AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

SUMMARY OF
1995 ENVIRONMENTAL PROGRAM

Prepared for:
American Bullion Minerals Ltd.
1500 - 675 West Hastings Street
Vancouver, B.C.
V6B 1N2

Prepared by:
Hallam Knight Piésold Ltd.
Suite 1450 - 750 West Pender Street
Vancouver, B.C.
V6C 2T8

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SUMMARY PAGE

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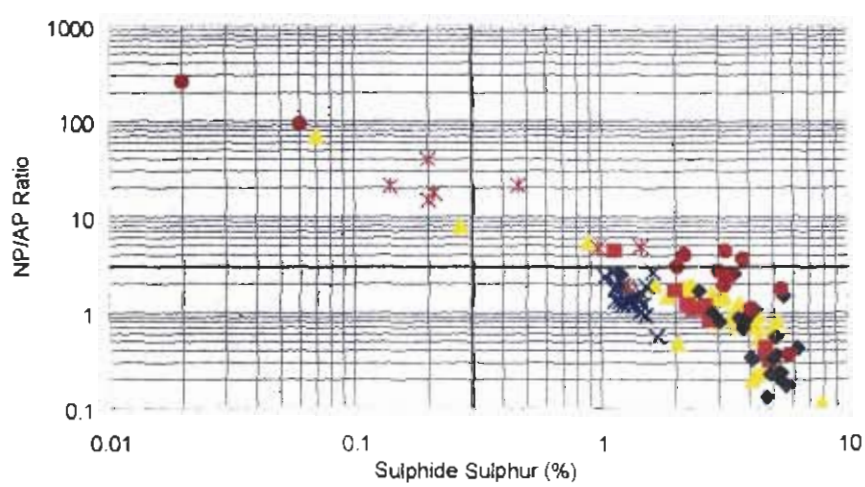
- Environmental studies, which have included baseline data collection programs for hydrology (5 sites, including 2 automatic water level recorders), water quality (11 sites), meteorology and wildlife, and preliminary vegetation and fisheries studies, have indicated that general environmental conditions at the Red Chris project site are typical for the region.

- Runoff from the deposit area reflects the mineralization with elevated levels of conductivity, dissolved solids, sulphates, and metals such as aluminum, cadmium, copper, iron, manganese and zinc.

- Mountain goat and stone sheep habitat on Todagin Mountain is of significant concern within the immediate area.

- Public response from the preliminary Public Consultation Program, which consisted of a series of Open House presentations in several communities near the project site, was generally supportive of the proposed Red Chris project.

- Preliminary waste characterization studies on the four main rock types found within the Red Chris deposit area suggested that main phase monzodiorite and late phase dyke material will likely be acid generating. Distal volcanic rocks will likely be acid consuming; however, proximal volcanics and siltstones will require further test work to determine their overall acid generation potential.



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EXECUTIVE SUMMARY

Environmental work completed during 1994 and 1995 was undertaken with the specific objective of providing sufficient environmental baseline data for incorporation into a pre-feasibility report and is intended to provide a basis for meeting government requirements for a "Project Approval Certificate" and for completion of feasibility-level studies in the future.

E.1 ENVIRONMENTAL BASELINE STUDIES

The initial baseline environmental monitoring program at the American Bullion Minerals Ltd. Red Chris property, located near Iskut, B.C., was established in July 1994, and has been maintained throughout the 1994 and 1995 exploration programs. The program established collection of baseline environmental data for meteorology, hydrology and water quality monitoring, and recording of wildlife observations. Additional work completed, during the 1995 exploration season, included a series of preliminary vegetation transects, preliminary fisheries studies, and establishing a preliminary waste rock characterization program. Further, existing background information relating to physiographic, socioeconomic, cultural, health and land use issues was compiled for incorporation into the "Application for a Project Approval Certificate."

The proposed Red Chris property lies within the Klastine Plateau, a subdivision of the Stikine Plateau, which is a major northern extension of B.C.'s Central Plateau and Mountain Area. Most of the claim holdings have relatively low relief with elevations ranging from 1,036 m along Coyote Creek to 1,676 m on the slopes of Todagin Mountain, and near the Red-Chris copper-gold deposit they are typically 1,500 m. Bedrock exposures are generally absent in areas of low to even moderate relief within the central portion of the property and in the valley bottoms. However, there is abundant outcrop along the higher-relief drainages and along mountainous ridges. Land types in the Red Chris project area include an integrated mixture of sub-alpine plateau, forested slopes and minor riparian units.

A weather station, including a rain gauge and maximum and minimum temperature thermometers, was established in July 1994. Data was recorded twice daily by ABM personnel throughout the 1994 and 1995 exploration programs. Based on site and regional data, the Red Chris project area is located in a region characterized by moderate total annual precipitation and extreme variations in temperature. Average annual precipitation in the project area ranges from approximately 465 mm in the area of the proposed tailings facilities to 725 mm in the area of the site meteorological station and proposed open pit. Approximately 60% of the annual precipitation falls as snow, with daily temperatures below freezing from October through April. Average

monthly temperatures range from a low of approximately -21°C in January to a high of approximately 9°C in July, with temperature extremes ranging from approximately -50°C to 30°C.

The initial hydrology monitoring program consisted of installation of staff gauges at five selected locations, and automatic water level recorders were installed in 1994 and 1995. Based on site and regional data, streamflows in the Red Chris Project Area are generally characterized by peak flows in the spring and low flows in the winter. Maximum discharges typically occur during the spring as the result of snow melt or-rain-on-snow events, with flows gradually decreasing following the disappearance of snow.

Surface water quality samples were collected monthly between July and October 1994, and between May and October 1995, at selected locations at the project site. Average surface water quality data for the entire period indicated that water quality at the Red Chris property is generally slightly basic, conductive, hard, alkaline, high in dissolved solids, and low in suspended solids and turbidity. Levels of anions and nutrients were generally moderate to low, average total cyanide concentrations were generally low, and total and dissolved metals concentrations were variable, depending on proximity to the ore body. Surface water near the headwaters of "Red Rock Canyon" reflects the mineralization of the deposit, containing levels of fluoride, sulphate, aluminum, cadmium, copper, iron, manganese and zinc exceeding provincial and/or federal criteria. The influence of the deposit is evident downstream, though, with dilution, the concentrations were not as high.

Drinking water from the camp supply was found to be of good quality when compared to provincial and federal Health and Welfare Canada drinking water guidelines.

A field study was conducted in July 1995 to confirm vegetation community types in the Red Chris Project area. Thirty metre transects were set at 14 locations and all plant species were identified and categorized as to overstory, understory, herb and moss/lichen layers. Based on the available site information and regional biogeoclimatic mapping, the Red Chris Project lies mostly within the Spruce-Willow-Birch zone of the Prince Rupert Forest District. Higher elevations fall within the Alpine Tundra zone, while lower elevations along Highway 37 are located within the Boreal White and Black Spruce zones. The mine site and facilities lie on an area dominated by scrub birch, willows, grasses and sedges at higher elevations, and a mixed coniferous forest consisting of spruce, lodgepole pine and sub-alpine fir at mid- and lower elevations. Forest resources are rated as low to very low.

Wildlife observations were recorded in field logs during both the 1994 and 1995 exploration programs, and habitat potential was assessed in 1995, based on the biogeoclimatic zones present at the sites. Based on wildlife habitat potential and field observations, the Todagin Mountain region provides good habitat for moose, grizzly and black bear, mountain goats, stone sheep, and

a variety of bird species, including several species of raptors such as gyrfalcon, owls and bald eagles. Based on the B.C. Ministry of Environment, Wildlife Branch 1993 Red and Blue Lists of native birds, mammals, reptiles and amphibians at risk in B.C., no Red List species and nine Blue List species potentially inhabit the Red Chris project area. Specifically, mountain goats and stone sheep are of significant concern within the immediate area, and key habitat for stone sheep has been identified on Todagin Mountain; however, this habitat does not extend to the proposed mine development area.

A preliminary fisheries study utilizing electrofishing and minnow traps was conducted in August 1995, and available regional fisheries data was acquired from government and private sources, for comparison to site data. Site drainage is part of the Stikine River system, which originates in northern British Columbia and flows to the Pacific Ocean approximately 32 km south of Petersburg, Alaska. Approximately 90% of the Stikine River system is inaccessible to anadromous fish due to natural barriers and velocity blocks and the lower river and most tributaries are glacially occluded.

The Klappan River flows into the Stikine River above the "Grand Canyon of the Stikine," which begins above the confluence with the Tahltan River, extends for 90 km and consists of a series of cascades, chutes and rapids. Anadromous fish known to inhabit the lower Stikine River have not been detected above this reach and the canyon is considered a barrier to migration. Species identified within the Klappan system include: mountain whitefish, longnose sucker, burbot, arctic grayling, Dolly Varden, cutthroat trout and rainbow trout.

Lakes surrounding the Red Chris Project include the Iskut Lakes, Edontennajon and Todagin, Kluea Lake and Ealue Lake. These lakes eventually flow into the Iskut River, which flows for approximately 195 km before confluencing with the Stikine River. A 5 km long canyon acts as a barrier to the upstream migration of fish approximately 80 km upstream from the Stikine River confluence on the Iskut River, and anadromous fish reported to inhabit the Iskut River system have not been detected above this barrier. Based on available site and regional fisheries data, the above mentioned lakes and associated streams apparently contain monoculture populations of rainbow trout.

E.2 SOCIOECONOMIC STUDIES

Based on 1991 Census Canada statistics, the total labour force for the Kitimat-Stikine Regional District was 21,900 people. The major sources of employment include: manufacturing, retail trade, government services, logging and forestry, educational services, and accommodation, food and beverage industries. Mining (including milling), quarrying and the oil well industry comprises 1.21% of the employment for the area. The work force in the three local communities (Iskut,

Dease Lake and Telegraph Creek) is approximately 820 people, with an available effective labour force of approximately 570 people. Smithers, the largest community in the region, had a population of 5,029 and labour force of 2,785. The surrounding unincorporated areas contribute another 4,925 to the local population, adding an estimated 2,727 people to the potential labour force.

A series of "Open House" presentations was held by American Bullion Minerals Ltd. during the week of November 20, 1995, in Iskut, Dease Lake, Telegraph Creek, Stewart and Smithers, as part of the Public Consultation Program, which is a component of the Project Approval Certificate application process. Attendance was relatively high, attracting 290 visitors to all five communities. Public response was generally positive, with 72% of respondents expressing support for the project. Of the remaining responses, 19% were undecided, 8% were opposed and 1% made no comment. Overall response varied among the five communities; however, the comments focused on environmental protection, social implications and employment opportunities. Environmental concerns were primarily directed toward Todagin Mountain sheep and goat habitat, and social issues reflected concerns with the lack of housing and inadequate medical, school and recreational facilities. Transportation of concentrate and available power options were also common topics of discussion.

The key socioeconomic features of the proposed mine development that have a bearing on the overall socioeconomic impacts to the region include: size and life expectancy of the proposed mine development; size and source of the construction and operational work forces; work schedule and accommodation, and equipment, supplies and services procurement.

The most significant socioeconomic impacts associated with this project will likely be of a positive nature, such as job opportunities and training, industrial diversification, contractor opportunities and increased tax base. In order to minimize impacts on the local communities, the construction workforce will be housed on site in a construction camp, and a rotational work schedule will be designed such that employees will be able to commute to the site and maintain a family base and lifestyles in their respective community. Preliminary projections indicate that the population of the local area will likely increase by approximately 274 people, comprising 15% singles, 25% two adult families and 60% families with children.

Indirect jobs will result from expenditures on goods and services such as transportation, explosives, drilling and camp services, and induced jobs, created by a demand for goods and services by direct and indirect employment of the mine, will encompass a broad spectrum of modern economic necessities, ranging from government services to consumer goods. The increased population and spending power is expected to result in increased demand for medical,

municipal and retail services, and operational requirements for goods and services will also benefit the regional economy to the order of approximately $10 million annually.

It is estimated that operations will generate a total $31 million annually in direct salaries, of which approximately $16.7 million will flow into the B.C. economy, the balance accruing to the federal and provincial governments as personal income tax. Indirect employment is expected to generate another $18 million annually. Indirect salaries are expected to inject an additional $12.8 million into the provincial economy, and generate $5.6 million in federal and provincial income taxes. In addition, operations will generate some $20 million annually in corporate income taxes and mineral royalties, which will accrue to the federal and provincial governments.

E.3 CULTURAL AND HEALTH ISSUES

The Red Chris Project is located in territory formally claimed by the Tahltan First Nation of northwestern B.C. Tahltan traditional areas include the region encompassed by the entire drainage basin of the upper Stikine River, and headwaters of the streams that flow into the Taku, Nass, Skeena and Yukon Rivers. The Tahltan people travelled extensively throughout their traditional territories in search of migratory game and other wildlife, and to trade with other native groups. The total area of the Tahltan land claim in northern B.C. is 93,600 km^2.; however, an overlap of land claims between the Tahltan First Nation and the Taku Tlingit First Nation exists in the northern portion of the territory.

Presently, the Tahltan people reside in three main towns in the region: Dease Lake, Telegraph Creek and Iskut. Major changes have occurred in the Tahltan communities in the past few decades due to the introduction of a cash economy, modern technology and industrial development in the territory. However, despite the changes in lifestyle that have occurred in recent years, the Tahltan people still fish, hunt and trap extensively in their territory and follow many traditional customs.

The Ministry of Health requires that proponents of new mine developments examine the potential immediate and long-term impacts on the health and welfare of the adjacent communities, due to the following factors:

- releases to the atmospheric and aquatic environments;
- increased resource development impacting on the assimilative capability of adjacent communities, and
- ultimate suspension of operations or closure impacting on the socioeconomic sustainability of adjacent communities.

The first item will be addressed through examination of potential sources of contamination to the environment and usually uses mass balance-based modelling techniques to predict potential impacts. This information is used to design appropriate mitigation or prevention measures to ensure that impacts meet acceptable levels. The other two items will be addressed through assessment of social determinants and sustainability impacts of health and welfare, as currently defined by the Ministry of Health.

E.4 LAND USE INFORMATION

Current regional land use issues addressed during preparation of the "Project Approval Certificate" application report included: parks, recreation and tourism; hunting, trapping and guiding; resource use and extraction, and Native land claims.

There are five Provincial parks and recreational areas proximal to the Red Chris property, and the region surrounding the Red Chris project site is popular for fishing, as the local lakes contain relatively large natural populations of rainbow trout. Local rivers and mountains also provide ample opportunity for fishing, camping, hiking, wildlife viewing and other nature-based recreation activities. Several lodges, motels and camp grounds along Highway 37 and Ealue Lake Road are available to accommodate tourists.

The Todagin Mountain area has been a no shooting region since 1975, with a closure on mountain goat hunting. Todagin Mountain has high value as a bow hunting area, being the most popular hunting spot in the Skeena region, and members of the Iskut Band also hunt, trap and fish in the region. Traditionally, medicinal plants such as Labrador tea, balsam bark and caribou weeds were collected from the area, and the band traditionally camped in the area during hunts; however, they did not construct permanent settlements. The trapline in the region is registered to 46 people in the Iskut band, and trappers from the band are actively using the traplines in the project area. Todagin Mountain falls within a guiding territory stretching from the Klappan River to Mt. Edziza.

Resource use and extraction issues are essentially limited to logging, mining and power generation. There are currently no forest tenures or licences in the Red Chris project area, and, although the property is surrounded by several adjacent mineral claims, there are currently no other registered mine development plans in the immediate vicinity of the property. There are currently no power generation development plans in the immediate vicinity of the property; however, there are several previously proposed, inactive plans in the region.

The Red Chris property lies completely within an area claimed by the Tahltan Nation. An overlap of land claims between the Tahltan First Nation and the Taku Tlingit First Nation exists in the

northern portion of the territory; however, it is understood that land claim boundaries to the south of the Tahltan territory have recently been settled with the Nisga'a.

E.5 PRELIMINARY WASTE CHARACTERIZATION STUDIES

Preliminary waste characterization test work was completed in 1994 and 1995 with analysis of pyritic and non-pyritic ore and waste rock samples for acid-base accounting (ABA), whole rock analysis and multielemental (ICP) scan. Samples analyzed in 1994 consisted primarily of ore grade material, and the 1995 samples represented the four main waste rock types: Bowser Lake Sediments; Dynamite Hill Volcanics ("proximal and distal"); Main Phase Monzodiorite, and Late Phase Dyke material. Additionally, 6 samples of tailings from metallurgical test work were submitted for ABA analysis.

The "ARD Guidelines for Mine Sites in British Columbia (January 1995)," used for interpreting the ABA results, suggests that sample results which fall below the 0.3% sulphur range are regarded as having insufficient oxidizable sulphide-sulphur content to sustain acid generation. Sample results with an NP/AP ratio above 3:1 are regarded as containing sufficient buffering capacity to neutralize any oxidation products of the contained sulphide-sulphur. Samples with an NP/AP ratio of between 1:1 and 3:1 are not conclusive with respect to acid generating potential and samples with an NP/AP ratio below 1:1 and sulphide-sulphur above 0.3% are regarded as being potentially acid generating. Samples falling within either of these two groups generally require further kinetic testing.

Waste rock samples from 1994 containing very weak and no stockwork generally represented the Main Phase Monzodiorite rock type. The ABA data for these samples suggested that waste rock may have a high potential to generate acid; however, these samples were not representative of all the waste rock types, and were not designed to have been representative of the monzodiorite in general.

All four waste rock types may have some propensity to generate acid, though there is great variability between rock types. Based on the ABA results, Late Phase Dyke material appears to have the highest acid generating potential, Main Phase Monzodiorite material slightly less, Bowser Lake Sediments less again, and Dynamite Hill Volcanics have the lowest potential to generate acid. "Distal" Dynamite Hill Volcanics are not likely to generate acid, possibly even providing neutralizing potential. It may be possible to determine a specific NP/AP ratio for each rock type, above which acid generation is unlikely, in order to minimize the volume of waste rock that will require special handling or disposal.

Tailings samples from the East Pit and West Starter Pit were similar in ABA characteristics and have a relatively high acid generating potential. In contrast, based on ABA results, Gully Zone tailings material is not likely to generate acid, and may contain substantial acid neutralizing capacity.

On the basis of criteria set out in the "ARD Guidelines," additional studies of all rock types and tailings, such as detailed mineralogical characterization and kinetic testing, are warranted to determine potential seepage quality, and possibly specific cut-off NP/AP ratios to ascertain whether or not delineation and separation of non-acid generating material (based on such a cut-off ratio) is practicable.

Whole rock analysis results suggest that the Main Phase Monzodiorite, Late Phase Dykes and Bowser Lake Sediments are fairly similar in composition, and differ significantly from the Dynamite Hill Volcanics. On the basis of average values, the former three rock types were found to comprise primarily silicon and aluminum, with lesser amounts of iron, calcium, potassium, magnesium and sodium, all in concentrations which were generally consistent with continental crust averages. Dynamite Hill Volcanics, however, were found to comprise primarily silicon, with lesser and approximately equal amounts of calcium, magnesium, iron and aluminum, closely resembling oceanic crustal averages.

Based on multielemental scan results, the Main Phase Monzodiorite and Late Phase Dyke samples were found to be moderately high in silver (though not to economic levels), arsenic, copper, lead, molybdenum, vanadium and zinc concentrations compared to global crustal averages. All other metals were found to be low or well within the range of common non-mineralized rock, and variability in concentrations of some metals was quite high. Bowser Lake Sediment samples generally contained less variable levels of most metals, distinctly lower levels of arsenic and copper, and higher concentrations of lithium. Dynamite Hill Volcanics were typically more variable in metals concentrations than the other three rock types and generally contained notably lower concentrations of copper, potassium and molybdenum, and higher levels of calcium, cobalt, chromium, lithium, magnesium, nickel and tungsten.

E.6 RECOMMENDATIONS FOR FURTHER WORK

Further work required to meet future objectives, such as government requirements for a "Project Report" and feasibility-level studies include detailed baseline aquatic, terrestrial and climatic studies, socioeconomic studies, an archaeological assessment, and waste characterization studies.

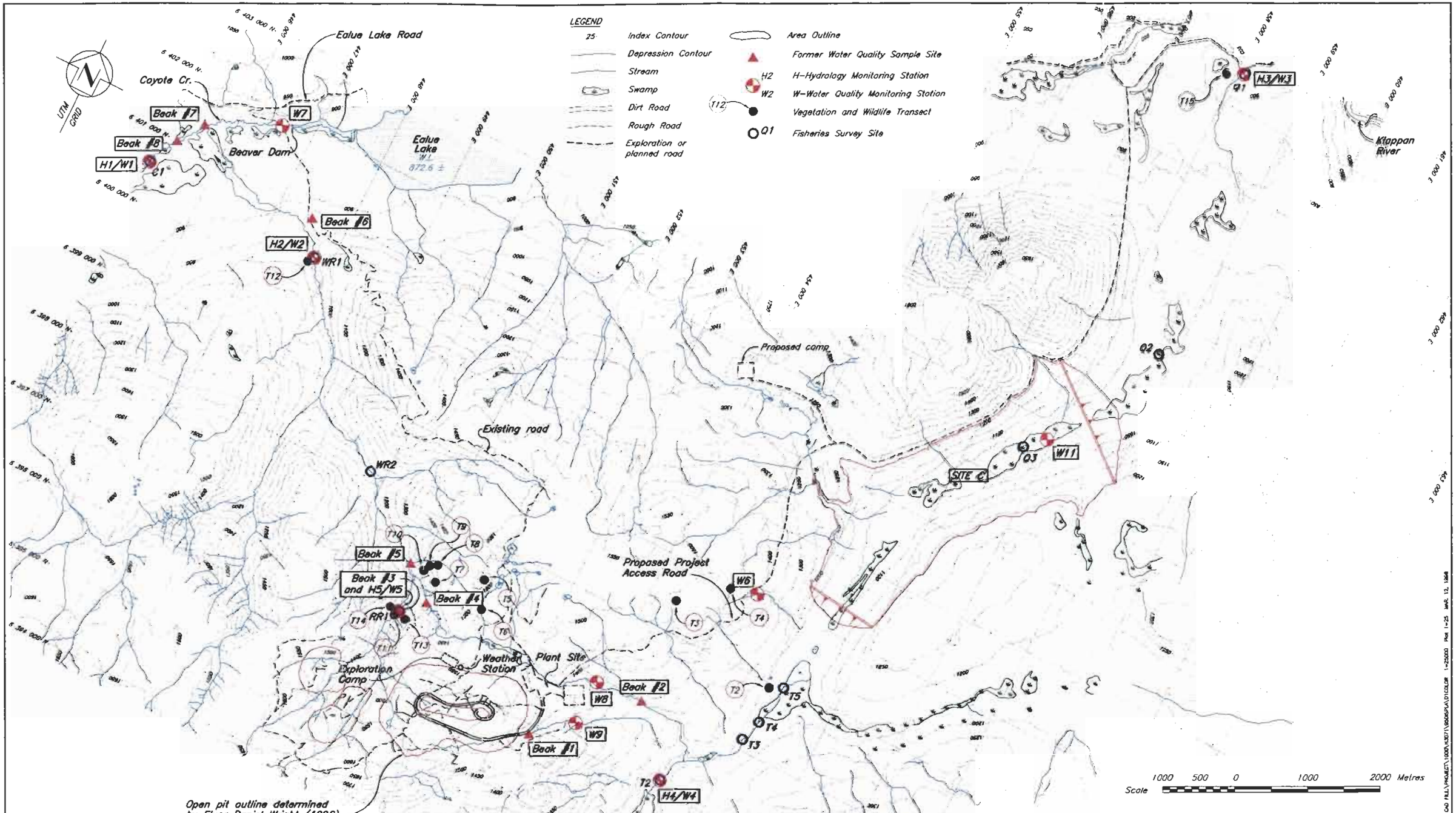
SECTION 1.0 - INTRODUCTION

The initial baseline environmental monitoring program at the American Bullion Minerals Ltd. Red Chris property, located near Iskut, B.C., was established in July 1994, and has been maintained throughout the 1994 and 1995 exploration programs. The program established collection of baseline environmental data for meteorology, hydrology and water quality monitoring, and recording of wildlife observations. Automatic water level recorders (AWLRs) were installed at hydrology Site H2 in "White Rock Canyon" in October, 1994, and at Site H3 in "Quarry Creek" in November 1995. Additional work completed, during the 1995 exploration season, included a series of preliminary vegetation transects, preliminary fisheries studies, and establishing a preliminary waste rock characterization program.

Further, existing background information relating to physiographic, socioeconomic, cultural, health and land use issues was compiled for incorporation into the "Application for a Project Approval Certificate" submitted to the B.C. Environmental Assessment Office in October 1995. A series of "Open House" presentations was held by American Bullion in five local communities during the week of November 20, 1995, as part of the Public Consultation Program, which is a component of the Project Approval Certificate application process.

The work completed in 1994 and 1995 was undertaken with the specific objective of providing sufficient environmental baseline data for incorporation into a pre-feasibility report (prepared March 1996), and is intended to provide a basis for meeting government requirements for a "Project Approval Certificate" and for completion of feasibility-level studies in the future.

Environmental baseline studies completed to-date are summarized in the following sections, and the locations of all baseline monitoring stations and survey sites are shown in Figure 1.0.



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KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

AMERICAN BULLION MINERALS LTD.

RED CHRIS PROJECT

FIGURE 1.0
ENVIRONMENTAL STUDIES

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SECTION 2.0 - PHYSIOGRAPHY

The proposed Red Chris property lies within the Klastine Plateau, a subdivision of the Stikine Plateau; a major northern extension of B.C.'s Central Plateau and Mountain Area (Interior Mountain System). The Stikine Plateau has been further subdivided into seven main subdivisions, including: Tahltan Highlands; Taku; Kawdy; Nahlin; Tanzilla; Klastine, and Spatsizi plateaus (Holland, 1964).

For the most part, the Stikine Plateau lies below the level of the surrounding mountains on the west, south and east. The Klastine Plateau lies south of the Stikine River and is bounded on the west by the Tahltan Highland and on the south by the Klappan Range of the Skeena Mountains. The plateau is separated from the Spatsizi Plateau to the east at the constriction between the Eaglenest Range and Three Sisters Range by a line running northwest from Mount Brock (2300 m).

The rolling upland surface of the Klastine Plateau represents the late Tertiary erosion surface, which is widespread in the Stikine Plateau. The surface was formed by late Tertiary time on Palaeozoic and Mesozoic sedimentary and volcanic rocks, with only a few small intrusive stocks known. Much of the plateau surface is sparsely forested or is only sparsely covered with clumps of spruce and willow.

The plateau lies above 1600 m elevation and rises to peaks over 2000 m elevation, although in the Mess Creek, Kinaskan Lake, Klappan River and Stikine River valleys the plateau has been incised to below 900 m.

Glacial ice that once covered the plateau, now remains as a capping of Edziza Peak in the Tahltan Highlands to the west, but its erosional and depositional effects are visible over the entire plateau surface. Cirques are cut into northern and eastern peaks and ridges; upland surfaces have been subdued by erosion and pation, and numerous lakes occupy basins created in drift-blocked valleys. Drumlin-like forms on the upper Iskut River valley, from Mowdade and Kinaskan Lakes southward, indicate that ice poured southward from the Klastine Plateau down the Iskut River valley from an ice divide that existed somewhat north of Nuttlude Lake.

Most of the claim holdings have relatively low relief with elevations ranging from 1,036 m along Coyote Creek to 1,676 m on the slopes of Todagin Mountain, and near the Red-Chris copper-gold deposit they are typically 1,500 ± 30 m. Bedrock exposures are generally absent in areas of low to even moderate relief within the central portion of the property and in the valley bottoms. However, there is abundant outcrop along the higher-relief drainages and along mountainous ridges.

SECTION 3.0 - METEOROLOGY

3.1 GENERAL

The Red Chris project area is located in a region characterized by moderate total annual precipitation and extreme variations in temperature. Average annual precipitation in the project area ranges from approximately 465 mm in the area of the proposed tailings facilities (approx. elevation 1000 m) to 725 mm in the area of the site meteorological station and proposed open pit (approx. elev. 1570 m). Precipitation is fairly evenly distributed throughout the year, with April to May as the driest period and August through December as the wettest. Approximately 60% of the annual precipitation falls as snow at the site meteorological station, with daily temperatures below freezing from October through April. Average monthly temperatures range from a low of approximately -21°C in January to a high of approximately 9°C in July, with temperature extremes ranging from approximately -50°C to 30°C.

On July 20, 1994, a manual meteorological station was established on the site at elevation 1570 m, and records are available from July 22 through November 3, 1994, and then again between May 26 and November 9, 1995. This data was collected twice daily by site personnel in the exploration camp. The location of the meteorological station is shown on Figure 1.0.

A number of regional meteorological stations are operated in the area by Atmospheric Environment Services (AES). The three closest and most relevant stations are those at Dease Lake, Telegraph Creek and Cassiar, located approximately 80 km north, 80 km west and 175 km north of the site, respectively. The locations of these stations are shown on Figure 3.1.

3.2 TEMPERATURE

3.2.1 General

Temperature recordings were taken at the site for intermittent periods in 1994 and 1995. These records are shown in Appendix I and are summarized in Table 3.1, with concurrent regional data provided for comparison. As can be seen, the Red Chris values are consistently lower than the regional data, indicating a lapse rate of approximately -3 to -4 °C per 1000 m, for the period of record.

As the recorded period of site data is very limited, it was necessary to use regional data to generate estimates of long-term monthly temperature values for the site. Table 3.2 presents long-term temperature values for Dease Lake, Telegraph Creek, Cassiar and Todagin Ranch. Also

presented are lapse rates between the various stations. As can be seen, the rates vary between data sets and from month to month. However, if one considers the three sets of lapse rates relative to Telegraph Creek, which is the lowest station, therefore providing the greatest elevation interval, a fairly consistent pattern emerges. These average rates range from a high of -7.3°C per 1000 m in April to a low of -1.4°C per 1000 m in January, with an annual average rate of -5.1 °C per 1000 m. These average lapse rates agree quite well with the short term lapse rates in Table 3.1, and are consistent with the lapse rates commonly seen in British Columbia. Consequently, these average rates were chosen as the basis for estimating long-term monthly temperature values for the Red Chris project site.

Temperature values for the Red Chris project site, at elevation 1570 m, were calculated by adjusting Dease Lake temperature values by the selected lapse rates, and are shown at the bottom of Table 3.2. Temperature estimates for other elevations at the site can be calculated in a similar fashion. As can be seen, July is the warmest month, with an average daily temperature of approximately 8.5°C, while January is the coldest month, with an average daily temperature of approximately -20.8°C.

3.2.2 Freeze-Thaw Indices

Monthly and annual freeze-thaw indices for open pit area of the Red Chris project area are presented in Table 3.3. These values were estimated on the basis of regional values for Dease Lake and Telegraph Creek, with Cassiar as a reference station (AES Climate Normals, 1951-1980). The regional values were adjusted according to the relative average monthly temperatures between the regional stations and those estimated for the site. These adjustments assume a linear relationship between freeze-thaw indices and average monthly temperature. This adjustment provides reasonable approximations given the available data. On the basis of these calculations, the Red Chris project area, at elevation 1570 m, is projected to experience approximately 2662 degree-days below 0°C and 857 degree-days above 0°C.

3.3 PRECIPITATION

3.3.1 Mean Annual Precipitation

Precipitation recordings were taken at the site for intermittent periods from 1994 to 1995. These records are shown in Appendix II and are summarized in Table 3.4, together with concurrent regional data provided for comparison.

Since there is insufficient site specific data to generate an estimate of mean annual precipitation, long-term synthetic data was generated for the site by adjusting Dease Lake values by an

orographic factor of +8% per 100 m of elevation gain. Applying this factor to the mean annual Dease Lake value of 405.9 mm results in a precipitation estimate of 725 mm, for the Red Chris project site, at elevation 1570 m.

Dease Lake was chosen as the base regional station as it is the most relevant station to the site in terms of both proximity and elevation. Selection of the +8% per 100 m orographic factor was based on the following:

- no consistent orographic factor was evident by comparing site specific and regional data. The short-term comparison of Dease Lake and Red Chris data in Table 3.4 does not indicate whether Red Chris receives more or less precipitation than Dease Lake;
- no consistent orographic factor was evident from the regional data. Orographic factors were calculated between Telegraph Creek and Dease Lake, Telegraph Creek and Cassiar, and Dease Lake and Cassiar, and found to be 1%, 7% and 23%, respectively;
- based on professional experience, +8% per 100 m of elevation gain has been found to be a fairly consistent and reasonable orographic estimate for other interior regions in B.C. and the Yukon (J. Cathcart), and
- meteorology studies by the B.C. Ministry of Environment, in a neighbouring area (the Kemess Project area, located approximately 200 km southeast of the site), indicate an orographic adjustment of approximately +100 mm of precipitation per 250 mm of elevation gain (personal communication between J. Cathcart and W. Obedkoff, April 14, 1994). This value agrees very closely with the estimated +8% per 100 m.

The mean annual precipitation values for the AES stations at Cassiar (el. 1077 m) and Baker Mine (el. 1646 m) are 699.5 mm and 805 mm, respectively. As the Red Chris elevation of 1570 m lies between the elevations of Cassiar and Baker Mine, it seems reasonable to assume that its precipitation would lie between the precipitation values of Cassiar and Baker Mine (Baker Mine is located approximately 175 km southeast of the site). Its record was not included in Table 3.4 because it is only for 1981 and 1982. However, its annual precipitation value is relevant in this case because long-term regional records indicate that 1981 and 1982 were approximately average precipitation years).

Clearly there is much uncertainty associated with the estimation of this orographic factor. The collection of additional site specific data is required for verification.

3.3.2 Monthly Precipitation Distribution

Because site precipitation data covers only a few months and gives little indication of long-term average monthly precipitation, the monthly precipitation distribution for the Red Chris project area was estimated on the basis of regional data. Table 3.5 presents the monthly distributions for Dease Lake, Telegraph Creek and Cassiar. As can be seen, Cassiar and Telegraph Creek have quite similar distributions, with their wettest periods in the fall and early winter, while Dease Lake has its wettest period in the summer. This is not as one would expect. As Telegraph Creek is at a relatively low elevation (183 m) while Dease Lake and Cassiar are much higher and have more similar elevations (816 m and 1077 m, respectively), the distributions for Dease Lake and Cassiar should be more similar. Clearly, factors other than elevation have a significant influence on the precipitation distribution. As the three regional distributions are not dramatically different, and as it is difficult to determine how to adjust the regional values to accurately represent conditions at the site, an average of the three regional distributions was assumed for the Red Chris project area. This distribution is shown at the bottom of Table 3.5. Precipitation is fairly evenly distributed throughout the year, with April to May as the driest period and August through December as the wettest.

Due to the range of temperatures experienced in the region throughout the year, precipitation falls as both rain and snow, as indicated in Table 3.5. The proportions of precipitation that fall as rain and snow generally vary with elevation. The higher elevations tend to receive a greater proportion of their precipitation as snow. For instance, Telegraph Creek, at an elevation of 183 m, has a rain/snow split of approximately 59% rain and 41% snow, while Cassiar, at an elevation of 1077 m. In contrast, Dease Lake, at an elevation of 816 m, has a rain/snow split of approximately 59% rain and 41% snow, which is practically the same as Telegraph Creek. Given the 633 m difference in elevation between the two stations, this is unusual, and difficult to explain, especially considering that the temperature records indicate a significant temperature difference between the two locations.

Given the uncertainty surrounding the precipitation rain/snow split, it was not possible to simply estimate the split on the basis of elevation. Rather, the Cassiar values were used as a guide and monthly percentages of rain and snow were estimated on the basis of temperature. For instance, the Cassiar record indicates that essentially all precipitation falling during the months of November through to April, falls as snow. Therefore, all precipitation on the Red Chris project area, at an elevation of 1570 m, was assumed to fall as snow. During the month of May, approximately 30% of Cassiar precipitation falls as snow. As Red Chris is higher, and therefore cooler during this month, it was estimated that approximately 50% of precipitation falls as snow. This split was somewhat arbitrary, but serves to generate a reasonable estimate. A similar approach was taken for each month, and the values at the bottom of Table 3.5 were generated. It

is estimated that the Red Chris project area, at an elevation of 1570 m, has a rain/snow split of approximately 40% rain and 60% snow.

3.3.3 Wet and Dry Year Precipitation

Wet and dry year return period precipitation values were calculated for the Red Chris project and are shown in Tables 3.6. These values were estimated by assuming an underlying normal distribution, which was found to reasonably fit both Dease Lake and Telegraph Creek data. The standard deviation values were determined with a coefficient of variation (c.v.) of 0.18, which was calculated as the average of the c.v. of the Dease Lake for 30 years of data. The return period precipitation values were calculated with the formula:

return period precipitation = mean ± (standard deviation x distribution coefficient).

3.3.4 Extreme 24 Hour Precipitation

Return period precipitation values are presented in the form of intensity-duration-frequency (IDF) curves (see Figure 3.2 and Table 3.7). These curves were generated from data in the "Rainfall Frequency Atlas For Canada (RFAC)" (Environment Canada, 1985). The RFAC curves were compared with IDF curves generated by AES for Dease Lake and Telegraph Creek, and the RFAC values were found to be the highest. This indicates that the RFAC curves are very conservative (i.e. on the high side), and therefore they were selected as the design values. The precipitation values associated with the 10, 20 and 200 year storm events are projected to be 46.8 mm, 51.4 mm and 66.4 mm, respectively.

3.4 SNOWMELT PATTERNS

For the purpose of water balance modeling, it is necessary to estimate the water inflow to an area due to monthly snowmelt runoff. Generally, snow accumulates during the winter months and then melts quickly during the spring. Snowpack records are used to determine snowmelt patterns.

No snowpack data has been collected at the Red Chris project site. Therefore, estimates of snowpack and snowmelt were generated on the basis of regional data. The snow course stations at Cassiar, Dease Lake, Telegraph Creek, Iskut and Upper Stikine were identified for this analysis, and a summary of their data is shown in Table 3.8.

As expected, the stations at the lower elevations tend to have an earlier snowmelt period. Dease Lake, Telegraph Creek and Iskut have essentially all their snowmelt taking place in April and May, with at least 60% of the melt occurring in April. The two stations at Cassiar and Upper

Stikine, which are both situated at elevations of about 1400 m, have essentially all their melt taking place in May and June, with at least 70% of the melt occurring in May. As the Red Chris project area, at an elevation of 1570 m, is higher than both the Cassiar and Upper Stikine snow courses, it is reasonable to assume that snowmelt will take place later in the year. On the basis of the Cassiar and Upper Stikine snow course values, it is estimated that approximately 60% of the snowpack melt occurs in May, 30% melts in June and 10% melts in July. The July value is somewhat arbitrary as it is not directly supported by local snowpack data. However, snowpillow values from various regions of the province indicate that some snowpack likely remains on the ground into July at elevations above 1500 m, and that 10% is a reasonable approximation.

As stated above, these snowmelt estimates are based solely on regional data, and as such contain considerable uncertainty. The collection of site specific snowpack data is required for the verification of these results.

3.5 EVAPORATION

No evaporation records are available for the Red Chris area. However, regionally representative lake evaporation values are available from the AES meteorological station at Topley Landing, and these are shown in Table 3.9. Lake evaporation values for the Red Chris Project area were estimated by applying an orographic adjustment factor to the long-term Topley Landing values. Topley Landing data indicates a mean annual evaporation value of 387 mm, at elevation 722 m, with measurable evaporation only occurring during the months of May through to September.

The Ministry of Environment's "Manual of Operational Hydrology in B.C." (Coulson et al, 1991) suggests that evaporation reduces with elevation at a rate of 10% per 350 m rise in elevation. Based on the above values, the mean annual evaporation for the Red Chris area, at an elevation of 1570 m, is estimated to be 293 mm. Estimates of monthly evaporation values are shown in Table 3.9. Maximum evaporation occurs in July, with approximately 72 mm, with little or no evaporation during the months of October through April. Evaporation estimates for other locations within the Red Chris project area can be calculated in a similar fashion.

3.6 SUBLIMATION

For the purpose of water balance modeling, it is necessary to estimate the amount of snowpack which is lost to sublimation. Sublimation is the process by which water transforms directly from the solid phase (ice) to the gaseous phase (vapour). In general, sublimation increases with increasing wind speed, air temperature and elevation (due to decreasing vapour pressure and increasing solar radiation) and decreasing relative humidity. Although Northern B.C. is extremely

cold for much of the winter, it is also quite dry (low relative humidity), and sublimation can be significant, particularly at the higher elevations.

In the Red Chris project region, however, sublimation does not appear to be significant. For instance, from September 1st through to April 1st, the snowfall at Dease Lake, is approximately 151 mm, in rainfall equivalent, while the snowpack on April 1st is approximately 144 mm (Snow Survey Bulletin). This indicates that approximately 7 mm, or 5% of water equivalents, has been lost to sublimation. A similar review of the Cassiar data shows that, on average, 390 mm of snowfall (assuming all October precipitation falls as snow) produces a 327 mm snowpack, indicating a 63 mm (16%) loss to sublimation or melt. If one considers that the Red Chris project area is at a higher elevation (1570 m) than either of these snow courses (820 m and 1390 m), a reasonable approximation of annual snowpack losses due to sublimation is 20%, or one fifth of the snowpack. For lower elevations in the project area, a smaller sublimation loss should be assumed.

3.7 COMBINED RAINFALL AND SNOWMELT DISTRIBUTION

For the purpose of water balance modeling, it is necessary to estimate the water inflow to an area due to direct precipitation. Approximately 60% of the annual precipitation falls as snow during the months of September through to May. However, during this period temperatures are very cold and consequently very little snowmelt occurs. Therefore, it was assumed that 100% of snowfall accumulates as snow pack and does not contribute to runoff until the spring melt. Approximately 20% of the snowpack is assumed to be lost to sublimation, leaving 80% of the total annual snowfall to contribute to runoff. Estimates of monthly inflows to the project area due to direct precipitation were therefore calculated by combining rainfall and snowmelt distribution values. The combined values, for an elevation of 1570 m, are shown in Table 3.10.

TABLE 3.1
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

COMPARISON OF SITE AND REGIONAL TEMPERATURE DATA (°C)

3/18/96 8:41 L:\HALLAM\H3071\DATA\[METEOROL.XLS]RainSnow Precip 3.10

Year	Station Name	Station Elev. (m)	Jan	Feb	Mar	Apr	May*	Jun	Jul*	Aug	Sep	Oct	Nov*	Dec	Mean
1994	Red Chris	1570							13.3	10.7	4	-1.4	-5.1		
	Dease Lake	816							15.4	14.4	7.2	1.5	-4.8		
	Telegraph	183							17.8	17	10.4	3.5	-3.1		
	Diff = Dease - Red Chris								2.1	3.7	3.2	2.9	0.3		
	Lapse Rate per 1000m Elev (Dease & Red Chris)								*-2.8*	*-4.9*	*-4.2*	*-3.8*	*-0.4*		*-3.2*
	Diff = Telegraph - Red Chris								4.5	6.3	6.4	4.9	2		
	Lapse Rate per 1000m Elev(Telegraph & Red Chris)								*-3.2*	*-4.5*	*-4.6*	*-3.5*	*-1.4*		*-3.5*
1995	Red Chris	1570					8.8	9.3	8.8	6.7	8.4	-1.8	-9.7		
	Dease Lake	816					10.4	12.3							
	Telegraph	183					12.3	15.4							
1995	Diff = Dease - Red Chris						1.6	3							
	Lapse Rate per 1000m Elev (Dease & Red Chris)						*-2.1*	*-4.0*							*-3.1*
	Diff = Telegraph - Red Chris						3.5	6.1							
	Lapse Rate per 1000m Elev (Telegraph & Red Chris)						-2.5	*-4.4*							*-3.5*

Notes:

1) *Temperature comparisons are for concurrent days of record. July/94 has 9 days of record; Nov/94 has 3 days; Nov/95 has 9 days; & May/95 has 4 days.

TABLE 3.2
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

LONG-TERM MONTHLY TEMPERATURE VALUES (°C)

3/18/96 8:41 L:\HALLAM\H3071\DATA\[METEOROL.XLS]RainSnow Precip 3.10

Location	Station Name	Station Elev.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
59 17 N 129 50 W	Cassiar	1077	-19.2	-14.5	-10.6	-3.3	3.5	8.8	11.2	9.8	5	-1.7	-10.5	-16.6	-3.2
57 36 N 130 4 W	Todagin Ranch	899	-18.7	-10.6	-6.9	-0.1	4.9	9	11.2	10.5	6.2	0.8	-8.2	-13.5	-1.3
58 36 N 130 4 W	Dease Lake	816	-19.7	-12.9	-7.4	0.3	6.1	10.4	12.5	11.6	7.1	1.3	-8.5	-16	-1.3
59 36 N 130 4 W	Telegraph Creek	183	-18.2	-9.2	-2.9	4.5	9.2	13.6	15.6	15	9.9	4.2	-5.1	-13.2	2
	Lapse Rate per 1000m Elev (Dease & Telegraph)		*-2.4*	*-5.8*	*-7.1*	*-6.6*	*-4.9*	*-5.1*	*-4.9*	*-5.4*	*-4.4*	*-4.6*	*-5.4*	*-4.4*	*-5.1*
	Lapse Rate per 1000m Elev (Tobagin & Telegraph)		*-0.7*	*-2.0*	*-5.6*	*-6.4*	*-6.0*	*-6.4*	*-6.1*	*-6.3*	*-5.2*	*-4.7*	*-4.3*	*-0.4*	*-4.5*
	Lapse Rate per 1000m Elev (Cassiar & Dease)		*1.9*	*-6.1*	*-12.3*	*-13.8*	*-10.0*	*-6.1*	*-5.0*	*-6.9*	*-8.0*	*-11.5*	*-7.7*	*-2.3*	*-7.3*
	Lapse Rate per 1000m Elev (Cassiar & Todagin)		*-2.8*	*-21.9*	*-20.8*	*-18.0*	*-7.9*	*-1.1*	*0.0*	*-3.9*	*-6.7*	*-14.0*	*-12.9*	*-17.4*	*-10.6*
	Lapse Rate per 1000m Elev (Cassiar & Telegraph)		*-1.1*	*-5.9*	*-8.6*	*-8.7*	*-6.4*	*-5.4*	*-4.9*	*-5.8*	*-5.5*	*-6.6*	*-6.0*	*-3.8*	*-5.7*
	Average Lapse Rate for stations relative to Telegraph		*-1.4*	*-4.6*	*-7.1*	*-7.3*	*-5.8*	*-5.6*	*-5.3*	*-5.8*	*-5.0*	*-5.3*	*-5.2*	*-2.9*	*-5.1*
57 42 N 129 47 W	Red Chris (Estimated)	1570	-20.8	-16.4	-12.8	-5.2	1.8	6.2	8.5	7.2	3.3	-2.7	-12.5	-18.2	-5.1

Notes:

1) Cassiar, Dease Lake, Telegraph Creek and Todagin Ranch values from AES historical data - Canadian Climate Normals (1951-80).

2) Red Chris values for 1994 to 1995 from American Bullion Minerals Ltd.'s Automated Meteorology Station.

3) Red Chris estimated values generated on the basis of the average monthly temperature lapse rates between regional stations and Telegraph Creek (average annual -5.1°C/1000 m).

TABLE 3.3
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

FREEZE - THAW INDICES (DEGREE-DAYS)

3/18/96 8:41 L:\HALLAM\H3071\DATA\[METEOROL..XLS]RainSnow Precip 3.10

Parameter	Station	Years of Record	Elev. (m)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Air Freezing Index (below 0°C)	Cassiar	1951 - 1980	1077	568.2	396.6	341.6	84.6	8.7	0.0	0.0	0.0	1.2	89.2	303.1	504.9	2298.1
	Dease Lake	1951 - 1980	816	611.2	365.4	235.8	40.6	0.7	0.0	0.0	0.0	1.1	34.9	260.1	502.0	2051.8
	Telegraph Creek	1951 - 1980	183	559.2	261.1	94.8	2.8	0.2	0.0	0.0	0.0	0.6	4.2	163.2	426.6	1512.7
	Red Chris (est.)	N/A	1570	648	463	404	90	1	0	0	0	2	77	373	561	2676
Air Thawing Index (above 0°C)	Cassiar	1951 - 1980	1077	1.2	0.5	0.6	21.2	126.8	269.8	344.1	306.7	163.7	38.1	3.9	0.9	1277.5
	Dease Lake	1951 - 1980	816	0.6	1.1	6.0	49.2	188.1	312.4	389.2	360.1	215.8	74.5	6.3	0.9	1604.2
	Telegraph Creek	1951 - 1980	183	0.8	7.7	36.1	135.7	283.3	393.0	485.8	473.2	297.5	137.5	12.6	0.6	2263.8
	Red Chris (est.)	N/A	1570	0.5	0	0	0	55	206	264	214	105	0	0	1	841
Air Heating Index (below 18°C)	Cassiar	1951 - 1980	1077	1127.8	906.2	888.4	623.0	437.4	268.7	214.4	253.1	378.0	594.2	840.2	1062.2	7593.6
	Dease Lake	1951 - 1980	816	1168.7	873.0	787.8	531.4	370.6	227.9	169.7	198.2	325.2	518.4	793.8	1059.1	7023.8
	Telegraph Creek	1951 - 1980	183	1120.0	763.6	630.1	388.3	259.0	134.4	85.6	97.8	237.3	419.8	688.6	986.9	5811.4
	Red Chris (est.)	N/A	1570	1203	975	975	718	527	352	279	328	444	655	916	1115	8427

Notes:

1) Cassiar, Dease Lake and Telegraph Creek degree-days values from AES Canadian climate normals, Volume 4, degree-days for 1951-1980 .

2) Red Chris site values estimated by adjusting Dease Lake and Telegraph Creek data on the basis of monthly temperature records and estimates (see Table 3.2)).

3) Cassiar degree-days values are for reference only.

TABLE 3.4
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

MEAN MONTHLY PRECIPITATION DATA (mm)

3/18/96 8:41 L:\HALLAM\H3071\DATA\[METEOROL.XLS]RainSnow Precip 3.10

Station	Years of Record	Elev. (m)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Long-term regional values															
Cassiar	*(See Note 1)*	1077	62.9	60.4	47.7	25.7	34.1	47.4	61.4	60.4	71.8	84.2	64.8	78.7	699.5
(percent distribution)			9%	9%	7%	4%	5%	7%	9%	9%	10%	12%	9%	11%	100%
Dease Lake	*(See Note 1)*	816	27.8	24.6	22.3	12.3	23.1	43.6	55.5	52.5	46.2	35.2	29.3	33.5	405.9
(percent distribution)			7%	6%	5%	3%	6%	11%	14%	13%	11%	9%	7%	8%	100%
Telegraph Creek	*(See Note 1)*	183	36.2	23.9	24.5	17	14.9	27.6	19.9	30.4	37.3	47.7	44.8	52.4	376.6
(percent distribution)			10%	6%	7%	5%	4%	7%	5%	8%	10%	13%	12%	14%	100%
Local recorded values															
Red Chris	1994	1570							30.6 *	85.4	95.8	19.7			
Dease Lake		816							15.3 *	79.5	102.4	17.6			
Diff.									15.3	5.9	-6.6	2.1			
Red Chris	1995	1570						18.8	87.9	95.9	15.3	34.2			
Dease Lake		816						25.6	n/a	n/a	n/a	n/a			
Diff.								-6.8							
Estimated values															
Red Chris	long-term	1570	62	51	45	27	35	60	67	72	76	81	69	81	725
(percent distribution)			8%	7%	6%	4%	5%	8%	9%	10%	11%	11%	9%	11%	100%

Notes:

1) Cassiar, Dease Lake and Telegraph Creek values from AES Climate Normals (1951-80).

2) Red Chris values for 1994 to 1995 from American Bullion Ltd.'s Automated Meteorology Station.

3) * = Partial data for the month, M = missing data.

4) Diff. = Red Chris - Dease Lake.

5) n/a = Not available.

6) Distribution of Red Chris estimated as the average of the regional distributions.

7) Red Chris Mean Annual Precipitation = Mean Annual for Dease Lake plus an orographic allowance (+8% per 100 m) ie. $405.9 \times 1.08^{(1570-816)/100} = 725$.

TABLE 3.5
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

PRECIPITATION DISTRIBUTION DATA

Regional Values

Precipitation Station	Years of Record	Elevation (m)	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Cassiar	*(See Note 2)*	1077	rain (mm)	2.4	0.4	0.8	2.2	25.2	45.8	61.4	60.2	65.1	36.8	3.6	1.3	305.2
			% precip.	0.3%	0.1%	0.1%	0.3%	3.6%	6.5%	8.8%	8.6%	9.3%	5.3%	0.5%	0.2%	43.6%
			snow (mm)	60.5	60.0	46.9	23.5	8.9	1.6	0.0	0.2	6.7	47.4	61.2	77.4	394.3
			% precip.	8.6%	8.6%	6.7%	3.4%	1.3%	0.2%	0.0%	0.0%	1.0%	6.8%	8.7%	11.1%	56.4%
			precip.(mm)	62.9	60.4	47.7	25.7	34.1	47.4	61.4	60.4	71.8	84.2	64.8	78.7	699.5
			% precip.	9.0%	8.6%	6.8%	3.7%	4.9%	6.8%	8.8%	8.6%	10.3%	12.0%	9.3%	11.3%	100.0%
Dease Lake A	*(See Note 2)*	816	rain (mm)	0.9	0.1	0.4	2	18.5	43.2	54.5	52.5	44.8	18.6	2.6	0.5	238.6
			% precip.	0.2%	0.0%	0.1%	0.5%	4.6%	10.6%	13.4%	12.9%	11.0%	4.6%	0.6%	0.1%	58.8%
			snow (mm)	26.9	24.5	21.9	10.3	4.6	0.4	1.0	0.0	1.4	16.6	26.7	33.0	167.3
			% precip.	6.6%	6.0%	5.4%	2.5%	1.1%	0.1%	0.2%	0.0%	0.3%	4.1%	6.6%	8.1%	41.2%
			precip.(mm)	27.8	24.6	22.3	12.3	23.1	43.6	55.5	52.5	46.2	35.2	29.3	33.5	405.9
			% precip.	6.8%	6.1%	5.5%	3.0%	5.7%	10.7%	13.7%	12.9%	11.4%	8.7%	7.2%	8.3%	100.0%
Telegraph Creek	*(See Note 2)*	183	rain	0.3	4	9.3	14.7	13.9	27.6	19.9	30.4	36.5	38.8	21.4	5.4	222.2
			% precip.	0.1%	1.1%	2.5%	3.9%	3.7%	7.3%	5.3%	8.1%	9.7%	10.3%	5.7%	1.4%	59.0%
			snow	35.9	19.9	15.2	2.3	1.0	0.0	0.0	0.0	0.8	8.9	23.4	47.0	154.4
			% precip.	9.5%	5.3%	4.0%	0.6%	0.3%	0.0%	0.0%	0.0%	0.2%	2.4%	6.2%	12.5%	41.0%
			precip.(mm)	36.2	23.9	24.5	17.0	14.9	27.6	19.9	30.4	37.3	47.7	44.8	52.4	376.6
			% precip.	9.6%	6.3%	6.5%	4.5%	4.0%	7.3%	5.3%	8.1%	9.9%	12.7%	11.9%	13.9%	100.0%

Estimated Site Values

Precipitation Station	Years of Record	Elevation (m)	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Red Chris	long-term	1570	rain (mm)	0	0	0	0	18	54	67	72	58	21	0	0	290
			% precip.	0.0%	0.0%	0.0%	0.0%	2.5%	7.5%	9.2%	9.9%	8.0%	2.9%	0.0%	0.0%	40.0%
			snow (mm)	62	51	45	27	17	6	0	0	18	60	69	81	435
			% precip.	8.5%	7.0%	6.3%	3.7%	2.3%	0.8%	0.0%	0.0%	2.5%	8.2%	9.5%	11.1%	60.0%
			precip.(mm)	62	51	45	27	35	60	67	72	76	81	69	81	725
			% precip.	8.5%	7.0%	6.3%	3.7%	4.8%	8.3%	9.2%	9.9%	10.5%	11.1%	9.5%	11.1%	100.0%

Notes:

1) Red Chris estimates made on the basis of regional rain/snow splits and estimated monthly site temperature values. No rain was assumed for Nov. to Apr., no snow was assumed for July and August, with various degrees in between for the remaining months.

