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March 3, 2021

Mr. John Castro
Garden Communities (Hagersville) Ltd.
125 Villarboit Crescent
Vaughan, ON L4K 4K2

Dear Mr. Castro:

LAND USE IMPACT ASSESSMENT - ADDENDUM, GARDEN COMMUNITIES (HAGERSVILLE) LTD.

Garden Communities (Hagersville) Ltd. (GC(H)L) owns two abutting parcels of land in Hagersville, Ontario within Haldimand County. The parcels are illustrated on Figure 1 and referred to as:

a) Parcel A:

Parcel A consists of Part Lot 30, Range East of Plank Road and Part of Lot 26, Registrar's Compiled Plan 73, Haldimand County. For this Parcel, GC(H)L has approval for a Draft Plan of Subdivision for Phase 1 with the balance of the lands (Phase 2 and Phase 3) awaiting future approvals for further residential development.

b) Parcel B:

Parcel B consists of two separate parts; Part Lot 29-30 Range East Of Plank Road Oneida, Pt 1 18R-5366 and, Part Lot 30 Range East Of Plank Road, Oneida Part 1 18R-556; Haldimand County. For these lands, they are mostly within the Urban Boundary of Hagersville and all the lands are zoned Agriculture.

GC(H)L retained IBI Group in 2018 to assist with a review of potential land use impacts (i.e., blasting, noise and air quality) from the abutting Lafarge Quarry(s) and to determine if developing the subject parcels would be consistent with the Provincial Policy Statement. The report prepared by IBI Group, entitled "Land Use Impact Assessment of Garden Communities (Hagersville) Ltd. Draft Plan of Subdivision and Lafarge Hagersville Quarry", dated November 2018 is attached as Appendix A. The November 2018 report generally concluded:

- Development can occur in certain portions of Parcels A and B and be consistent with the Provincial Policy Statement;
- Portions of Parcels A and B, between 300 metres and 100 metres of the quarry blasting limit could be developed assuming some mitigation measures (e.g., modified blasting program and berms); and
- Development cannot occur within 100 metres of the quarry blasting limit.

GC(H)L is currently proposing to develop Parcel B with a residential subdivision and has retained IBI Group to review the previously prepared study together with the Draft Plan of Subdivision for Parcel B in order to provide an addendum to the November 2018 report.

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Figure 1 Site Location



FILE: J:\115076_Hagersville\5.9 Drawings\5.9p\layouts\FIGURES\FIGURES.dwg LAYOUT: SITELOCATION
LAST SAVED BY: Jacqueline.savoie, Friday, April 27, 2018 10:54:35 AM PLOTTED BY: Jacqueline Savoie Wednesday, October 10, 2018 11:57:02 AM

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1.0 Existing Conditions

Parcel B is located in the southeast quadrant of Hagersville and abuts Parcel A to the southeast and totals +/-46.8 hectares. The entire parcel has frontage onto County Road 20 (King Street East) that extends +/-760 metres. The lands are used for agriculture (cash crops) and the one sub-parcel contains a house, two barns and other out-buildings while the other sub-parcel contains a single detached house.

2.0 Surrounding Land Uses

To the south, across County Road 20 (King Street East), is a string of 23 single detached residential homes that extends for +/-580 metres with common frontage with Parcel B. To the east is a hydro-electric transmission corridor consisting of four large hydro pylon's that originate at the former Nanticoke Generating Station. To the north of the site, with a common boundary of +/-462 metres is the existing and active Lafarge – Hagersville Quarry, referenced by the Ministry of Natural Resources and Forestry (MNR/F) as Licence No. 4443 totalling 84.73 hectares with an annual maximum tonnage limit of 862,000 tonnes. These licensed lands occupy lands southeast of the former rail line. In addition, to the northwest of the former rail line is a separate licensed quarry which is operated in conjunction with Licence 4443 and is referred to as Licence 607801 and totals 9.11 hectares, operating with the same annual maximum tonnage limit. To the west is Parcel A.

3.0 Quarrying Activities

As part of the Lafarge Quarry (Licence 4443), previous approval agencies (MNR/F/MECP) established a blasting buffer (refer to Appendix G of the November 2018 report with regard to reduced copies of the Lafarge Hagersville Quarry Site Plans-Licence 4443). It is our understanding that this limit was intended to reinforce Provincial Policy Statement (PPS) 2.5.2.4 where:

“Mineral Aggregate operations shall be protected from development and activities that would preclude or hinder their expansion or continued use of which would be incompatible for reasons of public health, public safety or environmental impact.”

The basis of the PPS policy is focused on providing security for the aggregate producer and to ensure that there is long-term protection for the ongoing operation of an active pit or quarry.

However, the converse is also true inasmuch that the Policy can be of assistance to help define setback limits for proposed sensitive receivers. Site specifically, this includes the GC(H)L lands and the pending residential development (Parcel B).

The limit of blasting, approximately 202 feet (61.6 metres) from the licensed boundary on the Lafarge lands, were agreed upon and surveyed in 1991.

For the Hagersville Quarry, the Site Plans specify that:

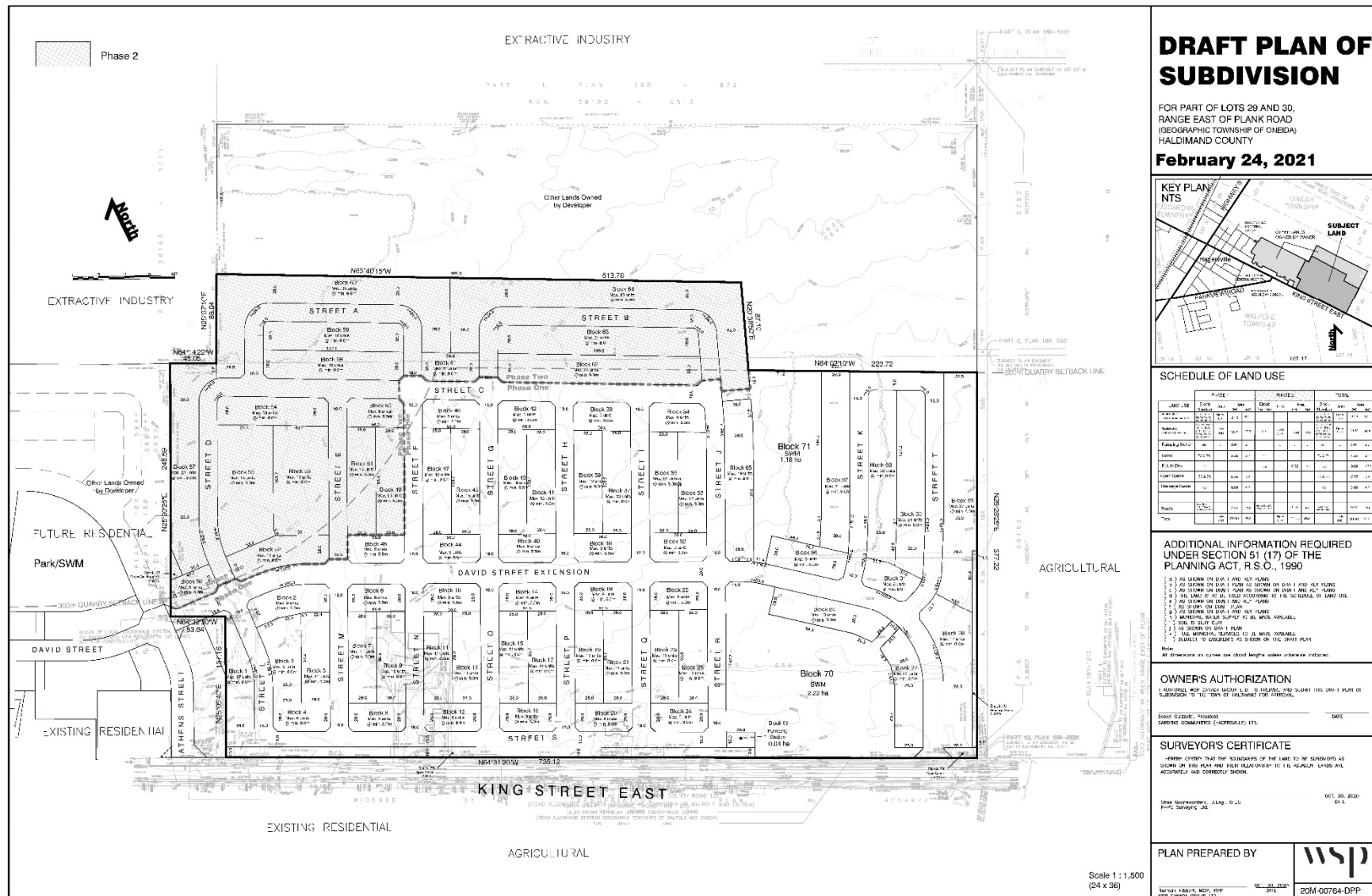
- Blasting can occur within 60.0 metres of a residential lot line.
- Processing can occur within 90.0 metres of the nearest residential lot line.

4.0 Draft Plan of Subdivision

The Draft Plan of Subdivision, prepared by WSP and dated October 30, 2020 is attached as Figure 2. A 300 metre “quarry setback line”, measured from the limit of blasting is illustrated on the Draft Plan of Subdivision. Given the restrictions on the location of blasting (it can occur a minimum of 60.0 metres from a residential lot line), the “quarry setback line” is appropriately measured from the blasting limit, as opposed to the property line. The quarry setback line is generally coincident with the limit between Phase One and Phase Two of development.

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Figure 2 Draft Plan of Subdivision Prepared by WSP, dated October 30, 2020



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5.0 Investigative Studies

Although the 300.0 metre buffer was identified, specific analysis needed to be undertaken to determine, if in fact, any land use impacts might occur beyond that limit, and/or within that limit. Specifically, these were identified as follows and to confirm:

- a) Could development located beyond 300.0 metres of the blasting limit in Parcel B proceed without impacting the quarry?
- b) Could development located within 300.0 metres of the blasting limit in Parcel B proceed without impacting the quarry? If impacts were identified, could they be quantified and mitigated?

The land use impacts that have been deemed to be of concern include the following:

- Blasting and vibration;
- Acoustical/noise impacts; and
- Air quality/dust.

In order to assess these, GC(H)L retained experts in these specific fields who have a substantial depth of knowledge working with the aggregate industry. The conclusions of these studies, specific to Parcel B, are summarized as follows:

5.1 Air Quality

That a processing plant operating in the quarry would comply with provincial standards for 1-hour and 24-hour concentrations of NO_x at and beyond the property boundary subject to:

- The diesel engine operating the processing plant meets US EPA Tier 2 emissions limits or better,
- The diesel engine remains >90.0 metres away from the nearest part of the property.

RDWI does stipulates that through provincial air quality standards; that these conditions already apply to the quarry operation regardless of the abutting land uses. Therefore, the current operation of the quarry will have no impacts off-site as it pertains to air quality. Specifically, this includes no impacts upon Parcel B.

5.2 Acoustical

- Based on there being existing residents along King St. (County Road 20), the Lafarge quarry operation, will already be required to provide some noise mitigation to meet MECP guidelines (NPC-300) including hours of operation, equipment and drilling with noise output < 120 dBA.
- There no identified quarry related impacts beyond 300.0 metres from the identified blasting limit.
- For lands within 300.0 metres of the blasting limit, the construction of a perimeter berm within Parcel B that is 5.75 to 7.0 metres in height would be required. If quarry processing equipment and drilling equipment produce noise levels in excess of 120 dBA, an 'at source' noise barrier (i.e., stockpile) would need to be utilized to shield the equipment that is 13.0 metres in height.

