Benefication Report

on the

Temagami Traprock Property

Best Township

Temagami, Ontario

NTS 31-M-4

Gino Chitaroni, B.Sc. Geology

Blackstone Development Inc.

December 15, 1998.

Cobalt, Ontario

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List of Reports:

1) Market Research Study (1996)
2) Operational Cruise "timber assessment" (1997)
3) Stage One "Archaeological and Heritage Impact Assessment" (1997)
4) Blast Impact Analysis (1998)
5) Aquatic Resources Baseline Study (1998)
6) Public Information Meeting -- Information provided to the public on the Temagami Traprock proposed operation by Blackstone Development

Inc. (1998)

7) Quarry Site Plans/Maps
8) Tests, Assays & Sampling Chart
9) Prospecting and Sampling Plan

Note: Most of the above reports are in included in a separate storage pocket accompanying the main Benefication Report.

Temagami Traprock Property
Property description

Expenditures/Financial Investment
Program costs, investments and expenditures

Sampling Chart, Analysis, Assays

Claim Map

Prospecting and Sampling Plan
Back pocket

Abstract

An enormous bedrock source of traprock aggregate has been identified in Best Township near Temagami, Ontario.

The traprock deposit rock-type is exclusively made up of "Nipissing Diabase Sill" gabbroic rock.

A preliminary estimate of the size of the deposit is in the order of : 238,000,000 to 260,000,000 tons.

The Temagami Traprock Property, inwhich lies the traprock deposit, is well suited to aggregate extraction and development due in large part to the property's excellent access and infrastructure.

Traprock aggregate is used for the following purposes: asphalt, high-strength concrete, railway ballast, riprap, shoreline breakwater fill, road/highway fill, roofing granules and rockwool.

Location

The Temagami Traprock Property is located in Best Township in the municipality of Temagami Ontario. The mineral claims covering the the traprock deposit lies 13 kilometers or 8.1 miles north of the Temagami's village centre and about 2 kilometers or 1.2 miles east along the Roosevelt Road from of Highway 11 "Trans-Canada Highway" northern route.

Provincially, the deposit lies 454 kilometers or 282.3 miles north of the City of Toronto.

Infrastructure/Access

Roads

The deposit straddles the Roosevelt Road, a non-maintained government gravel forestry access road in Best Township.

Asphalt paved Highway 11 lies just west of the deposit and is easily accessed via connection by the Roosevelt Road.

Rail

The main Ontario Northland Railway (ONR) railine runs through the western psotion of the Temagami Traprock Property. The Roosevelt Road crosses the railine 100 metres east of Highway 11; at this location the railine lies less than 2 kilometers west of the deposit.

Moreover, a major rail spurline lies 14 kilometers south of the property in Strathy Township near the fomer Sherman Iron Ore Mine and

the Milne Townsite just west of Highway 11. This is a candidate site for large-scale crushing operations and/or value-added plant development.

Electric Power/Telephone

Accessible power and telephone lines lies near the ONR railine and Highway 11 near the traprock property. The Spurline site near Sherman Mine/Milne Townsite is fully serviced.

Water

There is plenty of water accessible to the proposed quarry site as is the case with the Sherman/Milne site from nearby lakes.

Air Travel

The Temagami area is well serviced by float planes in summer or winter; however, two regional airports service the area: Earlton to the north and North Bay to the south.

Labour Pool

The Temagami area lies in the heart of mining country with Cobalt and Kirkland Lake a short distance to the north and Sudbury a fair distance to the southwest. There are plenty of experienced and skilled mining/quarrying personnel and contract firms in the general area to service the needs of traprock quarry development.

A wide range of municipal services are available in the village of Temagami immediately south of the property. Housing is readily available in Temagami or in nearby towns of Latchford and Cobalt. The Temagami

area further offers excellent quality of life standards, as the Temagami area is a world-renowned tourist haven.

Other Assets

A medium-sized Quartz/Silica deposit lies on the boundary of the Temagami Traprock Property, and if developed, it may assist the development of the Traprock quarry. Shared transportation and production costs could make both deposits more attractive to prospective client buyers and competitive with regard to similar operations.

There are a couple of nearby developed gravel deposits on the Roosevelt Road which could be used as a mix feedstock for road construction operations or for internal use purposes.

Zoning/Planning

The traprock property lies under the municipal jurisdiction of the Township of Temagami and the Ministry of Natural Resources' Temagami Comprehensive Planning Area. In the Township of Temagami the area in which the traprock is located is zoned "Rural" whereby quarrying and aggregate extraction are permissible uses. Under the Temagami Comprehensive Plan the area is zoned "Red" thereby allowing quarrying and aggregate extraction to occur.

Property

The Temagami Traprock Property mineral claims are currently held by the Gino Chitaroni intrust for Temagami Traprock Ltd. The Royalty on the claims are shared with prospectors: Mr. Gino Chitaroni and Mr. Art Beecham.

Blackstone Development Inc., a Cobalt, Ontario based company, wholey owns Temagami Traprock Ltd. the proposed operator of the Temagami Traprock Deposit.

Currently, Mr. Gino Chitaroni is preparing to bring two mineral claims: Claims #1118527 & #1212011 to official Quarry Permit standing, then to surface & mineral rights lease in the near future.

The Temagami Traprock Property consists of 7 Claims or 52 Units containing a total of 2,080 acres or 832 hectares of land holdings. (See "Temagami Traprock Property" summary)

Deposit

The Temagami Traprock Deposit is exclusively made up of Nipissing Diabase Sill gabbroic rock . The Nipissing Diabase is provincially recognized by the Ministry of Transportation as a bedrock source rock for traprock aggregate.

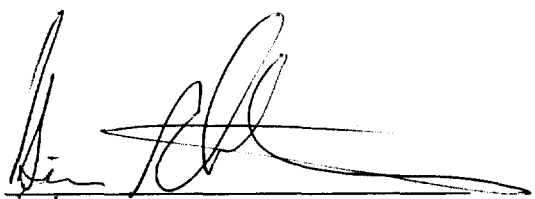
The deposit covers an approximate area of: 1 mile wide by 2.25 miles long, and is approximately 500-600 feet thick.. Preliminary investigations suggest that there is a resource of 238-260 million tons of Nipissing Diabase Sill rock available above the Roosevelt Road level or "O" datum level. In the near future, a geological/engineering report will outline the traprock aggregate resource/reserve of the traprock deposit.

Benefication Reports

The balance of the benefication report is outlined in separate studies, test work, assays and maps that were conducted, in order, to analyze the economic and social viability of the Temagami traprock quarry aggregate site and proposed operation. The following studies which are included in the report are as follows:

1) Market Research Study (1996)
2) Operational Cruise "timber assessment" (1997)
3) Stage One "Archaeological and Heritage Impact Assessment" (1997)
4) Blast Impact Analysis (1998)
5) Aquatic Resources Baseline Study (1998)
6) Public Information Meeting – Information provided to the public on the Temagami Traprock proposed operation by Blackstone Development Inc. (1998)
7) Quarry Site Plans/Maps
8) Tests, Assays & Sampling Chart
9) Prospecting and Sampling Plan

Respectfully Submitted,



Gino Chitaroni, B.Sc. Geology

December 15, 1998.
Cobalt, Ontario

Temagami Traprock Property

Best Township
Temagami, Ontario

Claim #	Units
1212011	3
1212012	4
1212013	4
1212069	14
1212070	9
1118527	3
1206294	15
7 Claims	52 Units

Totals = 2,080 acres or 832 hectares

Expenditures/Financial Investment

Temagami Traprock Ltd

Temagami Traprock Property

Best Township
Temagami, Ontario

Benefication Studies

Expenditures 1996-1998

Studies/Work:

Market Research Study (1996)	$ 7,942.00
Timber Cruise Forest Assessment (1997)	615.00
Explotech Blasting Study (1998)	2,129.60
Swastika Labs --- Sampling and Assays (1995-1998)	1,669.58
N.A.R. Environmental -- Environmental Baseline Study & Site Investigation (1998)	5,825.69
Geocomp (Division of Blackstone Development Inc.)	2,386.50
(a) Manual & Computerized Drafting (1997 revised 1998) (Norm Hawirko, P.J. MacArthur & Rick Lindsay) Total = $829.00	
(b) Site Plans & Field Work (1997 & 1998) (R.Lindsay & P.J. MacArthur) Total = $432.50	
(c) Quarry Application Plans & Sections (1997 & 1998) (Rick Lindsay) Rate: 45 hrs @ $25/hour Total = $1,125.00	
Settlement Surveys -- Archaeological Impact Study (1997)	580.00
Transportation	360.00

Gino Chitaroni:
Trips taken From December 1996 to December 1998.
Note: one trip with Bryan Wareing and 3 Trips with Jim Taylor
Round Trips: 12 Rd. Trips @ 100km per Rd. Trip = 1,200km
1,200 kilometers X $.30/km = $360

Total = $21,508.37

10. Financial Investment

From 1992 up to and including this presentation Gino Chitaroni and the principals, staff and administration of Blackstone Development Inc. have invested time, effort, materials and money into bringing the Project that is now Temagami Traprock Limited to it present, pre-production stage. Included has been;

1992-95 Claim Staking	1992-95 Grid Placement	1992-95 Geological Reports
1992-95 Soil Geochemical Samples and Tests	1992-95 Geological Maps	1993-98 Sample Test Analysis
1994-96 Geophysical Reports	1995-96 MOT HL 4 Tests	1996-97 Leachate Tests
1997-97 Timber Cruise	1997-97 Archeological Review	1996 -97 Market Study
1997-98 Quarry Design	1997-98 Permit Application	1998-98 Public Consultation

When all of the actions, purchases, writing of reports, manual and digital drafting of plans and maps, travel, administration, the time of technical and professional staff and the services of professional consultants are totalled it adds up to a considerable commitment and investment by BDI.

BDI Investment to Date: $ 95,496.00

Job Inquiry

8/22/96 To 12/14/98

12/14/98
7:54:19 PM

Job	ID#	Src	Date	Memo	Account #	Debit	Credit
A-2	Traprock Ltd.						
	5	CD	3/21/97	Bryan Wareing } Draws	6-5105	$400.00	
	37	CD	4/18/97		5-5001	$250.00	
	00000033	PJ	8/11/97	Purchase; Purolator Courier Ltd	6-3003	$15.41	$1250.41
	00000034	PJ	8/11/97	Purchase; Swastika Laboratorie	6-1001	$585.00	

Blackstone Development Inc.

50 Silver Street, P.O. Box 699
Cobalt, Ontario P0J 1C0

Job Inquiry

8/1/96 To 12/14/98

12/14/98
7:20:21 PM

Job	ID#	Src	Date	Memo	Account #	Debit	Credit
A-2	Temagami Traprock Ltd.						
	00000176	PJ	8/11/97	Purchase; Boreal Resources In	6-2040	$575.00	
	00000175	PJ	8/27/97	Purchase; Swastika Laboratorie	6-2040	$663.70	
	00000188	PJ	9/29/97	Purchase; Leisure Inn	6-3070	$57.00	
	00000294	PJ	3/6/98	Purchase; Settlement Surveys L	6-2010	$580.00	
	00000408	PJ	5/26/98	Purchase; Re-imburse Gino Chi	6-1050	$14.39	
	00000431	PJ	6/15/98	Purchase; Ministry of Natural Re	6-2015	$100.00	
	00000443	PJ	6/24/98	Purchase; Min. of Finance - Co	6-3010	$130.00	
	00000460	PJ	7/9/98	Purchase; Temiskaming Printin	6-3050	$47.20	
	00000464	PJ	7/9/98	Purchase; Re-imburse Gino Chi	6-1050	$18.00	
	00000464	PJ	7/9/98	Purchase; Re-imburse Gino Chi	6-3070	$31.22	
	00000470	PJ	7/16/98	Purchase; Cash Purchases	6-3070	$9.05	
	00000478	PJ	7/16/98	Purchase; Speedy Printing Cent	6-2060	$20.49	
	00000482	PJ	7/23/98	Purchase; N.A.R. Environmenta	6-2040	$325.00	
	00000482	PJ	7/23/98	Purchase; N.A.R. Environmenta	6-2050	$129.60	
	00000544	PJ	7/28/98	Purchase; Amex Bank of Canad	6-3070	$18.69	
	00000490	PJ	7/30/98	Purchase; C.I.B.C. Visa - Gino	6-2010	$36.72	
	00000491	PJ	7/30/98	Purchase; C.I.B.C. VISA - Jim	6-2010	$21.60	
	00000523	PJ	8/5/98	Purchase; Bealrsto, Rodney	6-2040	$50.00	
	00000510	PJ	8/13/98	Purchase; Petty Cash Purchase	6-1050	$14.40	
	00000526	PJ	8/21/98	Purchase; Smith, Freeman L.	6-2040	$50.00	
	00000537	PJ	8/25/98	Purchase; EXPLOTECH Engin	6-2040	$2,000.00	
	00000537	PJ	8/25/98	Purchase; EXPLOTECH Engin	6-3070	$129.60	
	00000555	PJ	8/29/98	Purchase; C.I.B.C. VISA - Jim	6-3070	$135.51	
	00000555	PJ	8/29/98	Purchase; C.I.B.C. VISA - Jim	6-2010	$10.80	
	00000590	PJ	9/10/98	Purchase; N.A.R. Environmenta	6-2011	$1,078.15	
	00000590	PJ	9/10/98	Purchase; N.A.R. Environmenta	6-2050	$505.64	
	00000591	PJ	9/10/98	Purchase; Petty Cash Purchase	6-1050	$0.90	
	00000685	PJ	10/16/98	Purchase; Petty Cash Purchase	6-1050	$18.00	
	00000713	PJ	10/29/98	Purchase; Shell - Hwy 11 Tema	6-3070	$42.99	
	00000717	PJ	11/2/98	Purchase; Petty Cash Purchase	6-1050	$5.58	
	00000726	PJ	11/4/98	Purchase; Swastika Laboratorie	6-2030	$30.75	
	00000727	PJ	11/4/98	Purchase; Swastika Laboratorie	6-2030	$29.00	
	00000774	PJ	11/17/98	Purchase; N.A.R. Environmenta	6-2011	$4,241.90	
						$11,120.88	$0.00

Net Activity ($11,120.88)

Investments Made to December 15, 1996

GinoChitaroni/BlackstoneDevelopmentInc.

Item	Description	Investment
1. Conceptdevelopment1995	60hours @ $50.00/hr	$3,000.00
	- Concept development	
	- Commence geological report	
	- Consult resident. geologist	
	- Research	
2. Potentialsite-visit&assessment	Time - 1 day @ $400/day	$ 400.00
	Travel - 80 km @ $0.30/km	$ 24.00
3. Potentialsite-Geo. Research	Purchase of Maps - 12 @ $2.00/ea	$ 24.00
	Purchase of Township Report (Best)	$ 40.00
	IGDIReport(MNDM).....	$ 20.00
	ResearchTime(GC).....	$ 1,500.00
4. Claimstakingandregistering	ArtBeecham.....	$ 1,182.00
	GinoChitaroni.....	$ 2,285.20
5. MarketResearchStudy	*Crushed Stone/Aggregate*.....	$ 7,942.00
	(Wareing Associates)	
6. Sampling&Testing	Sept. 9, 1995 - 6 samples.....	$ 144.45
	Nov. 18, 1996 - 9 samples.....	$ 216.68
7. Sitevisits(1996)	MTO visit, sampling,	
	picture taking, site inspection,	
	supervision e.g. site plan, gridding.	
	Time (GC) - 20 hrs @ $ 50/hr	$ 1,000.00
	Travel-5trips.....	$ 120.00

Investments(continued)

Item	Description	Investment
8. Site Plans for Permit	*Development and field work*	$ 432.50
9. Brief & Proposals	*Preparation and production* (BW) 35 hrs @ $ 50.00/hr	$ 1,750.00
10. Materials	*Photo-copies, sample bags etc.....*	$ 175.00
11. GeoComp Mapping	H&A- Best Township Compltn	$ 2,500.00
	- Traprock Site	$ 749.00
	SW. - 4.0 hrs @ $ 20/hr	$ 80.00
12. Incorporation	*Incorporation of Temagami Traprock Limited.....*	$ 908.50
	Preparation time - 3 hrs @ $ 50/hr	$ 150.00
13. Project Marketing	*Developing product and investment interest.*	
	Toronto trip to MTO - travel & time	
	Travel - 1040 km @ $0.30/km	$ 312.00
	Time (GC) - 8 hrs @ $ 50.00/hr ...	$ 400.00
	Mrktg letters, phone calls etc	
	Time (BW - Aug. 15 - Dec. 15. 1996)	
	265 hrs @ $50/hr.....	$ 13,250.00
14. Communications	*Telephone, fax, etc.....*	$ 215.00

Total Investment to December 15, 1996 in Temagami Traprock Limited $38,795.83

Investments Made from December 15, 1996 to August 31, 1997

A. Correspondence:	
1. Soliciting interest and responding - 6 hrs x $ 50/hr	$ 300.00
2. TEMFUND applications/responses etc. - 5x1.5hrsx$ 50/hr	$ 375.00
3. To Temprock - facility use (3 letters) - 3x1.5x50	$ 225.00
Total Correspondence	**$ 900.00**
B. Site Visits - Deposit site (average time - 2.5 hrs)	
1. Gino Chitaroni - 5 x 2.5 x 50	$ 375.00
2. Bryan Wareing - 1 x 2.5 x 50	$ 125.00
3. Mileage (km) - 5 trips x 100km x $ 0.30/km	$ 150.00
Total these trips	**$ 650.00**
C. Site Visits - Sherman Mine (Temagami)	
1. Gino Chitaroni - 6 x 2.0 hrs x 50	$ 600.00
2. Mileage (km) - 6 x 100 x $ 0.30	$ 180.00
Total these trips	**$ 780.00**
D. Meetings re: Project (GC, BW, & others)	
1. Ontario Northland R. & Temprock - 1 x 3 hrs x 2 x 50	$ 300.00
2. Temprock re: facilities & projects - 4 x 2 hrs x 2 x 50	$ 800.00
3. J. Bourque & Assoc. - over 1.5 days - 16 hrs x 2 x 50	$ 1,600.00
4. In office - strategy, planning etc. - 7 x 1 hr x 2 x 50	$ 700.00
Total - Meetings	**$3,400.00**
E. Applications for Funding (TEMFUND) - BW	
Form filling and reports assembly - 30 hrs x 50	**$1,500.00**

F. Applications for NRC Funding Assistance	
1. Meetings with NRC - 4 x 2 hrs x 2 x 50	$ 800.00
2. Structuring and Writing of Reports to suit. - 35 hrs x 50	$ 1,750.00
Total this element	**$2,550.00**
G. Application for Quarry Permit	
1. Permit application	$ 500.00
2. Board Drafting time - 45 hrs x $ 25/hr	$ 1,125.00
3. Associated meetings/discussions - 10 hrs x 50	$ 500.00
- 10 hrs x 25	$ 250.00
4. Property Location Map (GeoComp)	$ 500.00
Total this exercise	**$2,875.00**
H. Timber Cruise (Boreal Resources)	**$ 615.00**
I. Additional Sampling & Tests	**$ 710.00**
J. Telephone, Fax and Mail	**$ 200.00**
K. Report Revisions, Value Assessments etc. BW & GC - 60 x 50	**$3,000.00**
L. Stationery, Copying, Printing - time and supplies	**$ 350.00**

Total Investment - December 1996 to August 1997 $ 17,350.00

Blackstone's Investment in this Project - To Date (1 Year +)

$ 56,146.00

Bryan Wareing
Vice President

Invoice

May 3, 1996

To: Target Geological Services
Cobalt, Ontario

Per: Market Research & Scoping Study - Crushed Stone & Aggregates

Hours Consumed - Research, Analysis & Report Writing..... 231.25

Reports submitted:

1. Crushed Stone/Aggregate Production and Sales In Canada & the United States - A Market Research Study - April 1996 - Preliminary Report
2. Prospect List - Asphalt & Concrete Producers & Paving Contractors in Canada
3. Crushed Stone/Aggregate Production and Sales - Trends & Issues
4. Addendum to Preliminary Study - Aggregate Market
5. To Ed Rose - Detailed - Florida Dept of Transport - Testing Standards & Approval Procedures

Invoice charges:

Purchase of Research from 11 CORINFO (North Bay)	$ 1,000.00
Purchase of Prospect Lists	$ 163.00
Long Distance Telephone Calls	$ 129.00
Hours charged @ $35.00/hr ... 190	$ 6,650.00
Travel ..... not charged	Nil
Materials ..... included	Nil
Total	$ 7,942.00
Less Advances	$ 1,750.00
	$ 6,192.00
Less Purchase of Research paid by Target GS	$ 1,000.00
Balance Owing	$ 5,192.00

Thank You

Bryan Wareing

Please make cheques payable to : B. Wareing

Sampling Chart, Analysis, Assays

Temagami Traprock Property

Best Township, Temagami, Ontario

Sampling Program I

Sampled: September 13, 1995
Assayed: September 20, 1995

Sample #	Type	Description
K32059	chip	Low-grade material from the Cuniptau Silica Quartz Deposit northeast of the ONR Tracks at the Gravel Pit/Fish Rearing Ponds.
K32060	chip	Traprock/Nipissing Diabase rock, medium grained, 60% dark/40% light minerals, moderately magnetic (iron minerals) magnetite?; 1-2 miles east of the ONR tracks crossing.
K32061	chip	Same as above.
K32062	chip	Silica/Quartz Deposit white-green with some pink highlites variety; north end portion of the deposit, west of the ONR Tracks.
K32063	chip	Rocks were thought to be part of; or an extension of the Silica/Quartz Deposit at the Roosevelt Road east of the ONR Tracks.

K32064	chip	Silica/Quartz Deposit, pink variety; west of/at the ONR Tracks north-end of the Deposit.
K32065	chip	Traprock/Nip. Diabase, coarse-grained, 40% light: 60% dark minerals with 10-15% magnetite (fairly magnetic); 1.5 miles east of the ONR Tracks on the Roosevelt Road.
K32066	chip	Silica/Quartz Deposit, white-green variety located west/at the ONR Tracks, north-end of the deposit.
K32067	chip	Silica/Quartz Deposit, pale yellow variety located west of/at the ONR Tracks, north -end of the deposit.
K32068	chip	Nip. Diabase; 45% dark: 55% light minerals fine-medium grained texture rock; note: there was a presence of very minor pyrite/chalcopyrite.
K32069	chip	Nip. Diabase rock, located 0.5 miles east of the ONR Tracks; characterized by medium -fine grained texture with 35% light: 65% dark minerals.
K32070	chip	Nip. Diabase rock, located 1 mile east of the ONR Tracks; medium-grained texture 45% light: 55% dark minerals.
K32071	chip	Silica/Quartz Deposit? 200m east of the

ONR Tracks on the Roosevelt Road. Same general location as sample K32063.

Ministry of Transportation Test HL-4

Date Sampled: September 1st 1995
Sampled By: D.Jelly, MTO/G. Chitaroni, Prospector
Lab Analysis Date: February 14, 1996
Sample Number: 96-D-16003
Inventory Number: T16-038
Field Number: GAC-0001
Results Sent To: David Villard, MTO contract representative

* See Sample Map for Location and Test Chart for Results.

Sampling Program II

Sampled: October 29, 1996.
Assayed: November 18, 1996.

Sample #	Type	Description
K32072 – K32074	chip	Site #1 West side of the Nipissing

		Diabase /Traprock Deposit 1.8 km east of Highway 11 on the Roosevelt Road.
K32075 – K32077	chip	Site #2 Central Portion of the NipissingDiabase/Traprock Deposit 2.62 km East of Highway 11 on the Roosevelt Road.
K32078 – K32080	chi p	Site #3 East side of the Nipissing Diabase/Traprock Deposit 3.0 km East of Highway 11 on the Roosevelt Road.

Leachate Test

Sampled: June 24th 1997.
Received: July 11th 1997.
Assayed: July 24th 1997.

Sample #1 = K1407 chip sample taken at Site #1 (see sample map)

Sample #2 = K1408 chip sample taken at Site #2 (see sample map)

Sample #3 = K1409 chip sample taken at Site #3 (see sample map)

* See TSL Assaying Report for Results & cooresponding sample map

Specific Gravity Tests

Sampled: October 20th 1998.
Assayed: Nov. 2nd 1998.

Sample K1426 & K1427: Chip sample, location at Site #2 central part of Traprock Deposit.

Sample K1428: Chip sample, location at Site #3 east side of the Traprock Deposit.

Sample K1429: Chip sample, location at Site #1 western side of the Nipissing Diabase/Traprock Deposit.

* See sample map & assay results for detail.

H L - 4

TEST ANALYSIS

(Approval)

AGGREGATE TEST COMPUTATION SYSTEM (ATCS)

February 14, 1996

Sample number	96-D-16003	Date sampled	01/09/96
Field number	GAC-0001	Date received	01/26/96
Inventory number	T16-038	Date required	/ /
Contract number			
W.P. number			
W.O. number			
Source name	chitaroni		
Results to	dave villard		

LABORATORY REMARKS

stone micro-deval...4.0 % LOSS

limited sample

RECOMMENDATIONS: .....

.....

.....

.....

DATE_____ SIGNATURE _____

Tests Required

Coarse Aggregate	Fine Aggregate	Soils	Miscellaneous
C GRADATION	C GRADATION	GRADATION	C.B.R.
MgSO4	MgSO4	P.I.	FREE LIME
C P.N.	ATTRITION	PROCTOR	MORTAR BAR
C L.A. Abrn.	ABS. & Dr	MOISTURE	UNIT WEIGHT
ABS. & Dr	ORGANIC	SOIL Dr	
% CRUSHED	PETRO. EXAM		
% FLATS	PROCTOR		
W.P. 75 fm	MDA		
PROCTOR			
P.S.V.			
A.A.V.			
INSOL. RES.			
FREEZE THAW			

KEYS

S - selected tests

C - completed tests

AGGREGATE TEST COMPUTATION SYSTEM (ATCS)

Sample Number MMMM> 96-D-16003 February 14, 1996

Contract number MM>

: SIEVE ANALYSIS OF AGGREGATE LS-602 :

Aggregate Use MMMMMMM> Unprocessed

Total mass tested MMM> 15.4 kg

Percentage coarse MMM> 84.4

Percentage fine MMMMM> 15.6

Cumulative Percent Retained D COARSE AGGREGATE

Sieve,mm	Ret. 4.75mm	Total Sample % Ret	% Pass
19.0	29.2	24.7	75.3
16.0	45.4	38.3	61.7
13.2	59.2	50.0	50.0
9.5	81.5	68.8	31.2
6.7	93.1	78.6	21.4
4.75	100.0	84.4	15.6

```
:0000000000000000: AGGREGATE TEST COMPUTATION SYSTEM (ATCS) :0000000000000000
:03   Sample Number MMMM> 96-D-16003                    February 14, 1996
:03   Contract number MM>
:03                    :      PETROGRAPHIC ANALYSIS LS-609      :
:03 TYPE NO  ROCK TYPE DESCRIPTION                                    PERCENT
:03   9      TRAP(<=20% Sulphide)                                     100.0
:03                          PERCENT GOOD                            100.0
:03   FRACTION MMM> Full
:03        Granular & 16.0 mm Crushed P.N. MMM> 100.0
:03        Hot mix and Concrete P.N. MMMMMMMMM> 100.0
:03   WEIGHTED PETROGRAPHIC NUMBER
:03   SIZE(S) TESTED Full
:03        Granular & 16.0 mm Crushed P.N. MMM> 100.0
:03        Hot mix and Concrete P.N. MMMMMMMMM> 100.0
:03                    :      LOS ANGELES ABRASION  LS-603      :
:03   Los Angeles Abrasion MMM>    16  %
```

TABLE 2
PHYSICAL REQUIREMENTS FOR AGGREGATES
ONTARIO PROVINCIAL STANDARD SPECIFICATIONS AND MTO SPECIAL PROVISIONS

Coarse Aggregates

Type of Use \ Type of Test	Petrographic Number, Maximum	MgSO4 Soundness, Maximum % Loss	Absorption, Maximum %	Los Angeles Abr., Maximum %	Percent Crushed, Minimum %	Flat and Elongated Pieces, Maximum %	Loss by Washing pass 75 µm Max. % (Gravel)	Loss by Washing pass 75 µm Max. % (Quarried Rock)	Two Face Crushed, Minimum %	Plasticity Index	Freeze-Thaw, Maximum % Loss	Type of Material
Granular A	200			60	50					0		Cr. Rock, Cr. Gravel, BL Furn. and Ni Slag
Granular M	200			60	50					0		As Above
Granular S	200			60	50					0		Crushed Rock or Crushed Gravel
Granular Subbase B Type 1	250									0		Sand, Gravel, Cr. Rock, BL Furn. and Ni Slag
Type 2	250			60	100	15				0	6	Crushed Rock Only
Select Subgrade Material	250									0		Sand or Gravel, Crushed Rock
Open Graded Drainage Layer (1)	160	15	2.0	35	100	[illegible]	1.3	2.0		0		Crushed Rock Only
Hot Mix–H.L. 1, DFC, OFC	See OPSS 1149 and Special Provision No. 313S10											Trap Rock, Dolomitic Sandstone, Meta-Arkose, High Quality Gravel
Hot Mix–H.L. 3	135	12	1.75	35	60	[illegible]	1.3	2.0			6	Crushed Rock or Crushed Gravel
H.L. 4 (Surface)	160	12	2.0	35	60	[illegible]	1.3	2.0				As Above
H.L. 4 & 8 (Binder)	160	15	2.0	35	60	[illegible]	1.3	2.0				As Above
Medium Duty Binder	160	15	2.0	35		[illegible]	1.3	2.0	80			As Above
Heavy Duty Binder	160	15	2.0	35	100	[illegible]	1.3	2.0				All Crushed Rock
Surface Treatment (1)												
Class 1 & 5	135	12	1.75	35	60	[illegible]						Crushed Rock or Crushed Gravel
Class 2	160	15		35	60	[illegible]						As Above
Class 3	160	12	2.00	35	60	[illegible]						As Above
Structural Concrete and Concrete Base	140	12	2.0	50		[illegible]	1.0	2.0				Crushed Rock or Crushed Gravel Crushed Rock is Necessary for High Strength Must be Chemically Stable (Not Reactive)
Pavement Concrete and Exposed Structure Deck	125	12	2.0	35		2.0	1.0	2.0				As Above

Fine Aggregates

Type of Use \ Type of Test	MgSO4 Soundness, Maximum % Loss	Petrographic Analysis	Organic Impurities, Maximum	Sand Attrition, Maximum % Loss	Micro-Deval Abr., (3) Maximum % Loss	Pass 75 µm	Plasticity Index	Type of Material
Hot Mix – H.L. 1	16	(2)			20	0-5	0	Natural Sand, Gravel or Crushed Rock Screenings
H.L. 2	20				25	3-8	0	As Above
H.L. 3	16				20	0-5	0	As Above
H.L. 4 (Surface)	20				20	0-7	0	As Above
H.L. 4 & 8 (Binder)	20				25	0-7	0	As Above
Medium Duty Binder	20	(2)			25	0-7	0	As Above
Heavy Duty Binder	20	(2)			25	0-5	0	Crushed Rock Only
O.F.C.		(2)			20	0-3	0	High Quality Gravel, Dolomitic Sandstone, Trap Rock
D.F.C.	20	(2)			20	2-5	0	Dolomitic Sandstone, Traprock, Meta-Arkose
Surface Treatment Class 4	20					0-7	0	Natural Gravel or Crushed Rock Screenings
Structural Concrete and Concrete Base	16	(2)	3	(2)	20	0-3		Natural Sand
						0-5		Manufactured Sand
Pavement Concrete and Exposed Structure Deck	16	(2)	3	(2)	20	0-3		Natural Sand
						0-5		Manufactured Sand
Ice Control Sand				9	25	0-5		Natural Sand
				14	25	0-3		Manufactured Sand

(1) Hot mix and concrete petrographic number applies
(2) Test results are analyzed for specific contracts, but there are no current specification limits
(3) Replacing $MgSO_4$ Soundness as of 1992 on MTO contracts only

HE INFORMATION IS "STACKED"; IE HEADING A CORRESPONDS TO LINES A, HEADING B CORRESPONDS TO LINES B, HEADING C TI

SOURCE NAME	TOWNSHIP	LOT NOS. FROM-TO	CONCESSION FROM-TO	SOURCE LOCATION

Y	PIT/ QUARRY	OPEN/ UNOPEN	COUNTY, REG. MUN.	MAP ZONE	EAST.	NORTH.	TYPE OF INVESTIGATION

			DEPTH OF FACE (M)	DEPTH OF TEST HOLES (M)	STRIPPING REQUIRED (M)	% RETAINED		
TOTAL QUANTITY (TONNES)	NON-CRUSHABLE (TONNES)	CRUSHABLE (TONNES)	FROM-TO	FROM-TO	FROM-TO	4.76 MM FROM-TO	25.4 MM FROM-TO	100 MM FROM-TO
M.T.O. SURPLUS ROCK	STRATHY		0 -	0 -		17.5KM N OF TEMAGAMI ON W SIDE OF HWY 11		
0 NO REMARKS	OPEN	NIPISSING		17	592500 5219900	VISUAL		
20000	0	20000	-	-	-	-	-	-

ITY :

GRANULAR "B" I ----> N ---->
GRANULAR "A" ------> R ----> SEE REMARKS BELOW
H.L. 4 MOD FA -----> R ----> REQUIRES BLENDING IN ORDER TO PRODUCE HOT MIX WHICH CONFORMS TO CONTRACT REQUIREMENTS
H.L. 4 MOD CA -----> R ----> SEE REMARKS BELOW

SURPLUS ROCK FROM CONT. 92-214. CONSTRUCTION RECORDS SHOW APPROXIMATE 20,000 TONNES IN STOCKPILE. THIS QUARRIED ROCK VARIES IN SIZE AND DEBRIS SUCH AS WOOD,SILT,CLAY,ORGANIC MATTER,ETC. WOULD HAVE TO BE REMOVED FROM STOCKPILE BEFORE MATERIAL COULD BE PROCESSED.
THIS ROCK MEETS APPROVAL FOR HL4 CA.
AVAILABLE FREE FOR PURPOSES SPECIFIED

G. CHITARONI	BEST	0 -	0 -	1.85 KM.E. OF HWY 11. ON N. AND S. SIDE ROOSEVELT ROAD SOUTH ENT.

0 NO	QRY	UNOP	NIPISSING	17	598100 5224100	VISUAL		
100000	0	100000	-	-	-	-	-	-

ITY :

GRANULAR "B" I ----> N ---->
GRANULAR "A" ------> X ----> SEE REMARKS BELOW
H.L. 4 MOD FA -----> R ----> REQUIRES BLENDING IN ORDER TO PRODUCE HOT MIX WHICH CONFORMS TO CONTRACT REQUIREMENTS
H.L. 4 MOD CA -----> R ----> APPROVAL BY STOCKPILE ONLY

THIS UNOPENED QUARRY IS SHOWN APPROXIMATE LOCATION. FOR FURTHER INFORMATION CONTACT G.CHITARONI (705)672-2266
ROCK TYPE IS A NIPISSING DIABASE FINE GRAINED.