2) Dease Lake, Telegraph Creek and Cassiar values from AES Climate Normals (1951-80).

3) Annual Precipitation : Mean annual Red Chris value calculated by adjusting the Dease Lake value by an orographic factor of +8% per 100 m. ie. 405.9 mm x $1.08^{((1570-816)/100)}$ = 725 mm.

TABLE 3.6
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

WET AND DRY YEAR PRECIPITATION

Annual Precipitation:

mean = 725 mm
standard deviation = 131 mm

3/18/96 8:41 L:\HALLAM\H3071\DATA\[METEOROL.XLS]RainSnow Precip 3.10

Return Period	Precipitation (mm)
1:10 year dry (mean - 1.282 s.d.)	558
1:20 year dry (mean - 1.645 s.d.)	510
1:200 year dry (mean - 2.575 s.d.)	389
1:10 year wet (mean + 1.282 s.d.)	892
1:20 year wet (mean + 1.645 s.d.)	940
1:50 year wet (mean + 2.054 s.d.)	993
1:100 year wet (mean + 2.326 s.d.)	1029
1:200 year wet (mean + 2.575 s.d.)	1061

Notes:

1) Precipitation estimates for elevation 1570 m. Estimates for other elevations can be made by adjusting values + 8% per 100 m increase in elevation.
2) Mean value estimated by applying an orographic factor to Dease Lake historical data (AES Climate Normals, 1951-1980).
3) s.d. = standard deviation
4) Standard deviation estimated from a coefficient of variation value of 0.18, calculated with 29 years of Dease Lake data (1951-1980).

TABLE 3.7
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

INTENSITY-DURATION-FREQUENCY (IDF) VALUES

Developed from the "Rainfall Frequency Atlas of Canada".

Duration	Mean	St. Dv.	Factor	Year
5 min	3.2	1.4	-0.164	2
10 min	4	1.7	0.719	5
15 min	5	1.7	1.305	10
30 min	7	4	1.635	15
1 hr	8	4	1.866	20
2 hr	10	4	2.044	25
6 hr	15	5	2.592	50
12 hr	20	6	3.137	100
24 hr	24	5.5	3.679	200
			18.013	PMP

Return Period Rainfall Amounts (mm)

Duration	2 yrs	5 yrs	10 yrs	15 yrs	20 yrs	25 yrs	50 yrs	100 yrs	200 yrs	PMP
5 min	3.0	4.2	5.0	5.5	5.8	6.1	6.8	7.6	8.4	28.4
10 min	3.7	5.2	6.2	6.8	7.2	7.5	8.4	9.3	10.3	34.6
15 min	4.7	6.2	7.2	7.8	8.2	8.5	9.4	10.3	11.3	35.6
30 min	6.3	9.9	12.2	13.5	14.5	15.2	17.4	19.5	21.7	79.1
1 hr	7.3	10.9	13.2	14.5	15.5	16.2	18.4	20.5	22.7	80.1
2 hr	9.3	12.9	15.2	16.5	17.5	18.2	20.4	22.5	24.7	82.1
6 hr	14.2	18.6	21.5	23.2	24.3	25.2	28.0	30.7	33.4	105.1
12 hr	28.5	36.5	41.7	44.7	46.8	48.4	53.3	58.2	63.1	192.1 *
24 hr	34.6	41.9	46.8	49.5	51.4	52.9	57.4	61.9	66.4	184.6 *

* Calculations include an orographic factor = 1.50 for durations of 12 hours and more.

Rainfall Intensity (mm/hr)

Duration	2 yrs	5 yrs	10 yrs	15 yrs	20 yrs	25 yrs	50 yrs	100 yrs	200 yrs	PMP
5 min	35.6	50.5	60.3	65.9	69.7	72.7	81.9	91.1	100.2	341.0
10 min	22.3	31.3	37.3	40.7	43.0	44.8	50.4	56.0	61.5	207.7
15 min	18.9	24.9	28.9	31.1	32.7	33.9	37.6	41.3	45.0	142.5
30 min	12.7	19.8	24.4	27.1	28.9	30.4	34.7	39.1	43.4	158.1
1 hr	7.3	10.9	13.2	14.5	15.5	16.2	18.4	20.5	22.7	80.1
2 hr	4.7	6.4	7.6	8.3	8.7	9.1	10.2	11.3	12.4	41.0
6 hr	2.4	3.1	3.6	3.9	4.1	4.2	4.7	5.1	5.6	17.5
12 hr	2.4	3.0	3.5	3.7	3.9	4.0	4.4	4.9	5.3	16.0
24 hr	1.4	1.7	1.9	2.1	2.1	2.2	2.4	2.6	2.8	7.7

TABLE 3.8
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

RED CHRIS SNOWMELT DATA

Long-term Snow Survey Summary

Station Name	Elevation (m)	Years of Record	Location	Water Equivalent (mm)					% Snow Melt				
				Feb. 1	March 1	April 1	May 1	June 1	Feb.	March	April	May	> June 1
Cassiar	1390	31	59°19' 129°50'	234.0	286.0	327.0	308.0	44.0	0%	0%	6%	86%	8%
Dease Lake	820	30	58°26' 130°01'	104.0	129.0	144.0	55.0	0.0	0%	0%	62%	38%	0%
Telegraph Creek	580	20	57°57' 131°09'	131.0	156.0	155.0	32.0	0.0	0%	1%	79%	21%	0%
Iskut	1000	21	57°51' 130°00'	88.0	113.0	120.0	22.0	0.0	0%	0%	82%	18%	0%
Upper Stikine	1450	5	57°14' 128°19'	307.0	395.0	474.0	517.0	159.0	0%	0%	0%	69%	31%

Estimated Long-term Red Chris Site Snow Melt Distribution

Station Name	Elevation (m)	Years of Record	Location	% Snow Melt					
				February	March	April	May	June	> July 1
Red Chris	1570	0	57°42' 129°47'	0%	0%	0%	60%	30%	10%

Notes:

1) Cassiar, Dease Lake, Telegraph Creek, Iskut & Upper Stikine snowmelt data from Snow Survey Bulletin, 1995, published by Water Management Division, B.C. Environment.

2) Estimates of long-term Red Chris values, for elevation 1570 m, are based on data from the highest regional stations, those at Cassiar and Upper Stikine.

3) *Estimate of July snowmelt is somewhat arbitrary but generally based on snowpillow data from high elevation stations in various regions of the province.

TABLE 3.9
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

MEAN MONTHLY POND EVAPORATION (mm)

Station	Elevation (m)	No. of Years Record	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Topley Landing	722	23	0	0	0	0	79.9	93.3	95.4	78.4	40	0	0	0	387.0
Red Chris	1570	Estimated	0	0	0	0	61	71	72	59	30	0	0	0	293

Notes:

1) Topley Landing values from AES data collections.

2) Red Chris site data generated by reducing Topley Landing values by 10% per 350m rise in elevation, as suggested by the MOE Manual of Operational Hydrology in B.C.
ie. 1570 - 722 = 848 and 848/350 x 10% = 24%.

3) Evaporation values for other elevations within the Red Chris project area can be calculated in a similar fashion.

4) Pond evaporation refers to evaporation from a free water surface such as a lake or pond.

TABLE 3.10
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

ESTIMATED RAINFALL AND SNOWMELT DISTRIBUTIONS

Total Annual Precipitation =		725 (mm)
Total Annual Rainfall =	*40%*	290 (mm)
Total Annual Snowfall =	*60%*	435 (mm)
Total Annual Snowpack (Sublimation Loss 20%) =	*80%*	348 (mm)
Total Annual Inflow to the Project Site =		638 (mm)

Location	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Red Chris	Rainfall	0	0	0	0	18	54	67	72	58	21	0	0	290
Elevation 1570 m	% Rainfall	0%	0%	0%	0%	6%	19%	23%	25%	20%	7%	0%	0%	100%
	% Precipitation	0.0%	0.0%	0.0%	0.0%	2.8%	8.5%	10.5%	11.3%	9.1%	3.3%	0.0%	0.0%	45.5%
	Snowmelt	0	0	0	0	209	104	35	0	0	0	0	0	348
	% Snowmelt	0.0%	0.0%	0.0%	0.0%	60.0%	30.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	% Precipitation	0.0%	0.0%	0.0%	0.0%	32.7%	16.4%	5.5%	0.0%	0.0%	0.0%	0.0%	0.0%	54.5%
	Total Inflow	0	0	0	0	227	159	102	72	58	21	0	0	638
	% Precipitation	0.0%	0.0%	0.0%	0.0%	35.6%	24.9%	15.9%	11.3%	9.1%	3.3%	0.0%	0.0%	100.0%

Notes:

1) Snowpack assumed to be 80% of snowfall. 20% loss assumed to be due to sublimation.

2) Rainfall distribution based on values in Table 3.5.

AMERICAN BULLION MINERALS LTD.

RED CHRIS PROJECT

LOCATION MAP AND GAUGING STATIONS

Cassiar

Dease Lake

08CB002

08CB001

08CC001

08CC003

08CC002

08CG003

08CG005

08CE001

08CF001

Telegraph Creek

Baker Mine

Red Chris Project Site

Todagin Range

See Fig. 4.1 Drainage Basin Map

CASSIAR MOUNTAINS

ROCHEUSES MOUNTAINS

CASSIAR DISTRICT

STIKINE

KLAPPAN RIVER

ISKUT RIVER

SKEENA

COAST MOUNTAINS

Spatsizi Plateau Wilderness Provincial Park

Grand Canyon of the Stikine

Legend :

- ● Water Survey of Canada (WSC) Station
- ▲ Atmospheric Environment Services of Canada (AES) Station

Scale 1:1,000,000

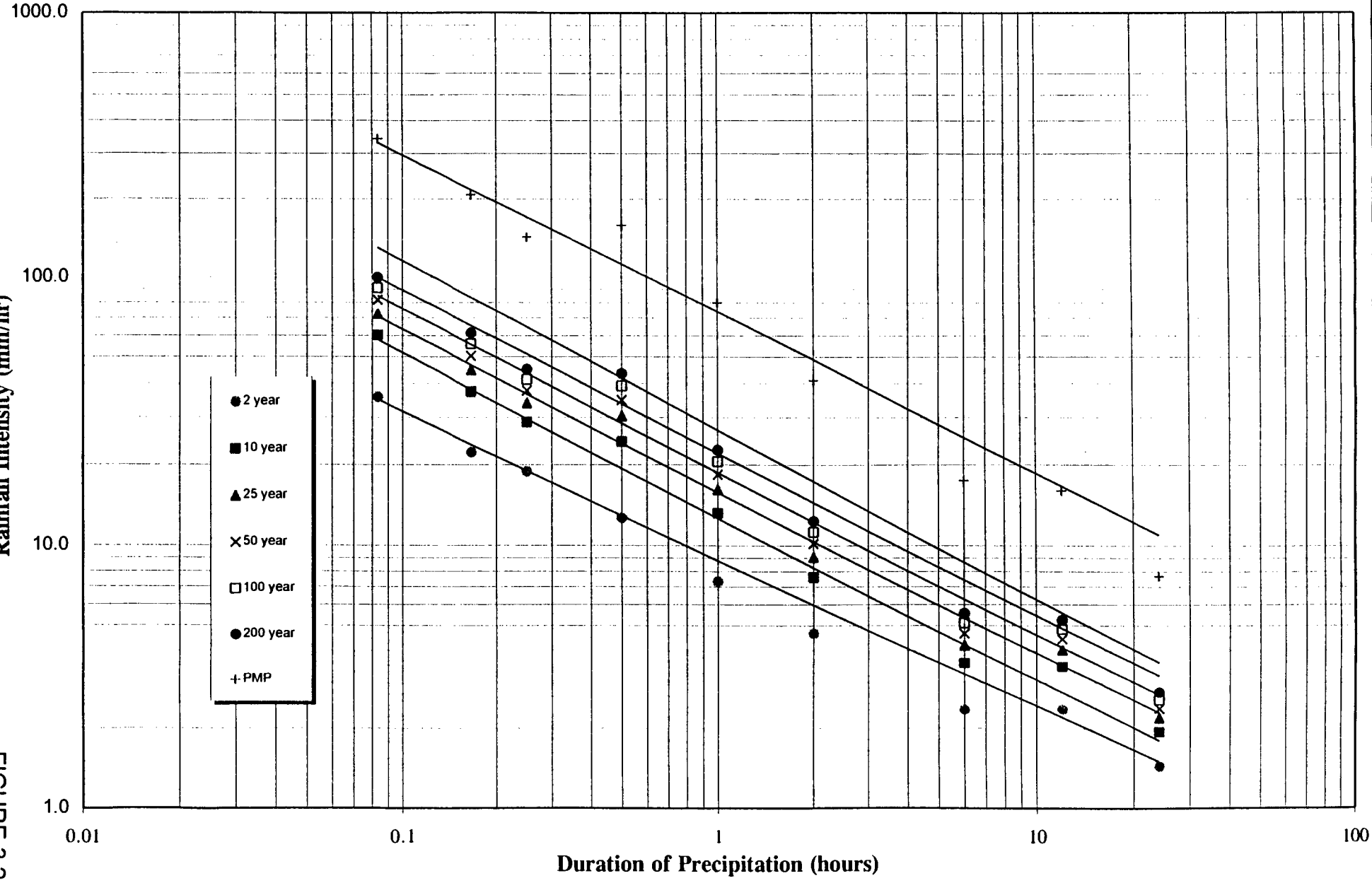
Feb. 19, 1996

HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

FIGURE 3.1

CAD FILE: \PROJECTS\1000\KB071\B3 1:1000 Plot 1-5

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY
1995 SUMMARY REPORT
INTENSITY-DURATION-FREQUENCY CURVES



KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 3.2

SECTION 4.0 - SURFACE HYDROLOGY

4.1 GENERAL

Streamflows in the Red Chris Project Area are generally characterized by peak flows in the spring and low flows in the winter. Maximum discharges typically occur during the spring as the result of snow melt or-rain-on-snow events, with flows gradually decreasing following the disappearance of snow. Sizeable flood events may also occur in the late summer due to intense rainstorms. These rainfall events are particularly significant on small basins. The smallest discharges of the year occur in mid-winter when major icing develops on all rivers and some small streams may freeze entirely.

4.2 DESCRIPTION OF WATERSHED

The Red Chris Project is located on a plateau near two main drainage systems which flow to the east and to the north. The system to the east of the project drains through Camp Creek, Thurston's Trickle and Trench Creek, which flow southeast into Trail Creek and then southwest into Kluea Lake. Kluea Lake feeds into Todagin Lake which in turn feeds into Todagin Creek, then into Tatogga Lake, Kinaskan Lake and finally into the Iskut River. The system to the north of the plateau drains through Red Rock Canyon and White Rock Canyon into Coyote Creek, which feeds into Lake Edontennajon and then Tatogga Lake, where it joins the Todagin Creek system which drains into Kinaskan Lake and finally the Iskut River. The Iskut River winds toward the coast and converges with the Stikine River approximately 80 km from the Pacific Ocean. A third minor drainage system east of the project site has its headwaters on Spit Mountain and drains north-northeast, converging into Quarry Creek which flows into the Klappan River, also a tributary of the Stikine River. The location of the project area and the major streams and rivers in the area are shown on Figures 3.1 and 4.1.

A number of minor streams drain the Red Chris Project area and serve as tributaries for the larger systems described above. These streams are very dendritic with numerous small channels feeding the main stems. Site streamflow measuring stations are located on selected streams, as shown on Figures 1.0, 4.1 and 4.2.

4.3 REGIONAL STREAMFLOW STATIONS

Streamflow values are recorded at a number of locations throughout the region by Water Survey of Canada (WSC). Those stations most relevant to the Red Chris Project area are located on Iskut River (08CG003), Klappen River (08CC001 and 08CC003) and Unnamed Creek

(08CC002). These stations were chosen for comparative study because the Red Chris Project area is contained within the Iskut River watershed while Klappen River and Unnamed Creek are fairly close to the project site and have basins which have sizes and elevations similar to the basin serviced by project station H2. The locations of all the regional stations are shown on Figure 3.1, while the drainage basins of the most relevant stations are delineated on Figure 4.1. Table 4.1 presents summary data for all the regional gauging stations. As can be seen, there is a large variation in unit runoff in the area, with values ranging from 8.6 to 57.1 l/s/km^2 for the entire region, and 13.6 to 53.8 l/s/km^2 amongst the most relevant stations. In general, there appears to be greater unit runoff for the smaller and higher basins.

Figure 4.3 presents unit runoff hydrographs for the four most relevant regional stations for the period of January 1994 to December 1995, and Table 4.2 presents a summary of the long-term monthly streamflow distributions. As can be seen, all four basins have the same general hydrograph pattern, on a monthly basis, with peak flows occurring during freshet and low flows occurring during the winter. However, as evident in Figure 4.3, the flow patterns are quite different on a daily basis between the small and large basins. The two smallest basins, those of Klappan River at Headwaters Plateau (08CC003) and Unnamed Creek at Site #10 (08CC002), exhibit very peaky responsive flow patterns typical of small steep catchments. These basins respond very quickly to precipitation events as there is very little storage and attenuation of flows. The two largest basins, those at Klappen River near Telegraph Creek (08CC001) and Iskut River at the Outlet of Kinaskan Lake (08CG003), have much more constant flow rates, which is typical of large basins. Their patterns result from the fact that large basins tend to have large storage capacities which serve to attenuate peak flows. The presence of a large lake in the Iskut River basin serves to magnify this effect. In addition to attenuation effects, precipitation generally falls on a relatively small portion of a large basin at any one time, thereby limiting the basin area contributing to runoff at that time.

The regional database provides a reasonable basis on which to estimate flows for the project area. Based on basin characteristics, the initial assessment indicates that the flow records for the stations on Klappen River at Headwaters Plateau and Unnamed Creek at Site #10 are likely the most representative of the flows in the project area.. These regional values will be combined with short-term site streamflow records to generate estimates of long-term site streamflow values. Streams in the Red Chris Project area are currently being monitored and the data collected to date is discussed in Section 4.1.4.

4.4 SITE STREAMFLOW RECORDS

The Red Chris hydrology program consists of five streamflow measuring sites. Three sites (H1, H4 and H5) are only equipped with staff gauges, while two sites (H2 and H3) are equipped with

both staff gauges and automatic water level recorder systems consisting of PS9000 submersible pressure transducers (Instrumentation Northwest Inc.) and Lakewood Ultraloggers, which record water levels every 60 minutes. These gauging stations are located on creeks which have been named by American Bullion Minerals Ltd. site personnel, to ensure accurate and consistent references for data collection purposes. The locations of these stations are shown on Figures 1.0, 4.1 and 4.2, with regional and site catchment areas outlined on Figures 4.1 and 4.2, respectively. Site gauging stations include:

Station No.	Location	Basin Area
H1	Coyote Creek below White Rock Canyon	72.4 km^2
H2	White Rock Canyon	38.3 km^2
H3	Quarry Creek	31.9 km^2
H4	Trail Creek below Camp Creek	27.1 km^2
H5	Red Rock Canyon	4.7 km^2

The staff gauges were installed at all locations in July 1994 and water levels were recorded approximately every three days. Staff gauge records for all stations are available between July and November 1994, and May and November 1995. An hourly record is available from the Site H2 automatic water level recorder between October 1994 and November 1995, although this was interrupted briefly in May 1995 due to a washout. The automatic water level recorder at Site H3 was installed in November 1995 and no data is yet available. All site hydrology data is summarized in Tables 4.3 and 4.4, and shown on Figures 4.4 and 4.5, with a complete record provided in Appendix III, along with stage discharge curves for the 5 locations. Due to winter conditions at the site this monitoring program is currently on hold, but it is scheduled to resume during the spring freshet.

It should be noted that there is some uncertainty associated with the H1 and H2 flows. The H1 station is located immediately upstream of some very active beaver dams and it is suspected that damming activity and associated backwater effects may have influenced recorded flows, particularly during 1995. The H2 staff gauge was washed out during the freshet of 1995 which resulted in problems with the development of a stage-discharge curve and with the establishment of the relationship between the logger and the staff gauge. These problems are described in detail in Appendix IV. All efforts have been made to minimize the effects of these problems and best estimates of H2 flows have been developed. Additional stage-discharge measurements and a re-survey of the gauging location are required to verify the H2 flows.

The results of the hydrology program to date indicate that Coyote Creek (Site H1) has the highest flows, with flows decreasing in the order of numbering such that "Red Rock Canyon" (Site H5) has the lowest flows. This is as expected, since the contributing basin areas decrease in size from H1 down to H5. All stations indicate a peak flow during the freshet month of May and a secondary peak during the wet month of September. For the period of record, low flows appear to occur during the warmest summer months of July and August. In reality, low flows likely occur during the winter months when the creeks are frozen over, but no flow measurements are available for that time.

Figure 4.6 presents unit runoff hydrographs for site station H2 and the Iskut River. This plot generally indicates that flow patterns in the project area are similar to those of the Iskut River. It also indicates that the staff gauge and data logger readings, after adjustement, agree very closely. The very large flow at H2 during November 1994 is likely due to instrument error caused by icing. The 1995 H2 flows are considerably lower than the Iskut River flows. This is surprising given that the regional study of Section 4.1.3 indicated that small, high elevation basins such as H2 would likely have higher unit area non-winter flows than large basins such as the Iskut River. Data from all of the site staff gauge locations support these lower H2 flows, indicating that the Red Chris Project area has a much lower runoff potential than the surrounding region. This conclusion is preliminary and the collection of additional site streamflow data is necessary for verification.

Once the layout of the proposed mine has been finalized, hydrological values such as peak flows and low flows will be calculated for specific locations in the creeks of interest. These calculations will be based on both regional and site flow data. Hydrological and meteorological data will continue to be collected and will be incorporated into the analysis. All efforts will be made to validate the existing data and ensure careful collection and calibration of future data.

TABLE 4.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

REGIONAL FLOW GAUGING STATIONS

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Station No.	Station Descriptions	Locattion		Drainage Area	Years	Operated by	Approx. Elevation	Mean Annual Flow	Mean Annual Unit Runoff	Remarks
		Long.(° ' ")	Lat.(° ' ")	(km^2)			(m)	(m^3/s)	($l/s/km^2$)	
	Project Site	129 47 00	57 42 00	38.32	1994-1995	American Bullion Minerals Ltd.	1620			
08CC001	Klappan R. near Telegraph Ck.	129 42 14	57 54 00	3550	1962-1990	WSC	1525	72.2	*20.3*	Natural Flow
08CC002	Unnamed Ck. at Site #10	129 06 28	57 13 02	29.2	1986-1990	WSC	1700	1.57	*53.8*	Natural Flow
08CC003	Klappan R. at Headwaters Plateau	129 03 12	57 15 00	16.6	1987-1990	WSC	1750	0.669	*40.3*	Natural Flow
08CG003	Iskut R. at Outlet of Kinaskan Lk.	130 10 45	57 31 50	1250	1964-1990	WSC	1475	17.0	*13.6*	Natural Flow
08CG005	More Ck. near the Mouth	130 24 05	57 02 27	844	1972-1990	WSC		48.2	*57.1*	Natural Flow
08CB001	Stikine R. above Grand Canyon	129 56 45	58 02 38	18800	1957-1990	WSC		298	*15.9*	Natural Flow
08CB002	Tanzilla R. near Telegraph Ck.	130 30 44	58 17 37	1600	1959-1966	WSC		13.7	*8.6*	Natural Flow
08CE001	Stikine R. at Telegraph Ck.	131 09 16	57 54 03	29300	1954-1990	WSC		407	*13.9*	Natural Flow
08CF001	Stikine R. above Butterfly Ck.	131 45 00	57 29 10	36000	1971-1990	WSC		648	*18.0*	Natural Flow

Note:

(1) = *WSC Stations used for Regional Analyses.*

TABLE 4.2

AMERICAN BULLION MINERAL LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

REGIONAL STREAMFLOW DISTRIBUTIONS

3/18/96 9:23 L:\HALLAM\H3071\DATA\HYDROL\[STA_SUM3.XLS]avg flow dist 4.2

Station No.	Station Name	Years	Parameter	Drainage Area (km^2)	Avg. Elev. (m)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
08CC001	Klappan R. near Telegraph Ck.	1988-1994	Flow (m^3/s)	3550	1525	12.71	11.68	11.82	19.90	116.66	254.57	199.71	119.26	78.79	55.14	24.30	16.69	77.11
			Unit flow (mm)			10	8	9	15	88	186	151	90	58	42	18	13	685
			Flow Distribution			*1%*	*1%*	*1%*	*2%*	*13%*	*27%*	*22%*	*13%*	*8%*	*6%*	*3%*	*2%*	*100%*
08CC002	Unnamed Ck. at Site #10	1988-1994	Flow (m^3/s)	29.2	1700	0.052	0.042	0.038	0.060	1.691	5.576	4.703	3.531	1.789	0.639	0.176	0.084	1.540
			Unit flow (mm)			5	3	3	5	155	495	431	324	159	59	16	8	1663
			Flow Distribution			*0%*	*0%*	*0%*	*0%*	*9%*	*30%*	*26%*	*19%*	*10%*	*4%*	*1%*	*0%*	*100%*
08CC003	Klappan R. at Headwaters Plateau	1988-1994	Flow (m^3/s)	16.6	1750	0.062	0.049	0.044	0.044	0.795	2.727	1.713	0.847	0.717	0.455	0.139	0.069	0.640
			Unit flow (mm)			10	7	7	7	128	426	276	137	112	73	22	11	1217
			Flow Distribution			*1%*	*1%*	*1%*	*1%*	*11%*	*35%*	*23%*	*11%*	*9%*	*6%*	*2%*	*1%*	*100%*
08CG003	Iskut R. at Outlet of Kinaskan Lk.	1988-1994	Flow (m^3/s)	1250	1475	5.42	4.79	4.15	4.58	18.77	57.57	49.29	30.47	20.76	17.10	10.70	7.15	19.30
			Unit flow (mm)			12	9	9	9	40	119	106	65	43	37	22	15	487
			Flow Distribution			*2%*	*2%*	*2%*	*2%*	*8%*	*25%*	*22%*	*13%*	*9%*	*8%*	*5%*	*3%*	*100%*
			Average Flow Distribution (long-term)			*1%*	*1%*	*1%*	*1%*	*10%*	*29%*	*23%*	*14%*	*9%*	*6%*	*2%*	*2%*	*100%*

Note:

(1) The long-term average flow distribution is the average of the flow distribution of the four long-term WSC stations - 08CC001, 08CC002, 08CC003 and 08CG003.

TABLE 4.3

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

SUMMARY OF AVERAGE MONTHLY SITE STREAMFLOWS

1994 Monthly Average Flows in m^3/s

Station		Drainage Area (km^2)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
H1	Staff	72.4							*0.310*	0.181	0.993	1.060		
H2	Staff	38.3							*0.679*	0.516	0.682	0.605		
	Logger											*0.510*	2.250	0.200
H3	Staff	31.9							*0.186*	0.156	0.197	0.187		
H4	Staff	27.1							*0.065*	0.059	0.117	0.115		
H5	Staff	4.7							*0.041*	0.041	0.068	0.106		

1995 Monthly Average Flows in m^3/s

Station		Drainage Area (km^2)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
H1	Staff	72.4					*1.056*	0.768	1.331	1.778	1.564	1.344		
H2	Staff	38.3					*0.600*	0.344	0.209	0.347	0.263	0.158		
	Logger		0.150	0.120	0.100	0.140	*0.870*	0.360	0.230	0.340	0.270	0.170	*0.450*	
H3	Staff	31.9					*0.258*	0.084	0.075	0.119	0.112	0.147		
H4	Staff	27.1					*0.384*	0.019	0.021	0.060	0.058	0.025		
H5	Staff	4.7					*0.133*	0.037	0.031	0.046	0.045	0.040		

Notes :

(1) See Appendix for Staff Gauge H1 to H5 3-day readings..
(2) *0.510* = Partial data in the month.

TABLE 4.4

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

SUMMARY OF AVERAGE MONTHLY SITE UNIT RUNOFF

1994 Monthly Unit Runoff in mm

Station		Drainage Area (km^2)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
H1	Staff	72.4							*11*	7	36	39		
H2	Staff	38.3							*47*	36	46	42		
	Logger											*36*	152	14
H3	Staff	31.9							*16*	13	16	16		
H4	Staff	27.1							*6*	6	11	11		
H5	Staff	4.7							*23*	23	37	60		

1995 Monthly Unit Runoff in mm

Station		Drainage Area (km^2)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
H1	Staff	72.4					*39*	27	49	66	56	50		
H2	Staff	38.3					*42*	23	15	24	18	11		
	Logger		10	8	7	9	*61*	24	16	24	18	12	*30*	
H3	Staff	31.9					*22*	7	6	10	9	12		
H4	Staff	27.1					*38*	2	2	6	6	2		
H5	Staff	4.7					*75*	20	18	26	25	23		

Notes :

(1) See Appendix for Staff Gauge H1 to H5 3-day readings..

(2) *36* = Partial data in the month.

H3071 B2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
DRAINAGE BASINS MAP

08CC001
Catchment Basin

See Fig. 4.2 Project Hydrology and Meteorology Stations

08CG003

Project Sta. H2
Catchment Basin

08CC003
Catchment Basin

08CC002
Catchment Basin

08CG003
Catchment Basin

08CC001

Notes :

(1) For locations of other Regional Stations and general information see Fig. 3.1 Location Map & Gauging Stations

Legend :

- WSC Stations
- Project Gauging Stations

Feb. 19, 1996

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Scale 1:300,000

FIGURE 4.1

AMERICAN BULLION MINERALS LTD.

RED CHRIS PROJECT

PROJECT HYDROLOGY AND METEOROLOGY STATIONS

H3071.81

Catchment Basins, typ.

EDDONTENAJON LAKE

EALUE LAKE

KLAPPAN RIVER

Quarry Creek

Coyote Creek

White Rock Canyon

Red Rock Canyon

Camp Creek

Trail Creek

Kluea Lake

H1

H2

H3

H4

H5

VQ

VP

Notes :

(1) For locations of other Regional Stations and general information see Fig. 3.1 Location Map & Gauging Stations

Legend :

▲ Project Meteorology Stations

● Project Hydrology Stations

Feb. 19, 1996

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Scale 1:75,000

FIGURE 4.2

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

AMERICA BULLION MINERALS LTD.
RED CHRIS PROPERTY

UNIT RUNOFF HYDROGRAPHS FOR THE REGIONAL WSC STREAMFLOW STATIONS

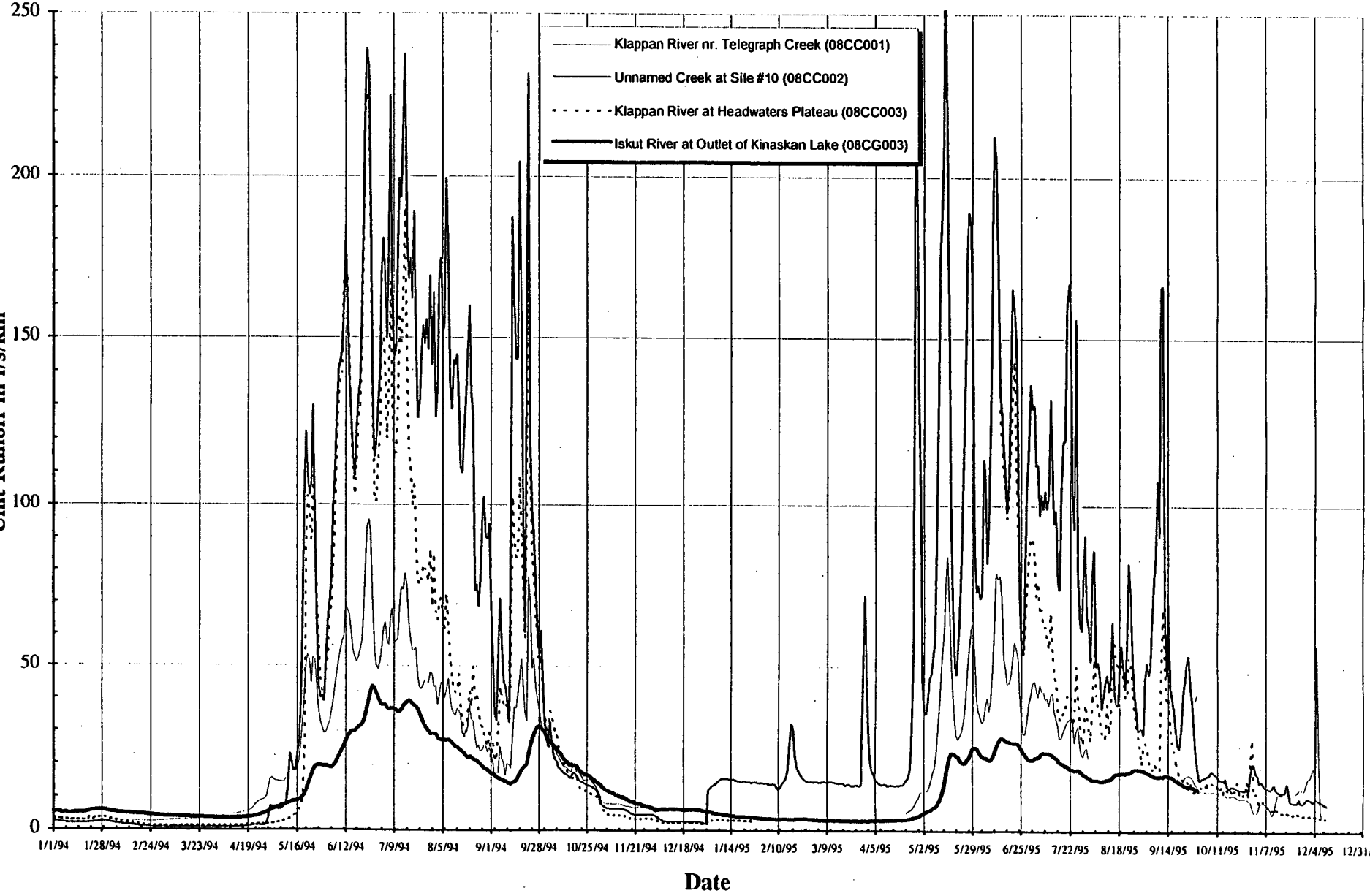
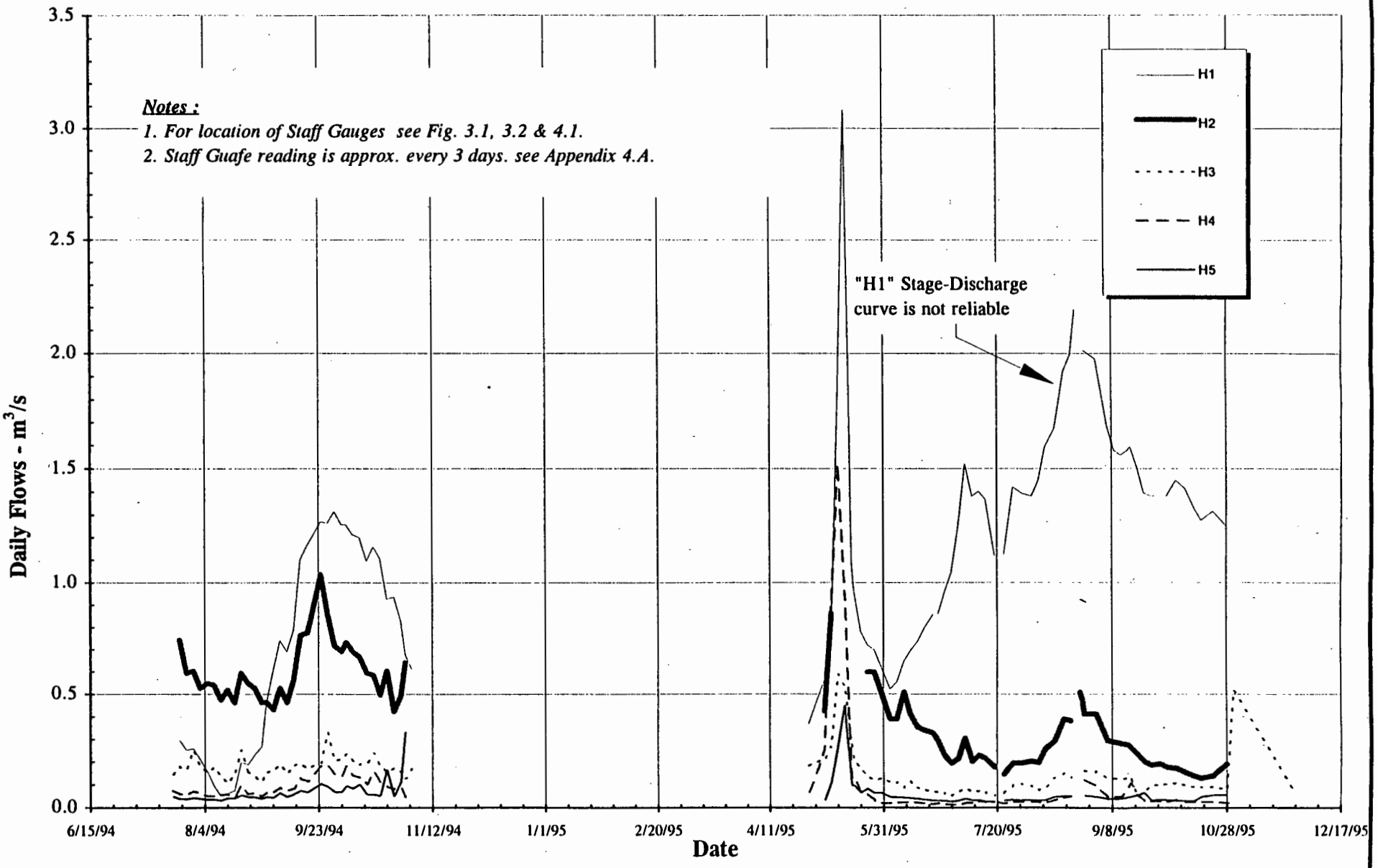


FIGURE 4.3

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

DAILY FLOW HYDROGRAPHS FROM SITE STAFF GAUGE READINGS

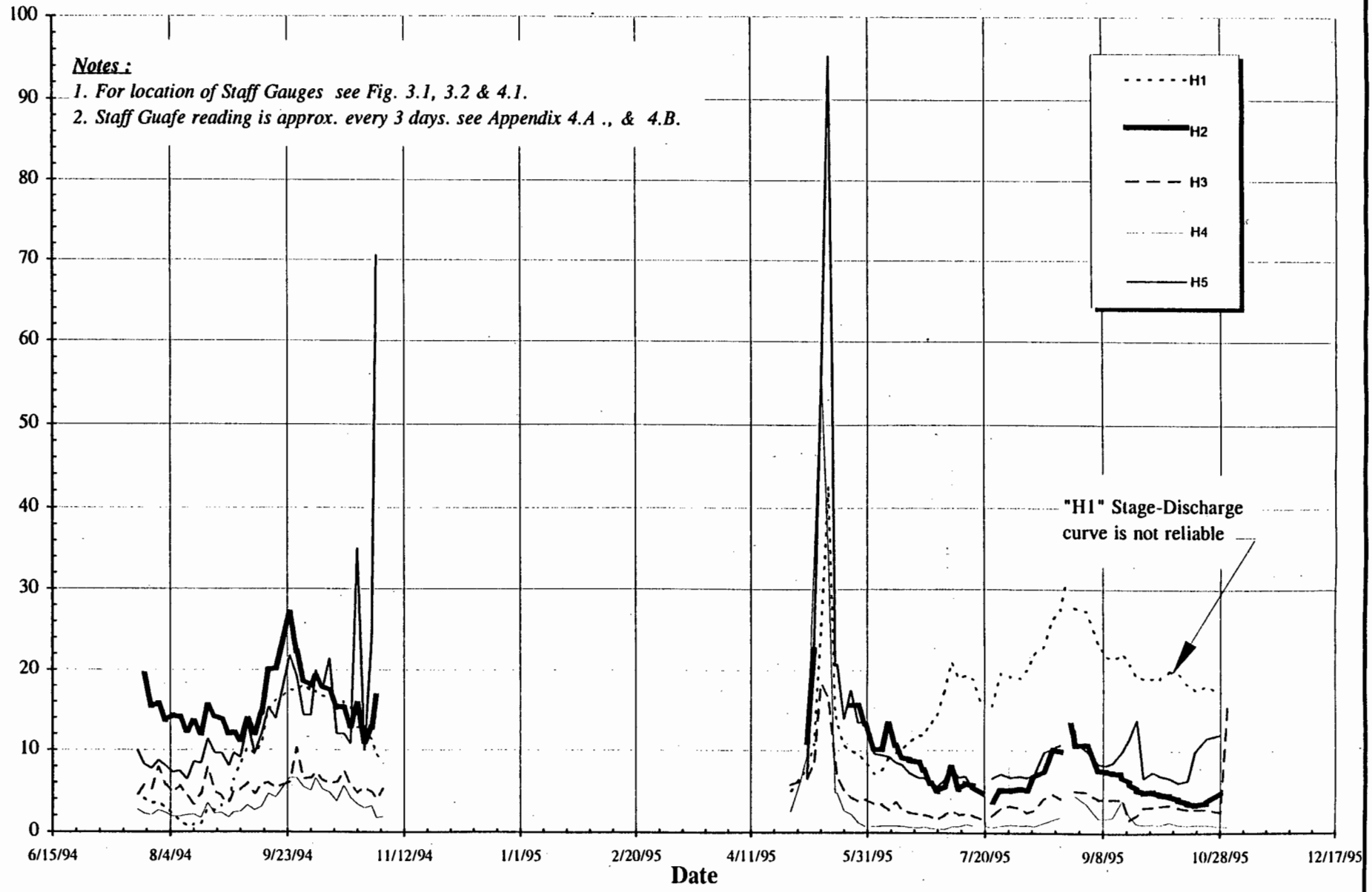


HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

FIGURE 4.4

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

UNIT RUNOFF HYDROGRAPHS FOR SITE STREAMFLOW STATIONS



HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

FIGURE 4.5

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

AMERICA BULLION MINERALS LTD.
RED CHRIS PROPERTY

UNIT RUNOFF HYDROGRAPHS FOR STATION "H2" AND ISKUT RIVER (08CG003)

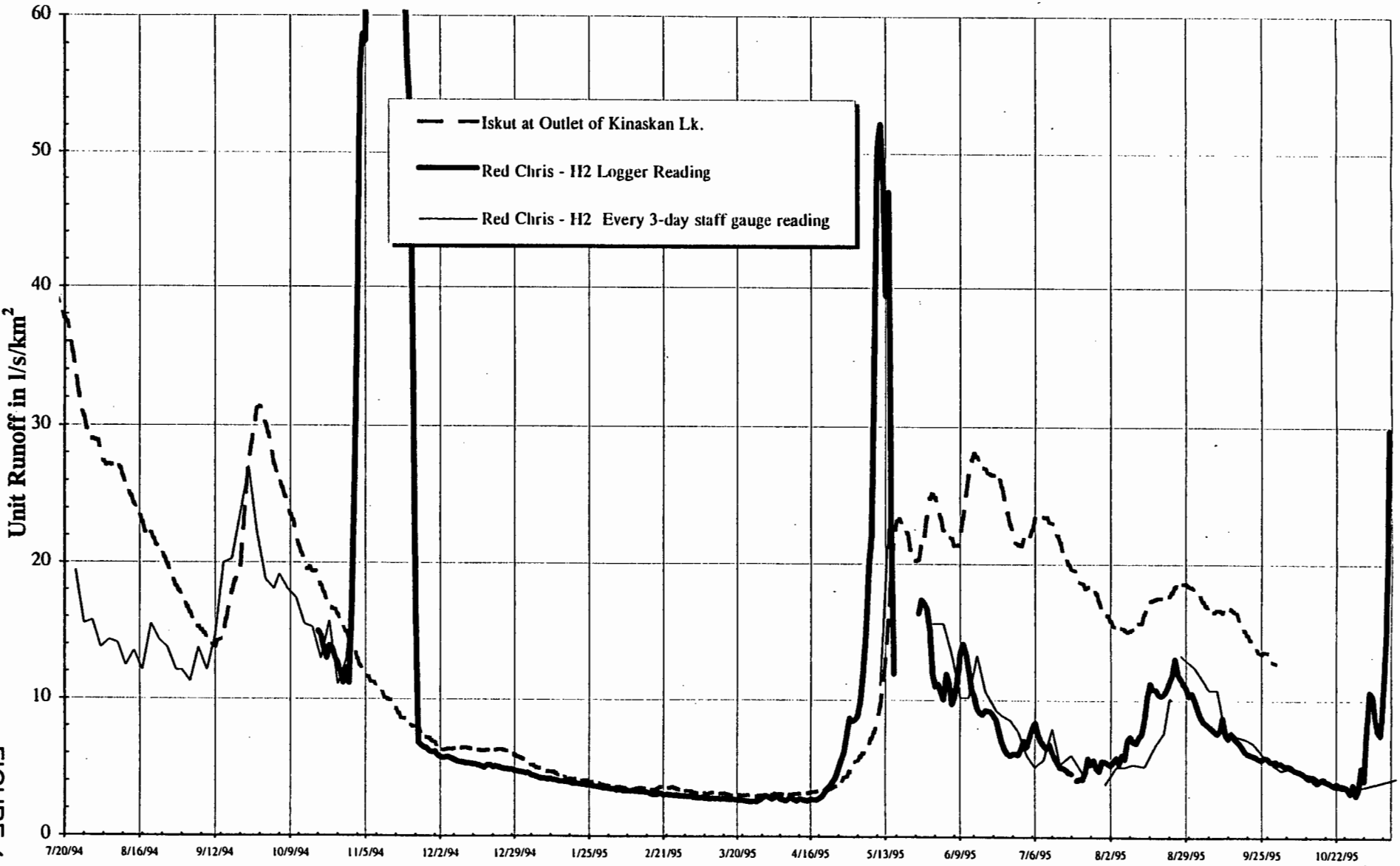


FIGURE 4.6

SECTION 5.0 - SURFACE WATER QUALITY

The Red Chris Project is located on a plateau near two main drainage systems which flow to the east and to the north. The system to the east of the project drains through Camp Creek, Thurston's Trickle and Trench Creek, which flow southeast into Trail Creek and then southwest into Kluea Lake. Kluea Lake feeds into Todagin Lake which feeds into Todagin Creek, into Tatogga Lake, then into Kinaskan Lake and into the Iskut River. The system to the north of the plateau drains through Red Rock Canyon and White Rock Canyon into Coyote Creek and then west into Lake Edontennajon which feeds into Tatogga Lake, joining the Todagin Creek system down into Kinaskan Lake and on to the Iskut River. The Iskut River winds toward the coast and converges with the Stikine River within approximately 80 km of the Pacific Ocean. A third minor drainage system east of the project site has its headwaters on Spit Mountain and drains north-northeast, converging into Quarry Creek which flows into the Klappan River, also a tributary of the Stikine River.

The minor streams draining the plateau area were named by American Bullion Minerals Ltd. site personnel, as cited above, to ensure accurate and consistent references for data collection purposes. Hydrology and water quality monitoring stations were located at selected points along these streams, as shown in Figure 1.0, and including:

Station No.	Type	Location
H1/W1	Hydrology & Water Quality	Coyote Creek below White Rock Canyon
H2/W2	Hydrology & Water Quality	White Rock Canyon
H3/W3	Hydrology & Water Quality	Quarry Creek
H4/W4	Hydrology & Water Quality	Trail Creek below Camp Creek
H5/W5	Hydrology & Water Quality	Red Rock Canyon
W6	Water Quality	Trench Creek
W7	Water Quality	Coyote Creek above White Rock Canyon
W8	Water Quality	Thurston's Trickle
W9	Water Quality	Camp Creek

5.1 METHODS

The locations of the water quality monitoring stations were selected based on proximity to the current exploration area and potential future mine development considerations. Surface water quality samples were collected monthly between July and October, 1994, and between May and October, 1995, at nine selected locations at the project site (W1 to W9); the first five water quality stations (W1 to W5) correspond to hydrology stations H1 to H5, respectively. Two additional surface water quality monitoring sites were sampled on November 11, 1995: Sites W10 and W11. Samples of drinking water from the camp supply were collected in both 1994 and 1995.

All samples, including replicates and travel blanks, were preserved, as appropriate, and submitted to Analytical Services Laboratory Ltd. (ASL) in Vancouver for analyses of the following parameters:

- physical tests such as conductivity, pH, total dissolved and suspended solids, hardness and turbidity;
- anions such as alkalinity, chloride, fluoride and sulphate;
- nutrients such as ammonia, nitrate and nitrite nitrogen, and ortho-, dissolved and total phosphate;
- total cyanide;
- selected total and dissolved metals, and
- total organic carbon.

Samples were collected into pre-cleaned, acid-washed containers provided by ASL. Sample containers were rinsed thoroughly with water from the specific sample site three times prior to collection of the final sample, except for cyanide bottles which contained sodium hydroxide (NaOH) preservative and were only filled once. All sample containers were fully submersed during sample collection. Samples were preserved, as appropriate, and shipped to the project laboratory in coolers packed with ice. Further details of the sample collection protocols are presented in Appendix V.

All 1995 water quality samples were collected by American Bullion Minerals Ltd. site personnel, except the July samples in both 1994 and 1995, which were collected by Hallam Knight Piésold Ltd. personnel. As components of the surface water quality QA/QC program, a single set of

replicate samples was taken four times during 1994, and during each of the seven 1995 sampling events. Travel blanks were included three times in 1994, and six times in 1995.

5.2 RESULTS

Surface water quality data was reviewed with respect to general characteristics and was compared to both Provincial, Approved and Working Criteria for Water Quality, 1994 (AWCWQ) and Federal, Canadian Council of Ministers of Environment, 1991 (CCME) criteria for protection of freshwater aquatic life. These criteria, specific to the parameters tested, are summarized in Table 4.1. All surface water, drinking water and QA/QC data is presented in Appendix VI.

5.2.1 Surface Water Quality

Surface water quality results from the 1995 monitoring period were similar to those found in 1994. Average surface water quality data for the entire period for each monitoring station is presented in Table 4.2 and indicated that water quality at the Red Chris property is generally slightly basic (pH ranging from 7.46 to 8.19), conductive (168.9 to 867.0 µmohs/cm), hard (81.1 to 461.4 mg/L $CaCO_3$), alkaline (60.4 to 194.7 mg/L $CaCO_3$), high in dissolved solids (111.0 to 722.0 mg/L), and low in suspended solids (<1 to 6.2 mg/L, although Site H5 averaged 31.7 mg/L) and turbidity (0.170 to 5.507 NTU, although Site W5 averaged 37.06 NTU). Levels of anions and nutrients were generally moderate to low, though fluoride concentrations at Site W5 averaged 0.364 mg/L, and sulphate concentrations at Sites W2 and W5 averaged 134.45 and 390.20 mg/L, respectively. Average total cyanide concentrations ranged from <0.001 to 0.0039 mg/L. Total and dissolved metals concentrations were variable and are discussed in greater detail below.

Sample sites selected to monitor background water quality conditions and potential future impacts due to development, such as W3, W4, W6, W7, W8 and W9, generally contained low metals concentrations that did not exceeded AWCWQ or CCME criteria for protection of aquatic life, though Site W6 consistently contained copper at or slightly above CCME criteria. This monitoring site was selected because it was thought to be isolated from the copper deposit; however, this data suggests that there is some influence from copper mineralization in the area. This contrasts with data from site W8 which drains from the closer to the general deposit area and generally did not contain elevated levels of copper or other metals. Site W9 (Camp Creek) occasionally showed elevated levels of aluminum, iron, and copper.

The sites selected to monitor water quality draining directly from the deposit area included:

- Site W5, near the headwaters of "Red Rock Canyon";

- Site W2, "White Rock Canyon" below "Red Rock Canyon", and
- Site W1, Coyote Creek below "White Rock Canyon".

Data from these locations indicated that surface water near the headwaters of "Red Rock Canyon" reflects the mineralization of the deposit, containing levels of fluoride, sulphate, aluminum, cadmium, copper, iron, manganese and zinc exceeding AWCWQ and/or CCME criteria.

The results also indicate that this influence is evident downstream at sites W2 and W1, though, with dilution, the concentrations were not as high. At Site W2, sulphate, aluminum, copper, iron, manganese and zinc concentrations consistently exceeded AWCWQ and/or CCME criteria, and further downstream at Site W1, aluminum, iron and occasionally copper and manganese exceeded one or both criteria.

Samples from Site W10, located near the mouth of "Trail Creek" as it flows into Kluea Lake (downstream of Site W4), and Site W11, located in the upper "Quarry Creek" basin (upstream of Site W3), were collected only on November 11, 1995, during a site visit by B.C. Ministry of Environment, Lands and Parks representative, Mr. Ian Sharp. Both Sites W10 and W11 are situated in portions of their respective basins that are more marshy than Sites W4 or W3, respectively. Although the water quality is generally very similar, this difference in physiography is reflected in the data.

Compared to the surface water sample collected at Site W4 on the same date, Site W10 contained:

- higher conductivity, dissolved solids, iron, manganese and sodium concentrations;
- marginally higher hardness, pH, alkalinity, sulphate, barium, calcium, potassium, silicon and strontium concentrations;
- lower aluminum and zinc concentrations, and
- moderately lower nitrate and phosphorus concentrations.

Compared to the surface water sample collected at Site W3 on the same date, Site W11 contained:

- higher conductivity, alkalinity, ammonia, nitrate, iron and manganese concentrations;

- marginally higher arsenic, barium, potassium, silicon, sodium, strontium, zinc and total organic carbon concentrations, and

- lower pH and aluminum concentrations.

