EXPLOTECH

Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Proposed Giofam Sebright Quarry
Part Lots 18, 19, 20 and 21 Concession 4,
Part Lots 19 and 20 Concession 5, Geographic Township of Dalton
City of Kawartha Lakes, Ontario

Submitted to:

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EXECUTIVE SUMMARY

Explotech Engineering Ltd. was retained in March 2006 to provide a Blast Impact Analysis for the proposed Giofam Sebright Quarry located on Part Lots 18, 19, 20 and 21 Concession 4, and Part Lots 19 and 20 Concession 5, Geographic Township of Dalton, City of Kawartha Lakes.

Vibration levels assessed in this report are based on the Ministry of Environment Model Municipal Noise Control By-law (NPC119) with regard to Guidelines for Blasting in Mines and Quarries. We have assessed the area surrounding the proposed Aggregate Resources Act license with regard to potential damage from blasting operations and compliance with the aforementioned by-law document.

We have inspected the property and reviewed the available site plans. Explotech is of the opinion that the planned aggregate extraction on the proposed property can be carried out safely and within MOE guidelines as set out in NPC 119 of the By-Law.

Recommendations are included in this report to ensure that blasting operations in all phases of this project are carried out in a safe and productive manner to ensure that no possibility of damage exists to any buildings or residences surrounding the property.

EXPLOTECH

TABLE OF CONTENTS

INTRODUCTION

The proposed Giofam Sebright Quarry operation is bounded by Queen Elizabeth II Wildland Provincial Park to the North and undeveloped forested lands immediately to the East, West and South. The property is accessed via County Road 45 approximately 650m South of the South limit of the proposed licence area. The legal description for the subject property is Part Lots 18, 19, 20 and 21 Concession 4, and Part Lots 19 and 20 Concession 5, Geographic Township of Dalton, City of Kawartha Lakes.

This Blast Impact Analysis is based on the Ministry of the Environment (MOE) Model Municipal Noise Control By-law with regard to Guidelines for Blasting in Mines and Quarries. We have additionally assessed the area surrounding the proposed license with regard to potential damage from blasting operations.

Given that mining operations have not been undertaken in the past on this property, site-specific blast monitoring data is not available. We have therefore applied data generated at a variety of quarries across Ontario which present similar material characteristics. It has been our experience that this data represents a conservative starting point for blasting operations. It is a recommendation of this report that a vibration monitoring program be initiated on-site upon the commencement of blasting operations and maintained for the duration of all blasting activities to permit timely adjustment to blast parameters as required. We note that blast monitoring is a prescribed condition to any licence issued for the proposed quarry under the Aggregate Resources Act.

Recommendations are included in this report to ensure that the blasting operations are carried out in a safe and productive manner and to ensure that no possibility of damage exists to any buildings, structures or residences surrounding the property.

EXISTING CONDITIONS

The licenced area for the proposed Giofam Sebright Quarry encompasses a total area of approximately 83ha. The site is broken into two (2) distinct extraction areas as shown on the attached Operational Plan (refer to Appendix A). The total extraction area after allowance for setbacks and sterilized zones consists of an area of 21.75ha.

The properties surrounding the proposed licence area are characterized by undeveloped forested areas with the closest sensitive receptors lying to the South of the subject lands along County Road 45. The proponent for the licence area currently owns the majority of surrounding lands immediately bordering the proposed licence and extraction areas.

PROPOSED AGGREGATE EXTRACTION

The quarry operations will be initiated in the Southwest quadrant of the Phase 1A Area. This blast will be located approximately 1000m from the closest sensitive receptor, namely 655 County Road 45. Extraction will then retreat towards the Northeast through the Phase 1A area. Phase 1B involves extraction of rock below the water table in the Phase 1 area and will follow the same retreat pattern as Phase 1A. Extraction in Phase 2 will commence at the Southwest limit of Phase 1 and retreat towards the Southwest thereby permitting projection of the blast overpressure towards the vacant lands Northeast of the property. Different phases of the operation may be operated concurrently.

The proposed final quarry floor elevation has been established at 220m ASL. Given a maximum existing bedrock elevation of 266m ASL, the maximum total cut depth will be approximately 46m. Benches shall be employed so as to limit the size of blasts conducted; the maximum bench height shall be limited to 20m. Quarrying operations on varied phases and benches may be ongoing concurrently throughout the life of the quarry.

Barring further residential development in the area, as quarry operations migrate across the site, the closest sensitive receptor to the required blasting operations will remain 655 County Road 45.

As noted above, the closest sensitive receptor to the initial sinking cut is located approximately 1000m removed from the blast. Our composite data suggests that a maximum explosive load of 746 kg per period can be employed at a distance of 1000 meters to remain compliant with MOE guidelines for ground vibrations and in excess of 2000kg per period can be employed to remain compliant with guidelines for overpressure.

Quarries in Ontario normally employ 76 to 152 mm diameter blast holes which, for a maximum 20 meter bench, would employ 100 kg to 375 kg of explosive load per hole. The choice of hole diameter and bench height will govern the maximum number of holes to be fired per period for the sinking cut. Once the quarry is opened up, subsequent blasts can be designed to minimize the number of holes fired per period.

BLAST VIBRATION AND OVERPRESSURE LIMITS

The Ontario MOE guidelines for blasting in quarries are among the most stringent in North America.

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 MOE. The limits suggested by the MOE are as follows.

Vibration	12.5mm/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 and apply when blasts are not monitored on a routine basis. It is a recommendation of this report that all blasts at the operation be monitored to quantify and record ground vibration and overpressure levels employing a minimum of one (1) digital seismograph.

BLAST VIBRATION AND OVERPRESSURE DATA

Blast vibration and overpressure data used in this report was collected from an amalgamation of quarries and mines throughout Ontario.

All ground vibration data was plotted using square root scaling from blast vibrations (Refer to Appendix C for a sample plot of data). The composite data employed has been proven to be very conservative and has been used as a start-up guideline for many aggregate extraction operations.

Overpressure data was plotted employing cube root scaling (Refer to Appendix C for a sample plot of data). It should again be noted that given the high dependence on local environmental conditions, overpressure prediction is far less reliable as a means of blast control.