Swastika Laboratories

A Division of TSL/Assayers Inc.

Established 1928

Assaying - Consulting - Representation

Assay Certificate

8W-4200-RA1

Company: **BLACKSTONE DEVELOPMENT INC**
Project: Traprock Quarry
Attn: G. Chitaroni

Date: NOV-02-98

We hereby certify the following Assay of 4 Chip/Grab samples submitted OCT-27-98 by .

Sample Number	Specific Gravity
K 1426	2.97
K 1427	2.93
K 1428	3.10
K 1429	2.94

Certified by Denis Chartre

1 Cameron Ave., P.O. Box 10, Swastika, Ontario P0K 1T0
Telephone (705)642-3244 Fax (705)642-3300

T...GAN...TRAP ROCK LTD.
ATTN: G. CH... NI
PROJ:

6W-4684-RA1

...AS ...ERS ...abo ...or...
1270 FEWSTER DRIVE, U... 3 MISSISSAUGA, ONTARIO L4W-1A4
PHONE #: (905)602-8236 FAX #: (905)206-0513

REPORT No. : M...312
Page No. : 1 of 1
File No. : NV18RA
Date : NOV-18-1996

I.C.A.P. TOTAL OXIDE ANALYSIS

Lithium MetaBorate Fusion

SAMPLE #	SiO2 %	Al2O3 %	Fe2O3 %	CaO %	MgO %	Na2O %	K2O %	TiO2 %	MnO %	P2O5 %	Ba PPm	Sr PPm	Zr PPm	Y PPm	Sc PPm	Nb PPm	Be PPm	Ni PPm	Cr PPm	Cu PPm	V PPm	Co PPm	Zn PPm	LOI %	TOTAL %
32072	50.98	14.82	10.42	8.19	8.45	3.79	0.70	0.62	0.19	0.10	280	250	50	16	32	< 30	2	125	215	155	215	45	80	2.60	100.65
32073	51.22	14.34	9.96	8.81	8.00	4.16	0.52	0.68	0.18	0.08	250	270	50	12	36	< 30	< 1	130	320	85	225	50	50	2.31	100.25
32074	51.01	14.56	10.00	9.20	7.70	3.96	0.40	0.64	0.18	0.08	180	230	50	14	33	< 30	< 1	140	250	110	230	45	50	2.39	100.11
32076	45.45	13.51	21.54	7.38	4.90	2.59	1.48	2.21	0.22	0.10	190	190	60	14	32	< 30	< 1	65	485	210	720	65	130	1.60	100.74
32077	49.95	14.61	16.05	8.06	4.55	3.00	1.28	1.49	0.20	0.12	240	240	70	16	33	< 30	1	115	360	365	1495	85	105	1.22	100.57
32078	52.87	12.17	19.34	5.59	1.78	2.86	1.74	1.51	0.26	0.52	270	190	150	38	26	< 30	1	65	175	240	705	65	90	1.63	100.93
32079	52.29	11.97	19.90	5.42	1.80	2.56	1.94	1.51	0.27	0.56	310	170	170	42	25	< 30	1	35	655	60	90	45	100	1.55	100.21
32080	53.26	11.90	19.51	5.38	1.94	2.67	1.70	1.57	0.27	0.54	230	180	150	38	25	< 30	1	30	270	50	60	40	105	1.55	99.76
	53.26	11.90	19.51	5.38	1.94	2.67	1.70	1.57	0.27	0.54	230	180	150	38	25	< 30	1	45	545	45	95	45	95	1.59	100.33

/96

SIGNED :

TSL/ASSAYERS Laboratories
1270 FEWSTER DRIVE, UNIT 3 MISSISSAUGA,ONTARIO L4W-1A4
PHONE #: (905)602-8236 FAX #: (905)206-0513

TARGET GEOLOGICAL SERVICES
ATTN: G. CHITARONI
PROJ: TEMAGAMI

5W-3587-RG1

REPORT No. : M5719
Page No. : 1 of 1
File No. : M5719
Date : SEP-20-1995

I.C.A.P. TOTAL OXIDE ANALYSIS

Lithium MetaBorate Fusion

P.2

SAMPLE #	SiO2 %	Al2O3 %	Fe2O3 %	CaO %	MgO %	Na2O %	K2O %	TiO2 %	MnO %	P2O5 %	Ba ppm	Zr ppm	Y ppm	Sc ppm	Nb ppm	Be ppm	Ni ppm	Cr ppm	Cu ppm	V ppm	Co ppm	Zn ppm	Rb %	LOI %	TOTAL %
K32059	84.96	8.65	1.54	0.08	0.46	2.48	1.68	0.07	0.01	0.04	250	70	8	< 1	< 30	< 1	20	660	10	25	10	15	<0.05	0.76	100.71
K32060	45.72	13.55	20.68	7.43	4.71	2.73	1.42	2.12	0.19	0.10	190	40	14	31	< 30	< 1	100	265	375	1395	80	180	<0.05	1.57	100.22
K32061	45.27	14.33	21.02	7.42	4.55	2.80	1.22	2.05	0.20	0.10	200	50	18	32	< 30	< 1	70	225	335	1285	80	170	<0.05	1.53	100.50
K32062	96.46	1.44	1.25	0.19	0.33	0.37	0.20	0.07	0.01	<0.02	20	< 10	2	< 1	< 30	< 1	< 5	955	15	45	10	10	<0.05	0.30	100.63
K32063	49.36	23.25	4.78	11.27	1.80	4.21	1.00	0.27	0.06	0.08	140	< 10	< 2	13	< 30	< 1	25	365	< 5	100	20	30	<0.05	2.19	98.28
K32064	95.20	1.10	0.45	0.25	0.21	0.17	0.16	0.03	<0.01	<0.02	20	< 10	6	< 1	< 30	< 1	< 5	770	10	35	10	10	<0.05	0.21	97.81
K32065	57.04	11.92	16.72	5.18	1.94	3.92	1.30	1.68	0.21	0.24	440	200	46	32	< 30	1	20	380	20	155	40	95	<0.05	0.71	100.84
K32066	92.27	2.46	1.12	0.15	0.29	0.87	0.30	0.06	0.01	<0.02	30	< 10	< 2	< 1	< 30	< 1	25	800	10	40	15	20	<0.05	0.28	97.82
K32067	96.72	1.71	0.85	0.03	0.25	0.04	0.54	0.02	<0.01	<0.02	40	30	< 2	< 1	< 30	< 1	< 5	845	< 5	80	5	20	<0.05	0.39	100.56
K32068	51.59	14.00	10.71	8.33	7.50	3.64	0.58	0.64	0.17	0.08	260	60	22	32	< 30	< 1	95	320	70	215	50	100	<0.05	2.33	99.56
K32069	46.02	14.34	19.65	7.49	4.62	3.00	1.18	2.14	0.21	0.10	200	40	10	35	< 30	< 1	125	275	300	1185	85	150	0.05	1.49	100.23
K32070	51.61	15.37	14.10	7.87	4.70	3.00	1.26	0.98	0.18	0.14	240	90	16	29	< 30	< 1	55	270	215	455	70	120	<0.05	1.50	100.70
K32071	47.38	25.18	6.04	9.91	3.19	3.31	1.88	0.33	0.08	0.06	230	40	6	11	< 30	< 1	10	210	< 5	105	20	45	<0.05	3.07	100.44

SEP 20 '95 13:26 TSL-ASSAYERS

SIGNED :

TSL/95

TSL/ASSAYERS Laboratories
1270 FEWSTER DRIVE, UNIT 3 MISSISSAUGA,ONTARIO L4W-1A4
PHONE #: (905)602-8236 FAX #: (905)206-0513

TARGET GEOLOGICAL SERVICES
ATTN: G. CHITARONI
PROJ: TEMAGAMI

5W-3587-RG1

REPORT No. : M5719
Page No. : 1 of 1
File No. : M5719
Date : SEP-20-1995

I.C.A.P. TOTAL OXIDE ANALYSIS

Lithium MetaBorate Fusion

P.2

SAMPLE #	SiO2 %	Al2O3 %	Fe2O3 %	CaO %	MgO %	Na2O %	K2O %	TiO2 %	MnO %	P2O5 %	Ba ppm	Zr ppm	Y ppm	Sc ppm	Nb ppm	Be ppm	Ni ppm	Cr ppm	Cu ppm	V ppm	Co ppm	Zn ppm	Rb %	LOI %	TOTAL %
Low-grade Silica Dep K32059	84.96	8.65	1.54	0.08	0.46	2.48	1.68	0.07	0.01	0.04	250	70	8	< 1	< 30	< 1	20	660	10	25	10	15	<0.05	0.76	100.71
K32060 Traprock	45.72	13.55	20.68	7.43	4.71	2.73	1.42	2.12	0.19	0.10	190	40	14	31	< 30	< 1	100	265	375	1395	80	180	<0.05	1.57	100.22
K32061 Traprock	45.27	14.33	21.02	7.42	4.55	2.80	1.22	2.05	0.20	0.10	200	50	18	32	< 30	< 1	70	225	335	1285	80	170	<0.05	1.53	100.50
K32062 Silica Dep	96.46	1.44	1.25	0.19	0.33	0.37	0.20	0.07	0.01	<0.02	20	< 10	2	< 1	< 30	< 1	< 5	955	15	45	10	10	<0.05	0.30	100.63
K32063 Granite - Diorite	49.36	23.25	4.78	11.27	1.80	4.21	1.00	0.27	0.06	0.08	140	< 10	< 2	13	< 30	< 1	25	365	< 5	100	20	30	<0.05	2.19	98.28
K32064 Silica Dep	95.20	1.10	0.45	0.25	0.21	0.17	0.16	0.03	<0.01	<0.02	20	< 10	6	< 1	< 30	< 1	< 5	770	10	35	10	10	<0.05	0.21	97.81
K32065 Traprock	57.04	11.92	16.72	5.18	1.94	3.92	1.30	1.68	0.21	0.24	440	200	46	32	< 30	1	20	380	20	155	40	95	<0.05	0.71	100.84
K32066 Silica Dep	92.27	2.46	1.12	0.15	0.29	0.87	0.30	0.06	0.01	<0.02	30	< 10	< 2	< 1	< 30	< 1	25	800	10	40	15	20	<0.05	0.28	97.82
K32067 Silica Dep	96.72	1.71	0.85	0.03	0.25	0.04	0.54	0.02	<0.01	<0.02	40	30	< 2	< 1	< 30	< 1	< 5	845	< 5	80	5	20	<0.05	0.39	100.56
K32068 Traprock	51.59	14.00	10.71	8.33	7.50	3.64	0.58	0.64	0.17	0.08	260	60	22	32	< 30	< 1	95	320	70	215	50	100	<0.05	2.33	99.56
K32069 Traprock	46.02	14.34	19.65	7.49	4.62	3.00	1.18	2.14	0.21	0.10	200	40	10	35	< 30	< 1	125	275	300	1185	85	150	0.05	1.49	100.23
K32070 Traprock	51.61	15.37	14.10	7.87	4.70	3.00	1.26	0.98	0.18	0.14	240	90	16	29	< 30	< 1	55	270	215	455	70	120	<0.05	1.50	100.70
K32071 Diorite	47.38	25.18	6.04	9.91	3.19	3.31	1.88	0.33	0.08	0.06	230	40	6	11	< 30	< 1	10	210	< 5	105	20	45	<0.05	2.07	100.44

SEP 20 '95 13:26 TSL-ASSAYERS

TSL/95

SIGNED :

Swastika Laboratories,
1 Cameron Avenue,
Swastika, Ontario
P0K 1T0

Attention: Ghislain Lebel

REPORT #S-15551

RE: ANALYSIS OF CRUSHED ROCK SAMPLES
FOR LEACHABLE TOXIC METALS
AS PER ONTARIO REGULATION 347, SCHEDULE 4

July 24, 1997

Signed

Mamdouh A. Salib, Ph.D.,C.Chem
Analytical Specialist

TSL PROFESSIONAL SERVICES
1270 FEWSTER DRIVE, UNIT 3
MISSISSAUGA, ONTARIO
L4W 1A4
TEL: (905) 602-5280 FAX: (905) 629-7937
DIVISION OF CAMBRIDGE MATERIALS TESTING LIMITED

REPORT #S-15551

RE: ANALYSIS OF CRUSHED ROCK SAMPLE
FOR LEACHABLE TOXIC METALS
AS PER ONTARIO REGULATION 347, SCHEDULE 4

1.0 INTRODUCTION

On July 11, 1997, TSL Professional Services received three (3) crushed rock samples for analysis of Leachable Toxic Metals as per Ontario Regulation 347, Schedule 4.

The samples received by the laboratory were identified as:

Sample #1 - #K1407 (7W-2736-RA1)
Sample #2 - #K1408 (7W-2736-RA1)
Sample #3 - #K1409 (7W-2736-RA1)

2.0 RESULTS OF ANALYSIS

The submitted samples were leached under controlled pH condition and the leachate were then analysed for metallic constituents using an ICAP Plasma Spectrometer and Hydride generation technique and the results obtained are detailed in a separate report attached hereto.

Note: The results of leachate analysis were compared with the Ontario Regulation 347, schedule 4, Leachate Quality Criteria for listed metals, which are as follows.

2.0 RESULTS OF ANALYSIS (CONT)

	Sample #1 #K1407 mg/L	Sample #2 #K1408 mg/L	Sample #3 #K1409 mg/L	Schedule 4 Leachate Criteria mg/L
Arsenic	<0.01	<0.01	<0.01	0.05
Barium	<0.03	<0.03	0.10	1.0
Boron	<0.5	<0.5	<0.5	5.0
Cadmium	<0.005	<0.005	<0.005	0.005
Chromium	<0.02	<0.02	<0.02	0.05
Lead	<0.05	<0.05	<0.05	0.05
Mercury	<0.001	<0.001	<0.001	0.001
Selenium	<0.01	<0.01	<0.01	0.01
Silver	<0.05	<0.05	<0.05	0.05
Cyanide (Free)	<0.1	<0.1	<0.1	0.2
Fluoride	<0.1	<0.1	<0.1	2.4

REMARKS

As indicated by the results of leachate analysis all toxic metals listed in the schedule 4 are within the leachate criteria for the analysed samples.

TSL PROFESSIONAL SERVICES

G-15551

I.C.A.P. PLASMA SCAN

Compositional Analysis of Crushed Rock Samples
(Leaching Test as per Ontario Regulation 347)

Element		Sample #1 #K1407 mg/L	Sample #2 #K1408 mg/L	Sample #3 #K1409 mg/L	LDL* mg/L
Aluminum	(Al)	<0.1	<0.1	<0.1	0.1
Barium	(Ba)	<0.03	<0.03	0.10	0.03
Beryllium	(Be)	<0.005	<0.005	<0.005	0.005
Boron	(B)	<0.5	<0.5	<0.5	0.5
Cadmium	(Cd)	<0.005	<0.005	<0.005	0.005
Calcium	(Ca)	13.5	6.0	3.0	0.50
Chromium	(Cr)	<0.02	<0.02	<0.02	0.02
Cobalt	(Co)	<0.01	<0.01	<0.01	0.01
Copper	(Cu)	<0.02	<0.02	<0.02	0.02
Iron	(Fe)	<0.1	1.3	<0.1	0.1
Lead	(Pb)	<0.05	<0.05	<0.05	0.05
Magnesium	(Mg)	3.90	2.30	0.95	0.03
Manganese	(Mn)	0.14	0.20	0.08	0.01
Molybdenum	(Mo)	<0.02	<0.02	<0.02	0.02
Nickel	(Ni)	<0.02	<0.02	<0.02	0.02
Phosphorus	(P)	<0.1	<0.1	<0.1	0.1
Potassium	(K)	<5.0	15	10	5.0
Silver	(Ag)	<0.05	<0.05	<0.05	0.05
Sodium	(Na)	2.0	1.5	23.0	0.50
Strontium	(Sr)	0.04	0.02	0.02	0.01
Titanium	(Ti)	<0.02	<0.02	<0.02	0.02
Vanadium	(V)	<0.02	<0.02	<0.02	0.02
Zinc	(Zn)	<0.02	<0.02	<0.02	0.02
Zirconium	(Zr)	<0.2	<0.2	<0.2	0.2
Arsenic	(As)	<0.01	<0.01	<0.01	0.01
Mercury	(Hg)	<0.001	<0.001	<0.001	0.001
Selenium	(Se)	<0.01	<0.01	<0.01	0.01
Free Cyanide	(CN)	<0.1	<0.1	<0.1	0.1
Fluoride	(F)	<0.1	<0.1	<0.1	0.1

Note: LDL* = Lower Detection Limit

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Crushed Stone/Aggregate Production and Sales In Canada & the United States

A Market Research Study

April 1996

Preliminary Report

Prepared by: Bryan Wareing - Wareing Associates

Crushed Stone/Aggregate Production and Sales

In Canada & the United States

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Crushed Stone/Aggregate Production and Sales

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In early March, 1996 Wareing Associates was contracted by Mr. Gino Chitaroni (Target Geological Services) to research the potential market for crushed stone, aggregate and related products pertaining to a proposed Nippissing Diabase quarry/mine in Northeastern Ontario. This study is being conducted at three levels:

1. A general scoping of the market to determine size, range, producers, number of quarries involved, value of goods shipped (Canadian and U.S.).

2 A more detailed examination of the above and expansion of data/information to determine market growth or decline, product categories, product uses, direct contact with producers and purchasers, potential for new or redesigned products.

3. Where potential exists, the development of prospect lists, acquisition of product standards/tests where available and where possible projections of market growth.

All three levels are being run concurrently and as contacts and information sources are developed more detail is being added at each level, except the first, general scoping.

There is a fourth level which can be added should the potential be perceived for the development of the project and that is the development of a marketing and sales strategy to be combined with an engineering study to become a feasibility study/prospectus for seeking investment and financing. This is separate from the initial marketing study.

Special Note: The U.S. Bureau of Mines statistics show a clear designation of Traprock as a specific category. This allows a reasonably accurate analysis of the U.S. market. Conversely, Canadian statistics do not separate out Traprock specifically but include this category with all other igneous rocks under the general heading of Granite. Thus, in order to estimate a market for the Traprock category in Canada an extrapolation using U.S. statistics is required.

Preliminary Findings

1. Scope

It should be noted that information supplied by the U.S. Bureau of Mines in relation to the product categories and uses of the various forms of crushed rock, trap rock etc., is considerably more refined and detailed than that of any Canadian government sources, e.g. Department of Natural Resources (DNR) and Statistics Canada. This means that Canadian statistics will tend to seem sparse when compared to U.S. data. Canadian data sources make considerable use of the category "Other Uses" without definition even although this may be a category comprising the largest quantities of use.

1.1 Definition of Traprock

The term "Traprock" cannot usually be found in any Canadian statistics neither is "Diabase" a recorded category. Conversely the U.S. Bureau of Mines (now the U.S. Geological Survey) does list traprock in its statistics as a measurable category. In Canada, however, this category of rock is bundled in with others under the more general heading of "Crushed Stone - Granite." .

Definition: From a Report published by the U.S. Bureau of Mines,"Overview: Crushed Stone: United States and the World - 1993" authored by Valentin Tepordei - crushed stone commodity specialist.

Gabbro, Diabase and Basalt are dark-colored igneous rocks, low in silica content and are commonly called traprock.

1.2 Narrowing the Focus of Search

In order to focus on markets in which diabase traprock would likely find a niche, either with direct products or as a substitute for existing ones, it was necessary to examine all uses of quarried stone, mine rock piles, gravel pits, etc. In addition to the use of rock, crushed or otherwise, there is also the use of smelter slags in some applications, most notably steel and nickel slags in railroad ballast, fill, road metal as well as some specialized asphalt and concrete products. Thus eliminating those applications in which diabase would not fit because of obvious structural or mineral and chemical characteristics.

1.3 Defining the Focus - Clearly identified areas of use

Most, although not all, crushed, broken and pulverized stone use categories would allow diabase to be substituted for the more common varieties such as limestone, granite and sandstone. **Key to that substitution will be in the chemical and structural characteristics defining the use.**

Given the above, areas of possible/probable use include;

Most of the aggregates for concretes and asphalt products if able to match or exceed required specifications.

Road metal, road base, fill and municipal or rural road construction

Housing and commercial site development e.g Single family dwelling development consumes about 300 tonnes of crushed stone per unit versus an apartment complex which consumes about 50 tonnes/unit. (Included in these numbers are all roadway developments, concrete products for basements and building supplies.)

Riprap and Jetty Stone

Railroad Ballast

The U.S. Bureau of Mines defines the uses of traprock as follows;

Coarse Aggregate > 1.5 inches
Macadam
Riprap & Jetty Stone
Filter Stone
Other Coarse Aggregate

Fine Aggregate < 3/8 inches
Stone sand, concrete
Stone sand, bituminous mix or seal
Screening, undesignated
Other fine aggregates

Special
Asphalt fillers and extenders
Other fillers and extenders
Other uses - not listed

Coarse Aggregate - Graded
Concrete Aggregate Coarse
Bituminous Aggregate - Coarse
Bituminous Surface treatment aggregate
Railroad Ballast
Other Grade Coarse Aggregate

Coarse & Fine Agrregate
Graded round base or sub-base
Terazzo & exposed aggregate
Crusher run or fill or waste
Unpaved road surfacing
Other coarse and fine aggregates
Roofing granules
Other consruction materials and pipe bedding

Unspecified

It would appear that diabase products could be inserted into any of the above markets provided that specifications are met or exceeded.

Amount of Traprock used in the U.S. - 1994: 91 million tonnes

Value of Traprock sold in the U.S.- 1994: $ 576 million

Average value per metric tonne sold - $ 6.3 U.S. / metric tonne
(See Chart 1 - Traprock Product Uses in the U.S. - 1994)

Traprock Sold as a percentage of all Crushed Stone Sold in the U.S. - 1994

Total of Crushed Stone Sold in U.S. 1994 - 1.23 billion tonnes

Traprock Sold in the U.S. 1994 - 91 million tonness

Traprock Sold as a percentage of all Crushed Stone - 7.4 %

Determining comparative Canadian Statistics

First, Canadian Statistics are complete only to 1993 and second, Traprock is not distinguished as a separate category in these numbers. Where comparison is made with the U.S.it is by extrapolation and this can only be regarded as speculative.

Chart 3 A shows Shipments of Stone From Canadian Quarries by kind of stone in 1993

Chart 3 B shows Shipments of Stone from Canadian Quarries by use of stone in 1993.

In neither case does Traprock show as a category which lends credence to the suggestion that the market for Traprock in Canada will be by substitution and/or special use characteristics.

Total Shipments of Stone from Canadian Quarries - 1993 104,369 kilotonnes

Total Shipments by use designated as Crushed Stone - 1993 81,468 kilotonnes

In addition to Crushed Stone two other categories might be added - Pulverized Stone & Miscellaneous

Pulverized Stone - 1842 kilotonnes

Miscellaneous Stone - 2843 kilotonnes

Combining these numbers to estimate total Crushed, Broken, Pulverized and similar stone shows the following:

Percentage of Stone Sold that is Broken, Pulverized or Crushed or similar - 83 %

To determine a market scope for Traprock in Canada we can use the 7% factor derived from U.S. figures. This suggests that the Canadian Market could reasonably sustain sales of about 6 million tonnes per year, but this could grow substantially with active marketing and the development of special use products. Substitution within most granite and some limestone and sandstone markets can be achieved.

1.4 Rock Types Predominating the Crushed Stone Markets

The Report " Overview: Crushed Stone: United States & theWorld - 1993" indicates that of all the crushed stone produced 75% of it is Limestone and Dolomite followed by Granite, Traprock, Sandstone and quartzite, miscellaneous stone, calcareous marl, shell, marble, volcanic cinder and scoria, and slate, in order of volume.

In Canada, Limestone and Dolomite also are predominant but in the absence of a category for Traprock these two are followed by Granite, Sandstone then the others, in order of volume.

In Canada, the reporting of Granite volumes and values includes all igneous rocks so it would be safe to assume that Traprock is buried somewhere within these numbers. Therefore it would be reasonable to conjecture that anywhere Granite is used as Crushed Stone so it may be possible to substitute Traprock.

Uses of Crushed Stone (Granite only) in Canada

Chart 4 shows the various uses to which Granite, crushed, broken or pulverized, is applied. In 1992 almost 19 million tonnes was sold and in 1993, 17.7 million. The bulk of sales occurred in

Crushed Stone -

concrete aggregate 1992 - 956 kilotonnes & 1993 - 758 kilotonnes;

asphalt aggregate 1992 - 3,010 kilotonnes & 1993 - 3,340 kilotonnes;

road metal 1992 - 3,586 kilotonnes & 1993 - 4,001 kilotonnes;

railroad ballast 1992 - 1,504 kilotonnes & 1993 - 1,111 kilotonnes;

other uses 1992 - 8,916 kilotonnes & 1993 - 7,476 kilotonnes

While there was an overall decline in sales between 1992 & 1993, particular attention should be paid to the substantial increases in asphalt aggregates and road metal. These increases are indicative of the impact of the government supported infrastructure programs introduced at this time. Government policy and programs with respect to infrastructure renewal will likely have impact on future growth of these markets. Indications are that despite the fiscal restraints infrastructure revitalization and development will, of necessity, be key areas of growth, in Canada and in the U.S.

1.5 Canada's Exports and Imports of Crushed Stone

The Category of Crushed Stone is defined: SIC Code 2517.10 -Pebbles, gravel, broken or crushed stone used for aggregates, etc.

Exports

In 1992 Canada exported 19.8 million tonnes of crushed stone. In 1993 it exported just over 2 million tonnes and in 1994 again just over 2 million metric tonnes.

The bulk of those exports are to the U.S. which in 1992 accounted for 94%, 1993 - 99.5% and in 1994 - almost 100%.

Exports to countries other than the U.S., mostly the Caribbean have been declining or ceased, those to the U.S have been increasing, 1992-1993 by 6.6% and 1993 - 1994 by 3.1%. This growth in exports to the U.S. is consistent with a prediction in the earlier mentioned Overview Report of a 5% per annum growth in this market.

Concurrent with the sales growth has been an increase in value per metric tonne, 1992 - $ 5.8, 1993 - $ 7.5 and 1994 - $ 8.5.

See Chart 5 - Canadian Exports of Crushed Stone

Imports

The bulk of the imports are from the U.S. which in 1992 were 910 kilotonnes, 1993 - 948 kilotonnes and declined in 1994 to 630 kilotonnes.

Imports from Germany have increased over the three years rising from 379 tonnes in 1992 to 2,342 tonnes in 1994. There has been an increase in imports from France which shipped just over 430 tonnes in 1992 & 1993 then 800 tonnes in 1994. Between the years 1992 and 1993 Belgian shipments showed a decrease from 363 tonnes down to 267 tonnes which then jumped in 1994 to 526 tonnes. Shipments from other countries, not designated, have fluctuated from a high of 1049 tonnes in 1992, down to 94 tonnes in 1993 and up to 723 tonnes in 1994.

See Chart 6 - Canadian Imports of Crushed Stone 1992-1994

1.6 Elimination of Product Categories where Diabase will not likely fit.

It is reasonably clear that any diabase product will be entering markets which already exist for crushed rock products. To be successfilly inserted it will have to be shown that diabase in all its product forms gives the user some advantage, be it price, quality, chemical and physical characteristics, long life and so on. However, there are some areas where diabase will clearly not fit for a variety of reasons. To better assess the true market potential we have attempted to address those markets to eliminate them. There are, too, some grey areas where substitution may occur so that this list may not yet be complete.

Limestone & Dolomite Products

While these rocks are used extensively in the crushed rock market, particularly in aggregates for both the concrete and asphalt product markets their main value lies in their high calcerous content. Thus, for most of the products that require a high calcium content diabase will not satisfy those requirements. Such product categories will include:

Any Lime Products	Most Chemical & metallurgical	Flux - Iron & Steel
Glass	Pulp & paper	Sugar Refineries
Linings for Furnaces (?)	Dimension Stone	

Pulverized Stone: Whiting (substitute)

Agricultural purposes where a high Calcium content is essential e.g. poultry grit

Filter Stone where sulphur removal/absorption is a criteria

Granite Products

Dimension Stone only

Sandstone Products

Dimension Stone Glass Products

Special Note - Dimension Stone: In 1993 this author did considerable market research for a Northern Ontario Mining Company to examine the potential for the production of Nippissing Diabase as a source of dimension stone/architectural stone. The results were such that the Company proceeded to bulk testing of various sites only to find that it was virtually impossible to obtain large unfractured blocks. While smaller block production for such as tiles, flagstone, curbstone and paving block production may have been possible, given the initially high capital investment to develop the quarries and set up a production plant, the project was abandoned.

Dimension Stone is a relatively small market in Canada when compared to all Crushed Stone

1.7 Markets Available for the Industry

Almost All Aggregate Products:

Concrete aggregate
Road metal
Other uses
Asphalt aggregates
Railroad Ballast

Miscellaneous Stone Products:

Artificial Stone
Some Poultry Grits
Terrazo Chips
Rubble and Riprap
Roofing Granules
Stucco Dash
Rock Wool
Other uses

Pulverized Stone Products:

Asphalt Filler
Some Fertilizer Products
Some Agricultural Purposes

Chemical & Metallurgical Products

Flux in non-ferrous smelters

2. The Competition in General

"The importance of mineral aggregates to the economic competiveness of Canada's urban areas is gaining increasing recognition."

"Demand for mineral aggregates is mainly local or regional and is influenced to a major degree by trends in domestic construction. However, in some populated regions, markets are not self sufficient as evidenced by their reliance on shipments from other areas. In addition, international bulk shipping of aggregates has increasingly been proven to be feasible.

" Urban expansion has greatly increased the demand for aggregates in support of major construction. Paradoxically, urban spread has not only tended to overrun operating pits and quarries, but also has extended into areas containing potentially valuable reserves and resources."

" Sand and gravel will continue to be competitive with crushed stone in some ares and, in some locations, with lightweight aggregates. .....

Estimates suggest that available sand and gravel supplies in some regions will be depleted during the 1990s."

" Prices for aggregates will continues to rise with increasing land values, more sophisticated operating techniques and equipment, the depletion of more accessible reserves and the added rehabilitation expenditures"

(Oliver Vogt, Natural Resources Canada in Canadian Mineral Year Book -1994 - Mineral Aggregates)

Lightweight Aggregate Producers in Canada

Lightweight aggregates include: Vermiculite, pumice, perlite, expanded shale, expanded clay and some slags. While most of these products are used in agriculture and horticulture some are used in concrete products and as loose insulation while slag and expanded clay are used almost exclusively in the concrete products industry. Vermicultite also finds use in friction materials.

