Discharge	m^3/s	1.9	2.1	2.3	2.6	4.7	6.3	9.0	12.9	20.8
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1
		%	7%	8%	6%	2%	0%	0%	-1%	-1%	-1%
December	Discharge	m^3/s	1.7	1.8	1.9	2.0	3.1	3.8	5.2	7.2	11.3
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		%	6%	7%	5%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	7.2	8.0	8.7	9.5	11.5	13.2	14.6	16.3	18.4
	Change from Pre-Mine	m^3/s	0.3	0.3	0.2	0.2	0.0	-0.3	-0.5	-0.5	-0.9
		%	4%	4%	3%	2%	0%	-2%	-3%	-3%	-5%

7.3 PEAK FLOWS

7.3.1 Methodology

Peak flows in the region are driven by the same climatic conditions as peak flows in the Project area, namely from either snowmelt or from rainfall precipitation events combined with snowmelt (rain-on-snow events) during the spring and early summer snowmelt freshet. Environment Canada's Consolidated Frequency Analysis (CFA) software package was used to compute peak flow statistics using the instantaneous peak flow annual maximum series published by WSC for each regional node. Return period instantaneous peak flows were calculated for 2, 5, 10, 20, 50, 100 and 200 year return periods.

LOM peak flows were then calculated for each regional node for the six selected years over the Project: This was done by applying the formula presented in Section 6.3.1 and the respective changes in upstream contributing area.

7.3.2 Results

A summary of LOM peak flows for Node 11, Barriere River below Sprague Creek is presented in Table 7.5 along with the change from Pre-Mine.

As was true for the LOM Watershed Model nodes peak flow, because peak instantaneous flows are assumed to be governed by contributing watershed area according to a scaling exponent of 0.75, peak flows are reduced by slightly less than the watershed area reduction.

Instantaneous peak flows are presented for each regional node in Appendices M through O for Nodes 11 to 13, respectively.

Table 7.5 Life of Mine Instantaneous Peak Flows Summary for Node 11, Barriere River below Sprague Creek

Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	624.0	Discharge	m^3/s	93	118	135	152	173	190	207
			Unit Runoff	$l/s/km^2$	149	189	216	243	277	304	332
-1	End of Construction	608.5	Discharge	m^3/s	91	116	133	149	170	186	203
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	334
			Change from Pre-Mine	m^3/s	-2	-2	-3	-3	-3	-4	-4
		-2%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
10	Operations I	605.7	Discharge	m^3/s	91	115	132	148	169	185	203
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	335
			Change from Pre-Mine	m^3/s	-2	-3	-3	-3	-4	-4	-5
		-3%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
22	Operations I	604.7	Discharge	m^3/s	91	115	132	148	169	185	202
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	335
			Change from Pre-Mine	m^3/s	-2	-3	-3	-4	-4	-4	-5
		-3%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
27	Operations II	605.0	Discharge	m^3/s	91	115	132	148	169	185	203
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	335
			Change from Pre-Mine	m^3/s	-2	-3	-3	-3	-4	-4	-5
		-3%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
30	Closure	620.2	Discharge	m^3/s	92	117	134	151	172	189	206
			Unit Runoff	$l/s/km^2$	149	189	217	243	278	304	333
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-1%		%	0%	0%	0%	0%	0%	0%	0%
50	Post-Closure	620.3	Discharge	m^3/s	92	117	134	151	172	189	206
			Unit Runoff	$l/s/km^2$	149	189	217	243	278	304	333
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-1%		%	0%	0%	0%	0%	0%	0%	0%

8 – CLIMATE CHANGE

8.1 CLIMATE CHANGE ANALYSIS OVERVIEW

There is a general consensus in the scientific community that the global atmosphere is warming and that worldwide climate patterns are correspondingly changing. According to the Pacific Climate Impacts Consortium (PCIC), mean temperatures in the Thompson-Nicola region of British Columbia are predicted to warm by approximately 1.8°C over the next 40 years. Furthermore, winter precipitation is predicted to increase by approximately 7% and summer precipitation to decrease by 8% (PCIC 2012). Winter snowfall is predicted to decrease by 10%, meaning the increase in winter precipitation will fall as rain (PCIC 2012). These values are summarized in Table 8.1.

Table 8.1 Summary of Climate Change for the Thompson-Nicola region in the 2050s

Climate Variable	Season	Projected Change from 1961-1990 Baseline in the 2050s		
		Ensemble Median	10th Percentile	90th Percentile
Mean Temperature (°C)	Annual	1.8	1.1	2.7
Precipitation (%)	Annual	6%	11%	-1%
	Summer	-8%	2%	-17%
	Winter	7%	15%	-4%
Snowfall (%)	Winter	-10%	2%	-18%
	Spring	-54%	-12%	-75%

NOTES:
1. SOURCE: PACIFIC CLIMATE IMPACTS CONSORTIUM, 2012.

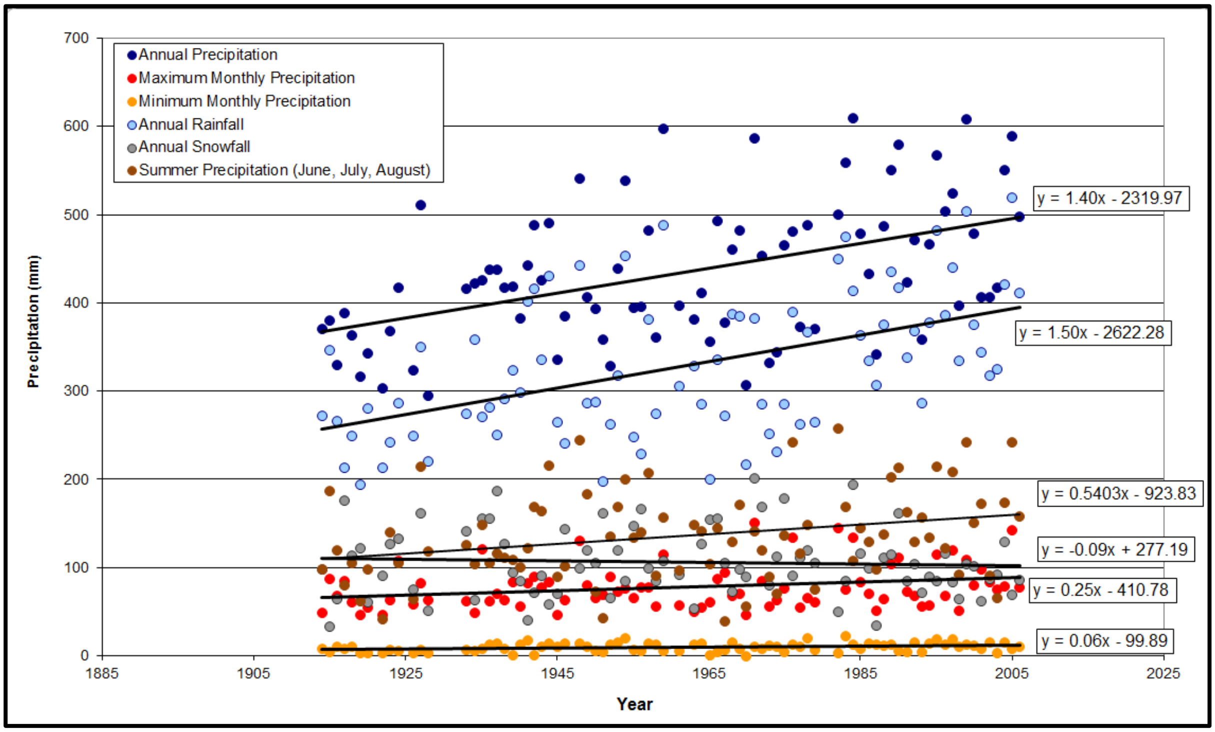
These changes, in turn, could affect streamflow patterns. Warmer winter temperatures would raise freezing levels, shorten the period of snowfall, and increase the proportion of winter precipitation that would occur as rain, which combined with higher winter precipitation, could increase the winter flows and decrease the corresponding freshet flows through reduced snowpack. Decreasing summer precipitation may result in lower summer flows, and this effect could be increased further by higher summer temperatures and correspondingly higher evaporation.

Given these predicted changes in climatic and hydrologic patterns, there is understandably some concern about whether or not historical flow and climate records, which were used to assess hydrologic conditions at the Project, reasonably represent conditions that might be expected over the next 20 to 30 years through Project operations, or even longer time scales through Project closure. In an effort to address this concern, admittedly at a very cursory level, historical trends of annual temperature, precipitation, and discharge were examined in the general region of the Project based on regional climate and streamflow data collected by EC.

8.2 CLIMATE TRENDS

The Vavenby climate station (1168520) operated by EC has the longest and most complete climate record in the region of the Project (99 years of data). Therefore, this dataset was used to analyze long-term regional climate trends applicable to the Project site.

Six precipitation metrics were assessed and plots of annual trends for this station are presented on Figure 8.1. All of the precipitation parameters demonstrate increasing trends except Annual Snowfall. All trends except Annual Snowfall are statistically significant at the 10% level. This significance level means that one can be 90% confident that these trends are not due to random chance. The Annual Precipitation trend indicates an increase of 14 mm per decade, while the Annual Rainfall indicates an increase of 15 mm per decade. Accordingly, one would expect Annual Snowfall to decrease at approximately 1 mm per decade. The Summer Precipitation indicates an increase of 5 mm per decade. The Maximum Monthly Precipitation indicates an increase of only 2.5 mm per decade, while the Minimum Monthly Precipitation indicates an increase of less than 1 mm per decade. The directions of these trends largely agree with the predications from PCIC presented in Table 8.1 above, with the exception of Summer Precipitation; however, the magnitude of changes remains less certain.

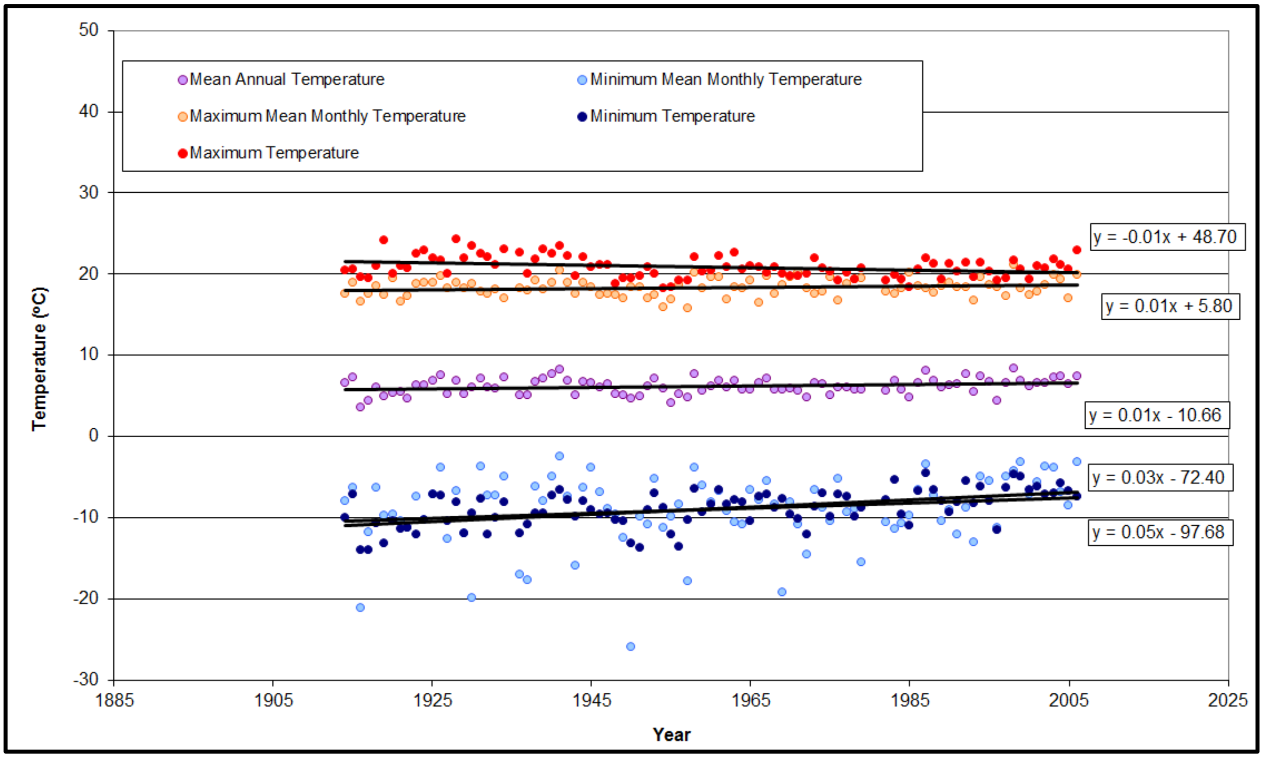


NOTES:

1. THE ANNUAL PRECIPITATION, MAXIMUM AND MINIMUM MEAN MONTHLY PRECIPITATION, ANNUAL RAINFALL AND SUMMER PRECIPITATION ARE ALL SIGNIFICANT AT THE 0.1 SIGNIFICANCE LEVEL.

Figure 8.1 Vavenby - Annual Precipitation Trends

Trend plots of annual temperature at Vavenby are presented on Figure 8.2. All the trends, with the exception of Maximum Mean Monthly Temperature, were found to be significant at the 10% level. The Mean Annual Temperature trend indicates an increase of +0.1 °C per decade. The Minimum Mean Monthly Temperature trend indicates an increase of 0.3°C per decade, while the Minimum Temperature trend indicates an increase of 0.5°C per decade. Maximum Temperatures indicate a decreasing trend of -0.1°C per decade. Overall, it appears that temperatures have been very consistent in the Project region over the past 100 years.



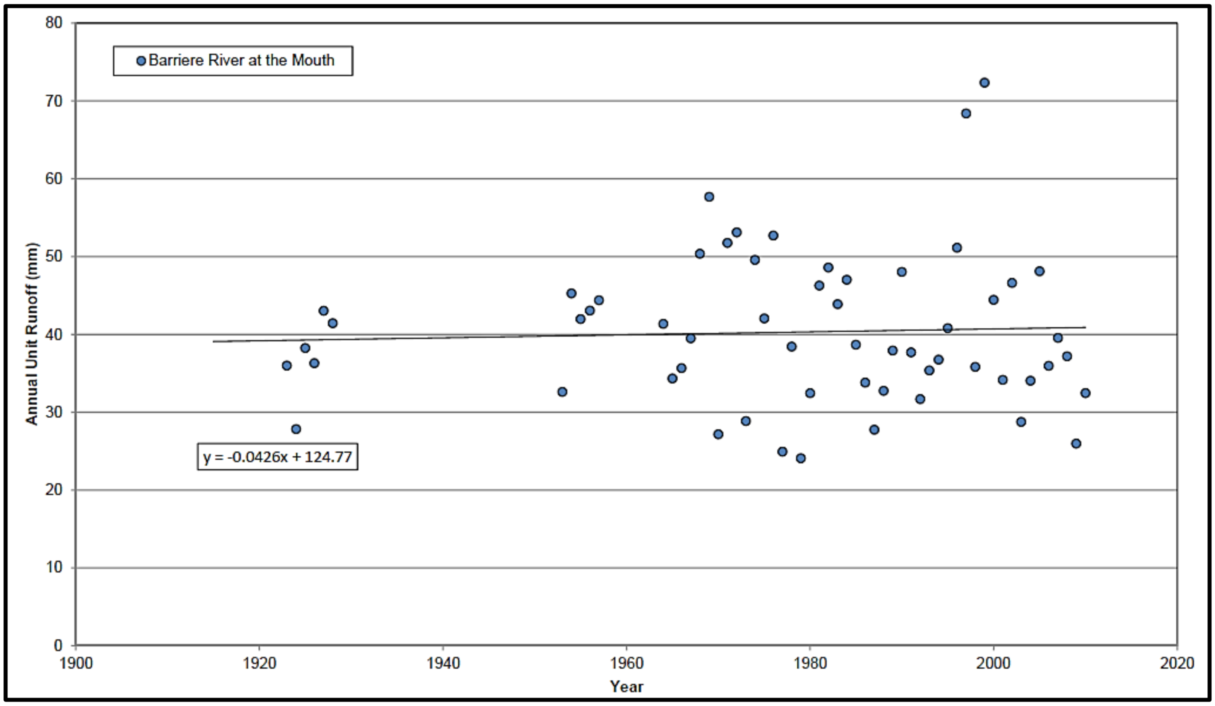
NOTES:

1. THE MEAN ANNUAL TEMPERATURE, MINIMUM AND MAXIMUM TEMPERATURE AND MINIMUM MEAN MONTHLY TEMPERATURE TRENDS ARE SIGNIFICANT AT THE 0.10 SIGNIFICANCE LEVEL.

Figure 8.2 Vavenby - Annual Temperature Trends

8.3 STREAMFLOW TRENDS

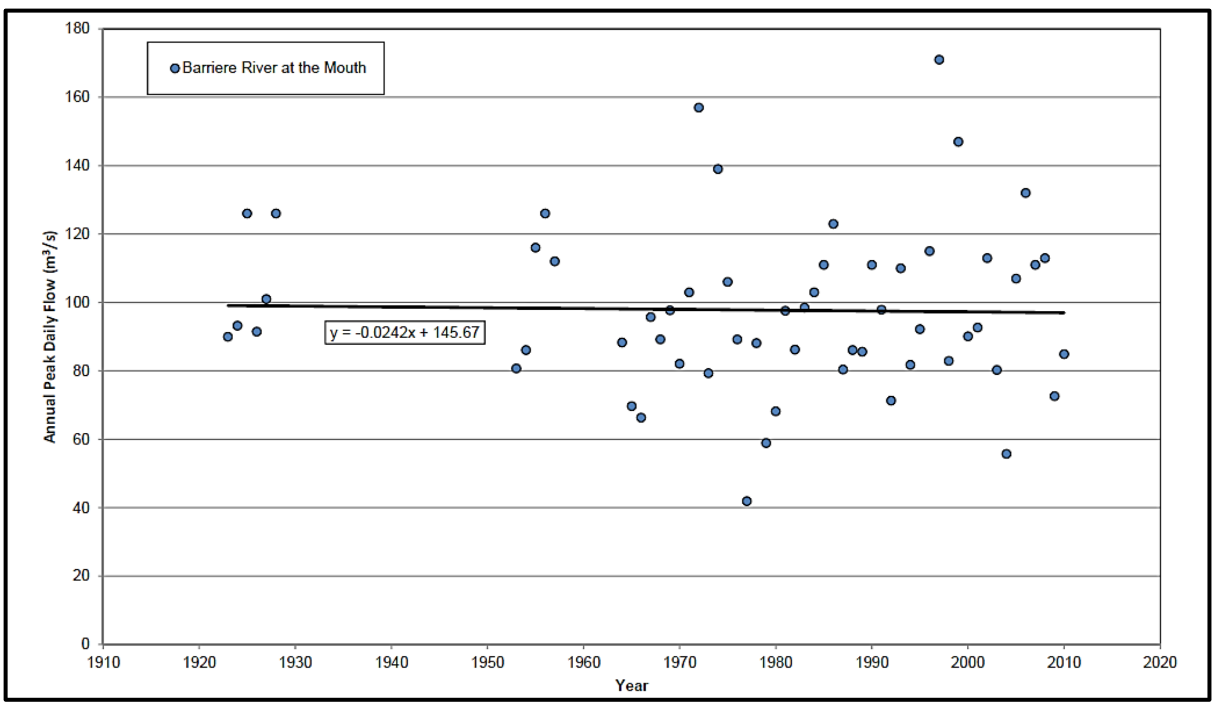
Insights into possible long-term climate effects on streamflow in the Project area are provided by examining flow records from Water Survey of Canada for the longest operating streamflow station in the Project region: Barriere River at the Mouth (08MA001). The trendline for annual unit runoff is provided on Figure 8.3, which indicates a slightly increasing trend; although it is not statistically significant at the 10% level, so one can conclude that annual runoff has not substantially changed over the past century. Similarly, the trend of annual peak daily flow, as shown on Figure 8.4, is not statistically significant at the 10% level. It is interesting to note that the regional historical peak flow patterns are not exhibiting the trends projected by the Intergovernmental Panel on Climate Change (IPCC), which state that increased atmospheric energy is expected to result in increased snowmelt rates and increased amounts and frequency of extreme precipitation (IPCC-AR4, 2007).



NOTES:

1. THE TRENDLINE IS NOT STATISTICALLY SIGNIFICANT AT THE 0.1 LEVEL OF SIGNIFICANCE.

Figure 8.3 Barriere River at the Mouth - Annual Discharge Trend



NOTES:

1. THE TRENDLINE IS NOT STATISTICALLY SIGNIFICANT AT THE 0.1 LEVEL OF SIGNIFICANCE.

Figure 8.4 Barriere River at the Mouth - Annual Peak Daily Flow Trend

To further investigate possible evidence of climate change effects, the mean monthly flows for the first half of the complete flow record for the Barriere River (29 years between 1923 and 1981) were compared with the corresponding flows for the second half of the record (29 years from 1982 to 2010). The mean annual discharge for the two periods, at 14.5 m^3/s and 14.7 m^3/s, respectively, is quite similar. However, the annual distribution of flows have changed somewhat. As shown on Figure 8.5, the later period shows a slightly earlier freshet and lower freshet peak. This shift is consistent with increasing minimum temperatures, which could cause earlier snowmelt and/or smaller snowpack's.

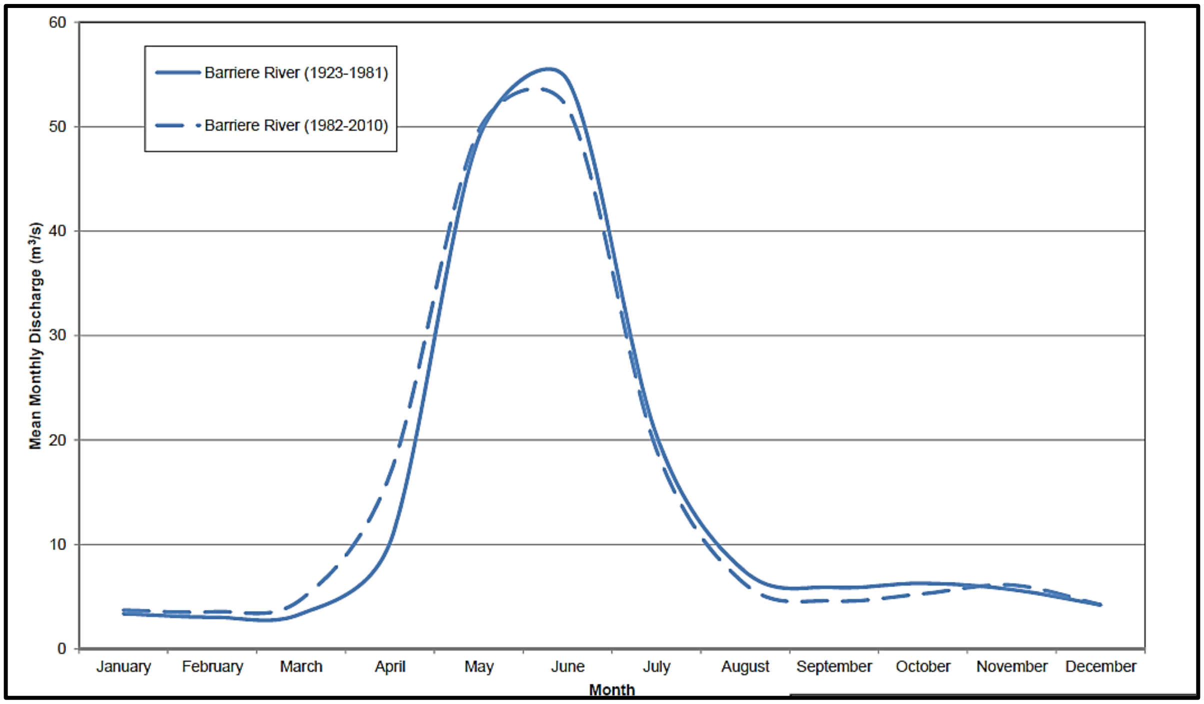
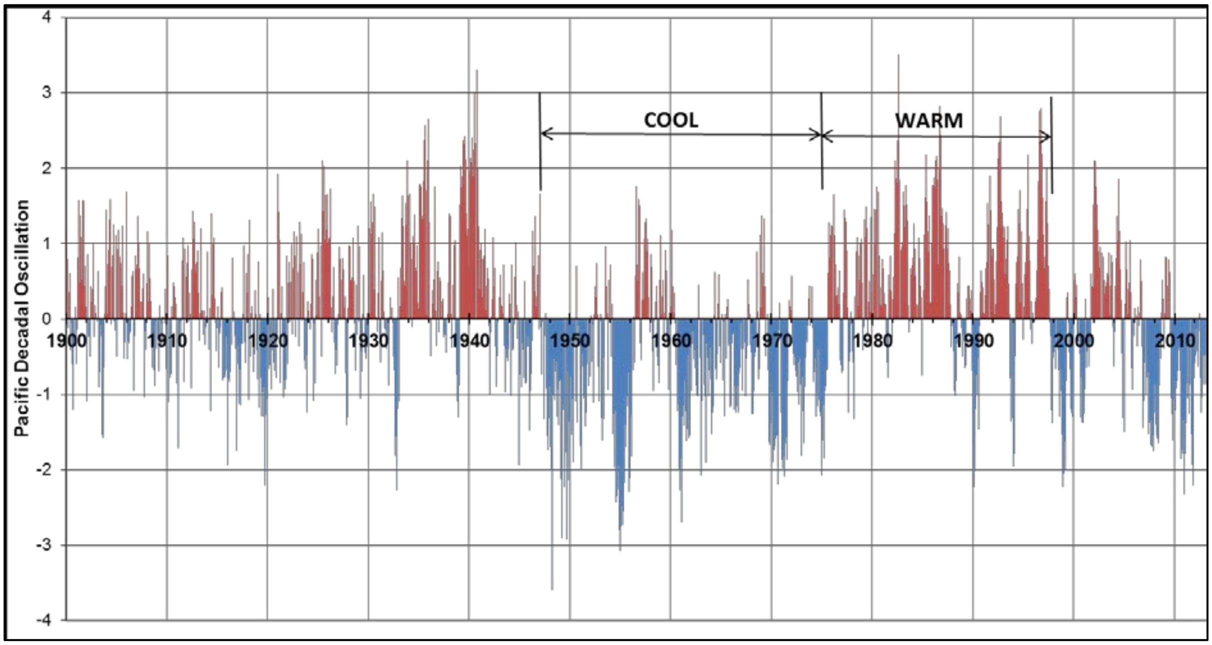


Figure 8.5 Barriere River at the Mouth – Hydrograph Shape

8.4 CLIMATE CYCLES

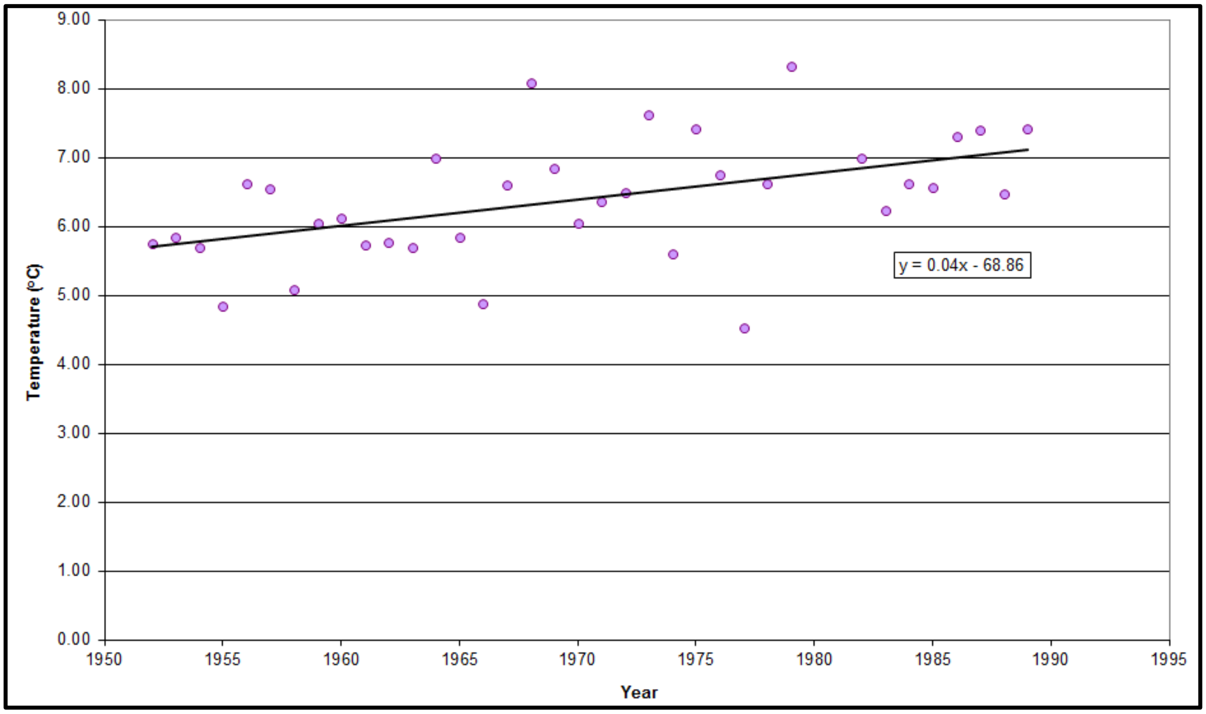
It should be recognized that one of the primary factors inhibiting the detection of changing patterns in local climate and streamflow records is the influence of cyclical climate patterns. A number of "normal" cyclical climate patterns occur regularly in the Pacific-Northwest over both short-term and relatively long-term periods. A variety of different climate patterns have been identified in the literature, but the two most recognized phenomena are the Pacific Decadal Oscillation (PDO), which has both warm and cool phases that typically persist for 20 to 30 years, and the El Nino Southern Oscillation (ENSO), which operates on a much shorter time scale with phases typically lasting for 6 to 18 months (Manua 2001). Both phenomena are defined by changes in surface water temperatures in the Pacific Ocean, which are indicators for changes in climate. The PDO has the strongest signature, as ENSO influences on climate in a region are strongly dependent on the phase of the PDO (McCabe and Dettinger 1999). The cool phase of the PDO is correlated with colder air temperatures and above average winter precipitation, snowpack and annual runoff (Mantua, 2001). These conditions tend to be even more pronounced if the ENSO is in phase. There is some question as to what are the exact periods that define the most recent warm and cool phases of the

PDO, but as indicated on Figure 8.6, the 1914 to 2006 climate record for the Vavenby station spans several cool and warm phases. It is therefore not surprising that the historical data indicated consistent temperatures. However, if one was to consider a shorter time period, which is commonly done, one might see fairly strong trends. For instance, if one was to consider the period of 1952 to 2006, which covers a cool phase and then a warm phase of the PDO, one should not be surprised to see a greater rising temperature trend, as demonstrated by the Vavenby temperature data shown on Figure 8.7. This is an example of a climate cycle effect, as opposed to a climate change effect.



NOTES:
1. SOURCE: JOINT INSTITUTE FOR THE STUDY OF THE ATMOSPHERE AND OCEAN

Figure 8.6 The Pacific Decadal Oscillation Index for the 20th Century



NOTES:

1. THE MEAN ANNUAL TEMPERATURE TREND IS SIGNIFICANT AT THE 0.10 SIGNIFICANCE LEVEL.

Figure 8.7 Vavenby - 1952-2006 Annual Mean Temperature Trend

8.5 SUMMARY

A review of long-term regional climatic and streamflow records indicate some changes in hydrologic conditions near the Project. However, it is not clear if these are the result of climate change or local climatic patterns. Additionally, climate change predictions, such as those presented by PCIC, include allowances for recent anthropogenic influence on climate that may not be evident in historic records. Regardless, inherent variability, the cyclic nature of climate, and our current inability to accurately predict and model future climate patterns, leads to the reasonable conclusion that current hydrologic records provide an appropriate basis for assessing the conditions in the Project area over the expected life of the mine. However, conservatism in hydrologic predictions should be applied where appropriate (e.g. a factor of safety on peak flow estimates).

9 – CONCLUSIONS

Activities during the life of the Harper Creek Project are expected to affect streamflows in T-Creek, Harper Creek, P-Creek, Jones Creek and Baker Creek. Baseline and LOM watershed models were developed for the Harper Creek Project to:

1. Improve the understanding of the site baseline hydrologic parameters and the hydrogeological setting surrounding the project area, and
2. Assess potential effects of the planned mine development and operations on surface water and groundwater conditions in the project area.

The open pit will serve as a groundwater sink, resulting in decreased streamflows in P-Creek, Harper Creek and Jones Creek during Construction, Operation I and II and Closure. Construction of the TMF and associated stockpiles will cut-off surface water and groundwater flows to downstream T-Creek and Harper Creek during Construction, Operations I and II and Closure. Construction of an overburden stockpile will cut off some surface water flows to downstream Baker Creek during Construction, Operations I and II and Closure.

Predicted streamflow changes were modeled for Pre-Mine and six mine years over five mine development stages at ten project area nodes and three regional nodes.

Annual streamflows in P-Creek and T-Creek were reduced by a maximum of approximately 65% and 73% respectively occurring in Year 22 of mine Operations I. The largest streamflow reductions in Harper Creek downstream of the confluence of P-Creek, downstream of the confluence of T-Creek, and at the mouth were shown to be 31%, 31% and 12% respectively and also occur during Operations Year 22. Streamflows in Baker Creek were reduced by 16% during Operations I Year 22, while Jones Creek was only minimally impacted with a maximum reduction in annual streamflow of 4% in Operations Year 10.

Annual streamflow reductions at the regional nodes on Barriere River for Operations I Year 22 were approximately 4% for the node below Sprague Creek, and approximately 3% at the mouth of Barriere River. Negligible reductions were estimated for the North Thompson River at Birch Island, even during Operations I Year 22.

Watershed modelling indicates residual changes to streamflow in T-Creek, P-Creek, Harper Creek, Baker Creek, and Jones Creek watersheds during the Post-Closure period. Streamflows in T-Creek had a residual increase of 20% caused by the diversion of a portion of the open pit and discharge from the WTP facility into perpetuity. P-Creek and Baker Creek had a reduction of 61% and 15% respectively due to diversion of a portion of the open pit to T-Creek. Harper Creek at the mouth was shown to have a residual streamflow reduction of 1% during Post-Closure. Streamflow in Jones Creek was shown to be minimally impacted with a residual annual decrease of 1%. Residual change at both Barriere River nodes was estimated to be negligible. Reductions at the North Thompson River node continue to be negligible.

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11 – CERTIFICATION

This report was prepared, reviewed and approved by the undersigned.

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Staff Engineer

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FOR

Ken Brouwer, P.Eng.
President

APPENDIX A

BASELINE AND PRE-MINE CALIBRATION RESULTS

APPENDIX A1

BASELINE MODEL CALIBRATION RESULTS

(Pages A1-1 to A1-18)

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TABLE A1-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

ASSIGNED AND CALIBRATED MODEL PARAMETERS BY SUB-CATCHMENT

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	Gauge I.D	Sub-Catchment #	K1 Factor[1]	K2 Factor[2]	Unit Discharge	Aquifer Transmissivity (T)[3]	Aquifer Width (w)[3]	Slope of Hydraulic Gradient at Discharge Point
			(m)	(%)		(m^2/day)	(m)	(m/m)
Harper Creek	**-**	**Area 2**	0.035	0.105	0.090	130	100	0.02
	HARPERUS	**Area 3**	0.035	0.105	0.200	130	100	0.02
	WSC 08LB076	**Area 6**	0.015	0.045	0.250	130	200	0.01
	-	**Area 7**	0.015	0.045	0.250	130	150	0.01
P-Creek	**OP**	**Area 1**	0.035	0.105	0.010	130	120	0.03
T-Creek	**TSFUS**	**Area 4**	0.025	0.075	0.090	130	225	0.03
	TSFDS	**Area 5**	0.025	0.075	0.090	130	150	0.03
Jones Creek	**JONESUS**	**Area 10**	0.022	0.066	0.120	130	75	0.03
	-	**Area 11**	0.022	0.066	0.120	130	75	0.03
Baker Creek	**-**	**Area 8**	0.020	0.060	0.120	130	75	0.02
	BAKER	**Area 9**	0.020	0.060	0.120	130	75	0.02

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NOTES:

1. K1 FACTOR REPRESENTS THE FIRST QUANTITY OF AVAILABLE WATER TO RECHARGE GROUNDWATER.
2. K2 FACTOR REPRESENTS THE PROPORTION OF REMAINING AVAILABLE WATER TO RECHARGE GROUNDWATER.
3. TRANSMISSIVITY, WIDTH AND HYDRAULIC GRADIENT ARE ESTIMATES OF THE AQUIFER PROPERTIES AT THE SURFACE WATER DISCHARGE LOCATION.

0	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE A1-2

HARPER CREEK MINING CORPORATION
HARPER CREEK PROJECT

BASELINE AVERAGE SIMULATED MONTHLY FLOWS (JANUARY 1914 TO JUNE 2012)

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Average Monthly Flows (L/s)							
Month	**HARPERUS**	**OP**	**TSFUS**	**TSFDS**	**WSC 08LB076**	**BAKER**	**JONES US**
Surface Water (L/s)							
January	261	8	0	30	656	5	39
February	224	8	0	25	554	3	30
March	198	7	0	21	541	33	37
April	778	86	125	231	3,457	436	272
May	3,185	497	978	1,551	11,442	788	743
June	3,025	504	1,309	1,990	11,495	483	810
July	1,291	141	528	818	5,191	128	427
August	663	44	124	235	2,273	56	156
September	507	25	76	156	1,700	33	91
October	565	40	65	144	1,948	104	129
November	419	19	14	60	1,135	45	126
December	306	9	2	37	803	14	59
Average	952	116	268	442	3,433	177	243
Minimum	198	7	0	21	541	3	30
Maximum	3,185	504	1,309	1,990	11,495	788	810
Groundwater (L/s)							
January	45	22	34	34	30	26	29
February	45	21	34	34	30	26	29
March	45	20	34	34	30	26	28
April	45	20	34	34	30	26	29
May	45	22	34	34	30	26	30
June	45	23	34	34	30	26	30
July	45	23	34	34	30	26	30
August	45	23	34	34	30	27	30
September	45	23	34	34	30	27	30
October	45	23	34	34	30	27	30
November	45	22	34	34	30	27	30
December	45	22	34	34	30	26	29
Average	45	22	34	34	30	26	29
Minimum	45	20	34	34	30	26	28
Maximum	45	23	34	34	30	27	30
Area (km^2)	47.0	7.6	15.0	23.4	166.4	14.3	17.6
Unit Flow (surface water only) ($L/s/km^2$)	20.2	15.2	17.9	18.9	20.6	12.4	13.8
Unit Flow (surface and groundwater) ($L/s/km^2$)	21.2	18.1	20.1	20.3	20.8	14.3	15.5

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1	10OCT'14	ISSUED WITH REPORT	KTD	DDF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE A1-3

HARPER CREEK MINING CORPORATION
HARPER CREEK PROJECT

BASELINE WATERSHED MODEL SUMMARY TABLE

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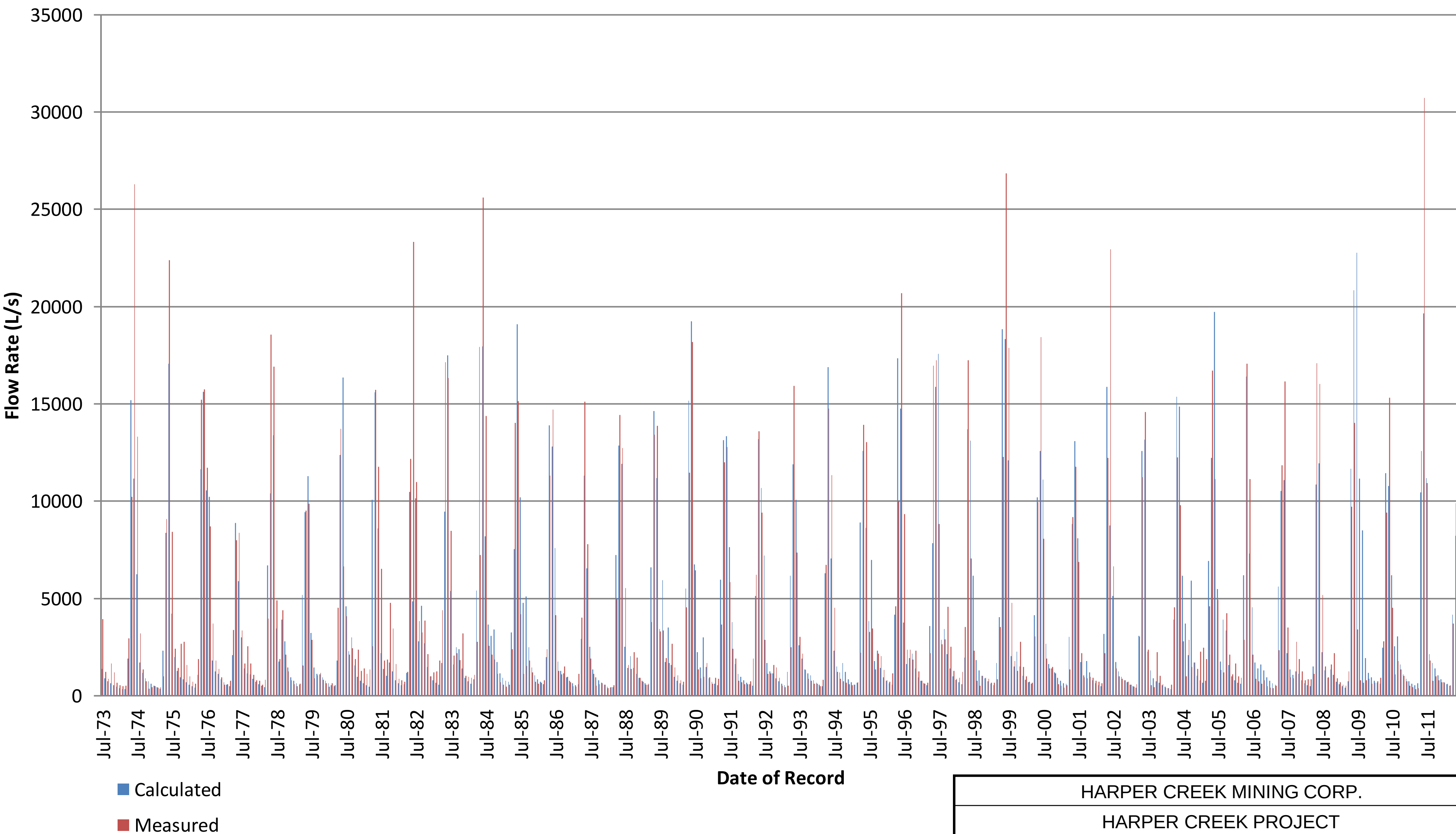
Subcatchment	Subcatchment Inputs (L/s)				Groundwater Within Subcatchment (L/s)		Subcatchment Outputs (L/s)		
	Surface Water from Upstream Catchment	Groundwater from Upstream Catchment	Surplus Water	Total	Groundwater Recharge	Groundwater Discharge	Groundwater to Downstream Catchment	Surface Water to Downstream Catchment	Total
HARPER US	150	22	644	817	235	301	23	953	976
OP	0	0	163	163	55	55	42	121	163
TSFUS	0	0	352	352	83	83	83	269	352
TSFDS	269	83	191	543	50	133	101	442	543
WSC 08LB076	1,395	124	1,943	3,462	374	497	23	3,439	3,461
BAKER	162	47	19	228	6	53	51	178	229
JONES US	0	0	272	272	76	76	28	244	272

M:\1\01\00458\14\A\Report\1 - Watershed Modelling\Rev 1\Appendices\App A\[Appendix A1&A2_r1.xlsx]Table A1-3

NOTES:

1. THE FLOW RATES PRESENTED HEREIN ARE AVERAGE ANNUAL VALUES.
2. SURPLUS WATER IS THE WATER AVAILABLE FOR GROUNDWATER RECHARGE AND SURFACE WATER RUNOFF (SUM OF RAINFALL AND SNOWMELT LESS THE EVAPOTRANSPIRATION AND SOIL MOISTURE CHANGE).

0	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - HARPER WSC GAUGE

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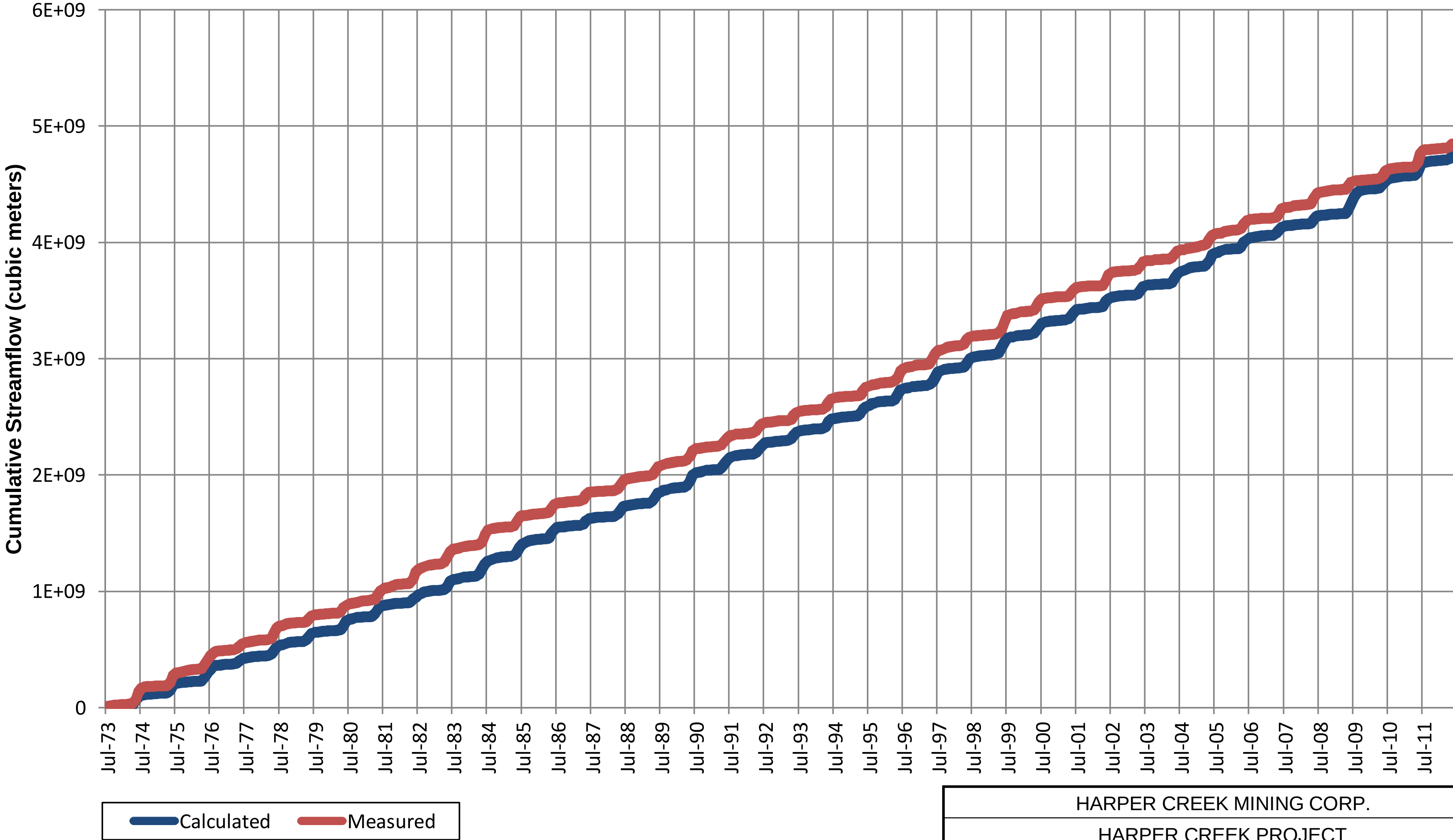
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A1-1

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - HARPER WSC GAUGE

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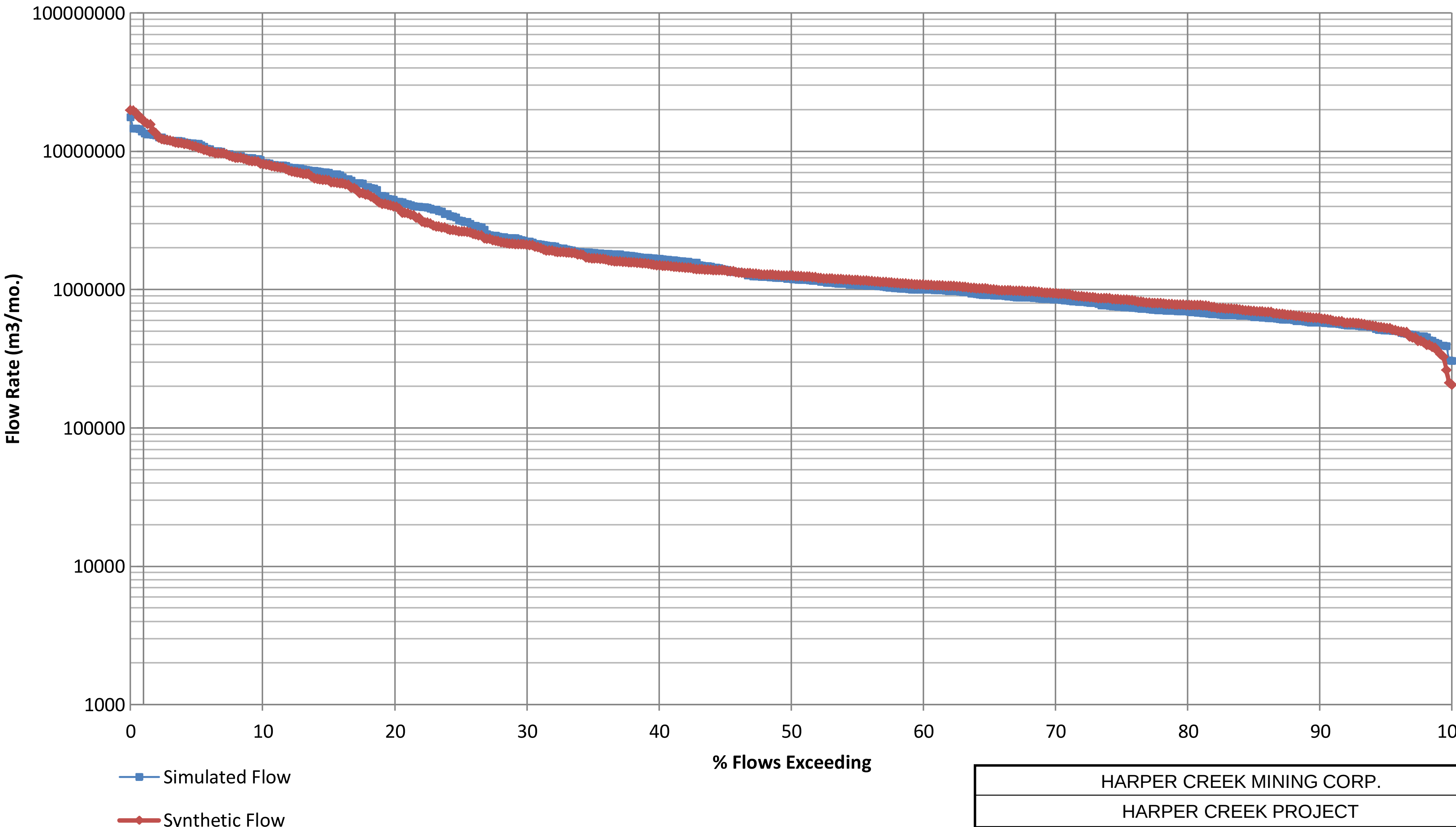
FIGURE A1-2

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW FLOW DURATION - HARPER WSC GAUGE

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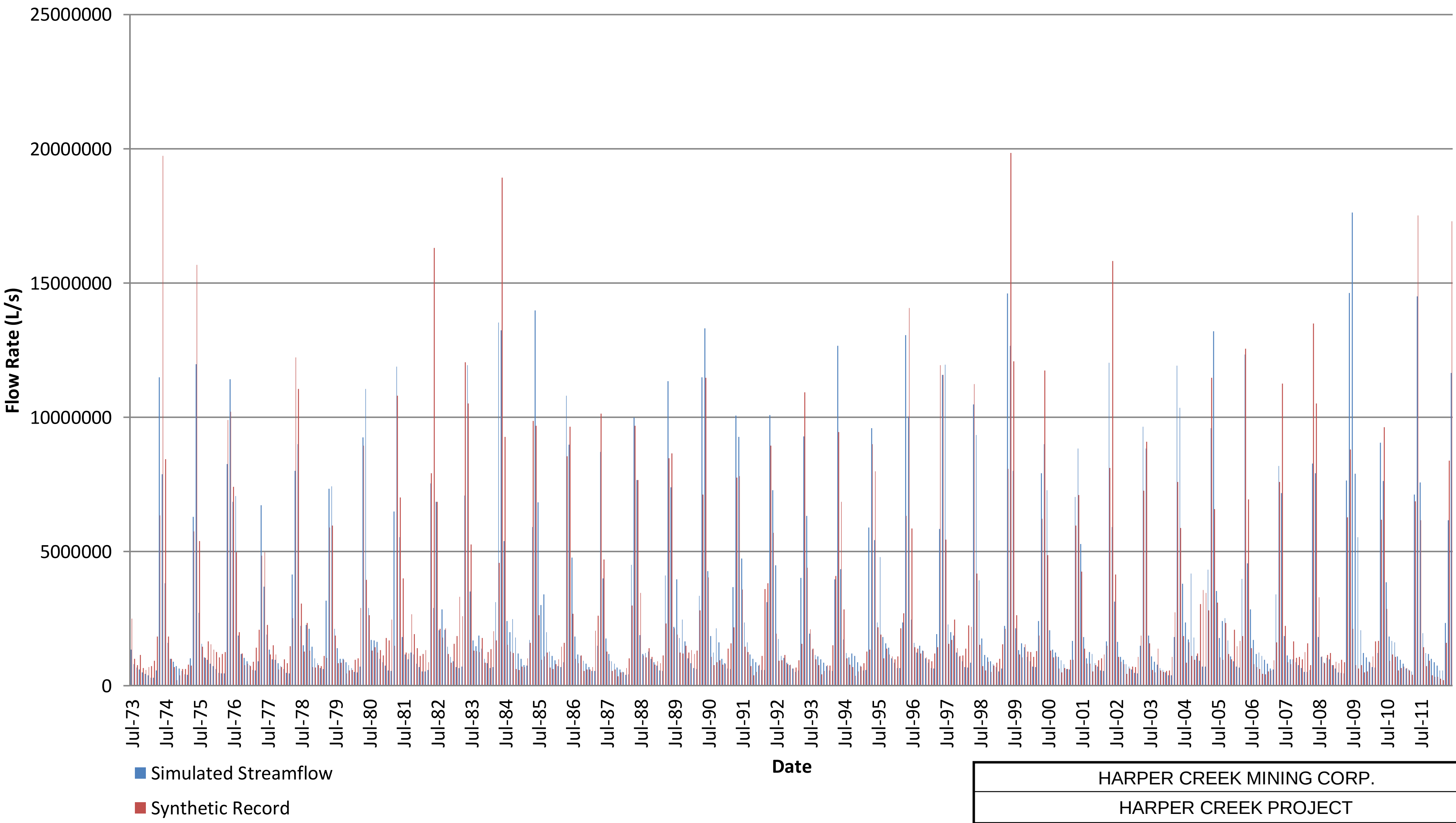
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A1-3

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - HARPERUS GAUGE

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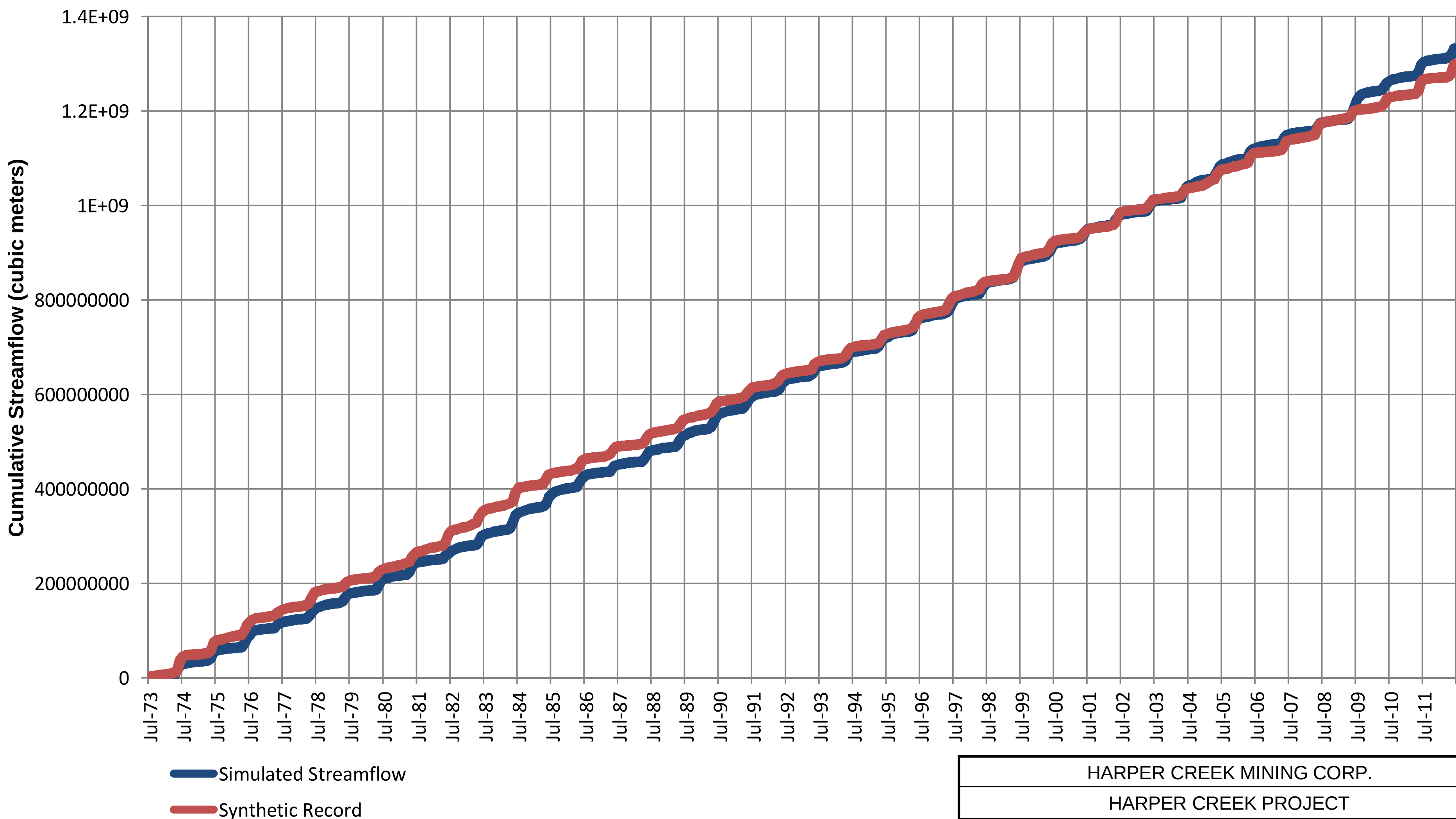
REF. NO. 1

FIGURE A1-4

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - HARPERUS GAUGE

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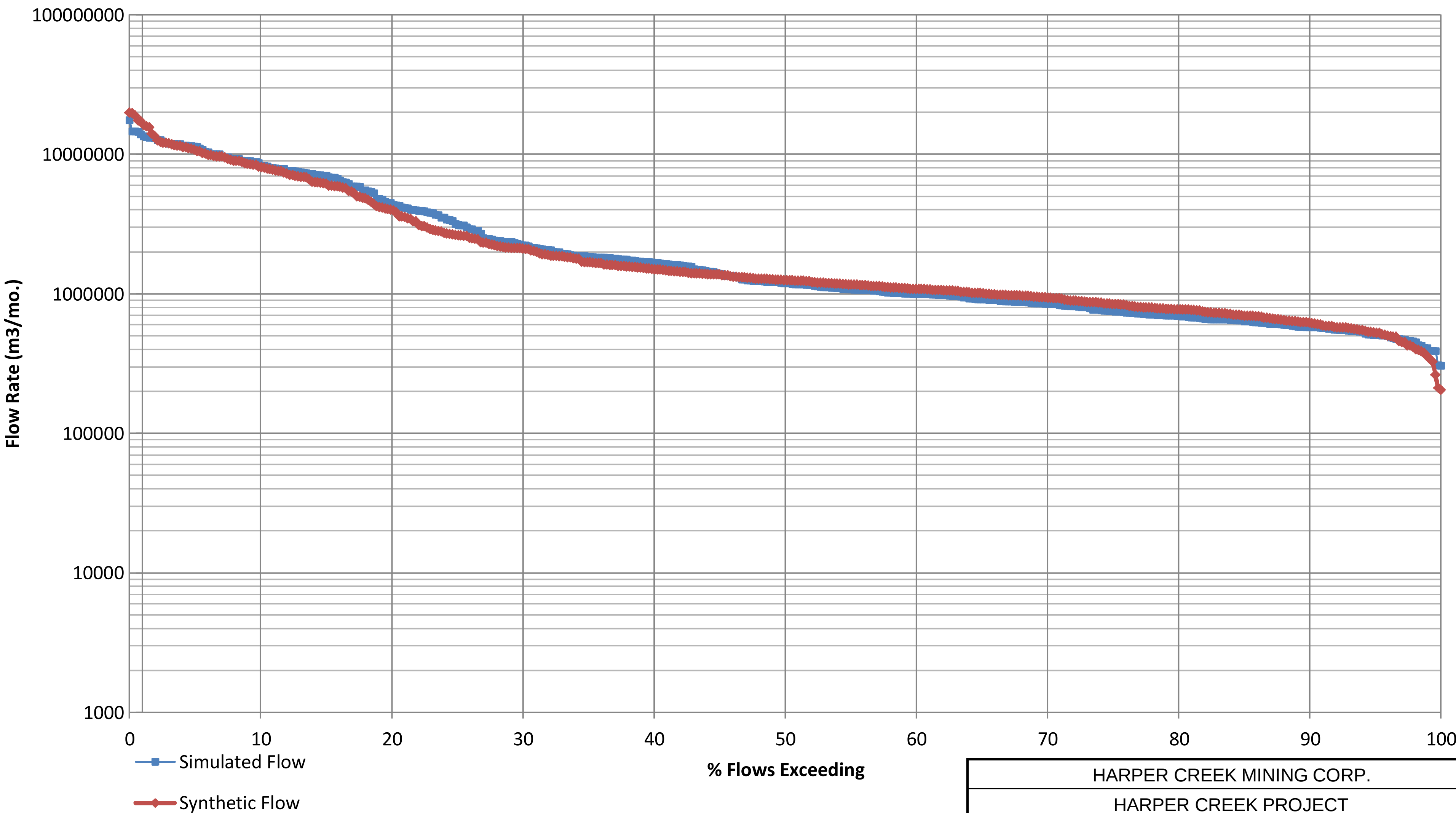
REF. NO. 1

FIGURE A1-5

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW FLOW DURATION - HARPERUS GAUGE

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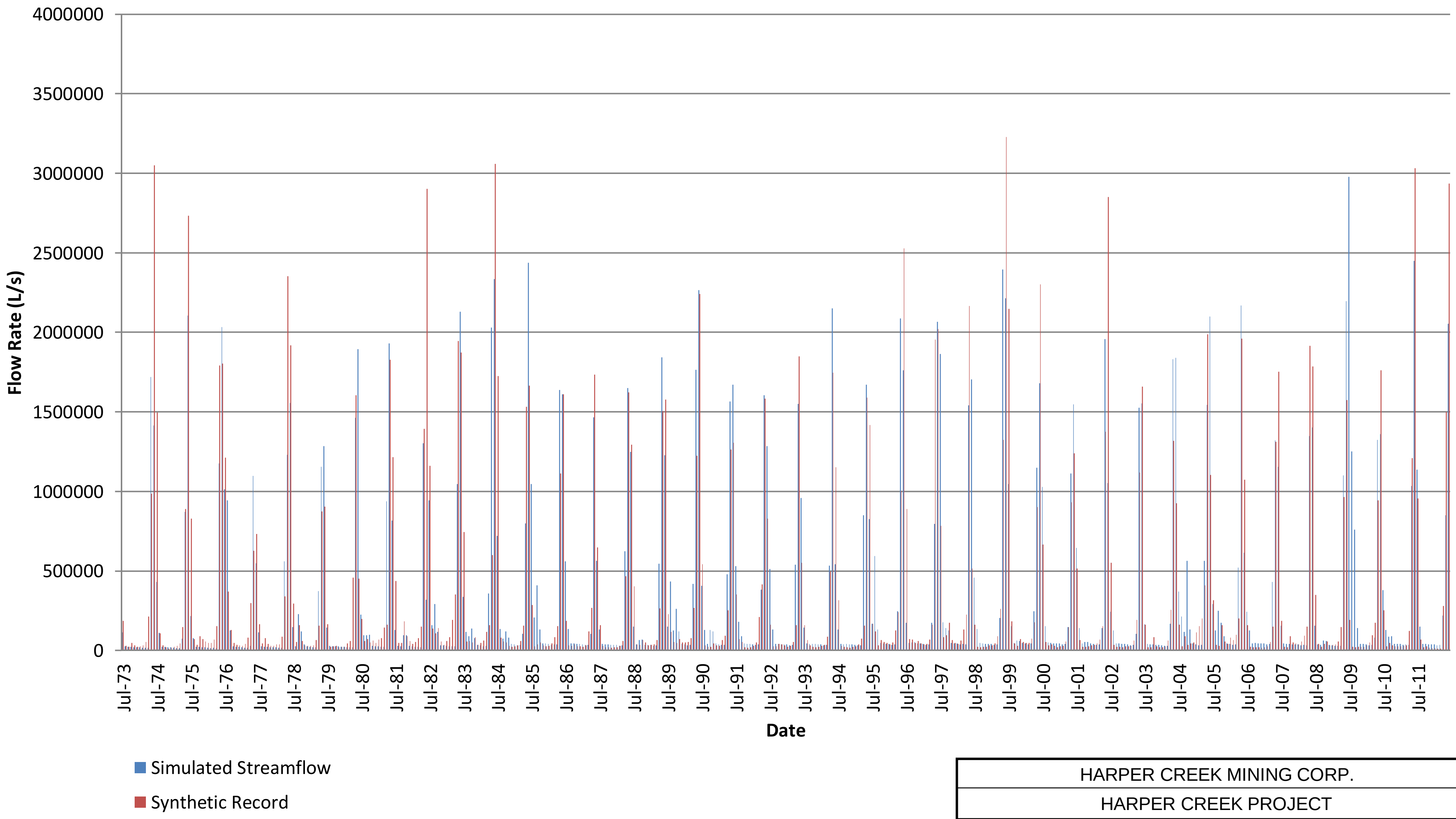
REF. NO. 1

FIGURE A1-6

REV 1



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - OP GAUGE

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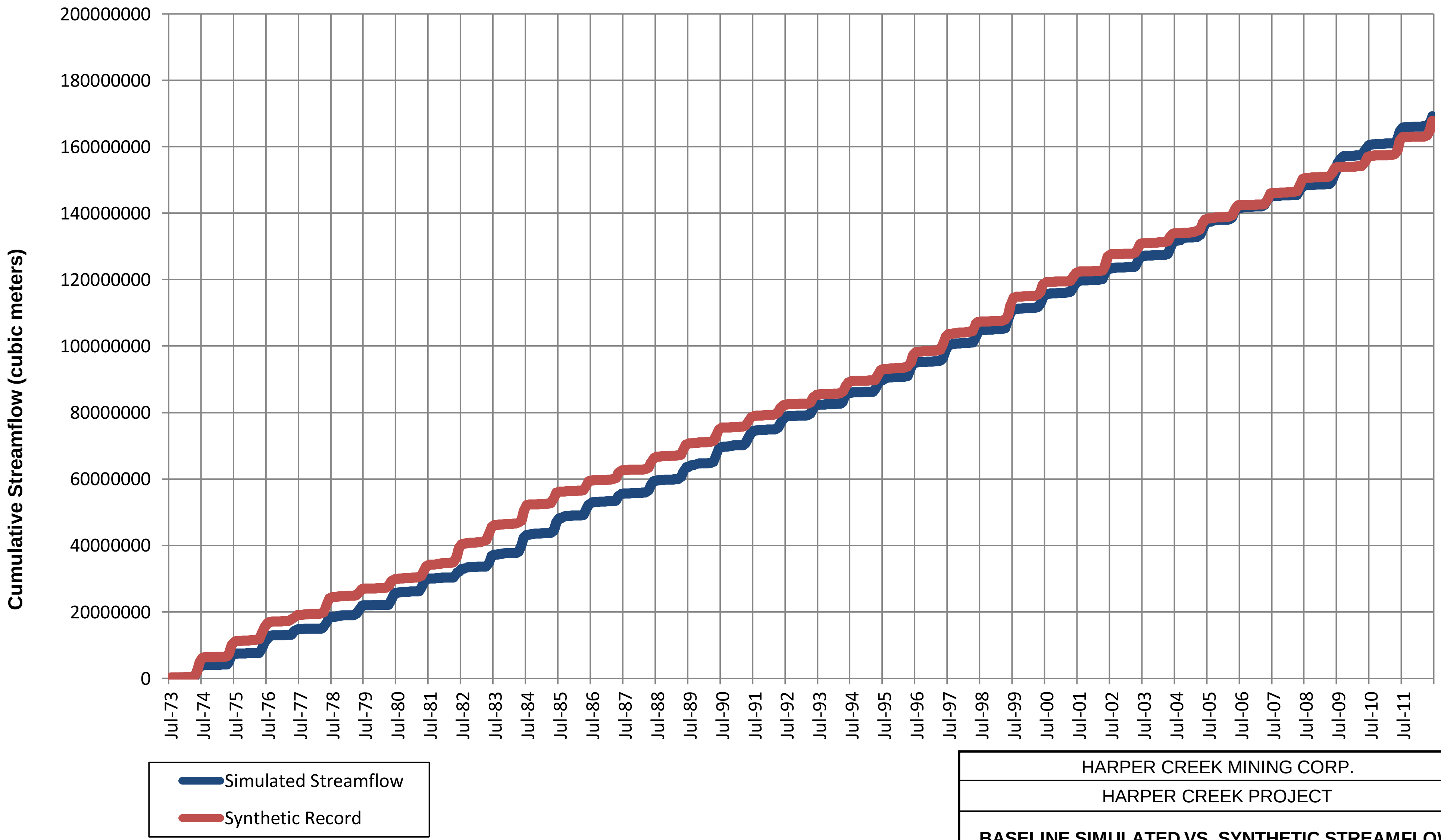
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A1-7

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

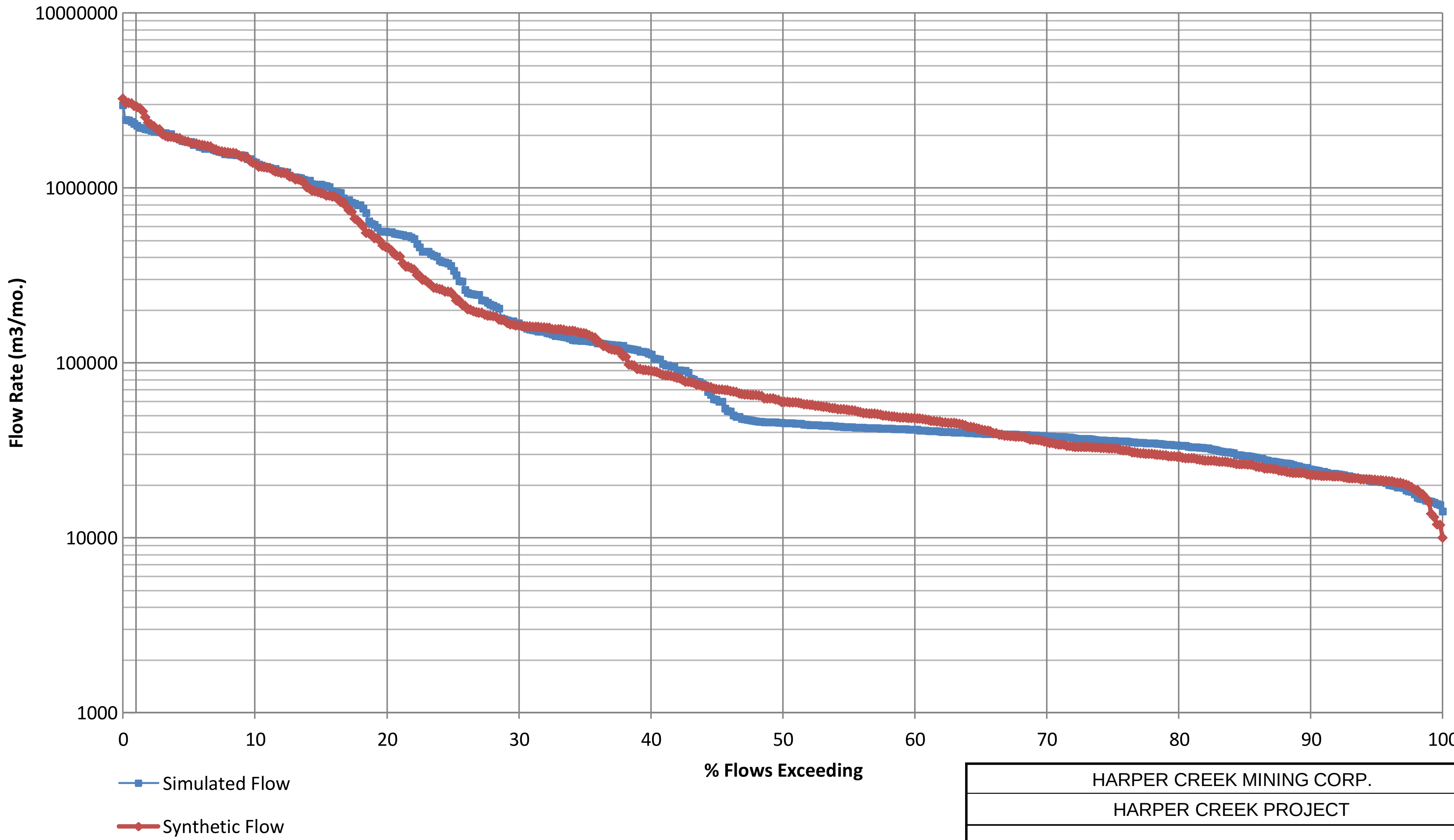
BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - OP GAUGE

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-458/14	1

FIGURE A1-8 REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB



1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW FLOW DURATION - OP GAUGE

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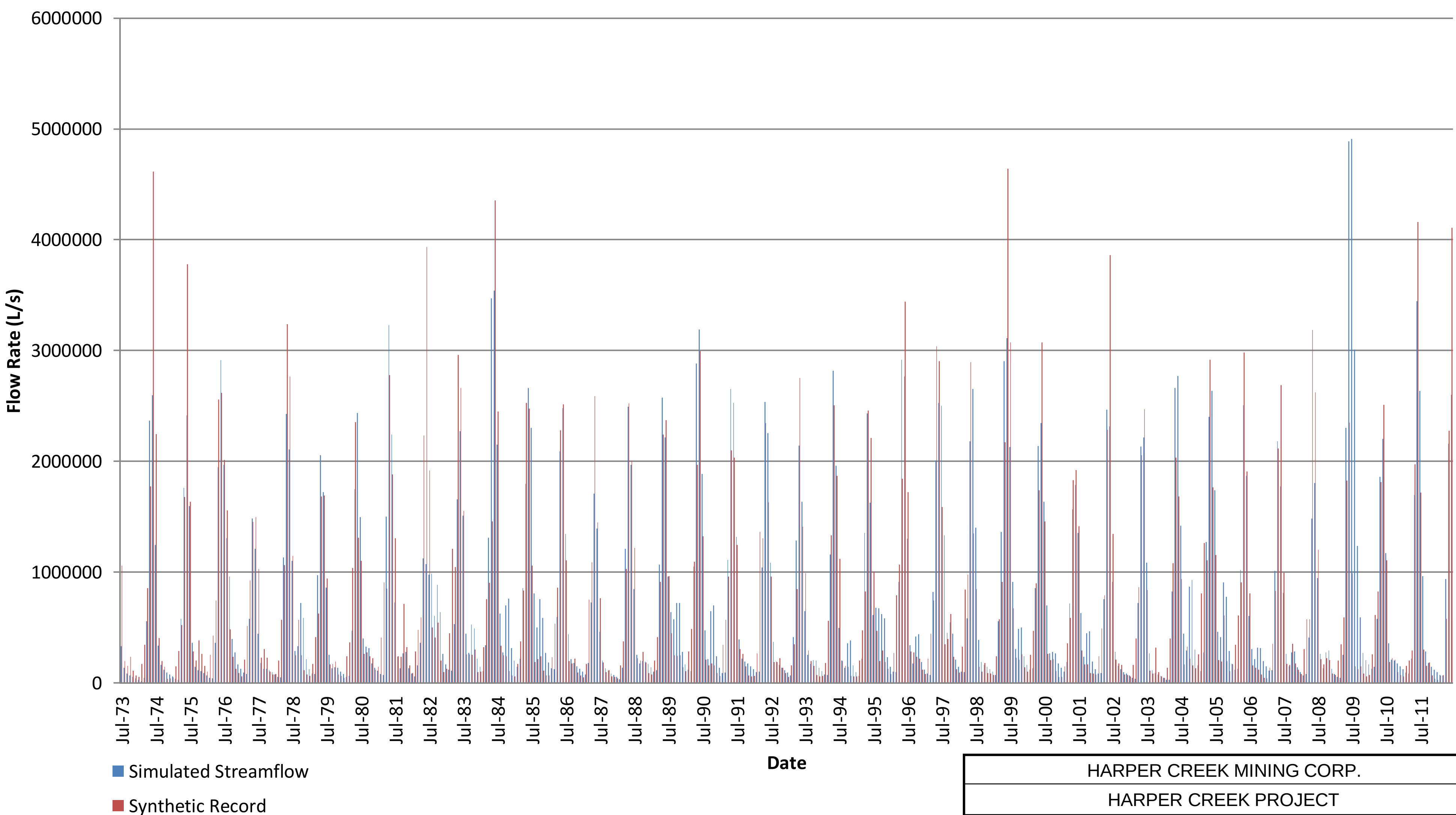
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A1-9

REV 1



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

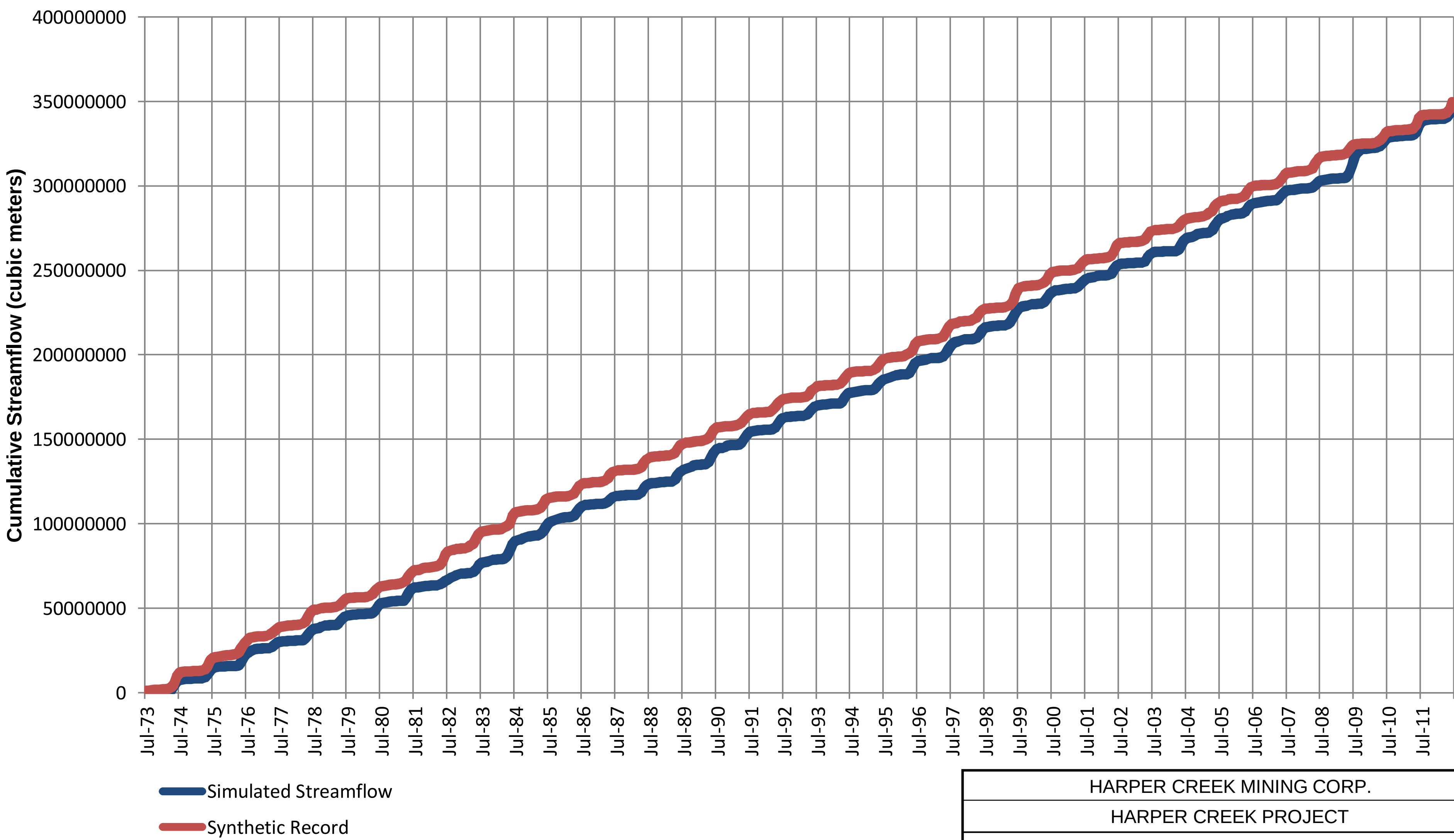
BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - JONESUS GAUGE

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-458/14	1

FIGURE A1-10 REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

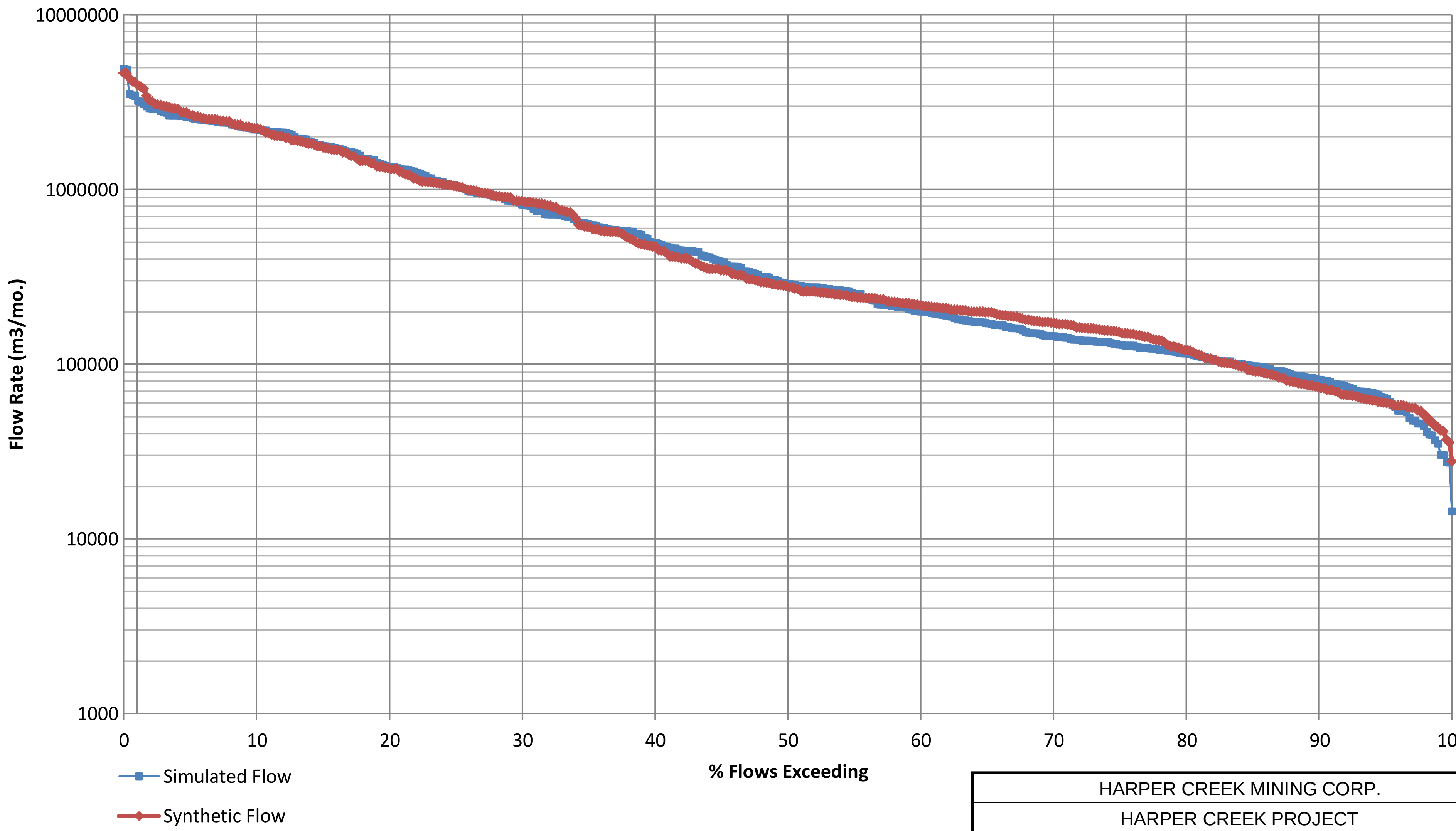
BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - JONESUS GAUGE

Knight Piésold CONSULTING

P/A NO. VA101-458/14 | REF. NO. 1

FIGURE A1-11 | REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW FLOW DURATION - JONESUS GAUGE

Knight Piésold CONSULTING

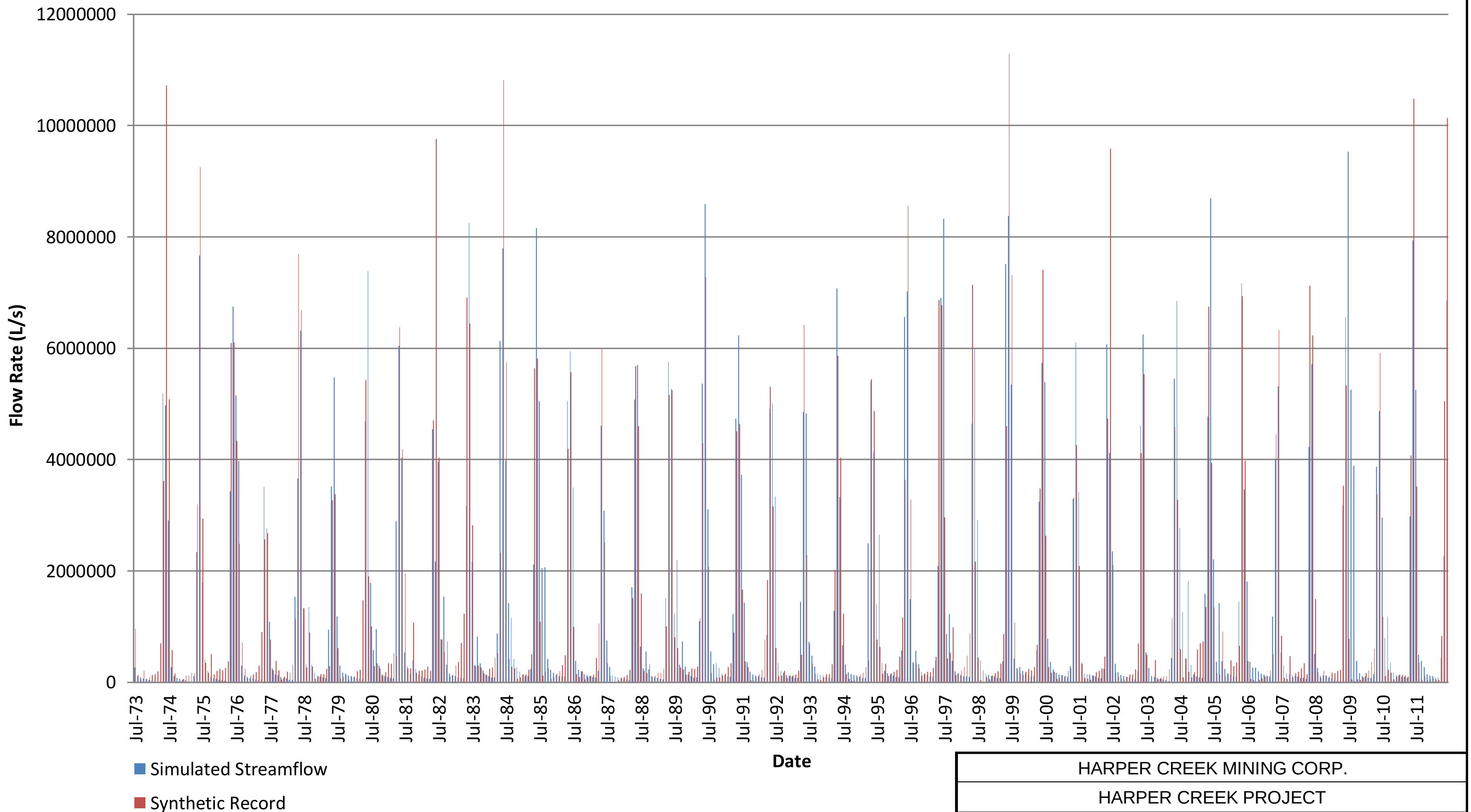
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A1-12

