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REPORT

TAILINGS MANAGEMENT PLAN
GIANT MINE
YELLOWKNIFE, NWT

Submitted to:

Royal Oak Mines Inc.
Yellowknife, NWT

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1. INTRODUCTION

1.1 Background

Giant Mine, owned and operated by Royal Oak Mines Inc., is located just north of the City of Yellowknife. Royal Oak's NWT Water License for this mine requires that a Tailings Management Plan be prepared and submitted by February 1, 1999. As such, Mr. J. Stard, Giant Mine Manager, requested that Golder Associates Ltd. prepare such a plan. A proposal to prepare this plan, dated 14 December and revised on 22 December 1998, was submitted and Purchase Order No. 166275 was issued to Golder Associates to proceed with the work. The report provided herein outlines the proposed tailings management plan for the next five years of operation (1999 – 2003) at Giant Mine.

1.2 TCA Operation

Detailed information concerning the depositional history within the Tailings Containment Areas (TCA) is beyond the scope of this report. However, it is believed that the Original Tailings Area, consisting of the South, Central and North Ponds shown in Figure 1, evolved cell by cell over a long period of time, beginning in 1952. As the Original Tailings Area was filled to its ultimate capacity, the Northwest Tailings Area was built for on-going storage. Several years ago, a portion of the tailings in the North Pond of the Original Tailings Area was reprocessed and it is understood that these tailings were consigned to the Northwest Tailings Area. In 1997, approximately 353,000 tonnes of ore was milled, decreasing to 315,000 tonnes in 1998.

As a general rule, tailings are consigned to the Northwest Tailings Area for beach building on the various dams. Currently, it is only during periods when the delivery line is down that tailings are consigned to the Original Tailings Area. Royal Oak used some of the remaining capacity within the South Pond in 1998 and hence, tailings deposition occurred from Dam 11, situated on the south side of that pond. Supernatant water collected in the South Pond was conveyed by pipeline to the North Pond (downstream of Dyke 6) before being pumped to the Effluent Treatment Plant (ETP).

Tailings transport water that accumulates in either the Northwest or North Ponds is pumped to the ETP for initial treatment. It is then discharged to the Settling Pond, whereupon it seeps to the

Polishing Pond for aging. It is decanted from the Polishing Pond for final processing at the carbon columns en-route to being released to the environment. Water treatment and release begins only after spring break-up. Hence, the maximum water level in the Northwest Tailings Area is reached each spring (May), and the minimum level occurs at the end of the period of pumping from the area (October).

The Original Tailings Area comprises three sub-basin storage areas, viz. the South Pond, the Central Pond, and the North Pond as shown on Figure 1. These three ponds form a cascade with division by internal retaining dykes, and perimeter by retaining dams required to close off topographic lows to design elevation of the individual ponds involved. Referring to Figure 1, the internal dykes are labeled as Dykes 4, 5, and 6. The perimeter dams are labeled as Dams 2, 3, 9, 10, 11 and 12. The seepage collection dams are labeled Dams 3C, 3D, and 7. Decant water was traditionally routed through a small concrete structure in Dam 2 from which it flowed to the Polishing Pond formed by Dam 1. A pump is now used to convey ponded water over Dam 2 to the ETP. Several years ago, the Polishing Pond was partitioned by building the Settling Pond Dyke to improve capture of suspended solids and to better manage the water chemistry.

Dam 2 and 3 provide containment at the north end of the North Pond. During the construction of the dams for the Northwest Pond, and due to the proposed reprocessing of the tails from the North Pond, construction materials were taken from Dams 2 and 3. For the existing configuration of Dam 2, a previous geotechnical consultant for Giant Mine (Mr. M.A.J. Matich, P.Eng) recomended that the maximum water level for the North Pond should be set at 6037 ft., and that no more than 5.5 ft. of head differential should exist between the North Pond and the Settling Pond.

The Northwest Tailings Area is enclosed by about 5000 ft of constructed dam sub-identified as Dams 21A, 21B, 21C, 21D, 22A, and 22B. The remainder of the perimeter of this area is described by bedrock highs. The dams are of zoned fill construction, the principal zones comprising core material supported by rockfill. The tailings area is being operated as planned whereby beach deposition upstream of the dams is intended to promote a low phreatic line from beach edge, thereby reducing seepage gradient through the dams, and thus seepage quantities.

2. INPUT PARAMETER SELECTION

2.1 Climatic Information

Climatic data has been collected by Atmospheric Environmental Services (AES) of Environment Canada since 1943 at the Yellowknife Airport. The recorded climate data from 1943 to 1998 were analyzed to provide a basis for deriving the climate parameters such as air temperature, precipitation, and lake evaporation to characterize the existing climate conditions at the Giant Mine site. A detailed review of the data is provided in Appendix I, but the following points summarize the major climatic parameters:

- The mean annual air temperature is –5.2°C, with mean monthly temperatures above freezing from May to September, inclusive.
- The average mean monthly air temperatures ranges from about -27.7°C in January to about 16.3°C in July.
- The mean annual total precipitation amounts to 350 mm, which consists of 150 mm of rainfall and 200 mm of snowfall (accounting for snowfall undercatch correction).
- The derived extreme annual precipitation for a 100-year return period is 581 mm.
- The derived 100-year return period, 24 hour rainfall amounts to 84 mm.
- The annual lake evaporation value was estimated to be 400 mm.

All associated data tables and figures are provided in Appendix I.

2.2 Ore Reserves

At current world gold prices, Royal Oak estimates that approximately 2 years of proven reserves remain at Giant Mine. For current planning purposes, and to account for exploration work to be undertaken in 1999, Royal Oak has requested that the Tailings Management Plan be developed for the next five years, based upon a nominal production rate of 317,500 tonnes per year.

2.3 Water Consumption

Details regarding water use at Giant Mine are provided in Royal Oak Mines (1998). Water discharged to the tailings ponds is taken from three major sources: water drawn from Great Slave

Lake ("lake water"), groundwater pumped from the underground mine ("groundwater") and potable water ("city water") used at the Giant town-site. It should be noted that groundwater volume is inferred from a measured volume of water pumped from the underground mine, minus both a measured volume of lake water pumped underground and minus an estimate of seepage from the Northwest tailings pond into the mine (previously assumed to be 698 m^3/day). The accuracy of this assumed seepage amount was tested using water consumption data from 1998 and details of the assessment are provided in Section 3.1.

In 1998, when 315,000 tonnes of ore was milled, the water usage reported by Royal Oak Mines Inc. included the following components:

- Lake Water = 787,929 m^3,
- Groundwater = 573,396 m^3 and,
- City Water = 13,677 m^3.

Hence, the total water consumption for the mine was 1,375,001 m^3. The total amount discharged to the environment in 1998 was 1,447,842 m^3, which was more than the water input. In comparison with the 1997 water consumption (for 353,000 tonnes of ore), 1998 saw a noticeable drop of lake water use (38% decrease). Groundwater and city water consumption remained largely unchanged.

For the basis of the tailings management plan, Table 1details the proposed daily and annual ore tonnages and water supply quantities:

Table 1: Proposed Water Consumption Quantities

Component	Daily	Annual
Ore milled (tonnes)	870	317,500
Lake Water (m^3)	2,159	787,926
Corrected Groundwater (m^3)	2,074	756,864
City Water (m^3)	38	13,688
Total Water (m^3)	4,270	1,558,477

At this water consumption rate, the slurry solids content for tailings discharge will be 16.9% (by weight). Mine water consumption is expected to be reduced by 20% as Royal Oak Mines implements several water conservation projects, taking effect by mid-1999. Hence, the total daily water consumption value decreases to 3,416 m^3 as of July 1, 1999 in the water balance model. This has the effect of increasing the tailings discharge slurry solids content to 20.3% (by weight).

2.4 Tailings Properties

Physical tailings parameters, such as dry density, void ratio and moisture content are required in order to develop the five year tailings management plan. In a previous project undertaken by Geocon (1986b), the tailings in Giant Mine tailings ponds were sampled and tested in order to determine distribution of permafrost in the tailings pond. The tailings were found to consist of particles 95% finer than 0.075 mm (#200 sieve). The finest grind was about 0.001 mm. The tailings were classified as "non-plastic silt". The dry density of tailings samples ranged from 1.23 to 1.56 t/m^3, with an average value of 1.38 t/m^3. Based on measured specific gravity of 2.85 at that time, the tailings void ratio was inferred to be 1.06, which is within the expected range for conventional gold tailings (approximately 0.95 to 1.1).

In a study carried out by Golder Associates (1997b), tailings from the nearby Con Mine were submitted to a large-diameter slurry consolidation test. Based on that testing, an average placed dry density of 1.4 t/m^3 was selected for their deposition plan. The saturation moisture content was approximately 36%. Grain size analyses indicates that the Con Mine grind size is very similar to that of Giant Mine. Hence, for a measured specific gravity (G_s) of 2.80, a void ratio (e) of 1, the dry density is 1.4 t/m^3 and the saturation moisture content (w) is 36%. These parameters were used as the base values for the water balance calculations, as shown in Table 2, which also provides the estimated range of void ratios, dry density and saturated moisture content that would be expected:

Table 2: Expected Physical Properties of Tailings

Parameter	Base Case	Lower Bound	Upper Bound
Deposited void ratio	1.00	0.95	1.10
Dry density (t/m^3)	1.40	1.44	1.33
Saturation moisture content	35.7%	33.9%	39.3%

direct testing of solids is required

to different processing

2.5 Basin Storage Capacity

Figure 2 provides an area plan of the two main tailings basins, including topographic contours outside of the basins. From this plan, watershed boundaries were drawn for the two main basins, covering 60.4 ha for the Northwest Pond and 72.2 ha for the Original Tailings Area. These watershed drainage areas were used for calculation of the precipitation run-off into the basins.

Elevation surveying, including land-based shots and bathymetric surveys, were undertaken by Royal Oak surveyors, according to the following schedule:

- Northwest Pond – September 1998,
- South Pond – December 1998, and
- North Pond – January 1999.

The Central Pond is not suitable for the storage of tailings water, given the condition of Dyke 6, and hence, no survey was undertaken for it.

This survey data was provided by Royal Oak Mines to Sub-Arctic Surveys Ltd. who prepared the contour drawings, attached herein as Figures 3, 4 and 5. Sub-Arctic Surveys also undertook calculations, based on these drawings, in order to produce storage-capacity curves for each of the basins, which are also provided here as Figures 6, 7 and 8.

3. WATER BALANCE

Water balance calculations were performed using the Golder Associates software, WATBAL, which has been used for several years now on numerous mines. This spreadsheet-based software allows the various water inputs (e.g. tailings discharge water) and losses (e.g. evaporation) to be summarized on a monthly basis. A decant strategy can also be accomodated if water is discharged to the environment. Given the two distinct basins at Giant Mine, it was necessary to have two linked WATBAL models. Before the five-year water balance model could be developed, and given the accuracy of the seepage quantity, it was necessary to carry out a calibration of the water balance model to the 1998 data. After that evaluation, and learning from the calibration, a five-year model was evaluated. Sensitivity analyses were also performed to evaluate the relative importance of various input factors.

3.1 1998 Water Balance Calibration

As mentioned previously, it was necessary to calibrate the WATBAL model, based on actual measured input parameters, where appropriate. On March 26, 1998, Mr. Bob Reid of DIAND undertook a snow survey at Giant Mine, where he measured 60 mm and 90 mm of water equivalent snowfall on the pond surface and in the trees, respectively. Since one of the water balance input parameters had been measured, it provided an opportunity to correlate the WATBAL predicted water accumulation versus the actual pond level response. In addition, warm temperatures were encountered in the Spring as ice was off the ponds by May 8, 1998 and hence, runoff would have probably occurred by the beginning of May.

Tailings deposition occurred in the Northwest Pond for the first portion of the year, until the discharge location was switched to the Original Tailings Area on May 3, 1998. This date is also advantageous since no decanting of water had occurred by then and no evaporation would have occurred either. Hence, the water balance calibration was undertaken for the Northwest pond, from January until April 1998.

The water level in the Northwest pond is surveyed regularly, and hence, it is known that the Northwest Pond level increased from approximately 6090 ft. in early January to approximately 6096 ft. at the end of April. Using the storage capacity curve for the Northwest Pond, surveyed in September 1998, this water level increase indicates a volume increase of approximately 600,000 m^3. Some of the pond level response is due to placement of submerged tailings, but probably only about 20,000 to 30,000 m^3. Hence, it is estimated that the Northwest Pond level increase indicates an increased volume of approximately 575,000 m^3 during this period.

The solids production, water usage, and actual precipitation data were used to compile the overall pond water balance. Table 3 presents water consumption and ore tonnage data that was provided by Royal Oak Mine Inc.:

Table 3: Water Consumption and Ore Milled in Early 1998

Month /Year	Groundwater (m^3)	Lake Water (m^3)	City Water (m^3)	Total Water (m^3)	Ore Milled (tonnes)
Jan-98	3,761	67,806	995	72,562	28,700
Feb-98	19,948	86,918	980	107,846	27,000
Mar-98	27,102	78,007	1,078	106,187	29,600
Apr-98	61,463	51,166	975	113,604	26,000

It should be noted that groundwater volumes in Table 3 are based upon an estimate of seepage (698 m^3/day) from the Northwest tailings pond into the mine. If this seepage estimate is inaccurate, then the groundwater volumes will also be inaccurate.

→ EOM was to evaluate the effectiveness of this value

If the 698 m^3/day value is used, and the WATBAL model is run, an accumulated water volume of 322,000 m^3 is predicted at the end of April 1998. This net accumulation is composed primarily of tailings production water (89% of the total inflow) and pond seepage (66% of the outflow), so snowfall run-off and locked-up pore water have little significance on the accumulated total volume. This WATBAL prediction is significantly lower than the actual pond volume inferred from the measured levels.

If the seepage quantity is assumed to be zero, and hence, the groundwater inflow increases by 21,000 m^3 per month, then the WATBAL accumulated water volume would be 490,000 m^3 by the end of April. This value is closer to the measured value of 575,000 m^3 (only 15% difference) if some surveying or calculation error is allowed for within the preparation of the storage capacity curve.

Indirect evidence, based on measured cyanide levels (indicative of tailings pond seepage) in the underground mine water, suggests that the seepage quantity has been decreasing over time.

Additionally, as the thickness of tailings solids increases in the Northwest Pond, the seepage amount should decrease as the hydraulic gradient decreases. Hence, the evidence indicates that the seepage value is probably less than 698 m^3/day, and therefore the groundwater volume quantity is higher than reported. Therefore, it was assumed that the seepage value was 200 m^3/day since it is unlikely that the seepage value is zero. This has the effect of increasing the groundwater value by 32%. Hence, the daily "corrected groundwater" value was assumed to be 2074 m^3/day, as noted in Section 2.3, for input to the five year water balance calculations.

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3.2 Five Year Water Balance

Since the tailings are to be placed in either the Northwest Pond or Original Tailings Area, water balance calculations were carried out for each pond separately for years 1999, 2000, 2001, 2002, and 2003, and then the results were linked back together in one summary sheet. Tailings storage requirements for the five year plan are based on the mill production of 870 metric tonnes per day. Water consumption is based on the data reviewed in Section 2.3. Other important parameters used in the water balance calculations are as follows:

- Mean annual precipitation = 350 mm.
- Mean annual lake evaporation = 400 mm.
- Catchment area run-off coefficient = 70%.
- Tailings pond run-off coefficient = 100%.
- Assumed that 20% of the solids deposited in each basin occurs underwater and that the other 80% forms a beach above water level.
- Northwest Pond has a seepage rate of 200 m^3/day or approximately 6000 m^3/month.
- The minimum water volumes are 60,000 m^3 in the Northwest Pond and 40,000 m^3 in the North Pond to allow sufficient water depth for water clarification.
- The initial volumes assumed for each of the ponds were 265,000 m^3 in the Northwest Pond, 70,000 m^3 in the North Pond and 2,000 m^3 in the South Pond.
- All water accumulating in the South Pond is assumed to be transferred immediately to the North Pond (decant pipe was installed in 1998).

The following deposition schedule has been proposed for the next five years:

- January to May 1999 – Northwest Pond
- June to September 1999 – South Pond
- October 1999 to October 2000 – Northwest Pond
- November 2000 to April 2001 – North Pond
- May to October 2001 – Northwest Pond
- November 2001 to April 2002 – North Pond
- May to October 2002 – Northwest Pond
- November 2002 to April 2003 – North Pond
- May to October 2003 – Northwest Pond

All of the water balance calculation and summary tables, along with associated figures are attached in Appendix II. Table II-1 summarizes all of the input tonnages and tailings water values monthly for the five year period. This table also indicates where the tailings are being deposited within any single month. WATBAL summaries are provided in Tables II-2 to II-11 for the two ponds for the five year period. Accumulated water totals for each month are then linked back to the summary Table II-1. The required decant strategy, to remain below required freeboard elevations and to have minimum clarification volumes in the ponds, is summarized in Table II-12. Figures II-1 to II-3 illustrate the fit of the Sub-Arctic Survey storage capacity data to a fitted curve for each of the three ponds. These curves are used to correlate accumulated tailings volumes to the appropriate elevation within each pond.

