

Specialists in Explosives, Blasting and Vibration **Consulting Engineers**

Michael plin

Blast Impact Analysis Burlington Quarry Extension Concession 2, Part Lot 1,2,17 &18 Township of Burlington

Submitted to:

Nelson Aggregate 2433 No. 2 Side Road Burlington, ON

L7P 0G8

Prepared by

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EXECUTIVE SUMMARY

Explotech Engineering Ltd. was retained in November 2018 to provide a Blast Impact Analysis for the proposed Nelson Aggregate – Burlington Quarry Extension operation located on Concession 2, Part Lot 1,2,17 and 18 – geographical City of Burlington, Ontario.

Vibration levels assessed in this report are based on the Ministry of the Environment, Conservation and Parks Model Municipal Noise Control By-law (NPC 119) with regard to guidelines for blasting in Mines and Quarries. We have assessed the area surrounding the proposed license area with regard to potential damage from blasting operations and compliance with the aforementioned by-law document. In addition, we have reviewed blast and/or vibration reports collected at the existing licenced quarry for the 2014 - 2019 blasting campaigns.

Golder Associates undertook a vibration attenuation study at the existing Burlington Quarry in 2004. The resultant data was analyzed in order to develop site specific vibration attenuation characteristics and equations.

We have inspected the site and reviewed the available site plans. Explotech Engineering Ltd. is of the opinion that the planned mineral extraction extension on the site can be carried out safely and within Ministry of the Environment, Conservation and Parks guidelines as set out in NPC 119 of the By-Law.

Recommendations are included in this report for blasting operations to be carried out in a safe and productive manner and to suitably manage and mitigate the possibility of damage to any buildings, wells, structures or residences surrounding the property.



TABLE OF CONTENTS

INTRODUCTION	4
EXISTING CONDITIONS	
PROPOSED MINERAL EXTRACTION	
BLAST VIBRATION AND OVERPRESSURE LIMITS	
BLAST MECHANICS AND DERIVATIVES	
VIBRATION AND OVERPRESSURE THEORY	14
VIBRATION LEVELS AT THE NEAREST SENSITIVE RECEPTOR	
OVERPRESSURE LEVELS AT THE NEAREST SENSITIVE RECEPTOR	18
ADDITIONAL CONSIDERATIONS OUTSIDE OF THE BLAST IMPACT ANALYSIS SCOPE	
SUN CANADIAN HIGH PRESSURE OIL PIPELINE	20
FLYROCK	22
THEORETICAL HORIZONTAL FLYROCK CALCULATIONS	
BLAST IMPACT ON ADJACENT FISH HABITATS	26
RESIDENTIAL WATER WELLS	
REVIEW OF HISTORICAL BURLINGTON QUARRY DATA	30
2014-2019 DATA	30
RECOMMENDATIONS	32
CONCLUSION	33

APPENDIX A – OPERATIONAL PLANS

SENSITIVE RECEPTOR OVERVIEWS

HISTORIC VIBRATION MONITORING OVERVIEW

APPENDIX B - METEOROLOGICAL CONDITIONS

APPENDIX C – GOLDER ASSOCIATES BLAST IMPACT ASSESSMENT
HISTORICAL BLAST REPORTS 2017-2019
HISTORICAL VIBRATION DATA SUMMARIES 2014-2018

APPENDIX D - CURRICULUM VITAE OF REPORT WRITERS

APPENDIX E – BLASTING TERMS & DEFINITIONS
REFERENCES

APPENDIX F - ATTACHMENTS



List of Tables

- Table 1 Pg 6 Sensitive Receptor Distances Relative to Original Quarry and

 Extension
- Table 2 Pg 10 Details for Extraction for Each Individual Phase of the Burlington

 Quarry Extension
- Table 3 Pg 16 Maximum Load per Delay based on varied Stand-off Distance from Sensitive Receptors to Maintain 12.5mm/s Vibration Limit
- Table 4 Pg 25 Maximum Flyrock Horizontal
- Table 5 Pg 27 Maximum Loads per Delay to Maintain 100kPa at Various Separation

 Distances
- Table 6 Pg 28 Maximum Loads per Delay to Maintain 13.0mm/s at Various Separation Distances
- Table 7 Pg 31 Exceedances of NPC 119 Recorded During 2014-2019 Blasting Operations

List of Attachments

1. Golder Blast Impact Assessment_April 2006



INTRODUCTION

The proposed Nelson Aggregate – Burlington Quarry Extension operation is separated into two areas. The Burlington Quarry South Extension is located on the Southeast side of the existing licensed and operating Burlington Quarry (Licence 5499) while the Burlington Quarry West Extension is located along the Southwest face of the existing quarry. The legal description for the proposed licence is Concession 2, Part Lot 1,2,17 and 18 – geographical City of Burlington, Ontario.

This Blast Impact Analysis is based on the Ministry of the Environment, Conservation and Parks (MECP) Model Municipal Noise Control By-law (NPC 119) 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. It is a recommendation of this report that a vibration monitoring program be continued on the existing licenced site as well as on the proposed Burlington Quarry extension lands and that this monitoring program be maintained for the duration of all blasting activities to permit timely adjustment to blast parameters as required.

While not specifically required as part of the required scope of the Blast Impact Analysis under the Aggregate Resources Act, this report reviews the topics of flyrock and residential water wells. Exhaustive details related to residential water wells are addressed in the hydrogeological report while specific flyrock control is addressed at the operational level given significant influences related to blast design, geology and field accuracy.

Recommendations are included in this report for blasting operations to be carried out in a safe and productive manner and to suitably manage and mitigate the possibility of damage to any buildings, wells, structures or residences surrounding the property.



EXISTING CONDITIONS

The current operating licensed area for the Nelson Aggregate Burlington Quarry (Licence 5499) is described as Concession 2, Lot 1 and 2 and Concession 3, Part Lot 1 and 2 – geographic City of Burlington. This property is bound by Colling Road to the Northeast, No. 2 Side Road to the Southeast, Burlington Springs Golf Club property to the Southwest and Guelph Line to the Northeast. The lands immediately surrounding the licence are sparsely populated with the areas of densest development lying to the Southwest.

The proposed Burlington Quarry extension is separated into two (2) areas designated as the South and West Extension Areas. The Burlington Quarry South Extension is legally described as Concession 2, Part Lot 17 and 18 and is located immediately Southeast of the existing licence separated by No 2.Side Road. The Burlington Quarry South extension lands are bound by vacant lands to the Northeast and Southeast, No. 2 Side Road and the existing Burlington Quarry to the Northwest and residential properties located along No. 2 Side Road as well as the Camisle Golf Course to the Southwest. The South Extension lands are generally highest towards the Northeast boundary of the extension lands. The maximum elevations are in the order of 282MASL. The land drops in the South corner of the South extension lands to an elevation of approximately 274MASL.

The Burlington Quarry West Extension is legally described as Concession 2, Part Lot 1 & 2 and lies Southwest of the existing licence. The West Extension lands are bound by the existing quarry and Colling Road to the North, Cedar Springs Road and residential properties along Cedar Springs Road to the West, residential properties located along No. 2 Side Road and Cedar Springs Road to the South and East. The West Extension lands are generally highest towards the Northeast and South boundaries of the extension lands. The maximum elevations are in the order of 275MASL. The existing topography drops along the West boundary of the West Extension lands to an elevation of approximately 262MASL.

The licenced area for the proposed Burlington Quarry extension lands encompasses a total area of approximately 78.4HA. The associated extraction area is approximately 50.2HA when allowing for setbacks and sterilized areas.

The closest sensitive receptors located to the existing Burlington Quarry licence boundary and the proposed Burlington Quarry Extension extraction boundaries are listed in Table 1 below as well as on the Sensitive Receptor Overviews contained in Appendix A:

5



	Straight Line	Straight Line Distance	
	Distance from	from proposed	Extension
Compiting December	Existing Burlington	Burlington Quarry	Area Closest
Sensitive Receptor	Quarry Boundary to	Extension Extraction	to Sensitive
	Receptor (m)	Boundary to Receptor	Receptor
		(m)	
2196 No. 2 Side Road	158	284	South
*2226 No. 2 Side Road	53	208	South
*2244 No. 2 Side Road	47	129	South
*2280 No. 2 Side Road	28	15	South
*2292 No. 2 Side Road	153	N/A	South
*2300 No. 2 Side Road	52	N/A	South
*2416 No. 2 Side Road	116	278	South
*2433 No 2 Side Road	69	280	South
2450 No. 2 Side Road	50	387	South
2462 No. 2 Side Road	60	423	South
2470 No. 2 Side Road	48	462	South
*2473 No. 2 Side Road	12	493	South
*2479 No. 2 Side Road	41	521	South
2485 No. 2 Side Road	75	549	South
2495 No. 2 Side Road	74	612	South
2496 No. 2 Side Road	449	636	South
2509 No. 2 Side Road	78	644	South
2519 No. 2 Side Road	118	664	South
4366 Guelph Line	613	740	South
4420 Guelph Line	380	517	South
4448 Guelph Line	349	663	South
4472 Guelph Line	312	674	South
4480 Guelph Line	288	669	South
4486 Guelph Line	183	535	South
4487 Guelph Line	329	672	South
4496 Guelph Line	282	668	South
5030 Guelph Line	35	697	South
1385 No. 2 Side Road	560	285	West
1405 No. 2 Side Road	500	239	West
1425 No. 2 Side Road	453	202	West
*2015 No. 2 Side Road	307	95	West



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	Straight Line	Straight Line Distance	Fustamaiam
	Distance from	from proposed	Extension
Sensitive Receptor	Existing Burlington	Burlington Quarry Extension Extraction	Area Closest to Sensitive
	Quarry Boundary to		
	Receptor (m)	Boundary to Receptor (m)	Receptor
2080 No. 2 Side Road	144	143	West
2090 No. 2 Side Road	249	268	West
2102 No. 2 Side Road	90	118	West
2116 No. 2 Side Road	36	77	West
2126 No. 2 Side Road	39	100	West
2136 No. 2 Side Road		140	West
2170 No. 2 Side Road	167	298	West
5050 Cedar Springs Road	478	146	West
5070 Cedar Springs Road	523	154	West
5029 Cedar Springs Court	634	326	West
5059 Cedar Springs Court	620	279	West
5069 Cedar Springs Court	615	226	West
5079 Cedar Springs Court	610	188	West
5089 Cedar Springs Court	615	150	West
5106 Cedar Springs Court	735	237	West
5116 Cedar Springs Court	731	220	West
5132 Cedar Springs Court	738	245	West
5140 Cedar Springs Court	717	233	West
5158 Cedar Springs Road	707	237	West
5164 Cedar Springs Road	717	259	West
5165 Cedar Springs Road	625	189	West
5168 Cedar Springs Road	728	296	West
5172 Cedar Springs Road	729	266	West
5179 Cedar Springs Road	636	222	West
5191 Cedar Springs Road	542	139	West
5206 Cedar Springs Road	727	231	West
5214 Cedar Springs Road	747	234	West
5224 Cedar Springs Road	720	196	West
5234 Cedar Springs Road	712	184	West
*5235 Cedar Springs Road	327	N/A	West
5244 Cedar Springs Road	716	184	West
5245 Cedar Springs Road	642	110	West
5248 Cedar Springs Road	716	184	West



Sensitive Receptor	Straight Line Distance from Existing Burlington Quarry Boundary to Receptor (m)	Straight Line Distance from proposed Burlington Quarry Extension Extraction Boundary to Receptor (m)	Extension Area Closest to Sensitive Receptor
5254 Cedar Springs Road	713	173	West
5255 Cedar Springs Road	637	103	West
5258 Cedar Springs Road	704	152	West
5264 Cedar Springs Road	705	138	West
5268 Cedar Springs Road	705	131	West
5300 Cedar Springs Road	721	146	West
5318 Cedar Springs Road	717	140	West
5336 Cedar Springs Road	710	163	West
5352 Cedar Springs Road	721	225	West
5353 Cedar Springs Road	524	149	West
5360 Cedar Springs Road	725	235	West
5380 Cedar Springs Road	752	312	West
2129 Colling Road	94	114	West
2139 Colling Road	67	103	West

^{*} Denotes properties owned by the proponent. If these properties are unoccupied at the time of blasting operations or their use has changed (eg converted to offices) they will no longer be considered sensitive receptors and are thereby exempt from the MECP Guideline vibration and overpressure limits.

The structures located at 2280 No 2 Side Road located directly adjacent the proposed south expansion license are classified as culturally significant and will be vacant at the time of extraction. In this instance, 2280 No 2 Side Road would not qualify as a sensitive receptor as defined by the MECP (refer to Appendix E for Definitions). In order to safeguard the structural integrity of these structures, we recommend that vibrations at the 2280 No 2 Side Road property be maintained below 50mm/s (>40Hz) in accordance with research performed by the United States Bureau of Mines (USBM RI8507). The closest structure on the property shall be monitored for ground vibration and overpressure when vibration calculations suggest vibrations in excess of 35mm/s.



PROPOSED MINERAL EXTRACTION

As per the April 2020 Extraction Plan (Refer to Appendix A), the proposed initial quarry operations will commence with a sinking cut at the North corner of the Burlington Quarry South extension area. The South Extension Area will be extracted in three (3) phases designated as Phase 1a, Phase 1b and Phase 2. Retreat of the face will progress in a general Southeast direction.

Initial blasting for the South Extension lands will be located approximately 410m from the closest sensitive receptor not owned by the proponent outside of the proposed limits of extraction, namely 2450 No. 2 Side Road. (Note: The property located at 2280 No. 2 Sideroad is located approximately 205m from the initial blasting. This property is owned by the proponent and will be vacant upon commencement of extraction operations in which case it would be exempt from NPC 119 guideline limits. In the event that the property is being used a residence upon commencement of blasting, the NPC 119 limits would be applicable at this property). As operations progress during the South Extension, quarry faces along the Southwest limits of extraction will come as close as 15m removed from the closest receptor (namely 2280 No.2 Side Road) owned by the proponent or approximately 300m (namely 2196 No. 2 Side Road) to the closest privately owned sensitive receptor.

The Burlington Quarry West Extension will be extracted in four (4) phases designated as Phases 3 through 6 (Refer to Appendix A). The West Extension area will leverage the existing Southwest face of the Burlington Quarry in Phases 3 and 5 with a general East to West face retreat in Phase 3, 4 and 5. The Phase 6 face will retreat in a general North to South direction leveraging the face created by the Phase 5 progress.

As operations progress during the Burlington Quarry West Extension, quarry faces along the East limits of extraction will come as close as 77m removed from the properties located on No. 2 Side Road. Table 2 denotes relevant extraction details as they pertain to each individual phase.



	TABLE 2			
Details for Extraction for Each Individual Phase of the Burlington Quarry				
Extension				
Phase 1a	 Phase 1a will commence with a sinking cut in the Northeast corner of the Burlington Quarry South Extension lands Extracted to a depth of 271MASL Retreat in a general Southeasterly direction Likely extracted in 1-2 benches 			
Phase 1b	 Initial operations for Phase 1b will leverage the existing face of Phase 1a thereby initially eliminating the need for a sinking cut. Extracted to a depth of 270MASL Retreat in a general Southeasterly direction Extracted in 1 bench 			
Phase 2	 Initial operations of Phase 2 will leverage the existing face of Phase 1b thereby initially eliminating the need for a sinking cut. Once operations reach the quarry floor elevation achieved in Phase 1b a sinking cut will be required to extract rock to the Phase 2 final floor elevation of 252.5MASL. Extracted to a depth of 252.5MASL Retreat in a general Southeasterly direction. Likely extracted in 1-2 benches 			
Phase 3	 Phase 3 will commence along the Southeast corner of the Burlington Quarry West Extension lands Phase 3 will leverage the existing face of the Burlington Quarry thereby eliminating the need for a sinking cut. Extracted to a depth of 252.5MASL Retreat in a general Westerly direction Likely extracted in 2-3 benches 			
Phase 4	 Phase 4 will leverage the face of the previously excavated Phase 3 therefore eliminating the need for a sinking cut. Extracted to a depth of 252.5MASL Retreat in a general Westerly and Southerly direction Likely extracted in 2-3 benches 			
Phase 5	 Phase 5 will leverage the existing West face of the Burlington Quarry therefore eliminating the need for a sinking cut. Extracted to a depth of 252.5MASL Retreat in a general Westerly direction Likely extracted in 2-3 benches 			

EXPLOTECH

Phase 6

- Phase 6 will leverage the face of the previously excavated
 Phase 5 thereby eliminating the need for a sinking cut.
- Extracted to a depth of 252.5MASL
- Retreat in a general Southerly direction
- Likely extracted in 2-3 benches

Current practice at the Nelson Aggregate Burlington Quarry operation employs 102-152mm diameter blast holes with a typical load per delay of between 10kg and 400kg per period. Calculations contained within this report suggest modifications to current blast designs will be necessary as operations progress towards adjacent receptors.

It is a recommendation of this report that all blasts shall, as a minimum, be monitored at the nearest sensitive receptors, or closer, in front and behind any given blast in order to ensure constant compliance with MECP guideline limits and to permit timely adjustment to blast designs as required.



BLAST VIBRATION AND OVERPRESSURE LIMITS

The Ontario MECP guidelines for blasting in quarries are among 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 MECP. The limits suggested by the MECP are as follows.

Vibration	12.5mm/s	Peak Particle Velocity (PPV)		
Overpressure	_128dB	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 two (2) digital seismographs, one installed at the closest receptor behind the blast, or closer, and one installed at the closest receptor in front of the blast, or closer.



BLAST MECHANICS AND DERIVATIVES

The detonation of explosives within a blast hole 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 linear decibels (or dBL) 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 vibration 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.

Our experience and analysis demonstrates that blast overpressure is greatest when blasting towards receptors, and blast vibrations are greatest when retreating towards the receptors.



<u>VIBRATION LEVELS AT THE NEAREST SENSITIVE RECEPTOR</u>

The most commonly used formula for predicting PPV is known as the 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 variable and is influenced by many factors (i.e. rock type, geology, thickness of overburden, blast parameters, etc.). Based on the data collected from the previous attenuation study prepared by Golder Associates, the values for "e" and "K" have been established at -1.32 and 896 respectively (refer to Appendix C).

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

For a distance of 410m (i.e. the closest standoff distance to the nearest existing structure outside of the extraction limits for the initial blasting of **Phase 1a** not owned by the proponent, namely 2450 No. 2 Sideroad) and a maximum explosive weight of 80kg (10m deep, 102mm blast hole, 2.4m collar, single hole per period), we can calculate the maximum PPV at the nearest receptor as follows:

$$ppv = 896 \left(\frac{410}{\sqrt{80}}\right)^{-1.32} = 5.75 mm / s$$

As discussed in previous sections, the MECP guideline for blast-induced vibration is 12.5 mm/s (0.5 in/s). The calculated PPV based on the design parameters above would remain compliant at a calculated value of 5.75mm/s.

As noted previously, In the event that the proponent owned unit located at 2280 No. 2 Side Road qualifies as a sensitive receptor at the



commencement of blasting, the above theoretical design would need to be adjusted to ensure compliance with MECP guidelines (i.e at a separation distance of 205m and a load of 80kg per delay, the above calculation results in a calculated vibration level of 14.35mm/s).

For the Phase 3 area in the West Extension lands it is recommended that the initial blasting take place in the North corner of the common boundary between the extension lands and the existing quarry. At a separation distance of 350m (i.e. the closest standoff distance to the nearest existing structure outside of the extraction limits for the initial blasting of **Phase 3** not owned by the proponent, namely 2116 No. 2 Side Road, and a maximum explosive load per delay of 85kg (20m deep, 102mm blast hole, 2.5m surface collar, 2 explosive decks, single deck per period), we can calculate the maximum PPV at the nearest receptor to be 7.37mm/s.

Based on the data collected from the previous attenuation study, Table 3 below denotes the theoretical maximum charge per delay that can be used given the standoff distance to the nearest sensitive receptor:

TABLE 3				
Maximum Load per Delay based on varied Stand-off Distance from				
Sensitive Receptors to Mainta	in 12.5mm/s Vibration Limit			
Distance from Sensitive Receptor	Maximum Load per Delay			
(m)	(kg)			
100 15.5				
125 24.1				
150 34.8				
175 47.3				
200 61.8				
225 78.2				
250 96.5				
275 116.8				
300	139.0			



As the separation distance between the blast and closest receptor decreases, it will be necessary to adjust blast parameters to ensure continued compliance with the guideline limit. Fortunately, a variety of blast design alternatives are available to accomplish this including but not limited to reductions in blast hole diameter, change in explosives types, adjustment in bench heights and decking of holes. Given the planned phasing of the extension, vibration data will be continually collected and analyzed as the adjacent receptors are approached in order to confirm the requirement for any design modifications.



OVERPRESSURE LEVELS AT THE NEAREST SENSITIVE RECEPTOR

It is unusual for overpressure to reach damaging levels, and when it does, the evidence is immediate and obvious in the form of broken windows in the area. However, overpressure remains of interest due to its ability to travel further distances as well as cause audible sounds and excitation in windows and walls.

Air overpressure decays in a known manner in a uniform atmosphere, however, a uniform atmosphere is not a normal condition. As such, air overpressure attenuation is far more variable due to its intimate relationship with environmental influences. Air vibrations decay slower than ground vibrations with an average decay rate of 6dBL for every doubling of distance.

As part of the attenuation study performed on site, air overpressure levels were measured and analyzed using cube root scaling based on the following equation:

$$PSPL = k \left(\frac{d}{\sqrt[3]{w}}\right)^e$$

Where, PSPL= the peak sound pressure level particle velocity (dBL)

K, e = site factors

d = distance from receptor (m)

w = maximum explosive charge per delay (kg)

The collection of points gathered in the linear arrays emanating from each blast vibration were again analyzed and used to develop the following 95% regression equation (refer to Appendix C). Based on the data collected from the previous attenuation study prepared by Golder Associates, the values for "e" and "K" have been established at -0.0867 and 181 respectively (refer Appendix C).

$$PSPL = 181 \left(\frac{D}{\sqrt[3]{W}}\right)^{-0.0867}$$

As discussed in previous sections, the MECP guideline for blast-induced overpressure is 128dBL. For a separation distance of



410m (i.e. the standoff distance to the closest existing structure located outside of the extraction limits in front of the blast for initial blasting for **Phase 1a** not owned by the proponent, namely 2450 No. 2 Sideroad) and a maximum explosive weight of 80kg per delay (10m deep, 102mm blast hole, 2.4m collar, single hole per period delay), we can calculate the PSPL at the nearest receptor as follows:

$$PSPL = 181 \left(\frac{410}{\sqrt[3]{80}} \right)^{-0.0867} = 121.94 dB(L)$$

As discussed in previous sections, the MECP guideline for blast-induced overpressure is 128dB(L). The calculated overpressure based on the above blast parameters would remain compliant at a calculated value of 121.94dBL.

In the event that the proponent owned unit located at 2280 No. 2 Sideroad qualifies as a sensitive receptor at the commencement of blasting, the above theoretical design would need to be adjusted to ensure compliance with MECP guidelines (i.e at a separation distance of 205m and a load of 80kg per delay, the above calculation results in a calculated overpressure level of 129.5dBL).

For the Phase 3 area in the West Extension lands, we again assume initial blasting will take place in the North corner of the common boundary between the extension lands and the existing quarry. At a separation distance of 350m (i.e. the closest standoff distance to the nearest existing structure outside of the extraction limits for the proposed initial blasting of **Phase 3** not owned by the proponent, namely 2116 No 2 Side Road and a maximum explosive load per delay of 85kg (20m deep, 102mm blast hole, 2.5m surface collar, 2 explosive decks, single deck per period), we can calculate the maximum overpressure at the nearest receptor to be 123.84dBL.

We reiterate that air overpressure attenuation is far more variable due to its intimate relationship with environmental influences and as such, the equation employed is less reliable than that developed for ground vibration. Overpressure monitoring performed on site shall be used to guide blast design as it pertains to the control of blast overpressures. Given the intimate correlation between overpressure and environmental conditions, care must be taken to avoid blasting on days when weather patterns are less favourable.



ADDITIONAL CONSIDERATIONS OUTSIDE OF THE BLAST IMPACT ANALYSIS SCOPE

The following headings are addressed for general information purposes and are not strictly required as part of the scope of the Blast Impact Analysis as required under the ARA to ensure compliance with MECP NPC-119 guidelines. The hydrogeological study prepared by EarthFX and Azimuth Environmental Consulting as part of the licence application will address residential water wells in detail. Flyrock control is addressed at the operational level given significant influences related to blast design, geology and field accuracy which render concrete recommendations related to control inappropriate at the licencing phase.

SUN CANADIAN HIGH PRESSURE OIL PIPELINE

A Sun Canadian High Pressure Oil Pipeline runs parallel to Colling Road adjacent to Phase 5 of the of the proposed West expansion quarry limits (refer to Appendix A). The MECP guideline for blast-induced vibration (12.5mm/s) does not apply to pipelines as they are not classified as sensitive receptors. Sun Canadian Policy employs a 50mm/s vibration limit for welded steel pipelines. For the Phase 5 area in the West Extension lands it is recommended that the initial blasting take place in the South corner of the common boundary between the extension lands of Phase 5 and the existing quarry. Initial blasting operations will take place approximately 370m from the subject pipeline if they are initiated at the South corner, however, will reach as close as 12.8m throughout the course of the Phase 5 extraction.

Applying the equation from Predicated Vibration Limits at the Nearest Sensitive Receptor, for a distance of 370m (the conservative standoff distance to the pipeline for the initial blasting in **Phase 5**) and a maximum explosives load per delay of 177kg (20m deep, 102mm blast hole, 2.5m collar, single hole per period), we can calculate the maximum PPV at the pipeline as follows for the initial blast:

$$ppv = 896 \left(\frac{370}{\sqrt{177}} \right)^{-1.32} = 11.12 mm/s$$

The calculated 95% predicted PPV (based on the proposed blasting data discussed above) would be 11.12mm/s, well below the



Sun Canadian limit of 50mm/s for a steel welded pipeline located adjacent to the proposed quarry. While this initial value resides below the required threshold, it is anticipated that design modifications will be necessary to maintain compliance as the separation distance to the pipeline decreases and column loads increase. Fortunately, a variety of blast design alternatives are available to accomplish this including but not limited to reductions in blast hole diameter, change in explosives types, adjustment in bench heights and decking of holes.

We do note that the Sun Canadian Blasting Specification requires the presence of a vibration monitoring program conducted by an independent third party engineer when blasting operations are to be conducted within 60m of a pipeline. The proposed Operational Plan dictates that blasting is to encroach within approximately 12.8m of the ROW and as such, it remains a recommendation of this report that an independent third party firm be retained to conduct vibration monitoring on this pipeline when separation encroaches within 60m of the pipeline or when calculations suggest ground vibrations in excess of 35mm/s as measured at the pipeline are anticipated. The results of this monitoring program will determine what alterations shall be necessary as the separation distance to the subject pipeline decreases.



FLYROCK

Flyrock is the term used to define rocks which are propelled from the blast area by the force of the explosion. This action is a predictable and necessary component of a blast and requires that every blast have an exclusion zone established within which no persons or property which may be harmed are permitted.

Government regulations strictly prohibit the ejection of flyrock off of a quarry property. The regulations regarding flyrock are enforced by the Ministries of Natural Resources and Forestry, Environment, Conservation and Parks and Labour. In the event of an incident where flyrock does leave a site, the punitive measures include suspension / revocation of licences and fines to both the blaster and quarry owner / operator. Fortunately, flyrock incidents are extremely rare due to the possible serious consequences of such an event. It is in the best interest of all, stakeholders and non-stakeholders, to ensure that dangerous flyrock does not occur. Through proper blast planning and design, it is possible to control and mitigate the possibility for flyrock.

THEORETICAL HORIZONTAL FLYROCK CALCULATIONS

Flyrock occurs when explosives in a hole are poorly confined by the stemming or rock mass and the high pressure gas breaks out of confinement and launches rock fragments into the air. The three primary sources of fly rock are as follows:

- **Face burst:** Lack of confinement by the rock mass in front of the blast hole results in fly rock in front of the face.
- Cratering: Insufficient stemming height or weakened collar rock results in a crater being formed around the hole collar with rock projected in any direction.
- **Stemming Ejection:** Poor stemming practice can result in a high angle throw of the stemming material and loose rocks in the blasthole wall and collar.

The horizontal distance flyrock can be thrown (L_H) from a blast hole is determined using the expression:



$$L_{H} = \frac{V_{o}^{2} Sin2\theta_{0}}{g}$$
 [1]

where: V_o = launch velocity (m/s)

 θ_0 = launch angle (degrees)

g = gravitational constant (9.8 m/s²)

The theoretical maximum horizontal distance fly rock will travel occurs when θ_0 = 45 degrees, thereby yielding the equation:

$$L_{H \max} = \frac{V_o^2}{g}$$
 [2]

The normal range of launch velocity for blasting is between 10m/s - 30m/s. To calculate the launch velocity of a blast the following formula is used:

$$V_o = k \left(\frac{\sqrt{m}}{B}\right)^{1.3}$$
 [3]

where: k = a constant

m = charge mass per meter (kg/m)

B = burden (m)

By combining equations 2 and 3 and taking into account the different sources of fly rock, the following equations can be used to calculate the maximum fly rock thrown from a blast:

Face burst:
$$L_{H \max} = \frac{k^2}{g} * \left(\frac{\sqrt{m}}{B}\right)^{2.6}$$

EXPLOTECH

Cratering:
$$L_{H \max} = \frac{k^2}{g} * \left(\frac{\sqrt{m}}{SH}\right)^{2.6}$$

Stemming Ejection:
$$L_{H \max} = \frac{k^2}{g} * \left(\frac{\sqrt{m}}{SH}\right)^{2.6} Sin2\theta$$

where: $\theta = \text{drill hole angle}$

L_{hmax} = maximum flyrock throw (m) m = charge mass per meter (kg/m)

B = burden (m)

SH = stemming height (m) g = gravitational constant

k = a constant

For flyrock calculation purposes, we have applied the current blasting parameters used in the Burlington Quarry which utilize 102mm (4") diameter holes on a 3.5m x 3.5m (11.5'x 11.5') pattern, with total depths of up to 24m (80') and a collar length of 2m (8').

The range for the constant k is 13.5 for soft rocks and 27 for hard rocks. Given the proposed licence area is predominantly dolostone, we have applied a k value of 20. The explosive density is assigned to be 1.2 g/cc for emulsion products and the drill hole angles are assumed to be 90 degrees (i.e. vertical).

The following does not apply to the sinking cut which will require highly specialized designs and additional considerations for flyrock. Based on a free face blast, maximum anticipated horizontal flyrock projection distances are calculated as follows in Table 4:



Table 4 – Maximum Flyrock Horizontal			
<i>Collar</i> Lengths	Maximum Throw Cratering and Stemming Ejection		
(m)	Face Burst (m)	(m)	
1.5	30	274	
2.0	30	129	
2.5	30	72	
3.0	30	45	
3.5	30	30	

Different collar lengths are displayed in the table above to account for over or under loaded holes. As demonstrated with these various collar lengths, any deviation, no matter how slight, can greatly affect these maximum values. Blast mats or sand can be placed on top of the shot to further reduce the distance for potential flyrock.

Through proper blast design and diligence in inspecting the geology before every blast, flyrock can readily be maintained within the quarry limits. It may be necessary to increase collars and adjust designs accordingly when blasting along the perimeter to accommodate the reduced distance to receptors and to ensure flyrock remains within the property limit.



BLAST IMPACT ON ADJACENT FISH HABITATS

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 (DFO) 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.

Current information suggests the presence of three waterbodies that have been classified as potential fish habitats located in close proximity to the proposed license areas. Specifically, these waterbodies are the Unnamed Tributary of Willoughby Creek located North of the proposed West extension along Colling Road, the Unnamed Tributary of Lake Medad located Southeast of the West extension along No. 2 Side Road and the East and West Arms of the West Branch of the Mount Nemo Tributary of Grindstone Creek located to Northeast and Southwest of the South extension area.

The operational plan shows an approximate minimum extraction setback distance of 55m to the Unnamed Tributary of Willoughby Creek, 130m to the Unnamed Tributary of Lake Medad and 85m to the West Arm of the West Branch of the Mount Nemo Tributary of Grindstone Creek. Based on these separation distances, it is anticipated that alterations to blast designs will be necessary when blasting in close proximity to the identified waterbodies to maintain compliance with DFO water overpressure guidelines of 100kPa. A review of available topographic maps identifies elevations in the extraction areas closest to the above noted waterbodies ranging from 271-281masl, which will require blasting hole depths of up to 20m in some areas to reach the design quarry floor. The utilization of shallower blast holes, decks, smaller hole diameters and/or



changes in blasting patterns may be necessary to maintain compliance with DFO Guidelines.

In the event that blast designs for any given blast are scheduled to exceed maximum loads per delay as specified in the DFO "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (1998)" publication Table 1, we recommend that a hydrophone sensor be installed in the closest point of the waterbody to verify water overpressure levels, provided water depth is a minimum of 1m. The DFO Table 1 load restrictions are reproduced in part in Table 5 below for continuity.

Separation distance between possible fish bearing waterbody and closest borehole (meters)	Maximum recommended explosive load per delay (Kilograms)	
150	887	
125	616	
100	394	
90	319	
80	252	
70	193	
60	142	
50	98.7	
40	63.1	
30	35.5	

Table 5: Maximum Loads per Delay to Maintain 100kPa at Various Separation Distances

Active spring spawning beds (March 15 – July 15) are assumed to be present in all three (3) waterbodies listed above. During the spawning season, these waterbodies are subject to a vibration limit of 13mm/s recorded at the shoreline of the closest spawning location to the blast. Vibration monitoring will be required in order to confirm compliance with DFO limits for ground vibration.

Table 6 below is provided as initial guidance demonstrating maximum permissible loads per delay based on various separation distances from spawning beds. The following maximum loads per



delay are derived from the equation for ground vibrations listed earlier in this report and are based on a maximum vibration intensity of 13.0mm/s as experienced at the active spawning habitat:

Separation distance between possible spawning bed and closest borehole (meters)	Maximum recommended explosive load per delay (Kilograms)	
500	410	
450	332	
400	262	
350	200	
300	147	
250	102	
200	65.5	
150	36.8	
100	16.4	
75	9.2	
50	4.1	
30	1.5	

Table 6: Maximum Loads per Delay to Maintain 13.0mm/s at Various Separation Distances

Should blasting operations take place outside of the active spawning window (March 15 – July 15), the above 13mm/s vibration limit would not apply.

It is a recommendation of this report that all blasts shall, as a minimum, be monitored for ground vibrations at the closest active spawning bed from March 15 – July 15 to ensure compliance with DFO guidelines when calculations suggest vibrations in excess of 75% of the DFO vibration limit may be reached at the location of a potential active spawning habitat.



RESIDENTIAL WATER WELLS

Possible impacts to the water quality and production capacity of groundwater supply wells is a common concern for residents near blasting operations. Complaints related to changes in water quality often include the appearance of turbidity, water discolouration and changes in water. Complaints regarding water production most often involve loss of quantity production, air in water and damage to well screens and casings. A review of research and common causes of these problems indicates that most of these concerns are not related to blasting and can be shown to be the direct impact of environmental factors and poor well construction and maintenance.

There is an intuitive belief that blasting operations have dramatic and disastrous impacts on residential water wells for large distances around such operations. Unfortunately, there is no scientific basis for such claims. Outside of the immediate radius of approximately 20-25 blasthole diameters from a loaded hole, there is no permanent ground displacement. As such, barring blasting activity within several meters of an existing well, the probability of damage to residential wells is essentially non-existent.

Despite the scientific support for the above conclusion, numerous studies have been performed to verify the validity of this statement. These studies have investigated the effects of blasting on varied well configurations and in varied geological mediums to ensure results could be readily extrapolated to all blasting operations. The conclusion of these studies has confirmed that with the exception of possible temporary increases in turbidity, blasting operations did not result in any permanent impact on wells outside of the immediate blast zone of the blast until vibrations levels reached exceedingly high intensities. Applying universally accepted threshold levels for ground vibrations eliminates the possibility for any long term adverse effects on wells in the vicinity of blasting operations.

In a study by Froedge (1983), blast vibration levels of up to 32.3mm/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 50mm/s PPV level is adequate to protect wells from any damage. We reiterate, the current guideline limit for vibrations from quarry and mining operations is 12.5mm/s.



REVIEW OF HISTORICAL BURLINGTON QUARRY DATA

A vibration and overpressure monitoring program has been in place for all blasts conducted at the Nelson Aggregate Burlington Quarry in recent years. As part of this analysis, Nelson Aggregates has provided copies of vibration data summaries collected for 2014 through 2019 inclusive. For continuity, summaries of the historical data collected and supplied by Nelson Aggregate are included in Appendix C to this report.

2014-2019 DATA

Vibration monitoring conducted during 2014 – 2019 has included the installation of seismographs at the following locations:

- 2479 No. 2 Side Road
- 2470 No. 2 Side Road
- 2450 No. 2 Side Road
- 2582 No. 2 Side Road
- Southwest Corner of the Quarry property along No. 2 Side Road (N 43.39339, W 79.88880)
- Colling Road and Blind Line Intersection (N 43.40605, W 79.89400)
- Northwest Corner of the Quarry Property along Colling Road
- Gas Line (N 43.40466, W 79.88098)

All vibration monitoring was performed by either the blasting contractor or the quarry owner. A review of the data supplied confirms that for 2014 through 2019 inclusive, two (2) blasts exceeded the MECP guideline limit of 12.5mm/s set for ground vibrations, while sixteen (16) blasts exceeded the MECP guideline limit of 128dB for overpressure. Table 7 below lists the blasts that exceeded these limits:



Table 7: Exceedances of NPC 119 Recorded During 2014-2019 Blasting Operations				
Date	Time	Location	Limit Exceeded	Value of Exceedance
August 25, 2014	13:52	*SW Corner	>128dB(L)	132.2dB(L)
September 16, 2014	12:12	*Colling Road and Blind Line Intersection	>128dB(L)	134.6dB(L)
October 2, 2014	13:40	*2479 # 2 Side Road	>128dB(L)	131.8dB(L)
October 22, 2014	12:02	*SW Corner	>128dB(L)	128.4dB(L)
November 11, 2014	12:00	*2479 # 2 Side Road	>128dB(L)	130.6dB(L)
November 24, 2014	12:08	*2479 # 2 Side Road	>128dB(L)	128.7dB(L)
December 2, 2014	11:57	*Colling Road and Blind Line Intersection	>128dB(L)	132.8 dB(L)
June 12, 2015	12:18	*SW Corner	>128dB(L)	133.0 dB(L)
June 17, 2015	12:03	*Colling Road and Blind Line Intersection	>128dB(L)	130.7 dB(L)
July 13, 2015	12:02	*Colling Road and Blind Line Intersection	>128dB(L)	129.2 dB(L)
July 30, 2015	12:00	*2479 # 2 Side Road	>128dB(L)	130.7 dB(L)
September 1, 2015	12:01	*2479 # 2 Side Road	>128dB(L)	130.5 dB(L)
October 21, 2015	12:03	*2479 # 2 Side Road	>128dB(L)	134.3 dB(L)
May 4 , 2016	12:00	SW Corner	>12.5mm/s	12.8 mm/s
May 9 , 2016	12:00	Colling Road	>128dB(L)	129.5 dB(L)
July 5, 2016	12:00	Colling Road	>128dB(L)	128.3 dB(L)
August 30, 2016	12:00	Colling Road	>128dB(L)	128.8 dB(L)
April 11, 2017	11:56	SW Corner	>12.5mm/s	15.6 mm/s

^{*} These locations are assumed but cannot be verified due to insufficient information being recorded during the 2014 and 2015 blasting campaigns.

Although the above table denotes exceedances of the MECP guidelines, given the heavy conservatism inherent to the guideline, the risk of damage associated with these vibrations and overpressures remain extremely low.



RECOMMENDATIONS

It is recommended that the following conditions be applied for all blasting operations at the proposed Nelson Aggregates – Burlington Quarry Extension areas:

- 1. All blasts shall be monitored for both ground vibration and overpressure at the closest privately owned sensitive receptors adjacent the site, or closer, with a minimum of two (2) instruments one installed in front of the blast and one installed behind the blast.
- 2. Vibration and overpressure data collected during the first 12 months of extraction in the proposed quarry extension lands will be used to calibrate and update the 2004 Golder Associates attenuation equation. The proponent shall ensure information collected includes all relevant blast and monitoring details to permit and facilitate inclusion of the data in the attenuation data and resultant equation.
- 3. In order to safeguard the structural integrity of the structures located at 2280 No 2 Side Road, ground vibrations shall be maintained below 50mm/s (>40Hz) in accordance with research performed by the United States Bureau of Mines (USBM RI8507). The closest structure located at 2280 No 2 Side Road shall be monitored for ground vibration and overpressure when vibration calculations suggest vibrations in excess of 35mm/s.
- 4. All blasts within 60m of the adjacent Sun-Canadian High Pressure Oil Pipeline will be designed and monitored by a registered engineer, licensed in the province of Ontario or any distance specified in later revisions of the Sun-Canadian guidelines or when vibration calculations suggest vibrations in excess of 35mm/s at the pipeline.
- 5. To protect adjacent fish habitat, the Department of Fisheries and Oceans (DFO) has established limits for water overpressure and ground vibrations. Water overpressures are to be limited to 100kPa (year round), and in the presence of active spawning beds (March 15 July 15), ground vibrations at the bed are to be limited to 13mm/s. Fish habitat and assumed spawning beds are present in the Unnamed Tributary of Willoughby Creek, the Unnamed Tributary of Lake Medad and the East and West Arms of the West Branch of the Mount Nemo Tributary of Grindstone Creek. The utilization of shallower blast holes, decks, smaller hole diameters and/or changes in blasting



- patterns may be necessary when blasting adjacent to fish habitat at any time of year. These mitigation measures would also apply, when adjacent to spawning beds from March 15 July 15.
- 6. From March 15 July 15 of any year, blasts shall be designed to maintain vibrations below 13mm/s at the closest point of any spawning habitat to the blast. One (1) additional seismograph shall be installed on the shoreline adjacent the closest spawning habitat to any blast performed between March 15 and July 15 when calculations suggest vibrations in excess of 75% of the DFO vibration limit may be reached at the location of a potential active spawning habitat.
- 7. All blasting operations encroaching the Sun Canadian High Pressure Oil Pipeline will follow all requirements in the Sun Canadian Guidelines outlined in Section 8.3 to 8.5 under the heading "Vibration and Blasting Control" and any requirements specified in later revisions of the Sun Canadian guidelines.
- 8. The guideline limits for vibration and overpressure shall adhere to standards as outlined in the MECP Model Municipal Noise Control By-law publication NPC 119 (1978) or any such document, regulation or guideline which supersedes this standard.
- 9. In the event of an exceedance of NPC 119 limits or any such document, regulation or guideline which supersedes this standard, blast designs and protocol shall be reviewed prior to any subsequent blasts and revised accordingly in order to return the operations to compliant levels.
- 10. Orientation of the aggregate extraction operation will be designed and maintained so that the direction of the overpressure propagation will be away from structures as much as possible.
- 11. 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 current applicable guidelines and regulations.
- 12. Blasting procedures such as drilling and loading shall be reviewed on a yearly basis and modified as required to ensure compliance with industry standards.



13. Detailed blast records shall be maintained in accordance with current industry best practices

The blast parameters described within this report are supported by the modeling in the attached appendices. As the quarry progresses and as site-specific data is collected from the on-going operation, the blast parameters can be refined, as necessary, to ensure continual compliance with MECP Guidelines.

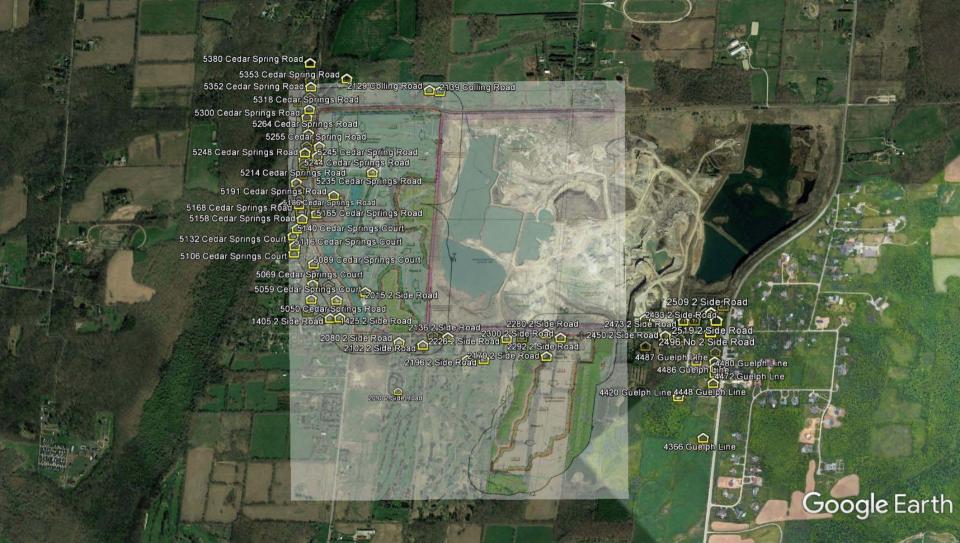


CONCLUSION

Blasting operations required for mineral extraction at the proposed Nelson Aggregates – Burlington Quarry Extension lands can be carried out safely and within governing guidelines set by the Ministry of the Environment, Conservation and Parks.

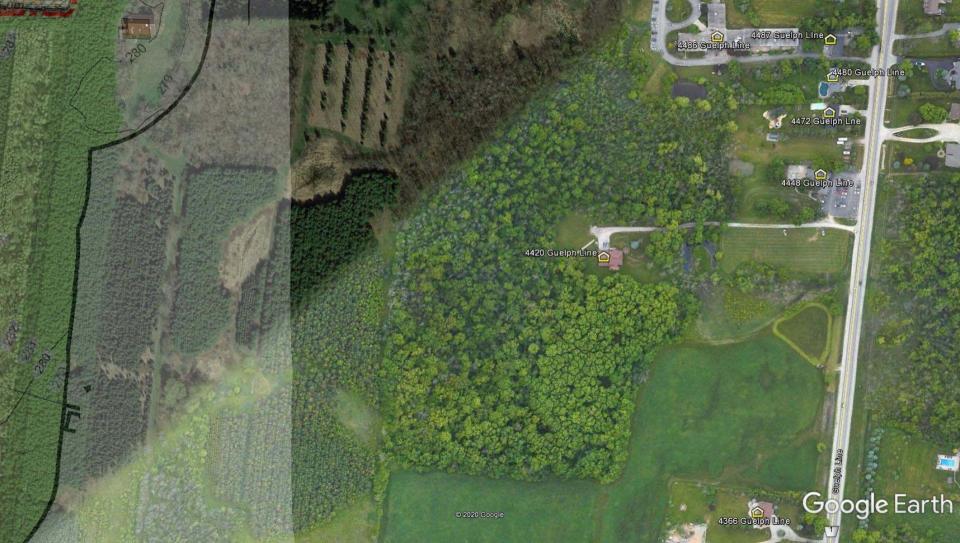
Modern blasting techniques will permit blasting to take place with explosives charges below allowable charge weights ensuring that blast vibrations and overpressure will remain minimal at the nearest receptors.

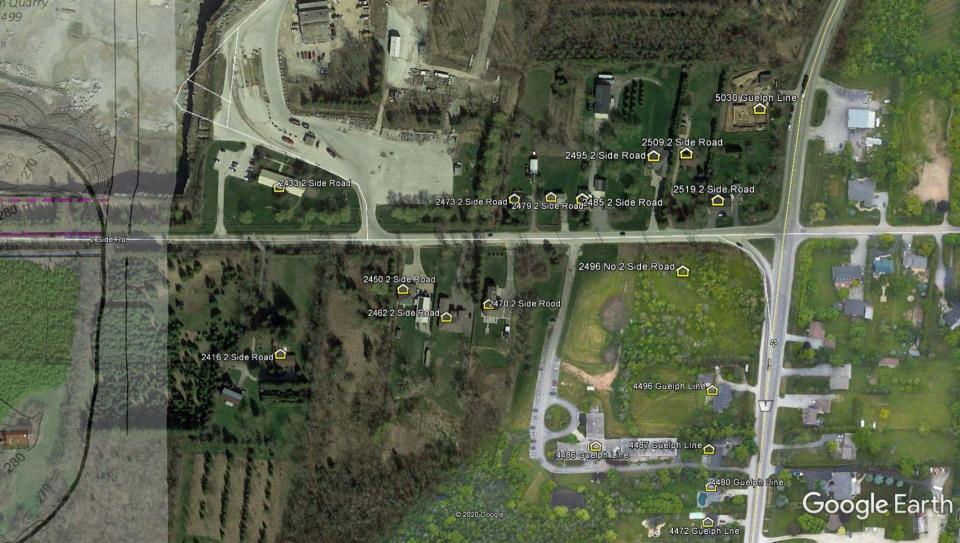
Appendix A





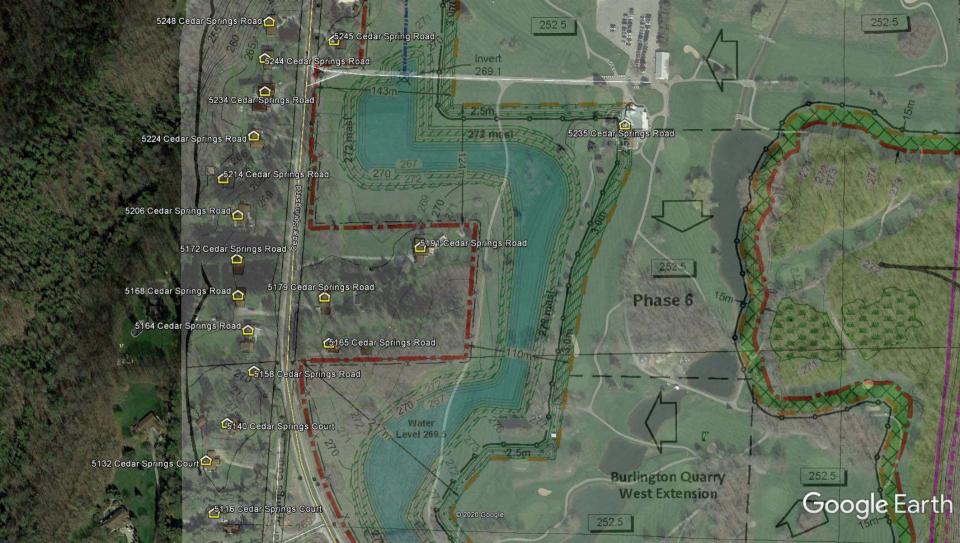








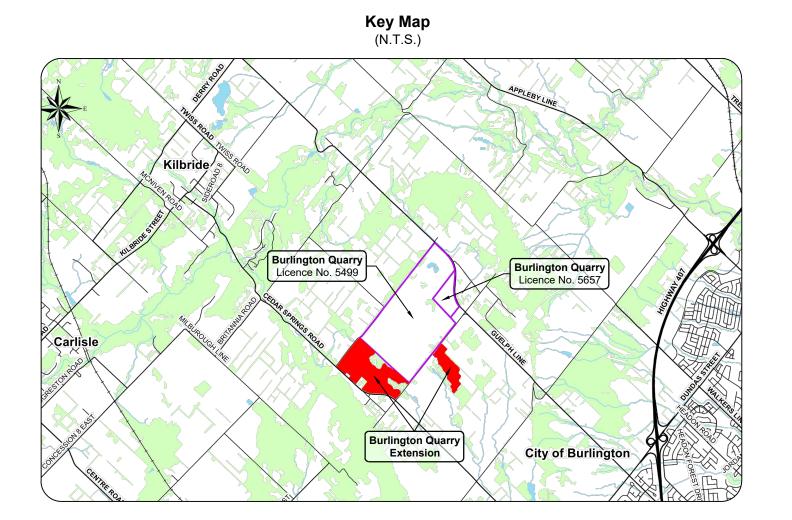












1. This site plan is prepared under the Aggregate Resources Act (ARA) for a Class 'A' Licence, Category 2. Area Calculations:

i. Licence Area (total) South Extension West Extension 60.1 ha

B. References

1. Contours were obtained from the City of Burlington's Open Data Catalogue based on 2017 data and are displayed in one metre intervals. Elevations shown are in metres above sea level (masl). 2. Topographic information was obtained from numerous sources including Ontario GeoHub (Land Information Ontario),

City of Burlington's Open Data Catalogue, Google Earth Pro aerial photography captured on May 7, 2018 and field investigations for technical reports.

3. All topographic features and structures are shown to scale in Universal Transverse Mercator (UTM) with North American Datum 1983 (NAD83), Zone 17 (metre), Central Meridian 81 degrees west coordinate system.

data. Distances are approximate and for reference purposes only. 5. Land use designations on and within 120 metres of the licences are from the Niagara Escarpment Plan, Map 3 -Regional Municipality of Halton, approved June 1, 2017. The Burlington Quarry Extension lands are designated

4. The licence boundaries were established using Municipal Property Assessment Corporation (MPAC) parcel fabric

6. Land use information and structures identified on or within 120 metres of the licence boundaries were determined using Google Earth Pro aerial photography captured on May 7, 2018.

1. Surface drainage on and within 120 metres of the licence boundaries are by overland flow in the directions shown by arrows on the plan view, or by infiltration.

D. Groundwater 1. The established groundwater table varies between 264 masl to 273 masl in the South Extension and 263 masl to 265

masl in the West Extension (EarthFX 2020).

E. Site Access and Fencing 1. There are four existing site accesses on Side Road No. 2 and a single existing site access on Cedar Springs Road.

2. Post and wire fencing (unless noted otherwise) exists in the locations shown on the plan view.

There are no existing aggregate operations or features on either Extension such as internal haul roads, processing, stockpiles, scrap, fuel storage, berms or excavation faces.

G. Cross Sections 1. See drawing 4 of 4.

H. Technical Reports - References

F. Aggregate Related Site Features

1. Adaptive Management Plan, Proposed Burlington Quarry Extension, EarthFX Inc., Savanta, and Tatham Engineering,

2. Agricultural Impact Assessment, Nelson Aggregate Co. Burlington Quarry Expansion, April 2020. 3. Air Quality Study for Nelson Aggregate Co., Burlington Quarry Extension, BCX Environmental Consulting, March 2020.

4. Archaeological Assessment (Stages 1, 2 & 3), Nelson Aggregates Quarry Expansion, Archaeologix Inc., August 2003.

5. Archaeological Assessment (Stage 4), Nelson Aggregates Quarry Expansion, Archaeologix Inc., August 2004. 6. Stage 1-2 Archaeological Assessment, Proposed West Extension of the Burlington Quarry, Golder Associates,

7. Blast Impact Analysis, Burlington Quarry Extension, Explotech Engineering Ltd, April 23, 2020.

9. Financial Impact Study, Proposed Burlington Quarry Extension, Nelson Aggregates Co., April, 2020.

8. Cultural Heritage Impact Assessment Report, Burlington Quarry Extension, MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC), April 2020.

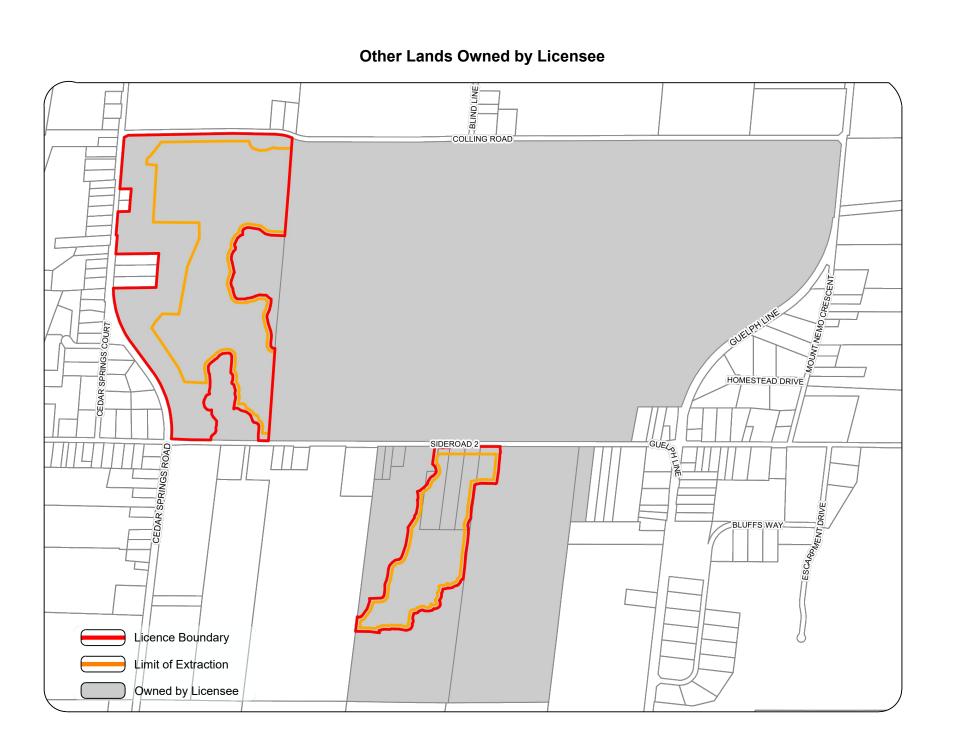
10. Level 1 and 2 Hydrogeological and Hydrological Impact Assessment Report, Proposed Burlington Quarry Extension, EarthFX Incorporated, April 2020.

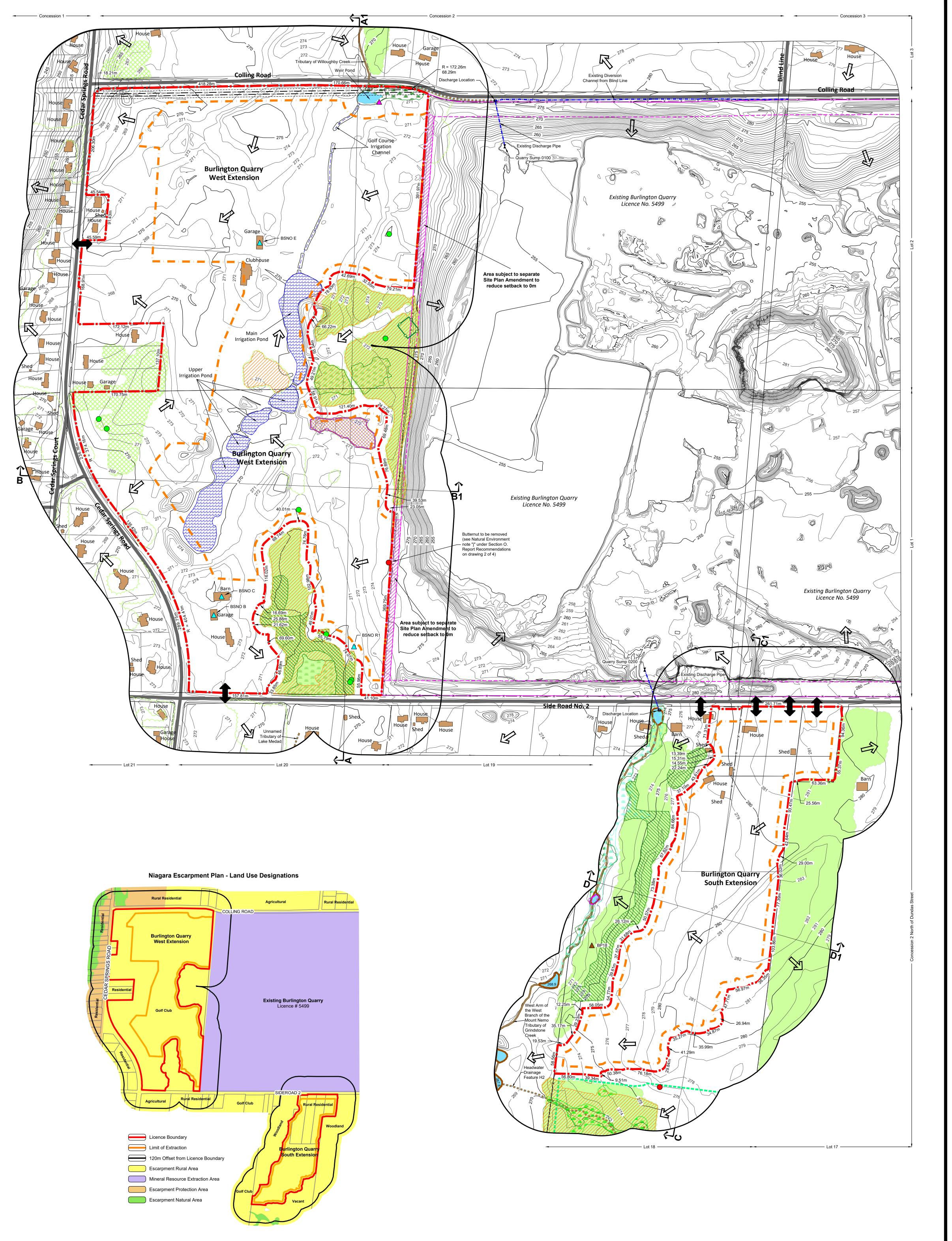
11. Level 1 and 2 Natural Environment Technical Report, Proposed Burlington Quarry Extension, Savanta, April 2020.

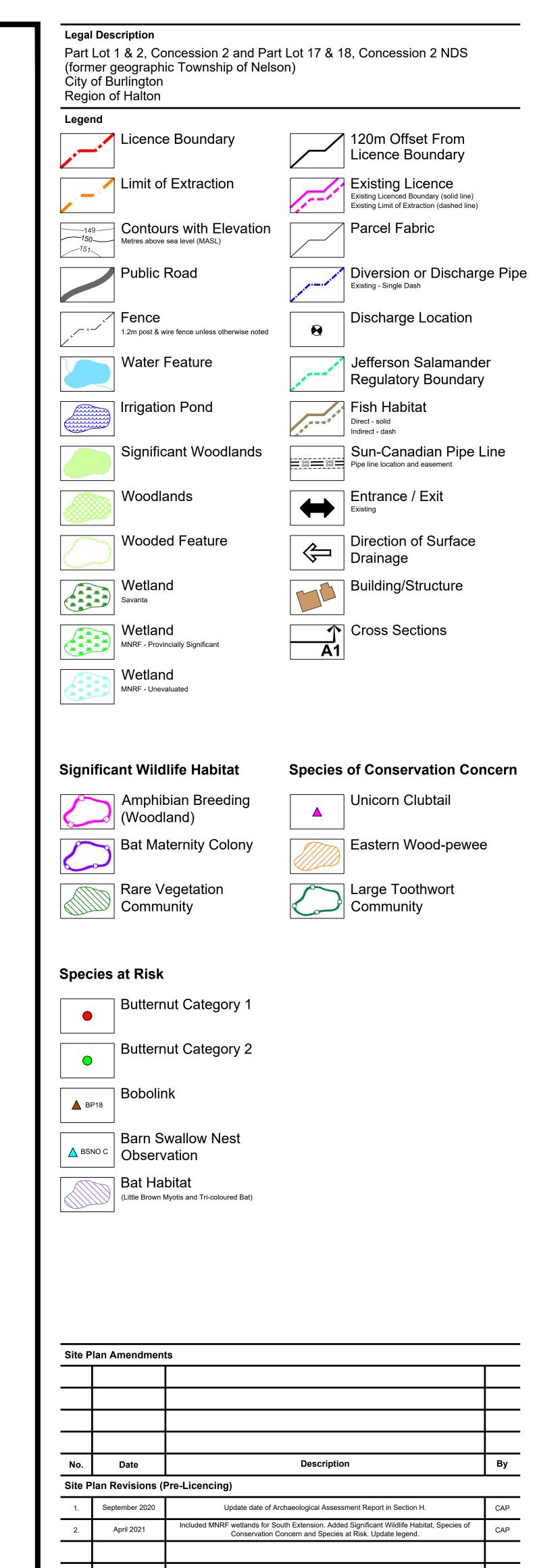
12. Noise Impact Assessment, Nelson Aggregate Quarry Extension, Howe Gastmeier Chapnik Limited, April 22, 2020. Nelson Aggregate Company, Burlington Quarry Extension Traffic Report, Paradigm Transportation Solutions Limited, February 2020.

14. Surface Water Assessment, Burlington Quarry Extension, Tatham Engineering, April 2020.

15. Visual Impact Assessment Report, Proposed Extension of the Burlington Quarry, MacNaughton Hermsen Britton Clarkson Planning Limited (MHBC), April 2020.





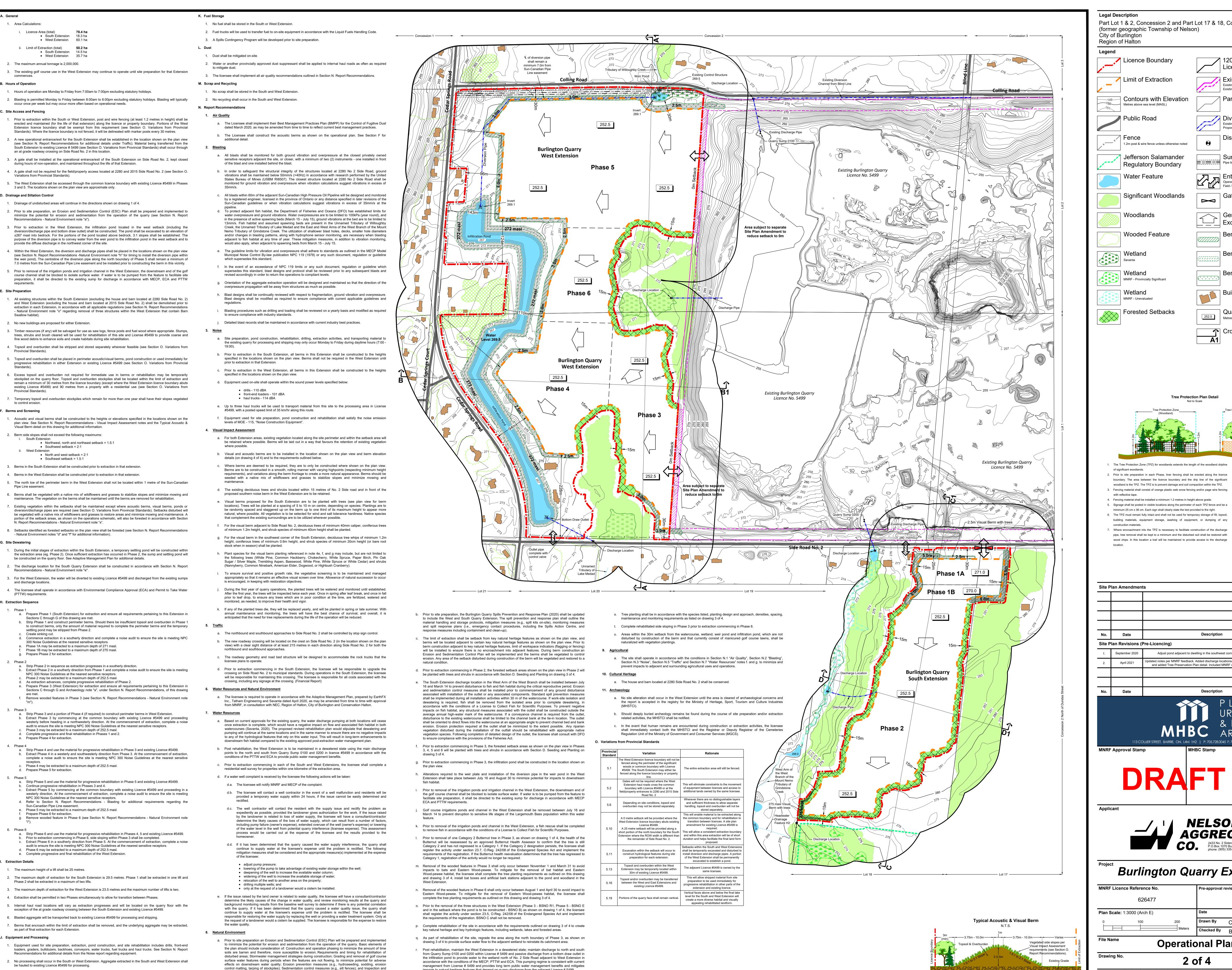






Burlington Quarry Extension

MNRF Licence Reference No.			Pre-approval review:			
	626477					
Plan Scale: 1:30	000 (Arch E)		Date		April 202	:1
0	100	200	Drawn By	C.P.	File No.	04050
		Meters	Checked By	B.Z.	1	9135D
File Name	E	xisting	Featu	res		
Drawing No.		1 (of 4			



impacts to natural heritage features that depend on quarry discharge from the adjacent License # 5499.

performance monitoring requirements and adaptive management.

Legal Description Part Lot 1 & 2, Concession 2 and Part Lot 17 & 18, Concession 2 NDS (former geographic Township of Nelson) City of Burlington Region of Halton Licence Boundary 120m Offset From **Existing Licence** Limit of Extraction Existing Licenced Boundary (solid line) Existing Limit of Extraction (dashed line) Parcel Fabric —149— Contours with Elevation —150 — Metres above sea level (MASL) Diversion or Discharge Pipe Existing - Single Dash Proposed - Double Dash Discharge Location 1.2m post & wire fence unless otherwise noted Sun-Canadian Pipe Line Jefferson Salamander GAS GAS Pipe line location and easement Regulatory Boundary Entrance / Ex Field / Property - hatch Significant Woodlands igwedgeGeneral Direction of Woodlands Excavation & Boundary Wooded Feature Berm - Acoustic Berm - Visua MNRF - Provincially Significant Wetland Building/Structure MNRF - Unevaluated Quarry Floor Metres above sea level (MASL) Cross Sections **Tree Protection Plan Detail** 1. The Tree Protection Zone (TPZ) for woodlands extends the length of the woodland dripline Legend of significant woodlands. 2. Prior to site preparation in each Phase, liner fencing shall be erected along the licence boundary. The area between the licence boundary and the drip line of the significant woodland is the TPZ. The TPZ is to prevent damage and soil compaction within the TPZ. 3. Fencing material shall consist of orange plastic web snow fencing and/or page wire fencing with reflective tape. 4. Fencing material shall be installed a minimum 1.2 metres in height above grade. 5. Signage shall be posted in visible locations along the perimeter of each TPZ fence and be a minimum 25 cm x 36 cm. Each sign shall clearly state the text provided to the right. 6. The TPZ must remain fully intact and shall not be used for temporary storage of fill, topsoil, No grade change, stora

Site Plan Amendments Site Plan Revisions (Pre-Licencing) Adjust pond adjacent to dwelling in the southwest corner of the West Extension. dated notes per MNRF feedback. Added discharge locations/pipe to plan view. Updated legend and added Tree Preservation Plan detail. Included MNRF wetlands for South Extension.

113 COLLIER STREET, BARRIE, ON, L4M 1H2 | P: 705.728.0045 F: 705.728.2010 | WWW.MHBCPLAN.

MHBC Stamp

of any materials or

within this area.



Burlington Quarry Extension

MNRF Licence Reference No. Pre-approval review: 626477 Plan Scale: 1:3000 (Arch E)

ings\ARA Site Plans\Extension Site Plan\CAD\9135D - Site Plan - Blacklined -

Operational Plan

Progressive Rehabilitation

A. General

 Area Calculations: i. To be extracted (total) South Extension West Extension 35.7 ha

South Extension 14.5 ha

West Extension 35.7 ha

ii. To be rehabilitated (total) 50.2 ha

iii. Leaving extraction faces vertical

B. Phasing

1. As excavation reaches the limit of extraction or maximum depth, progressive rehabilitation shall commence.

2. Progressive rehabilitation shall follow the direction and sequence of extraction identified on the plan view and described in the notes on

3. Prior to extraction commencing in Phase 6, side sloping within Phase 3 shall be completed.

C. Slopes and Grading 1. Progressive rehabilitation will utilize a variety of rehabilitation techniques including:

i. Backfilling extraction faces and quarry floors; ii. Partially backfilling extraction faces to create a cliff with talus slope; or

- 2. Excess soil, in accordance with MECP "Excess Soil Regulation (O. Reg 406/19), as may be amended from time to time, may be imported to facilitate the establishment of 3:1 and 2:1 (horizontal: vertical) slopes on the quarry faces and/or applied to the quarry floors to achieve the final contour elevations shown on the plan view. The licensee must ensure that the material is tested at the source, before it is deposited on-site, to ensure that the material meets the MECP's criteria under Table 1 of MECP's Soils, Ground Water and Sediment Standards for use under Part XV.1 of the Environmental Protection Act. Sampling results will be provided to the MNRF upon request.
- for sodium absorption ratio and electrical conductivity do not have to be met. 4. The final rehabilitated landforms established in the South and/or West Extension using the rehabilitation techniques will consist of lakes,

3. Notwithstanding Condition 1, where the imported material is not being placed within 1.5 metres of the surface, the criteria under Table 1

- islands, shoreline wetlands, vernal pools, beach, pond, woodlands, gradually sloping grades, 2:1 and 3:1 side slopes, cliff with talus slopes, and vertical faces as shown on the plan view.
- 5. Beach sand may be imported to establish the beach area in the South Extension.
- 6. As part of rehabilitation of the site, regrade the area along the north boundary of Phase 3, as shown on this drawing to provide surface water flow to the adjacent wetland to reinstate its catchment area.

D. Seeding and Planting

- 1. The side slopes and backfilled portions of the quarry floor will be seeded with the Ministry of Transportation's (MTO) Ontario Roadside Seed Mix (Creeping Red Fescue, Kentucky Bluegrass, Perennial Ryegrass and White Clover) or equivalent.
- 2. Ponds, wetlands, and tree planting areas identified in the plan view shall be planted in accordance with Table 1: Rehabilitation Plant List Recommendations on this drawing. 3. The planting design and approach will be guided by the Conservation Halton Landscaping and Tree Preservation Guidelines (2010).
- 4. Planting densities shall be determined based on the restoration objectives and presence/absence of existing natural features. For example, planting densities will be highest where the objective is to restore/establish a woodland, and meet the definition of woodland under the Forestry Act, but may be reduced if/when objective is to establish a buffer adjacent to a naturalized area. The type of species planted will also be dependent on adjacent habitat (e.g., greater reliance on shrub plantings when restoration occurs adjacent to a meadow, and tree plantings when planting next to woodland).
- 5. Where the restoration objective is the establishment of a woodland, trees will be planted at a minimum density of 10 trees per 100 m², in order to account for competition, stress or wildlife damage and to meet the definition of woodland under the Forestry Act. Within this area, the shrub to tree ratio will be 5:1, with trees planted no closer than 2.5 m on centre and shrubs planted between 0.75 m and 1.5 m apart.

6. Where the restoration objective is the establishment of a setback adjacent to a natural feature, planting densities will be dependent on the features they abut (e.g., densities will be higher when planting next to an existing forest relative to the densities when planting next to an anthropogenic or cultural feature). The planting design of a proposed setback adjacent to a natural feature will follow a 3-band approach, where woody planting densities will be highest within Band 1 (closest to the existing adjacent feature) and reduced in Band 2. No woody species will be planted in Band 3, which will be seeded with a soil and moisture-appropriate native seed mix. Where trees will be planted, the following planting densities will be applied: Band 1 - five trees per 100 m². Where shrubs are also being proposed, these will be planted at a shrub to tree ratio of 5:1; Band 2 - three trees per 100 m². Where shrubs are also being proposed, these will be planted at a shrub to tree ratio of 5:1.

- Competing herbaceous vegetation will be controlled by placing mulch around each planted tree or shrub (50 cm radius of mulch around each planting). Rodent protection will be installed as necessary. Where access permits, planting will be watered during periods of drought (defined as a 30 day period between May and September with less than 25mm of precipitation) until establishment has occurred.
- 8. For planting in areas not extracted, plantings shall be monitored at least annually until "free-to-grow" conditions have been achieved. "Free-to-grow" is a condition in which the plantings are considered established based on a minimum stocking standard, a minimum height and freedom from competition that could impede growth. At the "free-to-grow condition", the survival (stocking standard) of planted trees shall be a minimum of 1000 trees per hectare. If survival is less than 1000 "free-to-grow" condition trees per hectare,
- 9. For plantings in areas extracted, plantings shall be monitored at least annually until "free-to-grow" conditions have been achieved. "Free-to-grow" is considered established based on a minimum stocking standard, a minimum height and freedom from competition that could impede growth. At the "free-to-grow" condition, the survival (stocking standard) of planted trees shall be a minimum of 1000 trees per hectare. If survival is less than 1000 "free-to-grow" condition trees per hectare, additional planting will take place.

1. Final surface drainage will follow the rehabilitated contours and directional arrows shown on the plan view.

- 2. Once the South Extension is depleted, pumping will cease and portions of the site below the ground water table will fill with water.
- 3. Runoff within the South Extension will drain into the lake.
- 4. Construct overflow outlet in the southwest corner of the South Extension.
- 5. Once the West Extension is depleted, the West Extension will remain in a dewatered state. Runoff within the West Extension will either drain north towards the lake or southeast into existing Licence #5499.
- 6. During rehabilitation the licensee shall maintain discharge to fish habitat to the north and south from Quarry Sump 0100 and 0200 within License #5499 and passive discharge from a bottom draw outlet in the infiltration pond to provide water to the wetland north of No. 2 Side
- 7. During rehabilitation the licensee shall operate in accordance with the conditions of the MECP, PTTW and ECA for the ongoing dewatering of the site. This pumping regime is consistent with current management from License #5499 and provides long term public water management benefits and mitigates impacts to natural heritage features that depend on quarry discharge from the adjacent License
- 8. The licensee has committed to: conveying the site into public ownership and to maintain the West Extension in a dewatered state by maintaining the pumping regime from License #5499 to provide long-term public water management benefits and mitigate impacts on natural heritage features which depend on quarry discharge from the adjacent License #5499.

F. Adaptive Management Plan

1. During progressive rehabilitation, until surrendering the licence, the licensee is required to operate in accordance with the Adaptive Management Plan, prepared by EarthFX Inc., Savanta and Tatham Engineering, dated April 2020, as may be amended from the time to time with approval from MNRF, in consultation with NEC, Region of Halton, City of Burlington and Conservation Halton.

- 1. All equipment shall be removed from the South and West Extension. 2. No internal haul roads shall remain in either Extension.
- 3. The residence and barn at 2280 Side Road No. 2 in the South Extension shall remain.
- 4. The residence and barn located at 2015 Side Road No. 2 in the southwest corner of the West Extension shall remain. 5. A field/property access entrance shall remain to access the residence and barn located at 2280 and 2015 Side Road No. 2.
- 6. The groundwater table post rehabilitation varies between 263.5 masl to 271 masl in the South Extension and 255.5 masl to 265 masl in the West Extension (EarthFX 2020) or ±269 masl if the West Extension is not maintained in a dewatered state.
- 7. The licensee, prior to the surrender of the licence, shall complete a Record of Site Condition for the Extensions in accordance with the Environmental Protection Act.
- 8. Prior to the surrender of the Aggregate Resource Act Licence, the licensee shall define the transition of the site to another party and the pre-requisite for license surrender to the satisfaction of the MNRF.

Table 1: Rehabilitation Plant List Recommendations

Pond/Wetland (PW) Grassland and Existing Trees (GL) Gradual Grade/Side Slope with Trees (GG)

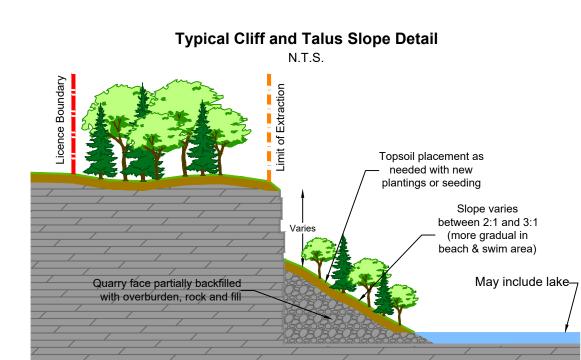
Forested Setback During Operation (FSO) Forested Setback Post Berm (FSB) Restored to Existing Grade and Forested (REG)

Location	LATIN NAME COMMON NAME		COEFFICIENT OF CONSERVATISM	WETNESS INDEX	OWES WETLAND SPECIES	PROVINCIAL STATUS (S- RANK)	LOCAL STATUS HALTON (Varga 2005)
FSB, REG	Sambucus racemosa ssp. pubens	Red Elderberry	5	3		S5	Х
FSB, REG	Cornus alternifolia	Alternate-Leaved Dogwood	6	3		S5	Х
FSB, REG	Cornus racemosa	Grey Dogwood	2	0	Т	S5	Х
PW, FSB, REG	Cornus sericea	Red-Osier Dogwood	2	-3	*	S5	Х
FSB, REG	Ribes cynosbati	Eastern Prickly Gooseberry	4	3		S5	Х
FSB, REG	Prunus virginiana var. virginiana	Chokecherry	2	3		S5	Х
FSB, REG	Rubus allegheniensis	Alleghany Blackberry	2	3		S5	Х
FSB, REG	Rubus occidentalis	Black Raspberry	2	5		S5	Х
PW	Salix discolor	Pussy Willow	3	-3		S5	Х
PW, FSB, REG	Salix eriocephala	Cottony Willow	4	-3	T	S5	Х
PW, FSB, REG	Salix interior	Sandbar Willow	1	-3	T	S5	U
PW	Salix petiolaris	Meadow Willow	3	-3		S5	Х
GG, FSB, REG	Betula alleghaniensis	Yellow Birch	6	0	T	S5	Х
GG, FSO, FSB, REG	Betula papyrifera	Paper Birch	2	3	T	S5	Х
GG, FSB, REG	Carpinus caroliniana ssp. virginiana	Blue-Beech	6	0	T	S5	Х
GL, GG, FSO, FSB, REG	Ostrya virginiana	Eastern Hop-Hornbeam	4	3		S5	Х
GL, GG, FSO, FSB, REG	Fagus grandifolia	American Beech	6	3		S4	Х
GL, GG, FSO, FSB, REG	Quercus macrocarpa	Burr Oak	5	3	T	S5	Х
GL, GG, FSO, FSB, REG	Quercus rubra	Northern Red Oak	6	3		S5	Х
GL, GG, FSB, REG	Carya cordiformis	Bitternut Hickory	6	0		S5	Х
GL, GG, FSO, FSB, REG	Tilia americana	Basswood	4	3		S5	Х
GL, GG, FSO, FSB, REG	Prunus serotina var. serotina	Black Cherry	3	3		S5	Х
GG, FSB, REG	Populus balsamifera	Balsam Poplar	4	-3	Т	S5	Х
GL, GG, FSO, FSB, REG	Populus deltoides ssp. deltoides	Eastern Cottonwood	4	0	T	S5	U
GL, GG, FSO, FSB, REG	Populus tremuloides	Trembling Aspen	2	0	T	S5	Х
PW, GG, FSB, REG	Salix amygdaloides	Peach-Leaved Willow	6	-3	T	S5	U
GL, GG, FSO, FSB, REG	Acer nigrum	Black Maple	7	3		S4?	Х
GG, FSB, REG	Acer saccharinum	Silver Maple	5	-3	ı	S5	Х
GL, GG, FSO, FSB, REG	Acer saccharum	Sugar Maple	4	3		S5	Х
GG, FSB, REG	Thuja occidentalis	Eastern White Cedar	4	-3	T	S5	Х
GG, FSB, REG	Abies balsamea	Balsam Fir	5	-3	T	S5	U
GL, GG, FSO, FSB, REG	Picea glauca	White Spruce	6	3	Т	S5	U
		t				7.50	

Herbaceous seed mixes will be applied where appropriate (e.g. if soil seedbank is deemed unsuitable). Potential mixes could include Upland Dry

Meadow Mix, Early Succession/Riparian Mix, and Meadow Marsh Mix, following Conservation Halton guidelines. A nurse crop will be applied to exposed soil, the species of which will depend on season of application but will follow Conservation Halton guidelines.

Typical Quarry Face Detail Deep water structures consisting of rock/rubble piles will remain on the quarry floor below the water level to provide submerged aquatic habitat Lake Level (masl) 255.5 North Extension 271.0 South Extension Selective blasting will create irregular cliff faces, shelves and ledges (with_ 3m North Extension 18m South Extension pools on exposed vertical faces) at and below the water level





Quarry face backfilled with overburden, rock and fill **Legal Description**

Licence Boundary

Limit of Extraction

—149— Contours with Elevation

Water Feature

Lake / Pond

⊦ Woodlands

Wooded Feature

MNRF - Provincially Significant

Wetland

MNRF - Unevaluated

| Licence # 5499

Significant Woodlands

1.2m post & wire fence unless otherwise noted

120m Offset From

Licence Boundary

Existing Licenced Boundary (solid line)

Existing Limit of Extraction (dashed line)

Diversion or Discharge Pipe

Sun-Canadian Pipe Line

Jefferson Salamander

Regulatory Boundary

Entrance / Exit

Building/Structure

Final Elevation

Cross Sections

Adjust pond adjacent to dwelling in the southwest corner of the West Extension.

ncluded MNRF wetlands for South Extension. Updated notes per MNRF feedback.

113 COLLIER STREET, BARRIE, ON, L4M 1H2 | P: 705.728.0045 F: 705.728.2010 | WWW.MHBCPLAN.CC

NELSON AGGREGATE

Pre-approval review:

April 2021

vings\ARA Site Plans\Extension Site Plan\CAD\9135D - Site Plan - Blacklined

Burlington Quarry Extension

Rehabilitation Plan

3 of 4

626477

Drawing No.

Proposed Final Grade

Discharge Location

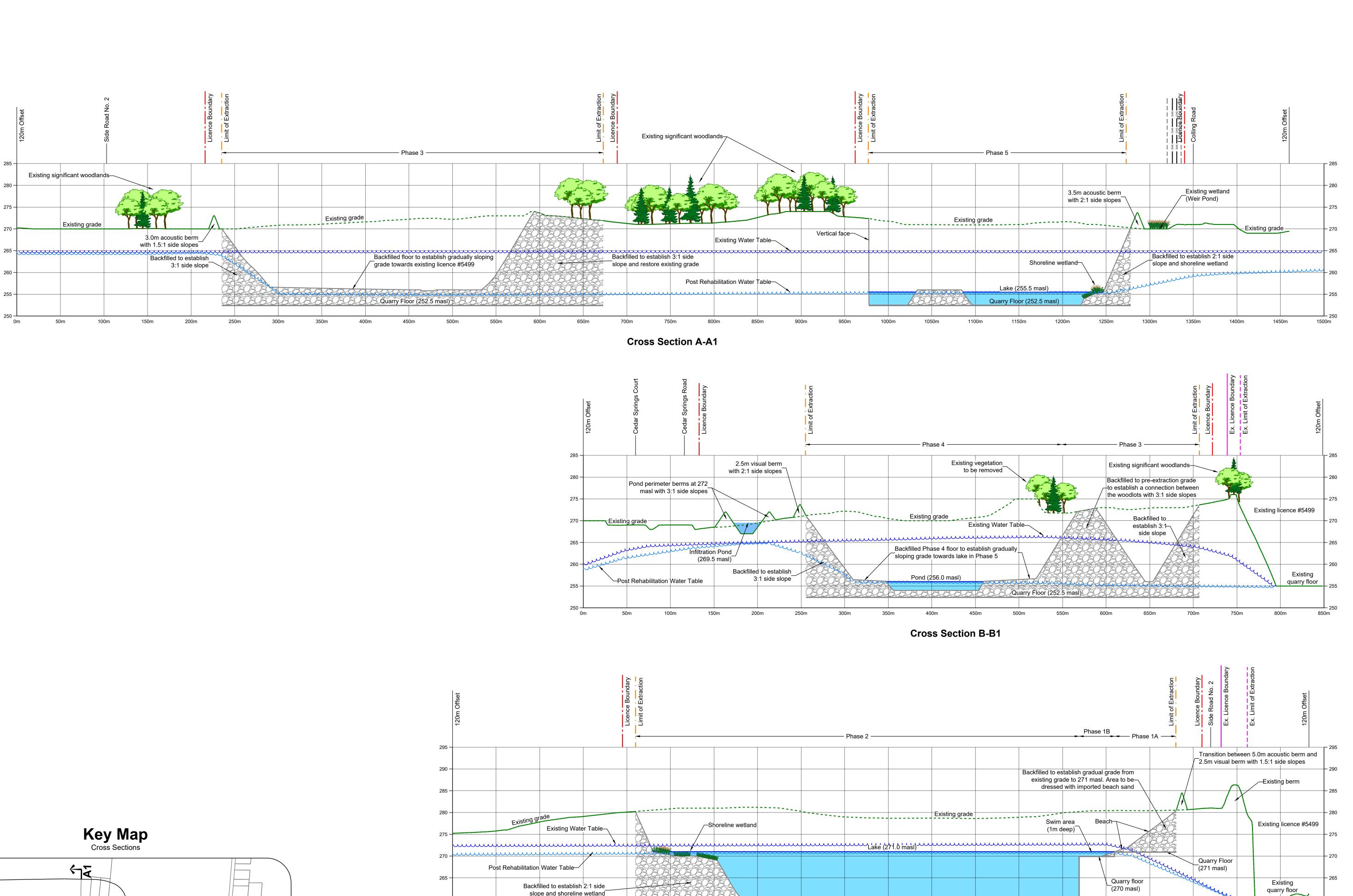
Existing Licence

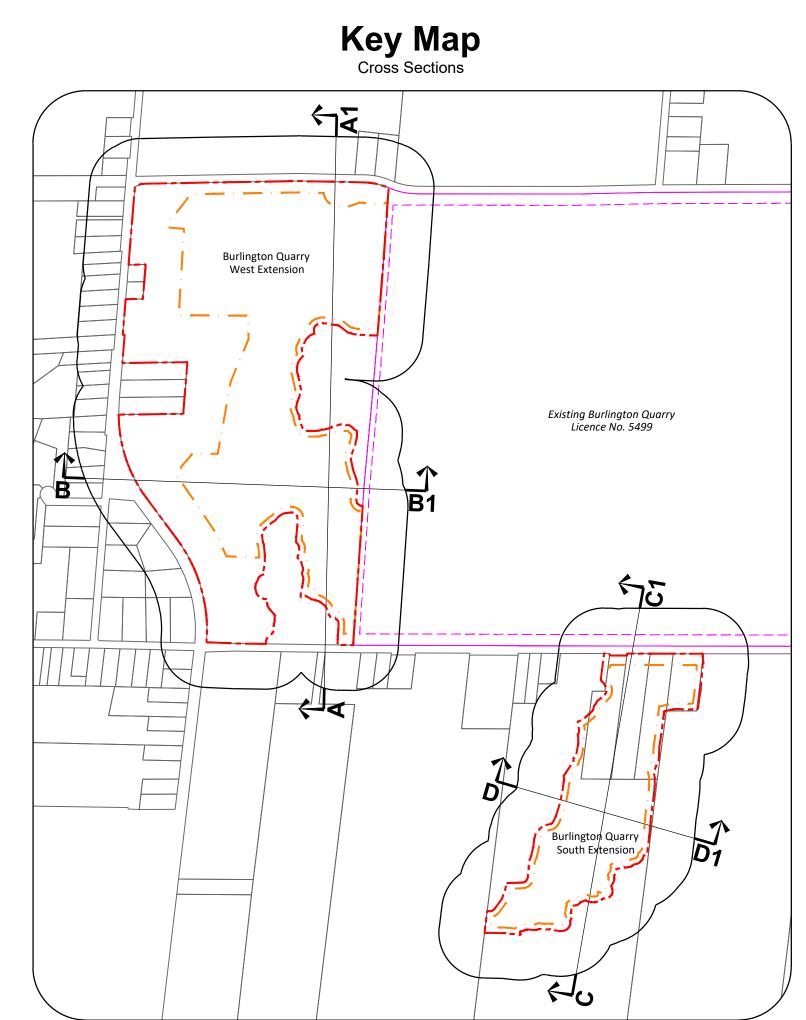
Parcel Fabric

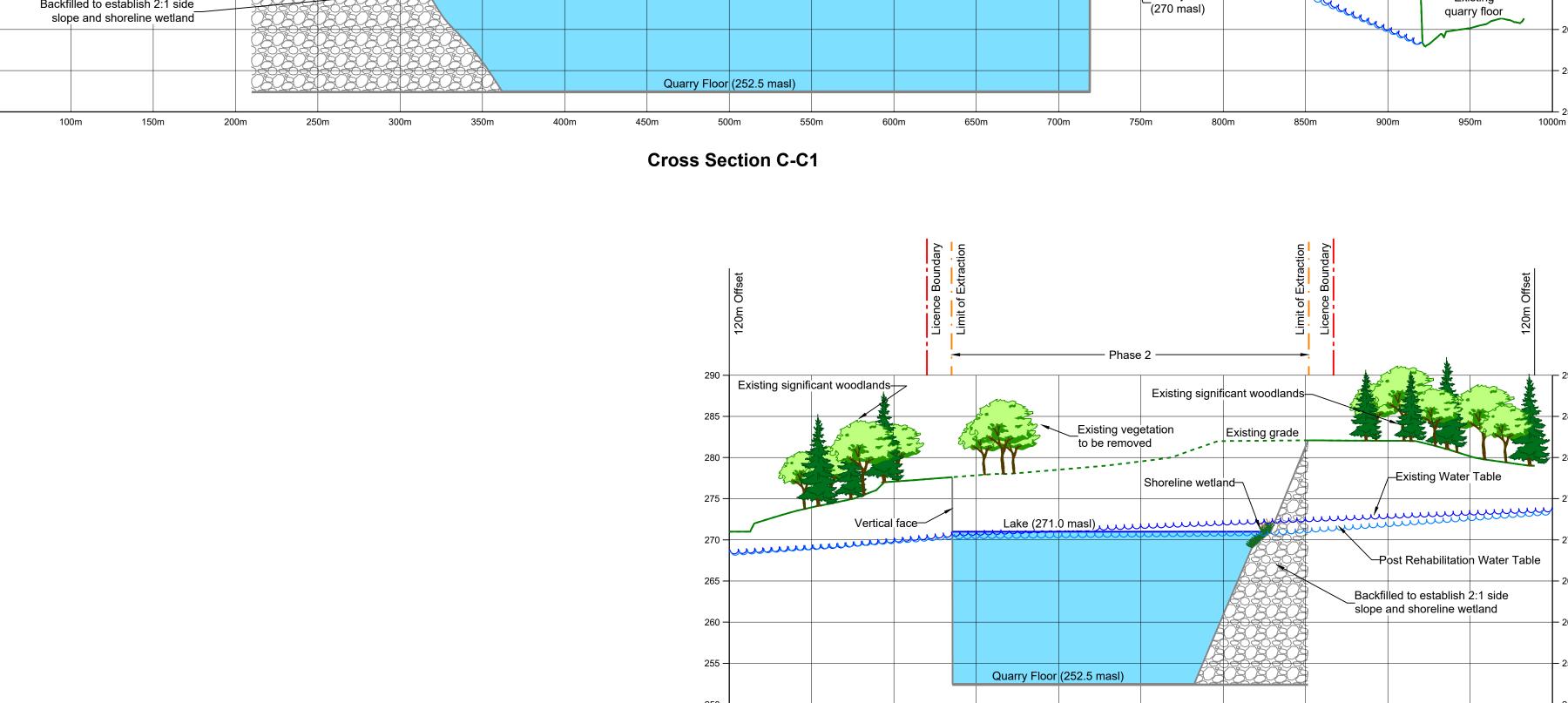
Existing - Single Dash

GAS GAS Pipe line location and easement

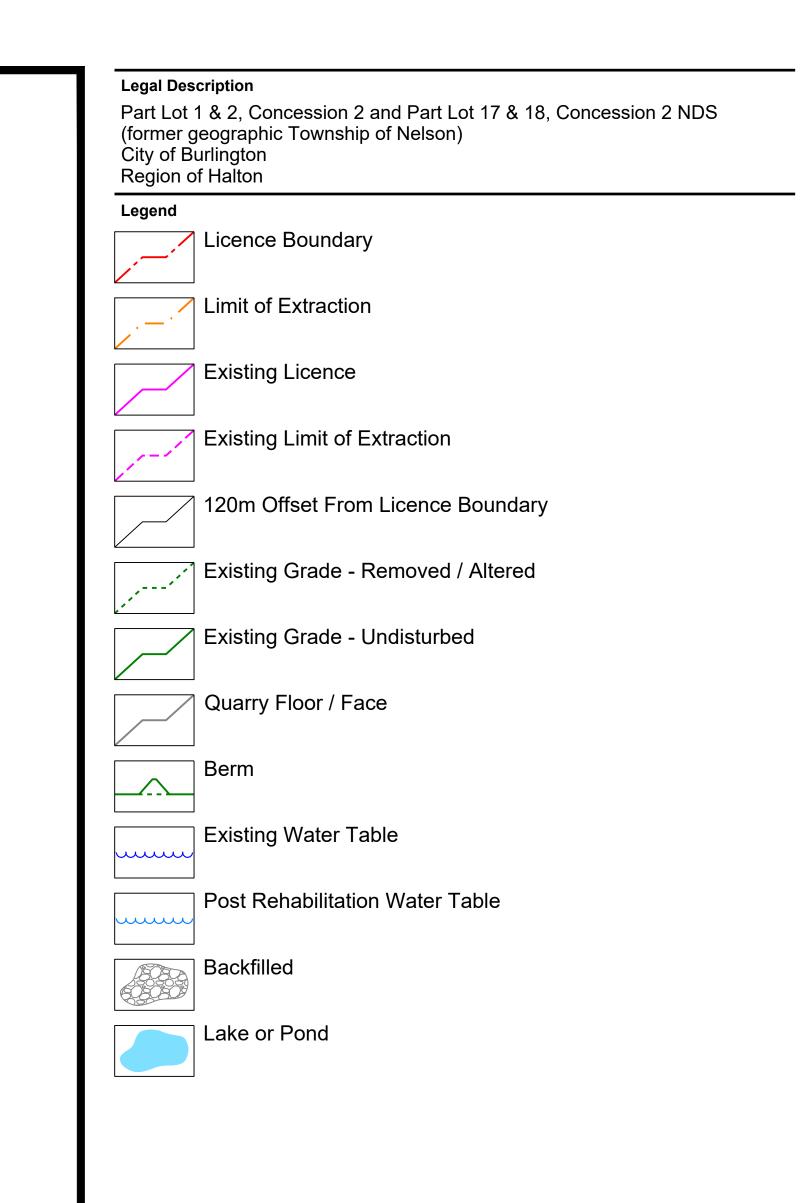
Proposed - Double Dash







Cross Section D-D1







Burlington Quarry Extension

MNRF Licence Reference No.			Pre-approval r	eview:	
	626477				
Plan Scale:			Date		April 2021
	Horizontal	1:2000	Drawn By	C.P.	File No.
	Vertical	1:400	Checked By	B.Z.	9135D
File Name		Cross	Section		1

Drawing No.

4 of 4

Appendix B

Burlington Quarry Extension

PREVAILING METEOROLOGICAL CONDITIONS

Medians provided by Environment Canada Canadian Climate Normals 1981-2010 Hamilton – Municipal Airport

Date	Wind Direction	Wind Velocity Km/h	Temperature (Deg Celsius)
January	SW	19.5	-5.5
February	W	18.6	-4.6
March	W	18.5	-0.1
A 21	NIF	45.0	0.7
April	NE	15.9	6.7
May	NE	14.0	12.8
			1_10
June	SW	14.0	18.3
July	W	12.6	20.9
	0)4/	44.0	00.0
August	SW	11.8	20.0
September	SW	13.1	15.8
·			
October	SW	15.6	9.3
	144	4-4	
November	W	17.4	3.7
December	SW	18.7	-2.3
December	SVV	10.7	- 2.3

Appendix C

Golder Associates Ltd.

2390 Argentia Road Mississauga, Ontario, Canada L5N 5Z7 Telephone 905-567-4444 Fax 905-567-6561



REPORT ON

BLASTING IMPACT ASSESSMENT PROPOSED NELSON AGGREGATE NELSON QUARRY EXTENSION

Submitted to:

Nelson Aggregate Co. P.O. Box 1070 Burlington, Ont. L7R 4L8

DISTRIBUTION:

20 Copies - Nelson Aggregate Co. 2 Copies - Golder Associates Ltd.

April 2006

021-1238





EXECUTIVE SUMMARY

Blasting operations within the proposed extension of the Nelson quarry may be readily carried out in compliance with existing provincial environmental guideline limits with respect to ground and air vibrations. These effects are subject to recommended limits of 12.5 mm/s and 128 dBL respectively, as established by the Ontario Ministry of the Environment and outlined in Noise Pollution Control (NPC) publication 119 of the Model Municipal Noise Control By-Law, for operations where monitoring of these effects is carried out as a matter of routine.

Ground and air vibration attenuation characteristics were monitored and assessed from a number of routine production blasts within the existing Nelson quarry. The results indicate that the majority of the proposed extension may be excavated using the blast parameters currently being used in the existing quarry. These would include reducing the borehole diameter, reducing the bench height and reducing the explosive weight per delay period. The Nelson quarry would continue monitoring all blasts during extraction within the proposed extension area. The blasting operations within the proposed extension would have no impact on the integrity of adjacent water wells.

By ensuring that the ground and air vibration levels produced during blasting operations at the Nelson quarry continue to remain within the recommended provincial guideline limits, there would not be any noticeable cumulative effect on adjacent structures associated with the blasting operations within the proposed extension.

TABLE OF CONTENTS

- ii -

<u>NC</u>							<u>PAGE</u>
UTIVE	SUMN	//ARY					
E OF C	ONTE	NTS					
INTRO	ODUCT	ΓΙΟΝ					1
EXIS	TING C	ONDITION	VS				2
2.1	Site D	escription					2
2.2	Quarry	y Blasting C	Operations.				2
PROF	POSED	EXTRAC	TION OF I	EXTENS	ION AREA	٩	3
IMPA	CT IDE	NTIFICAT	ION				4
QUAF	RRY BL	AST MON	IITORING				5
5.1	Attenu	uation Char	acteristics.				5
	5.1.1	Ground V	ibrations				5
	5.1.2	Air Vibrati	ons				6
IMPA	CT AS	SESSMEN	IT				8
6.1							
6.2	Repea	ated Vibrati	on Effects	on Structu	ıres		8
6.3							
		-					
Blastir	-						1
	vibrat	ion – Peak	Particle Ve	elocity Lim	III		Т
	E OF C INTRO EXIST 2.1 2.2 PROF IMPA QUAF 5.1 IMPA 6.1 6.2 6.3 CONC RENC ICATIO	UTIVE SUMME OF CONTE INTRODUCTEXISTING CONTE INTRODUCTEXISTING CONTE INTRODUCTEXISTING CONTEXISTING CONTEXIS CONTEXISTING	UTIVE SUMMARY E OF CONTENTS INTRODUCTION EXISTING CONDITION 2.1 Site Description 2.2 Quarry Blasting OPROPOSED EXTRACIMPACT IDENTIFICAT QUARRY BLAST MON 5.1 Attenuation Chart 5.1.1 Ground V 5.1.2 Air Vibrati IMPACT ASSESSMEN 6.1 Compliance with 6.2 Repeated Vibrati 6.3 Effects on Bedrod CONCLUSIONS RENCES ICATION NPC-119 Blasting Scope 1 Technical Definition Measurement Prococussion – Caroncussion – Caroncussion – Pervibration – Cautic	UTIVE SUMMARY E OF CONTENTS	UTIVE SUMMARY	UTIVE SUMMARY E OF CONTENTS INTRODUCTION EXISTING CONDITIONS 2.1 Site Description 2.2 Quarry Blasting Operations PROPOSED EXTRACTION OF EXTENSION AREA IMPACT IDENTIFICATION QUARRY BLAST MONITORING 5.1 Attenuation Characteristics 5.1.1 Ground Vibrations 5.1.2 Air Vibrations IMPACT ASSESSMENT 6.1 Compliance with NPC 119 6.2 Repeated Vibration Effects on Structures 6.3 Effects on Bedrock and Water Wells CONCLUSIONS RENCES ICATION NPC-119 Blasting Scope 1 Technical Definitions Measurement Procedures Concussion – Cautionary Limit Concussion – Peak Pressure Level Limit Vibration – Cautionary Limit	UTIVE SUMMARY E OF CONTENTS

LIST OF TABLES

Table 1	Existing Blast Details for Nelson Quarry Company Quarry
Table 2	Maximum Explosive Loads vs Distance for 12.5 mm/s and 128 dBL
Table 3	Strain Levels Induced by Household Activities, Environmental Changes and
	Blasting

LIST OF FIGURES

Figure 1	Key Location Plan Nelson Quarry
Figure 2	Proposed Nelson Quarry Extension Area
Figure 3	Description of Blasting Terms
Figure 4	Proposed Excavation Sequence of Nelson Quarry Extension Area
Figure 5	Nelson Quarry Ground Vibration Attenuation Curve
Figure 6	Nelson Quarry Air Vibration Attenuation Curve

LIST OF APPENDICES

Appendix A Publication NPC 119

Appendix B New Residence Receptor Location

1.0 INTRODUCTION

Golder Associates was retained by Nelson Aggregate Co. to carry out an impact assessment of the environmental effects from future blasting operations within the proposed extension of the existing licensed area of the Nelson Quarry Company quarry. The proposed extension would be located immediately south of No. 2 Sideroad on Part Lots 17 and 18, Concession 2 in the City of Burlington. The impact assessment specifically addresses whether the applicable Ontario Ministry of Environment guidelines with respect to ground and air vibration effects could be met at the residential properties closest to the proposed extension.

The investigation included monitoring a number of regularly scheduled production blasts at various receptor points around the blast site to assess site-specific ground and air vibration decay characteristics.

This report addresses the following topics:

- reviews existing provincial and federal guidelines for the assessment of environmental impacts from blasting,
- provides recommendations for the continued control of ground and air vibration effects,
- evaluates the potential impact of the blasting operations on bedrock strata and adjacent water wells,
- evaluates the long term impact of the blasting operations on surrounding structures.

2.0 EXISTING CONDITIONS

2.1 Site Description

The existing licensed Nelson Quarry Co. quarry (Nelson) is situated immediately north of No. 2 Sideroad and south of Colling Road between Guelph Line and Cedar Springs Road in the City of Burlington, Ontario in the Region of Halton (see Figure 1). The proposed extension area would encompass an area of approximately 82.3 Hectares immediately south of the existing quarry and No. 2 Sideroad, as seen in Figure 2.

As shown in Figures 2 and 4, the closest residential properties to the proposed extension consist of those residences to the east and west on the south side of No. 2 Sideroad. Compared to the existing quarry location, the proposed extension is relatively remote from the existing neighbouring properties. The closest residential receptors have been identified as the residences along No. 2 Sideroad (see Appendix B). The topography of the area generally consists of gently rolling hills.

2.2 Quarry Blasting Operations

The Nelson quarry currently operates a single bench which varies in height from approximately 19 to 26 m. Typical blast design details for the existing quarry are given in Table 1 while common quarry blasting terms and procedures are illustrated in Figure 3.

All blasting at the Nelson quarry is monitored for ground and air vibration effects. Monitoring is routinely being carried out at three locations along the south side of No. 2 Sideroad and occasionally within Mount Nemo Court, east of Guelph Line.

Blasting procedures within the proposed extension would be carried out in a manner similar to those currently being carried out for the existing Nelson quarry, as shown in Table 1.

3.0 PROPOSED EXTRACTION OF EXTENSION AREA

The proposed sequence of extraction for the extension is illustrated in Figure 4. Extraction within the proposed extension area would commence with the crossing of No. 2 Sideroad west of the existing office. Extraction of Phase 1 would see an approximately 100 m wide working face advanced in a westerly direction along the north side of the proposed extension, as shown in Figure 4. Phases 2 and 3 would see the entire west side of the extension extracted in a southerly direction before proceeding east along the south boundary.

Extraction of Phase 4 would be carried out in a northerly direction which would complete extraction of the west half of the proposed extension. Phases 5a and 5b would be carried out in an easterly direction in the southeast corner of the extension while the remainder of the property would be extracted as Phase 6 in a northerly direction, as seen in Figure 4.

4.0 IMPACT IDENTIFICATION

The environmental effects most often associated with blasting operations are ground vibrations and air concussion.

The intensity of ground vibrations, which is an elastic effect measured in units of peak particle velocity, is defined as the speed of excitation of particles within the ground resulting from vibratory motion. For the purposes of this report, peak particle velocity is measured in mm/s.

While ground vibration is an elastic effect, one must also consider the plastic or non-elastic effect produced locally by each detonation when assessing the effects on the bedrock strata and local water wells. The detonation of an explosive produces a very rapid and dramatic increase in volume due to the conversion of the explosive from a solid to a gaseous state. When this occurs within the confines of a borehole it has the following effect:

- The bedrock in the area immediately adjacent to the explosive product is crushed.
- As the energy from the detonation radiates outward from the borehole, the bedrock between the borehole and quarried face becomes fragmented and is displaced while the bedrock behind the borehole is fractured.
- Energy not used in the fracturing and displacement of the bedrock dissipates in the form
 of ground vibrations, sound and airblast. This energy attenuates rapidly from the blast
 site due to geometric spreading and natural damping.

Air concussion, or air vibrations, is a pressure wave traveling through the air produced by the direct action of the explosive on air or the indirect action of a confining material subjected to explosive loading. Air vibrations from surface blasting operations consist primarily of acoustic energy below 20 Hz, where human hearing is less acute (Siskind et al., 1980), while noise is that portion of the spectrum of the air vibration lying within the audible range from 20 to 2000 Hz. It is the lower frequency component (below 20 Hz) of air concussion, that which is less audible, that is of interest as it is often the source of secondary rattling and shaking within a structure. For the purposes of this report, air vibration is measured as decibels in the Linear or Unweighted mode (dBL). This differs from noise (above 20 Hz) which is measured in dBA.

Both ground and air vibration effects produced at private structures adjacent to surface or underground mining operations are subject to guidelines contained in Noise Pollution Control (NPC) publication 119 of the Model Municipal Noise Control By-Law, dated August, 1978, published by the Ontario Ministry of Environment. Under conditions where monitoring of the blasting operations is routinely carried out, as it is at the Nelson Quarry, the recommended ground and air vibration limitations at the nearest private structure would be 12.5 mm/s and 128 dBL respectively. A copy of Publication NPC 119 is reproduced in Appendix A.

As part of this study, peak ground and air vibration levels were monitored during several typical quarry production blasts in the existing quarry at progressively increasing distances from the blast site. The blasts occurred both on the south and east faces of the quarry. Instrumentation consisted of Instantel DS-077 Minimates, Minimate Pluses and DS-477 Blastmates. These instruments measure and record ground vibration velocities in each of three orthogonal directions, as well as simultaneously recording air vibration levels. Instrumentation was generally set up in a line at distances ranging from about 100 to 600 m from the blast site. Specific instrument and blast locations were established using a Garmin GPS electronic navigation aid (NAVAID) to determine accurate distances between the blast and receptors.

5.1 Attenuation Characteristics

The rate at which ground vibrations attenuate or decrease with increased distance from a blast source depends on a variety of conditions, including the type and condition of the bedrock being blasted, depth and composition of the earth covering deposits (soil), and the general topography. Air vibration effects are less affected by these factors, being more influenced by the prevailing weather conditions at the time of the blast.

The following relationships were established from the blast monitoring results.

5.1.1 Ground Vibrations

The ground vibration attenuation characteristics established for the Nelson Quarry is presented in Figure 5 as a plot of the peak particle velocity against the Scaled Distance. Scaled Distance is defined as:

Scaled Distance (SD) = D/\sqrt{W}

where D = distance (m) between the blast and receptor

W = maximum weight of explosive (kg) detonated per delay period

As seen in Figure 5 the collection of points defining the rate of decay for the ground vibrations exhibits a degree of scatter that is inherent in all Scaled Distance plots. Factors responsible for these variations include the geologic conditions of the bedrock (type and structure), different wave types, errors in blast initiation timing, differences between types of explosives, degree of confinement, and differences in blast efficiencies.

The equation for the 95% regression line developed in Figure 5 can be expressed as:

```
PPV = 896(SD)^{-1.32}

where PPV = Peak Particle Velocity (mm/s)

SD = Scaled Distance (m/(kg^{0.5}))
```

The calculated Scaled Distance for a peak ground vibration level of 12.5 mm/s would equal 25.5 m/(kg^{0.5}). The purpose of this equation is not so much to predict what a given vibration level would be at a particular location for a given blast, but to indicate the probability that the peak vibration would fall below the level indicated by the equation for a given distance and maximum explosive weight. The equation is therefore a useful blast design tool in establishing maximum explosive charge weights per delay for various distances from a blast site for a given maximum ground vibration level.

5.1.2 Air Vibrations

Cube root scaling was used in establishing the air vibration decay characteristics as given in the following relationship:

Scaled Distance (SD) = $D/\sqrt[3]{W}$, where D and W are defined as previously described.

Figure 6 shows the Scaled Distance air vibration plot, which exhibits considerably more scatter and has a typically poorer correlation than that seen with the ground vibration results. This is primarily due to variable weather conditions during each blast, which are entirely independent of the blasting operations. Other factors influencing air vibration distribution from a blast include the length of collar and type of stemming material used, differences in explosive types and variations in burden distance.

The 95% regression curve given in Figure 6 can be expressed as:

```
APL = 181(SD)^{-0.0867}
where SD = as defined above
APL = air pressure level (dBL)
```

The calculated Scaled Distance for a peak air vibration level of 128 dBL would equal 53.0 $m/(kg^{0.33})$. The variability in the plot suggests that it is less reliable as a tool for guiding blast design.

Site specific Scaled Distance plots are commonly used as a blast design tool since peak vibration levels can be reasonably predicted at specified distances from a blast site. Based on the 95%

regression equations given in Figures 5 and 6, Table 2 shows the maximum suggested explosive loads for various distances from the blast site based on the provincial guideline limits of 12.5 mm/s and 128 dBL discussed previously. It can be seen that the ground vibration limit of 12.5 mm/s becomes the more restrictive guideline when determining maximum explosive loads beyond a distance of about 225 m for the quarry's blasting operations.

6.0 IMPACT ASSESSMENT

6.1 Compliance with NPC 119

It is evident from the regression equations discussed in Section 5 that the distance between the blast and the receptor and the amount of explosive detonated per delay period are the principal parameters in controlling ground and air vibration effects. The maximum explosive loads given in Table 2 for limiting peak ground and air vibration levels to 12.5 mm/s and 128 dBL respectively, indicate that the provincial guidelines may be complied with for all blasting beyond a distance of about 200 m from adjacent private residential properties. This represents a majority of the proposed extension and is based on a maximum explosive weight per delay of about 60 kg. When blasting approaches to within about 200 m of adjacent private residences, it may become necessary to reduce the maximum explosive weight detonated per delay period within the blast. Any one or combination of the following operations would achieve this:

- 1. Reducing the borehole diameter with a corresponding reduction in the drill pattern.
- 2. Introduce additional decked charges within each borehole, as illustrated on Figure 3.
- 3. Reduce the borehole length (depth) by reducing the bench height.

For example, a reduction in the borehole diameter from 127 mm to 76 mm would effectively reduce the explosive column weight per hole by about 65%. Decking the explosive column could further reduce the explosive column weight by an additional 50%. Additional decking and reductions in bench heights, as identified above, could achieve further reductions in maximum explosive weights.

As it is the intention of the Nelson quarry to continue monitoring all blasting operations, the attenuation curves discussed previously would be used in conjunction with the monitoring data collected at adjacent properties to dictate when changes to the blast procedure become necessary within the proposed extension. Although a reduction in the maximum instantaneous explosive load is anticipated as blasting approaches the residences to the east and west, the ground and air vibration guideline limits contained within NPC 119 would continue to be maintained.

6.2 Repeated Vibration Effects on Structures

Blast vibrations characteristically produce temporary transient strains within the various materials that makeup a residential structure. These strains would typically have durations of no more than one or two seconds for each blast as the vibration passed the structure. In additional to these temporary strains, Table 3 shows the strain levels produced in a household by changes in temperature and humidity (environmental changes), as well as those produced by regular household activities (Dowding, 1985), which occur on a recurring and often frequent basis. These strain levels are compared to equivalent levels of ground vibration produced from blasting

operations. It is evident from Table 3 that routine household activities and environmental changes can at times produce strains within a structure that are well in excess of those produced by blasting.

Several studies have also been carried out to look at the long-term effects of repeated blasting on structures (Stagg et al, 1984, Siskind et al, 1980). These studies concluded that repeated blasting over several decades, producing peak vibration levels well in excess of the provincial guideline limit, were required to cause cosmetic threshold cracking to occur. By ensuring that blasting continues to remain within the provincial guideline limits, there would not be any noticeable cumulative effect associated with the blasting operations within the extension area.

6.3 Effects on Bedrock and Water Wells

As discussed previously, under typical blasting conditions stresses introduced into the bedrock by the explosive detonation and the accompanying gas pressures create and extend fractures within the bedrock around each borehole. Fracture development is usually limited to the equivalent distance of about 20 times the borehole diameter. In the case of the blast procedures expected for the proposed extension, this would equate to about two to three metres for a 114 mm diameter hole. The gas pressures within the hole may extend micro-cracks or existing natural discontinuities within the bedrock, such as joints or bedding planes, beyond this distance.

Studies on crack development within bedrock from blast detonations (Keil et al., 1977) indicate that peak ground vibration levels of 300 to 600 mm/s are required to create micro-cracks or open existing discontinuities. Our own experience within the limestone of Southern Ontario indicates that such values would not be anticipated beyond a distance of about 10 to 20 m from the blast site, depending on such parameters as drill hole diameter and the type of explosive product. It is evident therefore that the creation or extension of fractures within the bedrock would remain confined to an area immediately around the blast site.

Several studies have been carried out to investigate the effects of blasting on ground water wells (Froedge, 1983). These studies have concluded that:

- When blast induced ground vibrations are less than about 25 mm/s maximum resultant particle velocity, the response of the well is limited to a slight temporary variation in water level on the order of 3 to 6 cm either up or down. The specific capacity of the water well is unchanged based on drawdown tests.
- Vibration measurements made at the surface and at the bottom of the observation wells indicate the vibration levels are always lower at the bottom of the well.
- 3. All of the data collected indicates that a ground vibration limit of 50 mm/s peak particle velocity is adequate to protect the wells from any significant damage. There is a possibility that temporary turbidity may be caused at lower levels periodically, although not at any constant threshold level.

The research consistently indicates that blast vibrations below 25 mm/s should have no adverse effects on nearby wells. As the maximum provincial guideline vibration limitation at the nearest residence is only half of this value, at 12.5 mm/s, the ground vibrations produced from the quarry's blasting operations within the proposed extension area would have no effect on the integrity of neighbouring water wells.

7.0 CONCLUSIONS

Based on the foregoing considerations, it is our opinion that blasting operations may be readily performed within the limits of the proposed extension of Nelson Quarry Company quarry in compliance with the current quarry blasting guidelines published by the Ministry of Environment. All blasting and blast monitoring would occur in accordance with the Aggregate Resources Act prescribed conditions in order to ensure compliance with the provincial guidelines.

GOLDER ASSOCIATES LTD.

Marcus V/van Bers, P. Eng.

Associate

MVVB/AC/ms/co

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REFERENCES

Dowding, C. H., Blast Vibration Monitoring and Control, 1985.

Froedge, D. T., *Blasting Effects on Water Wells*, Proc. Ninth Conf. on Explosives and Blasting Technique, Int. Soc. of Explosives Engineers, 1983.

Keil, L. D., Burgess, A. S., Nielson, N. M., Koropatrick, A., *Blast Vibration Monitoring of Rock Excavation*, Canadian Geotechnical Journal, Volume 14, 1977.

Ministry of Environment, Model Municipal Noise Control By-Law, Final Report, August, 1978.

Siskind, D. E., Stagg, M. S., Kopp, J. W., Dowding, C. H., Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting, U.S.B.M. Report RI8507, 1980.

Stagg, M. S., Siskind, D. E., Stevens, M. G., Dowding, C. H., *Effects of Repeated Blasting on a Wood-Frame House*, U.S.B.M. Report RI8896, 1984.

TABLES

TABLE 1

Existing Blast Details for Nelson Quarry Company

PARAMETER	NELSON QUARRY	
Bench (face) height (m)	19 - 26	
Drill hole pattern (m)	2.4 x 2.4 – 4.3 x 4.3	
Drill hole diameter (mm)	76 – 114	
Sub-drill depth (m)	0.6	
Collar length (m)	1.7 – 3.0	
Holes per blast	7 – 40	
Explosive product(s) used	Emulsion/ANFO blend	
Initiation system	Electric, Electronic	
Delay timing (ms)	25ms (electric), 13ms (electronic)	
Maximum explosive weight per delay period (kg)	30 – 279	

Note: See Figure 3 for a description of blasting terms.

TABLE 2

Maximum Explosive Loads vs Distance for 12.5 mm/s and 128 dBL

Distance (m)	PPV = 12.5 mm/s $SD = 25.5 \text{ kg/m}^{0.5}$	INL = 128 dBL SD = 53.0 kg/m $^{0.33}$	
100	15	7	
150	35	23	
200	61	54	
250	96	105	
300	138	181	
400	246	429	
500	384	838	
600	553	1449	

Note: See Section 5 of accompanying report.

TABLE 3

Strain Levels Induced by Household Activities, Environmental Changes and Blasting

Loading Phenomena	Site ^a	Microstrain Induced by Phenomena (µin.in.)	Corresponding Blast Vibration Level ^b (mm/s)
Daily environmental	K_1	149	30.0
changes	K ₂	385	76.0
Household activities:			
1. Walking	S_2	9.1	0.8
2. Heel drops	S_2	16.0	0.8
3. Jumping	S_2	37.3	7.1
4. Door slams	S_1	48.8	12.7
5. Pounding nails	S_{12}	88.7	22.4

 $^{^{}a}\,K_{1}$ and K_{2} were placed across a taped joint between two sheets of gypsum wallboard.

Source: Dowding (1985)

_bBlast equivalent based on envelope line of strain vs ground vibration.

FIGURES

KEY LOCATION PLAN NELSON QUARRY

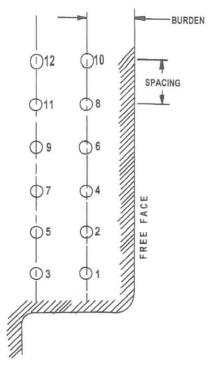
FIGURE '

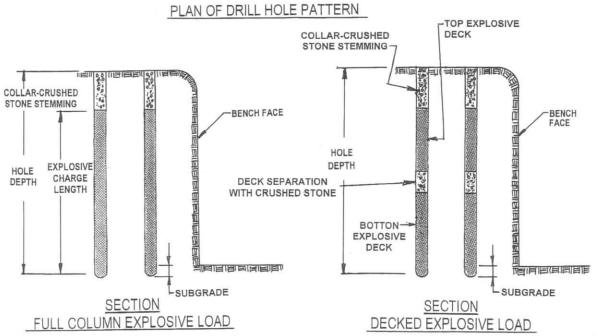


DESCRIPTION OF BLASTING TERMS

FIGURE 3

NUMBERS SHOW SHORT PERIOD DELAY	EXAMPLE OF FIRING TIMES (MILLISECONDS)
PERIOD 1	25
PERIOD 2	50
PERIOD 3	75
PERIOD 4	100
PERIOD 5	125



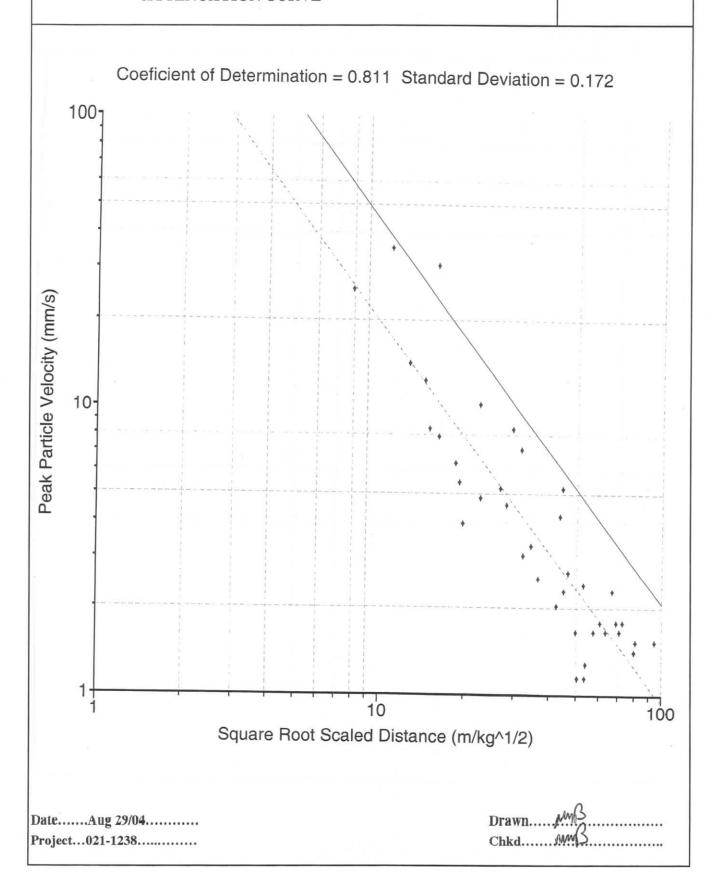


te: SEPTEMBER 2004

Project: 021-1238

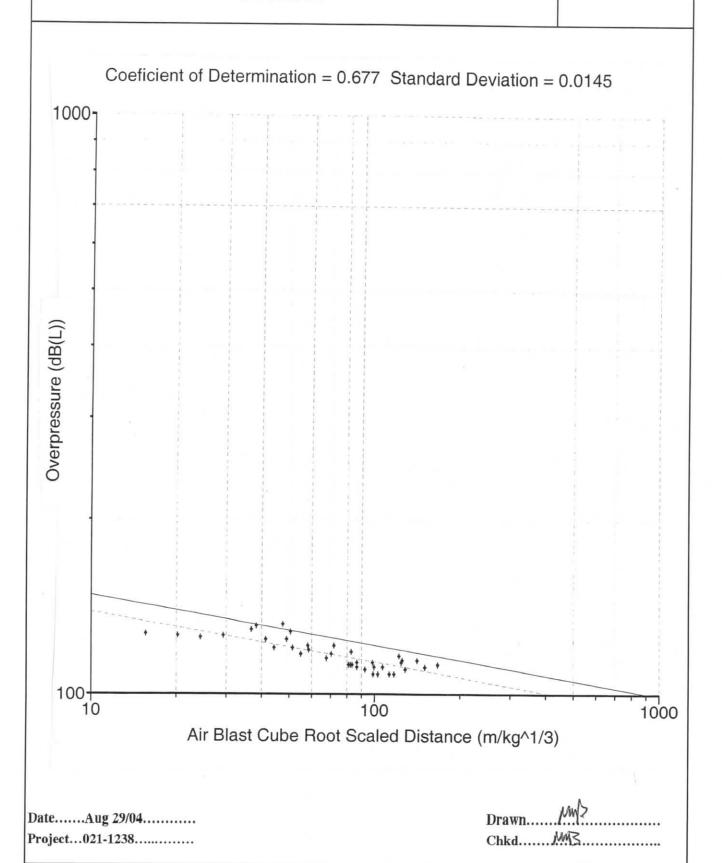
Golder Associates

Drawn: RJ



NELSON QUARRY AIR VIBRATION ATTENUATION CURVE

FIGURE



APPENDIX A
PUBLICATION NPC 119

PUBLICATION NPC-119

Blasting

Scope

This Publication refers to limits on sound (concussion) and vibration due to blasting operations.

Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 – Technical Definitions.

Measurement Procedures

All measurements of peak pressure level and vibration velocity shall be made in accordance with the "Procedure for Measurement of Sound and Vibration due to Blasting Operations" set out in Publication NPC-103 – Procedures, section 5.

Concussion - Cautionary Limit

Subject to section 5 the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 120 dB.

Concussion – Peak Pressure Level Limit

If the person in charge of a blasting operation carries out routine monitoring of the peak pressure level, the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 128 dB.

Vibration – Cautionary Limit

Subject to section 7, the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.00 cm/s.

Vibration – Peak Particle Velocity Limit

If the person in charge of a blasting operation carries out routine monitoring of the vibration the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.25 cm/s.

APPENDIX B NEW RESIDENCE RECEPTOR LOCATION

Golder Associates Ltd.

2390 Argentia Road Mississauga, Ontario, Canada L5N 5Z7 Telephone 905-567-4444 Fax 905-567-6561



December 13, 2004

021-1238

Nelson Aggregate Co. P.O. Box 1070 Burlington, Ontario L7R 4L8

Attention: Mr. Tom Palko

Property Manager

RE: BLASTING IMPACT ASSESSMENT PROPOSED NELSON AGGREGATE NELSON QUARRY EXTENSION NEW RESIDENCE RECEPTOR LOCATION

Dear Mr. Palko:

Further to our report entitled "Blasting Impact Assessment Proposed Nelson Aggregate Nelson Quarry Extension" dated September, 2004, it is our understanding that the closest residential receptor to the proposed Nelson Aggregate Nelson quarry extension has now been identified as the residence at 2416 No. 2 Sideroad, located in the northeast corner of the proposed extraction area. The residence and ancillary buildings at 2416 No. 2 Sideroad are located a minimum of 290 m from the Phase 1 extraction area and 370 m from the Phase 5B extraction area.

As stated in Section 6.0 Impact Assessment of the report identified above, the recommended Ontario provincial ground and air vibration guideline limits of 12.5 mm/s and 128 dBL respectively, may be complied with for all blasting beyond a distance of about 200 m. This indicates that the extraction of Phases 1 through 5B and part of Phase 6 may be carried out without any changes to the quarry's existing blasting procedures.





It is our opinion that blasting operations may be carried out within the proposed extension area in compliance with the current quarry blasting guidelines while the residence at 2416 No. 2 Sideroad is occupied. If you have any additional questions please do not hesitate to contact me.

Yours truly,

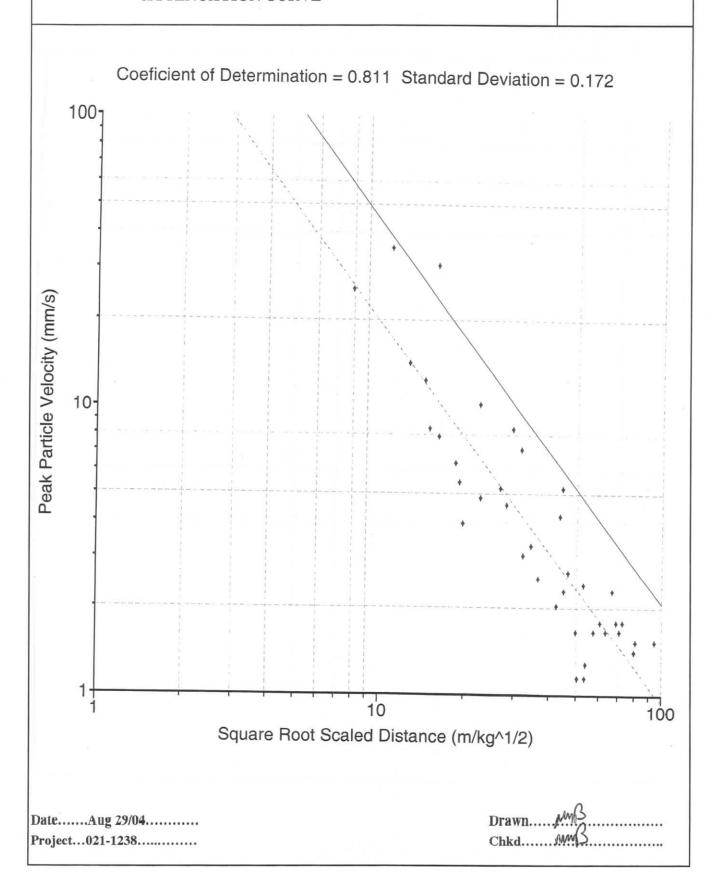
GOLDER ASSOCIATES LTD.

Marcus V. van Bers, P. Eng.
Associate

MVB/co

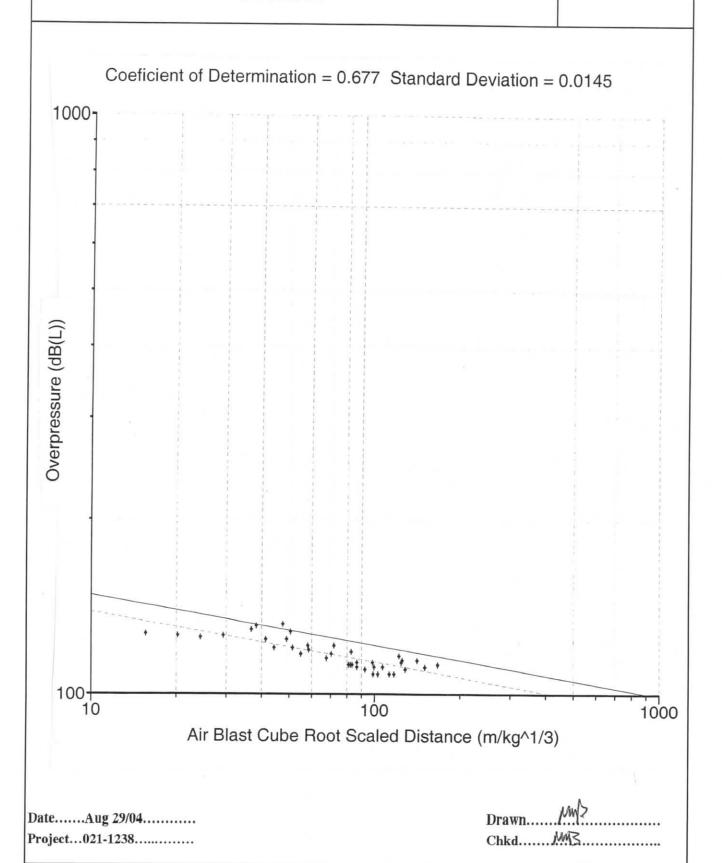
cc: Mr. Brian Zeman, MHBC Planning

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NELSON QUARRY AIR VIBRATION ATTENUATION CURVE

FIGURE





SEISMIC REPORT

Date: APRIZ 11/17 Time: 11',56AM Shot# 01-17
Weather: 20°C Terrain: UNEVEN Wind From: SW Wind Velocity: 20KPH
Location of Blast: BULDGE, 1251DE RD.
Seismic Setup By: B. WHITE, NELSON Max. Kg/Delay: 92.15
Detonator System: Electric Non-Electric Electronic
Toe Load Product: CENTRA GOLD Column Load Product: CENTRA GOLIS
Hole Diain. Pattern: Spacing// ft. x Burden// ft.
of Decks # of Rows # of Holes
Time Between: Decks 13 ms., Holes 26 ms., Rows 136 ms.
Subdrill
Max. Vibration = 12.5 mm/sec, Max Airblast = 128.0 dbl
Monitor 1
Location: 2450 #251DE RID.
Vibration: 2.55 mm/s Airblast: 111,5 dbl.
Monitor 2
Location: COLLING RID, BLIND LINE INTERSECTION, NELSON PROPERTY
Vibration: N/R mm/s Airblast: N/R dbl.
Monitor 3
Location: SOUTH WEST CORNER, CAMISLE
Vibration: 15,6 mm/s Airblast: 113,1 dbl.
Monitor 4
Location: NOT USED
Vibration:mm/s Airblast:dbl.

Prepared by:

m. Polson.



SEISMIC REPORT

Date: APAIL 18/17 Time: 11:53 AM Shot# 02-17
Weather: CLEAR 10° Terrain: FLAT , Wind From: EAST Wind Velocity: 15H PH
ocation of Blast: HIGH WALL OLD SUB STATION
Seismic Setup By: B. WHITE, NELSON Max. Kg/Delay: 222.95
Detonator System: Electric Non-Electric Electronic
Toe Load Product: CENTRA GOLD Column Load Product: CENTRA GOLD
Hole Dia. H In. Pattern: Spacing 105 ft. x Burden 115-ft.
f of Decks / # of Rows 3 # of Holes 27
Fime Between: Decks ms., Holes ms., Rows ms.
Subdrill 2 ft. Ave. Water 72,82 ft Ave. Hole Depth 80,5 ft Total Tons 21384
Max. Vibration = 12.5 mm/sec, Max Airblast = 128.0 dbl
Monitor 1
ocation: NOT USEID
/ibration:mm/s Airblast:dbl
Monitor 2
ocation: SOUTH WEST CORNER, CAMISLE
/ibration: 6,176 mm/s Airblast: 124,1 dbl.
Monitor 3
ocation: 2450 2 SIDE ROAD
/ibration: 3.66 mm/s Airblast: 125.0 dbl.
Monitor 4
ocation: NOT USED
/ibration:mm/s Airblast:dbl.

m. Pobo.

Prepared by:



SEISMIC REPORT

Date: APRIL 21/17 Time: 11,53 Am Shot# 03-17
Weather: RAIN, 10° Terrain: FLAT Wind From: WEST Wind Velocity: ZZKPH
Location of Blast: LOW BENCH
Seismic Setup By: B. WHITE, WELSON Max. Kg/Delay: 173.13
Detonator System: Electric Non-Electric Electronic
Toe Load Product: CENTRA GOLD Column Load Product: CENTRA GOLD
Hole Dia. Jeus in. Pattern: Spacing 105 ft. x Burden 112 ft.
of Decks / # of Rows 3 # of Holes 60, 19 M8 Time Between: Decks 6 ms., Holes 13 ms., Rows ms. Row 2 ? 3 91 ms
Time Between: Decks ems., Holes 13 ms., Rows ms. Row 213 91ms
Subdrillft. Ave. Water 39,38 ft Ave. Hole Depth 44,76 ft Total Tons
Max. Vibration = 12.5 mm/sec, Max Airblast = 128.0 dbl
Monitor 1
Location: COLLING RID BLINDLINE INTERSECTION, NELSON PROPERTY
Vibration N/R mm/s Airblast: N/R dbl.
Monitor 2
Location: 2450 2 SIDE ROAIZ
Vibration: 3.5% mm/s Airblast: 722.9 dbl
Monitor 3
Location: SGUTH WEST CORNER, CAMISSE
Vibration: 1,02 mm/s Airblast: 1/6,7 dbl.
Monitor 4
Location: NOT USED
Vibration:mm/s Airblast:dbl.