Our experience and analysis demonstrates that blast overpressure is greatest when blasting toward residences, and blast vibrations are greatest when retreating towards the residences. Based on our complete data set from other Ontario quarries, we present the following initial guidelines for blasting operations at the proposed Giofam Sebright Quarry:

MAXIMUM EXPLOSIVE LOADING BASED ON MOE GUIDELINE LIMITS

Blast Vibration Limit – 12.5 mm/sec

Distance to Receptor (Meters)	Allowable Explosives per Period - kg	
	Front of Blast	Back of Blast
150	39	17
200	69	30
250	108	48
300	156	68
350	213	94
400	278	122
500	434	190
600	625	275
700	851	374
800	1,111	477
900	1,406	604
1000	1,831	746
1100	2,216	903
1200	2,500	1,075

Blast Overpressure Limits – 128 dB

Distance to Receptor (Meters)	Allowable Explosives per Period – kg	
	Front of Blast	Back of Blast
150	8	38
200	20	88
250	38	171
300	67	296
350	105	470
400	158	702
500	308	1,372
700	846	3,764
900	1,799	8,000
1200	4,264	18,962

INITIAL BLASTING PARAMETERS

Blast Pattern:	2100 x 2100 to 3300 x 3300 mm
Number of holes;	Varies
Hole depth:	8 – 20 meters
Hole Diameter:	76 to 114 mm
Collar Length:	1200 - 1800 mm (minimum)
Toe Load:	ANFO/ANFO WR
Column Load:	ANFO/ANFO WR
Maximum Charge per hole:	Varies
Total Explosives per blast:	Varies
Toe Burden:	See pattern above
Crest Burden:	See pattern above
Material being blasted:	Granitic gneiss
Tonnage per blast:	Varies
Number of blasts per year	Varies with production required

The above parameters provide initial guidance to direct blasting operations. Upon the commencement of blasting on site, these parameters will require revision based on site-specific data obtained and attenuation equations developed.

While initial operations and in fact the majority of required blasting will be performed at extended distances from the closest sensitive receptors, blasting along the Southwest quarry face will come within 650m of some private buildings. Given planned phasing for the quarry, an abundance of vibration data and experience with the rock will be available long before any blasting in closer proximity to structures will be required thereby permitting effective design modifications as required to ensure compliance.

BLAST MECHANICS AND DERIVATIVES

The detonation of explosives within a borehole results in the development of very high gas and shock pressures. This energy is transmitted to the surrounding rock mass, crushing the rock immediately surrounding the borehole (approximately 1 borehole radius) and permanently distorts the rock to several borehole diameters (5-25, depending on the rock type, prevalence of joint sets, etc).

The intensity of this stress wave decays quickly so that there is no further permanent deformation of the rock mass. The remaining energy from the detonation travels through the unbroken material in the form of a pressure wave or shock front which, although it causes no plastic deformation of the rock mass, is transmitted in the form of vibrations.

Particle velocity is the descriptor of choice when dealing with vibrations because of its superior correlation with the appearance of cosmetic cracking. As such, for the purposes this report, ground vibration units have been listed in mm/s.

In addition to the ground vibrations, overpressure, or air vibrations are generated through the direct action of the explosive venting through cracks in the rock or through the indirect action of the rock movement. In either case, the result is a pressure wave which travels though the air, measured in decibels (or dB) for the purposes of this report.

VIBRATION AND OVERPRESSURE THEORY

Transmission and decay of vibrations and overpressure can be estimated by the development of attenuation relations. These relations utilize empirical data relating measured velocities at specific separation distances from the vibration source to predict particle velocities at variable distances from the source. While the resultant prediction equations are reliable, divergence of data occurs as a result of a wide variety of variables, most notably site-specific geological conditions and blast geometry and design for ground vibrations and local prevailing climatic conditions for overpressure.

In order to circumvent this scatter and improve confidence in forecast vibration levels, probabilistic and statistical modeling is employed to increase conservatism built into prediction models, usually by the application of 95% confidence lines to attenuation data.

The attenuation relations are not designed to conclusively predict vibrations levels at a specific location as a result of a specific blast design, application of this probabilistic model creates confidence that for any given scaled distance, 95% of the resultant velocities will fall below the calculated 95% regression line.

While the data still provides insight into probable vibration intensities, attenuation relations for overpressure tends to be less reliable and precise than results for ground vibrations. This is due primarily to wider variations in variables outside of the influence of the blast design which impact propagation of the vibrations. Atmospheric factors such as temperature gradients and prevailing winds (refer to Appendix B) as well as local topography can all serve to significantly alter overpressure attenuation characteristics.

PREDICTED VIBRATION LEVELS AT THE NEAREST SENSITIVE RECEPTOR

The most commonly used formula for predicting 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 for the initial operations.

$$PPV = k\left(\frac{d}{\sqrt{w}}\right)^{e}$$

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 monitoring performed in the Eastern Ontario region, our initial estimates for "e" will be set at -1.85 and "K" will be set at 7025 (refer Appendix C). In the absence of data for the proposed aggregate extraction operation, these are used for initial prediction purposes.

An ***example*** of this calculation is as follows:

For a distance of 1000m (i.e. the closest standoff distance for initial operations at the proposed quarry) and a maximum explosives load per delay of 300 kg (114mm diameter hole, 15 meters deep, 1.5 meter surface collar and 2 holes per delay), we can calculate the maximum PPV at the 655 County Road 45 building as follows:

$$ppv = 7025\left(\frac{1000}{\sqrt{300}}\right)^{-1.85} = 3.9mm/s$$

As discussed in previous sections, the MOE guideline for blast-induced vibration is 12.5 mm/s (0.5 in/s). The calculated 95% predicted PPV (based on the proposed blasting data discussed above) would be 3.9mm/s, well below the MOE guideline limit.

Blast Impacts on Adjacent Watercourses

The detonation of explosives in or near water can produce compressive shock waves which initiate damage to the internal organs of fish in close proximity, ultimately resulting in the death of the organism. Additionally, ground vibrations imparted on active spawning beds have the ability to adversely impact the incubating eggs and spawning activity. In an effort to alleviate adverse impacts on fish populations as a result of blasting, the Department of Fisheries and Oceans developed the *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (1998)*. This publication establishes limits for water overpressure and ground vibrations which are intended to mitigate impacts on aquatic organisms while providing sufficient flexibility for blasting to proceed. Specifically, water overpressures are to be limited to 100kPa and, in the presence of active spawning beds, ground vibrations at the bed are to be limited to 13mm/s.

The tributary to the Cranberry River meanders across the northern portion of the proposed quarry lands and houses several beaver ponds. All required blasting is scheduled to take place a minimum of 30m from the edge of the water body at its closest point (refer to appendix A). Based on this separation distance, water overpressures generated by the blasting will reside well below the DFO 100Kpa guideline limit and will have no impact on the adult fish populations present.

Spawning beds within the creek may be present at various locations. These beds are active during the period from April 1 through June 30 on a yearly basis. Revisions to blast designs may be required when blasting closer to active spawning beds to accommodate the DFO 13mm/s guideline vibration limit. Specific blast designs will be based on accumulated vibration data.

The generation of suspended solids within the watercourse as a result of the blasting activities will be negligible and grossly subordinate to suspended solids generated as a result of spring runoff and rain activity.

RECOMMENDATIONS

It is recommended that the following conditions be applied for all blasting operations at the proposed Giofam Sebright Quarry:

1. An attenuation study shall be undertaken by an independent blasting consultant during the first 12 months of operation in order to obtain sufficient quarry data for the development of site specific attenuation relations. This study will be used to confirm the applicability of the initial guideline parameters and assist in developing future blast designs.