For discussion of the yearly values, Table 4 provides a summary of the water inflows, losses, net accumulation and decant values for both ponds for the Year 1999:

Table 4: Summary of WATBAL Results for 1999

Pond	Annual Inflows (m^3)	Annual Losses (m^3)	Net Inflow (m^3)	Annual Decant (m^3)
Northwest	1,124,975	226,222	898,753	928,955
Original	625,920	59,272	566,648	599,266
Total	1,750,895	285,494	1,465,401	1,528,221

Hence, for the ponds to maintain their required levels, and including the impact of capacity loss due to solids deposition, it is necessary to decant slightly more than net inflow of water. For 1999, it should be noted that tailings inflow water accounts for 80% of the annual inflow while locked-up pore water accounts for 41% of the total losses.

3.3 Sensitivity Analyses

Water balance for the five year plan was developed based on mean annual climatic data and best estimates of expected parameters. These parameters will vary during the future and therefore, the impact of parameter variation on the water management strategy was evaluated. Among all parameters used in water balance, extremely high precipitation and low evaporation may be potential concerns. Table 5 presents a summary of the water balance results when a 100 year return period annual precipitation value (581 mm) is coupled with lower than expected evaporation (350 mm):

Table 5: Water Balance Results for Wet Year Case (Year 1999)

Case	Water Balance Parameter	Northwest Pond	Original Tailings Area
Base Case *{precipitation = 355 mm/year evaporation = 400 mm/year}*	Inflows (m^3)	1,124,975	625,920
	Losses (m^3)	226,222	59,272
	Decant (m^3)	928,955	599,266
	Accumulated Volume (m^3)	234,799	37,383
Wet Year Case *{precipitation = 581 mm/year (+64%) evaporation = 350 mm/year (−13%)}*	Inflow (m^3)	1,232,777	743,214
	Loss (m^3)	216,722	56,772
	Decant (m^3)	1,046,257	722,653
	Accumulated volume (m^3)	234,799	33,789
Change (%)	Inflows	9.6%	18.7%
	Losses	4.2%	4.2%
	Decant	12.6%	20.6%

Annual precipitation for this case was increased by 64% and the evaporation was decreased by 13%. The results show that the net annual inflows increased by 9.6% and 18.7% for the Northwest Pond and North/South Pond, respectively. Changes in losses for each pond are relatively small, only decreasing by about 4%. The increasing amount of water due to increase in inflows and decrease in losses requires increasing the decant volume by about 13% and 21%. Hence, the pond water balance is relatively insensitive to major variations in climatic parameters, which is to be expected given the major significance of tailings water inflow volumes to the overall balance.

Other parameter variation such as locked-up pore water and displaced water proportion are expected to have little significant effect on water balance.

4. BASIN FILLING PLAN

The storage volume required is a combination of the tailings solids deposited and the accumulated free water. The tailings solids volume required for beached material is simply the tonnage milled divided by the dry density of 1.4 t/m^3. Based upon the proposed deposition plan detailed in Section 3.2, the following distribution of tailings tonnage is proposed for the next five years:

Table 6: Summary and Proportion of Yearly Tailings Tonnages

Year	Northwest Pond Annual Tonnage (tonnes)	Original Tailings Area Annual Tonnage (tonnes)
1999	211,400 (67%)	106,100 (33%)
2000	264,500 (83%)	53,000 (17%)
2001	160,000 (50%)	157,500 (50%)
2002	160,000 (50%)	157,500 (50%)
2003	160,000 (50%)	157,500 (50%)

Table 6 indicates that that majority proportion of tailings will be discharged to the Northwest Pond in 1999 and 2000. The WATBAL tables provides results of volume of accumulated water in a storage area for each month. As shown on Table II-1, the total volume of tailings storage required in a pond is the sum of volume of tailings solids and volume of water.

The level of the tailings pond (and hence, the total volume) is limited due to various freeboard requirements, as outlined below:

- Water level in the Northwest Pond is not to exceed 6098.5 ft.
- Water level in the South Pond is not to exceed 6086.5 ft.
- Water level in the North Pond is not to exceed 6037 ft. until reconstruction of the retaining dams are undertaken in Fall 2000.

There are also minimum pond volumes required for water clarification, which have been discussed earlier.

The required volumes and the corresponding pond levels are summarized on Table II-1. Figures 9 to 11 show the pond levels for the next five years but the results are as follows:

- The South Pond filling is completed in the Summer of 1999, up to 6085 ft. The complete capacity of the pond is not consumed due to practical considerations such as beach slope and a small clarification pond that will occur.
- The Northwest Pond nearly reaches its maximum level in May, 1999 when decanting will have to begin. The pond level then drops (to a minimum level for water clarification) as tailings are discharged to the South Pond for the summer period. Then the pond levels rise again in the Fall, 1999 as tailings discharge switches back to this pond and decanting ends. Then discharge of tailings begins in Fall, 2000 after the dams are reconstructed.
- The different minimum pond levels from September, 1999 to September, 2000 are due to the large proportion of tailings which are placed in the Northwest Pond (67% versus 83%). Hence, the tailings solids volume uses a significant amount of pond volume forcing the minimum pond level up dramatically.
- The Northwest Pond level response then gradually increases for the remainder of the period until a maximum pond level of approximately 6096 ft. is reached.
- The North Pond level is constrained below the 6037 ft. level for the first two years of the plan. After Fall, 2000, the pond level fluctuates due to the Fall discharge and Spring decant that is required. A maximum pond elevation of 6060 ft. is estimated for the North Pond. Allowing for 1.5 ft. of freeboard, Dams 2 and 3 must be designed for retention up to 6061.5 ft.

It must be noted that these results are for mean climatic conditions and for best estimates of input parameters. Actual pond level results will be different from these, since both climatic and input parameters will be different. In addition, the storage capacity curve for a particular basin is changing all the time due to the deposition of tailings solids. Hence, there will be inaccuracies in using current storage-capacity curves to predict levels for the next five years. Hence, monitoring of pond inputs and response will be critical in evolving the water balance model to make better predictions in the future.

5. DAM STABILITY ISSUES

Since the North Pond will have to be used in the future for tailings deposition, both Dams 2 and 3 will be required for retention of solids and water. Geocon (1975) provides borehole information relative to both of these dams, based on drilling that was carried out in Fall 1974. Dam 2, with a crest at 6055.5 ft., consisted of 29 ft. of mine rockfill, underlain by 6 ft. of loose brown tailings, 4 ft. of muskeg and organic silts (native materials) followed by 25 ft. of silty clay (frozen), 5 ft. of sandy silt (frozen) and then bedrock at 70 ft. depth. A borehole drilled from the crest of Dam 3, at Elevation 6059.6 ft., encountered 30 ft. of mine rockfill, 8 ft. of tailings and organics, 7 ft. of silt and peat pockets (native) followed by 16 ft. of silty clay (frozen), 6 ft. of sandy silt (frozen) and then bedrock at 65 ft. Stability analyses were also provided in this report, assuming that both dams would be raised to a crest level of 6072 ft., a retained water level of 6069 ft. and a retained tailings solids level of 6052 ft. For Dam 2, with two 30 ft. wide toe berms (at 6044 and 6052 ft.), the minimum Factor of Safety (Bishop's method) was 1.8 for failure through the foundation and 2.0 for the toe berm. Dam 3 results were 1.7 for foundation failure and 1.4 for toe berm failure, based on one 45 ft. wide berm at 6040 ft. This construction work was not undertaken until 1979 and as-built information is provided in Geocon (1980).

Geocon (1986) also provided stability analyses for the two dams, with the proposed plan of raising both dams to 6082 ft. At the time of the report preparation, the crest of Dam 2 was at 6070.5 ft. with a width of 25 ft; tailings on the upstream side were at 6067 ft. The crest of Dam 3 was at 6071.5 ft. with a width of 35 ft.; tailings were situated up to 6071 ft. on the upstream side. For a proposed crest raising to 6082 ft., maximum water level of 6078 ft. and with surcharge loading on the crest, a minimum Factor of Safety of 1.66 was determined for Dam 2 and 1.69 for Dam 3. Downstream stabilizing berms were assumed in both of these analyses.

Approximately 14 to 20 ft. of the Dam 2 section was removed after construction in 1986, and the materials were used for construction of dams at the Northwest Pond. Golder Associates (1995) provided recommendations, including stability analyses, relative to the reconstruction of Dam 2 back to Elev. 6082 ft., based on drilling information obtained by Thurber (1993). With the assumption of a two-berm system on the downstream toe, the Factor of Safety for the pre-disturbed sections was in excess of 1.5.

Recommendations for the repair of the crest of Dam 3, back up to elevation 6082 ft., was provided in a report by Golder Associates (1996).

Hence, the basic design work for the raising of Dam 2 and 3 has been provided already. In the case of Dam 2, Giant Mine's external geotechnical reviewer, Mr. M.A.J. Matich, P.Eng., had some concerns regarding the potential for piping under the dams. Hence, it was recommended that Golder Associates carry out additional site investigation work, to confirm the subsurface ground conditions, as assumed in the reports by Golder Associates. Once the subsurface conditions are confirmed, and the proposed water level upstream of the dams is provided, the final design can be undertaken, after assessing the potential for piping. Also, stability analyses would be undertaken for the final dam configuration.

6. RECOMMENDATIONS

The following recommendations relative to the Tailings Management Plan are provided:

1. The actual filling rate of the tailings ponds need to monitored and compared to the filling plan model. Water consumption conservation projects suggested by Royal Oak to be implemented in the first half of 1999 should be evaluated by the basin filling rate response.

2. An evaluation of the Northwest Pond seepage rate should be undertaken by an appropriate and practical method, perhaps in concert with some of the hydrogeological studies that are currently underway at Giant Mine. In addition, an evaluation of the potential seepage from the Original Tailings Area should also be undertaken.

3. The main input parameters to the management plan, total water consumption and precipitation need to be monitored, relative to the actual filling rate of the various ponds. This would permit the further refinement of the basin filling model, when the plan is up-dated in the future. Hence, either Royal Oak or DIAND staff should carry out snow surveys on the various ponds, in the late winter to correlate winter snowfall amount with the snow-water equivalent actually residing in the watershed areas.

4. Since the basin filling plan has been captured in a spreadsheet-based model, up-dating of the management plan on an annual basis is a relatively minor exercise. Hence, the basins should be surveyed on an annual basis, and the revised storage-capacity curve be put into the model so that future water levels can be predicted to facilitate basin management.

5. The additional site investigation, sampling and testing work required for the North Pond dams should be undertaken in 1999 so that design work can be finalized in the Winter of 1999/2000 and construction can proceed in the Fall, 2000.

7. CLOSURE

Thank you for the opportunity to once again be of service to Royal Oak Mines and we trust this report presents the information you require. Should any portion of the report require clarification, please contact the undersigned.

Respectfully submitted,

GOLDER ASSOCIATES LTD.

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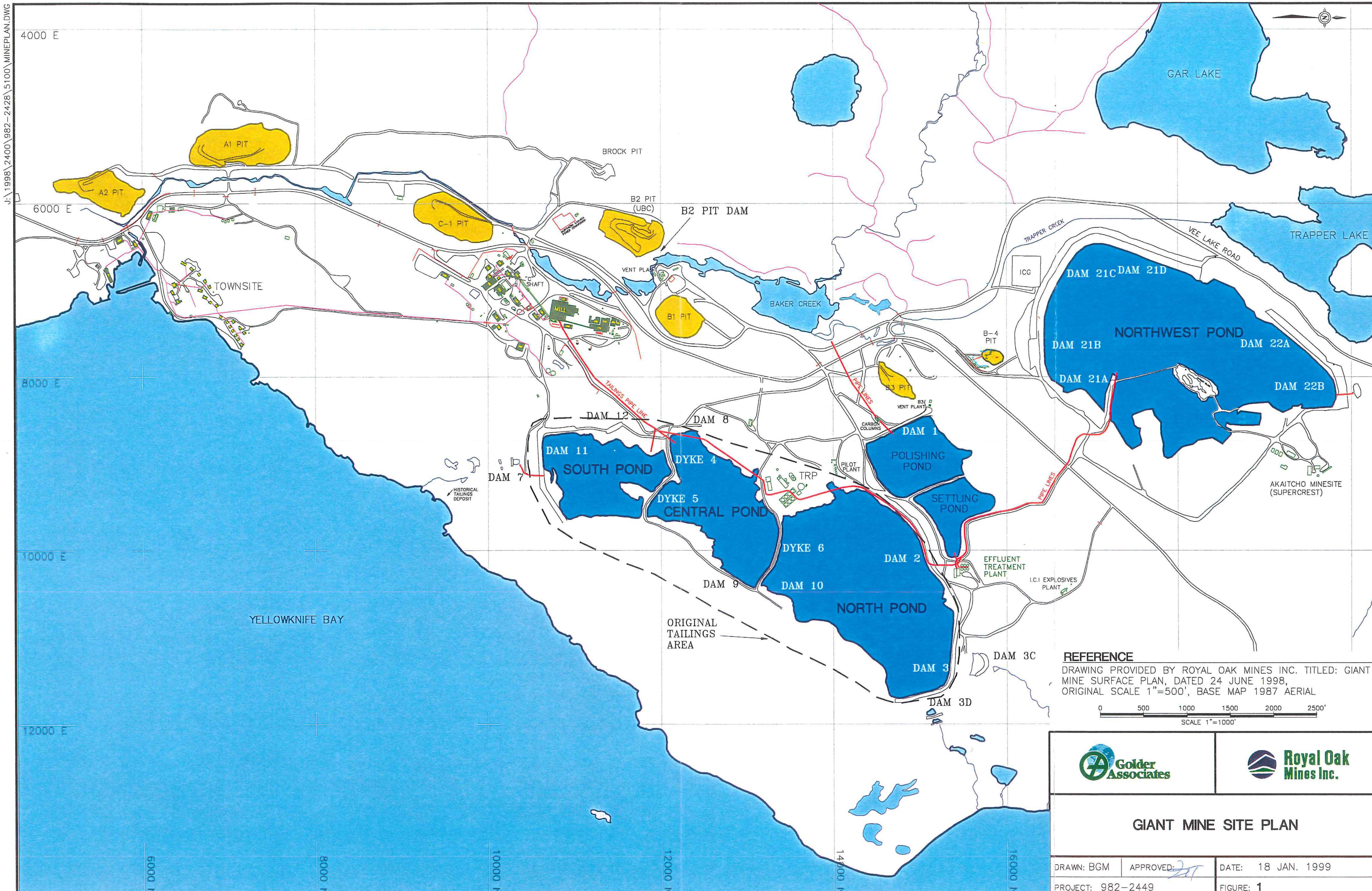
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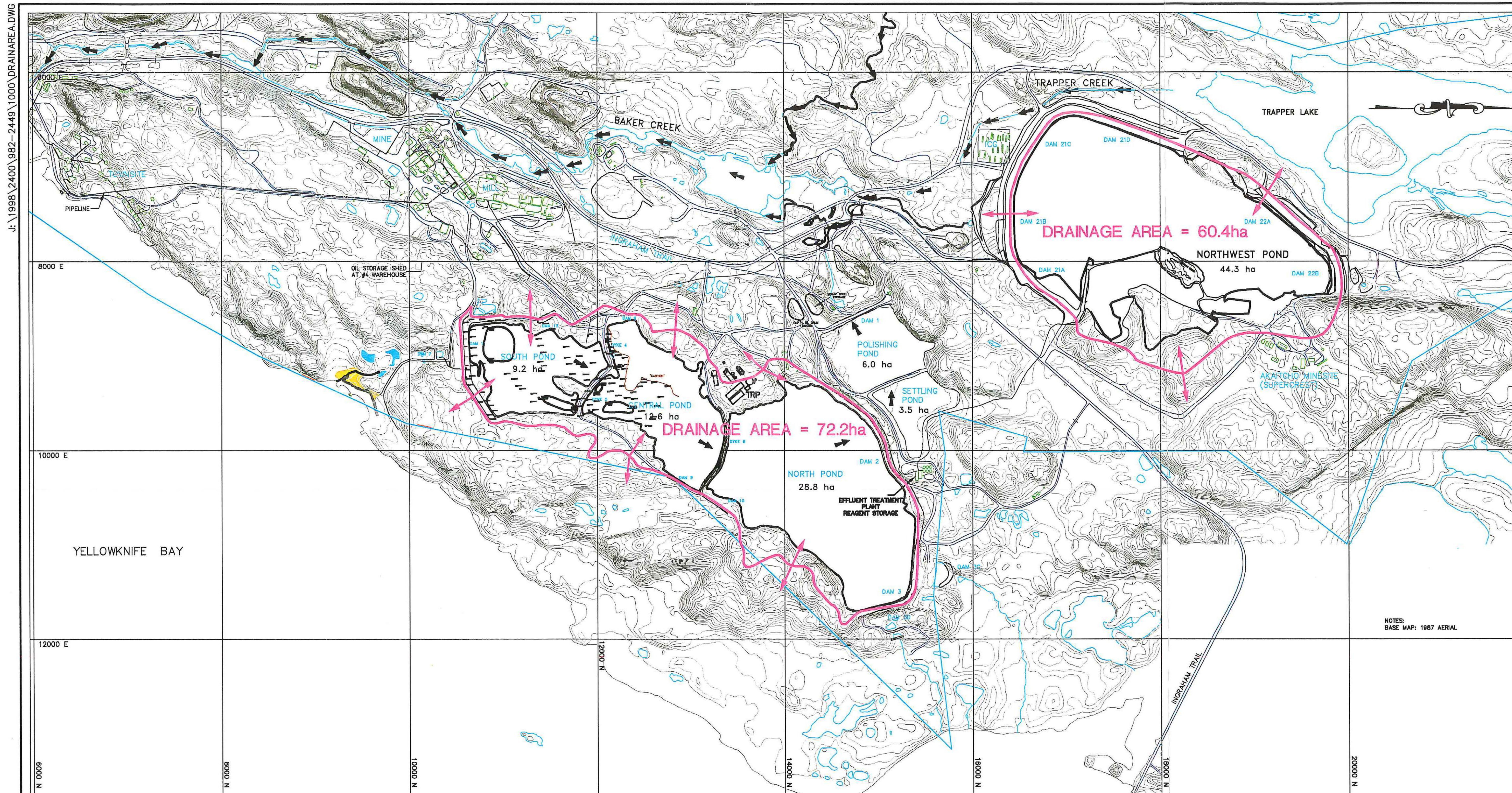
4000 E
6000 E
8000 E
10000 E
12000 E
6000 N
8000 N
10000 N
12000 N
14000 N
16000 N
A1 PIT
A2 PIT
C-1 PIT
BROCK PIT
B2 PIT (UBC)
B2 PIT DAM
B1 PIT
B-4 PIT
B3 PIT
B3 VENT PLANT
VENT PLANT
TOWNSITE
SHAFT
MILL
TAILINGS PIPE LINE
PIPE LINES
BAKER CREEK
TRAPPER CREEK
VEE LAKE ROAD
GAR LAKE
TRAPPER LAKE
ICG
NORTHWEST POND
DAM 21A
DAM 21B
DAM 21C
DAM 21D
DAM 22A
DAM 22B
AKAITCHO MINESITE (SUPERCREST)
CARBON COLUMNS
DAM 1
POLISHING POND
SETTLING POND
PILOT PLANT
TRP
EFFLUENT TREATMENT PLANT
I.C.I EXPLOSIVES PLANT
DAM 12
DAM 8
DAM 11
SOUTH POND
DYKE 4
DYKE 5
CENTRAL POND
DYKE 6
DAM 2
DAM 9
DAM 10
NORTH POND
DAM 7
HISTORICAL TAILINGS DEPOSIT
ORIGINAL TAILINGS AREA
DAM 3
DAM 3C
DAM 3D
YELLOWKNIFE BAY
REFERENCE
DRAWING PROVIDED BY ROYAL OAK MINES INC. TITLED: GIANT MINE SURFACE PLAN, DATED 24 JUNE 1998, ORIGINAL SCALE 1"=500', BASE MAP 1987 AERIAL
0 500 1000 1500 2000 2500'
SCALE 1"=1000'
Golder Associates
Royal Oak Mines Inc.
GIANT MINE SITE PLAN
DRAWN: BGM
APPROVED:
DATE: 18 JAN. 1999
PROJECT: 982-2449
FIGURE: 1



