July 24, 2012

File No.:VA101-447/2-A.01
Cont. No.:VA12-01435

Mr. John Boyle
Vice President Environment & Sustainability
Northcliff Holdings (Canada) Ltd.
15th Floor, 1040 West Georgia Street
Vancouver, BC V6E 4H8

Dear John,

Re: Sisson Project: Baseline Watershed Model Methodology and Results *DRAFT*
Update to VA12-00829 (Issued on May 4, 2012)

1. INTRODUCTION

The Sisson project (Project) is a proposed tungsten/molybdenum open pit mine located in central New Brunswick, approximately 100 km northwest of Fredericton (Figure 1). Knight Piésold Ltd. (KP) was retained by Northcliff Resources Ltd. (Northcliff) to assist with hydrogeology and hydrometeorology studies to support an Environmental Impact Assessment; this scope includes both baseline characterization and project effects assessment. A baseline watershed model was developed to assist with these studies. The purpose of this letter is to describe the methodology, model parameters, assumptions, and results of the baseline watershed model.

The baseline (pre-project) watershed model facilitates the understanding of the baseline site hydrologic parameters and hydrogeological setting and was developed using the site hydrometeorological data as primary inputs. The model was then used as a tool to help refine and constrain the estimated long term average climate parameters. The model and the hydrometeorology study thus inform each other to provide a more defensible understanding of the site conditions.

The baseline model was developed using the data available at the time of reporting and may be revised as additional data are collected. Methods to quantify the level of confidence in the data and results, such as R-squared and Nash-Sutcliffe efficiency values, are presented herein.

PROJECT SETTING

The Project is located primarily in the Napadogan Brook (west branch) watershed with a small portion of the footprint in the McBean Brook catchment; both streams are tributaries to the Nashwaak River (Figure 2). The Nashwaak River is a tributary to the Saint John River, which flows south to the Bay of Fundy. The elevation in the project area ranges from approximately 300 to 350 metres above sea level (masl), with some peaks rising to over 400 masl. Forest cover is mainly deciduous at higher elevations and coniferous at lower elevations. The area has a history of extensive commercial logging. Small lakes and wetlands are found in low-lying areas.

METHOD

A monthly time step, commonly used for hydrologic evaluations (Alley, 1984; Steenhuis et al, 1986), was selected for the watershed modelling. The time step of a hydrologic model depends on the requirements of the study. Time steps can range from portions of a day to months or even years. Shorter time steps are typically required when the objective is to simulate the response of streamflows to shorter term events such as storms. However, the primary purpose of this modelling exercise was to refine estimates of hydrogeological and hydrologic parameters that contribute to streamflows, on a seasonal basis, and therefore monthly time steps are appropriate. The analysis considered the interaction of surface water and groundwater components of the flow system while respecting the constraints imposed by the measured climate and streamflow data. The model was run over a relatively long-term period, as the use of a long-term climate record provides the following:

- Better averages of monthly conditions (e.g., temperature, precipitation)
- Identification of changing climate trends (e.g., dry periods), and
- Opportunity to simulate a long term streamflow record when measured stream flow data are limited.

Ideally, a concurrent long-term climate and streamflow record would be available for model calibration as this provides a higher confidence in the modelling results. The site climate and streamflow records for this watershed modelling assessment are relatively short; however, regional climate and streamflow data were available from stations operated by the Meteorological Services of Canada (MSC) and Water Survey of Canada (WSC), respectively. Both the MSC and WSC are branches of Environment Canada. The regional data currently provides the best approximation of the long-term average conditions at the site. The climate and streamflow records available for this watershed modelling are further discussed in the sections below.

The monthly baseline watershed model was set up using a Microsoft Excel spreadsheet using a semi-distributed method that allowed for adjacent sub-catchments to be chained together. The project area was discretized based on the catchments of the established stream-gauging stations shown on Figures 2 and 3. A sub-catchment area is defined as the catchment contributing to a stream gauge less the area of any defined upstream catchments. The general approach of the modelling was as follows:

- Inputs to each sub-catchment included precipitation within the sub-catchment and inflow (groundwater and surface water) from upstream sub-catchments.
- Precipitation, as rainfall, was distributed amongst the following components:
  - Surface runoff
  - Groundwater recharge, and
  - Evapotranspiration and sublimation.
- Precipitation as snowfall was accumulated until the temperature increased enough to melt the snow and generate snowmelt, at which time it was distributed into the appropriate components as defined above.
- Groundwater and surface water accumulation in storage, and discharge from storage, were modelled using a simple linear reservoir model approach.
- Outputs from each sub-catchment included surface water and groundwater discharge to downstream sub-catchments.

The model parameters were adjusted until the calculated streamflows were in reasonable agreement with the available measured streamflows from regional gauging sites. Calibration was completed for two regional streamflow stations operated by the WSC that are in close proximity to the Project and have a long period of streamflow record; the two stations are discussed in the follow section. The calibrated model parameters were then used to evaluate the goodness of fit to the streamflow measured at the site streamflow stations. The site stations within the Napadogan River catchment were only considered because the footprints of the key project infrastructure, including the proposed open pit and tailings storage facility, are predominantly in this catchment; very little of the proposed project footprint is located in the McBean Brook catchment. The development and calibration of the baseline watershed model to the regional and site streamflow stations are described further in the sections below.

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MODEL SET-UP

Discretization

The model study area was divided into the regional and site sub-catchments shown on Figures 2 and 3, respectively. The sub-catchments were defined based on the need to calibrate the model to measured flow rates and volumes at the streamflow stations. The two regional stations were the Nashwaak River (WSC ID 01AL002) and Narrows Mountain Brook (WSC ID 01AL004) gauging sites. The project site stations were B-2, SB-1 and NB-2B. The catchment area contributing to each stream gauge is shown in Table 1.

Climate Data

Meteorological Stations

Meteorological data (monthly total precipitation and monthly mean temperature) have been collected on site at the Sisson Brook station since 2007. However, the use of the site data in the model is limited to the relatively short duration of the time series. As such, regional data from EC climate stations were used to provide a long-term record of site conditions. A comparison was completed between the regional stations and the site station; the EC operated station at Juniper (Station ID 8102275) was considered the most representative of site conditions (KP, 2012). Juniper is approximately 23 km from the site at an elevation of 259 masl and is the closest site with long-term precipitation and temperature records (1969 to present). A data gap exists from 2004 to 2012, with a few smaller gaps within the remaining period of record. Data gaps in the Juniper record were in-filled based on a relationship developed with the EC operated site at Woodstock (Station ID 8105600) that is located about 46 km from the site at an elevation of about 153 masl. The active regional climate stations in close proximity to the site are shown on Figure 4.

Temperature

Temperature data from Juniper were used to provide an estimated long-term monthly average temperature record of the project site conditions using the methodology described in the Meteorological Stations section, above. The monthly temperature data from the Woodstock station were used to in-fill temperature data gaps in the period of record from the Juniper station; the complete data set shown in Table 2 was then applied to the model. A plot of the concurrent periods of records between the Juniper and Woodstock regional stations and the Sisson Brook site station indicated close agreement (Figure 5); therefore, adjustments for elevation or location were not required. Climate normal data (1971 to 2001 for Juniper) were used in the instances when Woodstock data were not available to in-fill missing data gaps in the Juniper record.

Daily maximum temperatures were used to estimate snowmelt, as it is not possible to capture the short periods of warming in the winter that result in a component of the winter snowmelt when using monthly average temperatures. For example, a winter month may have a mean temperature of below freezing, but with one or more days of above-freezing temperatures that lead to snowmelt. The snowmelt would be seen as an increase in the streamflow record during that month, but the model would not be able to simulate the increased flow based on the monthly temperature record.

Precipitation

Precipitation data from Juniper were used to develop a long-term record of site conditions using a similar approach as with the temperature record. Data gaps in the period of record from the Juniper station were in-filled using monthly precipitation data from the Woodstock station that were adjusted using a multiplier of 1.03. This relationship shown on Figure 6 was developed based on a correlation of the concurrent periods of records between the two regional stations. The R-squared calculated for the correlation is 0.67, which reflects the spatial and temporal variation that is generally found between stations as a result of local weather systems and was therefore considered acceptable for use in this analysis. Climate normal data (1971 to 2001 for Juniper) were used in the few instances when Woodstock data were not available to in-fill missing data gaps in the Juniper record.

The precipitation data set based on the Juniper station was increased by a factor of 1.06 in the winter months (October through May) to account for winter snowfall catch-inefficiencies. Precipitation gauge catch inefficiency, or under-catch, results from windblown rain and snow that does not get captured by the measuring instrument. A local precipitation factor of 1.11 was also applied in addition to the catch efficiency factor to the precipitation data for each sub-catchment to account for local site variations from the regional stations. Wetter conditions at the site compared to the regional stations are supported by an analysis of the site and long-term regional data (KP, 2012). The complete data set shown in Table 3 was applied to the model.

Hydrological Processes and Assumptions

Rainfall and Snowfall

The distribution of precipitation as either snow or rainfall was based on the assumption that all precipitation falls as rain if the average monthly temperature is greater than 2°C and all as snow if the average monthly temperature is below -2°C. For temperatures between -2°C and 2°C, the ratio of snow to rain was varied linearly. Manual snow surveys in the winters of 2010-2011 and 2011-2012 were considered in the analysis to provide a general indication of the characteristics of the snowpack (KP, 2012).

Sublimation and Snowmelt

A sublimation rate of 0.39 mm/day was estimated for this analysis and is comparable to the results found by KP (2012). Total potential snowmelt was estimated using a temperature index method; the actual snowmelt was constrained by the available snow after sublimation.

Potential and Actual Evapotranspiration

Evapotranspiration was calculated following the methods of Thornthwaite (1948). The potential monthly evapotranspiration (PET) was estimated based on average monthly temperature. Typically, the PET represents the evapotranspiration for a full vegetation cover on relatively flat tilled ground with saturated soil. The actual evapotranspiration (AET) is calculated as part of a soil water balance in the model and is based on actual moisture availability.

Water available for groundwater recharge and surface runoff

The water available for groundwater recharge and runoff was calculated as the sum of the rainfall and snowmelt for the month, less the evapotranspiration and soil moisture change. This unit value of water (surplus water) was multiplied by the area of the sub-catchment to estimate the total water available for recharge and runoff.

Groundwater recharge

Groundwater recharge was estimated with an adjustable portion of the water available for runoff and recharge to allow variability dependent on surface conditions, soil permeability, and available storage capacity. The water available for recharge and runoff that was not recharged remained as surface water to be either stored or runoff.

Groundwater storage and discharge

A linear reservoir model was used to simulate the storage and release of groundwater. Water assumed to recharge into storage in each sub-catchment was accumulated and released. The rate of release was determined by the product of the average volume of water in storage and an estimated discharge factor that is adjusted during the calibration. The volume of water in storage equals the sum of the storage in the preceding month, plus the volume of water entering the system, less the quantity discharged. A lower discharge factor value results in larger accumulated storage and a more uniform discharge rate. A discharge factor consistent with the site conditions was used.

Groundwater flow between catchments
Groundwater can flow downstream (into the next sub-catchment), or can discharge within the sub-catchment to surface water. Groundwater leaving the sub-catchment was estimated using Darcy's Law by taking the product of estimated values for transmissivity, width, and hydraulic gradient. The remainder was added to surface water within the catchment.

Surface water detention and discharge
Surface water storage was included because several sub-catchment areas included small ponds and wetlands that were not modelled as distinct water bodies. These retention features were simulated with a linear reservoir model similar to groundwater storage and discharge.

Streamflow Data

Measured monthly streamflow records were available for calibrating the model at the following stations and for the following periods:

- Nashwaak River from 1962 to 2011 (data from 2009 to 2011 have not yet been reviewed by WSC)
- Narrows Mountain Brook from 1972 to 2011 (data from 2009 to 2011 have not yet been reviewed by WSC)
- B-2 from June to November 2011
- SB-1 from June to November 2011, and
- NB-2B from June to November 2011.

Streamflow data prior to the start of the precipitation and temperature data set (1969) were not used in the calibration. Spot winter flow measurements collected in February and March 2012 were also available for comparison purposes with the calculated streamflows. The temperature and precipitation data sets were extended to include 2012 data using climate normal from Juniper, which allowed the modelled average monthly flows in 2012 to be compared to the site winter flow measurements.

A longer period of record was generated for streamflow measurement sites B-2, SB-1, and NB-2B based on a ranked linear regression technique with the Narrows Mountain Brook station (KP, 2012). A greater weight was given to the measured flows over the synthetic flows for the purpose of watershed model calibration. However, the synthetic record was reviewed to check that the total volumes and distribution of flows were in the expected range; this check is described in the following section.

RESULTS

Two methods were used to evaluate the goodness of fit between the measured and calculated streamflows: a visual method and the statistical Nash-Sutcliffe efficiency (1970) method. 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 Nash-Sutcliffe Efficiency (NSE) is a commonly adopted statistical measure used in hydrology and was considered appropriate for this analysis.

The cumulative flow and flow duration plots shown on Figures 7 through 10 were generated for the regional stations to visually evaluate the calibration. 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. Monthly measured and calculated streamflows (i.e. hydrographs) are provided for comparison purposes in Appendix A; a NSE value was calculated based on these monthly flows. NSE values of 0.65 and 0.70 were calculated for the Nashwaak River and Narrows Mountain Brook catchments, respectively. 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
- Unsatisfactory NSE < 0.50

The NSE performance rating was therefore Good for the model calibration to both the Nashwaak River and Narrows Mountain Brook recorded hydrographs.

The plots of measured and calculated monthly streamflows shown on Figures 11, 12, and 13 were generated to evaluate the calibration of the model to the site streamflow gauging station records. The measured period of record was not long enough to generate cumulative or flow duration plots; however, cumulative and flow duration plots of the synthetic records and the calculated streamflows show that the total volumes and distributions are within the expected range.

Calibrations to the site data were based on the calibrated parameters used for the regional model at Narrows Mountain Brook. The discrepancy between the measured and calculated streamflows, especially during the summer months, is likely a result of the precipitation values used in the model. The precipitation values that drive the calculated flows in the model were based on records from a regional site station and therefore provide a representation of the long term distribution rather than a specific period. Therefore it is expected that for a short-term stream flow record the calibration will not be as good as over a longer period. For example, the August 2011 precipitation value based on the regional station was approximately 55% less than the measured precipitation at the Sisson Brook station (131 mm compared to 241 mm) and this wetter period was not captured for this period of stream flow record in the precipitation data set. However, it would be expected that a calibration using a longer stream flow data set would capture some of the wetter and drier periods so that the long term distribution was simulated. The ability to develop a better calibration to the site data will be possible as additional precipitation and streamflow measurements (especially low flow measurements) are collected on site. The regional streamflow data currently provides the best approximation of the long-term distribution and volume of flow at the site.

The long-term temperature record used in the watershed modelling has a mean annual value of 3.8°C, with minimum and maximum average temperatures occurring in January and July, respectively. The mean annual precipitation was estimated to be about 1360 mm. The calculated mean annual potential evapotranspiration (PET) was estimated at 520 mm based on the model calibration. This value is consistent with the long-term annual PET value estimated by KP (2012), and is within the range of 500 to 600 mm indicated by the map of annual lake evaporation of Canada (NRC 1995). Enhanced AET was applied to 80% of the Nashwaak River sub-catchment, and 75% of the Narrows Mountain Brook sub-catchment as well as the projects site sub-catchments, to account for the low lying wetlands, streams and lakes that are characteristic of the region. The calculated average AET was estimated at about 510 mm in the enhanced AET area and 410 mm in the remaining catchment area. The average annual calculated groundwater component of the stream flow was about 3.3 L/s/km^2 for the Narrows Mountain Brook sub-catchment which was in good agreement with a visual inspection of the daily low flows during the winter months. The groundwater recharge was estimated as about 8 % of the total precipitation.

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Please contact the undersigned with any comments or questions.

Yours truly,
KNIGHT PIESOLD LTD.

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<u>Attachments:</u>

Table 1 Rev 0	Calculated Catchment Areas
Table 2 Rev 0	Monthly Average Temperature Data
Table 3 Rev 0	Monthly Precipitation Data
Figure 1 Rev 0	Project Site Location
Figure 2 Rev 0	Watershed Boundaries
Figure 3 Rev 0	Active Streamflow Stations
Figure 4 Rev 0	Regional Climate Stations
Figure 5 Rev 0	Comparison of Monthly Average Temperature

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TABLE 1

NORTHCLIFF RESOURCES LTD.
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CALCULATED CATCHMENT AREAS

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Stream Gauge	Area (km^2)
01AL002 Nashwaak River	1450
01AL004 Narrows Mountain Brook	4
B-2	7.7
SB-1	5.0
NB-2B	52.6

M:\1\01\00447\02\A\Correspondence\VA12-01435 Baseline Watershed Model - Update to VA12-008289\Attatchments\[Tables 1 to 3 and Figures 1 and Figures 5 to 13.xls]Table 1

NOTES:

1. AREA REPRESENTS THE TOTAL CONTRIBUTING CATCHMENT TO THE STREAM GAUGE.

0	24JUL'12	ISSUED WITH LETTER VA12-01435	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

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TABLE 2

NORTHCLIFF RESOURCES LTD.
SISSON PROJECT

MONTHLY AVERAGE TEMPERATURE DATA

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Temperature (^{o}C)	Average	10th percentile	90th percentile	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Jan	-12.1	-16.0	-9.0	-12.4	-15.8	-14.0	-10.4	-12.2	-13.8	-9.7	-14.6	-16.0	-14.0	-9.6	-11.1	-16.6	-16.2	-9.7
Feb	-10.5	-13.1	-7.2	-11.2	-11.1	-13.6	-15.6	-11.6	-11.2	-10.4	-11.0	-11.5	-12.9	-12.9	-12.6	-4.0	-11.8	-9.7
Mar	-4.3	-7.1	-1.3	-4.5	-5.9	-2.9	-6.0	-4.0	-7.3	-4.4	-6.0	-1.3	-7.6	-1.1	-5.3	-3.0	-5.6	-2.8
Apr	2.9	0.4	5.3	2.5	2.5	3.8	2.2	2.0	0.4	1.7	1.8	-0.4	0.0	2.6	3.6	3.3	0.3	4.1
May	10.1	8.4	12.3	10.1	9.5	11.8	8.4	10.1	6.0	10.5	9.0	9.8	11.6	10.7	8.0	10.9	10.3	8.4
June	15.2	13.7	16.5	14.9	14.8	13.4	15.1	14.9	15.1	15.3	15.8	13.6	15.2	15.1	12.8	15.1	13.9	15.5
July	18.0	16.6	19.9	16.5	19.0	16.7	17.0	18.7	16.6	19.9	17.1	16.9	17.5	18.3	16.0	18.0	17.7	17.6
Aug	17.0	15.8	18.6	16.3	16.9	17.9	16.6	17.5	16.7	16.3	15.8	16.5	16.1	14.9	16.2	16.4	14.1	17.1
Sept	12.1	10.6	14.3	11.3	10.6	12.0	11.5	11.4	10.8	11.1	11.1	9.9	9.0	10.9	9.1	11.0	11.9	13.3
Oct	6.0	4.1	7.7	5.9	5.6	6.9	1.6	5.7	3.0	5.1	6.4	7.7	5.7	5.8	3.5	4.1	6.1	6.3
Nov	-0.2	-2.9	1.9	0.9	1.8	-3.6	-3.4	-2.8	0.5	2.9	-4.2	0.5	-2.9	0.8	-1.9	-0.4	0.5	0.2
Dec	-8.2	-12.6	-4.4	-5.7	-11.4	-11.7	-13.8	-8.9	-5.4	-10.4	-13.2	-8.5	-8.8	-8.3	-13.2	-5.1	-5.6	-7.8
Average	3.8	1.5	6.2	3.7	3.0	3.1	1.9	3.4	2.6	4.0	2.3	3.1	2.4	3.9	2.1	4.1	3.0	4.4
Min	-12.9	-16.2	-9.3	-12.4	-15.8	-14.0	-15.6	-12.2	-13.8	-10.4	-14.6	-16.0	-14.0	-12.9	-13.2	-16.6	-16.2	-9.7
Max	18.2	16.7	19.9	16.5	19.0	17.9	17.0	18.7	16.7	19.9	17.1	16.9	17.5	18.3	16.2	18.0	17.7	17.6