Surface water quality samples were collected by Beak Consultants on July 15, 1975, at eight locations, several of which correspond closely to current water quality monitoring stations, as shown on Figure 1.0. The Beak sample data is included in Table VI.2 of Appendix VI. Comparison to recent data suggests that surface water quality has not changed significantly in the past twenty years, although total dissolved solids (TDS) and sulphate concentrations were consistently lower in the Beak samples. Dissolved iron and zinc concentrations were substatially lower in 1975 at the Beak #3 sample site, which is the same as current Site W5 in "Red Rock Canyon."

5.2.2 Drinking Water Quality

Drinking water from the camp supply was found to be of good quality when compared to AWCWQ and Health and Welfare Canada drinking water guidelines. In 1994, the sample of drinking water slightly exceeded the guidelines for colour and iron concentration, both of which are aesthetic objectives related to the appearance, taste and odour of the water, but are not generally health concerns. The elevated colour measurement was likely due to the slightly elevated iron level. The drinking water sample collected in 1995 did not exceed guideline levels for any parameters, except pH, which was moderately basic (9.79). The upper criteria limit for pH (8.5) has been designed to minimize precipitation of carbonate salts within the distribution system and maximize the effectiveness of chlorination; however, the AWCWQ states that "natural source water outside the criteria may be safe to drink from a public health perspective."

5.2.3 Quality Assurance / Quality Control (QA/QC)

Review and analysis of QA/QC data involved calculation of the ratios of values for original versus duplicate data, to compare the two sets of data. Most data generally matched very closely (i.e., ratios were close to 1.00), and the instances where there was greater than a 20% difference were generally isolated to cases where one or both concentrations were at or near (within 10 times) the method detection limit. This overwhelmingly suggests that analytical variability near the detection limit is the primary source of error with respect to replicability.

Travel and field blank samples were generally clean, with most parameters below detection limits, Minor levels of suspended solids and ammonia nitrogen were seen in the October 5, 1994, travel blank, and were also present in water quality samples collected during the same sampling event. Concentrations of aluminum and calcium were detected in most blank samples analysed during

1995, and were particularly elevated, along with strontium, in the May 18 blank. The September 7, 1994, travel blank contained levels of physical parameters, anions, nutrients, and several total and dissolved metals above detection limits; however, this apparent contamination was not reflected in water quality samples collected during the same sampling event.

Additionally, analysis of the September 16, 1995, sample collected from Site W5 shows dissolved metals concentrations consistently and significantly greater than total concentrations for several metals, such as aluminum, copper, iron, silcon and zinc, and to a lesser extent, barium, manganese, strontium and uranium. The dissolved metals concentrations in this sample correlated well with the total metals concentrations from all other samples collected at Site W5, and total levels correlated with dissolved concentrations, indicating that the two bottles for dissolved and total metals samples had likely been mis-labelled either in the field or during transfer at the laboratory. This being the case, aluminum, copper, iron, manganese and zinc concentrations exceeded AWCWQ and/or CCME criteria. Due to this apparent error, the September 16, 1995, Site W5 surface water quality data was not included in statistics calculations.

Table 5.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

British Columbia and Federal Water Quality Criteria
For Protection of Freshwater Aquatic Life

Parameters	B.C. (AWCWQ)	Federal (CCME)
Total Dissolved Solids	+10 or 10%	
pH	6.5 to 9	6.5 to 10
Total Suspended Solids		+10 or 10%
Turbidity	+5 or 10%	
Alkalinity (total)	20 (sensitivity rating)	
Sulphate (dissolved)	100	
Ammonia Nitrogen	0.680 to 1.37 fn([pH]&[Temp])	
Nitrate Nitrogen	200	
Nitrite Nitrogen	0.06 to 0.6	0.06
Cyanide	0.01 (as WAD cyanide)	0.005 (as Free cyanide)
Aluminum (total)		0.005 to 0.1 fn(pH)
Antimony (total)	0.05	
Arsenic (total)	0.05	0.05
Barium (total)	5	
Beryllium (total)	0.0053	
Cadmium (total)	0.0002 to 0.0018 fn(Hardness)	0.0002 to 0.0018 fn(Hardness)
Chromium (total)	0.002 or 0.02	0.002 or 0.02
Cobalt (total)	0.05	
Copper (total)	0.002 + fn(Hardness)	0.002 to 0.004 fn(Hardness)
Iron (total)	0.3	0.3
Lead (total)	0.001 + fn(Hardness)	0.001 to 0.007 fn(Hardness)
Manganese (total)	0.1 to 1	
Mercury (total)	0.0001	0.0001
Molybdenum (total)	2	
Nickel (total)	0.025 to 0.150 fn(Hardness)	0.025 to 0.150 fn(Hardness)
Selenium (total)	0.001	0.001
Silver (total)	0.0001	0.0001
Uranium (total)	0.3	
Vanadium (total)	10	
Zinc (total)	0.03	0.03
Aluminum (dissolved)	0.05 + fn (pH)	
Calcium (dissolved)	8 (sensitivity rating)	

CCME - Canadian Council of Ministers of Environment, 1991 guidelines.

AWCWQ - Approved and Working Criteria for Water Quality in British Columbia, 1994.

Table 5.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Average Values for Surface Water Quality Data

		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10*	W11*
Number of Samples:		11	11	12	12	10	11	11	11	11	1	1
Physical Tests	Units											
Conductivity	umhos/cm	451.5	574.3	318.1	288.9	867.0	168.9	328.5	318.9	301.7	326	365
Total Dissolved Solids	mg/L	319.6	429.1	214.8	197.1	722.0	111.0	225.6	213.7	215.0	224	253
Hardness	mg/L CaCO3	237.9	306.8	171.4	146.5	461.4	81.1	166.5	166.4	140.0	164	201
pH	pH Units	8.077	8.305	8.222	7.933	7.711	7.882	8.052	8.190	7.895	7.79	7.46
Total Suspended Solids	mg/L	4.8	6.2	3.6	2.1	31.7	2.0	1.7	1.3	5.5	<1	1
Turbidity	NTU	2.805	4.539	1.270	1.529	37.06	0.902	0.914	0.170	5.507	0.3	2.2
Anions												
Alkalinity (Total) *	mg/L CaCO3	174.7	194.9	168.0	114.3	76.0	60.4	147.8	148.5	73.0	136	189
Chloride (dissolved)	mg/L	0.627	0.545	0.504	0.413	0.690	0.356	0.473	0.459	0.509	<0.5	0.6
Fluoride (dissolved)	mg/L	0.084	0.099	0.058	0.060	**0.364**	0.054	0.076	0.080	0.115	0.07	0.05
Sulphate (dissolved)	mg/L	76.71	**134.45**	12.82	40.28	**390.20**	23.61	34.08	29.66	78.65	40.1	17.6
Nutrients												
Ammonia Nitrogen	mg/L	0.0064	0.0032	0.0034	0.0035	0.0087	0.0077	0.0066	0.0028	0.0038	<0.005	0.023
Nitrate Nitrogen	mg/L	0.0245	0.0470	0.0204	0.0653	0.0149	0.0982	0.0035	0.0298	0.0033	0.092	0.101
Nitrite Nitrogen	mg/L	0.0018	0.0022	0.0011	0.0014	0.0010	0.0017	0.0011	0.0011	0.0024	0.001	0.001
ortho-Phosphate	mg/L	0.0018	0.0017	0.0014	0.0014	0.0030	0.0021	0.0026	0.0009	0.0045	<0.001	0.001
Total Dissolved Phosphate	mg/L	0.0036	0.0029	0.0027	0.0029	0.0058	0.0029	0.0044	0.0017	0.0060	0.001	0.002
Total Phosphorus	mg/L	0.0103	0.0131	0.0070	0.0067	0.0306	0.0039	0.0080	0.0021	0.0179	0.003	0.007
Cyanide												
Total Cyanide	mg/L	0.0017	0.0010	0.0024	0.0014	0.0018	0.0010	0.0018	0.0016	0.0039	<0.001	0.003
Total Metals												
Aluminum (total)	mg/L	0.0844	**0.1611**	0.0343	0.0395	**1.1633**	0.0485	0.0256	0.0184	**0.2255**	0.021	0.017
Antimony (total)	mg/L	0.00026	0.00060	0.00010	0.00007	0.00024	0.00005	0.00008	0.00005	0.00005	0.0001	0.0001
Arsenic (total)	mg/L	0.00070	0.00066	0.00067	0.00009	0.00085	0.00025	0.00065	0.00007	0.00025	0.0001	0.001
Barium (total)	mg/L	0.0521	0.0489	0.0525	0.0373	0.0257	0.0325	0.0506	0.0428	0.0458	0.043	0.07
Beryllium (total)	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	<0.005	<0.005
Bismuth (total)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	<0.10	<0.10
Boron (total)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	<0.10	<0.10
Cadmium (total)	mg/L	0.00011	0.00019	0.0001	0.00013	**0.00240**	0.0001	0.0001	0.0001	0.0001	<0.0002	0.0003
Calcium (total)	mg/L	59.77	89.41	49.59	38.58	143.78	30.32	48.55	41.22	37.94	43.7	55.6
Chromium (total)	mg/L	0.00055	0.0005	0.00054	0.00054	0.00055	0.00050	0.0005	0.0005	0.00064	<0.001	<0.001
Cobalt (total)	mg/L	0.0005	0.00068	0.0005	0.0005	0.00980	0.00050	0.0005	0.0005	0.00109	<0.001	<0.001
Copper (total)	mg/L	0.0033	0.0089	0.0006	0.0010	**0.1209**	0.0053	0.0005	0.0006	0.0034	<0.001	<0.001
Iron (total)	mg/L	**0.3301**	**0.6785**	0.1366	0.0691	**9.3370**	0.0405	0.0621	0.0171	0.1501	0.085	**0.498**
Lead (total)	mg/L	0.0007	0.0009	0.0005	0.0005	0.0009	0.0005	0.0005	0.0005	0.0005	<0.001	<0.001
Magnesium (total)	mg/L	22.95	34.60	12.45	12.69	29.10	2.81	13.41	16.65	11.71	14.3	14.9
Manganese (total)	mg/L	0.0865	0.0879	0.0165	0.0081	**1.3644**	0.0025	0.0316	0.0033	0.0108	0.026	**0.124**
Mercury (total)	mg/L	0.000005	0.000005	0.000005	0.000005	0.000005	0.0000055	0.000006	0.000005	0.000005	<0.00001	<0.00001
Molybdenum (total)	mg/L	0.0008	0.0007	0.0015	0.0007	0.0006	0.0128	0.0007	0.0005	0.0005	<0.001	0.002
Nickel (total)	mg/L	0.0009	0.0009	0.0006	0.0006	0.0048	0.0005	0.0005	0.0015	0.0025	<0.001	<0.001
Selenium (total)	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	<0.0005	<0.0005
Silicon (total)	mg/L	2.896	2.573	2.950	3.384	5.086	3.795	3.025	3.149	4.771	3.03	3.43
Silver (total)	mg/L	0.00007	0.000073	0.00005	0.00005	0.00010	0.00005	0.00006	0.00005	0.00005	<0.0001	<0.0001
Strontium (total)	mg/L	0.3967	0.5668	0.2063	0.2194	1.4816	0.1227	0.2422	0.2389	0.2948	0.243	0.245
Titanium (total)	mg/L	0.005	0.005	0.005	0.005	0.0064	0.0050	0.005	0.005	0.0062	<0.010	<0.010
Uranium (total)	mg/L	0.000189	0.000332	0.000115	0.000074	0.000198	0.000131	0.000111	0.000052	0.000058	0.0001	0.00017
Vanadium (total)	mg/L	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	<0.030	<0.030
Zinc (total)	mg/L	0.0107	**0.0341**	0.0028	0.0029	**0.4686**	0.0031	0.0025	0.0025	0.0037	<0.005	0.005
Dissolved Metals												
Aluminum (dissolved)	mg/L	0.0295	0.0391	0.0145	0.0191	**0.1089**	0.0277	0.0101	0.0078	0.0464	0.007	0.007
Antimony (dissolved)	mg/L	0.00020	0.00047	0.00009	0.00006	0.00019	0.00005	0.00005	0.00005	0.00005	0.0001	0.0001
Arsenic (dissolved)	mg/L	0.00043	0.00026	0.00044	0.00008	0.00013	0.00020	0.00052	0.00006	0.00006	<0.0001	0.0005
Barium (dissolved)	mg/L	0.0502	0.0461	0.0514	0.0363	0.0207	0.0321	0.0494	0.0410	0.0431	0.043	0.066
Beryllium (dissolved)	mg/L	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	<0.005	<0.005
Bismuth (dissolved)	mg/L	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	<0.10	<0.10
Boron (dissolved)	mg/L	0.05	0.05	0.05	0.063	0.05	0.050	0.05	0.05	0.05	<0.10	<0.10
Cadmium (dissolved)	mg/L	0.0001	0.00013	0.0001	0.0001	0.00105	0.00010	0.0001	0.0001	0.0001	<0.0002	<0.0002
Calcium (dissolved) *	mg/L	58.26	67.34	48.57	38.11	139.00	29.75	46.54	39.57	37.56	42.5	55.8
Chromium (dissolved)	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.00050	0.0005	0.0005	0.0005	<0.001	<0.001
Cobalt (dissolved)	mg/L	0.0005	0.0005	0.0005	0.0005	0.00510	0.00050	0.0005	0.0005	0.0005	<0.001	<0.001
Copper (dissolved)	mg/L	0.0011	0.0016	0.0005	0.0010	0.0089	0.0043	0.0005	0.0005	0.0016	<0.001	<0.001
Iron (dissolved)	mg/L	0.0353	0.0197	0.0409	0.0258	0.6707	0.0212	0.0219	0.015	0.0350	0.031	0.128
Lead (dissolved)	mg/L	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	<0.001	<0.001
Magnesium (dissolved)	mg/L	22.42	33.66	12.20	12.44	27.77	2.77	12.91	16.42	11.21	14	14.9
Manganese (dissolved)	mg/L	0.0715	0.0737	0.0031	0.0059	1.2569	0.0025	0.0190	0.0025	0.0075	0.028	0.122
Molybdenum (dissolved)	mg/L	0.0005	0.0005	0.0015	0.0005	0.0005	0.0118	0.0005	0.0005	0.0005	<0.001	0.002
Nickel (dissolved)	mg/L	0.0007	0.0007	0.0005	0.0005	0.0035	0.0005	0.0005	0.0006	0.0019	<0.001	<0.001
Potassium (dissolved)	mg/L	1.013	1.183	0.818	0.715	1.317	0.349	0.751	0.432	0.588	0.79	0.97
Selenium (dissolved)	mg/L	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	<0.0005	<0.0005
Silicon (dissolved)	mg/L	2.628	2.416	2.902	3.280	3.873	3.691	2.896	2.915	4.683	2.97	3.43
Silver (dissolved)	mg/L	0.00005	0.00005	0.00005	0.00005	0.00007	0.000050	0.00005	0.00005	0.00005	<0.0001	<0.0001
Sodium (dissolved)	mg/L	4.974	7.158	2.594	4.071	17.028	2.171	3.381	2.731	5.921	5.44	3.51
Strontium (dissolved)	mg/L	0.3885	0.5695	0.2037	0.2168	1.4415	0.1219	0.2353	0.2215	0.3014	0.239	0.244
Titanium (dissolved)	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	<0.010	<0.010
Uranium (dissolved)	mg/L	0.000182	0.000308	0.000107	0.000071	0.000135	0.000129	0.000102	0.000048	0.000055	0.0001	0.00016
Vanadium (dissolved)	mg/L	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	0.015	<0.030	<0.030
Zinc (dissolved)	mg/L	0.0094	0.0115	0.0038	0.0045	0.1676	0.0033	0.0044	0.0030	0.0041	0.005	0.009
Organics												
Total Organic Carbon	mg/L	2.05	1.33	3.25	2.22	1.81	2.11	2.76	2.17	4.59	1.6	3.6

Note: Averages were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - Actual values are reported for W10 and W11, as only one sample was collected in each case.

BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

- exceeds B.C. AWCWQ (1994) for protection of aquatic life.

- exceeds federal CCME guidelines for protection of aquatic life.

SECTION 6.0 - VEGETATION

Hallam Knight Piésold Ltd. conducted a field study in July 1995 to confirm vegetation community types in the Red Chris Project area. Thirty metre transects were set at 14 locations, as shown in Figure 1.0. All plant species were identified and were categorized as to overstory, understory, herb and moss/lichen layers. A summary list of plant species observed at the Red Chris property is presented in Table 6.1, and detailed transect logs are presented in Appendix VII.

Results of the field study were compared to regional biogeoclimatic mapping (Pojar and Stewart, 1991), and site investigations conducted by Hallam Knight Piésold Ltd. (1994 and 1995) and R. Brock (1995). Based on this information, it was determined that the Red Chris Project lies mostly within the Spruce Willow Birch zone (SWB) of the Prince Rupert Forest District. Higher elevations fall within the Alpine Tundra (AT) zone, while lower elevations along Highway 37 are located within the Boreal White and Black Spruce Zones (BWBS). Forest resources are rated as low (0.8 to 3.4 m^3/ha/yr) to very low (<0.8 m^3/ha/yr).

6.1 SPRUCE-WILLOW-BIRCH (SWB) ZONE

Lower elevations of the SWB are generally forested, mostly with subalpine fir and white spruce. In many valleys, trees are distributed as an intermittent to closed forest, consisting mostly of white spruce with varying amounts of lodgepole pine and trembling aspen in the valley bottoms and lower slopes. As the elevation increases, the proportion of subalpine fir increases and frequently pure stands of fir will occur, especially on east and west aspect slopes.

Upper elevations of the SWB exist as a scrub/parkland and are dominated by tall deciduous shrubs such as scrub birch, grey-leaved willow, Barclay's willow, tea-leaved willow, Barratt's willow, Alaska willow and woolly willow. Groves of stunted balsam poplar and trembling aspen may occur on steep south aspect slopes near the timberline.

Frequently a double treeline will occur due to massive cold air ponding. The result is a mosaic of shrubfields, fens and dry to moist grassland on lower slopes and the valley bottom, a fringe of trees occurs on the lower slopes and shrubs will again dominate above the intermediate forested zone.

A lodgepole pine-scrub birch-lichen woodland association occurs on some of the driest, poorest sites. Trembling aspen stands are fairly common on drier sites along the major valleys, usually on the south aspect slopes of valley bottom moraines and glaciofluvial landforms, or on steep, south aspect colluvial slopes.

Subalpine fir commonly forms open forest and woodland on steep, moist, cold middle slopes, with best development on northern and eastern exposures, and is frequently associated with scrub birch and crowberry. Shrub dominated ecosystems are widespread and range from swamps and fens to dry colluvial scrub.

Wetlands in the SWB zone are usually quite rich and consist of white spruce and tall willow swamps and sedge fens. Acid, nutrient poor bogs consisting of black spruce, Labrador tea and sphagnum moss are less common.

Subalpine grasslands occur frequently, but do not cover extensive area in the SWB zone and are of two types. Dry grasslands occur on steep, south aspect slopes and are dominated by several species of grasses, three-toothed saxifrage, prairie cinquefoil, pasture sage and northern wormwood. Dry to fresh grassland occurs on flat to gently rolling outwash or morainal landforms and are dominated by altai fescue, monkshood, mountain sagewort, tall Jacob's ladder, diverse leaved cinqefoil, thick headed sedge and several grass species.

6.2 ALPINE TUNDRA (AT) ZONE

Although the alpine zone is defined as treeless, coniferous trees such as subalpine fir will often occur in the Krummholz form. Alpine vegetation is dominated by shrubs, herbs, mosses and lichens. Much of the alpine is absent of vegetation and consists of rock, ice and snow.

Common shrub species at the Red Chris site include: arctic willow; Barclay's willow; Barratt's willow; grey-leaved willow; tea-leaved willow, and scrub birch. The most common vegetation type is a dwarf shrub community, which is found mostly in moister regions that receive an abundance of snow. Important species include: mountain heathers; kinnikinnick; crowberry; lingonberry; alpine azalea; red bearberry; bog blueberry, and several species of willow.

Alpine grass communities become dominant in drier regions. Dominant grasses and sedges may include: altai fescue; alpine fescue; rough fescue; green fescue; fuzzy-spiked wildrye; broad-glumed wheatgrass; timberline bluegrass; alpine sweetgrass; purple reedgrass; timber oatgrass; spikenard sedge; small-awned sedge; dunhead sedge; single-spiked sedge, and Bellard's kobresia.

Herb meadows dominated by groad-leaved forbs are also common in the alpine in areas of well-drained deep soils, in seepage areas or along alpine streams. Dominant species include: arctic lupine; arrow-leaved groundsel; subalpine daisy; Sitka valerian; Indian hellebore; arnicas; louseworts; paintbrushes; woolly pussytoes; western pasqueflower; white marsh-marigold; cow parsnip; glacier lily; subalpine buttercup; snow buttercup; mountain sorrel, and mountain sagewort.

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

TABLE 6.1
PLANT SPECIES OBSERVED IN THE VICINITY OF THE RED CHRIS PROJECT

Trees:

balsam poplar	*Populus balsamifera* ssp. *balsamifera*
black spruce	*Picea mariana*
lodgepole pine	*Pinus contorta* var. *latifolia*
subalpine fir	*Abies lasiocarpa*
trembling aspen	*Populus tremuloides*
white spruce	*Picea glauca*

Shrubs:

Barratt's willow	*Salix barrattiana*
Barclay's willow	*Salix barclayi*
arctic willow	*Salix arctica*
woolly willow	*Salix lanata* ssp. *richardsonii*
little tree willow	*Salix arbusculoides*
blueberry willow	*Salix myrtillifolia*
grey leaved willow	*Salix glauca*
tall blueberry willow	*Salix myrtillifolia* var. *cordata*
tea-leaved willow	*Salix planifolia* ssp. *planifolia*
common juniper	*Juniperus communis*
scrub birch	*Betula glandulosa* var. *glandulosa*
soopalallie	*Shepherdia canadensis*
kinnikinnick	*Arctostaphylos uva-ursi*
dwarf blueberry	*Vaccinium caespitosum*
wild rose	*Rosa acicularis*

Herbs:

American brooklime	*Veronica americana*
alpine harebell	*Campanula lasiocarpa*
alpine milk vetch	*Astragalus alpinus*
alpine pussytoes	*Antennaria alpina*
alpine speedwell	*Veronica wormskjoldii*
arctic lupine	*Lupinus arcticus*
arctic wormwood	*Artemesia arctica*
arrow leaved groundsel	*Senecio triangularis*
bitter fleabane	*Erigeron acris*
black gooseberry	*Ribes lacustre*
bunchberry	*Cornus canadensis*
cloudberry	*Rubus chamaemorus*

Herbs (continued)

cow parsnip	*Heracleum lanatum*
crowberry	*Empetrum nigrum*
cut-leaf anemone	*Anemone multifida*
diverse leaved cinquefoil	*Potentilla diversifolia*
dune goldenrod	*Solidago decumbens*
elephant's head	*Pedicularis groenlandica*
fireweed	*Epilobium angustifolium*
fleabane sp.	*Erigeron* sp.
four-petalled gentian	*Gentianella propinqua*
inky gentian	*Gentiana glauca*
labrador lousewort	*Pedicularis labradorica*
lingonberry	*Vaccinium vitis-idaea*
marsh grass of parnassus	*Parnassia palustris*
monkshead	*Aconitum delphiniifolium*
mountain arnica	*Arnica latifolia*
nagoonberry	*Rubus arcticus*
northern bedstraw	*Galium boreals*
northern gentian	*Gentianella amarella*
northern goldenrod	*Solidago multiradiata*
northern paintbrush	*Castilleja hyperborea*
northern wormwood	*Artemisia borealis*
one-flowered cinquefoil	*Potentilla uniflora*
one-sided wintergreen	*Orthilia secunda*
orange agoseris	*Agoseris aurantiaca*
pasture sage	*Artemisa frigida*
pink wintergreen	*Pyrola chlorantha*
prairie cinquefoil	*Pontentilla pensylvanica*
purple-leaved willow herb	*Epilobium ciliatum*
red columbine	*Aquilegia formosa*
red-stemmed saxifrage	*Saxifraga lyallii*
river splendour	*Epilobium latifolium*
rock willow	*Salix vestita*
silky locoweed	*Oxytropis sericea*
stiff stemmed saxifrage	*Saxifraga hieracifolia*
sweet coltsfoot	*Petasites frigidus*
tall Jacob's ladder	*Polemonium caeruleum*
tall larkspur	*Delphinium glaucum*
tall lungwort	*Mertensia paniculata*
three-toothed saxifrage	*Saxifraga tricuspidata*
trailing raspberry	*Rubus pubescens*
trapper's tea	*Ledum glandulosum*
twinflower	*Linnea borealis*
water avens	*Geum rivale*
western meadowrue	*Thalictrum occidentale*
white geranium	*Geranium richardsonii*

Herbs (continued)

wild strawberry	*Fragaria virginiana*
winter cress	*Barbarea orthoceras*
yarrow	*Achillea millefolium*

Grasses and Sedges:

altai fescue	*Festuca altaica*
pumpelly brome	*Bromus inermis* ssp. *pumpellianus*
purple reedgrass	*Calamagrostis purpurascens*
little meadow foxtail	*Alopecurus aequalis*
blue-joint grass	*Calamagrostis canadensis*
glaucous bluegrass	*Poa glauca*
mountain hairgrass	*Vahlodea atropurpurea*
reedgrass species	*Calamagrostis* sp.
meadow horsetail	*Equisetum pratense*
swamp horsetail	*Equisetum fluviatile*
thick headed sedge	*Carex macloviana*
beaked sedge	*Carex rostrata*
dunhead sedge	*Carex phaeocephala*
water sedge	*Carex aquatilis*
small-flowered woodrush	*Luzula parviflora*

Mosses:

awned haircap moss	*Polytrichum piliferum*
golden fuzzy fen moss	*Tomenthypnum nitens*
red-stemmed feathermoss	*Pleurozium schreberi*
sidewalk moss	*Tortula ruralis*
sphagnum moss	*Sphagnum* sp.

Lichens:

common coral lichen	*Stereocaulon paschale*
few fingered lichen	*Dactylina arctica*
freckled lichen	*Peltigera aphthosa*
green kidney lichen	*Nephroma arcticum*
reindeer lichen	*Cladina* sp.
toadpelt lichen	*Peltigera scabrosa*

SECTION 7.0 - WILDLIFE

Wildlife observations were recorded in field logs during both the 1994 and 1995 exploration programs by American Bullion exploration personnel, by Hallam Knight Piésold Ltd. personnel during four site visits in 1994 and 1995 to collect baseline environmental data, and by American Bullion Mineral's staff biologist, Rachel Brock, during her 1995 environmental impact study for a proposed up-grading of the existing site access road. Habitat potential was also assessed in 1995, based on biogeoclimatic zones present at the sites. Based on wildlife habitat potential and field observations, the Todagin Mountain region supports a diverse population of mammals and birds.

A compiled list of the animal species that could potentially occur in Red Chris Project area is presented in Table 7.1; species observed during recent field studies and by site personnel have been indicated with an asterix.

7.1 HABITAT POTENTIAL IN THE SPRUCE-WILLOW-BIRCH (SWB) ZONE

The Spruce-Willow-Birch has a harsh climate, which has a profound effect on the wildlife. In late summer many species of birds will migrate out of the area before temperatures drop and snow fall commences. Hence, much of the habitat available is of a seasonal nature. Moose and caribou are the most abundant and widespread ungulates found in the SWB, particularly in the summer. Valley bottoms provide the best winter range for both species, but much of this zone is abandoned by mid-winter because of deep snow. Mountain goats remain in the steep terrain where less snow accumulates. Stone sheep are found where steep south aspect grasslands associated with rugged terrain occur. Mule deer are uncommon in the project area. Both grizzly bear and black bear occur in the SWB, although the former is often more common. No reptiles occur in this zone, and the Western toad, wood frog and spotted frog are the only amphibians.

Open stands of lodgepole pine, developed on coarse textured soils often provide important winter habitat for caribou. Large mammals, such as the moose, grizzly bear and gray wolf, use these areas primarily as summer habitat. Other species that inhabit these forests include: spruce grouse; common raven; gray jay; boreal chickadee; red-breasted nuthatch; three-toed woodpecker; ruby-crowned kinglet; red squirrel; wolverine, and marten.

Open, shrubby, valley bottom habitat provides important summer range for moose and caribou, but is usually too exposed to be used as winter range. Willow ptarmigan, arctic ground squirrel, gyrfalcon and Wilson's warbler often frequent these areas in the summer.

Coniferous and mixed coniferous/deciduous forests provide extensive habitat for mammals such as moose, black bear, gray wolf, lynx, wolverine, porcupine, snowshoe hare, red squirrel, deer mouse and least weasel. Habitat is also available for northern goshawk, northern hawk-owl, spruce grouse, three-toed woodpecker, common raven, gray jay, yellow-bellied sapsucker, hermit thrush, Swainson's thrush, dark-eyed junco, Wilson's warbler, Bohemian waxwing, ruby-crowned kinglet, boreal chickadee and red-breasted nuthatch.

Although wetlands and shallow lakes are not extensive in the SWB zone, these areas provide habitat for beaver, moose, northern harrier, mallard, northern pintail, bufflehead, arctic tern, California gull, red-necked phalarope and red-throated loon. Floodplains and riparian zones provide important habitat for moose because of good browse production. Other species found in these areas include northern waterthrush, American redstart and ruffed grouse.

Wintering habitat is available on open south aspect slopes for stone sheep, Dall sheep, mountain goat and moose due to reduced snow depth. These areas also provide habitat for golden eagle, gyrfalcon, common raven, blue grouse, Say's phoebe and arctic ground squirrel.

7.2 HABITAT POTENTIAL IN THE NORTHERN ALPINE TUNDRA (AT) ZONE

Due to severe winter conditions and the scattered nature of alpine habitats, wildlife species diversity and density are low. Stone sheep and caribou are found throughout the zone, especially in drier areas. Stone sheep winter on steep, windswept, south aspect hills while caribou prefer windswept mountain plateau habitats. Mountain goats are found in rugged terrain throughout the zone. Other mammals common to the zone include: grizzly bear; gray wolf; red fox; wolverine; hoary marmot; arctic ground squirrel; Siberian lemming, and least chipmunk.

Bird species present in the northern alpine tundra include: golden eagle; gyrfalcon; white-tailed ptarmigan; willow ptarmigan; rock ptarmigan; horned lark; snow bunting; water pipit, and rosy finch.

7.3 SPECIES OBSERVED

During the 1994 and 1995 exploration seasons the following wildlife species, or signs of species, have been observed and recorded in the vicinity of the Red Chris project by American Bullion Minerals Ltd. site personnel:

- black bear;
- grizzly bear;

- red fox;
- wolverine;
- moose;
- caribou;
- mountain goat;
- stone sheep;
- beaver;
- porcupine;
- great gray owl;
- bald eagle;
- ptarmigan;
- raven, and
- rainbow trout

Wildlife observations were categorized according to the area of observation, sightings of species versus signs (eg. tracks or scat), and, where possible, gender (either male, female or immature). The areas of observation were divided into the following seven regions:

- the Ealue Lake area;
- the Exploration area;
- the Ishahcezetle Mountain area;
- the Kluea Lake area;
- the Spit Mountain Area;
- the Todagin Mountain area, and
- the Tsatia Mountain area.

These areas are labelled on Figure 1.0, except for the Tsatia Mountain area, located approximately 10 km southwest of the exploration camp. A summary of wildlife observations by site personnel is presented in Table 7.2.

In general, wildlife observations were predominantly actual sightings of the animals themselves. Of 153 recorded observations, only 8 were of animal sign, such as tracks or scat. Most of the observations were recorded in the areas which were most commonly frequented by ABM personnel. The Todigan Mountain region, which lies under the flight path from the supply depot at Tatogga Lake Resort to the ABM camp, and the Exploration area itself together accounted for 70% of all wildlife observations. Moose, grizzly and black bears, and mountain goats seem to be the most observed animal species, accounting for over 60% of all wildlife observations.

During the July 1995 Hallam Knight Piésold Ltd. vegetation study, all wildlife signs associated with each of the 15 transects were recorded, including: bird calls; trails; burrows; remains; scat, and sightings. The locations of the 30 m transects are presented in Figure 1.0, and details of wildlife observations are presented under the "Comments and Observations" section of the vegetation transect logs in Appendix VII.

Wildlife observations by Rachel Brock during the Red Chris Road Study (R. Brock, 1995) are presented in Appendix VIII.

7.4 SPECIES OF CONCERN

Based on the B.C. Ministry of Environment, Wildlife Branch 1993 Red and Blue Lists of native birds, mammals, reptiles and amphibians at risk in B.C., no Red List species and seven Blue List species potentially inhabit the proposed Red Chris Project area. The Blue List species are considered sensitive and/or deserving of management attention. Population viability may be a concern for two reasons: due to major declines in population numbers, or due to major changes in habitat that will further reduce existing distribution. Based on the B.C. Conservation vertebrate animal tracking list for the Cassiar Forset District (August 1995), blue list species that could possibly occur in the vicinity of the Red Chris property include:

- grizzly bear;
- stone sheep;
- wolverine;
- fisher;

- bald eagle;
- short-eared owl;
- lesser golden-plover;
- Hudsonian godwit, and
- red-necked phalarope.

Specifically, mountain goats and stone sheep are of significant concern for the immediate area. The Todagin Mountain area is of special interest because of the combination of high capability sheep range, accessibility to Highway 37 and the high potential for both hunting and viewing (Brock 1995). In addition, the Todagin Mountain sheep population, which has been monitored over the past three decades is one of the densest in B.C. Population counts were:

Year	Count
1962	186
1972	109
1979	131
1985	186
1992	219

Stone sheep occur at elevations of 1280 m to 2133 m, with the majority of the population concentrated around 1829 m elevation. The best quality winter range is located on the south side of Todagin Mountain and on the Tsatia Mountain block.

The mountain goat population inhabiting Todagin Mountain is particularly vulnerable to hunting due to the relatively easy access to the area via all terrain vehicles. The current Todagin Mountain goat population is estimated at 8 to 10 goats. Declining population size, combined with the vulnerability of the goats to hunting, has resulted in an enforced closure on goat hunting by the B.C. Ministry of Environment, Lands and Parks (MoELP).

TABLE 7.1
ANIMAL SPECIES INDIGENOUS TO THE RED CHRIS PROJECT AREA.

[Species Identified at the Red Chris Property have been marked with an asterix (*)].

Mammals:

Moose*	*Alces alces*
Mule Deer	*Odocoileus hemionus*
Caribou*	*Rangifer tarandus*
Mountain Goat*	*Oreamnos americanus*
Stone Sheep*	*Ovis dalli stonei*
Grizzly Bear*	*Ursus horribilis*
Black Bear*	*Ursus americanus*
Gray Wolf*	*Canis lupus*
Coyote*	*Canis latrans*
Red Fox*	*Vulpes fulva*
Lynx	*Lynx canadensis*
Wolverine*	*Gulo luscus*
Marten*	*Martes americana*
Ermine	*Mustela erminea*
Mink	*Mustela vison*
Least Weasel	*Mustela rixosa*
Porcupine*	*Erithizon dorsatum*
Beaver *	*Castor canadensis*
Muskrat	*Ondatra zibethica*
Snowshoe Hare	*Lepus americanus*
Hoary Marmot*	*Marmota caligata*
Arctic Ground Squirrel	*Spermophilus undulatus plesius*
Red Squirrel*	*Tamiasciurus hudsonicus*
Least Chipmunk*	*Eutamias dorsalis*
Red-tailed Chipmunk	*Eutamias ruficaudus*
Deer Mouse	*Peromyscus maniculatus*
Meadow Jumping Mouse	*Zapus hudsonius*
Western Jumping Mouse	*Zapus princeps*
Northern Bog Lemming	*Synaptomys borealis*
Brown Lemming	*Lemmus trimucronatus*
Boreal Red-backed Vole	*Clethrionomys gapperi*

Meadow Vole	*Microtus pennsylvanicus*
Arctic Shrew	*Sorex arcticus*
Northern Water Shrew*	*Sorex palustris*
Long-eared Myotis	*Myotis evotis*

Birds:

Bald Eagle*	*Haliaeetus leucocephalus*
Golden Eagle	*Aquila chrysaetos*
Northern Goshawk	*Accipiter gentilis*
Sharp-shinned Hawk	*Accipiter striatus*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Northern Harrier*	*Circus cyaneus*
Northern Hawk-Owl	*Surnia ulula*
Great Horned Owl	*Bubo virginianus*
Boreal Owl	*Aegolius funereus*
Great Gray Owl*	*Strix nebulosa*
Common Raven*	*Corvus corax*
Common Crow	*Corvus brachyrhynchos*
Willow Ptarmigan*	*Lagopus lagopus*
Rock Ptarmigan*	*Lagopus mutus*
White-tailed Ptarmigan*	*Lagopus leucurus*
Ruffed Grouse	*Bonasa umbellus*
Spruce Grouse	*Dendragapus canadensis*
Blue Grouse	*Dendragapus obscurus*
Northern Shrike	*Lanius excubitor*
Gray Jay*	*Periosoreus canadensis*
Downy Woodpecker	*Picoides pubescens*
Three-toed Woodpecker	*Picoides tridactylus*
Northern Flicker*	*Colaptes auratus*
Black-billed Magpie	*Pica pica*
Red-winged Blackbird	*Agelaius phoeniceus*
American Robin	*Turdus migratorius*
Hermit Thrush	*Catharus guttatus*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Northern Waterthrush	*Seiurus noveboracensis*
Townsend's Solitaire	*Myadestes townsendi*
Bohemian Waxwing	*Bombycilla garrulus*
Least Flycatcher	*Empidonax minimus*
Yellow-bellied Flycatcher	*Empidonax flaviventris*
Olive-sided Flycatcher	*Contopus borealis*
Alder Flycatcher	*Empidonax alnorum*
Tree Swallow	*Tachycineta bicolor*

Cliff Swallow*	*Hirundo pyrrhonota*
Barn Swallow*	*Hirundo rustica*
Snow Bunting	*Plectrophenax nivalis*
Horned Lark	*Eremophila alpestris*
Yellow Warbler*	*Dendroica petechia*
Blackpoll Warbler	*Dendroica striata*
Magnolia Warbler*	*Dendroica magnolia*
Wilson's Warbler	*Wilsonia pusilla*
Dark-eyed Junco*	*Junco hyemalis*
American Redstart	*Setophaga ruticilla*
Purple Finch	*Carpodacus purpureus*
Rosy Finch	*Leucosticte arctoa*
Water Pipit	*Anthus rubescens*
Ruby-crowned Kinglet	*Regulus calendula*
White-throated Sparrow	*Zonotrichia albicollis*
Brewer's Sparrow*	*Spizella breweri*
Tree Sparrow	*Spizella arborea*
Golden-crowned Sparrow	*Zonotrichia albicollis*
Black-capped Chickadee*	*Parus atricapillus*
Boreal Chickadee	*Parus hudsonicus*
Red-breasted Nuthatch	*Sitta canadensis*
American Dipper	*Cinclus mexicanus*
Rufous Hummingbird*	*Selasphorus rufus*
Canada Goose	*Branta canadensis*
Common Loon	*Gavia immer*
Pacific Loon	*Gavia pacifica*
Sora	*Porzana carolina*
Mallard	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Northern Shoveller	*Anas clypeata*
Barrow's Goldeneye*	*Bucephala islandica*
Buffleheaded Duck	*Bucephala albeola*
Whitewinged Scoter	*Melanitta fusca*
Horned Grebe	*Podiceps auritus*
Bonaparte's Gull*	*Larus philadelphia*
Herring Gull	*Larus argentatus*
Mew Gull	*Larus canus*
Ring-billed Gull	*Larus delawarensis*
Black Tern	*Chlidonias niger*
Arctic Tern	*Sterna paradisaea*
Wandering Tattler	*Heteroscelus incanus*
Semipalmated Plover	*Charadrius semipalmatus*
American Golden-Plover	*Pluvialis dominica*
Lesser Golden-Plover	*Pluvialis dominica*

Common Snipe	*Gallinago gallinago*
Short-billed Dowitcher	*Limnodromus griseus*
Solitary Sandpiper	*Tringa flavipes*
Spotted Sandpiper*	*Actitis macularia*
Least Sandpiper*	*Calidris minutilla*
Lesser Yellowlegs	*Tringa flavipes*
Red-necked Phalarope	*Phalaropus lobatus*
Say's Phoebe	*Sayornis saya*

Amphibians:

Western Toad*	*Bufo boreas*
Wood Frog	*Rana sylvatica*
Spotted Frog	*Rana pretiosa*
Long-toed Salamander	*Ambystoma macrodactylum*

Fish:

Cutthroat Trout	*Oncorhynchus clarki lewisi*
Rainbow Trout*	*Oncorhynchus mykiss*
Dolly Varden	*Salvelinus malma*
Arctic grayling	*Thymallus arcticus*
Mountain Whitefish	*Prosopium williamsoni*
Burbot	*Lota lota*
Longnose sucker	*Catostomus catostomus*
Chub species	
Sculpin species	

Table 7.2

American Bullion Minerals Ltd.
Red Chris Project

1995 Summary Report

On-site Wildlife Log Summary

Location:		Ealue Lake		Ealue Lake Total	Exploration Area		Exploration Area Total	Ishahcezetle Mtn.	Ishahcezetle Mtn. Total	Kluea Lake		Kluea Lake Total	Spit Mountain	Spit Mountain Total	Todagin Mountain	Todagin Mountain Total	Tsatia Mountain	Tsatia Mountain Total			Grand Total
Species	Traits	sighting	sign		sighting	sign		sighting		sighting	sign		sighting		sighting		sighting		sighting Count	sign Count	
Bald Eagle		4		4	2		2												6		6
Barn Swallows					1		1												1		1
Bear	female				1		1												1		1
	immature				2		2												2		2
Bear Total					3		3												3		3
Beaver			1	1						2		2							2	1	3
Black Bear	(unspecified)	1	1	2	1		1				1	1	1	1	4	4			7	2	9
	female	1		1											2	2			3		3
	immature	2		2											2	2			4		4
	male														1	1			1		1
Black Bear Total		4	1	5	1		1				1	1	1	1	9	9			15	2	17
Canine (unidentifited)			1	1																1	1
Caribou	(unspecified)				3		3												3		3
	female				1		1												1		1
	herd																1	1	1		1
Caribou Total					4		4										1	1	5		5
Fox	(unspecified)	1		1	2		2								1	1			4		4
	male				1		1												1		1
Fox Total		1		1	3		3								1	1			5		5
Great Grey Owl					3		3												3		3
Grizzly Bear	(unspecified)				3		3								1	1			4		4
	female				1		1	1	1										2		2
	immature				2		2	2	2										4		4
Grizzly Bear Total					6		6	3	3						1	1			10		10
Grouse					2		2												2		2
Hawk					3		3												3		3
Moose	(unspecified)		1	1	4	1	5			3	1	4			2	2			9	3	12
	female				3		3			6		6			8	8			17		17
	immature				1		1			1		1			2	2			4		4
	male				8		8			3		3			2	2			13		13
Moose Total			1	1	16	1	17			13	1	14			14	14			43	3	46
Mountain Goat	(unspecified)				4		4	4	4						2	2			10		10
	female				1		1												1		1
	herd				2		2								4	4			6		6
	immature				1		1												1		1
Mountain Goat Total					8		8	4	4						6	6			18		18
Mouse					3		3												3		3
Owl	(unspecified)				4		4												4		4
	female				1		1												1		1
	male				1		1												1		1
Owl Total					6		6												6		6
Porcupine					4		4												4		4
Ptarmigan	female				2		2												2		2
	male				2		2												2		2
Ptarmigan Total					4		4												4		4
Rainbow Trout		1		1															1		1
Raven					1		1												1		1
Red Fox					2		2			1		1							3		3
Sheep										3		3							3		3
Ungulate (unidentified)											1	1								1	1
White Owl					3		3												3		3
Wolverine	(unspecified)				1		1												1		1
Wolverine Total					1		1												1		1
Grand Total		10	4	14	76	1	77	7	7	19	3	22	1	1	31	31	1	1	145	8	153

SECTION 8.0 - FISHERIES

8.1 DESCRIPTION OF REGIONAL FISHERIES HABITAT

The Stikine River system originates in northern British Columbia and flows to the Pacific Ocean approximately 32 km south of Petersburg, Alaska. The Stikine River drainage encompasses approximately 52,000 km^2 and includes principal tributaries such as the Tahltan, Chutine, Skud, Iskut and Tuya rivers.

Approximately 90% of the Stikine River system is inaccessible to anadromous fish due to natural barriers and velocity blocks and the lower river and most tributaries are glacially occluded. The majority of the chinook salmon spawning area in the Stikine River occur in the mainstem Tahltan and Little Tahltan river (Mecum and Kissner 1989).

Escapement data for the lower Stikine and tributaries such as Little Tahltan River, Tahltan River, Beatty Creek and Andrew Creek indicate that total numbers of chinook salmon observed from 1975 to 1990 range from 988 to 12,739 (Pahlke 1991).

The Klastline River, a tributary of the upper Stikine River feeds into the Stikine approximately 65 km downstream of the Klappan River confluence. This river was assessed for fisheries potential and presence in 1984 (MoELP 1984). The entire watershed appeared to contain a monoculture of rainbow trout, but could potentially contain a small population of chinook salmon in the first section of river.

Fish species present in the lower Stikine River include chinook salmon, coho salmon, sockeye salmon, chum salmon, pink salmon, cutthroat trout, rainbow trout, Dolly Varden, lake trout, mountain whitefish, arctic grayling, lake chub, longnose sucker, burbot, Pacific lamprey, slimy sculpin, prickly sculpin, coast range sculpin and three-spine stickleback (Northern Natural Resource Services Ltd. 1979).

The major tributaries of the upper Stikine are the Spatsizi, Pitman and Klappan river. The Klappan River watershed basin has an area of 3,550 km^2, approximately 6.9% of the Stikine watershed. The Klappan River flows into the Stikine River above the "Grand Canyon of the Stikine." The Grand Canyon begins above the confluence with the Tahltan River and extends for 90 km and consists of a series of cascades, chutes (drops of 100 m occur frequently) and rapids (Price 1986). Anadromous fish known to inhabit the lower Stikine River have not been detected above this reach and the canyon is considered a barrier to migration.

Fish habitat in the Klappan River mainstem is mostly riffles and fast runs (87%) over boulder, rubble and gravel. The gradient is steep and the banks are undercut and actively eroding. Water quality is good, but is turbid with high levels of suspended solids (Jones and Tsui 1979).

8.2 REGIONAL FISHERIES STUDIES

Fisheries studies were conducted on the Klappan River in 1977 for B.C. Hydro in conjunction with possible hydroelectric developments on the Stikine River (Irvine 1977). Beach seines and angling were conducted at the Klappan River/Stikine River confluence and approximately 1 km upstream on the Klappan River. Five seine sets and angling recovered 13 mountain whitefish, 2 arctic grayling, 4 Dolly Varden and 1 cutthroat trout at the confluence. Two seine sets and angling recovered 23 mountain whitefish, 2 arctic grayling, 1 Dolly Varden and 1 rainbow trout at the upstream site (Irvine 1977). Further studies for B.C. Hydro were conducted by Northern Natural Resource Services Ltd. in 1979 established six sites in the vicinity of the Klappan River and reported the following:

- on the Stikine River, immediately downstream of the Klappan River, arctic grayling and mountain whitefish were caught;
- on the Klappan River, 1.0 km upstream from the Stikine River confluence, Dolly Varden, longnose sucker and mountain whitefish were caught;
- on Tsetogamus Creek, at the confluence with the Klappan River, rainbow trout, arctic grayling and mountain whitefish were caught;
- on the Klappan River, immediately upstream of Tsetogamus Creek, mountain whitefish were caught;
- on McEwan Creek, above the confluence with the Klappan River, rainbow trout, arctic grayling and mountain whitefish were caught, and
- on the Klappan River, upstream of McEwan Creek, arctic grayling, longnose sucker and mountain whitefish were caught.
- Burbot have also been noted to occur in the Klappan River system (Irvine 1977).

Lakes surrounding the Red Chris Project include the Iskut Lakes, Edontennajon and Todagin, Kluea Lake and Ealue Lake. These lakes eventually flow into the Iskut River (drainage area 9,500 km^2) which flows for approximately 70 km before confluencing with More Creek. The Iskut River then flows southwest for 44 km to confluence with Forrest-Kerr Creek, then west for

80 km to confluence with the Stikine River. Approximately 80 km upstream from the Stikine River confluence on the Iskut River is a canyon of 5 km in length that acts as a barrier to the upstream migration of fish. Anadromous fish reported to inhabit the Iskut River system have not been detected above this barrier.

Fisheries studies have been conducted by the MoELP on the above mentioned lakes and it was discovered that they contained monoculture populations of rainbow trout. Table 8.1 presents further details of these studies.

Coyote Creek, which flows from Ealue Lake to Edontennajon Lake, appears to provide moderate spawning habitat and good rearing habitat for rainbow trout (MoELP 1984). Juvenile rainbow trout were observed by Hallam Knight Piésold Ltd. at H1/W1 and fry were observed at W7.

8.3 SITE FISHERIES STUDIES

A preliminary fisheries study was conducted by Hallam Knight Piésold Ltd. in August 1995. An aerial assessment of the watersheds surrounding the Red Chris Project was conducted to observe obstructions such as beaver dams, log jams or waterfalls and to determine the biophysical homogeneity of the system so that reaches could be defined. Twelve sample sites were established in Coyote Creek (C1), White Rock Canyon Creek (WR1 and WR2), Quarry Creek (Q1, Q2 and Q3), Trail Creek (T1, 2T, T3, T4 and T5), and Red Rock Canyon Creek (RR1), as shown on Figure 1.0.

Sampling protocol consisted of electrofishing replicate stream sections where possible, using stop-nets at the upstream and downstream limits of each survey section. During the electrofishing surveys, baited minnow traps were also set. At sites where electroshocking was not possible (*i.e.*, sites C1 and T5), minnow traps were set. The multiple capture (two passes) technique was used, depending on the size of the representative habitat being sampled, streamflow characteristics and capture success. The electrofishing lapse-time was recorded for each pass, and the cumulative total was calculated (catch per unit effort), as shown in Table 8.2. Fish collection was conducted using a Smith Root Model 12 Battery Powered Electrofisher. All fish captured were identified to species and the total number of species captured were recorded. All captured fish were anaesthetised with "Alka Seltzer," measured (fork length) to the nearest millimetre and weighed to the nearest 0.1 grams using an A&D EK-1200A Electronic Balance and released. Fish age data, based on scales analyses performed by North-South Consultants Ltd. (Winnipeg), is also included in Table 8.2. Stream biophysical characteristics were recorded for each site using DFO/MOE stream survey forms, and a summary of this information is presented in Table 8.3.

8.3.1 Kluea Lake Watershed

Rainbow trout were observed in Trail Creek at sites T1, T2 and T3. Nineteen fish were collected at site T1 which ranged from 1 to 4 years in age. Seven fish were collected at site T2; five young of year, one 2 year old and one three year old were sampled. One 2 year old fish was collected at site T3. Approximately 50 m of creek were sampled at site T4, but fish were not caught or observed. Electroshocking was not possible at site T5 due to unstable substrate. Therefore, four (4) baited minnow traps were set for 24 hours. Fish were not collected, but it is likely that some rainbow trout exist within the lake immediately upstream. Further sampling will be required to determine this.

8.3.2 Coyote Creek Watershed

One site was sampled on Coyote Creek (C1), downstream of its confluence with White Rock Canyon Creek. Electroshocking was not possible due to extremely deep water. Four baited minnow traps were set for 24 hours. Twenty-six rainbow trout ranging from 1 to 3 years old were trapped. Young of year were not caught, but they are expected to exist in the creek.

Fish were caught in White Rock Canyon Creek at sites WR1 and WR2. Seven rainbow trout were caught at site WR1 including six 3 years olds and one 2 year old. One fish of approximately 250 mm in length was observed at site WR2, but was not caught. This area of the creek consists of a series of deep pools and steep chutes which would likely prevent smaller fish from travelling upstream. Fish were not observed at RR1 in Red Rock Canyon Creek. The absence of fish at this site are probably due to poor water quality and steep gradients.

8.3.3 Klappan River Watershed

Rainbow trout were caught in Quarry Creek at sites Q1 and Q2. Ten fish were caught at site Q1 including: three 3 year olds, one 2 year old and 6 young-of-year (0+). Nine fish were caught at Q2. An older population of fish, ranging from 2 to 4 years of age were present at this site. Fish were not observed or caught at site Q3. This portion of Quarry Creek has been substantially augmented by beaver activity. Several beaver dams between sites Q2 and Q3 may act as barriers to upstream migration.