LEGEND

LOCAL DRAINAGE DIVIDE

FLOW DIRECTION

REFERENCE

BASE MAP PROVIDED BY ROYAL OAK MINES INC.
LOCAL SURFACE HYDROLOGY FIGURE 5 (APRIL 1998).

0 400 800 1200 1600 2000ft.

SCALE 1" = 1000'

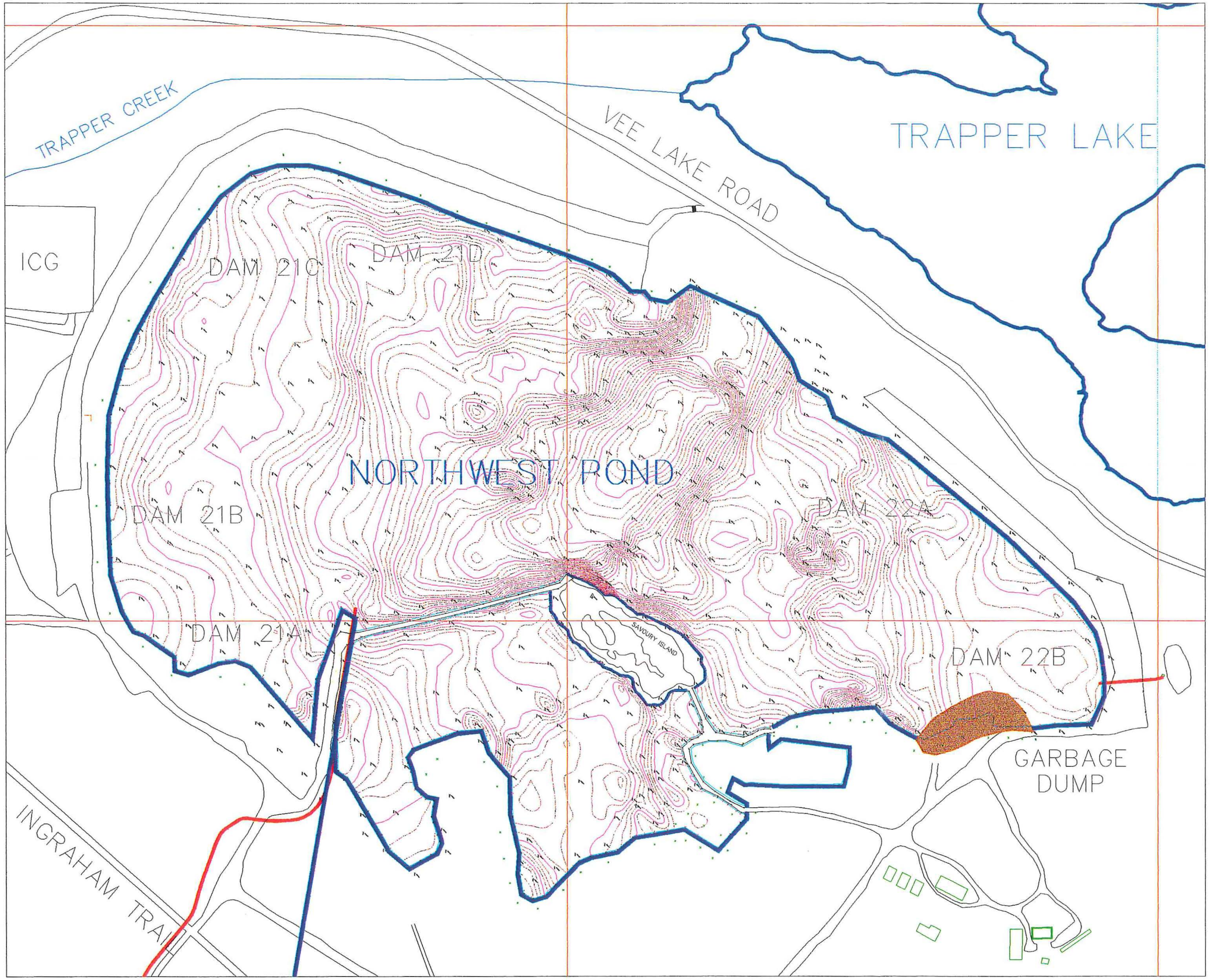
Golder Associates

Royal Oak Mines Inc.

DRAINAGE AREAS TO TAILINGS PONDS

DRAWN: BGM	APPROVED:	DATE: 22 JAN. 1999
PROJECT: 982-2449.1000		FIGURE: 2

J:\1998\2400\982-2449\NORTHWESTPOND.dwg



N

REFERENCE

SURVEY DONE BY ROYAL OAK STAFF IN SEPTEMBER, 1998.
DRAWING PROVIDED BY SUBARCTIC SURVEYS LTD. TITLED "BASE", ORIGINAL SCALE 1" = 200'

0 200 400 600 800 1000feet

Golder Associates | Royal Oak Mines Inc.

NORTHWEST POND SURVEY INFORMATION

DRAWN: CG	APPROVED:	DATE: 28 JAN. 1998
PROJECT: 982-2449		FIGURE: 3

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REFERENCE

SURVEY DONE BY ROYAL OAK STAFF
IN JANUARY, 1999
DRAWING PROVIDED BY SUBARCTIC SURVEYS
LTD. TITLED "C2", ORIGINAL
SCALE 1" = 200'

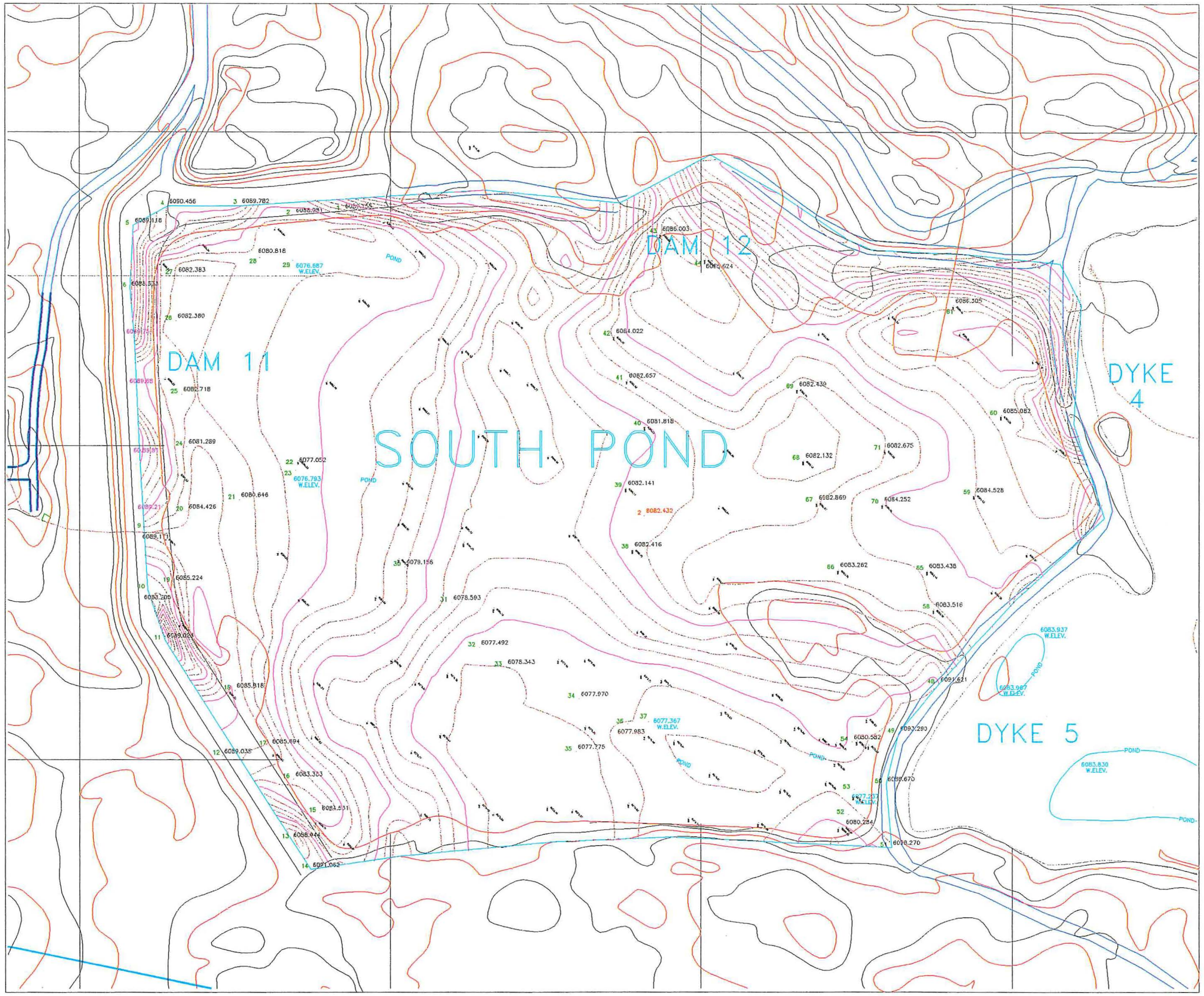
0 200 400 600 800 1000feet

Golder Associates | Royal Oak Mines Inc.

NORTH POND SURVEY INFORMATION

DRAWN: CG	APPROVED:	DATE: 28 JAN. 1998	
PROJECT: 982-2449		FIGURE: **4**	

J:\1998\2400\982-2449\SOUTHPOND.dwg



REFERENCE

SURVEY DONE BY ROYAL OAK STAFF
IN DECEMBER, 1998.
DRAWING PROVIDED BY SUBARCTIC SURVEYS
LTD. TITLED "POND-S12", ORIGINAL
SCALE 1" = 100'

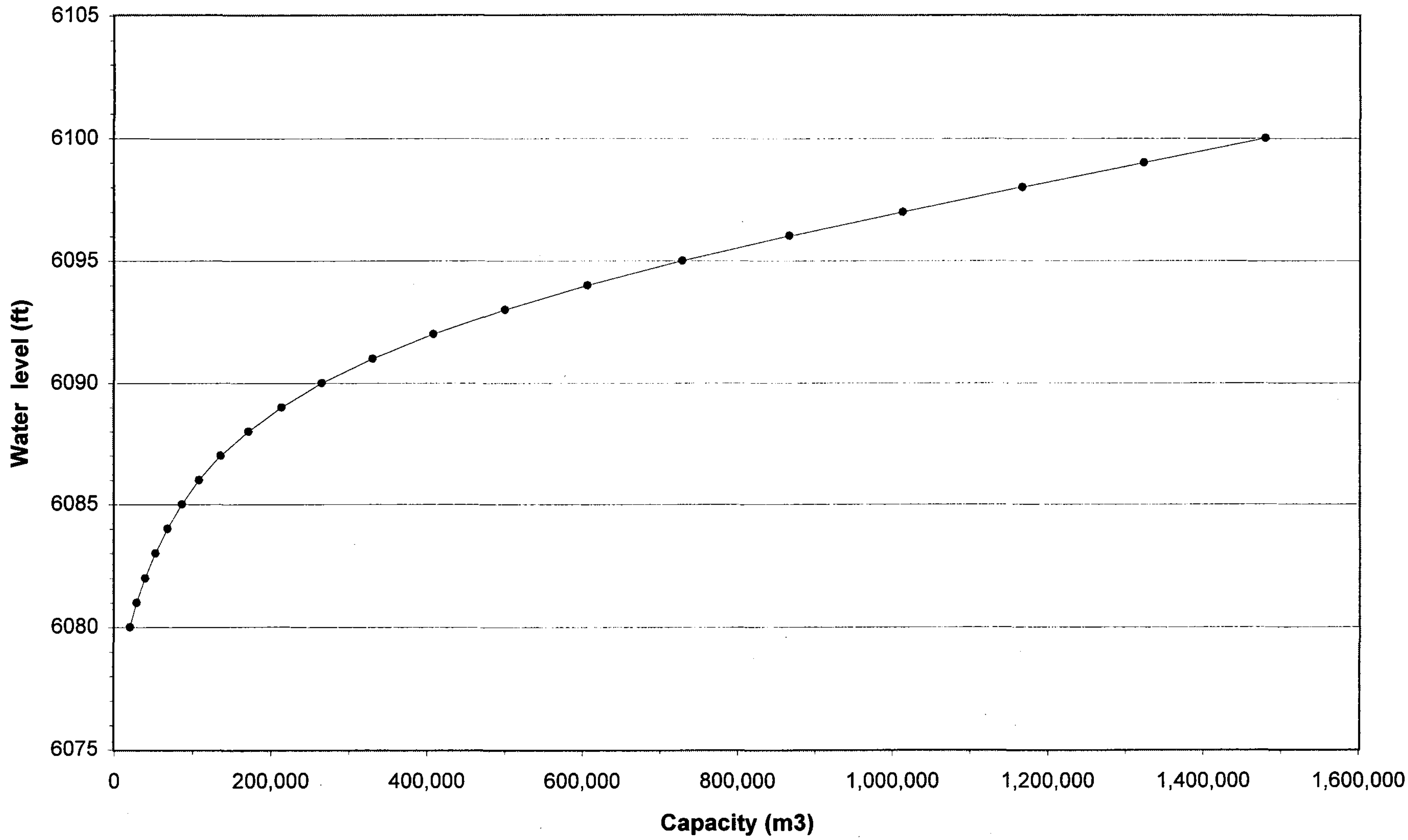
0 100 200 300 400 500feet

Golder Associates

Royal Oak Mines Inc.

SOUTH POND SURVEY INFORMATION

DRAWN: CG	APPROVED:	DATE: 28 JAN. 1998
PROJECT: 982-2449		FIGURE: 5



Golder Associates

Royal Oak Mines Inc.