Temperature (^{o}C)	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Jan	-13.2	-14.8	-11.3	-12.6	-11.8	-11.5	-8.7	-14.3	-12.6	-12.4	-17.4	-9.5	-11.7	-12.0	-9.6
Feb	-5.6	-9.2	-11.8	-11.1	-11.0	-12.3	-12.7	-10.6	-11.5	-15.8	-13.7	-13.1	-9.6	-11.3	-7.1
Mar	-7.1	-5.6	-5.9	-3.6	-4.4	-6.9	-5.1	-3.2	-7.5	-5.4	-3.6	-3.6	-5.2	-7.4	-3.2
Apr	3.0	1.1	4.2	5.6	3.4	1.6	3.2	2.7	1.9	3.8	2.8	0.5	3.1	1.2	3.9
May	9.0	9.0	9.3	9.9	12.0	12.4	8.6	10.5	10.6	9.8	8.4	9.0	8.6	7.9	12.6
June	14.6	14.2	12.3	14.6	13.7	15.1	16.2	15.4	14.9	14.5	16.6	16.1	15.6	15.1	15.1
July	18.2	18.2	15.8	17.7	19.4	16.6	17.8	17.4	15.0	17.3	19.7	19.6	17.3	17.8	18.8
Aug	18.1	16.0	15.0	15.3	17.4	16.3	18.0	17.8	17.1	18.1	16.4	17.3	17.2	16.3	16.6
Sept	10.8	12.7	9.1	11.5	10.8	12.3	11.5	10.8	12.9	12.5	11.4	10.6	12.4	12.3	12.9
Oct	6.0	5.5	4.7	6.1	4.2	6.0	6.8	7.3	5.2	3.9	6.9	8.7	5.7	4.7	6.1
Nov	1.0	-2.7	-3.6	-1.6	1.0	-2.3	-0.6	0.3	-2.1	-1.0	1.0	-1.8	-2.0	-1.6	-1.2
Dec	-7.3	-12.8	-9.3	-8.2	-10.5	-16.9	-7.2	-10.7	-6.9	-6.9	-7.1	-10.5	-3.8	-8.5	-5.9
Average	4.0	2.6	2.4	3.6	3.7	2.5	4.0	3.6	3.1	3.2	3.5	3.6	4.0	2.9	4.9
Min	-13.2	-14.8	-11.8	-12.6	-11.8	-16.9	-12.7	-14.3	-12.6	-15.8	-17.4	-13.1	-11.7	-12.0	-9.6
Max	18.2	18.2	15.8	17.7	19.4	16.6	18.0	17.8	17.1	18.1	19.7	19.6	17.3	17.8	18.8

Temperature (^{o}C)	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Jan	-11.8	-11.9	-11.8	-8.9	-14.6	-16.2	-12.6	-6.1	-9.5	-8.3	-14.3	-6.3	-9.2
Feb	-7.1	-9.7	-10.1	-8.3	-13.1	-8.8	-7.4	-7.7	-11.1	-8.6	-7.7	-4.0	-9.0
Mar	-1.3	-1.5	-5.4	-4.4	-5.6	-3.3	-3.8	-1.3	-3.2	-5.7	-3.7	1.5	-2.6
Apr	3.2	2.9	1.9	2.8	0.3	3.8	5.0	5.9	3.0	5.4	5.3	7.7	4.0
May	13.2	9.0	11.9	9.8	9.6	10.6	8.5	12.8	10.6	10.2	11.3	13.2	10.9
June	17.7	14.6	16.5	13.8	15.8	13.7	17.5	18.1	16.4	16.0	15.8	16.4	16.1
July	18.7	17.1	17.7	17.8	17.7	18.4	18.9	20.8	18.5	20.4	17.9	21.4	20.1
Aug	17.1	16.7	18.7	17.6	18.3	18.1	18.7	16.2	17.5	17.6	19.7	19.3	19.1
Sept	16.1	12.0	13.5	13.6	13.8	13.3	14.5	13.6	14.4	13.6	13.4	14.8	15.2
Oct	5.4	5.6	7.3	4.7	6.4	7.7	8.2	6.7	9.6	6.6	5.0	7.3	8.6
Nov	1.9	1.7	1.9	-1.8	0.9	-0.3	1.6	3.5	-0.4	1.4	3.9	1.1	3.9
Dec	-5.7	-9.6	-3.4	-8.1	-5.4	-7.6	-6.7	-4.0	-8.5	-7.1	-6.3	-3.9	-4.3
Average	5.6	3.9	4.9	4.1	3.7	4.1	5.2	6.5	4.8	5.1	5.0	7.4	6.1
Min	-11.8	-11.9	-11.8	-8.9	-14.6	-16.2	-12.6	-7.7	-11.1	-8.6	-14.3	-6.3	-9.2
Max	18.7	17.1	18.7	17.8	18.3	18.4	18.9	20.8	18.5	20.4	19.7	21.4	20.1

M:\1\01\00447\02\A\Correspondence\VA12-01435 Baseline Watershed Model - Update to VA12-008289\Attatchments\[Tables 1 to 3 and Figures 1 and Figures 5 to 13.xls]Table 2

NOTES:

1. TEMPERATURE WAS BASED ON MONTHLY DATA AT THE ENVIRONMENT CANADA OPERATED CLIMATE STATION AT JUNIPER (STATION ID 8102275).. DATA GAPS WERE INFILLED USING MONTHLY DATA FROM THE WOODSTOCK STATION WITH NO ADJUSTMENT APPLIED TO THE DATA. CLIMATE NORMAL DATA (1971 TO 2001 FOR JUNIPER) WERE USED IN THE INSTANCES WHEN WOODSTOCK DATA WERE NOT AVAILABLE.

0	24JULY'12	ISSUED WITH LETTER VA12-01435	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
CONSULTING

TABLE 3

NORTHCLIFF RESOURCES LTD.
SISSON PROJECT

MONTHLY PRECIPITATION DATA

Print Jul/24/12 15:52:53

Total Precipitation (mm)	Average	10 percentile	90 percentile	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Jan	118	67	179	129	14	71	91	134	77	100	128	66	166	181
Feb	90	42	148	80	163	145	114	121	60	55	151	93	8	57
Mar	111	76	155	111	78	126	155	102	129	95	101	110	140	167
Apr	101	50	165	100	74	42	36	164	180	79	84	68	90	115
May	107	67	164	106	120	103	105	136	101	125	172	78	86	152
June	109	68	168	106	82	72	156	91	97	68	79	235	129	108
July	121	73	178	104	152	93	94	156	145	75	148	83	73	109
Aug	116	47	192	104	112	72	119	192	94	47	193	135	47	193
Sept	112	65	159	170	114	47	115	147	128	175	88	115	56	132
Oct	113	49	200	34	101	104	120	41	72	55	206	202	112	96
Nov	128	77	174	135	57	114	112	113	103	156	80	72	77	157
Dec	139	76	207	119	232	112	188	134	78	204	202	158	146	116
Annual	1,364	1,109	1588	1,299	1,301	1,100	1,404	1,530	1,262	1,234	1,632	1,414	1,130	1,584
Min	47	26	73	34	14	42	36	41	60	47	79	66	8	57
Max	197	155	241	170	232	145	188	192	180	204	206	235	166	193

Total Precipitation (mm)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Jan	56	107	162	108	154	28	163	104	101	85	137
Feb	26	77	92	78	87	113	41	19	92	83	47
Mar	146	139	93	125	101	80	100	85	45	92	41
Apr	88	97	125	179	73	52	117	47	50	120	110
May	67	100	28	169	199	93	68	69	59	127	137
June	92	114	142	32	169	120	83	138	74	64	106
July	240	75	78	153	124	130	118	78	90	128	169
Aug	78	117	150	120	73	33	115	64	209	164	219
Sept	153	146	148	74	64	79	149	176	66	120	114
Oct	131	192	52	69	51	66	48	94	131	74	212
Nov	128	79	210	253	97	125	125	125	152	163	113
Dec	132	162	110	174	141	68	86	76	53	96	166
Annual	1,336	1,404	1,391	1,534	1,333	986	1,212	1,075	1,121	1,316	1,571
Min	26	75	28	32	51	28	41	19	45	64	41
Max	240	192	210	253	199	130	163	176	209	164	219

Total Precipitation (mm)	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Jan	112	122	114	202	186	179	179	158	186	138	57
Feb	36	120	93	69	115	115	89	64	68	111	104
Mar	113	77	82	155	75	120	128	128	180	97	77
Apr	74	70	141	165	119	132	36	101	52	174	69
May	115	34	105	146	87	109	164	134	67	112	85
June	108	118	194	130	61	70	86	91	76	86	75
July	45	158	116	94	77	210	73	133	63	133	100
Aug	178	60	121	66	92	45	118	144	101	156	129
Sept	161	75	123	80	74	96	95	136	227	98	99
Oct	119	184	173	48	158	121	35	107	124	87	78
Nov	57	86	122	147	165	129	102	92	155	79	89
Dec	69	125	182	92	114	264	154	113	130	113	32
Annual	1,187	1,228	1,565	1,393	1,322	1,589	1,260	1,398	1,429	1,384	995
Min	36	34	82	48	61	45	35	64	52	79	32
Max	178	184	194	202	186	264	179	158	227	174	129

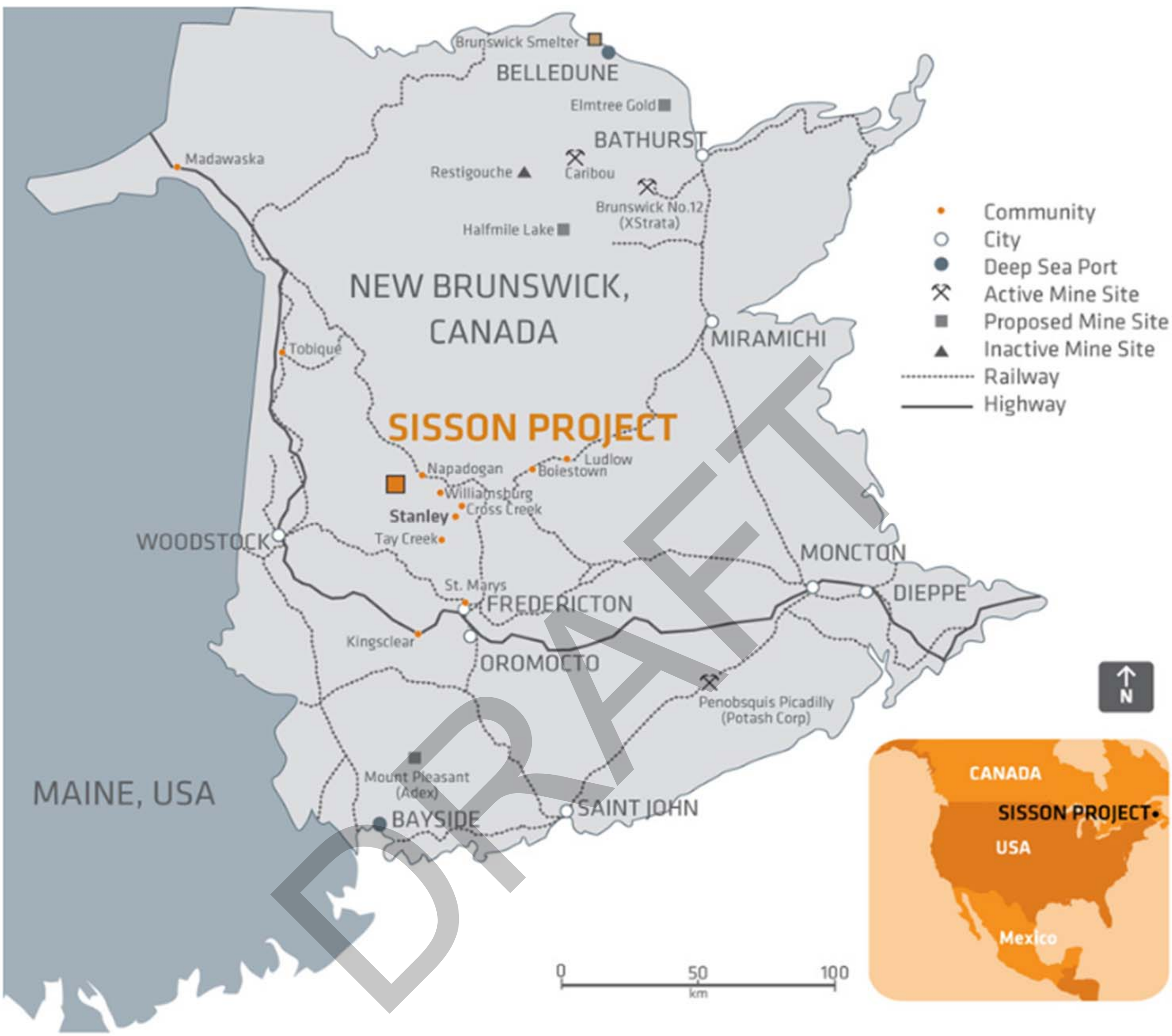
Total Precipitation (mm)	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Jan	128	71	70	89	176	111	115	96	112	93
Feb	149	128	44	107	77	58	156	147	56	166
Mar	130	119	71	177	39	131	151	106	94	169
Apr	133	52	100	184	88	156	78	97	92	124
May	77	98	93	101	164	57	67	125	79	164
June	63	83	75	99	172	69	168	143	150	192
July	207	167	92	142	191	61	118	151	89	180
Aug	78	113	155	191	71	160	128	48	46	145
Sept	128	69	89	142	77	19	150	65	139	107
Oct	69	282	70	220	148	83	101	148	134	95
Nov	117	162	113	225	176	232	122	154	158	63
Dec	124	176	134	208	82	155	241	136	268	128
Annual	1,402	1,521	1,107	1,886	1,459	1,292	1,595	1,416	1,416	1,626
Min	63	52	44	89	39	19	67	48	46	63
Max	207	282	155	225	191	232	241	154	268	192

M:\1\01\00447\02\A\Correspondence\VA12-01435 Baseline Watershed Model - Update to VA12-008289\Attatchments\[Tables 1 to 3 and Figures 1 and Figures 5 to 13.xls]Table 3

NOTES:

1. MONTHLY PRECIPITATION WAS BASED ON MONTHLY DATA AT THE ENVIRONMENT CANADA OPERATED CLIMATE STATION AT JUNIPER (STATION ID 8102275). DATA GAPS WERE INFILLED USING MONTHLY DATA FROM THE ENVIRONMENT CANADA OPERATED CLIMATE STATION AT WOODSTOCK (STATION ID 8105600) WITH A MULTIPLIER OF 1.03 APPLIED TO THE DATA. CLIMATE NORMAL DATA (1971 TO 2001 FOR JUNIPER) WERE USED IN THE INSTANCES WHEN WOODSTOCK DATA WERE NOT AVAILABLE.
2. THE PRECIPITATION VALUES WERE INCREASED BY A FACTOR OF 1.06 IN THE WINTER MONTHS (OCTOBER THROUGH MAY) TO ACCOUNT FOR WINTER SNOWFALL CATCH INEFFICIENCIES. A LOCAL PRECIPITATION FACTOR OF 1.11 WAS APPLIED TO ACCOUNT FOR LOCAL SITE VARIATIONS FROM THE REGIONAL STATIONS.

0	24JUL'12	ISSUED WITH LETTER VA12-01435	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NOTES:

1. SOURCE: NORTHCLIFF RESOURCES, RETRIEVED APRIL 27, 2012 FROM http://www.northcliffresources.com/s/Disclaimer.asp

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

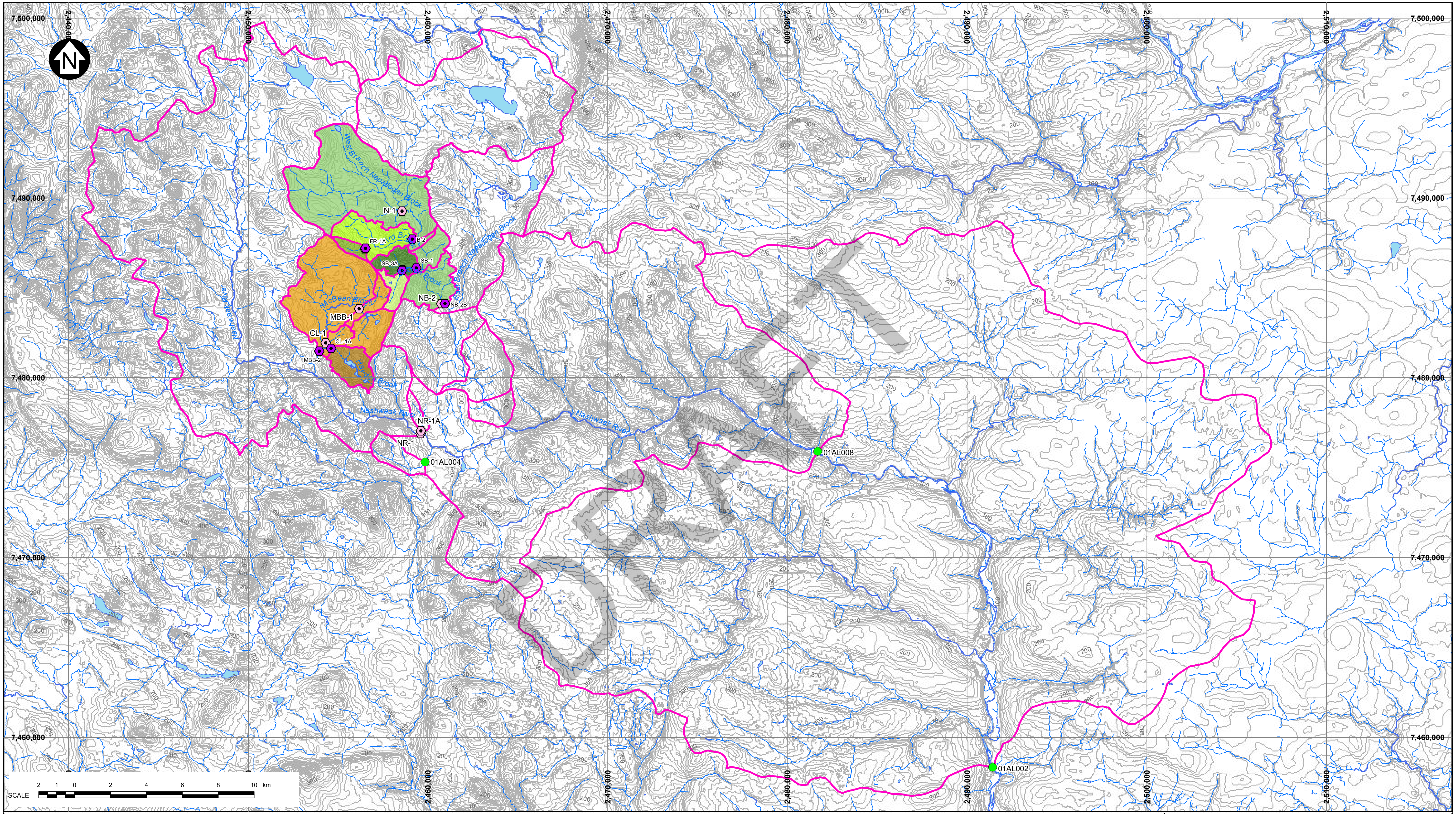
PROJECT SITE LOCATION

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

FIGURE 1 REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB



KP FIGURE SAVED: M:\1\01\00447\02\A\GIS\Figs\VA12-01435\B09_WatershedBoundaries.mxd; Jul 24, 2012 4:24:41 PM adinca

LEGEND:

- WSC STATION
- STREAMFLOW STATION (ACTIVE)
- STREAMFLOW STATION (INACTIVE)
- CONTOUR (10 M)
- RIVER
- LAKE
- WATERSHED BOUNDARY

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	19JUL'12	ISSUED WITH LETTER	AMD	AMD	CMB	KJB

NOTES:

1. BASE MAP: CANADA NTS MAPS.
2. COORDINATE GRID IS IN METRES.
COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:200,000
FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING
TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTOUR INTERVAL IS 10 METRES.
5. WATERSHED BOUNDARIES WERE DELINEATED BASED ON 2 METRE
LIDAR CONTOURS AND TRANSPOSED TO NTS MAPS.