5.3 Blasting

- There no identified quarry related impacts beyond 300.0 metres from the identified blasting limit.
- For lands located within 100.0 metres to 300.0 metres of the blasting limit, an increasing range of standard industry blasting modifications would be required. For those lands located closer than 100.0 metres of the blasting limit, no development could occur until

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such time that quarrying activity in close proximity to the future residential lands is exhausted.

A more fulsome summary of these reports is provided in the November 2018 report attached as Appendix A.

6.0 Planning Conformity

GC(H)L is required to be consistent with the Provincial Policy Statement including:

Policy 2.5.1 which states:

Mineral aggregate resources shall be protected for long-term use and, where provincial information is available, deposits of mineral aggregate resources shall be identified.

And

Policy 2.5.2.4 which states:

Mineral aggregate operations shall be protected from development and activities that would preclude or hinder their expansion or continued use or which would be incompatible for reasons of public health, public safety or environmental impact.

As a result of the assessments undertaken to address potential impacts for blasting, dust and noise based on reasonable assumptions of the quarry operation, it has been determined that there are no identified quarry related impacts beyond 300.0 metres from the identified blasting limit. Therefore, it can be concluded that such development would be consistent with both PPS policy 2.5.1 and 2.5.2.4.

To address impacts for blasting, dust and noise within 300.0 metres from the identified blasting limit, it was been determined that mitigation would be required including:

- a) Blasting: For lands located within 100.0 metres to 300.0 metres of the blasting limit, an increasing range of standard industry blasting modifications would be required. For those lands located closer than 100.0 metres of the blasting limit, no development could occur until such time that quarrying activity in close proximity to the future residential lands is exhausted.
- b) Noise: The construction of a perimeter berm within Parcel B that is 5.75 to 7.0 metres in height. If quarry processing equipment and drilling equipment produce noise levels in excess of 120 dBA, an 'at source' noise barrier (i.e., stockpile) would need to be utilized to shield the equipment that is 13.0 metres in height.

In summary, based on the above:

1. Development of the lands beyond 300.0 metres from quarry operations can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4.
2. Development of the lands between 100 and 300 metres of the blasting limit can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to the above noted mitigation.
3. Development within 100.0 metres of the blasting limit can be mitigated for noise and dust but no level of blasting mitigation can achieve a development scenario where these lands could be consistent with PPS Policy 2.5.1 and 2.5.2.4.

It is our understanding that Phase Two lands (the portion of Parcel B within 300 metres of the blasting limit) will be subject to Holding (H) provision under the proposed Zoning By-Law. It is our understanding that the Holding (H) provision may only be lifted subject to addressing one of the following conditions:

1. Lafarge ceases operations entirely and surrenders its Licence;

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2. The Licence is amended such that blasting and quarrying activities no longer occur within 300 metres of the Phase Two limit, or
3. Lafarge agrees to operational modifications to sufficiently mitigate impacts to the sensitive uses within 300 metres of blasting and quarrying activities, in compliance with MECP Guidelines.

It is our opinion that the above Holding (H) provision is appropriate and will sufficiently limit Phase Two to no development until such time that it can occur in conformity with Provincial policies.

7.0 Summary and Conclusions

It is our opinion that:

1. Development of the lands beyond 300.0 metres from quarry operations can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4.
2. Development of the lands between 100 and 300 metres of the quarry operation can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to the above noted mitigation.
3. Development within 100.0 metres of the blasting limit can be mitigated for noise and dust but no level of blasting mitigation can achieve a development scenario where these lands could be consistent with PPS Policy 2.5.1 and 2.5.2.4.
4. The proposed Holding (H) provision is appropriate and will sufficiently limit Phase Two to no development until such time that it can occur in conformity with Provincial policies.

Yours truly,

IBI GROUP



Dave Barrett, MCIP, RPP
Associate – Manager, Aggregate Planning

DB/baw

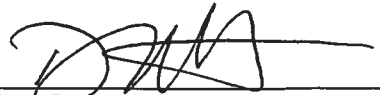
Encl.

cc: Michael Auduong, Armstrong Planning



I hereby certify that this Land Use Impact Assessment Update was prepared by a Registered Professional Planner, within the meaning of the Ontario Professional Planner's Institute Act, 1994.

March 4, 2021
Date


Dave Barrett, MCIP, RPP



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APPENDIX A

Land Use Impact Assessment
Garden Communities (Hagersville) Ltd.
Draft Plan of Subdivision and Lafarge Hagersville Quarry
dated November 28, 2018

Final

Land Use Impact Assessment Of Garden Communities (Hagersville) Ltd.

Draft Plan of Subdivision and Lafarge Hagersville Quarry



Prepared for Garden Communities (Hagersville) Ltd.
by IBI Group
RWDI, Explotech
November 28, 2018

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Appendix C	Blasting Compatibility Analysis – Final Gardens Community Subdivision Land Use Compatibility With Lafarge Canada Hagersville Quarry, Prepared by Explotech, dated April 30, 2018
Appendix D	Blast Impact Analysis to Include Newly Acquired Lands, Prepared by Explotech, dated August 27, 2018.
Appendix E	Haldimand Gardens AQ – Noise-Vibration Report, Prepared by RWDI, dated May 14, 2018
Appendix F	Haldimand Gardens AQ – Noise-Vibration Report, Prepared by RWDI, dated November 14, 2018
Appendix G	Reduced Copies of Lafarge Hagersville Quarry Site Plans – Licence 4443

1 Introduction

Garden Communities (Hagersville) Ltd. (GC(H)L) owns two abutting parcels of land in Hagersville, Ontario within Haldimand County. The parcels are illustrated on Figure 1 and referred to as:

a) Parcel A:

Parcel A consists of Part Lot 30, Range East of Plank Road and Part of Lot 26, Registrar's Compiled Plan 73, Haldimand County. For this Parcel, GC(H)L has approval for a Draft Plan of Subdivision for Phase 1 with the balance of the lands (Phase 2 and Phase 3) awaiting future approvals for further residential development.

b) Parcel B:

Parcel B consists of two separate parts; Part Lot 29-30 Range East Of Plank Road Oneida, Pt 1 18R-5366 and, Part Lot 30 Range East Of Plank Road, Oneida Part 1 18R-556; Haldimand County. For these lands, they are mostly within the Urban Boundary of Hagersville and all the lands are zoned Agriculture.

GC(H)L retained IBI Group to assist with a review of potential land use impacts (i.e., blasting, noise and air quality) from the abutting Lafarge Quarry(s) and to determine if developing the subject parcels would be consistent with the Provincial Policy Statement.

1.1 Existing Conditions

Parcel A:

Parcel A is located in the southeast quadrant of Hagersville with 53 metres of frontage onto County Road 20 (King Street East) and access via two local streets including David Street and Athens Street. The total land holdings are comprised of 22.58 hectares, all of which are currently used for agriculture (cash crops). There are no farm related buildings on the site, nor a residence.

At this time, GC(H)L has approval for a Draft Plan of Subdivision for Phase 1 which totals 8.01 hectares and includes the extension of David Street, numerous residential blocks, open space/walkways, and a parkland/stormwater management facility. The balance of the lands are represented by Phase 2 and Phase 3, awaiting future approvals for further residential development and which total 14.47 hectares in size. These phases will incorporate the extension of Athens Street, the creation of 7 new streets, numerous residential blocks and additional parkland to be added to an existing public park (refer to Appendix A which illustrates the development phasing and Appendix B which is a compilation of the Hagersville Quarry Existing Features with the Garden Communities (Hagersville) Ltd. Draft Plan).

Parcel B

Parcel B is also located in the southeast quadrant of Hagersville and abuts Parcel A to the south-east and totals +/-46.8 hectares. The entire parcel has frontage onto County Road 20 (King Street East) that extends +/-760 metres. The lands are used for agriculture (cash crops) and the one sub-parcel contains a house, two barns and other out-buildings while the other sub-parcel contains a single detached house.

LAND USE IMPACT ASSESSMENT OF GARDEN COMMUNITIES (HAGERSVILLE) LTD.
DRAFT PLAN OF SUBDIVISION AND LAFARGE HAGERSVILLE QUARRY

Prepared for Garden Communities (Hagersville) Ltd.

Figure 1 Site Location



1.2 Surrounding Land Uses

Parcel A:

To the south, toward County Road 20 (King Street East), the lands are located behind a series of +/-25 existing residential homes and a multiple unit residential building. The lands also abut an existing residential neighbourhood to the west (Athens Street and David Street) having been designed to naturally and eventually extend into the subject lands. Residential homes on Cedar Street also back onto the site. As part of the Athens Street neighbourhood is the Hagersville Memorial Arena and Grant Kett Park which includes ball diamonds and a park pavilion. To the east of the lands is Parcel B.

To the north of the site, with a common boundary of +/-462 metres is the existing and active Lafarge – Hagersville Quarry, referenced by the Ministry of Natural Resources and Forestry (MNRF) as Licence No. 4443 totalling 84.73 hectares with an annual maximum tonnage limit of 862,000 tonnes. These licensed lands occupy lands southeast of the former rail line. In addition, to the northwest of the former rail line is a separate licensed quarry which is operated in conjunction with Licence 4443 and is referred to as Licence 607801 and totals 9.11 hectares, operating with the same annual maximum tonnage limit.

Parcel B:

To the south, across County Road 20 (King Street East), is a string of 23 single detached residential homes that extends for +/-580 metres with common frontage with Parcel B. To the east is a hydro-electric transmission corridor consisting of four large hydro pylon's that originate at the former Nanticoke Generating Station. To the north is the quarry lands (as noted above) and to the west is Parcel A.

2 Blasting Setback / Limit

As part of the Lafarge Quarry (Licence 4443), previous approval agencies (MNRF/MECP) established a blasting buffer (refer to Appendix G with regard to reduced copies of the Lafarge Hagersville Quarry Site Plans-Licence 4443). It is our understanding that this limit was intended to reinforce Provincial Policy Statement (PPS) 2.5.2.4 where:

“Mineral Aggregate operations shall be protected from development and activities that would preclude or hinder their expansion or continued use of which would be incompatible for reasons of public health, public safety or environmental impact.”

The basis of the PPS policy is focused on providing security for the aggregate producer and to ensure that there is long-term protection for the ongoing operation of an active pit or quarry.

However, the converse is also true inasmuch that the Policy can be of assistance to help define setback limits for proposed sensitive receivers. Site specifically, this includes the GC(H)L lands and the pending residential development (Parcel A), as well as future residential development lands (Parcel B).

The limit of blasting, approximately 202 feet (61.6 metres) from the licensed boundary on the Lafarge lands, were agreed upon and surveyed in 1991.

3 Aggregate Reserves

Since 1991 and upon the buffer being established, as can be seen on Google aerial photos, Lafarge has extracted a significant volume of the bedrock in proximity to the GC(H)L lands, both in areal extent and depth, including to the third and final lift, being below the current dewatering level. In addition, according to the Site Plans, portions of the abutting lands are characterized as 'rehabilitated'.

Within proximity of the GC(H)L lands, it is acknowledged that there remains a quantity of bedrock reserve and that its' removal is encouraged by PPS Policy 2.5.2.1 whereas: "*As much of the mineral aggregate resources as is realistically possible shall be made available as close to markets as possible*". Furthermore, because these aggregate reserves are readily accessible and located within an existing licensed quarry, they should not be sterilized, but rather extracted and used in the market place.