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - TSFDS GAUGE

Knight Piésold CONSULTING

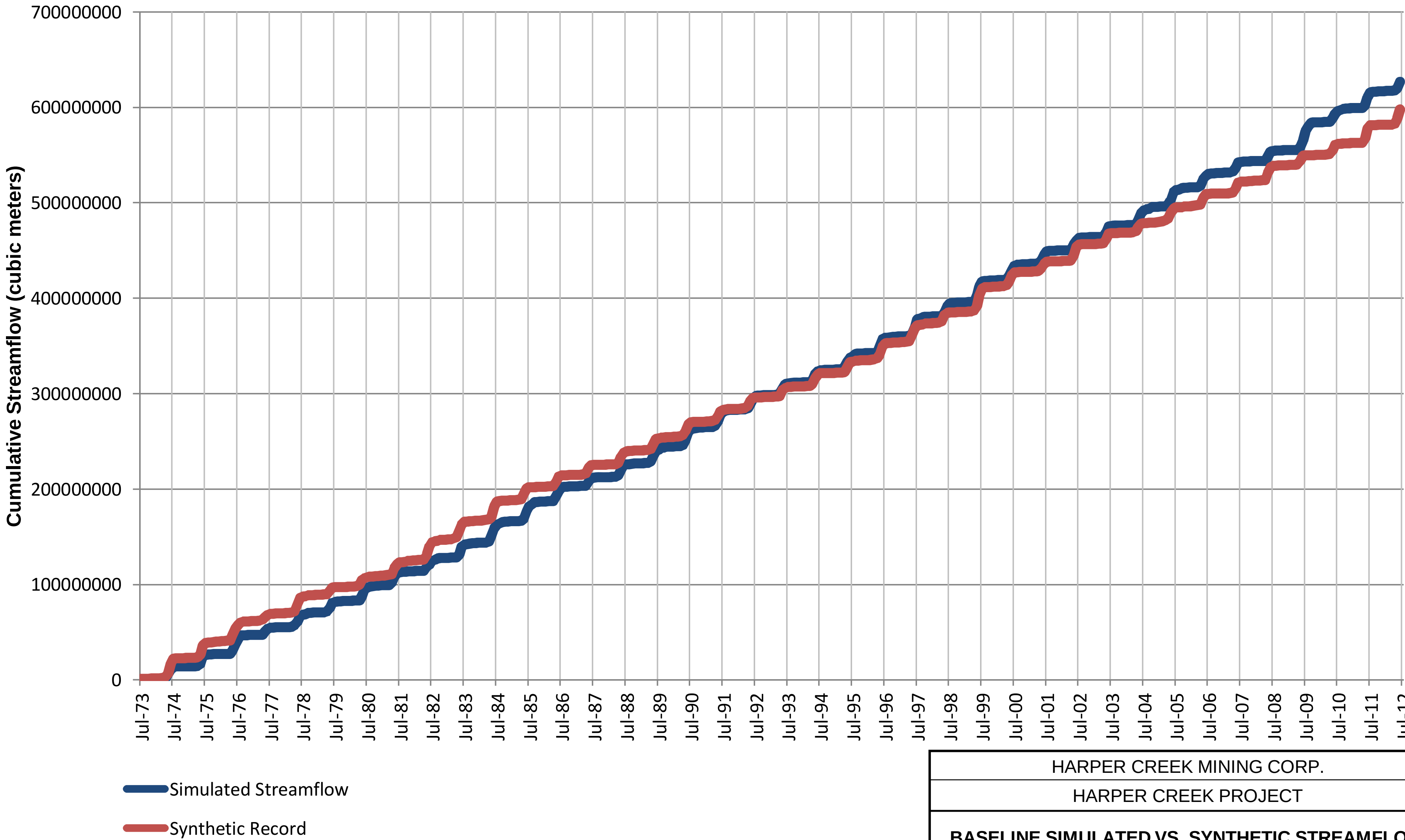
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A1-13

REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

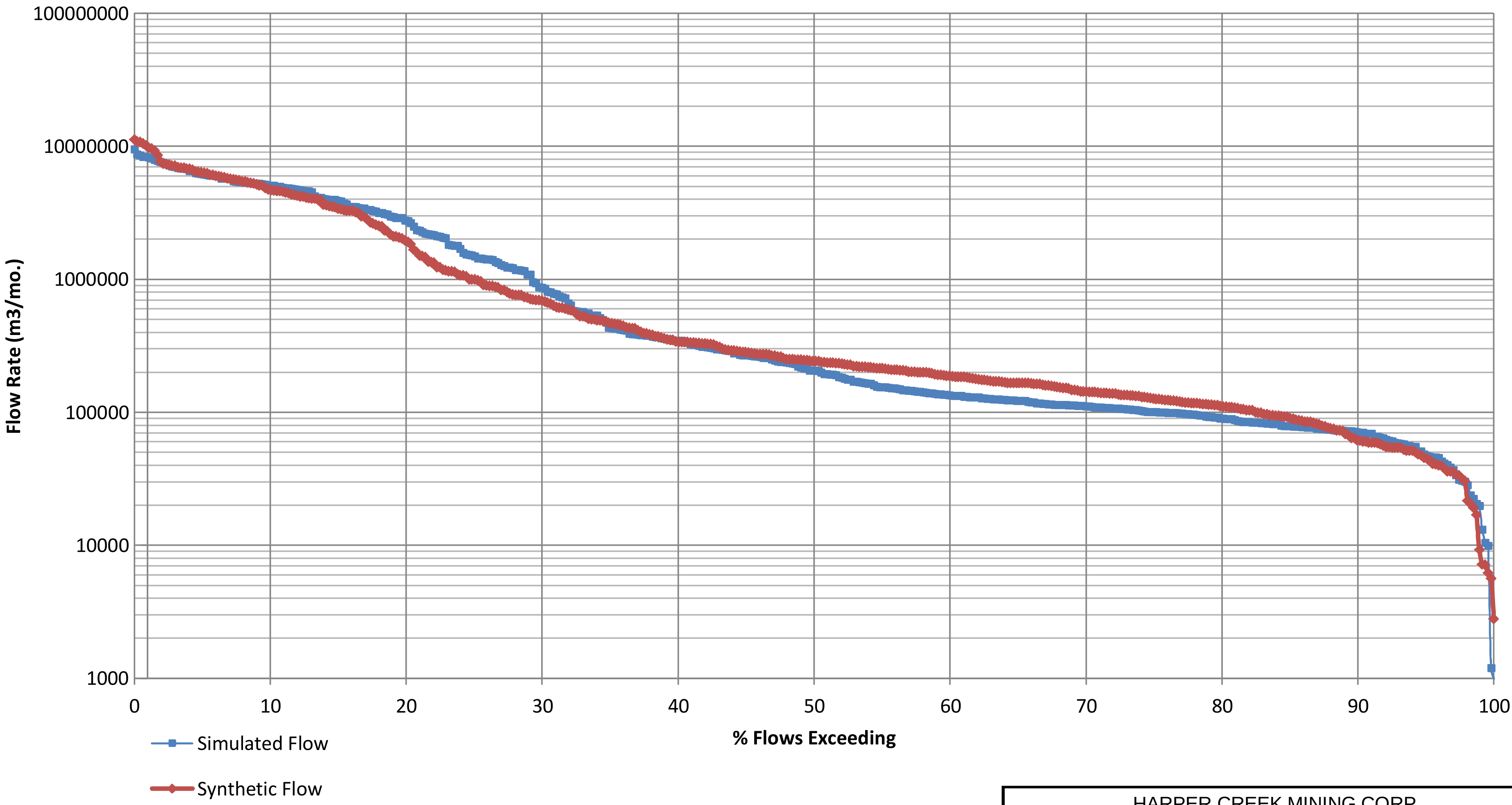
BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - TSFDS GAUGE

Knight Piésold CONSULTING

P/A NO. VA101-458/14 | REF. NO. 1

FIGURE A1-14 REV 1

1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

BASELINE SIMULATED VS. SYNTHETIC STREAMFLOW FLOW DURATION - TSFDS GAUGE

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P/A NO. VA101-458/14

REF. NO. 1

FIGURE A1-15

REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	25AUG'14	ISSUED WITH REPORT	KTD	RS	KJB

APPENDIX A2

PRE-MINE MODEL CALIBRATION RESULTS

(Pages A2-1 to A2-12)

Knight Piésold CONSULTING

TABLE A2-1

HARPER CREEK MINING CORPORATION
HARPER CREEK PROJECT

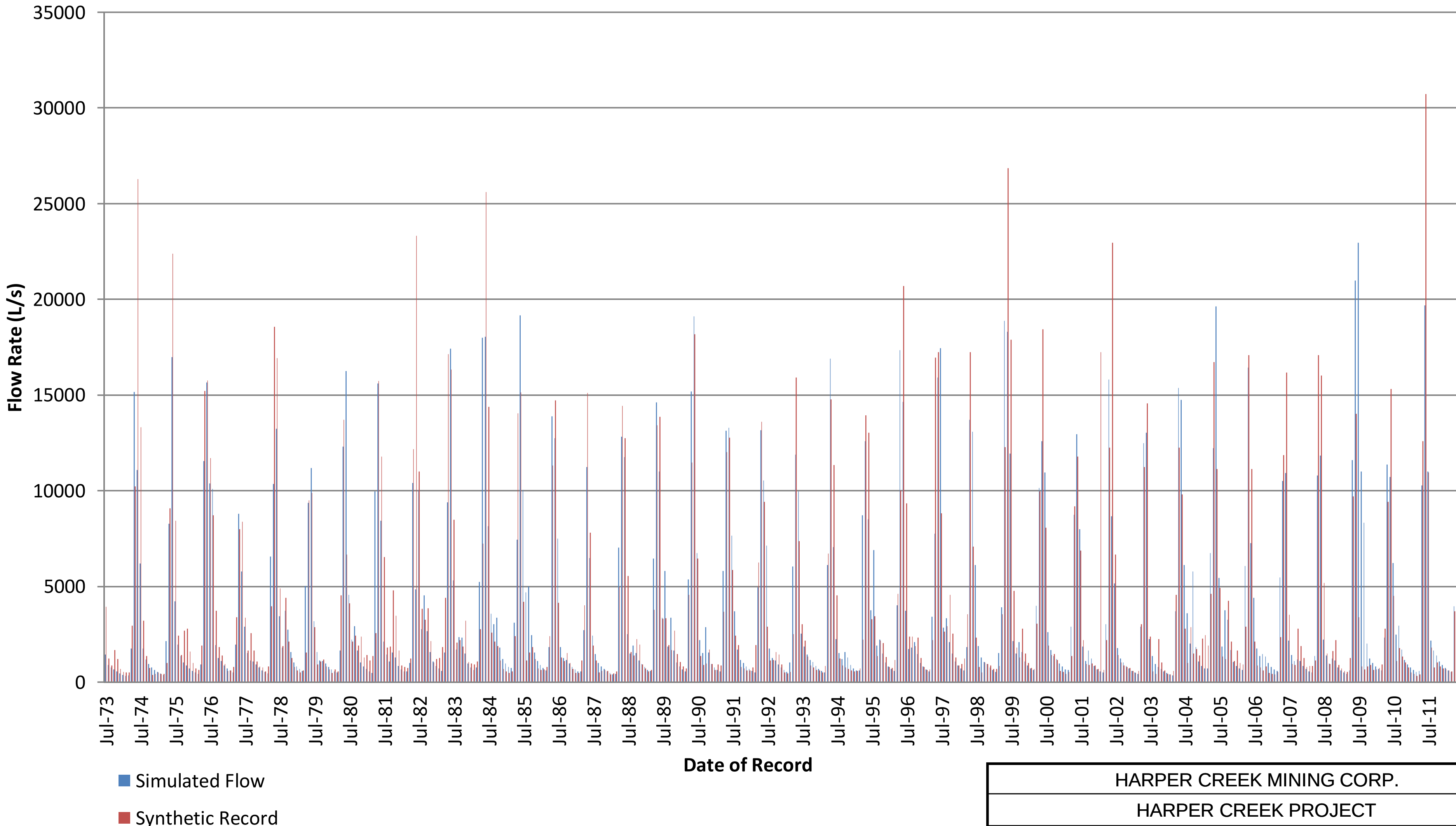
PRE-MINE AVERAGE SIMULATED MONTHLY FLOWS (JANUARY 1914 TO JUNE 2012)

Print Oct/10/14 15:33:22

Average Monthly Flows (L/s)							
Month	**HARPERUS**	**OP**	**TSFUS**	**TSFDS**	**WSC 08LB076**	**BAKER**	**JONES US**
Surface Water (L/s)							
January	244	13	0	19	682	6	13
February	208	12	0	15	571	3	6
March	183	13	0	11	539	30	14
April	760	94	123	220	3,311	263	247
May	3,194	545	1,005	1,563	11,357	565	740
June	2,966	524	1,374	2,038	11,406	619	858
July	1,266	148	569	847	5,153	325	471
August	639	48	141	240	2,285	99	161
September	486	28	75	143	1,712	43	74
October	530	39	66	133	1,899	77	105
November	399	22	18	52	1,183	73	99
December	292	14	1	24	844	19	32
Average	930	125	281	442	3,412	177	235
Minimum	183	12	0	11	539	3	6
Maximum	3,194	545	1,374	2,038	11,406	619	858
Groundwater (L/s)							
January	45	22	34	34	30	26	29
February	45	21	34	34	30	26	29
March	45	20	34	34	30	26	28
April	45	20	34	34	30	26	29
May	45	22	34	34	30	26	30
June	45	23	34	34	30	26	30
July	45	23	34	34	30	26	30
August	45	23	34	34	30	27	30
September	45	23	34	34	30	27	30
October	45	23	34	34	30	27	30
November	45	22	34	34	30	27	30
December	45	22	34	34	30	26	29
Average	45	22	34	34	30	26	29
Minimum	45	20	34	34	30	26	28
Maximum	45	23	34	34	30	27	30
Area (km^2)	47.0	7.6	15.0	23.4	166.4	14.3	17.6
Unit Flow (surface water only) ($L/s/km^2$)	19.8	16.4	18.7	18.9	20.5	12.4	13.4
Unit Flow (surface and groundwater) ($L/s/km^2$)	20.8	19.3	21.0	20.3	20.7	14.2	15.0

M:\1\01\00458\14\A\Report\1 - Watershed Modelling\Rev 1\Appendices\App A\[Appendix A1&A2_r1.xlsx]Table A2-1

1	10OCT'14	ISSUED WITH REPORT	KTD	DDF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINESIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - HARPER WSC GAUGE

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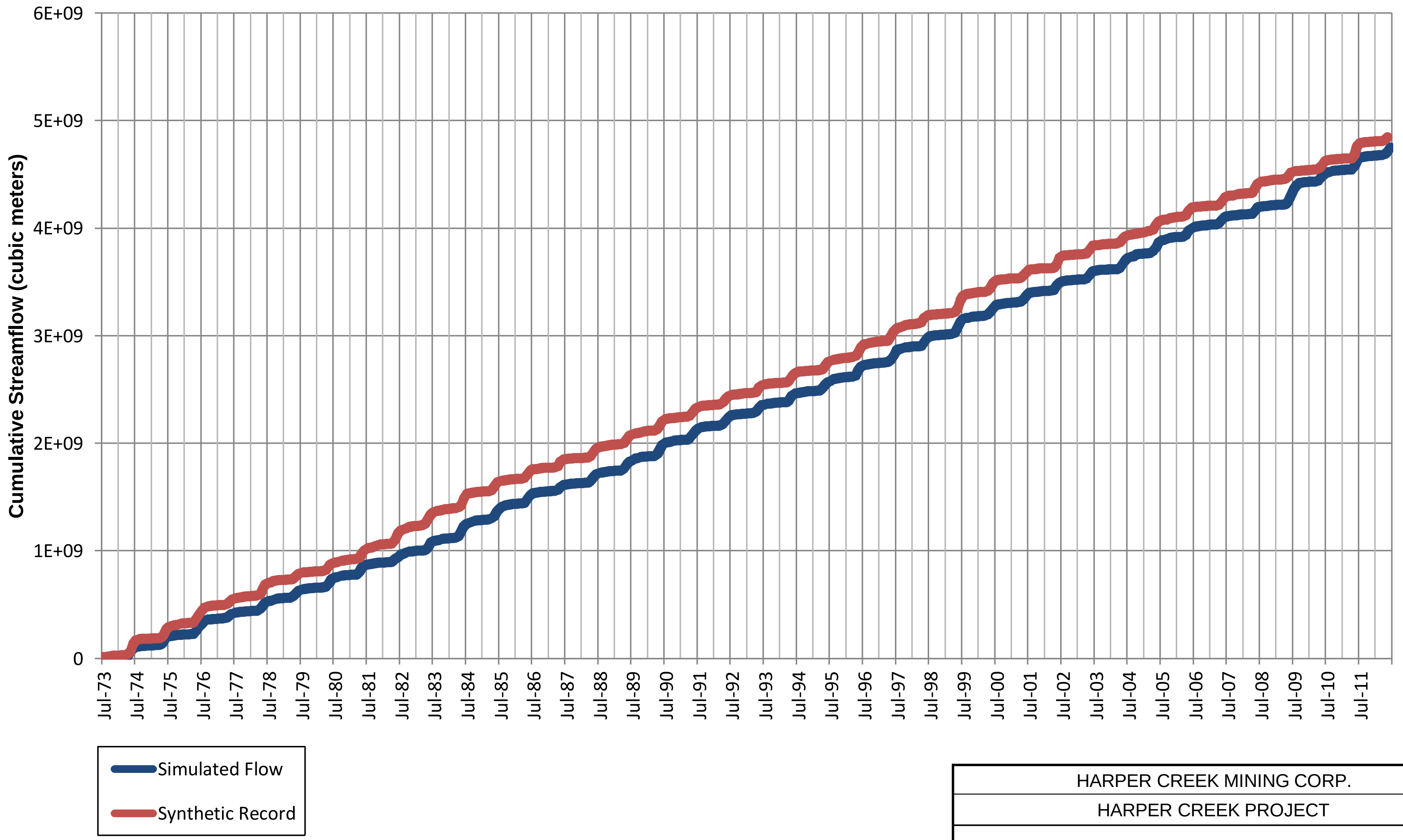
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A2-1

REV 1

1	[illegible]	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - HARPER WSC GAUGE

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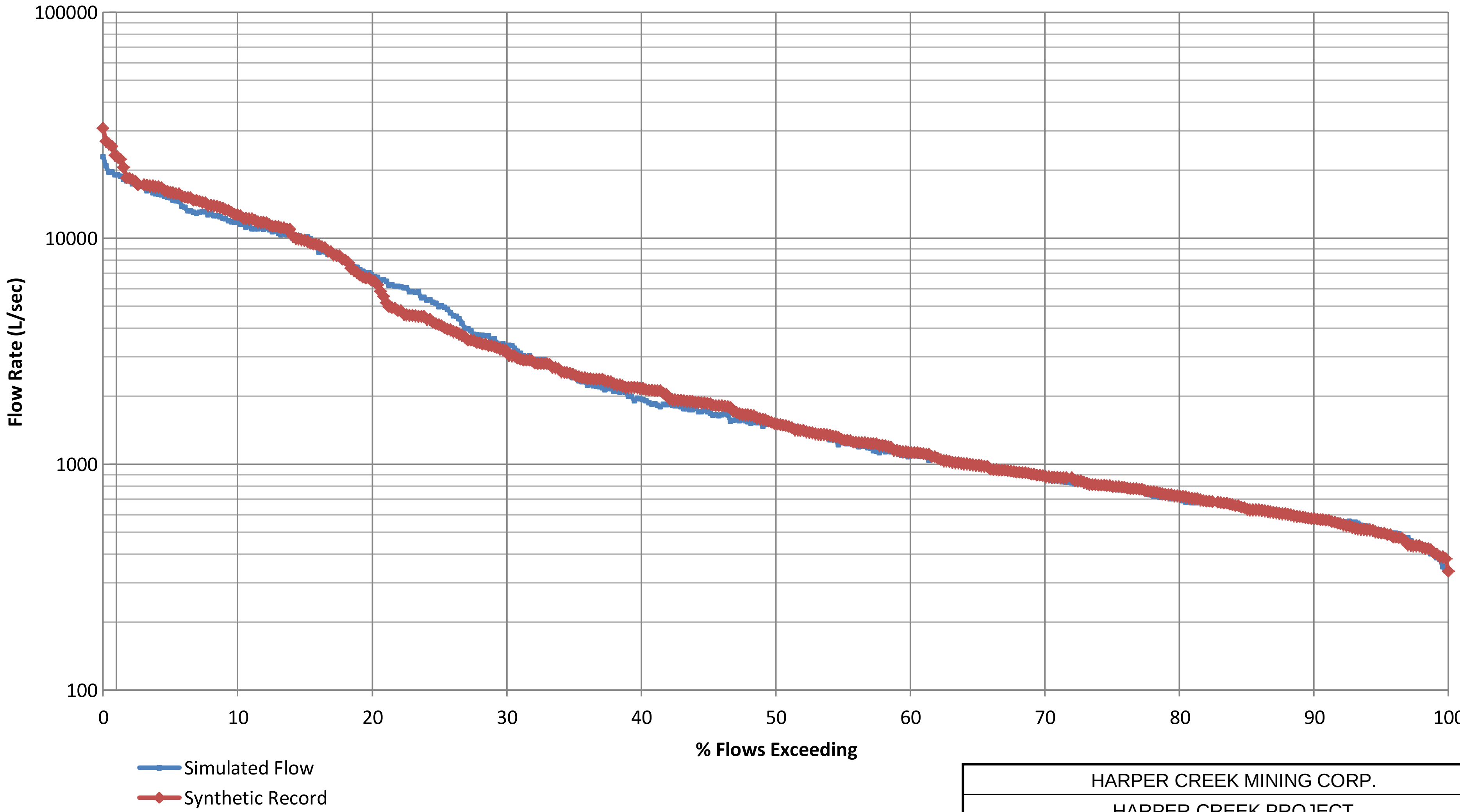
REF. NO. 1

FIGURE A2-2

REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW FLOW DURATION - HARPER WSC GAUGE

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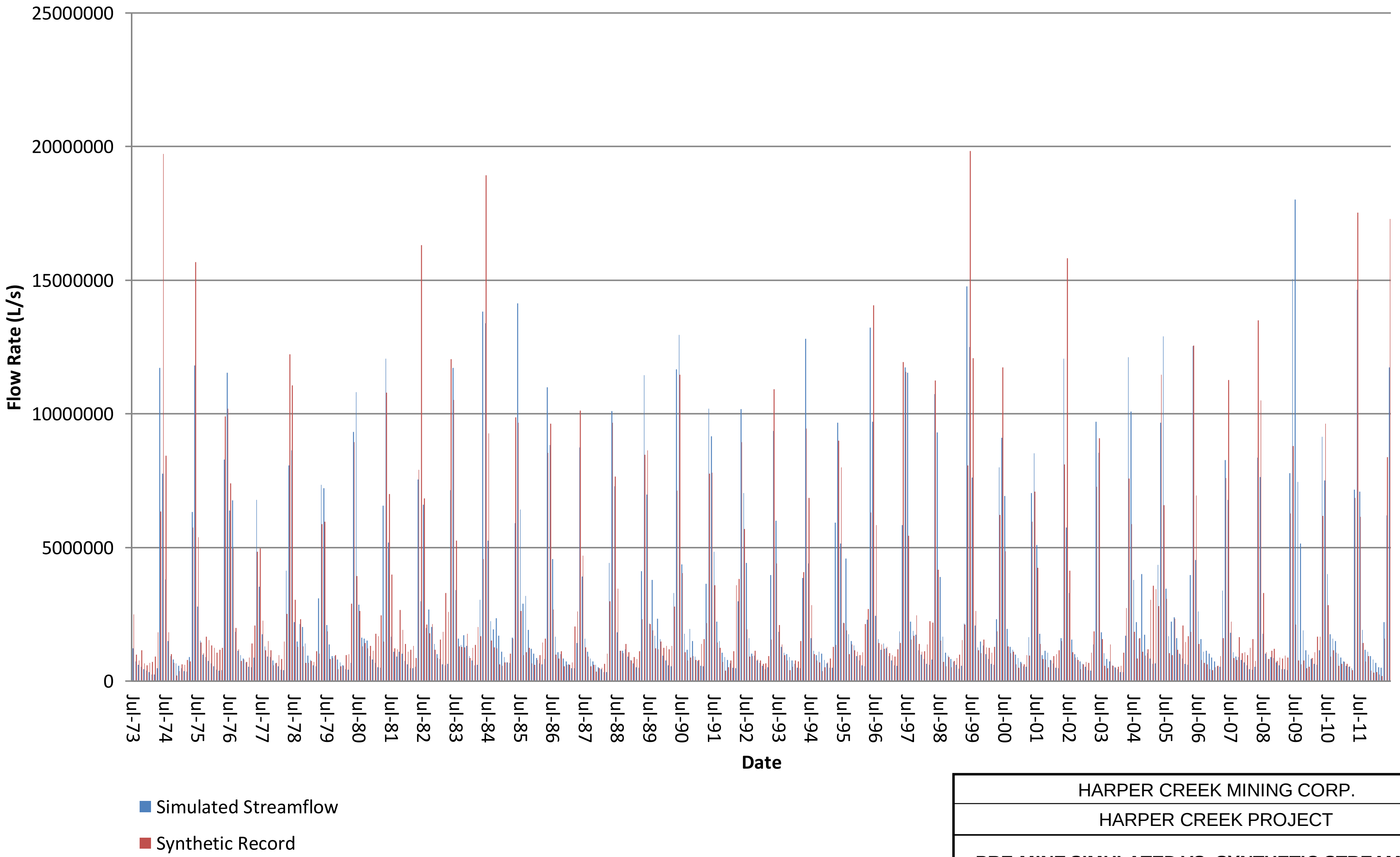
P/A NO.	REF. NO.	
VA101-458/14	1	
FIGURE A2-3		REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - HARPERUS GAUGE

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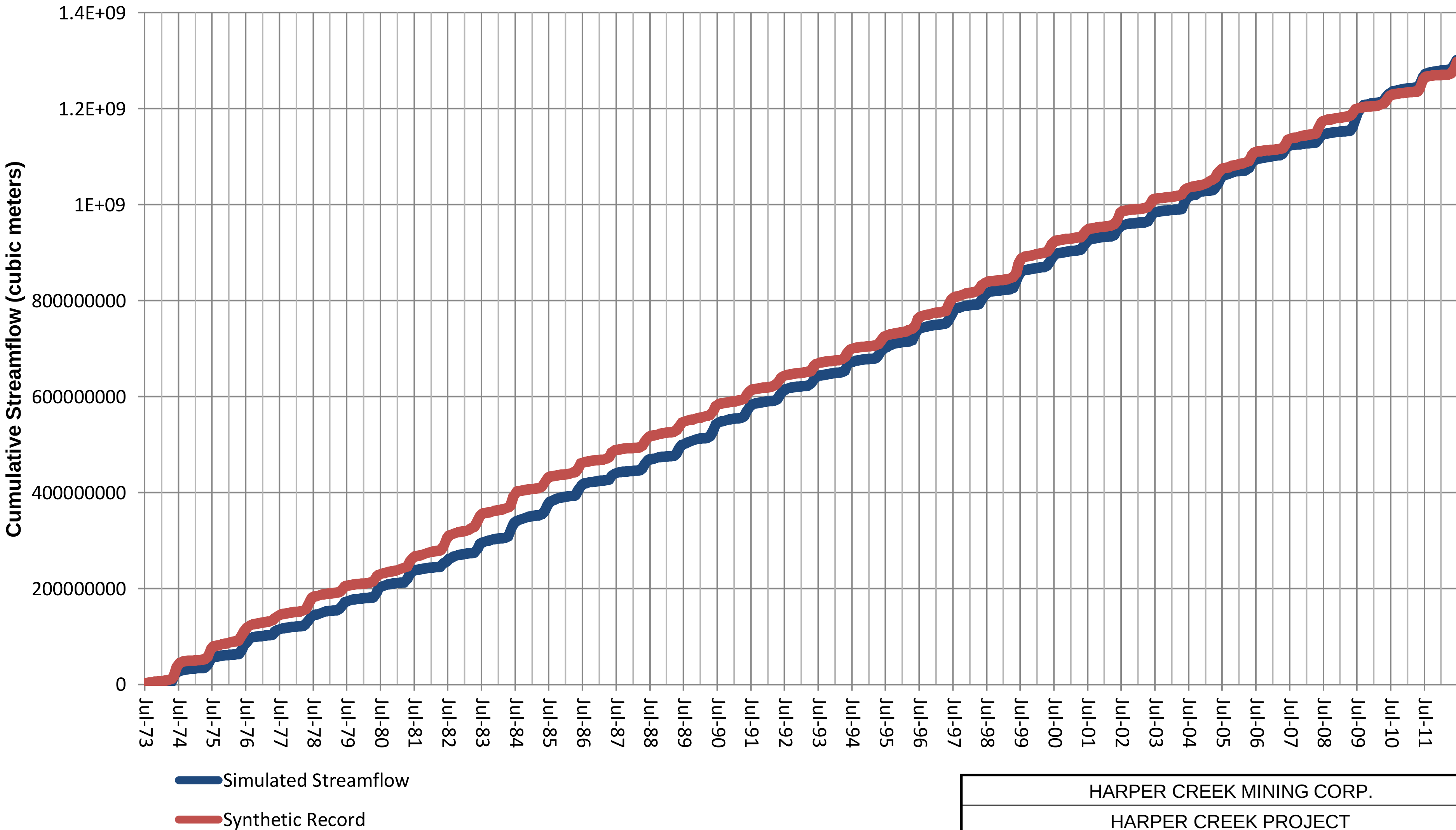
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A2-4

REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - HARPERUS GAUGE

Knight Piésold CONSULTING

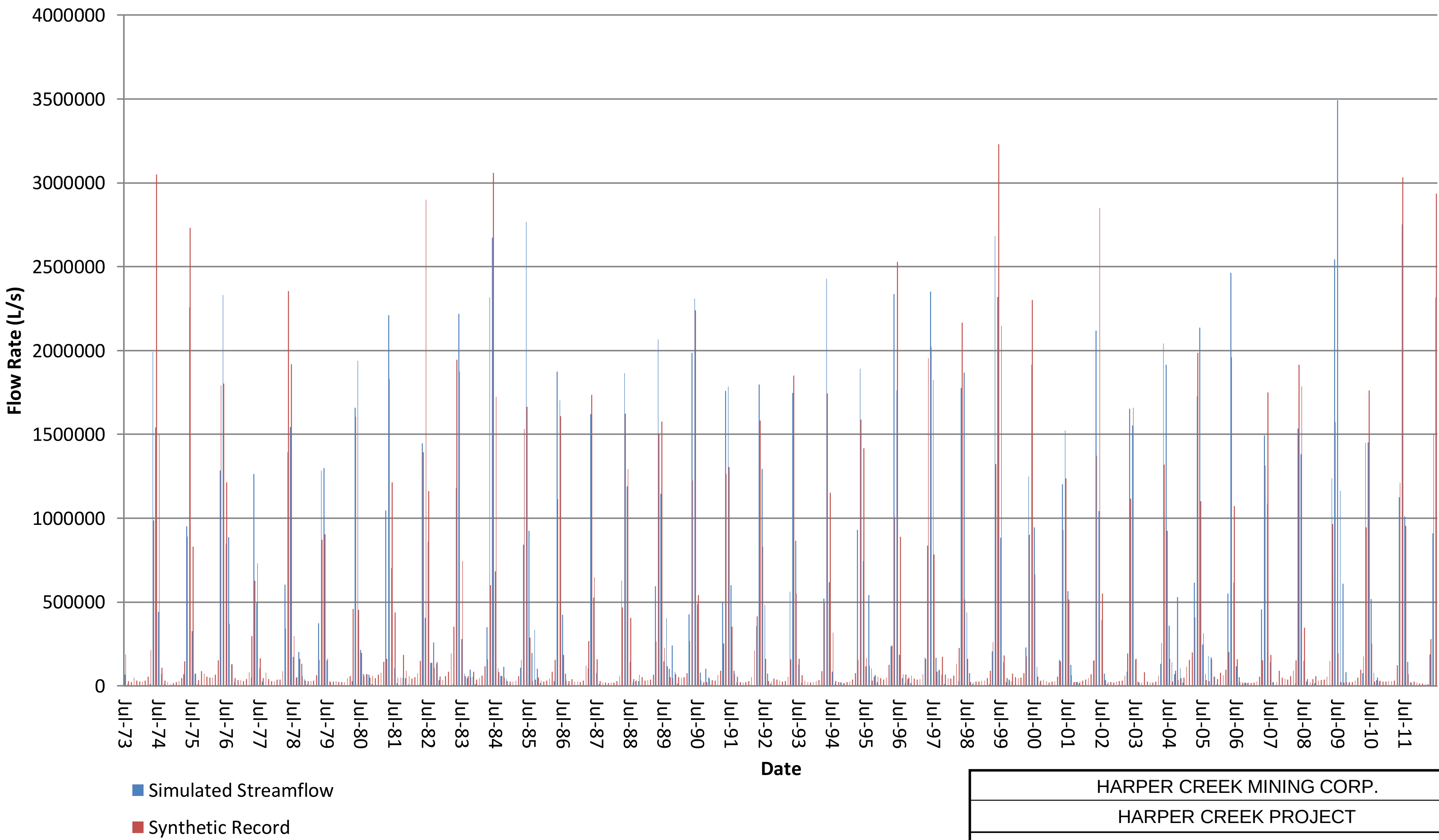
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A2-5

REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

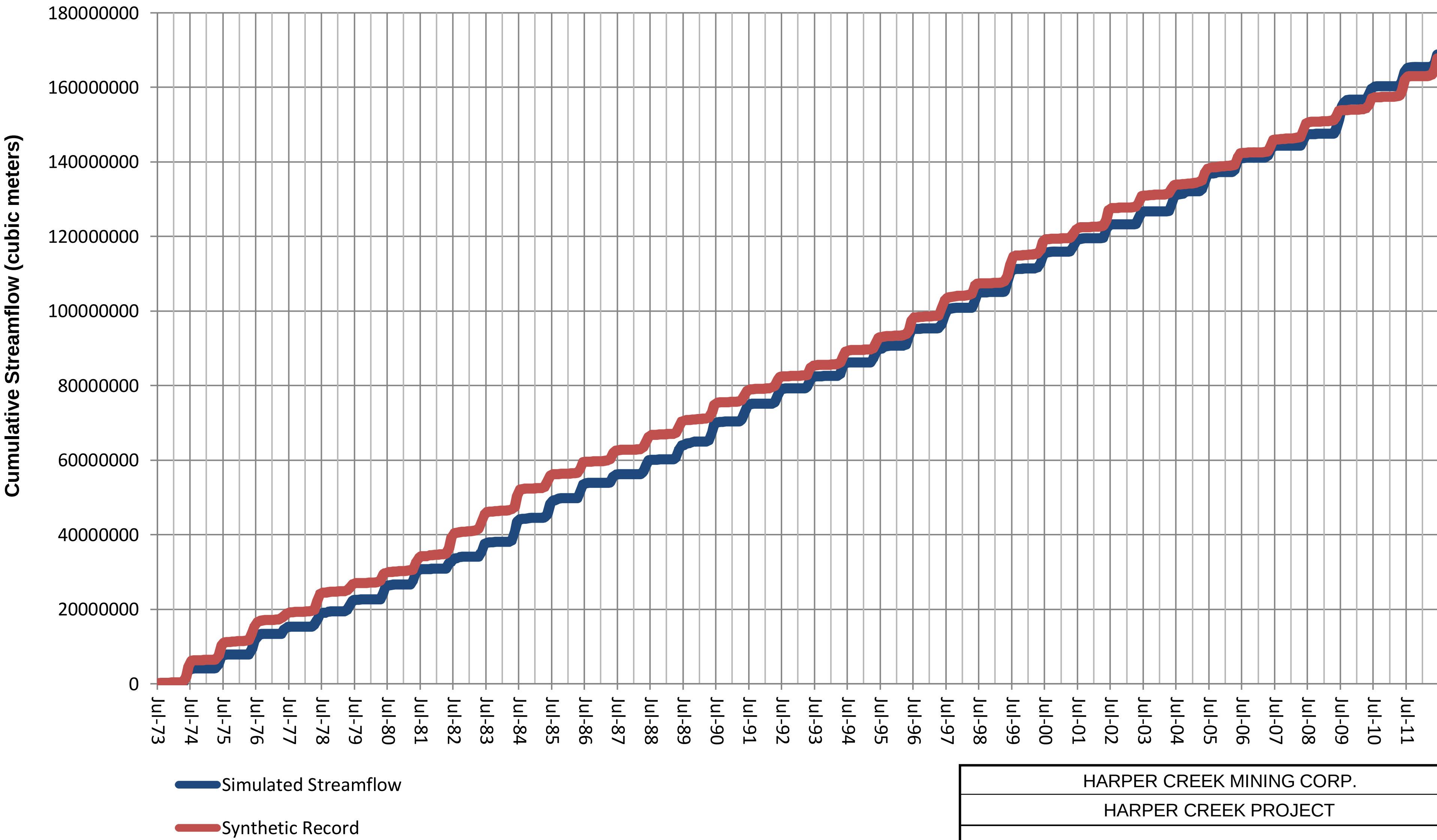
PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - OP GAUGE

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-458/14	1

FIGURE A2-6 REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - OP GAUGE

Knight Piésold CONSULTING

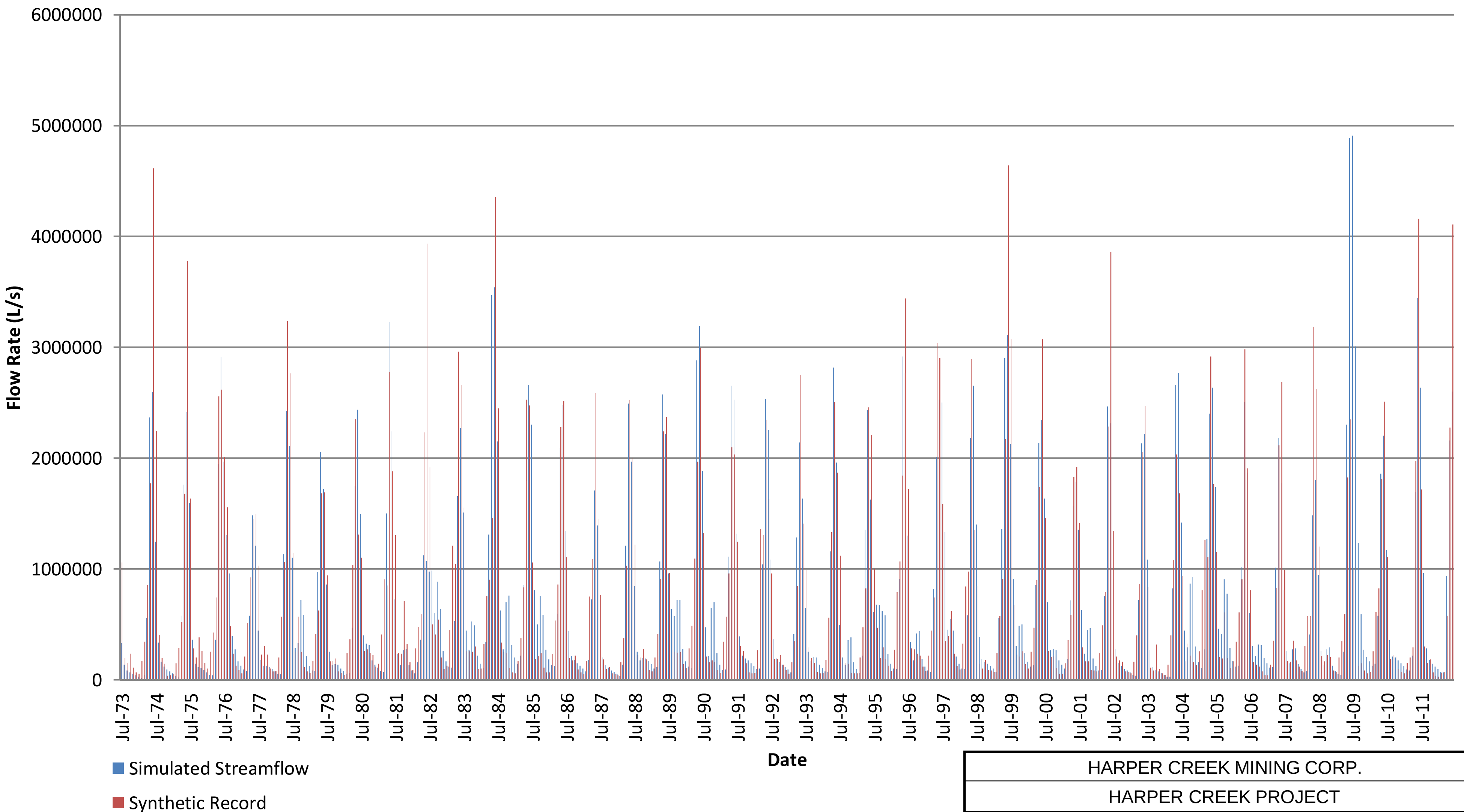
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A2-7

REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

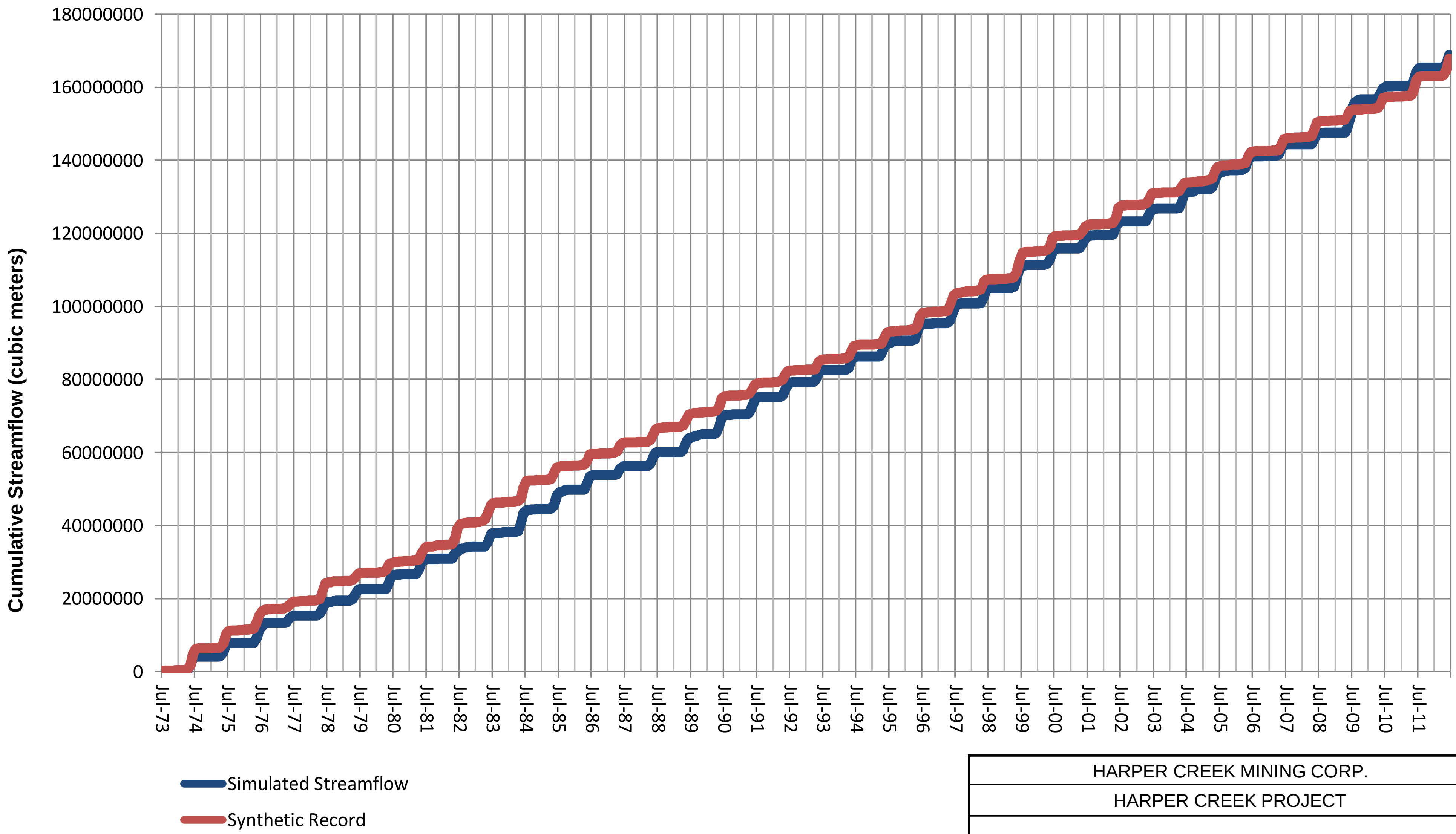
PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - JONESUS GAUGE

Knight Piésold CONSULTING

P/A NO. VA101-458/14 | REF. NO. 1

FIGURE A2-8 | REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - JONESUS GAUGE

Knight Piésold CONSULTING

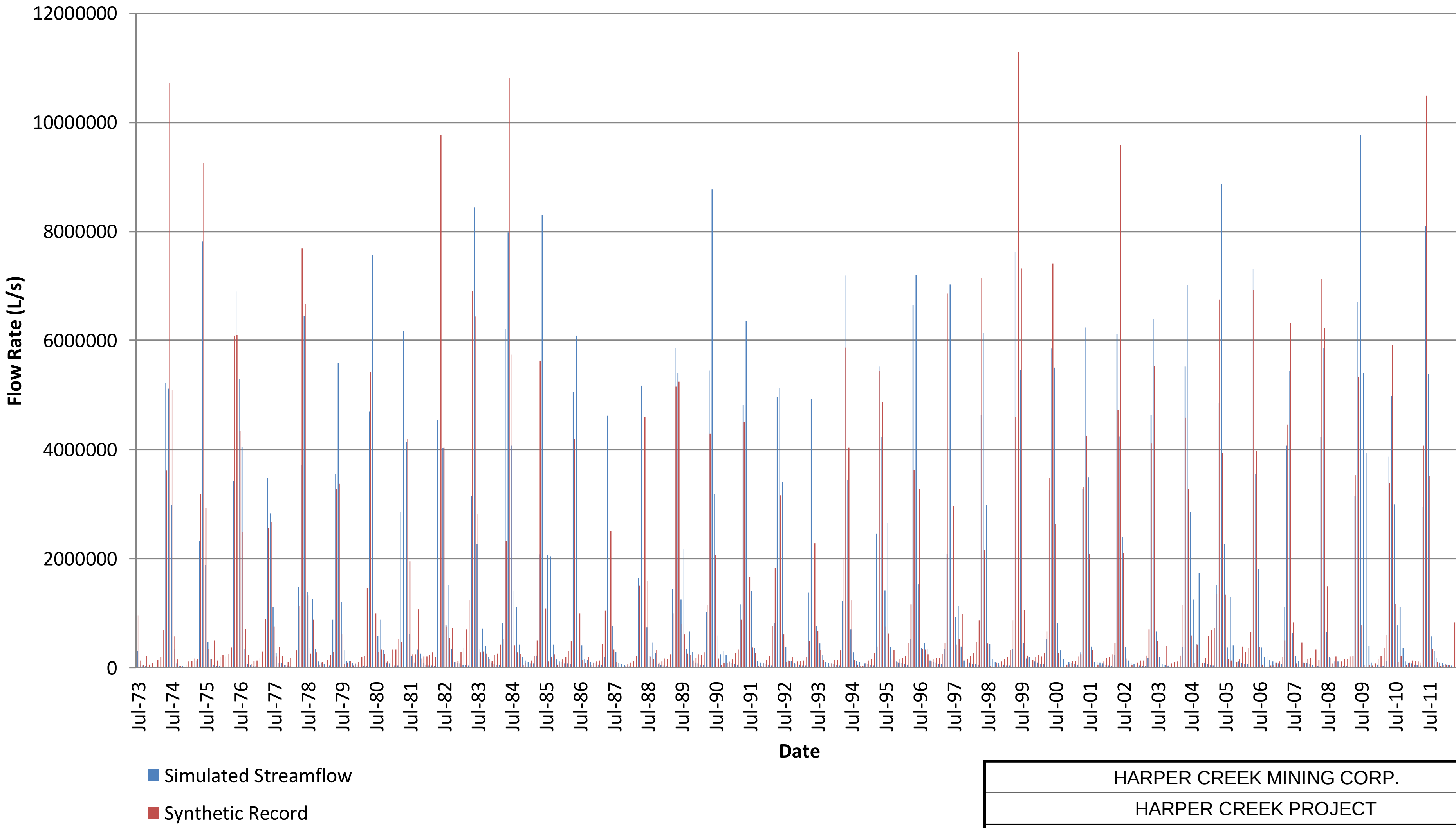
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A2-9

REV 1

1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW HYDROGRAPH - TSFDS GAUGE

Knight Piésold CONSULTING

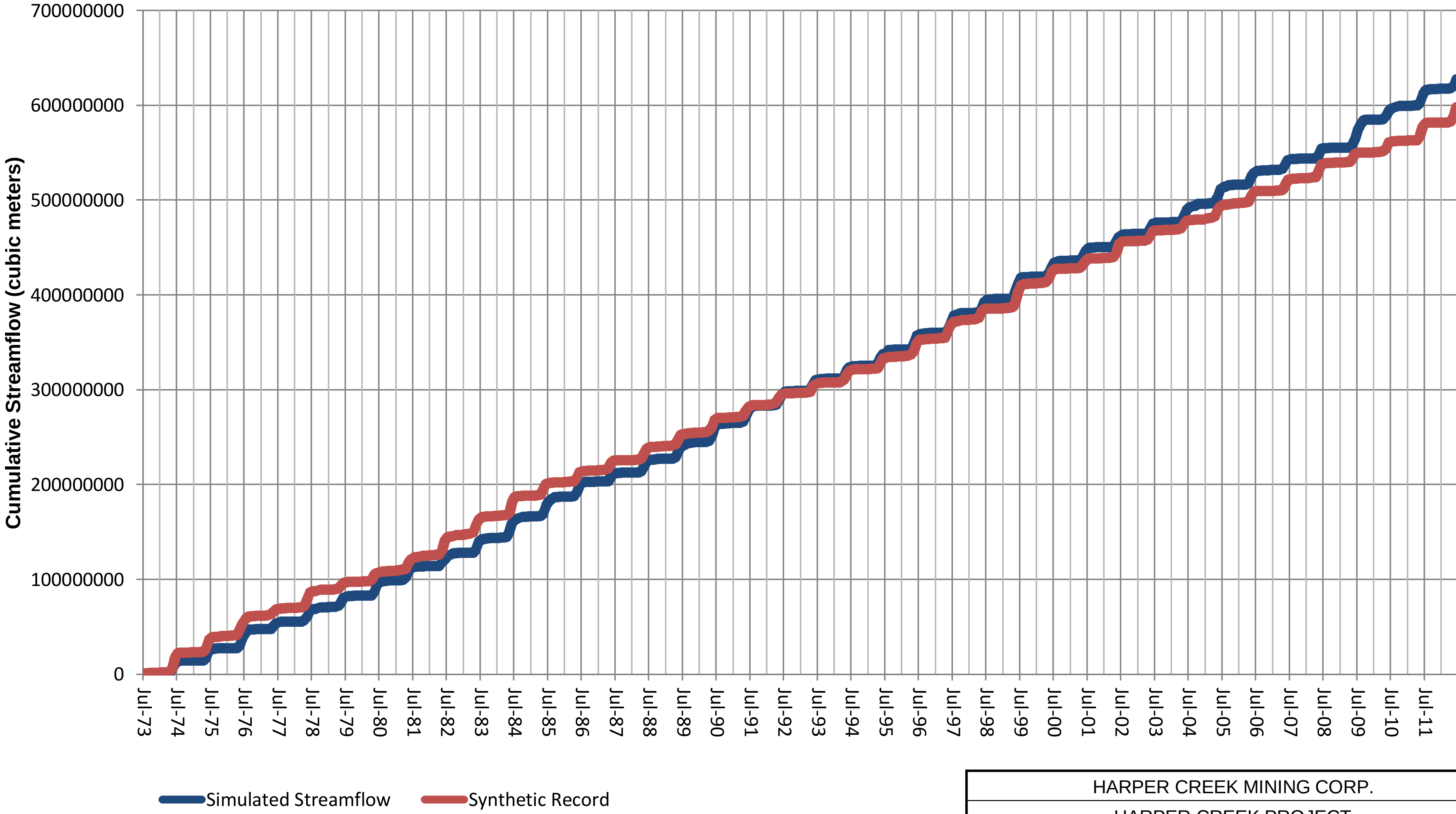
P/A NO. VA101-458/14

REF. NO. 1

FIGURE A2-10

REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

PRE-MINE SIMULATED VS. SYNTHETIC STREAMFLOW CUMULATIVE - TSFDS GAUGE

Knight Piésold CONSULTING

P/A NO. VA101-458/14 | REF. NO. 1

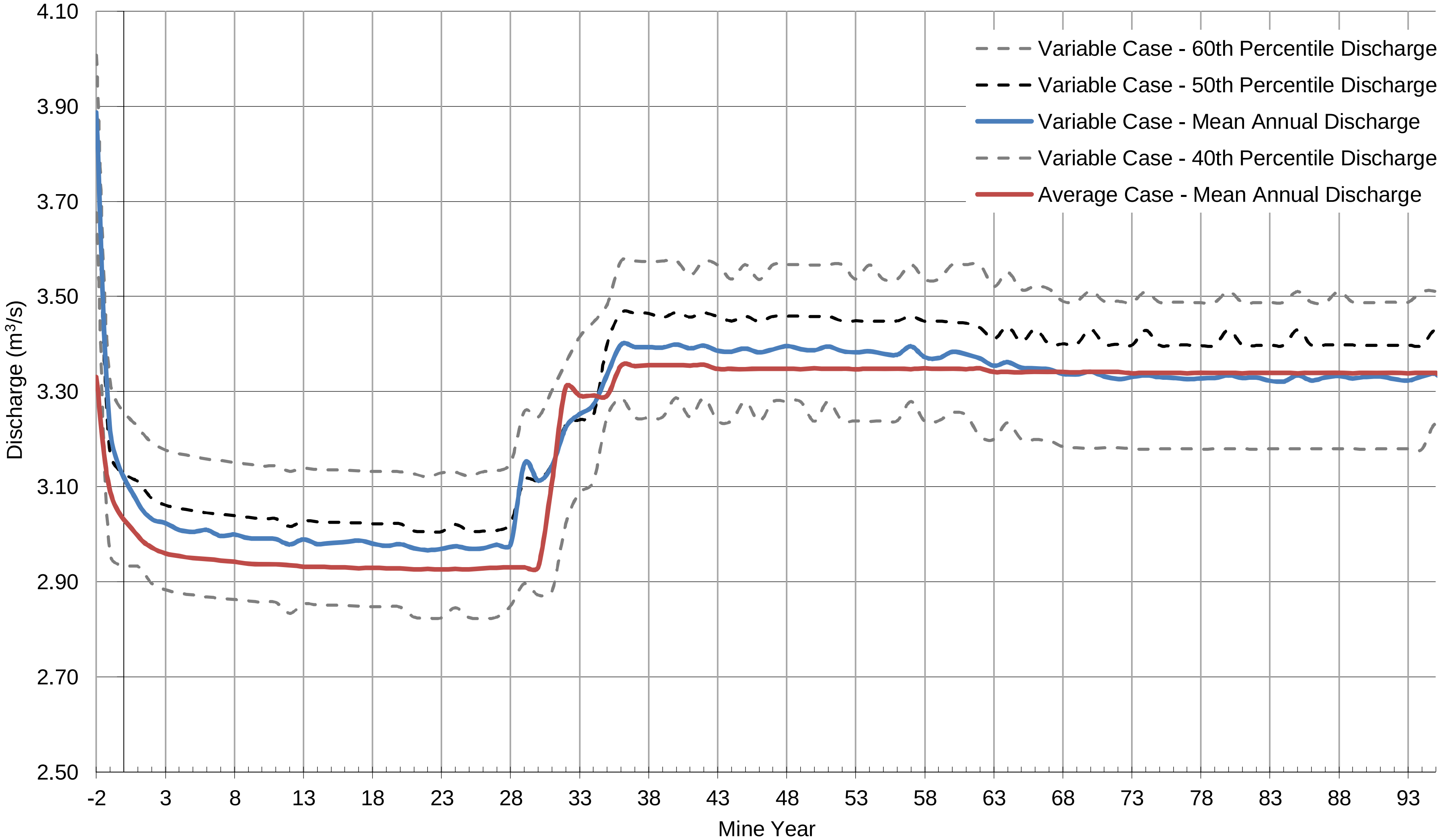
FIGURE A2-11 | REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	10OCT'14	ISSUED WITH REPORT	KTD	RS	KJB

APPENDIX B

COMPARISON OF MODELLED SCENARIO RESULTS AT NODES 1-10

(Pages B-1 to B-10)



1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

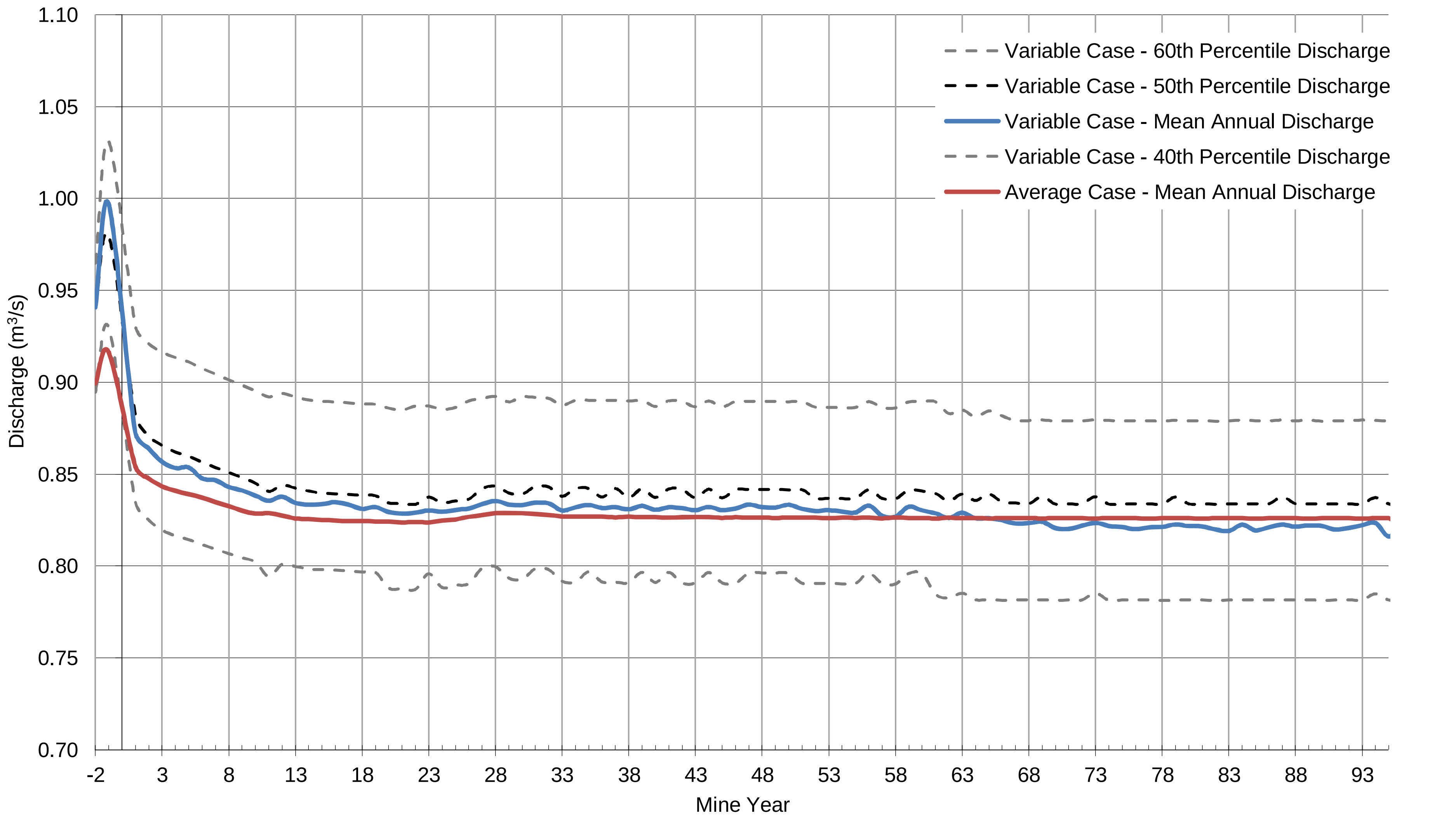
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-1

REV 1



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

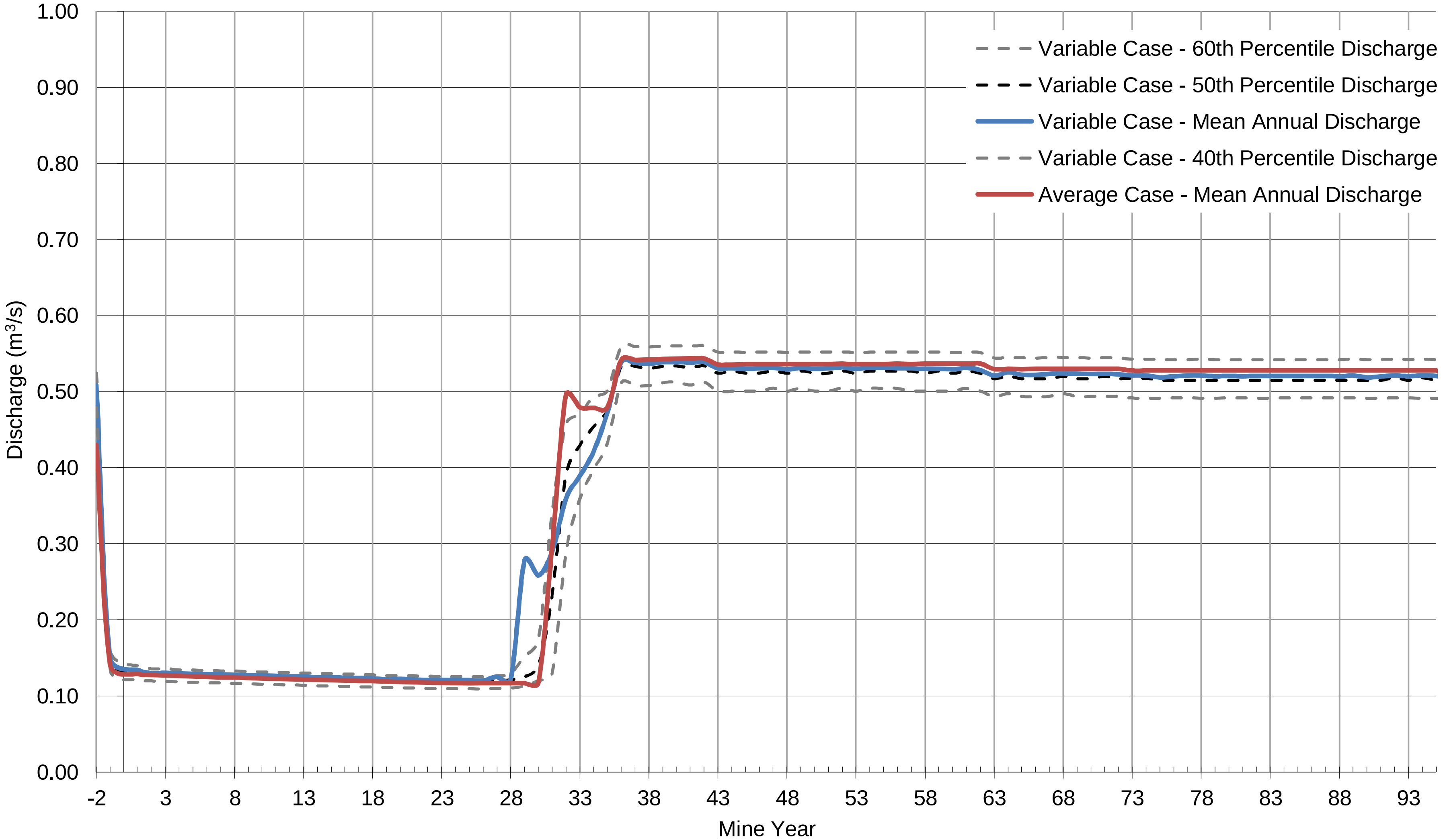
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-2

REV 1



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

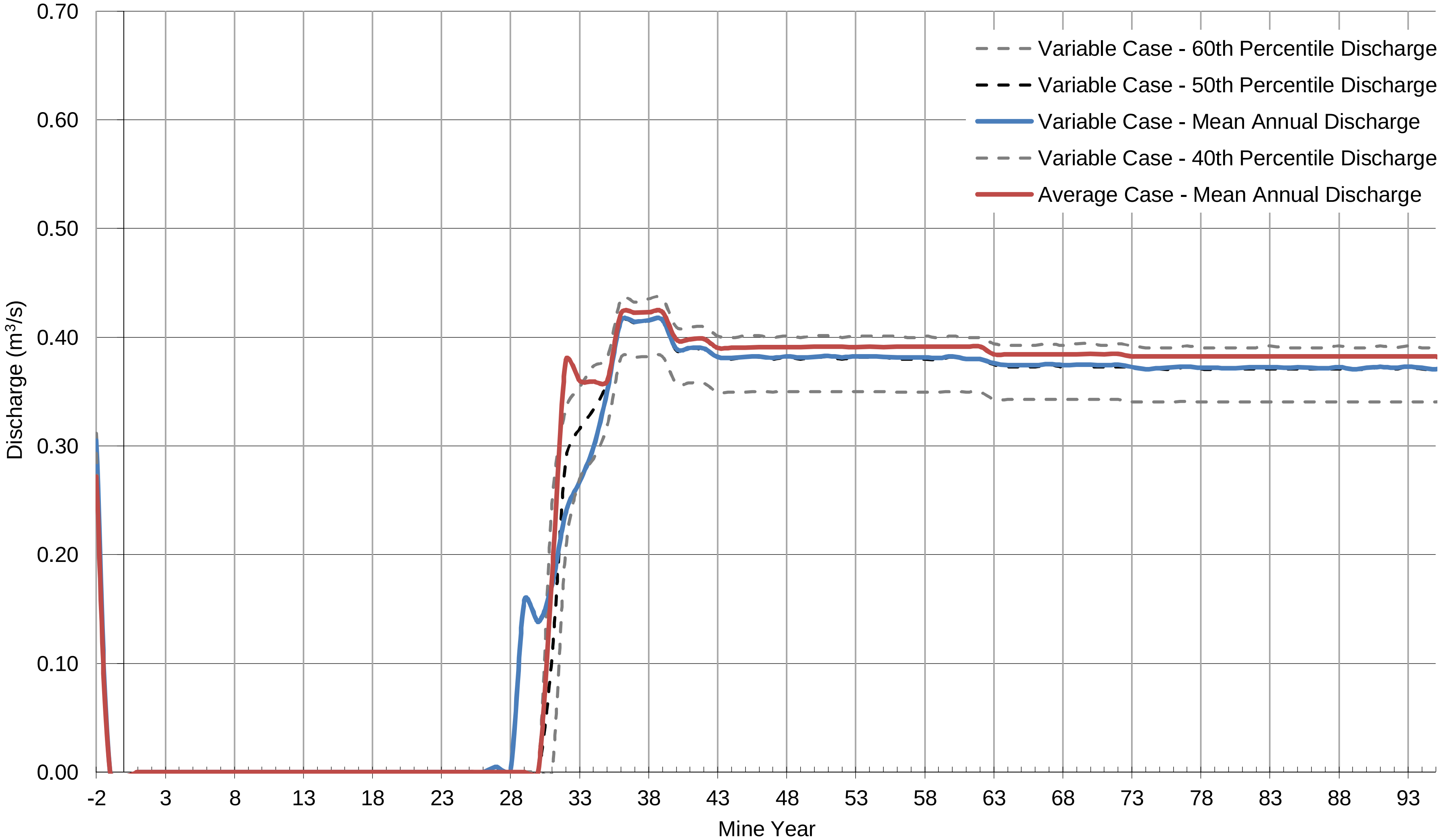
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-3

REV 1



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK

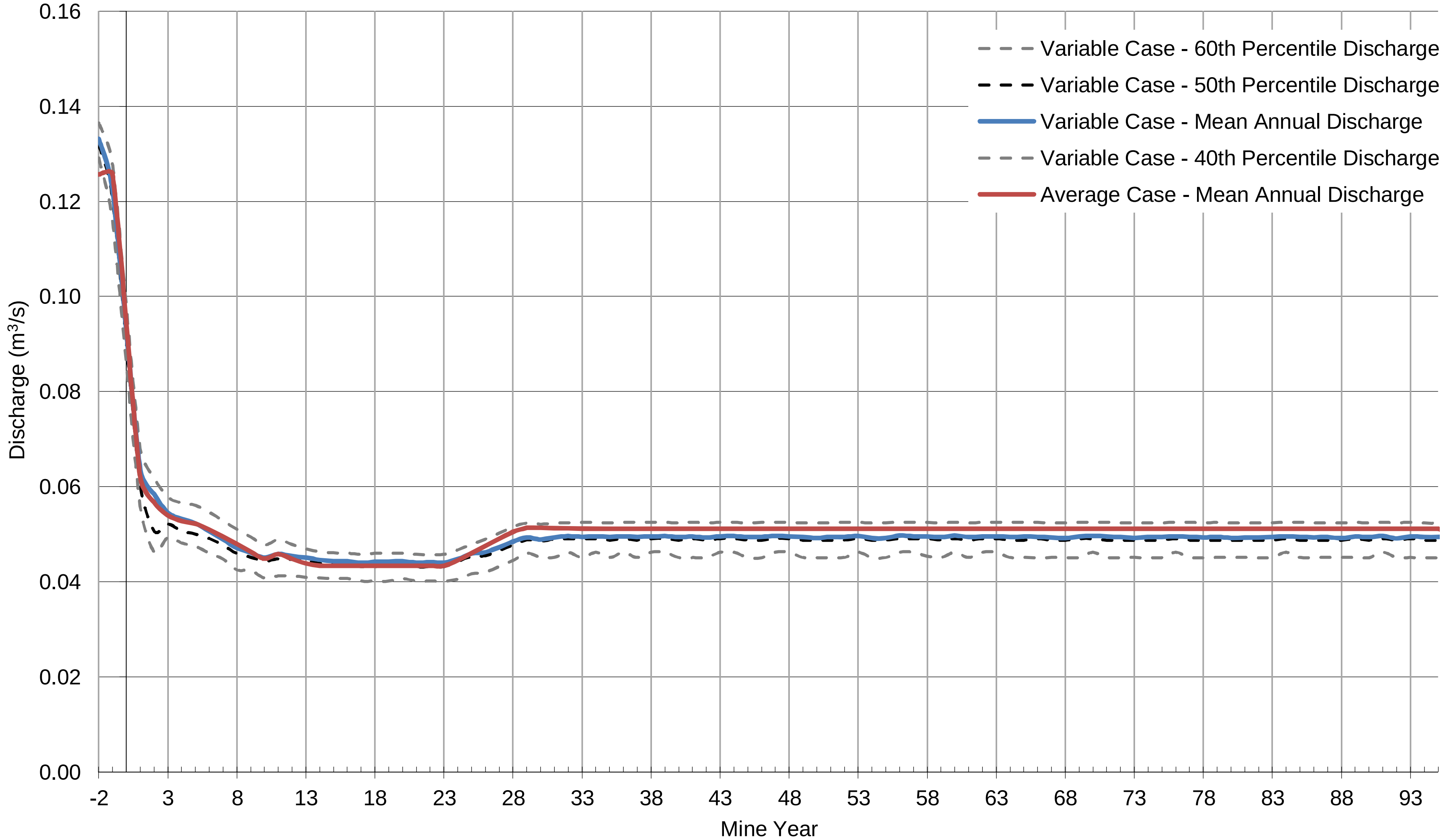
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-4

REV 1



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 5 P-CREEK AT HARPER CREEK CONFLUENCE

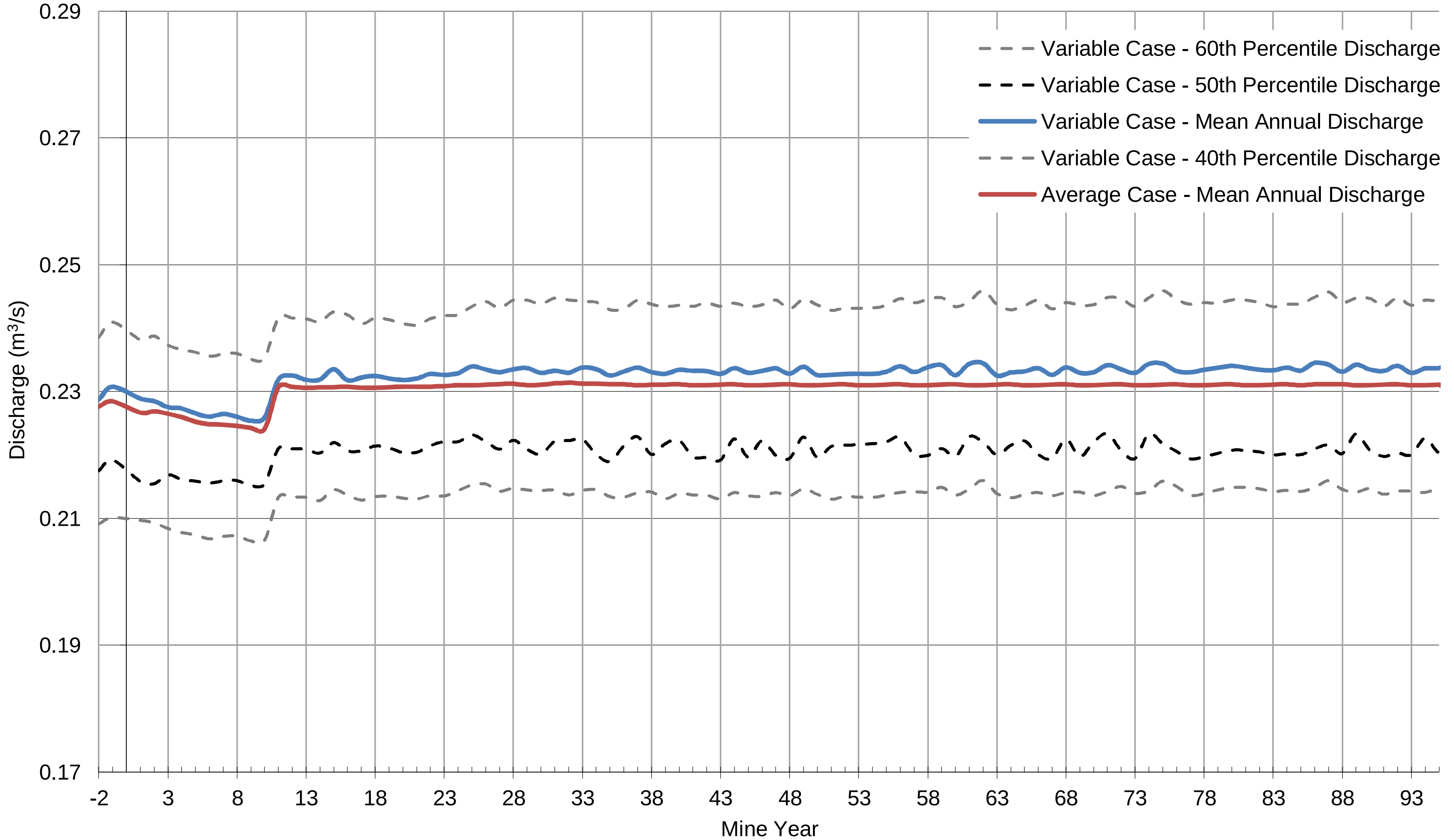
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-5

REV 1



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

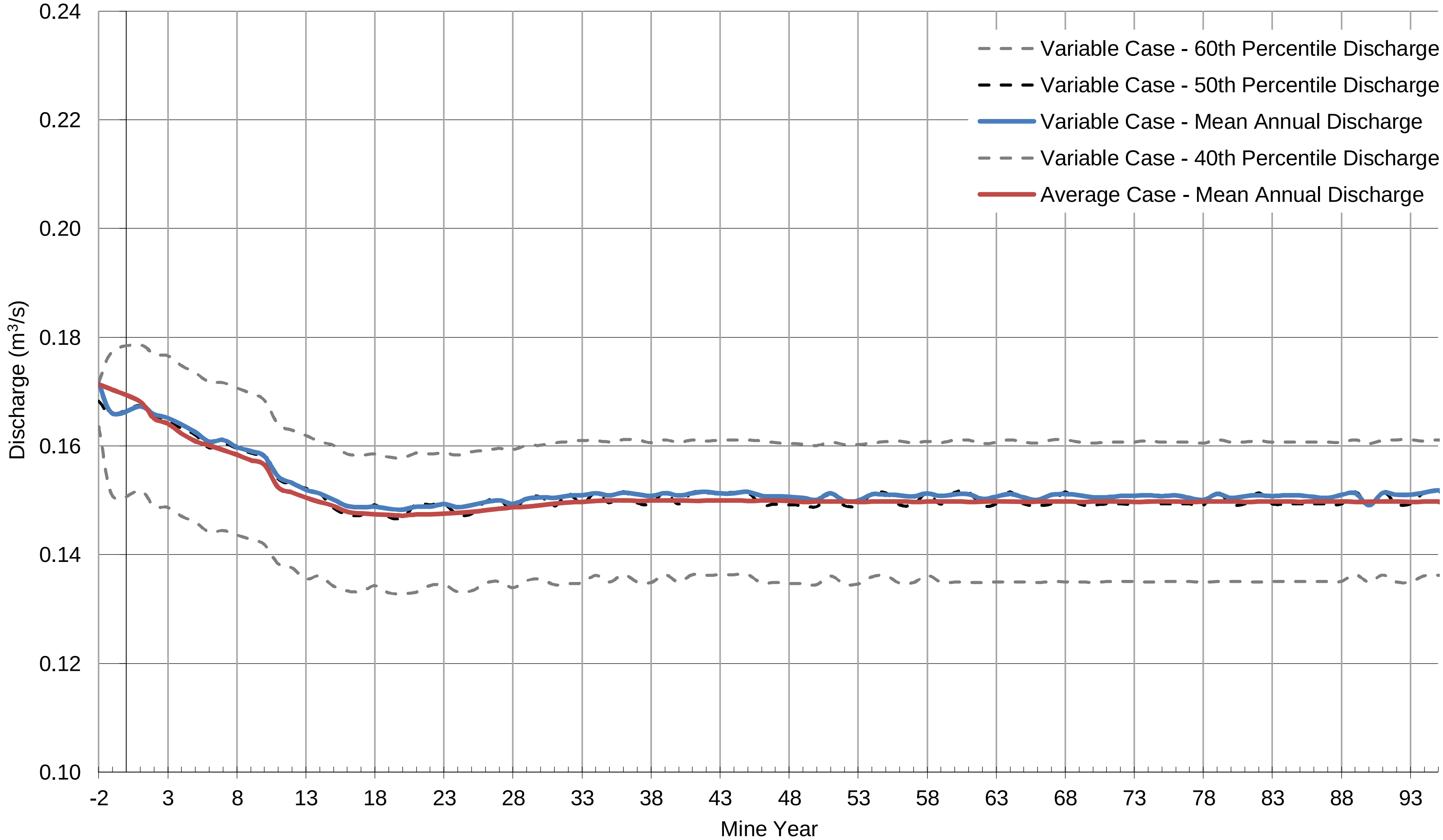
COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-458/14	1

FIGURE B-6 REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB



1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER

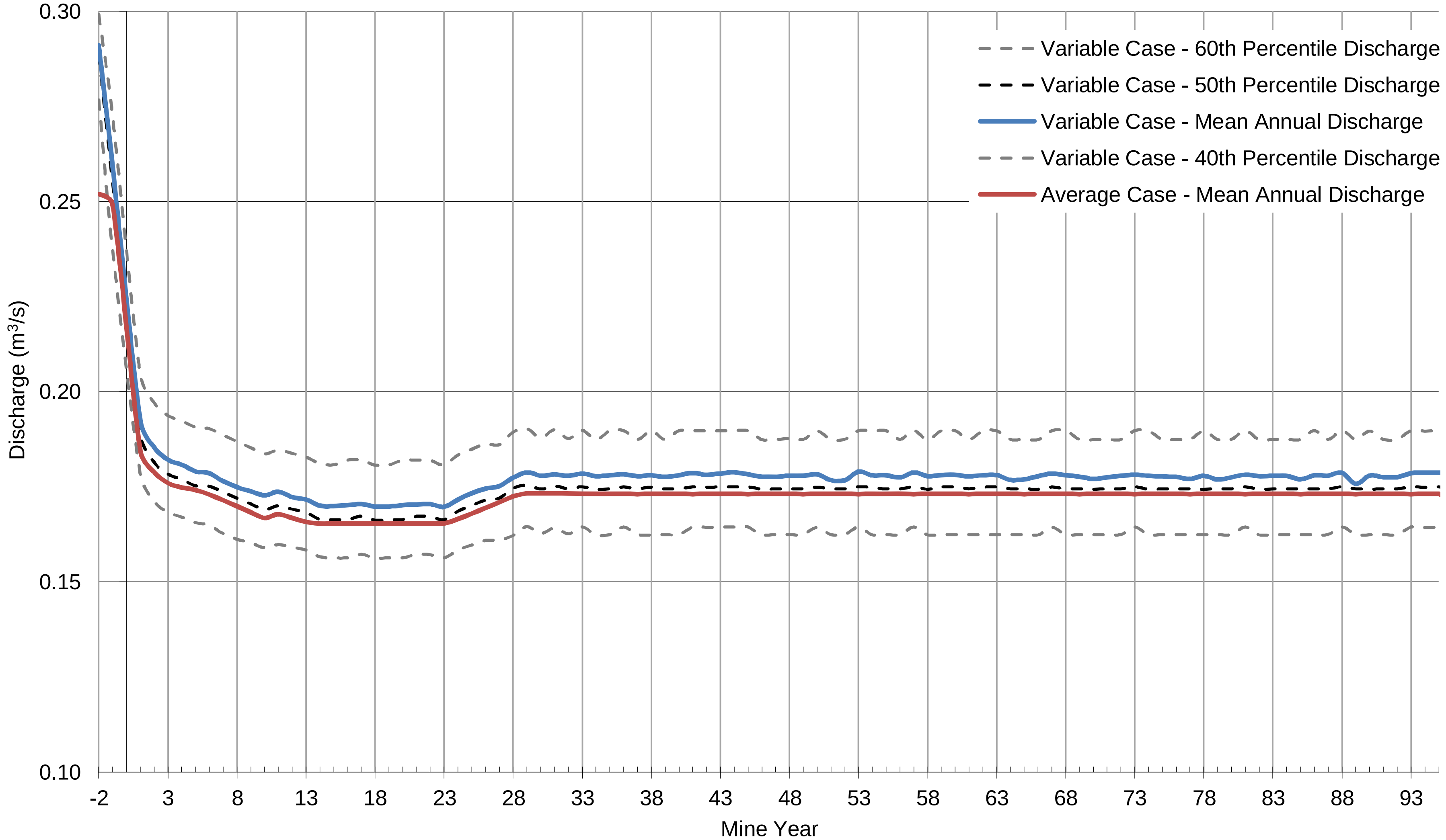
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-7

REV 1



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

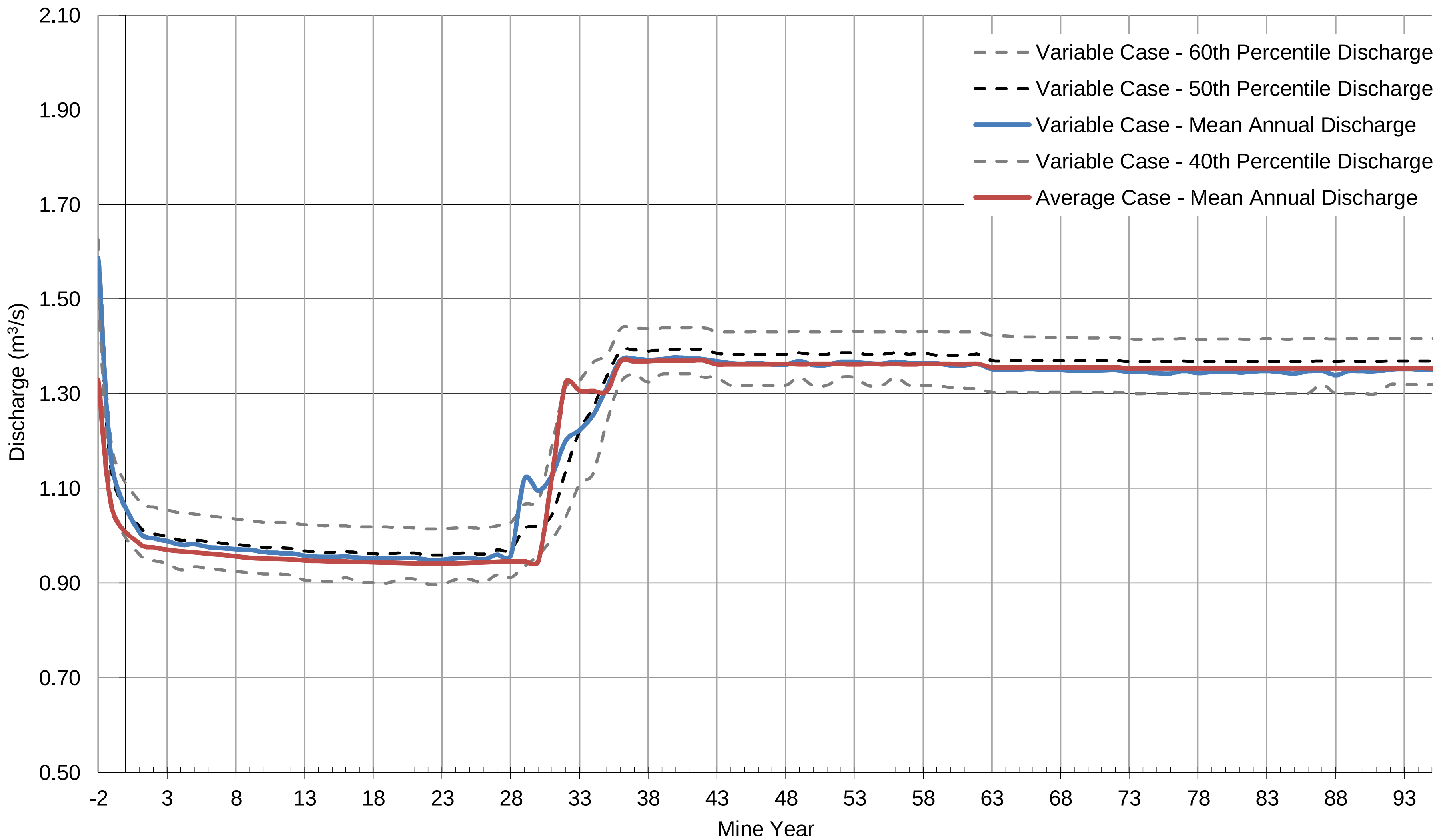
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-8

REV 1



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

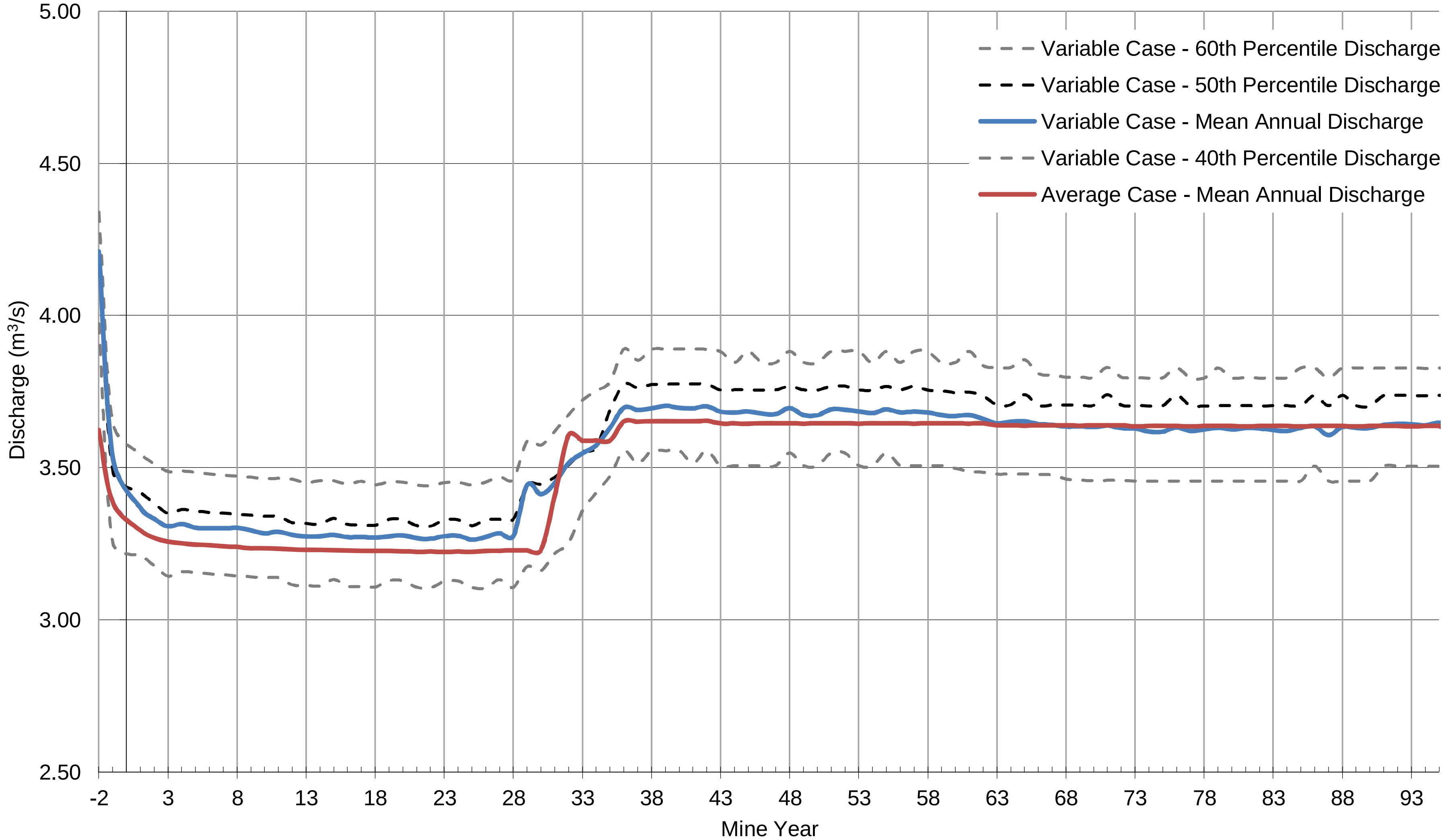
COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 9 HARPER CREEK BELOW T-CREEK CONFLUENCE

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-458/14	1

FIGURE B-9 REV 1

1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

COMPARISON OF VARIABLE AND AVERAGE MODEL SCENARIOS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE B-10

REV 1

APPENDIX C

WATERSHED MODEL RESULTS FOR NODE 1

(Pages C-1 to C-10)

