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Operational Monitoring Summary
Jericho Diamond Mine
Nunavut

Submitted to:

Tahera Diamond Corporation
Toronto, Ontario

Submitted by:

AMEC Earth & Environmental
Burnaby, BC

August 2004

VE51295

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EXECUTIVE SUMMARY

This report summarizes environmental monitoring proposed for the Jericho Diamond Mine and forms a part of the project application for a Water Licence to the Nunavut Water Board. Details of proposed monitoring programs can be found in the respective reports. Environmental monitoring will include climate and air quality, stream flows and PKCA discharge, water and sediment chemistry both on and off the site, aquatic biota and wildlife.

Key climate parameters useful in environmental management planning for Jericho will continue to be monitored at the airstrip meteorological station: wind speed and direction, precipitation (summer), temperature, relative humidity, net radiation. Two dual PM-2.5/PM-10 monitors will be installed and operated continuously. Vegetation will be sampled periodically: lichen for metals and vegetation transects for dustfall effects.

Two stream flows will be monitored during open water: Jericho River at the outlet to Carat Lake and Stream C1 at the diversion dam. As well, the PKCA will be continuously monitored during discharge.

Minesite monitoring for flows and water quality will include: temporary or permanent collection ditches or ponds, the pit sump, the process plant supernatant, treated sewage effluent, PKCA pond water and PKCA discharge water. As well seeps off dumps, ore stockpiles, coarse and recovery PK stockpiles will be monitored. The number and location cannot be predicted *a priori*.

Water and sediment quality will be measured in the receiving environment upstream and downstream from the mine and in a separate drainage basin from pre-construction through post-closure. A standard suite of parameters will be assayed including pH, alkalinity, hardness, nutrients, total and dissolved metals and total organic carbon. The potable water intake will also have bacterial analyses.

Aquatic effects on biota will be monitored at locations similar to water and sediment quality and will include fish, phyto- and zooplankton, periphyton and benthic invertebrates. The purpose of aquatic biota monitoring is to provide early indications of ecosystem changes that are not evident from chemistry.

Wildlife monitoring will include incident reporting, a wildlife sitings and encounters log, annual raptor surveys and joint industry-government programs for regional monitoring of caribou and barrenland grizzly. Additional regional surveys, such as for wolverine, could be undertaken co-operatively in the future.

1.0 INTRODUCTION

This report summarizes proposed environmental monitoring at the Jericho Diamond Mine (Jericho), Nunavut. Monitoring will commence with construction (or as indicated) and will carry through the post closure period (or as indicated). A number of management plans have been developed for submission to Nunavut Water Board in support of a Water Licence application for the Jericho Project. Most plans include a monitoring component or deal strictly with monitoring. This report provides a convenient overview of the proposed environmental monitoring for Jericho.

Subject reports include:

- Air Quality Management Plan
- Site Water Management Plan
    - discharge
    - minesite water chemistry
    - minesite solids geochemistry
- Aquatic Effects Monitoring Program
    - water and sediment chemistry
    - aquatic biota
- Wildlife Management Plan
- Abandonment and Restoration Plan

Monitoring and inspections required with respect to hazardous materials and wastes are not included in this summary; see the Hazardous Materials Management and Emergency and Spill Response plans for details.

Table 1-1 provides a list of monitoring by category.

Table 1-1: Monitoring Summary

Category	Parameters	Location	Frequency	Mining Phase
Climate[1]	wind speed @ 10 m	airstrip	continuous	construction and operation
	wind direction @ 10 m	airstrip	continuous	
	sigma theta[2]	calculated	continuous	
	temperature @ 3 m &10 m	airstrip	continuous	
	relative humidity @ 3 m	airstrip	continuous	
	net radiation @ 3 m	airstrip	continuous	
	precipitation (tipping bucket; summer)	airstrip	summer continuous	
Air Quality	particulate matter (PM-10, PM-2.5)[3]	between open pit and plant At exploration camp	continuous	operation
	lichen metal concentration[4]	eight stations nearfield and farfield	pre-start up and every 3 years after until closure	construction, operation
	vegetation transects[5]	at airstrip and near open pit	pre-start up and every 3 years after until closure	construction, operation
PKCA Discharge Volume	Rate and total volume	PKCA sed pond dam	continuous while discharging	operation
Carat Lake Outlet Discharge	height of outlet stream	outlet to Carat Lake	continuous during open water	operation, closure
Stream C1 Discharge	stream height calibrated to discharge	energy dissipation pool 2	continuous during open water	construction, operation, closure
Site Monitoring	water quality and quantity	ditches and ponds downslope for waste and ore handling facilities	monthly during open water	operation, closure
		pit sump		
		process plant supernatant		
		treated sewage effluent		
		PKCA pond water		
		PKCA discharge		
	solids geochemistry	waste rock: granite/granodiorite, pegmatite, diabase, waste kimberlite	each blast; every other blast for the last 3 years of mining	operation
		coarse and fine PK	once every two weeks for 1st year; monthly thereafter	operation
	ground ice chemistry	open pit	as encountered	operation
	thermal monitoring	waste rock dump, coarse PK, dams	continuous	operation
	visual inspection	dams, ponds, ditches, waste dumps, stockpiles	daily as required	operation

Category	Parameters	Location	Frequency	Mining Phase
Receiving Water Chemistry	low level metals, nutrients, pH (field/lab), temperature (field), TOC[6]	upstream control, downstream control, nearfield, farfield; Jericho and Lynne Lake drainages[7]	construction and operation: monthly, except summer for streams. Closure: periodically[8]	construction, operation, closure
Receiving Sediment Chemistry	low level metals, nutrients, TOC, particle size[9]	Control, C3, Carat, Jericho, d/s Jericho Lakes[7]	pre-construction and once every 3 years until closure	pre-construction, operation
Aquatic Effects	periphyton: biomass (Chl*a*), abundance, species diversity	upstream, downstream controls; nearfield, farfield[10]	summer/annual	pre-construction, operation
	benthic invertebrates: abundance; species diversity		spring/annual	
	phytoplankton: biomass (Chl*a*), abundance, species diversity		summer/annual	
	zooplankton: biomass, abundance, species diversity		summer/annual	
	fish: tissue metal concentration community characteristics	lakes	every 4 years spring-summer/annual	
	sediment deposition	lakes	annual	pre-construction, construction, operation, closure
Wildlife	incidents	on and off site	as occur	pre-construction, operation, closure
	encounters & sitings			
	raptors	off site	annual in summer	
	joint initiatives	off site	as determined	

2.0 CLIMATE AND AIR QUALITY MONITORING

Air quality monitoring was proposed in the Jericho final EIS. That proposal is included here with the addition of proposals for PM monitoring stations.

2.1 Climate

The climate station established at the airstrip will be continued through the construction and operation phases of mining at the request of DIAND. Temperature, precipitation, relative humidity and net radiation sensors currently at Carat Lake Camp will be re-installed, as required, on the airstrip tower and the datalogger reprogrammed to accommodate the added sensors. All existing sensors will be sent to the manufacturer for service and recalibration prior to re-installation.

2.2 PM-2.5 and PM-10

Dual Partisol™ samplers will be used that simultaneously monitor PM-10 and PM-2.5. Their limitation in placement is the requirement for AC power to operate. Two monitors will be installed as shown on Figure 2-1. Environment Canada will be consulted prior to installation to ensure the agency's concerns are taken into consideration.

2.3 Lichen Metals Concentrations

An initial survey of lichen metals levels was conducted by Tahera and reported in the final EIS. For operations, this survey will be expanded to eight stations as shown on Figure 2-2. Stations will be located at near (1 – 2 km) and far (8 – 12 km) from the mine site and at directions of prevalent and non-prevalent wind flows as indicated by the windrose data presented in the final EIS (Figure 2-2 insert). The most common fruiticose lichen at Jericho was found to be *Flavocetraria cucullata* and that species was sampled for the 2000 survey. It is proposed to continue to use this species if possible for the operational monitoring. Initial sampling will be prior to operations start up (Year 1) and the survey will be repeated every three years until mine closure at Year 9 (Years 1, 3, 6 and 9).