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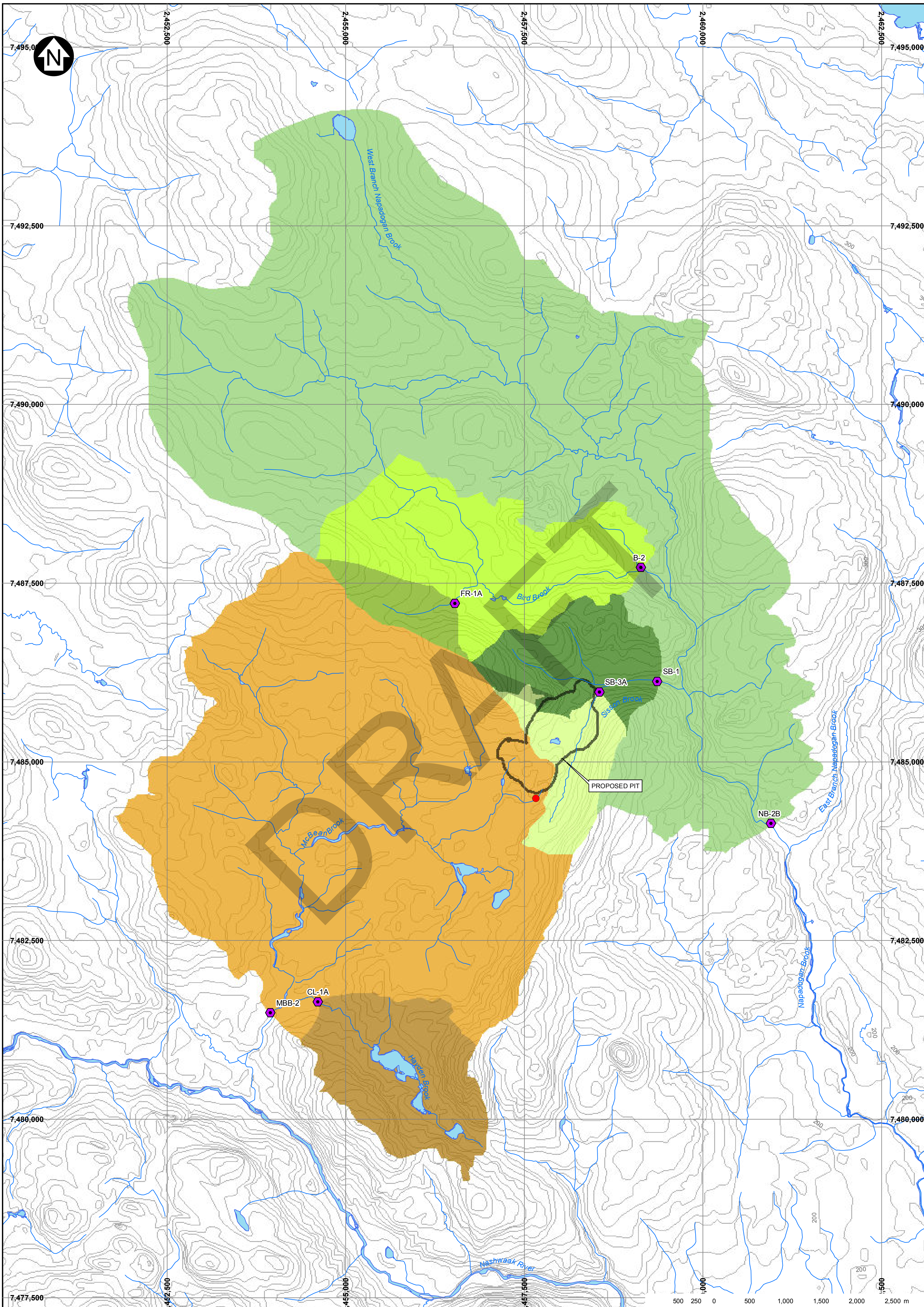
SISSON PROJECT

WATERSHED BOUNDARIES

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-447/2	VA12-01435

FIGURE 2 REV 0



LEGEND:

- ACTIVE STREAMFLOW STATION
- METEOROLOGICAL STATION
- CONTOUR (10 M)
- RIVER
- LAKE
- PROPOSED PIT

NOTES:

1. BASE MAP: CANADA NTS MAPS.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:50,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.
4. CONTOUR INTERVAL IS 10 METRES.

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SISSON PROJECT

ACTIVE STREAMFLOW STATIONS

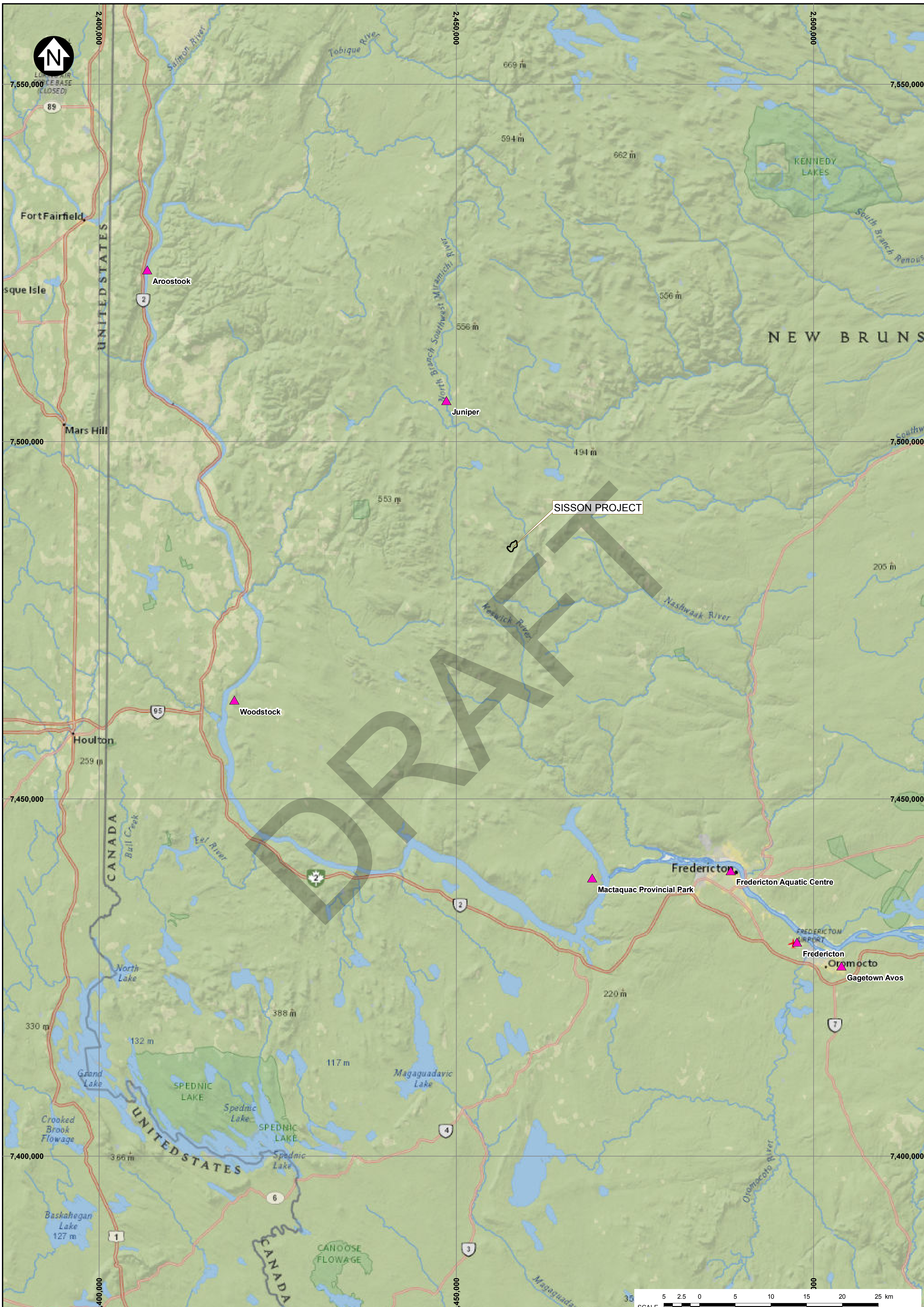
Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-447/2	VA12-01435

FIGURE 3	REV 0

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	19JUL'12	ISSUED WITH LETTER	ALR	ASM	CMB	KJB

KP FIGURE SAVED: M:\1\01\00447\02\A\GIS\Figs\VA12-01435\B04_HydrologyStations.mxd; Jul 24, 2012 9:46:48 AM adinca



LEGEND:

▲ METEROLOGICAL SERVICES OF CANADA (MSC) CLIMATE STATION

NOTES:

1. BASE MAP: ESRI ARCGIS TOPOGRAPHIC MAPS.
2. COORDINATE GRID IS IN METRES. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC.
3. THIS FIGURE IS PRODUCED AT A NOMINAL SCALE OF 1:500,000 FOR 11x17 (TABLOID) PAPER. ACTUAL SCALE MAY DIFFER ACCORDING TO CHANGES IN PRINTER SETTINGS OR PRINTED PAPER SIZE.

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	CHK'D	APP'D
0	19JUL'12	ISSUED WITH LETTER	CHS	AMD	CMB	KJB

NORTHCLIFF RESOURCES LTD.

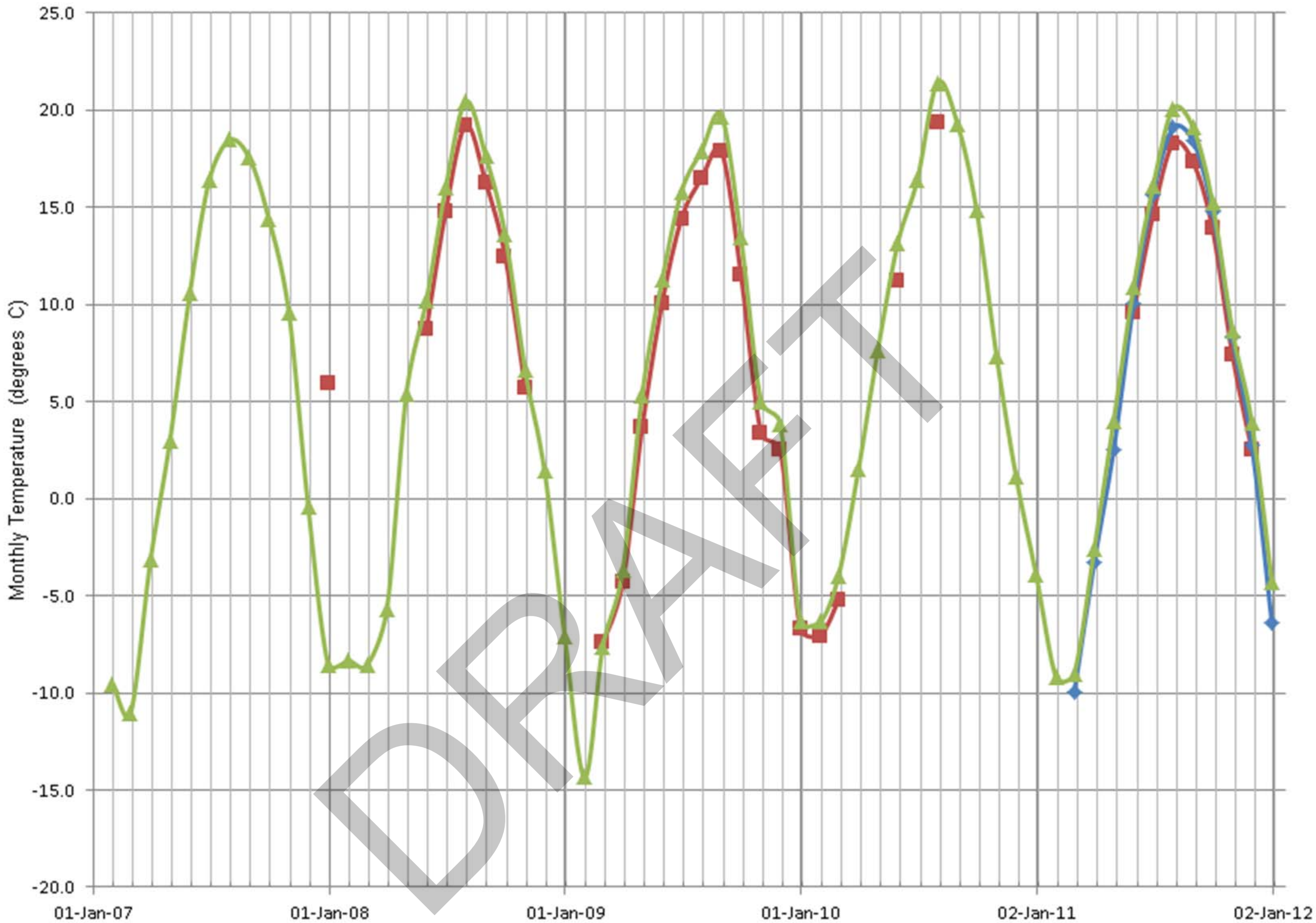
SISSON PROJECT

REGIONAL CLIMATE STATIONS

Knight Piésold CONSULTING

P/A NO.	REF NO.
VA101-447/2	VA12-01435

FIGURE 4 REV 0



NOTES:

1. MONTHLY TEMPERATURE WAS PLOTTED AT THE END OF THE RESPECTIVE MONTH.

LEGEND

Sisson Brook   Juniper   Woodstock

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

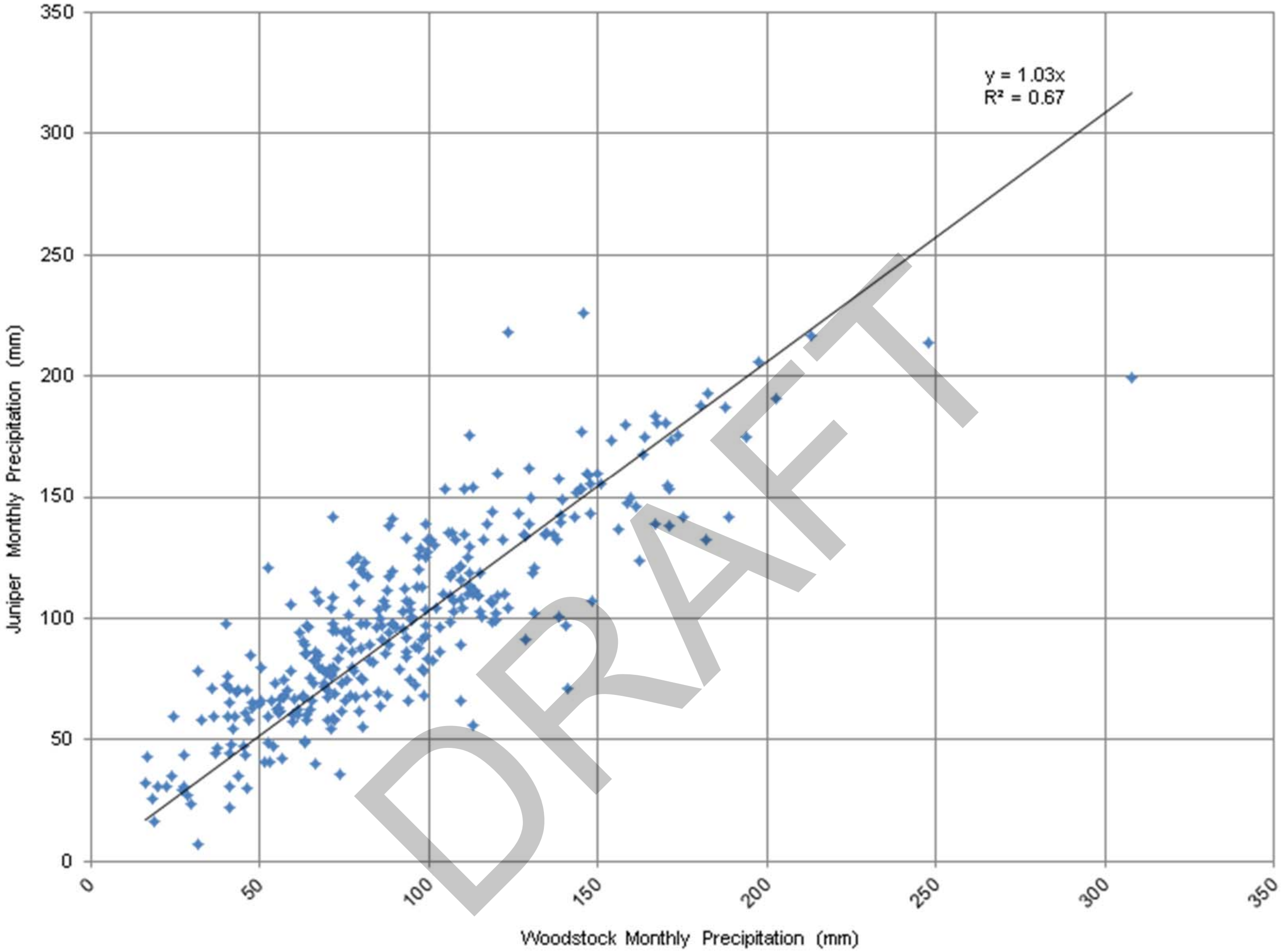
COMPARISON OF MONTHLY AVERAGE TEMPERATURE