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TABLE C-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	166.4	Discharge	m^3/s	0.68	0.57	0.54	3.30	11.39	11.36	5.15	2.28	1.71	1.90	1.18	0.84	3.41
			Unit Runoff	$l/s/km^2$	4.1	3.4	3.2	19.9	68.5	68.3	31.0	13.7	10.3	11.4	7.1	5.1	20.5
-1	End of Construction	150.9	Discharge	m^3/s	0.70	0.59	0.57	3.37	10.76	10.32	4.63	2.23	1.65	1.85	1.14	0.79	3.22
			Unit Runoff	$l/s/km^2$	4.7	3.9	3.8	22.3	71.3	68.4	30.7	14.8	11.0	12.3	7.6	5.3	21.3
			Change from Pre-Mine	m^3/s	0.02	0.02	0.03	0.06	-0.63	-1.04	-0.53	-0.05	-0.06	-0.05	-0.04	-0.05	-0.19
		-9%		%	3%	4%	5%	2%	-6%	-9%	-10%	-2%	-3%	-2%	-3%	-6%	-6%
10	Operations I	148.1	Discharge	m^3/s	0.63	0.51	0.49	3.06	9.94	9.49	4.39	2.13	1.57	1.76	1.14	0.80	2.99
			Unit Runoff	$l/s/km^2$	4.3	3.4	3.3	20.7	67.1	64.1	29.6	14.4	10.6	11.9	7.7	5.4	20.2
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.05	-0.24	-1.45	-1.87	-0.77	-0.16	-0.14	-0.14	-0.05	-0.04	-0.42
		-11%		%	-8%	-10%	-9%	-7%	-13%	-16%	-15%	-7%	-8%	-7%	-4%	-5%	-12%
22	Operations I	147.1	Discharge	m^3/s	0.62	0.50	0.48	3.07	9.90	9.38	4.30	2.10	1.56	1.75	1.13	0.80	2.97
			Unit Runoff	$l/s/km^2$	4.2	3.4	3.3	20.9	67.3	63.8	29.3	14.3	10.6	11.9	7.7	5.4	20.2
			Change from Pre-Mine	m^3/s	-0.06	-0.07	-0.05	-0.24	-1.49	-1.98	-0.85	-0.18	-0.16	-0.15	-0.05	-0.05	-0.44
		-12%		%	-8%	-11%	-10%	-7%	-13%	-17%	-17%	-8%	-9%	-8%	-4%	-6%	-13%
27	Operations II	147.4	Discharge	m^3/s	0.62	0.50	0.47	3.03	9.91	9.47	4.37	2.13	1.57	1.73	1.13	0.80	2.98
			Unit Runoff	$l/s/km^2$	4.2	3.4	3.2	20.5	67.2	64.2	29.7	14.4	10.7	11.7	7.7	5.4	20.2
			Change from Pre-Mine	m^3/s	-0.06	-0.07	-0.07	-0.27	-1.48	-1.89	-0.78	-0.16	-0.14	-0.17	-0.05	-0.05	-0.43
		-11%		%	-9%	-12%	-13%	-8%	-13%	-17%	-15%	-7%	-8%	-9%	-4%	-5%	-13%
30	Closure	162.5	Discharge	m^3/s	0.65	0.53	0.51	3.18	10.40	9.95	4.52	2.16	1.62	1.82	1.17	0.83	3.11
			Unit Runoff	$l/s/km^2$	4.0	3.3	3.2	19.5	64.0	61.2	27.8	13.3	9.9	11.2	7.2	5.1	19.2
			Change from Pre-Mine	m^3/s	-0.03	-0.04	-0.03	-0.13	-0.99	-1.40	-0.63	-0.12	-0.10	-0.08	-0.01	-0.01	-0.30
		-2%		%	-4%	-6%	-5%	-4%	-9%	-12%	-12%	-5%	-6%	-4%	-1%	-1%	-9%
50	Post-Closure	162.7	Discharge	m^3/s	0.70	0.64	0.68	3.46	11.35	11.00	4.81	2.26	1.69	1.97	1.21	0.87	3.39
			Unit Runoff	$l/s/km^2$	4.3	3.9	4.2	21.3	69.8	67.6	29.6	13.9	10.4	12.1	7.4	5.3	20.8
			Change from Pre-Mine	m^3/s	0.01	0.07	0.14	0.16	-0.04	-0.36	-0.35	-0.02	-0.02	0.07	0.03	0.03	-0.02
		-2%		%	2%	13%	25%	5%	0%	-3%	-7%	-1%	-1%	4%	2%	3%	-1%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 1_R1.xlsx]Mean Monthly

NOTE:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE C-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.43	0.45	0.49	0.59	0.68	0.81	0.85	0.87	0.90
February	0.36	0.38	0.41	0.50	0.57	0.68	0.70	0.72	0.75
March	0.33	0.34	0.36	0.43	0.54	0.60	0.64	0.77	1.10
April	0.48	0.54	0.62	0.97	3.30	5.72	6.58	7.11	8.79
May	5.87	6.45	7.36	8.36	11.39	14.48	15.68	16.94	18.02
June	3.52	4.13	5.86	7.08	11.36	15.73	17.44	19.19	20.96
July	1.44	1.48	1.67	2.13	5.15	7.05	10.02	11.13	15.01
August	0.88	0.91	1.10	1.39	2.28	2.71	3.62	4.86	8.79
September	0.76	0.83	0.91	0.98	1.71	1.92	2.98	3.82	5.18
October	0.68	0.77	0.84	0.98	1.90	2.71	3.37	4.03	5.93
November	0.62	0.64	0.71	0.87	1.18	1.55	1.69	1.74	1.78
December	0.51	0.54	0.58	0.72	0.84	1.02	1.07	1.09	1.12
Annual	1.73	1.99	2.33	2.63	3.41	4.15	4.61	4.90	5.38

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE C-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.57	0.58	0.60	0.65	0.70	0.76	0.79	0.80	0.82
	Change from Pre-Mine	m^3/s	0.14	0.13	0.12	0.06	0.02	-0.05	-0.06	-0.07	-0.08
		%	32%	28%	24%	10%	3%	-7%	-7%	-8%	-9%
February	Discharge	m^3/s	0.48	0.49	0.51	0.55	0.59	0.64	0.66	0.67	0.68
	Change from Pre-Mine	m^3/s	0.12	0.11	0.10	0.05	0.02	-0.04	-0.05	-0.06	-0.07
		%	32%	28%	23%	10%	4%	-6%	-7%	-8%	-9%
March	Discharge	m^3/s	0.41	0.43	0.45	0.48	0.57	0.57	0.62	0.83	1.14
	Change from Pre-Mine	m^3/s	0.08	0.09	0.08	0.05	0.03	-0.04	-0.02	0.06	0.04
		%	24%	26%	23%	12%	5%	-6%	-4%	8%	3%
April	Discharge	m^3/s	0.60	0.71	0.92	1.33	3.37	5.36	6.43	7.64	8.26
	Change from Pre-Mine	m^3/s	0.12	0.17	0.30	0.37	0.06	-0.36	-0.15	0.52	-0.52
		%	25%	32%	48%	38%	2%	-6%	-2%	7%	-6%
May	Discharge	m^3/s	6.49	7.06	7.46	8.17	10.76	13.03	14.34	15.90	16.53
	Change from Pre-Mine	m^3/s	0.62	0.61	0.10	-0.20	-0.63	-1.45	-1.34	-1.03	-1.49
		%	11%	10%	1%	-2%	-6%	-10%	-9%	-6%	-8%
June	Discharge	m^3/s	4.07	4.19	5.59	7.02	10.32	13.04	14.88	17.26	18.50
	Change from Pre-Mine	m^3/s	0.55	0.06	-0.27	-0.06	-1.04	-2.70	-2.56	-1.93	-2.47
		%	16%	2%	-5%	-1%	-9%	-17%	-15%	-10%	-12%
July	Discharge	m^3/s	1.59	1.73	2.02	2.79	4.63	6.29	7.70	8.36	10.56
	Change from Pre-Mine	m^3/s	0.15	0.25	0.35	0.66	-0.53	-0.76	-2.33	-2.78	-4.45
		%	10%	17%	21%	31%	-10%	-11%	-23%	-25%	-30%
August	Discharge	m^3/s	1.18	1.21	1.32	1.47	2.23	2.67	3.45	4.49	5.60
	Change from Pre-Mine	m^3/s	0.30	0.30	0.22	0.08	-0.05	-0.04	-0.17	-0.37	-3.19
		%	34%	33%	20%	6%	-2%	-1%	-5%	-8%	-36%
September	Discharge	m^3/s	0.93	0.97	1.01	1.09	1.65	1.81	2.41	3.23	4.97
	Change from Pre-Mine	m^3/s	0.17	0.14	0.09	0.10	-0.06	-0.11	-0.56	-0.59	-0.21
		%	22%	18%	10%	11%	-3%	-6%	-19%	-15%	-4%
October	Discharge	m^3/s	0.86	0.89	0.96	1.05	1.85	2.51	3.28	3.73	5.22
	Change from Pre-Mine	m^3/s	0.18	0.12	0.12	0.07	-0.05	-0.20	-0.09	-0.30	-0.70
		%	26%	15%	14%	7%	-2%	-7%	-3%	-7%	-12%
November	Discharge	m^3/s	0.72	0.76	0.81	0.87	1.14	1.39	1.48	1.53	1.56
	Change from Pre-Mine	m^3/s	0.10	0.12	0.11	0.00	-0.04	-0.16	-0.21	-0.21	-0.22
		%	16%	19%	15%	0%	-3%	-10%	-12%	-12%	-12%
December	Discharge	m^3/s	0.59	0.63	0.68	0.70	0.79	0.88	0.91	0.95	0.96
	Change from Pre-Mine	m^3/s	0.08	0.09	0.09	-0.01	-0.05	-0.14	-0.15	-0.14	-0.16
		%	15%	17%	16%	-2%	-6%	-14%	-14%	-13%	-15%
Annual	Discharge	m^3/s	2.11	2.23	2.36	2.68	3.22	3.83	4.04	4.36	4.41
	Change from Pre-Mine	m^3/s	0.39	0.24	0.03	0.05	-0.19	-0.33	-0.57	-0.54	-0.97
		%	23%	12%	1%	2%	-6%	-8%	-12%	-11%	-18%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

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TABLE C-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.42	0.47	0.49	0.54	0.63	0.71	0.74	0.76	0.78
	Change from Pre-Mine	m^3/s	-0.01	0.02	0.00	-0.05	-0.05	-0.10	-0.10	-0.11	-0.12
		%	-2%	4%	0%	-9%	-8%	-12%	-12%	-12%	-13%
February	Discharge	m^3/s	0.34	0.38	0.39	0.43	0.51	0.58	0.60	0.62	0.63
	Change from Pre-Mine	m^3/s	-0.02	0.00	-0.02	-0.06	-0.06	-0.10	-0.10	-0.10	-0.12
		%	-6%	0%	-5%	-12%	-10%	-15%	-15%	-14%	-16%
March	Discharge	m^3/s	0.29	0.33	0.35	0.38	0.49	0.51	0.56	0.69	0.94
	Change from Pre-Mine	m^3/s	-0.04	-0.02	-0.02	-0.05	-0.05	-0.09	-0.08	-0.07	-0.16
		%	-13%	-5%	-4%	-12%	-9%	-15%	-13%	-9%	-14%
April	Discharge	m^3/s	0.43	0.47	0.53	0.88	3.06	4.83	6.20	6.86	7.57
	Change from Pre-Mine	m^3/s	-0.05	-0.07	-0.09	-0.08	-0.24	-0.89	-0.38	-0.25	-1.21
		%	-10%	-13%	-15%	-8%	-7%	-16%	-6%	-4%	-14%
May	Discharge	m^3/s	5.70	6.04	7.16	7.98	9.94	11.83	12.81	14.04	14.64
	Change from Pre-Mine	m^3/s	-0.17	-0.41	-0.20	-0.39	-1.45	-2.65	-2.87	-2.90	-3.38
		%	-3%	-6%	-3%	-5%	-13%	-18%	-18%	-17%	-19%
June	Discharge	m^3/s	3.80	4.43	5.47	7.10	9.49	12.08	13.47	14.19	15.93
	Change from Pre-Mine	m^3/s	0.28	0.30	-0.39	0.02	-1.87	-3.66	-3.97	-5.00	-5.03
		%	8%	7%	-7%	0%	-16%	-23%	-23%	-26%	-24%
July	Discharge	m^3/s	1.46	1.57	1.89	2.52	4.39	5.69	7.44	9.38	10.69
	Change from Pre-Mine	m^3/s	0.02	0.09	0.22	0.39	-0.77	-1.36	-2.58	-1.75	-4.33
		%	1%	6%	13%	18%	-15%	-19%	-26%	-16%	-29%
August	Discharge	m^3/s	1.06	1.16	1.29	1.46	2.13	2.82	3.38	3.95	5.30
	Change from Pre-Mine	m^3/s	0.19	0.25	0.20	0.07	-0.16	0.12	-0.24	-0.91	-3.49
		%	21%	27%	18%	5%	-7%	4%	-7%	-19%	-40%
September	Discharge	m^3/s	0.90	0.94	1.00	1.07	1.57	1.83	2.18	3.02	3.56
	Change from Pre-Mine	m^3/s	0.14	0.11	0.09	0.09	-0.14	-0.09	-0.79	-0.80	-1.63
		%	18%	13%	9%	9%	-8%	-5%	-27%	-21%	-31%
October	Discharge	m^3/s	0.81	0.87	0.92	1.00	1.76	2.42	3.07	3.83	4.02
	Change from Pre-Mine	m^3/s	0.13	0.10	0.08	0.02	-0.14	-0.29	-0.31	-0.20	-1.90
		%	18%	13%	10%	3%	-7%	-11%	-9%	-5%	-32%
November	Discharge	m^3/s	0.65	0.72	0.76	0.83	1.14	1.40	1.47	1.55	1.59
	Change from Pre-Mine	m^3/s	0.04	0.07	0.05	-0.04	-0.05	-0.15	-0.22	-0.19	-0.18
		%	6%	11%	7%	-5%	-4%	-10%	-13%	-11%	-10%
December	Discharge	m^3/s	0.52	0.58	0.60	0.67	0.80	0.92	0.95	0.98	0.99
	Change from Pre-Mine	m^3/s	0.01	0.04	0.02	-0.05	-0.04	-0.10	-0.11	-0.11	-0.13
		%	2%	7%	3%	-7%	-5%	-9%	-11%	-10%	-12%
Annual	Discharge	m^3/s	1.78	1.99	2.22	2.46	2.99	3.44	3.77	4.00	4.12
	Change from Pre-Mine	m^3/s	0.05	0.00	-0.10	-0.17	-0.42	-0.72	-0.84	-0.90	-1.26
		%	3%	0%	-5%	-7%	-12%	-17%	-18%	-18%	-23%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE C-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.42	0.46	0.48	0.53	0.62	0.71	0.74	0.76	0.78
	Change from Pre-Mine	m^3/s	-0.01	0.01	-0.01	-0.06	-0.06	-0.11	-0.11	-0.11	-0.12
		%	-2%	3%	-1%	-10%	-8%	-13%	-13%	-13%	-14%
February	Discharge	m^3/s	0.34	0.38	0.39	0.43	0.50	0.57	0.59	0.61	0.63
	Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.02	-0.07	-0.07	-0.11	-0.11	-0.11	-0.12
		%	-7%	-2%	-6%	-13%	-11%	-16%	-15%	-15%	-16%
March	Discharge	m^3/s	0.29	0.32	0.34	0.37	0.48	0.51	0.56	0.69	0.94
	Change from Pre-Mine	m^3/s	-0.05	-0.02	-0.02	-0.06	-0.05	-0.10	-0.09	-0.08	-0.16
		%	-14%	-6%	-5%	-13%	-10%	-16%	-14%	-10%	-15%
April	Discharge	m^3/s	0.43	0.49	0.54	0.93	3.07	4.82	6.19	6.85	7.56
	Change from Pre-Mine	m^3/s	-0.05	-0.05	-0.08	-0.03	-0.24	-0.90	-0.39	-0.27	-1.23
		%	-11%	-9%	-13%	-4%	-7%	-16%	-6%	-4%	-14%
May	Discharge	m^3/s	5.68	6.03	7.15	7.96	9.90	11.79	12.78	14.00	14.59
	Change from Pre-Mine	m^3/s	-0.19	-0.42	-0.21	-0.41	-1.49	-2.68	-2.90	-2.94	-3.43
		%	-3%	-7%	-3%	-5%	-13%	-19%	-18%	-17%	-19%
June	Discharge	m^3/s	3.78	4.40	5.43	6.83	9.38	12.03	13.41	14.13	15.86
	Change from Pre-Mine	m^3/s	0.26	0.27	-0.42	-0.25	-1.98	-3.71	-4.03	-5.06	-5.10
		%	7%	7%	-7%	-4%	-17%	-24%	-23%	-26%	-24%
July	Discharge	m^3/s	1.46	1.57	1.74	2.49	4.30	5.52	7.27	9.33	10.63
	Change from Pre-Mine	m^3/s	0.02	0.09	0.07	0.36	-0.85	-1.52	-2.75	-1.80	-4.38
		%	1%	6%	4%	17%	-17%	-22%	-27%	-16%	-29%
August	Discharge	m^3/s	1.06	1.16	1.26	1.43	2.10	2.81	3.36	3.92	5.28
	Change from Pre-Mine	m^3/s	0.18	0.24	0.16	0.04	-0.18	0.10	-0.26	-0.94	-3.51
		%	21%	26%	15%	3%	-8%	4%	-7%	-19%	-40%
September	Discharge	m^3/s	0.90	0.93	0.99	1.07	1.56	1.82	2.17	3.00	3.52
	Change from Pre-Mine	m^3/s	0.14	0.11	0.08	0.08	-0.16	-0.10	-0.80	-0.82	-1.66
		%	18%	13%	9%	8%	-9%	-5%	-27%	-21%	-32%
October	Discharge	m^3/s	0.80	0.87	0.92	1.00	1.75	2.41	3.05	3.82	4.01
	Change from Pre-Mine	m^3/s	0.12	0.10	0.08	0.02	-0.15	-0.30	-0.32	-0.21	-1.91
		%	18%	12%	10%	2%	-8%	-11%	-10%	-5%	-32%
November	Discharge	m^3/s	0.65	0.71	0.75	0.82	1.13	1.40	1.47	1.54	1.59
	Change from Pre-Mine	m^3/s	0.04	0.07	0.04	-0.05	-0.05	-0.15	-0.22	-0.20	-0.19
		%	6%	11%	6%	-5%	-4%	-10%	-13%	-11%	-11%
December	Discharge	m^3/s	0.52	0.57	0.60	0.66	0.80	0.91	0.95	0.98	0.99
	Change from Pre-Mine	m^3/s	0.01	0.04	0.01	-0.05	-0.05	-0.10	-0.12	-0.11	-0.14
		%	2%	7%	2%	-7%	-6%	-10%	-11%	-10%	-12%
Annual	Discharge	m^3/s	1.77	1.98	2.21	2.44	2.97	3.42	3.75	3.98	4.10
	Change from Pre-Mine	m^3/s	0.04	-0.01	-0.12	-0.20	-0.44	-0.73	-0.85	-0.92	-1.27
		%	2%	0%	-5%	-7%	-13%	-18%	-19%	-19%	-24%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

TABLE C-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.42	0.46	0.48	0.53	0.62	0.71	0.73	0.76	0.77
	Change from Pre-Mine	m^3/s	-0.01	0.01	-0.01	-0.06	-0.06	-0.11	-0.11	-0.11	-0.13
		%	-3%	2%	-2%	-10%	-9%	-13%	-13%	-13%	-14%
February	Discharge	m^3/s	0.34	0.38	0.39	0.43	0.50	0.57	0.59	0.61	0.63
	Change from Pre-Mine	m^3/s	-0.03	-0.01	-0.03	-0.07	-0.07	-0.11	-0.11	-0.11	-0.12
		%	-7%	-2%	-6%	-14%	-12%	-16%	-16%	-16%	-16%
March	Discharge	m^3/s	0.28	0.31	0.33	0.36	0.47	0.49	0.53	0.60	0.92
	Change from Pre-Mine	m^3/s	-0.06	-0.03	-0.03	-0.07	-0.07	-0.12	-0.11	-0.17	-0.18
		%	-17%	-9%	-8%	-16%	-13%	-19%	-18%	-22%	-17%
April	Discharge	m^3/s	0.43	0.47	0.53	0.88	3.03	4.80	6.21	6.86	7.56
	Change from Pre-Mine	m^3/s	-0.05	-0.07	-0.10	-0.08	-0.27	-0.92	-0.38	-0.25	-1.23
		%	-11%	-13%	-15%	-9%	-8%	-16%	-6%	-4%	-14%
May	Discharge	m^3/s	5.69	6.04	7.16	7.97	9.91	11.81	12.80	14.02	14.61
	Change from Pre-Mine	m^3/s	-0.18	-0.41	-0.20	-0.39	-1.48	-2.66	-2.88	-2.92	-3.41
		%	-3%	-6%	-3%	-5%	-13%	-18%	-18%	-17%	-19%
June	Discharge	m^3/s	3.78	4.43	5.46	6.86	9.47	12.06	13.45	14.17	15.90
	Change from Pre-Mine	m^3/s	0.26	0.30	-0.40	-0.22	-1.89	-3.67	-3.99	-5.02	-5.06
		%	7%	7%	-7%	-3%	-17%	-23%	-23%	-26%	-24%
July	Discharge	m^3/s	1.46	1.57	1.74	2.49	4.37	5.73	7.42	9.37	10.66
	Change from Pre-Mine	m^3/s	0.02	0.09	0.07	0.36	-0.78	-1.32	-2.60	-1.76	-4.35
		%	1%	6%	4%	17%	-15%	-19%	-26%	-16%	-29%
August	Discharge	m^3/s	1.06	1.16	1.26	1.44	2.13	2.80	3.37	3.97	5.31
	Change from Pre-Mine	m^3/s	0.18	0.24	0.16	0.04	-0.16	0.09	-0.25	-0.89	-3.48
		%	21%	27%	15%	3%	-7%	3%	-7%	-18%	-40%
September	Discharge	m^3/s	0.90	0.93	0.99	1.07	1.57	1.82	2.27	3.00	3.94
	Change from Pre-Mine	m^3/s	0.14	0.11	0.08	0.08	-0.14	-0.10	-0.70	-0.82	-1.25
		%	18%	13%	9%	8%	-8%	-5%	-24%	-21%	-24%
October	Discharge	m^3/s	0.80	0.87	0.92	1.00	1.73	2.31	2.90	3.52	4.01
	Change from Pre-Mine	m^3/s	0.12	0.10	0.08	0.02	-0.17	-0.40	-0.47	-0.52	-1.92
		%	18%	12%	10%	2%	-9%	-15%	-14%	-13%	-32%
November	Discharge	m^3/s	0.65	0.72	0.75	0.82	1.13	1.39	1.46	1.55	1.61
	Change from Pre-Mine	m^3/s	0.04	0.07	0.04	-0.05	-0.05	-0.16	-0.23	-0.19	-0.17
		%	6%	11%	6%	-6%	-4%	-11%	-14%	-11%	-9%
December	Discharge	m^3/s	0.52	0.57	0.60	0.67	0.80	0.91	0.95	0.98	1.04
	Change from Pre-Mine	m^3/s	0.01	0.04	0.02	-0.05	-0.05	-0.10	-0.11	-0.11	-0.08
		%	2%	7%	3%	-7%	-5%	-10%	-11%	-10%	-7%
Annual	Discharge	m^3/s	1.77	1.99	2.21	2.44	2.98	3.43	3.76	3.99	4.11
	Change from Pre-Mine	m^3/s	0.04	-0.01	-0.12	-0.19	-0.43	-0.73	-0.85	-0.91	-1.27
		%	3%	0%	-5%	-7%	-13%	-18%	-18%	-19%	-24%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

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TABLE C-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.42	0.47	0.50	0.55	0.65	0.74	0.80	0.82	0.84
	Change from Pre-Mine	m^3/s	-0.01	0.02	0.01	-0.04	-0.03	-0.07	-0.04	-0.05	-0.06
		%	-1%	5%	3%	-7%	-4%	-9%	-5%	-5%	-7%
February	Discharge	m^3/s	0.34	0.39	0.40	0.44	0.53	0.62	0.66	0.68	0.69
	Change from Pre-Mine	m^3/s	-0.02	0.00	-0.01	-0.05	-0.04	-0.06	-0.04	-0.04	-0.06
		%	-6%	0%	-2%	-11%	-6%	-9%	-6%	-6%	-7%
March	Discharge	m^3/s	0.29	0.33	0.35	0.38	0.51	0.58	0.63	0.69	1.06
	Change from Pre-Mine	m^3/s	-0.05	-0.01	-0.02	-0.05	-0.03	-0.03	-0.02	-0.08	-0.04
		%	-14%	-3%	-5%	-11%	-5%	-5%	-2%	-10%	-3%
April	Discharge	m^3/s	0.43	0.47	0.52	0.93	3.18	5.30	6.74	7.19	7.57
	Change from Pre-Mine	m^3/s	-0.05	-0.07	-0.10	-0.03	-0.13	-0.42	0.15	0.07	-1.22
		%	-11%	-14%	-16%	-4%	-4%	-7%	2%	1%	-14%
May	Discharge	m^3/s	5.69	6.89	7.25	7.97	10.40	12.96	13.65	14.34	14.78
	Change from Pre-Mine	m^3/s	-0.18	0.44	-0.11	-0.39	-0.99	-1.52	-2.03	-2.59	-3.24
		%	-3%	7%	-1%	-5%	-9%	-10%	-13%	-15%	-18%
June	Discharge	m^3/s	3.87	4.56	5.46	7.08	9.95	12.57	13.91	15.95	18.01
	Change from Pre-Mine	m^3/s	0.34	0.43	-0.40	0.00	-1.40	-3.16	-3.53	-3.25	-2.96
		%	10%	10%	-7%	0%	-12%	-20%	-20%	-17%	-14%
July	Discharge	m^3/s	1.46	1.57	1.74	2.51	4.52	5.99	7.90	9.45	11.69
	Change from Pre-Mine	m^3/s	0.02	0.09	0.07	0.38	-0.63	-1.06	-2.13	-1.68	-3.33
		%	1%	6%	4%	18%	-12%	-15%	-21%	-15%	-22%
August	Discharge	m^3/s	1.06	1.16	1.26	1.44	2.16	2.85	3.40	4.14	5.31
	Change from Pre-Mine	m^3/s	0.18	0.24	0.16	0.04	-0.12	0.15	-0.23	-0.72	-3.48
		%	21%	26%	15%	3%	-5%	5%	-6%	-15%	-40%
September	Discharge	m^3/s	0.91	0.95	1.02	1.09	1.62	1.99	2.33	3.01	3.92
	Change from Pre-Mine	m^3/s	0.14	0.12	0.11	0.11	-0.10	0.07	-0.65	-0.81	-1.26
		%	19%	15%	12%	11%	-6%	4%	-22%	-21%	-24%
October	Discharge	m^3/s	0.82	0.91	0.93	1.00	1.82	2.58	3.19	3.88	4.23
	Change from Pre-Mine	m^3/s	0.14	0.14	0.09	0.02	-0.08	-0.13	-0.18	-0.15	-1.69
		%	20%	18%	11%	2%	-4%	-5%	-5%	-4%	-29%
November	Discharge	m^3/s	0.67	0.74	0.78	0.85	1.17	1.45	1.52	1.61	1.66
	Change from Pre-Mine	m^3/s	0.06	0.10	0.07	-0.02	-0.01	-0.10	-0.17	-0.12	-0.12
		%	10%	16%	10%	-2%	-1%	-7%	-10%	-7%	-7%
December	Discharge	m^3/s	0.55	0.60	0.62	0.68	0.83	0.97	1.04	1.06	1.09
	Change from Pre-Mine	m^3/s	0.04	0.06	0.04	-0.03	-0.01	-0.04	-0.03	-0.03	-0.04
		%	8%	11%	7%	-5%	-1%	-4%	-2%	-3%	-3%
Annual	Discharge	m^3/s	1.95	2.10	2.22	2.47	3.11	3.74	4.02	4.30	4.50
	Change from Pre-Mine	m^3/s	0.22	0.10	-0.11	-0.16	-0.30	-0.42	-0.59	-0.60	-0.88
		%	13%	5%	-5%	-6%	-9%	-10%	-13%	-12%	-16%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

Knight Piésold CONSULTING

TABLE C-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.48	0.53	0.55	0.60	0.70	0.78	0.81	0.84	0.85
	Change from Pre-Mine	m^3/s	0.05	0.08	0.06	0.01	0.01	-0.03	-0.03	-0.03	-0.05
		%	13%	18%	13%	1%	2%	-4%	-4%	-3%	-5%
February	Discharge	m^3/s	0.47	0.50	0.52	0.56	0.64	0.71	0.74	0.76	0.77
	Change from Pre-Mine	m^3/s	0.11	0.12	0.11	0.06	0.07	0.03	0.03	0.04	0.02
		%	29%	31%	26%	13%	13%	5%	5%	5%	3%
March	Discharge	m^3/s	0.47	0.50	0.52	0.56	0.68	0.70	0.75	0.88	1.17
	Change from Pre-Mine	m^3/s	0.13	0.16	0.16	0.13	0.14	0.10	0.11	0.12	0.07
		%	40%	47%	45%	30%	25%	16%	17%	15%	6%
April	Discharge	m^3/s	0.62	0.66	0.73	1.12	3.46	5.38	6.93	7.60	8.64
	Change from Pre-Mine	m^3/s	0.14	0.12	0.11	0.16	0.16	-0.34	0.35	0.48	-0.14
		%	30%	22%	18%	16%	5%	-6%	5%	7%	-2%
May	Discharge	m^3/s	6.71	7.33	8.43	9.28	11.35	13.49	14.43	15.75	16.67
	Change from Pre-Mine	m^3/s	0.84	0.88	1.06	0.92	-0.04	-0.99	-1.25	-1.19	-1.35
		%	14%	14%	14%	11%	0%	-7%	-8%	-7%	-7%
June	Discharge	m^3/s	4.26	4.83	6.06	7.91	11.00	13.90	15.63	16.89	18.08
	Change from Pre-Mine	m^3/s	0.74	0.70	0.20	0.83	-0.36	-1.84	-1.81	-2.30	-2.88
		%	21%	17%	3%	12%	-3%	-12%	-10%	-12%	-14%
July	Discharge	m^3/s	1.57	1.64	1.87	2.71	4.81	6.12	8.47	10.10	11.76
	Change from Pre-Mine	m^3/s	0.13	0.16	0.20	0.58	-0.35	-0.93	-1.55	-1.03	-3.25
		%	9%	10%	12%	27%	-7%	-13%	-15%	-9%	-22%
August	Discharge	m^3/s	1.10	1.20	1.31	1.47	2.26	2.96	3.64	4.28	5.40
	Change from Pre-Mine	m^3/s	0.22	0.29	0.22	0.08	-0.02	0.26	0.02	-0.58	-3.39
		%	25%	31%	20%	5%	-1%	9%	1%	-12%	-39%
September	Discharge	m^3/s	0.93	1.03	1.07	1.16	1.69	2.05	2.35	3.47	3.90
	Change from Pre-Mine	m^3/s	0.16	0.20	0.16	0.18	-0.02	0.13	-0.63	-0.35	-1.28
		%	22%	24%	18%	18%	-1%	7%	-21%	-9%	-25%
October	Discharge	m^3/s	0.87	0.94	1.00	1.13	1.97	2.77	3.28	4.38	4.71
	Change from Pre-Mine	m^3/s	0.19	0.17	0.16	0.15	0.07	0.06	-0.09	0.35	-1.22
		%	29%	22%	19%	15%	4%	2%	-3%	9%	-21%
November	Discharge	m^3/s	0.72	0.79	0.82	0.90	1.21	1.48	1.55	1.63	1.69
	Change from Pre-Mine	m^3/s	0.11	0.15	0.12	0.03	0.03	-0.07	-0.14	-0.10	-0.09
		%	18%	23%	16%	3%	2%	-4%	-8%	-6%	-5%
December	Discharge	m^3/s	0.59	0.65	0.67	0.73	0.87	0.99	1.03	1.06	1.08
	Change from Pre-Mine	m^3/s	0.08	0.11	0.09	0.01	0.03	-0.03	-0.04	-0.03	-0.05
		%	15%	21%	15%	2%	3%	-3%	-4%	-3%	-4%
Annual	Discharge	m^3/s	2.00	2.28	2.56	2.81	3.39	3.90	4.18	4.50	4.57
	Change from Pre-Mine	m^3/s	0.27	0.28	0.23	0.17	-0.02	-0.26	-0.43	-0.41	-0.80
		%	16%	14%	10%	7%	-1%	-6%	-9%	-8%	-15%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE C-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

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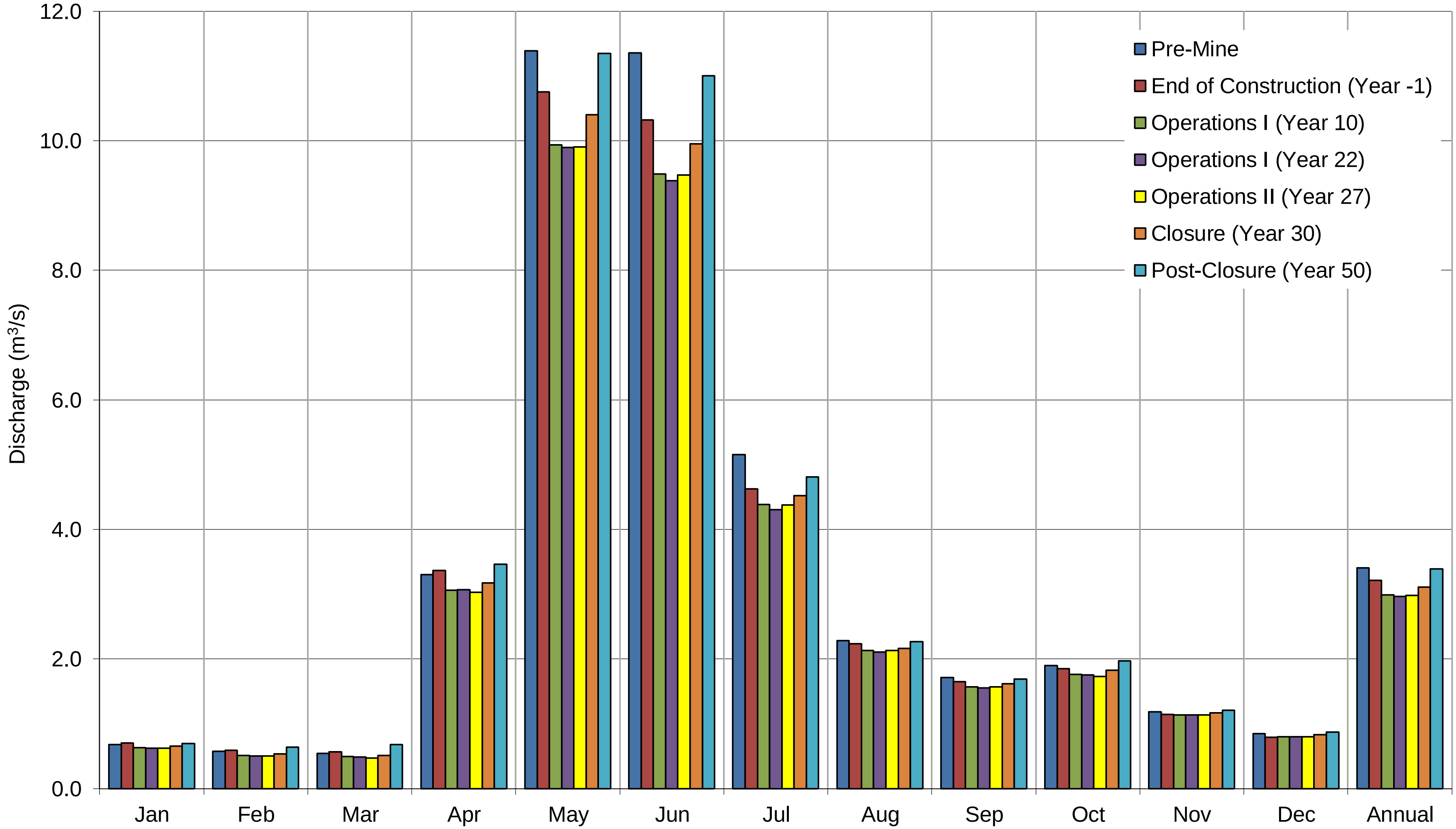
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	166.4	Discharge	m^3/s	43	53	59	63	68	71	74
			Unit Runoff	$l/s/km^2$	259	319	352	379	410	429	446
-1	End of Construction	150.9	Discharge	m^3/s	40	49	54	59	63	66	69
			Unit Runoff	$l/s/km^2$	266	327	361	389	420	440	457
			Change from Pre-Mine	m^3/s	-3	-4	-4	-4	-5	-5	-5
		-9%		%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
10	Operations I	148.1	Discharge	m^3/s	40	49	54	58	62	65	68
			Unit Runoff	$l/s/km^2$	267	329	362	391	422	442	459
			Change from Pre-Mine	m^3/s	-4	-4	-5	-5	-6	-6	-6
		-11%		%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
22	Operations I	147.1	Discharge	m^3/s	39	48	53	58	62	65	68
			Unit Runoff	$l/s/km^2$	267	329	363	391	423	443	460
			Change from Pre-Mine	m^3/s	-4	-5	-5	-6	-6	-6	-7
		-12%		%	-9%	-9%	-9%	-9%	-9%	-9%	-9%
27	Operations II	147.4	Discharge	m^3/s	39	49	53	58	62	65	68
			Unit Runoff	$l/s/km^2$	267	329	363	391	422	442	460
			Change from Pre-Mine	m^3/s	-4	-5	-5	-5	-6	-6	-6
		-11%		%	-9%	-9%	-9%	-9%	-9%	-9%	-9%
30	Closure	162.5	Discharge	m^3/s	42	52	58	62	67	70	73
			Unit Runoff	$l/s/km^2$	261	321	354	382	412	432	448
			Change from Pre-Mine	m^3/s	-1	-1	-1	-1	-1	-1	-1
		-2%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
50	Post-Closure	162.7	Discharge	m^3/s	42	52	58	62	67	70	73
			Unit Runoff	$l/s/km^2$	261	321	354	382	412	432	448
			Change from Pre-Mine	m^3/s	-1	-1	-1	-1	-1	-1	-1
		-2%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 1_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 1
HARPER CREEK NEAR THE MOUTH (WSC 08LB076)

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE C-1

REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

APPENDIX D

WATERSHED MODEL RESULTS FOR NODE 2

(Pages D-1 to D-10)

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TABLE D-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	47.0	Discharge	m^3/s	0.24	0.21	0.18	0.76	3.20	2.95	1.27	0.64	0.49	0.53	0.40	0.29	0.93
			Unit Runoff	$l/s/km^2$	5.2	4.4	3.9	16.1	68.1	62.7	26.9	13.6	10.3	11.3	8.5	6.2	19.8
-1	End of Construction	46.7	Discharge	m^3/s	0.27	0.23	0.20	0.83	3.40	3.19	1.30	0.68	0.51	0.57	0.44	0.32	1.00
			Unit Runoff	$l/s/km^2$	5.9	5.0	4.4	17.9	72.8	68.3	27.8	14.7	11.0	12.2	9.3	6.8	21.3
			Change from Pre-Mine	m^3/s	0.03	0.03	0.02	0.08	0.20	0.24	0.03	0.05	0.03	0.04	0.04	0.03	0.07
		-1%		%	13%	13%	12%	10%	6%	8%	3%	7%	6%	8%	9%	9%	7%
10	Operations I	44.4	Discharge	m^3/s	0.22	0.19	0.16	0.71	2.84	2.58	1.15	0.61	0.45	0.49	0.38	0.27	0.84
			Unit Runoff	$l/s/km^2$	5.1	4.2	3.7	15.9	64.0	58.2	26.0	13.7	10.2	11.0	8.6	6.2	18.9
			Change from Pre-Mine	m^3/s	-0.02	-0.02	-0.02	-0.05	-0.36	-0.37	-0.11	-0.03	-0.03	-0.04	-0.02	-0.02	-0.09
		-6%		%	-8%	-10%	-10%	-7%	-11%	-12%	-9%	-5%	-7%	-8%	-4%	-6%	-10%
22	Operations I	43.6	Discharge	m^3/s	0.22	0.18	0.16	0.69	2.82	2.56	1.14	0.60	0.45	0.48	0.38	0.27	0.83
			Unit Runoff	$l/s/km^2$	5.0	4.1	3.6	15.9	64.6	58.6	26.2	13.8	10.3	11.0	8.6	6.2	19.0
			Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.02	-0.06	-0.38	-0.39	-0.12	-0.04	-0.04	-0.05	-0.02	-0.02	-0.10
		-7%		%	-10%	-13%	-13%	-9%	-12%	-13%	-10%	-6%	-8%	-9%	-6%	-8%	-11%
27	Operations II	43.9	Discharge	m^3/s	0.22	0.18	0.15	0.68	2.86	2.60	1.15	0.61	0.44	0.47	0.37	0.27	0.83
			Unit Runoff	$l/s/km^2$	5.0	4.1	3.5	15.5	65.2	59.1	26.2	13.8	10.1	10.7	8.5	6.1	19.0
			Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.03	-0.08	-0.34	-0.35	-0.12	-0.03	-0.04	-0.06	-0.03	-0.02	-0.10
		-7%		%	-10%	-13%	-17%	-10%	-11%	-12%	-9%	-5%	-9%	-11%	-6%	-8%	-10%
30	Closure	44.0	Discharge	m^3/s	0.22	0.18	0.16	0.68	2.86	2.59	1.15	0.60	0.44	0.47	0.37	0.27	0.83
			Unit Runoff	$l/s/km^2$	5.0	4.1	3.6	15.5	65.0	59.0	26.1	13.7	10.1	10.8	8.5	6.1	19.0
			Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.03	-0.08	-0.34	-0.36	-0.12	-0.04	-0.04	-0.05	-0.03	-0.02	-0.10
		-7%		%	-11%	-13%	-14%	-10%	-11%	-12%	-9%	-6%	-9%	-10%	-6%	-8%	-10%
50	Post-Closure	44.0	Discharge	m^3/s	0.22	0.18	0.16	0.70	2.86	2.58	1.14	0.60	0.44	0.48	0.37	0.27	0.83
			Unit Runoff	$l/s/km^2$	4.9	4.1	3.6	15.9	64.9	58.7	26.0	13.7	10.1	10.9	8.5	6.1	18.9
			Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.03	-0.06	-0.35	-0.37	-0.12	-0.04	-0.04	-0.05	-0.02	-0.02	-0.10
		-6%		%	-11%	-14%	-15%	-8%	-11%	-12%	-10%	-6%	-8%	-10%	-6%	-9%	-10%

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NOTE:
1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE D-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.14	0.16	0.17	0.20	0.24	0.30	0.32	0.32	0.33
February	0.12	0.14	0.15	0.17	0.21	0.25	0.27	0.28	0.28
March	0.11	0.12	0.13	0.15	0.18	0.22	0.23	0.24	0.26
April	0.13	0.14	0.16	0.20	0.76	1.44	1.66	1.90	2.29
May	1.58	1.79	1.95	2.32	3.20	4.14	4.49	4.76	5.15
June	0.82	0.96	1.36	1.64	2.95	4.31	4.62	5.18	5.80
July	0.46	0.49	0.53	0.61	1.27	1.64	2.35	2.66	3.68
August	0.28	0.30	0.34	0.40	0.64	0.71	0.84	1.13	2.24
September	0.24	0.27	0.30	0.33	0.49	0.58	0.71	0.88	1.27
October	0.23	0.26	0.28	0.31	0.53	0.73	0.88	1.06	1.52
November	0.20	0.23	0.24	0.28	0.40	0.54	0.61	0.63	0.64
December	0.17	0.19	0.20	0.24	0.29	0.36	0.38	0.39	0.40
Annual	0.47	0.54	0.63	0.71	0.93	1.13	1.24	1.33	1.48

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE D-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.22	0.23	0.23	0.25	0.27	0.30	0.31	0.32	0.32
	Change from Pre-Mine	m^3/s	0.08	0.06	0.06	0.05	0.03	0.00	0.00	-0.01	-0.01
		%	53%	37%	35%	24%	13%	0%	0%	-2%	-3%
February	Discharge	m^3/s	0.19	0.19	0.20	0.21	0.23	0.26	0.27	0.27	0.27
	Change from Pre-Mine	m^3/s	0.06	0.05	0.05	0.04	0.03	0.00	0.00	-0.01	-0.01
		%	52%	37%	35%	24%	13%	0%	0%	-2%	-3%
March	Discharge	m^3/s	0.16	0.17	0.18	0.19	0.20	0.22	0.23	0.24	0.25
	Change from Pre-Mine	m^3/s	0.06	0.04	0.05	0.04	0.02	0.00	0.00	0.00	0.00
		%	54%	36%	37%	25%	12%	0%	0%	0%	0%
April	Discharge	m^3/s	0.18	0.21	0.22	0.25	0.83	1.40	1.79	2.16	2.36
	Change from Pre-Mine	m^3/s	0.05	0.07	0.06	0.05	0.08	-0.03	0.13	0.26	0.07
		%	41%	50%	40%	28%	10%	-2%	8%	14%	3%
May	Discharge	m^3/s	2.08	2.19	2.30	2.60	3.40	4.09	4.54	4.80	5.18
	Change from Pre-Mine	m^3/s	0.50	0.40	0.35	0.29	0.20	-0.05	0.05	0.04	0.03
		%	32%	22%	18%	12%	6%	-1%	1%	1%	1%
June	Discharge	m^3/s	1.13	1.21	1.60	2.02	3.19	4.07	4.82	5.51	6.01
	Change from Pre-Mine	m^3/s	0.31	0.24	0.24	0.38	0.24	-0.24	0.20	0.33	0.21
		%	38%	25%	17%	23%	8%	-6%	4%	6%	4%
July	Discharge	m^3/s	0.56	0.62	0.68	0.79	1.30	1.72	2.12	2.40	3.08
	Change from Pre-Mine	m^3/s	0.11	0.13	0.15	0.18	0.03	0.08	-0.23	-0.26	-0.60
		%	23%	28%	28%	29%	3%	5%	-10%	-10%	-16%
August	Discharge	m^3/s	0.37	0.38	0.45	0.54	0.68	0.76	0.85	1.12	1.49
	Change from Pre-Mine	m^3/s	0.09	0.09	0.10	0.14	0.05	0.05	0.01	-0.01	-0.75
		%	33%	30%	31%	35%	7%	6%	2%	-1%	-33%
September	Discharge	m^3/s	0.33	0.34	0.36	0.38	0.51	0.59	0.68	0.79	1.39
	Change from Pre-Mine	m^3/s	0.09	0.07	0.07	0.06	0.03	0.01	-0.03	-0.09	0.12
		%	37%	26%	23%	18%	6%	2%	-5%	-11%	9%
October	Discharge	m^3/s	0.31	0.33	0.36	0.38	0.57	0.72	0.92	1.09	1.58
	Change from Pre-Mine	m^3/s	0.08	0.07	0.08	0.07	0.04	-0.01	0.04	0.03	0.06
		%	37%	26%	28%	24%	8%	-2%	5%	3%	4%
November	Discharge	m^3/s	0.27	0.28	0.31	0.34	0.44	0.55	0.62	0.64	0.66
	Change from Pre-Mine	m^3/s	0.08	0.05	0.07	0.06	0.04	0.00	0.01	0.01	0.01
		%	39%	23%	31%	20%	9%	0%	2%	2%	2%
December	Discharge	m^3/s	0.23	0.24	0.26	0.28	0.32	0.36	0.38	0.40	0.40
	Change from Pre-Mine	m^3/s	0.06	0.04	0.06	0.04	0.03	0.00	0.00	0.01	0.00
		%	38%	22%	29%	17%	9%	0%	0%	2%	0%
Annual	Discharge	m^3/s	0.66	0.71	0.73	0.84	1.00	1.18	1.25	1.35	1.37
	Change from Pre-Mine	m^3/s	0.19	0.17	0.10	0.13	0.07	0.04	0.00	0.01	-0.11
		%	40%	31%	16%	18%	7%	4%	0%	1%	-7%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold
CONSULTING

TABLE D-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.16	0.17	0.18	0.22	0.26	0.27	0.29	0.30
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.02	-0.02	-0.04	-0.04	-0.04	-0.03
		%	0%	-5%	0%	-8%	-8%	-13%	-14%	-12%	-10%
February	Discharge	m^3/s	0.12	0.13	0.14	0.15	0.19	0.21	0.23	0.24	0.25
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.02	-0.02	-0.04	-0.04	-0.04	-0.03
		%	-5%	-8%	0%	-11%	-10%	-16%	-16%	-14%	-12%
March	Discharge	m^3/s	0.10	0.11	0.12	0.13	0.16	0.19	0.19	0.21	0.23
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.02	-0.02	-0.03	-0.04	-0.03	-0.02
		%	-6%	-10%	0%	-12%	-10%	-15%	-17%	-14%	-9%
April	Discharge	m^3/s	0.12	0.13	0.14	0.18	0.71	1.26	1.56	1.79	1.94
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.02	-0.02	-0.05	-0.18	-0.10	-0.12	-0.35
		%	-7%	-10%	-11%	-10%	-7%	-12%	-6%	-6%	-15%
May	Discharge	m^3/s	1.44	1.70	1.95	2.26	2.84	3.49	3.75	4.01	4.16
	Change from Pre-Mine	m^3/s	-0.14	-0.09	0.00	-0.06	-0.36	-0.66	-0.74	-0.75	-0.99
		%	-9%	-5%	0%	-3%	-11%	-16%	-16%	-16%	-19%
June	Discharge	m^3/s	0.97	1.14	1.44	1.81	2.58	3.42	3.73	4.14	4.68
	Change from Pre-Mine	m^3/s	0.14	0.18	0.08	0.17	-0.37	-0.89	-0.89	-1.04	-1.12
		%	17%	18%	6%	11%	-12%	-21%	-19%	-20%	-19%
July	Discharge	m^3/s	0.48	0.50	0.57	0.63	1.15	1.50	1.91	2.43	2.82
	Change from Pre-Mine	m^3/s	0.02	0.02	0.04	0.02	-0.11	-0.14	-0.45	-0.23	-0.86
		%	4%	3%	7%	3%	-9%	-9%	-19%	-9%	-23%
August	Discharge	m^3/s	0.30	0.32	0.36	0.47	0.61	0.70	0.83	0.96	1.46
	Change from Pre-Mine	m^3/s	0.02	0.03	0.02	0.07	-0.03	-0.02	-0.02	-0.17	-0.78
		%	8%	9%	6%	17%	-5%	-3%	-2%	-15%	-35%
September	Discharge	m^3/s	0.27	0.29	0.32	0.34	0.45	0.54	0.61	0.73	1.00
	Change from Pre-Mine	m^3/s	0.03	0.02	0.02	0.01	-0.03	-0.04	-0.10	-0.14	-0.26
		%	12%	9%	8%	4%	-7%	-7%	-14%	-16%	-21%
October	Discharge	m^3/s	0.25	0.28	0.29	0.31	0.49	0.64	0.79	0.93	1.09
	Change from Pre-Mine	m^3/s	0.02	0.01	0.01	0.00	-0.04	-0.09	-0.09	-0.12	-0.43
		%	9%	4%	4%	0%	-8%	-13%	-10%	-12%	-28%
November	Discharge	m^3/s	0.21	0.23	0.26	0.27	0.38	0.50	0.54	0.57	0.59
	Change from Pre-Mine	m^3/s	0.01	0.00	0.02	-0.01	-0.02	-0.05	-0.07	-0.06	-0.05
		%	7%	0%	8%	-3%	-4%	-9%	-12%	-9%	-8%
December	Discharge	m^3/s	0.17	0.19	0.21	0.22	0.27	0.32	0.33	0.35	0.36
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	-0.01	-0.02	-0.04	-0.05	-0.04	-0.04
		%	0%	0%	4%	-6%	-6%	-12%	-13%	-11%	-9%
Annual	Discharge	m^3/s	0.51	0.56	0.61	0.69	0.84	0.96	1.04	1.15	1.18
	Change from Pre-Mine	m^3/s	0.04	0.02	-0.02	-0.02	-0.09	-0.17	-0.20	-0.18	-0.29
		%	8%	4%	-3%	-3%	-10%	-15%	-16%	-14%	-20%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE D-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.15	0.17	0.18	0.22	0.25	0.27	0.28	0.29
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.02	-0.02	-0.05	-0.05	-0.04	-0.04
		%	-4%	-8%	0%	-11%	-10%	-15%	-16%	-14%	-12%
February	Discharge	m^3/s	0.11	0.12	0.14	0.15	0.18	0.21	0.22	0.23	0.24
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.02	-0.03	-0.04	-0.05	-0.04	-0.04
		%	-8%	-12%	-6%	-14%	-13%	-18%	-18%	-16%	-14%
March	Discharge	m^3/s	0.10	0.11	0.12	0.13	0.16	0.18	0.19	0.20	0.23
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.02	-0.02	-0.04	-0.05	-0.04	-0.03
		%	-10%	-14%	-7%	-15%	-13%	-18%	-20%	-16%	-11%
April	Discharge	m^3/s	0.12	0.12	0.14	0.17	0.69	1.25	1.55	1.78	1.93
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.03	-0.06	-0.18	-0.11	-0.13	-0.36
		%	-9%	-13%	-13%	-15%	-9%	-13%	-6%	-7%	-16%
May	Discharge	m^3/s	1.44	1.69	1.94	2.25	2.82	3.47	3.67	3.92	4.14
	Change from Pre-Mine	m^3/s	-0.14	-0.09	-0.01	-0.06	-0.38	-0.67	-0.82	-0.84	-1.01
		%	-9%	-5%	0%	-3%	-12%	-16%	-18%	-18%	-20%
June	Discharge	m^3/s	0.96	1.14	1.39	1.78	2.56	3.40	3.71	4.11	4.64
	Change from Pre-Mine	m^3/s	0.14	0.17	0.02	0.14	-0.39	-0.91	-0.91	-1.07	-1.16
		%	17%	18%	2%	8%	-13%	-21%	-20%	-21%	-20%
July	Discharge	m^3/s	0.47	0.50	0.57	0.63	1.14	1.49	1.89	2.42	2.80
	Change from Pre-Mine	m^3/s	0.01	0.01	0.03	0.01	-0.12	-0.16	-0.46	-0.25	-0.88
		%	3%	2%	7%	2%	-10%	-9%	-20%	-9%	-24%
August	Discharge	m^3/s	0.30	0.32	0.36	0.47	0.60	0.69	0.82	0.96	1.45
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.06	-0.04	-0.02	-0.02	-0.17	-0.79
		%	6%	8%	5%	16%	-6%	-3%	-3%	-15%	-35%
September	Discharge	m^3/s	0.27	0.29	0.31	0.33	0.45	0.53	0.61	0.73	0.99
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.00	-0.04	-0.05	-0.10	-0.15	-0.28
		%	10%	7%	6%	0%	-8%	-8%	-15%	-17%	-22%
October	Discharge	m^3/s	0.25	0.27	0.29	0.31	0.48	0.63	0.78	0.93	1.08
	Change from Pre-Mine	m^3/s	0.02	0.01	0.01	0.00	-0.05	-0.10	-0.10	-0.13	-0.44
		%	8%	3%	3%	0%	-9%	-14%	-11%	-13%	-29%
November	Discharge	m^3/s	0.21	0.23	0.25	0.27	0.38	0.49	0.53	0.57	0.59
	Change from Pre-Mine	m^3/s	0.01	0.00	0.02	-0.01	-0.02	-0.05	-0.08	-0.06	-0.06
		%	5%	0%	6%	-5%	-6%	-10%	-13%	-10%	-9%
December	Discharge	m^3/s	0.17	0.19	0.21	0.22	0.27	0.31	0.33	0.34	0.36
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.02	-0.02	-0.05	-0.05	-0.05	-0.04
		%	0%	-5%	0%	-8%	-8%	-13%	-14%	-12%	-10%
Annual	Discharge	m^3/s	0.50	0.55	0.61	0.67	0.83	0.95	1.04	1.14	1.17
	Change from Pre-Mine	m^3/s	0.03	0.01	-0.03	-0.04	-0.10	-0.18	-0.21	-0.19	-0.30
		%	7%	3%	-4%	-5%	-11%	-16%	-17%	-14%	-21%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE D-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.15	0.17	0.18	0.22	0.25	0.27	0.28	0.29
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.02	-0.03	-0.05	-0.05	-0.04	-0.04
		%	-5%	-8%	0%	-11%	-10%	-15%	-16%	-14%	-12%
February	Discharge	m^3/s	0.11	0.12	0.14	0.15	0.18	0.21	0.22	0.23	0.24
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.02	-0.03	-0.05	-0.05	-0.05	-0.04
		%	-9%	-12%	-6%	-14%	-13%	-18%	-18%	-16%	-14%
March	Discharge	m^3/s	0.09	0.10	0.12	0.12	0.15	0.17	0.18	0.19	0.22
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.03	-0.03	-0.05	-0.05	-0.05	-0.04
		%	-13%	-17%	-10%	-18%	-17%	-21%	-22%	-21%	-15%
April	Discharge	m^3/s	0.12	0.12	0.14	0.17	0.68	1.18	1.55	1.77	1.93
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.03	-0.08	-0.26	-0.11	-0.13	-0.36
		%	-9%	-13%	-13%	-15%	-10%	-18%	-7%	-7%	-16%
May	Discharge	m^3/s	1.46	1.83	2.00	2.30	2.86	3.49	3.76	4.02	4.17
	Change from Pre-Mine	m^3/s	-0.12	0.05	0.04	-0.02	-0.34	-0.65	-0.73	-0.75	-0.98
		%	-8%	3%	2%	-1%	-11%	-16%	-16%	-16%	-19%
June	Discharge	m^3/s	0.99	1.18	1.45	1.82	2.60	3.43	3.74	4.15	4.68
	Change from Pre-Mine	m^3/s	0.16	0.21	0.09	0.18	-0.35	-0.88	-0.87	-1.03	-1.12
		%	20%	22%	7%	11%	-12%	-20%	-19%	-20%	-19%
July	Discharge	m^3/s	0.47	0.50	0.58	0.63	1.15	1.51	1.91	2.43	2.83
	Change from Pre-Mine	m^3/s	0.01	0.01	0.04	0.02	-0.12	-0.14	-0.44	-0.23	-0.85
		%	3%	2%	8%	2%	-9%	-8%	-19%	-9%	-23%
August	Discharge	m^3/s	0.30	0.32	0.36	0.47	0.61	0.69	0.83	0.96	1.47
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.07	-0.03	-0.02	-0.02	-0.17	-0.77
		%	7%	8%	5%	16%	-5%	-3%	-2%	-15%	-34%
September	Discharge	m^3/s	0.27	0.29	0.31	0.33	0.44	0.53	0.60	0.67	1.00
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.00	-0.04	-0.05	-0.11	-0.21	-0.27
		%	10%	7%	6%	0%	-9%	-8%	-15%	-23%	-21%
October	Discharge	m^3/s	0.25	0.27	0.29	0.31	0.47	0.62	0.76	0.88	1.01
	Change from Pre-Mine	m^3/s	0.02	0.01	0.01	0.00	-0.06	-0.11	-0.12	-0.17	-0.52
		%	7%	2%	3%	0%	-11%	-15%	-14%	-16%	-34%
November	Discharge	m^3/s	0.21	0.23	0.25	0.27	0.37	0.49	0.53	0.56	0.57
	Change from Pre-Mine	m^3/s	0.01	0.00	0.01	-0.01	-0.03	-0.06	-0.08	-0.07	-0.07
		%	5%	0%	6%	-5%	-6%	-10%	-13%	-11%	-11%
December	Discharge	m^3/s	0.17	0.19	0.21	0.22	0.27	0.31	0.33	0.34	0.36
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.02	-0.02	-0.05	-0.06	-0.05	-0.04
		%	0%	-5%	0%	-8%	-8%	-14%	-15%	-13%	-11%
Annual	Discharge	m^3/s	0.50	0.56	0.61	0.68	0.83	0.96	1.04	1.15	1.18
	Change from Pre-Mine	m^3/s	0.03	0.02	-0.02	-0.04	-0.10	-0.18	-0.21	-0.18	-0.30
		%	7%	3%	-4%	-5%	-10%	-16%	-17%	-14%	-20%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE D-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.15	0.17	0.18	0.22	0.25	0.27	0.28	0.29
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.02	-0.03	-0.05	-0.05	-0.05	-0.04
		%	-5%	-8%	0%	-11%	-11%	-16%	-16%	-14%	-12%
February	Discharge	m^3/s	0.11	0.12	0.14	0.15	0.18	0.21	0.22	0.23	0.24
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.02	-0.03	-0.05	-0.05	-0.05	-0.04
		%	-9%	-12%	-6%	-14%	-13%	-18%	-18%	-17%	-15%
March	Discharge	m^3/s	0.10	0.10	0.12	0.13	0.16	0.18	0.19	0.20	0.23
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.02	-0.03	-0.04	-0.05	-0.04	-0.03
		%	-10%	-15%	-8%	-16%	-14%	-18%	-20%	-17%	-12%
April	Discharge	m^3/s	0.12	0.12	0.14	0.16	0.68	1.17	1.55	1.77	1.93
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.03	-0.08	-0.26	-0.11	-0.13	-0.36
		%	-10%	-13%	-14%	-16%	-10%	-18%	-7%	-7%	-16%
May	Discharge	m^3/s	1.45	1.71	1.96	2.30	2.86	3.49	3.76	4.02	4.17
	Change from Pre-Mine	m^3/s	-0.13	-0.08	0.01	-0.01	-0.34	-0.65	-0.73	-0.74	-0.98
		%	-8%	-4%	1%	-1%	-11%	-16%	-16%	-16%	-19%
June	Discharge	m^3/s	0.98	1.16	1.41	1.78	2.59	3.44	3.75	4.16	4.69
	Change from Pre-Mine	m^3/s	0.16	0.19	0.04	0.14	-0.36	-0.87	-0.86	-1.02	-1.11
		%	19%	20%	3%	9%	-12%	-20%	-19%	-20%	-19%
July	Discharge	m^3/s	0.47	0.50	0.57	0.62	1.15	1.51	1.92	2.43	2.84
	Change from Pre-Mine	m^3/s	0.01	0.01	0.04	0.00	-0.12	-0.13	-0.43	-0.23	-0.84
		%	3%	2%	7%	0%	-9%	-8%	-18%	-9%	-23%
August	Discharge	m^3/s	0.30	0.32	0.36	0.46	0.60	0.69	0.83	0.96	1.47
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.05	-0.04	-0.03	-0.02	-0.18	-0.76
		%	6%	8%	5%	14%	-6%	-4%	-2%	-15%	-34%
September	Discharge	m^3/s	0.26	0.29	0.31	0.33	0.44	0.53	0.60	0.67	1.00
	Change from Pre-Mine	m^3/s	0.02	0.02	0.01	0.00	-0.04	-0.05	-0.11	-0.21	-0.26
		%	10%	7%	5%	0%	-9%	-9%	-15%	-24%	-21%
October	Discharge	m^3/s	0.25	0.27	0.29	0.31	0.47	0.62	0.76	0.92	1.08
	Change from Pre-Mine	m^3/s	0.02	0.01	0.01	0.00	-0.05	-0.11	-0.12	-0.14	-0.44
		%	7%	2%	2%	0%	-10%	-15%	-14%	-13%	-29%
November	Discharge	m^3/s	0.21	0.23	0.25	0.27	0.37	0.49	0.53	0.56	0.57
	Change from Pre-Mine	m^3/s	0.01	0.00	0.01	-0.01	-0.03	-0.06	-0.08	-0.07	-0.07
		%	4%	0%	6%	-5%	-6%	-11%	-13%	-11%	-11%
December	Discharge	m^3/s	0.17	0.19	0.21	0.22	0.27	0.31	0.33	0.34	0.36
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.02	-0.02	-0.05	-0.06	-0.05	-0.04
		%	0%	-5%	0%	-8%	-8%	-14%	-15%	-13%	-11%
Annual	Discharge	m^3/s	0.50	0.56	0.61	0.67	0.83	0.96	1.04	1.15	1.19
	Change from Pre-Mine	m^3/s	0.03	0.02	-0.02	-0.04	-0.10	-0.18	-0.21	-0.18	-0.29
		%	7%	3%	-4%	-5%	-10%	-16%	-17%	-14%	-20%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 2_R1.xlsx]30 WD

NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE D-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.13	0.15	0.17	0.18	0.22	0.25	0.26	0.28	0.29
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.02	-0.03	-0.05	-0.05	-0.05	-0.04
		%	-5%	-9%	0%	-12%	-11%	-16%	-16%	-14%	-13%
February	Discharge	m^3/s	0.11	0.12	0.14	0.15	0.18	0.21	0.22	0.23	0.24
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.03	-0.03	-0.05	-0.05	-0.05	-0.04
		%	-10%	-13%	-7%	-15%	-14%	-18%	-19%	-17%	-15%
March	Discharge	m^3/s	0.09	0.10	0.12	0.12	0.16	0.18	0.19	0.20	0.23
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.02	-0.03	-0.04	-0.05	-0.04	-0.03
		%	-11%	-16%	-8%	-16%	-15%	-19%	-21%	-17%	-12%
April	Discharge	m^3/s	0.12	0.12	0.14	0.16	0.70	1.25	1.55	1.78	1.93
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.03	-0.06	-0.19	-0.11	-0.13	-0.36
		%	-10%	-14%	-14%	-16%	-8%	-13%	-6%	-7%	-16%
May	Discharge	m^3/s	1.45	1.71	1.99	2.30	2.86	3.49	3.76	4.02	4.17
	Change from Pre-Mine	m^3/s	-0.13	-0.08	0.04	-0.01	-0.35	-0.65	-0.73	-0.75	-0.98
		%	-8%	-4%	2%	-1%	-11%	-16%	-16%	-16%	-19%
June	Discharge	m^3/s	0.97	1.15	1.40	1.77	2.58	3.43	3.75	4.16	4.69
	Change from Pre-Mine	m^3/s	0.15	0.18	0.04	0.13	-0.37	-0.88	-0.87	-1.02	-1.11
		%	18%	19%	3%	8%	-12%	-20%	-19%	-20%	-19%
July	Discharge	m^3/s	0.47	0.50	0.57	0.61	1.14	1.50	1.91	2.42	2.83
	Change from Pre-Mine	m^3/s	0.01	0.01	0.03	0.00	-0.12	-0.14	-0.44	-0.24	-0.85
		%	2%	2%	6%	0%	-10%	-8%	-19%	-9%	-23%
August	Discharge	m^3/s	0.30	0.32	0.36	0.46	0.60	0.69	0.82	0.95	1.47
	Change from Pre-Mine	m^3/s	0.02	0.02	0.01	0.05	-0.04	-0.03	-0.02	-0.18	-0.76
		%	6%	7%	4%	13%	-6%	-4%	-2%	-16%	-34%
September	Discharge	m^3/s	0.26	0.29	0.31	0.33	0.44	0.54	0.61	0.73	1.00
	Change from Pre-Mine	m^3/s	0.02	0.02	0.01	0.00	-0.04	-0.04	-0.10	-0.15	-0.27
		%	9%	6%	4%	0%	-8%	-8%	-14%	-17%	-21%
October	Discharge	m^3/s	0.25	0.27	0.29	0.31	0.48	0.63	0.78	0.92	1.07
	Change from Pre-Mine	m^3/s	0.02	0.00	0.01	0.00	-0.05	-0.10	-0.10	-0.14	-0.45
		%	7%	0%	2%	0%	-10%	-14%	-11%	-13%	-29%
November	Discharge	m^3/s	0.20	0.23	0.25	0.27	0.37	0.49	0.53	0.56	0.58
	Change from Pre-Mine	m^3/s	0.01	0.00	0.01	-0.02	-0.02	-0.05	-0.08	-0.07	-0.06
		%	4%	0%	5%	-6%	-6%	-10%	-13%	-11%	-9%
December	Discharge	m^3/s	0.17	0.18	0.21	0.22	0.27	0.31	0.33	0.34	0.36
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.02	-0.02	-0.05	-0.06	-0.05	-0.04
		%	0%	-5%	0%	-9%	-9%	-14%	-15%	-13%	-11%
Annual	Discharge	m^3/s	0.50	0.55	0.61	0.68	0.83	0.95	1.03	1.15	1.18
	Change from Pre-Mine	m^3/s	0.03	0.02	-0.02	-0.03	-0.10	-0.18	-0.21	-0.18	-0.30
		%	7%	3%	-3%	-4%	-10%	-16%	-17%	-14%	-20%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE D-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

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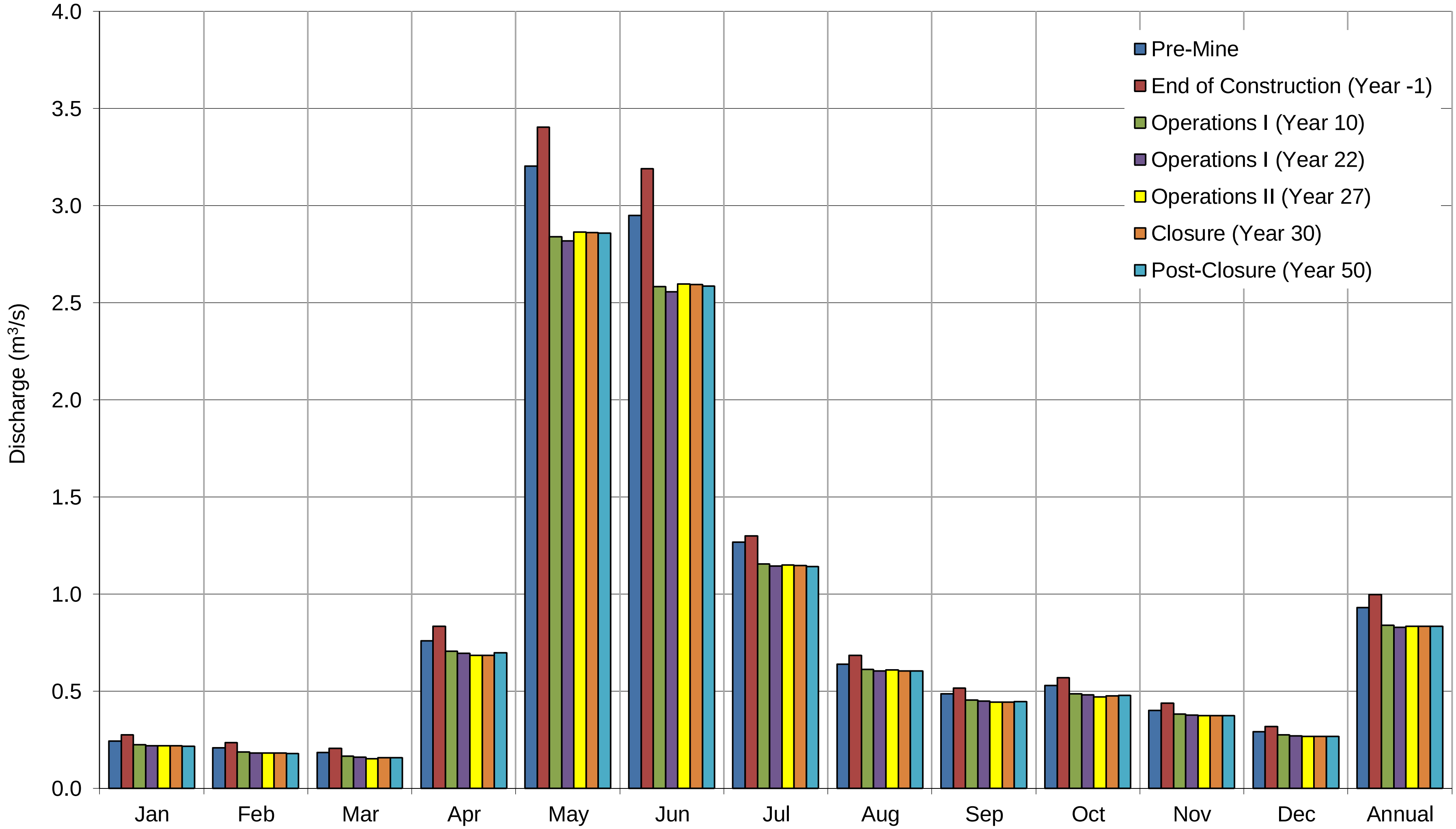
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	47.0	Discharge	m^3/s	16	22	26	31	36	40	44
			Unit Runoff	$l/s/km^2$	337	472	562	650	760	846	929
-1	End of Construction	46.7	Discharge	m^3/s	16	22	26	30	36	40	43
			Unit Runoff	$l/s/km^2$	338	473	563	651	762	847	931
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-1%		%	0%	0%	0%	0%	0%	0%	0%
10	Operations I	44.4	Discharge	m^3/s	15	21	25	29	34	38	42
			Unit Runoff	$l/s/km^2$	342	479	571	660	771	858	943
			Change from Pre-Mine	m^3/s	-1	-1	-1	-1	-2	-2	-2
		-6%		%	-4%	-4%	-4%	-4%	-4%	-4%	-4%
22	Operations I	43.6	Discharge	m^3/s	15	21	25	29	34	38	41
			Unit Runoff	$l/s/km^2$	344	481	573	663	775	862	947
			Change from Pre-Mine	m^3/s	-1	-1	-1	-2	-2	-2	-2
		-7%		%	-6%	-6%	-6%	-6%	-6%	-6%	-6%
27	Operations II	43.9	Discharge	m^3/s	15	21	25	29	34	38	42
			Unit Runoff	$l/s/km^2$	343	480	572	662	774	861	945
			Change from Pre-Mine	m^3/s	-1	-1	-1	-2	-2	-2	-2
		-7%		%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
30	Closure	44.0	Discharge	m^3/s	15	21	25	29	34	38	42
			Unit Runoff	$l/s/km^2$	343	480	572	661	773	860	945
			Change from Pre-Mine	m^3/s	-1	-1	-1	-2	-2	-2	-2
		-7%		%	-5%	-5%	-5%	-5%	-5%	-5%	-5%
50	Post-Closure	44.0	Discharge	m^3/s	15	21	25	29	34	38	42
			Unit Runoff	$l/s/km^2$	343	480	572	661	773	860	945
			Change from Pre-Mine	m^3/s	-1	-1	-1	-1	-2	-2	-2
		-6%		%	-5%	-5%	-5%	-5%	-5%	-5%	-5%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 2_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 2
HARPER CREEK ABOVE T-CREEK CONFLUENCE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE D-1

REV 1

APPENDIX E

WATERSHED MODEL RESULTS FOR NODE 3

(Pages E-1 to E-10)

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TABLE E-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	23.4	Discharge	m^3/s	0.02	0.01	0.01	0.22	1.57	2.03	0.85	0.24	0.14	0.13	0.05	0.02	0.44
			Unit Runoff	$l/s/km^2$	0.8	0.6	0.5	9.4	67.1	86.8	36.2	10.3	6.1	5.7	2.2	1.0	18.9
-1	End of Construction	8.2	Discharge	m^3/s	0.03	0.00	0.00	0.10	0.57	0.65	0.24	0.09	0.07	0.05	0.01	0.00	0.15
			Unit Runoff	$l/s/km^2$	3.3	0.3	0.1	12.2	69.0	79.2	29.2	10.4	8.5	6.5	0.8	0.0	18.3
			Change from Pre-Mine	m^3/s	0.01	-0.01	-0.01	-0.12	-1.00	-1.38	-0.61	-0.16	-0.07	-0.08	-0.05	-0.02	-0.29
		-65%		%	46%	-83%	-95%	-55%	-64%	-68%	-72%	-65%	-51%	-60%	-88%	-99%	-66%
10	Operations I	7.8	Discharge	m^3/s	0.00	0.00	0.00	0.09	0.55	0.61	0.18	0.04	0.02	0.03	0.01	0.00	0.13
			Unit Runoff	$l/s/km^2$	0.0	0.0	0.0	10.9	70.3	77.9	23.2	5.4	2.7	4.3	0.8	0.0	16.3
			Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.14	-1.02	-1.43	-0.67	-0.20	-0.12	-0.10	-0.05	-0.02	-0.32
		-67%		%	-100%	-100%	-100%	-61%	-65%	-70%	-79%	-82%	-85%	-75%	-88%	-99%	-71%
22	Operations I	7.5	Discharge	m^3/s	0.00	0.00	0.00	0.08	0.53	0.57	0.17	0.04	0.02	0.03	0.01	0.00	0.12
			Unit Runoff	$l/s/km^2$	0.0	0.0	0.0	11.1	70.5	76.4	22.0	5.2	2.6	4.3	0.8	0.0	16.1
			Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.14	-1.04	-1.46	-0.68	-0.20	-0.12	-0.10	-0.05	-0.02	-0.32
		-68%		%	-100%	-100%	-100%	-62%	-66%	-72%	-80%	-84%	-87%	-76%	-88%	-99%	-73%
27	Operations II	7.6	Discharge	m^3/s	0.00	0.00	0.00	0.08	0.53	0.58	0.18	0.05	0.03	0.04	0.01	0.01	0.13
			Unit Runoff	$l/s/km^2$	0.0	0.0	0.0	10.4	69.6	76.8	23.3	6.6	4.3	5.4	1.6	0.7	16.6
			Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.14	-1.04	-1.45	-0.67	-0.19	-0.11	-0.09	-0.04	-0.02	-0.32
		-68%		%	-100%	-100%	-100%	-64%	-66%	-71%	-79%	-79%	-77%	-69%	-77%	-78%	-72%
30	Closure	22.6	Discharge	m^3/s	0.03	0.03	0.03	0.21	0.98	1.11	0.35	0.09	0.08	0.12	0.05	0.04	0.26
			Unit Runoff	$l/s/km^2$	1.2	1.1	1.2	9.3	43.5	49.0	15.4	4.1	3.4	5.2	2.0	1.6	11.4
			Change from Pre-Mine	m^3/s	0.01	0.01	0.02	-0.01	-0.59	-0.92	-0.50	-0.15	-0.07	-0.01	-0.01	0.01	-0.18
		-3%		%	44%	78%	>100%	-4%	-37%	-45%	-59%	-62%	-47%	-11%	-13%	50%	-42%
50	Post-Closure	22.8	Discharge	m^3/s	0.07	0.13	0.18	0.54	1.95	2.12	0.62	0.19	0.14	0.27	0.09	0.07	0.53
			Unit Runoff	$l/s/km^2$	2.9	5.7	8.1	23.7	85.7	93.2	27.3	8.2	6.0	11.7	3.7	3.1	23.3
			Change from Pre-Mine	m^3/s	0.05	0.12	0.17	0.32	0.38	0.09	-0.23	-0.05	-0.01	0.13	0.03	0.05	0.09
		-3%		%	>100%	>100%	>100%	>100%	24%	4%	-27%	-22%	-4%	>100%	63%	>100%	20%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 3_R1.xlsx]Mean Monthly

NOTE:
1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
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TABLE E-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.00	0.00	0.00	0.00	0.02	0.03	0.03	0.04	0.04
February	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.03
March	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03
April	0.00	0.00	0.00	0.01	0.22	0.46	0.60	0.87	1.03
May	0.68	0.78	0.88	1.12	1.57	2.02	2.29	2.36	2.69
June	0.47	0.73	1.09	1.34	2.03	2.71	3.09	3.26	3.39
July	0.10	0.12	0.14	0.23	0.85	1.28	1.81	2.04	2.86
August	0.01	0.02	0.04	0.08	0.24	0.32	0.51	0.78	1.26
September	0.01	0.01	0.02	0.03	0.14	0.17	0.42	0.51	0.82
October	0.01	0.01	0.01	0.03	0.13	0.16	0.31	0.44	0.68
November	0.00	0.01	0.01	0.02	0.05	0.09	0.11	0.12	0.13
December	0.00	0.00	0.00	0.01	0.02	0.04	0.04	0.04	0.04
Annual	0.19	0.23	0.27	0.32	0.44	0.56	0.62	0.67	0.74

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE E-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.01	0.00	0.00	0.00	0.00
		%	>100%	>100%	>100%	>100%	46%	0%	0%	0%	0%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.02	-0.02
		%	0%	0%	0%	0%	-83%	-71%	-74%	-76%	-76%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.02	-0.03
		%	0%	0%	0%	0%	-95%	-92%	-93%	-94%	-94%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.10	0.20	0.28	0.38	0.42
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.12	-0.26	-0.32	-0.49	-0.60
		%	0%	0%	0%	-100%	-55%	-57%	-53%	-57%	-59%
May	Discharge	m^3/s	0.30	0.33	0.36	0.42	0.57	0.71	0.76	0.82	0.87
	Change from Pre-Mine	m^3/s	-0.37	-0.45	-0.51	-0.70	-1.00	-1.31	-1.53	-1.54	-1.81
		%	-55%	-58%	-58%	-62%	-64%	-65%	-67%	-65%	-67%
June	Discharge	m^3/s	0.21	0.22	0.32	0.43	0.65	0.85	0.94	1.09	1.13
	Change from Pre-Mine	m^3/s	-0.26	-0.50	-0.76	-0.92	-1.38	-1.86	-2.14	-2.17	-2.25
		%	-55%	-69%	-70%	-68%	-68%	-69%	-70%	-67%	-67%
July	Discharge	m^3/s	0.02	0.04	0.05	0.11	0.24	0.35	0.46	0.52	0.66
	Change from Pre-Mine	m^3/s	-0.08	-0.08	-0.09	-0.12	-0.61	-0.93	-1.35	-1.53	-2.20
		%	-77%	-69%	-64%	-52%	-72%	-73%	-75%	-75%	-77%
August	Discharge	m^3/s	0.00	0.02	0.02	0.02	0.09	0.12	0.19	0.28	0.36
	Change from Pre-Mine	m^3/s	-0.01	0.00	-0.01	-0.06	-0.16	-0.20	-0.32	-0.49	-0.90
		%	-75%	0%	-35%	-70%	-65%	-62%	-63%	-64%	-72%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.07	0.10	0.18	0.30	0.48
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.07	-0.07	-0.25	-0.21	-0.34
		%	-98%	-96%	-97%	-97%	-51%	-43%	-58%	-42%	-41%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.05	0.09	0.17	0.20	0.32
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.08	-0.07	-0.14	-0.24	-0.36
		%	-100%	-100%	-98%	-97%	-60%	-42%	-45%	-54%	-53%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.00	-0.01	-0.01	-0.02	-0.05	-0.07	-0.10	-0.10	-0.11
		%	0%	-100%	-100%	-100%	-88%	-81%	-84%	-85%	-85%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.02	-0.04	-0.04	-0.04	-0.04
		%	0%	0%	0%	-100%	-99%	-99%	-99%	-99%	-99%
Annual	Discharge	m^3/s	0.09	0.09	0.10	0.12	0.15	0.19	0.20	0.21	0.23
	Change from Pre-Mine	m^3/s	-0.11	-0.14	-0.18	-0.21	-0.29	-0.37	-0.42	-0.46	-0.51
		%	-56%	-60%	-64%	-64%	-66%	-66%	-67%	-68%	-69%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE E-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.03	-0.03	-0.04	-0.04
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.03	-0.03	-0.03
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.03	-0.03
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.09	0.17	0.24	0.32	0.36
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.14	-0.29	-0.36	-0.54	-0.67
		%	0%	0%	0%	-100%	-61%	-63%	-60%	-63%	-65%
May	Discharge	m^3/s	0.30	0.33	0.36	0.42	0.55	0.68	0.73	0.79	0.84
	Change from Pre-Mine	m^3/s	-0.38	-0.45	-0.52	-0.71	-1.02	-1.34	-1.56	-1.58	-1.85
		%	-56%	-58%	-59%	-63%	-65%	-66%	-68%	-67%	-69%
June	Discharge	m^3/s	0.17	0.18	0.27	0.38	0.61	0.79	0.89	1.04	1.07
	Change from Pre-Mine	m^3/s	-0.30	-0.55	-0.81	-0.96	-1.43	-1.92	-2.20	-2.23	-2.31
		%	-64%	-75%	-75%	-72%	-70%	-71%	-71%	-68%	-68%
July	Discharge	m^3/s	0.02	0.02	0.02	0.05	0.18	0.29	0.38	0.43	0.57
	Change from Pre-Mine	m^3/s	-0.09	-0.10	-0.12	-0.19	-0.67	-0.98	-1.43	-1.61	-2.30
		%	-82%	-82%	-83%	-81%	-79%	-77%	-79%	-79%	-80%
August	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.04	0.04	0.10	0.15	0.21
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.04	-0.06	-0.20	-0.27	-0.41	-0.62	-1.05
		%	-98%	-99%	-99%	-79%	-82%	-86%	-81%	-80%	-84%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.02	0.05	0.10	0.19
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.12	-0.14	-0.38	-0.41	-0.63
		%	-100%	-99%	-99%	-99%	-85%	-88%	-89%	-81%	-77%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.06	0.11	0.13	0.21
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.10	-0.10	-0.20	-0.31	-0.47
		%	-100%	-100%	-100%	-98%	-75%	-63%	-64%	-70%	-69%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.00	-0.01	-0.01	-0.02	-0.05	-0.07	-0.10	-0.10	-0.11
		%	0%	-100%	-100%	-100%	-88%	-81%	-84%	-85%	-85%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.02	-0.04	-0.04	-0.04	-0.04
		%	0%	0%	0%	-100%	-99%	-99%	-99%	-99%	-99%
Annual	Discharge	m^3/s	0.07	0.08	0.08	0.10	0.13	0.16	0.17	0.18	0.19
	Change from Pre-Mine	m^3/s	-0.12	-0.15	-0.19	-0.23	-0.32	-0.40	-0.45	-0.49	-0.54
		%	-61%	-66%	-70%	-70%	-71%	-72%	-73%	-73%	-74%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE E-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.03	-0.03	-0.04	-0.04
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.03	-0.03	-0.03
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.03	-0.03
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.08	0.17	0.24	0.31	0.35
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.14	-0.30	-0.36	-0.55	-0.68
		%	0%	0%	0%	-100%	-62%	-64%	-61%	-64%	-66%
May	Discharge	m^3/s	0.29	0.32	0.35	0.40	0.53	0.66	0.70	0.76	0.81
	Change from Pre-Mine	m^3/s	-0.38	-0.46	-0.52	-0.72	-1.04	-1.36	-1.58	-1.60	-1.88
		%	-57%	-59%	-60%	-64%	-66%	-67%	-69%	-68%	-70%
June	Discharge	m^3/s	0.15	0.16	0.25	0.36	0.57	0.76	0.86	1.01	1.04
	Change from Pre-Mine	m^3/s	-0.32	-0.56	-0.83	-0.98	-1.46	-1.95	-2.23	-2.26	-2.35
		%	-67%	-77%	-77%	-73%	-72%	-72%	-72%	-69%	-69%
July	Discharge	m^3/s	0.02	0.02	0.02	0.04	0.17	0.26	0.35	0.41	0.53
	Change from Pre-Mine	m^3/s	-0.09	-0.10	-0.12	-0.20	-0.68	-1.01	-1.46	-1.63	-2.34
		%	-82%	-83%	-84%	-84%	-80%	-79%	-81%	-80%	-82%
August	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.04	0.04	0.09	0.14	0.20
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.04	-0.06	-0.20	-0.28	-0.42	-0.63	-1.06
		%	-98%	-99%	-99%	-80%	-84%	-88%	-82%	-82%	-84%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.02	0.04	0.09	0.18
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.12	-0.15	-0.38	-0.42	-0.64
		%	-100%	-99%	-99%	-99%	-87%	-89%	-91%	-83%	-78%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.05	0.11	0.13	0.20
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.10	-0.10	-0.20	-0.31	-0.47
		%	-100%	-100%	-100%	-98%	-76%	-66%	-65%	-71%	-70%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.00	-0.01	-0.01	-0.02	-0.05	-0.07	-0.10	-0.10	-0.11
		%	0%	-100%	-100%	-100%	-88%	-81%	-84%	-85%	-85%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.02	-0.04	-0.04	-0.04	-0.04
		%	0%	0%	0%	-100%	-99%	-99%	-99%	-99%	-99%
Annual	Discharge	m^3/s	0.07	0.07	0.08	0.09	0.12	0.15	0.16	0.17	0.18
	Change from Pre-Mine	m^3/s	-0.12	-0.15	-0.19	-0.23	-0.32	-0.40	-0.46	-0.49	-0.55
		%	-63%	-67%	-71%	-72%	-73%	-73%	-74%	-74%	-75%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE E-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.03	-0.03	-0.04	-0.04
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.03	-0.03	-0.03
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.03	-0.03
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.08	0.16	0.22	0.31	0.34
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.14	-0.30	-0.38	-0.56	-0.69
		%	0%	0%	0%	-100%	-64%	-65%	-64%	-64%	-67%
May	Discharge	m^3/s	0.29	0.32	0.35	0.40	0.53	0.66	0.70	0.76	0.81
	Change from Pre-Mine	m^3/s	-0.39	-0.46	-0.53	-0.72	-1.04	-1.36	-1.59	-1.61	-1.88
		%	-57%	-59%	-60%	-64%	-66%	-67%	-69%	-68%	-70%
June	Discharge	m^3/s	0.15	0.20	0.26	0.37	0.58	0.76	0.88	1.00	1.04
	Change from Pre-Mine	m^3/s	-0.32	-0.52	-0.82	-0.98	-1.45	-1.95	-2.21	-2.26	-2.35
		%	-67%	-72%	-76%	-73%	-71%	-72%	-71%	-69%	-69%
July	Discharge	m^3/s	0.02	0.02	0.02	0.04	0.18	0.29	0.36	0.42	0.60
	Change from Pre-Mine	m^3/s	-0.09	-0.10	-0.12	-0.19	-0.67	-0.99	-1.45	-1.63	-2.27
		%	-82%	-83%	-83%	-83%	-79%	-78%	-80%	-80%	-79%
August	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.05	0.05	0.10	0.18	0.23
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.04	-0.06	-0.19	-0.27	-0.41	-0.59	-1.03
		%	-98%	-99%	-99%	-80%	-79%	-85%	-81%	-76%	-82%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.02	0.07	0.15	0.35
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.11	-0.15	-0.35	-0.36	-0.46
		%	-100%	-99%	-99%	-99%	-77%	-89%	-84%	-71%	-57%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.04	0.07	0.11	0.20	0.24
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.09	-0.09	-0.19	-0.24	-0.44
		%	-100%	-100%	-100%	-98%	-69%	-59%	-63%	-54%	-65%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.11
	Change from Pre-Mine	m^3/s	0.00	-0.01	-0.01	-0.02	-0.04	-0.07	-0.10	-0.10	-0.02
		%	0%	-100%	-100%	-100%	-77%	-81%	-84%	-79%	-17%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.02	-0.04	-0.04	-0.04	0.06
		%	0%	0%	0%	-100%	-78%	-99%	-99%	-87%	>100%
Annual	Discharge	m^3/s	0.07	0.07	0.08	0.09	0.13	0.15	0.17	0.18	0.22
	Change from Pre-Mine	m^3/s	-0.12	-0.16	-0.19	-0.23	-0.32	-0.40	-0.45	-0.49	-0.51
		%	-63%	-68%	-71%	-72%	-72%	-72%	-73%	-73%	-70%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE E-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.10	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.01	0.06	0.06	0.06	0.06
		%	0%	0%	0%	0%	44%	>100%	>100%	>100%	>100%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.09	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.01	0.06	0.06	0.06	0.06
		%	0%	0%	0%	0%	78%	>100%	>100%	>100%	>100%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.09	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.02	0.07	0.07	0.07	0.07
		%	0%	0%	0%	0%	>100%	>100%	>100%	>100%	>100%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.21	0.35	0.69	0.87	1.13
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.01	-0.12	0.08	0.01	0.10
		%	0%	0%	0%	-100%	-4%	-25%	14%	1%	10%
May	Discharge	m^3/s	0.31	0.33	0.38	0.42	0.98	1.89	2.19	2.42	2.57
	Change from Pre-Mine	m^3/s	-0.37	-0.45	-0.50	-0.70	-0.59	-0.13	-0.10	0.06	-0.12
		%	-55%	-58%	-57%	-63%	-37%	-6%	-4%	2%	-4%
June	Discharge	m^3/s	0.17	0.22	0.30	0.43	1.11	1.86	2.62	2.94	3.30
	Change from Pre-Mine	m^3/s	-0.31	-0.51	-0.79	-0.91	-0.92	-0.85	-0.46	-0.32	-0.09
		%	-65%	-70%	-73%	-68%	-45%	-31%	-15%	-10%	-3%
July	Discharge	m^3/s	0.02	0.02	0.02	0.05	0.35	0.52	0.89	1.05	1.92
	Change from Pre-Mine	m^3/s	-0.09	-0.10	-0.12	-0.18	-0.50	-0.76	-0.92	-1.00	-0.94
		%	-82%	-83%	-84%	-79%	-59%	-60%	-51%	-49%	-33%
August	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.09	0.12	0.22	0.36	0.63
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.04	-0.06	-0.15	-0.20	-0.28	-0.42	-0.63
		%	-98%	-99%	-99%	-80%	-62%	-62%	-56%	-54%	-50%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.08	0.12	0.23	0.32	0.48
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.07	-0.04	-0.19	-0.18	-0.33
		%	-100%	-99%	-99%	-99%	-47%	-25%	-46%	-36%	-41%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.12	0.20	0.26	0.45	0.57
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.03	-0.01	0.04	-0.04	0.01	-0.10
		%	-100%	-100%	-99%	-98%	-11%	25%	-14%	1%	-15%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.05	0.10	0.11	0.13	0.14
	Change from Pre-Mine	m^3/s	0.00	-0.01	-0.01	-0.02	-0.01	0.01	0.00	0.01	0.00
		%	0%	-100%	-100%	-100%	-13%	13%	0%	5%	0%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.04	0.10	0.10	0.10	0.11
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	0.01	0.06	0.06	0.06	0.06
		%	0%	0%	0%	-100%	50%	>100%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.07	0.08	0.08	0.10	0.26	0.46	0.56	0.63	0.73
	Change from Pre-Mine	m^3/s	-0.12	-0.15	-0.19	-0.22	-0.18	-0.09	-0.07	-0.04	0.00
		%	-63%	-67%	-71%	-70%	-42%	-16%	-11%	-6%	0%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold
CONSULTING