4 Quarrying Activities

For clarification, standard industry activities that are permitted to occur within the Hagersville Quarry include:

- a) **Blasting:** The quarry reserves are comprised of consolidated rock and the most efficient manner to remove such rock is through blasting. A single blast for a typically active quarry might provide a sufficient volume to meet an operators needs for a week or two. Blasting is primarily contracted out to third party licensed professionals who oversee the drilling of holes along the top quarry face at pre-calculated locations and depths, pack the drill holes with explosives and monitor the detonation. The underlying intent is to maximize the volume of rock released while minimizing the blast impacts.
- b) **Processing:** Once the rock is blasted, that stone is then loaded into a primary crusher to make the stone sufficiently small enough to then be run through a secondary crusher and/or screening plant which then produces individual stone products and/or blends aggregate products, all with the intent to create products that meet very specific provincial and/or municipal road construction specifications.

In some situations, in order to produce more specific aggregate products, (i.e. concrete), the operator may also wash the stone to remove fine silt particles. Once processed, the stone/sand products are then made into individual product stockpiles by aggregate stackers. In summary, the act of crushing, screening, and blending is commonly referred to as 'processing'.

Because the quarry face is active and moving, processing equipment is rarely operated from the hydro grid, but rather by large diesel generators which offer more flexibility to be located on the quarry floor where required. However, the diesel generators in and of themselves also create additional noise and air quality impacts. Some operators also use a conveyor belt system to move the larger rock from the active pit or quarry face to a permanent or semi-permanent processing plant, located in a central location.

Additional activity in the quarry involves the loading of haul trucks by front-end loaders either at the active quarry face or product stockpile, which as noted above, could occur anywhere throughout a licensed operation.

For the Hagersville Quarry, the Site Plans specify that:

- Blasting can occur within 60.0 metres of a residential lot line.
- Processing can occur within 90.0 metres of the nearest residential lot line.

5 Investigative Studies

Based on the above, it was evident to GC(H)L that although the 300.0 metre buffer was identified, specific analysis needs to be undertaken to determine, if in fact, any land use impacts might occur beyond that limit, and/or within that limit. Specifically, these were identified as follows and to confirm:

Parcel A:

- a) Could development of Phase 1 of the Draft Plan of Subdivision (located beyond 300.0 metres of the blasting limit) proceed without impacting the quarry?
- b) Could development of Phase 1 of the Draft Plan of Subdivision (located beyond 300.0 metres of the blasting limit) proceed without being impacted by the quarry, and if impacts were predicted, how could they be best mitigated?
- c) Could development of Phase 2 and Phase 3 of the Draft Plan of Subdivision (located within 300.0 metres of the blasting limit) proceed without impacting the quarry? If impacts were identified, could they be quantified and mitigated?
- d) Could development of Phase 2 and Phase 3 of the Draft Plan of Subdivision (located within 300.0 metres of the blasting limit) proceed without being impacted by the quarry? If impacts were identified, could they be quantified and mitigated?

Parcel B:

- a) Could future development located beyond 300.0 metres of the blasting limit proceed without impacting the quarry?
- b) Could future development located within 300.0 metres of the blasting limit proceed without impacting the quarry? If impacts were identified, could they be quantified and mitigated?

The land use impacts that have been deemed to be of concern include the following:

- Blasting and vibration.
- Acoustical/noise impacts.
- Air quality/dust.

In order to assess these, GC(H)L retained experts in these specific fields who have a substantial depth of knowledge working with the aggregate industry. A summary of their reports follow. It should be noted:

- a) Neither Explotech (blasting) nor RWDI (noise and dust) had access to the Lafarge site or any documentation relating to the equipment being used or proposed to be used by Lafarge. Assumptions used by both consultants are described in their respective reports (refer to Appendices C, D, E and F). However, given the depth of knowledge that both consultants have, due to their extensive experience working within the aggregate industry including quarry operations, they have used reasonable assumptions of best management practices while still identifying what they believe to be a worst-case operational scenario.
- b) Explotech and RWDI undertook separate assessments for Parcel A (both dated April 30, 2018) and Parcel B (August 27, 2018 and November 14, 2018 respectfully), with all four reports attached hereto.

5.1 Blasting / Vibration

GC(H)L retained Explotech to assess the impacts of blasting and vibration. Their initial report is entitled Blasting Compatibility Analysis – Final Gardens Community Subdivision Land Use Compatibility with Lafarge Canada Hagersville Quarry, dated April 5, 2018 attached hereto as Appendix C and their supplemental report entitled Blast Impact Analysis to Include Newly Acquired Lands, dated August 27, 2018 and attached hereto as Appendix D.

As noted, Explotech acknowledges that they did not have direct access to the Lafarge Quarry, nor were they privy to any ongoing blasting records. Instead, they relied on: i) the Site Plans for Licence 4443 which identify limitations and/or restrictions pertaining to the extraction of the site; ii) available aerial photography; and iii) their knowledge of best management practices within the aggregate industry to guide them in advancing a predicted blasting program that is efficient and practical. However, they do state that their designs represent a selected few of the many possible blasting options which could be implemented.

In assessing the Lafarge site Plans, Explotech identified that there remains one final bench of aggregate to be removed in the western most portion of the Hagersville Quarry, which is in proximity to the GC(H)L lands, (Parcel A). Explotech firstly assessed the blasting limitations that Lafarge would be limited to, based on the existing closest receptor, namely 44 Cedar Street.

Parcel A:

As blasting operations encroached on the closest properties (e.g., 44 Cedar Street), Lafarge blasting parameters likely required alteration to remain in compliance with MECP (formerly MOECC) vibration and overpressure guidelines at these properties. It is of note that the setback distances to these properties have been measured from the closest point of the structure to the quarry limits as designated in the Hagersville Quarry Site Plans previously provided to Explotech. An agreed limit of any future blasting conducted by Lafarge has increased the distances of the closest sensitive receptors to blasting by approximately 20 metres. As an example, the property at 44 Cedar Street has measured approximately 245 metres to the designated quarry limits, however with the inclusion of the blasting limit, this property lies approximately 265 metres from any future blasting. It is likely Lafarge would have required alterations to blasting parameters to remain compliant at 44 Cedar Street.

Explotech then identified the impacts of introducing additional sensitive receivers as development of the Draft Plan may proceed. Table 2 and Table 3 of their report highlights a range of progressive setbacks and correspondingly, recommendations for the maximum permissible load per delay (Kg/delay) to meet MECP NPC 119 guidelines. Based on this, they have concluded that:

GC(H)L Phase 1:

Explotech is of the opinion that assuming Lafarge implements a blasting program that meets typical industry standards; that the quarry can operate without being “*precluded or hindered*” by development that occurs beyond 300.0 metres from the blasting limit. Conversely, development of the Draft Plan beyond a distance of 300.0 metres (Phase 1) could proceed without land use impacts from the quarry related to blasting and vibration.

GC(H)L Phase 2 and 3:

Explotech is of the opinion that if Lafarge implements a blasting program that meets typical industry standards; that quarry activity would be “*precluded and/or hindered*” by development that was to occur between 100.0 metres to 300.0 metres of the blasting limit. Conversely, development of the Draft Plan within this range could not proceed without land use impacts occurring from the quarry related directly to blasting and vibration.

One scenario that would permit both the development of the GC(H)L lands to occur within this range while the quarry is in operation, is to request Lafarge to modify its' blasting program. Consequently, Explotech identified what practical modifications could be made to the Lafarge

blasting program and which are typically used by the industry, while continuing to meet MECP guidelines. What they identified was increasing levels of modifications to the blasting program as development might occur within these bands from the blasting limit, in multiple increments as follows:

- 250.0 metres to 300.0 metres
- 200.0 metres to 250.0 metres
- 175.0 metres to 200.0 metres
- 150.0 metres to 175.0 metres
- 125.0 metres to 150.0 metres
- 100.0 metres to 150.0 metres

Although Explotech identified Typical Blasting Parameters' to meet MECP guidelines for each individual setback distance, other options may be determined to be more appropriate. Given that such actions would result in increased operational costs to Lafarge, GC(H)L would need to financially underwrite the quantifiable costs directly related to any such modifications, subject to negotiations with Lafarge.

Practically for GC(H)L, the result is that subject to the implementation of a modified blasting program, and based on the current Draft Plan design, all of the Phase 2 lands could be developed and a portion of Phase 3.

In summary, Lafarge would continue to extract the balance of the aggregate reserves within the western portion of the site as permitted by their Licence without regard to timing, subject only to implementing a modified blasting program (that may be reflective of Explotech's recommendations), with GC(H)L offsetting financial costs of such a modified blasting program, or other identified options.

Development/Extraction Not Feasible:

Explotech is of the opinion that if Lafarge implements a blasting program that meets typical industry standards, or even a severely modified blasting program, that quarry activity would be "*precluded and/or hindered*" by any development that were to occur closer than 100.0 metres to the blasting limit. Conversely, development of the Draft Plan within this range could not proceed without land use impacts occurring from the quarry related directly to blasting and vibration.

Practically for GC(H)L, the result is that although a portion of Phase 3 could be developed, much of it cannot be at this time with further development hinging on one of the following scenarios:

- The lands within the western portion of Licence 4443 are extracted; or
- A Site Plan Amendment is sought to request that no further extraction would occur within the western portion of the licence. However, such an action may be deemed to not be consistent with PPS Policy 2.5.2.1 unless justification is provided (e.g., quality of material is not marketable, cost of extraction is prohibitive, etc.). In this, GC(H)L may financially compensate Lafarge for loss of the reserves.

In summary, Explotech has concluded that unless the remaining reserves located within the western portion of the Hagersville Quarry are either extracted or deemed non-extractable, then development of the GC(H)L lands within 100.0 metres cannot occur.

Parcel B:

Explotech has concluded that additional residential development (Parcel B) will significantly increase the impact to the operation of the Lafarge quarry. This will occur because a much larger footprint will be impacted resulting in Lafarge having to modify more of their blasting program and resulting in additional operational costs due to the reduction of the maximum allowable amount of blasts per hole and an increase to the number of holes required to be drilled. Furthermore, as with Parcel A, due to significant operational costs to retrieve insitu aggregate within 100.0 metres of the blasting limit, that material would be sterilized. Therefore, the only way to the full removal of the aggregate within 100.0 metres is for it to be extracted in

advance of any residential development of Parcel B. Conversely, residential development within 100.0 metres of the blasting limit would need to be postponed.

In summary, Lafarge would continue to extract the balance of the aggregate reserves within the western portion of the site as permitted by their Licence without regard to timing, subject only to implementing a modified blasting program (that may be reflective of Explotech's recommendations), with GC(H)L offsetting financial costs of a modified blasting program.

As well, GC(H)L will need to consider financial costs related to the sterilized aggregate (if any) within the 100.0 metres buffer of the blasting limit.

5.2 Acoustical/Noise and Air Quality/Dust

GC(H)L retained RWDI to assess the impacts of both noise and dust impacts. Their initial letter report (Parcel A) is dated May 14th, 2018 and is attached hereto as Appendix E and their supplemental letter report (Parcel B) is dated November 14, 2018 and is attached as Appendix F.

RWDI also acknowledges that they did not have direct access to the Lafarge Quarry, nor were they privy to any information related to processing equipment currently being used or proposed be used at the quarry. Instead, they relied on: i) the Site Plans for Licence 4443 which identify limitations and/or restrictions pertaining to the extraction of the site; ii) available aerial photography; and iii) their knowledge of best management practices within the aggregate industry to guide them in advancing predicted noise and air quality impacts.