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

FIGURE 5 REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

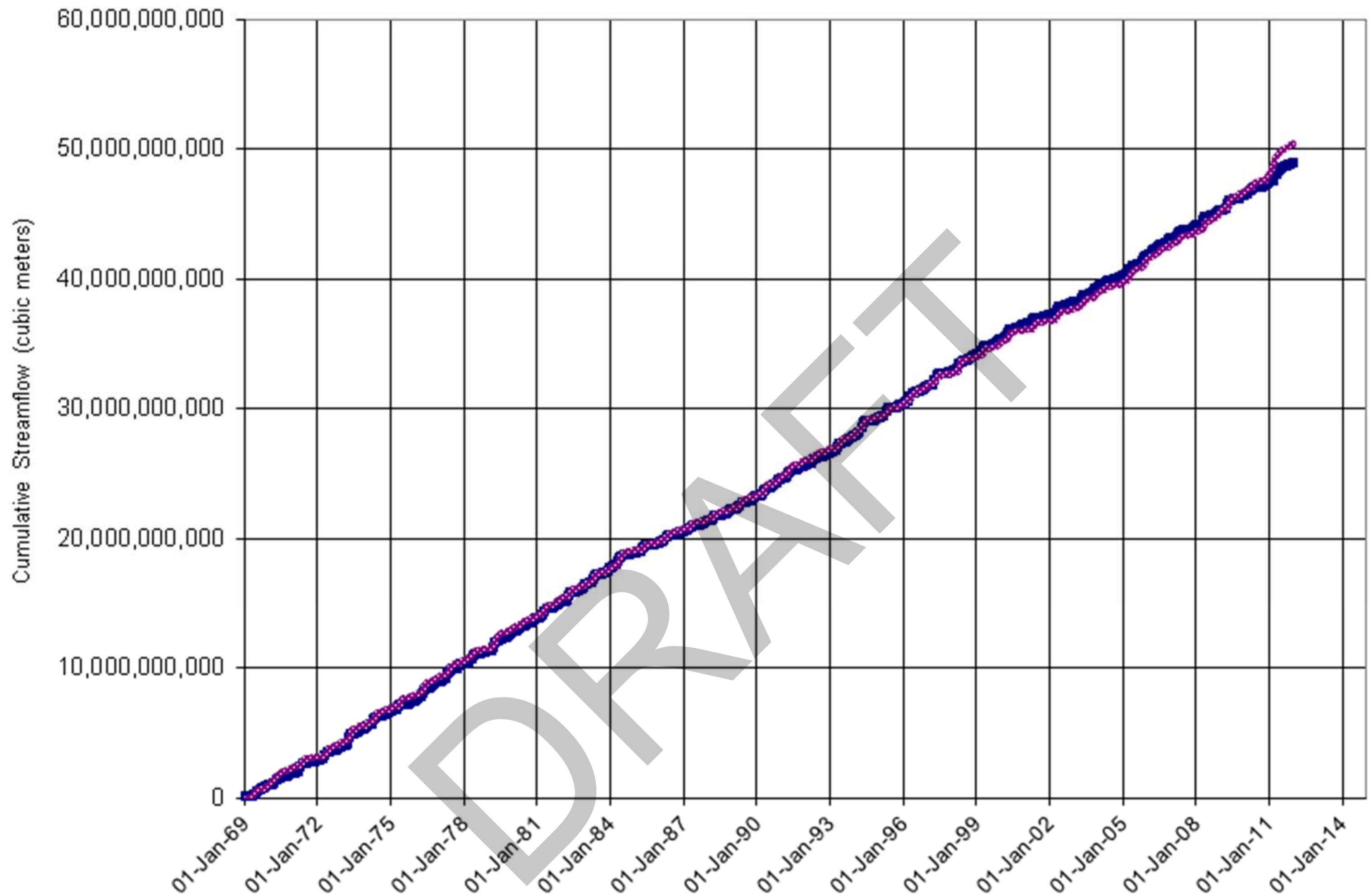
PRECIPITATION COMPARISON OF JUNIPER AND WOODSTOCK CLIMATE STATIONS

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

FIGURE 6 REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND

Nashwaak River Calculated

Nashwaak River Measured

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

CUMULATIVE STREAMFLOW (NASHWAAK RIVER)

Knight Piésold CONSULTING

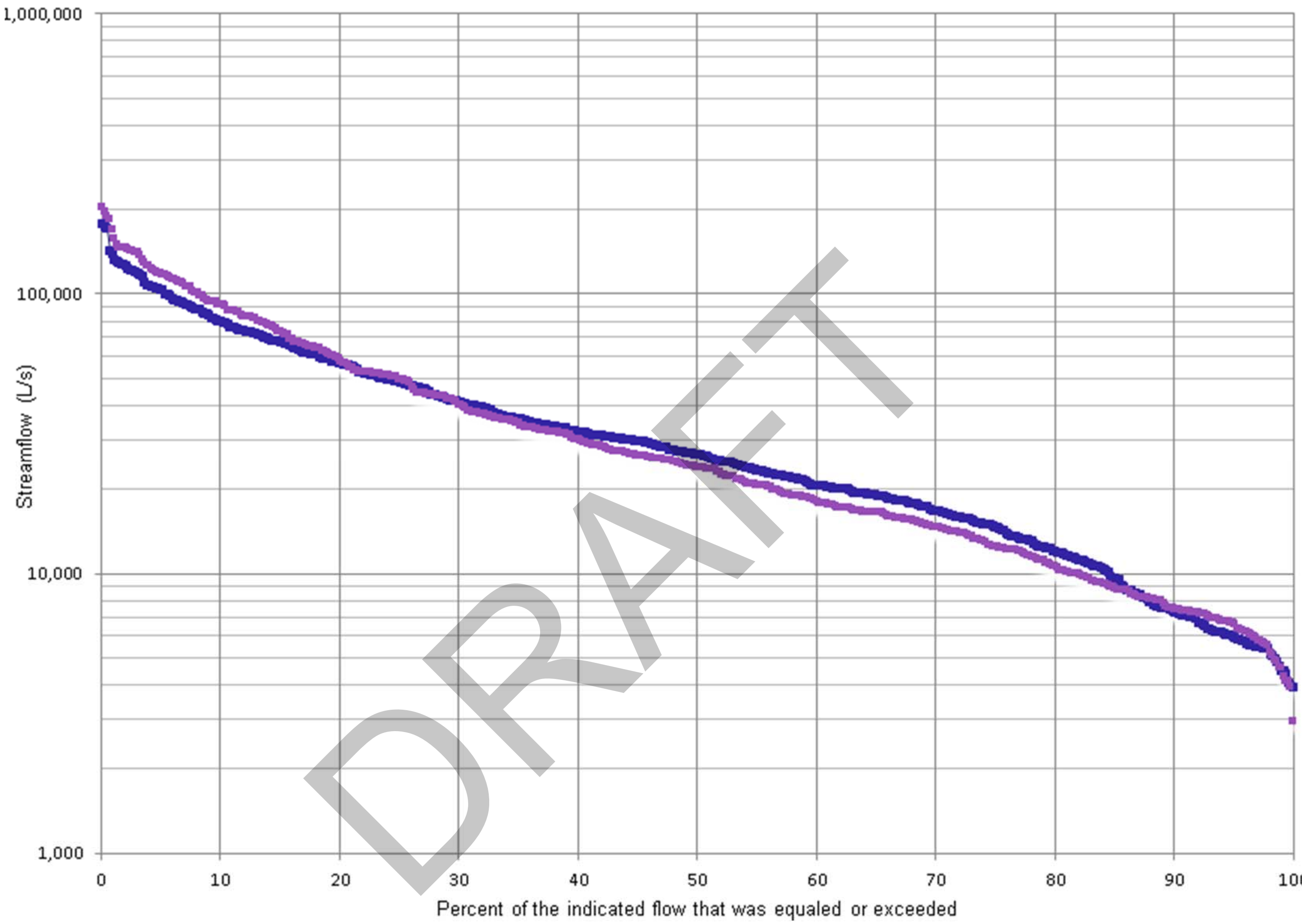
P/A NO. VA101-447/2

REF. NO. VA12-01435

FIGURE 7

REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND

Nashwaak River Calculated

Nashwaak River Measured

NORTHCLIFF RESOURCES LTD,

SISSON PROJECT

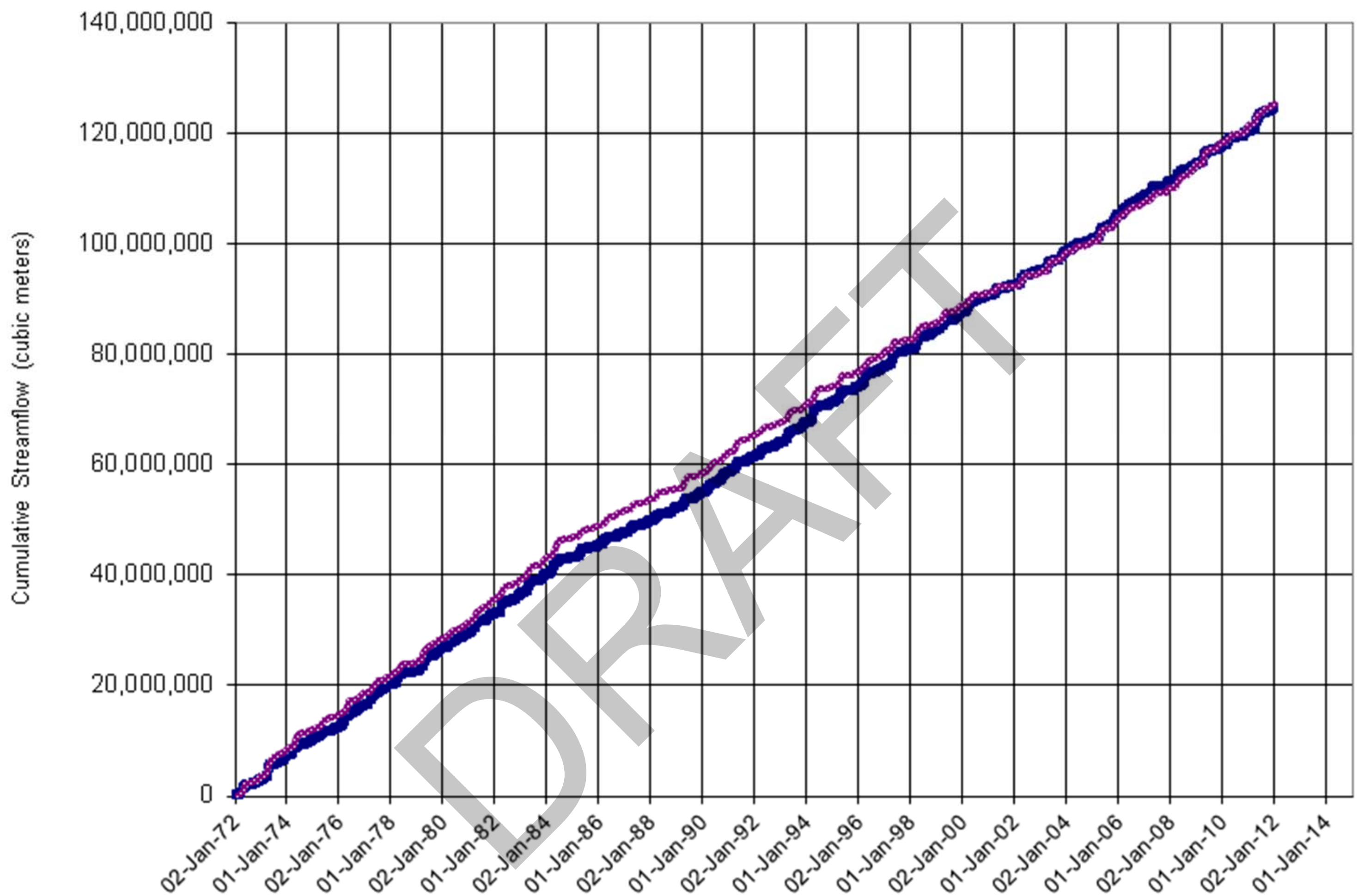
FLOW DURATION (NASHWAAK RIVER)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

FIGURE 8 REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	24JULY'12	ISSUED WITH LETTER	CHS	DF	KJB



LEGEND

Narrows Mountain Brook Calculated   Narrows Mountain Brook Measured

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

CUMULATIVE STREAMFLOW (NARROWS MOUNTAIN BROOK)

Knight Piésold CONSULTING

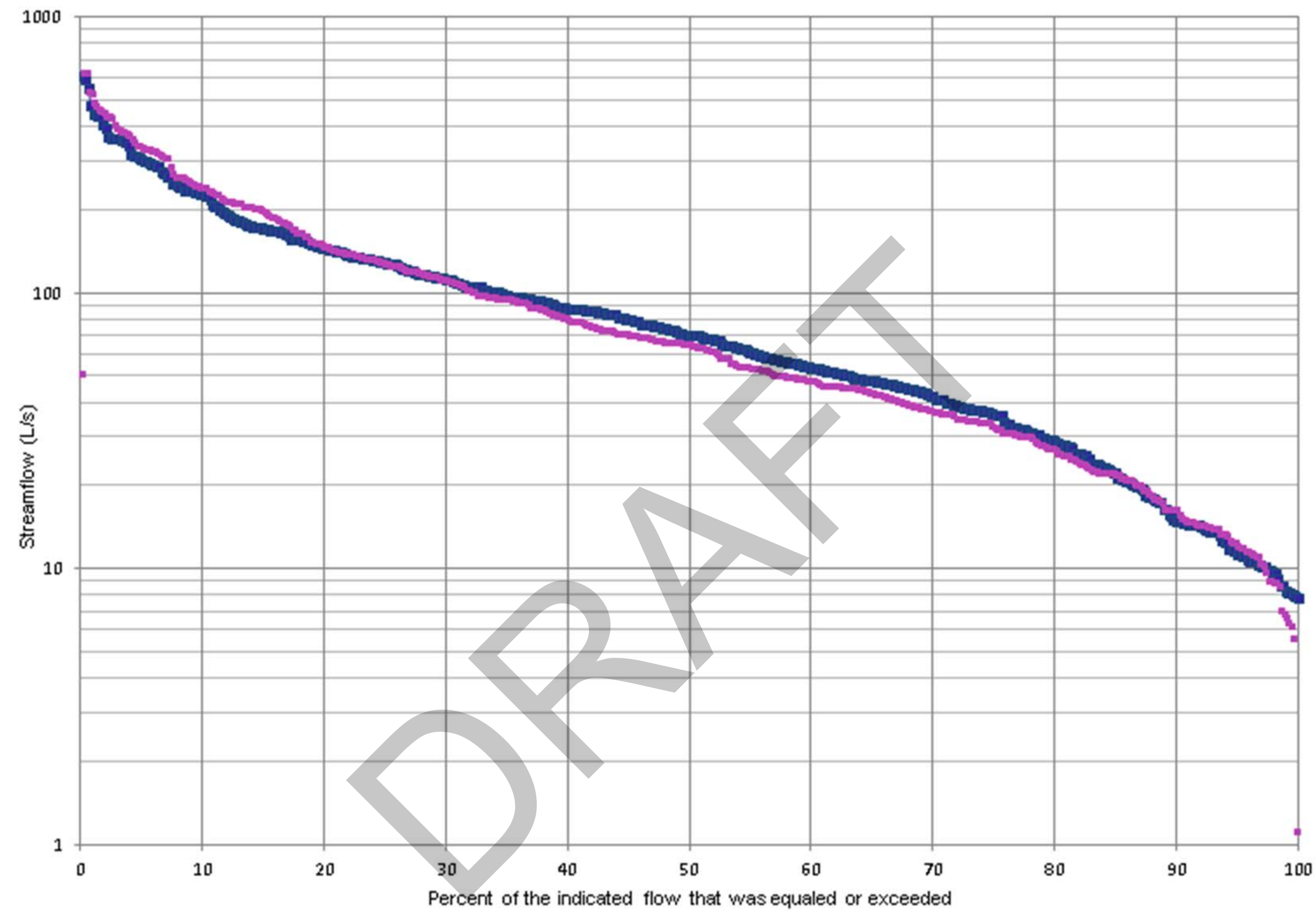
P/A NO. VA101-447/2

REF. NO. VA12-01435

FIGURE 9

REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND

Narrows Mountain Brook Calculated

Narrows Mountain Brook Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

FLOW DURATION
(NARROWS MOUNTAIN BROOK)

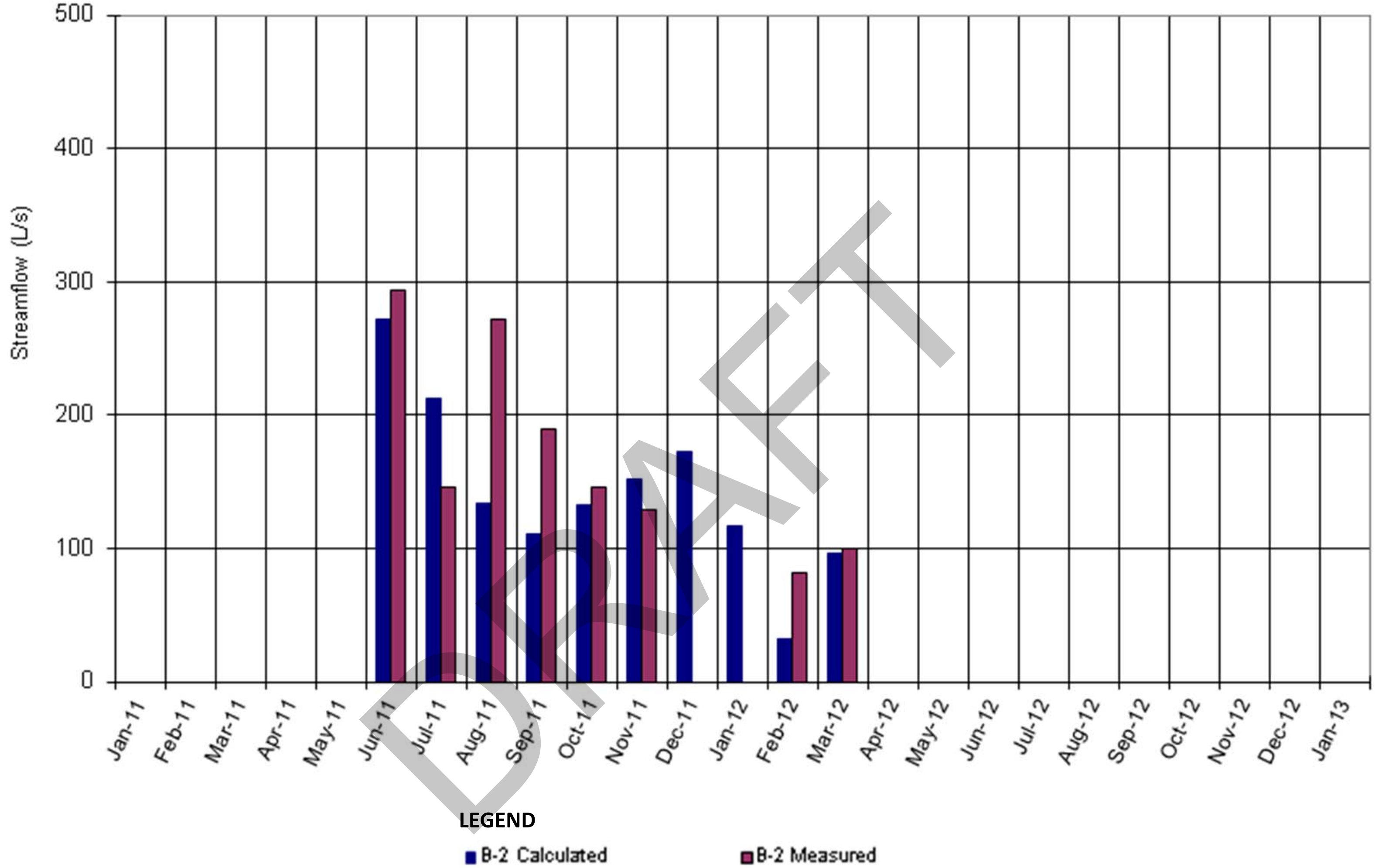
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

FIGURE 10

REV 0



NOTES:
1. MEASURED STREAMFLOWS IN 2012 ARE BASED ON SPOT MEASUREMENTS. CALCULATED STREAMFLOWS ARE MONTHLY.