Table 8.1

American Bullion Minerals Ltd.
Red Chris Project

Fisheries Lake Surveys (Ministry of Environment, Lands and Parks)

Lake	Date	Sampling Technique	Species	Number	Length/weight	Comments
Ealue Lake	Aug. 1981	sinking gillnet; 30 hr set	rainbow trout	45	23.8 - 35.5 cm 145 - 475 g	Fish appeared healthy, but some were heavily parasitized by *Acanthocephalons*. Gut analyses indicates that diet consists mostly of freshwater clams, gastropods and shrimp. Most fish collected were sexually immature. An almost even distribution of females and males were observed.
Ealue Lake at the south end near the outlet to Coyote Creek	July 1979	sinking gillnets	rainbow trout	119	21 - 45 cm (mostly 26 - 30 cm) 110 - 400 g.	Approximately 50 fish were dissected; 24 were female and 24 were male. Age range was 4 - 8 years, but the average was 5 - 6 years. Gut analyses indicated that diet consisted of caddisfly larvae, freshwater clams and gastropods. Observations in Coyote Creek: spawning rainbow trout and redds seen. Juvenile rainbow trout of approximately 20 cm in length observed.
Todagin Lake	Sept. 1984	sinking gillnets, 1.5 hr set	rainbow trout	43	19.4 - 30 cm 80 - 280 g	*Acanthocephalons* observed in the intestinal tracts
Edontenajon Lake	Sept. 1972	gillnets, overnight set	rainbow trout	116	av. length 30 cm	
Edontenajon Lake, at Coyote Creek inlet	Aug. 1981	gillnets, two 6 hr sets	rainbow trout	73 combined	13.5 - 33.3 cm 20 - 400 g	
Kluea Lake	Sept. 1984	gillnets, overnight set	rainbow trout	152	13.5 - 33.3 cm 20 - 400 g	Most fish were healthy, but parasitism by *Acanthocephalons*, *Salmincola* and a cestode species was observed in many individuals. Based on gut analyses it appears the fish are feeding mainly on amphipods.
		minnow traps (2)	rainbow trout	2	8 cm in length	

Table 8.2

American Bullion Minerals Ltd.
Red Chris Project

1995 Summary Report

Rainbow trout lengths, weights and ages

Location	Fish #	Pass (sec)	Weight (g)	Length (mm)	Age (yr)
T1	RB1	2 (657)	3	65	1
"	RB2	2	6.6	82	2
"	RB3	2	3.6	67	ds (1)*
"	RB4	2	2.1	59	1
"	RB5	2	3.7	74	1
"	RB6	2	1	46	1
"	RB7	2	1.9	58	1
"	RB8	1(692)	119	238	4
"	RB9	1	28.3	137	3
"	RB10	1	9.1	86	2
"	RB11	1	6.6	85	2
"	RB12	1	8.8	92	2
"	RB13	1	7.7	86	2
"	RB14	1	6	82	2
"	RB15	1	3.9	70	1
"	RB16	1	5.2	79	1
T1	RB17	1 (total = 1349)	4.6	71	2
T1	RBMT1	-	nd	95	2
T1	RBMT2	-	nd	70	1
T2	RB1	1 (988)	14.6	117	3
T2	RB2	1	12.7	114	2
T2	RB3	1	0.3	49	nd (0+)
T2	RB4	1	0.3	32	nd (0+)
T2	RB5	1	0.2	29	nd (0+)
T2	RB6	1	0.2	28	nd (0+)
T2	RB7	2 (813) (total = 1801)	0.1	30	nd (0+)
T3	RB1	1 (315)	nd	90	2
WR1	RB1	1(381)	36.1	141	3
WR1	RB2	1	16.3	110	3
WR1	RB3	1	12.3	101	2
WR1	RB4	2 (282) (total = 663)	12.7	99	3
WR1	RBMT1	-	14.6	108	3
WR1	RBMT2	-	16.7	115	ds (3)
WR1	RBMT3	-	16.7	115	ds (3)

RB = rainbow trout, RBMT = rainbow trout caught in minnow trap

nd = not determined

ds = damaged scale

* ages in brackets have been estimated based on age/length data

Table 8.2

American Bullion Minerals Ltd.
Red Chris Project

1995 Summary Report

Rainbow trout lengths, weights and ages

Location	Fish #	Pass (sec)	Weight (g)	Length (mm)	Age (yr)
C1	RBMT1	-	15.0	114	2
"	RBMT2	-	10.2	102	3
"	RBMT3	-	8.5	97	2
"	RBMT4	-	7.6	97	2
"	RBMT5	-	6.1	86	1
"	RBMT6	-	6.1	88	2
"	RBMT7	-	4.7	79	nd (2)
"	RBMT8	-	6.0	84	nd (2)
"	RBMT9	-	4.8	79	nd (2)
"	RBMT10	-	5.0	77	nd (2)
"	RBMT11	-	4.0	77	nd (2)
"	RBMT12	-	3.9	72	2
"	RBMT13	-	3.8	74	nd (1 or 2)
"	RBMT14	-	4.4	74	nd (1 or 2)
"	RBMT15	-	3.3	71	nd (1 or 2)
"	RBMT16	-	3.6	71	nd (1 or 2)
"	RBMT17	-	4.1	76	2
"	RBMT18	-	2.2	63	1
"	RBMT19	-	2.7	65	1
"	RBMT20	-	4.2	76	nd (1 or 2)
"	RBMT21	-	3.8	71	nd (1 or 2)
"	RBMT22	-	3.1	67	nd (1)
"	RBMT23	-	3.4	66	nd (1)
"	RBMT24	-	3.0	67	nd (1)
"	RBMT25	-	2.6	62	nd (1)
C1	RBMT26	-	2.8	67	nd (1)
Q1	RB1	1 (647)	nd	136	2
"	RB2	1	nd	118	3
"	RB3	1	nd	46	nd (0+)
"	RB4	1	nd	43	nd (0+)
"	RB5	1	nd	41	nd (0+)
"	RB6	1	nd	39	nd (0+)
"	RB7	2 (594)	nd	134	3
"	RB8	2	nd	90	3
"	RB9	2	nd	40	nd (0+)
Q1	RB10	2 (total = 1241)	nd	45	nd (0+)
Q2	RB1	1	35.8	142	4
"	RB2	1	24.2	129	3
"	RB3	1	15.1	110	3
"	RB4	1	14.8	106	3
"	RB5	1	8.5	84	2
"	RB6	1	13.7	105	3
"	RB7	1	12.2	102	3
"	RB8	1	9.8	95	2
Q2	RB9	1 (763)	8.7	91	2

Table 8.3

American Bullion Minerals Ltd.
Red Chris Project

1995 Summary Report

Summary of Stream Biophysical Information

Site #	Location	Reach #	Average Channel Width (m)	Average Wetted Width (m)	Average Maximum Riffle Depth (cm)	Average Maximum Pool Depth (cm)	Gradient %	% Pool	% Riffle	% Run	% Other	Side Channel (%)
T1	Trail Creek, immediately u/stream of Kluea Lake	1	1.7	1.6	12	75	2	20	20	60	0	2
T2	Trail Creek	2	3.5	2.5	15	40	4	20	35	45	0	8
T3	Trail Creek	3	1.5	1.2	10	25	2.5	25	25	50	0	3
T4	Trail Creek	4	2	1.8	20	60	1	50	10	40	0	5
T5	Trail Creek	4	N/A (undefined)	N/A (undefined)	N/A	200	0.5	90	0	10	0	10
WR1	White Rock Canyon Creek	2	4.5	4	45	50	6	10	80	10	0	0
WR2	White Rock Canyon Ck.	3	3.5	2.5	15	55	10	40	15	10	35 (chutes)	0
RR1	Red Rock Canyon Ck.	1	4	2.5	15	35	9	25	20	20	35 (chutes)	0
C1	Coyote Creek d/stream of White Rock Canyon Ck.	2	6	5	N/A	1.8	1	15	0	85	0	0
Q1	Quarry Creek	1	4.5	4.3	35	100	6	20	30	50	0	0
Q2	Quarry Creek	2	1.5	1.5	30	60	3.5	33	33	33	1 (chutes)	0
Q3	Quarry Creek	3	7	5	30	100	1.5	55	15	30	0	5

Table 8.3

American Bullion Minerals Ltd.
Red Chris Project

1995 Summary Report

Summary of Stream Biophysical Information

Site #	Debris Area %	Debris Stable %	Cover % Total	Deep Pool %	LOD %	Boulder %	Instream Veg. %	Overstream Veg. %	Cutbanks %	Crown Closure %	Aspect	% fines	% small gravels	% large gravels	% small cobble
T1	2	40	50	30	20	0	5	25	20	0	south	90	0	0	0
T2	5	95	45	10	10	20	10	20	30	20	south	30	10	10	10
T3	5	85	80	0	0	0	0	80	20	0	north	70	20	10	0
T4	2	80	15	15	0	0	10	0	75	0	north	85	15	0	0
T5	0	N/A	40	80	0	0	20	0	0	0	north	100	0	0	0
WR1	5	80	15	30	10	10	0	30	20	5	northwest	20	20	20	20
WR2	10	90	35	30	10	20	0	25	15	50	west/ northwest	5	5	10	20
RR1	3	50	20	20	10	35	0	25	10	5	north	5	10	10	20
C1	5	90	30	40	0	0	0	30	30	15	south	50	30	20	0
Q1	10	65	50	20	35	10	0	25	10	15	south	10	10	20	15
Q2	5	90	40	40	20	0	0	0	40	1	southwest	55	0	10	0
Q3	10	70	10	20	40	0	40	0	0	0	southwest	60	40	0	0

Table 8.3

American Bullion Minerals Ltd.
Red Chris Project

1995 Summary Report

Summary of Stream Biophysical Information

Site #	% large cobble	% boulder	% bedrock	D90 (cm)	Compaction L/M/H	Banks height (m)	Banks % unstable	Banks texture	Confinement	Valley: channel ratio	Stage	Flood signs height (m)	Braided	Bars (%)
T1	10	0	0	0.2	L	0.8	20	F	UC	10+	M	0.4	N	2
T2	20	20	0	38	M	0.5	20	F	OC	10+	M	0.65	Y	15
T3	0	0	0	5	M	0.8	10	F	UC	10+	M	0.85	Y	5
T4	0	0	0	0.5	L	1.2	30	F	UC	10+	L	1.5	Y	10
T5	0	0	0	0.5	L	0	N/A	F	UC	10+	Flood	N/A	Y	30
WR1	20	0	0	23	M	0.75	60	F	FC	5-10	M	0.8	N	30
WR2	30	30	0	80	H	0.8	25	F/G	FC	5-10	M/H	0.8	N	0
RR1	30	25	0	70	H	0.6	15	F/G	OC	2-5	M/H	0.55	Y	15
C1	0	0	0	10	L/M	1.2	10	F	EN	10+	flood	1.9	N	0
Q1	10	5	30	25	H	0.8	15	F/G/L	CO	0-2	H	1.2	N	0
Q2	30	5	0	30	M	0.4	50	F	UC	10+	M	0.5	Y	0
Q3	0	0	0	1.5	L	0.3	30	F	UC	5-10	M	0.3	Y	0

SECTION 9.0 - SOCIOECONOMIC STUDIES

Preliminary socioeconomic studies, which included a compliation of existing demographic information for the local area and region, initiation of a public consultation program and estimation of potential socioeconomic impacts, were completed for incorporation into both the Application for a Project Approval Certificate (October 1995) and prefeasibility report (March 1996). Results of these preliminary socioeconomic studies are presented below.

9.1 SOCIOECONOMIC CONDITIONS

Based on 1991 Canada Census statistics, the total labour force for the Kitimat-Stikine Regional District was 21,900 people, as shown in Table 9.1. The major sources of employment include: manufacturing (19.3%), retail trade (10.4%), government services (8.5%), logging and forestry (8.4%), educational services (7.6%) and accommodation, food and beverage industries (6.7%). Mining (including milling), quarrying and the oil well industry comprises 1.21% of the employment for the area. The estimate of employment in the mining sector was calculated prior to the development of the Eskay Creek Project, and therefore, may be an underestimate. The remaining 37.8% of the work force is employed in a variety of sectors that are outlined in Table 9.1.

The Red Chris property is located approximately 20 km southeast of Iskut, 80 km south of Dease Lake and 85 km east of Telegraph Creek. The closest large community in the region is Smithers, located approximately 450 km south of the project.

9.1.1 Iskut, Dease Lake and Telegraph Creek

Population data were obtained from Iskut and Telegraph Creek; however, no records were available for Dease Lake. As of June 1993, there were 331 Tahltan residents in Iskut, 301 in Telegraph Creek, and an estimated 500 native residents in the Dease Lake area. Historical population records from Iskut indicated a 37% growth between 1989 and 1993, at which time approximately 43% of the Iskut population, and 32% in Telegraph Creek were under the age of 15.

Based on an estimated current total population in the three communities of 1300 (1132 people in 1993 @ 7.4% growth/year over 2 years) and an average of 63% being of working age (over 14 years old), the work force in the immediate area is approximately 820 people. An unemployment rate of 70% in the Tahltan communities (estimated by the Tahltan Nation in 1993) gives an available effective labour force of approximately 570 people.

Jobs in the region tend to be seasonal and contract-based, resulting in a highly variable payroll situation for most people. Maximum seasonal employment for the Tahltans in 1993 was estimated to be in the range of 100 to 150 people. Industries and occupations in the communities of Iskut, Dease Lake and Telegraph Creek include the following:

- Band councils in Iskut and Telegraph Creek;
- the Tahltan Tribal Council in Dease Lake;
- Tahltan Nation Development Corporation;
- Spatsizi construction;
- Golden Bear Mine (currently not operating, but scheduled to re-open in the near future);
- Eskay Creek Mine;
- Snip Mine;
- Yellowhead road and bridge;
- local schools;
- guiding and outfitting camps;
- forestry;
- Ministry of Environment Land and Parks;
- arts and crafts;
- local co-operative stores, and
- local service industries such as restaurants, hotels, gas stations, etc.

Iskut and Telegraph Creek provide schooling from Kindergarten to Grade 9, inclusive. Grades 10 to 12 are available in Dease Lake. All schools have Tahltan native language teachers. Post-secondary education is available in Prince George and Terrace.

Communications, including the Northern Native Broadcasting Service, are available in Iskut and Telegraph Creek via satellite. Dease Lake receives CBC and CTV only. Radio stations include

CBC, CFMI (Vancouver), CFRN and CHON (Whitehorse). A local newspaper is published quarterly in Dease Lake by the Tahltan Tribal Council (Archibald and Boivin, 1993).

The Royal Canadian Mounted Police (RCMP) detachment located in Dease Lake, serves the communities of both Dease Lake and Iskut. The RCMP also have a detachment in Telegraph Creek.

Telegraph Creek and Iskut have equipped fire departments, but Dease Lake does not. Medical clinics staffed with nurses provide health services to the communities of Dease Lake and Iskut. A more substantial clinic staffed with a doctor is available in Dease Lake where medical emergencies are taken.

Northwest Tel provides telephone service to Iskut, Dease Lake and Telegraph Creek. Each village has a Canada Post office. Electricity is provided by a B.C. Hydro generator in each community. The nearest B.C. hydro power line is located at Meziadin Junction, approximately 150 km south of the Red Chris project.

9.1.2 Smithers

Smithers is the largest community in the region with a population of 5,029 and labour force of 2,785 (Census Canada, 1991). The surrounding unincorporated areas contribute another 4,925 to the local population, and, using a regional employment rate of 55%, this population likely provides another 2,727 people to the potential labour force. The major employers in the community are forestry, government, mining, tourism and agriculture. Forestry is estimated to account for 53% of direct jobs. Although mining represents an estimated 15% of the direct jobs, the industrial service sector receives an estimated 50% of its work from the mining sector. Included is transportation (10-15%), fabricating (50%), air charters (75%) and expediting (80%).

9.2 PUBLIC CONSULTATION PROGRAM

A series of "Open House" presentations was held by American Bullion Minerals Ltd. during the week of November 20, 1995, in Iskut, Dease Lake, Telegraph Creek, Stewart and Smithers, as part of the Public Consultation Program, which is a component of the Project Approval Certificate application process. The Open House presentations were coordinated with local community groups and were held in community, school or hotel facilities. The purpose of these events was to provide information regarding the proposed mine development at the Red Chris property, and to gather specific comments, input and general information regarding public opinion on the project.

Open House sessions were advertized in local newspapers and through notices sent to the five communities for posting and circulation.

The Open House events were held each day between 2:00 p.m. and 9:00 p.m. and included the following:

- a series of 16 posters describing details of the project, the company (American Bullion) and the government review process;
- printed information, as above, for all attendees;
- American Bullion, Hallam Knight Piésold and government (Iskut and Dease Lake only) representatives to direct or guide attendees through the poster series and answer questions;
- scheduled slide show presentations (at 3:00 p.m. and 7:00 p.m.), including question and answer periods, and
- questionnaires for attendees to provide comments, opinions and demographic information.

Data collected during the "Open House" series was compiled by American Bullion with assistance from Hallam Knight Piésold, as required. The results of the public consultation process were compiled into a detailed document prepared by American Bullion ("A Summary Report of the Open House Presentations") and the summary from that document is paraphrased, as follows:

> *Attendance was relatively high, attracting a total of 290 visitors to all five communities, with the slide presentations attracting the most public interest. Public response was generally positive, with 72% of respondents (151 of 209) expressing support for the project. Of the remaining responses, 19% (38) were undecided, 8% (17) were opposed and 1% (2) made no comment.*
>
> *Overall response varied among the five communities; however, the comments and questions received during the slide presentations and through the questionnaires focused on environmental protection, social implications and employment opportunities. Environmental concerns were primarily directed toward Todagin Mountain sheep and goat habitat, and social issues reflected concerns with the lack of housing and inadequate medical, school and recreational facilities. Transportation of concentrate and available power options were also common topics of discussion.*

9.3 SOCIOECONOMIC IMPACTS

The key socioeconomic features of the proposed mine development that have a bearing on the overall socioeconomic impacts to the region include:

- size and life expectancy of the proposed mine development;
- size and source of the construction and operational work forces;
- work schedule and accommodation, and
- equipment, supplies and services procurement.

Studies included a preliminary investigation of all demographic information for the First Nations and each community within the affected radius of the mine development, supplemented with information obtained from published and unpublished reports, meetings and discussions with individual agencies and groups familiar with the area, and from the Open House presentations.

Although project-related population increases in nearby communities are expected to be minimal, the study incorporated an analyses of community populations, demographics, levels of employment and housing availability for those communities that could be affected.

Planning has been focused on enhancing positive impacts, and to eliminate or mitigate negative impacts, where possible. It appears that the most significant socioeconomic impacts associated with this project will be of a positive nature (*i.e.*, job opportunities and training, industrial diversification, contractor opportunities and increased tax base).

Construction is projected to commence in July 1997, following receipt of a Project Approval Certificate, and will run for an 12 to 18 month period, with a workforce of between 500 and 700 people. In order to minimize impacts on the local communities, the construction workforce will be housed on site in a construction camp.

Operations are projected to require a total workforce of approximately 510 people. Local employment will be maximized in order to optimize the benefits to regional communities. This will likely require an educational and on-site training program to broaden opportunities for northern residents in the hope to achieve 50% local employment within 5 years. A rotational work schedule will be designed such that employees will be able to commute to the site and maintain a family base and lifestyles in their respective community.

Assuming that the company can attract approximately 40% of the workforce (204 people) initially from the local area and the remainder as commuters from the region, impacts on local communities from people moving into the area should be minimized. Preliminary projections,

based on 20% of the workforce consisting of new residents moving into the area, indicate that the population of the local area will likely increase by approximately 274 people, as shown in Table 9.2. This number is expected to comprise 15% singles, 25% two adult families and 60% families with children. On the basis of 3.4 persons per family, the number of school age children (Kindergarten to grade 12) that would accompany employees moving into the area will be approximately 86.

Indirect jobs will result from expenditures on goods and services such as transportation, explosives, drilling and camp services. Induced jobs (those created by a demand for goods and services by direct and indirect employment of the mine) will encompass a broad spectrum of modern economic necessities, ranging from government services to consumer goods.

The B.C. Mining Association (Annual Report, 1991) estimates that each direct job in mining results in one additional job within the province (or territory) and another job within Canada. Consequently, in addition to the 510 direct jobs created, the Red Chris Project is expected to generate an additional 1020 indirect or induced jobs in B.C. and within Canada.

While most of the indirect jobs created in B.C. will be centred in established regional service centres, such as Smithers, Terrace and Stewart, it is expected that the indirect jobs created in the local area will be filled by current residents and a number of the two-adult families expected to move into the area.

It is estimated that operations will generate a total $31 million annually in direct salaries, of which approximately $16.7 million (54.6%) will flow into the B.C. economy, as shown in Table 9.3. The balance will accrue to the federal and provincial governments as personal income tax: $9.2 million (30%), and $4.7 million (51.5% of federal), respectively. Indirect employment is expected to generate another $18 million annually, assuming a wage rate of 60% of direct employment. At a federal taxation rate of 20%, indirect salaries are expected to inject an additional $12.8 million into the provincial economy, and $3.7 million in federal and $1.9 million in provincial income taxes.

The increased population and spending power is expected to result in increased demand for medical, municipal and retail services. Operational requirements for goods and services will also benefit the regional economy to the order of approximately $10 million annually. In order to enhance the economic benefits to the region it will be the policy of the company to buy locally wherever prices, service and quality are competitive.

In addition, operations, which are expected to have a mine life of 17 years will generate some $20 million annually in corporate income taxes and mineral royalties, which will accrue to the federal and provincial governments. Combined provincial and federal direct, indirect, corporate and goods and services taxes over the life of the mine are projected to be approximately $692 million.

Table 9.1

American Bullion Minerals Ltd.
Red Chris Project

1995 Summary Report

Employment Statistics for the Kitimat–Stikine Regional District

Total Labour Force	21900	%
Agricultural and related service industries	235	1.0731
Fishing and trapping industries	195	0.8904
Logging and forestry industries	1845	8.4247
Mining (incl. milling), quarrying & oil well inds.	265	1.21
Manufacturing industries	4235	19.338
Construction industries	1385	6.3242
Transportation and storage industries	1250	5.7078
Communication and other utility industries	535	2.4429
Wholesale trade industries	635	2.8995
Retail trade industries	2280	10.411
Finance and insurance industries	380	1.7352
Real estate operator and insurance agent industries	165	0.7534
Business service industries	545	2.4886
Government service industries	1870	8.5388
Educational service industries	1655	7.5571
Health and social service industries	1345	6.1416
Accommodation, food and beverage service industries	1465	6.6895
Other service industries	1080	4.9315

Canada Census 1991

TABLE 9.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

PRELIMINARY PROJECTIONS ON POPULATION EFFECTS

EMPLOYEES WHO ARE CURRENTLY RESIDENTS OF THE PROJECT AREA (approx. 40%)	EMPLOYEES WHO ARE EXPECTED TO MOVE TO THE PROJECT AREA (approx. 20%)	EMPLOYEES WHO ARE EXPECTED TO COMMUTE FROM OTHER COMMUNITIES IN THE REGION (approx. 40%)	TOTAL PROJECTED WORKFORCE
204	102	204	510

PROJECTED POPULATION INCREASE IN PROJECT AREA (APPROXIMATELY 102 NEW RESIDENT EMPLOYEES)	SINGLES (1 Person Per Household)	TWO ADULT FAMILIES (2 Persons Per Household)	FAMILIES WITH CHILDREN (3.4 Persons Per Household)	TOTAL
EXPECTED DISTRIBUTION	15%	25%	60%	100%
ADULTS	15	51	122	189
CHILDREN	0	0	86	86
TOTAL	15	51	208	274

TABLE 9.3

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

PRELIMINARY PROJECTIONS ON ECONOMIC BENEFITS

ESTIMATED ECONOMIC BENEFITS	ANNUALLY (IN 1997 CN$)	17 - YEAR MINE LIFE (IN 1997 CN$)
DIRECT EMPLOYMENT PAYROLL[1]	$31 Million	$520 Million
Accruing to Regional Economy	$16.7 Million	$284 Million
Federal Income Tax (30%)	$9.2 Million	$156 Million
Provincial Income Tax (51.5% of Federal Tax)	$4.7 Million	$80 Million
INDIRECT EMPLOYMENT PAYROLL (approximately 60% of Direct)	$18 Million	$312 Million
Accruing to Regional Economy	$12.8 Million	$218 Million
Federal Income Tax (20%)	$3.7 Million	$62 Million
Provincial Income Tax (51.5% of Federal Tax)	$1.9 Million	$32 Million
LOCAL SUPPLIES AND SERVICES (estimate)	$10 Million	$170 Million
Federal GST (7%)	$0.7 Million	$12 Million
Provincial Sales Tax (7% on 75% of total)	$0.5 Million	$9 Million
FEDERAL & PROVINCIAL CORPORATE AND MINING TAXES	$20 Million	$340 Million
TOTAL ACCRUING TO REGIONAL ECONOMY	$38.3 Million	$650 Million
Total Federal and Provincial Taxes	$40.7 Million	$692 Million

[1] - assumes 510 employees at $60,000/year (including 34% payroll burden).

SECTION 10.0 - CULTURAL AND HERITAGE RESOURCES

Preliminary compliation of existing cultural and heritage resource information for the local area and region was completed for incorporation into the Application for a Project Approval Certificate (October 1995). The preliminary information acquired is presented below.

The Red Chris Project is located in territory formally claimed by the Tahltan First Nation of northwestern B.C. The Tahltans are an Athapascan speaking people who occupy the Stikine Plateau area of northern B.C. The area is classified as sub-arctic or boreal forest. Tahltan traditional areas include the region encompassed by the entire drainage basin of the upper Stikine River, and headwaters of the streams that flow into the Taku, Nass, Skeena and Yukon Rivers (Albright 1984, Rousseau 1990). The lower Stikine River area south of Telegraph Creek was shared with Tlingit people, and other alliances with neighbouring tribes were formed for the purpose of hunting, fishing and trade. The Tahltan people travelled extensively throughout their traditional territories in search of migratory game and other wildlife, and to trade with other native groups. The most commonly used territory was the Stikine River Valley, in the general vicinity of the present-day community of Telegraph Creek (Archibald and Boivin 1993).

The Tahltan territories include a large section of northwest B.C., with approximate borders of Alaska to the west, Treaty Creek to the south and the Yukon border to the north. Tahltan traditional areas include the region encompassed by the entire drainage basin of the upper Stikine River, and headwaters of the streams that flow into the Taku, Nass, Skeena and Yukon rivers (Rousseau 1990).

The total area of the Tahltan land claim in northern B.C. is 93,600 km ^{2} (Archibald and Boivin 1993). The first formal declaration of sovereign right to all territories occupied by the Tahltan First Nation was in the 1910 "Declaration of the Tahltan Tribe."

An overlap of land claims between the Tahltan First Nation and the Taku Tlingit First Nation exists in the northern portion of the territory. It is understood that claim boundaries to the south of the Tahltan territory have recently been settled by the Nisga'a (Archibald and Boivin, 1993).

Presently, the Tahltan people reside in three main towns in the region: Dease Lake, Telegraph Creek and Iskut. Major changes have occurred in the Tahltan communities in the past few decades due to the introduction of a cash economy, modern technology and industrial development in the territory. However, despite the changes in lifestyle that have occurred in recent years, the Tahltan people still fish, hunt and trap extensively in their territory and follow many traditional customs (Albright 1984).

SECTION 11.0 - HEALTH CONDITIONS

Preliminary information regarding potential impacts to health conditions within the local area and region was compiled for incorporation into the Application for a Project Approval Certificate (October 1995), as discussed below.

The Ministry of Health requires that proponents of new mine developments examine the potential immediate and long-term impacts on the health and welfare of the adjacent communities, due to the following factors:

- releases to the atmospheric and aquatic environments;
- increased resource development impacting on the assimilative capability of adjacent communities, and
- ultimate suspension of operations or closure impacting on the socioeconomic sustainability of adjacent communities.

The first item is addressed through examination of potential sources of contamination to the environment and usually uses mass balance-based modelling techniques to predict potential impacts. This information is used to design appropriate mitigation or prevention measures to ensure that impacts meet acceptable levels. The other two items are addressed through assessment of social determinants and sustainability impacts of health and welfare, as currently defined by the Ministry of Health.

American Bullion Minerals Ltd. proposed to address each of these areas of concern within the environmental assessment, and will include a full description of the company's approach to identify potential effects on health and welfare, recommendations on potential mitigation and appropriate monitoring programs.

11.1 HEALTH EFFECTS OF AIR EMISSIONS AND EFFLUENT SOURCES

The proposed development of the Red Chris property is expected to result in impacts to the immediate local ambient air quality due to the following factors:

- blasting, loading, hauling of ore and waste;
- crushing and grinding of ore;

- fugitive dust from tailings and waste rock disposal, and
- heating, assay laboratory, and fumes from reagent consumption.

As at most mine sites that do not require roasters or smelters, impacts on ambient air quality will be localized and are relatively minor and/or intermittent in nature. The proposed development is not expected to result in a measurable regional impact. Furthermore, mining results in far less dust than is generated from other resource industries, such as logging and timber harvesting.

Most facilities, such as the crusher and conveyor systems, and working areas will be equipped with the dust collection (wet scrubbers, hoods, etc.) and ventilation systems necessary to protect the immediately work force, from exposure to dust, particulates and reagent fumes. A section of the environmental assessment will be devoted to worker health protection as well as monitoring and mitigation measures necessary to ensure that facilities conform to Provincial requirements.

As with most mine sites without smelters, there is no chemical manufacturing, processing or chemical conversion of the ore, but simply a physical concentration process. Except for minor sources of air emissions, such as assay lab fume hoods and ventilation systems for the reagent area, there will be no point sources of chemical emissions or smoke stacks. The major source of emissions originates with blasting in the open pit, which may occur anywhere from once daily to once a week, and for which there are currently no dust control technologies available. A second major source of dust will be hauling of ore and waste, in which case dust control measures such as watering will be used to reduce fugitive dust. Neither of these sources is a point source, such as a stack; therefore, models are not directly applicable.

Although very unlikely, the mine site operations may employ a series of gen-sets for the on-site generation of electricity, in which case the combustion of diesel fuel would result in a source of air emissions, primarily NO_x, SO_x and CO_2 and particulates. If on-site diesel generation of power is selected as the preferred source of power, impacts would be modelled for worst case conditions (winter, under inversion conditions, using high sulphur fuels, at full output) using applicable Environmental Protection Agency (EPA) atmospheric models. Input data for the model would be obtained from the meteorological data for the site, along with ambient air quality data and projected emissions quality from the gen-set suppliers. Mitigation measures such as use of low sulphur fuels, retardation and stack height would be recommended based on the modelling results.

Ambient Air Quality Control Objectives and Control Objectives for Particulate Emissions for the Mining, Smelting and Related Industries of British Columbia (1979) will be used as the basis for the environmental assessment.

Similarly, impacts to water quality are expected to be minor and controllable to within the requirements for protection of aquatic life, which for the most part, are more stringent than that for protection of human health. If effluent discharges are contemplated, they will be subjected to applicable mathematical models to determine the spatial and temporal distribution of contaminants and the assimilative capacity of the immediate environment. Dispersion models and plume models will be applied as required to characterize threshold limits and risks to the ambient water quality and aquatic resources, particularly fish under a range of scenarios. These data, will also be used to evaluate the risks of metal bioaccummulation, such as metal uptake in biota, and project potential levels in fish that may contribute to human sustenance. Mitigation measures, such as recycle, treatment and maximizing available dilution, would be recommended based on modelling results.

Effluent standards will be based on federal Metal Mining Liquid Effluent Regulations (1977), the provincial Pollution Control Objectives for the Mining, Smelting and Related Industries of British Columbia (1979). Downstream water quality objectives will be based on federal CCME Guidelines (1991) and provincial Approved and Working Criteria for Water Quality (1994) for the protection of aquatic life.

In all cases, a comprehensive monitoring program will be prescribed and will include recommendations on sampling protocol, physical, chemical and biological components, frequency of sampling, sampling locations, levels of detection and reporting procedures.

11.2 SOCIAL DETERMINANTS OF HEALTH AND WELFARE

Historically, new mining developments located in close proximity to small, remote, unincorporated or First Nations communities have been disruptive, generating upheavals at the individual, family, band and community levels. Established First Nations communities, which are based on traditional life styles, values and customs, are extremely vulnerable to rapid changes in regional resources development, such as mining, within their Land Claims area. Problems that arise in small or First Nations communities are exacerbated when social determinants and socioeconomic consequences are not adequately projected and properly meshed with the infrastructure and support services necessary to provide the transitional mechanisms caused by regional development in historically remote northern environs.

However, the proposed development is located within a region that has been exposed to mining developments in the recent past (*e.g.*, Golden Bear, Eskay Creek and Snip). Residents within the region have been involved with, and have received economic benefits from such resource development. As with the Golden Bear and Eskay Creek projects, the work force will be drawn from a wide range of northern communities and the impacts widely disbursed. There are no plans

for a new townsite; shift rotations will be designed to allow employees to maintain a family in their own community, such that impacts on any one community are minimized and benefits regionalized to the maximum extent possible.

However, these preliminary conclusions are based on historical implicit models which suggests that recent mining operations will have no significant impact on regional community socioeconomics. Consequently, American Bullion will undertake to meet with representatives of each community, First Nations Bands and Tribal Councils that may be affected by the proposed development with the objective of determining where potential impacts could arise to develop a plan of action to minimize impacts wherever possible. For example, promised jobs, contract opportunities and spin-off benefits, must be supported with adequate means of access, education, training and practical experience to be of benefit to the regional populace.

The environmental assessment will examine the existing socioeconomic environment and attempt to superimpose (model) the probable impacts on the regional socioeconomic fabric, including housing, educational facilities, police and law enforcement, medical and mental health, social services and community infrastructure, and attempt to project the foreseeable consequences.

11.3 SUSTAINABILITY IMPACTS ON HEALTH AND WELFARE

By its very nature, extraction of mineral reserves has an end, and mining, which is extremely vulnerable to world economics, has contributed to the cyclical nature of the socioeconomics of communities dependent on one industry. To mitigate this "boom and bust" phenomena, the mining industry has tended to replace the institution of a "mining town" with site-based fully catered accommodation for a regionally recruited work force. Shift rotations are normally based on two to four weeks-in followed by one to two weeks-out, such that employees have adequate time to commute between the work place and maintain a regular family situation in already established communities. Drawing the work force from a wide range of established communities within the region and providing site accommodation broadens the sphere for employee recruitment, significantly reduces the requirement for new community infrastructure, disperses the potential socioeconomic impacts and reduces the cost to the company, the government and the local communities.

This approach also applies to the areas of procurement of contracting, services and supplies, as well as the pressures resulting from the creation of direct and indirect employment. By drawing from the resources of the region as a whole, economic stimulus and the social impacts are dispersed over a broader and more diffuse range of communities with established infrastructure, housing, educational and social services.

Similarly, with a regionally based work force, the closure of a mining development does not have the same impact on a one industry town as it does on a region. Although some individuals may suffer personal difficulties, the transfer of quantifiable skills and training can better equip individuals to recover and fill employment opportunities elsewhere. American Bullion will also outline in the environmental assessment, its plans to minimize the impacts of closure, which may include, for example, employment relocation services at the end of mine life.

SECTION 12.0 - LAND USE IN THE PROJECT AREA

Current regional land use issues addressed during preparation of the Application for a Project Approval Certificate (October 1995) and prefeasibility report (March 1996) included:

- parks, recreation and tourism;
- hunting, trapping and guiding;
- resource use and extraction, and
- Native land claims.

12.1 PARKS, RECREATION AND TOURISM

The following Provincial parks and recreational areas are proximal to the Red Chris property:

- Mount Edziza Provincial Park approximately 40 km to the west;
- Stikine River Recreational Area approximately 15 km to the north and northeast;
- Spatsizi Plateau Wilderness Park approximately 20 km to the east;
- Tatlatui Park approximately 150 km to the southeast, and
- Kinaskan Lake Park approximately 30 km to the south along Highway 37.

In 1985, the Todagin Mountain area was considered for Management Area status; however, there are currently no plans to change the present regulations or management status of the Todagin Mountain area (Brock 1995).

The region surrounding the Red Chris project site is popular for fishing, as the local lakes, such as Kinaskan, Tatogga, Eddontenajon and Ealue Lakes, contain relatively large natural populations of rainbow trout. Local rivers and mountains also provide ample opportunity for fishing, camping, hiking, wildlife viewing and other nature-based recreation activities. Several lodges, motels and camp grounds along Highway 37 and Ealue Lake Road are available to accommodate tourists.

12.2 HUNTING, TRAPPING AND GUIDING

The Red Chris property falls within Management Unit 6-20, Skeena Region (Region 6) Section B, and the Todagin Mountain area has been a no shooting region since 1975, with a closure on mountain goat hunting (Brock 1995). The no shooting area is bordered by Highway 37 to the west, Todagin Creek, Todagin Lake and Kluea Lake to the South, the Klappan River to the east, and Ealue Lake and Coyote Creek to the north, and all hunting is closed within 2 km of the road. The mountain goat closed area has the same borders to the west, south and east, but the northern border is the Stikine River.

Todagin Mountain has high value as a bow hunting area and is the most popular hunting spot in Region 6. Approximately 24-40 bow hunters use the area per season primarily hunting sheep, and to a lesser degree, moose.

The sheep season opens in August and is generally finished within a few weeks as hunting activity chases the sheep to their escape terrain. An estimated 6 to 8 sheep are taken from Todagin Mountain through regulated hunting each year, and another 6 to 8 sheep are likely taken by unregulated hunting. As there is currently a closure on goat hunting, no goats have recently been taken through regulated hunting; however, at least one goat has been taken since 1993 in the unregulated hunt.

Members of the Iskut Band also hunt, trap and fish in the region and are currently lobbying for the sheep hunting season to be shortened. Most of the hunters in the Iskut Band adhere to the no shooting regulation and are encouraged to abide by the regional hunting regulations by Chief Louis Louie (Brock 1995). Sheep, and sometimes moose, are the main game taken by band members; however, ground squirrels and marmots used to be hunted before the shooting ban. Traditionally, medicinal plants such as Labrador tea, balsam bark and caribou weeds were also collected from the area. The band traditionally camped in the area during hunts; however, they did not construct permanent settlements. Hunting and trapping are generally undertaken on foot or with the use of all-terrain vehicles (ATVs) or snowmobiles.

The trapline in the region, 620T001, is registered to 46 people in the Iskut band and trappers from the band are actively using the traplines in the project area (Brock, 1995). Trap returns (Table 12.1) indicate that beaver, coyote, fox, lynx, marten, mink, muskrat, squirrel, weasel, wolf and wolverine are currently being taken from the area, with marten the predominant species trapped. Bobcat, skunk, otter and racoon have not been taken in the last ten years.

Todagin Mountain falls within the a guiding territory registered to Bruce Creyke, which stretches from the Klappan River to Mt. Edziza. Mr Creyke generally guides in the area from mid-August

to mid-October, concentrating in the Todagin Mountain area. Mr Creyke typically guides 2 groups of bow hunters per year, with each hunt lasting 10 to 14 days (Brock, 1995).

12.3 RESOURCE USE AND EXTRACTION

Resource use and extraction issues are essentially limited to logging, mining and power generation, as detailed below.

The Ministry of Forests, Cassiar Forest Region, has indicated that there are currently no forest tenures or licences in the Red Chris project area; therefore, it is anticipated that the proposed development will not impact any existing logging activities. The open pit and proposed location for the mill facilities and camp are located in subalpine areas; consequently, the proposed project will have little impact on merchantable timber.

The Red Chris property is comprised of 156 two-post, fractional and modified grid mineral claims totalling 452 units located in the Liard Mining Division of northwestern British Columbia, Canada, as detailed in Appendix IX. There are currently no other registered mine development plans in the immediate vicinity of the Red Chris property; however, the property is surrounded by several adjacent mineral claims, which include:

- Rose of York 38 (8);
- Lancastrian Rose 33 (8);
- Last Rose of Summer 39 (8);
- ROK 4072 (5);
- Coyote 1 6429 (9);
- Coyote 2 6427 (9);
- Coyote 3 6428 (9);
- Eddon-5-48 7155 (3);
- Chance 121 (6);
- Shore 122 (6);
- Core 123 (6);

- Low 7325 (4);
- Tonic 1 302272;
- Tonic 2 302273;
- Tonic 3 302274;
- Tonic 4 302275;
- Saloon 1379 (6);
- Eldorado 29 (8), and
- Dude 1382 (6).

Further afield, the Klappan Coal, Galore Creek and Spectrum projects are all within the same general region as the Red Chris property.

There are currently no power generation development plans in the immediate vicinity of the Red Chris property; however, there are several previously proposed, inactive plans in the region. B.C. Hydro researched the potential for hydroelectric dams on the lower portion of the Iskut River, and at three sites along the Stikine River, the upper-most being below the confluence of the Klappan River. The other proposed project is for a coal-fuelled thermal-electric plant at the Groundhog coal fields, near Mount Klappan; however, these plans are not currently being pursued.

12.4 NATIVE LAND CLAIMS

The Red Chris property lies completely within an area claimed by the Tahltan Nation. The hierarchy of the Tahltan Nation, which is segregated into three separate communities in Iskut, Telegraph Creek and Dease Lake, is currently unclear.

The Tahltan territories include a large section of northwest B.C., with approximate borders of Alaska to the west, Treaty Creek to the south and the Yukon border to the north. Tahltan traditional areas include the region encompassed by the entire drainage basin of the upper Stikine River, and headwaters of the streams that flow into the Taku, Nass, Skeena and Yukon rivers (Rousseau 1990).

The total area of the Tahltan land claim in northern B.C. is 93,600 km ^{2} (Archibald and Boivin 1993). The first formal declaration of sovereign right to all territories occupied by the Tahltan

First Nation was in the "Declaration of the Tahltan Tribe ... signed at Telegraph Creek, B.C., [the] eighteenth day of October, nineteen hundred and ten [1910], by: Nanok, Chief of the Tahltans; Nastulta (alias Little Jackson); George Assadza, Kenetl (alias Big Jackson); and eighty other members of the tribe."

An overlap of land claims between the Tahltan First Nation and the Taku Tlingit First Nation exists in the northern portion of the territory. It is understood that land claim boundaries to the south of the Tahltan territory have recently been settled with the Nisga'a (Archibald and Boivin, 1993).

Table 12.1

Wild Fur Harvest for Trapline R0620T001

(Data from the B.C. Ministry of Environment, Lands and Parks - Wildlife Branch 1994)

Year	Bear	Beaver	Coyote	Fisher	Fox	Lynx	Marten	Mink	Muskrat	Squirrel	Weasel	Wolf	Wolverine
1985							17	1			4		
1986	4	21	1	3		10	300	11	4	63	8		5
1987	3	15		2	2	5	532	29	3	127	59	1	9
1988	2	22	1	3	4	2	542	15	4	31	21		7
1989		11				3	248	8	1	6	11	1	2
1990							277	5					
1991		4			9	17	382	9					5
1992					2	9	202	2					2
1993				1			16					1	3
Total	**9**	**73**	**2**	**9**	**17**	**46**	**2499**	**79**	**12**	**227**	**99**	**3**	**33**

SECTION 13.0 - PRELIMINARY WASTE CHARACTERIZATION STUDIES

The preliminary waste characterization program was initiated by American Bullion in 1994 with the submission of 15 ore grade and 10 waste rock samples for acid-base accounting (ABA) by modified Sobek method, whole rock analysis and multielemental (ICP) scan. These samples were distinguished based on the relative amount of "stockwork" within each sample, which is generally related to the ore grade; samples containing very weak or no stockwork were considered to be waste rock samples for the purposes of this report. In 1995, an additional 110 samples selected from both pyritic and non-pyritic waste rock were analysed for the same set of parameters. The 1995 samples represented the four main waste rock types, as follows:

- Bowser Lake Sediments, which contain minor amounts of pyrite and represent approximately 20% of the total waste rock to be excavated (20 samples);
- Dynamite Hill Volcanics ("proximal and distal"), which contain up to 5% disseminated pyrite and represent approximately 10 to 20% of the total waste rock to be excavated (20 samples);
- Main Phase Monzodiorite, which contains up to 3% pyrite and represents approximately 50 to 60% of the total waste rock to be excavated (45 samples), and
- Late Phase Dyke material, which contains up to 8% pyrite and represents approximately 10% of the total waste rock to be excavated (25 samples).

Additionally, 6 samples of tailings from metallurgical test work were submitted for ABA analysis.

Sample locations are shown on a plan of drill holes and cross-sectional diagrams in Appendix X, and the results of the static acid-base accounting (ABA), whole rock and multielemental scan analyses are summarized in the following sub-sections. Data acquired during the 1994 preliminary study are presented and discussed separately from the 1995 data.

13.1 STATIC ACID-BASE ACCOUNTING (ABA)

Static acid-base accounting (ABA) results from 1994 and a summary of 1995 results are presented in Tables 13.1 and 13.2, respectively, with all 1995 data presented in Appendix XI. The net neutralization potential (NNP) for each sample was determined by subtraction of neutralization potential (NP), based on the modified Sobek method, from total acid generation

potential (AP). All AP, NP and NNP values are measured in terms of tonnes $CaCO_3$ equivalents/1000 tonnes of sample.

Acid-base accounting results have been plotted on Klingmann Diagrams (log-log scale of sulphide-sulphur vs. NP/AP ratio) for ease of analysis. Results for the combined 1994 (25 samples) and 1995 (110 samples) data sets are presented in Figures 13.1 and 13.2, respectively.

The "ARD Guidelines for Mine Sites in British Columbia (January 1995)" have been used for interpreting the results. This policy outlines three ABA criteria, as follows:

Criteria 1 - Material with a Paste pH Less Than 3.5

All waste with a paste pH of less than 3.5 is considered a potential source of acid drainage.

Criteria 2 - Material Containing Greater Than 0.3% Sulphide-Sulphur

All waste containing greater than 0.3% sulphide-sulphur or paste pH of less than 5.0 should be submitted to static acid-base accounting tests in order to assess its acid generating potential. Waste containing 0.3% sulphide-sulphur can be regarded as containing an equivalent 0.9% pyrite (as FeS_2). This amount of sulphur would theoretically be capable of producing approximately 9.6 t/1000t of sulphuric acid. If the pyrite is highly reactive, it could require in excess of 50 t/1000t carbonate equivalent to provide the necessary neutralization capability.

Criteria 3 - Material Having an NP/AP Ratio of Less Than 3:1

All waste having an NP/AP ratio of less than 3:1 should be submitted to kinetic testing in order to determine if the release rates of available neutralization potential will be sufficient to counter the production of sulphuric acid during the oxidation of sulphides. The rate of carbonate release is a function of solubility and is generally faster than the production rate of sulphuric acid, which is a function of oxidation. Consequently, it is important to determine if there is sufficient neutralization potential, given the higher rate of depletion, to counter the generation of sulphuric acid over the long-term.

The originally published NP/AP ratio of 4:1 (in the January 1995 B.C. ARD guidelines) was selected based on review of an extensive database. However, due to an apparent error in the database, this value has come into question and has been informally revised to

3:1. For the purposes of this study, we have used the more recently accepted ratio (3:1) in our analysis of the data.

The guidelines suggest that sample results which fall below the 0.3% sulphur range are regarded as having insufficient oxidizable sulphide-sulphur content to sustain acid generation. Sample results with an NP/AP ratio above 3:1 are regarded as containing sufficient buffering capacity to neutralize any oxidation products of the contained sulphide-sulphur. Samples with an NP/AP ratio of between 1:1 and 3:1 are not conclusive with respect to acid generating potential and samples with an NP/AP ratio below 1:1 and sulphide-sulphur above 0.3% are regarded as being potentially acid generating. Samples falling within either of these two groups generally require further kinetic testing.

13.1.1 Very Weak and No Stockwork Rock Types

Samples containing very weak and no stockwork generally represented the Main Phase Monzodiorite rock type. Nine (9) of the 10 samples had NP/AP ratios below 2:1 and sulphide-sulphur concentrations above 1.0%. All 5 samples without stockwork, and two with very weak stockwork, had NP/AP ratios less than 1:1. This preliminary ABA data for the 1994 samples containing very weak and no stockwork suggested that waste rock may have a high potential to generate acid.

As these samples were not representative of all the waste rock types, and were not designed to have been representative of the monzodiorite in general, a more comprehensive characterization program was initiated in 1995.

13.1.2 Bowser Lake Sediments

The average NP/AP ratio of the Bowser Lake Sediments sample set (calculated from the average NP and AP values for the data set) was 1.52:1, all samples falling within an NP/AP ratio range of 0.57:1 to 2.64:1, with sulphide-sulphur ranging from 1.03% to 1.67%. All of the 20 samples examined (100%) were found to have NP/AP ratios less than 3:1; however, of these, only 3 had NP/AP ratios less than 1:1. With 100% of the samples having both NP/AP ratios less than 3:1 and sulphide-sulphur exceeding 1.0%, the Bowser Lake Sediments may to have some propensity to generate acid. However, with the bulk of the sample set having NP/AP ratios greater than 1:1, it may be possible to determine a specific NP/AP ratio for the rock type, above which acid generation is unlikely, in order to minimize the volume of waste rock that will require special handling or disposal.

On the basis of criteria set out in the "ARD Guidelines" discussed above, additional studies of the Bowser Lake Sediments, such as detailed mineralogical characterization and kinetic humidity cell

testing, are warranted to determine a specific cut-off NP/AP ratio, and ascertain whether or not delineation and separation of non-acid generating material (based on such a cut-off ratio) is practicable.

13.1.3 Dynamite Hill Volcanics ("Proximal and Distal")

Dynamite Hill Volcanics samples were separated into two sub-groups based on their proximity to the ore deposit; "proximal" samples being within approximately 75 m of the deposit and generally containing a relatively higher proportion of pyrite, and "distal" samples being greater than approximately 75 m of the deposit and generally containing less pyrite. As the ABA characteristics are slightly different for these two groups of samples, they are discussed separately below.

The average NP/AP ratio of the "proximal" Dynamite Hill Volcanics sample set was 2.53:1, and 9 of the 12 samples fell within an NP/AP ratio range of 1:08 to 4.39:1, with sulphide-sulphur concentrations between 2.03% and 5.38%. Two outliers had NP/AP ratios of 91.7:1 and 259:1, with sulphide-sulphur concentrations of 0.06% and 0.02%, respectively. (These outliers do not significantly affect the average NP/AP ratio reported above, as it was calculated from average NP and AP values for the data set, not from an average of NP/AP ratio values). Only one sample had an NP/AP ratio below 1:1 (0.36:1) and this sample contained 5.77% sulphide-sulphur. Seven of the 12 samples examined (58%) were found to have NP/AP ratios of less than 3:1. Of these, 4 had NP/AP ratios less than 2:1, and 2 samples had NP/AP ratios between 2:1 and 3:1.

The average NP/AP ratio of the "distal" Dynamite Hill Volcanics sample set was 8.42:1, with a range from 1.85:1 to 39.7:1. All but 1 of the 8 samples examined had NP/AP ratios greater than 4:1, and only 4 samples contained greater than 0.3% sulphide-sulphur. The sample with the lowest NP/AP ratio (1.85:1) contained 1.28% sulphide-sulphur.

The "distal" volcanics, with only one sample having an NP/AP ratio less than 4:1 and half the samples containing less than 0.3% sulphide-sulphur, are not likely to generate acid. However, the "proximal" volcanics generally contained in excess of 0.3% sulphide-sulphur and over half had NP/AP ratios less than 3:1, and therefore, may have some propensity to generate acid. With the bulk of the "proximal" sample set having NP/AP ratios greater than 1:1, it may be possible to determine a specific NP/AP ratio for the rock type, above which acid generation is unlikely.

Similar to the Bowser Lake Sediments, on the basis of criteria set out in "ARD Guidelines", additional studies on the Dynamite Hill Volcanics (especially "proximal" volcanics) are warranted to determine a specific cut-off NP/AP ratio, and ascertain whether or not delineation and separation of non-acid generating material is practicable.

13.1.4 Main Phase Monzodiorite

Main Phase Monzodiorite samples were separated into "Main and East Zone" and "Gully Zone" sub-groups based on their location with the overall Red Chris deposit. As the ABA characteristics are virtually identical for these two groups of samples, they are discussed together below.

The average NP/AP ratio of the entire Main Phase Monzodiorite sample set was 0.96:1, and 41 of the 45 samples fell within an NP/AP ratio range of 0.2:1 to 1.93:1, with sulphide-sulphur concentrations between 1.64% and 5.17%. The average NP/AP ratios for the 35 "Main Zone" and 10 "Gully Zone" samples were 0.98:1 and 0.89:1, which illustrates the similarity in ABA characteristics between the two groups of samples. Four outliers had NP/AP ratios ranging from 4.38:1 to 70.6:1, with sulphide-sulphur concentrations from 0.07% to 1.13% (as stated previously, these outliers do not significantly affect the average NP/AP ratios reported above, as they were calculated from average NP and AP values for the data set, not from an average of NP/AP ratio values). One sample had an NP/AP ratio below 0.2:1 (0.11:1) and contained 7.86% sulphide-sulphur. This rock type appears to have a moderate to high acid generating potential; however, with almost half of the samples (48.8%) having NP/AP ratios greater than 1:1, it may be possible to determine a specific NP/AP ratio, above which acid generation is unlikely.

Based on the criteria set out in the "ARD Guidelines", additional studies on the Main Phase Monzodiorite are warranted to determine a specific cut-off NP/AP ratio, and ascertain whether or not delineation and separation of non-acid generating material (based on such a cut-off ratio) is practicable.

13.1.5 Late Phase Dyke Material

The ABA characteristics of the Late Phase Dyke material appeared to be very similar to the Main Phase Monzodiorite; however, a greater proportion of the Late Phase Dyke material had NP/AP ratios less than 1:1.

The average NP/AP ratio of the Late Phase Dyke sample set was 0.79:1, with the entire data set falling within an NP/AP ratio range of 0.13:1 to 2.55:1, and sulphide-sulphur concentrations between 1.2% and 6.26%. All of the 20 samples examined (100%) were found to have NP/AP ratios less than 3:1, and of these, only 7 (35%) had NP/AP ratios greater than 1:1. With 100% of the samples having NP/AP ratios less than 3:1, and sulphide-sulphur exceeding 1.0%, the Late Phase Dyke material appears to a relatively high acid generating potential. Further, with 65% of the samples having a NP/AP ratios less than 1:1, and assuming that these are representative samples, it is not likely that determination of a specific cut-off NP/AP ratio will significantly affect the volume of waste rock that will require special handling or disposal.

Based on the criteria set out in the "ARD Guidelines", additional studies on the Late Phase Dyke material, such as detailed mineralogical characterization and kinetic humidity cell testing, may be warranted to determine potential seepage quality.

13.1.6 Tailings Samples

The 6 tailings samples were prepared from "Combined Rougher Tails" and "1st Cleaner Scavenger Tails" produced during metallurgical test work on ore from the East Pit, West Starter Pit and Gully Zone. The 6 samples represented duplicates from each of these three areas.

Tailings samples from the East Pit and West Starter Pit were similar in ABA characteristics, with NP/AP ratios averaging 0.83 and 0.63, and sulphide-sulphur concentrations of 2.58% and 4.29%, respectively. This suggests that these two types of tailings have a relatively high acid generating potential.

In contrast, Gully Zone tailings had an average NP/AP ratio of 4.5 and contained only 0.91% sulphide-sulphur, which suggests that this material is not likely to generate acid. Further, with an average NNP of 111 tonnes $CaCO_3$ equivalent/1000 tonnes, there appears to be a substantial acid neutralizing capacity within this material.

Based on the criteria set out in the "ARD Guidelines", additional characterization studies on tailings material may be warranted.

13.2 WHOLE ROCK ANALYSIS

A summary of whole rock analysis results from the 1995 waste characterization program is presented in Table 13.3, with all 1995 data presented in Appendix XII. The results suggest that the Main Phase Monzodiorite, Late Phase Dykes and Bowser Lake Sediments are fairly similar in composition, and differ significantly from the Dynamite Hill Volcanics. As such, these are discussed separately below.

Of note is the overall constancy in the composition of the Main Phase Monzodiorite, Late Phase Dyke and Bowser Lake Sediment samples, regardless of rock type. The sediments had slightly differing proportions of some constituents, but overall there was virtually no variability in rock composition. On the basis of average values, all rock types were found to comprise primarily silicon (55.32% as SiO_2 (58.95% in sediments)) and aluminum (15.08% as Al_2O_3 (13.62% in sediments)). Secondary constituents in descending order of concentration were iron (7.13% as Fe_2O_3 (5.03% in sediments)), calcium (5.46% as CaO (5.38% in sediments)), potassium (3.10% as K_2O (2.18% in sediments)), magnesium (2.22% as MgO (1.95% in sediments)) and sodium (0.58% as Na_2O (1.37% in sediments)). Minor constituents included barium, manganese,

phosphorous, strontium and titanium. These values are generally consistent with continental crust averages, and suggest a possible link between source of the material in the sedimentary rock and the monzodiorite.