In assessing the Lafarge Site Plans, RWDI identified that there remains "the possibility to extend the lowest lift northward, westward and eastward". Furthermore, the Site Plans indicate that processing can occur seasonally at the active pit face, subject to a 90 metre separation distance from any lands zoned for residential purposes.

Based on the assumptions determined by RWDI related to the site and the size and make-up of processing equipment, they concluded the following:

Air Quality:

Parcel A and B:

That a processing plant operating in the quarry would comply with provincial standards for 1-hour and 24-hour concentrations of NO_x at and beyond the property boundary subject to:

- The diesel engine operating the processing plant meets US EPA Tier 2 emissions limits or better,
- The diesel engine remains >90.0 metres away from the nearest part of the property.

RWDI does stipulates that through provincial air quality standards; that these conditions already apply to the quarry operation regardless of the abutting land uses. Therefore, the current operation of the quarry will have no impacts off-site as it pertains to air quality. Specifically, this includes no impacts upon Parcel A or Parcel B.

Acoustical:

Parcel A:

That a processing plant and/or drilling equipment located in the quarry has the potential to achieve noise levels in excess of 120 dBA, and therefore result in impacts on the GC(H)L lands. However, under MECP (formerly MOECC) Noise Guideline NPC-300, Lafarge as the licensee would be required to implement attenuation techniques to reduce exceedances to protect existing sensitive receivers. Mitigation suggested by RWDI would need to include; operating hours not exceeding 7:00 am to 7:00 pm, and could entail the configuration or use of processing equipment not exceeding 120 dBA, and the use of an 'at source' noise barrier (i.e., product stockpile) being a minimum 11.0 metres in height if noise levels exceed 120 dBA.

Based on the above:

Phase 1:

Lafarge is requirement to mitigate noise levels to 120 dBA to meet NPC-300, and this results in there being no noise exceedances for GC(H)L Phase 1. No further noise attenuation measures are required on these GC(H)L lands.

Phase 2 and 3:

For development within Phases 2 and 3, RWDI has predicted that noise impacts will exist. Although significant attenuation can be achieved through the implementation of a 7.0 metre high perimeter berm along the GC(H)L property limit, additional attenuation would still be required;

- For the processing equipment/plant and/or drilling equipment, that the 'at source' noise barrier (e.g., product stockpile) be increased in height from 11.0 metres to 13.0 metres and/or potentially increase the separation of the processing plant from the licensed boundary.

As with the blasting impacts, GC(H)L would need to enter into discussions with Lafarge to quantify these mitigation techniques and be prepared to cover any applicable and reasonable financial costs incurred by Lafarge.

The initial May 14 2018 assessment concluded that there would be impacts to portions of the GC(H)L, specifically Block 45 and the eastern portion of Block 20. However, as a result of the November 14 2018 assessment update, with the introduction of a 5 – 7 m high continuous perimeter berm abutting the quarry lands, development of these Parcels could proceed without further mitigation.

Parcel B:

Based on there being existing residents along King St. (County Road 20), the Lafarge quarry operation, will already be required to provide some noise mitigation to meet MECP guidelines (NPC-300) including hours of operation, equipment and drilling with noise output $\leq$ 120 dBA .

In order to accommodate the development while allowing the quarry to operate unfettered, assuming that equipment and drilling does not exceed 120 dBA, GC(H)L would be need to construct a continuous perimeter berm along the common property boundary to be 5.75 to 7.0 metres in height.

However, if equipment and drilling noise levels were to exceed 120 dBA, an operation restriction upon Lafarge would necessitate that they locate their processing plant behind product stockpiles with a minimum height of 13.0 metres. As with the blasting impacts, GC(H)L would need to enter into discussions with Lafarge to quantify these mitigation techniques and be prepared to cover any applicable and reasonable financial costs incurred by Lafarge.

6 Planning Conformity

6.1 Provincial Policy Statement

GC(H)L is required to be consistent with the Provincial Policy Statement including:

Policy 2.5.1 which states:

Mineral aggregate resources shall be protected for long-term use and, where provincial information is available, deposits of mineral aggregate resources shall be identified.

And

Policy 2.5.2.4 which states:

Mineral aggregate operations shall be protected from development and activities that would preclude or hinder their expansion or continued use or which would be incompatible for reasons of public health, public safety or environmental impact."

Parcel A:

Phase 1:

As a result of the assessments undertaken to address potential impacts for blasting, dust and noise based on reasonable assumptions of the quarry operation, it has been determined that there are no identified quarry related impacts beyond 300.0 metres from the identified blasting limit. Therefore, it can be concluded that the development of the Phase 1 lands would be consistent with both PPS policy 2.5.1 and 2.5.2.4.

Phases 2 and 3:

As a result of the assessments undertaken to address potential impacts for blasting, dust and noise based on reasonable assumptions of the quarry operation, it has been determined that there are identified quarry related impacts within 300.0 metres from the identified blasting limit.

As such, one scenario to address the impacts is:

- a) Blasting: For all the Phase 2 lands, an increasing range of standard industry blasting modifications would be required.

For those Phase 3 lands located within 100.0 metres to 175.0 metres of the blasting limit, an increasing range of standard industry blasting modifications would be required. For those lands located closer than 100.0 metres of the blasting limit, no development could occur until such time that quarrying activity in close proximity to the GC(H)L lands is exhausted.

- b) Noise:

- The 'at source' noise barrier would need to be increased in height from 11.0 metres to 13.0 metres.
- For Block 45 and the eastern portion of Block 20, no development could occur until such time that quarrying activity in close proximity to the GC(H)L lands is exhausted.

In summary, based on the above:

1. Development of Phase 1 of the GC(H)L lands can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4.
2. Development of Phase 2 and Block 45 of the GC(H)L lands can only occur, and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to the above noted and industry standard operational modifications to the Hagersville Quarry operation; with the exception of Block 45.
3. Development of a portion of Phase 3 and the eastern portion of Block 20 of the GC(H)L lands can occur, and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to the above noted and industry standard operational modifications to the Hagersville Quarry operation.
4. Development within 100.0 m of the blasting limit can be mitigated for noise and dust but no level of blasting mitigation can achieve a development scenario where these lands could be consistent with PPS Policy 2.5.1 and 2.5.2.4.

Parcel B:

As a result of the assessments undertaken to address potential impacts for blasting, dust and noise based on reasonable assumptions of the quarry operation, it has been determined that there are no identified quarry related impacts beyond 300.0 metres from the identified blasting

limit. Therefore, it can be concluded that such development would be consistent with both PPS policy 2.5.1 and 2.5.2.4.

To address impacts for blasting, dust and noise within 300.0 metres from the identified blasting limit, it has been determined that mitigation is required including:

- a) **Blasting:** For lands located within 100.0 metres to 175.0 metres of the blasting limit, an increasing range of standard industry blasting modifications would be required. For those lands located closer than 100.0 metres of the blasting limit, no development could occur until such time that quarrying activity in close proximity to the future residential lands is exhausted.
- b) **Noise:**
 - The construction of a perimeter berm within Parcel B that is 5.75 to 7.0 metres in height.
 - If quarry processing equipment and drilling equipment produce noise levels in excess of 120 dBA, an 'at source' noise barrier (i.e. stockpile) would need to be utilized to shield the equipment that is 13.0 metres in height.

In summary, based on the above:

1. Development of the lands beyond 300.0 metres from quarry operations can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4.
2. Development of the lands between 100 and 300 metres of the blasting limit can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to the above noted mitigation.
3. Development within 100.0 m of the blasting limit can be mitigated for noise and dust but no level of blasting mitigation can achieve a development scenario where these lands could be consistent with PPS Policy 2.5.1 and 2.5.2.4.

Development area		Current quarry restrictions	Additional quarry mitigation required	Mitigation required by gc(h)
Parcel A				
	Phase 1	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l	n/a	n/a
	Phase 2	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l	• Modified blasting program • 11-13 m Processing Plant barrier	• 5-7 m high Perimeter Berm
	Phase 3 – up to 100 m from blasting limit	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l	• Modified Blasting Program • 11-13 m Processing Plant barrier	• 5-7 m high Perimeter Berm
	Phase 3 – within 100 m of blasting limit	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l	• No development possible due to potential blasting impacts	• No development possible due to potential blasting impacts
Parcel B				
	Beyond 300.0 m	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l		

	100-300 m	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l	• Plant PWL of 120 dBA	
	100-300m	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l	• Plant PWL of 127 dBA • 13.0 m Processing Plant barrier	
	Within 100 m	• Diesel engine meets US EPA Tier 2 emissions • Diesel engine >90 m from p/l	• No development possible due to potential blasting impacts	• No development possible due to potential blasting impacts

6.2 Haldimand County Official Plan

Under Section 3 – Economy and subsection A – Natural Resources; and Section 2 entitled Mineral Aggregate Resources, Policy 5 states:

“New residential and institutional development within 500 metres of existing operations or resource areas shall be assessed on a case by case basis and appropriate development setbacks shall be established in consultation with the appropriate agencies based on studies carried out in support of the application for land use approvals.”

Based on this policy, it is our opinion that the studies undertaken by GC(H)L wherein they retained experts related to; i) blasting/vibration, ii) acoustical/noise and iii) air quality/dust; meets this Official Plan requirement.

7 Summary and Conclusions

It is our opinion that:

Parcel A:

1. Development of Phase 1 of the GC(H)L lands can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4;
2. Development of Phase 2 including Block 45 of the GC(H)L lands can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to industry-standard operational modifications being incorporated into the Hagersville Quarry operation, and based on a further recommendation that GC(H)L enter into discussions with Lafarge to quantify the required modifications and to provide financial remuneration to off-set those costs, and,
3. Development of a portion of Phase 3 including the eastern portion of Block 20 of the GC(H)L lands can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to industry-standard operational modifications being incorporated into the Hagersville Quarry operation, based on a further recommendation that GC(H)L enter into discussions with Lafarge to quantify the required modifications and to provide financial remuneration to off-set those costs; and,
4. Development within 100.0 m of the blasting limit can be mitigated for noise and dust but no level of blasting mitigation can achieve a development scenario where these lands could be consistent with PPS Policy 2.5.1 and 2.5.2.4.

LAND USE IMPACT ASSESSMENT OF GARDEN COMMUNITIES (HAGERSVILLE) LTD.
DRAFT PLAN OF SUBDIVISION AND LAFARGE HAGERSVILLE QUARRY

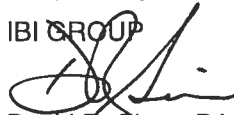
Prepared for Garden Communities (Hagersville) Ltd.

Parcel B:

1. Development of the lands beyond 300.0 metres from quarry operations can occur and be consistent with PPS Policy 2.5.1 and 2.5.2.4.
2. Development of the lands between 100 and 300 metres of the quarry operation can occur, and be consistent with PPS Policy 2.5.1 and 2.5.2.4 subject to the above noted mitigation.
3. Development within 100.0 metres of the blasting limit can be mitigated for noise and dust but no level of blasting mitigation can achieve a development scenario where these lands could be consistent with PPS Policy 2.5.1 and 2.5.2.4.

Respectfully Submitted,

IBI GROUP

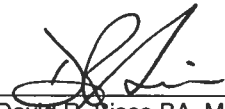
David R. Sisco, BA, MCIP, RPP
Associate, Senior Planner

DRS/baw



I hereby certify that this Land Use Impact Assessment Report Addendum was prepared by a Registered Professional Planner, within the meaning of the Ontario Professional Planners' Institute Act, 1994.