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

MONTHLY STREAMFLOW (B-2)

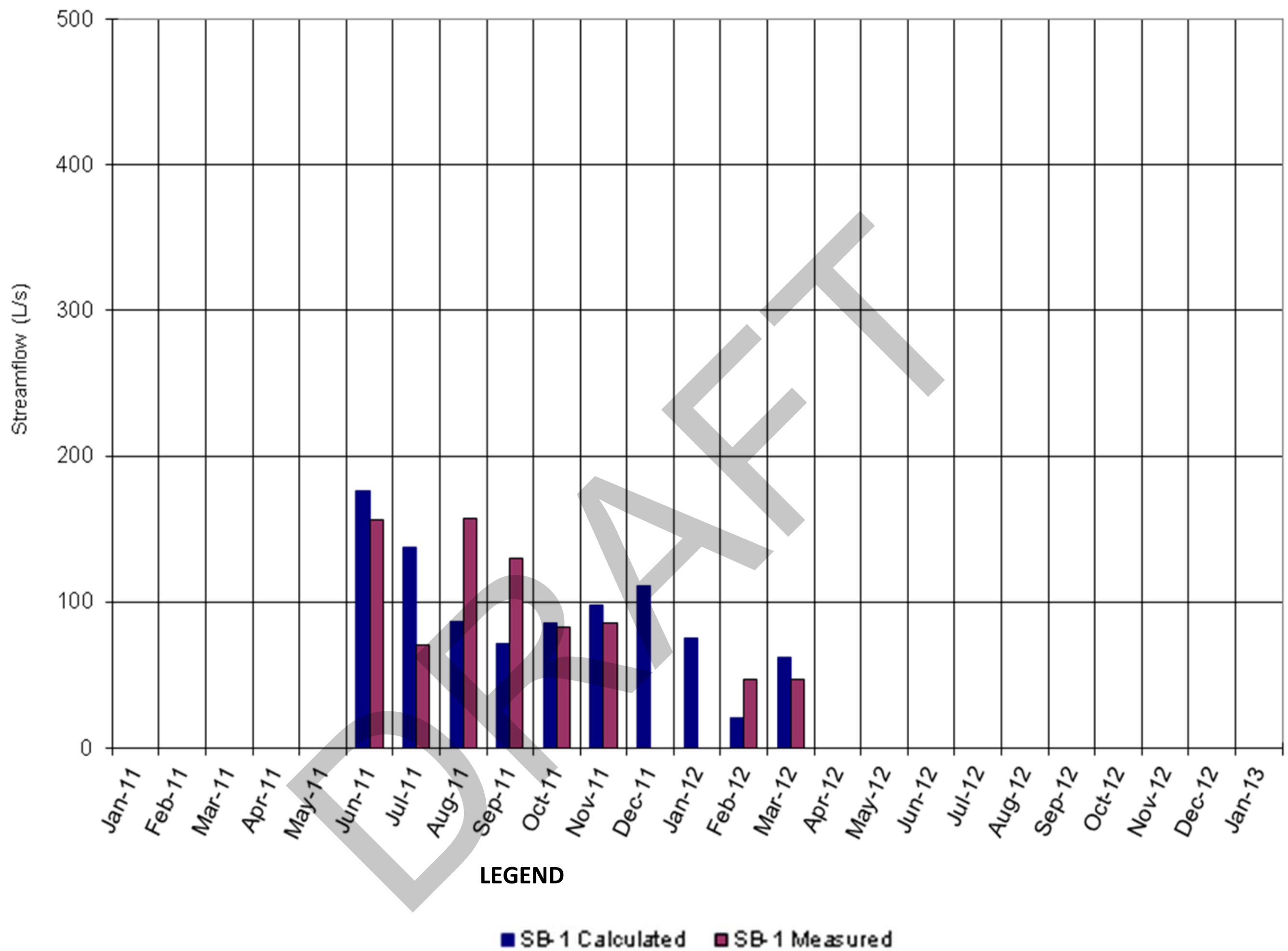
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

FIGURE 11

REV 0



NOTES:

1. MEASURED STREAMFLOWS IN 2012 ARE BASED ON SPOT MEASUREMENTS. CALCULATED STREAM FLOWS ARE MONTHLY.

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

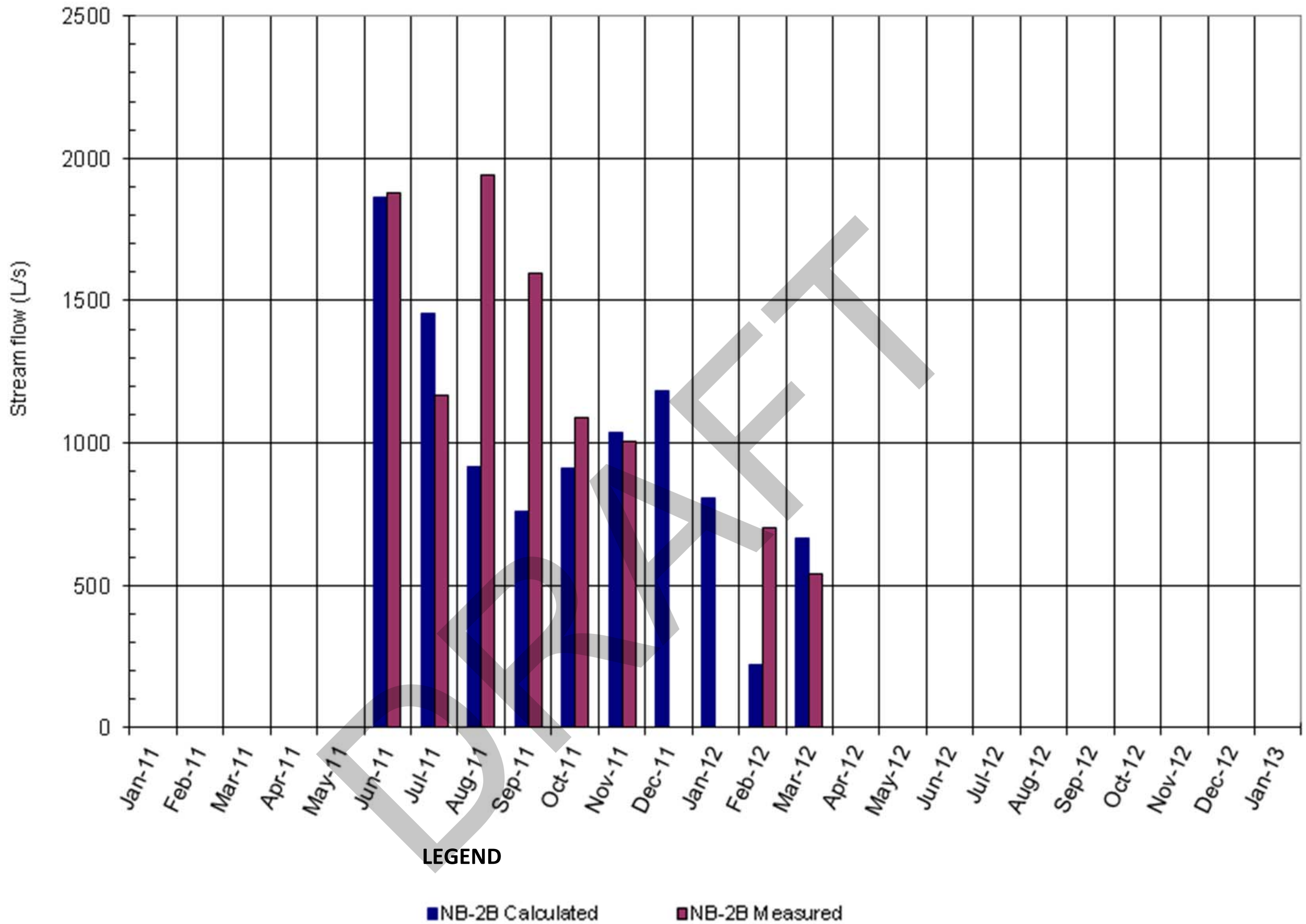
MONTHLY STREAMFLOW (SB-1)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

FIGURE 12 REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



NOTES:

1. MEASURED STREAMFLOWS IN 2012 ARE BASED ON SPOT MEASUREMENTS. CALCULATED STREAM FLOWS ARE MONTHLY.

NORTHCLIFF RESOURCES LTD.

SISSON PROJECT

MONTHLY STREAMFLOW (NB-2B)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

FIGURE 13 REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

Knight Piésold
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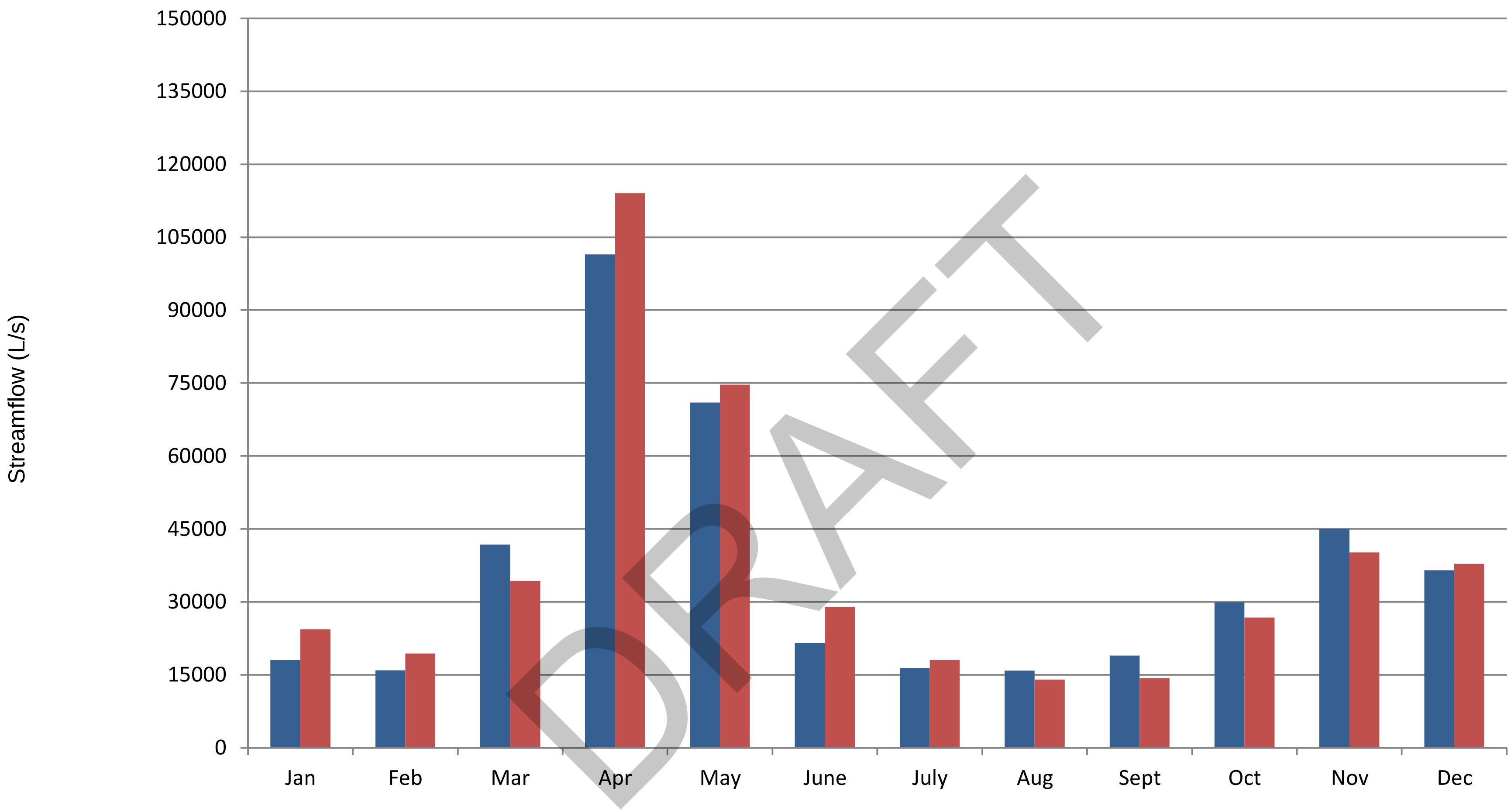
APPENDIX A

MONTHLY STREAM FLOW (NASHWAAK RIVER AND NARROWS BROOK MOUNTAIN

(Pages A-1 to A-18)

VA12-01435
July 24, 2012

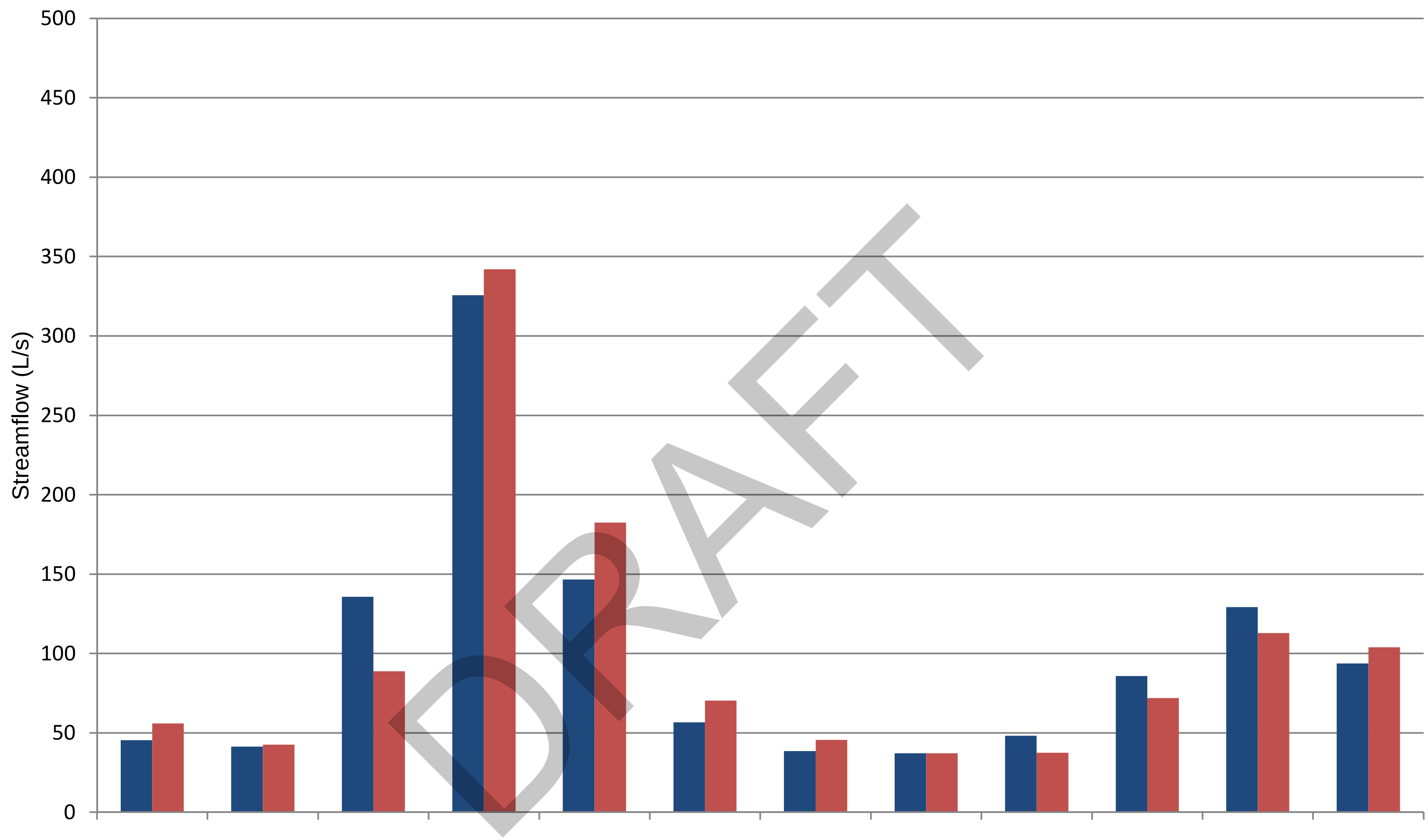


LEGEND

■ Calculated ■ Measured

NORTHCLIFF RESOURCES		
SISSON PROJECT		
AVERAGE ANNUAL STREAMFLOW (NASHWAAK)		
Knight Piésold CONSULTING	P/A NO. VA101-447/2	REF. NO. VA12-01435
	APPENDIX A-1	REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND

Calculated Measured

NORTHCLIFF RESOURCES

SISSON PROJECT

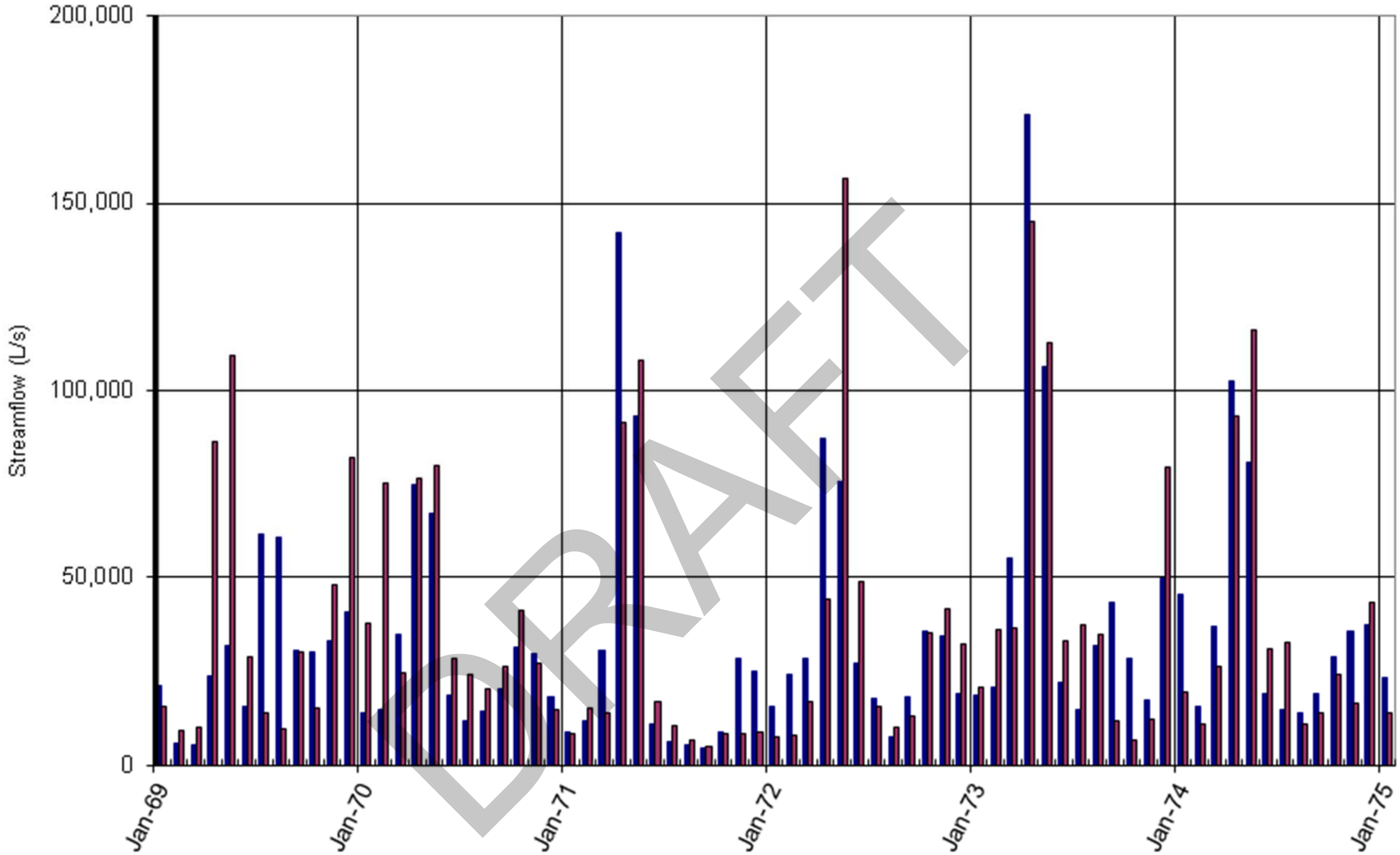
AVERAGE ANNUAL STREAMFLOW (NARROWS MOUNTAIN BROOK)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

APPENDIX A-2 REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NASHWAAK)