NORTHWEST POND STORAGE CAPACITY CURVE

DRAWN: CG	APPROVED:	DATE: 27 JAN. 1999
PROJECT: 982-2449		FIGURE: 6

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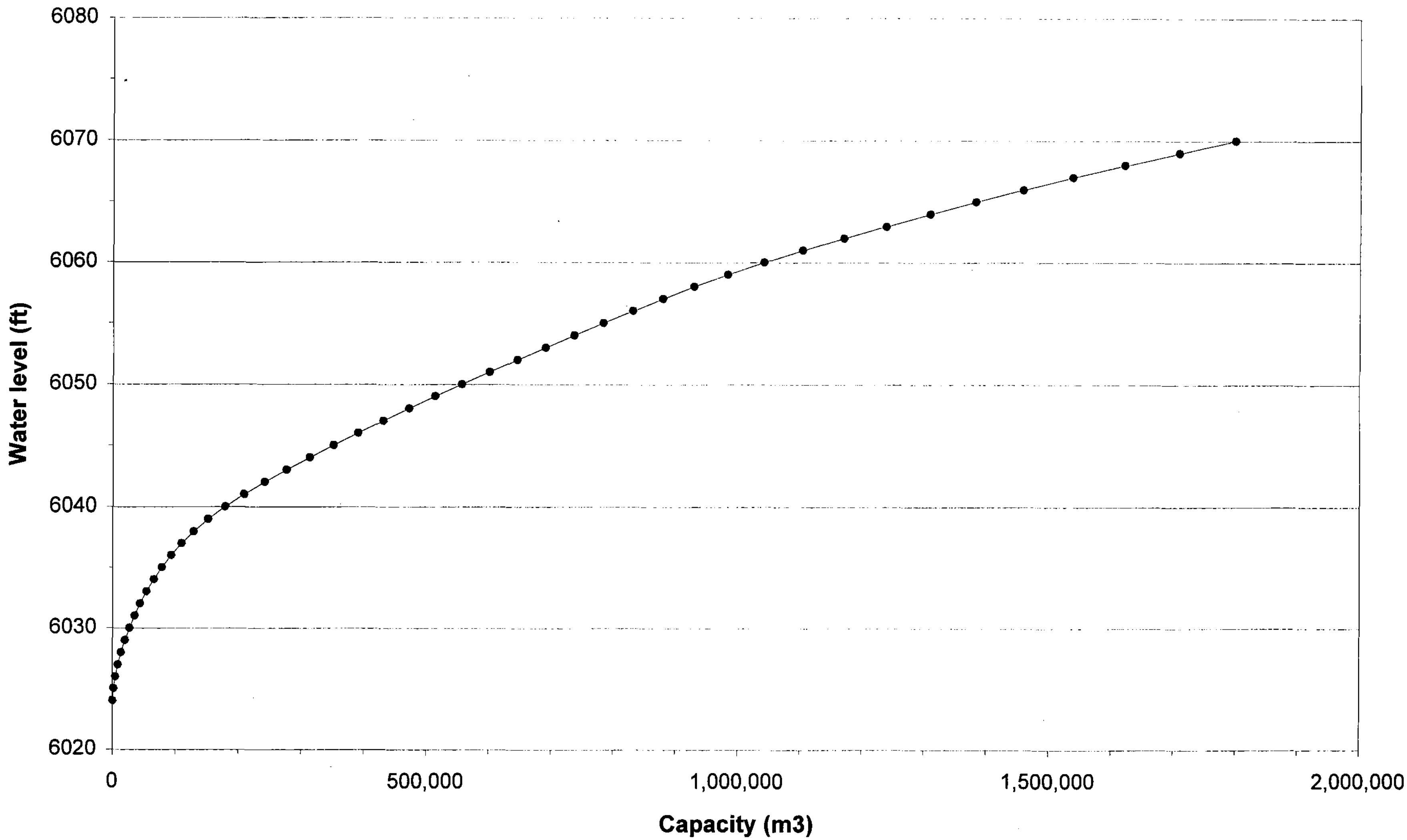
J:\1998\982-2449\1000\CUT-PASTE.dwg



Golder Associates

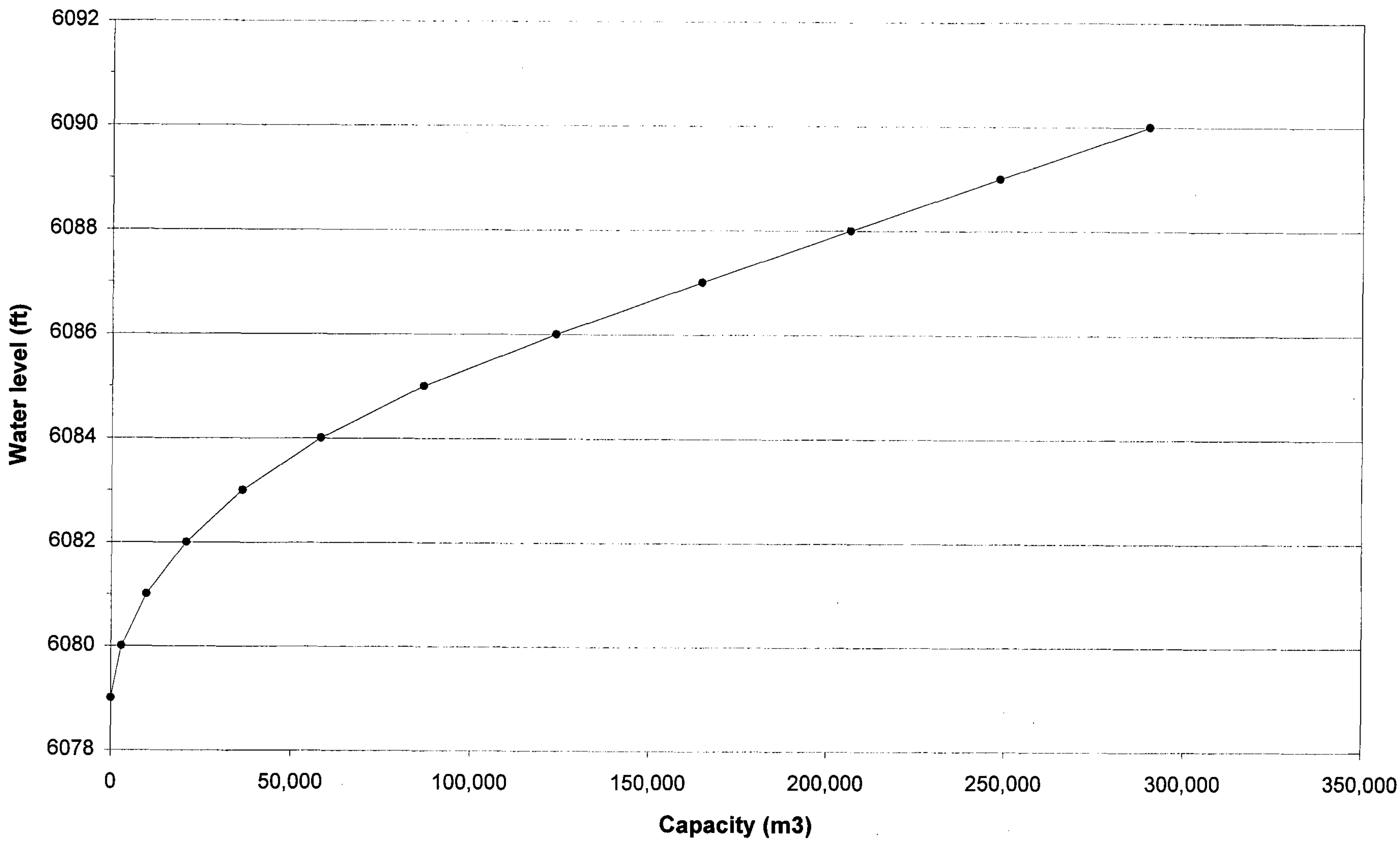
Royal Oak Mines Inc.

NORTH POND STORAGE
CAPACITY CURVE

DRAWN: CG	APPROVED:	DATE: 27 JAN. 1999
PROJECT: 982-2449		FIGURE: 7

R:\1998\982-2449\DATAFILE\99-01-01\S_CAPACITY.xls

J:\1998\982-2449\1000\CUT-PASTE.dwg



Golder Associates

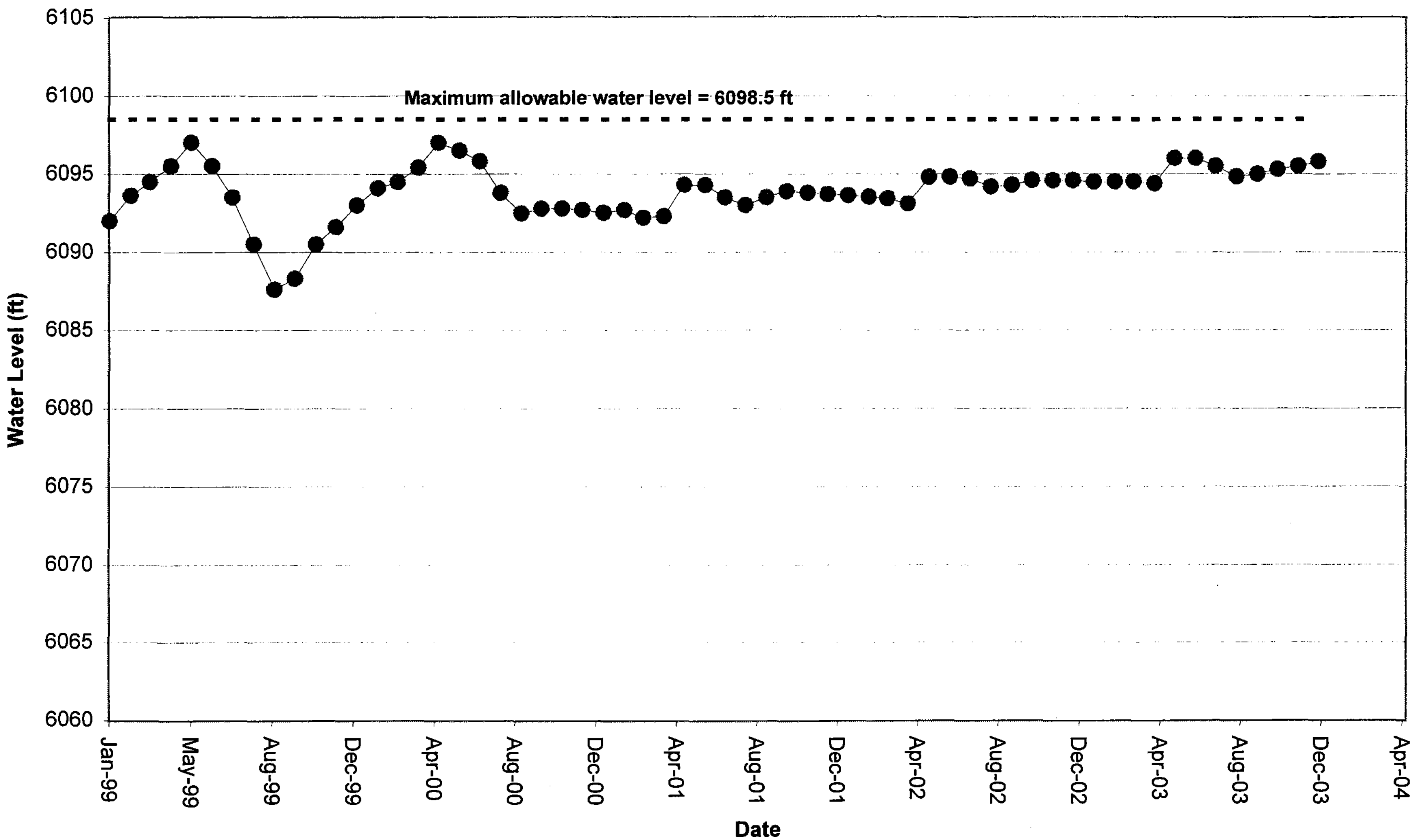
Royal Oak Mines Inc.

SOUTH POND STORAGE CAPACITY CURVE

DRAWN: CG	APPROVED:	DATE: 27 JAN. 1999
PROJECT: 982-2449		FIGURE: 8

R:\1998\982-2449\DATAFILE\99-01-01\S_CAPACITY.xls

J:\1998\982-2449\1000\CUT-PASTE.dwg



Golder Associates

Royal Oak Mines Inc.

NORTHWEST POND LEVELS VERSUS DATE

DRAWN: CG	APPROVED: SPT	DATE: 28 JAN. 1999
PROJECT: 982-2449		FIGURE: 9

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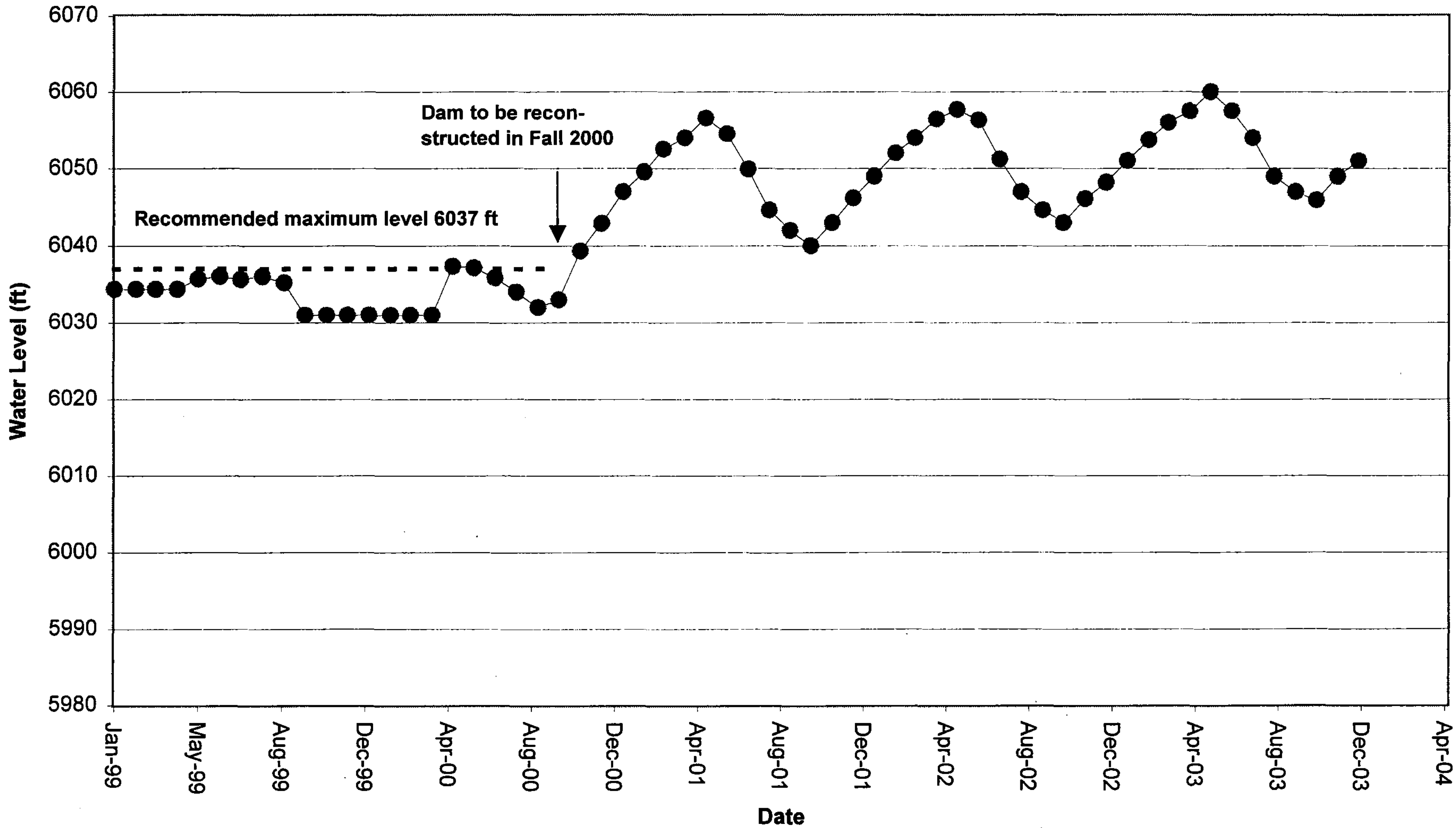

Golder Associates

Royal Oak Mines Inc.

NORTH POND LEVELS VERSUS DATE

DRAWN: CG	APPROVED:	DATE: 28 JAN. 1999
PROJECT: 982-2449		FIGURE: 10

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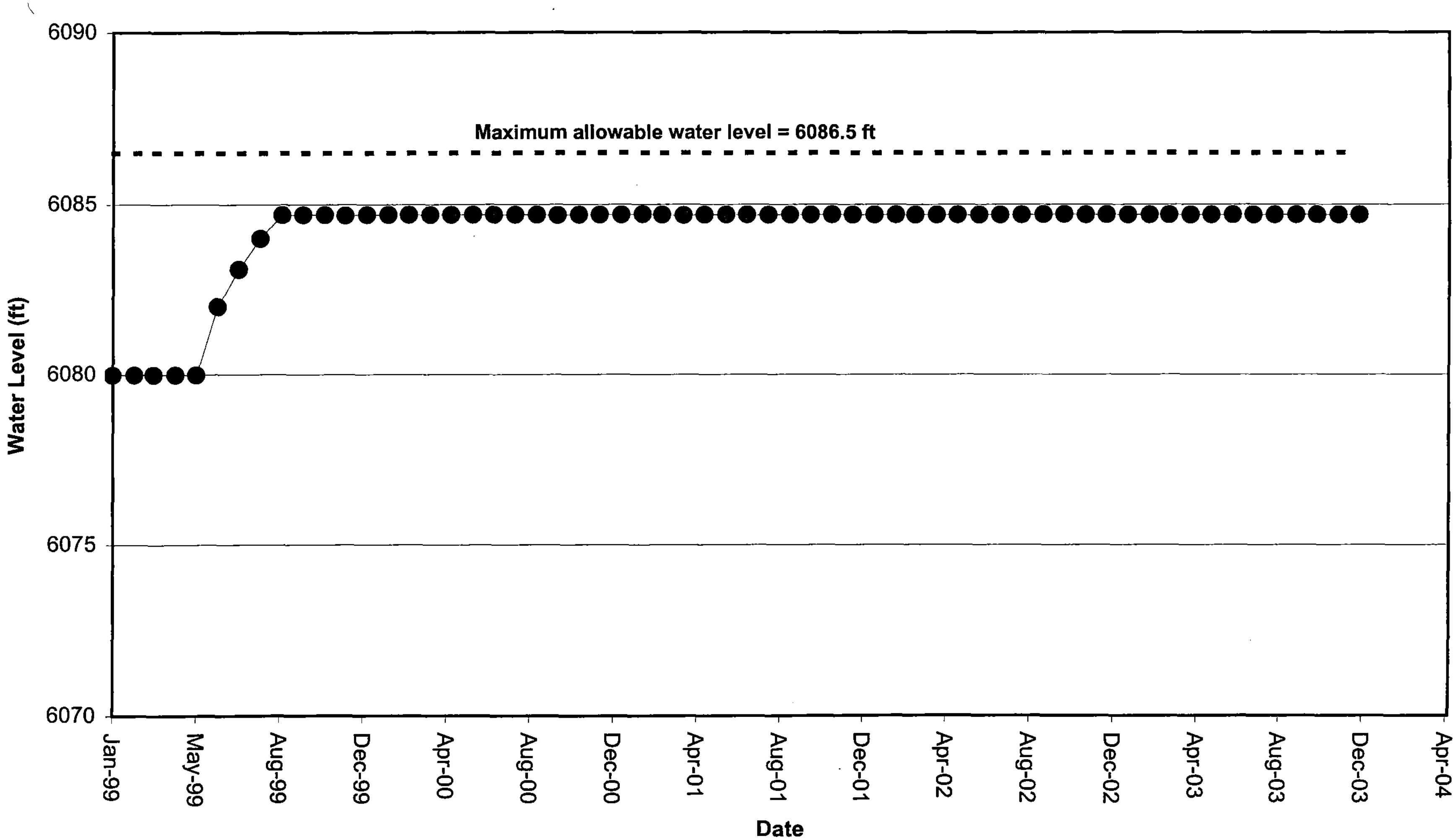

Golder Associates

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SOUTH POND LEVELS VERSUS DATE

DRAWN: CG	APPROVED:	DATE: 28 JAN. 1999
PROJECT: 982-2449		FIGURE: 11

APPENDIX I

CLIMATIC INFORMATION SUMMARY

1.0 Climate Information

Climatic data has been collected by Atmospheric Environmental Services (AES) of Environment Canada since 1943 at the Yellowknife Airport. The recorded climate data were analyzed to provide a basis for deriving the climate parameters such as air temperature, precipitation, and lake evaporation to characterize the existing climate conditions at the Giant Mine site.