2. All blasts shall be monitored for both vibration and overpressure at the closest privately owned sensitive receptors adjacent the property with a minimum of one (1) digital seismograph. Monitoring practices shall conform to industry standards.

3. Blast design must be such that during the warm water spawning season (April 1 - June 30) overpressure does not exceed 100Kpa (14.5 PSI) or vibration exceed 13mm/s at the edge of the closest open water.

4. Orientation of the aggregate extraction operation will be designed and maintained so that the direction of the overpressure propagation and flyrock from the face will be away from structures as much as possible.

5. Blast designs shall be continually reviewed with respect to fragmentation, ground vibration and overpressure. Blast designs shall be modified as required to ensure compliance with applicable guidelines and regulations. Decking, reduced hole diameters and sequential blasting techniques will be used to ensure minimal explosives per delay period initiated.

6. Minimum collar will be 1.5m on body holes and 2.7m on face holes. In the event of the application of boreholes greater than 100mm in diameter, collars will be increased accordingly.

7. Clear crushed stone will be used for stemming.

8. Primary and secondary dust collectors will be employed on the rock drills to keep the level of rock dust to a minimum.

9. Blasting procedures such as drilling and loading shall be reviewed on a yearly basis and modified as required to ensure compliance with industry standards.

10. Detailed blast records shall be maintained. The MOE (1985) recommends that the body of blast reports should include the following information:

- Location, date and time of the blast.
- Dimensional sketch including photographs, if necessary, of the location of the blasting operation, and the nearest point of reception.
- Physical and topographical description of the ground between the source and the receptor location.
- Type of material being blasted.
- Sub-soil conditions, if known.
- Prevailing meteorological conditions including wind speed in m/s, wind direction, air temperature in ^{o}C, relative humidity, degree of cloud cover and ground moisture content.
- Number of drill holes.
- Pattern and pitch of drill holes.
- Size of holes.
- Depth of drilling.
- Depth of collar (or stemming).
- Depth of toe-load.
- Weight of charge per delay.
- Number and time of delays.
- The result and calculated value of Peak Pressure Level in dB and Peak Particle Velocity in mm/s.
- Applicable limits.
- The excess, if any, over the prescribed limit.

Conclusion

The blast parameters described within this report will provide a good basis for the initial blasting operations at this location. As site specific blast vibration and overpressure data becomes available, it will be possible to refine these parameters on an on-going basis.

Blasting operations required for operations at the proposed Giofam Sebright Quarry site can be carried out safely and well within governing guidelines set by the Ministry of the Environment.

Modern blasting techniques will permit blasting to take place with explosives charges below allowable charge weights ensuring that blast vibrations and overpressure will remain minimal at the nearest receptors.

Appendix A

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SCALE 1:10,000

DECLARATION OF PURPOSE

THIS SITE PLAN IS PREPARED UNDER THE AGGREGATE RESOURCES ACT FOR A CLASS 'A' LICENCE, CATEGORY 2.

PART LOTS 18, 19, 20, & 21 CONCESSION 4
PART LOTS 19, 20 CONCESSION 5
GEOGRAPHIC TOWNSHIP OF DALTON
CITY OF KAWARTHA LAKES

A. GENERAL

1. LICENCED AREA83.69 HA
2. AREA TO BE EXTRACTED
   PHASES 1 AND 2 21.75 HA
   PHASE 3 16.34 HA
   PHASE 4 12.13 HA
   TOTAL 50.22 HA
3. THE ESTABLISHED GROUNDWATER TABLE IS AT AN ELEVATION OF BETWEEN 231.99 MASL SEPT 29/08 (BH03-4) AND 254.08 MASL JAN 24/07 (BH00-2) BASED ON ON-SITE BOREHOLES.
4. EXTRACTION WILL OCCUR BELOW THE ESTABLISHED WATER TABLE BUT NOT BELOW 220 MASL EXCEPT FOR SUMPS.
5. ANNUAL EXTRACTION WILL NOT EXCEED 200,000 TONNES.
6. NO DISTURBANCE, INCLUDING CLEARING, GRADING OR EXCAVATION, WILL OCCUR WITHIN THE METRE 30 BUFFERS OF WATERCOURSES 1 AND 2 EXCEPT FOR THE CONSTRUCTION OF OVERFLOW CHANNELS DURING PROGRESSIVE REHABILITATION.
7. THE SCALES, A SCALE HOUSE, MAINTENANCE/OFFICE FACILITIES AND FUEL STORAGE AS SHOWN MAY BE INSTALLED/CONSTRUCTED ON SITE.

B. HOURS OF OPERATION

1. OPERATIONS, INCLUDING LOADING, SHIPPING AND PROCESSING WILL OCCUR ONLY BETWEEN 7 AM AND 7 PM MONDAY TO FRIDAY AND SATURDAY 7 AM TO 12:00 NOON. NO OPERATIONS ARE PERMITTED ON SUNDAYS AND PUBLIC HOLIDAYS AS DEFINED BY THE EMPLOYMENT STANDARDS ACT.
2. BLASTING WILL OCCUR ONLY BETWEEN 8 AM AND 6 PM MONDAY TO FRIDAY EXCEPT PUBLIC HOLIDAYS AS DEFINED BY THE EMPLOYMENT STANDARDS ACT.

C. FENCING

1. POST AND WIRE FENCING, MINIMUM HEIGHT 1.2 M, WILL BE INSTALLED ALONG PART OF THE SOUTHERLY LICENCED BOUNDARY AS SHOWN ON THIS PLAN WITHIN 12 MONTHS OF LICENCING. THE REMAINDER OF THE LICENCED BOUNDARY WILL BE MARKED WITH BLAZES AND PAINT.
2. A GATE WILL BE INSTALLED AT THE ENTRANCE/EXIT OF THE SITE AND WILL BE KEPT CLOSED DURING HOURS OF NON-OPERATION.
3. FENCING, BLAZES AND PAINT WILL BE MAINTAINED AND/OR REPLACED AS NECESSARY UNTIL THE LICENCE IS SURRENDERED.
4. REPTILE FENCING WILL BE INSTALLED AS SHOWN PRIOR TO CONSTRUCTION OF THE SETTLING/EQUALIZATION PONDS AND/OR HAUL ROAD.