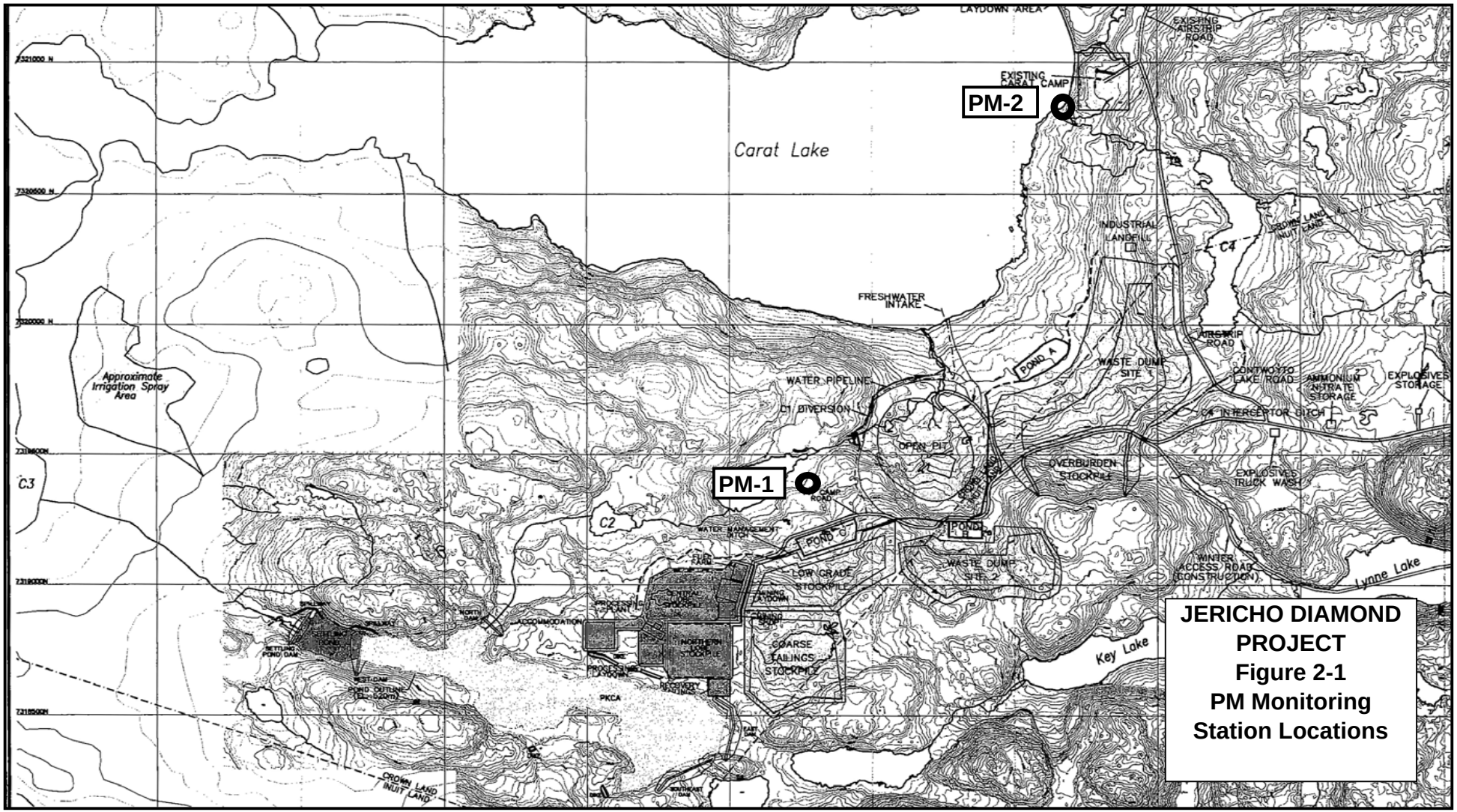
2.4 Vegetation Transects

Two transects were sampled in 2000 for plant community composition (Figure 2-3). Transects were located west of the airstrip and southeast of the portal. One-meter quadrats were inventoried at 10 m intervals up to 100 m. Transect zero points were adjacent to the airstrip and portal access road. Transects were marked with stakes so that locations could be recovered. Quadrats were divided into 10 cm square subdivisions and the percent cover of plant species were noted for each subdivision. Total cover for the 1 m square quadrats were then calculated from subtotals. These transects will be resampled each three years of operation co-incident with lichen metals surveys.

2.5 Triggers for Action

2.5.1 Dust

Mines are inherently dusty environments and some local exceedances of PM-10 and PM-2.5 guidelines were predicted in the Environmental Impact Assessment. If exceedances are significantly (>20%) greater than EIA predictions, additional dust control that are practical will be examined.



JERICHO DIAMOND PROJECT
Figure 2-1
PM Monitoring Station Locations

AQ-6

WILLINGHAM LAKE

AQ-5

AQ-B

AQ-2

AQ-1

CARAT LAKE

AQ-3

AQ-4

CONTWOYTO LAKE

AQ-8

AQ-7

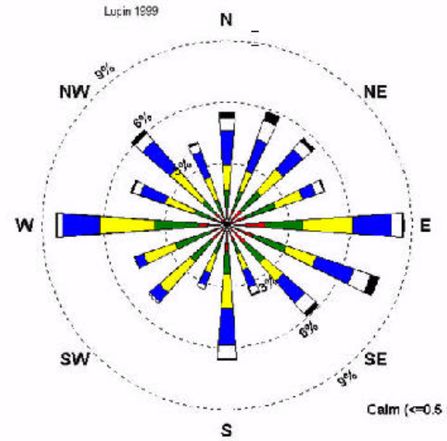


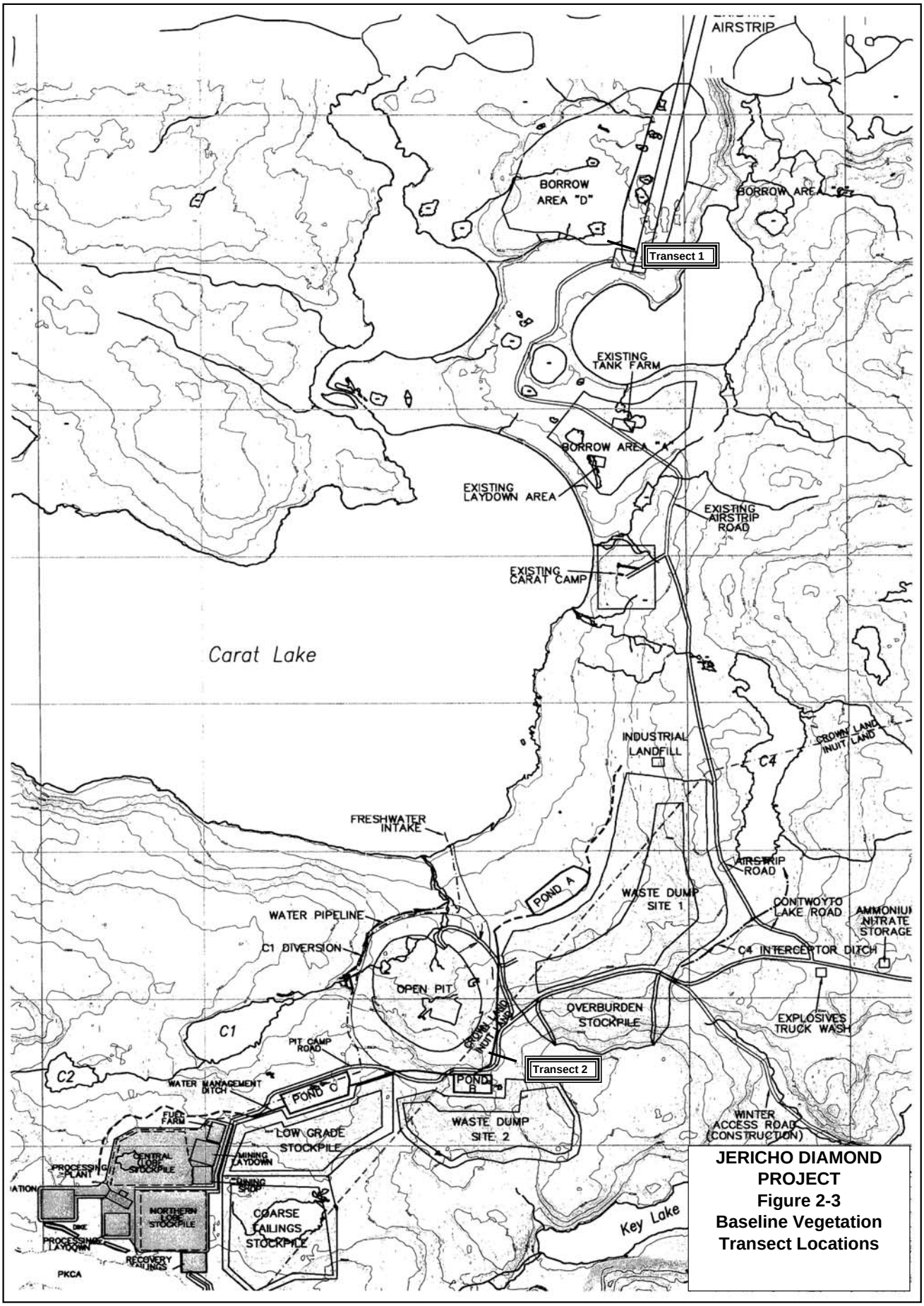
Figure 2.4 Wind Rose Based on 1999 Data from the Lupin Automatic Station

N
W E
S

Tahera Corporation

FIG.2.2	**LICHEN SURVEY STATIONS**
Date:6/5/2004	
Author: MJ/BO	
Office: VAN	
Drawing:	
Scale: 1:60000	Projection: UTM Zone 12 (NAD 83)