Nov. 28th 2018
Date


David R. Sisco, BA, MCIP, RPP

http://projects1.ibigroup.com/115076/Project Documents/10.0 Reports/PTR_LandUseImpactAddendum.docx2018-11-28\BAW

LAND USE IMPACT ASSESSMENT OF GARDEN COMMUNITIES (HAGERSVILLE) LTD.
DRAFT PLAN OF SUBDIVISION AND LAFARGE HAGERSVILLE QUARRY

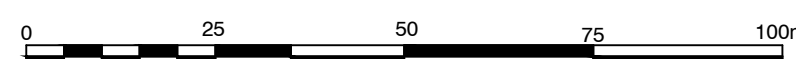
Prepared for Garden Communities (Hagersville) Ltd.

APPENDIX A

Garden Communities (Hagersville) Ltd., Draft Plan Phasing



February 6, 2018



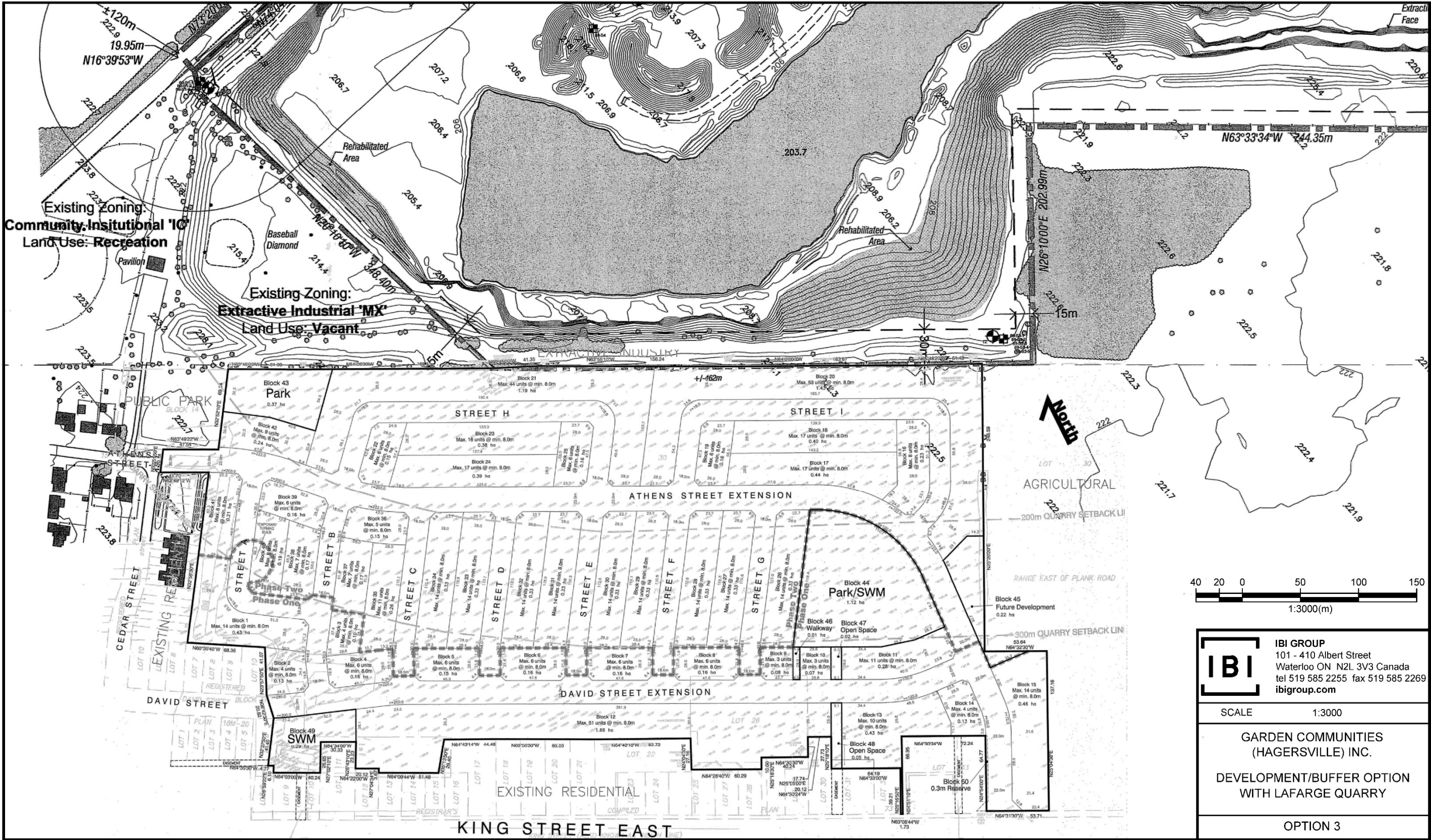
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APPENDIX B

Compilation of the Hagersville Quarry Existing Features (Sheet 1 of 4) With The Garden Communities (Hagersville) Ltd. Draft Plan

LAND USE IMPACT ASSESSMENT OF GARDEN COMMUNITIES (HAGERSVILLE) LTD.
DRAFT PLAN OF SUBDIVISION AND LAFARGE HAGERSVILLE QUARRY

Prepared for Garden Communities (Hagersville) Ltd.



FILE:J:\115076_Hagersville\5.9 Drawings\59pin\layouts\FIGURES\FIGURES.dwg LAYOUT:OPTION 3 Baseplan
LAST SAVED BY:Dan.roethel, Wednesday, January 24, 2018 5:13:47 PM PLOTTED BY:Dan Roethel Friday, April 27, 2018 10:53:26 AM

APPENDIX C

Blasting Compatibility Analysis – Final Gardens Community Subdivision Land Use Compatibility with Lafarge Canada Hagersville Quarry, prepared by Explotech dated April 30, 2018



Specialists in Explosives, Blasting and Vibration
Consulting Engineers

Blasting Compatibility Analysis – Final Revision 1
Gardens Communities Subdivision Land Use Compatibility
with Lafarge Canada Hagersville Quarry
Hagersville, Ontario

Submitted to:

IBI Group
410 Albert Street, Suite 101
Waterloo, Ontario
N2L 3V3



Prepared by:

Explotech Engineering Ltd.

April 30, 2018

EXPLOTECH ENGINEERING LTD.

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EXECUTIVE SUMMARY

ExploTech Engineering Ltd. was retained in October 2017 to provide a Blast Compatibility Analysis for the proposed Gardens Communities Subdivision Development located on Part of Lot 30, Range East of Plank Road and Part of Lot 26, Registrar's Complied Plan 73 (Geographic Township of Oneida), Town of Hagersville, Haldimand County. Specifically, this study was undertaken to identify land use compatibility issues between the proposed residential development and the existing blasting operations ongoing at Lafarge Canada's Hagersville Quarry located to the North of the proposed subdivision.

Vibration levels assessed in this report are based on the Ministry of Environment and Climate Change Model Municipal Noise Control By-law (NPC119) with regard to guidelines for blasting in Mines and Quarries. We have assessed the area surrounding the proposed license area, including the proposed subdivision development, with regard to potential damage from blasting operations and compliance with the aforementioned by-law document.

On November 11, 2017, ExploTech Engineering Ltd. completed a site visit of the development area and reviewed all available site maps and operational plans provided by Empire Communities. Our analysis of the predictable derivatives associated with the blasting concluded that the planned subdivision development can coexist with the adjacent mineral extraction operations at Lafarge Canada's Hagersville Quarry in a safe manner and within MOECC guidelines. Notwithstanding, the development of the residential subdivision may impose the need for operational changes at the Lafarge Hagersville Quarry, depending on the specific location of future blasting.



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APPENDIX E – REGRESSION LINE FOR CALCULATED QUARRY BLASTS

APPENDIX F – CURRICULUM VITA OF REPORT WRITERS



INTRODUCTION

The proposed Gardens Communities Subdivision is located on Part of Lot 30, Range East of Plank Road and Part of Lot 26, Registrar's Complied Plan 73 (Geographic Township of Oneida), Town of Hagersville, Haldimand County (refer to Appendix A). Lafarge Hagersville Quarry limits used in this report are based on quarry operations plans received from Empire Communities. The quarry property is located on Part of Lots 28 and 29, Range E of Plank Road, Geographic Township of Oneida, County of Haldimand.

This Blast Compatibility Analysis has been prepared to assess the potential for the Gardens Communities Subdivision to coexist with the adjacent Lafarge Hagersville Quarry in accordance with requirements stipulated under the Ministry of the Environment and Climate Change (MOECC) Model Municipal Noise Control By-law (NPC 119) with regard to Guidelines for Blasting in Mines and Quarries. Additionally, we have investigated the need for any special provisions or operational changes required at either property in order to permit or maintain reasonable use.

Limited information is available with regards to current blasting practice at the Lafarge Hagersville Quarry. As such, our analysis applied typical blasting parameters at quarry operations similar to Lafarge Hagersville to assess the impacts of the blasting on both the existing and proposed residences (ie. closest existing home to the blasting at 44 Cedar Street versus Block 20 or Block 21 on Phase II of the proposed Gardens Communities Subdivision Development). Additionally, our review analyzed whether the introduction of the proposed homes would impose the need for any adjustments to the Lafarge operations or result in the sterilization of areas of the quarry where extraction would no longer be feasible.



EXISTING AND FUTURE BLASTING CONDITIONS

The Lafarge Canada Hagersville Quarry encompasses approximately 232 Acres (94 Hectares). The property is bounded by Haldimand Road 9 with farm fields and sparse residential properties to the East, Main Street N and dense residential and commercial properties to the West, First Line Road with farm fields and sparse residential and commercial properties to the North, and the proposed Gardens Communities (Hagersville) Subdivision along with existing dense residential properties to the South.

The Lafarge Hagersville Quarry Lands lie approximately 60m from the closest home on the proposed Gardens Communities Subdivision Development (refer to Appendix A). The closest existing structure to the quarry operation is located at 44 Cedar Street at a distance of 245m due West of the quarry (refer to Appendix B). The closest existing receptors surrounding the Hagersville Quarry include the following:

Table 1: Closest <u>Existing</u> Sensitive Receptors to Lafarge Hagersville Quarry		
Sensitive Receptor	Closest Straight Line Distance to Receptor (m)	Direction from Quarry
1 Athens Street	278	West
3 Athens Street	270	West
5 Athens Street	258	West
12 Athens Street	298	West
14 Athens Street	285	West
16 Carrick Street	415	West
18 Carrick Street	392	West
20 Carrick Street	380	West
21 Carrick Street	400	West
22 Carrick Street	350	West
23 Carrick Street	385	West
24 Carrick Street	335	West
25 Carrick Street	375	West
26 Carrick Street	315	West
27 Carrick Street	355	West



29 Carrick Street	350	West
9 Cedar Street	390	West
10 Cedar Street	353	West
12 Cedar Street	350	West
13 Cedar Street	375	West
14 Cedar Street	342	West
16 Cedar Street	337	West
17 Cedar Street	363	West
18 Cedar Street	330	West
20 Cedar Street	325	West
21 Cedar Street	348	West
22 Cedar Street	315	West
24 Cedar Street	307	West
25 Cedar Street	337	West
26 Cedar Street	303	West
28 Cedar Street	296	West
29 Cedar Street	325	West
30 Cedar Street	291	West
32 Cedar Street	285	West
33 Cedar Street	310	West
34 Cedar Street	275	West
36 Cedar Street	270	West
38 Cedar Street	264	West
40 Cedar Street	257	West
42 Cedar Street	250	West
44 Cedar Street	245	West



BLAST VIBRATION AND OVERPRESSURE LIMITS

The Ontario MOECC 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 MOECC. The limits suggested by the MOECC are as follows.