TABLE E-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.08
	Change from Pre-Mine	m^3/s	0.06	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.04
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
February	Discharge	m^3/s	0.12	0.12	0.12	0.12	0.13	0.14	0.14	0.14	0.14
	Change from Pre-Mine	m^3/s	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
March	Discharge	m^3/s	0.17	0.17	0.17	0.18	0.18	0.19	0.19	0.19	0.20
	Change from Pre-Mine	m^3/s	0.17	0.17	0.17	0.18	0.17	0.17	0.17	0.17	0.18
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
April	Discharge	m^3/s	0.18	0.18	0.19	0.21	0.54	0.84	1.03	1.23	1.34
	Change from Pre-Mine	m^3/s	0.18	0.18	0.19	0.21	0.32	0.38	0.43	0.36	0.31
		%	>100%	>100%	>100%	>100%	>100%	81%	71%	41%	31%
May	Discharge	m^3/s	1.13	1.26	1.38	1.54	1.95	2.31	2.48	2.65	3.00
	Change from Pre-Mine	m^3/s	0.45	0.48	0.50	0.42	0.38	0.29	0.19	0.28	0.32
		%	67%	62%	57%	37%	24%	15%	8%	12%	12%
June	Discharge	m^3/s	0.55	0.61	0.83	1.22	2.12	2.92	3.28	3.54	4.05
	Change from Pre-Mine	m^3/s	0.08	-0.11	-0.26	-0.13	0.09	0.21	0.20	0.27	0.66
		%	17%	-15%	-24%	-9%	4%	8%	6%	8%	19%
July	Discharge	m^3/s	0.06	0.12	0.18	0.30	0.62	0.83	1.14	1.60	2.00
	Change from Pre-Mine	m^3/s	-0.05	0.00	0.04	0.07	-0.23	-0.45	-0.67	-0.45	-0.86
		%	-43%	0%	27%	28%	-27%	-35%	-37%	-22%	-30%
August	Discharge	m^3/s	0.01	0.03	0.03	0.04	0.19	0.29	0.37	0.54	0.87
	Change from Pre-Mine	m^3/s	0.00	0.01	-0.01	-0.05	-0.05	-0.03	-0.14	-0.23	-0.39
		%	0%	29%	-17%	-56%	-22%	-10%	-28%	-30%	-31%
September	Discharge	m^3/s	0.01	0.01	0.01	0.04	0.14	0.19	0.31	0.38	0.50
	Change from Pre-Mine	m^3/s	0.01	0.00	0.00	0.01	-0.01	0.03	-0.11	-0.12	-0.32
		%	>100%	0%	0%	33%	-4%	16%	-26%	-24%	-39%
October	Discharge	m^3/s	0.07	0.07	0.07	0.09	0.27	0.43	0.60	0.71	0.81
	Change from Pre-Mine	m^3/s	0.06	0.06	0.06	0.06	0.13	0.27	0.30	0.27	0.13
		%	>100%	>100%	>100%	>100%	>100%	>100%	97%	62%	19%
November	Discharge	m^3/s	0.06	0.06	0.07	0.07	0.09	0.10	0.11	0.12	0.13
	Change from Pre-Mine	m^3/s	0.06	0.06	0.06	0.05	0.03	0.01	0.00	0.00	0.00
		%	>100%	>100%	>100%	>100%	63%	13%	0%	0%	0%
December	Discharge	m^3/s	0.06	0.06	0.06	0.06	0.07	0.08	0.08	0.08	0.08
	Change from Pre-Mine	m^3/s	0.06	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.04
		%	>100%	>100%	>100%	>100%	>100%	>100%	87%	88%	86%
Annual	Discharge	m^3/s	0.35	0.36	0.38	0.44	0.53	0.61	0.66	0.75	0.78
	Change from Pre-Mine	m^3/s	0.15	0.13	0.10	0.11	0.09	0.06	0.03	0.08	0.04
		%	80%	56%	38%	36%	20%	11%	5%	12%	6%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE E-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	23.4	Discharge	m^3/s	9	13	16	18	22	25	27
			Unit Runoff	$l/s/km^2$	393	560	673	786	939	1052	1169
-1	End of Construction	8.2	Discharge	m^3/s	4	6	7	8	10	11	12
			Unit Runoff	$l/s/km^2$	511	728	875	1022	1220	1367	1520
			Change from Pre-Mine	m^3/s	-5	-7	-9	-10	-12	-13	-15
		-65%		%	-54%	-54%	-54%	-54%	-54%	-54%	-54%
10	Operations I	7.8	Discharge	m^3/s	4	6	7	8	10	11	12
			Unit Runoff	$l/s/km^2$	518	738	887	1036	1236	1385	1540
			Change from Pre-Mine	m^3/s	-5	-7	-9	-10	-12	-14	-15
		-67%		%	-56%	-56%	-56%	-56%	-56%	-56%	-56%
22	Operations I	7.5	Discharge	m^3/s	4	6	7	8	9	10	12
			Unit Runoff	$l/s/km^2$	522	744	894	1045	1247	1397	1554
			Change from Pre-Mine	m^3/s	-5	-8	-9	-11	-13	-14	-16
		-68%		%	-57%	-57%	-57%	-57%	-57%	-57%	-57%
27	Operations II	7.6	Discharge	m^3/s	4	6	7	8	9	11	12
			Unit Runoff	$l/s/km^2$	521	743	893	1043	1245	1395	1551
			Change from Pre-Mine	m^3/s	-5	-7	-9	-11	-13	-14	-16
		-68%		%	-57%	-57%	-57%	-57%	-57%	-57%	-57%
30	Closure	22.6	Discharge	m^3/s	9	13	15	18	21	24	27
			Unit Runoff	$l/s/km^2$	396	565	679	793	946	1060	1179
			Change from Pre-Mine	m^3/s	0	0	0	0	-1	-1	-1
		-3%		%	0%	0%	0%	0%	-3%	-3%	-3%
50	Post-Closure	22.8	Discharge	m^3/s	9	13	15	18	22	24	27
			Unit Runoff	$l/s/km^2$	396	564	678	792	945	1059	1178
			Change from Pre-Mine	m^3/s	0	0	0	0	0	-1	-1
		-3%		%	0%	0%	0%	0%	0%	-2%	-2%

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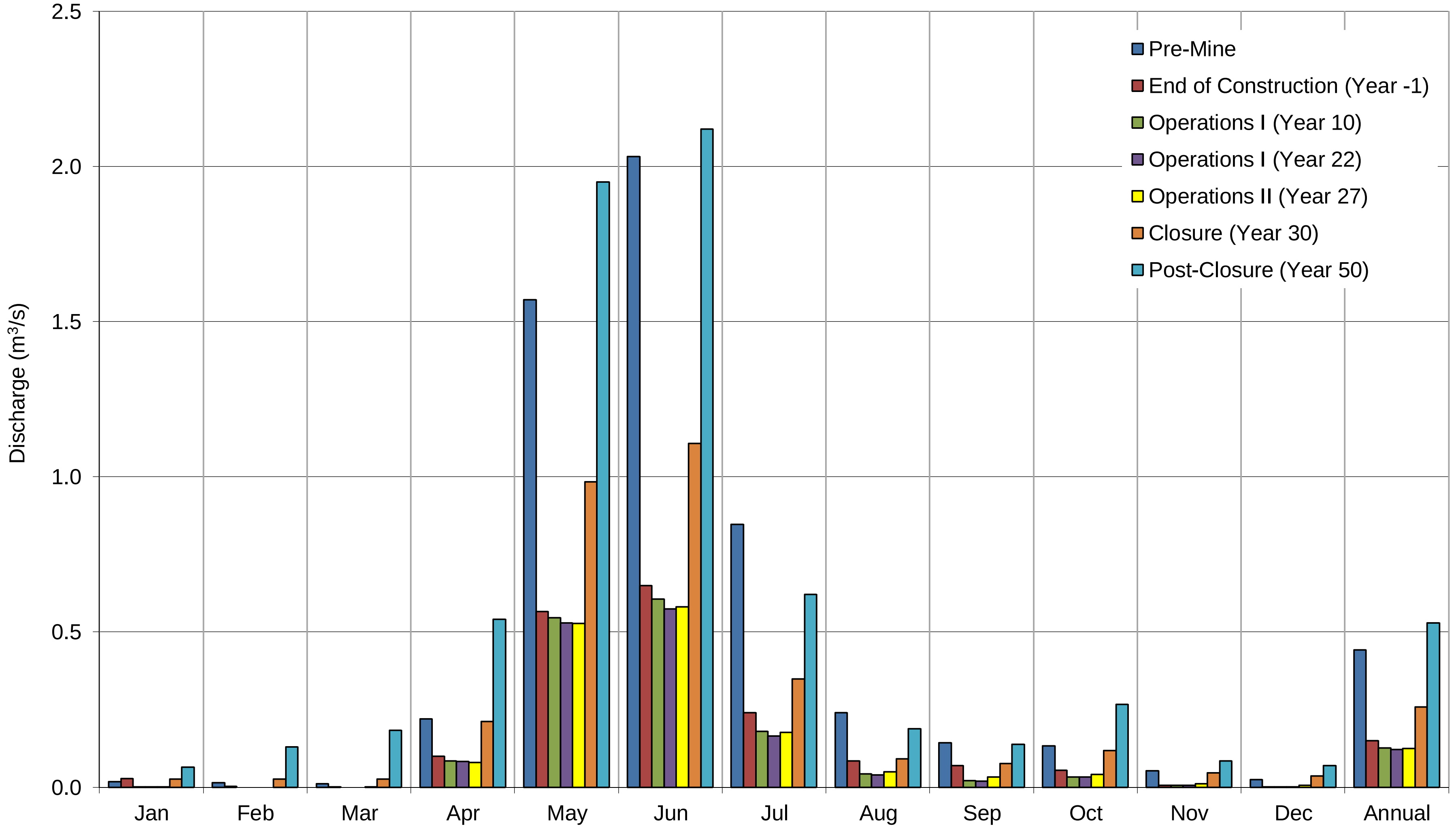
NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 3
T-CREEK AT HARPER CREEK CONFLUENCE

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-458/14	1

FIGURE E-1 REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

APPENDIX F

WATERSHED MODEL RESULTS FOR NODE 4

(Pages F-1 to F-10)

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TABLE F-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Mine Stage: Year	Mine Stage: Description	Drainage Area (km^2)	Parameter	Units	Mean Monthly: Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average Annual
-	Pre-Mine	15.0	Discharge	m^3/s	0.00	0.00	0.00	0.12	1.01	1.37	0.57	0.14	0.08	0.07	0.02	0.00	0.28
			Unit Runoff	$l/s/km^2$	0.0	0.0	0.0	8.2	67.3	91.2	37.9	9.4	5.0	4.4	1.2	0.0	18.7
-1	End of Construction	0.0	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.12	-1.01	-1.37	-0.57	-0.14	-0.08	-0.07	-0.02	0.00	-0.28
		-100%		%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	0%	-100%
10	Operations I	0.0	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.12	-1.01	-1.37	-0.57	-0.14	-0.08	-0.07	-0.02	0.00	-0.28
		-100%		%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	0%	-100%
22	Operations I	0.0	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.12	-1.01	-1.37	-0.57	-0.14	-0.08	-0.07	-0.02	0.00	-0.28
		-100%		%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	0%	-100%
27	Operations II	0.0	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.12	-1.01	-1.37	-0.56	-0.13	-0.06	-0.05	-0.01	0.00	-0.28
		-100%		%	0%	0%	0%	-100%	-100%	-100%	-98%	-92%	-83%	-84%	-68%	0%	-98%
30	Closure	15.0	Discharge	m^3/s	0.03	0.03	0.03	0.13	0.46	0.53	0.18	0.05	0.06	0.09	0.04	0.04	0.14
			Unit Runoff	$l/s/km^2$	1.8	1.7	1.8	8.6	30.6	35.6	12.0	3.5	3.8	5.8	2.6	2.4	9.2
			Change from Pre-Mine	m^3/s	0.03	0.03	0.03	0.01	-0.55	-0.83	-0.39	-0.09	-0.02	0.02	0.02	0.04	-0.14
		0%		%	>100%	>100%	>100%	4%	-54%	-61%	-68%	-63%	-25%	33%	>100%	>100%	-51%
50	Post-Closure	15.0	Discharge	m^3/s	0.05	0.12	0.17	0.43	1.35	1.47	0.42	0.13	0.11	0.21	0.07	0.06	0.38
			Unit Runoff	$l/s/km^2$	3.5	7.7	11.4	28.5	89.8	97.7	28.2	8.9	7.1	14.1	4.4	3.8	25.4
			Change from Pre-Mine	m^3/s	0.05	0.12	0.17	0.30	0.34	0.10	-0.15	-0.01	0.03	0.15	0.05	0.06	0.10
		0%		%	>100%	>100%	>100%	>100%	33%	7%	-26%	-5%	41%	>100%	>100%	>100%	36%

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NOTE:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE F-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
April	0.00	0.00	0.00	0.00	0.12	0.26	0.36	0.55	0.66
May	0.41	0.47	0.57	0.72	1.01	1.31	1.47	1.53	1.76
June	0.30	0.50	0.76	0.93	1.37	1.81	2.03	2.16	2.27
July	0.07	0.08	0.08	0.13	0.57	0.86	1.25	1.39	1.96
August	0.00	0.00	0.01	0.03	0.14	0.18	0.30	0.50	0.79
September	0.00	0.00	0.00	0.00	0.08	0.09	0.25	0.30	0.53
October	0.00	0.00	0.00	0.00	0.07	0.09	0.17	0.25	0.40
November	0.00	0.00	0.00	0.00	0.02	0.05	0.06	0.07	0.07
December	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	0.13	0.15	0.18	0.20	0.28	0.35	0.40	0.42	0.47

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE F-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.12	-0.26	-0.36	-0.55	-0.66
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
May	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.41	-0.47	-0.57	-0.72	-1.01	-1.31	-1.47	-1.53	-1.76
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
June	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.30	-0.50	-0.76	-0.93	-1.37	-1.81	-2.03	-2.16	-2.27
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
July	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.07	-0.08	-0.08	-0.13	-0.57	-0.86	-1.25	-1.39	-1.96
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	-0.03	-0.14	-0.18	-0.30	-0.50	-0.79
		%	0%	0%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.08	-0.09	-0.25	-0.30	-0.53
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.07	-0.09	-0.17	-0.25	-0.40
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.05	-0.06	-0.07	-0.07
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.13	-0.15	-0.18	-0.20	-0.28	-0.35	-0.40	-0.42	-0.47
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE F-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.12	-0.26	-0.36	-0.55	-0.66
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
May	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.41	-0.47	-0.57	-0.72	-1.01	-1.31	-1.47	-1.53	-1.76
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
June	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.30	-0.50	-0.76	-0.93	-1.37	-1.81	-2.03	-2.16	-2.27
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
July	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.07	-0.08	-0.08	-0.13	-0.57	-0.86	-1.25	-1.39	-1.96
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	-0.03	-0.14	-0.18	-0.30	-0.50	-0.79
		%	0%	0%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.08	-0.09	-0.25	-0.30	-0.53
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.07	-0.09	-0.17	-0.25	-0.40
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.05	-0.06	-0.07	-0.07
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.13	-0.15	-0.18	-0.20	-0.28	-0.35	-0.40	-0.42	-0.47
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE F-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.12	-0.26	-0.36	-0.55	-0.66
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
May	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.41	-0.47	-0.57	-0.72	-1.01	-1.31	-1.47	-1.53	-1.76
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
June	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.30	-0.50	-0.76	-0.93	-1.37	-1.81	-2.03	-2.16	-2.27
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
July	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.07	-0.08	-0.08	-0.13	-0.57	-0.86	-1.25	-1.39	-1.96
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	-0.03	-0.14	-0.18	-0.30	-0.50	-0.79
		%	0%	0%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.08	-0.09	-0.25	-0.30	-0.53
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.07	-0.09	-0.17	-0.25	-0.40
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.05	-0.06	-0.07	-0.07
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.13	-0.15	-0.18	-0.20	-0.28	-0.35	-0.40	-0.42	-0.47
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE F-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.12	-0.26	-0.36	-0.55	-0.66
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
May	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.41	-0.47	-0.57	-0.72	-1.01	-1.31	-1.47	-1.53	-1.76
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
June	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.30	-0.50	-0.76	-0.93	-1.37	-1.81	-2.03	-2.16	-2.27
		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
July	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.08
	Change from Pre-Mine	m^3/s	-0.07	-0.08	-0.08	-0.13	-0.56	-0.86	-1.25	-1.39	-1.88
		%	-100%	-100%	-100%	-100%	-98%	-100%	-100%	-100%	-96%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.17
	Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	-0.03	-0.13	-0.18	-0.30	-0.50	-0.63
		%	0%	0%	-100%	-100%	-92%	-100%	-100%	-100%	-79%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.31
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.06	-0.09	-0.25	-0.30	-0.22
		%	0%	0%	0%	0%	-83%	-100%	-100%	-100%	-42%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.20
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.05	-0.09	-0.17	-0.25	-0.21
		%	0%	0%	0%	0%	-84%	-100%	-100%	-100%	-52%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.11
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.05	-0.06	-0.06	0.04
		%	0%	0%	0%	0%	-68%	-100%	-100%	-93%	54%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
		%	0%	0%	0%	0%	0%	0%	0%	0%	>100%
Annual	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
	Change from Pre-Mine	m^3/s	-0.13	-0.15	-0.18	-0.20	-0.28	-0.35	-0.40	-0.42	-0.36
		%	-100%	-100%	-100%	-100%	-98%	-100%	-100%	-100%	-77%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 4_R1.xlsx]27 WD

NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE F-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.10	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.10	0.10
		%	0%	0%	0%	0%	>100%	>100%	>100%	>100%	>100%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.09	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.09	0.10
		%	0%	0%	0%	0%	>100%	>100%	>100%	>100%	>100%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.09	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.03	0.09	0.09	0.09	0.10
		%	0%	0%	0%	0%	>100%	>100%	>100%	>100%	>100%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.13	0.27	0.53	0.68	0.79
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.01	0.01	0.17	0.13	0.13
		%	0%	0%	0%	0%	4%	5%	49%	24%	20%
May	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.46	1.34	1.58	1.68	1.91
	Change from Pre-Mine	m^3/s	-0.41	-0.47	-0.57	-0.72	-0.55	0.03	0.11	0.15	0.15
		%	-100%	-100%	-100%	-100%	-54%	2%	8%	10%	8%
June	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.53	1.30	1.89	2.23	2.54
	Change from Pre-Mine	m^3/s	-0.30	-0.50	-0.76	-0.93	-0.83	-0.51	-0.14	0.07	0.28
		%	-100%	-100%	-100%	-100%	-61%	-28%	-7%	3%	12%
July	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.18	0.30	0.54	0.75	1.41
	Change from Pre-Mine	m^3/s	-0.07	-0.08	-0.08	-0.13	-0.39	-0.55	-0.71	-0.64	-0.55
		%	-100%	-100%	-100%	-100%	-68%	-64%	-57%	-46%	-28%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.05	0.08	0.13	0.24	0.48
	Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	-0.03	-0.09	-0.10	-0.17	-0.26	-0.32
		%	0%	0%	-100%	-100%	-63%	-57%	-55%	-52%	-40%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.06	0.12	0.21	0.28	0.36
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	0.03	-0.03	-0.02	-0.17
		%	0%	0%	0%	0%	-25%	32%	-14%	-8%	-32%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.09	0.18	0.24	0.42	0.54
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.02	0.09	0.07	0.17	0.14
		%	0%	0%	0%	0%	33%	>100%	37%	67%	35%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.04	0.10	0.11	0.12	0.12
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.02	0.05	0.05	0.05	0.05
		%	0%	0%	0%	0%	>100%	98%	81%	80%	69%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.04	0.10	0.10	0.10	0.11
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.04	0.10	0.10	0.10	0.10
		%	0%	0%	0%	0%	>100%	>100%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.14	0.34	0.43	0.46	0.58
	Change from Pre-Mine	m^3/s	-0.13	-0.15	-0.18	-0.20	-0.14	-0.01	0.03	0.04	0.11
		%	-100%	-100%	-100%	-100%	-51%	-2%	8%	9%	24%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE F-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.07
	Change from Pre-Mine	m^3/s	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.07
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
February	Discharge	m^3/s	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13
	Change from Pre-Mine	m^3/s	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
March	Discharge	m^3/s	0.16	0.16	0.16	0.16	0.17	0.18	0.18	0.18	0.19
	Change from Pre-Mine	m^3/s	0.16	0.16	0.16	0.16	0.17	0.18	0.18	0.18	0.19
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
April	Discharge	m^3/s	0.17	0.17	0.18	0.20	0.43	0.63	0.79	0.85	0.96
	Change from Pre-Mine	m^3/s	0.17	0.17	0.18	0.20	0.30	0.37	0.43	0.31	0.30
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	55%	46%
May	Discharge	m^3/s	0.78	0.85	0.96	1.07	1.35	1.60	1.68	1.84	1.94
	Change from Pre-Mine	m^3/s	0.37	0.38	0.39	0.35	0.34	0.29	0.20	0.32	0.18
		%	90%	81%	68%	48%	33%	22%	14%	21%	10%
June	Discharge	m^3/s	0.36	0.42	0.51	0.81	1.47	2.12	2.26	2.56	2.92
	Change from Pre-Mine	m^3/s	0.06	-0.08	-0.25	-0.12	0.10	0.32	0.23	0.39	0.66
		%	19%	-16%	-33%	-13%	7%	18%	11%	18%	29%
July	Discharge	m^3/s	0.03	0.09	0.15	0.20	0.42	0.52	0.75	1.24	1.43
	Change from Pre-Mine	m^3/s	-0.04	0.01	0.06	0.06	-0.15	-0.34	-0.50	-0.15	-0.53
		%	-59%	12%	75%	49%	-26%	-40%	-40%	-11%	-27%
August	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.13	0.20	0.30	0.34	0.65
	Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	-0.01	-0.01	0.02	0.00	-0.16	-0.14
		%	0%	0%	-100%	-42%	-5%	10%	0%	-32%	-18%
September	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.11	0.16	0.24	0.29	0.37
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.02	0.03	0.07	0.00	-0.01	-0.16
		%	0%	0%	0%	>100%	41%	81%	0%	-2%	-31%
October	Discharge	m^3/s	0.04	0.06	0.06	0.07	0.21	0.36	0.44	0.55	0.71
	Change from Pre-Mine	m^3/s	0.04	0.06	0.06	0.07	0.15	0.27	0.27	0.29	0.30
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	75%
November	Discharge	m^3/s	0.05	0.05	0.05	0.06	0.07	0.08	0.09	0.09	0.10
	Change from Pre-Mine	m^3/s	0.05	0.05	0.05	0.06	0.05	0.02	0.02	0.02	0.03
		%	>100%	>100%	>100%	>100%	>100%	48%	38%	35%	36%
December	Discharge	m^3/s	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07
	Change from Pre-Mine	m^3/s	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.07	0.07
		%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.25	0.26	0.28	0.31	0.38	0.44	0.47	0.54	0.58
	Change from Pre-Mine	m^3/s	0.12	0.11	0.10	0.11	0.10	0.09	0.07	0.12	0.11
		%	91%	74%	57%	53%	36%	26%	18%	27%	24%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE F-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK CONFLUENCE

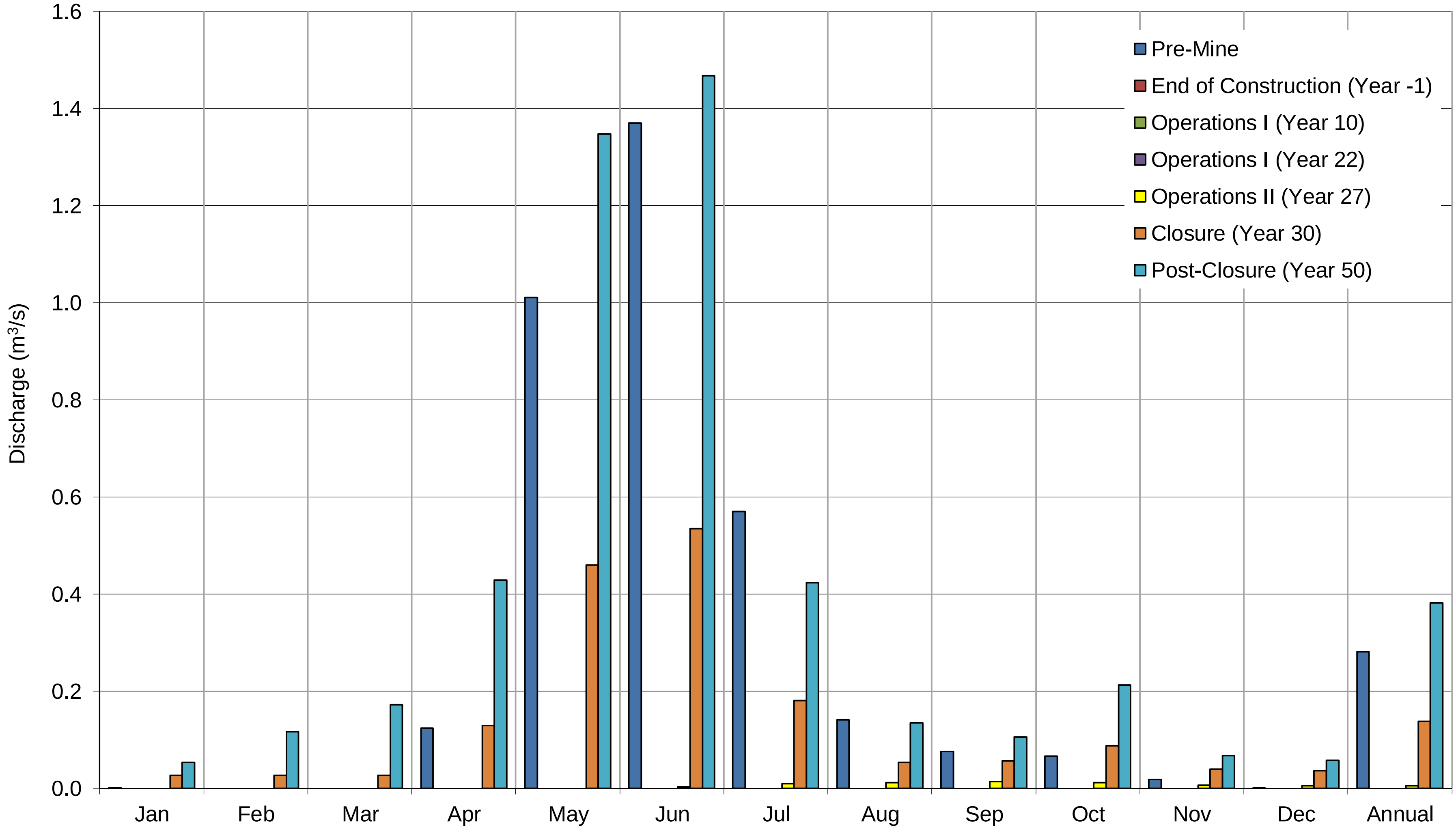
Print Oct/08/14 16:43:49

Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	15.0	Discharge	m^3/s	7	10	12	14	16	19	21
			Unit Runoff	$l/s/km^2$	437	636	774	911	1088	1233	1379
-1	End of Construction	0.0	Discharge	m^3/s	0	0	0	0	0	0	0
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	-7	-10	-12	-14	-16	-19	-21
		-100%		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
10	Operations I	0.0	Discharge	m^3/s	0	0	0	0	0	0	0
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	-7	-10	-12	-14	-16	-19	-21
		-100%		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
22	Operations I	0.0	Discharge	m^3/s	0	0	0	0	0	0	0
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	-7	-10	-12	-14	-16	-19	-21
		-100%		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
27	Operations II	0.0	Discharge	m^3/s	0	0	0	0	0	0	0
			Unit Runoff	$l/s/km^2$	-	-	-	-	-	-	-
			Change from Pre-Mine	m^3/s	-7	-10	-12	-14	-16	-19	-21
		-100%		%	-100%	-100%	-100%	-100%	-100%	-100%	-100%
30	Closure	15.0	Discharge	m^3/s	7	10	12	14	16	19	21
			Unit Runoff	$l/s/km^2$	437	636	774	911	1088	1233	1379
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%
50	Post-Closure	15.0	Discharge	m^3/s	7	10	12	14	16	19	21
			Unit Runoff	$l/s/km^2$	437	636	774	911	1088	1233	1379
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 4_R1.xlsx]Peak Q

NOTE:
1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 4
T-CREEK UPSTREAM OF HARPER CREEK
CONFLUENCE

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P/A NO. VA101-458/14

REF NO. 1

FIGURE F-1

REV 1

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APPENDIX G

WATERSHED MODEL RESULTS FOR NODE 5

(Pages G-1 to G-10)

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TABLE G-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	7.6	Discharge	m^3/s	0.01	0.01	0.01	0.09	0.55	0.52	0.15	0.05	0.03	0.04	0.02	0.01	0.12
			Unit Runoff	$l/s/km^2$	1.7	1.6	1.6	12.4	71.8	68.3	19.4	6.2	3.7	5.1	2.8	1.9	16.4
-1	End of Construction	7.3	Discharge	m^3/s	0.02	0.02	0.02	0.08	0.60	0.55	0.10	0.03	0.02	0.02	0.01	0.02	0.12
			Unit Runoff	$l/s/km^2$	2.3	2.3	2.3	10.6	81.5	74.7	13.5	4.5	2.1	3.2	1.7	2.3	16.7
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.02	0.05	0.02	-0.05	-0.01	-0.01	-0.02	-0.01	0.00	0.00
		-4%		%	0%	0%	0%	-18%	9%	5%	-33%	-31%	-47%	-41%	-41%	0%	0%
10	Operations I	5.0	Discharge	m^3/s	0.00	0.00	0.01	0.02	0.23	0.17	0.03	0.01	0.00	0.01	0.05	0.02	0.05
			Unit Runoff	$l/s/km^2$	0.6	0.1	1.2	3.1	45.6	34.4	6.0	1.7	0.5	2.2	9.7	3.9	9.1
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.08	-0.32	-0.35	-0.12	-0.04	-0.03	-0.03	0.03	0.01	-0.08
		-35%		%	-77%	-96%	-53%	-84%	-59%	-67%	-80%	-82%	-91%	-72%	>100%	37%	-64%
22	Operations I	4.2	Discharge	m^3/s	0.00	0.00	0.01	0.02	0.22	0.16	0.03	0.01	0.00	0.01	0.05	0.02	0.04
			Unit Runoff	$l/s/km^2$	0.8	0.1	1.5	3.6	52.7	38.6	6.6	1.9	0.6	2.7	12.2	4.9	10.5
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.08	-0.33	-0.36	-0.12	-0.04	-0.03	-0.03	0.03	0.01	-0.08
		-45%		%	-75%	-96%	-49%	-84%	-60%	-69%	-81%	-83%	-91%	-71%	>100%	46%	-65%
27	Operations II	4.5	Discharge	m^3/s	0.00	0.00	0.01	0.02	0.24	0.19	0.03	0.01	0.00	0.01	0.04	0.02	0.05
			Unit Runoff	$l/s/km^2$	0.6	0.1	1.1	3.4	53.3	42.4	7.2	2.3	0.7	2.7	8.8	3.5	10.5
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.08	-0.31	-0.33	-0.12	-0.04	-0.03	-0.03	0.02	0.00	-0.08
		-41%		%	-79%	-96%	-59%	-84%	-56%	-63%	-78%	-78%	-90%	-69%	81%	0%	-62%
30	Closure	4.5	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.25	0.20	0.03	0.01	0.00	0.01	0.04	0.02	0.05
			Unit Runoff	$l/s/km^2$	0.6	0.1	1.0	3.5	53.9	44.0	7.6	2.4	0.7	3.0	8.7	3.5	10.7
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.08	-0.30	-0.32	-0.11	-0.04	-0.03	-0.03	0.02	0.00	-0.08
		-40%		%	-79%	-96%	-63%	-83%	-55%	-62%	-77%	-77%	-89%	-65%	82%	0%	-61%
50	Post-Closure	4.6	Discharge	m^3/s	0.00	0.00	0.00	0.02	0.25	0.20	0.03	0.01	0.00	0.02	0.04	0.02	0.05
			Unit Runoff	$l/s/km^2$	0.6	0.1	1.0	3.5	54.0	43.7	7.5	2.3	0.7	3.6	8.7	3.5	10.8
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.08	-0.30	-0.32	-0.11	-0.04	-0.03	-0.02	0.02	0.00	-0.08
		-40%		%	-79%	-96%	-63%	-83%	-55%	-62%	-77%	-78%	-89%	-57%	84%	0%	-61%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 5_R1.xlsx]Mean Monthly

NOTE:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE G-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
February	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02
March	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
April	0.01	0.01	0.01	0.01	0.09	0.19	0.23	0.32	0.35
May	0.24	0.28	0.31	0.38	0.55	0.71	0.78	0.85	0.91
June	0.07	0.11	0.17	0.22	0.52	0.82	0.89	0.97	1.05
July	0.03	0.04	0.04	0.04	0.15	0.19	0.31	0.36	0.58
August	0.01	0.01	0.02	0.02	0.05	0.05	0.07	0.09	0.30
September	0.01	0.01	0.01	0.01	0.03	0.03	0.05	0.08	0.13
October	0.01	0.01	0.01	0.01	0.04	0.05	0.09	0.12	0.20
November	0.01	0.01	0.01	0.01	0.02	0.03	0.05	0.05	0.05
December	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
Annual	0.06	0.07	0.08	0.09	0.12	0.16	0.17	0.18	0.21

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE G-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

Print Oct/08/14 16:45:47

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
		%	77%	71%	58%	52%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
		%	77%	75%	65%	53%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00
		%	77%	70%	63%	51%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	0.02	0.02	0.02	0.02	0.08	0.13	0.16	0.20	0.22
	Change from Pre-Mine	m^3/s	0.00	0.01	0.01	0.01	-0.02	-0.06	-0.07	-0.12	-0.13
		%	0%	50%	59%	75%	-18%	-33%	-30%	-38%	-38%
May	Discharge	m^3/s	0.38	0.40	0.43	0.47	0.60	0.72	0.77	0.82	0.86
	Change from Pre-Mine	m^3/s	0.14	0.12	0.12	0.09	0.05	0.01	-0.01	-0.03	-0.05
		%	58%	45%	39%	24%	9%	1%	-2%	-4%	-5%
June	Discharge	m^3/s	0.18	0.20	0.25	0.32	0.55	0.70	0.82	0.96	0.99
	Change from Pre-Mine	m^3/s	0.11	0.09	0.08	0.10	0.02	-0.12	-0.06	-0.01	-0.06
		%	>100%	82%	44%	43%	5%	-15%	-7%	-1%	-6%
July	Discharge	m^3/s	0.03	0.04	0.04	0.05	0.10	0.12	0.17	0.19	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.01	-0.05	-0.07	-0.13	-0.16	-0.36
		%	0%	0%	16%	21%	-33%	-37%	-43%	-46%	-62%
August	Discharge	m^3/s	0.01	0.02	0.02	0.02	0.03	0.04	0.05	0.07	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.21
		%	0%	0%	0%	0%	-31%	-12%	-20%	-21%	-69%
September	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.05
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.03	-0.04	-0.08
		%	0%	0%	0%	-39%	-47%	-26%	-60%	-55%	-60%
October	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.02	0.03	0.05	0.05	0.08
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.02	-0.04	-0.07	-0.12
		%	0%	0%	0%	0%	-41%	-30%	-46%	-55%	-61%
November	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.03	-0.03	-0.03
		%	0%	0%	0%	0%	-41%	-45%	-60%	-62%	-64%
December	Discharge	m^3/s	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00
		%	66%	61%	47%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	0.08	0.09	0.09	0.10	0.12	0.14	0.16	0.17	0.17
	Change from Pre-Mine	m^3/s	0.02	0.02	0.01	0.01	0.00	-0.01	-0.02	-0.02	-0.04
		%	43%	28%	20%	10%	0%	-7%	-9%	-10%	-19%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE G-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00
		%	-100%	-100%	-100%	-100%	-77%	-64%	-32%	-31%	0%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-96%	-94%	-88%	-88%	-88%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
		%	-100%	-100%	-100%	-100%	-53%	-99%	-98%	-98%	-62%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.04	0.05	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.08	-0.17	-0.19	-0.27	-0.30
		%	-100%	-100%	-100%	-100%	-84%	-86%	-81%	-83%	-84%
May	Discharge	m^3/s	0.09	0.13	0.14	0.16	0.23	0.29	0.31	0.34	0.36
	Change from Pre-Mine	m^3/s	-0.15	-0.15	-0.17	-0.22	-0.32	-0.42	-0.47	-0.50	-0.54
		%	-62%	-54%	-54%	-58%	-59%	-59%	-60%	-59%	-60%
June	Discharge	m^3/s	0.04	0.05	0.07	0.10	0.17	0.24	0.28	0.29	0.36
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.10	-0.13	-0.35	-0.58	-0.61	-0.68	-0.70
		%	-47%	-56%	-60%	-56%	-67%	-71%	-69%	-70%	-66%
July	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.03	0.05	0.06	0.09	0.11
	Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.03	-0.03	-0.12	-0.15	-0.24	-0.27	-0.48
		%	-82%	-78%	-76%	-77%	-80%	-77%	-80%	-75%	-82%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.03	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.05	-0.06	-0.26
		%	-91%	-88%	-89%	-90%	-82%	-80%	-81%	-66%	-85%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.05	-0.07	-0.12
		%	-98%	-98%	-98%	-97%	-91%	-88%	-88%	-90%	-91%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.03	-0.06	-0.08	-0.15
		%	-93%	-93%	-93%	-93%	-72%	-58%	-64%	-66%	-73%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.05	0.09	0.18	0.19	0.20
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.03	0.06	0.13	0.14	0.14
		%	-99%	-98%	-98%	-96%	>100%	>100%	>100%	>100%	>100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.04	0.07	0.08	0.08
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.01	0.02	0.05	0.06	0.06
		%	-99%	-99%	-99%	-98%	37%	>100%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.02	0.02	0.03	0.03	0.05	0.06	0.07	0.07	0.08
	Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.05	-0.06	-0.08	-0.10	-0.11	-0.11	-0.13
		%	-64%	-65%	-67%	-64%	-64%	-64%	-61%	-62%	-63%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE G-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00
		%	-100%	-100%	-100%	-100%	-75%	-60%	0%	0%	0%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-96%	-93%	-87%	-87%	-87%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
		%	-100%	-100%	-100%	-100%	-49%	-99%	-97%	-97%	-59%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.04	0.05	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.08	-0.17	-0.19	-0.27	-0.30
		%	-100%	-100%	-100%	-100%	-84%	-87%	-81%	-83%	-84%
May	Discharge	m^3/s	0.09	0.13	0.14	0.16	0.22	0.28	0.30	0.33	0.35
	Change from Pre-Mine	m^3/s	-0.15	-0.15	-0.17	-0.22	-0.33	-0.43	-0.48	-0.52	-0.56
		%	-62%	-53%	-54%	-58%	-60%	-60%	-61%	-61%	-62%
June	Discharge	m^3/s	0.04	0.04	0.07	0.09	0.16	0.23	0.26	0.27	0.32
	Change from Pre-Mine	m^3/s	-0.03	-0.07	-0.11	-0.13	-0.36	-0.59	-0.63	-0.70	-0.73
		%	-47%	-60%	-61%	-59%	-69%	-72%	-71%	-72%	-69%
July	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.03	0.04	0.06	0.08	0.10
	Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.03	-0.03	-0.12	-0.15	-0.25	-0.27	-0.48
		%	-82%	-79%	-78%	-78%	-81%	-79%	-81%	-77%	-83%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.03	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.06	-0.06	-0.26
		%	-91%	-89%	-89%	-91%	-83%	-82%	-82%	-69%	-86%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.05	-0.07	-0.12
		%	-98%	-98%	-98%	-97%	-91%	-88%	-88%	-90%	-91%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.03	-0.05	-0.08	-0.15
		%	-93%	-93%	-93%	-93%	-71%	-55%	-61%	-66%	-72%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.05	0.10	0.19	0.19	0.20
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.03	0.06	0.14	0.15	0.15
		%	-99%	-98%	-98%	-96%	>100%	>100%	>100%	>100%	>100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.04	0.08	0.08	0.08
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.01	0.02	0.06	0.06	0.06
		%	-99%	-99%	-99%	-98%	46%	>100%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.02	0.02	0.03	0.03	0.04	0.06	0.07	0.07	0.07
	Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.05	-0.06	-0.08	-0.10	-0.11	-0.11	-0.14
		%	-64%	-65%	-67%	-65%	-65%	-64%	-62%	-62%	-65%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold
CONSULTING

TABLE G-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-79%	-68%	-40%	-37%	-32%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-96%	-95%	-90%	-89%	-88%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
		%	-100%	-100%	-100%	-100%	-59%	-99%	-98%	-98%	-66%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.05	0.06	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.08	-0.17	-0.19	-0.26	-0.29
		%	-100%	-100%	-100%	-100%	-84%	-87%	-81%	-82%	-83%
May	Discharge	m^3/s	0.11	0.14	0.16	0.17	0.24	0.31	0.33	0.36	0.37
	Change from Pre-Mine	m^3/s	-0.14	-0.14	-0.15	-0.21	-0.31	-0.40	-0.46	-0.49	-0.53
		%	-56%	-49%	-50%	-55%	-56%	-57%	-58%	-58%	-59%
June	Discharge	m^3/s	0.04	0.05	0.08	0.12	0.19	0.26	0.29	0.32	0.37
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.09	-0.10	-0.33	-0.56	-0.60	-0.65	-0.68
		%	-46%	-56%	-53%	-46%	-63%	-68%	-67%	-67%	-65%
July	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.03	0.05	0.07	0.10	0.12
	Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.03	-0.03	-0.12	-0.14	-0.23	-0.26	-0.47
		%	-76%	-77%	-77%	-77%	-78%	-73%	-77%	-72%	-80%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.05	-0.05	-0.24
		%	-89%	-88%	-88%	-90%	-78%	-78%	-79%	-55%	-80%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.05	-0.07	-0.12
		%	-98%	-98%	-98%	-97%	-90%	-89%	-85%	-88%	-88%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.04	0.07
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.03	-0.05	-0.08	-0.14
		%	-95%	-95%	-95%	-95%	-69%	-52%	-55%	-63%	-67%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.04	0.07	0.14	0.15	0.17
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.02	0.04	0.10	0.11	0.12
		%	-99%	-99%	-98%	-97%	81%	>100%	>100%	>100%	>100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.06	0.06	0.07
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.04	0.04	0.05
		%	-99%	-99%	-99%	-99%	0%	70%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.02	0.02	0.03	0.03	0.05	0.06	0.07	0.07	0.08
	Change from Pre-Mine	m^3/s	-0.03	-0.04	-0.05	-0.05	-0.08	-0.10	-0.10	-0.11	-0.13
		%	-59%	-63%	-64%	-61%	-62%	-63%	-60%	-60%	-63%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 5_R1.xlsx]27 WD

NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE G-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-79%	-68%	-41%	-38%	-34%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-96%	-95%	-90%	-89%	-89%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
		%	-100%	-100%	-100%	-100%	-63%	-99%	-98%	-98%	-70%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.05	0.06	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.08	-0.17	-0.19	-0.26	-0.29
		%	-100%	-100%	-100%	-100%	-83%	-86%	-80%	-82%	-83%
May	Discharge	m^3/s	0.11	0.14	0.16	0.18	0.25	0.31	0.33	0.36	0.38
	Change from Pre-Mine	m^3/s	-0.13	-0.13	-0.15	-0.20	-0.30	-0.40	-0.45	-0.49	-0.52
		%	-53%	-48%	-48%	-54%	-55%	-56%	-57%	-58%	-58%
June	Discharge	m^3/s	0.04	0.05	0.09	0.13	0.20	0.28	0.30	0.34	0.39
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.09	-0.10	-0.32	-0.54	-0.58	-0.63	-0.67
		%	-45%	-55%	-49%	-43%	-62%	-66%	-66%	-65%	-63%
July	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.03	0.06	0.08	0.11	0.13
	Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.03	-0.03	-0.11	-0.14	-0.23	-0.24	-0.45
		%	-75%	-77%	-77%	-78%	-77%	-70%	-75%	-69%	-78%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.07
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.05	-0.04	-0.24
		%	-89%	-89%	-89%	-90%	-77%	-77%	-79%	-50%	-78%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.04	-0.06	-0.12
		%	-98%	-98%	-98%	-98%	-89%	-86%	-83%	-86%	-87%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.03	0.04	0.05	0.08
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.05	-0.07	-0.13
		%	-96%	-96%	-96%	-96%	-65%	-42%	-54%	-58%	-62%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.04	0.07	0.14	0.16	0.17
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.02	0.04	0.10	0.11	0.11
		%	-99%	-99%	-98%	-97%	82%	>100%	>100%	>100%	>100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.06	0.06	0.07
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.04	0.04	0.05
		%	-99%	-99%	-99%	-99%	0%	70%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.07	0.08
	Change from Pre-Mine	m^3/s	-0.03	-0.04	-0.05	-0.05	-0.08	-0.10	-0.10	-0.11	-0.13
		%	-58%	-62%	-62%	-60%	-61%	-62%	-59%	-60%	-62%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE G-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-79%	-68%	-41%	-37%	-33%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-100%	-100%	-100%	-100%	-96%	-95%	-90%	-89%	-88%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
		%	-100%	-100%	-100%	-100%	-63%	-99%	-98%	-98%	-70%
April	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.05	0.06	0.06
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.08	-0.17	-0.19	-0.26	-0.29
		%	-100%	-100%	-100%	-100%	-83%	-86%	-80%	-82%	-82%
May	Discharge	m^3/s	0.11	0.14	0.16	0.18	0.25	0.32	0.34	0.37	0.38
	Change from Pre-Mine	m^3/s	-0.13	-0.13	-0.15	-0.20	-0.30	-0.40	-0.45	-0.48	-0.52
		%	-54%	-48%	-48%	-53%	-55%	-56%	-57%	-56%	-58%
June	Discharge	m^3/s	0.04	0.05	0.09	0.13	0.20	0.27	0.31	0.34	0.39
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.09	-0.10	-0.32	-0.55	-0.58	-0.63	-0.66
		%	-47%	-57%	-50%	-43%	-62%	-67%	-66%	-65%	-63%
July	Discharge	m^3/s	0.01	0.01	0.01	0.01	0.03	0.06	0.08	0.11	0.13
	Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.03	-0.04	-0.11	-0.14	-0.23	-0.24	-0.45
		%	-77%	-80%	-79%	-80%	-77%	-70%	-74%	-68%	-77%
August	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.07
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.05	-0.04	-0.24
		%	-91%	-91%	-91%	-92%	-78%	-78%	-79%	-49%	-78%
September	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.04	-0.06	-0.12
		%	-98%	-98%	-98%	-98%	-89%	-86%	-83%	-86%	-87%
October	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.04	0.05	0.06	0.08
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.04	-0.06	-0.12
		%	-99%	-99%	-98%	-97%	-57%	-30%	-44%	-48%	-61%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.04	0.07	0.15	0.16	0.18
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.02	0.04	0.10	0.11	0.12
		%	-99%	-99%	-98%	-96%	84%	>100%	>100%	>100%	>100%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.06	0.06	0.07
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	0.00	0.01	0.04	0.05	0.05
		%	-99%	-99%	-99%	-99%	0%	70%	>100%	>100%	>100%
Annual	Discharge	m^3/s	0.02	0.03	0.03	0.04	0.05	0.06	0.07	0.08	0.08
	Change from Pre-Mine	m^3/s	-0.03	-0.04	-0.05	-0.05	-0.08	-0.10	-0.10	-0.11	-0.13
		%	-59%	-62%	-63%	-60%	-61%	-61%	-58%	-58%	-61%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE G-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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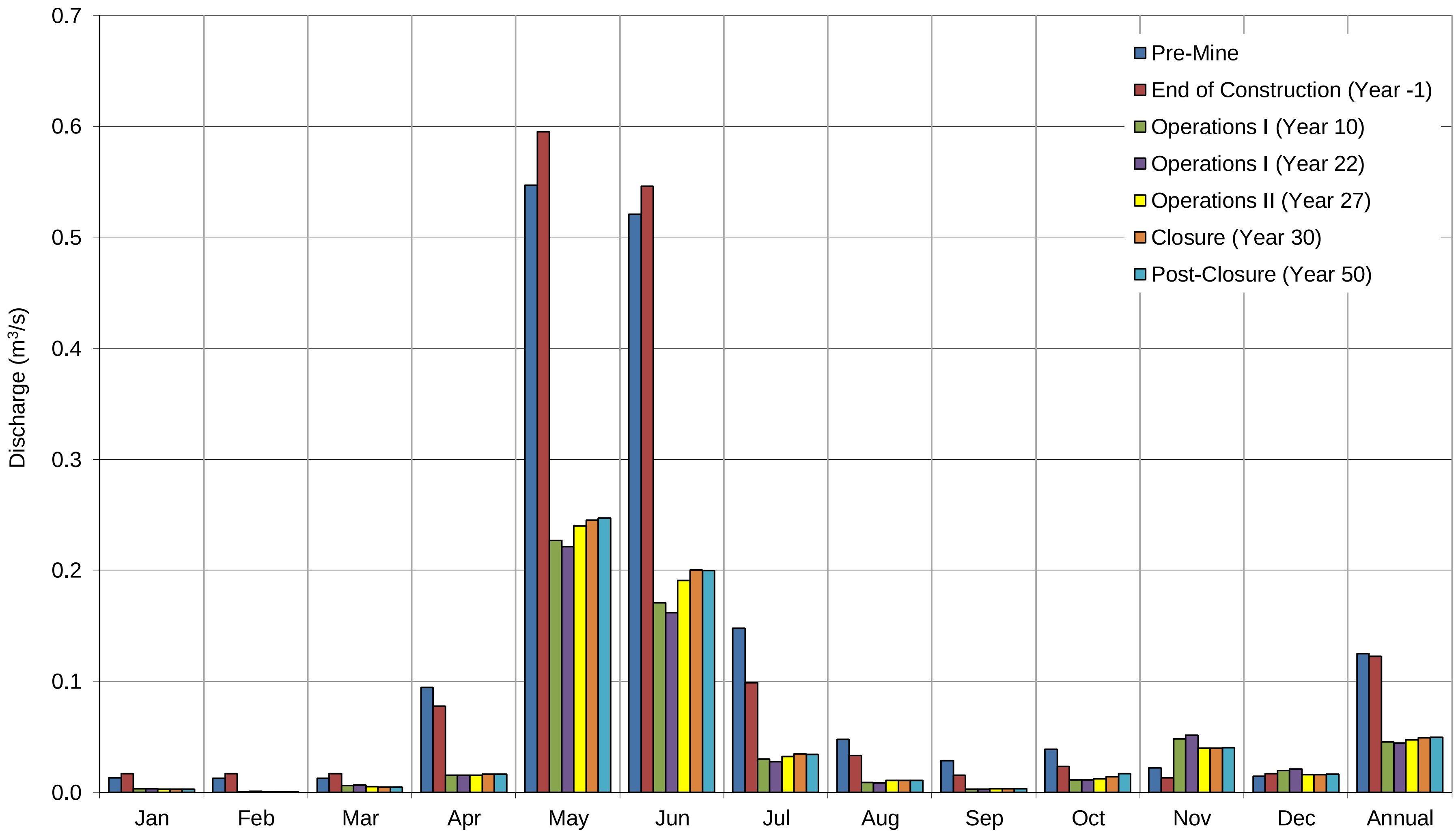
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	7.6	Discharge	m^3/s	4	6	7	8	10	12	13
			Unit Runoff	$l/s/km^2$	509	748	927	1092	1331	1511	1690
-1	End of Construction	7.3	Discharge	m^3/s	4	6	7	8	10	11	12
			Unit Runoff	$l/s/km^2$	514	756	937	1103	1345	1527	1708
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-4%		%	0%	0%	0%	0%	0%	0%	0%
10	Operations I	5.0	Discharge	m^3/s	3	4	5	6	7	8	9
			Unit Runoff	$l/s/km^2$	566	833	1032	1216	1482	1682	1882
			Change from Pre-Mine	m^3/s	-1	-2	-2	-2	-3	-3	-4
		-35%		%	-27%	-27%	-27%	-27%	-27%	-27%	-27%
22	Operations I	4.2	Discharge	m^3/s	2	4	5	5	6	7	8
			Unit Runoff	$l/s/km^2$	590	868	1077	1268	1546	1754	1962
			Change from Pre-Mine	m^3/s	-1	-2	-3	-3	-4	-4	-5
		-45%		%	-36%	-36%	-36%	-36%	-36%	-36%	-36%
27	Operations II	4.5	Discharge	m^3/s	3	4	5	6	7	8	9
			Unit Runoff	$l/s/km^2$	580	853	1058	1246	1519	1724	1928
			Change from Pre-Mine	m^3/s	-1	-2	-2	-3	-3	-4	-4
		-41%		%	-33%	-33%	-33%	-33%	-33%	-33%	-33%
30	Closure	4.5	Discharge	m^3/s	3	4	5	6	7	8	9
			Unit Runoff	$l/s/km^2$	579	851	1055	1242	1515	1719	1923
			Change from Pre-Mine	m^3/s	-1	-2	-2	-3	-3	-4	-4
		-40%		%	-32%	-32%	-32%	-32%	-32%	-32%	-32%
50	Post-Closure	4.6	Discharge	m^3/s	3	4	5	6	7	8	9
			Unit Runoff	$l/s/km^2$	578	850	1054	1241	1513	1717	1921
			Change from Pre-Mine	m^3/s	-1	-2	-2	-3	-3	-4	-4
		-40%		%	-32%	-32%	-32%	-32%	-32%	-32%	-32%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 5_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 5
P-CREEK AT HARPER CREEK CONFLUENCE

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P/A NO. VA101-458/14

REF NO. 1

FIGURE G-1

REV 1

APPENDIX H

WATERSHED MODEL RESULTS FOR NODE 6

(Pages H-1 to H-10)

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TABLE H-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

Print Oct/08/14 16:49:00

Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	17.6	Discharge	m^3/s	0.01	0.01	0.01	0.25	0.74	0.86	0.47	0.16	0.07	0.10	0.10	0.03	0.23
			Unit Runoff	$l/s/km^2$	0.7	0.3	0.8	14.0	42.1	48.7	26.8	9.2	4.2	6.0	5.6	1.8	13.3
-1	End of Construction		Discharge	m^3/s	0.01	0.00	0.00	0.26	0.80	0.91	0.45	0.10	0.04	0.09	0.09	0.03	0.23
		17.5	Unit Runoff	$l/s/km^2$	0.5	0.0	0.0	14.8	45.6	51.8	25.6	6.0	2.1	4.9	5.3	1.6	13.2
			Change from Pre-Mine	m^3/s	0.00	-0.01	-0.01	0.01	0.06	0.05	-0.02	-0.06	-0.04	-0.02	-0.01	0.00	0.00
		-1%		%	-37%	-95%	-100%	6%	8%	6%	-5%	-35%	-49%	-18%	-6%	-10%	-2%
10	Operations I		Discharge	m^3/s	0.01	0.00	0.00	0.26	0.78	0.87	0.43	0.10	0.04	0.09	0.09	0.03	0.23
		17.1	Unit Runoff	$l/s/km^2$	0.7	0.1	0.0	14.9	45.5	51.1	25.3	6.1	2.3	5.1	5.5	1.8	13.2
			Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	0.01	0.04	0.02	-0.04	-0.06	-0.03	-0.02	0.00	0.00	-0.01
		-3%		%	-8%	-56%	-100%	4%	5%	2%	-8%	-36%	-47%	-17%	-4%	-4%	-4%
22	Operations I		Discharge	m^3/s	0.01	0.00	0.00	0.25	0.80	0.91	0.45	0.10	0.04	0.09	0.09	0.03	0.23
		17.0	Unit Runoff	$l/s/km^2$	0.7	0.2	0.0	15.0	47.1	53.9	26.6	6.1	2.4	5.2	5.6	1.8	13.7
			Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	0.01	0.06	0.06	-0.02	-0.06	-0.03	-0.02	0.00	0.00	0.00
		-4%		%	-1%	-43%	-100%	4%	8%	7%	-4%	-35%	-45%	-16%	-4%	-1%	-1%
27	Operations II		Discharge	m^3/s	0.01	0.00	0.00	0.26	0.80	0.91	0.45	0.10	0.04	0.09	0.10	0.03	0.23
		17.2	Unit Runoff	$l/s/km^2$	0.7	0.2	0.0	15.0	46.5	52.9	26.1	6.1	2.3	5.1	5.5	1.8	13.5
			Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	0.01	0.06	0.06	-0.02	-0.06	-0.03	-0.02	0.00	0.00	0.00
		-2%		%	-4%	-50%	-100%	5%	8%	7%	-4%	-35%	-46%	-16%	-3%	-3%	-1%
30	Closure		Discharge	m^3/s	0.01	0.00	0.00	0.26	0.80	0.91	0.45	0.11	0.04	0.09	0.10	0.03	0.23
		17.4	Unit Runoff	$l/s/km^2$	0.7	0.1	0.0	15.0	45.9	52.2	25.9	6.0	2.2	5.1	5.5	1.7	13.4
			Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	0.02	0.06	0.05	-0.02	-0.06	-0.03	-0.02	0.00	0.00	0.00
		-1%		%	-10%	-63%	-99%	7%	8%	6%	-4%	-35%	-47%	-15%	-3%	-5%	-1%
50	Post-Closure		Discharge	m^3/s	0.01	0.00	0.00	0.26	0.80	0.91	0.45	0.11	0.04	0.09	0.09	0.03	0.23
		17.6	Unit Runoff	$l/s/km^2$	0.6	0.1	0.0	14.7	45.6	52.0	25.7	6.0	2.2	5.0	5.4	1.6	13.2
			Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	0.01	0.06	0.06	-0.02	-0.06	-0.04	-0.02	0.00	0.00	0.00
		0%		%	-19%	-82%	-98%	5%	8%	7%	-4%	-34%	-48%	-17%	-4%	-9%	-1%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 6_R1.xlsx]Mean Monthly

NOTE:
1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE H-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.00	0.00	0.00	0.00	0.01	0.02	0.03	0.03	0.04
February	0.00	0.00	0.00	0.00	0.01	0.01	0.02	0.02	0.03
March	0.00	0.00	0.00	0.00	0.01	0.01	0.04	0.08	0.13
April	0.02	0.05	0.08	0.11	0.25	0.38	0.43	0.47	0.51
May	0.37	0.41	0.48	0.55	0.74	0.94	1.04	1.11	1.25
June	0.28	0.35	0.45	0.57	0.86	1.07	1.16	1.35	1.74
July	0.07	0.11	0.15	0.22	0.47	0.64	0.80	0.95	1.19
August	0.02	0.02	0.04	0.06	0.16	0.20	0.33	0.41	0.57
September	0.00	0.01	0.01	0.02	0.07	0.10	0.16	0.25	0.37
October	0.00	0.00	0.01	0.02	0.10	0.19	0.25	0.31	0.38
November	0.00	0.00	0.00	0.01	0.10	0.19	0.24	0.27	0.34
December	0.00	0.00	0.00	0.00	0.03	0.06	0.07	0.08	0.09
Annual	0.08	0.11	0.13	0.16	0.23	0.29	0.34	0.37	0.42

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE H-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	0.00	-0.01	-0.02	-0.02	-0.03
		%	0%	0%	0%	>100%	0%	-55%	-57%	-56%	-64%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.02	-0.02	-0.03
		%	0%	0%	0%	0%	-95%	-96%	-97%	-97%	-97%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.04	-0.08	-0.13
		%	0%	0%	0%	0%	-100%	-99%	-100%	-100%	-100%
April	Discharge	m^3/s	0.04	0.07	0.10	0.14	0.26	0.39	0.44	0.48	0.52
	Change from Pre-Mine	m^3/s	0.02	0.03	0.02	0.02	0.01	0.01	0.02	0.01	0.01
		%	>100%	54%	26%	20%	6%	3%	4%	3%	2%
May	Discharge	m^3/s	0.48	0.55	0.58	0.62	0.80	0.99	1.07	1.11	1.17
	Change from Pre-Mine	m^3/s	0.11	0.14	0.10	0.08	0.06	0.05	0.03	0.01	-0.07
		%	31%	34%	20%	14%	8%	6%	3%	1%	-6%
June	Discharge	m^3/s	0.42	0.44	0.52	0.64	0.91	1.11	1.30	1.42	1.62
	Change from Pre-Mine	m^3/s	0.14	0.09	0.06	0.07	0.05	0.04	0.13	0.07	-0.12
		%	51%	27%	14%	12%	6%	4%	12%	5%	-7%
July	Discharge	m^3/s	0.12	0.14	0.17	0.23	0.45	0.56	0.79	0.89	0.96
	Change from Pre-Mine	m^3/s	0.05	0.03	0.02	0.01	-0.02	-0.08	0.00	-0.07	-0.23
		%	79%	23%	16%	5%	-5%	-13%	0%	-7%	-19%
August	Discharge	m^3/s	0.02	0.03	0.04	0.05	0.10	0.14	0.18	0.23	0.28
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.06	-0.06	-0.14	-0.18	-0.29
		%	0%	0%	0%	0%	-35%	-30%	-44%	-44%	-51%
September	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.04	0.05	0.06	0.10	0.13
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.04	-0.05	-0.09	-0.15	-0.24
		%	0%	0%	0%	0%	-49%	-50%	-59%	-58%	-66%
October	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.09	0.12	0.18	0.22	0.29
	Change from Pre-Mine	m^3/s	0.01	0.01	0.02	0.01	-0.02	-0.07	-0.07	-0.09	-0.08
		%	>100%	>100%	>100%	64%	-18%	-37%	-28%	-28%	-22%
November	Discharge	m^3/s	0.00	0.01	0.02	0.03	0.09	0.14	0.20	0.26	0.31
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.02	-0.01	-0.05	-0.04	-0.01	-0.03
		%	0%	>100%	>100%	>100%	-6%	-24%	-17%	-4%	-8%
December	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.03	0.04	0.05	0.06	0.07
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.01	0.00	-0.02	-0.02	-0.02	-0.02
		%	0%	0%	>100%	>100%	0%	-27%	-23%	-21%	-24%
Annual	Discharge	m^3/s	0.12	0.14	0.15	0.17	0.23	0.29	0.32	0.34	0.35
	Change from Pre-Mine	m^3/s	0.04	0.03	0.02	0.01	0.00	-0.01	-0.02	-0.03	-0.07
		%	46%	22%	13%	8%	0%	-2%	-7%	-8%	-16%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE H-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-25%	-25%	-23%	-35%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-64%	-67%	-66%	-71%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.04	-0.08	-0.13
		%	0%	0%	0%	0%	-100%	-99%	-100%	-100%	-100%
April	Discharge	m^3/s	0.06	0.07	0.10	0.14	0.26	0.38	0.43	0.47	0.51
	Change from Pre-Mine	m^3/s	0.05	0.03	0.02	0.02	0.01	0.00	0.00	0.00	0.00
		%	>100%	54%	27%	20%	4%	0%	0%	0%	0%
May	Discharge	m^3/s	0.48	0.53	0.58	0.61	0.78	0.96	1.05	1.07	1.14
	Change from Pre-Mine	m^3/s	0.11	0.12	0.10	0.06	0.04	0.02	0.01	-0.04	-0.10
		%	30%	30%	20%	11%	5%	2%	1%	-3%	-8%
June	Discharge	m^3/s	0.40	0.41	0.50	0.61	0.87	1.07	1.26	1.37	1.57
	Change from Pre-Mine	m^3/s	0.12	0.07	0.04	0.04	0.02	0.00	0.10	0.02	-0.17
		%	43%	20%	9%	7%	2%	0%	9%	2%	-10%
July	Discharge	m^3/s	0.11	0.13	0.16	0.22	0.43	0.55	0.77	0.87	0.94
	Change from Pre-Mine	m^3/s	0.04	0.02	0.02	0.00	-0.04	-0.10	-0.02	-0.09	-0.25
		%	63%	15%	11%	0%	-8%	-15%	-3%	-9%	-21%
August	Discharge	m^3/s	0.02	0.03	0.04	0.05	0.10	0.14	0.18	0.23	0.27
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.06	-0.14	-0.19	-0.29
		%	0%	0%	0%	-10%	-36%	-28%	-44%	-45%	-52%
September	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.04	0.05	0.07	0.11	0.13
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.05	-0.09	-0.14	-0.23
		%	0%	0%	0%	0%	-47%	-47%	-57%	-57%	-64%
October	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.09	0.13	0.18	0.22	0.30
	Change from Pre-Mine	m^3/s	0.01	0.01	0.02	0.01	-0.02	-0.07	-0.07	-0.08	-0.08
		%	>100%	>100%	>100%	70%	-17%	-34%	-28%	-27%	-21%
November	Discharge	m^3/s	0.00	0.01	0.02	0.03	0.09	0.15	0.20	0.27	0.32
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.02	0.00	-0.04	-0.04	0.00	-0.03
		%	0%	>100%	>100%	>100%	0%	-21%	-16%	0%	-8%
December	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.03	0.04	0.06	0.07	0.07
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.01	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	>100%	>100%	0%	-20%	-19%	-14%	-18%
Annual	Discharge	m^3/s	0.12	0.13	0.15	0.17	0.23	0.28	0.31	0.34	0.34
	Change from Pre-Mine	m^3/s	0.03	0.02	0.01	0.01	-0.01	-0.01	-0.03	-0.03	-0.08
		%	39%	20%	9%	5%	-4%	-5%	-9%	-9%	-19%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE H-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-21%	-21%	-19%	-32%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-55%	-59%	-58%	-64%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.04	-0.08	-0.13
		%	0%	0%	0%	0%	-100%	-99%	-100%	-100%	-100%
April	Discharge	m^3/s	0.04	0.07	0.09	0.13	0.25	0.39	0.44	0.48	0.52
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.01	0.00	0.02	0.01	0.01
		%	>100%	51%	25%	17%	4%	0%	4%	2%	1%
May	Discharge	m^3/s	0.47	0.55	0.58	0.63	0.80	0.99	1.07	1.10	1.17
	Change from Pre-Mine	m^3/s	0.10	0.14	0.10	0.08	0.06	0.05	0.03	-0.01	-0.08
		%	28%	34%	20%	15%	8%	6%	3%	-1%	-6%
June	Discharge	m^3/s	0.42	0.44	0.54	0.66	0.91	1.12	1.31	1.43	1.61
	Change from Pre-Mine	m^3/s	0.15	0.09	0.09	0.08	0.06	0.05	0.15	0.08	-0.13
		%	53%	26%	19%	15%	7%	5%	13%	6%	-8%
July	Discharge	m^3/s	0.11	0.13	0.17	0.23	0.45	0.57	0.77	0.93	1.00
	Change from Pre-Mine	m^3/s	0.04	0.01	0.03	0.00	-0.02	-0.07	-0.02	-0.02	-0.18
		%	60%	13%	18%	0%	-4%	-11%	-3%	-2%	-16%
August	Discharge	m^3/s	0.02	0.03	0.04	0.05	0.10	0.14	0.19	0.24	0.27
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.06	-0.14	-0.18	-0.30
		%	0%	0%	0%	-10%	-35%	-29%	-43%	-43%	-53%
September	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.04	0.05	0.07	0.11	0.14
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.05	-0.09	-0.14	-0.23
		%	0%	0%	0%	0%	-45%	-47%	-54%	-57%	-63%
October	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.09	0.13	0.18	0.23	0.30
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.01	-0.02	-0.07	-0.07	-0.08	-0.08
		%	>100%	>100%	>100%	74%	-16%	-34%	-28%	-26%	-20%
November	Discharge	m^3/s	0.00	0.01	0.02	0.03	0.09	0.15	0.20	0.27	0.31
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.02	0.00	-0.04	-0.04	0.00	-0.03
		%	0%	>100%	>100%	>100%	0%	-21%	-16%	0%	-8%
December	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.03	0.05	0.06	0.07	0.08
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.01	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	>100%	>100%	0%	-17%	-17%	-12%	-16%
Annual	Discharge	m^3/s	0.12	0.13	0.15	0.17	0.23	0.29	0.32	0.34	0.36
	Change from Pre-Mine	m^3/s	0.04	0.02	0.02	0.01	0.00	-0.01	-0.02	-0.03	-0.06
		%	44%	20%	13%	7%	0%	-2%	-6%	-8%	-15%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 6_R1.xlsx]22 WD

NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE H-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-22%	-22%	-19%	-32%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-59%	-63%	-61%	-67%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.04	-0.08	-0.13
		%	0%	0%	0%	0%	-100%	-100%	-100%	-100%	-100%
April	Discharge	m^3/s	0.04	0.07	0.09	0.13	0.26	0.39	0.45	0.49	0.52
	Change from Pre-Mine	m^3/s	0.02	0.03	0.02	0.02	0.01	0.01	0.02	0.02	0.01
		%	>100%	52%	25%	17%	5%	2%	5%	4%	2%
May	Discharge	m^3/s	0.48	0.55	0.59	0.63	0.80	0.99	1.08	1.11	1.18
	Change from Pre-Mine	m^3/s	0.11	0.14	0.10	0.08	0.06	0.06	0.04	0.00	-0.07
		%	29%	34%	21%	16%	8%	6%	4%	0%	-6%
June	Discharge	m^3/s	0.42	0.44	0.52	0.65	0.91	1.13	1.32	1.44	1.62
	Change from Pre-Mine	m^3/s	0.15	0.09	0.07	0.08	0.06	0.05	0.16	0.09	-0.12
		%	53%	26%	14%	14%	7%	5%	14%	7%	-7%
July	Discharge	m^3/s	0.11	0.13	0.17	0.23	0.45	0.57	0.79	0.93	1.00
	Change from Pre-Mine	m^3/s	0.04	0.02	0.03	0.00	-0.02	-0.07	-0.01	-0.03	-0.19
		%	65%	16%	18%	0%	-4%	-11%	-1%	-3%	-16%
August	Discharge	m^3/s	0.02	0.03	0.04	0.05	0.10	0.14	0.19	0.24	0.27
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.06	-0.14	-0.18	-0.29
		%	0%	0%	0%	-10%	-35%	-28%	-43%	-43%	-52%
September	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.04	0.05	0.07	0.11	0.14
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.05	-0.09	-0.14	-0.23
		%	0%	0%	0%	0%	-46%	-47%	-55%	-56%	-63%
October	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.09	0.13	0.19	0.23	0.31
	Change from Pre-Mine	m^3/s	0.01	0.01	0.02	0.01	-0.02	-0.06	-0.07	-0.08	-0.07
		%	>100%	>100%	>100%	72%	-16%	-33%	-26%	-25%	-19%
November	Discharge	m^3/s	0.00	0.01	0.02	0.03	0.10	0.14	0.21	0.27	0.32
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.02	0.00	-0.05	-0.03	0.00	-0.02
		%	0%	>100%	>100%	>100%	0%	-24%	-14%	0%	-6%
December	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.03	0.05	0.06	0.07	0.08
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.01	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	>100%	>100%	0%	-18%	-17%	-13%	-16%
Annual	Discharge	m^3/s	0.12	0.14	0.15	0.17	0.23	0.29	0.32	0.35	0.36
	Change from Pre-Mine	m^3/s	0.04	0.02	0.02	0.01	0.00	0.00	-0.02	-0.03	-0.06
		%	45%	21%	13%	7%	0%	0%	-5%	-7%	-15%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 6_R1.xlsx]27 WD

NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE H-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.03	0.03
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-25%	-29%	-22%	-35%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-69%	-72%	-70%	-74%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.04	-0.08	-0.12
		%	0%	0%	0%	0%	-99%	-99%	-100%	-100%	-100%
April	Discharge	m^3/s	0.03	0.07	0.10	0.13	0.26	0.39	0.45	0.50	0.53
	Change from Pre-Mine	m^3/s	0.02	0.03	0.02	0.02	0.02	0.01	0.03	0.03	0.02
		%	>100%	55%	28%	19%	7%	3%	7%	6%	5%
May	Discharge	m^3/s	0.48	0.55	0.58	0.63	0.80	0.99	1.08	1.11	1.18
	Change from Pre-Mine	m^3/s	0.11	0.14	0.10	0.08	0.06	0.05	0.04	0.01	-0.07
		%	29%	34%	21%	15%	8%	6%	4%	1%	-5%
June	Discharge	m^3/s	0.42	0.44	0.52	0.64	0.91	1.12	1.31	1.43	1.63
	Change from Pre-Mine	m^3/s	0.14	0.09	0.06	0.07	0.05	0.05	0.15	0.08	-0.11
		%	52%	26%	14%	12%	6%	4%	13%	6%	-7%
July	Discharge	m^3/s	0.11	0.13	0.17	0.23	0.45	0.57	0.80	0.91	0.98
	Change from Pre-Mine	m^3/s	0.04	0.02	0.02	0.01	-0.02	-0.07	0.00	-0.04	-0.20
		%	67%	18%	17%	3%	-4%	-11%	0%	-5%	-17%
August	Discharge	m^3/s	0.02	0.03	0.04	0.05	0.11	0.15	0.19	0.24	0.28
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.05	-0.14	-0.18	-0.29
		%	0%	0%	0%	-10%	-35%	-27%	-43%	-43%	-51%
September	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.04	0.05	0.07	0.11	0.14
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.05	-0.09	-0.14	-0.23
		%	0%	0%	0%	0%	-47%	-48%	-56%	-57%	-63%
October	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.09	0.13	0.19	0.23	0.32
	Change from Pre-Mine	m^3/s	0.01	0.01	0.02	0.01	-0.02	-0.06	-0.06	-0.08	-0.06
		%	>100%	>100%	>100%	70%	-15%	-32%	-26%	-26%	-17%
November	Discharge	m^3/s	0.00	0.01	0.02	0.03	0.10	0.15	0.19	0.27	0.29
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.02	0.00	-0.04	-0.05	0.00	-0.05
		%	0%	>100%	>100%	>100%	0%	-22%	-21%	0%	-15%
December	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.03	0.04	0.06	0.07	0.08
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	>100%	0%	-22%	-19%	-12%	-16%
Annual	Discharge	m^3/s	0.12	0.14	0.15	0.17	0.23	0.29	0.32	0.35	0.36
	Change from Pre-Mine	m^3/s	0.04	0.02	0.02	0.01	0.00	0.00	-0.02	-0.03	-0.06
		%	45%	21%	13%	8%	0%	0%	-5%	-7%	-15%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE H-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.02	0.02	0.03
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-32%	-32%	-29%	-40%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.03
		%	0%	0%	0%	0%	0%	-85%	-86%	-85%	-87%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.04	-0.07	-0.12
		%	0%	0%	0%	0%	-98%	-98%	-98%	-98%	-98%
April	Discharge	m^3/s	0.03	0.07	0.10	0.13	0.26	0.39	0.44	0.49	0.52
	Change from Pre-Mine	m^3/s	0.02	0.03	0.02	0.02	0.01	0.01	0.02	0.02	0.02
		%	>100%	52%	25%	16%	5%	2%	4%	4%	3%
May	Discharge	m^3/s	0.48	0.55	0.59	0.63	0.80	0.99	1.08	1.12	1.19
	Change from Pre-Mine	m^3/s	0.11	0.14	0.10	0.08	0.06	0.05	0.04	0.01	-0.06
		%	30%	34%	21%	14%	8%	5%	4%	1%	-5%
June	Discharge	m^3/s	0.42	0.44	0.52	0.65	0.91	1.13	1.31	1.44	1.64
	Change from Pre-Mine	m^3/s	0.14	0.09	0.07	0.07	0.06	0.05	0.15	0.09	-0.10
		%	51%	26%	15%	13%	7%	5%	13%	6%	-6%
July	Discharge	m^3/s	0.11	0.13	0.17	0.23	0.45	0.57	0.80	0.90	0.97
	Change from Pre-Mine	m^3/s	0.05	0.02	0.02	0.01	-0.02	-0.07	0.01	-0.06	-0.22
		%	71%	20%	16%	5%	-4%	-12%	1%	-6%	-18%
August	Discharge	m^3/s	0.02	0.03	0.04	0.05	0.11	0.15	0.19	0.24	0.28
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.05	-0.14	-0.18	-0.29
		%	0%	0%	0%	-10%	-34%	-27%	-43%	-43%	-50%
September	Discharge	m^3/s	0.00	0.01	0.01	0.02	0.04	0.05	0.07	0.10	0.14
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.04	-0.05	-0.09	-0.15	-0.23
		%	0%	0%	0%	0%	-48%	-48%	-59%	-61%	-63%
October	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.09	0.13	0.19	0.23	0.27
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.01	-0.02	-0.06	-0.06	-0.08	-0.11
		%	0%	>100%	>100%	66%	-17%	-32%	-24%	-25%	-30%
November	Discharge	m^3/s	0.00	0.01	0.02	0.03	0.09	0.15	0.19	0.27	0.29
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.02	0.00	-0.04	-0.05	0.00	-0.05
		%	0%	>100%	>100%	>100%	0%	-23%	-21%	0%	-15%
December	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.03	0.04	0.06	0.07	0.07
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	>100%	0%	-24%	-21%	-15%	-23%
Annual	Discharge	m^3/s	0.12	0.14	0.15	0.17	0.23	0.29	0.32	0.35	0.36
	Change from Pre-Mine	m^3/s	0.04	0.02	0.02	0.01	0.00	-0.01	-0.02	-0.02	-0.07
		%	45%	21%	12%	8%	0%	-2%	-5%	-6%	-16%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE H-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

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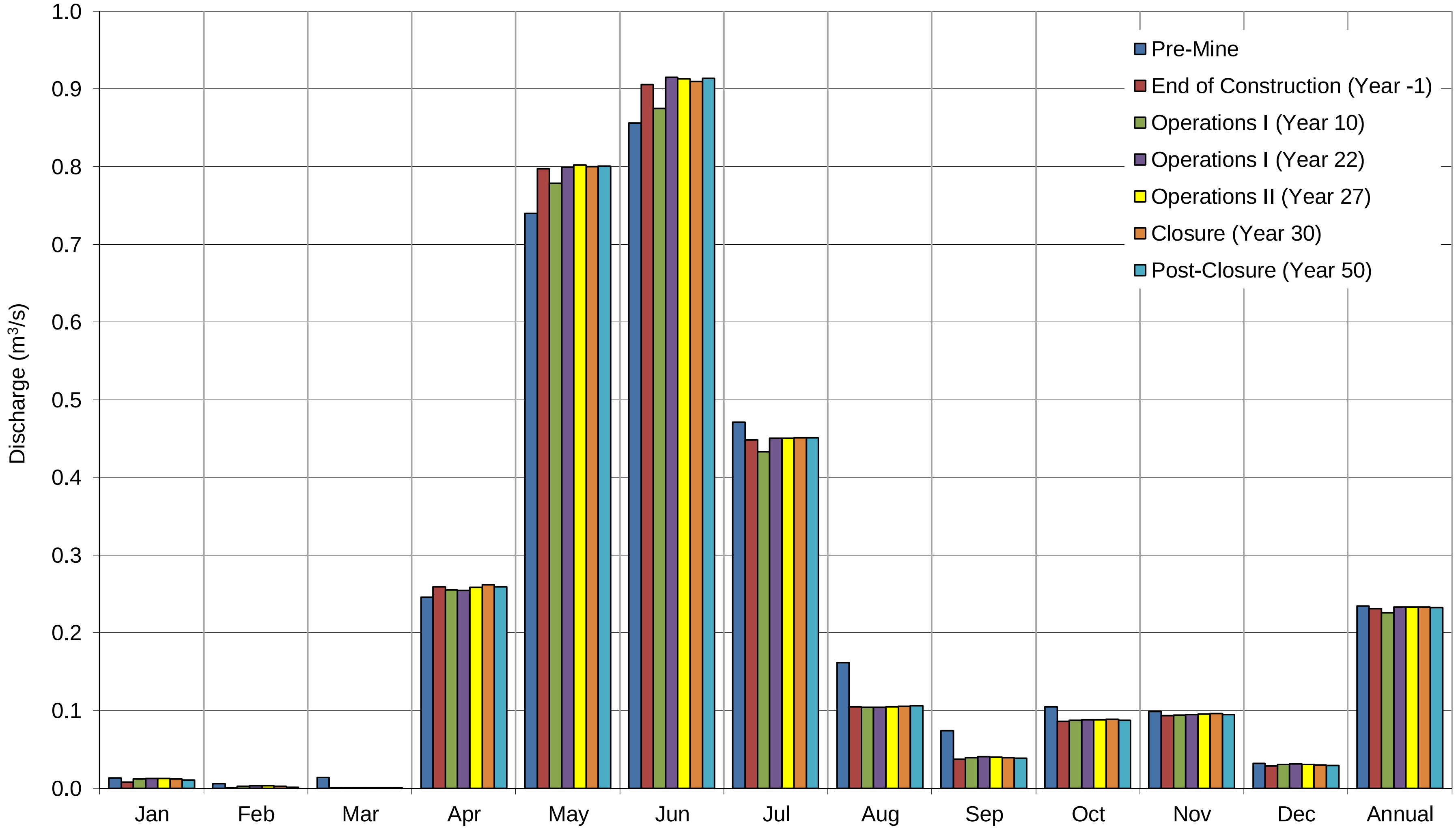
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	17.6	Discharge	m^3/s	7	11	13	15	18	21	23
			Unit Runoff	$l/s/km^2$	425	615	746	877	1047	1184	1328
-1	End of Construction	17.5	Discharge	m^3/s	7	11	13	15	18	21	23
			Unit Runoff	$l/s/km^2$	426	616	747	878	1048	1186	1330
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-1%		%	0%	0%	0%	0%	0%	0%	0%
10	Operations I	17.1	Discharge	m^3/s	7	11	13	15	18	20	23
			Unit Runoff	$l/s/km^2$	428	619	751	882	1054	1192	1337
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-3%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
22	Operations I	17.0	Discharge	m^3/s	7	11	13	15	18	20	23
			Unit Runoff	$l/s/km^2$	429	621	753	885	1056	1195	1340
			Change from Pre-Mine	m^3/s	0	0	0	0	0	-1	-1
		-4%		%	-3%	-3%	-3%	-3%	-3%	-3%	-3%
27	Operations II	17.2	Discharge	m^3/s	7	11	13	15	18	21	23
			Unit Runoff	$l/s/km^2$	427	618	749	881	1052	1190	1335
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-2%		%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
30	Closure	17.4	Discharge	m^3/s	7	11	13	15	18	21	23
			Unit Runoff	$l/s/km^2$	426	616	748	879	1049	1187	1331
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-1%		%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
50	Post-Closure	17.6	Discharge	m^3/s	7	11	13	15	18	21	23
			Unit Runoff	$l/s/km^2$	425	615	746	877	1047	1184	1328
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 6_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB



1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 6
JONES CREEK ABOVE NORTH THOMPSON RIVER CONFLUENCE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE H-1

REV 1

APPENDIX I

WATERSHED MODEL RESULTS FOR NODE 7

(Pages I-1 to I-10)

TABLE I-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	14.0	Discharge	m^3/s	0.01	0.00	0.03	0.26	0.56	0.62	0.32	0.10	0.04	0.08	0.07	0.02	0.18
			Unit Runoff	$l/s/km^2$	0.4	0.2	2.1	18.8	40.5	44.2	23.2	7.1	3.1	5.5	5.2	1.4	12.6
-1	End of Construction	13.8	Discharge	m^3/s	0.00	0.00	0.01	0.26	0.55	0.60	0.31	0.08	0.02	0.06	0.07	0.02	0.17
			Unit Runoff	$l/s/km^2$	0.1	0.0	1.1	18.5	39.8	43.6	22.4	6.1	1.7	4.6	4.8	1.2	12.0
			Change from Pre-Mine	m^3/s	0.00	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	0.00	-0.01
		-1%		%	0%	0%	-50%	-3%	-2%	-2%	-4%	-15%	-44%	-16%	-9%	0%	-6%
10	Operations I	13.2	Discharge	m^3/s	0.00	0.00	0.03	0.26	0.52	0.55	0.28	0.08	0.03	0.06	0.06	0.02	0.16
			Unit Runoff	$l/s/km^2$	0.3	0.3	2.4	19.3	39.6	41.8	21.0	5.9	1.9	4.7	4.9	1.3	11.9
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.04	-0.06	-0.05	-0.02	-0.02	-0.01	-0.01	0.00	-0.02
		-5%		%	0%	0%	0%	-2%	-7%	-10%	-15%	-22%	-41%	-19%	-12%	0%	-10%
22	Operations I	12.8	Discharge	m^3/s	0.00	0.00	0.03	0.25	0.50	0.52	0.25	0.07	0.03	0.06	0.06	0.02	0.15
			Unit Runoff	$l/s/km^2$	0.3	0.3	2.3	19.5	39.3	40.9	20.0	5.4	2.0	4.3	4.6	1.2	11.7
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.10	-0.07	-0.03	-0.02	-0.02	-0.01	0.00	-0.03
		-9%		%	0%	0%	0%	-5%	-11%	-16%	-21%	-30%	-42%	-28%	-20%	0%	-16%
27	Operations II	12.8	Discharge	m^3/s	0.00	0.00	0.03	0.25	0.50	0.52	0.26	0.07	0.02	0.06	0.06	0.02	0.15
			Unit Runoff	$l/s/km^2$	0.3	0.3	2.4	19.6	39.2	40.8	20.1	5.5	1.9	4.5	4.7	1.3	11.7
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.10	-0.07	-0.03	-0.02	-0.02	-0.01	0.00	-0.03
		-8%		%	0%	0%	0%	-4%	-11%	-15%	-21%	-29%	-43%	-25%	-17%	0%	-15%
30	Closure	12.8	Discharge	m^3/s	0.00	0.00	0.03	0.25	0.50	0.53	0.26	0.07	0.02	0.06	0.06	0.02	0.15
			Unit Runoff	$l/s/km^2$	0.3	0.3	2.5	19.5	39.2	40.9	20.1	5.5	1.9	4.5	4.8	1.3	11.7
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.09	-0.07	-0.03	-0.02	-0.02	-0.01	0.00	-0.03
		-8%		%	0%	0%	0%	-5%	-11%	-15%	-20%	-29%	-43%	-24%	-17%	0%	-15%
50	Post-Closure	12.9	Discharge	m^3/s	0.00	0.00	0.03	0.25	0.50	0.52	0.26	0.07	0.02	0.06	0.06	0.02	0.15
			Unit Runoff	$l/s/km^2$	0.3	0.3	2.5	19.4	39.1	40.8	20.0	5.5	1.9	4.5	4.7	1.3	11.7
			Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.06	-0.09	-0.07	-0.03	-0.02	-0.02	-0.01	0.00	-0.03
		-8%		%	0%	0%	0%	-5%	-11%	-15%	-21%	-29%	-44%	-25%	-17%	0%	-15%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 7_R1.xlsx]Mean Monthly

NOTE:
1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE I-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02
February	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
March	0.00	0.00	0.00	0.00	0.03	0.05	0.09	0.13	0.18
April	0.04	0.09	0.12	0.15	0.26	0.36	0.42	0.44	0.49
May	0.30	0.31	0.36	0.42	0.56	0.71	0.81	0.83	0.92
June	0.19	0.24	0.32	0.40	0.62	0.78	0.83	0.98	1.27
July	0.04	0.06	0.09	0.14	0.32	0.46	0.56	0.68	0.84
August	0.01	0.01	0.01	0.03	0.10	0.12	0.21	0.29	0.39
September	0.00	0.00	0.00	0.01	0.04	0.06	0.11	0.17	0.26
October	0.00	0.00	0.00	0.00	0.08	0.16	0.20	0.26	0.30
November	0.00	0.00	0.00	0.00	0.07	0.14	0.19	0.22	0.25
December	0.00	0.00	0.00	0.00	0.02	0.04	0.05	0.05	0.06
Annual	0.06	0.08	0.10	0.12	0.18	0.22	0.26	0.28	0.32