M. Salson

Prepared by:

•	Ou stance in	N-1		0.10.40.41	Diviliantes	Diget Number	17.004
	Customer:	Nelson		Quarry:		Blast Number: Orica Order #:	17-004
ORICA Tre Blasters	Blas [.]	t Report		P.O. #: Blast Date:		Blast Time:	2179557 11:51 AM
A							
ige 1 laster	-in-charge: Ke	vin Topllis			(Phini Name)	tonnes Blasted:	17,585 te 6,763 m
					L	Total tonnes per day:	
		uth Wall			(Bench / Face)	Total Holes Loaded:	32 holes
GPS C			N Latitude	79.88487	W Longitude	including:	Dead Holes
	Ce	ntre of Blast		Centre of Blast		and:	Helper Holes
1411 14	. Final	uele i		-	C to 10 00	Helper Hole Collar:	ft avg
Wind fror	n the: E at	15 kph		I emperature:	6 to 10 ℃	# Rows Blasted:	3 rows (Front Row)-
01		D		×		Burden:	10.5 ft avg
Clear:		Rain:	Overcast:	0.5	On as I was an	Spacing:	10.5 ft avg
artly Cloudy:		Snow:	Inversion:	Cei	ling: 185 m	# Holes:	10 front row
- Drilling In	formation -					1 1,0,00.1	To press, rou
3		from Vertical		Nom	inal Bit Diameter:	Burden:	10.5 ft avg
Primary Bit	dlam: 101.6 mm	0 #⊦	loles: 32	= 2,230.4	ft (4 " diam)	Spacing:	10.5 ft avg
econdary Bit		0 # ⊢	loles:	= 0.0	ft (" diam)	# Holes:	22
Tertiary Bit	diam: mm	* #H	loles:	= 0.0	ft (" diam)	Bench Height:	67.7 ft avg
					1	Sub-drill:	2.0 ft avg
Bulk Explo	osives:	in (kg)	out (kg)	kg		Hole Depth:	2.0 ft avg 69.7 ft avg Decking 4.0 ft avg 4.0 ft avg 31 per blast Stemming 7.0 ft avg 7.0 ft avg 75 clear e Length 58.7 ft avg 58.7 ft avg
CENTRA GOL	.D 70	27,020	20,900	6,120		- Stone	Decking -
						Front Row:	4.0 ft avg
Packaged	Explosives:	cs shipped	cs returned	kg		Main Body:	4.0 ft avg
						# Stone Decks:	31 per blast
						2	Stemming -
						Front Row:	7.0 ft avg
Boosters:		kg/i	unit # used	kg		Main Body:	7.0 ft avg
PENTEX 12 (C	R EQUIVALENT)		0.34 95	32.3		Material used:	75 clear
					A.	(1)	e Length -
		-1	DI==1 ((+=)	6,152		Front Row:	58.7 ft avg 58.7 ft avg
	•	sives weight ir Prod (0 kg) %		0.0%			e Weight -
Detonator	-	case #'s	ms	# used		Front Row:	171.2 kg/hole
UNITRONIC 6		Case # 5	1113	# useu		Main Body:	171.2 kg/hole
UNITRONIC 6	_			63		Max. per delay:	128.0 kg/delay
DIVITADING 0	OU JOHN					SD () Equation:	622.8 kg/delay
						Total kg Loaded:	6,152 kg
						Rock Density:	2.60 g/cc = te/m ³
	cessories:		U of M	# used	3		er Factor -
HARNES	S WIRE DUPLEX (6	PACK) 400M	units	1	1.533 lb/yd ³	Yield PF:	0.350 kg/te (actual)
	SPIDER STEMMI	NG PLUG 8"	units	25	1.365 lb/yd ³	Front row:	
	A least section in		unils		1.365 lb/yd ³ 0.000 lb/yd ³	Main Body:	0.311 kg/te (theoretical
Resource Da						"KPI" PF:	0.000 kg/te (theoretical
	ay (this Quarry)			1			S, Expl or IS from previous Blas
# of Blasters (I				1	There is no video for th		ado for the tone. At was a star
of Helpers (t			-	1		ie pottorn and then adjusted to	ads for the tops. A1 was only I
# of MMU's (th	is blast)			1	to 50ft	1 blaster and 2 beloor	
Services:		line Item /Lic	lu Dolo)	1	16 hours split between	i biasiei and z neiper	
GPS LAYOUT		Line Item (Hour		-			
BULK TRUCK		>/=5,000kg	<10,000kg	1			
SHOT SERVIC		Line Item (Fee		1			
SEISMOGRAF		Line Item (Fee		-			
3D LASER PR		Enter "1" if 3D i					
BORETRACK	PGE (anter HOURS)	Enter "1" if Bor		16.0			

2017-05-01 Burlington 17-004



Customer:

Nelson

Blast Design

Quarry: Burlington
P.O. #:
Blast Date: 2017-05-01

Blast Number: Orica Order #: Blast Time: 17-004 2179557 11:51 AM

page 2

Blast Co-ordinates	Enter N Lat.	Enter * W Long.
Mid Blast	43.39783	79.88548
Front Row Corner	43.39795	79 88469
Back Row Corner	43.39775	79.88443
Average (Centre of Blast)	43.39784	79.88487

(N) Radians	(W) Radians
0.757435	1.394265
0.757437	1.394251
0.757434	1.394246
0.757435	1.394254

Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N
1st Reading	43.40246	79.87814	
2nd Reading			
Average	43.40246	79.87814	1000
Distance (1st Seis. From Centre of Blast)	748.7	m	1/2
Post Blast Data: ppV:	2.6	mm/s Trigger set at:	2.0 mm/s
frequency:	41.0	Hz V/T/L:	T (Vertic

(N) Radians	(W) Radians	
0.757516	1.394137	
0.757516	1.394137	

 frequency:
 41.0 Hz
 V / T / L : T
 (Vertical. Transverse or Longitudinal)

 air overpressure:
 121.0 dB
 Trigger set at: 115 dB

2nd concession (orica monitor)

2nd Seismograph Co-ordinates	Enter ON Lat.	Enter OW Long.
1st Reading	43.71939	80.38847
2nd Reading		
Average	43.71939	80,38847
Distance (2nd Sels. From Centre of Blas	0.0	'n
		- 10

(N) Radians	(W) Radians	
0.763047	1.403043	
0.763047	1.403043	

Post Blast Data: ppV: 3.1 mm/s Trigger set at: 2.0 mm/s V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: 108.0 dB Trigger set at: 115 dB 2450 2nd concession (Nelson monitor)

3rd	Selsmograph Co-ordinates	Enter ON Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m
	Poet Blact Date: noV:		mm/s Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

Post Blast Data: ppV: mm/s Trigger set at: 2.0 mm/s frequency: Hz V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement,

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$
= $\frac{(748.7)^2}{30^2}$ kg

= <u>560,552</u> kg

Maximum Indicated Charge Weight per Delay = 623

Orica

Blaster-in-charge:

Kevin Toplis

Jan Bridge

Signature required, indicating that Blast Report is Complete & Accurate

ORICA The Blasting Professionals	Customer: Blast	Nelsons Report		Quarry: P.O. #: Blast Date:		urlington NA 017-05-15	Blast Number: Orica Order #: Blast Time:	17-005 2185675 12:35PM	
		ch Ossingto	n		(Print N	ama) /Face)	tonnes Blasted: Total tonnes per day: Total Holes Loaded:	21,062 te 21,062 te 34 holes	8,101 m ³ TBA Rate
			N Latitude	79.88447		ngilude	including:	0 Dead Ho	oles
	Cent	re of Blast		Centre of Blast			and:	0 Helper H	Holes
							Helper Hole Collar:	0.0 ft avg	
Wind fro	m the: NW at	10 kph		Temperature:	16 to	20 °C	# Rows Blasted:	3 rows	
		x		K.			, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	Front Row)-	
Clear	: X I	Rain:	Overcast:				Burden:	10.5 ft avg	
Partly Cloudy:	: S	now:	Inversion:	Ceil	ing: 3	100000ft: m	Spacing: # Holes:	11.6 ft avg	v
- Drilling Ir	nformation -						1 "110100.	() Walk to	•
		rom Vertical		Nom	ninal B	it Diameter:	Burden:	10.0 ft avg	
Primary Bit	t diam: 101.6 mm	0; #H	oles: 34	= 2,516.0	ft (4 " diam)	Spacing:	11.5 ft avg	
Secondary Bi		0; #H	oles:	= 0.0	ft (" diam)	# Holes:	23	
Tertiary Bi	t diam: mm .	° #H	oles:	= 0.0	ft (" diam)	Bench Height:	72.0 ft avg	
					1		Sub-drill:	2.0 ft avg	31
Bulk Expl	osives:	in (kg)	out (kg)	kg			Hole Depth:	74.0 ft avg	F 50 P C 18
CENTRA GO	LD 70	27,020	19,900	7,120	1			Decking -	4
							Front Row:	4.0 ft avg	- 3
Packaged	l Exptosives:	cs shipped	cs returned	kg			Main Body:	4.0 ft avg	1
							# Stone Decks:	33 per blas	t a
								Stemming -	
					1		Front Row:	7.0 ft avg	10 (B) (B)
Boosters	•	•	ınit #usec	kg	1		Main Body:	7.0 ft avg	1
PENTEX 12 (OR EQUIVALENT)		0.34 103	35.0			Material used:		
							Front Row:	e Length - 63.0 ft avg	11
	4-4-1	ives weight in	Dient (kg):	7,155	1		Main Body:	63.0 ft avg	2
		Prod (0 kg) %		0.0%	1		•	e Weight -	
Detonato	_	case #'s	ms	# used	1		Front Row:	183.7 kg/hole	
UNITRONIC		Case # s	1113	34			Main Body:	183.7 kg/hole	
UNITRONIC				32			Max. per delay:	110.0 kg/dela	
UNITRONIC				37	1		SD () Equation:	kg/dela	y
ONTRONO	000 00111						Total kg Loaded:	7,155 kg	
					1		Rock Density:	2.60 g/cc =	te/m³
					1		Cound	or Englar	
	ccessories:		U of M	# used		1.489 lb/yd ³	Yield PF:	er Factor - 0.340 kg/te (a	actuett
HARNES	S WIRE DUPLEX (6 PA		units	1 12		1.489 lb/yd 1 258 lb/yd 3	Front row:	0.340 kg/te (t	
	STEMMING P	LUG MINI	units	12		1 321 lb/yd ³	Main Body:	0.301 kg/te (t	
Resource C)enlovment:		units		#	##### lb/yd ³	•	#DIV/0! kg/te (t	
	day (this Quarry)			1	_		this Blast) - change in Bit , B. S		
# of Blasters				1		er profile = 0.5hrs			
# of Helpers (1		r hours = 6.5hrs			
# of MMU's (1				1	Helpe	hours = 6			
Services:					All Ne	sons selemograp	hs used.		
GPS LAYOU		Line Item (Hour	y Rate)	1	Sales	nen will have to p	rovide a rate code.		
BULK TRUCI		>/≈5,000kg	<10,000kg	1					
SHOT SERV		Line Item (Fee p		1					
SEISMOGRA		1 unit in Shot							
W									

3D LASER PROFILE BORETRACK Enter "1" if 3D Profiled

Enter "1" If Boretraked

LABOUR CHARGE (enter HOURS) Must be pre-authorized



Customer:

Nelsons

Blast Design

Quarry:

Blast Date:

P.O. #:

NA 2017-05-15

Burlington

Blast Number:

17-005 2185675

Orica Order #: 12:35PM

65	
46	
39	
47	

Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.39805	79.88455
Front Row Corner	43.39790	79.88446
Back Row Corner	43.39770	79.88439
Average (Centre of Blast)	43.39788	79.88447

(N) Radians		(W) Radians
ī	0.757439	1.394248
Ī	0.757436	1.394247
Ī	0.757433	1.394246
-	0.757436	1.394247

Selemograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.		(N
1st Reading					
2nd Reading					
Average	0.00000		0.00000		V
Distance (1st Seis, From Centre of Blast)	0.0	m			
Post Blast Data: ppV:	0.1	mm/s	Trigger set at:	2.0	mm/s
frequency:		Hz	V/T/L	T	(Vertic
air overpressure:	0.88	dB	Trigger set at:	115	dB

(W) Radians
0.000000

T (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

2nd	Selamograph Co-ordinates	Enter ° N Lat.	
	1st Donding		

air overpressure:

air overpressure:

Selamograph Co-ordinates	Enter ° N Lat.	Ente	r°W Long.		(N
1st Reading					
2nd Reading					
Average	0.00000		0.00000		
Distance (2nd Sels. From Centre of Blast	0.0	m			
Post Blast Data: ppV:	3.8	mm/s	Trigger set at:	2.0	mm/s
frequency:		Hz	V/T/L	?	(Verlic
il equelicy.					,

(N) Radians	(W) Radians
0.000000	0.000000

? (Vertical, Transverse or Longitudinal) VITIL Ingger set at: 115 dB

2450 #2 sideroad

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	
Distance (3rd Seis, From Centre of Blast)	0.0	m
Post Blast Data: ppV:	3.3	mm/s Trigger set at:
frequency:		Hz V/T/I
		with the second and all

(N) Radians	(W) Radians
0.000000	0.000000

iger set at: 2.0 mm/s V / T / I ? (Vertical, Transverse or Longitudinal) Tripger set at: 115 dB

Camisle

Colling Rd

Scaling Factor denotes the degree of Blast confinement.

air overpressure:

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor:

$$W = \frac{D^2}{2}$$
$$= \frac{(0)^2}{2}$$

111.5 dB

95.9 dB

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mitch Ossington

Signature required, indicating that Blast Report is Complete & Accurate

0	Customer	Malaca		Ouarrail	Burlington	Blast Number:	17-006	
	Customer:	Nelson		Quarry:	Burlington			
ORICA	Blas	t Report	- 11	P.O. #:		Orica Order #:	218700	
Professionals				Blast Date:	2017-05-17	Blast Time:	11:53 Al	M I
ge 1 laster	-in-charge: Ke	vin Topllis			(Print Name)	tonnes Blasted:	15,010 te	5,773 m
						Total tonnes per day:	15,010 te	Flat
Blas	t Location: Lov	ver middle b	ench		(Bench / Face)	Total Holes Loaded:	42 holes	
GPS Co	ordinates: 4	3.40414	N Latitude	79.88442	*W Longitude	including:	Dead	Holes
		intre of Blast	1	Centre of Blast		and:	Helpe	Holes
						Helper Hole Collar:	ft avg	
Wind from	n the: SW at	40 kph		Temperature:	26 to 30 °C	# Rows Blasted:	2 rows	
		×		×		- Pattern	(Front Row)-	
Clear:		Rain:	Overcast:			Burden:	10.5 It avg	
artly Cloudy:	X	Snow:	Inversion:	Ceili	ng: 9,144 m	Spacing:	11.5 It avg	
2 2 2 2 2 1		201201	The second		91	# Holes:	22 front r	ow
- Drilling In	formation -							
		from Vertical	-	Nomi	nal Bit Diameter:	Burden:	10.5 It avg	
	diam: 101.6 mm	0 # H	loles: 41	= 1,689.2	ft (4 " diam)	Spacing:	11.5 ft avg	
condary Bit	diam: 114.3 mm	u # h	loles: 1	= 41.2	,	# Holes:	20	
Tertiary Bit	diam: mm	0 # F	loles:	= 0.0	ft (" diam)	Bench Height:	40.2 It avg	
					1	Sub-drill:	1.0 ft avg	
Bulk Explo	osives:	in (kg)	out (kg)	kg		Hole Depth:	41.2 ft avg	
ENTRA GOL	D 70	27,060	22,200	4,860		Stone Front Row:	Decking -	
						Front Row:	ft avg	
Packaged	Explosives:	cs shipped	cs returned	kg)	Main Body:	ft avg	
						# Stone Decks:	0 per bl	ast
						- Collar	Stemming -	
						Front Row:	7.0 ft avg	ast
Boosters:		kg /	unit # used	kg			7.0 ft avg	L
PENTEX 12 (C	R EQUIVALENT)		0.34 84	28.6		Material used:	.75 clear	
						- Charg	e Length -	
						Front Row:	34.2 ft avg	
	total explo	sives weight in	Blast (kg):	4,889	8	Main Body:	34.2 ft avg	
	Pkgd	Prod (0 kg) %	of Total kg:	0.0%		- Charg	ie Weight -	
Detonators	s:	case #'s	ms	# used		Front Row:	99.7 kg/ho	le
UNITRONIC 6	00 6M			41		Main Body:	99.7 kg/ho	
UNITRONIC 6	00 15M			43		Max. per delay:	140.0 kg/de	lay
						SD () Equation:	325.6 kg/de	lay
						Total kg Loaded:	4,889 kg	
						Rock Density:	2.60 g/cc	= te/m ³
						-	Con Front	
	cessories:		U of M	# used			er Factor -	
HARNES	S WIRE DUPLEX (6	PACK) 400M	units	1	1.427 lb/yd ³	Yield PF:	0.326 kg/te	
	SPIDER STEMMI	NG PLUG 8"	units	3	1_223 lb/yd ³	Front row:	0,279 kg/te	
			units		1 223 lb/yd ⁻¹	Main Body:	0.279 kg/te	
Resource De	ployment:				0.000 lb/yd ³	"KPI" PF:	0.000 kg/te	
	ay (this Quarry)			. 1	Total Control of the	(this Blast) change in Bit B	S. Expl or IS from J	orevious Blas
# of Blasters (t	his Blast)			1	Hole B2 is a 4 1/2"			
# of Helpers (ti	his Blast)	Note Exception		2	Hole B1 slumped to 18	ft, a 15m uni was used instead	d of a 6m uni. The	hole was pli
# of MMU's (th	is Blast)			1	1 Oft.			
Services:					Hole collars adjusted:	A22 10fl, A21-19 10fl, A18-14	8ft.	
GPS LAYOUT		Line Item (Hou	ly Rate)	1	There was no Orica se	ismograph used		
BULK TRUCK	CHARGE	>/=2,000kg	<5,000kg	1	Labour hours is 16 spli	l between 1 blaster and 2 help	pers	
SHOT SERVIC	E FEE *	Line Item (Fee	per Blast)	1				
SEISMOGRAF	PH RENTAL	* 1 unit in Shot	Service Fee					
3D LASER PR	OFILE	Line Item (Hou	ly Rate)	1				
BORETRACK		Enter "1" if Bor	etraked					
A DOLLD OLLA	DOE (antor HOUDE)	Line Ham /Fee	nor Hour)	16.0				



Customer:

Nelson

Blast Design

Burlington Quarry: P.O. #: Blast Date: 2017-05-17

Blast Number: Orica Order #: Blast Time:

17-006 2187001 11:53 AM

page 2

Blast Co-ordinates	Enter ON Lat.	Enter W Long.
Mid Blast	43.40414	79.88444
Front Row Corner	43.40388	79.88413
Back Row Corner	43.40440	79.88469
Average (Centre of Blast)	43.40414	79.88442

(N) Radians	(W) Radians
0.757545	1.394246
0.757541	1.394241
0.757550	1.394251
0.757545	1.394246

st Selsmograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.
1st Reading	43 40246		79.87814
2nd Reading			
Average	43.40246		79.87814
Distance (1st Seis. From Centre of Blast)	541.3	m	
Post Blast Data: ppV	DID	mm/s	Trigger set at:

(W) Radians
1.39413
1.394137

frequency: NOT air overpressure: TRIGGER Hz V/T/L: T (Vertical, Transverse or Longitudinal) dB Trigger set at: 115 dB 2nd concession (Nelson monitor)

2nd	Selsmograph Co-ordinates	Enter ON Lat.	Enter ° W Long.
	1st Reading	43.71939	80.38847
	0.10.1		

(N) Radians	(W) Radians
0.763047	1.403043
0.763047	1 403043

2nd Reading Average
Distance (2nd Sels. From Centre of Blas ppV: 43.71939 80.38847 0.0 m 1.1 mm/s ppV: Hz frequency:

Trigger set at: 2.0 mm/s V/T/L: ? (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

111.8 dB air overpressure: 2450 2nd concession (Nelson monitor)

Selamograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (3rd Seis: From Centre of Blast)	0.0	m
Boot Bloot Date: ppl/:		mm/s Trioger eet at:

(N) Radians	(W) Radians
0.000000	0.000000

Trigger set at: 2.0 mm/s frequency: Hz V / T / L : ? (Vertical Transverse or Longitudinal) dB Trigger set at: 115 dB air overpressure:

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast

Enter description of seismograph location

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting!

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(541.3)^2}{30^2} \text{ kg}$$

= **293,006** kg

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate populs

ORICA The Blasting Profusions/s	Customer: Blas	Nelsons Report		Quarry: P.O. #: Blast Date:	Burlington NA 2017-05-29	Blast Number: Orica Order #: Blast Time:	17-007 2191786 12:00PM
age 1 laster-	in-charge: N	Mitch Ossingto	nn -		(Print Name)	tonnes Blasted:	20,898 te 7,886 n
nuster-in-charge. Witch Ossington					Total tonnes per day:	20,898 te TBA	
Blast Location: South face			(Bench / Face)	Total Holes Loaded:	30 holes		
			N Latitude	79.88433 °W Longitude		including:	O Dead Holes
Centre of Blast		Centre of Blast		and:	Helper Holes		
				Helper Hole Collar:	0.0 ft avg		
Wind from	n the: SE at	5 kph		Temperature:	21 to 25 °C	# Rows Blasted:	3 rows
		х		x		- Pattern	(Front Row)-
Clear:	X	Rain:	Overcast:			Burden:	10.5 ft avg
Partly Cloudy:		Snow:	Inversion:	Ceilir	ng: 30000 ft m	Spacing: # Holes:	11.5 ft avg 10 front row
- Drilling Info	ormation -] # noies.	TO HORE TOW
		le from Vertical		Nomi	inal Bit Diameter:	Burden:	10.0 ft avg
Primary Bit o	diam: 101.6 mm		oles: 30	= 2,442.0 f	t (4 " diam)	Spacing:	11.5 ft avg
Secondary Bit of			oles:	= 0.0 f	•	# Holes:	20
Tertiary Bit o		° #H	oles:	= 0.0 f		Bench Height:	79.4 ft avg
						Sub-drill:	2.0 ft avg
Bulk Explo	sives:	in (kg)	out (kg)	kg		Hole Depth:	2.0 ft avg 81.4 ft avg 2 Docking - 4.0 ft avg 29 per blast Stemming - 10.0 ft avg 7.0 ft avg 1/2" crush ye Length - 67.4 ft avg 70.4 ft avg
CENTRA GOLD	70	33,530	26,710	6,820		- Stone	Docking -
						- Stone Front Row: Main Body:	4.0 ft avg
Packaged E	Explosives:	cs shipped	cs returned	kg		1.7	4.0 ft avg
						# Stone Decks:	29 per blast
						- Collar	Stemming -
				1		- Collar Front Row:	10.0 ft avg
Boosters:		kg / ı	ınit # usec	kg		Main Body:	7.0 ft avg
PENTEX 12 (O	R EQUIVALENT)	-	0.34 118	40.1		Material used: - Charg Front Row: Main Body:	1/2" crush
		-	-			Front Row:	ge Length - 67.4 ft avg
	total aval	osives weight in	Plant /kg\:	6,860		Main Body:	70.4 ft avg
	•	d Prod (0 kg) %		0.0%			re Weight -
Detonators		case #'s	ms	# used		Front Row:	196.5 kg/hole
UNITRONIC 60		cuse # s	1110	29		Main Body:	205.3 kg/hole
UNITRONIC 60		1 1	1	29		Max. per delay:	•
UNITRONIC 60		1 1		60		SD () Equation:	0.0 kg/delay
3						Total kg Loaded:	6,860 kg
						Rock Density:	2.65 g/cc = te/m^3
						•	
Cord & Acc	cessories:		U of M	# used		- Powd	er Factor -
HARNESS	WIRE DUPLEX (6 P	ACK) 400M	units	1	1.466 lb/yd ³	Yield PF:	'
			units		1 220 lb/yd ³	Front row:	0 273 kg/te (theoretical
			units		1 338 lb/yd ³	Main Body:	
Resource Dep	ployment:	1			###### lb/yd ³		#DIV/0! kg/le (theoretical
# of Blasts today	y (this Quarry)						S, Expl or IS from previous Blas
# of Blasters (th					saleman will provide a ra	ate code.	
# of Helpers (thi		Note Exception		2	<u> </u>		
# of MMU's (this	Blast)				Blaster Hours= 6hrs		
Services:				- 0	Helper Hours= 10hrs		
GPS LAYOUT		Line Item (Hourly		- 1			
BULK TRUCK O		>/=5,000kg	<10,000kg	1			
SHOT SERVICE		Line Item (Fee p		1			
SEISMOGRAPH		* 1 unit in Shot !		4			
3D LASER PRO)FILE	Line Item (Hourl		1			
BORETRACK Enter "1" if Boretraked		U					

LABOUR CHARGE (enter HOURS) Must be pre-authorized



Customer: Nelsons

Blast Design

Quarry: P.O. #: Blast Date:

Burlington NA 2017-05-29 Blast Number: Orica Order #:

17-007 2191786 12:00PM

Blast Time:

page 2

Blast Co-ordinates	Enter N Lat.	Enter ° W Long.	
Mid Blast	43.39814	79.88442	
Front Row Corner	43.39803	79.88434	
Back Row Corner	43.39798	79.88423	
Average (Centre of Blast)	43.39805	79.88433	

(N) Radians	(W) Radians
0.757440	1.394246
0.757439	1.394245
0.757438	1.394243
0.757439	1.394245

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N)
	1st Reading			
	2nd Reading			
	Average	0.00000	0.00000	
	Distance (1st Sels. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	DNT	mm/s Trigger set at:	2.0 mm/s

(N) Radians	(W) Radians		
0.000000	0.000000		

frequency: DNT V/T/L **T** (Vertical, Transverse or Longitudinal) Hz air overpressure: DNT dB Engger set at 115 dB

Colling Rd

2nd	Seismograph Co-ordinates	Enter ON Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (2nd Sels. From Centre of Blast	0.0	m
	Post Blast Data: ppV:	3.3	mm/s Ingger set at:

(N) Radians	(W) Radians
0.000000	0.000000

2.0 mm/s Hz V/T/L: ? (Vertical, Transverse or Longitudinal) frequency:

94.0 dB air overpressure: Frigger set at. 115 dB 2450 #2 sideroad

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Sels. From Centre of Blast)	0.0	m
	Post Blast Data: ppV:	2.4	mm/s Trigger set at
	-		

(N) Radians	(W) Radians	
0.000000	0.000000	

2.0 mm/s V / T / L ? (Vertical, Transverse or Longitudinal) Hz 88.0 dB frequency: air overpressure: Ingger set at: 115 dti

Camisle

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^{2}}{30^{2}}$$

$$= \frac{(0)^{2}}{30^{3}} kg$$

$$= \frac{0}{900} kg$$

0 Maximum indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mitch Ossington

Signature required, indicating that Blast Report is Complete & Accurate

ORICA The Bit on ng	Customer:	Nelsor Repor	- 1	Quarry: P.O. #: Blast Date:	Burlington n/a 2017-06-01	Blast Number: Orica Order #: Blast Time:	17-008 2194148 2:38 PM
page 1 laster	in-charge: Ke	en George				tonnes Blasted:	29,085 te 10,976 r
	_					Total tonnes per day: Total Holes Loaded:	te d 86 holes
		ast Middle			OLAN I	Including:	0 Dead Holes
GPS C	oordinates: (00000	°N Latitude	0 00000	°W Longitude		Helper Holes
						and:	·
					40 00 00	Helper Hole Collar:	0.0 ft avg 4 rows
Wind from	m the: SW at	25 kph		Temperature:	-16 to -20 °C	# Rows Blasted:	→ rows
Clear:	X	Rain:	Overcast:			Burden:	10.5 ft avg
Partly Cloudy:		Snow:	Inversion:	Ceili	ing: m	Spacing:	11.5 ft avg
						# Holes:	27
				Nom	inal Bit Diameter	Burden:	10.5 ft avg
Primary Bit	diam: 101.6 mm	0 #	Holes: 86	= 3,382.0	ft (4 " dlam) Spacing:	11.5 ft avg
Secondary Bit			Holes:	= 0.0)	
Tertiary Bit			Holes:	= 0.0	,		37.3 ft avg
, ortitally Bit	0.0111.				r	Sub-drill:	2.0 ft avg
Bulk Expl	nsives:	in (kg)	out (kg)	kg		Hole Depth:	39.3 ft avg
CENTRA GOL		26,860	17,350	9,510		•	
OLIVINA GOL	.5 10		,	0,010		Front Row:	0.0 ft avg
Packaged	Explosives:	cs shipped	cs returned	kg		Main Body:	0.0 ft avg
3				3		# Stone Decks:	0 per blast
						Front Row:	9.0 ft avg
Boosters:		kg /	unit # usec	kg		Main Body:	7.0 ft avg
PENTEX 12 (OR EQUIVALENT)		0 34 174	59.2		Material used:	3/4 Clear
						Front Row:	30.3 ft avg
	total explos	sives weight i	n Blast (kg):	9,569		Main Body:	32.3 ft avg
	Pkgd	Prod (0 kg) %	6 of Total kg	0 0%			
Detonator	s:	case #'s	ms	# used		Front Row:	88.4 kg/hole
UNITRONIC 6	00 6M			84		Main Body:	94.3 kg/hole
UNITRONIC 6	00 15M			90		Max. per delay:	130.0 kg/delay
						SD () Equation:	kg/delay
						Total kg Loaded:	9,569 kg
						Rock Density:	2.65 g/cc = te/m^3
Cord & Ac	cessories:		U of M	# used			
HARNESS	S WIRE DUPLEX (6 PA	ACK) 400M	units	4	1.470 lb/yd ³	Yield PF:	0.329 kg/te (actual)
			units			r 1	
			units		Ila k	WZDW DE	#DIVIOL kalka Abasastia
					##### lb/yd ³	"KPI" PF:	#DIV/0! kg/te (theoretical
				1			
				1	-	derneath concrete tunnel	
				2	MMU ran out of ammo	onlum nitrate,100% emulsion ble	end used to load last 9 holes
				1			
Services:							
GPS LAYOUT	•	Line Item (Hou	irly Rate)	1			
BULK TRUCK	CHARGE	>/=5,000kg	<10,000kg	1			
SHOT SERVI	CE FEE *	Line Item (Fee	per Blast)	1			

-1

1.1

SHOT SERVICE FEE *
SEISMOGRAPH RENTAL

3D LASER PROFILE

BORETRACK

* 1 unit in Shot Service Fee

Line Item (Hourly Rate)

Line Item (Hourly Rate)



Customer:

Nelson

Blast Design

Quarry:

P.O #:

Blast Date:

Burlington n/a 2017-06-01 Blast Number: Orica Order #: 17-008 2194148

Blast Time:

2:38 PM

page 2

Blast Co-ordinates	Enter o N Lat.	Enter ° W Long.
Mid Blast		
Front Row Corner		
Back Row Corner		
Average (Centre of Blast)	0.00000	0.00000

(N) Radians	(W) Radians
0.000000	0.000000

1st	Seismograph Co-ordinates		Enter ° N Lat.	Enter * W Long.	
	1st Reading				
	2nd Reading				
	Average		0.00000	0.00000	
	Distance (1st Seis From Centre of Blast)			m	
	Post Blast Data:	ppV	5.8	mm/s	2.
		frequency		Hz	٦
	air	overoressure:	101.0	dB	11

(N) Radians	(W) Radians
0 000000	0.000000

	2450 #2 Side Rd	all Over
and	Calemograph Co.	ordinato

2nd	Seismograph Co-ordinates	Enter N Lat.	Enter W Long.	
	1st Reading			
	2nd Reading			8
	Average	0.00000	0.00000	
	Distance (2nd Seis. From Centre of Blast		m	
	Post Blast Data: ppV:	3,8	mm/s	2.0
	frequency.		Hz	?
	air overpressure:	91.5	dB	115

(N) Radians	(W) Radians
0.000000	0.000000

The s	101	 	-		
2714	_		_		

Selsmograph Co-ordinates 1st Reading 2nd Reading Average		Enter " N Lat.	Enter °	W Long.	(N) Radians	(W) Radians	
				-		0.000000	
		0.00000		0 00000	0.000000	0.000000	
Distance (3rd Seis	From Centre of Blast)		m				
Post Blast Data:	ppV:	1.5	mm/s	2.0			
frequency:			Hz	?			
	air overpressure:	88.0	dB	115			
Southwest							

Scaling Factor denotes the degree of Blast confinement

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor:

$$W = \frac{D^2}{z}$$

$$= \frac{(0)^x}{z} \text{ kg}$$

$$= \frac{0}{0} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = k

Orica
Blaster-in-charge:

Ken George

	Customer:	Nelsons		Quarry:	Burlington	Blast Number:	17-009
ORICA	Rige	Report	.	P.O. #:		Orica Order #:	2191786
The Biarting Professionals	Dius.	Report		Blast Date:	2017-06-08	Blast Time:	12:00PM
ge 1 laster-	in-charge: Mit	ch Ossingtor	1		(Print Name)	tonnes Blasted:	20,898 te 7,886 m
						Total tonnes per day:	20,898 te TBA
Blas	t Location: Sou	ıth face			(Boach / Face)	Total Holes Loaded:	30 holes
GPS Co	ordinates: 4	3.39805	N Latitude	79.88433	°W Longitude	including:	0 Dead Holes
	Ce	ntie of Blast		Centre of Blast		and:	0 Helper Holes
						Helper Hole Collar:	0.0 ft avg
Wind fron	n the: SE at	5 kph		Temperature:	21 to 25 °C	# Rows Blasted:	3 rows
		×		×		- Pattern	Front Row)-
Clear:	x	Rain:	Overcast:			Burden:	10.5 ft avg
artly Cloudy:		Snow:	Inversion:	Cei	ling: 30000H m	Spacing:	11.5 ft avg
					,	# Holes:	10 front row
Drilling In	formation -						
	Angle	from Vertical		Nom	inal Bit Diameter:	Burden:	10.0 ft avg
Primary Bit	dlam: 101.6 mm	0 #H	loles: 30	= 2,442.0	ft (4 " diam)	Spacing:	11.5 ft avg
econdary Bit	diam: mm	0 # H	loles:	= 0.0	ft (" diam)	# Holes:	20
Tertiary Bit		. #H	loles:	= 0.0	ft (" diam)	Bench Height:	79.4 It avg
					1	Sub-drill:	2.0 (t avg
Bulk Explo	osives:	in (kg)	out (kg)	kg	100	Hole Depth:	81.4 ft avg Becking 4.0 ft avg 4.0 ft avg 29 per blast Stemming 10.0 ft avg 7.0 ft avg 1/2" crush e Length 67.4 ft avg 70.4 ft avg
CENTRA GOL	D 70	33,530	26,710	6,820		- Stone	Decking -
						Front Row:	4.0 ft avg
Packaged	Explosives:	cs shipped	cs returned	kg	1	Main Body:	4.0 ft avg
						# Stone Decks:	29 per blast
						ੁੱ - Collar	Stemming -
						Front Row:	10.0 ft avg
Boosters:		kg/u	unit # used	kg		IVIAITI DOUY.	7.0 ft avg
PENTEX 12 (C	R EQUIVALENT)		0.34 118	40.1		Material used: - Charg Front Row: Main Body:	1/2" crush
						- Charg	e Length -
						Front Row:	67.4 ft avg
	total explo	sives weight in	Blast (kg):	6,860		- wan body.	70.4 It avg
	Pkgd	Prod (0 kg) %	of Total kg:	0.0%			e Weight -
Detonator	s:	case #'s	ms	# used		Front Row:	196.5 kg/hole
UNITRONIC 6	00 6M			29		Main Body:	205.3 kg/hole
UNITRONIC 6	00 20M			29		Max. per delay:	130.0 kg/delay
UNITRONIC 6	00 30M			60	1	SD () Equation:	0.0 kg/delay
						Total kg Loaded:	6,860 kg
						Rock Density:	$2.65 \text{ g/cc} = \text{te/m}^3$
Cord & Ac	cessories:		U of M	# used			er Factor -
HARNES	S WIRE DUPLEX (6	PACK) 400M	units	1	1.466 lb/yd ³	Yield PF:	0.328 kg/te (actual)
			units		1.220 lb/yd ³		0.273 kg/le (theoretica
			unite		1 338 lb/yd ³	Main Body:	
Resource De	eployment:				##### lb/yd ³		#DIV/01 kg/te (theoretica
# of Blasts tod	ay (this Quarry)			1		(this Blast) change in Bit B	S, Expl or IS from previous Bla
# of Blasters (t	his Blast)			1	saleman will provide a	rate code	
# of Helpers (t	his Blast)	Note Exception		2			
# of MMU's (th	is Blast)			1	Blaster Hours= 6hrs		
Services:					Helper Hours= 10hrs		
GPS LAYOUT		Line Item (Hour	rly Rate)	1			
BULK TRUCK	CHARGE	>/=5,000kg	<10,000kg	1			
SHOT SERVIC	DE FEE *	Line Item (Fee	per Blast)	1			
SEISMOGRAF		* 1 unit in Shot	Service Fee	0			
3D LASER PR		Line Item (Hour	rly Rate)	1			
BORETRACK		Enter "1" if Bor		0			
	DOE (anter HOURS)	Must be pro ou					

2017-06-08 Soulth Wall 17-009 Report REPORT



Customer:

Nelsons

Blast Design

Burlington Quarry: P.O. #: NA 2017-06-08 Blast Date:

> Hz dB

94.0 dB

Blast Number: Orica Order #: Blast Time:

17-009 2191786 12:00PM

page 2

Blast Co-ordinates	Enter N Lat.	Enter * W Long.
Mid Blast	43.39814	79.88442
Front Row Corner	43.39803	79.88434
Back Row Corner	43.39798	79.88420
Average (Centre of Blast)	43.39805	79.88433

	(N) Radlans	(W) Radians
Ī	0.757440	1.394246
	0.757439	1.394245
	0.757438	1.394243
	0.757439	1.394245

Selamograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0.00000	0.000000	0.0000
Distance (1st Seis. From Centre of Blast)	0.0	m		
Post Blast Data: ppV:	DNT	mm/s Trigger set at: 2.6	0 imm/s	
frequency:	DNT	Hz V/T/L: T	(Vertical, Transverse o	r Longitudinal)

(N) Radians	(W) Radians
0.000000	0.000000

Colling Rd

2nd	Selamograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (2nd Sels. From Centre of Blas	0.0	m

air overpressure: DNT

(N) Radians	(W) Radians
	2.6-1
0.000000	0.000000

ppV: 3.3 mm/s Trigger set at: 2.0 mm/s Post Blast Data: Hz V/T/L: ? (Vertical, Transverse or Longitudinal) frequency:

Trigger set at: 115 dB

Trigger set al: 115 dB

2450 #2 sideroad

3rd	Selamograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m
	Post Blast Data: ppV:	2.4	mm/s Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

gger set at: 2.0 mm/s V/T/L: 2 (Vertical, Transverse or Longitudinal) Hz frequency: 88.0 dB Trigger set at: 115 dB air overpressure: Camisle

Scaling Factor denotes the degree of Blast confinement.

air overpressure:

The higher the SF, the more confined the Blast.
A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2} = \frac{1}{30^2}$$

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge: Mitch Ossington

Signature required, indicating that Blast Report is Complete & Accurate

ORICA The Bleaning Professionals	Customer Blas	: Nelson st Repor		Quarry: P.O. #: Blast Date:	Burlington NA 2017-06-21	Blast Number: Orica Order #: Blast Time:	17-010 2202619 12:35PM
		Mitch Ossingt			0,	tonnes Blasted: Total tonnes per day:	25,680 te 9,690 m 25,680 te TBA Ra
	st Location: oordinates:	Lower Middle 43.40406	°N Latitude	79.88412	°W Longitude	Total Holes Loaded: including: and:	84 holes 0 Dead Holes 0 Helper Holes
Wind from	m the: W at	10 kph		Temperature:	21 to 25 °C	Helper Hole Collar: # Rows Blasted:	0.0 ft avg
						746	
Clear:		Rain:	Overcast:			Burden:	12.0 ft avg
Partly Cloudy:	X	Snow:	Inversion:	Ceili	ng: 30000H m	Spacing: # Holes:	10.5 ft avg 28
Talking or	Birmsimi-					J # Holes.	20
	THE	no fears Venico)		Nom	inal Bit Diameter:	Burden:	9.0 ft avg
	diam: 101.6 mm	0 # # 1	Holes: 78	= 3,182.4	ft (4 " diam)	Spacing:	10.5 ft avg
Secondary Bit	diam; 114.3 mm	0 #1	Holes: 6	= 244.8	,		-50
Tertiary Bit	diam: mm	* #I	Holes:	= 0.0	ft (" diam)	Bench Height:	38.8 ft avg
						Sub-drill:	2.0 ft avg
Bulk Explo	osives:	in (kg)	out (kg)	kg		Hole Depth:	40.8 ft avg
CENTRA GOL	D 70	27,170	18,720	8,450			
						Front Row:	10.0 ft avg
Packaged	Explosives:	cs shipped	cs returned	kg		Main Body:	0.0 ft avg
						# Stone Decks:	1 per blast
						Front Row:	8.0 ft avg
Boosters:		kg /	unit # usec	kg		Main Body:	7.0 ft avg
PENTEX 12 (O	R EQUIVALENT)		0.34 95	32.3		Material used:	1/2" crush
						Front Row:	22.8 ft avg
		osives weight li		8,482		Main Body:	33.8 ft avg
	-	d Prod (0 kg) %	of Total kg:	0.0%			
Detonators	S :	case #'s	ms	# used		Front Row:	66.5 kg/hale
UNITRONIC 60	00 15M			91		Main Body:	98.6 kg/hole
UNITRONIC 60	00 6M			4		Max. per delay:	117.0 kg/delay
						SD () Equation:	0.0 kg/delay
				1		Total kg Loaded:	8,482 kg
						Rock Density:	$2.65 \text{ g/cc} = \text{te/m}^3$
Cord & Ac	cessories:		U of M	# used			
HARNESS	WIRE DUPLEX (6 F	ACK) 400M	units	1	1.475 lb/yd ³	Yield PF:	0.330 kg/te (actual)
	STEMMING	PLUG MINI	units	6	nyah castar	From row	O 181 kg/le treorous
			units		1.500 0050	Main Body	D 35B kyrie imponiczno
Resource De	phymient				###### lb/yd ³	"KPI" PF:	#DIV/0! kg/te (theoretical)
w. of Eligibia (pd.)	ry (Mile Lindony)			1	Carl Beday for field of		End or iS hard previous Broat
# Of Blancock (9)	e-Dust:			1	Customer wants to try hi	gher collars in back row to try	to break the top better on the mid
# or Hispanic re-	ry, Ethania	Non-Amplian		2	bench		
Molfillius (die	a fitmu			1			
Services:							
GPS LAYOUT		Line Item (Hour		4.0	Blaster Hours= 6.5		
BULK TRUCK		>/=5,000kg	<10,000kg		Helper Hours≖ 12		
SHOT SERVIC		Line Item (Fee p		1			
SEISMOGRAPI	H RENTAL	* 1 unit in Shot	Service Fee	0			
3D LASER PRO	OFILE	Line Item (Hour	•	1			
BORETRACK		Enter "1" if Bore	etraked	0			

LABOUR CHARGE (enter HOURS) Must be pre-authorized



Customer: Nelsons

Blast Design

Quarry: P.O. #:

dB

Blast Date:

Burlington NA 2017-06-21 Blast Number: Orica Order #:

Blast Time:

17-010 2202619

12:35PM

page 2

Blast Co-ordinates	Enter " N Lat.	Enter "W Long.	
Mid Blast	43.40401	79.88408	
Front Row Corner	43 40370	79 88380	
Back Row Corner	43 40447	79.88447	
Average (Centre of Blast)	43.40406	79.88412	

(N) Radians	(W) Radians
0.757543	1.394240
0.757537	1.394235
0.757551	1.394247
0.757544	1.394241

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading		
2nd Reading		
Average	0.00000	0.00000
Distance (1st Seis. From Centre of Blast)	0.0	
Post Blast Data: ppV:	DNT	mm/s
frequency:	DNT	Hz
	-	1.4570

air overpressure: DNT

(N) Radians	(W) Radiana	
0.000000	0.000000	

2.0 115

Colling Rd

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
	1st Reading			
	2nd Reading			
	Average	0.00000	0.0000	
	Distance (2nd Sels. From Centre of Blast	0.0	m	
	Post Blast Data: ppV:	DNT	mm/s	
	frequency:		Hz	
	air overpressure:	DNt	dB	

(N) Radians	(W) Radians
0.000000	0.000000

2,0 Hz 2 voito a dB 115 on

2450 #2 sideroad

Camisle

Seismograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.
1st Reading			-
2nd Reading			
Average	0.00000		0.00000
Distance (3rd Seis. From Centre of Blast)	0.0	m	
Post Blast Data: ppV:	DNT	mm/s	1000
frequency:		Hz	
air overpressure:	DNT	dB	Trippe and of

(N) Radians	(W) Radians
0.000000	0.000000

2 0 1141 -115

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^3}$$

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mitch Ossington

ORICA The Blasting Professionals	Customer: Blas	Nelsons † Report		Quarry: P.O. #: Blast Date:	NA	Blast Number: Orica Order #: Blast Time:	17-011 2201920 12:02PM
	r-in-charge: N	Mitch Ossingto	on		(Wnit Name)	tonnes Blasted:	23,583 te 8,899 m ³
laster	in Glarge. IV	on Obalingti				Total tonnes per day:	23,583 te TBA Rate Cod
Blas	st Location:	South Wall			(Bench Face)	Total Holes Loaded:	36 holes
			°N Latitude	79.88425	°W Longitude	including:	0 Dead Holes
		entre of Blast		Centro of Blast		and:	0 Helper Holes
						Helper Hole Collar:	0.0 ft avg
Wind fro	m the: SW at	10 kph		Temperature:	21 to 25 °C	# Rows Blasted:	3 rows
		X				- Pattern	(Front Row)-
Clear:		Rain:	Overcast:			Burden:	18.0 ft avg
artly Cloudy:	X	Snow:	Inversion:	Cei	ling: 2540ft m	Spacing:	6.0 ft avg
- Drilling Ir	iformation -					# Holes:	16 front row
- w/ ///// ///		le from Vertical		Non	ninal Bit Diameter:	Burden:	10.0 ft avg
Primary Bit	diam: 101.6 mm		Holes: 36	= 3,027.6	ft (4 " diam)	Spacing:	10.5 ft avg
econdary Bit			Holes:		ft (" diam)	# Holes	20
Tertiary Bit			Holes:		ft (" diam)	Bench Height:	82.1 ft avg
					1	Sub-drill:	2 0 ft avo
Bulk Expl	osives:	in (kg)	out (kg)	kg		Hole Depth:	84.1 ft avg
CENTRA GOL	LD 70	30,240	21,910	8,330		- Stone	Decking -
		1				Front Row:	4.0 ft avg
Packaged	Explosives:	cs shipped	cs returned	kg		Main Body:	4.0 ft avg
						# Stone Decks:	35 per blast
						E - Collar	Stemming -
						Front Row:	8.0 ft avg
Boosters:		kg /	unit # usec	kg		Main Body:	7.0 ft avg
PENTEX 12 (0	OR EQUIVALENT)		0.34 143	48.6		Material used:	1/2" crush le Length -
						Front Row:	72.1 ft avg
		osives weight i		8,379		Main Body:	73.1 ft avg
	J	d Prod (0 kg) %	of Total kg:	0.0%			e Weight -
Detonator		case #'s	ms	# used		Front Row:	210.2 kg/hole
UNITRONIC 6				35		Main Body:	213.2 kg/hole
UNITRONIC 6				36		Max. per delay:	150.0 kg/delay
UNITRONIC 6	30M 30M			72		SD () Equation:	0.0 kg/delay
						Total kg Loaded: Rock Density:	8,379 kg $2.65 \text{ g/cc} = \text{te/m}^3$
							2.00 3.00 (0/11)
	ccessories:		U of M	# used	4 55 15 1 3		er Factor -
HARNES	S WIRE DUPLEX (6 P	PACK) 400M	units	1	1.587 lb/yd ³	Yield PF:	0.355 kg/te (actual)
			units		1 411 lb/yd ³ 1 472 lb/yd ³	Front row	0.316 kg/te (theoretical)
Resource D	enloyment.		units		###### lb/yd ³	Main Body:	0.330 kg/te (theoretical)
				1			#DIV/0! kg/te (theoretical)
	tay (this Quarry)	-		1		uns Brasil - change in Bit , B, b buid not pull so a 15m unitronic	8. Expl or IS from previous Blast:
# of Blasters (Nata Evacation		2	Hole A4 collapsed at co		was noon as a salety
# of Helpers ()		Note Exception		1	Hole A4 collapsed at CC	mar no top deck	
# of MMU's (1) Services:				1	Blaster Hours= 6.5		
GPS LAYOUT		Line Item (Hour	dy Rate\	1	Helper Hours= 11		
BULK TRUCK		>/=5,000kg	<10,000kg	1	Troiper (Tours= 1)		
SHOT SERVI		>/=5,000kg		1			
SEISMOGRA		* 1 unit in Shot		0			
3D LASER PR		Line Item (Hou		1			
BORETRACK		Enter "1" if Bor		0			
DUNCHMON		LING! I DOI!		· ·			

LABOUR CHARGE (enter HOURS) Must be pre-authorized



Customer: Nelsons

Blast Design

Quarry: Burlington P.O. #: NA Blast Date: 2017-06-20

dB

2017-06-21 Loner Moode 17-010 neputs Blast Number: 17-011 Orica Order #: 2201920 Blast Time: 12:02PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
Mid Blast	43.39823	79.88432	
Front Row Corner	43 39816	79 88428	
Back Row Corner	43_39810	79.88415	
Average (Centre of Blast)	43.39816	79.88425	

(N) Radians	(W) Radians		
0.757442	1.394244		
0.757441	1.394244		
0.757440	1.394241		
0.757441	1.394243		

1st	Seismograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.		(N
	1st Reading					
	2nd Reading					
	Average	0.00000		0.00000		
	Distance (1st Seis, From Centre of Blast	0.0	m			
	Post Blast Data: pp\	/: DNT	mm/s	Trigger set at:	2.0	mm/s
	frequenc	y: DNT	Hz	W/T/L:	T	(Vertica

(N) Radians	(W) Radians		
0.000000	0.000000		

WT/L: T (Vertical, Transverse or Longitudinal)

Trigger set at: 115 dB

Colling Rd

	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (2nd Seis. From Centre of Blast)	0.0	m
	Poet Blact Data: nn\/:	2.0	mm/s Trigger sal at:

air overpressure: DNT

(N) Radians	(W) Radians		
0.000000	0.000000		

Trigger set at: 2.0 mm/s ppv: U mm/s frequency: Hz V / T / L : ? (Vertical, Transverse or Longitudinal) 108.4 dB air overpressure: Fogger set at: 115 dB 2450 #2 sideroad

Enter ° W Long. 3rd Seismograph Co-ordinates Enter ° N Lat. 1st Reading 2nd Reading

(N) Radians	(W) Radians		
0.000000	0.000000		

0.00000 0.00000 Average Distance (3rd Seis, From Centre of Blast) 0.0 m Post Blast Data: 2.4 mm/s Trigger set at 2.0 mm/s V / F / L ? (Vertical, Transverse or Longitudinal) frequency: Hz 101.9 dB air overpressure: Ingger set at 115 dB Camisle

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = D^2 \over 30^2$$

$$=$$
 $\frac{(0)^2}{30^2}$ kg

Maximum Indicated Charge Weight per Delay = 0 kg

Orica

Blaster-in-charge:

Mitch Ossington

11

17-011 Blast Number: Burlington Quarry: Customer: **Nelsons** Orica Order #: NA P.O. #: Blast Design 2017-06-20 Design Date: Design te Blasted: 23,583 te page 1 Mitch Ossington laster-in-charge: 36 holes Total Holes Loaded: O Dead Holes ... including: (Blarien | Faqe) Blast Location: South Face ... and: 0 Helper Holes °W Longitude °N Latitude 79.88433 GPS Coordinates: 43.39805 Helper Hole Collar: 0.0 ft avg Centre of Blasi # Rows Blasted: 3 rows - Design Pattern (Front Row)-18.0 ft avg Nominal Bit Diameter: Burden: Angle from Vertical 3,027.6 ft (" diam) Spacing: 6.0 ft avg Primary Bit diam: 101.6 mm # Holes: = # Holes: 16 frankraw 0.0 ft (" diam) # Holes: 0 Secondary Bit diam: mm Design Pattern (Main Body) -" diam) 0.0 ft (Tertiary Bit diam: mm # Holes: Burden: 10.0 ft avg Spacing: 10.5 ft avg 12:02 pm 22°C P. Cloudy 7km/L SW 2540' # Holes 20 main body Bench Height: 82.1 ft avg Sub-drill: 2.0 ft avg Hole Depth: 84.1 ft avg **Bulk Explosives Req'd:** kg Design Stone Decking -8,500 **CENTRA GOLD 70** ChargeWt.exe Front Row: 4.0 ft avg Main Body: 4.0 ft avg Pkgd Explosives Req'd: kg - Design Collar Stemming -Front Row: 7.0 ft avq Main Body: 7.0 ft avg Material used: 1/2" crush Boosters Req'd: kg/u # used kg PENTEX 16 (OR EQUIVALENT) 0.45 144 65.4 - Design Charge Length -Front Row: 73.1 ft avg Main Body: 73.1 ft avq total explosives weight in Blast (kg): 8,565 Pkgd Prod (0 kg) % of Total kg: 0.0% - Design Charge Weight -Detonators Reg'd: # reg'd Front Row: 213.2 kg/hole ms Main Body: 213.2 kg/hole **UNITRONIC 600 30M** 72 UNITRONIC 600 46M 20 m Max Chge Wt / delay: +30.8 kg/delay 36 150 **UNITRONIC 600 9M** 36 Required kg Loaded: 8.565 kg $2.65 \text{ g/cc} = \text{te/m}^3$ Rock Density: Cord & Access. Req'd: U of M - Design Powder Factor -# req'd Expected Yield PF: IRE DUPLEX (6 PACK) 400M 0.363 kg/te (actual) units 1 431 lb/yd~ STEMMING PLUG MINI Front row: 0 320 kg/te (theoretical) units 1.472 lb/yd3 Main Body: 0 330 kg/te (theoretical) units Resource Deployment 1.458 lb/yd3 "KPI" PF: 0.326 kg/te (théoretical) # of Blasts today (this Quarry) 1 1 # of Blasters (this Blast) Hole A8 bottom dets would not pull, put in a 15m as safety. # of Helpers (this Blast) 2 Note Exception # of MMU's (this Blast) Services Reg'd: **BULK TRUCK CHARGE** >/=5,000kg <10,000kg 1 Hole A4 collapsed at collar, no top deck. SHOT SERVICE FEE . Line Item (Fee per Blast) 1 SEISMOGRAPH RENTAL * 1 unit in Shot Service Fee

LABOUR CHARGE (enter HOURS Must be pre-authorized

Line Item (Fee per Blast) Enter "1" if Boretraked

3D LASER PROFILE

BORETRACK



Customer:

Nelsons

Blast Design

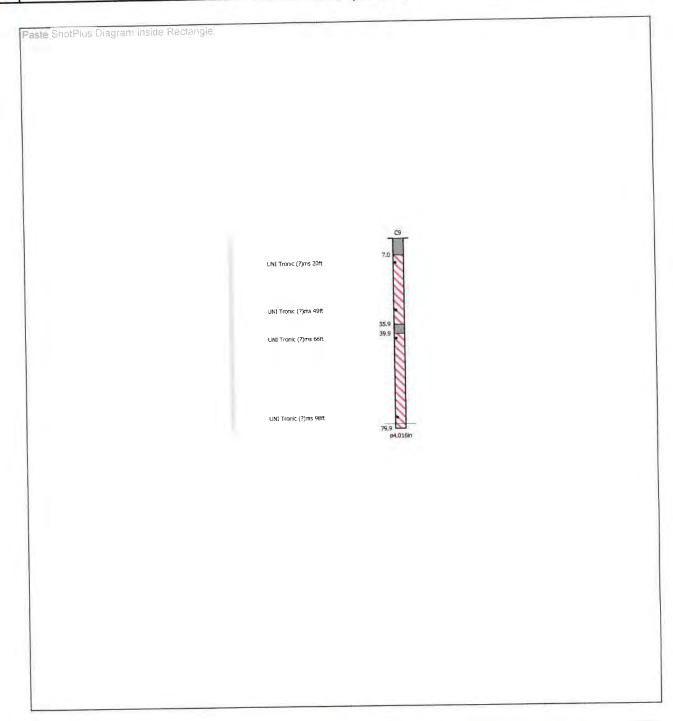
Quarry: P.O. #:

Blast Date:

Burlington

Blast Number: Orica Order #:

page 2



_			
O	ri	C	a

Blaster-in-charge:





Quarry Manager:

COMBINATION SHUM! FURM STRAIGHT BILL OF LUDING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND DYPRESS CARRIERS SUBJECT TO THE JUDISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE PE LA JURISDICTION DE L'OFFICE DES TRANSPORTS. 199EM GROSS / BRUT TARE Bill of Lading / Connaissement Orica Canada inc. GRAND VALLEY BUSTER MITCH NET 033411 SIDE ROAD 21-22 CONSIGNOR HELP KEITH BAND TIME OUT TIME IN EXPÉDITEUR HEURE D'ENTRÉE HEURE SORTIE GRAND VALLEY ON CA L9W 7G1 1230 100 ORDER NUMBER B/L NUMBER Nº DE COMMANDE N° DE CONNAISSEMENT NELSON AGGREGATE COMPANY CONSIGNEE BURLINGTON ON CONSIGNATAIRE 2201920 85682632 CA L7R 4L8 REPRINT PAGE CUSTOMER REFERENCE NO. INVOICE TO / BUYER
FACTURÉ À / ACHETEUR DATE REQUIRED TIME REQUIRED Nº DE COMMANDE DU CLIENT DATE REQUISE HEURE REQUISE NELSON AGGREGATE COMPANY 20 Jun 2017 00:00:00 n/a SHIP, MAG. LIC. VEHICLE NO. DATE SHIPPED **FREIGHT TERMS** EXPÉDIÉ LE CONDITIONS DE LIVRAISON PERMIS EXPEDITEUR Nº DE VÉHICULE 20 Jun 2017 FOB Dest'n, Own Truck F-73289 500 MAG. LIC. NO. ROUTING SHIP VIA Nº DE PERMIS TRANSPORTFUR MNÉRAIRE Orica Truck STANDARD AMOUNT CITY. DG MD OTY, HET'D OTY, SOLD υм DESCRIPTION OTE RET. OTE. FACT PKG5. MONTANT 143 196 PCPENTEX BC 340 (49/CS) 71.540 1 2 PC Harness Wire Duplex (6 pack) 400m 1 5.840 35 25 60 PC *uni tronic 600-09.0M CU/ZC(30')60PC 1 5.880 30 36 66 PC *uni tronic 600-15M C/Z SPL(50')66PC 1 11.286 72 108 PC *uni tronic 600-30M C/Z SPL(100')36P 3 36 31.752 100 PC MINI STEM PLUGS - PART #6015 0.700 100 PC 1 LICENSED BLASTER 1.0 HR LABOUR CHARGE PC 1 ROG (ROCK ON GROUND) TOTAL GROSS WEIGHT 126.998 KG TOTAL PACKAGES *** 10 GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422) 24 HOUR TECHNICAL INFORMATION: 1-613-996-6666 PALLETS RETURNED / PALETTES RETOURNÉES BAGS USED / BACS UTILISÉS EMERGENCY RESPONSE NO 24 NOUR NUMBER TELEPHONE O'URGENCE/24 HEURE NUMERO EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE PLACARDS OFFERED / PLACARDS OFFERT FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA BA. TO / FAIRE SUIVRE FACTURE POUR EXPEDITION PORT PAYÉ EN RÉFÉRANT À NITOCORNAMISSIONILLIEUROS. ERAP 2-1510 1-877-561-3636 YES / OUI NO / NON THIS IS TO GERITFY THAT THE ABOVE NAMEO ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND DECLARED VALUE OF SHIPMENT NETTE NO. CONV LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF VALEUR DÉCLARÉE PRESSAGE WIT AGREEMENT OF TRANSPORT.

NOUS CERTIFIONS QUEL A CLASSE, LA DESCRIPTION, L'EVRALLAGE, LE MARCUAGE ET L'EDICUETAGE DES MARCHANDISES SUSMEMTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS 301 rue hotel de ville Brownsburg-Chatham, QC WT AGREEMENT NO. J8G 3B5 DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.

SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR צו DATE DATE SIGNATURE DATE М/М M/M Y/A SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK SOUS RESERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRES AU VERSO OMIGINAL - NOT NEGOTIABLE
OMIGINAL - NON NEGOCIABLE
OMIGINAL - NON NEGOCIABLE
OMIGINAL - NON NEGOCIABLE

OGRAND VALLEY

OPPER JAMES TO THE

**** PAGE 2 OF 2 **** DEG \$7772

RECEDIO AGGREGATE COMPANY

Blast Summary Data

Burden: 10.0ft

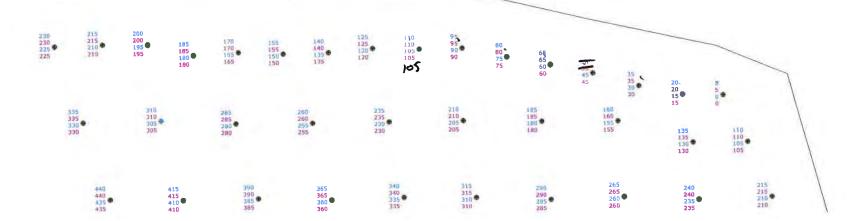
Spacing: 10.5ft Hole Diameter: 4.0in Subdrill: 2.0ft

Number of holes: 36

Stemming: 7.0ft Hole angle: 0.0°

1st row burden: 18.0ft Total drilled: 3030.6ft







SHOTPlus 5.6	.2.7 20/06/2017
Mine	
Location	
Title/author	17-011 South Face Final G. Palcso
Filename	17-011 South Face Final (2).spf

Blast Summary Data

Burden: 10.0ft

1st row burden: 18.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Hole Diameter: 4.0in

Number of holes: 36

Stemming: 7.0ft Hole angle: 0.0°

Total drilled: 3030.6ft

Free Face

* 150 kg in all botton decks:



SHOTPlus 5.6	.2.7 20/06/2017
Mine	
Location	
Title/author	17-011 South Face Final G. Palcso
Filename	17-011 South Face Final.spf

Blast Summary Data

Burden: 10.0ft 1st row burden: 18.0ft Spacing: 10.5ft Hole Diameter: 4.0in Subdrill: 2.0ft

Stemming: 7.0ft

Total drilled: 3030.8ft

Number of holes: 36

Hole angle: 0.0°



17-011 South Face Final Front Row - 18' X 6' - Body - 10' X 10.5' - 4" Bit 248.5 + .6 Sub





ShotPlus5 5.2.2	29.0	12/06/2017			
Mine					
Location					
Title/author	17-011 South Face Final G. Palcso				
Filename	17-011 South Face Final.spf				

ORICA Bull-s	Customer Blas	Nelso		Quarry: P.O. #: Blast Date:	Burlington n/a 2017-06-26	Blast Number: Orica Order #: Blast Time:	2204495	
		Ken George				tonnes Blasted: Total tonnes per day:	40,014 te 15,09 40,014 te	99 m
		43.40250	°N Latitude	79.88614 °	W Longitude	Total Holes Loaded: including and:	252 holes 0 Dead Holes 0 Helper Holes	3
Wind from	the: SW at	15 kph		Temperature:	21 to 25 °C	Helper Hole Collar: # Rows Blasted:	0.0 ft avg 12 rows	
Clear:	٧	Rain:	Overcast:			Burden:	11.5 ft avg	
Partly Cloudy:	^	Snow:	Inversion:	Ceilin	g: 30 000 m	Spacing: # Holes:	11.5 ft avg 17	
Drimon, Pit o	liam: 404.6 mm	0 #	Lielen 250		nal Bit Diameter:	Burden:	11.5 ft avg	
Secondary Bit of		0 #	Holes: 252 Holes:	= 4,032.0 ft = 0.0 ft	(" diam)	Spacing:	11.5 ft avg	
Tertiary Bit o	liam: mm	* #	Holes:	= 0.0 ft	(" diam)	Bench Height: Sub-drill:	16.0 ft avg 0 0 ft avg	
Bulk Explo		in (kg) 34,290	out (kg) 27,570	kg 6,720		Hole Depth:	16.0 ft avg	
Packaged I			·			Front Row:	0.0 ft avg	
Packageu i	explosives.	cs snipped	cs returned	kg		Main Body: # Stone Decks:	0.0 ft avg 0 per blast	
Desertions						Front Row:	7.0 ft avg	
Boosters: PENTEX 12 (OI	R EQUIVALENT)	kg /	/ unit # usec 0.34 252	kg 85.7		Main Body: Material used:	7.0 ft avg 3/4 Clear	
						Front Row:	9.0 ft avg	
		sives weight i Prod (0 kg) %		6,806 0.0%		Main Body:	9.0 ft avg	
Detonators		case #'s	ms	# used		Front Row:	26.2 kg/hole	
CONNECTADE			25/500 42 ms	252 18		Main Body: Max. per delay:	26.2 kg/hole 45.0 kg/delay	
UNITRONIC 600			42 1115	10		SD () Equation:	kg/delay	
						Total kg Loaded:	6,806 kg	
				1		Rock Density:	2.65 g/cc = te/m ³	I
Cord & Acc			U of M	# used		V. 1155	0.470	
HARNESS	VIRE DUPLEX (6 P.	ACK) 400M	units units	4	0.760 lb/yd ³	Yield PF:	0.170 kg/te (actual)	
			units		##### lb/yd ³	"KPI" PF:	#DIV/0! kg/te (theoreti	cal)
				1				
				1 2				
				1				

1

1

15,099 m³

GPS LAYOUT Line Item (Hourly Rate) BULK TRUCK CHARGE >/=5.000kg <10.000kg SHOT SERVICE FEE * Line Item (Fee per Blast) SEISMOGRAPH RENTAL * 1 unit in Shot Service Fee 3D LASER PROFILE Enter "1" if 3D Profiled BORETRACK Enter "1" if Boretraked



Customer:

2450 #2 Side Rd

Nelson

Blast Design

on

Quarry: P.O. #: Blast Date: Burlington n/a

2017-06-26

Blast Number: Orica Order #: 17-012 2204495

Blast Time:

1:14 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
Mid Blast	43.40254	79.88612	
Front Row Corner	43 40207	79 88607	
Back Row Corner	43 40288	79 88623	
Average (Centre of Blast)	43.40250	79 88614	

(N) Radians	(W) Radians
0.757517	1.394276
0.757509	1.394275
0.757523	1 394278
0 757516	1.394276

t	Selsmograph Co-ordinat	es	Enter ON Lat.	Enter ° W Long.	1
Ý	1st Reading				
í	2nd Reading				
ř	Average		0.00000	0.0000	0
ľ	Distance (1st Seis From Cer	itre of Blast)	0.0	m	
Ř	Post Blast Data:	ppV:	6.2	mm/s	. :
1		frequency:		Hz	
1	air ove	erpressure:	91.5	dB	_ 1

(N) Radians	(W) Radians
0.000000	0.000000

Seismograph Co-ordinates	Enter ° N Lat.	Enter * W Long.	(N) Radians	(W) Radians
1st Reading				1
2nd Reading				
Average	0 00000	0.00000	0.000000	0.000000
Distance (2nd Seis. From Centre of Blast	0.0	m		
Post Blast Data: ppV:	DNT	mm/s 2.0		
frequency:		Hz ?		
air overpressure:	TNC	dB 11	5	

Seismograph Co-ordinates	Enter ° N Lat.	Enter W Long.	(N) Radians	(W) Radians
1st Reading				
2nd Reading				
Average	0.00000	0 00000	0 000000	0.000000
Distance (3rd Seis From Centre of Blast	0.0	m		
Post Blast Data: pp	/: 1.8	mm/s 2.0)	
frequenc	y:	Hz ?		
air overpressur	e: 88.0	dB 118	5	
Southwest				

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor:

$$W = \frac{D^2}{2}$$

$$= \frac{(0)^2}{2} \text{ kg}$$

$$= \frac{0}{0} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = ____k

Orica

Blaster-in-charge:

Ken George

3	Customer	: Nelsor	1	Quarry:	Burlington	Blast Number:	17-013
ORICA	Blas	t Repor	t	P.O. #:		Orica Order #:	2210809
The Blasting Professionals	Dias	n Ropor	•	Blast Date:	2017-07-10	Blast Time:	1:40 PM
age 1	r-in-charge: Ke	evin Toplis			(Print Name)	tonnes Blasted:	58,552 te 22,095 m ³
	ger				10	Total tonnes per day:	58,552 te
Blas	st Location: Flo	oor			(Bench / Face)	Total Holes Loaded:	295 holes
		43.40152	°N Latitude	79.88959	°W Longitude	including:	0 Dead Holes
		entre of Blast		Centre of Blast		and:	0 Helper Holes
						Helper Hole Collar:	0.0 ft avg
Wind from	m the: SW at	10 kph		Temperature:	21 to 25 ℃	# Rows Blasted:	11 rows
				X		- Pattern	(Front Row)-
Clear:		Rain:	Overcast:			Burden:	
artly Cloudy:	X	Snow:	Inversion:	Ceil	ing: 2,804 m	Spacing:	11.5 ft avg
						# Holes:	28 front row
- Drilling In	formation -						
		le from Vertical		1	ninal Bit Diameter:	Burden:	
	diam: 101.6 mm		Holes: 299	= 5,980.0	,	Spacing:	11.5 ft avg
Secondary Bit			Holes:		ft (" diam)	# Holes:	58,524
Tertiary Bit	diam:mm	° # ŀ	Holes:	0.0	ft (" diam)	Bench Height:	20.0 ft avg
	_					Sub-drill:	0.0 ft avg
Bulk Explo		in (kg)	out (kg)	kg		Hole Depth:	20.0 ft avg
CENTRA GOL	D 70	34,150	25,680	8,470			Decking -
Da alaa aa al	F	1. 1				Front Row:	0.0 ft avg
Раскадеа	Explosives:	cs shipped	cs returned	kg		0	0.0 ft avg
						# Stone Decks:	0 per blast
						Front Row:	Stemming -
Pagatara		len /	: #	les.			20.0 ft avg 30.0 ft avg 3/4 Clear 20.0 ft avg
Boosters:	D FOURTAL FUT	Kg /	unit # used			Main Body:	7.0 ft avg
PENTEX 12 (C	OR EQUIVALENT)		0.34 300	102.0		Material used: - Charg Front Row: Main Body:	ge Length -
						Front Row:	13.0 ft avg
	total explo	osives weight in	n Blast (kg):	8,572		Main Body:	13.0 ft avg
		d Prod (0 kg) %		0.0%			ge Weight -
Detonators		case #'s	ms	# used		Front Row:	
EXEL HANDID)ET 12m		25/500	300		Main Body:	
CONNECTADI			42 ms	21		Max. per delay:	
UNITRONIC 60	00 6M			1		SD () Equation:	0.0 kg/delay
						Total kg Loaded:	8,572 kg
						Rock Density:	2.65 g/cc = te/m^3
Cord & Ac			U of M	# used			ler Factor -
HARNES	SS WIRE DUPLEX (6	PACK) 400M	units	1	0.654 lb/yd ³	Yield PF:	0 ()
			units		0.853 lb/yd ³	Front row:	3.11 (. 1111)
Deer			units		0.853 lb/yd ³	Main Body:	
Resource De	. ,				#DIV/0! lb/yd ³		#DIV/0! kg/te (theoretical)
# of Blasts toda	3,			1	,	, , ,	S, Expl or IS from previous Blast:
# of Blasters (ti				1	Holes A1,2,3- B1,2- C1 v		
# of Helpers (th		Note Exception		2		ot loaded, but primed. They be	orn where at 8ft.
# of MMU's (thi	is blast)			1		ot pull, a safety was used.	
Services:		F-4- 949 ''			Holes, G28, H28 did not	get loaded, do to both only bei	ing stt.
GPS LAYOUT	CHARCE	Enter "1" if Layo		0	Di		
BULK TRUCK		>/=5,000kg	<10,000kg	1	Blaster hours: 8.5		
SHOT SERVIC		Line Item (Fee p		1	Helper hours: 7.5		
SEISMOGRAP		* 1 unit in Shot					
3D LASER PR	OFILE	Enter "1" if 3D F		0			
BORETRACK		Enter "1" if Bore	etraked	l o l			

2017-07-10 Burlington 17-013 floor REPORT

16.0

LABOUR CHARGE (enter HOURS) Line Item (Fee per Hour)



Customer:

Nelson

Blast Design

Quarry: P.O. #: Blast Date:

Burlington 2017-07-10 Blast Number: Orica Order #: Blast Time:

17-013 2210809 1:40 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40144	79.88941
Front Row Corner	43.40125	79.89002
Back Row Corner	43.40186	79.88933
Average (Centre of Blast)	43.40152	79.88959

(N) Radians	(W) Radians
0.757498	1.394333
0.757495	1.394344
0.757505	1.394332
0.757499	1.394336

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.71939	80.38847
	2nd Reading		
	Average	43.71939	80.38847
	Distance (1st Seis From Centre of Blast)	0.0	m

(N) Radians	(W) Radians
0.763047	1.403043
0.763047	1.403043

ppV: 2.2 mm/s Post Blast Data: frequency: Hz

Trigger set at: 2.0 mm/s V / T / L : T (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

air overpressure: 2450 #2 Side Rd (Nelson monitor)

2nd	Seismograph Co-ordinates	Enter ON Lat.	Enter ° \	W Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (2nd Seis. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	1.0	mm/s ⊤	rigger set at:

(N) Radians	(W) Radians
0.00000	0.00000

Trigger set at: 2.0 mm/s V / T / L : ? (Vertical, Transverse or Longitudinal) 1.0 mm/s ppV: frequency: Hz **104.2** dB air overpressure: Trigger set at: 115 dB

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
	1st Reading			
	2nd Reading			
	Average	0.00000	0.00000	
	Distance (3rd Seis. From Centre of Blast)	0.0	m	
	D+ DI+ D-+-			

(N) Radians	(W) Radians
0.000000	0.000000

Trigger set at: 2.0 mm/s V / T / L: (Vertical, Transverse or Longitudinal) Post Blast Data: ppV: 4.2 mm/s Hz frequency: Trigger set at: 115 dB air overpressure: **88.0** dB

91.5 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(0)^2}{30^2}$$

900

Maximum Indicated Charge Weight per Delay =

0

Orica

Blaster-in-charge:

Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate.

2017-07-10 Burlington 17-013 floor REPORT

Blast Summary Data

Burden: 11.5ft

Spacing: 11.5ft Hole Diameter: 4.0in

Subdrill: 0.0ft Number of holes: 305 Stemming: 7.0ft Hole angle: 0.0°

1st row burden: 11.5ft Total drilled: 6100.0ft

Free Face

× × 20. 45. 35. 46. 25. 15. 15. 25. 25. 25. 25. 25. 27. 27. 21. 25. 26. 27. 21. 31. 35. 41. 8 .19 .22 .16 .14 .16 .13 .18 .26 .25 .22 .22 .24 .27 .26 .22 .23 .34 .34 .34 .35 .37 .35 .34 .34 .42 × × 13 .22 .27 .16 x .19 .16 .22 .22 .22 .22 .24 .24 .27 .27 .35 .38 .37 .37 .37 .38 .44 x8 x ·16 ·16 ·18 ·22 ·14 ·19 ·22 ·24 ·36 ·22 ·22 ·22 ·21 ·30 ·30 ·32 ·37 ·38 ·39 ·37 ·34 ·35 ·42 ·42 ·42 ·34 ·29 ·16 ·19 ·13 ·16 ·21 ·22 ·24 ·22 ·22 ·22 ·16 ·22 ·30 ·30 ·32 ·37 ·37 ·38 ·38 ·37 ·38 ·38 ·42 ·44 ·44 ·44 ·16 ·29 ·29 ·13 ·16 ·16 ·22 ·22 ·19 ·19 ·24 ·26 ·26 ·26 ·26 ·26 ·29 ·26 ·37 ·38 ·40 ·35 ·35 ·35 ·38 ·41 ·44 ·44 -19 -14 - 22 - 12 - 16 - 16 - 20 - 22 - 19 - 19 - 26 - 26 - 29 - 29 - 29 - 30 - 29 - 37 - 35 - 35 - 35 - 38 - 38 - 42 - 42 - 42 - 42 x .16 .13 .19 -20.19 .22.19 .24.26 26 .29 27 22 .29 .32 .35 .38 .38 .47 .38 .38 .42 .42 .38 .45 ·19 ·19 ·22 ·19 ·19 ·19 ·22 ·18 ·22 ·29 ·29 ·29 ·29 ·26 ·25 ·32 ·34 ·34 ·29 ·38 ·42 ·45 ·38 ·45 ·45 ·45 ·45

17-013 Floor Blast - 11.5' X 11.5' - 4" Bit - Drill to shale



SHOTPlus 5.6	.3.6	07/07/2017
Mine Burlington		
Location		
Title/author	17-013 Floor Blast G. Palcso	
Filename 17-013_Floor_Blast_Final.spf		

Blast Summary Data

Burden: 11.5ft 1st row burden: 11.5ft Spacing: 11.5ft

Hole Diameter: 4.0in

Subdrill: 0.0ft

Stemming: 7.0ft

Total drilled: 6100.0ft

Number of holes: 305

Hole angle: 0.0°

Timing

Free Face

600 ct 575 ct 550 ct 525 ct 500 ct 475 ct 450 ct 425 ct 400 ct 375 ct 350 ct 325 ct 300 ct 275 ct 250 ct 225 ct 200 ct 175 ct 150 ct 125 ct 100 ct -75 ct -50 ct -25 ct -0 ct -25 ct -25

17-013 Floor Blast - 11.5' X 11.5' - 4" Bit - Drill to shale



SHOTPlus 5.6.4.3 10/07/2017

Mine Burlington

Location

Title/author 17-013 Floor Blast G. Palcso

Filename 17-013 Floor Blast Final Timing Ope

Not to scale

Blast Summary Data

Burden: 11.5ft 1st row burden: 11.5ft

Spacing: 11.5ft

Hole Diameter: 4.0in

Subdrill: 0.0ft

Stemming: 7.0ft

Total drilled: 4575.0ft

Number of holes: 305

Hole angle: 0.0°

Free Face

 $\frac{127}{\oplus 15.00} \frac{126}{15.00} \frac{125}{15.00} \frac{124}{15.00} \frac{123}{15.00} \frac{122}{15.00} \frac{121}{15.00} \frac{120}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{117}{15.00} \frac{116}{15.00} \frac{115}{15.00} \frac{114}{15.00} \frac{113}{15.00} \frac{112}{15.00} \frac{111}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{11}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{119}{15.00} \frac{118}{15.00} \frac{119}{15.00} \frac{119}{15.00}$

17-013 Floor Blast - 11.5' X 11.5' - 4" Bit - Drill to shale





ShotPlus5 5.2.29.0 16/06		
Mine	Burlington	
Location		
Title/author	17-013 Floor Blast G. Palcso	
Filename	17-013 Floor Blast Final.spf	
rilename	17-013 Floor blast Finalispi	

ORICA The Blasting Professionals*	omer: Blast		lelson esign	Desig
page 1 laster-in-charge	: Ke	vin T	oplis	
Blast Location	n: Flo	oor		
GPS Coordinates	7	.0000		ude 0.0
- Drilling Information -			arani.	
Primary Bit diam: 101.	7.00	from Ve		305 =
Secondary Bit diam:	mm	0	200	=
Tertiary Bit diam:	mm	0		-
Pkgd Explosives Req'd	ChargeV		7,808 kg	
Boosters Reg'd:	kg/u #	used	kg	
PENTEX 12 (OR EQUIVALENT)	1 2 2 2 1	305	103.7	
total explosives weight		100	7,912	
Pkgd Prod (0 kg)		-	0.0%	
Detonators Req'd:			# req'd	
EXEL HANDIDET 12m CONNECTADET 12M	25/5 42 n		305	
UNITRONIC 600 6M	74.0		1	
Cord & Access. Reg'd:	U of	M	# req'd	
RE DUPLEX (6 PACK) 400M	unit	s	1	
	unit	s		
	unit	s		
Resource Deployment				2.7
# of Blasts today (this Quarry)				1
of Blasters (this Blast)				1
f of Helpers (this Blast)	Note Exc	eption		2
# of MMU's (this Blast)				1
Services Req'd:				-
BULK TRUCK CHARGE	>/=5,00		<10,000kg	- 1

Burlington Quarry: Blast Number: 17-013 P.O. #: Orica Order #: gn Date: 2017-07-07 Design te Blasted: 60,536 te Total Holes Loaded: 305 holes ... including: O Dead Holes 00000 °W Longitude ... and: 0 Helper Holes Helper Hole Collar: 0.0 ft avg # Rows Blasted: 11 rows Nominal Bit Diameter: Burden: 11.5 ft avg 6,100.0 ft (4 " diam) Spacing: 11.5 ft avg 0.0ft (" diam) # Holes: 28 hard low 0.0 ft (" diam) Burden: 11.5 ft avg Spacing: 11.5 ft avg # Holes Bench Height: 20.0 ft avg Sub-drill: 0.0 ft avg Hole Depth: 20.0 ft avg Front Row: 0.0 ft avg Main Body: 0.0 ft avg Front Row: 7.0 ft avg Main Body: 7.0 ft avg Material used: 3/4 Clear - Design Charge Length -Front Row: 13.0 ft avg Main Body: 13.0 ft avg Front Row: 37.9 kg/hole Main Body: 37.9 kg/hole Max Chge Wt / delay: 30.0 kg/delay Required kg Loaded: 7,912 kg Rock Density: $2.65 \text{ g/cc} = \text{te/m}^3$ Expected Yield PF: 0.131 kg/te (actual) 0.853 lb/yd3 Front row 0.191 kg/le (theoretical) 0.853 lb/yd3 Main Body 0.191 kg/te (theoretical) 0.853 lb/yd3 "KPI" PF: 0.191 kg/te (theoretical) Cost Reduction Notes (this Blast) - change in Bit . B. S. Expl or IS from previous Blast >/=5,000kg <10,000kg Line Item (Fee per Blast) * 1 unit in Shot Service Fee Enter "1" if 3D Profiled 0 Enter "1" if Boretraked 0 LABOUR CHARGE (enter HOUR! Must be pre-authorized

SHOT SERVICE FEE *

3D LASER PROFILE

BORETRACK

SEISMOGRAPH RENTAL



Customer:

Nelson

Blast Design

Quarry: P.O. #:

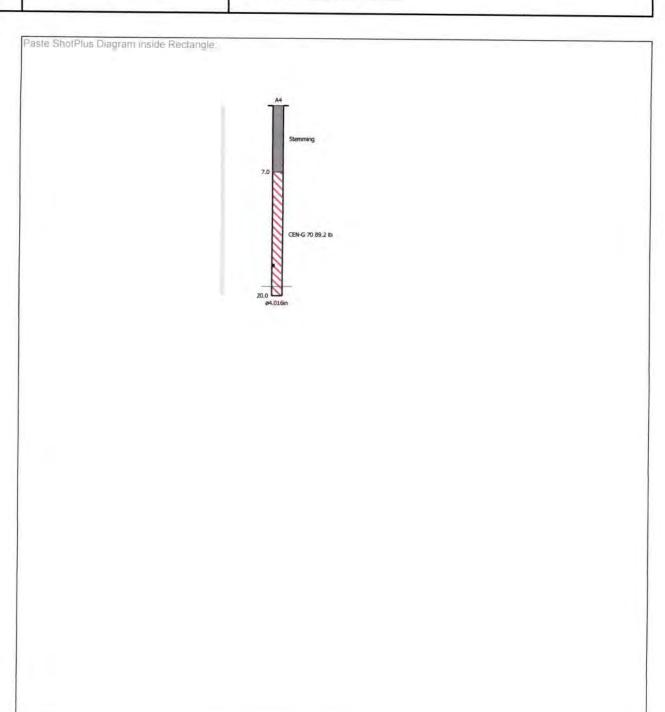
Blast Date:

Burlington

2017-07-10

Blast Number: Orica Order #: 17-013

page 2



	Orica Blaster-in-charge:	Kevin Toplis	
#	Quarry Manager:		

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Orica Canada Inc.

CONSIGNOR

EXPÉDITEUR

033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON

CA L7R 4L8

Bill of Lading / Connaissement

BLASTER KEVIN

GROSS / BRUT	85980
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
6:45	14:00
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT

2210809

PAGE

85701951

DATE REQUIRED TIME REQUIRED HEURE REQUISE			INVOICE TO / BUYER FACTURÉ À / ACHETEUR			CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT					
10 Jul 2017	00:0	00:0	00	NELSON	AGGREGATE	COMPANY			n/a		
DATE SHIPPED EXPÉDIÉ LE				FREIGHT TONDITIONS DE			SHIP. MA PERMIS EXP				HICLE NO. DE VÉHICULE
10 Jul 2017	FOB	Des		Own Tr		F-	73289			PIII	56013
	SHIF	VIA	10				ROUTING				MAG. LIC. NO. N° DE PERMIS
Orica Truck	INANSP	OFITEL	Jr.		STAND	DARD	macron	-			
QTY. QTÉ.	UM		QTY, RET	D QTY. SOLD			ESCRIPTION			# OF / DE PKGS.	AMOUNT MONTANT
			NET	BXPLOS	IVES QU	ANTITY:		133.810	KG		
392 400 65 20 50 5 2	PC PC PC PC PC	XXXX	92/05/94	300 0 21	EXEL HAND EXEL Cond *Uni trod Harness & LICENSED LABOUR CE	nectadet 1 nic 600-06. Wire Duplex BLASTER	5/500(40') M 25MS (30 2M 42MS (4 0M CU/ZC(2 (6 pack)	FT) 65/0 40 FT) 50/ 20')80PC		8 2 1 1	143.080 49.200 7.760 6 0.365 5.840
					TOTAL GR	OSS WEIGHT					212.245 KG
					***	TOTAL PACK	GES *	***		21	
24 HOUR TECHNI (PALLETS USED / PALETTES UTILISÉ	ES		ORMAT	PALLETS R	-613-996-6	RETOURNÉES		BAGS USED /		Colorador de Colorador	
ERAP				NCE EME	Contract Con	NO./24 HOUR NUMBER 1/24 HEURE NUMERO 161-3636	YES / OUI	NO / NON	QUI	OTING ORICA B	CE FOR PREPAID FREIC L TO / FAIRE SUIVRE FACTI PORT PAYÉ EN RÉFÉRAN MENT D'ORICA:

	E MARQUAGE ET L'ÉTIQUETAGE DES MARCHANDISES \$ DNT CONFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS		Brownsburg-Chathem, QC J&G 3B5
CONSIGNOR EXPEDITED Y	CARRIER / TRANSPORTEUR OFFICA TYUCK	CONSIGNEE DES	TINATARE GGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DUCAN	MIONNEUR RECEIVER'S NAME	(PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE DATE	SIGNATURE SIGNATURE	DATE SIGNATURE	DATE D/J M/M Y/A
		SUBJECT TO ALL THE TE	BMS AND CONDITIONS ON THE BACK

	Cuetemer	Malaa	_	Ouerra	Dividirentese	Diget Number	17.014.4
	Customer:	Nelso	1	Quarry: P.O. #:		Blast Number: Orica Order #:	17-014 A
ORICA The Blasting	Blas [.]	t Report		Blast Date:		Blast Time:	2207581 12:46 PM
Professionals*		•		Diasi Dale.	2017-07-04	Diast Time.	12.40 FW
page 1 laster	-in-charge: Ke	vin Topllis			(Print Name)	tonnes Blasted:	11,970 te 4,517 m ³
<u>.</u>						Total tonnes per day:	33,601 te TBA Rate Code
Blas	t Location: Lov	wer middle b	ench		(Bench / Face)	Total Holes Loaded:	43 holes
GPS C	oordinates: 4	3.40390	°N Latitude	79.88386	°W Longitude	including:	0 Dead Holes
	Ce	entre of Blast		Centre of Blast		and:	4 Helper Holes
						Helper Hole Collar:	10.0 ft avg
Wind from	m the: SE at	10 kph		Temperature:	21 to 25 ℃	# Rows Blasted:	3 rows
		X		X			(Front Row)-
Clear:		Rain:	Overcast:			Burden:	12.0 ft avg
Partly Cloudy:	X	Snow:	Inversion:	Ceil	ling: 9,144 m	Spacing:	10.5 ft avg
						# Holes:	12 front row
- Drilling In						i i	Main Body) -
D		from Vertical			inal Bit Diameter:	Burden:	9.0 ft avg
-	diam: 101.6 mm		Holes: 36	= 1,497.6	,	Spacing:	10.5 ft avg
=	diam: 114.3 mm		Holes: 7	= 291.2	,	# Holes:	31 main body
Tertiary Bit	diam:mm	° #	Holes:	= 0.0	ft (" diam)	Bench Height:	39.6 ft avg
						Sub-drill:	2.0 ft avg
Bulk Explo		in (kg)	out (kg)	kg		Hole Depth:	41.6 ft avg
CENTRA GOL	.D 70	34,050	29,193	4,857		- i	41.6 ft avg 41.6 ft avg Decking - 0.0 ft avg 0 per blast Stemming - 7.0 ft avg 7.0 ft avg 7.0 ft avg 34.6 ft avg 34.6 ft avg
Dealconed	Funlasiuss					Front Row:	0.0 ft avg
Раскадеа	Explosives:	cs shipped	cs returned	kg		Main Body:	0.0 ft avg
						E " CTONG DOOKS!	oper blast
							Stemming - 2 5
Boosters:		len /		len		Front Row: Main Body: Material used: - Charge Front Row: Main Body:	7.0 it avg
		Kg /	unit # used	kg		Matarial was de	7.0 It avg
PENTEX 12 (C	OR EQUIVALENT)		0.34 86	29.2		Material used:	re Length -
						Front Row:	34.6 ft avg
	total explo	sives weight i	n Blast (kg):	4,886		Main Body:	34.6 ft avg
	· ·	Prod (0 kg) %		0.0%			ne Weight -
Detonator	=	case #'s	ms	# used		Front Row:	100.9 kg/hole
UNITRONIC 6				43		Main Body:	100.9 kg/hole
UNITRONIC 6	00 15M			43		Max. per delay:	125.0 kg/delay
						SD () Equation:	0.0 kg/delay
						Total kg Loaded:	4,886 kg
						Rock Density:	2.65 g/cc = te/m^3
Cord & Ac	cessories:		U of M	# used		- Powd	er Factor -
HARNES	S WIRE DUPLEX (6 I	PACK) 400M	units	1	1.823 lb/yd ³	Yield PF:	0.408 kg/te (actual)
	SPIDER STEMMII	NG PLUG 8"	units	20	1.204 lb/yd ³	Front row:	0.269 kg/te (theoretical)
			units		1.605 lb/yd ³	Main Body:	0.359 kg/te (theoretical)
Resource De					1.565 lb/yd ³	"KPI" PF:	0.350 kg/te (theoretical)
# of Blasts tod	ay (this Quarry)	Note Exception	1	2	,	his Blast) - change in Bit , B,	S, Expl or IS from previous Blast:
# of Blasters (t	his Blast)			1	blaster hours: 7.5		
# of Helpers (the		Note Exception	1	2	helper hours: 6.5		
# of MMU's (th	is Blast)			1		17-014 B, with a 5 second do	
Services:					Holes A1, X1, X2 got 10	ft collars. Holes B1, X3, X4,	C1 got 12ft collars.
GPS LAYOUT		Line Item (Hou	rly Rate)	1			
BULK TRUCK	CHARGE	>/=2,000kg	<5,000kg	1			
SHOT SERVIC		Line Item (Fee	per Blast)	1/2			
SEISMOGRAF	PH RENTAL	* 1 unit in Sho	t Service Fee				
3D LASER PR	OFILE	Line Item (Hou	rly Rate)	1			
BORETRACK		Enter "1" if Bor	etraked	0			
LABOUR CHA	RGE (enter HOURS)	Line Item (Fee	per Hour)	14.0			

2017-07-04 Burlington 17-014- A Lower Middle REPORT



1

Customer:

Nelson

Blast Design

Quarry: P.O. #: Blast Date:

88.0 dB

Burlington 2017-07-04 Blast Number: Orica Order #: Blast Time: 17-014 A 2207581 12:46 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40388	
Front Row Corner	43.40375	79.88372
Back Row Corner	43.40406	79.88399
Average (Centre of Blast)	43.40390	79.88386

(N) Radians	(W) Radians
0.757541	1.394236
0.757538	1.394234
0.757544	1.394239
0.757541	1.394236

lst	Seismograph Co-ordinates	Enter ° N Lat.	Enter	r ° W Long.	
	1st Reading				
	2nd Reading				
	Average	0.00000		0.00000	
	Distance (1st Seis. From Centre of Blast)	0.0	m		
	Post Blast Data: ppV:	1.3	mm/s	Trigger set at:	2

(N) Radians	(W) Radians
0.000000	0.000000

frequency: Hz

2.0 mm/s V/T/L: T (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

air overpressure: northwest- colling rd. (Nelson monitor)

Enter ° N Lat.	Enter ° W Long.
43.71939	80.38847
43.71939	80.38847
0.0	m
	Enter ° N Lat. 43.71939 43.71939 0.0

(N) Radians	(W) Radians
0.763047	1.403043
0.763047	1.403043

Post Blast Data: ppV: 12.2 mm/s frequency: Hz 95.9 dB

Trigger set at: 2.0 mm/s V / T / L : ? (Vertical, Transverse or Longitudinal)

air overpressure: 2450 2nd concession (Nelson monitor)

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m
	Post Blast Data: ppV:	4.2	mm/s Trigger set at:

(N) Radians (W) Radians 0.000000 0.000000

frequency: air overpressure: southwest- Camisle (Nelson Monitor)

2.0 mm/s V / T / L: (Vertical, Transverse or Longitudinal)

Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^{2}}{30^{2}}$$

$$= \frac{(0)^{2}}{30^{2}} kg$$

$$= \frac{0}{900} kg$$

Hz

88.0 dB

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge: Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate.

Burden: 9.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

Number of holes: 43

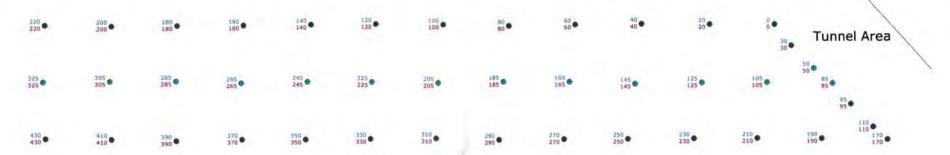
Hole angle: 0.0°

Total drilled: 1793.4ft

Holes A1,B1,C1, X1,X2,X3,X4 are 4.5" Diameter Marked with Green Paint

open face

timing



Lower Middle 17-014 Part A 12x10.5 Front Row, 9x10.5 Body 4" Hole Diameter 250m Floor Elevation + 0.6m Subdrill



SHOTPlus 5.6	.3.6 03/07/2017
Mine	Burlington
Location	Lower Middle
Title/author	Blast 17-014 Design Ken George
Filename	Blast 17-014 Lower Middle Design.spf

Burden: 9.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

Number of holes: 43

Stemming: 7.0ft Hole angle: 0.0°

1st row burden: 12.0ft Total drilled: 1793.4ft

Holes A1,B1,C1, X1,X2,X3,X4 are 4.5" Diameter Marked with Green Paint

load sheet pc counter open face

max load: 140kg

Lower Middle 17-014 Part A 12x10.5 Front Row, 9x10.5 Body 4" Hole Diameter 250m Floor Elevation + 0.6m Subdrill

4.5" holes



SHOTPlus 5.6	.3.6 03/07/20	017
Mine	Burlington	
Location	Lower Middle	
Title/author	Blast 17-014 Design Ken George	
Filename	Blast 17-014 Lower Middle Design.spf	

Burden: 9.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft Total drilled: 1793.4ft

Number of holes: 43

Hole angle: 0.0°

Holes A1,B1,C1, X1,X2,X3,X4 are 4.5" Diameter Marked with Green Paint

open face

⊕ A12 ⊕ 40.7ft	⊕ A11 ⊕ 38.7ft	⊕ A10 37.8ft	⊕ 49 42.4ft	⊕ AB 42.9R	⊕ 47 ⊕ 43.2ft	⊕43.0ft	⊕ 45 ⊕ 42.0ft	⊕ ^{A4} 41.7ft	⊕ A3 ⊕ 41.5ft	⊕ ^{A2} 41.6tt	⊕ A1 41.7ft ⊕ X1 ⊕ 41	Tunnel Area	
⊕ B14 ⊕ 41.4ft	⊕813 ⊕38.3ft	⊕812 ⊕38.4ft	⊕ 811 ⊕ 42.6tt	⊕810 ⊕42.8ft	⊕ 89 43,3ft	⊕88 ⊕43.6ft	⊕ 87 42,7ft	⊕ 86 41.9ft	85 ⊕ 41.9ft	⊕84 ⊕41.4ft		± X2 ± 41.6ft ± B1 ± 41.5ft ± X3 ± 41.4ft	1
€15 ⊕39.3ft	⊕C14 ⊕39.3ft	€C13 ⊕37.0ft	⊕C12 ⊕43.1ft	⊕C11 ⊕43.3ft	⊕ C10 ⊕ 43.5R	⊕ C9 44.1ft	⊕ C8 ⊕ 43.8ft	⊕ ^{C7} ⊕44.4ft	€ 6 43.7ft	⊕ C5 ⊕ 42.7ft	⊕ C4 ⊕ 41.4ft	C3 ⊕ 41.3ft C1 C1 ⊕ 41,2ft	

Lower Middle 17-014 Part A 12x10.5 Front Row, 9x10.5 Body 4" Hole Diameter 250m Floor Elevation + 0.6m Subdrill



22/06/2017 **SHOTPlus 5.6.4.3** Burlington Mine Lower Middle Location Title/author Blast 17-014 Design Ken George Blast 17-014 Lower Middle Design.sp Filename

ORICA The Blasting Professionals	Custo	mer: Blast		elson sign			Quarry: P.O. #: gn Date:		Burlington 2017-07-04	Blast Number: Orica Order #:	17-014 A
page 1 laster-in-	-charge:	Ke	vin To	plis				(Brint	(Nama)	Design te Blasted:	12,949 te
7-7-00										Total Holes Loaded:	43 holes
Blast L	ocation:	Lo	wer m	iddle bench				Ben	ON Face)	including:	O Dead Holes
GPS Coor	dinates:	4:	3.40390	°N Latitu	de	79	.88386	°WI	ongitude	and:	4 Helper Holes
		Our	are of Bo	MIT		Cent	re of Blast			Helper Hole Collar:	7.0 ft avg
										# Rows Blasted:	3 rows
- Drilling Inform	malimi -				_	-				- Dusian Path	im (Front Row)-
2mmg man	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		from Ve	rtical			Non	ninal	Bit Diameter:	Burden:	12.0 ft avg
Primary Bit diar	m: 101.6		0	# Holes:	36	=	1,497.6		4 " diam)	Spacing:	10.5 ft avg
Secondary Bit diar			0.	# Holes:	7	=	291.2		4 1/2 " diam)	# Holes:	12 front row
Tertiary Bit diar		mm	0	# Holes:		=		ft (" diam)	- Design Patte	m (Main Body)
1.50										Burden:	9.0 ft avg
										Spacing:	10.5 ft avg
										# Holes	31 main body
										Bench Height:	39.6 ft avg
										Sub-drill:	2.0 ft avg
Bulk Explosives	Req'd:			kg						Hole Depth:	41.6 ft avg
CENTRA GOLD 70		Charge	Wt.exe	4,891						N. 570 7 7 7 5 7 1 M	ana Decking -
										Front Row:	0.0 ft avg
Pkgd Explosives	Req'd:			kg						Main Body:	0.0 ft avg
											lar Stemming -
										Front Row:	7.0 ft avg
										Main Body:	7.0 ft avg
Boosters Req'd:		kg/u	# used	kg						Material used:	75 clear
PENTEX 12 (OR EQUIV	VALENT)	0.34	86	29.2						Dague Ce	armi Lansilla
										Front Row:	34.6 ft avg
total explosive	e woight	in Place	/kal-	4,920						Main Body:	34.6 ft avg
Pkgd Prod			1	0.0%							arge Weight -
Detonators Req		m		# req'd						Front Row:	100.9 kg/hole
UNITRONIC 600 15M		,,,,		43					Main Body: 100.9 kg/h		
UNITRONIC 600 9M				43						Max Chge Wt / delay:	140.0 kg/delay
										Required kg Loaded:	4,920 kg
			-							Rock Density:	$2.60 \text{ g/cc} = \text{te/m}^3$
Cord & Access.	Rea'd:	Uo	f M	# req'd						- Design Pr	owder Factor -
IRE DUPLEX (6 PACK)	-	un		1						Expected Yield PF:	0.380 kg/te (actual)
		un							1 204 lb/yd2	Front row:	0.275 kg/te (theoretical)
		un							1.605 lb/yd3	Main Body	0.366 kg/fe (theoretical)
Resource Deployme	ent								1.471 lb/yd3	"KPI" PF:	0.336 kg/te (theoretical)
# of Blests today Ithis C	Quarry)	Note Ex	ception			2		Cost	Reduction Notes (ti	lis Blasti - change in Bit. B. S.	Expl or IS from previous Blast
# of Blasters (this Blast))					1					
# of Helpers (this Blast)		Note E	ception			2					
# of MML/'s (this Blast)						1					
Services Req'd:											
BULK TRUCK CHARGE	E	>/=2,0	000kg	<5,000kg		1					
SHOT SERVICE FEE *		Line Ite	m (Fee j	per Blast)		1/2					
SEISMOGRAPH RENTAL * 1 unit in Shot Service Fee			0								
3D LASER PROFILE		Enter "	1" if 3D F	Profiled		0					
BORETRACK Enter "1" if Boretraked			0								

LABOUR CHARGE (enter HOURS Must be pre-authorized



Customer:

Nelson

Blast Design

Quarry: P.O. #:

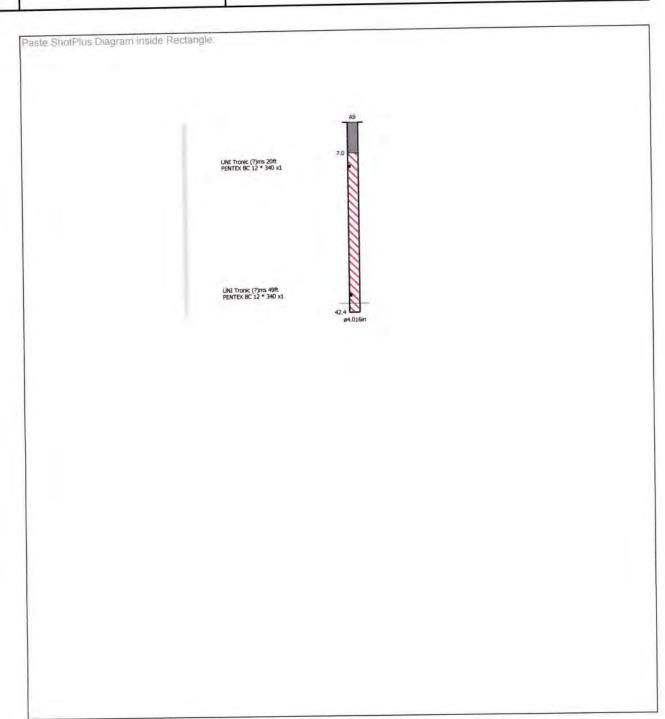
Blast Date:

Burlington

2017-07-04

Blast Number: Orica Order #: 17-014 A

page 2



	Orica Blaster-in-charge:	Kevin Toplis
#	Quarry Manager:	

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

EY

CONSIGNOR EXPÉDITEUR 033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

Bill of Lading / Connaissement

1085878 GROSS / BRUT TARE NET TIME IN TIME OUT HEURE SORTIE HEURE D'ENTRÉE 13:30 .00 ORDER NUMBER N° DE COMMANDE B/L NUMBER N° DE CONNAISSEMENT 2207581 85695134

2

DATE REQUIRED TIME REQUIRED HEURE REQUISE 04 Jul 2017 00:00:00 NELSON A					INVOICE TO / BUYER FACTURÉ À / ACHETEUR	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT			
			NELSON	AGGR	EGATE COMPANY	n/a			
			FREIGHT T		SHIP, MAG. LIC, PERMIS EXPÉDITEUR		VEHICLE NO. N° DE VÉHICULE		
04 Jul 2017	FOB	Dest'r	n, Own Tr	uck	F-73289		PT 1201	3	
1	SHIP				ROUTING ITINÉRAIRE			MAG, LIC. NO. N° DE PERMIS	
Orica Truck					STANDARD				
QTY. QTÉ.	UM	DG QTY. F	ET'D QTY, SOLD RET. QTÉ, FACT		DESCRIPTION		# OF / DE PKGS.	AMOUNT MONTANT	
245 160 66 72 2 1 1.0 1 200		X X X X X X X X X X X X X X X X X X X	793	*uni *uni *uni Harn LICE LABO ROG Stra TOTA ****	tronic 600-06.0M CU/ZC(20')80F tronic 600-15M C/Z SPL(50')66F tronic 600-30M C/Z SPL(100')36 ess Wire Duplex (6 pack) 400m NSED BLASTER JR CHARGE (ROCK ON GROUND) +-Gh- L GROSS WEIGHT TOTAL PACKAGES **** /WHMIS SDS documents available site: www.oricaminingservices. il: sds.na@orica.com ne: 1-855-26-ORICA (1-855-266-	COM	11	89.425 11.680 11.286 21.168 5.840	

PALLETS USED / PALETTES UTILISÉES	ALLETS RETURNED / PALETTES RETOUR	1	BAGS USE	D / SACS UTILISÉS		
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HO TELEPHONE D'URGENCE/24 HEUR	OUR NUMBER RE NUMERO PLACARDS	OFFERED / PLACARDS O	FFERT FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE		
ERAP 2-1510	1-877-561-	3636 YES/	OUI NO / NON	POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À IND DE CONNAISSEMENT D'ORICA :		
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASS LABELLED, AND ARE IN PROPER CONDITION FOOT TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPOLIS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUE SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CON DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTI	NG TO THE APPLICABLE REGULATIONS OF ORT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES FORMES À LA RÉALITÉ ET AUX RÉGLEMENTS	VALEUR DÉCLARÉE	NETTE No. CONV PRESSAGE WT AGREEMENT NO.	301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5		
CONSIGNARY EXPEDITED T	CARRIER TRANSPORTEUR		CONSIGNEE D	YELSON AGGREGATE COMPANY		
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT	NOM DU CAMIONNEUR	RECEIVER'S NA	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR		
SIGNATURE DATE	SIGNATURE	DATE D/J M/M	SIGNATURE	DATE D/J M/M Y/A		

	Customer:	Nelso	า	Quarry	: Burlington	Blast Number:	17-014 B			
ORICA Blast		t Report		P.O. #:		Orica Order #:	2207581			
The Blasting Professionals	bius	Repor	1	Blast Date: 2017-07-04		Blast Time:	12:46 PM			
page 1	-in-charge: Kev	/in Topllis			(Print Name)	tonnes Blasted:	21,631 te 8,163 m ³			
						Total tonnes per day:	33,601 te TBA Rate Code			
Blas	t Location: Lov	ver middle b	ench		(Bench / Face)	Total Holes Loaded:	36 holes			
GPS Co	oordinates: 4	3.40347	°N Latitude	79.88363	°W Longitude	including:	0 Dead Holes			
	Ce	ntre of Blast	ı ı	Centre of Blast	_	and:	0 Helper Holes			
						Helper Hole Collar: 0.0 ft avg				
Wind fron	n the: SE at	10 kph		Temperature	: 21 to 25 ℃	# Rows Blasted:	3 rows			
		X		Х		- Pattern (Front Row)-				
Clear:		Rain:	Overcast:			Burden:	12.0 ft avg			
Partly Cloudy:	X	Snow:	Inversion:	Ce	iling: 9,144 m	Spacing:	10.5 ft avg			
						# Holes:	11 front row			
- Drilling In	formation -									
	Angle	from Vertical		Non	ninal Bit Diameter:	Burden:	9.0 ft avg			
-	diam: 101.6 mm		Holes: 36	= 2,840.4	,	Spacing:	10.5 ft avg			
Secondary Bit			Holes:		Oft (" diam)	# Holes:	25			
Tertiary Bit	diam:mm	° #	Holes:	= 0.0	Oft (" diam)	Bench Height:	76.9 ft avg			
					7	Sub-drill:	2.0 ft avg			
Bulk Explo		in (kg)	out (kg)	kg		Hole Depth:	78.9 ft avg Poecking - 15.0 ft avg 0.0 ft avg 1 per blast Stemming - 8.0 ft avg 7.0 ft avg 7.5 clear 1 per blast Stemming - 8.0 ft avg 7.0 ft avg 7.1 ft avg 7.1 ft avg 7.2 ft avg 7.3 ft avg 7.4 ft avg 7.5 ft avg 7.7 ft avg 7.7 ft avg			
CENTRA GOL	D 70	29,193	20,540	8,653		-	Decking -			
						Front Row:	15.0 ft avg			
Packaged	Explosives:	cs shipped	cs returned	kg		Main Body:	0.0 ft avg			
						# Stone Decks:	1 per blast			
						- Collar	Stemming -			
Pagatara		 /	#	1		- Collar Front Row:	8.0 ft avg			
Boosters:		Kg /	unit # used	kg or o		Main Body: Material used:	7.0 ft avg			
PENTEX 12 (C	OR EQUIVALENT)		0.34 74	25.2		CC .	re Length -			
						Front Row:	55.9 ft avg			
	total explos	sives weight i	n Blast (kg):	8,678		Main Body:	71.9 ft avg			
	•	Prod (0 kg) %		0.0%			ne Weight -			
Detonators	=	case #'s	ms	# used		Front Row:	163.0 kg/hole			
UNITRONIC 60	00 6M			36		Main Body:	209.7 kg/hole			
UNITRONIC 60	00 30M			38		Max. per delay:	250.0 kg/delay			
						SD () Equation:	0.0 kg/delay			
						Total kg Loaded:	8,678 kg			
						Rock Density:	2.65 g/cc = te/m^3			
Cord & Ac	cessories:		U of M	# used	2		ler Factor -			
HARNES	S WIRE DUPLEX (6 F	· · ·	units	1	1.792 lb/yd ³	Yield PF:	0.401 kg/te (actual)			
	SPIDER STEMMIN	NG PLUG 8"	units	20	1.001 lb/yd ³	Front row:	0.224 kg/te (theoretical)			
Possiur- P	noloument:		units		1.717 lb/yd ³ ##### lb/yd ³	Main Body:	0.384 kg/te (theoretical)			
Resource De		Nata E:					#DIV/0! kg/te (theoretical)			
# of Blasts today (this Quarry) Note Exception		2		riis Biast) - change in Bit , B,	S, Expl or IS from previous Blast:					
# of Blasters (this Blast)		1 2	blaster hours: 7.5							
# of Helpers (this Blast) Note Exception # of MMU's (this Blast)		1	helper hours: 6.5	17-014 A, with a 5 second de	Nav					
Services:			<u>'</u>	Hole A11 was loaded to		oay.				
			1		ar, Hole A1 got a 10ft collar, I	Holes A4±5 not 14ft coller				
GPS LAYOUT Line Item (Hourly Rate) BULK TRUCK CHARGE >/=5,000kg <10,000kg		1	TIOIA ATO GOL A 1411 COIII	ar, riole Ar got a Tutt cullar, I	iolos, A4+3 got 1411 Collat.					
SHOT SERVICE		Line Item (Fee	-	1/2						
SEISMOGRAP		* 1 unit in Sho	·	1/2						
3D LASER PR		Line Item (Hou		1						
BORETRACK		Enter "1" if Bor		0						
LABOUR CHARGE (enter HOURS) Line Item (Fe				14.0						

2017-07-04 Burlington 17-014-B- Lower Middle REPORT



1

Customer:

Nelson

Blast Design

Quarry: P.O. #: Blast Date:

88.0 dB

Burlington 2017-07-04

Blast Number: 17-014 B Orica Order #: 2207581 Blast Time: 12:46 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40345	79.88364
Front Row Corner	43.40335	79.88349
Back Row Corner	43.40362	79.88376
Average (Centre of Blast)	43.40347	79.88363

(N) Radians	(W) Radians
0.757533	1.394232
0.757531	1.394230
0.757536	1.394235
0.757533	1.394232

lst	Seismograph Co-ordinates	Enter ° N Lat.	Enter	r ° W Long.	
	1st Reading				
	2nd Reading				
	Average	0.00000		0.00000	
	Distance (1st Seis. From Centre of Blast)	0.0	m		
	Post Blast Data: ppV:	1.3	mm/s	Trigger set at:	2

(N) Radians	(W) Radians			
0.000000	0.000000			

frequency: Hz

2.0 mm/s V/T/L: T (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

air overpressure: Northwest- colling rd (Nelson monitor)

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.71939	80.38847
	2nd Reading		
	Average	43.71939	80.38847
	Distance (2nd Seis. From Centre of Blast	0.0	m

(N) Radians	(W) Radians
0.763047	1.403043
0.763047	1.403043

Post Blast Data: ppV: 12.2 mm/s frequency: Hz

Trigger set at: 2.0 mm/s V / T / L : ? (Vertical, Transverse or Longitudinal)

95.9 dB air overpressure: 2450 2nd concession (Nelson monitor)

	,		
3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000

(N) Radians	(W) Radians
0.000000	0.000000

0.00000 Average Distance (3rd Seis. From Centre of Blast) **0.0** m Post Blast Data: ppV: 4.2 mm/s Hz frequency: **88.0** dB

Trigger set at: 2.0 mm/s V / T / L : 2 (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

air overpressure: Southwest- Camisle (Nelson monitor)

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$
$$= \frac{(0)^2}{30^2} k$$

= <u>0</u> kg

Orica

Maximum Indicated Charge Weight per Delay =

Blaster-in-charge:

Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate.

Blast Summary Data

Burden: 9.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

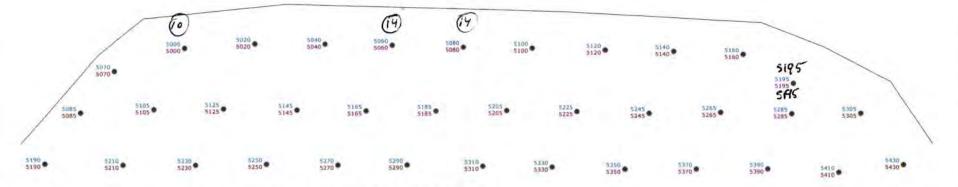
Number of holes: 36 Hole angle: 0.0°

Rock density: 2.65g/cc Total drilled: 2841.9ft Blasted tonnage: 20,509S/T

timing



open face



Lower Middle 17-014 Part B 12x10.5 Front Row, 9x10.5 Body 4" Hole Diamter 250m Elevation + 0.6m subdrill



SHOTPlus 5.6	5.3.6 03/07/2017
Mine	Burlington
Location	Lower Middle Bench
Title/author	Lower Middle 17-014 Part B Ken George
Filename	Blast_17-014_Lower_Middle_Design_Part_B.sr

Burden: 9.0ft

· 9.0ft

Spacing: 10.5ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

Number of holes: 36

Subdrill: 2.0ft

Hole angle: 0.0°

Rock density: 2.65g/cc

Total drilled: 2841.9ft

Blasted tonnage: 20,509S/T

load sheet pc counter: max load 233kg



open face

Lower Middle 17-014 Part B 12x10.5 Front Row, 9x10.5 Body 4" Hole Diamter 250m Elevation + 0.6m subdrill





SHOTPlus 5.6	.3.6 03/07/2017
Mine	Burlington
Location	Lower Middle Bench
Title/author	Lower Middle 17-014 Part B Ken George
Filename	Blast_17-014_Lower_Middle_Design_Part_B.s

Burden: 9.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

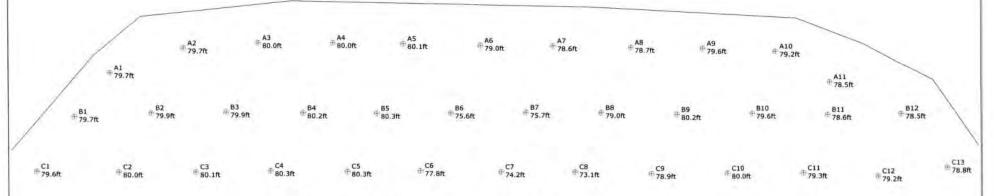
Number of holes: 36

Hole angle: 0.0°

Rock density: 2.65g/cc Total drilled: 2841.9ft Blasted tonnage: 20,509S/T



open face



Lower Middle 17-014 Part B 12x10.5 Front Row, 9x10.5 Body 4" Hole Diamter 250m Elevation + 0.6m subdrill



Not to scale

SHOTPlus !	5.6.4.3 22/0	06/2017
Mine	Burlington	
Location	Lower Middle Bench	
Title/autho	r Lower Middle 17-014 Part B	Ken Ge
Filename	Blast 17-014 Lower Middle D	esign Pa



Orica Order #: P.O. #: 2017-07-04 Design Date: Design te Blasted: 21.631 te Total Holes Loaded: 36 holes ... including: Dead Holes Bench Face) 0 Helper Holes ... and: °W Longitude Helper Hole Collar: 0.0 ft avg # Rows Blasted: 3 rows - Design Paltern (Front Row) Nominal Bit Diameter: Burden: 12.0 ft avg 10.5 ft avg Spacing: 2,840.4 ft (" diam) # Holes: 11 front row 0.0ft (" diam) - Design Pattern (Main Body) -" diam) 0.0 ft (Burden: 9.0 ft avg Spacing: 10.5 ft avg ■ Hidles. 25 maio body Bench Height: 76.9 ft avg Sub-drill: 2.0 ft avg Hole Depth: 78.9 ft avg Front Row: 0.0 ft avg Main Body: 0.0 ft avg - Design Collar Stemming -Front Row: 7.0 ft avg Main Body: 7.0 ft avg Material used: .75 clear Front Row: 71.9 ft avg Main Body: 71.9 ft avg - Design Charge Weight Front Row: 209.7 kg/hole Main Body: 209.7 kg/hole 230.0 kg/delay Max Chge Wt / delay: Required kg Loaded: 8,318 kg Rock Density: $2.65 \text{ g/cc} = \text{te/m}^3$ - Design Powder Factor -Expected Yield PF: 0.385 kg/te (actual) 1.288 lb/yd3 Front row: 0.288 kg/te (theoretical) 1.717 lb/yd Main Body: 0.384 kg/te (theoretical) 1.574 lb/yd3 "KPI" PF: 0.352 kg/te (theoretical) Cost Reduction Notes (this Blast) - change in Bit. B. S. Expl or IS from previous Blast.

Blast Number:

Burlington

17-014 B

LABOUR CHARGE (enter HOURS Must be pre-authorized

SEISMOGRAPH RENTAL

3D LASER PROFILE

BORETRACK

0

O

0

* 1 unit in Shot Service Fee

Enter "1" if 3D Profiled

Enter "1" if Boretraked



Customer:

Nelson

Blast Design

Quarry: P.O. #:

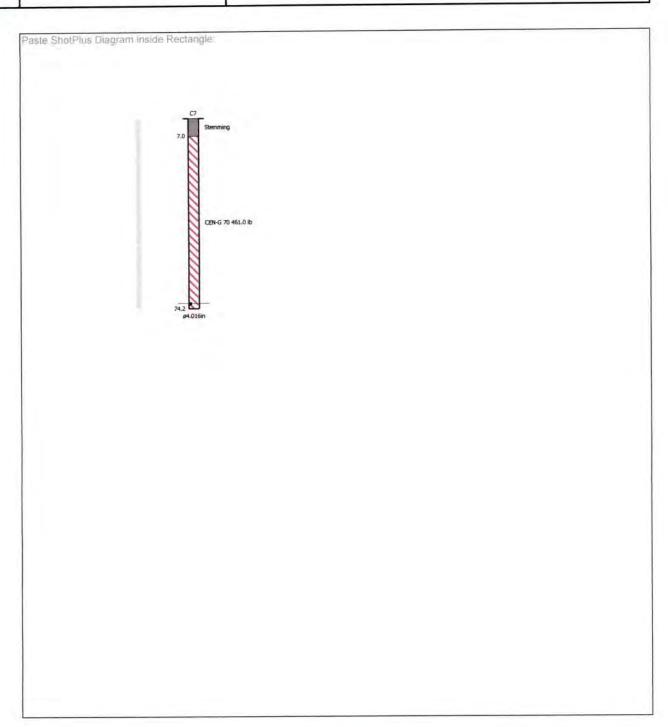
Blast Date:

Burlington

2017-07-04

Blast Number: Orica Order #: 17-014B

page 2



Orica Blaster-in-charge:	Kevin Toplis	
# Quarry Manager:		

3	Customer:	Nelson		Quarry	Burlington	Blast Number:	17-015
ORICA	Dlac	t Report		P.O. #	:	Orica Order #:	2216725
The Blasting Professionals	Dius	Report		Blast Date	2017-07-25	Blast Time:	11:57 AM
page 1 laster	-in-charge: Kev	/in Topllis			(Print Name)	tonnes Blasted:	15,057 te 5,682 m ³
						Total tonnes per day:	15,057 te TBA Rate Code
Blas	t Location: Lov	ver middle be	nch		(Bench / Face)	Total Holes Loaded:	52 holes
GPS Co			N Latitude	79.88376	°W Longitude	including:	3 Dead Holes
		ntre of Blast		Centre of Blast	3	and:	0 Helper Holes
						Helper Hole Collar:	0.0 ft avg
Wind from	m the: NE at	5 kph		Temperature	: 16 to 20 ℃	# Rows Blasted:	4 rows
		X		Х			(Front Row)-
Clear:		Rain:	Overcast:			Burden:	12.0 ft avg
Partly Cloudy:	X	Snow:	Inversion:	Cei	ling: 9,144 m	Spacing:	10.5 ft avg
, ,					3	# Holes:	13 front row
- Drilling In	formation -					'	
	Angle	from Vertical		Nom	ninal Bit Diameter:	Burden:	9.0 ft avg
Primary Bit	diam: 101.6 mm	0° # Ho	oles: 52	= 2,184.0	oft (4 " diam)	Spacing:	10.5 ft avg
Secondary Bit	diam: mm	° # Ho	oles:	= 0.0	Oft (" diam)	# Holes:	39
Tertiary Bit	diam: mm	° # Hc	oles:	= 0.0	oft (" diam)	Bench Height:	40.0 ft avg
					٦	Sub-drill:	2.0 ft avg
Bulk Explo	osives:	in (kg)	out (kg)	kg		Hole Depth:	42.0 ft avg 42.0 ft avg 0.0 ft avg 0.0 ft avg 0 per blast Stemming - 9.0 ft avg 7.0 ft avg 7.0 ft avg 33.0 ft avg 35.0 ft avg
CENTRA GOL	.D 70	27,100	21,270	5,830		- Stone	Decking -
						- Stone Front Row: Main Body:	0.0 ft avg
Packaged	Explosives:	cs shipped c	s returned	kg		Main Body:	0.0 ft avg
				_		# Stone Decks:	0 per blast
						- Collar Front Row:	Stemming -
						Front Row:	9.0 ft avg
Boosters:		kg / ur	nit # used	kg		Main Body:	7.0 ft avg
PENTEX 12 (C	OR EQUIVALENT)		0.34 52	17.7		Material used: - Charge Front Row: Main Body:	.75 clear
,	,					- Charg	re Length -
						Front Row:	33.0 ft avg
	total explo	sives weight in I	Blast (kg):	5,848		Main Body:	35.0 ft avg
	Pkgd	Prod (0 kg) % c	of Total kg:	0.0%		- Charg	e Weight -
Detonator	s:	case #'s	ms	# used		Front Row:	96.2 kg/hole
UNITRONIC 6	00 15M			52		Main Body:	102.1 kg/hole
						Max. per delay:	125.0 kg/delay
						SD () Equation:	0.0 kg/delay
						Total kg Loaded:	5,848 kg
						Rock Density:	2.65 g/cc = te/m^3
Cord & Ac	cessories:		U of M	# used	2		er Factor -
HARNES	SS WIRE DUPLEX (6 I	PACK) 400M	units	1	1.735 lb/yd ³	Yield PF:	0.388 kg/te (actual)
			units		1.136 lb/yd ³	Front row:	0.254 kg/te (theoretical)
			units		1.607 lb/yd ³	Main Body:	0.360 kg/te (theoretical)
Resource De				.1	##### lb/yd ³		#DIV/0! kg/te (theoretical)
	ay (this Quarry)			1	,	his Blast) - change in Bit , B,	S, Expl or IS from previous Blast:
# of Blasters (t				1	blaster hours: 6.5		
# of Helpers (the		Note Exception		2	helper hours: 5.5		
# of MMU's (th	is Blast)			1	Tech hours: GPS 1hr		
Services:							3-11ft A9,10,11-10ft A12-12ft A13-
GPS LAYOUT		Line Item (Hourly	Rate)	1	B1, C1, D1-10ft X1-20ft	X2-12ft X3-10ft	
BULK TRUCK		>/=5,000kg	<10,000kg	1			
SHOT SERVIC	DE FEE *	Line Item (Fee pe	er Blast)	1			
SEISMOGRAF	PH RENTAL	* 1 unit in Shot S	Service Fee				
3D LASER PR	OFILE	Enter "1" if 3D Pr	ofiled	0			
BORETRACK		Enter "1" if Boreti	raked	0			
LABOUR CHA	RGE (enter HOURS)	Line Item (Fee pe	er Hour)	12.0			

2017-07-25 Burlington 17-015 Lower Middle REPORT



1

Customer:

Nelson

Blast Design

Quarry: Burlington P.O. #: Blast Date: 2017-07-25

Blast Number: Orica Order #: Blast Time:

17-015 2216725 11:57 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40393	79.88378
Front Row Corner	43.40406	79.88393
Back Row Corner	43.40385	79.88356
Average (Centre of Blast)	43.40395	79.88376

(N) Radians	(W) Radians
0.757542	1.394235
0.757544	1.394238
0.757540	1.394231
0.757542	1.394235

lst	Seismograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (1st Seis. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	1.1	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

2.0 mm/s V/T/L: frequency: Hz **112.8** dB air overpressure:

T (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

Northwest- colling rd (Nelson monitor)

2nd	Seismograph Co-ordinates	Enter ON Lat.	Enter	° W Long.
	1st Reading	43.71939		80.38847
	2nd Reading			
	Average	43.71939		80.38847
	Distance (2nd Seis. From Centre of Blast	0.0	m	
	Post Plast Data: nn\/:	2.6	mm/a	Tuisman and ad-

(N) Radians	(W) Radians
0.763047	1.403043
0.763047	1.403043

Trigger set at: 2.0 mm/s V / T / L: (Vertical, Transverse or Longitudinal) Post Blast Data ppV: frequency: Hz air overpressure: 91.5 dB

2450 2nd concession (Nelson monitor)

3rd	Seismograph Co-ordina	ates	Enter ° N Lat.	Enter	° W Long.
	1st Reading				
	2nd Reading				
	Average		0.00000		0.00000
	Distance (3rd Seis. From C	entre of Blast)	0.0	m	
	Post Blast Data:	ppV:	2.2	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

2.0 mm/s ? (Vertical, Transverse or Longitudinal) Hz V/T/L: frequency: Trigger set at: 115 dB **88.0** dB air overpressure:

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

Southwest- Camisle (Nelson monitor)

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^{2}}{30^{2}}$$

$$= \frac{(0)^{2}}{30^{2}} kg$$

$$= \frac{0}{900} kg$$

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate.

2017-07-25 Burlington 17-015 Lower Middle

REPORT

Burden: 9.0ft

1st row burden: 12.0ft

Spacing: 10.5ft Hole Diameter: 4.0in

4" Drill Bit

250 Floor Elevation + .6 Sub

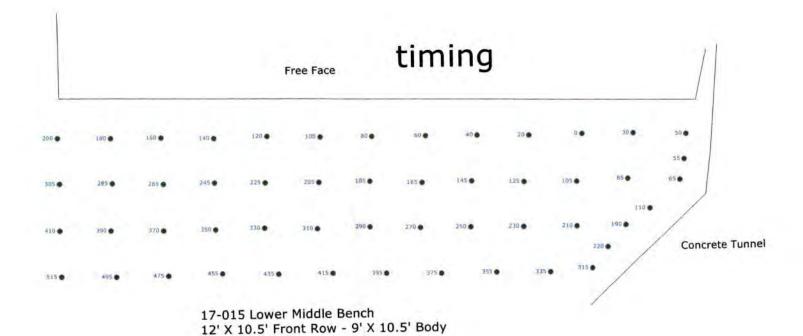
Subdrill: 2.0ft

Stemming: 7.0ft

Total drilled: 2188.5ft

Number of holes: 52

Hole angle: 0.0°





SHOTPlus 5.6	.3.6 24/07/2017
Mine	Burlington
Location	
Title/author	17-015 Lower Middle Bench G. Palcso
Filename	17-015_Lower_Middle_Bench_Final.spf

Burden: 9.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

Subdrill; 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Number of holes: 52

Hole angle: 0.0°

Total drilled: 2188.5ft

> 17-015 Lower Middle Bench 12' X 10.5' Front Row - 9' X 10.5' Body 4" Drill Bit 250 Floor Elevation + .6 Sub

121



SHOTPlus 5.6	.3.6 24/07/2017
Mine	Burlington
Location	
Title/author	17-015 Lower Middle Bench G. Palcso
Filename	17-015_Lower_Middle_Bench_Final.spf

Concrete Tunnel

hil

Burden: 9.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

Number of holes: 52

Total drilled: 2188.5ft

Hole angle: 0.0°

Free Face •41.5ft ●X1 40.9ft ●810 43.5ft ●81 41.0ft

●D3 42.1ft

17-015 Lower Middle Bench 12' X 10.5' Front Row - 9' X 10.5' Body 4" Drill Bit 250 Floor Elevation + .6 Sub



SHOTPlus 5.6	.3.6 24/07/2017
Mine	Burlington
Location	
Title/author	17-015 Lower Middle Bench G. Palcso
Filename	17-015_Lower_Middle_Bench_Final.spf

Concrete Tunnel

●D11 43.2ft

Custo		Nelson	Quarry: P.O. #:	Burlington	Blast Number: Orica Order #:	17-015
ORICA The Blasting Professionals*	Blast D	esign	Design Date:	2017-07-25		
page 1 laster-in-charge	: Kevin	Toplis		(Print Name)	Design te Blasted:	15,057 te
		-			Total Holes Loaded:	52 holes
Blast Location	Lower	middle bench		(Blench Fare)	including:	3 Dead Holes
GPS Coordinates		395 °N Latitude	9.88376	°W Longitude	and:	0 Helper Holes
	Blast	Centre of Blast	A. S.	Helper Hole Collar:	0.0 ft avg	
					# Rows Blasted:	4 rows
- Drilling Information -					- Design Path	ein (Front Row)
	Angle from	Vertical	Nom	inal Bit Diameter:	Burden:	12.0 ft avg
Primary Bit diam: 101.6			2 = 2,184.0	ft (4 " diam)	Spacing:	10.5 ft avg
Secondary Bit diam:		0 * # Holes:	= 0.0	ft (" diam)	# Holes:	13 from row
Tertiary Bit diam:	mm	0 # Holes:	= 0.0	ft (" diam)	Design Patte	em (Main Body) -
					Burden:	9.0 ft avg
					Spacing:	10.5 ft avg
					# Floles	39 main body
					Bench Height:	40.0 ft avg
					Sub-drill:	2.0 ft avg
Bulk Explosives Reg'd:		kg			Hole Depth:	42.0 ft avg
CENTRA GOLD 70	ChargeWt.ex					ang Decking -
	Z. C. G. T. C. C.				Front Row:	0.0 ft avg
Pkgd Explosives Req'd		kg			Main Body:	0.0 ft avg
r nga zapicontos noqu		"g				for Stemming -
					Front Row:	8.0 ft avg
					Main Body:	7.0 ft avg
Boosters Reg'd:	kg/u # use	ed kg			Material used:	
PENTEX 12 (OR EQUIVALENT)	0.34 5	2 17.7				
	1 201				- Design Ch	rarge Length -
					Front Row:	34.0 ft avg
total explosives weight	in Blast (kg)	5,842			Main Body:	35.0 ft avg
Pkgd Prod (0 kg)					- Design Ch	arge Weight -
Detonators Reg'd:	ms	# req'd			Front Row:	99.1 kg/hole
UNITRONIC 600 15M		52			Main Body:	102.1 kg/hole
					Max Chge Wt / delay:	115.0 kg/delay
					Required kg Loaded:	5,842 kg
					Rock Density:	2.65 g/cc = te/m ³
Cord & Access. Reg'd:	U of M	# req'd			- Design Po	wder Factor -
IRE DUPLEX (6 PACK) 400M	units	1			Expected Yield PF:	0.388 kg/te (actual)
	units			1.171 (b/yd)	Front row	0.262 kg/te (theoretical)
	units			1.607 lb/yd3	Main Body	0.360 kg/te (theoretical)
Resource Deployment	2.00			1.498 lb/yd3	"KPI" PF:	0.335 kg/te (theoretical)
# n/ Blasts today (trus Quarry)			1			Expl or IS from previous Blast
# pf Blasters (this Blast)			1	The state of the s		
# of Helpers (this Blast)	Note Except	on	2			
# of MMU's (this Blast)			1			
Services Req'd:			- 24			
BULK TRUCK CHARGE	>/=5,000kg	<10,000kg	1			
SHOT SERVICE FEE *	Line Item (Fe		1			
SEISMOGRAPH RENTAL		not Service Fee	0			
3D LASER PROFILE	Enter "1" if 3		0			
BORETRACK	Enter "1" if E		0			

LABOUR CHARGE (enter HOURS Must be pre-authorized

Bill of Lading / Connaissement

EXPÉDITEUR

Orica Canada Inc. CONSIGNOR

GRAND VALLEY

033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

1086292 GROSS / BRUT TARE NET TIME OUT HEURE SORTIE TIME IN HEURE D'ENTRÉE ORDER NUMBER N° DE COMMANDE B/L NUMBER N° DE CONNAISSEMENT 2216725 85716915

DATE REQUIRED DATE REQUISE TIME REQUIRED HEURE REQUISE									REFERENCE NO. ANDE DU CLIENT	
25 Jul 2017 00:00:00			00 1	FREIGHT	N AGGREGATE COMPANY SHIP, MAG, LIC.			VEHICLE NO.		
EXPÉDIÉ LE			CO	NDITIONS DE		PE	RMIS EXPÉDITEUR	N° D	DE VÉHICULE	
25 Jul 2017	5 Jul 2017 FOR Dest'n Own Truck F-				F-73289	72200 . /60		5		
76.4	SHIP	VIA		VIII 44		1. 10000	ROUTING ITINÉRAIRE		MAG. LIC. NO. N° DE PERMIS	
rica Truck					STANDARD					
QTY. QTÉ.	UM		QTY, RET'D QTÉ, RET.	QTY. SOLD QTÉ. FACT		DESCRIPTIO	N	# OF / DE PKGS.	AMOUNT MONTANT	
AL 10 10	PC PC PC PC PC PC PC	X X		52 0	*uni tronic 6 *uni tronic 6	lire Duplex (6 pack) 400m Lic 600-06.0M CU/ZC(20')80PC Lic 600-15M C/Z SPL(50')66PC PLUGS - PART #6015 BLASTER WARGE			35.770 5.840 5.840 22.572 0.700	
					**** TOTAL GHS/WHMIS SI Website: www Email: sds.r Phone: 1-85	PACKAGES OS documents oricaminio	6	70.722 KG		

PALLETS USED PPALETTES LYTHINGEES A.L. I	NFORMATION	ETS RETURNED- PROFITES RETOLEN	BAGS USED / SACS UTILISÉS				
THIS IS TO CERTIFY THAT THE ABOVE NAMED ATTICL LABELLED, AND ARE IN PROPER CONDITION FOR TITHE NATIONAL TRANSPORTATION AGENCY AND THE NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION SUSMENTIONNÉES DE MÉME QUE LES CONDITIONS DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MIR	ES ARE PROPERLY CLASSIFIED PANSPORTATION ACCORDING DEPARTMENT OF TRANSPORT , L'EMBALLAGE, LE MARQUAGI ET TRANSPORT SONT CONFOR	D, DESCRIBED, PACKAGED, MARKED AND TO THE APPLICABLE REGULATIONS OF I ET L'ÉTIQUETAGE DES MARCHANDISES	TELEPHONE D'URGENCE/24 HEURE NUMERO YES / OUI NO / NON ESCRIBED, PACKAGED, MARKED AND DECLARED VALUE OF SHIPMENT OTHE APPLICABLE REGULATIONS OF VALEUR DÉCLARÉE VALEUR DÉCLARÉE T L'ÉTIQUETAGE DES MARCHANDISES S À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR YES / OUI NO / NON NETTE No. CONV PRESSAGE WIT AGREEMENT NO. CONSIGNEE / DESTINATAIR			FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA BL TO / FAIRE SURRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA: Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5	
CONSIGNOR / EXPÉDITEUR		CARRIER / TRANSPORTEUR				AIRE	
GRAND VALLEY		Orica Truck				REGATE COMPANY	
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EX	PÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR		NEUR RECEIVER'S NAME (PLI		EASE PRINT) / NOM DU RECEVEUR	
SIGNATURE	DATE 25 07 17 D/J M/M Y/	SIGNATURE 7/-//	7	DIJ M/M ZIA	SIGNATURE	DATE D/J M/M Y/	

3	Customer:	Nelson	s	Quarry	Burlington	Blast Number:	17-016			
ORICA	Dlac	t Repor	+	P.O. #	NA NA	Orica Order #:	2232326			
The Blasting Professionals	Dius	i Kepoi	1	Blast Date: 2017-08-30		Blast Time:	12:01 PM			
page 1 laster	-in-charge: Mit	ch Ossingto	n		(Print Name)	tonnes Blasted:	16,211 te 6,118 m ³			
	<u> </u>					Total tonnes per day:	16,211 te TBA Rate Code			
Blas	t Location: Sou	uth face			(Bench / Face)	Total Holes Loaded:	28 holes			
GPS C	oordinates: 4	3.39837	°N Latitude	79.88412	°W Longitude	including:	0 Dead Holes			
Centre of Blast			Centre of Blast		and:	3 Helper Holes				
						Helper Hole Collar:	7.0 ft avg			
Wind from	n the: SW at	5 kph		Temperature	: 21 to 25 °C	# Rows Blasted: 3 rows				
		X		X		- Pattern	(Front Row)-			
Clear:		Rain:	Overcast:			Burden:	10.0 ft avg			
Partly Cloudy:	X	Snow:	Inversion:	Cei	ling: 30000ft m	Spacing:	10.5 ft avg			
						# Holes:	14 front row			
- Drilling In	formation -					- Pattern	(Main Body) -			
		from Vertical			ninal Bit Diameter:	Burden:	10.0 ft avg			
-	diam: 101.6 mm		Holes: 28	= 2,360.4	,	Spacing:	10.5 ft avg			
Secondary Bit			Holes:		Oft (" diam)	# Holes:	14 main body			
Tertiary Bit	diam:mm	° #1	Holes:	= 0.0	Oft (" diam)	Bench Height:	82.3 ft avg			
						Sub-drill:	2.0 ft avg			
Bulk Explo		in (kg)	out (kg)	kg		Hole Depth:	84.3 ft avg 84.0 ft avg 4.0 ft avg 28 per blast Stemming - 10.0 ft avg 7.0 ft avg 1/2" crush 1/2" c			
CENTRA GOL	.D 70	27,280	20,510	6,770		~	Decking -			
						Front Row:	4.0 ft avg			
Packaged	Explosives:	cs shipped	cs returned	kg		Main Body:	4.0 ft avg			
						# Stone Decks:	28 per blast			
							Stemming -			
D						Front Row:	10.0 ft avg			
Boosters:		kg /	unit # used	kg		Main Body:	7.0 ft avg			
PENTEX 12 (C	OR EQUIVALENT)		0.34 112	38.1		Material used: - Charge Front Row: Main Body:	ge Length -			
						Front Row:	70.3 ft avg			
	total evolo	sives weight in	n Blast (kg):	6,808		Main Body:	73.3 ft avg			
	=	Prod (0 kg) %		0.0%			ne Weight -			
Detonator	-	case #'s	ms	# used		Front Row:	205.0 kg/hole			
UNITRONIC 6		0000 # 0	1110	28		Main Body:	213.7 kg/hole			
UNITRONIC 6				28		Max. per delay:	150.0 kg/delay			
UNITRONIC 6				56		SD () Equation:	0.0 kg/delay			
						Total kg Loaded:	6,808 kg			
						Rock Density:	2.65 g/cc = te/m ³			
Cord & Ac	cessories:		U of M	# used		- Powd	er Factor -			
HARNES	S WIRE DUPLEX (6 I	PACK) 400M	units	1	1.876 lb/yd ³	Yield PF:	0.420 kg/te (actual)			
			units		1.412 lb/yd ³	Front row:	0.316 kg/te (theoretical)			
			units		1.472 lb/yd ³	Main Body:	0.330 kg/te (theoretical)			
Resource De	eployment:				1.464 lb/yd ³	"KPI" PF:	0.328 kg/te (theoretical)			
# of Blasts tod	ay (this Quarry)			1	Cost Reduction Notes (t	his Blast) - change in Bit , B,	S, Expl or IS from previous Blast:			
# of Blasters (t	his Blast)			1						
# of Helpers (the	his Blast)	Note Exception		2						
# of MMU's (th	is Blast)			1	Blaster Hours= 6hr					
Services:					Helper Hours= 10hrs					
GPS LAYOUT		Line Item (Hou	• •	1						
BULK TRUCK		>/=5,000kg	<10,000kg	1						
SHOT SERVIC		Line Item (Fee		1						
SEISMOGRAF	PH RENTAL	* 1 unit in Sho	Service Fee	0						
3D LASER PR	OFILE	Line Item (Hou	rly Rate)	1						
BORETRACK		Enter "1" if Bor	etraked	0						
LABOUR CHA	RGE (enter HOURS)	Must be pre-au	thorized							

2017-08-30 South wall 17-016 report REPORT



1

Customer:

Nelsons

Blast Design

Quarry: P.O. #: Blast Date:

Burlington NA 2017-08-30 Blast Number: Orica Order #: Blast Time:

17-016 2232326 12:01 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.39827	79.88426
Front Row Corner	43.39837	79.88413
Back Row Corner	43.39847	79.88398
Average (Centre of Blast)	43.39837	79.88412

(N) Radians	(W) Radians
0.757443	1.394243
0.757444	1.394241
0.757446	1.394238
0.757444	1.394241

		_		_
1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter	r ° W Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (1st Seis. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	1.1	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

frequency: Hz **107.5** dB

air overpressure:

2.0 mm/s V / T / L : T (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

Colling Rd

2nd	Seismograph Co-ordinates	Enter ON Lat.	Enter ° W Long.		
	1st Reading				
	2nd Reading				
	Average	0.00000	0.00000		
	Distance (2nd Seis. From Centre of Blast	0.0	m		
	Deat Discus Date	4 -	/		

(N) Radians	(W) Radians
0.000000	0.000000

Post Blast Data: ppV: 1.5 mm/s frequency: Hz 91.5 dB air overpressure:

2450 #2 sideroad

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter	° W Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	1.5	mm/s	Trigger set at:
	_			

(W) Radians
0.000000

2.0 mm/s V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB frequency: air overpressure: Hz **88.0** dB Camisle

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge: Mitch Ossington

Signature required, indicating that Blast Report is Complete & Accurate.