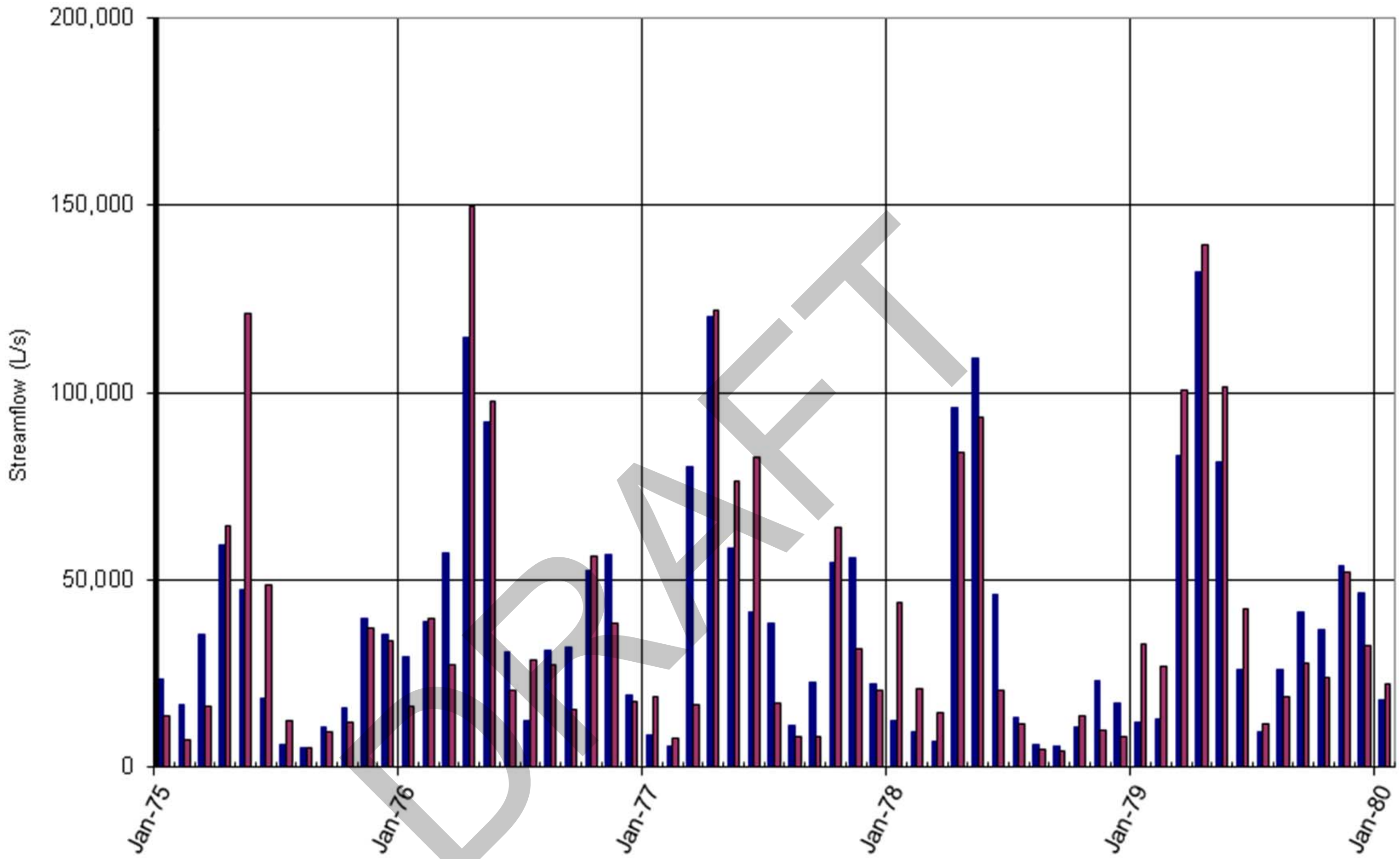
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-3

REV 0



LEGEND

Nashwaak Calculated   Nashwaak Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NASHWAAK)

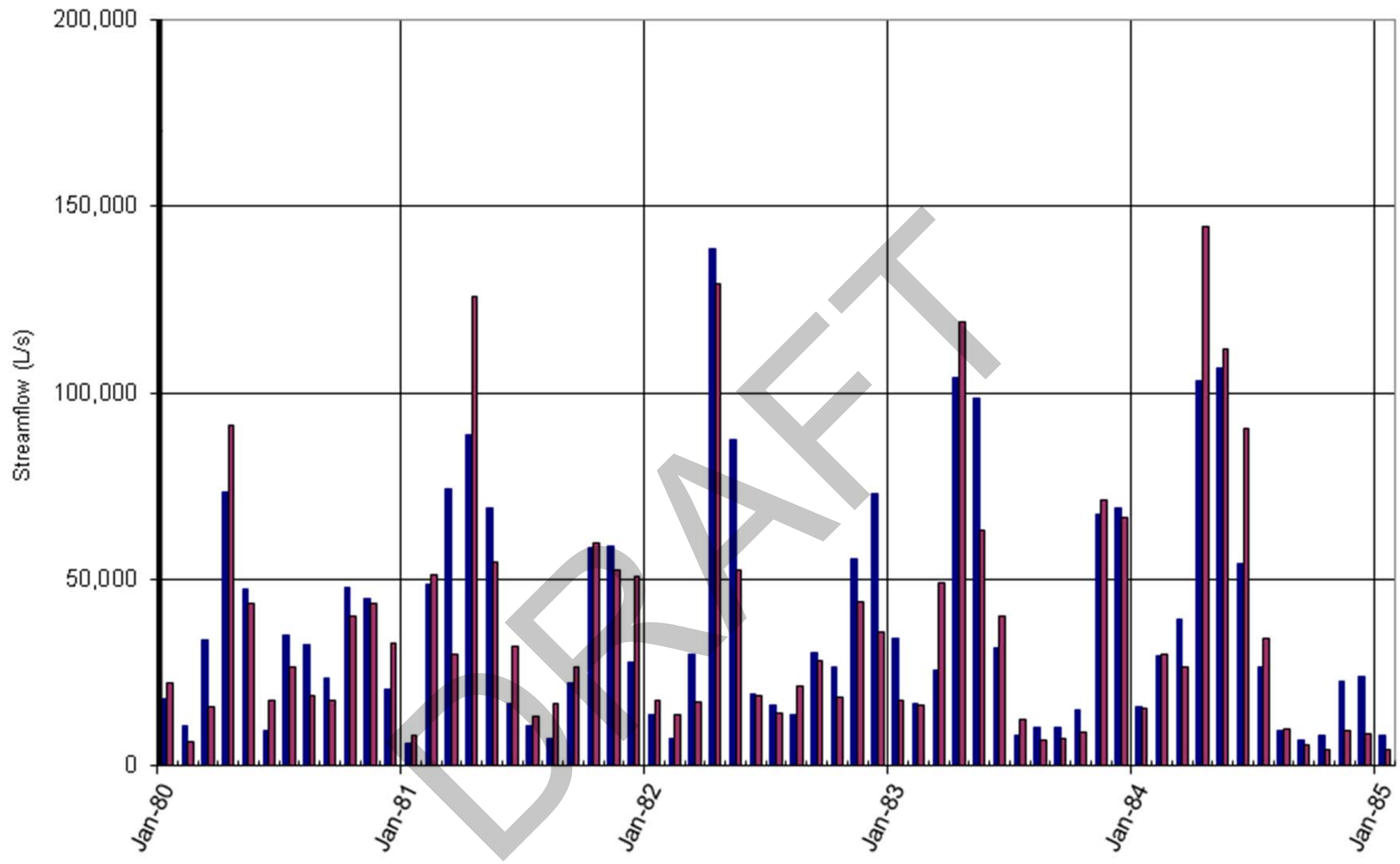
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-4

REV 0



LEGEND

Nashwaak Calculated Nashwaak Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NASHWAAK)

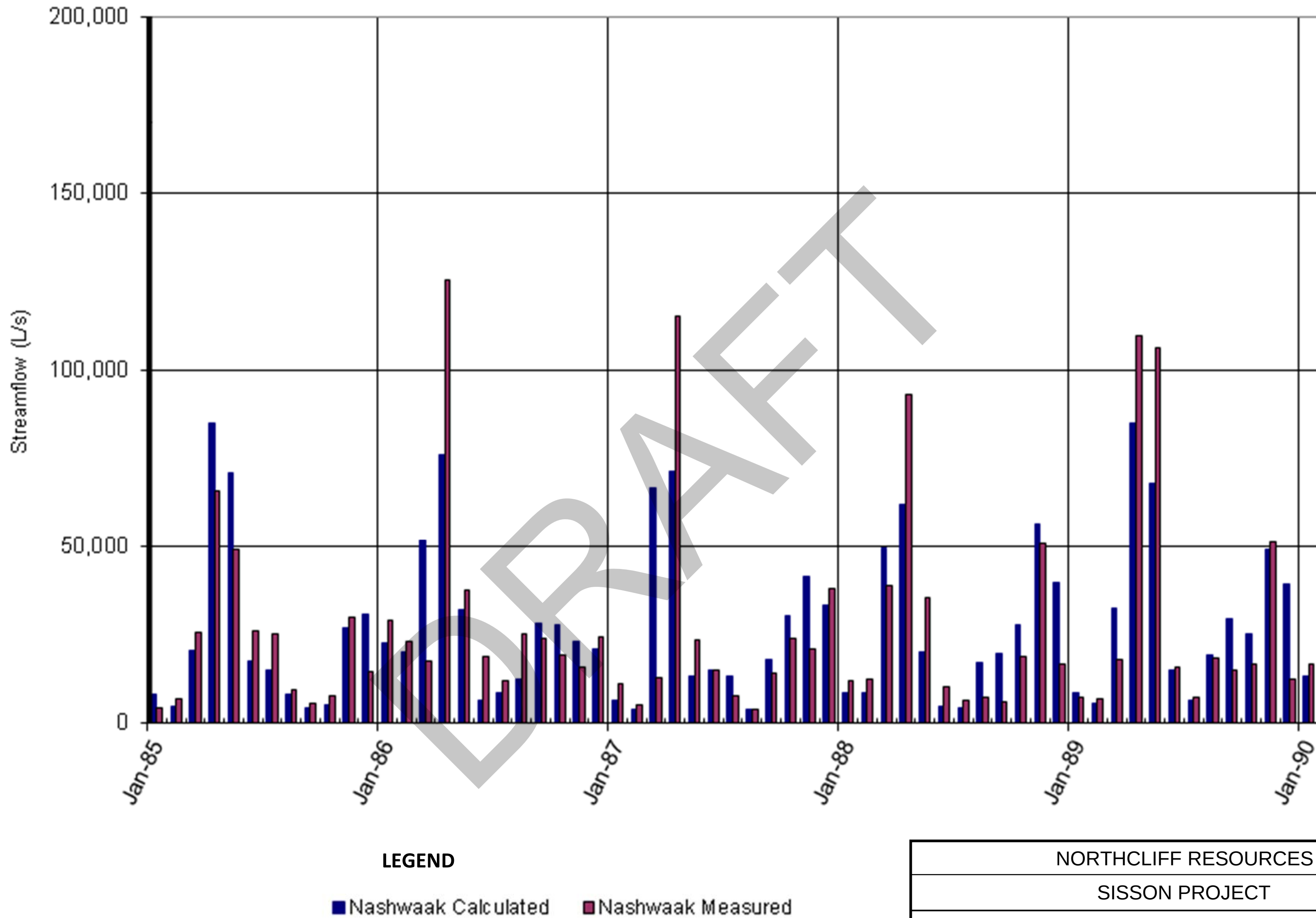
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

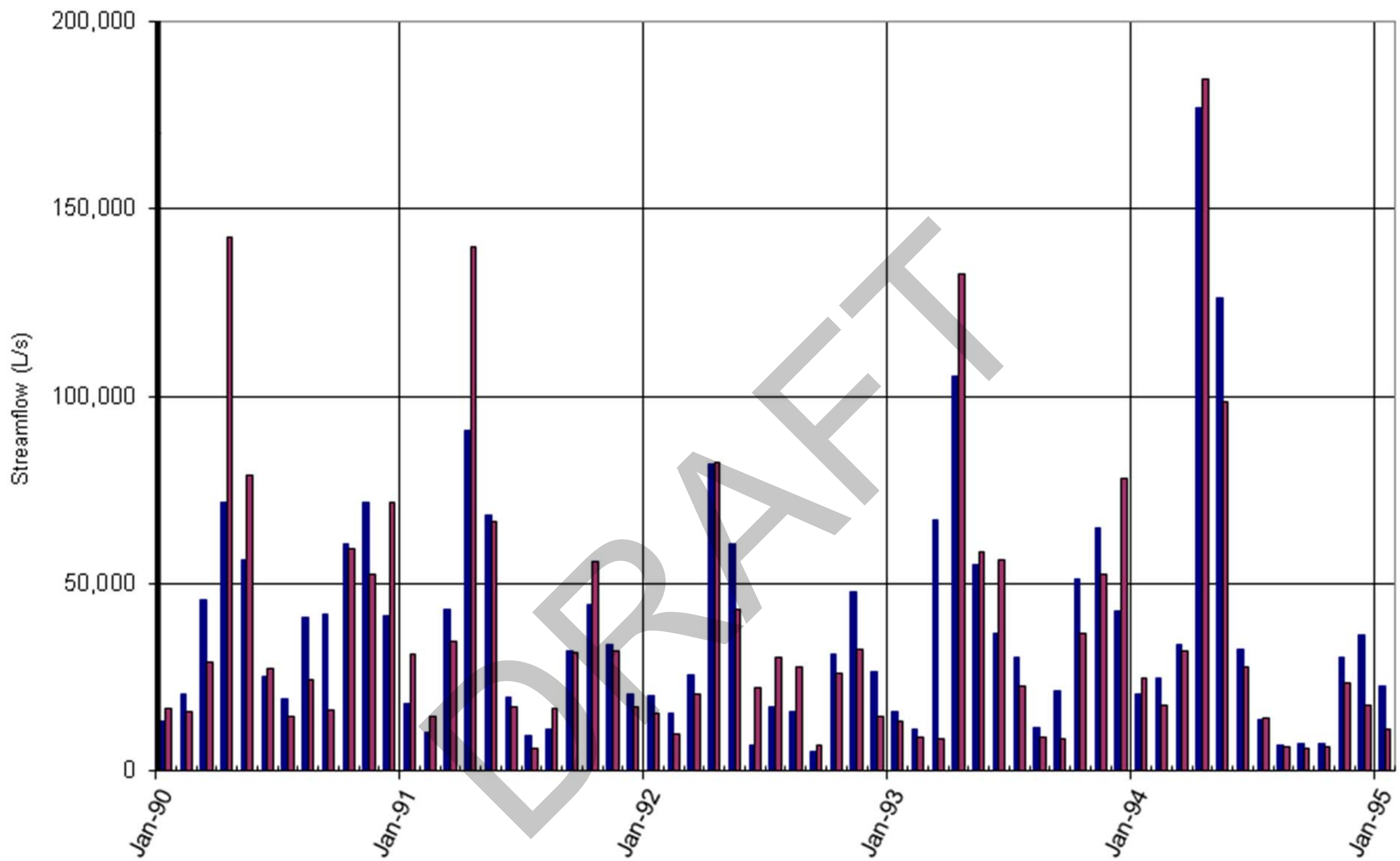
APPENDIX A-5

REV 0



NORTHCLIFF RESOURCES		
SISSON PROJECT		
MONTHLY STREAMFLOW (NASHWAAK)		
Knight Piésold CONSULTING	P/A NO. VA101-447/2	REF. NO. VA12-01435
	APPENDIX A-6	REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND

Nashwaak Calculated   Nashwaak Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NASHWAAK)

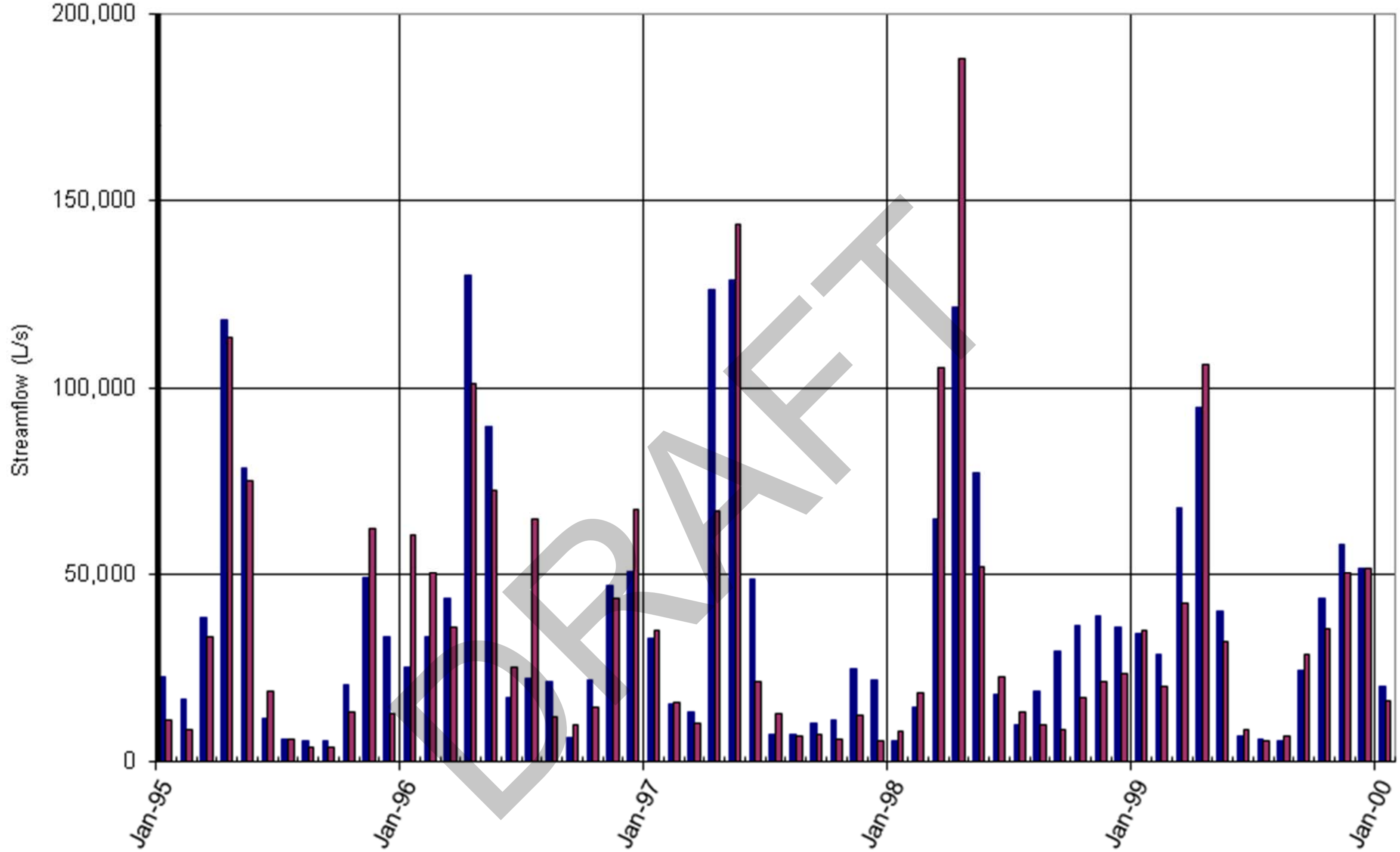
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-7