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE I-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
		%	0%	0%	0%	0%	0%	-79%	-77%	-76%	-80%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	0%	-96%	-96%	-96%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.01	0.02	0.05	0.06	0.08
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.04	-0.06	-0.09
		%	0%	0%	0%	0%	-50%	-51%	-45%	-50%	-53%
April	Discharge	m^3/s	0.06	0.09	0.11	0.14	0.26	0.35	0.39	0.42	0.46
	Change from Pre-Mine	m^3/s	0.02	0.00	-0.01	-0.01	-0.01	-0.01	-0.03	-0.02	-0.03
		%	69%	0%	-9%	-4%	-3%	-2%	-8%	-5%	-7%
May	Discharge	m^3/s	0.36	0.37	0.38	0.42	0.55	0.67	0.73	0.76	0.78
	Change from Pre-Mine	m^3/s	0.06	0.05	0.03	0.00	-0.01	-0.04	-0.07	-0.07	-0.14
		%	19%	17%	7%	0%	-2%	-6%	-9%	-9%	-16%
June	Discharge	m^3/s	0.23	0.31	0.39	0.46	0.60	0.77	0.83	0.86	1.04
	Change from Pre-Mine	m^3/s	0.04	0.07	0.07	0.05	-0.01	0.00	0.00	-0.12	-0.23
		%	21%	30%	21%	14%	-2%	0%	0%	-12%	-18%
July	Discharge	m^3/s	0.06	0.09	0.12	0.17	0.31	0.45	0.52	0.62	0.67
	Change from Pre-Mine	m^3/s	0.02	0.03	0.04	0.03	-0.01	-0.01	-0.04	-0.06	-0.17
		%	47%	48%	45%	22%	-4%	-2%	-8%	-9%	-20%
August	Discharge	m^3/s	0.01	0.02	0.03	0.04	0.08	0.11	0.16	0.22	0.26
	Change from Pre-Mine	m^3/s	0.01	0.00	0.01	0.01	-0.02	-0.01	-0.05	-0.06	-0.13
		%	80%	0%	77%	32%	-15%	-9%	-23%	-23%	-33%
September	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.02	0.04	0.05	0.08	0.09
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.02	-0.06	-0.09	-0.17
		%	0%	0%	0%	0%	-44%	-36%	-53%	-54%	-64%
October	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.10	0.14	0.17	0.23
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	-0.01	-0.06	-0.06	-0.09	-0.07
		%	0%	0%	0%	>100%	-16%	-36%	-31%	-34%	-23%
November	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.07	0.12	0.15	0.18	0.19
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	-0.01	-0.03	-0.05	-0.04	-0.06
		%	0%	0%	0%	>100%	-9%	-20%	-24%	-20%	-24%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.03	0.04	0.05
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-24%	-31%	-21%	-19%
Annual	Discharge	m^3/s	0.09	0.09	0.11	0.12	0.17	0.20	0.22	0.24	0.26
	Change from Pre-Mine	m^3/s	0.02	0.01	0.01	0.00	-0.01	-0.02	-0.04	-0.04	-0.06
		%	37%	13%	14%	0%	-6%	-10%	-14%	-14%	-19%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE I-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
		%	0%	0%	0%	0%	0%	0%	0%	-31%	-31%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.05	0.11	0.14	0.18
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00
		%	0%	0%	0%	0%	0%	0%	17%	8%	0%
April	Discharge	m^3/s	0.06	0.09	0.11	0.16	0.26	0.35	0.39	0.42	0.45
	Change from Pre-Mine	m^3/s	0.02	0.00	0.00	0.00	-0.01	-0.01	-0.04	-0.03	-0.04
		%	65%	0%	0%	0%	-2%	-3%	-8%	-6%	-9%
May	Discharge	m^3/s	0.34	0.35	0.36	0.40	0.52	0.64	0.69	0.72	0.74
	Change from Pre-Mine	m^3/s	0.03	0.04	0.00	-0.02	-0.04	-0.07	-0.12	-0.10	-0.18
		%	11%	12%	0%	-5%	-7%	-10%	-15%	-13%	-19%
June	Discharge	m^3/s	0.19	0.21	0.35	0.41	0.55	0.72	0.79	0.81	0.97
	Change from Pre-Mine	m^3/s	0.00	-0.02	0.03	0.01	-0.06	-0.06	-0.05	-0.17	-0.30
		%	0%	-10%	9%	2%	-10%	-8%	-6%	-18%	-23%
July	Discharge	m^3/s	0.04	0.06	0.10	0.15	0.28	0.40	0.47	0.56	0.62
	Change from Pre-Mine	m^3/s	0.00	0.01	0.02	0.01	-0.05	-0.06	-0.09	-0.12	-0.21
		%	0%	13%	18%	7%	-15%	-12%	-16%	-17%	-26%
August	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.08	0.10	0.15	0.21	0.24
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.01	-0.02	-0.02	-0.06	-0.08	-0.14
		%	0%	0%	38%	19%	-22%	-15%	-28%	-28%	-37%
September	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.03	0.04	0.05	0.08	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.02	-0.05	-0.09	-0.16
		%	0%	0%	0%	0%	-41%	-28%	-50%	-51%	-61%
October	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.10	0.13	0.17	0.23
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	-0.01	-0.06	-0.07	-0.09	-0.07
		%	0%	0%	0%	>100%	-19%	-37%	-34%	-34%	-23%
November	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.11	0.14	0.17	0.18
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.03	-0.06	-0.05	-0.07
		%	0%	0%	0%	0%	-12%	-23%	-29%	-23%	-28%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.04	0.05	0.05
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-14%	-24%	-12%	-9%
Annual	Discharge	m^3/s	0.07	0.09	0.10	0.12	0.16	0.19	0.22	0.23	0.25
	Change from Pre-Mine	m^3/s	0.01	0.00	0.00	-0.01	-0.02	-0.03	-0.04	-0.05	-0.08
		%	15%	0%	0%	-5%	-10%	-13%	-16%	-19%	-23%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE I-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
		%	0%	0%	0%	0%	0%	0%	0%	-41%	-41%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.05	0.10	0.12	0.16
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.02
		%	0%	0%	0%	0%	0%	0%	11%	0%	-10%
April	Discharge	m^3/s	0.06	0.09	0.11	0.14	0.25	0.34	0.38	0.41	0.43
	Change from Pre-Mine	m^3/s	0.02	0.00	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.06
		%	63%	0%	-7%	-5%	-5%	-6%	-10%	-8%	-12%
May	Discharge	m^3/s	0.32	0.33	0.34	0.38	0.50	0.61	0.66	0.69	0.71
	Change from Pre-Mine	m^3/s	0.02	0.02	-0.02	-0.04	-0.06	-0.10	-0.15	-0.14	-0.21
		%	7%	7%	-4%	-10%	-11%	-14%	-18%	-17%	-23%
June	Discharge	m^3/s	0.18	0.26	0.33	0.38	0.52	0.67	0.74	0.77	0.93
	Change from Pre-Mine	m^3/s	-0.01	0.02	0.01	-0.02	-0.10	-0.11	-0.09	-0.21	-0.34
		%	-5%	8%	2%	-5%	-16%	-14%	-11%	-22%	-27%
July	Discharge	m^3/s	0.04	0.07	0.10	0.14	0.25	0.37	0.43	0.52	0.58
	Change from Pre-Mine	m^3/s	0.00	0.01	0.01	0.00	-0.07	-0.09	-0.13	-0.16	-0.26
		%	0%	14%	11%	0%	-21%	-20%	-23%	-24%	-31%
August	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.07	0.09	0.13	0.19	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.03	-0.07	-0.10	-0.17
		%	0%	0%	0%	0%	-30%	-24%	-36%	-35%	-43%
September	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.03	0.04	0.05	0.09	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.02	-0.05	-0.09	-0.16
		%	0%	0%	0%	0%	-42%	-30%	-48%	-51%	-60%
October	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.09	0.12	0.15	0.18
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.07	-0.08	-0.11	-0.12
		%	0%	0%	0%	0%	-28%	-42%	-40%	-41%	-40%
November	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.06	0.10	0.12	0.16	0.17
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.04	-0.07	-0.06	-0.08
		%	0%	0%	0%	0%	-20%	-28%	-36%	-29%	-33%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.03	0.04	0.05
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-25%	-31%	-21%	-16%
Annual	Discharge	m^3/s	0.07	0.08	0.09	0.11	0.15	0.18	0.21	0.22	0.23
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.01	-0.03	-0.04	-0.05	-0.06	-0.09
		%	0%	0%	0%	-12%	-16%	-18%	-21%	-23%	-27%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE I-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	0%	-35%	-42%	-43%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.05	0.10	0.14	0.18
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
		%	0%	0%	0%	0%	0%	0%	15%	6%	0%
April	Discharge	m^3/s	0.06	0.09	0.11	0.14	0.25	0.34	0.38	0.41	0.44
	Change from Pre-Mine	m^3/s	0.02	0.00	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.06
		%	64%	0%	-7%	-4%	-4%	-5%	-10%	-8%	-12%
May	Discharge	m^3/s	0.32	0.33	0.34	0.38	0.50	0.61	0.66	0.69	0.72
	Change from Pre-Mine	m^3/s	0.02	0.02	-0.01	-0.04	-0.06	-0.10	-0.15	-0.14	-0.21
		%	6%	8%	-4%	-10%	-11%	-14%	-18%	-16%	-22%
June	Discharge	m^3/s	0.18	0.20	0.33	0.38	0.52	0.68	0.75	0.77	0.93
	Change from Pre-Mine	m^3/s	-0.01	-0.04	0.01	-0.02	-0.10	-0.10	-0.09	-0.21	-0.34
		%	-7%	-17%	2%	-4%	-15%	-13%	-10%	-21%	-26%
July	Discharge	m^3/s	0.04	0.06	0.09	0.14	0.26	0.37	0.44	0.52	0.58
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.00	-0.07	-0.08	-0.13	-0.16	-0.26
		%	0%	0%	6%	0%	-21%	-19%	-22%	-23%	-31%
August	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.07	0.09	0.14	0.19	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.03	-0.07	-0.10	-0.16
		%	0%	0%	0%	0%	-29%	-23%	-35%	-34%	-42%
September	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.02	0.04	0.05	0.08	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.02	-0.05	-0.09	-0.16
		%	0%	0%	0%	0%	-43%	-30%	-51%	-53%	-62%
October	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.09	0.12	0.17	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	-0.02	-0.06	-0.08	-0.09	-0.08
		%	0%	0%	0%	>100%	-25%	-41%	-38%	-36%	-27%
November	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.11	0.13	0.16	0.17
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.04	-0.06	-0.06	-0.08
		%	0%	0%	0%	0%	-17%	-25%	-33%	-26%	-32%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.03	0.04	0.05
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-21%	-28%	-17%	-14%
Annual	Discharge	m^3/s	0.07	0.08	0.09	0.11	0.15	0.18	0.21	0.22	0.24
	Change from Pre-Mine	m^3/s	0.01	0.00	0.00	-0.01	-0.03	-0.04	-0.05	-0.06	-0.09
		%	8%	0%	0%	-11%	-15%	-17%	-20%	-22%	-27%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE I-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01
		%	0%	0%	0%	0%	0%	0%	0%	-41%	-42%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.05	0.11	0.14	0.18
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00
		%	0%	0%	0%	0%	0%	0%	17%	8%	0%
April	Discharge	m^3/s	0.06	0.09	0.11	0.14	0.25	0.34	0.38	0.41	0.43
	Change from Pre-Mine	m^3/s	0.02	0.00	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.06
		%	64%	0%	-7%	-5%	-5%	-6%	-10%	-8%	-12%
May	Discharge	m^3/s	0.32	0.34	0.34	0.38	0.50	0.62	0.66	0.69	0.72
	Change from Pre-Mine	m^3/s	0.02	0.02	-0.01	-0.04	-0.06	-0.09	-0.14	-0.13	-0.21
		%	6%	8%	-4%	-10%	-11%	-13%	-18%	-16%	-22%
June	Discharge	m^3/s	0.18	0.20	0.33	0.39	0.53	0.68	0.75	0.77	0.94
	Change from Pre-Mine	m^3/s	-0.01	-0.04	0.01	-0.01	-0.09	-0.10	-0.08	-0.21	-0.33
		%	-6%	-16%	2%	-3%	-15%	-13%	-10%	-21%	-26%
July	Discharge	m^3/s	0.04	0.06	0.09	0.14	0.26	0.37	0.44	0.52	0.58
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.00	-0.07	-0.08	-0.12	-0.15	-0.25
		%	0%	0%	7%	0%	-20%	-18%	-22%	-23%	-30%
August	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.07	0.09	0.14	0.19	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.03	-0.07	-0.10	-0.16
		%	0%	0%	0%	0%	-29%	-22%	-34%	-33%	-42%
September	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.02	0.04	0.05	0.08	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.02	-0.05	-0.09	-0.16
		%	0%	0%	0%	0%	-43%	-30%	-50%	-53%	-61%
October	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.09	0.12	0.17	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	-0.02	-0.06	-0.07	-0.09	-0.08
		%	0%	0%	0%	>100%	-24%	-41%	-38%	-36%	-26%
November	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.11	0.13	0.16	0.17
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.04	-0.06	-0.06	-0.08
		%	0%	0%	0%	0%	-17%	-25%	-33%	-26%	-31%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.03	0.04	0.05
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-20%	-27%	-16%	-14%
Annual	Discharge	m^3/s	0.07	0.08	0.09	0.11	0.15	0.18	0.21	0.22	0.24
	Change from Pre-Mine	m^3/s	0.01	0.00	0.00	-0.01	-0.03	-0.04	-0.05	-0.06	-0.09
		%	9%	0%	0%	-11%	-15%	-17%	-20%	-22%	-27%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE I-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	0%	-38%	-44%	-45%
February	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.02
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.03	0.05	0.11	0.14	0.18
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.00
		%	0%	0%	0%	0%	0%	0%	17%	8%	0%
April	Discharge	m^3/s	0.06	0.09	0.11	0.14	0.25	0.34	0.38	0.41	0.44
	Change from Pre-Mine	m^3/s	0.02	0.00	-0.01	-0.01	-0.01	-0.02	-0.04	-0.04	-0.06
		%	64%	0%	-7%	-5%	-5%	-6%	-10%	-8%	-11%
May	Discharge	m^3/s	0.32	0.34	0.35	0.38	0.50	0.61	0.66	0.68	0.71
	Change from Pre-Mine	m^3/s	0.02	0.03	-0.01	-0.04	-0.06	-0.10	-0.14	-0.15	-0.21
		%	7%	8%	-3%	-9%	-11%	-14%	-18%	-18%	-23%
June	Discharge	m^3/s	0.18	0.20	0.33	0.39	0.52	0.68	0.76	0.78	0.94
	Change from Pre-Mine	m^3/s	-0.01	-0.04	0.01	-0.01	-0.09	-0.10	-0.08	-0.20	-0.33
		%	-6%	-16%	3%	-3%	-15%	-13%	-9%	-21%	-26%
July	Discharge	m^3/s	0.04	0.06	0.09	0.14	0.26	0.36	0.44	0.53	0.59
	Change from Pre-Mine	m^3/s	0.00	0.00	0.01	0.00	-0.07	-0.09	-0.12	-0.15	-0.25
		%	0%	0%	8%	0%	-21%	-20%	-21%	-22%	-30%
August	Discharge	m^3/s	0.01	0.01	0.02	0.03	0.07	0.09	0.14	0.19	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.03	-0.03	-0.07	-0.10	-0.16
		%	0%	0%	0%	0%	-29%	-24%	-34%	-34%	-42%
September	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.02	0.04	0.05	0.08	0.10
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.02	-0.02	-0.05	-0.09	-0.16
		%	0%	0%	0%	0%	-44%	-31%	-52%	-54%	-63%
October	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.09	0.12	0.16	0.22
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.01	-0.02	-0.06	-0.07	-0.09	-0.08
		%	0%	0%	0%	>100%	-25%	-41%	-38%	-36%	-27%
November	Discharge	m^3/s	0.00	0.00	0.00	0.01	0.06	0.11	0.13	0.16	0.17
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	-0.01	-0.04	-0.06	-0.06	-0.08
		%	0%	0%	0%	0%	-17%	-25%	-33%	-26%	-31%
December	Discharge	m^3/s	0.00	0.00	0.00	0.00	0.02	0.03	0.03	0.04	0.05
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
		%	0%	0%	0%	0%	0%	-21%	-28%	-17%	-14%
Annual	Discharge	m^3/s	0.07	0.08	0.10	0.11	0.15	0.18	0.21	0.22	0.24
	Change from Pre-Mine	m^3/s	0.01	0.00	0.00	-0.01	-0.03	-0.04	-0.05	-0.06	-0.09
		%	9%	0%	0%	-11%	-15%	-18%	-19%	-22%	-27%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE I-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER CONFLUENCE

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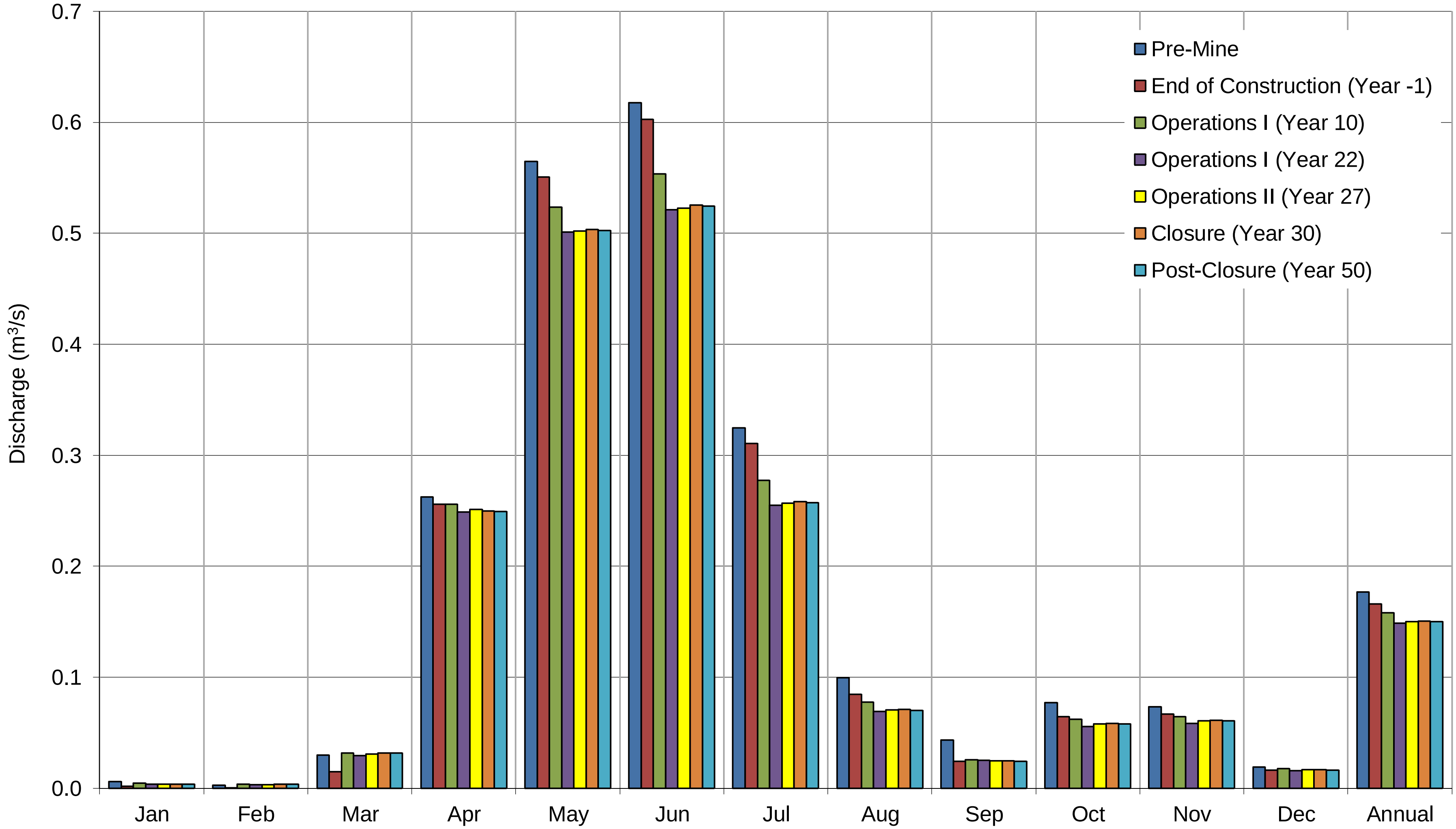
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	14.0	Discharge	m^3/s	6	9	11	13	16	18	20
			Unit Runoff	$l/s/km^2$	461	667	807	947	1137	1285	1433
-1	End of Construction	13.8	Discharge	m^3/s	6	9	11	13	16	18	20
			Unit Runoff	$l/s/km^2$	462	669	809	949	1139	1288	1436
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-1%		%	0%	0%	0%	0%	0%	0%	0%
10	Operations I	13.2	Discharge	m^3/s	6	9	11	13	15	17	19
			Unit Runoff	$l/s/km^2$	468	676	818	960	1152	1302	1453
			Change from Pre-Mine	m^3/s	0	0	0	-1	-1	-1	-1
		-5%		%	0%	0%	0%	-4%	-4%	-4%	-4%
22	Operations I	12.8	Discharge	m^3/s	6	9	11	12	15	17	19
			Unit Runoff	$l/s/km^2$	472	683	826	969	1163	1315	1466
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-9%		%	0%	-7%	-7%	-7%	-7%	-7%	-7%
27	Operations II	12.8	Discharge	m^3/s	6	9	11	12	15	17	19
			Unit Runoff	$l/s/km^2$	471	682	825	968	1162	1313	1465
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-8%		%	0%	-6%	-6%	-6%	-6%	-6%	-6%
30	Closure	12.8	Discharge	m^3/s	6	9	11	12	15	17	19
			Unit Runoff	$l/s/km^2$	471	681	825	968	1161	1313	1464
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-8%		%	0%	-6%	-6%	-6%	-6%	-6%	-6%
50	Post-Closure	12.9	Discharge	m^3/s	6	9	11	12	15	17	19
			Unit Runoff	$l/s/km^2$	471	681	824	967	1160	1312	1463
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-8%		%	0%	-6%	-6%	-6%	-6%	-6%	-6%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 7_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB



1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 7
BAKER CREEK AT NORTH THOMPSON RIVER
CONFLUENCE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE I-1

REV 1

APPENDIX J

WATERSHED MODEL RESULTS FOR NODE 8

(Pages J-1 to J-10)

Knight Piésold CONSULTING

TABLE J-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	16.6	Discharge	m^3/s	0.04	0.03	0.03	0.25	1.14	0.87	0.24	0.10	0.07	0.11	0.07	0.04	0.25
			Unit Runoff	$l/s/km^2$	2.2	1.9	1.7	14.9	68.6	52.7	14.6	5.9	4.2	6.4	4.0	2.5	15.0
-1	End of Construction	16.3	Discharge	m^3/s	0.05	0.05	0.04	0.28	1.19	0.85	0.24	0.11	0.07	0.11	0.08	0.05	0.26
			Unit Runoff	$l/s/km^2$	3.1	2.8	2.6	17.4	72.8	52.3	14.6	6.7	4.5	6.5	4.7	3.1	15.9
			Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.04	0.05	-0.02	0.00	0.01	0.00	0.00	0.01	0.01	0.01
		-2%		%	40%	43%	44%	14%	4%	-3%	0%	11%	0%	0%	14%	20%	4%
10	Operations I	13.9	Discharge	m^3/s	0.02	0.02	0.02	0.21	0.83	0.54	0.16	0.07	0.05	0.08	0.05	0.03	0.17
			Unit Runoff	$l/s/km^2$	1.7	1.4	1.2	14.8	59.5	38.9	11.3	5.1	3.5	5.7	3.6	2.1	12.4
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.04	-0.31	-0.33	-0.08	-0.03	-0.02	-0.03	-0.02	-0.01	-0.08
		-16%		%	-35%	-39%	-40%	-16%	-27%	-38%	-35%	-28%	-30%	-25%	-24%	-31%	-30%
22	Operations I	13.2	Discharge	m^3/s	0.02	0.02	0.02	0.21	0.82	0.53	0.15	0.07	0.05	0.08	0.05	0.03	0.17
			Unit Runoff	$l/s/km^2$	1.8	1.5	1.3	15.6	62.4	40.3	11.6	5.3	3.7	6.0	3.8	2.2	12.9
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.04	-0.32	-0.34	-0.09	-0.03	-0.02	-0.03	-0.02	-0.01	-0.08
		-21%		%	-36%	-40%	-41%	-17%	-28%	-39%	-37%	-29%	-31%	-26%	-25%	-32%	-31%
27	Operations II	13.5	Discharge	m^3/s	0.02	0.02	0.02	0.21	0.83	0.56	0.16	0.07	0.05	0.08	0.05	0.03	0.18
			Unit Runoff	$l/s/km^2$	1.7	1.4	1.2	15.5	61.9	41.4	12.0	5.5	3.7	5.7	3.7	2.1	13.0
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.04	-0.30	-0.32	-0.08	-0.02	-0.02	-0.03	-0.02	-0.01	-0.07
		-19%		%	-35%	-39%	-42%	-16%	-27%	-36%	-33%	-24%	-29%	-27%	-25%	-32%	-29%
30	Closure	13.5	Discharge	m^3/s	0.02	0.02	0.02	0.21	0.85	0.57	0.17	0.08	0.05	0.08	0.05	0.03	0.18
			Unit Runoff	$l/s/km^2$	1.7	1.4	1.3	15.6	62.7	42.0	12.3	5.6	3.7	5.9	3.7	2.1	13.2
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.04	-0.29	-0.31	-0.08	-0.02	-0.02	-0.03	-0.02	-0.01	-0.07
		-19%		%	-35%	-39%	-40%	-15%	-26%	-35%	-31%	-23%	-29%	-25%	-24%	-31%	-28%
50	Post-Closure	13.5	Discharge	m^3/s	0.02	0.02	0.02	0.21	0.85	0.57	0.17	0.07	0.05	0.08	0.05	0.03	0.18
			Unit Runoff	$l/s/km^2$	1.7	1.4	1.3	15.6	62.5	42.3	12.3	5.5	3.6	5.8	3.8	2.1	13.2
			Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.04	-0.29	-0.30	-0.08	-0.02	-0.02	-0.03	-0.02	-0.01	-0.07
		-18%		%	-35%	-40%	-41%	-15%	-26%	-35%	-31%	-23%	-29%	-25%	-24%	-31%	-28%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 8_R1.xlsx]Mean Monthly

NOTE:
1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE J-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.02	0.02	0.02	0.03	0.04	0.05	0.05	0.05	0.06
February	0.01	0.02	0.02	0.02	0.03	0.04	0.05	0.05	0.05
March	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.05
April	0.02	0.02	0.02	0.03	0.25	0.51	0.58	0.68	0.81
May	0.49	0.56	0.64	0.83	1.14	1.50	1.61	1.69	1.85
June	0.14	0.19	0.26	0.31	0.87	1.38	1.61	1.86	2.08
July	0.06	0.07	0.07	0.08	0.24	0.29	0.40	0.54	0.86
August	0.03	0.04	0.04	0.05	0.10	0.10	0.15	0.19	0.58
September	0.03	0.03	0.03	0.04	0.07	0.07	0.13	0.16	0.23
October	0.03	0.03	0.03	0.04	0.11	0.16	0.24	0.31	0.47
November	0.02	0.03	0.03	0.03	0.07	0.11	0.12	0.13	0.14
December	0.02	0.02	0.03	0.03	0.04	0.05	0.06	0.06	0.06
Annual	0.12	0.13	0.15	0.18	0.25	0.31	0.34	0.37	0.43

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE J-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.04	0.04	0.04	0.04	0.05	0.06	0.06	0.06	0.07
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
		%	>100%	>100%	82%	72%	40%	19%	17%	15%	15%
February	Discharge	m^3/s	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.06	0.06
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
		%	>100%	>100%	90%	78%	43%	21%	18%	15%	15%
March	Discharge	m^3/s	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.06
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
		%	>100%	>100%	99%	81%	44%	20%	16%	17%	19%
April	Discharge	m^3/s	0.05	0.05	0.05	0.06	0.28	0.49	0.67	0.75	0.81
	Change from Pre-Mine	m^3/s	0.03	0.03	0.03	0.03	0.04	-0.03	0.09	0.07	0.00
		%	>100%	>100%	>100%	88%	14%	-5%	15%	11%	0%
May	Discharge	m^3/s	0.46	0.63	0.82	0.94	1.19	1.49	1.57	1.63	1.76
	Change from Pre-Mine	m^3/s	-0.03	0.07	0.18	0.11	0.05	-0.01	-0.05	-0.06	-0.09
		%	-7%	13%	29%	13%	4%	-1%	-3%	-4%	-5%
June	Discharge	m^3/s	0.19	0.21	0.27	0.32	0.85	1.38	1.61	1.85	2.07
	Change from Pre-Mine	m^3/s	0.05	0.02	0.01	0.01	-0.02	0.00	0.01	0.00	0.00
		%	40%	9%	5%	3%	-3%	0%	0%	0%	0%
July	Discharge	m^3/s	0.08	0.09	0.10	0.11	0.24	0.28	0.33	0.62	0.91
	Change from Pre-Mine	m^3/s	0.02	0.02	0.03	0.03	0.00	-0.01	-0.08	0.08	0.05
		%	41%	35%	35%	31%	0%	-4%	-19%	15%	6%
August	Discharge	m^3/s	0.05	0.06	0.06	0.07	0.11	0.10	0.16	0.22	0.47
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.03	-0.11
		%	53%	52%	40%	30%	11%	7%	4%	17%	-19%
September	Discharge	m^3/s	0.04	0.04	0.05	0.05	0.07	0.07	0.11	0.14	0.17
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.01	0.00	0.00	-0.02	-0.01	-0.06
		%	54%	47%	35%	29%	0%	0%	-18%	-9%	-26%
October	Discharge	m^3/s	0.04	0.05	0.05	0.05	0.11	0.14	0.24	0.27	0.31
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.00	-0.02	0.00	-0.04	-0.16
		%	74%	53%	44%	44%	0%	-11%	0%	-12%	-34%
November	Discharge	m^3/s	0.04	0.04	0.05	0.05	0.08	0.11	0.12	0.13	0.14
	Change from Pre-Mine	m^3/s	0.02	0.02	0.02	0.02	0.01	0.01	0.00	0.00	0.00
		%	79%	64%	48%	48%	14%	5%	0%	0%	0%
December	Discharge	m^3/s	0.03	0.04	0.04	0.04	0.05	0.06	0.06	0.07	0.07
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
		%	75%	59%	42%	39%	20%	0%	0%	0%	0%
Annual	Discharge	m^3/s	0.14	0.16	0.17	0.19	0.26	0.31	0.34	0.40	0.43
	Change from Pre-Mine	m^3/s	0.03	0.03	0.01	0.02	0.01	-0.01	0.00	0.02	0.01
		%	23%	22%	9%	10%	4%	-2%	0%	6%	1%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE J-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-71%	-48%	-50%	-45%	-35%	-33%	-32%	-23%	-24%
February	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-82%	-57%	-56%	-52%	-39%	-36%	-35%	-25%	-27%
March	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-97%	-66%	-64%	-58%	-40%	-38%	-34%	-24%	-16%
April	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.21	0.38	0.52	0.57	0.63
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.04	-0.13	-0.06	-0.11	-0.18
		%	-68%	-60%	-47%	-35%	-16%	-26%	-11%	-17%	-22%
May	Discharge	m^3/s	0.27	0.36	0.54	0.64	0.83	1.03	1.13	1.18	1.25
	Change from Pre-Mine	m^3/s	-0.22	-0.20	-0.10	-0.18	-0.31	-0.46	-0.48	-0.51	-0.59
		%	-44%	-35%	-16%	-22%	-27%	-31%	-30%	-30%	-32%
June	Discharge	m^3/s	0.11	0.13	0.16	0.20	0.54	0.86	1.01	1.24	1.36
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.09	-0.11	-0.33	-0.52	-0.60	-0.61	-0.71
		%	-23%	-31%	-36%	-35%	-38%	-38%	-37%	-33%	-34%
July	Discharge	m^3/s	0.04	0.05	0.05	0.07	0.16	0.19	0.23	0.45	0.60
	Change from Pre-Mine	m^3/s	-0.02	-0.02	-0.02	-0.02	-0.08	-0.10	-0.17	-0.10	-0.25
		%	-39%	-30%	-26%	-20%	-35%	-33%	-43%	-18%	-30%
August	Discharge	m^3/s	0.02	0.02	0.03	0.04	0.07	0.07	0.11	0.16	0.36
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.03	-0.02	-0.04	-0.02	-0.22
		%	-40%	-36%	-28%	-31%	-28%	-25%	-25%	-13%	-38%
September	Discharge	m^3/s	0.02	0.02	0.02	0.03	0.05	0.06	0.08	0.11	0.14
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.05	-0.04	-0.08
		%	-43%	-42%	-35%	-33%	-30%	-23%	-39%	-29%	-38%
October	Discharge	m^3/s	0.02	0.02	0.02	0.03	0.08	0.12	0.20	0.22	0.26
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.04	-0.04	-0.08	-0.21
		%	-25%	-31%	-30%	-26%	-25%	-24%	-17%	-27%	-45%
November	Discharge	m^3/s	0.02	0.02	0.02	0.02	0.05	0.08	0.09	0.10	0.11
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03
		%	-32%	-30%	-36%	-31%	-24%	-21%	-24%	-22%	-21%
December	Discharge	m^3/s	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.05
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-41%	-41%	-44%	-40%	-31%	-30%	-27%	-22%	-21%
Annual	Discharge	m^3/s	0.09	0.10	0.10	0.13	0.17	0.21	0.23	0.28	0.29
	Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.05	-0.05	-0.08	-0.10	-0.11	-0.09	-0.13
		%	-25%	-25%	-31%	-28%	-30%	-34%	-33%	-26%	-31%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

TABLE J-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-71%	-53%	-50%	-46%	-36%	-35%	-32%	-23%	-24%
February	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-82%	-62%	-57%	-52%	-40%	-38%	-35%	-25%	-27%
March	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-97%	-72%	-64%	-59%	-41%	-39%	-34%	-24%	-16%
April	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.21	0.38	0.52	0.57	0.63
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.04	-0.13	-0.06	-0.11	-0.18
		%	-68%	-60%	-47%	-35%	-17%	-26%	-11%	-17%	-22%
May	Discharge	m^3/s	0.27	0.36	0.52	0.64	0.82	1.03	1.12	1.17	1.23
	Change from Pre-Mine	m^3/s	-0.22	-0.20	-0.11	-0.19	-0.32	-0.47	-0.49	-0.52	-0.61
		%	-44%	-35%	-18%	-23%	-28%	-31%	-31%	-31%	-33%
June	Discharge	m^3/s	0.11	0.13	0.16	0.19	0.53	0.84	0.99	1.23	1.34
	Change from Pre-Mine	m^3/s	-0.03	-0.07	-0.09	-0.11	-0.34	-0.54	-0.62	-0.63	-0.74
		%	-23%	-34%	-37%	-36%	-39%	-39%	-39%	-34%	-35%
July	Discharge	m^3/s	0.03	0.04	0.05	0.06	0.15	0.18	0.22	0.44	0.59
	Change from Pre-Mine	m^3/s	-0.02	-0.02	-0.02	-0.02	-0.09	-0.11	-0.18	-0.11	-0.26
		%	-42%	-34%	-27%	-24%	-37%	-36%	-44%	-19%	-31%
August	Discharge	m^3/s	0.02	0.02	0.03	0.03	0.07	0.07	0.11	0.16	0.36
	Change from Pre-Mine	m^3/s	-0.02	-0.02	-0.01	-0.02	-0.03	-0.03	-0.04	-0.03	-0.22
		%	-47%	-41%	-34%	-32%	-29%	-27%	-25%	-13%	-38%
September	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.05	0.06	0.08	0.11	0.14
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.05	-0.04	-0.09
		%	-50%	-44%	-37%	-35%	-31%	-23%	-39%	-29%	-38%
October	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.08	0.12	0.20	0.22	0.26
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.04	-0.04	-0.08	-0.21
		%	-42%	-31%	-32%	-27%	-26%	-24%	-17%	-27%	-45%
November	Discharge	m^3/s	0.01	0.02	0.02	0.02	0.05	0.08	0.09	0.10	0.11
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03
		%	-52%	-33%	-37%	-32%	-25%	-21%	-24%	-22%	-21%
December	Discharge	m^3/s	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.05
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-62%	-44%	-44%	-41%	-32%	-30%	-27%	-22%	-21%
Annual	Discharge	m^3/s	0.08	0.09	0.10	0.12	0.17	0.20	0.23	0.27	0.29
	Change from Pre-Mine	m^3/s	-0.04	-0.03	-0.05	-0.05	-0.08	-0.11	-0.12	-0.10	-0.14
		%	-32%	-27%	-32%	-30%	-31%	-34%	-34%	-27%	-33%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE J-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.04	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-71%	-53%	-50%	-46%	-35%	-33%	-32%	-23%	-25%
February	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-83%	-62%	-57%	-52%	-39%	-36%	-35%	-26%	-27%
March	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	-0.01
		%	-97%	-73%	-65%	-59%	-42%	-40%	-36%	-27%	-18%
April	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.21	0.38	0.52	0.57	0.64
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.04	-0.13	-0.06	-0.10	-0.17
		%	-68%	-60%	-47%	-35%	-16%	-25%	-10%	-15%	-21%
May	Discharge	m^3/s	0.29	0.38	0.53	0.65	0.83	1.04	1.14	1.19	1.23
	Change from Pre-Mine	m^3/s	-0.20	-0.18	-0.10	-0.17	-0.30	-0.45	-0.48	-0.51	-0.61
		%	-42%	-32%	-16%	-21%	-27%	-30%	-29%	-30%	-33%
June	Discharge	m^3/s	0.11	0.13	0.18	0.21	0.56	0.88	1.03	1.27	1.40
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.08	-0.09	-0.32	-0.50	-0.57	-0.58	-0.68
		%	-22%	-32%	-31%	-30%	-36%	-36%	-36%	-31%	-33%
July	Discharge	m^3/s	0.04	0.04	0.05	0.06	0.16	0.21	0.25	0.48	0.63
	Change from Pre-Mine	m^3/s	-0.02	-0.02	-0.02	-0.02	-0.08	-0.08	-0.15	-0.07	-0.22
		%	-37%	-32%	-28%	-23%	-33%	-29%	-38%	-12%	-26%
August	Discharge	m^3/s	0.02	0.02	0.03	0.04	0.07	0.07	0.12	0.18	0.39
	Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.01	-0.19
		%	-45%	-38%	-32%	-30%	-24%	-23%	-22%	-6%	-33%
September	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.05	0.05	0.09	0.11	0.15
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.05	-0.04	-0.08
		%	-51%	-44%	-39%	-34%	-29%	-24%	-36%	-27%	-35%
October	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.08	0.12	0.20	0.22	0.25
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.04	-0.04	-0.08	-0.22
		%	-43%	-32%	-32%	-27%	-27%	-24%	-18%	-27%	-46%
November	Discharge	m^3/s	0.01	0.02	0.02	0.02	0.05	0.08	0.09	0.10	0.11
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03
		%	-52%	-32%	-37%	-32%	-25%	-21%	-24%	-21%	-21%
December	Discharge	m^3/s	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.05
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-61%	-44%	-44%	-40%	-32%	-30%	-26%	-21%	-21%
Annual	Discharge	m^3/s	0.08	0.10	0.11	0.13	0.18	0.21	0.23	0.28	0.30
	Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.05	-0.05	-0.07	-0.10	-0.11	-0.09	-0.13
		%	-30%	-24%	-30%	-28%	-29%	-33%	-32%	-24%	-30%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE J-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.04	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-71%	-53%	-50%	-46%	-35%	-33%	-32%	-23%	-24%
February	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-82%	-62%	-57%	-52%	-39%	-36%	-35%	-25%	-27%
March	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-97%	-72%	-64%	-59%	-40%	-38%	-34%	-24%	-16%
April	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.21	0.38	0.52	0.58	0.64
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.04	-0.13	-0.06	-0.10	-0.17
		%	-68%	-60%	-47%	-33%	-15%	-25%	-10%	-15%	-21%
May	Discharge	m^3/s	0.29	0.39	0.54	0.66	0.85	1.06	1.15	1.21	1.27
	Change from Pre-Mine	m^3/s	-0.20	-0.17	-0.10	-0.16	-0.29	-0.44	-0.46	-0.48	-0.57
		%	-40%	-31%	-15%	-20%	-26%	-29%	-28%	-29%	-31%
June	Discharge	m^3/s	0.11	0.14	0.18	0.22	0.57	0.89	1.04	1.29	1.42
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.07	-0.08	-0.31	-0.48	-0.57	-0.56	-0.66
		%	-22%	-30%	-29%	-27%	-35%	-35%	-36%	-30%	-32%
July	Discharge	m^3/s	0.04	0.04	0.05	0.06	0.17	0.21	0.26	0.50	0.66
	Change from Pre-Mine	m^3/s	-0.02	-0.02	-0.02	-0.02	-0.08	-0.08	-0.14	-0.05	-0.20
		%	-37%	-32%	-29%	-26%	-31%	-26%	-35%	-8%	-23%
August	Discharge	m^3/s	0.02	0.02	0.03	0.03	0.08	0.08	0.12	0.18	0.39
	Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.01	-0.18
		%	-45%	-39%	-33%	-33%	-23%	-22%	-22%	-4%	-32%
September	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.05	0.05	0.09	0.11	0.15
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.05	-0.04	-0.08
		%	-52%	-45%	-40%	-35%	-29%	-24%	-35%	-27%	-34%
October	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.08	0.12	0.20	0.22	0.26
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.04	-0.04	-0.08	-0.21
		%	-44%	-32%	-33%	-28%	-25%	-24%	-17%	-27%	-44%
November	Discharge	m^3/s	0.01	0.02	0.02	0.02	0.05	0.08	0.09	0.10	0.11
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03
		%	-52%	-33%	-37%	-32%	-24%	-21%	-24%	-21%	-21%
December	Discharge	m^3/s	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.05
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-62%	-44%	-44%	-40%	-31%	-30%	-26%	-21%	-21%
Annual	Discharge	m^3/s	0.08	0.10	0.11	0.13	0.18	0.21	0.24	0.29	0.31
	Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.05	-0.05	-0.07	-0.10	-0.10	-0.09	-0.12
		%	-30%	-24%	-30%	-27%	-28%	-32%	-30%	-23%	-29%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE J-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.04	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-71%	-53%	-50%	-46%	-35%	-33%	-32%	-23%	-24%
February	Discharge	m^3/s	0.00	0.01	0.01	0.01	0.02	0.03	0.03	0.04	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-82%	-62%	-57%	-52%	-40%	-36%	-35%	-25%	-27%
March	Discharge	m^3/s	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.03	0.04
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
		%	-97%	-72%	-64%	-59%	-41%	-38%	-34%	-24%	-16%
April	Discharge	m^3/s	0.01	0.01	0.01	0.02	0.21	0.38	0.52	0.58	0.64
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.04	-0.13	-0.05	-0.10	-0.17
		%	-68%	-60%	-47%	-35%	-15%	-25%	-9%	-15%	-21%
May	Discharge	m^3/s	0.29	0.39	0.54	0.67	0.85	1.06	1.15	1.21	1.27
	Change from Pre-Mine	m^3/s	-0.20	-0.17	-0.10	-0.16	-0.29	-0.44	-0.46	-0.48	-0.57
		%	-40%	-31%	-15%	-20%	-26%	-29%	-28%	-29%	-31%
June	Discharge	m^3/s	0.10	0.13	0.18	0.22	0.57	0.90	1.05	1.29	1.42
	Change from Pre-Mine	m^3/s	-0.03	-0.06	-0.07	-0.08	-0.30	-0.48	-0.55	-0.56	-0.65
		%	-24%	-32%	-29%	-27%	-35%	-35%	-34%	-30%	-32%
July	Discharge	m^3/s	0.03	0.04	0.05	0.06	0.17	0.22	0.26	0.50	0.66
	Change from Pre-Mine	m^3/s	-0.02	-0.02	-0.02	-0.03	-0.08	-0.07	-0.14	-0.05	-0.20
		%	-41%	-34%	-32%	-30%	-31%	-24%	-36%	-8%	-23%
August	Discharge	m^3/s	0.02	0.02	0.03	0.03	0.07	0.08	0.12	0.18	0.39
	Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.01	-0.18
		%	-46%	-40%	-35%	-34%	-23%	-22%	-22%	-3%	-32%
September	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.05	0.05	0.09	0.11	0.15
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.05	-0.04	-0.08
		%	-53%	-45%	-42%	-36%	-29%	-24%	-35%	-27%	-33%
October	Discharge	m^3/s	0.01	0.02	0.02	0.03	0.08	0.12	0.20	0.22	0.26
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.03	-0.04	-0.04	-0.08	-0.21
		%	-44%	-33%	-33%	-28%	-25%	-24%	-17%	-27%	-44%
November	Discharge	m^3/s	0.01	0.02	0.02	0.02	0.05	0.08	0.09	0.10	0.11
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.03	-0.03	-0.03
		%	-52%	-33%	-37%	-31%	-24%	-20%	-24%	-21%	-21%
December	Discharge	m^3/s	0.01	0.01	0.02	0.02	0.03	0.04	0.04	0.05	0.05
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01
		%	-62%	-44%	-44%	-40%	-31%	-30%	-26%	-21%	-21%
Annual	Discharge	m^3/s	0.08	0.10	0.11	0.13	0.18	0.21	0.24	0.29	0.31
	Change from Pre-Mine	m^3/s	-0.03	-0.03	-0.05	-0.05	-0.07	-0.10	-0.10	-0.08	-0.12
		%	-30%	-24%	-30%	-27%	-28%	-32%	-30%	-23%	-29%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold
CONSULTING

TABLE J-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

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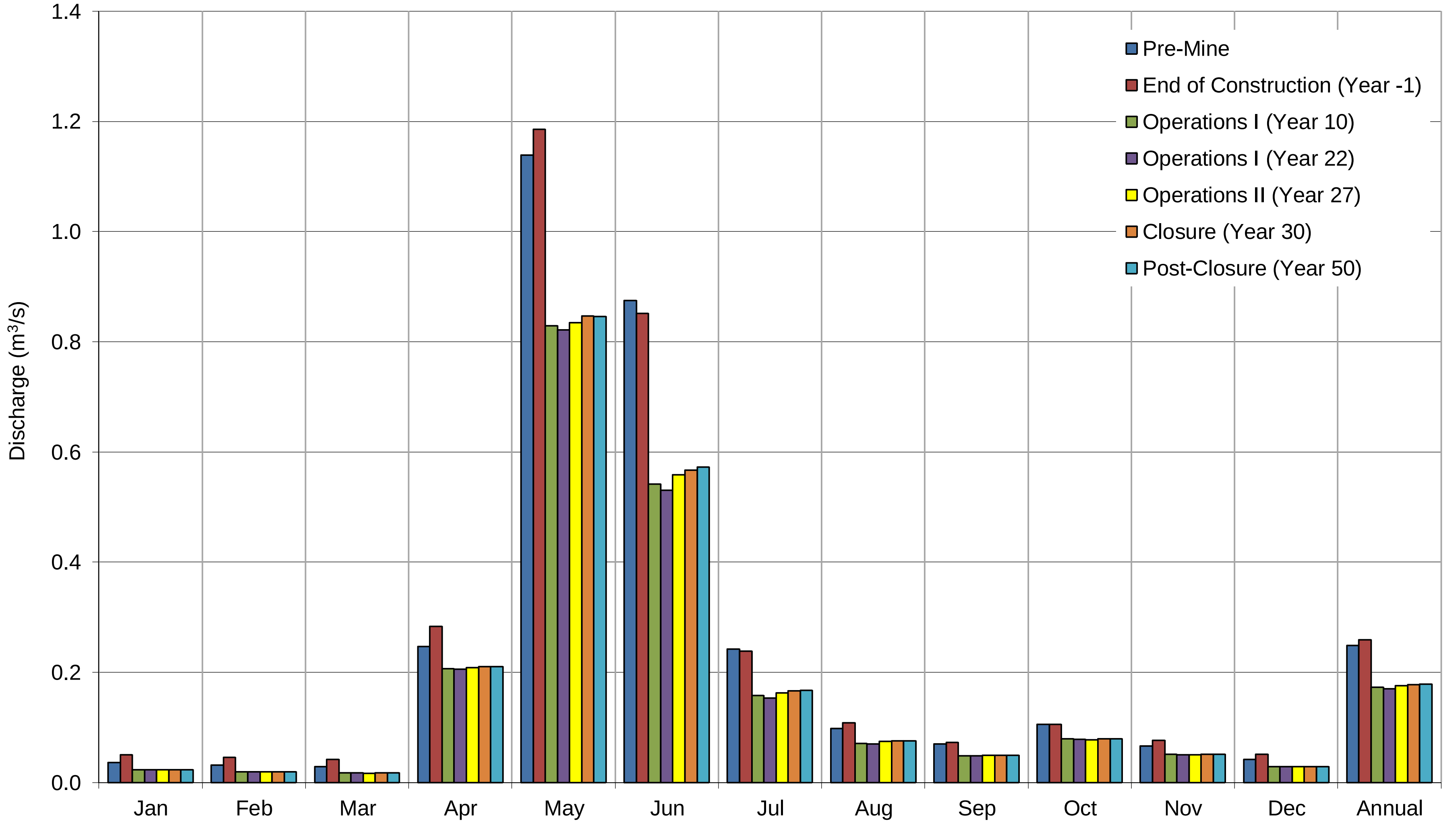
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	16.6	Discharge	m^3/s	7	10	13	15	18	21	23
			Unit Runoff	$l/s/km^2$	419	616	764	900	1097	1245	1392
-1	End of Construction	16.3	Discharge	m^3/s	7	10	12	15	18	20	23
			Unit Runoff	$l/s/km^2$	421	619	768	904	1102	1250	1399
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		-2%		%	0%	0%	0%	0%	0%	0%	0%
10	Operations I	13.9	Discharge	m^3/s	6	9	11	13	16	18	20
			Unit Runoff	$l/s/km^2$	438	644	798	940	1146	1300	1455
			Change from Pre-Mine	m^3/s	-1	-1	-2	-2	-2	-3	-3
		-16%		%	-12%	-12%	-12%	-12%	-12%	-12%	-12%
22	Operations I	13.2	Discharge	m^3/s	6	9	11	13	15	17	19
			Unit Runoff	$l/s/km^2$	444	653	809	953	1162	1319	1475
			Change from Pre-Mine	m^3/s	-1	-2	-2	-2	-3	-3	-4
		-21%		%	-16%	-16%	-16%	-16%	-16%	-16%	-16%
27	Operations II	13.5	Discharge	m^3/s	6	9	11	13	16	18	20
			Unit Runoff	$l/s/km^2$	441	649	805	948	1155	1311	1467
			Change from Pre-Mine	m^3/s	-1	-1	-2	-2	-3	-3	-3
		-19%		%	-14%	-14%	-14%	-14%	-14%	-14%	-14%
30	Closure	13.5	Discharge	m^3/s	6	9	11	13	16	18	20
			Unit Runoff	$l/s/km^2$	441	648	804	947	1154	1310	1466
			Change from Pre-Mine	m^3/s	-1	-1	-2	-2	-3	-3	-3
		-19%		%	-14%	-14%	-14%	-14%	-14%	-14%	-14%
50	Post-Closure	13.5	Discharge	m^3/s	6	9	11	13	16	18	20
			Unit Runoff	$l/s/km^2$	441	648	804	946	1154	1309	1465
			Change from Pre-Mine	m^3/s	-1	-1	-2	-2	-3	-3	-3
		-18%		%	-14%	-14%	-14%	-14%	-14%	-14%	-14%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 8_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 8
HARPER CREEK BELOW P-CREEK CONFLUENCE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE J-1

REV 1

APPENDIX K

WATERSHED MODEL RESULTS FOR NODE 9

(Pages K-1 to K-10)

Knight Piésold CONSULTING

TABLE K-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	70.4	Discharge	m^3/s	0.26	0.22	0.19	0.98	4.77	4.98	2.11	0.88	0.63	0.66	0.45	0.32	1.37
			Unit Runoff	$l/s/km^2$	3.7	3.2	2.8	13.9	67.8	70.7	30.0	12.5	8.9	9.4	6.4	4.5	19.5
-1	End of Construction	54.9	Discharge	m^3/s	0.30	0.26	0.22	0.93	3.98	3.85	1.56	0.76	0.56	0.61	0.45	0.32	1.15
			Unit Runoff	$l/s/km^2$	5.5	4.7	4.0	16.9	72.5	70.1	28.3	13.9	10.1	11.1	8.1	5.8	20.9
			Change from Pre-Mine	m^3/s	0.04	0.04	0.03	-0.05	-0.79	-1.13	-0.56	-0.12	-0.07	-0.05	-0.01	0.00	-0.22
		-22%		%	15%	16%	14%	-5%	-17%	-23%	-26%	-13%	-11%	-8%	-1%	0%	-16%
10	Operations I	52.2	Discharge	m^3/s	0.23	0.19	0.16	0.78	3.39	3.18	1.34	0.66	0.48	0.52	0.39	0.27	0.97
			Unit Runoff	$l/s/km^2$	4.3	3.6	3.2	15.0	65.0	60.9	25.7	12.6	9.1	10.0	7.4	5.3	18.5
			Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.03	-0.20	-1.38	-1.80	-0.77	-0.22	-0.15	-0.14	-0.06	-0.04	-0.41
		-26%		%	-14%	-16%	-15%	-20%	-29%	-36%	-36%	-25%	-24%	-21%	-14%	-13%	-30%
22	Operations I	51.1	Discharge	m^3/s	0.22	0.18	0.16	0.78	3.36	3.11	1.31	0.64	0.47	0.51	0.38	0.27	0.95
			Unit Runoff	$l/s/km^2$	4.3	3.5	3.1	15.2	65.7	60.8	25.5	12.6	9.1	10.0	7.5	5.3	18.6
			Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.04	-0.20	-1.41	-1.87	-0.81	-0.24	-0.16	-0.15	-0.07	-0.05	-0.42
		-27%		%	-16%	-19%	-18%	-20%	-30%	-38%	-38%	-27%	-26%	-23%	-15%	-15%	-31%
27	Operations II	51.5	Discharge	m^3/s	0.22	0.18	0.15	0.79	3.36	3.17	1.34	0.65	0.48	0.52	0.39	0.27	0.96
			Unit Runoff	$l/s/km^2$	4.2	3.5	3.0	15.3	65.4	61.5	26.1	12.6	9.3	10.2	7.6	5.3	18.6
			Change from Pre-Mine	m^3/s	-0.04	-0.04	-0.04	-0.19	-1.41	-1.82	-0.77	-0.23	-0.15	-0.14	-0.06	-0.04	-0.41
		-27%		%	-17%	-19%	-21%	-20%	-30%	-36%	-36%	-26%	-24%	-21%	-14%	-13%	-30%
30	Closure	66.6	Discharge	m^3/s	0.25	0.21	0.19	0.93	3.84	3.68	1.50	0.69	0.52	0.60	0.42	0.31	1.09
			Unit Runoff	$l/s/km^2$	3.7	3.1	2.8	13.9	57.7	55.2	22.5	10.4	7.9	9.0	6.4	4.6	16.4
			Change from Pre-Mine	m^3/s	-0.02	-0.01	-0.01	-0.05	-0.93	-1.30	-0.61	-0.18	-0.11	-0.06	-0.03	-0.01	-0.28
		-5%		%	-6%	-6%	-4%	-5%	-20%	-26%	-29%	-21%	-17%	-9%	-6%	-3%	-20%
50	Post-Closure	66.7	Discharge	m^3/s	0.29	0.32	0.35	1.24	4.76	4.65	1.75	0.80	0.60	0.76	0.47	0.35	1.36
			Unit Runoff	$l/s/km^2$	4.4	4.8	5.2	18.5	71.3	69.7	26.3	11.9	8.9	11.4	7.0	5.2	20.4
			Change from Pre-Mine	m^3/s	0.03	0.10	0.16	0.26	-0.01	-0.33	-0.36	-0.08	-0.03	0.10	0.02	0.03	-0.01
		-5%		%	11%	43%	80%	26%	0%	-7%	-17%	-10%	-5%	15%	4%	9%	-1%

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NOTE:
1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.14	0.17	0.17	0.21	0.26	0.33	0.35	0.36	0.37
February	0.12	0.14	0.15	0.18	0.22	0.28	0.29	0.31	0.31
March	0.11	0.12	0.13	0.15	0.19	0.24	0.25	0.27	0.28
April	0.13	0.14	0.16	0.20	0.98	1.91	2.28	2.84	3.25
May	2.10	2.67	3.01	3.41	4.77	6.07	6.77	7.38	7.49
June	1.31	1.69	2.44	3.01	4.98	7.08	7.78	8.36	8.79
July	0.58	0.60	0.67	0.85	2.11	2.92	4.05	4.68	6.55
August	0.30	0.31	0.38	0.49	0.88	1.04	1.36	1.91	3.49
September	0.26	0.28	0.31	0.35	0.63	0.75	1.03	1.39	2.09
October	0.24	0.27	0.30	0.34	0.66	0.88	1.15	1.46	2.20
November	0.20	0.24	0.25	0.31	0.45	0.62	0.72	0.75	0.76
December	0.17	0.20	0.21	0.26	0.32	0.39	0.42	0.43	0.44
Annual	0.65	0.76	0.91	1.04	1.37	1.70	1.87	1.99	2.19

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.24	0.24	0.25	0.27	0.30	0.33	0.35	0.35	0.36
	Change from Pre-Mine	m^3/s	0.10	0.08	0.08	0.06	0.04	0.01	0.00	-0.01	-0.01
		%	67%	48%	47%	31%	15%	2%	0%	-3%	-3%
February	Discharge	m^3/s	0.20	0.21	0.22	0.23	0.26	0.28	0.29	0.30	0.30
	Change from Pre-Mine	m^3/s	0.08	0.07	0.07	0.06	0.04	0.01	0.00	-0.01	-0.01
		%	67%	51%	48%	33%	16%	2%	0%	-3%	-4%
March	Discharge	m^3/s	0.18	0.18	0.19	0.20	0.22	0.24	0.25	0.26	0.27
	Change from Pre-Mine	m^3/s	0.07	0.06	0.06	0.05	0.03	0.00	0.00	-0.01	0.00
		%	65%	47%	47%	32%	14%	0%	0%	-2%	0%
April	Discharge	m^3/s	0.19	0.22	0.23	0.25	0.93	1.59	2.06	2.52	2.75
	Change from Pre-Mine	m^3/s	0.06	0.07	0.06	0.05	-0.05	-0.32	-0.22	-0.32	-0.50
		%	42%	50%	40%	25%	-5%	-17%	-9%	-11%	-15%
May	Discharge	m^3/s	2.38	2.56	2.70	3.04	3.98	4.83	5.36	5.57	6.02
	Change from Pre-Mine	m^3/s	0.28	-0.11	-0.30	-0.37	-0.79	-1.24	-1.41	-1.81	-1.47
		%	13%	-4%	-10%	-11%	-17%	-20%	-21%	-25%	-20%
June	Discharge	m^3/s	1.34	1.43	1.94	2.45	3.85	4.91	5.77	6.59	7.11
	Change from Pre-Mine	m^3/s	0.04	-0.26	-0.51	-0.57	-1.13	-2.16	-2.02	-1.77	-1.67
		%	3%	-15%	-21%	-19%	-23%	-31%	-26%	-21%	-19%
July	Discharge	m^3/s	0.60	0.65	0.74	0.90	1.56	2.10	2.60	2.94	3.74
	Change from Pre-Mine	m^3/s	0.02	0.05	0.07	0.05	-0.56	-0.82	-1.45	-1.74	-2.81
		%	3%	8%	10%	6%	-26%	-28%	-36%	-37%	-43%
August	Discharge	m^3/s	0.38	0.40	0.47	0.57	0.76	0.87	1.02	1.39	1.77
	Change from Pre-Mine	m^3/s	0.09	0.08	0.09	0.08	-0.12	-0.17	-0.34	-0.52	-1.72
		%	30%	27%	24%	17%	-13%	-17%	-25%	-27%	-49%
September	Discharge	m^3/s	0.33	0.34	0.37	0.39	0.56	0.64	0.70	0.93	1.61
	Change from Pre-Mine	m^3/s	0.08	0.06	0.05	0.04	-0.07	-0.11	-0.33	-0.46	-0.48
		%	30%	20%	17%	12%	-11%	-14%	-32%	-33%	-23%
October	Discharge	m^3/s	0.32	0.33	0.36	0.39	0.61	0.79	1.00	1.22	1.78
	Change from Pre-Mine	m^3/s	0.07	0.06	0.06	0.05	-0.05	-0.09	-0.15	-0.25	-0.42
		%	31%	22%	21%	14%	-8%	-11%	-13%	-17%	-19%
November	Discharge	m^3/s	0.27	0.28	0.32	0.34	0.45	0.57	0.64	0.66	0.67
	Change from Pre-Mine	m^3/s	0.07	0.05	0.07	0.03	-0.01	-0.06	-0.08	-0.09	-0.09
		%	35%	20%	27%	10%	-1%	-9%	-11%	-12%	-12%
December	Discharge	m^3/s	0.23	0.24	0.26	0.28	0.32	0.36	0.38	0.40	0.41
	Change from Pre-Mine	m^3/s	0.06	0.04	0.06	0.02	0.00	-0.03	-0.03	-0.03	-0.03
		%	37%	21%	28%	9%	0%	-8%	-8%	-7%	-7%
Annual	Discharge	m^3/s	0.75	0.81	0.83	0.96	1.15	1.37	1.45	1.57	1.59
	Change from Pre-Mine	m^3/s	0.10	0.05	-0.08	-0.08	-0.22	-0.33	-0.42	-0.42	-0.61
		%	15%	6%	-9%	-8%	-16%	-19%	-23%	-21%	-28%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.16	0.17	0.19	0.23	0.26	0.27	0.29	0.30
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.02	-0.04	-0.07	-0.07	-0.07	-0.07
		%	0%	0%	0%	-11%	-14%	-21%	-21%	-20%	-19%
February	Discharge	m^3/s	0.12	0.13	0.14	0.15	0.19	0.21	0.23	0.24	0.25
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.02	-0.04	-0.06	-0.07	-0.07	-0.07
		%	0%	-5%	0%	-13%	-16%	-23%	-23%	-22%	-21%
March	Discharge	m^3/s	0.10	0.12	0.12	0.13	0.16	0.19	0.19	0.21	0.23
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.02	-0.03	-0.05	-0.06	-0.06	-0.04
		%	0%	0%	0%	-13%	-15%	-21%	-23%	-22%	-15%
April	Discharge	m^3/s	0.12	0.13	0.14	0.17	0.78	1.45	1.82	2.09	2.28
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.03	-0.20	-0.46	-0.46	-0.75	-0.96
		%	-7%	-12%	-13%	-17%	-20%	-24%	-20%	-26%	-30%
May	Discharge	m^3/s	1.78	2.10	2.35	2.67	3.39	4.17	4.39	4.70	5.05
	Change from Pre-Mine	m^3/s	-0.32	-0.57	-0.66	-0.74	-1.38	-1.90	-2.38	-2.68	-2.44
		%	-15%	-21%	-22%	-22%	-29%	-31%	-35%	-36%	-33%
June	Discharge	m^3/s	1.16	1.37	1.74	2.25	3.18	4.22	4.60	5.02	5.70
	Change from Pre-Mine	m^3/s	-0.15	-0.31	-0.71	-0.77	-1.80	-2.86	-3.19	-3.35	-3.09
		%	-11%	-19%	-29%	-25%	-36%	-40%	-41%	-40%	-35%
July	Discharge	m^3/s	0.50	0.53	0.61	0.68	1.34	1.78	2.29	3.02	3.40
	Change from Pre-Mine	m^3/s	-0.09	-0.07	-0.07	-0.17	-0.77	-1.14	-1.77	-1.66	-3.14
		%	-15%	-12%	-10%	-20%	-36%	-39%	-44%	-35%	-48%
August	Discharge	m^3/s	0.31	0.33	0.36	0.49	0.66	0.76	0.94	1.15	1.66
	Change from Pre-Mine	m^3/s	0.01	0.01	-0.02	0.00	-0.22	-0.28	-0.42	-0.76	-1.83
		%	4%	4%	-4%	0%	-25%	-27%	-31%	-40%	-52%
September	Discharge	m^3/s	0.27	0.30	0.32	0.34	0.48	0.58	0.64	0.80	1.14
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	-0.01	-0.15	-0.17	-0.40	-0.59	-0.95
		%	5%	4%	2%	-3%	-24%	-23%	-38%	-43%	-46%
October	Discharge	m^3/s	0.25	0.28	0.30	0.32	0.52	0.66	0.89	1.12	1.27
	Change from Pre-Mine	m^3/s	0.01	0.01	0.00	-0.03	-0.14	-0.22	-0.26	-0.35	-0.93
		%	4%	3%	0%	-8%	-21%	-25%	-22%	-24%	-42%
November	Discharge	m^3/s	0.21	0.23	0.26	0.27	0.39	0.52	0.56	0.59	0.61
	Change from Pre-Mine	m^3/s	0.01	0.00	0.01	-0.04	-0.06	-0.11	-0.16	-0.16	-0.15
		%	4%	0%	4%	-11%	-14%	-17%	-22%	-22%	-19%
December	Discharge	m^3/s	0.17	0.19	0.21	0.22	0.27	0.32	0.33	0.35	0.36
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.03	-0.04	-0.08	-0.08	-0.08	-0.08
		%	0%	-4%	0%	-12%	-13%	-20%	-20%	-19%	-18%
Annual	Discharge	m^3/s	0.57	0.64	0.71	0.79	0.97	1.12	1.22	1.33	1.38
	Change from Pre-Mine	m^3/s	-0.08	-0.12	-0.20	-0.25	-0.41	-0.58	-0.65	-0.66	-0.82
		%	-13%	-16%	-22%	-24%	-30%	-34%	-35%	-33%	-37%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.15	0.17	0.18	0.22	0.25	0.27	0.28	0.29
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.03	-0.04	-0.07	-0.08	-0.08	-0.08
		%	-4%	-8%	0%	-14%	-16%	-22%	-23%	-22%	-21%
February	Discharge	m^3/s	0.11	0.12	0.14	0.15	0.18	0.21	0.22	0.23	0.24
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.03	-0.04	-0.07	-0.07	-0.07	-0.07
		%	-8%	-12%	-6%	-16%	-19%	-24%	-25%	-24%	-23%
March	Discharge	m^3/s	0.10	0.11	0.12	0.13	0.16	0.18	0.19	0.20	0.23
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.03	-0.04	-0.06	-0.06	-0.06	-0.05
		%	-10%	-14%	-7%	-17%	-18%	-24%	-25%	-24%	-17%
April	Discharge	m^3/s	0.12	0.12	0.14	0.17	0.78	1.43	1.80	2.07	2.26
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.04	-0.20	-0.48	-0.48	-0.77	-0.99
		%	-9%	-14%	-15%	-19%	-20%	-25%	-21%	-27%	-30%
May	Discharge	m^3/s	1.77	2.08	2.33	2.64	3.36	4.14	4.36	4.67	5.00
	Change from Pre-Mine	m^3/s	-0.34	-0.59	-0.67	-0.76	-1.41	-1.93	-2.41	-2.72	-2.49
		%	-16%	-22%	-22%	-22%	-30%	-32%	-36%	-37%	-33%
June	Discharge	m^3/s	1.14	1.34	1.62	2.17	3.11	4.12	4.55	4.95	5.62
	Change from Pre-Mine	m^3/s	-0.17	-0.34	-0.82	-0.84	-1.87	-2.96	-3.24	-3.41	-3.17
		%	-13%	-20%	-34%	-28%	-38%	-42%	-42%	-41%	-36%
July	Discharge	m^3/s	0.49	0.52	0.59	0.67	1.31	1.73	2.24	2.97	3.35
	Change from Pre-Mine	m^3/s	-0.09	-0.08	-0.08	-0.18	-0.81	-1.19	-1.82	-1.71	-3.20
		%	-15%	-13%	-12%	-21%	-38%	-41%	-45%	-37%	-49%
August	Discharge	m^3/s	0.30	0.32	0.36	0.47	0.64	0.75	0.92	1.13	1.64
	Change from Pre-Mine	m^3/s	0.01	0.01	-0.02	-0.02	-0.24	-0.29	-0.44	-0.78	-1.85
		%	2%	3%	-6%	-4%	-27%	-28%	-32%	-41%	-53%
September	Discharge	m^3/s	0.27	0.29	0.31	0.33	0.47	0.57	0.63	0.78	1.11
	Change from Pre-Mine	m^3/s	0.01	0.01	0.00	-0.02	-0.16	-0.18	-0.41	-0.61	-0.99
		%	3%	3%	0%	-6%	-26%	-24%	-39%	-44%	-47%
October	Discharge	m^3/s	0.25	0.28	0.29	0.31	0.51	0.65	0.88	1.11	1.26
	Change from Pre-Mine	m^3/s	0.01	0.00	0.00	-0.03	-0.15	-0.24	-0.27	-0.36	-0.94
		%	3%	0%	0%	-9%	-23%	-27%	-23%	-24%	-43%
November	Discharge	m^3/s	0.21	0.23	0.26	0.27	0.38	0.51	0.55	0.58	0.61
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.01	-0.04	-0.07	-0.12	-0.17	-0.17	-0.15
		%	0%	-3%	3%	-13%	-15%	-19%	-23%	-23%	-20%
December	Discharge	m^3/s	0.17	0.19	0.21	0.22	0.27	0.31	0.33	0.34	0.36
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.03	-0.05	-0.08	-0.09	-0.09	-0.08
		%	0%	-6%	0%	-14%	-15%	-21%	-21%	-21%	-19%
Annual	Discharge	m^3/s	0.56	0.63	0.68	0.76	0.95	1.10	1.20	1.31	1.36
	Change from Pre-Mine	m^3/s	-0.09	-0.13	-0.23	-0.28	-0.42	-0.60	-0.67	-0.67	-0.83
		%	-14%	-17%	-25%	-26%	-31%	-35%	-36%	-34%	-38%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.15	0.17	0.18	0.22	0.25	0.27	0.28	0.29
	Change from Pre-Mine	m^3/s	-0.01	-0.01	0.00	-0.03	-0.04	-0.07	-0.08	-0.08	-0.08
		%	-5%	-9%	0%	-14%	-17%	-23%	-23%	-22%	-21%
February	Discharge	m^3/s	0.11	0.12	0.14	0.15	0.18	0.21	0.22	0.23	0.24
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.03	-0.04	-0.07	-0.07	-0.07	-0.07
		%	-9%	-12%	-6%	-16%	-19%	-25%	-25%	-25%	-23%
March	Discharge	m^3/s	0.09	0.10	0.12	0.12	0.15	0.18	0.18	0.20	0.22
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.01	-0.03	-0.04	-0.06	-0.07	-0.07	-0.05
		%	-13%	-17%	-10%	-20%	-21%	-26%	-28%	-27%	-20%
April	Discharge	m^3/s	0.12	0.12	0.14	0.17	0.79	1.43	1.80	2.07	2.28
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.04	-0.19	-0.48	-0.48	-0.77	-0.97
		%	-9%	-14%	-15%	-18%	-20%	-25%	-21%	-27%	-30%
May	Discharge	m^3/s	1.78	2.09	2.34	2.65	3.36	4.16	4.37	4.68	5.01
	Change from Pre-Mine	m^3/s	-0.33	-0.58	-0.66	-0.76	-1.41	-1.92	-2.40	-2.70	-2.48
		%	-16%	-22%	-22%	-22%	-30%	-32%	-35%	-37%	-33%
June	Discharge	m^3/s	1.15	1.36	1.64	2.23	3.17	4.25	4.57	4.99	5.66
	Change from Pre-Mine	m^3/s	-0.15	-0.32	-0.80	-0.79	-1.82	-2.83	-3.21	-3.37	-3.13
		%	-12%	-19%	-33%	-26%	-36%	-40%	-41%	-40%	-36%
July	Discharge	m^3/s	0.49	0.52	0.60	0.67	1.34	1.77	2.36	2.98	3.38
	Change from Pre-Mine	m^3/s	-0.09	-0.08	-0.08	-0.18	-0.77	-1.15	-1.70	-1.70	-3.17
		%	-15%	-13%	-12%	-22%	-36%	-39%	-42%	-36%	-48%
August	Discharge	m^3/s	0.30	0.32	0.36	0.48	0.65	0.74	0.93	1.08	1.51
	Change from Pre-Mine	m^3/s	0.01	0.01	-0.02	-0.02	-0.23	-0.30	-0.44	-0.82	-1.99
		%	3%	3%	-5%	-3%	-26%	-29%	-32%	-43%	-57%
September	Discharge	m^3/s	0.27	0.29	0.31	0.33	0.48	0.57	0.65	0.88	1.23
	Change from Pre-Mine	m^3/s	0.01	0.01	0.00	-0.02	-0.15	-0.18	-0.39	-0.51	-0.87
		%	3%	3%	0%	-6%	-24%	-24%	-37%	-37%	-41%
October	Discharge	m^3/s	0.25	0.28	0.29	0.31	0.52	0.68	0.94	1.10	1.26
	Change from Pre-Mine	m^3/s	0.01	0.00	-0.01	-0.03	-0.14	-0.21	-0.21	-0.36	-0.94
		%	2%	0%	-2%	-9%	-21%	-23%	-19%	-25%	-43%
November	Discharge	m^3/s	0.21	0.23	0.26	0.28	0.39	0.52	0.55	0.59	0.63
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.01	-0.03	-0.06	-0.11	-0.17	-0.16	-0.13
		%	0%	-4%	3%	-11%	-14%	-17%	-23%	-22%	-18%
December	Discharge	m^3/s	0.17	0.19	0.21	0.22	0.27	0.31	0.34	0.36	0.43
	Change from Pre-Mine	m^3/s	0.00	-0.01	0.00	-0.03	-0.04	-0.08	-0.08	-0.07	-0.02
		%	0%	-6%	0%	-14%	-13%	-21%	-19%	-17%	-4%
Annual	Discharge	m^3/s	0.56	0.64	0.68	0.77	0.96	1.11	1.24	1.32	1.37
	Change from Pre-Mine	m^3/s	-0.09	-0.13	-0.23	-0.27	-0.41	-0.59	-0.62	-0.66	-0.83
		%	-14%	-17%	-25%	-26%	-30%	-35%	-33%	-33%	-38%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.14	0.16	0.17	0.19	0.25	0.30	0.35	0.36	0.37
	Change from Pre-Mine	m^3/s	0.00	0.00	0.00	-0.02	-0.02	-0.02	0.00	0.01	0.00
		%	0%	0%	0%	-10%	-6%	-7%	0%	2%	0%
February	Discharge	m^3/s	0.12	0.13	0.14	0.15	0.21	0.27	0.30	0.31	0.32
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.01	-0.01	0.01	0.01	0.01
		%	-6%	-6%	-5%	-12%	-6%	-3%	3%	3%	3%
March	Discharge	m^3/s	0.10	0.11	0.12	0.13	0.19	0.25	0.27	0.29	0.31
	Change from Pre-Mine	m^3/s	-0.01	-0.01	-0.01	-0.02	-0.01	0.01	0.02	0.02	0.04
		%	-8%	-8%	-5%	-14%	-4%	4%	8%	8%	14%
April	Discharge	m^3/s	0.12	0.12	0.14	0.18	0.93	1.70	2.25	2.53	2.88
	Change from Pre-Mine	m^3/s	-0.01	-0.02	-0.02	-0.02	-0.05	-0.21	-0.03	-0.31	-0.37
		%	-10%	-14%	-15%	-12%	-5%	-11%	-1%	-11%	-11%
May	Discharge	m^3/s	1.78	2.24	2.44	2.79	3.84	4.98	5.70	5.92	6.03
	Change from Pre-Mine	m^3/s	-0.32	-0.42	-0.56	-0.62	-0.93	-1.09	-1.07	-1.47	-1.46
		%	-15%	-16%	-19%	-18%	-20%	-18%	-16%	-20%	-20%
June	Discharge	m^3/s	1.18	1.40	1.66	2.25	3.68	4.84	5.73	6.69	7.58
	Change from Pre-Mine	m^3/s	-0.13	-0.28	-0.78	-0.76	-1.30	-2.24	-2.05	-1.68	-1.20
		%	-10%	-17%	-32%	-25%	-26%	-32%	-26%	-20%	-14%
July	Discharge	m^3/s	0.49	0.52	0.59	0.71	1.50	2.07	2.74	3.72	4.40
	Change from Pre-Mine	m^3/s	-0.09	-0.08	-0.08	-0.14	-0.61	-0.84	-1.31	-0.96	-2.14
		%	-16%	-13%	-12%	-16%	-29%	-29%	-32%	-21%	-33%
August	Discharge	m^3/s	0.30	0.32	0.36	0.49	0.69	0.81	1.13	1.36	1.67
	Change from Pre-Mine	m^3/s	0.01	0.01	-0.02	-0.01	-0.18	-0.23	-0.23	-0.54	-1.82
		%	3%	3%	-6%	-1%	-21%	-22%	-17%	-28%	-52%
September	Discharge	m^3/s	0.27	0.29	0.31	0.34	0.52	0.70	0.80	0.88	1.50
	Change from Pre-Mine	m^3/s	0.01	0.01	0.00	-0.01	-0.11	-0.05	-0.23	-0.51	-0.60
		%	3%	3%	0%	-3%	-17%	-7%	-23%	-37%	-29%
October	Discharge	m^3/s	0.25	0.29	0.30	0.34	0.60	0.84	1.02	1.23	1.33
	Change from Pre-Mine	m^3/s	0.01	0.01	0.00	0.00	-0.06	-0.04	-0.13	-0.23	-0.87
		%	3%	5%	0%	0%	-9%	-5%	-11%	-16%	-40%
November	Discharge	m^3/s	0.21	0.25	0.26	0.29	0.42	0.54	0.61	0.66	0.70
	Change from Pre-Mine	m^3/s	0.01	0.01	0.01	-0.02	-0.03	-0.08	-0.11	-0.09	-0.06
		%	3%	6%	4%	-6%	-6%	-14%	-15%	-12%	-9%
December	Discharge	m^3/s	0.17	0.20	0.21	0.24	0.31	0.38	0.42	0.44	0.46
	Change from Pre-Mine	m^3/s	0.00	0.01	0.00	-0.02	-0.01	-0.01	0.00	0.01	0.02
		%	0%	4%	0%	-7%	-3%	-2%	0%	2%	4%
Annual	Discharge	m^3/s	0.62	0.67	0.72	0.80	1.09	1.39	1.55	1.64	1.83
	Change from Pre-Mine	m^3/s	-0.03	-0.09	-0.19	-0.24	-0.28	-0.30	-0.31	-0.35	-0.36
		%	-5%	-12%	-21%	-23%	-20%	-18%	-17%	-17%	-17%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.20	0.23	0.23	0.25	0.29	0.33	0.34	0.36	0.37
	Change from Pre-Mine	m^3/s	0.05	0.06	0.06	0.04	0.03	0.00	0.00	0.00	0.00
		%	39%	36%	35%	19%	11%	0%	0%	0%	0%
February	Discharge	m^3/s	0.24	0.26	0.27	0.28	0.32	0.35	0.36	0.38	0.38
	Change from Pre-Mine	m^3/s	0.12	0.12	0.12	0.10	0.10	0.07	0.07	0.07	0.07
		%	94%	85%	82%	59%	43%	26%	24%	23%	23%
March	Discharge	m^3/s	0.27	0.29	0.30	0.31	0.35	0.37	0.39	0.40	0.43
	Change from Pre-Mine	m^3/s	0.17	0.17	0.17	0.16	0.16	0.14	0.13	0.13	0.16
		%	>100%	>100%	>100%	>100%	80%	58%	53%	50%	57%
April	Discharge	m^3/s	0.32	0.32	0.34	0.39	1.24	2.17	2.56	2.94	3.34
	Change from Pre-Mine	m^3/s	0.19	0.18	0.18	0.19	0.26	0.26	0.28	0.10	0.09
		%	>100%	>100%	>100%	92%	26%	13%	12%	4%	3%
May	Discharge	m^3/s	2.99	3.25	3.40	3.94	4.76	5.72	6.03	6.47	7.15
	Change from Pre-Mine	m^3/s	0.89	0.58	0.39	0.53	-0.01	-0.36	-0.74	-0.92	-0.34
		%	42%	22%	13%	16%	0%	-6%	-11%	-12%	-4%
June	Discharge	m^3/s	1.64	1.84	2.39	3.15	4.65	5.86	6.68	7.44	7.94
	Change from Pre-Mine	m^3/s	0.33	0.16	-0.05	0.14	-0.33	-1.21	-1.10	-0.92	-0.84
		%	26%	9%	-2%	5%	-7%	-17%	-14%	-11%	-10%
July	Discharge	m^3/s	0.56	0.64	0.74	0.91	1.75	2.24	3.04	4.29	4.77
	Change from Pre-Mine	m^3/s	-0.02	0.04	0.07	0.06	-0.36	-0.67	-1.01	-0.39	-1.77
		%	-3%	6%	10%	7%	-17%	-23%	-25%	-8%	-27%
August	Discharge	m^3/s	0.34	0.39	0.43	0.54	0.80	0.99	1.24	1.46	1.76
	Change from Pre-Mine	m^3/s	0.05	0.08	0.05	0.05	-0.08	-0.06	-0.12	-0.45	-1.73
		%	17%	25%	13%	10%	-10%	-5%	-9%	-23%	-50%
September	Discharge	m^3/s	0.32	0.35	0.37	0.40	0.60	0.73	0.81	1.21	1.48
	Change from Pre-Mine	m^3/s	0.06	0.07	0.06	0.05	-0.03	-0.02	-0.22	-0.18	-0.61
		%	23%	24%	18%	14%	-5%	-3%	-21%	-13%	-29%
October	Discharge	m^3/s	0.32	0.34	0.38	0.44	0.76	1.04	1.30	1.65	1.90
	Change from Pre-Mine	m^3/s	0.07	0.07	0.08	0.10	0.10	0.16	0.15	0.18	-0.30
		%	31%	25%	28%	29%	15%	18%	13%	12%	-13%
November	Discharge	m^3/s	0.27	0.29	0.32	0.35	0.47	0.60	0.64	0.68	0.72
	Change from Pre-Mine	m^3/s	0.07	0.06	0.08	0.04	0.02	-0.03	-0.07	-0.07	-0.04
		%	34%	24%	31%	12%	4%	-5%	-10%	-10%	-5%
December	Discharge	m^3/s	0.23	0.25	0.27	0.29	0.35	0.39	0.41	0.42	0.44
	Change from Pre-Mine	m^3/s	0.06	0.05	0.07	0.04	0.03	0.00	-0.01	-0.01	0.00
		%	37%	26%	33%	14%	9%	0%	-1%	-2%	0%
Annual	Discharge	m^3/s	0.79	0.93	1.03	1.12	1.36	1.55	1.68	1.80	1.87
	Change from Pre-Mine	m^3/s	0.14	0.16	0.12	0.08	-0.01	-0.15	-0.19	-0.18	-0.33
		%	21%	22%	13%	8%	-1%	-9%	-10%	-9%	-15%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE K-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	70.4	Discharge	m^3/s	21	30	36	41	48	54	59
			Unit Runoff	$l/s/km^2$	305	426	508	588	687	765	840
-1	End of Construction	54.9	Discharge	m^3/s	18	25	30	34	40	45	49
			Unit Runoff	$l/s/km^2$	325	454	541	626	731	814	894
			Change from Pre-Mine	m^3/s	-4	-5	-6	-7	-8	-9	-10
		-22%		%	-17%	-17%	-17%	-17%	-17%	-17%	-17%
10	Operations I	52.2	Discharge	m^3/s	17	24	29	33	39	43	47
			Unit Runoff	$l/s/km^2$	329	460	548	634	741	824	905
			Change from Pre-Mine	m^3/s	-4	-6	-7	-8	-10	-11	-12
		-26%		%	-20%	-20%	-20%	-20%	-20%	-20%	-20%
22	Operations I	51.1	Discharge	m^3/s	17	24	28	33	38	42	47
			Unit Runoff	$l/s/km^2$	330	462	551	637	745	828	910
			Change from Pre-Mine	m^3/s	-5	-6	-8	-9	-10	-12	-13
		-27%		%	-21%	-21%	-21%	-21%	-21%	-21%	-21%
27	Operations II	51.5	Discharge	m^3/s	17	24	28	33	38	43	47
			Unit Runoff	$l/s/km^2$	330	461	550	636	743	827	908
			Change from Pre-Mine	m^3/s	-5	-6	-8	-9	-10	-11	-12
		-27%		%	-21%	-21%	-21%	-21%	-21%	-21%	-21%
30	Closure	66.6	Discharge	m^3/s	21	29	34	40	46	52	57
			Unit Runoff	$l/s/km^2$	309	433	515	596	697	775	852
			Change from Pre-Mine	m^3/s	-1	-1	-1	-2	-2	-2	-2
		-5%		%	-4%	-4%	-4%	-4%	-4%	-4%	-4%
50	Post-Closure	66.7	Discharge	m^3/s	21	29	34	40	46	52	57
			Unit Runoff	$l/s/km^2$	309	432	515	596	697	775	851
			Change from Pre-Mine	m^3/s	-1	-1	-1	-2	-2	-2	-2
		-5%		%	-4%	-4%	-4%	-4%	-4%	-4%	-4%

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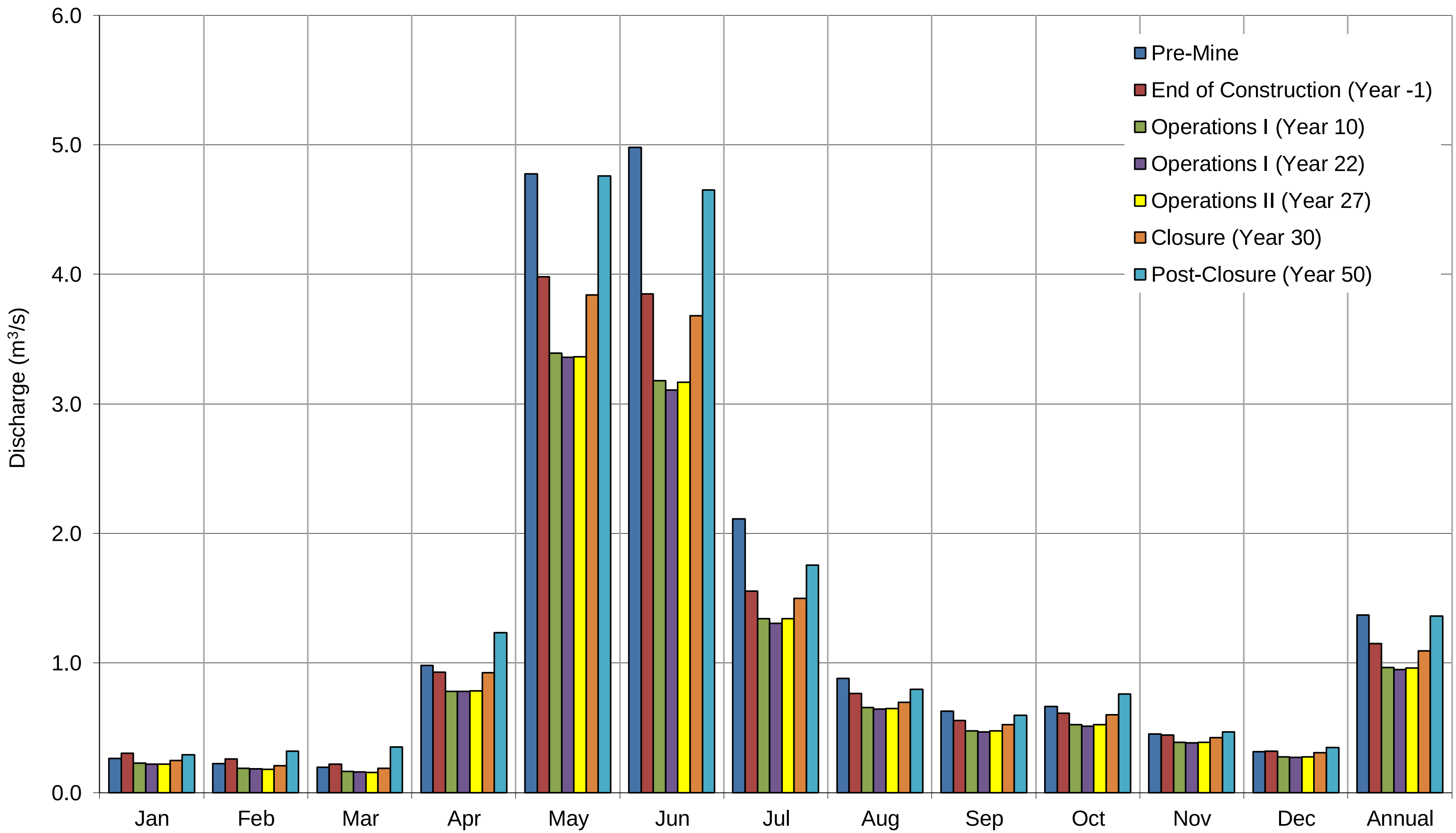
NOTE:
1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 9
HARPER CREEK BELOW T-CREEK CONFLUENCE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE K-1

REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

APPENDIX L

WATERSHED MODEL RESULTS FOR NODE 10

(Pages L-1 to L-10)

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TABLE L-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	185.6	Discharge	m^3/s	0.73	0.61	0.65	4.09	12.42	12.02	5.40	2.43	1.82	2.12	1.30	0.91	3.71
			Unit Runoff	$l/s/km^2$	3.9	3.3	3.5	22.0	66.9	64.7	29.1	13.1	9.8	11.4	7.0	4.9	20.0
-1	End of Construction	170.1	Discharge	m^3/s	0.76	0.64	0.69	4.16	11.83	11.09	4.87	2.38	1.78	2.08	1.27	0.87	3.53
			Unit Runoff	$l/s/km^2$	4.5	3.7	4.0	24.5	69.5	65.2	28.7	14.0	10.5	12.2	7.4	5.1	20.8
			Change from Pre-Mine	m^3/s	0.03	0.03	0.04	0.08	-0.60	-0.92	-0.52	-0.05	-0.04	-0.05	-0.03	-0.04	-0.17
		-8%		%	4%	4%	6%	2%	-5%	-8%	-10%	-2%	-2%	-2%	-2%	-5%	-5%
10	Operations I	167.3	Discharge	m^3/s	0.68	0.56	0.61	3.79	10.97	10.13	4.61	2.26	1.68	1.98	1.26	0.87	3.28
			Unit Runoff	$l/s/km^2$	4.1	3.3	3.6	22.6	65.6	60.6	27.6	13.5	10.0	11.8	7.5	5.2	19.6
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.04	-0.30	-1.45	-1.88	-0.79	-0.16	-0.15	-0.15	-0.04	-0.04	-0.42
		-10%		%	-6%	-9%	-6%	-7%	-12%	-16%	-15%	-7%	-8%	-7%	-3%	-4%	-11%
22	Operations I	166.3	Discharge	m^3/s	0.68	0.55	0.60	3.77	10.96	10.09	4.58	2.24	1.66	1.95	1.25	0.87	3.27
			Unit Runoff	$l/s/km^2$	4.1	3.3	3.6	22.7	65.9	60.7	27.6	13.5	10.0	11.7	7.5	5.2	19.6
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.05	-0.31	-1.47	-1.93	-0.81	-0.19	-0.17	-0.18	-0.05	-0.05	-0.44
		-10%		%	-7%	-10%	-7%	-8%	-12%	-16%	-15%	-8%	-9%	-8%	-4%	-5%	-12%
27	Operations II	166.6	Discharge	m^3/s	0.68	0.55	0.59	3.80	10.98	10.14	4.62	2.26	1.68	1.98	1.26	0.88	3.28
			Unit Runoff	$l/s/km^2$	4.1	3.3	3.5	22.8	65.9	60.8	27.7	13.6	10.1	11.9	7.6	5.3	19.7
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.06	-0.28	-1.45	-1.88	-0.78	-0.17	-0.14	-0.14	-0.03	-0.04	-0.42
		-10%		%	-7%	-10%	-10%	-7%	-12%	-16%	-14%	-7%	-8%	-7%	-3%	-4%	-11%
30	Closure	181.8	Discharge	m^3/s	0.71	0.58	0.63	3.97	11.41	10.59	4.75	2.31	1.73	2.06	1.30	0.91	3.41
			Unit Runoff	$l/s/km^2$	3.9	3.2	3.5	21.8	62.8	58.3	26.1	12.7	9.5	11.3	7.1	5.0	18.8
			Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.02	-0.12	-1.01	-1.43	-0.65	-0.12	-0.09	-0.06	0.00	0.00	-0.30
		-2%		%	-3%	-5%	-3%	-3%	-8%	-12%	-12%	-5%	-5%	-3%	0%	0%	-8%
50	Post-Closure	181.9	Discharge	m^3/s	0.75	0.69	0.80	4.30	12.29	11.52	5.00	2.41	1.80	2.22	1.34	0.95	3.67
			Unit Runoff	$l/s/km^2$	4.1	3.8	4.4	23.7	67.6	63.3	27.5	13.2	9.9	12.2	7.4	5.2	20.2
			Change from Pre-Mine	m^3/s	0.02	0.08	0.15	0.22	-0.13	-0.49	-0.40	-0.02	-0.02	0.09	0.04	0.03	-0.04
		-2%		%	3%	12%	22%	5%	-1%	-4%	-7%	-1%	-1%	4%	3%	4%	-1%

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NOTE:
1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE L-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	0.46	0.48	0.52	0.63	0.73	0.87	0.91	0.94	0.97
February	0.39	0.41	0.44	0.53	0.61	0.73	0.75	0.78	0.80
March	0.35	0.38	0.40	0.47	0.65	0.74	0.89	1.18	1.70
April	0.70	0.89	1.03	1.52	4.09	6.79	7.65	8.28	9.98
May	6.52	7.33	7.94	9.29	12.42	15.77	16.94	18.22	19.95
June	3.70	4.28	6.09	7.37	12.02	16.70	18.47	20.46	22.86
July	1.56	1.59	1.80	2.26	5.40	7.32	10.50	11.73	15.77
August	0.94	0.98	1.17	1.48	2.43	2.88	3.80	5.07	9.52
September	0.81	0.88	0.98	1.05	1.82	2.04	3.13	4.09	5.49
October	0.74	0.82	0.90	1.08	2.12	3.13	3.89	4.68	6.62
November	0.66	0.69	0.76	0.94	1.30	1.69	1.84	1.90	1.98
December	0.55	0.57	0.63	0.77	0.91	1.09	1.16	1.19	1.23
Annual	1.87	2.16	2.52	2.87	3.71	4.51	5.01	5.35	5.88