2017-08-30 South wall 17-016 report REPORT

ORICA The Blasting Profisk skichtats*	Custo	mer: Ne Blast De	sign	Des	Quarry: P.O. #: ign Date:	Burlington NA 2017-08-30	Blast Number: Orica Order #:	17-016
page 1 laster	-in-charge:	Mitch Os	sington		(3	Print Name)	Design te Blasted:	18,157 te
						Total Holes Loaded:	28 holes	
Blas	t Location:	South Fa	ace		(Birinch / Face)		including:	O Dead Holes
GPS Coordinates: 43.39805 °N Latitude			e 79	9.88433 °	W Longitude	and:	3 Helper Holes	
		Centre of B	BST	Cen	tre of Blast		Helper Hole Collar:	7.0 ft avg
							# Rows Blasted:	3 rows
- Dritting In	formation -						■ - Design Patte	ern (Front Row)-
		Angle from Ve	rtical		Nomii	nal Bit Diameter:	Burden:	10.0 ft avg
Primary Bit	diam: 101.6	mm 0;	# Holes:	28 =	2,360.4 ft	(4 " diam)	Spacing:	10.5 ft avg
Secondary Bit	diam:	mm 0 '	# Holes:	=	0.0 ft	,	# Holes:	14 front row
Tertiary Bit	diam:	mm 0'	# Holes:	=	0.0 ft	(" diam)	- Design Patte	rn (Main Body) -
							Burden:	10.0 ft avg
							Spacing:	10.5 ft avg
							# Holes	14 main body
							Bench Height:	82.3 ft avg
							Sub-drill:	2.0 ft avg
Bulk Explosiv	es Req'd:		kg				Hole Depth:	84.3 ft avg
CENTRA GOLD 70	l	ChargeWt.exe	6,500					one Decking -
		1					Front Row:	4.0 ft avg
Pkgd Explosi	ves Req'd:	7	kg				Main Body:	4.0 ft avg
								lar Stemming -
	~ ~ ~ ~ ~ ~ ~ ~						Front Row:	7.0 ft avg
							Main Body:	7.0 ft avg
Boosters Rec		kg/u # used	kg				Material used:	I/Z" Crush
PENTEX 16 (OR E	QUIVALENT)	0.45 112	50.8				Province Ch	iarge Length -
							Front Row:	73.3 ft avg
total avalac	iluna umiaht	in Blast (kg):	6,551				Main Body:	73.3 ft avg
•	-	% of Total kg:	0.0%				-	arge Weight -
Detonators R		ms	# req'd				Front Row:	213.7 kg/hole
UNITRONIC 600 3		1110	56				Main Body:	213.7 kg/hole
UNITRONIC 600 20			28				Max Chge Wt / delay:	130.0 kg/delay
UNITRONIC 600 9			28					, , , , , , , , , , , , , , , , , , ,
							Required kg Loaded:	6,551 kg
		1					Rock Density:	$2.65 \text{ g/cc} = \text{te/m}^3$
Cord & Acces	s. Req'd:	U of M	# req'd				- Design Po	owder Factor -
IRE DUPLEX (6 PA		units	1				Expected Yield PF:	0.361 kg/te (actual)
STEMMING F	LUG MINI	units				1 472 lb/yd ³	Front row:	0.330 kg/te (theoretical)
		units				1 472 lb/yd ³	Main Body:	0 330 kg/te (theoretical)
Resource Deplo	yment					1,472 lb/yd ³	"KPI" PF:	0.330 kg/te (theoretical)
# of Blasts today (t	nis Quarry)				1	Cost Reduction Notes (this Blast) - change in Bit , B, S	Expl or IS from previous Blast
# of Blasters (this E	Blast)				1 1	30 kg in bottom deck.	Bob the top deck to collar.	
# of Helpers (this B	last)	Note Exception	1)	3	2			
# of MMU's (this Blast)			1					
Services Req	'd:							
BULK TRUCK CHA	ARGE	>/=5,000kg	<10,000kg		1			
SHOT SERVICE F	EE *	Line Item (Fee	per Blast)	1				
SEISMOGRAPH R	ENTAL	* 1 unit in Shot	Service Fee		1			
3D LASER PROFIL	E	Line Item (Fee	per Blast)		1			
BORETRACK		Enter "1" if Bor	etraked					
LABOUR CHARGE	(enter HOUR	S Must be pre-au	thorized					



Customer:

Nelsons

Blast Design

Quarry:

Blast Date:

P.O. #:

Burlington

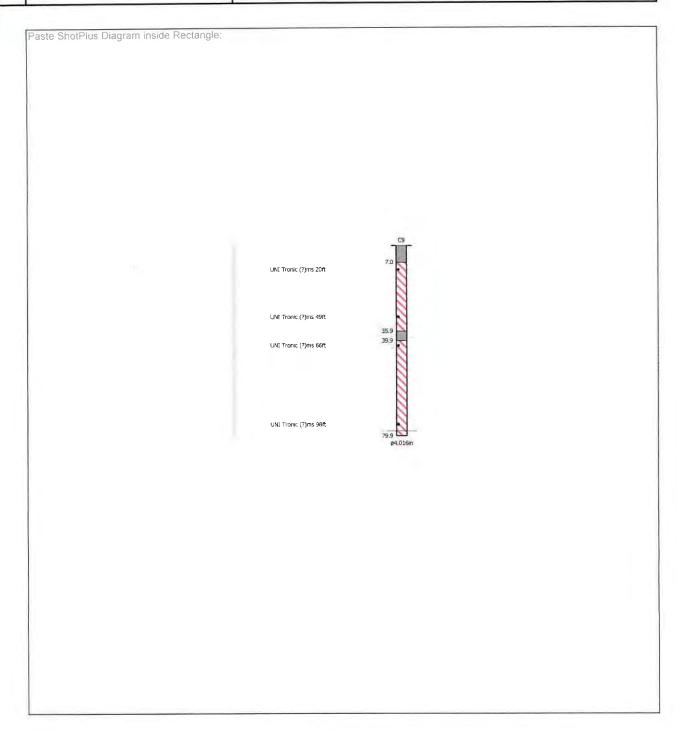
2017-08-30

Blast Number:

17-019

Orica Order #:

page 2



Orica Mitch Ossington Blaster-in-charge: Quarry Manager:

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.

FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES

SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

Orica Canada Inc.

CONSIGNOR EXPÉDITEUR GRAND VALLEY

033411 SIDE ROAD 21-22

GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

1086863 GROSS / BRUT TARE NET TIME IN TIME OUT HEURE D'ENTRÉE HEURE SORTIE 1230 ORDER NUMBER B/L, NUMBER N° DE CONNAISSEMENT N° DE COMMANDE 2232326 85752392

DATE REQUIRED DATE REQUISE							CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT		
DATE SHIPPED FREIO		FREIGHT T NDITIONS DE		VEHICLE NO. N° DE VÉHICULE					
30 Aug 2017	FOR SHIP RANSP	VIA		Own Tr	uck F-73289 ROUTING TINÉRAIRE		MAG. LIC. NO. N° DE PERMIS		
in the					GP3 ND A DD				
rica Truck OTY. OTE.	UM	DG MD		QTY, SOLD QTÉ, FACT	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT		
2 80 66 72 100	PC PC PC PC PC PC PC PC	X	64 528 100	28 28 56	PENTEX BC 340 (49/CS) Harness Wire Duplex (6 pack) 400m *uni tronic 600-06.0M CU/ZC(20')80PC *uni tronic 600-20M CU/ZC SPL(65')66P *uni tronic 600-30M C/Z SPL(100')36P MINI STEM PLUGS - PART #6015 LICENSED BLASTER LABOUR CHARGE ROG (ROCK ON GROUND)	4 1 1 2	71.540 5.840 5.840 13.464 21.168 0.700		
					TOTAL GROSS WEIGHT		18.552 KG		
					**** TOTAL PACKAGES **** GHS/WHMIS SDS documents available Website: www.oricaminingservices.com Email: sds.na@orica.com Phone: 1-855-26-ORICA (1-855-266-7422)	9			

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TELEPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OF YES / OL	I NO / NON	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA:		
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIF LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPONOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUE SUSMENTIONNÉES DE MÉME QUE LES CONDITIONS DE TRANSPORT SONT CONFIDE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.	IED, DESCRIBED, PACKAGED, MARKED AND DECLARED VALUI NG TO THE APPLICABLE REGULATIONS OF VALEUR DÉCLARE DRT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES SOMMES À LA RÉALTÉ ET AUX RÉGLEMENTS	E P	ETTE No. CONV RESSAGE T AGREEMENT NO.	Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5		
CONSIGNOR / EXPÉDITEUR GRAND VALLEY	Orica Truck			CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY		
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIN	ONNEUR	RECEIVER'S NAME (PLE	ASE PRINT) / NOM DU RECEVEUR		
SIGNATURE DATE	SIGNATURE	D/J M/M	SIGNATURE	DATE D/J M/M Y/A		
				AND CONDITIONS ON THE DAOK		

PACLETS USED / PALETTES LITUISPES I. INFORMATIO PALETS RETURNED / PALETTES RETOURNEES

BAGS USED / SACS UTILISÉS

Burden: 10.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

Stemming: 7.0ft

SHOTPlus 5.6.2.7

Burlington

17-016 South Wall Final G. Palcso

17-016 South Wall Final Timing.spf

Mine

Location

Filename

Title/author

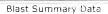
1st row burden: 10.0ft Total drilled: 2362.0ft Number of holes: 28

Hole angle: 0.0°

29/08/2017

MARKED.

Scale 1:175



Burden: 10.0ft 1st row burden: 10.0ft Spacing: 10.5ft

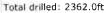
Hole Diameter: 4.0in

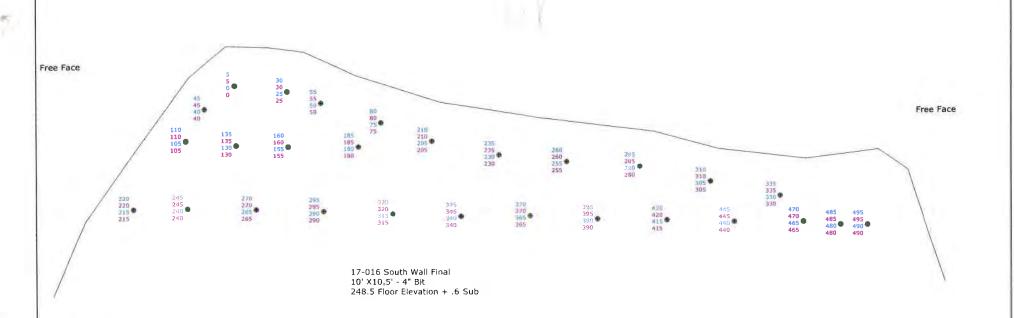
Subdrill: 2.0ft

Stemming: 7.0ft

Number of holes: 28

Hole angle: 0.0°







Sca	_	1	1	7	5
Sca	Ę		 т	,	J

SHOTPlus 5.6	5.2.7 29/08/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-016 South Wall Final Timing.spf

Burden: 10.0ft 1st row burden: 10.0ft Spacing: 10.5ft

over drilled 2' needs to be back filled.

Hole Diameter: 4.0in

Subdrill: 2.0ft

Stemming: 7.0ft

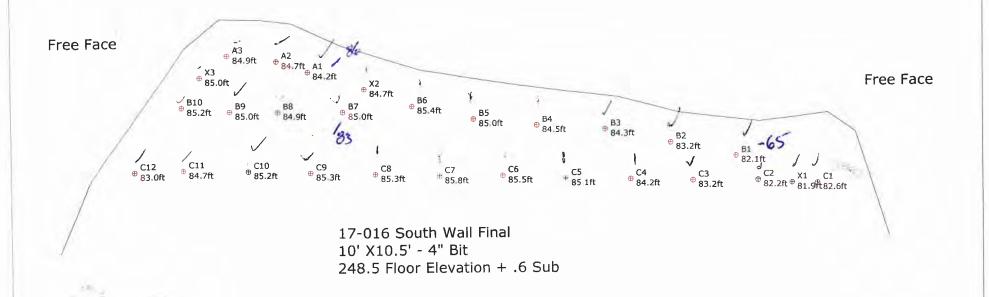
Total drilled: 2362.1ft

Number of holes: 28

Hole angle: 0,0°

0.02000300

Hole din





ShotPlus5 5.2.29.0 13/07/2017

Mine Burlington

Location

Title/author 17-016 South Wall Final G. Palcso

Filename 17-016 South Wall Final.spf

Not to scale

1

3	Customer:	Nelsor	1	Quarry	: Burlington	Blast Number:	17-017
ORICA	Rlas-	t Repor	+	P.O. #	:	Orica Order #:	2220757
The Blasting Professionals	Dias	ГКерог	1	Blast Date	: 2017-08-03	Blast Time:	12:41 PM
page 1 laster	-in-charge: Kev	vin Topllis			(Print Name)	tonnes Blasted:	11,832 te 4,465 m ³
					_	Total tonnes per day:	11,832 te TBA
		oer middle b			(Bench / Face)	Total Holes Loaded:	23 holes
GPS Co		3.40358	N Latitude	79.88363	[™] W Longitude	including:	2 Dead Holes
	Ce	ntre of Blast		Centre of Blast		and:	0 Helper Holes
						Helper Hole Collar:	0.0 ft avg
Wind fror	n the: N at	0 kph		Temperature	26 to 30 ℃	# Rows Blasted:	4 rows
01		D . X		X			(Front Row)-
Clear: Partly Cloudy:	×	Rain: Snow:	Overcast: Inversion:		iling: 9,144 m	Burden: Spacing:	12.0 ft avg 10.5 ft avg
railly Gloudy.	^	SHOW.	inversion.		iling: 9,144 m	# Holes:	4 front row
- Drilling In	formation -						
		from Vertical			ninal Bit Diameter:	Burden:	9.0 ft avg
-	diam: 101.6 mm		Holes: 7	= 539.7	,	Spacing:	10.5 ft avg
=	diam: 114.3 mm		Holes: 6	= 462.6	,	# Holes:	19
Tertiary Bit	diam: 127.0 mm	° # ŀ	Holes: 8	= 616.8	3 ft (5 " diam)	Bench Height:	75.1 ft avg
- ·					7	Sub-drill:	2.0 ft avg
Bulk Explo		in (kg)	out (kg)	kg		Hole Depth:	77.1 ft avg
CENTRA GOL	D 70	31,090	25,230	5,860			77.1 ft avg Pocking - 0.0 ft avg 0.0 ft avg per blast Stemming - 9.0 ft avg 8.0 ft avg 75 clear Pe Length - 68.1 ft avg 69.1 ft avg
Dookogod	Evalosivos		as vetureed	len.		Front Row:	0.0 ft avg
Раскадео	Explosives:	cs shipped	cs returned	kg		Main Body:	0.0 ft avg
						# Stone Decks.	Stemming -
						- Collar Front Row:	9.0 ft avg
Boosters:		ka /	unit # used	kg			8.0 ft avg
	R EQUIVALENT)		0.34 46	15.6		Motorial used:	.75 clear
	,					T I	ge Length -
						Front Row:	68.1 ft avg
	total explo	sives weight in	n Blast (kg):	5,876		≝ Main Body:	69.1 ft avg
	Pkgd	Prod (0 kg) %	of Total kg:	0.0%		- Charg	ge Weight -
Detonators	s:	case #'s	ms	# used		Front Row:	198.6 kg/hole
UNITRONIC 60				26		Main Body:	201.5 kg/hole
UNITRONIC 60	00 9M			20		Max. per delay:	
						SD () Equation:	0.0 kg/delay
						Total kg Loaded:	5,876 kg
						Rock Density:	2.65 g/cc = te/m ³
Cord & Ac	cessories:		U of M	# used		- Powe	ler Factor -
	S WIRE DUPLEX (6 I	PACK) 400M	units	# useu	2.218 lb/yd ³	Yield PF:	
HAINES	SPIDER STEMMII		units	2	1.249 lb/yd ³	Front row:	3 ()
			units		1.690 lb/yd ³	Main Body:	9.11 (. 11111)
Resource De	ployment:				##### lb/yd ³		#DIV/0! kg/te (theoretical)
# of Blasts toda	ay (this Quarry)			1	Cost Reduction Notes (t	his Blast) - change in Bit , B,	S, Expl or IS from previous Blast:
# of Blasters (t	his Blast)			1	Blaster hours: 7		
# of Helpers (th	nis Blast)			1	helper hours: 6		
# of MMU's (thi	is Blast)			1	B1 and X1 are 6"		
Services:					Ajusted collars to holes:	A1-23ft, A2-16ft, A3-14ft, A4	-16ft, A5-20ft, B1-20ft, C1-15ft
GPS LAYOUT		Line Item (Hou	ly Rate)	1	C6-load to 63ft 10ft colla	ar, D1-20ft, D7-12ft, D8-12ft,	X1 load to 35ft 10ft collar, X2-28ft
BULK TRUCK	CHARGE	>/=5,000kg	<10,000kg	1	Holes C6, X1 and X2 go	t 2 30m uni,	
SHOT SERVIC	E FEE *	Line Item (Fee	per Blast)	1			
SEISMOGRAP	H RENTAL	* 1 unit in Shot	Service Fee				
3D LASER PR	OFILE	Line Item (Hou	ly Rate)	1			
BORETRACK		Enter "1" if Bor	etraked	0			
LABOUR CHA	RGE (enter HOURS)	Line Item (Fee	per Hour)	13.0			

2017-08-03 Burlington 17-017 Upper Middle REPORT



1

Customer:

Nelson

Blast Design

Quarry: P.O. #: Blast Date:

dΒ

Burlington 2017-08-03 Blast Number: Orica Order #: Blast Time: 17-017 2220757 12:41 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40358	79.88365
Front Row Corner	43.40365	79.88370
Back Row Corner	43.40350	79.88355
Average (Centre of Blast)	43.40358	79.88363

(N) Radians	(W) Radians
0.757535	1.394233
0.757537	1.394234
0.757534	1.394231
0.757535	1.394232

lst	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (1st Seis. From Centre of Blast)	0.0	m
	Deat Discus Date	31.4	/

(N) Radians	(W) Radians
0.000000	0.000000

Trigger set at:

V / T / L:

Trigger set at:

Trigger set at:

115 dB

air overpressure: trigger
Northwest- colling rd (Nelson monitor)

 2nd
 Seismograph Co-ordinates
 Enter ° N Lat.
 Enter ° W Long.

 1st Reading
 43.71939
 80.3884

 2nd Reading
 80.3884

(N) Radians (W) Radians 0.763047 1.403043 0.763047 1.403043

 Average
 43.71939

 Distance (2nd Seis. From Centre of Blast Post Blast Data:
 0.0 mm/s

 Frequency:
 42.9 mm/s

 Hz
 Hz

Trigger set at: 2.0 mm/s V / T / L : (Vertical, Transverse or Longitudinal)

80.38847

air overpressure: 88.0 dB Trigger set at: 115 dB 2450 2nd concession (Nelson monitor)

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		

(N) Radians	(W) Radians
0.000000	0.000000

 2nd Reading
 0.00000
 0.00000

 Average
 0.00000
 0.00000

 Distance (3rd Seis. From Centre of Blast)
 0.0
 m

 Post Blast Data:
 ppV:
 1.3
 mm/s
 Trigger set at:

 frequency:
 Hz
 V/T/L:

Trigger set at: 2.0 mm/s V / T / L : 7 (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

air overpressure: Southwest- Camisle (Nelson monitor)

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$
$$= (0)^2$$

88.0 dB

= (0)² kg

= <u>0</u> kg

Maximum Indicated Charge Weight per Delay =

tion to see

Orica

Blaster-in-charge:

Kevin Toplis
Signature required, indicating that

Blast Report is Complete & Accurate.

Burden: 9.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

Number of holes: 23

Hole angle: 0.0°

Rock density: 2.65g/cc

Total drilled: 1775.1ft

Blasted tonnage: 18,4535/T

Timing

A2, A3, B4, B5, D7, and D8 are 4.5" Diameter A1, B1, C1, D1, X1, X2, B6, and C6 are 5" Diameter all other holes drill 4" Diameter

open face



Upper Middle 17-017 Final 12x10.5 9x10.5 Pattern 4" - 4.5" - 5" Hole Diameter 250m Elevation + 0.6m Subdrill



SHOTPlus 5.6.3.6 03/08/2017

Mine
Location

Title/author Middle/ Upper 17-015 Design G. Palcso
Filename 17-017_Upper_Middle_Final.spf

Burden: 9.0ft

1st row burden: 12.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

Rock density: 2.65g/cc

Hole Diameter: 4.0in

Number of holes: 23

Hole angle: 0.0°

/cc Total drilled: 1775.1ft Blasted tonnage: 14,442S/T

0-6" D-5" A-4.5"

A2, A3, B4, B5, D7, and D8 are 4.5" Diameter A1, B1, C1, D1, X1, X2, B6, and C6 are 5" Diameter all other holes drill 4" Diameter

load sheet pc counter:

open face

255 -231 -295 -231 -245 -240 -274 -261 -263 -246 -2633 -246 -2633

Upper Middle 17-017 Final 12x10.5 9x10.5 Pattern 4" - 4.5" - 5" Hole Diameter 250m Elevation + 0.6m Subdrill

5731 kgs



SHOTPlus 5.6.3.6 03/08/2017
Mine
Location
Title/author Middle/ Upper 17-015 Design G. Palcso

Filename 17-017_Upper_Middle_Final.spf



ORICA The Bastry Professionals*	Blast De	Nelson Esign		uarry: P.O. #: Date:	Burlington 2017-08-03	Blast Number: Orica Order #:	17-017 2220757
page 1 laster-in-char	ge: Kevin 1	oplis		(Min	(Autro)	Design te Blasted:	11,670 te
						Total Holes Loaded:	23 holes
Blast Locati	ion: Upper i	niddle bench			dy(Taen)	including:	2 Dead Holes
GPS Coordinat	tes: 43.403	58 °N Latitud	79.88	363 °W	Longitude	and:	0 Helper Holes
	Control of		Centre of			Helper Hole Collar:	0.0 ft avg
						# Rows Blasted:	4 rows
Drilling Informatic	Ü1					- Design Patti	am (Front-Row)-
	Anglé from V	ertical		Nominal	Bit Diameter:	Burden:	12.0 ft avg
Primary Bit diam: 10	1.6 mm 0	# Holes:	9 =	693.9 ft (4 " diam)	Spacing:	10.5 ft avg
Secondary Bit diam: 11	4.3 mm 0	# Holes:	6 =	462.6 ft (4 1/2 " diam)	# Holes:	3 from row
Tertiary Bit diam: 12	7.0 mm 0	# Holes:	8 =	616.8 ft (5 " diam)	- Design Patte	m (Mein Body)-
						Burden:	9.0 ft avg
						Spacing:	10.5 ft avg
						# Holes	20 main body
						Bench Height:	75.1 ft avg
						Sub-drill:	2.0 ft avg
Bulk Explosives Req	'd: ChargeWt.exe	kg				Hole Depth:	77.1 ft avg
ENTRA GOLD /U	Chargevvi.exe					Front Row:	0.0 ft avg
kgd Explosives Red	ı'd.	kg				Main Body:	0.0 ft avg
ngu Explosives Net		ng .					lar Stemming -
						Front Row:	8.0 ft avg
						Main Body:	7.0 ft avg
Boosters Reg'd:	kg/u # used	kg				Material used:	The second second second
PENTEX 12 (OR EQUIVALEN		17.7					
							large Length -
						Front Row:	69.1 ft avg
total explosives weigh		18				Main Body:	70.1 ft avg
	g) % of Total kg:						arge Weight -
Detonators Req'd:	ms	# req'd				Front Row:	201.5 kg/hole
INITRONIC 600 30M		23				Main Body:	204.4 kg/hole
						Max Chge Wt / delay:	kg/delay
						Required kg Loaded:	18 kg
						Rock Density:	2.65 g/cc = te/m ³
Cord & Access. Req'	d: U of M	# req'd					waar Factor -
RE DUPLEX (6 PACK) 400M	units	- 1				Expected Yield PF:	0.002 kg/te (actual)
	units				1.267 lb/yd3	Front row.	0.284 kg/te (theoretical
	units				1.714 lb/yd²	Main Body	0.384 kg/te (theoretical
Resource Deployment				6	1.603 lb/yd ³	"KPI" PF:	0.359 kg/te (theoretical
of Blasts today (this Quarry)			1	Cost	Reduction Notes (t	his Blast) - change in Bit. B. S.	Expl or IS from previous Blast
of Blasters (this Blast)			1				
of Helpers (this Blast)	Note Exception	Y	2				
of MMU's (this Blast)			1				
Services Req'd:	The state						
BULK TRUCK CHARGE	<2,000kg						
HOT SERVICE FEE *	Line Item (Fee		1				
EISMOGRAPH RENTAL	* 1 unit in Sho		0				
D LASER PROFILE	Enter "1" if 3D		0				
ORETRACK	Enter "1" if Bo	etraked	0				

LABOUR CHARGE (enter HOURS Must be pre-authorized



Customer:

Nelson

Blast Design

Quarry: P.O. #:

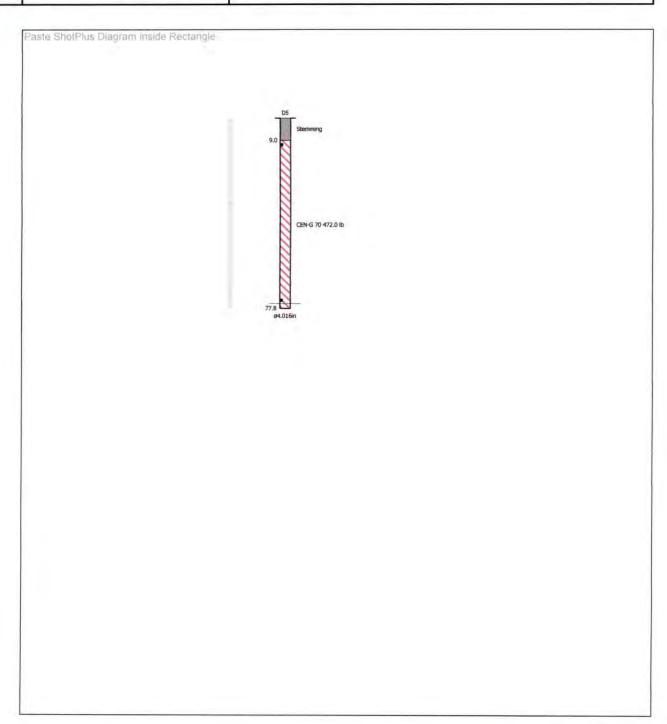
Blast Date:

Burlington

2017-08-03

Blast Number: Orica Order #: 17-017

page 2



Orica
Blaster-in-charge: Kevin Toplis

#
Quarry Manager:

Burden: 9.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 12.0ft

Hole Diameter: 4.0in

Number of holes: 23

Hole angle: 0.0°

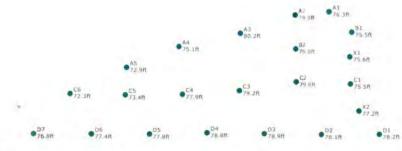
Rock density: 2.65g/cc

Total drilled: 1775.1ft

Blasted tonnage: 14,442S/T

A2, A3, B4, B5, D7, and D8 are 4.5" Diameter A1, B1, C1, D1, X1, X2, B6, and C6 are 5" Diameter all other holes drill 4" Diameter

open face



●78.8ft

Upper Middle 17-017 Final 12x10.5 9x10.5 Pattern 4" - 4.5" - 5" Hole Diameter 250m Elevation + 0.6m Subdrill



SHOTPlus 5.6	.3.6 03/08/2017
Mine	
Location	The state of the s
Title/author	Middle/ Upper 17-015 Design G. Palcso
Filename	17-017_Upper_Middle_Final.spf

Burden: 9.0ft 1st row burden: 12.0ft

Not to scale

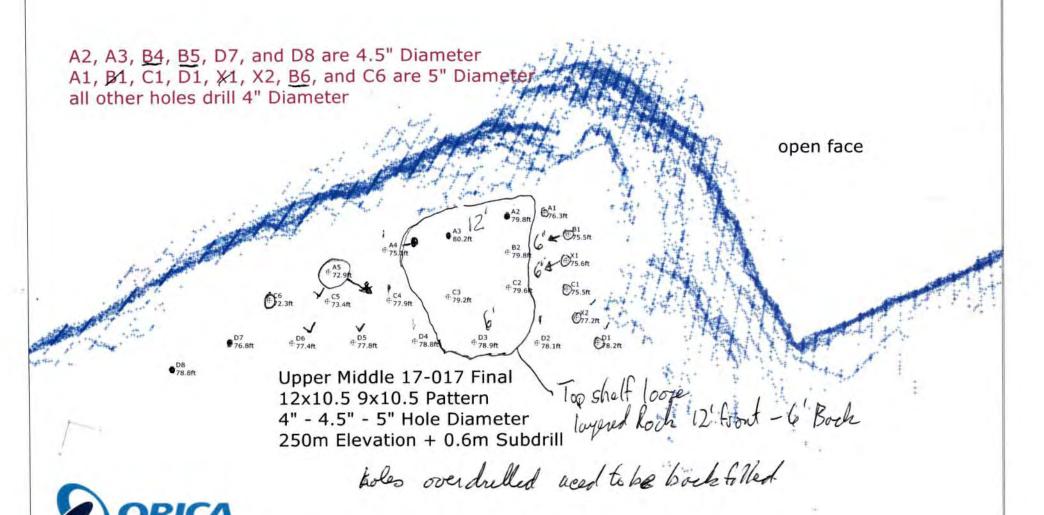
Spacing: 10.5ft Hole Diameter: 4.0in Subdrill: 2.0ft

Stemming: 7.0ft Hole angle: 0.0°

Rock density: 2.65g/cc

Number of holes: 23

g/cc Total drilled: 1775.1ft Blasted tonnage: 14,442S/T



INDEMNITY & RELEASE AGREEMENT

Orica	Orica Canada Inc., a Canadian corporation with its principal place of business at 301 Hotel de Ville, Brownsburg, Quebec J8G 3B5 ("Orica")
Customer	Cox Construction Limited, with a place of business at 965 York Road, Guelph, Ontario Canada.
Date	June 1, 2017
Site	Nelson Aggregates, Burlington Quarry
Blasting Plan	Crushing production requires that a the crushing plant and other equipment and property be left in the designated blast area during the blast. Crusher is 64 meters from blast.

Subject to the terms and conditions of this Indemnity & Release Agreement (this "Agreement"), Orica has agreed to perform certain blasting services (the "Services") for Customer in accordance with the Blasting Plan. Customer recognizes and acknowledges that the performance of the Services in accordance with the Blasting Plan, despite the use of best practices, subjects Orica and Customer to increased risks (a) that the intended blasting results will not be obtained, and (b) of injury and/or death to persons and damage and/or destruction to real and personal property, including without limitation. any property listed above in the Blasting Plan.

Customer, for itself and its parent companies, subsidiaries, shareholders, affiliates and each of their respective agents, representatives, managers, members, directors, officers, employees, heirs, executors, successors and assigns (the "Customer Parties"), shall forever release, discharge, defend and indemnify Orica, its direct and indirect shareholders, subsidiaries, affiliates and parent companies, and each of their respective agents, representatives, managers, members, directors, officers, employees, successors and assigns (collectively, the "Orica Parties"), of, from and against each and every claim made, asserted or threatened and any and all disputes, suits, losses, demands, actions, causes of action, damages, compensation, costs, fees, expenses, interest, awards, judgment, diminution in value, fines, contracts, covenants. obligations, liens, debts and liabilities of every kind and nature whatsoever, presently known or unknown, that the Customer Parties or any third party may now or in the future claim, assert or have, whether in tort, contract, law, equity or otherwise, against the Orica Parties, resulting from, arising out of or relating in any way to the performance of the Services in accordance with the Blasting Plan.

This Agreement constitutes the entire agreement between Customer and Orica with respect to all matters referred to herein and there is no other understanding, agreement, warranty or representation whether express or implied (whether by statute or otherwise) in any way extending, defining or otherwise relating to this Agreement. This Agreement may only be varied or amended by an agreement in writing between Orica and Customer. This Agreement shall be governed and construed in accordance with the laws of the Province of Ontario, without reference to its rules regarding conflicts of laws. This Agreement may be executed by electronic signature and in one or more counterparts.

Cox Constuction Limited

Name: Bill white
Title: Super

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY, FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Orica Canada Inc.

CONSIGNOR EXPÉDITEUR

GRAND VALLEY

033411 SIDE ROAD 21-22

GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

86458
HEURE SORTIE
1.00 B/L NUMBER
Nº DE CONNAISSEMENT

PAGE 2

DATE REQUIRED DATE REQUISE		TIME REQUIRED HEURE REQUISE				TO / BUYER À / ACHETEUR			REFERENCE NO. IANDE DU CLIENT
DATE SHIPPED EXPEDIT LE		CONDITIO		NELSON ACCREGATE COMPAN FREIGHT TERMS CONDITIONS DE LIVRAISON		SHIP, MAG. LIC, PERMIS EXPÉDITEUR	n/e	VI	EHICLE NO. DE VÉHICULE
03 Aug 2017	SHIP	VIA		Own Ti	ruck	F-73289 ROUTING			MAG. LIC. NO. Nº DE PERMIS
Ossi an Managh					CITIANTORDO				
Orica Truck	UM	DG MD	QTY, RET'D	QTY, SOLD QTÉ, FACT	STANDARD	DESCRIPTION		# OF / DE PKGS.	AMOUNT MONTANT
147 2 60 66 72 100 1	PC PC PC PC PC	XXXX	40	46 200 262	*uni tronic 60 *uni tronic 60	uplex (6 pack) 400m 0-09.0M CU/ZC(30')60P 0-15M C/Z SPL(50')66P 0-30M C/Z SPL(100')36 S - PART #6015	C	3 1 1 2	53.655 5.840 5.880 11.286 21.168 0.700
					GHS/WHMIS SDS Website: www. Email: sds.na	PACKAGES **** S documents available .oricaminingservices.		8	98.529 KG

Bill of Lading / Connaissement

24FTHOUR ATREMNTEAL INFO		BAGS USED / SACS	UTILISÉS						
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLA		MERGENCY RESPONSE NO.24 HOUR NOTELEPHONE D'URGENCER4 HEURE NU	YES		NO / NON	FORWARD INVOICE FO QUOTING ORICA BAL TO / POUR EXPÉDITION PORT NO DE CONNAISSEMENT D	PAYÉ EN D'ORICA :	AE FACT	TURE
THIS IS TO CERTIFY THAT THE ABOVE MANED ARTICLES ARE LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION AGENCY AND THE DEPAINOUS CERTIFICION, QUE LA CLASSE, LA DESCRIPTION, L'EMPAISUMENTIONNÉES DE MÊME QUE LES CONDITIONS OF THE DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈR	ORTATION ACCORDING TO RTMENT OF TRANSPORT. BALLAGE, LE MARQUAGE ET INSPORT SONT CONFORME!	THE APPLICABLE REGULATIONS OF VALE L'ÉTIQUETAGE DES MARCHANDISES \$	SUPPLIEVALUE OF SHIPMENT	PRESS	No. CONV AGE REEMENT NO.	Orica Canada I 301 rue hotel Brownsburg-Cha J8G 3B5	de vi		
CONSIGNOR / EXPÉDITEUR		CARRIER / TRANSPORTEUR			CONSIGNEE / DESTINAT	AIRE			
GRAND VALLEY		Orica Truck			NELSON AGG	REGATE COMPAI	YY		
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDIT	TEUR	Trister New New	M DU CAMIONNEUR		RECEIVER'S NAME (PLE)	SE PRINT) / NOM DU RECEVE	EUR		
SIGNATURE	DATE 3 8 17	SIGNATIVE	DATE & S	17	SIGNATURE		DATE	MM	Y/A
ORIGINAL - NOT NEGOTIABLE ORIGINAL - NON NEGOCIABLE	HOPPER AND CARRYERS	ES SHIPTING CONTRACT IS TO BE SIGNED BY IT O'LUPÉDITION PAR MESSAGERIES DOIT ÉTA HEPORTYUR)		BJECT	TO ALL THE TERMS DES CONDITIONS E	AND CONDITIONS OF T RESTRICTIONS ENU	THE B	ACK AU VEF	

ORICA The Blacking Protest Foods	Customer:	Nelson t Report	-	Quarry: P.O. #: Blast Date:	Burlington 2017-08-28	Blast Number: Orica Order #: Blast Time:	17-018 2230835 12:32 PM
4		4 S W			Escape de la constante de la c	town District	26,351 te 9,944 m
plaster-	in-charge: Key	in Toplis			(Print Name)	tonnes Blasted: Total tonnes per day:	26,351 te 9,944 m ²
Rlact	Location: Flo	or			(Bench / Face)	Total Holes Loaded:	167 holes
			% Latitude	79.92779	*W Longitude	including:	8 Dead Holes
GI 0 00		ntre of Blast	IV Latitudo	Centre of Blast	W Longhous	and:	0 Helper Holes
						Helper Hole Collar:	0.0 ft avg
Wind from	the: W at	5 kph		Temperature:	21 to 25 ℃	# Rows Blasted:	8 rows
	1	X		×		- Pattern	Front Row)-
Clear:		Rain:	Overcast:			Burden:	11.5 ft avg
artly Cloudy:	X	Snow:	Inversion:	Ceil	ing:9,144 m	Spacing:	11.5 ft avg
						# Holes:	26 front row
- Drilling Info	ormation -						
		from Vertical			ninal Bit Diameter:	Burden:	11.5 ft avg
	liam: 101.6 mm		loles: 188	= 3,327.6	,	Spacing:	11.5 It avg
econdary Bit o	700		loles:		ft (" diam)	# Holes: Bench Height:	26,325
Tertiary Bit o	liam: mm	# 1	loles:	= 0.0	ft (" diam)	2.5 A. A. B. C. W.	16.7 ft avg
Dulle Event	shvor	in the	and the s	44		Sub-drill:	1.0 It avg 17.7 It avg
Bulk Explos		in (kg) 27,130	out (kg) 21,910	kg 5,220		(D)	Decking -
CENTRA GOLD	70	27,130	21,910	5,220		Front Row:	0.0 It avg
Packaged E	vnlociuse:	cs shipped	cs returned	kg		Main Body:	0.0 It avg
Packageu E	xpiosives.	cs snipped	CS TEILITHEO	v.A		# Stone Decks:	0 per blast
							Stemming -
						Front Row:	7.0 ft avg
Boosters:		kg /	unit #used	kg		Main Body:	7.0 ft avg
	R EQUIVALENT)	100	0.34 167	56.8		Material used:	3/4 Clear
						A CONTRACTOR OF THE PARTY OF TH	e Length -
						Front Row:	1.0 It avg 17.7 ft avg Docking 0.0 It avg 0 per blast Stemming 7.0 it avg 7.0 it avg 3/4 Clear e Length - 10.7 ft avg
	total explo	sives weight in	n Blast (kg):	5,277		Main Body:	10.7 it avy
	Pkgd	Prod (0 kg) %	of Total kg;	0.0%		-	e Weight
Detonators	:	case #'s	ms	# used		Front Row:	31.2 kg/hole
EXEL HANDIDI	ET 12m		25/500	167		Main Body:	31.2 kg/hole
CONNECTADE			42 ms	31		Max. per delay:	45.0 kg/delay
UNITRONIC 60				1		SD () Equation:	0.0 kg/delay
CONNECTADE	T 9M		25 ms	3		Total kg Loaded:	5,277 kg
						Rock Density:	2.65 g/cc = te/m ³
Cord & Acc	eccorice:		U of M	# used		- Powid	er Factor -
	S WIRE DUPLEX (6	PACK) 400M	units	# useu	0.894 lb/yd ³		0.200 kg/te (actual)
HARRES	O THIL DUFFLEX (O	. AGIC TOOM	units		0.841 lb/yd ³	Front row:	0.188 kg/te (theoretical)
			units		0.841 lb/yd ³	Main Body:	0.188 kg/le (theoretical)
Resource De	ployment:		-		#DIV/01 lb/yd3	"KPI" PF:	#DIV/0! kg/te (theoretical)
# of Blasts today				1	Cost Reduction Notes (this Blast) - change in Bit , B. S.	Expl or IS from previous Blast:
# of Blasters (th				1		o, G18,19,20,21 H9, 11, 17,18,1	
# of Helpers (thi		Note Exception		2	where left out of the sho	t, due to not being drilled, or to	short on depth
# of MMU's (this				1			
Services:					(
GPS LAYOUT		Enter "1" if Laye	out by GPS	0			
BULK TRUCK (CHARGE	>/=5,000kg	<10,000kg	1	Blaster hours: 7		
SHOT SERVICE		Line Item (Fee)		1	Helper hours: 5		
SEISMOGRAPI		1 unit in Shot	Service Fee				
3D LASER PRO		Enter "1" If 3D 1	Profiled	0			
BORETRACK		Enter "1" if Bore	etraked	0			
	RGE (enter HOURS)	Line Item (Fee	ner Hour)	12.0			



Customer:

Nelson

Blast Design

Quarry: Burlington P.O. #: Blast Date: 2017-08-28

Blast Number: Orica Order #: Blast Time:

17-018 2230835 12:32 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter W Long.
Mid Blast	43.31765	80,00309
Front Row Corner	43.40165	79.88986
Back Row Corner	43.40179	79.89043
Average (Centre of Blast)	43.37370	79.92779

Ī	(N) Radians	(W) Radians
Ī	0.756036	1.396317
Ī	0.757502	1.394341
	0.757504	1.394351
Ī	0.757014	1.395003

lst	Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.71939	80,38847
	2nd Reading		
	Average	43.71939	80.38847
	Distance (1st Seis. From Centre of Blast)	0.0	
	Post Blast Data: ppV:	4.7	mm/s Trigger set at:

(N) Radians	(W) Radians
0.763047	1_403043
0.763047	1.403043
0.763047	1.40304

Hz frequency: air overpressure: 104.9 dB

Trigger set at: 115 dB

ger set al: 2.0 mm/s V / T / L: T (Vertical, Transverse or Longitudinal)

2450 #2 Side Rd (Nelson monitor)

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (2nd Sels. From Centre of Blast)	0.0	m
	Book Block Boto.		***

(N) Radians	(W) Radians
0.000000	0.000000

1.1 mm/s Post Blast Data: ppV: Trigger set at: 2.0 mm/s frequency: Hz V / T / L: ? (Vertical, Transverse or Longitudinal)

air overpressure: 107.5 dB Tricaler set at: 115 dB

Northwest (Nelson monitor)

3rd	Selsmograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	3.3	mm/s	Trigger set at:
				00

(N) Radians	(W) Radians
0.000000	0.000000

.0 mm/s Hz 88.0 dB frequency: V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure:

Trigger set at: 115 dB

Southwest (Nelson monitor)

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = D^2$$

$$30^2$$

Maximum Indicated Charge Weight per Delay = 0 kg

Orica

Blaster-in-charge;

Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate

Custom Che Blading Professionals Professionals	ner: Nelson ast Report	Quarry: P.O. #: Blast Date:		Blast Number: Orica Order #: Blast Time:	17-019 2237955 11:49 AM
page 1 laster-in-charge:	Kevin Topllis		(Print Name)	tonnes Blasted:	10,087 te 3,806 m ³
Blast Location: GPS Coordinates:	Lower middle bench-nor 43.40436 N Latitude Centre of Blast		(Bench / Face) *W Longitude	Total tonnes per day: Total Holes Loaded: including: and:	21,101 te TBA Code 37 holes 3 Dead Holes Helper Holes
Wind from the: SE Clear: Partly Cloudy: X	at 10 kph X Rain: Overcas Snow: Inversio	t:	: 21 to 25 ℃	# Rows Blasted: # Rows Blasted: - Pattern Burden: Spacing:	0.0 ft avg 3 rows (Front Row)- 12.0 ft avg 10.5 ft avg
- Drilling Information -				# Holes:	12 front row
Primary Bit diam: 101.6 n	Angle from Vertical mm	7 = 1,513.3 = 0.0	ninal Bit Diameter: Bit (4 " diam) Oft (" diam)	Burden: Spacing: # Holes: Bench Height:	9.0 ft avg 10.5 ft avg 25 38.9 ft avg
Bulk Explosives:	in (kg) out (kg) 30,317 24,94			Front Row:	2.0 ft avg 40.9 ft avg 2.0 ft avg 40.9 ft avg 4.0 ft avg
Packaged Explosives	cs shipped cs returne	d kg		# Stone Decks:	4.0 ft avg 2 per blast Stemming - 8.0 ft avg 7.0 ft avg 7.0 ft avg 28.9 ft avg 29.9 ft avg
Boosters: PENTEX 12 (OR EQUIVALENT	kg / unit # usi 0.34 4	ed kg 1 13.9		Material used:	7.0 ft avg .75 clear ge Length - 28.9 ft avg
	xplosives weight in Blast (kg kgd Prod (0 kg) % of Total k case #'s ms				ge Weight - 84.3 kg/hole
UNITRONIC 600 15M UNITRONIC 600 9M		2		Main Body: Max. per delay: SD () Equation: Total kg Loaded: Rock Density:	140.0 kg/delay 0.0 kg/delay 5,391 kg
Cord & Accessories:	U of M	# used			2.65 g/cc = te/m ³
HARNESS WIRE DUPLE		1 6	2.387 lb/yd ³ 1.023 lb/yd ³ 1.412 lb/yd ³	Yield PF: Front row: Main Body:	0.534 kg/te (actual) 0.229 kg/te (theoretical) 0.316 kg/te (theoretical)
Resource Deployment: # of Blasts today (this Quarry) # of Blasters (this Blast)	Note Exception	2 1	total labour charge, see	his Blast) - change in Bit , B, blast report 17-021	#DIV/0! kg/te (theoretical) S, Expl or IS from previous Blast:
# of Helpers (this Blast) # of MMU's (this Blast) Services: GPS LAYOUT	Note Exception Line Item (Hourly Rate)	1		17-021, 6 second delay, this ving holes: A1 12ft, A4 13ft, A	
BULK TRUCK CHARGE SHOT SERVICE FEE * SEISMOGRAPH RENTAL	>/=5,000kg <10,000kg Line Item (Fee per Blast) * 1 unit in Shot Service Fee	1 1/2			
3D LASER PROFILE BORETRACK LABOUR CHARGE (enter HOU	Enter "1" if 3D Profiled Enter "1" if Boretraked RS) Must be pre-authorized	0			



1

Customer:

Nelson

Blast Design

Quarry: Burlington
P.O. #:
Blast Date: 2017-09-12

Blast Number: Orica Order #: Blast Time:

r: 17-019 #: 2237955 e: 11:49 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40436	79.88428
Front Row Corner	43.40423	79.88413
Back Row Corner	43.40450	79.88436
Average (Centre of Blast)	43.40436	79.88425

(N) Radians	(W) Radians
0.757549	1.394244
0.757547	1.394241
0.757551	1.394245
0.757549	1.394243

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter	° W Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (1st Seis. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	1.0	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

 Post Blast Data:
 ppV:
 1.0 mm/s

 frequency:
 Hz

 air overpressure:
 114.6 dB

Trigger set at: 2.0 mm/s
V / T / L: T (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

air overpressure:

Northwest- colling rd (Nelson monitor)

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.71939	80.38847
	2nd Reading		
	Average	43.71939	80.38847
	Distance (2nd Seis. From Centre of Blast	0.0	m

(N) Radians	(W) Radians
0.763047	1.403043
0.763047	1.403043

Trigger set at: 2.0 mm/s V / T / L : (Vertical, Transverse or Longitudinal)

air overpressure: 88.0 dB Trigger set at: 115 dB 2450 2nd concession (Nelson monitor)

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m
	Post Blast Data: ppV:	1.9	mm/s Trigger set at:
			1

(N) Radians	(W) Radians	
0.000000	0.000000	

frequency:
air overpressure:
Southwest- Camisle (Nelson monitor)

Trigger set at: 2.0 mm/s
V / T / L: ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$
$$= \frac{(0)^2}{30^2} k$$

Hz

94.0 dB

= <u>0</u> kg

Maximum Indicated Charge Weight per Delay =

*Orica*Blaster-in-charge:

Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate.

Burden: 9.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

Subdrill: 2.0ft Number of holes: 37 Stemming: 7.0ft Hole angle: 0.0°

1st row burden: 12.0ft Total drilled: 1515.0ft



timing



17-019 Lower Middle North Final - 12' X 10.5' - 9' X 10.5' - 4" Bit 250 + .6m Sub



SHOTPlus 5.6.3.6		11/09/2017
Mine	Burlington	
Location		
Title/author	17-019 Lower Middle North Final	G. Palcso
Filename	17-019 Lower Middle North Fina	al.spf

Burden: 9.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

Subdrill: 2.0ft Number of holes: 37 Stemming: 7.0ft

1st row burden: 12.0ft Total drilled: 1515.0ft

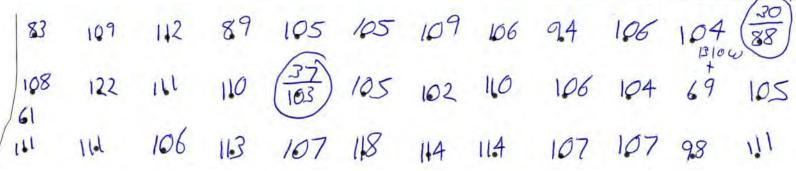
realiser of notes. 37

Hole angle: 0.0°

Free Face

load sheet pc counter:

max load: 115kg



17-019 Lower Middle North Final - 12' X 10.5' - 9' X 10.5' - 4" Bit 250 + .6m Sub

8148



SHOTPlus 5.6.3.6		11/09/2017
Mine	Burlington	
Location		
Title/author	17-019 Lower Middle North Final	G. Palcso
Filename	17-019 Lower Middle North Fina	al.spf



Customer:

Nelson

Burlington

Blast Number:

Design te Blasted:

Total Holes Loaded:

17-019

Blast Design

Quarry: P.O. #:

Design Date:

2017-09-12

Orica Order #:

page 1

laster-in-charge:

Kevin Toplis

Blast Location:

Lower middle bench-north

GPS Coordinates:

43.40436 °N Latitude 79.88425

°W Longitude

Nominal Bit Diameter:

Helper Hole Collar:

37 holes 3 Dead Holes

10,393 te

1 Helper Holes 0.0 ft avg 3 rows

12.0 ft avg 10.5 ft avg

Rows Blasted:

Burden:

Spacing:

Holes:

... and:

... including:

Secondary Bit diam:

Tertiary Bit diam:

Bulk Explosives Req'd:

CENTRA GOLD 70

Angle from Verscal Primary Bit diam: 101.6 mm

mm

ChargeWt.exe

mm

0 # Holes: 37 # Holes: 0

kg

4,025

Holes: = 1,513.3ft (4 0.0ft (0.0ft (

" diam) " diam) " diam)

1.165 lb/yd

1 801 lb/yd

1.455 lb/yd3

12 from now

Burden: 9.0 ft avg Spacing: 10.5 ft avg

Design Pattern (Front Row)

Hilles Bench Height: 38.9 ft avg

Sub-drill: 2.0 ft avg Hole Depth: 40.9 ft avg

Front Row: 0.0 ft avg Main Body: 0.0 ft avg

- Design Collar Stemming Front Row: 8.0 ft avg Main Body: 7.0 ft avg

Material used: .75 clear

Pkgd Explosives Req'd: kg Boosters Reg'd: kg/u # used PENTEX 12 (OR EQUIVALENT) 0.34 12.6

total explosives weight in Blast (kg): 4.038 Pkgd Prod (0 kg) % of Total kg: 0.0%

Detonators Reg'd: ms # req'd UNITRONIC 600 15M 37

Cord & Access. Reg'd: U of M # reg'd IRE DUPLEX (6 PACK) 400M units units units

Resource Deployment # of Blasts today (this Quarry) 2 Note Exception # of Blasters (this Blast) 1 #.of Helpers (this Blast) 2 Note Exception # of MMU's (this Blest) 1

Services Req'd: >/=2,000kg **BULK TRUCK CHARGE** <5,000kg 1 SHOT SERVICE FEE * 1/2 Line Item (Fee per Blast) SEISMOGRAPH RENTAL 0 * 1 unit in Shot Service Fee 3D LASER PROFILE Enter "1" if 3D Profiled 0 BORETRACK Enter "1" if Boretraked 0 LABOUR CHARGE (enter HOURS Must be pre-authorized

Front Row: 32.9 ft avg Main Body: 33.9 ft avg

- Design Sharge Length -

Front Row: 95.9 kg/hole Main Body: 98.8 kg/hole Max Chge Wt / delay: 115.0 kg/delay

Required kg Loaded: 4,038 kg

Rock Density: $2.65 \text{ g/cc} = \text{te/m}^3$

- Design Powder Factor -Expected Yield PF:

Front row Main Body

0.388 kg/te (actual) 0.261 kg/te (theoretical) 0.358 kg/te (thebretical)

"KPI" PF: 0.326 kg/te (theoretical)

Cost Reduction Notes (mis Blast) - change in Bit. B. S. Expl or IS from previous Blast.



Customer:

Nelson

Blast Design

Quarry: P.O. #:

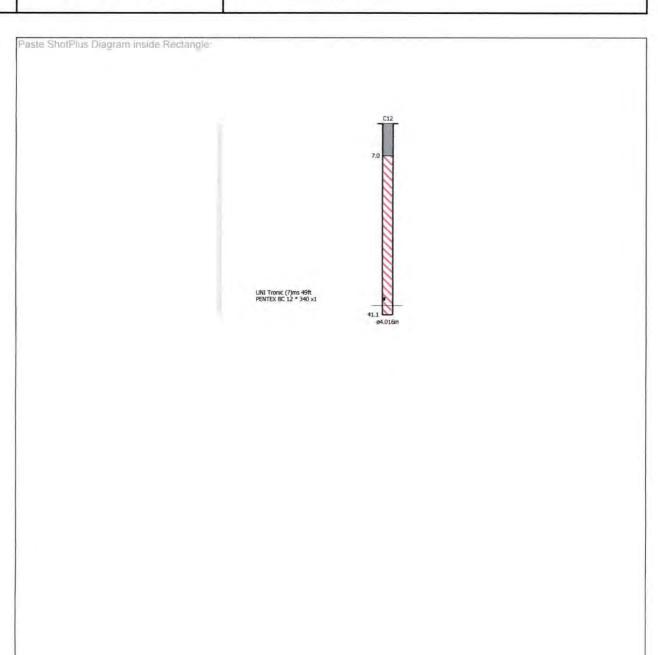
Blast Date:

Burlington

2017-09-12

Blast Number: Orica Order #: 17-019

page 2



Orica Blaster-in-charge:	Kevin Toplis		
#	Quarry Manager:		

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

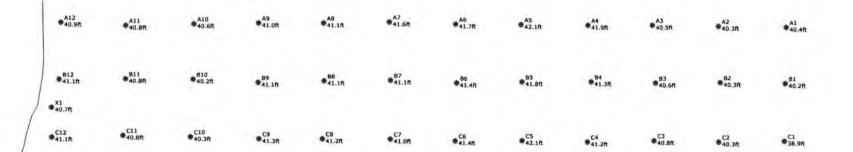
Subdrill: 2.0ft

Stemming: 7.0ft Number of holes: 37

Hole angle: 0.0°

1st row burden: 12.0ft Total drilled: 1515.0ft

Free Face



17-019 Lower Middle North Final - 12' X 10.5' - 9' X 10.5' - 4" Bit 250 + .6m Sub



SHOTPlus 5.6.3.6		11/09/2017
Mine	Burlington	
Location		
Title/author	17-019 Lower Middle North Final	G. Palcso
Filename	17-019 Lower Middle North Fina	al.spf

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

CONSIGNOR

GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

Orica Canada Inc.

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

1086994 GROSS / BRUT TARE NET TIME OUT TIME IN HEURE D'ENTRÉE HEURE SORTIE ORDER NUMBER N° DE CONNAISSEMENT Nº DE COMMANDE 2237955 85765597

DATE REQUIRED DATE REQUISE		REQUI E REQ		INVOICE TO / BUYER FACTURÉ À / ACHETEUR					REFERENCE NO. IANDE DU CLIENT
12 Sep 2017 DATE SHIPPED EXPÉDIÉ LE	IIPPED FREIGHT TERMS SHIP. MAG. LIC.				EHICLE NO. DE VÉHICULE				
12 Sep 2017	FOB	VIA		Own Tr	uck		ROUTING INÉRAIRE		MAG. LIC. NO. N° DE PERMIS
orica Truck	UM	DG MD	QTY, RET'C	OTY, SOLD	STANDARI	DESCRIPTION		# OF / DE PKGS.	AMOUNT MONTANT
100	PC PC PC	X	19 36 58	79 - 452	*uni tronic *uni tronic	Duplex (6 pa 600-09.0M CU, 600-15M C/Z S LUGS - PART #6 ASTER GE	ZC(30')60PC SPL(50')66PC	2 1 1 2	35.770 5.840 5.880 22.572 0.700
					GHS/WHMIS Website: W	WEIGHT CAL PACKAGES SDS documents Www.oricamining s.na@orica.com 355-26-ORICA	ngservices.co		70.762 KG

PALLETS USED PALETTES UTILISEES AL INFORMATION	CLETS RETURNED + PARETTES BETOVENEES		BAGS USED / SACS	UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS	OFFERED / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FRI QUOTING ORICA B/L TO / FAIRE SUIVRE FAC
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFILABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDIN THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORTATION ACCORDING THE NATIONAL STANDAY OF TRANSPORTATION ACCORDING THE NATIONAL SEE THANSPORT SONT CONDITIONS OF TRANSPORT SONT CONDITIONS DET TRANSPORT SONT CONDITIONS DET TRANSPORT SONT CONDITIONS TO THE NATIONAL DES TRANSPORTS TO DU MINISTÉRE DES TRANSPORTS.	NOTO THE APPLICABLE REGULATIONS OF VALLEY TO SEE STATE OF THE SECOND SEC	-		POUR EXPÉDITION PORT PAYÉ EN RÉFÉRI NO DE CONNAISSEMENT D'ORICA: Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER/TRANSPORTEUR Orica Truck		CONSIGNEE / DESTINAT	REGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIO		RECEIVER'S NAME (PLE	ASE PRINT) / NOM DU RECEVEUR
SIGNATURE DATE	1)10/11/1	DATE 12-9	SIGNATURE	DATE D/J M/M
900		SUB	LIECT TO ALL THE TERMS	S AND CONDITIONS ON THE BACK

	Customer:	Nelson	ıs	Quarry:	Burlington	Blast Number:	17-020
	Dlag	- Danas	_	P.O. #:	. NA	Orica Order #:	2244865
The Blasting Professionals	Bius	t Repor	1	Blast Date:	2017-09-27	Blast Time:	12:01 PM
page 1 laster	-in-charge: Mit	ch Ossingto	n		(Print Name)	tonnes Blasted:	27,877 te 10,520 m ³
						Total tonnes per day:	27,877 te TBA Rate Code
Blas	t Location: Soi	uth face			(Bench / Face)	Total Holes Loaded:	40 holes
GPS Co	oordinates: 4	3.39828	°N Latitude	79.88401	°W Longitude	including:	0 Dead Holes
	Ce	ntre of Blast		Centre of Blast		and:	0 Helper Holes
						Helper Hole Collar:	0.0 ft avg
Wind fror	n the: W at	10 kph		Temperature	: 26 to 30 °C	# Rows Blasted:	3 rows
		 X		X		- Pattern	(Front Row)-
Clear:		Rain:	Overcast:			Burden:	12.0 ft avg
Partly Cloudy:	X	Snow:	Inversion:	Cei	ling: 30000ft m	Spacing:	10.5 ft avg
•						# Holes:	16 front row
- Drilling In						D 1	400
D.: 5::		from Vertical	Ualar a		ninal Bit Diameter:	Burden:	10.0 ft avg
	diam: 101.6 mm		Holes: 34	= 2,852.6	,	Spacing:	10.5 ft avg
=	diam: 114.3 mm		Holes: 6	= 503.4	,	# Holes:	24
Tertiary Bit	diam:mm	° #1	Holes:	= 0.0	Oft (" diam)	Bench Height:	81.9 ft avg
B11. 5 :						Sub-drill:	2.0 ft avg
Bulk Explo		in (kg)	out (kg)	kg		Hole Depth:	83.9 ft avg
CENTRA GOL	D 70	34,070	24,600	9,470			83.9 ft avg 83.9 ft avg 6.0 ft avg 6.0 ft avg 40 per blast Stemming - 10.0 ft avg 7.0 ft avg 1/2" crush 96 Length - 67.9 ft avg 70.9 ft avg
<u> </u>						Front Row:	6.0 ft avg
Раскадеа	Explosives:	cs shipped	cs returned	kg		Main Body:	6.0 ft avg
						# Stone Decks:	40 per blast
						- Collar	Stemming -
Decetors						Front Row:	10.0 ft avg
Boosters:		kg /	unit # used	kg		Main Body:	7.0 ft avg
PENTEX 12 (C	R EQUIVALENT)		0.34 157	53.4		Material used: - Charge Front Row: Main Body:	1/2" crush
						- Charg	ge Length -
	total avala	aluaa uualahti	n Diant (ka)	0.500		Front Row: Main Body:	67.9 ft avg
	· ·	sives weight i Prod (0 kg) %		9,523			ge Weight -
Detonators	-	case #'s	- 1	# used		Front Row:	198.0 kg/hole
UNITRONIC 60		Case # S	ms	# useu		Main Body:	206.7 kg/hole
UNITRONIC 60				41		Max. per delay:	
UNITRONIC 60				80		SD () Equation:	0.0 kg/delay
UNIT RONIC 60	JO SOIVI			- 80		Total kg Loaded:	9,523 kg
						Rock Density:	2.65 g/cc = te/m ³
							3711
Cord & Ac	cessories:		U of M	# used		- Powa	ler Factor -
HARNES	S WIRE DUPLEX (6 I	PACK) 400M	units	1	1.526 lb/yd ³	Yield PF:	0 ()
	STEMMING	PLUG MINI	units	2	1.142 lb/yd ³	Front row:	3 (
			units		1.431 lb/yd ³	Main Body:	0 (
Resource De					###### lb/yd ³		#DIV/0! kg/te (theoretical)
	ay (this Quarry)			1	,	, , ,	S, Expl or IS from previous Blast:
# of Blasters (t				1	Deck height veried if de	ck was in a void.	
# of Helpers (th	,	Note Exception	1	2			
# of MMU's (thi	is Blast)			1	Blaster Hours= 6hr		
Services:				.1	Helper Hours= 11hrs		
GPS LAYOUT		Line Item (Hou		1			
BULK TRUCK		>/=5,000kg	<10,000kg	1			
SHOT SERVIC	E FEE *	Line Item (Fee	per Blast)	1			
SEISMOGRAP	H RENTAL	* 1 unit in Sho	t Service Fee	0			
3D LASER PR	OFILE	Line Item (Hou	rly Rate)	1			
BORETRACK		Enter "1" if Bor	Enter "1" if Boretraked 0				
LABOUR CHA	RGE (enter HOURS)	Must be pre-au	thorized				

2017-09-27 South Wall 17-020 report REPORT



1

Customer:

Nelsons

Blast Design

Quarry: P.O. #: Blast Date:

Burlington NA 2017-09-27 Blast Number: Orica Order #: Blast Time:

17-020 2244865 12:01 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.39844	79.88387
Front Row Corner	43.39826	79.88401
Back Row Corner	43.39813	79.88414
Average (Centre of Blast)	43.39828	79.88401

(N) Radians	(W) Radians
0.757446	1.394237
0.757443	1.394239
0.757440	1.394241
0.757443	1.394239

	Colomograph Co. audinotes	Enter ° N Lat.	- Fmta	r ° W Long.
ısı	Seismograph Co-ordinates	Enter N Lat.	Ente	r w Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (1st Seis. From Centre of Blast)	0.0	m	
	Poet Blact Data: nn\/:	DNT	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

mm/s Hz frequency: DNT air overpressure: DNT dB

ger set at: 2.0 mm/s
V / T / L : T (Vertical, Transverse or Longitudinal) Trigger set at: 115 dB

Colling Rd

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (2nd Seis. From Centre of Blast	0.0	m
		•	,

(N) Radians	(W) Radians
0.000000	0.000000

Post Blast Data: ppV: 2.5 mm/s frequency: Hz

Trigger set at: 2.0 mm/s V / T / L : ? (Vertical, Transverse or Longitudinal)

103.5 dB air overpressure:

2450 #2 sideroad

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter	° W Long.
	1st Reading			
	2nd Reading			
	Average	0.00000		0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m	
	Post Blast Data: ppV:	3.2	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

2.0 mm/s frequency: air overpressure: Hz 88.0 dB

V/T/L: (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

Camisle

Scaling Factor denotes the degree of Blast confinement. The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^{2}}{30^{2}}$$

$$= \frac{(0)^{2}}{30^{2}} kg$$

$$= \frac{0}{900} kg$$

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge: Mitch Ossington

Signature required, indicating that Blast Report is Complete & Accurate.

2017-09-27 South Wall 17-020 report REPORT

ORICA The Blasting Profe successor	Custo	mer: Blast		elsons sign	Des	Quarry: P.O. #: sign Date:	Burlington NA 2017-09-27	Blast Number: Orica Order #:	17	7-020
page 1 laster-	in-charge:	Mi	tch Os	sington			(Prmt Name)	Design te Blasted:	27,877	te
	Ū							Total Holes Loaded:	40	holes
Blast	Location:	So	uth Fa	ice			(Berich / Face)	including:	0	Dead Holes
GPS Co	ordinates:	0	.00000	°N Latitud	9 0	0.00000	°W Longitude	and:	3	Helper Holes
		Cer	itie of Bi	asi	Cer	irre of Blasi		Helper Hole Collar:	0.0	ft avg
								# Rows Blasted:	3	rows
- Drilling Info	omration -							- Design Patt	em (Fron	t Rowl-
- Littlining Total	H MICHTURY -	Annie	from Ver	tical		Nom	inal Bit Diameter:	Burden:		ft avg
Primary Bit d	iam: 101.6		0		0 =	3,356.0 f		Spacing:		ft avg
Secondary Bit d		mm	0	# Holes:	=	0.0		# Holes:		front row
Tertiary Bit d		mm	0 '	# Holes:	=	0.0	` ,	- Design Patte	ern (Main	Body) -
,								Burden:		ft avg
								Spacing:	10.5	ft avg
						12:0	s I pm	# Hales	24	main body
						,	s faucle	Bench Height:	81.9	ft avg
ķ.							Caclo	Sub-drill:	2.0	ft avg
Bulk Explosive	es Req'd:			kg		28	c far	Hole Depth:	83.9	ft avg
CENTRA GOLD 70		Charge ¹	Wt.exe	9,500			11 W	- Design Si	larie Deck	ing -
						11/2	sull st	Front Row:	4.0	ft avg
Pkgd Explosiv	es Req'd:			kg			a cope	Main Body:	4.0	ft avg
							30,	- Design Co	llar Stemi	ming -
								Front Row:	7.0	ft avg
								Main Body:	7.0	ft avg
Boosters Req	d:	kg/u i	# used	kg				Material used:	1/2" crush	
PENTEX 12 (OR EQ	UIVALENT)	0.34	160	54.4						
								- Design Ci		
								Front Row:		ft avg
total explosi	_			9,554				Main Body:		ft avg
Pkgd Prod (0 kg) % of Tota		-	0.0%				- Design Ci			
Detonators Re		m	IS	# req'd				Front Row:		kg/hole
UNITRONIC 600 301				80				Main Body:		kg/hole
UNITRONIC 600 201	VI		-	40				Max Chge Wt / delay:	150.0	kg/delay
UNITRONIC 600 9M		-	-	40				Demoised to Leaded:	0.554	1
								Required kg Loaded: Rock Density:	9,554	
			- +					NOON Density.	4.00	$g/cc = te/m^3$
Cord & Access	s. Rea'd:	Uο	f M	# req'd				- Design P	owder Fa	clor-
IRE DUPLEX (6 PAC		un		1				Expected Yield PF:		kg/te (actual)
STEMMING PL		un		-			1 226 lb/yd ³	Front row:		kg/te (theoretical)
		un					1 471 lb/yd ³	Main Body:		kg/te (theoretical)
Resource Deployi	ment						1.390 lb/yd ³	"KPI" PF:		kg/te (theoretical)
# of Blasts today (this	s Quarry)					1	-	his Blast) - change in Bit , B, S		
# of Blasters (this Bla	951)					1				
# of Helpers (this Bla		Note Ex	cception			2				
# of MMLI's (this Blas						1				
Services Req'o	d:									
BULK TRUCK CHAR	RGE	>/=5,0	000kg	<10,000kg		1				
SHOT SERVICE FEI	E *	Line Ite	m (Fee p	per Blast)	1					
SEISMOGRAPH RE	NTAL	* 1 unit	t in Shot	Service Fee						
3D LASER PROFILE		Line Ite	m (Fee	per Blast)		1				
BORETRACK		Enter "	1" if Bore	etraked						
LABOUR CHARGE (enter HOURS	Must be	e pre-aut	horized						



Customer: Nelsons

Blast Design

Quarry: P.O. #:

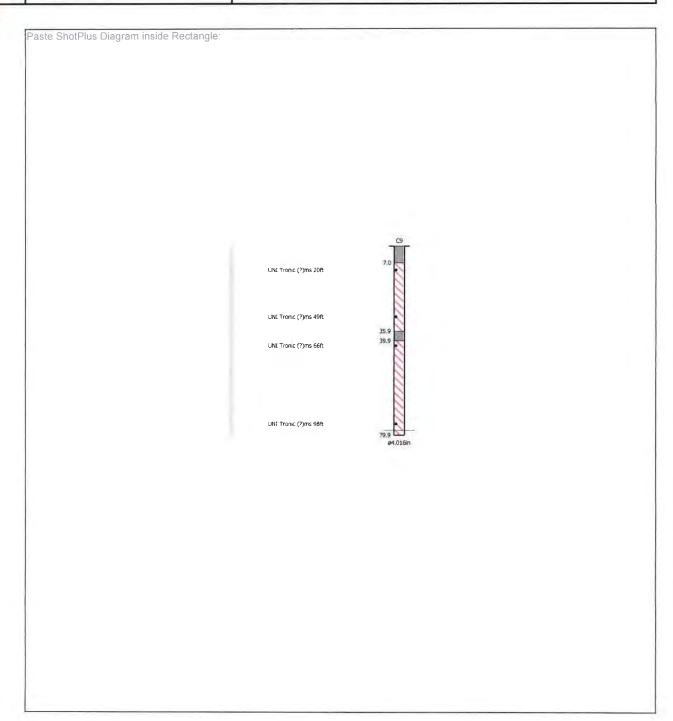
Blast Date:

Burlington

2017-09-27

Blast Number: Orica Order #: 17-020

page 2



	Orica Blaster-in-charge:	Mitch Ossington
#	Quarry Manager:	

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.

FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Orica Canada Inc.

EXPÉDITEUR

GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

Bill of Lading / Connaissement

Appeller Ton

GROSS / BRUT	OILIO
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
6-36	
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2244965	06701602

DATE REQUISE	TIME REQUIRED HEURE REQUISE				INVOICE FACTURÉ	CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT					
7 Sep 2017 DATE SHIPPED	00:	00:		FREIGHT T		SHIP.	MAG, LIC.	V	EHICLE NO.		
EXPÉDIÉ LE			CO	NDITIONS DE	LIVRAISON	VRAISON PERMIS EXPÉDITEUR			Nº DE VÉHICULE		
7 Sep 2017	2017 FOR Dest'n,			Own Tr	ruck	. IING	MAG. LIC. NO.				
TF	RANSPO	DATEL	A			ITINÉF			N° DE PERMIS		
ica Truck					STANDARD		-		V		
QTY. QTÉ.	UM	DG MD	QTY, RET'D QTÉ, RET.	QTY, SOLD		DESCRIPTION		# OF / DE PKGS.	AMOUNT MONTANT		
60 66 1 40 75 1	PC PC PC PC PC PC PC PC	X	34 2454 73	509100	PENTEX BC 340 Harness Wire Do *uni tronic 600 *uni tronic 600 *uni tronic 600 MINI STEM PLUGS LICENSED BLASTO LABOUR CHARGE ROG (ROCK ON GE	uplex (6 pack 0-09.0M CU/ZC 0-20M CU/ZC 0-30M C/Z SPI 5 - PART #601	C(30')60PC SPL(65')66P 4(100')36P	1 1 1 4	71.540 5.840 5.880 13.464 35.280 0.525		
	41				**** TOTAL	IGHT PACKAGES	***	1.1	132.529 KG		
					GHS/WHMIS SDS Website: www. Email: sds.na Phone: 1-855-	oricaminings @orica.com	ervices.com				

EMERGENCY RESPONSE PLAN / RÉSUMÉ DI	E PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 H TELEPHONE D'URGENCE/24 HEU	HOUR NUMBER PLACARDS OFFER			ED / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT /		
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICL LABELLED, AND ARE IN PROPER CONDITION FOR TE THE NATIONAL TRANSPORTATION AGENCY AND THE NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION SUMENTIONNÉES DE MÉME QUE LES CONDITIONS E DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MIN	ES ARE PROPERLY CLASSIFIED, RANSPORTATION ACCORDING T DEPARTMENT OF TRANSPORT L'EMBALLAGE, LE MARQUAGE JE TRANSPORT SONT CONFORM	DESCRIBED, PACKAGED, MARKED AND TO THE APPLICABLE REGULATIONS OF ET L'ÉTIQUETAGE DES MARCHANDISES.	VALEUR DÉCLARÉE	YES / OF SHIPMENT	NETTE	NO / NON No. CONV AGE REEMENT NO	NO DE CONNAISSEMENT Orica Canada 1 301 rue hotel Brownsburg-Cha J8G 3B5	D'ORICA: Inc. de ville	9
CONSIGNOR / EXPÉDITEUR GRAND VALLEY	Orica Truck				CONSIGNEE / DESTINAT				
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EX	PÉDITEUR	DRIVER'S NAME (PLEASE PRIN	T) / NOM DU CAMION	INEUR			SE PRINT) / NOM DU RECEV		
SIGNATURE	DATE CONTRACTOR OF THE CONTRAC	SIGNATURE	13	TE 7 G D/J M/M	Y/A	SIGNATURE		DATE D/J M	VM Y/A
CTHIS BILL DE L	ADDRESS SHIPPING COM	FRACT IS TO BE SIGNED BY THE		SUE	SJECT	TO ALL THE TERMS	AND CONDITIONS OF	-	-

Burden: 12.0ft

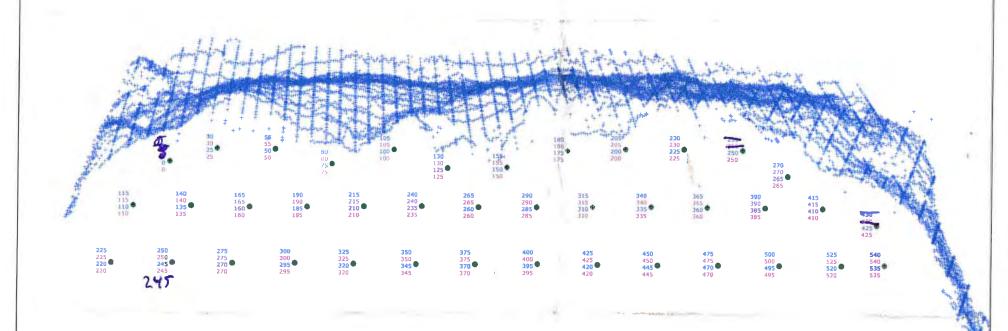
Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 10.0ft Total drilled: 3358.0ft Hole Diameter: 4.0in Number of holes: 40

Hole angle: 0.0°





SHOTPlus 5.6	.2.7 27/09/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-020_South Wall Final.spf

Burden: 12.0ft

Spacing: 10.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

1st row burden: 10.0ft Total drilled: 3358.0ft Hole Diameter: 4.0in Number of holes: 40

40

Hole angle: 0.0°



SHOTPlus 5.6	.2.7 27/09/2017
Mine	Burlington
Location	
Title/author	17-016 South Wall Final G. Palcso
Filename	17-020_South_Wall_Final.spf

Burden: 12.0ft

Spacing: 10.5ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

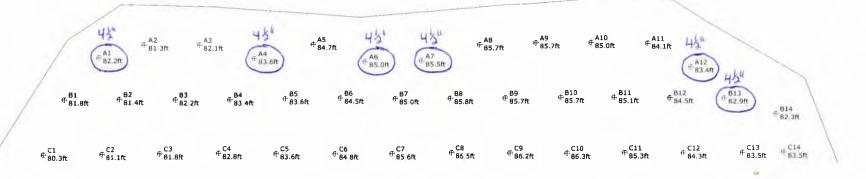
Number of holes: 40

Stemming: 7.0ft Hole angle: 0.0°

1st row burden: 10.0ft Total drilled: 3358.0ft

Hole A1, A4, A6, A7, A12 and B13 are 4.5 Hole Diamter Marked in Green open face





South Face 17-020 12x10.5 Front Row - 10x10.5 Body 4" Hole Diamater 248.5m Floor Elevation + 0.6m Sub



	Customer	lelson Aggı	regat		Quarry	/: Burlington	Blast Number:	1	8-001	
ORICA	Dlag	st Donord	-		P.O. #	# :	Orica Order #:	23	322201	
The Blasting Professionals	Dius	st Report		ВІ	ast Date	2018-04-09	Blast Time:	11	:56 AN	
age 1 laster	-in-charge:	Mike Derkinde	eren			(Print Name)	tonnes Blasted:	27,194	te	10,262 r
							# Holes Loaded:	49	holes	
Blas	st Location:	Upper Middle				(Bench / Face)	including:	0	Dead H	Holes
GPS C	oordinates:	43.40358	°N Latitude	79	.88337	°W Longitude	and:	3	Helper	Holes
	C	Centre of Blast		Cent	tre of Blast		Helper Hole Collar:	8.0	ft avg	
							# Rows Blasted:	3	rows	
Wind fror	n the: SE at	5 kph		Ter	nperature	e: 1 to 5 °C				
	· · · · · · · · · · · · · · · · · · ·	X		X	4		- Pattern	(Front Ro	-(wo	
Clear:		Rain:	Overcast:				Burden:	12.0	ft avg	
artly Cloudy:	X	Snow:	Inversion:			30000	Spacing:		ft avg	
							# Holes:		front ro	w
- Drilling In	formation -						- Pattern (Main Boo	dy) -	
		gle from Vertical			No	minal Bit Diameter:	Burden:		ft avg	
-	diam: 101.6 mm	0 #⊦	Holes: 49	=	3,797.	,	Spacing:	10.0	ft avg	
econdary Bit		0 #⊦	loles:	=		0 ft (" diam)	# Holes:		main b	ody
Tertiary Bit	diam: mm	0 #⊦	loles:	=	0.	0 ft (" diam)	Bench Height:		ft avg	
Va. 79						7	Sub-drill:		ft avg	
Bulk Explo		in (kg)	out (kg)		kg .		Hole Depth:		ft avg	
CENTRA GOL	D 70	34,030	21,700		12,330		- Stone	Decking	1	
	- 12 d				- 1		Front Row:		ft avg	
Packaged	Explosives:	cs shipped	cs returned	- 1	(g		erii.		ft avg	
		1					# Stone Decks:		per bla	st
							- Collar	Stemming	1	
							Front Row:		ft avg	st
Boosters:		kg /		1	(g		Front Row: Main Body:		ft avg	
PENTEX 12 (O	R EQUIVALENT)	-	0.34 102		34.7		Material used:			
							0	e Length		
	total aval	onivos vysialet ia	Diest (ke)		10.005		Front Row:		ft avg	
		osives weight in			12,365		Main Body:		ft avg	
Detonators	_	d Prod (0 kg) %	- 1	ш.	0.0%			e Weight		
		case #'s	ms	# L	sed		Front Row:		kg/hole	
UNITRONIC 60		-			48		Main Body:		kg/hole kg/dela	
UNITRONIC 60	JO 30141	+ +			52		Max. per delay: SD () Equation:		,	
		1			-		Total kg Loaded:	#NUM! 12,365		У
							Rock Density:		g/cc =	- to/m ³
							reduce Deficity.	2.00	9,00 -	- te/iii
Cord & Ace	cessories:		U of M	# L	ised		- Powde	er Factor	_	
	WIRE DUPLEX (6 F	PACK) 400M	units		1	2.031 lb/yd ³	Yield PF:		kg/te (a	actual)
	ser sen (e)	11, 100.0	units			1.351 lb/yd ³	Front row:			lheoretical
			units			1.801 lb/yd ³	Main Body:		-	theoretical
Resource De	ployment:		# req'd			1.651 lb/yd ³	"KPI" PF:			heoretical
# of Blasts toda	ay (this Quarry)		1			NOTES:			10	
# of Blasters (th			1	6	hr		one deck from 50'-32 due to l	ean burden		
# of Helpers (th		Note Exception	2		hr		ne deck from 60'-50' due to le			
# of MMU's (this			1			Hole X-1 Received a toe				
Services:		1				Hole X-2 was plugged at				
ADVANCED BL	LAST DESIGN	Enter "1" if Adve	ance Blast Des			Rate Code TBA by sale r				
BULK TRUCK		As per agreeme			1	6 Blaster hours			i e e e e e e e e e e e e e e e e e e e	
SHOT SERVICE FEE * As per agreement			1	6 Helper hours times 2 H	elpers		-			
BORETRACK		Enter "1" if Bore			0	Tropo Mode and Ell				
SEISMOGRAP	H RENTAL	Enter # of Seism			0	1-0-1-0-1-0-1				
			5 7 0.00		-	Literature in lease and a				



Customer: lelson Aggregat

Blast Design

Quarry: Burlington
P.O. #:
Blast Date: 2018-04-09

Blast Number:
Orica Order #:
Blast Time:

18-001 2322201 11:56 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40358	79.88339
Front Row Corner	43.40343	79.88334
Back Row Corner	43.40374	79.88338
Average (Centre of Blast)	43.40358	79.88337

(N) Radians	(W) Radians
0.757535	1.394228
0.757533	1.394227
0.757538	1.394228
0.757535	1.394228

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40245	79.87814
	2nd Reading		
	Average	43.40245	79.87814
	Distance (1st Seis. From Centre of Blast)	441.3	m
	Post Blast Data: pp\/:	3.6	mm/s Trigger set at:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

rost blast bata.	ppv.	5.0 11111/3	rrigger ser ar.	2.0	11111/5
	frequency:	7.3 Hz	V/T/L:	?	(Vertical, Transverse or Longitudinal)
air	overpressure:	115.3 dB	Trioner set at:	115	dB

air overpressure: 115.3 dB Trigger set at: 115 dB

2450 2nd Line

2nd	Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43,40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Sels. From Centre of Blast	902.8	m
	Post Blast Data: pn\/:	0.4	mm/s Triagos ant ot:

(N) Radians	(W) Radlans
0.757578	1.394413
0.757578	1.394413

 Post Blast Data:
 ppV:
 0.4 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 7.4 Hz
 V / T / L :
 ? (Vertical, Transported)

V / T / L: ? (Vertical, Transverse or Longitudinal)

air overpressure: 121.9 dB Trigger set at: 115 dB Colling Road & Blind line Bruce Trail

 3rd
 Seismograph Co-ordinates
 Enter ° N Lat.
 Enter ° W Long.

 1st Reading
 43.39339
 79.88880

 2nd Reading
 43.39339
 79.88880

 Average
 43.39339
 79.88880

(N) Radians	(W) Radians
0.757358	1.394323
0.757359	1 204222

 Average
 43.39339
 79.88880
 0.757358
 1.394

 Distance (3rd Seis From Centre of Blast)
 #NUM!
 m
 m
 Trigger set at: 2.0 mm/s
 mm/s
 V/T/L: ? (Vertical, Transverse or Longitudinal)

 frequency:
 7.3 dB
 Trigger set at: 115 dB
 1.394

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

South West Corner Of Property

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = D^2 \over 30^2$$

= <u>#NUM!</u> kg 30²

= #NUM! kg

Maximum Indicated Charge Weight per Delay = #NUM! kg

Orica
Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that Blast Report is Complete & Accurate

pm bray

	Customer:	lelson Aggr	egat		Quarry		Blast Number:	18-002
ORICA	Blas	t Report			P.O. #		Orica Order #:	2323512
The Blasting Professionals™	Dias	, Kopo, i		Bla	ast Date	2018-04-11	Blast Time:	11:16 AM
age 1 Blaster	-in-charge: Mik	ke Derkindere	en			(Print Name)	tonnes Blasted:	19,279 te 7,415 m ³
	<u> </u>					,	# Holes Loaded:	180 holes
Blas	st Location: Flo	or				(Bench / Face)	including:	0 Dead Holes
GPS C	oordinates: 4	13.40235	N Latitude	79.	88634	°W Longitude	and:	0 Helper Holes
	Ce	entre of Blast		Centr	e of Blast		Helper Hole Collar:	0.0 ft avg
							# Rows Blasted:	9 rows
Wind fron	n the: SW at	10 kph			perature	: 1 to 5 °C	Dottorn	(Frant Daw)
Clear:		Rain: X	Overcast:	X			- Pattern Burden:	(Front Row)-
Partly Cloudy:		Snow:	Inversion:			30000	Spacing:	
. a.a.y 0.0aay.[SS				00000	# Holes:	28 front row
- Drilling Int	formation -						- Pattern	(Main Body) -
	Angle	e from Vertical			No	minal Bit Diameter:	Burden:	11.5 ft avg
	diam: 101.6 mm		loles: 180	=	1,980.0		Spacing:	
Secondary Bit			loles:	=		0 ft (" diam)	# Holes:	152 main body
Tertiary Bit	diam: mm	0 # H	loles:	=	0.0	Oft (" diam)	Bench Height:	11.0 ft avg
D !! = -						7	Sub-drill:	0.0 ft avg
Bulk Explo		in (kg)	out (kg)	k			Hole Depth:	11.0 ft avg 11.0 ft avg 2 Decking - 0.0 ft avg 0.0 ft avg 0 per blast Stemming - 7.0 ft avg 7.0 ft avg 7.0 ft avg 4.0 ft avg 4.0 ft avg 4.0 ft avg
CENTRA GOLI	D 70	30,150	27,630		2,520		- Stone Front Row: Main Body:	0.0 ft avg
Packaged	Explosives:	cs shipped	ce returned	k	<u> </u>		Main Body:	0.0 It avg
Tuonagea	Explosives.	CS SHIPPCU	os retarrica	10,	9		σ " o	0 per blast
							0 "	Stemming -
							Front Row:	7.0 ft avg
Boosters:		kg / ι	unit # used	k	g		Main Body:	7.0 ft avg
PENTEX 12 (O	R EQUIVALENT)		0.34 182		61.9		Material used:	.75 clear
							U .	ge Length -
			D				Front Row:	4.0 ft avg
	•	sives weight in Prod (0 kg) %			2,582			4.0 ft avg
Detonators		case #'s	ms	# us			Front Row:	
UNITRONIC 60				,, a.	1		Main Body:	
EXEL HANDID			25/500		182		Max. per delay:	
CONNECTADE	ET 9M		25 ms		3		SD () Equation:	#NUM! kg/delay
CONNECTADE	T 9M		42 ms		30		Total kg Loaded:	2,582 kg
							Rock Density:	2.60 g/cc = te/m^3
O = 11 0 A = 1							Danie	I F (
Cord & Acc		DACK) 400M	U of M	# us	sed 1	0.587 lb/yd ³	- Powd Yield PF:	ler Factor - 0.134 kg/te (actual)
HARNES	SS WIRE DUPLEX (6	FACK) 400W	units			0.587 lb/yd 0.477 lb/yd ³	Front row:	• , ,
			units			0.477 lb/yd ³	Main Body:	
Resource De	ployment:		# req'd			0.477 lb/yd ³	"KPI" PF:	0 (
# of Blasts toda	y (this Quarry)	Enter #	. [1		NOTES:		•
# of Blasters (th	nis Blast)		1	7	hr	5 Holes in the pattern had	d caved in when we measured	I the shot the morning of, we were
# of Helpers (th	is Blast)	Note Exception	2	10	hr	unable to load those 5 ho	les	
# of MMU's (this	s Blast)		1					
Services:								
ADVANCED BI	LAST DESIGN	Enter "1" if Adva	ince Blast Des					
BULK TRUCK CHARGE As per agreement			1					
SHOT SERVICE FEE * As per agreement		#1	DIV/0!					
BORETRACK Enter "1" if Boretraked			0					
SEISMOGRAP	H KENTAL	Enter # of Seism	ographs Used		0			

2018-04-11 18-002 Floor-R1 REPORT



Customer: lelson Aggregate

Blast Design

Quarry: Burlington
P.O. #:
Blast Date: 2018-04-11

Blast Number: 18-002
Orica Order #: 2323512
Blast Time: 11:16 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40230	79.88635
Front Row Corner	43.40209	79.88602
Back Row Corner	43.40267	79.88664
Average (Centre of Blast)	43.40235	79.88634

(N) Radians	(W) Radians
0.757513	1.394280
0.757509	1.394274
0.757519	1.394285
0.757514	1.394280

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
	1st Reading	43.40245	79.87814	
	2nd Reading			
	Average	43.40245	79.87814	
	Distance (1st Seis. From Centre of Blast)	663.1	m	

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

Post Blast Data: ppV: mm/s Trigger set at: 2.0 mm/s
frequency: Hz V/T/L: ? (Vertical, Transverse or Longitudinal)
air overpressure: dB Trigger set at: 115 dB

2450 2nd Line Did not set up for this blast (as per bill)

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	744.0	m

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

 Post Blast Data:
 ppV:
 Did
 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 Not
 Hz
 V / T / L :
 ? (Vertical, Transverse or Longitudinal)

 air overpressure:
 Trigger
 dB
 Trigger set at:
 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	#NUM!	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Distance (3rd Seis. From Centre of Blast) #NUM! m

Post Blast Data: ppV: 2.0 mm/s

frequency: 3.3 Hz V / T / L : ? (Vertical, Transverse or Longitudinal)

air overpressure: 88.4 dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$
$$= \frac{\text{#NUM!}}{30^2} \text{ kg}$$

= #NUM! kg 900

Maximum Indicated Charge Weight per Delay =

#NUM! kg

Orica

Blaster-in-charge:

Mike Derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-04-11 18-002 Floor-R1 REPORT



Primary Bit diam: 101.6 mm

Secondary Bit diam:

Tertiary Bit diam:

Blast Report

Quarry: P.O. #: Blast Date:

2018-04-18

Blast Number:
Orica Order #: 2
Blast Time: 19

Tonnes Blasted:

18-003 2326529 10:54 AM

11,087 te

4,184 m3

	Monnellon -		_		minal Bit Diamete
Clear: Partly Cloudy:		Rain: Snow:	Overcast: Inversion:	X Ceiling	30,000 ft
Wind fro	m the:	at 10 kph		Temperature	: 1 to 5 °C
	ast Location: Coordinates:	43.40418	°N Latitude	79.88352	°W Longitude
age 1 Blaste	er-in-charge:	Mik	e der Kindere	ก	

Holes:

Holes:

Holes:

TOTALES DISSIES.	11,001 to
Total tonnes per day:	11,087 te TBA Code
Total Holes Loaded:	39 holes
including:	0 Dead Holes
and:	1 Helper Holes
Helper Hole Collar:	7.0 ft avg
# Rows Blasted:	4 rows
Parter of	mm Paul -
Burden:	12.0 ft avg
Spacing:	10.0 ft avg
# Holes:	9 # 600 # 126/5
, Palletti M	a Hoth
Burden:	9.0 ft avg
Spacing:	10.0 ft avg
# 14 (10)	30 main eser
Bench Height:	40.1 ft avg
Sub-drill:	2.0 ft avg
Hole Depth:	42.1 ft avg

Bulk Explosives:	in (kg)	out ((kg)	kg
CENTRA GOLD 70	29,810	2	5,070	4,740
Packaged Explosives:	cs shipped	cs ret	umed	kg
FORTEL PRO 75X400	6		4	50
Boosters:	kg /	unit	# usec	kg
PENTEX 12 (OR EQUIVALENT)		0.34	78	26.5
				4.047

0

mm

mm

Front Row:	8.0	ft avg
Main Body:	0.0	ft avg
# Decks:	1	per blast
- Dilar	Stemming	

	total explosives weight in Pkgd Prod (50 kg) % o		4,817 1.0%
Detonators:	case #s	ms	# used
UNITRONIC 600 6M			39
UNITRONIC 600 15M			39

Front Row:	7.0 ft avg
Main Body:	7.0 ft avg

" diam)

" diam)

" diam)

1,642.4 R (4

0.0 ft (

0.0 ft (

0

0.0

4.0

0.0

Material used: 3/4 Stone

Front Row:	27.1	ft avg
Main Body:	35.1	ft avg

Front Row:	79.1 kg/hole
Main Body:	102.4 kg/hole
Max. per delay:	129.0 kg/delay
SD () Equation:	251.0 kg/delay
Total kg Loaded:	4,817 kg
Rock Density:	$2.65 \text{ g/cc} = \text{te/m}^3$

Cord & Accessories:		U of M	# used
HARNESS WIRE DUPLEX	6 PACK) 400M	units	1
		units	
		units	
Resource Deployment			
# at filants today mes. Опалут			1
s of Glaston, the Blasti			1
a of heriparti trick Plast,	Note Exception	i -	2
# of MMU of this elasti			1
Services:			
GPS LAYOUT	Enter hours		0.0
BULK TRUCK CHARGE	>/=2,000kg	<5,000kg	1
BLASTER HOURS	Enter Blaster I	NOUITS	6.0
HELPER HOURS	Enter total Hel	per man-hours	10.0

Enter # Orica Selsmographs

(per day) Enter# of days

Enter hours

Enter hours

1,941 lb/yd3	Yield PF:	0.434 kg/te (actual)
15 977 MOVVI	Front row	d 219 kg/te (Paratical)
1 585 12 VJ	Main Body	0.378 kg/te thekrendo
1.511 lb/yd3	"KPI" PF:	0.338 kg/te (theoretical)

Hole B-1 Was loaded to 18" then package was used on the top
A-7 Received a stone deck from 16"-24" due to a void identified on the drill log
Prease contact our sales rep for Rate code

Holes D-1 D-2 D-3 Had either caved in or were to short to load

Cost Reduction Notes this Blasti - change in thit B. 5. Employ iS from previous Blast.

TECHNICAL BLAST DESIGN

SEISMOGRAPH RENTAL

3D LASER PROFILE

BORETRACK



Blast Report

Quarry: P.O. #:

Blast Date: 2018-04-18 Blast Number:

18-003 2326529

Orica Order #: **Blast Time:** 10:54 AM

page 2

Blast Co-ordinates	Enter N Lat.	Enter * W Long.
Mid Blast	43.40418	79.88317
Front Row Corner	43.40423	79.88351
Back Row Corner	43.40412	79.88387
Average (Centre of Blast)	43,40418	79.88352

(N) Radians	(W) Radians
0.757546	1.394224
0.757547	1.394230
0.757545	1.394236
0.757546	1.394230

1et	Seismograph Co-ordinates	Enter ° N Let.	Enter ° W Long.
100	1st Reading	43.40245	79.87814
	2nd Reading		
	Average	43.40245	79.87814
	Distance (1st Sels, From Centre of Blast)	476.3	
	Post Blast Data: ppV:	2.7	mm/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

Poet Blest Data:	ppv:	2.7	The San Cont.	2.0
	frequency:	43.0 Hz	VIII -	7
	air overpressure:	119.7 dB	Ingpersor of	115
450 2nd Line				

_	0.101010	
	0.757516	1.394137
virtis -		

vertical fransverse a Long/Lidensia

Enter ° W Long. 79.89400 2nd Seismograph Co-ordinates 1st Reading Enter ° N Lat. 43.40605 2nd Reading 00

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 394413

Average		0805	79.89400
Distance (2nd Sels. From Centre of Blast)		73.3 m	
Post Blast Data: ppV:		mm/s	Trigger local
frequency:	NOT	Hz	0.5
air overpressure:		dB	Industrial and

2.0 2 -Vertical Fransverse of Landaudmini 115

Colling Road & Blind Line Bruce Trail

	Seismograph Co-ordinates	Enter ° N Let.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1274.5	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Zira (taza)ira						6.757650
Average	43.39339		79.88880			0.757358
Distance (3rd Seis. From Centre of Blast)	1274.5	m				
Poet Blest Data: ppV:	DID	mm/s	"/gp mtal	2.0	0.000	
frequency:	NOT	Hz	VA.	2	Lyenton	Transverse of Londindins
air overpressure:	TRIGGER	dB	Training per al	115	項	
South West Corner of Property						

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

Maximum Indicated Charge Weight per Delay = 251

Orica

Blaster-in-charge:

Mike der kinderen

2	
ORICA	
The Blasting	

Black Deport

Quarry:

Burlington

Blast Number:

18-004

Orica Order #: Blast Time:

2339509 12 02 PM

ORICA Tre Stateme		Report Aggregate		P.O. #: Blast Date:	2018-05-22
Prograpionals	14613011	nggi ega i		Digst Date.	2010-03-22
Blaster-in-ch	narge:	Mike	e der Kindere	en	
Blast Loc			Jpper Middle		
GPS Coordin	nates: 43	3.40364	°N Latitude	79.88324	°W Longitude
Wind from the:	SE at	5 kph		Temperature:	11 to 15 °C
Clear:		Rain:	Overcast:	х	
Partly Cloudy:		Snow:	Inversion:	Celling	1 002 ft
- Smally sets conti		from vertical		Nom	inal Bit Diameter:
Primary Bit diam:			Holes: 40	= 3,098.6	
Secondary Bit diam:	114.3 mm	0" #	Holes: 9	= 697.2	ft (4 1/2 " diam)
Tertiary Bit diam:	mm	0 * #	Holes:	= 0.0	ft (" diam)
Bulk Explosives:		in (kg)	out (kg)	kg	
CENTRA GOLD 70		33,680	21,760	11,920	. 1
Boosters:		ka	/unit #usec	kg	
PENTEX 12 (OR EQUIV	VALENT)	ng.	0.34 98	33.3	
	total explos	ives weight	in Blast (kg):	11,953	
	Pkgd i	Prod (0 kg) ^c	% of Total kg:	0.0%	
Detonators:		case #s	ms	# used	
UNITRONIC 600 9M				49	
UNITRONIC 600 25M				14	
UNITRONIC 600 30M				35	
Cord & Accessor	ries:		U of M	# used	
HARNESS WIRE	DUPLEX (6 PA	CK) 400M	units	1	2.028 lb/yd ³
			units		agu finna
Resource Deployme	nt		units		1.651 lb/yd ³
# of Blasse Local, stns. []	5.7				1,007
	URTEV!			1	CARLES AND VOICE
# of Blasters (Ins. Gar)				1	If was extremely foggy of

Enter hours

Enter hours

Enter hours

Enter Blaster hours

Enter total Helper man-hours

Enter # Orica Seismographs

(per day) Enter # of days

>/=10,000 kg

Blast Time:	12 02 PM
Tonnes Blasted:	26,332 te 9,937 m ³
Total tonnes per day:	26,332 te NB80-01 Ratin
Total Holes Loaded:	49 holes
including:	0 Dead Holes
and:	0 Helper Holes
Helper Hole Collar:	0.0 ft avg
# Rows Blasted:	3 rows
Burden:	12.0 ft avg
Spacing:	10.0 ft avg
# Holes:	8
Burden:	9.0 ft avg
Spacing:	10.0 ft avg
\$°-	d. man
Bench Height:	75.5 ft avg
Sub-drill:	2.0 ft avg
Hole Depth:	77.5 ft avg
·	
Front Row:	ft avg
Main Body:	ft avg
# Decks:	per blast
Front Row:	7.0 ft avg
Main Body:	7.0 ft avg
Material used:	75" Stone
	- 11
Front Row:	70.5 ft avg
Main Body:	70.5 ft avg
Front Row:	205.5 kg/hole
Main Body:	205.5 kg/hole
Max. per delay:	298.0 kg/delay
SD () Equation:	208.9 kg/delay
Total kg Loaded:	11,953 kg
Rock Density:	2.65 g/cc = te/m ³
Yield PF:	0.454 kg/te (actual)
Erent ogvi	2 302 kg/m minimum
Main Body	0.403 kg/te interelical
"KPI" PF:	0.370 kg/te (theoretical)

If was extremely foggy during the blast

It Remarks Notice than Blazzy and region (B) IF I File of 15 from processing Blazzy

1

0.0

7.0 5.5

1

2

0.0

0.0

0.0

TECHNICAL BLAST DESIGN

of MANUTE LINES (FIRST)

BULK TRUCK CHARGE

SEISMOGRAPH RENTAL

3D LASER PROFILE

BLASTER HOURS

HELPER HOURS

BORETRACK

Services:

GPS LAYOUT



Blast Report

Nelson Aggregate

Quarry: P.O. #:

Blast Date:

Burlington

2018-05-22

Blast Number: Orica Order #:

18-004 2339509

Blast Time: 12:02 PM

page 2

Blast Co-ordinates	Enter N Lat.	Enter ° W Long.	
Mid Blast	43.40362	79.88325	
Front Row Corner	43.40349	79.88326	
Back Row Corner	43.40382	79.88322	
Average (Centre of Blast)	43.40364	79.88324	

(N) Radians	(W) Radiens
0.757536	1.394226
0.757534	1.394226
0.757540	1.394225
0.757536	1.394226

Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
1st Reading	43.40245	79.87814
2nd Reading		
Average	43.40245	79.87814
Distance (1st Seis, From Centre of Blast)	433,6	m
Post Blast Data: ppV:	3.3	mm/s
frequency:	8.1	Hz
air overpressure:	124_3	dB

(N) Radians	(W) Radians
0.757518	1.394137
0.757516	1.394137

2nd	Seismograph Co-ordinates	Enter ON Lat.	Enter W Long.
	1st Reading	43.40605	79 89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Sels, From Centre of Blast)	910.4	m

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 304413

0.3 mm/s 1.5 Post Blast Data: ppV: frequency: 8.9 Hz 123.1 dB air overpressure: Colling Rd & Blind Line Bruce Trail

? d6# tai 9€ 115 €

1.5 7

115

3rd	Selsmograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43 39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance to 4 Oct. From Contract Class	4750 7	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

26.7 m 0.3 mm/s Distance (3rd Sels. From Centre of Blast) Post Blast Data: ppV: 1.5 100.0 Hz frequency: 39.1 dB air overpressure: 115 SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^3}$$

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike der Kinderen



Quarry: e:

Burlington 2018-06-04

Blast Number: 18-005 Orica Order #: 2345753 Blast Time: 11:50 AM

ORICA	elson Aggreg			P.O. a Blast Date	
Blaster-in-charge:	M	ike der l	Kinden	en	(Paint Warmer
Blast Location:	1	ower Mide	dle Sou	th	(Brief Print)
GPS Coordinates:	43.40398 Centre of Blass	°N La	titude	79.88319 Cantre of Blass	°W Longitude
Wind from the: W	at 15 kpl	1		Temperature	e: 16 to 20 °C
Clear:	Rain:	Ove	ercast:		
Partly Cloudy: X	Snow:		ersion:	Ceiling	2,563 ft
- Drilling Information -	_				
210002000000000000000000000000000000000	Angle from Vertic	al		No	minal Bit Diameter:
Primary Bit diam: 101.6		# Holes:	67	= 2,963.	5 ft (4 " diam)
	mm 0°	# Holes:		= 0.	0 ft (" diam)
Tertiary Bit diam:	mm 0,	# Holes:		= 0.	0 ft (" diam
Bulk Explosives:	in (kg)	out	(kg)	kg	
CENTRA GOLD 70	33,8		5,710	8,180	
Packaged Explosives:	cs shippe	ed cs ret	urned	kg	
Boosters: PENTEX 12 (OR EQUIVALENT)	k	g / unit 0.34	# usec	kg 46.9	
	explosives weigl Pkgd Prod (0 kg		100	8,227	
Detonators:	case #'s			0.0% # used	
UNITRONIC 600 6M	Case # s	- 111	5	# useu	
UNITRONIC 600 15M				69	
Cord & Accessories:		Uo	f M	# used	1
HARNESS WIRE DUPLEX	(6 PACK) 400M	uni		1	1.766 lb/yd ³
		uni			1.218 lb/yd ³
Resource Deployment:		uni	ts		1.405 lb/yd ³
					1.382 lb/yd ³
# of Blasts today (this Quarry)				1	Cost Reduction Notes (
# of Blasters (this Blast)	61.0			1	Stone decks were requi
# of Helpers (this Blast)	Note Except	ion .		2	Hole H-5 was at 38'
# of MMU's (this Blast) Services:				1	1st seismograph was se
					truck traffic going by.
GPS LAYOUT	Enter hours	2014-3		0.0	
BULK TRUCK CHARGE	>/=5,000kg		UUkg	7.0	
BLASTER HOURS	Enter Blaster			7.0	
HELPER HOURS	Enter total H			11.0	
SEISMOGRAPH RENTAL	Enter # Orica	seismogr	apns	0	
3D LASER PROFILE	Enter hours			0.0	

Enter hours

(per day) Enter # of days

(Rani Namuri	Tonnes Blasted:		te 7,853 m²
	Total tonnes per day:	20,811	The second second
(Birnch / Face)	Total Holes Loaded:	67	holes
°W Longitude	including:		Dead Holes
	and:		Helper Holes
	Helper Hole Collar:		ft avg
: 16 to 20 °C	# Rows Blasted:		rows
	- Pattern	(Front Roll	
	Burden:	12.0	ft avg
2,563 ft	Spacing:		ft avg
	# Holes:	8	front row
	- Pattern	Main Body	
ninal Bit Diameter:	Burden:		ft avg
ft (4 " diam)	Spacing:		ft avg
ft (" diam)	# Holes		main body
ft (" diam)	Bench Height:		
1	Sub-drill:		ft avo
	Hole Depth:		ft avg ft avg ft avg per blast ft avg ft avg
		Decking -	
	Front Row:		ft avg
	Main Body:		ft avg
	# Decks:	2	per blast
		Stemming	- 1
	Front Row:		ft avg
	Main Body:		ft avg
	Material used:		
		e Length -	
	Front Row:		
	Main Body:	32.2	ft avg
		e Weight -	
	Front Row:	108.6	kg/hole
	Main Body:		kg/hole
	Max. per delay:		kg/delay
	SD () Equation:		kg/delay
	Total kg Loaded:		
	Rock Density:	2.65	g/cc = te/m3
	- Down	er Factor -	
1.766 lb/yd3	Yield PF:		kg/te (actual)
1.218 lb/yd ²	Front row		kg/te (theoretical)
1.405 lb/yd ³	Main Body:	-	kg/te (theoretical)
1.382 lb/yd ³	"KPI" PF:		kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit B. S. Expl or IS from previous Blast

Stone decks were required at E-7 & F-7 due to voids identified on drill log

0.0

0.0

1st seismograph was set to trigger at 100db and when I went to pick it up the memory was ful truck traffic going by

TECHNICAL BLAST DESIGN

BORETRACK



Blast Report

Nelson Aggregate

Quarry: Burlington

P.O. #: Blast Date: 2018-06-04 Blast Number: Orica Order #:

Blast Time:

18-005 2345753 11:50 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
Mid Blast	43.40399	79.88318	
Front Row Corner	43.40400	79.88336	
Back Row Corner	43.40396	79.88302	
Average (Centre of Blast)	43.40398	79.88319	

(N) Radians	(W) Radians
0.757542	1.394225
0.757543	1.394228
0.757542	1.394222
0.757542	1.394225

1st Seismograph Co-ordinates Enter º N Lat. Enter ° W Long. 1st Reading 43.40245 2nd Reading 43.40245 Average 79.87814 Distance (1st Seis. From Centre of Blast) 442.5 m ppV: Memory frequency: Was Post Blast Data: mm/s Trigger sel at: 2.0 mm/s Hz

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

V/T/L ? (Vertical Transverse or Longitudinal)
Trigger set at 100 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	904.3	m
		Mary .	The state of the s

air overpressure: Full

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 304413

Post Blast Data: ppV: Did mm/s Trigger set at 2.0 mm/s
frequency: Not Hz V/T/L ? (Vertical, Transverse or Longitudinal)
air overpressure: Trigger dB Trigger set at 115 dB

dB

Colling Rd & Blind Line Bruce Trail

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1263.7	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Post Blast Data: ppV: Did mm/s Trigger set at . 2.0 mm/s frequency: Not Hz V/T/L ? (Vertical Transverse or Longitudinal) air overpressure: Trigger dB Trigger set at . 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= 195,806 kg

Maximum Indicated Charge Weight per Delay = 218 kg

Orica

Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete a Accurate



Blast Design

Nelson Aggregate

Quarry: P.O. #:

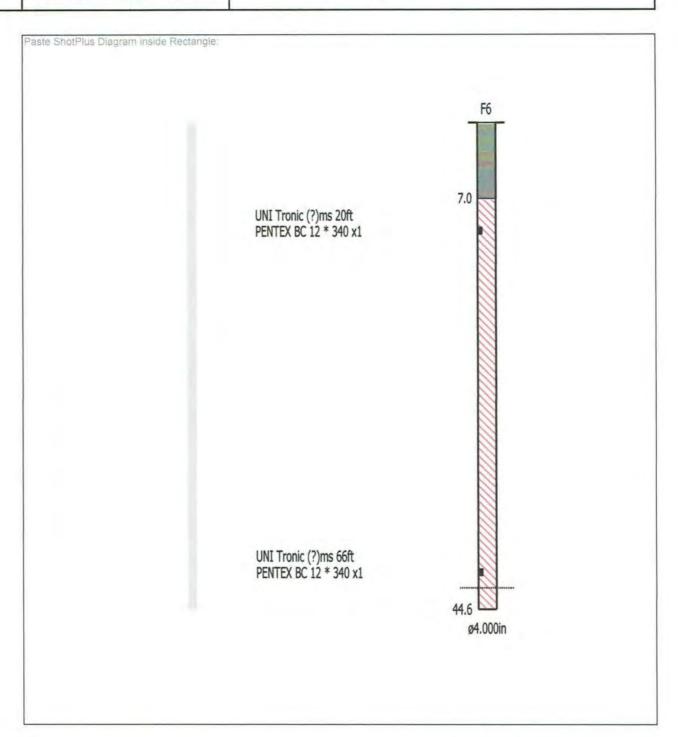
Blast Date:

Burlington

6/4/2018

Blast Number: Orica Order #: 18-005

page 2



Orica

Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White



Not to scale

906	811 810 *	716 715 •	591 590	486 485	371 370 •	256 255	141
886	791 790	696	570 571 571	466 465	351 350	236 235	121 120
866	771 770 *	675 676 676	551 550	446 445	331	216 215	101
846 845	751 750 •	656	531 530	426 425	311	196 195	81
826 825	731 730 •	636	• 511 • 510	406	291 290	176 175	60
806 77 805 77	711 69 710 69	616 596 615 595	491	386	271 270 •	156	40
786 76 785 76	670 • 670	•	471 470	366 365	251	136 11 135 • 11	0 0
56 746 55 745	650		451	346	231 •	UTO	

SHOTPlus 5.7.1.1	1.1	6/4/20
Mine	Burlington	
Location		
Title/author	18-005 Bottom Middle South I. Deemert	I. Deemert
Filename	2018-06-04 18-005 Lower Middle.spf	dle.spf

6/4/2018

Blast Summary Data

Burden: 9.0ft

Rock density: 2.65g/cc 1st row burden: 12.0ft

Total drilled: 2963.6ft Hole Diameter: 4.0in Spacing: 10.0ft

Blasted tonnage: 21,880S/T Number of holes: 67 Subdrill: 0.0ft

Hole angle: 0.0° Stemming: 6.0ft

Load Sheet 132kg MAX

·123 · 126 · 133 · 119 · 122 · 107 · 119 · 681 · 677 121 · 621 · 511 · 45 · 611 · 121 · 921 · 401 · 181 Uni ozi. 121. 121. 66. 821. 881. 621. 601. 119 *124 *124 . 118 +110 Z11 1/20 + 111 + 111 + 111 + 12 + 111 + 11 15 121 121 123 125 124 109 11/6 + II4 · 122 · 132 · 123 · 116 · 106 · 109 20 151 . 151 . 511 . 121 . 1811 . 121 . * 118 ·116 ·117 ·126 ·119 ·11/2



Not to scale

18-005 Bottom Middle South I. Deemert 2018-06-04 18-005 Lower Middle.spf 5/30/2018

Mine

Burlington

Filename Title/author Location SHOTPlus 5.7.1.1

Highwall

SHOTPlus 5 Plan
Blast Summary Data

Rock density: 2.65g/cc 1st row burden: 12.0ft Burden: 9.0ft F9 F8 F7 F6 F5 F4 F3 F2 F1 47.2ft 46.4ft 45.2ft 44.6ft 44.6ft 43.4ft 42.8ft 41.5ft 40|9ft E8 E7 47.1ft 45.2ft H9 H8 H7 H6 H5 H4 H3 H2 H1 H9 H8 H7 H6 H5 H4 H3 H2 H1 47.6ft 47.0ft 46.5ft 46.3ft 43.7ft 44.8ft 45.3ft 45.0ft 44.3ft C8 C7 C6 44.9ft 44.6ft 44.7ft G9 G8 G7 G6 G5 G4 G3 G2 G1 47.7ft 46.9ft 45.8ft 45.6ft 45.6ft 43.0ft 44.9ft 45.0ft 42.5ft B8 B7 B6 B5 B4 B3 B2 B1 44.6ft 44.3ft 44.1ft 43.9ft 44.1ft 43.8ft 43.5ft 43.1ft A8 A7 A6 A5 A4 A3 44.1ft 44.6ft 43.8ft 44.0ft 43.8ft 43.7ft E6 44.4ft Total drilled: 2963.6ft Hole Diameter: 4.0in Spacing: 10.0ft C5 C4 C3 C2 C1 44,2ft 44,4ft 43.7ft 43.2ft 39,5ft E5 E4 E3 E2 E1 44.4ft 43.8ft 43.1ft 40.5ft 40.3ft Blasted tonnage: 21,880S/T Number of holes: 67 Subdrill: 0.0ft A2 A1 43.7f43.4ft Hole angle: 0.0° Stemming: 6.0ft



Not to scale

Mine Burlington

Location

Title/author 18-005 Bottom Middle South I. Deemert
Filename 2018-06-04 18-005 Lower Middle.spf

COMBINATION SHORT FORM ST XYPRESS CARRIERS SUBJECT										ROSS / BR		189712
ORMULE COMBINÉE ET ABRÉ OUS RÉSERVE DE LA JURISDIC					CONTRAT	DE TRANSPORT DE ME		-1		ARE		74
Orica Car	nada ND V					Bill Of L	ading / Conna	aisseme		ET		
CRA	411	SIDE		D 21-22	2	Ben	TER 1	WIKE		TIME HEURE D		TIME OUT HEURE SORTIE
ONSIGNEE NEL	SON	AGGR	REGAT	E COMPA	NY		up I A	Time	A	ORDER N N° DE COI		B/L NUMBER N° DE CONNAISSEM
	LING L7R		ON			Rill	, 1	ET	TH 2	34575	3	86028794
DATE REQUIRED DATE REQUISE		E REQUI					TO / BUYER	16/4		,	LISTOMER	PAGE 2
)4 Jun 2018		OO: 0		NET SON	ACCI	FACTURE /	A/ACHETEUR			N	° DE COMM	ANDE DU CLIENT
DATE SHIPPED EXPÉDIÉ LE		0010	-	FREIGHT ONDITIONS DI	TERMS	AND READ SHIP	S	SHIP. MAG, I	IC.	/a		HICLE NO.
04 Jun 2018	FOB	Des	st'n,	Own Tr	ruck		F-73289		12011		158	DE VÉHICULE
	SHIF	P VIA PORTEUR	R					ROUTING TINÉRAIRE				MAG. LIC. NO. N° DE PERMIS
ica Truck ory. oré.	UM	DG C	TY, RET'I	OTY. SOLD		STANDARD	DESCRIPTION				# OF / DE	AMOUNT
196	PC	MD	STÉ. RET.	/38		TEX BC 340 (PKGS.	MONTANT
2 80 132 66 100 1	PC PC PC PC PC PC	X X X	113695	99901	*uni *uni *uni MINI LICE LABO ROG	tronic 600 tronic 600 tronic 600 tronic 600 STEM PLUGS NSED BLASTE DUR CHARGE (ROCK ON GR	0-06.0M CU/ 0-15M C/Z S 0-20M CU/ZC 0-PART #7 FR	ZC(20 SPL(50 SPL()80PC		1 2 1	5.840 5.840 22.572 13.464 0.700
					TOTA	AL GROSS WE	GHT				1	19.956 KG
					Wel Ema	S/WHMIS SDS bsite: www.cail: sds.hacone: 1-855-2	oricamining Porica.com	gservi	able ces.com		9	
S USED PALETTES UNUSEE	AL T	NFO	RMATT	ON:	612	006-6666				Į.	1	
RGENCY RESPONSE PLAN / F						ESPONSE NO./24 HOUR NU PURGENCE/24 HEURE NUM	MBER PLACARI	DS OFFERED	PLACARDS OFFERT	FORWA		FOR PREPAID FRE
ERAP TO CERTIFY THAT THE ABOVE NA			IBODEDI V O	ASSIDIED DESCRI		77-561-36			NO / NON	NO DE	EXPÉDITION F	TO / FAIRE SUIVRE FACT PORT PAYÉ EN RÉFÉRA JENT D'ORICA : B Inc.
ED, AND ARE IN PROPER CONDITIONAL TRANSPORTATION AGENC ERTIFIONS QUE LA CLASSE, LA DI NTIONNÉES DE MÊME QUE LES CO FFICE NATIONAL DES TRANSPORT	TON FOR THE CY AND THE ESCRIPTION ONDITIONS	TRANSPOR E DEPARTI N, L'EMBAI DE TRANS	MENT OF TR LLAGE, LE M SPORT SONT	CORDING TO THE ANSPORT. ARQUAGE ET L'ÉTI CONFORMES À L	APPLICABL	E REGULATIONS OF VALEUR	R DÉCLARÉE	PRESSAG			nsburg-	ol de ville Chatham, QC
GNOR / EXPÉDITEUR RAND VALLEY					One i and many at			ONSIGNEE / DESTINA				
ER'S NAME (PLEASE PRINT) /	NOM D'E	XPÉDITE	UR	DR	IVER'S NA	ME (PLEASE PRINT) NOM	DU CAMIONNEUR		ECEIVER'S NAME (PL			
ATURE	1	DA	TE /	SIG	SNATURE	INA	DATE	100	GNATURE			DATE

**** PAGE 2 OF 2 ****

Blast Summary Data

Rock density: 2.65g/cc 1st row burden: 12,0ft Burden: 9.0ft

Total drilled: 2963.6ft Hole Diameter: 4.0in Spacing: 10.0ft

> Number of holes: 67 Subdrill: 0.0ft

Blasted tonnage: 21,8805/T

Stemming: 6.0ft

Hole angle: 0.0°

Open Face

4" Hole Diameter

12x10 Front Row 9x10 Body Bottom Middle South 18-005

250m Floor Elevation + 0.6m Sul

⊕ H9 47.6€ 47.0€ # F9 47.2m # 47.7ft 46.9ft 44.1ft # 44.6ft

Highwall

Mine SHOTPlus 5.7.2.1 Burlington

02/05/2018

Location

Title/author 18-005 Bottom Middle South Filename 18-005 Design Final.spf I. Dee

Not to scale

ORICA



Quarry: Burlington 2018-06-06 Blast Number: 18-006 Orica Order #: 2346925 Blast Time: 12:10 PM

ORICA The Blasting Professionals*		on Aggrega			P.O. # Blast Date	The second of th
age 1 Blaster-in-c	harge:	Mi	ike der k	(indere	n	(Print Vame)
Blast Lo	cation:		Lower E	lanch		(Bench / Face)
GPS Coord		43.40428	°N La		79.88387	°W Longitude
01 0 00010		Cantre of Blass		ituuo	Centre of Alast	TT Longitudo
Wind from the:	W a	t 5 kph	1		Temperature	: 11 to 15 °C
01		Delet	0	ercast:	X	
Clear: Partly Cloudy:		Rain: Snow:		ersion:	Ceiling	3,116 ft
- Drilling Informa	tion –					
		gle from Vertica				minal Bit Diameter:
Primary Bit diam:			# Holes:	61	= 2,668.	
Secondary Bit diam:	mn		# Holes:			0 ft (" diam
Tertiary Bit diam:	mn	1 0'	# Holes:		= 0.	0 ft (" diam
Bulk Explosives	3:	in (kg)	out	(kg)	kg	
CENTRA GOLD 70		26,6	50	19,410	7,240	
						1
Packaged Explo	osives:	cs shippe	ed cs re	turned	kg	1
Boosters:			cg / unit	# usec	kg	1
PENTEX 8 (OR EQUI	VALENT)		0.23	130	29.5	
	total ex	olosives weig	ht in Blas	t (kg):	7,270	
		gd Prod (0 kg			0.0%	1
Detonators:		case #'s	s r	ns	# used	
UNITRONIC 600 6M					59	
UNITRONIC 600 15M					71	
Cord & Access	ories:		U	of M	# used	
HARNESS WIR	E DUPLEX (6	PACK) 400M	u	nits	1	1.809 lb/yd ³
MIN	NI STEM PLU	35 - 6015 (4")	u	nits	8	1.031 lb/yd ³
			u	nits		1.467 lb/yd ²
Resource Deploym	ient.					1.427 lb/yd ³
# of Blasts today (this	Quarry)				1	Cost Reduction Notes
# of Blasters (this Blast	st)				1	Due to voids identified
# of Helpers (this Blas	t)	Note Excep	otion		2	from 5'-7'
# of MMU's (this Blast	1				1	Every front row hole h
Services:		12.000				See load adjustment s
GPS LAYOUT		Enter hours	1000	2701	0.0	
BULK TRUCK CHAR	GE	>/=5,000k		000kg	1	
BLASTER HOURS		Enter Blast		. 200 - 00 - 0	7.0	
HELPER HOURS		Enter total			11.0	
SEISMOGRAPH REN	ITAL	Enter # Ori		graphs	0	
3D LASER PROFILE		Enter hours			0.0	
BORETRACK		Enter hours	S		0.0	

		12010	14 1	0.770
	Tonnes Blasted:			6,773 m3
	Total tonnes per day:			NB40-08 Code
7	Total Holes Loaded:		holes	Carabia.
de	including:		-	Holes
	and:		Helpe	r Holes
	Helper Hole Collar:		ft avg	
°C	# Rows Blasted:		rows	
	- Pattern	(Front Roy		
	Burden:	12.0	ft avg	
ft	Spacing:		ft avg	
	# Holes:	8	front	DW
	- Pattern	Main Body	1) -	
meter:	Burden:	9.0	ft avg	
" diam)	Spacing:	10.0	ft avg	
" diam)	# Holes	53	main	body
" diam)	Bench Height:	41.7	ft avg	
	Sub-drill:	2.0	ft avg	
	Hole Depth:	43.7	ft avg	100
	- Stone	Decking -		10
	Front Row:	7.0	ft avg	3 7
	Main Body:	5.0	ft avg	90
	# Decks:	6	per bl	ast
	- Collar	Stemming	-	N. S.
	Front Row:	7.0	ft avg	0
	Main Body:	7.0	ft avg	18
	Material used:	.75" stone		5
	- Char	ge Length -		
	Front Row:	29.7	ft avg	2
	Main Body:	31.7	ft avg	3
	+ Chan	ge Weight		
	Front Row:	86.7	kg/ho	le
	Main Body:	92.6	kg/ho	le
	Max. per delay:	145.0	kg/de	lay
	SD () Equation:		kg/de	lay
	Total kg Loaded:		kg	
	Rock Density:		g/cc	= te/m³
	- Powe	ler Factor -		
lb/yd3	Yield PF:	0.405	kg/te	(actual)
lb/yd ²	Front row:	0.231	kg/te	(theoretical)
lb/yd2	Main Body	0.328	kg/te	(theoretical)
lb/yd3	"KPI" PF:	0.319	kg/te	(theoretical)

Due to voids identified on drill log and found while loading we had to put in 6 stone decks rang

0.0

(per day) Enter # of days

Every front row hole hole had lean burden, therefore we used toe loads and stem plugs See load adjustment sheet in report

TECHNICAL BLAST DESIGN



Blast Report

Nelson Aggregate

Burlington Quarry: P.O. #:

2018-06-06

Blast Date:

Blast Number: Orica Order #: Blast Time:

18-006 2346925 12:10 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40427	79.88388
Front Row Corner	43.40428	79.88368
Back Row Corner	43.40428	79.88405
Average (Centre of Blast)	43.40428	79.88387

(N) Radians	(W) Radians
0.757547	1.394237
0.757548	1.394233
0.757548	1.394240
0.757548	1.394237

1st	Seismograph Co-ordinates	Enter ON Lat.	Ente	r ° W Long.
	1st Reading	43.40245		79.87814
	2nd Reading		1.0	
	Average	43.40245		79.87814
	Distance (1st Seis. From Centre of Blast)	506.1	m	
	Post Blast Data: ppV:	Did	mm/s	Trigger set at
			1.	

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

2.0 mm/s frequency: Not Hz VITIL ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dB Trigger set at 120 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter o N Lat.	Enter ° W Long.		(1)
	1st Reading	43,40605			1
	2nd Reading				
	Average	43.40605	79.89400		
	Distance (2nd Seis. From Centre of Blast)	842.9	m		
	Post Blast Data: ppV:	Did	mm/s Trigger set at:	2.0 mm/s	5
	frequency:	Not	Hz VITIL	? (Vert	tics

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

frequency: Not VITIL ? (Vertical Transverse or Longitudinal) air overpressure: Trigger dB Trigger set at: 115 dB Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter o N Lat.	Enter ° W Long.
	1st Reading	43.39339	
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1276.3	m
	Doot Diget Date: ant/	Did	

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s frequency: Not Hz V/T/L ? (Vertical, Transverse or Longitudinal). air overpressure: Trigger dB Trigger set at 115 dB

SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(506.1)^2}{30^2} \text{ kg}$$

$$= \frac{256,137}{900} \text{ kg}$$

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike der Kinderen

Signature regioned todicating that



Blast Design

Nelson Aggregate

Quarry: P.O. #:

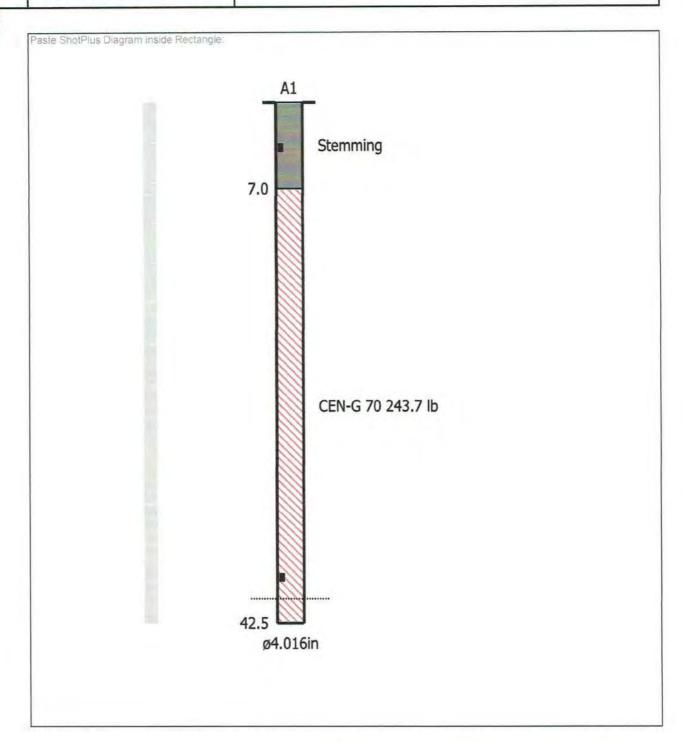
Blast Date:

Burlington

6/6/2018

Blast Number: Orica Order #: 18-006

page 2



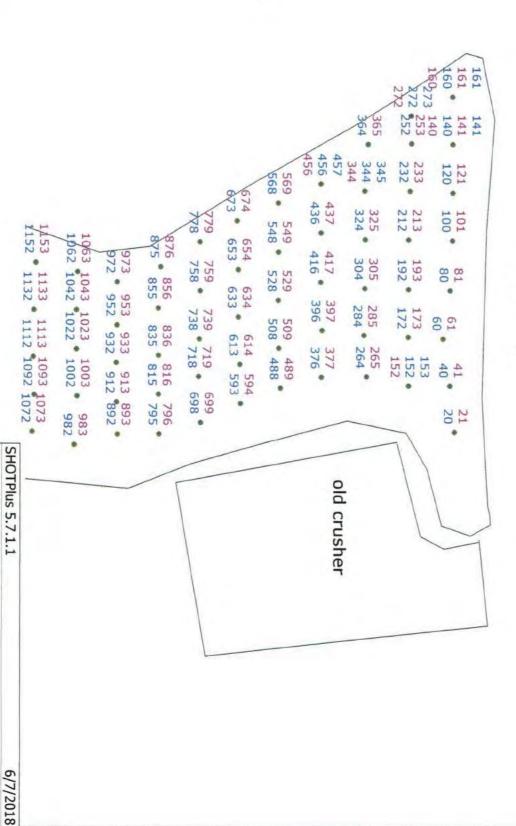
Orica Blaster-in-charge:

Quarry Manager:

Mike der Kinderen

Bill White

Timing



open face



Mine

Burlington

Title/author Filename

18-006 K. George 2018-06-06 18-006.spf

Blast Summary Data

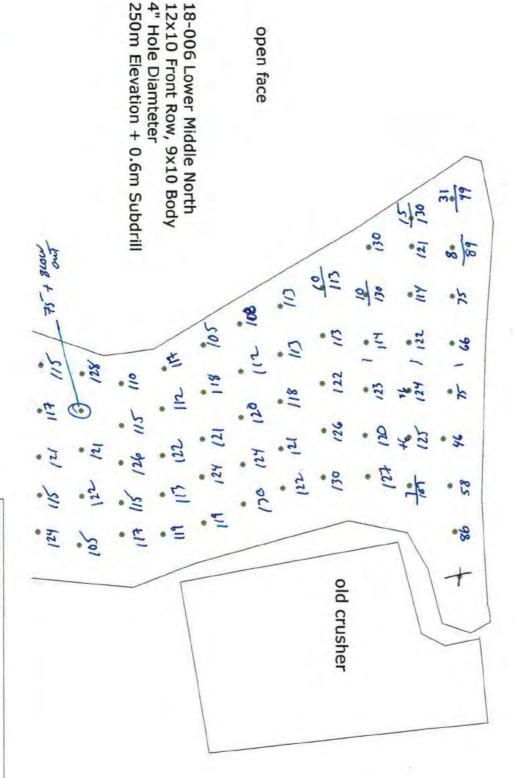
Hole Diameter: 4.0in Spacing: 10.0ft Subdrill: 2.0ft

Burden: 9.0ft

Number of holes: 62

Hole angle: 0.0° Stemming: 6.0ft

Total drilled: 2588.0ft 1st row burden: 12.0ft Load Sheet 130Kg MAX



open face



Not to scale

SHOTPlus 5.7.1.1 2018-06-06 18-006.spf 18-006 K. George Burlington 6/4/2018

Mine

Location

Filename

Title/author

Blast Summary Data

Subdrill: 2.0ft

Number of holes: 62

Stemming: 6.0ft

Hole angle: 0.0°

Total drilled: 2588.0ft 1st row burden: 12.0ft Hole Diameter: 4.0in

Burden: 9.0ft Spacing: 10.0ft

A1 A2 A3 A4 A5 42.5ft 43.0ft 43.0ft 42.3ft 41.9ft 42.2ft B1 B2 B3 B4 B5 B6 B7 42.5f#2.8ft 42.5ft 42.4ft 42.0ft 41.9ft 41.8ft C1 C2 C3 C4 C5 C6 42.6ft 42.6ft 41.7ft 41.7ft 41.7ft 42.1ft D1 D2 D3 D4 D5 41.9ft 41.5ft 41.6ft 41.9ft 41.5ft E1 E2 E3 E4 E5 41.3ft 41.4ft 41.6ft 41.7ft 41.7ft F1 F2 F3 F4 F5 41.5ft 41.4ft 41.7ft 41.7ft 41.5ft G1 G2 G3 G4 G5 41.3ft 41.6ft 41.3ft 41.1ft H1 H2 H3 H4 H5 41.3ft 41.4ft 41.1ft 41.2ft 41.3ft A7 88 A9 42.3ft 42.3ft 41.4ft old crusher

4" Hole Diamteter 250m Elevation + 0.6m Subdrill 12x10 Front Row, 9x10 Body 18-006 Lower Middle North

open face

K1 K2 K3 K4 K5 41.3ft 41.7ft 41.9ft 41.8ft 41.2ft

J1 J2 J3 J4 J5 41.4ft 41.7ft 41.7ft 41.4ft 41.2ff

I1 I2 I3 I4 I5 41.4ft 41.5ft 41.5ft 41.3ft41.3ft

Mine Filename Location **SHOTPlus 5.7.1.1** Title/author 2018-06-06 18-006.spf 18-006 K. George Burlington 6/4/2018



COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONTAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Orica Canada Inc.