Atlantic Canada

Annapolis Valley Peat Moss Company Limites	Berwick, Nova Scotia	Vermiculite
Avon Aggregates Ltd.	Minto, New Bruswick	Expanded shale
Fafard Peat Moss Company Ltd.	Shippagan, New Brunswick	Perlite, Vermiculite
Sun Gro Horticulture Inc	Maisonnette, NB	Perlite

Quebec

Miron Inc	Ville St-Laurent	Pumice
Premier Peat Moss Ltd.	Riviere-du-Loup	Perlite, Vermiculite
Vermi-lite Inc	Baie-du-Febvre	Perlite

Ontario

National Slag Limited	Hamilton	Slag
V.I.L. Vermiculite Inc.	Woodbridge	Vermiculite
W.R. Grace & Co. of Canada	ST. Thomas Ajax	Vermiculite Vermiculite, perlite

Prairie Provinces

Cindercrete Products Limited	Saskatoon, Sask Regina, Sask.	Expanded clay Expanded clay
Inland Cement Limited	Calgary, Alta Edmonton, Alta	Expanded shale Expanded clay
Kildonan Concrete Ltd.	Winnipeg, Man	Expanded clay
Sun Gro Horticulture Inc	Elma, Man	Perlite
Sun Gro Horticulture Inc.	Seba Beach, Alta	Perlite
W.R. Grace & Co. of Canada	Winnipeg, Man Edmonton, Alta.	Vermiculite, perlite Vermiculite, perlite

British Columbia

Ocean Construction Supplies Ltd.	Vancouver	Pumice
W.R. Grace & Co. of Canada	Vancouver	Vermiculite, perlite

In 1994 Canada imported 12, 738 tonnes of pumice (crude or crushed) at a value of $ 127/tonne.

In 1994 Canada imported 3,830 tonnes of other pumice stone at a value of $ 221/tonne

Also imported: Vermiculite (unexpanded) - 17,516 tonnes @ $ 18.6/tonne
Perlite (unexpanded) - 37,605 tonnes @ $ 134/tonne; Perlite (expanded) - 5150 tonnes @ $ 622/tonne.

Sand & Gravel

Just about every municipality, county, province/state departments of transport, railroad company, major and minor construction companies own sand and gravel pits. Consequently they can be regarded as part of the competition. With some exceptions, such as glass manufacture, road ice control, morter sand and fill, the products from these pits absorb a considerable amount of the market one would expect to see crushed or broken rock used and neither are the quantities used small.

Available data on consumption of sand and gravel for the years 1992 & 1993

The data shows that with some minor exceptions the amounts used in both 1992 and 1993 were about the same.

The total of sand & gravel used in each year was close to 240 million tonnes

Just over half went to the construction of road bed and surface - 143 million tonnes

Of the rest:

Concrete aggregate - 27 million tonnes Asphalt aggregate - 16 million tonnes

Railroad ballast - 6 million tonnes in 1992 & 461 kilotonnes in 1993

Backfill for mines - 1 million tonnes Fill - 17-20 million tonnes

While another 20 million tonnes went to other purposes (probably a combination of both sand and gravel uses) the rest went to specific uses for sand, silicates, quartz etc.

It should be noted that all of the major national and international cement producers and some of the major asphalt producers also own their own quarries and pits. It should be also noted that the reserves of these companies are generally close to the larger urban centres where environmental regulations and urban sprawl are placing them in jeopardy both in Canada and the U.S.

Crushed Stone/Traprock Producers - U.S. & Canada

In Canada producers of Traprock cannot be singled out from other Crushed Stone producers because all igneous rocks are reported under the general heading of Granite. Thus Granite quarries can be assessed to be the main competitive areas. At this point we have not pinned down ownership completely for all Crushed stone producers, although we are actively pursuing this line of enquiry. We do, however, have an idea of the magnitude of the competition as some of the following charts show.

In reporting U.S. data we are in better shape in that Traprock is shown as a distinct category. We have recognized that the true ownership of many of the companies in both the U.S. and Canada is more difficult to ascertain as may are owned or part owned by major conglomerates. This line of enquiry we are still pursuing.

Chart 7 - Stone Quarries in Canada - 1993, shows the active quarries by rock type, by province.

Chart 8 - Traprock Sold or used by Producers in the U.S. by State , shows the following:

States Reporting Sales or Use of Traprock in excess of 10 million tonnes
States Reporting Sales or Use of Traprock - no amounts disclosed
States listed as neither Seliing nor Using Traprock
The Rank Order of Leading U.S. Producers

Chart 9 - Type of Crushed Stone Produced - by State - 1994

Comments on Canadian Producers

The closest rival in this market must be recognized as **Ontario Trap Rock Limited** - Bruce Mines, Ontario. While they are listed as a Canadian Company we know that they have been financed and supported by U.S. interests. Their customers in Canada include CP Rail, Ontario Ministry of Transport, possibly the Toronto Transit Commision (Railway Ballast) and in the U.S. Wiscconsin Central Railway (Ballast) and the U.S. Corps of Engineers (Riprap). Currently they are revitalizing a harbour facility on Lake Huron and they also ship to Thessalon and to Sault Ste Marie, Ontario for shipment on the Great Lakes. Their product is Basalt/Nippissing Diabase of which they have an estimated reserve of 100 million tonnes. They appear to have satisfied Ontario and other jurisdictions of the HL 1 standard of their product and may now be certified to produce DFC aggregate for use in high traffic wear asphalts and also in a variety of high strength concretes. **They are very marketing and product development oriented.**

We do know of other producers in Ontario such as 3M, Armbro, Dufferin Aggregates (St.Lawrence Cement) but as yet have not been able to pull data on these operations. Dufferin Aggregates appears to be mainly into the production of Limestone/dolomite for the cement industry.

Railroad Ballast

Railroad Ballast is drawn from a variety of crushed stone and gravel sources. Currently Ontario Northland takes its stone from the Adams Mine site in Kirkland Lake using about 40,000 tonnes per year at a cost of $ 5 / tonne f.o.b. The product is crushed mine waste. CN Rail contacts gave us a number of 250,000 tonnes per year drawn primarily from their own gravel pits along the routes. We believe this number to be on the low side and may be applicable to the Western Provinces only. CP Rail is purchasing quanities of ballast from Ontario Trap Rock and has obviously elected to use a higher grade ballast with its long life characteristics. We were also informed that CN RAil uses quantities of Nickel Slag in its ballast mix.

Transport & Costs

We have opened up lines of enquiry with respect to transport methods and costs and are currently awaiting responses from suppliers. Thus far:

Chart 10 - Crushed Stone Sold or used in the U.S. - 1994 by Region and Method of Transportation

Ontario Northland Conceptual Quote
- supplied by Mr. Brian Conrad, Manager Pricing & Fleet Logistics

Detinations: Winnipeg - $ 3579.00 Montreal - $ 2333.00 Toronto - $ 2160.00

Volume: 20,000 net tonnes

Minimum Weight: per car

Routing: ONT-NBAY-CNR

Equipment: Gondolas (Open Top)

Conditions - * Subject to availability of equipment
* Rates are exclusive of car loading/unloading, construction or modification to any rail trackage, machinery, equipment or other facilities as may be required at the origin or destination
* Rate application presumes use of existing scheduling in regular train service.
* Rate provided for study purposes. Subject to additional detail becoming available.

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Chart 1. - Traprock Product Uses in the U.S. - 1994

Chart 2. - Traprock Sold or Used in the U.S. - 1993 & 1994

Chart 3 - A - Shipments of Stone from Canadian Quarries, by Kind and Purpose for which used, by Province
B - Continuation of above

Chart 4. - Uses of Crushed Stone (granite only) in Canada

Chart 5. - Exports of Crushed Stone by Canada 1992 - 1994

Chart 6. - Canadian Imports of Crushed Stone 1992 - 1994

Chart 7. - Stone Quarries in Canada - 1993

Chart 8. - Traprock Sold or Used by Producers in the U.S. by State - 1994

Chart 9. - Parts A, B, C - Types of Crushed Stone Produced - by State

Chart 10 - Crushed Stone Sold or Used by Producers in U.S. in 1994 by Region and Method of Transportation

Traprock Product Uses in the U.S.

1994

Uses	Quantity (metric tonnes)	Value ($ '000 U.S.)
Coarse Aggregate, > 1.5 inches		
Macadam	187,000	1,470
Riprap & Jetty Stone	1,370,000	10,300
Filter Stone	649,000	3,980
Other coarse aggregate	1,480,000	9,380
Coarse Aggregate - graded		
Concrete aggregate - coarse	7,150,000	52,200
Bituminous aggregate - coarse	4,860,000	36,300
Bituminous surface-treatment aggregate	21,210,000	14,200
Railroad Ballast	1,860,000	11,100
Other graded coarse aggregate	2,210,000	18.600
Fine Aggregate, < 3/8 inches		
Stone sand, concrete	1,520,000	15,100
Stone sand, bituminous mix or seal	1,570,000	12,800
Sceening, undesignated	2,710,000	15,300
Other fine aggregate	452,000	3,210
Coarse & Fine Aggregates		
Graded round base or sub-base	15,500,000	79,600
Unpaved road surfacing	3,340,000	13,800
Terrazo & exposed aggregate	* Note1	* Note 1
Crusher run or fill or waste	2,810,000	16,600
Other coarse and fine aggregates	4,880,000	37.000
Roofing granules	* Note 1	* Note 1
Other construction materials incl. pipe bedding	3,030,000	25,800
Special		
Asphalt fillers & extenders	NA	NA
Other fillers & extenders	** Note 2	** Note 2
Other uses - not listed	99,000	85,400
Unspecified		
Actual	16,300,000	94,100
Estimated	16,700,000	104,000
Total	**91,000,000**	**576,000**

Notes: 1. * included in "Other construction material, including pipe bedding".
2. ** included with "Other uses -not listed".

Chart 1

Traprock Sold or Used in the U.S.

Year	1993	1994
Number of Quarries	600	591
Quantity (metric tonnes)	87,600,000	91,000,000
Value ($ '000 U.S.)	535,000	576,000
Value ($ '000 Cdn.*)	722,250	777,600
Unit Value (U.S.)	$6.11/metric tonne	$6.33/metric tonne
Unit Value (Cdn)	$8.25/metric tonne	$8.55/metric tonne

Note: * Calcultated on an exchange rate (estimated) of $ 1.00 U.S. = $ 1.35 Cdn.

Source (except for unit value calculations): U.S. Bureau of Mines

Shipments of Stone from Canadian Quarries, by Kind and Purpose for Which Used, by Province

1993

Kind		Newfoundland	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon NWT
1. Granite	kilotonnes	296	3878	2507	7497	1469	366	-	8	1893	196
	$ '000	2188	17046	11299	59049	18583	2597	-	461	13533	1781
2. Limestone	kilotonnes	1579	630	644	25326	43181	2225	-	1640	4673	586
	$ '000	3993	4333	7112	131568	216403	9199	-	12418	27153	2722
3. Marble	kilotonnes	-	-	-	393	321	-	-	-	-	-
	$ '000	-	-	-	8433	9263	-	-	-	-	-
4. Sandstone	kilotonnes	84	1067	95	1930	5	-	-	25	-	-
	$ '000	408	4436	147	12819	1066	-	-	107	-	-
5. Shale	kilotonnes	18	26	108	788	603	93	-	347	20	41
	$'000	78	113	598	3277	1781	32	-	848	170	77
6. Slate	kilotonnes	1	-	-	-	-	-	-	-	-	-
Total	**kilotonnes**	**1979**	**5601**	**3355**	**35934**	**45580**	**2684**	**-**	**2019**	**6386**	**821**
	$ '000	**7430**	**25928**	**19156**	**215095**	**247096**	**11828**	**-**	**13833**	**40856**	**4560**

Shipments of Stone from Canadian Quarries, by Kind and Purpose for Which Used, by Province

1993

		Newfoundland	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon NWT
Uses											
1.Dimension Stone	kilotonnes	x	x	1	148	92	19	x	8	1	x
	$ '000	x	x	130	17347	7157	1363	x	485	192	x
2.Chemical Process	kiltonnes	171	529	277	2982	7953	283	x	1732	3904	x
	$ '000	1031	2353	2315	14847	28145	1568	x	11076	17390	x
3.Pulverized Stone	kilotonnes	x	x	141	543	976	43	x	93	46	x
	$ '000	x	x	2663	10713	11347	568	x	1048	3157	x
4.Miscellaneous Stone	kilotonnes	x	138	105	436	1389	105	x	91	498	81
	$ '000	x	411	683	4534	15719	84	x	991	4538	277
5.Crushed Stone	kilotonnes	1801	4835	2831	31824	35170	2234	x	95	1938	740
	$ '000	5040	21138	13365	168195	184728	8246	x	233	15535	4284

Source: StatsCan - Publication - Cat. No. 26-225

Note 1.: Data includes shipments by producers regardless of industrial classification. Granite includes all igneous rocks, limestone includes dolomite; stone used in the Canadian cement and lime industries is included.

Note 2: A few quick calculations will show a wide variation in price/tonne for different rock categories from province to province. This is likely reflecting the availability of a product in each particular province.

Uses of Crushed Stone (granite only) in Canada

Purpose/Use	1992 Quantity (metric tonnes)	1992 Value ($ '000)	1993 Quantity (metric tonnes)	1993 Value ($ '000)
Misc. Stone:				
Roofing Granules	270,000 ($ 23.4/tonne)	6,352	271,000 ($ 25.2/tonne)	6,837
Rock Wool	18,000 ($ 25.0/tonne)	450	18,000 ($24.4/tonne)	440
Other Uses (Misc. Stone)	521,000 ($ 3.6/tonne)	1,899	378,000 ($ 4.6/tonne)	1,737
Rubble & Riprap	126,000 ($ 5.2/tonne)	659	334,000 ($ 7.4/tonne)	2,485
Crushed Stone:				
Concrete aggregate	956,000 ($ 6.4/tonne)	6,104	758,000 ($ 6.3/tonne)	4,766
Asphalt aggregate	3,010,000 ($ 6.17/tonne)	18,853	3,340,000 ($ 5.9/tonne)	19,784
Road metal	3,586,000 ($ 4.9/tonne)	17,712	4,001,000 ($ 5.2/tonne)	20,833
Railroad ballast	1,504,000 ($ 8.6/tonne)	12,909	1,111,000 ($ 9.5/tonne)	10,594
Other Uses (Crushed Stone)	8,916,000 ($ 4.4/tonne)	39,578	7,476,000 ($ 5.3/tonne)	39,512

Source: Statistics Canada

Exports of Crushed Stone by Canada 1992 - 1994

Categories: SIC Code 2517.10 Pebbles, gravel, broken or crushed stone used for aggregates etc.

Market	1992 tonnes	($ '000)	1993 tonnes	($ '000)	1994 tonnes	($ '000)
United States	1,866,513	10,853	1,991,839	14,997	2,052,322	17,740
	($ 5.8/tonne)		($ 7.5/tonne)		($ 8.5/tonne)	
Bermuda	25,395	215	15,296	138	4,705	53
	($ 8.46/tonne)		($ 9.02/tonne)		($ 11.26/tonne)	
Taiwan	0		79	8	0	
			($ 101.12/tonne)			
Antigua	0		1,800	10	0	
			($ 5.5/tonne)			
St. Lucia	12,814	265	0		0	
	($ 20.6/tonne)					
St.Vincent/Granada	25,867	512	0		0	
	($ 19.79/tonne)					
Bahamas	27,312	397	0		0	
	($ 14.53/tonne)					
Other Countries	184	50	0		85	25
	($ 271.7/tonne)		0		($ 294.11/tonne)	

Source: Statistics Canada

Chart 5

Canadian Imports of Crushed Stone 1992-1994

Categories: SIC Code 2517-10 Pebbles, broken or crushed stone used for aggregate etc.

Source Country	1992 Tonnes	1992 ($ '000)	1993 Tonnes	1993 ($ '000)	1994 Tonnes	1994 ($ '000)
United States	910,550	6,948 ($ 7.6/tonne)	948,181	7430 ($ 7.8/tonne)	629,825	6,692 ($ 10.6/tonne)
Germany	379	5 ($ 13.2/tonne)	1,081	15 ($ 13.9/tonne)	2,342	20 ($ 8.75/tonne)
France	433	6 ($ 13.8/tonne)	437	6 ($ 13.7/tonne)	800	11 ($ 13.75/tonne)
Belgium	363	5 ($ 13.7/tonne)	267	4 ($ 15.0/tonne)	526	4 ($ 7.6/tonne)
Other Countries	1049	17 ($ 16.2/tonne)	94	5 ($ 53.19/tonne)*	723	9 ($ 12.4/tonne)
U.S. shipments Avg/tonne		$ 7.6		$ 7.8		$ 10.6
Overseas shipments		$ 14.22		$ 14.2 * excludes anomaly		$ 10.6

Source for base data: Statistics Canada

Stone Quarries in Canada - 1993

SIC Code	Type	Nfld	N.S.	N.B.	Queb	Ont	MB.	Sask.	Alberta	B.C.	Total
081	Granite	-	1	3	17	-	-	-	-	2	23
0812	Limestone	3	2	2	39	27	2	-	-	4	79
0814	Sandstone	-	2	-	4	-	-	-	-	-	6
0813	Marble	-	-	-	4	-	-	-	-	-	4

Source: Statistics Canada

Notes: 1. Small operators, local gravel pits and specialized stone sources are **not listed**.

2. The lack of granite quarries in Ontario appears to be a missing item. However much of the granite produced in Ontario appears to be secondary, (e.g. Rock piles at the Adams Mine Site in Kirkland Lake) or from small local operations.

Traprock Sold or Used by Producers in the U.S. by State

1994

States Reporting Sales or Use of Traprock in excess of 10 million tonnes per State

New Jersey - 10.6 million metric tonnes

Oregon - 15.2 million metric tonnes

Virginia - 12.7 million metric tonnes

Washington - 10.7 million metric tonnes

States Reporting Sales or Use of Traprock but did not disclose amounts - (to avoid disclosing propriety company data)

Arizona	Minnesota	New Mexico	Wisconsin
Arkansas	Montana	Oklahoma	
Maine	Nevada	Rhode Island	
Maryland	New Hampshire	Texas	

States listed as neither Selling nor Using Traprock

Alabama	Kentucky	South Dakota	Wyoming
Colorado	Louisiana	Tennessee	
Georgia	Missouri	Utah	
Illinois	Ohio	Vermont	
Kansas	South Carolina	West Virginia	

The Rank Order of the Leading U.S Producers by Tonnage (Trap Rock only considered)

Company	Active Quarries	States
Vulcan Mareias Co.	26	Texas, Virginia
Luck Stone Corp.	13	Virginia
Stavola Inc/Traprock Ind	5	New Jersey
Meridian Aggregates	4	Montana, Washington

Notes: 1. The Top Four States plus Hawaii or California accounted for 60.9% of total U.S output.

2. Traprock was produced by 265 companies at 379 operations with 591 quarries in 27 States.

Source: U.S. Bureau of Mines

Type of Crushed Stone Produced - by State - 1994

State	Limestone	Dolomite	Marble	Marl	Shell	Granite	Traprock	Sandstone	Quarzite	Slate	Volcanic Cinder & Scoria	Misc
Albama	*	*	*			*				*		
Alaska						*	*	*		*		*
Arizona	*		*			*	*	*	*		*	*
Arkansas	*	*				*	*	*				*
California	*	*				*	*	*	*	*	*	*
Colorado	*					*		*			*	*
Connecticut	*	*				*	*					
Florida	*	*		*	*							
Georgia	*		*	*		*			*			
Hawaii	*						*				*	*
Idaho	*				*	*	*		*		*	*
Illinois	*	*										*
Indiana	*	*										
Iowa	*	*										
Kansas	*							*	*			
Kentucky	*							*				
Louisiana					*			*				*
Maine	*			*		*	*			*		*
State	Limestone	Dolomite	Marble	Marl	Shell	Granite	Traprock	Sandstone	Quarzite	Slate	Volcanic Cinder & Scoria	Misc

Chart 9 A

Type of Crushed Stone Produced - by State - 1994

State	Limestone	Dolomite	Marble	Marl	Shell	Granite	Traprock	Sandstone	Quarzite	Slate	Volcanic Cinder & Scoria	Misc
Maryland	*					*	*	*				*
Massachusets	*	*				*	*					*
Michigan	*	*		*			*	*				*
Minnesota	*	*				*	*	*	*			
Mississippi	*			*								
Missouri	*	*				*		*				
Montana	*					*	*	*	*		*	*
Nebraska	*											
Nevada	*	*				*	*				*	*
New Hampshire	*					*	*					
New Jersey	*					*	*	*				*
New Mexico	*					*	*	*	*		*	*
New York	*	*	*			*	*	*		*		
North Carolina	*	*		*		*	*	*		*		
Ohio	*	*						*				
Oklahoma	*	*				*	*	*		*		*
Oregon	*				*							
Pennsylvania	*	*	*			*	*	*	*			*

State	Limestone	Dolomite	Marble	Marl	Shell	Granite	Traprock	Sandstone	Quarzite	Slate	Volcanic Cinder & Scoria	Misc

Type of Crushed Stone Produced - by State - 1994

State	Limestone	Dolomite	Marble	Marl	Shell	Granite	Traprock	Sandstone	Quarzite	Slate	Volcanic Cinder & Scoria	Misc
Rhode Island	*					*	*					
South Carolina	*		*	*		*						
South Dakota	*								*			*
Tennessee	*	*				*		*				*
Texas	*	*	*			*	*	*			*	*
Utah	*	*						*	*		*	
Vermont	*	*	*			*			*	*		
Virginia	*	*				*	*	*	*	*		*
Washington	*	*	*			*	*	*			*	*
West Virginia	*	*						*				
Wisconsin	*	*				*	*	*	*			
Wyoming	*		*			*			*		*	*

Source: U.S. Bureau of Mines

Crushed Stone Sold or Used by Producers in the U.S. in 1994

By Region and Method of Transportation

Region	Truck	Rail	Water	Other	Not Transported	Not Specified	Total
Northeast:							
New England	9,450,000	491,000	(2)	(2)	2,220,000	13,900,000	26,100,000
Middle Atlantic	80, 300,000	1,700,000	3,810,000	719,000	15,200,000	34,200,000	136,000,000
Midwest:							
East North Central	99,200,000	6,180,000	26,500,000	915,000	13,300,000	83,800,000	230,000,000
West North Central	59,500,000	2,130,000	7,490,000	7,000	11,000,000	70,200,000	150,000,000
South:							
South Atlantic	138,000.000	14,200,000	4,240,000	153,000	21,100,000	115,000,000	293,000,000
East South Central	78,400,000	3,530,000	12,500,000	1,460,000	9,170,000	34,200,000	140,000,000
West South Central	67,000,000	21,000,000	2,400,000	4,190,000	11,300,000	24,000,000	130,000,000
West:							
Mountain	14,400,000	4,180,000	(2)	1,450,000	2,350,000	13,400,000	35,800,000
Pacific	34,900,000	1,470,000	370,000	10,560,000	5,300,000	35,100,000	87,000,000
Totals	582,000,000	54,900,000	57,300,000	19,000,000	91,000,000	424,000,000	1,230,000,000

Notes: 1. Figures have been rounded so totals will not be exactly as shown.
2. (2) Values too insignificant to be expressed.
3. No means of transportation was reported by producers for 424 million tonnes or 34.5% of the total 1.23 billion tonnes of crushed stone in 1994. Of the balance, 72,2% was reported as transported by truck from the processing plant or quarry to the first point of sale or use, 6.8% by rail and 7.1% by waterway. About 11.3% of total production was reported as transported and therefore used on-site.

Source: U.S. Bureau of Mines

2.19167

Operational Cruise

Point Sample

Blackstone Development Inc.

June 16, 1997

Prepared By:

BOREAL RESOURCES INC.

P.O. Box 100, Elk Lake, Ontario, POJ 1GO
Phone: (705) 678-2244 Fax: (705) 678-2422

On June 16, 1997 an operational cruise, using the point sample method, was completed for Blackstone Development Inc. in [redacted]s Twp. on mining claims 1118527 and 1212011 at the site of the "Traprock Project. As there were no Forest Resource Inventory maps available of the area it was determined to cruise the area as a single "stand". Compilation of cruise data was completed using *Plonski Volume Tables* and *Morowskis Cull Survey Tables.* Weights are based on OMNR conversion factors. Volumes are estimates only and should not be construed as exact figures. Area calculation were derived from estimates provided by client (ie. the area of interest being approximately 800m x 700m or 56 ha). Field notes have been included for your records. The following is a summary of OPC cruise data and field observation.

Block Information:

Traprock Project Site

Block Descriptions:

Stand Net Volume - m3:

Jack Pine	3680.73
Black Spruce	254.17
Trembling Aspen	782.14
White birch	173.12

NMV	**4890.16m3**

Stand Net Volume - (tonnes):

Jack Pine	2974.02
Black Spruce	193.93
Trembling Aspen	718.00
White birch	184.02

NMV	**4069.97 tonnes**

Merchantable timber on this block is limited to the Jack Pine. Most other species are not of merchantable size with the exception of scattered Poplar and Black Spruce. Volumes indicate all trees measured. However all trees measured may not necessarily reflect those which will meet local mill requirements. A review of the detailed cruise data based on these requirements is recommended. Minimum diameters are based on the final sawmill destination. For example, minimum butt diameters for pulp material are significantly lower than those for sawlog material.

A portion of the available jackpine is located on bedrock with shallow soils. There is evidence of blowdown in areas. Old charred stumps in the block indicate that the block was previously harvested and has burnt. The current stand is second growth. The jackpine have reached maturity and are now suitable for harvest. There is very little merchantable timber in the south east corner of the block.

Access:

The block is situated just north of Temagami and 2 km east of Hwy. 11 on Roosevelt Rd. The existing road bisects the block and is a public forest access road that has not been maintained but is in good shape and would require only some grading. There are no water crossings required but there is an existing rail crossing. There is also a private residence located just east of Hwy. 11 on the Roosevelt Rd.

As there is an existing forest access road running through the property there should not be a problem utilizing this as the main access road for harvesting operations. The existing trail in the north east section of the block could be upgraded to allow for a turnaround for haul trucks.

Topography:

The topography of the block consists of rolling rocky slopes. On the east side of the road there is one jack pine knoll while the west side of the road has a constant slope of about 30 degrees with jack pine and poplar mixed near the base and gradually becoming more heavily concentrated with jack pine higher up the slope. Since site protection, in this case, is not a priority the shallow soils and rock should pose no harvesting problems.

1989 OPERATIONAL CRUISE COMPILATION FORM

Species Summary 7

Mgt. Unit:	Species:	Pj	Average Age:	19		
Township:	Site Class:	ERR	Height: (m)	Max 19	Min 11	Ave 15
Stand no.:	Basal Area: (m2/ha)	9.1	Diameter: (cm)	Max 32	Min 10	Ave 18

Total Stand Volume :
GTV (m3): 3832.50
NMV (m3): 3680.73

1989 OPERATIONAL CRUISE COMPILATION FORM

Species Summary 0

Mgt. Unit:	Species:	Po	Average Age:	0		
Township:	Site Class:	ERR	Height: (m)	Max 26	Min 15	Ave 19
Stand no.:	Basal Area: (m2/ha)	1.6	Diameter: (cm)	Max 34	Min 14	Ave 19

Total Stand Volume :
GTV (m3): 814.39
NMV (m3): 782.14

1989 OPERATIONAL CRUISE COMPILATION FORM

Species Summary 3

Mgt. Unit: Species: Sb Average Age: 0

Township: Site Class: ERR Height: Max Min Ave
(m) 12 6 9

Stand no.: Basal Area:
(m2/ha) 1.1 Diameter: Max Min Ave
(cm) 22 10 14

Total Stand Volume :
GTV (m3): 264.65
NMV (m3): 254.17

1989 OPERATIONAL CRUISE COMPILATION FORM

Species Summary 6

Mgt. Unit: Species: Pr Average Age: 0

Township: Site Class: ERR Height: Max Min Ave
(m) ERR ERR ***

Stand no.: Basal Area:
(m2/ha) 0.1 Diameter: Max Min Ave
(cm) 20 20 20

Total Stand Volume :
GTV (m3): ERR
NMV (m3): ERR

1989 OPERATIONAL CRUISE COMPILATION FORM

Species Summary 5

Mgt. Unit: Species: Pw Average Age: 0

Township: Site Class: ERR Height: Max Min Ave
(m) ERR ERR ***

Stand no.: Basal Area:
(m2/ha) 0.2 Diameter: Max Min Ave
(cm) 28 26 27

Total Stand Volume :
GTV (m3): ERR
NMV (m3): ERR

1989 OPERATIONAL CRUISE COMPILATION FORM

Species Summary 5

Mgt. Unit: Species: Pw Average Age: 0

Township: Site Class: ERR Height: Max Min Ave
(m) ERR ERR ***

Stand no.: Basal Area:
(m2/ha) 0.2 Diameter: Max Min Ave
(cm) 28 26 27

Total Stand Volume :
GTV (m3): ERR
NMV (m3): ERR

1989 OPERATIONAL CRUISE COMPILATION FORM

Species Summary 2

Mgt. Unit: Species: Bw Average Age: 0

Township: Site Class: ERR Height: Max Min Ave
(m) 14 4 9

Stand no.: Basal Area:
(m2/ha) 0.6 Diameter: Max Min Ave
(cm) 22 12 17

Total Stand Volume :
GTV (m3): 180.25
NMV (m3): 173.12

On June 16, 1997 an operational cruise, using the point sample method, was completed for Blackstone Development Inc. in Cassels Twp. on mining claims 1118527 and 1212011 at the site of the "Traprock Project. As there were no Forest Resource Inventory maps available of the area it was determined to cruise the area as a single "stand". Compilation of cruise data was completed using *Plonski Volume Tables* and *Morowskis Cull Survey Tables*. Weights are based on OMNR conversion factors. Volumes are estimates only and should not be construed as exact figures. Area calculation were derived from estimates provided by client (ie. the area of interest being approximately 800m x 700m or 56 ha). Field notes have been included for your records. The following is a summary of OPC cruise data and field observation.

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Trembling Aspen	782.14
White birch	173.12

NMV	**4890.16m3**

Stand Net Volume - (tonnes):

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Trembling Aspen	718.00
White birch	184.02

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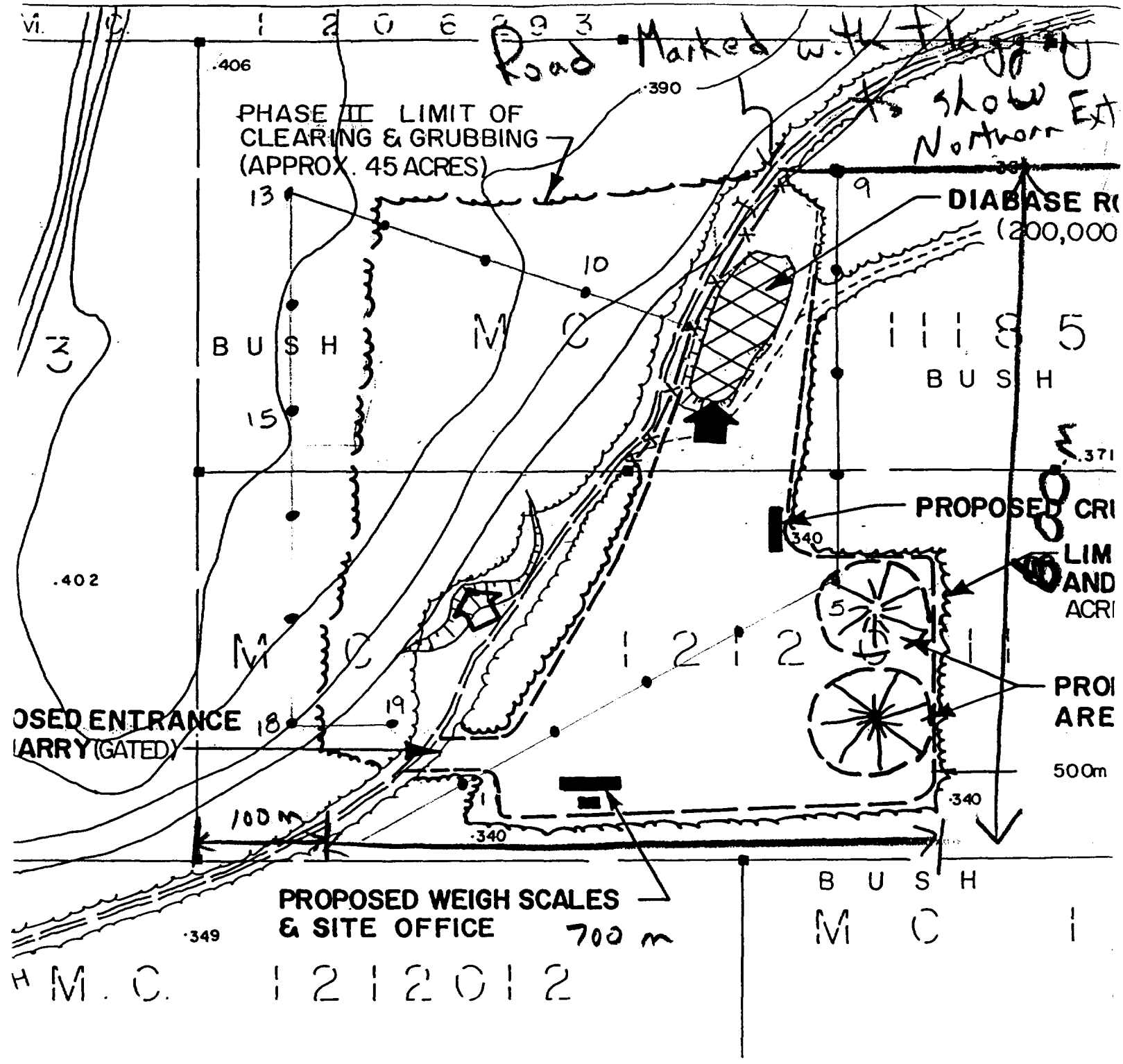
Field Notes



LEGEND

- PHASE I DIRECTION OF OPERATION
- PHASE II DIRECTION OF OPERATION
- LIMIT OF EXISTING BUSH
- LIMIT OF BUSH AFTER CLEARING & GUBBING
- PUBLIC ROAD (NOT MAINTAINED)
- M C — DENOTES MINING CLAIM
- 1212070 — DENOTES CLAIM Nº
- X—X—X — PROPOSED FENCE
- ■ — DENOTES CLAIM POST & LINE POST

.D.M. PLAN G-3409
PE & COMPASS DEC. 96
EN MN.D.M. CLAIM MAP
ION OF CLAIM.