D. SITE PREPARATION

1. PRIOR TO CLEARING IN ANY EXTRACTION PHASE, THE HIGH WATER MARK OF THE ADJACENT WATERCOURSE/POND WILL BE STAKED BY A QUALIFIED PROFESSIONAL AND THE LIMIT OF EXTRACTION OF THE PHASE WILL BE MARKED BY THE OPERATOR USING BLAZES AND/OR PICKETS AND PAINT. THE OPERATOR WILL ENSURE THAT THE LIMIT OF EXTRACTION IS AT LEAST 30 METRES FROM STAKED HIGH WATER MARK OF THE WATERCOURSE/POND. THE HIGH WATER MARK AND THE LIMIT OF EXTRACTION WILL BE TIED IN BY GPS SURVEY.
2. PRIOR TO CLEARING OF THE STOCKPILE AND PROCESSING AREA, THE HIGH WATER MARK OF THE POND TO THE SOUTH WILL BE STAKED BY A QUALIFIED PROFESSIONAL AND THE LICENCED BOUNDARY IN THE VICINITY WILL BE MARKED BY THE OPERATOR USING BLAZES AND/OR PICKETS AND PAINT. THE OPERATOR WILL ENSURE THAT THE LICENCED BOUNDARY IS AT LEAST 30 METRES FROM STAKED HIGH WATER MARK OF THE POND. THE HIGH WATER MARK AND THE LICENCED BOUNDARY WILL BE TIED IN BY GPS SURVEY.
3. BRUSH AND STUMPS WILL BE REMOVED FROM SITE, DISPOSED OF BY BURNING WITH APPLICABLE PERMITS, CHIPPED AND/OR STOCKPILED IN THE PROCESSING AREA FOR USE IN REHABILITATION.
4. WITHIN THE LIMIT OF EXTRACTION ALL TREES WILL BE REMOVED WITHIN 5 M OF THE EXCAVATION FACE.
5. THE DEPTH OF TOPSOIL/OVERBURDEN VARIES BUT IS GENERALLY LESS THAN 0.3 M. ALL TOPSOIL/OVERBURDEN WILL BE STRIPPED AND STOCKPILED WITHIN THE AREA TO BE EXTRACTED, THE STOCKPILE AND PROCESSING AREA, OR UTILIZED IN PROGRESSIVE REHABILITATION. (SEE SECTION O – VARIATIONS FROM PROVINCIAL STANDARDS.)
6. TOPSOIL/OVERBURDEN STOCKPILES AND ANY EROSION PRONE AREAS WILL BE SEEDED AND MAINTAINED TO CONTROL EROSION.
7. NO TOPSOIL/OVERBURDEN WILL BE REMOVED FROM THE SITE.

E. SILTATION CONTROL

1. SEDIMENT TRAPS WILL BE INSTALLED IN LOCATIONS SHOWN ON THIS PLAN AND IN ACCORDANCE WITH DETAIL 2 ON DWG NO. 2019-4 OF 5 ALONG THE LIMIT OF EXTRACTION DOWN SLOPE OF AREAS TO BE PREPARED FOR EXTRACTION:

   A) PRIOR TO STRIPPING WITHIN 30 METRES OF THE LIMIT OF EXTRACTION, AND

   B) PRIOR TO ANY STRIPPING IN AREAS WHERE THERE IS INSUFFICIENT NATURAL VEGETATION WITHIN 30 METRES OF THE LIMIT OF EXTRACTION TO PREVENT SILTATION ONTO SETBACKS OR ADJACENT LANDS.

2. SEDIMENT TRAPS WILL BE MAINTAINED UNTIL THE STRIPPED AREA IS EXTRACTED TO AN ELEVATION THAT DIRECTS ALL RUNOFF TO A SUMP.
3. WHERE REQUIRED, SILT FENCING WILL BE INSTALLED ALONG THE REPTILE FENCING.

F. DRAINAGE AND WATER DIVERSION

1. DRAINAGE OF UNDISTURBED AREAS WILL CONTINUE AS SHOWN AND DESCRIBED ON THE EXISTING CONDITIONS PLAN.
2. DURING INITIAL EXTRACTION IN PHASE 1A DRAINAGE FROM THE EXTRACTION AREA WILL GENERALLY FOLLOW THE EXISTING PATTERNS. THE SUMP WILL BE CONSTRUCTED IN PHASE 1 ONCE EXTRACTION IS BELOW THE ELEVATION OF THE ADJACENT LANDS.
3. THE SUMP WILL BE LOCATED A MINIMUM OF 10 METRES FROM THE LIMIT OF EXTRACTION.
4. FOLLOWING INSTALLATION OF THE SUMP IN PHASE 1, AND DURING EXTRACTION IN PHASE 2, PRECIPITATION AND GROUNDWATER FROM THE DISTURBED AREAS WILL BE COLLECTED IN THE SUMP AND DISCHARGED TO MAINTAIN FLOW IN THE WATERCOURSES OR TO THE EQUALIZATION POND.
5. RUNOFF FROM THE STOCKPILE AND PROCESSING AREA, AND WASH PLANT DISCHARGE WILL BE DIRECTED TOWARD THE SETTLING POND. WATER COLLECTED IN THE SETTLING POND WILL BE RECYCLED TO THE WASH PLANT, USED FOR DUST CONTROL, OR DISCHARGED TO THE EQUALIZATION POND.
6. WATER WILL BE DISCHARGED FROM THE EQUALIZATION POND TO MAINTAIN FLOW IN WATERCOURSE 1, AND FROM THE PHASE 1/2 SUMP TO MAINTAIN FLOW CONDITIONS IN WATERCOURSE 2. (SEE DETAIL 1, DWG NO. 2019-4 OF 5)
7. A PERMIT TO TAKE WATER, FOR WATER TAKING IN EXCESS OF 50 CU M PER DAY, AND CERTIFICATE OF APPROVAL FOR DISCHARGE WILL BE OBTAINED PRIOR TO ANY PUMPING.
8. THERE WILL BE NO DIRECT DISCHARGE INTO THE CRANBERRY RIVER.