CONSIGNOR EXPÉDITEUR

GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE

NELSON AGGREGATE COMPANY BURLINGTON ON

CA L7R 4L8

Bill of Lading / Connaissement

Blaster - M. Ke Helpers - Dylan Ken

1.0	03130
GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2346925	86032192

1000726

DATE REQUIRED DATE REQUISE		REQUI				INVOICE TO / BUYER FACTURÉ À / ACHETEUR		CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT		
06 Jun 2018	00:0	00:0	00 1	VELSON	AGGREG	TE COMPANY	n/a			
DATE SHIPPED EXPÉDIÉ LE			COL	FREIGHT T		SHIP. MAG. LIC. PERMIS EXPÉDITEUR		VEHICLE NO. N° DE VÉHICULE		
	L								PT 15001	
06 Jun 2018	FOB		st'n,	Own Tr	uck	ROUTING			MAG. LIC. NO.	
	TRANSPO		R			ITINÉRAIRE			N° DE PERMIS	
rica Truck					SI	NDARD				
QTY. QTÉ.	UM		OTY. RET'D OTÉ. RET.	QTY. SOLD QTÉ. FACT		DESCRIPTION		# OF / DE PKGS.	AMOUNT MONTANT	
196 2 80 132 100 1 1.0	PC PC PC PC		66 21 61 92	130	Harnes *uni t *uni t MINI S LICENS LABOUR	BC 340 (49/CS) Wire Duplex (6 pack) 400m conic 600-06.0M CU/ZC(20')80PC conic 600-15M C/Z SPL(50')66PC TEM PLUGS - PART #74853 ED BLASTER CHARGE DCK ON GROUND)		1 1 2	71.540 5.840 5.840 22.572 0.700	
					**** GHS/Webs	GROSS WEIGHT TOTAL PACKAGES **** THMIS SDS documents available te: www.oricaminingservices.c.: sds.na@orica.com 1-855-26-ORICA (1-855-266-7)		8	106.492 KG	

24 HOLD TECHNICAL INFORMATION	ALLETS REFORMED / PALEFTES RETOURNÉES		BAGS USED / SACS	umusés	
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OFF	FERED / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA BYL TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA : Orica Canada Inc.	
ERAP 2-1510	1-877-561-3636	YES / OUI	NO / NON		
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASS LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCOUNTED THE NATIONAL TRANSPORTATION ACENCY AND THE DEPARTMENT OF TRANSPORTS NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MAPQUE SUBMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CON DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORT	ING TO THE APPLICABLE REGULATIONS OF VALEUR DECLA PORT. JUGGE ET L'ÉTIQUETAGE DES MARCHANDISES \$ FORMES À LA RÉALITÉ ET AUX RÉGLEMENTS	RÉE PRI	TTE No. CONV ESSAGE AGREEMENT NO.	301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5	
CONSIGNOR / EXPÉDITEUR GRAND VALLEY	Orica Truck		NELSON AGG	REGATE COMPANY	
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAN	MONNEUR	RECEIVER'S NAME (PLE	ASE PRINT) / NOM DU RECEVEUR	
SIGNATURE DATE	SIGNATURE	DATE 06 15	SIGNATURE	DATE	

Blast Summary Data

Number of holes: 62 Subdrill: 2.0ft

Hole angle: 0.0° Stemming: 6.0ft

Total drilled: 2588.0ft 1st row burden: 12.0ft Burden: 9.0ft

Hole Diameter: 4.0in Spacing: 10.0ft

E1 E2 E3 E41.7tt +41.7tt +41.7tt # 84 # 42.4ft ⊕ C3 41.70 ⊕ D3 ⊕ D4 ⊕ D5 ⊕ 41.6ft ⊕ 41.9ft ⊕ 41.5ft +41.7ft +41.7ft +42.1ft # A6 42.2ft A7 42.3ft A8 + A9 + 41.4ft

open face

#41.4ft #41.7ft #41.7ft #41.5ft

old crusher

18-006 Lower Middle North 250m Elevation + 0.6m Subdrill 4" Hole Diamteter 12x10 Front Row, 9x10 Body

H1 H2 H3 H4 H5 41.30 ⊕41.40 ⊕41.10 ⊕41.20 ⊕41.30

41.3ft # 41.3ft # 41.1ft

"41.4ft #41.5ft #41.5ft #41.3ft 41.3ft

K1 41.3ft	⊕ 41.4ft
± ± 41.7€	132 13 1441.7ft (#) 41.7ft
± 41.9n	13 41.7ft
± 41.9n	# 41.4ft
¥5 41.2π	# 41.2R



C)	
_	7	•
6	5	•
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Č	j	
2	U	
d	D	

SHOTPlus 5.7.2.1	.7.2.1	02/05/2018
Mine	Burlington	
Location		
Title/author	Title/author 18-006 K. George	rge
Filename	Filename 18-006 Lower Middle.spf	1iddle.spf

ORICA The Blasting Professionals*	Blast Re	•		Quarry: P.O. #: Blast Date:			Blast Number: Orica Order #: Blast Time:	234	3-007 48563 56 AM
page 1 Rlaster-in-ch		Miles device			1		Tamas Diagtada	00.407	te 10,742 m ³
Blaster-in-ch	narge:	Mike der Ki	ndere	n	(Print Name)		Tonnes Blasted:	28,467	/
Plant Los	ation	I Imman Mi	حالما م		1,5	,	Total Holes Leaded:	28,467	
Blast Loc		Upper Mi		70 00045	(Bench / Fac	′	Total Holes Loaded:	55	holes
GPS Coordin	nates: 43.403		ude _	79.88315 Centre of Blast	°W Longitu	ae	including:		Dead Holes
	Centre of	i bidst		Certife of Blast			and: Helper Hole Collar:		Helper Holes
Wind from the:	E at 1	5 kph		Temperature:	21 to 25	°C	# Rows Blasted:	4	ft avg
wind from the.	E at1			•	21 (0 25	C		(Front Row	1
Clear:	Rair) X	cast:	X			Burden:		ft avg
Partly Cloudy: X	Snow			Ceiling	30,000	ft	Spacing:		ft avg
r artiy Gloddy.	Onow	v illivel	31011.	Cennig	30,000],,	# Holes:		front row
- Drilling Informati	ion -							(Main Body	1
Drining mornida	Angle from	Vertical		Nom	ninal Bit Dia	ameter:	Burden:		ft avg
Primary Bit diam:		0 , # Holes:	54	= 4,055.1		" diam)	Spacing:		ft avg
		0 # Holes:	1	= 75.1	•	" diam)	# Holes:		main body
Tertiary Bit diam:		0 # Holes:			ft (" diam)	Bench Height:		ft avg
					1	,	Sub-drill:		_
Bulk Explosives:	: in	n (kg) out (l	ka)	kg			Hole Denth:		ft avg
		, ,,	1,090	12,760			- Stone	Decking -	
			,	12,100			Front Row:		ft avg
Packaged Explos	sives: cs s	shipped cs retu	rned	kg			- Stone Front Row: Main Body:		ft avg
J							© # Deales		per blast
							0	Stemming	- 8
							- Collar Front Row:		ft avg
Boosters:	'	kg / unit #	used	kg			Main Body:		ft avg
PENTEX 12 (OR EQUIV	/ALENT)	0.34	110	37.4			Material used:	.75" Stone	ft avg ft avg ft avg per blast ft avg
,	,						(0)	ge Length -	
							Front Row:	68.1	ft avg
	total explosives	weight in Blast	(kg):	12,797			⊨ Main Body:	68.1	ft avg
	Pkgd Prod	(0 kg) % of Tota	al kg:	0.0%			- Charg	ge Weight -	
Detonators:	ca	se #'s ms	s	# used			Front Row:	198.6	kg/hole
UNITRONIC 600 6M				54			Main Body:		kg/hole
UNITRONIC 600 15M				1			Max. per delay:	261.0	kg/delay
UNITRONIC 600 25M				55			SD () Equation:		kg/delay
							Total kg Loaded:	12,797	-
							Rock Density:	2.65	g/cc = te/m ³
Cord & Accessor		U of		# used		11- 4 13		er Factor -	
	DUPLEX (6 PACK) 4			1		lb/yd ³	Yield PF:		kg/te (actual)
MINI	STEM PLUGS - 6015	, ,		10		lb/yd ³	Front row:		kg/te (theoretical)
Resource Deployme	nt·	unit	5			lb/yd ³	Main Body: "KPI" PF:		kg/te (theoretical)
# of Blasts today (this Q				1			his Blast) - change in Bit , B, S,		, ,
# of Blasters (this Blast)	- 77			1			8' or 9' collar due to broken rock		-
# of Helpers (this Blast)		Exception		2	20110 110163	COCIVOU AII	C Si C Conai duo to bioren 100	. on top or leaf	Saraon at the crest
# of MMU's (this Blast)	14016			1					
Services:				•					
GPS LAYOUT	Enter	hours		0.0					
BULK TRUCK CHARGE		>/=10,0	00 ka	1					
BLASTER HOURS		Blaster hours	- o ng	0.0					
HELPER HOURS		total Helper man-h	nours	0.0					
SEISMOGRAPH RENTA		# Orica Seismogra		0.0					
3D LASER PROFILE		hours	۵, ، م	0.0					
BORETRACK		hours		0.0					
	Linter			0.0					

2018-06-11 18-007 Upper Middle Blast Report

0.0

(per day) Enter # of days

TECHNICAL BLAST DESIGN



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-11

Blast Number:
Orica Order #:
Blast Time:

18-007 2348563 11:56 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40364	79.88314
Front Row Corner	43.40353	79.88317
Back Row Corner	43.40386	79.88312
Average (Centre of Blast)	43.40368	79.88315

(N) Radians	(W) Radians
0.757536	1.394224
0.757535	1.394224
0.757540	1.394223
0.757537	1.394224

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40245	79.87814
	2nd Reading		
	Average	43.40245	79.87814
	Distance (1st Seis. From Centre of Blast)	427.3	m
Ī	D (D) (D)	0.7	

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

 Post Blast Data:
 ppV:
 2.7 mm/s
 T

 frequency:
 12.0 dB
 Hz

 air overpressure:
 116.9 dB
 T

V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	916.8	m
	Dood Direct Doto: no.\/.	0.0	

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

 Post Blast Data:
 ppV:
 0.2 mm/s
 Trigger set at:
 2.0 mm/s
 mm/s
 CVETICAL, Transverse or Longitudinal)

 frequency:
 10.0 Hz
 V / T / L:
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 120.2 dB
 Trigger set at:
 115 dB

Colling Rd & Blind Line Bruce Trail

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1233.5	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 0.1 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 0.0 Hz
 V / T / L:
 ? (Vertical, Transverse or Longitudinal)

 air overpressure:
 119.6 dB
 Trigger set at:
 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = D^2 \over 30^2$$

 $= \frac{(427.3)^2}{30^2} \text{ kg}$

= <u>182,585</u> kg 900

Maximum Indicated Charge Weight per Delay = 203 k

OricaBlaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-06-11 18-007 Upper Middle

JIIII DI a

Blast Report



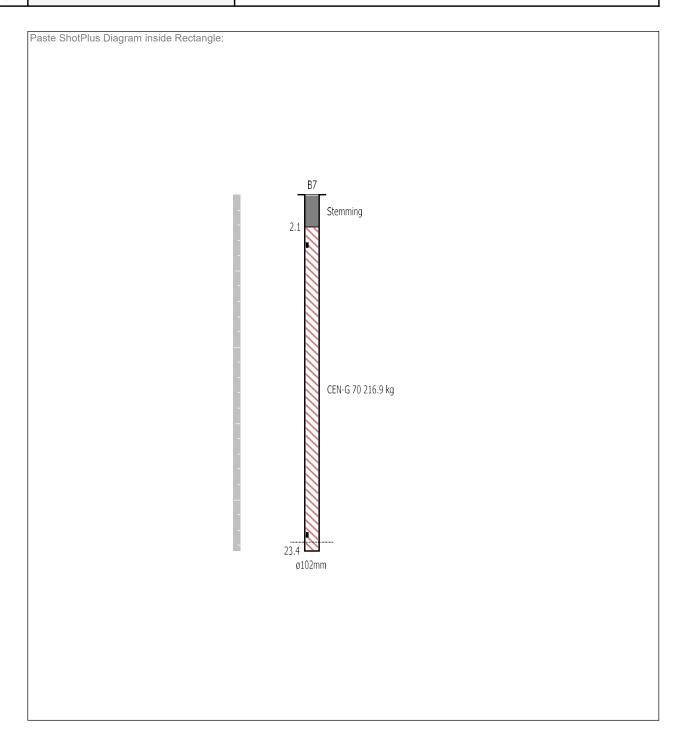
Blast Design

Nelson Aggregate

Quarry:	Burlington
P.O. #:	
ast Date:	6/11/2018

Blast Number: 18-007 Orica Order #: 2348563

page 2



Orica
Blaster-in-charge:

Quarry Manager:

Mike der Kinderen

Bill White

SHOTPlus 5 Plan

Subdrill: 0.2m Blast Summary Data Spacing: 3.0m

Blasted tonnage: 29,020tne Hole Diameter: 102.0mm Number of holes: 55 Total drilled: 1292.0m

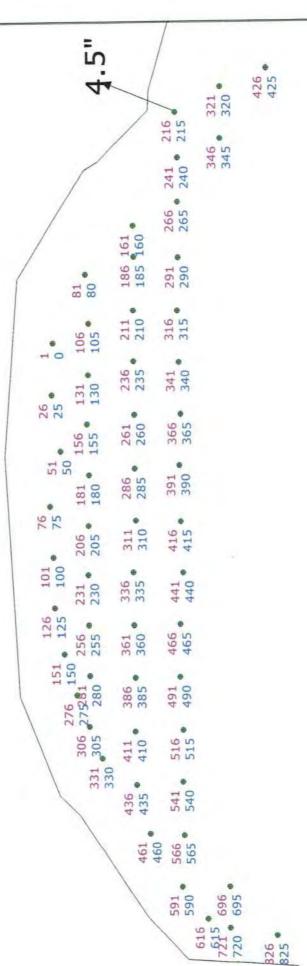
Rock density: 2.65g/cc

1st row burden: 3.7m Burden: 2.7m

Stemming: 2.1m

Hole angle: 0.0°

open face





6/11/2018 18-007 Upper Middle Design Ken George 18-007_Upper_Middle_Final.spf Upper Middle Bench Burlington **SHOTPlus** 5.7.1.1 Title/author Filename Location

SHOTPlus 5 Plan

Blast Summary Data

Spacing: 10.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Number of holes: 55 Subdrill: 0.6ft

Hole angle: 0.0°

Load Sheet Max Load 240kg Blasted tonnage: 25,592S/T Total drilled: 4130.2ft Rock density: 2.65g/cc 1st row burden: 12.0ft

SORICA

6/7/2018 18-007 Upper Middle Design Ken George 18-007_Upper_Middle_Final.spf Upper Middle Bench Burlington **SHOTPlus** 5.7.1.1 Title/author Filename Location

81×0

. 435

\$313

SHOTPlus 5 Plan

Blast Summary Data

Spacing: 3.0m

Blasted tonnage: 29,020tne Hole Diameter: 102.0mm Number of holes: 55 Total drilled: 1292.0m

Rock density: 2.65g/cc 1st row burden: 3.7m Burden: 2.7m

Subdrill: 0.2m

Stemming: 2.1m Hole angle: 0.0°

open face

A1 23.3m 23.3m 23.3m 46 A7 A8 23.5m B2 23.6m 23.5m B1 23.4m 23.5m 23.7m

* D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 \/ D17 \ 24.5m 23.8m 23.8m 23.8m 23.8m 23.8m 23.8m 23.8m 23.8m 21.3m

EZ4.6m22 24.6m 24.5m

• F1 24.5m

e F2 21.3m

^e 22.3m ^e 21.4m

SHOTPlus 5.7.1.1

6/11/2018

18-007 Upper Middle Design Ken George 18-007_Upper_Middle_Final.spf Upper Middle Bench Burlington Title/author Filename Location

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

Orica Canada Inc. GRAND VALLEY

CONSIGNOR EXPÉDITEUR 033411 SIDE ROAD 21-22

GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

GROSS / BRUT TARE NET TIME OUT TIME IN HEURE SORTIE HEURE D'ENTRÉE B/L NUMBER N° DE CONNAISSEMENT ORDER NUMBER N° DE COMMANDE 86036212 2348563

2

DATE REQUIRED		REQUI			INVOICE TO / BUYER FACTURÉ À / ACHETEUR			CUST N° DE	COMMA	EFERENCE NO. NDE DU CLIENT			
DATE REQUISE		E REQU		MET CON	ACCDUCA	AGGREGATE COMPANY n/a			1				
11 Jun 2018	00:0	00:0		FREIGHT T	OLUD MAG LIC			VEHICLE NO.					
DATE SHIPPED EXPÉDIÉ LE			CC	ONDITIONS DE				PERMIS E	XPÉDITE	ÜR	N° DE VÉHICULE		
11 Jun 2018	FOB	Des	st'n,	Own Tr	uck		F-73	289			PI IS GL		2012
	SHIP					ROUTING ITINÉRAIRE					MAG. LIC. NO. N° DE PERMIS		
rica Truck	TRANSP	ONIEU	n		STA	TANDARD				- 10-16			
QTY.		DG	OTY, RET	D QTY. SOLD			DESC	RIPTION	NO.	SAN LITTE		F / DE KGS.	AMOUNT MONTANT
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147	PC	X	37	110		BC 340			1		-	2	
2	PC		1	11.	Harness	Wire D	uplex (6 pack) 40	Om		1	5.840
80	PC	X	26	54	*uni tr	conic 60	0-06.0M	I CU/ZC	(201)80PC		1	5.840
66	PC	X	65	1	kumi tr	conic 60	00-15M C	ZZ SPL	(501)66PC		1	11,286
		1 1		55		conic 60						2	26.352
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1	PC					OCK ON	GROUND)						V
-										-	100 570 80		
	<u></u>				TOTAL GROSS WEIGHT **** TOTAL PACKAGES ****						103.673 KG		
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EMERGENCY RESPONSE PLAN		É DE PL	AN D'URGE			ONSE NO./24 HOUR BENCE/24 HEURE		PLACARDS	OFFERED	/ PLACARDS OFFERT	QUOTING	ORICA E	ICE FOR PREPAID FR B/L TO / FAIRE SUIVRE FAC N PORT PAYÉ EN RÉFÉR
ERAP	2-1	510)		1-877	-561-3	3636	YES /	OUI	NO / NON			EMENTIPIORICA:
HIS IS TO CERTIFY THAT THE ABOVE				VOI ACCITICA DES					NETTE N		301 I	rue ho	tel de ville
ARELLED, AND ARE IN PROPER CON	NDITION FO	OR TRANS	POHIATION	ACCOMUNG TO T	HE APPLICABLE RE	GULATIONS OF VA	ALEUR DÉCLARÉ	E	PRESSA		-3-0-0		-Chatham, QC
THE NATIONAL TRANSPORTATION AG NOUS CERTIFIONS QUE LA CLASSE, LI SUSMENTIONNÉES DE MÊME QUE LES DE L'OFFICE NATIONAL DES TRANSPO	ENCY AND A DESCRIP S CONDITIO	THE DEP TION, L'EI DNS DE TE	MBALLAGE, L RANSPORT S	E MARQUAGE ET L ONT CONFORMES	ÉTIQUETAGE DES M	MARCHANDISES S	V-4.		WI AGRI	EEMEN NO.	J8G 3		
CONSIGNORY EXPEDITELIA		- medic	1000	- 1	CARRIER TRAN	SPORTEUR	1			CONSIGNEE / DESTINA	REGAT	E CO	MPANY
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HIPPER'S NAME (BLEASE PRIN'	MON. (T	D'EXPÉR	TEUR		DRIVER'S NAME	(PLEASE PRINT)	NOM DU CAMIO	NNEUR		RECEIVER'S NAME (PL	EASE PHINT)	/ NOM DI	U NEUZVEUN

SIGNATURE

DATE

SIGNATURE

SIGNATURE

DATE

DATE

M/M

ORICA The Blating Professionals*	Blast Design Nelson Aggregate					Quar P.O. sign Da
page 1 Blaster-in-charg	ge: Mil	ke der	Kinderen			
Blast Location	on: Upp	per Mic	ldle			
GPS Coordinate	- //-	.40368 re of Bla		tude		.88315 re of Blan
- Drilling Information -						
Primary Bit diam: 101		om Ven		-2		N
Secondary Bit diam:		0	# Holes:	55	=	4,130
Tertiary Bit diam:	mm	0	# Holes:	_	=	0
Pkgd Expl. Required:			kg			
Boosters Required:	kg/u # 1	usec	kg			
PENTEX 12 (OR EQUIVALENT)	0.34	110	37.4			
total explosives weight	t in Blast (k	(g):	13,237			
Pkgd Prod (0 kg)	% of Total	kg:	0.0%			
Detonators Required:	ms	-	# req'd			
UNITRONIC 600 6M			55			
Cord & Access. Req'd:	U of N	1	# req'd			
WIRE DUPLEX (6 PACK) 400M	units		1			
Resource Deployment:	units					
of Blasts today (this Quarry)					1	
# of Blasters (this Blast)					1	
# of Helpers (this Blast)	Note Exce	otion			2	
# of MMU's (this Blast)					1	
Services Req'd:						
	Enter hour	s			0.0	

Enter Blaster hours

Enter hours

Enter hours

Enter total Helper man-hours

Enter # Orica Seismographs

(per day) Enter # of days

0.0

0.0

0

0

0

0.0

	Burlington	Blast Number:		
P.O. #: sign Date: 2018-06-11		Orica Order #:		
		1 4 4 4 4 4 4		5
	(Pnot liame)	Design te Blasted:		te
	Table 1	Total Holes Loaded:	55	holes
20245	(Bench / Face)	including:		Dead Holes
.88315	°W Longitude	and:		Helper Holes
re of Blast		Helper Hole Collar:		ft avg
		# Rows Blasted:	4	rows
		– Design Patt	ern (Fran	t Rowl-
Non	ninal Bit Diameter	Burden:		ft avg
4,130.2	ft (4 " diam			ft avg
0.0	ft (" diam		10.0	front raw
0.0	ft (" diam		ern /Main	
		Burden:		ft avg
		Spacing:		ft avg
		# Holes		main body
		Bench Height:		ft avg
		Sub-drill:		π avg ft avg
		Hole Depth:		π avg ft avg
		- Design St		
		Front Row:		
		Main Body:		ft avg
				ft avg
		- Design Coll Front Row:		
				ft avg
		Main Body:		ft avg
		Material used: .	75" Stone	
		- Design Ch	arge Len	gth -
		Front Row:	68.1	
		Main Body:	68.1	
		- Design Chi		
		Front Row:		
		Main Body:	198.6	kg/hole
		Max Chge Wt / delay:		
		Required kg Loaded:	13,237	(a
		Rock Density:		g/cc = te/m ³
		- Design Po	wder Ear	tor -
		Expected Yield PF:		
	1.347 lb/yd3			g/te (actual) (g/te (theoretical)
	1.797 lb/yd ³			g/te (theoretical)
	1.684 lb/yd ³			g/te (theoretical)
	- Addition III etc.	his Blast, - change in Bit B. S. S.		
-	A-3 (9)	mar under mange in all 18. S. S.	apror la mo	m previous diast
	110			
	017	PD		
	211 6-60	18		

BLASTER HOURS

HELPER HOURS

3D LASER PROFILE

BORETRACK

SEISMOGRAPH RENTAL

TECHNICAL BLAST DESIGN

976.2tt 976.0tt 975.5tt 972.8tt 967.9tt ⊕76.0ft ⊕76.2ft ⊕75.8f€75.6ft Hole angle: 0.0% Stemming: 7.0ft Blasted tonnage: 25,862S/T Number of holes: 55 #73.5ft #75.ft #74.9ft #75.0ft Subdrill: 0.6ft 677.4R 676.1R 675.4R 674.9R 675.0R 675.2R 675.1R Blast Summary Data SHOTPlus 5 Plan open face Total drilled: 4130.2ft Hole Diameter: 4.0in Spacing: 10.0ft Rock density: 2.65g/cc 1st row burden: 12.0ft Burden: 9.0ft D1 ⊕D2 ⊕78.7ft ⊕78.9ft

4" Hole Unless otherwise noted 250m + 0.6m Subdrill 18-007 Upper Middle 12x10, 9x10 Pattern

#71.2ft



Not to scale

Title/author 18-004 Upper Middle Design Ken G 04/06/2018 18-007 Upper Middle Final.spf Upper Middle Bench SHOTPlus5Beta 5.7.3.9 Burlington Filename Location Mine



Event Report



Date/Time Long at 11:56:25 June 11, 2018 Trigger Source Geo: 2.000 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Notes

Location: 2450 2nd Line Client: **Nelson Aggregates** User Name: Orica Canada

N.43.40245 W.79.87814 General:

Extended Notes

Sand Bagged

Microphone Linear Weighting

PSPL 116.9 dB(L) at 1.206 sec

ZC Freq 3.5 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 693 mv)

	Tran	Vert	Long	
PPV	2.540	2.667	2.286	mm/s
ZC Freq	11	12	8.0	Hz
Time (Rel. to Trig)	0.024	0.324	0.006	sec
Peak Acceleration	0.040	0.027	0.040	g
Peak Displacement	0.038	0.031	0.042	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.4	7.4	Hz
Overswing Ratio	3.8	3.8	4.2	

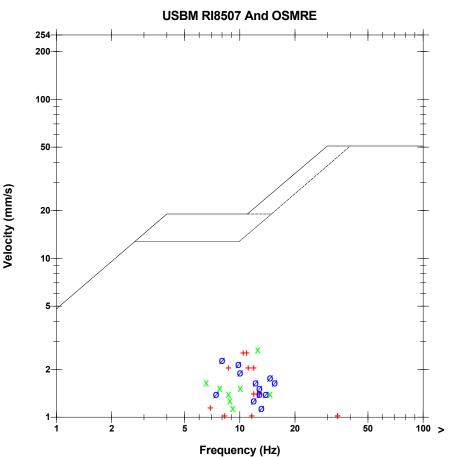
Peak Vector Sum 3.277 mm/s at 0.393 sec

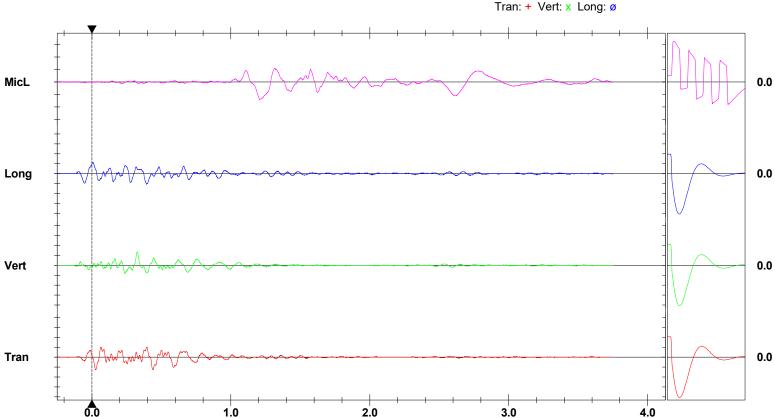
Serial Number BE19461 V 10.72-8.17 MiniMate Plus **Battery Level**

6.5 Volts

Unit Calibration May 3, 2017 by Instantel

File Name _TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check



Event Report

Velocity (mm/s)

File Name



Date/Time MicL at 11:56:27 June 11, 2018 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.107 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/BURLINGTON.MMB

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES** User Name: ORICA CANADA

General:

Extended Notes N 43.31617

W 80.02664

Microphone Linear Weighting 120.2 dB(L) at 0.015 sec **PSPL**

ZC Freq 13.0 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1331 mv)

	Tran	Vert	Long	
PPV	0.213	0.126	0.158	mm/s
ZC Freq	9.7	9.3	10.0	Hz
Time (Rel. to Trig)	-0.085	-0.241	0.533	sec
Peak Acceleration	0.010	0.010	0.010	g
Peak Displacement	0.004	0.004	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.3	3.6	

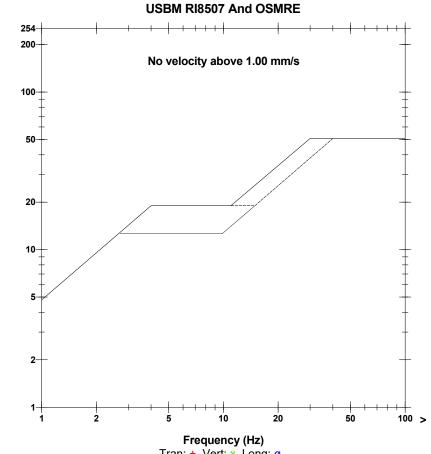
Peak Vector Sum 0.227 mm/s at -0.084 sec

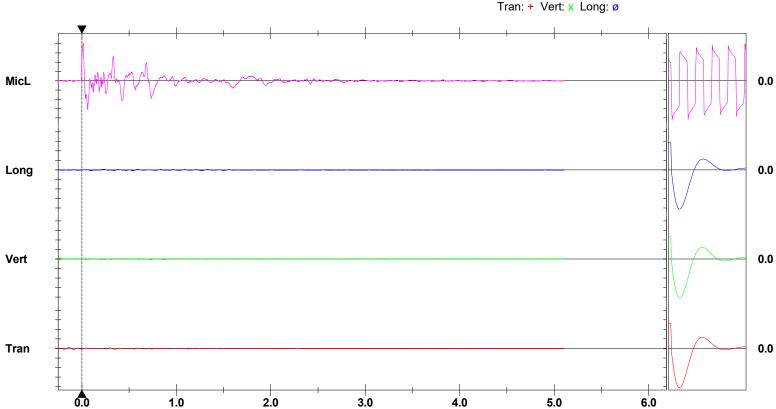
Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level**

3.5 Volts

Unit Calibration February 14, 2018 by Instantel

_TEMP.EVT





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶

Sensor Check



Event Report



Date/Time MicL at 11:56:29 June 11, 2018 **Trigger Source** Geo: 1.500 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Job Number: 1

Notes

Location: South West Corner of Property
Client: Nelson Aggregates Burlington Quarry

Linear Weighting

User Name: ORICA CANADA INC.

General:

Extended Notes 43.39339 ,79.88880

Microphone

PSPL 119.6 dB(L) at 0.533 sec

ZC Freq 6.8 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 618 mv)

	Tran	Vert	Long	
PPV	0.127	0.127	0.127	mm/s
ZC Freq	N/A	N/A	>100	Hz
Time (Rel. to Trig)	-0.250	-0.250	-0.246	sec
Peak Acceleration	0.013	0.013	0.013	g
Peak Displacement	0.000	0.000	0.000	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.7	4.0	

Peak Vector Sum 0.220 mm/s at -0.244 sec

N/A: Not Applicable

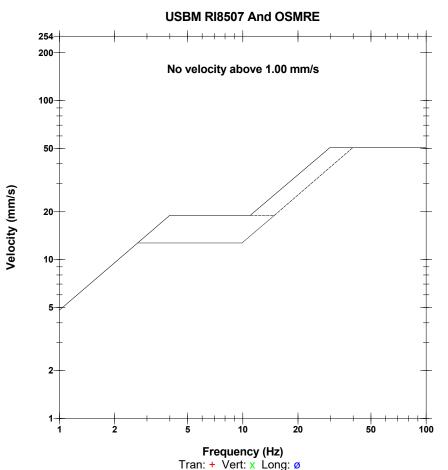
Serial Number BE12877 V 10.72-1.1 Minimate Blaster

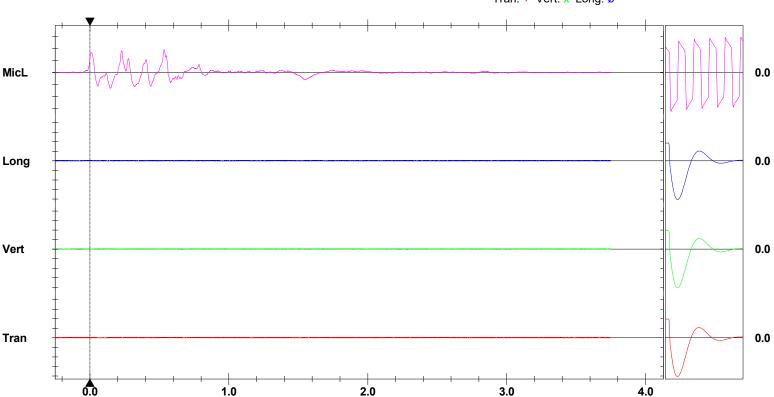
Battery Level 6.3 Volts

Unit Calibration November 3, 2017 by Instantel

File Name __TEMP.EVT

Scaled Distance 3879.2 (1226.7 m, 0.1 kg)





Sensor Check

8	Blas	t Report	Quarry	_	Blast Number:	18-008
ORICA		•	P.O. #		Orica Order #:	2349625
The Blasting Professionals"	Neiso	n Aggregate	Blast Date	2018-06-13	Blast Time:	11:52 AM
page 1 Rlaste	er-in-charge:	Mike der Kind	loren	(Drint Name)	Tonnes Blasted:	28,929 te 10,917 m ³
Diasi	er-in-charge.	Wilke del Killi	leren	(Print Name)	Total tonnes per day:	28,929 te NB40-06 Rate Code
Bl	ast Location:	Lower Midd	le	(Bench / Face)	Total Holes Loaded:	89 holes
		43.40407 °N Latitud		°W Longitude	including:	Dead Holes
0.0		entre of Blast	Centre of Blast		and:	3 Helper Holes
					Helper Hole Collar:	9.0 ft avg
Wind from	m the: W at	10 kph	Temperatur	e: 21 to 25 °C	# Rows Blasted:	7 rows
		X	X			(Front Row)-
Clear:		Rain: Overca	st:		Burden:	12.0 ft avg
Partly Cloudy:	X	Snow: Inversi	on: Ceiling	2,554 ft	Spacing:	10.0 ft avg
					# Holes:	10 front row
- Drilling In	formation -				- Pattern	(Main Body) -
	Ang	le from Vertical	No	minal Bit Diameter:	Burden:	9.0 ft avg
Primary Bit	diam: 101.6 mm	0 * # Holes:	89 = 4,450.	9 ft (4 " diam)	Spacing:	10.0 ft avg
Secondary Bit	diam: mm	0 , # Holes:	= 0.	0 ft (" diam)	# Holes:	79 main body
Tertiary Bit	diam: mm	0 ' # Holes:	= 0.	0 ft (" diam)	Bench Height:	48.0 ft avg
				٦	Sub-drill:	2.0 ft avg
Bulk Explo	osives:	in (kg) out (kg) kg		Hole Depth:	2.0 ft avg 50.0 ft avg
CENTRA GOL	.D 70	33,790 20,9	40 12,850		- Stone	e Decking -
					- Stone Front Row: Main Body:	5.0 ft avg 5.0 ft avg 8 per blast Stemming - 7.0 ft avg 7.0 ft avg 7.5" Stone 9 Length - 38.0 ft avg 38.0 ft avg
	Explosives:	cs shipped cs return			Main Body:	5.0 ft avg
FORTEL PRO	75X400	3	2 25		# Decks:	8 per blast
						Stemming -
D 1					Front Row: Main Body: Material used: - Charg Front Row: Main Body:	7.0 ft avg
Boosters:		kg / unit # u			Main Body:	7.0 ft avg
PENTEX 12 (C	OR EQUIVALENT)	0.34 1	87 63.6		Material used:	.75" Stone
					Front Row:	ge Length - 38.0 ft avg
	total evol	osives weight in Blast (k	12,939		Main Body:	38.0 ft avg
	•	Prod (25 kg) % of Total	"		·	ge Weight -
Detonators		case #'s ms	# used		Front Row:	
UNITRONIC 60			87		Main Body:	3
UNITRONIC 6	00 15M		8		Max. per delay:	
UNITRONIC 6	00 20M		92		SD () Equation:	
					Total kg Loaded:	12,939 kg
					Rock Density:	2.65 g/cc = te/m ³
Cord & Ac	cessories:	U of M	# used		- Powd	ler Factor -
HARNES	SS WIRE DUPLEX (6 P	PACK) 400M units	1	1.998 lb/yd ³	Yield PF:	0.447 kg/te (actual)
		units		1.145 lb/yd ³	Front row:	0.256 kg/te (theoretical)
		units		1.527 lb/yd ³	Main Body:	0.342 kg/te (theoretical)
Resource De	eployment:			1.472 lb/yd ³	"KPI" PF:	0.330 kg/te (theoretical)
# of Blasts toda	ay (this Quarry)		1	Cost Reduction Notes (th	his Blast) - change in Bit , B, S,	Expl or IS from previous Blast:
# of Blasters (t	his Blast)		1	Hole X-3 & G9 Could not	be found once loading had bee	n started
# of Helpers (th	nis Blast)	Note Exception	2	A-8,C-4,B-8,C-12,C-7,C-	8,F-4,F-10 All Received a 5' sto	one deck due to incompetant rock
# of MMU's (thi	is Blast)		1	See Atached Load Adust	tment sheet for any more Chan	ges
Services:						
GPS LAYOUT		Enter hours	0.0			
BULK TRUCK	CHARGE	>/=10,000	kg 1			
BLASTER HO	URS	Enter Blaster hours	7.0			
HELPER HOU	RS	Enter total Helper man-hou				
SEISMOGRAP		Enter # Orica Seismograph				
3D LASER PR	OFILE	Enter hours	0.0			
BORETRACK		Enter hours	0.0			

Burlington Template Blast Report

0.0

TECHNICAL BLAST DESIGN

(per day) Enter # of days



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-06-13

Blast Number:
Orica Order #:
Blast Time:

18-008 2349625 11:52 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40407	79.88286
Front Row Corner	43.40417	79.88310
Back Row Corner	43.40397	79.88271
Average (Centre of Blast)	43.40407	79.88289

(N) Radians	(W) Radians
0.757544	1.394219
0.757546	1.394223
0.757542	1.394216
0.757544	1.394219

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		1)
	1st Reading	43.40245	79.87814		
	2nd Reading				
	Average	43.40245	79.87814		
	Distance (1st Seis. From Centre of Blast)	424.3	m		
	Post Blast Data: ppV:	1.0	mm/s Trigger set at:	2.0	mm/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

Post Blast Data: ppV: 1.0 mm/s Trigger set at: 2.0 mm/s

frequency: 15.0 Hz V/T/L: ? (Vertical, Transverse or Longitudinal)

air overpressure: 120.6 dB Trigger set at: 115 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	925.3	m
	Post Blast Data: ppV:	Did	mm/s Trigger set at:
	_		1

(N) Radians	(W) Radians						
0.757578	1.394413						
0.757578	1.394413						

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s
frequency: Not Hz V/T/L: ? (Vertical, Transverse or Longitudinal)
air overpressure: Trigger dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1281.4	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 Did
 mm/s
 Trigger set at:
 2.0
 mm/s

 frequency:
 Not
 Hz
 V / T / L :
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 Trigger
 dB
 Trigger set at:
 115
 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= \frac{(424.3)^2}{30^2} \text{ kg}$

= <u>180,030</u> kg 900

Maximum Indicated Charge Weight per Delay = 200 kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

Burlington Template Blast Report



Blast Design

Nelson Aggregate

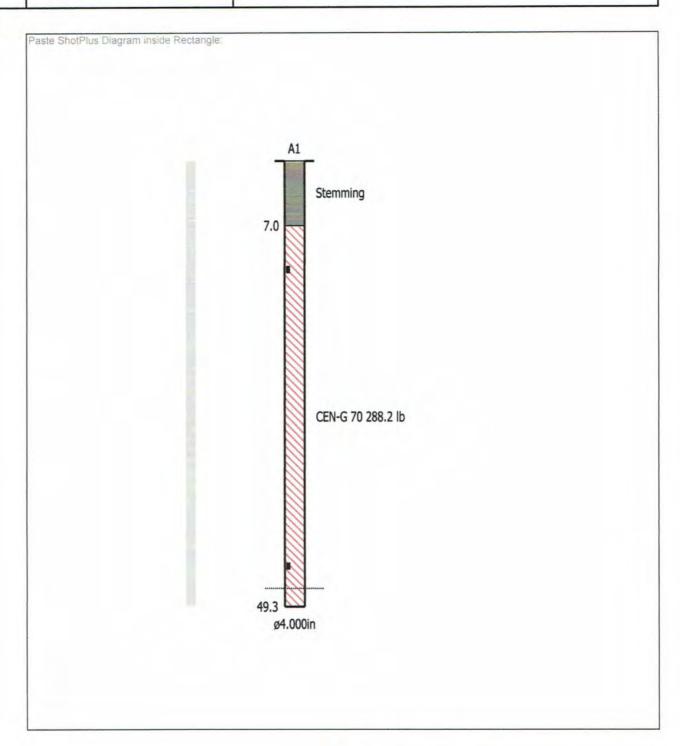
Quarry: Burlington P.O. #:

Blast Date:

6/13/2018

Blast Number: Orica Order #: 18-008

page 2



Orica
Blaster-in-charge:

Quarry Manager:

Mike der Kinderen Bill White

Signature required, indicating sign off on Blast Design.

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A1 A2 49.6ft 50.5ft 51.4ft 52.7ft 53.3ft A8 54.9ft 56.1ft X1 46.1ft 47.1ft 47.2ft 48.3ft 49.0ft 49.7ft 50.6ft 51.2ft 52.0ft 52.0ft 53.0ft 53.0ft 53.4ft 47.3ft 7.3ft 7 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 45.1ft 46.4ft 46.7ft 47.5ft 48.5ft 49.2ft 49.6ft 50.5ft 51.4ft 52.0ft 52.3ft 53.0ft 53.9ft F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11

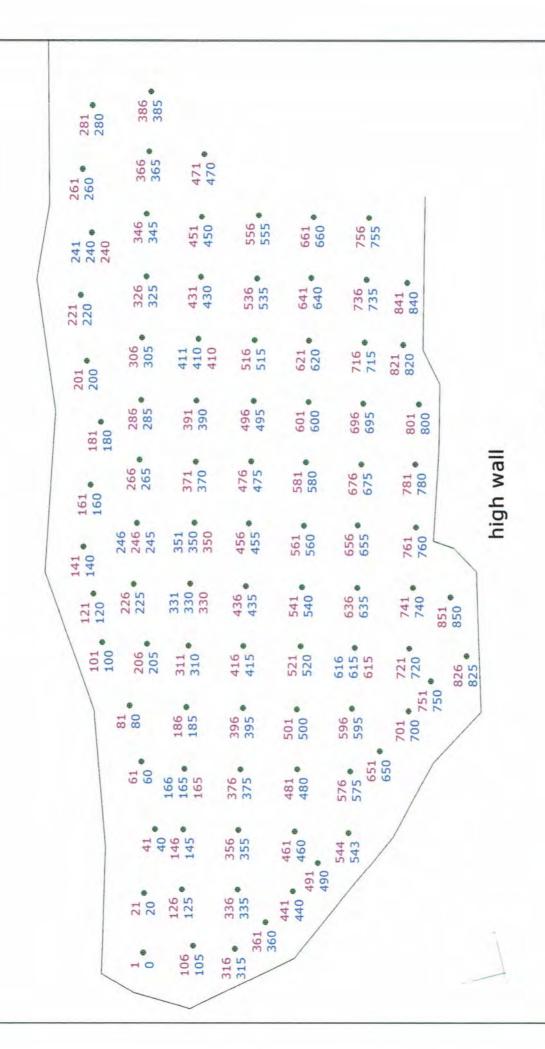
47.6ft 47.5ft 47.5ft 48.5ft 49.2ft 49.6ft 50.2ft 50.0ft 51.0ft 52.0ft 52.9ft

47.6ft 67.6ft 52.0ft 52.0ft 52.0ft 52.0ft 52.0ft 52.9ft G1 G2 G3 G4 G5 G6 51.3ft \$52.0ft Stemming: 6.0ft Hole angle: 0.0° Blasted tonnage: 33,192S/T Number of holes: 89 Subdrill: 2.0ft Blast Summary Data high wall Total drilled: 4446.2ft Hole Diameter: 4.0in . H2 50.0ft Spacing: 10.0ft ® 48.5ft Rock density: 2.65g/cc 1st row burden: 12.0ft Burden: 9.0ft **B1 B2 B3 **
43.7ft 45.1ft 46.1ft ● 44.4ft





6/13/2018 18-008 Bottom Middle South K George 2018-06-13 18-008 Lower Middle.spf Burlington SHOTPlus 5.7.1.1 Title/author Filename Location





6/13/2018

18-008 Bottom Middle South K George

Title/author

Location

Filename

Burlington

SHOTPlus 5.7.1.1

2018-06-13 18-008 Lower Middle.spf

3

Blast Summary Data Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Rock density: 2.65g/cc

Subdrill: 2.0ft

Number of holes: 92

Hole angle: 0.0°

Blasted tonnage: 34,239S/T Load Sheet Total drilled: 4601.0ft

157 Kg Max

138 Kg Max

751 . 651 . 551 . 551 . 561 . 051 . 051 . 851 . 861 . 751 . 181 × 7516 050 0148 0.153 0.120 0133 0.146 0.150 0148 X + 154 151 - 158 - 150 - 140 - 157 - 159 - 145 - 146 - 150 - 146 - 151



Not to scale

6/11/2018 18-008 Bottom Middle South K George 2018-06-13 18-008 Lower Middle.spf Burlington SHOTPlus 5.7.1.1 Title/author Filename

high wall

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY PAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

Orica Canada Inc.

CONSIGNOR **EXPÉDITEUR** GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON

CA L7R 4L8

089815 GROSS / BRUT TARE NET TIME OUT HEURE SORTIE TIME IN HEURE D'ENTRÉE ORDER NUMBER N° DE COMMANDE B/L NUMBER N° DE CONNAISSEMENT 2349625 86039399

PAGE 2

OTY. OTÉ. UM DG OTY, RET'D OTY, SOLD OTÉ, RET. OTÉ, FACT DESCRIPTION # OF/PKGS 3 CS X 2 / FORTEL PRO 75X400 (3X16) 3 294 PC X /07 /87 PENTEX BC 340 (49/CS) 6 2 PC / Harness Wire Duplex (6 pack) 400m 1	N	ERMS LIVRAISON UCK	VRAISON	AISON		13	GAI	TE	E	C	COM	PA		(A		PERMI					n/a				CLE NO.		
13 Jun 2018 FOB Dest'n, Own Truck F-73289 FOB Dest'n, Own Truck F-73289 FORTEL PRO 75X400 (3X16) 294 PC X /07 /87 PENTEX BC 340 (49/CS) Harness Wire Duplex (6 pack) 400m 1		uck	RAISON	NSON	ON	N					o P			F-7		PERMI							N				
SHIP VIA TRANSPORTEUR Orica Truck OTY. OTY. OTÉ. UM DG OTY. RET'D OTÉ. FACT DESCRIPTION 3 CS X 2 / FORTEL PRO 75X400 (3X16) 294 PC X /07 /87 PENTEX BC 340 (49/CS) 2 PC / Harness Wire Duplex (6 pack) 400m 1 POF/PKG	TAN													F-7	3289											P. S.	
TRANSPORTEUR TINÉRAIRE	TAN	S	SI	Qm												ruck F-73289							/	3/	50	13	
OTY. QTÉ. UM DG QTY. RET'D QTY. SOLD QTÉ. FACT DESCRIPTION # OF/ PKGS 3 CS X 2 / FORTEL PRO 75X400 (3X16) 3 294 PC X /07 /87 PENTEX BC 340 (49/CS) 6 2 PC / Harness Wire Duplex (6 pack) 400m 1	TAN	S	Si	Cult		F						ITINÉRAIRE												LIC. NO			
3 CS X 2 / FORTEL PRO 75X400 (3X16) 3 294 PC X /07 /87 PENTEX BC 340 (49/CS) 6 2 PC / Harness Wire Duplex (6 pack) 400m 1				DI	STA	TA	AN	ND	DA	ARI	D														101	Contract of	
294 PC X /07 /87 PENTEX BC 340 (49/CS) 6 2 PC / Harness Wire Duplex (6 pack) 400m 1					-	900					in-	77		DE	CRIPTI	ION	LE:	716	w.				# OF / DI PKGS.			TANT	
294 PC X /07 /87 PENTEX BC 340 (49/CS) 6 2 PC / Harness Wire Duplex (6 pack) 400m 1													-						-								
294 PC X /07 /87 PENTEX BC 340 (49/CS) 6 2 PC / Harness Wire Duplex (6 pack) 400m 1																						-+-					
66 PC X 58 *uni tronic 600-15M C/Z SPL(50')66PC 1 132 PC X 40 92 *uni tronic 600-20M CU/ZC SPL(65')66P 2 100 PC 94 6 MINI STEM PLUGS - PART #74853 LICENSED BLASTER LABOUR CHARGE ROG (ROCK ON GROUND)	tro	PENTE Harne *uni *uni *uni MINI LICEN LABOU	ENTER arnes uni t uni t ENI S CENS ABOUT	nes ni t ni t ni t si t si t si t	EX ess ti ti ti SI NSI	ess tr tr tr st st	ro ro ro STE	BC 340 (49/CS) Wire Duplex (6 pack) 400m conic 600-06.0M CU/ZC(20')80PC conic 600-15M C/Z SPL(50')66PC conic 600-20M CU/ZC SPL(65')66P EM PLUGS - PART #74853 CD BLASTER CHARGE						3 6 1 2 1 2		10°	3.900 7.310 5.840 1.680 1.286 6.928										
TOTAL GROSS WEIGHT	G GI	TOTAL	DTAL	CAL	T	L (GE	R	203	SS	S W	VE)	IGH	HT										24	2.64	4 KG	
**** TOTAL PACKAGES **** 15		****	***	**	k			7	T	OT	CAL	I	PAC	CKA	ES		*	***	c				15				

EMERGENCY RESPONSE NO./24 H TÉLÉPHONE D'URGENCE/24 HEU	OUR NUMBER RE NUMERO	PLACARDS	OFFERE	D / PLACARDS OFFERT					
1-877-561-	-3636	YES /	OUI	NO / NON	POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT NO DE CONNAISSEMENT D'ORICA :				
NG TO THE APPLICABLE REGULATIONS OF ORT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES CORMES À LA RÉALITÉ ET AUX RÉGLEMENTS	VALEUR DÉCLARÉE	SHIPMENT	PRESSA	AGE					
Orica Truck									
DRIVER'S NAME PLEASE PRIN	T) / NOM DU CAMIONN	IEUR		RECEIVER'S NAME (PLE	ASE PRINT) / NOM DU RECEVE	UR			
SIGNATURE	DATI Lov	3 OC M/M	13	SIGNATURE		DATE D/J M/M Y/A			
	TÉLÉPHONE D'URGENCE/24 HEU 1-877-561- THE APPLICABLE REGULATIONS OF DRT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES ORMES À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR OTICA TRUCK DRIVER'S NAME (PLEASE PRIN	NG TO THE APPLICABLE REGULATIONS OF DRT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES ORMES À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR OTICA TTUCK DRIVER'S NAME (PLÉASE PRINT) / NOM DUCAMIONN	TÉLÉPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636 YES / INC. THE APPLICABLE REGULATIONS OF ORT. ORT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES ORMES À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR OTICA Truck DRIVER'S NAME (PLEASE PRINT) / MOM DUCAMIONNEUR	TÉLÉPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636 YES / OUI DECLARED VALUE OF SHIPMENT NETTE L'ALLE RÉGLEMENTS DECLARED VALUE OF SHIPMENT NETTE L'ALLE RÉGLEMENTS VALEUR DÉCLARÉE VALEUR DÉCLARÉE PRESS/ WT AGE CARRIER / TRANSPORTEUR OTICA Truck DRIVER'S NAME (PLEASE PRINT) / MOM DUCAMIONNEUR	TELÉPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636 YES / OUI NO / NON NO / NON NED, DESCRIBED, PACKAGED, MARKED AND NO TO THE APPLICABLE REGULATIONS OF VALEUR DÉCLARÉE PRIT. PRIT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES ORMES À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR OTICA TRUCK DRIVER'S NAME (PLEASE PRINT) / NOM DUICAMIONNEUR RECEIVER'S NAME (PLEASE PRINT) / NOM DUICAMIONNEUR RECEIVER'S NAME (PLEASE PRINT) / NOM DUICAMIONNEUR	TÉLÉPHONE D'URGENCE/24 HEURE NUMERO 1-877-561-3636 YES / OUI NO / NON NO / NON NO / NON DECLARED VALUE OF SHIPMENT NOT DE CONNAISSEMENT D'O			

24 HOUR TECHNICAL INFORMATION: 1-613-996-6666



Event Report

Velocity (mm/s)



Date/Time MicL at 11:52:09 June 13, 2018 Trigger Source Geo: 2.000 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.25 sec (Auto=3Sec) at 1024 sps

Notes

2450 2nd Line Location: Client: **Nelson Aggregates** User Name: Orica Canada

General: N.43.40245 W.79.87814

Extended Notes

Sand Bagged

Microphone Linear Weighting **PSPL** 120.6 dB(L) at 0.004 sec

ZC Freq 3.4 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 615 mv)

	Tran	Vert	Long	
PPV	1.016	1.016	0.889	mm/s
ZC Freq	9.0	15	10	Hz
Time (Rel. to Trig)	-0.223	-0.228	-0.208	sec
Peak Acceleration	0.013	0.013	0.027	g
Peak Displacement	0.017	0.012	0.014	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.4	7.4	Hz
Overswing Ratio	3.8	3.8	4.2	

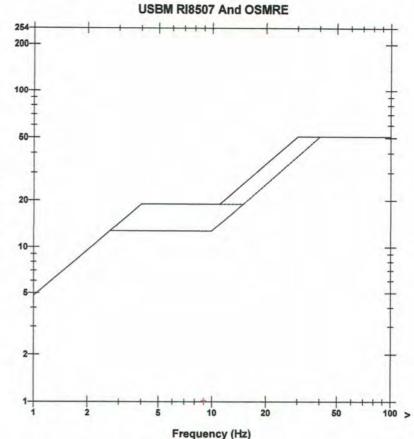
Peak Vector Sum 1.420 mm/s at -0.228 sec

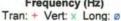
Serial Number BE19461 V 10.72-8.17 MiniMate Plus

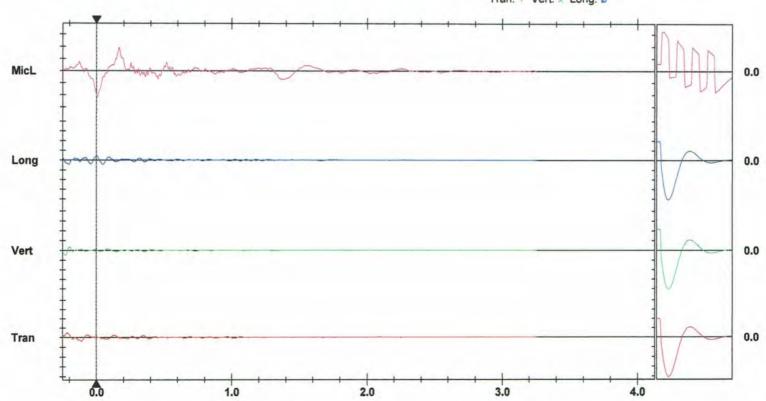
Battery Level 6.4 Volts

Unit Calibration May 3, 2017 by Instantel **File Name**

TEMP.EVT







Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger =

Sensor Check

Blast Summary Data Spacing: 10.0ft

Total drilled: 4601.0ft Hole Diameter: 4.0in

> Rock density: 2.65g/cc 1st row burden: 12.0ft

Burden: 9.0ft

Number of holes: 92

Subdrill: 2.0ft

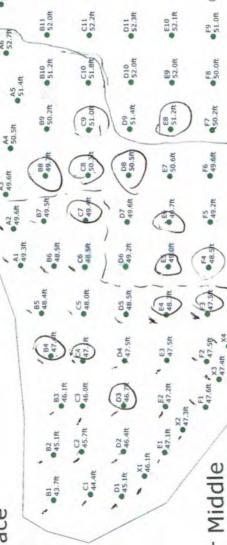
Blasted tonnage: 34,239S/T

Stemming: 6.0ft Hole angle: 0.0°

open face

A9 .54.9

9A6 52.7ft



53.4ft

53.0ft

D13

F11 52.9ft

G7 51.3ft

.G6 50.7ft

G5 49.4ft

... 9.2ft

G2 48.8ft

... 50.0ft

18-008 Lower Middle 12X10, 9X10 Pattern 250m + 0.6m Sub 4" Hole Diameter

high wall

SHOTPlus5Beta 5.7.3.9

06/06/2018

Burlington Mine

Location

18-008 Lower Middle South Design F Title/author 18-005 Bottom Middle South I. Dee Filename

Not to scale

ORICA



ORICA The Blasting Professionals*	Blast De Nelson Aggr		P.O. #: Design Date:		Orica Order #:	11	8-008
page 1 Blaster-in-charge	e: Mike der	Kinderen		(Print Name)	Design te Blasted:	29,670	te
					Total Holes Loaded:		holes
Blast Location	n: Lower Mid	ddle		(Bench / Face)	including:		Dead Holes
GPS Coordinates	s: 43.4040	7 °N Latitud	e 79.88289	°W Longitude	and:	4	Helper Holes
	Centre of B	last	Centre of Blast		Helper Hole Collar:		ft avg
					# Rows Blasted:	8	rows
- Drilling Information -					- Design Patte	arn (Fron	t Row)-
	Angle from Ve	ertical	Non	ninal Bit Diameter:	Burden:		ft avg
Primary Bit diam: 101	.6 mm 0 °	# Holes:	92 = 4,600.9	ft (4 " diam)	Spacing:	10.0	ft avg
Secondary Bit diam:	mm 0°	# Holes:	= 0.0	ft (" diam)	# Holes:	11	front row
Tertiary Bit diam:	mm 0°	# Holes:	= 0.0	ft (" diam)	- Design Patte	m (Main	Body) -
					Burden:	9.0	ft avg
					Spacing:		ft avg
					# Holes:		main body
					Bench Height:		ft avg
					Sub-drill:		ft avg
Bulk Expl. Required:		kg			Hole Depth:		ft avg
		12,700			- Design St	one Deci	
					Front Row:		ft avg
Pkgd Expl. Required:		kg			Main Body:	ller Clan	ft avg
FORTEL PRO 75X400	3	75			- Design Co		ft avg
					Main Body:		ft avg
Pagetora Paguirodi	kalu # uppd	ka			Material used:		
Boosters Required:	kg/u # used 0.34 294	kg 100.0			Waterial used.	iro otono	
PENTEX 12 (OR EQUIVALENT)	0.34 254	100.0			- Design Cl	harde Lei	nath -
					Front Row:		ft avg
total explosives weigh	nt in Blast (kg):	12,875			Main Body:		ft avg
Pkgd Prod (75 kg		0.6%			- Design Ci	narge We	eight -
Detonators Required:	ms	# req'd			Front Row:	125.4	kg/hole
UNITRONIC 600 6M		160			Main Body:	125.4	kg/hole
UNITRONIC 600 15M		66			Max Chge Wt / delay:	170.0	kg/delay
UNITRONIC 600 20M		132					
					Required kg Loaded:		
					Rock Density:	2.65	g/cc = te/m ³
Cord & Access. Reg'd:	U of M	# reg'd			- Design P	owder Fa	ictor -
WIRE DUPLEX (6 PACK) 400M	units	1			Expected Yield PF:	0.434	kg/te (actual)
	units			1.296 lb/yd-	Front row:	0.290	kg/te (theoretical)
	units			1.728 lb/yd ³	Main Body:		kg/te (theoretical)
Resource Deployment:				1.674 lb/yd3	"KPI" PF:		kg/te (theoretical)
# of Blasts today (this Quarry)			1	Cost Reduction Notes	this Blast) - change in Bit , B. S	Explor IS	from previous Blast:
# of Blasters (this Blast)			1				
# of Helpers (this Blast)	Note Exception	1	2				
# of MMU's (this Blast)			1				
Services Req'd:			0.0				
GPS LAYOUT	Enter hours		0.0				
BULK TRUCK CHARGE	<2,000kg		0.0				
BLASTER HOURS	Enter Blaster h		0.0				
HELPER HOURS SEISMOGRAPH RENTAL	Enter # Orica S		0.0				
3D LASER PROFILE	Enter hours	o s. sinographio	0				

0

0.0

TECHNICAL BLAST DESIGN

Enter hours

(per day) Enter # of days

BORETRACK

The Blaster-in-charge: Blast Location:		der Kindere	Quarry: P.O. #: Blast Date:	(Print Name) (Bench / Face)	Blast Number: Orica Order #: Blast Time: Tonnes Blasted: Total tonnes per day: Total Holes Loaded:	18-009 2354121 12:01 PM 25,983 te 9,805 m3 25,893 te NB40-07 Rate Code holes
	43.40451 entre of Blast	°N Latitude	79.88425 Centre of Blast	°W Longitude	including: and: Helper Hole Collar:	Dead Holes Helper Holes ft avg
Wind from the: SE at	10 kph	-	Temperature:	16 to 20 °C	# Rows Blasted: - Pattern	13 rows (Front Row)-
Clear: X Partly Cloudy:	Rain:	Overcast: Inversion:	Ceiling	30,000 ft	Burden: Spacing: # Holes:	12.0 ft avg 10.0 ft avg 30 front row
- Drilling Information -					- Pattern	Main Body) -
	le from Vertical			ninal Bit Diameter:	Burden:	9.0 ft avg
Primary Bit diam: 101.6 mm		Holes: 99	= 3,692.3	,	Spacing:	10.0 ft avg
Secondary Bit diam: mm		Holes:		oft (" diam)	# Holes:	69 main body
Tertiary Bit diam: mm	0 # F	Holes:	= 0.0	oft (" diam)	Bench Height:	35.3 ft avg
Bully Francisco					Sub-drill:	2.0 ft avg 37.3 ft avg 5.0 ft avg 5.0 ft avg 5.0 ft avg 2 per blast Stemming - 7.0 ft avg 7.0 ft avg 7.0 ft avg 25.3 ft avg 25.3 ft avg 25.3 ft avg
Bulk Explosives:	in (kg)	out (kg)	kg		Hole Depth:	37.3 ft avg
CENTRA GOLD 70	27,280	17,620	9,660			Decking -
Deales and Francisco	1				Front Row:	5.0 ft avg
Packaged Explosives:	1	cs returned	kg		CTS	5.0 ft avg
FORTEL PRO 75X400	3	0	75		# Decks:	2 per blast
					Front Row: Main Body:	Stemming -
Boosters:	les /		le su		Moin Pody	7.0 ft avg
	Kg /	unit # used	kg		Main Body:	7.0 It avg
PENTEX 12 (OR EQUIVALENT)		0.34 200	68.0		Material used: - Charg Front Row: Main Body:	./5" Stone
					Front Row:	ze Length - 25.3 ft avg
total evolu	osives weight ir	Blact (kg):	9,803		Main Body:	25.3 ft avg
	Prod (75 kg) %		0.8%			e Weight -
Detonators:	case #'s	ms	# used		Front Row:	73.8 kg/hole
UNITRONIC 600 6M	Case # s	1115	# useu		Main Body:	73.8 kg/hole
UNITRONIC 600 15M			102		Max. per delay:	118.0 kg/delay
UNITRONIC 600 15W			102		SD () Equation:	329.8 kg/delay
					Total kg Loaded:	9,803 kg
					Rock Density:	2.65 g/cc = te/m ³
Cord & Accessories:		U of M	# used		- Powd	er Factor -
HARNESS WIRE DUPLEX (6 P	ACK) 400M	units	1	1.685 lb/yd ³	Yield PF:	0.377 kg/te (actual)
		units		1.037 lb/yd ³	Front row:	0.232 kg/te (theoretical)
		units		1.382 lb/yd ³	Main Body:	0.309 kg/te (theoretical)
Resource Deployment:				1.356 lb/yd ³	"KPI" PF:	0.303 kg/te (theoretical)
# of Blasts today (this Quarry)			1	Cost Reduction Notes (th	nis Blast) - change in Bit , B, S,	Expl or IS from previous Blast:
# of Blasters (this Blast)			1	Hole B-1 and B-2 Review	ed stone decks due to voids for	ınd while loading
# of Helpers (this Blast)	Note Exception		2	Hole N-5 to N-11 were no	ot loaded because we ran out of	product in our MMU
# of MMU's (this Blast)			1			
Services:						
GPS LAYOUT	Enter hours		0.0			
BULK TRUCK CHARGE	>/=5,000kg	<10,000kg	1			
BLASTER HOURS	Enter Blaster ho	ours	7.0			
HELPER HOURS	Enter total Helpe	er man-hours	11.0			
SEISMOGRAPH RENTAL	Enter # Orica Se	eismographs	0			
3D LASER PROFILE	Enter hours		0.0			
BORETRACK	Enter hours		0.0			

2018-06-25 18-009 Lower Middle Blast Report

0.0

(per day) Enter # of days

TECHNICAL BLAST DESIGN



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2018-06-25

Hz

dΒ

V/T/L:

Trigger set at: 115 dB

Blast Number: 18-009 Orica Order #: 2354121 Blast Time: 12:01 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40452	79.88424
Front Row Corner	43.40442	79.88402
Back Row Corner	43.40458	79.88449
Average (Centre of Blast)	43.40451	79.88425

(N) Radians	(W) Radians
0.757552	1.394243
0.757550	1.394239
0.757553	1.394247
0.757552	1.394243

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	[(1)
	1st Reading	43.40245	79.87814		
	2nd Reading				
	Average	43.40245	79.87814	Ī	
	Distance (1st Seis. From Centre of Blast)	544.8	m	_	
	Post Blast Data: ppV:	Did	mm/s Trigger set at:	2.0	mm/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

2450 2nd Line

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137
-	

? (Vertical, Transverse or Longitudinal)

2nd Seismograph Co-ordinates Enter ° N Lat. Enter ° W Long. 1st Reading 43.40605 79.89400 2nd Reading 43.40605 79.89400 Average Distance (2nd Seis. From Centre of Blast) **807.0** m Post Blast Data: mm/s

frequency: Not

air overpressure: Trigger

(N) Radians	(W) Radians
0.757578	1.394413
0.757570	1 204412

ppV: Did Trigger set at: 2.0 mm/s frequency: Not Hz V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1291.1	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s V/T/L: frequency: Not Нz ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

SouthWest Corner of Property

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= __(544.8)²_ kg 30²

= **296,807** kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

				Quarry:	Burlington	Blast Number	. 18	3-010		
	Blas	t Report	•	P.O. #:		Orica Order #		59087		
ORICA The Blasting Professionals**	Nelso	n Aggregate		Blast Date:		Blast Time		51 AM		
page 1 Blaste	er-in-charge:	Mike	der Kinder	en	(Print Name)	Tonnes Blasted	30,963	te	11,684	m3
<u> </u>	<u> </u>				,	Total tonnes per day			NB80-01	Rate
Bla	ast Location:	U	pper Middle		(Bench / Face)	Total Holes Loaded		holes		
GPS C	Coordinates:	43.40369	°N Latitude	79.88327	°W Longitude	including	:	Dead I	Holes	
	C	entre of Blast		Centre of Blast		and	:	Helper	Holes	
						Helper Hole Collar	:	ft avg		
Wind fron	n the: SW at	5 kph		Temperature:	26 to 30 °C	# Rows Blasted	3	rows		
-		Х		X		- Patterr	(Front Row	v)-		
Clear:	X	Rain:	Overcast:			Burden	12.0	ft avg		
Partly Cloudy:		Snow:	Inversion:	Ceiling	30,000 ft	Spacing		ft avg		
						# Holes		front ro	WC	
- Drilling Inf							(Main Body	ľ		
		le from Vertical			ninal Bit Diameter:	Burden		ft avg		
Primary Bit		-	Holes: 53	= 4,133.5	` ,	Spacing		ft avg		
Secondary Bit			Holes:		ft (" diam)	# Holes		main b	ody	
Tertiary Bit	diam:mm	0	Holes:	= 0.0	ft(" diam)	Bench Height		ft avg		
Bulk Evala	- chron	in (1cm)	- ut (lea)	le m	1	Sub-drill		ft avg		stec
Bulk Explo		in (kg) 33,780	out (kg)	kg 12,680		Hole Depth	e Decking -	ft avg		Ba
CENTRA GOLL	70	33,700	21,100	12,000		Front Row		ft avg		/ te
Packaged I	Explosives:	cs shipped	cs returned	kg		- Ston		ft avg		ged
I donagou i	Explosives.	os sriipped	05 Total floa	Ng		т п		per bla	est	09
						0 "	Stemming	- -		Kg
						Front Row		ft avg		tor (
Boosters:		kg /	unit #used	kg		Main Body		ft avg		Fac
PENTEX 12 (O	R EQUIVALENT)		0.34 118	40.1		Front Row Main Body Material used - Chai Front Row Main Body Main Body				Yield Powder Factor (kg Loaded / te Blastec
,	,					- Chai	ge Length -			OWO
						Front Row	70.0	ft avg		P P
	total expl	osives weight in	n Blast (kg):	12,720		⊨ Main Body	: 56.0	ft avg		Ϋ́e
	Pkg	d Prod (0 kg) %	of Total kg:	0.0%			ge Weight -			
Detonators	s:	case #'s	ms	# used		Front Row		-		
UNITRONIC 60	00 6M			53		Main Body				
UNITRONIC 60	00 25M			16		Max. per delay		4		
UNITRONIC 60	00 30M			49		SD () Equation		kg/dela	ay	
						Total kg Loaded		_	3	
						Rock Density	2.65	g/cc	= te/m ³	
Cord & Acc	cassarias:		U of M	# used		- Pow	der Factor -			
	SS WIRE DUPLEX (6 F	ACK) 400M	units	# useu	1.835 lb/yd ³	Yield PF		ka/te	(actual)	
HARTE	O WINE DOT LEX (01	AOIT) 400M	units	<u> </u>	1.332 lb/yd ³	Front row		-	,	al)
			units		1.421 lb/yd ³	Main Body		0	,	,
Resource De	ployment:		G. 110		1.391 lb/yd ³	"KPI" PF				
# of Blasts toda	. ,			1		this Blast) - change in Bit , B, S			`	
# of Blasters (th				1		st we discovered Hole B-4 was	-			f the
# of Helpers (th		Note Exception		2		son Aggregates and he told us				
# of MMU's (this				1		tment sheet showing all the de			to voids a	and s
Services:										
GPS LAYOUT		Enter hours		0.0						
BULK TRUCK	CHARGE		>/=10,000 kg	1						
BLASTER HOU	JRS	Enter Blaster ho	ours	7.0						
HELPER HOUF	RS	Enter total Help	er man-hours	10.0						
SEISMOGRAPI	H RENTAL	Enter # Orica S	eismographs	0						
3D LASER PRO	OFILE	Enter hours		0.0						
BORETRACK		Enter hours		0.0						
TECHNICAL BL	LAST DESIGN	(per day) Enter	# of days	0.0						

2018-07-05 18-010 Upper Middle Blast Report



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-07-05

9.5 Hz

115.9 dB

V/T/L:

Trigger set at: 115 dB

Blast Number:
Orica Order #:
Blast Time:

18-010 2359087 11:51 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40367	79.88381
Front Row Corner	43.40348	79.88299
Back Row Corner	43.40391	79.88301
Average (Centre of Blast)	43.40369	79.88327

(N) Radians	(W) Radians
0.757537	1.394235
0.757534	1.394221
0.757541	1.394222
0.757537	1.394226

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		1)
	1st Reading	43.40245	79.87814		
	2nd Reading				
	Average	43.40245	79.87814		
	Distance (1st Seis. From Centre of Blast)	437.4	m		
	Post Blast Data: ppV:	2.3	mm/s Trigger set at:	2.0	mm/s

2450 2nd Line

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

? (Vertical, Transverse or Longitudinal)

2nd Seismograph Co-ordinates Enter ° N Lat. Enter ° W Long. 1st Reading 43.40605 79.89400 2nd Reading 43.40605 79.89400 Average Distance (2nd Seis. From Centre of Blast) **906.7** m Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s

frequency:

air overpressure:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 30//13

frequency: Not Hz V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1230.8	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 Did
 mm/s
 Trigger set at:
 2.0
 mm/s

 frequency:
 Not
 Hz
 V / T / L :
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 Trigger
 dB
 Trigger set at:
 115
 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= _{\frac{(437.4)^2}{30^2}} kg$

= <u>191,319</u> kg 900

Maximum Indicated Charge Weight per Delay = 213 kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-07-05 18-010 Upper Middle

Blast Report



Blast Design

Nelson Aggregate

Quarry: P.O. #:

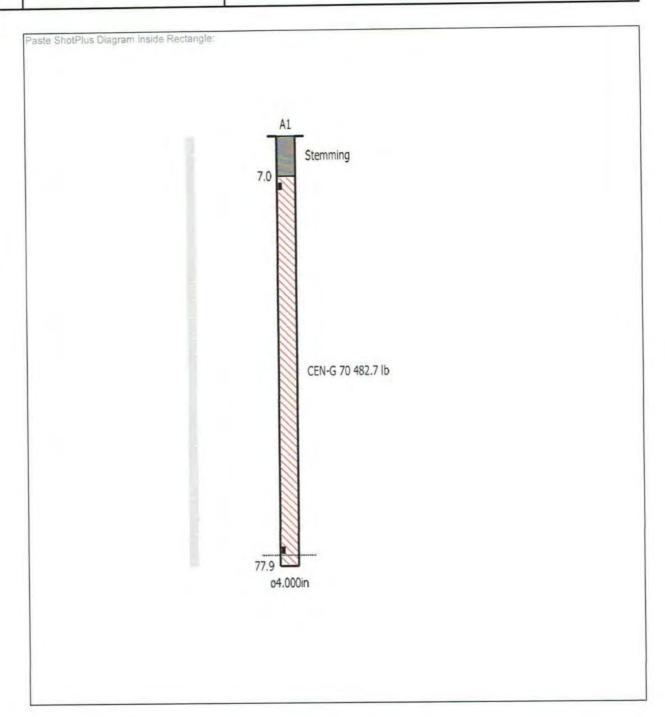
Blast Date:

Burlington 7/5/2018

Blast Number: Orica Order #:

18-010

page 2



Orica Mike der Kinderen Blaster-in-charge: Bill White

Quarry Manager:

Signature required implicating sign off on Blast Design

SHOTPlus 5 Plan

SHOTPlus 5.7.1.1

Mine Burlington

Location

Title/author 18-010 Upper Middle Final
Filename 2018-07-05 18-010 Upper Middle.spf



SHOTPlus 5 Plan

Blast Summary Data

Spacing: 10.0ft

1st row burden: 12.0ft

Burden: 9.0ft

Total drilled: 4133.5ft

Subdrill: 2.0ft

Stemming: 7.0ft

Load Sheet 250 Kg Max Hole angle: 0.0° Number of holes: 53 Hole Diameter: 4.0in

Free Face

وكما 318 233 233 ess ese ess. 243 .25° 215 . 224 233 235 155° PEL. 33 570 255. 856. 816. 455. 233 243 324 sto 25. 25. 25. 37 27 95 334 350 334 330 324 315 אוני אני נוצי נדבי 244 X165 . 225 , 246 허파 2/8 e233 94.7° な

够

\$25°

9249

4025 11

6/27/2018 18-010_Upper_Middle_Final.spf 18-010 Upper Middle Final Burlington SHOTPlus 5.7.1.1 Title/author Filename Location Mine

Blast Summary Data

Hole Diameter: 4.0in Spacing: 10.0ft

> 1st row burden: 12.0ft Total drilled: 4133,5ft

Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 53

Stemming: 7.0ft Hole angle: 0.0°

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15
80.3ft 80.1ft 78.0ft 78.1ft 77.7ft 77.9ft 78.4ft 78.5ft 78.3ft 78.1ft 78.7ft 78.8ft 77.8ft 76.2ft 75.9ft B16
C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 72.9ft
81.8ft81.6ft80.9ft 80.7ft 80.1ft 79.0ft 78.5ft 78.5ft 78.5ft 78.3ft 78.2ft 78.7ft 79.4ft 77.3ft 75.9ft 75.7ft 73.1ft A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 77.9ft 77.2ft 78.0ft 78.2ft 78.1ft 78.2ft 77.3ft 76.7ft

D1 D2 81.1ft 81.3ft

E1 80.9ft

* F2 73.3ft

D3 D4 73.8ft 73.0ft

7/4/2018 2018-07-05 18-010 Upper Middle.spf 18-010 Upper Middle Final Burlington SHOTPlus 5.7.1.1 Title/author Filename Location Mine

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

2

Orica Canada Inc.

CONSIGNOR EXPÉDITEUR GRAND VALLEY

033411 SIDE ROAD 21-22

GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8 11853

1089976

ala V	00010
GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2359087	86063385

PAGE 2

DATE DECLINED	THE DEC	NIDED		INVOICE	TO / BUYER			LISTOMER	REFERENCE NO.
DATE REQUIRED DATE REQUISE	TIME REC				À / ACHETEUR			N° DE COMMANDE DU CLIENT	
05 Jul 2018	00:00	.00	JET GON	AGGREGATE COMP	ANV		n/a		
DATE SHIPPED	00.00		FREIGHT T	ERMS	SHIP.	MAG. LIC. EXPÉDITEUR	11/ 6		HICLE NO. DE VÉHICULE
EXPÉDIÉ LE		CO	INDITIONS DE	LIVIAISON	PERIVIO	EXPEDITEON		0-7	17 ,113
05 Jul 2018	FOR DI	est'n,	Own Tr	ruck	F-73289	ING	DE ALCOHOLIS	10	MAG. LIC. NO.
	RANSPORT			1111	ITINÉF				N° DE PERMIS
Orica Truck				STANDARD					
QTY. QTÉ.	UM DG	QTY. RET'D		THE RESERVE OF THE PARTY OF THE	DESCRIPTION		Print	# OF / DE PKGS.	AMOUNT MONTANT
147 80 54 72 100 1	PC PC	x 2 9 x 27 x 36 x 23 100		PENTEX BC 340 *uni tronic 60 *uni tronic 60 *uni tronic 60 MINI STEM PLUG LICENSED BLAST LABOUR CHARGE ROG (ROCK ON 6) Harness Wire I	0-06.0M CU/ZC S 0-25M CU/ZC S 0-30M C/Z SPL S - PART #748 ER	PL(80')54P (100')36P 53		3 1 1 2	53.655 5.840 13.176 21.168 0.700
				**** TOTAL GHS/WHMIS SD Website: www Email: sds.n	TOTAL PACKAGES **** /WHMIS SDS documents available site: www.oricaminingservices.com il: sds.na@orica.com ne: 1-855-26-ORICA (1-855-266-7422)			8	100.379 KG

EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OF	PERED / PLACARDS OFFERT	QUOTING ORICA B/L TO / FAIRE SUIVRE FACTU		
NG TO THE APPLICABLE REGULATIONS OF VALEUR DÉCLARÉ ORT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES \$ CORMES À LA RÉALITÉ ET AUX RÉGLEMENTS	OF SHIPMENT NE	TTE No. CONV ESSAGE	POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA: Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5		
CARRIER / TRANSPORTEUR		CONSIGNEE / DESTINAT	TAIRE		
Orica Truck		NELSON AGG	REGATE COMPANY		
DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIC	NNEUR	RECEIVER'S NAME (PLE	ASE PRINT) / NOM DU RECEVEUR		
SIGNATURE	SCA7/8	SIGNATURE	DATE		
	THED, DESCRIBED, PACKAGED, MARKED AND ING TO THE APPLICABLE REGULATIONS OF ORT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES ORMES À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR ORICA TRUCK DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIC	TED, DESCRIBED, PACKAGED, MARKED AND DECLARED VALUE OF SHIPMENT NE PRIVALEUR DÉCLARÉE SORMES À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR ORICA TRUCK DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR	THE DESCRIBED, PACKAGED, MARKED AND DECLARED VALUE OF SHIPMENT NETTE No. CONVING TO THE APPLICABLE REGULATIONS OF ORT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES PORMES À LA RÉALITÉ ET AUX RÉGLEMENTS CARRIER / TRANSPORTEUR ORICA TRUCK DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR RECEIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR RECEIVER'S NAME (PLE		

24-HOLD AND PROCES 1-613-996-6666 ETS RETURNED / PALETTES RETOURNES

BAGS USED / SACS UTILISÉS



Event Report

Velocity (mm/s)



Date/Time Long at 11:51:55 July 5, 2018 Trigger Source Geo: 2.000 mm/s, Mic: 120.0 dB(L)

Geo: 254.0 mm/s Range

Record Time 3.25 sec (Auto=3Sec) at 1024 sps

Notes

Location: 2450 2nd Line Client: Nelson Aggregates User Name: Orica Canada

General: N.43.40245 W.79.87814

Extended Notes

Sand Bagged

Microphone Linear Weighting PSPL 115.9 dB(L) at 1.240 sec

ZC Freq 3.6 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 673 mv)

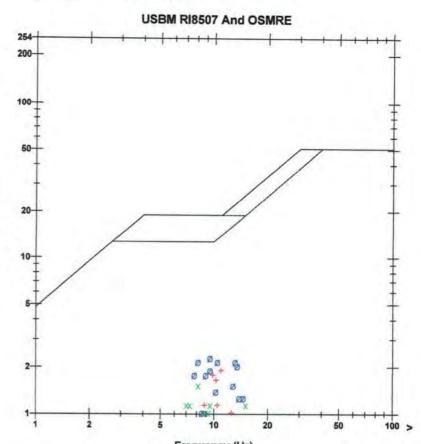
	Tran	Vert	Long	
PPV	1.905	1.524	2.286	mm/s
ZC Freq	11	8.1	9.5	Hz
Time (Rel. to Trig)	-0.037	0.226	0.198	sec
Peak Acceleration	0.027	0.027	0.040	g
Peak Displacement	0.028	0.029	0.046	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.2	7.4	7.5	Hz
Overswing Ratio	3.8	3.7	4.1	

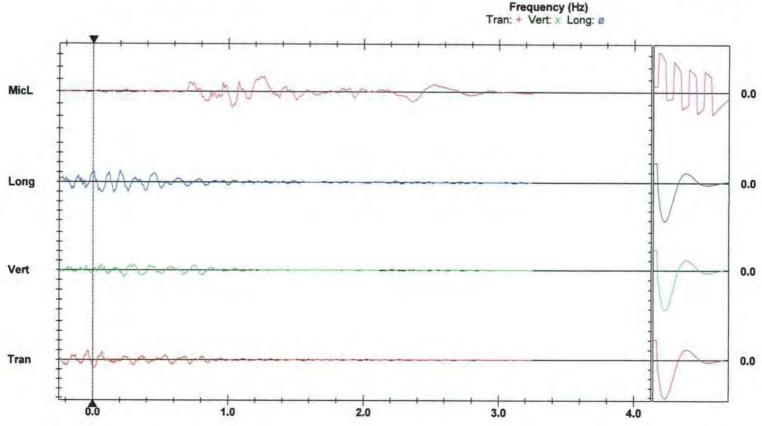
Peak Vector Sum 2.823 mm/s at 0.003 sec

Serial Number BE19461 V 10.72-8.17 MiniMate Plus

Battery Level 6.5 Volts **Unit Calibration** May 3, 2017 by Instantel

File Name TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check

Printed: July 5, 2018 (V 10.74)

Blast Summary Data

Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

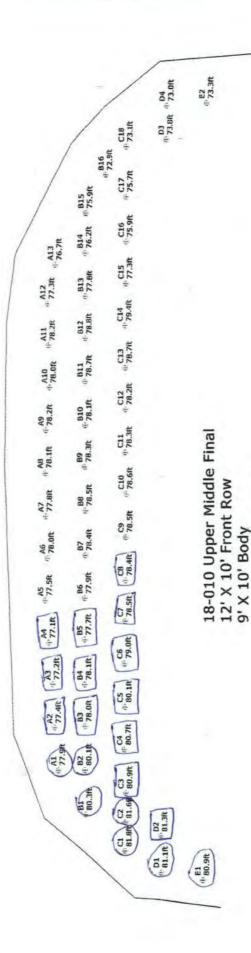
Total drilled: 4133.5ft

Subdrill: 2.0ft

Number of holes: 53

Hole angle: 0.0° Stemming: 7.0ft

Free Face



4" Bit - 250 + .6 Sub

SHOTPlus 5.7.2.1

12/06/2018

Burlington

Mine

Location

Title/author 18-010 Upper Middle Final

18-010 Upper Middle Final.spf

Filename

SHOTPlus 5 Plan

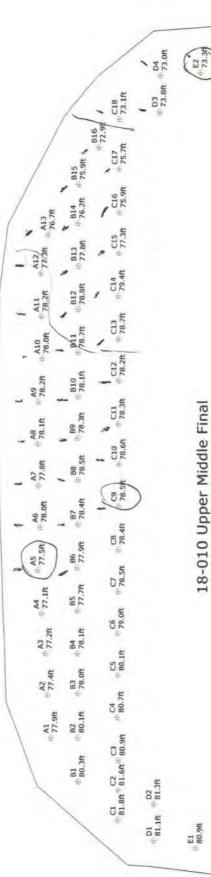
Blast Summary Data Hole Diameter: 4.0in Spacing: 10.0ft 1st row burden: 12.0ft Total drilled: 4133.5ft Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 53

Stemming: 7.0ft Hole angle: 0.0°

Free Face



18-010 Upper Middle Final 12' X 10' Front Row 4" Bit - 250 + .6 Sub 9' X 10' Body



Not to scale

12/06/2018 18-010 Upper Middle Final.spf Title/author 18-010 Upper Middle Final Burlington SHOTPlus 5.7.2.1 Filename Location Mine



Blast Design

Nelson Aggregate

Upper Middle

43,40369

Quarry: Burlington P.O. #:

Blast Number: Orica Order #:

Design te Blasted:

Total Holes Loaded:

18-010

53 holes

30,963 te

page 1 Blaster-in-charge:

Blast Location:

GPS Coordinates:

Mike der Kinderen

°N Latitude 79.88327

Design Date:

°W Longitude

2018-07-05

... including: Dead Holes Helper Holes ... and: Helper Hole Collar: ft avo

Rows Blasted: 3 rows

Bulk Expl. Required:

Pkgd Expl. Required:

PENTEX 12 (OR EQUIVALENT)

Angle from Vertical Nominal Bit Diameter: 4.133.5 ft (4 " diam) Primary Bit diam: 101.6 mm 03 # Holes 53 " diam) Secondary Bit diam: 03 # Holes: = 0.0 ft (" diam) Tertiary Bit diam: mm 03 # Holes: 0.0 ft (

kg

kg

13,200

36.0

Design Pattern (Front Row)-Burden: 12.0 ft ava

Spacing: 10.0 ft avg 22 front row # Holes: - Design Pattern (Main Body) -

> 9.0 ft avg Burden: Spacing: 10.0 ft avg

Holes: Bench Height: 76.0 ft avg 2.0 ft avg Sub-drill:

Hole Depth: - Design Stone Decking -Front Row: ft avo

78.0 ft avg

71.0 ft avg

71.0 ft avg

Main Body: ft avg Front Row: 7.0 ft avg

7.0 ft avg Main Body: Material used: .75" Stone

Design Charge Length -

Boosters Required: kg/u # used kg

> 13,236 total explosives weight in Blast (kg): 0.0% Pkgd Prod (0 kg) % of Total kg:

0.34 106

Detonators Required: # reg'd UNITRONIC 600 6M 80 UNITRONIC 600 25M 54 36 UNITRONIC 600 30M

Front Row: 207.0 kg/hole 207.0 kg/hole Main Body:

- Dasign Charge Weight -

Max Chge Wt / delay: 250.0 kg/delay

Required kg Loaded: 13,236 kg

Front Row:

Main Body:

Rock Density: $2.65 \text{ g/cc} = \text{te/m}^3$

Cord & Access. Reg'd: U of M # reg'd

WIRE DUPLEX (6 PACK) 400M units units units - Design Powder Factor -

Expected Yield PF: 0.427 kg/te (actual) 1,351 lb/yd3 Front row. 0,303 kg/te (theoretical) 1.802 lb/yd3 Main Body! 0.403 kg/te (thecretical) "KPI" PF: 1.652 lb/yd3 0.370 kg/te (theoretical)

Resource Deployment

1 # of Blasts today (this Quarry) # of Blasters (this Blast) 1 Note Exception 2 # of Helpers (this Blast) # of MMU's (this Blast)

Services Reg'd:

ocivices iteq u.		
GPS LAYOUT	Enter hours	0.0
BULK TRUCK CHARGE	<2,000kg	
BLASTER HOURS	Enter Blaster hours	0.0
HELPER HOURS	Enter total Helper man-hours	0.0
SEISMOGRAPH RENTAL	Enter # Orica Seismographs	0
3D LASER PROFILE	Enter hours	0
BORETRACK	Enter hours	0
TECHNICAL BLAST DESIGN	(per day) Enter # of days	0.0

Dost Reduction Notes (this Blast) - change in Bit. B. S. Expl or IS from previous Blast

2016-01-05-15-010 Upper Middle

Javan Ci

	Rlas	t Report		Quarry:	Burlington	Blast Number:	18-011
ORICA		•		P.O. #:		Orica Order #:	2367871
The Blasting Professionals	Nelso	n Aggregate	_	Blast Date:	2018-06-20	Blast Time:	11:59 AM
page 1 Rlaste	er-in-charge:	Mike der	مار ما ماراء		1,5	Tonnes Blasted:	24,173 te 9,122 m³
Diasi	er-in-charge.	wike den	Kiriuere	3 11	(Print Name)	Total tonnes per day:	te NB40-07 Rate
RI:	ast Location:	Lower	Middle	(Bench / Face)		Total Holes Loaded:	125 holes
			atitude	79.88449 °W Longitude		including:	Dead Holes
010	Centre of Blast		illuuc	Centre of Blast		and:	Helper Holes
						Helper Hole Collar:	ft avg
Wind from	m the:	5 kph		Temperature:	21 to 25 °C	# Rows Blasted:	15 rows
		X		X	2.1020		(Front Row)-
Clear:		Rain: Ov	ercast:			Burden:	12.0 ft avg
Partly Cloudy:	X	Snow: Inv	ersion:	Ceiling	30,000 ft	Spacing:	10.0 ft avg
						# Holes:	38 front row
- Drilling In	formation -					- Pattern ((Main Body) -
	Angl	le from Vertical		Nom	ninal Bit Diameter:	Burden:	9.0 ft avg
Primary Bit	diam: 101.6 mm	0 , # Holes	125	= 3,500.0	ft (4 " diam)	Spacing:	10.0 ft avg
Secondary Bit	diam: mm	0 , # Holes	:	= 0.0	ft (" diam)	# Holes:	87 main body
Tertiary Bit	diam: mm	0 , # Holes	:	= 0.0	ft (" diam)	Bench Height:	26.0 ft avg
					1	Sub-drill:	2.0 ft avg
Bulk Explo	osives:	in (kg) out	t (kg)	kg		Hole Depth:	2.0 ft avg 28.0 ft avg
CENTRA GOL	.D 70	34,090	25,800	8,290		- Stone	Decking -
						- Stone Front Row: Main Body:	5.0 ft avg 6.0 ft avg 10 per blast Stemming - 7.0 ft avg 7.0 ft avg 7.0 ft avg 16.0 ft avg 15.0 ft avg
Packaged	Explosives:	cs shipped cs re	turned	kg		Main Body:	6.0 ft avg
						# Decks:	10 per blast
							Stemming -
						Front Row:	7.0 ft avg
Boosters:		kg / unit				Main Body:	7.0 ft avg
PENTEX 12 (C	OR EQUIVALENT)	0.34	270	91.8		Material used:	.75" Stone
						Front Row: Main Body: Material used: - Charg Front Row: Main Body: Main Body:	ge Length - 16.0 ft avg
	total evol	osives weight in Blas	et (ka):	8,382		Main Body:	15.0 ft avg
	•	d Prod (0 kg) % of To	,	0.0%			ne Weight -
Detonators	-	,	ns	# used		Front Row:	46.7 kg/hole
UNITRONIC 60				123		Main Body:	
UNITRONIC 6				51		Max. per delay:	90.0 kg/delay
UNITRONIC 6	00 15M			96		SD () Equation:	372.7 kg/delay
						Total kg Loaded:	8,382 kg
						Rock Density:	2.65 g/cc = te/m^3
Cord & Ac	cessories:	U	of M	# used		- Powd	er Factor -
HARNES	SS WIRE DUPLEX (6 P	ACK) 400M u	nits	1	1.549 lb/yd ³	Yield PF:	0.347 kg/te (actual)
	MINI STEM PLUGS	6 - 6015 (4") u	nits	3	0.890 lb/yd ³	Front row:	0.199 kg/te (theoretical)
		u	nits		1.113 lb/yd ³	Main Body:	0.249 kg/te (theoretical)
Resource De	eployment:				1.098 lb/yd ³	"KPI" PF:	0.246 kg/te (theoretical)
# of Blasts toda	ay (this Quarry)			1	Cost Reduction Notes (th	nis Blast) - change in Bit , B, S,	Expl or IS from previous Blast:
# of Blasters (t	this Blast)			1	10 Stone decks were add	led to this blast due to the drill le	ogs showing voids
# of Helpers (th	his Blast)	Note Exception		2	The timing sheet identifie	s where they are as well as the	drill log and load sheet.
# of MMU's (thi	is Blast)			1	Attached is a load adjust	ment sheet	
Services:							
GPS LAYOUT	GPS LAYOUT Enter hours		0.0				
BULK TRUCK	BULK TRUCK CHARGE >/=5,000kg <10,000kg		1				
BLASTER HOL		Enter Blaster hours		7.0			
HELPER HOU		Enter total Helper mai		12.0			
SEISMOGRAP		Enter # Orica Seismo	graphs	0			
3D LASER PR		Enter hours		0.0			
BORETRACK		Enter hours		0.0			

2018-07-30 18-011 Lower Middle Blast Report

0.0

(per day) Enter # of days

TECHNICAL BLAST DESIGN



1

Blast Report

Nelson Aggregate

Burlington Quarry: P.O. #: Blast Date: 2018-06-20

Hz

dΒ

V/T/L:

Trigger set at: 115 dB

Blast Number: Orica Order #: Blast Time:

18-011 2367871 11:59 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
Mid Blast	43.40487	79.88448	
Front Row Corner	43.40462	79.88452	
Back Row Corner	43.40508	79.88446	
Average (Centre of Blast)	43.40486	79.88449	

(N) Radians	(W) Radians		
0.757558	1.394247		
0.757554	1.394248		
0.757562	1.394247		
0.757558	1.394247		

lst	Seismograph Co-ordinates	Enter ° N Lat.	Enter	° W Long.
	1st Reading	43.40245		79.87814
	2nd Reading			
	Average	43.40245		79.87814
	Distance (1st Seis. From Centre of Blast)	579.2	m	
	Post Blast Data: ppV:	Did	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

2450 2nd Line

79.87814	0.757516	1.3941
79.87814	0.757516	1.3941
Trigger set at: 2.0	mm/s	

? (Vertical, Transverse or Longitudinal)

1)
2.0 mm/s

frequency: Not

air overpressure: Trigger

(N) Radians	(W) Radians		
0.757578	1.394413		
0.757578	1.394413		

V/T/L: frequency: Not Hz ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1323.3	m

(N) Radians	(W) Radians		
0.757358	1.394323		
0.757358	1.394323		

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s V/T/L: frequency: Not Hz ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= <u>(579.2)</u>² kg 30²

= <u>335,473</u> kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge: Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-07-30 18-011 Lower Middle

Blast Report



Blast Design

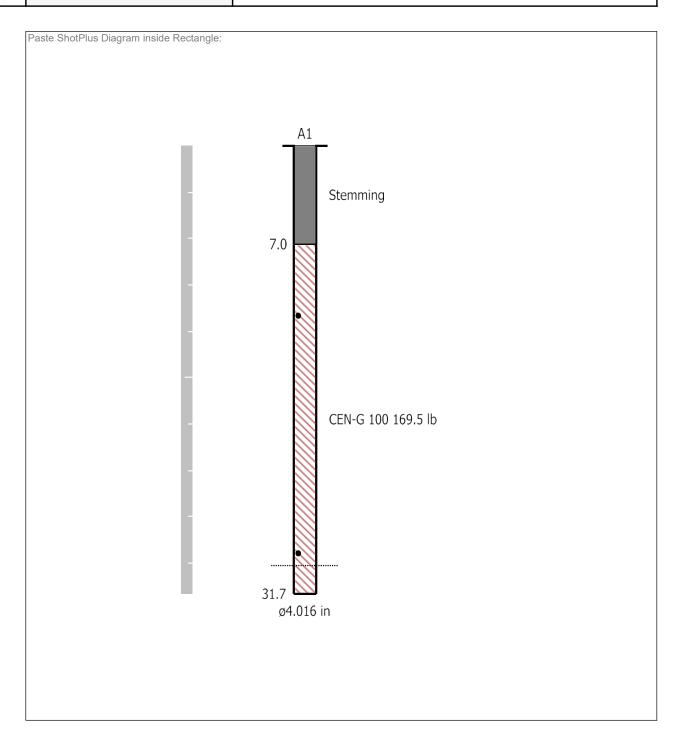
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 7/30/2018

Blast Number:
Orica Order #: 2

18-011 2367871

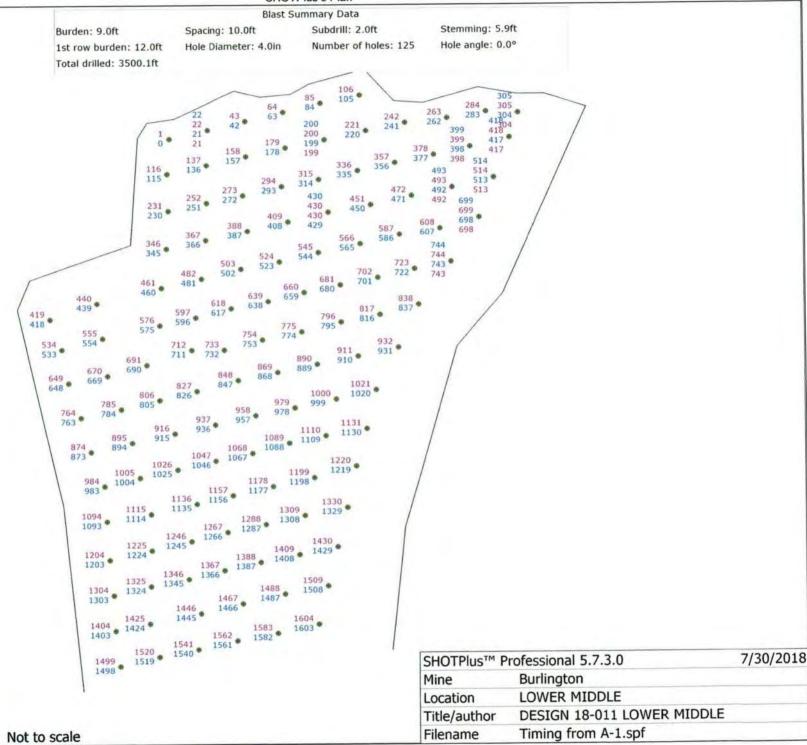
page 2



OricaBlaster-in-charge:

Quarry Manager:

Mike der Kinderen Bill White SHOTPlus 5 Plan



Blast Summary Data

Burden: 9.0ft

Spacing: 10.0ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

Number of holes: 125

Stemming: 5.9ft Hole angle: 0.0°

1st row burden: 12.0ft Total drilled: 3500.1ft

18-011 Lower Middle North 12x10 Front Row, 9x10 Body 4" Hole Diamteter 250m Elevation + 0.6m Subdrill

80 KG Max

65KG Max

42 56 48 51 54 54

7/27/2018 SHOTPlus™ Professional 5.7.3.0 Burlington Mine LOWER MIDDLE Location **DESIGN 18-011 LOWER MIDDLE** Title/author Blast_18-011_Lower_Middle.spf Filename

Blast Summary Data

Burden: 9.0ft 1st row burden: 12.0ft Spacing: 10.0ft

Hole Diameter: 4.0in

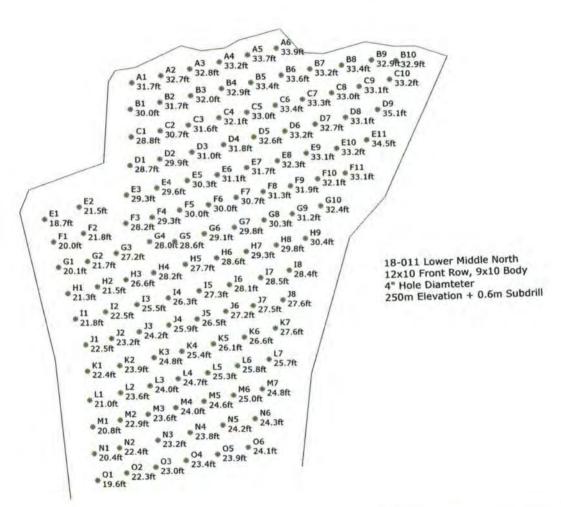
Subdrill: 2.0ft

Number of holes: 125

Stemming: 5.9ft

Hole angle: 0.0°

Total drilled: 3500.1ft





SHOTPlus™ P	rofessional 5.7.3.0	7/30/2018
Mine	Burlington	
Location	LOWER MIDDLE	
Title/author	DESIGN 18-011 LOWER MIDDLE	
Filename	2018-07-30 18-011 Lower Middle	.spf

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONVAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

Orica Canada Inc.

CONSIGNOR EXPÉDITEUR GRAND VALLEY 033411 SIDE ROAD 21-22

GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON

CA L7R 4L8

GROSS / BRUT TARE NET TIME IN HEURE D'ENTRÉE TIME OUT HEURE SORTIE ORDER NUMBER B/L NUMBER N° DE CONNAISSEMENT N° DE COMMANDE 86087520 2367871

109021

2

DATE REQUIRED	TIME REQUIRE	D D	INVOICE T	O / BUYER			REFERENCE NO.	
DATE REQUISE HEURE REQUISE			FACTURÉ À / ACHETEUR				N° DE COMMANDE DU CLIENT	
30 Jul 2018	00:00:00	NELSON	NELSON AGGREGATE COMPANY n/a					
DATE SHIPPED EXPÉDIÉ LE			FREIGHT TERMS SHIP, MAG. LIC. CONDITIONS DE LIVRAISON PERMIS EXPÉDITEUR			HICLE NO. DE VÉHICULE		
30 Jul 2018	FOB Dest	'n, Own Tr	NOTION DE L'INSTOCK		182	230		
	SHIP VIA		The latest terminal t		UTING ÉRAIRE		MAG. LIC. NO. N° DE PERMIS	
Orica Truck	TRANSPORTEUR		STANDARD	THIS	Ennine			
OTTCA TITUCK		Y. RET'D QTY. SOLD	DIMIDNE	DESCRIPTION	BUILD HOUSE	# OF / DE PKGS.	AMOUNT MONTANT	
QTÉ. 294	MD Q	1É. RET. QTÉ. FACT	PENTEX BC 340 (49/09)		6	107.310	
2 184 60 102 131 100 1	PC X PC PC PC PC	161 123 51 96 031 3	Harness Wire Du *uni tronic 600 *uni tronic 600 *uni tronic 600 *uni tronic 600 MINI STEM PLUGS LICENSED BLASTE LABOUR CHARGE ROG (ROCK ON GR	plex (6 pac -06.0M CU/Z -09.0M CU/Z -15M C/Z SP -20M CU/ZC - PART #74 R	C(20')80PC C(30')60PC L(50')66PC SPL(65')66P	1 3 1 2 2	5.840 13.432 5.880 17.442 26.724 0.700	
24-hour number			GHS/WHMIS SDS Website: www. Email: sds.na Phone: 1-855-	PACKAGES documents oricamining @orica.com	-855-266-7422)	15	177.328 KG	
PALLETS USED / PALETTES UTILISE EMERGENCY RESPONSE PLAN	ÉES	PALLETS F	ETURNED / PALETTES RETOURNÉES ERGENCY RESPONSE NO./24 HOUR NI LÉPHONE D'URGENCE/24 HEURE NUI	UMBER PLACARD	BAGS USED / SACS	FORWARD INVO	ICE FOR PREPAID FR	
	2-1510	TE TE	1-877-561-36		/OUI NO / NON		S/L TO / FAIRE SUIVRE FAC N PORT PAYÉ EN RÉFÉR EMENT PLORICA :	

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT, MOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE I SUSMENTIONNÉES DE MÉMIE QUE LES CONDITIONS DE TRANSPORT SONT CONFORM DE L'OFFOCE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.	O THE APPLICABLE REGULATIONS OF VALI ET L'ÉTIQUETAGE DES MARCHANDISES \$	CLARED VALUE OF SHIPMENT EUR DÉCLARÉE	NETTE No. CONV PRESSAGE WT AGREEMENT	PRESSAGE NT AGREEMENT NO. Brownsburg-Chath J8G 3B5			
CONSIGNORY EXPEDITEDREY	CARRIER TRANSPORTEUR		CONSIG	SON DESTRUCTIVE DE LA T	E COMPANY		
SHIPPER'S NAME (PLEASE PRINTY) NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / N	IOM DU CAMIONNEUR	RECEIV	VER'S NAME (PLEASE PRINT)	/ NOM DU RECEVEUR		
SIGNATURE CONTROL OF THE SIGNATURE CONTROL OF	SIGNATURE SOLUTION	P DATE 7	SIGNAT	TURE	DATE D/J M/M Y/		

YES / OUI

NO / NON



Blast Design

Nelson Aggregate

Quarry: Burlington P.O. #:

Design Date:

2018-07-30

1 158 lb/yd

1.558 lb/yd3

Blast Number:

18-011

Orica Order #:

page 1 Blaster-in-charge: Mike derkinderen Blast Location: Lower Middle **GPS Coordinates:** 43.40486 °N Latitude 79.88449 °W Longitude Denire of Blass

Design te Blasted: 24,173 te Total Holes Loaded: ... including: Dead Holes ... and: Helper Holes Helper Hole Collar: ft avg # Rows Blasted: 15 rows

- Design Pattern (Front Row):

- Drilling Information -

Bulk Eval Deguired

	Angle t	ram Vert	ical			Nominal Bit Diamete		
Primary Bit diam:	101.6 mm	02	# Holes:	125	=	3,500.0 ft (4	" diam)
Secondary Bit diam:	mm	0 3	# Holes:		=	0.0 ft (" diam)
Tertiary Bit diam:	mm	03	# Holes:		=	0.0 ft (" diam)

Burden: 12.0 ft avg Spacing: 10.0 ft avg # Holes: 38 Irant row - Design Pattern (Main Body) -

Burden: 9.0 ft avg Spacing: 10.0 ft avg 87 main body = Holes

Bench Height: 26.0 ft avg Sub-drill: 2.0 ft avg Hole Depth: 28.0 ft avg

Front Row: ft avq Main Body: ft avg - Design Callar Stemming -Front Row: 7.0 ft avq

Main Body: 7.0 ft avg Material used: .75" Stone

- Design Charge Length -

Front Row: 21.0 ft avg Main Body: 21.0 ft avg

Front Row: 61.2 kg/hole Main Body: 61.2 kg/hole Max Chge Wt / delay: 80.0 kg/delay

Required kg Loaded: 10,085 kg

Rock Density: 2.65 g/cc = te/m3

- Design Powder Factor -

Expected Yield PF: 0.417 kg/te (actual) Front row: 0.262 kg/te (theoretical) Main Body 0.349 kg/te (theoretical)

1.532 lb/yd3 "KPI" PF: 0.343 kg/te (theoretical)

Bulk Expl. Required:			kg		
CENTRA GOLD 70			10,000		
Pkgd Expl. Required:			kg		
E113 75X400					
Boosters Required:	kg/u ‡	used	kg		
PENTEX 12 (OR EQUIVALENT)	0.34	250	85.0		
total explosives weigh	t in Blast	(kg):	10,085		
Pkgd Prod (0 kg)	% of Tot	al kg:	0.0%		
Detonators Required:	m	s	# req'd		
UNITRONIC 600 6M			125		
UNITRONIC 600 15M			125		
		_			
Cord & Access. Req'd:	Uo	f M	# req'd		
WIRE DUPLEX (6 PACK) 400M	uni	ts	1		
	un				
	un	its			
Resource Deployment:					
# of Blasts today (this Quarry)	-			1	
# of Blasters (this Blast)				1	
# of Helpers (this Blast)	Note Ex	ception		2	
# of MMU's (this Blast)				1	
Services Req'd:	la constitution			0.0	
GPS LAYOUT	Enter h			0.0	
BULK TRUCK CHARGE	<2,0			0.0	
BLASTER HOURS	Enter Blaster hours		10.5	0.0	
HELDED HOLIDS	Enter total Helper man-hours			0.0	
HELPER HOURS		Orica C	Enter # Orica Seismographs		
SEISMOGRAPH RENTAL	Enter#		eismographs		
100000000000000000000000000000000000000		ours	eismographs	0	

Blast Summary Data

Burden: 9.0ft

Spacing: 10.0ft

Subdrill: 2.0ft

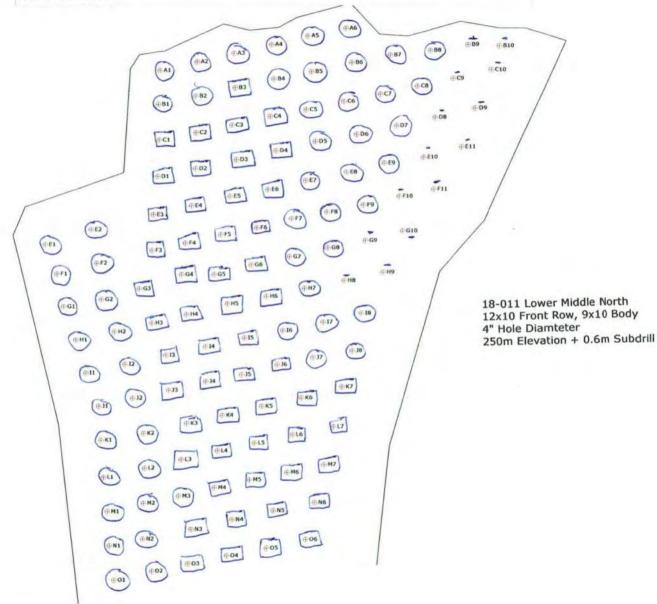
Stemming: 5.9ft

Hole Diameter: 4.0in

Number of holes: 125

Hole angle: 0.0°

1st row burden: 12.0ft Total drilled: 3500.1ft





ORICA The Blasting		t Repor			Quarry P.O. # Blast Date	:	_	Blast Number: Orica Order #: Blast Time:	237	70307 52 AM
Professionals**		<i>JJ J</i>						<u> </u>		
page 1 Blaster-in-	-charge:	Mil	ke derki	indere	n	(Print Name)		Tonnes Blasted:	27,176	
								Total tonnes per day:	27,176	
	ocation:		Upper M			(Bench / Fac	′	Total Holes Loaded:	47	holes
GPS Coor		43.40371	°N Lat	itude	79.88291	°W Longitu	ıde	including:		Dead Holes
	Ce	entre of Blast			Centre of Blast			and:		Helper Holes
M. 16 (1					- .	40.4- 00	٦,,	Helper Hole Collar:		ft avg
Wind from the	e: at	0 kph			Temperature	: 16 to 20]°C	# Rows Blasted:	(Front Row	rows
Clear:		Rain:	0,40	ercast:	X			Burden:		ft avg
Partly Cloudy: X		Snow:	-	ersion:	Ceiling	24,79	ft	Spacing:		ft avg
Turty Gloddy.		Onow.		, 31011. _[Cennig	24,73		# Holes:		front row
- Drilling Inform	ation -								(Main Body	
Drining mionin		e from Vertical			Non	ninal Bit Di	ameter:	Burden:		ft avg
Primary Bit diam			Holes:	46	= 3,606.6		" diam)	Spacing:		ft avg
Secondary Bit diam			Holes:	1	,	4 ft (5	" diam)	# Holes:		main body
Tertiary Bit diam			Holes:			Oft (" diam)	Bench Height:		ft avg
			L			٦ `	,	Sub-drill:		
Bulk Explosive	es:	in (kg)	out	(kg)	kg			Hole Depth:		ft avg
CENTRA GOLD 70		33,80) 2	2,760	11,040			- Stone	Decking -	<u>B</u>
								- Stone Front Row: Main Body:		ft avg ft avg ft avg ft avg per blast ft avg
Packaged Exp	losives:	cs shipped	cs ret	urned	kg			Main Body:	10.0	ft avg
								# Decks:	6	per blast
								- Collar	Stemming	- \$
								Front Row: Main Body:	7.0	ft avg
Boosters:		kg	/ unit	# used	kg			Main Body:	7.0	ft avg
PENTEX 12 (OR EQ	(UIVALENT)		0.34	106	36.0			Material used:	.75" Stone	/del
								0	ge Length -	Pow
								Front Row:		ft avg
		osives weight		,	11,076			· · · · · · · · · · · · · · · · · · ·		0
5	Pkgc	Prod (0 kg)			0.0%				ge Weight -	
Detonators:		case #'s	m	is	# used			Front Row:		kg/hole
UNITRONIC 600 9M					45			Main Body:		kg/hole
UNITRONIC 600 25					25			Max. per delay:		kg/delay
UNITRONIC 600 30	VI				36			SD () Equation: Total kg Loaded:	11,076	kg/delay
								Rock Density:		$g/cc = te/m^3$
								Rook Delisity.	2.03	g/cc = te/m
Cord & Access	sorios:		Uο	f M	# used			- Powo	ler Factor -	
	INI STEM PLUGS	- 6015 (4")	un		# uscu	1 820	lb/yd ³	Yield PF:		kg/te (actual)
		3010 (4)	un				lb/yd ³	Front row:		kg/te (theoretical)
			un				lb/yd ³	Main Body:		kg/te (theoretical)
Resource Deployi	ment:						lb/yd ³	"KPI" PF:		kg/te (theoretical)
# of Blasts today (this					1			his Blast) - change in Bit , B, S,		, ,
# of Blasters (this Bla	*/				1	3 Siesmogra		,	,	
# of Helpers (this Bla	· · · · · · · · · · · · · · · · · · ·	Note Exception	n		2			ere not loaded due to lean burde	n on profiles	
# of MMU's (this Blas					1					
Services:										
GPS LAYOUT		Enter hours			0.0					
BULK TRUCK CHAP	RGE		>/=10,0	000 kg	1					
BLASTER HOURS		Enter Blaster	hours		6.0					
HELPER HOURS		Enter total He	lper man-	-hours	11.0					
SEISMOGRAPH RE	NTAL	Enter # Orica	Seismogi	raphs	0					
3D LASER PROFILE		Enter hours			0.0					
BORETRACK		Enter hours			0.0					

2018-08-03 18-012 Upper Middle Blast Report

0.0

(per day) Enter # of days

TECHNICAL BLAST DESIGN



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-08-03

Blast Number:
Orica Order #:
Blast Time:

18-012 2370307 11:52 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40369	79.88291
Front Row Corner	43.40351	79.88288
Back Row Corner	43.40392	79.88295
Average (Centre of Blast)	43.40371	79.88291

(N) Radians	(W) Radians
0.757537	1.394220
0.757534	1.394219
0.757541	1.394220
0.757538	1.394220

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
	1st Reading	43.40245	79.87814	
	2nd Reading			
	Average	43.40245	79.87814	
	Distance (1st Seis. From Centre of Blast)	410.5	m	· -
	Post Blast Data: ppV:	2.4	mm/s Trigger set at:	2.0 mm/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: 7.2 Hz V / T / L : ? (Vertical, Transverse or Longitudinal)
air overpressure: 115.0 dB Trigger set at: 115 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	934.1	m
	Post Blast Data: nn\/:	0.1	mm/e Trigger set at:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

 Post Blast Data:
 ppV:
 0.1 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 7.1 Hz
 V / T / L:
 ? (Vertical, Transverse or Longitudinal)

 air overpressure:
 116.4 dB
 Trigger set at:
 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1243.6	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 0.1 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 7.4 Hz
 V / T / L :
 ? (Vertical, Transverse or Longitudinal)

 air overpressure:
 117.1 dB

Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= \frac{(410.5)^2}{30^2} \text{ kg}$

= <u>168,510</u> kg 900

Maximum Indicated Charge Weight per Delay = 187 k

OricaBlaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-08-03 18-012 Upper Middle Blast Report

ORICA The Blasting Professionals*		t Report n Aggregate		Quarry: P.O. #: Blast Date:	Burlington 2018-08-14	Blast Number: Orica Order #: Blast Time:	237	-013 (4191 54 AM
page 1 Blaster-in					1		4= 000	2.111
Blaster-ir	n-charge:	Mike d	lerkindere	n	(Print Name)	Tonnes Blasted:	17,069	
DI t.I					1	Total tonnes per day:	17,069	
	Location:		Floor		(Bench / Face)	Total Holes Loaded:	182	
GPS Coo			I Latitude	79.88807	°W Longitude	including:		Dead Holes
	Ce	entre of Blast		Centre of Blast		and:		Helper Holes
					044 05 00	Helper Hole Collar:		ft avg
Wind from the	e: S at	5 kph		•	21 to 25 °C	# Rows Blasted:		rows
a		_ X		X			(Front Row	<i>'</i>
Clear:		Rain:	Overcast:			Burden:	11.5	•
Partly Cloudy: X		Snow:	Inversion:	Ceiling	30,420 ft	Spacing: # Holes:	11.5	π avg front row
Drilling Inform	notion						(Main Body)	
- Drilling Inforn		6 1/ 0 1		Nom	ninal Bit Diameter:	- Pattern Burden:		
Primary Bit dian		e from Vertical	les: 182	= 1,820.0		Spacing:	11.5 11.5	•
•					,	# Holes:		-
Secondary Bit diam		0 # Ho			,			main body
Tertiary Bit dian	n:mm	0 # Ho	ies:	= 0.0	ft (" diam)	Bench Height: Sub-drill:	10.0	•
Bulk Evalosiv		in (1cm)	t (1,)	lem.				ft avg
Bulk Explosiv		,	out (kg)	kg		Hole Depth:	10.0	π avg
CENTRA GOLD 70		27,500	26,290	1,210		= Front Row:	e Decking -	te /
Dooksaad Evr	alaaiyaay		- u - 4: al	len		0		ft avg ft avg ft avg per blast ft avg ft avg
Packaged Exp	Diosives:	cs shipped cs	s returned	kg		CCS		ft avg
						# Decks:		per blast
						- Collar	Stemming -	
Docatero:		l /	:. #	I		- Collar Front Row:		ft avg
Boosters:		kg / un		kg		iviain body.		ft avg
PENTEX 12 (OR EC	QUIVALENT)	0).34 182	61.9		m iviateriai used.		
						Front Row:	ge Length -	ft avg
	total avala	sives weight in E	Plant (kg):	1,272		Main Body:		ft avg
	•	Prod (0 kg) % o	` •,	0.0%		·	ge Weight -	it avg >
Detonators:	Fkgu	case #'s	ms	# used		Front Row:		kg/hole
UNITRONIC 600 6N		Case # s	1115	# useu		Main Body:		kg/hole
EXEL HANDIDET 9			25/500	182		Max. per delay:		kg/flole kg/delay
EXEL HANDIDET 9	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		23/300	102		SD () Equation:		kg/delay
CONNECTADET 9	м		25 ms	4		Total kg Loaded:	1,272	-
CONNECTADET 12			42 ms	44		Rock Density:		g/cc = te/m ³
CONNECTABLITIZ	ZIVI		42 1115			rtook Bonoky.	2.00	9/00 = (e/11)
Cord & Acces	enrine:		U of M	# used		- Powd	ler Factor -	
	/IRE DUPLEX (6 P/	ACK) 400M	units	1	0.333 lb/yd ³	Yield PF:		kg/te (actual)
THURSDOWN	20. EEX (0 F)	10.19 400111	units	•	0.394 lb/yd ³	Front row:		kg/te (theoretical)
			units		0.394 lb/yd ³	Main Body:		kg/te (theoretical)
Resource Deploy	/ment:		unito		0.394 lb/yd ³	"KPI" PF:		kg/te (theoretical)
# of Blasts today (th	<u>'</u>			1	<u>, </u>	nis Blast) - change in Bit , B, S,		, ,
# of Blasters (this B				1	Cost reduction redicts (ii	iis blasty - change in bit , b, o,	Expror 10 IIOIII	previous biast.
# of Helpers (this Bl	,	Note Exception		2				
# of MMU's (this Bla		140to Exception		1				
Services:	100			1				
GPS LAYOUT		Enter hours		0.0				
BULK TRUCK CHA	RGE	<2,000kg		1				
BLASTER HOURS	II.OL	Enter Blaster hours	c	0.0				
HELPER HOURS		Enter total Helper		0.0				
SEISMOGRAPH RE	ΕΝΤΔΙ			0.0				
3D LASER PROFIL		Enter # Orica Seis	mographs	0.0				
	E	Enter hours						
BORETRACK		Enter hours		0.0				

2018-08-14 18-013 Floor Blast Report

0.0

(per day) Enter # of days

TECHNICAL BLAST DESIGN



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-08-14

Hz

dΒ

Blast Number:
Orica Order #:
Blast Time:

18-013 2374191 10:54 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40115	79.88796
Front Row Corner	43.40147	79.88808
Back Row Corner	43.40176	79.88818
Average (Centre of Blast)	43.40146	79.88807

(W) Radians
1.394308
1.394310
1.394312
1.394310

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40245	79.87814
	2nd Reading		
	Average	43.40245	79.87814
	Distance (1st Seis. From Centre of Blast)	811.0	m
	Post Blast Data: ppV:	Did	mm/s Trigger set at:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

Post Blast Data: ppV: Did frequency: Not

air overpressure: Trigger

Trigger set at: 2.0 mm/s
V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

ım/s

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter	° W Long.
	1st Reading	43.40605		79.89400
	2nd Reading			
	Average	43.40605		79.89400
	Distance (2nd Seis. From Centre of Blast)	700.4	m	
	Post Blast Data: ppV:	Did	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

ost Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s

frequency: Not Hz V/T/L: ? (Vertical, Transverse or Longitudinal)

air overpressure: Trigger dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	900.7	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 Did
 mm/s
 Trigger set at:
 2.0
 mm/s

 frequency:
 Not
 Hz
 V / T / L:
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 Trigger
 dB
 Trigger set at:
 115
 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= \frac{(700.4)^2}{30^2} \text{ kg}$

= <u>490,560</u> kg 900

Maximum Indicated Charge Weight per Delay = 545 kg

OricaBlaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-08-14 18-013 Floor

JIIII DI a

Blast Report



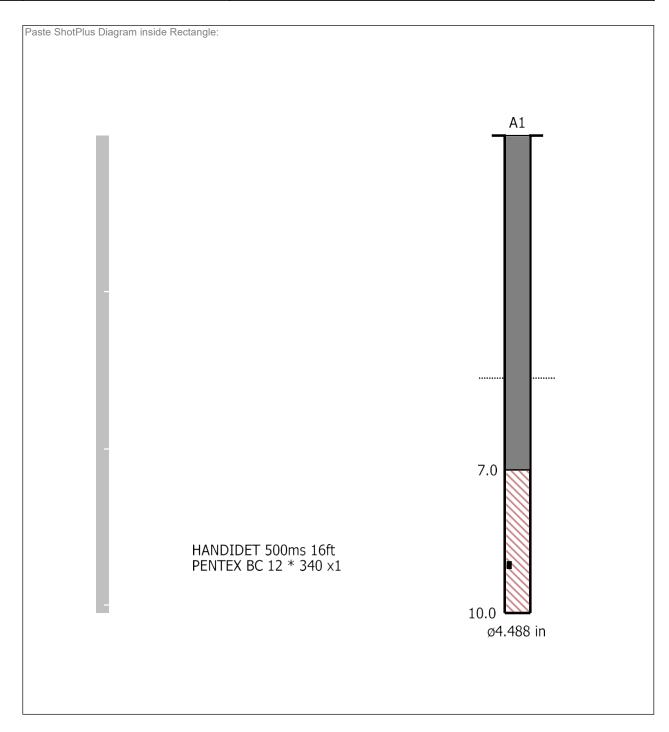
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 8/9/2018

Blast Number: 18-013
Orica Order #: 2374191

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

Blast Summary Data

Burden: 11.5ft

1st row burden: 11.5ft

Spacing: 11.5ft Hole Diameter: 4.0in Subdrill: 0.0ft

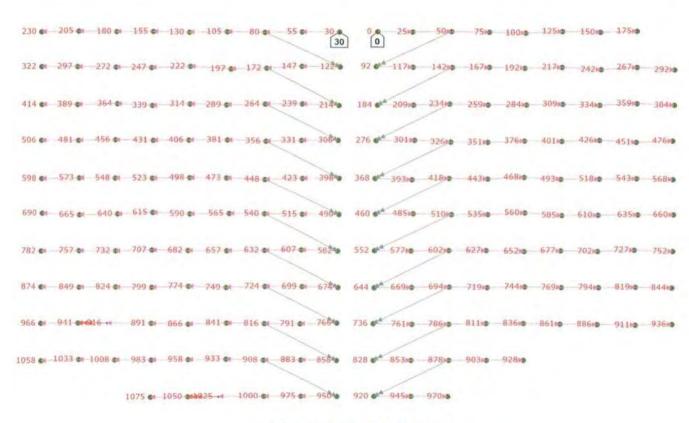
Stemming: 8.2ft

Total drilled: 1819.9ft

Number of holes: 182

Hole angle: 0.0°

Blasted and Backfilled



Blast 18-013 Floor 4" Hole 11.5 X 11.5



SHOTPlus™ P	8/14/2018	
Mine	Burlington	
Location		
Title/author	18-013 Floor	
Filename	2018-08-14 18-013 Floor.spf	

Load Sheet

10 for 60 for 10 10 to 10 po yo po 10 12 to 10 to 10 to 10 to 10 to 10 to 10 60 60 60 10 15 10 10 10 to bu to for to for to for of my it as as it is as as my my of it as as up up at up at at of at of up we we will up up up up up up up up mp mb mp mb us mp for des for for for for for for to so so for for for so for for my my est my my se est my my my my my my my my x x x of why for for for ox for to x x x

> Blast 18-013 Floor 4" Hole 11.5 X 11.5



SHOTPlus™ F	Professional 5.7.3.0	1.5	8/7/2018
Mine	Burlington		
Location	*		
Title/author	18-013 Floor		
Filename	Timing.spf		

Blasted and Backfilled

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 10.0ft 10 B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B10.0ft 10.0ft 1 C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C10.0ft 10.0ft 1 D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17 D18 10.0ft 10 E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E18 10.0ft 10 F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 F13 F14 F15 F16 F17 F18 10.0ft 10 G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11 G12 G13 G14 G15 G16 G17 G18 10.0ft 10 H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 H11 H12 H13 H14 H15 H16 H17 H18 H10.0ft 10.0ft 1 11 12 13 14 15 16 17 18 19 110 111 112 113 114 115 116 117 118 110.0ft 10.0ft 1 J1 J2 J3 J4 J5 J6 J7 J8 J9 J10 J11 J12 J13 J14 J15 J16 J17 J18 J10.0ft 10.0ft 1 K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17 K18 10.0ft 10

> Blast 18-013 Floor 4" Hole 11.5 X 11.5



SHOTPlus™ F	8/7/2018	
Mine	Burlington	
Location		
Title/author	18-013 Floor	
Filename	Timing.spf	





COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

CONSIGNOR

Orica Canada Inc. GRAND VALLEY

033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8 GROSS / BRUT

TARE

NET

TIME IN TIME OUT HEURE SORTIE

ORDER NUMBER N° DE COMMANDE N° DE CONNAISSEMENT

2374191

36102967

DATE REQUISE			UIRED		INVOIC FACTURI	DE TO / BUYER É À / ACHETEUR			R REFERENCE NO. MANDE DU CLIENT
4 Aug 2018	00:	00:	00	NELSON	AGGREGATE COME		n/		MANDE DO CLIENT
DATE SHIPPED EXPÉDIÉ LE			c	FREIGHT ONDITIONS D			HP. MAG, LIC. MIS EXPÉDITEUR	,	VEHICLE NO. DE VÉHICULE
1 Aug 2018	FOB	De	st'n,	Own Tr	uck	F-73289		150	
	SHIF	VIA	UR				OUTING NÉRAIRE		MAG. LIC. NO. N° DE PERMIS
ca Truck	2 5	- 1			STANDARD				10 021 2111110
QTY. QTÉ.	UM	DG MD	QTY, RET	OTY. SOLD		DESCRIPTION	Cold Mary St. 1000	# OF / DE PKGS.	AMOUNT MONTANT
			NET	EXPLO	IVES QUANTI	TY;	83.718	KG	
2 18 100 260 50 27 50 1	PC PC PC PC PC PC PC PC PC PC PC	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	63 1 16 100 78 50 23 6	2	EXEL HANDIDET EXEL Connectad EXEL Connectad LICENSED BLAST LABOUR CHARGE ROG (ROCK ON G	Duplex (6 pac 00-06.0M CU/Z S - PART #74 9M 25/500(3 12M 25/500(4 let 9M 25MS let 12M 42MS TER ROUND)	3C(20')80PC 4853 80') 65/CS 40') 50/CS	5 1 1 4 1 1	89.425 5.840 1.314 0.700 26.260 6.150 2.619
					TOTAL GROSS WE	PACKAGES		- 3	138.308 KG

THE NATIONAL TRANSPORTATION AGENCY AND THE DEPAR NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EME SUSMENTIONNÉES DE MÉME QUE LES CONDITIONS DE TRA DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRI	BALLAGE, LE MARQUAGE ET NSPORT SONT CONFORME	WT	GREEMENT NO. Brownsburg-Chatham, QC J8G 3B5		
CONSIGNOR EXPEDITEUR		CARRIER / TRANSPORTEUR Orica Truck		CONSIGNEE / DESTIN	ATAIRE GREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDIT	ÉUR	DRIVER'S NAME (PLEASE PRINT) / NOM	DU CAMIONNEUR	RECEIVER'S NAME (PI	LEASE PRINT) / NOM DU RECEVEUR
SIGNATURE C	9 00 /8 D/J M/M Y/A	SIGNATURE 1	DATE 14 08 18	SIGNATURE	D/J M/M Y/A

EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO

1-877-561-3636

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE

ERAP 2-1510

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND DECLARED VALUE OF SHIPMENT NETTE NO. CONV LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF VALEUR DÉCLARÉE PRESSAGE

FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À

NO DE GONNAISSEMENT D'ORICA :

301 rue hotel de ville

PLACARDS OFFERED / PLACARDS OFFERT

NO / NON

YES / OUI



Blast Design

Quarry: Burlington P.O. #:

Blast Number:

18-013

Orica Order #: Nelson Aggregate Design Date: 2018-08-09 page 1 Blaster-in-charge: Mike derkinderen Design te Blasted: 19,650 te Total Holes Loaded: 198 holes Blast Location: Floor ... including: Dead Holes **GPS Coordinates:** 43,40146 °N Latitude 79.88807 °W Longitude ... and: Helper Holes Helper Hole Collar: ft avg # Rows Blasted: 11 rows - Design Pattern (Front Row)-Angle from Vertical Nominal Bit Diameter: Burden: 11.5 ft avg Primary Bit diam: 101.6 mm 0' # Holes: 198 1,980.0 ft (4 = " diam) Spacing: 11.5 ft avo Secondary Bit diam: 03 # Holes: = 0.0 ft (" diam) # Holes: 38 front row Tertiary Bit diam: mm 03 # Holes: = 0.0 ft (" diam) - Design Pattern (Main Body) -Burden: 11.5 ft avg Spacing: 11.5 ft avg # Hales 160 main body Bench Height: 10.0 ft avo Sub-drill: 0.0 ft avg Bulk Expl. Required: kg Hole Depth: 10.0 ft avg CENTRA GOLD 70 3,500 - Design Stone Decking -Front Row: ft avg Pkgd Expl. Required: kg Main Body: ft avg - Design Collar Stemming -Front Row: 6.0 ft avg 6.0 ft avg Main Body: **Boosters Required:** kg/u # used Material used: 75" Stone kg PENTEX 12 (OR EQUIVALENT) 0.34 198 67.3 - Design Charge Length -Front Row: 4.0 ft avg total explosives weight in Blast (kg): 3,567 Main Body: 4.0 ft avg 0.0% Pkgd Prod (0 kg) % of Total kg: **Detonators Required:** ms # reg'd Front Row: 11.7 kg/hole UNITRONIC 600 6M 6 Main Body: 11.7 kg/hole EXEL HANDIDET 9m 25/500 198 Max Chge Wt / delay: 20.0 kg/delay 25/500 **EXEL HANDIDET 12m** 50 Required kg Loaded: CONNECTADET 9M 25 ms 50 3,567 kg Rock Density: CONNECTADET 12M 42 ms 2.65 g/cc = te/m3 Cord & Access. Reg'd: # req'd - Design Powder Factor -U of M WIRE DUPLEX (6 PACK) 400M units Expected Yield PF: 0.182 kg/te (actual) 0.525 lb/yd3 Front row: 0.118 kg/te (theoretical) units 0.525 lb/yd3 Main Body: 0.118 kg/te (theoretical) units Resource Deployment: 0.525 lb/yd3 "KPI" PF: 0.118 kg/te (theoretical) 1 Cost Reduction Notes (this Blast) - change in Bit, B. S. Expl or IS from previous Blast. # of Blasts today (this Quarry) # of Blasters (this Blast) 1 # of Helpers (this Blast) Note Exception 2 1 # of MMU's (this Blast) Services Reg'd:

0.0

0.0

0.0

0 0

0

0.0

GPS LAYOUT

BULK TRUCK CHARGE

SEISMOGRAPH RENTAL

TECHNICAL BLAST DESIGN

BLASTER HOURS

HELPER HOURS

BORETRACK

3D LASER PROFILE

Enter hours

Enter hours

Enter hours

<2,000kg

Enter Blaster hours

Enter total Helper man-hours

Enter # Orica Seismographs

(per day) Enter # of days

	Plact Danon	+	Quarry:	Burlington	Blast Number:	18-014
OPICA	Blast Repor		P.O. #:		Orica Order #:	2380811
The Blasting Professionals	Nelson Aggregate	2	Blast Date:	2018-08-30	Blast Time:	11:55 AM
Blaster-in-cha	arge: Mik	e derkindere	'n	(Print Name)	Tonnes Blasted:	31,778 te 11,992 m³
Bidotoi iii one	argo	o doritindore	<u> </u>	(i illicivanie)	Total tonnes per day:	31,778 te NB80-01 Rate
Blast Loca	ition:	Jpper Middle		(Bench / Face)	Total Holes Loaded:	58 holes
GPS Coordina		°N Latitude	79.88278	°W Longitude	including:	Dead Holes
	Centre of Blast		Centre of Blast	3	and:	3 Helper Holes
					Helper Hole Collar:	
Wind from the:	NE at 5 kph		Temperature:	16 to 20 °C	# Rows Blasted:	
	х		X		- Pattern	(Front Row)-
Clear:	Rain:	Overcast:			Burden:	12.0 ft avg
Partly Cloudy: X	Snow:	Inversion:	Ceiling	30,000 ft	Spacing:	10.0 ft avg
				-	# Holes:	24 front row
- Drilling Informatio	n -				- Pattern	(Main Body) -
	Angle from Vertical		Nom	inal Bit Diameter:	Burden:	9.0 ft avg
Primary Bit diam: 1	01.6 mm 0 +	Holes: 50	= 3,859.1	ft (4 " diam)	Spacing:	10.0 ft avg
Secondary Bit diam: 1	27.0 mm 0 #	Holes: 8	= 617.4	,	# Holes:	34 main body
Tertiary Bit diam:	mm *#	Holes:	= 0.0	ft (" diam)	Bench Height:	75.2 ft avg
]	Sub-drill:	
Bulk Explosives:	in (kg)	out (kg)	kg		Hole Depth:	77.2 ft avg
CENTRA GOLD 70	33,770	20,690	13,080			77.2 ft avg
					Front Row:	8.4 ft avg
Packaged Explosi	ives: cs shipped	cs returned	kg		CTS	9.8 ft avg
					# Decks:	`19 per blast
					- Collar	Stemming -
					Front Row:	9.8 ft avg
Boosters:		/ unit # used	kg		Main Body:	7.0 ft avg
PENTEX 12 (OR EQUIVA	ALENT)	0.34 154	52.4		Material used:	.75" Stone
					# Decks: - Collar Front Row: Main Body: Material used: - Charg Front Row: Main Body:	ge Length - 61.8 ft avg
	total explosives weight	in Blact (kg):	13,132		Main Body:	
	Pkgd Prod (0 kg)	, -,	0.0%		· · · · · · · · · · · · · · · · · · ·	ge Weight -
Detonators:	case #'s	ms	# used		Front Row:	
UNITRONIC 600 6M	0030 # 3	1113	# d30d		Main Body:	3.
UNITRONIC 600 9M			4		Max. per delay:	
UNITRONIC 600 20M			22		SD () Equation:	178.7 kg/delay
UNITRONIC 600 25M			6		Total kg Loaded:	13,132 kg
UNITRONIC 600 30M			72		Rock Density:	
Cord & Accessori	es:	U of M	# used		- Powa	ler Factor -
HARNESS WIRE D	OUPLEX (6 PACK) 400M	units	1	1.846 lb/yd ³	Yield PF:	0.413 kg/te (actual)
		units		1.189 lb/yd ³	Front row:	0.266 kg/te (theoretical)
		units		1.549 lb/yd ³	Main Body:	0.347 kg/te (theoretical)
Resource Deploymen	t:			1.429 lb/yd ³	"KPI" PF:	0.320 kg/te (theoretical)
# of Blasts today (this Qua	arry)		1	Cost Reduction Notes (t	his Blast) - change in Bit , B, S,	Expl or IS from previous Blast:
# of Blasters (this Blast)			1	3 Helpers requested due	to the amount of voids located	on drill log and stone decking requ
# of Helpers (this Blast)	Note Exception	n	3	Holes A3,A7,B5,B8,C8,0	C12 All measured short in depth	by an average of 12'.
# of MMU's (this Blast)			1	Bill White from Nelson B	urlington said we have to blast i	t, the drill wont be back until Sept.4
Services:				3 Siesmographs supplie	d and set-up	
GPS LAYOUT	Enter hours		0.0			
BULK TRUCK CHARGE		>/=10,000 kg	1			
BLASTER HOURS	Enter Blaster h	nours	6.0			
HELPER HOURS	Enter total Hel	per man-hours	15.0			
SEISMOGRAPH RENTAI	L Enter # Orica	Seismographs				
3D LASER PROFILE	Enter hours					
BORETRACK	Enter hours					

Report Blast Report

TECHNICAL BLAST DESIGN

(per day) Enter # of days



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-08-30

Blast Number:
Orica Order #:
Blast Time:

18-014 2380811 11:55 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40374	79.88277
Front Row Corner	43.40351	79.88279
Back Row Corner	43.40392	79.88277
Average (Centre of Blast)	43.40372	79.88278

(N) Radians	(W) Radians
0.757538	1.394217
0.757534	1.394218
0.757541	1.394217
0.757538	1.394217

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(1
	1st Reading	43.40245	79.87814		
	2nd Reading				
	Average	43.40245	79.87814		
	Distance (1st Seis. From Centre of Blast)	401.0	m		
	Post Blast Data: ppV:	3.7	mm/s Trigger set at:	2.0 m	m/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

? (Vertical, Transverse or Longitudinal)

 frequency:
 12.0
 Hz
 V/T/L:

 air overpressure:
 113.3
 dB
 Trigger set at:

air overpressure: 113.3 dB Trigger set at: 115 dB 2450 2nd Line

2430 ZHU LIHE

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	943.9	m
	Post Blast Data: ppV:	Did	mm/s Trigger set at
	_		1

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

 Post Blast Data:
 ppV:
 Did
 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 Not
 Hz
 V/T/L:
 ? (Vertical, Transverse or Longitudinal)

 air overpressure:
 Trigger
 dB
 Trigger set at:
 115 dB

Colling Rd & Blind Line Bruce Trail

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1249.2	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 2.0 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 2.5 Hz
 V / T / L :
 ? (Vertical, Transverse or Longitudinal)

 air overpressure:
 93.2 dB
 Trigger set at:
 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= <u>(401)</u>² kg 30²

= <u>160,801</u> kg 900

Maximum Indicated Charge Weight per Delay = 179 k

Orica

Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

Blast Report

Report



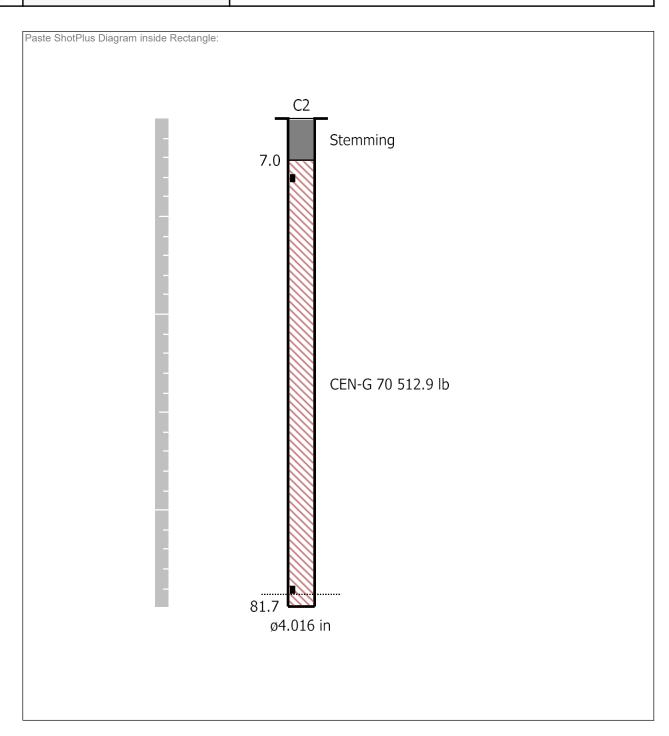
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 8/30/2018

Blast Number: Orica Order #: 18-014 2380811

page 2



Orica
Blaster-in-charge:

Quarry Manager:

Mike der Kinderen

Bill White

Blast Summary Data

Burden: 9.2ft

Spacing: 10.2ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

Number of holes: 58

Stemming: 6.9ft Hole angle: 0.0°

1st row burden: 12.1ft Total drilled: 4476.5ft

	3 23 0 0 20	43	60	83	103 100	123 120	143 140	163 160	183 180	203	223 220	243 240	263 260	28: 28:	3 •
118 115	138 135	158 155 •	178 175	198 195	218 215	238 235	258 255	278 275	298 295	318 315 •	338 335 •	358 355	378 375 •	398 395	303 300 418 415
233 230 •	253 250	273 270 •	293 290 •	313 310	333 330	353 350 •	373 370	393 390	413 410	433 430	453 450	473 470	493 490 •	513 510	533 530 530 550
348 345	368 365													6	613 610 68 65 68 68 68 68
463 460															748 745 803 800



SHOTPlus™ P	rofessional 5.7.3.0	8/16/2018
Mine	Burlington	
Location	UPPER MIDDLE	
Title/author	Design 18-013 UPPER MIDDLE Par	rtial Final
Filename	Design_18-014_UPPER_MIDDLE_F	inal.spf

Blast Summary Data

Burden: 9.2ft

Spacing: 10.2ft

Subdrill: 2.0ft

Hole Diameter: 4.0in

Number of holes: 58

Stemming: 6.9ft Hole angle: 0.0°

1st row burden: 12.1ft Total drilled: 4476.5ft 8 Ho

Load Sheet 4" 270kg Max 5" 350Kg Max



SHOTPlus™ P	rofessional 5.7.3.0	8/29/2018
Mine	Burlington	
Location	UPPER MIDDLE	
Title/author	Design 18-013 UPPER MIDI	DLE Partial Final
Filename	2018-08-00 18-014 Upper N	Middle.spf

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.2ft 1st row burden: 12.1ft Spacing: 10.2ft

Subdrill: 2.0ft

Stemming: 6.9ft

Hole Diameter: 4.0in

Number of holes: 58

Hole angle: 0.0°

Total drilled: 4476.5ft



SHOTPlus™ P	rofessional 5.7.3.0	8/29/2018
Mine	Burlington	
Location	UPPER MIDDLE	
Title/author	Design 18-013 UPPER MIDDI	LE Partial Final
Filename	2018-08-00 18-014 Upper M	

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

Orica Canada Inc.