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot (Area Sampled) 1.56 ha or Stations 119 | Plot Number 011 of 119

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp	Plot No.
1-23	B (1)							20	011

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Sp	Q/C	C/F	Ht. Code	Ht.%	Diameter Class	Sp	Q/C	C/F	Ht. Code	Ht.%	Sp	Q/C	C/F	Ht. Code	Ht.%	Sp	Q/C	C/F	Ht. Code	Ht.%
25-26	PJ							PO							Sp BW						Sp					Sp					Sp				
27-29																																		
30-31																																		
32-34																																		
35-36							8							8						8														
37-38							10							10						10														
39-40							12							12						12														
41-42							14							14						14														
43-44							16							16						16														
45-46							18							18						18														
47-48							20							20						20														
49-50							22							22						22														
51-52							24							24						24														
53-54							26							26						26														
55-56							28							28						28														
57-58							30							30						30														
59-60							32							32						32														
61-62							34							34						34														
63-64							36							36						36														
65-66							38							38						38														
67-68							40							40						40														
69-70							42							42						42														
71-72							44							44						44														
73-74							46							46						46														
75-76							48							48						48														
77-78							50							50						50														
79-80							52							52						52														

1	C ← Card Type
35-36	54
37-38	56
39-40	58
41-42	60
43-44	62
45-46	64
47-48	66
49-50	68
51-52	70
53-54	72
55-56	74
57-58	76
59-60	78
61-62	80
63-64	82
65-66	84
67-68	86

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot (Area Sampled) 5.6 or Stations 19 Page 2 of 1 C

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	102

	Species	Species	Sp	Sp	Sp	Sp	Sp	Sp
25-26	PJ	PC	SB	PO		BW		
27-29	Quality Class / Cull Factor	Quality Class / Cull Factor	QC / CF	QC / CF	QC / CF	QC / CF	QC / CF	QC / CF
30-31	Height Code	Height Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code
32-34	Ht.%	Ht.%	Ht.% 80	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%

	Heights	Diameter Class	Heights	Diameter Class
35-36		8		8
37-38		10		10
39-40		12		12
41-42		14		14
43-44		16		16
45-46		18		18
47-48		20		20
49-50		22		22
51-52		24		24
53-54		26		26
55-56		28		28
57-58		30		30
59-60		32		32
61-62		34		34
63-64		36		36
65-66		38		38
67-68		40		40
69-70		42		42
71-72		44		44
73-74		46		46
75-76		48		48
77-78		50		50
79-80		52		52

1	C ← Card Type	
35 36		54
37-38		56
39 40		58
41 42		60
43 44		62
45 46		64
47 48		66
49 50		68
51-52		70
53-54		72
55 56		74
57 58		76
59 60		78
61-62		80
63-64		82
65 66		84
67 68		86

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot (Area Sampled) | Declared | 5 6 | or | Stations | | 9 | | 3 of 19

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	103

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Sp	Sp	Sp	Sp	Sp
25-26	Sb																		
27-29																			
30-31																			
32-34																			
35-36							8							8					
37-38							10							10					
39-40							12							12					
41-42							14							14					
43-44							16							16					
45-46							18							18					
47-48							20							20					
49-50							22							22					
51-52							24							24					
53-54							26							26					
55-56							28							28					
57-58							30							30					
59-60							32							32					
61-62							34							34					
63-64							36							36					
65-66							38							38					
67-68							40							40					
69-70							42							42					
71-72							44							44					
73-74							46							46					
75-76							48							48					
77-78							50							50					
79-80							52							52					

1 C ← Card Type

35-36							54							54					
37-38							56							56					
39-40							58							58					
41-42							60							60					
43-44							62							62					
45-46							64							64					
47-48							66							66					
49-50							68							68					
51-52							70							70					
53-54							72							72					
55-56							74							74					
57-58							76							76					
59-60							78							78					
61-62							80							80					
63-64							82							82					
65-66							84							84					
67-68							86							86					

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot (Area Sampled) hectares .56 or Stations 19 Sheet Number 04 of 1

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	04

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Species	Quality Class	Cull Factor	Height Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%	Diameter Class	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%
25-26	Sb																																			
27-29																																				
30-31																																				
32-34																																				
	Heights						Heights																													
35-36					8																8														
37-38					10																10														
39-40					12																12														
41-42					14																14														
43-44					16																16														
45-46					18																18														
47-48					20																20														
49-50					22																22														
51-52					24																24														
53-54					26																26														
55-56					28																28														
57-58					30																30														
59-60					32																32														
61-62					34																34														
63-64					36																36														
65-66					38																38														
67-68					40																40														
69-70					42																42														
71-72					44																44														
73-74					46																46														
75-76					48																48														
77-78					50																50														
79-80					52																52														

1 C ← Card Type

35-36					54																54														
37-38					56																56														
39-40					58																58														
41-42					60																60														
43-44					62																62														
45-46					64																64														
47-48					66																66														
49-50					68																68														
51-52					70																70														
53-54					72																72														
55-56					74																74														
57-58					76																76														
59-60					78																78														
61-62					80																80														
63-64					82																82														
65-66					84																84														
67-68					86																86														

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot (Sampled) Inclusion or Stations 19 Sheet Number 5 of 19

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	05

	Species	Quality Class / Cull Factor	Height Code	Ht.%	Diameter Class	Species	Quality Class / Cull Factor	Height Code	Ht.%	Diameter Class	Sp	Sp	Sp	Sp	Sp
25-26	PJ					SB					BW				
27-29											Qc Cf	Qc Cf	Qc Cf	Qc Cf	Qc Cf
30-31											Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code
32-34				Heights					Heights		Ht.% 80	Ht.%	Ht.%	Ht.%	Ht.%
35-36					8					8					
37-38					10					10					
39-40					12					12					
41-42					14					14					
43-44					16					16					
45-46					18					18					
47-48					20					20					
49-50					22					22					
51-52					24					24					
53-54					26					26					
55-56					28					28					
57-58					30					30					
59-60					32					32					
61-62					34					34					
63-64					36					36					
65-66					38					38					
67-68					40					40					
69-70					42					42					
71-72					44					44					
73-74					46					46					
75-76					48					48					
77-78					50					50					
79-80					52					52					

1 C ← Card Type

35-36				54	54
37-38				56	56
39-40				58	58
41-42				60	60
43-44				62	62
45-46				64	64
47-48				66	66
49-50				68	68
51-52				70	70
53-54				72	72
55-56				74	74
57-58				76	76
59-60				78	78
61-62				80	80
63-64				82	82
65-66				84	84
67-68				86	86

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot Sizes Sampled | Hectares: 1.56 | or | Stations | No. of: 19 | Sheet Number: 10 6 of

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	6

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Heights	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Heights	Sp	Q/C	C/F	Ht. Code	Ht.%	Sp	Q/C	C/F	Ht. Code	Ht.%	Sp	Q/C	C/F	Ht. Code	Ht.%
25-26																													
27-29																													
30-31																													
32-34																													
35-36						8							8																
37-38						10							10																
39-40						12							12																
41-42						14							14																
43-44						16							16																
45-46						18							18																
47-48						20							20																
49-50						22							22																
51-52				18m		24							24																
53-54						26							26																
55-56						28							28																
57-58						30							30																
59-60						32							32																
61-62						34							34																
63-64						36							36																
65-66						38							38																
67-68						40							40																
69-70						42							42																
71-72						44							44																
73-74						46							46																
75-76						48							48																
77-78						50							50																
79-80						52							52																

1 C ← Card Type

35-36						54							54																
37-38						56							56																
39-40						58							58																
41-42						60							60																
43-44						62							62																
45-46						64							64																
47-48						66							66																
49-50						68							68																
51-52						70							70																
53-54						72							72																
55-56						74							74																
57-58						76							76																
59-60						78							78																
61-62						80							80																
63-64						82							82																
65-66						84							84																
67-68						86							86																

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot (Area Sampled) hectares: 1.56 or Stations: 19

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	07 of 1

	Species	Species	Sp	Sp	Sp	Sp	Sp	Diameter Class
25-26	PJ	PO						
27-29	Quality Class / Cull Factor	Quality Class / Cull Factor	Q/C / C/F	Q/C / C/F	Q/C / C/F	Q/C / C/F	Q/C / C/F	
30-31	Height Code	Height Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	
32-34	Ht.%	Ht.% 110	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	
	Heights	Heights						
35-36								8
37-38								10
39-40								12
41-42								14
43-44		•						16
45-46								18
47-48	•							20
49-50								22
51-52	• •	•						24
53-54								26
55-56	•							28
57-58								30
59-60								32
61-62								34
63-64								36
65-66								38
67-68								40
69-70								42
71-72								44
73-74								46
75-76								48
77-78								50
79-80								52

1 C ← Card Type

35-36									54
37-38									56
39-40									58
41-42									60
43-44									62
45-46									64
47-48									66
49-50									68
51-52									70
53-54									72
55-56									74
57-58									76
59-60									78
61-62									80
63-64									82
65-66									84
67-68									86

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Plot (Area Sampled) [illegible] 56 or Stations 19 Plot Number 108 of [illegible]

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B							20	108

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Sp	Q/C	C/F	Ht. Code	Ht.%	Diameter Class	Sp	Q/C	C/F	Ht. Code	Ht.%	Diameter Class	Sp	Q/C	C/F	Ht. Code	Ht.%	Diameter Class	Sp	Q/C	C/F	Ht. Code	Ht.%
25-26																																		
27-29	Pj																																	
30-31																																		
32-34	28cm 584rs				Heights						Heights																							
35-36						8						8						8						8						8				
37-38						10						10						10						10						10				
39-40						12						12						12						12						12				
41-42						14						14						14						14						14				
43-44	"					16						16						16						16						16				
45-46	"					18						18						18						18						18				
47-48	"				16	20						20						20						20						20				
49-50	"					22						22						22						22						22				
51-52	"					24						24						24						24						24				
53-54	'					26						26						26						26						26				
55-56	"				18	28						28						28						28						28				
57-58						30						30						30						30						30				
59-60						32						32						32						32						32				
61-62						34						34						34						34						34				
63-64						36						36						36						36						36				
65-66						38						38						38						38						38				
67-68						40						40						40						40						40				
69-70						42						42						42						42						42				
71-72						44						44						44						44						44				
73-74						46						46						46						46						46				
75-76						48						48						48						48						48				
77-78						50						50						50						50						50				
79-80						52						52						52						52						52				

1	C ← Card Type																																	
35-36						54						54						54						54						54				
37-38						56						56						56						56						56				
39-40						58						58						58						58						58				
41-42						60						60						60						60						60				
43-44						62						62						62						62						62				
45-46						64						64						64						64						64				
47-48						66						66						66						66						66				
49-50						68						68						68						68						68				
51-52						70						70						70						70						70				
53-54						72						72						72						72						72				
55-56						74						74						74						74						74				
57-58						76						76						76						76						76				
59-60						78						78						78						78						78				
61-62						80						80						80						80						80				
63-64						82						82						82						82						82				
65-66						84						84						84						84						84				
67-68						86						86						86						86						86				

Operational Survey

Field Tally Sheet

Elk Lake Community Forest

Plot (Area Sampled) [illegible] or Stations [illegible] 19 | 09 of 1

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	9

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Heights
25-26 / 27-29 / 30-31 / 32-34							
35-36						8	
37-38						10	
39-40						12	
41-42						14	
43-44						16	
45-46						18	
47-48						20	
49-50						22	
51-52						24	
53-54						26	
55-56						28	
57-58						30	
59-60						32	
61-62						34	
63-64						36	
65-66						38	
67-68						40	
69-70						42	
71-72						44	
73-74						46	
75-76						48	
77-78						50	
79-80						52	

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Heights
25-26 / 27-29 / 30-31 / 32-34							
35-36						8	
37-38						10	
39-40						12	
41-42						14	
43-44						16	
45-46						18	
47-48						20	
49-50						22	
51-52						24	
53-54						26	
55-56						28	
57-58						30	
59-60						32	
61-62						34	
63-64						36	
65-66						38	
67-68						40	
69-70						42	
71-72						44	
73-74						46	
75-76						48	
77-78						50	
79-80						52	

	Sp	Sp	Sp	Sp	Sp
25-26					
27-29	Q/C C/F	Q/C C/F	Q/C C/F	Q/C C/F	Q/C C/F
30-31	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code
32-34	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%
35-36					
37-38					
39-40					
41-42					
43-44					
45-46					
47-48					
49-50					
51-52					
53-54					
55-56					
57-58					
59-60					
61-62					
63-64					
65-66					
67-68					
69-70					
71-72					
73-74					
75-76					
77-78					
79-80					

	Sp	Sp	Sp	Sp	Sp
25-26					
27-29	Q/C C/F	Q/C C/F	Q/C C/F	Q/C C/F	Q/C C/F
30-31	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code
32-34	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%
35-36					
37-38					
39-40					
41-42					
43-44					
45-46					
47-48					
49-50					
51-52					
53-54					
55-56					
57-58					
59-60					
61-62					
63-64					
65-66					
67-68					
69-70					
71-72					
73-74					
75-76					
77-78					
79-80					

1 C ← Card Type

35-36		54
37-38		56
39-40		58
41-42		60
43-44		62
45-46		64
47-48		66
49-50		68
51-52		70
53-54		72
55-56		74
57-58		76
59-60		78
61-62		80
63-64		82
65-66		84
67-68		86

35-36		54
37-38		56
39-40		58
41-42		60
43-44		62
45-46		64
47-48		66
49-50		68
51-52		70
53-54		72
55-56		74
57-58		76
59-60		78
61-62		80
63-64		82
65-66		84
67-68		86

Elk Lake
Community Forest

Operational Survey
Field Tally Sheet

Sampled) 56 or Stations 19 10 of 1

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	10

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%	Diameter Class
25-26	Pj																																
27-29																																	
30-31																																	
32-34																																	
35-36							8																										8
37-38							10																										10
39-40							12																										12
41-42							14																										14
43-44							16																										16
45-46							18																										18
47-48							20																										20
49-50							22																										22
51-52							24																										24
53-54							26																										26
55-56							28																										28
57-58							30																										30
59-60							32																										32
61-62							34																										34
63-64							36																										36
65-66							38																										38
67-68							40																										40
69-70							42																										42
71-72							44																										44
73-74							46																										46
75-76							48																										48
77-78							50																										50
79-80							52																										52

1	C ← Card Type																																
35-36							54																										54
37-38							56																										56
39-40							58																										58
41-42							60																										60
43-44							62																										62
45-46							64																										64
47-48							66																										66
49-50							68																										68
51-52							70																										70
53-54							72																										72
55-56							74																										74
57-58							76																										76
59-60							78																										78
61-62							80																										80
63-64							82																										82
65-66							84																										84
67-68							86																										86

Elk Lake
Community Forest

Field Tally Sheet

Sampled) 56 or 19

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B							20	

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Sp	Sp	Sp	Sp	Sp
25-26																			
27-29																			
30-31																			
32-34																			
35-36							8							8					
37-38							10							10					
39-40							12							12					
41-42							14							14					
43-44							16							16					
45-46							18							18					
47-48							20							20					
49-50							22							22					
51-52							24							24					
53-54							26							26					
55-56							28							28					
57-58							30							30					
59-60							32							32					
61-62							34							34					
63-64							36							36					
65-66							38							38					
67-68							40							40					
69-70							42							42					
71-72							44							44					
73-74							46							46					
75-76							48							48					
77-78							50							50					
79-80							52							52					

1 C ← Card Type

35-36							54							54					
37-38							56							56					
39-40							58							58					
41-42							60							60					
43-44							62							62					
45-46							64							64					
47-48							66							66					
49-50							68							68					
51-52							70							70					
53-54							72							72					
55-56							74							74					
57-58							76							76					
59-60							78							78					
61-62							80							80					
63-64							82							82					
65-66							84							84					
67-68							86							86					

Elk Lake Community Forest

Operational Survey
Field Tally Sheet

Sampled) 56 or 19

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B 1							20	12

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Heights
25-26	Species						
27-29		Quality Class	Cull Factor				
30-31				Height Code			
32-34					Ht.%		
35-36						8	
37-38						10	
39-40						12	
41-42						14	
43-44						16	
45-46						18	
47-48						20	
49-50						22	
51-52						24	
53-54						26	
55-56						28	
57-58						30	
59-60						32	
61-62						34	
63-64						36	
65-66						38	
67-68						40	
69-70						42	
71-72						44	
73-74						46	
75-76						48	
77-78						50	
79-80						52	

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Heights
25-26	Species						
27-29		Quality Class	Cull Factor				
30-31				Height Code			
32-34					Ht.%		
35-36						8	
37-38						10	
39-40						12	
41-42						14	
43-44						16	
45-46						18	
47-48						20	
49-50						22	
51-52						24	
53-54						26	
55-56						28	
57-58						30	
59-60						32	
61-62						34	
63-64						36	
65-66						38	
67-68						40	
69-70						42	
71-72						44	
73-74						46	
75-76						48	
77-78						50	
79-80						52	

	Sp	Sp	Sp	Sp	Sp	Diameter Class
	Q_C C_F	Q_C C_F	Q_C C_F	Q_C C_F	Q_C C_F	
	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	
	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	
						8
						10
						12
						14
						16
						18
						20
						22
						24
						26
						28
						30
						32
						34
						36
						38
						40
						42
						44
						46
						48
						50
						52

1 C ← Card Type

35-36							54
37-38							56
39-40							58
41-42							60
43-44							62
45-46							64
47-48							66
49-50							68
51-52							70
53-54							72
55-56							74
57-58							76
59-60							78
61-62							80
63-64							82
65-66							84
67-68							86

Elk Lake Community Forest

Field Tally Sheet

Sampled) 5 6 or 1 9 1 3 of 1 5

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	1 3

	Species	Species	Sp	Sp	Sp	Sp	Sp	Sp
25-26	1 PW	SB	BF					
27-29	Quality Class / Cull Factor	Quality Class / Cull Factor	QC / CF	QC / CF	QC / CF	QC / CF	QC / CF	QC / CF
30-31	Height Code	Height Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code
32-34	Ht.% 100	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%

	Heights	Diameter Class	Heights	Diameter Class
35-36		8		8
37-38		10		10
39-40		12		12
41-42		14		14
43-44		16		16
45-46		18		18
47-48		20		20
49-50		22		22
51-52		24		24
53-54		26		26
55-56		28		28
57-58		30		30
59-60		32		32
61-62		34		34
63-64		36		36
65-66		38		38
67-68		40		40
69-70		42		42
71-72		44		44
73-74		46		46
75-76		48		48
77-78		50		50
79-80		52		52

1 C ← Card Type

35-36		54
37-38		56
39-40		58
41-42		60
43-44		62
45-46		64
47-48		66
49-50		68
51-52		70
53-54		72
55-56		74
57-58		76
59-60		78
61-62		80
63-64		82
65-66		84
67-68		86

Elk Lake Community Forest

Field Tally Sheet

Sampled 156 of 179 — 14 of 19

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	14

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Diameter Class	Heights	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%	Diameter Class	Sp	Qc	Cf	Ht. Code	Ht.%	Sp	Qc	Cf	Ht. Code	Ht.%
25-26																																	
27-29																																	
30-31																																	
32-34																																	
35-36						8																		8									
37-38						10																		10									
39-40						12																		12									
41-42						14																		14									
43-44						16																		16									
45-46						18																		18									
47-48						20																		20									
49-50						22																		22									
51-52						24																		24									
53-54						26																		26									
55-56						28																		28									
57-58						30																		30									
59-60						32																		32									
61-62						34																		34									
63-64						36																		36									
65-66						38																		38									
67-68						40																		40									
69-70						42																		42									
71-72						44																		44									
73-74						46																		46									
75-76						48																		48									
77-78						50																		50									
79-80						52																		52									

1 C ← Card Type

35-36						54																		54									
37-38						56																		56									
39-40						58																		58									
41-42						60																		60									
43-44						62																		62									
45-46						64																		64									
47-48						66																		66									
49-50						68																		68									
51-52						70																		70									
53-54						72																		72									
55-56						74																		74									
57-58						76																		76									
59-60						78																		78									
61-62						80																		80									
63-64						82																		82									
65-66						84																		84									
67-68						86																		86									

Elk Lake Community Forest

Field Tally Sheet

Sampled) 156 or 19 15 of

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	15

	Species	Quality Class / Cull Factor	Height Code / Ht.%	Diameter Class	Species	Quality Class / Cull Factor	Height Code / Ht.%	Sp	Sp	Diameter Class	Sp	Sp	Sp
25-26	Pj				Po								
27-29								QC / CF	QC / CF		QC / CF	QC / CF	QC / CF
30-31			Height Code				Height Code	Ht. Code	Ht. Code		Ht. Code	Ht. Code	Ht. Code
32-34			Ht.%				Ht.% 110	Ht.%	Ht.%		Ht.%	Ht.%	Ht.%
			Heights				Heights						
35-36				8						8			
37-38				10						10			
39-40				12						12			
41-42				14						14			
43-44	•			16	•					16			
45-46	• •			18	•					18			
47-48	•			20						20			
49-50				22						22			
51-52				24						24			
53-54				26	•					26			
55-56				28						28			
57-58				30						30			
59-60				32						32			
61-62				34						34			
63-64				36						36			
65-66				38						38			
67-68				40						40			
69-70				42						42			
71-72				44						44			
73-74				46						46			
75-76				48						48			
77-78				50						50			
79-80				52						52			

1	C ← Card Type												
35-36				54						54			
37-38				56						56			
39-40				58						58			
41-42				60						60			
43-44				62						62			
45-46				64						64			
47-48				66						66			
49-50				68						68			
51-52				70						70			
53-54				72						72			
55-56				74						74			
57-58				76						76			
59-60				78						78			
61-62				80						80			
63-64				82						82			
65-66				84						84			
67-68				86						86			

Elk Lake Community Forest

Field Tally Sheet

Sampled) 56 or

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	16

	Species	Species	Sp	Sp	Sp	Sp	Sp	Diameter Class
25-26	Pj	Po						
27-29	Quality Class / Cull Factor	Quality Class / Cull Factor	Qc / Cf	Qc / Cf	Qc / Cf	Qc / Cf	Qc / Cf	
30-31	Height Code	Height Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	
32-34	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	
	Heights	Heights						
35-36								8
37-38								10
39-40								12
41-42								14
43-44								16
45-46								18
47-48								20
49-50								22
51-52								24
53-54								26
55-56								28
57-58								30
59-60								32
61-62								34
63-64								36
65-66								38
67-68								40
69-70								42
71-72								44
73-74								46
75-76								48
77-78								50
79-80								52

1 C ← Card Type

35-36								54
37-38								56
39-40								58
41-42								60
43-44								62
45-46								64
47-48								66
49-50								68
51-52								70
53-54								72
55-56								74
57-58								76
59-60								78
61-62								80
63-64								82
65-66								84
67-68								86

Elk Lake Community Forest

Field Tally Sheet

Sample 15 of 19 | 17 of 19

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	17

	Species	Species	Sp	Sp	Sp	Sp	Sp
	Pj	Po	Sb				
25-26							
27-29	Quality Class / Cull Factor	Quality Class / Cull Factor	QC / CF	QC / CF	QC / CF	QC / CF	QC / CF
30-31	Height Code	Height Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code
32-34	Ht. %	Ht. %	Ht. %	Ht. %	Ht. %	Ht. %	Ht. %
	Heights	Heights					

Diameter Class							
8							
10							
12							
14							
16							
18							
20							
22							
24							
26							
28							
30							
32							
34							
36							
38							
40							
42							
44							
46							
48							
50							
52							

1 C ← Card Type

Diameter Class							
54							
56							
58							
60							
62							
64							
66							
68							
70							
72							
74							
76							
78							
80							
82							
84							
86							

Elk Lake Community Forest

Field Tally Sheet

Sample(s) 15 6 of 17 6 of

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	18

	Species	Species	Sp	Sp	Sp	Sp	Sp
25-26	Pj	Pb					
27-29	Quality Class / Cull Factor	Quality Class / Cull Factor	QC / CF	QC / CF	QC / CF	QC / CF	QC / CF
30-31	Height Code	Height Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code	Ht. Code
32-34	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%	Ht.%
	Heights	Heights					

	Diameter Class	Heights	Heights	Diameter Class				
35-36	8			8				
37-38	10	•		10				
39-40	12			12				
41-42	14			14				
43-44	16			16				
45-46	18		•	18				
47-48	20	• • •	•	20				
49-50	22	• •		22				
51-52	24			24				
53-54	26			26				
55-56	28			28				
57-58	30			30				
59-60	32			32				
61-62	34			34				
63-64	36			36				
65-66	38			38				
67-68	40			40				
69-70	42			42				
71-72	44			44				
73-74	46			46				
75-76	48			48				
77-78	50			50				
79-80	52			52				

1 C ← Card Type

35-36	54		54	
37-38	56		56	
39-40	58		58	
41-42	60		60	
43-44	62		62	
45-46	64		64	
47-48	66		66	
49-50	68		68	
51-52	70		70	
53-54	72		72	
55-56	74		74	
57-58	76		76	
59-60	78		78	
61-62	80		80	
63-64	82		82	
65-66	84		84	
67-68	86		86	

Elk Lake Community Forest

Field Tally Sheet

Sample(s) 156 of ____ of ____

Record of Sample

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B (1)							20	19

	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Species	Quality Class	Cull Factor	Height Code	Ht.%	Heights	Diameter Class	Sp	Sp	Diameter Class	Sp	Sp	Sp
25-26								PJ												
27-29																				
30-31																				
32-34																				
35-36							8							8			8			
37-38							10							10			10			
39-40							12							12			12			
41-42							14							14			14			
43-44							16							16			16			
45-46							18							18			18			
47-48							20							20			20			
49-50							22							22			22			
51-52							24							24			24			
53-54							26							26			26			
55-56							28							28			28			
57-58							30							30			30			
59-60							32							32			32			
61-62							34							34			34			
63-64							36							36			36			
65-66							38							38			38			
67-68							40							40			40			
69-70							42							42			42			
71-72							44							44			44			
73-74							46							46			46			
75-76							48							48			48			
77-78							50							50			50			
79-80							52							52			52			

1 C ← Card Type

35-36							54							54			54			
37-38							56							56			56			
39-40							58							58			58			
41-42							60							60			60			
43-44							62							62			62			
45-46							64							64			64			
47-48							66							66			66			
49-50							68							68			68			
51-52							70							70			70			
53-54							72							72			72			
55-56							74							74			74			
57-58							76							76			76			
59-60							78							78			78			
61-62							80							80			80			
63-64							82							82			82			
65-66							84							84			84			
67-68							86							86			86			

Elk Lake Community Forest

Field Tally Sheet

Summary

Sample(d) ____ or Stations ____ of ____

Record of Sample ____

C.C.	Card Type	District	Mgmt. Unit	W. Circle	Status	Township or Base Map	Comp. or Stand No.	Sub-Comp.	Plot No.
1-23	B							20	

	Species	Pj	Species	Pl	Sp	Sb	Sp	Pr	Sp	Pw	Sp	Bw	Sp	B
25-26														
27-29	Quality Class / Cull Factor		Quality Class / Cull Factor		Q/C / C/F		Q/C / C/F		Q/C / C/F		Q/C / C/F		Q/C / C/F	
30-31	Height Code		Height Code		Ht. Code		Ht. Code		Ht. Code		Ht. Code		Ht. Code	
32-34	Ht.%	564(7)	Ht.%	10	Ht.%	80	Ht.%	140	Ht.%	190	Ht.%	80	Ht.%	60

Diameter Class	Heights	Pj	Pl	Sb	Pr	Pw	Bw	B
35-36								
37-38		2						
39-40		5						
41-42		1						
43-44		9						
45-46		9						
47-48	16	21						
49-50		12						
51-52	18	10						
53-54		5						
55-56	18	9						
57-58		2						
59-60		1						
61-62								
63-64								
65-66								
67-68								
69-70								
71-72								
73-74								
75-76								
77-78								
79-80								

Diameter Class	Heights	Pj	Pl	Sb	Pr	Pw	Bw	B
8								
10				•/1				•/1
12				••/2			•/1	
14		•/1		•/1				
16		:/2		•/1				
18		••/2		:/2			••/2	
20		:/4		•/1	14	•/1	••/2	1 4
22		•/1		:/2			•/1	
24	20	:/3						
26		•/1				•/1		
28						•/1		
30								
32								
34		•/1						
36								
38								
40								
42								
44								
46								
48								
50								
52								

1 C ← Card Type

Diameter Class	Pj	Pl	Sb	Pr	Pw	Bw	B
35 36							
37-38							
39 40							
41 42							
43 44							
45 46							
47-48							
49-50							
51-52							
53-54							
55-56							
57 58							
59-60							
61-62							
63 64							
65 66							
67 68							

Diameter Class	Pj	Pl	Sb	Pr	Pw	Bw	B
54							
56							
58							
60							
62							
64							
66							
68							
70							
72							
74							
76							
78							
80							
82							
84							
86							

2.

SETTLEMENT SURVEYS LTD.

STAGE ONE PROJECT REPORT

STAGE ONE ARCHAEOLOGICAL AND HERITAGE IMPACT ASSESSMENT, PHASE I AND II QUARRY / AGGREGATE PERMIT, BEST TOWNSHIP

Prepared for

Temagami Trap Rock Ltd.
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Attention: Gino Chitaroni

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Archaeological Consulting Licence 97-043

Project #97-33

December 8, 1997

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ABSTRACT

Location of Activity: Mining claims 1206293, 1212013, 1118527, 1212011, 1212012, 1212069, 1212070 = 842 ha, Best Township, Ontario

Purpose: To inventory and assess cultural heritage sites and features prior to Aggregrate/Quarry permit approval by MNR & MCC. This was a Stage I assessment undertaken under Ontario Heritage Act Regulations by a licenced archaeologist, which involved a field visit but no subsurface testing. Subsurface testing is only undertaken under a Stage II assessment (if required due to the results of the Stage I work).

Study Results and recommendations: All areas are considered to be of low potential for archaeological and historical sites, except claim # 1206293 located adjacent to Rib Lake. This claim which is outside the main development area has a pre-1900 portage with a treadway present that crosses the northeast corner of the claim. Further archaeological work (ie a stage II field assessment) is recommended for this area prior to any surface disturbances. Other possible areas of concern would be lookouts or fasting on topographic highs. We recommend that these be examined by a licenced archaeologist before any disturbances in these areas.

PROJECT CREDITS

Report Authors:	Dr. John Pollock, B.A., M.A., Ph.D.
Word Processing:	J&G. Pollock
Archaeological Photography and Fieldwork:	Dr. John Pollock and Norm Hawirko

ACKNOWLEDGMENTS

We would like to acknowledge the assistance of Gino Chitaroni and Norm Hawirko

I. BACKGROUND DATA

1.1 ARCHAEOLOGICAL LICENCE REGULATIONS

Recommendations: Any recommendation made in this report are subject to approval by the Minister responsible for the Ontario Heritage Act, R.S.O. 1990. Pursuant to Section 65(1) of the Act, it is required that the licensee shall include in any report the following: a statement of impacts that the proposed undertaking may reasonably be expected to have upon archaeological heritage, any recommendations made to the proponent regarding the protection, preservation or conservation of archaeological heritage in the area of the undertaking, and a statement of the reasons for those recommendations.

Site Record Form: Every newly discovered site must be recorded on an Archaeological Site Record Form. Each site revisited or previously recorded must be documented on a Site Update Sheet.

Prior Notice: The licensee must, before initiating field work on a particular undertaking, provide the Ministry of Citizenship, Culture and Recreation with notice concerning the identity of the proponent and/or contractor, the identity of the Project Director, the nature, purpose, location, duration and extent of the planned field work, the anticipated staffing of the project, and the details of special arrangements or conditions of the contract. Before commencing field work, the licensee must receive confirmation of receipt of this notice from M.C.C.R.