Vibration_____12.5mm/sec 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. The guideline limits apply at the location of sensitive receptors which includes residential homes.



BLAST MECHANICS AND DERIVATIVES

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

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

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

In addition to the ground vibrations, overpressure, or air vibrations, are generated through the direct action of the explosive venting through cracks in the rock or through the indirect action of the rock movement. In either case, the result is a pressure wave which travels through 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 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 toward residences, and blast vibrations are greatest when retreating towards the residences.

We are of the understanding that Empire Communities intends to elevate the development site by approximately 1.3m using fill material from a nearby construction site to accommodate the installation of underground services. Assuming competent fill material is used, we do not anticipate any significant impact on ground vibrations or overpressures due to the presence of the fill or the marginally higher elevation.



We were unfortunately not provided any details of current blast practices at the Lafarge Hagersville operations. As such, for the purposes of our analysis, we have assumed a baseline blast design comprised of 114mm (4 ½") diameter hole, 3.35m x 3.35m (11' x 11') square pattern, 10m bench, 7.5m bulk emulsion column with a density of 1.2g/cc and a 2.5m collar. Bench height was limited to 10m given that the closest rock to the proposed subdivision is currently at elevation 207MASL and final quarry floor elevation is 197MASL.

The blasting parameters described above represents one of several designs which we have noted being used at other limestone quarries in the province that are similar in nature to the Lafarge Hagersville Quarry. Given that we are currently unaware as to the exact location of the ongoing blasting within the quarry, ExploTech cannot make any additional comments or recommendations beyond the assumed blast design described above.



VIBRATION LEVELS AT THE NEAREST SENSITIVE RECEPTOR

The most commonly used formula for predicting PPV is known as the Bureau of Mines (BOM) prediction formula or Propagation Law.

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

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” and “e” are variable and influenced by many factors (i.e. rock type, geology, thickness of overburden, etc.). Based on monitoring performed at similar Ontario rock quarries with comparable material characteristics, our initial estimates for “e” will be set at -1.85 and “K” will be set at 7025 (refer to Appendix E).

EXISTING CONDITIONS

It is our understanding that the approved site plans for the Hagersville Quarry permit Lafarge to remove one remaining bench in the Western most portion of the Hagersville Quarry, making this area the closest point to the majority of the sensitive receptors. This bench would be approximately 10m in depth. We have assumed that the initial blast will be approximately 395m removed from the closest existing sensitive receptor, namely 44 Cedar Street. For a distance of 395m and a maximum explosive load per delay of 92kg per delay (assumed 114mm (4 ½”) diameter hole, 3.35m x 3.35m (11’ x 11’) square pattern, 10m bench, 7.5m bulk emulsion column with a density of 1.2g/cc and a 2.5m collar), we can calculate the maximum PPV at the closest existing sensitive receptor for the initial quarry operations as follows:

$$ppv = 7025 \left(\frac{395}{\sqrt{92}} \right)^{-1.85} = 7.24 \text{ mm/s}$$



As discussed in previous sections, the MOECC guideline for blast-induced vibration is 12.5 mm/s (0.5 in/s). The calculated predicted PPV (based on the proposed blasting data discussed above) would be 7.24mm/s.

Under current conditions, the closest separation distance between a sensitive receptor and any blast over the life of the quarry would be approximately 245m (44 Cedar Street). Applying the same blast parameters as above to this reduced separation distance yields a calculated vibration of 17.51mm/s suggesting the need for design modifications as the distance to existing receptors decreases. In order to maintain compliance at a separation distance of 245m, maximum load per delay would have to be reduced to 64kg. While this reduced load would result in elevated drill and blast costs, the extraction of the rock would remain economically feasible based on current market conditions.

PROPOSED CONDITIONS

With the introduction of the proposed subdivision, the separation distance to the closest receptor for the initial blast in the Western quadrant of the quarry would decrease from 395m to 220m (Residences in Block 21). Applying the same blast parameters as above, the calculated vibration level at the closest proposed receptor for the initial blast would be 21.36mm/s, again necessitating the need for design modifications in the event that the residential structures are built prior to the blasting in this area. In order to maintain compliance at a separation distance of 220m, maximum load per delay would have to be reduced to 52kg. Once again, while this reduced load would result in elevated drill and blast costs, the extraction of the rock would remain economically feasible based on current market conditions.

The closest separation distance between the blasting and a sensitive receptor in the proposed subdivision over the life of the quarry is approximately 60m (Residences in Block 21). While technically feasible, given current blasting technology and techniques, blasting at the separation distance of 60m would not be economically feasible as maximum loads per delay would be in the 4kg range.



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 6dB for every doubling of distance.

Air overpressure predictive formulas employ 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)

Research performed by the United States Bureau of Mines (USBM RI8485) established the following 95% regression equation for peak sound pressure level in front of a quarry blast. The values for "e" and "K" have been established at - 0.966 and 1.317 respectively based on the collected empirical data.

$$PSPL = 1.317 \left(\frac{D}{\sqrt[3]{W}} \right)^{-0.966}$$

As previously stated in this report, the closest existing sensitive receptor to initial blasting in the remaining Western portion of the quarry will be 395m. This receptor is positioned behind the blast and hence overpressures will be significantly reduced. Research conducted by the USBM has produced a predictive equation for a typical quarry blast in which the receptor is behind the blast.



Based on the data collected, the values for "e" and "K" have been established at -0.515 and 0.056 respectively:

$$PSPL = 0.056 \left(\frac{D}{\sqrt[3]{W}} \right)^{-0.515}$$

EXISTING CONDITIONS

Lot 22 on King Street East is the closest existing structure which lies in front of the blast. At a separation distance of 550m (i.e. the closest standoff distance to the existing structure in front of the initial blasting in the remaining Western portion of the quarry) and a maximum explosive weight of 92kg per delay (assumed 114mm (4 ½") diameter hole, 3.35m x 3.35m (11' x 11') square pattern, 10m bench, 7.5m bulk emulsion column with a density of 1.2g/cc and a 2.5m collar), we calculate the PSPL at the nearest receptor in front to be 125.1dBL.

For a distance of 395 m (i.e. the standoff distance to the closest existing structure behind the commencement of blasting in the remaining Western portion of the quarry, namely 44 Cedar Street) and a maximum explosive weight of 92kg per delay (assumed 114mm (4 ½") diameter hole, 3.35m x 3.35m (11' x 11') square pattern, 10m bench, 7.5m bulk emulsion column with a density of 1.2g/cc and a 2.5m collar), we calculate the PSPL at the nearest receptor to be 121.1dBL.

The closest separation distance between the blasting and an existing sensitive receptor in front of a blast over the lifetime of the quarry is approximately 420m, namely Lot 22 on King Street East. Using a maximum explosive weight of 92kg per delay (assumed 114mm (4 ½") diameter hole, 3.35m x 3.35m (11' x 11') square pattern, 10m bench, 7.5m bulk emulsion column with a density of 1.2g/cc and a 2.5m collar), we calculate the PSPL at the nearest receptor to be 127.4dBL.

With regards to the closest existing sensitive receptor behind a blast over the lifetime of the quarry, namely 44 Cedar Street, we have calculated the closest blast to be approximately 245m. Utilizing the same blasting parameters as above, we can calculate the PSPL at this address to be 123.7dBL.

Given the calculations above, the anticipated overpressure levels at the existing receptors would remain within MOECC guidelines, however, actual PSPL amplitudes will be determined by the on-site monitoring program.



PROPOSED CONDITIONS

With the introduction of the proposed subdivision, the separation distance to the closest receptor in front for the initial blast in the Western quadrant of the quarry would decrease from 550m to 215m. Applying the same blast parameters as above, the calculated overpressure level at the closest proposed receptor for the initial blast would be 133.0dB, again necessitating the need for design modifications in the event that the residential structures are built prior to the blasting in this area. In order to maintain overpressure compliance at a separation distance of 215m in front of the blast, maximum load per delay would have to be reduced to 16kg. Once again, while this reduced load would result in elevated drill and blast costs, the extraction of the rock would likely remain economically feasible based on current market conditions.

For the initial blast in the Western quadrant, the closest sensitive receptor behind the blast will remain 44 Cedar Street and as such, the existing sensitive receptor will govern design.

The closest separation distance between the blasting and a sensitive receptor in front of a blast in the proposed subdivision over the life of the quarry is approximately 85m. As maximum loads per delay would be below 1kg to maintain compliance with MOECC guidelines, the rock in this area is likely to be sterilized.

The closest separation distance between the blasting and a sensitive receptor behind a blast in the proposed subdivision over the life of the quarry is approximately 60m. Utilizing the same blasting parameters as above, the calculated overpressure at this distance is approximately 130.0dB.



COMPLIANCE AT SENSITIVE RECEPTOR SETBACK DISTANCES

With plans to develop the proposed subdivision, the setback distances from the blasting operations to the closest sensitive receptor will decrease. Table 2 below provides a guide to maximum loads per delay based on various separation distances in order to ensure compliance with MOECC NPC 119 guidelines. The following maximum loads per delay are derived from the ground vibration attenuation equation and are based on an intensity of 12.5mm/s:

TABLE 2 – Maximum Permissible Load per Delay to Maintain 12.5mm/s at each Respective Setback Distances	
Setback Range from Blasting Limits (m)	Maximum Permissible Load Per Delay (kg/delay)
60 – 75	3.75 – 6.0
75 – 100	6.0 – 10.50
100 – 125	10.50 – 16.50
125 – 150	16.50 – 23.75
150 – 175	23.75 – 32.50
175 – 200	32.50 – 42.50
200 – 250	42.50 – 66.50
250 – 300	66.50 – 95.50
300 – 400	95.50 – 170.0
400 – 450	170.0 – 215.0
450+	215.0+

Given that the quarry will be extracted from 207masl to 197masl in the Western part of the site and closest to the sensitive receptors, Table 3 below lists feasible blasting parameters that would effectively fragment the rock for removal based on the setback distance from the nearest sensitive receptor(s). These setback distances from the perspective of the Hagersville Quarry are shown visually in the aerial overview contained in Appendix C. These same distances were also calculated from the perspective of the subdivision to illustrate the encroachment on blasting operations as the development expands and can be shown in the aerial overview contained in Appendix D.



We do note that the yellow line on the Appendix D overview denoting the Lafarge blasting limit has been provided by Empire Communities in reference to the Subdivision Draft Plan 28T 89002 Condition 16 that reads as follows:

“That the owner shall agree to provide a 300 metre minimum separation distance between the point of blasting on the adjacent quarry to the property line of the proposed plan of subdivision, to the satisfaction of the Ministry of the Environment and the Ministry of Natural Resources.”

We are unaware as to what time period this condition was implemented for the development, however, based on conversations with Armstrong Planning personnel, it is estimated that this condition was implemented into the site plan in 1989.

Explotech does make reference to small portions of rock remaining in the Western most area of the quarry that falls within the aforementioned 300m separation distance. Based on the blasting limit established in 1989, it is assumed that this limit will be respected and no blasting is to occur South of blasting limit line noted in Appendix D.

Note that the listed designs below represent a select few of many possible designs which could be implemented on site.