CONSIGNOR **EXPÉDITEUR** GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON

CA L7R 4L8

NET

TIME IN HEURE D'ENTRÉE AM

TIME OUT 12.30 PM

ORDER NUMBER N° DE COMMANDE

B/L NUMBER N° DE CONNAISSEMENT

2380811

GROSS / BRUT

86120203

1090563

DATE REQUIRED DATE REQUISE TIME REQUIRED HEURE REQUISE			INVOICE TO / BUYER FACTURÉ À / ACHETEUR					CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT			
30 Aug 2018 00:00:00 NELSON AG					AGGE	REGATE COMPAN	ſΥ	n/a			
DATE SHIPPED EXPÉDIÉ LE			CC	FREIGHT ONDITIONS DI	TERMS LIVRAL	AND DESCRIPTION OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUM	SHIP. MAG. LIC. PERMIS EXPÉDITEUR		VEHICLE NO. N° DE VÉHICULE		
30 Aug 2018		2010 Call 10 / 10 / 10 / 10 / 10 / 10 / 10 / 10	st'n,	Own Tr	uck		F-73289	- 1	11/50	1)	
	TRANSF	P VIA PORTE	UR				ROUTING ITINÉRAIRE			MAG. LIC. NO. N° DE PERMIS	
rica Truck						STANDARD					
QTY. QTÉ.	UM	DG MD	QTY, RET'E QTÉ, RET.	QTY. SOLD QTÉ. FACT			DESCRIPTION		# OF / DE PKGS.	AMOUNT MONTANT	
245 2 80 60 66 54 72 100 1	PC PC PC PC PC PC	X X X X	30648	154 10 42267210	Harr *uni *uni *uni *uni MINI LICE LABO	tronic 600- tronic 600- tronic 600- tronic 600- tronic 600-	lex (6 pack) 400m 06.0M CU/ZC(20')80PC 09.0M CU/ZC(30')60PC 20M CU/ZC SPL(65')66P 25M CU/ZC SPL(80')54P 30M C/Z SPL(100')36P - PART #74853		5 1 1 1 1 2	89.425 5.840 5.880 13.464 13.176 21.168 0.700	
					TOT	AL GROSS WEIG	HT		1	55.493 KG	
				-	We Em	S/WHMIS SDS (bsite: www.orail: sds.na@	documents available ricaminingservices.com		12		

PALLETS USED / PALETTES UTILISÉES PA	LLETS RETURNED / PALETTES RETOUR	INÉES			BAGS USED / SACS	UTILISES		
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 H TÉLÉPHONE D'URGENCE/24 HEU	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO			D / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FREIGH QUOTING ORICA B/L TO / FAIRE SUIVRE FACTUR		
ERAP 2-1510	1-877-561-	-3636	YES / OUI NO / NON		NO / NON	POUR EXPÉDITION PORT PAYE EN RÉFÉRANT NO DE CONNAISSEMENT D'ORICA :		
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFI LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDIN THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUA SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFIDE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.	NG TO THE APPLICABLE REGULATIONS OF ORT. NGE ET L'ÉTIQUETAGE DES MARCHANDISES ORMES À LA RÉALITÉ ET AUX RÉGLEMENTS	VALEUR DÉCLARÉ		PRESS	No. CONV AGE REEMENT NO.	301 rue hotel o Brownsburg-Char J8G 3B5		
CONSIGNOR/ EXPÉDITEUR GRAND VALLEY				CONSIGNEE / DESTINATION AGGI	REGATE COMPAN	TY		
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRIN	PANOM DU CAMIC	ONNEUR RECEIVER'S NAME (F		RECEIVER'S NAME (PLE	LEASE PRINT) / NOM DU RECEVEUR		
SIGNATURE DATE	18 SIGNATURE	1 3	DATE 08	13	SIGNATURE		DATE	

SUBJECT TO ALL THE TERMS AND CONDITIONS ON THE BACK SOUS RÉSERVE DES CONDITIONS ET RESTRICTIONS ÉNUMÉRES AU VERSO **** PAGE 2 OF 2 ****

SHIPPING ORDER BON D'EXPÉDITION

(AGENT MUST DETACH AND RETAIN THIS SHIPPING ORDER AND MUST SIGN THE ORIGINAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
(L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNE LA COPIE ORIGINALE (1) DU CONNAISSEMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)



Event Report

File Name



Date/Time Tran at 12:17:50 August 30, 2018 Geo: 1,500 mm/s. Mic: 115.0 dB(L) **Trigger Source**

Geo: 254.0 mm/s Range

Record Time 4.758 sec (Auto=4Sec) at 2048 sps Operator/Setup: Operator/Nelson Agg.mmb

Notes Location:

SouthWest Corner Of Property

Client: Nelson Aggregates User Name: Orica Canada General: Burlington

Extended Notes

Sand Bagged 43.39339-79.88880

Microphone Linear Weighting PSPL 93.2 dB(L) at 0.916 sec

ZC Freq 22 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1334 mv)

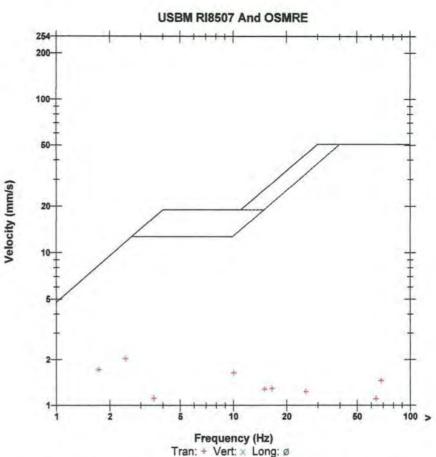
	Tran	Vert	Long	
PPV	2.041	0.110	0.055	mm/s
ZC Freq	2.5	68	>200	Hz
Time (Rel. to Trig)	0.044	0.822	4.283	sec
Peak Acceleration	0.142	0.012	0.008	g
Peak Displacement	0.152	0.000	0.000	mm
Sensor Check	Check	Check	Check	
Frequency	20.9	1024.0	1024.0	Hz
Overswing Ratio	1.2	0.0	0.0	

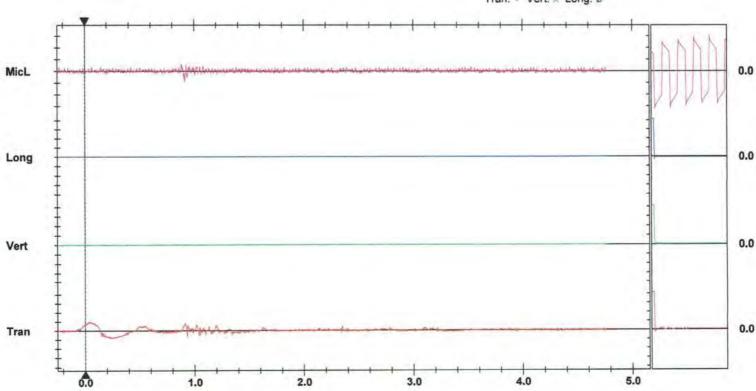
Peak Vector Sum 2.041 mm/s at 0.044 sec

UM6859 V 10-89 Micromate ISEE Serial Number

Battery Level 3.7 Volts

Unit Calibration December 22, 2017 by Instantel UM6859_20180830121750.IDFW





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div Trigger = >

Sensor Check



Event Report



Date/Time Tran at 11:55:00 August 30, 2018 Trigger Source Geo: 1.500 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.25 sec (Auto=3Sec) at 1024 sps

Job Number:

Notes

Location: 2450 2nd Line
Client: Nelson Aggregate
User Name: Orica Canada
General: Burlington

Extended Notes

Sand Bagged 43.40245-79.87814

Microphone Linear Weighting
PSPL 113.3 dB(L) at 1.545 sec

ZC Freq 3.0 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 558 mv)

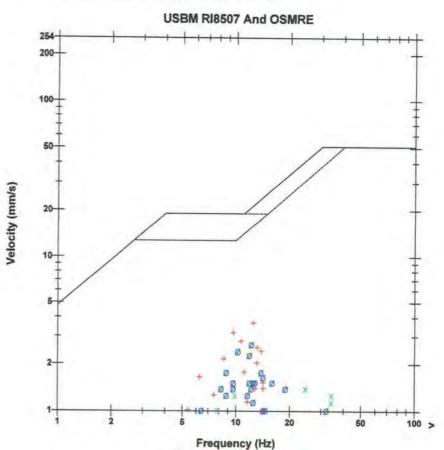
	Tran	Vert	Long	
PPV	3.683	1.397	2.667	mm/s
ZC Freq	12	24	12	Hz
Time (Rel. to Trig)	0.395	0.229	0.614	sec
Peak Acceleration	0.053	0.040	0.040	g
Peak Displacement	0.050	0.022	0.037	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.6	4.0	

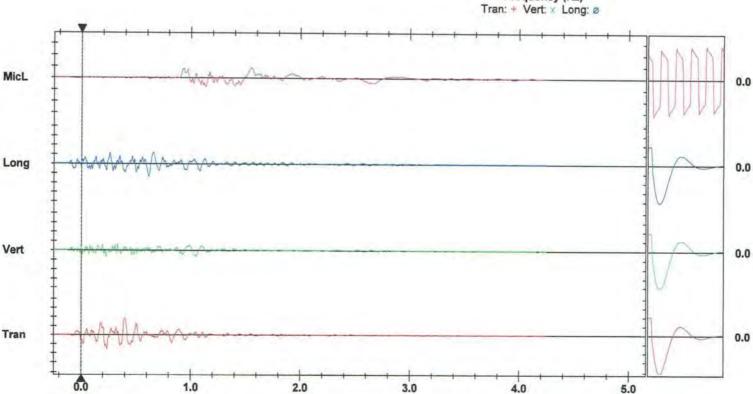
Peak Vector Sum 4.139 mm/s at 0.396 sec

Serial Number BE12877 V 10.72-1.1 Minimate Blaster 6.1 Volts Unit Calibration November 3, 2017 by Instantel

File Name __TEMP.EVT

Scaled Distance 5850.2 (1850.0 m, 0.1 kg)





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger =

Sensor Check

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.2ft

Spacing: 10.2ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

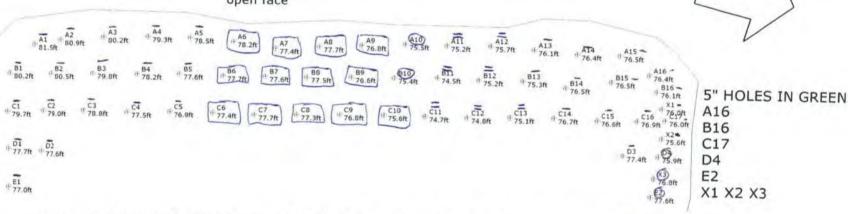
Number of holes: 58

Stemming: 6.9ft Hole angle: 0.0°

1st row burden: 12.1ft

Total drilled: 4476.5ft

open face



Design 18-013 UPPER MIDDLE Final- 4" Blast Hole $12x10 \ 9x10 \ 274$ and 250 + .6 SUB ELEV



SHOTPlus 5.7	7.0.8 8/7/2018
Mine	Burlington
Location	UPPER MIDDLE
Title/author	Design 18-013 UPPER MIDDLE Partial Final
Filename	Design 18-013 UPPER MIDDLE Partial.spf



Blast Design

Nelson Aggregate

Quarry:	Burlington
P.O. #:	
Design Date:	2018-08-30

Blast Number: 18-014
Orica Order #:

page 1

Blaster-in-charge: Mike derkinderen

Blast Location: Upper Middle

GPS Coordinates: 43.40372 °N Latitude 79.88278 °W Longitude

Design te Blasted: 31,778 te

Total Holes Loaded: 58 holes
... including: Dead Holes
... and: 3 Helper Holes

Helper Hole Collar: ft avg

Rows Blasted: 3 rows

- Drilling Information -

Bulk Expl. Required:

Pkgd Expl. Required:

Boosters Required:

PENTEX 12 (OR EQUIVALENT)

Detonators Required:

UNITRONIC 600 6M

UNITRONIC 600 15M

UNITRONIC 600 30M

CENTRA GOLD 70

	Angle from Vertical				Nominal	Bit D)ian	neter:		
Primary Bit diam:	101.6	mm	0 3	# Holes:	50	=	3,859.1 ft (4	**	diam)
Secondary Bit diam:	127.0	mm	0 3	# Holes:	8	=	617.4 ft (5	*	diam)
Tertiary Bit diam:		mm	0 °	# Holes:		=	0.0 ft (**	diam)

kg

kg

kg

39.4

13.539

0.0%

58

reg'd

kg/u # used

0.34 116

ms

13,500

- Design Pattern (Front Row)-

12.0 ft avg

34 main body

Burden:

Holes

Spacing:	10.0	ft avg
# Holes:	24	front row
- Design Pattern	(Main	Body) -
Burden:		ft avg
Spacing:	10.0	ft avg

Bench Height: 75.2 ft avg
Sub-drill: 2.0 ft avg
Hole Depth: 77.2 ft avg
- Design Stone Decking Front Row: 5.0 ft avg

Main Body: ft avg

- Design Collar Stemming Front Row: 7.0 ft avg
Main Body: 7.0 ft avg

Material used: .75" Stone

- Design Charge Length -

Front Row: 65.2 ft avg
Main Body: 70.2 ft avg

- Design Charge Weight -

Front Row: 190.1 kg/hole
Main Body: 204.6 kg/hole
Max Chge Wt / delay: 240.0 kg/delay

Required kg Loaded: 13,539 kg

Rock Density: 2.65 g/cc = te/m3

Cord & Access. Req'd: U of M # req'd
WIRE DUPLEX (6 PACK) 400M units 1

total explosives weight in Blast (kg):

Pkgd Prod (0 kg) % of Total kg:

units units
Resource Deployment:

Services Reg'd: **GPS LAYOUT** Enter hours 0.0 **BULK TRUCK CHARGE** <2.000kg **BLASTER HOURS** Enter Blaster hours 0.0 HELPER HOURS Enter total Helper man-hours 0.0 0 SEISMOGRAPH RENTAL Enter # Orica Seismographs 0 3D LASER PROFILE Enter hours BORETRACK 0 Enter hours TECHNICAL BLAST DESIGN 0.0 (per day) Enter # of days

- Design Powder Factor -

Expected Yield PF: 0.426 kg/te (actual)
Front row: 0.281 kg/te (theoretical)
Main Body: 0.403 kg/te (theoretical)
"KPI" PF: 0.362 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast

3 Helpers

1.254 lb/yd2

1,800 lb/yd2

1.618 lb/yd3

D	Bla	st Repor	t	Quarry	_	Blast Number: Orica Order #:	18-015	
ORICA The Biastine		on Aggregat		P.O. # Blast Date		Blast Time:	2384839 11:49 AM	
Professionals*	14613	on Aggi egai	•	Blast Bate	2010-00-10	Diagr Time.	11.40740	
age 1 Blaste	er-in-charge:	Mik	e derkinder	 en	(Print Name)	Tonnes Blasted:	22,269 te	3,404 m3
						Total tonnes per day:		F-15 Rate Code
Bla	ast Location:		Floor		(Bench / Face)	Total Holes Loaded:	204 holes	
GPS (Coordinates:	43.40084	°N Latitude	79.88808	°W Longitude	including:	Dead Hol	es
	·	Centre of Blast	_	Centre of Blast		and:	Helper Ho	oles
						Helper Hole Collar:	ft avg	
Wind from	m the: E a	it 15 kph		Temperature	e: 11 to 15 °C	# Rows Blasted:	9 rows	
		X		X		- Pattern	(Front Row)-	
Clear:		Rain: X	Overcast:	X		Burden:		
Partly Cloudy:		Snow:	Inversion:	Ceiling	1,324 ft	Spacing:		
5 :11: 1	<i>r</i>					# Holes:	20 front row	
- Drilling In				NI.	: IB'(B'		(Main Body) -	
Dulina a ma Dit		ngle from Vertical		1	minal Bit Diameter:	Burden:		
	diam: 101.6 mr		Holes: 204	1	,	Spacing:	11.5 ft avg	
Secondary Bit Tertiary Bit			Holes:	-	0 ft(" diam) 0 ft(" diam)	# Holes: Bench Height:	184 main bod 11.0 ft avg	У
rentary bit	diam:mr	II U #	noies.	_ 0.0	on (diam)	Sub-drill:	0.0 ft avg	70
Bulk Explo	nsives:	in (kg)	out (kg)	kg		Hole Denth	11.0 ft avg	Blastec
CENTRA GOL		31,670	, ,,			- Stone	Decking -	8
OLIVITICA GOL	.5 70	01,070	20,010	2,000		- Stone Front Row: Main Body:	ft avg	Yield Powder Factor (kg Loaded / te
Packaged	Explosives:	cs shipped	cs returned	kg		Main Body:		pep
	•					# Decks:	per blast	Loa
							Stemming -	Kg
						Front Row:	7.0 ft avg	ctor
Boosters:		kg	/ unit # used	kg		Main Body:	7.0 ft avg	Fac
PENTEX 12 (C	R EQUIVALENT)		0.34 235	79.9		Material used:	.75" Stone	/der
						- Charg	ge Length -	Pow
						Front Row: Main Body: Material used: - Charge Front Row: Main Body: Main Body:		eld
		plosives weight	(0,	2,380		· · · · · · · · · · · · · · · · · · ·	ū	\geq
Detemates		gd Prod (0 kg)		0.0%		Front Row:	ge Weight -	
Detonators		case #'s	ms	# used		Main Body:	3	
EXEL HANDID			25/500	235		Max. per delay:		
CONNECTADI			25 ms	11 X		SD () Equation:		
CONNECTADI			42 ms	34		Total kg Loaded:		
COMILECTAL			42 1110			Rock Density:		e/m ³
						· ·		2,
Cord & Ac	cessories:		U of M	# used		- Powa	ler Factor -	
HARNES	SS WIRE DUPLEX (6	PACK) 400M	units	1	0.477 lb/yd ³	Yield PF:	0.107 kg/te (act	tual)
			units		0.477 lb/yd ³	Front row:	0.107 kg/te (the	oretical)
			units		0.477 lb/yd ³	Main Body:	0.107 kg/te (the	oretical)
Resource De	eployment:				0.477 lb/yd ³	"KPI" PF:	0.107 kg/te (the	oretical)
# of Blasts toda	ay (this Quarry)			1	Cost Reduction Notes (th	nis Blast) - change in Bit , B, S,	Expl or IS from previous E	3/ast:
# of Blasters (t	his Blast)			1	3 Helpers needed due to	the number of holes and condi-	tions	
# of Helpers (th	nis Blast)	Note Exception	n	3	31 additional primers wer	re needed because the primary	was stuck and would not p	oull into
# of MMU's (thi	is Blast)			1	product.			
Services:								
GPS LAYOUT		Enter hours		0.0				
BULK TRUCK		>/=2,000kg	<5,000kg	1				
BLASTER HOL		Enter Blaster		7.0				
HELPER HOU			lper man-hours	16.0				
SEISMOGRAP			Seismographs	0				
3D LASER PR		Enter hours		0.0				
BORETRACK		Enter hours			1			

18-015Floor Blast Report

0.0

(per day) Enter # of days

TECHNICAL BLAST DESIGN



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2018-09-10

Hz

Trigger set at: 1.5 mm/s

Trigger set at: 124 dB

V/T/L:

Blast Number: Orica Order #: Blast Time:

18-015 2384839 11:49 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
Mid Blast	43.40083	79.88805	
Front Row Corner	43.40067	79.88858	
Back Row Corner	43.40102	79.88760	
Average (Centre of Blast)	43.40084	79.88808	

(N) Radians	(W) Radians
0.757487	1.394310
0.757485	1.394319
0.757491	1.394302
0.757487	1.394310

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40245	79.87814
	2nd Reading		
	Average	43.40245	79.87814
	Distance (1st Seis. From Centre of Blast)	823.6	m
	Post Blast Data: ppV:	Did	mm/s Trigger set at:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: Not air overpressure: Trigger dΒ

2450 2nd Line (set to 124DB trigger due to continious truck traffic)

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

? (Vertical, Transverse or Longitudinal)

2nd Seismograph Co-ordinates Enter ° N Lat. Enter ° W Long. 1st Reading 43.40605 79.89400 2nd Reading 43.40605 79.89400 Average Distance (2nd Seis. From Centre of Blast) **752.7** m Post Blast Data: ppV: 0.1 mm/s Trigger set at: 2.0 mm/s

(N) Radians (W) Radians 0.757578 1.394413 0.757578 1.394413

7.5 Hz V/T/L: ? (Vertical, Transverse or Longitudinal) frequency: air overpressure: **118.0** dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	831.0	m

SouthWest Corner of Property (Only require 2 Siesmographs for floor blasts)

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Post Blast Data: ppV: Not mm/s Trigger set at: 2.0 mm/s Нz V / T / L : ? (Vertical, Transverse or Longitudinal) frequency: Set air overpressure: Up dΒ Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$
$$= (752.7)^2 \text{ kg}$$

30²

= **566,5<u>57</u>** kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge: Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

18-015Floor

Blast Report



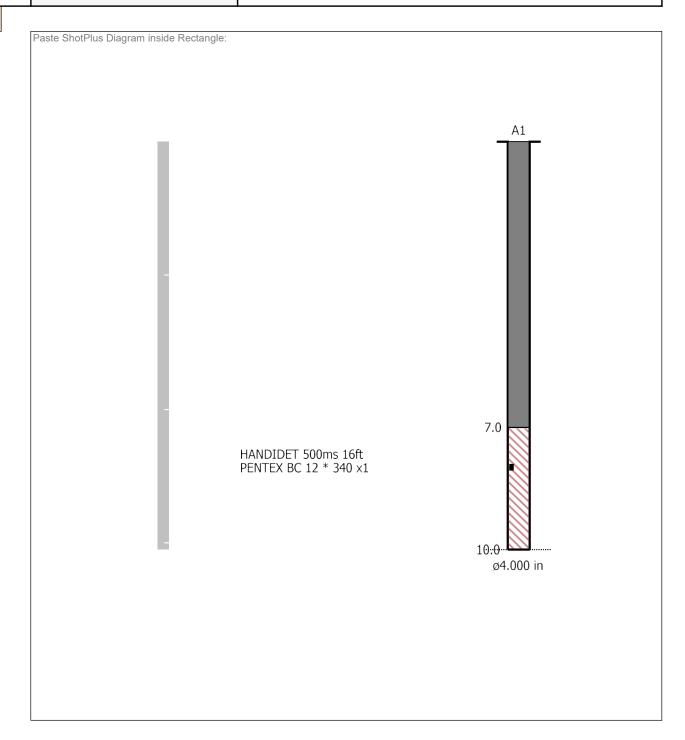
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/10/2018

Blast Number: 18-015 Orica Order #: 2384839

page 2



OricaBlaster-in-charge:

Quarry Manager:

Mike der Kinderen Bill White

Signature required, indicating sign off on Blast Design.

Blast Summary Data

Burden: 3.5m

1st row burden: 3.5m Total drilled: 673.2m

Spacing: 3.5m

Subdrill: 0.0m

Hole Diameter: 101.6mm Number of holes: 204

Stemming: 2.5m

Hole angle: 0.0°

-013 Floor

Previous Blast

Timing

416

0 e 85 e 50 e 75 e 199 e 195 e 150 e 175 e 290 e 295 e 250 e 67 - 08:0 148:0 148:0 168:0 198:0 248:0 248:0 268:0 348:0 348:0

651 ex 626 ex 681 ex 626 ex 681 ex 626 ex 501 .4476 .4451 .4426 .4401 .44376 ex 351 .4226 ex 401 ex 426 ex 401 ex 743 er748 er 603 er 668 er 6613 er 648 er 603 er 668 er 6613 er 6618 er 603 er 6

885 \$1860 \$1825 \$1920 \$1745 \$1760 \$1725 \$1740 \$1685 \$1660 \$1685 \$1660 \$1685 \$1660 \$1685 \$1660 \$1685 \$1640 \$1640 \$16

977 CASZ C1927 C1802 C1827 C1862 C1827 C1862 C1827 C18

1069 \$1844 \$1929 \$1894 \$1859 \$1844 \$1859 \$1884 \$1859 \$1844 \$1829 \$1844 \$1859 \$1844 \$1859 \$1844 \$1859 \$1859 \$1854 \$1859 \$1

1228 01263 01478 01463 01463 01463 01463 01463 01463 01468 01463 01468 01463 01478 01478 0 Concrete Pad



SHOTPlus™ P	rofessional 5.7.3.0	9/10/2018
Mine	Burlington	
Location		
Title/author	18-013 Floor	
Filename	18-015 Floor Final Not timed.spf	

Blast Summary Data

Burden: 11.5ft

1st row burden: 11.5ft Total drilled: 2360.2ft

Spacing: 11.5ft Hole Diameter: 4.0in Subdrill: 0.0ft

Number of holes: 218

Stemming: 8.2ft Hole angle: 0.0°

loor Previous Blast

8-013

Load Sheet

014 015 08 08 04 × × × 04 × 04 × 04 05 15 15 15 10 05

12 -12 -12 -8 -15 -15 -15 -15 -8 -10 -12 -15 -15 -15 -10 -4 × +2 10 -15 -15 -4 4 8 8 ×

12 12 12 14 4 8 15 15 15 15 12 15 15 15 12 14 10 4 2 12 12 18 12 10 4 8 12 +12 +15 +12 +8 +8 +4 +8 +12 +15 +16 +15 +15 +15 +15 +15 +16 +15 +12 +10 +16 +15 +12

14 -14 -12 -12 -8 -4 -8 -4 -4 - 15 -15 -15 -15 -15 -15 -16 -12 -12 -4 -10 -10 -10 -15 -15

Concrete Pad

DRILL TO SHALE



SHOTPlus™ P	rofessional 5.7.3.0	9/9/2018
Mine	Burlington	
Location		
Title/author	18-013 Floor	
Filename	18-015 Floor Final.spf	



Event Report



Date/Time MicL at 11:49:28 September 10, 2018 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.03 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/BURLINGTON.MMB

Notes

Location: **COLLING RD & BLINDLINE** Client: **NELSON AGGREGATES**

User Name: ORICA CANADA

General:

Extended Notes N 43.31617

W 80.02664

Microphone Linear Weighting PSPL 118.0 dB(L) at 0.001 sec

ZC Freq 11.1 Hz

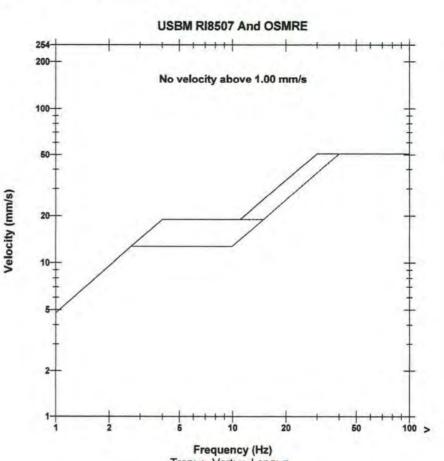
Channel Test Passed (Freq = 20.5 Hz Amp = 1457 mv)

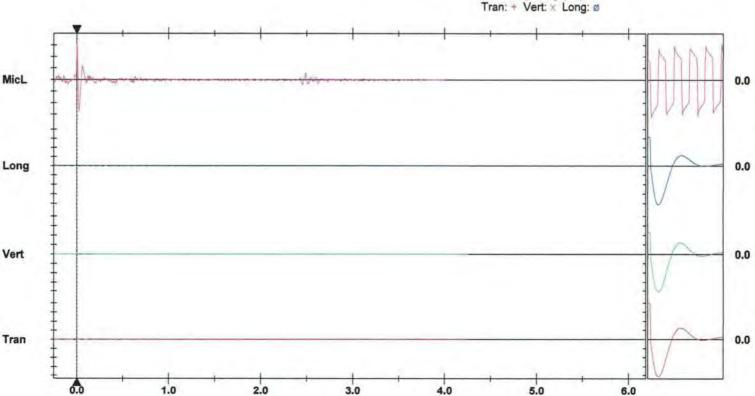
	Iran	Vert	Long	
PPV	0.110	0.110	0.110	mm/s
ZC Freq	11.6	27	16.0	Hz
Time (Rel. to Trig)	-0.020	0.049	0.026	sec
Peak Acceleration	0.010	0.010	0.012	g
Peak Displacement	0.001	0.001	0.010	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.5	7.3	Hz
Overswing Ratio	3.3	3.4	3.6	

Peak Vector Sum 0.136 mm/s at 0.049 sec

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level** 3.6 Volts

Unit Calibration February 14, 2018 by Instantel File Name UM6857 20180910114928.IDFW





Trigger = >

Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div

Sensor Check

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY. FORMULE COMBINÉE ET ABRÉGÉE DE CONVAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

Orica Canada Inc. GRAND VALLEY CONSIGNOR EXPÉDITEUR

033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON CA L7R 4L8

10	90658
GROSS / BRUT	
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2384839	86129828

DATE REQUIRED DATE REQUISE			UIRED		-	INVOICE TO) / BUYER				CUSTOME	PAGE R REFERENCE NO.	
10 Sep 2018	00:	2.5.20	2027/75	NRT.SON	AGGREGATE COMPANY			N° DE COMMANDE DU CLIENT					
DATE SHIPPED		-	-	FREIGHT	_		(Y			ı/a			
EXPÉDIÉ LE				ONDITIONS D	E LIVRA	NSON		SHIP, MAG PERMIS EXPÉ			VEHICLE NO. N° DE VÉHICULE		
10 Sep 2018	FOB	De	est'n,	Own Tr	ruck		F-73	3289			A15013		
	SHIF	VIA	UR					ROUTING	ile He		H MANN	MAG. LIC. NO.	
rica Truck						STANDARD		HINERAIRE				N° DE PERMIS	
QTY. QTÉ.	UM	DG	QTY, RET'E	QTY. SOLD			-				# OF / DE		
QIE.		MD		QTÉ, FACT				CRIPTION			# OF / DE PKGS.	AMOUNT MONTANT	
		_	NET	EXPLO	SIV	ES QUANTITY	1		100.426	KG		0.200	
		-											
30 100 325 65 65 10 8 1	PC PC PC PC PC PC PC PC PC PC	X X X X X X X X X X X X X X X X X X X	100	235 34.	Hari *un: MIN: EXEI EXEI EXEI LICE LABO	L Connectadet L Connectadet	lex (06.0M - PAR M 25/ 9M 9M 12M	6 pack) 4 1 CU/ZC(20 T #74853	65/CS FT) 65/CS FT) 65/CS	70	6 1 1 5 1 1	107.310 5.840 2.190 0.700 32.825 6.305 6.370 1.080	
					TOT	AL GROSS WEIG	HT					162.620 KG	
	d == G				***	* TOTAL PA	CKAGE	S ***	r*		16	A STATE	
-HOUR NUMBER:	1-6	13-	996-6		TIDNES	PALETTES RETOURNÉES			2122.000.000				
ERGENCY RESPONSE PLAN / RI	ÉSUMÉ D	E PLAI	N D'URGENCI			RESPONSE NO./24 HOUR NUMBE D'URGENCE/24 HEURE NUMERO	ER	PLACARDS OFFERE	BAGS USED / SAC D / PLACARDS OFFERT			DE FOR PREPAID FREI	
ERAP 2	-15	10				377-561-3630		YES / OUI	NO / NON	QUO	TING ORICA BAR EXPÉDITION	L TO / FAIRE SUIVRE FACT PORT PAYÉ EN RÉFÉRAN MENT D'ORICA :	

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIRED; I LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORT, NOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUAGE I SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFORM DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.	O THE APPLICABLE REGULATIONS OF VALEUR DÉCLARÉE ET L'ÉTIQUETAGE DES MARCHANDISES	NETTE No. CONV PRESSAGE WT AGREEMENT NO.	301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
CONSIGNOR EXPÉDITEUR	CARRIER / TRANSPORTEUR OFFICA Truck	CONSIGNEE / D	ESTINATABLE AGGREGATE COMPANY
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR	RECEIVER'S NAI	ME (PLEASE PRINT) / NOM DU RECEVEUR
SIGNATURE DATE DATE DAY MAN Y/A	SIGNATURE WAAL DATE 10 9	SIGNATURE Y/A	DATE D/J M/M Y/A
The second secon	CI	IB IECT TO ALL THE	FDMO AND COMPTON

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED AND DECLARED VALUE OF SHIPMENT NETTE No. CONV.
LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE DECLARED VALUE OF SHIPMENT NETTE NO.

ORICA The Basting Professional	Blas		sign regate		Des	Qua P.C ign D
page 1 Blaster-in-charg	ge: Mi	ke de	rkinderen			
Blast Location	on: Flo	or				
GPS Coordinate		3.4008 fre of B		itude		.8880 - of B
- Drilling Information -	4-1	Len.	7/4	_		
Primary Bit diam: 101		ram Ve		225	=	2.21
Secondary Bit diam:	mm	0'	# Holes:	220	=	2,25
Tertiary Bit diam:	mm	0 '	# Holes:		=	
Pkgd Expl. Required:			2,880 kg			
Boosters Required:	kg/u #	heau	kg			
PENTEX 12 (OR EQUIVALENT)	0.34	225	76.5			
total explosives weigh		-	2,957			
Pkgd Prod (0 kg) Detonators Required:	% of Total	kg:	0.0% # reg'd			
UNITRONIC 600 6M			6			
EXEL HANDIDET 9m	25/50	0	225			
CONNECTADET 12M	42 m	S	36			
Cord & Access. Reg'd:	U of I	Л	# req'd			
WIRE DUPLEX (6 PACK) 400M	units		1			
	units					
Resource Deployment						
# of Blasts today (this Quarry)					1	
# of Blasters (this Blast)					1	
# of Helpers (this Blast)	Note Exce	ption			3	
# of MMU's (this Blast)					1	
Services Req'd:						
GPS LAYOUT	Enter hour				0.0	
BULK TRUCK CHARGE	<2,000k	g				

Enter Blaster hours

Enter hours

Enter hours

Enter total Helper man-hours

Enter # Orica Seismographs

(per day) Enter # of days

0.0

0.0

0

0

0

0,0

Name)	Design te Blasted: Total Holes Loaded: including: and: Helper Hole Collar: # Rows Blasted: Design Patte Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes: Bench Height: Sub-drill: Hole Depth: Design Sto	22,329 te 225 holes Dead Hole Helper Hole ft avg rows 20 front row 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
ongitude Bit Diameter: 4 " diam) " diam)	Total Holes Loaded: including: and: Helper Hole Collar: # Rows Blasted: - Design Patte Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	225 holes Dead Hole Helper Ho ft avg rows 20 front row 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
ongitude Bit Diameter: 4 " diam) " diam)	Total Holes Loaded: including: and: Helper Hole Collar: # Rows Blasted: - Design Patte Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	225 holes Dead Hole Helper Ho ft avg rows 20 front row 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
ongitude Bit Diameter: 4 " diam) " diam)	including: and: Helper Hole Collar: # Rows Blasted: - Design Path Burden: Spacing: # Holes: Burden: Spacing: # Holes: Burden: Spacing: Holes: Burden: Spacing: # Holes: Burden: Spacing: # Holes: Bench Height: Sub-drill: Hole Depth: - Design Sto	Dead Hol Helper Hoft avg rows Pern (Front Row)- 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
Bit Diameter: 4 " diam) " diam)	and: Helper Hole Collar: # Rows Blasted: - Design Patte Burden: Spacing: # Holes: Burden: Spacing: # Holes: Bench Height: Sub-drill: Hole Depth: - Design Sto	Helper He ft avg rows 20 front row 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
4 " diam) " diam)	Helper Hole Collar: # Rows Blasted: - Design Patte Burden: Spacing: # Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	ft avg rows 20 front row 11.5 ft avg 10.0 ft avg 10.0 ft avg	
4 " diam) " diam)	# Rows Blasted: - Design Path Burden: Spacing: # Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	rows ern (Front Row)- 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
4 " diam) " diam)	Burden: Spacing: # Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	11.5 ft avg 11.5 ft avg 20 front row 11.5 ft avg 11.5 ft avg 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
4 " diam) " diam)	Burden: Spacing: # Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	11.5 ft avg 11.5 ft avg 20 front row 11.5 ft avg 11.5 ft avg 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
4 " diam) " diam)	Spacing: # Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	11.5 ft avg 11.5 ft avg 11.5 ft avg 11.5 ft avg 10.0 ft avg 10.0 ft avg 10.0 ft avg	
" diam)	# Holes: Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	11.5 ft avg 11.5 ft avg 205 10.0 ft avg 10.0 ft avg 10.0 ft avg	
	Burden: Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	11.5 ft avg 11.5 ft avg 205 10.0 ft avg 10.0 ft avg	
	Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	11.5 ft avg 205 10.0 ft avg 0.0 ft avg 10.0 ft avg	
	Spacing: # Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	11.5 ft avg 205 10.0 ft avg 0.0 ft avg 10.0 ft avg	
	# Holes Bench Height: Sub-drill: Hole Depth: - Design Sto	205 10.0 ft avg 0.0 ft avg 10.0 ft avg	
	Bench Height: Sub-drill: Hole Depth: - Design Sto	10.0 ft avg 0.0 ft avg 10.0 ft avg	
	Sub-drill: Hole Depth: - Design Sto	0.0 ft avg 10.0 ft avg	
	Hole Depth: - Design Sto	10.0 ft avg	
	- Design Sto		
	TIOH NOW.		
		ft avg	
	Main Body:	ft avg	
	Front Row:	ar Stemming -	
	Main Body:	7.0 ft avg	
	Material used: .7	7.0 ft avg	
	Max Chge Wt / delay:	12.0 kg/delay	
1	Required kg Loaded:	2,957 kg	
	Rock Density:	2.65 g/cc = te/	m ³
	- Design Pau	vder Factor -	
			el)
394 lb/yd ³			
394 lb/yd ¹			
.000 lb/yd3			
	s Blast) - change in Bit . B. S. &	J. J. J. R. Karte (meor	encel
	.394 lb/yd³ .394 lb/yd¹	Pesign Che Front Row: Main Body: Design Che Front Row: Main Body: Max Chge Wt / delay: Required kg Loaded: Rock Density: Pesign Pov Expected Yield PF: Front row: Main Body: Main Body:	Front Row: 3.0 ft avg Main Body: 3.0 ft avg Design Charge Weight Front Row: 8.7 kg/hole Main Body: 8.7 kg/hole Main Body: 12.0 kg/delay Required kg Loaded: 2,957 kg Rock Density: 2.65 g/cc = te/ Design Powder Factor Expected Yield PF: 0.132 kg/te (actual control of the con

BORETRACK

BLASTER HOURS

HELPER HOURS

3D LASER PROFILE

SEISMOGRAPH RENTAL

TECHNICAL BLAST DESIGN

DRILL TO SHALE

⊕H9 ⊕H10 ⊕H11 ⊕H12 ⊕H13 ⊕H14⊕H15 ⊕H16 ⊕H17 ⊕H18 ⊕H19 ⊕H20⊕H21 ⊕H22 ⊕H23⊕H24 ⊕H25 ⊕H26 ⊕H27 ⊕I9 ⊕I10 ⊕I11 ⊕I12 ⊕I13 ⊕I14 ⊕I15 ⊕I16 ⊕I17 ⊕I18 ⊕I19 ⊕I20 ⊕I21 ⊕I22 ⊕I23 ⊕I24 ⊕I25 ⊕I26 ⊕I27 Pad



la Di	aat Dan	- m+	1	Quarry:	Burlington
ORICA	ast Rep elson Aggre			P.O. #: Blast Date:	
Professionals**			Į		2010 00 21
age 1 Blaster-in-charge:		Mike derk	indere	en	(Print Name)
Blast Location:		Flo	or		(Bench / Face)
GPS Coordinates:	43.40052	°N La	titude	79.88765	°W Longitude
	Centre of Bla	ast		Centre of Blast	
Wind from the: SW	at 15 k	nh		Temperature:	26 to 30 °C
willia from the.	at 10 K	Х		X	20 10 30 C
Clear:	Rain:	Ove	ercast:		
Partly Cloudy: X	Snow:	Inve	ersion:	Ceiling	30,000 ft
- Drilling Information -					
g	Angle from Ver	tical		Nom	ninal Bit Diameter:
Primary Bit diam: 101.6	mm 0	# Holes:	345	= 3,877.8	ft (4 " diam)
Secondary Bit diam:	mm <mark>0</mark>	# Holes:		= 0.0	ft (" diam)
Tertiary Bit diam:	mm O	# Holes:		= 0.0	ft (" diam)
Bulk Explosives:	in (k	a) out	(kg)	kg	1
CENTRA GOLD 70			26,640	3,850	
OLIVINA GOLD 70		7,400	20,040	0,000	
Packaged Explosives:	cs ship	ped cs re	turned	kg	
Deceters:		1/		L	
Boosters:		kg / unit	# used	kg 118.7	
PENTEX 12 (OR EQUIVALENT)		0.34	349	110.7	
total	explosives we	ight in Blas	t (kg):	3,969	
ļ	Pkgd Prod (0	kg) % of To	tal kg:	0.0%	
Detonators:	case	#'s n	ns	# used	
UNITRONIC 600 6M				349	
Cord & Accessories:		U	of M	# used	
HARNESS WIRE DUPLEX	(6 PACK) 400F	vI ur	nits	2	0.461 lb/yd ³
		ur	nits		0.495 lb/yd ³
		ur	nits		0.495 lb/yd ³
Resource Deployment:					0.495 lb/yd ³
# of Blasts today (this Quarry)				1	Cost Reduction Notes (
# of Blasters (this Blast)	Not- E	ontion		1 2	Unitronic detonators we
# of Helpers (this Blast) # of MMU's (this Blast)	Note Exc	ериоп		1	The rate code will show will be incured by the cu
Services:				1	4 holes received a seon
GPS LAYOUT	Enter hou	ırs		0.0	additional helper due to
BULK TRUCK CHARGE	>/=2,00		000kg	1	
BLASTER HOURS		ster hours	J	7.0	
HELPER HOURS		al Helper man	-hours	18.0	
SEISMOGRAPH RENTAL	Enter # C	rica Seismog	raphs	0	

Enter hours

Enter hours

(per day) Enter # of days

3D LASER PROFILE

TECHNICAL BLAST DESIGN

BORETRACK

1					
	Tonnes Blasted:	38,483	te	14,522	m3
To	otal tonnes per day:	38,483	te	NF-14	Rate Code
Т	otal Holes Loaded:	345	holes		
	including:		Dead	Holes	
	and:		Helpe	r Holes	
	Helper Hole Collar:		ft avg		
	# Rows Blasted:	21	rows		
	- Pattern	(Front Row	/)-		
	Burden:	11.5	ft avg		
	Spacing:	11.5	ft avg		
	# Holes:	26	front r	OW	
	- Pattern	(Main Body	() -		
	Burden:	11.5	ft avg		
	Spacing:	11.5	ft avg		
	# Holes:	319	main	body	
	Bench Height:	11.2	ft avg		
	Sub-drill:		ft avg		tec
(e)	Hole Depth:		ft avg		Slas
ho		Decking -	ı		te
ngle	Front Row:		ft avg		/ pe
. <u></u>	Main Body:		ft avg		ade
OD 3	# Decks:		per bl	ast	g Lc
sed		Stemming			r (k
Bas	Front Row:		ft avg		acto
<u>Н</u>	Main Body:		ft avg	1	r Fa
Theoretical PF (Based on a single hole)	Material used:				Yield Powder Factor (kg Loaded / te Blastec
reti		ge Length -	4		Ро
hec	Front Row: Main Body:		ft avg		ield
-		4.2 9e Weight -	ft avg		>
	Front Row:		kg/ho	ام	
	Main Body:		kg/ho		
	Max. per delay:		kg/de		
	SD () Equation:		kg/de	•	
	Total kg Loaded:	3,969		y	
	Rock Density:	2.65	_	= te/m ³	
	- Powd	er Factor -			
	Yield PF:	0.103	kg/te	(actual)	
	Front row:		-	(theoretic	al)
	Main Body:		_	(theoretic	
	"KPI" PF:		_	(theoretic	,
			_		

Blast Number:

Orica Order #:

Blast Time:

18-018

2390035

12:34 PM

ion Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast:

Unitronic detonators were used due to a shortage of non-electronic detonators.
The rate code will show use of non-electronic detonators, therefore no additional cost
will be incured by the customer
4 holes received a seondary primers because the bottom primer was stuck
additional helper due to number of hole and difficulty of blast

2018-09-21 18-018 Floor Blast Report

0.0

0.0

0.0



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-09-21

Blast Number: Orica Order #: Blast Time: 18-018 2390035 12:34 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40053	79.88773
Front Row Corner	43.40099	79.88756
Back Row Corner	43.40004	79.88767
Average (Centre of Blast)	43.40052	79.88765

(N) Radians	(W) Radians
0.757482	1.394304
0.757490	1.394301
0.757474	1.394303
0.757482	1.394303

N Lat.	Enter ° W Long.
43.40245	79.87814
43.40245	79.87814
798.8	m
	43.40245

(N) Radians	(W) Radians				
0.757516	1.394137				
0.757516	1.394137				

Average		43.40243		19.01014		0.757510
Distance (1st Seis. Fron	n Centre of Blast)	798.8	m			
Post Blast Data:	ppV:	Did	mm/s	Trigger set at:	1.5	mm/s
	frequency:	Not	Hz	V/T/L:	?	(Vertical, Transverse or Longitudinal)
	air overpressure:	Trigger	dB	Trigger set at:	124	dB
2450 2nd Line						

2.002.102.1

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	801.6	m
	Post Blast Data: ppV:	Did	mm/s Trigger set at:
			i

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

 Post Blast Data:
 ppV:
 Did
 mm/s
 Trigger set at:
 2.0
 mm/s

 frequency:
 Not
 Hz
 V/T/L:
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 Trigger
 dB
 Trigger set at:
 115
 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	799.3	m
	D4 DI4 D-4\/.	Dist	

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 Did
 mm/s
 Trigger set at:
 2.0
 mm/s

 frequency:
 Not
 Hz
 V / T / L :
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 Set-up
 dB
 Trigger set at:
 115
 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(798.8)^2}{30^2} \text{ kg}$$

Maximum Indicated Charge Weight per Delay = 709 kg

Orica
Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-09-21 18-018 Floor Blast Report



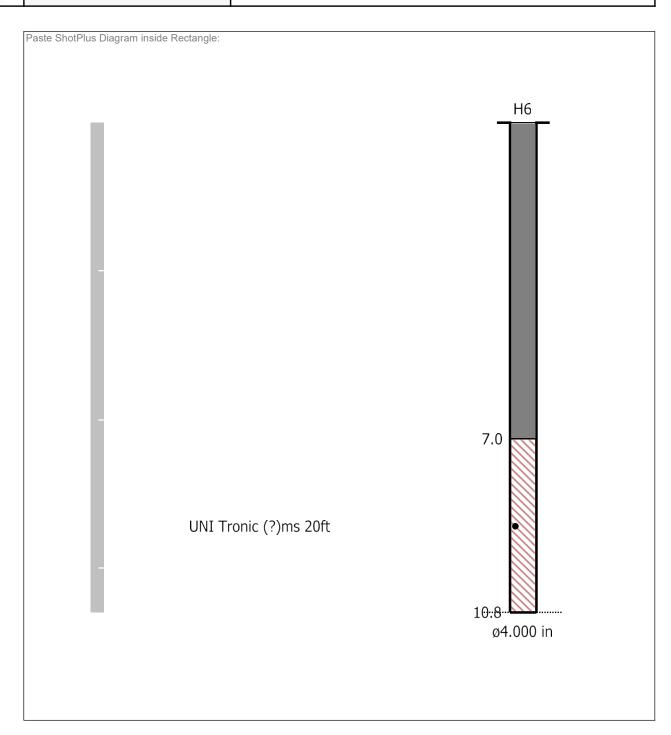
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/21/2018

Blast Number: 18-018
Orica Order #: 2390035

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White

60	20	249 ● 269 ●		379 등 399 등 419 등 439 등 459 등 479 등 499 등	534 ● 554 ⊕ 574 ● 594 ● 614 ●	649 ★ 669 ★ 689 ★ 709 ★ 729 ★	764 484 # 804 # 824 # 844 #	879 # 899 # 919 # 939 # 959 #	974 * 994 *1014 *1034 * 1054 *1074 *	109 ●				X = HOLE UNLOADABLE	O= DOBLE PRIMED						
60	60	9 @ 109 @ 129 @ 149 @ 169 @	4 € 224 € 244 € 264 € 284 €	9 € 339 € 359 € 379 € 399 €	4 ● 454 ● 474 ● 494 ● 514 ●	9 ⊕ 569 ⊕ 589 ⊕ 609 ⊕ 629 ⊕	4 € 584 € 704 € 724 € 744 €	859.	914 € 934 € 954 €	9 @1029 @1049 @1069 @1089 @1	4 #1144 #1164 #1184 #1204 #	9 ₩ 1259 ₩ 1279 ₩ 1299 ₩	4 ● 1374 ● 1394 ●	• 6			L:	\$			
60	60		84 \$ 204	99 4 319	14 . 43	29 € 54	44 + 66	59 • 77	74 + 89.	89 4 100	04 . 112	19 123	34 - 135	49 . 146							
60	60		164 + 1	279 . 2	394 . 4	5 0 605	624 . 6	739 . 7	854 . 8	6 • 696	084×11	199 # 12	314 + 13	429 • 14	1544						
60	60	29 ♣	144 .	259 +	374 .	489	604	9614	334 •	948	064 •1	79 .1	294 #1	409 € 1	524 . 1						
60	60		X511	230 +	345	460 .	575 +	₩ 069	805	2 026	1035 41	1150 011	1265	1380 01	1495 +1	\$ 010					
226 # 2206 # 180 # 160 # 120 # 120 # 100 # 80 # 60 # 40 # 40 # 410 # 390 # 370 # 350 # 310 # 210 X 290 # 270 # 450 # 430 # 410 # 390 # 370 # 350 # 330 # 310 X 290 # 270 # 450 # 430 # 410 # 390 # 370 # 350 # 330 # 310 X 290 # 270 # 450 # 430 # 410 # 390 # 370 # 350 # 330 # 310 X 290 # 270 # 555	240		135 4	250 €	365	480	595	710 .	825	940	1055	1170 .	1285 €	1400	1515	163					
226 ± 200 ± 180 ± 160 € 140 € 120 ⊕ 100 € 80 € 604 450 € 430 € 410 € 390 € 370 € 350 € 330 € 310 × 290 € 450 € 445 € 445 € 425 € 405 € 460 € 660 € 640 € 620 € 600 € 580 € 560 € 540 € 520 € 600 € 660 € 580 € 560 € 540 € 520 € 600 € 600 € 580 € 650 € 540 € 520 € 600 € 600 € 580 € 600 € 770 € 750 € 750 € 750 € 775 € 755 € 735 € 715 × 695 € 675 € 655 € 635 € 140 € 1120 € 1120 € 1100 € 1080 € 1060 € 1040 € 1020 € 1000 € 980 € 1130 € 1120 € 1130 € 1135 € 1135 € 1135 € 1135 € 1135 € 1135 € 1135 € 1135 € 1135 € 12	240 220 200 180 160 140 120 100 88 60 80 470 450 450 450 175 185 135 215 135 175 175 470 450 430 410 390 370 350 350 330 310 290 858 255 235 215 195 175 175 470 450 430 410 8390 8370 350 350 310 290 858 255 255 255 255 250 858 250 858 250 858 250 858 250 858 250 858 250 858 250 858 250 858 858 858 858 858 858 858 858 858 8		155		385	500	615		845	● 096	1075 #	1190 .	1305	1420 ₽	1535	1650	1775				
450 ± 200 ± 180 + 160 € 140 € 120 ± 100 € 80 € 335 € 315 € 295 € 275 € 255 € 235 € 215 € 195 € 450 € 430 € 410 € 390 € 370 € 350 € 330 € 310 € 425 € 565 € 545 € 545 € 545 € 545 € 545 € 545 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 560 € 540 € 570 € 1250 € 1120 €	240 = 220 = 200 = 180 = 160 = 140 = 120 = 100 = 80 = 355 = 335 = 315 = 295 = 275 = 255 = 235 = 215 = 195 = 470 = 450 = 430 = 410 = 390 = 370 = 350 = 330 = 310 × 100 = 450 = 430 = 410 = 390 = 370 = 350 = 350 = 310 × 100 = 600 = 600 = 600 = 580 = 560 = 540 = 790 = 775 = 775 = 755 = 735 = 715 × 695 = 675 = 655 = 910 = 890 = 870 = 850 = 810 = 790 = 770 = 1025 = 1000 = 1040 = 1120 = 1100 = 1000 = 1040 = 1040 = 1020 = 1000 = 1140 = 1120 = 1120 = 1100 = 1000 = 1040 = 1040 = 1020 = 1000 = 1155 = 1235 = 1215 = 1215 = 1295 = 1250 =		175	290	405	520	635	750 +	865	980	1095	1210	1325	1440	1555	1670	1795				
450 # 200 # 180 # 160 # 140 # 120 # 100 # 135 # 315 # 216 # 2240 # 2220 #	240 • 220 • 200 • 180 • 160 • 140 • 120 • 100 • 355 • 335 • 315 • 295 • 275 • 255 • 235 • 215 • 470 • 450 • 430 • 410 • 390 • 370 • 350 • 330 • 320 • 470 • 450 • 430 • 410 • 390 • 370 • 350 • 330 • 320 • 445 • 700 • 680 • 660 • 640 • 620 • 600 • 580 • 650 • 675 • 700 • 680 • 660 • 640 • 620 • 600 • 580 • 675 • 700 • 680 • 660 • 840 • 620 • 600 • 580 • 675 • 700 • 700 • 890 • 870 • 850 • 830 • 810 • 790 • 1025 • 1025 • 1120 • 1100 • 1080 • 1060 • 1040 • 1020 • 1140 • 1120 • 1100 • 1080 • 1060 • 1040 • 1020 • 1140 • 1120 • 1120 •		195.	310	425	540	655	770	885	1000	1115	1230 @	1345	1460	1575	1690	1815	1930			
450 # 200 # 180 # 160 # 140 # 120 # 135 # 315 # 295 # 275 # 255 # 235 # 450 # 410 # 390 # 370 # 350 # 450 # 450 # 410 # 390 # 370 # 350 # 450 #	240 • 220 • 180 • 160 • 140 • 120 • 355 • 335 • 315 • 295 • 275 • 255 • 235 • 470 • 450 • 430 • 410 • 390 • 370 • 350 • 470 • 450 • 430 • 410 • 390 • 370 • 350 • 470 • 450 • 430 • 410 • 390 • 370 • 350 • 470 • 450 • 430 • 410 • 390 • 370 • 350 • 470 • 450 • 455 • 525 • 505 • 485 • 465 • 650 • 600 • 580 • 705 • 775 • 755 • 735 • 715 • 695 • 1025 • 1005 • 985 • 965 • 945 • 925 • 11000 • 11000 • 11000 • 1100	100	215	330	445	560	675	790	905	1020	1135	1250	1365	1480	1595	1710	1835	1950	2065		
450 # 200 # 180 # 160 # 140 # 1335 # 315 # 295 # 275 # 255 # 455 # 450 # 410 # 390 # 370 # 450 # 430 # 410 # 390 # 370 # 450 # 430 # 410 # 390 # 370 # 450 # 620 # 600 # 450 # 620 # 600 # 450 # 620 # 600 # 450 # 620 #	240 • 220 • 180 • 160 • 140 355 • 335 • 315 • 295 • 275 • 255 470 • 450 • 430 • 410 • 390 • 370 585 × 565 • 545 • 525 • 505 • 485 700 • 680 • 660 • 640 • 620 • 600 700 • 680 • 660 • 640 • 620 • 600 1025 • 1005 • 775 • 755 • 735 • 715 910 • 890 • 870 • 850 • 830 1140 • 1120 • 1100 • 1080 • 1050 1255 • 1235 • 1215 • 1195 • 1175 1350 • 1350 • 1310 • 1290 1695 • 1675 • 1655 • 1635 1810 • 1790 • 1770 • 1750 1935 • 1915 • 1895 • 1875 2050 • 2030 • 2010 • 1990 2165 • 2145 • 2125 • 2105	120	235	350	465	580	, 695	810	925	1040	1155	(1270	1385	1500	1615	1730	1855	. 1970	2085		
450 # 200 # 180 # 160 # 160 # 160 # 150 #	240 • 220 • 200 • 180 • 160 • 355 • 335 • 315 • 295 • 275 • 470 • 450 • 430 • 410 • 390 • 470 • 450 • 430 • 410 • 390 • 585 × 565 •	140	255	370	485	009	1157	830	945	1060	1175	1290	1405	1520	#1635	1750	1875	41990	\$2105	+2220	
450	240 • 220 • 280 • 180 · 355 • 335 • 315 • 295 · 470 • 450 • 430 • 410 · 470 • 450 • 430 • 410 · 470 • 450 • 430 • 410 · 470 • 450 • 660 • 640 · 795 • 775 • 755 · 985 · 1140 • 1120 • 1100 · 1140 • 1120 • 1100 · 1255 • 1215 · 1255 • 12	160	275	390	202	620	735	850	965	1080	1195	1310	1425	₽1540	1655	1770	1895	+ 2010	\$2125	₩ 2240	# 2255
220	240 • 220 • 200 • 240 • 470 • 450 • 430 • 470 • 450 • 430 • 470 • 680 • 660 • 775 •	180	295	410	525	640	755	870	\$886	1100	1215	1330	1445	1560	1675	1790	1915	2030	2145	2260	2375
220 • 450 • 450 • 450 • 910 • 910 • 910 • 255 •	240 220 470 450 470 450 680 7700 680 910 1140 1140	200	315	430	545	660	775	890	1005	1120	1235	1350	1465	1580	1695	1810	1935	2050	2165	2280	2305
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Filename



2510 ♣ 2490 ♣

Not to scale

9/20/2018 18-018 Floor I. Deemert 18-018_Floor_Design_Final.spf SHOTPlusTM Professional 5.7.3.0
Mine Burlington
Location
Title/author 18-018 Floor I. De

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND COMBINATION SHORT POINT STANDART BLEECH DAVING-EAPHERS SHIPPING CONTRACT REPORT AGENCY.

FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRACT DE TRANSPORT DE MESSAGERIES
SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

Orica Canada Inc.

CONSIGNOR **EXPÉDITEUR** GRAND VALLEY

033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

GROSS / BRUT TARE NET TIME OUT TIME IN HEURE D'ENTRÉE HEURE SORTIE B/L NUMBER N° DE CONNAISSEMENT ORDER NUMBER N° DE COMMANDE 2390035 86143198

DATE REQUIRED INVOICE TO / BUYER DATE REQUISE HEURE REQUISE FACTURE À / ACHETEUR					CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT			
21 Sep 2018	00:00:00	NELSON AGGREGATE CO	MPANY	n/a				
DATE SHIPPED EXPÉDIÉ LE		FREIGHT TERMS CONDITIONS DE LIVRAISON	SHIP. MAG. LIC. PERMIS EXPÉDITEUR			EHICLE NO. DE VÉHICULE		
21 Sep 2018	FOB Dest'n	Own Truck	F-73289		180	230		
7	SHIP VIA TRANSPORTEUR		ROUTING ITINÉRAIRE			MAG. LIC. NO. Nº DE PERMIS		
rica Truck		STANDARD						
QTY. QTÉ.	UM DG QTY, RET	D QTY. SOLD	DESCRIPTION		# OF / DE PKGS.	AMOUNT MONTANT		
. 60 100 1	PC X 43 PC X SI PC X GO PC 100 PC PC PC	349 *uni tronic 0 *uni tronic 0 MINI STEM PI LICENSED BLA LABOUR CHARG ROG (ROCK ON TOTAL GROSS **** TOT GHS/WHMIS Website: W Email: sds	Duplex (6 pack) 400m 600-06.0M CU/ZC(20')8 600-09.0M CU/ZC(30')6 JUGS - PART #74853 ASTER GE W GROUND)	OPC OPC	8 1 5 1	143.080 8.760 29.200 5.880 0.700		

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HO TÉLÉPHONE D'URGENCE/24 HEUP	DUR NUMBER RE NUMERO PLACARDS	OFFERED / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE			
BRAP 2-1510	1-877-561-	3636 YES /	OUI NO / NON	POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT À NO DE CONNAISSEMENT D'ORICA :			
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIFILABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORTONOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUA SUSMENTIONNÉES DE MÉME QUE LES CONDITIONS DE TRANSPORT SONT CONFIDE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS.	G TO THE APPLICABLE REGULATIONS OF RT. GE ET L'ÉTIQUETAGE DES MARCHANDISES	DECLARED VALUE OF SHIPMENT VALEUR DÉCLARÉE \$	NETTE No. CONV PRESSAGE WT AGREEMENT NO.	301 rue hotel de ville Brownsburg-Chatham, QC J&G 3B5			
CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER/TRANSPORTEUR Orica Truck			CONSIGNEE / DESTINATAIRE NELSON AGGREGATE COMPANY			
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT	D LNOM DU CAMIONNEUR	RECEIVER'S NAME (PLE	ASE PRINT) / NOM DU RECEVEUR			
SIGNATURE DATE 9 1	SIGNATURE SIGNATURE	DATE 2/ 9	SIGNATURE Y/A	D/J M/M Y/A			
- 0		CITE	PIECT TO ALL THE TERM	S AND CONDITIONS ON THE BACK			

10

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12 to 10 to 10 to 15 15 15 10 No to 10 to 10 to 10	
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Je go 15 to 12 15 15 16 16 10 16	1



9/20/2018

18-018_Floor_Design_Final.spf

18-018 Floor I. Deemert

Title/author Filename

Location Mine

Burlington

Not to scale

Blast 18-015 Floor Previous Blast

⊕C9 (FC10 (FC11 (FC12 (FC13 (FC14 (FC15 (FC16 (FC17 (FC18 (FC19 (FC20 (FC21 (FC22 (FC24 (FC25 (FC25 (FC25 (FC25 ⊕D9 ⊞D10 ⊕D11 ⊕D12 ⊕D13 ⊕D14 ⊕D15 ⊕D16 ⊕D17 ⊕D18 ⊕D19 ⊕D20 ⊕D21 ⊕D22 ⊕D23 ⊕D24 ⊕D25 ⊕D26 #G6 #G7 (6G8) FG9 +610 FG11 FG12 +G13 FG14 FG15 FG16 +G17 +G18 FG19 FG20 +G21 FG22 FG23 FG24 +G25 # 810 @ 811 # 812 # 813 # 814 # 815 # 816 # 817 # 818 # 819 # 820 # 821 € 822 # 824 # 825 # 826 E22 FE23 #E24 #E25 #E26 #A9 #A10 #A11 MA12 #A13 #A14 #A15 #A16 #A17 #A18 #A19 #A20 #A21 #A22 #A23 #A24 #A25 #A26 ⊕F₽11 F22 ⊕F23 ⊕F24 ₽F25 #19 #110 #111 #112 #113 #114 #115 #116 #117 #118 #119 #120 #121 #E8 RE9 @E10 @E11 @E12 @E13 @E14 ÆE15 @E16 @E17 ÆE18 ŒE19 @E20 @E21 ⊕F6 ⊕F7 ⊕F8 ⊕F9 ⊕F10 ⊕F11 ⊕F12 ⊕F13 ⊕F14 ⊕F15 ⊕F16 ⊕F17 ⊕F18 ⊕F19 ⊕F20 €310 €311 €312 €313 €314 €315 €316 €317 €318 €319 €320 #K9 #K10 #K11 #K12 #K13 #K14 #K15 #K16 #K17 #K18 DRILL TO SHALE 13 हाने क्षित्र हमाउ हमाउ हमार हमार हमार हमार 18-018 Floor 4" Drill Bit EM9 AMIO EM11 EM12 EM13 EM14 FM15 ENI ENZ EN3 EN4 ENS EN6 EN7 EN8 EN9 EN10 EN11 EN12 EN13 ⊕02 ∈03 ⊕04 ⊕05 ⊕06 ⊕07 ⊕08 ⊕09 ⊕010⊕011 (8) €19 K8 #Q3 #Q4 #Q5 #Q6 (#Q7) (FMB) (BMB) (EKZ) 68 1 €H6 | 6H7 K6 97 @ 9d⊕ 5d⊕ td⊕ E¢⊞ BA8 80 ⊕ D8 11 GMI (GM2) GM3 GM4 GM5 E7 EKS. EC7 H D7 16 ₩63 @64 @65 ⊕K2 ⊕K3 ⊕K4 和田 市立 田田 田村 ₩ A6 90 ± 93 H FFS 98 € 90 H ⊕H3 ⊕H4 ⊕H5 ED5 ES. +AS E CS # BS E13 E4 E - D4 FA4 - 12 01 . K1 · E3 63 ⊕D3 190 - D2 ⊕ E2 FA1 GA2 □ D1 EI CI



Not to scale

C:\Users\ideemert\Documents\Blast Reports\Nelsons Burlington 2018\18-018 Design\18-018 Floor Design Final.spf

6# 27,5 POI +1891 35 30,76 MA \$5 to 10 to 33 SHOT DIA 32 Total Footage: 31 30 53 10-7 28 GPS RR: 27 56 Total Tonnes: Driller: Blast Num: Employee: 25 Shot Notes E33-9-15- Freehird HA GODRI ING THE 23 55 134 holes Footage-1531 In shot so four 1 foot into the Shale GPS LR: 2 Total Cubic Meters: 8 19 48 16 GPS RF: 15 4 THE THE PER Total Holes: 3 Hole Diameter: 12 9 GPS LF: 0 100 m MINT AL HOB Send Average Hole Depth: **GPS** Coordinates 9000 Burden: Client: Date: Job: 000 4 0 ď 8 O ۵ Σ z 0 ш L KE SUL



Blast Design

Nelson Aggregate

Quarry: P.O. #:

Design Date:

Burlington

2018-09-21

Blast Number: Orica Order #:

Design te Blasted:

18-018

Dead Holes

39,153 te

page 1

Blaster-in-charge:

Blast Location:

Primary Bit diam: 101.6 mm

Mike derkinderen

Holes:

Holes:

Holes:

kg 10,000

kg

kg

119.3

10.119

0.0%

351

reg'd

GPS Coordinates: enter data on p2 °N Latitude enter data on p2 °W Longitude

Total Holes Loaded:

... including:

Helper Holes ... and: Helper Hole Collar: ft avg

Rows Blasted: 21 rows

Secondary Bit diam:

Bulk Expl. Required:

Pkgd Expl. Required:

Boosters Required:

PENTEX 12 (OR EQUIVALENT)

Detonators Required:

UNITRONIC 600 6M

CENTRA GOLD 70

Tertiary Bit diam:

Angla from Vertical

kg/u # used

351

0.34

mm

0'

Nominal Bit Diameter: 3,945.2 ft (4 " diam)

0.0 ft (

= 0.0 ft (" diam)

" diam)

Burden: 11.5 ft avg

Spacing: 11.5 ft avg # Holes: 26 front row. - Design Pattern (Main Body) -

Burden: 11.5 ft avg 11.5 ft avg Spacing:

Holes

Bench Height: 11.2 ft avg Sub-drill: 0.0 ft avg Hole Depth: 11.2 ft avg

> Design Stone Decking -Front Row: ft avg Main Body: ft avg

Front Row: 7.0 ft avg Main Body: 7.0 ft avg

Material used: .75" Stone

Front Row: 4.2 ft avg

Main Body: 4.2 ft avg Dealdn Charge Weight

Front Row: 12.4 kg/hole Main Body: 12.4 kg/hole Max Chge Wt / delay: 16.0 kg/delay

Required kg Loaded: 10,119 kg

> Rock Density: $2.65 \text{ g/cc} = \text{te/m}^3$

Cord & Access. Req'd: U of M # reg'd WIRE DUPLEX (6 PACK) 400M units units units

total explosives weight in Blast (kg): Pkgd Prod (0 kg) % of Total kg:

Resource Deployment:

of Blasts today (this Quarry) 1 1 # of Blasters (this Blast) 3 # of Helpers (this Blast) Note Exception 1 # of MMU's (this Blast)

Services Req'd:

Enter hours 0.0 **GPS LAYOUT BULK TRUCK CHARGE** <2,000kg Enter Blaster hours 0.0 **BLASTER HOURS** 0.0 HELPER HOURS Enter total Helper man-hours 0 Enter # Orica Seismographs SEISMOGRAPH RENTAL 0 3D LASER PROFILE Enter hours Ö BORETRACK Enter hours 0.0 TECHNICAL BLAST DESIGN (per day) Enter # of days

- Design Powder Factor -

Expected Yield PF: 0.258 kg/te (actual)

0 495 lb/yd3 Front row: 0.111 kg/le riheoretical) 0.495 lb/yd Main Body: 0.111 kg/te (theoretical) 0.495 lb/yd3 "KPI" PF: 0.111 kg/te (theoretical)

Cost Reduction Notes (this Blast) - change in Bir. B. S. Expl or IS from previous Blast

ORICA The Blasting Professionals	Blast R Nelson Ag	•		Quarry: P.O. #: Blast Date:		Blast Number: Orica Order #: Blast Time:	18-017 2394470 12:02 PM
page 1 Blaster-in-ch		N 4:11-			1	Tana a Dianta da	26.868 te 10,139 m³
Blaster-in-ch	large:	Mike de	rkindere	n	(Print Name)	Tonnes Blasted:	,
Digetion	ation	11	- N 40 -1 -11 -		1,5 , ,5 ,	Total tonnes per day:	26,868 te NB80-01 Rate Code
Blast Loc			Middle	70,00000	(Bench / Face)	Total Holes Loaded:	48 holes
GPS Coordin			atitude	79.88268	°W Longitude	including:	Dead Holes
	Centre	of Blast		Centre of Blast		and:	2 Helper Holes
	0144	. .			44 1 45 00	Helper Hole Collar:	50.0 ft avg
Wind from the:	SW at	5 kph			11 to 15 °C	# Rows Blasted:	3 rows
Q I	_	. X	[X			(Front Row)-
Clear:			vercast:	X		Burden:	12.0 ft avg
Partly Cloudy:	Sno	ow: in	version:	Ceiling	751 ft	Spacing: # Holes:	10.0 ft avg
Duilling Informati							
- Drilling Informati				Nam	sinal Dit Diameter		Main Body) -
Deine em a Ditadia ma		m Vertical	- 40		ninal Bit Diameter:	Burden:	9.0 ft avg
•	101.6 mm	0 # Hole		= 3,763.4	,	Spacing:	10.0 ft avg
Secondary Bit diam:	mm	# Hole			ft (" diam)	# Holes:	29 main body
Tertiary Bit diam:	mm	° # Hole	s:	= 0.0	ft (" diam)	Bench Height:	76.4 ft avg
D. II. E I					1	Sub-drill:	2.0 ft avg
Bulk Explosives:		, 0,	ut (kg)	kg		Hole Depth:	78.4 ft avg
CENTRA GOLD 70		33,740	22,350	11,390		- Stone	Decking -
Dealer and France						- Stone Front Row: Main Body:	10.0 ft avg
Packaged Explos	SIVES: CS	s shipped cs i	returned	kg		775	10.0 ft avg
						# Decks:	6 per blast
						(1)	Stemming -
						Front Row:	7.0 ft avg
Boosters:			# used	kg		Wall body.	7.0 ft avg
PENTEX 12 (OR EQUIV	ALENT)	0.3	34 108	36.7		Material used:	>
						0	ge Length -
			1 (1)	44.407		Front Row:	61.4 ft avg
	· ·	es weight in Bla	,	11,427		· · · · · · · · · · · · · · · · · · ·	
Detonators:		od (0 kg) % of ⁻		0.0%		Front Row:	e Weight -
	C	case #'s	ms	# used			179.0 kg/hole
UNITRONIC 600 6M				45		Main Body:	179.0 kg/hole
UNITRONIC 600 25M				26		Max. per delay:	265.0 kg/delay
UNITRONIC 600 30M				36		SD () Equation: Total kg Loaded:	172.7 kg/delay
UNITRONIC 600 15M				1		Rock Density:	11,427 kg
						Nock Delisity.	2.65 g/cc = te/m^3
Cord & Accessor	ioci		J of M	# used		Powd	er Factor -
				# useu	1.900 lb/yd ³	Yield PF:	0.425 kg/te (actual)
HARNESS WIRE	DUPLEX (6 PACK)) 400W	units	-	1.162 lb/yd ³	Front row:	0.260 kg/te (theoretical)
			units		1.550 lb/yd ³	Main Body:	
Resource Deployme	nt·		units		1.421 lb/yd ³	"KPI" PF:	0.318 kg/te (theoretical)
. ,				1			
# of Blasts today (this Qu	uaiiy)			1		is Blast) - change in Bit , B, S, I	zxpi or io iroiii previous Biast:
# of Blasters (this Blast)	,	to Eveenting			3 Siesmographs set up		
# of Helpers (this Blast)	Not	te Exception		2			
# of MMU's (this Blast) Services:				1			
	F /	b		0.0			
GPS LAYOUT		er hours	10.055	0.0			
BULK TRUCK CHARGE			10,000 kg	1			
BLASTER HOURS		er Blaster hours		7.0			
HELPER HOURS		er total Helper m		11.0			
SEISMOGRAPH RENTA		er # Orica Seism	ographs	0			
3D LASER PROFILE		er hours		0.0			
BORETRACK	Ent	er hours		0.0			

2018-10-02 18-017 Upper Middle Blast Report

0.0

(per day) Enter # of days

TECHNICAL BLAST DESIGN



Blast Report

Nelson Aggregate

Burlington Quarry: P.O. #: Blast Date: 2018-10-02

Blast Number: Orica Order #: 2394470 Blast Time: 12:02 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40371	79.88267
Front Row Corner	43.40358	79.88266
Back Row Corner	43.40393	79.88271
Average (Centre of Blast)	43.40374	79.88268

(N) Radians	(W) Radians
0.757538	1.394216
0.757535	1.394215
0.757541	1.394216
0.757538	1.394216

18-017

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		1)
	1st Reading	43.40245	79.87814		
	2nd Reading				
	Average	43.40245	79.87814		
	Distance (1st Seis. From Centre of Blast)	394.2	m		
	Post Blast Data: ppV:	5.3	mm/s Trigger set at:	2.0 mr	m/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

7.6 Hz V/T/L: frequency: ? (Vertical, Transverse or Longitudinal) air overpressure: **114.2** dB

2450 2nd Line

2n

nd	Seismograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.
	1st Reading	43.40605		79.89400
	2nd Reading			
	Average	43.40605		79.89400
	Distance (2nd Seis. From Centre of Blast)	951.1	m	
	Post Blast Data: nn\/:	0.2	mm/c	Trigger set et:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 394413

Trigger set at: 2.0 mm/s 0.2 mm/s Post Blast Data: ppV: **7.1** Hz V/T/L: ? (Vertical, Transverse or Longitudinal) frequency: **121.6** dB air overpressure: Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1253.8	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Post Blast Data: ppV: 0.5 mm/s Trigger set at: 2.0 mm/s **7.3** Hz V/T/L: ? (Vertical, Transverse or Longitudinal) frequency: air overpressure: **123.5** dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = D^2 \over 30^2$$

$$= \frac{(394.2)^2}{30^2} \text{ kg}$$

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-10-02 18-017 Upper Middle Blast Report



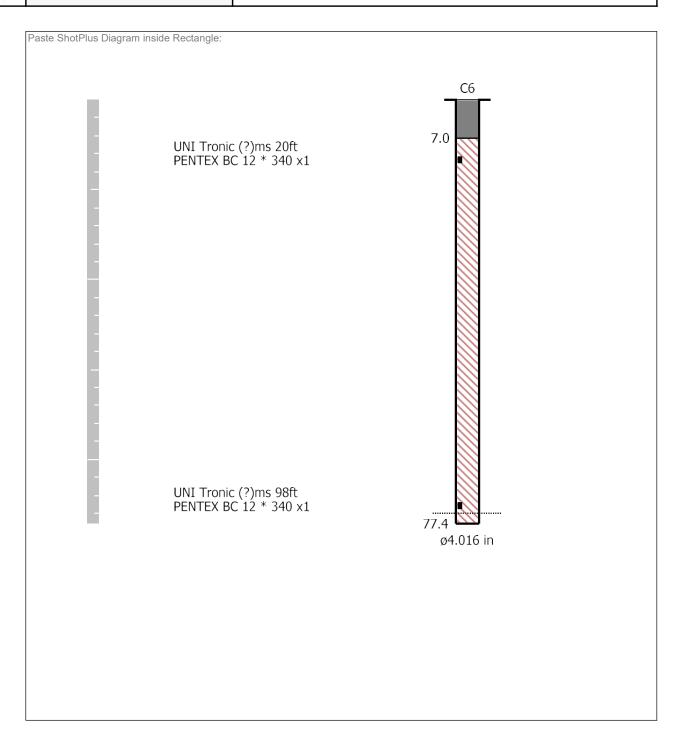
Blast Design

Nelson Aggregate

Quarry:	Burlington
P.O. #:	
lact Date:	10/2/2018

Blast Number: 18-017
Orica Order #: 2394470

page 2



OricaBlaster-in-charge:

Quarry Manager:

Mike der Kinderen Bill White

Burden: 9.0ft

Spacing: 10.0ft

Subdrill: 2.0ft

1st row burden: 12.1ft

Hole Diameter: 4.0in

Number of holes: 49

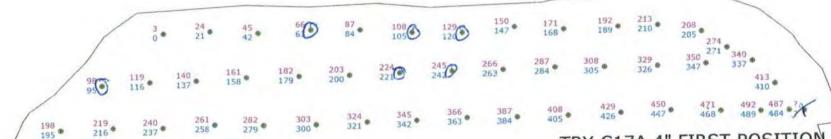
Stemming: 6.0ft

Total drilled: 3733.8ft

34741440117.0014.22.00

Hole angle: 0.0°

open face



TRY C17A 4" FIRST POSITION IF UNSUC



SHOTPlus™ P	rofessional 5.7.3.0	10/1/2018
Mine	Burlington	
Location	UPPER MIDDLE NO ROUNDING ON NORTH	
Title/author	Design 18-017 UPPER MIDDLE	
Filename	name 2018-10-02 18-017 Upper Middle.spf	

Burden: 9.0ft

Spacing: 10.0ft

Subdrill: 2.0ft

Stemming: 6.0ft

1st row burden: 12.1ft

Hole Diameter: 4.0in

Number of holes: 49

Hole angle: 0.0°

Total drilled: 3733.8ft

open face

El ₹ 73.3ft TRY C17A 4" FIRST POSITION IF UNSUC TRY C17B 5" SECRND PROSITION AMP



SHOTPlus™ P	rofessional 5.7.3.0	9/17/2018
Mine	Burlington	
Location	UPPER MIDDLE NO ROUNI	
Title/author	Design 18-017 UPPER MID	DLE
Filename	Design_18-017_UPPER_MI	IDDLE_Fnl.spf

Burden: 9.0ft

1st row burden: 12.1ft

Spacing: 10.0ft

Hole Diameter: 4.0in

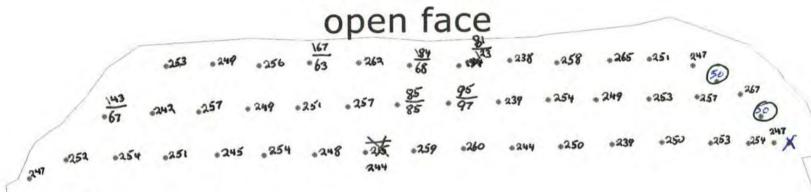
Subdrill: 2.0ft

Number of holes: 49

Stemming: 6.0ft Hole angle: 0.0°

Total drilled: 3733.8ft

Load Sheet 240 Kg Max



245



SHOTPlus™ P	rofessional 5.7.3.0	9/28/2018
Mine	Burlington	
Location	UPPER MIDDLE NO ROUNDING ON NORTH	
Title/author	Design 18-017 UPPER MIDDI	
Filename	Design_18-017_UPPER_MID	DLE_Fnl.spf

Bill of Lading / Connaissement

Orica Canada Inc. GRAND VALLEY

CONSIGNOR EXPÉDITEUR 033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

GROSS / BRUT	-
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
1150	-1-
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2394470	86154431

DATE REQUIRED DATE REQUISE	TIME	REQUI E REQ			FACTURÉ À / ACHETEUR				54 9445 As 100 As 1				
02 Oct 2018	00:0	00:0	00	NELSON	AGGREGATE COM	PANY	n/a	VIC	HICLE NO				
DATE SHIPPED EXPÉDIÉ LE			CC	FREIGHT TI ONDITIONS DE	RMS LIVRAISON	SHI	P. MAG. LIC. IS EXPÉDITEUR	VEHICLE NO. N° DE VÉHICULE					
02 Oct 2018	FOB	Des	st'n,	Own Tr	uck	F-73289		14/1	MAG. LIC. NO.				
	SHIP	VIA					DUTING IÉRAIRE		N° DE PERMIS				
orica Truck					STANDARD				AMOUNT				
QTY. OTÉ.	UM	DG MD	QTY, RET	D QTY. SOLD		DESCRIPTION		# OF / DE PKGS.	MONTANT				
147 2 80 66 54 30 100	PC PC PC PC PC PC	X X X X	39 35 28 0	108 45 26 36	*uni tronic *uni tronic *uni tronic *uni tronic	Duplex (6 page 600-06.0M CU/2 600-15M C/Z SE 600-25M CU/Z SE 600-30M C/Z SE UGS - PART #7 STER	ZC(20')80PC PL(50')66PC SPL(80')54P PL(100')36P	3 1 1 1 1	53.655 5.840 5.840 11.286 13.176 8.820 0.700				
		li i			TOTAL GROSS	WEIGHT			99.317 KG				
					**** TOT	AL PACKAGES	***	8	-18-11-1				
		340)	1 - 1	Website: w Email: sds	SDS documents www.oricaminin .na@orica.com 55-26-ORICA (gservices.com						

PALLETS USED / PALETTES UTILISEES	LLETO RETURNED / A MEET 120 TIETO OF			-	Security Sec		B PREPAID FREIGHT	
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO			OFFERE	D / PLACARDS OFFERT	QUOTING ORICA B/L TO / FAIRE SUIVRE FACTUR		
ERAP 2-1510			NO / NON	POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT NO DE CONNAISSEMENT D'ORICA :				
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIF LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDIT THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPORTS HOUSE CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUE SUBMENTIONNÉES DE MÉMIE QUE LES CONDITIONS DE TRANSPORT SONT CONTROL L'OFFICE NATIONAL DES TRANSPORTS ED DI MINISTÈRE DES TRANSPORTS DE L'OFFICE NATIONAL DES TRANSPORTS	ING TO THE APPLICABLE REGULATIONS OF ORT. AGE ET L'ÉTIQUETAGE DES MARCHANDISES FORMES À LA RÉALITÉ ET AUX RÉGLEMENTS		F SHIPMENT	PRESSA	NO, CONV NGE REEMENT NO.	301 rue hotel Brownsburg-Cha J8G 3B5		
CONSIGNOR / EXPÉDITEUR GRAND VALLEY	CARRIER/TRANSPORTEUR Orica Truck				CONSIGNEE / DESTINA NELSON AGG	REGATE COMPA	NY	
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT	T) / NOM DU CAMION	NEUR		RECEIVER'S NAME (PLE	EASE PRINT) / NOM DU RECE	VEUR	
SIGNATURE DATE	SIGNATURE	DA G	TE /U-	18 Y/A	SIGNATURE		DATE D/J M/M Y/A	
THE DIST MIN	W THE CHIPPING ODDER AND MIRST SIGN THE		SŲI	BJECT	TO ALL THE TERM	IS AND CONDITIONS OF	ON THE BACK	





Date/Time Trigger Source Range

MicL at 12:02:29 October 2, 2018 Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Geo: 254.0 mm/s

5.308 sec (Auto=5Sec) at 2048 sps **Record Time**

Operator/Setup: MIKE DERKNDEREN/BURLINGTON MMB

Notes

COLLING RD & BLINDLINE Location: **NELSON AGGREGATES** Client: ORICA CANADA User Name:

General:

Extended Notes

N 43.31617 W 80.02664

Linear Weighting Microphone 121.6 dB(L) at 0.202 sec PSPL

ZC Freq 4.3 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1470 mv)

	Tran	Vert	Long	
PPV	0.150	0.189	0.205	mm/s
ZC Freq	16.5	17.1	7.9	Hz
Time (Rel. to Trig)	0.407	0.215	0.388	sec
Peak Acceleration	0.010	0.010	0.010	g
Peak Displacement	0.002	0.002	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.3	3.4	3.6	

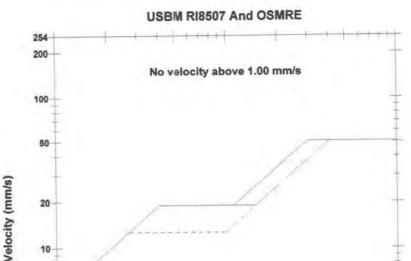
Peak Vector Sum 0.214 mm/s at 0.394 sec

Serial Number **Battery Level** Unit Calibration File Name

UM6857 V 10-89 Micromate ISEE

3.6 Volts

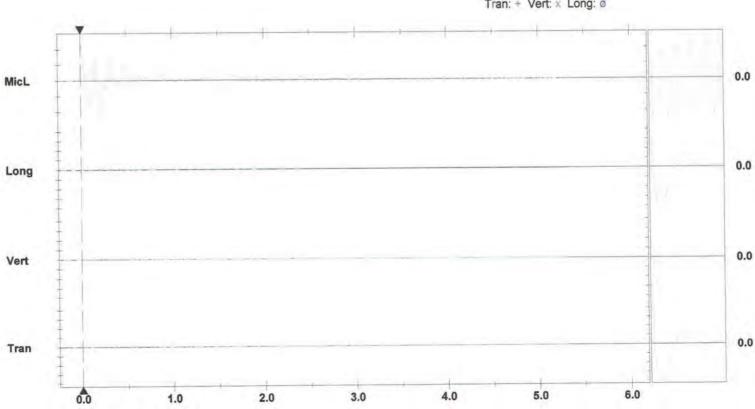
February 14, 2018 by Instantel UM6857 20181002120229.IDFW



Frequency (Hz) Tran: + Vert: x Long: Ø

10

20



10

< 1

Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check

100 >



Velocity (mm/s



Date/Time Long at 12:02:24 October 2, 2018
Trigger Source Geo: 2.000 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Notes

Location: 2450 2nd Line
Client: Nelson Aggregates
User Name: Orica Canada

General: N.43.40245 W.79.87814

Extended Notes Sand Bagged

Microphone Linear Weighting
PSPL 114.2 dB(L) at 1.513 sec

ZC Freq 3.5 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 692 mv)

	Tran	Vert	Long	
PPV	5.334	2.413	4.953	mm/s
ZC Freq	24	16	12	Hz
Time (Rel. to Trig)	0.334	0.275	0.388	sec
Peak Acceleration	0.093	0.053	0.066	g
Peak Displacement	0.056	0.027	0.066	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.6	7.4	7.4	Hz
Overswing Ratio	3.7	3.9	4.2	

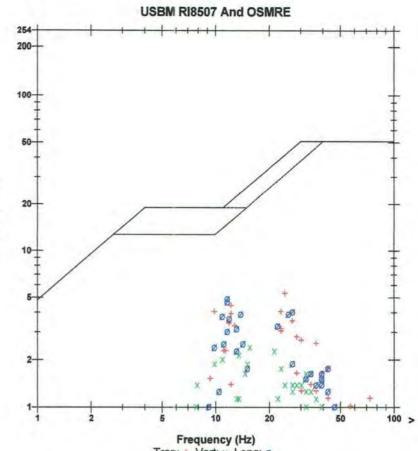
Peak Vector Sum 5.677 mm/s at 0.333 sec

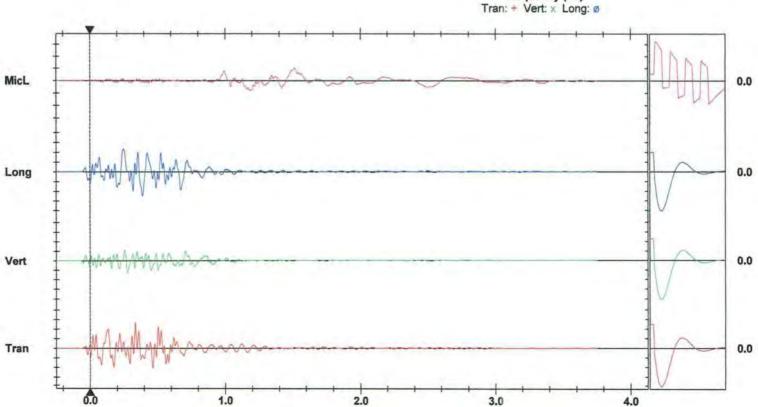
Serial Number BE19461 V 10.72-8.17 MiniMate Plus

Battery Level 6.3 Volts

Unit Calibration August 31, 2018 by Instantel

File Name __TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger =



Velocity (mm/s)

File Name





Date/Time

MicL at 12:02:29 October 2, 2018 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range

Geo: 254.0 mm/s

3.25 sec (Auto=3Sec) at 1024 sps **Record Time**

Job Number:

Notes

SouthWest Corner of property Location:

Nelson Aggregates Client: Orica Canada User Name:

General: N. 44.39585; W-80.25085

Extended Notes Sand Bagged

Linear Weighting Microphone PSPL 123.5 dB(L) at 0.004 sec

ZC Freq 20 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 584 mv)

	Tran	Vert	Long	
PPV	0.254	0.508	0.254	mm/s
ZC Freq	>100	47	73	Hz
Time (Rel. to Trig)	0.032	0.197	0.037	sec
Peak Acceleration	0.013	0.013	0.027	g
Peak Displacement	0.001	0.002	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.9	3.7	4.1	

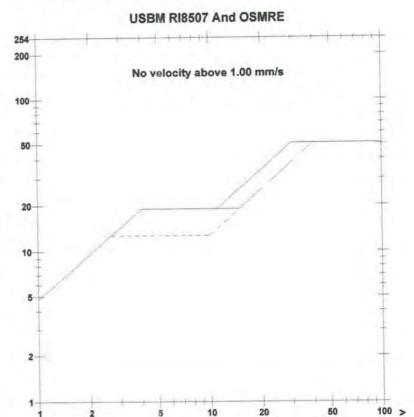
Peak Vector Sum 0.568 mm/s at 0.197 sec

BE12877 V 10.72-1.1 Minimate Blaster Serial Number 6.2 Volts **Battery Level Unit Calibration**

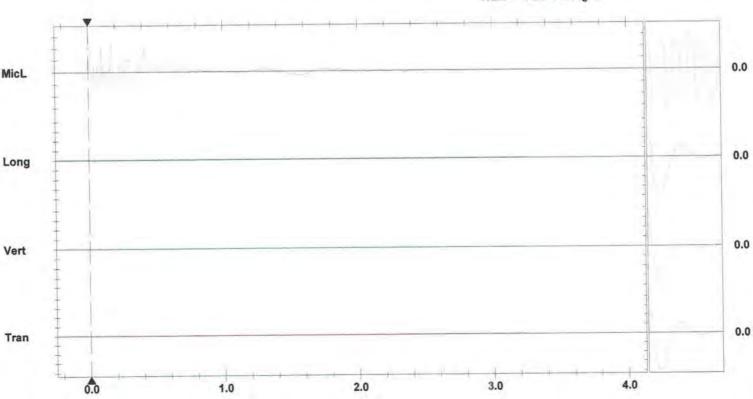
November 3, 2017 by Instantel

TEMP.EVT

Scaled Distance 5850.2 (1850.0 m, 0.1 kg)



Frequency (Hz) Tran: + Vert: x Long: Ø



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶



Quarry: Burlington P.O. #: gn Date: 2018-10-02

Nominal Bit Diameter:

" diam)

" diam)

" diam)

1.349 lb/yd3 1.799 lb/yd3 1.686 lb/yd3

0

0

0

0.0

Enter # Orica Seismographs

(per day) Enter # of days

Enter hours

Enter hours

Blast Number: 18-017 Orica Order #:

ORIC The Biretie	4			t De on Aggr				P.O. #: gn Date:		2018-10-
Profession				n Aggi	egure		Desi	gn Date.		2010-10-
page 1	Blaster-in-cl	harge:	٨	like der	kinderen				Prin	(Name)
	Blast Loc	cation:	L	pper Mic	idle				Een	ch / Faces
	GPS Coordi			43.40374		itude	79	.88268		Longitude
			-	entre of Bu				re of Brasil		Longitudo
- Dril	lling Informatio	0/7 +	Angl	e from Ve	tical			Nom	inal	Bit Diam
Pi	rimary Bit diam:	101.6		0'	# Holes:	48	=	3,657.6		4 "
Seco	ondary Bit diam:		mm	0 '	# Holes:		=		ft (
Te	ertiary Bit diam:		mm	0°	# Holes:		=		ft (
Bulk Ex	pl. Required				kg 12,500					
Pkad Ex	xpl. Required				ka					
r ngu L	kpi. Nequireu	•			kg					
Ponetor	e Doguirod:		leahi	Augad	le-					
	rs Required:		1	# used	kg					
PENTEX 1	2 (OR EQUIVALE	NT)	0.34	98	33.3					
to	otal explosives v	weight i	in Blas	st (kg):	12,533					
	Pkgd Prod (0 kg) 9	6 of T	otal kg:	0.0%					
Detonat	tors Required	1:	1	ms	# req'd					
UNITRONI	C 600 6M				80					
UNITRONI	C 600 15M				66					
UNITRONI			-		54					
UNITRONI	C 600 30M				36					
Cord &	Access. Req	d:	U	of M	# req'd					
WIRE DUP	PLEX (6 PACK) 40	MOO	U	inits	1					
			U	inits						1.349 lb
			U	mits						1.799 lb
Resource	Deployment:									1.686 lb
# of Blasts	today (this Quarry	3					1		Cost	Reduction
# of Blaster	rs (this Blast)						1			
# of Helper	s (this Blast)		Note !	Exception			2			
	(this Blast)						1			
Service	s Req'd:							1		
GPS LAYO	DUT		Enter	hours			0.0			
	ICK CHARGE		1	000kg						
BLASTER				Blaster ho						
HELPER HOURS			Enter	total Help	er man-hours					

Design te Blasted:	26,093	te	
Total Holes Loaded:	48	holes	
including:		Dead	Holes
and:	2	Helpe	er Holes
Helper Hole Collar:	60.0	ft avg	
# Rows Blasted:	4	rows	
- Design Patte	ern (Fron	t Ron	/)-
Burden:	12.0	ft avg	
Spacing:	10.0	ft avg	
# Holes:	19	front (row.
- Design Patte	m (Main	Body	1) -
Burden:	9.0	ft avg	
Spacing:	10.0	ft avg	
# Holes:		main	7.004
Bench Height:	74.2	ft avg	
Sub-drill:		ft avg	
Hole Depth:	76.2	ft avg	
- Design St	one Deci	king -	
Front Row:		ft avg	
Main Body:		ft avg	
- Design Col	lar Stem	ming.	
Front Row:		ft avg	
	7.0		
Material used:	.75" Stone		
- Design Ch	arge Lei	ngth -	
Front Row:	69.2		
Main Body:	69.2		
- Design Ch			
Front Row:			
Main Body:			
Max Chge Wt / delay:	250.0	kg/de	lay
Required kg Loaded:	12,533	kg	
Rock Density:	2.65	g/cc	= te/m ³
- Design Po			
Expected Yield PF:	0.480	kg/te	(actual)
Front row:			
Main Body:			
"KPI" PF:	0.377	kg/te	(theoretical

Cost Reduction Notes (this Blast) - change in Bit , B, S, Expl or IS from previous Blast;

TECHNICAL BLAST DESIGN

SEISMOGRAPH RENTAL

3D LASER PROFILE

BORETRACK

Burden: 9.0ft

Spacing: 10.0ft

DRILLER NAME:

Subdrill: 2.0ft

1st row burden: 12.1ft

Hole Diameter: 4.0in

Number of holes: 49

Stemming: 6.0ft

Total drilled: 3733.8ft

Hole angle: 0.0°

open face # 75.6ft 6 89 75.2ft B10 75.6ft 74.6ft TRY C17A 4" FIRST POSITION IF UNSUCCESFUL TRY C17B 5" SECOND POSITION RAMP ± 73.7ft NO ROUNDING DUE TO RAMP Design 18-017 UPPER MIDDLE - 4" (5") Blast Hole 12x10 9x10 273 and 250 + .6 SUB ELEV



SHOTPlus 5.7	2.0.8	* * *	9/5/2018
Mine	Burlington	1 2 3 5	
Location	UPPER MIDDLE NO	ROUNDING O	N NORTH
Title/author	Design 18-017 UPF	ER MIDDLE	
Filename			

	Plac	t Danant		Quarry:	Burlington	Blast Number:	18	-019	
OPICA		t Report		P.O. #:		Orica Order #:	240	7202	
The Blasting Professionals	Nelso	n Aggregate		Blast Date:	2018-11-01	Blast Time:	11:5	57 AM	
bage 1 Blaste	er-in-charge:	Mike o	derkindere	en	(Print Name)	Tonnes Blasted:	27,342		-
					1	Total tonnes per day:	27,342	te NB80-01	Rate Code
	ast Location:	Upp	er Middle		(Bench / Face)	Total Holes Loaded:	50	holes	
GPS (l Latitude	79.88251	°W Longitude	including:		Dead Holes	
	С	entre of Blast		Centre of Blast		and:		Helper Holes	
						Helper Hole Collar:	60.0	O	
Wind fror	m the: at	0 kph		Temperature:	6 to 10 °C	# Rows Blasted:		rows	
		X	Γ	X			(Front Row	·	
Clear:		Rain: X	Overcast:			Burden:	12.0	•	
Partly Cloudy:		Snow:	Inversion:	Ceiling	7,842 ft	Spacing:	10.0	•	
D.:III.	f ('					# Holes:		front row	
- Drilling In				None	inal Dit Diameter		(Main Body	<i>'</i>	
Duine au / Dit		le from Vertical	Jan. 44		ninal Bit Diameter:	Burden:		ft avg	
	diam: 101.6 mm	0 # Ho		-,	` ,	Spacing: # Holes:	10.0	•	
Secondary Bit Tertiary Bit		0 # Ho			ft (4 1/2 " diam) ft (" diam)	Bench Height:	73.4	main body	
Terliary Dit	ulailiillili	0 # HO	iles	- 0.0	it (diaiii)	Sub-drill:		ft avg	-73
Bulk Explo	neivae:	in (kg)	out (kg)	kg		Hole Depth:	75.4	-	ste
CENTRA GOL		33,970	22,720	11,250		- Stone	Decking -	it avg	<u>B</u>
OLIVINA GOL	.570	00,010	22,720	11,200		- Stone Front Row: Main Body:		ft avg	Yield Powder Factor (kg Loaded / te Blasted
Packaged	Explosives:	cs shipped c	s returned	kg		Main Body:		ft avg	ded
				5		Ф # D = -1		per blast	Loa
						0	Stemming -	•	Š
						Front Row: Main Body:		ft avg	tor
Boosters:		kg / ur	nit # used	kg		Main Body:	7.0	ft avg	Fac
PENTEX 12 (C	OR EQUIVALENT)		0.34 132	44.9		Material used:	.75' Stone		der
						- Charg	ge Length -		MO _C
						Front Row: Main Body:	60.4	ft avg	90
	•	osives weight in E	, -,	11,295		⊨ Main Body:	60.4	ft avg	Ϋ́
	Pkg	d Prod (0 kg) % o	of Total kg:	0.0%			ge Weight -		
Detonators	s:	case #'s	ms	# used		Front Row:	176.2	-	
UNITRONIC 60	00 6M			49		Main Body:		ū	
UNITRONIC 60	00 15M			10		Max. per delay:		kg/delay	
UNITRONIC 60				7		SD () Equation:		kg/delay	
UNITRONIC 60	00 25M			66		Total kg Loaded:	11,295	•	
						Rock Density:	2.60	g/cc = te/m ³	
Card 9 Aa			11 -5 84	#		Davis	las Faatas		
	cessories:	A CIC) 400M	U of M	# used	1.810 lb/yd ³	Yield PF:	er Factor -	kg/te (actual)	
HARNES	SS WIRE DUPLEX (6 P		units	1 	1.190 lb/yd ³	Front row:		kg/te (actual)	(1)
	WINI STEW PLUGS	5 - 60 15 (4)	units	3	1.587 lb/yd ³	Main Body:		kg/te (theoretic	,
Resource De	eplovment:		uriits		1.508 lb/yd ³	"KPI" PF:		kg/te (theoretic	,
	ay (this Quarry)			1		is Blast) - change in Bit , B, S,		,	ai)
# of Blasters (tl				1		int of voids found on the drill log		i previous biast.	
# of Helpers (th		Note Exception		3	16 Stone decks in total	int of voido found of the drift lo	J-		
# of MMU's (thi	,			1					
Services:	,			•					
GPS LAYOUT		Enter hours		1.0					
BULK TRUCK	CHARGE		/=10,000 kg	1					
BLASTER HOL		Enter Blaster hour	-	7.0					
HELPER HOU		Enter total Helper		15.0					
SEISMOGRAP		Enter # Orica Seis		0					
3D LASER PR		Enter hours		0.0					
BORETRACK		Enter hours		0.0					

2018-11-02 18-019 Upper Middle Blast Report

1.0

TECHNICAL BLAST DESIGN

(per day) Enter # of days



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2018-11-01

Blast Number: Orica Order #: Blast Time: 18-019 2407202 11:57 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40371	79.88251
Front Row Corner	43.40391	79.88264
Back Row Corner	43.40352	79.88237
Average (Centre of Blast)	43.40371	79.88251

(N) Radians	(W) Radians
0.757538	1.394213
0.757541	1.394215
0.757534	1.394210
0.757538	1.394213

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(1)
	1st Reading	43.40245	79.87814		
	2nd Reading				
	Average	43.40245	79.87814		
	Distance (1st Seis. From Centre of Blast)	380.2	m		
	Post Blast Data: ppV:	5.7	mm/s Trigger set at:	2.0 mm	1/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

 frequency:
 11.3 Hz
 V / T / L :
 ?
 (V/T/L)
 ?</th

/ L : ? (Vertical, Transverse or Longitudinal) et at: 124 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	965.3	m
	Post Blast Data: nnV·	0.3	mm/s Trigger set at:

frequency:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1.394413

Trigger set at: 2.0 mm/s
V / T / L: ? (Vertical, Transverse or Longitudinal)
Trigger set at: 120 dB

air overpressure:
Coling rd & Blind Line (Bruce Trail)

South West Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
	1st Reading	43.39339	79.88880	
	2nd Reading			
	Average	43.39339	79.88880	
	Distance (3rd Seis. From Centre of Blast)	1257.1	m	

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

 Post Blast Data:
 ppV:
 1.8 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 41.0 Hz
 V / T / L:
 ? (Vertical, Transverse or Longitudinal)

 air overpressure:
 114.2 dB
 Trigger set at:
 120 dB

12.2 Hz

118.8 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= \frac{(380.2)^2}{30^2} \text{ kg}$

= <u>144,552</u> kg 900

Maximum Indicated Charge Weight per Delay = 161 k

Orica

Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-11-02 18-019 Upper Middle Blast Report



Blast Design

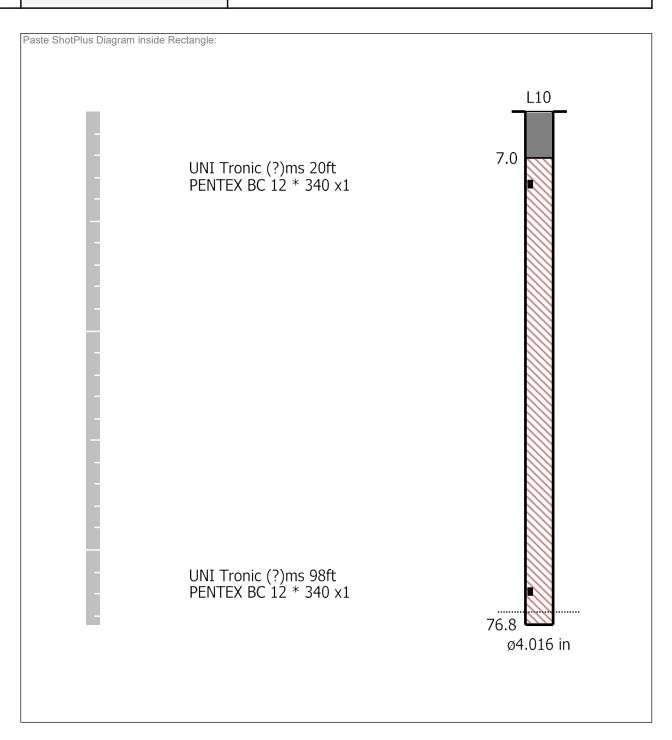
Nelson Aggregate

Quarry:	Burlington
P.O. #:	
act Date:	10/23/2018

Blast Number: 18 Orica Order #: 24

18-019 2407202

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Bill White



Unit Calibration



Date/Time MicL at 11:57:30 November 1, 2018 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s **Record Time** 5.357 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/COLLING RD_BURLINGTO.MMB

File Name

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level** 3.6 Volts

> February 14, 2018 by Instantel UM6857_20181101115730.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES**

User Name: ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

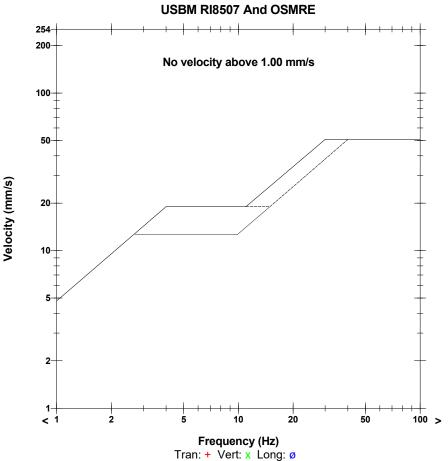
PSPL 118.8 dB(L) at 0.010 sec

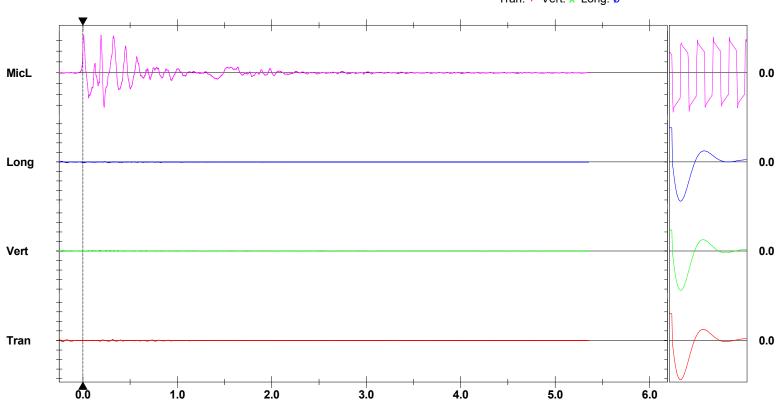
ZC Freq 5.7 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1551 mv)

Tran	Vert	Long	
0.284	0.166	0.181	mm/s
12.2	17.7	7.5	Hz
-0.209	0.292	0.275	sec
0.010	0.010	0.010	g
0.004	0.023	0.018	mm
Passed	Passed	Passed	
7.3	7.3	7.1	Hz
3.5	3.5	3.5	
	0.284 12.2 -0.209 0.010 0.004 Passed 7.3	0.284 0.166 12.2 17.7 -0.209 0.292 0.010 0.010 0.004 0.023 Passed Passed 7.3 7.3	0.284 0.166 0.181 12.2 17.7 7.5 -0.209 0.292 0.275 0.010 0.010 0.010 0.004 0.023 0.018 Passed Passed Passed 7.3 7.3 7.1

Peak Vector Sum 0.299 mm/s at -0.209 sec





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶





Date/Time Long at 11:57:29 November 1, 2018 **Trigger Source** Geo: 1.500 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s **Record Time** 5.0 sec at 2048 sps

Operator/Setup: ORICA CANADA/Nelson 2450 2nd MMB

Notes

Location: 2450 2nd Line Client: **Nelson Aggregates** Orica Canada Inc. User Name: General: Burlington

Extended Notes

43.40245,-79.87814 Sand Bagged

Microphone Linear Weighting PSPL 116.3 dB(L) at 1.216 sec

ZC Freq 4.1 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 1547 mv)

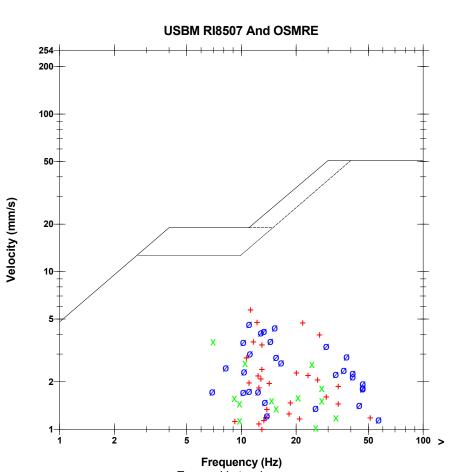
Tran	Vert	Long	
5.714	3.618	4.658	mm/s
11.3	7.0	11.0	Hz
0.459	0.321	0.648	sec
0.092	0.066	0.123	g
0.068	0.049	0.055	mm
Passed	Passed	Passed	
7.1	7.5	7.3	Hz
3.7	3.8	3.8	
	5.714 11.3 0.459 0.092 0.068 Passed 7.1	5.714 3.618 11.3 7.0 0.459 0.321 0.092 0.066 0.068 0.049 Passed Passed 7.1 7.5	5.714 3.618 4.658 11.3 7.0 11.0 0.459 0.321 0.648 0.092 0.066 0.123 0.068 0.049 0.055 Passed Passed Passed 7.1 7.5 7.3

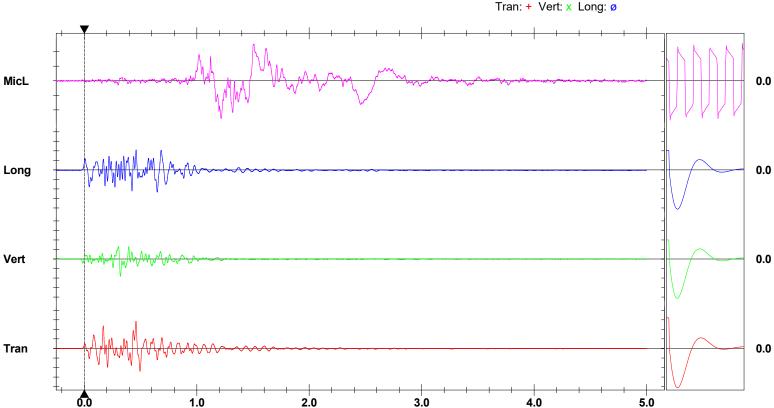
Peak Vector Sum 7.029 mm/s at 0.460 sec

Serial Number UM9119 V 10-89 Micromate ISEE **Battery Level** 3.7 Volts **Unit Calibration**

File Name

December 7, 2017 by Instantel UM9119_20181101115729.IDFW





Trigger = ▶

Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div



File Name



Date/Time Long at 11:57:29 November 1, 2018 **Trigger Source** Geo: 1.500 mm/s, Mic: 121.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.024 sec (Auto=4Sec) at 2048 sps Operator/Setup: Operator/Nelsons SW.mmb

Notes

Location: SouthWest Corner of Quarry

Client: **Nelsons Burlington** User Name: Orica Canada Inc.

General: Monitoring Vibration and Airblast

Extended Notes N 43.39339

W 79.88880

Microphone **Linear Weighting**

114.2 dB(L) at 3.019 sec **PSPL**

ZC Freq 17.1 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1525 mv)

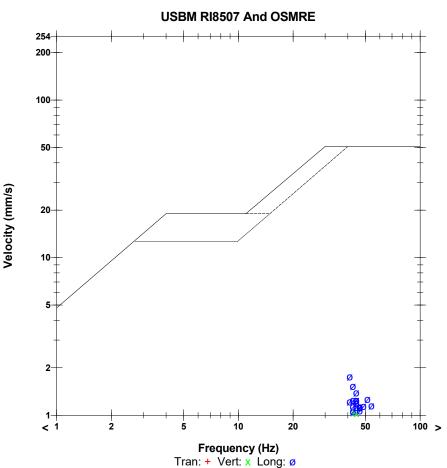
	Tran	Vert	Long	
PPV	0.977	1.040	1.766	mm/s
ZC Freq	43	43	41	Hz
Time (Rel. to Trig)	-0.007	-0.052	0.022	sec
Peak Acceleration	0.031	0.038	0.048	g
Peak Displacement	0.060	0.004	0.105	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	3.6	4.4	

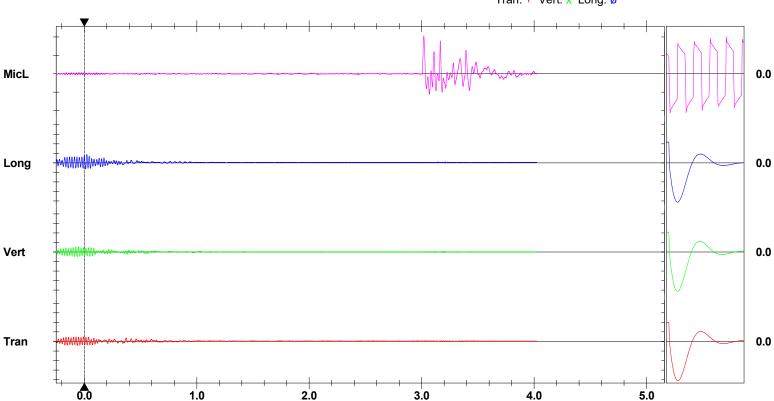
Peak Vector Sum 1.938 mm/s at 0.023 sec

Serial Number UM6859 V 10-89 Micromate ISEE **Battery Level** 3.7 Volts

Unit Calibration

December 22, 2017 by Instantel UM6859_20181101115729.IDFW





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶

Burden: 9.3ft

Spacing: 10.0ft

Hole Diameter: 4.0in

Subdrill: 2.0ft

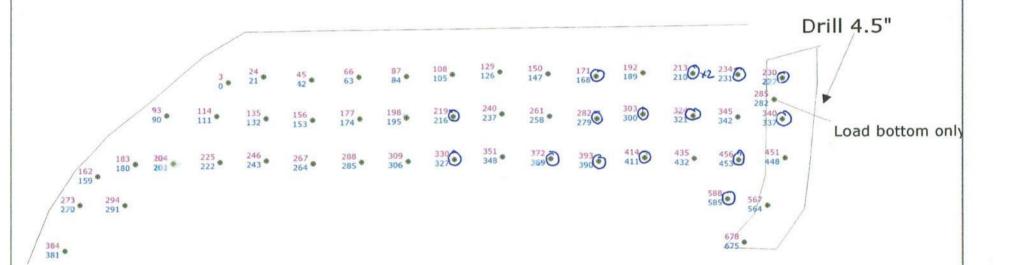
Number of holes: 50

Stemming: 7.0ft

Hole angle: 0.0°

O = DECK

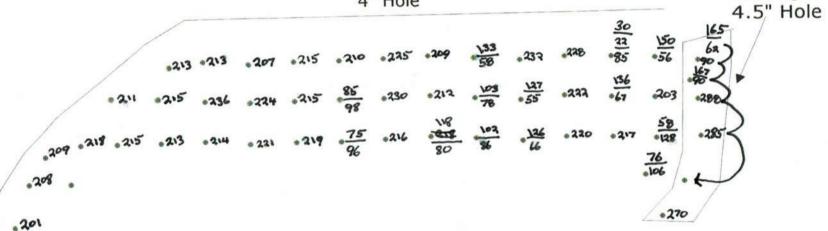
1st row burden: 12.1ft Total drilled: 3772.9ft





SHOTPlus™ Professional 5.7.3.0 10/31/2			
Mine	Burlington		
Location UPPER MIDDLE SOUTH FACE SCAN Des			
Title/author Design 18-019 UPPER MIDDLE Partia			
Filename	l Timing Upper Mid		







SHOTPlus™ P	Professional 5.7.3.0	10/29/2018	
Mine	Burlington		
Location	Location UPPER MIDDLE SOUTH FACE SCAN Design		
Title/author Design 18-019 UPPER MIDDLE Partial Fnl			
Filename Dessign_18-019_Upper_Middle_Partial_Fr			

320 Kg

Burden: 9.3ft

Spacing: 10.0ft

Subdrill: 2.0ft

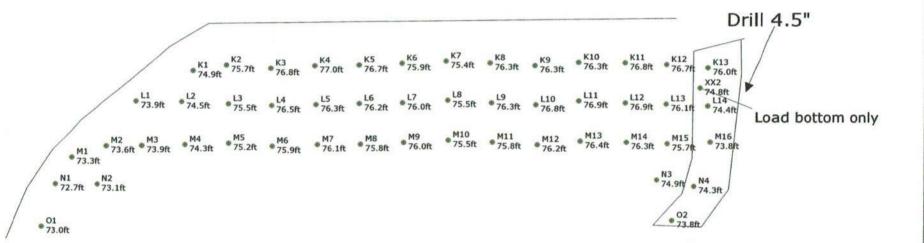
Stemming: 7.0ft

Hole Diameter: 4.0in

Number of holes: 50

Hole angle: 0.0°

1st row burden: 12.1ft Total drilled: 3772.9ft





SHOTPlus™ F	rofessional 5.7.3.0 11/1/2018
Mine	Burlington
Location	UPPER MIDDLE SOUTH FACE SCAN Design
Title/author	Design 18-019 UPPER MIDDLE Partial Fnl
Filename	2018-11-02 18-019 Revised Timing Upper Mid

SHOTPlus 5 Plan

Blast Summary Data

Burden: 9.3ft

Spacing: 10.0ft

1st row burden: 12.1ft

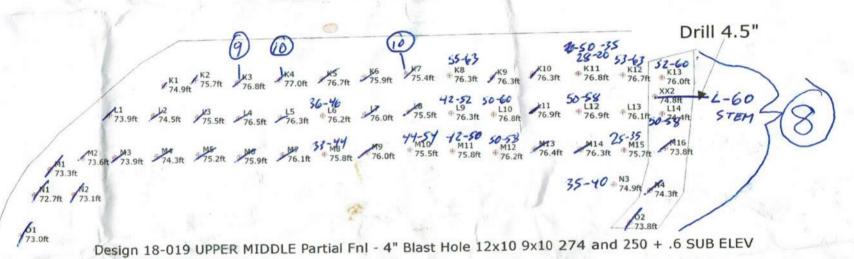
Hole Diameter: 4.0in

Subdrill: 2.0ft Number of holes: 50 Stemming: 7.0ft

Total drilled: 3772.9ft

Hole angle: 0.0°

16 DECKS





10/23/2018 SHOTPlus™ Professional 5.7.3.0 Burlington Mine UPPER MIDDLE SOUTH FACE SCAN Design Location Design 18-019 UPPER MIDDLE Partial Fnl Title/author Dessign_18-019_Upper_Middle_Partial_Fnl.spt Filename

DRILLER NAME:

Orica Canada Inc.

CONSIGNOR EXPÉDITEUR GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON

CA L9W 7G1

CONSIGNEE CONSIGNATAIRE

NELSON AGGREGATE COMPANY

BURLINGTON ON CA L7R 4L8

Bill of Lading / Connaissement

GROSS / BRUT	per la lami.
TARE	
NET	
TIME IN HEURE D'ENTRÉE	TIME OUT HEURE SORTIE
6:45cm	o to a supply control of
ORDER NUMBER N° DE COMMANDE	B/L NUMBER N° DE CONNAISSEMENT
2407202	86185300

1091137

						REPRINT		PAGE 2		
DATE REQUIRED DATE REQUISE						CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT				
01 Nov 2018	00:	00:	00 N	Section 1 to 1 to 1 to 1	AGGREGATE COMPANY	n/	10 27 15 15			
DATE SHIPPED EXPÉDIÉ LE			CON	FREIGHT T NDITIONS DE		SHIP. MAG. LIC. PERMIS EXPÉDITEUR		HICLE NO. DE VÉHICULE		
01 Nov 2018		VIA		'n, Own Truck F-73289 ROUTING HINÉRAIRE				MAG. LIC. NO. N° DE PERMIS		
Orica Truck OTV. OTÉ.	UM	DG MD	QTY, RET'D QTÉ, RET.	QTY, SOLD QTÉ, FACT	STANDARD	DESCRIPTION	# OF / DE PKGS.	AMOUNT MONTANT		
132 108 100 1	PC PC PC PC PC	X X X		49	*uni tronic 600-1 *uni tronic 600-2 MINI STEM PLUGS - LICENSED BLASTER	ex (6 pack) 400m 6.0M CU/ZC(20')80PC 5M C/Z SPL(50')66PC 5M CU/ZC SPL(80')54P	5 1 2 2 2 2	89.425 5.840 22.572 26.352 0.700		
1.0 1 66	HR PC PC	PC	X ·	69			ROG (ROCK ON GROUND)			13.464
					TOTAL GROSS WEIGH	HT		170,033		
	o ign				**** TOTAL PA	CKAGES ****	13	170,033		
					Website: www.or Email: sds.na@o	ocuments available icaminingservices.com rica.com -ORICA (1-855-266-7422)		Winner of a province of the month of the mon		

EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HOUR NUMBER TÉLÉPHONE D'URGENCE/24 HEURE NUMERO	PLACARDS OFFER	PLACARDS OFFERED / PLACARDS OFFERT		OR PREPAID FREIGHT
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASSIS LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDIT THE NATIONAL TRANSPORTATION AGENCY AND THE DEPARTMENT OF TRANSPOUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MARQUI SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CONFIDE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTS	1—877—561—3636 IED, DESCRIBED, PACKAGED, MARKED AND DECLARED VALUE OF ORT. ORT. ORT. ORTHORNOOTH THE APPLICABLE REGULATIONS OF VALUE OF CLARED VALUE OF COMMES A LA RÉALITÉ ET AUX RÉGLEMENTS	YES / OUI NO / NON OF SHIPMENT NETTE No. CONV PRESSAGE WT AGREEMENT NO.		QUOTING ORICA B/L TO / FAIRE SUIVRE FACTUI POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT NO DE CONNAISSEMENT D'ORICA: Orica Canada Inc. 301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5	
CONSIGNOR / EXPÉDITEUR	CARRIER / TRANSPORTEUR	THOUGHT BUTTON	CONSIGNEE / DESTINAT	TAIRE	OVER BUILDING BALL
GRAND VALLEY	Orica Truck		NELSON AGGREGATE COMPANY		
SHIPPER'S NAME (PLEASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (BLEASE PRINT) / NOM DID CAMI	ONNEUR 14/19	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RI		CEVEUR
SIGNATURE DATE DATE	18 SIGNATURE	DATE 0/ 1/18	SIGNATURE		DATE

2 SHIPPING ORDER
BON D'EXPÉDITION

SRIGHAL BILL OF LADING-EXPRESS SHIPPING CONTRACT)
(L'AGENT DOIT DETACHER ET GARDER CETTE COPIE APRES AVOIR SIGNE LA COPIE
ORIGINALE (1) DU CONNAISSEMENT CONTRAT D'EXPÉDITION PAR MESSAGERIES)



BORETRACK

TECHNICAL BLAST DESIGN

Enter hours

(per day) Enter # of days

Quarry: Burlington

Blast Number 18-019

ORICA	Nelson Agg	-	P.O. #		Orica Order #:		0-010
page 1 Blaster-in-charge	Mike de	rkinderen		(Print Name)	Design te Blasted:	27,342	te
15274HIC Self-1000 II 1000	-				Total Holes Loaded:	50	holes
Blast Location	Upper M	iddle		(Bench / Face)	including:		Dead Holes
GPS Coordinates	43.4037	1 °N Latitud	e 79.88251	°W Longitude	and:	1	Helper Holes
	Centre of E	Blast	Centre of Blast		Helper Hole Collar:		ft avg
					# Rows Blasted:	5	rows
- Drilling Information -					- Design Patt	ern (Fron	it Row)-
	Angle from V	ertical	Non	ninal Bit Diameter:	Burden:		ft avg
Primary Bit diam: 101.6	mm 0	" # Holes:	4 = 3,319.4	fft (4 " diam)	Spacing:		ft avg
Secondary Bit diam: 114.3	mm 0	* # Holes:	6 = 452.6	oft (4 1/2 " diam)	# Holes:	22	front row
Tertiary Bit diam:	mm 0	" # Holes:	= 0.0	Oft (" diam)			
ELECTRONIC PROPERTY AND A STATE OF THE STATE				5000000000000000000000000000000000000	Burden:		ft avg
					Spacing:		ft avg
					# Holes:		main body
					Bench Height:		ft avg
					Sub-drill:		ft avg
Bulk Expl. Required:		kg			Hole Depth:		ft avg
		12,200			- Design Si		
					Front Row:		ft avg
Pkgd Expl. Required:		kg			Main Body:		ft avg
					- Design Co	llar Stem	
					Front Row:		ft avg
					Main Body:		ft avg
Boosters Required:	kg/u # used	kg			Material used:		The State of the S
PENTEX 12 (OR EQUIVALENT)	0.34 100	34.0					
					- Design Ci	harge Lei	nath -
					Front Row:		ft avg
total explosives weight	in Blast (kg):	12,234			Main Body:		ft avg
Pkgd Prod (0 kg)	% of Total kg:	0.0%			- Design Ci	harge We	eight -
Detonators Required:	ms	# req'd			Front Row:	199.6	kg/hole
UNITRONIC 600 6M		60			Main Body:		kg/hole
UNITRONIC 600 15M		66			Max Chge Wt / delay:		kg/delay
UNITRONIC 600 25M		54					350 353
					Required kg Loaded:	12,234	kg
					Rock Density:	2.60	$g/cc = te/m^3$
Cord & Access. Reg'd:	U of M	# req'd			- Design Pe	owder Fa	ictor -
	units				Expected Yield PF:		kg/te (actual)
	units			1.348 lb/yd3	Front row:		kg/te (theoretical)
	units			1.797 lb/yd3	Main Body:		kg/te (theoretical)
Resource Deployment:	1			1.707 lb/yd3	"KPI" PF:		kg/te (theoretical)
# of Blasts today (this Quarry)			1		this Blast) - change in Bit , B. S		
# of Blasters (this Blast)			1	O O O I TI CO O O O O O O O O O O O O O O O O O O	and blody andinge in bit , b, c	r, Expror 10	morn previous brest.
# of Helpers (this Blast)	Note Exception	1	2				
# of MMU's (this Blast)			1				
Services Req'd:							
GPS LAYOUT	Enter hours		0.0				
BULK TRUCK CHARGE	<2,000kg		0.0				
BLASTER HOURS	Enter Blaster h	ours	0.0				
HELPER HOURS	Enter total Hel		0.0				
SEISMOGRAPH RENTAL	Enter # Orica		0				
3D LASER PROFILE	Enter hours		0				

0

0.0

1st row burden: 12.1ft Total drilled: 3772.9ft

Burden: 9.3ft

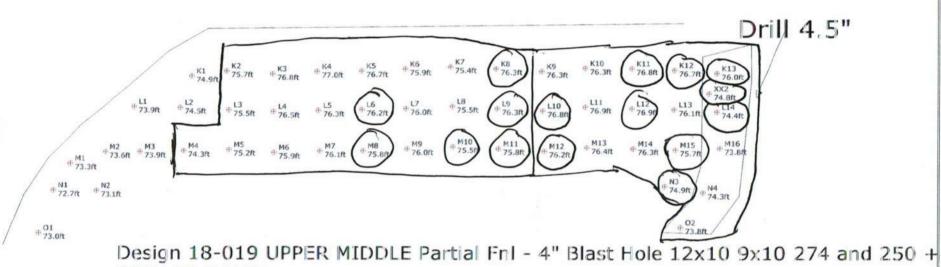
Hole Diameter: 4.0in

Spacing: 10.0ft

Subdrill: 2.0ft Number of holes: 50 Stemming: 7.0ft

Hole angle: 0.0°

4" dia = 3376 41" dia = 447.1





Not to scale

DRILLER NAME:

SHOTPlus™	Professional 5.7.4.19 11/10/2018
Mine	Burlington
Location	UPPER MIDDLE SOUTH FACE SCAN I
Title/author	Design 18-019 UPPER MIDDLE Partia
Filename	Dessign 18-019 Upper Middle Parti

3	Blas	t Report	Quarry	: Burlington	Blast Number:	18-020	
ORICA		•	P.O. #		Orica Order #:	2410149	
The Blasting Professionals	Nelso	n Aggregate	Blast Date	2018-11-08	Blast Time:	11:57 AM	
page 1 Blaste	nge 1						
Blaste	er-in-charge:	Mike derki	nderen	(Print Name)	Tonnes Blasted:	24,552 te 9,443	
D.					Total tonnes per day:		Rate Code
	ast Location:	Floor		(Bench / Face)	Total Holes Loaded:	holes	
GPS (Coordinates:	43.40437 °N Lati		°W Longitude	including:	Dead Holes	
		Centre of Blast	Centre of Blast		and:	Helper Holes	
				41.5.00	Helper Hole Collar:	ft avg	
Wind from	m the: W at	·	Temperature	e: 1 to 5 °C	# Rows Blasted:	12 rows	
01		X X	X			(Front Row)-	
Clear:			rcast: X	0.750 #	Burden:	11.0 ft avg	
Partly Cloudy:		Snow: Inve	rsion: Ceiling	3,758 ft	Spacing: # Holes:	11.0 ft avg 21 front row	
Duilling	formation						
- Drilling In			Na	nainal Dit Diamatan		(Main Body) -	
D.:		gle from Vertical		minal Bit Diameter:	Burden:	11.0 ft avg	
	diam: 101.6 mm	0 # Holes:		,	Spacing:	11.0 ft avg	
Secondary Bit		0 # Holes:		0 ft (" diam)	# Holes:	230 main body	
Tertiary Bit	diam:mm	0 # Holes:	= 0.	0 ft(" diam)	Bench Height:	11.0 ft avg	
Dulle Frente		: (lan)	1\ I		Sub-drill:	0.0 ft avg	Blasted
Bulk Explo		in (kg) out (<u> </u>		Hole Depth:	11.0 ft avg	Bla
CENTRA GOL	.D 70	25,140 22	2,650 2,490			Decking -	/ te
Dealsaged	Evalosivos				Front Row:	ft avg	ed
Раскадео	Explosives:	cs shipped cs retu	ırned kg		Main Body: # Decks:	ft avg	oad
					0 "	per blast	S L
					- Collar	Stemming -	or (k
Pootoro		len lumit d	4d Jen		Front Row:	7.0 ft avg 7.0 ft avg	acto
Boosters:	ND FOURTH FUT	kg / unit #			Front Row: Main Body: Material used: - Charg Front Row: Main Body: Main Body:	7.0 It avg	Yield Powder Factor (kg Loaded / te
PENTEX 12 (U	OR EQUIVALENT)	0.34	251 85.3		Material used:	ge Length -	wd
					Front Row:	4.0 ft avg	1 Pc
	total evol	losives weight in Blast	(kg): 2,575		Main Body:	4.0 ft avg	ielc
		d Prod (0 kg) % of Total	. 0,		· · · · · · · · · · · · · · · · · · ·	ne Weight -	
Detonators	-	case #'s ms			Front Row:	11.6 kg/hole	
EXEL HANDID		25/5			Main Body:	-	
CONNECTADE		25 n			Max. per delay:	21.0 kg/delay	
CONNECTADI		42 n			SD () Equation:	429.0 kg/delay	
UNITRONIC 60		72 11	2		Total kg Loaded:	2,575 kg	
ONT NOTION	OO OM				Rock Density:	$\frac{2.60}{\text{g/cc}} = \text{te/m}^3$	
						9,55 - 10/111	
Cord & Ac	cessories:	U of	f M # used		- Powd	er Factor -	
	SS WIRE DUPLEX (6 F			0.460 lb/yd ³	Yield PF:	0.105 kg/te (actual)	
		unit		0.520 lb/yd ³	Front row:	0.119 kg/te (theoretical	al)
		unit		0.520 lb/yd ³	Main Body:	0.119 kg/te (theoretical	
Resource De	eployment:			0.520 lb/yd ³	"KPI" PF:	0.119 kg/te (theoretical	,
# of Blasts toda	ay (this Quarry)		1	Cost Reduction Notes (t)	nis Blast) - change in Bit , B, S,		
# of Blasters (tl			1	1 Extra helper due to the			_
# of Helpers (th	,	Note Exception	3	1 Advanced Blast design			
# of MMU's (thi	,		1				
Services:	,						
GPS LAYOUT		Enter hours	2.5				
BULK TRUCK		>/=2,000kg <5,00					
BLASTER HOL		Enter Blaster hours	7.0				
HELPER HOU		Enter total Helper man-h					
SEISMOGRAP		Enter # Orica Seismogra	_				
3D LASER PR		Enter # Onca Seismogra	0.0				
BORETRACK		Enter hours	0.0				
	BLAST DESIGN	(per day) Enter # of day					
I LOHINICAL B	LAGI DESIGN	(per day) Enter # or day	J U.U				

2018-11-08 18-020 Floor Blast Report



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2018-11-08

43.0 Hz

110.4 dB

V/T/L:

Trigger set at: 115 dB

Blast Number: Orica Order #: Blast Time:

18-020 2410149 11:57 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40442	79.88533
Front Row Corner	43.40454	79.88495
Back Row Corner	43.40417	79.88577
Average (Centre of Blast)	43.40437	79.88535

(N) Radians	(W) Radians
0.757550	1.394262
0.757552	1.394255
0.757546	1.394270
0.757549	1.394262

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(1)
	1st Reading	43.40245	79.87814	
	2nd Reading			
	Average	43.40245	79.87814	
	Distance (1st Seis. From Centre of Blast)	621.4	m	
	Post Blast Data: ppV:	2.0	mm/s Trigger set at:	2.0 mm/s

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: air overpressure:

? (Vertical, Transverse or Longitudinal)

2450 2nd Line (Beside cut tree stump in front yard)

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (2nd Seis. From Centre of Blast)	1254.2	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s V/T/L: frequency: Not Hz ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ

South West Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
	1st Reading			
	2nd Reading			
	Average	0.00000	0.00000	
	Distance (3rd Seis. From Centre of Blast)	0.0	m	

(N) Radians	(W) Radians
0.000000	0.000000

Post Blast Data: ppV: 0.0 mm/s Trigger set at: 2.0 mm/s V/T/L: frequency: 0.0 Hz ? (Vertical, Transverse or Longitudinal) air overpressure: **0.0** dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= __(621.4)²_ kg 30²

= <u>386,138</u> kg 900

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

2018-11-08 18-020 Floor Blast Report



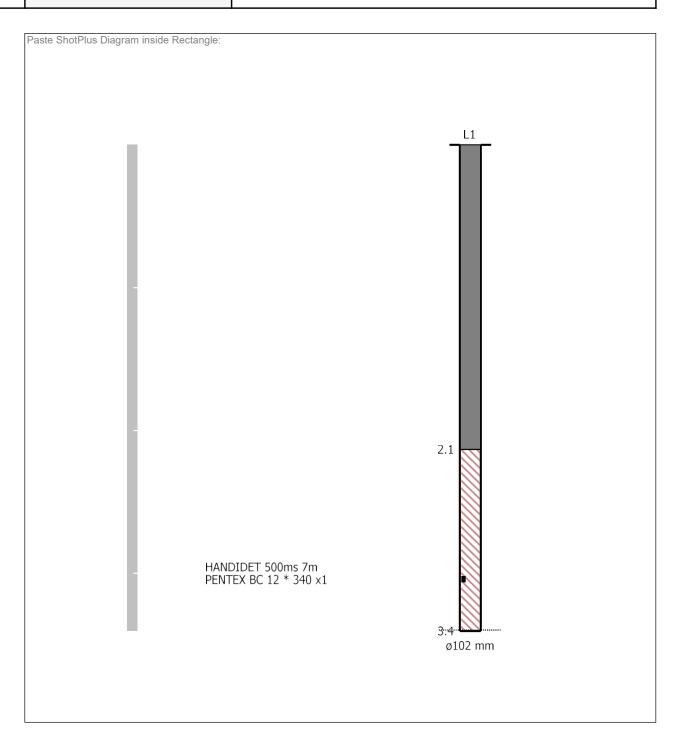
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 11/8/2018

Blast Number: Orica Order #: 18-020 2410149

page 2



Orica Blaster-in-charge:	Mike der Kinderen
Quarry Manager:	



File Name





Date/Time Trigger Source Vert at 12:57:15 November 8, 2018 Geo: 1.500 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s Record Time 5.0 sec at 2048 sps

Operator/Setup: ORICA CANADA/Nelson 2450 2nd.mmb

Notes

Location: 2450 2nd Line
Client: Nelson Aggregates
User Name: Orica Canada Inc.
General: Burlington

Extended Notes

43.40245,-79.87814 Sand Bagged

Microphone Linear Weighting
PSPL 110.4 dB(L) at 1.525 sec

ZC Freq 14.2 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1585 mv)

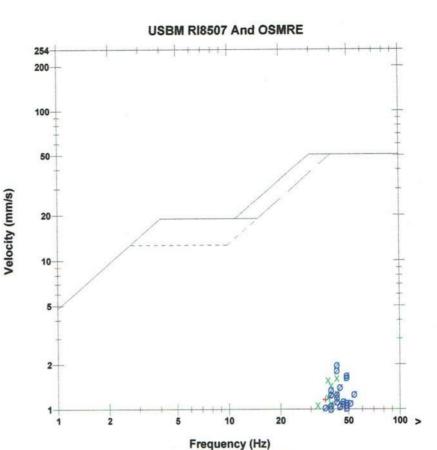
Tran	Vert	Long	
1.151	1.616	1.978	mm/s
37	43	43	Hz
-0.081	0.013	0.022	sec
0.031	0.046	0.089	g
0.005	0.008	0.018	mm
Passed	Passed	Passed	
7.1	7.3	7.3	Hz
3.9	3.9	3.9	
	1.151 37 -0.081 0.031 0.005 Passed 7.1	1.151 1.616 37 43 -0.081 0.013 0.031 0.046 0.005 0.008 Passed Passed 7.1 7.3	1.151 1.616 1.978 37 43 43 -0.081 0.013 0.022 0.031 0.046 0.089 0.005 0.008 0.018 Passed Passed Passed 7.1 7.3 7.3

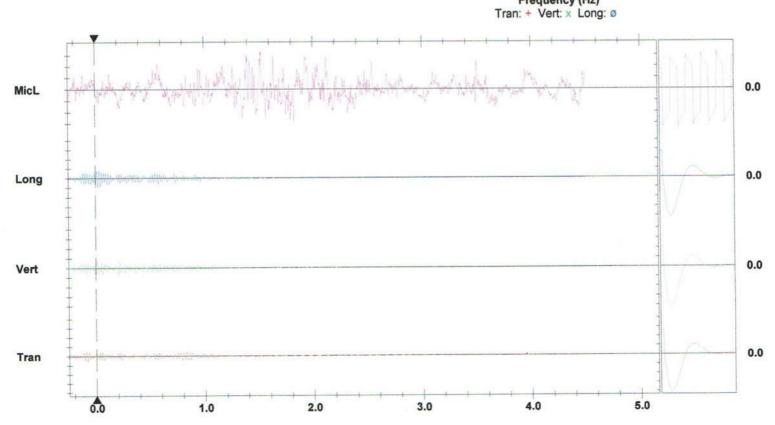
Peak Vector Sum 2.305 mm/s at 0.023 sec

Serial Number UM9119 V 10-89 Micromate ISEE

Battery Level 3.7 Volts
Unit Calibration December 7

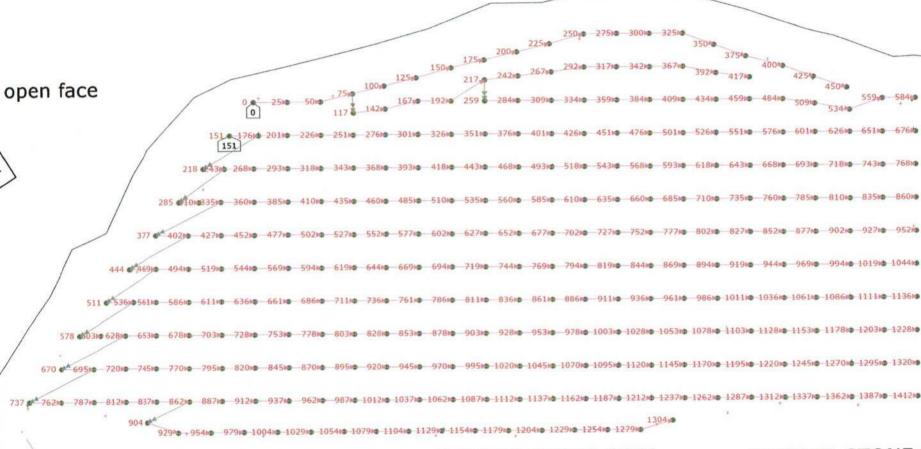
December 7, 2017 by Instantel UM9119_20181108125715.IDFW





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div





ARMOUR STONE ROW

ARMOUR STONE ROW

ARMOUR STONE ROW

Design 18-020 FLOOR Fnl - 4" Blast Hole 11.5x11.5 253 and 249.6 ELEV



DRILL TO SHALE

SHOTPlus™ P	11/8/2018			
Mine	Burlington			
Location	FLOOR			
Title/author	Design 18-020 FLOOR			
Filename	Design_18-020_FLOOR_Final R1.spf			

Load sheet Max Load 21Kg

poter le tar. Le 12 pa 12. 19 pe 12 12 12 12 12 12 16 16 16 16 16 19 你. 女师你你你你你你你你你 ARMOUR STONE RO

ARMOUR STONE ROW

ARMOUR STONE ROW



SHOTPlus™ P	rofessional 5.7.4.4	11/7/2018	
Mine	Burlington		
Location	cation FLOOR		
Title/author	Design 18-020 FLOOR		
Filename	Design_18-020_FLOOR_Final.spf		

SHOTPlus 5 Plan

Blast Summary Data

Burden: 11.8ft

Spacing: 11.8ft

Subdrill: 0.0ft

Stemming: 5.6ft

1st row burden: 11.8ft Total drilled: 3228.3ft Hole Diameter: 4.0in Number of holes: 289

Hole angle: 0.0°

open face

open face

M.3

H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 H11 H12 H13 H14 H15 H16 H17 H18 H19 H20 H21 H22 H23 H1.2ft 11.2ft 11.