Human Remains: An archaeological licence does not authorize disinterment of human remains. Disinterment must be conducted in compliance with the Cemeteries Act, R.S.O. 1990, c. C.4 and the Ministry of Consumer and Commercial Relations.

Archaeological licenses are issued pursuant to the Ontario Heritage Act. R.S.O. 1990, c. 0.18, and are subject to the provisions of this Act. Licences are not transferable.

Under archaeological license regulations, three copies of this report must be submitted to the Ministry of Citizenship, Culture and Recreation.

1.2 INTRODUCTION AND RECORD REVIEW

Before initiation of fieldwork, the site files and catalogued reports at Settlement Surveys Ltd. and/or the offices of the Archaeological Data Coordinator Ministry of Citizenship, Culture and Recreation were checked to determine if any prehistoric sites had been previously recorded either in or near the study area.

There had been no sites previously recorded within the study area.

1.3 BRIEF PREHISTORY AND HISTORY OF THE RIB LAKE & BEST TOWNSHIP STUDY AREA

Cultural Prehistory

Archaeologists generally divide northeastern Ontario's prehistory into the following generalized temporal/cultural sequences;

Late Palaeo (circa 7,000 - 5000 BC)
Shield Archaic (circa 5,000 - 500 BC)
Middle Woodland (circa 500 BC - AD 1200)
Late Woodland (circa AD 1200 - AD 1600)
Historic (circa AD 1600 - present)

Brief History of Best Township

Best township lies within the historic lands used by the Kanachinz/Whitebear family of the Temagami First Nation (TAA).

Aboriginal Landscape Features and Land Use in Best Township

Many original place names for lakes in Best Township have not been collected. They called Breeches Lake Ka-Wag-Anchigama that essentially means 'A Curved Lake'. Thieving Bear Lake is a direct translation of the Indian name.

Native land use in Best Township involved four major water bodies including: Rib Lake, Thieving Bear Lake, Granite lake, the upper end of Net Lake, and Mountain Lake.

Rib Lake Area Place Names

Native People originally called Rib Lake `Big Rib Lake' or Gitchiway-Pigigonaysing. Cliff Lake was originally known as `Little Perch Lake' or Ka-Sahwaince-A-Wang from a large perch population that had the odd habit of spawning in streams rather than using shoals in the lake.

Friday Lake was renamed after a well known local Native family, but the original name was `Rib Lake', Way-Pigigon-Aysing.

Rib Mountain

A which mountain divides Friday Lake and Rib Lake was named in local folklore as Animal Rib Mountain. The distinct gullies which cut down the sides of the mountain were seen as ribs on the side of a giant animal. Rib Mountain was one of several mountains in the greater Temagami area believed to be a mythological animal turned into a landscape feature at the beginning of time. As such, it provides a permanent reminder of the Algonkian creation stories.

The largest and most important sugarbush in the Temagami Anishnabek homeland stood on the south slopes of Rib Mountain. Within the maple forest used by Wabiko, the ancestor of the Whitebear family, several species of trees could be found which were otherwise rare in the Temagami area. These included red oaks and ironwood. Both hard woods were used to make axe handles and parts of sleds (Settlement Surveys Ltd: 1992).

II. PREVIOUS ARCHAEOLOGICAL WORK IN THE AREA

2.0 KNOWN AREA SITES

Two archaeological sites have been recorded in the area just north of the proposed agregate/quarry site as follows:

Rib Lake Archaeological Site

A small prehistoric archaeological camp site was discovered on Rib Lake in 1991. The level rock ledge on the east side of the lake is covered with a carpet of moss and soil. Archaeologists found prehistoric stone tools, bits of red ochre pigment and small fragments of aboriginal pottery at this site which dates to the Late Woodland time period over 500 years ago. The site is located on a

point at the first camp spot near the traditional trail leading to Cliff Lake. The ancient remains indirectly date the use of the trail back in time.

Similar rock ledge travel camps have been discovered during archaeological surveys on Obabika Lake and throughout Lake Temagami. There is a term in the Teme-Augama language used to identify level ledges suitable for temporary habitation. These sites are called "Good Rock Campsites" in the Algonkian dialect.

Rib Lake Logging Camp

A large, very early logging camp was located on the east of Rib Lake. This was a Gillies Bros. camp which predates 1912. The camp remains in a virtually undisturbed condition and we would recommend that it be protected and preserved as a good example of a turn-of-the century logging camp. Several foundations The site consists of a series of building outlines recognizable from the massive berms of earth which originally insulated the foundations and some remains of cabin walls plus numerous other features are present.

This site is significant due to its good state of preservation and its early date for the Temagami area. The site is part of the pine era movement which extend up the Ottawa River Valley in the later 1800's and eventually moved into interior river systems (Settlement Surveys Ltd: 1992).

2.1 STUDY AREA DESCRIPTION AND ENVIRONMENTAL SETTING

This was a Stage I assessment undertaken under Ontario Heritage Act Regulations by a licenced archaeologist, which involved a field visit but no subsurface testing. Subsurface testing is only undertaken under a Stage II assessment (if required due to the results of the Stage I work).
The study area (see photo-Figure 1)covered the Temagami Traprock Ltd.'s 842 ha property consisting of the following mining claims: 1206293, 1212013, 1118527, 1212011, 1212012, 1212069, 1212070. (see sketch map figure2). The area is very rugged with high hills and valleys. The immediate development area (Stage I and II) is away from any major water bodies or streams and has low knolls and ridges of Diabase rock also known as Traprock). This material is suitable for aggregate and other uses.

2.2 ASSESSMENT METHODOLOGY

After examining information concerning the project faxed by Gino Chitaroni, it appears that a Stage One archaeological assessment would satisfy the requirements for this project. Stage one elements as determined by Regulations under the Ontario Heritage Act are as follows:

STAGE I - ARCHAEOLOGICAL OVERVIEW/BACKGROUND STUDY

A Stage I background study provides the consulting archaeologist (must be licenced under the Ontario heritage Act) and the Ministry report reviewer with information about the Known and potential cultural heritage resources within a particular study area prior to the start of the field assessment. As part of the Stage I background study, the consulting archaeologist shall:

* examine the National Site Registration Database to determine the presence of known archaeological sites in and around the project area. This information is available through the MCzCR Data Co-ordinator,

* review the land use history and the present condition of the study area,

* talk to individuals with information regarding archaeological remains on the subject property-

The consulting archaeologist may also examine/document, as deemed appropriate:

* describe the geomorphological history of the land during the period of possible human occupation, in order to evaluate the potential for buried cultural deposits,

* document any other historical, environmental, planning or archaeological data applicable for the subject lands.

The consulting archaeologist may also wish to review the development property with the appropriate MCTR development review officer, to determine if additional information regarding known and/or potential heritage resources is available for the project area.

2.3 ARCHAEOLOGICAL FINDINGS

No historical features or built environmental features of heritage significance or the potential for such were noted from the Stage one work, other than the portage trail on claim # 1206293 located adjacent to Rib Lake. This claim which is outside the Phase I and II development area, has a pre-1900 portage with a treadway present that crosses the northeast corner of the claim. A few topographic highs elsewhere on the overall 842 ha (2,080 acres) property may also have some cultural potential as viewing or fasting sites by past Native Peoples.

2.4 Figure 1. Photograph of Study Area.

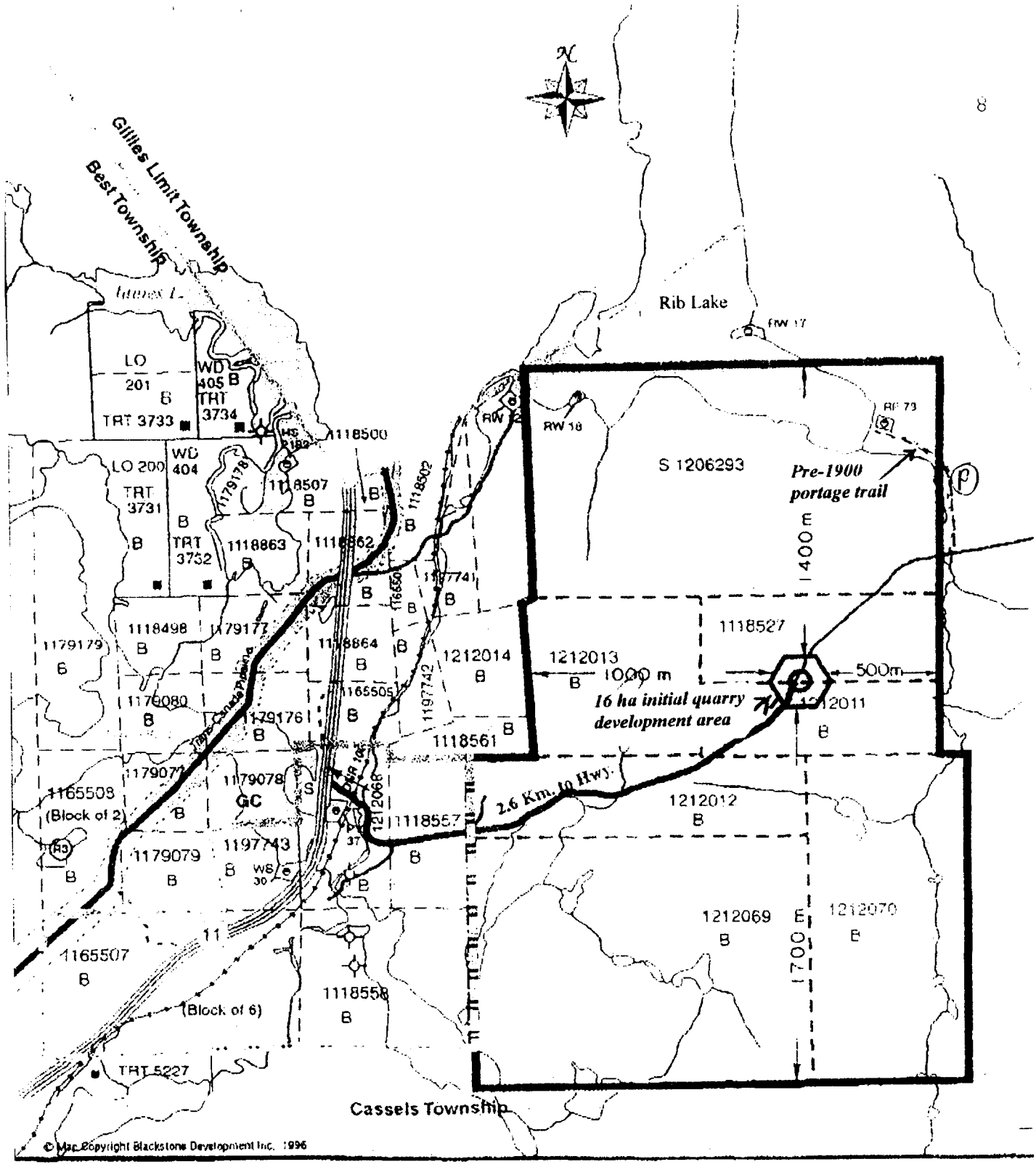

Figure 2. Sketch Map of Study Area.

2.5 SITE SIGNIFICANCE

The study area does not appear to be of high heritage or archaeological significance, except for two areas as noted below.

III. RECOMMENDATIONS

3.1 ANTICIPATED IMPACT ON HERITAGE RESOURCES

The purpose of this study was to assess the potential for cultural heritage sites and features in the study area prior to Aggregrate/Quarry permit approval by MNR & MCC. Archaeological sites are a non-renewable resource requiring proper planning, development, management and protection similar to that afforded to most natural resources.
All project areas were found to be of generally low potential for archaeological and historical sites, except for claim # 1206293 located adjacent to Rib Lake. This claim which is outside the main development area has a pre-1900 portage with a tread way present that crosses the northeast corner of the claim. A few topographic highs may also have some cultural potential.

3.2 MITIGATION RESEARCH REQUIREMENTS

Further archaeological work (ie a stage II field assessment) is recommended for the northeast portion of claim # 1206293 located adjacent to Rib Lake prior to any surface disturbances. Another area of concern would be lookout or fasting sites on topographic highs on the 842 ha (2,080 acre) property. It is recommended that the topographic high areas also be examined by a licenced archaeologist prior to any disturbances.

3.3 RECOMMENDATIONS AND CONCLUSION

3.3.1 **For Stage I and Stage II of this project involving a 16-18 ha area, no further archaeological work is needed and it is recommended that these initial project stages be allowed to proceed without any further concerns or constraints in regards to cultural heritage resources.**
For portions of the remainder of the 842 ha (2,080 acre) property, ie., future phases or expansion of the quarry, the following recommendations apply:

3.3.2 A stage II Archaeological Field Assessment by a licenced archaeologist is recommended for the northeast portion of claim # 1206293 located adjacent to Rib Lake prior to any surface disturbances.

3.3.3 A stage II Archaeological Field Assessment by a licenced archaeologist of topographic highs which may contain lookout sites or Aboriginal fasting sites. It is recommended that these areas be examined prior to any disturbances or development.

3.3.4 Finally, as required by Ministry of Citizenship, Culture and Recreation regulations under the Ontario Heritage Act, all archaeological reports must also state that there is a possibility of deeply buried, undetected archaeological remains existing within the 842ha claim parcel. If such materials are uncovered during aggregate/quarry activities, the proponent must immediately contact the Development Plans Review Unit of the Ministry of Citizenship, Culture and Recreation, 2nd Floor, 77 Bloor Street West, Toronto.

3.4 REFERENCES

Settlement Surveys Ltd.
1992 1991 Cultural Assessments of Proposed Timber Harvest Areas in the Temagami, Latchford, Sturgeon river, Wanapitei, and Elk Lake Timber Management Units. Paper on file at the Ministry of Citizenship, Culture and Recreation, Toronto.

Ontario

Ministry of Culture, Tourism and Recreation	Ministere de la Culture, du Tourisme et des Loisirs	77 Bloor Street W Toronto ON M7A 2R9	77 rueBloor O Toronto ON M7A 2R9

CONTRACT INFORMATION FORM

The information provided on this form will be held in confidence, subject to the requirements of the Freedom of Information and Protection of Privacy Act.

Archaeological Licence Office, Phone: (416) **314-7123,** Fax: **(416)** 314-7175
Firm/individual: Settlement Surveys Ltd. Licence#: 97-043
Phone Number: (705) 647-8833 Fax Number: (705) 647-7026
E-mail: jpollock@onlink.net
Project Purpose: *(pL -V)* Sudivision: ____; E.A.: X ; Master Plan: ____
Proponent: *(incl on report title)* Temagami Trap Rock Limited
Project File # & Name: *(incl on report title page)* Proposed Aggregate /Quary Permit Area, Best Twp. 97-33
Project Director: Dr. John Pollock
Field Directors: Dr. John Pollock
Other Supervisory Staff: N.A.

Project Location: (*Please fill in as completely as possible*) Stage One - Assessment of aggregate/quarry area - no subsurface work
County, Regional Municipality, District: Temagami MNR Dist
Township, City, Town, Village: Temagami
Lot and Concession Number: Best Twp (Rib Lake)
Site Name & Borden #: N.A.
T-Number: N.A. Size of Study Area: 465 ha, 98 to be excavated

(Please provide a location map of the study area, preferably at 1:50,000)

Stage of Activity: as per Archaeological Assessment Technical Guidelines, Ministry of Culture, Tourism and Recreation, 1993.
Stage 1. X background research
Stage 2. ____ surface collecting/ exploratory testing for site discovery
Stage 3. ____ testing for site definition/evaluation
Stage 4. ____ mitigation: ____ partial excavation; ____ complete excavation
Proposed Field Methods:
% of pedestrian survey na interval na
% of test-pitting na interval na
mechanical equipment na.
Artifact Disposition: na
Date Contract Awarded: Nov. 20, 1997
Date of Submission of Form: Nov. 24, 1997
Estimated Start Date of Project: Nov 26, 1997
Estimated Completion Date of Project: January 1998

Signature of Licensee/s

42-054 (1997)

EXPLOTECH

BLAST IMPACT ANALYSIS
TAMAGAMI TRAPROCK QUARRY
BEST TOWNSHIP, ONTARIO

August 24, 1998

Prepared for

Blackstone Devevopment Inc.
50 Silver Street, P.O. Box 699
Cobalt, Ontario
P0J 1C0

By

Dan Corkery, B.Sc.

Reviewed By

Ray Jambakhsh, M.Sc., P.Eng.

EXPLOTECH

Blackstone Development Inc.

Proposed Tamagami Traprock Quarry

Best Township, Ontario

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EXECUTIVE SUMMARY

The Blast Impact Analysis report on the proposed Best Township Quarry of Tamagami Traprock Limited is based on a review of the drawings of the proposed quarry, a review of the Ministry of the Environment and Energy Guidelines for Blasting in Mines and Quarries as well as a review of blast damage potential to surrounding structures from blasting operations.

Recommendations are included in this report to ensure that the blasting operations for the quarry are carried out safely and to ensure that there is no possibility of damage to any buildings and/or residences near the site.

BLAST VIBRATION AND OVERPRESSURE LIMITS

The Ontario Ministry of the Environment and Energy's (M.O.E.E.) guidelines for blasting in quarries are amongst the most stringent in North America.

Recent studies by the U.S. Bureau of Mines have shown that normal temperature and humidity changes can cause more damage to residences than blast vibrations and overpressure in the range permitted by the M.O.E.E. The limits suggested by the M.O.E.E. are as follows.

Vibration:	12.5 mm/sec Peak Particle Velocity (PPV)
Overpressure:	128 dB Peak Sound Pressure Level (PSPL)

The above guidelines apply when blasts are being monitored. Cautionary levels are slightly lower.

Definitions:

Peak Particle Velocity: the rate of change of the amplitude, usually measured in mm/sec or in/sec. This the excitation of the particles in the ground resulting from vibratory motion.

Blast Overpressure: a compression wave in air caused by

a) the direct action of the unconfined explosive, or

b) the direct action of the confining material subjected to explosive loading.

BLAST VIBRATION AND OVERPRESSURE DATA

Blast vibration and overpressure data used in the report was collected from various locations in and around Eastern Ontario quarries during the 1991 season. Also incorporated are data collected from blasting in hard rock quarries and mines in Northern Ontario (i.e. Sudbury, Timmins, and North Bay). The M.O.E.E. attenuation graphs were also used in determination of the maximum allowable weight of explosives per delay period. In order to be conservative, we have selected the most stringent criteria obtained from this data.

Instantel self triggering digital blasting seismographs were used to collect the data.

All data was plotted using square root scaling from blast vibrations and cube root scaling for blast overpressure.

This data has proven to be quite conservative when used as a guideline for blasting in quarries. The following table outlines the maximum allowable explosives per delay period at various standoff distances.

TAMAGAMI TRAPROCK
PROPOSED BEST TOWNSHIP QUARRY
BEST TOWNSHIP, ONTARIO

M.O.E.E. RECOMMENDED VIBRATION AND OVERPRESSURE LIMITS

Blast Vibration Limit - 12.5 mm/s

Distance to Nearest Residence (meters)	Max. Allowable Explosives / Period (kg)
300	222
600	888
900	2000
1200	3555

Blast Noise/Overpressure Limit - 128 dB

Distance to Receptor (meters)	Allowable Explosives per Period (kg)	
Nearest Residence	Front of Blast	Behind Blast
300	16	296
600	125	2370
900	422	9409
1200	1150	27,000

DETAILS OF PROPOSED BLASTING OPERATIONS

The applicant proposes the following procedure for their blasting operations in the proposed quarry location:

- Orientation of the quarry will be designed so that the direction of the noise propagation will be away from the residence(s) where possible.
- Sequential blasting techniques will be used to ensure minimal explosives per delay period initiated. These include a) programmable blasting machines such as the REO Sequential Blasting Machine or b) nonelectric blasting systems such as the EZ-Det/Handi-Det systems.
- The maximum drill hole diameter and drilling pattern will be: 4.0 in. (100 mm) diameter hole and a 10 ft x 10 ft (3.0 m x 3.0 m) square pattern.
- Maximum explosives per delay period will not exceed 257 lb (116 kg).
- Only one hole will be fired at any one instant (i.e. one hole per delay period).
- Maximum blast hole depth will be 60 ft (18 m).
- Minimum collar will be 4.5 ft (1.4 m).
- Only 3/4 in. (19 mm) clear crushed stone will be used for stemming.
- When necessary, techniques such as multiple decking will be used to reduce any possibility of annoyance due to blast induced vibration and overpressure.
- Primary and secondary dust collectors will be employed on the rock drills to keep the level of rock dust to a minimum.

CALCULATION OF PREDICTED VIBRATION LEVELS AT THE NEAREST HOUSE/BUILDING

Based on the direct vectorial distances measured from a topographical map of the area, the closest house is approximately 1,200 meters (3,937 feet) from the blast site.

The most commonly used formula for predicting Peak Particle Velocity (PPV) is known as Bureau of Mines (BOM) prediction formula or Propagation Law. We have used this formula to predict the PPV's at the closest house.

$$PPV = K [d/\sqrt{w}]^{e}$$

where,

PPV = the predicted peak particle velocity (mm/s)
K, e = site factors
d = distance from receptor (m)
w = maximum explosive charge per delay (kg)

The value of K is highly variable and is influenced by many factors (i.e. rock type, geology, thickness of overburden, etc.). Based on the monitoring discussed in earlier sections, "e" will be set at –1.11 and "K" will be set at 350 (see Appendix 1).

For a distance of 1,200 m and a maximum explosives weight of 116 kg, we can determine the predicted maximum PPV at the nearest house.

$$PPV = 350 [1200/\sqrt{116}]^{-1.11} = 1.87 \text{ mm/s} = 0.074 \text{ in/s}$$

As discussed in previous sections, the MOEE guideline for blast induced vibrations is 12.5 mm/s (0.5 in/s) PPV. The calculated maximum PPV of 1.87 mm/s (based on the contractors proposed blasting data) at the closest house is less than one sixth (1/6) of the acceptable level.

The MOEE attenuation graph (see Appendix 2) suggests a Scaled Distance (SD = $d/\sqrt{w}$) of 111 $m/kg^{1/2}$ for a maximum PPV of 12.5 mm/s. For a distance of 1,200 m and a maximum explosives weight of 116 kg (as indicated by the blast

parameters outlined above) this graph yields a predicted maximum PPV of 0.53 mm/s (0.021 in/s).

Both predictions described above indicate that the blasting operations proposed will yield vibrations levels that are well below the MOEE Guidelines for blast vibrations induced by quarries.

FLYROCK PREDICTION ANALYSIS

Based on the contractors proposed drilling and blasting parameters, which were highlighted in a previous section of this report, we have calculated a maximum possible range of flyrock. The calculations, which are based on the publication "A Model for Determination of Flyrock Range as a Function of Shot Conditions" (prepared for the U.S. Bureau of Mines) are displayed in Appendix 3. The calculations provide a good guideline to follow until site specific data becomes available. The results predict maximum distance of:

- 1,451 feet (422 meters) from the bench top for the proposed blasting operations.

These results indicate that the maximum flyrock range is much shorter than the distance to the closest house.

WELL WATER IMPACT

The effects of blasting operations on water wells have been studied by a number of mine operators and blasting consultants. In a study by Froedge (1983), blast vibration levels of up to 32.3 mm/s were recorded at the bottom of a shallow well located at a distance of 60 meters (200 feet) from an open pit blast. There was no report of visible damage to the well, nor was there any change in the water pumping flow rate. This study concluded that the commonly accepted limit of 50 mm/s PPV level is adequate to protect wells from any significant damage.

Rose et al. (1991), studied the effect of blasting in close proximity to water wells near an open pit mine in Nevada, USA. Blasts of up to 70 kilograms (154 pounds) of explosives per delay period were detonated at a distance of 75 meters (245 feet) from a deep water well. There was no reported visible damage to the well. Fluctuations in water level and flow rate were evident immediately after the blast. However, the well water level and flow rate stabilized after a few days.

Matheson et al. (1997) brought together available information on the most common complaints, the possible causes of the complaints and the relation between blasting and the complaint causes. This publication stated:

> "Probably the most frequent blast related complaint is that a well has "gone dry". Related complaints about reductions in ground water quantity are also common. Blasting does not cause a well to go dry or reduce the water quantity available to a well. Research has shown that blasting near open borehole wells in bedrock may actually increase the water production capacity due to opening rock fractures.
>
> "The major complaints for changes in well water production capacity include: loss of quantity production, air in water and/or water lines, damage to pump, and damage to well screen or borehole.
>
> "The review of research and common causes of these problems indicates that most of these complaints are not related to blasting and can be shown to be related to either environmental factors, poor well construction, or wells whose elements required repair or replacement prior to blasting."

Based on observations and research, we believe that the blasting operations at the proposed Best Township Quarry will not affect the water wells in the area.

RECOMMENDATIONS

Blasts shall be monitored on an occasional basis for both vibration and overpressure (noise) at the closest building to the blast site.

Test blasts shall be monitored with a minimum of one seismograph at the closest location between the quarry site and the nearest building.

The seismograph shall be a self triggering unit capable of printing a complete waveform for blast overpressure and blast vibrations in three orthogonal directions (Instantel DS-477/677 or equivalent).

Careful blast records shall be maintained. The MOEE (1985) recommended the body of blast reports include the following information:

a) Location, date and time of the blast.

b) Dimensional sketch including photographs, if necessary, of the location of the blasting operation, and the nearest point of reception.

c) Physical and topographical description of the ground between the source and the receptor location.

d) Type of material being blasted.

e) Sub-soil conditions, if known.

f) Prevailing meteorological conditions including wind speed in m/s, wind direction, air temperature in °C, relative humidity, degree of cloud cover and ground moisture content.

g) Number of drill holes.

h) Pattern and pitch of drill holes.

i) Size of holes.

j) Depth of drilling.

k) Depth of collar and stemming and stemming column.

l) Depth of toe-load.

m) Weight of charge per delay.

n) Number and time of delays.

o) The result and calculated value of Peak Pressure Level in dB and Peak Vibration Velocity in mm/s.

p) Applicable limits.

q) The excess, if any, over the prescribed limit.

The blast parameters described within this report will provide a good basis for the initial blasting operations at this quarry. However, it may be possible to refine these once site specific data from the blasting operation becomes available.

Only clean 3/4 inch clear crushed stone shall be used for stemming.

If warranted, Stemtite plugs may be used to reduce noise impact on surrounding residences and buildings.

Blasting procedures such as drilling and loading shall be monitored on occasional basis by an independent blasting consultant.

CONCLUSIONS

The proposed Best Township Quarry of Temagami Traprock Limited can be developed safely and productively in the proposed area while staying well within the Ontario Ministry of the Environment and Energy's guidelines for blasting in quarries, provided all recommendations in this report are seriously considered by the quarry operator.

REFERENCES

Froedge, D.T., *"Blasting Effects on Water Wells"*, Proceedings of the Ninth Conference on Explosives and Blasting Technique, Dallas, Texas, 1983.

Matheson, G.M., Miller, D.K., *"Blast Vibration Damage to Water Supply, Well Water Quality and Quantity"*, Proceedings of the Twenty-Third Annual Conference on Explosives and Blasting Technique, Las Vegas, Nevada, 1997.

Ontario Ministry of the Environment and Energy, "*Municipal Noise Control By-Law – Final Report*", Noise Pollution Control Section, 1978.

Ontario Ministry of the Environment and Energy, "*Guidelines on Information required for the Assessment of Blasting Noise and Vibration*", Noise Assessment Unit, 1985.

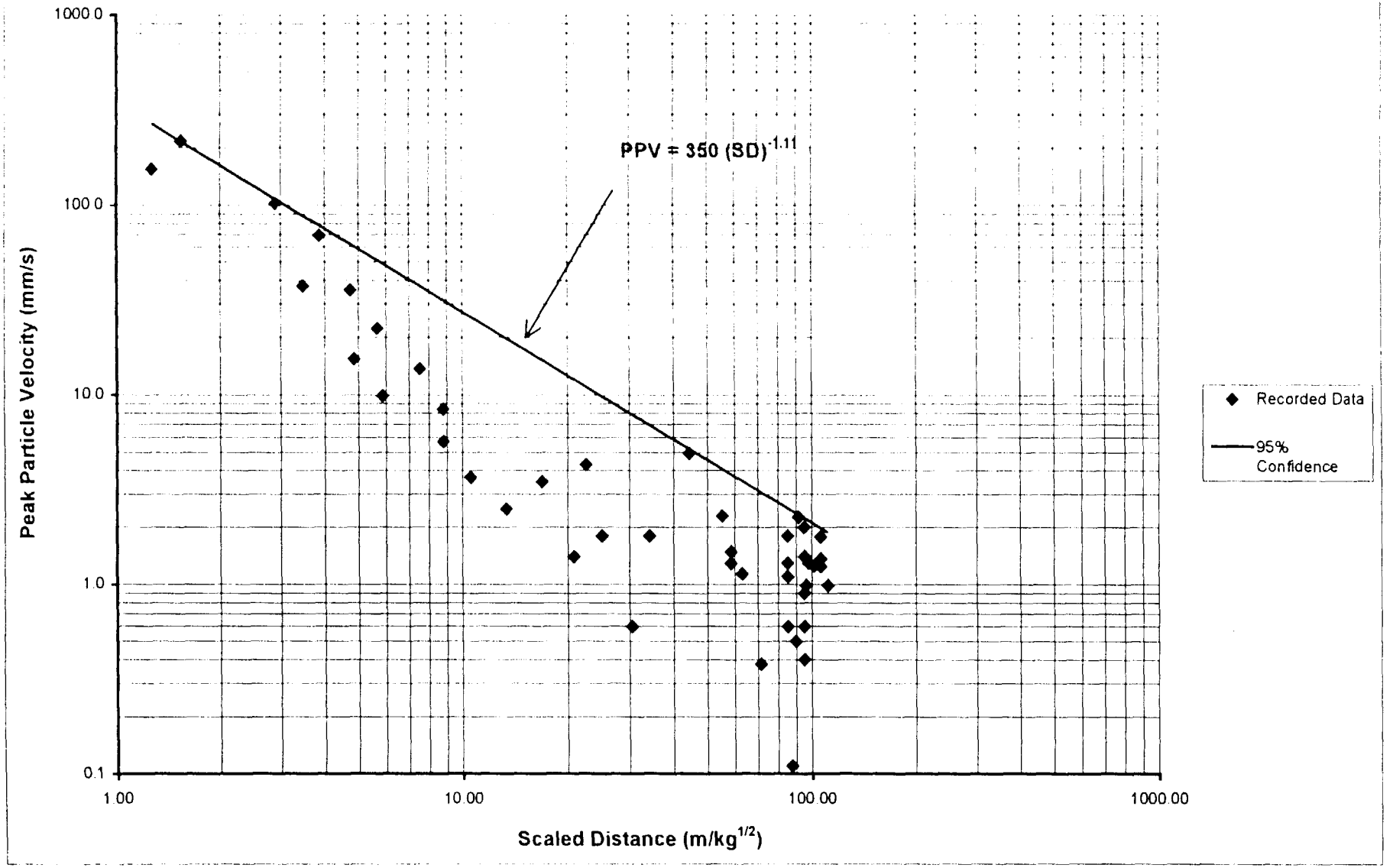
Rose, R., Bowles, B., Bender, W.L., *"Results of Blasting in Close Proximity to Water Wells at the Sleeper Mine"*, Proceedings of the Seventeenth Conference on Explosives and Blasting Technique, Las Vegas, Nevada, 1991.

U.S. Management Science Associates, *"A Model for the Determination of Flyrock Range as a Function of Shot Conditions"*, Los Altos, California, 1979.