G. WASHING AND PONDS

1. A WASH PLANT WILL BE INSTALLED AFTER A SUMP HAS BEEN ESTABLISHED IN PHASE 1 AND THE SETTLING AND EQUALIZATION PONDS HAVE BEEN CONSTRUCTED. THE WASH PLANT MAY BE RELOCATED FROM TIME TO TIME BUT WILL REMAIN WITHIN THE LIMIT OF EXTRACTION.
2. THE SETTLING AND EQUALIZATION PONDS WILL BE CONSTRUCTED PRIOR TO ANY STRIPPING, GRADING, STOCKPILING AND/OR PROCESSING IN THE STOCKPILE AND PROCESSING AREA, AND PRIOR TO ANY PUMPING FROM THE SUMPS TO THIS AREA. (SEE DETAILS, DWG NO. 2019-5 OF 5)
3. THE SETTLING POND WILL BE THE PRIMARY SETTLING POND FOR RUNOFF FROM THE STOCKPILE AND PROCESSING AREA AND WASH WATER FROM THE WASH PLANT. WATER FROM THIS POND WILL BE RECYCLED TO THE WASH PLANT, USED FOR DUST CONTROL OR DISCHARGED TO THE EQUALIZATION POND.
4. THE EQUALIZATION POND WILL PROVIDE SECONDARY SETTLING AND WILL COLLECT OVERFLOW FROM SETTLING POND AND WATER PUMPED FROM THE SUMPS. WATER FROM THE EQUALIZATION POND WILL BE DISCHARGED TO MAINTAIN FLOW IN WATERCOURSE 1. (SEE DETAIL 1, DWG NO. 2019-4 OF 5)
5. THE SETTLING AND EQUALIZATION PONDS WILL BE CONSTRUCTED WITH CONTROL STRUCTURES TO MAINTAIN ACCEPTABLE SURFACE WATER QUALITY FOR DISCHARGE TO WATERCOURSE 1. SIMILARLY, DIRECT DISCHARGE INTO THE HEADWATER OF WATERCOURSE 2 WILL SATISFY THE PROVINCIAL WATER QUALITY OBJECTIVES (1999 AND UPDATES) OR BACKGROUND CONDITIONS.
6. THE SETTLING AND EQUALIZATION PONDS AND SUMPS WILL BE CLEANED OUT ON A REGULAR BASIS TO MAINTAIN THE REQUIRED VOLUME AND SETTLING TIME. MATERIAL REMOVED FROM THE PONDS AND SUMPS (POND FINES) WILL BE STOCKPILED IN THE STOCKPILE AND PROCESSING AREA FOR BLENDING WITH OTHER MATERIALS FOR SALE OR USED IN PROGRESSIVE REHABILITATION.

H. DUST CONTROL

1. DUST WILL BE MITIGATED ON SITE.
2. WATER FROM THE SETTLING POND, OR OTHER PROVINCIALLY APPROVED DUST SUPPRESSANT, WILL BE APPLIED TO HAUL ROADS AND PROCESSING AREAS AS OFTEN AS REQUIRED TO MITIGATE DUST.
3. PRIMARY AND SECONDARY DUST COLLECTORS WILL BE EMPLOYED ON THE ROCK DRILL TO KEEP THE LEVEL OF ROCK DUST TO A MINIMUM.

I. BLASTING

1. BLASTING WILL OCCUR A MAXIMUM OF 3 TIMES PER WEEK.
2. THE INITIAL FOUR (4) BLASTS WILL BE MONITORED BY AN INDEPENDENT BLASTING CONSULTANT IN ORDER TO OBTAIN SUFFICIENT QUARRY DATA FOR THE DEVELOPMENT OF SITE SPECIFIC ATTENUATION RELATIONS. THIS INITIAL MONITORING PROGRAM WILL BE USED TO CONFIRM THE APPLICABILITY OF THE INITIAL GUIDELINE PARAMETERS AND ASSIST IN DEVELOPMENT OF FUTURE BLAST DESIGNS.
3. MINIMUM COLLAR WILL BE 1.5 METRES ON BODY HOLES AND 2.7 METRES ON FACE HOLES. IN THE EVENT OF THE APPLICATION OF BOREHOLES GREATER THAN 100 MILLIMETRES IN DIAMETER, COLLARS WILL BE INCREASED ACCORDINGLY.
4. CLEAR CRUSHED STONE WILL BE USED FOR STEMMING.
5. BLAST DESIGN WILL BE CONTINUALLY REVIEWED WITH RESPECT TO FRAGMENTATION, GROUND VIBRATION AND OVERPRESSURE. BLAST DESIGNS SHALL BE MODIFIED AS REQUIRED TO ENSURE COMPLIANCE WITH APPLICABLE GUIDELINES AND REGULATIONS. DECKING, REDUCED HOLE DIAMETERS AND SEQUENTIAL BLASTING TECHNIQUES WILL BE USED TO ENSURE MINIMAL EXPLOSIVES PER DELAY PERIOD INITIATED.
6. BLASTING WILL BE MONITORED IN ACCORDANCE WITH THE PERFORMANCE MONITORING PROGRAM. (SEE DRAWING 5 OF 5)
7. THE OPERATOR WILL BE AWARE OF THE GUIDELINES FOR USE OF EXPLOSIVES IN OR NEAR CANADIAN FISHERIES WATERS.

J. EXTRACTION SEQUENCE

1. INITIAL EXTRACTION WILL OCCUR IN PHASE 1A PRIOR TO THE ESTABLISHMENT OF THE STOCKPILE AND PROCESSING AREA AND WASH PLANT. MATERIAL WILL BE CRUSHED, SCREENED AND STOCKPILED WITHIN THE DISTURBED AREA. NO WASHING OF THIS MATERIAL WILL OCCUR ON SITE.
2. EXTRACTION WILL CONTINUE IN PHASE 1A AND PROCEED FROM SOUTH TO NORTH THROUGH THE PHASE TO DEPTH OF APPROXIMATELY 242 MASL.
3. EXTRACTION IN PHASE 1B MAY COMMENCE DURING EXTRACTION IN PHASE 1A AND PROCEED FROM SOUTH TO NORTH TO AN ELEVATION OF 220 MASL.
4. EXTRACTION IN PHASE 2 WILL PROCEED FROM NORTH TO SOUTH THROUGH THE PHASE, AND MAY OCCUR DURING EXTRACTION IN PHASES 1A OR 1B.
5. AS THE HORIZONTAL LIMIT OF EXTRACTION IN ANY PART OF EACH PHASE, PROGRESSIVE REHABILITATION WILL COMMENCE AS SHOWN ON THE PROGRESSIVE AND FINAL REHABILITATION PLAN.

K. EXTRACTION DETAILS

1. HEIGHT OF THE LIFTS WILL VARY DUE TO ROCK QUALITY AND SAFETY CONSIDERATIONS, BUT WILL NOT EXCEED 20 M. THE NUMBER OF LIFTS WILL VARY THROUGH THE PHASES DUE TO THE VARIABLE SURFACE TOPOGRAPHY.
2. THE HIGHEST ELEVATION WITHIN THE LIMIT OF EXTRACTION IS 266.2 MASL EXTRACTED TO A QUARRY FLOOR ELEVATION OF 220 MASL ESTABLISHES AN APPROXIMATE MAXIMUM DEPTH OF EXCAVATION OF 46.2 M. AT THE MAXIMUM LIFT HEIGHT OF 20 METRES THERE WILL BE A MAXIMUM OF 3 LIFTS.
3. AGGREGATE STOCKPILES WILL BE LOCATED ON THE QUARRY FLOOR IN CLOSE PROXIMITY TO THE EXTRACTION FACE AND IN THE STOCK PILE AND PROCESSING AREA.
4. WHERE THE QUALITY OF MATERIAL DOES NOT MEET THE OPERATORS MARKET REQUIREMENTS, THE HORIZONTAL EXTENT OR DEPTH OF EXTRACTION MAY BE REDUCED.
5. THE LOCATION OF THE INTERNAL HAUL ROAD FROM THE ENTRANCE TO PHASE 1 WILL BE PERMANENT. THE LOCATION OF SECONDARY HAUL ROADS WILL VARY AS THE OPERATION PROGRESSES.
6. SCRAP WILL BE STORED IN THE STOCKPILE AND PROCESSING AREA AND WILL BE REMOVED FROM THE SITE ON AN ON-GOING BASIS.