G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11 G12 G13 G14 G15 G16 G17 G18 G19 G20 G21 G22 G23 G24 11.2tt 1.2tt 1.2tt 1.2tt 1.2tt 11.2tt 11.

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 F20 F21 F22 F23 F24 11.2ft 11.2ft

E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25 11.2ft 11

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 11.2m 11.

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B19 B20 B21 B22 B23 B24 B25 B26 B27 11.2ft 1

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24 A25 A26 A27 A28 11.2ft 11.2

ARMOUR STONE ROW

ARMOUR STONE ROW

ARMOUR STONE ROW

= BILL'S

STONE

Design 18-020 FLOOR FnI - 4" Blast Hole 11.5x11.5 253 and 249.6 ELEV



DRILL TO SHALE

SHOTPlus™ P	rofessional 5.7.3.0	11/1/2018
Mine	Burlington	
Location	FLOOR	
Title/author	Design 18-020 FLOOR	
Filename	Design_18-020_FLOOR_Final.spf	

Not to scale

COMBINATION SHORT FORM STRAIGHT BILL OF LADING-EXPRESS SHIPPING CONTRACT ADOPTED BY RAIL FREIGHT AND EXPRESS CARRIERS SUBJECT TO THE JURISDICTION OF THE NATIONAL TRANSPORT AGENCY.
FORMULE COMBINÉE ET ABRÉGÉE DE CONNAISEMENT NOMINATIF ET CONTRAT DE TRANSPORT DE MESSAGERIES SOUS RÉSERVE DE LA JURISDICTION DE L'OFFICE DES TRANSPORTS.

Bill of Lading / Connaissement

CONSIGNOR EXPÉDITEUR

Orica Canada Inc. GRAND VALLEY 033411 SIDE ROAD 21-22 GRAND VALLEY ON CA L9W 7G1

CONSIGNEE CONSIGNATAIRE NELSON AGGREGATE COMPANY BURLINGTON ON

CA L7R 4L8

GROSS / BRUT TARE NET TIME IN TIME OUT HEURE D'ENTRÉE HEURE SORTIE ORDER NUMBER N° DE COMMANDE B/L NUMBER N° DE CONNAISSEMENT 2410149 86192440

DATE REQUIRED DATE REQUISE			UIRED		INVOICE TO / BUYER FACTURÉ À / ACHETEUR AGGREGATE COMPANY n/a			CUSTOMER REFERENCE NO. N° DE COMMANDE DU CLIENT			
08 Nov 2018	00:	00:	00	NELSON				TO DE OCIVINA	SE SOMMANDE DO CLIENT		
DATE SHIPPED EXPÉDIÉ LE				FREIGHT ONDITIONS DE	TERMS SHIP MAG LIC			VEHICLE NO. № DE VÉHICULE			
08 Nov 2018	FOB	De	st'n,	Own Tr	ruck	and the last transfer to be a	F-73289			PT 18.	230
	SHI	P VIA	UR					UTING ÉRAIRE		in the second and	MAG. LIC. NO. N° DE PERMIS
Drica Truck						STANDARD				DAME TO DESCRIPT	N. DE PERMIS
QTY. QTÉ.	UM	DG MD	QTY. RET'E	QTY, SOLD QTÉ, FACT		Company of the party of	DESCRIPTION	The State of the State of	-	# OF / DE PKGS.	AMOUNT
			NET :	EXPLOS	IVI	ES QUANTITY	7:	117.137	KG	PNGS.	MONTANT
SEATTLE COLD FEBRURE TO											
DARK MA CHINE	LS/IIIp-	100	CHECKELS.	S MILES							
0.0	PC	X	92	251	PEN'	TEX BC 340 (4	19/CS)			7	125.195
	PC		1	2	Hari	ness Wire Dur	olex (6 pac)	k) 400m		1	2.920
	PC PC	X	100	. 1	*un:	i tronic 600-	-06.0M CU/Z	C(20')80PC		1	0.365
390	PC	X	-	201		STEM PLUGS					0.700
65	PC	X		-	EXE!		M 25/500(30			6	39.390
65	PC	X						(30 FT) 65/0	E. C.	1	6.305
1	PC	- 1	42	61		Connectadet		(30 FT) 65/0	S	1	6.370
1.0	HR	30.00				OUR CHARGE					
	PC			1	ROG (ROCK ON GROUND)						
						(210021 021 0210	OND)				
	S. Strang	i.	interest and	e.	TOT	AL GROSS WEIG	SHT			1	81.245 KG
					***	* TOTAL P	ACKAGES	****		17	
	0.800	1								THE STATE OF	
										100	

4-HOUR	NUMBER:	1-613-	-996-	6666

PALLETS USED / PALETTES UTILISÉES	PALLETS RETURNED / PALETTES RETOUR	NÉES	BAGS USED / SACS	S UTILISÉS
EMERGENCY RESPONSE PLAN / RÉSUMÉ DE PLAN D'URGENCE	EMERGENCY RESPONSE NO./24 HO TÉLÉPHONE D'URGENCE/24 HEUR	OUR NUMBER RE NUMERO PLACA	RDS OFFERED / PLACARDS OFFERT	FORWARD INVOICE FOR PREPAID FREIGHT QUOTING ORICA B/L TO / FAIRE SUIVRE FACTURE POUR EXPÉDITION PORT PAYÉ EN RÉFÉRANT / NO DE CONNAISSEMENT DIORICA :
ERAP 2-1510	1-877-561-	-3636 _{YE}	S/OUI NO/NON	
THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY CLASS LABELLED, AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCOUNT. THE NATIONAL TRANSPORTATION ACCOUNT AND THE DEPARTMENT OF TRANSINGUS CERTIFIONS QUE LA CLASSE, LA DESCRIPTION, L'EMBALLAGE, LE MAPIO SUSMENTIONNÉES DE MÊME QUE LES CONDITIONS DE TRANSPORT SONT CON DE L'OFFICE NATIONAL DES TRANSPORTS ET DU MINISTÈRE DES TRANSPORTI	DING TO THE APPLICABLE REGULATIONS OF PORT. UAGE ET L'ÉTIQUETAGE DES MARCHANDISES IFORMES À LA RÉALITÉ ET AUX RÉGLEMENTS	VALEUR DÉCLARÉE	ENT NETTE No. CONV PRESSAGE WT AGREEMENT NO.	301 rue hotel de ville Brownsburg-Chatham, QC J8G 3B5
COMPLOS IODA ENDÓDITOS IDAS S			The state of the s	

DE COTTOE NATIONAL DES TRANSPORTS ET DO MINISTÈRE DES TRANSPORTS.			
CONSIGNORY EXPEDITABLE Y	CARRIER STRANSPORTEUR	RECEIVER'S NAME (PLEASE PRINT) / NOM DU RECEVEUR	
SHIPPER'S NAME (PLBASE PRINT) / NOM D'EXPÉDITEUR	DRIVER'S NAME (PLEASE PRINT) / NOM DU CAMIONNEUR		
SIGNATURE DATE 11 18	SIGNATURE DATE 8 11 18	SIGNATURE DATE D/J M/M Y/A	

Burden: 11.8ft

4'-5' Broken material over all holes

Spacing: 11.8ft

Subdrill: 0.0ft

Stemming: 5.6ft

1st row burden: 11.8ft

Hole Diameter: 4.0in

Number of holes: 289

Hole angle: 0.0°

Total drilled: 3228.3ft

K9 JOID 7-7.5'

C22 VOID 7.5-8' C3 NO ROCK

H15 6'0B

B21 VOID 7-7.5

A 22 VOID 7-7.5 AZI NO ROCK

A16 7'0B

open face

open face

11 12 13 14 15 16 17 18 19 110 111 112 113 114 115 116 117 118 119 120 121 122 11.2ft 11.2ft

L11 L12 L13 L14

= BILL'S MARK STONE

FI NOROCK

EI NO ROCK

H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 H11 H12 H13 H14 H15 H16 H17 H18 H19 H20 H21 H22 H23 H11.2ft 11.2ft 11

G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11 G12 G13 G14 G15 G16 G17 G18 G19 G20 G21 G22 G23 G24 11.2ft 11.2ft

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 F20 F21 F22 F23 F24 F112ft 11.2ft 11.2ft

E1) E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E18 E19 E20 E21 E22 E23 E24 E25 E11/2ft11.2ft 11.2ft 1

D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 D20 D21 D22 D23 D24 D25 D26 5 11.2ft 11.

C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C11.2tt 11.2tt 11.2tt

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B19 B20 B21 B22 B23 B24 B25 B26 B27 B11.2ft 11.2ft 11.2ft

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A16 A17 A18 A19 A20 A21 A22 A23 A24 A25 A26 A27 A28 A11.2ft 11.2ft 11.

11.2ft AA2 AA3 AA4 AA5 AA6 AA7 AA8 AA9 AA10 AA11 AA12 AA13 AA14 AA15 AA16 11.2ft 11

ARMOUR STONE ROW

ARMOUR STONE ROW ARMOUR STONE ROW

Design 18-020 FLOOR Fnl - 4" Blast Hole 11.5x11.5 253 and 249.6 ELEV



DRILL TO SHALE

SHOTPlus™ P	11/1/2018	
Mine	Burlington	
Location	FLOOR	
Title/author	Design 18-020 FLOOR	
Filename	Design_18-020_FLOOR_Final.spf	

Not to scale

	<i>GODRILL</i>	.ING [®]	S	OT DIAGRAM							
OKICA	riller: ONEILL										
Burlington		Blast N	Num:								
	11 1 -1 0	Emplo	oyee:	- laws							
Dep	th to shale.										
S Coordinates GPS LF:	GPS RF:	GPS LR:	GPS RR:								
	13 14 15 16 17 18	19 20 21 22 23 24 2	25 26 27 28 29	30 31 32 33 34 35							
				K							
				J							
	14 14 14 12 11 10										
CCHUCCULI 1214	14 14 14 12 11 11			H							
	15 16 15 14 14 12	<u> </u>		6							
(((((((((((((((((((((15 6 4 11 11 11										
10 11 11 11 11 11 12 14	14 14 12 11 11 17	11 11 11 11 11 11		E							
		HHALLIN									
			[s H	B							
			(le l(1)	4							
				94							
6(8)											
USTD @ 7.5 A 22 US	DC7	FINDROCK									
Vollock A 21 No	Rock.	EI NOROCK									
(1) @ 7' A (6) 7'	58										
Spacing: Hole Diameter	onnes: Tala	Il Footage:									
verage Hole Depth: Total Hole	es: 26 4	oic Meters: Total To									

ORICA The Blasting Professionals*	Blast D Nelson Agg		Quarry: P.O. #: Design Date:	Burlington	Blast Number: Orica Order #:	18-020			
page 1 Blaster-in-cha	arge: Mike d	erkinderen		(Print Name)	Design te Blasted:	28,320 te			
					Total Holes Loaded:	289 holes			
Blast Loca	ition: Floor			(Bench / Face)	including:	Dead Holes			
GPS Coordin	ates: enter data	on p2 °N Latitud	le enter data on p2	°W Longitude	and:	Helper Holes			
	Centre of		Centre of Blast		Helper Hole Collar:	ft avg			
					# Rows Blasted:	12 rows			
5.00]				
- Drilling Information				L Dit Di		ern (Front Row)-			
	Angle from			nal Bit Diameter:	Burden:	11.0 ft avg			
Primary Bit diam:			89 = 3,179.0 f	N. A. STEC STREET		11.0 ft avg			
Secondary Bit diam:) # Holes:	= 0.0 f	N A		21 front row			
Tertiary Bit diam:	mm () # Holes:	= 0.0 f	ft (" diam)		rn (Main Body) -			
					Burden:	11.0 ft avg			
					Spacing:	11.0 ft avg			
					# Holes:	268 main body			
					Bench Height:	11.0 ft avg			
					Sub-drill:	0.0 ft avg			
Bulk Expl. Required:		kg			Hole Depth:	11.0 ft avg			
		6,000			. W. C. B. B. C. B	one Decking -			
		3,000			Front Row:	0.0 ft avg			
Pkgd Expl. Required:		la la			Main Body:	0.0 ft avg			
rkyu Expi. Requireu.		kg			The second secon				
		-				llar Stemming -			
					Front Row:	7.0 ft avg			
					Main Body:	7.0 ft avg			
Boosters Required:	kg/u # use	d kg			Material used:	75" Stone			
PENTEX 12 (OR EQUIVALEN	T) 0.34 28	9 98.3							
					- Design Cl	narge Length -			
					Front Row:	4.0 ft avg			
total explosives w	eight in Blast (kg):	6,098			Main Body:	4.0 ft avg			
Pkgd Prod (0	kg) % of Total kg	0.0%			- Design Ch	narge Weight -			
Detonators Required	: ms	# req'd			Front Row:	11.7 kg/hole			
EXEL HANDIDET 9m	25/500	289			Main Body:	11.7 kg/hole			
					Max Chge Wt / delay:	16.0 kg/delay			
					Required kg Loaded:	6,098 kg			
					Rock Density:	2.60 g/cc = te/m ³			
	3 9MN 59M100								
Cord & Access. Reg'o		# req'd			- Design Po	0.215 kg/te (actual)			
WIRE DUPLEX (6 PACK) 400		1		0.522 lb/yd3	Front row:				
	units			0.522 lb/yd 3		and the second of the second of			
Deserves Desley-	units			0.522 lb/yd ³	Main Body:	The second of th			
Resource Deployment:			-21		"KPI" PF:	0.119 kg/te (theoretica			
# of Blasts today (this Quarry)			1	Cost Reduction Notes	this Blast) - change in Bit , B, S	S, Expl or IS from previous Blas			
# of Blasters (this Blast)			1						
# of Helpers (this Blast)	Note Except	on	3						
# of MMU's (this Blast)			1						
Services Req'd:									
GPS LAYOUT	Enter hours		0.0						
BULK TRUCK CHARGE	<2,000kg								
BLASTER HOURS	Enter Blaster	hours	0.0						
HELPER HOURS		elper man-hours	0.0						
SEISMOGRAPH RENTAL			0						
3D LASER PROFILE	Enter hours	- San April	0						
BORETRACK	Enter hours		0						
TECHNICAL BLAST DESIGN	The Control of the Co	ter # of days	0.0						
LOUISIONE DEVOT DESIGN	(per day) En	w w uays	0.0						

(per day) Enter # of days



SIESMIC REPORT SUMMARY

				<u>Hole</u>	<u>Patt</u>	<u>ern</u>																				
			<u>Max</u>	<u>Dia.</u>	<u>Spacing</u>		<u># Of</u>	<u># Of</u>	<u># Of</u>	Time Between (ms.)		me Between (ms.)		me Between (ms.)		<u>Ave.</u>	Ave Hole	<u>Total</u>	<u>Moni</u>	itor 1	<u>Moni</u>	tor 2	<u>Mon</u>	itor 3	<u>Moni</u>	<u>tor 4</u>
Shot #	<u>Date</u>	<u>Time</u>	Kg/Delay	<u>(in.)</u>	<u>(ft.)</u>	<u>(ft.)</u>	<u>Decks</u>	Rows	<u>Holes</u>	<u>Decks</u>	<u>Holes</u>	Rows	<u>Drill</u>	<u>Water</u>	<u>Depth</u>	<u>Tons</u>	(mm/s)	<u>(dbl.)</u>	(mm/s)	<u>(dbl.)</u>	(mm/s)		(mm/s)	<u>(dbl.)</u>		
01-14	Mar. 5/14	11:21AM	130.80	4	11.5	11.5	1	8	117	0	25	67	0	N/A	17.00	21800.0	1.02	103.5	2.05	104.2	1.78	115.2				
02-14	Mar. 31/14	11:58AM	75.80	4	11.5	11.5	1	6	102	0	25	67	0	N/A	18.75	20609.0	N/R	N/R	2.52	103.5	1.78	115.2				
03-14	Apr. 9/14	12:42PM	54.0	4	12	12	1	6	186	0	25	134	0	N/A	13.00	28371.2	2.03	104.9	1.02	108.0	1.02	100.0				
04-14	Apr. 21/14	12:00PM	240.79	4	11	11	1	2	37	0	13	110	2	73.38	81.00	29548.2	2.79	126.7	N/R	N/R	N/R	N/R				
05-14	Apr. 30/14	11:57AM	107.02	4	11.5	11.5	1	9	138	0	25	67	0	N/A	18.00	26726.4	1.78	106.0	N/R	N/R	1.27	101.0				
06-14	May 7/14	11:59AM	44.59	4	11.5	11.5	1	7	162	0	25	67	0	N/A	11.00	19202.7	2.16	105.5	N/R	N/R	1.02	104.9				
07-14	May 16/14	12:01PM	80.06	4	11.5	11.5	1	9	125	0	25	67	0	N/A	15.50	23884.8	2.67	101.9	1.48	97.5	3.17	110.6				
08-14	May 27/14	01:08PM	234.84	4	11	11	1	2	40	0	13	58	2	71.56	82.25	32437.0	3.56	120.4	N/R	N/R	1.90	125.5				
09-14	Jun. 2/14	11:10AM	89.19	4	11.5	11.5	1	10	116	0	25	67	0	N/A	16.00	21379.4	N/R	N/R	N/R	N/R	N/R	N/R				
10-14	Jun. 11/14	12:00PM	89.18	4	11.5	11.5	1	8	155	0	25	67	0	N/A	13.50	26185.5	N/R	N/R	1.78	0.88	3.43	111.5				
11-14	Jun. 17/14	12:07PM	237.42	4	11	11	1	2	43	0	13	110	2	76.29	82.50	34975.7	3.05	114.9	2.16	118.6	N/R	N/R				
12-14	Jun. 24/14	11:11AM	65.25	4	11.5	11.5	1	14	164	0	25	67	0	N/A	13.50	24294.3	N/R	N/R	N/R	N/R	3.05	111.2				
13-14	Jul. 7/14	12.18PM	240.79	4	11	11	1	1	34	0	13	0	2	70.83	80.50	26984.8	2.92	116.9	N/R	N/R	1.78	124.1				
14-14	Jul. 15/14	11:57AM	55.74	4	11.5	11.5	1	8	210	0	25	67	0	N/A	11.25	25458.1	N/R	N/R	N/R	N/R	N/R	N/R				
15-14	Jul. 21/14	12:07PM	240.79	4	11	11	1	1	35	0	13	0	2	77.04	83.50	28813.7	4.57	123.4	1.02	124.2	N/R	N/R				
16-14	Aug. 1/14	12:02PM	240.79	4	11	11	1	1	29	0	13	0	2	78.28	82.75	23659.8	3.68	126.6	N/R	N/R	1.90	127.0				
17-14	Aug. 14/14	11:34AM	77.29	4	11.5	11.5	1	7	155	0	25	84	0	N/A	12.50	20878.4	1.78	106.0	1.27	104.2	1.02	100.0				
18-14	Aug. 20/14	11:55AM	49.05	4	11.5	11.5	1	9	166	0	25	67	0	N/A	11.50	23669.3	N/R	N/R	1.02	88.0	N/R	N/R				
19-14	Aug. 25/14	1:52PM	204.67	4	11	11	1	1	35	0	13	0	2	76.73	85.00	29331.3	3.30	129.4	2.16	132.2	N/R	N/R				
20-14	Aug. 28/14	12:15PM	77.29	4	11.5	11.5	1	9	190	0	25	84	0	N/A	12.50	25592.8	N/R	N/R	1.40	103.5	1.02	101.0				
21-14	Sept. 4/14	12:11PM	62.43	4	11.5	11.5	1	17	187	0	25	67	0	N/A	13.00	26336.4	N/R	N/R	N/R	N/R	5.08	111.8				
22-14	Sept. 10/14	12:47PM	176.58	4	11.5	11.5	1	14	186	0	25	67	0	N/A	12.75	25555.1	N/R	N/R	1.02	94.0	8.64	127.9				
23-14	Sept. 16/14	12:12PM	204.14	4	11.5	11.5	1	2	37	0	13	97	2	71.70	83.50	33292.2	5.21	128.4	1.40	133.4	1.40	134.6				
24-14	Sept. 24/14	11:59AM	40.13	4	11.5	11.5	1	9	141	0	25	84	0	N/A	12.75	19509.8	N/R	N/R	N/R	N/R	2.92	107.0				
25-14	Sept. 24/14	12:10PM	62.43	4	11.5	11.5	1	7	73	0	25	67	0	N/A	13.00	10226.3	N/R	N/R	N/R	N/R	10.70	113.3				
26-14	Oct. 2/14	1:40PM	240.79	4	11.5	11.5	1	2	60	0	13	97	2	74.93	85.25	55107.0	4.32	131.8	1.65	124.2	1.27	128.6				
27-14	Oct. 7/14	12:23PM	60.20	4	11.5	11.5	1	10	172	0	25	67	0	N/A	12.75	23631.6					6.86	116.4				
28-14	Oct. 22/14	11:54AM	255.65	4	11.5	11.5	1	2	31	0	13	97	2	73.73	87.75	29313.2	6.22	128.0	2.03	128.4	1.40	119.2				
29-14	Oct. 31/14	12:02PM	62.43	4	11.5	11.5	1	9	231	0	25	67	0	N/A	13.00	33340.7	N/R	N/R	3.17	104.9	3.68	112.3				
30-14	Nov. 5/14	12:02PM	246.74	4	11.5	11.5	1	2	35	0	13	97	2	74.69	87.00	32812.7	4.57	118.6	1.02	127.1	1.65	126.7				
31-14	Nov. 11/14	12:00PM	237.82	4	11.5	11.5	1	2	28	0	13	110	2	72.85	81.75	24666.1	3.56	130.6	N/R	N/R	N/R	N/R				
32-14	Nov. 24/14	12:08PM	246.74	4	11.5	11.5	1	2	26	0	13	97	2	74.88	88.75	24865.5	3.81	128.7	1.02	98.8	1.90	101.0				
33-14	Nov 27/14	11:55AM	71.34	4	11.5	11.5	1	7	232	0	24	84	0	N/A	14.00	35000.2	N/R	N/R	3.56	94.0	4.83	115.9				



SIESMIC REPORT SUMMARY

				<u>Hole</u>	<u>Patte</u>	<u>ern</u>																		
			<u>Max</u>	Dia.	Spacing	<u>Burden</u>	<u># Of</u>	# Of	# Of	Time	Betwee	<u>n (ms.)</u>	<u>Sub</u>	Ave.	Ave Hole	<u>Total</u>	<u>Monit</u>	tor 1	<u>Monit</u>	tor 2	<u>Moni</u>	tor 3	Monito	<u>or 4</u>
Shot #	<u>Date</u>	<u>Time</u>	Kg/Delay	<u>(in.)</u>	<u>(ft.)</u>	<u>(ft.)</u>	<u>Decks</u>	Rows	<u>Holes</u>	<u>Decks</u>	<u>Holes</u>	Rows	<u>Drill</u>	<u>Water</u>	<u>Depth</u>	<u>Tons</u>	(mm/s)	<u>(dbl.)</u>	(mm/s)	<u>(dbl.)</u>	(mm/s)	<u>(dbl.)</u>	(mm/s)	<u>(dbl.)</u>
34-14	Dec. 2/14	11:57AM	246.74	4	11.5	11.5	1	2	59	0	13	97	2	71.46	83.75	52344.1	4.83	129.6	2.03	127.5	1.40	132.8		
35-14	Dec. 9/14	11:50AM	89.60	4	11.5	11.5	1	9	179	0	25	67,84	0	N/A	13.00	25215.7	1.14	104.9	2.16	88.0	4.83	116.7		



SIESMIC REPORT SUMMARY

				<u>Hole</u>	<u>Patt</u>	<u>ern</u>																		
			<u>Max</u>	<u>Dia.</u>	Spacing	<u>Burden</u>	# Of	<u># Of</u>	<u># Of</u>	<u>Time</u>	Betweer	n (ms.)	<u>Sub</u>	Ave.	Ave Hole	<u>Total</u>	<u>Moni</u>	tor 1	<u>Monit</u>	tor 2	<u>Moni</u>	tor 3	Monitor	4
Shot #	<u>Date</u>	<u>Time</u>	Kg/Delay	<u>(in.)</u>	<u>(ft.)</u>	<u>(ft.)</u>	<u>Decks</u>	Rows	<u>Holes</u>	<u>Decks</u>	<u>Holes</u>	Rows	<u>Drill</u>	<u>Water</u>	<u>Depth</u>	<u>Tons</u>	(mm/s)	<u>(dbl.)</u>	(mm/s)	<u>(dbl.)</u>	(mm/s)	<u>(dbl.)</u>	(mm/s) (d	dbl.)
01-15	Apr. 2/15	12:00PM	225.93	4	11.5	11.5	1	2	24	0	13	84	2	73.37	82.00	21207.0	2.41	115.6	1.52	94.0	2.29	125.6		
02-15	Apr. 9/15	11:57AM	35.67	4	11.5	11.5	1	19	121	0	25	84	0	N/A	12.00	17198.4	1.27	117.1	2.16	0.88	2.16	126.7		
03-15	Apr. 21/15	12:05PM	11.9	4	11.5	11.5	1	20	114	0	25	84	0	N/A	10.00	14763.0	11.78	104.2	1.02	98.8	N/R	N/R		
04-15	Apr. 23/15	12:03PM	225.93	4	11.5	11.5	1	2	23	0	13	123	2	75.04	81.00	20075.5	4.06	123.2	1.78	122.4	2.79	124.8		
07-15	May. 15/15	11:54AM	49.05	4	11.5	11.5	1	19	159	0	25	67	0	N/A	14.25	25644.0	1.78	103.5	1.4	103.5	N/R	N/R		
08-15	May. 22/15	11:51AM	120.39	4	11.5	11.5	1	12	153	0	25	67	0	N/A	19.50	32150.0	1.02	104.9	1.27	105.5	1.52	101.9		
09-15	May 28 2015	12:02PM	222.95	4	11.5	11.5	1	2	28	0	13	110	2	70.42	28.00	23534.6	3.81	116.6	N/R	N/R	1.02	122.3		
10-15	June 2 2015	12:01PM	246.74	4	11.5	11.5	1	1	15	0	13	0	2	80.27	92.75	14992.0	3.3	122.9	1.02	95.9	1.78	125		
11-'15	June 10/15	11:50AM	225.92	4	11.5	11.5	1	2	30	0	13	110	2	70.86	77.25	24793.2	4.32	119.8	1.02	114.2	2.79	123.4		
12-'15	June 12/15	12:18PM	98.1	4	11.5	11.5	1	13	254	0	25	67	0	N/A	17.00	47629.6	1.78	125.5	3.81	133.0	1.40	128.2		
13-'15	June 17/15	12:03PM	255.65	4	11.5	11.5	1	2	35	0	13	130	2	83.00	92.00	34698.5	4.83	125.3	1.27	122	11.52	130.7		
14-'15	July 8/15	12:02PM	214.04	4	11.5	11.5	1	2	29	0	13	123	2	71.64	77.00	24062.6	3.17	117.2	N/R	N/R	2.67	124.1		
15'-15'	July 13/15	12:02PM	275.20	4	11.5	11.5	1	2	38	0	13	38	2	77.87	88.50	36239.4	4.32	124.3	N/R	N/R	1.40	129.2		
16-'15	July 30/15	12:00PM	214.04	4	11.5	11.5	1	6	29	0	13	29	2	75.38	77.75	24297.0	2.29	130.7	N/R	N/R	2.92	112.6		
17-'15	Aug 19/15	12:02PM	246.74	<u>4</u>	11.5	11.5	1	2	44	0	13	182	2	75.75	86.25	39827.8	3.68	126.3	1.4	126.9	N/R	N/R		
18'-15'	Aug 26/15	12:01PM	120.49	4	11.5	11.5	1	9	242	0	25	84	0	N/A	19.50	51061.7	1.27	107	2.03	108.4	N/R	N/R		
19'-15'	Sept 1/15	12:01PM	217.01	4	11.5	11.5	1	3	34	0	13	68	2	70.87	78.50	28761.0	4.19	130.5	1.02	91.5	N/R	N/R		
20'-15'	Sept10/15	11:19AM	115.94	4	11.5	11.5	1	9	153	0	25	67	0	N/A	19.00	31325.6	N/R	N/R	1.40	106.0	N/R	N/R		
21'-15	Oct 6/15	12:03PM	237.82	4	11.5	11.5	1	3	25	0	13	45	2	72.72	82.50	22225.4	5.08	121.1	1.78	88	1.02	123.0		
22-15	Oct 21/15	12:03PM	225.93	4	11.5	11.5	1	5	32	0	13	45	2	73.28	80.50	27758.7	6.6	134.3	1.78	91.5	3.94	130.9		



BLAST REPORT SUMMARY

			<u>Blast</u>				<u> </u>	lole Dia	<u># Of</u>	# Of	Ave.	Ave Hole	<u>Total</u>	<u>Moi</u>	nitor 1		<u>Mc</u>	onitor 2		<u>Mo</u>	nitor 3	
Blast #	<u>Date</u>	<u>Time</u>	<u>Location</u>	<u>Weather</u>	Wind From M	Vind Velocity	<u>Terrain</u>	<u>(in.)</u>	Rows	<u>Holes</u>	Water	<u>Depth</u>	<u>Tons</u>	<u>Location</u>	(mm/s)	<u>(dbl.)</u>	Location	(mm/s)	<u>(dbl.)</u>	<u>Location</u>	(mm/s)	<u>(dbl.)</u>
01-16	Apr. 8/16	1:01PM	Buldge #2 Side R	d				4	2	40	55.25	70.00	27605.9	2479 #2 Side F	N/R	N/R	SW Corner	N/R	N/R	2450 #2 Side	R 2.29	113.5
02-16	Apr. 19/16	12:28PM	NE Face					4	2	27	69.37	81.00	23567.0	2470 #2 Side F	N/R	N/R	SW Corner	1.65	97.5	Colling Rd	1.14	123.1
03-16	May 4/16	12:00PM	Buldge #2 Side R	d				4	2	42	51.86	67.75	28054.0	2470 #2 Side F	1.40	112.0	SW Corner	12.80	118.1	Colling Rd	2.41	116.6
04-16	May 9/16	12:00PM	NE Face	Partly Cloudy 140	East	5 KPH	Rough	4,4.5	2	26,1	75.35	84.25	23604.7	2450 #2 Side R	3.43	118.8	SW Corner	1.65	91.5	Colling Rd	3.17	129.5
05-16	May 18/16	12:06PM	Pit Floor	Clear 15c	East	10 KPH	Flat	4	16	272	N/A	15.00	43965.8	2450 #2 Side F	N/R	N/R	SW Corner	2.92	105.5	Colling Rd	1.65	111.5
06-16	May 24/16	12:01PM	Pit Floor	Clear 27c	West	15 KPH	Flat	4	14	152	N/A	16.50	27026.0	2450 #2 Side F	1.02	109.5	SW Corner	2.41	95.9	Colling Rd	3.81	106.0
07-16	May 30/16	2:41PM	NE Face	Partly Cloudy 250	West	10 KPH	Uneven	4,4.5	3	46,3	70.40	79.50	41977.6	2450 #2 Side F	3.94	124.9	SW Corner	1.14	125.0	Colling Rd	2.67	124.6
08-16	Jun 3/16	12:00PM	Buldge #2 Side R	coartly Coludy 230	East	10 KPH	Slope	4	2	43	50.39	63.75	27026.7	2450 #2 Side F	1.52	113.3	SW Corner	5.71	114.8	Colling Rd	1.90	115.9
16-09	Jul 5/16	12:00PM	N Face	Partly Cloudy 31	West	15KPH	Flat	4	3	20	74.74	83.00	17888.0	2450 #2 Side F	2.79	123.6	SW corner	N/R	N/R	Colling Rd	N/R	N/R
16-10	Jul 5/16	12:01PM	NE Face	Partly Cloudy 31	West	15kKPH	Flat	4	1	10	62.20	74.25	8001.1	2450 #2 Side F	4.06	122.1	SW Corner	N/R	N/R	Colling Rd	1.90	128.3
16-11	Jul 12/16	12:38PM	Pit Floor	Clear 32	Southwest	15KPH	Flat	4	14	248	N/A	19.00	50776.2	NOT USED			SW Corner	1.02	106	Colling Rd	4.06	105.5
16-12	Jul 15/16	12:00PM	Bulge#2 Side Ro	d Partly Cloudy 27	West	25KPH	Flat	4	3	31	45.40	57.75	17650.5	2450 #2 Side F	1.14	88	SW Corner	4.44	117.4	Colling Rd	1.52	110.9
16-13	Jul 20/16	11:55PM	Pit Floor	Clear 29	West	10KPH	Flat	4.5	14	202	N/A	17.50	39035.8	2450 #2 Side F	N/R	N/R	SW Corner	2.54	103.5	Colling Rd	2.41	106
16-14	Jul 22/16	12:00PM	N Face	Partly Cloudy 33	Northwest	25KPH	Flat	4	3	21	61.50	73.50	16632.6	2450 #2 Side F	2.92	118.1	SW Corner	N/R	N/R	Colling Rd	1.40	124.5
16-15	Aug 4/16	12:00PM	Bulge#2 Side Ro	d Clear 31	Southwest	10KPH	Flat	4	3	35	43.85	58.00	20014.3	2450 #2 Side F	1.40	108.8	SW Corner	3.05	117.9	Colling Rd	1.02	113.8
16-16	Aug 9/16	12:00PM	N Face	Partly Cloudy 31	South	15KPH	Uneven	4,4.5	3	45	66.05	77.50	37581.0	2450 #2 Side F	2.29	115.7	SW Corner	1.4	118.8	Colling Rd	2.16	127.5
16-17	Aug 30/16	12:00PM	N Face	Clear	West	15KPH	Uneven	4	3	41	64.95	80.00	35345.0	2450 #2 Side F	3.05	120.0	SW Corner	N/R	N/R	Colling Rd	1.78	128.8
16-18	Sep 20/16	12:01PM	NE Face	Clear	Northwest	10KPH	Flat	4,4.5	3	47	41.90	47.50	24057.3	2450 #2 Side F	2.52	127.2	SW Corner	N/R	N/R	Colling Rd	1.78	117.4
16-19	Oct 6/16	11:55AM	N Face	Clear	South	10KPH	Flat	4,4.5	2	41	38.78	45.75	20212.9	2450 #2 Side F	2.67	124.3	SW Corner	2.29	91.5	Colling Rd	1.65	114.4
16-20	Oct 12/16	11:47AM	NE Face	Clear	South	20KPH	Downslope	4,4.5	6	27	60.00	71.75	20872.3	2450 #2 Side F	4.57	122.1	SW Corner	1.52	88	Colling Rd	2.03	122.9
16-21	Oct 24/16	11:59AM	Bulge#2 Side Ro	Partly Cloudy 11	Northwest	25KPH	Uneven	4	4	29	45.68	59.25	16940.7	2450 #2 Side F	3.05	111.2	SW Corner	4.06	123.4	Colling Rd	2.41	109.9
17-01	Apr 11/17	11:56AM	Bulge#2 Side Ro	d Partly Cloudy 20	Southwest	20KPH	Uneven	4	5	26	50.33	58.25	26417.9	2450 #2 Side F	2.55	111.5	SW Corner	N/R	N/R	Colling Rd	N/R	N/R
17-02	Apr 18/17	11:53AM	N Face	Clear	East	15KPH	Flat	4	3	13	72.82	80.50	21384.4	2450 #2 Side F	3.56	125.0	SW Corner	0.18	124.1	Colling Rd	N/R	N/R
17-03	April 21/17	11:53AM	Low Bench	Rain	West	22KPH	Flat	4,4.5	3	50	39.38	44.75	21133.9	2450 #2 Side F	3.56	122.9	SW Corner	1.02	116.7	Colling Rd	N/R	N/R
17-04	May 1/17	11:52AM	Bulge#2 Side Ro	d Rain	East	15KPH	Downslope	4	3	32	N/A	69.70	17585.0	2450 #2 Side F	3.05	108.0	SW Corner	2.03	88	Colling Rd	N/R	N/R
17-05	May 15/17	12:35PM	Bulge#2 Side Ro	d Clear	Northwest	10KPH	Downslope	4	3	34	N/A	74.00	21062.0	2450 #2 Side F	3.82	111.5	SW Corner	3.30	95.9	Colling Rd	0.13	88.0
17-06	May 17/17	11:53AM	Low Bench	Cloudy26	Southwest	40KPH	Flat	4,4.5	2	42	N/A	41.20	15010.0	2450 #2 Side F	N/R	N/R	SW Corner	N/R	N/R	Colling Rd	1.14	111.8
17-07	May 29/17	12:00PM	Bulge#2 Side Ro	d Cloudy23	West	10KPH	Flat	4	3	32	N/A	72.00	21440.0	2450 #2 Side R	1.42	98.8	SW Corner	1.52	88	Colling Rd	6.10	91.5
17-08	Jun 1/17	2:30PM	Low Bench	Clear	Southwest	25KPH	Flat	4	4	86	N/A	37.30	29085	2450 #2 Side F	5.84	101.0	SW Corner	N/R	N/R	Colling Rd	3.81	91.5
17-09	June 8/17	11:55PM	Bulge#2 Side Ro	d Clear	Southeast	5KPH	Flat	4	3	30	N/A	79.40	20898	2450 #2 Side R	3.30	94.0	SW Corner	2.41	88	Colling Rd	N/R	N/R



BLAST REPORT SUMMARY

			<u>Blast</u>				<u> </u>	lole Dia	# Of	# Of	Ave.	Ave Hole	<u>Total</u>	<u>Mor</u>	nitor 1		<u>Mc</u>	nitor 2		<u>Mc</u>	nitor 3	
Blast #	<u>Date</u>	<u>Time</u>	<u>Location</u>	<u>Weather</u>	Wind From V	Vind Velocity	<u>Terrain</u>	<u>(in.)</u>	Rows	<u>Holes</u>	Water	<u>Depth</u>	<u>Tons</u>	<u>Location</u>	(mm/s)	(dbl.)	Location	(mm/s)	(dbl.)	Location	(mm/s)	<u>(dbl.)</u>
17-01	April 11/17	11:56AM	Bulge#2 Side Rd	Part Cloudy20	Southwest	20KPH	Uneven	4	5	26	50.33	58.25	26417.9	2450#2 Side R	2.55	111.5	SW Corner	N/R	N/R	Colling Rd	N/R	N/R
17-02	April 18/17	11:53AM	North Face	Clear	East	15KPH	Flat	4	3	13	72.82	80.50	21384.4	2450#2 Side R	3.56	125	SW Corner	0.18	124.1	Colling Rd	N/R	N/R
17-03	April 21/17	11:53AM	Low bench	Rain	West	22KPH	Flat	4,4.5	3	50	39.38	44.75	21133.9	2450#2 Side R	3.56	122.9	SW Corner	1.02	116.7	Colling Rd	N/R	N/R
17-04	May 1/17	11:52AM	Bulge#2 Side Rd	Rain	East	15KPH	Downslope	4	3	32	N/A	69.70	17585.0	2450 #2 Side R	3.05	108	SW Corner	2.03	88	Colling Rd	N/R	N/R
17-05	May 15/17	12:35PM	Bulge#2 Side Rd	Clear	Northwest	10KPH	Downslope	4	3	34	N/A	74.00	21062.0	2450#2 Side R	3.82	111.5	SW Corner	3.3	95.9	Colling Rd	0.13	88.0
17-06	May 17/17	11:53AM	Low bench	Cloudy 26	Southwest	40KPH	Flat	4,4.5	2	42	N/A	41.20	15010.0	2450#2 Side R	N/R	N/R	SW Corner	N/R	N/R	Colling Rd	1.14	111.8
17-07	May 29/17	12:00PM	Bulge#2 Side Rd	Cloudy 23	West	10KPH	Flat	4	3	32	N/A	72.00	21440.0	2450#2 Side R	1.42	98.8	SW Corner	1.52	88.0	Colling Rd	6.10	91.5
17-08	June 1/17	2:30PM	Low bench	Clear	Southwest	25KPH	Flat	4	4	86	N/A	37.30	29085.0	2450#2 Side R	5.84	101	SW Corner	N/R	N/R	Colling Rd	3.81	91.5
17-09	June 8/17	11:55AM	Bulge#2 Side Rd	Clear	Southeast	5KPH	Flat	4	3	30	N/A	79.40	20898.0	2450#2 Side R	3.3	94	SW Corner	2.41	88	Colling Rd	N/R	N/R
17-11	June 20/17	12:02PM	Bulge#2 Side Rd	Part Cloudy22	Southwest	10KPH	Flat	4	3	36	N/A	84.10	23583.0	2450#2 Side R	2.03	108.4	SW Corner	2.41	101.9	Colling Rd	N/R	N/R
17-10	June 21/17	12:35PM	Low bench	Part Cloudy21	West	10KPH	Flat	4,4.5	3	84	N/A	40.80	25680.0	2450#2 Side R	N/R	N/R	SW Corner	N/R	N/R	Colling Rd	did not	use
17-12	June 26/17	1:00PM	Floor	Part Cloudy	Southwest	15KPH	Flat	4	12	252	N/A	16.00	40014.0	2450#2 Side R	6.22	91.5	SW Corner	1.78	88	Colling Rd	N/R	N/R
17-14	July 4/17	12:46PM	North Face	Part Cloudy	Southeast	10KPH	Flat	4,4.5	3	36	N/A	57.95	33601.0	2450#2 Side R	12.20	95.9	SW Corner	4.19	88.0	Colling Rd	1.27	88
17-13	July 10/17	1:40PM	Floor	Part Cloudy	Southwest	10KPH	Flat	4	11	295	N/A	16.70	48920.0	2450#2 Side R	2.16	91.5	SW Corner	4.22	88.0	Colling Rd	1.02	104.2
17-15	July 25/17	11:57AM	Low Bench	Part Cloudy	NorthEast	5KPH	Flat	4	4	52	N/A	42.00	15057.0	2450#2 Side R	3.56	91.5	SW Corner	2.16	88	Colling Rd	1.14	112.8
17-17	August 3/17	12:41PM	North Face	Part Cloudy	North	0.00	Flat	4,5	4	23	N/A	77.10	11832.0	2450#2 Side R	2.92	88	SW Corner	1.27	88	Colling Rd	N/R	N/R
17-18	August 28/17	12:32PM	Floor	Partly Cloudy	West	5KPH	Flat	4	8	188	N/A	17.70	26351.0	2450 #2 Side R	4.70	104.9	SW Corner	3.3	88	Colling Rd	1.14	107.5
17-16	August 30/17	12:01PM	Bulge#2 Side Rd	Partly Cloudy	Southwest	5KPH	Flat	4	3	28	N/A	84.30	16211.0	2450 #2 Side R	1.52	91.5	SW Corner	1.52	92.0	Colling Rd	N/R	N/R
17-19	ptember 12 20	11:49AM	Low bench	Partly Cloudy	Southeast	10KPH	Flat	4	3	37	N/A	38.90	21101.0	2450 #2 Side R	2.92	88.0	SW Corner	1.90	94	Colling Rd	1.02	114.6
17-22	eptember26/1	11:56AM	Low bench	Partly Cloudy	South	5KPH	Flat	4	5	62	N/A	38.80	19349.0	2450 #2 Side R	1.65	88.0	SW Corner	1.65	88	Colling Rd	1.14	115.6
17-20	eptember 27/1	12:01PM	Bulge#2 Side Rd	Partly Cloudy	West	10KPH	Flat	4,4.5	3	40	N/A	81.90	27877.0	2450 #2 Side R	2.54	103.5	SW Corner	3.17	88	Colling Rd	N/R	N/R
17-23	October 6/17	11:53AM	Upper Middle	Partly Cloudy	North	10KPH	Flat	4,4.5	3	34	N/A	77.20	21365.0	2450 #2 Side R	3.43	95.9	SW Corner	3.05	94	Colling Rd	1.27	88.0
17-24	October 11/17	12:41PM	Bulge#2 Side Rd	Rain	East	20KPH	Flat	4,4.5	3	45	N/A	81.70	30695.0	2450 #2 Side R	0.38	91.5	SW Corner	4.95	122.4	Colling Rd	N/R	N/R
17-25	October 30/17	11:55AM	Low bench	Partly Cloudy	West	35KPH	Flat	4	9	41	N/A	39.10	11407.0	2450#2 Side R	1.14	122.8	SW Corner	N/R	N/R	Colling Rd	N/R	N/R



BLAST REPORT SUMMARY

			<u>Blast</u>					Hole Dia	# Of	# Of	Ave.	Ave Hole	Total	<u>Mor</u>	nitor 1		<u>Mc</u>	nitor 2		Mo	nitor 3	
Blast#	<u>Date</u>	<u>Time</u>	<u>Location</u>	<u>Weather</u>	Wind From W	ind Velocity	<u>Terrain</u>	<u>(in.)</u>	Rows	<u>Holes</u>	Water	<u>Depth</u>	<u>Tons</u>	<u>Location</u>	(mm/s)	(dbl.)	Location	(mm/s)	(dbl.)	Location	(mm/s)	(dbl.)
18-001	Apr 9/18	11:56 AM	Upper Middle	Part Cloudy	Southeast	5KPH	Flat	4	3	49	N/A	75.50	27194.0	2450#2 Side R	3.60	115.3	SW Corner	1.2	119.7	Colling Rd	0.4	121.9
18-002	Apr 11/18	11:16AM	Floor	Overcast	Southwest	10KPH	Flat	4	9	180	N/A	10.00	19279.0	2450#2 Side R	DNT	DNT	SW Corner	2	88.4	Colling Rd	N/A	N/A
18-003	Apr 18/18	10:54	Lower middle	Overcast	West	10KPH	Flat	4	4	39	N/A	40.10	11087.0	2450#2 Side R	2.70	119.7	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-004	May 22/18	12:02PM	Upper Middle	Overcast	SouthEast	5KPH	Flat	4,4.5	3	49	N/A	75.50	26332.0	2450#2 Side R	3.3	124.3	SW Corner	0.3	39.1	Colling Rd	0.30	123.1
18-005	June 4/18	11:50AM	Lower middle	Overcast	West	15KPH	Flat	4	8	67	N/A	44.20	20811.0	2450#2 Side R	N/R	N/R	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-006	June 6/18	12:10PM	Lower middle	Overcast	West	5KPH	Flat	4	11	61	N/A	41.70	17948.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-007	June 11/18	11:56AM	Upper Middle	Part Cloudy	East	15KPH	Flat	4,4.5	4	55	N/A	73.10	28467.0	2450#2 Side R	2.70	116.9	SW Corner	0.10	119.6	Colling Rd	0.20	120.2
18-008	June 13/18	11:52AM	Lower middle	Part Cloudy	West	10KPH	Sloped	4	7	89	N/A	50.00	28929.0	2450#2 Side R	1	120.6	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-009	June 25/18	12:01PM	Lower middle	Clear	Southeast	10KPH	Flat	4	13	99	N/A	35.30	25983.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-010	July 5/18	11:51AM	Upper Middle	Clear	Southwest	5KPH	Flat	4	3	53	N/A	76.00	30963.0	2450#2 Side R	2.30	115.9	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-011	20-Jul	11:59AM	Lower middle	Part Cloudy	East	5KPH	Flat	4	15	125	N/A	26.00	24173.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-012	Aug 3/18	11:52AM	Upper Middle	Part Cloudy	none	0	Flat	4,5	3	46	N/A	76.40	27176.0	2450#2 Side R	2.4	115	SW Corner	0.01	117.1	Colling Rd	0.01	116.4
18-013	Aug 14/18	10:54AM	Floor	Part Cloudy	South	5.00	Flat	4	11	182	N/A	10.00	17069.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-014	Aug 30/18	11:55AM	Upper Middle	Part Cloudy	NorthEast	5KPH	Flat	4,5	3	58	N/A	75.20	31778.0	2450#2 Side R	3.7	113.3	SW Corner	2.00	93.2	Colling Rd	DNT	DNT
18-015	Sept 10/18	11:49AM	Floor	Rain	East	15KPH	Flat	4	9	204	N/A	11.50	22269.0	2450#2 Side R	DNT	DNT	SW Corner	NSU	NSU	Colling Rd	0.1	118
18-018	Sept 21/18	12:34PM	Floor	Part Cloudy	Southwest	15KPH	Flat	4	21	345	N/A	11.20	38483.0	2450#2 Side R	DNT	DNT	SW Corner	NSU	NSU	Colling Rd	DNT	DNT
18-017	Oct 2/18	12:02PM	Upper Middle	Rain	Sourhwest	5KPH	Flat	4	3	48	N/A	76.40	26868.0	2450#2 Side R	5.30	114.2	SW Corner	0.5	123.5	Colling Rd	0.20	121.6
18-016	Oct 10/18	12:24PM	Lower middle	Part Cloudy	East	5KPH	Flat	4	5	100	N/A	61.80	44223.0	2450#2 Side R	DNT	DNT	SW Corner	DNT	DNT	Colling Rd	DNT	DNT
18-019	Nov 1/18	11:57AM	Upper Middle	Rain	None	0.00	Flat	4,4.5	5	50	N/A	73.40	27342.0	2450#2 Side R	5.70	116.3	SW Corner	1.80	114.2	Colling Rd	0.30	118.8
18-020	Nov11/18	11:57AM	Floor	Cloudy	West	5KPH	Flat	4	12	251	N/A	11.00	24552.0	2450#2 Side R	2.00	110.4	SW Corner	DNT	DNT	Colling Rd	0.00	0.0

ORICA The Blasting Professionals
page 1 Bla
GP:
Wind f
Clea Partly Cloud
- Drilling

Blast Report

Quarry:	Burlington
P.O. #:	
Blast Date:	2019-05-28

Blast Number:	19-006
Orica Order #:	2487394
Blast Time:	11:09 AM

	D.00.	· ··opo· ·			P.O. #:		Orica Order #:	248	37394		
The Blasting Professionals	Nelsor	n Aggregate			Blast Date:		Blast Time:	11:0	09 AM	1	
age 1 Blaste						7	T 51	10.700	. [7.045	
Blaste	er-in-charge:	Mike	der K	indere	en	(Print Name)	Tonnes Blasted:			7,215	Poto
DI	ast Location:	l lanea A	A: al all a	Niamble I		7(5) (5)	Total tonnes per day: Total Holes Loaded:		te holes	NB60-08	Code
		Upper N				(Bench / Face)			Dead	l lalaa	
GP3 (43.40506 '	°N Lati	ilude	79.88187 Centre of Blast	°W Longitude	including: and:			r Holes	
	Ce	sille of blast			Centre or blast		Helper Hole Collar:		ft avg	Holes	
Wind fror	n the: NE at	10 kph			Temperature:	6 to 10 °C	# Rows Blasted:		rows		
vvilla iloi	ii liie. INL at				•	01010 0		(Front Row	1		
Clear:		Rain: X	Ovo	rcast:	X		Burden:		ft avg		
Partly Cloudy:		Snow:		rsion:	Ceiling	591 ft	Spacing:		ft avg		
artiy Oloudy.		Onow.	IIIVC	131011.	Celling	391	# Holes:		front r	OW	
- Drilling In:	formation -						-	(Main Body	1	5 **	
Drilling III		e from Vertical			Non	ninal Bit Diameter:	Burden:		ft avg		
Primary Bit			loles:	43	= 2,739.9		Spacing:		ft avg		
Secondary Bit			loles:	4	= 254.9		# Holes:		main k	oodv	
Tertiary Bit			loles:			ft (" diam)	Bench Height:		ft avg	, , ,	
			.0.00.			1	Sub-drill:		ft avg		-0
Bulk Explo	sives:	in (kg)	out ((ka)	kg		Hole Denth:		ft avg		aste
CENTRA GOL		33.740		5.080	8,660		(1)	e Decking -	-		8
		22,112		,,,,,,	2,000		Front Row:		ft avg		/ te
Packaged	Explosives:	cs shipped	cs reti	urned	kg		Main Body:		ft avg		ded
FORTEL PRO	•	2		1	25		# Decks:		per bla	ast	Loa
							0 - 11 -	Stemming			Yield Powder Factor (kg Loaded / te Blastec
							Front Row: Main Body: Material used: - Change Front Row: Main Body: Main Body:		ft avg		tor
Boosters:		kg/ı	unit #	# used	kg		Main Body:		ft avg		Fac
PENTEX 8 (OF	R EQUIVALENT)		0.23	47	10.7		Material used:				Je L
	R EQUIVALENT)		0.34	47	16.0		- Char	ge Length -			OWO
							Front Row:	55.7	ft avg		0
	total explo	sives weight in	n Blast	(kg):	8,712		⊨ Main Body:	55.7	ft avg		₹
	Pkgd F	Prod (25 kg) %	of Tot	tal kg:	0.3%		- Char	ge Weight -			
Detonators	s:	case #'s	m	s	# used		Front Row:	162.5	kg/hol	е	
UNITRONIC 60	00 6M				47		Main Body:				
							Max. per delay:	197.0	kg/del	ay	
UNITRONIC 60	00 25M				47		SD () Equation:		kg/del	ay	
							Total kg Loaded:				
							Rock Density:	2.60	g/cc	= te/m ³	
Cord & Ac			U of		# used			der Factor -			
HARNES	SS WIRE DUPLEX (6 PA	-	uni		1	2.035 lb/yd ³	Yield PF:		0	,	
	MINI STEM PLUGS	- 6015 (4")	uni	its	2	1.306 lb/yd ³	Front row:			(theoretic	,
			uni	its		1.741 lb/yd ³	Main Body:			(theoretic	,
Resource De						1.632 lb/yd ³	"KPI" PF:	0.372	kg/te	(theoretic	cal)
# of Blasts toda	ay (this Quarry)				1	NOTES (ANY VARIATIO					
# of Blasters (th					1		ged product to load though sma	Il seam from 15	5'-9'		
# of Helpers (th		Note Exception			2	We were unable to locat					
# of MMU's (thi	s Blast)				1	After speaking with the o	Iriller we felt confident to continu	ie and load the	blast		
Services:											
BULK TRUCK					1.0						
BLASTER HOU		Enter Blaster ho			5.0						
HELPER HOU		Enter total Helpe			10.0						
SHOT LAYOU		Enter # trips ext	ra beyo	nd 1	0.0						
ADVANCED BI	LAST DESIGN	Enter hours			1.0						
BORETRACK		Enter hours			0.0						



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: 2019-05-28 Blast Date:

Trigger set at: 115 dB

Blast Number: 19-006 Orica Order #: 2487394 Blast Time: 11:09 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40510	79.88190
Front Row Corner	43.40488	79.88179
Back Row Corner	43.40519	79.88193
Average (Centre of Blast)	43.40506	79.88187

(N) Radians	(W) Radians
0.757562	1.394202
0.757558	1.394200
0.757563	1.394203
0.757561	1.394202

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Lo	ng.	(N) Radians	(W) Rad
	1st Reading	43.40245	79.8	7814	0.757516	1.3
	2nd Reading					
	Average	43.40245	79.8	7814	0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	418.9	m			
	Post Blast Data: ppV:	4.2	mm/s Trigger :	set at: 2.0	mm/s	
	frequency:	10.7	Hz V /	T/L: ?	(Vertical, Transverse or L	ongitudinal)

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

air overpressure: **119.6** dB

2450 2nd Line

	0.757516	1.394137
	0.757516	1.394137
am/a		

Enter ° N Lat. Enter ° W Long. 2nd Seismograph Co-ordinates 1st Reading 43.40605 79.89400 2nd Reading Average 43.40605 79.89400 Distance (2nd Seis. From Centre of Blast) **987.1** m Post Blast Data: 0.2 mm/s Trigger set at: 2.0 mm/s

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 394413

8.8 Hz ? (Vertical, Transverse or Longitudinal) V/T/L: frequency: air overpressure: **118.9** dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1414.7	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

ppV: Did Trigger set at: 2.0 mm/s Post Blast Data: mm/s frequency: Not Hz V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= __(418.9)² kg

175,477 kg 900

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike der Kinderen

Signature required, indicating that Blast Report is Complete & Accurate. jim bray



Blast Design

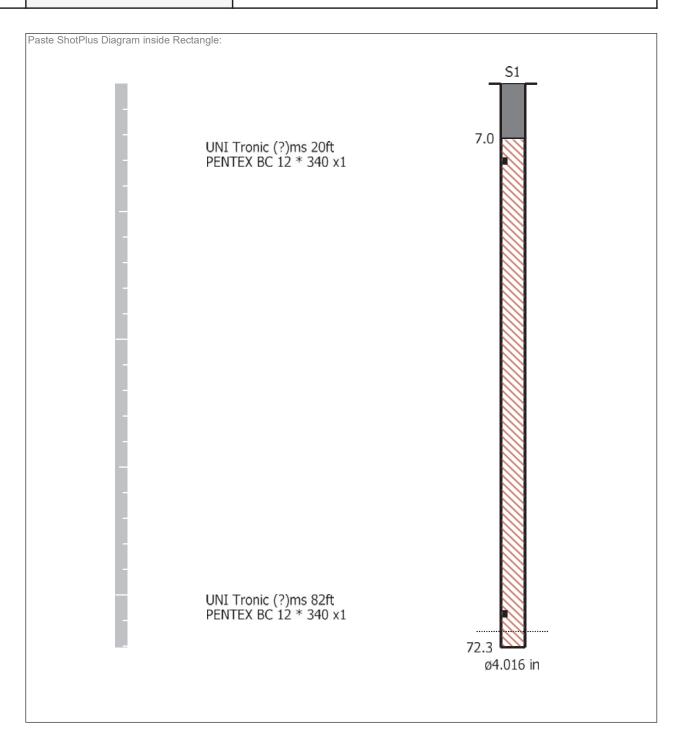
Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 5/28/2019

Blast Number:
Orica Order #:

19-006 2487394

page 2



Orica
Blaster-in-charge: Mike der Kinderen

Quarry Manager: Nick Heap



Event Report



Date/Time Long at 11:09:14 May 28, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 Line 2 Client: Nelson Aggregate User Name: Orica Canada Inc.

General: Burlington

Extended Notes

In front Yard by tree stump N-43.40245, W-79.87814

Microphone Linear Weighting **PSPL** 119.6 dB(L) at 1.301 sec

ZC Freq 2.0 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 562 mv)

	Tran	Vert	Long	
PPV	2.667	3.683	4.191	mm/s
ZC Freq	25	33	10.7	Hz
Time (Rel. to Trig)	0.250	0.482	0.325	sec
Peak Acceleration	0.053	0.106	0.106	g
Peak Displacement	0.030	0.018	0.057	mm
Sensor Check	Check	Check	Check	
Frequency	2.2	2.2	2.2	Hz
Overswing Ratio	226.0	174.0	247.0	

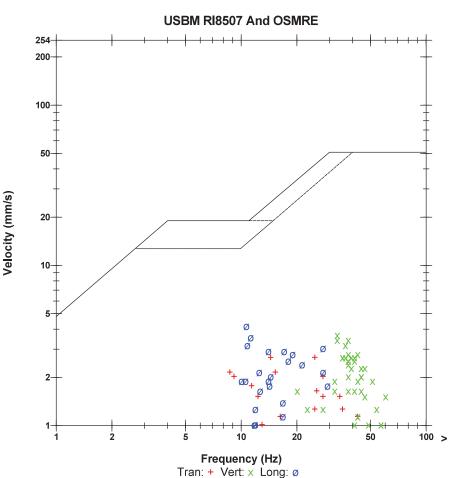
Peak Vector Sum 4.814 mm/s at 0.482 sec

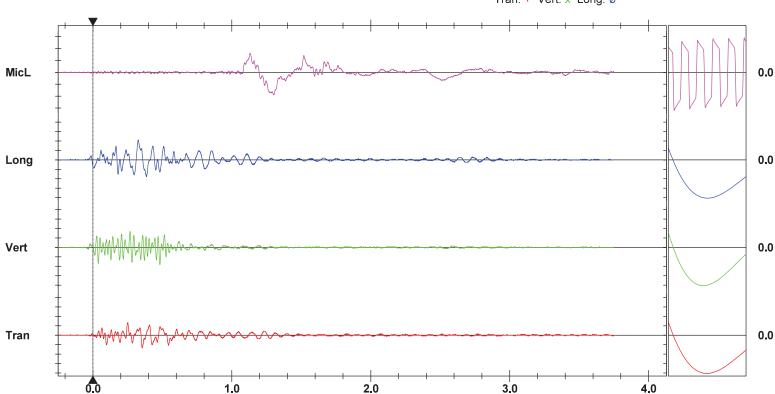
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.2 Volts

Unit Calibration December 4, 2018 by Instantel File Name

__TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check



Event Report

File Name



Date/Time MicL at 11:09:17 May 28, 2019 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.117 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL MMB

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level**

3.8 Volts

Unit Calibration January 15, 2019 by Instantel UM6857_20190528110917.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES** ORICA CANADA User Name:

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

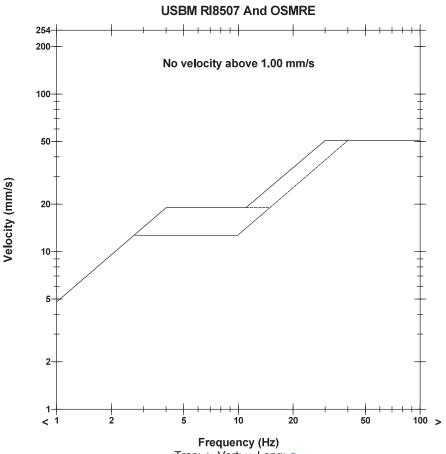
PSPL 118.9 dB(L) at 0.093 sec

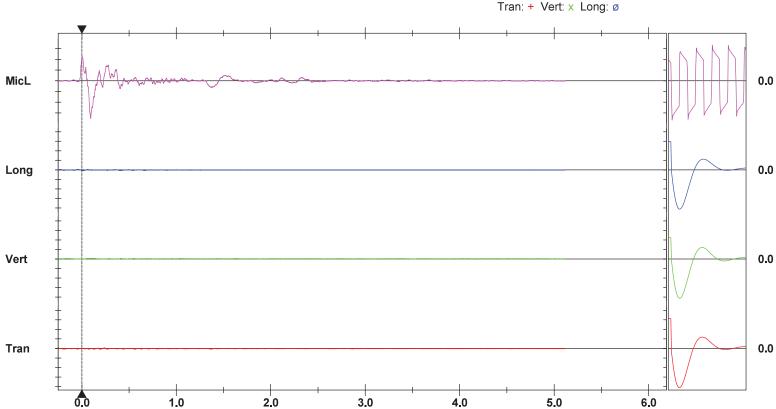
ZC Freq 4.7 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1541 mv)

	Tran	Vert	Long	
PPV	0.142	0.166	0.197	mm/s
ZC Freq	9.6	3.0	8.8	Hz
Time (Rel. to Trig)	0.124	0.103	0.008	sec
Peak Acceleration	0.012	0.010	0.015	g
Peak Displacement	0.026	0.034	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.6	

Peak Vector Sum 0.202 mm/s at 0.008 sec





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶

Sensor Check

Nelson Aggregate Across rod from 2102 Road 2 Burlington 2019-05-28 Blast 19-005

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
		SERIAL NUMBER: UM6859
May 28 /19 05:53:15		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
May 28 /19 05:53:15	May 28 /19 11:40:31	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic:

Printed: May 28, 2019 (V 10.72 - 10.74)

					U)	SHOTPlus 5 Plan	, Plan					
			400			Blast Summary Data	ry Data			100		
		Burdt 1st rc Total	Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 2994.8ft		Spacing: 10.0ft Hole Diameter: 4.0in		Subdrill: 2.0ft Number of holes: 47		Stemming: 7.0ft Hole angle: 0.0°	7.0ft 0.0°		
											7	
					open	open face	a v				+ POST HOLES	
138 117 114 • 114 •	96	75	54	33	, mo	24	+ 45	99	84	108 105 151 148	172 169 219 216	
207	186	165	144	123	93	111	135	156 153	177	198 3 195 3	309 ●	
	276 273	255	234	213	183 180	201	225	246	267	288 378 285 375		
			345 324 342 321	303	273	294 291	315	336	357	468 465		
e ,								SHC	NTPlus™	Profession	SHOTPlus™ Professional 5.7.4.4	5/28/2019
SORIC	4							Mine	Mine	Burlington N E CRNR	Burlington N E CRNR NEXT TO UPPER MIDDLE	J. (27 /2
	Not to	Not to scale						File	Title/author Filename	9NECR Burling	9NECRNR005 Design Partial Burlington 2019-05-28 Blast 19-005 Upper Mid)5 Upper Mid

SHOTPlus 5 Plan

Subdrill: 2.0ft Blast Summary Data Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Total drilled: 2994.8ft

Number of holes: 47

Stemming: 7.0ft Hole angle: 0.0°

open face

A14	●66.1ft	A15
	A12 66.0ft	A13
+	411	● 66.0ft
		A10
	+	● A9 ● 64.3ft

HOLES

POST

A15 66.5ft A13 66.5ft

• A8 63.4ft

A7 62.5ft

• A6 62.1ft

● A5 60.9ft

59.3ft

● 57.8ft

A2 56.4ft

● A1 55.7ft

B11 67.0ft ● 66.5ft 65.3ft

€ 66.7ft ●89 65.7ft

B8 65.3ft

64.7ft

B6 63.7ft

B5 62.9ft

B4 61.5ft

B3 59.9ft

● 58.1ft

● B1 ● 57.1ft

4

66.0ft 65.4ft

65.3ft

64.7ft

63.4ft

⊕ C3 ⊕ 62.1ft

€C2 61.1A

59.8ft

C10 C11 67.3ft 68.0ft

D7 66.0ft

D5 65.8ft

● D4 65.3ft

D1 D2 D3 62.2ft 63.1ft 64.0ft

● D6 ● 65.7ft

⊕ D8 66.8ft

67.5ft

9NECRNR005 Design Fnl -3.625 and 4" Blast Holes 12x10 9x10 270.25 $\frac{1}{4}$ DRILLER NAME:

GREEN MARKER STONES 3.625" Blast Holes

5/27/2019 Burlington 2019-05-28 Blast 19-005 Upper Mid N E CRNR NEXT TO UPPER MIDDLE 9NECRNR005 Design Partial SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Location



Not to scale

SHOTPlus 5 Plan

Blast Summary Data

Subdrill: 2.0ft Hole Diameter: 4.0in

Spacing: 10.0ft

1st row burden: 12.0ft Total drilled: 2994.8ft

Burden: 9.0ft

Number of holes: 47

Stemming: 7.0ft Hole angle: 0.0° + POST HOLES

Load Sheet 215Kg Max open face

\$ C8

HH10 6310

061

·184

191. 951. 181. 861.

• 159

591 . (191 91.

161. The hole 961

. 192 OING . 193

0610

C81 - [10] .

061

981 . 181. 891.

98

10

581. Ep1. Ep1. PC1. PP1. HP1. 481. ONIO

ORICA

Not to scale

Burlington 2019-05-28 Blast 19-005 Upper Mid 5/27/2019 N E CRNR NEXT TO UPPER MIDDLE 9NECRNR005 Design Partial SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Mine

Plac	t Danout		Quarry:	Burlington	Blast Number:	19	9-007	
ORICA	t Report		P.O. #:		Orica Order #:	248	80529	
The Blasting Professionals**	n Aggregate		Blast Date:	2019-05-10	Blast Time:	12:	55 PM	
page 1 Blaster-in-charge:	V.	vin Toplio		10:11	Tonnes Blasted:	40,349	4- 15.5	19 m ₃
Biaster-in-charge:	, ke	vin Toplis		(Print Name)	Total tonnes per day:			Rate
Blast Location:		Floor		(Bench / Face)	Total Holes Loaded:		te NF-0	O2 Code
	43.40368	N Latitude	79.88238	°W Longitude	including:		Dead Holes	
	entre of Blast	N Lalliude	Centre of Blast	vv Longitude	including.		Helper Hole	
	onii o oi bidot		oona o o baot		Helper Hole Collar:		ft avg	55
Wind from the: W at	30 kph		Temperature:	11 to 15 °C	# Rows Blasted:		rows	
wind from the.	Х		х	11 10 10		(Front Row	1	
Clear:	Rain:	Overcast:	x		Burden:		ft avg	
Partly Cloudy:	Snow:	Inversion:	Ceiling	2,434 ft	Spacing:		ft avg	
					# Holes:		front row	
- Drilling Information -					- Pattern	(Main Body	1	
	e from Vertical		Nom	ninal Bit Diameter:	Burden:		ft avg	
Primary Bit diam: 101.6 mm		loles: 283	= 4,188.4	ft (4 " diam)	Spacing:		ft avg	
Secondary Bit diam: mm	0 + H	loles:	= 0.0	ft (" diam)	# Holes:		main body	
Tertiary Bit diam: mm	0 + H	loles:	= 0.0		Bench Height:	14.8	ft avg	
-				1	Sub-drill:	0.0	ft avg	-00
Bulk Explosives:	in (kg)	out (kg)	kg		Hole Depth:	14.8	ft avg	aste
CENTRA GOLD 70	34,110	27,740	6,370		- Stone Front Row: Main Body:	e Decking -		e <u>B</u>
					Front Row:		ft avg	Yield Powder Factor (kg Loaded / te Blastec
Packaged Explosives:	cs shipped	cs returned	kg		Main Body:		ft avg	ade
FORTEL PRO 75X400	5	5	0		# Decks:	0	per blast	200
					- Collar	Stemming	_	(X 8
					- Collar Front Row:	7.0	ft avg	ctor
Boosters:	kg / ι	unit # used	kg		Main Body:	7.0	ft avg	Ta
PENTEX 12 (OR EQUIVALENT)		0.34 280	95.2		Material used:	3/4" Stone		/der
					- Charg	ge Length -		Pow
					Front Row:		ft avg	<u>0</u>
·	osives weight in	(0,	6,465		· · · · · · · · · · · · · · · · · · ·		ft avg	;=
	d Prod (0 kg) %	of Total kg:	0.0%			ge Weight -		
Detonators:	case #'s	ms	# used		Front Row:		kg/hole	
UNITRONIC 600 6M			1		Main Body:		kg/hole	
EXEL HANDIDET 9m		25/500	280		Max. per delay:		kg/delay	
CONNECTADET 9M		25 ms	1		SD () Equation:		kg/delay	
CONNECTADET 9M		42 ms	26		Total kg Loaded:		-	3
					Rock Density:	2.60	g/cc = te/r	ทั
Cord & Accessories:		U of M	# used		Powe	der Factor -		
HARNESS WIRE DUPLEX (6 P	A CK) 400M	units	# useu	0.702 lb/yd ³	Yield PF:		kg/te (actua	-I\
HARNESS WIRE DUPLEX (6 P	ACK) 400W			0.692 lb/yd ³	Front row:		kg/te (theor	,
		units		0.692 lb/yd ³	Main Body:		kg/te (theor	,
Resource Deployment:		uiiis		0.692 lb/yd ³	"KPI" PF:		kg/te (theor	,
# of Blasts today (this Quarry)			1	NOTES (ANY VARIATIO		0.100	ng/to (tileof	ouodi)
# of Blasters (this Blast)			1	,	taken out of the shot due to be	ing caved in bo	efore loading	
# of Helpers (this Blast)	Note Exception		2	helper hours: 6.5 hours x		ing caved in De	nore loading.	
# of MMU's (this Blast)	140te Exception		1	Therper Hours, 0.0 Hours X				
Services:			1					
BULK TRUCK CHARGE			1.0					
BLASTER HOURS	Enter Blaster ho	ure	7.5					
HELPER HOURS	Enter total Helpe		13.0					
SHOT LAYOUT FEE	Enter total Helpe		0.0					
ADVANCED BLAST DESIGN	Enter # trips extr	a beyond 1	1.0					
			0.0					
BORETRACK	Enter hours		0.0	<u> </u>				



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-05-10

Blast Number: 19-007
Orica Order #: 2480529
Blast Time: 12:55 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40368	79.88241
Front Row Corner	43.40387	79.88250
Back Row Corner	43.40348	79.88223
Average (Centre of Blast)	43.40368	79.88238

(N) Radians	(W) Radians
0.757537	1.394211
0.757540	1.394213
0.757534	1.394208
0.757537	1.394211

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
	1st Reading	43.40245	79.87814	
	2nd Reading			
	Average	43.40245	79.87814	
	Distance (1st Seis. From Centre of Blast)	369.0	m	
	Post Blast Data: ppV:	did	mm/s Trigger set at:	2

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: not Hz V/T/L: ? (Vertical, Transverse or Longitudinal)
air overpressure: trigger dB Trigger set at: 115 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W L	ong.
	1st Reading	43.40605	79.	89400
	2nd Reading			
	Average	43.40605	79.	89400
	Distance (2nd Seis. From Centre of Blast)	976.5	m	
	Post Blast Data: nnV·	did	mm/s Trigge	r set at·

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 30//13

 Post Blast Data:
 ppV:
 did
 mm/s
 Trigger set at:
 2.0
 mm/s

 frequency:
 not
 Hz
 V / T / L:
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 trigger
 dB
 Trigger set at:
 115
 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m
	Post Blast Data: ppV:	0.0	mm/s Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

Distance (3rd Seis. From Centre of Blast)

Post Blast Data: ppV: 0.0 mm/s

frequency: 0.0 Hz V/T/L: ? (Vertical, Transverse or Longitudinal)

air overpressure: 0.0 dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= <u>(369)</u>² kg

= <u>136,161</u> kg

Maximum Indicated Charge Weight per Delay = 151 kg

Orica
Blaster-in-charge:

Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate.

Burlington 2019-05-10 Blast 19-007 Floor.xlsm

Blast Report

jim bray

5/9/2019 Burlington 2019-05-10 Blast 19-007 Floor.spf **DEPTHS ARE ONLY APPROXIMATIONS** FLOOR SHOT NEXT TO 9FLR004 9FLR007 Partial Design Fnl ARMOUR STONE 9FLR007 Design Partial Fnl - 4" Blast Hole 11.5 x 11.5 253 and 248.6 ELEV SHOTPlus™ Professional 5.7.6.1 Burlington #00#605;#630#P655;#680#705;#730#755;#780;#805;#830;#855;#880;#905;#930;#955;#980;#005;#030;#055;#080;#105;#105 651@5901@6151@6401@6651@6901@7751@7401@7651@7901@8151@8401@8651@8901@9151@9401@0651@0901@0151@0401@0651@0901@ 第51章850章8751章9901章9251章9501章9751章8001章0251章8501章0751章1001章1251章1501章1751章2001章2251章2501章3751章3001章3251章3751章4001章4251章251章 \$70;\$695;\$720;\$770;\$770;\$795;\$820;\$845;\$870;\$895;\$920;\$945;\$970;\$995;\$020;\$045;\$070;\$095;\$120;\$145;\$170;\$195;\$220;\$245;\$76; (1300章1550章1800章2551章2301章2551章2801乗3953章3301章3553章3801章4051章4303章4551章4801章5951章551章5551章5804節051番5301章1551 #260##785##810##835##860##885##910##935##960##885##010##035##060##085##110##135##160##185##210##235##260##285##310##335## 1495 #520m 545m 570m 595m 620m 645m 670m 720 7514500145525145591457514560014662514565014667514790014572514775148900148825145855145900149925149950145975145 Hole angle: 0.0° Stemming: 5.5ft ARMOUR STONE Title/author Filename Location Mine open face Number of holes: 283 1851#4101#4351#4601#4851#5101#5351#5601#5851#6101#6351#6601#6851#7101#7351#7601# Subdrill: 0.0ft Blast Summary Data SHOTPlus Plan DRILL TO SHALE 5500 32000 34500 37000 39500 44500 44500 49500 52000 54500 57000 Hole Diameter: 4.0in)51023010 2551028010 30510 33010 35510 38010 40510 43010 5510 Spacing: 11,5ft 25hos-compectadets DRILLER NAME: ARMOUR STONE 1st row burden: 11.5ft Total drilled: 4211.9ft Burden: 11.5ft open face 1599140m165m198m Not to scale ARMOUR STONE ORICA 65ms Connectadets open face

SHOTPlus Plan

Subdrill: 0.0ft Blast Summary Data Spacing: 11.5ft

Hole Diameter: 4.0in

1st row burden: 11.5ft Fotal drilled: 4211.9ft

Burden: 11.5ft

Number of holes: 283

Hole angle: 0.0° Stemming: 5.5ft

load sheet 45 open face

33

65ms Connectadets

25ms connectadets

open face

max load: 35kg

いいころ ひかれない ひまっしゃ ないない ひというこうしょう ひょうしょう かんかん かんしょう かんしょう かんかん かんしょう なながれているがあるというながらなったというながられているというながらないないないがられているというないないないないないないというないないのものできるというないというないというないというないというない いるないないないない

15 27 Ju 76. 17.23

> open face

ひかいかびのあるかいれいいいれんかいいいいいいいいいい ·我中中了·我们·我们·我的·安·安·安·安·安·安·安·安·特·好·好·好·好·我你 ARMOUR STONE

ARMOUR STONE

ARMOUR STONE

9FLR007 Design Partial FnI - 4" Blast Hole 11.5 imes 11.5 imes 253 and $248.6 \; \text{ELEV}$

DEPTHS ARE ONLY **APPROXIMATIONS**

ARMOUR STONE

DRILLER NAME:

DRILL TO SHALE

5/9/2019

SHOTPlusTM Professional 5.7.6.1

Burlington

Burlington 2019-05-10 Blast 19-007 Floor.spf

FLOOR SHOT NEXT TO 9FLR004

9FLR007 Partial Design Fnl

Fitle/author Filename

Location



Not to scale

SHOTPlus Plan

Blast Summary Data Spacing: 11.5ft 1st row burden: 11.5ft

Burden: 11.5ft

Hole Diameter: 4.0in

Total drilled: 4211.9ft

Number of holes: 283

Stemming: 5.5ft Hole angle: 0.0°

Subdrill: 0.0ft

open face

13.9m13.9m13.sm14.0m12.1m14.sm14.3m13.5m13.5m13.9m13.6m12.9m3.6m

JAN 12.9H2.7F12.0ft

65ms Connectadets

25ms connectadets

open face

open face

62 G3 G4 G5 G6 G7 G8 G9 G10 G11 G12 G13 G14 G15 G16 G17 G18 G19 G20 G21 G22 G23 G24 G25 G26 G22 G28 G27 G28 14-0ns.9ni3.9nii3.

ARMOUR

STONE

11.9945.1H.15.4P.15.5H.15.7H.15.9R.15.9R. ARMOUR STONE

ARMOUR STONE

9FLR007 Design Partial Fnl - 4" Blast Hole 11.5 imes 11.5 253 and 248.6 ELEV

DEPTHS ARE ONLY **APPROXIMATIONS**

ARMOUR STONE

DRILL TO SHALE

DRILLER NAME:



Not to scale

Burlington 2019-05-10 Blast 19-007 Floor.spf FLOOR SHOT NEXT TO 9FLR004 9FLR007 Partial Design Fnl Burlington Title/author Filename Location Mine

SHOTPlus™ Professional 5.7.6.1

5/9/2019

ORICA The Blasting Professionals*	1 .			esign regate		De
page 1 Blaster-in-cl	narge:	K	evin To	oplis		
Blast Loc	ation:	FI	oor			
GPS Coordii	nates:		13.4036 ntre of B		itude	Ce
- Drilling Information	on -					
			from Ve			
Primary Bit diam:	101.6		0,		283	=
Secondary Bit diam: Tertiary Bit diam:		mm	0,			=
CENTRA GOLD 70 Pkgd Expl. Required:				8,000 kg		
r nga Expii Noquilea				Ny .		
Boosters Required:		kg/u i	# used	kg		
PENTEX 12 (OR EQUIVALEN	IT)	0.34	283	96.2		
total explosives w				8,096		
Pkgd Prod (0 Detonators Required		of Ioi m		0.0% # req'd		
EXEL HANDIDET 9m UNITRONIC 600 6M				283		
CONNECTADET 9M		65 1	ns	1 27		
o				14277		
Cord & Access. Req'o		U of	11	# req'd		
WIRE DUPLEX (6 PACK) 400	IVI	uni		1		
		unit				
William Company of the Company						
Resource Deployment:						
of Blasts today (this Quarry)						1
of Blasts today (this Quarry) of Blasters (this Blast)						1
of Blasts today (this Quarry) of Blasters (this Blast) of Helpers (this Blast)		Note Ex	ception			
of Blasts today (this Quarry) of Blasters (this Blast) of Helpers (this Blast) of MMU's (this Blast)	P	Note Ex	ception			1
of Blasts today (this Quarry) of Blasters (this Blast)	P	Note Ex	ception			1

ORICA The Blasting Protessionals*		Design Aggregate		Quarry: P.O. #: esign Date:		Blast Number: 19-007 Orica Order #:		9-007
page 1 Blaster-in-charge	ge: Kev	in Toplis		472.0	(Print Name)	Design te Blasted:	35,821	te
30						Total Holes Loaded:		holes
Blast Location	on: Floo	r			(Bench / Face)	including:		Dead Holes
GPS Coordinate	es: 43.4	40368 °N La	titude	79.88238	°W Longitude	and:		Helper Holes
	Centre	e of Blast	(Centre of Blast		Helper Hole Collar:		ft avg
						# Rows Blasted:	13	rows
- Drilling Information -						- Design Patt	em (Fron	it Row)-
	Angle fro	m Vertical		Nom	inal Bit Diameter			ft avg
Primary Bit diam: 101	1.6 mm	0° # Holes:	283	4,245.0	ft (4 " dian	n) Spacing:		ft avg
Secondary Bit diam:	mm	0 * # Holes:		= 0.0	ft (" dian			front row
Tertiary Bit diam:	mm	0 * # Holes:		= 0.0	ft (" dian) - Design Patte		
						Burden:		ft avg
						Spacing:		ft avg
						# Holes:		main body
						Bench Height:		ft avg
						Sub-drill:		ft avg
Bulk Expl. Required:		kg				Hole Depth:		
CENTRA GOLD 70		8,000						ft avg
		0,000				- Design St	one Deck	
Pkgd Expl. Required:		kg				Front Row:		ft avg
. nga Expi: required.		N9				Main Body:		ft avg
						- Design Col		
						Front Row:		ft avg
Pagetore Pagetinada						Main Body:		ft avg
Boosters Required:	kg/u # u					Material used:	3/4" Clear	
PENTEX 12 (OR EQUIVALENT)	0.34 2	96.2				- Design Ch	arao Lor	with
						Front Row:		ft avg
total explosives weigh	t in Blast (ke	g): 8,096				Main Body:		ft avg
Pkgd Prod (0 kg)	and the superior of the superi	2000				- Design Ch		
Detonators Required:	ms	# req'd				Front Row:		
EXEL HANDIDET 9m	15	283						kg/hole
UNITRONIC 600 6M		1				Main Body:		kg/hole
CONNECTADET 9M	65 ms					Max Chge Wt / delay:	25.0	kg/delay
						Required kg Loaded:	8,096	kg
						Rock Density:		g/cc = te/m ³
Cord & Access. Reg'd:	U of M	# req'd				- Design Po	wder Fac	tor -
WIRE DUPLEX (6 PACK) 400M	units	1				Expected Yield PF:		kg/te (actual)
	units				0.808 lb/yd3	Front row:		kg/te (theoretical
	units				0.808 lb/yd3	Main Body:		kg/te (theoretical)
Resource Deployment:	11				0.808 lb/yd3	"KPI" PF:		kg/te (theoretical)
# of Blasts today (this Quarry)				1		ION FROM STANDARD):	0.1011	tg/tc (theoretical
# of Blasters (this Blast)				1		or and or an analysis		
# of Helpers (this Blast)	Note Excep	tion		2				
of MMU's (this Blast)		20.072		1				
Services Req'd:				(1)				
BULK TRUCK CHARGE			1	.0				
BLASTER HOURS	Enter Blaste	or house						
HELPER HOURS	A STATE OF THE PARTY OF THE PAR	WHEN THE	0					
SHOT LAYOUT FEE	ALC: CHICAGO	Helper man-hours						
PARTICIPATE DE LA COMPTE DELICA DE LA COMPTE DEL LA COMPTE DE LA COMPTE DE LA COMPTE DE LA COMPTE DE LA COMPTE DEL LA COMPTE DE LA COMPTE DE LA COMPTE DE LA COMPTE DE LA COMPTE DELA COMPTE DE LA COMPTE DE LA COMPTE DE LA COMPTE DE LA COMPT	1000	extra beyond 1	0.					
ADVANCED BLAST DESIGN	Enter hours		1.					
BORETRACK	Enter hours	1	0.	0				



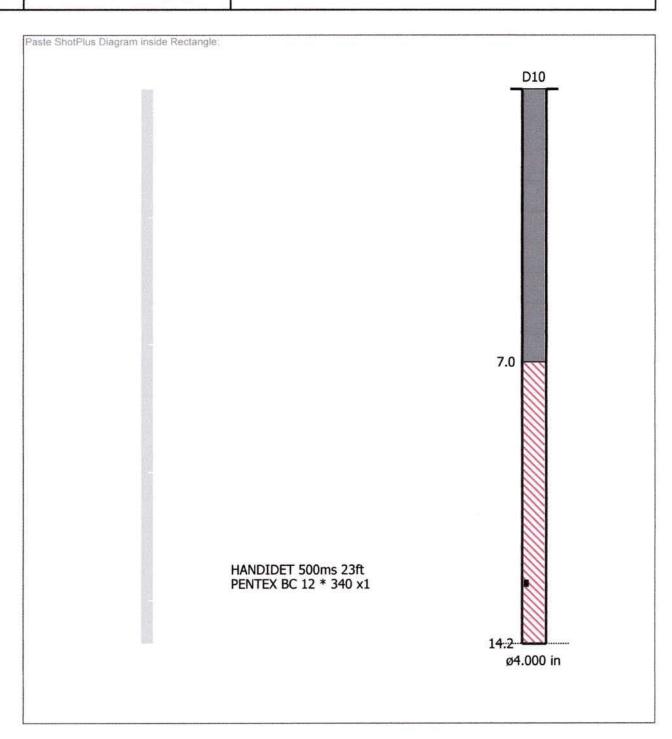
Blast Design

Nelson Aggregate

Quarry: P.O. #: Blast Date:

Burlington 5/10/2019 Blast Number: Orica Order #: 19-007

page 2



Orica

Blaster-in-charge:

Quarry Manager:

Kevin Toplis Nick Heap

> Signature required, indicating sign off on Blast Design.

	DIA	at Danant	Quarry:	Burlington	Blast Number:	19-008
OPICA	BIC	ast Report	P.O. #		Orica Order #:	2488743
The Blasting Professionals	Nel	son Aggregate	Blast Date:	2019-05-30	Blast Time:	11:55 AM
age 1 Blaste	er-in-charge:	Mike der Kinde	ren	(Print Name)	Tonnes Blasted:	40,960 te 15,754 m ³
Didott	or in onargo.	Will Con Till Co	7011	_(i int value)	Total tonnes per day:	
Bla	ast Location:	Floor		(Bench / Face)	Total Holes Loaded:	
	Coordinates:	43.40286 °N Latitude	79.88663	°W Longitude	including:	0 Dead Holes
0,00	ooordinates.	Centre of Blast	Centre of Blast	_ w Longitude	and:	0 Helper Holes
					Helper Hole Collar:	
Wind fror	m the: W	at 10 kph	Temperature	: 16 to 20 °C	# Rows Blasted:	
Willia II OI	mulc.	х	Х	10 10 20	.,	(Front Row)-
Clear:		Rain: Overcas			Burden:	
Partly Cloudy:	X	Snow: Inversion		23,061 ft	Spacing:	
					# Holes:	20 front row
- Drilling In:	formation -				- Pattern	(Main Body) -
		Angle from Vertical	Non	ninal Bit Diameter:	Burden:	
Primary Bit			9 = 4,243.8	3 ft (4 " diam)	Spacing:	
Secondary Bit		ım 0 # Holes:	_) ft(" diam)	# Holes:	207 main body
Tertiary Bit		ım 0 # Holes:		oft (" diam)	Bench Height:	
				1	Sub-drill:	
Bulk Explo	sives:	in (kg) out (kg)	kg		Hole Depth:	
CENTRA GOL		26,810 19,27			0	e Decking -
			,		Front Row:	ft avg
Packaged	Explosives:	cs shipped cs returne	d kg		Main Body:	ft avg
FORTEL PRO	-		2 0		# Dooks:	per blast
					- Collar	Stemming -
					- Collar Front Row: Main Body: Material used: - Charg Front Row: Main Body: Main Body:	ft avg ft avg per blast Stemming - 8.0 ft avg 8.0 ft avg 1/2" Clear ge Length - 10.5 ft avg 10.5 ft avg
Boosters:		kg / unit # use	ed kg		Main Body:	8.0 ft avg
PENTEX 12 (O	R EQUIVALENT)	0.34 22	7 77.2		Material used:	1/2" Clear
					- Charg	ge Length -
					Front Row:	10.5 ft avg
		xplosives weight in Blast (kg)			· · · · · · · · · · · · · · · · · · ·	
	Р	kgd Prod (0 kg) % of Total kç	0.0%			ge Weight -
Detonators	s:	case #'s ms	# used		Front Row:	3
UNITRONIC 60	00 6M		1		Main Body:	
EXEL HANDID	ET 9m	25/500	227		Max. per delay:	45.0 kg/delay
CONNECTADE	ET 9M	65 ms	18		SD () Equation:	526.2 kg/delay
					Total kg Loaded:	7,617 kg
					Rock Density:	2.60 g/cc = te/m^3
Cord & Ac	cessories:	U of M	# used	0.04= 11.4.13		ler Factor -
		units		0.815 lb/yd ³	Yield PF:	3 ()
		units		0.746 lb/yd ³	Front row:	3 ()
Possures D	nlovmost.	units		0.746 lb/yd ³ 0.746 lb/yd ³	Main Body:	
Resource De	. ,				"KPI" PF:	0.170 kg/te (theoretical)
# of Blasts toda			1	NOTES (ANY VARIATIO	IN FROM STANDARD):	
# of Blasters (th		N / E "	1			
# of Helpers (th		Note Exception	2			
# of MMU's (thi	is Blast)		1			
Services:	OUADOE		4.0			
BULK TRUCK		F + D + :	1.0			
BLASTER HOU		Enter Blaster hours	0.0			
HELPER HOUI		Enter total Helper man-hours				
SHOT LAYOU		Enter # trips extra beyond 1	0.0			
ADVANCED BI	LAST DESIGN	Enter hours	1.0	I		

0.0

BORETRACK

Enter hours



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-05-30 Blast Number: 19-008 Orica Order #: 2488743 Blast Time: 11:55 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40292	79.88668
Front Row Corner	43.40298	79.88617
Back Row Corner	43.40269	79.88704
Average (Centre of Blast)	43.40286	79.88663

(N) Radians	(W) Radians
0.757524	1.394286
0.757525	1.394277
0.757520	1.394292
0.757523	1.394285

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(N) Radians	(W) Radi
	1st Reading	43.40245	79.87814		0.757516	1.3
	2nd Reading					
	Average	43.40245	79.87814		0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	688.2	m			
	Post Blast Data: ppV:	1.3	mm/s Trigger set at:	2.0	mm/s	
	frequency:	35.0	Hz V/T/L:	?	(Vertical, Transverse or L	ongitudinal)

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

35.0 Hz 104.2 dB air overpressure:

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (2nd Seis. From Centre of Blast)	1068.8	m

(N) Radians	(W) Radians				
0.757358	1.394323				
0.757358	1.394323				

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s frequency: Not Hz V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m
	Poet Blact Data: nn\/:	0.0	mm/e Triager set et:

(N) Radians	(W) Radians
0.000000	0.000000

Trigger set at: 2.0 mm/s Post Blast Data ppV: 0.0 mm/s frequency: **0.0** Hz V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: **0.0** dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= <u>(688.2)</u>2 kg 30^2

473,619 kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

> Signature required, indicating that Blast Report is Complete & Accurate.



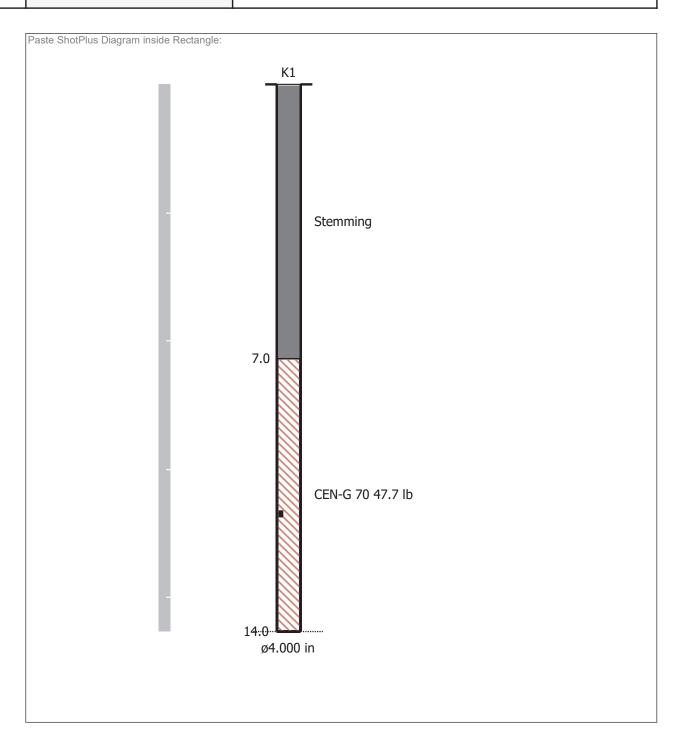
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 5/30/2019

Blast Number: Orica Order #: 19-008 2488743

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Vick Heap



Event Report



Date/Time Long at 11:55:15 May 30, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.0 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

2450 Line 2 Location: Client: Nelson Aggregate User Name: Orica Canada Inc. General: Burlington

Extended Notes

In front Yard by tree stump N-43.40245, W-79.87814

Microphone Linear Weighting

104.2 dB(L) at 0.481 sec **PSPL**

ZC Freq 20 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 566 mv)

	Tran	Vert	Long	
PPV	1.270	1.270	1.524	mm/s
ZC Freq	35	33	41	Hz
Time (Rel. to Trig)	-0.092	-0.096	0.000	sec
Peak Acceleration	0.053	0.053	0.053	g
Peak Displacement	0.006	0.006	0.007	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.3	Hz
Overswing Ratio	3.9	3.5	3.7	

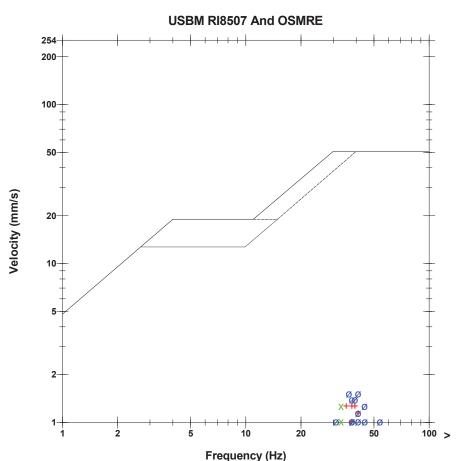
Peak Vector Sum 2.020 mm/s at 0.083 sec

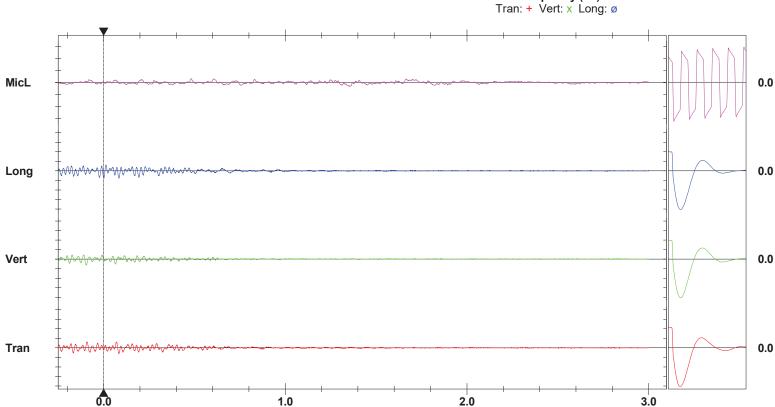
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.3 Volts

Unit Calibration December 4, 2018 by Instantel File Name

__TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check

Nelson Aggregate Across rod from 2102 Road 2 Burlington 2019-05-30 Blast 19-008 Floor

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
 May 30 /19 05:22:36		SERIAL NUMBER: UM6859 Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
•	May 30 /19 12:21:22	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic

Printed: May 30, 2019 (V 10.72 - 10.74)

SHOTPlus 5 Plan

Blast Summary Data Spacing: 11.5ft

> 1st row burden: 11.5ft Total drilled: 3206.0ft

Burden: 11,5ft

Subdrill: 0.0ft Hole Diameter: 4.0in

Number of holes: 229

Stemming: 5.5ft Hole angle: 0.0°

Ramp

9090 11500 14090

180ia 205ia 230ia 255ia

270m 295m 320m 345m 370m

360% 385% 410% 435% 460% 485%

400 # 425ya 450ia 475ia 500ia 525ia 550ia 575ia 600ia 490 - 515ya 540w 565w 590w 615w 640w 665w 690w

open Face

605hp 630hp 655hp 680hp 705hp 730hp 755hp 780hp 805hp

0ye 695re 720re 745re 770re 795re 820re 845re 870re 895re 920ve

open Face

9454 970%

735 #760,9-785;0-810;0-835;0-860;0-885;0-910;0-935;0-960;0-985;010;0-1035;01060;0-1085;0-1140;0-1135;0-1160;0

850ya 875va 900va 925va 950va 975va1000va1025va1075va1100va1125va1150va1175va1175va1270va1225va 940x# 965x# 990x#1015x#1040x#1065x#1090x#1145x#1140x#1165x#1190x#1215x#1240x#1265x#1290x#1315x#1340x# 825

980 #1005\$@30\@1055\@1080\@1105\@1130\@1155\@1180\@1205\@1230\@125\@1250\@130\$\@135\@135\@135\@1380\@1405\@1430\@

1160 # 185;#1210;#1235;#1260;#1285;#1310;#1335;#1360;#1385;#1410;#1435;#1460;#1485;#1510;#1535;#1560;#1585;#1610;# ### 1200m11457m11700m11951m12200m12457m12700m12951m13200m13457m13700m13957m14200m14457m14700m14957m15200m

1390 #1415:m1440:m1465;p1490:m1515:m1540:m1565:m1590:m1615:m1665:m1650:m1690:m1715:m1740:m1765:m1790:m 1250 #1275;#1308;#1325;#1358;#1375;#14808;#1425;#1458;#1475;#1508;#1525;#1558;#1558;#1550;#1625;#1658;#1658;#1675;#1798;#

Road

5/29/2019 Burlington 2019-05-30 Blast 19-008 Floor.spf SHOTPlusTM Professional 5.7.4.4 9FLR008 Final Burlington Title/author Filename Location Mine



Not to scale

	Stemming: 5.5ft Hole angle: 0.0°							9FLR008 Final	4" Blastnole 11.5 X 11.5' Pattern		DRILL TO SHALE	116 117 118 t14.0ft14.0ft14.0ft	H16 H17 H18 114.0ft14.0ft14.0ft	G16 G17 G18 t14.0ft14.0ft14.0ft	F17 F18 F19 L14.0H14.0H14.0H	E17 E18 E19 114.0ft14.0ft14.0ft	D17 D18 D19 114.0ft14.0ft14.0ft	C17 C18 C19 R14.0R14.0R14.0R	B15 B16 B17 R14.0R14.0R14.0R	A13 A14 A15
Blast Summary Data	Subdrill: 0.0ft Number of holes: 229			<	K		7			K10 .oft14.oft	112 14.0ft13	0 111 112 H3PK H4UK 115 .0R14.0R14.0R14.0R14.0R14.0R	H1 H2 H3 H4 H5 H6 H7 H8 H9 H10 H11 H12 H13 H14 H15 H16 H17 H18 H18 H14 H15 H16 H17 H18 H14.0R14.0R14.0R14.0R14.0R14.0R14.0R14.0R	G1 G2 G3 G4 G5 G6 G7 G8 G9 G10 G11 G12 G13 G14 G15 G16 G17 G18 14.0114.0114.0114.01114.01114.01114.01114.01114.01114.01114.01114.01114.01114.01114.01114.01114.01	F1 F2 F3 F4 F5 F6 F7 F8 F9 F10 F11 F12 F13 F14 F15 F16 F17 F18 F19 14,0t14,0t14,0t14,0t14,0t14,0t14,0t14,0t	E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12 E13 E14 E15 E16 E17 E18 E19 #14.0h14.0h14.0h14.0h14.0h14.0h14.0h14.0h	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 14.0h14.0h14.0h14.0h14.0h14.0h14.0h14.0h	C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 C19 14 0h14 0h14 0h14 0h14 0h14 0h14 0h14 0	81 82 83 84 85 86 87 88 89 810 811 812 813 814 815 816 817 4 0ft14,0ft14	A A A A A A A A A A A A A A A A A A A
Blast S	Spacing: 11.5ft Hole Diameter: 4.0in		2 4.0ft	3 Q4 4.0ft14.0ft	P1 P2 P3 P4 P5 14.0h14.0h14.0h14.0h1	01 02 03 04 05 06 14.0ft14.0ft14.0ft14.0ft14.0ft	NI N2 N3 N4 N5 N6 N7 N8 14.0M14.0M14.0M14.0M14.0M	M1 M2 M3 M4 M5 M6 M7 M8 14.0ft14.0ft14.0ft14.0ft14.0ft14.0ft14.0ft14.0ft14.0ft14.0ft14.0ft19.0ftM9	L1 L2 L3 L4 L5 L6 L7 L8 [5] U14.0h14.0h14.0h14.0h14.0h14.0h	K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 14.0f.14.0f.14.0f.14.0f.14.0f.14.0f.14.0f.14.0f.14.0f.	5 16 17 18 19 110 4.0h14.0h14.0h14.0h14	5 16 17 18 19 110 4.0h14.0h14.0h14.0h14	15 H6 H7 H8 H9 H1 4.0ft14.0ft14.0ft14.0ft14	55 G6 G7 G8 G9 G1 (4.0ft14.0ft14.0ft14.0ft14	6 F7 F8 F9 F10 F1 (4.0f14.0f14.0f14.0f14.0f14	6 E7 E8 E9 E10 E1 E4.0R14.0R14.0R14	06 D7 D8 D9 D10 D1 04.0R14.0R14.0R14.0R14.0R14	26 C7 C8 C9 C10 C1 14.0ft.14.0ft.14.0ft.14.0ft.14	34 B5 B6 B7 B8 B9 14.0h14.0h14.0h14.0h14.0h14	
	Burden: 11.5ft 1st row burden: 11.5ft Total drilled: 3206.0ft	Ramp	R1 R2 14.0ft14.0ft	Q1 Q2 Q3 Q4 14.0f114.0f114.0f114.0ft	P1 P2 P	01 02 0 14.0H14.0H1	NI N2 N3 N 14.054.0114.011	M1 M2 M3 N 14.0R14.0R14.0R1	L1 L2 L3 L 14.0ft14.0ft14.0ft1	K1 K2 K3 K 14.0f.14.0f.14.0f.1	11 12 13 14 1 14.09.0414.0414.041	11 12 13 14 I 14.0ft14.0ft14.0ft14.0ft1	H1 H2 H3 H4 F 14.0ft14.0ft14.0ft14	G1 G2 G3 G4 C	F1 F2 F3 F4 F5 F	E1 E2 E3 E4 E5 E	D1 D2 D3 D4 D5 I	C1 C2 C3 C4 C5 (B1 B2 B3 I	

SHOTPlusTM Professional 5.7.4.4 5/29/2019
Mine Burlington
Location
Title/author 9FLR008 Final
Filename Burlington 2019-05-30 Blast 19-008 Floor.spf

Not to scale

Road

	SHOTPlus 5 Plan		
	Blast Summary Data Burden: 11.5ft Spacing: 11.5ft Subdrill: 0.0ft 1st row burden: 11.5ft Hole Diameter: 4.0in Number of holes: 229 Total drilled: 3206.0ft Ramp	Stemming: 5.5ft 9 Hole angle: 0.0°	
	13 28 36 39 41 39 92 92 36 19 33 19 36 38 41 42 42 43 42 39 19 26 34 33 31 34 37 37 40 42 45 45 45 26 33 34 29 29 26 28 35 39 42 45 23 45 45 19 31 33 33 27 26 29 29 37 46 41 41 43 41 41 43 41 41 49 19 38 31 31 33 28 26 29 33 35 36 38 41 41 41 41 41 41 41 41 41 41 41 41 41	Day Of 25 16 22 24 25 25 25 24 25 25 29 29 25 26 29 25 26 25 29 25 26 25 26 29 25 26 25 26 29 26 26 26 26 26 26 26 26 26 26 26 26 26	74/6 - P.C.
	Road	SHOTPlus™ Professional 5.7.4.4	5/29/2019
OBICA		Mine Burlington Location	
	NI STATE OF	hor	9FLR008 Final Burlington 2019-05-30 Blast 19-008 Floor.spf
	Not to scale		

Blast Re	port		Quarry: P.O. #:	_		Blast Numbe Orica Order
The Blasting Professionals Nelson Agg	regate		Blast Date:			Blast Tim
Blaster-in-charge:	Mike Der	kindere	en	(Print Name)		Tonnes Blaste
Di di di						tal tonnes per da
Blast Location: GPS Coordinates: 43.403	Upper I		70.004.04	(Bench / Face)	"	otal Holes Loade
GPS Coordinates: 43.403		titude	79.88191 Centre of Blast	°W Longitude		includin an
Golillo of	Didot		Contro or Blace		Ι,	مار. Helper Hole Colla
Wind from the: S at	kph		Temperature	16 to 20 °C	'	# Rows Blaste
vvina nom ano.	ДКРП		Х	10 10 20 0		- Patte
Clear: Rain		ercast:				Burde
artly Cloudy: X Snow		ersion:	Ceiling	3,169 ft		Spacin
, , ,		L				# Hole
- Drilling Information -					-	- Patter
Angle from	Vertical		Non	ninal Bit Diameter:		Burde
Primary Bit diam: 101.6 mm	0 , # Holes	52	= 3,754.9	oft (4 " diam)		Spacin
econdary Bit diam: 92.1 mm	0 , # Holes:	1	= 72.2	2 ft (3 5/8 " diam)		# Hole
T						
Tertiary Bit diam:mm	0 # Holes:		= 0.0	ft (" diam)		Bench Heigh
Tertiary Bit diam:mmm	U # Holes:		= 0.0	oft(" diam) <mark>1</mark>		_
		(kg)	= 0.0	oft (" diam)	(e)	Sub-dri
	(kg) out			Oft("diam)	hole)	Sub-dri Hole Dept
Bulk Explosives: in	(kg) out	(kg)	kg)ft (" diam)	ngle hole)	Sub-dri Hole Dept - Sto Front Rov
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s	(kg) out 33,970 hipped cs re	(kg) 22,050 turned	kg 11,920 kg	oft (" diam)	a single hole)	Sub-dri Hole Dept - <i>Sto</i> Front Ro Main Bod
Bulk Explosives: in	(kg) out	(kg) 22,050	kg 11,920	oft ("diam)	on a single hole)	Sub-dri Hole Dept - Sto Front Ro Main Bod # Deck
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s	(kg) out 33,970 hipped cs re	(kg) 22,050 turned	kg 11,920 kg)ft (" diam)	on a	Sub-dri Hole Dept - Sto Front Rov Main Bod # Deck - Colla
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400	(kg) out 33,970 hipped cs re	(kg) 22,050 turned	kg 11,920 kg 0)ft (" diam)	on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Colla Front Roy
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters:	(kg) out 33,970 hipped cs re 2 kg / unit	(kg) 22,050 turned 2	kg 11,920 kg 0)ft (" diam)	(Based on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Colle Front Roy Main Bod
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT)	(kg) out 33,970 hipped cs re 2 kg / unit 0.23	# used # 55	kg 11,920 kg 0 kg 12.5)ft (" diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Rov Main Bod # Deck - Colla Front Rov Main Bod Material use
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters:	(kg) out 33,970 hipped cs re 2 kg / unit	# used # 55	kg 11,920 kg 0	Off (" diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Ro Main Bod - Coll Front Ro Main Bod Material use - Che
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT)	(kg) out 33,970 hipped cs re 2 kg / unit 0.23 0.34	# used 55 55	kg 11,920 kg 0 kg 12.5 18.7	oft (" diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Ro Main Bod - Coll Front Ro Main Bod Material use - Che Front Ro
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives	kg / unit 0.23 weight in Blass	# used 55 55 st (kg):	kg 11,920 kg 0 kg 12.5 18.7	Off (" diam)	(Based on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Colle Front Roy Main Bod Material use - Che Front Roy Main Bod
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod	kg / unit 0.23 weight in Blas (0 kg) % of To	# used 55 55 st (kg): otal kg:	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0%	Off (" diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Colle Front Roy Main Bod Material use - Che Front Roy Main Bod
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca:	kg / unit 0.23 weight in Blas (0 kg) % of To	# used 55 55 st (kg):	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used	Off (" diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Colle Front Roy Main Bod Material use - Cha Front Roy Main Bod - Cha Front Roy Front Roy Front Roy Front Roy Front Roy Front Roy
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod	kg / unit 0.23 weight in Blas (0 kg) % of To	# used 55 55 st (kg): otal kg:	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0%	Off (" diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Colle Front Roy Main Bod Material use - Cha Front Roy Main Bod - Cha Front Roy Main Bod - Cha Front Roy Main Bod
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca: UNITRONIC 600 6M UNITRONIC 600 20M	kg / unit 0.23 weight in Blas (0 kg) % of To	# used 55 55 st (kg): otal kg:	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used 53 2	oft ("diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Colle Front Roy Main Bod Material use - Cha Front Roy Main Bod - Cha Front Roy Main Bod Mare Bod Main Bod Mare Bod Main Bod
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca: UNITRONIC 600 6M	kg / unit 0.23 weight in Blas (0 kg) % of To	# used 55 55 st (kg): otal kg:	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used 53	oft ("diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Roy Main Bod # Deck - Coll Front Roy Main Bod Material use - Cha Front Roy Main Bod - Cha Front Roy Main Bod Material use - Cha Source Cha Front Roy Main Bod Cha Front Roy Main Bod Front Roy Main Bod Max. per dela SD () Equation
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca: UNITRONIC 600 6M UNITRONIC 600 20M	kg / unit 0.23 weight in Blas (0 kg) % of To	# used 55 55 st (kg): otal kg:	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used 53 2	Off (" diam)	PF (Based on a	Sub-dr Hole Dept - Sto Front Ro Main Boo # Deck - Coll Front Ro Main Boo Material use - Che Front Ro Main Boo - Che Front Ro Main Boo Ache Front Ro Main Boo - Che Front Ro Main Boo Che Front Ro Main Boo Che Front Ro Main Boo Max. per dela SD () Equatio Total kg Loade
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca: UNITRONIC 600 6M UNITRONIC 600 25M UNITRONIC 600 25M	kg / unit 0.23 weight in Blas (0 kg) % of Tose #'s	# used 55 55 st (kg): otal kg: ms	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used 53 2 55	Off (" diam)	PF (Based on a	Sub-dri Hole Dept - Sto Front Rov Main Bod # Deck - Colle Front Rov Main Bod Material use - Che Front Rov Main Bod - Che Front Rov Main Bod SD () Equation Total kg Loade
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca: UNITRONIC 600 6M UNITRONIC 600 25M Cord & Accessories:	kg / unit 0.23 0.34 weight in Blas (0 kg) % of Tose #'s r	# used 55 55 st (kg): of M	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used 53 2 55		PF (Based on a	Bench Height Sub-dri Hole Deptil - Sto. Front Rov. Main Bod # Deck - Colla Front Rov. Main Bod Material use - Cha Front Rov. Main Bod - Cha Front Rov. Main Bod South Bod Max. per dela SD () Equatio Total kg Loader Rock Densit
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca: UNITRONIC 600 6M UNITRONIC 600 20M UNITRONIC 600 25M Cord & Accessories: HARNESS WIRE DUPLEX (6 PACK) 4	kg / unit 0.23 0.34 weight in Blas (0 kg) % of To se #'s U 0.00M u	# used 55 55 st (kg): of M nits	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used 53 2 55 # used	1.897 lb/yd ³	PF (Based on a	Sub-dri Hole Dept - Sto Front Rov Main Bod # Deck - Colla Front Rov Main Bod Material use - Cha Front Rov Main Bod - Cha Front Rov Main Bod SD () Equatio Total kg Loade Rock Densit
Bulk Explosives: in CENTRA GOLD 70 Packaged Explosives: cs s FORTEL PRO 75X400 Boosters: PENTEX 8 (OR EQUIVALENT) PENTEX 12 (OR EQUIVALENT) total explosives Pkgd Prod Detonators: ca: UNITRONIC 600 6M UNITRONIC 600 25M Cord & Accessories:	kg / unit 0.23 0.34 weight in Blas (0 kg) % of To se #'s r	# used 55 55 st (kg): of M	kg 11,920 kg 0 kg 12.5 18.7 11,951 0.0% # used 53 2 55		PF (Based on a	Sub-dri Hole Dept - Sto Front Rov Main Bod # Deck - Colla Front Rov Main Bod Material use - Cha Front Rov Main Bod - Cha Front Rov Main Bod - Cha Front Rov Main Bod Total kg Loade Rock Densit

(Print Name)		Tonnes Blasted:	27,603	te	10,616	m3
	Tot	tal tonnes per day:	27,603	te	NB80-01	Rate Code
(Bench / Face)	To	otal Holes Loaded:	53	holes		
°W Longitude		including:	0	Dead	Holes	
		and:	0	Helpe	r Holes	
	l ⊦	Helper Hole Collar:		ft avg		
16 to 20 °C	'	# Rows Blasted:		rows		
10 10 20			(Front Rov	l .		
		Burden:	<u> </u>	ľ		
				ft avg		
3,169 ft		Spacing:		ft avg		
		# Holes:		front r	OW	
			(Main Body			
ninal Bit Diameter:		Burden:		ft avg		
ft (4 " diam)		Spacing:	10.0	ft avg		
ft (3 5/8 " diam)		# Holes:	34	main	body	
ft (" diam)		Bench Height:	70.2	ft avg		
1		Sub-drill:	2.0	ft avg		90
	(i)	Hole Depth:	72.2	ft avg		ast
	ole	- Stone	Decking -			B
	le l	Front Row:		ft avg		1 / te
	sing	Main Body:		ft avg		ded
	a	# Decks:		per bl		_0a
	on		Stemming		ust	kg l
	Theoretical PF (Based on a single hole)	Front Row:		ft avg		Yield Powder Factor (kg Loaded / te Blastec
	(Ba			ft avg		act
	ద	Main Body:		it avg]	P. F
	<u>a</u>	Material used:				wde
	reti		ge Length -			Ро
	Jeo	Front Row:		ft avg		eld
	F	Main Body:		ft avg		>
			ge Weight -			
		Front Row:		•		
		Main Body:	190.1	kg/hol	le	
		Max. per delay:	230.0	kg/de	lay	
		SD () Equation:	122.0	kg/del	lay	
		Total kg Loaded:	11,951	kg		
		Rock Density:	2.60	g/cc	= te/m ³	
		- Powd	ler Factor -			
1.897 lb/yd ³		Yield PF:	0.433	kg/te	(actual)	
1.179 lb/yd ³		Front row:		-	(theoretic	al)
1.791 lb/yd ³		Main Body:		_	(theoretic	
1.587 lb/yd ³		"KPI" PF:		0	(theoretic	
•	N ED		0.002	Kg/tc	(tricorctic	ai)
NOTES (ANY VARIATIO						
2 Stone decks were adde	a que	to voids identified on ani	i iog			

19-009

2491485

12:07 PM

of Blasts today (this Quarry)

Note Exception

Enter Blaster hours

Enter hours

Enter hours

Enter total Helper man-hours

Enter # trips extra beyond 1

of Blasters (this Blast)

of Helpers (this Blast)

of MMU's (this Blast)

BLASTER HOURS

HELPER HOURS

BORETRACK

SHOT LAYOUT FEE

ADVANCED BLAST DESIGN

Services:
BULK TRUCK CHARGE

1

1

2

1

1.0

6.0

5.0

0.0

0.0

0.0



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-06-06

 Blast Number:
 19-009

 Orica Order #:
 2491485

 Blast Time:
 12:07 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40362	79.88191
Front Row Corner	43.40341	79.88199
Back Row Corner	43.40381	79.88183
Average (Centre of Blast)	43.40361	79.88191

(N) Radians	(W) Radians
0.757536	1.394202
0.757532	1.394204
0.757539	1.394201
0.757536	1.394202

Enter ° W Long. 1st Seismograph Co-ordinates Enter ° N Lat. 1st Reading 43.40245 79.87814 2nd Reading Average 43.40245 79.87814 **331.4** m Distance (1st Seis. From Centre of Blast) Post Blast Data: ppV: 9.7 mm/s Trigger set at: 2.0 mm/s **11.0** Hz frequency:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	1014.8	m

air overpressure:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 394413

 Post Blast Data:
 ppV:
 0.2 mm/s
 Trigger set at:
 2.0 mm/s
 mm/s
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 121.7 dB
 Trigger set at:
 115 dB
 Trigger set at:
 115 dB

116.9 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1267.4	m

(W) Radians
1.394323
1.394323

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s

frequency: Not Hz V/T/L: ? (Vertical, Transverse or Longitudinal)
air overpressure: Trigger dB Trigger set at: 115 dB

SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= _{\frac{(331.4)^2}{30^2}} kg$

= <u>109,826</u> kg

Maximum Indicated Charge Weight per Delay = 122 kg

Orica
Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.



Event Report



Date/Time Long at 12:07:12 June 6, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 #2 Sideroad Client: Nelson Aggregate User Name: Orica Canada Inc. General: Burlington

Extended Notes

43.40245 -79.87814

Beside tree stump in front yard

Microphone Linear Weighting

116.9 dB(L) at 2.322 sec **PSPL**

ZC Freq 2.3 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 571 mv)

	Tran	Vert	Long	
PPV	7.874	3.302	9.652	mm/s
ZC Freq	13.8	32	11.0	Hz
Time (Rel. to Trig)	0.527	0.386	0.413	sec
Peak Acceleration	0.106	0.080	0.106	g
Peak Displacement	0.089	0.029	0.089	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.5	7.3	Hz
Overswing Ratio	3.8	3.6	4.0	

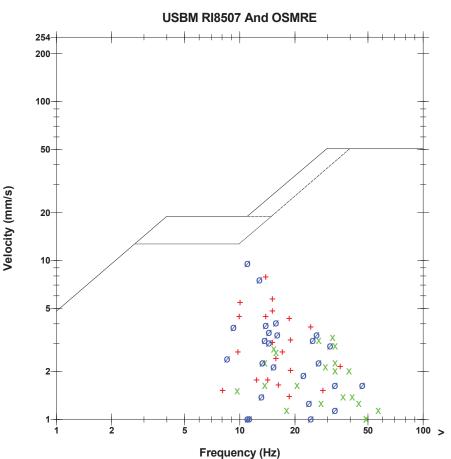
Peak Vector Sum 10.53 mm/s at 0.414 sec

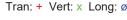
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

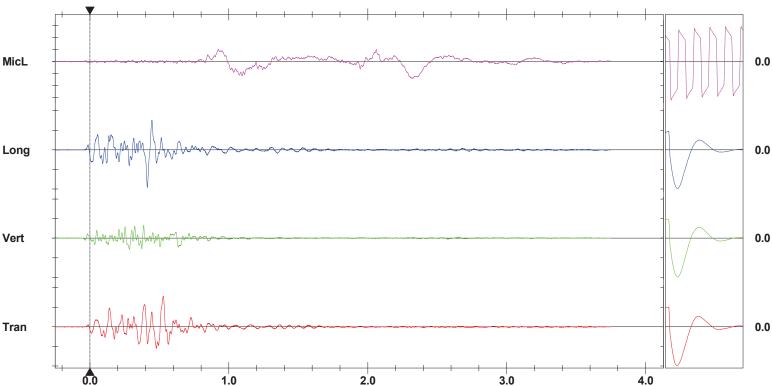
6.3 Volts

Unit Calibration December 4, 2018 by Instantel **File Name**

__TEMP.EVT







Time Scale: 0.20 sec/div Amplitude Scale: Geo: 5.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check



Event Report

File Name



Date/Time MicL at 12:07:14 June 6, 2019 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.353 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE

Battery Level 3.7 Volts Unit Calibration

January 15, 2019 by Instantel

UM6857_20190606120714.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES** User Name: ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

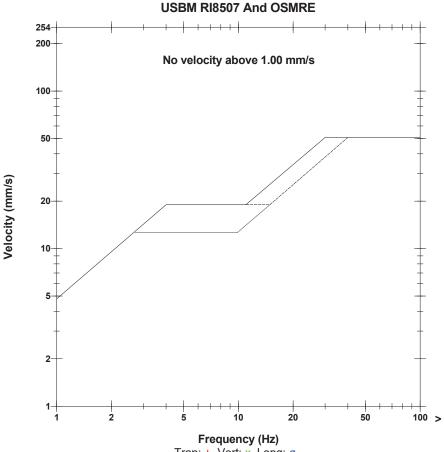
PSPL 121.7 dB(L) at 0.400 sec

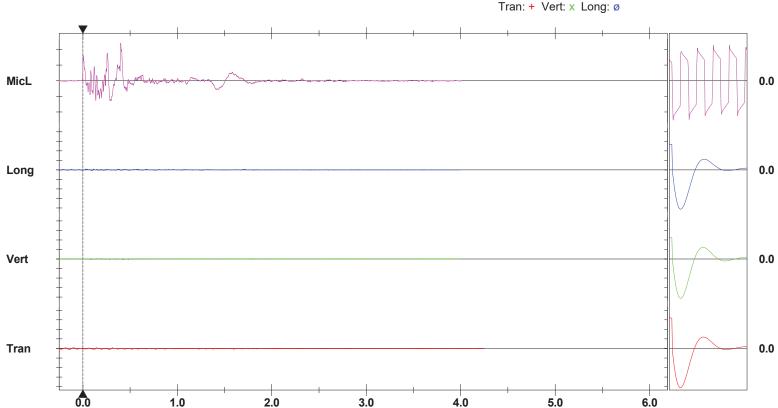
ZC Freq 5.6 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1345 mv)

	Tran	Vert	Long	
PPV	0.213	0.126	0.173	mm/s
ZC Freq	15.5	14.4	25	Hz
Time (Rel. to Trig)	0.200	0.081	0.114	sec
Peak Acceleration	0.010	0.012	0.016	g
Peak Displacement	0.009	0.002	0.002	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.7	

Peak Vector Sum 0.232 mm/s at 0.200 sec





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check

Nelson Aggregate SW Corner of Property Burlington 2019-06-06 Blast 19-009 Upper Middle

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
		SERIAL NUMBER: UM6859
Jun 6 /19 05:55:30		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Jun 6 /19 12:29:39	Jun 6 /19 12:29:41	Event recorded. Trigger Level Long: 1.50 mm/s
Jun 6 /19 12:29:41	Jun 6 /19 12:29:49	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0

Printed: June 6, 2019 (V 10.72 - 10.74)

SHOTPlus 5 Plan

Blast Summary Data Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3827.1ft

Burden: 9.0ft

O= Deck

Subdrill: 2.0ft

Number of holes: 53

Hole angle: 0.0°

Stemming: 7.0ft

open face

	403	
	408	469
271	387	477
	366	455 •
255	345	435 432
234	324	414 •
213	303	393
192 189	282	372 369
171	261	351 348
150	240	330
129	219	309
108	198 195	288 285
8 4 8 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	177	267 • 264 •
63	156	246
45		225
36 24	1114	201
8	83	183
	72	162
	86	220 141 117 138

C2 3.625" DIA HOLE



Not to scale

Burlington 2019-06-06 Blast 19-009 Upper Mid 9UPMD009 Design Fnl UPPER MIDDLE Title/author Filename Location

6/5/2019

SHOTPlusTM Professional 5.7.4.4

Burlington

Mine

SHOTPlus 5 Plan

Blast Summary Data

Subdrill: 2.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3827.1ft

Burden: 9.0ft

Number of holes: 53

Hole angle: 0.0° Stemming: 7.0ft

Max 230 Kg Load Sheet



open face

715. P15. 125. 815. 815. 155. 155. 255. 255. 215. 217. 815. 815. 82. 82. 49.

C2 3.625" DIA HOLE



Not to scale

SHOTPINSTM P.	SHOTPlus TM Professional 5.7.4.4
Mine	Burlington
Location	UPPER MIDDLE
Title/author	9UPMD009 Design Fnl
Filename	Burlington 2019-06-06 Blast 19-009 Upper Mid

SHOTPlus 5 Plan

Blast Summary Data

Subdrill: 2.0ft Hole Diameter: 4.0in Spacing: 10.0ft

Number of holes: 53

1st row burden: 12.0ft Total drilled: 3827.1ft

Burden: 9.0ft

Hole angle: 0.0° Stemming: 7.0ft

open face

73.5ft # 73.4ft # 73.5ft # 74.0ft © C16 C17 ◆72.9ft # 73.6ft 813 72.7ft € 72.6ft ₱ 812 ₱ 72.5ft C10 C11 C12 C13 C13 70.7ft 72.7ft * 71.8ft * 72.8ft * 73.5ft • 70.7ft C1 C2 C3 C4 C5 C6 C7 C8 C9 C9 70.9R 70.9R 70.4R 71.7R 71.1R B1 69.4ft 70.4ft 71.1ft 71.8ft 72.8ft 72.3ft 71.1ft 69.3ft ● 71.2ft A1 A2 A3 A4 70.8ft 71.1ft 72.0ft 72.2ft

9UPMD009 Design Fnl - 3.625" and 4" Blast Holes 12x10 9x10 272 and 250 + .6 S DRILLER NAME:

C2 3.625" DIA HOLE



Burlington 2019-06-06 Blast 19-009 Upper Mid 6/5/2019 9UPMD009 Design Fnl SHOTPlusTM Professional 5.7.4.4 UPPER MIDDLE Burlington Title/author Filename Location

Not to scale

-
ORICA
The Blasting Professioners

Quarry:	Burlington
P.O. #:	
sign Date	2019-06-06

Blast Number:	19-009
Orica Order #:	

ORICA The Blasting Professional's	Blast De Nelson Aggr	335	Des	P.O. #: sign Date:		Orica Order #:	1	19-009	
page 1 Blaster-in-charg	e: Mike De	rkinderen			(Print Name)	Design te Blasted:	27,603	te	
						Total Holes Loaded:	53	holes	
Blast Locatio		ddle			(Bench / Face)	including:		Dead H	Holes
GPS Coordinate	s: 43.4036	1 °N Latitud	de 7	9.88191	°W Longitude	and:		Helper	Holes
	Centre of B	ast	Cer	ntre of Blast		Helper Hole Collar:		ft avg	
						# Rows Blasted:	3	rows	
- Drilling Information -						_ - Design Patt	ern (Fror	nt Rowi	1-
	Angle from Ve	rtical		Non	ninal Bit Diameter:			ft avg	
Primary Bit diam: 101	.6 mm 0 °	# Holes:	52 =	3,754.9	ft (4 " diam) Spacing:		ft avg	
Secondary Bit diam: 92.	1 mm 0 3	# Holes:	1 =	72.2				front re	Nu.
Tertiary Bit diam:	mm 0°	# Holes:	=		ft (" diam				
2%					1301 % 075070474	Burden:		ft avg	
						Spacing:		ft avg	
						# Holes		main b	vody
						Bench Height:		ft avg	Ouy
						Sub-drill:		ft avg	
Bulk Expl. Required:		kg				Hole Depth:		ft avg	
CENTRA GOLD 70		12,500				- Design Si			
		72,000				Front Row:		1	
Pkgd Expl. Required:		kg				Main Body:		ft avg	
FORTEL PRO 75X400	2	50				- Design Co		ft avg	
TOTTI LET TO TOX TO	-	30							
						Front Row:		ft avg	
Boosters Required:	kg/u # used	kg				Main Body:		ft avg	
PENTEX 8 (OR EQUIVALENT)	0.23	Ny .				Material used:	.75 Clear		
PENTEX 12 (OR EQUIVALENT)	0.23					Franks C	haras I a		
TENTER IZ (ON EGOTALLIT)	0.04					- Design Ci Front Row:		**	
total explosives weigh	t in Blast (kg):	12,550						ft avg	
Pkgd Prod (50 kg)	Carlo and Carlo	0.4%				Main Body: - Design Ci		ft avg	
Detonators Required:	ms	# reg'd				Front Row:			
UNITRONIC 600 6M	III.S	# loqu				and the second s		kg/hole	
UNITRONIC 600 25M						Main Body:		kg/hole	
ON TROMO OU ZOM						Max Chge Wt / delay:	230.0	kg/dela	ly
						Required kg Loaded:	12,550	1	
						Rock Density:	2.60	g/cc =	= te/m³
Cord & Access. Req'd:	U of M	# req'd				- Design Po	owder Fa	ctor -	
WIRE DUPLEX (6 PACK) 400M	units	1			C00000 121721 1840	Expected Yield PF:		kg/te (
	units				1.343 lb/yd ³	Front row:		kg/te ((theoretical)
1	units				1.791 lb/yd ³	Main Body:		kg/te ((theoretical)
Resource Deployment:					1.642 lb/yd ³	"KPI" PF:	0.375	kg/te ((theoretical)
# of Blasts today (this Quarry)				1	NOTES (ANY VARIAT	ION FROM STANDARD):			
# of Blasters (this Blast)				1					
# of Helpers (this Blast)				1					
# of MMU's (this Blast)				1					
Services Req'd:									
BULK TRUCK CHARGE			1.0	0					
BLASTER HOURS	Enter Blaster ho	urs	0.0	0					
HELPER HOURS	Enter total Helpe	er man-hours	0.0	-11					
SHOT LAYOUT FEE	Enter # trips ext	ra beyond 1	0.0						
ADVANCED BLAST DESIGN	Enter hours		0.0						
BORETRACK	Enter hours		0.0	0					

Dlac	t Danant	-	Quarry:	Burlington	Blast Number:	19	9-010	
OPICA	t Report		P.O. #:		Orica Order #:	249	96865	
The Blasting Professionals*	on Aggregate		Blast Date:	2019-06-20	Blast Time:	12:	11 PM	
page 1 Blaster-in-charge:				1				
Blaster-in-charge:	K	evin Toplis		(Print Name)	Tonnes Blasted:	45,552		7,520 m ₃ Rate
Diget Legation		FI 044		1,5 , ,5 ,	Total tonnes per day:	45,552	· ·	F-02 Code
Blast Location:	40,40000	Floor 011	70.00000	(Bench / Face)	Total Holes Loaded:		holes	
GPS Coordinates:	43.40226 Centre of Blast	°N Latitude	79.88668 Centre of Blast	°W Longitude	including:		Dead Hol	
· ·	Delitie of Blast		Certife of Blast		and: Helper Hole Collar:	0	Helper H	oies
Wind from the: N at	5 kph		Tomporeture	16 to 20 °C	# Rows Blasted:	17	ft avg rows	
wind from the. N at			-	10 10 20 C		(Front Row		
Clear:	Rain: X	Overcast:	X		Burden:	_	ft avg	
Partly Cloudy:	Snow:	Inversion:	Ceiling	30,000 ft	Spacing:		ft avg	
artiy oloudy.	onow.	involcion.	coming	30,000 10	# Holes:		front row	
- Drilling Information -						(Main Body	_	
	gle from Vertical		Nom	ninal Bit Diameter:	Burden:		ft avg	
Primary Bit diam: 101.6 mm		Holes: 272	= 4,678.4		Spacing:		ft avg	
Secondary Bit diam: mm		Holes:		ft (" diam)	# Holes:		main bod	V
Tertiary Bit diam: mm		Holes:		ft (" diam)	Bench Height:		ft avg	
				1	Sub-drill:		ft avg	
Bulk Explosives:	in (kg)	out (kg)	kg		Hole Depth:		ft avg	aste
CENTRA GOLD 70	35,630	29,410	6,220		- Stone Front Row: Main Body:	Decking -		<u>B</u>
					Front Row:		ft avg	d/t
Packaged Explosives:	cs shipped	cs returned	kg		Main Body:		ft avg	Yield Powder Factor (kg Loaded / te Blastec
FORTEL PRO 75X400	2	2	0		# Decks:	0	per blast	P
					- Collar	Stemming	_	(8)
					- Collar Front Row:	7.0	ft avg	ctor
Boosters:	kg /	unit # used	kg		Main Body:	7.0	ft avg	T.
PENTEX 12 (OR EQUIVALENT)		0.34 272	92.5		Material used:	1/2" Clear		vder
					- Charg	ge Length -		Pov
					Front Row: Main Body:		ft avg	ed
·	losives weight in	` 0,	6,312				ft avg	=
•	d Prod (0 kg) %	- 1	0.0%			ge Weight -		
Detonators:	case #'s	ms	# used		Front Row:		kg/hole	
UNITRONIC 600 6M			1		Main Body:		kg/hole	
EXEL HANDIDET 12m		25/500	24		Max. per delay:		kg/delay	
CONNECTADET 9M		25 ms	11		SD () Equation: Total kg Loaded:		kg/delay	
CONNECTADET 9M		33 ms	36		Rock Density:	6,312	g/cc = t	o/m ³
CONNECTADET 9M		65 ms			Rook Delisity.	2.00	g/cc = [3/111
EXEL HANDIDET 9m Cord & Accessories:		25/500 U of M	# used		- Powo	ler Factor -		
HARNESS WIRE DUPLEX (6	PACK) 400M	units	1	0.607 lb/yd ³	Yield PF:		kg/te (ac	tual)
HARRIEGO WIRE DOT EEX (O	AON) 400M	units	•	0.778 lb/yd ³	Front row:		kg/te (the	,
		units		0.778 lb/yd ³	Main Body:		kg/te (the	,
Resource Deployment:		2		0.778 lb/yd ³	"KPI" PF:		kg/te (the	,
# of Blasts today (this Quarry)			1	NOTES (ANY VARIATIO			J (410	
# of Blasters (this Blast)			1	helper hours 2x6=12hrs				
# of Helpers (this Blast)	Note Exception		2					
# of MMU's (this Blast)			1					
Services:								
BULK TRUCK CHARGE			1.0					
BLASTER HOURS	Enter Blaster ho	ours	6.5					
HELPER HOURS	Enter total Help	er man-hours	12.0					
SHOT LAYOUT FEE	Enter # trips ex		0.0					
ADVANCED BLAST DESIGN	Enter hours		0.0					
BORETRACK	Enter hours		0.0					
			-					



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-06-20 Blast Number: 19-010 Orica Order #: 2496865 Blast Time: 12:11 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40226	79.88684
Front Row Corner	43.40197	79.88588
Back Row Corner	43.40255	79.88732
Average (Centre of Blast)	43.40226	79.88668

(N) Radians	(W) Radians
0.757512	1.394288
0.757507	1.394272
0.757517	1.394297
0.757512	1.394286

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter °	W Long.
	1st Reading	43.40245		79.87814
	2nd Reading			
	Average	43.40245		79.87814
	Distance (1st Seis. From Centre of Blast)	690.9	m	
	Post Blast Data: ppV:	did	mm/s ⊺	rigger set at:
	frequency:	not	Hz	V/T/L:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: not V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: trigger dΒ

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	l
	1st Reading	43.39339	79.88880	
	2nd Reading			
	Average	43.39339	79.88880	
	Distance (2nd Seis. From Centre of Blast)	1002.0	m	
	Post Blast Data: ppV:	did	mm/s Trigger set at:	2

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1 30/1323

.0 mm/s frequency: not Hz V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: trigger dΒ Trigger set at: 115 dB

SouthWest Corner of Property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading		
	2nd Reading		
	Average	0.00000	0.00000
	Distance (3rd Seis. From Centre of Blast)	0.0	m
	Post Blast Data: nn\/-	0.0	mm/e Trigger set at:

(N) Radians	(W) Radians
0.000000	0.000000

Trigger set at: 2.0 mm/s frequency: **0.0** Hz V / T / L : (Vertical, Transverse or Longitudinal) air overpressure: **0.0** dB Trigger set at: 115 dB

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= <u>(690.9)</u>² kg

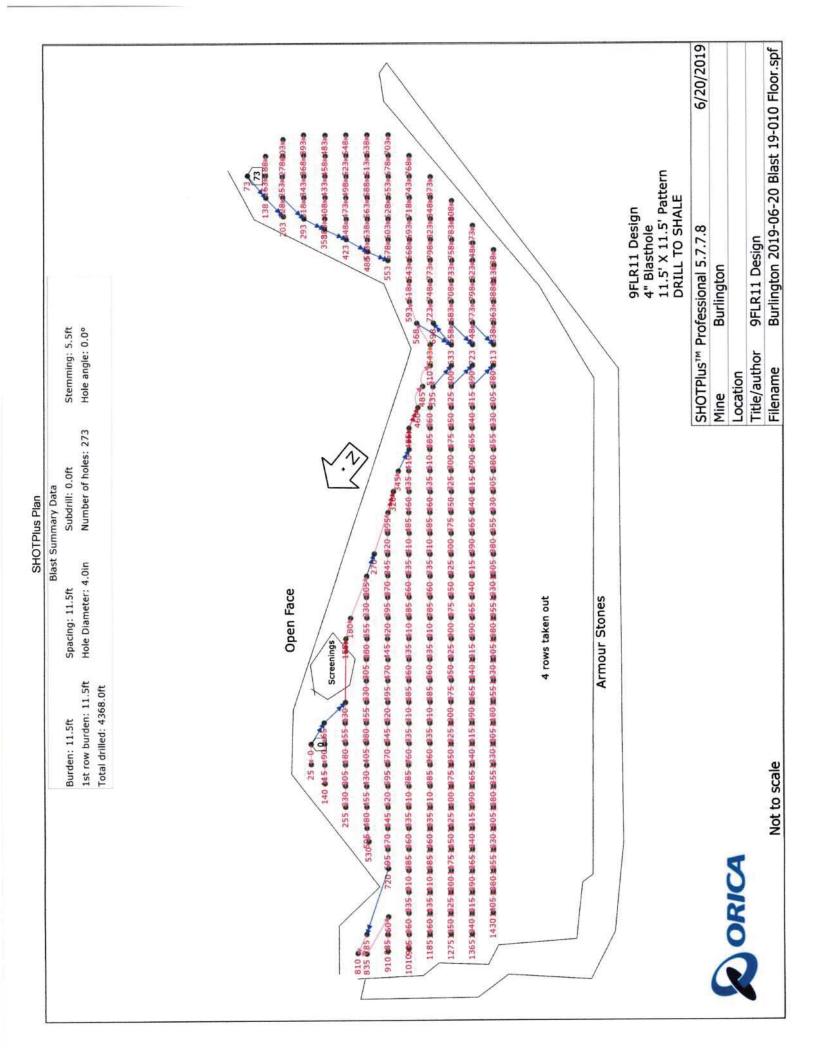
477,343 kg 900

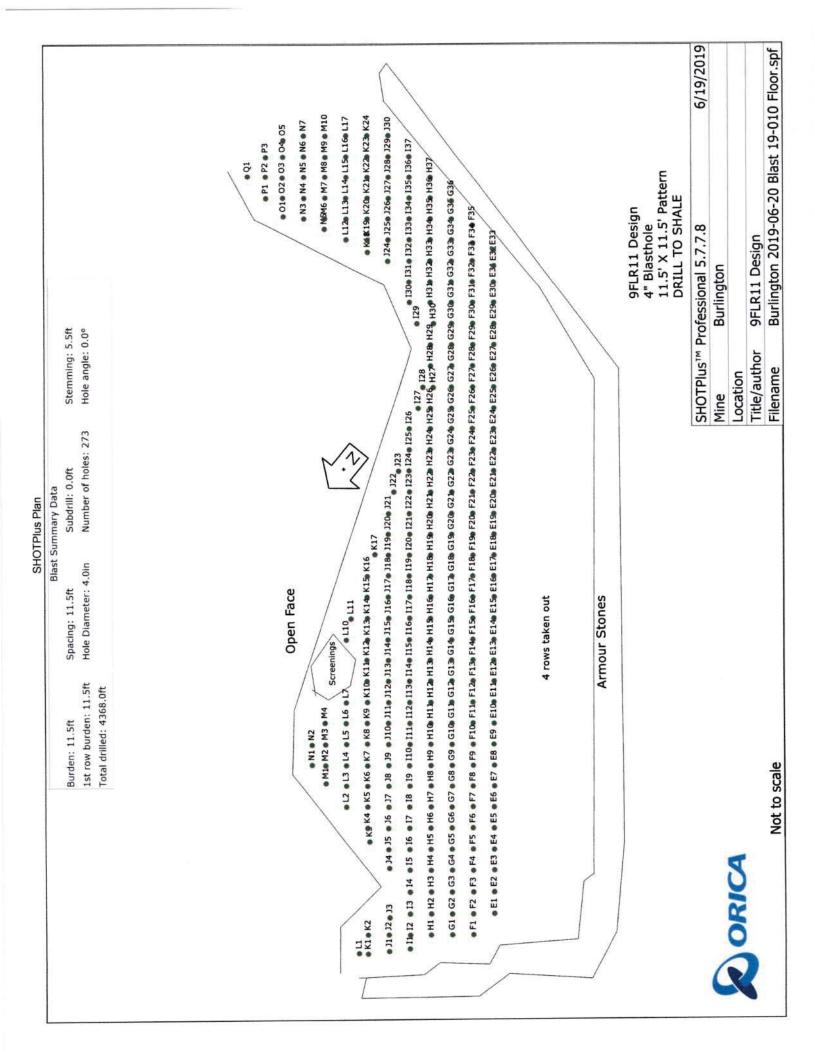
Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge: Kevin Toplis

Signature required, indicating that Blast Report is Complete & Accurate. jim bray

6/19/2019 Burlington 2019-06-20 Blast 19-010 Floor.spf 200 80 20 30 30 30 34 Ry 24927 12 21 22 31 91 X 6 22.2.2.3. X2+5-9-6-910 02 2. 51.58 91.92 hi 22 5 81-81- R X4V OF 4" Blasthole 11.5' X 11.5' Pattern max load: 45kg DRILL TO SHALE load sheet NY 9FLR11 Design SHOTPlusTM Professional 5.7.7.8 9FLR11 Design Burlington Hole angle: 0.0° Title/author Filename Location Number of holes: 273 24 02 55 40 56 Bo 96 65 50 50 50 50 50 150 100 100 050 150450 500 150 Subdrill: 0.0ft Blast Summary Data 120 Blogge 12120 910 220 h2 510 910 810 52 h2 220 he Hole Diameter: 4.0in Open Face Spacing: 11,5ft 110 910 4 rows taken out Armour Stones Screenings 1st row burden: 11.5ft Total drilled: 4368.0ft N 33 - 16 21 - 19 34 16-31-31-81 Burden: 11.5ft Not to scale 48 42 42 30 38 74 38







Blast Design

Quarry: P.O. #:

Burlington

Blast Number: Orica Order #: 19-010

Design Date: 2019-06-20 Nelson Aggregate page 1 Blaster-in-charge: Kevin Toplis (Print Name) Design te Blasted: 61,536 te Total Holes Loaded: Blast Location: ... including: Dead Holes Floor 011 (Bench / Face) **GPS Coordinates:** 43.40226 °N Latitude 79.88668 °W Longitude ... and: Helper Holes Helper Hole Collar: ft avg # Rows Blasted: 17 rows - Design Pattern (Front Row)- Drilling Information -Angle from Vertical Nominal Bit Diameter: Burden: 11.5 ft avg = 6,320.0 ft (4 " diam) Spacing: 11.5 ft avg Primary Bit diam: 101.6 mm 03 # Holes: 395 # Holes: 40 front row = 0.0 ft (" diam) Secondary Bit diam: mm 0 ' # Holes: - Design Pattern (Main Body) -= " diam) 0 0.0ft (Tertiary Bit diam: # Holes: mm Burden: 11.5 ft avg 11.5 ft avg Spacing: 355 main body # Holes: Bench Height: 16.0 ft avg Sub-drill: 0.0 ft avg **Bulk Expl. Required:** Hole Depth: 16.0 ft avg kg Design Stone Decking -CENTRA GOLD 70 Front Row: ft avg Pkgd Expl. Required: Main Body: ft avg kg - Design Collar Stemming -FORTEL PRO 75X400 2 50 Front Row: 7.0 ft avg Main Body: 7.0 ft avg **Boosters Required:** kg/u # used Material used: 3/4" Clear kg PENTEX 12 (OR EQUIVALENT) 0.34 134.3 - Design Charge Length -Front Row: 9.0 ft avg Main Body: 9.0 ft avg total explosives weight in Blast (kg): 184 Pkgd Prod (50 kg) % of Total kg: 27.1% - Design Charge Weight -**Detonators Required:** Front Row: 26.2 kg/hole # reg'd UNITRONIC 600 6M 2 Main Body: 26.2 kg/hole EXEL HANDIDET 12m 25/500 395 Max Chge Wt / delay: 45.0 kg/delay CONNECTADET 9M 25 ms 3 Required kg Loaded: 184 kg CONNECTADET 9M 33 ms 1 Rock Density: $2.60 \text{ g/cc} = \text{te/m}^3$ CONNECTADET 9M 65 ms 24 Cord & Access. Req'd: - Design Powder Factor -U of M # reg'd Expected Yield PF: WIRE DUPLEX (6 PACK) 400M units 0.003 kg/te (actual) 0.738 lb/yd3 units Front row: 0.168 kg/te (theoretical) 0.738 lb/yd3 units Main Body: 0.168 kg/te (theoretical) Resource Deployment: 0.738 lb/yd3 "KPI" PF: 0.168 kg/te (theoretical) # of Blasts today (this Quarry) 1 NOTES (ANY VARIATION FROM STANDARD). # of Blasters (this Blast) 1 Drilling to shale, final depths to be determined once shot has been measured 2 # of Helpers (this Blast) Note Exception # of MMU's (this Blast) 1 Services Reg'd: BULK TRUCK CHARGE 1.0 BLASTER HOURS 0.0 Enter Blaster hours 0.0 HELPER HOURS Enter total Helper man-hours 0.0 SHOT LAYOUT FEE Enter # trips extra beyond 1 ADVANCED BLAST DESIGN Enter hours 0.0 BORETRACK Enter hours 0.0



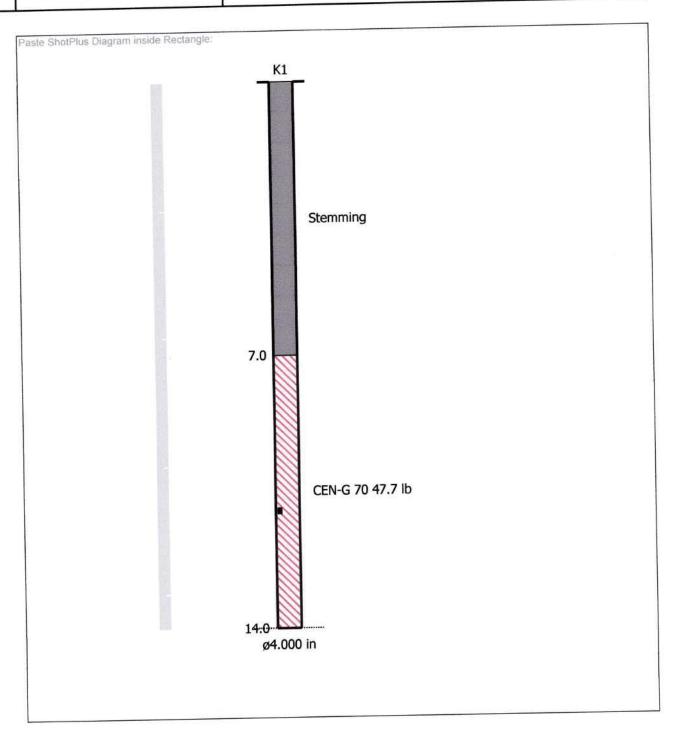
Blast Design

Nelson Aggregate

Quarry: P.O. #: Blast Date:

Burlington 6/20/2019 Blast Number: Orica Order #: 19-010

page 2



Orica
Blaster-in-charge: Kevin Toplis

Quarry Manager: Nick Heap

ORICA The Blasting Professionals*	
page 1 Blaste	er-in
BI: GPS	ast L Coor
Wind from	m the
Clear: Partly Cloudy:	Х
- Drilling In	form
Primary Bit Secondary Bit Tertiary Bit	diam
Bulk Explo	D 70
Packaged	
FORTEL PRO	

Blast Report Nelson Aggregate						
narge:		Mi	ke	Derk	inder	en
ation: nates:		Up 13.40499 ntre of Blast	ре	er Mido °N Lat	lle Nor	th
SE	at	10 kph X Rain: Snow:			ercast: ersion:	
on -	Angle	e from Vertica	ı			
101.6 92.1	mm mm mm	0,	# H # H	Holes: Holes: Holes:	53 4	
		in (kg)	ın	out	(kg)	

Quarry:

P.O. #: Blast Date:

Burlington

2019-07-04

page 1 Blaster-in-charge:		Mike	e Derk	kindere	en	(Print Name)
Blast Location:		Llee	N 4: -l	alla Niaw		
GPS Coordinates:	43.4049			dle Nor	79.88175	(Bench / Face) *W Longitude
GF3 Cooldinates.	Centre of E] IN La	lilude	Centre of Blas	
		1				
Wind from the: SE a	t 10	kph				re: 26 to 30 °C
Olaran	Deim	X	0	[X	
Clear: X	Rain: Snow:			ercast: ersion:	Ceiling	30,000 ft
Failiy Cloudy.	SHOW.		11100	ersiori.	Celling	30,000 It
- Drilling Information -						
Ar	ngle from V	ertical			No	ominal Bit Diameter:
Primary Bit diam: 101.6 mn	n 0	, #	Holes:	53	= 3,205	5.4 ft(4 " diam
Secondary Bit diam: 92.1 mn	n 0		Holes:			1.9 ft (3 5/8 " diam
Tertiary Bit diam:mm	n 0	, #	Holes:		= (0.0 ft(" diam
Bulk Explosives:	in (kg)	out	(kg)	kg	
CENTRA GOLD 70		27,440		19,700	7,740	
CENTRA GOLD 70		34,450		32,820	1,630	
Packaged Explosives:		ipped		turned	kg	
FORTEL PRO 75X400		2		2	0	
Boosters:		kg /	unit	# used	kg	
PENTEX 8 (OR EQUIVALENT)			0.23	57	12.9	
PENTEX 12 (OR EQUIVALENT)			0.34	57	19.4	
					0.100	
	olosives v gd Prod (-			9,402	
Detonators:		o kg) 🤊 e #'s		nai kg. _[0.0% # used	
UNITRONIC 600 6M	Casi	5 π 5	"		# d3cd	
UNITRONIC 600 20M					25	
UNITRONIC 600 25M					32	
Cord & Accessories:			U	of M	# used	
HARNESS WIRE DUPLEX (6				nits	1	1.763 lb/yd ³
MINI STEM PLUC	3S - 6015 (4")		nits	5	1.298 lb/yd ³ 1.731 lb/yd ³
Resource Deployment:			ur	nits		1.586 lb/yd ³
# of Blasts today (this Quarry)					1	NOTES (ANY VARIAT
# of Blasters (this Blast)					1	F-16 Was measured a
# of Helpers (this Blast)	Note F	xception	1		2	8' Collars were used di
# of MMU's (this Blast)					1	
Services:						
BULK TRUCK CHARGE					1.0	
BLASTER HOURS	Enter B	laster h	ours		6.0	

# of Blasters (this Blast)		1
# of Helpers (this Blast)	Note Exception	2
# of MMU's (this Blast)		1
Services:		
BULK TRUCK CHARGE		1.0
BLASTER HOURS	Enter Blaster hours	6.0
HELPER HOURS	Enter total Helper man-hours	10.0
SHOT LAYOUT FEE	Enter # trips extra beyond 1	0.0
ADVANCED BLAST DESIGN	Enter hours	0.0
BORETRACK	Enter hours	0.0

e: 2019-07-04		Blast Time:	1 13	U4 AIV	1	
(Print Name)		Tonnes Blasted:	23,372	te	8,989	m3
(1 111111111111111111111111111111111111	То	tal tonnes per day:	23,372		NB60-07	Rate Code
(Bench / Face)		otal Holes Loaded:		holes		Code
°W Longitude		including:		Dead	Holes	
st		and:		1	r Holes	
		Helper Hole Collar:		ft avg		
re: 26 to 30 °C		# Rows Blasted:		rows		
0. 20 10 00		**	(Front Rov	1		
		Burden:		ft avg		
30,000 ft		Spacing:		ft avg		
00,000		# Holes:		front r		
			Main Body	1		
ominal Bit Diameter:		Burden:		ft avg		
5.4 ft (4 " diam)		Spacing:		ft avg		
.9 ft (3 5/8 " diam)		# Holes:		main		
0.0 ft (Bench Height:		ft avg		
J.OTE (diam)		Sub-drill:		ft avg		70
		Hole Depth:		ft avg		ste
	ole)	'	Decking -	it avy		Bla
	e h	Front Row:		ft avg		/ te
	ingl	Main Body:		ft avg		led
	ω S	# Decks:		per bl		oac
	lon		Stemming		ası	kg L
	Isec	Front Row:		ft avg		or (I
	(Ba	Main Body:		ft avg		act
	F F	•		it avg		er F
	Theoretical PF (Based on a single hole)	Material used:	ge Length -			Yield Powder Factor (kg Loaded / te Blastec
	oret	Front Row:		ft avg		И Ро
	_hec	Main Body:		ft avg		/ielc
	_		e Weight -	_		
		Front Row:			le.	
		Main Body:		•		
		Max. per delay:		1		
		SD () Equation:		kg/del		
		Total kg Loaded:	9,402		lay	
		Rock Density:		g/cc	= te/m ³	
		ROOK Delisity.	2.00	g/cc	- te/m	
		Powd	er Factor -			
1.763 lb/yd ³		Yield PF:		kalto	(actual)	
1.763 lb/yd 1.298 lb/yd ³		Front row:		•	(actual)	01)
1.731 lb/yd ³		Main Body:		_	(theoretic	- 1
1.586 lb/yd ³		"KPI" PF:		_	*	- 1
	N/ 55		0.302	kg/te	(theoretic	al)
NOTES (ANY VARIATIO			177 500			
F-16 Was measured at 61' the morning of the blast and brought to Nick Heap's attention						

Blast Number:

Orica Order #:

Blast Time:

19-011

2503180

11:04 AM

F-16 Was measured at 61' the morning of the blast and brought to Nick Heap's attention					
'Collars were used due to excessive over burden					



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-07-04

Blast Number: 19-011 Orica Order #: 2503180 Blast Time: 11:04 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40505	79.88168
Front Row Corner	43.40470	79.88175
Back Row Corner	43.40521	79.88182
Average (Centre of Blast)	43.40499	79.88175

(N) Radians	(W) Radians
0.757561	1.394198
0.757555	1.394200
0.757564	1.394201
0.757560	1.394199

				_		
1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(N) Radians	(W) Radi
	1st Reading	43.40245	79.87814		0.757516	1.3
	2nd Reading					
	Average	43.40245	79.87814		0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	406.2	m			
	Post Blast Data: ppV:	3.3	mm/s Trigger set at:	2.0	mm/s	
	frequency:	20.0	Hz V/T/L:	?	(Vertical, Transverse or L	ongitudinal)

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

20.0 Hz 113.5 dB air overpressure: Trigger set at: 115 dB 2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	998.1	m
	Poet Blact Data: nn\/:	0.2	mm/e Triager set et:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 394413

Trigger set at: 2.0 mm/s 0.2 mm/s Post Blast Data: ppV: 9.1 Hz frequency: V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: **115.3** dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1411.7	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Trigger set at: 2.0 mm/s Post Blast Data: ppV: Did mm/s frequency: Not Hz V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= <u>(406.2)</u>² kg 30^2

164,998 kg 900

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate. jim bray



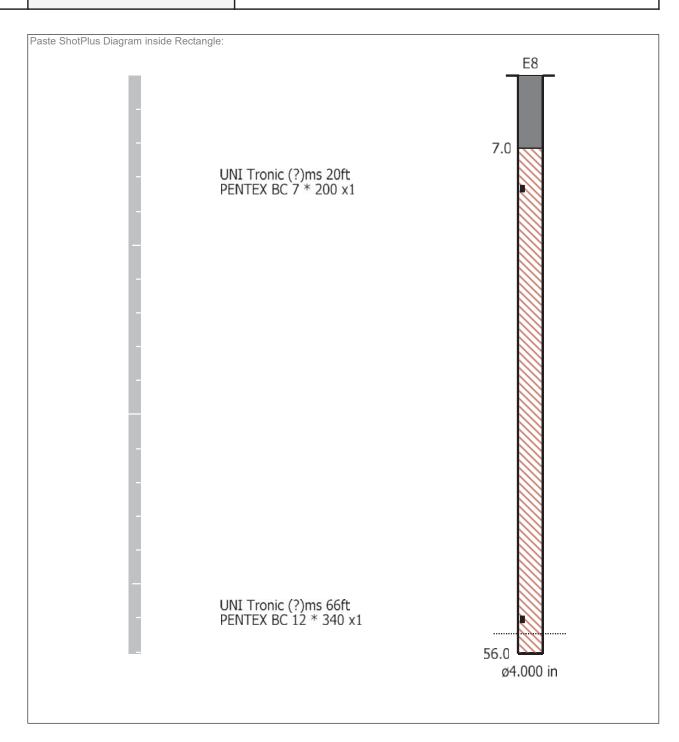
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 7/4/2019

Blast Number: Orica Order #: 19-011 2503180

page 2



Orica
Blaster-in-charge: Mike derkinderen

Quarry Manager: Nick Heap

Signature required, indicating sign off on Blast Design.