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE PRE-MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE L-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.60	0.63	0.65	0.71	0.76	0.82	0.85	0.87	0.89
	Change from Pre-Mine	m^3/s	0.14	0.15	0.13	0.07	0.03	-0.05	-0.06	-0.07	-0.08
		%	31%	32%	25%	12%	4%	-6%	-6%	-8%	-9%
February	Discharge	m^3/s	0.51	0.54	0.55	0.59	0.64	0.69	0.71	0.72	0.74
	Change from Pre-Mine	m^3/s	0.12	0.13	0.11	0.06	0.03	-0.04	-0.04	-0.05	-0.06
		%	30%	32%	24%	12%	4%	-5%	-6%	-7%	-8%
March	Discharge	m^3/s	0.44	0.46	0.49	0.52	0.69	0.75	0.90	1.28	1.62
	Change from Pre-Mine	m^3/s	0.09	0.08	0.09	0.06	0.04	0.01	0.02	0.10	-0.07
		%	24%	22%	22%	12%	6%	1%	2%	9%	-4%
April	Discharge	m^3/s	0.91	1.12	1.37	1.87	4.16	6.55	7.58	8.61	9.50
	Change from Pre-Mine	m^3/s	0.20	0.23	0.34	0.35	0.08	-0.23	-0.07	0.33	-0.48
		%	29%	26%	33%	23%	2%	-3%	-1%	4%	-5%
May	Discharge	m^3/s	7.03	7.60	8.15	9.00	11.83	14.17	15.69	17.86	18.17
	Change from Pre-Mine	m^3/s	0.51	0.27	0.21	-0.29	-0.60	-1.59	-1.25	-0.36	-1.79
		%	8%	4%	3%	-3%	-5%	-10%	-7%	-2%	-9%
June	Discharge	m^3/s	4.25	4.74	6.08	7.64	11.09	14.00	15.93	18.44	19.90
	Change from Pre-Mine	m^3/s	0.55	0.46	-0.01	0.27	-0.92	-2.70	-2.54	-2.02	-2.96
		%	15%	11%	0%	4%	-8%	-16%	-14%	-10%	-13%
July	Discharge	m^3/s	1.72	1.85	2.14	2.98	4.87	6.53	8.06	8.87	11.15
	Change from Pre-Mine	m^3/s	0.16	0.26	0.34	0.72	-0.52	-0.80	-2.43	-2.86	-4.63
		%	10%	16%	19%	32%	-10%	-11%	-23%	-24%	-29%
August	Discharge	m^3/s	1.26	1.29	1.44	1.58	2.38	2.81	3.73	4.76	5.99
	Change from Pre-Mine	m^3/s	0.32	0.31	0.28	0.10	-0.05	-0.07	-0.07	-0.31	-3.53
		%	34%	31%	24%	7%	-2%	-2%	-2%	-6%	-37%
September	Discharge	m^3/s	1.02	1.05	1.09	1.18	1.78	2.02	2.52	3.41	5.42
	Change from Pre-Mine	m^3/s	0.21	0.17	0.12	0.13	-0.04	-0.02	-0.61	-0.68	-0.07
		%	26%	19%	12%	13%	-2%	-1%	-19%	-17%	-1%
October	Discharge	m^3/s	0.94	0.97	1.05	1.16	2.08	2.75	3.82	4.31	5.89
	Change from Pre-Mine	m^3/s	0.20	0.15	0.15	0.08	-0.05	-0.38	-0.08	-0.37	-0.73
		%	27%	18%	17%	7%	-2%	-12%	-2%	-8%	-11%
November	Discharge	m^3/s	0.77	0.84	0.89	0.99	1.27	1.53	1.63	1.69	1.70
	Change from Pre-Mine	m^3/s	0.12	0.15	0.13	0.05	-0.03	-0.16	-0.21	-0.21	-0.28
		%	18%	22%	18%	5%	-2%	-10%	-11%	-11%	-14%
December	Discharge	m^3/s	0.64	0.69	0.73	0.77	0.87	0.96	1.00	1.05	1.07
	Change from Pre-Mine	m^3/s	0.09	0.12	0.10	0.01	-0.04	-0.14	-0.15	-0.14	-0.16
		%	17%	20%	17%	1%	-5%	-12%	-13%	-11%	-13%
Annual	Discharge	m^3/s	2.35	2.49	2.58	2.93	3.53	4.19	4.43	4.78	4.82
	Change from Pre-Mine	m^3/s	0.48	0.33	0.06	0.06	-0.17	-0.33	-0.58	-0.57	-1.06
		%	25%	15%	2%	2%	-5%	-7%	-12%	-11%	-18%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE L-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.46	0.50	0.53	0.58	0.68	0.78	0.81	0.83	0.86
	Change from Pre-Mine	m^3/s	0.00	0.02	0.01	-0.05	-0.05	-0.09	-0.11	-0.11	-0.11
		%	0%	5%	1%	-9%	-6%	-10%	-12%	-11%	-12%
February	Discharge	m^3/s	0.37	0.41	0.43	0.47	0.56	0.64	0.65	0.67	0.69
	Change from Pre-Mine	m^3/s	-0.02	0.00	-0.01	-0.06	-0.06	-0.09	-0.10	-0.10	-0.11
		%	-5%	0%	-2%	-11%	-9%	-13%	-13%	-13%	-14%
March	Discharge	m^3/s	0.31	0.36	0.38	0.43	0.61	0.65	0.90	1.14	1.55
	Change from Pre-Mine	m^3/s	-0.04	-0.02	-0.02	-0.04	-0.04	-0.09	0.01	-0.04	-0.14
		%	-11%	-5%	-5%	-8%	-6%	-13%	1%	-3%	-8%
April	Discharge	m^3/s	0.67	0.80	0.91	1.40	3.79	5.67	7.21	8.00	8.84
	Change from Pre-Mine	m^3/s	-0.03	-0.09	-0.13	-0.12	-0.30	-1.12	-0.44	-0.28	-1.14
		%	-4%	-10%	-12%	-8%	-7%	-16%	-6%	-3%	-11%
May	Discharge	m^3/s	6.15	6.64	8.02	8.82	10.97	12.90	14.38	15.48	16.05
	Change from Pre-Mine	m^3/s	-0.37	-0.69	0.08	-0.47	-1.45	-2.87	-2.56	-2.74	-3.90
		%	-6%	-9%	1%	-5%	-12%	-18%	-15%	-15%	-20%
June	Discharge	m^3/s	3.98	4.63	5.71	7.26	10.13	13.08	14.48	15.27	17.20
	Change from Pre-Mine	m^3/s	0.28	0.34	-0.38	-0.11	-1.88	-3.61	-3.99	-5.19	-5.65
		%	8%	8%	-6%	-2%	-16%	-22%	-22%	-25%	-25%
July	Discharge	m^3/s	1.59	1.71	1.88	2.65	4.61	5.90	7.81	9.90	11.40
	Change from Pre-Mine	m^3/s	0.04	0.11	0.08	0.39	-0.79	-1.42	-2.69	-1.83	-4.37
		%	2%	7%	5%	17%	-15%	-19%	-26%	-16%	-28%
August	Discharge	m^3/s	1.14	1.23	1.35	1.54	2.26	2.99	3.57	4.11	5.74
	Change from Pre-Mine	m^3/s	0.20	0.25	0.18	0.06	-0.16	0.11	-0.23	-0.96	-3.78
		%	22%	25%	15%	4%	-7%	4%	-6%	-19%	-40%
September	Discharge	m^3/s	0.97	1.00	1.07	1.15	1.68	1.95	2.30	3.25	3.76
	Change from Pre-Mine	m^3/s	0.16	0.11	0.09	0.10	-0.15	-0.10	-0.83	-0.84	-1.73
		%	20%	13%	10%	9%	-8%	-5%	-26%	-21%	-32%
October	Discharge	m^3/s	0.87	0.94	0.99	1.09	1.98	2.68	3.40	4.25	4.53
	Change from Pre-Mine	m^3/s	0.13	0.12	0.10	0.01	-0.15	-0.44	-0.49	-0.44	-2.09
		%	17%	15%	11%	1%	-7%	-14%	-13%	-9%	-32%
November	Discharge	m^3/s	0.72	0.78	0.82	0.91	1.26	1.55	1.61	1.70	1.76
	Change from Pre-Mine	m^3/s	0.06	0.09	0.06	-0.03	-0.04	-0.14	-0.23	-0.20	-0.23
		%	9%	12%	8%	-4%	-3%	-8%	-12%	-10%	-11%
December	Discharge	m^3/s	0.57	0.62	0.66	0.73	0.87	1.00	1.04	1.08	1.12
	Change from Pre-Mine	m^3/s	0.03	0.05	0.03	-0.03	-0.04	-0.09	-0.12	-0.11	-0.11
		%	5%	8%	5%	-4%	-4%	-8%	-10%	-9%	-9%
Annual	Discharge	m^3/s	1.94	2.18	2.44	2.68	3.28	3.78	4.15	4.41	4.55
	Change from Pre-Mine	m^3/s	0.07	0.02	-0.09	-0.19	-0.42	-0.73	-0.86	-0.94	-1.34
		%	4%	1%	-3%	-7%	-11%	-16%	-17%	-18%	-23%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE L-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.46	0.50	0.52	0.57	0.68	0.78	0.80	0.83	0.85
	Change from Pre-Mine	m^3/s	0.00	0.02	0.00	-0.06	-0.05	-0.10	-0.11	-0.11	-0.12
		%	0%	4%	0%	-9%	-7%	-11%	-12%	-12%	-12%
February	Discharge	m^3/s	0.37	0.41	0.43	0.47	0.55	0.63	0.65	0.67	0.69
	Change from Pre-Mine	m^3/s	-0.02	0.00	-0.02	-0.06	-0.06	-0.10	-0.10	-0.11	-0.12
		%	-6%	0%	-4%	-12%	-10%	-13%	-14%	-14%	-15%
March	Discharge	m^3/s	0.31	0.35	0.37	0.43	0.60	0.64	0.89	1.13	1.54
	Change from Pre-Mine	m^3/s	-0.04	-0.02	-0.03	-0.04	-0.05	-0.10	0.00	-0.04	-0.15
		%	-12%	-6%	-6%	-9%	-7%	-14%	0%	-4%	-9%
April	Discharge	m^3/s	0.67	0.79	0.90	1.40	3.77	5.66	7.19	7.77	8.82
	Change from Pre-Mine	m^3/s	-0.03	-0.10	-0.13	-0.12	-0.31	-1.13	-0.46	-0.51	-1.16
		%	-5%	-11%	-12%	-8%	-8%	-17%	-6%	-6%	-12%
May	Discharge	m^3/s	6.14	6.62	8.01	9.03	10.96	12.87	14.35	15.44	16.02
	Change from Pre-Mine	m^3/s	-0.39	-0.71	0.07	-0.25	-1.47	-2.90	-2.59	-2.78	-3.94
		%	-6%	-10%	1%	-3%	-12%	-18%	-15%	-15%	-20%
June	Discharge	m^3/s	3.96	4.60	5.67	7.22	10.09	13.04	14.42	15.21	17.13
	Change from Pre-Mine	m^3/s	0.26	0.32	-0.42	-0.15	-1.93	-3.65	-4.05	-5.25	-5.73
		%	7%	7%	-7%	-2%	-16%	-22%	-22%	-26%	-25%
July	Discharge	m^3/s	1.59	1.70	1.87	2.63	4.58	5.86	7.76	9.84	11.35
	Change from Pre-Mine	m^3/s	0.03	0.11	0.08	0.38	-0.81	-1.46	-2.74	-1.88	-4.42
		%	2%	7%	4%	17%	-15%	-20%	-26%	-16%	-28%
August	Discharge	m^3/s	1.14	1.23	1.34	1.53	2.24	2.86	3.54	4.08	5.72
	Change from Pre-Mine	m^3/s	0.20	0.24	0.17	0.05	-0.19	-0.02	-0.26	-0.99	-3.80
		%	21%	25%	15%	4%	-8%	-1%	-7%	-20%	-40%
September	Discharge	m^3/s	0.97	0.99	1.07	1.14	1.66	1.92	2.25	3.24	3.72
	Change from Pre-Mine	m^3/s	0.16	0.11	0.09	0.09	-0.17	-0.13	-0.88	-0.86	-1.76
		%	19%	13%	9%	9%	-9%	-6%	-28%	-21%	-32%
October	Discharge	m^3/s	0.86	0.94	0.99	1.08	1.95	2.59	3.32	4.23	4.52
	Change from Pre-Mine	m^3/s	0.12	0.12	0.09	0.01	-0.18	-0.53	-0.58	-0.45	-2.10
		%	17%	14%	11%	1%	-8%	-17%	-15%	-10%	-32%
November	Discharge	m^3/s	0.71	0.77	0.82	0.91	1.25	1.54	1.60	1.69	1.74
	Change from Pre-Mine	m^3/s	0.05	0.08	0.06	-0.04	-0.05	-0.15	-0.24	-0.21	-0.24
		%	8%	12%	7%	-4%	-4%	-9%	-13%	-11%	-12%
December	Discharge	m^3/s	0.57	0.62	0.65	0.73	0.87	1.00	1.03	1.06	1.12
	Change from Pre-Mine	m^3/s	0.02	0.04	0.02	-0.04	-0.05	-0.09	-0.12	-0.13	-0.11
		%	4%	7%	4%	-5%	-5%	-9%	-11%	-11%	-9%
Annual	Discharge	m^3/s	1.93	2.18	2.43	2.67	3.27	3.77	4.13	4.39	4.53
	Change from Pre-Mine	m^3/s	0.06	0.01	-0.10	-0.20	-0.44	-0.74	-0.88	-0.96	-1.35
		%	3%	1%	-4%	-7%	-12%	-16%	-18%	-18%	-23%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE L-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.46	0.50	0.52	0.57	0.68	0.78	0.80	0.82	0.85
	Change from Pre-Mine	m^3/s	0.00	0.02	0.00	-0.06	-0.05	-0.10	-0.11	-0.11	-0.12
		%	0%	4%	0%	-9%	-7%	-11%	-12%	-12%	-13%
February	Discharge	m^3/s	0.37	0.40	0.42	0.46	0.55	0.63	0.65	0.67	0.68
	Change from Pre-Mine	m^3/s	-0.02	0.00	-0.02	-0.06	-0.06	-0.10	-0.11	-0.11	-0.12
		%	-6%	0%	-4%	-12%	-10%	-14%	-14%	-14%	-15%
March	Discharge	m^3/s	0.30	0.34	0.36	0.41	0.59	0.62	0.86	1.10	1.51
	Change from Pre-Mine	m^3/s	-0.05	-0.04	-0.04	-0.05	-0.06	-0.12	-0.02	-0.07	-0.19
		%	-15%	-9%	-10%	-11%	-10%	-16%	-2%	-6%	-11%
April	Discharge	m^3/s	0.67	0.80	0.91	1.40	3.80	5.86	7.25	8.01	8.83
	Change from Pre-Mine	m^3/s	-0.03	-0.09	-0.13	-0.12	-0.28	-0.93	-0.39	-0.27	-1.15
		%	-4%	-10%	-12%	-8%	-7%	-14%	-5%	-3%	-12%
May	Discharge	m^3/s	6.14	6.63	8.02	9.04	10.98	12.89	14.36	15.46	16.04
	Change from Pre-Mine	m^3/s	-0.38	-0.70	0.08	-0.24	-1.45	-2.88	-2.57	-2.76	-3.92
		%	-6%	-10%	1%	-3%	-12%	-18%	-15%	-15%	-20%
June	Discharge	m^3/s	3.96	4.62	5.70	7.49	10.14	13.07	14.46	15.25	17.17
	Change from Pre-Mine	m^3/s	0.27	0.34	-0.40	0.12	-1.88	-3.63	-4.01	-5.21	-5.68
		%	7%	8%	-6%	2%	-16%	-22%	-22%	-25%	-25%
July	Discharge	m^3/s	1.59	1.70	1.88	2.63	4.62	5.98	7.79	9.88	11.38
	Change from Pre-Mine	m^3/s	0.03	0.11	0.08	0.38	-0.78	-1.34	-2.70	-1.84	-4.39
		%	2%	7%	4%	17%	-14%	-18%	-26%	-16%	-28%
August	Discharge	m^3/s	1.14	1.23	1.34	1.53	2.26	2.86	3.55	4.14	5.74
	Change from Pre-Mine	m^3/s	0.20	0.25	0.17	0.06	-0.17	-0.01	-0.25	-0.93	-3.77
		%	21%	25%	15%	4%	-7%	0%	-6%	-18%	-40%
September	Discharge	m^3/s	0.97	0.99	1.07	1.15	1.68	1.93	2.39	3.23	4.14
	Change from Pre-Mine	m^3/s	0.16	0.11	0.09	0.10	-0.14	-0.11	-0.73	-0.86	-1.35
		%	19%	12%	9%	9%	-8%	-5%	-23%	-21%	-25%
October	Discharge	m^3/s	0.86	0.94	0.99	1.10	1.98	2.76	3.39	4.23	4.52
	Change from Pre-Mine	m^3/s	0.12	0.12	0.10	0.02	-0.14	-0.37	-0.51	-0.45	-2.10
		%	17%	14%	11%	2%	-7%	-12%	-13%	-10%	-32%
November	Discharge	m^3/s	0.71	0.77	0.84	0.93	1.26	1.55	1.61	1.74	1.76
	Change from Pre-Mine	m^3/s	0.05	0.08	0.08	-0.02	-0.03	-0.14	-0.23	-0.16	-0.23
		%	8%	12%	10%	-2%	-3%	-8%	-13%	-8%	-11%
December	Discharge	m^3/s	0.57	0.62	0.65	0.74	0.88	1.00	1.05	1.07	1.12
	Change from Pre-Mine	m^3/s	0.02	0.04	0.02	-0.03	-0.04	-0.09	-0.11	-0.11	-0.11
		%	4%	7%	4%	-3%	-4%	-8%	-9%	-10%	-9%
Annual	Discharge	m^3/s	1.94	2.18	2.43	2.67	3.28	3.77	4.14	4.40	4.54
	Change from Pre-Mine	m^3/s	0.06	0.02	-0.09	-0.20	-0.42	-0.74	-0.87	-0.95	-1.35
		%	3%	1%	-4%	-7%	-11%	-16%	-17%	-18%	-23%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE L-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.46	0.51	0.54	0.59	0.71	0.81	0.87	0.89	0.90
	Change from Pre-Mine	m^3/s	0.00	0.04	0.02	-0.04	-0.02	-0.07	-0.04	-0.05	-0.07
		%	0%	8%	3%	-6%	-3%	-8%	-4%	-5%	-7%
February	Discharge	m^3/s	0.37	0.41	0.44	0.48	0.58	0.66	0.72	0.73	0.75
	Change from Pre-Mine	m^3/s	-0.02	0.01	-0.01	-0.05	-0.03	-0.06	-0.03	-0.05	-0.06
		%	-6%	2%	-1%	-10%	-5%	-9%	-4%	-6%	-7%
March	Discharge	m^3/s	0.31	0.36	0.38	0.43	0.63	0.69	0.97	1.13	1.67
	Change from Pre-Mine	m^3/s	-0.04	-0.01	-0.02	-0.03	-0.02	-0.05	0.08	-0.05	-0.03
		%	-12%	-3%	-5%	-7%	-3%	-7%	9%	-4%	-2%
April	Discharge	m^3/s	0.67	0.79	0.90	1.48	3.97	6.23	7.85	8.50	8.84
	Change from Pre-Mine	m^3/s	-0.03	-0.10	-0.13	-0.04	-0.12	-0.56	0.20	0.22	-1.14
		%	-5%	-11%	-13%	-3%	-3%	-8%	3%	3%	-11%
May	Discharge	m^3/s	6.14	7.41	8.02	8.82	11.41	14.35	14.89	15.98	16.72
	Change from Pre-Mine	m^3/s	-0.38	0.08	0.08	-0.47	-1.01	-1.41	-2.05	-2.24	-3.24
		%	-6%	1%	1%	-5%	-8%	-9%	-12%	-12%	-16%
June	Discharge	m^3/s	4.11	4.81	5.70	7.43	10.59	13.32	14.96	17.21	19.21
	Change from Pre-Mine	m^3/s	0.41	0.53	-0.39	0.06	-1.43	-3.37	-3.51	-3.25	-3.65
		%	11%	12%	-6%	1%	-12%	-20%	-19%	-16%	-16%
July	Discharge	m^3/s	1.59	1.70	1.88	2.66	4.75	6.27	8.30	9.95	12.29
	Change from Pre-Mine	m^3/s	0.03	0.11	0.08	0.40	-0.65	-1.05	-2.19	-1.78	-3.48
		%	2%	7%	4%	18%	-12%	-14%	-21%	-15%	-22%
August	Discharge	m^3/s	1.14	1.23	1.34	1.53	2.31	3.00	3.62	4.30	5.75
	Change from Pre-Mine	m^3/s	0.20	0.24	0.17	0.06	-0.12	0.13	-0.18	-0.77	-3.77
		%	21%	25%	15%	4%	-5%	4%	-5%	-15%	-40%
September	Discharge	m^3/s	0.97	1.01	1.12	1.18	1.73	2.10	2.45	3.24	4.12
	Change from Pre-Mine	m^3/s	0.16	0.13	0.14	0.13	-0.09	0.06	-0.68	-0.85	-1.37
		%	19%	15%	14%	12%	-5%	3%	-22%	-21%	-25%
October	Discharge	m^3/s	0.87	0.98	1.01	1.12	2.06	2.88	3.57	4.23	4.76
	Change from Pre-Mine	m^3/s	0.14	0.16	0.12	0.04	-0.06	-0.25	-0.32	-0.45	-1.87
		%	19%	19%	13%	4%	-3%	-8%	-8%	-10%	-28%
November	Discharge	m^3/s	0.72	0.81	0.85	0.95	1.30	1.58	1.70	1.77	1.80
	Change from Pre-Mine	m^3/s	0.06	0.11	0.09	0.01	0.00	-0.11	-0.15	-0.13	-0.18
		%	9%	17%	11%	1%	0%	-7%	-8%	-7%	-9%
December	Discharge	m^3/s	0.59	0.65	0.67	0.76	0.91	1.06	1.12	1.14	1.20
	Change from Pre-Mine	m^3/s	0.04	0.08	0.04	-0.01	0.00	-0.03	-0.04	-0.05	-0.03
		%	8%	13%	7%	-1%	0%	-3%	-3%	-4%	-2%
Annual	Discharge	m^3/s	2.11	2.29	2.43	2.71	3.41	4.07	4.41	4.72	4.91
	Change from Pre-Mine	m^3/s	0.24	0.13	-0.09	-0.16	-0.30	-0.44	-0.61	-0.63	-0.98
		%	13%	6%	-4%	-6%	-8%	-10%	-12%	-12%	-17%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE L-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	0.52	0.57	0.59	0.64	0.75	0.85	0.88	0.90	0.93
	Change from Pre-Mine	m^3/s	0.06	0.09	0.07	0.01	0.02	-0.02	-0.03	-0.03	-0.04
		%	13%	19%	13%	2%	3%	-3%	-4%	-4%	-5%
February	Discharge	m^3/s	0.50	0.54	0.56	0.60	0.69	0.77	0.79	0.81	0.83
	Change from Pre-Mine	m^3/s	0.11	0.13	0.12	0.07	0.08	0.04	0.04	0.03	0.02
		%	27%	32%	26%	13%	12%	6%	5%	4%	3%
March	Discharge	m^3/s	0.49	0.53	0.56	0.62	0.80	0.83	1.08	1.32	1.77
	Change from Pre-Mine	m^3/s	0.14	0.16	0.16	0.15	0.15	0.09	0.20	0.15	0.08
		%	39%	42%	40%	32%	22%	12%	22%	13%	5%
April	Discharge	m^3/s	0.90	1.04	1.11	1.65	4.30	6.59	8.04	8.75	9.91
	Change from Pre-Mine	m^3/s	0.20	0.15	0.08	0.13	0.22	-0.19	0.39	0.47	-0.07
		%	28%	16%	8%	8%	5%	-3%	5%	6%	-1%
May	Discharge	m^3/s	7.50	7.74	9.04	10.00	12.29	14.48	15.90	16.96	18.05
	Change from Pre-Mine	m^3/s	0.98	0.41	1.10	0.72	-0.13	-1.28	-1.04	-1.26	-1.90
		%	15%	6%	14%	8%	-1%	-8%	-6%	-7%	-10%
June	Discharge	m^3/s	4.42	5.02	6.32	8.38	11.52	14.70	15.96	17.84	19.25
	Change from Pre-Mine	m^3/s	0.73	0.74	0.23	1.01	-0.49	-2.00	-2.51	-2.62	-3.61
		%	20%	17%	4%	14%	-4%	-12%	-14%	-13%	-16%
July	Discharge	m^3/s	1.69	1.76	2.01	2.85	5.00	6.37	8.66	10.60	12.37
	Change from Pre-Mine	m^3/s	0.14	0.17	0.21	0.60	-0.40	-0.96	-1.84	-1.13	-3.40
		%	9%	10%	12%	26%	-7%	-13%	-18%	-10%	-22%
August	Discharge	m^3/s	1.16	1.27	1.40	1.57	2.41	3.13	3.87	4.55	5.84
	Change from Pre-Mine	m^3/s	0.23	0.29	0.23	0.10	-0.02	0.25	0.07	-0.52	-3.68
		%	24%	30%	20%	7%	-1%	9%	2%	-10%	-39%
September	Discharge	m^3/s	0.99	1.09	1.15	1.24	1.80	2.16	2.48	3.71	4.11
	Change from Pre-Mine	m^3/s	0.18	0.21	0.18	0.19	-0.02	0.12	-0.65	-0.38	-1.38
		%	22%	24%	18%	18%	-1%	6%	-21%	-9%	-25%
October	Discharge	m^3/s	0.94	1.01	1.07	1.26	2.22	3.10	3.86	4.74	5.15
	Change from Pre-Mine	m^3/s	0.20	0.19	0.18	0.18	0.09	-0.03	-0.04	0.05	-1.47
		%	27%	23%	20%	17%	4%	-1%	-1%	1%	-22%
November	Discharge	m^3/s	0.78	0.85	0.89	1.00	1.34	1.65	1.71	1.78	1.86
	Change from Pre-Mine	m^3/s	0.12	0.15	0.13	0.05	0.04	-0.04	-0.13	-0.12	-0.12
		%	19%	22%	17%	5%	3%	-3%	-7%	-6%	-6%
December	Discharge	m^3/s	0.64	0.69	0.72	0.80	0.95	1.08	1.11	1.15	1.20
	Change from Pre-Mine	m^3/s	0.09	0.12	0.10	0.04	0.03	-0.01	-0.04	-0.04	-0.03
		%	16%	21%	15%	5%	4%	-1%	-4%	-3%	-3%
Annual	Discharge	m^3/s	2.16	2.47	2.77	3.05	3.67	4.22	4.54	4.89	5.00
	Change from Pre-Mine	m^3/s	0.29	0.31	0.25	0.18	-0.04	-0.29	-0.47	-0.46	-0.88
		%	16%	14%	10%	6%	-1%	-6%	-9%	-9%	-15%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE L-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

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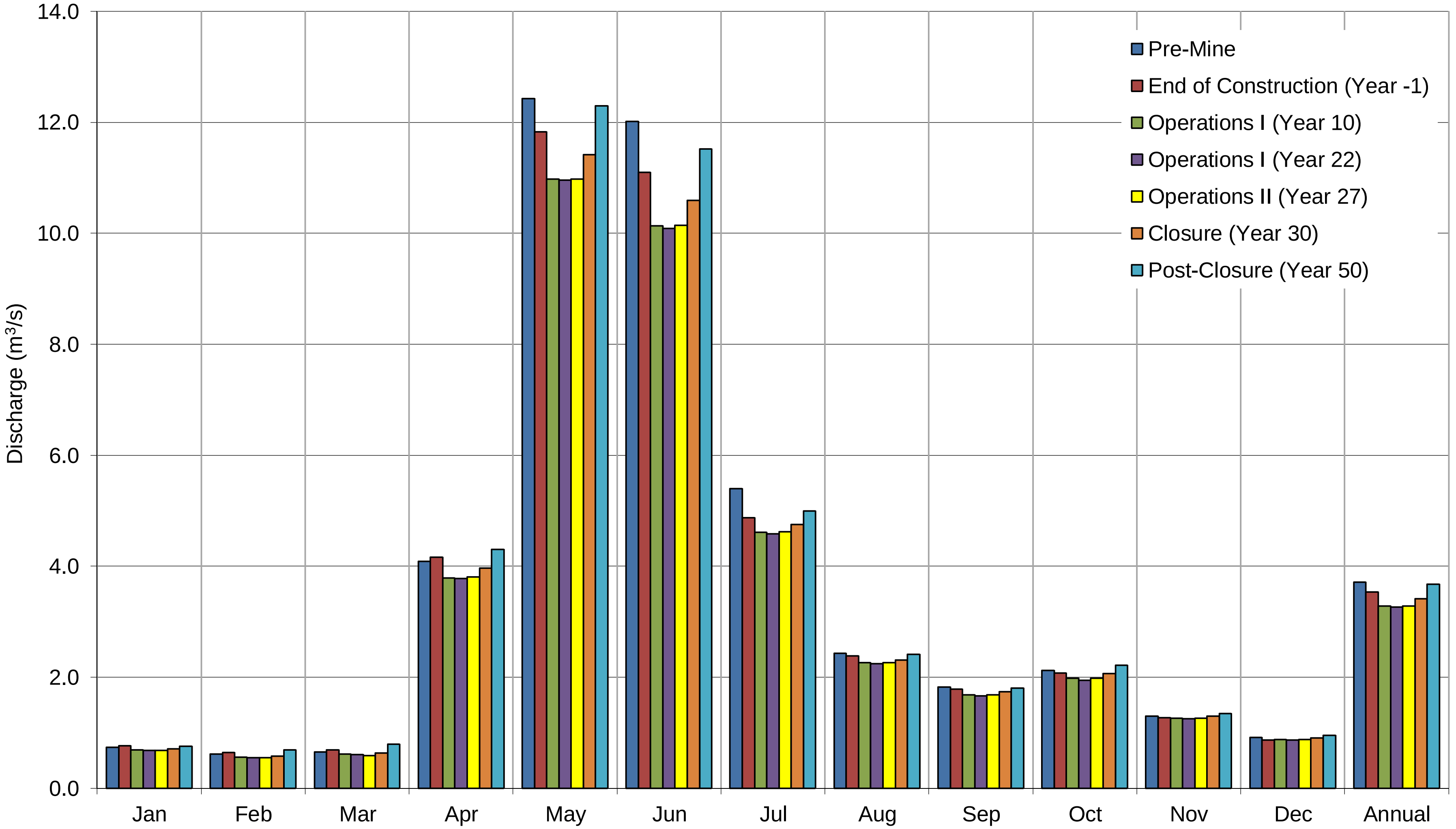
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	185.6	Discharge	m^3/s	47	58	64	69	74	78	81
			Unit Runoff	$l/s/km^2$	253	311	343	370	400	418	435
-1	End of Construction	170.1	Discharge	m^3/s	44	54	60	64	69	73	76
			Unit Runoff	$l/s/km^2$	258	318	350	378	408	428	444
			Change from Pre-Mine	m^3/s	-3	-4	-4	-4	-5	-5	-5
		-8%		%	-6%	-6%	-6%	-6%	-6%	-6%	-6%
10	Operations I	167.3	Discharge	m^3/s	43	53	59	64	69	72	75
			Unit Runoff	$l/s/km^2$	259	319	352	380	410	429	446
			Change from Pre-Mine	m^3/s	-4	-4	-5	-5	-6	-6	-6
		-10%		%	-7%	-7%	-7%	-7%	-7%	-7%	-7%
22	Operations I	166.3	Discharge	m^3/s	43	53	59	63	68	72	74
			Unit Runoff	$l/s/km^2$	260	320	352	380	411	430	447
			Change from Pre-Mine	m^3/s	-4	-5	-5	-5	-6	-6	-6
		-10%		%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
27	Operations II	166.6	Discharge	m^3/s	43	53	59	63	68	72	74
			Unit Runoff	$l/s/km^2$	260	320	352	380	410	430	446
			Change from Pre-Mine	m^3/s	-4	-4	-5	-5	-6	-6	-6
		-10%		%	-8%	-8%	-8%	-8%	-8%	-8%	-8%
30	Closure	181.8	Discharge	m^3/s	46	57	63	68	73	76	79
			Unit Runoff	$l/s/km^2$	254	313	345	372	402	421	437
			Change from Pre-Mine	m^3/s	-1	-1	-1	-1	-1	-1	-1
		-2%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
50	Post-Closure	181.9	Discharge	m^3/s	46	57	63	68	73	76	79
			Unit Runoff	$l/s/km^2$	254	313	345	372	402	420	437
			Change from Pre-Mine	m^3/s	-1	-1	-1	-1	-1	-1	-1
		-2%		%	-1%	-1%	-1%	-1%	-1%	-1%	-1%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 10_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB



1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 10
HARPER CREEK AT BARRIERE RIVER CONFLUENCE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE L-1

REV 1

APPENDIX M

REGIONAL RESULTS FOR NODE 11

(Pages M-1 to M-10)

Knight Piésold CONSULTING

TABLE M-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	624.0	Discharge	m^3/s	2.49	2.32	2.81	9.66	38.41	43.89	16.45	5.45	4.12	4.56	4.61	3.07	11.48
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.5	15.5	61.5	70.3	26.4	8.7	6.6	7.3	7.4	4.9	18.4
-1	End of Construction	608.5	Discharge	m^3/s	2.52	2.35	2.84	9.73	37.81	42.96	15.93	5.40	4.07	4.51	4.58	3.02	11.31
			Unit Runoff	$l/s/km^2$	4.1	3.9	4.7	16.0	62.1	70.6	26.2	8.9	6.7	7.4	7.5	5.0	18.6
			Change from Pre-Mine	m^3/s	0.03	0.03	0.04	0.08	-0.60	-0.92	-0.52	-0.05	-0.04	-0.05	-0.03	-0.04	-0.17
		-2%		%	1%	1%	1%	1%	-2%	-2%	-3%	-1%	-1%	-1%	-1%	-1%	-2%
10	Operations I	605.7	Discharge	m^3/s	2.45	2.27	2.77	9.36	36.96	42.00	15.66	5.28	3.97	4.41	4.57	3.03	11.06
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.6	15.4	61.0	69.3	25.9	8.7	6.6	7.3	7.6	5.0	18.3
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.04	-0.30	-1.45	-1.88	-0.79	-0.16	-0.15	-0.15	-0.04	-0.04	-0.42
		-3%		%	-2%	-2%	-1%	-3%	-4%	-4%	-5%	-3%	-4%	-3%	-1%	-1%	-4%
22	Operations I	604.7	Discharge	m^3/s	2.44	2.26	2.76	9.34	36.94	41.96	15.64	5.26	3.95	4.38	4.56	3.02	11.04
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.6	15.5	61.1	69.4	25.9	8.7	6.5	7.2	7.5	5.0	18.3
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.05	-0.31	-1.47	-1.93	-0.81	-0.19	-0.17	-0.18	-0.05	-0.05	-0.44
		-3%		%	-2%	-3%	-2%	-3%	-4%	-4%	-5%	-3%	-4%	-4%	-1%	-2%	-4%
27	Operations II	605.0	Discharge	m^3/s	2.44	2.26	2.74	9.38	36.96	42.01	15.67	5.28	3.97	4.41	4.58	3.03	11.06
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.5	15.5	61.1	69.4	25.9	8.7	6.6	7.3	7.6	5.0	18.3
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.06	-0.28	-1.45	-1.88	-0.78	-0.17	-0.14	-0.14	-0.03	-0.04	-0.42
		-3%		%	-2%	-3%	-2%	-3%	-4%	-4%	-5%	-3%	-3%	-3%	-1%	-1%	-4%
30	Closure	620.2	Discharge	m^3/s	2.47	2.29	2.79	9.54	37.39	42.46	15.80	5.33	4.02	4.49	4.61	3.06	11.19
			Unit Runoff	$l/s/km^2$	4.0	3.7	4.5	15.4	60.3	68.5	25.5	8.6	6.5	7.2	7.4	4.9	18.0
			Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.02	-0.12	-1.01	-1.43	-0.65	-0.12	-0.09	-0.06	0.00	0.00	-0.30
		-1%		%	-1%	-1%	-1%	-1%	-3%	-3%	-4%	-2%	-2%	-1%	0%	0%	-3%
50	Post-Closure	620.3	Discharge	m^3/s	2.51	2.40	2.95	9.87	38.27	43.39	16.05	5.43	4.09	4.65	4.66	3.10	11.45
			Unit Runoff	$l/s/km^2$	4.1	3.9	4.8	15.9	61.7	70.0	25.9	8.7	6.6	7.5	7.5	5.0	18.5
			Change from Pre-Mine	m^3/s	0.02	0.08	0.15	0.22	-0.13	-0.49	-0.40	-0.02	-0.02	0.09	0.04	0.03	-0.04
		-1%		%	1%	3%	5%	2%	0%	-1%	-2%	0%	-1%	2%	1%	1%	0%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 11_R1.xlsx]Mean Monthly

NOTE:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE M-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	1.2	1.3	1.5	1.7	2.5	3.0	3.8	4.8	6.4
February	1.2	1.3	1.4	1.5	2.3	2.9	3.8	5.0	7.4
March	1.4	1.4	1.5	1.7	2.8	3.6	4.9	6.9	10.9
April	2.2	3.5	4.7	6.1	9.7	12.9	15.6	18.4	22.5
May	20.2	23.9	27.0	30.7	38.4	45.6	50.8	55.9	63.0
June	18.1	22.4	26.4	31.4	43.9	55.4	65.0	75.2	90.3
July	5.3	6.1	7.1	8.6	16.5	22.9	32.4	45.5	70.9
August	1.8	2.1	2.5	3.0	5.4	7.1	9.4	12.4	17.7
September	1.3	1.5	1.8	2.3	4.1	5.5	7.3	9.6	13.7
October	1.3	1.6	2.0	2.5	4.6	6.0	7.9	10.3	14.5
November	1.8	2.0	2.2	2.6	4.6	6.4	9.1	13.0	20.9
December	1.6	1.7	1.8	2.0	3.1	3.8	5.2	7.2	11.3
Annual	6.9	7.7	8.4	9.3	11.5	13.5	15.1	16.8	19.3

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NOTE:

1. MONTHLY WET AND DRY VALUES WERE CALCULATED FROM DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	15AUG'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE M-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.4	1.5	1.6	1.7	2.5	3.0	3.7	4.7	6.3
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.1	0.0	-0.1	-0.1	-0.1	-0.1
		%	12%	11%	9%	4%	0%	-2%	-2%	-2%	-1%
February	Discharge	m^3/s	1.3	1.4	1.5	1.6	2.4	2.8	3.7	4.9	7.3
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1
		%	10%	10%	8%	4%	0%	0%	0%	-1%	-1%
March	Discharge	m^3/s	1.4	1.5	1.6	1.8	2.8	3.6	4.9	7.0	10.8
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	-0.1
		%	6%	6%	6%	3%	0%	0%	0%	1%	-1%
April	Discharge	m^3/s	2.4	3.7	5.0	6.5	9.7	12.7	15.5	18.7	22.0
	Change from Pre-Mine	m^3/s	0.2	0.2	0.3	0.4	0.1	-0.2	-0.1	0.3	-0.5
		%	9%	7%	7%	6%	1%	-2%	0%	2%	-2%
May	Discharge	m^3/s	20.7	24.2	27.2	30.4	37.8	44.0	49.5	55.6	61.2
	Change from Pre-Mine	m^3/s	0.5	0.3	0.2	-0.3	-0.6	-1.6	-1.2	-0.4	-1.8
		%	3%	1%	1%	-1%	-2%	-3%	-2%	-1%	-3%
June	Discharge	m^3/s	18.7	22.9	26.4	31.7	43.0	52.7	62.4	73.2	87.3
	Change from Pre-Mine	m^3/s	0.6	0.5	0.0	0.3	-0.9	-2.7	-2.5	-2.0	-3.0
		%	3%	2%	0%	1%	-2%	-5%	-4%	-3%	-3%
July	Discharge	m^3/s	5.5	6.3	7.4	9.3	15.9	22.1	30.0	42.6	66.3
	Change from Pre-Mine	m^3/s	0.2	0.3	0.3	0.7	-0.5	-0.8	-2.4	-2.9	-4.6
		%	3%	4%	5%	8%	-3%	-3%	-8%	-6%	-7%
August	Discharge	m^3/s	2.1	2.4	2.7	3.1	5.4	7.0	9.3	12.1	14.2
	Change from Pre-Mine	m^3/s	0.3	0.3	0.3	0.1	0.0	-0.1	-0.1	-0.3	-3.5
		%	18%	14%	11%	3%	0%	-1%	-1%	-2%	-20%
September	Discharge	m^3/s	1.5	1.7	1.9	2.4	4.1	5.5	6.7	8.9	13.6
	Change from Pre-Mine	m^3/s	0.2	0.2	0.1	0.1	0.0	0.0	-0.6	-0.7	-0.1
		%	17%	11%	7%	6%	0%	0%	-8%	-7%	-1%
October	Discharge	m^3/s	1.5	1.8	2.1	2.6	4.5	5.6	7.8	9.9	13.7
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	0.0	-0.4	-0.1	-0.4	-0.7
		%	15%	9%	8%	3%	0%	-6%	-1%	-4%	-5%
November	Discharge	m^3/s	1.9	2.1	2.3	2.6	4.6	6.2	8.9	12.8	20.6
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	0.0	-0.2	-0.2	-0.2	-0.3
		%	7%	8%	6%	0%	0%	-3%	-2%	-2%	-1%
December	Discharge	m^3/s	1.7	1.8	1.9	2.0	3.0	3.7	5.1	7.1	11.1
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.1	-0.2
		%	6%	7%	6%	0%	0%	-4%	-3%	-2%	-1%
Annual	Discharge	m^3/s	7.4	8.0	8.5	9.4	11.3	13.1	14.5	16.2	18.3
	Change from Pre-Mine	m^3/s	0.5	0.3	0.1	0.1	-0.2	-0.3	-0.6	-0.6	-1.1
		%	7%	4%	1%	1%	-2%	-2%	-4%	-3%	-5%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

TABLE M-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.2	1.4	1.5	1.6	2.4	3.0	3.7	4.6	6.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-3%	0%	-3%	-3%	-2%	-2%
February	Discharge	m^3/s	1.2	1.3	1.4	1.5	2.3	2.8	3.7	4.9	7.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-4%	-2%	-3%	-3%	-2%	-2%
March	Discharge	m^3/s	1.3	1.4	1.5	1.7	2.8	3.5	4.9	6.8	10.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1
		%	0%	0%	0%	0%	0%	-3%	0%	0%	-1%
April	Discharge	m^3/s	2.1	3.4	4.5	6.0	9.4	11.8	15.1	18.1	21.3
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	-0.1	-0.3	-1.1	-0.4	-0.3	-1.1
		%	0%	-3%	-3%	-2%	-3%	-9%	-3%	-2%	-5%
May	Discharge	m^3/s	19.8	23.2	27.1	30.2	37.0	42.7	48.2	53.2	59.1
	Change from Pre-Mine	m^3/s	-0.4	-0.7	0.1	-0.5	-1.4	-2.9	-2.6	-2.7	-3.9
		%	-2%	-3%	0%	-2%	-4%	-6%	-5%	-5%	-6%
June	Discharge	m^3/s	18.4	22.7	26.0	31.3	42.0	51.7	61.0	70.0	84.6
	Change from Pre-Mine	m^3/s	0.3	0.3	-0.4	-0.1	-1.9	-3.6	-4.0	-5.2	-5.7
		%	2%	2%	-1%	0%	-4%	-7%	-6%	-7%	-6%
July	Discharge	m^3/s	5.3	6.2	7.1	9.0	15.7	21.4	29.7	43.6	66.5
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.8	-1.4	-2.7	-1.8	-4.4
		%	0%	2%	1%	5%	-5%	-6%	-8%	-4%	-6%
August	Discharge	m^3/s	2.0	2.4	2.7	3.1	5.3	7.2	9.2	11.4	13.9
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.2	0.1	-0.2	-1.0	-3.8
		%	11%	12%	7%	2%	-3%	2%	-2%	-8%	-21%
September	Discharge	m^3/s	1.4	1.6	1.9	2.4	4.0	5.4	6.5	8.8	12.0
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.1	-0.1	-0.8	-0.8	-1.7
		%	13%	8%	5%	4%	-4%	-2%	-11%	-9%	-13%
October	Discharge	m^3/s	1.4	1.8	2.1	2.5	4.4	5.5	7.4	9.9	12.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	-0.1	-0.4	-0.5	-0.4	-2.1
		%	10%	7%	5%	0%	-3%	-7%	-6%	-4%	-14%
November	Discharge	m^3/s	1.8	2.0	2.2	2.5	4.6	6.2	8.9	12.8	20.7
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.2
		%	3%	4%	3%	0%	0%	-2%	-3%	-2%	-1%
December	Discharge	m^3/s	1.6	1.7	1.8	1.9	3.0	3.7	5.1	7.1	11.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	-2%	-2%	-1%
Annual	Discharge	m^3/s	7.0	7.7	8.4	9.1	11.1	12.7	14.2	15.9	18.0
	Change from Pre-Mine	m^3/s	0.1	0.0	-0.1	-0.2	-0.4	-0.7	-0.9	-0.9	-1.3
		%	1%	0%	-1%	-2%	-4%	-5%	-6%	-6%	-7%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE M-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.2	1.4	1.5	1.6	2.4	2.9	3.7	4.6	6.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-3%	-2%	-3%	-3%	-2%	-2%
February	Discharge	m^3/s	1.2	1.3	1.4	1.5	2.3	2.8	3.7	4.9	7.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-4%	-3%	-3%	-3%	-2%	-2%
March	Discharge	m^3/s	1.3	1.4	1.5	1.7	2.8	3.5	4.9	6.8	10.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.2
		%	0%	0%	0%	0%	0%	-3%	0%	0%	-1%
April	Discharge	m^3/s	2.1	3.4	4.5	6.0	9.3	11.8	15.1	17.9	21.3
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	-0.1	-0.3	-1.1	-0.5	-0.5	-1.2
		%	0%	-3%	-3%	-2%	-3%	-9%	-3%	-3%	-5%
May	Discharge	m^3/s	19.8	23.2	27.1	30.4	36.9	42.7	48.2	53.1	59.1
	Change from Pre-Mine	m^3/s	-0.4	-0.7	0.1	-0.3	-1.5	-2.9	-2.6	-2.8	-3.9
		%	-2%	-3%	0%	-1%	-4%	-6%	-5%	-5%	-6%
June	Discharge	m^3/s	18.4	22.7	26.0	31.2	42.0	51.7	60.9	69.9	84.6
	Change from Pre-Mine	m^3/s	0.3	0.3	-0.4	-0.2	-1.9	-3.7	-4.1	-5.2	-5.7
		%	1%	1%	-2%	0%	-4%	-7%	-6%	-7%	-6%
July	Discharge	m^3/s	5.3	6.2	7.1	9.0	15.6	21.4	29.7	43.6	66.5
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.8	-1.5	-2.7	-1.9	-4.4
		%	0%	2%	1%	4%	-5%	-6%	-8%	-4%	-6%
August	Discharge	m^3/s	2.0	2.4	2.6	3.1	5.3	7.0	9.1	11.4	13.9
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.2	0.0	-0.3	-1.0	-3.8
		%	11%	12%	7%	2%	-3%	0%	-3%	-8%	-21%
September	Discharge	m^3/s	1.4	1.6	1.9	2.4	3.9	5.3	6.4	8.7	11.9
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.2	-0.1	-0.9	-0.9	-1.8
		%	13%	7%	5%	4%	-4%	-2%	-12%	-9%	-13%
October	Discharge	m^3/s	1.4	1.7	2.1	2.5	4.4	5.4	7.3	9.8	12.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	-0.2	-0.5	-0.6	-0.5	-2.1
		%	9%	7%	5%	0%	-4%	-9%	-7%	-4%	-15%
November	Discharge	m^3/s	1.8	2.0	2.2	2.5	4.6	6.2	8.9	12.8	20.7
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.2	-0.2	-0.2	-0.2
		%	3%	4%	3%	0%	0%	-2%	-3%	-2%	-1%
December	Discharge	m^3/s	1.6	1.7	1.8	1.9	3.0	3.7	5.1	7.1	11.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	-2%	-2%	-1%
Annual	Discharge	m^3/s	7.0	7.7	8.3	9.1	11.1	12.7	14.2	15.8	18.0
	Change from Pre-Mine	m^3/s	0.1	0.0	-0.1	-0.2	-0.4	-0.7	-0.9	-1.0	-1.4
		%	1%	0%	-1%	-2%	-4%	-6%	-6%	-6%	-7%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE M-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.2	1.4	1.5	1.6	2.4	2.9	3.7	4.6	6.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-4%	-2%	-3%	-3%	-2%	-2%
February	Discharge	m^3/s	1.2	1.3	1.4	1.5	2.3	2.8	3.7	4.9	7.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-4%	-3%	-3%	-3%	-2%	-2%
March	Discharge	m^3/s	1.3	1.4	1.5	1.7	2.7	3.4	4.9	6.8	10.7
	Change from Pre-Mine	m^3/s	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.2
		%	-4%	0%	0%	-3%	-2%	-3%	0%	-1%	-2%
April	Discharge	m^3/s	2.2	3.4	4.5	6.0	9.4	12.0	15.2	18.1	21.3
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	-0.1	-0.3	-0.9	-0.4	-0.3	-1.2
		%	0%	-3%	-3%	-2%	-3%	-7%	-3%	-1%	-5%
May	Discharge	m^3/s	19.8	23.2	27.1	30.4	37.0	42.7	48.2	53.2	59.1
	Change from Pre-Mine	m^3/s	-0.4	-0.7	0.1	-0.2	-1.4	-2.9	-2.6	-2.8	-3.9
		%	-2%	-3%	0%	-1%	-4%	-6%	-5%	-5%	-6%
June	Discharge	m^3/s	18.4	22.7	26.0	31.5	42.0	51.7	60.9	70.0	84.6
	Change from Pre-Mine	m^3/s	0.3	0.3	-0.4	0.1	-1.9	-3.6	-4.0	-5.2	-5.7
		%	1%	2%	-1%	0%	-4%	-7%	-6%	-7%	-6%
July	Discharge	m^3/s	5.3	6.2	7.1	9.0	15.7	21.5	29.7	43.6	66.5
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.8	-1.3	-2.7	-1.8	-4.4
		%	0%	2%	1%	4%	-5%	-6%	-8%	-4%	-6%
August	Discharge	m^3/s	2.0	2.4	2.6	3.1	5.3	7.0	9.1	11.4	13.9
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.2	0.0	-0.2	-0.9	-3.8
		%	11%	12%	7%	2%	-3%	0%	-3%	-8%	-21%
September	Discharge	m^3/s	1.4	1.6	1.9	2.4	4.0	5.4	6.6	8.7	12.3
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.1	-0.1	-0.7	-0.9	-1.3
		%	13%	7%	5%	4%	-3%	-2%	-10%	-9%	-10%
October	Discharge	m^3/s	1.4	1.7	2.1	2.5	4.4	5.6	7.4	9.8	12.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	-0.1	-0.4	-0.5	-0.5	-2.1
		%	9%	7%	5%	0%	-3%	-6%	-6%	-4%	-15%
November	Discharge	m^3/s	1.8	2.0	2.3	2.5	4.6	6.2	8.9	12.8	20.7
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.2
		%	3%	4%	4%	0%	0%	-2%	-3%	-1%	-1%
December	Discharge	m^3/s	1.6	1.7	1.8	1.9	3.0	3.7	5.1	7.1	11.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	-2%	-2%	-1%
Annual	Discharge	m^3/s	7.0	7.7	8.3	9.1	11.1	12.7	14.2	15.9	18.0
	Change from Pre-Mine	m^3/s	0.1	0.0	-0.1	-0.2	-0.4	-0.7	-0.9	-1.0	-1.3
		%	1%	0%	-1%	-2%	-4%	-5%	-6%	-6%	-7%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold
CONSULTING

TABLE M-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.2	1.4	1.5	1.6	2.5	3.0	3.8	4.7	6.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	0%	-1%	-1%
February	Discharge	m^3/s	1.2	1.3	1.4	1.5	2.3	2.8	3.7	4.9	7.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.0	-0.1
		%	0%	0%	0%	-3%	0%	-2%	0%	0%	-1%
March	Discharge	m^3/s	1.3	1.4	1.5	1.7	2.8	3.5	5.0	6.8	10.9
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	2%	0%	0%
April	Discharge	m^3/s	2.1	3.4	4.5	6.1	9.5	12.3	15.8	18.6	21.3
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	0.0	-0.1	-0.6	0.2	0.2	-1.1
		%	0%	-3%	-3%	0%	-1%	-4%	1%	1%	-5%
May	Discharge	m^3/s	19.8	24.0	27.1	30.2	37.4	44.2	48.7	53.7	59.8
	Change from Pre-Mine	m^3/s	-0.4	0.1	0.1	-0.5	-1.0	-1.4	-2.0	-2.2	-3.2
		%	-2%	0%	0%	-2%	-3%	-3%	-4%	-4%	-5%
June	Discharge	m^3/s	18.5	22.9	26.0	31.5	42.5	52.0	61.4	71.9	86.7
	Change from Pre-Mine	m^3/s	0.4	0.5	-0.4	0.1	-1.4	-3.4	-3.5	-3.3	-3.6
		%	2%	2%	-1%	0%	-3%	-6%	-5%	-4%	-4%
July	Discharge	m^3/s	5.3	6.2	7.1	9.0	15.8	21.8	30.2	43.7	67.4
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.6	-1.1	-2.2	-1.8	-3.5
		%	0%	2%	1%	5%	-4%	-5%	-7%	-4%	-5%
August	Discharge	m^3/s	2.0	2.4	2.6	3.1	5.3	7.2	9.2	11.6	13.9
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.1	0.1	-0.2	-0.8	-3.8
		%	11%	12%	7%	2%	-2%	2%	-2%	-6%	-21%
September	Discharge	m^3/s	1.4	1.7	2.0	2.4	4.0	5.5	6.6	8.8	12.3
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.1	0.1	-0.7	-0.8	-1.4
		%	13%	9%	8%	6%	-2%	1%	-9%	-9%	-10%
October	Discharge	m^3/s	1.5	1.8	2.1	2.5	4.5	5.7	7.6	9.8	12.6
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	-0.1	-0.2	-0.3	-0.5	-1.9
		%	10%	10%	6%	0%	-1%	-4%	-4%	-4%	-13%
November	Discharge	m^3/s	1.8	2.1	2.3	2.6	4.6	6.2	9.0	12.9	20.7
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.2
		%	3%	6%	4%	0%	0%	-2%	-2%	-1%	-1%
December	Discharge	m^3/s	1.6	1.7	1.8	1.9	3.1	3.8	5.2	7.2	11.3
	Change from Pre-Mine	m^3/s	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	5%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	7.2	7.8	8.3	9.2	11.2	13.0	14.5	16.2	18.3
	Change from Pre-Mine	m^3/s	0.2	0.1	-0.1	-0.2	-0.3	-0.4	-0.6	-0.6	-1.0
		%	3%	2%	-1%	-2%	-3%	-3%	-4%	-4%	-5%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 11_R1.xlsx]30 WD

NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

TABLE M-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.3	1.4	1.5	1.7	2.5	3.0	3.8	4.7	6.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		%	5%	7%	5%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	1.3	1.4	1.5	1.6	2.4	2.9	3.8	5.0	7.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
		%	9%	10%	9%	5%	3%	0%	0%	0%	0%
March	Discharge	m^3/s	1.5	1.6	1.7	1.9	3.0	3.6	5.1	7.0	11.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1
		%	10%	11%	10%	9%	5%	3%	4%	2%	1%
April	Discharge	m^3/s	2.4	3.6	4.7	6.2	9.9	12.7	16.0	18.9	22.4
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	0.2	-0.2	0.4	0.5	-0.1
		%	9%	4%	2%	2%	2%	-1%	3%	3%	0%
May	Discharge	m^3/s	21.2	24.3	28.1	31.4	38.3	44.3	49.7	54.7	61.1
	Change from Pre-Mine	m^3/s	1.0	0.4	1.1	0.7	-0.1	-1.3	-1.0	-1.3	-1.9
		%	5%	2%	4%	2%	0%	-3%	-2%	-2%	-3%
June	Discharge	m^3/s	18.8	23.1	26.6	32.4	43.4	53.4	62.5	72.6	86.7
	Change from Pre-Mine	m^3/s	0.7	0.7	0.2	1.0	-0.5	-2.0	-2.5	-2.6	-3.6
		%	4%	3%	1%	3%	-1%	-4%	-4%	-3%	-4%
July	Discharge	m^3/s	5.4	6.2	7.3	9.2	16.0	21.9	30.6	44.3	67.5
	Change from Pre-Mine	m^3/s	0.1	0.2	0.2	0.6	-0.4	-1.0	-1.8	-1.1	-3.4
		%	3%	3%	3%	7%	-2%	-4%	-6%	-2%	-5%
August	Discharge	m^3/s	2.0	2.4	2.7	3.1	5.4	7.3	9.5	11.8	14.0
	Change from Pre-Mine	m^3/s	0.2	0.3	0.2	0.1	0.0	0.3	0.1	-0.5	-3.7
		%	13%	14%	9%	3%	0%	4%	1%	-4%	-21%
September	Discharge	m^3/s	1.4	1.7	2.0	2.5	4.1	5.6	6.6	9.2	12.3
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.2	0.0	0.1	-0.7	-0.4	-1.4
		%	14%	14%	10%	8%	0%	2%	-9%	-4%	-10%
October	Discharge	m^3/s	1.5	1.8	2.2	2.7	4.7	5.9	7.9	10.3	13.0
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.1	-1.5
		%	15%	12%	9%	7%	2%	0%	0%	1%	-10%
November	Discharge	m^3/s	1.9	2.1	2.3	2.6	4.7	6.3	9.0	12.9	20.8
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1
		%	7%	8%	6%	2%	0%	0%	-1%	-1%	-1%
December	Discharge	m^3/s	1.7	1.8	1.9	2.0	3.1	3.8	5.2	7.2	11.3
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		%	6%	7%	5%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	7.2	8.0	8.7	9.5	11.5	13.2	14.6	16.3	18.4
	Change from Pre-Mine	m^3/s	0.3	0.3	0.2	0.2	0.0	-0.3	-0.5	-0.5	-0.9
		%	4%	4%	3%	2%	0%	-2%	-3%	-3%	-5%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE M-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 11
BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	624.0	Discharge	m^3/s	93	118	135	152	173	190	207
			Unit Runoff	$l/s/km^2$	149	189	216	243	277	304	332
-1	End of Construction	608.5	Discharge	m^3/s	91	116	133	149	170	186	203
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	334
			Change from Pre-Mine	m^3/s	-2	-2	-3	-3	-3	-4	-4
		-2%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
10	Operations I	605.7	Discharge	m^3/s	91	115	132	148	169	185	203
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	335
			Change from Pre-Mine	m^3/s	-2	-3	-3	-3	-4	-4	-5
		-3%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
22	Operations I	604.7	Discharge	m^3/s	91	115	132	148	169	185	202
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	335
			Change from Pre-Mine	m^3/s	-2	-3	-3	-4	-4	-4	-5
		-3%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
27	Operations II	605.0	Discharge	m^3/s	91	115	132	148	169	185	203
			Unit Runoff	$l/s/km^2$	150	190	218	245	279	306	335
			Change from Pre-Mine	m^3/s	-2	-3	-3	-3	-4	-4	-5
		-3%		%	-2%	-2%	-2%	-2%	-2%	-2%	-2%
30	Closure	620.2	Discharge	m^3/s	92	117	134	151	172	189	206
			Unit Runoff	$l/s/km^2$	149	189	217	243	278	304	333
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-1%		%	0%	0%	0%	0%	0%	0%	0%
50	Post-Closure	620.3	Discharge	m^3/s	92	117	134	151	172	189	206
			Unit Runoff	$l/s/km^2$	149	189	217	243	278	304	333
			Change from Pre-Mine	m^3/s	0	-1	-1	-1	-1	-1	-1
		-1%		%	0%	0%	0%	0%	0%	0%	0%

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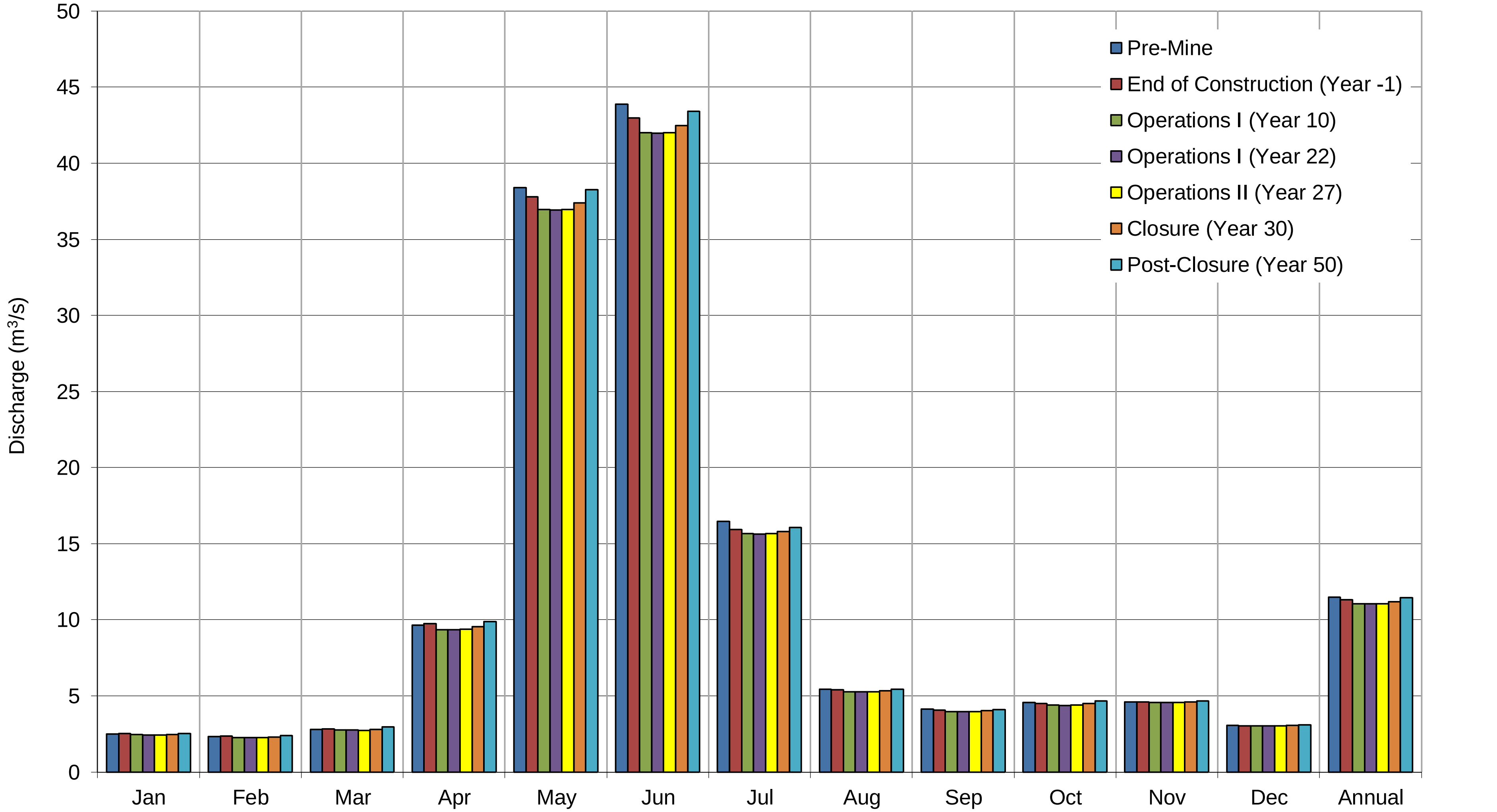
NOTE:
1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 11 BARRIERE RIVER BELOW SPRAGUE CREEK (WSC 08LB069)

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P/A NO. VA101-458/14 | REF NO. 1

FIGURE M-1 REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

APPENDIX N

REGIONAL RESULTS FOR NODE 12

(Pages N-1 to N-10)

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TABLE N-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 12
BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	1140.0	Discharge	m^3/s	3.57	3.43	4.32	14.41	49.09	52.87	20.35	6.96	5.26	5.60	5.96	4.17	14.66
			Unit Runoff	$l/s/km^2$	3.1	3.0	3.8	12.6	43.1	46.4	17.9	6.1	4.6	4.9	5.2	3.7	12.9
-1	End of Construction	1124.5	Discharge	m^3/s	3.60	3.45	4.35	14.49	48.49	51.95	19.83	6.91	5.22	5.55	5.93	4.13	14.49
			Unit Runoff	$l/s/km^2$	3.2	3.1	3.9	12.9	43.1	46.2	17.6	6.1	4.6	4.9	5.3	3.7	12.9
			Change from Pre-Mine	m^3/s	0.03	0.03	0.04	0.08	-0.60	-0.92	-0.52	-0.05	-0.04	-0.05	-0.03	-0.04	-0.17
		-1%		%	1%	1%	1%	1%	-1%	-2%	-3%	-1%	-1%	-1%	0%	-1%	-1%
10	Operations I	1121.7	Discharge	m^3/s	3.52	3.37	4.28	14.11	47.64	50.98	19.56	6.80	5.11	5.45	5.92	4.13	14.24
			Unit Runoff	$l/s/km^2$	3.1	3.0	3.8	12.6	42.5	45.5	17.4	6.1	4.6	4.9	5.3	3.7	12.7
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.04	-0.30	-1.45	-1.88	-0.79	-0.16	-0.15	-0.15	-0.04	-0.04	-0.42
		-2%		%	-1%	-2%	-1%	-2%	-3%	-4%	-4%	-2%	-3%	-3%	-1%	-1%	-3%
22	Operations I	1120.7	Discharge	m^3/s	3.51	3.37	4.27	14.10	47.62	50.94	19.54	6.78	5.09	5.42	5.91	4.12	14.22
			Unit Runoff	$l/s/km^2$	3.1	3.0	3.8	12.6	42.5	45.5	17.4	6.0	4.5	4.8	5.3	3.7	12.7
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.05	-0.31	-1.47	-1.93	-0.81	-0.19	-0.17	-0.18	-0.05	-0.05	-0.44
		-2%		%	-1%	-2%	-1%	-2%	-3%	-4%	-4%	-3%	-3%	-3%	-1%	-1%	-3%
27	Operations II	1121.0	Discharge	m^3/s	3.51	3.36	4.25	14.13	47.64	50.99	19.57	6.79	5.12	5.45	5.93	4.13	14.24
			Unit Runoff	$l/s/km^2$	3.1	3.0	3.8	12.6	42.5	45.5	17.5	6.1	4.6	4.9	5.3	3.7	12.7
			Change from Pre-Mine	m^3/s	-0.05	-0.06	-0.06	-0.28	-1.45	-1.88	-0.78	-0.17	-0.14	-0.14	-0.03	-0.04	-0.42
		-2%		%	-2%	-2%	-1%	-2%	-3%	-4%	-4%	-2%	-3%	-3%	-1%	-1%	-3%
30	Closure	1136.2	Discharge	m^3/s	3.54	3.40	4.30	14.29	48.07	51.44	19.70	6.84	5.17	5.53	5.96	4.16	14.37
			Unit Runoff	$l/s/km^2$	3.1	3.0	3.8	12.6	42.3	45.3	17.3	6.0	4.5	4.9	5.2	3.7	12.6
			Change from Pre-Mine	m^3/s	-0.02	-0.03	-0.02	-0.12	-1.01	-1.43	-0.65	-0.12	-0.09	-0.06	0.00	0.00	-0.30
		0%		%	-1%	-1%	0%	-1%	-2%	-3%	-3%	-2%	-2%	-1%	0%	0%	-2%
50	Post-Closure	1136.3	Discharge	m^3/s	3.59	3.50	4.46	14.63	48.95	52.37	19.95	6.94	5.24	5.69	6.01	4.20	14.63
			Unit Runoff	$l/s/km^2$	3.2	3.1	3.9	12.9	43.1	46.1	17.6	6.1	4.6	5.0	5.3	3.7	12.9
			Change from Pre-Mine	m^3/s	0.02	0.08	0.15	0.22	-0.13	-0.49	-0.40	-0.02	-0.02	0.09	0.04	0.03	-0.04
		0%		%	1%	2%	3%	2%	0%	-1%	-2%	0%	0%	2%	1%	1%	0%

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NOTE:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

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TABLE N-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 12
BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

Print Oct/09/14 8:57:52

Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	1.7	1.9	2.1	2.3	3.6	4.4	5.5	6.8	9.2
February	1.8	1.9	2.0	2.3	3.4	4.1	5.2	6.7	9.5
March	2.1	2.2	2.3	2.6	4.3	5.4	7.5	10.6	17.1
April	3.3	5.3	7.1	9.3	14.4	19.2	22.9	26.7	32.3
May	28.5	32.2	35.6	39.6	49.1	57.7	64.6	71.6	81.7
June	22.2	26.6	30.8	36.5	52.9	67.6	81.8	97.7	122.7
July	6.5	7.4	8.5	10.3	20.4	28.0	40.4	57.8	92.7
August	2.4	2.7	3.2	3.8	7.0	9.3	12.7	17.3	26.0
September	1.7	2.0	2.4	2.9	5.3	7.0	9.5	12.7	18.8
October	1.6	2.0	2.4	3.1	5.6	7.2	9.5	12.2	16.9
November	2.0	2.3	2.7	3.2	6.0	8.1	11.3	15.4	23.2
December	1.9	2.1	2.3	2.6	4.2	5.3	7.0	9.2	13.3
Annual	8.6	9.6	10.5	11.6	14.7	17.4	19.9	22.6	26.6

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NOTE:

1. MONTHLY WET AND DRY VALUES WERE CALCULATED FROM DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

0	15AUG'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE N-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 12
BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.8	2.0	2.2	2.4	3.6	4.3	5.4	6.8	9.1
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.1	0.0	-0.1	-0.1	-0.1	-0.1
		%	9%	8%	6%	3%	0%	-1%	-1%	-1%	-1%
February	Discharge	m^3/s	1.9	2.0	2.1	2.3	3.5	4.1	5.2	6.7	9.4
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.0	0.0	0.0	-0.1	-0.1
		%	7%	7%	5%	3%	0%	0%	0%	-1%	-1%
March	Discharge	m^3/s	2.1	2.3	2.4	2.6	4.4	5.4	7.5	10.7	17.0
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.1	-0.1
		%	4%	4%	4%	2%	0%	0%	0%	1%	0%
April	Discharge	m^3/s	3.5	5.5	7.4	9.7	14.5	18.9	22.8	27.1	31.8
	Change from Pre-Mine	m^3/s	0.2	0.2	0.3	0.4	0.1	-0.2	-0.1	0.3	-0.5
		%	6%	4%	5%	4%	1%	-1%	0%	1%	-1%
May	Discharge	m^3/s	29.0	32.5	35.8	39.3	48.5	56.1	63.3	71.3	79.9
	Change from Pre-Mine	m^3/s	0.5	0.3	0.2	-0.3	-0.6	-1.6	-1.2	-0.4	-1.8
		%	2%	1%	1%	-1%	-1%	-3%	-2%	-1%	-2%
June	Discharge	m^3/s	22.8	27.0	30.8	36.7	51.9	64.9	79.2	95.7	119.7
	Change from Pre-Mine	m^3/s	0.6	0.5	0.0	0.3	-0.9	-2.7	-2.5	-2.0	-3.0
		%	2%	2%	0%	1%	-2%	-4%	-3%	-2%	-2%
July	Discharge	m^3/s	6.7	7.7	8.8	11.0	19.8	27.2	38.0	55.0	88.1
	Change from Pre-Mine	m^3/s	0.2	0.3	0.3	0.7	-0.5	-0.8	-2.4	-2.9	-4.6
		%	2%	4%	4%	7%	-3%	-3%	-6%	-5%	-5%
August	Discharge	m^3/s	2.7	3.0	3.4	3.9	6.9	9.2	12.7	17.0	22.4
	Change from Pre-Mine	m^3/s	0.3	0.3	0.3	0.1	0.0	-0.1	-0.1	-0.3	-3.5
		%	14%	11%	9%	3%	0%	-1%	-1%	-2%	-14%
September	Discharge	m^3/s	1.9	2.2	2.5	3.0	5.2	6.9	8.8	12.0	18.7
	Change from Pre-Mine	m^3/s	0.2	0.2	0.1	0.1	0.0	0.0	-0.6	-0.7	-0.1
		%	12%	8%	5%	5%	0%	0%	-6%	-5%	0%
October	Discharge	m^3/s	1.8	2.1	2.6	3.1	5.5	6.9	9.4	11.8	16.2
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	0.0	-0.4	-0.1	-0.4	-0.7
		%	13%	7%	6%	3%	0%	-5%	-1%	-3%	-4%
November	Discharge	m^3/s	2.1	2.4	2.8	3.3	5.9	8.0	11.0	15.2	22.9
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	0.0	-0.2	-0.2	-0.2	-0.3
		%	6%	7%	5%	0%	0%	-2%	-2%	-1%	-1%
December	Discharge	m^3/s	2.0	2.2	2.4	2.6	4.1	5.2	6.8	9.0	13.1
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.1	-0.2
		%	5%	6%	5%	0%	0%	-3%	-2%	-1%	-1%
Annual	Discharge	m^3/s	9.1	9.9	10.5	11.7	14.5	17.1	19.3	22.0	25.6
	Change from Pre-Mine	m^3/s	0.5	0.3	0.1	0.1	-0.2	-0.3	-0.6	-0.6	-1.1
		%	6%	3%	1%	0%	-1%	-2%	-3%	-3%	-4%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE N-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 12 BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.7	1.9	2.1	2.3	3.5	4.3	5.4	6.7	9.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-2%	0%	-2%	-2%	-2%	-1%
February	Discharge	m^3/s	1.7	1.9	2.0	2.2	3.4	4.0	5.1	6.6	9.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-3%	-2%	-2%	-2%	-2%	-1%
March	Discharge	m^3/s	2.0	2.1	2.3	2.6	4.3	5.3	7.5	10.6	16.9
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1
		%	0%	0%	0%	0%	0%	-2%	0%	0%	-1%
April	Discharge	m^3/s	3.2	5.2	7.0	9.2	14.1	18.1	22.4	26.5	31.1
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	-0.1	-0.3	-1.1	-0.4	-0.3	-1.1
		%	0%	-2%	-2%	-1%	-2%	-6%	-2%	-1%	-4%
May	Discharge	m^3/s	28.1	31.5	35.7	39.2	47.6	54.9	62.0	68.9	77.8
	Change from Pre-Mine	m^3/s	-0.4	-0.7	0.1	-0.5	-1.4	-2.9	-2.6	-2.7	-3.9
		%	-1%	-2%	0%	-1%	-3%	-5%	-4%	-4%	-5%
June	Discharge	m^3/s	22.5	26.9	30.4	36.4	51.0	64.0	77.8	92.5	117.0
	Change from Pre-Mine	m^3/s	0.3	0.3	-0.4	-0.1	-1.9	-3.6	-4.0	-5.2	-5.7
		%	1%	1%	-1%	0%	-4%	-5%	-5%	-5%	-5%
July	Discharge	m^3/s	6.5	7.5	8.6	10.7	19.6	26.6	37.8	56.0	88.3
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.8	-1.4	-2.7	-1.8	-4.4
		%	0%	2%	1%	4%	-4%	-5%	-7%	-3%	-5%
August	Discharge	m^3/s	2.6	3.0	3.3	3.9	6.8	9.4	12.5	16.4	22.2
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.2	0.1	-0.2	-1.0	-3.8
		%	9%	9%	6%	2%	-2%	1%	-2%	-6%	-15%
September	Discharge	m^3/s	1.9	2.1	2.4	3.0	5.1	6.9	8.6	11.9	17.0
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.1	-0.1	-0.8	-0.8	-1.7
		%	9%	6%	4%	3%	-3%	-1%	-9%	-7%	-9%
October	Discharge	m^3/s	1.7	2.1	2.5	3.1	5.5	6.8	9.0	11.8	14.8
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	-0.1	-0.4	-0.5	-0.4	-2.1
		%	8%	6%	4%	0%	-3%	-6%	-5%	-4%	-12%
November	Discharge	m^3/s	2.0	2.4	2.7	3.2	5.9	8.0	11.0	15.2	23.0
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.2
		%	3%	4%	2%	0%	0%	-2%	-2%	-1%	-1%
December	Discharge	m^3/s	1.9	2.1	2.3	2.6	4.1	5.2	6.9	9.1	13.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	-2%	-1%	-1%
Annual	Discharge	m^3/s	8.7	9.6	10.4	11.4	14.3	16.7	19.0	21.6	25.3
	Change from Pre-Mine	m^3/s	0.1	0.0	-0.1	-0.2	-0.4	-0.7	-0.9	-0.9	-1.3
		%	1%	0%	-1%	-2%	-3%	-4%	-4%	-4%	-5%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE N-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 12
BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

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Month	Parameter		Units	Estimated Return Period Monthly Discharge								
				Dry				Mean	Wet			
				50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge		m^3/s	1.7	1.9	2.1	2.3	3.5	4.3	5.3	6.7	9.1
	Change from Pre-Mine		m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
			%	0%	0%	0%	-2%	-1%	-2%	-2%	-2%	-1%
February	Discharge		m^3/s	1.7	1.9	2.0	2.2	3.4	4.0	5.1	6.6	9.3
	Change from Pre-Mine		m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
			%	0%	0%	0%	-3%	-2%	-2%	-2%	-2%	-1%
March	Discharge		m^3/s	2.0	2.1	2.3	2.5	4.3	5.3	7.5	10.6	16.9
	Change from Pre-Mine		m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.2
			%	0%	0%	0%	0%	0%	-2%	0%	0%	-1%
April	Discharge		m^3/s	3.2	5.2	7.0	9.2	14.1	18.0	22.4	26.2	31.1
	Change from Pre-Mine		m^3/s	0.0	-0.1	-0.1	-0.1	-0.3	-1.1	-0.5	-0.5	-1.2
			%	0%	-2%	-2%	-1%	-2%	-6%	-2%	-2%	-4%
May	Discharge		m^3/s	28.1	31.5	35.7	39.4	47.6	54.8	62.0	68.8	77.8
	Change from Pre-Mine		m^3/s	-0.4	-0.7	0.1	-0.3	-1.5	-2.9	-2.6	-2.8	-3.9
			%	-1%	-2%	0%	-1%	-3%	-5%	-4%	-4%	-5%
June	Discharge		m^3/s	22.5	26.9	30.4	36.3	50.9	64.0	77.7	92.4	117.0
	Change from Pre-Mine		m^3/s	0.3	0.3	-0.4	-0.2	-1.9	-3.7	-4.1	-5.2	-5.7
			%	1%	1%	-1%	0%	-4%	-5%	-5%	-5%	-5%
July	Discharge		m^3/s	6.5	7.5	8.6	10.7	19.5	26.5	37.7	55.9	88.3
	Change from Pre-Mine		m^3/s	0.0	0.1	0.1	0.4	-0.8	-1.5	-2.7	-1.9	-4.4
			%	0%	1%	1%	4%	-4%	-5%	-7%	-3%	-5%
August	Discharge		m^3/s	2.6	3.0	3.3	3.9	6.8	9.3	12.5	16.3	22.2
	Change from Pre-Mine		m^3/s	0.2	0.2	0.2	0.1	-0.2	0.0	-0.3	-1.0	-3.8
			%	8%	9%	5%	1%	-3%	0%	-2%	-6%	-15%
September	Discharge		m^3/s	1.9	2.1	2.4	3.0	5.1	6.8	8.6	11.9	17.0
	Change from Pre-Mine		m^3/s	0.2	0.1	0.1	0.1	-0.2	-0.1	-0.9	-0.9	-1.8
			%	9%	5%	4%	3%	-3%	-2%	-9%	-7%	-9%
October	Discharge		m^3/s	1.7	2.1	2.5	3.1	5.4	6.7	8.9	11.7	14.8
	Change from Pre-Mine		m^3/s	0.1	0.1	0.1	0.0	-0.2	-0.5	-0.6	-0.5	-2.1
			%	8%	6%	4%	0%	-3%	-7%	-6%	-4%	-12%
November	Discharge		m^3/s	2.0	2.4	2.7	3.2	5.9	8.0	11.0	15.2	23.0
	Change from Pre-Mine		m^3/s	0.1	0.1	0.1	0.0	0.0	-0.2	-0.2	-0.2	-0.2
			%	3%	4%	2%	0%	0%	-2%	-2%	-1%	-1%
December	Discharge		m^3/s	1.9	2.1	2.3	2.6	4.1	5.2	6.9	9.0	13.2
	Change from Pre-Mine		m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
			%	0%	0%	0%	0%	0%	-2%	-2%	-1%	-1%
Annual	Discharge		m^3/s	8.7	9.6	10.4	11.4	14.3	16.7	19.0	21.6	25.3
	Change from Pre-Mine		m^3/s	0.1	0.0	-0.1	-0.2	-0.4	-0.7	-0.9	-1.0	-1.4
			%	1%	0%	-1%	-2%	-3%	-4%	-4%	-4%	-5%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE N-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 12 BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.7	1.9	2.0	2.3	3.5	4.3	5.3	6.7	9.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-3%	-2%	-2%	-2%	-2%	-1%
February	Discharge	m^3/s	1.7	1.9	2.0	2.2	3.4	4.0	5.1	6.6	9.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	-3%	-2%	-2%	-2%	-2%	-1%
March	Discharge	m^3/s	2.0	2.1	2.3	2.5	4.3	5.3	7.5	10.5	16.9
	Change from Pre-Mine	m^3/s	-0.1	0.0	0.0	-0.1	-0.1	-0.1	0.0	-0.1	-0.2
		%	-3%	0%	0%	-2%	-1%	-2%	0%	-1%	-1%
April	Discharge	m^3/s	3.2	5.2	7.0	9.2	14.1	18.2	22.5	26.5	31.1
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	-0.1	-0.3	-0.9	-0.4	-0.3	-1.2
		%	0%	-2%	-2%	-1%	-2%	-5%	-2%	-1%	-4%
May	Discharge	m^3/s	28.1	31.5	35.7	39.4	47.6	54.9	62.0	68.9	77.8
	Change from Pre-Mine	m^3/s	-0.4	-0.7	0.1	-0.2	-1.4	-2.9	-2.6	-2.8	-3.9
		%	-1%	-2%	0%	-1%	-3%	-5%	-4%	-4%	-5%
June	Discharge	m^3/s	22.5	26.9	30.4	36.6	51.0	64.0	77.8	92.5	117.0
	Change from Pre-Mine	m^3/s	0.3	0.3	-0.4	0.1	-1.9	-3.6	-4.0	-5.2	-5.7
		%	1%	1%	-1%	0%	-4%	-5%	-5%	-5%	-5%
July	Discharge	m^3/s	6.5	7.5	8.6	10.7	19.6	26.7	37.7	56.0	88.3
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.8	-1.3	-2.7	-1.8	-4.4
		%	0%	1%	1%	4%	-4%	-5%	-7%	-3%	-5%
August	Discharge	m^3/s	2.6	3.0	3.3	3.9	6.8	9.3	12.5	16.4	22.2
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.2	0.0	-0.2	-0.9	-3.8
		%	8%	9%	6%	2%	-2%	0%	-2%	-5%	-15%
September	Discharge	m^3/s	1.9	2.1	2.4	3.0	5.1	6.8	8.7	11.9	17.4
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.1	-0.1	-0.7	-0.9	-1.3
		%	9%	5%	4%	3%	-3%	-2%	-8%	-7%	-7%
October	Discharge	m^3/s	1.7	2.1	2.5	3.1	5.5	6.9	9.0	11.7	14.8
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	-0.1	-0.4	-0.5	-0.5	-2.1
		%	8%	6%	4%	0%	-3%	-5%	-5%	-4%	-12%
November	Discharge	m^3/s	2.0	2.4	2.7	3.2	5.9	8.0	11.0	15.2	23.0
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.2
		%	3%	4%	3%	0%	0%	-2%	-2%	-1%	-1%
December	Discharge	m^3/s	1.9	2.1	2.3	2.6	4.1	5.2	6.9	9.1	13.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	-2%	-1%	-1%
Annual	Discharge	m^3/s	8.7	9.6	10.4	11.4	14.3	16.7	19.0	21.6	25.3
	Change from Pre-Mine	m^3/s	0.1	0.0	-0.1	-0.2	-0.4	-0.7	-0.9	-1.0	-1.3
		%	1%	0%	-1%	-2%	-3%	-4%	-4%	-4%	-5%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 12_R1.xlsx]27 WD

NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE N-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 12 BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

Print Oct/08/14 16:54:32

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.7	1.9	2.1	2.3	3.5	4.3	5.4	6.8	9.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	-0.1	-0.1
		%	0%	0%	0%	0%	0%	-2%	0%	-1%	-1%
February	Discharge	m^3/s	1.7	1.9	2.0	2.2	3.4	4.0	5.2	6.7	9.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	-0.1	0.0	-0.1	0.0	0.0	-0.1
		%	0%	0%	0%	-2%	0%	-2%	0%	0%	-1%
March	Discharge	m^3/s	2.0	2.2	2.3	2.6	4.3	5.4	7.6	10.6	17.0
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	1%	0%	0%
April	Discharge	m^3/s	3.2	5.2	7.0	9.3	14.3	18.6	23.1	27.0	31.1
	Change from Pre-Mine	m^3/s	0.0	-0.1	-0.1	0.0	-0.1	-0.6	0.2	0.2	-1.1
		%	0%	-2%	-2%	0%	-1%	-3%	1%	1%	-4%
May	Discharge	m^3/s	28.1	32.3	35.7	39.2	48.1	56.3	62.5	69.4	78.5
	Change from Pre-Mine	m^3/s	-0.4	0.1	0.1	-0.5	-1.0	-1.4	-2.0	-2.2	-3.2
		%	-1%	0%	0%	-1%	-2%	-2%	-3%	-3%	-4%
June	Discharge	m^3/s	22.6	27.1	30.4	36.5	51.4	64.2	78.3	94.4	119.1
	Change from Pre-Mine	m^3/s	0.4	0.5	-0.4	0.1	-1.4	-3.4	-3.5	-3.3	-3.6
		%	2%	2%	-1%	0%	-3%	-5%	-4%	-3%	-3%
July	Discharge	m^3/s	6.5	7.5	8.6	10.7	19.7	26.9	38.2	56.1	89.2
	Change from Pre-Mine	m^3/s	0.0	0.1	0.1	0.4	-0.6	-1.1	-2.2	-1.8	-3.5
		%	0%	1%	1%	4%	-3%	-4%	-5%	-3%	-4%
August	Discharge	m^3/s	2.6	3.0	3.3	3.9	6.8	9.4	12.5	16.5	22.2
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.1	-0.1	0.1	-0.2	-0.8	-3.8
		%	8%	9%	6%	1%	-2%	1%	-1%	-4%	-15%
September	Discharge	m^3/s	1.9	2.2	2.5	3.0	5.2	7.0	8.8	11.9	17.4
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	-0.1	0.1	-0.7	-0.8	-1.4
		%	9%	6%	6%	4%	-2%	1%	-7%	-7%	-7%
October	Discharge	m^3/s	1.7	2.2	2.5	3.1	5.5	7.0	9.1	11.7	15.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	-0.1	-0.2	-0.3	-0.5	-1.9
		%	9%	8%	5%	0%	-1%	-3%	-3%	-4%	-11%
November	Discharge	m^3/s	2.0	2.4	2.7	3.2	6.0	8.0	11.1	15.3	23.0
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.2
		%	3%	5%	3%	0%	0%	-1%	-1%	-1%	-1%
December	Discharge	m^3/s	1.9	2.1	2.3	2.6	4.2	5.3	6.9	9.1	13.3
	Change from Pre-Mine	m^3/s	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	4%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	8.9	9.7	10.4	11.5	14.4	17.0	19.3	21.9	25.7
	Change from Pre-Mine	m^3/s	0.2	0.1	-0.1	-0.2	-0.3	-0.4	-0.6	-0.6	-1.0
		%	3%	1%	-1%	-1%	-2%	-3%	-3%	-3%	-4%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE N-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 12
BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

Print Oct/08/14 16:54:32

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	1.7	2.0	2.1	2.4	3.6	4.3	5.4	6.8	9.2
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		%	4%	5%	3%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	1.9	2.0	2.1	2.3	3.5	4.1	5.3	6.7	9.5
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
		%	6%	7%	6%	3%	2%	0%	0%	0%	0%
March	Discharge	m^3/s	2.2	2.3	2.5	2.7	4.5	5.5	7.7	10.8	17.1
	Change from Pre-Mine	m^3/s	0.1	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.1
		%	7%	7%	7%	6%	3%	2%	3%	1%	0%
April	Discharge	m^3/s	3.5	5.4	7.2	9.4	14.6	19.0	23.3	27.2	32.2
	Change from Pre-Mine	m^3/s	0.2	0.1	0.1	0.1	0.2	-0.2	0.4	0.5	-0.1
		%	6%	3%	1%	1%	2%	-1%	2%	2%	0%
May	Discharge	m^3/s	29.5	32.7	36.7	40.3	49.0	56.5	63.5	70.4	79.8
	Change from Pre-Mine	m^3/s	1.0	0.4	1.1	0.7	-0.1	-1.3	-1.0	-1.3	-1.9
		%	3%	1%	3%	2%	0%	-2%	-2%	-2%	-2%
June	Discharge	m^3/s	22.9	27.3	31.0	37.5	52.4	65.6	79.3	95.0	119.1
	Change from Pre-Mine	m^3/s	0.7	0.7	0.2	1.0	-0.5	-2.0	-2.5	-2.6	-3.6
		%	3%	3%	1%	3%	-1%	-3%	-3%	-3%	-3%
July	Discharge	m^3/s	6.6	7.6	8.7	10.9	19.9	27.0	38.6	56.7	89.3
	Change from Pre-Mine	m^3/s	0.1	0.2	0.2	0.6	-0.4	-1.0	-1.8	-1.1	-3.4
		%	2%	2%	2%	6%	-2%	-3%	-5%	-2%	-4%
August	Discharge	m^3/s	2.6	3.0	3.4	3.9	6.9	9.5	12.8	16.8	22.3
	Change from Pre-Mine	m^3/s	0.2	0.3	0.2	0.1	0.0	0.3	0.1	-0.5	-3.7
		%	9%	11%	7%	3%	0%	3%	1%	-3%	-14%
September	Discharge	m^3/s	1.9	2.2	2.5	3.1	5.2	7.1	8.8	12.3	17.4
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.2	0.0	0.1	-0.7	-0.4	-1.4
		%	10%	10%	8%	7%	0%	2%	-7%	-3%	-7%
October	Discharge	m^3/s	1.8	2.2	2.6	3.2	5.7	7.2	9.4	12.3	15.4
	Change from Pre-Mine	m^3/s	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.1	-1.5
		%	12%	9%	7%	6%	2%	0%	0%	0%	-9%
November	Discharge	m^3/s	2.1	2.4	2.8	3.3	6.0	8.1	11.1	15.3	23.1
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.1	0.0	0.0	-0.1	-0.1	-0.1
		%	6%	7%	5%	2%	0%	0%	-1%	-1%	-1%
December	Discharge	m^3/s	2.0	2.2	2.4	2.6	4.2	5.3	6.9	9.1	13.2
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		%	5%	6%	4%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	8.9	9.9	10.7	11.8	14.7	17.1	19.4	22.1	25.7
	Change from Pre-Mine	m^3/s	0.3	0.3	0.2	0.2	0.0	-0.3	-0.5	-0.5	-0.9
		%	3%	3%	2%	2%	0%	-2%	-2%	-2%	-3%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE N-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 12
BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