REV 0

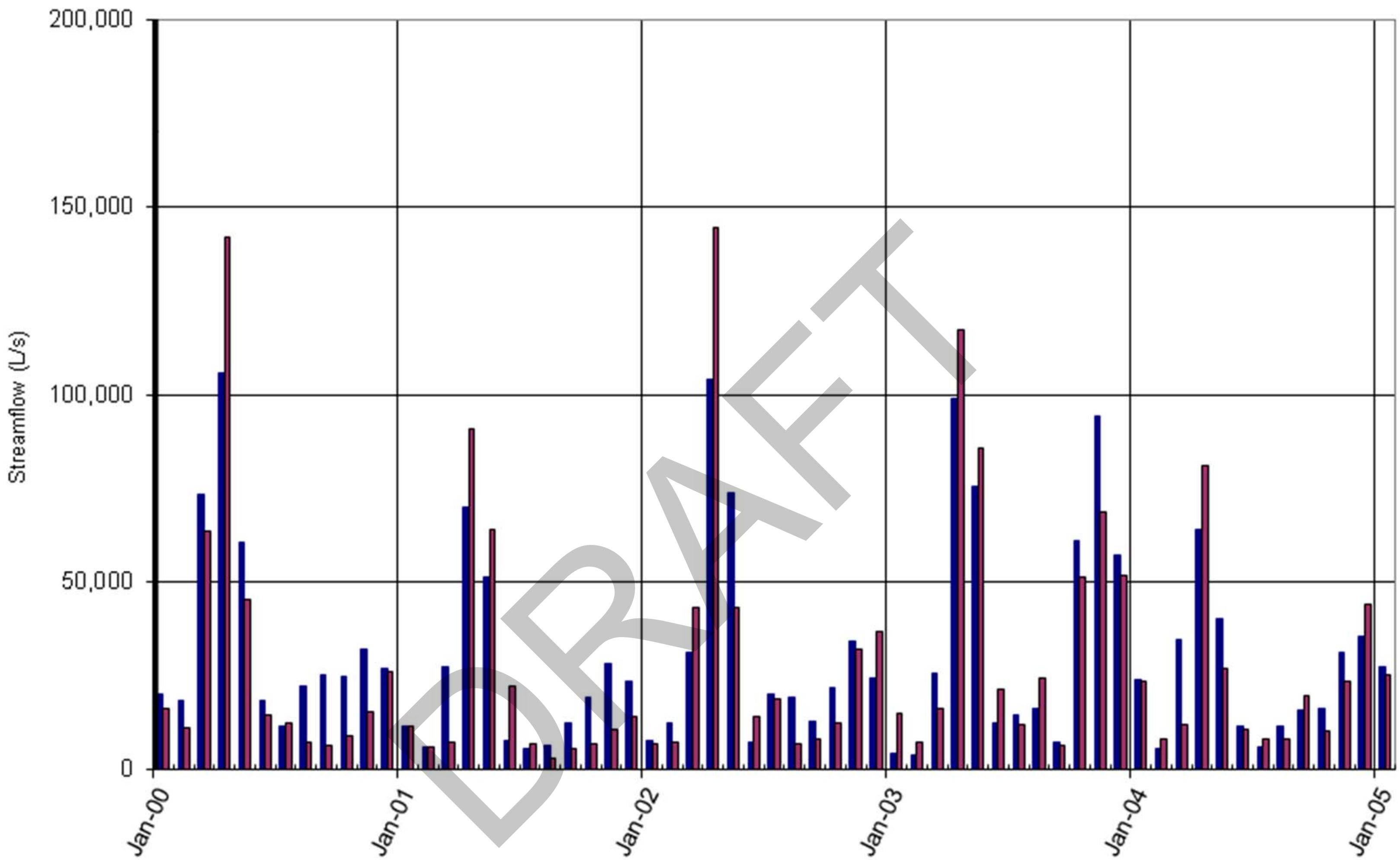


LEGEND

■ Nashwaak Calculated ■ Nashwaak Measured

NORTHCLIFF RESOURCES		
SISSON PROJECT		
MONTHLY STREAMFLOW (NASHWAAK)		
Knight Piésold CONSULTING	P/A NO. VA101-447/2	REF. NO. VA12-01435
	APPENDIX A-8	REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND

■ Nashwaak Calculated ■ Nashwaak Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NASHWAAK)

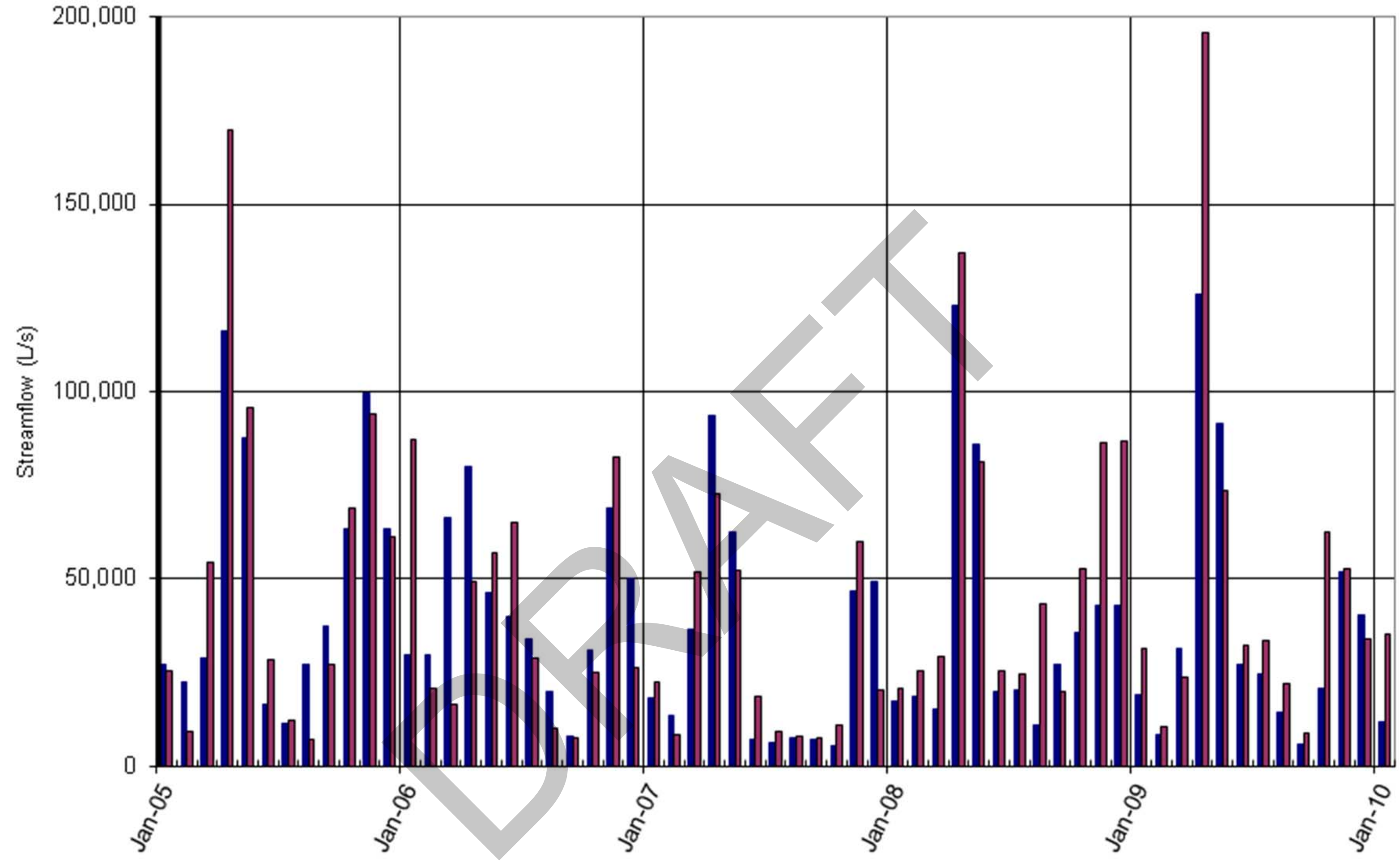
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-9

REV 0



LEGEND

■ Nashwaak Calculated ■ Nashwaak Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NASHWAAK)

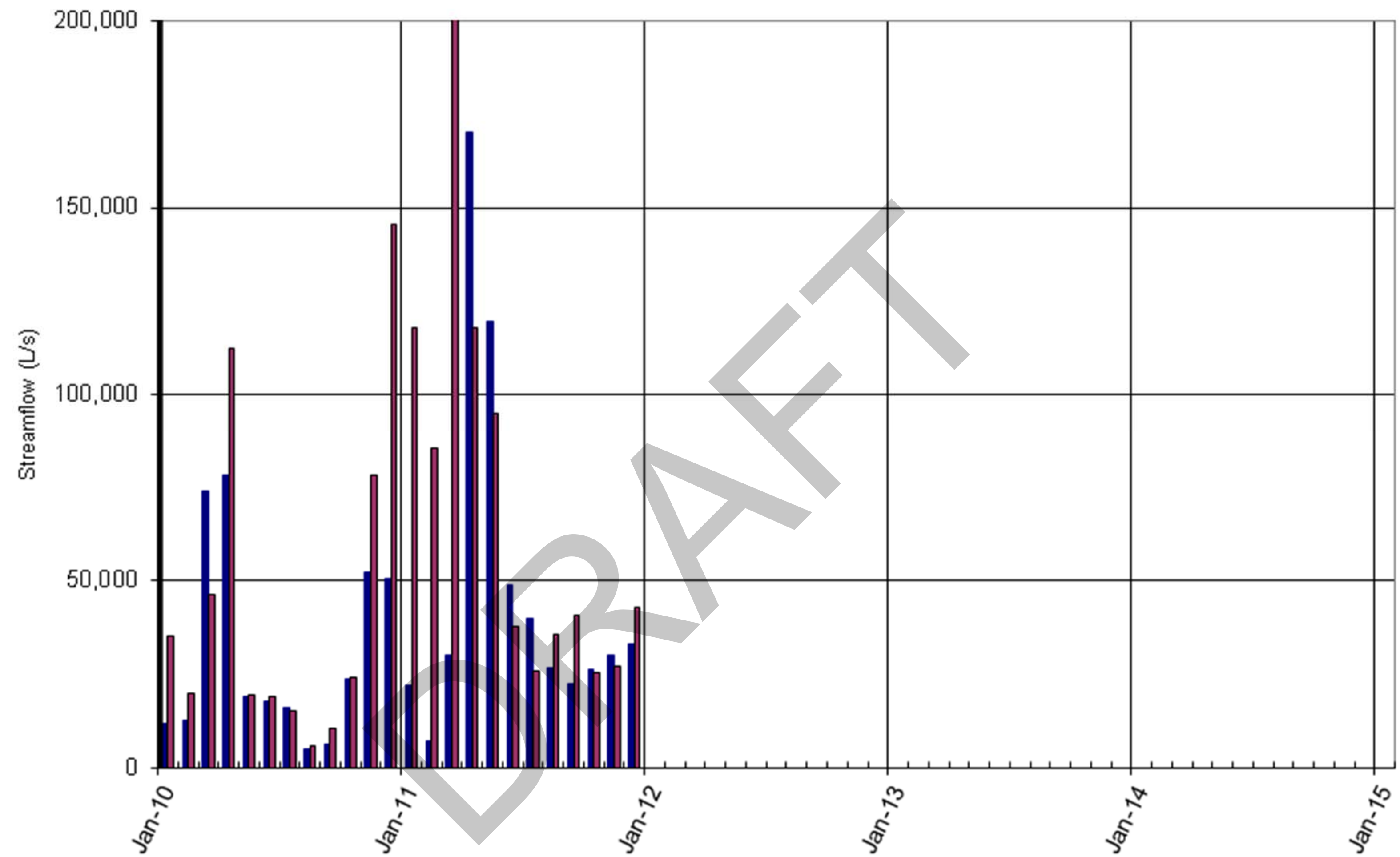
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-10

REV 0



LEGEND

Nashwaak Calculated   Nashwaak Measured

NORTHCLIFF RESOURCES

SISSON PROJECT

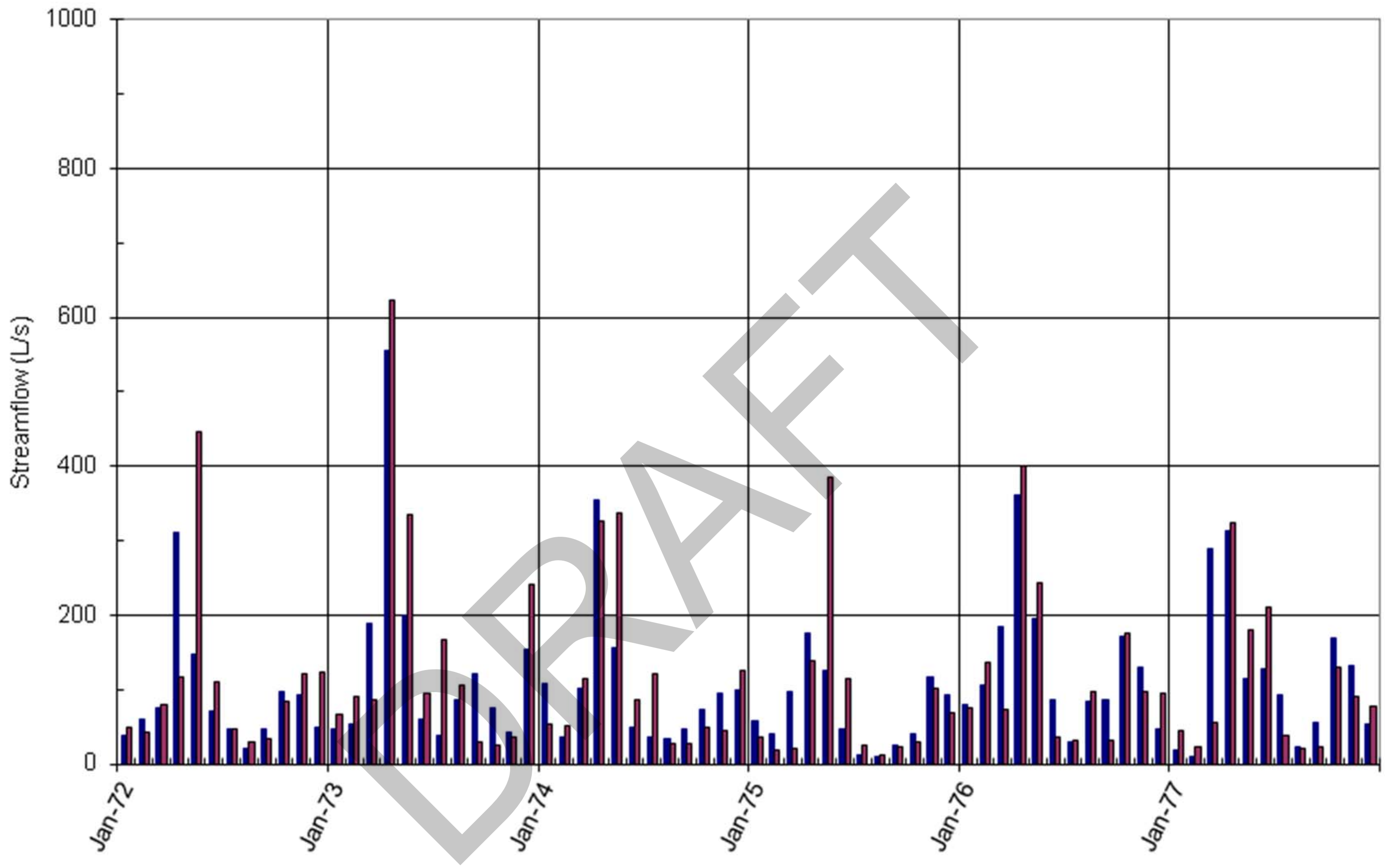
MONTHLY STREAMFLOW (NASHWAAK)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

APPENDIX A-11 REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D



LEGEND

■ Narrows Mountain Brook Calculated ■ Narrows Mountain Brook Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NARROWS MOUNTAIN BROOK)

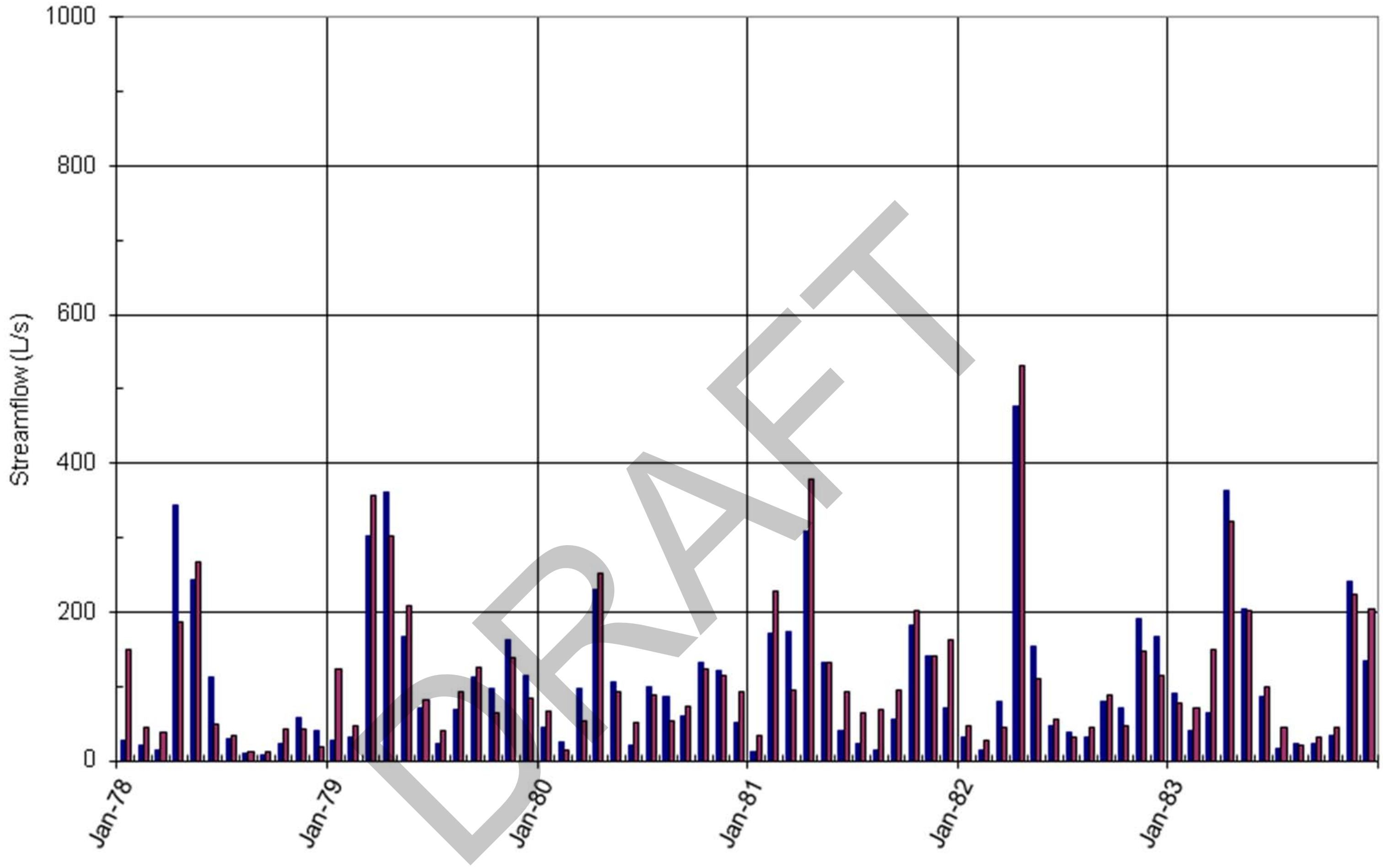
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-12

REV 0



LEGEND

■ Narrows Mountain Brook Calculated ■ Narrows Mountain Brook Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NARROWS MOUNTAIN BROOK)