1.1 Air Temperature

The long-term daily air temperature data recorded at the Yellowknife Airport climate station were analyzed to represent the mean and extreme monthly temperature distributions for the project site. Table I-1 summarizes the resulting statistics of monthly air temperatures recorded at the Yellowknife Airport climate station. Figure I-1 illustrates the distributions of the long-term mean monthly air temperatures at the Yellowknife climate station.

Mean annual air temperature is -5.2°C. The estimated average mean monthly air temperatures ranges from about -27.7°C in January to about 16.3°C in July. The estimated average minimum monthly air temperature is -31.9°C (occurred in January) and average maximum monthly air temperature is 20.7°C (occurred in July).

1.2 Precipitation

<u>Mean Monthly and Annual Precipitation</u>

The recorded rainfall and snowfall data at the Yellowknife Airport climate station were analyzed to represent the project site precipitation characteristics due to its close proximity and similar elevation. A snowfall under-catch correction factor of 1.5 was applied to the recorded snowfall data to estimate the actual snowfall onto the ground (Metcalfe et. al. 1996). Total mean annual precipitation is estimated to be 350 mm.

Table I-2 presents the derived mean monthly and annual rainfall, snowfall, and total precipitation values for the Yellowknife Airport climate data. Figure I-2 shows the distributions of the mean monthly rainfall and snowfall values at the Yellowknife climate station.

Extreme Annual Precipitation

A frequency analysis on the annual precipitation series at the Yellowknife Airport climate station was conducted to derive extreme annual precipitation rates for the project site. The results for selected return periods are presented in Table I-3, which shows that the derived extreme annual precipitation for 100-year return period is 581 mm at the Giant Mine site.

Short Duration Extreme Rainfall

The intensity-duration-frequency (IDF) curves for the Yellowknife Airport climate station were used to define the short duration extreme rainfall characteristics for the project site. The resulting extreme rainfall depths for various durations and frequencies ranging from 2 to 100 years return periods are summarized in Table I-4. The intensity-duration-frequency (IDF) curves are also shown in Figure I-3 for the project site.

1.3 Lake Evaporation

Lake evaporation estimates are required to design a tailings management facility at the project site. Therefore, the lake evaporation rates measured at Pocket Lake (actually situated on the mine lease property) were used to derive monthly and annual lake evaporation rates for the project site. The mean annual lake evaporation estimates at Pocket Lake made by Reid (1996), and up-dated by recent personal communications, ranges from less than 400 mm to more than 500 mm.

There is a considerable uncertainty associated with the evaporation estimates. Therefore, it is recommenced that a degree of conservatism be used. For water balance and wet period storage calculations (eg. tailings containment), it is reasonable to assume a lower limit for the estimated mean annual evaporation (400 mm).

Table I-5 presents the distribution of the mean monthly lake evaporations derived based on mean monthly air temperate distribution and the evaporation distribution reported at the Yellowknife climate station (Golder, 1997a).

Table I-1
Monthly Air Temperature at Yellowknife Airport Climate Station
(Period of Record: 1943 to 1996)

Month	Mean Monthly Air Temperatures (°C)		
	Minimum	Mean	Maximum
January	-31.9	-27.7	-23.5
February	-29.8	-25.0	-20.1
March	-23.9	-18.1	-12.2
April	-12.5	-6.8	-1.0
May	-0.4	4.7	9.8
June	7.8	12.8	17.6
July	11.8	16.3	20.7
August	10.0	14.1	18.2
September	3.5	6.9	10.1
October	-4.2	-1.4	1.3
November	-18.3	-14.4	-10.4
December	-28.0	-23.9	-19.9
Annual	-9.7	-5.2	-0.8

Table I-2
Derived Mean Monthly Rainfall, Snowfall and Precipitation at Yellowknife
(Period of Record: 1943 to 1998)

Month	Mean Monthly Precipitation (mm)		
	Rainfall	Snowfall(1)	Precipitation(1)
January	0.0	25.6	25.6
February	0.0	23.4	23.5
March	0.1	22.8	22.9
April	2.0	14.6	16.6
May	13.3	5.1	18.4
June	22.0	0.2	22.2
July	34.5	0.0	34.5
August	38.0	0.0	38.0
September	27.5	4.2	31.7
October	13.4	29.7	43.1
November	0.6	44.1	44.7
December	0.1	32.7	32.8
Annual	152	202	354

(1): A snowfall under-catch correction factor of 1.5 was used to derive these estimates.

Table I-3
Derived Extreme Annual Precipitation
(Period of Record: 1943 to 1998)

Return Period (Years)	Total Annual Precipitation[1] (mm)
2	331
5	404
10	450
20	492
50	544
100	581

(1): A snowfall under-catch correction factor of 1.5 was used to derive these estimates.

Table I-4

Frequencies of Extreme Rainfall at Yellowknife Airport Climate Station

Return	Extreme Rainfall Intensity for Various Durations (mm/hr)						
(Year)	5-minute	10-minute	30-minute	1-hour	2-hour	12-hour	24-hour
2	43.9	31.2	15.8	9.6	6.2	1.9	1.1
5	68.5	48.4	24.2	14.5	9.2	2.9	1.8
10	84.9	59.8	29.8	17.7	11.2	3.6	2.2
50	120.7	84.8	42.0	24.8	15.6	5.0	3.1
100	135.7	95.3	47.2	27.8	17.5	5.6	3.5

Table I-5
Estimated Mean Monthly and Annual Lake Evaporations

Month	Estimated Lake Evaporation[1] (mm)
January	0
February	0
March	0
April	0
May	32
June	92
July	132
August	100
September	44
October	0
November	0
December	0
Total	400

(1). Recommended lower limit estimates for water balance analysis.

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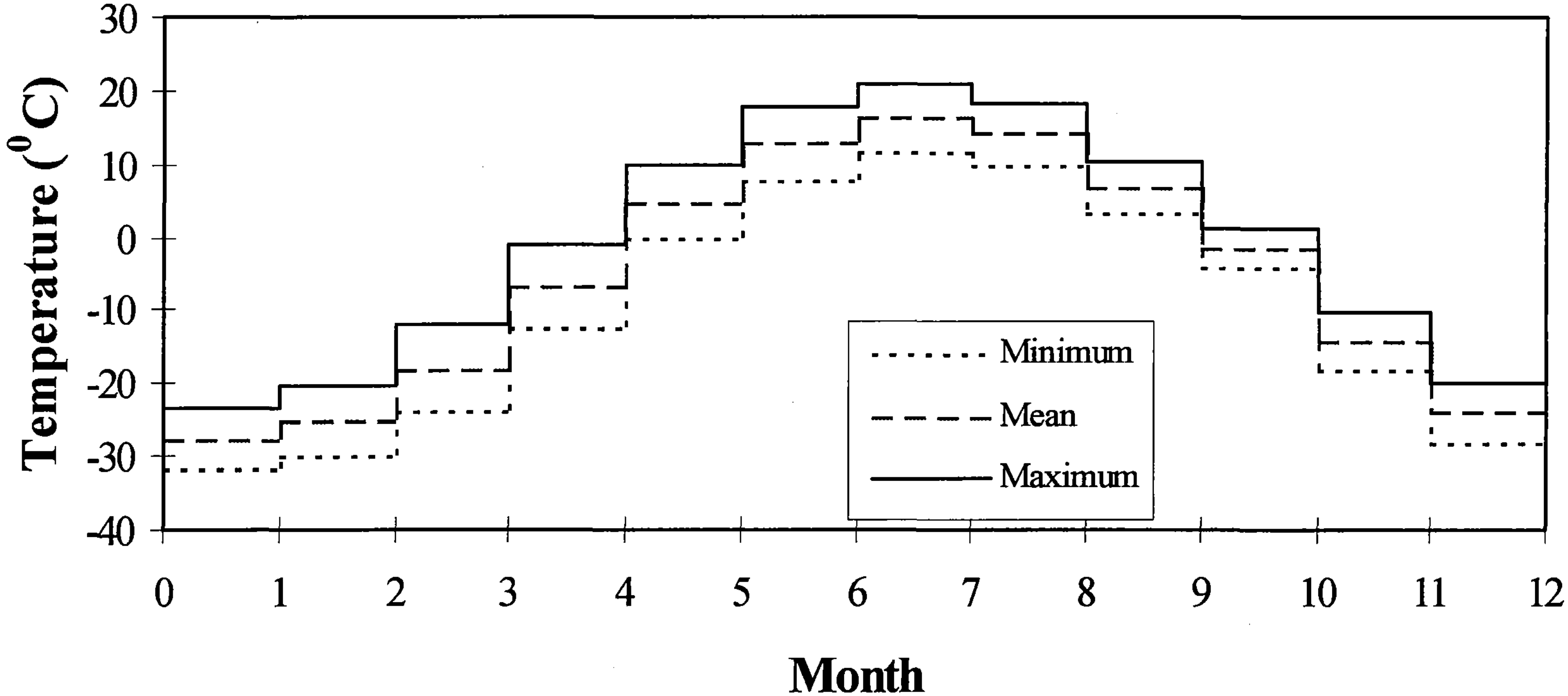

Golder Associates

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RECORDED MONTHLY AIR TEMPERATURES AT THE YELLOWKNIFE AIRPORT (Period of Record: 1943 to 1996)

DRAWN: VS	APPROVED:	DATE: 27 JAN. 1999
PROJECT: 982-2449		FIGURE: I-1

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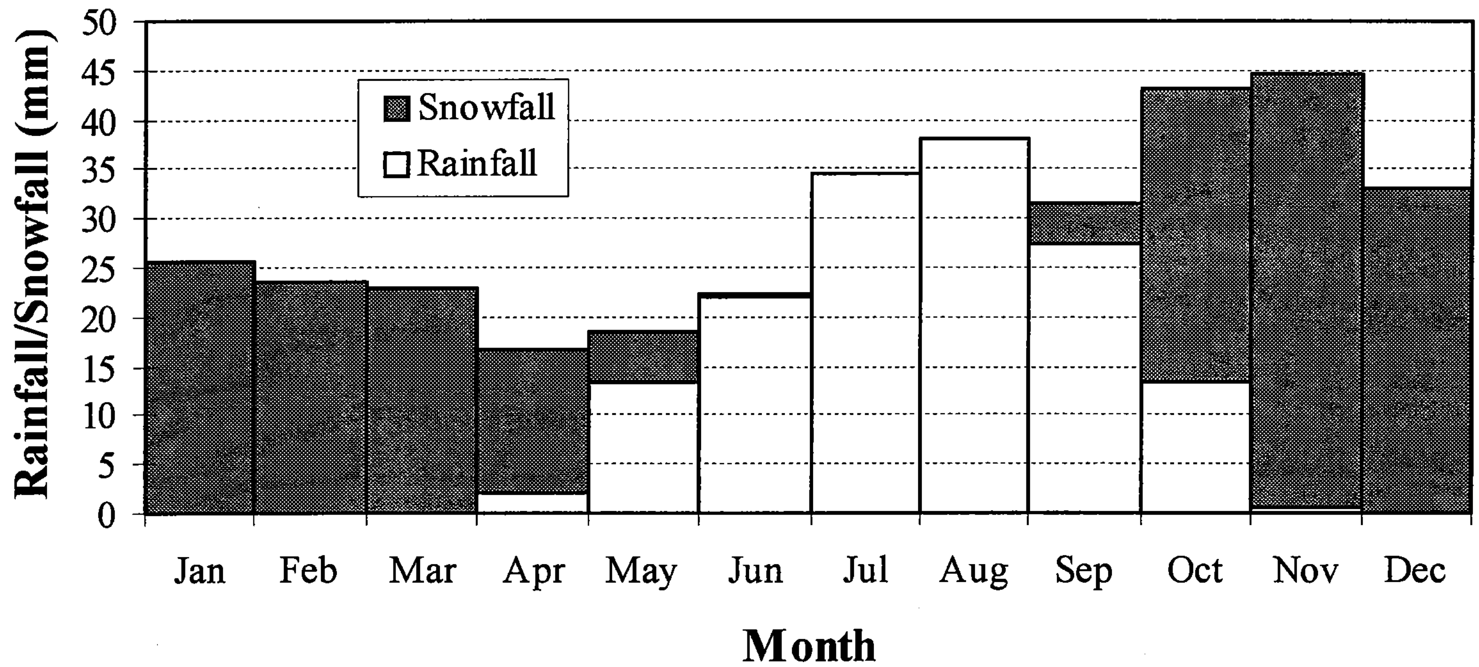
J:\1998\982-2449\1000\RAIN-SNOW.dwg



Golder Associates

Royal Oak Mines Inc.

MEAN MONTHLY RAINFALL AND SNOWFALL AT YELLOWKNIFE AIRPORT (1943-1998) (with snowfall under-catch correction factor of 1.5)

DRAWN: VS	APPROVED:	DATE: 27 JAN. 1999
PROJECT: 982-2449		FIGURE: I-2

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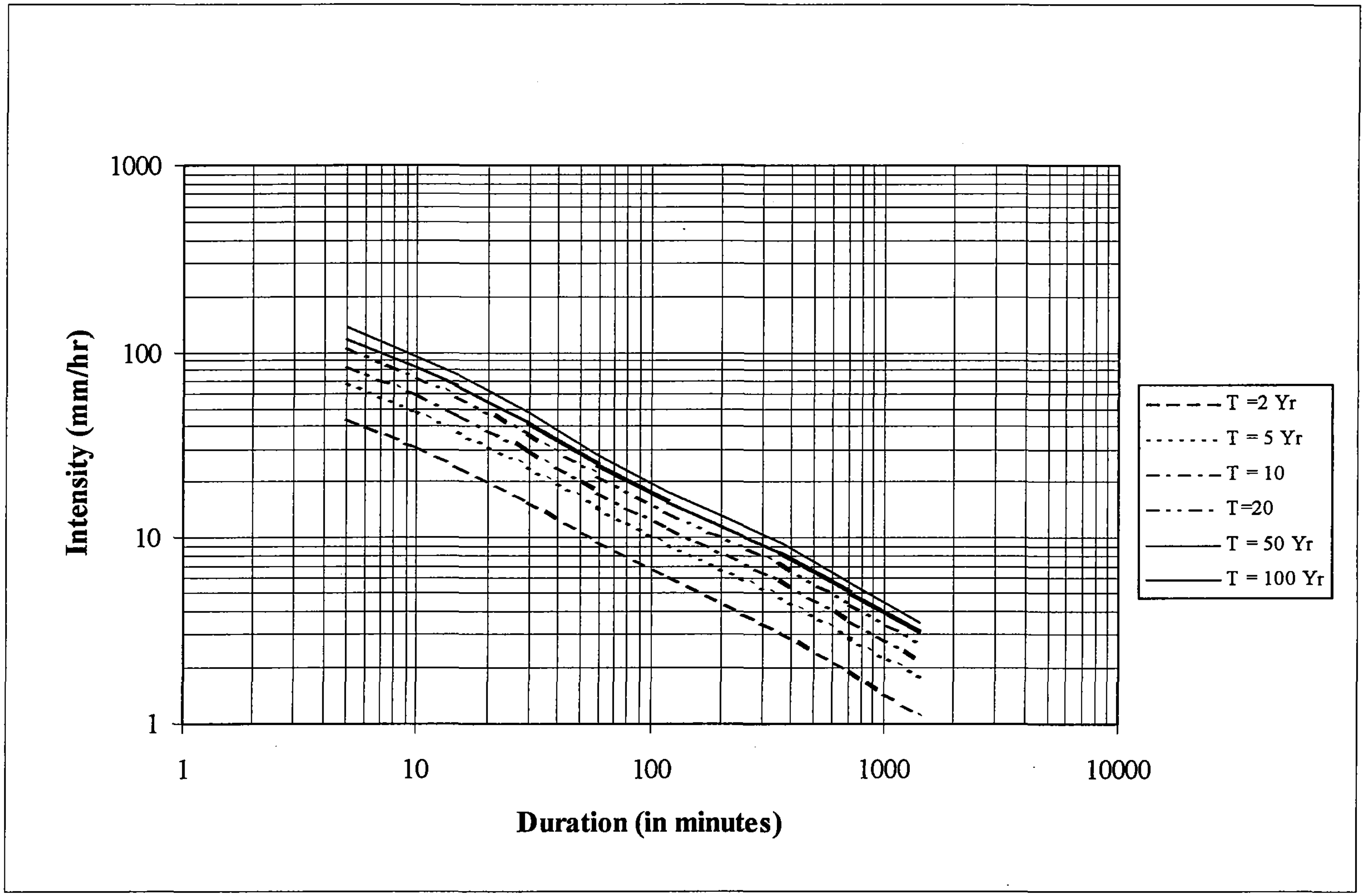

Golder Associates

Royal Oak Mines Inc.