0 kilometres 3



JERICHO DIAMOND PROJECT
Figure 2-3
Baseline Vegetation Transect Locations

2.5.2 Lichen Metals Levels

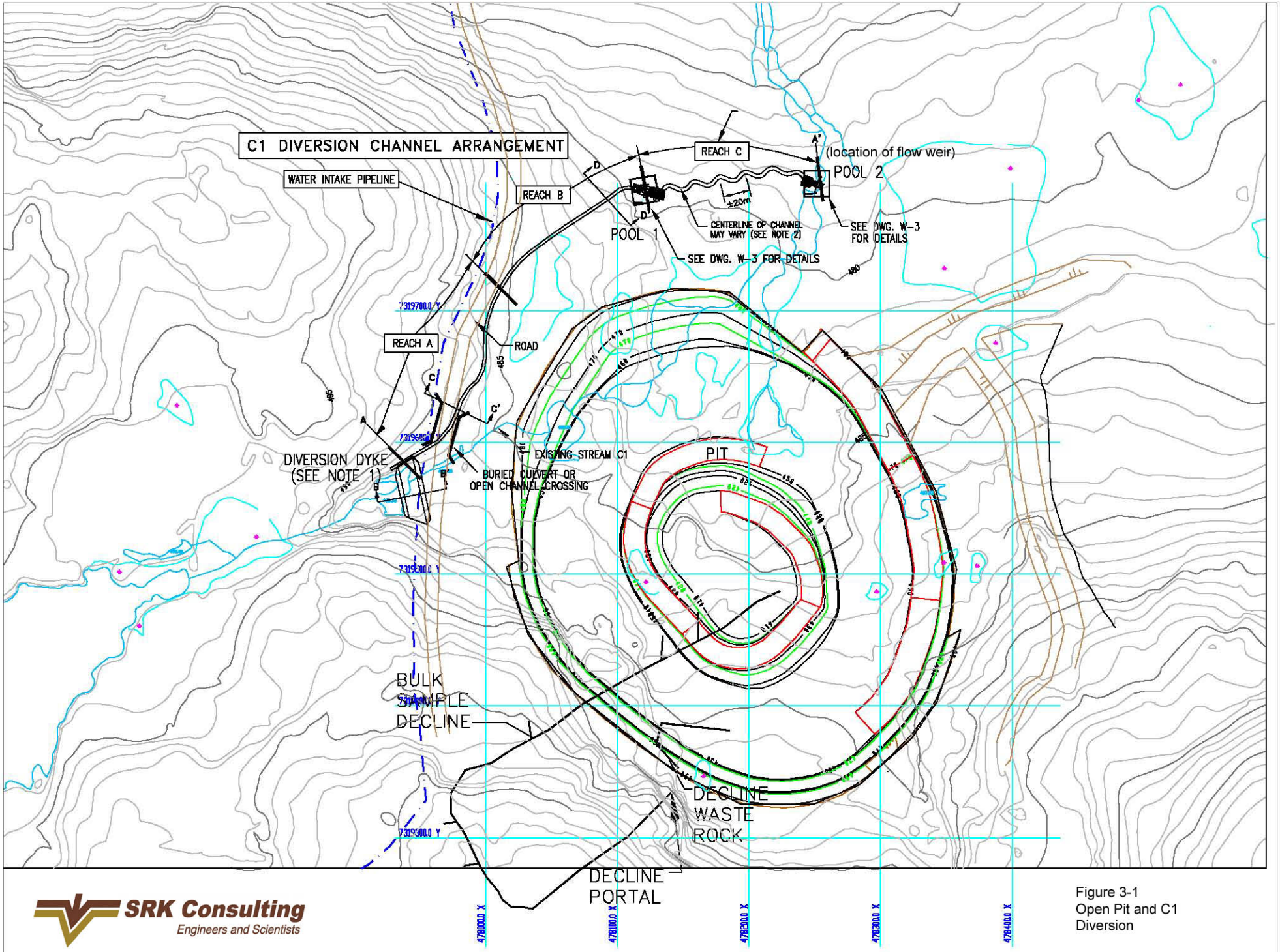
The trigger for action will be lichen metals levels in exposure levels above CCME guidelines or 20% above background levels for metals concentrations naturally above CCME guidelines. Management action will consist of examining sources of metals export to determine where mitigation can be applied. Exogenous causes (long distance transport) will be examined closely first to eliminate this possible source of elevated metals.

3.0 STREAM FLOWS

Pursuant to a request from DIAND, an automated stream gauging station will be installed on the Jericho River at the outlet to Carat Lake prior to mine start up. The site will include a pressure transducer linked to a continuous height recorder to provide a continuous record of stream height. As is standard practice, the gauge will be located in Carat Lake just at the outlet to Jericho River. A staff gauge will also be installed. The staff gauge height will be surveyed against two or three permanent bench marks upon installation. The staff gauge is likely to be moved somewhat annually by ice breakup and thus will be resurveyed annually to provide continuity of height records. Jericho River will be manually gauged annually during mine operations to provide a discharge against stream height.

In order to provide data for operation of the Stream C1 diversion, this stream will also be gauged at the transition pool 2 (Figure 3-1) by means of a weir and a continuous height recorder (pressure transducer) once the diversion becomes operational. Use of a calibrated weir at this location will allow direct conversion of water height records to discharge.

Nunavut Water Board has requested that a second control lake be monitored for “stream flows”. The intent of a second control lake is to provide data from a second unaffected water body on water quality and aquatic biota, not to provide flow data in a separate drainage system. Firstly, currents in lakes are almost entirely wind driven. Secondly, flow data from a drainage basin outside of the Jericho River system would not provide any useful data that could be used for management of environmental effects at the Jericho Diamond Mine.



SRK Consulting
Engineers and Scientists

Figure 3-1
Open Pit and C1 Diversion

4.0 SITE MONITORING

4.1 Flows and Water Chemistry

Flows and water quality will be monitored at key locations in the site water management system to anticipate any significant deviations from the conditions assumed in the current water and load balance that could indicate the need for management to ensure that the PKCA discharges continue to meet discharge criteria. The site monitoring program will be complemented by monitoring of the waste rock, kimberlite and processed kimberlite solids, monitoring of receiving water quality, and environmental effects monitoring. Details of those other programs are provided in the *Waste Rock, Kimberlite and Coarse PK Management Plan* (SRK 2004) and the *Aquatic Effects Monitoring Program* (Mainstream Aquatics 2004).

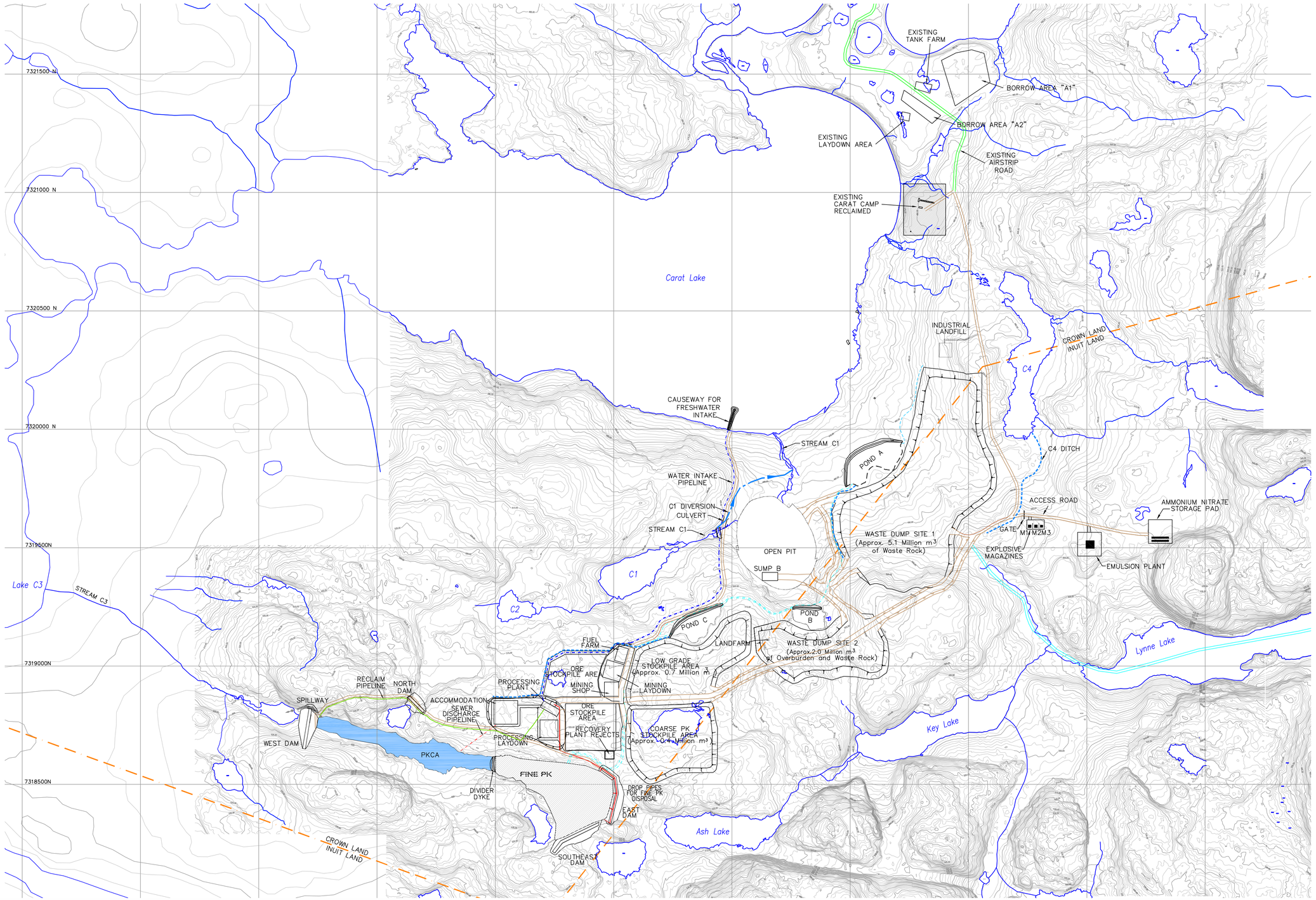
Key locations in the site water monitoring network are shown on drawing 1CT004.06 – G12. These include:

- Temporary or permanent collection ditches or ponds A, B and C, which will be used as control structures to direct water to the pit sump or PKCA during operations
- The pit sump
- The process plant supernatant
- Treated sewage effluent
- PKCA pond water
- PKCA discharge water
- Stream C3 during PKCA discharge for signs of erosion (periodically, as required)

During the first two years of operations, each of the above locations would be established as "routine monitoring stations" for measurement of flow and water quality. Sampling of the PKCA inflows would be on a monthly basis during the open water season (generally June to September). The PKCA pond and any inflows that continue through the winter months (i.e. the supernatant and the treated sewage) would continue to be monitored on a monthly basis during the winter. The PKCA discharge would be monitored on a weekly basis during the discharge period from June through September; flows will be continuously monitored.

The methods for estimating flow will depend on the final details of the water management facilities. Any pumped flows would be equipped with totalizer meters to record the total throughput of water occurring between sampling events. Ditch flows would be monitored using weirs, and piped flows directed by gravity would be measured using bucket and stopwatch methods.

An annual seepage survey would be completed along the down-gradient side of each of waste rock dumps, ore stockpiles, coarse PK stockpile, recovery plant stockpile and any sumps in the plant area to develop a better understanding of variations in source concentrations from different areas of site. This information may be used to optimize the water management system. For example, seeps that meet discharge criteria may be managed separately from those that do not. Based on Ekati Diamond Mine™ seepage chemistry, this sampling will take place in July or August to coincide with maximum seepage concentrations. It should be noted that the provision of routine monitoring stations at each of the collection points ensures that seepage and runoff from the waste rock is monitored on a seasonal basis. Therefore an annual seepage survey is considered sufficient for characterizing variability in the source concentrations from different areas of the dumps and stockpiles.



LEGEND

- EXISTING ROAD
- EXISTING ROAD (APPROXIMATE LOCATION)
- ROAD REQUIRED BY YEAR 3
- WINTER ROAD
- FRESH WATER PIPELINE
- MINE WATER PIPELINE
- FINE PK DISCHARGE PIPELINE
- RECLAIM PIPELINE
- SEWER PIPELINE
- PKCA DISCHARGE PIPELINE
- DITCH

NOTES:

1. LAYOUTS ARE APPROXIMATE AND MAY NOT REFLECT ACTUAL SIZE AND FOOTPRINT LOCATIONS
2. SHOULD THE GRADE OF THE LOW GRADE MATERIAL BE FAVORABLE, THIS MATERIAL MAY GET PROCESSED WHICH WOULD LEAD TO A REDUCTION IN THE SIZE OF THE STOCKPILE
3. THE TIMING OF THE CONSTRUCTION AT THE NORTH DAM, AND THE COMPLETION OF THE EAST AND SOUTHEAST DAMS WILL BE REVIEWED ANNUALLY UNTIL THE DAMS ARE CONSTRUCTED OR OPERATIONS CEASE.
4. THE TIMING OF THE CONSTRUCTION OF POND B WILL BE REVIEWED ANNUALLY.
5. STOCKPILE FOR CENTRAL AND NORTH KIMBERLITE LOBES SHOW MAXIMUM LIMITS. ACTUAL FOOTPRINTS MAY VARY.

TAHERA CORPORATION
JERICHO LAKE SOUTHWEST EXTENSION

Date of Photography: August 5, 1995.
Scale of Photography: 1:10 000
Survey control supplied by: Canamera Geological Ltd.
Survey control based on: UTM Projection, NAD 27, Zone 12
Compiled by The ORTHOSHOP, Calgary, October 1995.
WO 7423

0 100 200 300 400 500 METRES
1: 8000

REFERENCE DRAWINGS				REVISIONS					ISSUE AUTHORIZATION			
DRAWING NO.	DRAWING TITLE	DRAWING NO.		No.	DESCRIPTION	CHK'D	APP'D	DATE	REV.	ISSUE PURPOSE	AUTH. BY	DATE
DRAWING G-9	AMMONIUM NITRATE STORAGE LAYOUT								A	WATER LICENSE APPLICATION	CCS	JULY 2004
DRAWING G-8	BORROW AREAS PLAN & SECTION											
DRAWING G-7	TERRAIN EVALUATION MAP											
DRAWING G-6	BEDROCK GEOLOGY MAP											
DRAWING G-5	QUATERNARY GEOLOGY MAP											
DRAWING G-4	EXISTING THERMISTOR INSTALLATION PLAN	DRAWING G-14	CLOSURE CONCEPTS									
DRAWING G-3	SITE INVESTIGATION MAP	DRAWING G-13	GENERAL ARRANGEMENT APRIL 2013									
DRAWING G-2	SITE VICINITY MAP	DRAWING G-11	GENERAL ARRANGEMENT APRIL 2007									
DRAWING G-1	PROJECT LOCATION AND DRAWING INDEX	DRAWING G-10	GENERAL ARRANGEMENT APRIL 2006									

WATER LICENSE APPLICATION

SRK Consulting
Engineers and Scientists

DESIGNED BY: CCS	DRAWN BY: JM
DATE: JULY 2004	DATE: JULY 2004
CHECKED BY: CCS	DISCIP. ENGR.
DATE: JULY 2004	DATE:
PROJ. MGR:	PROJ. ENGR.
DATE	DATE

SRK PROJECT NUMBER: 1CT004.06

Tahera Diamond Corporation

JERICHO PROJECT

DRAFT

GENERAL ARRANGEMENT AT END OF APRIL 2008

DRAWING NUMBER: 1CT004.06 – G12

REV.: A

FILE NAME: F:\Tahera Corp (Lytton minerals)\Mapping and Drawings-2004 dwgs\general-figures(2004)\figureGA-year1

All routine samples would be submitted for the parameters outlined in Table 4-1. Seepage samples would be submitted for all parameters in Table 4-1, except for total metals and turbidity.

Total metals are not recommended due to the high potential for entraining sediments from the bottom of the small seepage channels during sample collection. This common sampling error can lead to highly variable concentrations that do not represent true loading of suspended sediments from the source areas.

Standard QA/QC procedures for water sampling including collection of field, travel and method blanks as well as duplicate samples will be included in the program.

The results of the routine and seepage monitoring will be provided in an annual seepage and waste rock monitoring report.

Table 4-1: Analytical Parameters

Test Group	Analytical Parameters	Measurement Units
Routine	Alkalinity, acidity, chloride, carbonate, bicarbonate, total hardness, hydroxide, sulphate, total suspended solids (TSS), total organic carbon (TOC), total inorganic (TIC),	mg/L
	pH (field and lab)	pH units
	ORP (field)	mV
	Conductivity (field and lab)	uS/cm
	Temperature (field)	^{o}C
	Turbidity	NTU
Metals (total and dissolved)	Ca, Mg, Na, K, Al, As, Ba, B, Be, Cd, Cr, Co, Cu, Fe, Hg, Pb, Mn, Mo, Ni, Se, Sr, U, V, Zn	mg/L
Nutrients	Ammonia-N, Nitrate-N, Nitrite-N, Total Phosphorus, Orthophosphate	mg N/L mg/L

Flows and water quality will be monitored on a monthly basis at key locations in the site water management system, including temporary or permanent collection ditches or ponds A, B, and C, which will be used to intercept water from the waste dumps, ore stockpiles and coarse PK stockpile, the pit sump, and other inflows to the PKCA.

An annual seepage survey will also be completed along the down-gradient side of each of waste rock dumps, ore stockpiles, coarse PK stockpile, recovery plant stockpile and any sumps in the plant area to develop a better understanding of variations in source concentrations from different areas of site.

Samples would be submitted for a comprehensive suite of parameters, including pH, conductivity, ORP, temperature, major ions, acidity, alkalinity, metals and nutrients. Standard QA/QC procedures for water sampling including collection of field, travel and method blanks as well as duplicate samples will be included in the program.

Further details on the site monitoring program are provided in the *Site Water Management* (SRK Consulting and Clearwater Consulting, 2004).