The composition of the Dynamite Hill Volcanics was generally lower in percent silicon, aluminum and potassium than the previously discussed rock types, and higher in percent calcium, magnesium, iron, phosphorus, titanium, manganese, barium and strontium. On the basis of average values, Dynamite Hill Volcanics were found to comprise primarily silicon (42.39% as SiO_2) with approximately equal amounts of calcium (11.73% as CaO), magnesium (10.70% as MgO), iron (10.51% as Fe_2O_3) and aluminum (9.20% as Al_2O_3). Secondary constituents included minor quantities of sodium, phosphorous, titanium, potassium, manganese, barium and strontium. These values more closely resemble oceanic crustal averages, suggesting the possible simatic origin of the volcanic rock.

13.3 MULTIELEMENTAL SCAN ANALYSIS

A summary of multielemental scan results from the 1995 waste characterization program is presented in Table 13.4, with all 1995 data presented in Appendix XIII. All acid-base accounting samples were submitted for 31 element, multielemental scan for purposes of identifying elements which may be of environmental concern. All four waste rock types were found to be fairly similar in metal content with minor differences, as discussed below.

The Main Phase Monzodiorite and Late Phase Dyke samples were found to contain silver, arsenic, copper, lead, molybdenum, vanadium and zinc in moderately high concentrations compared to global crustal averages (though still at trace levels), as would be expected in an area of mineralization. All other metals were found to be low or well within the range of common non-mineralized rock. Relatively high levels of variability were identified for antimony, arsenic, copper, manganese, molybdenum, strontium and zinc concentrations.

Compared to the Main Phase Monzodiorites and Late Phase Dykes, Bowser Lake Sediment samples generally contained less variable levels of most metals, distinctly lower levels of arsenic and copper, and higher concentrations of lithium. Several other metals also varied, although generally less significantly. Unlike the monzdiorites and dykes, sediment samples did not contain elevated concentrations of arsenic and copper, compared to global crustal averages.

Through the same comparison with Main and Late Phase material, Dynamite Hill Volcanics generally contained notably lower concentrations of copper, potassium and molybdenum, and higher levels of calcium, cobalt, chromium, lithium, magnesium, nickel and tungsten. Volcanics samples generally did not contain elevated levels of arsenic or molybdenum (although arsenic levels were occasionally quite high), and levels of chromium and tungsten, and to a lesser extent

cobalt, nickel and tin were elevated compared to global crustal averages. Metals concentrations in volcanics samples were generally more variable than in the other three rock types.

13.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

A total of 13 samples, representing each of the four main rock types, were submitted in duplicate for acid-base accounting (ABA) analyses, as a quality assurance/quality control (QA/QC) measure. These samples were selected at random and were representative of the entire database, containing between 0.03 and 5.38% total sulphide-sulphur, NNP values ranging from -126 to 289 tonnes $CaCO_3$ equivalent/tonne, and NP/AP ratios ranging from 0.13:1 to 183:1.

All duplicate data, with the exception of one sample, matched very closely with the results for the original samples, and substantiated the integrity of the ABA data set. Sample number 81417 from drill hole 119, a proximal volcanic sample, contained a 50% difference in total sulphide-sulphur concentration (and hence NP/AP ratio) compared to the duplicate. This difference was due to the fact that the concentration was near the detection limit, where the analytical error is greatest. This difference did not affect the classification of this sample with respect to acid generation potential, based on the "ARD Guidelines," as the sulphide sulphur remained below 0.3% (at 0.03 to 0.06%) and the NP/AP ratio was well above 3:1 (at 91.7:1 to 183:1).

Table 13.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1994 ACID-BASE ACCOUNTING (ABA) RESULTS

Sample Number	ROCK TYPE	PASTE Ph	S TOTAL (%)	$S^{=}$ as S (%)	SO4 as S (%)	NP	AP from $S^{=}$	NP/AP
76001	MS	7.70	1.00	0.96	0.04	127.60	30.00	4.25
76730	MS	7.75	6.44	6.37	0.07	101.40	199.06	0.51
77291	MS	9.15	3.80	3.75	0.05	86.60	117.19	0.74
80046	MS	8.00	1.30	1.26	0.04	75.27	39.38	1.91
80592	MS	9.50	0.69	0.65	0.04	100.36	20.31	4.94
76660	NS	8.00	3.47	3.44	0.03	91.80	107.50	0.85
77251	NS	0.20	3.88	3.78	0.10	61.20	118.13	0.52
80122	NS	8.55	3.34	3.30	0.04	24.48	103.13	0.24
80381	NS	7.40	6.14	2.66	3.48	21.72	83.13	0.26
80791	NS	7.45	5.75	5.72	0.03	13.16	178.75	0.07
76689	SS	7.70	8.95	8.83	0.12	67.01	275.94	0.24
77036	SS	8.10	4.47	4.42	0.05	77.42	138.13	0.56
77448	SS	8.00	7.98	7.90	0.08	112.60	246.88	0.46
80043	SS	8.15	2.34	2.29	0.05	126.68	71.56	1.77
80878	SS	8.20	1.87	1.85	0.02	26.93	57.81	0.47
76768	VWS	8.60	3.87	3.58	0.29	78.33	111.88	0.70
77234	VWS	7.95	4.99	4.94	0.05	57.83	154.38	0.37
80065	VWS	9.25	1.81	1.74	0.07	105.87	54.38	1.95
80532	VWS	9.35	1.98	1.94	0.04	110.16	60.63	1.82
80836	VWS	9.45	0.23	0.19	0.04	131.27	5.94	22.11
76030	WS	9.10	0.37	0.33	0.04	90.73	10.31	8.80
76755	WS	8.40	4.83	4.75	0.08	86.29	148.44	0.58
77325	WS	8.45	4.26	4.20	0.06	90.27	131.25	0.69
80078	WS	9.55	1.05	1.00	0.05	121.17	31.25	3.88
80616	WS	9.50	0.42	0.37	0.05	134.64	11.56	11.64

MS	Moderate Stockwork
WS	Weak Stockwork
NS	No Stockwork
SS	Strong Stockwork
VWS	Very Weak Stockwork

Table 13.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

SUMMARY OF 1995 ACID-BASE ACCOUNTING (ABA) RESULTS

Rock Type	Paste pH	Total Sulphur (%)	Total Sulphate-S (%)	Total Sulphide-S (%)	AP (t/1000t)	NP (t/1000t)	NNP (t/1000t)	NP/AP Ratio
Bowser Sediments								
Average	8.91	1.57	0.24	1.32	41.4	62.9	21.5	1.5
Maximum	9.7	1.92	0.31	1.67	52.2	132.8	82.5	2.6
Minimum	8.2	1.27	0.16	1.03	32.2	29.8	-22.3	0.6
Standard Deviation	0.507	0.180	0.039	0.174	5.45	21.96	22.31	0.53
Volcanics (Proximal)								
Average	8.40	3.54	0.54	3.00	93.8	237.1	143.2	2.5
Maximum	9.55	6.13	0.84	5.77	180.3	440.0	339.7	258.6
Minimum	8.0	0.44	0.36	0.02	0.6	64.1	-116.2	0.4
Standard Deviation	0.392	1.712	0.116	1.693	52.89	106.53	115.36	72.82
Volcanics (Distal)								
Average	8.36	1.04	0.43	0.61	19.2	161.4	142.3	8.4
Maximum	8.7	1.91	0.49	1.45	45.3	303.8	289.4	39.7
Minimum	8.1	0.52	0.35	0.14	4.4	73.9	33.9	1.8
Standard Deviation	0.188	0.498	0.047	0.503	15.72	79.78	80.97	11.55
Main Phase (Main Zone)								
Average	8.28	3.66	0.45	3.21	100.4	98.6	-1.8	1.0
Maximum	9.45	7.98	3.36	7.86	245.6	154.4	152.2	70.6
Minimum	6.9	0.4	0.12	0.07	2.2	25.5	-218.0	0.1
Standard Deviation	0.586	1.579	0.659	1.468	45.88	37.49	70.21	11.62
Main Phase (Gully Zone)								
Average	8.47	3.79	0.79	2.99	93.5	82.9	-10.5	0.9
Maximum	9.6	6.44	2.06	4.8	150.0	154.4	119.1	4.4
Minimum	7.7	1.57	0.25	1.13	35.3	46.7	-103.3	0.3
Standard Deviation	0.621	1.423	0.711	1.201	37.54	29.21	64.40	1.12
Late Phase Dykes								
Average	8.01	4.64	0.41	4.24	132.4	88.9	-43.5	0.7
Maximum	9.55	6.49	2.17	6.26	195.6	276.1	167.6	2.5
Minimum	7.1	1.54	0.14	1.2	37.5	18.8	-145.8	0.1
Standard Deviation	0.436	1.184	0.412	1.111	34.73	61.62	77.22	0.65
Tailings Samples								
East Pit	7.44	3.35		2.58	104.7	87	-19	0.83
East Pit (Dup)		3.35		2.58	104.7	86	-18	0.82
West Starter Pit	7.94	4.93		4.29	154.1	96	-58	0.62
West Starter Pit (Dup)		4.93		4.29	154.1	98	-56	0.64
Gully Zone	8.27	1.03		0.91	32.2	145	113	4.5
Gully Zone (Dup)		1.03		0.91	32.2	141	109	4.4

Table 13.3

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

SUMMARY OF 1995 WHOLE ROCK ANALYSIS RESULTS

Rock Type	Al2O3 (%)	BaO (%)	CaO (%)	Fe2O3 (%)	K2O (%)	MgO (%)	MnO (%)	Na2O (%)	P2O5 (%)	SiO2 (%)	SrO2 (%)	TiO2 (%)	L.O.I. (%)	Total (%)
Bowser Sediments														
Average	13.62	0.08	5.38	5.03	2.18	1.95	0.05	1.37	0.17	58.95	0.03	0.63	9.7	
Maximum	14.67	0.49	9.46	5.78	2.38	2.29	0.11	1.62	0.23	62.03	0.045	0.7	11.6	0
Minimum	12.2	0.04	3.2	4.07	1.87	1.7	0.03	1.08	0.07	55.07	0.02	0.56	8.6	0
Standard Deviation	0.534	0.095	1.319	0.426	0.133	0.158	0.016	0.165	0.043	1.570	0.007	0.032	0.63	
Volcanics (Proximal)														
Average	9.82	0.13	11.73	10.56	0.45	9.33	0.29	0.89	0.63	42.24	0.11	0.55	12.3	
Maximum	15.56	0.36	15.72	12.72	0.85	19.99	0.4	2.51	0.98	46.25	0.82	0.78	19.8	0
Minimum	6.56	0.025	7.84	8.22	0.02	4.61	0.13	0.01	0.02	37.82	0.03	0.4	8.2	0
Standard Deviation	2.812	0.095	2.331	1.392	0.252	4.242	0.075	0.831	0.295	2.342	0.215	0.114	3.53	
Volcanics (Distal)														
Average	8.27	0.08	11.73	10.44	0.35	12.75	0.26	1.23	0.68	42.61	0.05	0.50	10.1	
Maximum	9.86	0.18	14.34	10.84	1.1	19.98	0.46	2.28	0.86	44.65	0.06	0.58	15.2	0
Minimum	6.53	0.015	9.74	9.76	0.05	6.84	0.19	0.04	0.56	38.55	0.035	0.42	6.8	0
Standard Deviation	1.019	0.053	1.330	0.319	0.381	4.135	0.080	0.706	0.096	2.015	0.009	0.060	2.96	
Main Phase (Main Zone)														
Average	15.06	0.06	5.67	7.20	2.90	2.20	0.10	0.48	0.26	55.17	0.03	0.45	9.5	
Maximum	16.93	0.245	8.69	10.53	4.01	3.15	0.28	4.02	0.36	62.69	0.08	0.54	12.5	0
Minimum	13.6	0.01	2.32	3.31	1.81	0.86	0.02	0.01	0.15	49.84	0.015	0.37	6.4	0
Standard Deviation	0.889	0.052	1.385	1.527	0.563	0.558	0.064	0.850	0.048	2.564	0.017	0.040	1.38	
Main Phase (Gully Zone)														
Average	15.01	0.09	5.33	7.23	3.69	2.26	0.22	1.38	0.27	54.24	0.045	0.44	8.8	
Maximum	15.94	0.155	7.29	11.51	4.49	3.93	0.38	3.21	0.33	58.44	0.065	0.53	14.4	0
Minimum	14.19	0.045	2.15	5.25	2.62	1.58	0.11	0.01	0.16	47.44	0.025	0.37	4.9	0
Standard Deviation	0.622	0.032	1.382	1.769	0.606	0.668	0.087	1.146	0.054	3.360	0.014	0.042	2.62	
Late Phase Dykes														
Average	15.13	0.10	5.23	6.99	3.14	2.23	0.12	0.39	0.26	55.97	0.03	0.43	9.0	
Maximum	17.13	0.5	12.05	10.42	4.36	6.14	0.43	2.62	0.72	60.88	0.08	0.55	13.4	0
Minimum	8.37	0.045	2.06	4.8	0.19	1.02	0.02	0.01	0.15	45.49	0.015	0.33	6.4	0
Standard Deviation	1.792	0.087	2.314	1.306	0.875	1.173	0.098	0.773	0.107	3.526	0.019	0.045	1.86	

Table 13.4

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

SUMMARY OF 1995 MULTIELEMENTAL (ICP) RESULTS

Rock Type	Ag (ug/g)	Al (%)	As (ug/g)	Ba (ug/g)	Be (ug/g)	Bi (ug/g)	Ca (%)	Cd (ug/g)	Co (ug/g)	Cr (ug/g)	Cu (ug/g)	Fe (%)	Ga (ug/g)	K (%)	Li (ug/g)	Mg (%)
Bowser Sediments																
Average	1.2	1.03	1	123	1.8	6	2.72	0.1	8	14	38	2.50	2	0.21	15	0.67
Maximum	1.8	1.25	1	319	2.2	9	4.44	0.1	10	18	51	3.09	6	0.23	18	0.93
Minimum	0.6	0.9	1	65	1.4	3	1.2	0.1	8	11	29	1.99	1	0.19	11	0.53
Standard Deviation	0.38	0.094	0	77.8	0.21	1.8	0.692	0	1.4	1.9	5.0	0.299	1.6	0.015	2.1	0.115
Volcanics (Proximal)																
Average	0.6	1.91	64	138	3.7	6	4.57	0.1	38	194	158	5.18	1	0.09	12	4.08
Maximum	1.4	4.03	337	293	4.6	11	7.38	0.1	50	299	268	6.82	1	0.15	22	6.63
Minimum	0.1	0.28	1	57	3	2	1.41	0.1	31	108	79	4.59	1	0.01	2	2.58
Standard Deviation	0.46	1.039	109.9	72.8	0.44	2.8	1.461	0	4.6	69.0	55.0	0.609	0	0.039	6.2	1.035
Volcanics (Distal)																
Average	0.8	2.11	19	152	3.4	3	4.14	0.1	38	233	109	4.1	1	0.06	12	5.12
Maximum	1.3	2.42	97	333	4.2	6	5.47	0.1	44	307	168	5.2	1	0.1	14	6.59
Minimum	0.1	1.55	1	47	2.9	1	2.96	0.1	30	168	36	3.4	1	0.03	8	3.86
Standard Deviation	0.38	0.242	33.6	107.6	0.44	2.1	1.029	0	3.9	44.4	40.2	0.70	0	0.019	1.9	0.874
Main Phase (Main Zone)																
Average	0.9	0.41	96	90	2.3	2	2.54	0.1	12	29	1104	3.72	1	0.23	2	0.98
Maximum	3.9	0.7	217	282	3	8	3.78	0.1	18	69	2952	5.71	4	0.34	5	1.51
Minimum	0.1	0.25	1	17	1.1	1	0.71	0.1	5	18	184	1.77	1	0.11	1	0.08
Standard Deviation	0.82	0.101	57.6	49.3	0.40	1.9	0.636	0	3.0	11.0	547.3	0.780	0.9	0.048	1.1	0.333
Main Phase (Gully Zone)																
Average	0.2	0.47	6	157	2.4	3	2.75	0.1	10	23	998	3.93	1	0.22	4	1.07
Maximum	0.6	0.94	34	328	3.7	9	3.42	0.1	13	43	1790	6.56	1	0.26	10	2.2
Minimum	0.1	0.2	1	72	1.9	1	1.22	0.1	7	16	60	2.6	1	0.13	1	0.43
Standard Deviation	0.18	0.260	10.2	78.3	0.53	2.7	0.584	0	2.3	7.3	600.6	1.080	0	0.035	3.5	0.454
Late Phase Dykes																
Average	0.7	0.41	88	116	2.4	5	2.40	0.1	12	29	373	3.88	2	0.20	2	0.97
Maximum	2	0.98	328	493	3.4	8	4.48	0.1	36	128	1604	5.42	6	0.38	9	3.23
Minimum	0.1	0.18	1	46	1.7	1	0.72	0.1	7	7	16	2.38	1	0.06	1	0.17
Standard Deviation	0.66	0.179	90.7	86.0	0.37	2.2	0.958	0	5.6	23.2	446.3	0.685	1.6	0.059	1.8	0.706

Table 13.4

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

SUMMARY OF 1995 MULTIELEMENTAL (ICP) RESULTS

Rock Type	Mn (ug/g)	Mo (ug/g)	Na (%)	Ni (ug/g)	P (ug/g)	Pb (ug/g)	Sb (ug/g)	Sn (ug/g)	Sr (ug/g)	Th (ug/g)	Ti (%)	U (ug/g)	V (ug/g)	W (ug/g)	Zn (ug/g)
Bowser Sediments															
Average	342	6	0.12	26	777	36	5	1	301	1	0.01	1	31.8	1	157
Maximum	802	9	0.28	32	910	46	9	1	551	1	0.01	1	40.4	2	249
Minimum	197	4	0.02	21	610	25	2	1	102	1	0.01	1	25.2	1	117
Standard Deviation	123.9	1.6	0.092	2.8	90.7	5.4	1.8	0.0	122.9	0	0	0	4.95	0.2	41.9
Volcanics (Proximal)															
Average	1478	1	0.08	111	1968	52	5	5	1005	1	0.01	1	100.4	8	155
Maximum	2137	3	0.47	177	3670	111	23	8	8116	1	0.03	1	165.2	12	220
Minimum	849	1	0.01	67	100	21	1	2	192	1	0.01	1	42.6	3	72
Standard Deviation	416.2	0.6	0.129	34.9	982.3	20.5	7.4	1.8	2151.6	0	0.006	0	30.38	2.6	48.3
Volcanics (Distal)															
Average	1223	1	0.02	130	2130	30	2	7	434	1	0.02	1	82.2	8	158
Maximum	2751	1	0.04	178	2720	63	4	8	589	1	0.03	1	142.6	11	701
Minimum	800	1	0.01	88	1570	3	1	5	263	1	0.01	1	40.7	4	67
Standard Deviation	614.5	0	0.008	33.4	417.4	18.4	1.0	1.2	106.9	0	0.008	0	30.55	2.2	205.4
Main Phase (Main Zone)															
Average	609	16	0.04	15	1139	59	7	1	183	1	0.01	1	23.9	2	142
Maximum	1766	35	0.12	28	1360	125	135	3	816	1	0.01	1	53.2	4	892
Minimum	92	1	0.01	8	820	34	1	1	8	1	0.01	1	4.7	1	23
Standard Deviation	400.1	9.8	0.028	4.0	136.6	18.7	23.1	0.7	222.8	0	0	0	11.69	0.8	170.2
Main Phase (Gully Zone)															
Average	1418	9	0.05	16	1122	71	5	2	304	1	0.01	1	28.9	1	196
Maximum	2541	23	0.08	30	1480	125	35	3	646	1	0.01	1	64.2	2	719
Minimum	732	1	0.02	10	850	48	1	1	38	1	0.01	1	7.2	1	71
Standard Deviation	607.7	6.1	0.019	6.0	211.2	22.6	10.2	0.6	220.9	0	0	0	19.09	0.3	181.0
Late Phase Dykes															
Average	786	8	0.03	18	1158	70	3	1	219	1	0.01	1	18.6	1	207
Maximum	2908	52	0.06	93	2180	150	25	6	858	1	0.01	1	88.1	4	690
Minimum	72	1	0.01	11	710	35	1	1	4	1	0.01	1	1.4	1	31
Standard Deviation	649.5	10.6	0.017	15.5	278.1	23.9	4.6	1.2	265.6	0	0	0	18.42	0.7	171.7

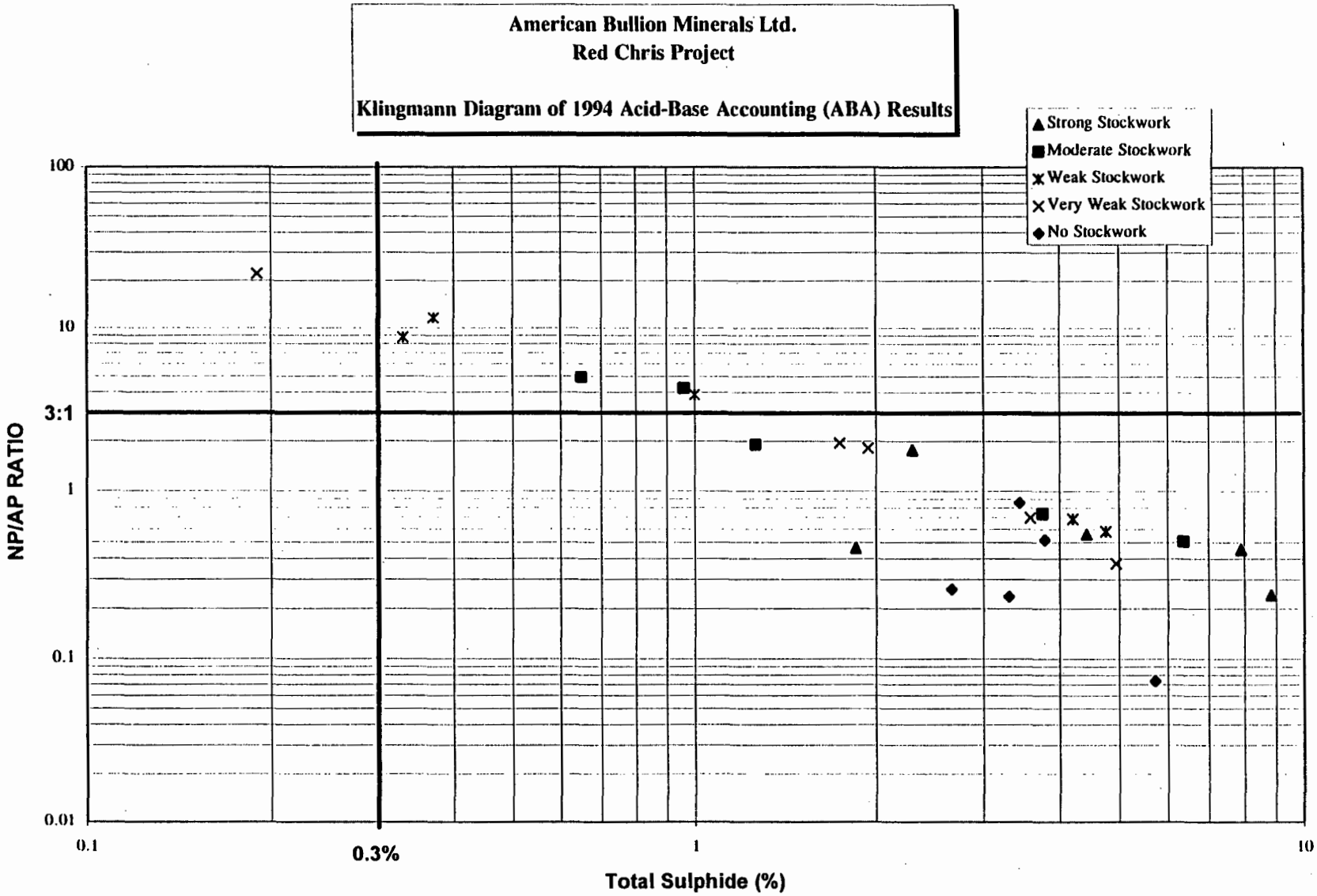


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Figure 13.1

American Bullion Minerals Ltd.
Red Chris Project

Klingmann Diagram of 1995 Acid-Base Accounting (ABA) Data

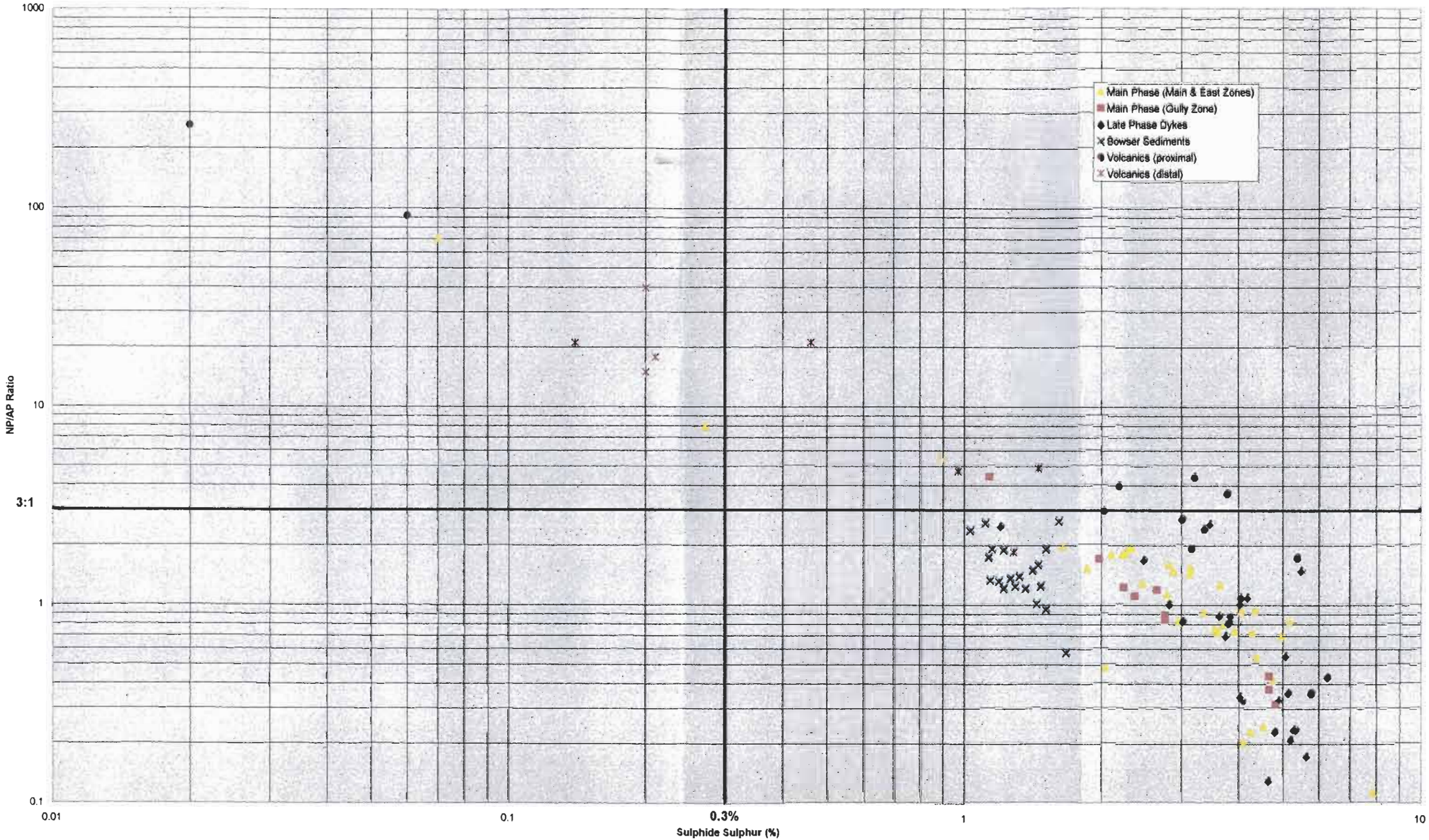

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Figure 13.2

SECTION 14.0 - RECOMMENDATIONS FOR FURTHER WORK

Environmental studies completed to date were undertaken with the specific objective of providing sufficient environmental baseline data for incorporation into the pre-feasibility report and were intended to provide a basis for meeting government requirements for a "Project Approval Certificate" and for completion of feasibility-level studies in the future. Further work required to meet these future objectives will include:

- detailed physiography studies, including soils investigations and seismicity assessment;
- collection and analysis of detailed meteorological data, including installation of an automatic weather station to record temperature, precipitation, and wind speed and direction data throughout the year;
- additional hydrological studies, including further calibration of staff gauges and calculation of specific peak and low flows;
- continued collection of surface water quality data from existing monitoring sites;
- installation of groundwater monitoring wells at selected locations throughout the property for assessment of groundwater hydrology and quality;
- detailed assessment of aquatic resources, including evaluation of stream health indicators, such as benthic macroinvertebrates and periphyton, and additional fisheries studies;
- detailed vegetation studies, including biophysical mapping and assessment of existing habitat in areas that may be disturbed during mine development and operation;
- detailed wildlife studies, including further assessment of species presence, populations and seasonal site uses;
- detailed socioeconomic studies, including further evaluation of local communities and continuation of the Public Consultation Program;
- detailed assessment of land capability and historic use;
- detailed assessment of archaeological and heritage resources, and

- additional waste characterization studies, including detailed mineralogical and petrographic studies, and kinetic test work (such as humidity cell and column leach tests) to further define possible waste rock handling, segregation and disposal strategies.

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APPENDIX I

SITE TEMPERATURE DATA (1994 - 1995)

APPENDIX I
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1994 JULY & AUGUST TEMPERATURE (°C)

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July	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22	14.3	14.9	17.5
23	16.6	M	18.3
24	17.5	16.0	18.5
25	17.6	16.9	19.0
26	11.9	16.1	17.5
27	12.0	16.8	19.3
28	M	14.6	15.3
29	12.0	16.0	17.5
30	8.3	M	15.5
31	7.7	11.2	15.5
Average	13.3	15.4	17.8

Aug.	Site	Dease	Telegraph
1	8.6	13.4	15.5
2	10.7	16.2	21.0
3	15.6	20.5	21.0
4	13.9	17.1	19.5
5	14.1	18.6	21.0
6	12.3	M	20.8
7	14.7	18.9	20.0
8	12.1	17.4	22.5
9	13.3	17.3	21.3
10	15.2	18.9	21.5
11	M	17.5	20.0
12	15.1	17.1	20.0
13	16.0	M	21.0
14	11.1	14.8	15.5
15	8.6	11.7	13.5
16	8.3	14.5	17.5
17	11.3	14.4	17.5
18	11.3	16.0	16.5
19	13.0	16.4	17.3
20	13.5	M	17.3
21	9.5	M	14.5
22	5.5	10.5	14.0
23	5.2	7.1	13.3
24	5.7	10.1	14.0
25	4.8	10.0	14.0
26	8.3	10.7	13.8
27	11.6	M	15.0
28	12.3	12.5	14.8
29	11.8	12.2	12.3
30	10.2	12.2	13.5
31	8.1	12.3	14.3
Average	10.7	14.4	17.0

Notes:
1) Averages are for concurrent days of data only.
2) M = missing data

APPENDIX I (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1994 SEPTEMBER & OCTOBER TEMPERATURE (°C)

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Sept.	Site	Dease	Telegraph
1	6.5	7.6	10.8
2	4.9	6.0	10.5
3	M	M	13.0
4	3.4	8.2	11.3
5	3.6	10.5	12.5
6	M	7.6	M
7	2.9	9.8	M
8	3.1	6.9	11.8
9	4.6	8.4	10.5
10	3.7	M	9.3
11	2.1	2.5	8.5
12	4.7	7.2	10.5
13	5.0	9.4	13.3
14	5.2	9.0	10.8
15	4.7	10.4	11.3
16	4.0	5.6	9.8
17	6.3	M	10.8
18	4.2	M	8.0
19	3.2	4.6	8.3
20	0.6	3.9	5.8
21	M	8.1	9.0
22	M	7.3	10.0
23	M	4.4	7.3
24	M	9.2	10.5
25	M	M	9.0
26	M	4.8	7.8
27	M	3.9	7.5
28	M	4.0	5.8
29	M	2.1	3.8
30	M	2.1	4.0
Average	4.0	7.2	10.4

Oct.	Site	Dease	Telegraph
1	M	2.3	6.0
2	M	3.5	4.0
3	5.3	7.5	8.8
4	M	9.7	11.8
5	3.4	6.1	M
6	2.3	5.2	M
7	0.1	3.1	M
8	0.6	M	6.0
9	-0.5	1.6	5.5
10	M	2.2	4.8
11	-1.3	0.4	2.0
12	M	4.3	4.3
13	M	1.3	4.5
14	-1.3	3.2	5.5
15	0.1	2.3	4.5
16	1.6	6.6	6.5
17	-0.5	2.0	6.3
18	0.5	-0.6	2.5
19	-0.2	2.3	3.8
20	-0.9	2.7	4.5
21	-1.3	1.2	5.0
22	-3.3	M	2.5
23	-5.3	-3.3	0.3
24	-1.4	3.7	0.8
25	M	2.3	1.5
26	-1.8	3.7	2.3
27	-2.9	2.9	4.0
28	-3.8	-0.3	2.3
29	-2.3	2.3	3.0
30	-5.1	-2.3	1.5
31	-5.8	-6.5	-2.8
Average	-1.4	1.5	3.5

Notes:
1) Averages are for concurrent days of data only.
2) M = missing data

APPENDIX I (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1994 NOVEMBER & DECEMBER TEMPERATURE (°C)

3/18/96 8:51 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_temp

Nov.	Site	Dease	Telegraph
1	-5.9	-6.0	-3.0
2	-8.0	-7.4	-5.0
3	-1.5	-1.1	-1.3
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Average	-5.1	-4.8	-3.1

Dec.	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Average			

Notes:
1) Averages are for concurrent days of data only.
2) M = missing data

APPENDIX I (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 MAY & JUNE TEMPERATURE (°C)

3/18/96 8:51 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_temp

May	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26	16.8	14.0	14.5
27	11.9	13.2	13.0
28*	M	9.9	12.8
29*	M	7.6	12.3
30	3.1	7.5	11.5
31	3.6	6.8	10.3
Average	8.8	10.4	12.3

June	Site	Dease	Telegraph
1	4.5	8.5	11.3
2	3.3	8.7	10.8
3	4.8	7.2	12.5
4	7.8	10.8	14.5
5	4.0	7.5	12.3
6	4.8	8.6	11.0
7	9.3	13.0	15.0
8	13.5	15.2	18.3
9	15.0	18.1	21.5
10	18.8	17.8	20.3
11	10.3	15.8	M
12	6.3	7.9	12.5
13	6.3	10.9	13.8
14	5.6	9.5	12.3
15	6.4	12.5	16.8
16	6.6	11.8	15.8
17	6.3	13.7	15.5
18	9.0	15.3	17.8
19	13.4	14.7	16.8
20	15.0	14.6	17.0
21	13.9	14.8	17.5
22	13.9	13.4	18.0
23	7.3	9.3	12.0
24	5.5	7.0	11.3
25	4.5	9.3	M
26	10.6	11.0	M
27	15.5	13.6	M
28	17.1	15.7	M
29	15.5	17.1	19.8
30	16.8	18.5	20.3
Average	9.3	12.3	15.4

Notes:
1) Averages are for concurrent days of data only.
2) M = missing data

APPENDIX I (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 JULY & AUGUST TEMPERATURE (°C)

3/18/96 8:51 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_temp

July	Site	Dease	Telegraph
1	12.3		
2	7.0		
3	8.5		
4	7.9		
5	5.4		
6	8.4		
7	11.1		
8	10.5		
9	11.8		
10	11.3		
11	10.5		
12	7.3		
13	8.1		
14	7.8		
15	6.5		
16	6.5		
17	10.0		
18	13.5		
19	13.6		
20	11.9		
21	14.9		
22	13.9		
23	7.3		
24	4.6		
25	7.4		
26	5.9		
27	4.5		
28	5.9		
29	8.3		
30	6.3		
31	4.5		
Average	8.8		

Aug.	Site	Dease	Telegraph
1	5.6		
2	9.0		
3	7.6		
4	6.5		
5	5.4		
6	5.1		
7	6.9		
8	9.5		
9	7.6		
10	9.9		
11	8.5		
12	8.5		
13	7.0		
14	5.4		
15*	M		
16	4.0		
17	7.0		
18	7.8		
19	7.5		
20	6.8		
21	6.8		
22	7.5		
23	6.8		
24	7.0		
25	5.3		
26	5.0		
27	5.5		
28	4.8		
29	4.3		
30	5.0		
31*			
Average	6.7		

Notes:
1) Averages are for concurrent days of data only.
2) M = missing data

APPENDIX I (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 SEPTEMBER & OCTOBER TEMPERATURE (°C)

3/18/96 8:51 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_temp

Sept.	Site	Dease	Telegraph
1	6.4		
2	8.1		
3	6.1		
4*	M		
5	12.0		
6	13.3		
7	14.5		
8	13.1		
9*	M		
10	8.0		
11	7.3		
12	3.8		
13	3.6		
14	7.3		
15	6.5		
16	6.0		
17	6.8		
18	4.6		
19	6.5		
20	8.5		
21	10.9		
22	14.1		
23	14.4		
24	15.0		
25	12.6		
26	8.5		
27	5.9		
28	5.8		
29	3.4		
30	1.8		
31			
Average	8.4		

Oct.	Site	Dease	Telegraph
1	1.3		
2	1.8		
3	0.8		
4*	M		
5	0.5		
6*	M		
7	1.4		
8	1.3		
9	-0.1		
10	-1.1		
11	-0.8		
12	-1.9		
13	0.6		
14*	M		
15	-3.1		
16	-4.4		
17	-2.8		
18	-1.4		
19	-1.0		
20	-1.9		
21	-3.4		
22	-4.1		
23	0.5		
24	0.5		
25	0.5		
26	-2.8		
27	-5.5		
28	-5.8		
29	-7.3		
30	-5.8		
31	-5.8		
Average	-1.8		

Notes:
1) Averages are for concurrent days of data only.
2) M = missing data

APPENDIX I (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 NOVEMBER & DECEMBER TEMPERATURE (°C)

3/18/96 8:51 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_temp

Nov.	Site	Dease	Telegraph
1	-2.5		
2	-5.5		
3	-5.4		
4	-5.5		
5	-8.3		
6	-10.3		
7	-12.5		
8	-16.8		
9	-20.3		
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Average	-9.7		

Dec.	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Average			

Notes:
1) Averages are for concurrent days of data only.
2) M = missing data

APPENDIX II

SITE PRECIPITATION DATA (1994 - 1995)

APPENDIX II
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1994 JULY & AUGUST PRECIPITATION (mm)

3/18/96 8:59 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_precip

July	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25	Start		
26	1.6	1.2	0.4
27	1.5	0.2	
28	0.3	8.6	5.4
29	17.8	2.0	1.4
30	1.6	3.1	3.8
31	7.8	0.2	0.4
Total	30.6	15.3	11.4

Aug.	Site	Dease	Telegraph
1		T	
2		0.2	
3			0.4
4	7.0	3.6	
5	2.4	17.5	0.3
6	1.0	14.4	
7	9.8	1.2	
8	0.2		
9			
10			
11			
12			
13	3.7		
14	19.7	12.0	17.6
15	1.3	10.8	23.5
16			0.2
17			
18			
19			2.8
20	15.2		
21	3.0	5.4	2.0
22	3.8	1.4	2.0
23	2.5	4.4	T
24	7.7	2.2	3.2
25	1.0		
26			
27			
28			
29			0.6
30	2.3	6.0	1.0
31	4.8	0.4	0.4
Total	85.4	79.5	54.0

Notes:
1) Totals are for concurrent days of data only.
2) T = Trace of Precipitation

APPENDIX II (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1994 SEPTEMBER & OCTOBER PRECIPITATION (mm)

3/18/96 8:59 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_precip

Sept.	Site	Dease	Telegraph
1		5.0	1.0
2	5.5	15.8	0.4
3	2.4		
4	1.2	2.2	1.8
5	6.8	3.2	1.6
6	5.1	4.2	1.8
7	3.8	2.2	0.2
8	1.6		
9		4.6	0.6
10	4.0	2.6	1.6
11		2.0	0.4
12	4.6	14.6	6.4
13	12.6	1.2	0.4
14	0.2	2.2	9.8
15	6.6	T	1.2
16	3.6	9.2	19.2
17	5.4	1.0	0.2
18	0.8	0.4	1.4
19		0.6	0.2
20		1.6	6.8
21	1.9	10.4	47.8
22	18.6	1.4	0.2
23		1.4	5.4
24	1.3		0.6
25	0.5		15.6
26		7.8	0.4
27	9.3	2.8	
28			T
29			6.4
30		6.0	
Total	95.8	102.4	131.4

Oct.	Site	Dease	Telegraph
1	10.0		
2			0.4
3			0.6
4		0.2	1.6
5	1.5	0.4	0.2
6	0.3	0.8	T
7		0.4	1.0
8			0.2
9			
10		T	
11		T	0.5
12	1.0	T	
13	0.1	0.6	0.4
14	1.2	T	
15		2.0	13.0
16	2.4	1.2	3.6
17	0.4	T	T
18		T	0.4
19		T	0.2
20	0.4	6.2	6.4
21		0.2	T
22			
23		3.0	C
24	0.8	0.8	12.3
25	1.6	0.8	1.0
26			
27			
28			
29		C	
30		1.0	
31			
Total	19.7	17.6	41.8

Notes:
1) Totals are for concurrent days of data only.
2) T = Trace of Precipitation
3) C = Precipitation Occured, Amount Unknown

APPENDIX II (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1994 NOVEMBER & DECEMBER PRECIPITATION (mm)

3/18/96 8:59 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_precip

Nov.	Site	Dease	Telegraph
1			
2	1.0	0.4	2.0
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Total			

Dec.	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Total			

Notes:
1) Totals are for concurrent days of data only.
2) T = Trace of Precipitation

APPENDIX II (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 MAY & JUNE PRECIPITATION (mm)

3/18/96 8:59 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_precip

May	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28	1.0	M	M
29	0.2	3.4	M
30		4.4	M
31		4.2	M
Total			

June	Site	Dease	Telegraph
1	1.6	3.2	0.5
2	0.6	0.6	
3		0.2	
4	2.8	3.0	3.6
5	3.2	2.6	
6			
7			
8			
9			
10			
11		2.4	6.6
12	3.2	10.6	1.0
13		0.6	
14	1.4		
15			
16		0.4	
17	2.2		12.0
18	3.4		0.2
19			
20			
21			
22		0.6	0.6
23	0.4	1.2	
24		0.2	
25			
26			
27			
28			
29			
30		T	
Total	18.8	25.6	24.5

Notes:
1) Totals are for concurrent days of data only.
2) T = Trace of Precipitation
3) M = Missing Value

APPENDIX II (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 JULY & AUGUST PRECIPITATION (mm)

3/18/96 8:59 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_precip

July	Site	Dease	Telegraph
1	10.2		
2	3.0		
3	2.9		
4	10.3		
5	6.3		
6	1.5		
7	1.2		
8			
9	1.8		
10	1.0		
11	6.2		
12			
13	0.2		
14	0.4		
15			
16	3.0		
17			
18			
19			
20	1.0		
21			
22	0.8		
23	1.0		
24	9.5		
25	5.2		
26	8.3		
27	2.2		
28	2.0		
29			
30	8.3		
31	1.6		
Total	87.9		

Aug.	Site	Dease	Telegraph
1	0.4		
2	1.5		
3	3.0		
4	1.4		
5			
6	6.0		
7	0.5		
8	6.4		
9	2.2		
10	0.1		
11	2.8		
12	6.6		
13	6.4		
14	4.8		
15	15.0		
16			
17			
18			
19	7.2		
20	0.6		
21	1.8		
22	10.0		
23	5.2		
24	7.2		
25	1.2		
26	3.2		
27			
28			
29			
30			
31	2.4		
Total	95.9		

Notes:
1) Totals are for concurrent days of data only.
2) T = Trace of Precipitation

APPENDIX II (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 SEPTEMBER & OCTOBER PRECIPITATION (mm)

3/18/96 8:59 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_precip

Sept.	Site	Dease	Telegraph
1	0.6		
2			
3			
4			
5			
6			
7			
8			
9	1.3		
10	2.6		
11	3.7		
12			
13			
14	2.2		
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26	2.6		
27	0.2		
28			
29	0.1		
30	2.0		
31			
Total	15.3		

Oct.	Site	Dease	Telegraph
1	1.0		
2			
3	1.5		
4	0.2		
5	0.6		
6	1.0		
7			
8	1.4		
9	0.8		
10			
11			
12	0.8		
13	1.0		
14			
15			
16	3.0		
17	2.2		
18	0.5		
19	0.5		
20	3.0		
21	5.5		
22	1.0		
23	1.2		
24	1.0		
25	5.0		
26	0.4		
27			
28	2.6		
29			
30			
31			
Total	34.2		

Notes:
1) Totals are for concurrent days of data only.
2) T = Trace of Precipitation

APPENDIX II (cont'd)
AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

1995 NOVEMBER & DECEMBER PRECIPITATION (mm)

3/18/96 8:59 L:\HALLAM\H3071\DATA\[METEOROL.XLS]site_precip

Nov.	Site	Dease	Telegraph
1			
2			
3	2.6		
4	2.0		
5	6.6		
6			
7			
8	6.2		
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Total			

Dec.	Site	Dease	Telegraph
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
Total			

Notes:
1) Totals are for concurrent days of data only.
2) T = Trace of Precipitation

APPENDIX III

SITE HYDROLOGY DATA (1994 - 1995)

TABLE III.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY STATIONS "H1", "H3", "H4" "H5"
STAFF GAUGE HEIGHTS FLOWS

3/18/96 9:54 L:\HALLAM\H3071\DATA\HYDROL\[HYDROL3.XLS]appendix_tab

	H1		H3		H4		H5	
Date	Gauge Ht.	Flow	Gauge Ht.	Flow	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
7/20/94	0.808	0.430						
7/21/94			0.310	0.147	0.120	0.075	0.170	0.047
7/24/94	0.750	0.297	0.326	0.179	0.110	0.060	0.160	0.039
7/27/94	0.726	0.252	0.320	0.167	0.106	0.055	0.157	0.037
7/30/94	0.730	0.259	0.355	0.251	0.118	0.072	0.163	0.041
8/2/94	0.700	0.210	0.327	0.181	0.112	0.063	0.159	0.038
8/5/94	0.662	0.159	0.314	0.155	0.102	0.050	0.154	0.034
8/8/94	0.598	0.096	0.325	0.177	0.102	0.050	0.155	0.035
8/11/94	0.527	0.051	0.305	0.138	0.106	0.055	0.148	0.030
8/14/94	0.546	0.061	0.286	0.107	0.108	0.057	0.162	0.040
8/17/94	0.568	0.074	0.310	0.147	0.098	0.045	0.161	0.040
8/20/94	0.692	0.198	0.355	0.251	0.132	0.095	0.177	0.054
8/23/94	0.685	0.189	0.316	0.158	0.110	0.060	0.168	0.046
8/26/94	0.714	0.232	0.305	0.138	0.112	0.063	0.168	0.046
8/29/94	0.735	0.268	0.290	0.113	0.100	0.047	0.159	0.038
8/31/94	0.818	0.458	0.313	0.153	0.113	0.064	0.168	0.046
9/3/94	0.865	0.605	0.318	0.162	0.114	0.066	0.165	0.043
9/6/94	0.901	0.742	0.330	0.188	0.128	0.088	0.185	0.062
9/9/94	0.888	0.690	0.311	0.149	0.118	0.072	0.168	0.046
9/12/94	0.912	0.789	0.328	0.184	0.125	0.083	0.180	0.057
9/15/94	0.975	1.101	0.332	0.193	0.148	0.126	0.194	0.073
9/18/94	0.986	1.165	0.322	0.171	0.142	0.114	0.188	0.066
9/24/94	1.003	1.269	0.333	0.195	0.170	0.179	0.216	0.103
9/27/94	1.002	1.263	0.380	0.328	0.170	0.179	0.208	0.091
9/30/94	1.010	1.314	0.338	0.207	0.158	0.149	0.190	0.068
10/3/94	1.001	1.256	0.340	0.212	0.153	0.137	0.190	0.068
10/5/94	1.001	1.256	0.348	0.232	0.170	0.179	0.210	0.094
10/8/94	0.994	1.213	0.337	0.204	0.155	0.142	0.202	0.083
10/11/94	0.992	1.201	0.330	0.188	0.150	0.131	0.215	0.102
10/14/94	0.974	1.096	0.333	0.195	0.136	0.102	0.180	0.057
10/17/94	0.985	1.159	0.350	0.237	0.160	0.154	0.180	0.057
10/20/94	0.976	1.107	0.328	0.184	0.142	0.114	0.174	0.051
10/23/94	0.942	0.927	0.314	0.155	0.130	0.091	0.250	0.166
10/26/94	0.944	0.937	0.323	0.173	0.123	0.080	0.170	0.047
10/29/94	0.921	0.828	0.314	0.155	0.127	0.086	0.222	0.113
10/31/94	0.885	0.679	0.300	0.129	0.100	0.047	0.310	0.333
11/3/94	0.867	0.612	0.320	0.167	0.102	0.050		
4/28/95	0.782	0.366	0.328	0.184	0.115	0.067		

TABLE III.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY STATIONS "H1", "H3", "H4" "H5"
STAFF GAUGE HEIGHTS FLOWS

3/18/96 9:54 L:\HALLAM\H3071\DATA\HYDROL [HYDROL3.XLS]appendix_tab

	H1		H3		H4		H5	
Date	Gauge Ht.	Flow	Gauge Ht.	Flow	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
5/2/95	0.826	0.481	0.335	0.200	0.165	0.166		
5/5/95	0.853	0.564	0.340	0.212	0.195	0.252	0.150	0.032
5/8/95	0.910	0.780	0.360	0.265	0.325	0.903	0.222	0.113
5/11/95	1.080	1.837	0.440	0.586	0.400	1.518	0.290	0.268
5/14/95	1.198	3.085	0.430	0.535	0.330	0.938	0.340	0.450
5/17/95	0.972	1.085	0.365	0.280	0.150	0.131	0.212	0.097
5/18/95	0.950	0.967	0.340	0.212	0.150	0.131	0.213	0.098
5/21/95	0.910	0.780	0.320	0.167	0.118	0.072	0.188	0.066
5/24/95	0.896	0.722	0.305	0.138	0.110	0.060	0.202	0.083
5/27/95	0.890	0.698	0.295	0.121	0.086	0.033	0.186	0.063
5/30/95	0.870	0.623	0.300	0.129	0.070	0.019	0.187	0.065
6/3/95	0.840	0.523	0.288	0.110	0.070	0.019	0.168	0.046
6/6/95	0.850	0.555	0.288	0.110	0.073	0.022	0.167	0.045
6/9/95	0.877	0.648	0.272	0.088	0.074	0.022	0.166	0.044
6/12/95	0.890	0.698	0.292	0.116	0.074	0.022	0.162	0.040
6/15/95	0.900	0.738	0.272	0.088	0.072	0.021	0.160	0.039
6/18/95	0.914	0.797	0.264	0.078	0.068	0.018	0.154	0.034
6/22/95	0.928	0.860	0.258	0.071	0.064	0.016	0.150	0.032
6/24/95	0.928	0.860	0.256	0.069	0.070	0.019	0.150	0.032
6/27/95	0.948	0.957	0.250	0.063	0.062	0.014	0.146	0.029
6/30/95	0.965	1.046	0.238	0.052	0.060	0.013	0.142	0.026
7/3/95	1.000	1.250	0.256	0.069	0.057	0.012	0.148	0.030
7/6/95	1.040	1.521	0.270	0.085	0.071	0.020	0.160	0.039
7/9/95	1.020	1.380	0.256	0.069	0.071	0.020	0.150	0.032
7/12/95	1.023	1.401	0.260	0.073	0.080	0.027	0.151	0.032
7/15/95	1.018	1.367	0.253	0.066	0.075	0.023	0.140	0.025
7/19/95	0.978	1.118	0.238	0.052			0.138	0.024
7/20/95					0.075	0.023		
7/23/95	0.979	1.124	0.250	0.063	0.066	0.017	0.149	0.031
7/27/95	1.026	1.421	0.280	0.098	0.075	0.023	0.153	0.034
7/31/95	1.022	1.394	0.283	0.102	0.078	0.025	0.150	0.032

TABLE III.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY STATIONS "H1", "H3", "H4" "H5"
STAFF GAUGE HEIGHTS FLOWS

3/18/96 9:54 L:\HALLAM\H3071\DATA\HYDROL\[HYDROL3.XLS]appendix_tab

	H1		H3		H4		H5	
Date	Gauge Ht.	Flow	Gauge Ht.	Flow	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)
8/4/95	1.020	1.380	0.277	0.094	0.076	0.024	0.151	0.032
8/7/95	1.030	1.449	0.263	0.077	0.077	0.025	0.150	0.032
8/10/95	1.050	1.595	0.272	0.088	0.072	0.021	0.152	0.033
8/14/95	1.060	1.673	0.300	0.129	0.086	0.033	0.169	0.046
8/18/95	1.090	1.923	0.312	0.151	0.096	0.043	0.172	0.049
8/21/95	1.098	1.995	0.302	0.132	0.102	0.050	0.174	0.051
8/23/95	1.119	2.193						
8/24/95					0.163	0.161		
8/25/95							0.192	0.070
8/26/95								
8/27/95	1.100	2.013	0.318	0.162	0.146	0.122	0.176	0.053
9/1/95	1.096	1.977	0.316	0.158	0.132	0.095	0.170	0.047
9/6/95	1.062	1.689	0.300	0.129	0.100	0.047	0.161	0.040
9/9/95	1.048	1.580	0.300	0.129	0.100	0.047	0.160	0.039
9/12/95	1.045	1.558	0.300	0.129	0.103	0.051	0.162	0.040
9/15/95	1.048	1.580	0.300	0.129	0.130	0.091	0.168	0.046
9/16/95	1.050	1.595	0.300	0.129	0.138	0.106	0.170	0.047
9/19/95	1.038	1.506	0.236	0.050	0.108	0.057	0.178	0.055
9/22/95	1.022	1.394	0.258	0.071	0.084	0.031	0.188	0.066
9/25/95	1.020	1.380	0.280	0.098	0.080	0.027	0.150	0.032
9/29/95	1.020	1.380	0.282	0.101	0.082	0.029	0.155	0.035
10/2/95	1.020	1.380	0.284	0.104	0.078	0.025	0.152	0.033
10/6/95	1.030	1.449	0.287	0.108	0.088	0.034	0.150	0.032
10/10/95	1.025	1.414	0.280	0.098	0.078	0.025	0.146	0.029
10/14/95	1.012	1.327	0.274	0.090	0.076	0.024	0.148	0.030
10/17/95	1.004	1.275	0.274	0.090	0.078	0.025	0.170	0.047
10/22/95	1.010	1.314	0.275	0.092	0.078	0.025	0.178	0.055
10/28/95	1.000	1.250	0.266	0.080	0.072	0.021	0.180	0.057
10/31/95			0.426	0.516	0.070	0.019		
11/26/95			0.268	0.083				