RAINFALL INTENSITY-DURATION-FREQUENCY CURVES AT YELLOWKNIFE AIRPORT

DRAWN: VS	APPROVED:	DATE: 27 JAN. 1999
PROJECT: 982-2449		FIGURE: I-3

APPENDIX II

WATER BALANCE SUMMARY, TABLES AND FIGURES

Table II - 1 Water Balance Inputs and Summary

	Unit	Initial	Jan-99	Feb-99	Mar-99	Apr-99	May-99	Jun-99	Jul-99	Aug-99	Sep-99	Oct-99	Nov-99	Dec-99
Ore milled	Short t/day		958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9
	Metric t/day		870	870	870	870	870	870	870	870	870	870	870	870
	Metric t/mon		26,970	24,360	26,970	26,100	26,970	26,100	26,970	26,970	26,100	26,970	26,100	26,970
Accum Ore milled	metric ton		26,970	51,330	78,300	104,400	131,370	157,470	184,440	211,410	237,510	264,480	290,580	317,550
Slurry solids content	% by weight		17%	17%	17%	17%	17%	17%	20%	20%	20%	20%	20%	20%
Solids specific gravity			2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Slurry solids volume	m3/day		311	311	311	311	311	311	311	311	311	311	311	311
	m3/month		9632	8700	9632	9321	9632	9321	9632	9632	9321	9632	9321	9632
Water from Great Slave Lake	m3/day		2158.7	2158.7	2158.7	2158.7	2158.7	2158.7	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9
	m3/month		66,920	60,444	66,920	64,761	66,920	64,761	40,453	40,453	39,148	40,453	39,148	40,453
Groundwater	m3/day		2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6
	m3/month		64,282	58,061	64,282	62,208	64,282	62,208	64,282	64,282	62,208	64,282	62,208	64,282
City Water	m3/day		37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
	m3/month		1,163	1,050	1,163	1,125	1,163	1,125	1,163	1,163	1,125	1,163	1,125	1,163
Total water consumption	m3/day		4,270	4,270	4,270	4,270	4,270	4,270	3,416	3,416	3,416	3,416	3,416	3,416
	m3/month		132,364	119,554	132,364	128,094	132,364	128,094	105,897	105,897	102,481	105,897	102,481	105,897
Slurry discharge volume	m3/day		4,581	4,581	4,581	4,581	4,581	4,581	3,727	3,727	3,727	3,727	3,727	3,727
	m3/month		141,996	128,254	141,996	137,415	141,996	137,415	115,529	115,529	111,802	115,529	111,802	115,529
Deposited tails moisture content	%		36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Deposited tails dry density	t/m3		1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Deposited tails volume	m3/day		621	621	621	621	621	621	621	621	621	621	621	621
	m3/month		19264	17400	19264	18643	19264	18643	19264	19264	18643	19264	18643	19264
Tailings into Northwest pond (monthly)	m3		19264	17400	19264	18643	19264					19264	18643	19264
Tailings into South pond (monthly)	m3							18643	19264	19264	18643			
Tailings into North pond (monthly)	m3													
Tailings in Northwest pond (Cumulative)	m3		19264	36664	55929	74571	93836	93836	93836	93836	93836	113100	131743	151007
Tailings Solids in South pond (Cumulative)	m3		0	0	0	0	0	18643	37907	57171	75814	75814	75814	75814
Tailings Solids in North pond (Cumulative)	m3		0	0	0	0	0	0	0	0	0	0	0	0
Total tailings solids	m3		19264	36664	55929	74571	93836	112479	131743	151007	169650	188914	207557	226821
Northwest pond:														
Basin free water (WATBAL)	m3	265,000	380,698	484,619	600,317	712,090	920,924	722,147	475,523	189,962	60,813	58,076	144,890	234,799
Total tailings	m3	0	19,264	36,664	55,929	74,571	93,836	93,836	93,836	93,836	93,836	113,100	131,743	151,007
Total tailings and free water	m3	265000	399962	521,283	656,246	786,661	1,014,760	815,982	569,359	283,798	154,648	171,176	276,633	385,806
Water level: Northwest Pond	feet	6089.0	6092.0	6093.6	6094.5	6095.5	6097.0	6095.5	6093.5	6090.4	6087.6	6088	6090.3	6091.6
North pond and South pond:														
Basin free water (WATBAL):	m3		70,000	70,000	70,000	70,000	89,080	97,308	88,420	94,324	85,184	37,383	37,383	37,383
South pond:	m3	2000												
North pond:	m3	70000												
Total tailings in South Pond	m3	0.0	0	0	0	0	0	18643	37907	57171	75814	75814	75814	75814
Total tailings in North Pond	m3	0	0	0	0	0	0	0	0	0	0	0	0	0
Total tailings (S.Pond) with no free water	m3	2000	2,000	2,000	2,000	2,000	2,000	20,643	39,907	59,171	77,814	77,814	77,814	77,814
Water level: South Pond	feet	6080.0	6080.0	6080.0	6080.0	6080.0	6080.0	6082.0	6083.1	6084.0	6084.7	6084.7	6084.7	6084.7
Total tailings and free water (N.Pond)	m3	70000	70,000	70,000	70,000	70,000	89,080	97,308	88,420	94,324	85,184	37,383	37,383	37,383
Water levels: North Pond	feet	6034.4	6034.4	6034.4	6034.4	6034.4	6035.7	6036.0	6035.6	6036.0	6035.2	6031.0	6031.0	6031.0

	Unit	Initial	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00
Ore milled	Short t/day		958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9
	Metric t/day		870	870	870	870	870	870	870	870	870	870	870	870
	Metric t/mon		26,970	24,360	26,970	26,100	26,970	26,100	26,970	26,970	26,100	26,970	26,100	26,970
Accum Ore milled	metric ton		344,520	368,880	395,850	421,950	448,920	475,020	501,990	528,960	555,060	582,030	608,130	635,100
Slurry solids content	% by weight		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Solids specific gravity			2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Slurry solids volume	m3/day		311	311	311	311	311	311	311	311	311	311	311	311
	m3/month		9632	8700	9632	9321	9632	9321	9632	9632	9321	9632	9321	9632
Water from Great Slave Lake	m3/day		1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9
	m3/month		40,453	36,538	40,453	39,148	40,453	39,148	40,453	40,453	39,148	40,453	39,148	40,453
Groundwater	m3/day		2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6
	m3/month		64,282	58,061	64,282	62,208	64,282	62,208	64,282	64,282	62,208	64,282	62,208	64,282
City Water	m3/day		37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
	m3/month		1,163	1,050	1,163	1,125	1,163	1,125	1,163	1,163	1,125	1,163	1,125	1,163
Total water consumption	m3/day		3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416
	m3/month		105,897	95,649	105,897	102,481	105,897	102,481	105,897	105,897	102,481	105,897	102,481	105,897
Slurry discharge volume	m3/day		3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727
	m3/month		115,529	104,349	115,529	111,802	115,529	111,802	115,529	115,529	111,802	115,529	111,802	115,529
Deposited tails moisture content	%		36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Deposited tails dry density	t/m3		1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Deposited tails volume	m3/day		621	621	621	621	621	621	621	621	621	621	621	621
	m3/month		19264	17400	19264	18643	19264	18643	19264	19264	18643	19264	18643	19264
Tailings into Northwest pond (monthly)	m3		19264	17400	19264	18643	19264	18643	19264	19264	18643	19264		
Tailings into South pond (monthly)	m3													
Tailings into North pond (monthly)	m3												18643	19264
Tailings in Northwest pond (Cumulative)	m3		170271	187671	206936	225579	244843	263486	282750	302014	320657	339921	339921	339921
Tailings Solids in South pond (Cumulative)	m3		75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Tailings Solids in North pond (Cumulative)	m3		0	0	0	0	0	0	0	0	0	0	18643	37907
Total tailings solids	m3		246086	263486	282750	301393	320657	339300	358564	377829	396471	415736	434379	453643
Northwest pond:														
Basin free water (WATBAL)	m3	265,000	324,707	405,334	495,242	582,056	765,101	694,983	476,615	265,758	109,567	109,052	103,052	97,052
Total tailings	m3	0	170,271	187,671	206,936	225,579	244,843	263,486	282,750	302,014	320,657	339,921	339,921	339,921
Total tailings and free water	m3	265000	494,978	593,005	702,178	807,635	1,009,943	958,469	759,365	567,773	430,225	448,973	442,973	436,973
Water level: Northwest Pond	feet	6089.0	6093.0	6094.1	6094.5	6095.4	6097.0	6096.5	6095.1	6093.8	6092.5	6092.8	6092.5	6092.4
North pond and South pond:														
Basin free water (WATBAL):	m3		37,383	37,383	37,383	37,383	125,707	114,498	90,008	68,675	47,028	57,408	150,223	246,131
South pond:	m3	2000												
North pond:	m3	70000												
Total tailings in South Pond	m3	0.0	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Total tailings in North Pond	m3	0	0	0	0	0	0	0	0	0	0	0	18643	37907
Total tailings (S.Pond) with no free water	m3	2000	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814
Water level: South Pond	feet	6080.0	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7
Total tailings and free water (N.Pond)	m3	70000	37,383	37,383	37,383	37,383	125,707	114,498	90,008	68,675	47,028	57,408	168,865	284,038
Water levels: North Pond	feet	6034.4	6031.0	6031.0	6031.0	6031.0	6037.3	6037.1	6035.8	6034.0	6032.0	6033.0	6039.3	6042.9

	Unit	Initial	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01
Ore milled	Short t/day		958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9
	Metric t/day		870	870	870	870	870	870	870	870	870	870	870	870
	Metric t/mon		26,970	24,360	26,970	26,100	26,970	26,100	26,970	26,970	26,100	26,970	26,100	26,970
Accum Ore milled	metric ton		662,070	686,430	713,400	739,500	766,470	792,570	819,540	846,510	872,610	899,580	925,680	952,650
Slurry solids content	% by weight		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Solids specific gravity			2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Slurry solids volume	m3/day		311	311	311	311	311	311	311	311	311	311	311	311
	m3/month		9632	8700	9632	9321	9632	9321	9632	9632	9321	9632	9321	9632
Water from Great Slave Lake	m3/day		1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9
	m3/month		40,453	36,538	40,453	39,148	40,453	39,148	40,453	40,453	39,148	40,453	39,148	40,453
Groundwater	m3/day		2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6
	m3/month		64,282	58,061	64,282	62,208	64,282	62,208	64,282	64,282	62,208	64,282	62,208	64,282
City Water	m3/day		37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
	m3/month		1,163	1,050	1,163	1,125	1,163	1,125	1,163	1,163	1,125	1,163	1,125	1,163
Total water consumption	m3/day		3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416
	m3/month		105,897	95,649	105,897	102,481	105,897	102,481	105,897	105,897	102,481	105,897	102,481	105,897
Slurry discharge volume	m3/day		3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727
	m3/month		115,529	104,349	115,529	111,802	115,529	111,802	115,529	115,529	111,802	115,529	111,802	115,529
Deposited tails moisture content	%		36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Deposited tails dry density	t/m3		1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Deposited tails volume	m3/day		621	621	621	621	621	621	621	621	621	621	621	621
	m3/month		19264	17400	19264	18643	19264	18643	19264	19264	18643	19264	18643	19264
Tailings into Northwest pond (monthly)	m3						19264	18643	19264	19264	18643	19264		
Tailings into South pond (monthly)	m3													
Tailings into North pond (monthly)	m3		19264	17400	19264	18643							18643	19264
Tailings in Northwest pond (Cumulative)	m3		339921	339921	339921	339921	359186	377829	397093	416357	435000	454264	454264	454264
Tailings Solids in South pond (Cumulative)	m3		75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Tailings Solids in North pond (Cumulative)	m3		57171	74571	93836	112479	112479	112479	112479	112479	112479	112479	131121	150386
Total tailings solids	m3		472907	490307	509571	528214	547479	566121	585386	604650	623293	642557	661200	680464
Northwest pond:														
Basin free water (WATBAL)	m3	265,000	91,052	85,052	79,052	73,052	256,096	243,905	141,388	77,056	78,755	86,183	80,183	74,183
Total tailings	m3	0	339,921	339,921	339,921	339,921	359,186	377,829	397,093	416,357	435,000	454,264	454,264	454,264
Total tailings and free water	m3	265000	430,973	424,973	418,973	412,973	615,282	621,733	538,481	493,413	513,755	540,448	534,448	528,448
Water level: Northwest Pond	feet	6089.0	6092.3	6092.2	6092.2	6092.3	6094.3	6094.3	6093.5	6093.0	6093.2	6093.9	6093.5	6093.5
North pond and South pond:														
Basin free water (WATBAL):	m3		342,039	428,666	524,574	617,389	723,741	618,550	406,099	196,805	99,205	34,912	127,727	223,635
South pond:	m3	2000												
North pond:	m3	70000												
Total tailings in South Pond	m3	0.0	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Total tailings in North Pond	m3	0	57171	74571	93836	112479	112479	112479	112479	112479	112479	112479	131121	150386
Total tailings (S.Pond) with no free water	m3	2000	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814
Water level: South Pond	feet	6080.0	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7
Total tailings and free water (N.Pond)	m3	70000	399,211	503,237	618,410	729,867	836,219	731,029	518,578	309,283	211,683	147,391	258,848	374,021
Water levels: North Pond	feet	6034.4	6047.0	6049.5	6052.5	6054.0	6056.6	6054.5	6049.9	6044.6	6042.0	6040.0	6043.0	6046.2

	Unit	Initial	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02
Ore milled	Short t/day		958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9
	Metric t/day		870	870	870	870	870	870	870	870	870	870	870	870
	Metric t/mon		26,970	24,360	26,970	26,100	26,970	26,100	26,970	26,970	26,100	26,970	26,100	26,970
Accum Ore milled	metric ton		979,620	1,003,980	1,030,950	1,057,050	1,084,020	1,110,120	1,137,090	1,164,060	1,190,160	1,217,130	1,243,230	1,270,200
Slurry solids content	% by weight		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Solids specific gravity			2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Slurry solids volume	m3/day		311	311	311	311	311	311	311	311	311	311	311	311
	m3/month		9632	8700	9632	9321	9632	9321	9632	9632	9321	9632	9321	9632
Water from Great Slave Lake	m3/day		1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9
	m3/month		40,453	36,538	40,453	39,148	40,453	39,148	40,453	40,453	39,148	40,453	39,148	40,453
Groundwater	m3/day		2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6
	m3/month		64,282	58,061	64,282	62,208	64,282	62,208	64,282	64,282	62,208	64,282	62,208	64,282
City Water	m3/day		37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
	m3/month		1,163	1,050	1,163	1,125	1,163	1,125	1,163	1,163	1,125	1,163	1,125	1,163
Total water consumption	m3/day		3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416
	m3/month		105,897	95,649	105,897	102,481	105,897	102,481	105,897	105,897	102,481	105,897	102,481	105,897
Slurry discharge volume	m3/day		3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727
	m3/month		115,529	104,349	115,529	111,802	115,529	111,802	115,529	115,529	111,802	115,529	111,802	115,529
Deposited tails moisture content	%		36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Deposited tails dry density	t/m3		1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Deposited tails volume	m3/day		621	621	621	621	621	621	621	621	621	621	621	621
	m3/month		19264	17400	19264	18643	19264	18643	19264	19264	18643	19264	18643	19264
Tailings into Northwest pond (monthly)	m3						19264	18643	19264	19264	18643	19264		
Tailings into South pond (monthly)	m3													
Tailings into North pond (monthly)	m3		19264	17400	19264	18643							18643	19264
Tailings in Northwest pond (Cumulative)	m3		454264	454264	454264	454264	473529	492171	511436	530700	549343	568607	568607	568607
Tailings Solids in South pond (Cumulative)	m3		75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Tailings Solids in North pond (Cumulative)	m3		169650	187050	206314	224957	224957	224957	224957	224957	224957	224957	243600	262864
Total tailings solids	m3		699729	717129	736393	755036	774300	792943	812207	831471	850114	869379	888021	907286
Northwest pond:														
Basin free water (WATBAL)	m3	265,000	68,183	62,183	56,183	50,183	233,228	221,036	179,866	84,861	86,560	124,661	118,661	112,661
Total tailings	m3	0	454,264	454,264	454,264	454,264	473,529	492,171	511,436	530,700	549,343	568,607	568,607	568,607
Total tailings and free water	m3	265000	522,448	516,448	510,448	504,448	706,756	713,208	691,302	615,561	635,903	693,269	687,269	681,269
Water level: Northwest Pond	feet	6089.0	6093.2	6093.1	6093.5	6093.1	6094.8	6094.8	6094.7	6094.2	6094.3	6094.6	6094.6	6094.6
North pond and South pond:														
Basin free water (WATBAL):	m3		319,543	406,170	502,078	594,893	701,245	596,055	383,603	174,309	76,709	12,417	105,231	201,139
South pond:	m3	2000												
North pond:	m3	70000												
Total tailings in South Pond	m3	0.0	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Total tailings in North Pond	m3	0	169650	187050	206314	224957	224957	224957	224957	224957	224957	224957	243600	262864
Total tailings (S.Pond) with no free water	m3	2000	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814
Water level: South Pond	feet	6080.0	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7
Total tailings and free water (N.Pond)	m3	70000	489,193	593,220	708,393	819,850	926,202	821,012	608,560	399,266	301,666	237,374	348,831	464,004
Water levels: North Pond	feet	6034.4	6049.0	6052.0	6054.0	6056.5	6057.7	6056.3	6051.2	6047.0	6044.6	6043.0	6046.1	6048.2