L. EQUIPMENT

1. EQUIPMENT TO BE UTILIZED ON THE SITE WILL INCLUDE, BUT NOT BE LIMITED TO:

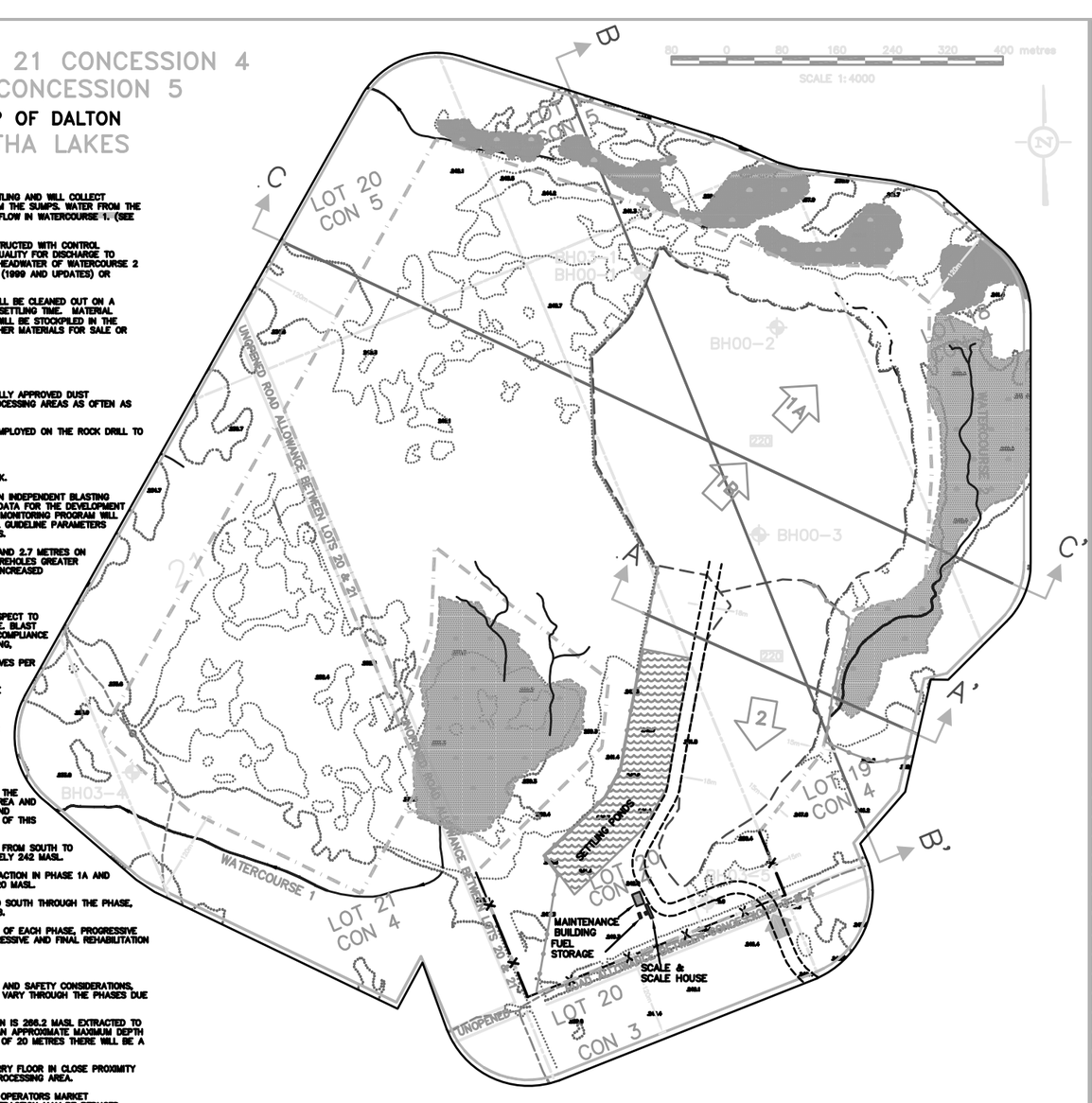
   MOBILE (SELF PROPELLED) – SCRAPERS, EXCAVATORS, LOADERS, DOZERS, TRUCKS AND OFF-ROAD TRUCKS

   STATIONARY – SCREENING PLANT, STACKER, CONVEYORS, POWER PLANT, FEED BIN, CRUSHING PLANT, WASH PLANT, TOOL TRAILER AND ROCK DRILLS

2. PROCESSING EQUIPMENT WILL BE PORTABLE AND WILL BE LOCATED IN THE STOCKPILE AND PROCESSING AREA EXCEPT DURING PHASE 1A WHEN PROCESSING EQUIPMENT MAY BE LOCATED WITHIN THE PHASE 1A EXTRACTION AREA.
3. IF REQUIRED, A CERTIFICATE OF APPROVAL WILL BE OBTAINED FOR PROCESSING EQUIPMENT TO BE USED ON SITE.

M. FUEL STORAGE AND EQUIPMENT MAINTENANCE

1. FUEL STORAGE FACILITIES WILL BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH THE LIQUID FUEL HANDLING CODE.
2. STATIONARY EQUIPMENT WILL BE FUELLED BY A MOBILE REFUELLING TANK, ALL IN ACCORDANCE WITH THE LIQUID FUEL HANDLING CODE AND WITH CARE TO PREVENT SPILLS.
3. ALL EQUIPMENT WILL BE INSPECTED DAILY FOR LEAKS OF FUEL, OIL OR HYDRAULIC SYSTEMS.
4. MOBILE EQUIPMENT MAY BE SERVICED ON-SITE IN THE MAINTENANCE BUILDING, OR OFF-SITE.
5. STATIONARY EQUIPMENT WILL BE SERVICED ON-SITE.
6. ALL PETROLEUM WASTE PRODUCTS WILL BE COLLECTED AND DISPOSED OF BY AN MOE APPROVED AGENT.
7. SPILLS CONTAINMENT MATERIALS WILL BE STORED ON SITE IN THE STOCKPILE AND PROCESSING AREA.