Print Oct/08/14 16:54:32

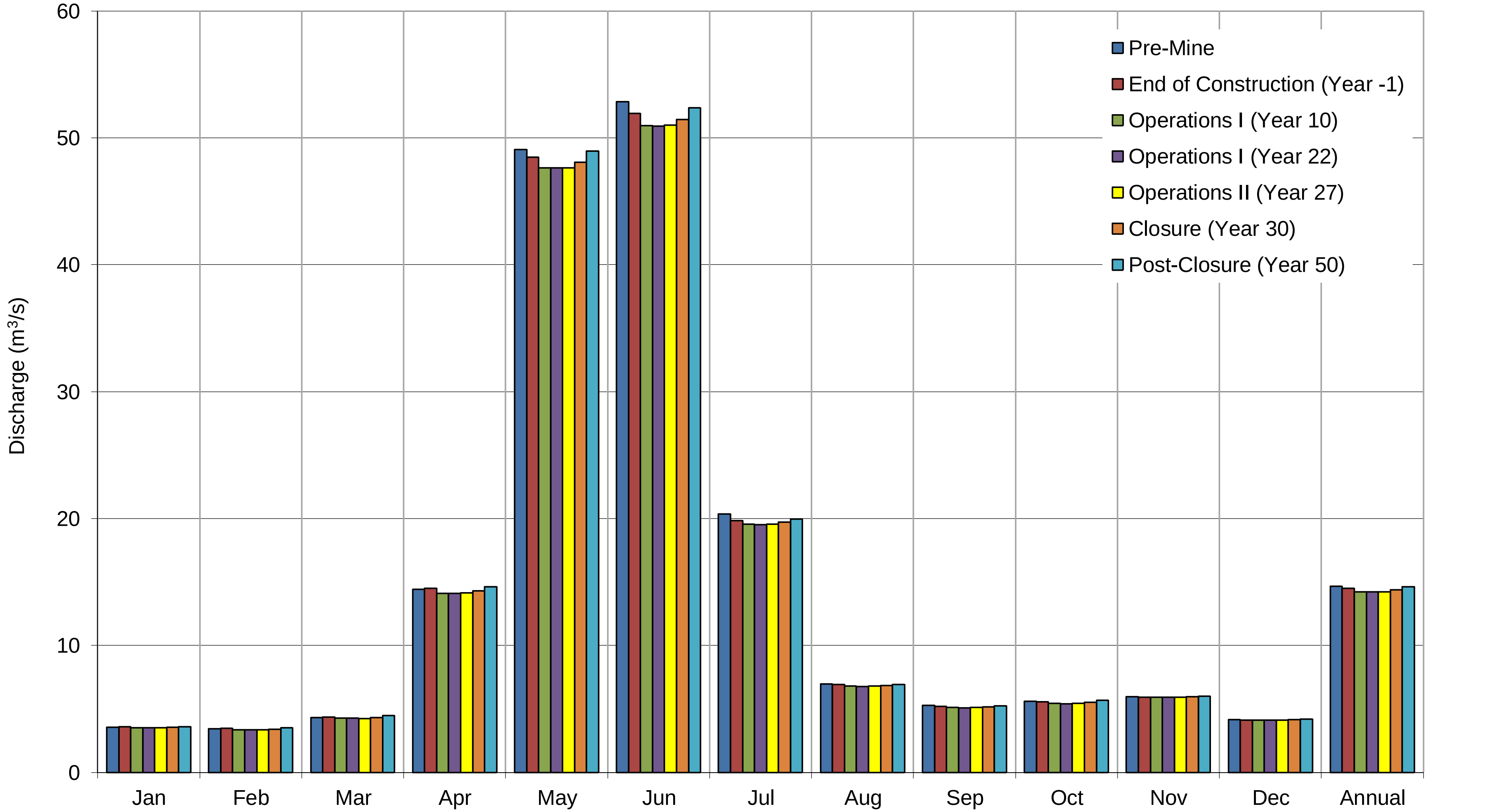
Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	1140.0	Discharge	m^3/s	111	137	153	167	184	195	207
			Unit Runoff	$l/s/km^2$	98	121	134	147	161	171	182
-1	End of Construction	1124.5	Discharge	m^3/s	110	136	151	165	182	193	205
			Unit Runoff	$l/s/km^2$	98	121	134	147	162	172	182
			Change from Pre-Mine	m^3/s	-1	-1	-2	-2	-2	-2	-2
		-1%		%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
10	Operations I	1121.7	Discharge	m^3/s	110	136	151	165	181	193	205
			Unit Runoff	$l/s/km^2$	98	121	135	147	162	172	183
			Change from Pre-Mine	m^3/s	-1	-2	-2	-2	-2	-2	-2
		-2%		%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
22	Operations I	1120.7	Discharge	m^3/s	110	136	151	165	181	193	205
			Unit Runoff	$l/s/km^2$	98	121	135	147	162	172	183
			Change from Pre-Mine	m^3/s	-1	-2	-2	-2	-2	-2	-3
		-2%		%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
27	Operations II	1121.0	Discharge	m^3/s	110	136	151	165	181	193	205
			Unit Runoff	$l/s/km^2$	98	121	135	147	162	172	183
			Change from Pre-Mine	m^3/s	-1	-2	-2	-2	-2	-2	-3
		-2%		%	-1%	-1%	-1%	-1%	-1%	-1%	-1%
30	Closure	1136.2	Discharge	m^3/s	111	137	152	167	183	195	207
			Unit Runoff	$l/s/km^2$	98	121	134	147	161	172	182
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	-1
		0%		%	0%	0%	0%	0%	0%	0%	0%
50	Post-Closure	1136.3	Discharge	m^3/s	111	137	152	167	183	195	207
			Unit Runoff	$l/s/km^2$	98	121	134	147	161	172	182
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	-1
		0%		%	0%	0%	0%	0%	0%	0%	0%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 12_R1.xlsx]Peak Q

NOTE:

1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 12
BARRIERE RIVER AT THE MOUTH (WSC 08LB020)

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE N-1

REV 1

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT	ACA	TJP	KJB

APPENDIX O

REGIONAL RESULTS FOR NODE 13

(Pages O-1 to O-10)

Knight Piésold CONSULTING

TABLE O-1

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Mean Monthly												Average Annual
Year	Description				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
-	Pre-Mine	4490	Discharge	m^3/s	30	28	34	90	295	437	345	217	130	92	65	35	150
			Unit Runoff	$l/s/km^2$	6.6	6.2	7.5	20.1	65.8	97.3	76.9	48.3	29.0	20.4	14.4	7.8	33.4
-1	End of Construction	4490	Discharge	m^3/s	30	28	34	90	295	437	345	217	130	91	65	35	150
			Unit Runoff	$l/s/km^2$	6.6	6.2	7.5	20.1	65.8	97.3	76.9	48.3	29.0	20.4	14.4	7.8	33.4
			Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0
		0%		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10	Operations I	4489	Discharge	m^3/s	30	28	34	90	295	437	345	217	130	91	65	35	150
			Unit Runoff	$l/s/km^2$	6.6	6.2	7.5	20.1	65.8	97.3	76.9	48.3	29.0	20.4	14.4	7.8	33.4
			Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
		0%		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
22	Operations I	4488	Discharge	m^3/s	30	28	34	90	295	437	345	217	130	91	65	35	150
			Unit Runoff	$l/s/km^2$	6.6	6.2	7.5	20.1	65.8	97.3	76.9	48.3	29.0	20.4	14.4	7.8	33.4
			Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
		0%		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
27	Operations II	4489	Discharge	m^3/s	30	28	34	90	295	437	345	217	130	91	65	35	150
			Unit Runoff	$l/s/km^2$	6.6	6.2	7.5	20.1	65.8	97.3	76.9	48.3	29.0	20.4	14.4	7.8	33.4
			Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
		0%		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
30	Closure	4489	Discharge	m^3/s	30	28	34	90	295	437	345	217	130	91	65	35	150
			Unit Runoff	$l/s/km^2$	6.6	6.2	7.5	20.1	65.8	97.3	76.9	48.3	29.0	20.4	14.4	7.8	33.4
			Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
		0%		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
50	Post-Closure	4489	Discharge	m^3/s	30	28	34	90	295	437	345	217	130	91	65	35	150
			Unit Runoff	$l/s/km^2$	6.6	6.2	7.5	20.1	65.8	97.3	76.9	48.3	29.0	20.4	14.4	7.8	33.4
			Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.0	0.0	0.0	0.0
		0%		%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 13_R1.xlsx]Mean Monthly

NOTE:

1. MEAN MONTHLY VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODELS.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE O-2

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

PRE-MINE MONTHLY WET AND DRY FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

Print Oct/09/14 8:58:30

Month	Estimated Return Period Monthly Discharge (m^3/s)								
	Dry				Mean	Wet			
	50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	14.3	16.0	17.7	20.3	29.6	37.5	44.6	51.5	60.4
February	16.2	17.4	18.8	20.8	28.0	34.2	39.7	45.1	52.1
March	18.4	19.7	21.2	23.5	33.5	41.6	50.1	58.7	70.4
April	35.0	43.9	52.3	63.4	90.4	115.7	132.3	146.9	164.6
May	178.1	201.1	221.8	246.9	295.3	344.5	370.4	391.9	416.3
June	309.3	329.5	348.9	374.4	436.8	495.2	533.7	567.9	609.1
July	223.5	240.4	257.3	280.5	345.1	403.5	446.5	486.0	535.0
August	148.6	156.2	164.3	176.2	216.9	251.7	282.0	311.1	348.8
September	79.6	85.3	91.3	100.1	130.2	155.9	178.3	199.7	227.5
October	48.2	52.1	56.5	63.4	91.5	114.4	137.5	160.6	191.5
November	30.5	33.9	37.6	43.3	64.7	82.6	99.4	115.9	137.6
December	19.7	21.3	23.0	25.6	35.1	43.2	50.7	58.0	67.7
Annual	120.0	124.9	129.5	135.6	150.4	164.2	173.2	181.1	190.6

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 0\[Node 13.xlsx]PM WD

NOTE:

1. MONTHLY WET AND DRY VALUES WERE CALCULATED FROM DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

0	15AUG'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE O-3

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

END OF CONSTRUCTION (YEAR -1) WET AND DRY FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

Print Oct/09/14 8:50:21

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	14.3	16.0	17.7	20.3	29.6	37.5	44.5	51.4	60.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	16.2	17.4	18.8	20.8	28.0	34.1	39.7	45.0	52.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	18.4	19.7	21.2	23.5	33.5	41.5	50.0	58.6	70.2
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	35.0	43.9	52.3	63.4	90.4	115.7	132.2	146.9	164.6
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	Discharge	m^3/s	178.3	201.3	221.9	246.9	295.4	344.5	370.3	391.8	416.1
	Change from Pre-Mine	m^3/s	0.2	0.2	0.1	0.1	0.0	0.0	0.0	-0.1	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
June	Discharge	m^3/s	309.5	329.6	349.0	374.5	436.9	495.3	533.8	567.8	608.8
	Change from Pre-Mine	m^3/s	0.2	0.2	0.1	0.1	0.0	0.0	0.1	-0.1	-0.3
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
July	Discharge	m^3/s	223.6	240.5	257.4	280.6	345.1	403.4	446.5	485.9	534.6
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.0	0.0	-0.1	0.0	-0.1	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
August	Discharge	m^3/s	148.6	156.2	164.3	176.2	216.8	251.6	281.8	310.9	348.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
September	Discharge	m^3/s	79.6	85.3	91.3	100.1	130.1	155.9	178.1	199.5	227.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
October	Discharge	m^3/s	48.2	52.2	56.6	63.4	91.5	114.3	137.3	160.4	191.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
November	Discharge	m^3/s	30.5	33.9	37.7	43.3	64.7	82.5	99.3	115.8	137.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
December	Discharge	m^3/s	19.7	21.3	23.0	25.6	35.1	43.1	50.6	58.0	67.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	120.1	124.9	129.6	135.7	150.3	164.1	173.1	181.0	190.5
	Change from Pre-Mine	m^3/s	0.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold CONSULTING

TABLE O-4

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 10) MONTHLY WET AND DRY FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	14.3	16.0	17.7	20.3	29.6	37.5	44.6	51.4	60.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	16.2	17.4	18.8	20.8	28.0	34.2	39.7	45.1	52.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	18.4	19.7	21.2	23.5	33.5	41.6	50.1	58.7	70.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	35.1	43.9	52.3	63.5	90.4	115.7	132.2	146.9	164.6
	Change from Pre-Mine	m^3/s	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	Discharge	m^3/s	178.2	201.3	221.9	246.9	295.3	344.4	370.3	391.8	416.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.3
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
June	Discharge	m^3/s	309.4	329.5	348.9	374.4	436.8	495.2	533.8	567.7	608.6
	Change from Pre-Mine	m^3/s	0.1	0.0	0.1	0.0	0.0	-0.1	0.1	-0.1	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
July	Discharge	m^3/s	223.5	240.4	257.3	280.5	345.0	403.4	446.4	485.8	534.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.2	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
August	Discharge	m^3/s	148.6	156.2	164.3	176.2	216.8	251.6	281.8	310.8	348.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
September	Discharge	m^3/s	79.6	85.3	91.3	100.1	130.1	155.9	178.1	199.5	227.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
October	Discharge	m^3/s	48.2	52.2	56.6	63.4	91.5	114.3	137.3	160.4	191.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
November	Discharge	m^3/s	30.5	33.9	37.7	43.3	64.7	82.5	99.3	115.8	137.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
December	Discharge	m^3/s	19.7	21.3	23.0	25.6	35.1	43.2	50.6	58.0	67.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	120.0	124.9	129.5	135.6	150.3	164.1	173.1	181.0	190.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE O-5

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS I (YEAR 22) MONTHLY WET AND DRY FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

Print Oct/09/14 8:50:21

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	14.3	16.0	17.7	20.3	29.6	37.5	44.6	51.4	60.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	16.2	17.4	18.8	20.8	28.0	34.2	39.7	45.1	52.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	18.4	19.7	21.2	23.5	33.5	41.6	50.1	58.7	70.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	35.0	43.9	52.3	63.4	90.4	115.7	132.2	146.9	164.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	Discharge	m^3/s	178.2	201.3	221.8	246.9	295.3	344.4	370.3	391.8	416.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.3
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
June	Discharge	m^3/s	309.4	329.6	349.0	374.4	436.8	495.2	533.8	567.7	608.6
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.0	-0.1	0.1	-0.1	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
July	Discharge	m^3/s	223.5	240.4	257.3	280.5	345.0	403.4	446.4	485.8	534.6
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
August	Discharge	m^3/s	148.6	156.2	164.3	176.2	216.8	251.6	281.7	310.8	348.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
September	Discharge	m^3/s	79.6	85.3	91.3	100.1	130.1	155.9	178.1	199.5	227.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
October	Discharge	m^3/s	48.2	52.2	56.6	63.4	91.5	114.3	137.3	160.4	191.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
November	Discharge	m^3/s	30.5	33.9	37.7	43.3	64.7	82.5	99.3	115.8	137.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
December	Discharge	m^3/s	19.7	21.3	23.0	25.6	35.1	43.2	50.6	58.0	67.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	120.0	124.9	129.5	135.6	150.3	164.1	173.1	181.0	190.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%

M:\1\01\00458\14\A\Data\Task 400 - Site Wide Watershed Modelling\Life of Mine Results\Rev 1\[Node 13_R1.xlsx]22 WD

NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

Knight Piésold CONSULTING

TABLE O-6

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

OPERATIONS II (YEAR 27) MONTHLY WET AND DRY FLOWS FOR NODE 13 NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

Print Oct/09/14 8:50:21

Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	14.3	16.0	17.7	20.3	29.6	37.5	44.6	51.4	60.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	16.2	17.4	18.8	20.8	28.0	34.2	39.7	45.1	52.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	18.4	19.7	21.2	23.5	33.5	41.6	50.1	58.7	70.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	35.0	43.9	52.3	63.4	90.4	115.7	132.2	146.9	164.6
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	Discharge	m^3/s	178.2	201.3	221.8	246.9	295.3	344.4	370.3	391.8	416.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.3
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
June	Discharge	m^3/s	309.4	329.5	348.9	374.4	436.8	495.2	533.8	567.8	608.6
	Change from Pre-Mine	m^3/s	0.1	0.0	0.1	0.1	0.0	-0.1	0.1	-0.1	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
July	Discharge	m^3/s	223.5	240.4	257.3	280.5	345.0	403.4	446.4	485.8	534.6
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
August	Discharge	m^3/s	148.6	156.2	164.3	176.2	216.8	251.6	281.7	310.8	348.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
September	Discharge	m^3/s	79.6	85.3	91.3	100.1	130.1	155.9	178.1	199.5	227.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
October	Discharge	m^3/s	48.2	52.2	56.6	63.4	91.5	114.3	137.3	160.4	191.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
November	Discharge	m^3/s	30.5	33.9	37.7	43.3	64.7	82.5	99.3	115.8	137.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
December	Discharge	m^3/s	19.7	21.3	23.0	25.6	35.1	43.2	50.6	58.0	67.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	120.0	124.9	129.5	135.6	150.3	164.1	173.1	181.0	190.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

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TABLE O-7

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

CLOSURE (YEAR 30) MONTHLY WET AND DRY FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	14.3	16.0	17.7	20.3	29.6	37.5	44.6	51.4	60.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	16.2	17.4	18.8	20.8	28.0	34.2	39.7	45.1	52.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	18.4	19.7	21.2	23.5	33.5	41.6	50.1	58.7	70.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	35.0	43.9	52.3	63.4	90.4	115.7	132.2	146.9	164.6
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	Discharge	m^3/s	178.2	201.3	221.8	246.9	295.3	344.4	370.3	391.8	416.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	0.0	0.0	-0.1	-0.1	-0.3
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
June	Discharge	m^3/s	309.4	329.5	348.9	374.4	436.8	495.2	533.8	567.8	608.7
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.0	-0.1	0.1	-0.1	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
July	Discharge	m^3/s	223.5	240.4	257.3	280.5	345.0	403.4	446.4	485.8	534.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.2	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
August	Discharge	m^3/s	148.6	156.2	164.3	176.2	216.8	251.6	281.7	310.8	348.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
September	Discharge	m^3/s	79.6	85.3	91.3	100.1	130.1	155.9	178.1	199.5	227.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
October	Discharge	m^3/s	48.2	52.2	56.6	63.4	91.5	114.3	137.3	160.4	191.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
November	Discharge	m^3/s	30.5	33.9	37.7	43.3	64.7	82.5	99.2	115.8	137.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
December	Discharge	m^3/s	19.7	21.3	23.0	25.6	35.1	43.2	50.6	58.0	67.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	120.0	124.9	129.5	135.6	150.3	164.1	173.1	181.0	190.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%

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NOTE:

1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE O-8

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

POST-CLOSURE (YEAR 50) MONTHLY WET AND DRY FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

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Month	Parameter	Units	Estimated Return Period Monthly Discharge								
			Dry				Mean	Wet			
			50 yr	20 yr	10 yr	5 yr		5 yr	10 yr	20 yr	50 yr
January	Discharge	m^3/s	14.3	16.0	17.7	20.3	29.6	37.5	44.6	51.4	60.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
February	Discharge	m^3/s	16.2	17.4	18.8	20.8	28.0	34.1	39.7	45.1	52.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
March	Discharge	m^3/s	18.4	19.7	21.2	23.5	33.5	41.6	50.1	58.7	70.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
April	Discharge	m^3/s	35.0	43.9	52.3	63.4	90.4	115.7	132.2	146.9	164.6
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
May	Discharge	m^3/s	178.2	201.3	221.8	246.9	295.3	344.4	370.3	391.8	416.0
	Change from Pre-Mine	m^3/s	0.1	0.2	0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.3
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
June	Discharge	m^3/s	309.4	329.5	348.9	374.4	436.8	495.2	533.8	567.8	608.7
	Change from Pre-Mine	m^3/s	0.1	0.1	0.1	0.1	0.0	-0.1	0.1	-0.1	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
July	Discharge	m^3/s	223.5	240.4	257.3	280.5	345.0	403.4	446.4	485.8	534.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	-0.2	-0.5
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
August	Discharge	m^3/s	148.6	156.2	164.3	176.2	216.8	251.6	281.7	310.8	348.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.3	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
September	Discharge	m^3/s	79.6	85.3	91.3	100.1	130.1	155.9	178.1	199.5	227.1
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.4
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
October	Discharge	m^3/s	48.2	52.2	56.6	63.4	91.5	114.3	137.3	160.4	191.3
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
November	Discharge	m^3/s	30.5	33.9	37.7	43.3	64.7	82.5	99.2	115.8	137.5
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
December	Discharge	m^3/s	19.7	21.3	23.0	25.6	35.1	43.1	50.6	58.0	67.7
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Annual	Discharge	m^3/s	120.0	124.9	129.5	135.6	150.3	164.1	173.1	181.0	190.4
	Change from Pre-Mine	m^3/s	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
		%	0%	0%	0%	0%	0%	0%	0%	0%	0%

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NOTE:
1. MONTHLY WET AND DRY VALUES CALCULATED FROM THE LIFE OF MINE SURFACE WATER WATERSHED MODEL AND DATA PRESENTED BY THE WSC FOR 1965, 1966, AND 1968-2011 USING PALISADE @RISK SOFTWARE.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB

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TABLE O-9

HARPER CREEK MINING CORP.
HARPER CREEK PROJECT

LIFE OF MINE INSTANTANEOUS PEAK FLOWS FOR NODE 13
NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

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Mine Stage		Drainage Area (km^2)	Parameter	Units	Return Period Flows						
Year	Description				2	5	10	20	50	100	200
-	Pre-Mine	4490	Discharge	m^3/s	796	927	1014	1096	1208	1279	1362
			Unit Runoff	$l/s/km^2$	177	207	226	244	269	285	303
-1	End of Construction	4490	Discharge	m^3/s	796	927	1014	1096	1208	1279	1362
			Unit Runoff	$l/s/km^2$	177	207	226	244	269	285	303
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%
10	Operations I	4489	Discharge	m^3/s	796	927	1014	1095	1208	1279	1362
			Unit Runoff	$l/s/km^2$	177	207	226	244	269	285	303
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%
22	Operations I	4488	Discharge	m^3/s	796	927	1014	1095	1208	1279	1362
			Unit Runoff	$l/s/km^2$	177	207	226	244	269	285	303
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%
27	Operations II	4489	Discharge	m^3/s	796	927	1014	1095	1208	1279	1362
			Unit Runoff	$l/s/km^2$	177	207	226	244	269	285	303
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%
30	Closure	4489	Discharge	m^3/s	796	927	1014	1095	1208	1279	1362
			Unit Runoff	$l/s/km^2$	177	207	226	244	269	285	303
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%
50	Post-Closure	4489	Discharge	m^3/s	796	927	1014	1095	1208	1279	1362
			Unit Runoff	$l/s/km^2$	177	207	226	244	269	285	303
			Change from Pre-Mine	m^3/s	0	0	0	0	0	0	0
		0%		%	0%	0%	0%	0%	0%	0%	0%

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NOTE:
1. RETURN PERIOD PEAK FLOW VALUES CALCULATED FROM THE PRE-MINE AND LIFE OF MINE SURFACE WATER WATERSHED MODEL USING METHODOLOGY FROM THE BASELINE HYDROLOGY REPORT (KP, 2014).

1	07OCT'14	ISSUED WITH REPORT VA101-00458/14-1	ACA	TJP	KJB
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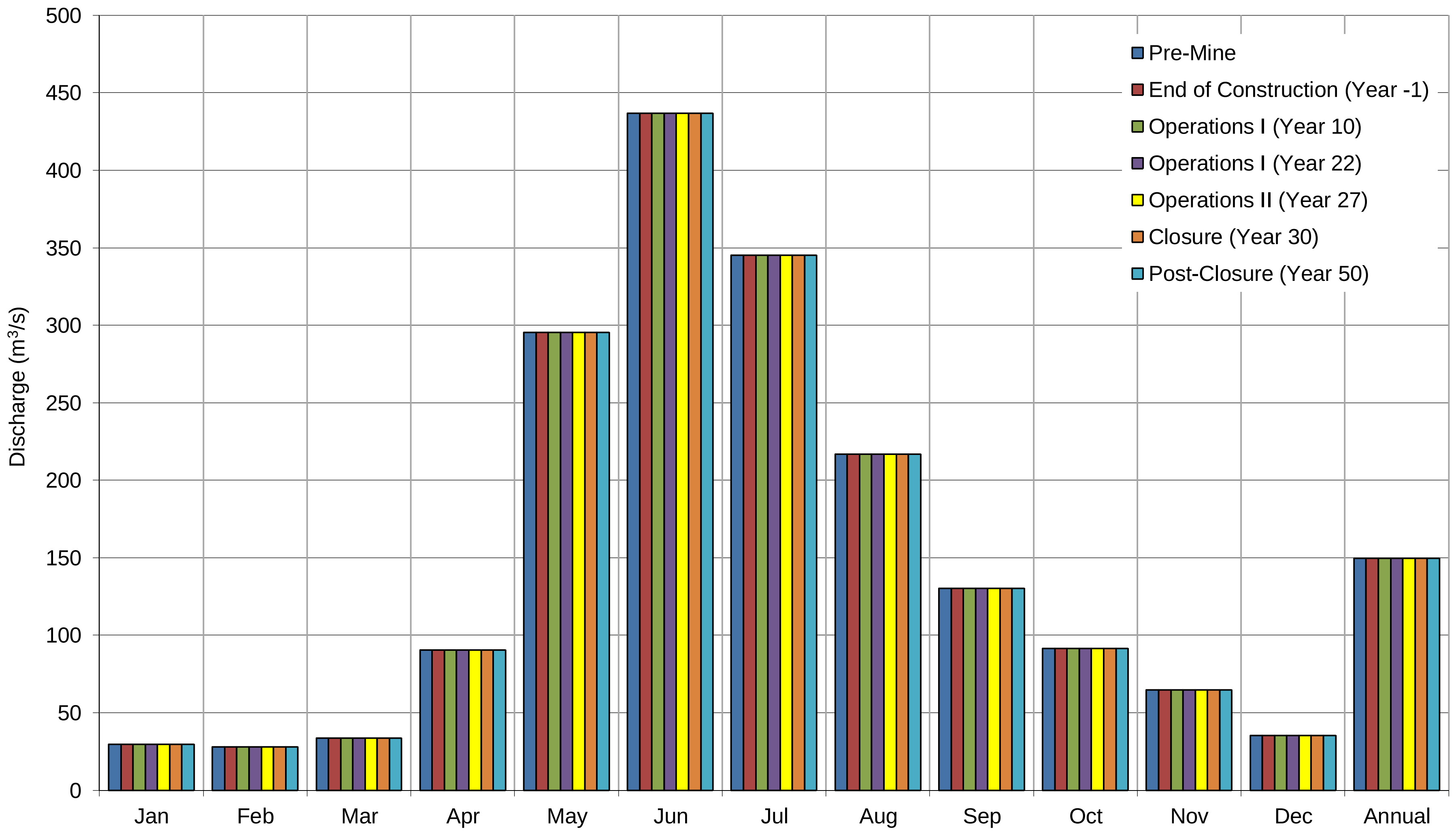

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

LIFE OF MINE MEAN MONTHLY FLOWS FOR NODE 13 NORTH THOMPSON RIVER AT BIRCH ISLAND (WSC 08LB047)

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF NO. 1

FIGURE O-1

REV 1

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

APPENDIX P

GOLDSIM OPERATIONAL AND CLOSURE WATER BALANCE

(Pages P-1 to P-12)

July 24, 2014

File No.:VA101-458/14-A.01
Cont. No.:VA14-00700

Mr. Alastair Tiver
Feasibility Study Director
Harper Creek Mining Corp
Suite 1800, Two Bentall Centre
555 Burrard Street
Vancouver, BC V7X 1M9

Dear Alastair

Re: Harper Creek Project – Updated Feasibility Study Water Balance Model

1 – GENERAL

A monthly operational and closure water balance was developed by Knight Piésold Ltd. (KP) for the Harper Creek Project using the GoldSim© software package. This letter provides results for the updated monthly water balance and the updated model reflects the most up to date mine waste management concepts and water management routing assumptions (KP, 2014).

The intent of the modelling was to estimate the magnitude and extent of any water surplus and/or deficit conditions in the tailings management facility (TMF) based on a range of possible climatic conditions. The modelling timeline included:

- One year of pre-production (Year -1)
- 28 years of operations (Year 1 to 28) at a nominal milling rate of 70,000 dry metric tonnes per day, and
- 17 years of closure.

The model incorporates the following major project components:

- Open Pit
- Mill
- Tailings Management Facility (TMF)
- Non-Potentially Acid Generating (non-PAG) Waste Rock Stockpiles
- Potentially Acid Generating (PAG) Waste Rock Stockpile to be stored within the TMF, and
- Non-PAG and PAG Low-Grade Ore (LGO) Stockpiles.

The water balance model is illustrated schematically on Figure 1 and the key model assumptions are summarized below in Table 1.

Table 1 Water Balance Input Parameters

Component	Assumption
Total Tailings Production (million tonnes)	718
Total Tailings stored in TMF (Years 1 to 23) (million tonnes)	585
Total Tailings stored in Open pit (Years 24 to 28) (million tonnes)	133
Waste Rock (million tonnes stored in TMF Years 1 to 25)	237
Mine Life (years)	28
Tailings slurry solids content (% by weight)	34.5%
Tailings dry density (tonnes/m^3)	1.3
Bulk tailings specific gravity	2.66
Waste Rock dry density (tonnes/m^3)	2.2
Waste Rock specific gravity	2.7
TMF total embankment seepage (total) (L/s) – Year 1	0
TMF total embankment seepage (total) (L/s) – Year 28	15
Open Pit Groundwater inflows (L/s) - Year 1	0
Open Pit Groundwater inflows (L/s) - Year 23	21
Open Pit Groundwater inflows (L/s) - Year 38	2.5
TMF tailings consolidation seepage (L/s) – Year 1	20
TMF tailings consolidation seepage (L/s) – Year 23	82
TMF tailings consolidation seepage (L/s) – Year 24	45
TMF tailings consolidation seepage (L/s) – Year 53	10
TMF tailings consolidation seepage (L/s) – Year 123	0

NOTES:

1. THE OPEN PIT GROUNDWATER INFLOWS WERE ASSUMED TO INCREASE LINEARLY FROM 0 L/S AT THE BEGINNING OF YEAR 1 TO A MAXIMUM OF 21 L/S AT THE END OF YEAR 23. ONCE THE OPEN PIT IS FULL, THE GROUNDWATER INFLOWS ARE ASSUMED TO BE AT A CONSTANT OF 2.5 L/S.
2. THE TAILINGS CONSOLIDATION SEEPAGE IS ASSUMED TO CONTRIBUTE THE TMF SUPERNATANT POND VOLUME UNTIL 100 YEARS (YEAR 123) AFTER THE END OF TAILNGS DEPOSITION IN THE TMF (YEAR 23).
3. THE TMF EMBANKMENT SEEPAGE (FROM BOTH THE MAIN AND NORTH EMBANKMENTS) IS ASSUMED TO INCREASE LINEARLY FROM 0 L/S AT THE BEGINNING OF YEAR 1 TO A MAXIMUM OF 15 L/S AT THE END OF YEAR 28.

2 – OVERVIEW OF SITE WATER MANAGEMENT

A schematic illustration of the components of the water balance model for the Harper Creek Project is shown on Figure 1. The water management plan for the project is summarized below.

2.1 SITE WATER MANAGEMENT: START-UP AND OPERATIONS DURING OPEN PIT MINING

The water management plan for Years 1 to 23 of operations is summarized below:

- The open pit will be mined and tailings will be stored in the TMF during the first 23 years of the mine life.
- All runoff from the open pit walls and upslope catchment areas will be collected by the open pit dewatering system and pumped to the TMF pond.

- The TMF will be the primary source of water to the mill for the first 25.5 years of operations. The TMF pond is assumed to collect runoff for one year prior to mill start-up.
- TMF embankment seepage and runoff will be collected in water management ponds situated at low points downstream of the Main and North embankments. The recycled seepage will be pumped back to the TMF during operations.
- Seepage and runoff from the non-PAG waste rock stockpile, PAG LGO stockpile and the non-PAG LGO stockpile outside the TMF will be collected in water management ponds and pumped to the TMF pond throughout operations.
- Seepage and surface runoff from the overburden stockpile adjacent to the open pit will be directed to the open pit until Year 10 from where it will be pumped to the TMF by the open pit dewatering system. After Year 10, the collected runoff seepage and runoff will be routed through a sediment pond and discharged to the receiving environment.
- The current mine plan includes approximately 237 million tonnes of PAG waste rock over the course of the mine life from Years 1 to 25. The PAG will be deposited in the footprint of the TMF. The PAG will be inundated by water and tailings as the TMF rises over the mine life.

2.2 SITE WATER MANAGEMENT: OPERATIONS DURING LGO PROCESSING

The water management plan for Years 24 to 28 of operations is summarized below:

- Starting in Year 24, LGO will be processed through the mill and tailings will be deposited in the open pit until the end of operations in Year 28.
- The open pit dewatering system will be decommissioned once the LGO tailings deposition in the open pit commences.
- Reclaim water from the TMF will continue to supply the mill for the first 18 months of the LGO processing (Years 24 to 25.5), while the open pit is filling. Starting in Year 25.5, the open pit will be the primary source of water to supply the mill until the end of operations in Year 28.
- Seepage and runoff from waste rock stockpiles (outside of the TMF) will continue to be pumped to the TMF.
- The PAG waste rock stored in the TMF is assumed to be completely encapsulated within the tailings and TMF supernatant pond at the end of operations.

2.3 SITE WATER MANAGEMENT: CLOSURE AND POST-CLOSURE

Closure commences at the end of operations, once the mill operations cease. Post-closure starts once the open pit is full and water is being pumped to the TMF. The water management plan for closure and post-closure is summarized below:

- The mill will be decommissioned and LGO stockpile footprints will be revegetated where practical.
- The open pit will be allowed to fill naturally to elevation 1530 m. Once full, any surplus water will be pumped to the TMF for long-term storage.
- All tailings distribution pipeworks and the water reclaim pump and pipeline will be removed from the TMF.
- A permanent spillway channel will be excavated at the southeastern end of the TMF. The TMF pond will be allowed to fill and spill to the downstream receiving environment.
- The seepage recycle pumping system from the water management ponds to the TMF, will be decommissioned approximately 12 years after the end of operations.
- Seepage and runoff from the waste rock stockpiles outside of the TMF will continue to be pumped to the TMF for long-term storage.

3 – WATER BALANCE MODEL ASSUMPTIONS

3.1 AVERAGE HYDROMETEOROLOGICAL CONDITIONS

The hydrometeorological inputs to the water balance model were based on the baseline watershed model (KP, 2014), which uses long-term data series for both temperature and precipitation. The 96 year long-term data series for the project was developed by correlating the concurrent climate record from the regional climate station at Vavenby operated by Environment Canada (EC) with available measured project site data. Details of the development of the precipitation and temperature record for the project site are included in the Watershed Modelling Report (KP, 2014).

The baseline watershed model was developed separately from the operational water balance to assess the baseline surface and groundwater flow patterns in the project area. The baseline watershed model was calibrated by translating inputs of regional long-term precipitation into corresponding streamflow values for the project area. The hydrologic inputs were adjusted until best fits were reached between calculated and reliable measured site streamflow values.

The mean annual precipitation (MAP) for the project area was estimated to be 1264 mm, at a reference elevation of 1800 m, with 32% of the annual precipitation falling as rain and the remainder as snow. The mean monthly values for precipitation, rainfall, snowfall and the resulting surplus water volumes are summarized in Table 2.

Table 2 Average Hydrometeorological Inputs

Parameter	Monthly Value (mm)												Annual (mm)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Precipitation	189	103	97	51	84	76	66	61	53	117	170	197	1264
Rainfall	0	0	0	30	84	76	66	61	53	35	0	0	405
Snowfall	189	103	97	21	0	0	0	0	0	82	170	197	859
Sublimation	11	10	11	11	11	11	11	0	0	11	11	11	109
Snowmelt	0	0	0	0	200	364	186	0	0	0	0	0	750
Available Precipitation	0	0	0	30	284	440	252	61	53	35	0	0	1155
Lake Evaporation	0	0	0	11	60	86	103	88	49	0	0	0	397
Undisturbed Surplus Water	0	0	0	21	232	367	165	0	0	35	0	0	820

NOTES:

1. THE PRECIPITATION VALUES WERE ESTIMATED FOR THE PROJECT SITE REFERENCE ELEVATION OF 1800 m.
2. THE LAKE EVAPORATION VALUES WERE APPLIED TO OPEN WATER SURFACES TO ESTIMATE EVAPORATIVE LOSSES.
3. AVAILABLE SURPLUS WATER VALUES WERE APPLIED TO UNDISTURBED AREAS WITHIN THE MINE FOOTPRINT TO ESTIMATE RUNOFF.

The available precipitation and surplus water values shown in Table 2 were estimated based on results of the baseline watershed model. The available precipitation values are rainfall plus snowmelt minus sublimation losses. The surplus water values represent the water available for runoff or groundwater recharge, once evapotranspiration and soil moisture losses have been removed for natural (undisturbed) catchment areas.

Available precipitation (mm) = rainfall + snowfall - sublimation

Surplus water for undisturbed areas (mm) = available precipitation - actual evapotranspiration - soil moisture losses

3.2 EVAPOTRANSPIRATION

Potential evapotranspiration (PET) is defined as the amount of evapotranspiration that would occur from a full vegetation cover given an infinite supply of water (ideal conditions); these values are believed to reasonably represent lake evaporation conditions (Ponce, 1989 and Maidment, 1993). The estimated annual average lake evaporation for the project site is 397 mm, which was applied to open water surfaces in the project area (e.g. the TMF pond area and pit lake in closure). The monthly evaporation values are summarized in Table 2.

Site-specific evaporation data are not available for the project area. Accordingly, the PET for the project site was estimated based on the empirical Thornthwaite equation (Thornthwaite, 1948) that requires monthly temperature as an input:

$$ET_0 = \begin{cases} 0, T < 0 \deg C \\ 16\left(\frac{10T_i}{I}\right)^a, 0 \le T \le 26.5 \deg C \\ -415.85 + 32.24T_i - 0.43T_i^2, T \ge 26.5 \deg C \end{cases}$$

Where:

PET_0 = Potential evapotranspiration (mm/month)

T_i = Mean monthly temperature (°C)

I = Heat index, sum of 12 monthly index values (i)

i = Monthly heat index

a = Empirically derived exponent, which is a function of I

And:

$$i = \left(\frac{T}{5}\right)^{1.514}$$

$$a = 6.75*10^{-7} I^3 - 7.71*10^{-5} I^2 + 1.79*10^{-2} I + 0.49$$

Actual evapotranspiration (AET) from undisturbed catchment areas and bare rock surfaces (e.g. TMF embankments, open pit walls, waste rock piles and low grade stockpiles) in the model are assumed to be limited by the availability of water. Therefore evapotranspiration loss for these surfaces was estimated by applying a reduction factor to the calculated PET values to account for non-ideal conditions for evapotranspiration. The AET factors for undisturbed and bare rock areas were assumed to be 0.85 and 0.7, respectively, based on the calibrated baseline watershed model (KP, 2014).

3.3 DISTURBED FOOTPRINT AREA RUNOFF

The surplus water values for the disturbed areas within the mine footprint were estimated on the basis of rainfall and snowmelt estimates (available precipitation) minus the estimated corresponding actual evapotranspiration and soil moisture losses. For bare rock surfaces the soil moisture losses were considered to be negligible. A runoff coefficient was then applied to estimate the runoff component of the surplus water to account for the water lost to groundwater recharge. Generally, for all modelled areas in the water balance (undisturbed and disturbed), the model tracks only the surface water component (runoff) of the surplus water and assumes that any water that goes to ground (groundwater recharge) is lost from the system. Some exceptions include the groundwater recharge for the PAG waste rock stored in the TMF and the undisturbed area within the TMF catchment. For these areas, the groundwater recharge component is assumed to be captured and stored in the TMF itself and therefore the corresponding runoff coefficients are assumed to be 1.0.

Runoff from disturbed areas (mm) = (available precipitation - actual evapotranspiration) x runoff coefficient

The assumed runoff coefficients for the mine site areas are:

- PAG waste rock stored in TMF (exposed): 1.0
- Undisturbed TMF area: 1.0
- Non-PAG LGO stockpile: 0.85
- PAG LGO stockpile: 0.85
- Non-PAG waste rock stockpile: 0.75
- Overburden stockpile: 0.70
- Open pit walls: 0.65
- TMF embankments: 0.75
- Undisturbed area contributing to TMF seepage pond: 0.75

3.4 CLIMATIC VARIABILITY

The potential variability of climate conditions over the project life was addressed by systematically varying climatic inputs to the water balance based on the 96 year historical precipitation and temperature record developed for the project site (KP, 2014). The model was run with 96 iterations for each year of simulated mine life, enabling a large number of combinations of resulting wet, dry, and median months and years of precipitation and corresponding temperature values to be considered. Additionally, this approach maintains the inherent cyclical nature of the climate record. Model outputs, in particular flow volumes, were then compiled as distributions for each month in each year from which probabilities of occurrence could be determined. The probabilities of occurrence presented in the water balance results represent the following conditions:

- Median scenario – 50% chance of the value being equaled or exceeded in any given month or year
- 95th percentile scenario –5% chance that the water volume or flow rate will be equaled or exceeded in any given month or year (also referred to as the 95th percentile wet), and
- 5th percentile scenario – 95% chance that a water volume or flow will be equaled or exceeded in any given month or year (also referred to as the 95th percentile dry).

3.5 TMF EMBANKMENT SEEPAGE AND RECYCLE

Steady-state seepage analyses were completed using the finite element computer program SEEP/W to estimate the amount of seepage through the embankments. The total embankment seepage was estimated to be approximately 15 L/s in Year 28, with 98% being lost through the Main Embankment and the remaining 2% through the North Embankment. It was assumed that approximately 12.5 L/s (85%) of seepage can be captured by the Main Embankment seepage collection system. Therefore, a maximum of approximately 2.5 L/s (15%) of total seepage is assumed to bypass the seepage collection system to the environment downstream of the Main and North Embankments. Recycle from the Main Embankment seepage pond is assumed to continue until Year 40.

3.6 GROUNDWATER INFLOW TO OPEN PIT AND PIT DEWATERING SYSTEM

The total groundwater inflows to the open pit were estimated to be approximately 21 L/s by Year 23. The water pumped from the open pit by the dewatering system includes groundwater inflows, pit wall runoff, and undisturbed pit catchment runoff. Water from the open pit is assumed to be sent to the TMF until the end of Year 23, at which time the dewatering system will be decommissioned temporarily for 1.5 years when tailings deposition to the open pit commences. The dewatering system will be used to supply process water to the mill starting in Year 25.5.

The open pit is assumed to fill naturally from pit wall runoff, direct precipitation on the pit lake surface, and groundwater inflows starting in Year 29, once mill operations and tailings deposition to the open pit has ceased. The groundwater inflows are assumed to decrease as the open pit fills from a maximum of 21 L/s to 2.5 L/s once the open pit lake is full (at elevation 1530 m). Once full, the open pit surplus is assumed to be pumped to the TMF pond for long-term storage.

3.7 WATER RETAINED IN TAILINGS AND WASTE ROCK VOIDS

The amount of water retained in the tailings voids is a function of the mine production schedule, and the dry density and specific gravity of the tailings, as summarized in Table 1. The PAG waste rock stored in the TMF will also retain water in its void spaces as it becomes inundated.

3.8 PROCESS WATER REQUIREMENTS

The amount of water required for ore processing at the mill was based on the mine production schedule and average mill throughput. The modelled mine production rate is 70,000 tpd for 28 years of the mine life. The expected solids content of the tailings slurry is 34.5% by weight. The volume of water available for reclaim to the mill was estimated using the TMF (Years 1 to 25.5) and open pit (Years 25.5 to 28) water balances. Process water will be supplied by the TMF reclaim system to the mill from Years 1 to 23 while tailings are being deposited in the TMF, and for an additional 1.5 years (Years 24 to 25.5) once tailings from LGO processing are being deposited in the open pit. The mill process water requirements will be supplied by the open pit dewatering system from Year 25.5 until the end of Year 28.

The primary TMF inflows are:

- Water in the tailings slurry (Years 1 to 23 only),
- Direct precipitation and runoff to the TMF, which includes runoff from the upslope catchments, and
- Runoff pumped directly to the TMF from the Non-PAG waste rock and LGO stockpiles and exposed PAG waste rock in the TMF.

The primary TMF water losses are:

- Water retained in the tailings voids,
- Water retained in the PAG waste rock voids,
- Evaporation, and
- Unrecoverable seepage.

The primary open pit inflows are:

- Water in the tailings slurry (Years 25.5 to 28),
- Direct precipitation and runoff to the open pit, which includes runoff from the upslope catchments, and
- Groundwater inflows to the open pit.

The primary open pit water losses are:

- Water retained in the tailings voids, and
- Pit lake evaporation.

The water available for process use was assumed to be the difference between these inflows and losses. Any shortfall in the water available for milling will be made up from an external source.

4 – RESULTS

4.1 OPERATIONS

The water balance model results were used to estimate the likelihood of having a water surplus or deficit in the TMF. The TMF pond is predicted to be in a net surplus condition for the entire operating life of the mine, indicating that the system (including the TMF and contributing catchment) is able to supply more than enough water to meet the mill process water requirements. The TMF pond volume throughout operations (Years 1 to 28) is shown on Figure 2.

4.2 CLOSURE

Mining of the open pit will be complete at the end of Year 23, at which time the LGO will be processed through the mill and tailings will be deposited in the open pit until the end of operations in Year 28. Figure 3 illustrates the water accumulated in the open pit, on a monthly basis, as of Year 24 onwards. The initial water volume in the open pit is from the tailings slurry and water trapped in the tailings void spaces (Years 24 to 25.5), when the TMF reclaim system is still in operations. Reclaim water is then supplied to the mill from the open pit, which draws down the open pit water volume from Years 25.5 to 28. The open pit begins to fill naturally to elevation 1530 m starting in Year 29.

The model shows that under the median condition the pit will require 1.5 years to reach its maximum pond capacity of 37 Mm^3. The total pit volume is approximately 139 Mm^3, which includes 102 Mm^3 of stored tailings.

5 – CONCLUSIONS

The results of the monthly water balance model indicate that:

- The TMF pond is predicted to be in a surplus condition throughout operations and is able to supply all the process water required to support mill processing from Years 1 to 25.5. As of Year 25.5, when LGO is processed through the mill, the open pit is able to supply all the process water required for the mill to the end of operations in Year 28.
- The TMF pond ranges from a minimum of 12 Mm^3 at start-up to a maximum of 196 Mm^3 at the end of operations, under median conditions.
- The open pit is predicted to be full as of Year 30 under median conditions, approximately 1.5 years after the end of operations. The excess water from the open pit will be pumped to the TMF for long-term storage.

6 – REFERENCES

Knight Piesold (KP) (2014). *Harper Creek Mining Corp., Harper Creek Project: Watershed Modelling* (Ref. no. VA101-458/14-1, Rev A) July 22, 2014.

Maidment, D.R. (1993). Handbook of Hydrology. McGraw-Hill Inc., Washington, DC, USA.

Ponce, M.P. (1989). Engineering Hydrology – Principles and Practices. Prentice-Hall Inc., New Jersey, USA.

Thornthwaite, C.W., 1948. *An approach toward a rational classification of climate,* Geographical Review (American Geographical Society) 38 (1): 55–94.

We trust that this letter meets the current needs of the project team. Please contact the undersigned with any questions or comments.

Yours truly,

KNIGHT PIESOLD LTD.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA E. E. RAINEY # 34952

July 24/14

Signed: Erin Rainey, P.Eng.
Project Engineer

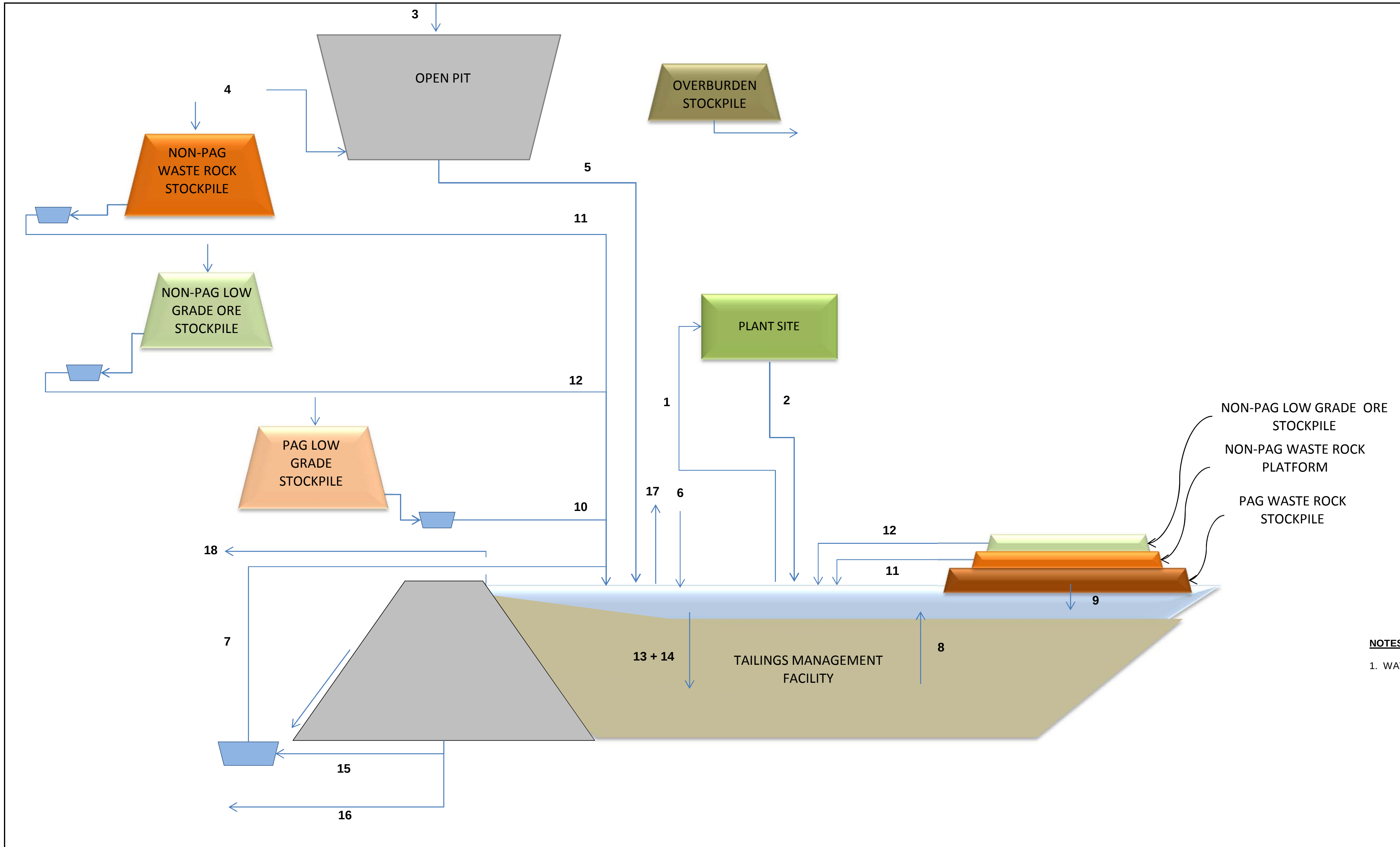
Reviewed: for: Daniel Fontaine, P.Eng.
Senior Engineer

Approved: Ken Brouwer, P.Eng.
President

Attachments:

Figure 1 Rev 0	Mine Site Water Balance Model Schematic
Figure 2 Rev 0	Monthly TMF Pond Volume Average
Figure 3 Rev 0	Closure Pit Filling Average

/er



Number	Description
	Plant Site Balance
1	TMF Reclaim
2	Water in Tailings Slurry
	Open Pit Balance
3	Direct Precip and Runoff
4	Groundwater Inflows
5	Dewatering to TMF
	Tailings Management Facility Balance
2	Water in Tailings Slurry
5	Pit Dewatering to TMF
6	Direct precipitation and runoff (pond, beach and undisturbed area)
7	Seepage Recycle (including TMF embankment runoff)
1	TMF Reclaim
8	Tailings Consolidation Seepage
9	Exposed PAG waste rock stockpile runoff into TMF
10	PAG LGO stockpile runoff
11	Non-PAG Waste Rock runoff
12	Non-PAG LGO stockpile runoff
13	Water trapped in tailings voids
14	Water trapped in PAG waste rock voids
15	Recoverable embankment seepage
16	Unrecoverable embankment seepage
17	TMF pond and beach evaporation
18	TMF spillway overflow

NOTES:

1. WATER BALANCE SCHEMATIC IS NOT DRAWN TO SCALE.

0	22JUL'14	ISSUED WITH LETTER	EER	DDF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

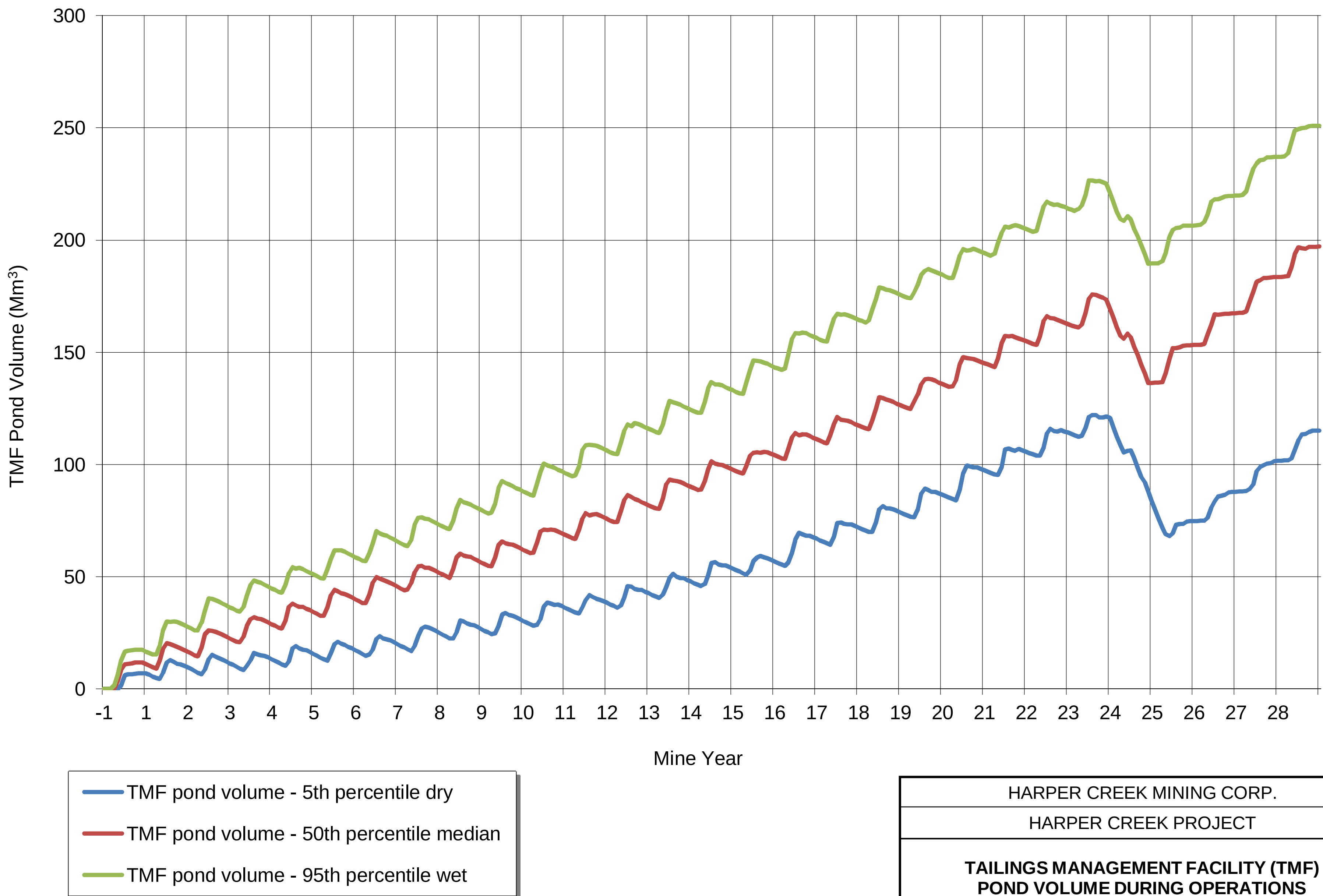
HARPER CREEK PROJECT

MINE SITE WATER BALANCE SCHEMATIC

Knight Piésold CONSULTING

P/A NO. VA101-458/14 | REF. NO. VA14-00700

FIGURE 1 | REV 0



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HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY (TMF)
POND VOLUME DURING OPERATIONS

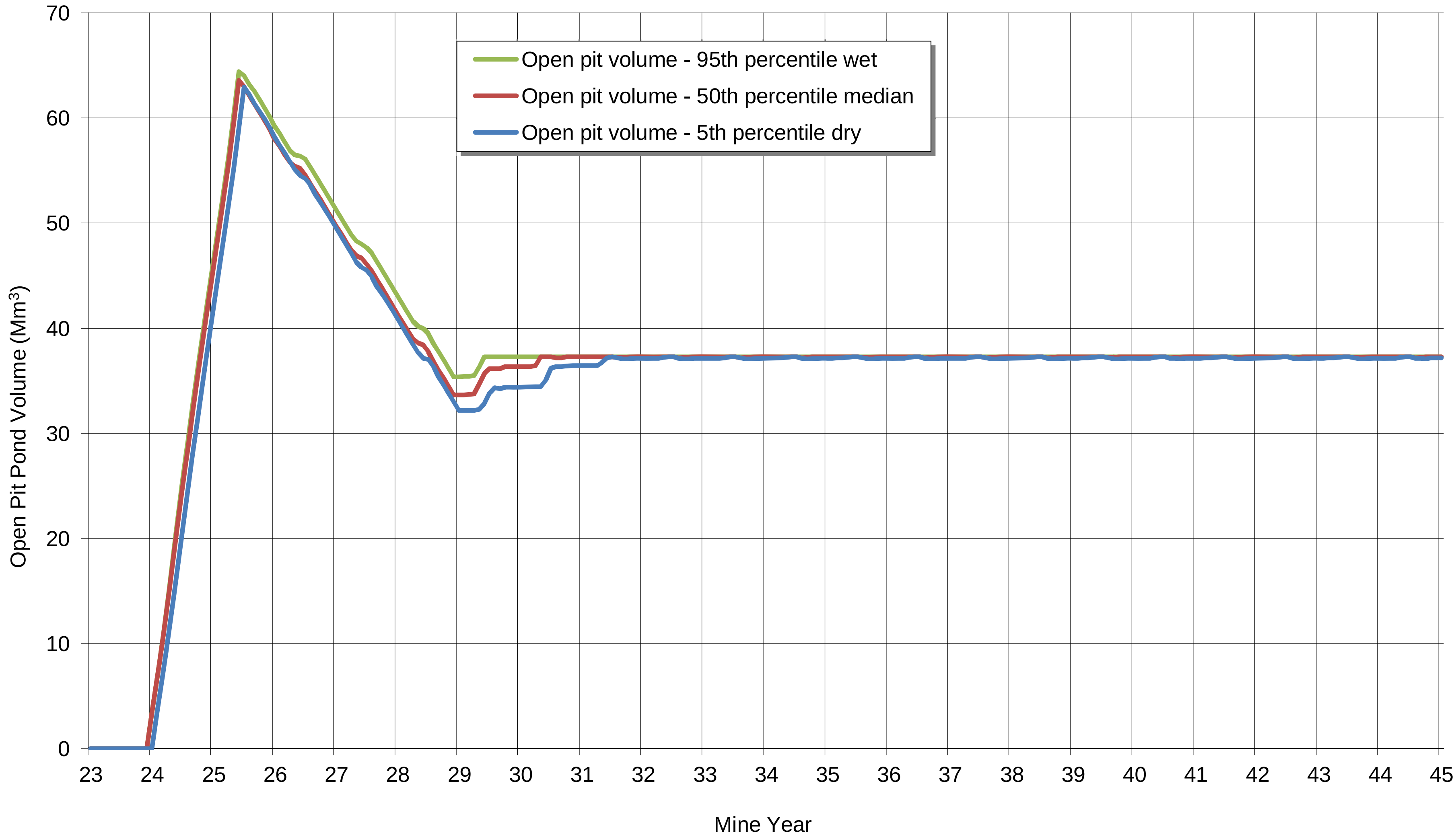
Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF. NO. VA14-00700

FIGURE 2

REV 0



NOTES:

1. THE OPEN PIT FILLING IN YEAR 24 IS BASED ON WATER TRAPPED IN THE VOIDS AND TAILINGS SLURRY WATER THAT IS DISCHARGED DURING THE LGO PROCESSING.

2. AS OF YEAR 25.5, PROCESS WATER WILL BE RECLAIMED FROM THE OPEN PIT AND THE OPEN PIT POND IS DRAWN DOWN AS A RESULT.

3. ONCE TAILING DEPOSITION CEASES IN YEAR 29, THE OPEN PIT BEGINS TO FILL NATURALLY UNTIL IT REACHES AN ULTIMATE ELEVATION OF 1530 m.

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REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

OPEN PIT VOLUME
FILLING DURING OPERATIONS AND CLOSURE

Knight Piésold CONSULTING

P/A NO. VA101-458/14

REF. NO. VA14-00700

FIGURE 3

REV 0

APPENDIX Q

SEEPAGE AND STABILITY MODELLING

(Pages Q-1 to Q-42)

June 25, 2014

File No.:VA101-458/14-A.01
Cont. No.:VA14-00865

Mr. Alastair Tiver
Vice President Operations
Harper Creek Mining Corp
730 - 800 West Pender Street
Vancouver, BC V6C 2V6

Dear Alastair,

Re: Harper Creek Project - Seepage and Stability Modelling

1 – INTRODUCTION

Harper Creek Mining Corporation (HCMC) proposes to construct and operate the Harper Creek Project (the Project), an open pit copper mine near Vavenby, British Columbia (BC). HCMC is a wholly owned subsidiary of Yellowhead Mining Inc. (YMI), which is a public BC junior mineral development company trading on the Toronto Stock Exchange. The Project has an estimated 28-year mine life based on a process plant throughput of 70,000 tonnes per day (25 million tonnes per year). Ore will be processed on site through a conventional crushing, grinding and flotation process to produce a copper concentrate, with gold and silver by-products, which will be trucked from the Project site along approximately 24km of existing access roads to a rail load-out facility located at Vavenby. The concentrate will be transported via the existing Canadian National Railway network to the existing Vancouver Wharves storage, handling and loading facilities located at the Port of Vancouver for shipment to overseas smelters.

The Project consists of an open pit mine, on-site processing facility, tailings management facility (TMF) (for tailings solids, subaqueous storage of Potentially Acid Generating (PAG) waste rock, and recycling of water for processing), waste rock stockpiles, low grade and overburden stockpiles, a temporary construction camp, ancillary facilities, mine haul roads, sewage and waste management facilities, a 24km access road between the Project site and a rail load-out facility located on private land owned by HCMC in Vavenby, and a 12km power line connecting the Project site to the BC Hydro transmission line corridor in Vavenby.

2 – SCOPE OF REPORT AND KEY REFERENCE DOCUMENTS

In 2012, YMI commissioned Merit Consultants International Inc., Knight Piésold Ltd. (KP), Nilsson Mine Services Ltd., All North Consultants, and other specialist consults to undertake a Feasibility Study (FS) for the Project. The Technical Report for the FS was filed on SEDAR on March 29, 2012 (Merit, 2012). The FS included technical modelling of seepage potential and stability analyses for the tailings management facility (TMF).

In 2014, KP was retained by HCMC to complete engineering studies and to update the design of the mine waste and water management facilities to contribute to an updated FS for the project. Following an update to the project layout and TMF design, KP was commissioned by HCMC to revise the technical modeling for the project, including updates to the 2 Dimensional (2D) stability and seepage analyses for the following:

- Tailings Management Facility (TMF)
- Non-PAG Waste Rock Stockpile

This letter presents the results of the revised 2D seepage and stability modeling for the project, and supersedes the findings discussed in the previous study (Knight Piésold, 2012a). This letter discusses the technical modelling approach and findings, and should be read in conjunction with other comprehensive reports that have been developed for the project. The following KP reports are essential to developing a complete understanding of the project mine waste and water management design and predicted project effects:

- **Mine Waste and Water Management Design** – KP report *Mine Waste and Water Management Design Report*, Ref. No. VA101-458/11-1. (Knight Piésold, 2014a)
- **Watershed Modelling** – KP report *Watershed Modelling*, Ref. No. VA101-458/14-1. (Knight Piésold, 2014b)
- **Numerical Groundwater Modelling** – KP report *Numerical Groundwater Modelling*, Ref. No. VA101-458/14-2. (Knight Piésold, 2014c)
- **Water Quality Predictions** – KP report *Water Quality Predictions*, Ref. No. VA101-458/14-3. (Knight Piésold, 2014d)

3 – TAILINGS MANAGEMENT FACILITY SEEPAGE ANALYSES

3.1 MODELLING APPROACH

Steady state seepage analyses were carried out for the Main and North Embankments to provide preliminary estimates of the seepage through the embankments and foundation materials for the final embankment configuration.

In order to determine the potential for seepage flow along the northwestern and southeastern flanks of the TMF, seepage analyses were completed at two sections of low topography (denoted East Saddle and West Saddle).

The analysed sections for the TMF are identified on Figure 1 and are described as follows:

- Main Embankment: Sections 1, 2 & 3
- North Embankment: Section 6
- East Saddle: Section 4
- West Saddle: Section 5

The seepage analyses were conducted using the 2D finite element computer program SEEP/W (Geostudio, 2007). Sensitivity analyses were also carried out to assess the range of the predicted seepage rates to variation in the saturated hydraulic conductivity of the foundation and embankment materials and variation in the model boundary conditions.

The seepage rate through foundation materials and embankment fill zones will be influenced by the following factors:

- Permeability of the natural glacial till materials that blanket the basin
- Permeability of the Orthogneiss bedrock foundation
- Thickness and permeability of the tailings stored within the TMF
- Permeability of the embankment core zones
- Seepage gradients in the embankment and foundation zones, and
- Seepage area (increases during operations).

The seepage flow rate is expected to vary over the life of the TMF as it is gradually filled with tailings, PAG waste rock materials and supernatant water. The tailings deposit will increase in thickness during operations and the tailings mass will also decrease in permeability due to on-going self-weight consolidation.

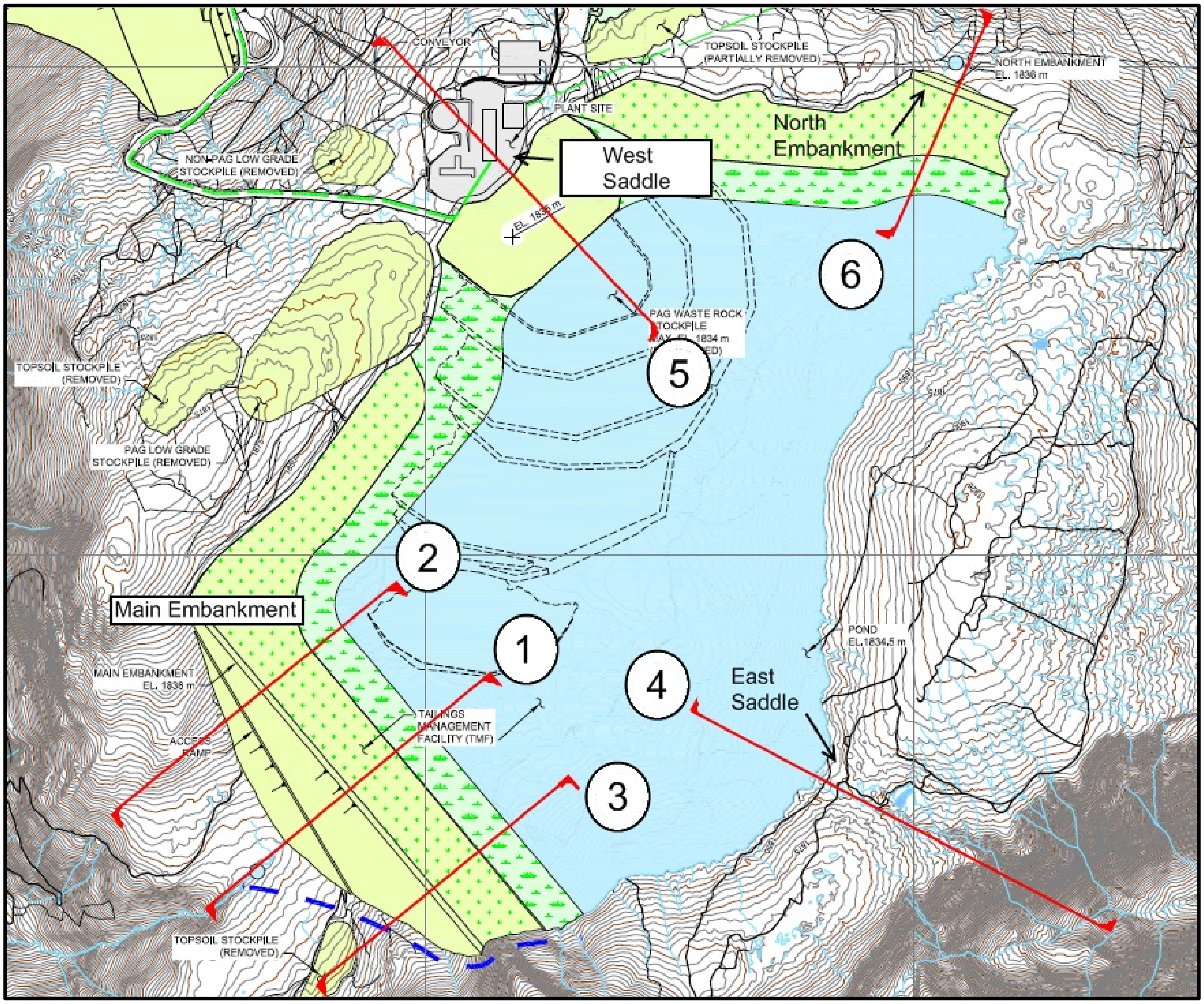

Figure 1: General Arrangement of TMF at Closure with 2D Analysis Sections Identified

3.2 SUMMARY OF MATERIAL PARAMETERS

The following sections provide a description of materials that have been included in the seepage analysis. The saturated hydraulic conductivity of each of the materials was based on published values for anticipated material types and compared with existing in-situ permeability testing or laboratory test results wherever possible to derive a best estimate value. Where the material permeability is expected to be variable, or is expected to have a significant impact on the estimated seepage rates, the sensitivity of the total seepage rates has been assessed by varying the saturated hydraulic conductivity within a reasonable range. Hydraulic conductivity functions for partially saturated soils were estimated based on material type.

The material parameters used in the seepage analyses are summarized in Table 1.

Table 1 - Summary of Seepage Analysis Material Parameters

Unit	Saturated or Unsaturated	Horizontal Saturated Hydraulic Conductivity (m/sec)			Anisotropy Ratio (KV:KH)
		Lower Bound	Base Case	Upper Bound	
Embankment Materials					
Zone S (Core)	Saturated or Unsaturated	1.00E-08	5.00E-08	1.00E-07	1
Zone F (Filter)	Saturated or Unsaturated		5.00E-05		1
Zone T (Transition)	Saturated or Unsaturated		1.00E-04		1
Zone C (Waste Rock / Shell)	Saturated or Unsaturated		1.00E-04		1
Waste Materials					
Tailings Beach	Saturated or Unsaturated	1.00E-07	5.00E-07	1.00E-06	0.1
Consolidated Tailings	Saturated or Unsaturated	1.00E-08	5.00E-08	1.00E-07	0.1
Unconsolidated Tailings	Saturated or Unsaturated		5.00E-07		0.1
PAG Waste Rock	Saturated or Unsaturated		1.00E-04		1
Foundation Materials					
Overburden (SEE NOTE 1)	Saturated or Unsaturated		5.00E-07		1
Glacial Till (SEE NOTE 1)	Saturated or Unsaturated	5.00E-08	1.00E-07	5.00E-07	1
Orthogneiss Bedrock (to 30m depth)	Saturated or Unsaturated	5.00E-08	1.00E-07	1.00E-06	1
Orthogneiss Bedrock (30 to 50m depth)	Saturated or Unsaturated	2.00E-08	5.00E-08	2.00E-07	1
Orthogneiss Bedrock (50 to 200m depth)	Saturated or Unsaturated		1.00E-08		1
Orthogneiss Bedrock (200 to >500m depth)	Saturated		1.00E-10		1

NOTES:

1. 'Overburden' refers to the moderately permeable foundation material that is expected to comprise a combination of glacial till and colluvium in the vicinity of the non PAG waste rock stockpile and seepage collection dam, whilst 'Glacial Till' refers to the foundation material in the vicinity of the TMF.

3.2.1 Embankment Materials

The materials used in the construction of the embankments will be excavated and/or processed from the open pit and local borrow areas. The embankments will comprise the following zones:

- The core zone (Zone S) will be will be constructed from low-permeability glacial till from nearby external borrows and from pit stripping. The material will consist of well-graded silty sand with some gravel with a fines content of 20% to 60% passing the #200 sieve. The material will be compacted to 95% standard proctor maximum dry density (SPMDD).
- The filter zone (Zone F) will be processed material and will comprise clean, fine to coarse sand. Zone F will be placed and spread in maximum 600 mm lifts loose and compacted by four to six passes with smooth drum vibratory rollers.
- The transition zone (Zone T) will be processed material and will clean, sand and gravel. Zone T will be placed and spread in maximum 600 mm lifts loose and compacted by four to six passes with smooth-drum vibratory rollers.
- The shell zone (Zone C) will comprise random fill consisting of overburden and specific waste rock material types from the open pit. The material will be compacted by truck traffic in maximum lifts between 1 to 2 m depending on the equipment utilised.

3.2.2 Tailings and Waste Rock Materials

Laboratory testing has been completed on the tailings samples produced during lock cycle metallurgical test work. The tested tailings materials can be described as a non-plastic, fine-grained sandy-silt with traces of clay. The particle size distribution of the tailings sample comprised approximately 46-52% fine sand, 44-50% silt, and 4% clay. The Unified Soil Classification System (USCS) has been used for describing and categorizing soil within groups to allow for the development of distinct soil properties. The tailings can be classified as sand with fines (SM) and a fine-grained soil with very fine sands (ML) depending on the particle size distribution. The tailings material was grouped into three separate units for the purposes of the seepage analysis;

- The ‘tailings beach’ unit represents the higher permeability coarser grained fraction of the tailings that is expected to settle into the tailings basin over the length of the beach as the tailings slurries migrate towards the TMF pond
- The ‘consolidated tailings’ unit represents the tailings materials that have consolidated under considerable self-weight over the life of the project. A clear boundary between consolidated and unconsolidated tailings will not exist, however for modelling purposes this has been approximated to half the depth of the tailings impoundment.
- The ‘unconsolidated tailings’ unit represents the portion of tailings that are undergoing ongoing self-weight consolidation.

The PAG waste rock from the open pit will be placed in the TMF impoundment for subaqueous disposal. For the purposes of the seepage analysis, the PAG waste rock material is assumed to have the same saturated hydraulic conductivity as the shell zone (Zone C) waste rock.

3.2.3 Foundation Materials

<u>Overburden Materials</u>

The overburden thickness in the vicinity of the embankments is a glacial till material that is found to range in thickness from scarce to approximately 10 m. An average thickness was chosen to represent the overburden layer in the numerical models. The glacial till material was characterized through visual classification as well as through the completion of laboratory particle size analysis testing. The details of the site investigation and laboratory program were presented in the 2011 Site Investigation Report (Knight Piésold Ltd., 2012a). The overburden typically consisted of silty-sand with some gravel, and is classified by the USCS as a coarse grained soil with gravel and fines (SM-SC and GM-GC).

The USCS classification group allows for comparison of anticipated geotechnical properties of the soil with published typical ranges of these properties. These properties include permeability, shear strength, compaction characteristics, workability and volume change potential of a soil, and how it will be affected by water, frost and other physical conditions. The range of material parameters was verified with respect to the expected hydraulic conductivity ranges published in Freeze and Cherry (1979).

Orthogneiss Bedrock

The bedrock unit in the vicinity of the TMF footprint comprises orthogneiss. Bedrock characterization undertaken during the 2011 site investigation program (Knight Piésold, 2012b) identified that the orthogneiss has a mean RMR of 68, a mean RQD of 74%, and a mean intact Uniaxial Compressive Strength of approximately 130 MPa. No distinct weathering profile was observed. During the site program, hydrogeological testing was completed in order to estimate the in situ hydraulic conductivity of the orthogneiss. Lugeon testing (single packer) was completed in all geotechnical and geomechanical drillholes, and falling head response testing was conducted following standpipe piezometer or monitoring well installation. The hydraulic conductivity of the orthogneiss was shown to generally decrease with depth. A plot of hydraulic conductivity values measured during the testing compared with test interval depth is shown on Figure 2.

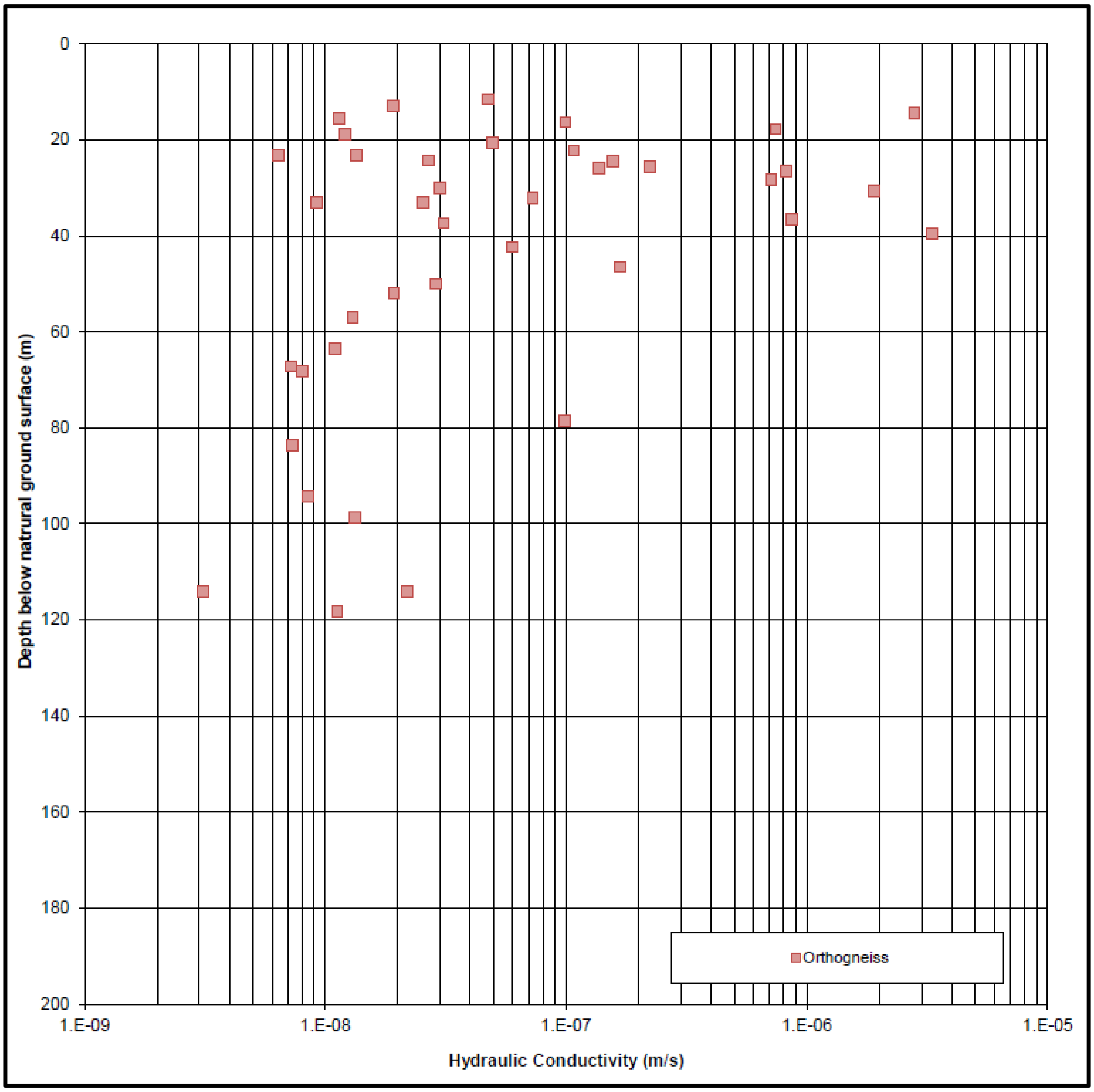

Figure 2: Hydraulic Conductivity Testing Summary – Orthogneiss Bedrock

3.3 BOUNDARY CONDITIONS AND FLUX SECTIONS

Boundary conditions used in the seepage analyses were selected to represent the hydrogeological conditions expected during operation of the TMF. The boundary conditions used in the analyses are summarised as follows:

- A total head boundary was used to represent the water table at the upstream side of the embankment for the final embankment elevations. A final embankment pond elevation of 1,834 m was assumed with a 300 m tailings beach as the base case condition.
- A total head boundary was used to represent the water table at the downstream extent of the models. The downstream water table was assumed to be approximately 2 m below natural ground surface.
- A seepage face boundary condition was applied to the downstream face of the dam and the downstream natural ground surface to estimate the seepage flow expected to exit the ground within the model extents. The seepage flowing out of the embankment dam face was assumed to be recovered and returned to the tailings pond via the seepage collection pond whilst the seepage exiting the ground downslope of the embankment dam was assumed to be lost to the watershed
- A seepage face boundary condition was applied to the base of the transition zone to model the presence of a longitudinal PVC drain. The seepage flow exiting the model via this drain was assumed to be recovered and returned to the tailings pond via the seepage collection pond
- As a sensitivity case, a recharge value of between 1×10^{-8} m/sec (315 mm/year) was applied to the beach of the main embankment dam sections to assess the effect of tailings water (transport water) and precipitation infiltration on the total seepage flow rates.
- As a sensitivity case, a recharge value of between 1×10^{-9} m/sec (31.5 mm/year) was applied to the downslope ground surface of the saddle sections to assess the effect of precipitation infiltration on the total seepage flow rates.

Flux sections were located in key areas of the seepage models to estimate total, recovered and potentially unrecoverable seepage flows.

3.4 SEEPAGE FLOW CALCULATION METHODOLOGY

The seepage models provided an estimate of the unit seepage rate (per lineal metre of embankment) through each representative section.

The main embankment was divided into three sections (Sections 1, 2 and 3 as identified on Figure 1) and the unit seepage rates were estimated for each section. The total seepage flow was estimated by establishing a function between unit flow rate and dam height across the length of the dam from the three representative sections.

The seepage rates for the north embankment (Section 6), east saddle (Section 4) and the west saddle (Section 5) were estimated using a single representative cross section at each location. The total seepage flow was calculated by establishing a function between unit flow rate, section height, and a representative length for each section. The seepage estimate is reported by means of the following metrics:

- Total Seepage (l/s) – Indicates the total tailings seepage that is expected to permeate through the TMF embankments and foundation for each section
- Unrecoverable Seepage (l/s) – Indicates the total tailings seepage that is expected to be unrecoverable and could reach the watershed downstream of the TMF with the planned seepage controls in place.
- Unrecoverable Seepage as a Percentage of Total Seepage (%) – Indicates the proportion of unrecoverable seepage relative to the total seepage originating from the TMF. This is considered a useful metric to evaluate the effectiveness of the water management features.

Representative cross sections through the main embankment, north embankment, east saddle and west saddle are shown on Figures A-1 through A-5 in Appendix A.

3.5 BASE CASE SEEPAGE RESULTS

3.5.1 Base Case Seepage Estimates

The base case seepage was estimated using the base case parameters identified in Table 1.

The base case total seepage through the main embankment and foundation was predicted to be approximately 14 l/s at the end of operations at a final embankment crest elevation of 1836 m. Approximately 1 l/s (7%) was estimated to be unrecoverable and lost to the watershed. The remaining amount was modelled to be captured in the seepage collection system and returned to the TMF.

The base case total seepage through the north embankment and foundation was predicted to be approximately 0.10 l/s at the end of operations at a final embankment crest elevation of 1836 m. The analysis indicated that the majority of this seepage will infiltrate into the foundation and will be unrecoverable, however in practice it is expected that a portion of this total seepage will be recovered in the downslope seepage collection system and will be returned to the TMF.

The base case total seepage through the foundation in the vicinity of the east saddle and west saddle was estimated to be 0.11 l/s and 0.07 l/s respectively and at the end of operations and at a final pond elevation of 1834 m. In practice, precipitation recharge on the downslope side of TMF the embankment is expected to reduce the hydraulic gradient across these saddles and the net total seepage is expected to be negligible.

3.6 MATERIAL PARAMETER SENSITIVITY ANALYSIS SEEPAGE RESULTS

A material parameter sensitivity analysis was completed for each of the sections. The sensitivity analyses were undertaken by investigating the change in total seepage estimate when the saturated hydraulic conductivity of a single material was varied in isolation. Hydraulic conductivity parameters were varied for the following materials:

- Zone S (core zone material)
- Tailings Beach Material (coarse grained tailings)
- Consolidated Tailings
- Glacial Till
- Orthogneiss Bedrock to 30 m depth
- Orthogneiss Bedrock from 30 m to 50 m depth.

The following sections describe the results of the material parameter sensitivity analysis completed for each of the analysis sections. Plots of the sensitivity analysis results are provided in Appendix B.

3.6.1 Main Embankment (Sections 1, 2 & 3)

The results of the sensitivity analysis for the main embankment are presented in Table 2 (below) and Figure B-1 and Figure B-2 (Appendix B). The results indicate that the main embankment dam seepage estimate is sensitive to the saturated hydraulic conductivity of the ‘Tailings Beach’ material and the uppermost layer of the orthogneiss bedrock (<30 m depth below natural ground level (ngl)). The unrecoverable seepage is shown to be most notably sensitive to the saturated hydraulic conductivity of the uppermost layer of the orthogneiss bedrock (<30 m depth below ngl). The unrecoverable seepage is generally insensitive to the saturated hydraulic conductivity of the other materials.

Table 2 - Upper, Lower Bound and Base Case Seepage Estimates – Main Embankment

Sensitivity Analysis	Lower Bound	Base Case	Upper Bound
Material	**Total Seepage (l/s)**		
Zone C	13	14	15
Tailings Beach	9	14	17
Consolidated Tailings	13	14	15
Glacial Till	14	14	15
Orthogneiss Bedrock (to 30 m depth)	14	14	19
Orthogneiss Bedrock (30 to 50 m depth)	14	14	15
Material	**Unrecoverable Seepage (l/s)**		
Zone C	1	1	1
Tailings Beach	1	1	1
Consolidated Tailings	1	1	1
Glacial Till	1	1	1
Orthogneiss Bedrock (to 30 m depth)	1	1	4
Orthogneiss Bedrock (30 to 50 m depth)	1	1	2
Material	**Unrecoverable Seepage as a percentage of Total (%)**		
Zone C	9	7	7
Tailings Beach	11	7	6
Consolidated Tailings	8	7	7
Glacial Till	7	7	9
Orthogneiss Bedrock (to 30 m depth)	7	7	18
Orthogneiss Bedrock (30 to 50 m depth)	6	7	12

3.6.2 North Embankment (Section 6)

The results of the sensitivity analysis for the north embankment are presented in Figure B-3 and Figure B-4 (attached). The results indicate that the north embankment seepage estimate is sensitive to the saturated hydraulic conductivity of the uppermost layer of the orthogneiss bedrock (<30 m depth below ngl) and the second layer of orthogneiss bedrock (30 to 50 m depth below ngl). The total seepage estimate is not sensitive to the embankment material hydraulic conductivity or the tailings hydraulic conductivity and for each sensitivity case, the estimate of unrecoverable seepage is expected to be over 95% of the total seepage estimate.

3.6.3 East Saddle (Section 4)

The results of the sensitivity analysis for the east saddle are presented in Figure B-5. The results indicate that the east saddle seepage estimate is sensitive to the saturated hydraulic conductivity of the uppermost layer of the Orthogneiss bedrock (<30 m depth below ngl) and the second layer of orthogneiss bedrock (30 to 50 m depth below ngl) with an upper bound total seepage estimate of 0.20 l/s. The total seepage estimate is not sensitive to the tailings hydraulic conductivity.

3.6.4 West Saddle (Section 5)

The results of the sensitivity analysis for the west saddle are presented in Figure B-6. The results indicate that the North embankment dam seepage estimate is sensitive to the saturated hydraulic conductivity of the uppermost layer of the Orthogneiss bedrock (<30 m depth below ngl) with an upper bound total seepage estimate of 0.39 l/s.

3.7 BOUNDARY CONDITIONS SEEPAGE SENSITIVITY ANALYSIS

3.7.1 Effect of Recharge Water on Tailings Beach

A recharge boundary condition of 1 x 10^{-8} m/sec (315 mm/year) was applied to the tailings beach at the main embankment to assess the effect of tailings transport water and precipitation on the total seepage rates. The total seepage estimate for the main embankment was found to increase to 19 l/s (132% of the base case estimate) with 1 l/s unrecovered seepage (unchanged).

3.7.2 Effect of Tailings Beach

In normal operating conditions, the tailings beach is expected to extend approximately 300 m from the main embankment crest. A scenario was modelled to determine an upper bound seepage estimate assuming the supernatant pond was allowed to reach the embankment dam (i.e. no tailings beach). The result was an increase in total seepage by an order of magnitude, with a total seepage of approximately 160 L/s. Unrecoverable seepage did not increase in this scenario, indicating that in this upper bound case seepage could still be captured at the downstream water management pond and recycled back to the TMF for long-term storage.

4 – TAILINGS MANAGEMENT FACILITY STABILITY ANALYSES

4.1 MODELLING APPROACH

Stability analyses of the TMF embankment were carried out to investigate the slope stability under both static and seismic loading conditions. The following cases were evaluated:

- Static conditions during operations and post-closure
- Earthquake loading from the Operating Basis Earthquake (OBE), the Maximum Design Earthquake (MDE), and Earthquake loading from the 1:10,000 year earthquake event
- Post-earthquake conditions using residual (post-liquefaction) tailings strengths.