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H307I\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date	Logger		Staff Gauge	
	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)
7/20/94			0.325	0.771
7/21/94				
7/24/94			0.320	0.744
7/27/94			0.290	0.595
7/30/94			0.292	0.604
8/2/94			0.275	0.527
8/5/94			0.280	0.549
8/8/94			0.278	0.540
8/11/94			0.263	0.476
8/14/94			0.273	0.518
8/17/94			0.260	0.464
8/20/94			0.290	0.595
8/23/94			0.280	0.549
8/26/94			0.275	0.527
8/29/94			0.260	0.464
8/31/94			0.260	0.464
9/3/94			0.252	0.432
9/6/94			0.275	0.527
9/9/94			0.260	0.464
9/12/94			0.283	0.562
9/15/94			0.324	0.766
9/18/94			0.326	0.776
9/24/94			0.370	1.036
9/27/94			0.340	0.855
9/30/94			0.315	0.718
10/3/94			0.310	0.692
10/5/94			0.318	0.734
10/8/94			0.310	0.692
10/11/94			0.305	0.667
10/14/94			0.290	0.595
10/17/94			0.288	0.585
10/19/94	0.323	0.575		
10/20/94	0.320	0.562	0.268	0.497
10/21/94	0.312	0.526		
10/22/94	0.305	0.498		
10/23/94	0.314	0.535	0.292	0.604
10/24/94	0.312	0.527		
10/25/94	0.306	0.500		
10/26/94	0.302	0.485	0.250	0.424
10/27/94	0.296	0.458		
10/28/94	0.288	0.428		
10/29/94	0.299	0.471	0.267	0.493
10/30/94	0.288	0.428		
10/31/94	0.335	0.632	0.300	0.642

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date	Logger		Staff Gauge	
	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)
11/1/94	0.401	0.999		
11/2/94	0.471	1.488		
11/3/94	0.546	2.149		
11/4/94	0.557	2.250		
11/5/94	0.555	2.231		
11/6/94	0.607	2.773		
11/7/94	0.654	3.324		
11/8/94	0.669	3.518		
11/9/94	0.667	3.482		
11/10/94	0.737	4.436		
11/11/94	0.742	4.506		
11/12/94	0.739	4.461		
11/13/94	0.731	4.341		
11/14/94	0.708	4.024		
11/15/94	0.689	3.766		
11/16/94	0.652	3.304		
11/17/94	0.628	3.017		
11/18/94	0.629	3.023		
11/19/94	0.578	2.469		
11/20/94	0.549	2.176		
11/21/94	0.534	2.030		
11/22/94	0.461	1.416		
11/23/94	0.338	0.649		
11/24/94	0.239	0.262		
11/25/94	0.237	0.254		
11/26/94	0.235	0.248		
11/27/94	0.234	0.246		
11/28/94	0.231	0.237		
11/29/94	0.230	0.235		
11/30/94	0.231	0.236		
12/1/94	0.227	0.226		
12/2/94	0.225	0.221		
12/3/94	0.224	0.219		
12/4/94	0.224	0.220		
12/5/94	0.225	0.221		
12/6/94	0.223	0.217		
12/7/94	0.222	0.213		
12/8/94	0.220	0.209		
12/9/94	0.219	0.207		
12/10/94	0.219	0.206		
12/11/94	0.218	0.204		
12/12/94	0.218	0.203		
12/13/94	0.218	0.202		
12/14/94	0.217	0.201		
12/15/94	0.217	0.200		
12/16/94	0.216	0.198		
12/17/94	0.215	0.194		

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date (mm/dd/yy)	Logger		Staff Gauge	
	Gauge Ht. (m)	Flow (m^3/s)	Gauge Ht. (m)	Flow (m^3/s)
12/18/94	0.214	0.192		
12/19/94	0.216	0.198		
12/20/94	0.216	0.199		
12/21/94	0.214	0.193		
12/22/94	0.215	0.195		
12/23/94	0.214	0.193		
12/24/94	0.213	0.190		
12/25/94	0.212	0.188		
12/26/94	0.212	0.188		
12/27/94	0.211	0.186		
12/28/94	0.211	0.186		
12/29/94	0.210	0.183		
12/30/94	0.209	0.181		
12/31/94	0.208	0.179		
1/1/95	0.208	0.179		
1/2/95	0.207	0.176		
1/3/95	0.208	0.177		
1/4/95	0.205	0.171		
1/5/95	0.204	0.170		
1/6/95	0.203	0.166		
1/7/95	0.202	0.164		
1/8/95	0.201	0.162		
1/9/95	0.201	0.161		
1/10/95	0.200	0.159		
1/11/95	0.200	0.161		
1/12/95	0.199	0.157		
1/13/95	0.199	0.157		
1/14/95	0.197	0.154		
1/15/95	0.197	0.154		
1/16/95	0.197	0.154		
1/17/95	0.197	0.153		
1/18/95	0.196	0.151		
1/19/95	0.194	0.148		
1/20/95	0.195	0.148		
1/21/95	0.194	0.147		
1/22/95	0.194	0.146		
1/23/95	0.193	0.144		
1/24/95	0.193	0.144		
1/25/95	0.192	0.142		
1/26/95	0.191	0.141		
1/27/95	0.190	0.139		
1/28/95	0.190	0.139		
1/29/95	0.190	0.138		
1/30/95	0.189	0.136		
1/31/95	0.188	0.135		
2/1/95	0.188	0.133		
2/2/95	0.187	0.133		

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L: HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date	Logger		Staff Gauge	
	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)
2/3/95	0.187	0.132		
2/4/95	0.185	0.129		
2/5/95	0.186	0.131		
2/6/95	0.185	0.128		
2/7/95	0.184	0.127		
2/8/95	0.184	0.127		
2/9/95	0.184	0.126		
2/10/95	0.184	0.126		
2/11/95	0.184	0.125		
2/12/95	0.183	0.125		
2/13/95	0.183	0.125		
2/14/95	0.183	0.124		
2/15/95	0.182	0.123		
2/16/95	0.181	0.121		
2/17/95	0.179	0.117		
2/18/95	0.179	0.116		
2/19/95	0.179	0.117		
2/20/95	0.181	0.120		
2/21/95	0.179	0.116		
2/22/95	0.179	0.117		
2/23/95	0.178	0.115		
2/24/95	0.178	0.115		
2/25/95	0.178	0.114		
2/26/95	0.178	0.115		
2/27/95	0.177	0.112		
2/28/95	0.177	0.112		
3/1/95	0.176	0.112		
3/2/95	0.176	0.111		
3/3/95	0.176	0.111		
3/4/95	0.175	0.109		
3/5/95	0.174	0.108		
3/6/95	0.174	0.108		
3/7/95	0.174	0.108		
3/8/95	0.173	0.107		
3/9/95	0.173	0.106		
3/10/95	0.173	0.105		
3/11/95	0.173	0.106		
3/12/95	0.173	0.105		
3/13/95	0.173	0.105		
3/14/95	0.172	0.104		
3/15/95	0.172	0.105		
3/16/95	0.171	0.103		
3/17/95	0.171	0.103		
3/18/95	0.172	0.103		
3/19/95	0.171	0.103		
3/20/95	0.171	0.101		
3/21/95	0.170	0.101		

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date (mm/dd/yy)	Logger		Staff Gauge	
	Gauge Ht. (m)	Flow (m^3/s)	Gauge Ht. (m)	Flow (m^3/s)
3/22/95	0.170	0.101		
3/23/95	0.169	0.099		
3/24/95	0.168	0.098		
3/25/95	0.168	0.097		
3/26/95	0.169	0.098		
3/27/95	0.168	0.097		
3/28/95	0.170	0.101		
3/29/95	0.173	0.106		
3/30/95	0.177	0.113		
3/31/95	0.177	0.112		
4/1/95	0.174	0.108		
4/2/95	0.172	0.104		
4/3/95	0.175	0.109		
4/4/95	0.177	0.113		
4/5/95	0.172	0.105		
4/6/95	0.171	0.102		
4/7/95	0.170	0.100		
4/8/95	0.172	0.105		
4/9/95	0.175	0.110		
4/10/95	0.171	0.103		
4/11/95	0.170	0.100		
4/12/95	0.173	0.105		
4/13/95	0.171	0.103		
4/14/95	0.170	0.101		
4/15/95	0.169	0.099		
4/16/95	0.172	0.104		
4/17/95	0.171	0.103		
4/18/95	0.171	0.102		
4/19/95	0.173	0.106		
4/20/95	0.176	0.111		
4/21/95	0.182	0.122		
4/22/95	0.188	0.135		
4/23/95	0.192	0.142		
4/24/95	0.198	0.154		
4/25/95	0.203	0.166		
4/26/95	0.214	0.192		
4/27/95	0.222	0.213		
4/28/95	0.230	0.236		
4/29/95	0.247	0.284		
4/30/95	0.262	0.332		
5/1/95	0.259	0.323		
5/2/95	0.260	0.327		
5/3/95	0.264	0.339		
5/4/95	0.275	0.378		
5/5/95	0.298	0.467	0.250	0.424
5/6/95	0.324	0.583		
5/7/95	0.361	0.765		

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date	Logger		Staff Gauge	
(mm/dd/yy)	Gauge Ht. (m)	Flow (m^3/s)	Gauge Ht. (m)	Flow (m^3/s)
5/8/95	0.376	0.847	0.342	0.866
5/9/95	0.460	1.408		
5/10/95	0.524	1.941		
5/11/95	0.531	2.000		
5/12/95	0.514	1.846		
5/13/95	0.474	1.511		
5/14/95	0.509	1.807		
5/15/95	0.383	0.887		
5/16/95	0.295	0.457		
5/17/95				
5/18/95				
5/19/95				
5/20/95				
5/21/95				
5/22/95				
5/23/95				
5/24/95			0.500	0.599
5/25/95	0.480	0.627		
5/26/95	0.488	0.665		
5/27/95	0.486	0.656	0.500	0.599
5/28/95	0.482	0.640		
5/29/95	0.470	0.582		
5/30/95	0.442	0.458	0.480	0.510
5/31/95	0.433	0.422		
6/1/95	0.434	0.429		
6/2/95	0.428	0.405		
6/3/95	0.423	0.385	0.450	0.390
6/4/95	0.441	0.457		
6/5/95	0.434	0.428		
6/6/95	0.419	0.373	0.450	0.390
6/7/95	0.425	0.395		
6/8/95	0.438	0.445		
6/9/95	0.456	0.517	0.480	0.510
6/10/95	0.461	0.542		
6/11/95	0.455	0.515		
6/12/95	0.444	0.468	0.455	0.409
6/13/95	0.430	0.412		
6/14/95	0.425	0.395		
6/15/95	0.416	0.361	0.440	0.354
6/16/95	0.412	0.347		
6/17/95	0.411	0.343		
6/18/95	0.414	0.354	0.436	0.340
6/19/95	0.413	0.352		
6/20/95	0.413	0.351		
6/21/95	0.410	0.339		
6/22/95	0.406	0.328	0.432	0.327
6/23/95	0.396	0.294		

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date (mm/dd/yy)	Logger		Staff Gauge	
	Gauge Ht. (m)	Flow (m^3/s)	Gauge Ht. (m)	Flow (m^3/s)
6/24/95	0.386	0.265	0.422	0.294
6/25/95	0.380	0.246		
6/26/95	0.375	0.233		
6/27/95	0.373	0.228	0.400	0.229
6/28/95	0.375	0.233		
6/29/95	0.375	0.232		
6/30/95	0.374	0.231	0.387	0.195
7/1/95	0.380	0.246		
7/2/95	0.388	0.270		
7/3/95	0.382	0.252	0.395	0.216
7/4/95	0.391	0.277		
7/5/95	0.399	0.305		
7/6/95	0.404	0.320	0.425	0.304
7/7/95	0.393	0.286		
7/8/95	0.387	0.268		
7/9/95	0.383	0.256	0.390	0.203
7/10/95	0.380	0.248		
7/11/95	0.384	0.259		
7/12/95	0.377	0.238	0.400	0.229
7/13/95	0.371	0.221		
7/14/95	0.366	0.208		
7/15/95	0.361	0.195	0.395	0.216
7/16/95	0.360	0.193		
7/17/95	0.358	0.188		
7/18/95	0.355	0.181		
7/19/95	0.354	0.178	0.380	0.178
7/21/95	0.345	0.159		
7/22/95	0.346	0.164		
7/23/95	0.345	0.161	0.366	0.147
7/24/95	0.353	0.182		
7/25/95	0.367	0.220		
7/26/95	0.360	0.202		
7/27/95	0.365	0.216	0.387	0.195
7/28/95	0.355	0.193		
7/29/95	0.351	0.184		
7/30/95	0.362	0.213		
7/31/95	0.361	0.212	0.387	0.195
8/1/95	0.358	0.206		
8/2/95	0.356	0.201		
8/3/95	0.359	0.211		
8/4/95	0.363	0.222	0.390	0.203
8/5/95	0.356	0.205		
8/6/95	0.365	0.230		
8/7/95	0.360	0.219	0.388	0.198
8/8/95	0.378	0.272		
8/9/95	0.381	0.281		

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date	Logger		Staff Gauge	
	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)
8/10/95	0.376	0.266	0.410	0.258
8/11/95	0.374	0.263		
8/12/95	0.379	0.281		
8/13/95	0.381	0.288		
8/14/95	0.394	0.330	0.421	0.291
8/15/95	0.412	0.396		
8/16/95	0.420	0.430		
8/17/95	0.415	0.414		
8/18/95	0.415	0.415	0.450	0.390
8/19/95	0.411	0.400		
8/20/95	0.409	0.396		
8/21/95	0.410	0.402	0.448	0.383
8/22/95	0.413	0.415		
8/23/95	0.418	0.435		
8/24/95	0.422	0.453		
8/25/95	0.434	0.501	0.480	0.510
8/26/95	0.423	0.457	0.472	0.476
8/27/95	0.420	0.444	0.456	0.412
8/28/95	0.417	0.430		
8/29/95	0.413	0.418		
8/30/95	0.407	0.395		
8/31/95	0.410	0.404		
9/1/95	0.405	0.385	0.456	0.412
9/2/95	0.397	0.358		
9/3/95	0.391	0.337		
9/4/95	0.387	0.324		
9/5/95	0.385	0.318		
9/6/95	0.383	0.311	0.422	0.294
9/7/95	0.381	0.304		
9/8/95	0.379	0.297		
9/9/95	0.377	0.290	0.420	0.288
9/10/95	0.379	0.297		
9/11/95	0.390	0.334		
9/12/95	0.377	0.290	0.418	0.282
9/13/95	0.372	0.277		
9/14/95	0.377	0.292		
9/15/95	0.373	0.280	0.416	0.276
9/16/95	0.370	0.270	0.412	0.264
9/17/95	0.368	0.264		
9/18/95	0.364	0.251		
9/19/95	0.360	0.240	0.402	0.235
9/20/95	0.358	0.234		
9/21/95	0.357	0.231		
9/22/95	0.356	0.229	0.390	0.203
9/23/95	0.354	0.225		
9/24/95	0.352	0.220		
9/25/95	0.352	0.217	0.384	0.188

TABLE III.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

HYDROLOGY MONITORING STATION "H2" - LOGGER VS. STAFF GAUGE
GAUGE HEIGHTS DAILY FLOWS

3/18/96 10:07 L:\HALLAM\H3071\DATA\HYDROL\[REDFLOW3.XLS]appendix

Date	Logger		Staff Gauge	
	Gauge Ht.	Flow	Gauge Ht.	Flow
(mm/dd/yy)	(m)	(m^3/s)	(m)	(m^3/s)
9/26/95	0.354	0.224		
9/27/95	0.353	0.222		
9/28/95	0.350	0.213		
9/29/95	0.349	0.210	0.386	0.193
9/30/95	0.350	0.213		
10/1/95	0.347	0.207		
10/2/95	0.348	0.207	0.380	0.178
10/3/95	0.345	0.201		
10/4/95	0.345	0.200		
10/5/95	0.344	0.199		
10/6/95	0.341	0.192	0.378	0.174
10/7/95	0.340	0.188		
10/8/95	0.339	0.185		
10/9/95	0.338	0.182		
10/10/95	0.335	0.177	0.370	0.155
10/11/95	0.333	0.171		
10/12/95	0.331	0.166		
10/13/95	0.331	0.168		
10/14/95	0.328	0.161	0.362	0.138
10/15/95	0.325	0.154		
10/16/95	0.327	0.157		
10/17/95	0.330	0.164	0.358	0.130
10/18/95	0.327	0.158		
10/19/95	0.325	0.154		
10/20/95	0.324	0.151		
10/21/95	0.321	0.145		
10/22/95	0.324	0.150	0.363	0.140
10/23/95	0.322	0.146		
10/24/95	0.321	0.144		
10/25/95	0.321	0.144		
10/26/95	0.318	0.137		
10/27/95	0.311	0.123		
10/28/95	0.323	0.148	0.386	0.193
10/29/95	0.308	0.119		
10/30/95	0.317	0.136		
10/31/95	0.343	0.194		
11/1/95	0.328	0.159		
11/2/95	0.380	0.299		
11/3/95	0.411	0.407		
11/4/95	0.408	0.396		
11/5/95	0.389	0.329		
11/6/95	0.379	0.296		
11/7/95	0.375	0.286		
11/8/95	0.410	0.405		
11/9/95	0.445	0.547		
11/10/95	0.551	1.142		
11/11/95	0.480	0.716		

Table III.3

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROPERTY

1995 SUMMARY REPORT

SUMMARY OF HYDROLOGY STATION CALIBRATIONS

	H1		H2		H3		H4		H5	
Date	Flow (m^3/s)	Staff Gauge	Flow (m^3/s)	Staff Gauge	Flow (m^3/s)	Staff Gauge	Flow (m^3/s)	Staff Gauge	Flow (m^3/s)	Staff Gauge
Jul-94	1.414	0.808	0.805	0.325	0.206	0.310	0.087	0.120	0.058	0.170
Oct-94	1.137	0.985	0.568	0.288	0.257	0.350	0.148	0.160	0.081	0.180
Jul-95	0.162	0.978	0.213	0.380	0.054	0.238	0.036	0.075	0.024	0.138
Aug-95	1.300	1.119	0.497	0.480	N/A	N/A	0.141	0.163	0.064	0.192

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AMERICAN BULLION MINERALS LTD.
RED DHRIS PROPERTY

STAGE-DISCHARGE CURVE FOR GAUGE H1 - COYOTE CREEK BELOW WHITE ROCK WHITE ROCK CANYON

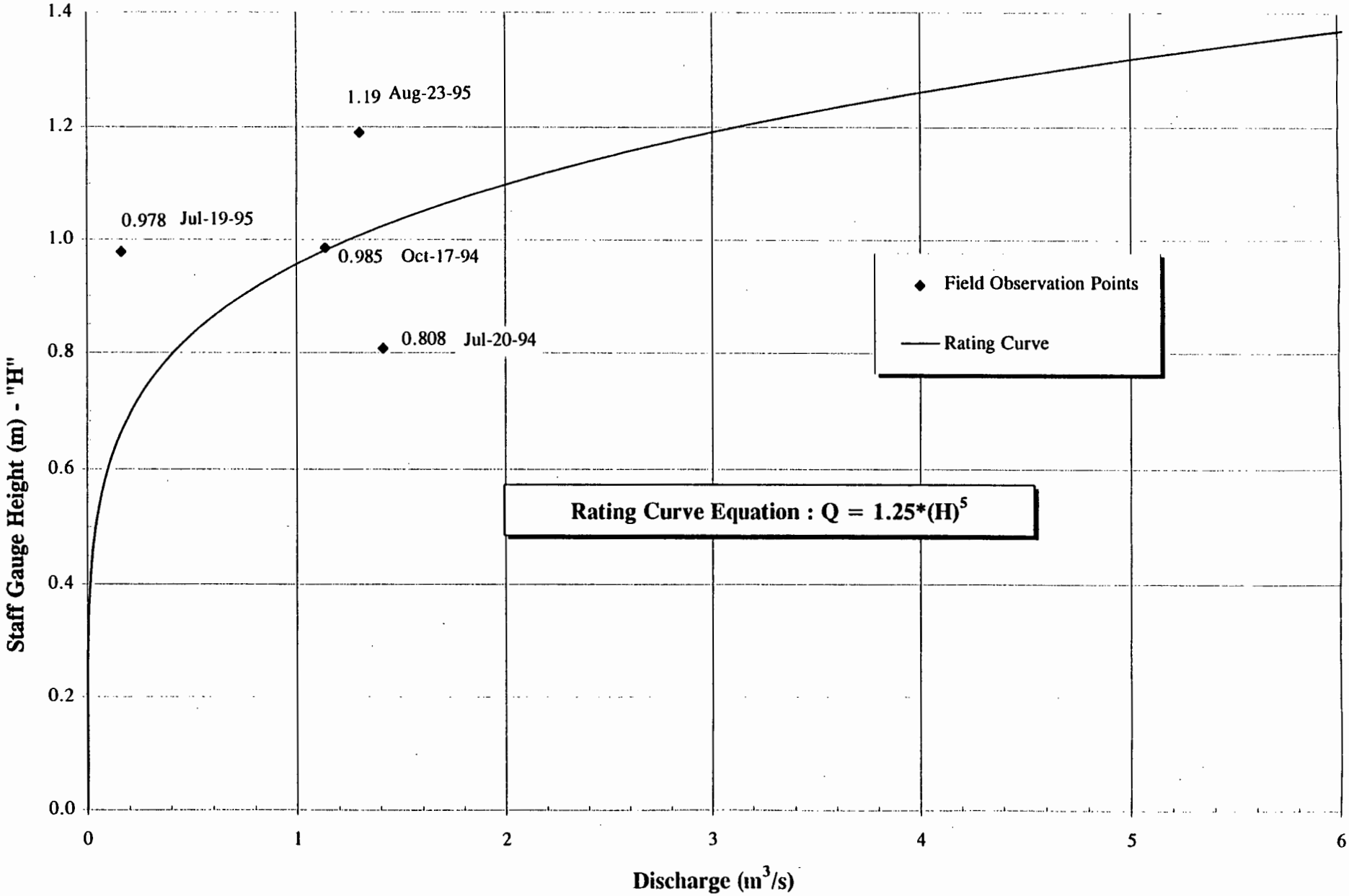
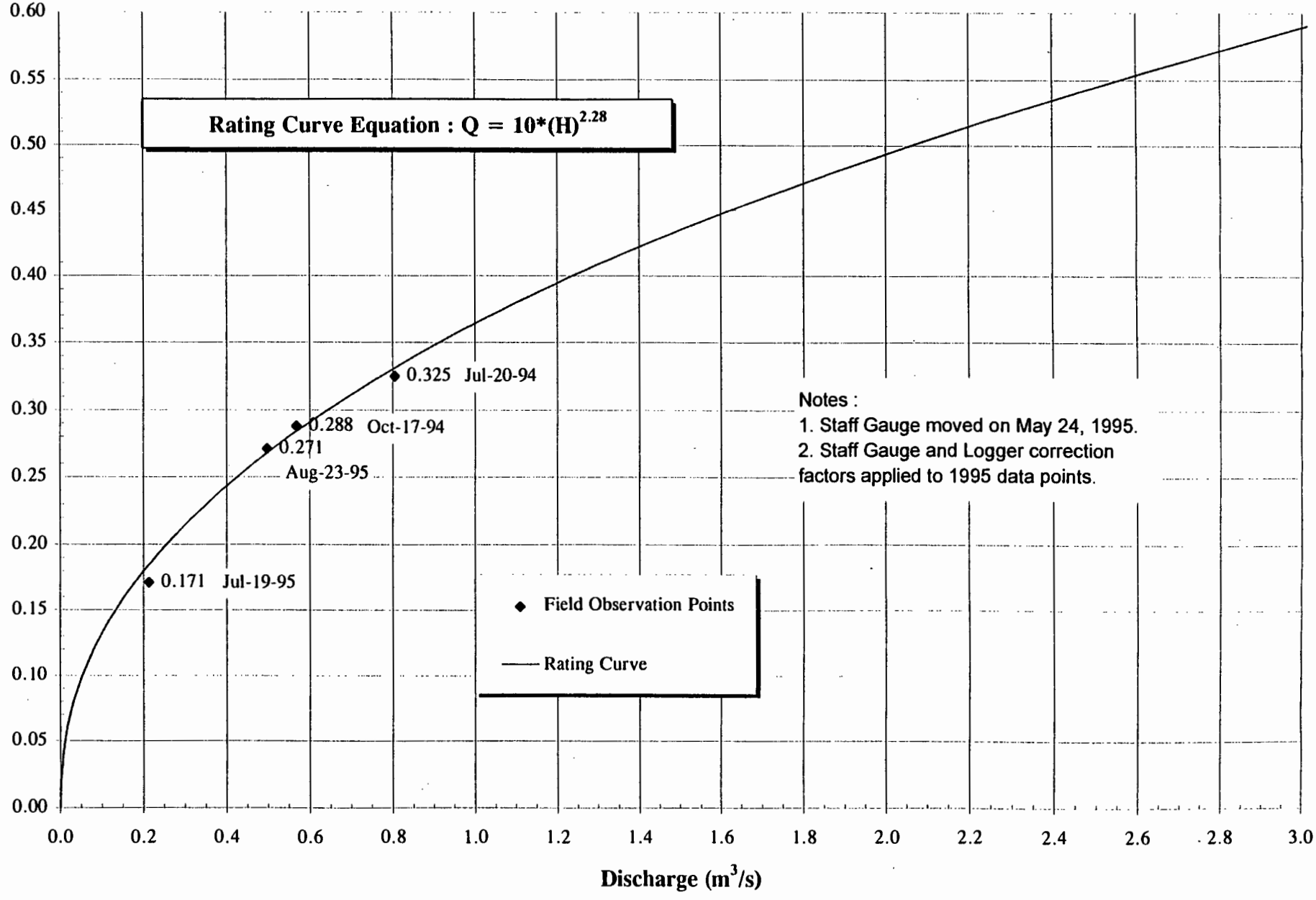


FIGURE III.1

AMERICAN BULLION MINERALS LTD.
RED DHRIS PROPERTY

STAGE-DISCHARGE CURVE FOR GAUGE H2 -WHITE ROCK CANYON

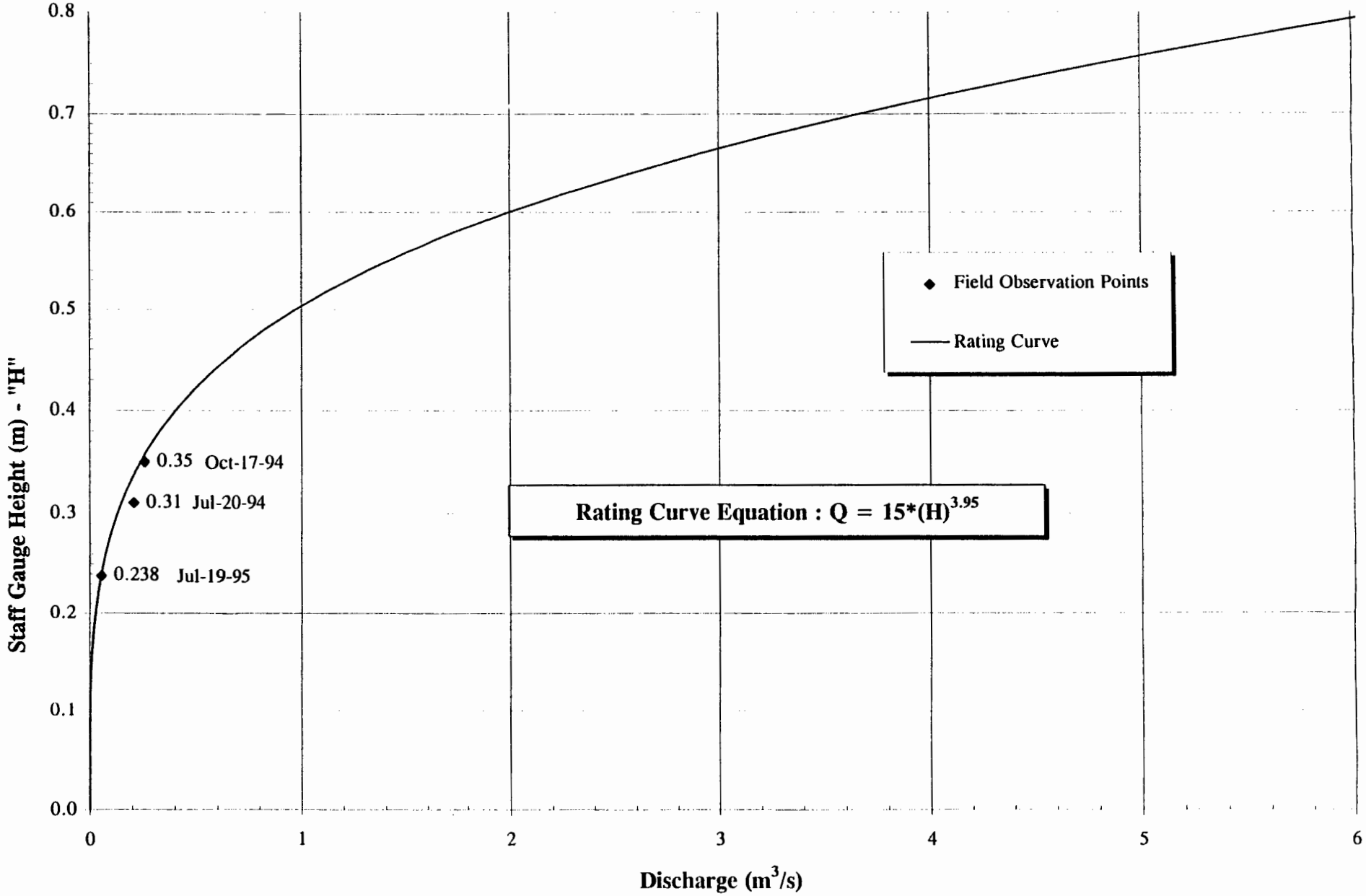


HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

FIGURE III.2

AMERICAN BULLION MINERALS LTD.
RED DHRIS PROPERTY

STAGE-DISCHARGE CURVE FOR GAUGE H3 - QUARRY CREEK



HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

FIGURE III.3

HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

AMERICAN BULLION MINERALS LTD.
RED DHRIS PROPERTY

STAGE-DISCHARGE CURVE FOR GAUGE H4 - TAIL CREEK BELOW CAMP CREEK

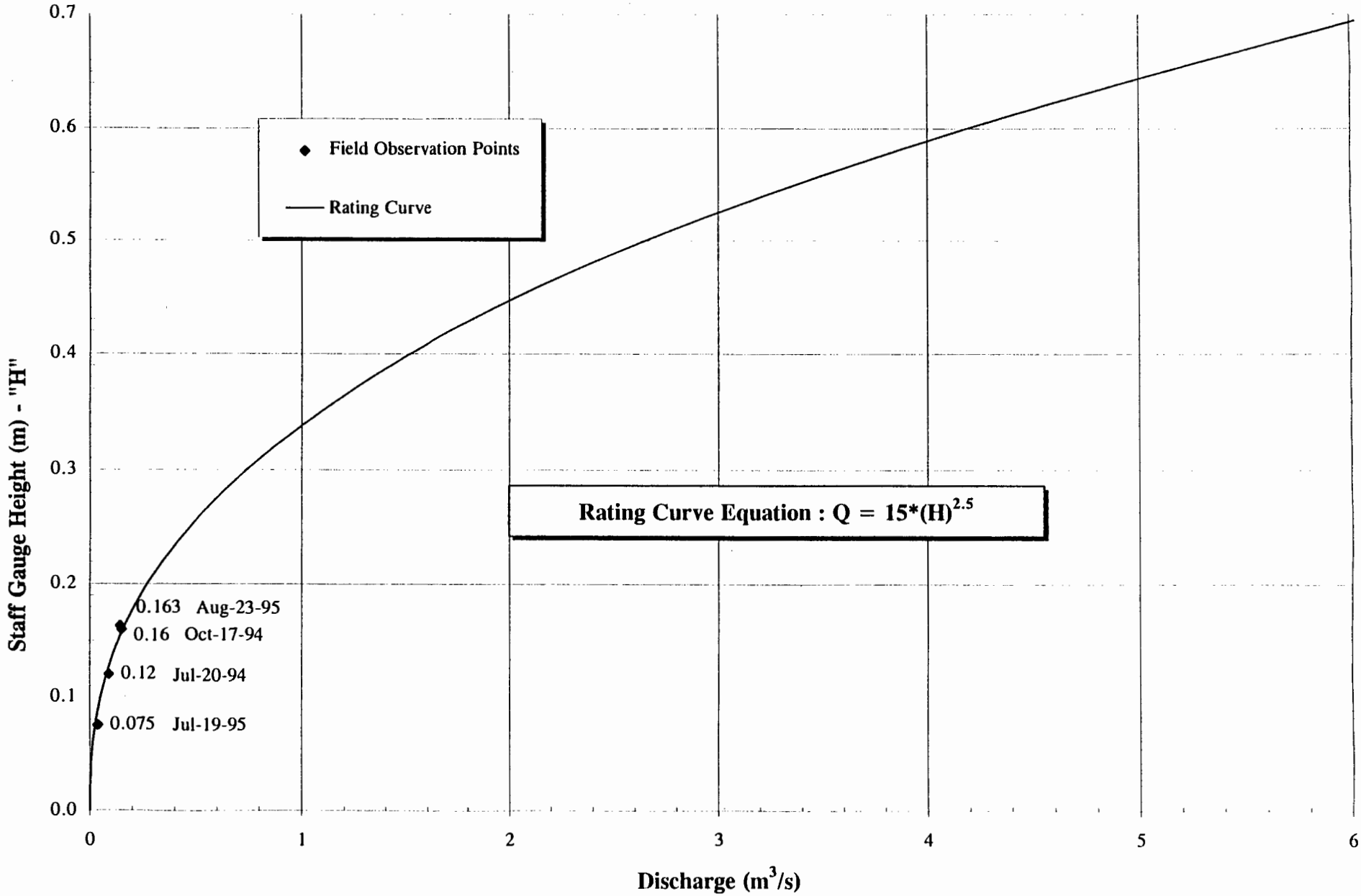


FIGURE III.4

HALLAM KNIGHT PIESOLD LTD.
ENVIRONMENTAL CONSULTANTS

AMERICAN BULLION MINERALS LTD.
RED DHRIS PROPERTY

STAGE-DISCHARGE CURVE FOR GAUGE H5 - RED ROCK CANYON

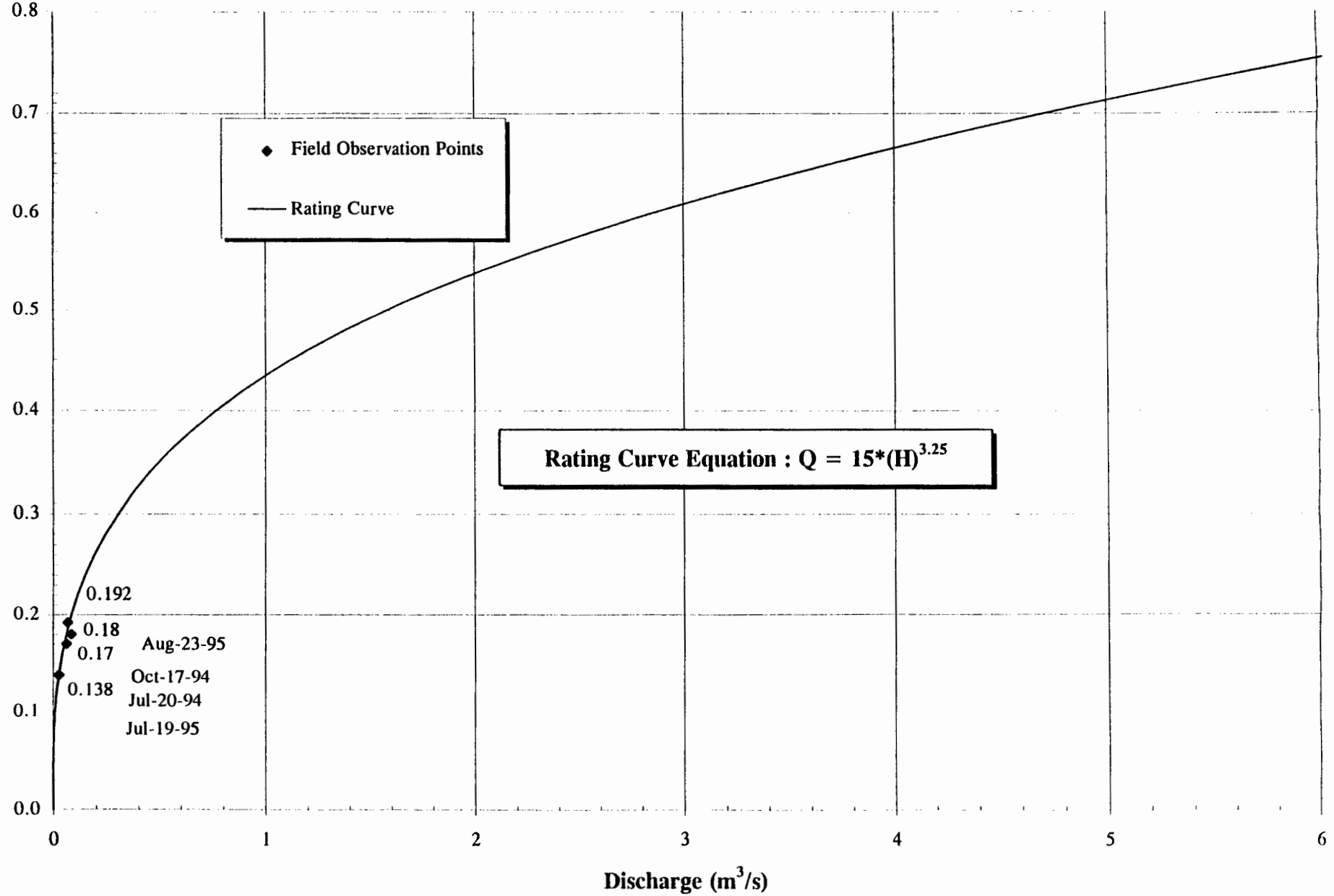


FIGURE III.5

APPENDIX IV

H2 GAUGING STATION
PROBLEMS WITH DATA COLLECTION

Appendix IV

H2 GAUGING STATION

PROBLEMS WITH DATA COLLECTION

A number of problems were encountered during the calibration of the H2 water level data. More specifically, there were problems with the development of a stage-discharge curve and with the establishment of the relationship between the logger and the staff gauge. These problems are described briefly as follows:

1) Only 4 stage-discharge measurements were taken and are available for developing the stage-discharge relationship. As all four points fall within a fairly narrow range of moderate flows, it is difficult to determine the relationship between water levels and flows during high and low flow periods. In addition, the staff gauge was washed out during the freshet period of 1995 and was reinstalled in May 1995. Two stage-discharge measurements were taken before the washout and two were taken after. As it is difficult to develop a stage-discharge relationship on the basis of two points, it was assumed that the channel section was largely unaffected by the washout flows and that all four points belong to the same stage-discharge family. Field observations indicate that this is a reasonable assumption. Inorder to relate the after washout stage-discharge measurements to the pre-washout values, survey data was required to establish the new gauge position relative to the old one. Prior to washout the staff gauge position had been surveyed relative to two bench marks on the stream banks. After the washout, this process was repeated, but unfortunately, there appears to have been an error in one of the surveys, as the benchmark elevations before and after do not match. Therefore, the difference in elevation between the old and new staff gauges had to be estimated.

2) Only 2 concurrent staff gauge and data logger readings were taken. One was taken before the washout and one was taken after. This lack of data made it very difficult to determine the relationship between the logger readings and the staff gauge stage-discharge relationship, and to assess instrument drift over time. These relationships were estimated but due to the lack of data there is considerable uncertainty surrounding these estimates.

It is suggested that stage-discharge measurements be taken annually to re-establish stage-discharge relationships at each station. In addition, at the sites were data loggers are installed, it is essential that concurrent staff-gauge and logger readings be taken at intermittent periods so that logger/staff gauge relationships and instrument drift can be established.

APPENDIX V

WATER QUALITY SAMPLING PROTOCOLS

APPENDIX V

WATER QUALITY SAMPLING PROTOCOLS

The water quality sampling program for the American Bullion, Red Chris project included the following:

- Samples were collected each month at all established surface water quality stations;
- A replicate sample was taken at one station each month (rotate sites) as part of a quality assurance/quality control (QA/QC) program;

Sample bottles were stored in coolers after samples have been collected. Five (5) bottles are filled at each sample location, and

- Samples were filtered, preserved and shipped to Analytical Services Laboratories (ASL) in Vancouver.

Sample collection protocols were as follows:

1) GENERAL (1 litre plastic bottle)

- rinse three times with the creek water being sampled;
- fill to the top, rinse cap and fasten securely, do not preserve, but keep cold.

2) CYANIDE (1 litre plastic bottle containing NaOH pellets as preservative)

- fill to the top, rinse cap and keep cold.

3) MERCURY (500 ml plastic bottle)

- rinse three times with creek water being sampled;
- fill bottle to top, preserve with 1 ml of HNO_3 and keep cold.

4) TOTAL METALS (250 ml plastic bottle)

- rinse three times with creek water being sampled;
- fill bottle to top, preserve with 1 ml of HNO_3 and keep cold.

5) DISSOLVED METALS (250 ml plastic bottle)

- rinse three times with creek water being sampled;
- fill bottle to top;
- filter using a Sartorius membrane filter (0.45 u);
- preserve with 1 ml of HNO_3 and keep cold.

AMERICAN BULLION MINERALS LTD.

RED CHRIS PROJECT

TABLE V.1

WATER QUALITY MONITORING PROGRAM - DETECTION LIMITS

Parameter	Detection Limits
Temperature	0.1 degree
pH	0.5 units
Conductivity	5 umhos/cm
Suspended Solids	1 mg/L
Turbidity	0.1 NTU
Total Dissolved Solids	1 mg/L
Total Hardness	1 mg/L
Total Alkalinity	1 mg/L
Sulphate	1 mg/L
Chloride	0.5 mg/L
Fluoride	0.02 mg/L
Nitrate	5 ug/L
Nitrite	1 ug/L
Ammonia	5 ug/L
Total Dissolved Phosphorous	1 ug/L
Orthophosphate	1 ug/L
Total Cyanide	1 ug/L
Total Mercury	0.01 ug/L

Total and Dissolved Metals

Parameter	Detection Limits
Aluminum	1 ug/L
Antimony	0.1 ug/L
Arsenic	0.1 ug/L
Barium	10 ug/L
Beryllium	5 ug/L
Bismuth	100 ug/L
Boron	100 ug/L
Cadmium	0.2 ug/L
Calcium	100 ug/L
Chromium	1 ug/L
Cobalt	1 ug/L
Copper	1 ug/L

Total and Dissolved Metals (continued)

Parameter	Detection Limits
Iron	30 ug/L
Lead	1 ug/L
Magnesium	10 ug/L
Manganese	5 ug/L
Molybdenum	1 ug/L
Nickel	1 ug/L
Selenium	0.5 ug/L
Silicon	10 ug/L
Silver	0.1 ug/L
Strontium	1 ug/L
Uranium	0.05 ug/L
Vanadium	30 ug/L
Zinc	5 ug/L

mg/L=milligrams per litre, ug/L=microgram per litre

APPENDIX VI

SITE WATER QUALITY DATA

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Site W1 Water Quality Data - Coyote Creek Below "White Rock Canyon" confluence

Date		20-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																
Conductivity	umhos/cm	412	545	452	424	376	422	542	478	473	468	374	451.5	545	374	55.0	11
Total Dissolved Solids	mg/L	289	367	293	299	269	313	398	349	350	330	259	319.6	398	259	41.2	11
Hardness	mg/L CaCO3	219	292	224	227	198	239	283	255	246	245	189	237.9	292	189	30.2	11
pH	pH Units	8.21	8.31	7.80	8.11	7.96	8.01	7.98	8.4	8.01	8.14	7.92	8.077	8.4	7.8	0.169	11
Total Suspended Solids	mg/L	5	3	9	3	7	5	4	8	3	4	2	4.8	9	2	2.2	11
Turbidity	NTU	1.65	1.90	2.25	1.18	5.06	2.39	1.8	9.33	1.6	1.9	1.8	2.805	9.33	1.18	2.281	11
Anions																	
Alkalinity (Total) *	mg/L CaCO3	162	188	169	171	153.0	165	203	179	192	175	165	174.7	203	153	14.0	11
Chloride (dissolved)	mg/L	0.6	0.5	0.6	0.6	0.7	0.5	<0.5	0.8	<0.5	0.9	1.1	0.627	1.1	0.25	0.241	11
Fluoride (dissolved)	mg/L	0.08	0.10	0.09	0.08	0.06	0.08	0.09	0.09	0.1	0.08	0.07	0.084	0.1	0.06	0.011	11
Sulphate (dissolved)	mg/L	63.8	**113**	80.8	61.0	56.6	72.6	**106**	87.5	83.5	77.2	41.8	76.71	113	41.8	20.02	11
Nutrients																	
Ammonia Nitrogen	mg/L	<0.005	<0.005	0.009	<0.005	0.009	<0.005	0.007	0.007	0.019	0.007	<0.005	0.0064	0.019	0.0025	0.0048	11
Nitrate Nitrogen	mg/L	0.023	0.013	0.020	0.022	0.041	0.025	0.024	0.013	0.009	0.073	0.006	0.0245	0.073	0.006	0.0178	11
Nitrite Nitrogen	mg/L	0.001	0.002	0.004	0.002	0.001	0.001	0.001	0.004	0.001	0.002	0.001	0.0018	0.004	0.001	0.0011	11
ortho-Phosphate	mg/L	0.003	0.003	0.001	0.002	0.004	0.002	0.001	<0.001	0.002	<0.001	<0.001	0.0018	0.004	0.0005	0.0011	11
Total Dissolved Phosphate	mg/L	0.004	0.004	0.006	0.006	0.004	0.003	0.002	0.001	0.003	0.004	0.003	0.0036	0.006	0.001	0.0014	11
Total Phosphorus	mg/L	0.007	0.005	0.009	0.009	0.018	0.011	0.008	0.03	0.005	0.007	0.008	0.0103	0.03	0.005	0.0069	11
Cyanide																	
Total Cyanide	mg/L	0.001	<0.001	0.002	0.002	0.002	0.001	0.002	0.002	0.002	0.002	0.002	0.0017	0.002	0.0005	0.0005	11
Total Metals																	
Aluminum (total)	mg/L	0.075	0.053	0.082	0.063	0.117	0.138	0.051	0.18	0.057	0.086	0.026	0.0844	0.18	0.026	0.0425	11
Antimony (total)	mg/L	0.0002	0.0004	0.0002	0.0003	0.0002	0.0004	0.0001	0.0004	0.0004	0.0002	0.0001	0.00026	0.0004	0.0001	0.00011	11
Arsenic (total)	mg/L	0.0008	0.0005	0.0005	0.0006	0.0014	0.0005	0.0005	0.0012	0.0007	0.0005	0.0007	0.00070	0.0014	0.0005	0.00030	11
Barium (total)	mg/L	0.053	0.058	0.048	0.052	0.045	0.048	0.061	0.055	0.051	0.05	0.052	0.0521	0.061	0.045	0.0044	11
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (total)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.00011	0.0002	0.0001	0.00003	11
Calcium (total)	mg/L	55.8	69.7	65.0	58.6	49.6	57.2	66.9	61.5	61.1	59.3	52.8	59.77	69.7	49.6	5.70	11
Chromium (total)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00055	0.001	0.0005	0.00014	11
Cobalt (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (total)	mg/L	0.002	0.008	0.005	0.001	0.009	0.002	0.001	0.003	0.003	0.002	<0.001	0.0033	0.009	0.0005	0.0027	11
Iron (total)	mg/L	0.289	**0.502**	**0.434**	0.285	**0.303**	0.27	0.252	**0.484**	**0.304**	**0.308**	0.23	0.3301	0.502	0.23	0.0858	11
Lead (total)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.0007	0.002	0.0005	0.0004	11
Magnesium (total)	mg/L	19.8	29.3	25.5	20.7	18.3	23.2	28.4	24.8	23.8	22.5	16.2	22.95	29.3	16.2	3.85	11
Manganese (total)	mg/L	0.060	**0.129**	0.089	0.083	0.048	0.072	0.091	**0.103**	**0.105**	0.091	0.081	0.0865	0.129	0.048	0.0211	11
Mercury (total)	mg/L	<0.00001	<0.00001	0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000005	0.000005	0.000005	0	11
Molybdenum (total)	mg/L	<0.001	0.001	<0.001	0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.0008	0.002	0.0005	0.0004	11
Nickel (total)	mg/L	<0.001	<0.001	0.002	<0.001	0.003	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.0009	0.003	0.0005	0.0008	11
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (total)	mg/L	2.92	2.99	3.09	3.25	2.81	2.55	2.7	2.99	2.94	2.7	3.12	2.898	3.25	2.55	0.216	11
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.00007	0.0001	0.00005	0.00002	11
Strontium (total)	mg/L	0.333	0.519	0.422	0.347	0.311	0.382	0.488	0.448	0.427	0.396	0.291	0.3967	0.519	0.291	0.0692	11
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (total)	mg/L	0.00015	0.00018	0.00021	0.00010	0.00019	0.00022	0.00019	0.00024	0.00021	0.00025	0.00014	0.000189	0.00025	0.0001	0.000043	11
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (total)	mg/L	0.006	0.018	0.017	0.007	0.017	0.009	0.006	0.014	0.01	0.011	<0.005	0.0107	0.018	0.0025	0.0050	11
Dissolved Metals																	
Aluminum (dissolved)	mg/L	0.019	0.041	0.036	**0.052**	0.027	0.033	0.023	0.034	0.021	0.024	0.015	0.0295	0.052	0.015	0.0104	11
Antimony (dissolved)	mg/L	0.0002	0.0003	0.0002	0.0003	0.0002	0.0003	<0.0001	0.0001	0.0002	0.0003	<0.0001	0.00020	0.0003	0.00005	0.00009	11
Arsenic (dissolved)	mg/L	0.0003	0.0003	0.0003	0.0004	0.0007	0.0005	0.0003	0.0005	0.0006	0.0004	0.0004	0.00043	0.0007	0.0003	0.00013	11
Barium (dissolved)	mg/L	0.050	0.058	0.045	0.052	0.044	0.048	0.058	0.048	0.048	0.049	0.052	0.0502	0.058	0.044	0.0044	11
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (dissolved) *	mg/L	55.3	68.6	53.8	57.4	49.3	57.5	66.8	61.5	60.1	60.6	50.2	58.26	68.6	49.3	5.85	11
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (dissolved)	mg/L	0.001	0.001	0.002	<0.001	0.002	0.002	<0.001	0.001	0.001	0.001	<0.001	0.0011	0.002	0.0005	0.0006	11
Iron (dissolved)	mg/L	0.036	<0.030	<0.030	0.072	<0.030	0.07	<0.030	0.032	0.04	0.041	0.037	0.0353	0.072	0.015	0.0197	11
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Magnesium (dissolved)	mg/L	19.7	29.3	21.9	20.2	18.1	23.1	28.1	24.7	23.4	22.7	15.4	22.42	29.3	15.4	3.89	11
Manganese (dissolved)	mg/L	0.047	0.119	0.062	0.071	<0.005	0.052	0.08	0.085	0.095	0.088	0.075	0.0715	0.119	0.0025	0.0284	11
Molybdenum (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Nickel (dissolved)	mg/L	<0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0007	0.002	0.0005	0.0004	11
Potassium (dissolved)	mg/L	0.78	1.03	0.89	0.84	0.95	0.87	1.19	1.33	1.2	1.22	0.84	1.013	1.33	0.78	0.182	11
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (dissolved)	mg/L	2.85	2.90	2.78	3.22	2.52	2.81	2.66	2.83	2.9	2.71	2.95	2.828	3.22	2.52	0.171	11
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Sodium (dissolved)	mg/L	3.67	6.64	4.62	3.85	3.91	5.23	6.23	5.69	5.72	5.03	4.12	4.974	6.64	3.67	0.974	11
Strontium (dissolved)	mg/L	0.330	0.517	0.368	0.341	0.309	0.382	0.484	0.446	0.419	0.401	0.277	0.3685	0.517	0.277	0.0707	11
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (dissolved)	mg/L	0.00015	0.00018	0.00021	0.00010	0.00018	0.00021	0.00019	0.00023	0.00017	0.00024	0.00014	0.000182	0.00024	0.0001	0.000039	11
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (dissolved)	mg/L	<0.005	0.010	0.008	0.007	0.007	0.034	<0.005	0.006	0.007	0.008	0.013	0.0094	0.034	0.0025	0.0083	11
Organics																	
Total Organic Carbon	mg/L		1.9	1.9	2.3	2.2	1.5	1.5	2.0	2.2	2.2	2.8	2.05	2.8	1.5	0.37	10

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

underlined - exceeds B.C. AWCWQ (1994) for protection of aquatic life.

boxed - exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT

Site W2 Water Quality Data - "White Rock Canyon" below "Red Rock Canyon"