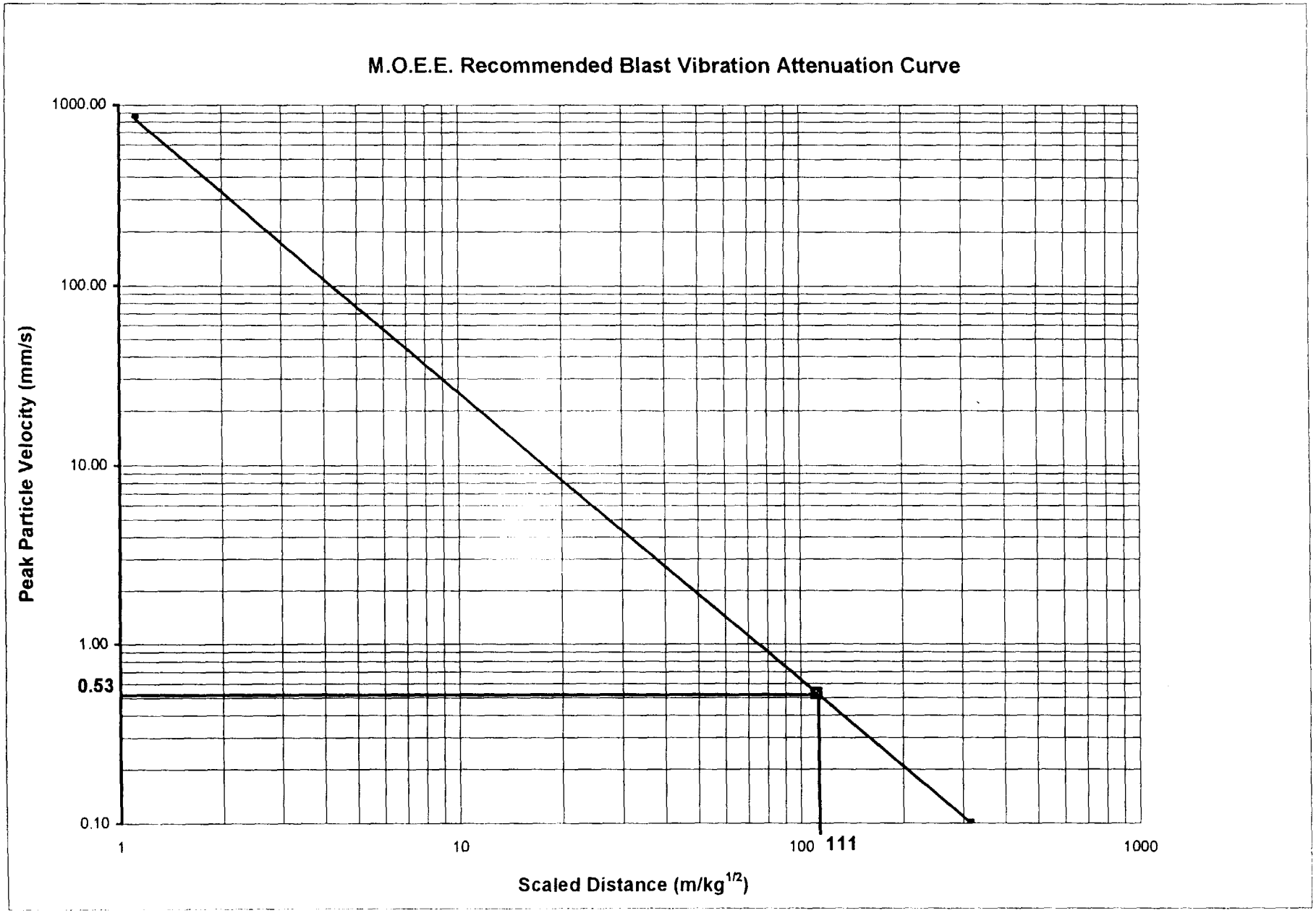
EXPLOTECH

APPENDIX 1

Regression Line For Quarry Blasts in Northern Ontario



APPENDIX 2


M.O.E.E. Recommended Blast Vibration Attenuation Curve
1000.00
100.00
10.00
1.00
0.53
0.10
Peak Particle Velocity (mm/s)
1
10
100
111
1000
Scaled Distance (m/kg1/2)

APPENDIX 3

FLYROCK

The following calculations are based on the following publication:

"A Model for Determination of Flyrock Range as a Function of Shot Conditions
(U.S.) Management Science Associates, Los Angeles, CA
Prepared for U.S. Bureau of Mines

The model indicates that for flyrock from a vertical face is controlled predominantly by: a) borehole diameter, b) minimum burden and c) height of the explosive column define the maximum flyrock range for a given explosive, shot in a given rock. Variations in the flyrock range for different rock types under otherwise equivalent shot conditions appear to be fairly small.

For flyrock originating from bench tops, flyrock range appears to be controlled by: a) the distance of the top of the explosive column to the borehole collar b) the total explosive load per borehole and to a lesser extent c) the borehole diameter. However, difference in flyrock range among different rock types appears to be relatively large. The timing sequence of detonations of indivual boreholes and gas venting and breaking of the vertical face may also effect top flyrock range.

Flyrock range is given by:

$L=V_0 \sin 2\theta/g$

where L = horizontal range
V_0 = initial velocity
θ = initial angle
g = accelation due to gravity

The maximum flyrock, $Lm = V_0^2/g$ where $\theta = 45^\circ$ & $g = 9.8\ m/s^2$
If the flyrock origates at an elevation h above ground level

$Lm' = Lm/2\ (\ (1+ 4h/Lm)^{1/2} +1)$

FLYROCK FROM VERTICAL FACES

For most explosives (shot in a single borehole)

$V_0 = 0.33D(c/m)^{1/2}$

where D = VOD of the explosive
c = mass of the explosive
m = mass of the material propelled

For ANFO

$V_0 = 0.44D(c/m)^{1/2}$

Per unit length of borehole

$c/m = W/(\rho_m b^2 \tan(\alpha/2))$

where W = weight of explosive per unit length of borehole

ρ_m = density of the rock
b = burden to the free face
α = breakout angle

Estimations are:	b(cm)	b(ft)	α(°)
	40.6	1.3	90
	53.3	1.7	95
	72.3	2.4	107
	91.4	3.0	120

From regression slopes

For Granite & ANFO
$Lm = 0.334[8.95*10^5(d/b)^2 - 584] (0.44D/7544)^2$ (ft)

For Granite & Non-ANFO Explosives
$Lm = 0.334[8.95*10^5(d/b)^2 - 584] (0.33D/7544)^2$ (ft)

For Sandstone & ANFO
$Lm = 0.334[6.86*10^5(d/b)^2 - 475] (0.44D/5740)^2$ (ft)

For Sandstone & Non-ANFO Explosives
$Lm = 0.334[6.86*10^5(d/b)^2 - 475] (0.33D/5740)^2$ (ft)

For Limestone & ANFO
$Lm = 0.334[7.42*10^5(d/b)^2 - 200] (0.44D/5490)^2$ (ft)

For Limestone & Non-ANFO Explosives
$Lm = 0.334[7.42*10^5(d/b)^2 - 200] (0.44D/5490)^2$ (ft)

Case No. 1
Given the following:

d	4.0	inch diameter hole
ρ	2.6	g/cm^3 for Granite
b	120.0	ft. for a 10.0 ft. X 10.0 ft. square pattern
α	120	degrees breakout
D	13410	ft/s (V.O.D.) for ANFO
h1	60	Bench height in ft.
elev	50	Elevation of toe in ft.
h	h1 - elev	ft. for the rock collar above the ground level
h =	110	ft.

$$Lm \quad 0.334 \cdot \left[8.95 \cdot 10^5 \cdot \left(\frac{d}{b} \right)^2 - 584 \right] \cdot \left(0.44 \cdot \frac{D}{7544} \right)^2 \quad \text{(ft)}$$

$$L \quad \frac{Lm}{2} \cdot \left[1 + \sqrt{1 + 4 \cdot \frac{h}{Lm}} \right] \qquad L = 146.73 \quad \text{ft. is the maximum flyrock range from the face.}$$

FLYROCK FROM BENCH TOPS

Empirical data indicates that the relation of initial benchtop flyrock velocity (Vobs) with the Scaled Depth of Burial ($s/W^{1/3}$) is as follows:

For Sandstone
$V_{obs} = 98.4(s/W^{1/3})^{-0.90}$ (ft/s)

For Granite
$V_{obs} = 180.0(s/W^{1/3})^{-0.79}$ (ft/s)

where s is the depth of burial of charge (ft)
W is the weight of the charge (lb)

$W \quad 166.7 \quad$ lb.

$s \quad 4.5 \quad$ ft.

$g \quad 32.14 \quad ft/s^2$

$$SB \quad \frac{s}{W^{0.33}} \qquad SB = 0.832 \quad ft/lb^{1/3} \quad \text{Scaled Depth of Charge Burial}$$

$$Vobs \quad 180.0 \cdot (SB)^{-0.79} \qquad Vobs = 208.206 \quad \text{Initial velocity in ft/s}$$

$$Lobs \quad \frac{Vobs^2}{g} \quad \text{in ft., where } \theta = 45^\circ \qquad Lobs = 1.349 \cdot 10^3 \quad \text{Maximum flyrock range in ft.}$$

$$Lb \quad \frac{Lobs}{2} \cdot \left[1 + \sqrt{1 + 4 \cdot \frac{h}{Lobs}} \right] \quad \text{Maximum flyrock range for a bench at "h" feet above ground level.}$$

$Lb = 1.451 \cdot 10^3$ ft. is the maximum flyrock range from the bench top.

Temagami Traprock Project

Aquatic Resources Baseline Survey

Prepared for:
Blackstone Development Inc.
Cobalt, Ontario

Prepared by:
N.A.R. Environmental Consultants Inc.
1351C Kelly Lake Road, Unit #11
Sudbury, Ontario P3E 5P5
(705)522-5990

November 1998

1.0 Introduction

Blackstone Development Inc. is proposing to establish a traprock quarry to be located on Roosevelt Road in the Temagami Township Municipality (formerly Best Township). The site is located approximately 13 km northeast of the Town of Temagami and 1.5 km south Rib Lake. The site is 15 ha in size and is located on unpatented mining claims No. 118527 and 1212011.

The work involves the blasting and removal of the traprock material. No crushing or additional processing of the rock will be conducted on site. The current forest access road will be relocated south of the quarry site and the site will be progressively grubbed as it is developed.

N.A.R. Environmental Consultants Inc. has been retained by Blackstone Development Inc. to conduct an environmental survey of adjacent waterbodies. The general objective of the survey is to establish pre-operative baseline conditions from which to measure changes in water, sediment and biotic quality following the development of the quarry.

2.0 Site Drainage

The traprock site is located at the approximate watershed divide between the McNab Creek and Lake #76 watersheds. Field observations and OBM mapping (1:20,000) appear to indicate that drainage from the site would flow to the south, and would eventually report to McNab Creek and Rib Lake. There is a intermittent stream located approximately 0.9 km to the east of the site which crosses the forest access road and drains into Lake #76.

There are no significant drainage courses located in the proximity of the proposed quarry site at this time. A stormwater management plan will be completed for the site prior to development, with the proposed site drainage to be directed towards Lake #76. While it is not anticipated that the McNab Creek watershed will be impacted by the site, baseline sampling was conducted on the creek for the purposes of this inventory.

3.0 Water Quality

Water quality samples were collected on August 12 and September 24, 1998 at McNab Creek, immediately upstream of the forest access road, and at a mid-lake station in Lake #76 (Figure 1). Field measurements of temperature, dissolved oxygen (Hach kit), pH and conductivity (DSPH-1 pH/Conductivity Meter) were conducted at each site on both dates. In addition, Secchi disc visibility was recorded at the Lake #76 station. Grab samples were collected at McNab Creek and 2.5 m composites samples were collected at Lake #76. All samples were kept on ice and submitted to Philip Analytical Services for analyses of nutrients, metals and general characterization parameters.

Results of the water quality analyses are presented in Table 1. Applicable Provincial Water Quality Objectives (PWQO)(MOE 1994) are also reported.

pH was slightly below neutral at both locations on both sampling dates. Conductivity levels measured were low. Alkalinity and hardness levels were higher at McNab Creek than Lake #76. Dissolved oxygen concentrations at Lake #76 were high, ranging from 8.0 to 9.0 mg/L (78% to 100% saturation), exceeding the PWQO of 47% for the protection of warm water biota. While dissolved oxygen levels at McNab Creek were low with saturation levels ranging from 37% to 46%, healthy cyprinid populations were noted at the station during both sampling dates. Total phosphorus concentrations were low, indicative of good water quality with respect to nutrient concentrations. Total suspended solids at both stations on both dates were good (<5 mg/L).

With the exception of iron at the McNab Creek station during August, levels of all metals analyzed were below their respective PWQOs, with approximately 50% of the metal concentrations below the laboratory method detection limits. Iron levels at McNab Creek on August 12th were 2.5 times the PWQO of 0.300 mg/L. A significant iron hydroxide floc was noted throughout the sampling reach during that date, however, it was not present during the September sampling.

In summary, the levels of most parameters analyzed were low and met applicable Provincial objectives.

4.0 Sediment Quality

Triplicate sediment samples were collected on Sept. 24, 1998 at the Lake #76 mid-lake station. Samples were collected using a 15 x 15 x 15 cm (6 x 6 x 6 in) Ekman dredge. The top 2.5 cm was placed in sample jars, shipped on ice and analyzed for metals, total phosphorus (TP) and total Kjeldahl nitrogen (TKN). Sediment descriptions (after Roelofs 1944) were recorded for each sample.

Results of the sediment chemistry analyses presented in Table 2. Sediment descriptions are provided in Table 3.

Chromium and manganese concentrations in the sediments were below MOE's applicable Provincial Sediment Quality Guidelines (PSQG) Lowest Effect Levels (LEL). Zinc levels were slightly below or equal to the LEL. Levels of cadmium, nickel and lead exceeded their respective LELs but were below the Severe Effect Level (SEL). Copper concentrations in all samples (mean = 133 ug/g) exceeded the SEL of 110 ug/g.

TP concentrations exceeded the LEL, while TKN levels exceeded the SEL of 4800 ug/g by approximately three times. Elevated levels of these parameters are indicative of highly organic sediments. This is supported by the sediment descriptions which characterized the substrate as a finely divided organic muck.

In general, sediment results are typical of a shallow, organic shield lake with no man-made inputs. As stated in *Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario* (MOE 1992), those areas where the local background levels are above the LEL, the background levels will form the practical lower limit for management decisions.

Table 3: Sediment Descriptions - Lake #76, Sept. 224, 1998

Station	Description (after Roelofs 1944)
Sample #1	-3.5 m deep, 90% dredge -approximately 5 cm soft watery (finely divided) layer overlying brown muck layer -slight organic odour -no macrophytes
Sample #2	-3.5 m deep, 80% dredge -organic muck layer below finely divided layer -slight organic dour
Sample #3	-3.5 m deep, 95% dredge -finely divided organic muck -slight organic odour -no macrophytes

4.0 Benthic Macroinvertebrate Community

Three benthic macroinvertebrate samples were collected at the mid-lake station on Lake #76 on Sept. 25, 1998, using a 15 x 15 x 15 cm Ekman dredge. Individual samples were sieved in the field and returned to the lab to be live "picked". All samples were identified to order, placed in vials and preserved with 70% ethanol. The samples have been submitted to Aquatic Ecostudies Ltd. for detailed taxonomic identification. Results will be provided when available.

Number of taxa and number of individuals collected were low, however species present (Ephemeroptera, Chaoboridae) are indicative of good water quality.

5.0 Fish Community

To assess the fish communities present at McNab Creek, two standard minnow traps were baited and deployed upstream and downstream of the forest access road on September 24th. Traps were retrieved the following day and the species captured were identified, enumerated and released. Unknown species were preserved and returned to NAR's lab for identification. Due to the creek depth and substrate nature, electrofishing could not be conducted at this site.

At Lake #76, two standard minnow traps were baited and deployed at both the inlet and outlet ends of the lake on September 24th. Traps were retrieved the following day, species identified, enumerated and released. An overnight set of gill gangs, consisting of 8 panels (38 to 127 mm mesh size) was employed on September 24th. Individual measurements of fork length, total length and weight were recorded for each fish captured. Live fish were released and mortalities

were appropriately disposed.

Results of all fisheries collections are presented in Table 4. Complete fish metrics for species collected in the overnight netting program are presented in Table 5.

At McNab Creek, five cyprinid species, totalling 128 fish were captured (Table 4). Finescale dace comprised approximately 71% of the fish community. This species is common to cool bog lakes and streams and is often found in stained waters (Scott and Crossman 1973). Numbers of remaining species collected, all common widely distributed cyprinids, were low.

Species collected by minnow trap in Lake #76 were limited to two species, with pumpkinseeds comprising 89% of the catch. Results of the netting program characterize the fish community as cool water, with species captured common to shield bog lakes. A total of 5 species were captured with northern pike and rock bass each comprising approximately 33% of the total catch.

6.0 Summary

Water quality analyses conducted for Lake #76 and McNab Creek showed low levels of most parameters measured and generally good water quality in both waterbodies. In that no development has occurred within the Lake #76 watershed, elevated metal levels in the sediments are probably a result of natural mineralization within the watershed. Biological communities (benthos, fisheries) are indicative of cool water communities and good water quality. Macroinvertebrate taxonomic identifications will be provided when completed.

7.0 References

MOE. 1992. Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario. Water Resources Branch. Ontario Ministry of Environment and Energy. 27 pg.

MOE. 1994. Water Management: Policies, Guidelines, Provincial Water Quality Ofjectives of the Ministry of Environment and Energy. Water Resources Branch. Ministry of Environment and Energy. 31 pg.

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Scott, W.B. and E.J. Crossman. 1973. Freshwater Fishes of Canada. Bulletin 184. Fisheries Research Board of Canada. Environment Canada. Ottawa, Canada. 966 pg.

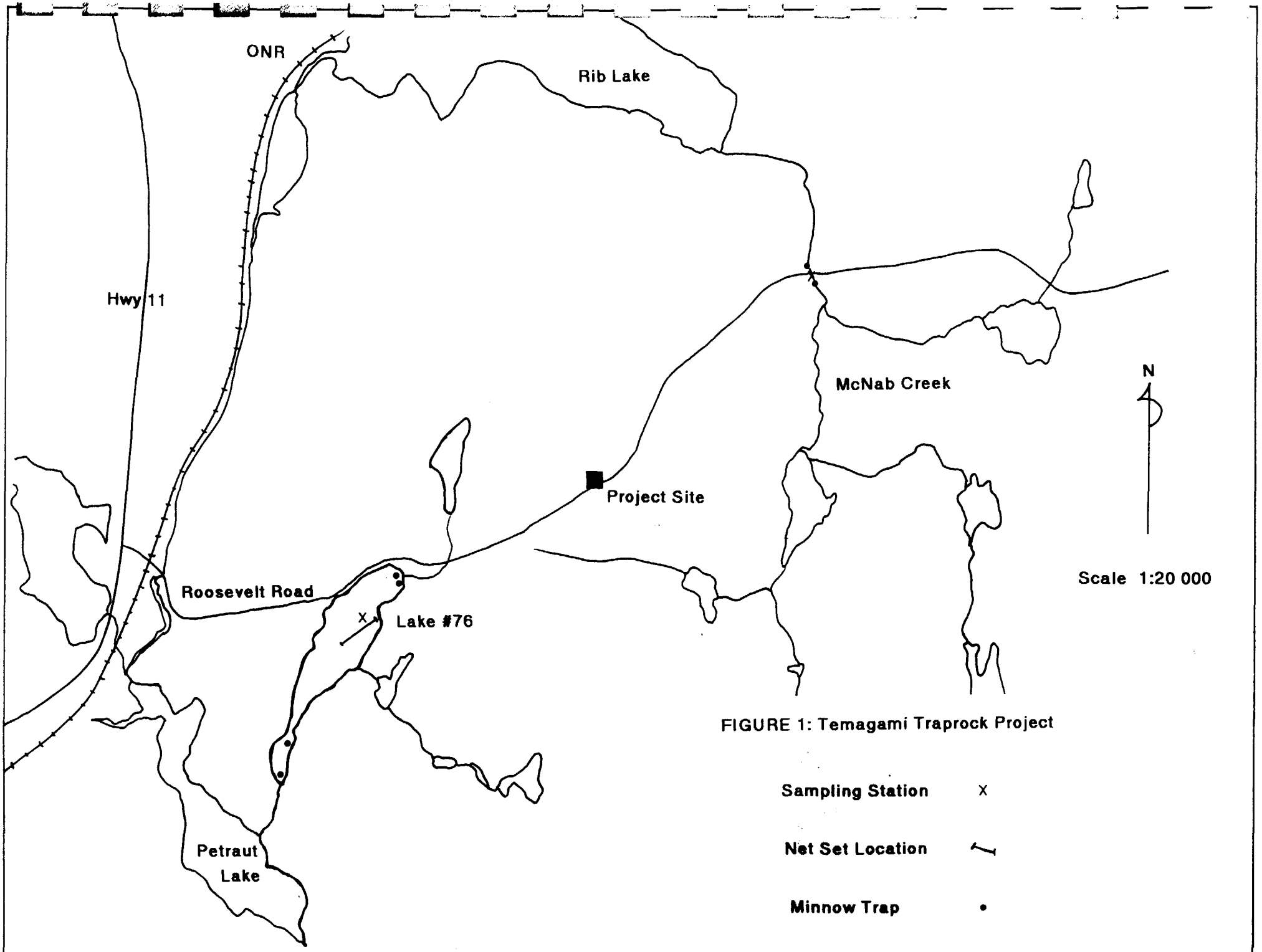


FIGURE 1: Temagami Traprock Project

NAR Environmental Consultants Inc.

Table 1 - Water Quality Results
Lake #76 and McNab Creek - 1998

Parameter	Lake #76 98/08/12	Lake #76 98/09/24	McNab Creek 98/08/12	McNab Creek 98/09/24	PWQO
Field measurements					
pH (pH units)	6.80	6.30	6.66	**6.21**	6.5 - 8.5
Cond. (ppm)	30	30	100	90	-
Temp. (°C)	22.5	15.0	19.0	12.0	-
D.O. (mg/L)	9.0 (100%)	8.0 (78%)	**4.0 (46%)**	**4.0 (37%)**	47%
Secchi depth (m)	3.0 (bottom)	2.75	-	-	-
Lab analyses					
TSS (mg/L)	2	2	4	1	-
TP (mg/L)	0.007	0.008	0.014	0.006	0.020
TKN (mg/L)	0.18	0.37	0.24	0.19	-
Alk (mg/L)	15.0	15	67.0	69	-
NH3 (mg/L)	0.02	0.04	0.04	0.07	-
Hard (mg/L)	-	22.7	-	79.9	-
SO4 (mg/L)	5.97	-	3.53	-	-
Ag (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Al (mg/L)	0.052	0.038	0.015	0.012	0.075
As (mg/L)	<0.002	<0.002	<0.002	<0.002	0.100
B (mg/L)	<0.005	-	<0.005	-	0.200
Ba (mg/L)	<0.005	<0.005	0.009	0.008	-
Be (mg/L)	<0.001	<0.001	<0.001	<0.001	0.011
Bi (mg/L)	<0.001	<0.001	<0.001	<0.001	-
Ca (mg/L)	5.7	5.7	20.4	19.1	-
Cd (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Co (mg/L)	0.0001	<0.0001	0.0004	<0.0001	0.0006
Cr (mg/L)	<0.005	<0.005	<0.005	<0.005	0.100
Cu (mg/L)	0.0020	0.0024	<0.0005	0.0007	0.005
Fe (mg/L)	0.05	0.11	**0.77**	0.24	0.300
K (mg/L)	0.1	0.4	0.3	0.5	-
Mg (mg/L)	1.76	1.63	5.57	5.07	-
Mn (mg/L)	0.008	0.016	0.120	0.024	-
Mo (mg/L)	<0.001	<0.001	<0.001	<0.001	0.010
Na (mg/L)	0.9	0.9	1.4	1.3	-
Ni (mg/L)	<0.001	<0.001	<0.001	<0.001	0.025
Pb (mg/L)	0.0005	0.0034	0.0130	0.0037	0.005-0.02
Sb (mg/L)	0.0005	<0.0005	0.0007	<0.0005	0.020
Se (mg/L)	<0.002	<0.002	<0.002	<0.002	0.100
Si (mg/L)	0.83	-	3.41	-	-
Sn (mg/L)	<0.001	-	<0.001	-	-
Sr (mg/L)	0.015	0.016	0.032	0.032	-
Ti (mg/L)	<0.005	<0.005	<0.005	<0.005	-
V (mg/L)	0.0008	0.0007	0.0008	0.0006	0.007
Zn (mg/L)	<0.002	0.002	<0.002	0.004	0.020

Table 2: Sediment Results
Lake #76 - Sept. 24, 1998

Parameter	Sample 76A	76B	76C	Mean	Provincial Quality LEL	Sediment Guideline SEL
TKN	**14600**	**16000**	**14200**	**14933**	550	4800
Phosphorus	**970**	**1030**	**1000**	**1000**	600	2000
Silver	<0.3	<0.3	<0.3	<0.3	-	-
Aluminum	13500	13500	13500	13500	-	-
Barium	50	53	51	51	-	-
Beryllium	0.4	0.4	0.4	0.4	-	-
Calcium	6640	6730	7020	6797	-	-
Cadmium	**1.6**	**1.5**	**1.4**	**1.5**	0.6	10
Cobalt	14	14	14	14	-	-
Chromium	24	24	24	24	26	110
Copper	**130**	**134**	**134**	**133**	16	110
Iron	10600	10600	10700	10633	20000	40000
Potassium	520	507	536	521	-	-
Magnesium	1920	1960	2090	1990	-	-
Manganese	172	186	185	181	460	1100
Molybdenum	<3	<3	<3	<3	-	-
Sodium	77	94	77	83	-	-
Nickel	**50**	**54**	**48**	**51**	16	75
Lead	**51**	**49**	**49**	**50**	31	250
Strontium	22.2	22.1	22.8	22.4	-	-
Titanium	131	140	131	134	-	-
Vanadium	14	14	14	14	-	-
Zinc	118	**120**	117	118	120	820

All results in ug/g dry weight.
All exceedances are bolded.

LEL = Lowest Effect Level
SEL = Severe Effect Level

Table 4: Fish Species Collected - Sept. 25, 1998

Species Captured			
Minnow traps:		**McNab Creek Trap #1 - D/S**	**McNab Creek Trap #2 - U/S**
Finescale dace	*Chrosomus neogaeus*	52	39
Bluntnose minnow	*Pimephales notatus*	8	3
Pearl dace	*Semotilus margarita*	5	-
Creek chub	*Semotilus atromaculatus*	3	6
Spottail shiner	*Notropis hudsonius*	6	4
Total		**74**	**54**
Minnow traps:		**Lake # 76 - Outlet**	**Lake #76 - Inlet**
Pumpkinseed	*Lepomis gibbosus*	5	20
Yellow perch	*Perca flavescens*	-	3
Total		**5**	**23**
Gill nets:		**Lake #76**	
White sucker	*Catastomus commersoni*	3	
Northern pike	*Esox lucius*	6	
Rock bass	*Ambloplites rupestris*	6	
Pumpkinseed	*Lepomis gibbosus*	1	
Yellow perch	*Perca flavescens*	1	
Total		17	

Table 5: Fish Metrics - Results of Netting Program
Lake # 76 - September 25, 1998

Panel #	Mesh Size (mm)	Species	Number	Fork Length (cm)	Total Length (cm)	Weight (g)
1	127	White Sucker	1	49	53	1575
2	114	White Sucker	2	48	51	1500
3	89	White Sucker	3	36.5	39	6259
4	102	no fish				
5	76	no fish				
6	64	Northern Pike	1	40	41.5	375
	64	Rock Bass	1	15.5	16	50
7	38	Northern Pike	2	43	45	475
	38	Northern Pike	3	29	31	125
	38	Northern Pike	4	48.5	52	775
	38	Rock Bass	2	11.5	12	20
	38	Rock Bass	3	10.5	11	15
	38	Rock Bass	4	11	11.5	15
	38	Rock Bass	5	12.5	13	20
	38	Yellow Perch	1	15.5	16	25
	38	Northern Pike	5	31	33	150
	38	Rock Bass	6	11	12	15
8	51	Pumpkinseed	1	12.5	13	25
	51	Northern Pike	6	34.5	37	225

Addendum Report

Temagami Traprock Project
Aquatic Resources Baseline Survey

The following report provides the results of the benthic macroinvertebrate collections conducted on September 24, 1998 as part of the environmental baseline survey of Lake #76, prior to the establishment of the Temagami Traprock quarry. An assessment of water and sediment quality and the fish communities present was provided in *Temagami Traprock Project - Aquatic Resources Baseline Survey,* previously completed by N.A.R. Environmental Consultants Inc.

As detailed in the baseline survey, three samples were collected at the mid-lake station on Lake #76 using an 15 x 15 x 15 cm Ekman dredge. Samples were sieved in the field and lived picked at NARs lab. The samples were identified to family/order, placed in vials and preserved with 70% ethanol. The samples have been archived should taxonomic identification to a lower order (i.e. genus/species) be required at a future date.

Results of the benthic collections are presented in Table A.

Table A: Macroinvertebrates collected at Lake #76 mid-lake station, September 24, 1998

Organism	Lake #76A	Lake #76B	Lake #76C
Class Insecta:			
Ephemeroptera			
Ephemeridae	1	1	2
Diptera			
Chironomidae	3	4	3
Chaoboridae	5		4
Other diptera	1	1	
Total no. of taxa	**4**	**3**	**3**
Total no. of individuals	**10**	**6**	**9**

Samples collected using 15 x 15 x 15 cm Ekman dredge.

In general, numbers of taxa and of individuals were low. *Hexagenia limbata* (Ephemeridae) has a moderate tolerance to low oxygen levels, indicating that the sediments are probably aerobic on a year-round basis. Conversely, dipterans as a group are generally tolerant of anaerobic conditions. In summary, the species present are typical of and common to Precambrian shield lakes.

PUBLIC INFORMATION MEETING

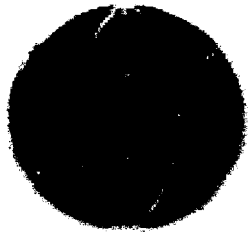
RE: Proposed Traprock Quarry Permit
Mr. Gino Chitaroni

DATE: July 8th, 1998

LOCATION: Township of Temagami
Temagami Welcome Centre
Ministry of Natural Resources Room

TIME: Session #1 - 2:00 P.M. to 4:00 P.M.
Session #2 - 7:00 P.M. to 9:00 P.M.

AGENDA:
1) Introductions
2) Permitted Land Use in Best Township
3) Maps
4) Background Information
5) What is Traprock?
6) Consultants & Advisors
7) Permit Process
8) Pre-Production
9) Quarry Operation & Production
10) Market
11) Financial Investment
12) Economic Impact
13) Concerns



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PERMITTED LAND USE in BEST TOWNSHIP

Report of the Comprehensive Planning Council on land use for the Temagami Comprehensive Planning Area (April 10, 1996)

1989 - Temagami Area Comprehensive Planning Program launched by Natural Resources Minister Lyn McLeod for the management of the resources of the Temagami area.
1991 - Natural Resources Minister Bud Wildman created the Comprehensive Planning Council to strengthen the role of local communities in the management of natural resources in the Temagami area.
1995 - Natural Resources Minister Chris Hodgson directed the Council to complete and submit recommendations on land use for the Temagami comprehensive planning area.
1996 - the Comprehensive Planning Council presented a report on land use for the Temagami Comprehensive Planning Area.

Management Area #16 Roosevelt Road (Red Zone)

Purpose Statement:

To allow for forestry and mining related activities while providing for a full range of recreational opportunities with a focus on managing the high intensity angling on stocked lakes. Existing tourism operations will continue and new opportunities will be explored.

Summary of Permitted Uses includes:

Commercial Timber Harvesting
Forest Renewal and Maintenance
Aggregate Extraction
Mineral Exploration & Development

TOWNSHIP of TEMAGAMI - MUNICIPAL ZONING BYLAW 81-82

The location of the proposed traprock quarry, situated in Best Township as determined by Mining Claims #1118527 and #1212011, are zoned Moose Pasture (MP), and as such wayside pits or quarries are permitted uses in this zone.

PAST, PRESENT & FUTURE LAND DISPOSITION (refer to maps)

Line Cutting
Gravel Pit
Highway Construction
Forestry
Sand Pit
Power Trenching
Diamond Drilling
Staking
Surveying
Mining
Pipeline Construction
Road Construction

MAPS

Plan #1	Area Land Disposition - Regional
Plan #2	Topographical
Plan #3	Exploration Data Map
Plan #4	Engineering Geology Terrain Study
Plan #5	Combined Geology Map
Plan #5a	Combined Geology Map Legend
Plan #6	Area Land Disposition - Local
Plan #7	Cross Section - Proposed Traprock Quarry to Rib Lake

BACKGROUND INFORMATION

1992 - The Temagami Land Caution was lifted which permitted mineral exploration and land development in Best Township.

1992 - A report of exploration on Rib Lake Claims, Best Township, under the Ontario Prospectors Assistance Program Grant #OP92-619 was presented by A. W. Beecham identified a source of Nipissing Diabase-Gabbro.

1995 - The Ontario Geological Survey Aggregate Resources Inventory Paper #156 for the Bruce Mines to Blind River Area. "Of the bedrock in the report area, The Nipissing Diabase-Gabbro is considered to have the highest potential for extractive development."

1996 - Market Research Study on Crushed Stone Aggregate Production and Sales in Canada and the United States by Wareing Associates

1996 - Letter of support received from the Temagami Economic Development Corporation.

1996 - Letter of support received from the Temagami & District Chamber of Commerce.

1996 - Application for an Aggregate Permit received from the Ministry of Natural Resources.

1997 - Gino Chitaroni obtained claims from A.W. Beecham.

1997 - Application for an aggregate quarry permit sent to the Ministry of Natural Resources.

1997 - Transfer of unpatented mining claims from A.W. Beecham to Gino Chitaroni is approved by the Ministry of Northern Development and Mines.

1997 - The Ministry of Natural Resources advised Mr. Chitaroni that the application for the aggregate quarry permit should not exceed 16 hectares and a cultural heritage study was required by a licenced archaeologist.

1998 - The Ministry of Natural Resources conducted a site inspection.

1998 - The Township of Temagami advised Mr. Chitaroni that wayside pits or quarries are permitted in the location of mining claims #1118527 and #1212011 in Best Township.

1998 - A revised application for the aggregate permit, based on the guidelines and restrictions presented by the Ministry of Natural Resources, submitted for approval.