TABLE 3 – Typical Blasting Parameters within Maximum Permissible Load per Delays		
Setback Distance from Blasting Limits to Nearest Sensitive Receptor(s) (m)	Maximum Permissible Load Per Delay (kg/delay)	Typical Blasting Parameters
60 – 75	3.75 – 6.0	• 76mm (3") Hole Diameter • 1.2m x 1.2m (4' x 4') Pattern • 5m Bench • Two (2) Decks of Explosives - o 3.5 Sticks of Emulsion (50x400) - o 0.9m Stemming Deck • 1.3m Surface Collar • 1.0 Powder Factor



75 – 100	6.0 – 10.50	• 76mm (3") Hole Diameter • 1.5m x 1.5m (5' x 5') Pattern • 10m Bench • Four (4) Decks of Explosives ◦ 4 Sticks of Emulsion (65x400) per Deck ◦ 0.6m Stemming Deck • 1.7m Surface Collar • 1.1 Powder Factor
100 - 125	10.50 – 16.50	• 76mm (3") Hole Diameter • 1.8m x 1.8m (6' x 6') Pattern • 10m Bench • Three (3) Decks of Bulk Explosives ◦ Three 2m explosive decks ◦ 1.0m Stemming Deck • 2.0m Surface Collar • 1.0 Powder Factor
125 – 150	16.50 – 23.75	• 89mm (3 ½") Hole Diameter • 2.1m x 2.1m (7' x 7') Pattern • 10m Bench • Three (3) Decks of Bulk Explosives ◦ Three 2m Explosive Decks ◦ 1.0m Stemming Decks • 2.0m Surface Collar • 1.0 Powder Factor
150 – 175	23.75 – 32.50	• 101mm (4") Hole Diameter • 2.4m x 2.4m (8' x 8') Pattern • 10m Bench • Three (3) Decks of Bulk Explosives ◦ Three 2m Explosive Decks ◦ 1.0m Stemming Deck • 2.0m Surface Collar • 1.0 Powder Factor



175 - 200	32.50 – 42.50	• 101mm (4") Hole Diameter • 2.7m x 2.7m (9' x 9') Pattern • 10m Bench • Two (2) Decks of Bulk Explosives ◦ Two 3.5m Explosive Decks ◦ 1.0m Stemming Deck • 2.0m Surface Collar • 0.94 Powder Factor
200 - 250	42.50 – 66.50	• 114mm (4 ½") Hole Diameter • 3m x 3m (10' x 10') Pattern • 10m Bench • Two (2) Decks of Bulk Explosives ◦ Two 3.5m Explosive Decks ◦ 1.0m Stemming Deck • 2.0m Surface Collar • 0.92 Powder Factor
250 - 300	66.50 – 95.50	• 114mm (4 ½") Hole Diameter • 3m x 3m (10' x 10') Pattern • 10m Bench • Two (2) Decks of Bulk Explosives ◦ Two 3.5m Explosive Decks ◦ 1.0m Stemming Deck • 2.0m Surface Collar • 0.92 Powder Factor
300 - 400	95.50 – 170.0	• 114mm (4 ½") Hole Diameter • 3.4m x 3.4m (11' x 11') Pattern • 10m Bench • 8m Bulk Explosive Column Load • 2.0m Collar • 0.84 Powder Factor
400 - 450	170.0 – 215.0	• 152mm (6") Hole Diameter • 4.6m x 4.6m (15' x 15') Pattern • 10m Bench • 7.5m of Bulk Emulsion (1.2g/cc) (163kg) and Booster (0.45kg) • 2.5m Collar • 0.77 Powder Factor



450+	215.0+	• 178mm (7") Hole Diameter • 4.9m x 4.9m (16' x 16') Pattern • 10m Bench • 7m of Bulk Emulsion (1.2g/cc) (209kg) and Booster (0.45kg) • 3m Collar • 0.87 Powder Factor
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While the above blasting parameters provide technically feasible ways of remaining within MOECC guidelines at the nearest receptors, the economic efficiency of such parameters will differ with each given separation distance.

Based on the above calculations and baseline blast design assumed (114mm (4 ½") diameter hole, 3.35m x 3.35m (11' x 11') square pattern, 10m bench, 7.5m bulk emulsion column with a density of 1.2g/cc and a 2.5m collar), the development of the subdivision will impact drill and blast costs to a separation distance of approximately 300m. The extent of these additional costs will naturally reduce as the separation distance increases. The majority of the cost escalation is associated with increases in the cost of drilling. As an example, decreasing hole diameter from 114mm (4 ½") to 89mm (3 ½") increases drill costs in the order of 40% as a result of the necessity for additional holes. Blast costs will still increase with decreased hole diameters as a result for the need for additional supplies (caps and boosters) and labour, however, these escalations are far less than those associated with the drilling portion of the operation.

For rock lying within the 60m to 100m radius from the closest unit in the proposed subdivision, this area is likely to be sterilized for economic reasons. Due to the significantly elevated costs associated with blast designs at this separation distance, the costs associated with blasting to compliance at this distance would remain economically impractical based on today's market conditions.

Beyond approximately a 100m separation distance, drilling and blasting could be economically feasible, however, costs associated with the drill and blast program will be significantly elevated. As previously noted, these cost escalations would systematically reduce as separation distances increase to the point where they are eliminated at a separation distance of approximately 300m. We note that several existing properties adjacent to the Hagersville Quarry currently reside closer than 300m. As such, it is likely Lafarge would be aware of the anticipated alterations in their blasting parameters required in order to remain compliant at these existing properties.

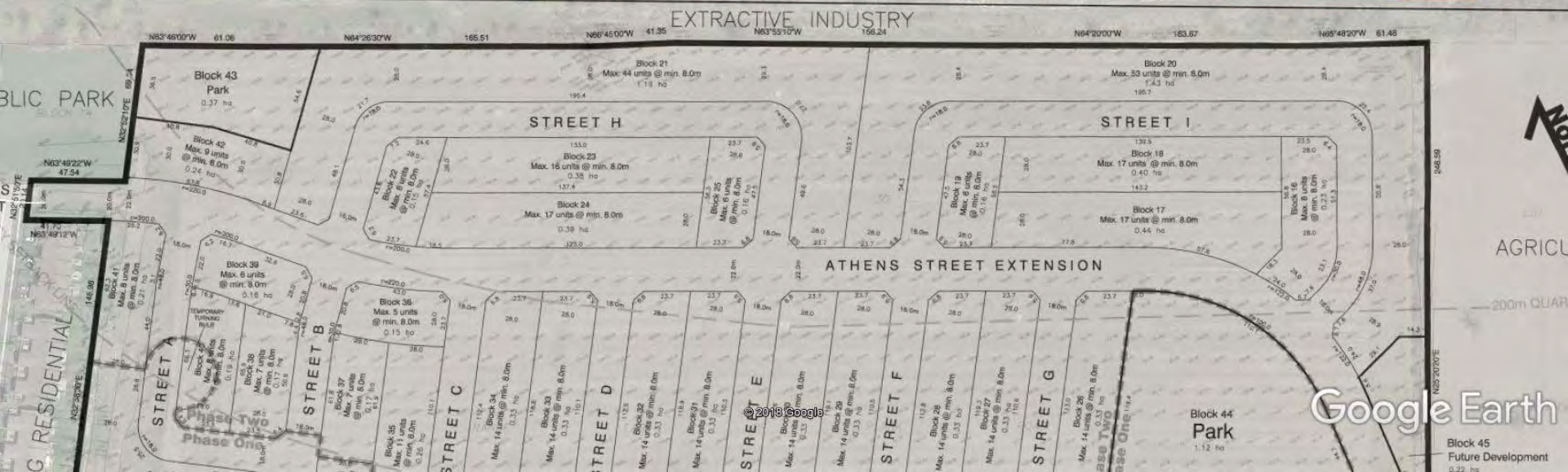


CONCLUSION

Based on the predicted and measured peak particle velocities and overpressures at the Lafarge Hagersville Quarry, it is the opinion of Explotech Engineering Ltd. that the planned development of the Gardens Communities Subdivision can coexist with the Lafarge mineral extraction operations, within the requirements stipulated under the Ministry of the Environment and Climate Change (MOECC) Model Municipal Noise Control By-law (NPC 119) with regard to Guidelines for Blasting in Mines and Quarries. However, while the above information holds true, the development of residential structures as close as 60 meters to the Hagersville Quarry will require dramatic alterations to blasting parameters and subsequent increase in blasting costs to remain in compliance with MOECC guidelines at this distance.