Date		20-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																
Conductivity	umhos/cm	512	582	540	673	438	444	588	538	611	663	728	574.3	728	438	87.8	11
Total Dissolved Solids	mg/L	379	400	356	520	322	334	448	402	477	512	570	429.1	570	322	78.4	11
Hardness	mg/L CaCO3	275	308	260	389	234	245	311	280	329	352	392	306.8	392	234	51.9	11
pH	pH Units	8.40	8.45	8.30	8.32	8.14	8.19	8.28	8.44	8.27	8.39	8.18	8.305	8.45	8.14	0.102	11
Total Suspended Solids	mg/L	7	7	5	1	5	1	3	28	3	6	2	6.2	28	1	7.2	11
Turbidity	NTU	3.90	3.40	4.16	1.25	8.34	2.28	2.1	17.2	3.6	5	0.7	4.539	17.2	0.7	4.297	11
Anions																	
Alkalinity (Total) *	mg/L CaCO3	179	184	182	229	158.0	158	200	182	215	213	244	194.9	244	158	26.6	11
Chloride (dissolved)	mg/L	0.6	<0.5	0.6	0.7	0.7	<0.5	<0.5	<0.5	0.5	0.7	1.2	0.545	1.2	0.25	0.279	11
Fluoride (dissolved)	mg/L	0.09	0.10	0.10	0.10	0.08	0.08	0.1	0.1	0.13	0.1	0.11	0.099	0.13	0.08	0.013	11
Sulphate (dissolved)	mg/L	110	142	120	157	86.8	95.1	140	123	149	171	185	134.45	185	95.8	29.32	11
Nutrients																	
Ammonia Nitrogen	mg/L	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	<0.005	0.0032	0.007	0.0025	0.0016	11
Nitrate Nitrogen	mg/L	0.043	0.019	0.070	0.106	0.097	0.038	0.023	0.021	0.02	0.01	0.07	0.0470	0.106	0.01	0.0320	11
Nitrite Nitrogen	mg/L	0.002	0.002	0.004	0.002	0.003	0.001	0.001	0.005	0.002	0.001	0.001	0.0022	0.005	0.001	0.0013	11
ortho-Phosphate	mg/L	0.002	0.004	0.003	0.001	0.004	0.002	0.001	<0.001	<0.001	<0.001	<0.001	0.0017	0.004	0.0005	0.0013	11
Total Dissolved Phosphate	mg/L	0.003	0.005	0.007	0.004	0.004	0.002	0.002	<0.001	<0.001	0.003	0.001	0.0029	0.007	0.0005	0.0019	11
Total Phosphorus	mg/L	0.012	0.006	0.016	0.005	0.020	0.006	0.003	0.058	0.007	0.009	0.002	0.0131	0.058	0.002	0.0151	11
Cyanide																	
Total Cyanide	mg/L	0.001	<0.001	0.001	0.002	0.002	0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.0010	0.002	0.0005	0.0005	11
Total Metals																	
Aluminum (total)	mg/L	0.152	0.215	0.148	0.079	0.197	0.115	0.072	0.28	0.28	0.185	0.049	0.1611	0.28	0.049	0.0755	11
Antimony (total)	mg/L	0.0004	0.0005	0.0003	0.0008	0.0003	0.0005	0.0005	0.0009	0.0005	0.0007	0.0012	0.00060	0.0012	0.0003	0.00026	11
Arsenic (total)	mg/L	0.0007	0.0004	0.0004	0.0004	0.0009	0.0004	0.0004	0.0022	0.0007	0.0006	0.0004	0.00068	0.0022	0.0004	0.00051	11
Barium (total)	mg/L	0.050	0.051	0.046	0.054	0.037	0.041	0.053	0.048	0.052	0.052	0.054	0.0489	0.054	0.037	0.0053	11
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (total)	mg/L	<0.0002	0.0003	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0003	0.0003	<0.0002	0.00019	0.0003	0.0001	0.00010	11
Calcium (total)	mg/L	62.1	69.4	67.2	81.3	50.4	53.7	68.4	65.9	74.1	81.6	89.4	69.41	89.4	50.4	11.25	11
Chromium (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (total)	mg/L	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001	0.00068	0.001	0.0005	0.00024	11
Copper (total)	mg/L	0.004	0.022	0.014	0.003	0.006	0.003	0.004	0.011	0.001	0.006	0.002	0.0069	0.022	0.001	0.0061	11
Iron (total)	mg/L	0.707	1.07	1.09	0.400	0.381	0.315	0.344	1.11	0.995	0.993	0.099	0.6785	1.11	0.099	0.3597	11
Lead (total)	mg/L	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	0.0009	0.004	0.0005	0.0010	11
Magnesium (total)	mg/L	30.3	33.3	33.0	45.1	26.3	27.6	34.3	31.1	35.6	39.3	44.7	34.60	45.1	26.3	5.94	11
Manganese (total)	mg/L	0.081	0.110	0.117	0.067	0.044	0.041	0.062	0.12	0.138	0.144	0.043	0.0879	0.144	0.041	0.0373	11
Mercury (total)	mg/L	<0.00001	<0.00001	0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000005	0.000005	0.000005	0	11
Molybdenum (total)	mg/L	<0.001	0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.0007	0.002	0.0005	0.0004	11
Nickel (total)	mg/L	<0.001	<0.001	0.002	<0.001	0.003	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.0009	0.003	0.0005	0.0008	11
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (total)	mg/L	2.59	2.82	2.71	2.83	2.15	2.17	2.51	2.97	2.64	2.4	2.51	2.573	2.97	2.15	0.250	11
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	<0.0001	0.000073	0.0002	0.00005	0.000045	11
Strontium (total)	mg/L	0.477	0.595	0.543	0.686	0.417	0.438	0.603	0.588	0.65	0.715	0.763	0.5868	0.763	0.417	0.1074	11
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (total)	mg/L	0.00026	0.00031	0.00025	0.00041	0.00026	0.00028	0.00024	0.00037	0.00033	0.00049	0.00045	0.000332	0.00049	0.00024	0.000083	11
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (total)	mg/L	0.035	0.053	0.049	0.025	0.011	0.016	0.019	0.049	0.051	0.055	0.012	0.0341	0.055	0.011	0.0170	11
Dissolved Metals																	
Aluminum (dissolved)	mg/L	0.042	0.030	0.064	0.030	0.039	0.034	0.047	0.06	0.039	0.029	0.017	0.0391	0.064	0.017	0.0132	11
Antimony (dissolved)	mg/L	0.0004	0.0005	0.0003	0.0005	0.0003	0.0004	0.0006	0.0004	0.0004	0.0007	0.0007	0.00047	0.0007	0.0003	0.00014	11
Arsenic (dissolved)	mg/L	<0.0001	0.0002	0.0001	0.0003	0.0003	0.0002	0.0002	0.0004	0.0005	0.0003	0.0003	0.00026	0.0005	0.00005	0.00012	11
Barium (dissolved)	mg/L	0.046	0.050	0.039	0.054	0.037	0.039	0.05	0.041	0.052	0.047	0.052	0.0461	0.054	0.037	0.0058	11
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	0.00013	0.0003	0.0001	0.00006	11
Calcium (dissolved) *	mg/L	60.9	69.0	56.4	81.3	50.4	53.2	66.7	62.8	73.4	78.1	86.5	67.34	86.5	50.4	11.23	11
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (dissolved)	mg/L	0.002	0.003	0.002	0.001	0.003	0.001	0.002	0.001	<0.001	0.001	0.001	0.0018	0.003	0.0005	0.0008	11
Iron (dissolved)	mg/L	0.031	<0.030	<0.030	<0.030	<0.030	<0.030	0.051	<0.030	<0.030	<0.030	<0.030	0.0197	0.051	0.015	0.0109	11
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.0005	0.001	0.0005	0.0001	11
Magnesium (dissolved)	mg/L	29.8	33.0	28.9	45.1	26.3	27.1	34	29.9	35.3	38.2	42.7	33.66	45.1	26.3	5.92	11
Manganese (dissolved)	mg/L	0.064	0.101	0.083	0.064	0.034	0.038	0.059	0.072	0.129	0.127	0.04	0.0737	0.129	0.034	0.0318	11
Molybdenum (dissolved)	mg/L	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.001	0.0005	0.0001	11
Nickel (dissolved)	mg/L	<0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0007	0.002	0.0005	0.0004	11
Potassium (dissolved)	mg/L	0.95	1.07	0.95	1.16	1.12	0.94	1.31	1.42	1.25	1.55	1.29	1.183	1.55	0.94	0.193	11
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (dissolved)	mg/L	2.43	2.66	2.42	2.80	2.13	2.08	2.46	2.51	2.51	2.22	2.36	2.416	2.8	2.08	0.205	11
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Sodium (dissolved)	mg/L	5.99	6.98	5.74	8.61	5.22	5.59	7.58	7.04	7.84	8.2	9.95	7.158	9.95	5.22	1.390	11
Strontium (dissolved)	mg/L	0.465	0.587	0.481	0.686	0.417	0.432	0.597	0.546	0.636	0.691	0.727	0.5695	0.727	0.417	0.1045	11
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (dissolved)	mg/L	0.00025	0.00022	0.00025	0.00034	0.00025	0.00027	0.00024	0.00032	0.00032	0.00048	0.00043	0.000306	0.00048	0.00022	0.000080	11
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (dissolved)	mg/L	0.006	0.010	<0.005	0.013	<0.005	0.012	0.015	0.006	0.015	0.032	0.012	0.0115	0.032	0.0025	0.0078	11
Organics																	
Total Organic Carbon	mg/L		1.0	1.4	1.3	2.0	0.9	0.9	1.3	1.4	1.5	1.6	1.33	2	0.9	0.32	10

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).
* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.
- exceeds B.C. AWCWQ (1994) for protection of aquatic life.
- exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT

Site W3 Water Quality Data - Quarry Creek

Date		21-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	11-Nov-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																	
Conductivity	umhos/cm	317	333	302	328	236	301	341	322	320	317	342	358	318.1	358	236	29.3	12
Total Dissolved Solids	mg/L	214	202	186	218	163	212	232	215	228	215	241	251	214.8	251	163	22.7	12
Hardness	mg/L CaCO3	180	178	151	172	123	169	178	171	172	171	191	201	171.4	201	123	18.7	12
pH	pH Units	8.32	8.42	8.21	8.19	8.00	8.19	8.21	8.43	8.25	8.32	8.13	7.98	8.222	8.43	7.98	0.134	12
Total Suspended Solids	mg/L	< 1	5	10	1	11	5	3	4	< 1	< 1	2	< 1	3.6	11	0.5	3.5	12
Turbidity	NTU	0.50	1.00	3.11	1.07	2.81	1.21	0.8	1.84	0.7	0.5	0.7	1	1.270	3.11	0.5	0.833	12
Anions																		
Alkalinity (Total) *	mg/L CaCO3	164	174	159	165	121.0	162	188	169	182	163	182	187	168.0	188	121	17.2	12
Chloride (dissolved)	mg/L	0.6	<0.5	0.7	0.6	0.5	<0.5	<0.5	<0.5	<0.5	0.7	1.2	0.5	0.504	1.2	0.25	0.274	12
Fluoride (dissolved)	mg/L	0.06	0.06	0.06	0.05	0.05	0.06	0.07	0.06	0.07	0.05	0.06	0.05	0.058	0.07	0.05	0.007	12
Sulphate (dissolved)	mg/L	11.5	10.0	13.2	15.4	12	13.1	9.7	9.8	12.1	13.2	16	17.8	12.82	17.8	9.7	2.44	12
Nutrients																		
Ammonia Nitrogen	mg/L	0.009	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0034	0.009	0.0025	0.0021	12
Nitrate Nitrogen	mg/L	0.006	0.008	<0.005	0.027	0.021	0.009	0.01	<0.005	<0.005	0.092	0.021	0.041	0.0204	0.092	0.0025	0.0243	12
Nitrite Nitrogen	mg/L	0.001	0.002	<0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.0011	0.002	0.0005	0.0004	12
ortho-Phosphate	mg/L	0.001	0.002	0.001	<0.001	0.004	0.002	0.002	<0.001	<0.001	<0.001	<0.001	0.002	0.0014	0.004	0.0005	0.0010	12
Total Dissolved Phosphate	mg/L	0.004	0.004	0.004	0.003	0.004	0.003	0.003	<0.001	0.002	0.002	0.001	0.002	0.0027	0.004	0.0005	0.0012	12
Total Phosphorus	mg/L	0.007	0.006	0.015	0.006	0.015	0.008	0.004	0.004	0.004	0.004	0.005	0.006	0.0070	0.015	0.004	0.0038	12
Cyanide																		
Total Cyanide	mg/L	0.003	<0.001	0.003	<0.001	0.004	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.0024	0.004	0.0005	0.0010	12
Total Metals																		
Aluminum (total)	mg/L	0.021	0.013	0.009	0.044	0.093	0.049	0.032	0.033	0.006	0.035	0.052	0.025	0.0343	0.093	0.006	0.0228	12
Antimony (total)	mg/L	0.0001	0.0001	<0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.00010	0.0002	0.00005	0.00005	12
Arsenic (total)	mg/L	0.0006	0.0009	0.0006	0.0006	0.0009	0.0008	0.0003	0.0009	0.0008	0.0005	0.0005	0.0006	0.00067	0.0009	0.0003	0.00018	12
Barium (total)	mg/L	0.057	0.058	0.047	0.048	0.045	0.057	0.057	0.055	0.053	0.049	0.047	0.059	0.0525	0.059	0.045	0.0051	12
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	12
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	12
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	12
Cadmium (total)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	12
Calcium (total)	mg/L	53.0	50.8	52.1	48.7	36.1	49.5	51.6	48.3	48.6	47.7	51.4	56.2	49.59	56.2	36.1	4.64	12
Chromium (total)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00054	0.001	0.0005	0.00014	12
Cobalt (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Copper (total)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.0006	0.001	0.0005	0.0002	12
Iron (total)	mg/L	0.139	0.165	0.106	0.155	0.244	0.151	0.091	0.191	0.044	0.115	0.097	0.141	0.1368	0.244	0.044	0.0496	12
Lead (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Magnesium (total)	mg/L	11.7	12.7	12.6	13.0	9.2	12.3	12.7	12	12.3	12.4	13.6	14.7	12.45	14.7	8.19	1.24	12
Manganese (total)	mg/L	0.016	0.019	0.012	0.019	0.025	0.022	0.014	0.023	<0.005	0.013	0.014	0.019	0.0165	0.025	0.0025	0.0058	12
Mercury (total)	mg/L	<0.00001	<0.00001	<0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000005	0.000005	0.000005	0	12
Molybdenum (total)	mg/L	0.002	0.002	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.0015	0.002	0.001	0.0005	12
Nickel (total)	mg/L	<0.001	<0.001	0.001	<0.001	0.003	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0008	0.003	0.0005	0.0007	12
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	12
Silicon (total)	mg/L	3.05	3.16	2.96	2.89	2.29	2.69	3.28	3.19	3.01	2.85	2.82	3.31	2.950	3.31	2.29	0.282	12
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	12
Strontium (total)	mg/L	0.206	0.218	0.204	0.194	0.155	0.208	0.223	0.213	0.212	0.193	0.212	0.238	0.2083	0.238	0.155	0.0194	12
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	12
Uranium (total)	mg/L	0.00010	0.00008	0.00008	0.00011	0.00011	0.00015	0.0001	0.00012	0.00009	0.00014	0.00014	0.00016	0.000115	0.00016	0.00008	0.000026	12
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	12
Zinc (total)	mg/L	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0028	0.006	0.0025	0.0010	12
Dissolved Metals																		
Aluminum (dissolved)	mg/L	<0.005	<0.005	<0.005	0.006	0.011	0.026	0.024	0.014	0.02	0.008	0.013	0.044	0.0145	0.044	0.0025	0.0118	12
Antimony (dissolved)	mg/L	0.0001	0.0001	<0.0001	0.0002	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.00009	0.0002	0.00005	0.00005	12
Arsenic (dissolved)	mg/L	<0.0001	0.0007	0.0005	0.0004	0.0006	0.0005	0.0003	0.0008	0.0008	0.0004	0.0003	0.0001	0.00044	0.0008	0.00005	0.00022	12
Barium (dissolved)	mg/L	0.057	0.058	0.041	0.044	0.042	0.053	0.058	0.055	0.054	0.047	0.05	0.057	0.0514	0.059	0.041	0.0062	12
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	12
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	12
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	12
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	12
Calcium (dissolved) *	mg/L	53.0	50.3	42.5	47.8	34.6	48	50.9	48.7	49	47.9	53.9	56.2	48.57	56.2	34.6	5.39	12
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Copper (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Iron (dissolved)	mg/L	0.051	0.051	<0.030	0.035	0.070	0.035	<0.030	0.057	0.094	0.038	<0.030	<0.030	0.0408	0.094	0.015	0.0240	12
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Magnesium (dissolved)	mg/L	11.7	12.7	10.9	12.8	8.9	12	12.5	12	12.1	12.4	13.7	14.7	12.20	14.7	8.93	1.35	12
Manganese (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.005	<0.005	0.0031	0.01	0.0025	0.0021	12
Molybdenum (dissolved)	mg/L	<0.001	0.002	<0.001	0.002	0.002	<0.001	0.002	0.002	0.002	0.001	0.001	0.002	0.0015	0.002	0.0005	0.0007	12
Nickel (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Potassium (dissolved)	mg/L	0.81	0.85	0.98	0.76	0.84	0.81	0.76	0.85	0.79	0.88	0.8	0.88	0.818	0.98	0.81	0.085	12
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	12
Silicon (dissolved)	mg/L	3.05	3.12	2.73	2.82	2.20	2.61	3.22	3.18	2.98	2.63	3	3.28	2.902	3.28	2.2	0.302	12
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	12
Sodium (dissolved)	mg/L	2.36	2.38	2.36	2.32	2.13	2.62	2.45	2.46	2.92	2.66	3.21	3.26	2.594	3.26	2.13	0.344	12
Strontium (dissolved)	mg/L	0.206	0.217	0.176	0.193	0.154	0.204	0.223	0.213	0.208	0.193	0.218	0.239	0.2037	0.238	0.154	0.0216	12
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	12
Uranium (dissolved)	mg/L	0.00009	0.00008	0.00008	0.00009	0.00010	0.00014	0.00007	0.0001	0.00009	0.00013	0.00014	0.00017	0.000107	0.00017	0.00007	0.000030	12
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	12
Zinc (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.008	0.005	0.0038	0.008	0.0025	0.0019	12
Organics																		
Total Organic Carbon	mg/L		3.5	3.0	2.8	3.8	3.2	3.4	3.8	3.4	3.0	3.1	2.7	3.25	3.8	2.7	0.35	11

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

- exceeds B.C. AWCWQ (1994) for protection of aquatic life.

- exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Site W4 Water Quality Data - Trail Creek

Date		21-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	18-Sep-95	17-Oct-95	31-Oct-95	11-Nov-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																	
Conductivity	umhos/cm	297	316	245	305	155	282	321	319	303	311	311	302	288.9	321	155	45.0	12
Total Dissolved Solids	mg/L	203	199	154	189	103	203	228	224	215	212	216	209	197.1	228	103	33.6	12
Hardness	mg/L CaCO3	153	164	118	151	74.1	152	168	155	154	155	159	157	146.5	168	74.1	24.7	12
pH	pH Units	8.10	8.05	7.96	7.92	7.78	7.87	7.79	8.09	8.14	8.01	7.78	7.7	7.933	8.14	7.7	0.142	12
Total Suspended Solids	mg/L	1	2	2	<1	5	3	<1	2	<1	5	1	3	2.1	5	0.5	1.5	12
Turbidity	NTU	0.69	0.40	2.68	0.31	6.82	1.77	0.5	3.28	0.3	0.9	0.1	0.6	1.529	6.82	0.1	1.866	12
Anions																		
Alkalinity (Total) *	mg/L CaCO3	118	122	94.8	115	64.0	107	134	114	125	116	132	130	114.3	134	64	18.5	12
Chloride (dissolved)	mg/L	0.5	<0.5	0.6	<0.5	0.6	<0.5	<0.5	<0.5	<0.5	0.5	1	<0.5	0.413	1	0.25	0.226	12
Fluoride (dissolved)	mg/L	0.09	0.08	0.08	0.07	0.06	0.08	0.09	0.1	0.1	0.08	0.07	0.06	0.080	0.1	0.06	0.013	12
Sulphate (dissolved)	mg/L	40.0	43.8	34.3	38.7	20	44.2	44	55.9	43.5	46.4	37.7	34.8	40.26	55.9	20	8.26	12
Nutrients																		
Ammonia Nitrogen	mg/L	0.007	<0.005	0.007	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0035	0.007	0.0025	0.0017	12
Nitrate Nitrogen	mg/L	0.056	0.056	0.028	0.081	0.031	0.048	0.082	0.039	0.055	0.093	0.104	0.11	0.0653	0.11	0.028	0.0268	12
Nitrite Nitrogen	mg/L	0.002	0.002	<0.001	0.002	0.003	0.001	0.001	0.002	0.001	0.001	0.001	<0.001	0.0014	0.003	0.0005	0.0007	12
ortho-Phosphate	mg/L	0.002	0.002	0.003	<0.001	0.002	0.002	<0.001	<0.001	0.002	<0.001	<0.001	0.001	0.0014	0.003	0.0005	0.0008	12
Total Dissolved Phosphate	mg/L	0.003	0.002	0.008	0.006	0.004	0.003	0.001	0.001	0.002	0.002	0.002	0.001	0.0029	0.008	0.001	0.0021	12
Total Phosphorus	mg/L	0.004	0.003	0.008	0.007	0.020	0.008	0.002	0.012	0.002	0.006	0.002	0.006	0.0067	0.02	0.002	0.0050	12
Cyanide																		
Total Cyanide	mg/L	0.001	<0.001	0.002	<0.001	0.005	0.001	0.001	0.003	0.001	<0.001	<0.001	<0.001	0.0014	0.005	0.0005	0.0013	12
Total Metals																		
Aluminum (total)	mg/L	0.023	0.011	0.066	0.028	0.071	0.046	<0.050	0.11	0.012	0.016	<0.005	0.044	0.0395	0.11	0.0025	0.0320	12
Antimony (total)	mg/L	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.00007	0.0001	0.00005	0.00002	12
Arsenic (total)	mg/L	<0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.00009	0.0002	0.00005	0.00004	12
Barium (total)	mg/L	0.041	0.040	0.033	0.036	0.027	0.039	0.04	0.036	0.038	0.04	0.035	0.043	0.0373	0.043	0.027	0.0041	12
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	12
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	12
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	12
Cadmium (total)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00013	0.0004	0.0001	0.00008	12
Calcium (total)	mg/L	40.6	43.2	34.9	39.2	19.1	40.1	41.1	40.8	39.6	41.7	41.6	41.1	38.58	43.2	19.1	6.18	12
Chromium (total)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00054	0.001	0.0005	0.00014	12
Cobalt (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Copper (total)	mg/L	<0.001	<0.001	0.002	<0.001	0.003	0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.0010	0.003	0.0005	0.0007	12
Iron (total)	mg/L	0.058	0.037	0.164	0.034	0.233	0.069	<0.030	0.116	<0.030	<0.030	<0.030	0.058	0.0691	0.233	0.015	0.0660	12
Lead (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Magnesium (total)	mg/L	12.7	14.0	11.4	13.4	6.4	12.9	13.6	13.2	12.6	13.7	14.4	13.9	12.69	14.4	6.42	2.04	12
Manganese (total)	mg/L	0.007	0.008	0.010	0.010	0.01	0.008	<0.005	0.007	0.006	0.007	0.005	0.017	0.0081	0.017	0.0025	0.0034	12
Mercury (total)	mg/L	<0.00001	<0.00001	<0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000005	0.000005	0.000005	0	12
Molybdenum (total)	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0007	0.002	0.0005	0.0004	12
Nickel (total)	mg/L	<0.001	<0.001	0.001	<0.001	0.002	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.0008	0.002	0.0005	0.0004	12
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	12
Silicon (total)	mg/L	3.61	3.72	3.83	3.38	2.94	3.54	3.29	3.88	3.39	3.01	3.05	2.97	3.384	3.88	2.94	0.326	12
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	12
Strontium (total)	mg/L	0.214	0.246	0.195	0.218	0.121	0.229	0.235	0.26	0.227	0.23	0.231	0.227	0.2194	0.26	0.121	0.0334	12
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	12
Uranium (total)	mg/L	0.00006	0.00005	0.00004	0.00007	0.00004	0.0001	0.00007	0.00009	0.00007	0.0001	0.0001	0.0001	0.000074	0.0001	0.00004	0.000023	12
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	12
Zinc (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.005	0.0029	0.005	0.0025	0.0009	12
Dissolved Metals																		
Aluminum (dissolved)	mg/L	0.009	<0.005	0.021	0.009	0.043	0.016	<0.050	0.033	0.021	0.028	<0.005	0.019	0.0191	0.043	0.0025	0.0117	12
Antimony (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.00006	0.0001	0.00005	0.00002	12
Arsenic (dissolved)	mg/L	<0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	0.0001	0.0002	<0.0001	<0.0001	<0.0001	0.00008	0.0002	0.00005	0.00004	12
Barium (dissolved)	mg/L	0.040	0.040	0.029	0.036	0.025	0.039	0.041	0.036	0.038	0.04	0.036	0.035	0.0363	0.041	0.025	0.0046	12
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	12
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	12
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.2	<0.10	<0.10	<0.10	<0.10	<0.10	0.063	0.2	0.05	0.041	12
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	12
Calcium (dissolved) *	mg/L	40.6	42.8	30.3	38.7	19.1	39.9	43.8	40.5	40.4	40.2	40.7	40.3	38.11	43.8	19.1	6.54	12
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Copper (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.001	0.004	<0.001	<0.001	<0.001	0.0010	0.004	0.0005	0.0010	12
Iron (dissolved)	mg/L	<0.030	<0.030	0.030	<0.030	0.081	<0.030	0.044	0.034	<0.030	<0.030	<0.030	<0.030	0.0258	0.081	0.015	0.0191	12
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Magnesium (dissolved)	mg/L	12.6	13.9	10.2	13.1	6.4	12.7	13.6	13.1	12.9	13.3	13.8	13.6	12.44	13.9	6.42	2.04	12
Manganese (dissolved)	mg/L	0.007	0.008	<0.005	0.009	0.005	0.006	<0.005	0.006	0.006	0.007	0.006	0.006	0.0059	0.009	0.0025	0.0018	12
Molybdenum (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	12
Nickel (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.001	0.0005	0.0001	12
Potassium (dissolved)	mg/L	0.62	0.72	0.51	0.66	0.64	0.75	0.83	0.91	0.67	0.82	0.71	0.74	0.715	0.91	0.51	0.102	12
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	12
Silicon (dissolved)	mg/L	3.57	3.69	3.50	3.30	2.83	3.4	3.3	3.69	3.39	2.92	2.87	2.9	3.280	3.69	2.83	0.308	12
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	12
Sodium (dissolved)	mg/L	3.37	4.28	3.33	3.64	3.07	5.02	4.51	4.82	3.98	4.23	4.7	3.9	4.071	5.02	3.07	0.604	12
Strontium (dissolved)	mg/L	0.213	0.244	0.175	0.215	0.121	0.228	0.253	0.257	0.23	0.222	0.222	0.222	0.2168	0.257	0.121	0.0353	12
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	12
Uranium (dissolved)	mg/L	0.00006	0.00005	0.00004	0.00007	0.00004	0.00009	0.00006	0.00007	0.00007	0.0001	0.0001	0.0001	0.000071	0.0001	0.00004	0.000021	12
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	12
Zinc (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.026	0.0045	0.026	0.0025	0.0065	12
Organics																		
Total Organic Carbon	mg/L		1.6	3.2	1.9	4.7	1.8	1.6	2.6	1.9	1.7	1.6	1.6	2.22	4.7	1.6	0.92	11

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

<u> </u> - exceeds B.C. AWCWQ (1994) for protection of aquatic life.

☐ - exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT

Site WS Water Quality Data - "Red Rock Canyon"

Date		21-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																
Conductivity	umhos/cm	872	890	666	996	466	711	1030	779	896	1080	1180	867.0	1180	466	205.0	10
Total Dissolved Solids	mg/L	693	710	494	904	364	657	872	628	812	937	961	722.0	961	364	187.9	10
Hardness	mg/L CaCO3	467	491	338	549	233	337	556	408	483	586	649	461.4	649	233	124.1	10
pH	pH Units	7.81	7.86	7.41	7.71	7.67	7.8	7.86	8	7.89	7.72	7.27	7.711	8	7.27	0.208	10
Total Suspended Solids	mg/L	29	32	33	21	29	8	30	37	29	43	55	31.7	55	8	11.8	10
Turbidity	NTU	29.3	28.9	25.3	30.3	24.8	17.2	33.4	40	31.4	62.7	78.7	37.06	78.7	17.2	18.08	10
Anions																	
Alkalinity (Total) *	mg/L CaCO3	80.0	68.3	63.2	79.3	61.6	81.1	87.9	79.2	83.5	77.7	82.1	76.0	87.9	61.6	8.2	10
Chloride (dissolved)	mg/L	0.9	<0.5	0.7	0.7	0.5	0.5	1	<0.5	<0.5	0.7	1.4	0.690	1.4	0.25	0.332	10
Fluoride (dissolved)	mg/L	**0.39**	**0.40**	0.30	**0.41**	0.18	0.28	**0.42**	**0.34**	**0.44**	**0.43**	**0.49**	0.364	0.49	0.18	0.085	10
Sulphate (dissolved)	mg/L	**403**	**413**	**280**	**494**	**175**	**320**	**452**	**363**	**428**	**505**	**497**	390.20	505	175	101.97	10
Nutrients																	
Ammonia Nitrogen	mg/L	0.011	0.009	0.016	0.008	<0.005	0.005	0.011	0.009	<0.005	0.013	<0.005	0.0087	0.016	0.0025	0.0042	10
Nitrate Nitrogen	mg/L	0.021	0.008	0.009	0.015	0.037	0.014	0.013	0.008	0.006	0.013	0.011	0.0149	0.037	0.008	0.0082	10
Nitrite Nitrogen	mg/L	0.001	0.002	<0.001	0.001	0.001	0.001	0.001	<0.001	0.001	0.001	<0.001	0.0010	0.002	0.0005	0.0004	10
ortho-Phosphate	mg/L	0.003	0.003	0.015	0.003	0.002	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	0.0030	0.015	0.0005	0.0041	10
Total Dissolved Phosphate	mg/L	0.006	0.007	0.018	0.007	0.003	0.003	0.003	0.007	0.003	0.002	0.002	0.0058	0.018	0.002	0.0045	10
Total Phosphorus	mg/L	0.013	0.009	0.028	0.007	0.052	0.033	0.025	0.09	0.03	0.014	0.035	0.0308	0.09	0.007	0.0238	10
Cyanide																	
Total Cyanide	mg/L	0.002	<0.001	0.002	<0.001	0.003	0.001	0.002	0.004	0.001	0.002	0.001	0.0018	0.004	0.0005	0.0011	10
Total Metals																	
Aluminum (total)	mg/L	**1.260**	**1.610**	**1.390**	**0.864**	**0.501**	**0.637**	**0.951**	**1.5**	**0.084**	**1.32**	**1.6**	1.1833	1.61	0.501	0.3794	10
Antimony (total)	mg/L	0.0003	0.0002	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.0001	0.0003	0.0003	0.00024	0.0003	0.0002	0.00005	10
Arsenic (total)	mg/L	0.0009	0.0008	0.0011	0.0006	0.0013	0.0007	0.0006	0.0008	0.0001	0.0008	0.0009	0.00085	0.0013	0.0006	0.00021	10
Barium (total)	mg/L	0.026	0.027	0.025	0.025	0.025	0.023	0.026	0.03	0.026	0.024	0.026	0.0257	0.03	0.023	0.0018	10
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	10
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	10
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	10
Cadmium (total)	mg/L	**0.0035**	**0.0025**	**0.0028**	**0.0028**	0.0009	0.0013	**0.0025**	0.0018	0.001	**0.003**	**0.0035**	0.00240	0.0035	0.0009	0.00084	10
Calcium (total)	mg/L	141	152	116	162	67.8	119	169	123	146	189	199	143.78	199	67.8	37.05	10
Chromium (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.00055	0.001	0.0005	0.00015	10
Cobalt (total)	mg/L	0.018	0.013	0.009	0.012	0.003	0.005	0.01	0.006	0.007	0.008	0.014	0.00980	0.018	0.003	0.00433	10
Copper (total)	mg/L	**0.158**	**0.194**	**0.134**	**0.088**	**0.05**	**0.067**	**0.117**	**0.106**	0.001	**0.137**	**0.16**	0.1209	0.194	0.05	0.0422	10
Iron (total)	mg/L	**9.42**	**11.3**	**8.92**	**7.21**	**3.26**	**6.07**	**9.07**	**7.92**	<0.030	**13.7**	**16.5**	9.3370	18.5	3.26	3.5859	10
Lead (total)	mg/L	<0.001	0.001	0.001	<0.001	0.001	<0.001	<0.001	0.001	<0.001	0.001	0.002	0.0009	0.002	0.0005	0.0004	10
Magnesium (total)	mg/L	28.5	28.7	23.4	36.2	16.6	26	33.7	24.8	28.4	35.9	37.2	29.10	37.2	16.6	8.33	10
Manganese (total)	mg/L	**1.36**	**1.57**	**1.13**	**1.62**	**0.546**	**0.969**	**1.47**	**1.09**	**1.4**	**1.8**	**2.1**	1.3644	2.1	0.546	0.4280	10
Mercury (total)	mg/L	<0.00001	<0.00001	0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000005	0.000005	0.000005	0	10
Molybdenum (total)	mg/L	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0006	0.001	0.0005	0.0002	10
Nickel (total)	mg/L	0.003	0.005	0.008	0.005	0.003	0.004	0.006	0.005	0.004	0.005	0.008	0.0048	0.008	0.003	0.0011	10
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	10
Silicon (total)	mg/L	5.42	6.12	5.21	4.90	3.42	4.26	5.21	5.96	4.03	4.99	5.37	5.086	6.12	3.42	0.745	10
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0001	<0.0001	**0.0003**	0.00010	0.0003	0.00005	0.00007	10
Strontium (total)	mg/L	1.35	1.53	1.07	1.66	0.686	1.19	1.85	1.32	1.51	1.97	2.19	1.4616	2.19	0.686	0.4291	10
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.019	<0.010	<0.010	<0.010	0.0064	0.019	0.005	0.0042	10
Uranium (total)	mg/L	0.00019	0.00018	0.00017	0.00017	0.00012	0.00021	0.0002	0.00023	0.00015	0.00027	0.00024	0.000196	0.00027	0.00012	0.000042	10
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	10
Zinc (total)	mg/L	**0.482**	**0.572**	**0.418**	**0.517**	**0.164**	**0.288**	**0.462**	**0.382**	**0.091**	**0.68**	**0.753**	0.4688	0.753	0.164	0.1869	10
Dissolved Metals																	
Aluminum (dissolved)	mg/L	**0.080**	**0.053**	**0.052**	**0.073**	0.047	0.041	**0.552**	**0.11**	**1.13**	0.037	0.024	0.1069	0.552	0.024	0.1502	10
Antimony (dissolved)	mg/L	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0003	0.0001	<0.0001	<0.0001	0.0003	0.00019	0.0003	0.00005	0.00008	10
Arsenic (dissolved)	mg/L	0.0008	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.0002	0.0001	0.0007	<0.0001	<0.0001	0.00013	0.0008	0.00005	0.00016	10
Barium (dissolved)	mg/L	0.024	0.024	0.017	0.020	0.021	0.019	0.024	0.025	0.028	0.018	0.017	0.0207	0.025	0.018	0.0032	10
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	10
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	10
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	10
Cadmium (dissolved)	mg/L	<0.0002	0.0013	0.0005	0.0020	0.0004	0.0005	0.0017	0.0004	<0.0002	0.0014	0.0022	0.00105	0.0022	0.0001	0.00072	10
Calcium (dissolved) *	mg/L	140	150	100	161	66	105	168	123	146	179	198	139.00	198	66	38.48	10
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	10
Cobalt (dissolved)	mg/L	<0.001	0.008	0.004	<0.001	0.003	0.002	0.007	0.006	0.008	0.008	0.012	0.00510	0.012	0.0005	0.00358	10
Cooper (dissolved)	mg/L	0.002	0.003	0.002	0.005	0.004	0.001	0.065	0.002	0.135	0.001	0.004	0.0089	0.065	0.001	0.0187	10
Iron (dissolved)	mg/L	<0.030	<0.030	0.040	0.503	<0.030	<0.030	5.09	<0.030	9.63	<0.030	0.984	0.8707	5.09	0.015	1.5045	10
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	10
Magnesium (dissolved)	mg/L	28.4	28.4	21.3	35.8	16.5	18	33.3	24.7	28.4	34	37.3	27.77	37.3	16.5	7.07	10
Manganese (dissolved)	mg/L	1.270	1.47	0.898	1.59	0.514	0.647	1.43	1.03	1.45	1.86	2.08	1.2569	2.08	0.514	0.4581	10
Molybdenum (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	10
Nickel (dissolved)	mg/L	0.002	0.002	0.004	0.004	0.002	0.002	0.006	0.003	0.004	0.004	0.008	0.0035	0.008	0.002	0.0015	10
Potassium (dissolved)	mg/L	1.14	1.10	0.80	1.23	0.95	1.33	1.83	1.48	1.37	1.97	1.56	1.317	1.97	0.8	0.330	10
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	10
Silicon (dissolved)	mg/L	4.10	4.57	3.18	4.26	3.07	3.32	4.82	4	5.15	3.54	4.07	3.873	4.82	3.07	0.533	10
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.00007	0.0002	0.00005	0.00005	10
Sodium (dissolved)	mg/L	6.87	8.26	5.77	8.28	4.44	101	8.89	7.64	8.27	8.75	10.8	17.028	101	4.44	28.039	10
Strontium (dissolved)	mg/L	1.33	1.49	0.982	1.64	0.673	1.13	1.83	1.31	1.52	1.84	2.19	1.4415	2.19	0.673	0.4290	10
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	10
Uranium (dissolved)	mg/L	0.00014	0.00011	0.00013	0.00013	0.00009	0.00012	0.00012	0.00018	0.00017	0.0002	0.00015	0.000135	0.0002	0.00009	0.000029	10
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	10
Zinc (dissolved)	mg/L	0.043	0.085	0.031	0.341	0.072	0.048	0.28	0.045	0.492	0.272	0.459	0.1676	0.459	0.031	0.1476	10
Organics																	
Total Organic Carbon	mg/L		1.0	1.3	1.0	1.9	1.2	1.4	2.4	1.5	2.7	1.6	1.61	2.7	1	0.57	9

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).
(Data from September 16, 1995, was not included in statistical analysis due to an apparent error with respect to total and dissolved metals concentrations).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

bold - exceeds B.C. AWCWQ (1994) for protection of aquatic life.

<u>underline</u> - exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT

Site W6 Water Quality Data - Trench Creek

Date		20-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																
Conductivity	umhos/cm	162	210	147	192	107	153	201		159	189		168.9	210	107	30.5	9
Total Dissolved Solids	mg/L	96	131	90	124	72	106	140		112	128		111.0	140	72	20.8	9
Hardness	mg/L CaCO3	76.4	104	67.1	90.8	51	77	98.5		75.9	89.5		81.1	104	51	15.5	9
pH	pH Units	7.86	8.08	7.76	7.91	7.57	7.83	7.85		7.98	8.04		7.882	8.08	7.57	0.119	9
Total Suspended Solids	mg/L	5	3	3	<1	3	<1	<1		<1	2		2.0	5	0.5	1.5	9
Turbidity	NTU	0.81	1.10	1.41	0.47	2.54	0.59	0.4		0.6	0.2		0.902	2.54	0.2	0.676	9
Anions																	
Alkalinity (Total) *	mg/L CaCO3	57.4	76.8	48.9	64.7	41.5	55.8	76.6		59.4	62.7		60.4	75.3	41.6	10.9	9
Chloride (dissolved)	mg/L	<0.5	<0.5	0.5	<0.5	<0.5	0.6	<0.5		<0.5	0.6		0.356	0.6	0.25	0.152	9
Fluoride (dissolved)	mg/L	0.06	0.05	0.06	0.06	0.05	0.05	0.05		0.06	0.05		0.054	0.06	0.05	0.005	9
Sulphate (dissolved)	mg/L	21.2	28.1	21.5	25.1	14.5	19.2	29.3		23.8	29.8		23.61	29.3	14.5	4.78	9
Nutrients																	
Ammonia Nitrogen	mg/L	0.038	<0.005	0.009	<0.005	0.007	<0.005	<0.005		<0.005	<0.005		0.0077	0.038	0.0025	0.0110	9
Nitrate Nitrogen	mg/L	0.059	0.061	0.084	0.134	0.108	0.11	0.077		0.087	0.164		0.0982	0.164	0.059	0.0328	9
Nitrite Nitrogen	mg/L	0.001	0.002	0.003	0.003	0.002	0.001	0.001		0.001	0.001		0.0017	0.003	0.001	0.0008	9
ortho-Phosphate	mg/L	0.007	0.002	<0.001	0.002	0.003	0.001	0.002		<0.001	<0.001		0.0021	0.007	0.0005	0.0019	9
Total Dissolved Phosphate	mg/L	0.008	0.003	0.003	0.003	0.004	0.002	0.002		<0.001	<0.001		0.0029	0.008	0.0005	0.0021	9
Total Phosphorus	mg/L	0.011	0.004	0.003	0.005	0.007	0.002	0.002		0.001	<0.001		0.0039	0.011	0.0005	0.0031	9
Cyanide																	
Total Cyanide	mg/L	0.001	<0.001	0.002	0.002	0.002	<0.001	<0.001	0.001	0.001	<0.001	<0.001	0.0010	0.002	0.0005	0.0006	11
Total Metals																	
Aluminum (total)	mg/L	0.048	0.023	0.049	0.048	0.171	0.042	<0.050	0.028	0.028	0.026	0.045	0.0485	0.171	0.023	0.0400	11
Antimony (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.00005	0.0001	0.00005	0.00001	11
Arsenic (total)	mg/L	<0.0001	0.0002	0.0002	0.0002	0.0005	0.0003	0.0003	0.0003	0.0003	0.0002	0.0002	0.00025	0.0005	0.00005	0.00011	11
Barium (total)	mg/L	0.031	0.038	0.025	0.032	0.026	0.029	0.037	0.037	0.035	0.031	0.036	0.0325	0.038	0.025	0.0043	11
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (total)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (total)	mg/L	27.0	37.6	26.1	31.3	17.3	26.8	34.9	38.1	25.2	31.5	37.9	30.32	38.1	17.3	6.27	11
Chromium (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00050	0.0005	0.0005	0	11
Cobalt (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00050	0.0005	0.0005	0	11
Copper (total)	mg/L	0.005	0.005	0.005	0.004	0.012	0.005	0.004	0.004	0.004	0.006	0.004	0.0053	0.012	0.004	0.0022	11
Iron (total)	mg/L	0.069	0.049	0.081	0.042	0.095	0.034	<0.030	<0.030	<0.030	<0.030	<0.030	0.0405	0.095	0.015	0.0283	11
Lead (total)	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.001	0.0005	0.0001	11
Magnesium (total)	mg/L	2.4	3.2	2.6	3.0	1.93	2.53	3.05	3.2	2.59	2.91	3.37	2.81	3.37	1.93	0.41	11
Manganese (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Mercury (total)	mg/L	<0.00001	<0.00001	0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001	<0.00001	0.0000055	0.00001	0.000005	0.0000014	11
Molybdenum (total)	mg/L	0.013	0.017	0.009	0.015	0.01	<0.001	0.016	0.018	0.01	0.012	0.02	0.0128	0.02	0.0005	0.0052	11
Nickel (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (total)	mg/L	4.11	4.08	4.56	3.90	3.58	3.66	3.81	3.72	3.95	3.27	3.3	3.795	4.56	3.27	0.360	11
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Strontium (total)	mg/L	0.100	0.151	0.098	0.125	0.074	0.103	0.146	0.162	0.108	0.126	0.157	0.1227	0.162	0.074	0.0273	11
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.0050	0.005	0.005	0	11
Uranium (total)	mg/L	0.00009	0.00010	0.00006	0.00010	0.00007	0.00014	0.00014	0.00022	0.00009	0.0002	0.00023	0.000131	0.00023	0.00006	0.000058	11
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005	<0.005	<0.005	0.0031	0.009	0.0025	0.0019	11
Dissolved Metals																	
Aluminum (dissolved)	mg/L	0.044	<0.006	0.035	0.024	0.059	0.035	0.028	0.016	0.026	0.023	0.012	0.0277	0.059	0.0025	0.0148	11
Antimony (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.00005	0.0001	0.00005	0.00001	11
Arsenic (dissolved)	mg/L	<0.0001	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.0002	0.0003	0.0002	0.0002	0.00020	0.0003	0.00005	0.00006	11
Barium (dissolved)	mg/L	0.031	0.038	0.025	0.032	0.026	0.027	0.036	0.037	0.035	0.031	0.035	0.0321	0.038	0.025	0.0043	11
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.050	0.05	0.05	0	11
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.00010	0.0001	0.0001	0	11
Calcium (dissolved) *	mg/L	26.6	36.7	22.8	31.3	17.2	26.7	34.5	36.7	26	31.1	37.7	29.75	37.7	17.2	6.22	11
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00050	0.0005	0.0005	0	11
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00050	0.0005	0.0005	0	11
Copper (dissolved)	mg/L	0.005	0.003	0.005	0.003	0.009	0.005	0.004	0.003	0.004	0.003	0.003	0.0043	0.009	0.003	0.0017	11
Iron (dissolved)	mg/L	<0.030	<0.030	0.030	<0.030	0.048	0.035	<0.030	<0.030	<0.030	<0.030	<0.030	0.0212	0.048	0.015	0.0108	11
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Magnesium (dissolved)	mg/L	2.41	3.08	2.44	3.04	1.93	2.51	2.99	3.12	2.7	2.89	3.31	2.77	3.31	1.93	0.39	11
Manganese (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Molybdenum (dissolved)	mg/L	0.013	0.015	0.009	0.014	0.007	<0.001	0.016	0.018	0.011	0.011	0.015	0.0118	0.018	0.0005	0.0047	11
Nickel (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Potassium (dissolved)	mg/L	0.33	0.41	0.32	0.37	0.39	0.33	0.37	0.38	0.24	0.34	0.36	0.349	0.41	0.24	0.044	11
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (dissolved)	mg/L	4.06	3.89	4.08	3.83	3.49	3.6	3.57	3.58	4.01	3.25	3.24	3.691	4.08	3.24	0.289	11
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000050	0.00005	0.00005	0	11
Sodium (dissolved)	mg/L	1.87	1.93	1.97	1.81	1.79	2.89	1.93	2.16	2.68	2.29	2.56	2.171	2.89	1.79	0.365	11
Strontium (dissolved)	mg/L	0.100	0.146	0.093	0.125	0.074	0.105	0.145	0.158	0.113	0.127	0.155	0.1219	0.158	0.074	0.0262	11
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (dissolved)	mg/L	0.00009	0.00010	0.00006	0.00010	0.00007	0.00013	0.00014	0.00021	0.00009	0.0002	0.00023	0.000129	0.00023	0.00006	0.000056	11
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.007	0.0033	0.007	0.0025	0.0017	11
Organics																	
Total Organic Carbon	mg/L		2.0	2.1	1.7	3.9	2.2	1.8	1.6	1.9	1.8		2.11	3.9	1.6	0.66	9

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

- exceeds B.C. AWCWQ (1994) for protection of aquatic life.

- exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Site W7 Water Quality Data - Coyote Creek above "White Rock Canyon" confluence

Date		21-Jul-94	7-Sep-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																
Conductivity	umhos/cm	324	338	320	330	317	304	357	334	324	330	335	328.5	357	304	12.9	11
Total Dissolved Solids	mg/L	218	228	196	223	222	221	247	233	234	221	239	225.6	247	196	12.7	11
Hardness	mg/L CaCO3	170	136	162	171	167	167	174	172	165	167	180	166.5	180	136	10.7	11
pH	pH Units	8.16	7.99	8.05	8.11	8.02	7.88	7.88	8.48	7.99	8.06	7.95	8.052	8.48	7.88	0.159	11
Total Suspended Solids	mg/L	3	3	<1	<1	<1	3	<1	3	1	3	<1	1.7	3	0.5	1.2	11
Turbidity	NTU	0.48	1.23	0.75	0.45	0.48	1.01	1.4	1.65	1.2	0.8	0.6	0.914	1.65	0.45	0.393	11
Anions																	
Alkalinity (Total) *	mg/L CaCO3	142	149	138	143	145	142	158	152	163	141	153	147.8	163	138	7.5	11
Chloride (dissolved)	mg/L	0.6	<0.5	0.5	0.5	0.5	0.6	<0.5	<0.5	<0.5	0.6	0.9	0.473	0.9	0.25	0.198	11
Fluoride (dissolved)	mg/L	0.07	0.14	0.07	0.07	0.06	0.06	0.07	0.07	0.08	0.07	0.08	0.076	0.14	0.06	0.021	11
Sulphate (dissolved)	mg/L	32.0	35.3	32.2	33.9	32.3	31.4	42.6	34.9	32.2	33.1	35	34.08	42.6	31.4	2.99	11
Nutrients																	
Ammonia Nitrogen	mg/L	0.009	<0.005	0.010	<0.005	0.007	0.008	0.014	<0.005	0.008	0.007	<0.005	0.0086	0.014	0.0025	0.0036	11
Nitrate Nitrogen	mg/L	<0.005	<0.005	<0.005	0.008	<0.005	0.005	0.005	<0.005	<0.005	0.005	<0.005	0.0035	0.008	0.0025	0.0013	11
Nitrite Nitrogen	mg/L	0.001	0.001	<0.001	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.0011	0.002	0.0005	0.0004	11
ortho-Phosphate	mg/L	0.005	0.009	<0.001	0.002	0.002	0.003	0.003	<0.001	0.002	0.001	<0.001	0.0026	0.009	0.0005	0.0024	11
Total Dissolved Phosphate	mg/L	0.005	0.012	0.004	0.005	0.003	0.006	0.005	<0.001	0.004	0.001	0.003	0.0044	0.012	0.0005	0.0029	11
Total Phosphorus	mg/L	0.005	0.012	0.011	0.005	0.005	0.012	0.01	0.009	0.009	0.005	0.005	0.0080	0.012	0.005	0.0029	11
Cyanide																	
Total Cyanide	mg/L	0.001	0.001	0.002	0.002	0.002	0.002	0.003	0.003	0.002	<0.001	0.001	0.0018	0.003	0.0005	0.0008	11
Total Metals																	
Aluminum (total)	mg/L	0.023	0.018	0.012	0.020	0.018	0.031	0.041	0.028	0.025	0.023	0.043	0.0256	0.043	0.012	0.0091	11
Antimony (total)	mg/L	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.00006	0.0001	0.00005	0.00002	11
Arsenic (total)	mg/L	0.0006	0.0005	0.0006	0.0006	0.0008	0.0006	0.0007	0.0007	0.0007	0.0006	0.0007	0.00065	0.0008	0.0005	0.00008	11
Barium (total)	mg/L	0.052	0.051	0.047	0.052	0.051	0.049	0.051	0.05	0.052	0.05	0.052	0.0506	0.052	0.047	0.0015	11
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (total)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (total)	mg/L	49.0	47.9	51.3	49.9	47	48.4	48	48.2	47.7	46.4	50.3	48.55	51.3	46.4	1.39	11
Chromium (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Iron (total)	mg/L	0.063	0.038	0.057	0.037	<0.030	0.083	0.097	0.097	0.084	0.055	0.057	0.0621	0.097	0.015	0.0250	11
Lead (total)	mg/L	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.001	0.0005	0.0001	11
Magnesium (total)	mg/L	12.2	14.4	13.3	14.3	12.6	12.9	14.4	13.7	13	12.9	13.8	13.41	14.4	12.2	0.73	11
Manganese (total)	mg/L	0.014	0.026	0.016	0.016	0.01	0.037	0.064	0.045	0.046	0.032	0.042	0.0316	0.064	0.01	0.0161	11
Mercury (total)	mg/L	<0.00001	<0.00001	<0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00002	<0.00001	0.000006	0.00002	0.000005	0.000004	11
Molybdenum (total)	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.0007	0.002	0.0005	0.0004	11
Nickel (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (total)	mg/L	3.08	2.65	3.31	3.28	3.03	2.82	2.63	3.14	3.17	2.94	3.22	3.025	3.31	2.63	0.227	11
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00006	0.0001	0.00005	0.00002	11
Strontium (total)	mg/L	0.223	0.224	0.244	0.248	0.24	0.238	0.258	0.256	0.24	0.235	0.258	0.2422	0.258	0.223	0.0117	11
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (total)	mg/L	0.00010	0.00008	0.00008	0.00011	0.00013	0.00014	0.00009	0.00012	0.0001	0.00014	0.00013	0.000111	0.00014	0.00008	0.000022	11
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Dissolved Metals																	
Aluminum (dissolved)	mg/L	0.007	0.007	<0.005	<0.005	0.01	0.013	0.03	0.012	0.007	0.012	0.008	0.0101	0.03	0.0025	0.0071	11
Antimony (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.00005	0.0001	0.00005	0.00001	11
Arsenic (dissolved)	mg/L	<0.0001	0.0005	0.0005	0.0005	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.00052	0.0007	0.00005	0.00016	11
Barium (dissolved)	mg/L	0.050	0.051	0.047	0.048	0.051	0.046	0.05	0.048	0.052	0.048	0.052	0.0494	0.052	0.046	0.0020	11
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (dissolved) *	mg/L	48.1	44.9	44.7	46.9	46.2	46.3	46.7	47	45.6	46	48.5	46.54	49.5	44.7	1.31	11
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Iron (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	0.034	0.044	0.043	<0.030	<0.030	<0.030	0.0219	0.044	0.015	0.0115	11
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Magnesium (dissolved)	mg/L	12.1	13.9	12.1	13.0	12.5	12.4	13.9	13.3	12.4	12.8	13.6	12.91	13.9	12.1	0.65	11
Manganese (dissolved)	mg/L	0.008	0.005	<0.005	0.009	0.005	0.021	0.044	0.029	0.027	0.026	0.032	0.0190	0.044	0.0025	0.0131	11
Molybdenum (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Nickel (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Potassium (dissolved)	mg/L	0.67	0.71	0.71	0.71	0.77	0.69	0.82	0.87	0.84	0.88	0.79	0.751	0.88	0.64	0.077	11
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (dissolved)	mg/L	3.02	2.44	2.96	3.14	2.99	2.7	2.53	3.02	3.01	2.89	3.16	2.896	3.16	2.44	0.227	11
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Sodium (dissolved)	mg/L	2.89	2.98	2.79	2.75	3.38	4.15	3.89	3.61	3.32	3.52	3.91	3.381	4.15	2.75	0.463	11
Strontium (dissolved)	mg/L	0.219	0.224	0.227	0.233	0.236	0.228	0.249	0.248	0.236	0.233	0.255	0.2353	0.255	0.219	0.0107	11
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (dissolved)	mg/L	0.00010	0.00008	0.00008	0.00005	0.00012	0.00013	0.00008	0.00012	0.00009	0.00014	0.00013	0.000102	0.00014	0.00005	0.000027	11
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.01	<0.005	<0.005	0.013	<0.005	0.0044	0.013	0.0025	0.0035	11
Organics																	
Total Organic Carbon	mg/L		2.9	2.5	2.6	2.5	2.4	3.4	2.8	2.7	2.8	3.0	2.76	3.4	2.4	0.28	10

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

- exceeds B.C. AWCWQ (1994) for protection of aquatic life.

- exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT

Site W8 Water Quality Data - Thurston's Trickle

Date		22-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																
Conductivity	umhos/cm	335	340	299	349	237	308	350	303	334	319	334	318.9	350	237	30.9	11
Total Dissolved Solids	mg/L	226	210	180	232	163	216	238	208	240	208	230	213.7	240	163	23.0	11
Hardness	mg/L CaCO3	161	185	153	182	128	169	173	156	176	157	170	166.4	185	128	16.0	11
pH	pH Units	8.23	8.32	8.20	8.19	7.97	8.11	8.08	8.5	8.21	8.23	8.05	8.190	8.5	7.97	0.136	11
Total Suspended Solids	mg/L	1	<1	4	3	<1	<1	<1	<1	<1	3	<1	1.3	4	0.5	1.3	11
Turbidity	NTU	<0.10	0.15	0.12	<0.10	0.66	0.1	0.2	0.19	0.15	0.1	0.1	0.170	0.65	0.05	0.162	11
Anions																	
Alkalinity (Total) *	mg/L CaCO3	153	158	133	159	117	149	165	140	169	139	154	148.5	169	117	14.5	11
Chloride (dissolved)	mg/L	0.6	<0.5	0.5	<0.5	<0.5	0.6	<0.5	<0.5	0.5	0.7	0.9	0.459	0.9	0.25	0.216	11
Fluoride (dissolved)	mg/L	0.08	0.08	0.07	0.08	0.06	0.07	0.09	0.09	0.1	0.08	0.08	0.080	0.1	0.06	0.010	11
Sulphate (dissolved)	mg/L	30.8	29.6	26.7	32.5	17.3	27.2	35.5	30.1	32.7	31.1	35	29.86	35.5	17.3	4.77	11
Nutrients																	
Ammonia Nitrogen	mg/L	<0.005	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0028	0.006	0.0025	0.0010	11
Nitrate Nitrogen	mg/L	0.023	0.006	0.011	0.058	0.023	0.028	0.01	0.005	0.009	0.072	0.083	0.0298	0.083	0.005	0.0267	11
Nitrite Nitrogen	mg/L	0.001	0.001	0.002	0.002	0.001	0.001	0.001	0.001	0.001	0.001	<0.001	0.0011	0.002	0.0005	0.0004	11
ortho-Phosphate	mg/L	0.002	0.001	<0.001	<0.001	0.002	0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.0009	0.002	0.0005	0.0006	11
Total Dissolved Phosphate	mg/L	0.003	0.002	<0.001	0.003	0.003	0.002	0.002	<0.001	<0.001	0.002	<0.001	0.0017	0.003	0.0005	0.0010	11
Total Phosphorus	mg/L	0.005	0.002	<0.001	0.003	0.003	0.002	0.004	<0.001	<0.001	0.002	<0.001	0.0021	0.005	0.0005	0.0015	11
Cyanide																	
Total Cyanide	mg/L	0.001	<0.001	0.002	0.001	0.003	0.002	0.001	0.003	0.002	0.001	0.001	0.0016	0.003	0.0005	0.0008	11
Total Metals																	
Aluminum (total)	mg/L	0.005	<0.005	0.011	0.005	0.014	0.009	0.042	0.016	0.008	0.082	0.019	0.0194	0.082	0.0025	0.0223	11
Antimony (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Arsenic (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	0.0001	0.0001	<0.0001	<0.0001	0.00007	0.0001	0.00005	0.00002	11
Barium (total)	mg/L	0.046	0.050	0.035	0.044	0.034	0.046	0.045	0.037	0.044	0.047	0.043	0.0428	0.05	0.034	0.0050	11
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (total)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (total)	mg/L	44.8	45.1	41.1	44.4	30	41.6	42.1	37.7	42.2	41.7	42.9	41.22	45.1	30	4.04	11
Chromium (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.0006	0.002	0.0005	0.0004	11
Iron (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.038	<0.030	0.0171	0.038	0.015	0.0066	11
Lead (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Magnesium (total)	mg/L	17.3	18.2	17.1	19.7	13.3	17.4	17.4	15.3	17	12.8	17.8	18.85	19.7	12.6	2.01	11
Manganese (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	0.0033	0.011	0.0025	0.0024	11
Mercury (total)	mg/L	<0.00001	<0.00001	0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000005	0.000005	0.000005	0	11
Molybdenum (total)	mg/L	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.001	0.0005	0.0001	11
Nickel (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.01	<0.001	0.0015	0.01	0.0005	0.0027	11
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (total)	mg/L	3.12	3.38	3.08	3.21	2.37	2.88	3.14	3.16	3.04	4.28	2.98	3.149	4.28	2.37	0.433	11
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Strontium (total)	mg/L	0.231	0.255	0.209	0.241	0.171	0.229	0.25	0.22	0.241	0.338	0.243	0.2389	0.338	0.171	0.0384	11
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (total)	mg/L	0.00004	0.00004	0.00003	0.00004	0.00006	0.00007	0.00005	0.00004	0.00005	0.00009	0.00008	0.000052	0.00009	0.00003	0.000016	11
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Dissolved Metals																	
Aluminum (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	0.012	0.007	0.012	0.014	0.009	0.015	0.007	0.0078	0.015	0.0025	0.0047	11
Antimony (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Arsenic (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	0.0001	<0.0001	<0.0001	0.00006	0.0001	0.00005	0.00002	11
Barium (dissolved)	mg/L	0.046	0.047	0.035	0.040	0.034	0.043	0.045	0.037	0.046	0.035	0.043	0.0410	0.047	0.034	0.0047	11
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (dissolved) *	mg/L	44.1	44.6	36.1	42.1	29.8	40	41.2	37.5	42.3	37.1	40.5	39.57	44.6	29.8	4.06	11
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Iron (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Magnesium (dissolved)	mg/L	17.3	17.9	15.4	18.6	13.1	16.7	17	15.2	17	15.6	16.8	16.42	18.6	13.1	1.44	11
Manganese (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Molybdenum (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Nickel (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.0008	0.002	0.0005	0.0004	11
Potassium (dissolved)	mg/L	0.37	0.48	0.31	0.39	0.81	0.51	0.57	0.41	0.36	0.38	0.38	0.432	0.61	0.31	0.090	11
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (dissolved)	mg/L	3.11	3.32	2.74	3.03	2.32	2.77	3.08	3.14	3.04	2.69	2.82	2.915	3.32	2.32	0.265	11
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Sodium (dissolved)	mg/L	2.50	2.58	2.05	2.40	1.88	3.14	2.93	2.83	3.05	3.01	3.87	2.731	3.87	1.88	0.491	11
Strontium (dissolved)	mg/L	0.231	0.251	0.195	0.229	0.169	0.22	0.245	0.22	0.241	0.208	0.228	0.2215	0.251	0.169	0.0226	11
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (dissolved)	mg/L	0.00004	0.00004	0.00003	0.00004	0.00005	0.00007	0.00005	0.00004	0.00005	0.00006	0.00006	0.000048	0.00007	0.00003	0.000011	11
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	0.0030	0.008	0.0025	0.0016	11
Organics																	
Total Organic Carbon	mg/L		1.9	2.5	1.7	3.2	1.9	1.8	3.0	2.2	1.7	1.8	2.17	3.2	1.7	0.52	10

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

__ - exceeds B.C. AWCWQ (1994) for protection of aquatic life.

▭ - exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Site W9 Water Quality Data - Camp Creek

Date		22-Jul-94	31-Aug-94	5-Oct-94	31-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	17-Oct-95	31-Oct-95	Average	Maximum	Minimum	Standard Deviation	Count
Physical Tests	Units																
Conductivity	umhos/cm	299	323	260	351	169	289	343	291	297	339	378	301.7	378	169	54.2	11
Total Dissolved Solids	mg/L	212	213	167	258	113	202	250	211	222	240	277	215.0	277	113	43.2	11
Hardness	mg/L CaCO3	146	158	115	169	76.5	133	152	135	138	154	168	140.0	169	75.5	25.0	11
pH	pH Units	7.94	8.00	7.71	7.85	7.66	7.87	7.86	8.29	8.02	7.99	7.65	7.895	8.29	7.55	0.178	11
Total Suspended Solids	mg/L	4	<1	10	6	17	9	3	5	<1	3	2	5.5	17	0.5	4.7	11
Turbidity	NTU	1.14	1.10	13.3	2.85	21.3	8.94	0.7	8.05	1.3	0.7	1.2	5.507	21.3	0.7	8.441	11
Anions																	
Alkalinity (Total) *	mg/L CaCO3	72.1	80.4	53.3	74.5	41.8	71.1	87.3	77.8	81.3	75.2	87.8	73.0	87.8	41.8	13.3	11
Chloride (dissolved)	mg/L	0.5	<0.5	0.8	<0.5	0.9	0.5	<0.5	<0.5	0.6	0.5	0.8	0.509	0.9	0.25	0.233	11
Fluoride (dissolved)	mg/L	0.11	0.10	0.09	0.12	0.08	0.1	0.14	0.12	0.14	0.12	0.14	0.115	0.14	0.08	0.020	11
Sulphate (dissolved)	mg/L	75.6	79.2	68.5	101	39.4	67.1	91.4	70.1	76.3	89.5	107	78.85	107	39.4	17.71	11
Nutrients																	
Ammonia Nitrogen	mg/L	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	<0.005	0.0038	0.011	0.0025	0.0028	11
Nitrate Nitrogen	mg/L	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0033	0.011	0.0025	0.0024	11
Nitrite Nitrogen	mg/L	0.002	0.001	0.007	0.001	0.002	0.004	0.001	0.004	0.002	0.001	0.001	0.0024	0.007	0.001	0.0018	11
ortho-Phosphate	mg/L	0.003	0.005	0.026	0.004	0.005	0.002	0.001	<0.001	0.001	0.001	<0.001	0.0045	0.026	0.0005	0.0070	11
Total Dissolved Phosphate	mg/L	0.006	0.006	0.026	0.008	0.009	0.003	0.003	<0.001	0.003	0.003	0.001	0.0060	0.026	0.0005	0.0067	11
Total Phosphorus	mg/L	0.008	0.007	0.038	0.014	0.061	0.027	0.004	0.022	0.006	0.005	0.007	0.0179	0.061	0.004	0.0172	11
Cyanide																	
Total Cyanide	mg/L	0.005	<0.001	0.006	0.004	0.004	0.005	0.003	0.005	0.005	0.003	0.002	0.0039	0.006	0.0005	0.0015	11
Total Metals																	
Aluminum (total)	mg/L	0.064	0.033	0.363	0.111	0.71	0.211	0.05	0.75	0.097	<0.005	0.089	0.2255	0.75	0.0025	0.2560	11
Antimony (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.0001	0.00005	0.00001	11
Arsenic (total)	mg/L	<0.0001	<0.0001	<0.0001	0.0020	0.0002	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.00025	0.002	0.00005	0.00056	11
Barium (total)	mg/L	0.045	0.050	0.042	0.052	0.038	0.05	0.048	0.048	0.046	0.038	0.051	0.0458	0.052	0.038	0.0046	11
Beryllium (total)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (total)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (total)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (total)	mg/L	40.0	42.7	36.3	44.9	20.5	35.8	40.8	36	38	37.6	44.7	37.94	44.9	20.5	6.36	11
Chromium (total)	mg/L	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00084	0.002	0.0005	0.00043	11
Cobalt (total)	mg/L	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00109	0.007	0.0005	0.00187	11
Copper (total)	mg/L	0.002	0.002	0.008	0.002	0.009	0.004	0.001	0.004	0.002	0.003	0.002	0.0034	0.009	0.001	0.0022	11
Iron (total)	mg/L	0.071	0.086	0.332	0.107	0.394	0.27	0.032	0.251	0.088	<0.030	0.045	0.1501	0.394	0.015	0.1287	11
Lead (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Magnesium (total)	mg/L	11.2	12.2	10.2	13.8	8.55	10.8	12.6	10.7	10.9	15.9	14	11.71	15.9	8.55	2.33	11
Manganese (total)	mg/L	0.008	0.007	0.011	0.010	0.02	0.023	<0.005	0.015	0.008	<0.005	0.013	0.0106	0.023	0.0025	0.0064	11
Mercury (total)	mg/L	<0.00001	<0.00001	0.0000	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.000005	0.000005	0.000005	0	11
Molybdenum (total)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Nickel (total)	mg/L	0.002	0.001	0.003	0.002	0.004	0.003	0.004	0.003	0.002	<0.001	0.003	0.0025	0.004	0.0005	0.0011	11
Selenium (total)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (total)	mg/L	5.19	5.10	5.22	5.22	4.23	5.16	4.79	5.45	4.91	2.73	4.48	4.771	5.45	2.73	0.730	11
Silver (total)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Strontium (total)	mg/L	0.269	0.343	0.279	0.346	0.182	0.29	0.324	0.309	0.313	0.21	0.358	0.2948	0.358	0.182	0.0527	11
Titanium (total)	mg/L	<0.010	<0.010	<0.010	<0.010	0.011	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	0.0062	0.012	0.005	0.0025	11
Uranium (total)	mg/L	0.00005	0.00004	0.00004	0.00005	0.00005	0.00009	0.00008	0.00006	0.00005	0.00008	0.00009	0.000058	0.00009	0.00004	0.000018	11
Vanadium (total)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (total)	mg/L	<0.005	<0.005	0.005	<0.005	0.008	0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.0037	0.008	0.0025	0.0017	11
Dissolved Metals																	
Aluminum (dissolved)	mg/L	0.029	0.020	0.127	0.043	<0.005	0.077	0.043	0.086	0.054	<0.005	0.026	0.0464	0.127	0.0025	0.0361	11
Antimony (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Arsenic (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	<0.0001	0.00006	0.0001	0.00005	0.00002	11
Barium (dissolved)	mg/L	0.045	0.049	0.034	0.049	0.028	0.046	0.045	0.042	0.044	0.046	0.048	0.0431	0.049	0.028	0.0061	11
Beryllium (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0025	0.0025	0.0025	0	11
Bismuth (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Boron (dissolved)	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.05	0.05	0.05	0	11
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0001	0.0001	0.0001	0	11
Calcium (dissolved) *	mg/L	40.0	42.5	31.1	44.9	20	35.8	40.5	38.3	37.3	41.4	43.8	37.56	44.9	20	6.74	11
Chromium (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Cobalt (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Copper (dissolved)	mg/L	0.001	0.001	0.003	0.001	0.004	0.002	<0.001	0.002	0.002	0.001	0.002	0.0018	0.004	0.0005	0.0010	11
Iron (dissolved)	mg/L	0.033	<0.030	<0.030	<0.030	0.091	0.065	<0.030	0.072	0.034	<0.030	<0.030	0.0350	0.091	0.015	0.0266	11
Lead (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Magnesium (dissolved)	mg/L	11.2	12.1	9.05	13.8	6.43	10.6	12.4	10.7	10.8	12.4	13.8	11.21	13.8	6.43	2.03	11
Manganese (dissolved)	mg/L	<0.005	<0.005	<0.005	0.008	0.008	0.018	<0.005	0.009	0.007	0.011	0.011	0.0075	0.018	0.0025	0.0046	11
Molybdenum (dissolved)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0005	0.0005	0.0005	0	11
Nickel (dissolved)	mg/L	0.002	<0.001	0.003	0.001	0.003	0.002	0.002	0.002	0.002	<0.001	0.003	0.0019	0.003	0.0005	0.0009	11
Potassium (dissolved)	mg/L	0.41	0.47	0.40	0.46	0.78	0.68	0.77	0.71	0.48	0.69	0.82	0.588	0.78	0.4	0.139	11
Selenium (dissolved)	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.00025	0.00025	0.00025	0	11
Silicon (dissolved)	mg/L	5.19	5.00	4.71	5.21	3.77	4.79	4.67	4.87	4.73	4.21	4.36	4.683	5.21	3.77	0.410	11
Silver (dissolved)	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00005	0.00005	0.00005	0	11
Sodium (dissolved)	mg/L	5.49	5.82	4.26	6.18	3.88	6.05	6.81	6.01	5.69	6.31	8.63	5.921	8.63	3.88	1.189	11
Strontium (dissolved)	mg/L	0.289	0.340	0.251	0.346	0.179	0.286	0.32	0.309	0.307	0.335	0.353	0.3014	0.353	0.179	0.0483	11
Titanium (dissolved)	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.005	0.005	0.005	0	11
Uranium (dissolved)	mg/L	0.00004	0.00004	0.00004	0.00005	0.00004	0.00006	0.00005	0.00005	0.00005	0.00009	0.00009	0.000055	0.00009	0.00004	0.000018	11
Vanadium (dissolved)	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.015	0.015	0.015	0	11
Zinc (dissolved)	mg/L	<0.005	<0.005	<0.005	<0.005	0.006	0.007	<0.005	<0.005	<0.005	0.008	0.007	0.0041	0.008	0.0025	0.0022	11
Organics																	
Total Organic Carbon	mg/L		5.0	6.1	4.0	6.6	4.0	3.4	5.4	4.5	3.6	3.3	4.59	6.6	3.3	1.09	10

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.

___ - exceeds B.C. AWCWQ (1994) for protection of aquatic life.

▭ - exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.1

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Sites W10 & W11 Water Quality Data
Near mouth of Trail Creek & in upper Quarry Creek

	Station:	W10	W11
	Date:	11-Nov-95	11-Nov-95
Physical Tests	Units		
Conductivity	umhos/cm	326	365
Total Dissolved Solids	mg/L	224	253
Hardness	mg/L CaCO3	164	201
pH	pH Units	7.79	7.48
Total Suspended Solids	mg/L	<1	1
Turbidity	NTU	0.3	2.2
Anions			
Alkalinity (Total) *	mg/L CaCO3	136	189
Chloride (dissolved)	mg/L	<0.5	0.8
Fluoride (dissolved)	mg/L	0.07	0.05
Sulphate (dissolved)	mg/L	40.1	17.8
Nutrients			
Ammonia Nitrogen	mg/L	<0.005	0.023
Nitrate Nitrogen	mg/L	0.092	0.101
Nitrite Nitrogen	mg/L	0.001	0.001
ortho-Phosphate	mg/L	<0.001	0.001
Total Dissolved Phosphate	mg/L	0.001	0.002
Total Phosphorus	mg/L	0.003	0.007
Cyanide			
Total Cyanide	mg/L	<0.001	0.003
Total Metals			
Aluminum (total)	mg/L	0.021	0.017
Antimony (total)	mg/L	0.0001	0.0001
Arsenic (total)	mg/L	0.0001	0.001
Barium (total)	mg/L	0.043	0.07
Beryllium (total)	mg/L	<0.005	<0.005
Bismuth (total)	mg/L	<0.10	<0.10
Boron (total)	mg/L	<0.10	<0.10
Cadmium (total)	mg/L	<0.0002	0.0003
Calcium (total)	mg/L	43.7	55.6
Chromium (total)	mg/L	<0.001	<0.001
Cobalt (total)	mg/L	<0.001	<0.001
Copper (total)	mg/L	<0.001	<0.001
Iron (total)	mg/L	0.085	0.498
Lead (total)	mg/L	<0.001	<0.001
Magnesium (total)	mg/L	14.3	14.9
Manganese (total)	mg/L	0.026	0.124
Mercury (total)	mg/L	<0.00001	<0.00001
Molybdenum (total)	mg/L	<0.001	0.002
Nickel (total)	mg/L	<0.001	<0.001
Selenium (total)	mg/L	<0.0005	<0.0005
Silicon (total)	mg/L	3.03	3.43
Silver (total)	mg/L	<0.0001	<0.0001
Strontium (total)	mg/L	0.243	0.245
Titanium (total)	mg/L	<0.010	<0.010
Uranium (total)	mg/L	0.0001	0.00017
Vanadium (total)	mg/L	<0.030	<0.030
Zinc (total)	mg/L	<0.005	0.005
Dissolved Metals			
Aluminum (dissolved)	mg/L	0.007	0.007
Antimony (dissolved)	mg/L	0.0001	0.0001
Arsenic (dissolved)	mg/L	<0.0001	0.0005
Barium (dissolved)	mg/L	0.043	0.068
Beryllium (dissolved)	mg/L	<0.005	<0.005
Bismuth (dissolved)	mg/L	<0.10	<0.10
Boron (dissolved)	mg/L	<0.10	<0.10
Cadmium (dissolved)	mg/L	<0.0002	<0.0002
Calcium (dissolved) *	mg/L	42.5	55.8
Chromium (dissolved)	mg/L	<0.001	<0.001
Cobalt (dissolved)	mg/L	<0.001	<0.001
Copper (dissolved)	mg/L	<0.001	<0.001
Iron (dissolved)	mg/L	0.031	0.128
Lead (dissolved)	mg/L	<0.001	<0.001
Magnesium (dissolved)	mg/L	14	14.9
Manganese (dissolved)	mg/L	0.028	0.122
Molybdenum (dissolved)	mg/L	<0.001	0.002
Nickel (dissolved)	mg/L	<0.001	<0.001
Potassium (dissolved)	mg/L	0.79	0.97
Selenium (dissolved)	mg/L	<0.0005	<0.0005
Silicon (dissolved)	mg/L	2.97	3.43
Silver (dissolved)	mg/L	<0.0001	<0.0001
Sodium (dissolved)	mg/L	5.44	3.51
Strontium (dissolved)	mg/L	0.239	0.244
Titanium (dissolved)	mg/L	<0.010	<0.010
Uranium (dissolved)	mg/L	0.0001	0.00016
Vanadium (dissolved)	mg/L	<0.030	<0.030
Zinc (dissolved)	mg/L	0.005	0.009
Organics			
Total Organic Carbon	mg/L	1.6	3.6

* - BOLD VALUES for alkalinity and dissolved calcium indicate moderate or low acid buffering capacity.
- exceeds B.C. AWCWQ (1994) for protection of aquatic life.
- exceeds federal CCME guidelines for protection of aquatic life.

TABLE VI.2

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Beak Surface Water Quality Data
July 15, 1975

Station #		Beak #1	Beak #2	Beak #3	Beak #4	Beak #5	Beak #6	Beak #7	Beak #8
Physical Tests	Units								
Temperature	°C	4.3	7.8	5.7	6.1	6.9	8.6	13.2	12.4
Dissolved Oxygen	mg/L	10.6	9.8	10.6	10.4	10.1	10.2	8.7	9.1
Saturation	%	98	96	99	99	97	97	92	95
Total Solids	mg/L	143	188	555	218	471	243	198	221
COD	mg/L	11	<10	<10	<10	<10	<10	<10	<10
Sulphide	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Dissolved Solids	mg/L	141	187	526	218	459	231	196	217
pH	pH Units	7.7	8.3	7.8	8.4	8.1	8.4	8.2	8.3
Total Suspended Solids	mg/L	2	1	29	<1	12	12	2	4
Turbidity	NTU	1.3	0.35	25	0.10	17	6.3	0.40	0.85
Anions									
Sulphate (dissolved)	mg/L	44	25	**290**	34	**250**	69	33	48
Cyanide									
Total Cyanide	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Metals									
Arsenic (total)	mg/L	<0.005	<0.005	<0.005	0.010	<0.005	<0.005	<0.005	<0.005
Copper (dissolved)	mg/L	<0.005	<0.005	0.005	<0.005	0.006	<0.005	<0.005	<0.005
Iron (dissolved)	mg/L	0.044	0.018	<0.01	0.015	0.010	<0.01	<0.01	<0.01
Lead (dissolved)	mg/L	<0.01	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum (dissolved)	mg/L	0.020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Zinc (dissolved)	mg/L	<0.005	<0.005	0.090	<0.005	0.071	0.014	<0.005	<0.005

__ - exceeds B.C. AWCWQ (1994) for protection of aquatic life.

TABLE VI.3

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT

1995 SUMMARY REPORT

Drinking Water Quality Data

Sample		Camp Supply	Bottle Blank	Camp Supply	B.C.	H & W
Date		31-Oct-94	31-Oct-94	17-Oct-95	AWCWQ	Canada
Physical Tests	Units					
Colour	CU	17.8			15	15
Conductivity	umhos/cm	231		357		
Total Dissolved Solids	mg/L	156		175	500	500
Hardness	mg/L CaCO3	106		111	500	
pH	pH Units	7.74		9.79	6.5 - 8.5	6.5 - 8.5
Total Suspended Solids	mg/L	<1		<1		
Turbidity	NTU	3.37		1	5	5
Anions						
Alkalinity (Total)	mg/L CaCO3	56.8		59.9		
Chloride (dissolved)	mg/L	<0.5		2	250	250
Fluoride (dissolved)	mg/L	0.06		0.06	1.5	1.5
Silicate (dissolved)	mg/L	10.2				
Sulphate (dissolved)	mg/L	53.3		58.8	500	500
Nutrients						
Ammonia Nitrogen	mg/L			0.005		
Nitrate Nitrogen	mg/L	0.022		0.024	10	10.0
Nitrite Nitrogen	mg/L	0.007		0.001	1	1.0
ortho-Phosphate	mg/L			0.003		
Total Dissolved Phosphate	mg/L			0.006		
Total Phosphorus	mg/L			0.007	10	
Cyanide						
Total Cyanide	mg/L			0.005		0.2
Total Metals						
Aluminum (total)	mg/L		0.006	<0.005	0.2	
Antimony (total)	mg/L		<0.0001	<0.0001	0.006	
Arsenic (total)	mg/L		<0.0001	<0.0001	0.05	0.05
Barium (total)	mg/L		<0.010	0.057	1	1.0
Beryllium (total)	mg/L		<0.005	<0.005		
Bismuth (total)	mg/L		<0.10	<0.10		
Boron (total)	mg/L		<0.10	<0.10	5	5.0
Cadmium (total)	mg/L		<0.0002	<0.0002	0.005	0.005
Calcium (total)	mg/L		<0.050	33		
Chromium (total)	mg/L		<0.001	<0.001	0.05	0.05
Cobalt (total)	mg/L		<0.001	<0.001		
Copper (total)	mg/L		0.022	0.007	0.5	1.0
Iron (total)	mg/L		<0.030	0.084	0.3	0.3
Lead (total)	mg/L		<0.001	<0.001	0.05	0.05
Magnesium (total)	mg/L		<0.010	8.22	500	
Manganese (total)	mg/L		<0.005	0.013	0.05	0.05
Mercury (total)	mg/L		<0.00001	<0.00001	0.001	0.001
Molybdenum (total)	mg/L		<0.001	<0.001	0.25	
Nickel (total)	mg/L		<0.001	0.002	0.2	
Selenium (total)	mg/L		<0.0005	<0.0005	0.01	0.01
Silicon (total)	mg/L		<0.050	3.98		
Silver (total)	mg/L		<0.0001	<0.0001		0.05
Strontium (total)	mg/L		<0.001	0.302		
Titanium (total)	mg/L		<0.010	<0.010	0.1	
Uranium (total)	mg/L		<0.00001	0.00008	0.1	0.02
Vanadium (total)	mg/L		<0.030	<0.030	0.1	
Zinc (total)	mg/L		<0.005	0.019	5	5.0
Dissolved Metals						
Aluminum (dissolved)	mg/L	<0.20		<0.005	0.2	
Antimony (dissolved)	mg/L			<0.0001	0.006	
Arsenic (dissolved)	mg/L	<0.0001		<0.0001	0.05	0.05
Barium (dissolved)	mg/L	0.052		0.055	1	1.0
Beryllium (dissolved)	mg/L			<0.005		
Bismuth (dissolved)	mg/L			<0.10		
Boron (dissolved)	mg/L	<0.10		<0.10	5	5.0
Cadmium (dissolved)	mg/L	<0.0002		<0.0002	0.005	0.005
Calcium (dissolved)	mg/L	29.9		31.3		
Chromium (dissolved)	mg/L	<0.015		<0.001	0.05	0.05
Cobalt (dissolved)	mg/L			<0.001		
Copper (dissolved)	mg/L	0.016		<0.001	0.5	1.0
Iron (dissolved)	mg/L	0.350		0.059	0.3	0.3
Lead (dissolved)	mg/L	<0.001		<0.001	0.05	0.05
Magnesium (dissolved)	mg/L	7.61		7.87	500	
Manganese (dissolved)	mg/L	0.019		0.013	0.05	0.05
Mercury (dissolved)	mg/L	<0.00005			0.001	0.001
Molybdenum (dissolved)	mg/L			<0.001	0.25	
Nickel (dissolved)	mg/L			0.001	0.2	
Potassium (dissolved)	mg/L	0.30		0.4		
Selenium (dissolved)	mg/L	<0.0005		<0.0005	0.01	0.01
Silicon (dissolved)	mg/L			3.8		
Silver (dissolved)	mg/L			<0.0001		0.05
Sodium (dissolved)	mg/L	3.63		5.33	200	200
Strontium (dissolved)	mg/L			0.289		
Titanium (dissolved)	mg/L			<0.010	0.1	
Uranium (dissolved)	mg/L			0.00007	0.1	0.02
Vanadium (dissolved)	mg/L			<0.030	0.1	
Zinc (dissolved)	mg/L	0.016		0.023	5	5.0
Organic & Bacteriological Tests						
Total Organic Carbon				3.7		
Fecal Coliform Bacteria	MPN/100ml	0	0		0	0
Total Coliform Bacteria	MPN/100ml	0	0			

— - exceeds AWCWQ and Health & Welfare Canada drinking water guidelines.

TABLE VI.4

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT
Surface Water QA/QC Data

		Replicate Set 1			Replicate Set 2			Replicate Set 3			Replicate Set 4			Replicate Set 5		
Station #		W1	W1 (Rep)	Orig:Rep	W1	W1 (Rep)	Orig:Rep	W4	W4 (Rep)	Orig:Rep	W5	W5 (Rep)	Orig:Rep	W2	W2 (Rep)	Orig:Rep
Date		20-Jul-94	20-Jul-94	Ratio	31-Aug-94	31-Aug-94	Ratio	5-Oct-94	5-Oct-94	Ratio	31-Oct-94	31-Oct-94	Ratio	18-May-95	18-May-95	Ratio
Physical Tests	Units															
Conductivity	umhos/cm	412	413	1.00	545	546	1.00	245	249	0.98	998	996	1.00	438	439	1.00
Total Dissolved Solids	mg/L	289	289	1.00	367	387	1.00	154	155	0.99	904	889	1.02	322	322	1.00
Hardness	mg/L CaCO3	219	218	1.00	292	292	1.00	118	123	0.96	549	536	1.02	234	231	1.01
pH	pH Units	8.21	8.27	0.99	8.31	8.29	1.00	7.96	7.95	1.00	7.71	7.73	1.00	8.14	8.16	1.00
Total Suspended Solids	mg/L	5	3	1.67	3	7	0.43	2	1	2.00	21	15	1.40	5	5	1.00
Turbidity	NTU	1.65	1.68	0.98	1.90	2.80	0.68	2.68	2.59	1.03	30.3	30.5	0.99	6.34	6.04	1.05
Anions																
Alkalinity (Total)	mg/L CaCO3	162	162	1.00	188	189	0.99	94.8	95.7	0.99	79.3	79.2	1.00	158.0	157.0	1.01
Chloride (dissolved)	mg/L	0.8	0.8	1.00	0.5	<0.5	2.00	0.6	0.8	0.75	0.7	0.7	1.00	0.7	0.7	1.00
Fluoride (dissolved)	mg/L	0.08	0.08	1.00	0.10	0.10	1.00	0.08	0.07	1.14	0.41	0.41	1.00	0.08	0.08	1.00
Sulphate (dissolved)	mg/L	63.8	63.2	1.01	113	113	1.00	34.3	33.2	1.03	494	488	1.01	85.8	88.7	0.98
Nutrients																
Ammonia Nitrogen	mg/L	<0.005	<0.005	1.00	<0.005	0.006	0.42	0.007	0.013	0.54	0.008	0.006	1.33	<0.005	<0.005	1.00
Nitrate Nitrogen	mg/L	0.023	0.022	1.05	0.013	0.014	0.93	0.028	0.027	1.04	0.015	0.015	1.00	0.097	0.098	0.99
Nitrite Nitrogen	mg/L	0.001	0.002	0.50	0.002	0.002	1.00	<0.001	<0.001	1.00	0.001	0.001	1.00	0.003	0.002	1.50
ortho-Phosphate	mg/L	0.003	0.001	3.00	0.003	0.004	0.75	0.003	0.003	1.00	0.003	0.004	0.75	0.004	0.005	0.80
Total Dissolved Phosphate	mg/L	0.004	0.004	1.00	0.004	0.005	0.80	0.008	0.006	1.33	0.007	0.004	1.75	0.004	0.005	0.80
Total Phosphorus	mg/L	0.007	0.006	1.17	0.005	0.011	0.45	0.008	0.010	0.80	0.007	0.004	1.75	0.020	0.025	0.80
Cyanide																
Total Cyanide	mg/L	0.001	0.001	1.00	<0.001	<0.001	1.00	0.002	0.003	0.67	<0.001	<0.001	1.00	0.002	0.002	1.00
Total Metals																
Aluminum (total)	mg/L	0.075	0.069	1.09	0.053	0.052	1.02	0.086	0.097	0.89	0.864	0.882	0.98	0.197	0.181	1.09
Antimony (total)	mg/L	0.0002	0.0002	1.00	0.0004	0.0004	1.00	<0.0001	<0.0001	1.00	0.0002	0.0002	1.00	0.0003	0.0003	1.00
Arsenic (total)	mg/L	0.0008	0.0008	1.00	0.0005	0.0006	0.83	0.0001	0.0001	1.00	0.0008	0.0006	1.00	0.0009	0.0006	1.50
Barium (total)	mg/L	0.053	0.050	1.06	0.058	0.058	1.00	0.033	0.032	1.03	0.025	0.024	1.04	0.037	0.037	1.00
Beryllium (total)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00
Bismuth (total)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Boron (total)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Cadmium (total)	mg/L	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	0.0026	0.0030	0.87	<0.0002	<0.0002	1.00
Calcium (total)	mg/L	55.8	55.2	1.01	89.7	89.6	1.00	34.9	36.1	0.97	162	160	1.01	50.4	50.0	1.01
Chromium (total)	mg/L	0.001	<0.001	2.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Cobalt (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	0.012	0.012	1.00	<0.001	<0.001	1.00
Copper (total)	mg/L	0.002	0.002	1.00	0.008	0.004	2.00	0.002	0.001	2.00	0.088	0.086	1.02	0.006	0.006	1.00
Iron (total)	mg/L	0.289	0.285	1.09	0.502	0.496	1.01	0.164	0.150	1.09	7.21	7.16	1.01	0.381	0.362	1.05
Lead (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	0.001	0.001	1.00
Magnesium (total)	mg/L	19.8	19.8	1.01	29.3	29.5	0.99	11.4	11.8	0.98	36.2	35.9	1.01	26.3	26.2	1.00
Manganese (total)	mg/L	0.060	0.057	1.05	0.129	0.129	1.00	0.010	0.011	0.91	1.62	1.60	1.01	0.044	0.043	1.02
Mercury (total)	mg/L	<0.0000	0.00004	0.13	<0.0000	<0.00001	1.00	<0.0000	<0.00001	1.00	<0.0000	<0.00001	1.00	<0.0000	<0.00001	1.00
Molybdenum (total)	mg/L	<0.001	0.001	0.50	0.001	<0.001	2.00	<0.001	0.001	0.50	0.001	<0.001	2.00	<0.001	<0.001	1.00
Nickel (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	0.001	0.001	1.00	0.005	0.004	1.25	0.003	0.002	1.50
Selenium (total)	mg/L	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00
Silicon (total)	mg/L	2.92	2.88	1.01	2.99	2.99	1.00	3.83	3.87	0.99	4.90	4.82	1.02	2.15	2.16	1.00
Silver (total)	mg/L	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	0.0001	0.0005	0.20	0.0001	0.0001	1.00
Strontium (total)	mg/L	0.333	0.328	1.02	0.519	0.521	1.00	0.195	0.196	0.99	1.66	1.65	1.01	0.417	0.412	1.01
Titanium (total)	mg/L	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00
Uranium (total)	mg/L	0.00015	0.00015	1.00	0.00018	0.00019	0.95	0.00004	0.00004	1.00	0.00017	0.00019	0.89	0.00026	0.00027	0.96
Vanadium (total)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00
Zinc (total)	mg/L	0.006	0.006	1.00	0.018	0.018	1.00	<0.005	<0.005	1.00	0.517	0.509	1.02	0.011	0.017	0.65
Dissolved Metals																
Aluminum (dissolved)	mg/L	0.019	0.018	1.08	0.041	0.021	1.95	0.021	0.021	1.00	0.073	0.016	4.56	0.038	0.034	1.12
Antimony (dissolved)	mg/L	0.0002	0.0002	1.00	0.0003	0.0004	0.75	<0.0001	<0.0001	1.00	0.0002	0.0002	1.00	0.0003	0.0003	1.00
Arsenic (dissolved)	mg/L	0.0003	0.0004	0.75	0.0003	0.0004	0.75	<0.0001	<0.0001	1.00	0.0001	<0.0001	2.00	0.0003	0.0003	1.00
Barium (dissolved)	mg/L	0.050	0.050	1.00	0.058	0.058	1.00	0.029	0.032	0.91	0.020	0.020	1.00	0.037	0.037	1.00
Beryllium (dissolved)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00
Bismuth (dissolved)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Boron (dissolved)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	0.0020	0.0020	1.00	<0.0002	<0.0002	1.00
Calcium (dissolved)	mg/L	55.3	55.2	1.00	88.6	86.8	1.00	30.3	31.7	0.96	161	157	1.03	50.4	49.3	1.02
Chromium (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Cobalt (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Copper (dissolved)	mg/L	0.001	0.001	1.00	0.001	0.001	1.00	<0.001	0.001	0.50	0.005	0.002	2.50	0.003	0.003	1.00
Iron (dissolved)	mg/L	0.036	0.036	1.00	<0.030	<0.030	1.00	0.030	0.030	1.00	0.503	0.085	5.92	<0.030	<0.030	1.00
Lead (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Magnesium (dissolved)	mg/L	19.7	19.6	1.01	29.3	29.2	1.00	10.2	10.6	0.96	35.8	35.0	1.02	26.3	26.2	1.00
Manganese (dissolved)	mg/L	0.047	0.047	1.00	0.119	0.120	0.99	<0.005	<0.005	1.00	1.59	1.55	1.03	0.034	0.032	1.06
Molybdenum (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Nickel (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	0.004	0.004	1.00	0.001	0.001	1.00
Potassium (dissolved)	mg/L	0.78	0.78	1.00	1.03	1.03	1.00	0.51	0.51	1.00	1.23	1.22	1.01	1.12	1.10	1.02
Selenium (dissolved)	mg/L	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00
Silicon (dissolved)	mg/L	2.85	2.86	1.00	2.90	2.91	1.00	3.50	3.38	1.04	4.26	4.12	1.03	2.13	2.07	1.03
Silver (dissolved)	mg/L	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	0.0001	0.0005	0.20	<0.0001	<0.0001	1.00
Sodium (dissolved)	mg/L	3.67	3.74	0.98	8.64	8.37	1.04	3.33	3.35	0.99	8.26	8.09	1.02	5.22	5.05	1.03
Strontium (dissolved)	mg/L	0.330	0.328	1.01	0.517	0.512	1.01	0.175	0.182	0.96	1.64	1.60	1.03	0.417	0.412	1.01
Titanium (dissolved)	mg/L	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00
Uranium (dissolved)	mg/L	0.00015	0.00015	1.00	0.00018	0.00019	0.95	0.00004	0.00004	1.00	0.00013	0.00010	1.30	0.00025	0.00026	0.96
Vanadium (dissolved)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00
Zinc (dissolved)	mg/L	<0.005	<0.005	1.00	0.010	0.007	1.43	<0.005	<0.005	1.00	0.341	0.323	1.06	<0.005	0.009	0.28
Organics																
Total Organic Carbon	mg/L				1.9	1.5	1.27	3.2	3.1	1.03	1.0	1.1	0.91	2.0	2.1	0.95

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).
BOLD RATIOS indicate that difference between values exceeds 20%.

TABLE VI.4

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT

Surface Water QA/QC Data

		Replicate Set 6			Replicate Set 7			Replicate Set 8			Replicate Set 9			Replicate Set 10		
Station #		W7	W7 (Rep)	Orig:Rep	W1	W1 (Rep)	Orig:Rep	W3	W3 (Rep)	Orig:Rep	W4	W4 (Rep)	Orig:Rep	W4	W4 (Rep)	Orig:Rep
Date		12-Jun-95	12-Jun-95	Ratio	19-Jul-95	19-Jul-95	Ratio	14-Aug-95	14-Aug-95	Ratio	16-Sep-95	16-Sep-95	Ratio	17-Oct-95	17-Oct-95	Ratio
Physical Tests	Units															
Conductivity	umhos/cm	304	307	0.99	542	540	1.00	322	317	1.02	303	301	1.01	311	315	0.99
Total Dissolved Solids	mg/L	221	218	1.01	398	396	1.01	215	218	0.99	215	212	1.01	212	212	1.00
Hardness	mg/L CaCO3	167	169	0.99	283	279	1.01	171	168	1.02	154	146	1.05	155	152	1.02
pH	pH Units	7.88	7.89	1.00	7.98	8.01	1.00	8.43	8.42	1.00	8.14	7.94	1.03	8.01	7.98	1.00
Total Suspended Solids	mg/L	3	3	1.00	4	3	**1.33**	4	4	1.00	<1	<1	1.00	5	3	**1.87**
Turbidity	NTU	1.01	1.19	0.85	1.8	2.2	0.82	1.84	1.39	**1.32**	0.3	0.3	1.00	0.9	1.2	0.75
Anions																
Alkalinity (Total)	mg/L CaCO3	142	141	1.01	203	203	1.00	169	175	0.97	125	125	1.00	116	118	0.98
Chloride (dissolved)	mg/L	0.6	0.6	1.00	<0.5	<0.5	1.00	<0.5	<0.5	1.00	<0.5	<0.5	1.00	0.5	0.5	1.00
Fluoride (dissolved)	mg/L	0.06	0.06	1.00	0.09	0.09	1.00	0.06	0.06	1.00	0.1	0.1	1.00	0.08	0.08	1.00
Sulphate (dissolved)	mg/L	31.4	31.4	1.00	106	105	1.01	9.8	10.2	0.96	43.5	44	0.99	46.4	45.8	1.02
Nutrients																
Ammonia Nitrogen	mg/L	0.008	0.009	0.89	0.007	0.007	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00
Nitrate Nitrogen	mg/L	0.005	0.005	1.00	0.024	0.023	1.04	<0.005	<0.005	1.00	0.055	0.05	1.10	0.093	0.013	**7.15**
Nitrite Nitrogen	mg/L	0.002	0.001	**2.00**	0.001	0.001	1.00	0.001	0.001	1.00	0.001	0.001	1.00	0.001	0.001	1.00
ortho-Phosphate	mg/L	0.003	0.004	**0.75**	0.001	<0.001	**2.00**	<0.001	<0.001	1.00	0.002	0.001	**2.00**	<0.001	<0.001	1.00
Total Dissolved Phosphate	mg/L	0.006	0.005	1.20	0.002	0.002	1.00	<0.001	<0.001	1.00	0.002	0.002	1.00	0.002	0.002	1.00
Total Phosphorus	mg/L	0.012	0.015	0.80	0.006	0.009	**0.67**	0.004	0.006	**0.67**	0.002	0.003	**0.67**	0.006	0.007	0.86
Cyanide																
Total Cyanide	mg/L	0.002	0.002	1.00	0.002	0.002	1.00	0.003	0.004	0.75	0.001	0.002	**0.50**	<0.001	<0.001	1.00
Total Metals																
Aluminum (total)	mg/L	0.031	0.037	0.84	0.051	0.013	**3.92**	0.033	0.103	**0.32**	0.012	0.024	**0.50**	0.016	0.063	**0.25**
Antimony (total)	mg/L	<0.0001	0.0001	**0.50**	0.0001	0.0002	**0.50**	0.0001	0.0002	0.50	<0.0001	<0.0001	1.00	<0.0001	0.0001	**0.50**
Arsenic (total)	mg/L	0.0006	0.0006	1.00	0.0005	0.0005	1.00	0.0009	0.0009	1.00	0.0002	0.0001	**2.00**	<0.0001	<0.0001	1.00
Barium (total)	mg/L	0.049	0.048	1.02	0.061	0.058	1.05	0.055	0.055	1.00	0.038	0.039	0.97	0.04	0.04	1.00
Beryllium (total)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00
Bismuth (total)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Boron (total)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Cadmium (total)	mg/L	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00
Calcium (total)	mg/L	48.4	46.5	1.04	66.9	66.6	1.00	48.3	47.5	1.02	39.6	38.8	1.02	41.7	40	1.04
Chromium (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Cobalt (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Copper (total)	mg/L	<0.001	<0.001	1.00	0.001	0.001	1.00	<0.001	<0.001	1.00	0.001	0.001	1.00	<0.001	<0.001	1.00
Iron (total)	mg/L	0.083	0.085	0.98	0.252	0.091	**2.77**	0.191	0.181	1.06	<0.030	0.037	**0.41**	<0.030	0.05	**0.30**
Lead (total)	mg/L	<0.001	0.001	**0.50**	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Magnesium (total)	mg/L	12.9	12.7	1.02	28.4	28.4	1.00	12	11.6	1.02	12.6	12.5	1.01	13.7	13.4	1.02
Manganese (total)	mg/L	0.037	0.037	1.00	0.091	0.056	**1.63**	0.023	0.024	0.96	0.006	0.007	0.86	0.007	0.011	**0.64**
Mercury (total)	mg/L	<0.0000	<0.00001	1.00	<0.00001	<0.00001	1.00	<0.0000	<0.00001	1.00	<0.0000	<0.00001	1.00	0.0000	<0.00001	1.00
Molybdenum (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	0.001	0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Nickel (total)	mg/L	<0.001	<0.001	1.00	0.001	<0.001	**2.00**	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Selenium (total)	mg/L	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00
Silicon (total)	mg/L	2.82	2.74	1.03	2.7	2.81	0.96	3.19	3.17	1.01	3.38	3.37	1.00	3.01	2.95	1.02
Silver (total)	mg/L	0.0001	<0.0001	**2.00**	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00
Strontium (total)	mg/L	0.238	0.226	1.05	0.488	0.484	1.01	0.213	0.211	1.01	0.227	0.225	1.01	0.23	0.223	1.03
Titanium (total)	mg/L	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00
Uranium (total)	mg/L	0.00014	0.00014	1.00	0.00019	0.00018	1.06	0.00012	0.00012	1.00	0.00007	0.00007	1.00	0.0001	0.0001	1.00
Vanadium (total)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00
Zinc (total)	mg/L	<0.005	<0.005	1.00	0.006	<0.005	**2.40**	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00
Dissolved Metals																
Aluminum (dissolved)	mg/L	0.013	0.009	**1.44**	0.023	0.038	**0.61**	0.014	0.015	0.93	0.021	0.012	**1.75**	0.028	0.035	0.80
Antimony (dissolved)	mg/L	<0.0001	<0.0001	1.00	<0.0001	0.0003	0.17	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00
Arsenic (dissolved)	mg/L	0.0006	0.0005	1.20	0.0003	0.0003	1.00	0.0006	0.0006	1.00	0.0002	0.0001	**2.00**	<0.0001	<0.0001	1.00
Barium (dissolved)	mg/L	0.046	0.048	0.96	0.058	0.058	1.00	0.055	0.055	1.00	0.038	0.039	0.97	0.04	0.037	1.08
Beryllium (dissolved)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	<0.005	1.00
Bismuth (dissolved)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Boron (dissolved)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00	<0.10	<0.10	1.00
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00	<0.0002	<0.0002	1.00
Calcium (dissolved)	mg/L	46.3	46.6	0.99	66.8	65.9	1.01	48.7	47.7	1.02	40.4	38.2	1.06	40.2	39.4	1.02
Chromium (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Cobalt (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Copper (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	0.004	0.001	**4.00**	<0.001	<0.001	1.00
Iron (dissolved)	mg/L	0.034	<0.030	**2.27**	<0.030	<0.030	1.00	0.057	0.054	1.06	<0.030	<0.030	1.00	<0.030	<0.030	1.00
Lead (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Magnesium (dissolved)	mg/L	12.4	12.7	0.98	28.1	27.8	1.01	12	11.9	1.01	12.9	12.2	1.06	13.3	13.1	1.02
Manganese (dissolved)	mg/L	0.021	0.023	0.91	0.08	0.08	1.00	<0.005	<0.005	1.00	0.006	0.007	0.86	0.007	0.007	1.00
Molybdenum (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	0.002	0.002	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Nickel (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00	<0.001	<0.001	1.00
Potassium (dissolved)	mg/L	0.69	0.74	0.93	1.19	1.2	0.99	0.85	0.87	0.98	0.67	0.61	1.10	0.62	0.82	1.00
Selenium (dissolved)	mg/L	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00	<0.0005	<0.0005	1.00
Silicon (dissolved)	mg/L	2.7	2.71	1.00	2.66	2.61	1.02	3.16	3.15	1.01	3.39	3.32	1.02	2.92	2.88	1.01
Silver (dissolved)	mg/L	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00	<0.0001	<0.0001	1.00
Sodium (dissolved)	mg/L	4.15	3.33	**1.25**	6.23	6.15	1.01	2.46	2.45	1.00	3.98	4.12	0.97	4.23	4.8	0.88
Strontium (dissolved)	mg/L	0.228	0.226	1.01	0.484	0.472	1.03	0.213	0.213	1.00	0.23	0.222	1.04	0.222	0.216	1.03
Titanium (dissolved)	mg/L	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00	<0.010	<0.010	1.00
Uranium (dissolved)	mg/L	0.00013	0.00013	1.00	0.00019	0.00018	1.06	0.0001	0.00012	0.83	0.00007	0.00006	1.17	0.0001	0.0001	1.00
Vanadium (dissolved)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00	<0.030	<0.030	1.00
Zinc (dissolved)	mg/L	0.005	<0.005	**2.00**	<0.005	0.006	**0.42**	<0.005	<0.005	1.00	<0.005	<0.005	1.00	<0.005	0.009	**0.28**
Organics																
Total Organic Carbon	mg/L	2.4	2.4	1.00	1.5	1.6	0.94	3.8	3.8	1.00	1.9	2.2	0.86	1.7	1.9	0.89

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).
BOLD RATIOS indicate that difference between values exceeds 20%.

TABLE VI.4

AMERICAN BULLION MINERALS LTD.
RED CHRIS PROJECT
1995 SUMMARY REPORT

Surfece Water QA/QC Data

		Replicate Set 11			Travel & Field Blanks								
Station #		W4	W4 (Rep)	Orig:Rep									
Date		31-Oct-95	31-Oct-95	Ratio	20-Jul-94	7-Sep-94	5-Oct-94	18-May-95	12-Jun-95	19-Jul-95	14-Aug-95	16-Sep-95	31-Oct-95
Physical Tests	Units												
Conductivity	umhos/cm	311	313	0.99	1.7	6.8	1.1	1	1.1	1.3	1.4	1.9	1.3
Total Dissolved Solids	mg/L	216	216	1.00	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hardness	mg/L CaCO3	159	160	0.99	0.19	1.31	<0.05	0.13	<0.05	0.45	<0.05	<0.05	<0.05
pH	pH Units	7.78	7.76	1.00	5.73	5.52	7.01	5.7	5.32	4.87	5.55	5.75	6.36
Total Suspended Solids	mg/L	1	<1	2.00	<1	<1	4	<1	<1	<1	<1	<1	<1
Turbidity	NTU	0.1	0.1	1.00	<0.10	0.13	<0.10	<0.10	<0.10	<0.10	0.1	<0.10	<0.10
Anions													
Alkalinity (Total)	mg/L CaCO3	132	132	1.00	<1.0	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chloride (dissolved)	mg/L	1	0.9	1.11	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9
Fluoride (dissolved)	mg/L	0.07	0.07	1.00	<0.02	0.04	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02
Sulphate (dissolved)	mg/L	37.7	37.4	1.01	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Nutrients													
Ammonia Nitrogen	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	0.007	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrate Nitrogen	mg/L	0.104	0.104	1.00	<0.005	0.102	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Nitrite Nitrogen	mg/L	0.001	0.001	1.00	<0.001	0.003	<0.001	<0.001	<0.001	0.001	<0.001	0.001	<0.001
ortho-Phosphate	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Total Dissolved Phosphate	mg/L	0.002	<0.001	4.00	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001
Total Phosphorus	mg/L	0.002	0.001	2.00	0.001	0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001
Cyanide													
Total Cyanide	mg/L	<0.001	<0.001	1.00	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Total Metals													
Aluminum (total)	mg/L	<0.005	0.024	0.10	<0.005	0.052	<0.005	0.366	<0.005	0.027	0.02	0.064	<0.005
Antimony (total)	mg/L	0.0001	0.0001	1.00	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic (total)	mg/L	<0.0001	<0.0001	1.00	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (total)	mg/L	0.035	0.039	0.90	<0.010	0.034	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Beryllium (total)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bismuth (total)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron (total)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium (total)	mg/L	<0.0002	<0.0002	1.00	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium (total)	mg/L	41.8	42.2	0.99	<0.050	0.476	<0.050	0.848	<0.050	0.082	0.059	0.186	<0.050
Chromium (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (total)	mg/L	<0.001	<0.001	1.00	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (total)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (total)	mg/L	14.4	14.2	1.01	<0.010	0.048	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Manganese (total)	mg/L	0.005	0.007	0.71	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Mercury (total)	mg/L	0.0000	<0.00001	1.00	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (total)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium (total)	mg/L	<0.0005	<0.0005	1.00	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silicon (total)	mg/L	3.05	2.96	1.03	<0.050	0.60	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (total)	mg/L	<0.0001	<0.0001	1.00	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Strontium (total)	mg/L	0.231	0.23	1.00	<0.001	0.002	<0.001	0.008	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (total)	mg/L	<0.010	<0.010	1.00	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (total)	mg/L	0.0001	0.0001	1.00	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Vanadium (total)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc (total)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Dissolved Metals													
Aluminum (dissolved)	mg/L	<0.005	0.015	0.17	<0.005	0.031	<0.005	0.013	<0.005	0.03	0.016	0.015	<0.005
Antimony (dissolved)	mg/L	0.0001	<0.0001	2.00	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic (dissolved)	mg/L	<0.0001	<0.0001	1.00	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Barium (dissolved)	mg/L	0.036	0.036	1.00	<0.010	0.034	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Beryllium (dissolved)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Bismuth (dissolved)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Boron (dissolved)	mg/L	<0.10	<0.10	1.00	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Cadmium (dissolved)	mg/L	<0.0002	<0.0002	1.00	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Calcium (dissolved)	mg/L	40.7	41.2	0.99	<0.050	0.5	<0.050	0.051	<0.050	0.181	<0.050	<0.050	<0.050
Chromium (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron (dissolved)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Lead (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium (dissolved)	mg/L	13.8	13.8	1.00	<0.010	0.04	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Manganese (dissolved)	mg/L	0.006	0.006	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Nickel (dissolved)	mg/L	<0.001	<0.001	1.00	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Potassium (dissolved)	mg/L	0.71	0.74	0.96	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Selenium (dissolved)	mg/L	<0.0005	<0.0005	1.00	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Silicon (dissolved)	mg/L	2.87	2.89	0.99	<0.050	0.58	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Silver (dissolved)	mg/L	<0.0001	<0.0001	1.00	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sodium (dissolved)	mg/L	4.7	4.81	0.98	0.03	0.18	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Strontium (dissolved)	mg/L	0.222	0.224	0.99	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium (dissolved)	mg/L	<0.010	<0.010	1.00	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Uranium (dissolved)	mg/L	0.0001	0.0001	1.00	<0.00001	0.00002	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Vanadium (dissolved)	mg/L	<0.030	<0.030	1.00	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030
Zinc (dissolved)	mg/L	<0.005	<0.005	1.00	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Organics													
Total Organic Carbon	mg/L	1.8	1.8	1.00		0.7	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Note: Statistics were calculated using a value of ½ the detection limit where reported as "<" (less than).

* - BOLD VALUES indicate either greater than 20% difference for ratios, or moderate or low acid buffering capacity for alkalinity and dissolved calcium.

- exceeds B.C. AWCWQ (1994) for protection of aquatic life.

- exceeds federal CCME guidelines for protection of aquatic life.