4.2 Solids Geochemistry

Geochemical monitoring will be carried out to confirm the geochemical properties of the waste rock, low-grade kimberlite ore, fine PK and coarse PK.

Waste rock and low-grade kimberlite ore samples will be collected as grab samples from the muck pile produced by blasting. In the first two years of the mine operation blasting will occur approximately once per day, with approximately one blast per two days in the next two years of mining. Characterization of the waste rock should include:

- Sample collection during every blast for the first year of mining, and, assuming that the testing data indicates minimal variability in the geochemistry of the waste rock, the sample frequency would be reduced to every other blast for the last three years of mining.

- Sample collection from each rock type present in the blast (i.e. granite/granodiorite, pegmatite, diabase, waste kimberlite)

- Geological description of the sample by a geologist, and general geological observations of the blasted rock, such as presence and composition of any xenoliths, occurrence of sulphide minerals etc.

- Testing of paste pH, reaction with HCl, total sulphur, and uranium on every sample. (Uranium analyses may be discontinued after the first year of testing if uniformity can be demonstrated). Full ABA analyses and ICP-metals would be performed on every 10th sample.

- Testing of a duplicate sample every 10th sample.

Coarse and fine PK samples will be collected once every two weeks during the first year of mining, with the frequency reduced to once per month for the remainder of operations if it can be demonstrated that there is limited variability in the data. Samples would be submitted for testing of paste pH, reactivity with HCl, and total sulphur. Full ABA analyses, ICP-metals and uranium analyses would be performed on every 5th sample.

Results of the solids characterization work would be reported in an annual seepage and waste rock monitoring report.

4.3 Ground Ice

During collection of the waste rock samples, blasted rock and freshly blasted rock faces will be examined for presence of significant quantities of ground ice. If present, the quantity of ice will be estimated, and samples of the ice lenses will be collected and submitted for water quality analyses to characterize the quality of ice melt water that would report to the pit or waste rock dumps. The frequency of sampling would depend on the amount of ice encountered, and the water quality data from the first few samples. However, based on observations from the underground development and drilling, it is considered unlikely that significant amounts of ice will be encountered.

4.4 Thermal Monitoring

A limited number of thermistors would be installed in one of the waste rock dumps and the Coarse PK Stockpile. The thermistors would likely be installed following construction of the first waste rock dump, when they would be less likely to be disturbed as a result of mining activities.

Two thermistors per dam will also be installed in the frozen zone of each of the dams.

4.5 Site Surveys and Visual Inspections

Three pairs of survey hubs will be established on each of the dams to monitor dam movements should they occur.

Daily inspections will be conducted by Tahera mine personnel of the PKCA, including dams, all collection ponds, water control dikes, waste rock dumps and stockpiles. Formal semi-annual inspections will also be carried out by site personnel, one of which will be conducted by an independent professional geotechnical or civil engineer.

Stream C3 will be inspected prior to discharge of the PKCA by a qualified hydrologist to determine the potential for erosion under discharge scenarios. Stream C3 will be inspected periodically as required during Long Lake pump out and PKCA discharge to determine whether bank or bed erosion is occurring. Should erosion be occurring, pumping/discharge will cease and rock armouring will be placed at the erosion site prior to commencement of pumping/discharge.

4.6 Post Closure PKCA Monitoring

Annual dam and spillway inspections will be carried out by an independent geotechnical or civil engineer for a period of at least 5 years; this will include assessments of cover performance assuming a cover is placed over the coarse PK. A number (to be determined prior to closure) of piezometers will be established in the PK in order to measure piezometric changes and sample porewater.

Quality and volume of any ponded water on the surface of the PKCA will be determined together with any discharge flows and discharge water quality.

4.7 Triggers for Action

Details are provided in the respective management plans for mine water and waste management. As a general guide, no water exceeding water licence criteria would be discharged to the environment. Geotechnical stability issues will be dealt with on a case by case basis with appropriate action to re-establish stability.

5.0 RECEIVING ENVIRONMENT WATER AND SEDIMENT QUALITY MONITORING

5.1 Water Chemistry

5.1.1 Parameters

Table 5-1 provides a list of water chemistry parameters to be analyzed together with detection limits. Both total and dissolved metals will be analyzed. An accredited laboratory will be chosen for routine water quality analyses. Bacterial analyses will be completed in Yellowknife to eliminate issues associated with excessive holding times.

Table 5-1: Water Chemistry Monitoring Parameters and Detection Limits

Water Quality Parameter	Detection Limits (mg/L or parameter units)	Water Quality Parameter	Detection Limits (mg/L or parameter units)
Physical Tests		**Total & Dissolved Metals**	
Conductivity (umhos/cm)	2	Cobalt (Co)	0.0001
Hardness $CaCO_3$	0.05	Copper (Cu)	0.0001
pH	0.01	Iron (Fe)	0.03
Total Suspended Solids	3	Lead (Pb)	0.00005
Total Dissolved Solids	3	Lithium (Li)	0.001
Dissolved Anions		Magnesium (Mg)	0.05
Alkalinity-Total $CaCO_3$	1	Manganese (Mn)	0.00005
Chloride Cl	0.5	Mercury (Hg)	0.00005
Sulphate SO_4	1	Molybdenum (Mo)	0.00005
Nutrients		Nickel (Ni)	0.0001
Nitrate (NO_3)	0.005	Phosphorus (P)	0.3
Nitrite (NO_2)	0.002	Potassium (K)	2
Ammonia (NH_3)	0.005	Selenium (Se)	0.001
Total Dissolved Phosphorus	0.001	Silicon (Si)	0.05
Total Phosphorus	0.001	Silver (Ag)	0.00001
Total & Dissolved Metals		Sodium (Na)	2
Aluminum (Al)	0.001	Strontium (Sr)	0.0001
Antimony (Sb)	0.00005	Thallium (Tl)	0.00005
Arsenic (As)	0.0001	Tin (Sn)	0.0001
Barium (Ba)	0.00005	Titanium (Ti)	0.01
Beryllium (Be)	0.0005	Uranium (U)	0.001
Bismuth (Bi)	0.0005	Vanadium (Va)	0.001
Boron (B)	0.001	Zinc (Zn)	0.001
Cadmium (Cd)	0.00005	**Organic Parameters**	
Calcium (Ca)	0.05	Total Organic Carbon (TOC)	0.01
Chromium (Cr)	0.0005		

Parameters that will be measured in the field for each station are listed in Table 5-2:

Table 5-2: Field Data Records

Sampler's name	Field pH
Station number	Water temperature
Single or replicate sample	Dissolved oxygen (where appropriate)
Date and time	Water transparency (secci disk) where appropriate
Type and number of bottles filled	Any other field measurements, e.g. weather
Sample depth (for depth profiles)	

All information will be kept in a field log book and data entered into a water quality database kept by the mine environmental co-ordinator.

5.1.2 Sample Waterbodies and Stations

The specific purpose of individual stations and their locations are presented in Table 5-3 and Figure 5-1, respectively.

Table 5-3: Water and Sediment Chemistry Monitoring Stations and Purpose

Station	Location	Purpose
SNP-1	PKCA Discharge	Compliance with water licence
SNP-2	Stream C3 above Mouth	Nearfield PKCA discharge
SNP-5	Lake C3 South Basin	Nearfield
SNP-6	Lake C3 Outlet	Nearfield
SNP-3	Control Lake	Upstream control
SNP-4	Cigar Lake (2nd Control)	Outside basin control
SNP-7	Lake C1	Near mine, non-discharge effects[a]
SNP-8	Stream C1 above Mouth	Near mine, non-discharge effects
SNP-9	Water Intake	Intake water quality
SNP-10	Stream C4 above Mouth	Near mine, non-discharge effects
SNP-11	Carat Lake Center Basin	Farfield
SNP-12	Carat Lake Outlet	Farfield
SNP-13	Jericho Lake North Basin	Downstream control
SNP-14	Jericho River	Downstream control
SNP-15	Lynne Lake	Near mine, non-discharge effects

[a] Non-discharge includes surface runoff, accidental spill, and airborne dust.