LEGEND

- LICENCED BOUNDARY
- LIMIT OF EXTRACTION
- LIMIT OF EXTRACTION VERTICAL FACE
- LIMIT OF EXTRACTION CUT & FILL
- LOT/CONCESSION LINE
- 120m SETBACK
- INTERNAL HAUL ROAD
- POST & WIRE FENCE
- TRAIL
- CONTOURS & SPOT ELEVATIONS
- GENERAL DIRECTION OF DRAINAGE
- PIT ENTRANCE/EXIT
- GATE
- TREES/BUSH
- BH00-1 BOREHOLE
- POND/SURFACE WATER AS MAPPED BY MICHASKI NIELSEN & ASSOCIATES
- INTERMITTENT WATERCOURSE
- WATERCOURSE
- A A' SECTION ARROWS
- 1 DIRECTION/SEQUENCE OF EXTRACTION
- BUILDING
- 220 MAXIMUM DEPTH OF EXCAVATION
- DISCHARGE POINTS
- REPTILE FENCE
- PERIMETER DITCH
- SUMP DISCHARGE
- GATE

N. PERFORMANCE MONITORING PLAN

SEE DWG. NO. 05-2019-5 OF 5

O. VARIATIONS FROM PROVINCIAL STANDARDS

No.	DESCRIPTION	REFERENCE TO STANDARDS	COMMENTS
1.	Only the south boundary of the licenced area in the vicinity of the road allowance will be fenced.	5.1	Adjacent lands are vacant woodlands owned by the licencee. The boundary will be marked with blazes and paint.
2.	Topsoil and Overburden will not be stripped and stockpiled separately.	5.4	The depth of topsoil/overburden is 0.3 metres or less.
3.	Setback from the road allowance between Lots 20 and 21 is reduced from 30 metres to 15 metres	5.10.2.1	The road allowance is unopened and untravelled.
4.	Slopes below the future lake surface elevations will be vertical (17-21m high) except in specified locations.	5.19	Extraction to a vertical face provides for maximum resource recovery. Shallow access point with full 2:1 slopes are provided for each lake.
5.	The slopes above the future lake surface elevation will be vertical (3-4m high) in the specified location.	5.19	The south-facing vertical face with shallow water at the base will provide valuable habitat for bird and aquatic species.

P. SPILLS CONTINGENCY PLAN

1. SPILL CONTAINMENT MATERIALS WILL BE STORED ON SITE.
2. IN THE EVENT OF A SPILL ON SITE, ALL EMPLOYEES AND CONTRACTORS ARE RESPONSIBLE TO IMMEDIATELY:
   - CEASE PUMPING OPERATIONS AND BLOCK OVERFLOW STRUCTURES;
   - IDENTIFY THE SOURCE OF THE SPILL AND PREVENT FURTHER SPILLAGE;
   - CONTAIN THE SPILL;
   - NOTIFY SITE MANAGER;
   - EXCAVATE ALL CONTAMINATED MATERIAL AND PLACE IN AN IMPERVIOUS CONTAINER FOR DISPOSAL AS DIRECTED; AND
   - COMPLETE A RECORD OF SPILL.
3. IF THE SPILL IS MORE THAN 100 LITRES OF FUEL OR OTHER FLUID FROM ANY EQUIPMENT, OR IF THE SPILL ENTERS, OR IS LIKELY TO ENTER ANY WATER, THE FOLLOWING MUST ALSO BE NOTIFIED:

   CITY OF KAWARTHA LAKES 1-888-822-2225 OR

   COBOCONK SERVICE CENTRE 1-705-454-3322

   MOE SPILLS ACTION CENTRE 1-800-268-6060
4. THE SPILLS CONTINGENCY PLAN WILL BE UPDATED AS NECESSARY IN ACCORDANCE WITH APPLICABLE LEGISLATION AND REGULATIONS.
5. THE INTERNAL ROAD WILL BE MAINTAINED FOR ACCESS.

SCHEDULE OF REVISIONS PRIOR TO LICENCE

NO.	DATE	DESCRIPTION	APPROVED
1	DEC 11/08	REV PER MNR COMMENTS NOV 24/08	
2	APR. 30/09	ADDED NOTE O.5.	
3	MAR 2011	GENERAL REVISIONS	

SCHEDULE OF AMENDMENTS

NO.	DATE	DESCRIPTION	APPROVED

TRUDY P. PATERSON
IS APPROVED BY THE MINISTRY OF NATURAL RESOURCES PURSUANT TO SECTION 8 (4) OF THE AGGREGATE RESOURCES ACT TO PREPARE AND CERTIFY SITE PLANS.

TRUDY P. PATERSON DATE

SEBRIGHT QUARRY
CITY OF KAWARTHA LAKES

APPLICANT: GIOFAM INVESTMENTS INC.
BOX 1359
UXBRIDGE, ONTARIO
L9P 1N6

OPERATIONAL PLAN

PROJECT NO. 05-2019 DRWG. NO. 052019-2OF 5
DATE: MAR 2011 SCALE: 1:4000
DRAWN: TAR CHECKED: APPROVED:

Skelton Brumwell
CONSULTING ENGINEERS & PLANNERS
93 BELL FARM ROAD, SUITE 107 BARRIE, ONTARIO L4M 5G1
TELEPHONE (705) 726-1141 FAX (705) 726-6331

Appendix B

Giofam Sebright Quarry

PREVAILING METEOROLOGICAL CONDITIONS

Medians provided by Environment Canada

Date	Wind Direction	Wind Velocity Km/h	Temperature (Deg Celsius)
January	SE	17.4	-8.4
February	ESE	17.7	- 7.7
March	SE	19.3	- 2.1
April	SE	20.1	5.7
May	SE	16.8	12.9
June	SSE	14.3	17.1
July	WNW	14.2	20.6
August	WNW	14.1	19.4
September	WNW	15.1	14.8
October	WNW	16.1	8.2
November	WNW	17.5	2.2
December	WNW	17.7	- 4.8

** Data is not available specifically for the proposed quarry location.
Nearest weather station is Orillia / Muskoka A (Gravenhurst area)
** Data is based on averaged climate normals gathered 1951 – 1980.