	Unit	Initial	Jan-03	Feb-03	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03
Ore milled	Short t/day		958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9	958.9
	Metric t/day		870	870	870	870	870	870	870	870	870	870	870	870
	Metric t/mon		26,970	24,360	26,970	26,100	26,970	26,100	26,970	26,970	26,100	26,970	26,100	26,970
Accum Ore milled	metric ton		1,297,170	1,321,530	1,348,500	1,374,600	1,401,570	1,427,670	1,454,640	1,481,610	1,507,710	1,534,680	1,560,780	1,587,750
Slurry solids content	% by weight		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Solids specific gravity			2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Slurry solids volume	m3/day		311	311	311	311	311	311	311	311	311	311	311	311
	m3/month		9632	8700	9632	9321	9632	9321	9632	9632	9321	9632	9321	9632
Water from Great Slave Lake	m3/day		1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9	1304.9
	m3/month		40,453	36,538	40,453	39,148	40,453	39,148	40,453	40,453	39,148	40,453	39,148	40,453
Groundwater	m3/day		2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6	2073.6
	m3/month		64,282	58,061	64,282	62,208	64,282	62,208	64,282	64,282	62,208	64,282	62,208	64,282
City Water	m3/day		37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5	37.5
	m3/month		1,163	1,050	1,163	1,125	1,163	1,125	1,163	1,163	1,125	1,163	1,125	1,163
Total water consumption	m3/day		3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416	3,416
	m3/month		105,897	95,649	105,897	102,481	105,897	102,481	105,897	105,897	102,481	105,897	102,481	105,897
Slurry discharge volume	m3/day		3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727	3,727
	m3/month		115,529	104,349	115,529	111,802	115,529	111,802	115,529	115,529	111,802	115,529	111,802	115,529
Deposited tails moisture content	%		36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%	36%
Deposited tails dry density	t/m3		1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Deposited tails volume	m3/day		621	621	621	621	621	621	621	621	621	621	621	621
	m3/month		19264	17400	19264	18643	19264	18643	19264	19264	18643	19264	18643	19264
Tailings into Northwest pond (monthly)	m3						19264	18643	19264	19264	18643	19264		
Tailings into South pond (monthly)	m3													
Tailings into North pond (monthly)	m3		19264	17400	19264	18643							18643	19264
Tailings in Northwest pond (Cumulative)	m3		568607	568607	568607	568607	587871	606514	625779	645043	663686	682950	682950	682950
Tailings Solids in South pond (Cumulative)	m3		75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Tailings Solids in North pond (Cumulative)	m3		282129	299529	318793	337436	337436	337436	337436	337436	337436	337436	356079	375343
Total tailings solids	m3		926550	943950	963214	981857	1001121	1019764	1039029	1058293	1076936	1096200	1114843	1134107
Northwest pond:														
Basin free water (WATBAL)	m3	265,000	106,661	100,661	94,661	88,661	271,706	259,514	156,998	61,992	63,691	101,793	95,793	89,793
Total tailings	m3	0	568,607	568,607	568,607	568,607	587,871	606,514	625,779	645,043	663,686	682,950	682,950	682,950
Total tailings and free water	m3	265000	675,269	669,269	663,269	657,269	859,577	866,029	782,776	707,035	727,377	784,743	778,743	772,743
Water level: Northwest Pond	feet	6089.0	6094.5	6094.5	6094.5	6094.4	6096.0	6096.0	6095.5	6094.8	6095.0	6095.3	6095.5	6095.6
North pond and South pond:														
Basin free water (WATBAL):	m3		297,048	383,674	479,583	572,397	678,749	573,559	361,108	151,813	54,213	27,257	120,072	215,980
South pond:	m3	2000												
North pond:	m3	70000												
Total tailings in South Pond	m3	0.0	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814	75814
Total tailings in North Pond	m3	0	282129	299529	318793	337436	337436	337436	337436	337436	337436	337436	356079	375343
Total tailings (S.Pond) with no free water	m3	2000	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814	77,814
Water level: South Pond	feet	6080.0	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7	6084.7
Total tailings and free water (N.Pond)	m3	70000	579,176	683,203	798,376	909,833	1,016,185	910,995	698,543	489,249	391,649	364,693	476,150	591,323
Water levels: North Pond	feet	6034.4	6051.0	6053.7	6056.0	6057.5	6060.0	6057.5	6054.0	6049.0	6047.0	6046.0	6049.0	6051.0

TABLE II - 2

WATBAL PRINTOUT - PRECIPITATION VERSION

Northwest Pond Water Balance - 1999

TABLE II - 2A

INPUT DATA (Note: precipitation of May includes amount of Oct.,Nov. and Dec. the year earlier)

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		870	870	870	870	870	0	0	0	0	870	870	870	211410
	Solids (by weight) in discharge	%		17	17	17	17	17	17	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	41													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	6000													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	19													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	20	25	30	14	11	0	0	100
	Initial water volume in ponds	m^3	265000													

TABLE II - 2B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															265000
Jan	131677	0	0	131677	9979	6000	0	0	15979	115698	3853	119551	0	115698	380698
Feb	118934	0	0	118934	9013	6000	0	0	15013	103921	3480	107401	0	103921	484619
Mar	131677	0	0	131677	9979	6000	0	0	15979	115698	3853	119551	0	115698	600317
Apr	127429	0	0	127429	9657	6000	0	0	15657	111772	3729	115501	0	111772	712090
May	131677	0	99216	230893	9979	6000	6080	0	22059	208834	3853	212687	0	208834	920924
Jun	0	0	10494	10494	0	6000	17480	0	23480	-12986	0	-12986	185791	-198777	722147
Jul	0	0	16695	16695	0	6000	25080	0	31080	-14385	0	-14385	232239	-246624	475523
Aug	0	0	18126	18126	0	6000	19000	0	25000	-6874	0	-6874	278687	-285561	189962
Sep	0	0	15264	15264	0	6000	8360	0	14360	904	0	904	130054	-129150	60813
Oct	105887	0	9540	115427	9979	6000	0	0	15979	99448	3853	103301	102185	-2737	58076
Nov	102471	0	0	102471	9657	6000	0	0	15657	86814	3729	90543	0	86814	144890
Dec	105887	0	0	105887	9979	6000	0	0	15979	89908	3853	93761	0	89908	234799
TOTAL	955640	0	169335	1124975	78222	72000	76000	0	226222	898754	30201	928955	928955	-30201	

TABLE II - 3

WATBAL PRINTOUT - PRECIPITATION VERSION

South Pond and North Pond Water Balance - 1999

TABLE II - 3A
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		0	0	0	0	0	870	870	870	870	0	0	0	106140
	Solids (by weight) in discharge	%		17	17	17	17	17	17	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	67													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	5													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	0													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	5													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	15	20	20	18	20	10	0	0	103
	Initial water volume in ponds	m^3	70000													

TABLE II - 3B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															70000
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70000
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70000
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70000
Apr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	70000
May	0	0	107952	107952	0	0	1600	0	1600	106352	0	106352	87272	19080	89080
Jun	127429	0	11418	138847	9657	0	4600	0	14257	124590	3729	128319	116362	8228	97308
Jul	105887	0	18165	124052	9979	0	6600	0	16579	107473	3853	111326	116362	-8889	88420
Aug	105887	0	19722	125609	9979	0	5000	0	14979	110630	3853	114483	104726	5904	94324
Sep	102471	0	16608	119079	9657	0	2200	0	11857	107222	3729	110951	116362	-9140	85184
Oct	0	0	10380	10380	0	0	0	0	0	10380	0	10380	58181	-47801	37383
Nov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37383
Dec	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37383
TOTAL	441675	0	184245	625920	39272	0	20000	0	59272	566648	15163	581811	599266	-32617	

TABLE II - 4

WATBAL PRINTOUT - PRECIPITATION VERSION

Northwest Pond Water Balance - 2000

TABLE II - 4A

INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		870	870	870	870	870	870	870	870	870	870	0	0	264480
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	41													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	6000													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	19													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	15	30	30	25	10	0	0	110
	Initial water volume in ponds	m^3	234799													

TABLE II - 4B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															234799
Jan	105887	0	0	105887	9979	6000	0	0	15979	89908	3853	93761	0	89908	324707
Feb	95640	0	0	95640	9013	6000	0	0	15013	80627	3480	84107	0	80627	405334
Mar	105887	0	0	105887	9979	6000	0	0	15979	89908	3853	93761	0	89908	495242
Apr	102471	0	0	102471	9657	6000	0	0	15657	86814	3729	90543	0	86814	582056
May	105887	0	99216	205103	9979	6000	6080	0	22059	183044	3853	186897	0	183044	765101
Jun	102471	0	10494	112965	9657	6000	17480	0	33137	79828	3729	83557	149946	-70117	694983
Jul	105887	0	16695	122582	9979	6000	25080	0	41059	81523	3853	85376	299891	-218368	476615
Aug	105887	0	18126	124013	9979	6000	19000	0	34979	89034	3853	92887	299891	-210857	265758
Sep	102471	0	15264	117735	9657	6000	8360	0	24017	93718	3729	97447	249909	-156191	109567
Oct	105887	0	9540	115427	9979	6000	0	0	15979	99448	3853	103301	99964	-515	109052
Nov	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	103052
Dec	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	97052
TOTAL	1038377	0	169335	1207712	97858	72000	76000	0	245858	961855	37783	999637	1099601	-137747	

TABLE II - 5

WATBAL PRINTOUT - PRECIPITATION VERSION

South Pond and North Pond Water Balance - 2000

TABLE II - 5A
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		0	0	0	0	0	0	0	0	0	0	870	870	53070
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	67													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	5													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	0													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	5													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	5	5	10	10	10	0	0	0	40
	Initial water volume in ponds	m^3	37383													

TABLE II - 5B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															37383
Jan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37383
Feb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37383
Mar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37383
Apr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37383
May	0	0	107952	107952	0	0	1600	0	1600	106352	0	106352	18027	88325	125707
Jun	0	0	11418	11418	0	0	4600	0	4600	6818	0	6818	18027	-11209	114498
Jul	0	0	18165	18165	0	0	6600	0	6600	11565	0	11565	36055	-24490	90008
Aug	0	0	19722	19722	0	0	5000	0	5000	14722	0	14722	36055	-21333	68675
Sep	0	0	16608	16608	0	0	2200	0	2200	14408	0	14408	36055	-21647	47028
Oct	0	0	10380	10380	0	0	0	0	0	10380	0	10380	0	10380	57408
Nov	102471	0	0	102471	9657	0	0	0	9657	92814	3729	96543	0	92814	150223
Dec	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	246131
TOTAL	208359	0	184245	392604	19636	0	20000	0	39636	352968	7581	360549	144220	208748	

TABLE II - 6

WATBAL PRINTOUT - PRECIPITATION VERSION

Northwest Pond Water Balance - 2001

TABLE II - 6A

INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		0	0	0	0	870	870	870	870	870	870	0	0	160080
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	41													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	6000													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	19													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	15	30	25	15	15	0	0	100
	Initial water volume in ponds	m^3	97052													

TABLE II - 6B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															97052
Jan	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	91052
Feb	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	85052
Mar	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	79052
Apr	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	73052
May	105887	0	99216	205103	9979	6000	6080	0	22059	183044	3853	186897	0	183044	256096
Jun	102471	0	10494	112965	9657	6000	17480	0	33137	79828	3729	83557	92020	-12191	243905
Jul	105887	0	16695	122582	9979	6000	25080	0	41059	81523	3853	85376	184040	-102516	141388
Aug	105887	0	18126	124013	9979	6000	19000	0	34979	89034	3853	92887	153366	-64332	77056
Sep	102471	0	15264	117735	9657	6000	8360	0	24017	93718	3729	97447	92020	1699	78755
Oct	105887	0	9540	115427	9979	6000	0	0	15979	99448	3853	103301	92020	7428	86183
Nov	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	80183
Dec	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	74183
TOTAL	628491	0	169335	797826	59230	72000	76000	0	207230	590597	22869	613465	613465	-22869	

TABLE II - 7

WATBAL PRINTOUT - PRECIPITATION VERSION

South Pond and North Pond Water Balance - 2001

TABLE II - 7A
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		870	870	870	870	0	0	0	0	0	0	870	870	157470
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	67													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	5													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	0													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	5													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	15	30	30	15	10	0	0	100
	Initial water volume in ponds	m^3	246131													

TABLE II -7B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															246131
Jan	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	342039
Feb	95640	0	0	95640	9013	0	0	0	9013	86627	3480	90107	0	86627	428666
Mar	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	524574
Apr	102471	0	0	102471	9657	0	0	0	9657	92814	3729	96543	0	92814	617389
May	0	0	107952	107952	0	0	1600	0	1600	106352	0	106352	0	106352	723741
Jun	0	0	11418	11418	0	0	4600	0	4600	6818	0	6818	112008	-105190	618550
Jul	0	0	18165	18165	0	0	6600	0	6600	11565	0	11565	224016	-212451	406099
Aug	0	0	19722	19722	0	0	5000	0	5000	14722	0	14722	224016	-209294	196805
Sep	0	0	16608	16608	0	0	2200	0	2200	14408	0	14408	112008	-97600	99205
Oct	0	0	10380	10380	0	0	0	0	0	10380	0	10380	74672	-64292	34912
Nov	102471	0	0	102471	9657	0	0	0	9657	92814	3729	96543	0	92814	127727
Dec	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	223635
TOTAL	618244	0	184245	802489	58264	0	20000	0	78264	724225	22496	746721	746721	-22496	

TABLE II - 8

WATBAL PRINTOUT - PRECIPITATION VERSION

Northwest Pond Water Balance - 2002

TABLE II -8A
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		0	0	0	0	870	870	870	870	870	870	0	0	160080
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	41													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	6000													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	19													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	15	20	30	15	10	0	0	90
	Initial water volume in ponds	m^3	74183													

TABLE II -8B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															74183
Jan	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	68183
Feb	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	62183
Mar	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	56183
Apr	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	50183
May	105887	0	99216	205103	9979	6000	6080	0	22059	183044	3853	186897	0	183044	233228
Jun	102471	0	10494	112965	9657	6000	17480	0	33137	79828	3729	83557	92020	-12191	221036
Jul	105887	0	16695	122582	9979	6000	25080	0	41059	81523	3853	85376	122693	-41170	179866
Aug	105887	0	18126	124013	9979	6000	19000	0	34979	89034	3853	92887	184040	-95005	84861
Sep	102471	0	15264	117735	9657	6000	8360	0	24017	93718	3729	97447	92020	1699	86560
Oct	105887	0	9540	115427	9979	6000	0	0	15979	99448	3853	103301	61347	38102	124661
Nov	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	118661
Dec	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	112661
TOTAL	628491	0	169335	797826	59230	72000	76000	0	207230	590597	22869	613465	552119	38478	

TABLE II - 9

WATBAL PRINTOUT - PRECIPITATION VERSION

South Pond and North Pond Water Balance - 2002

TABLE II - 9A
INPUT DATA

Precipitation Version

.		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		870	870	870	870	0	0	0	0	0	0	870	870	157470
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	67													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	5													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	0													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	5													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	15	30	30	15	10	0	0	100
	Initial water volume in ponds	m^3	223635													

TABLE II - 9B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															223635
Jan	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	319543
Feb	95640	0	0	95640	9013	0	0	0	9013	86627	3480	90107	0	86627	406170
Mar	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	502078
Apr	102471	0	0	102471	9657	0	0	0	9657	92814	3729	96543	0	92814	594893
May	0	0	107952	107952	0	0	1600	0	1600	106352	0	106352	0	106352	701245
Jun	0	0	11418	11418	0	0	4600	0	4600	6818	0	6818	112008	-105190	596055
Jul	0	0	18165	18165	0	0	6600	0	6600	11565	0	11565	224016	-212451	383603
Aug	0	0	19722	19722	0	0	5000	0	5000	14722	0	14722	224016	-209294	174309
Sep	0	0	16608	16608	0	0	2200	0	2200	14408	0	14408	112008	-97600	76709
Oct	0	0	10380	10380	0	0	0	0	0	10380	0	10380	74672	-64292	12417
Nov	102471	0	0	102471	9657	0	0	0	9657	92814	3729	96543	0	92814	105231
Dec	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	201139
TOTAL	618244	0	184245	802489	58264	0	20000	0	78264	724225	22496	746721	746721	-22496	