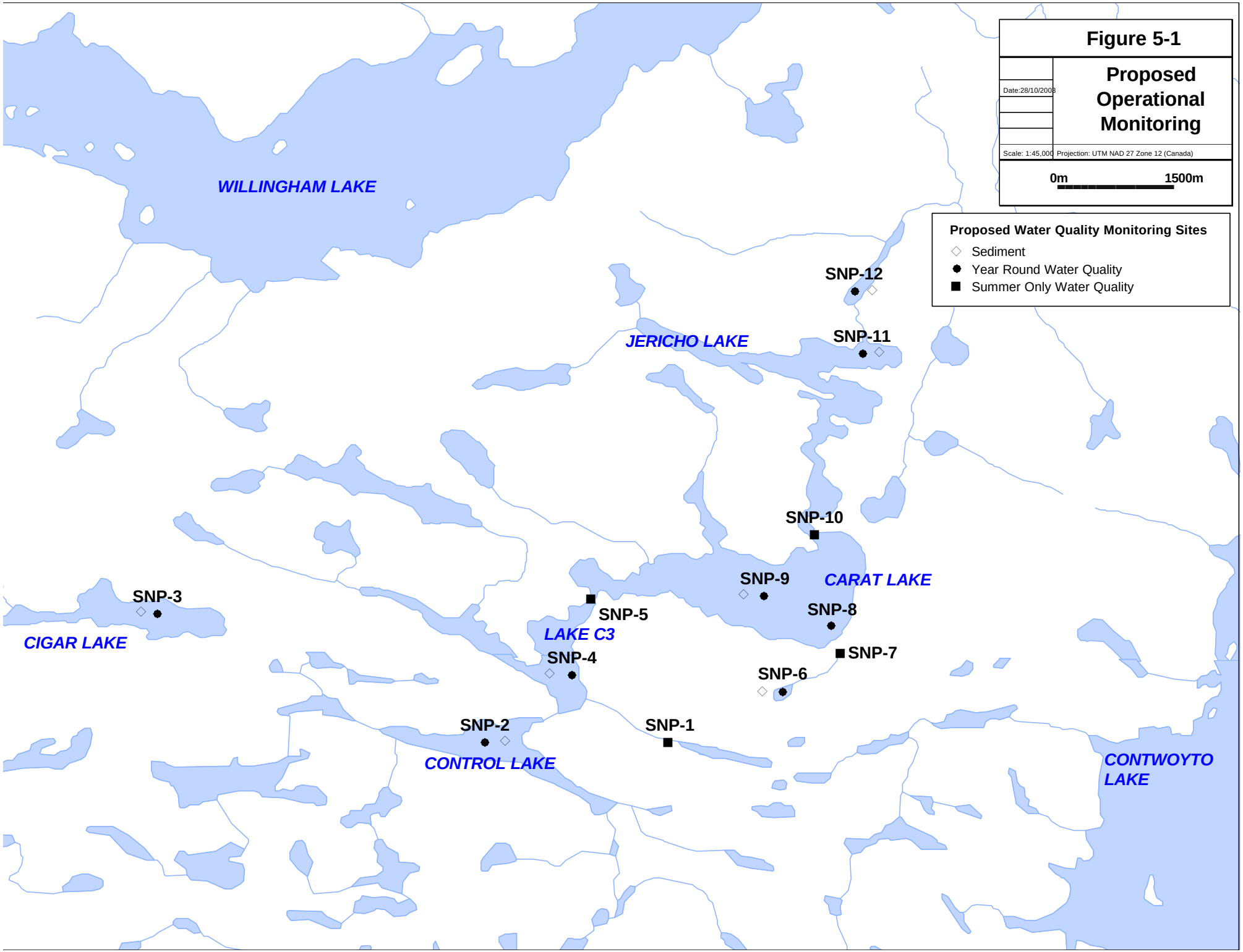


Figure 5-1
Proposed Operational Monitoring
Date:28/10/2008
Scale: 1:45,000
Projection: UTM NAD 27 Zone 12 (Canada)
0m
1500m
Proposed Water Quality Monitoring Sites
Sediment
Year Round Water Quality
Summer Only Water Quality
WILLINGHAM LAKE
JERICHO LAKE
CARAT LAKE
LAKE C3
CIGAR LAKE
CONTROL LAKE
CONTWOYTO LAKE
SNP-12
SNP-11
SNP-10
SNP-9
SNP-8
SNP-7
SNP-6
SNP-5
SNP-4
SNP-3
SNP-2
SNP-1

Table 5-4 provides the proposed monitoring frequency for water quality sampling.

Table 5-4: Water Chemistry Monitoring Frequency

Station	Location	Phase	Frequency
SNP-1	PKCA Discharge	Pre-construction Construction Operation Post-closure	Not applicable Turbudity daily; correlate with TSS Weekly during discharge Once per year for 5 years
SNP-2	Stream C3 above Mouth	Pre-construction Construction Operation Post-closure	Monthly during open water[c] Monthly during open water[c] Monthly during open water[c] Once per summer for 5 years
SNP-3	Control Lake	Pre-construction Construction Operation Post-closure	None Monthly[a] Monthly[a] Once per summer for 5 years
SNP-4	Cigar Lake (2nd control)	Pre-construction Construction Operation Post-closure	None Monthly[a] Monthly[a] Once per summer for 5 years
SNP-5	Lake C3 South Basin	Pre-construction	Once in winter[b]
		Construction Operation Post-closure	Monthly[a] Monthly[a] Once per summer for 5 years
SNP-6	Lake C3 Outlet	Pre-construction Construction Operation Post-closure	None Monthly during open water[c] Monthly during open water[c] Once per summer for 5 years
SNP-7	Lake C1	Pre-construction Construction Operation Post-closure	Once in winter[2] Monthly[a] Monthly[a] Once per summer for 5 years
SNP-8	Stream C1 above Mouth	Pre-construction Construction Operation Post-closure	None Monthly during open water[c] Monthly during open water[c] Once per summer for 5 years
SNP-9	Water Intake	Pre-construction Construction Operation Post-closure	None None Monthly during open water[d] None
SNP-10	Carat Lake Centre Basin	Pre-construction Construction Operation Post-closure	Once in winter[b] Monthly[a] Monthly[a] Once per summer for 5 years
SNP-11	Stream C4 above Mouth	Pre-construction Construction Operation Post-closure	None Monthly during open water[c] Monthly during open water[c] Once per summer for 5 years
SNP-12	Carat Lake Outlet	Pre-construction Construction Operation Post-closure	None Monthly during open water[c] Monthly during open water[c] Once per summer for 5 years
SNP-13	Jericho Lake North Basin	Pre-construction Construction Operation	Once in winter[b] Monthly[a] Monthly[a]

Station	Location	Phase	Frequency
		Post-closure	Once per summer for 5 years
SNP-14	Jericho River	Pre-construction Construction Operation Post-closure	None Monthly[a] Monthly[a] Once per summer for 5 years
SNP-15	Lynne Lake	Pre-construction Construction Operation Post-closure	None None Once per summer Once per summer for 5 years

[a] Mid December, mid April, June, July, August, September
[b] Dissolved oxygen profile prior to construction
[c] June, July, August, September
[d] Bacteria, ICP metals, TSS; the potable water supply will be monitored monthly for the above plus residual chlorine.

5.1.3 Triggers for Action

In general exposure site exceedance of site specific water quality guidelines outside of the initial dilution zone will be a trigger for action. Increases mirrored at control sites and reasonably ascribable to natural causes will not trigger remedial action. The management strategy will be to first isolate the probable cause(s). Should the probable cause be PKCA discharge, management strategies discussed in the Environmental Impact Assessment include alternate treatment methods for PKCA supernatant water such as increased storage time, spray irrigation and controlled phosphate addition to the PKCA. If the source is other than PKCA discharge, appropriate action will be instituted to eliminate or adequately control discharge from the source.

5.2 Sediment Chemistry

5.2.1 Parameters

Table 5-5 lists the analyses and detection limits for sediment samples.

Table 5-5: Sediment Chemistry Monitoring Parameters and Detection Limits

Constituent		Detection Limit	Units	Constituent		Detection Limit	Units
Moisture		0.01	%	Mercury	Hg	0.001	µg/g
				Molybdenum	Mo	4	µg/g
Aluminum	Al	10	µg/g	Nickel	Ni	2	µg/g
Antimony	Sb	10	µg/g	Phosphorus	PO4	20	µg/g
Arsenic	As	0.05	µg/g	Selenium	Se	0.5	µg/g
Barium	Ba	0.1	µg/g	Silver	Ag	2	µg/g
Beryllium	Be	1	µg/g	Sodium	Na	5	µg/g
Boron	B	0.5	µg/g	Strontium	Sr	0.1	µg/g
Cadmium	Cd	0.25	µg/g	Tin	Sn	5	µg/g
Calcium	Ca	1	µg/g	Titanium	Ti	0.3	µg/g
Chromium	Cr	2	µg/g	Uranium	U	0.05	µg/g
Cobalt	Co	1	µg/g	Vanadium	V	0.5	µg/g
Copper	Cu	1	µg/g	Zinc	Zn	1	µg/g
Iron	Fe	2	µg/g				
Lead	Pb	1	µg/g	Total Organic Carbon	C	0.01	%
Magnesium	Mg	0.1	µg/g	Total Kjeldahl Nitrogen	N	0.005	%
Manganese	Mn	0.2	µg/g	Phosphorus	PO_4	40	µg/g

A particle size analysis will also be done on one replicate sample from each station.

5.2.2 Sample Waterbodies and Stations

Stations and their locations are presented in Table 5-6 and illustrated in Figure 5-1. The specific purpose of each station is described in Table 5-2.

Table 5-6: Sediment Chemistry Site Locations

Station	Location
SNP-3	Control Lake
SNP-4	Cigar Lake (2nd Control)
SNP-5	Lake C3
SNP-7	Lake C1
SNP-10	Carat Lake
SNP-13	Jericho Lake
SNP-14	Jericho River

5.2.3 Triggers for Action

Many background sediment metals are above CCME guidelines. Thus CCME guidelines cannot be used as a trigger for these metals. Instead a statistically significant trend to increasing concentrations of metals in sediments coupled with changes in the benthic biotic community in a gradient downstream from the mine over a two to three year period will be used as a trigger. The source(s) will be investigated and if identified, remedial action taken, similar to those previously indicated for water quality.