Representative cross sections through the main and north embankments were based on the geotechnical foundation conditions and the maximum section for each embankment. The analyses were carried out for the following embankment configurations:

- Final embankment (crest elevation 1836 m) with full tailings storage and pond elevation at 1834 m
- Stage 1 embankment (crest elevation 1720 m) with no tailings deposition and no retained water (main embankment only – upstream failure mode)
- Stage 1 embankment (crest elevation 1720 m) with no tailings deposition and pond water level at 1718 m (main embankment only – downstream failure mode)

The stability analyses were carried out using the limit equilibrium computer program SLOPE/W (Geostudio, 2007). In this program a systematic search is performed to obtain the minimum factor of safety from a number of potential slip surfaces. Factors of safety have been computed using the Morgenstern-Price Method.

In accordance with international recommendations (ICOLD, 1995) and standard industry practice, the minimum acceptable factor of safety for the tailings embankment under static conditions is 1.5 for normal operating conditions and for long-term (post-closure) of the TMF. A factor of safety of less than 1.0 is acceptable for earthquake loading conditions provided that calculated embankment deformations resulting from seismic loading are not significant and that the post-earthquake stability of the embankment maintains a factor of safety greater than 1.2, to ensure there is no potential for a flow-slide failure following liquefaction. Limited deformation of the embankment is acceptable under seismic loading from the MDE, provided that the overall stability and integrity of the TMF is maintained and that there is no release of stored tailings or water. Some remediation may be required following the MDE.

4.2 MATERIAL PARAMETERS AND ASSUMPTIONS

The following parameters and assumptions were incorporated into the stability analyses:

- Bulk unit weights for the embankment and foundation materials were based on laboratory testing or typical values for similar materials.
- An undrained shear strength was adopted to represent the tailings material strength for the static, seismic and post-earthquake cases, as described by the following relation:
  - o S_u/p' = 0.25 (static and seismic loading)
  - o S_u/p' = 0.10 (post liquefaction residual strength), where;
    - S_u = undrained shear strength, and
    - p' = effective vertical stress.
- Effective strength parameters for the embankment fill and foundation materials were estimated based on typical values for similar materials.
- The shear strength for Zone C was defined using a conservative strength function that defines the variation with shear strength with normal stress. This strength function is based on published information on the shear strength properties of rockfill (Leps, 1970).
- A piezometric line was used to represent the predicted phreatic surface in the stability analysis as determined from the seepage analysis.

The material strength parameters adopted for the stability analyses are summarized in Table 3.

The embankment geometries analyzed for the main embankment are shown on Figures C-1 and C-2 (Appendix C) for the Stage 1A embankment and final embankment, respectively. The geometry of the final north embankment used in the stability analyses is shown in Figure C-3.

Table 3 - Material Strength Parameters

Unit	Unit Weight (kN/m^3)	Friction Angle (deg)	Cohesion (kPa)
Embankment Materials			
Zone S (Core)	22	34	0
Zone F (Filter)	21	36	0
Zone T (Transition)	21	36	0
Zone C (Waste Rock / Shell)	23	See Note 1	
Tailings Materials			
Tailings Beach	18	See Note 2	
Consolidated Tailings	18	See Note 2	
Unconsolidated Tailings	18	See Note 2	
Waste Rock			
Non PAG Waste Rock	23	See Note 1	
PAG Waste Rock	23	See Note 1	
Foundation Materials			
Overburden (See Note 1)	22	36	0
Glacial Till (See Note 1)	22	36	0
Orthogneiss Bedrock	Impenetrable		

NOTES:

1. A relationship for friction angle and effective stress was developed for the rockfill materials, based on published information on the shear strength properties of rockfill (Leps, 1970).
2. A relationship for shear stress and effective normal stress (S_u/p') was used to model the tailings strength. The (S_u/p') values used for the analyses were 0.25 for static and seismic loading and 0.1 for liquefied tailings.

4.3 RESULTS OF STABILITY ANALYSIS

4.3.1 Static Analyses

The calculated Factors of Safety (FOS) for each of the dam sections considered in this study exceed the minimum Factor of Safety requirement of 1.5 for static normal operating (steady-state) conditions and the minimum Factor of Safety of 1.3 for upstream failure post construction of the starter embankment. It should be further noted that the critical surface identified for each static analysis does not result in any loss of freeboard as the critical failure surface is shown to pass through the dam crest. A summary of the Factors of Safety (FOS) for the cases analysed are presented in Table 4.

Table 4 - Static Analyses Results Summary

Description	Minimum FOS	Comments
TMF Main Embankment at EL 1836 m (Final Height)		
Normal Operating Conditions	1.56	-
TMF Main Embankment at EL 1720 m (Starter Embankment – Stage 1A)		
Normal Operating Conditions	1.71	-
Normal Operating Conditions – Failure of upstream slope	1.42	-
Normal Operating Conditions – Pond at EL 1718 m	1.63	No tailings deposition, water in impoundment to EL 1718 m
TMF North Embankment at EL 1836 m (Final Height)		
Normal Operating Conditions	2.04	-

NOTES:
1. Only slip surfaces with a minimum of 2 m depth have been considered in the analysis

4.3.2 Seismic Stability and Deformation Analyses

A seismic stability assessment of the TMF has included estimation of earthquake induced deformation of the embankment from the OBE, MDE, and the 1:10,000 event. The design ground motion parameters for the design earthquake events have been provided by the seismic hazard analysis completed for the project (Knight Piésold, 2012c).

The OBE has been defined as the 1 in 475 year earthquake with a mean Peak Ground Acceleration (PGA) of 0.08g. A design earthquake magnitude of 7 was adopted for the OBE.

The MDE has been assessed to correspond with the Earthquake Design Ground Motion (EDGM) as per table 6-1B of the 2013 revision to the 2007 CDA Dam Safety Guidelines. The guidelines revision states that the EDGM for a Dam Class ‘Very High’ should be selected based on the mean PGA corresponding to halfway between the PGA for the 1 in 2,475 year earthquake and the PGA for the 1 in 10,000 year earthquake. This corresponds to a PGA of 0.21g. A design earthquake magnitude of 7.3 was adopted for the MDE.

The PGA acceleration for the 1:10,000 year event has also been considered to demonstrate the robustness of the embankment design in closure to seismic loading. The 1 in 10,000 year earthquake corresponds with a PGA of 0.26g. A design earthquake magnitude of 7.3 was adopted for the 1:10,000 year event.

Embankment stability during earthquake loading from the OBE, MDE and 1:10,000 year event has been assessed by performing pseudo-static analysis, whereby a horizontal force (seismic coefficient) is applied to the embankment to simulate earthquake loading. The yield acceleration required to reduce the factor of safety to 1.0 was determined by iterative stability analyses. Deformation of the embankment is predicted to occur if the yield acceleration is lower than the average maximum ground acceleration along the potential slip surface from the earthquake.

Potential deformations under earthquake loading from the design earthquake events have been estimated using the simplified methods of Newmark (1965) and Makdisi-Seed (1977). These two methods estimate displacement of the potential sliding mass based on the average maximum ground acceleration along the slip surface and the yield acceleration.

The more recently published method of Bray (2007) was also used to predict seismically induced slide displacement of the embankment. In addition to the yield acceleration, this method considers the predominant period of response (Ts) of the embankment under seismic loading and the corresponding spectral ground acceleration (Sa). The predominant period is related to the stiffness characteristics of the embankment fill and to the height of the embankment. Spectral acceleration values were provided by the uniform hazard spectrum defined for each design earthquake event. The uniform hazard spectra for the design earthquake events were defined from the results of the site specific probabilistic seismic hazard analysis (Knight Piésold, 2012c).

The estimated yield acceleration is 0.2g for the Main Embankment at final height, between 0.18g and 0.23g for the Main Embankment at the starter height (elevation 1720 m) and 0.35g for the North Embankment at final height. Predicted embankment deformations under seismic loading are negligible, if any, as the calculated yield acceleration either exceeds, or is only slightly lower than the estimated average PGA values for the OBE and MDE events. For the 1:10,000 event, the estimated deformations are very small (<0.03 m) and do not impact the embankment freeboard or result in any loss of embankment integrity.

Some deformation of the embankment is expected to result from settlement of the fill materials during earthquake shaking. Potential settlement of the embankment crest has been estimated using the empirical relationship provided by Swaisgood (2003). This relationship was developed from an extensive review of case histories of embankment dam behaviour due to earthquake loading. Required inputs to the relationship are the earthquake magnitude, the maximum acceleration on rock at the site, the depth to rock (overburden thickness) and the embankment height. The predicted maximum crest settlements for the Main Embankment at final height are approximately 0.05 m for the OBE, 0.14 m for the MDE and 0.19 m for the 1:10,000 year event. The predicted maximum crest settlements for the North Embankment at final height are minor (<0.02) for all design earthquake events.

The calculated yield accelerations and corresponding estimated embankment deformations and crest settlements for each of the methods described above are presented in Table 5.

The predicted maximum embankment displacements and potential crest settlements under seismic loading from the OBE and MDE are acceptable and would not significantly impact embankment freeboard or result in any loss of embankment stability or integrity. The performance and integrity of the embankment core, drainage and filter zones would not be impacted by the predicted deformations.

The findings of the seismic stability analyses indicate that the TMF would remain stable and function normally after the OBE, MDE and 1:10,000 year event.

Table 5 – TMF Seismic Displacement Results Summary

Description	Design PGA[1] (g) Mean[2]	Design Earthquake Magnitude	Calculated Yield Acceleration (K_Y)[3]	Displacement Along Slip Surface (m)			Crest Settlement (m)
				Newmark[4]	Makdisi-Seed (Average)[4]	Bray ($D_{84\%}$)[5]	Swaisgood[6]
TMF Main Embankment at EL 1836 m (Final Height)							
OBE	0.08	7	0.20	0.00	0.00	0.00	0.05
MDE	0.21	7.3	0.20	0.00	0.02	0.00	0.14
1:10,000 event	0.26	7.3	0.20	0.01	0.03	0.02	0.19
TMF Main Embankment at EL 1720 m (Starter Embankment – Stage 1A)							
OBE – Full tailings height volume	0.08	7	0.18	0.00	0.00	0.00	0.02
MDE – Empty Impoundment	0.21	7.3	0.18	0.01	0.04	0.01	0.05
MDE – Pond at EL 1718 m	0.21	7.3	0.23	0.00	0.00	0.01	0.05
TMF North Embankment at EL 1836 m (Final Height)							
OBE	0.08	7	0.35	0.00	0.00	0.00	0.01
MDE	0.21	7.3	0.35	0.00	0.01	0.01	0.02
1:10,000 Event	0.26	7.3	0.35	0.00	0.00	0.01	0.02

NOTES

1. The design maximum acceleration is for site class C conditions (defined as soft rock or very dense soils).
2. Mean acceleration values are conservatively estimated by multiplying the median acceleration value by 1.15. Mean acceleration values are recommended for dam design by the Canadian Dam Association "Dam Safety Guidelines" (2007).
3. The yield acceleration (ky) corresponds to the horizontal seismic coefficient (acceleration) required to reduce the factor of safety to 1.0
4. The Newmark (1965) and Makdisi-Seed (1977) methods estimate potential displacement along the critical slip surface.
5. The Bray (2007) method estimates potential displacement taking into consideration the fundamental period of the structure (Ts) and the ground motion's spectral acceleration at a degraded period equal to 1.5Ts.
6. The Swaisgood (2003) method estimates the predicted vertical settlement of the dam crest
7. Slip surfaces are a minimum of 2 m depth

4.3.3 Post-Liquefaction Stability Analysis

A stability assessment of the TMF has been undertaken to assess the static stability of the embankments following an earthquake event. The calculated Factors of Safety (FOS) for each of the dam sections considered in this study exceed the minimum Factor of Safety requirement of 1.2 for post liquefaction stability.

The post-earthquake condition conservatively assumes complete liquefaction of the tailing deposit and assumes a post-liquefaction residual strength for the entire tailings deposit. For each of the dam sections the calculated minimum factors of safety are the same as the static factor of safety as the critical potential slip surface does not pass through the liquefied tailing deposit. This indicates that the TMF embankment is not dependent on tailing strength to maintain stability and is not susceptible to a flow slide or large deformations resulting from earthquake-induced liquefaction of the tailing deposit.

A summary of the Factors of Safety (FOS) for the cases analysed are presented in Table 6.

Table 6 – Post-Liquefaction Analyses Results Summary

Description	Minimum FOS	Comments
TMF Main Embankment at EL 1836 m (Final Height)		
Post Liquefaction Stability - Reduced Tailings Strength	1.56	Failure does not propagate into tailings (see Note 2)
TMF North Embankment at EL 1836 m (Final Height)		
Post Liquefaction Stability - Reduced Tailings Strength	2.04	Failure does not propagate into tailings (see Note 2)

NOTES:

1. Only slip surfaces with a minimum of 2 m depth have been considered in the analysis
2. The post liquefaction Factor of Safety is the same as the pre earthquake static case as critical potential slip surfaces do not pass through the tailings deposit

5 – NON PAG WASTE STOCKPILE STABILITY

The non PAG waste stockpile was assessed against the Dump Stability Rating (DSR) scheme from the Investigation and Design Manual Interim Guidelines (BC MWRPRC, 1991). A stability analysis was also undertaken to determine the factors of safety for the stockpile.

5.1 WASTE STOCKPILE STABILITY RATING SCHEME

The Investigation and Design Manual Interim Guidelines (BC MWRPRC, 1991) provides recommendations for stability assessment of mine waste piles. These guidelines include a Dump Stability Rating (DSR) scheme. The DSR system provides a semi-quantitative method for assessing the relative potential of dump stability and recommends the appropriate level of investigation and design. This is based on individual point ratings for each of the main factors affecting dump stability. Each factor is given a point rating based on qualitative and/or quantitative descriptions accounting for the possible range of conditions. An overall DSR is calculated as the sum of the individual ratings for each of the various factors. Copies of Table 5.1 “Dump Stability Rating Scheme” and Table 5.2 “Dump Stability Classes and Recommended Level of Effort” from the waste dump research committee guidelines are included in Appendix A.

The dump rating guidelines were used to classify the Non PAG Waste Stockpile. A summary of the results are presented in Table 7. The Non-PAG Waste Stockpile is classified as Class III, Moderate Hazard. The Moderate Hazard classification recommends that additional site investigations, including laboratory testing and a detailed stability analysis be completed for the next level of detailed design.

Table 7 - Non-PAG Waste Rock Stockpile Stability Classification

Key Factors Affecting Stability[1]	Condition	Point Rating
Dump Height	100 - 200 m	100
Dump Volume	Large	100
Dump Slope	Moderate	50
Foundation Slope	Moderate	50
Degree of Confinement	Confined	0
Foundation Type	Intermediate	100
Dump Material Quality	Moderate	100
Method of Construction	Mixed	100
Piezometric & Climatic Conditions	Intermediate	100
Dumping Rate	Moderate	100
Seismicity	Moderate	50
DUMP STABILITY RATING		**850**
	Class	**Failure Hazard**
Dump Stability Class[2]	III	Moderate

In general, the dump stability classification indicates that a basic stability analysis is required. In accordance with provincial guidelines (BC MWRPRC, 1991) and standard industry practice, the minimum acceptable factor of safety for waste dumps under static conditions is 1.3 for short-term operating conditions, 1.5 after reclamation and abandonment and 1.0 for a pseudo-static analysis. The BC Mine Waste Rock Pile Research Committee (MWRPRC) interim guidelines for design factors of safety are presented in Appendix D (Table 6.4).

5.2 NON-PAG WASTE STOCKPILE STABILITY ANALYSES

Slope stability analyses for the non PAG Waste Stockpile were carried out for the final design height of the stockpile (closure condition). The stability analyses were carried out using the SLOPE/W (Geostudio, 2007) along the section identified in plan on Figure 3. The analysis was undertaken to assess the stability of the maximum height of the stockpile slope. The effect of the interaction of the waste stockpile on the open pit slope stability was not assessed for this study.

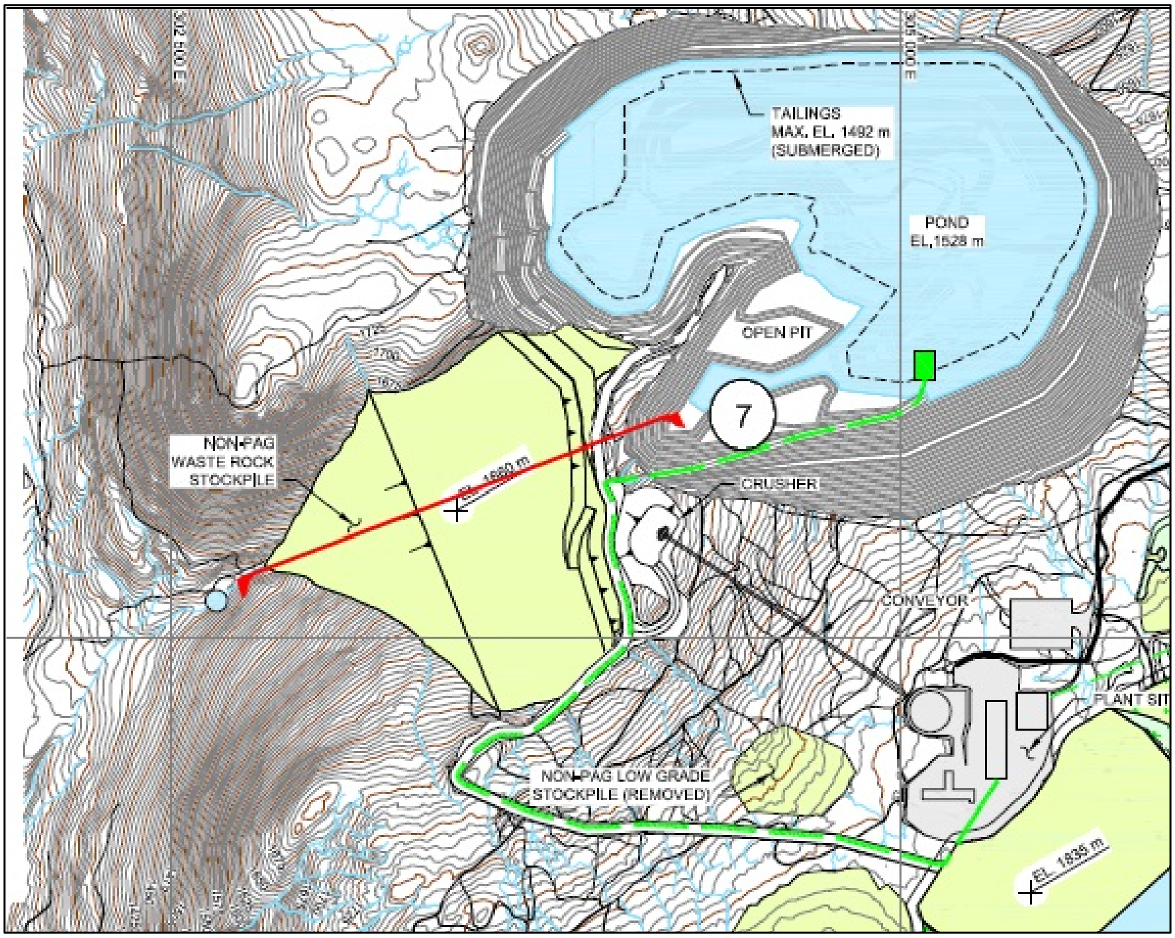

Figure 3 Non PAG Waste Stock Pile General Arrangement at closure with 2D analysis section (Section 7) identified

The static Factor of Safety against failure is 1.52 and the pseudo-static Factor of Safety against failure from an applied PGA corresponding to the 1:475 event (defined as the event which has a 10% probability of exceedance in 50 years) was determined to be 1.38. Both the static and pseudo-static Factors of Safety exceed the minimum design Factors of Safety for as presented in Table 6.4 of the BC MWRPRC (1991) and included in Appendix D. The critical potential failure surface and factor of safety for the static condition is shown on Figure C-4.

In order to demonstrate the robustness of the design, seismic displacements were estimated according to the methods of Newmark (1965), Makdisi and Seed (1977), Bray (2007) and Swaisgood (2003) (described in detailed in Section 4.3.2). The ground motion parameters for the 1:10,000 year events as identified in the TMF stability analysis were used to estimate the seismic displacements for the waste stockpile. The estimated yield acceleration is 0.19g. Predicted displacements under seismic loading for the 1:10,000 event are shown to be negligible and estimated crest settlement is 0.29 m.

6 – REFERENCES

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7 – CLOSURE

This letter report presents a summary of the stability and seepage analyses undertaken for the Harper Creek mining project to date.

We trust the information contained herein meets your needs at this time. Should you required additional information please contact the undersigned.

Yours truly,
KNIGHT PIESOLD LTD.

Signed: ______________________ Angus Robb, P.Eng. Project Engineer

Reviewed: ______________________ Dan Fontaine, P.Eng Senior Engineer

Approved: ______________________ Ken Brouwer, P.Eng. Managing Principal

Attachments:

Appendix A	Seepage Analysis Figures
Appendix B	Seepage Sensitivity Analysis Plots
Appendix C	Stability Analysis Plots
Appendix D	Selected Tables from the Investigation and Design Manual Interim Guidelines (BC MWRPRC, 1991)

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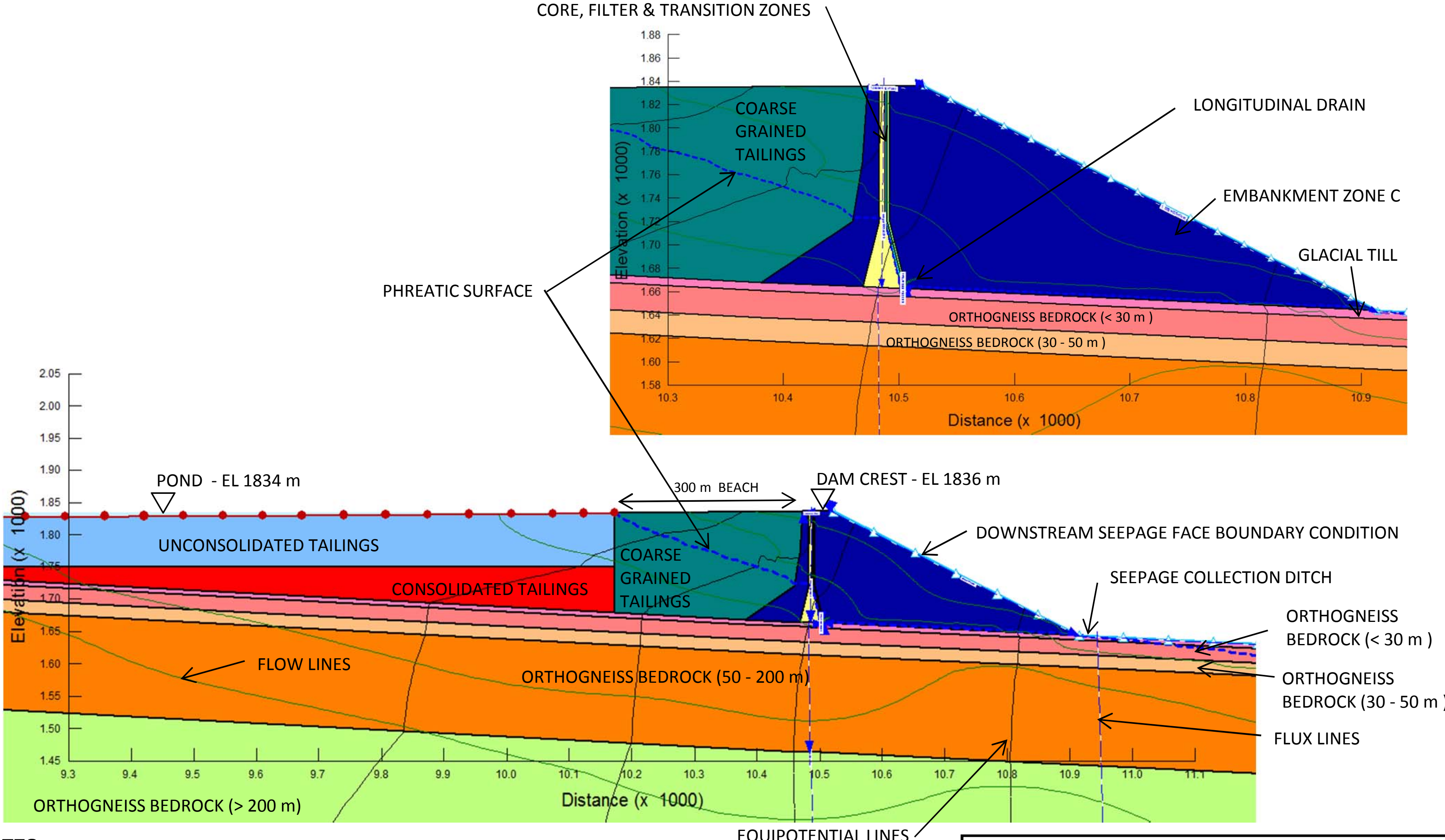
APPENDIX A

SEEPAGE ANALYSIS FIGURES

(Figures A-1 to A-5)



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
SEEPAGE ANALYSIS
MAIN EMBANKMENT - SECTION 1

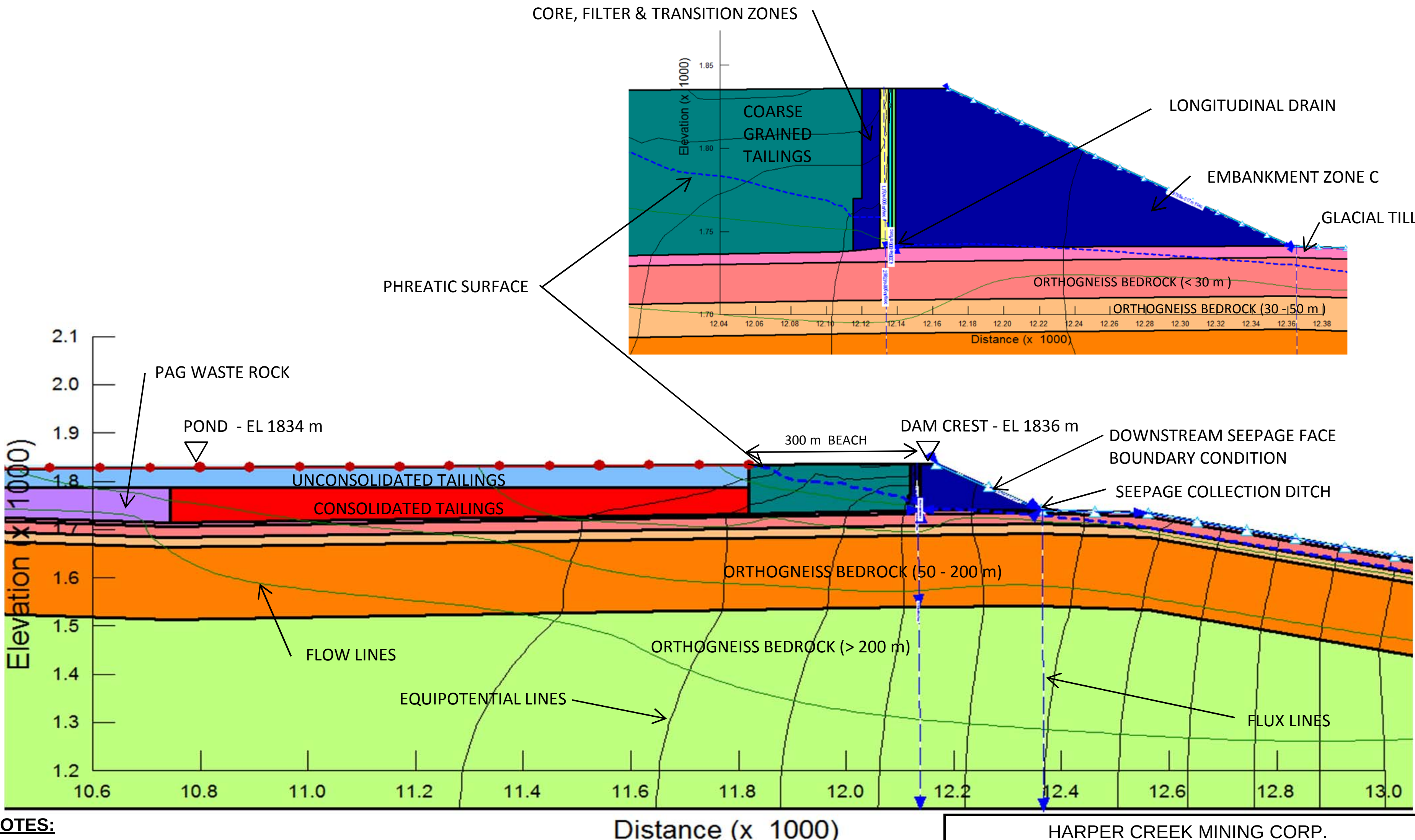
Knight Piésold CONSULTING

P/A. NO. VA101-458/14

REF NO. VA14-00865

FIGURE A-1

REV A



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
SEEPAGE ANALYSIS
MAIN EMBANKMENT - SECTION 2 & 3

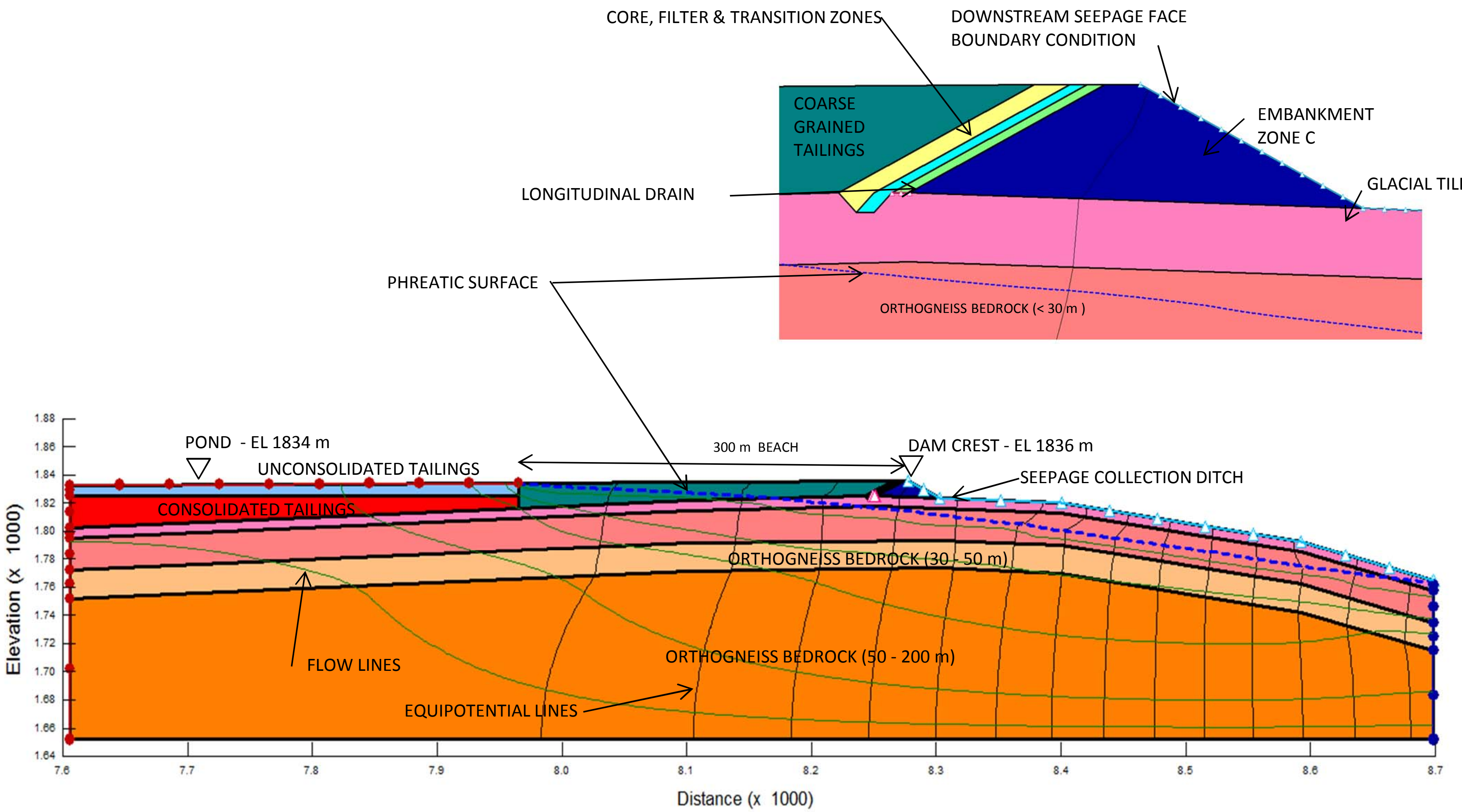
Knight Piésold CONSULTING

P/A. NO. VA101-458/14

REF NO. VA14-00865

FIGURE A-2

REV A



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
SEEPAGE ANALYSIS
NORTH EMBANKMENT - SECTION 6

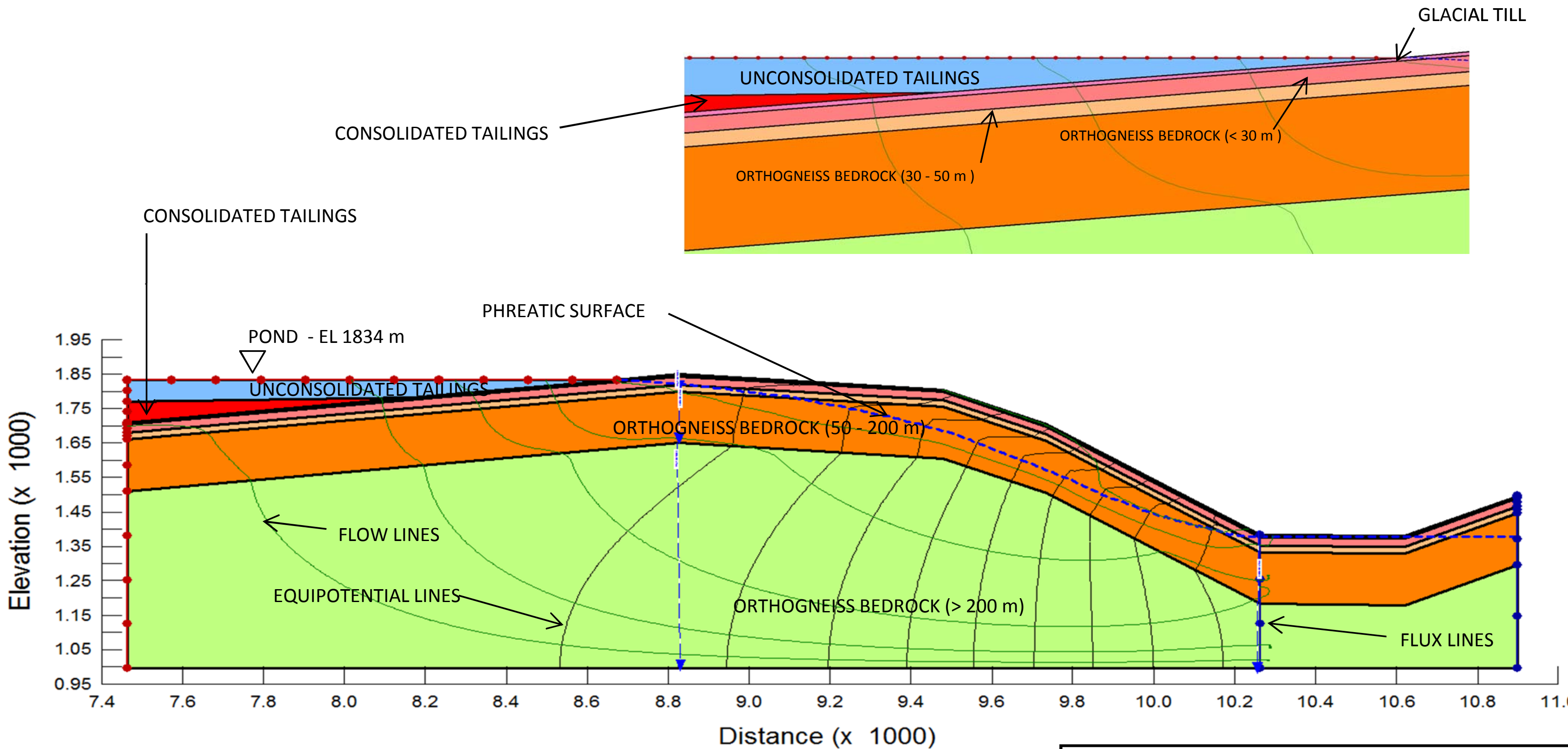
Knight Piésold CONSULTING

P/A. NO. VA101-458/14

REF NO. VA14-00865

FIGURE A-3

REV A



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS.

HARPER CREEK MINING CORP.	
HARPER CREEK PROJECT	
TAILINGS MANAGEMENT FACILITY SEEPAGE ANALYSIS EAST SADDLE - SECTION 4	
Knight Piésold CONSULTING	P/A. NO. VA101-458/14 — REF NO. VA14-00865
	FIGURE A-4 — REV A

A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-
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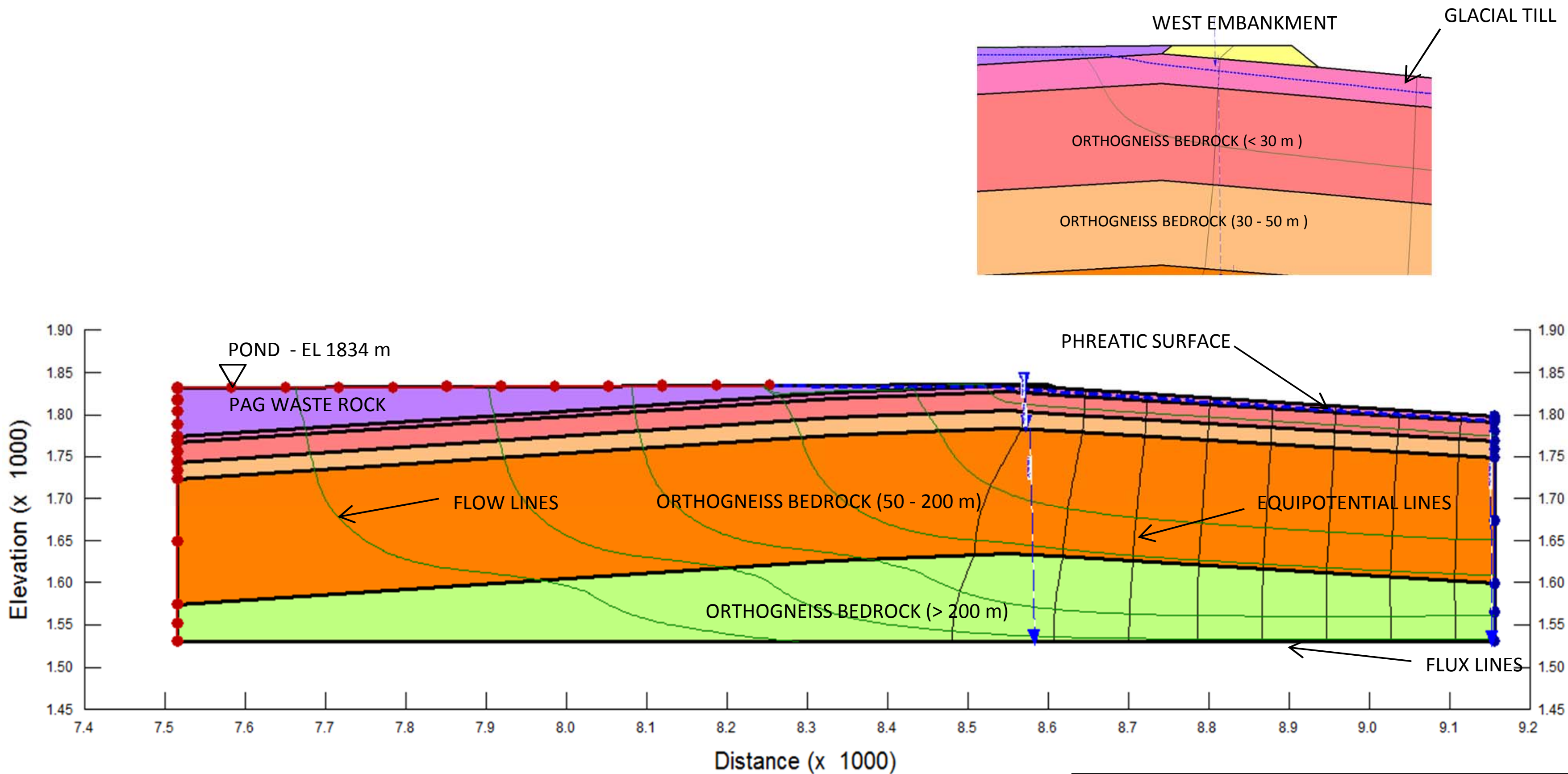

NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
SEEPAGE ANALYSIS
WEST SADDLE - SECTION 5

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P/A. NO. VA101-458/14

REF NO. VA14-00865

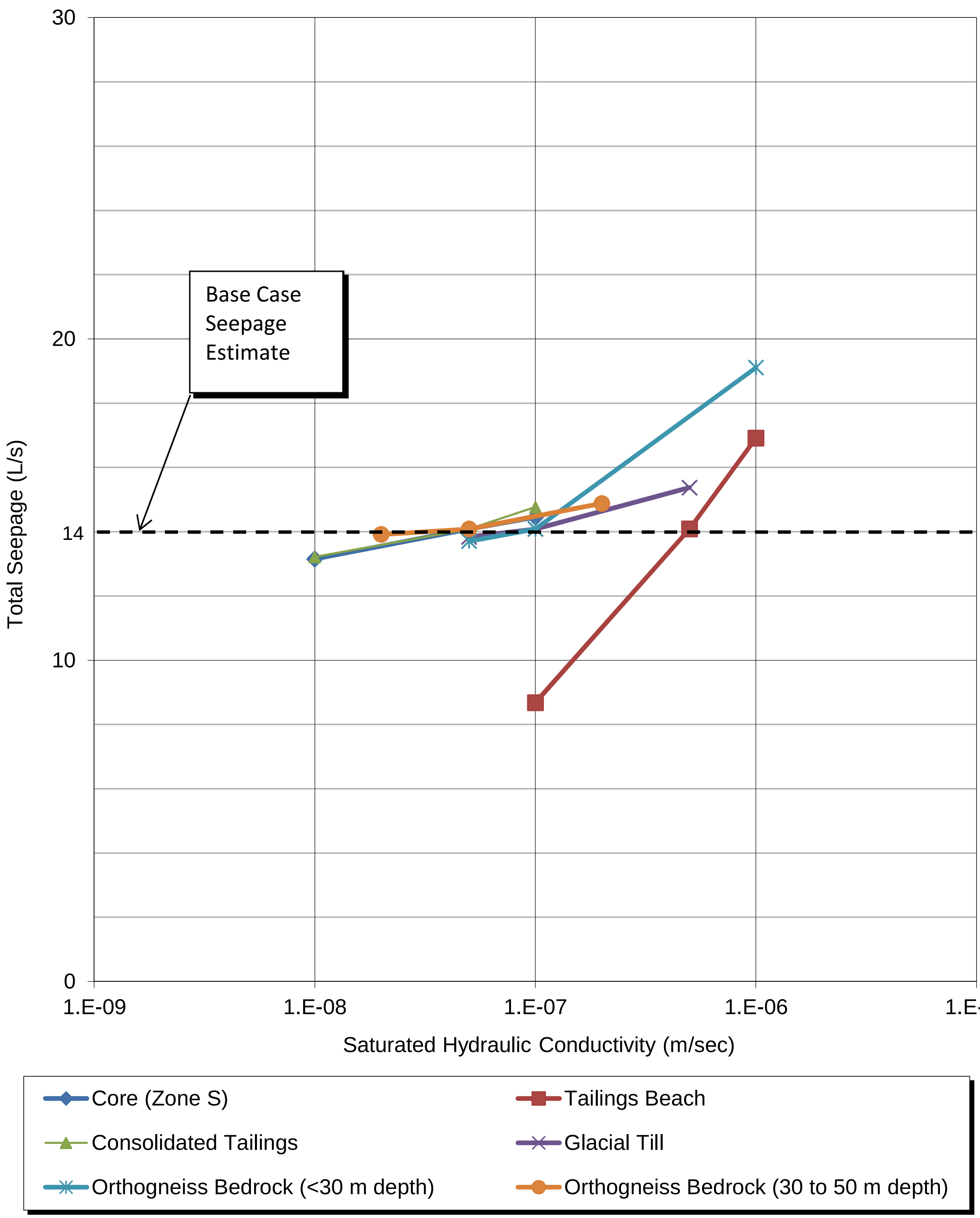
FIGURE A-5

REV A

APPENDIX B

SEEPAGE SENSITIVITY ANALYSIS PLOTS

(Figures B-1 to B-6)



NOTES:
1. EACH SERIES REPRESENTS THE SENSITIVITY ANALYSIS PERFORMED FOR THE MATERIAL IDENTIFIED IN THE SERIES TITLE, WITH ALL OTHER MATERIAL PARAMETERS AS PER THE BASE CASE PARAMETERS

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

SECTIONS 1,2, & 3 - MAIN EMBANKMENT
TMF SEEPAGE SENSITIVITY ANALYSIS
TOTAL SEEPAGE

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-457/6	VA14-00825

FIGURE B-1 REV A

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
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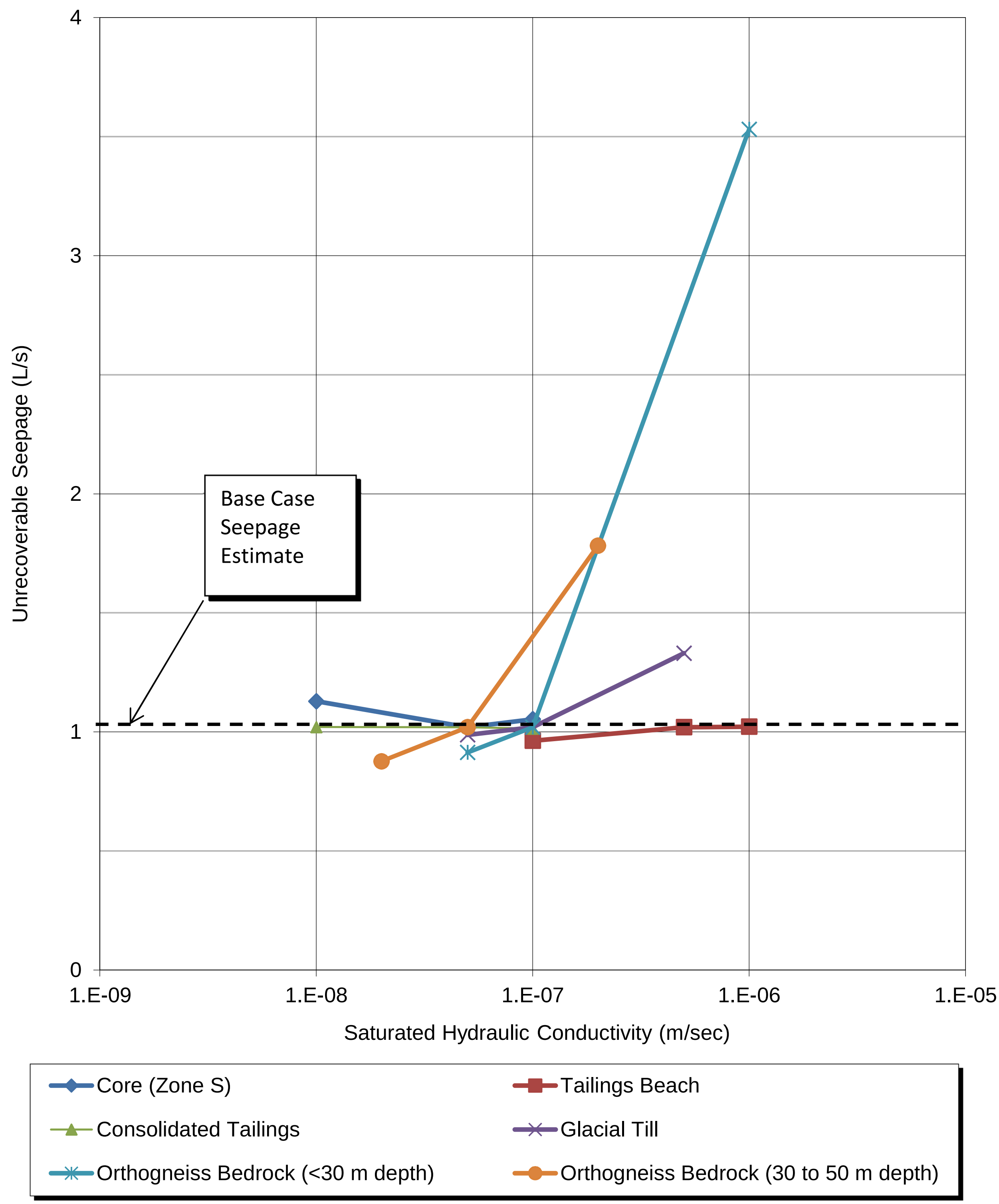


NOTES:

1. EACH SERIES REPRESENTS THE SENSITIVITY ANALYSIS PERFORMED FOR THE MATERIAL IDENTIFIED IN THE SERIES TITLE, WITH ALL OTHER MATERIAL PARAMETERS AS PER THE BASE CASE PARAMETERS

A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

SECTIONS 1, 2 & 3 MAIN EMBANKMENT
TMF SEEPAGE SENSITIVITY ANALYSIS
UNRECOVERABLE SEEPAGE

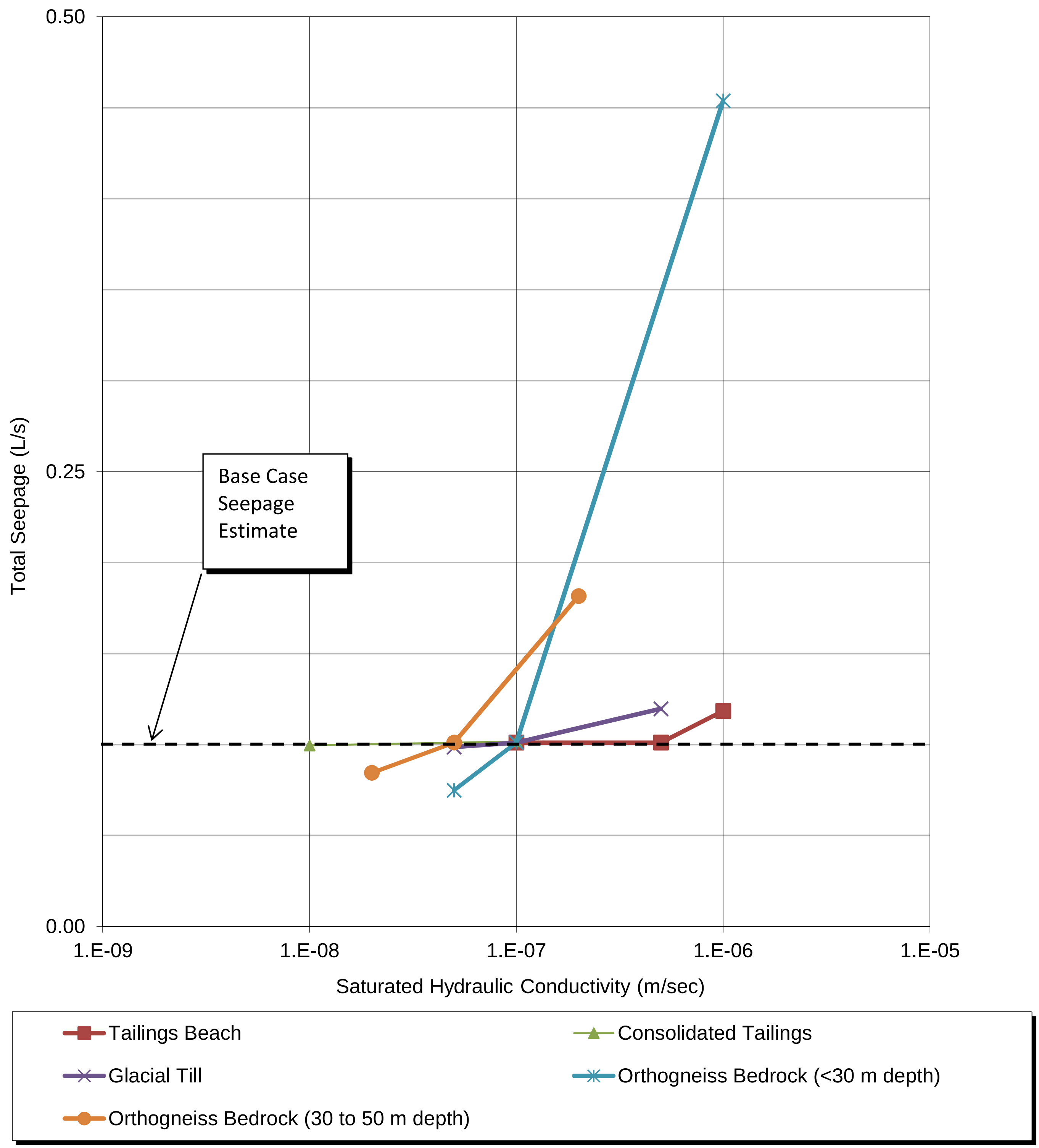
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. VA14-00825

FIGURE B-2

REV A



NOTES:

1. EACH SERIES REPRESENTS THE SENSITIVITY ANALYSIS PERFORMED FOR THE MATERIAL IDENTIFIED IN THE SERIES TITLE, WITH ALL OTHER MATERIAL PARAMETERS AS PER THE BASE CASE PARAMETERS
2. THE SENSITIVITY OF THE CORE ZONE MATERIAL WAS NOT INVESTIGATED FOR THE NORTH EMBANKMENT SECTION

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

SECTION 6 - NORTH EMBANKMENT
TMF SEEPAGE SENSITIVITY ANALYSIS
TOTAL SEEPAGE

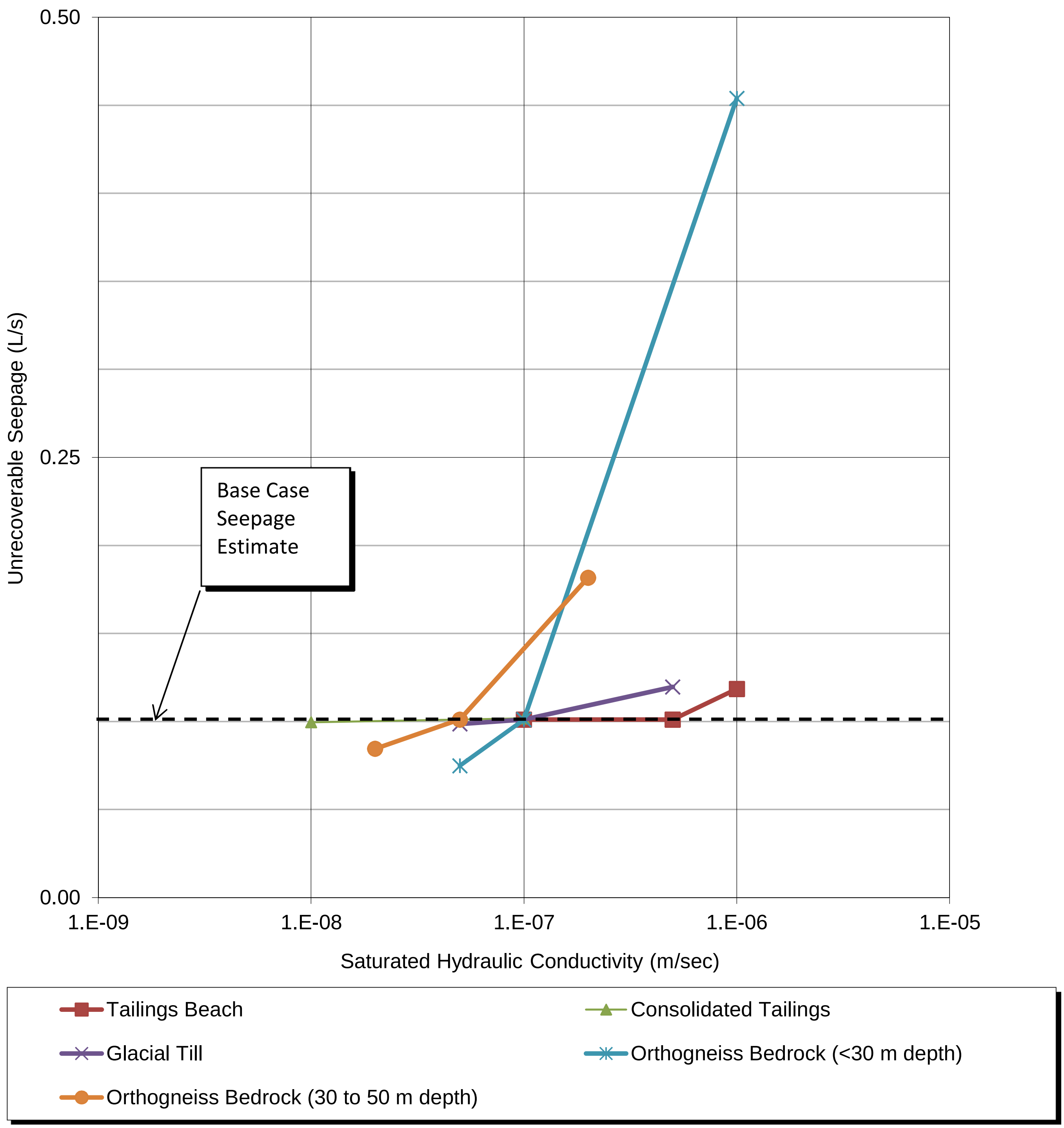
Knight Piésold CONSULTING

P/A NO. VA101-457/6

REF. NO. VA14-00825

FIGURE B-3

REV A



NOTES:
1. EACH SERIES REPRESENTS THE SENSITIVITY ANALYSIS PERFORMED FOR THE MATERIAL IDENTIFIED IN THE SERIES TITLE, WITH ALL OTHER MATERIAL PARAMETERS AS PER THE BASE CASE PARAMETERS
2. THE SENSITIVITY OF THE CORE ZONE MATERIAL WAS NOT INVESTIGATED FOR THE NORTH EMBANKMENT SECTION
3. LOST SEEPAGE ESTIMATES EQUAL THE TOTAL SEEPAGE ESTIMATES AS THE PHREATIC SURFACE IS FOUND TO DROP BELOW THE EMBANKMENT CORE AND NO SEEPAGE IS RECOVERABLE

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

SECTION 6 - NORTH EMBANKMENT
TMF SEEPAGE SENSITIVITY ANALYSIS
UNRECOVERABLE SEEPAGE

Knight Piésold CONSULTING

P/A NO. VA101-457/6 | REF. NO. VA14-00825

FIGURE B-4 | REV A

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
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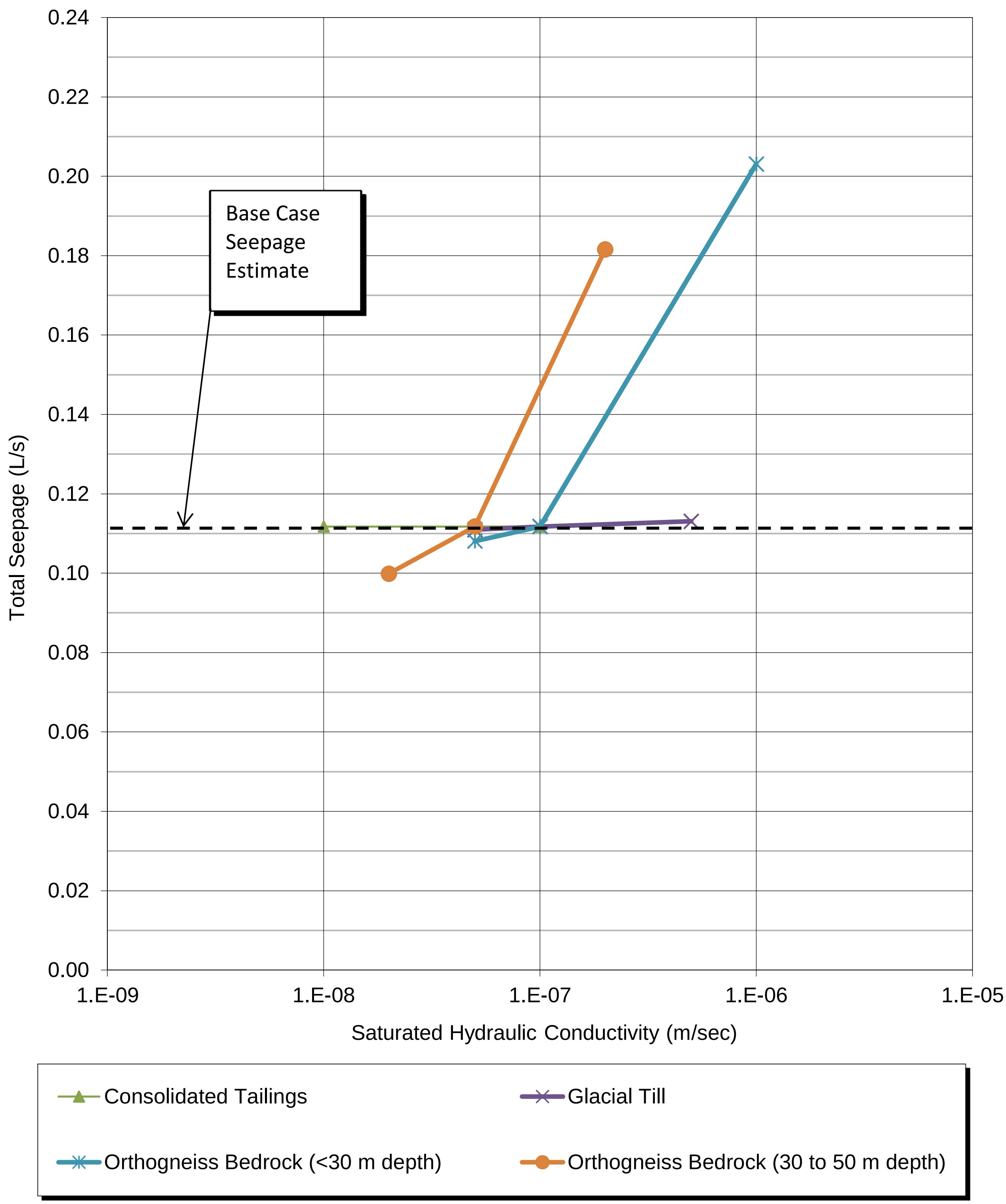

NOTES:
1. EACH SERIES REPRESENTS THE SENSITIVITY ANALYSIS PERFORMED FOR THE MATERIAL IDENTIFIED IN THE SERIES TITLE, WITH ALL OTHER MATERIAL PARAMETERS AS PER THE BASE CASE PARAMETERS
2. ALL SEEPAGE IS ASSUMED TO BE UNRECOVERABLE

HARPER CREEK MINING CORP.

HARPER CREEK PROJECT

SECTION 4 - EAST SADDLE
TMF SEEPAGE SENSITIVITY ANALYSIS
TOTAL SEEPAGE

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P/A NO. VA101-457/6

REF. NO. VA14-00825

FIGURE B-5

REV A

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
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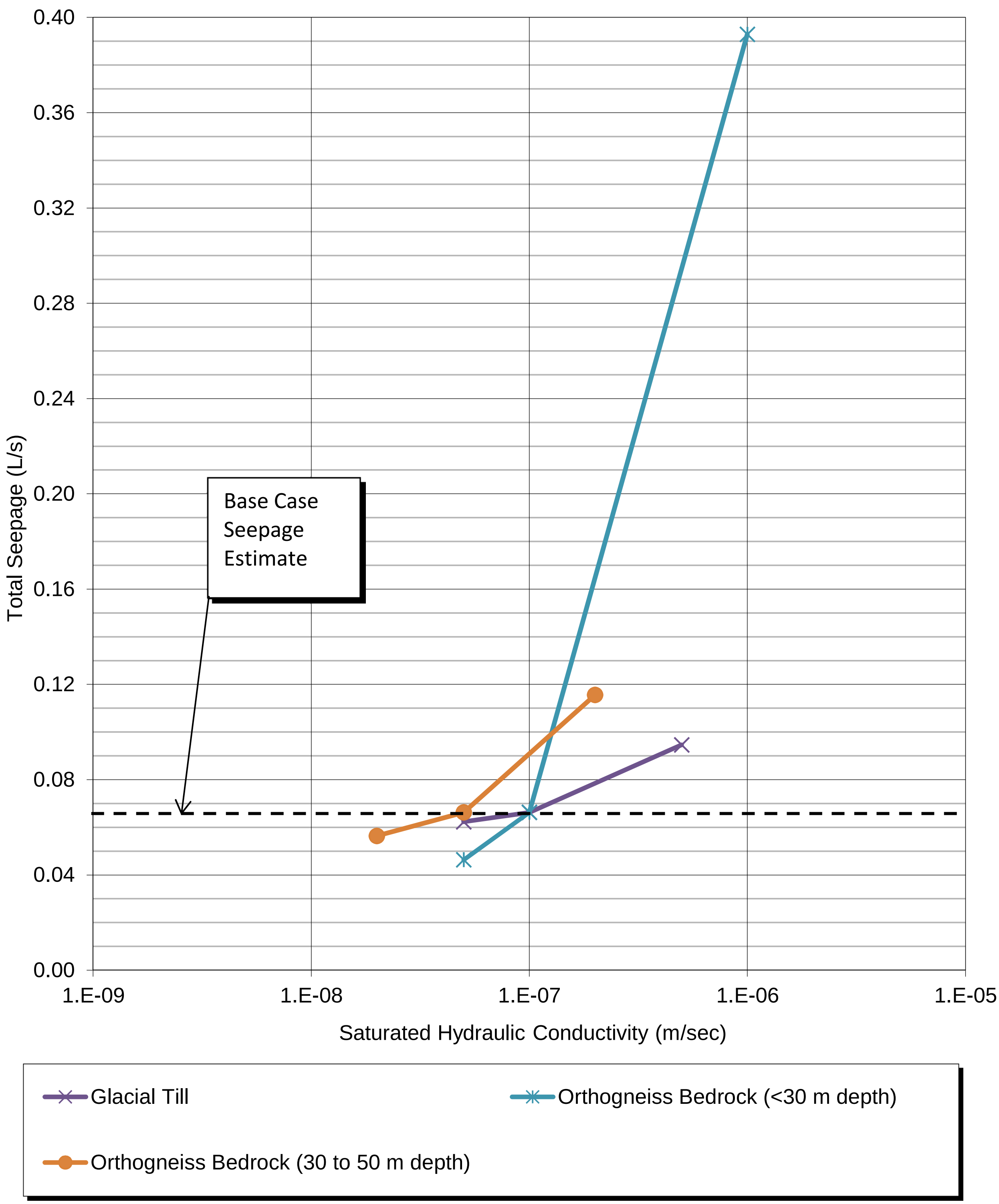

NOTES:
1. EACH SERIES REPRESENTS THE SENSITIVITY ANALYSIS PERFORMED FOR THE MATERIAL IDENTIFIED IN THE SERIES TITLE, WITH ALL OTHER MATERIAL PARAMETERS AS PER THE BASE CASE PARAMETERS
2. ALL SEEPAGE IS ASSUMED TO BE UNRECOVERABLE

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HARPER CREEK PROJECT

SECTION 5 - WEST SADDLE
TMF SEEPAGE SENSITIVITY ANALYSIS
TOTAL SEEPAGE

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P/A NO. VA101-457/6 | REF. NO. VA14-00825

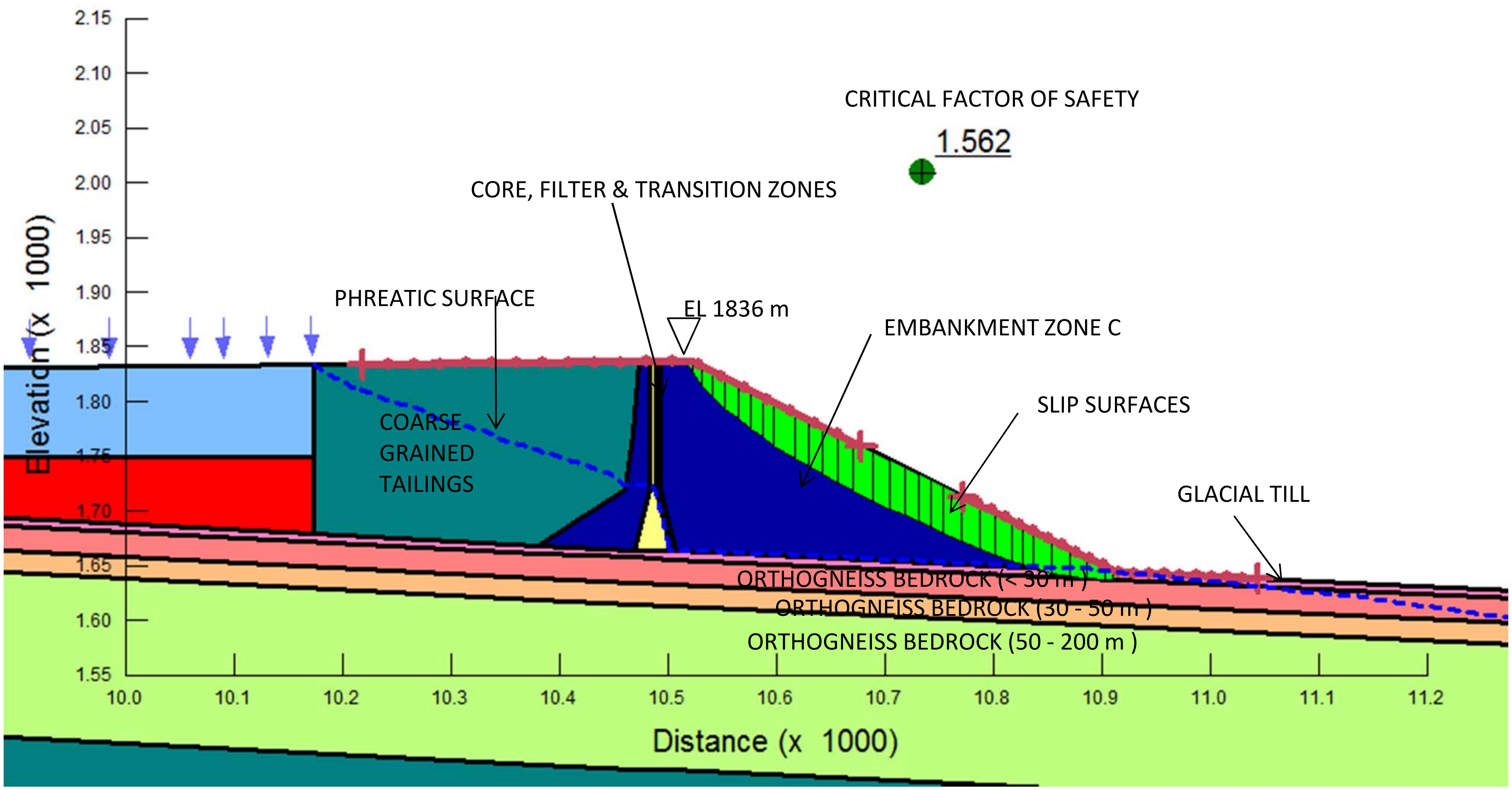
FIGURE B-6 | REV A

A	05JUN'14	ISSUED WITH LETTER VA14-00865	ACR	-	-
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

APPENDIX C

STABILITY ANALYSIS FIGURES

(Figures C-1 to C-4)



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS.

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	10APR14	ISSUED WITH LETTER VA14-00865	ACR	-	-

HARPER CREEK MINING CORP

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
MAIN EMBANKMENT STABILITY ANALYSIS
NORMAL OPERATING CONDITIONS AT

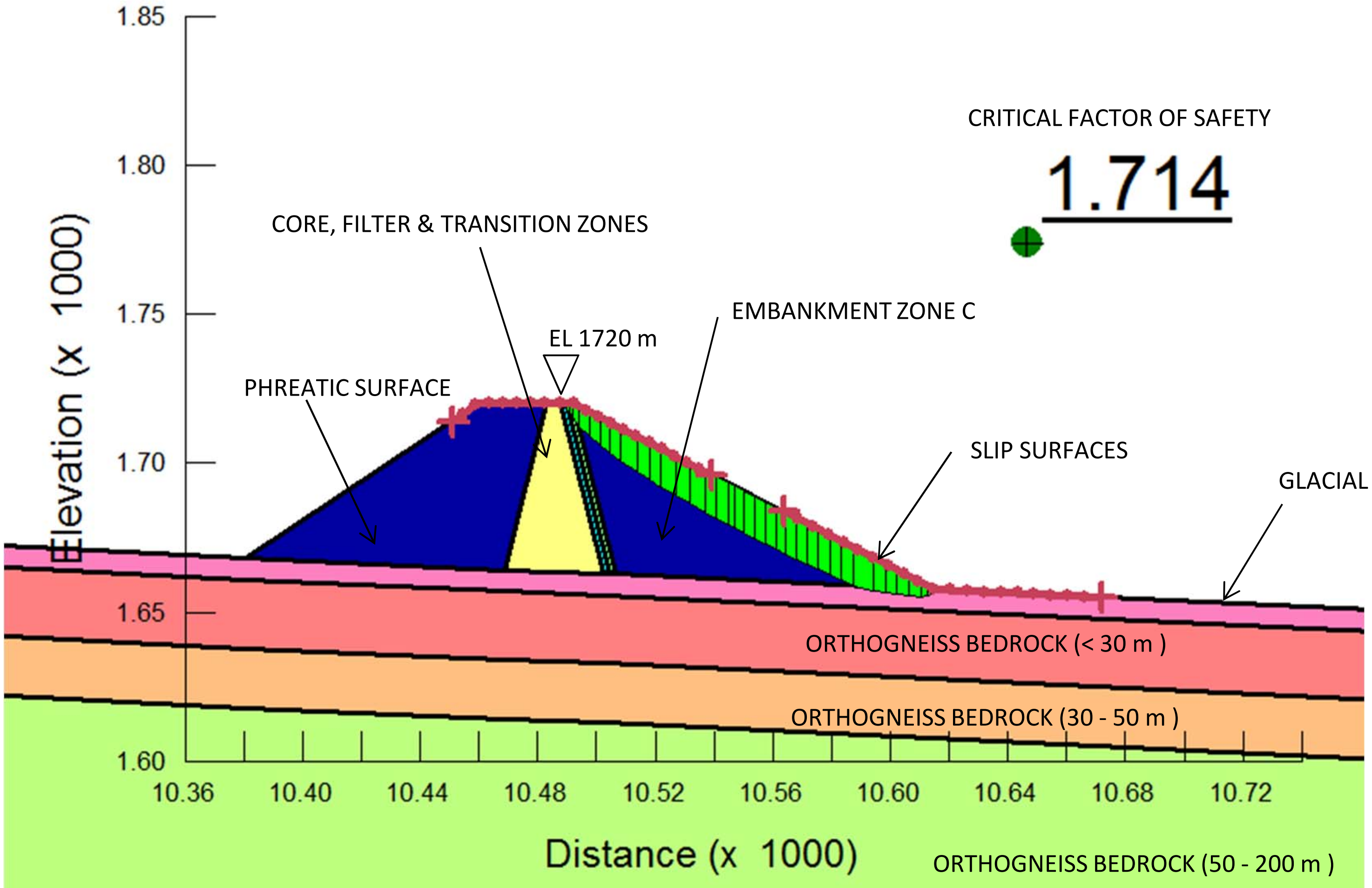
Knight Piésold CONSULTING

P/A. NO. VA101-563/4

REF NO. N/A

FIGURE C-1

REV A



NOTES:

1. LOCATION OF PHREATIC SURFACE ASSUMED TO BE AT NATURAL GROUND LEVEL

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	10APR14	ISSUED WITH LETTER VA14-00865	ACR	-	-

HARPER CREEK MINING CORP

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
MAIN EMBANKMENT STABILITY ANALYSIS
NORMAL OPERATING CONDITIONS AT STAGE

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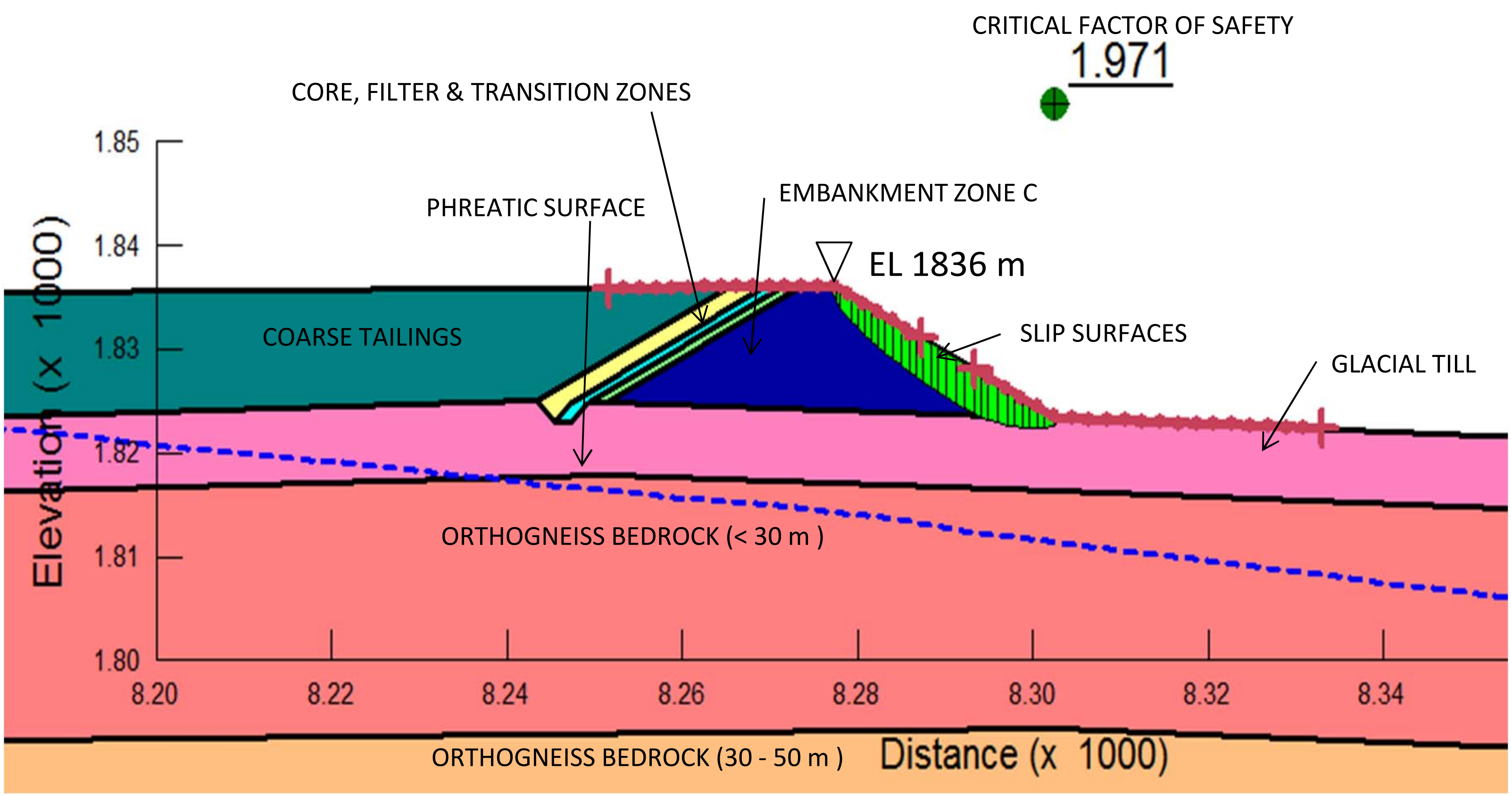
P/A. NO. VA101-563/4

REF NO. N/A

FIGURE C-2

REV A



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
A	10APR14	ISSUED WITH VA14-00865	ACR	-	-

HARPER CREEK MINING CORP

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
NORTH EMBANKMENTSTABILITY ANALYSIS
NORMAL OPERATING CONDITIONS AT

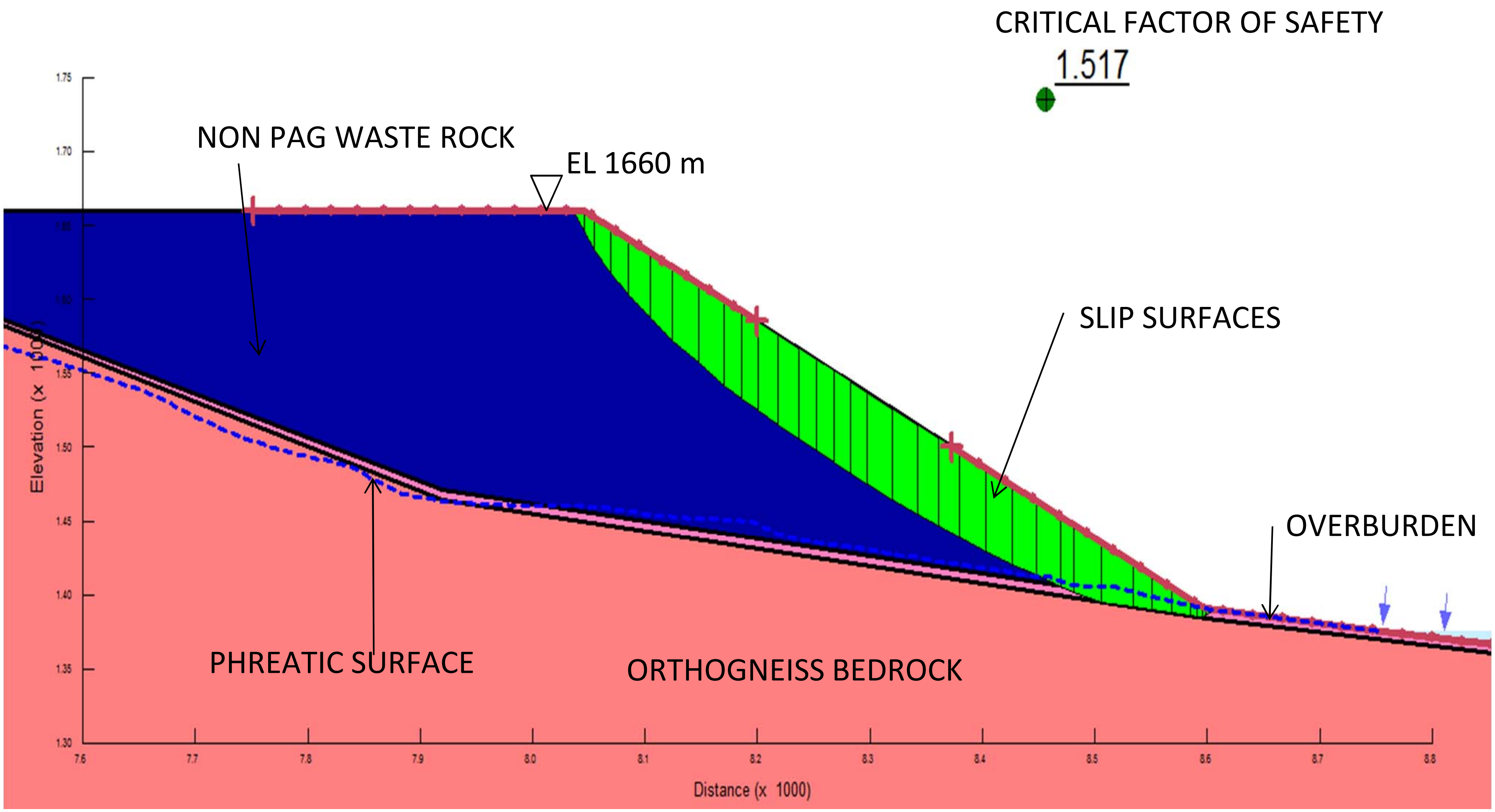
Knight Piésold CONSULTING

P/A. NO. VA101-563/4

REF NO. N/A

FIGURE C-3

REV A



NOTES:

1. LOCATION OF PHREATIC SURFACE PREDICTED FROM STEADY STATE SEEPAGE ANALYSIS

A	10APR14	ISSUED WITH VA14-00865	ACR	-	-
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

HARPER CREEK MINING CORP

HARPER CREEK PROJECT

TAILINGS MANAGEMENT FACILITY
NON PAG WASTE STOCKPILE STABILITY
OPERATING CONDITIONS AT CLOSURE

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P/A. NO.	REF NO.
VA101-563/4	N/A

FIGURE C-4 REV A

APPENDIX D

SELECTED TABLES FROM THE INVESTIGATION AND DESIGN MANUAL INTERIM GUIDELINES (BC MWRPRC, 1991)

(Pages D-1 to D-4)

TABLE 5.1
DUMP STABILITY RATING SCHEME

KEY FACTORS AFFECTING STABILITY		RANGE OF CONDITIONS OR DESCRIPTION	POINT RATING
DUMP CONFIGURATION		< 50m	0
		50m - 100m	50
DUMP HEIGHT		100m - 200m	100
		> 200m	200
	Small	< 1 million BCM's	0
DUMP VOLUME	Medium	1 - 50 million BCM's	50
	Large	> 50 million BCM's	100
	Flat	< 26°	0
DUMP SLOPE	Moderate	26° - 35°	50
	Steep	> 35°	100
FOUNDATION SLOPE	Flat	< 10°	0
	Moderate	10° - 25°	50
	Steep	25° - 32°	100
	Extreme	> 32°	200
DEGREE OF CONFINEMENT	Confined	-Concave slope in plan or section -Valley or Cross-Valley fill, toe butressed against opposite valley wall -Incised gullies which can be used to limit foundation slope during development	0
	Moderately Confined	-Natural benches or terraces on slope -Even slopes, limited natural topographic diversity -Heaped, Sidehill or broad Valley or Cross-Valley fills	50
	Unconfined	-Convex slope in plan or section -Sidehill or Ridge Crest fill with no toe confinement -No gullies or benches to assist development	100
FOUNDATION TYPE	Competent	-Foundation materials as strong or stronger than dump materials -Not subject to adverse pore pressures -No adverse geologic structure	0
	Intermediate	-Intermediate between competent and weak -Soils gain strength with consolidation -Adverse pore pressures dissipate if loading rate controlled	100
	Weak	-Limited bearing capacity, soft soils -Subject to adverse pore pressure generation upon loading -Adverse groundwater conditions, springs or seeps -Strength sensitive to shear strain, potentially liquefiable	200
DUMP MATERIAL QUALITY	High	-Strong, durable -Less than about 10% fines	0
	Moderate	-Moderately strong, variable durability -10 to 25% fines	100
	Poor	-Predominantly weak rocks of low durability -Greater than about 25% fines, overburden	200

Continued..

TABLE 5.1 (Continued)
DUMP STABILITY RATING SCHEME

KEY FACTORS AFFECTING STABILITY		RANGE OF CONDITIONS OR DESCRIPTION	POINT RATING
METHOD OF CONSTRUCTION	Favourable	-Thin lifts (<25m thick), wide platforms -Dumping along contours -Ascending construction -Wrap-arounds or terraces	0
	Mixed	-Moderately thick lifts (25m - 50m) -Mixed construction methods	100
	Unfavourable	-Thick lifts (> 50m), narrow platform (sliver fill) -Dumping down the fall line of the slope -Descending construction	200
PIEZOMETRIC AND CLIMATIC CONDITIONS	Favourable	-Low piezometric pressures, no seepage in foundation -Development of phreatic surface within dump unlikely -Limited precipitation -Minimal infiltration into dump -No snow or ice layers in dump or foundation	0
	Intermediate	-Moderate piezometric pressures, some seeps in foundation -Limited development of phreatic surface in dump possible -Moderate precipitation -High infiltration into dump -Discontinuous snow or ice lenses or layers in dump	100
	Unfavourable	-High piezometric pressures, springs in foundation -High precipitation -Significant potential for development of phreatic surface or perched water tables in dump -Continuous layers or lenses of snow or ice in dump or foundation	200
DUMPING RATE	Slow	-< 25 BCM's per lineal metre of crest per day -Crest advancement rate < 0.1m per day	0
	Moderate	-25 - 200 BCM's per lineal metre of crest per day -Crest advancement rate 0.1m - 1.0m per day	100
	High	-> 200 BCM's per lineal metre of crest per day -Crest advancement > 1.0m per day	200
SEISMICITY	Low	Seismic Risk Zones 0 and 1	0
	Moderate	Seismic Risk Zones 2 and 3	50
	High	Seismic Risk Zones 4 or higher	100

MAXIMUM POSSIBLE DUMP STABILITY RATING: 1800

TABLE 5.2

DUMP STABILITY CLASSES AND RECOMMENDED LEVEL OF EFFORT

DUMP STABILITY CLASS	FAILURE HAZARD	RECOMMENDED LEVEL OF EFFORT FOR INVESTIGATION, DESIGN AND CONSTRUCTION	RANGE OF DUMP RATING (DSR)
I	Negligible	-Basic site reconnaissance, baseline documentation -Minimal lab testing -Routine check of stability, possibly using charts -Minimal restrictions on construction -Visual monitoring only	< 300
II	Low	-Thorough site investigation -Test pits, sampling may be required -Limited lab index testing -Stability may or may not influence design -Basic stability analysis required -Limited restrictions on construction -Routine visual and instrument monitoring	300-600
III	Moderate	-Detailed, phased site investigation -Test pits required, drilling or other subsurface investigations may be required -Undisturbed samples may be required -Detailed lab testing, including index properties, shear strength and durability likely required -Stability influences and may control design -Detailed stability analysis, possibly including parametric studies, required -Stage II detailed design report may be required for approval/permitting -Moderate restrictions on construction (eg. limiting loading rate, lift thickness, material quality, etc.) -Detailed instrument monitoring to confirm design, document behaviour and establish loading limits	600-1200
IV	High	-Detailed, phased site investigation -Test pits, and possibly trenches, required -Drilling, and possible other subsurface investigations probably required -Undisturbed sampling probably required -Detailed lab testing, including index properties, shear strength and durability testing probably required -Stability considerations paramount. -Detailed stability analyses, probably including parametric studies and full evaluation of alternatives probably required -Stage II detailed design report probably required for approval/permitting -Severe restrictions on construction (eg. limiting loading rates, lift thickness, material quality, etc.) -Detailed instrument monitoring to confirm design, document behaviour and establish loading limits	> 1200

TABLE 6.4

INTERIM GUIDELINES FOR MINIMUM DESIGN FACTOR OF SAFETY [1]

STABILITY CONDITION	SUGGESTED MINIMUM DESIGN VALUES FOR FACTOR OF SAFETY	
	CASE A	CASE B
STABILITY OF DUMP SURFACE		
–Short Term (during construction)	1.0	1.0
–Long Term (reclamation – abandonment)	1.2	1.1
OVERALL STABILITY (DEEP SEATED STABILITY)		
–Short Term (static)	1.3 – 1.5	1.1 – 1.3
–Long Term (static)	1.5	1.3
–Pseudo–Static (earthquake) [2]	1.1 – 1.3	1.0

CASE A:
- –Low level of confidence in critical analysis parameters
- –Possibly unconservative interpretation of conditions, assumptions
- –Severe consequences of failure
- –Simplified stability analysis method (charts, simplified method of slices)
- –Stability analysis method poorly simulates physical conditions
- –Poor understanding of potential failure mechanism(s)

CASE B:
- –High level of confidence in critical analysis parameters
- –Conservative interpretation of conditions, assumptions
- –Minimal consequences of failure
- –Rigorous stability analysis method
- –Stability analysis method simulates physical conditions well
- –High level of confidence in critical failure mechanism(s)

NOTES:
1. A range of suggested minimum design values are given to reflect different levels of confidence in understanding site conditions, material parameters, consequences of instability, and other factors.
2. Where pseudo–static analyses, based on peak ground accelerations which have a 10% probability of exceedance in 50 years, yield F.O.S. < 1.0, dynamic analysis of stress–strain response, and comparison of results with stress–strain characteristics of dump materials is recommended.