1998 - Information packages were sent to the Ministry of Natural Resources for distribution.

WHAT IS TRAPROCK?

The term traprock can not usually be found in any Canadian statistics and neither is diabase a recorded category. Conversely, the United States Bureau of Mines (now the U.S. Geological Survey) does list traprock in its statistics as a measureable category. However, in Canada, this category of rock is bundled in with others under the more general heading of crushed stone - granite.

The definition from a report published by the U.S. Bureau of Mines, "Overview: Crushed Stone - United States and the World 1993" is as follows:

"Gabbro, diabase and basalt are dark-coloured igneous rocks, low in silica content and are commonly called traprock."

Because of its high strength and durability, diabase-gabbro represents a potential source for a variety of high-specification aggregates, including the production of Stone Mastic Asphalt (SMA), Canadian HL #1 Dense Friction Coarse (DFC) asphalt and high strength concrete. Other industrial mineral applications include the production of rail ballast, riprap, road bed fill, pit run, roofing granules and raw material for rock wool insulation.

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PERMIT PROCESS

The cost of a permit application and issue of the permit is quite cheap, only a few hundred dollars. **However the information required to obtain the permit, demanded by the Ministry of Natural Resources, is detailed, complex, time consuming and very costly to obtain, running into thousands of dollars.** Apart from the many dozens of drafted plans and maps of the quarry site showing location, how the quarry will be designed, constructed, operated and finally rehabilitated, there are **independent professional consultant studies and reports** which had to be obtained and provided. Included in these are:

1. A Stage 1 Archeological and Heritage Impact Assessment - Dr. John Pollock, Settlement Surveys Ltd.

2. A Timber Cruise and Forestry Assessment - Elk Lake Community Forest/Boreal Resources Ltd.

3. A Site Survey - Tape and Compass

4. Opinions have been sought from a variety of professionals, through site visits, in regard to the hydrogeology of the area, potential environmental impact, quarry rehabilitation and more.

All of the information obtained has been incorporated into the numerous reports and plan modifications demanded by the MNR over a period of almost two years.

The Process has demanded careful study, very detailed plans and reports and has occupied the professional and technical skills of several people for various blocks of time to allow us to bring it to its present stage.

PRE-PRODUCTION

1992 - 1995	Claim Staking
1992 - 1995	Grid Placement
1992 - 1995	Geological Reports
1992 - 1995	Soil Geochemical Analysis
1992 - 1995	Geological Maps
1993 - 1998	Sample Test Analysis
1994 -1996	Geophysical Reports
1995 - 1996	Ministry of Transport - HL 4 Designation Tests
1996 - 1997	Leachate Tests
1997 - 1997	Boreal Resources - Operational Cruise Report
1997 - 1997	Archaeological and Heritage Impact Assessment
1996 - 1997	Market Study
1997 - 1998	Quarry Design
1997 - 1998	Quarry Permit Application
1998 - 1998	Public Consultation
1998 - 1999	Clear & Grub Quarry Site
1998 - 1999	Mechanical Strip of Site
1998 - 1999	Outcrop Wash of Site
1998 - 1999	Ministry of Transport - Bulk Sample for HL 1 Designation Tests
1998 - 1999	Construct Access Road
1998 - 1999	Construct Perimeter Fence
1998 - 1999	Marketing
1998 - 1999	Initial Production

QUARRY OPERATION & PRODUCTION

Production Estimates: (upon permit approval)

Months in Production	Bulk Sample	Shot Rock	Crushed
0 to 3 months	nil	nil	nil
4 to 12 months	5,000 tons	50,000 tons	50,000 tons
13 to 24 months		100,000 tons	100,000 tons
25 to 36 months		200,000 tons	200,000 tons
37 to 48 months		300,000 tons	300,000 tons
49 to 60 months		375,000 tons	375,000 tons

NOTE: production expected from May 1st to November 1st
hours of operations - not continuous (dependent on sales)

Noise:

The greatest amount of noise will be generated by the blasting and haul equipment. To evaluate the impacts of noise on the surrounding areas, a noise survey will be conducted on a similar operation. As a general rule, sound from an essentially localized source spreads out as it travels away from the source, and the sound pressure level due to that source decreases at a rate equal to 8 decibels with each doubling of the distance from the source. (referred to as the inverse square law)

Blasting:

The only accepted and cost effective manner to remove bedrock in aggregate operations is by way of blasting. Over the years, that blasting has been employed in the industry, many advances have been made by improving safety standards and blasting efficiency of the charge. When explosives are detonated in the course of quarrying operations, the basic purpose is to break up rock. Almost all of the energy in a properly designed blast is used to this end. Vibrational energy is waste energy, and it is to the blaster's advantage to minimize the waste. A blasting program will be developed with a sub-contractor which will keep impacts below the standards commonly used in other existing quarry operations.

Trucking & Hauling:

The traprock will be loaded at the quarry site on to 25 ton tandem trucks by the use of front end loaders, excavators or bulldozers and hauled to the client's location or stockpiled off-site.

Crushing:

The traprock will be shipped as unfinished shot rock or crushed off-site to minus 3/4 inch. The only crushing or screening at the quarry site would be minimal and incidental and is not anticipated. It is more economical to haul the material to a stockpile location that has a rail siding and crush the traprock at that location.

Erosion and Sedimentation:

1.5 metre berm blocking road on west side of proposed quarry site

berm will be vegetated to prevent erosion

the northeast corner will be extracted first and rehabilitated, as other areas are depleted they will be sloped, topsoil spread and seeded

overburden and topsoil will be spread on the slopes and pit floor during rehabilitation

there will be no discharge or diversion of surface water from the excavation area, all surface water will percolate into the pit floor

there is a natural tree screen around the quarry site

Operational Practices:

careful loading of haul trucks

crushing operations at another location

idle and unloaded equipment shut down

travel speed of vehicles on haulways and access roads to be reduced

stockpile operations at another location

equipment maintained and inspected regularily

spillage clean-up

hose down or sweep settled dust

MARKET

Road construction, commercial and residential development, bridges, railways, harbours, erosion control on waterways and drainage systems, asphalt paved driveways and parking lots, even landscaping and asphalt roofing tiles demand reliable supplies of aggregate, preferably crushed stone and high grade.

The in-depth market study conducted in May, 1996 confirmed the following:

1. The markets range from local through Central and Southern Ontario into the Northern and Mid-Western U.S.

2. There is a declining resource base in Southern Ontario i.e limestone and granite quarries and gravel pits, are either running out or being closed. There is increasing import of all forms of aggregate and in some areas supplies have already run out.

3. New technical standards for road-building and high test concrete are serving to increase demands for the high quality (HL 1, modified HL 3 and HL 4), non-leaching and high skid resistant crushed stone products (Nipissing Diabase).

4. There is a projected growth rate in the markets for aggregates, generally, of 4 - 5% per year into the foreseeable future (15 -20 years).

On the supply side, accessible deposits of this type and quality of bedrock are rare in Ontario, and especially rare south of North Bay.

FINANCIAL INVESTMENT

From 1992 up to and including this presentation Gino Chitaroni and the principals, staff and administration of Blackstone Development Inc., have invested time, effort, materials and money into bringing the project that is now Temagami Traprock Limited to its present, pre-production stage. Included has been:

1992-95 Claim Staking	1992-95 Grid Placement	1992-95 Geological Reports
1992-95 Soil Geochemical Samples and Tests	1992-95 Geological Maps	1993-98 Sample Test Analysis
1994-96 Geophysical Reports	1995-96 MOT HL 4 Tests	1996-97 Leachate Tests
1997-97 Timber Cruise	1997-97 Archeological Review	1996 -97 Market Study
1997-98 Quarry Design	1997-98 Permit Application	1998-98 Public Consultation

When all of the actions, purchases, writing of reports, manual and digital drafting of plans and maps, travel, administration, the time of technical and professional staff and the services of professional consultants are totalled it adds up to a considerable commitment and investment by BDI.

BDI Investment to Date: $ 95,496.00

ECONOMIC IMPACT

There are several methods that can be used to calculate the potential economic impact of any project. Rather than subjecting you to a detailed set of calculations that would require extensive viewing of overheads and charts, for simplicity we have elected to use a multiplication factor, accepted by the economic development community for general calculations and overviews. The components of an impact study include:

Investment
Construction or Start-up Costs including equipment
Operating Costs including employees and wages paid
Taxes paid at all three government levels by the company and employees
Purchase of supplies and services (sub-contractors and materials)
Disposable income of employees - company and sub-contractors
Average housing costs and living expenses
Utilities etc.
Transport
Sales

The multiplication factor we have used (they can range from 2.0 to about 4.5 dependent on the industry sector) is 3.0, being most applicable to this type of business.

Stage or Operation	**Investment/Expenditures**	**Value of Impact**
Start-up, Quarry opening	$ 315,000	$ 945,000
0 to 60 months production		
shot rock (1.025 million tons)	$ 7,421,000	$ 22,263,000
crushed (1.025 million tons)	$10,947,000	$ 32,841,000

This shows that over a 5 year period approximately $19 million of new money will be injected into the communities of Temagami and South Temiskaming giving rise to a generation of business in the area of approximately $55 million.

Creation of Jobs: (seasonal but permanent)

management & supervisory - 3
quarry site - 4 to 6
transportation - 4
crushing & stockpiling - 4

CONCERNS

52 information packages and meeting notices were distributed
20 posters and notices were distributed and displayed
public notification in the Temiskaming Speaker - **circulation 7,745**

WRITTEN RESPONSES - Total (13)

Local Responses (4)
- Temagami (3)
- Cobalt

Outside of Area Responses (9)
- Niagara Falls
- Barrie
- Bracebridge
- London
- Thunder Bay
- Carlisle
- Orillia
- Toronto
- Peterborough

SUMMARY OF CONCERNS:

Noise
- blasting
- crushing
- excavation
- extraction
- trucking
- heavy equipment

Economic Impact
- property value
- loss of business
- proximity to cottages

Hours of Operation
- daily
- monthly
- seasonal

Environmental
- natural beauty and solitude
- wildlife habitat
- fish stocks
- removal of vegetation
- water quality and water run off
- toxicity and contaminants

Safety
- increased traffic
- increased crime
- fire safety

Notice
- 20 days
- public consultation

Ontario Ministry of Northern Development and Mines

Declaration of Assessment Work Performed on Mining Land

Mining Act, Subsection 65(2) and 66(3), R.S.O. 1990

Transaction Number (office use): W9970.00001

Assessment Files Research Imaging

31M04NE2014 2.19167 BEST 900

)section 65(2) and 66(3) of the Mining Act. Under section 8 of the Mining esment work and correspond with the mining land holder. Questions abou: hern Development and Mines, 3rd Floor, 933 Ramsey Lake Road, Sud

Traprock Deposit
Best Twp
Temagami, Ontario

Instructions: - For work performed on Crown Lands before **recording** a claim, use form 0240.
- Please type or print in ink.

1. Recorded holder(s) (Attach a list if necessary)

Name: Gino Chitaroni	Client Number: 117874
Address: Portage Bay Rd; P.O. Box 271, Cobalt, Ontario P0J1C0	Telephone Number: (705) 679-5500
	Fax Number: (705) 679-5519
Name	Client Number
Address	Telephone Number
	Fax Number

2. Type of work performed: Check (✓) and report on only ONE of the following groups for this declaration.

X Geotechnical: prospecting, surveys, assays and work under section 18 (regs) — Physical: drilling stripping, trenching and associated assays — Rehabilitation

Work Type: Multiple Beneficiation Surveys/Studies + Reports, Assays + Maps.	Office Use: Commodity
	Total $ Value of Work Claimed: 21,508
Dates Work Performed: From 01 (Day) 04 (Month) 96 (Year) To 15 (Day) 12 (Month) 98 (Year) ✓	NTS Reference
Global Positioning System Data (if available) — Township/Area: Best Township	Mining Division: Sudbury
M or G-Plan Number: G-3409	Resident Geologist District: Kirkland Lake

RECEIVED 3:15
JAN 06 1999
GEOSCIENCE ASSESSMENT OFFICE

Please remember to:
- obtain a work permit from the Ministry of Natural Resources as required;
- provide proper notice to surface rights holders before starting work;
- complete and attach a Statement of Costs, form 0212;
- provide a map showing contiguous mining lands that are linked for assigning work;
- include two copies of your technical report.

3. Person or companies who prepared the technical report (Attach a list if necessary)

①	Name: Blackstone Dev Inc/Temagami Traprock Ltd Address: 50 Silver St., P.O. Box 699, Cobalt, Ont., P0J1C0	Telephone Number: (705) 679-5500 Fax Number: (705) 679-5519
②	Name: Boreal Resources Inc. (Aka: Elk Lake Community Forest Address: P.O. Box 100 Elk Lake Ontario P0J1G0	Telephone Number: (705) 678-2244 Fax Number: (705) 678-2422
③	Name: Settlement Surveys Ltd: 17 Wellington St. Address: P.O. Box 2529 New Liskeard	Telephone Number: (705) 647-8833 Fax Number: (705) 647-7026
④	Swastika Labs : 1 Cameron Ave., P.O. Box 10, Swastika Ontario	(705) 642-3244 fax (705) 642-3300

4. Certification by Recorded Holder or Agent

I, Gino Chitaroni (Print Name), do hereby certify that I have personal knowledge of the facts set forth in this Declaration of Assessment Work having caused the work to be performed or witnessed the same during or after its completion and, to the best of my knowledge, the annexed report is true.

Signature of Recorded Holder or Agent: Gino Chitaroni	c/o Blackstone Dev Inc	Date: Dec 16, 1998
Agent's Address: 50 Silver St; P.O. Box 699 Cobalt Ont P0J1C0	Telephone Number: (705) 679-5500	Fax Number: (705) 679-5519

0241 (03/97)

Deemed April 06/1999

2.19167

5. Work to be recorded and distributed. Work can only be assigned to claims that are contiguous (adjoining) to the mining land where work was performed, at the time work was performed. A map showing the contiguous link must accompany this form. ✓ Amendment W9970.00001 Pg 2

	Mining Claim Number. Or if work was done on other eligible mining land, show in this column the location number indicated on the claim map.	Number of Claim Units. For other mining land, list hectares.	Value of work performed on this claim or other mining land.	Value of work applied to this claim.	Value of work assigned to other mining claims.	Bank. Value of work to be distributed at a future date.
eg	TB 7827	16 ha	$26, 825	N/A	$24,000	$2,825
eg	1234567	12	0	$24,000	0	0
eg	1234588	2	$ 8, 892	$ 4,000	0	$4,892
1	1118527	3	~~$ 10,754~~	~~$ 5,754~~ $ 4749	~~$ 0~~	~~$ 6,005~~ ~~$ 5,000~~
2	1212011	3	10,754	~~10,754~~	0	~~0~~
3				5,243		5,511
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15	2 Claims	6 units				
	Column Totals		$21,508	~~$ 16,508~~ $ 9,992	$ 0	~~$ 11,516~~ ~~$ 5,000.00~~

RECEIVED
JAN 06 1999 3:15
GEOSCIENCE ASSESSMENT OFFICE

I, Gino Chitaroni (Print Full Name), do hereby certify that the above work credits are eligible under subsection 7 (1) of the Assessment Work Regulation 6/96 for assignment to contiguous claims or for application to the claim where the work was done.

Signature of Recorded Holder or Agent Authorized in Writing: Gino Chitaroni Date: Dec 16 1998

6. Instructions for cutting back credits that are not approved.

Some of the credits claimed in this declaration may be cut back. Please check (✓) in the boxes below to show how you wish to prioritize the deletion of credits:

- ☐ 1. Credits are to be cut back from the Bank first, followed by option 2 or 3 or 4 as indicated.
- ☐ 2. Credits are to be cut back starting with the claims listed last, working backwards, or
- ☒ 3. Credits are to be cut back equally over all claims listed in this declaration; or
- ☐ 4. Credits are to be cut back as prioritized on the attached appendix or as follows (describe):

Note: If you have not indicated how your credits are to be deleted, credits will be cut back from the Bank first, followed by option number 2 if necessary.

For Office Use Only

Received Stamp	Deemed Approved Date	Date Notification Sent
	Date Approved	Total Value of Credit Approved

Ontario Ministry of Northern Development and Mines

Declaration of Assessment Work Performed on Mining Land

Mining Act, Subsection 65(2) and 66(3), R.S.O. 1990

Transaction Number (office use)
W9970.00001
Assessment Files Research Imaging

Personal information collected on this form is obtained under the authority of subsection 65(2) and 66(3) of the Mining Act. Under section 8 of the Mining this information is a public record. This information will be used to review the assesment work and correspond with the mining land holder. Questions abou collection should be directed to a Provincial Mining Recorder, Ministry of Northern Development and Mines, 3rd Floor, 933 Ramsey Lake Road, Sudl Ontario, P3E 6B5.

2.19167

Pg. 1a

Instructions: - For work performed on Crown Lands before recording a claim, use form 0240.
- Please type or print in ink.

1. Recorded holder(s) (Attach a list if necessary)

Name	Client Number
Address	Telephone Number
	Fax Number
Name	Client Number
Address	Telephone Number
	Fax Number

2. Type of work performed: Check (✓) and report on only ONE of the following groups for this declaration.

Geotechnical: prospecting, surveys, assays and work under section 18 (regs) | Physical: drilling stripping, trenching and associated assays | Rehabilitation

Work Type	Office Use
	Commodity
	Total $ Value of Work Claimed
Dates Work Performed From Day / Month / Year To Day / Month / Year	NTS Reference
Global Positioning System Data (If available) — Township/Area	Mining Division
M or G-Plan Number	Resident Geologist District

RECEIVED
JAN 06 1999 3:16
GEOSCIENCE ASSESSMENT OFFICE

Please remember to:
- obtain a work permit from the Ministry of Natural Resources as required;
- provide proper notice to surface rights holders before starting work;
- complete and attach a Statement of Costs, form 0212;
- provide a map showing contiguous mining lands that are linked for assigning work;
- include two copies of your technical report.

3. Person or companies who prepared the technical report (Attach a list if necessary)

(5)	Name: Explotech Engineering Ltd.	Telephone Number: (705) 522-0585
	Address: 200-469 Bouchard Street, Sudbury, Ont, P3E 2K8	Fax Number: —
(6)	Name: N.A.R. Environmental Consultants Inc.	Telephone Number: 705 522-5990
	Address: 1351C Kelly Lake Road, Unit #11 Sudbury Ontario P3E 5P5	Fax Number: —
(7)	Name: Bryan Wareing of Wareing & Associates	Telephone Number: (705) 676-2005
	Address: c/o Blackstone Dev. Inc. 50 Silver St. P.O. Box 699, Cobalt Ontario	Fax Number: —

4. Certification by Recorded Holder or Agent

I, Gino Chitaroni (Print Name), do hereby certify that I have personal knowledge of the facts set forth in this Declaration of Assessment Work having caused the work to be performed or witnessed the same during or after its completion and, to the best of my knowledge, the annexed report is true.

Signature of Recorded Holder or Agent	Date
Gino Chitaroni c/o Blackstone Dev. Inc.	Dec 16, 1998
Agent's Address: 50 Silver St. P.O. Box 699 Cobalt Ont P0J 1C0	Telephone Number: (705) 679-5500 — Fax Number: (705) 679-5519

0241 (03/97)

Ontario Ministry of Northern Development and Mines

Statement of Costs for Assessment Credit

Transaction Number (office use): W9970.00001

Personal information collected on this form is obtained under the authority of subsection 6 (1) of the Assessment Work Regulation 6/96. Under section 8 of the Mining Act, this information is a public record. This information will be used to review the assessment work and correspond with the mining land holder. Questions about this collection should be directed to a Provincial Mining Recorder, Ministry of Northern Development and Mines, 3rd Floor, 933 Ramsey Lake Road, Sudbury, Ontario, P3E 6B5.

2.19167

Pg 3

Work Type	Units of work Depending on the type of work, list the number of hours/days worked, metres of drilling, kilometres of grid line, number of samples, etc.	Cost Per Unit of work	Total Cost
Market Research			$ 7,942.
Blasting Study			2,129.
Environmental Investigation & Baseline Study			5,825.
Timber Cruise and	Baseline Forest Evaluation		615.
Archaelogical Evaluation & Impact Study	(Preliminary)		580.
Drafting Computer	+ Manual		2,386.
Assays			1,669.
Associated Costs (e.g. supplies, mobilization and demobilization).		Not Available	—
Not Included			
Transportation Costs		360.00	360.
Car + 4x4 Pick-up Truck (Cobalt to Temagami)			
12 Trips @ 100 km per Round Trip @ .30/km			
Food and Lodging Costs		Not Available	—
Not Included			
Total Value of Assessment Work			$ 21,508.3

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GEOSCIENCE ASSESSMENT OFFICE

Total Used: $ 21,508

Calculations of Filing Discounts

1. Work filed within two years of performance is claimed at 100% of the above Total Value of Assessment Work.
2. If work is filed after two years and up to five years after performance, it can only be claimed at 50% of the Total Value of Assessment Work. If this situation applies to your claims, use the calculation below:

TOTAL VALUE OF ASSESSMENT WORK	x 0.50 =	Total $ value of worked claimed.

Note:
- Work older than 5 years is not eligible for credit.
- A recorded holder may be required to verify expenditures claimed in this statement of costs within 45 days of a request for verification and/or correction/clarification. If verification and/or correction/clarification is not made, the Minister may reject all or part of the assessment work submitted.

Certification verifying costs:

I, Gino Chitaroni (please print full name), do hereby certify, that the amounts shown are as accurate as may reasonably be determined and the costs were incurred while conducting assessment work on the lands indicated on the accompanying Declaration of Work form as Recorded Holder (recorded holder, agent, or state company position with signing authority). I am authorized to make this certification.

Signature	Date
	Dec 16, 1998

0212 (03/97)

Ministry of Northern Development and Mines

Ministère du Développement du Nord et des Mines

Ontario

Geoscience Assessment Office
933 Ramsey Lake Road
6th Floor
Sudbury, Ontario
P3E 6B5

Telephone: (888) 415-9846
Fax: (877) 670-1555

Visit our website at:
www.gov.on.ca/MNDM/MINES/LANDS/mlsmnpge.htm

May 18, 1999

GINO PAUL CHITARONI
P.O. BOX 271
PORTAGE BAY ROAD
COBALT, Ontario
P0J-1C0

Dear Sir or Madam:

Submission Number: 2.19167

Subject: Transaction Number(s):		**Status**
	W9970.00001	Approval After Notice

We have reviewed your Assessment Work submission with the above noted Transaction Number(s). The attached summary page(s) indicate the results of the review. WE RECOMMEND YOU READ THIS SUMMARY FOR THE DETAILS PERTAINING TO YOUR ASSESSMENT WORK.

If the status for a transaction is a 45 Day Notice, the summary will outline the reasons for the notice, and any steps you can take to remedy deficiencies. The 90-day deemed approval provision, subsection 6(7) of the Assessment Work Regulation, will no longer be in effect for assessment work which has received a 45 Day Notice. Allowable changes to your credit distribution can be made by contacting the Geoscience Assessment Office within this 45 Day period, otherwise assessment credit will be cut back and distributed as outlined in Section #6 of the Declaration of Assessment work form.

Please note any revisions must be submitted in DUPLICATE to the Geoscience Assessment Office, by the response date on the summary.

If you have any questions regarding this correspondence, please contact Lucille Jerome by e-mail at lucille.jerome@ndm.gov.on.ca or by telephone at (705) 670-5858.

Yours sincerely,

ORIGINAL SIGNED BY
Blair Kite
Supervisor, Geoscience Assessment Office
Mining Lands Section

Correspondence ID: 13766

Copy for: Assessment Library

Work Report Assessment Results

Submission Number: 2.19167

Date Correspondence Sent: May 18, 1999 **Assessor:** Lucille Jerome

Transaction Number	First Claim Number	Township(s) / Area(s)	Status	Approval Date
W9970.00001	1118527	BEST	Approval After Notice	May 18, 1999

Section:
17 Assays ASSAY

The 45 days outlined in the Notice dated March 30, 1999 have passed.

Assessment work credit has been approved as outlined on the attached Distribution of Assessment Work Credit sheet.

Correspondence to:
Resident Geologist
Kirkland Lake, ON

Assessment Files Library
Sudbury, ON

Recorded Holder(s) and/or Agent(s):
GINO PAUL CHITARONI
COBALT, Ontario

Correspondence ID: 13766

Distribution of Assessment Work Credit

The following credit distribution reflects the value of assessment work performed on the mining land(s).

Date: May 18, 1999

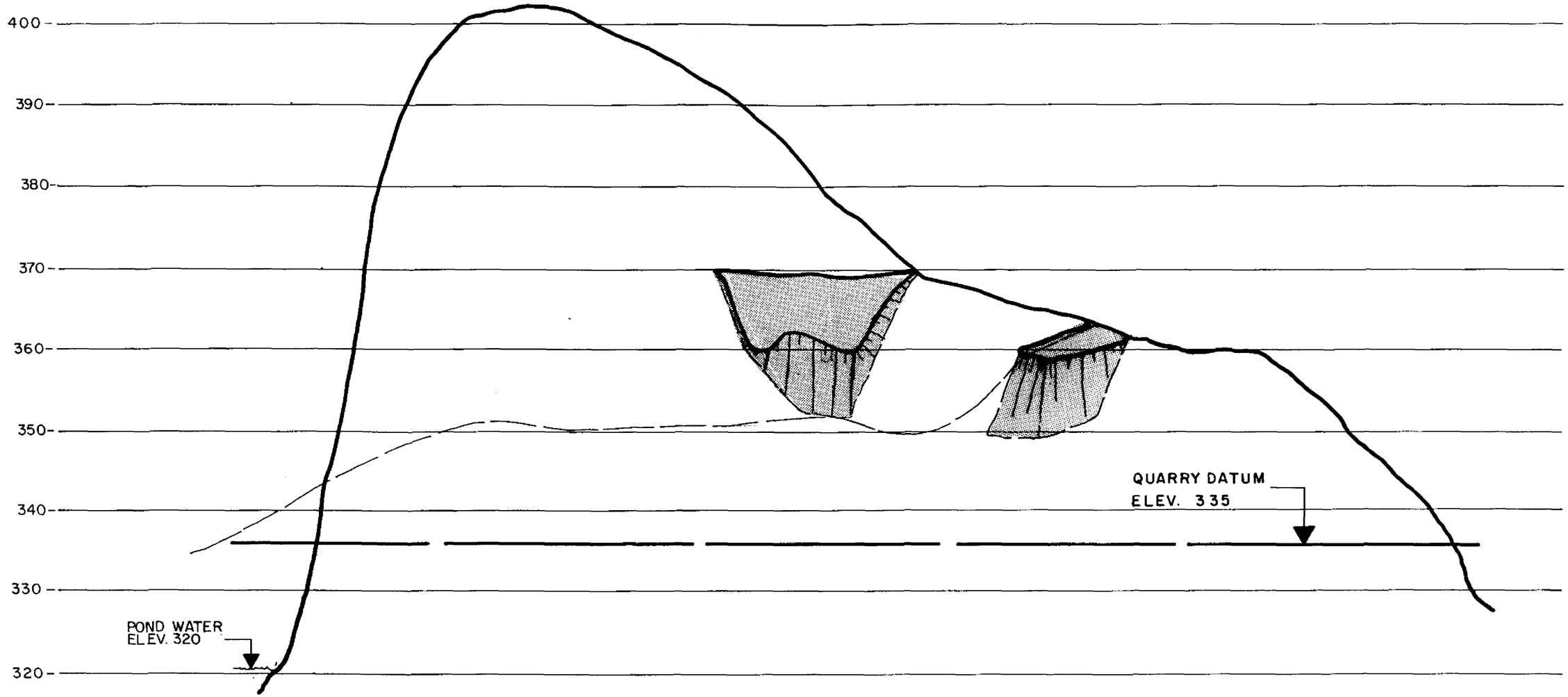
Submission Number: 2.19167

Transaction Number: W9970.00001

Claim Number	Value Of Work Performed
1118527	1,151.00
1212011	1,151.00
Total: $	2,302.00

Correspondence ID: 13766

INDEX TO LAND DISPOSITION
Ontario
Ministry of Natural Resources
Ministry of Northern Development and Mines
PLAN
G-3409
TOWNSHIP
BEST
M.N.R. ADMINISTRATIVE DISTRICT
TEMAGAMI
MINING DIVISION
SUDBURY
NIPISSING
THE INFORMATION THAT APPEARS ON THIS MAP HAS BEEN COMPILED FROM VARIOUS SOURCES, AND ACCURACY IS NOT GUARANTEED. THOSE WISHING TO STAKE MINING CLAIMS SHOULD CONSULT WITH THE MINING RECORDER, MINISTRY OF NORTHERN DEVELOPMENT AND MINES, FOR ADDITIONAL INFORMATION ON THE STATUS OF THE LANDS SHOWN HEREON.
THIS TOWNSHIP FALLS WITHIN THE TEMAGAMI COMPREHENSIVE PLANNING AREA. SPECIAL WORKING CONDITIONS MAY APPLY TO EXPLORATION ACTIVITIES. FOR MORE DETAILS PLEASE CONTACT DISTRICT MANAGER, NORTH BAY DISTRICT MINISTRY, NATURAL RESOURCES
Contour Interval 10 Metres
Map base and land disposition drafting by Surveys and Mapping Branch, Ministry of Natural Resources.
The disposition of land, location of lot fabric and parcel boundaries on this index was compiled for administrative purposes only.
AREAS WITHDRAWN FROM DISPOSITION
MRO - Mining Rights Only
SRO - Surface Rights Only
M+S - Mining and Surface Rights
AREA DEEMED IN NEED OF PROTECTION BY THE CROWN AND WILL REMAIN WITHDRAWN INDEFINITELY.
DISPOSITION OF CROWN LANDS
Patent
Surface & Mining Rights
Surface Rights Only
Mining Rights Only
Lease
Surface & Mining Rights
Surface Rights Only
Mining Rights Only
Licence of Occupation
Order-in-Council
Cancelled
Reservation
Sand & Gravel
LAND USE PERMIT
PLACER CLAIM
SYMBOLS
Boundary
Township, Meridian, Baseline
Road allowance; surveyed
shoreline
Lot/Concession; surveyed
unsurveyed
Parcel; surveyed
unsurveyed
Right-of-way; road
railway
utility
Reservation
Cliff, Pit, Pile
Contour
Interpolated
Approximate
Depression
Control point (horizontal)
Flooded land
Mine head frame
Pipeline (above ground)
Railway; single track
double track
abandoned
Road; highway county, township
access
trail, bush
Shoreline (original)
Transmission line
Wooded area
THE INFORMATION THAT APPEARS ON THIS MAP HAS BEEN COMPILED FROM VARIOUS SOURCES, AND ACCURACY IS NOT GUARANTEED.
MAY 27 1999
THOSE WISHING TO STAKE MINING CLAIMS SHOULD CONSULT WITH THE MINING RECORDER, MINISTRY OF NORTHERN DEVELOPMENT AND MINES, FOR ADDITIONAL INFORMATION ON THE STATUS OF THE LANDS SHOWN HEREON.
BRIGSTOCKE TOWNSHIP
LORRAIN TOWNSHIP
BANTING TOWNSHIP
SOUTH LORRAIN TOWNSHIP
GILLIES LIMIT TOWNSHIP
CHAMBERS TOWNSHIP
STRATHY TOWNSHIP
CASSELS TOWNSHIP
ASSAY
R2
1227375
1227376
1230699
1212108
S 1223249
1230680
S 1223247
1230697
1227369
1227368
1231339
1231338
1212553
1212552
1227364
1191100
1230493
1227365
1223730
1227380
1184128
S 1217650
1206294
PC
1217649
1212043
1118527
1212011
1212012
P.C.
1217651
1212069
1212070
1165507
1118558
1212235
BEST TWP.
G-3409



BENCH MARK

NAIL SET IN CLAIM POST 4.10m EAST OF POST #3 MC 1218527. 0.5m ABOVE GROUND ON THE WEST FACE HAVING AN ELEV OF 349m

NOTE

THIS SITE SURVEY WAS DONE DEC. 96 USING TAPE AND COMPASS METHOD SLIGHT DESCREPANCY BETWEEN THE MNDM CLAIM MAP AND ACTUAL FIELD LOCATION OF CLAIMS.

LAND USE ZONING - ZONED " (RURAL) WITHIN THE TWP of TEMAGAMI BOUNDARY

THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR AN AGGREGATE PERMIT CATEGORY 11

SPOT ELEVATIONS & CONTOURS DERIVED FROM MNDM PLAN G-3409

LEGEND

- MC 1212013 – CLAIM Nº
- CLAIM LINE
- CLAIM POST
- DIABASE OUTCROP
- BUSH
- POND
- BUSH ROAD
- 340 – SPOT EL.
- 360 – CONTOUR
- x-x-x – PROP FENCE
- PHASE I OPERATION DIRECTION
- PHASE II OPERATION DIRECTION
- LIMIT OF BUSH AFTER CLEARING

UTM COORDINATES

522 43 00m N
59 82 00m E
ZONE 17

DATE	REVISION	BY

TEMAGAMI TRAPROCK LTD.