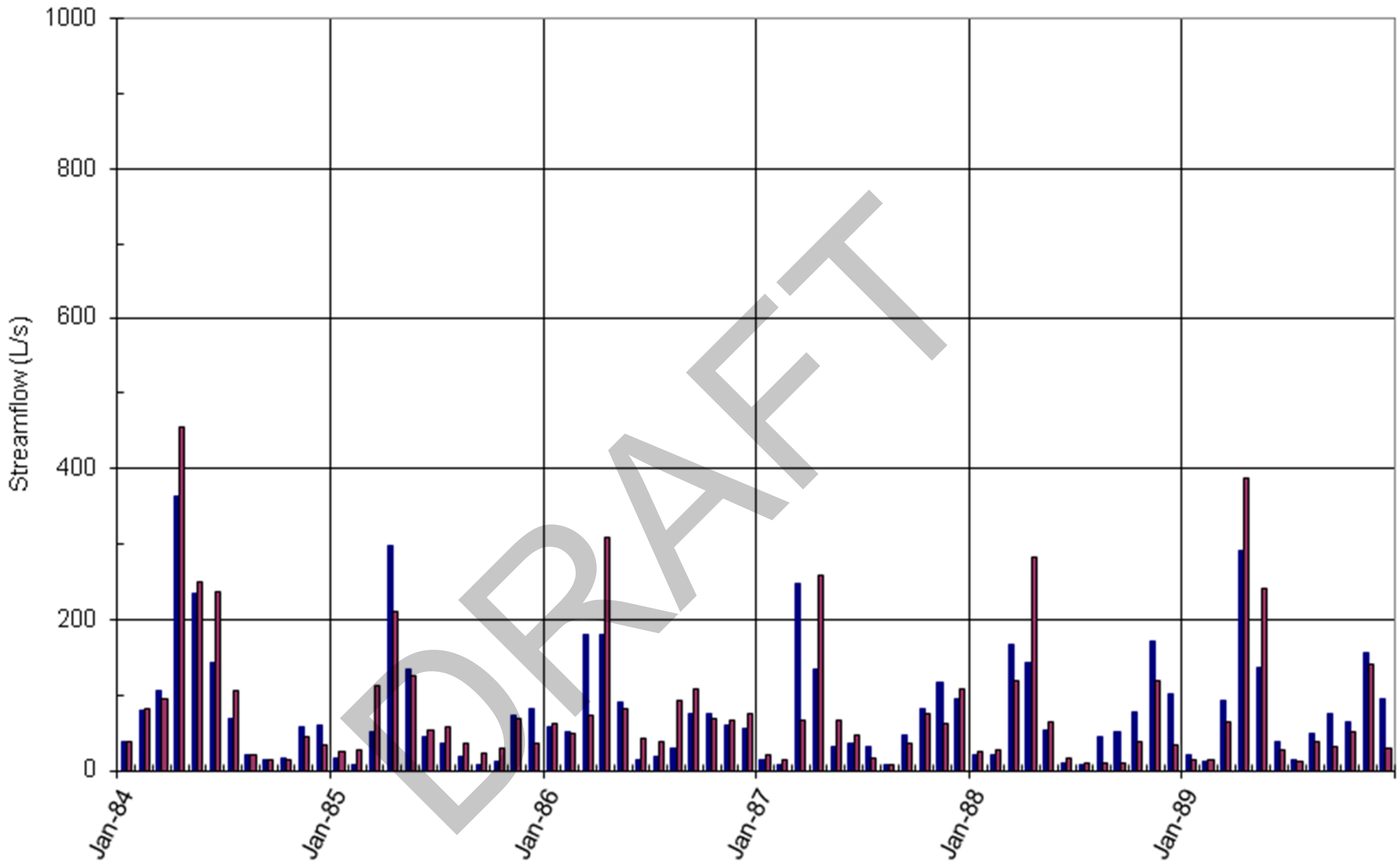
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-13

REV 0



LEGEND

■ Narrows Mountain Brook Calculated ■ Narrows Mountain Brook Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

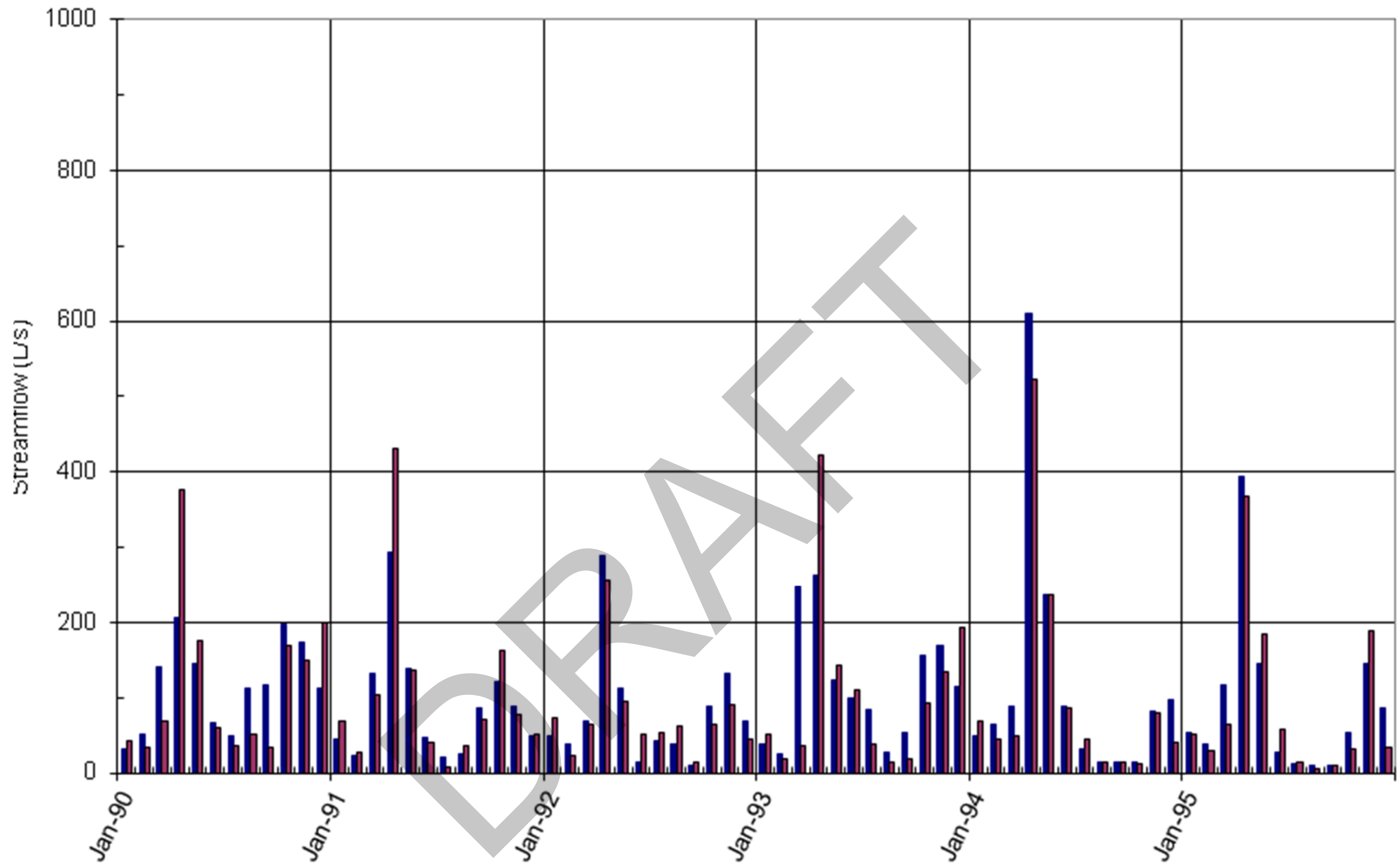
SISSON PROJECT

MONTHLY STREAMFLOW (NARROWS MOUNTAIN BROOK)

Knight Piésold CONSULTING

P/A NO.	REF. NO.
VA101-447/2	VA12-01435

APPENDIX A-14 REV 0



LEGEND

■ Narrows Mountain Brook Calculated ■ Narrows Mountain Brook Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW
(NARROWS MOUNTAIN BROOK)

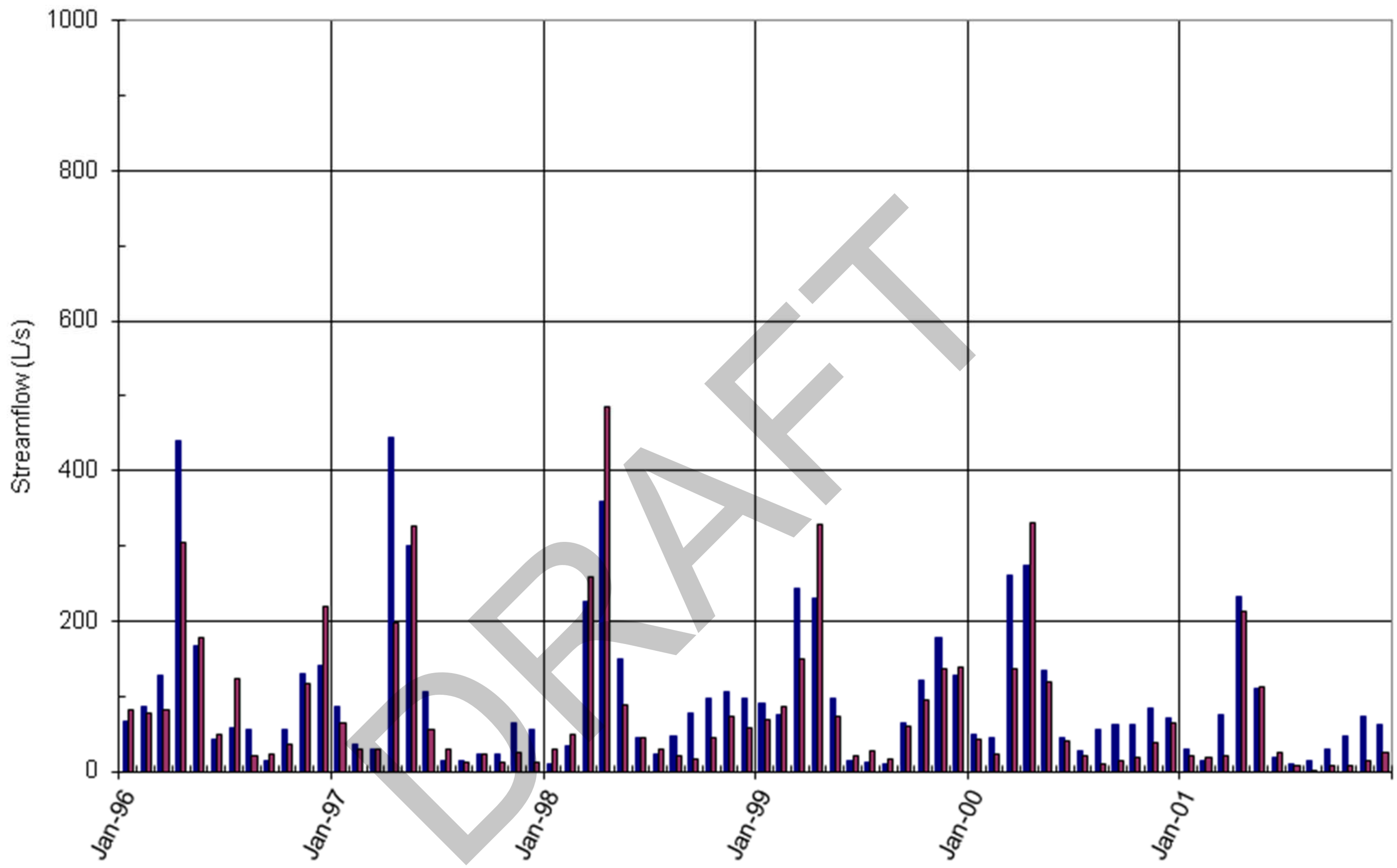
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-15

REV 0



LEGEND

■ Narrows Mountain Brook Calculated ■ Narrows Mountain Brook Measured

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW
(NARROWS MOUNTAIN BROOK)

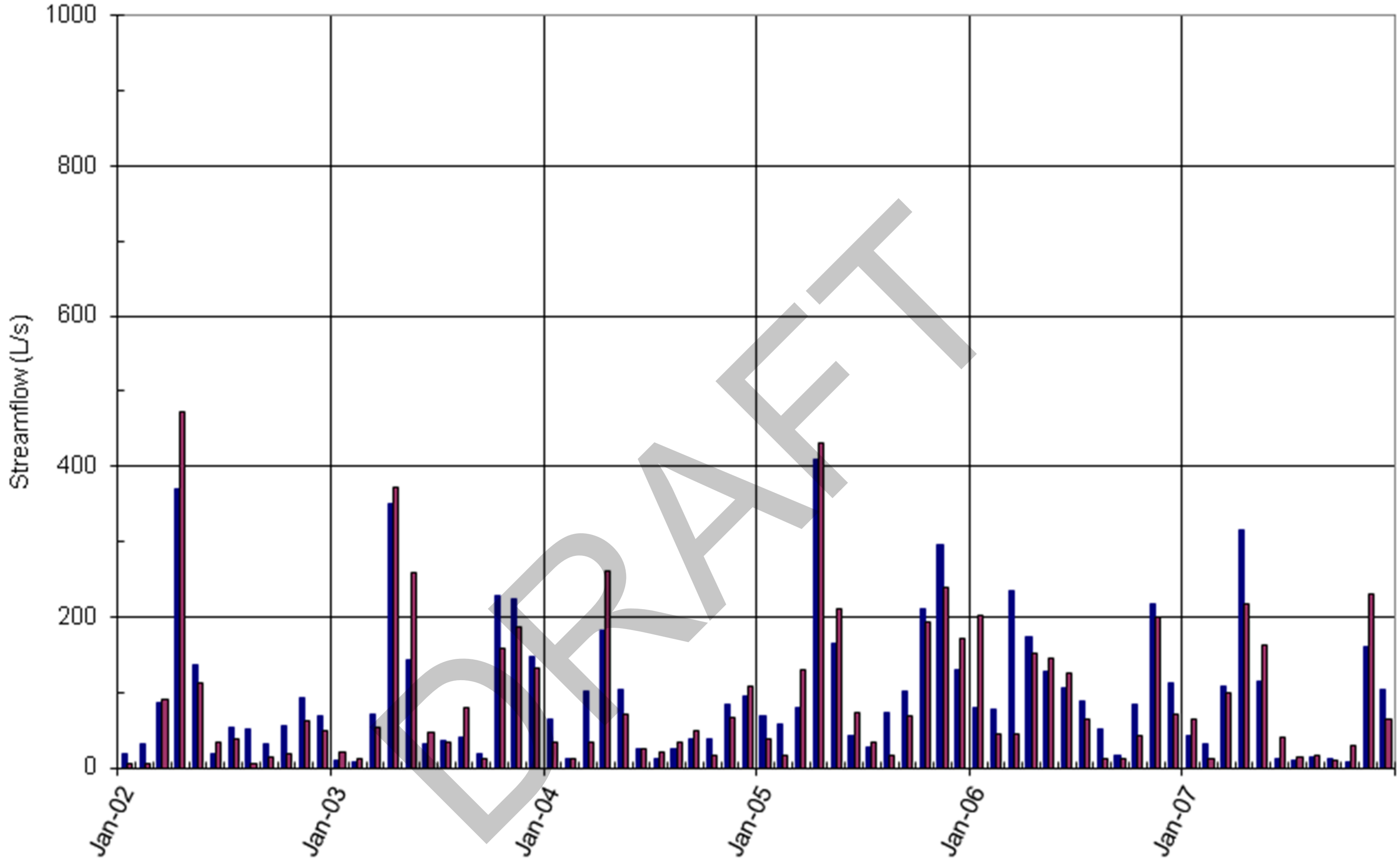
Knight Piésold CONSULTING

P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-16

REV 0



LEGEND

■ Narrows Mountain Brook Calculated ■ Narrows Mountain Brook Measured

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW
(NARROWS MOUNTAIN BROOK)

Knight Piésold CONSULTING

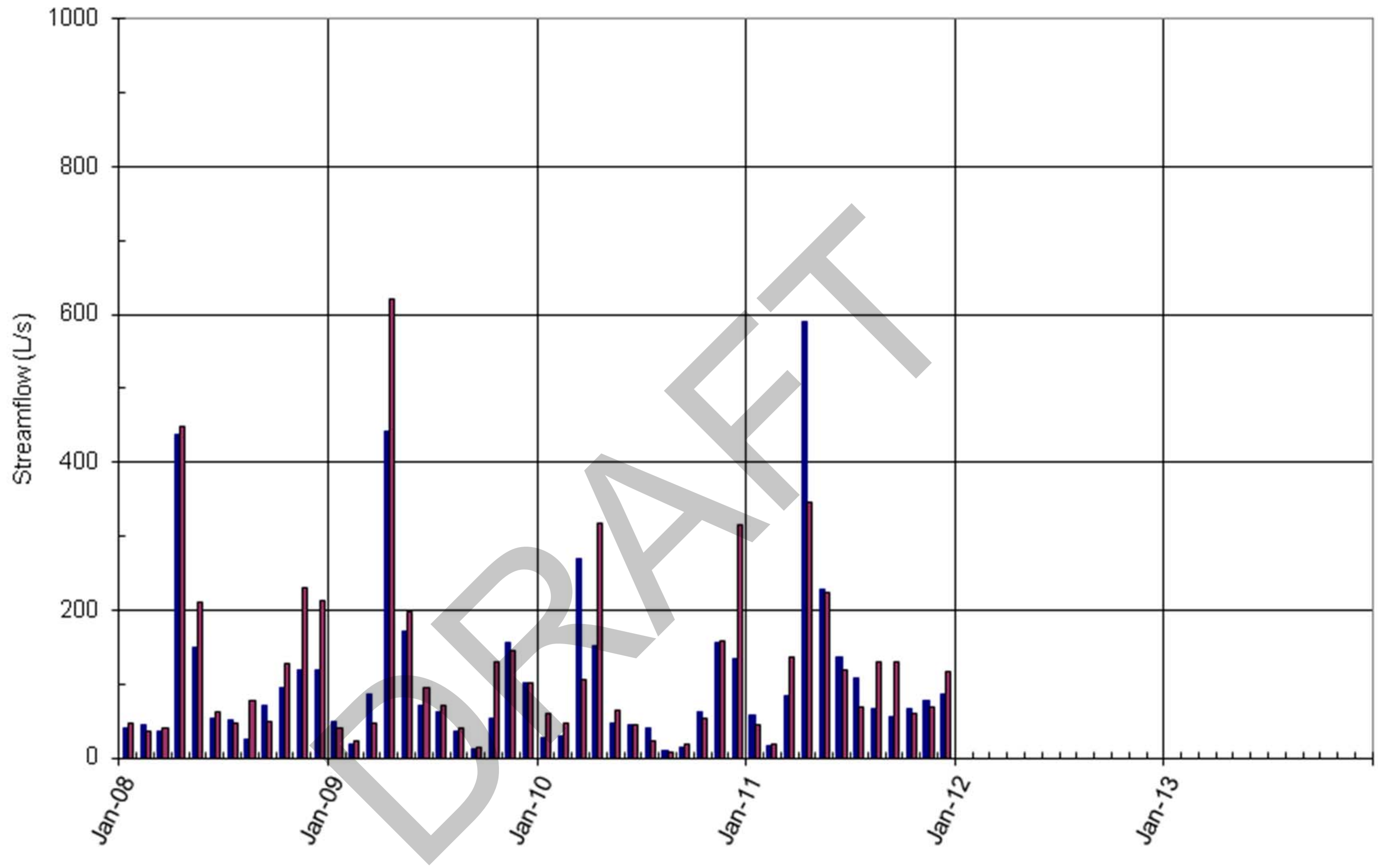
P/A NO. VA101-447/2

REF. NO. VA12-01435

APPENDIX A-17

REV 0

REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D
0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB



LEGEND

■ Narrows Mountain Brook Calculated ■ Narrows Mountain Brook Measured

NORTHCLIFF RESOURCES

SISSON PROJECT

MONTHLY STREAMFLOW (NARROWS MOUNTAIN BROOK)

Knight Piésold CONSULTING

P/A NO.	REF. NO.	
VA101-447/2	VA12-01435	
APPENDIX A-18		REV 0

0	24JUL'12	ISSUED WITH LETTER	CHS	DF	KJB
REV	DATE	DESCRIPTION	PREP'D	CHK'D	APP'D