Event Report



Date/Time Long at 11:04:45 July 4, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 #2 Road Client: Nelson Aggregate User Name: Orica Canada Inc. General: Burlington

Extended Notes

N43.40245;W-79.87814

Microphone Linear Weighting **PSPL** 113.5 dB(L) at 1.575 sec

ZC Freq 9.1 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 514 mv)

	Tran	Vert	Long	
PPV	2.413	1.524	3.302	mm/
ZC Freq	10.2	43	20	Hz
Time (Rel. to Trig)	0.338	0.059	0.042	sec
Peak Acceleration	0.053	0.053	0.080	g
Peak Displacement	0.026	0.019	0.029	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.4	Hz
Overswing Ratio	3.8	3.6	3.9	

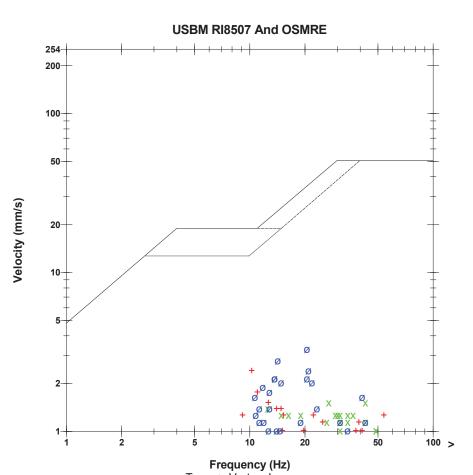
Peak Vector Sum 3.326 mm/s at 0.042 sec

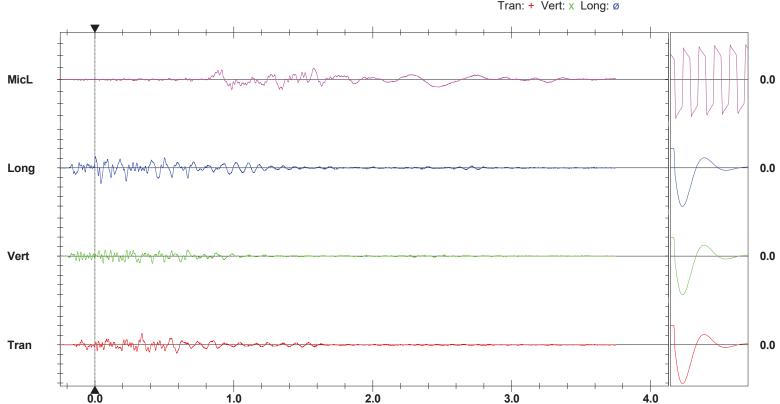
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.4 Volts

Unit Calibration December 4, 2018 by Instantel File Name

__TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check



Event Report



Date/Time MicL at 11:04:45 July 4, 2019

Trigger Source Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.009 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level** 3.7 Volts

Unit Calibration January 15, 2019 by Instantel **File Name** UM6857_20190704110445.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES** User Name:

ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

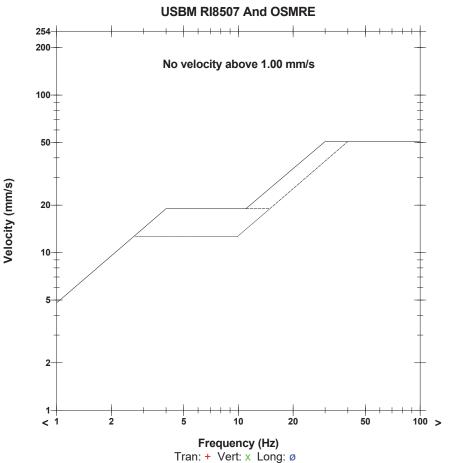
PSPL 115.3 dB(L) at 0.007 sec

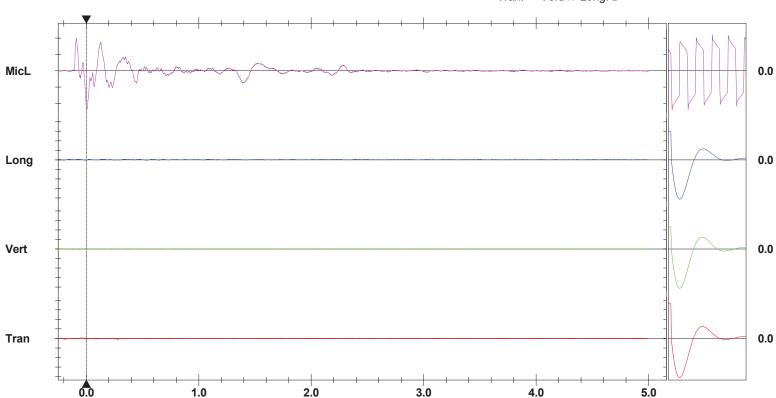
ZC Freq 4.5 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1273 mv)

	Tran	Vert	Long	
PPV	0.150	0.102	0.150	mm/s
ZC Freq	9.1	4.9	7.2	Hz
Time (Rel. to Trig)	-0.188	-0.104	0.141	sec
Peak Acceleration	0.010	0.012	0.012	g
Peak Displacement	0.003	0.016	0.012	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.3	3.3	3.5	

Peak Vector Sum 0.166 mm/s at -0.060 sec





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶

Sensor Check

Southwest Corner of property Nelson Aggregate Burlington 2019-07-04 Blast 19-011 Upper Middle

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
		SERIAL NUMBER: UM6859
Jul 4 /19 10:13:22		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Jul 4 /19 10:13:22	Jul 4 /19 11:37:50	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121

SHOTPlus 5 Plan

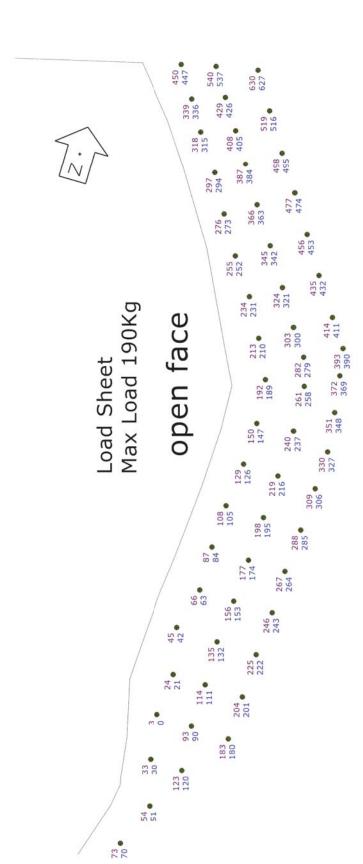
Blast Summary Data

Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft

1st row burden: 12.0ft Hole Diameter: 4.0in Number of holes: 57

Total drilled: 3447.4ft

Stemming: 7.0ft Hole angle: 0.0°



9NECRNR010 Design Fnl- 3.625" and 4" Blast Holes 12x10 9x10 266 and 2 E19 F11 F18 G10 G11 are 3.625" DIA HOLES PAINTED PINK MARKER STONES



F15 F17 F18 67.4ft F15 66.9ft 66.9ft 66.0ft E18 67.0f G17 67.5ft 67.3ft G16 66.9ft E16 66.5ft 66.5ft G15 66.7ft F14 F13 66.2ft 65.6ft E15 66.1ft Stemming: 7.0ft Hole angle: 0.0° 59.1ft E11 E13 65.2ft 60.5ft E12 63.7ft F13 53.3ft F2 53.3ft F3 53.8ft F4 61.8ft E11 60.5ft E11 55.3ft F7 60.5ft E11 64.0ft 61.8ft F12 61.5ft 62.7ft 612 61.5ft 62.7ft 612 61.5ft 62.7ft 612 61.5ft 62.7ft 612 55.1ft G5 55.2ft G6 59.9ft 61.5ft 02.... 58.9ft G9 60.5ft 62.1ft 62.9ft Number of holes: 57 Subdrill: 2.0ft Blast Summary Data SHOTPlus 5 Plan Hole Diameter: 4.0in Spacing: 10.0ft 1st row burden: 12.0ft Total drilled: 3447.4ft • E5 • 53.8ft • 54.7ft Burden: 9.0ft E2 E3 E4 52.3f E4 53.6f €1. 52.7ft

E19 F11 F18 G10 G11 are 3.625" DIA HOLES PAINTED PINK MARKER STONES



SHOTPlus 5 Plan

Blast Summary Data

Hole Diameter: 4.0in Spacing: 10.0ft

> 1st row burden: 12.0ft Total drilled: 3447,4ft

Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 57

Hole angle: 0.0° Stemming: 7.0ft

Load Sheet

Max Load 190Kg

0/25

18 - 181 - 1 E19 F11 F18 G10 G11 are 3.625" DIA HOLES PAINTED PINK MARKER STONES



6/12/2019 9NECRNR010 Design Fnl- 3.625" and 4" Blast Holes 12x10 9x10 266 and 250 + .6 SUB ELEV 66.9ft F18 + 4.000in F17 + 3.625in 67.4ft G18 ii 4.000in 67.5ft E19 +4.000ir +4.000ir 67.0ft #3.625in #4.000in 67.2ft 66.7ft N E Corner along haul road 9NECRNR010 Design Fnl G16 4.000in 66.9ft E16 4.000in 4.000in 66.5ft 66.5ft F16 E19 F11 F18 G10 G11 are 3.625" DIA HOLES G15 • 4.000in 66.7ft SHOTPlusTM Professional 5.7.4.4 F15 • 4.000in 66.6ft APPROX 10700 kgs G14 66.4ft Burlington F14 • 4.000in 66.2ft E15 4.000in 66.1ft Stemming: 7.0ft Hole angle: 0.0° . 4.000in • 4.000in 65.6ft 613 E14 4.000in 65.2ft F13 PAINTED PINK MARKER STONES Title/author F12 F11 \$4.000in 6 4.000in 3.625in 64.0ft 61.5ft 62.7ft 67.5ft 62.77 \$4.000in G8 57.7ft \$4.000in G9 58.9ft \$4.000in G10 G11 \$4.000in 58.9ft \$4.000in G9 60.5ft \$62.1ft 62.9ft Filename Location E12 E13 E13 P4.000in 63.7ft 61.8ft Number of holes: 57 Subdrill: 2.0ft open face Blast Summary Data SHOTPlus 5 Plan E11 # 4.000in 60.5ft F9 4.000in 59.9ft £10 4.000in 59.1ft F7 • 4.000in 56.8ft • 4.000in 58.4ft Hole Diameter: 4.0in • 4.000in 57.2ft Spacing: 10.0ft .4.000in 56.4ft E8 • 4.000in 56.0ft F6 • 4.000in 55.3ft G5 # 4.000in 1st row burden: 12.0ft 4.000in Total drilled: 3447.4ft F5 • 4.000in 54.8ft 55.3ft G4 • 4.000in 55.1ft E6 ⊕ 4.000in Burden: 9.0ft F4 + 4.000in 54.5ft 54.7ft + 4.000in 54.1ft Scale 1:250 E5 +-4.000in 53.8ft 63 F3 + 4.000in 53.8ft + G2 + 4.000in 53.5ft 6 4.000in 53.6ft € 4.000in 53.4ft G1 9 4.000in 53.1ft ORICA E3 • 4.000in 52.3ft F1 • 4.000in 53.3ft 62 4.000in 52.0ft €1 • 4.000in 52.7ft

ORICA The Blaating Professionals
page 1 B
G
Wind
Cl Partly Clo

Rlast Report

Quarry:	Burlington
P.O. #:	
Blast Date:	2019-07-11

Blast Number:	19-012
Orica Order #:	2505549
Blast Time:	11:01 AM

ORICA			1 Kep			P.O. #:		Orica Order #:	250	05549		
The Blasting Professionals		Nelso	n Aggre	egate		Blast Date:	2019-07-11	Blast Time:	11:0	01 AN	1	
age 1 Blaste	or in a	harge:		Mike Derl	indor		(D: (N)	Tonnes Blasted:	24,817	4-	9,545	m3
Blaste	er-in-c	narge:		MIKE Den	Kindere	2 11	(Print Name)	Total tonnes per day:			9,545 NB80-02	
Bla	ast I o	cation:		Upper N	Middle		(Bench / Face)	Total Holes Loaded:		holes	ND00-02	Code
		inates:	43.40358		titude	79.88181	°W Longitude	including:		Dead	Holes	
0. 0			Centre of Bl			Centre of Blast	oga.o	and:			r Holes	
								Helper Hole Collar:		ft avg		
Wind fror	m the	SW at	5 H	cph		Temperature	26 to 30 °C	# Rows Blasted:		rows		
				X		Х			(Front Row	1		
Clear:			Rain:		ercast:	X		Burden:		ft avg		
Partly Cloudy:			Snow:		ersion:	Ceiling	29,209 ft	Spacing:		ft avg		
, ,								# Holes:		front r	OW	
- Drilling In:	forma	tion -						- Pattern	(Main Body	1		
			le from Ve	rtical		Non	ninal Bit Diameter:	Burden:		ft avg		
Primary Bit	diam:		0,	# Holes:	51	= 3,662.6	ift (4 " diam)	Spacing:	10.0	ft avg		
Secondary Bit		mm	0,	# Holes:		= 0.0	oft (" diam)	# Holes:		main l	oody	
Tertiary Bit		mm	0,	# Holes:) ft (" diam)	Bench Height:		ft avg	,	
	-						^	Sub-drill:		ft avg		
Bulk Explo	sives	; :	in (k	g) out	(kg)	kg		Hole Depth:		ft avg		aste
CENTRA GOL				-	22,660	11,230		0	Decking -	_		
								Front Row:		ft avg		d / te
Packaged	Explo	sives:	cs ship	oped cs re	turned	kg		Main Body:		ft avg		adec
FORTEL PRO				2	2	0		# Decks:	3	per bla	ast	Log
									Stemming			(kg
								Front Row:	7.0	ft avg		tor
Boosters:				kg / unit	# used	kg		Main Body:	7.0	ft avg		Fac
PENTEX 8 (OF	R EQUIV	/ALENT)		0.23	52	11.8		Material used: - Charge Front Row: Main Body:	3/4" Clear			der
PENTEX 12 (O	R EQU	IVALENT)		0.34	53	18.0		- Charg	ge Length -			Yield Powder Factor (kg Loaded / te Blastec
								Front Row:	60.8	ft avg		10 H
		total exp	osives we	eight in Blas	t (kg):	11,260		☐ Main Body:	60.8	ft avg		₹
		Pkg	d Prod (0	kg) % of To	otal kg:	0.0%		- Charg	ge Weight -			
Detonators	s:		case	#'s n	ns	# used		Front Row:				
UNITRONIC 60	00 6M					48		Main Body:		1		
UNITRONIC 60	00 15M					4		Max. per delay:		_		
UNITRONIC 60	00 25M					53		SD () Equation:		kg/del	ay	
								Total kg Loaded:				
								Rock Density:	2.60	g/cc	= te/m ³	
Cord & Ac					of M	# used	3		ler Factor -			
HARNES	SS WIRI	E DUPLEX (6 F	PACK) 400	M ur	nits	1	1.988 lb/yd ³	Yield PF:		•	, ,	
	MIN	I STEM PLUG	S - 6015 (4 ¹	") uı	nits	5	1.260 lb/yd ³	Front row:			(theoretic	,
				uı	nits		1.680 lb/yd ³	Main Body:		_	(theoretic	,
Resource De	eploym	ent:	I				1.540 lb/yd ³	"KPI" PF:	0.351	kg/te	(theoretic	cal)
# of Blasts toda	ay (this (Quarry)				1	NOTES (ANY VARIATIO					
# of Blasters (th	his Blast	t)				1	Hole E18's top detonator	showed an error at blast time (NCO) All holes	are do	uble prim	ed so
# of Helpers (th	nis Blast)	Note Exc	ception		2	we continued to fire the b	olast.				
# of MMU's (thi	is Blast)					1						
Services:												
BULK TRUCK	CHARG	E				1.0						
BLASTER HOU	JRS		Enter Bla	aster hours		6.0						
HELPER HOU	RS		Enter tot	al Helper man	-hours	10.0						
SHOT LAYOU	T FEE		Enter # t	rips extra bey	ond 1	0.0						
ADVANCED BI	LAST D	ESIGN	Enter ho	urs		0.0						
BORETRACK			Enter ho	urs		0.0						



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-07-11

Blast Number: 19-012 Orica Order #: 2505549 Blast Time: 11:01 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40361	79.88180
Front Row Corner	43.40336	79.88190
Back Row Corner	43.40377	79.88172
Average (Centre of Blast)	43.40358	79.88181

(N) Radians	(W) Radians
0.757536	1.394200
0.757532	1.394202
0.757539	1.394199
0.757535	1.394201

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(N) Radians	(W) Rad
	1st Reading	43.40245	79.87814	ļ	0.757516	1.3
	2nd Reading					
	Average	43.40245	79.87814	ļ.	0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	322.0	m			
	Post Blast Data: ppV:	7.9	mm/s Trigger set at	2.0	mm/s	
	frequency:	13.1	Hz V/T/L	?	(Vertical, Transverse or L	ongitudinal)

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1 394137

13.1 Hz 119.7 dB air overpressure: 2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	1024.0	m
			,

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 30//13

Post Blast Data: ppV: 0.3 mm/s Trigger set at: 2.0 mm/s **10.0** Hz frequency: V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: **120.3** dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1267.6	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Trigger set at: 2.0 mm/s Post Blast Data: ppV: Did mm/s frequency: Not Hz V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(322)^2}{30^2} \text{ kg}$$

= 103,684 kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

> Signature required, indicating that Blast Report is Complete & Accurate.



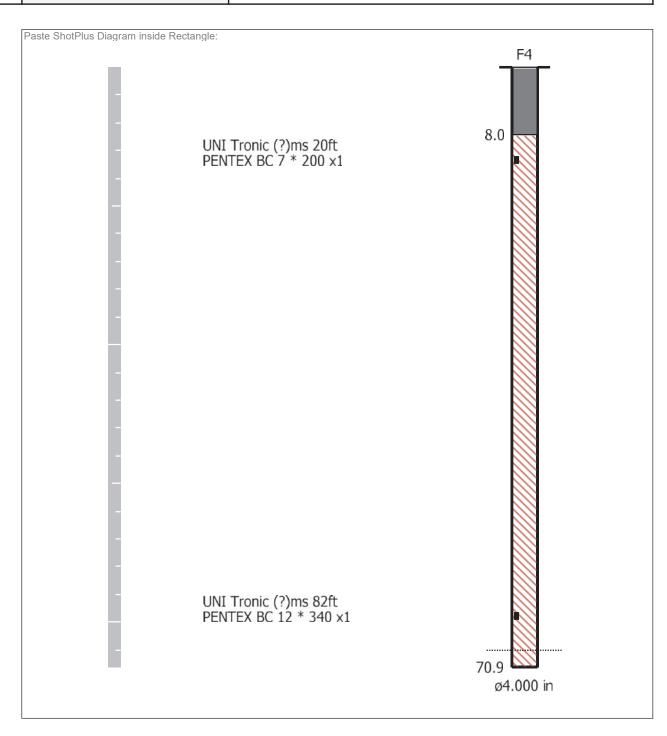
Blast Design

Nelson Aggregate

Quarry:	Burlington
P.O. #:	
ast Date:	

Blast Number: Orica Order #: 19-012 2505549

page 2



Orica Blaster-in-charge:	Mike der Kinderen
Quarry Manager:	Nich Heap



Event Report



Date/Time Long at 11:01:03 July 11, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.0 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 #2 Road Client: Nelson Aggregate User Name: Orica Canada Inc. General: Burlington

Extended Notes

N43.40245;W-79.87814

Microphone Linear Weighting **PSPL** 119.7 dB(L) at 1.034 sec

ZC Freq 1.9 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 543 mv)

	Tran	Vert	Long	
PPV	5.461	3.302	7.874	mm/
ZC Freq	13.7	21	13.1	Hz
Time (Rel. to Trig)	0.344	0.530	0.218	sec
Peak Acceleration	0.080	0.080	0.133	g
Peak Displacement	0.063	0.037	0.111	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.7	3.6	4.0	

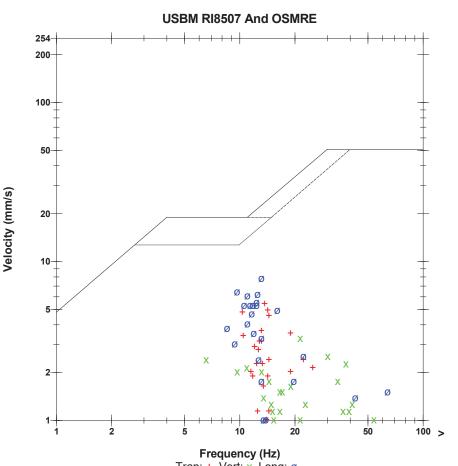
Peak Vector Sum 8.807 mm/s at 0.218 sec

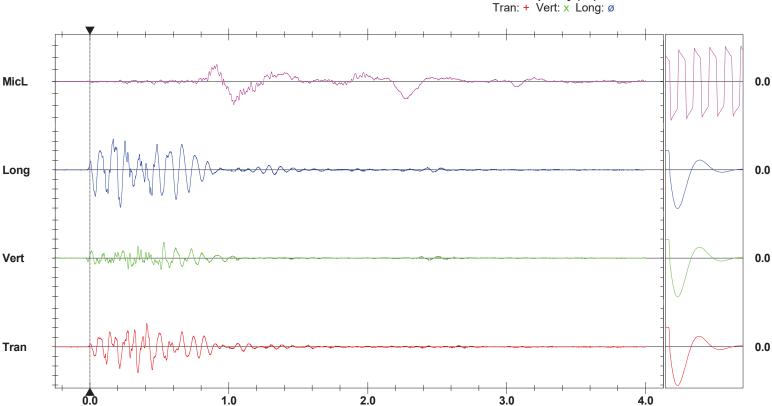
Serial Number BE12877 V 10.72-1.1 Minimate Blaster

Battery Level 6.3 Volts

Unit Calibration December 4, 2018 by Instantel File Name

__TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check



Event Report



Date/Time MicL at 11:01:04 July 11, 2019 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.133 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level** 3.6 Volts

Unit Calibration January 15, 2019 by Instantel File Name UM6857_20190711110104.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES**

User Name: ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

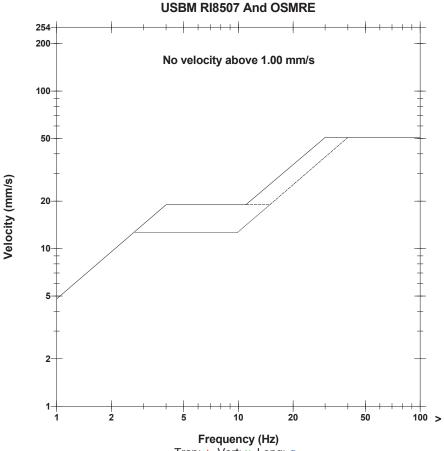
PSPL 120.3 dB(L) at 0.011 sec

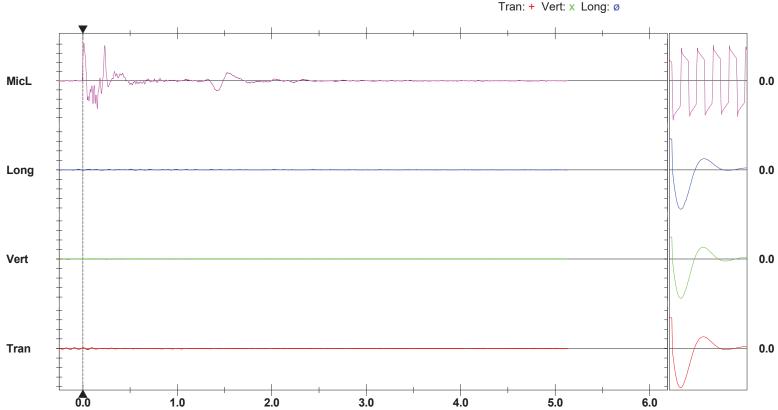
ZC Freq 10.6 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1329 mv)

	Tran	Vert	Long	
PPV	0.252	0.102	0.158	mm/s
ZC Freq	10.0	6.4	9.0	Hz
Time (Rel. to Trig)	0.046	-0.164	0.511	sec
Peak Acceleration	0.010	0.010	0.012	g
Peak Displacement	0.004	0.002	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.3	3.5	

Peak Vector Sum 0.275 mm/s at 0.053 sec





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶

Sensor Check

Southwest Corner of property Nelson Aggregate Burlington 2019-07-11 Blast 19-12 Upper Middle

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
		SERIAL NUMBER: UM6859
Jul 11 /19 06:21:03 Jul 11 /19 06:21:02	Jul 11 /19 11:33:15	Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 1.50

SHOTPlus 5 Plan Blast Summary Data

		15 15 To	Burden: 9.0ft 1st row burde Total drilled: 3	Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 3662.6ft		Spacing: 10.0ft	Spacing: 10.0ft Hole Diameter: 4.0in		Subdrill: 2.0ft Number of holes: 51	oft noles: 51	Hol	Stemming: 7.0ft Hole angle: 0.0°	.0°				
(24.35)	(7.5)		7	22.74		O	obe	L L	open face	-			1 60	Z T Z	4.2		* D19 72.7R
, D2 71.0ft	D3 D.	D4 D771.6ft 7	, DS 71.7ft	D6 71.3ft	D7 .7ft	+ D8	D9 71.5ft	D10 73.2ft	+ D11 • 73.9ft	D12 72.8ft	D13	, D14 73.1ft	D15	D16	D17	*72.9ft	
BERM 13.00 P. 21.50 P. 11.30	E3 E4	.3f. *7	E5 71.0ft	E6 70.6ft	E7 70.3ft	E8 70.2ft	E9 70.6ft	E10 72.3ft	€11 Ф 73.3ft	€12 ●72.4R	• F13 • 72.3ft	₱ F14 ₱ 72.2ft	#72.6ft	E16 72.7ft	₱ 72.3ft	72.8ft	
F2 73.5ft	F3 F4 F5 F6 72.0ft 70.0ft 69.8ft	.9ft	75.0ft		F7 69.7ft	F8 69.9ft	F9 70.2ft	F10 70.5ft	F11 71.1ft	F12 71.4ft	F13 71.5ft	F14 71.9ft	F15 72.5ft	F16 72.6ft	F17 • 72.8ft		



		Stemming: 7.0ft
OTPlus 5 Plan	st Summary Data	Subdrill: 2.0ft
HS	Blas	Spacing: 10.0ft
		Burden: 9.0ft

urden: 9.0ft	Spacing:
st row burden: 12.0ft	Hole Dia
otal drilled: 3662.6ft	

0=Deck

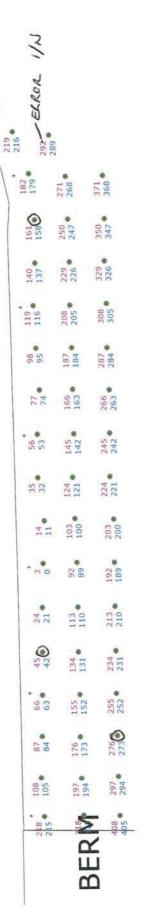
	Blast Summary Da
Spacing: 10.0ft	Subdrill
Hole Diameter:	: 4.0in Number

ummary Data	Subdrill: 2.0ft	Number of holes: 51
Blast Si		4.0in

Hole angle: 0.0°

PLANT

open face





SHOTPlus 5 Plan

Blast Summary Data

Subdrill: 2.0ft Hole Diameter: 4.0in

> 1st row burden: 12.0ft Total drilled: 3662.6ft

Burden: 9.0ft

Number of holes: 51

Hole angle: 0.0°

Max Load 230Kg Load Sheet 245 open face BERM227-250 . 228 . 224 . 237 . 222 . 326 . 722 . 232 . 237 . 236 . 222 . 211 . 221 . 327 . 325

0250 025 025 025 112. 112. 112. 012. 025. 825. 815. 112. 815. 245. 255. 025.

Not to scale

SHOTPlus 5 Plan

Blast Summary Data Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Total drilled: 3662.6ft

Number of holes: 51 Subdrill: 2.0ft

Stemming: 7.0ft Hole angle: 0.0°

⊕ D19 D18 72.9ft F17 (F72.8ft €15 ⊕72.6ft POSTS ⊕ D15 ⊕ D13 ⊕71,4R ⊕71,5R €71.1R ⊕ D11 ⊕ 73.9ft 11650 KGS ₽10 ₽70.5ft F9 ⊕70.2ft €9 ⊕70.6ft open face F7 ⊕ 69.7ft ⊕ F7 ⊕FS ⊕F6 ⊕70.0ft ⊕69.8ft ⊕ E6 70.6ft ⊕ ES ⊕ 71.0ft ⊕D4 ⊕71.6k F3 ⊕72.0ft F72.5ft

9UPMD012 Design FnI - 4" Blast Hole 12x10 9x10 271.5 and 250 + .6 SUB ELEV DRILLER NAME:



7/5/2019 UPPER MIDDLE NEXT TO OLD WHEEL WASH 9UPMD012 Design Fnl SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Location Mine

Scale 1:300

ORIC The Blastin Professiona
page 1

Blast Report

Quarry:	Burlington
P.O. #:	
Blast Date:	2019-07-30

Blast Number:	19-014
Orica Order #:	2512320
Blast Time:	12:20 PM

ORICA					P.O. #:		07.00		Orica Order #:		12320		_
The Blasting Professionals	Nelso	n Aggregate			Blast Date:	2019	-07-30		Blast Time:	12:2	20 PN	1	
age 1 Blaste	er-in-charge:	Miko	Derkin	dere	an .	(Print Name	,)		Tonnes Blasted:	21,052	to	8,097	7 m3
Diaste	si-iii-ciiaige.	IVIIKC	Derkin	idere		(FIIII IVAIIIE	;)	То	tal tonnes per day:	21,052		NB60-07	Poto
RI	ast Location:	116	pper Mid	Idla		(Bench / Fa	20)		otal Holes Loaded:		holes	ND00-07	Code
	Coordinates:		°N Latitu		79.88169	°W Longit	′		including:		Dead	Holes	
GF3 (entre of Blast	IN Laut	iue [Centre of Blast	vv Longii	uue		including.			r Holes	
		ontro or blast			Contro or Blace			ı	Helper Hole Collar:		ft avg		
Wind fror	n the: W at	5 kph			Temperature:	26 to 30	·c	'	# Rows Blasted:		rows		
Willia IIOI	ii iiie. VV ai	Х			X	20 10 30			1	(Front Row	l .		
Clear:		Rain:	Overd	act.					Burden:		ft avg		
Partly Cloudy:	X	Snow:	Invers	-	Ceiling	2.55	52 ft		Spacing:		ft avg		
artiy Oloday.		Onow.	IIIVOIG	,ioii.	Cennig	2,00	, <u>,</u>		# Holes:		front r		
- Drilling In:	formation -									Main Body			
Drilling III		le from Vertical			Nom	inal Bit D	iameter		Burden:		ft avg		
Primary Bit	diam: 101.6 mm		Holes:	45	= 3,113.3		" diam)		Spacing:		ft avg		
Secondary Bit			Holes:		= 0.0	`	" diam)		# Holes:		main l		
Tertiary Bit			Holes:		= 0.0	•	" diam)		Bench Height:		ft avg	-	
Tortiary Dit	diam.	# 1	10103.		0.0	ı. (I	alam)		Sub-drill:		ft avg		-0
Bulk Explo	sives:	in (kg)	out (k	a)	kg				Hole Depth:		ft avg		Yield Powder Factor (kg Loaded / te Blasted
CENTRA GOL		36,290	`	,610	9,680			a single hole)	•	Decking -	iturg		<u>B</u>
OLIVINA GOL	570	00,200	20,	,010	3,000			le h	Front Row:		ft avg		/ te
Packaged	Explosives:	cs shipped	cs retur	ned	kg			ing	Main Body:		ft avg		ded
FORTEL PRO	-	2	oo rotar	1	25			9	# Decks:		per bla		0.0
TORTELLING	10,400	_						d on		Stemming		aot	<u>S</u>
								(Based	Front Row:		ft avg) Joi
Boosters:		ka /	unit #	used	kg			(B)	Main Body:		ft avg		act
	R EQUIVALENT)	, ing /	0.23	46	10.4			P	Material used:		ituvg		er
	R EQUIVALENT)		0.34	46	15.6			Theoretical		ge Length -			owo
(0	,		0.0.		10.0			ore	Front Row:		ft avg		0
	total expl	osives weight ir	n Blast (l	kg):	9,731			The	Main Body:		ft avg		Ϋ́e
	•	Prod (25 kg) %	•	-	0.3%				- Charg	e Weight -	-		
Detonators	s:	case #'s	ms		# used				Front Row:	181.3		le	
UNITRONIC 60	00 6M				45				Main Body:	166.7	kg/hol	le	
UNITRONIC 60	00 15M				2				Max. per delay:	209.0	kg/del	lay	
UNITRONIC 60	00 25M				45				SD () Equation:	108.4	kg/del	lay	
									Total kg Loaded:	9,731	kg		
									Rock Density:	2.60	g/cc	= te/m ³	š
Cord & Ac	cessories:		U of I	М	# used				- Powd	er Factor -			
HARNES	SS WIRE DUPLEX (6 P	ACK) 400M	units		1	2.02	6 lb/yd ³		Yield PF:	0.462	kg/te	(actual)	
	MINI STEM PLUGS	6 - 6015 (4")	units				g lb/yd³		Front row:	0.305	kg/te	(theoreti	cal)
			units				1 lb/yd ³		Main Body:	0.375	kg/te	(theoreti	cal)
Resource De	ployment:					1.54	₁ lb/yd ³		"KPI" PF:	0.352	kg/te	(theoreti	cal)
# of Blasts toda	ay (this Quarry)				1	NOTES (AN	IY VARIATIO	N FR	OM STANDARD):				
# of Blasters (th	nis Blast)				1	Hole I5 rece	eived a 5' stor	e dec	k due to void identified wh	nile loading			
# of Helpers (th	nis Blast)	Note Exception			2								
# of MMU's (thi	s Blast)				1								
Services:													
BULK TRUCK	CHARGE				1.0								
BLASTER HOL		Enter Blaster ho	ours		7.0								
HELPER HOU		Enter total Help		ours	11.0								
SHOT LAYOU		Enter # trips ext			0.0								
ADVANCED BI		Enter hours			0.0								
BORETRACK													



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-07-30

Blast Number: 19-014 Orica Order #: 2512320 Blast Time: 12:20 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40354	79.88170
Front Row Corner	43.40376	79.88168
Back Row Corner	43.40336	79.88170
Average (Centre of Blast)	43.40355	79.88169

(N) Radians	(W) Radians
0.757535	1.394199
0.757539	1.394198
0.757532	1.394199
0.757535	1.394199

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(N) Radians	(W) Radi
	1st Reading	43.40245	79.87814		0.757516	1.3
	2nd Reading					
	Average	43.40245	79.87814		0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	312.4	m			
	Post Blast Data: ppV:	7.7	mm/s Trigger set at:	2.0	mm/s	
	frequency:	12.8	Hz V/T/L:	?	(Vertical, Transverse or L	ongitudinal)

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

12.8 Hz **120.7** dB air overpressure: Trigger set at: 115 dB 2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	1033.6	m
	Post Blast Data: nn\/-	0.2	mm/s Trigger set at:

(N) Radians	(W) Radians
0.757578	1.394413
0.757578	1 394413

Trigger set at: 2.0 mm/s 0.2 mm/s **8.9** Hz frequency: ? (Vertical, Transverse or Longitudinal) V/T/L: air overpressure: **120.5** dB Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (3rd Seis. From Centre of Blast)	1269.2	m
			,

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1.394323

Trigger set at: 2.0 mm/s Post Blast Data: ppV: Did mm/s frequency: Not Hz V / T / L : (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= __(312.4)² kg

97,594 kg 900

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate. jim bray



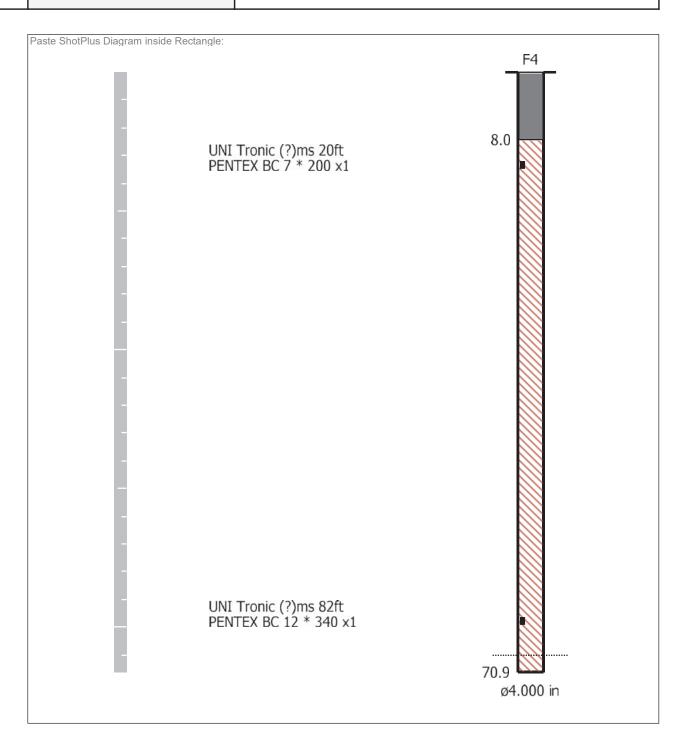
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 7/30/2019

Blast Number: Orica Order #: 19-014 2512320

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Vich Heap



Event Report



Date/Time Long at 12:20:36 July 30, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.0 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 #2 Sideroad Client: Nelson Aggregate User Name: Orica Canada Inc. General: Burlington

Extended Notes

Sand Bagged

N43.40245W-79.87814

Microphone Linear Weighting

PSPL 120.7 dB(L) at 1.059 sec

ZC Freq 2.7 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 556 mv)

	Tran	Vert	Long	
PPV	4.699	2.794	7.747	mm/s
ZC Freq	17.1	23	12.8	Hz
Time (Rel. to Trig)	0.143	0.237	0.430	sec
Peak Acceleration	0.080	0.080	0.106	g
Peak Displacement	0.049	0.023	0.091	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.3	Hz
Overswing Ratio	3.7	3.6	4.0	

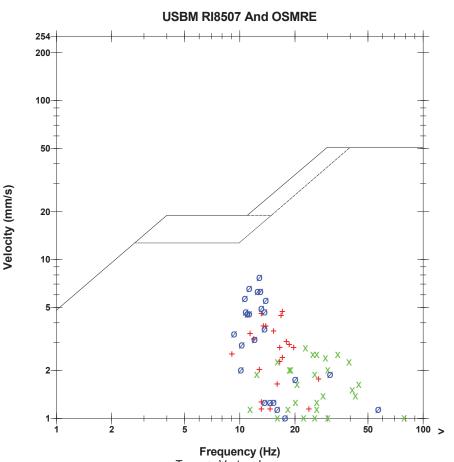
Peak Vector Sum 7.832 mm/s at 0.430 sec

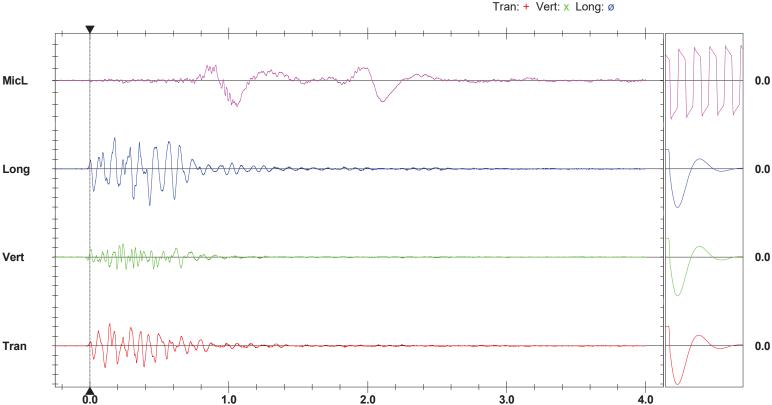
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.3 Volts

Unit Calibration December 4, 2018 by Instantel **File Name**

_TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Sensor Check



Event Report

File Name



Date/Time MicL at 12:20:37 July 30, 2019 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.147 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level**

3.5 Volts

Unit Calibration January 15, 2019 by Instantel UM6857_20190730122037.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES**

User Name: ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

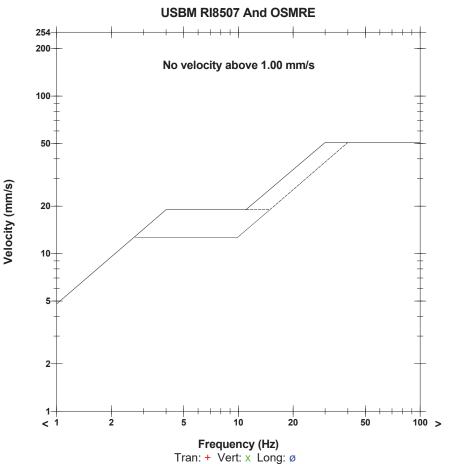
PSPL 120.5 dB(L) at 0.011 sec

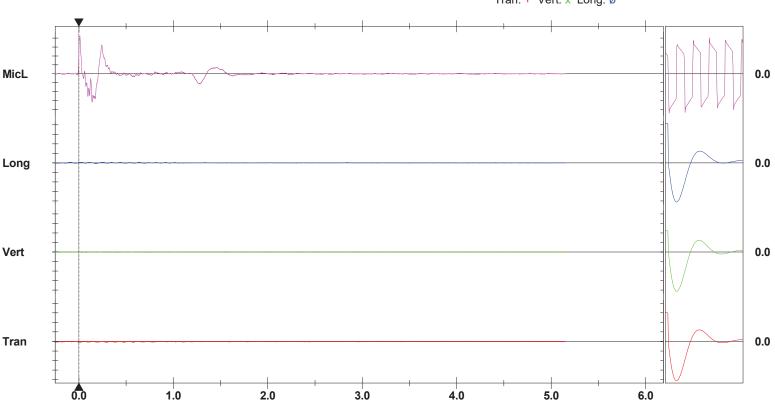
ZC Freq 11.0 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1301 mv)

	Tran	Vert	Long	
PPV	0.166	0.102	0.150	mm/
ZC Freq	8.9	5.4	8.1	Hz
Time (Rel. to Trig)	0.185	-0.232	0.012	sec
Peak Acceleration	0.010	0.010	0.013	g
Peak Displacement	0.018	0.044	0.003	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.4	3.3	3.3	

Peak Vector Sum 0.209 mm/s at 0.185 sec





Trigger = ▶

Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div

Sensor Check

South west corner of property(N43.39339W-79.88880) Nelson Aggregate Burlington 2019-07-30 Blast 19-014

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
		SERIAL NUMBER: UM6859
Jul 30 /19 05:43:58		Start Monitoring Waveform Geo: 1.50 mm/s Mic: 121.0 dB
Jul 30 /19 11:20:23	Jul 30 /19 11:20:26	Event recorded. Trigger Level Long: 1.50 mm/s
Jul 30 /19 12:43:42	Jul 30 /19 12:43:46	Event recorded. Trigger Level Tran: 1.50 mm/s
Jul 30 /19 12:43:46	Jul 30 /19 12:43:53	Event recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic: 121.0

Printed: July 30, 2019 (V 10.72 - 10.74)

				171 168					
				150	240				
				129	219	306			
	7.0ft 0.0°			108 ⁺	198 195	288			
	Stemming: 7.0ft Hole angle: 0.0°	Number of holes: 45 Hole angle:		87	177	267			
				66	156	243			
Jara	Subdrill: 2.0ft Number of holes:		open face	45	135 132	222			
DIASE SUITINIALY DATA	Subdr			24 21	111	204			
	0.0ft ter: 4.0in			e 0	93	183 180			
	Spacing: 10.0ft Hole Diameter: 4.0in			14	104	194			
				35	125	215			
	Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 3113.3ft	Total drilled: 3113.3ft		53	146 143	236 236 233			
	Burd 1st r Total			77	167	257			
				98	188	278		-	
				119	209 1	299 2		35	
				230 [†] 1 227 • 1	320 2	410 2		ORI	

			N		#			9UPMD015 Design Fnl - 4" Blast Hole 12x10 9x10 270 and DRILLER NAME:
					G15 + G16 70.6ft 70.2ft	H15 • 70.6ft		9x10 2
					G14 71.2ft	H14 70.8ft	114 70.7ft	10 8
					+ G13 • 71.0ft	#113 70.3ft	₱ 70.0ft	12x
		Stemming: 7.0ft Hole angle: 0.0°			612 70.7ft	# H12 # 69.0ft	112 68.3ft	Tole
		Stem			G11 70.7R	#11 • 68.3ft	111 67.9ft	ist F
		Oft holes: 45			⊕ G10 ₱ 70.5ft	H10 67.3ft	110 • 66.9ft	Bla
us Plan	Blast Summary Data	Subdrill: 2.0ft Number of holes: 45		ce	* G9 70.2ft	H9 67.9ft	19 66.4ft	4
SHOTPlus Plan	Blast Sumi	4.0in		open face	G8 69.7ft	₩ 68.5Æ	18 67.2ft	Fn
		Spacing: 10.0ft Hole Diameter: 4.0in		obe	G7 69.4ft	H7 68.4ft	±17 €67.7ft	esign E:
						H6 67.4ft	16 67.2ft	5 De
		Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 3113.3ft			+ G5 • 69.2ft	# 67.0ft	14 15 16 67.5f 66.9f 67.2ft	001 ER I
		Burden: 9.0ft 1st row burde Total drilled:			G4 69.7ft	H4 67.8ft	14 67.5ft	9UPMD015 Desi DRILLER NAME:
					G3	₩ • 69.1ft	13 68.0ft	9 PF
					62 ₱71.3ft	+H2 +70.3ft	12 69.5ft	
					G1 71.8ft		11 69.9ft	



Subdrill: 2.0ft Blast Summary Data

Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3113.3ft

Burden: 9.0ft

Number of holes: 45

Stemming: 7.0ft Hole angle: 0.0°

Load Sheet 230Kg Max open face

By Bow

241



G16 # 70.2ft ⊕ G15 ⊕ 70.6ft ⊕ H14 H15 ⊕ 70.8ft ⊕ 70.6ft ⊕ G14 ⊕ 71.2ft POSTS Stemming: 7.0ft Hole angle: 0.0° ⊕ H13 ← 70.3ft + G13 + 71.0ft ⊕ H12 ⊕ 69.0ft ⊕ 70.7ft APPROX 10000 KGS Number of holes: 45 ⊕ G11 ⊕ 70.7ft ⊕ H11 ⊕ 68.3ft Subdrill: 2.0ft Blast Summary Data ⊕ H10 ⊕ 67.3ft ⊕ G10 ⊕ 70.5ft SHOTPlus 5 Plan ⊕ 70.2ft # 67.9ft Hole Diameter: 4.0in H8 ⊕ 68.5ft open face Spacing: 10.0ft G8 ⊕ 69.7ft G7 ⊕ 69,4ft H7 ⊕ 68.4ft 1st row burden: 12.0ft Total drilled: 3113.3ft ⊕ H6 67.4ft ⊕ 69.0ft Burden: 9.0ft ⊕ H5 ⊕ 67.0ft . G5 ⊕ 69.2ft ⊕ 67.8ft G4 69.7ft ⊕ 70.4ft ⊕ H3 ⊕ 69.1ft ⊕ 70.3ft G2 ⊕71.3ft G1 71.8ft H1 ⊕ 71.0ft

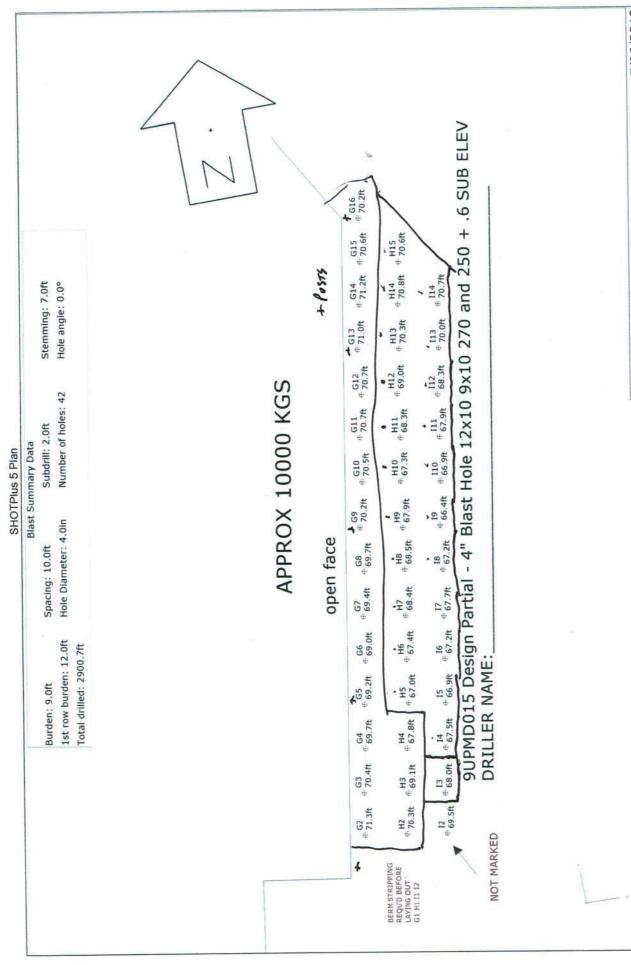
9UPMD015 Design Fnl - 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV DRILLER NAME: Mike Kelle Finish July 29/19 Start July 25/19

⊕ 69.9ft ⊕ 69.5ft



7/29/2019 9UPMD015 Design Fnl.spf 9UPMD015 Design Partial SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Location

Scale 1:250





Scale 1:275

SHOTPlusTM Professional 5.7.4.4 7/26/2019
Mine Burlington
Location
Title/author 9UPMD015 Design Partial
Filename 9UPMD015 Design Partial

9UPMD015 Design Partial - 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV DRILLER NAME: المرابعة ا G16 ⊕ 70.2ft G15 © 70.6ft ⊕ 70.6ft ⊕ H14 70.8ft G14 ⊕71.2ft Stemming: 7.0ft Hole angle: 0.0° ⊕ H13 ⊕ G13 ⊕ 71.0ft ⊕ H12 ⊕ 69.0ft ⊕ G12 ⊕ 70.7ft Number of holes: 29 ⊕ G11 ⊕ 70.7ft H11 ⊕68.3ft Subdrill: 2.0ft Blast Summary Data SHOTPlus 5 Plan ⊕ H10 € 67.3ft ⊕ G10 ⊕ 70.5ft G9 ⊕ 70.2ft ⊕ 67.9ft Hole Diameter: 4.0in Spacing: 10.0ft H8 ⊕ 68.5ft open face ⊕ G8 ⊕ 69.7ft H7 ⊕ 68.4ft G7 ⊕ 69.4ft 1st row burden: 12.0ft Total drilled: 2016.5ft H6 ⊕ 67.4ft ⊕ G6 ⊕ 69.0ft Burden: 9.0ft ⊕ H5 67.0ft G5 ⊕ 69.2ft ⊕ 67.8ft ⊕ 69.7ft ⊕ G3 ⊕ 70.4ft H3 ⊕69.1ft ⊕ G2 ⊕ 71.3ft ⊕ 70.3ft

Stant July 25/19



Scale 1:250

7/25/2019 9UPMD015 Design Partial SHOTPlus™ Professional 5.7.4.4 Burlington Title/author Filename Location Mine

ORICA The Blasting Professionals*
page 1 Blaster-
Blast GPS Co
Wind from t
Clear: Partly Cloudy:
- Drilling Infor
Primary Bit dia Secondary Bit dia Tertiary Bit dia
Bulk Explosi
Packaged Ex

Blast Report	
Nelson Aggregate	

Quarry:	Burlington
P.O. #:	
Blast Date:	2019-08-12

Blast Number:	19-015
Orica Order #:	2517100
Blast Time:	12:10 PM

	0100	· ··opo· ·	'		P.O. #:		Orica Order #:	251	17100		
The Blasting Professionals	Nelso	n Aggregate	:		Blast Date:	2019-08-12	Blast Time:		10 PM		
age 1 Blaste						1					
Blaste	er-in-charge:	Mike	Derk	indere	en	(Print Name)	Tonnes Blasted:	28,893		11,113	Poto
DI						1	Total tonnes per day:	28,893	-	NB60-06	Code
	ast Location:		pper M			(Bench / Face)	Total Holes Loaded:		holes		
GPS (43.40432 entre of Blast	°N Lat	itude	79.88176 Centre of Blast	°W Longitude	including:		Dead I		
	C	entre of Blast			Centre of Blast		and:		Helper	Holes	
						044 05 00	Helper Hole Collar:		ft avg		
Wind fror	n the: N at	0 kph				21 to 25 °C	# Rows Blasted:		rows		
Q 1		X X		. [X			(Front Row	1		
Clear:		Rain:		ercast:		6	Burden:		ft avg		
Partly Cloudy:	X	Snow:	inve	ersion:	Ceiling	30,000 ft	Spacing: # Holes:		ft avg	2147	
Drilling In	formation							(Main Body	1	JVV	
- Drilling Int		6 1/ ()			Non	ninal Bit Diameter:					
Drimory Dit		e from Vertical	Holes:	64	= 3,799.9		Burden: Spacing:		ft avg		
Primary Bit Secondary Bit				2	= 3,799.9		# Holes:		main b	od.	
Tertiary Bit			Holes: Holes:			ft (35/8 diam)	Bench Height:		ft avg	ody	
refliary bit	diam: mm	U #1	noies.		- 0.0	it (diam)	Sub-drill:		_		7.3
Bulk Evolo	scivos:	in (kg)	out	(ka)	ka		Hole Depth:		ft avg		stec
Bulk Explo		in (kg) 33,850	out	` '	kg 11.160		Hole Deptil.	Decking -	•		$\frac{B}{a}$
CENTRA GOLI	70	33,850		22,690	11,160		Front Row:		ft avg		/ te
Packagod	Explosives:	cs shipped	cs ret	urnod	ka		- Stone Front Row: Main Body:		ft avg		ped
rackageu	Explosives.	cs snippeu	CS Tell	urnea	kg		# Decks:		per bla	not.	090
							0 - 11 - 1	Stemming		ısı	2 p
							Front Row:		ft avg		or (
Boosters:		ka /	unit i	# 11500	kg		Main Body:		ft avg		act
	R EQUIVALENT)	Ng /	0.23	69	15.7		Material used:		it avy		erF
	R EQUIVALENT)		0.23	69	23.5		- Charc	ge Length -			Yield Powder Factor (kg Loaded / te Blastec
PENTEX 12 (O	K EQUIVALENT)		0.04	0.5	25.5		Front Row: Main Body: Material used: - Charg Front Row: Main Body: Main Body:		ft avg		d P
	total explo	osives weight i	n Blast	(kg):	11,199		Main Body:		ft avg		Yiel
	•	I Prod (0 kg) %			0.0%			ge Weight -	_		
Detonators		case #'s	m	- 1	# used		Front Row:			Э	
UNITRONIC 60	00 6M				65		Main Body:		-		
UNITRONIC 60	00 20M				43		Max. per delay:		1		
UNITRONIC 60	00 25M				30		SD () Equation:		kg/dela		
							Total kg Loaded:	11,199			
							Rock Density:			= te/m ³	
									1 -		
Cord & Ac	cessories:		Uο	f M	# used		- Powd	ler Factor -			
HARNES	S WIRE DUPLEX (6 P.	ACK) 400M	un	its	1	1.699 lb/yd ³	Yield PF:	0.388	kg/te	(actual)	
	MINI STEM PLUGS	- 6015 (4")	un	its	2	1.093 lb/yd ³	Front row:	0.250	kg/te	(theoretic	cal)
			un	its		1.760 lb/yd ³	Main Body:	0.402	kg/te	(theoretic	cal)
Resource De	ployment:					1.538 lb/yd ³	"KPI" PF:	0.351	kg/te	(theoretic	cal)
# of Blasts toda	y (this Quarry)				1	NOTES (ANY VARIATIO	N FROM STANDARD):				
# of Blasters (th	nis Blast)				1	3 Stone decks were adde	ed due to voids identified by drill	er on the drill le	og.		
# of Helpers (th	is Blast)	Note Exception	ı		2						
# of MMU's (this	s Blast)				1						
Services:											
BULK TRUCK	CHARGE				1.0						
BLASTER HOL		Enter Blaster he	ours		6.0						
HELPER HOUR		Enter total Help		-hours	10.0						
SHOT LAYOUT		Enter # trips ex			0.0						
ADVANCED BL		Enter hours			0.0						
BORETRACK		Enter hours			0.0						



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: 2019-08-12 Blast Date:

Blast Number: 19-015 2517100 Orica Order #: 12:10 PM Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40437	79.88178
Front Row Corner	43.40390	79.88181
Back Row Corner	43.40470	79.88170
Average (Centre of Blast)	43.40432	79.88176

(N) Radians	(W) Radians
0.757549	1.394200
0.757541	1.394201
0.757555	1.394199
0.757548	1.394200

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(N) Radians	(W) Rad
	1st Reading	43.40245	79.87814		0.757516	1.3
	2nd Reading					
	Average	43.40245	79.87814		0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	359.7	m			
	Post Blast Data: ppV:	3.9	mm/s Trigger set at:	2.0	mm/s	
	frequency:	11.6	Hz V/T/L:	?	(Vertical, Transverse or L	ongitudinal)
			l			

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

air overpressure: **112.8** dB Trigger set at: 115 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40605	79.89400
	2nd Reading		
	Average	43.40605	79.89400
	Distance (2nd Seis. From Centre of Blast)	1008.2	m

(N) Radians	(W) Radians
0.757578	1.394413
0.757570	1 20///12

Post Blast Data: ppV: Did mm/s Trigger set at: 2.0 mm/s frequency: Not Hz V/T/L: ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

Colling Rd & Blind Line Bruce Trail

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39329	79.88868
	2nd Reading		
	Average	43.39329	79.88868
	Distance (3rd Seis. From Centre of Blast)	1349.6	m

(N) Radians	(W) Radians
0.757356	1.394321
0.757356	1.394321

Trigger set at: 2.0 mm/s Post Blast Data: ppV: Did mm/s frequency: Not Hz V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: Trigger dΒ Trigger set at: 115 dB

SouthWest Corner of Property

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= _{\frac{(359.7)^2}{30^2}} kg$$

129,384 kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

> Signature required, indicating that Blast Report is Complete & Accurate.



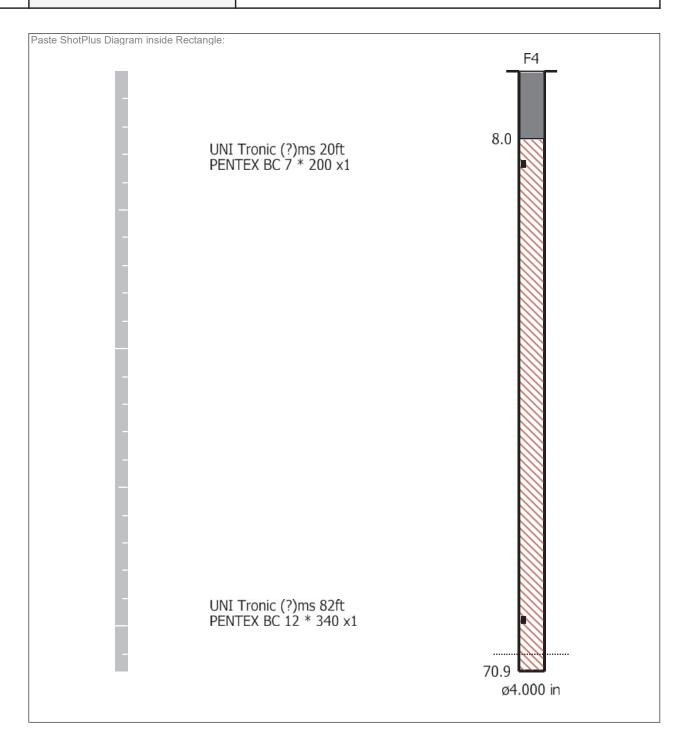
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 8/12/2019

Blast Number: Orica Order #: 19-015 2517100

page 2



Orica
Blaster-in-charge: Mike der Kinderen

Quarry Manager: Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Long at 12:10:05 August 12, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.25 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

2450 2nd Line, Burlington,On Location:

Client: Nelson Aggregate Orica Canada Inc. User Name: General: Burlington

Extended Notes

Sand Bagged

N43.40245:W-79.87814

Microphone Linear Weighting

PSPL 112.8 dB(L) at 1.056 sec

ZC Freq 2.4 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 533 mv)

	Tran	Vert	Long	
PPV	3.683	1.778	3.937	mm/s
ZC Freq	12.5	13.1	11.6	Hz
Time (Rel. to Trig)	0.388	0.312	0.494	sec
Peak Acceleration	0.053	0.053	0.080	g
Peak Displacement	0.044	0.018	0.052	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.4	Hz
Overswing Ratio	3.8	3.6	4.0	

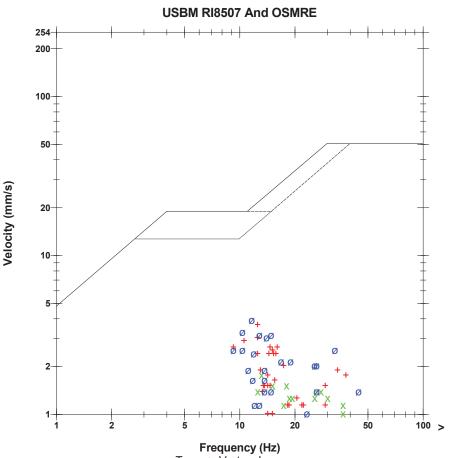
Peak Vector Sum 4.111 mm/s at 0.491 sec

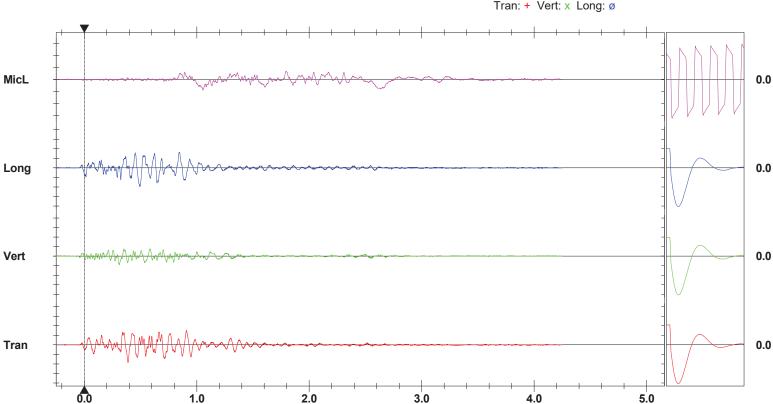
Serial Number BE12877 V 10.72-1.1 Minimate Blaster

Battery Level 6.3 Volts

Unit Calibration December 4, 2018 by Instantel File Name

__TEMP.EVT





Trigger = ▶

Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div

Coling rd & Blind Line (Bruce Trail) Nelson Aggregate Burlington 2019-08-12 Blast 19-015 Upper Middle

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
 Aug 12 /19 06:04:45		SERIAL NUMBER: UM6857 Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB
9	Aug 12 /19 12:42:41	No events recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic:

SW Corner of Property Nelson Aggregate Burlington 2019-08-12 Blast 19-015 Upper Middle

Event Report: Monitor Log - Micromate ISEE # UM6859-Compliance

Start Time	End Time	Status
		SERIAL NUMBER: UM6859 Start Monitoring Waveform Geo: 1.50 mm/s Mic: 115.0 dB
Aug 12 /19 06:09:14 Aug 12 /19 06:09:14	Aug 12 /19 12:38:37	No events recorded. (Keyboard Exit) Waveform Geo: 1.50 mm/s Mic. 115.0 db

Blast Summary Data

Hole Diameter: 4.0in Spacing: 10.0ft

> 1st row burden: 12.0ft Total drilled: 3918.7ft

Burden: 9.0ft

D= Deuk

Subdrill: 2.0ft

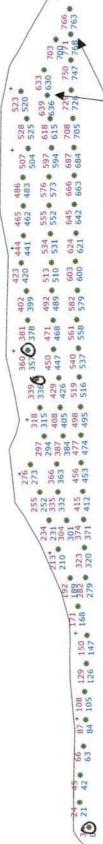
Number of holes: 66

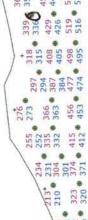
Stemming: 7.0ft

Hole angle: 0.0°

Load Sheet Max 75 Kg







B18 and C29 3.625" DIA

Not to scale

_	П
a	П
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ns	١
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O	ı
工	L
Ś	ı
	ł

Blast Summary Data Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3918.7ft

Burden: 9.0ft

Number of holes: 66

Subdrill: 2.0ft

Stemming: 7.0ft

Hole angle: 0.0°

Load Sheet

Max 75 Kg

open face

B18 and C29 3.625" DIA.

SORICA

Not to scale

Blast Summary Data

Subdrill: 2.0ft Hole Diameter: 4.0in

Spacing: 10.0ft

1st row burden: 12.0ft Total drilled: 3918.7ft

Burden: 9.0ft

Number of holes: 66

Stemming: 7.0ft

Hole angle: 0.0°

open face

POSTS

B18 and C29 3.625" DIA.

A1 A2 A5 A6 56.7R 55.3R 54.2R 55.0R 55.1R 55.0R 55.1R 55.0R 54.2R 55.0R 55.1R 55.0R 55.1R 55.0R 54.3R 53.5R 52.5R 52.5R

Blast Summary Data

Hole Diameter: 4.0in Spacing: 10.0ft

> 1st row burden: 12.0ft Total drilled: 3918.7ft

Burden: 9.0ft

3913.2

Number of holes: 66 Subdrill: 2.0ft

Stemming: 7.0ft Hole angle: 0.0°

12165 KGS

POSTS

open face

72.7 22.7 22.7 22.7 22.7 22.7 22.7 22.7 22.7 22.7 22.7 22.7 22.7 22.7 23.3 24.2 43.4 A9 64.2ff 54.0ff 55.1ff 55.0ft 54.3ff 53.5ft 52.5ft

B18 and C29 3.625" DIA.

9MID014 Design Partial - 3.625 and 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV DRILLER NAME: M1 chart Kalle

Start 5013 29/19 Finish July 31/19



O= see log

7/29/2019 MID BETWEEN NECRNR AND UPMD 9MID014 Partial Design Fnl.spf 9MID014 Partial Design Fnl SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Location

Scale 1:400

Blast Summary Data Spacing: 10.0ft

Subdrill: 2.0ft Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3624.7ft

Burden: 9.0ft

Number of holes: 62

Hole angle: 0.0°

Stemming: 7.0ft

open face

POSTS

LS C6 C7 C8 68.2ft 65.0ft 65.8ft 63.0ft 61.3ft 67.0ft 65.8ft 65.5ft 72.8ft 72.8ft 72.8ft 72.8ft 65.0ft 72.8ft 72.8ft 72.8ft 73.7ft 55.0ft 65.8ft 62.9ft 62.3ft 72.8ft 72.8ft 72.8ft 72.8ft 72.8ft 72.8ft 72.8ft 72.8ft 72.8ft 65.0ft 65.8ft 64.8ft 65.0ft 61.8ft 60.8ft 79.2ft 72.8ft 72.8

cleanup p,nba. B18 and C29 3.625" DIA. 9MID014 Design Partial - 3.625 and 4" Blast Hole 12x10 9x10 270 and 250 + .6 SUB ELEV DRILLER NAME:

7/29/2019

SHOTPlusTM Professional 5.7.4.4

Burlington

MID BETWEEN NECRNR AND UPMD

9MID014 Partial Design Fnl

Title/author Filename

Location Mine

Scale 1:375

D1	- A + D		Quarry	: Burlington	Blast Number:	19-016	
N BIG	ist Repor	Т	P.O. #	_	Orica Order #:	2521575	
The Blasting Professionals	son Aggregat	e	Blast Date	2019-08-22	Blast Time:		
age 1 Blaster-in-charge:	Mik	e Derkinde	eren	(Print Name)	Tonnes Blasted:	30,187 te	11,610 m
				,	Total tonnes per day:		TBD R
Blast Location:	l	Jpper Middl	e	(Bench / Face)	Total Holes Loaded:		
GPS Coordinates:	43.40434	°N Latitude	79.88168	°W Longitude	including:	0 Dead	Holes
	Centre of Blast		Centre of Blast		and:	2 Helpe	r Holes
					Helper Hole Collar:	35.0 ft avg	
Wind from the: NW	at 15 kph		Temperature	: 21 to 25 °C	# Rows Blasted:	2 rows	
	X		X		- Pattern	(Front Row)-	
Clear:	Rain:	Overcas	st:		Burden:	12.0 ft avg	
Partly Cloudy: X	Snow:	Inversio	n: Ceiling	9,144 ft	Spacing:	10.0 ft avg	
					# Holes:	34 front r	OW
- Drilling Information -					- Pattern	(Back Row) -	
	Angle from Vertical		Non	ninal Bit Diameter:	Burden:	9.0 ft avg	
Primary Bit diam: 101.6 n	ım <mark>0</mark>	Holes: 6	66 = 3,937.6	6ft (4 " diam)	Spacing:	10.0 ft avg	
Secondary Bit diam: 114.3 n	ım <mark>0</mark>	Holes:	4 = 238.6	6 ft (4 1/2 " diam)	# Holes:	36 back r	ow
Tertiary Bit diam: n	ım <mark>0</mark>	Holes:	= 0.0	oft (" diam)	Bench Height:	57.7 ft avg	
				7	Sub-drill:	2.0 ft avg	
Bulk Explosives:	in (kg)	out (kg)	kg		Hole Depth:	· ·	
CENTRA GOLD 70	33,930	22,98	10,950		- Stone	e Decking -	
					- Stone Front Row: Back Row:	4.0 ft avg	
Packaged Explosives:	cs shipped	cs returne	d kg		Back Row:	4.0 ft avg	ast
FORTEL PRO 75X400	2	2	1 25		# Decks:	·	ast
						Stemming -	
					Front Row:	8.0 ft avg	
Boosters:	kg	/ unit # us	ed kg		Back Row:	7.0 ft avg	
PENTEX 12 (OR EQUIVALENT)		0.34	23.1		Material used: - Charge Front Row: Back Row:	3/4" Clear	
PENTEX DUO (OR EQUIVALENT)	0.45	'0 31.8		- Charg	ge Length -	
					Front Row:	3	
	xplosives weight					U	
	gd Prod (25 kg) '					ge Weight -	
Detonators:	case #'s	ms	# used		Front Row:	3	
UNITRONIC 600 9M			23		Back Row:		
UNITRONIC 600 15M			45		Max. per delay:		
UNITRONIC 600 20M			18		SD () Equation:		ay
UNITRONIC 600 25M			52		Total kg Loaded: Rock Density:		3
EXEL MS 18m		25 ms	25		Nock Delisity.	2.60 g/cc	= te/m
Cord & Accessories		25 ms	45		Powe	ler Factor -	
Cord & Accessories:	(C DA CIC) 400M	U of M	# used	1.601 lb/yd ³	Yield PF:		/tI)
HARNESS WIRE DUPLEX		units	1	1.196 lb/yd ³	Front row:	J	
MINISTEMPL	JGS - 6015 (4")	units	1	1.628 lb/yd ³	Main Body:	O	
Resource Deployment:		units		1.412 lb/yd ³	"KPI" PF:		
. ,			1			U.UZZ kg/le	(u leoretica
# of Blasts today (this Quarry)			1	,	ON FROM STANDARD):		
# of Blasters (this Blast)	Note From C	10		Package was used to b	ning up collars		
# of Helpers (this Blast)	Note Exceptio	Π	2				

1.412 lb/yd ³	"KPI" PF:	0.322	kg/te	(theoretical)		
NOTES (ANY VARIATIO	N FROM STANDARD):					
	Package was used to bring up collars					
Rate code to be determin	ed by sale rep.					

of MMU's (this Blast) Services:

BULK TRUCK CHARGE

BLASTER HOURS

HELPER HOURS

BORETRACK

SHOT LAYOUT FEE

ADVANCED BLAST DESIGN

1.0

6.0

10.0

0.0

0.0 0.0

Enter Blaster hours

Enter hours

Enter hours

Enter total Helper man-hours

Enter # trips extra beyond 1



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: 2019-08-22 Blast Date:

Blast Number: 19-016 Orica Order #: 2521575 12:04 PM Blast Time:

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40439	79.88167
Front Row Corner	43.40387	79.88176
Back Row Corner	43.40478	79.88161
Average (Centre of Blast)	43.40434	79.88168

(N) Radians	(W) Radians
0.757549	1.394198
0.757540	1.394200
0.757556	1.394197
0.757549	1.394198

1st	Seismograph Co-ordinat	es	Enter ° N Lat.	Enter	° W Long.
	1st Reading		43.40245		79.87814
	2nd Reading				
	Average		43.40245		79.87814
	Distance (1st Seis. From Cen	tre of Blast)	355.8	m	
	Post Blast Data:	ppV:	7.2	mm/s	Trigger set at:
		frequency:	12.5	Hz	V/T/L:
	air c	verpressure:	116.7	dB	Trigger set at:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

air overpressure: 2450 2nd Line

V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880

(W) Radians (N) Radians 0.757358 1.394323 0.757358 1.394323

Distance (2nd Seis. From Centre of Blast) **1348.6** m ppV: Post Blast Data: 1.5 mm/s

Trigger set at: 2.0 mm/s ? (Vertical, Transverse or Longitudinal) V/T/L:

41.0 Hz frequency: air overpressure: **111.3** dB Trigger set at: 115 dB

South West Corner of property

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		
	1st Reading	43.40466	79.88098		
	2nd Reading				
	Average	43.40466	79.88098		
	Distance (3rd Seis. From Centre of Blast)	67.1	m		

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

ppV: Trigger set at: 2.0 mm/s Post Blast Data: xxx5 mm/s 48.64 30 **¥¥X** Hz V / T / L : ? (Vertical, Transverse or Longitudinal) frequency: air overpressure: xlxlxlx3 dB Trigger set at: 115 dB Gas Line

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= \frac{(67.1)^2}{30^2} \text{ kg}$

4,502 kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

Burlington 2019-08-22 Blast 19-016 Upper Middle.xlsm

Public

Blast Report

jim bray



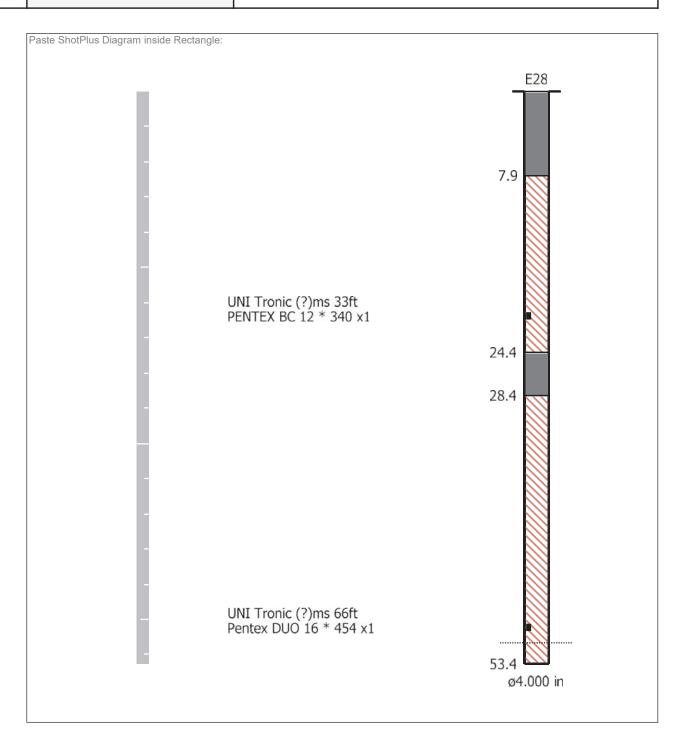
Blast Design

Nelson Aggregate

Quarry:	Burlington
P.O. #:	
ast Date	

Blast Number: 19-016 Orica Order #: 2521575

page 2



<i>Orica</i> Blaster-in-charge:	Mike der Kinderen
Quarry Manager:	Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Long at 12:05:01 August 22, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.25 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 2nd Line Client: Nelson Aggregate Orica Canada Inc. User Name: General: Burlington

Extended Notes

Sand Bagged

N43.40245,W-79.87814

Microphone Linear Weighting

116.7 dB(L) at 2.612 sec **PSPL**

ZC Freq 2.6 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 530 mv)

	Tran	Vert	Long	
PPV	7.239	2.794	4.572	mm/s
ZC Freq	12.5	33	13.3	Hz
Time (Rel. to Trig)	0.864	0.165	0.793	sec
Peak Acceleration	0.106	0.080	0.080	g
Peak Displacement	0.079	0.019	0.050	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.6	3.9	

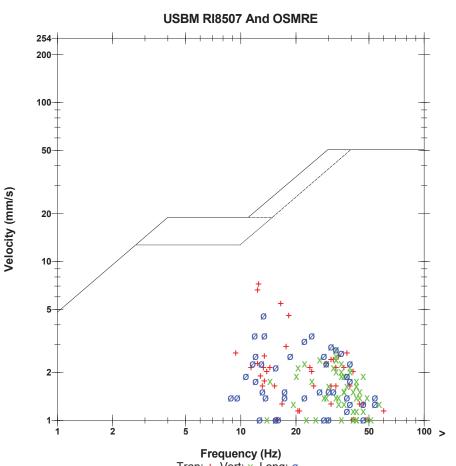
Peak Vector Sum 7.523 mm/s at 0.864 sec

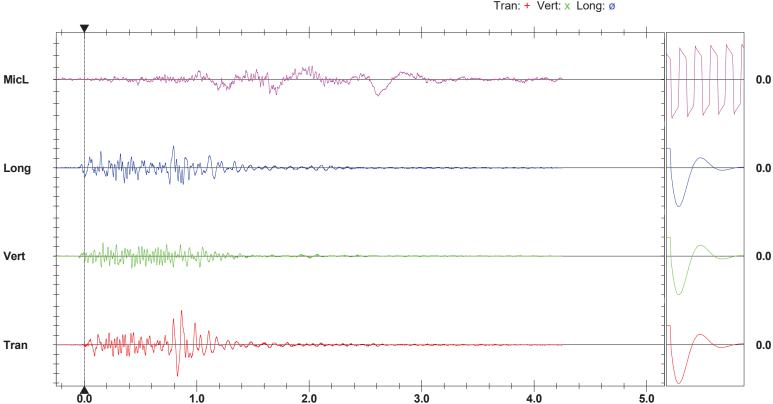
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.3 Volts

Unit Calibration December 4, 2018 by Instantel File Name

_TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶





Date/Time Long at 12:04:56 August 22, 2019 **Trigger Source** Geo: 1.500 mm/s, Mic: 121.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.0 sec (Auto=4Sec) at 2048 sps Operator/Setup: Mike der Kinderen/Burlington SW MMB

Notes

Location: SouthWest Corner of Quarry

Client: **Nelsons Burlington** User Name: Orica Canada Inc.

General: Monitoring Vibration and Airblast

Extended Notes

N 43.39339 W 79.88880

Microphone **Linear Weighting**

PSPL 111.3 dB(L) at 3.400 sec

ZC Freq 7.7 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 1355 mv)

	Tran	Vert	Long	
PPV	1.040	0.938	1.498	mm/s
ZC Freq	39	43	41	Hz
Time (Rel. to Trig)	0.035	-0.063	0.000	sec
Peak Acceleration	0.028	0.033	0.064	g
Peak Displacement	0.004	0.004	0.006	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.1	7.3	7.1	Hz
Overswing Ratio	3.9	3.8	4.0	

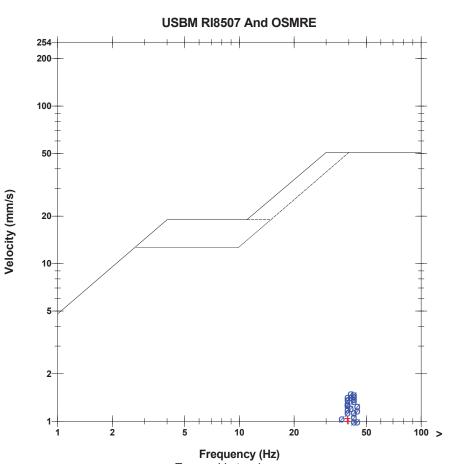
Peak Vector Sum 1.884 mm/s at 0.000 sec

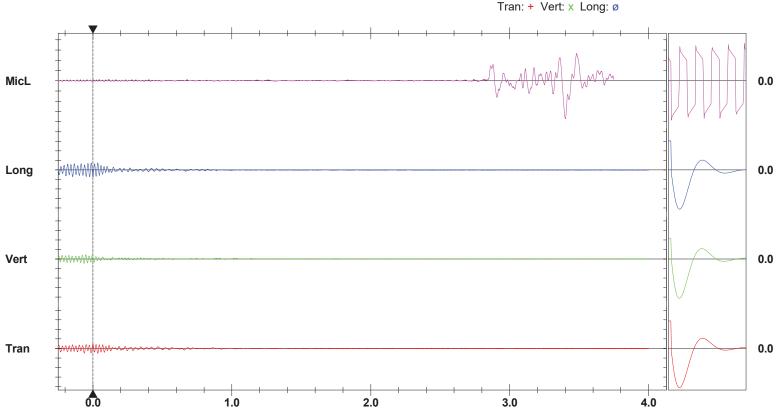
Serial Number UM6859 V 10-89 Micromate ISEE **Battery Level** Unit Calibration

File Name

3.7 Volts

December 24, 2018 by Instantel UM6859_20190822120456.IDFW





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 2.000 pa.(L)/div Trigger = ▶





Date/Time Vert at 12:05:00 August 22, 2019 Trigger Source Geo: 2.000 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Notes

Location: Gas Line 52 Meters Behind Blast

Client: **Nelson Aggregates** User Name: Orica Canada General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting **PSPL** 128.3 dB(L) at 0.199 sec

ZC Freq 10 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 683 mv)

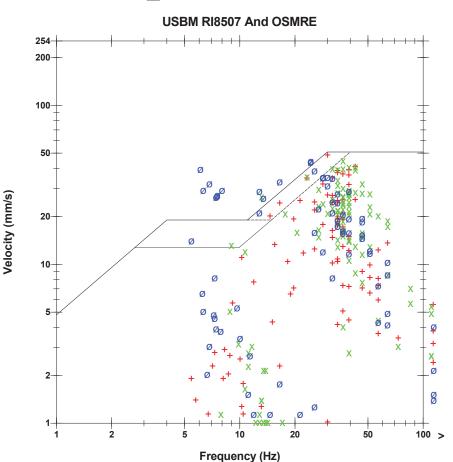
	Tran	Vert	Long	
PPV	48.64	45.08	44.58	mm/s
ZC Freq	30	37	24	Hz
Time (Rel. to Trig)	0.224	0.355	0.196	sec
Peak Acceleration	1.644	1.591	1.259	g
Peak Displacement	0.227	0.301	0.675	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.4	Hz
Overswing Ratio	3.7	3.9	4.1	

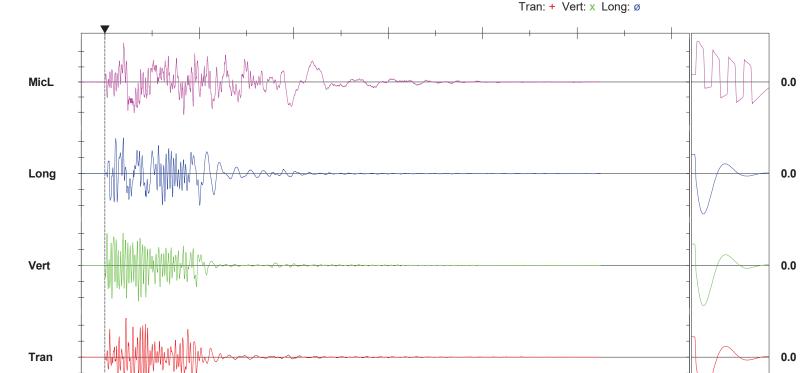
Peak Vector Sum 56.13 mm/s at 0.194 sec

Serial Number BE19461 V 10.72-8.17 MiniMate Plus **Battery Level** 6.3 Volts

Unit Calibration August 31, 2018 by Instantel

File Name TEMP.EVT





Trigger = ▶

1.0

Time Scale: 0.50 sec/div Amplitude Scale: Geo: 20.00 mm/s/div Mic: 20.00 pa.(L)/div

3.0

2.0

Sensor Check

6.0

4.0

5.0

Blind line & Colling rd Nelson Aggregate Burlington 2019-08-22 Blast 19-016Middle

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
 Aug 22 /19 11:20:47		SERIAL NUMBER: UM6857 Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB
0	Aug 22 /19 12:41:21	No events recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic:



Subdrill: 2.0ft Blast Summary Data

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 4176.3ft

Burden: 9.0ft

Number of holes: 70

Hole angle: 0.0° Stemming: 8.0ft

Load Sheet

Open Face

110 Kg Bottom

D1, D3, D4, D5 4.5" Painted Green

130 Kg Bottom

103Kg Top

Top deck to be loaded to collar

80 Kg Bottom 54 Kg Top Top deck to be loaded to collar

TOE LOAD and the second of the second



Not to scale

Subdrill: 2.0ft Blast Summary Data

Hole Diameter: 4.0in Spacing: 10.0ft

Stemming: 8.0ft

1st row burden: 12.0ft Total drilled: 4176.3ft

Burden: 9.0ft

Number of holes: 70

Hole angle: 0.0°

130 Kg Bottom

Open Face

103Kg Top

4.5" Painted Green D1, D3, D4, D5

80 Kg Bottom 54 Kg Top Top deck to be loaded to collar

Top deck to be loaded to collar

110 Kg Bottom

82 Kg Top

を一般がなるまでするがのは特別は特別を有る

The said the said the said of the said of

D1 D2 D3 D4 D5 D6 D7 D8 D9 D10 D11 D12 D13 D14 D15 D16 D17 D18 D19 D20 D21 D22 D23 D24 D25 D26 D27 D28 D29 D30 D31X1 D3X2 D33 D3 D31X1 D3X2 D33 D31X1 D31X1

250.0 + 0.6m Subdrill 12' X 10' Front Row 9MID017 Final 9' X 10' Body 4" Blasthole



Holes D1, D3, D4, D5 are 4.5" Painted Green



Blast Summary Data Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 4069.7ft

Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 68

Hole angle: 0.0° Stemming: 8.0ft

Open Face

D1, D3, D4, D5 4.5" Painted Green

020 D21 D22 D23 D24 D25 D26 D26 D27 D26 S4.1ff S4.0ff S4.0ff S4.0ff S4.0ff S4.3ff S5.1ff S4.8ff S4.0ff S3.9ff S3.6ff S3.0ff S3.0 (54.04 53.84 53.84 54.14 55.24 54.

F31 E32 E33 E34 E35 1153.111 53.311 53.31 53.31

Holes D1, D3, D4, D5 are 4.5" Painted Green

9' X 10' Body 250.0 + 0.6m Subdrill 12' X 10' Front Row

9MID017 Final 4" Blasthole



ORICA The Blasting Professionals*				Rep Aggr	
page 1 Blaster-	-in-c	charge:			Mik
Blas GPS Co		cation: linates:		13.4034 entre of B	-
Wind from	the:	W	at	5	kph
Clear: Partly Cloudy:	X			Rain: Snow:	X
- Drilling Info	rma	tion -			
Primary Bit dia Secondary Bit dia Tertiary Bit dia	am:	101.6	mm mm mm	o from Ve	' #
Bulk Explos	ive	s:		in (kg)
CENTRA GOLD	70			3	34,180
Packaged Ex				cs shi	ipped
Boosters:					kg
PENTEX 8 (OR E					
PENTEX 12 (OR	EQU	IIVALENT)		
		total		sives w	•
Detonators:				case	e #'s

Rlas		t Report			Quarry: Burlington			Blast Number: 19-017			
ODICA.	Dius	Repo	1.1		P.O. #:			Orica Order #:	252	23993	
The Blasting Professionals	Nelsor	n Aggrego	ite]	Blast Date:	2019-08-28		Blast Time:	10:	59 AN	1
page 1 Blaste	er-in-charge:	N/	ike Derl	de de re] _{(B: (N)}		Tonnes Blasted:	15,727	4.0	6,049 m3
Diasie	er-in-charge.	IV	ike Den	andere	#11	(Print Name)	_{Ta}				NB60-08 Co
DIa	not Logation		I lanau N	At al all a		1,5		tal tonnes per day: otal Holes Loaded:	15,727	holes	NB60-08
Blast Location: GPS Coordinates:		10 100 10	Upper N		70.00400	(Bench / Face)	'				
GPS (43.40346 entre of Blast		titude	79.88160 Centre of Blast	°W Longitude		including:		Dead	
	Ce	entre or biasi			Centre of Blast		Ι.	and:			r Holes
\A/: 1.5		F			- .	04 +- 05 00	'	Helper Hole Collar:		ft avg	
Wind fror	n the: W at	5 kpl				21 to 25 °C		# Rows Blasted:		rows	
Q I [D : (. [X				(Front Roy	1	
Clear:		Rain:		ercast:				Burden:		ft avg	
Partly Cloudy:	X	Snow:	Inv	ersion:	Ceiling	30,000 ft		Spacing: # Holes:		ft avg	
Duillin or Ind	5						1			1	OW
- Drilling Int					New	inal Dit Diameter			(Back Row	ĺ	
Duine and Dit		e from Vertic		00		ninal Bit Diameter:		Burden:		ft avg	
Primary Bit		0,	# Holes:	36	= 2,383.1	,		Spacing:		ft avg	
Secondary Bit		•	# Holes:			ft (" diam)		# Holes:		back ı	row
Tertiary Bit	diam: mm		# Holes:		= 0.0	ft (" diam)		Bench Height:		ft avg	
D. II. E	-•			<i>(</i> ,)]		Sub-drill:		ft avg	
Bulk Explo		in (kg)		(kg)	kg		<u>e</u>	Hole Depth:		ft avg	ē
CENTRA GOL	D 70	34,1	80 :	27,010	7,170		single hole)		Decking -	1	4
Dankanad	Frankskins.						ngle	Front Row:		ft avg	7
	Explosives:	cs shippe		turned	kg		<u>S</u>	Back Row:		ft avg	ast _
FORTEL PRO	75X400		2	2	0		0	# Decks:		per bl	ast _
							sed		Stemming	1	
D 1			,				(Based	Front Row:		ft avg	-
Boosters:		k		# used	kg		L	Back Row:		ft avg	
	R EQUIVALENT)		0.23		7.9		Theoretical PF	Material used:			
PENTEX 12 (O	R EQUIVALENT)		0.34	36	12.2		reti		ge Length -		C
				1 (1)	7.400		heo	Front Row:		ft avg	
	-	sives weig			7,190		-	Back Row:		ft avg	
Detonators		Prod (0 kg		- 1	0.0%			Front Row:	ge Weight -		
		case #'s	5 n	ns	# used			Back Row:			
UNITRONIC 60					35 36			Max. per delay:		7	
UNITRONIC 60	JU 25IVI				36			SD () Equation:		kg/de	
								Total kg Loaded:	7,190		lay
								Rock Density:			= te/m ³
								rtook Borioky.	2.00	9,00	- (6/11)
Cord & Ac	cessories:		U (of M	# used			- Powd	er Factor -		
	S WIRE DUPLEX (6 PA	ACK) 400M		nits	1	2.004 lb/yd ³		Yield PF:			(actual)
TIA COLLEGE	O WINE DOI LEX (01)	1011) 100111		nits		1.334 lb/yd ³		Front row:		-	(theoretical)
				nits		1.778 lb/yd ³		Main Body:		_	(theoretical)
Resource De	plovment:		4			1.556 lb/yd ³		"KPI" PF:		-	(theoretical)
# of Blasts toda	ov (this Quarry)				1	NOTES (ANY VARIATIO	N FR			1.3	()
# of Blasters (th					1	,		mer due to hole bridging v	vhile retracting	the hos	e
# of Helpers (th		Note Excep	tion		2	o o o o o o o o o o o o o o o o o o o	5 P	nor day to note bridging t			
# of MMU's (this		TOTO EXOUP			1						
Services:	,										
BULK TRUCK	CHARGE				1.0						
BLASTER HOL		Enter Blaste	er houre		5.5						
HELPER HOUR		Enter total I		-hours	10.0						
SHOT LAYOUT		Enter # trips			0.0						
ADVANCED BL		Enter hours		ond I	0.0						
BORETRACK	J.O. DEGIGIN	Enter hours			0.0						
DONLINAON		Linci Hours			0.0						



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-08-28 Blast Number: 19-017 Orica Order #: 2523993 Blast Time: 10:59 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40346	79.88160
Front Row Corner	43.40333	79.88167
Back Row Corner	43.40360	79.88153
Average (Centre of Blast)	43.40346	79.88160

(N) Radians	(W) Radians
0.757533	1.394197
0.757531	1.394198
0.757536	1.394196
0.757533	1.394197

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	(1)
	1st Reading	43.40245	79.87814	
	2nd Reading			
	Average	43.40245	79.87814	
	Distance (1st Seis. From Centre of Blast)	301.5	m	
	Post Blast Data: ppV:	7.2	mm/s Trigger set at:	2.0 mm/s
		10.0		

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

12.3 Hz 119.1 dB V / T / L : ? (Vertical, Transverse or Longitudinal) frequency: air overpressure: Trigger set at: 115 dB 2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (2nd Seis. From Centre of Blast)	1263.8	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757250	1 20/1222

Post Blast Data: ppV: 0.1 mm/s Trigger set at: 2.0 mm/s **10.1** Hz V/T/L: frequency: ? (Vertical, Transverse or Longitudinal) air overpressure: **117.4** dB Trigger set at: 115 dB

Blind Line and Colling Road (Bruce Trail Entrance)

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40466	79.88098
	2nd Reading		
	Average	43.40466	79.88098
	Distance (3rd Seis. From Centre of Blast)	142.4	m
	Doot Bloot Doto: nn\/:	24.4	mm/a Tilinininini

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

Trigger set at: 2.0 mm/s Post Blast Data: ppV: 34.4 mm/s **30.0** Hz frequency: V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: **131.6** dB Trigger set at: 115 dB

Gas Line

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= <u>(142.4)</u>² kg

20,278 kg 900

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate. jim bray



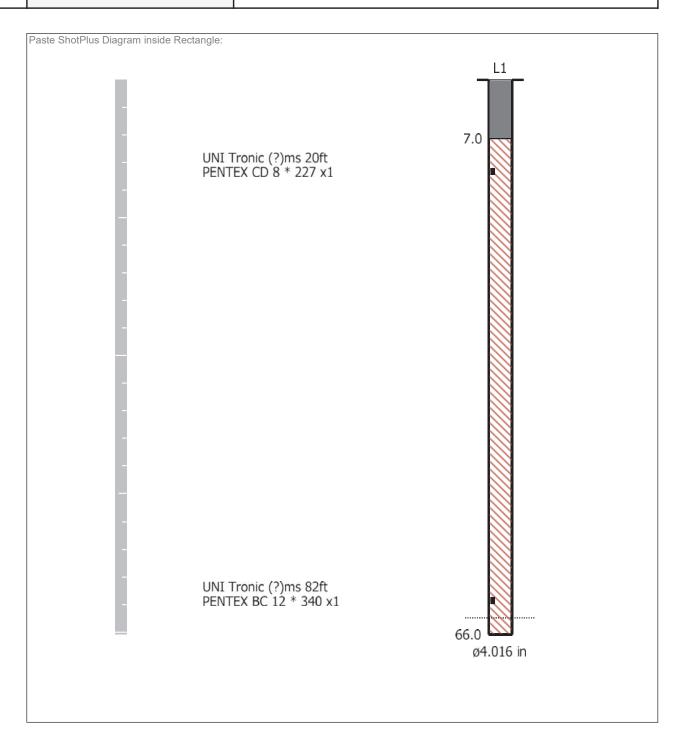
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 8/28/2019

Blast Number: Orica Order #: 19-017 2523993

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Vert at 10:59:42 August 28, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 2nd Line Client: Nelson Aggregate Orica Canada Inc. User Name: General: Burlington

Extended Notes

Sand Bagged

N43.40245,W-79.87814

Microphone Linear Weighting

119.1 dB(L) at 0.987 sec **PSPL**

ZC Freq 3.0 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 520 mv)

	Tran	Vert	Long	
PPV	7.239	3.556	6.731	mm/s
ZC Freq	12.3	31	9.7	Hz
Time (Rel. to Trig)	0.248	0.144	0.502	sec
Peak Acceleration	0.106	0.106	0.106	g
Peak Displacement	0.073	0.027	0.094	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.3	Hz
Overswing Ratio	3.6	3.5	3.9	

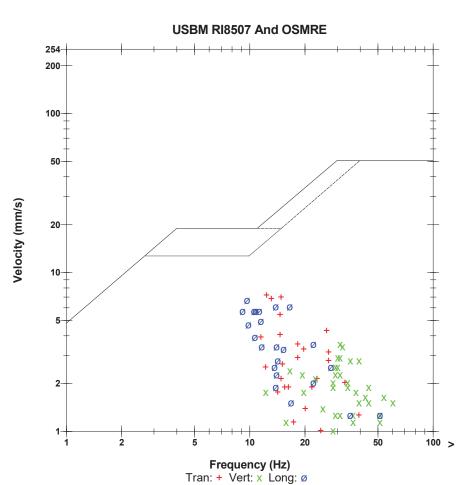
Peak Vector Sum 9.410 mm/s at 0.216 sec

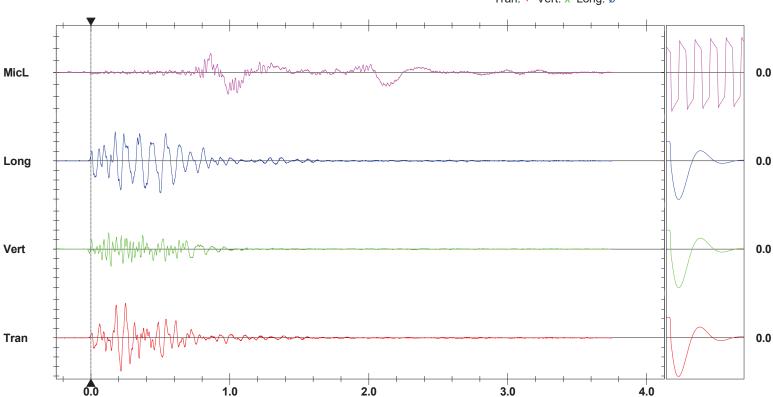
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.2 Volts

Unit Calibration December 4, 2018 by Instantel File Name

_TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶



File Name



Date/Time MicL at 10:59:42 August 28, 2019 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.088 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level**

3.5 Volts

Unit Calibration January 15, 2019 by Instantel UM6857_20190828105942.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES**

User Name: ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

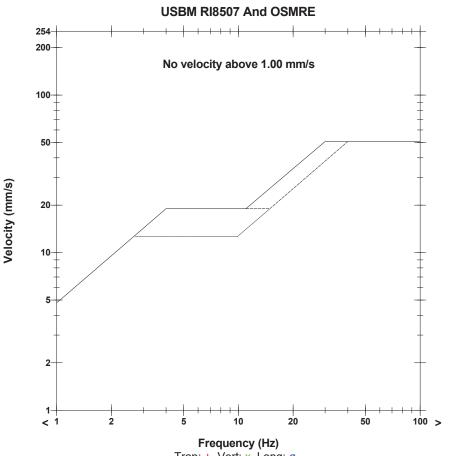
PSPL 117.4 dB(L) at 0.004 sec

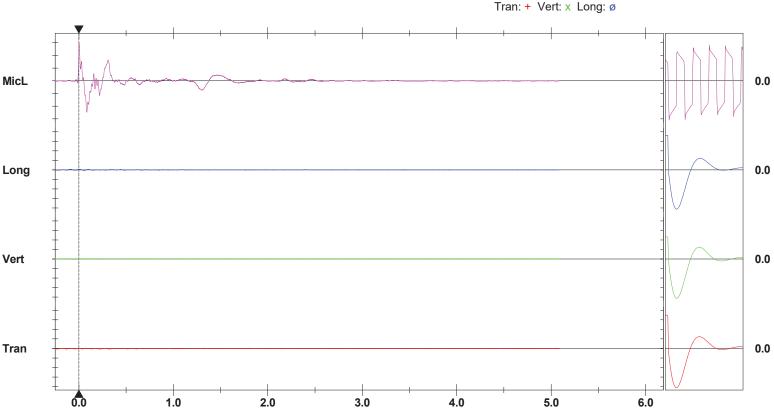
ZC Freq 8.0 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1338 mv)

	Tran	Vert	Long	
PPV	0.126	0.079	0.134	mm/s
ZC Freq	9.5	6.6	10.1	Hz
Time (Rel. to Trig)	-0.219	-0.071	-0.093	sec
Peak Acceleration	0.008	0.010	0.010	g
Peak Displacement	0.017	0.002	0.002	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.3	3.3	3.4	

Peak Vector Sum 0.146 mm/s at -0.088 sec





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶





Date/Time Vert at 10:59:42 August 28, 2019 **Trigger Source** Geo: 10.000 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s
Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Notes

Location: Gas Line

Client: Nelson Aggregates
User Name: Orica Canada
General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting

PSPL 131.6 dB(L) at 0.717 sec

ZC Freq 4.1 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 695 mv)

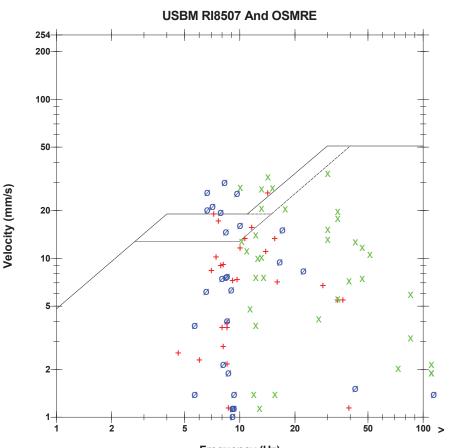
Tran	Vert	Long	
25.65	34.42	30.10	mm/s
14	30	8.3	Hz
0.198	0.186	0.282	sec
0.424	0.663	0.278	g
0.333	0.340	0.556	mm
Passed	Passed	Passed	
7.2	7.3	7.5	Hz
3.7	3.7	4.0	
	25.65 14 0.198 0.424 0.333 Passed 7.2	25.65 34.42 14 30 0.198 0.186 0.424 0.663 0.333 0.340 Passed Passed 7.2 7.3	25.65 34.42 30.10 14 30 8.3 0.198 0.186 0.282 0.424 0.663 0.278 0.333 0.340 0.556 Passed Passed Passed 7.2 7.3 7.5

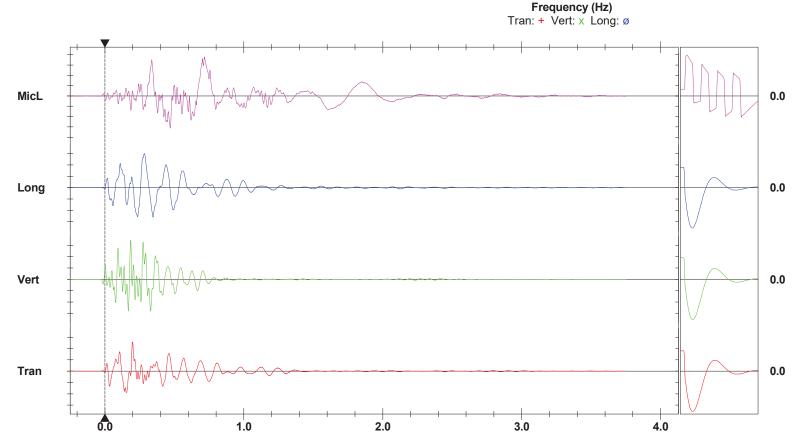
Peak Vector Sum 43.35 mm/s at 0.275 sec

Serial Number BE19461 V 10.72-8.17 MiniMate Plus Battery Level 6.4 Volts

Unit Calibration August 31, 2018 by Instantel

File Name __TEMP.EVT





Ins Plan	
SHOTP	5

	Blast S	Blast Summary Data	
Burden: 9.0ft	Spacing: 10.0ft	Subdrill: 2.0ft	Stemming: 7.0ft
1st row burden: 12.0ft	Hole Diameter: 4.0in	Number of holes: 36	Hole angle: 0.0°
Total drilled: 2383.1ft			

POSTS

a	
()
U	3
4	-
C	-
0)
2	5
7	7
-	-

								+				+
, J1 • 66.5ft	32 66.1ft	13 65.7ft	34 65.9ft	, 35 66.3ft		37 65.7ft	J8 66.1ft	19 66.2ft	310 66.6ft	311 68.2ft	312 69.4ft	J13 70.6ft
K1 65.9ft	K2 65.6ft	K3 • 64.9ft	K4 65.4ft	K5 65.6ft	K6 65.5ft	K7 65.2ft	K8 66.4ft	K9 66.5ft	K10 66.3ft	K11 67.5ft	K12 68.4ft	
L1 66.0ft	• L2 • 65.5ft	65.2ft	L4 65.3ft	L5 66.2ft	L6 64.2ft	• 64.7R	L8 66.3ft	19 65.3ft	110 65.0ft	L11 66.8ft		

9UPMD016 Design Fnl - 4" Blast Hole 12x10 9x10 271 and 250 + DRILLER NAME:



		^			
		POSTS	55 4 +		
		+	33	123	
			m 0	93	183
	Stemming: 7.0ft Hole angle: 0.0°		24	114 111	204
			4 45	135	225
an Data	Subdrill: 2.0ft Number of holes: 36	Ge	63	156	246
SHOTPlus Plan Blast Summary Data		n fa	87 84	177	267
SP	Spacing: 10.0ft Hole Diameter: 4.0in	open face	108	198	288
	59		129 126	219	309
	Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 2383.1ft		150	240	330
	Burde 1st ro Total		171	261 258	351
			192	282 279	372
			303	393	483

9UPMD016 Design Fnl - 4" Blast Hole 12x10 9x10 271 and 250 + DRILLER NAME:



					2	(2)			
							. 237		
							224	219	110
		.0ft					216	215	162 162
		Stemming: 7.0ft Hole angle: 0.0°					217	213	31,7
		t les: 36					. 211	214	211
us Plan	mary Data	Subdrill: 2.0ft Number of holes: 36		et	Max 225 Kg	e	318	210	207
SHOTPlus Plan	Blast Summary Data			Shee		fac	216	201	205
		Spacing: 10.0ft Hole Dlameter: 4.0in		Load Sheet	ax 2	open face	211	3,4	213
		_		L _o	Σ		210	214	214
		Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 2383.1ft					214	213	Jos
	8 1 1				208	307	ءَار عاد		
					2,11	209	909		
							رەر	502	205

Not to scale

DORICA

			Zis	. Market				
			STS	7 4 313 4 70.6ft			Ë	
			POSTS	6 + 59.4R	€ K12 ⊕ 68.4ft		SUB EL	
				+ J11 + 68.2ft	+ K11 + 67.5ft	+ L11 + 66.8ft	9UPMD016 Design Fnl - 4" Blast Hole 12x10 9x10 271 and 250 + .6 SUB ELEV	1
	Stemming: 7.0ft Hole angle: 0.0°			, 110 + 66.6ft	₩ K10 + 66.3ft	/ L10 + 65.0ft	71 and	
	Stemmii Hole and			, (, 19 + 66.2ft	, + K9 + 66.5ft	4 LS 3rt	9×10 2	
	2.0ft of holes: 36	Subdrill: 2.0ft Number of holes: 36	7500 KGS	+ J8 + 66.1ft	K K8 ⊕ 66.4ft	4 L8 66.3ft	Sulface our last Hole 12x10 9x10	
Blast Summary Data	Subdrill: Number o			7 ⊕ 37 ⊕ 65.7ft	f ⊕K7 ⊕65.2ft	# U7 # 64.7#	Slast Ho	
Blast Su).Oft ter: 4.0in		open face	7 + 36 + 66.2ft	F + K6 + 65.5ft	# L6	14 E	
	Spacing: 10.0ft Hole Diameter: 4.0in		0	+ JS + 66.3ft	⊕ K5 ⊕ 65.6ft	⊕ L5 ⊕ 66.2ft	Ocher J. J.	ALIE.
	t en: 12.0ft 2383.1ft			9.4 €65.9ft	# K4 65.4f	⊕ L4 65.3ft	Olympoie Desi	TLLER IN
	Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 2383.1ft			⊕ J3 ⊕ 65.7ft	+ K3 + 64.9ft	⊕ L3 65.2ft	06	2
				⊕ 32 ⊕ 66.1ft	+ K2 + 65.6ft	⊕ L2 ⊕ 65.5ft		
				+ - 31 - 66.5ft	⊬ ⊕ 65.9#	⊕ L1 ⊕ 66.0ft		

SHOTPlusTM Professional 5.7.4.4 8/19/2019
Mine Burlington
Location UPPER MIDDLE SLOT NEXT TO OLD WHLWAS
Title/author 9UPMD016 Design Fnl
Filename

Scale 1:200

ORICA The Blasting Professionals	
page 1 Blaste	er-in-
Bl: GPS	ast L Coor
Wind from	m the
Clear:	
Partly Cloudy:	Х
- Drilling In	form
Primary Bit	diam
Secondary Bit	
Tertiary Bit	diam
Bulk Explo	
Packaged	Fyn
FORTEL PRO	
- SAILE FIRE	
Boosters:	

Blast Report
Nelson Aggregate

Quarry:	Burlington
P.O. #:	
Blast Date:	2019-09-09

Blast Number:	19-018
Orica Order #:	2528633
Blast Time:	12:37 PM

	Blas	st Repor	т		P.O. #:		Orica Order #:	25286	633	
The Blasting Professionals	Nels	on Aggregat	2		Blast Date:		Blast Time:	12:37		
age 1 Blaste	er-in-charge:	Mik	e Derki	indere	n	(Print Name)	Tonnes Blasted:	35,108 te	13,503	m3
							Total tonnes per day:	35,108 te	NB60-16	Rate Code
Bla	ast Location:		Midd	le		(Bench / Face)	Total Holes Loaded:	78 ho	oles	
GPS (Coordinates:	43.40434	°N Lati	itude	79.88160	°W Longitude	including:	0 De	ead Holes	
		Centre of Blast			Centre of Blast	_	and:	0 He	elper Holes	
							Helper Hole Collar:	0.0 ft	avg	
Wind fror	m the: NE at	15 kph			Temperature:	16 to 20 °C	# Rows Blasted:	2 ro	WS	
		X	_		X		- Pattern	(Front Row)-		
Clear:		Rain:	Ove	rcast:			Burden:	12.0 ft	avg	
Partly Cloudy:	X	Snow:	Inve	rsion:	Ceiling	2,400 ft	Spacing:	10.0 ft	avg	
							# Holes:	40 fro	ont row	
- Drilling In	formation -						- Pattern	(Back Row) -		
	An	gle from Vertical			Non	ninal Bit Diameter:	Burden:	9.0 ft	avg	
Primary Bit	diam: 101.6 mm	0 #	Holes:	78	= 4,680.9	ft (4 " diam)	Spacing:	10.0 ft	avg	
Secondary Bit	diam: mm	ı° #	Holes:		= 0.0	ft (" diam)	# Holes:		ack row	
Tertiary Bit	diam:mm	·° #	Holes:		= 0.0	ft (" diam)	Bench Height:		-	
						1	Sub-drill:	2.0 ft	avg	fec
Bulk Explo	sives:	in (kg)	out ((kg)	kg		Hole Depth:		avg	slas
CENTRA GOL	D 70	33,710	2	2,210	11,500		- Stone	e Decking -		te E
							- Stone Front Row: Back Row:		· ·	/ pa
Packaged	Explosives:	cs shipped	cs retu	urned	kg		CT.		-	ade
FORTEL PRO	75X400	2	!	1	25		# Decks:		er blast	Yield Powder Factor (kg Loaded / te Blasted
								Stemming -		r (Kg
							Front Row:		-	acto
Boosters:		kg	/ unit #		kg		Back Now.	7.0 ft	avg	r F
	R EQUIVALENT)		0.34	79	26.9		Material used:			wde
PENTEX DUO	(OR EQUIVALENT)		0.45	97	44.0		- Charg	ge Length -		Po
			. D	(1)	44.500		Front Row:		•	ield
		losives weight			11,596				avg	>
Detenator		d Prod (25 kg)			0.2% # used		Front Row:	ge Weight -	u/la a l a	
Detonators UNITRONIC 60		case #'s	m	s	# used		Back Row:			
UNITRONIC 60					78		Max. per delay:		-	
UNITRONIC 60					39		SD () Equation:			
UNITRONIC 60					54		Total kg Loaded:			
EXEL MS 15m					19		Rock Density:		cc = te/m ³	
EXEL MS 18m					39		r teen 2 energy	2.00 9/	00 - 10/111	
Cord & Ac			U of	f M	# used		- Powo	ler Factor -		
	SS WIRE DUPLEX (6	PACK) 400M	uni		1	1.447 lb/yd ³	Yield PF:		g/te (actual)	
TOTAL	MINI STEM PLUG	-	uni		4	1.222 lb/yd ³	Front row:		g/te (theoretical	al)
		0010 (4)	uni			1.629 lb/yd ³	Main Body:	· ·	g/te (theoretical	,
Resource De	eployment:					1.426 lb/yd ³	"KPI" PF:		g/te (theoretica	,
	ay (this Quarry)				1	NOTES (ANY VARIATIO			y, (,
# of Blasters (th					1	·	north end of the blast received	3 emulsion decks	the rest of the	
# of Helpers (th		Note Exceptio	n		2		n decks to control vibrations at			
# of MMU's (thi		Troto Excoptio			1		decks in addtion to the 78 built			
Services:	5 5.401/					Excel MS 25M 25ms2			7	
BULK TRUCK	CHARGE				1.0	LAGOT WO ZOW ZOWO Z				
BLASTER HOL		Enter Blaster	nours		7.0	15 additional 25M Unitror	nics were used instead of 25M r	ms because of lim	nited stock	
HELPER HOU				hours	12.0	No additional charge sho		2034400 01 1111		
HELPER HOURS Enter total Helper man-hours SHOT LAYOUT FEE Enter # trips extra beyond 1			0.0	additional offarge \$110	a.a bo addod					
ADVANCED BI		Enter hours	a beyo		0.0					
BORETRACK	51 D201014	Enter hours			0.0					
SOMETIVACION		Entor Hours			0.0					



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-09-09

Blast Number: 19-018 Orica Order #: 2528633 Blast Time: 12:37 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40436	79.88159
Front Row Corner	43.40381	79.88168
Back Row Corner	43.40486	79.88152
Average (Centre of Blast)	43.40434	79.88160

(N) Radians	(W) Radians
0.757549	1.394197
0.757539	1.394198
0.757558	1.394196
0.757549	1.394197

1st	Seismograph Co-ordina	tes	Enter ° N Lat.	Ente	r ° W Long.
	1st Reading		43.40245		79.87814
	2nd Reading				
	Average		43.40245		79.87814
	Distance (1st Seis. From Ce	ntre of Blast)	349.9	m	
	Post Blast Data:	ppV:	4.1	mm/s	Trigger set at:
		frequency:	10.9	Hz	V/T/L:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

10.9 Hz 117.4 dB air overpressure: 2450 2nd Line

V / T / L : ? (Vertical, Transverse or Longitudinal)
Trigger set at: 115 dB

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (2nd Seis. From Centre of Blast)	1351.1	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757358	1 394323

Post Blast Data: ppV: **0.1** mm/s Trigger set at: 2.0 mm/s **14.0** Hz V/T/L: frequency: ? (Vertical, Transverse or Longitudinal) **116.4** dB air overpressure:

Trigger set at: 115 dB

Blind Line and Colling Road (Bruce Trail Entrance)

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter	° W Long.
	1st Reading	43.40466		79.88098
	2nd Reading			
	Average	43.40466		79.88098
	Distance (3rd Seis. From Centre of Blast)	61.5	m	
	Post Blast Data: ppV:	29.3	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

: 2.0 mm/s **20.0** Hz frequency: V / T / L : (Vertical, Transverse or Longitudinal) air overpressure: **128.2** dB Trigger set at: 115 dB

Gas Line

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= \frac{(61.5)^2}{30^2} \text{ kg}$

3,782 kg 900

Maximum Indicated Charge Weight per Delay =

Orica

Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate. jim bray



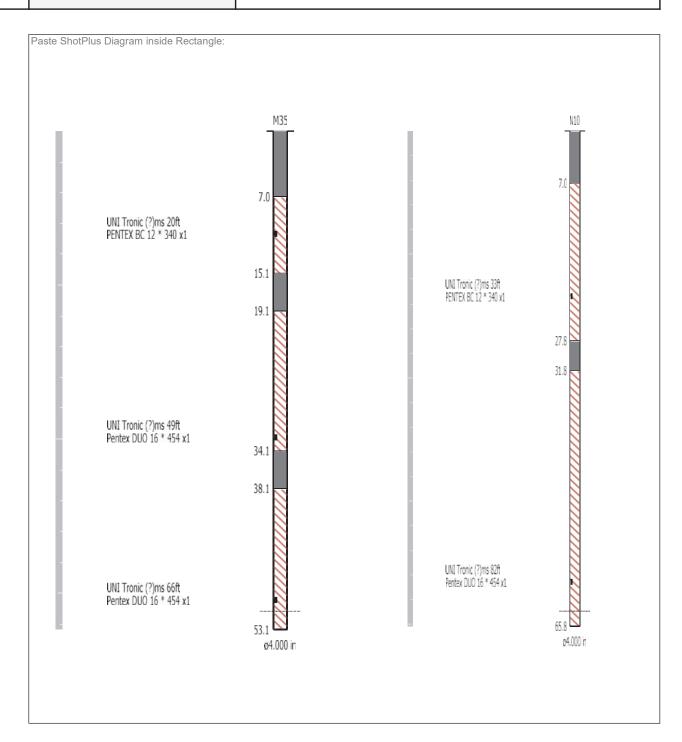
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/9/2019

Blast Number: Orica Order #: 19-018 2528633

page 2



Orica
Blaster-in-charge: Mike der Kinderen

Quarry Manager: Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Long at 12:37:13 September 9, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.0 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 #2 Road Burlington Client: Nelson Aggregate Orica Canada Inc. User Name: General: Burlington

Extended Notes

Sand Bagged

Microphone Linear Weighting **PSPL** 117.4 dB(L) at 2.425 sec

ZC Freq 2.3 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 599 mv)

	Tran	Vert	Long	
PPV	2.794	2.159	4.064	mm/
ZC Freq	11.5	47	10.9	Hz
Time (Rel. to Trig)	0.750	0.326	0.678	sec
Peak Acceleration	0.053	0.080	0.106	g
Peak Displacement	0.036	0.010	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.3	7.2	Hz
Overswing Ratio	3.8	3.7	4.1	

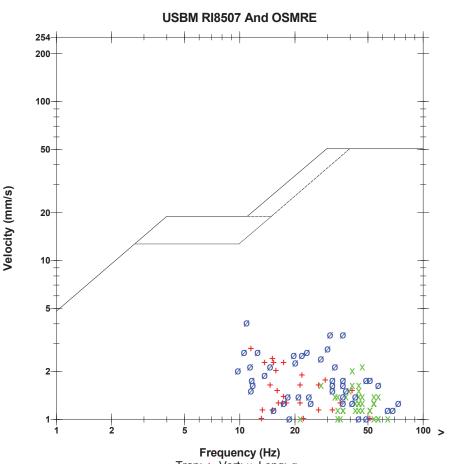
Peak Vector Sum 4.098 mm/s at 0.678 sec

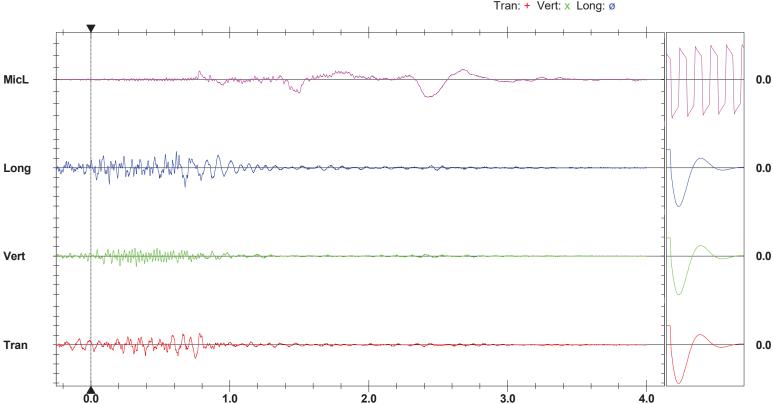
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.2 Volts

Unit Calibration December 4, 2018 by Instantel File Name

_TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger =



File Name



Date/Time MicL at 12:37:15 September 9, 2019 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.012 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE

Battery Level 3.7 Volts

Unit Calibration

January 15, 2019 by Instantel UM6857_20190909123715.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES**

User Name: ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

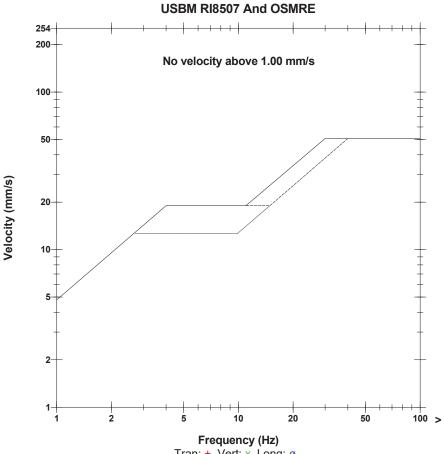
PSPL 116.4 dB(L) at 0.007 sec

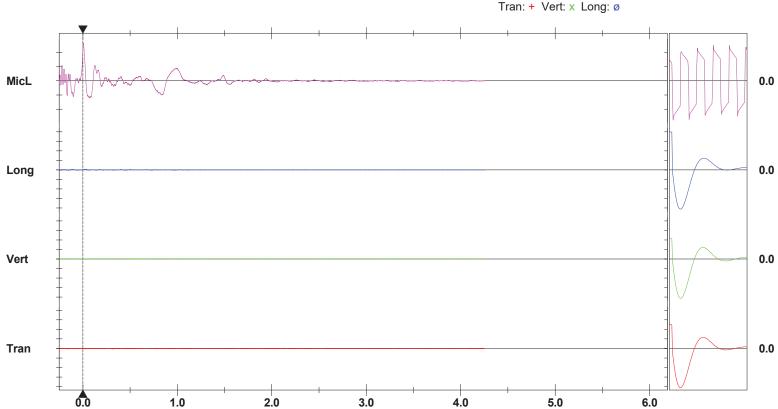
ZC Freq 7.0 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1392 mv)