6.0 AQUATIC EFFECTS MONITORING

6.1 Components Monitored

Components of the aquatic biological community that have been chosen as indicators include periphyton, benthic invertebrates, phytoplankton, zooplankton, and fish (Table 6-1). The first two organisms are used because they are stationary and are likely to reflect changes in the environment more rapidly than the other organisms. The latter reason also applies to phytoplankton and zooplankton. Fish are used as indicators because they have the potential to bioaccumulate some metals and they have a high value to society.

For most invertebrate indicators, monitored parameters will include biomass, abundance, and species diversity. Fish tissue constituents and community characteristics to be monitored are identified in Tables 6-2 and 6-3, respectively.

Table 6-1: Indicators and Parameters to be Measured as Part of the AEMP

Indicator	Parameter
Phytoplankton	Biomass (Chl. *a*); abundance; species diversity
Zooplankton	Biomass; abundance; species diversity
Periphyton	Biomass (Chl. *a*); abundance; species diversity
Benthic invertebrates	Abundance; species diversity
Fish[a]	Tissue metal concentration; community characteristics

[a] See Tables 6-2 and 6-3 for description of fish parameters

Table 6-2: Metal Constituents and Detection Limits for Fish Tissue Metal Contaminants as Part of the AEMP

Metal	Abbreviation	Detection Limit (µg/g)	Metal	Abbreviation	Detection Limit (µg/g)
Aluminum	Al	0.2	Magnesium	Mg	0.05
Antimony	Sb	0.08	Manganese	Mn	0.04
Arsenic	As	0.05	Mercury	Hg	0.005
Barium	Ba	0.01	Molybdenum	Mo	0.04
Beryllium	Be	0.05	Nickel	Ni	0.08
Boron	B	0.5	Phosphorus	PO_4	2
Cadmium	Cd	0.05	Potassium	K	0.5
Calcium	Ca	10	Silver	Ag	0.01
Chromium	Cr	0.5	Sodium	Na	0.5
Cobalt	Co	0.05	Strontium	Sr	0.01
Copper	Cu	0.05	Tin	Sn	0.08
Iron	Fe	1	Vanadium	V	0.08
Lead	Pb	0.04	Zinc	Zn	0.05

Table 6-3: Community Characteristics to be Measured as Part of the AEMP

Category	Parameter
Community Structure	Species diversity Abundance (catch rate)
Population Structure	Age distribution Length distribution Sex ratio
Population Health	Fecundity Percent sexual maturity Body condition Growth rate

6.2 Sample Locations

Site locations are based on the indicator to be monitored and the anticipated discharge from the mine site. For sedentary indicators such as periphyton and benthic invertebrates sampling will occur near point sources, which include the Stream C3 outlet in Lake C3 and the Stream C1 outlet in Carat Lake (Table 6-4; Figure 6-1). For other receptors that are not sedentary (phytoplankton, zooplankton, and fish) sites that represent whole lake conditions will be monitored. Wherever possible, aquatic biota sites correspond to water and sediment sampling sites. Fish sampling will occur in Stream C1 and Stream C3 to monitor changes in community characteristics. Tissue samples will not be collected from fish captured at these sites.

Table 6-4: Stations and Waterbodies to be Sampled for Aquatic Biota as Part of the AEMP

Station	Location	Indicators				
		Phytoplankton	Zooplankton	Periphyton	Benthic Invertebrates	Fish
SNP-3	Control Lake	✓	✓	✓	✓	
SNP-4	Cigar Lake (2nd Control)	✓	✓	✓	✓	✓
SNP-2	Stream C3 above Mouth					✓
SNP-5	Lake C3 South Basin	✓	✓			✓
SNP-8	Stream C1 above Mouth					✓
SNP-11	Carat Lake Center Basin	✓	✓			✓
SNP-12	Carat Lake Outlet			✓	✓	
SNP-13	Jericho Lake North Basin	✓	✓	✓	✓	
SNP-16	Carat Lake at Stream C1			✓	✓	✓
SNP-17	Lake C3 at Stream C3			✓	✓	✓

6.3 Sample Frequency and Replication

Sample frequency and replication are listed in Table 6-5. Pre-construction baseline data has been collected once for most indicators (all except zooplankton and phytoplankton). Collection of a complete suite of pre-construction baseline data is scheduled to occur in 2004. Assuming project start-up, annual sampling will commence in 2005. Fish tissues will be collected once every four years starting in 2004.

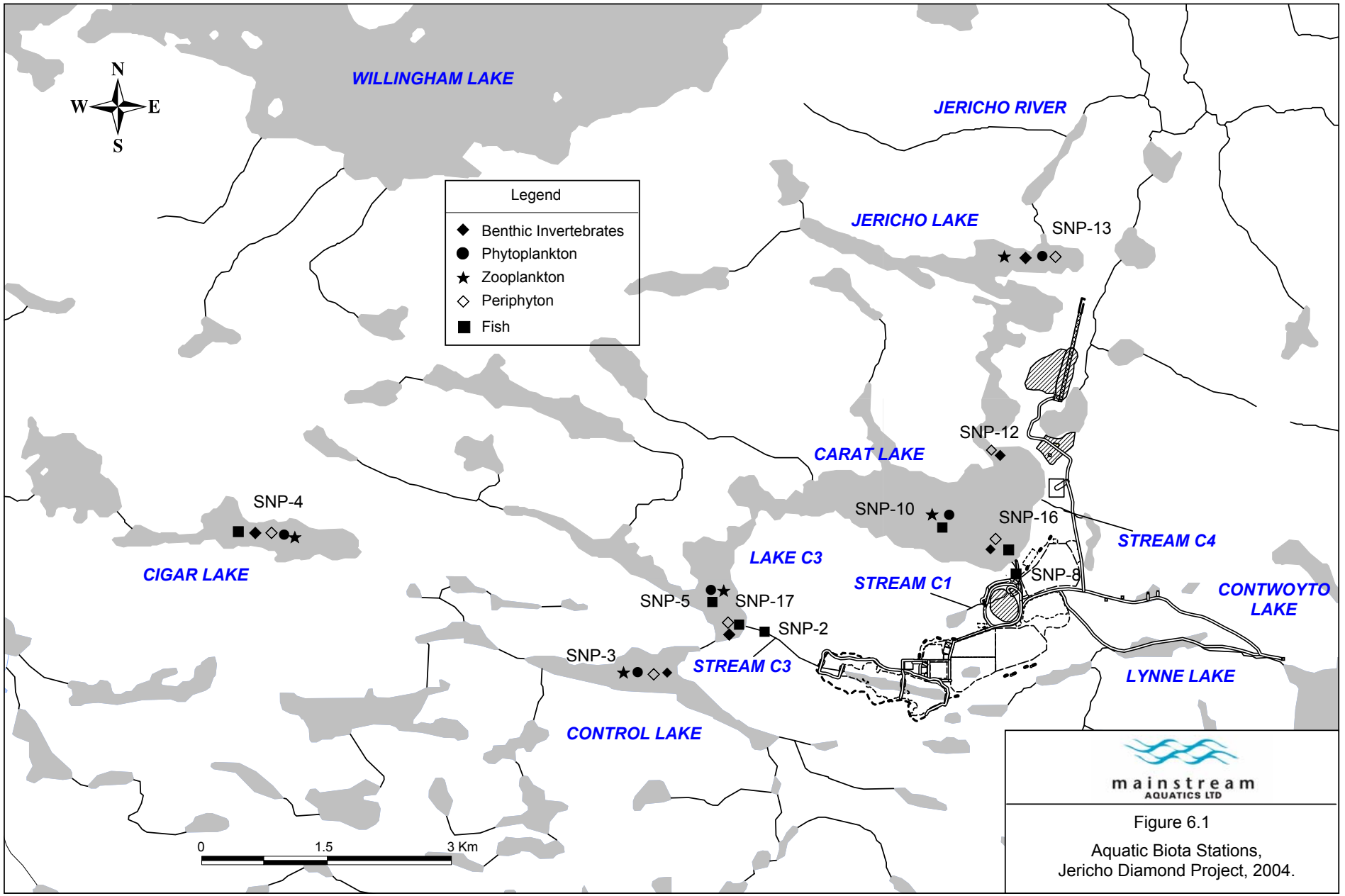

N
W
E
S
WILLINGHAM LAKE
JERICHO RIVER
JERICHO LAKE
SNP-13
Legend
Benthic Invertebrates
Phytoplankton
Zooplankton
Periphyton
Fish
SNP-12
CARAT LAKE
SNP-4
SNP-10
SNP-16
STREAM C4
LAKE C3
CIGAR LAKE
STREAM C1
SNP-8
CONTWOYTO LAKE
SNP-5
SNP-17
SNP-2
SNP-3
STREAM C3
LYNNE LAKE
CONTROL LAKE
0
1.5
3 Km
mainstream
AQUATICS LTD
Figure 6.1
Aquatic Biota Stations,
Jericho Diamond Project, 2004.