TABLE II - 10

WATBAL PRINTOUT - PRECIPITATION VERSION

Northwest Pond Water Balance - 2003

TABLE II - 10A

INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		0	0	0	0	870	870	870	870	870	870	0	0	160080
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	41													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	19													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	0	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	6000													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	19													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	15	30	30	15	10	0	0	100
	Initial water volume in ponds	m^3	112661													

TABLE II - 10B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															112661
Jan	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	106661
Feb	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	100661
Mar	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	94661
Apr	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	88661
May	105887	0	99216	205103	9979	6000	6080	0	22059	183044	3853	186897	0	183044	271706
Jun	102471	0	10494	112965	9657	6000	17480	0	33137	79828	3729	83557	92020	-12191	259514
Jul	105887	0	16695	122582	9979	6000	25080	0	41059	81523	3853	85376	184040	-102516	156998
Aug	105887	0	18126	124013	9979	6000	19000	0	34979	89034	3853	92887	184040	-95005	61992
Sep	102471	0	15264	117735	9657	6000	8360	0	24017	93718	3729	97447	92020	1699	63691
Oct	105887	0	9540	115427	9979	6000	0	0	15979	99448	3853	103301	61347	38102	101793
Nov	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	95793
Dec	0	0	0	0	0	6000	0	0	6000	-6000	0	-6000	0	-6000	89793
TOTAL	628491	0	169335	797826	59230	72000	76000	0	207230	590597	22869	613465	613465	-22869	

TABLE II - 11

WATBAL PRINTOUT - PRECIPITATION VERSION

South Pond and North Pond Water Balance - 2003

TABLE II - 11A
INPUT DATA

Precipitation Version

		UNITS	VALUE	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PROCESS WATER	Starting month	no.	1													
	Tailings production	t/day		870	870	870	870	0	0	0	0	0	0	870	870	157470
	Solids (by weight) in discharge	%		20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	20.3	
	Miscellaneous inflows	m^3/mo.		0	0	0	0	0	0	0	0	0	0	0	0	0
RUNOFF	Average precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Change in precipitation	%	0													
	Total precipitation	mm/mo.		26	23	23	17	119	22	35	38	32	20	0	0	355.0
	Area of virgin land in basin	ha	67													
	Runoff factor	%	70													
	Area of tailings and ponds	ha	5													
	Runoff factor	%	100													
	Monthly runoff (% of accumulation)	%		0	0	0	0	100	100	100	100	100	100	100	0	
DISPLACED	IF TAILS DISPLACE POND															
	Tailings submerged (% of total)	%	20													
	Deposited dry density	t/m^3	1.4													
LOSSES	Water retained in tailings (dry wt basis)	%	37													
	Estimated seepage losses	m^3/mo.	0													
	Average Evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Change in evaporation	%	0													
	Total evaporation	mm/mo.		0	0	0	0	32	92	132	100	44	0	0	0	400
	Area of ponds and wetted tailings	ha	5													
	Recirculation to mill (% of process water)	%	0													
DECANT	Decant strategy (% of net inflow)	% / mo.		0	0	0	0	0	15	30	30	15	5	0	0	95
	Initial water volume in ponds	m^3	201139													

TABLE II - 11B

OUTPUT COMPUTATIONS

	INFLOWS (m^3/mo.)				LOSSES (m^3/mo.)					ACCUMULATION (m^3/mo.)					(m^3)
	Tailings Water	Misc. Inflows	Runoff	Total	Retained in Tailings	Seepage	Pond Evap.	Recirc-ulation	Total	Net Inflow	Water Displaced	Total to be Decanted	Decant	Net Change	Accum. Volume
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
INITIAL															201139
Jan	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	297048
Feb	95640	0	0	95640	9013	0	0	0	9013	86627	3480	90107	0	86627	383674
Mar	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	479583
Apr	102471	0	0	102471	9657	0	0	0	9657	92814	3729	96543	0	92814	572397
May	0	0	107952	107952	0	0	1600	0	1600	106352	0	106352	0	106352	678749
Jun	0	0	11418	11418	0	0	4600	0	4600	6818	0	6818	112008	-105190	573559
Jul	0	0	18165	18165	0	0	6600	0	6600	11565	0	11565	224016	-212451	361108
Aug	0	0	19722	19722	0	0	5000	0	5000	14722	0	14722	224016	-209294	151813
Sep	0	0	16608	16608	0	0	2200	0	2200	14408	0	14408	112008	-97600	54213
Oct	0	0	10380	10380	0	0	0	0	0	10380	0	10380	37336	-26956	27257
Nov	102471	0	0	102471	9657	0	0	0	9657	92814	3729	96543	0	92814	120072
Dec	105887	0	0	105887	9979	0	0	0	9979	95908	3853	99761	0	95908	215980
TOTAL	618244	0	184245	802489	58264	0	20000	0	78264	724225	22496	746721	709385	14840	

Table II - 12: Base Case Decant Plan

Year	Pond	May	June	July	Aug.	Sept.	Oct.	Total (m3)
1999	Northwest (%)		20	25	30	14	11	928,955
	North/South (%)	15	20	20	18	20	10	599,266
	Total decanted:							**1,528,221**
2000	Northwest		15	30	30	25	10	1,099,601
	North/South		5	10	10	10	0	144,220
	Total decanted:							**1,243,821**
2001	Northwest		15	30	25	15	15	613,465
	North/South		15	30	30	15	10	746,721
	Total decanted:							**1,360,187**
2002	Northwest		15	20	30	15	10	552,119
	North/South		15	30	30	15	10	746,721
	Total decanted:							**1,298,840**
2003	Northwest		15	30	30	15	10	613,465
	North/South		15	30	30	15	5	709,385
	Total decanted:							**1,322,850**

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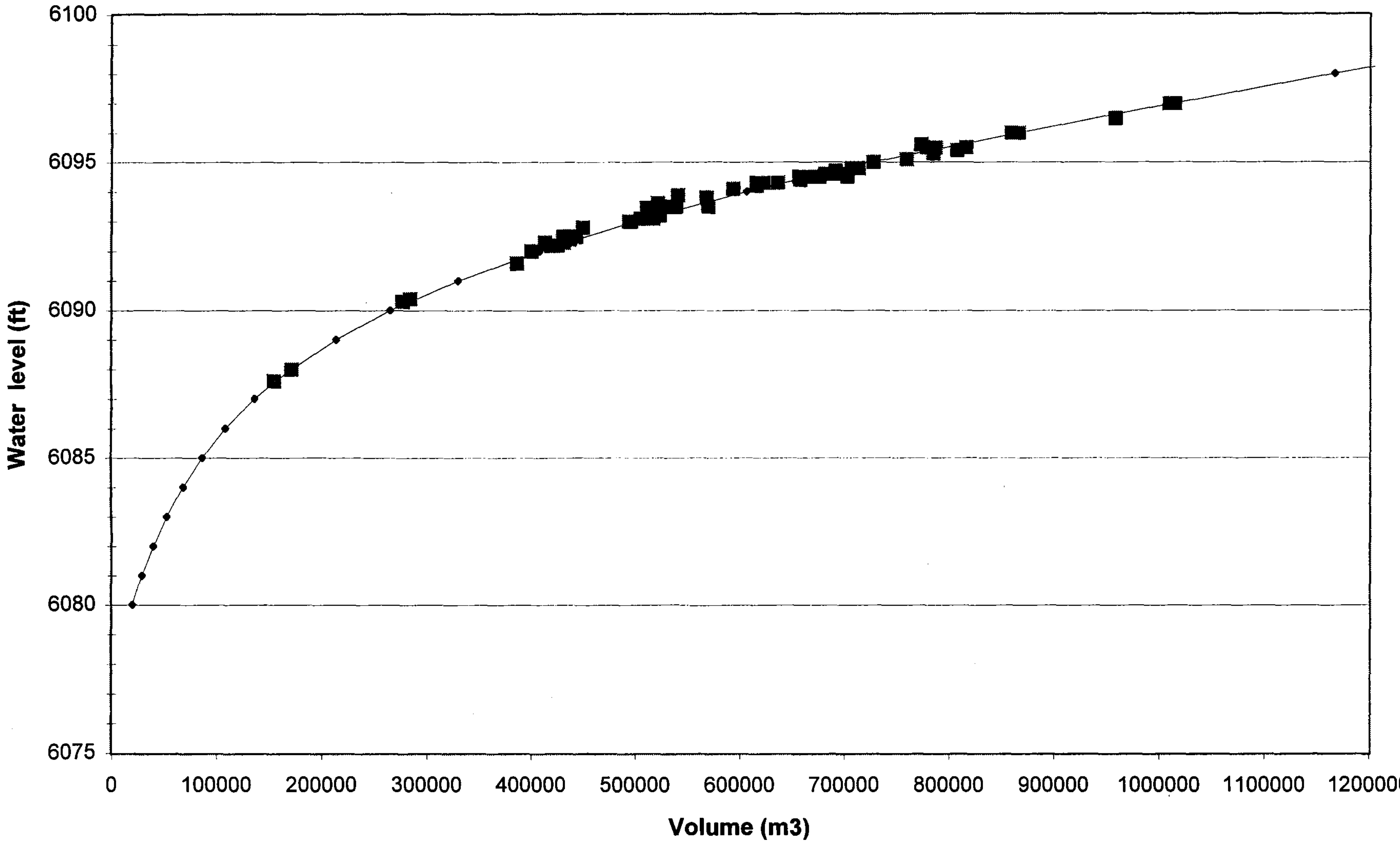

Golder Associates

Royal Oak Mines Inc.

NORTHWEST POND CAPACITY
CURVE FIT

DRAWN: CG	APPROVED:	DATE: 28 JAN. 1999
PROJECT: 982-2449		FIGURE: II-1

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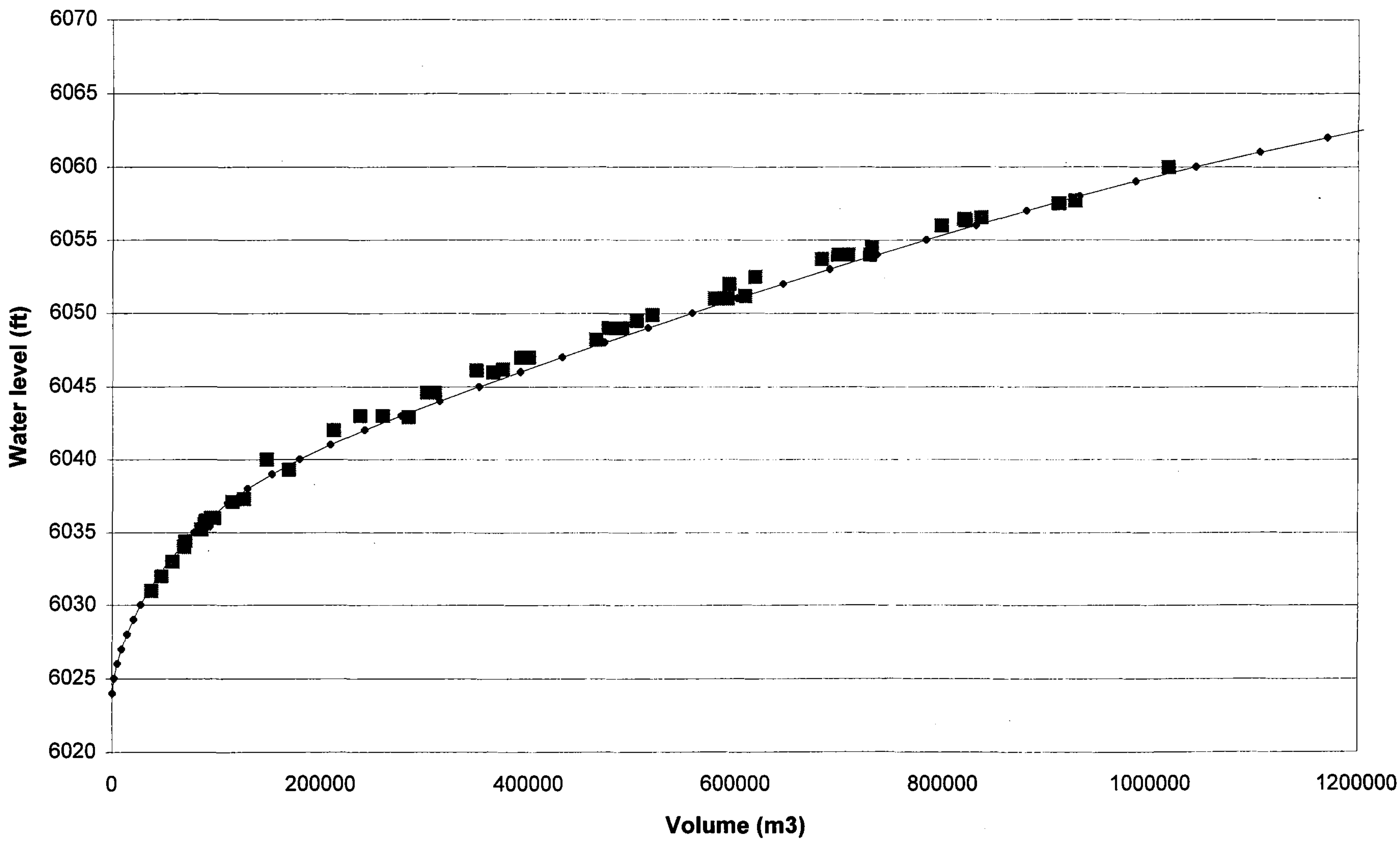

Golder Associates

Royal Oak Mines Inc.

NORTH POND CAPACITY
CURVE FIT

DRAWN: CG	APPROVED:
DATE: 28 JAN. 1999	
PROJECT: 982-2449	FIGURE: I-2

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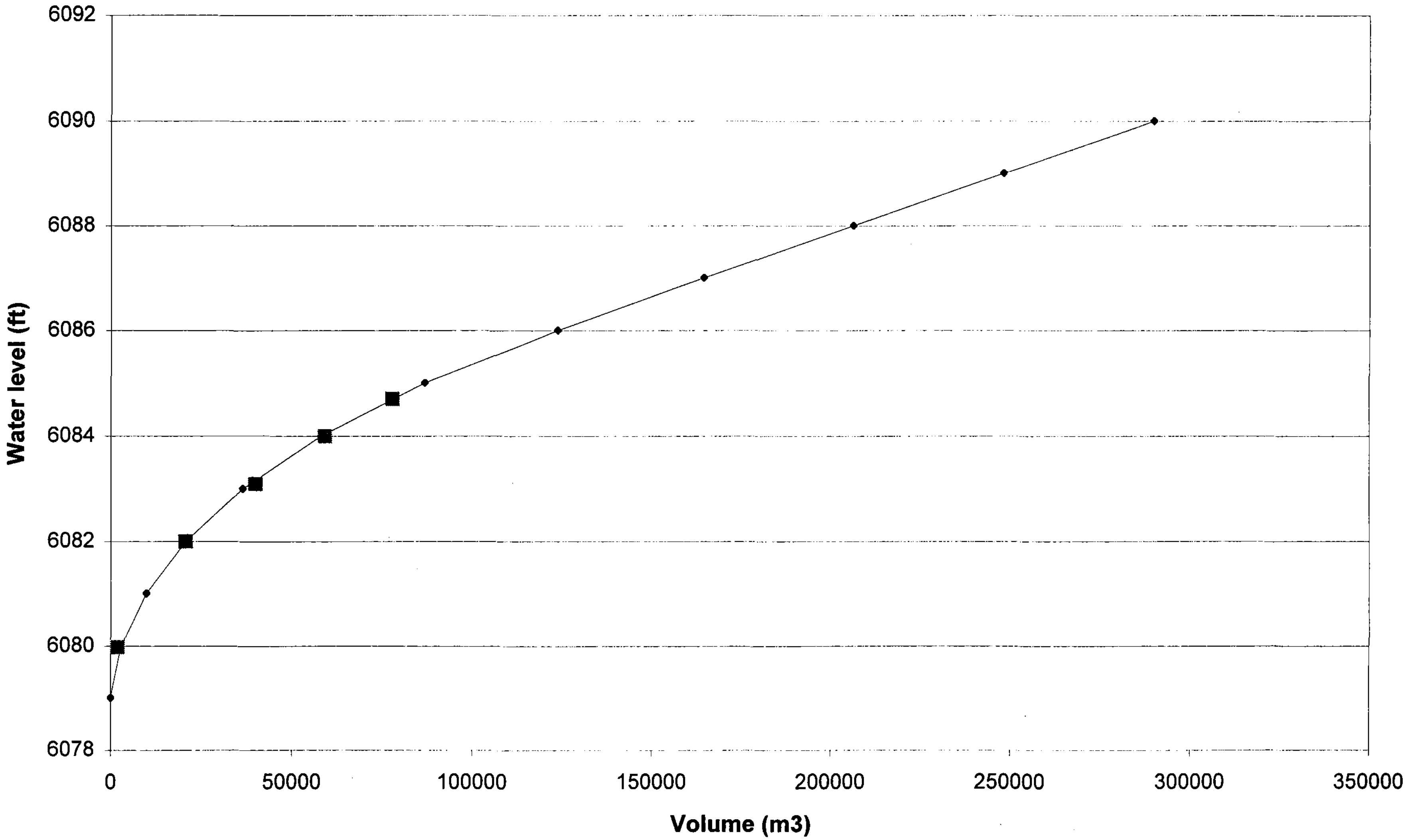

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SOUTH POND CAPACITY CURVE FIT

DRAWN: CG	APPROVED:	DATE: 28 JAN. 1999
PROJECT: 982-2449		FIGURE: II-3