	Tran	Vert	Long	
PPV	0.102	0.071	0.142	mm/s
ZC Freq	9.1	20	14.0	Hz
Time (Rel. to Trig)	-0.167	-0.214	-0.104	sec
Peak Acceleration	0.010	0.010	0.010	g
Peak Displacement	0.003	0.000	0.001	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.3	Hz
Overswing Ratio	3.6	3.4	3.4	

Peak Vector Sum 0.151 mm/s at -0.104 sec





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger = ▶





Date/Time Vert at 12:35:20 September 9, 2019 Trigger Source Geo: 10.000 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Notes

Location: Gas Line

Client: **Nelson Aggregates** User Name: Orica Canada General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting

PSPL 128.2 dB(L) at 0.177 sec

ZC Freq 16 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 624 mv)

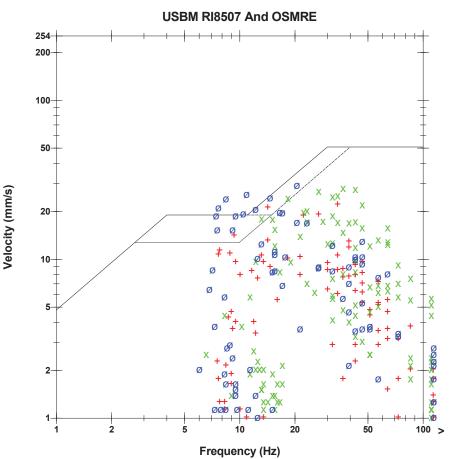
Tran	Vert	Long	
22.35	28.07	29.34	mm/s
34	37	20	Hz
0.414	0.349	0.303	sec
0.464	0.862	0.583	g
0.224	0.195	0.444	mm
Passed	Passed	Passed	
7.3	7.3	7.4	Hz
3.9	3.9	4.2	
	22.35 34 0.414 0.464 0.224 Passed 7.3	22.35 28.07 34 37 0.414 0.349 0.464 0.862 0.224 0.195 Passed Passed 7.3 7.3	22.35 28.07 29.34 34 37 20 0.414 0.349 0.303 0.464 0.862 0.583 0.224 0.195 0.444 Passed Passed Passed 7.3 7.3 7.4

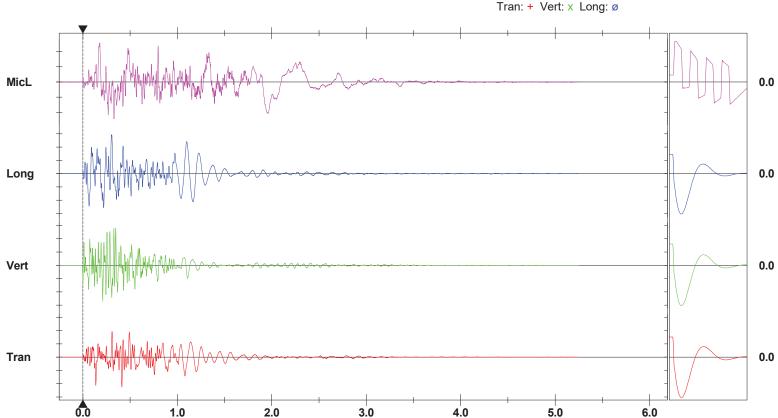
Peak Vector Sum 41.10 mm/s at 0.308 sec

Serial Number BE19461 V 10.72-8.17 MiniMate Plus **Battery Level** 6.4 Volts

Unit Calibration August 31, 2018 by Instantel File Name

TEMP.EVT





Trigger =

Time Scale: 0.50 sec/div Amplitude Scale: Geo: 10.000 mm/s/div Mic: 20.00 pa.(L)/div

Blast Summary Data

Spacing: 10.0ft

1st row burden: 12.0ft Total drilled: 4681.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Number of holes: 78 Subdrill: 2.0ft

Stemming: 8.0ft Hole angle: 0.0°

2 decks 110kg **78Kg**

2 decks

68Kg 85kg

3 decks 32Kg **48Kg 48Kg**

open face PETER

9MID018 Design Fnl -4" Blast Hole 12x10 9x10 271.25 and 250 + .6 SUB ELEV DRILLER NAME:



		3 decks 32Kg 48Kg 48Kg		230 200 170 140 110 80 50 20 220 190 160 160 170 140 110 80 50 20 220 190 160 160 130 1900 70 40 10 10 10 10 10 10 10 10 10 10 10 10 10	
	Stemming: 8.0ft Hole angle: 0.0°			340 320 300 280 260 330 330 9310 9290 270 9250 435 415 395 375 9345 425 405 9385 365 335	-
Blast Summary Data	Subdrill: 2.0ft Number of holes: 78	S	ace	7 460 440 420 400 380 360 340 320 300 280 260 3450 430 410 390 370 350 350 310 290 250 250 450 430 410 390 370 350 350 310 290 270 250 255 555 535 515 495 475 455 435 415 395 375 345 555 525 505 485 465 445 425 405 385 365 335	V2 12 0112 A
Blast Sur	Spacing: 10.0ft Hole Diameter: 4.0in	2 decks 68Kg 85Kg	open face	840 880 780 760 740 720 700 680 660 640 620 600 580 560 540 520 500 480 460 440 400 880 790 770 750 730 710 690 670 650 630 610 990 570 550 530 510 490 470 450 430 990 510 895 875 855 835 815 795 775 755 735 715 495 675 655 635 615 595 575 575 535 930 905 885 885 885 885 885 885 765 745 745 725 705 485 665 645 625 605 885 865 845 825 805 785 765 745 725 705 485 665 645 625 605 885 565 545 525	9MID018 Design Fnl - 4" Blast Hole
	Burden: 9.0ft 1st row burden: 12.0ft Total drilled: 4681.0ft			660 640 620 600 580 56 650 630 610 990 570 55 755 735 715 695 675 65 745 725 705 685 665 64	_
		2 decks 78Kg 110kg		760 740 720 700 680 750 730 710 690 670 855 835 815 795 775 845 825 805 785 765	
				840 800 780 0 830 790 770 1 4015 895 875 30905 885 865	



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Subdrill: 2.0ft Blast Summary Data Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Total drilled: 4681.0ft

Number of holes: 78

Stemming: 8.0ft Hole angle: 0.0°

> 2 decks 110kg **78Kg**

2 decks

68Kg

85kg

3 decks 32Kg **48Kg 48Kg**

open face

12x10 9x10 271.25 and 250 + .6 SUB ELEV DRILLER NAME: 9MID018 Design Fnl -4" Blast Hole



Blast Summary Data

Subdrill: 2.0ft Hole Diameter: 4.0in Spacing: 10.0ft

1st row burden: 12.0ft Total drilled: 4681.0ft

Burden: 9.0ft

Number of holes: 78

Stemming: 8.0ft Hole angle: 0.0°

open face

9MID018 Design Fnl - 4" Blast Hole 12x10 9x10 271.25 and 250 + .6 SUB ELEV DRILLER NAME:

Scale 1:525

8/29/2019 9MID018 Design Fnl 2 ROW MID WALL SHOTPlus[™] Professional 5.7.4.4 Burlington Title/author Location Mine

Filename

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Blast Summary Data Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Total drilled: 4681.0ft

Number of holes: 78 Subdrill: 2.0ft

Stemming: 8.0ft Hole angle: 0.0°

open face

011 6N2 8N3 0N4 NS 0N6 NS 0N8 0N9 NIO 4N11 XN12 N13 XN14 XN15 XN15 XN17 XN18 XN19 XN20 N21 N22 0N23 0N24 0S5.0R 65.2R 65.3R X65.0R 65.3R X65.2R X65.2R X61.5R X61.1R X60.5R X69.6R 658.4R 656.7R 655.0R 654.2R 654.0R 654.0R 654.0R 654.0R 654.0R 654.0R 655.0R

9MID018 Design Fnl - 4" Blast Hole 12x10 9x10 271.25 and 250 + .6 SUB ELEV DRILLER NAME:



8/29/2019 9MID018 Design Fnl 2 ROW MID WALL SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Location Mine

Scale 1:325

Blast Summary Data Spacing: 10.0ft

Hole Diameter: 4.0in

Number of holes: 78 Subdrill: 2.0ft

> 1st row burden: 12.0ft Total drilled: 4681.0ft

Burden: 9.0ft

Stemming: 8.0ft Hole angle: 0.0°

ppen face

NIG NIT NIB NI9 N20 N21 N22 N23 N24 N25 N26 N27 N28 N29 N30 N31 N32 N34 N34 N37 N38 N39 N40 N39 N40 N30 N30 N30 N30 N30 N40 €52.2H €52.2H €52.2H ₹52.7H ₹53.2H ₹53

ble 12x10 9x10 271.25 and 250 + .6 SUB ELEV



8/29/2019 9MID018 Design Fnl 2 ROW MID WALL SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Location

Scale 1:325

		. 7	Quarry	/: Burlington	Blast Number:	19	9-019
Blas	st Repor	τ	P.O. #	_	Orica Order #:		34945
The Blasting Professionals Nels	on Aggregate	2	Blast Date		Blast Time:		05 PN
Blaster-in-charge:	Mik	e Derkinder	en	(Print Name)	Tonnes Blasted:	32,416	te
				_	Total tonnes per day:	32,416	te
Blast Location:		Middle		(Bench / Face)	Total Holes Loaded:	72	holes
GPS Coordinates:	43.40405	°N Latitude	79.88154	°W Longitude	including:	3	Dead
	Centre of Blast		Centre of Blast		and:	0	Helpe
					Helper Hole Collar:	0.0	ft avg
Wind from the: W at	10 kph		Temperature	e: 21 to 25 °C	# Rows Blasted:	3	rows
	X		X		- Pattern	(Front Rov	v)-
Clear:	Rain:	Overcast:			Burden:	12.0	ft avg
Partly Cloudy: X	Snow:	Inversion:	Ceiling	30,000 ft	Spacing:		ft avg
					# Holes:	26	front
- Drilling Information -					- Pattern	(Main Body	() -
An	gle from Vertical		No	minal Bit Diameter:	Burden:	9.0	ft avg
Primary Bit diam: 101.6 mm	0 , #	Holes: 72	= 4,700.	4 ft (4 " diam)	Spacing:	10.0	ft avg
Secondary Bit diam:mm	° #	Holes:	= 0.	0 ft (" diam)	# Holes:	46	main
Tertiary Bit diam:mm	° #	Holes:	= 0.	0 ft (" diam)	Bench Height:	63.3	ft avg
				٦	Sub-drill:	2.0	ft avg
Bulk Explosives:	in (kg)	out (kg)	kg		Hole Depth:	65.3	ft avg
CENTRA GOLD 70	36,500	23,730	12,770		- Stone Front Row: Main Body:	e Decking -	
					Front Row:	4.0	ft avg
Packaged Explosives:	cs shipped	cs returned	kg		Main Body:	4.0	ft avg
FORTEL PRO 75X400	2	1	25		# Decks:		per bl
					- Collar	Stemming	7
					Front Row:		ft avg
Boosters:	kg /	unit # used	kg kg		Main Body:	7.0	ft avg
PENTEX 12 (OR EQUIVALENT)		0.34 74	25.2		Material used:	3/4" Clear	
PENTEX DUO (OR EQUIVALENT)		0.45 72	32.7		- Charg	ge Length -	
					Front Row: Main Body: Material used: - Charge Front Row: Main Body: Main Body:	54.3	ft avg
	losives weight		12,853				ft avg
Pkgo	d Prod (25 kg)	% of Total kg:	0.2%			ge Weight -	
Detonators:	case #'s	ms	# used		Front Row:		_
UNITRONIC 600 6M			2		Main Body:		1
UNITRONIC 600 15M			72		Max. per delay:		kg/de
UNITRONIC 600 20M			54		SD () Equation:		kg/de
UNITRONIC 600 25M			90		Total kg Loaded:		
					Rock Density:	2.60	g/cc
Cord & Accessories:		U of M	# used		- Powo	ler Factor -	
HARNESS WIRE DUPLEX (6	PACK) 400M	units	1	1.738 lb/yd ³	Yield PF:	0.396	kg/te
		units		1.241 lb/yd ³	Front row:		_
		units		1.654 lb/yd ³	Main Body:		kg/te
Resource Deployment:				1.516 lb/yd ³	"KPI" PF:	0.346	kg/te
# of Blasts today (this Quarry)			1	NOTES (ANY VARIATIO	ON FROM STANDARD):		

		Sub-drill:	2.0	ft avg		00			
	(i)	Hole Depth:	65.3	ft avg		Yield Powder Factor (kg Loaded / te Blastec			
	Theoretical PF (Based on a single hole)	- Stone	Decking -			e B			
	<u>g</u>	Front Row:	4.0	ft avg		d / t			
	sin	Main Body:	4.0	ft avg		ade			
	a _	# Decks:	72	per bl	ast	Los			
	0 0	- Collar	Stemming	_		(kg			
	ase	Front Row:	7.0	ft avg		ctor			
	(B)	Main Body:	7.0	ft avg		Fac			
	P	Material used:	3/4" Clear			der			
	tice	- Charg	ge Length -		-) O M			
	eore	Front Row:	54.3	ft avg		Id F			
	The	Main Body:	54.3	ft avg		Yie			
		- Charg	ge Weight -						
		Front Row:	158.3	kg/ho	le				
		Main Body:	158.3	kg/ho	le				
		Max. per delay:	110.0	kg/de	lay				
		SD () Equation:	7.5	kg/de	lay				
		Total kg Loaded:	12,853	kg					
		Rock Density:	2.60	g/cc	= te/m ³				
		- Powa	er Factor -						
1.738 lb/yd ³		Yield PF:	0.396	kg/te	(actual)				
1.241 lb/yd ³		Front row:	0.283	kg/te	(theoretic	al)			
1.654 lb/yd ³		Main Body:	0.377	kg/te	(theoretic	al)			
2		"KPI" PF:	0.346	kg/te	(theoretic	al)			
1.516 lb/yd ³									
1.516 lb/yd ³ NOTES (ANY VARIATIO	N FR	OM STANDARD):		We had to use 2 unitronics per dou booster due to shortage of 25M Excel ms 25ms					
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO			age of 25M Ex	cel ms	25ms				
NOTES (ANY VARIATIO We had to use 2 unitronic			age of 25M Ex	cel ms	25ms Blast Report	t			
NOTES (ANY VARIATIO			age of 25M Ex	cel ms		t			

19-019 2534945 12:05 PM

26 front row

9.0 ft avg **10.0** ft avg 46 main body **63.3** ft avg

3 Dead Holes 0 Helper Holes

12,468 m³

NB60-16 Rate Code

of Blasters (this Blast)

of Helpers (this Blast)

of MMU's (this Blast)

BLASTER HOURS

HELPER HOURS

BORETRACK

SHOT LAYOUT FEE

ADVANCED BLAST DESIGN

Services: BULK TRUCK CHARGE Note Exception

Enter Blaster hours

Enter hours

Enter hours

Enter total Helper man-hours

Enter # trips extra beyond 1

1

2

1

1.0

7.0

13.0

0.0

0.0

0.0



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-09-24

 Blast Number:
 19-019

 Orica Order #:
 2534945

 Blast Time:
 12:05 PM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40407	79.88154
Front Row Corner	43.40376	79.88161
Back Row Corner	43.40432	79.88148
Average (Centre of Blast)	43.40405	79.88154

(N) Radians	(W) Radians
0.757544	1.394196
0.757538	1.394197
0.757548	1.394195
0.757544	1.394196

1st	Seismograph Co-ordin	Enter ° N Lat.	Ente	r ° W Long.	
	1st Reading		43.40245		79.87814
	2nd Reading				
	Average		43.40245		79.87814
	Distance (1st Seis. From C	Centre of Blast)	327.9	m	
	Post Blast Data:	ppV:	6.7	mm/s	Trigger set at:
		frequency:	16.5	Hz	V/T/L:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: 16.5 Hz V/T/L: ? (Vertical, Transverse or Longitudinal)
air overpressure: 116.7 dB Trigger set at: 115 dB

2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (2nd Seis, From Centre of Blast)	1324.1	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757250	1 20/1222

Distance (2nd Seis. From Centre of Blast)

Post Blast Data:

ppV:

mm/s

Trigger set at:

2.0

mm/s

V/T/L:

(Vertical, Transverse or Longitudinal)

air overpressure:

Trigger

dB

Trigger set at:

115 dB

Blind Line and Colling Road (Bruce Trail Entrance)

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40466	79.88098
	2nd Reading		
	Average	43.40466	79.88098
	Distance (3rd Seis. From Centre of Blast)	81.9	m
	Post Blast Data: nn\/:	37 3	mm/s Trigger set at:

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

Gas Line

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

Public

Maximum Indicated Charge Weight per Delay = 7 kg

OricaBlaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

jim bray



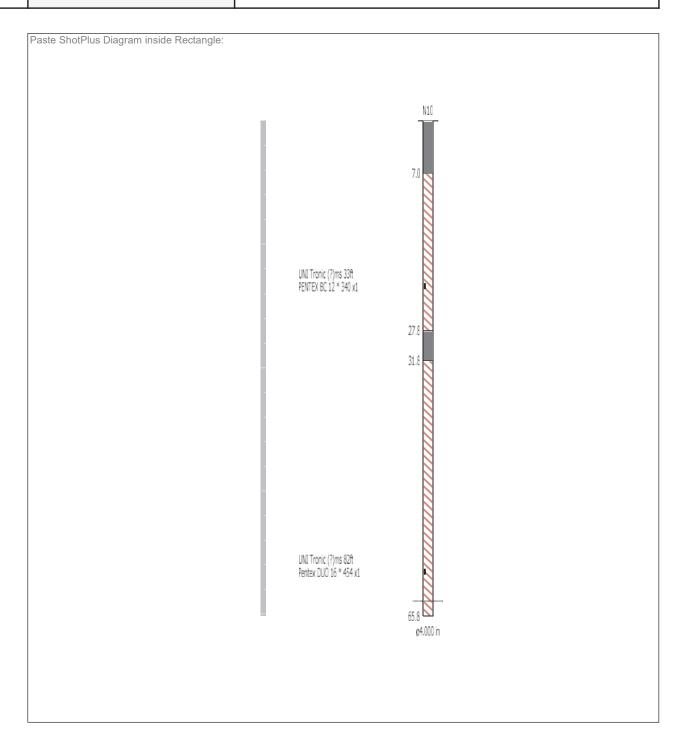
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/9/2019

Blast Number: Orica Order #: 19-019 2534945

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Quarry Manager:

Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Long at 12:06:02 September 24, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.0 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

2450 #2 road, Burlington Location: Client: Nelson Aggregate Orica Canada Inc. User Name: General: Burlington

Extended Notes

Sand Bagged

N43.40245 W-79.87814

Microphone Linear Weighting

116.7 dB(L) at 1.080 sec **PSPL**

ZC Freq 3.8 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 570 mv)

	Tran	Vert	Long	
PPV	6.731	2.032	4.064	mm/s
ZC Freq	16.5	23	13.3	Hz
Time (Rel. to Trig)	0.114	0.869	0.184	sec
Peak Acceleration	0.106	0.080	0.106	g
Peak Displacement	0.063	0.018	0.039	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.5	7.4	7.2	Hz
Overswing Ratio	3.8	3.7	4.1	

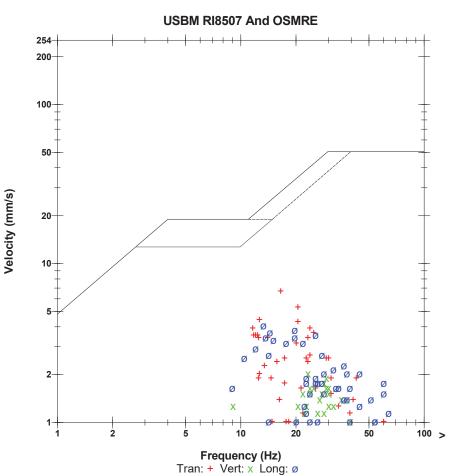
Peak Vector Sum 6.901 mm/s at 0.116 sec

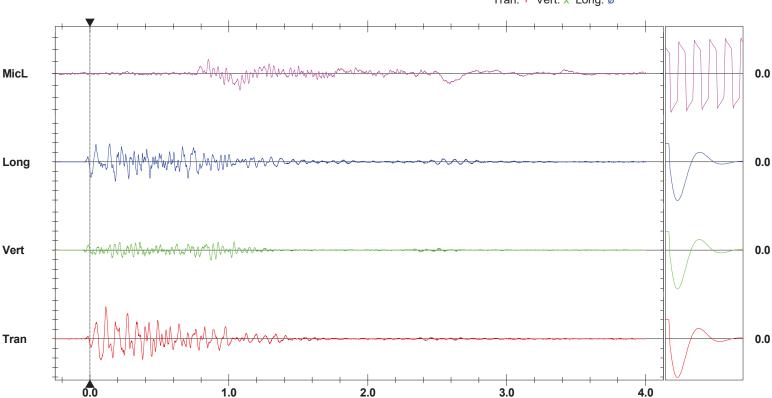
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.3 Volts

Unit Calibration December 4, 2018 by Instantel File Name

__TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger =

Blind Line & Colling rd Nelson Aggregate Burlington 2019-09-24 Blast 19-019 Middle

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
Sep 24 /19 06:03:57		SERIAL NUMBER: UM6857 Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB
•	Sep 24 /19 13:17:31	No events recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic:

Printed: September 24, 2019 (V 10.72 - 10.74)



File Name



Date/Time Long at 12:06:01 September 24, 2019 **Trigger Source** Geo: 10.000 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Notes

Location: Gas Line

Client: Nelson Aggregates
User Name: Orica Canada
General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting

PSPL 131.9 dB(L) at 1.840 sec

ZC Freq 3.5 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 611 mv)

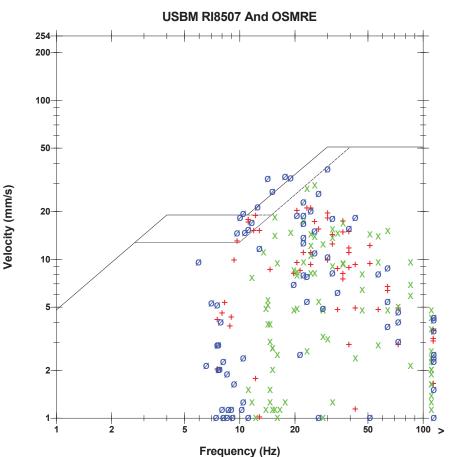
Tran	Vert	Long	
21.08	29.46	37.34	mm/s
24	26	30	Hz
0.349	0.688	0.667	sec
0.490	0.742	0.623	g
0.235	0.167	0.378	mm
Passed	Passed	Passed	
7.3	7.3	7.3	Hz
3.7	3.7	4.1	
	21.08 24 0.349 0.490 0.235 Passed 7.3	21.08 29.46 24 26 0.349 0.688 0.490 0.742 0.235 0.167 Passed Passed 7.3 7.3	21.08 29.46 37.34 24 26 30 0.349 0.688 0.667 0.490 0.742 0.623 0.235 0.167 0.378 Passed Passed Passed 7.3 7.3 7.3

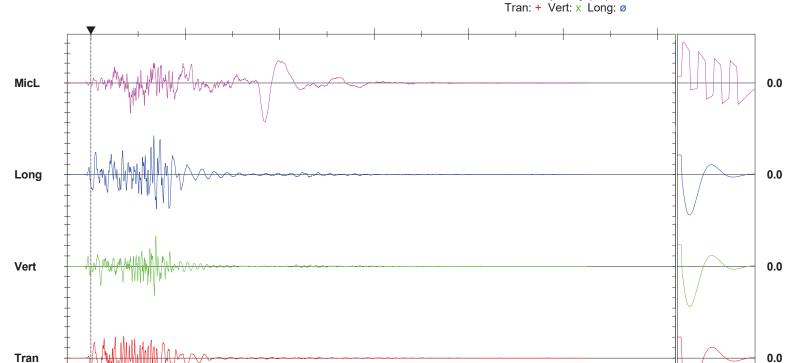
Peak Vector Sum 42.02 mm/s at 0.667 sec

Serial Number BE19461 V 10.72-8.17 MiniMate Plus **Battery Level** 6.3 Volts

Battery Level 6.3 Volts **Unit Calibration** August 31, 2018 by Instantel

__TEMP.EVT





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 10.000 mm/s/div Mic: 20.00 pa.(L)/div Trigger = ▶--------

2.0

1.0

Sensor Check

6.0

4.0

5.0

3.0

Number of holes: 72 Subdrill: 2.0ft Blast Summary Data Hole Diameter: 4.0in Spacing: 10.0ft 1st row burden: 12.0ft Burden: 9.0ft

Total drilled: 4700.5ft

Stemming: 8.0ft

Hole angle: 0.0°

25M/25M 15M/15M,ms open face 110Kg/delay 82Kg/delay

85Kg/Delay 85Kg/Delay

20M/18M,ms 15M/15M,ms

335

155, 185, 215, 245, 275, 305, 170, 200, 230, 260, 290, 320

310

220

120

9MID019 Design Fnl - 4" Blast Hole 12x10 9x10 271 266 and 250 + .6 SUB ELEV DRILLER NAME:



Subdrill: 2.0ft Blast Summary Data Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 4700.5ft

Burden: 9.0ft

Number of holes: 72

Stemming: 8.0ft Hole angle: 0.0°

> 25M/25M 15M/15M,ms open face 110Kg/delay 82Kg/delay

85Kg/Delay

85Kg/Delay

20M/18M,ms 15M/15M,ms

P0 P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 P11 P12 P13 P14 P15 P16 P17 P18 P19 P20 P21 P22 P23 P14 P1.8f 71.4f 71.0f 70.3f 69.8f 69.8f 68.9f 68.8f 67.8f 66.5f 65.5f 64.3f 64.1f 63.9f 63.1f 61.9f 61.0f 60.1f 59.5f 58.5f 57.5f 56.2f 9MID019 Design Fnl - 4" Blast Hole 12x10 9x10 271 266 and 250 + .6 SUB ELEV DRILLER NAME:



Not to scale



open face

110Kg/delay 82Kg/delay

85Kg/Delay 85Kg/Delay

Hole angle: 0.0°

Maing: 8.0ft

Number of holes: 72 Subdrill: 2.0ft Hole Diameter: 4.0in Spacing: 10.0ft

10131 drilled: 4700.5ft 1st row burden: 12.0ft H0.9 : n9brud

Blast Summary Data

SHOTPlus Plan

9/11/2019 POSTS PO PI PZ P3 P4 P5 P6 P5 P6 P70 3R 69.8R 68.9R 68.8R 67.8R 65.5R 65.5R 64.9R 64.3R 64.3R 63.9R 63.9R 65.5R 65 9MID019 Design Fnl SOUTH OPEN END SHOTPlusTM Professional 5.7.4.4 9MID019 Design Fnl - 4" Blast Hole 12x10 9x10 271 266 and 250 + .6 SUB ELEV DRILLER NAME:_____ Burlington Stemming: 8.0ft Hole angle: 0.0° Title/author Filename Location Number of holes: 72 Subdrill: 2.0ft Blast Summary Data SHOTPlus 5 Plan Hole Diameter: 4.0in open face Spacing: 10.0ft 1st row burden: 12.0ft Total drilled: 4700.5ft H. 199-11 38-1904, Burden: 9.0ft 1-185, Scale 1:350

OPICA	st Repor on Aggregati	1 1			Burl					
200.1	on Aganagat			P.O. #:			Orica Order #:		37318	
Blaster-in-charge:	on Aggi egui	е		Blast Date:	2019	-09-30	Blast Time:	11:	56 AN	1
	Mik	e Derkind	deren		(Print Name	e)	Tonnes Blasted:	24,167	te	9,295 m3
							Total tonnes per day:	24,167	te	NB60-17 Ra
Blast Location:		Middle			(Bench / Fa	ace)	Total Holes Loaded:	64	holes	
GPS Coordinates:	43.40469	°N Latitu	de	79.88146	°W Longit	tude	including:	0	Dead	Holes
	Centre of Blast		(Centre of Blast			and:	0	Helpe	r Holes
							Helper Hole Collar:	0.0	ft avg	
Wind from the: NE a	t 15 kph			Temperature	: 16 to 20) °C	# Rows Blasted:	3	rows	
	X			X			- Pattern	Front Rov	v)-	
Clear:	Rain:	Overc	ast:				Burden:	12.0	ft avg	
artly Cloudy: X	Snow:	Inversi	ion:	Ceiling	30,00	00 ft	Spacing:		ft avg	
							# Holes:	24	front r	OW
- Drilling Information -							- Pattern (Main Body	() -	
	igle from Vertical			Non	ninal Bit D	iameter:	Burden:	9.0	ft avg	
Primary Bit diam: 101.6 mr	າ <mark>0</mark> , #	Holes:	64	= 3,370.0) ft (4	" diam)	Spacing:		ft avg	
Secondary Bit diam: mr		Holes:)ft (" diam)	# Holes:		main l	,
Tertiary Bit diam: mr	າ° #	Holes:		= 0.0)ft (" diam)	Bench Height:		ft avg	
					7		Sub-drill:		ft avg	
Bulk Explosives:	in (kg)	out (kg		kg			Hole Depth:		ft avg	
CENTRA GOLD 70	27,320	20,0	030	7,290			- Stone	Decking -	1	
							- Stone Front Row: Main Body:		ft avg	
Packaged Explosives:	cs shipped			kg			CTS		ft avg	
FORTEL PRO 75X400	2	2	0	50			# Decks:		per bla	ast .
							- Collar	Stemming	1	
							Front Row:		ft avg	
Boosters:	kg	/ unit # u		kg			Main Body:		ft avg	1
PENTEX 12 (OR EQUIVALENT)		0.34	65	22.1			Front Row: Main Body: Material used: - Charg Front Row: Main Body:			1
PENTEX DUO (OR EQUIVALENT)		0.45	64	29.1			- Charg	e Length -		
4-4-1		: DI+ /I-		7.004			Front Row:		ft avg	
	olosives weight			7,391			,		ft avg	
	d Prod (50 kg) '		kg:	0.7%			Front Row:	e Weight -		la.
Detonators:	case #'s	ms		# used			Main Body:	121.5 121.5	_	
UNITRONIC 600 6M				64			Max. per delay:		kg/noi	
UNITRONIC 600 9M				64			SD () Equation:			
UNITRONIC 600 15M				64			Total kg Loaded:	7,391	kg/del	ау
UNITRONIC 600 20M EXEL MS 15m				64			Rock Density:			= te/m ³
							ROOK Delisity.	2.00	g/cc	- te/III
Cord & Accessories:		U of N	1	# used			- Poud	er Factor -		
JOIN & ACCESSORES.		units	/1	# useu	1 3/	10 lb/yd ³	Yield PF:			(actual)
		units				39 lb/yd ³	Front row:		-	(theoretical
		units				36 lb/yd ³	Main Body:		_	(theoretical
Resource Deployment:		units				54 lb/yd ³	"KPI" PF:		-	(theoretical
# of Blasts today (this Quarry)				1			N FROM STANDARD):	3.002	9, 10	(Incorolical)
,, c. Didoto today (tillo Quality)				1			of rate code			

of Helpers (this Blast)

of MMU's (this Blast) Services: BULK TRUCK CHARGE

BLASTER HOURS

HELPER HOURS

BORETRACK

SHOT LAYOUT FEE

ADVANCED BLAST DESIGN

Burlington 2019-09-30 Blast 19-020 Middle.xlsm

Note Exception

Enter Blaster hours

Enter hours

Enter hours

Enter total Helper man-hours

Enter # trips extra beyond 1

9,295 m³ NB60-17 Rate Code

Blast Report

Factor (kg Loaded / te Blasted

Public

2

1.0

6.0

12.0

0.0

0.0

0.0



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: 2019-09-30 Blast Date:

Blast Number: Orica Order #: Blast Time:

19-020 2537318 11:56 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40469	79.88146
Front Row Corner	43.40444	79.88153
Back Row Corner	43.40493	79.88140
Average (Centre of Blast)	43.40469	79.88146

(N) Radians	(W) Radians
0.757555	1.394195
0.757550	1.394196
0.757559	1.394193
0.757555	1.394195

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.		(N) Radians	(W) Rad
	1st Reading	43.40245	79.87814		0.757516	1.3
	2nd Reading					
	Average	43.40245	79.87814		0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	366.2	m			
	Post Blast Data: ppV:	2.8	mm/s Trigger set at:	2.0	mm/s	
	frequency:	26.0	Hz V/T/L:	?	(Vertical, Transverse or L	ongitudinal)
			l		I .	

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

air overpressure: **111.8** dB Trigger set at: 115 dB 2450 2nd Line

Enter ° N Lat. Enter ° W Long. 2nd Seismograph Co-ordinates 1st Reading 43.39339

(N) Radians	(W) Radians
0.757358	1.394323
0.757050	4 00 4000

79.88880 2nd Reading Average 43.39339 79.88880 Distance (2nd Seis. From Centre of Blast) **1390.6** m ppV: Did Post Blast Data: mm/s

0.757358 1.394323 Trigger set at: 2.0 mm/s ? (Vertical, Transverse or Longitudinal)

frequency: Not Hz V/T/L: air overpressure: Trigger dΒ Trigger set at: 115 dB

Blind Line and Colling Road (Bruce Trail Entrance) 3r

Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
1st Reading	43.40466	79.88098	
2nd Reading			
Average	43.40466	79.88098	
Distance (3rd Seis. From Centre of Blast)	39.3	m	
Post Blast Data: ppV:	30.4	mm/s Trigger set at:	
	2nd Reading Average Distance (3rd Seis. From Centre of Blast)	1st Reading 43.40466 2nd Reading 43.40466 Average 43.40466 Distance (3rd Seis. From Centre of Blast) 39.3	1st Reading 43.40466 79.88098 2nd Reading 43.40466 79.88098 Average 43.40466 79.88098 Distance (3rd Seis. From Centre of Blast) 39.3 m

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

2.0 mm/s 20.0 Hz 129.9 dB frequency: V / T / L : (Vertical, Transverse or Longitudinal) air overpressure: Trigger set at: 115 dB Gas Line

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= __(39.3)² kg

1,544 kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate. jim bray



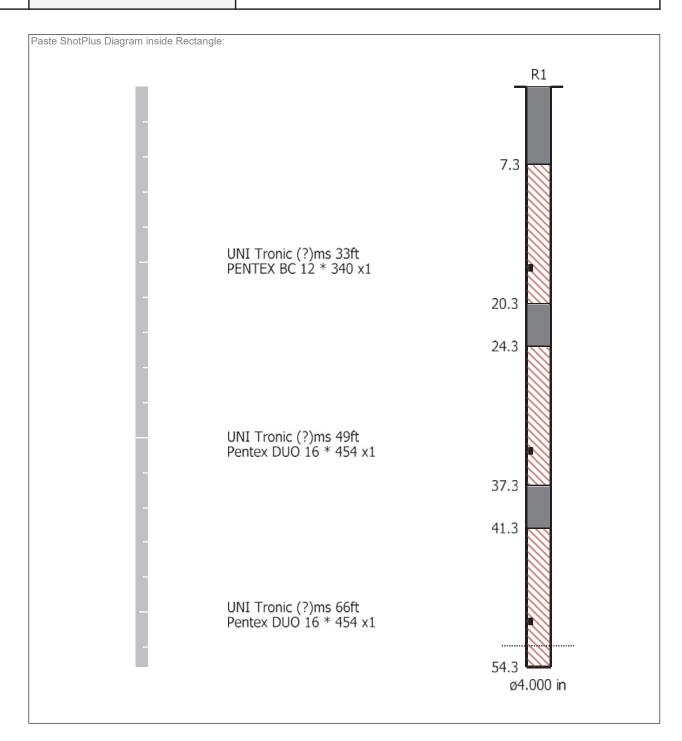
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 9/30/2019

Blast Number: Orica Order #: 19-020 2537318

page 2



Orica
Blaster-in-charge: Mike der Kinderen

Quarry Manager: Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Vert at 11:56:54 September 30, 2019 Trigger Source Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.0 sec (Auto=3Sec) at 2048 sps

Job Number:

Notes

Location: 2450 #2 road, Burlington Client: Nelson Aggregate User Name: Orica Canada Inc. General: Burlington

Extended Notes

Sand Bagged

N43.40245 W-79.87814

Microphone Linear Weighting

PSPL 111.8 dB(L) at 0.757 sec

ZC Freq 10.8 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 574 mv)

	Tran	Vert	Long	
PPV	1.651	2.794	1.397	mm/s
ZC Freq	16.3	26	18.0	Hz
Time (Rel. to Trig)	0.216	0.161	-0.167	sec
Peak Acceleration	0.053	0.080	0.053	g
Peak Displacement	0.018	0.019	0.012	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.3	Hz
Overswing Ratio	3.8	3.7	4.0	

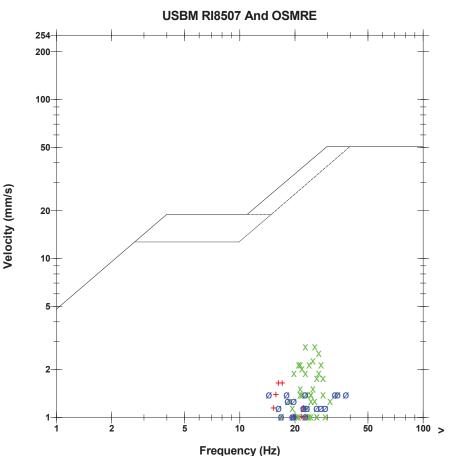
Peak Vector Sum 3.113 mm/s at 0.181 sec

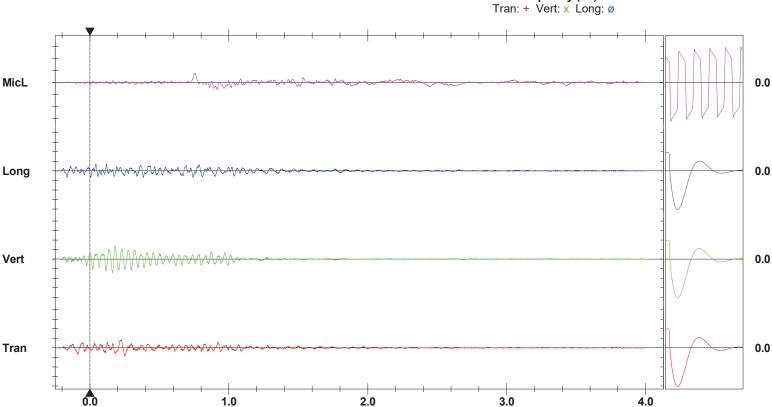
Serial Number BE12877 V 10.72-1.1 Minimate Blaster **Battery Level**

6.2 Volts

Unit Calibration December 4, 2018 by Instantel File Name

__TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶

Blind Line & Colling road Burlington Burlington 2019-09-30 Blast 19-020 Middle

Event Report: Monitor Log - Micromate ISEE # UM6857-Compliance

Start Time	End Time	Status
		SERIAL NUMBER: UM6857
Sep 30 /19 06:17:01		Start Monitoring Waveform Geo: 2.00 mm/s Mic: 115.0 dB
Sep 30 /19 10:16:29	Sep 30 /19 10:16:34	Event recorded. Trigger Level MicL: 115.0 dB
Sep 30 /19 10:16:34	Sep 30 /19 12:25:24	Event recorded. (Keyboard Exit) Waveform Geo: 2.00 mm/s Mic: 115.

Printed: September 30, 2019 (V 10.72 - 10.74)



File Name



Date/Time Vert at 11:56:52 September 30, 2019 **Trigger Source** Geo: 10.000 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.25 sec (Auto=3Sec) at 1024 sps

Notes

Location: Gas Line

Client: Nelson Aggregates
User Name: Orica Canada
General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting

PSPL 129.9 dB(L) at 0.182 sec

ZC Freq 10 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 644 mv)

	Tran	Vert	Long	
PPV	28.57	30.35	29.72	mm/s
ZC Freq	18	20	17	Hz
Time (Rel. to Trig)	1.027	0.785	0.656	sec
Peak Acceleration	0.610	1.418	0.663	g
Peak Displacement	0.246	0.144	0.403	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.3	Hz
Overswing Ratio	3.7	3.9	4.2	

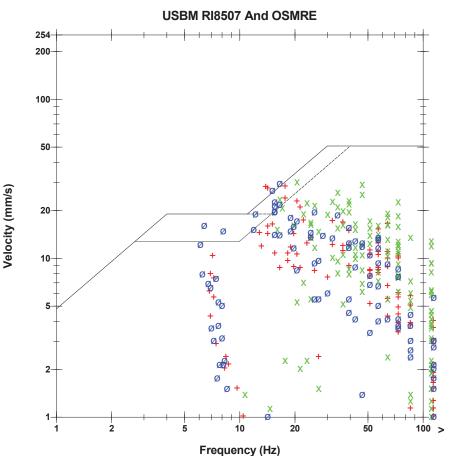
Peak Vector Sum 40.18 mm/s at 0.787 sec

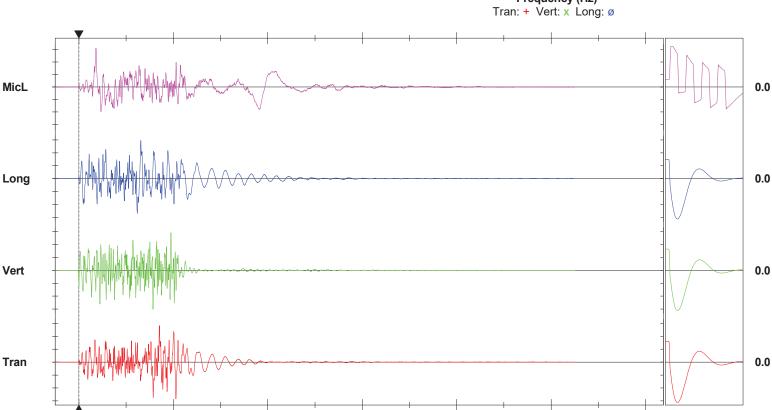
Serial Number BE19461 V 10.72-8.17 MiniMate Plus **Battery Level** 6.3 Volts

Battery Level 6.3 Volts **Unit Calibration** August 31, 201

August 31, 2018 by Instantel

__TEMP.EVT





2.0

1.0

Sensor Check

6.0

4.0

5.0

3.0

Subdrill: 2.0ft Blast Summary Data Spacing: 10.0ft Burden: 9.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 4105.8ft

Number of holes: 73

Stemming: 8.0ft Hole angle: 0.0°

open face

POSTS

975 960 945							
930	22 22	000	o Lr				
885 93 870 91	855	0	•	,			
840 8	810	940	925	910	040	025	010
795	765	895	880	865	952	980	965
735	720	850	835	820	950	935	920
705	675	805	● 062	775	905	890	875
660	630	260	745 .	730	860	845	830
615	585	715	€ 002	685	815	800	785
570	540	670	655 .	640	770	755 .	740
525	495	625	610 •	265	725	710 •	695
480	450	580	565	550	089	665	650
435	405	535	520	505	635	620	509
390							
345							
300							
255							
210	180	310	295	280	410	395	380
165	135	265	250	235	365	350	335
120	06	220	205	190	320	305 ●	290
75	45	175	160	145	275	260	245
30	0	130	115 .	100	230	215	200
	/	85	70 •	55	185	170	155
		1	\	\	140	125	110
					1	1	

9MID020 Design Fnl - 4" Blast Hole 12x10 9x10 266 and 250 + .6 SUB ELEV DRILLER NAME:



Subdrill: 2.0ft Blast Summary Data Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Total drilled: 4105.8ft

Number of holes: 73

Hole angle: 0.0° Stemming: 8.0ft

POSTS

R1 R2 R3 R4 R5 R6 R7 R8 R9 R10 R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R52.3ft 52.3ft 52.3ft 53.2ft 53.2ft 53.2ft 53.2ft 53.3ft 53.5ft 54.0ft 54.9ft 54.7ft 51 52 53 54 55 56 57 58 59 510 511 512 513 514 52.5ft 52.6ft 52.3ft 52.6ft 52.2ft 52.2ft 52.5ft 52.5ft 52.5ft 53.0ft 53.0ft 53.8ft 53.3ft 53.3

open face

71 72 73 74 75.2.24 52.24 51.34 51.34 52.74 52.34 52.34 51.34 52.24 52.24 52.34 52.34 52.34 52.34 53.34 53.34 53.34 53.34

9MID020 Design Fnl - 4" Blast Hole 12x10 9x10 266 and 250 + .6 SUB ELEV DRILLER NAME:



Blast Summary Data

Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 4105.8ft

Burden: 9.0ft

Number of holes: 73 Subdrill: 2.0ft

Hole angle: 0.0° Stemming: 8.0ft

Load Sheet 3 Decks 40 Kg/ Delay

大学を大路 大学大学 多人 北北北 ジメ_をシメ メなメジャル 在外人 XX+XX 学学 XXXXX 的不致致 大学大学 2X 2X XX *****



Not to scale

Spacing: 10.0ft Blast Summary Data

Subdrill: 2.0ft

Burden: 9.0ft

Total drilled: 3489.7ft 1st row burden: 12.0ft

Stemming: 8.0ft

Hole Diameter: 4.0in

Number of holes: 64

Hole angle: 0.0°

open face

POSTS

9MID020 Design Fnl - 4" Blast Hole 12x10 9x10 266 and 250 + .6 SUB ELEV

DRILLER NAME:

10-543,8

Mine SHOTPlus™ Professional 5.7.4.4 Filename Title/author Location 9MID020 Design Fnl NORTH CLOSED END Burlington

9/11/2019

ORICA

Scale 1:350

-
ORICA
The Blasting Professional
page 1

Quarry:	Burlington
P.O. #:	
Blast Date:	2019-10-15

Blast Number:	19-021
Orica Order #:	2543361
Blast Time:	11:55 AM

ORICA			31 16	•		P.0	D. #:			Orica Order #:	254	43361		
The Blasting Professionals		Ne	son Aggr	egate		Blast D	ate:	2019-10-15		Blast Time:	11:	55 AN	Л	
age 1 Blaste				Miles De				1		Tanasa Diagtada	00.504		10,216	
Biaste	er-in-c	charge:		Mike De	rkindere	311		(Print Name)	To	Tonnes Blasted: tal tonnes per day:	26,561 26,561		NB60-17	Pata
Bla	ast I o	cation:		Upper	Middle			(Bench / Face)		otal Holes Loaded:		holes		Code
			43.4036		.atitude	79.8814	18	°W Longitude		including:			Holes	
0.0	000. 0		Centre of E			Centre of E		ga.c		and:			r Holes	
									l i	Helper Hole Collar:		ft avg		
Wind fror	m the:	S	at 5	kph		Tempera	ature:	11 to 15 °C		# Rows Blasted:		rows		
	1			X		X					(Front Rov	1		
Clear:			Rain:	0	vercast:					Burden:		ft avg		
Partly Cloudy:	Х		Snow:	In	version:	Ceili	ng	30,000 ft		Spacing:	10.0	ft avg		
										# Holes:	22	front i	OW	
- Drilling In	forma	tion -								- Pattern	Main Body	() -		
			Angle from V	ertical			Nom	ninal Bit Diameter:		Burden:	9.0	ft avg		
Primary Bit	diam:	101.6 m	ım 0	, # Hole:	s: 56	= 3,8	332.6	ft (4 " diam)		Spacing:	10.0	ft avg		
Secondary Bit	diam:	92.1 m	ım	° # Hole	s: 3	= 2	205.3	,		# Holes:	31	main	body	
Tertiary Bit	diam:	m	ım	° # Hole:	s:	=	0.0	ft (" diam)		Bench Height:	66.4	ft avg		
								1		Sub-drill:	2.0	ft avg		fec
Bulk Explo	osives	S:			ut (kg)	kg			(e)	Hole Depth:		ft avg		<u>8</u>
CENTRA GOL	.D 70		- ;	33,740	24,140	9,60	0		single hole)		Decking -	1		te E
									ogle	Front Row:		ft avg		/ pe
Packaged			cs sh	•	eturned	kg			asi	Main Body:		ft avg		ade
FORTEL PRO	75X400)		2	1	2	25		On	# Decks:		per bl	ast	g Lo
									sed		Stemming	1		Yield Powder Factor (kg Loaded / te Blastec
									(Based	Front Row:		ft avg		acto
Boosters:				kg / unit			_		H H	Main Body:		ft avg	1	7
PENTEX 12 (O				0.3		19.			Theoretical PF	Material used:				wde
PENTEX DUO	(OR E	QUIVALENT)	0.4	·5 54	24.	.5		oreti	- Charg Front Row:	ge Length -			I Po
		total e	vnlocivec v	∣ veight in Bla	et (ka):	9,66	:Ω		Thec	Main Body:		ft avg		/ielc
				5 kg) % of 7	,	0.39				•	e Weight -	_		
Detonators	s:			e #'s	ms	# used				Front Row:	155.8		le	
UNITRONIC 60							4			Main Body:	179.2			
UNITRONIC 60							4			Max. per delay:	107.0			
EXEL MS 25m	1					5	4			SD () Equation:		kg/de	•	
UNITRONIC 60	00 6M						2			Total kg Loaded:	9,669			
										Rock Density:	2.60	g/cc	= te/m ³	
Cord & Ac	cesso	ories:		U	of M	# used	_	3			er Factor -			
HARNES	SS WIR	E DUPLEX	(6 PACK) 40	OM	units		1	1.595 lb/yd ³		Yield PF:		•	(actual)	
					units			1.163 lb/yd ³		Front row:			(theoretic	,
Danauman Da		a un fi			units			1.783 lb/yd ³ 1.577 lb/yd ³		Main Body:		-	(theoretic	
Resource De	. ,							L		"KPI" PF:	0.360	kg/te	(theoretic	cal)
# of Blasts toda							1	NOTES (ANY VARIATIC						
# of Blasters (tl							1		it was	best to cut 6 holes off to	the south due	to a ho	le that wa	S
# of Helpers (th			Note E	xception			2	20' short in depth.						
# of MMU's (thi	is Blast)						1							
Services:	01115	\F						Package was use to load	throu	gn lean burden				
BULK TRUCK		5E	F : -	N4- 1		1.	_							
BLASTER HOU				Blaster hours		6.	_							
HELPER HOURS Enter total Help				10.	_									
SHOT LAYOUT FEE Enter # trips e			eyond 1	0.	_									
ADVANCED BLAST DESIGN Enter ho				0.	_									
BORETRACK			Enter h	ours		0.	U							
							_							



Blast Report

Nelson Aggregate

Quarry: Burlington P.O. #: Blast Date: 2019-10-15

Blast Number: 19-021 Orica Order #: 2543361 Blast Time: 11:55 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.	
Mid Blast	43.40365	79.88148	
Front Row Corner	43.40332	79.88155	
Back Row Corner	43.40390	79.88141	
Average (Centre of Blast)	43.40362	79.88148	

(N) Radians	(W) Radians
0.757537	1.394195
0.757531	1.394196
0.757541	1.394194
0.757536	1.394195

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter o	W Long.		(N) Radians	(W) Radi
	1st Reading	43.40245		79.87814		0.757516	1.3
2nd Reading							
	Average	43.40245		79.87814		0.757516	1.3
	Distance (1st Seis. From Centre of Blast)	300.1	m				
	Post Blast Data: ppV:	6.0	mm/s	Trigger set at:	2.0	mm/s	
	frequency:	14.6	Hz	V/T/L:	?	(Vertical, Transverse or L	ongitudinal)

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

air overpressure: **112.8** dB 2450 2nd Line

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.39339	79.88880
	2nd Reading		
	Average	43.39339	79.88880
	Distance (2nd Seis. From Centre of Blast)	1283.8	m

(N) Radians	(W) Radians
0.757358	1.394323
0.757250	1 20/1222

Post Blast Data: ppV: **0.2** mm/s Trigger set at: 2.0 mm/s 9.1 Hz V/T/L: frequency: ? (Vertical, Transverse or Longitudinal) air overpressure: **117.0** dB Trigger set at: 115 dB

Blind Line and Colling Road (Bruce Trail Entrance)

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40466	79.88098
	2nd Reading		
	Average	43.40466	79.88098
	Distance (3rd Seis. From Centre of Blast)	122.6	m
	Post Blast Data: nn\/:	18.8	mm/s Trigger set at:

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

gger set at: 2.0 mm/s frequency: **15.0** Hz V / T / L : ? (Vertical, Transverse or Longitudinal) air overpressure: **129.7** dB Trigger set at: 115 dB Gas Line

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

= __(122.6)² kg

15,031 kg 900

Maximum Indicated Charge Weight per Delay =

Orica Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate. jim bray



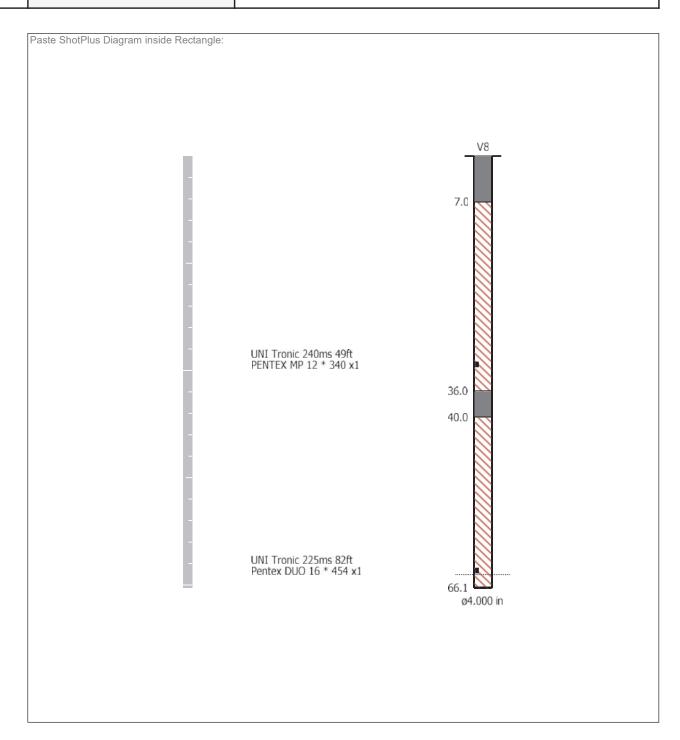
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 10/15/2019

Blast Number: Orica Order #: 19-021 2543361

page 2



Orica
Blaster-in-charge:

Mike der Kinderen

Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Vert at 11:55:04 October 15, 2019 **Trigger Source** Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.25 sec (Auto=3Sec) at 2048 sps

Job Number: 1

Notes

Location: 2450 #2 road, Burlington
Client: Nelson Aggregate
User Name: Orica Canada Inc.
General: Burlington, On

Extended Notes

Sand Bagged 43.40245 -79.87814

MicrophoneLinear WeightingPSPL112.8 dB(L) at 1.290 sec

ZC Freq 15.3 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 627 mv)

	Tran	Vert	Long	
PPV	5.461	3.048	5.969	mm/s
ZC Freq	13.5	30	14.6	Hz
Time (Rel. to Trig)	0.458	0.446	0.855	sec
Peak Acceleration	0.080	0.080	0.106	g
Peak Displacement	0.064	0.019	0.065	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.2	Hz
Overswing Ratio	3.9	3.7	4.1	

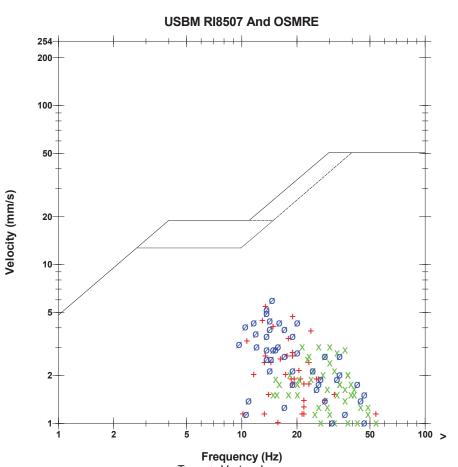
Peak Vector Sum 6.571 mm/s at 0.856 sec

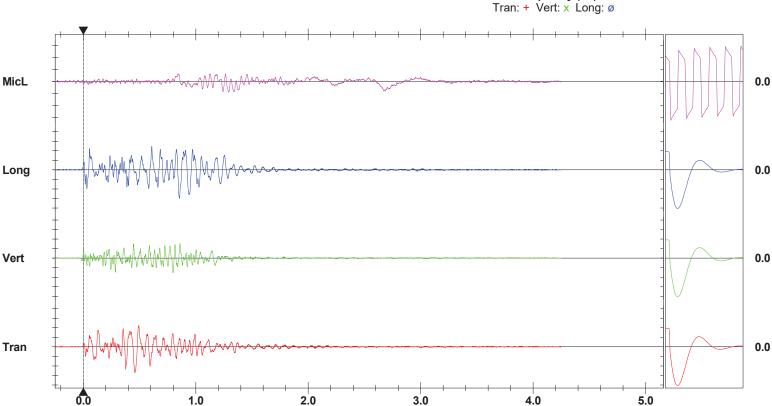
Serial Number BE12877 V 10.72-1.1 Minimate Blaster

Battery Level 6.3 Volts

Unit Calibration December 4, 2018 by Instantel

File Name __TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶--------



File Name



Date/Time MicL at 11:55:03 October 15, 2019 **Trigger Source** Geo: 2.000 mm/s, Mic: 115.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 5.054 sec (Auto=5Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington Bruce TRL.MMB

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level**

3.6 Volts

Unit Calibration January 15, 2019 by Instantel UM6857_20191015115503.IDFW

Notes

COLLING RD & BLINDLINE Location: Client: **NELSON AGGREGATES**

User Name: ORICA CANADA

General:

Extended Notes

N 43.31617 W 80.02664

Microphone Linear Weighting

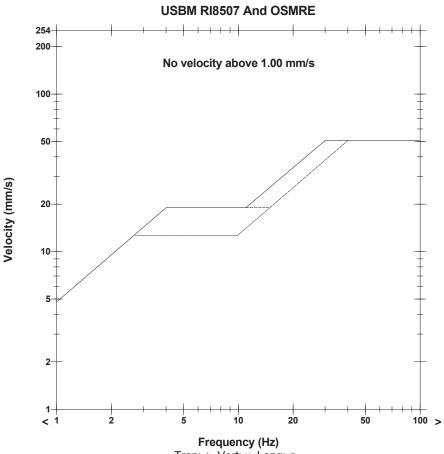
PSPL 117.0 dB(L) at 0.006 sec

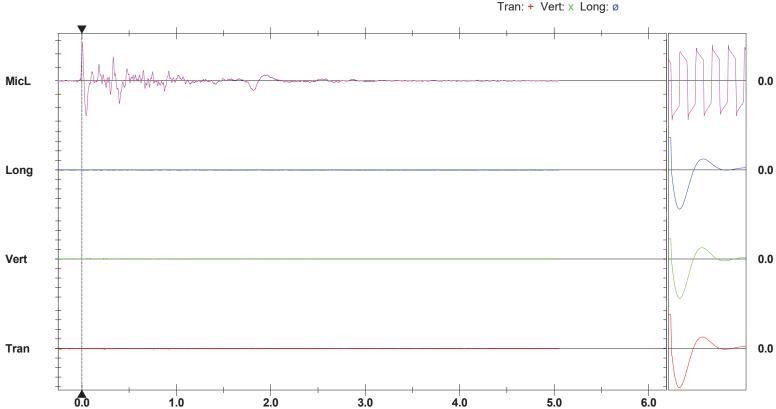
ZC Freq 10.0 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1474 mv)

	Tran	Vert	Long	
PPV	0.166	0.110	0.102	mm/s
ZC Freq	9.1	4.0	13.7	Hz
Time (Rel. to Trig)	-0.229	0.056	0.206	sec
Peak Acceleration	0.008	0.010	0.012	g
Peak Displacement	0.005	0.013	0.002	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.4	3.4	3.6	

Peak Vector Sum 0.177 mm/s at -0.229 sec





Time Scale: 0.50 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 5.000 pa.(L)/div Trigger =





Date/Time Tran at 11:52:41 October 15, 2019 Trigger Source Geo: 10.000 mm/s, Mic: 124.0 dB(L)

Range Geo: 254.0 mm/s **Record Time** 5.25 sec (Auto=3Sec) at 1024 sps

Notes

Location: Gas Line

Client: **Nelson Aggregates** User Name: Orica Canada General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting

PSPL 129.7 dB(L) at 0.607 sec

ZC Freq 16 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 627 mv)

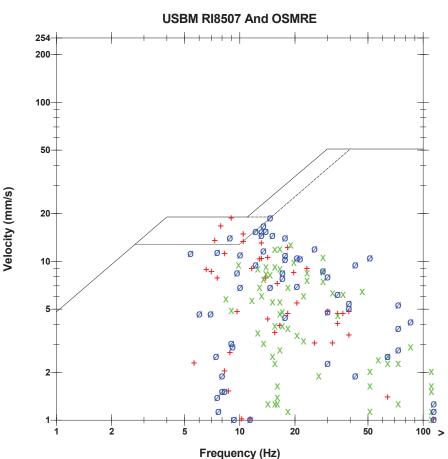
Tran	Vert	Long	
18.67	12.70	18.80	mm/s
9.0	19	15	Hz
0.125	0.278	0.613	sec
0.199	0.318	0.318	g
0.323	0.112	0.234	mm
Passed	Passed	Passed	
7.3	7.3	7.4	Hz
3.8	3.9	4.2	
	18.67 9.0 0.125 0.199 0.323 Passed 7.3	18.67 12.70 9.0 19 0.125 0.278 0.199 0.318 0.323 0.112 Passed Passed 7.3 7.3	18.67 12.70 18.80 9.0 19 15 0.125 0.278 0.613 0.199 0.318 0.318 0.323 0.112 0.234 Passed Passed Passed 7.3 7.4

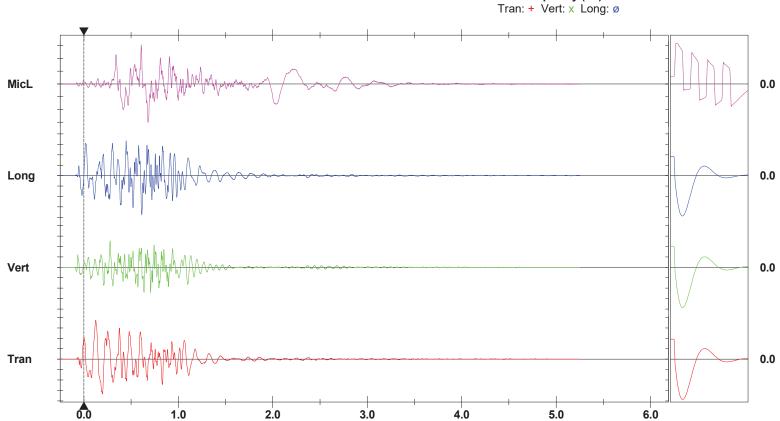
Peak Vector Sum 22.37 mm/s at 0.610 sec

Serial Number BE19461 V 10.72-8.17 MiniMate Plus **Battery Level**

6.3 Volts Unit Calibration August 31, 2018 by Instantel

File Name TEMP.EVT





Trigger = ▶

Time Scale: 0.50 sec/div Amplitude Scale: Geo: 5.000 mm/s/div Mic: 20.00 pa.(L)/div

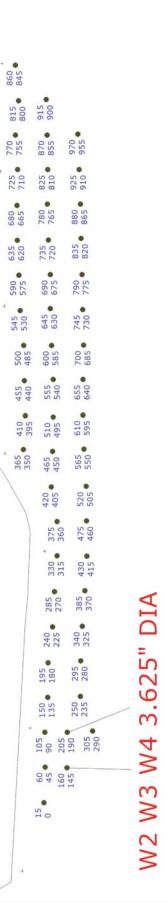
Blast Summary Data
Burden: 9.0ft Spacing: 10.0ft Subdrill: 2.0ft
1st row burden: 12.0ft Hole Diameter: 4.0in Number of hole

Total drilled: 3634.7ft

Number of holes: 53 H

Stemming: 7.0ft Hole angle: 0.0°

open face





Blast Summary Data Spacing: 10.0ft Subdrill: 2.0ft

Hole Diameter: 4.0in N

1st row burden: 12.0ft Total drilled: 3634.7ft

Burden: 9.0ft

Number of holes: 53

Stemming: 7.0ft Hole angle: 0.0°

open face

100 Kg Max 95Kg Bottom Deck

Load Sheet

01 U2 UU3 U4 U5 U6 U7 U8 U9 U10 U11 U12 69.3H 69.7H 70.6H 71.3H 72.4H 72.4H 71.6H 69.8H 69.3H 69.0H 68.3H 66.8H 55.5ft 65.8ft 65.8ft 65.6ft 65.9ft 66.3ft 66.7ft 65.7ft 65.7ft 66.7ft 65.7ft 65.7ft 67.4ft 68.2ft 69.0ft 69.0ft 69.0ft 70.1ft 70.5ft 71.2ft 71.2ft 71.8ft 72.0ft 69.2ft 69.0ft 67.4ft W3 W4 65.8ft 66.4ft 66.7ft 67.2ft 67.7ft 68.7ft 68.7ft 68.7ft 69.6ft 70.1ft 70.5ft 71.2ft 71.8ft 72.0ft 70.2ft 70.2ft 70.2ft 71.2ft 71.0ft 70.2ft 69.4ft 68.8ft 65.8ft 65.8ft 65.8ft 65.8ft 65.8ft 67.2ft 67.2ft 67.7ft 68.7ft 68.7ft 68.7ft 69.4ft 69.9ft 71.0ft 70.9ft 70.2ft 69.4ft 68.8ft 68.8ft 65.8ft 69.4ft 67.2ft 67.7ft 67.7ft 68.7ft 67.7ft 67.

W2 W3 W4 3.625" DIA



Blast Summary Data

Hole Diameter: 4.0in Spacing: 10.0ft

> 1st row burden: 12.0ft Total drilled: 4029.6ft

Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 59

Stemming: 7.0ft

Hole angle: 0.0°

open face

100 Kg Max Load Sheet

W2 W3 W4 3.625" DIA



Blast Summary Data

Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Total drilled: 4029.6ft

Number of holes: 59 Subdrill: 2.0ft

Stemming: 7.0ft Hole angle: 0.0°

APPROX 12300 KGS WITH NO DECKS

POSTS

open face

V1 V2 V3 V4 V5 Str K65.8tr K65.8tr K65.9tr X66.1tr X66.3tr X66.7tr V10 V11 V12 V13 V14 V15 V15 V15 V15 V15 V19 V19 V20 V21 V22 V23 V23 V3 W3 W4 W3 W4 W19 W10 W11 W12 W13 W14 W15 W16 W17 W18 W19 W20 W21 W22 W23 W24 W55.8tr K65.8tr K65.8tr K65.8tr K65.8tr K66.4tr K65.8tr K65.0tr K65.0tr K65.5tr W8 W19 W10 W11 W12 W13 W14 W15 W16 W17 W18 W19 W20 W21 W22 W23 W24 W55.8tr K65.8tr K66.4tr K65.6tr K67.0tr €7.2tr €7.7tr €8.9tr €8.9tr €8.9tr €8.9tr €8.9tr €8.9tr €8.9tr €8.9tr €8.9tr K65.8tr K65.8tr K65.4tr K65.8tr K65.8tr

W2 W3 W4 3.625" DIA

9MID021 Design Fnl - 3.625 and 4" Blast Holes 12x10 9x10 271 and 250 + .6 SUB ELEV

DRILL TO DEPTH OR SHALE + 2 FEET



Title/author Filename Location Scale 1:350

SOUTH WALL TO MID NEXT TO OLD WHL WS

9MID021 Design Partial Fnl.spf 9MID021 Design Partial Fnl

9/25/2019

SHOTPlusTM Professional 5.7.4.4

Burlington

	Dlac	t Depost		Quarry:	Bur	ington		Blast Number:	19	-022	
ORICA		st Report		P.O. #:		10.22		Orica Order #:		47256	
The Blasting Professionals	Neisc	on Aggregate	J	Blast Date:	2018	9-10-23		Blast Time:	113	59 AN	
age 1 Blaster-in	n-charge:	Mike Der	kinder	en	(Print Nam	e)		Tonnes Blasted:	26,393	te	10,151
							То	tal tonnes per day:	26,393	te	NB60-17
Blast	Location:	Mid	dle		(Bench / F	ace)	T	otal Holes Loaded:	64	holes	
GPS Coo	ordinates:	43.40443 °N La	atitude	79.88139	°W Long	tude		including:	0	Dead	Holes
	(Centre of Blast		Centre of Blast				and:	0	Helpe	r Holes
							H	Helper Hole Collar:	0.0	ft avg	
Wind from th	ie: W at	15 kph		Temperature:	11 to 1	5 °C		# Rows Blasted:		rows	
		X		Х				- Pattern	(Front Rov	/)-	
Clear:		Rain: O\	/ercast:			_		Burden:		ft avg	
Partly Cloudy: X		Snow: Inv	ersion:	Ceiling	30,0	00 ft		Spacing:		ft avg	
							1	# Holes:		front r	OW
- Drilling Inform	mation -							- Pattern	(Back Row	() -	
		gle from Vertical		1		Diameter:		Burden:		ft avg	
Primary Bit diar	m: 101.6 mm		: 64	= 3,527.0	ft (4	" diam)		Spacing:	10.0	ft avg	
Secondary Bit diar	m: mm	° # Holes	:	= 0.0	ft (" diam)		# Holes:	31	back r	ow
Tertiary Bit diar	m:mm	° # Holes	:	= 0.0	ft (" diam)		Bench Height:	53.1	ft avg	
					1			Sub-drill:	2.0	ft avg	
Bulk Explosiv	/es:	in (kg) ou	t (kg)	kg			(e)	Hole Depth:		ft avg	
CENTRA GOLD 70)	33,760	24,820	8,940			single hole)	- Stone	Decking -	1	
							gle	Front Row:	4.0	ft avg	
Packaged Exp	plosives:	cs shipped cs re	eturned	kg			Si	Back Row:		ft avg	
FORTEL PRO 75X	400	2	0	50			on a	# Decks:	64	per bla	ast
								- Collar	Stemming	_	
							Theoretical PF (Based	Front Row:		ft avg	
Boosters:		kg / unit	# used	kg			F (E	Back Row:	7.0	ft avg	
PENTEX 12 (OR E	QUIVALENT)	0.34	1 66	22.4			<u></u>	Material used:	3/4" Clear		
PENTEX DUO (OR	EQUIVALENT)	0.45	64	29.1			etic	- Charg	ge Length -		
							leor	Front Row:		ft avg	
		losives weight in Bla		9,041			Ė	Back Row:		ft avg	
	Pkgd	Prod (50 kg) % of T	otal kg:	0.6%					ge Weight -		
Detonators:		case #'s	ms	# used				Front Row:	128.6	•	
UNITRONIC 600 61	M			1				Back Row:	140.3		
UNITRONIC 600 15	5M			64				Max. per delay:	85.0	kg/del	ay
UNITRONIC 600 20	DM			36				SD () Equation:		kg/del	ay
UNITRONIC 600 25	5M			29				Total kg Loaded:	9,041	_	
EXEL MS 18m		2!	5 ms	36				Rock Density:	2.60	g/cc	= te/m ³
EXEL MS 25m		25	5 ms	28							
Cord & Acces	ssories:	U	of M	# used		2			er Factor -		
HARNESS W	VIRE DUPLEX (6	PACK) 400M ι	ınits	1)1 lb/yd ³		Yield PF:	0.343	kg/te	(actual)
		l	ınits)1 lb/yd ³		Front row:			(theoretica
		L	ınits			47 lb/yd ³		Main Body:		-	(theoretica
Resource Deploy	yment:				1.4	74 lb/yd ³		"KPI" PF:	0.336	kg/te	(theoretica
# of Blasts today (th	nis Quarry)			1	NOTES (A	NY VARIATIO	N FR	OM STANDARD):			
# of Blasters (this B	Blast)			1							
# of Helpers (this B	last)	Note Exception		2	2 Cases of package were used for X1 due to lean burden from 30' to collar						
# of MMU's (this Bla	ast)			1							
Services:											
BULK TRUCK CHA	ARGE			1.0							
BLASTER HOURS		Enter Blaster hours		6.0							
HELPER HOURS		Enter total Helper ma	n-hours	12.0							

0.0

0.0

Enter # trips extra beyond 1

Enter hours

Enter hours

SHOT LAYOUT FEE

BORETRACK

ADVANCED BLAST DESIGN



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-10-23

 Blast Number:
 19-022

 Orica Order #:
 2547256

 Blast Time:
 11:59 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40443	79.88138
Front Row Corner	43.40401	79.88147
Back Row Corner	43.40485	79.88133
Average (Centre of Blast)	43.40443	79.88139

(N) Radians	(W) Radians
0.757550	1.394193
0.757543	1.394195
0.757557	1.394192
0.757550	1.394193

1st	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40245	79.87814
	2nd Reading		
	Average	43.40245	79.87814
	Distance (1st Seis. From Centre of Blast)	343.1	m
	Post Blast Data: ppV:	Memory	mm/s Trigger set at:
	frequency:	was full	Hz V/T/L:

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: was full Hz V/T/L: ? (Vertical, Transverse or Longitudinal)
air overpressure: from high wind dB Trigger set at: 115 dB

2450 #2 Sideroad, Burlington, On

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40614	79.87455
	2nd Reading		
	Average	43.40614	79.87455
	Distance (2nd Seis. From Centre of Blast)	585.1	m
	Post Blast Data: ppV:	3.3	mm/s Trigger set at:

(N) Radians	(W) Radians
0.757580	1.394074
0.757580	1.394074

 Post Blast Data:
 ppV:
 3.3 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 43.0 Hz
 V / T / L :
 ?
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 104.6 dB
 Trigger set at:
 115 dB

2582 #2 Sideroad, Burlington, On

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40466	79.88098
	2nd Reading		
	Average	43.40466	79.88098
	Distance (3rd Seis. From Centre of Blast)	42.2	m
	D (D) (D)	Management	

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

Post Blast Data:	ppV:	Memory	mm/s	Trigger set at:	2.0	mm/s
	frequency:	was full	Hz	V/T/L:	?	(Vertical, Transverse or Longitudinal)
	air overpressure:	from high wind	dB	Trigger set at:	115	dB
Gas Line						

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

$$= \frac{(42.2)^2}{30^2} \text{ kg}$$

= <u>1,781</u> kg

Maximum Indicated Charge Weight per Delay = 2 kg

Orica
Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

jim bray



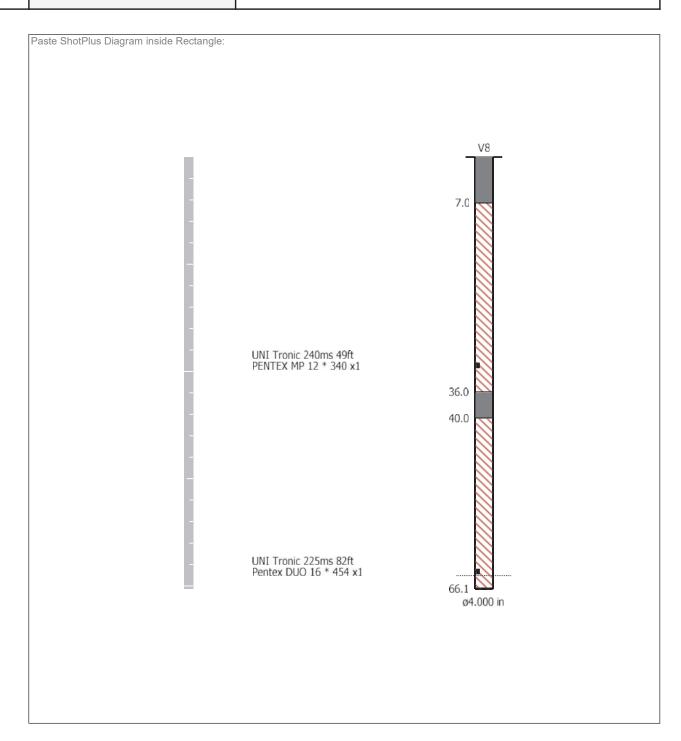
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 10/23/2019

Blast Number: Orica Order #: 19-022 2547256

page 2



Orica
Blaster-in-charge: Mike der Kinderen

Quarry Manager: Nich Heap

Signature required, indicating sign off on Blast Design.



File Name



Date/Time Long at 11:59:19 October 23, 2019 **Trigger Source** Geo: 1.500 mm/s, Mic: 120.0 dB(L)

Range Geo: 254.0 mm/s

Record Time 4.875 sec (Auto=4Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington 2582.mmb

Notes

Location: 2582 #2 Sideroad, Mount Nemo,On

Client: Nelson Aggregate User Name: Orica Canada Inc.

General: Monitoring Vibration and Airblast

Extended Notes

Sand Bagged

N43.40614,W-79.87455

MicrophoneLinear WeightingPSPL104.6 dB(L) at 1.625 sec

ZC Freq 5.9 Hz

Channel Test Passed (Freq = 19.7 Hz Amp = 1484 mv)

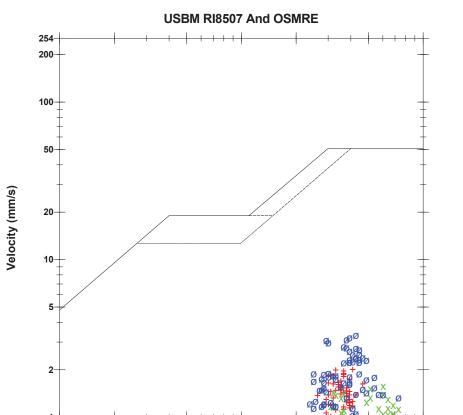
	Tran	Vert	Long	
PPV	2.018	1.576	3.334	mm/s
ZC Freq	41	60	43	Hz
Time (Rel. to Trig)	0.572	0.417	0.091	sec
Peak Acceleration	0.064	0.077	0.145	g
Peak Displacement	0.011	0.005	0.013	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.1	Hz
Overswing Ratio	3.5	3.4	3.6	

Peak Vector Sum 3.595 mm/s at 0.388 sec

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level** 3.8 Volts

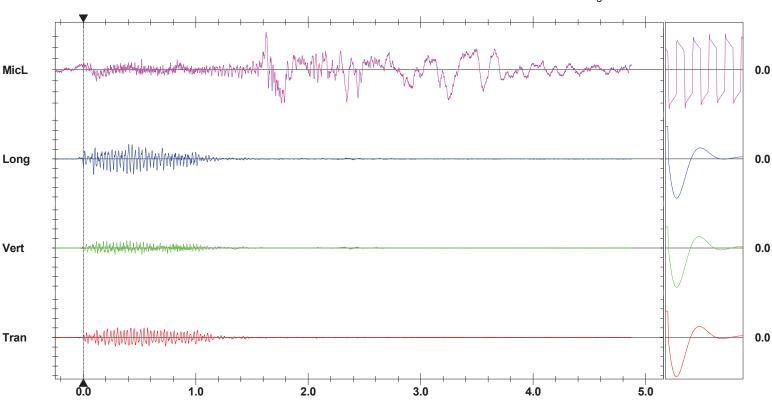
Unit Calibration January 15, 2019 by Instantel

January 15, 2019 by Instantel UM6857_20191023115919.IDFW



Frequency (Hz)
Tran: + Vert: x Long: Ø

20



Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 1.000 pa.(L)/div Trigger = -----

Sensor Check

100 >

Subdrill: 2.0ft Blast Summary Data Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3628.0ft

Burden: 9.0ft

Number of holes: 63

Stemming: 7.0ft Hole angle: 0.0°

POSTŚ

open face

*X1 X2 X3 X4 *5 X6 X7 X8 X9 X10 X11 X12 X13 X14 *X15 X16 X17 X18 X19 *X20 X21 X22 X23 X24 *X25 X26 X27 X28 X29 X30 X31 64.3f 63.9f 64.1f 64.2f 64.1f 63.3f 61.9f 60.8f 59.6f 59.6f 59.7f 64.1f 64.2f 64.1f 64.2f 64.1f 64.2f 64.1f 64.0f 63.2f 60.7f 59.6f 57.2f 56.2f 59.8f 54.1f 53.2f 53.3f 57.0f 56.4f 55.3f 59.0f 57.2f 56.4f 55.3f 57.0f 59.0f 57.2f 56.2f 59.3f 57.2f 56.2f 57.2f 57.2f 57.2f 57.2f 57.2f 56.2f 57.2f 5

Subdrill: 2.0ft Blast Summary Data

Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3628.0ft

Burden: 9.0ft

Number of holes: 63

Stemming: 7.0ft Hole angle: 0.0°

open face

POSTŚ



Blast Summary Data

Spacing: 10.0ft

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 3628.0ft

Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 63

Hole angle: 0.0° Stemming: 7.0ft

85 Kg / Top Deck 75 Kg / Bottom Deck Load Sheet

POSTS

open face



Blast Summary Data Spacing: 10.0ft 1st row burden: 12.0ft

Burden: 9.0ft

Hole Diameter: 4.0in

Total drilled: 3684,3ft

Subdrill: 2.0ft

Number of holes: 64

Stemming: 7.0ft Hole angle: 0.0° POSTS

open face

9MID022 Design Fnl - 4" Blast Hole 12x10 9x10 268 266.5 and 250 + .6 SUB ELEV DRILLER NAME:

DRIUTO DEPTH OR SHALF + 2 FEET



10/1/2019 MID TO NORTH WALL DESIGN 9MID022 Design Fnl SHOTPlusTM Professional 5.7.4.4 Burlington Title/author Filename Location Mine

Scale 1:500

ORICA The Blasting Professional
page 1
1
1
1.5.
1.0

Blast Report

Quarry:	Burlington
P.O. #:	
Blast Date:	2019-10-31

Blast Number:	19-023
Orica Order #:	2550103
Blast Time:	10:56 AM

ORIGI	1 2143	· ···opo· ·		P.O. #:			Orica Order #:	255	50103		
ORICA The Blasting Professionals*	Nelso	n Aggregate		Blast Date:			Blast Time:		56 AM		
age 1 Blaste					1	Т		10 =00			
Blaste	er-in-charge:	Mike I	Derkinde	ren	(Print Name)		Tonnes Blasted:	19,709		7,580	Poto
Б.					7		otal tonnes per day:	19,709	-	NB60-18	Code
	ast Location:		per Middle		(Bench / Face)		Total Holes Loaded:		holes		
GPS (43.40370 °I	N Latitude	79.88137 Centre of Blast	°W Longitude		including:		Dead I		
		entre or biast		Certife of Blast			and:		Helper	Holes	
Wind fron	n the: E at	5 kph		T	6 to 10 %		Helper Hole Collar: # Rows Blasted:		ft avg		
wind from	n the: E at			Temperature:	6 to 10 °C			(Front Row	a.		
Clear:		Rain: X	Overcast	. X			Burden:	r e	ft avg		
Partly Cloudy:		Snow:	Inversion	·	18,000 ft		Spacing:		ft avg		
artiy Cloudy.		SHOW.	IIIVEISIOII	Celling	18,000 11		# Holes:		front ro	nw.	
- Drilling Int	formation -					_		(Back Row	1	, , ,	
Drilling IIII		le from Vertical		Non	ninal Bit Diamete	r.	Burden:		ft avg		
Primary Bit	diam: 101.6 mm		oles: 4				Spacing:		ft avg		
Secondary Bit			oles:	-	ft(" dia	<i>'</i>	# Holes:		back ro	OW	
Tertiary Bit			oles:		ft (" dia	′	Bench Height:		ft avg		
			0.00.	0.0	7	,	Sub-drill:		ft avg		-0
Bulk Explo	sives:	in (kg)	out (kg)	kg			Hole Denth		ft avg		aste
CENTRA GOLI		33,440	25.960			single hole)	- Stone	Decking -	_		8
		55,775		1,122		0	Front Row:		ft avg		1 / te
Packaged	Explosives:	cs shipped o	cs returned	kg			Back Row:		ft avg		dec
FORTEL PRO	-	2	(CO	# D I	41	per bla	ast	Loa
						doh		Stemming	-		Kg
						PF (Based	Front Row:		ft avg		tor
Boosters:		kg/u	ınit # use	d kg		(B	Back Row:		ft avg		Fac
PENTEX 12 (O	R EQUIVALENT)		0.34 4	13.9		<u>a</u>	Material used:	3/4" Clear			der
PENTEX DUO	(OR EQUIVALENT)		0.45 4	18.6		Theoretical	- Charg	ge Length -			Yield Powder Factor (kg Loaded / te Blastec
						eore	Front Row:	56.1	ft avg		10 10
	total expl	osives weight in	Blast (kg):	7,563		F	Back Row:	60.1	ft avg		, Fe
	Pkgd	Prod (50 kg) % o	of Total kg	0.7%			- Charg	ge Weight -			
Detonators	s:	case #'s	ms	# used			Front Row:	163.7	-		
UNITRONIC 60	0 15M			41			Back Row:	175.4			
UNITRONIC 60	0 25M			82			Max. per delay:		kg/dela		
							SD () Equation:		kg/dela	ay	
							Total kg Loaded:	7,563			
							Rock Density:	2.60	g/cc	= te/m ³	
Cord & Acc			U of M	# used	4 000 11-4-4			er Factor -			
HARNES	S WIRE DUPLEX (6 P	PACK) 400M	units	1	1.682 lb/yd ³ 1.247 lb/yd ³		Yield PF:		Ū	,	
			units		1.247 lb/yd 1.781 lb/yd		Front row:		_	(theoretic	,
Pasauraa Da	playmant:		units		1.781 lb/yd 1.514 lb/yd		Main Body:		-	(theoretic	
Resource De							"KPI" PF:	0.345	kg/te	(theoretic	cal)
# of Blasts toda	37			1	NOTES (ANY VARIA		,				
# of Blasters (th	,			1	Unitronics were used	Instead	of 25ms Excel MS in botton	m deck due to	an error	on Orica	a.
# of Helpers (th		Note Exception		2							
# of MMU's (this	s Blast)			1							
Services:	CHARGE			4.0							
BULK TRUCK		F-t DI 1		1.0							
BLASTER HOU		Enter Blaster hou		5.0							
HELPER HOUR		Enter total Helper		10.0							
SHOT LAYOUT		Enter # trips extra	a peyond 1	0.0							
ADVANCED BL	AST DESIGN	Enter hours		0.0							
BORETRACK		Enter hours		0.0							



Blast Report

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 2019-10-31

 Blast Number:
 19-023

 Orica Order #:
 2550103

 Blast Time:
 10:56 AM

page 2

Blast Co-ordinates	Enter ° N Lat.	Enter ° W Long.
Mid Blast	43.40370	79.88136
Front Row Corner	43.40345	79.88143
Back Row Corner	43.40395	79.88133
Average (Centre of Blast)	43.40370	79.88137

(N) Radians	(W) Radians
0.757537	1.394193
0.757533	1.394194
0.757542	1.394192
0.757537	1.394193

1st	Seismograph Co-ordina	tes	Enter ° N Lat.	Ente	r ° W Long.	
	1st Reading		43.40245		79.87814]
	2nd Reading]
	Average		43.40245		79.87814	
	Distance (1st Seis. From Ce	ntre of Blast)	296.0	m		_
	Post Blast Data:	ppV:	8.6	mm/s	Trigger set at:	Г
		frequency:	20.0	Hz	V/T/L:	Г

(N) Radians	(W) Radians
0.757516	1.394137
0.757516	1.394137

frequency: 20.0 Hz V/T/L: ? (Vertical, Transverse or Longitudinal)
air overpressure: 115.7 dB Trigger set at: 115 dB

2450 #2 Sideroad, Burlington, On

2400 #2 Oldcroad, Burlington, On

2nd	Seismograph Co-ordinates	Enter ° N Lat.	Ente	r ° W Long.
	1st Reading	43.40614		79.87455
	2nd Reading			
	Average	43.40614		79.87455
	Distance (2nd Seis. From Centre of Blast)	615.0	m	
	Post Blast Data: ppV	3.3	mm/s	Trigger set at:

(N) Radians	(W) Radians
0.757580	1.394074
0.757580	1 30/07/

 Post Blast Data:
 ppV:
 3.3 mm/s
 Trigger set at:
 2.0 mm/s

 frequency:
 28.0 Hz
 V/T/L:
 (Vertical, Transverse or Longitudinal)

 air overpressure:
 Set to not trigger
 dB
 Trigger set at:
 n/a

2582 #2 Sideroad, Burlington, On

3rd	Seismograph Co-ordinates	Enter ° N Lat.	Enter ° W Long.
	1st Reading	43.40466	79.88098
	2nd Reading		
	Average	43.40466	79.88098
	Distance (3rd Seis. From Centre of Blast)	111.8	m
	Post Blast Data: nnV·	36.2	mm/s Trigger set at-

(N) Radians	(W) Radians
0.757554	1.394186
0.757554	1.394186

Scaling Factor denotes the degree of Blast confinement.

The higher the SF, the more confined the Blast.

A Scaling Factor of 30 is commonly used in the Scaled Distance formula for Quarry Bench Blasting:

Enter a scaling Factor: 30 Quarry Bench Blasting - 2 Free Faces

$$W = \frac{D^2}{30^2}$$

 $= \frac{(111.8)^2}{30^2} \text{ kg}$

= <u>12,499</u> kg

Maximum Indicated Charge Weight per Delay = 14 kg

Orica

Blaster-in-charge:

Mike derkinderen

Signature required, indicating that Blast Report is Complete & Accurate.

jim bray



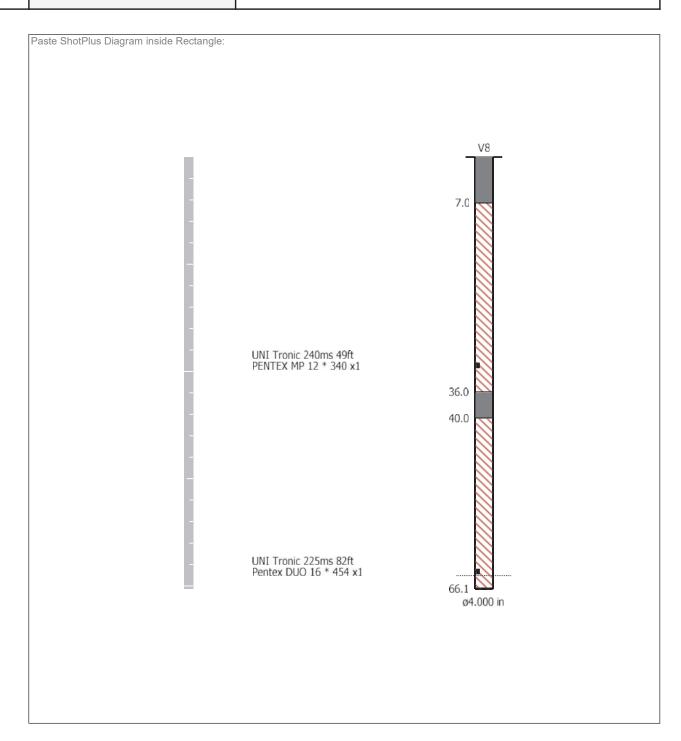
Blast Design

Nelson Aggregate

Quarry: Burlington
P.O. #:
Blast Date: 10/31/2019

Blast Number: Orica Order #: 19-023 2550103

page 2



Orica
Blaster-in-charge: Mike der Kinderen

Quarry Manager: Nich Heap

Signature required, indicating sign off on Blast Design.





Date/Time Vert at 10:56:06 October 30, 2019

Trigger Source Geo: 1.500 mm/s Range Geo: 254.0 mm/s **Record Time** 1.0 sec at 2048 sps

Job Number:

Notes

2450 #2 Road, Burlington, On Location:

Client: Nelson Aggregate Orica Canada Inc. User Name: General: Burlington

Extended Notes Sand Bagged

Microphone Linear Weighting **PSPL** 115.7 dB(L) at 0.821 sec

ZC Freq 6.0 Hz

Channel Test Passed (Freq = 20.5 Hz Amp = 612 mv)

	Tran	Vert	Long	
PPV	8.636	6.858	7.874	mm/s
ZC Freq	20	29	22	Hz
Time (Rel. to Trig)	0.202	0.268	0.310	sec
Peak Acceleration	0.159	0.159	0.186	g
Peak Displacement	0.102	0.037	0.048	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.4	7.2	Hz
Overswing Ratio	3.7	3.7	4.0	

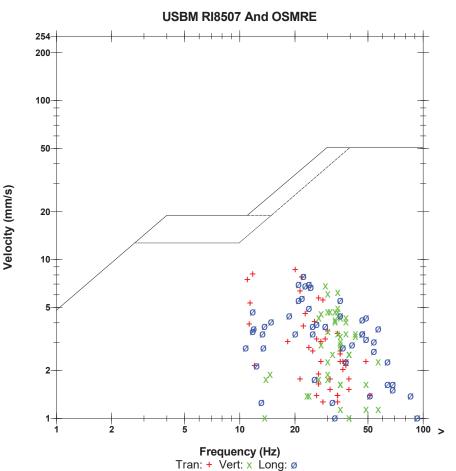
Peak Vector Sum 9.809 mm/s at 0.269 sec

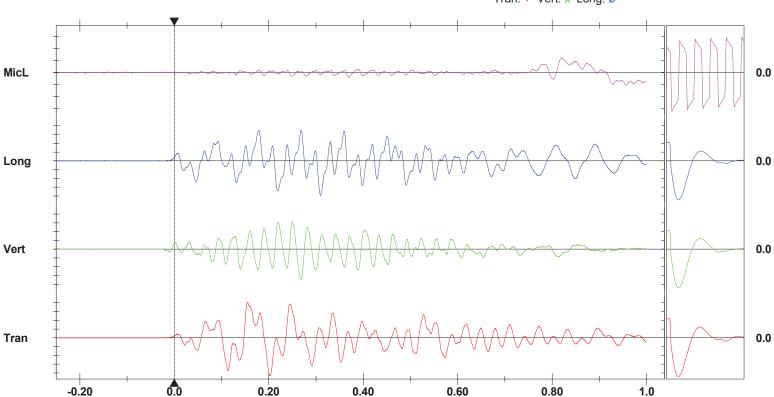
Serial Number BE12877 V 10.72-1.1 Minimate Blaster

Battery Level 6.1 Volts

Unit Calibration December 4, 2018 by Instantel

File Name _TEMP.EVT





Time Scale: 0.10 sec/div Amplitude Scale: Geo: 2.000 mm/s/div Mic: 10.000 pa.(L)/div Trigger = ▶



Velocity (mm/s)

File Name



Date/Time Long at 10:56:07 October 30, 2019

Trigger Source Geo: 1.500 mm/s Range Geo: 254.0 mm/s

Record Time 4.756 sec (Auto=4Sec) at 2048 sps

Operator/Setup: MIKE DERKNDEREN/Burlington 2582.MMB

Notes

2582 #2 Sideroad, Mount Nemo,On Location:

Client: Nelson Aggregate User Name: Orica Canada Inc.

General: Monitoring Vibration and Airblast

Extended Notes

Sand Bagged

N43.40614,W-79.87455

	Tran	Vert	Long	
PPV	3.090	2.743	3.302	mm/s
ZC Freq	31	29	28	Hz
Time (Rel. to Trig)	0.408	0.384	0.458	sec
Peak Acceleration	0.081	0.114	0.102	g
Peak Displacement	0.016	0.017	0.016	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.3	7.3	7.5	Hz
Overswing Ratio	3.5	3.4	3.4	

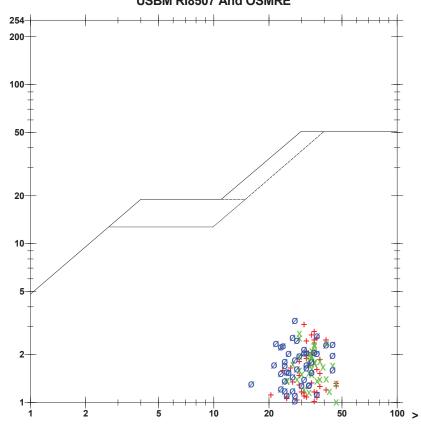
Peak Vector Sum 3.783 mm/s at 0.458 sec

Serial Number UM6857 V 10-89 Micromate ISEE **Battery Level**

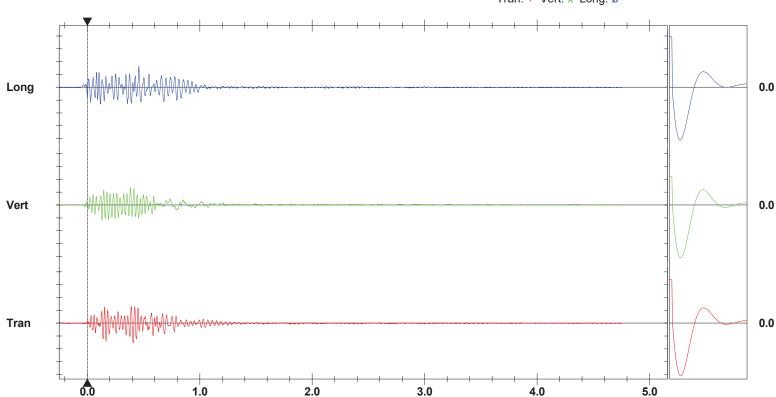
3.8 Volts **Unit Calibration**

January 15, 2019 by Instantel UM6857_20191030105607.IDFW





Frequency (Hz) Tran: + Vert: x Long: ø



Trigger = ▶

Time Scale: 0.20 sec/div Amplitude Scale: Geo: 2.000 mm/s/div





Date/Time Tran at 10:56:05 October 30, 2019

Trigger Source Geo: 10.000 mm/s Range Geo: 254.0 mm/s

Record Time 3.75 sec (Auto=3Sec) at 1024 sps

Notes

Location: Gas Line

Client: **Nelson Aggregates** User Name: Orica Canada General: 43.40466,-79.88098

Extended Notes

Sand Bagged at gas line

Microphone Linear Weighting

PSPL 130.5 dB(L) at 0.421 sec

ZC Freq 9.0 Hz

Channel Test Passed (Freq = 20.1 Hz Amp = 658 mv)

	Tran	Vert	Long	
PPV	32.51	33.27	36.19	mm/s
ZC Freq	8.8	28	26	Hz
Time (Rel. to Trig)	0.568	0.329	0.372	sec
Peak Acceleration	0.610	0.848	0.623	g
Peak Displacement	0.579	0.182	0.257	mm
Sensor Check	Passed	Passed	Passed	
Frequency	7.4	7.3	7.4	Hz
Overswing Ratio	3.8	3.9	4.3	

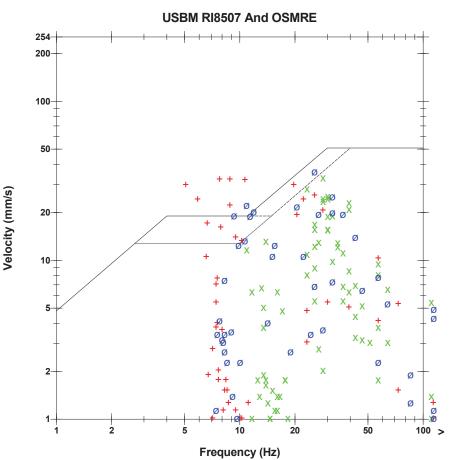
Peak Vector Sum 45.51 mm/s at 0.371 sec

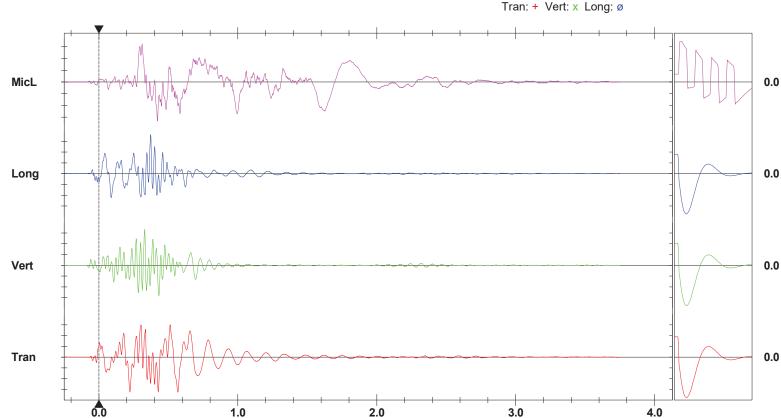
Serial Number BE19461 V 10.72-8.17 MiniMate Plus **Battery Level**

6.3 Volts

Unit Calibration August 31, 2018 by Instantel **File Name**

TEMP.EVT





Time Scale: 0.20 sec/div Amplitude Scale: Geo: 10.000 mm/s/div Mic: 20.00 pa.(L)/div Trigger = ▶

Stemming: 8.0ft Hole angle: 0.0° Number of holes: 41 Subdrill: 2.0ft Blast Summary Data 9MID023 Final **SHOTPlus Plan** Open Face Hole Diameter: 4.0in 290 275 Spacing: 10.0ft 260 245 1st row burden: 12.0ft Total drilled: 2774.7ft Burden: 9.0ft

250 + 0.6m Subdrill ILL TO DEPTH OR SHALE + 2 FEET 12 X 10, 9 X 10 Pattern 4" Blasthole DRILL .

Not to scale

Subdrill: 2.0ft Blast Summary Data **SHOTPlus Plan** Burden: 9.0ft

Spacing: 10.0ft 1st row burden: 12.0ft Total drilled: 2774.7ft

Hole Diameter: 4.0in

Number of holes: 41

Stemming: 8.0ft Hole angle: 0.0°

Open Face

B1 B2 B3 B4 B5 B6 B7 B8 B9 B10 B11 B12 B13 B14 B15 B16 B17 B18 B19 B20 69.1ft 65.7ft 65.7ft 67.7ft 68.4ft 68.6ft 69.6ft 69.9ft 70.5ft 70.5ft 70.0ft 69.5ft 68.4ft 66.5ft 65.0ft 63.8ft C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16 C17 C18 68.9ft 67.1ft 67.1ft 67.7ft 68.0ft 68.0ft 69.4ft 70.0ft 70.2ft 69.7ft 69.0ft 67.9ft 65.1ft 65.1ft 250 + 0.6m Subdrill DRILL TO DEPTH OR SHALE + 2 FEET 12 X 10, 9 X 10 Pattern 9MID023 Final 4" Blasthole

9

• A1 A2 A3 65.5ft • 63.8ft • 63.5ft



Blast Summary Data

Hole Diameter: 4.0in Spacing: 10.0ft

> 1st row burden: 12.0ft Total drilled: 2774.7ft

Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 41

Hole angle: 0.0° Stemming: 8.0ft

> Open Face 95Kg/ Delay Load Sheet

1M6

250 + 0.6m Subdrill DRILL TO DEPTH OR SHALE + 2 FEET 12 X 10, 9 X 10 Pattern 9MID023 Final 4" Blasthole



Blast Summary Data

Hole Diameter: 4.0in

1st row burden: 12.0ft Total drilled: 2774.6ft

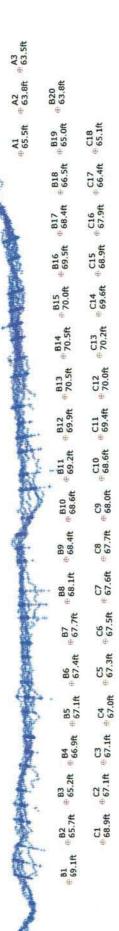
Burden: 9.0ft

Subdrill: 2.0ft

Number of holes: 41

Stemming: 8.0ft Hole angle: 0.0°

Open Face



12 X 10, 9 X 10 Pattern 250.0 + 0.6m Subdrill 9MID023 Final 4" Blasthole



DRILL TO DEPTH OR SHALE + 2 FEET

Appendix D



Robert J. Cyr, P. Eng.

Principal, 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)

Association of Professional Engineers, Geologists and Geophysicists of Alberta

Association of Professional Engineers and Geoscientists of New Brunswick

Association of Professional Engineers of Nova Scotia

Association of Professional Engineers and Geoscientists Manitoba

Professional Engineers and Geoscientists Newfoundland and Labrador

Northwest Territories and Nunavut Association of Professional Engineers (NAPEG)

International Society of Explosives Engineers (ISEE)

Ontario Stone Sand & Gravel Association (OSSGA)

Surface Blaster Ontario Licence 450109

SUMMARY OF EXPERIENCE

Over thirty five 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

2004

2001 – Present	-Principal, 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

Dringing | Evalutoch Engineering | to



Mitch Malcomson, P.Eng.

Consulting Engineer, Explotech Engineering Ltd.

EDUCATION

Bachelor of Engineering,
Civil Engineering with Concentration in Business Management,
Carleton 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)
Ontario Stone Sand and Gravel Association (OSSGA)

SUMMARY OF EXPERIENCE

A Consulting Engineer and Project Manager for Explotech Engineering Ltd., Mitch holds a Bachelor of Engineering degree from Carleton University in Civil Engineering with a Concentration in Business Management. Mitch has strong analytical, technical, business and leadership skills. As a Project Manager, Mitch is responsible for operational strategies, scheduling and contract procurement. As a Consulting Engineer, the technical responsibilities include detailed blast designs, blast investigations and reviews, implementation of vibration monitoring programs, development of monitoring equipment/ technologies and building assessments for construction and the drilling and blasting portions of mining, quarrying and construction projects across Canada.

PROFESSIONAL RECORD

2008 - Present - Consulting Engineer / Project Manager, Explotech Engineering Ltd.



Mark Morelli, B.Eng.

Explotech Engineering Ltd.

EDUCATION

Bachelor of Engineering, Civil Engineering, Carleton University

PROFESSIONAL AFFILIATIONS

International Society of Explosives Engineers (ISEE)

SUMMARY OF EXPERIENCE

A technician working for Explotech Engineering Ltd., Mark holds a Bachelor of Engineering degree in Civil Engineering and has strong technical, leadership, interpersonal, communication, and presentation skills. Recent focus on blast monitoring, data management, scheduling, job estimations, vibration analysis, damage complaint investigation and attenuation anlysis.

PROFESSIONAL RECORD

2006 – Present - Technician, Explotech Engineering Ltd.

2003 – 2004 - Labourer, Hydracorp Canada Ltd.

2002 – 2003 - Labourer, Quad Construction



Michael Tobin, B.A.Sc.

Explotech Engineering Ltd.

EDUCATION

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

PROFESSIONAL AFFILIATIONS

International Society of Explosives Engineers (ISEE)

SUMMARY OF EXPERIENCE

A technician working for Explotech Engineering Ltd., Michael holds a Bachelor of Applied Science degree from Queen's University in Geological Engineering. Michael has strong analytical, technical, and interpersonal skills. Recent projects have focused on blast monitoring, vibration analysis, job estimation, damage complaint investigation and equipment maintenance and repair.

PROFESSIONAL RECORD

2017 – Present - Technician, Explotech Engineering Ltd.

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.

Sensitive Receptor: Sensitive land use may include recreational uses which are

deemed by the municipality or provincial agency to be sensitive; and/or any building or associated amenity area (i.e. may be indoor or outdoor space) which is not directly associated with the industrial use, where humans or the

natural environment may be adversely affected by

emissions generated by the operation of a nearby industrial facility. For example, the building or amenity area may be associated with residences, senior citizen homes, schools,



day care facilities, hospitals, churches and other similar institutional uses, or campgrounds.

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



References

Building Research Establishment, (1990), "Damage to Structures From Ground-Borne Vibration", BRE Digest 353, Gaston, Watford, U.K.

Crum S. V., Siskind D. E., Pierce W. E., Radcliffe K. S., (1995) "Ground Vibrations and Airblasts Monitored in Swedesburg, Pennsylvania, From Blasting at McCoy Quarry", Contract Research Rept. By the United States Bureau of Mines for the Pennsylvania Department of Environmental Resources, 120 pp.

Dowding C.H., (1985), "Blast Vibration, Monitoring and Control", Prentice-Hall Canada Inc., 297 pp.

Dowding C.H., (1996), "Construction Vibrations", Prentice-Hall, Upper Saddle, N.J., USA, 610 pp.

Du Pont Company, (1980), "Blaster's Handbook" Wilmington, Delaware, United States of America

Fletcher L.R., D'Andrea D.V., (1986) "Control of Flyrock in Blasting", Proceedings of the Twelfth Annual Conference on Explosives and Blasting Technique, International Society of Explosives Engineers

Froedge D. T., (1983) "Blasting Effects on Water Wells", Proceedings of the Ninth Annual Conference on Explosives and Blasting Technique, International Society of Explosives Engineers

Kopp J.W., (1994) "Observation of Flyrock at Several Mines and Quarries", Proceedings of the Twentieth Annual Conference on Explosives and Blasting Technique, International Society of Explosives Engineers

Matheson G. M., Miller D. K., (1997) "Blasting Vibration Damage to Water Supply, Well Water Quality and Quantity", Proceedings of the Twenty-Third Conference on Explosives and Blasting Technique, International Society of Explosive Engineers

Moore A.J., Richards A.B., (2005), "Golden Pike Cut-Back Flyrock Control and Calibration of a Predictive Model", Terrock Consulting Engineers, Eltham, Victoria, Australia.



Nicholls H., Johnson C., Duvall W., (1970), "Blasting Vibrations and their Effects on Structures", United States Department of the Interior, Bureau of Mines, Bulletin 656

Oriard L.L., (1989) "The Scale of Effects in Evaluating Vibration Damage Potential" Fifteenth Conference on Explosives and Blasting Technique, International Society of Explosive Engineers

Oriard L.L., (2002) "Explosives Engineering, Construction Vibrations and Geology" International Society of Explosive Engineers, Clevland, Ohio, United States of America

Robertson D. A., Gould J. A., Straw J. A., Dayton M. A., (1980) "Survey of Blasting Effects on Ground Water Supplies in Appalachia", United States Department of the Interior, Bureau of Mines, Contract No. J-0285029

Rose R., Bowles B., Bender W. L., (1991) "Results of Blasting in Close Proximity to Water Wells at the Sleeper Mine", Proceedings of the Seventeenth Annual Conference on Explosives and Blasting Technique, International Society of Explosive Engineers

Roth J., (1979) "A Model for Determination of Flyrock Range as a Function of Shot Conditions", United States Department of the Interior, Bureau of Mines, Report OFR 77-81

Siskind D.E., Stagg M.S., Kopp J.W., Dowding C.H., (1980), "Structural Response and Damage Produced by Ground Vibration from Surface Mine Blasting", United States Bureau of Mines RI 8507.

White, T.J., Farnfield, R.A., Kelly, M., (1993), "The Effect of Low Level Blast Vibrations and the Environment on a Domestic Building", Proceedings of the Ninth Annual Symposium on Explosives and Blasting Research, International Society of Explosives Engineers.

Wright D.G., Hopky G. E., (1998) "Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters", Canadian Technical Report of Fisheries and Aquatic Sciences 2107

Appendix F

Golder Associates Ltd.

2390 Argentia Road Mississauga, Ontario, Canada L5N 5Z7 Telephone 905-567-4444 Fax 905-567-6561



REPORT ON

BLASTING IMPACT ASSESSMENT PROPOSED NELSON AGGREGATE NELSON QUARRY EXTENSION

Submitted to:

Nelson Aggregate Co. P.O. Box 1070 Burlington, Ont. L7R 4L8

DISTRIBUTION:

20 Copies - Nelson Aggregate Co. 2 Copies - Golder Associates Ltd.

April 2006

021-1238





EXECUTIVE SUMMARY

Blasting operations within the proposed extension of the Nelson quarry may be readily carried out in compliance with existing provincial environmental guideline limits with respect to ground and air vibrations. These effects are subject to recommended limits of 12.5 mm/s and 128 dBL respectively, as established by the Ontario Ministry of the Environment and outlined in Noise Pollution Control (NPC) publication 119 of the Model Municipal Noise Control By-Law, for operations where monitoring of these effects is carried out as a matter of routine.

Ground and air vibration attenuation characteristics were monitored and assessed from a number of routine production blasts within the existing Nelson quarry. The results indicate that the majority of the proposed extension may be excavated using the blast parameters currently being used in the existing quarry. These would include reducing the borehole diameter, reducing the bench height and reducing the explosive weight per delay period. The Nelson quarry would continue monitoring all blasts during extraction within the proposed extension area. The blasting operations within the proposed extension would have no impact on the integrity of adjacent water wells.

By ensuring that the ground and air vibration levels produced during blasting operations at the Nelson quarry continue to remain within the recommended provincial guideline limits, there would not be any noticeable cumulative effect on adjacent structures associated with the blasting operations within the proposed extension.

TABLE OF CONTENTS

- ii -

SECT	<u>ION</u>		<u>PAGE</u>		
EXE	CUTIVE	E SUMMARY	I		
TABL	E OF	CONTENTS			
1.0	INTR	RODUCTION	1		
2.0	EXISTING CONDITIONS				
	2.1	Site Description			
	2.2	Quarry Blasting Operations			
3.0	PRO	POSED EXTRACTION OF EXTENSION AREA	3		
4.0	IMPACT IDENTIFICATION				
5.0	QUA	QUARRY BLAST MONITORING			
	5.1	Attenuation Characteristics	5		
		5.1.1 Ground Vibrations	5		
		5.1.2 Air Vibrations	6		
6.0	IMPACT ASSESSMENT				
	6.1	Compliance with NPC 119			
	6.2	Repeated Vibration Effects on Structures	8		
	6.3	Effects on Bedrock and Water Wells			
7.0		ICLUSIONS			
		CES			
PUBI		ION NPC-119			
	Blast	ting	1		
		Scope 1			
		Technical Definitions			
		Measurement Procedures			
		Concussion - Cautionary Limit			
		Concussion – Peak Pressure Level Limit			
		Vibration – Cautionary Limit			
		Vibration – Peak Particle Velocity Limit	1		

LIST OF TABLES

Table 1	Existing Blast Details for Nelson Quarry Company Quarry
Table 2	Maximum Explosive Loads vs Distance for 12.5 mm/s and 128 dBL
Table 3	Strain Levels Induced by Household Activities, Environmental Changes and
	Blasting

LIST OF FIGURES

Figure 1 Key Location Plan Nelson Quarry
Figure 2 Proposed Nelson Quarry Extension Area
Figure 3 Description of Blasting Terms
Figure 4 Proposed Excavation Sequence of Nelson Quarry Extension Area
Figure 5 Nelson Quarry Ground Vibration Attenuation Curve
Figure 6 Nelson Quarry Air Vibration Attenuation Curve

LIST OF APPENDICES

Appendix A Publication NPC 119

Appendix B New Residence Receptor Location

1.0 INTRODUCTION

Golder Associates was retained by Nelson Aggregate Co. to carry out an impact assessment of the environmental effects from future blasting operations within the proposed extension of the existing licensed area of the Nelson Quarry Company quarry. The proposed extension would be located immediately south of No. 2 Sideroad on Part Lots 17 and 18, Concession 2 in the City of Burlington. The impact assessment specifically addresses whether the applicable Ontario Ministry of Environment guidelines with respect to ground and air vibration effects could be met at the residential properties closest to the proposed extension.

The investigation included monitoring a number of regularly scheduled production blasts at various receptor points around the blast site to assess site-specific ground and air vibration decay characteristics.

This report addresses the following topics:

- reviews existing provincial and federal guidelines for the assessment of environmental impacts from blasting,
- provides recommendations for the continued control of ground and air vibration effects,
- evaluates the potential impact of the blasting operations on bedrock strata and adjacent water wells,
- evaluates the long term impact of the blasting operations on surrounding structures.

2.0 EXISTING CONDITIONS

2.1 Site Description

The existing licensed Nelson Quarry Co. quarry (Nelson) is situated immediately north of No. 2 Sideroad and south of Colling Road between Guelph Line and Cedar Springs Road in the City of Burlington, Ontario in the Region of Halton (see Figure 1). The proposed extension area would encompass an area of approximately 82.3 Hectares immediately south of the existing quarry and No. 2 Sideroad, as seen in Figure 2.

As shown in Figures 2 and 4, the closest residential properties to the proposed extension consist of those residences to the east and west on the south side of No. 2 Sideroad. Compared to the existing quarry location, the proposed extension is relatively remote from the existing neighbouring properties. The closest residential receptors have been identified as the residences along No. 2 Sideroad (see Appendix B). The topography of the area generally consists of gently rolling hills.

2.2 Quarry Blasting Operations

The Nelson quarry currently operates a single bench which varies in height from approximately 19 to 26 m. Typical blast design details for the existing quarry are given in Table 1 while common quarry blasting terms and procedures are illustrated in Figure 3.

All blasting at the Nelson quarry is monitored for ground and air vibration effects. Monitoring is routinely being carried out at three locations along the south side of No. 2 Sideroad and occasionally within Mount Nemo Court, east of Guelph Line.

Blasting procedures within the proposed extension would be carried out in a manner similar to those currently being carried out for the existing Nelson quarry, as shown in Table 1.

3.0 PROPOSED EXTRACTION OF EXTENSION AREA

The proposed sequence of extraction for the extension is illustrated in Figure 4. Extraction within the proposed extension area would commence with the crossing of No. 2 Sideroad west of the existing office. Extraction of Phase 1 would see an approximately 100 m wide working face advanced in a westerly direction along the north side of the proposed extension, as shown in Figure 4. Phases 2 and 3 would see the entire west side of the extension extracted in a southerly direction before proceeding east along the south boundary.

Extraction of Phase 4 would be carried out in a northerly direction which would complete extraction of the west half of the proposed extension. Phases 5a and 5b would be carried out in an easterly direction in the southeast corner of the extension while the remainder of the property would be extracted as Phase 6 in a northerly direction, as seen in Figure 4.

4.0 IMPACT IDENTIFICATION

The environmental effects most often associated with blasting operations are ground vibrations and air concussion.

The intensity of ground vibrations, which is an elastic effect measured in units of peak particle velocity, is defined as the speed of excitation of particles within the ground resulting from vibratory motion. For the purposes of this report, peak particle velocity is measured in mm/s.

While ground vibration is an elastic effect, one must also consider the plastic or non-elastic effect produced locally by each detonation when assessing the effects on the bedrock strata and local water wells. The detonation of an explosive produces a very rapid and dramatic increase in volume due to the conversion of the explosive from a solid to a gaseous state. When this occurs within the confines of a borehole it has the following effect:

- The bedrock in the area immediately adjacent to the explosive product is crushed.
- As the energy from the detonation radiates outward from the borehole, the bedrock between the borehole and quarried face becomes fragmented and is displaced while the bedrock behind the borehole is fractured.
- Energy not used in the fracturing and displacement of the bedrock dissipates in the form
 of ground vibrations, sound and airblast. This energy attenuates rapidly from the blast
 site due to geometric spreading and natural damping.

Air concussion, or air vibrations, is a pressure wave traveling through the air produced by the direct action of the explosive on air or the indirect action of a confining material subjected to explosive loading. Air vibrations from surface blasting operations consist primarily of acoustic energy below 20 Hz, where human hearing is less acute (Siskind et al., 1980), while noise is that portion of the spectrum of the air vibration lying within the audible range from 20 to 2000 Hz. It is the lower frequency component (below 20 Hz) of air concussion, that which is less audible, that is of interest as it is often the source of secondary rattling and shaking within a structure. For the purposes of this report, air vibration is measured as decibels in the Linear or Unweighted mode (dBL). This differs from noise (above 20 Hz) which is measured in dBA.

Both ground and air vibration effects produced at private structures adjacent to surface or underground mining operations are subject to guidelines contained in Noise Pollution Control (NPC) publication 119 of the Model Municipal Noise Control By-Law, dated August, 1978, published by the Ontario Ministry of Environment. Under conditions where monitoring of the blasting operations is routinely carried out, as it is at the Nelson Quarry, the recommended ground and air vibration limitations at the nearest private structure would be 12.5 mm/s and 128 dBL respectively. A copy of Publication NPC 119 is reproduced in Appendix A.

5.0 QUARRY BLAST MONITORING

As part of this study, peak ground and air vibration levels were monitored during several typical quarry production blasts in the existing quarry at progressively increasing distances from the blast site. The blasts occurred both on the south and east faces of the quarry. Instrumentation consisted of Instantel DS-077 Minimates, Minimate Pluses and DS-477 Blastmates. These instruments measure and record ground vibration velocities in each of three orthogonal directions, as well as simultaneously recording air vibration levels. Instrumentation was generally set up in a line at distances ranging from about 100 to 600 m from the blast site. Specific instrument and blast locations were established using a Garmin GPS electronic navigation aid (NAVAID) to determine accurate distances between the blast and receptors.

5.1 Attenuation Characteristics

The rate at which ground vibrations attenuate or decrease with increased distance from a blast source depends on a variety of conditions, including the type and condition of the bedrock being blasted, depth and composition of the earth covering deposits (soil), and the general topography. Air vibration effects are less affected by these factors, being more influenced by the prevailing weather conditions at the time of the blast.

The following relationships were established from the blast monitoring results.

5.1.1 Ground Vibrations

The ground vibration attenuation characteristics established for the Nelson Quarry is presented in Figure 5 as a plot of the peak particle velocity against the Scaled Distance. Scaled Distance is defined as:

Scaled Distance (SD) = D/\sqrt{W}

where D = distance (m) between the blast and receptor

W = maximum weight of explosive (kg) detonated per delay period

As seen in Figure 5 the collection of points defining the rate of decay for the ground vibrations exhibits a degree of scatter that is inherent in all Scaled Distance plots. Factors responsible for these variations include the geologic conditions of the bedrock (type and structure), different wave types, errors in blast initiation timing, differences between types of explosives, degree of confinement, and differences in blast efficiencies.

The equation for the 95% regression line developed in Figure 5 can be expressed as:

```
PPV = 896(SD)^{-1.32}

where PPV = Peak Particle Velocity (mm/s)

SD = Scaled Distance (m/(kg^{0.5}))
```

The calculated Scaled Distance for a peak ground vibration level of 12.5 mm/s would equal 25.5 m/(kg^{0.5}). The purpose of this equation is not so much to predict what a given vibration level would be at a particular location for a given blast, but to indicate the probability that the peak vibration would fall below the level indicated by the equation for a given distance and maximum explosive weight. The equation is therefore a useful blast design tool in establishing maximum explosive charge weights per delay for various distances from a blast site for a given maximum ground vibration level.

5.1.2 Air Vibrations

Cube root scaling was used in establishing the air vibration decay characteristics as given in the following relationship:

Scaled Distance (SD) = $D/\sqrt[3]{W}$, where D and W are defined as previously described.

Figure 6 shows the Scaled Distance air vibration plot, which exhibits considerably more scatter and has a typically poorer correlation than that seen with the ground vibration results. This is primarily due to variable weather conditions during each blast, which are entirely independent of the blasting operations. Other factors influencing air vibration distribution from a blast include the length of collar and type of stemming material used, differences in explosive types and variations in burden distance.

The 95% regression curve given in Figure 6 can be expressed as:

```
APL = 181(SD)^{-0.0867}
where SD = as defined above
APL = air pressure level (dBL)
```

The calculated Scaled Distance for a peak air vibration level of 128 dBL would equal 53.0 $m/(kg^{0.33})$. The variability in the plot suggests that it is less reliable as a tool for guiding blast design.

Site specific Scaled Distance plots are commonly used as a blast design tool since peak vibration levels can be reasonably predicted at specified distances from a blast site. Based on the 95%

regression equations given in Figures 5 and 6, Table 2 shows the maximum suggested explosive loads for various distances from the blast site based on the provincial guideline limits of 12.5 mm/s and 128 dBL discussed previously. It can be seen that the ground vibration limit of 12.5 mm/s becomes the more restrictive guideline when determining maximum explosive loads beyond a distance of about 225 m for the quarry's blasting operations.

6.0 IMPACT ASSESSMENT

6.1 Compliance with NPC 119

It is evident from the regression equations discussed in Section 5 that the distance between the blast and the receptor and the amount of explosive detonated per delay period are the principal parameters in controlling ground and air vibration effects. The maximum explosive loads given in Table 2 for limiting peak ground and air vibration levels to 12.5 mm/s and 128 dBL respectively, indicate that the provincial guidelines may be complied with for all blasting beyond a distance of about 200 m from adjacent private residential properties. This represents a majority of the proposed extension and is based on a maximum explosive weight per delay of about 60 kg. When blasting approaches to within about 200 m of adjacent private residences, it may become necessary to reduce the maximum explosive weight detonated per delay period within the blast. Any one or combination of the following operations would achieve this:

- 1. Reducing the borehole diameter with a corresponding reduction in the drill pattern.
- 2. Introduce additional decked charges within each borehole, as illustrated on Figure 3.
- 3. Reduce the borehole length (depth) by reducing the bench height.

For example, a reduction in the borehole diameter from 127 mm to 76 mm would effectively reduce the explosive column weight per hole by about 65%. Decking the explosive column could further reduce the explosive column weight by an additional 50%. Additional decking and reductions in bench heights, as identified above, could achieve further reductions in maximum explosive weights.

As it is the intention of the Nelson quarry to continue monitoring all blasting operations, the attenuation curves discussed previously would be used in conjunction with the monitoring data collected at adjacent properties to dictate when changes to the blast procedure become necessary within the proposed extension. Although a reduction in the maximum instantaneous explosive load is anticipated as blasting approaches the residences to the east and west, the ground and air vibration guideline limits contained within NPC 119 would continue to be maintained.

6.2 Repeated Vibration Effects on Structures

Blast vibrations characteristically produce temporary transient strains within the various materials that makeup a residential structure. These strains would typically have durations of no more than one or two seconds for each blast as the vibration passed the structure. In additional to these temporary strains, Table 3 shows the strain levels produced in a household by changes in temperature and humidity (environmental changes), as well as those produced by regular household activities (Dowding, 1985), which occur on a recurring and often frequent basis. These strain levels are compared to equivalent levels of ground vibration produced from blasting

operations. It is evident from Table 3 that routine household activities and environmental changes can at times produce strains within a structure that are well in excess of those produced by blasting.

Several studies have also been carried out to look at the long-term effects of repeated blasting on structures (Stagg et al, 1984, Siskind et al, 1980). These studies concluded that repeated blasting over several decades, producing peak vibration levels well in excess of the provincial guideline limit, were required to cause cosmetic threshold cracking to occur. By ensuring that blasting continues to remain within the provincial guideline limits, there would not be any noticeable cumulative effect associated with the blasting operations within the extension area.

6.3 Effects on Bedrock and Water Wells

As discussed previously, under typical blasting conditions stresses introduced into the bedrock by the explosive detonation and the accompanying gas pressures create and extend fractures within the bedrock around each borehole. Fracture development is usually limited to the equivalent distance of about 20 times the borehole diameter. In the case of the blast procedures expected for the proposed extension, this would equate to about two to three metres for a 114 mm diameter hole. The gas pressures within the hole may extend micro-cracks or existing natural discontinuities within the bedrock, such as joints or bedding planes, beyond this distance.

Studies on crack development within bedrock from blast detonations (Keil et al., 1977) indicate that peak ground vibration levels of 300 to 600 mm/s are required to create micro-cracks or open existing discontinuities. Our own experience within the limestone of Southern Ontario indicates that such values would not be anticipated beyond a distance of about 10 to 20 m from the blast site, depending on such parameters as drill hole diameter and the type of explosive product. It is evident therefore that the creation or extension of fractures within the bedrock would remain confined to an area immediately around the blast site.

Several studies have been carried out to investigate the effects of blasting on ground water wells (Froedge, 1983). These studies have concluded that:

- When blast induced ground vibrations are less than about 25 mm/s maximum resultant particle velocity, the response of the well is limited to a slight temporary variation in water level on the order of 3 to 6 cm either up or down. The specific capacity of the water well is unchanged based on drawdown tests.
- Vibration measurements made at the surface and at the bottom of the observation wells indicate the vibration levels are always lower at the bottom of the well.
- 3. All of the data collected indicates that a ground vibration limit of 50 mm/s peak particle velocity is adequate to protect the wells from any significant damage. There is a possibility that temporary turbidity may be caused at lower levels periodically, although not at any constant threshold level.

The research consistently indicates that blast vibrations below 25 mm/s should have no adverse effects on nearby wells. As the maximum provincial guideline vibration limitation at the nearest residence is only half of this value, at 12.5 mm/s, the ground vibrations produced from the quarry's blasting operations within the proposed extension area would have no effect on the integrity of neighbouring water wells.

7.0 CONCLUSIONS

Based on the foregoing considerations, it is our opinion that blasting operations may be readily performed within the limits of the proposed extension of Nelson Quarry Company quarry in compliance with the current quarry blasting guidelines published by the Ministry of Environment. All blasting and blast monitoring would occur in accordance with the Aggregate Resources Act prescribed conditions in order to ensure compliance with the provincial guidelines.

GOLDER ASSOCIATES LTD.

Marcus V/van Bers, P. Eng.

Associate

MVVB/AC/ms/co

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REFERENCES

Dowding, C. H., Blast Vibration Monitoring and Control, 1985.

Froedge, D. T., *Blasting Effects on Water Wells*, Proc. Ninth Conf. on Explosives and Blasting Technique, Int. Soc. of Explosives Engineers, 1983.

Keil, L. D., Burgess, A. S., Nielson, N. M., Koropatrick, A., *Blast Vibration Monitoring of Rock Excavation*, Canadian Geotechnical Journal, Volume 14, 1977.

Ministry of Environment, Model Municipal Noise Control By-Law, Final Report, August, 1978.

Siskind, D. E., Stagg, M. S., Kopp, J. W., Dowding, C. H., Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting, U.S.B.M. Report RI8507, 1980.

Stagg, M. S., Siskind, D. E., Stevens, M. G., Dowding, C. H., *Effects of Repeated Blasting on a Wood-Frame House*, U.S.B.M. Report RI8896, 1984.

TABLES

TABLE 1

Existing Blast Details for Nelson Quarry Company

PARAMETER	NELSON QUARRY	
Bench (face) height (m)	19 - 26	
Drill hole pattern (m)	2.4 x 2.4 – 4.3 x 4.3	
Drill hole diameter (mm)	76 – 114	
Sub-drill depth (m)	0.6	
Collar length (m)	1.7 – 3.0	
Holes per blast	7 – 40	
Explosive product(s) used	Emulsion/ANFO blend	
Initiation system	Electric, Electronic	
Delay timing (ms)	25ms (electric), 13ms (electronic)	
Maximum explosive weight per delay period (kg)	30 – 279	

Note: See Figure 3 for a description of blasting terms.

TABLE 2

Maximum Explosive Loads vs Distance for 12.5 mm/s and 128 dBL

Distance (m)	PPV = 12.5 mm/s $SD = 25.5 \text{ kg/m}^{0.5}$	INL = 128 dBL SD = 53.0 kg/m $^{0.33}$
100	15	7
150	35	23
200	61	54
250	96	105
300	138	181
400	246	429
500	384	838
600	553	1449

Note: See Section 5 of accompanying report.

TABLE 3

Strain Levels Induced by Household Activities, Environmental Changes and Blasting

Loading Phenomena	Site ^a	Microstrain Induced by Phenomena (µin.in.)	Corresponding Blast Vibration Level ^b (mm/s)
Daily environmental	K_1	149	30.0
changes	K ₂	385	76.0
Household activities:			
1. Walking	S_2	9.1	0.8
2. Heel drops	S_2	16.0	0.8
3. Jumping	S_2	37.3	7.1
4. Door slams	S_1	48.8	12.7
5. Pounding nails	S_{12}	88.7	22.4

 $^{^{}a}\,K_{1}$ and K_{2} were placed across a taped joint between two sheets of gypsum wallboard.

Source: Dowding (1985)

_bBlast equivalent based on envelope line of strain vs ground vibration.

FIGURES

KEY LOCATION PLAN NELSON QUARRY

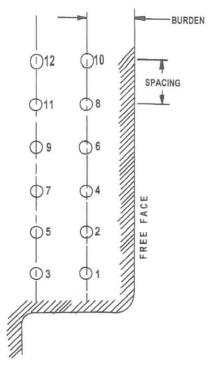
FIGURE '

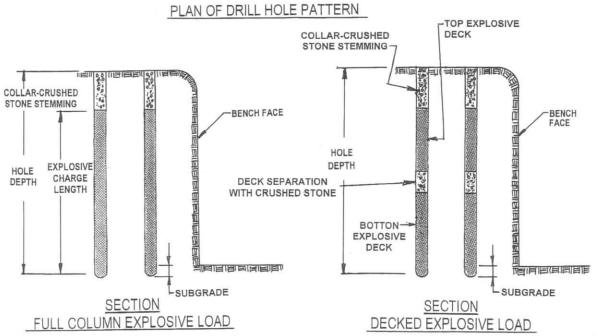


DESCRIPTION OF BLASTING TERMS

FIGURE 3

NUMBERS SHOW SHORT PERIOD DELAY	EXAMPLE OF FIRING TIMES (MILLISECONDS)
PERIOD 1	25
PERIOD 2	50
PERIOD 3	75
PERIOD 4	100
PERIOD 5	125



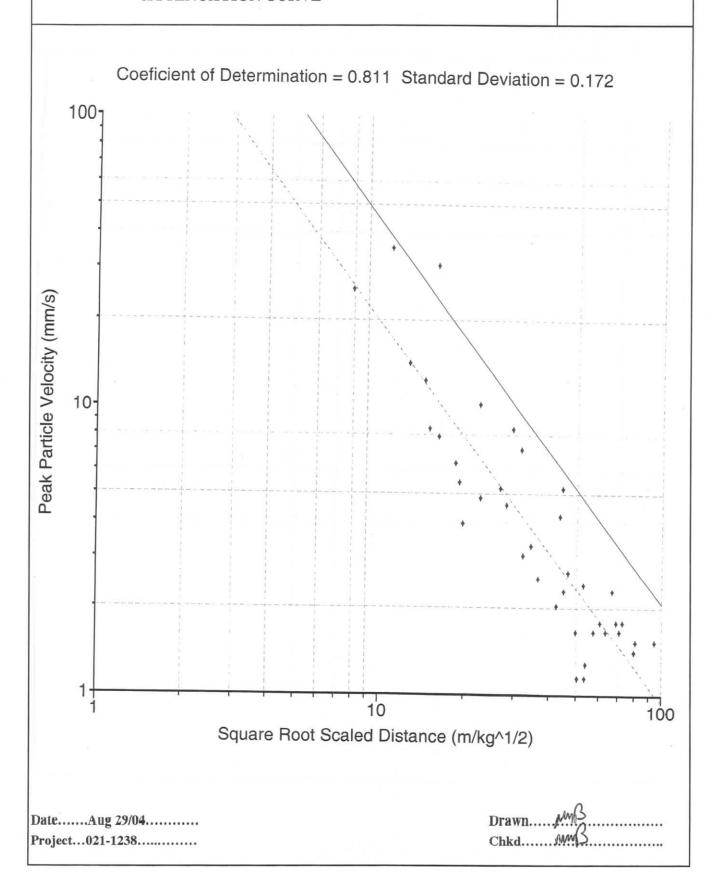


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Project: 021-1238

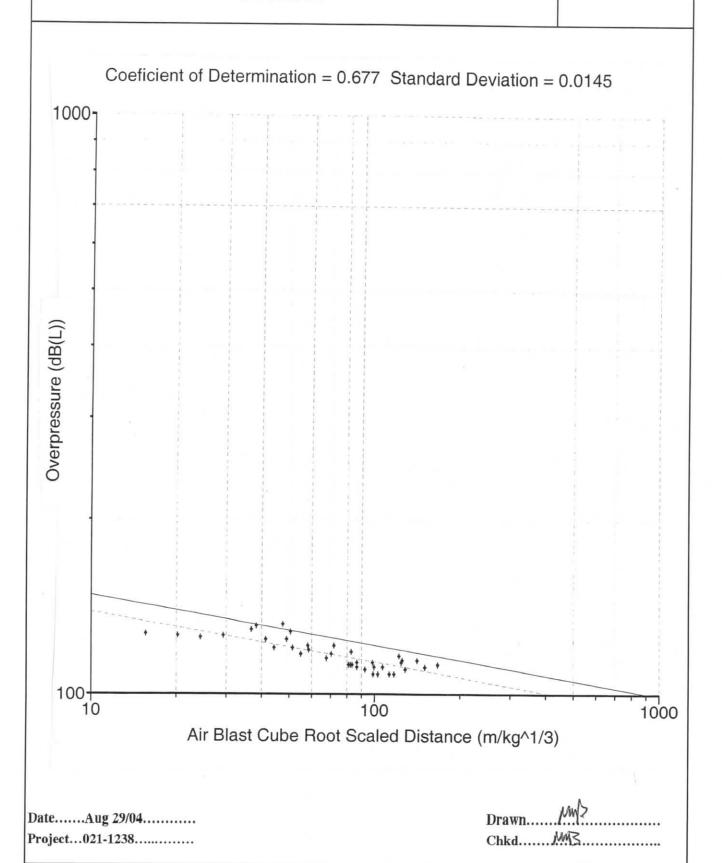
Golder Associates

Drawn: RJ



NELSON QUARRY AIR VIBRATION ATTENUATION CURVE

FIGURE



APPENDIX A
PUBLICATION NPC 119

PUBLICATION NPC-119

Blasting

Scope

This Publication refers to limits on sound (concussion) and vibration due to blasting operations.

Technical Definitions

The technical terms used in this Publication are defined in Publication NPC-101 – Technical Definitions.

Measurement Procedures

All measurements of peak pressure level and vibration velocity shall be made in accordance with the "Procedure for Measurement of Sound and Vibration due to Blasting Operations" set out in Publication NPC-103 – Procedures, section 5.

Concussion - Cautionary Limit

Subject to section 5 the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 120 dB.

Concussion – Peak Pressure Level Limit

If the person in charge of a blasting operation carries out routine monitoring of the peak pressure level, the peak pressure level limit for concussion resulting from blasting operations in a mine or quarry is 128 dB.

Vibration – Cautionary Limit

Subject to section 7, the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.00 cm/s.

Vibration – Peak Particle Velocity Limit

If the person in charge of a blasting operation carries out routine monitoring of the vibration the peak particle velocity limit for vibration resulting from blasting operations in a mine or quarry is 1.25 cm/s.

APPENDIX B NEW RESIDENCE RECEPTOR LOCATION

Golder Associates Ltd.

2390 Argentia Road Mississauga, Ontario, Canada L5N 5Z7 Telephone 905-567-4444 Fax 905-567-6561



December 13, 2004

021-1238

Nelson Aggregate Co. P.O. Box 1070 Burlington, Ontario L7R 4L8

Attention: Mr. Tom Palko

Property Manager

RE: BLASTING IMPACT ASSESSMENT PROPOSED NELSON AGGREGATE NELSON QUARRY EXTENSION NEW RESIDENCE RECEPTOR LOCATION

Dear Mr. Palko:

Further to our report entitled "Blasting Impact Assessment Proposed Nelson Aggregate Nelson Quarry Extension" dated September, 2004, it is our understanding that the closest residential receptor to the proposed Nelson Aggregate Nelson quarry extension has now been identified as the residence at 2416 No. 2 Sideroad, located in the northeast corner of the proposed extraction area. The residence and ancillary buildings at 2416 No. 2 Sideroad are located a minimum of 290 m from the Phase 1 extraction area and 370 m from the Phase 5B extraction area.

As stated in Section 6.0 Impact Assessment of the report identified above, the recommended Ontario provincial ground and air vibration guideline limits of 12.5 mm/s and 128 dBL respectively, may be complied with for all blasting beyond a distance of about 200 m. This indicates that the extraction of Phases 1 through 5B and part of Phase 6 may be carried out without any changes to the quarry's existing blasting procedures.





It is our opinion that blasting operations may be carried out within the proposed extension area in compliance with the current quarry blasting guidelines while the residence at 2416 No. 2 Sideroad is occupied. If you have any additional questions please do not hesitate to contact me.

Yours truly,

GOLDER ASSOCIATES LTD.

Marcus V. van Bers, P. Eng.
Associate

MVB/co

cc: Mr. Brian Zeman, MHBC Planning

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