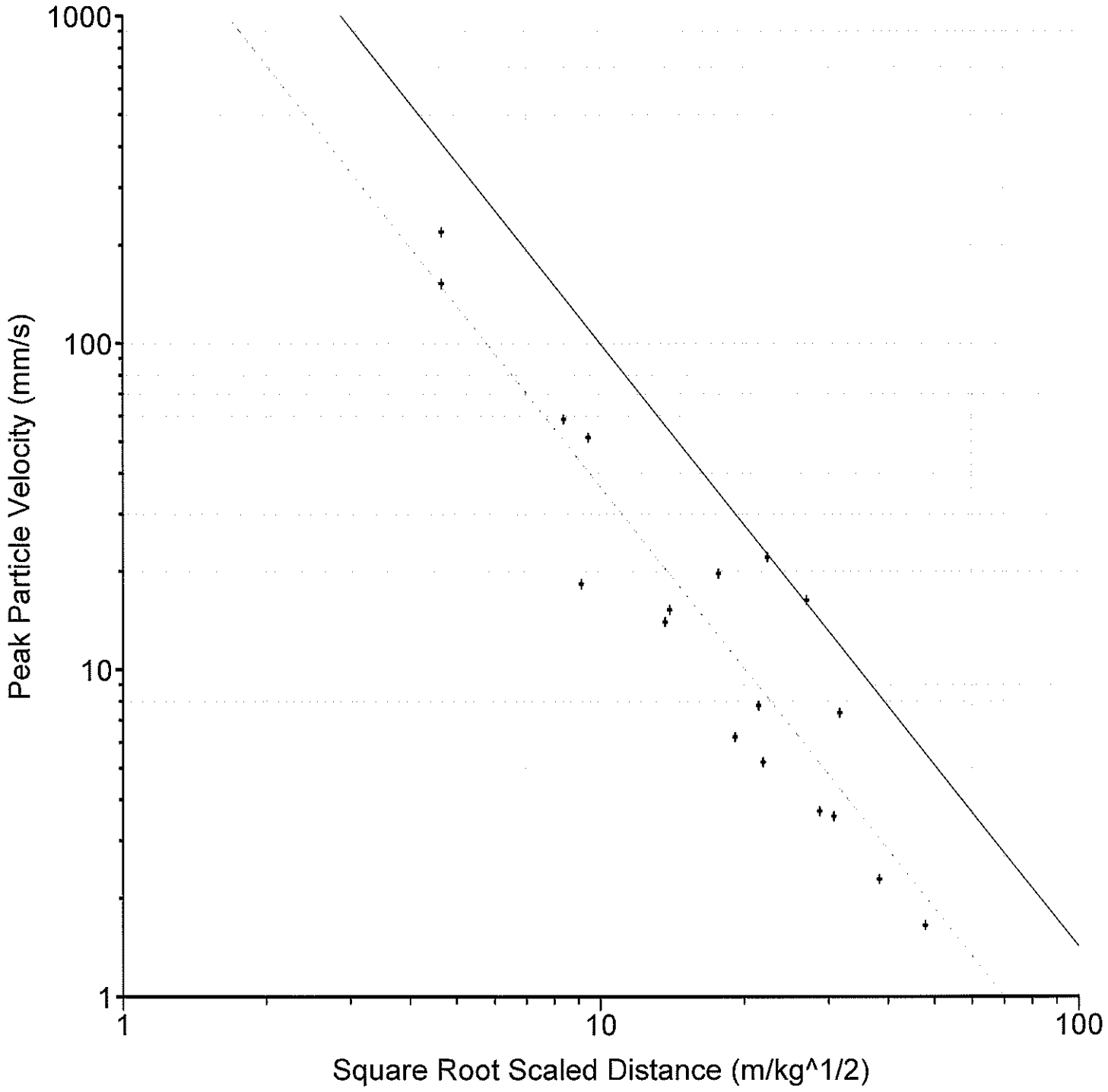
Appendix C

Regression Behind the shot

Regression Line For BEHIND.SDF

95% Line Equation: V = 7025 * (SD)^(-1.85)

Coeficient of Determination = 0.854 Standard Deviation = 0.219



Appendix D

René A. (Moose) Morin, P. Eng.

Co-owner, Principal of Explotech Engineering Ltd.

EDUCATION

B. Sc. Mining Engineering, University of Alberta 1959
Summer Management Program University of Western Ontario
Extension English - Queen's University
Extension French - University of Montreal

PROFESSIONAL AFFILIATIONS

P. E. O. O.I.Q.
Canadian Institute of Mining and Metallurgy (CIMM)
International Society of Explosives Engineers (ISEE)

SUMMARY OF EXPERIENCE

Since 1958, Mr. Morin has specialized in drilling and blasting phases of mining, quarrying and construction throughout Canada as well as offshore. This experience includes all aspects of drilling, blast design, blast control, operations and management. Mr. Morin has been accepted as an expert witness in the field of explosives and blasting in provincial and federal courts as well as at Municipal Board hearings in Ontario.

INSTANTEL INC., the world leader in digital blasting seismographs was created by Mr. Morin and Mr. Doyle some twenty years ago.

PROFESSIONAL RECORD

1979- Present	**- Owner/Principal, Explotech Engineering Ltd.**
1977 - 1979	**- Manager Operations, Armac Drilling and Blasting**
1961 - 1977	**- Various responsibilities, starting as Branch Manager in Western Quebec, through Construction Sales Manager, Bulk Products Manager and National Sales Manager DuPont of Canada Explosives Division.**

Robert J. Cyr, P. Eng.

Associate, Explotech Engineering Ltd.

EDUCATION

Bachelor of Applied Science,
Civil Engineering, Queen's University

PROFESSIONAL AFFILIATIONS

Association of Professional Engineers of Ontario (APEO)
Association of Professional Engineers and Geoscientists of BC (APEG)
International Society of Explosives Engineers (ISEE)
Aggregate Producers Association of Ontario (APAO)
Canadian Institute of Mining and Metallurgy (CIMM)

SUMMARY OF EXPERIENCE

Over twenty years experience in many facets of the construction and mining industry has provided the expertise and experience required to efficiently and accurately address a comprehensive range of engineering and construction conditions. Sound technical training is reinforced by formidable practical experience providing the tools necessary for accurate, comprehensive analysis and application of feasible solutions. Recent focus on vibration analysis, blast monitoring, blast design, damage complaint investigation for explosives consumers and specialized consulting to various consulting engineering firms.

PROFESSIONAL RECORD

2001 – Present	-Project Engineer, Explotech Engineering Ltd.
1996 – 2001	-Leo Alarie & Sons Limited - Project Engineer/Manager
1993 – 1996	-Rideau Oxford Developments Inc. – Project Manager
1982 – 1993:	-Alphe Cyr Ltd. – Project Coordinator/Manager/Engineer

Appendix E

Blasting Terminology

ANFO:	Ammonium Nitrate and Fuel Oil – explosive product
ANFO WR:	Water resistant ANFO
Blast Pattern:	Array of blast holes
Body hole:	Those blast holes behind the first row of holes (Face Holes)
Burden:	Distance between the blast hole and a free face
Column:	That portion of the blast hole above the required grade
Column Load:	The portion of the explosive loaded above grade
Collar:	That portion of the blast hole above the explosive column, filled with inert material, preferably clean crushed stone
Face Hole:	The blast holes nearest the free face
Overpressure:	A compressional wave in air caused by the direct action of the unconfined explosive or the direct action of confining material subjected to explosive loading.
Peak Particle Velocity*:*	The rate of change of amplitude, usually measured in mm/s or in/s. This is the velocity or excitation of the particles in the ground resulting from vibratory motion.
Scaled distance:	An equation relating separation distance between a blast and receptor to the energy (usually expressed as explosive weight) released at any given instant in time.
Spacing:	Distance between blast holes
Stemming:	Inert material, preferably clean crushed stone applied into the blast hole from the surface of the rock to the surface of the explosive in the blast hole.
Sub-grade:	That portion of the blast hole drilled band loaded below the required grade
Toe Load:	The portion of explosive loaded below grade