Table 6-5: Sampling Frequency and Replication for Aquatic Biota as Part of the AEMP

Indicator		Sampling Frequency	Replication
Phytoplankton		Summer/Annual	5
Zooplankton		Summer/Annual	5
Periphyton		Summer/Annual	5
Benthic Invertebrates		Spring/Annual	5
Fish	Community characteristics	Spring and Summer/Annual	-
	Tissue metal contaminants	Every 4 years	10 per species

Fish for tissue metal contaminants will be collected once every four years from monitored lake stations (Table 6-6). Lake trout and round whitefish will be collected from main basins, while slimy sculpin will be collected from the outlet areas of Stream C1 and Stream C3. Community characteristics will be measured from all captured fish during sampling for tissues. Fish for tissue metal contaminants will not be collected from Control Lake because it is connected directly to Lake C3, which allows free movement of fish.

Table 6-6: Fish Sampling Strategy as Part of the AEMP

Station	Location	Species[a]	Parameters	
			Tissue	Community Characteristics
SNP-4	Cigar Lake (2nd Control)	LKTR, RNWH, SLSC	✓	✓
SNP-2	Stream C3 above Mouth	LKTR, RNWH, SLSC		✓
SNP-5	Lake C3 South Basin	LKTR, RNWH	✓	✓
SNP-8	Stream C1 above Mouth	LKTR, RNWH, SLSC		✓
SNP-11	Carat Lake Center Basin	LKTR, RNWH	✓	✓
SNP-16	Carat Lake at Stream C1	SLSC	✓	✓
SNP-17	Lake C3 at Stream C3	SLSC	✓	✓

[a] LKTR – lake trout; RNWH – round whitefish; SLSC – slimy sculpin

6.4 Sediment Deposition

Potential sediment deposition caused by introduction of suspended sediments in lakes will be monitored as part of the AEMP. Parameters investigated will include weight of sediment deposited, size distribution of sediment deposited and sedimentation rate. Station locations (Table 6-7) are based on anticipated discharge from the mine site. The sites correspond to the aquatic biota sample sites.

Table 6-7: Stations and Waterbodies to be Sampled for Sediment Deposition

Station	Location
SNP-3	Control Lake
SNP-4	Cigar Lake (2nd Control)
SNP-12	Carat Lake Outlet
SNP-13	Jericho Lake North Basin
SNP-16	Carat Lake at Stream C1
SNP-17	Lake C3 at Stream C3

Pre-construction baseline data suitable for monitoring has been collected once. Collection of pre-construction baseline data is scheduled to occur in 2004. Assuming project start-up, annual sampling will commence in 2005.

6.5 Triggers for Action

Aquatic Effects Monitoring Program protocols published by DFO (2002) prescribe actions to be taken in the event that statistically significant effects are manifested in the aquatic environment and these protocols will be followed.

7.0 WILDLIFE MONITORING

7.1 Metals Bioaccumulation

KIA's reviewer, DSD and Health Canada identified metals bioaccumulation as an issue. However, with respect to caribou, there is no evidence of metals accumulation in NWT-Nunavut herds (INAC 2003). As well, there is no good vector for measuring metals bioaccumulation in wildlife at Jericho. Ungulates and carnivores are not hunted at the site and therefore there is not assured method of obtaining organ samples for analyses. Further, the Jericho site is but a small fraction of the range of the subject animals and therefore no conclusions could be drawn about metals levels found. Further, it is unreasonable to assume results would be different from those reported by INAC. Small mammals (microtine rodents) have been suggested but microtine rodents do not live long enough to accumulate metals measurably above background. Tahera is therefore not proposing to monitor metals bioaccumulation in wildlife at the Jericho site.

7.2 Incident Monitoring and Reporting

The wildlife management plan (Bear Wise 2004) contains details about wildlife incident reporting for any encounters or sightings of wildlife at Jericho. In summary, a log will be kept of all incidents (including incidents where wildlife are killed accidentally or as a protective measure for the operations). Maintaining the log will be the responsibility of the mine environmental co-ordinator. Annual environmental reports will contain a summary of logged information. The mine environmental co-ordinator will analyze incidents and develop an issues tracking file so that management can be modified proactively to address recurring issues effectively. This could include fencing of roads in problematic areas, posting of signs and reduction of speed in such areas.

7.3 Caribou and Muskox

The migratory nature of most wildlife populations represented in the Project area, the seasonal nature of the major Project components, and the relatively short Project history combined present a set of variables that make definitive monitoring of Project/wildlife interactions very difficult. Two wildlife monitoring components, however, stand out as worthy of a monitoring effort to both test the predictive relevance of the assessment, and to add to the overall knowledge of tundra ecosystems interacting with mining activities.

The Bathurst caribou herd is of high value to the lifestyle of Nunavut and NWT residents. As such, the Jericho Project will participate in a caribou monitoring program with the Government of Nunavut and other governments and industry interests, to ensure that the health of the herd is under ongoing surveillance in relation to all human activities on the herd's overall range.

Tahera Diamond Corporation will participate in any joint industry-government body set up to monitor the Bathurst caribou herd and barrenland grizzly.

The Project EIS predicts negligible effects (on a regional scale) on caribou and muskox from mine construction and operation. The primary purpose of monitoring will be to determine whether any significant local effects occur (e.g. road kills or other mortalities that might be caused by Project activities) and to adjust activities to reduce or eliminate these effects.

7.4 Carnivores

Barrenland grizzly bears are of primary concern, but also wolves, foxes, and wolverines. None of these large carnivores are common at Jericho, but all have been observed to pass through the site periodically. Grizzly bears and other carnivores will not be the subject of special on going studies by the mine, unless dens are found within one km of mine operations. These will be reported to Department of Sustainable Development in Kugluktuk and an appropriate monitoring program that will not result in wildlife harassment will be developed in consultation with the Department. Any encounters with grizzlies will be recorded and a report prepared by the Project environmental coordinator. Two primary objectives of observations will be: to increase employee safety at the site and modify activities, if indicated; and to reduce or eliminate disturbance and stress to grizzlies that may travel through the Project area. The primary management tools for grizzlies with be employee bear aware orientation, a strict no feeding wildlife policy and incineration of all kitchen wastes before final disposal.

There are no carnivore dens within 1 km of the mine. A fox den complex, occupied at least since 1996 is within 500 m of the airstrip. Activities to date have not affected activities and young have been raised every year at the den site since it was first observed. Any cessation in use of the den complex will be noted and reported in the annual environmental report for the Project. An assessment will be made by an independent wildlife biologist as to the probable cause. If mine activities are implicated, changes in activities will be made (if practical) to mitigate the situation. The most probable change in behaviour by carnivores is attraction to the camp as a food source. Tahera's no wildlife feeding policy will be communicated to employees at their initial orientation briefings.

7.5 Raptors

There are a number of raptor nests within 1 km of the proposed mine operations at Jericho. All raptor nests in the vicinity of the Project will be monitored by a qualified wildlife biologist during the Project operating life. Either fixed wing or helicopter surveys will be conducted in the Willingham Hills area where nests are know to be located. Baseline surveys were conducted in 1999 through 2001 in early to mid July and this timing will continue during the life of mine. The raptor program will be developed in discussions with Department of Sustainable Development raptor biologists to ensure harassment of the birds does not result from monitoring activities. The program will be closely monitored to ensure that any negative effects from surveying nesting raptors cease immediately upon detection.

7.6 Triggers for Action

7.6.1 Ungulates

Any moderately large aggregation of herd animals at the Jericho site in areas that conflict with mining activities will be cause for cessation of affected operations until the herd moves away. Any collisions between mine vehicles and herd animals (or any wildlife) will be recorded, the reasons analyzed and corrective action taken, e.g. speed reductions, signage, fencing or other deflectors, as appropriate to the situation.

7.6.2 Carnivores

Discovery of large carnivore dens within 1 km of the mine footprint will trigger a monitoring program which will provide information on use of the den. The program will be structured in

consultation with DSD wildlife biologists, Kugluktuk. Carnivore dens will be avoided by mining operations.

Feeding of animals will be prohibited. Should mine employees be found feeding animals disciplinary action will be taken in consultation with the mine Health, Safety and Environment Committee.

Should incidents with large carnivores occur which potentially endanger personnel, the bear-aware program orientation program will be reviewed and improved to address the issue raised.

7.6.3 Raptors

Baseline studies at the Jericho site indicated nearby population levels of raptors vary considerably. As well the raptors have alternate nesting sites to occupy. Therefore these two measures of changes are relatively insensitive. Raptors will be monitored to determine whether declining trends are evident which are not mirrored in unaffected birds and which can reasonably be ascribed to mining disturbance. The cause of the disturbance will be investigated, and if practical, mitigative measures will be instituted. Some disturbance of the nest sites closest to the open pit are likely to experience disturbance and alternate nest sites would likely be used by birds that would otherwise be within the disturbance zone. This is an expected result of mining and no mine changes are possible to eliminate this potential impact.

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