PROJECT:
BEST TWP.
DISTRICT of TIMISKAMING

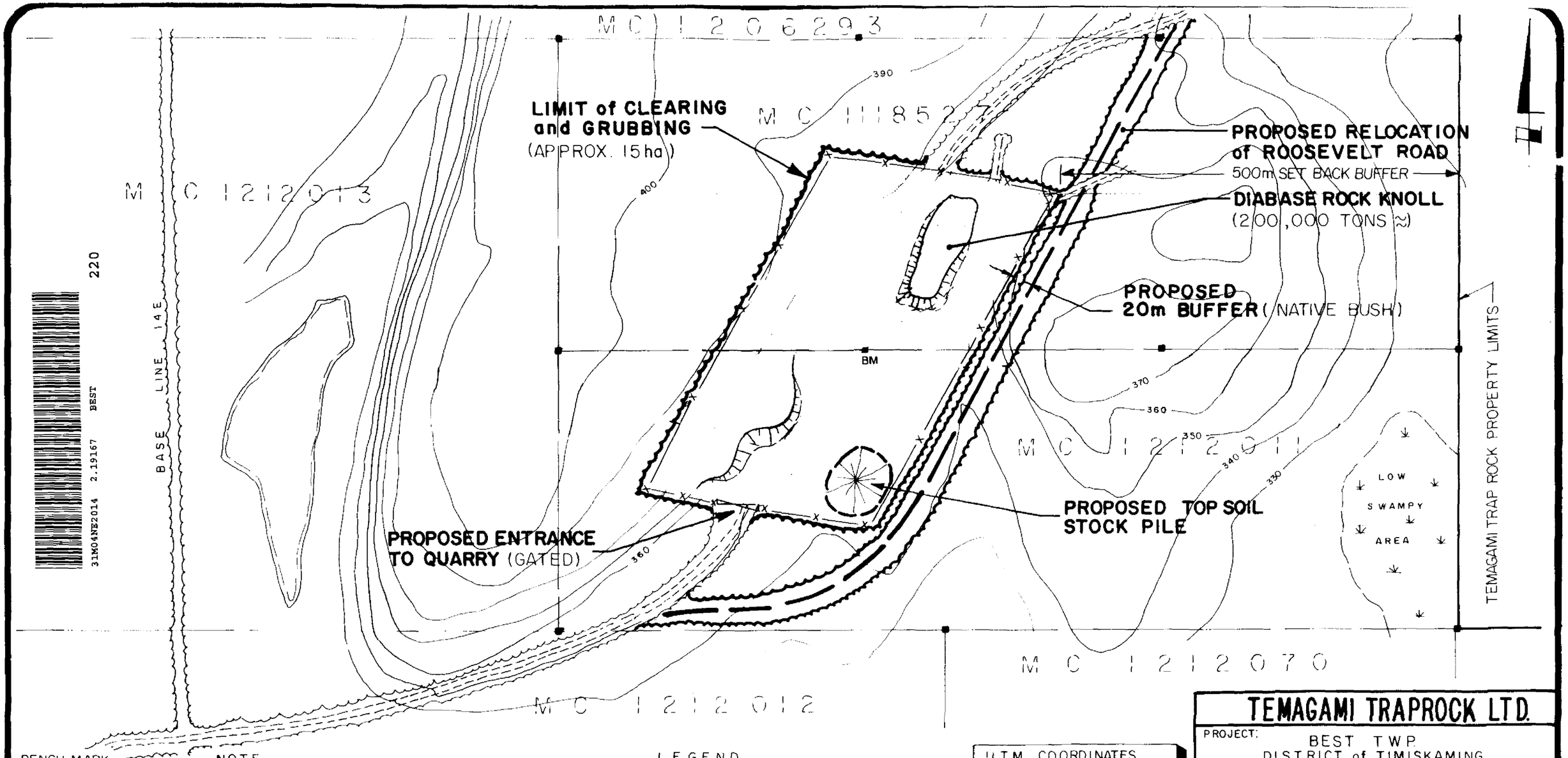
QUARRY SITE PLAN SHOWING

SECTION A-A

APPLICANT TEMAGAMI TRAP ROCK LTD.
PRESIDENT: GINO P. CHITARONI B.Sc. GEOLOGY

SCALE:
100 50 0 50 100 200 300
1:5000 metric

DRAWN: R.D.L.
DATE: DEC. 96
DWG Nº



BENCH MARK

NAIL SET IN CLAIM POST 400m EAST OF POST "3 MC 1118527. 0.5m ABOVE GROUND ON THE WEST FACE HAVING AN ELEV. OF 349m

NOTE

THIS SITE SURVEY WAS DONE DEC 96 USING TAPE AND COMPASS. METHOD SLIGHT DESCREPANCY BETWEEN THE MNDM CLAIM MAP AND ACTUAL FIELD LOCATION OF CLAIMS.

LAND USE ZONING - ZONED "(RURAL) WITHIN THE TWP of TEMAGAMI BOUNDARY

THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR AN AGGREGATE PERMIT CATEGORY 11

SPOT ELEVATIONS & CONTOURS DERIVED FROM MNDM PLAN G-3409.

LEGEND

MC 1212013	- CLAIM Nº	X-X-X	- PROP FENCE
	- CLAIM LINE		
■	- CLAIM POST	➡	- OPERATION DIRECTION
	- DIABASE OUTCROP		-
	- BUSH	)	- LIMIT OF BUSH AFTER CLEARING
	- POND		
	- BUSH ROAD		
340	- SPOT EL.		
360	- CONTOUR		

U.T.M COORDINATES

522 43 00m N } ZONE 17
59 82 00m E }

DATE	REVISION	BY

TEMAGAMI TRAPROCK LTD.

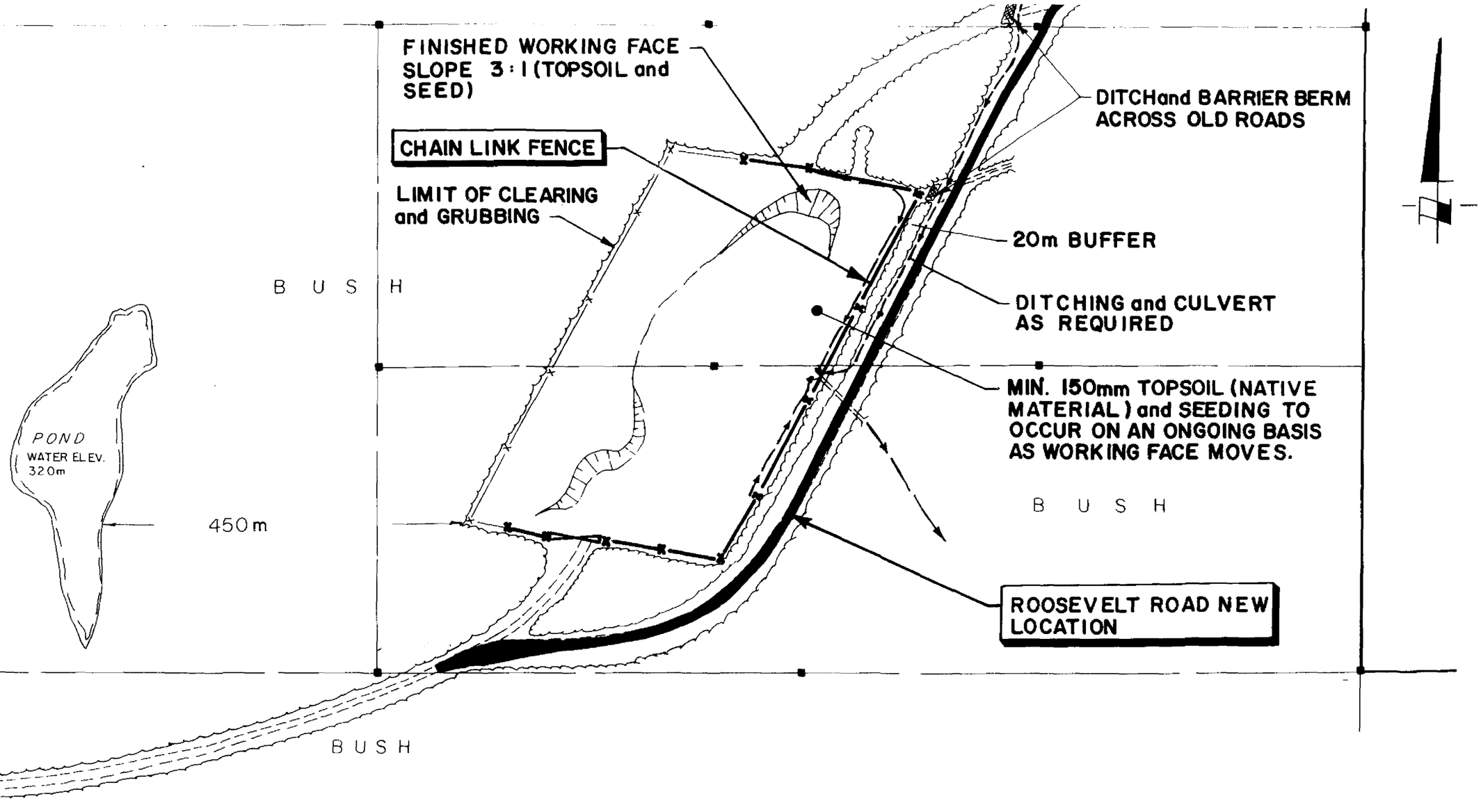
PROJECT:
BEST TWP
DISTRICT of TIMISKAMING

QUARRY SITE PLAN SHOWING ROAD RELOCATION and CLEARING & GRUBBING

APPLICANT: TEMAGAMI TRAP ROCK LTD.
PRESIDENT: GINO P. CHITARONI B Sc GEOLOGY

SCALE:
100 50 0 50 100 200 300
1:5000 metric

DRAWN: R.D.L. | DATE: DEC. 96 | DWG Nº



M C 1 2 0 6 2 9 3

2.19167

M.C. 1 2 1 2 0 1 3

M C 1 1 8 5 2 7

M C 1 2 1 2 0 1 1

M C 1 2 1 2 0 7 0

406 390 400 380 359 371 370 360 350 340 330 402 360 340 340

A A'

LOW SWAMPY AREA

TEMAGAMI TRAPROCK LTD. PROPERTY BOUNDARY

BENCH MARK

NAIL SET IN CLAIM POST 400m EAST OF POST #3 MC 1118527. 0.5m ABOVE GROUND ON THE WEST FACE HAVING AN ELEV OF 349 m

NOTE

THIS SITE SURVEY WAS DONE DEC 96 USING TAPE AND COMPASS. METHOD SLIGHT DESCREPANCY BETWEEN THE MNDM CLAIM MAP AND ACTUAL FIELD LOCATION OF CLAIMS

LAND USE ZONING - ZONED "(RURAL) WITHIN THE TWP of TEMAGAMI BOUNDARY

THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR AN AGGREGATE PERMIT CATEGORY 11

SPOT ELEVATIONS & CONTOURS DERIVED FROM MNDM PLAN G-3409

LEGEND

- MC 1212013 - CLAIM Nº
- CLAIM LINE
- CLAIM POST
- DIABASE OUTCROP
- BUSH
- POND
- BUSH ROAD
- 340 - SPOT EL
- 360 - CONTOUR
- x-x-x - PROP FENCE
- PHASE I OPERATION DIRECTION
- PHASE II OPERATION DIRECTION
- LIMIT OF BUSH AFTER CLEARING

UTM COORDINATES

522 43 00m N
59 82 00m E
ZONE 17

DATE	REVISION	BY

TEMAGAMI TRAPROCK LTD.

PROJECT:
BEST TWP
DISTRICT of TIMISKAMING

QUARRY SITE PLAN SHOWING SECTION A-A' LOCATION

APPLICANT TEMAGAMI TRAP ROCK LTD.
PRESIDENT: GINO P. CHITARONI B Sc GEOLOGY

SCALE:
100 50 0 50 100 200 300
1:5000 metric

DRAWN: R.D.L. | DATE: DEC. 96 | DWG Nº

FINISHED WORKING FACE SLOPE 3:1 (TOPSOIL and SEED)

CHAIN LINK FENCE

LIMIT OF CLEARING and GRUBBING

DITCH and BARRIER BERM ACROSS OLD ROADS

20m BUFFER

DITCHING and CULVERT AS REQUIRED

MIN. 150mm TOPSOIL (NATIVE MATERIAL) and SEEDING TO OCCUR ON AN ONGOING BASIS AS WORKING FACE MOVES.

ROOSEVELT ROAD NEW LOCATION

B U S H

B U S H

B U S H

POND
WATER ELEV.
320m

450m

BENCH MARK

NAIL SET IN CLAIM POST 400m EAST OF POST #3 MC 1118527. 0.5m ABOVE GROUND ON THE WEST FACE HAVING AN ELEV OF 349m

NOTE

THIS SITE SURVEY WAS DONE DEC 96 USING TAPE AND COMPASS. METHOD SLIGHT DESCREPANCY BETWEEN THE MNDM CLAIM MAP AND ACTUAL FIELD LOCATION OF CLAIMS.

LAND USE ZONING - ZONED "RURAL" WITHIN THE TWP of TEMAGAMI BOUNDARY

THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR AN AGGREGATE PERMIT CATEGORY 11

SPOT ELEVATIONS & CONTOURS DERIVED FROM MNDM PLAN G-3409.

LEGEND

- MC 1212013 – CLAIM Nº
- CLAIM LINE
- CLAIM POST
- x-x-x – PROP FENCE
- OPERATION DIRECTION
- DIABASE OUTCROP
- BUSH
- LIMIT OF BUSH AFTER CLEARING
- POND
- BUSH ROAD
- 340 – SPOT EL
- 360 – CONTOUR

UTM COORDINATES

522 43 00m N } ZONE 17
59 82 00m E }

DATE	REVISION	BY

TEMAGAMI TRAPROCK LTD.

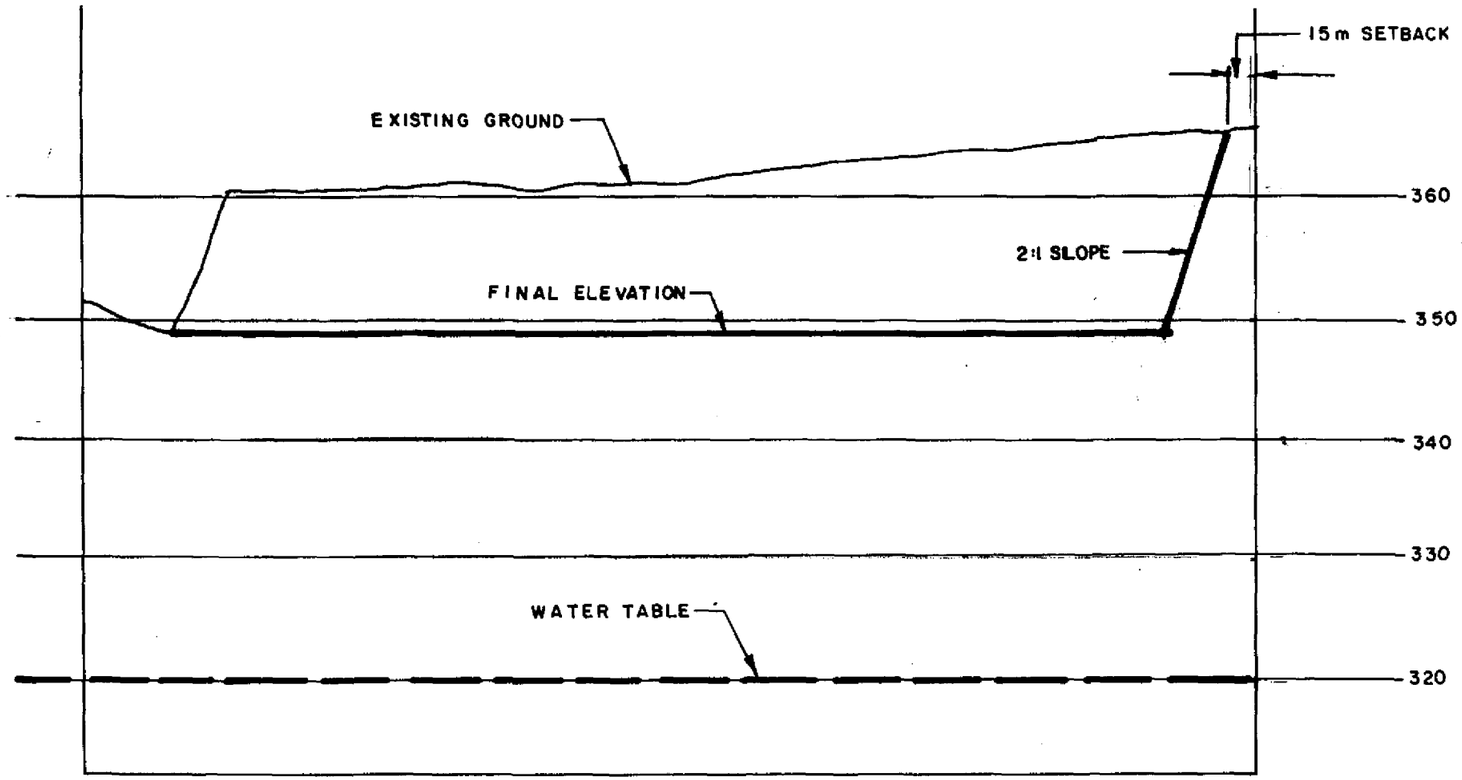
PROJECT:
BEST TWP.
DISTRICT of TIMISKAMING

QUARRY SITE PLAN SHOWING REHABILITATION

APPLICANT TEMAGAMI TRAP ROCK LTD.
PRESIDENT GINO P CHITARONI B Sc GEOLOGY

SCALE:
100 50 0 50 100 200 300
1:5000 metric

DRAWN: R.D.L. | DATE: DEC 96 | DWG Nº



BENCH MARK

NAIL SET IN CLAIM POST 400m EAST OF POST #3 MC 1118527. 0.5m ABOVE GROUND ON THE WEST FACE HAVING AN ELEV. OF 359m

NOTE

THIS SITE SURVEY WAS DONE DEC 96 USING TAPE AND COMPASS. METHOD SLIGHT DESCREPANCY BETWEEN THE MNDM CLAIM MAP AND ACTUAL FIELD LOCATION OF CLAIMS

LAND USE ZONING - ZONED "HP" (RURAL) WITHIN THE TWP of TEMAGAMI BOUNDARY

THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR AN AGGREGATE PERMIT CATEGORY 11

SPOT ELEVATIONS & CONTOURS DERIVED FROM MNDM PLAN G-3409.

LEGEND

- MC 1212013 — CLAIM Nº
- CLAIM LINE
- CLAIM POST
- DIABASE OUTCROP
- BUSH
- POND
- BUSH ROAD
- 340 — SPOT EL
- 360 — CONTOUR
- x-x-x — PROP FENCE
- PHASE I OPERATION DIRECTION
- PHASE II OPERATION DIRECTION
- LIMIT OF BUSH AFTER CLEARING

U.T.M. COORDINATES

522 43 00m N
59 82 00m E
ZONE 17

DATE	REVISION	BY

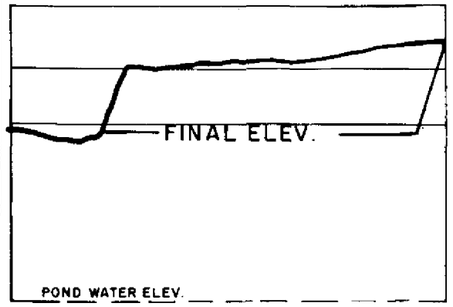
PROJECT:
BEST TWP.
DISTRICT of TIMISKAMING
QUARRY SITE PLAN SHOWING CROSS SECTION

APPLICANT:
PRESIDENT: GINO P. CHITARONI B Sc GEOLOGY

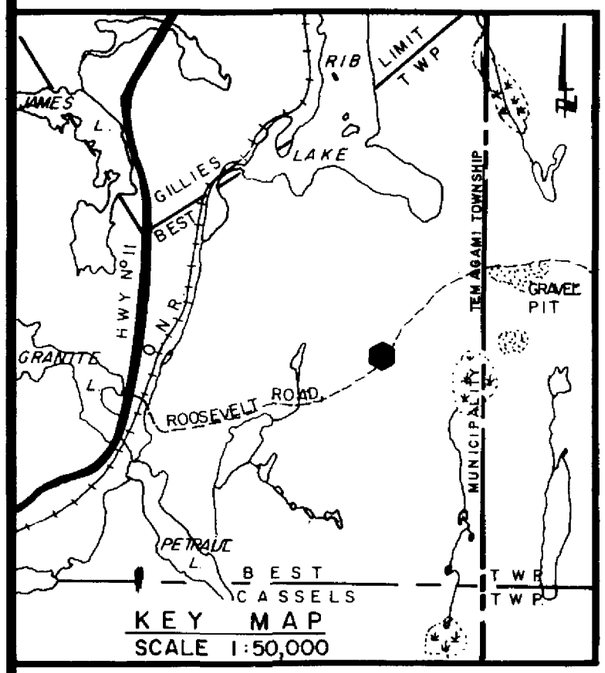
SCALE:
1:1000 HORIZONTAL
1:500 VERTICAL

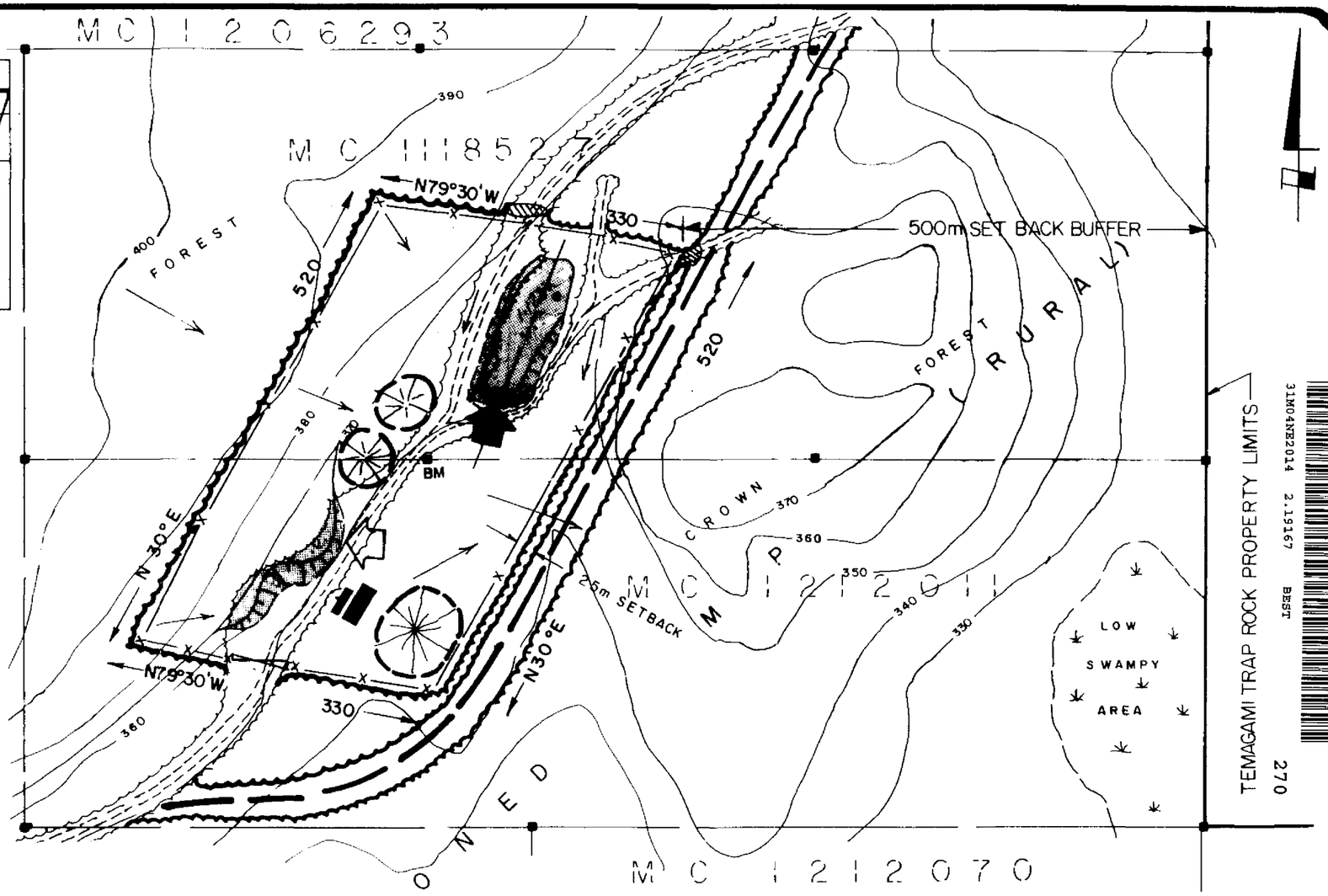
DRAWN R.D.L. | DATE: DEC. 96 | DWG Nº 2 of 2

OPERATIONAL VARIANCES



SCALE: HORIZ. 1:2000 VERT. 1:1000
CROSS SECTION





BENCH MARK

NAIL SET IN CLAIM POST 400m EAST OF POST #3 MC 1118527. 0.5m ABOVE GROUND ON THE WEST FACE HAVING AN ELEV OF 349m.

NOTE

THIS SITE SURVEY WAS DONE DEC. 96 USING TAPE AND COMPASS. METHOD SLIGHT DESCREPANCY BETWEEN THE MNDM CLAIM MAP AND ACTUAL FIELD LOCATION OF CLAIMS.

LAND USE ZONING - ZONED "MP" (RURAL) WITHIN THE TWP of TEMAGAMI BOUNDARY

THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR AN AGGREGATE PERMIT CATEGORY 11

SPOT ELEVATIONS & CONTOURS DERIVED FROM MNDM PLAN G-3409.

LEGEND

- MC 1212013 — CLAIM Nº
- CLAIM LINE
- CLAIM POST
- BENCH MARK
- DIABASE OUTCROP
- BERM
- BUSH
- POND
- BUSH ROAD
- 340 — SPOT EL.
- 360 — CONTOUR
- X-X-X — CROSS SECTION CLF FENCE
- OPERATION DIRECTION
- AGGREGATE STOCK PILE
- DRAINAGE
- LIMIT OF BUSH AFTER CLEARING
- TOP SOIL
- RELOCATED ROAD
- SCALES & SCALE HOUSE

U.T.M. COORDINATES

522 43 00m N
59 82 00m E
ZONE 17

DATE	SITE PLAN AMMENDMENTS	BY

TEMAGAMI TRAPROCK LTD.

PROJECT:
BEST TWP.
DISTRICT of TIMISKAMING

QUARRY SITE PLAN SHOWING AGGRIGATE PERMIT AREA PROPOSAL

APPLICANT: TEMAGAMI TRAP ROCK LTD.
PRESIDENT: GINO P. CHITARONI B Sc. GEOLOGY

SCALE:
100 50 0 50 100 200 300
1:5000 metric

DRAWN:	DATE:	DWG. Nº
R.D.L.	DEC. 96	

GILLIES

GILLIES BEST LIMIT TOWNSHIP

PIKE LAKE

POWER LINE HWY No 11

T.C.P.L.

PIKE LAKE

JAMES LAKE

GRANITE LAKE

JAMES LAKE

CREEK

BEST

GRANITE LAKE

NET

O.N.R. 1212068

1118557

K32063
K32071

4197743

K32059

K32062

K32056

K32064

SILICA DEPOSIT

K32060

POWER LINE HWY No 11

O.N.R. 1165507

1118558

PETRAUT LAKE

TRANS CANADA PIPE LINE

DUNCAN LAKE

280

BEST TWP.
STRATHY TWP.

STRATHY TWP

MIT

TOWNSHIP

RIB LAKE

O.N.R.

GILLIES LIMIT TOWNSHIP

BEST TOWNSHIP

ASTRONOMIC

Murphy's Bay

TEMAGAMI TRAPROCK PROPERTY LIMIT

Nipissing sill "gabbro" rock

1206294

1212234

1212013

TOWNSHIP

1118527

K32060
K32061
K32069
K1428
K32078
K32079
K32080
K1409

M.T.O. HL4 TEST
K1426
K1427
K32070
K32075
K32076
K32077
K1408

ROAD

1212011

ROOSEVELT

K32068
K1429
K32072
K32073
K32074
K1407

1212012

K32065

1212014

1212065

1212069

1212070

BEST TWP

CASSELS T WP.

CASSELS TWP

LEGEND

- OUTCROP
- CUNIPTAU SILICA DEPOSIT
- TRAPROCK DEPOSIT "Nip sill gabbro rock"
- X — SAMPLE LOCATION
- K 32071 — SAMPLE NUMBER
- QUARRY PERMIT BOUNDARY

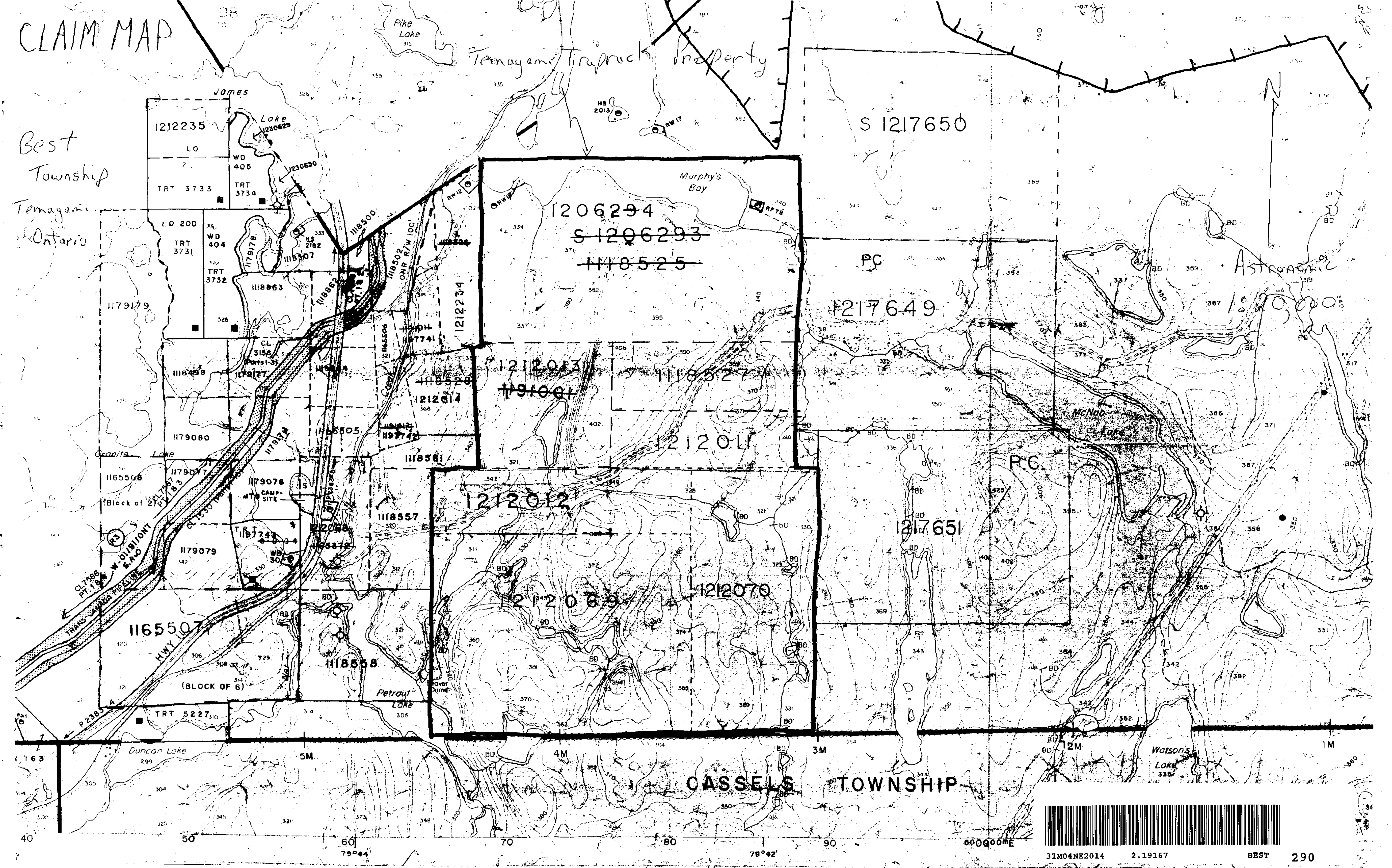
2.19167

TEMAGAMI TRAPROCK LIMITED
50 SILVER ST., COBALT, ONT. P.O. Box 699 P0J 1C0 TEL.: (705)-679-5500

PROSPECTING and SAMPLING PLAN

BLACKSTONE DEVELOPMENT INC.

DATE: DEC. 1998	SCALE: 1:5000 metric
DRAWN: R.D. Lindsay	DWG. No.



31M04NE2014 2.19167 BEST 290