Appendix A

Proposed Sensitive Receptor Overview



Appendix B

Existing Sensitive Receptor Overview



1 Athens Street

29 Carrick Street

3 Athens Street

5 Athens Street

27 Carrick Street

25 Carrick Street

26 Carrick Street

12 Athens Street

24 Carrick Street

14 Carrick Street

21 Carrick Street

22 Carrick Street

44 Cedar Street

20 Carrick Street

33 Cedar Street

29 Cedar Street

34 Cedar Street

18 Carrick Street

25 Cedar Street

32 Cedar Street

16 Carrick Street

21 Cedar Street

17 Cedar Street

13 Cedar Street

22 Cedar Street

9 Cedar Street

20 Cedar Street

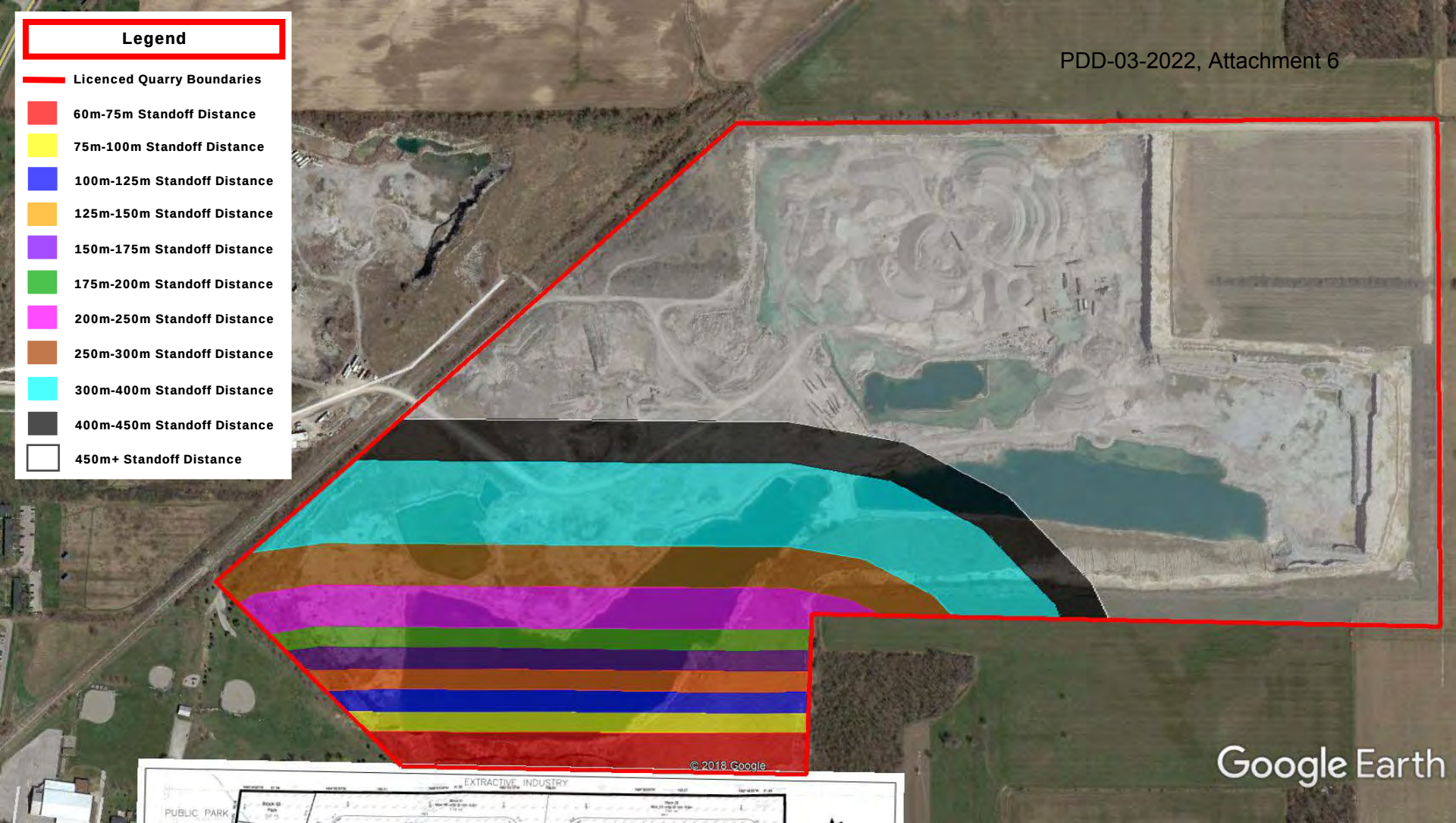
10 Cedar Street

Appendix C

Quarry Setback Distance Overview

Legend

-  Licenced Quarry Boundaries
-  60m-75m Standoff Distance
-  75m-100m Standoff Distance
-  100m-125m Standoff Distance
-  125m-150m Standoff Distance
-  150m-175m Standoff Distance
-  175m-200m Standoff Distance
-  200m-250m Standoff Distance
-  250m-300m Standoff Distance
-  300m-400m Standoff Distance
-  400m-450m Standoff Distance
-  450m+ Standoff Distance

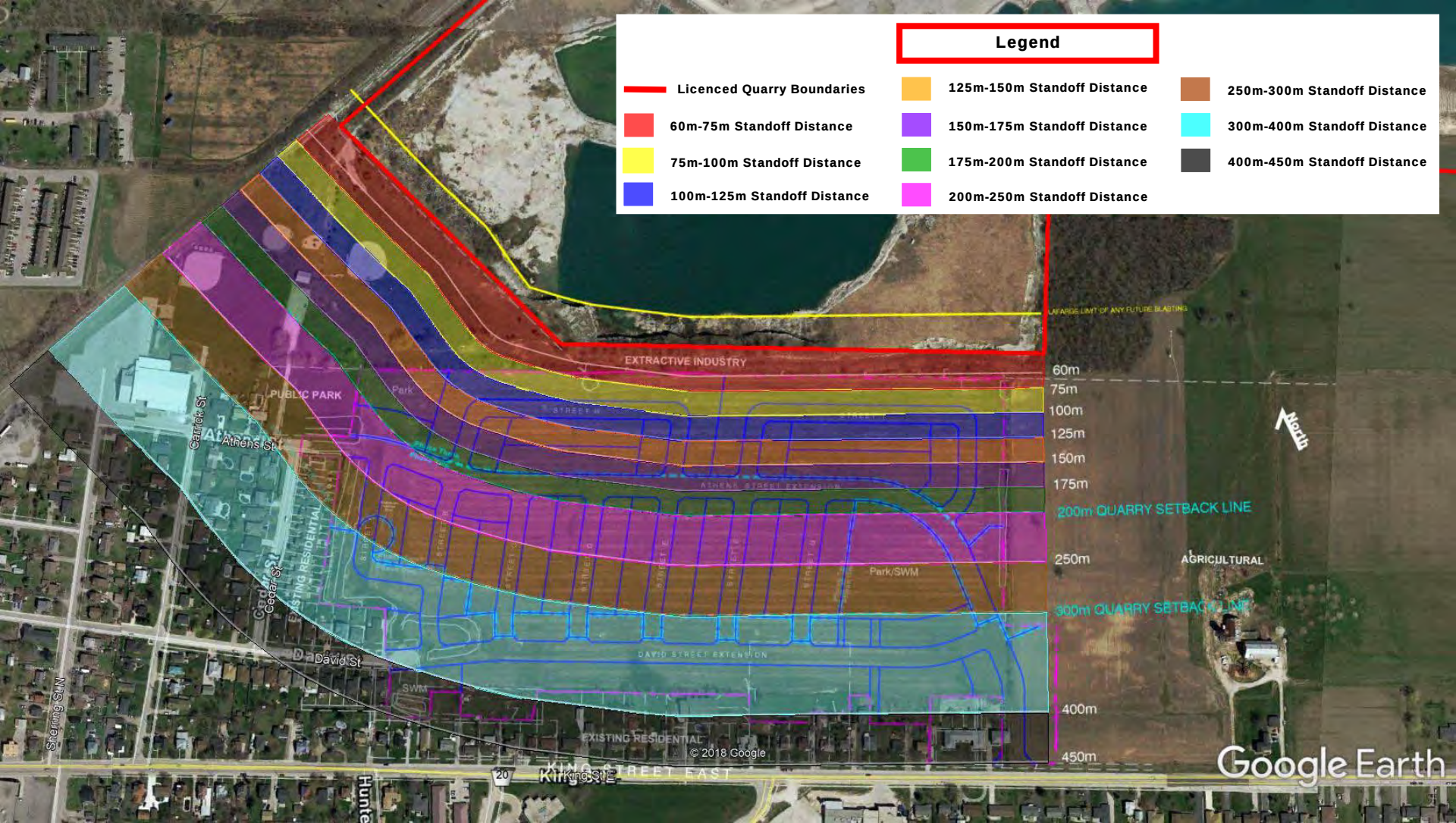


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Google Earth

Appendix D

Subdivision Setback Distance Overview



Appendix E

Regression Line for Calculated Quarry Blasts

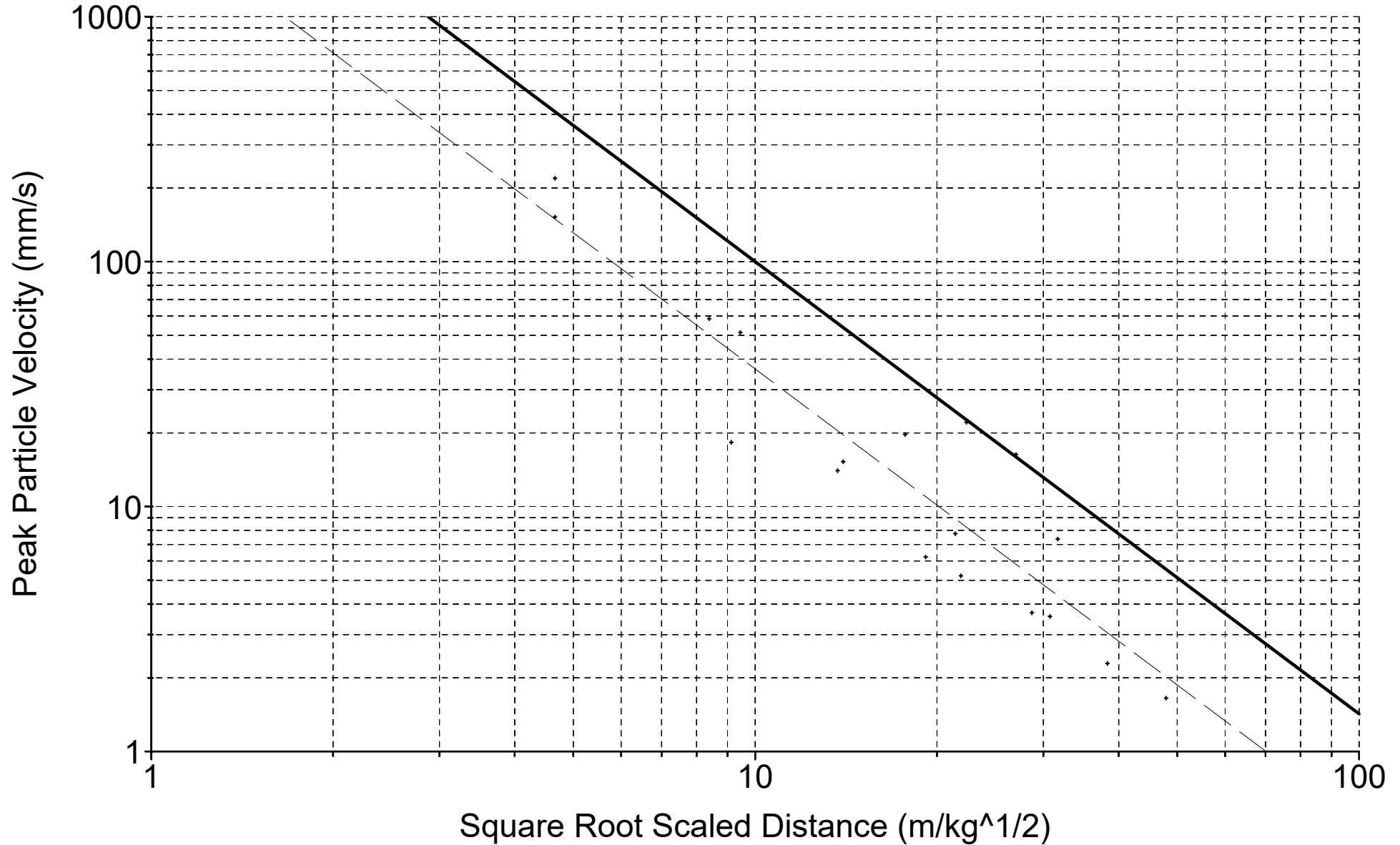
Regression Behind the shot

PDD-03-2022, Attachment 6

Regression Line For M3932A AECON 2003 BEHIND.SDF

95% Line Equation: $V = 7025.0 * (SD)^{-1.847}$

Coefficient of Determination = 0.854 Standard Deviation = 0.219



Appendix F

Curriculum Vita of Report Writers



Specialists in Explosives, Blasting and Vibration
Consulting Engineers

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
International Society of Explosives Engineers (ISEE)
Aggregate Producers Association of Ontario (APAO)
Surface Blaster Ontario Licence 450109

SUMMARY OF EXPERIENCE

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

PROFESSIONAL RECORD

2001 – Present	-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

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Matt Morling

Explotech Engineering Ltd.

EDUCATION

Police Foundations,
Algonquin College

Human Resources Management,
Algonquin College

PROFESSIONAL AFFILIATIONS

International Society of Explosives Engineers (ISEE)

SUMMARY OF EXPERIENCE

Hard-working and motivated, Matt holds multiple diplomas from Algonquin College. Strong leadership skills who works well in a team oriented environment and excels in communication. Matt has the ability to manage projects and thrive under various pressure intensive situations. Recent projects have focused on vibration analysis, job estimation, blast monitoring and damage complaint investigations.

PROFESSIONAL RECORD

2013 – Present - Technician, Explotech Engineering Ltd.

APPENDIX D

Blast Impact Analysis to Include Newly Acquired Lands, prepared by Explotech dated August 27, 2018



Specialists in Explosives, Blasting and Vibration
Consulting Engineers

August 27, 2018

IBI Group
410 Albert Street, Suite 101
Waterloo, Ontario
N2L 3V3

Attention: Mr. David Sisco

**Re: Gardens Communities Subdivision Land Use Compatibility Study
Report Amendment – Blast Impact Analysis to Include Newly Acquired Lands**

EXECUTIVE SUMMARY

Explotech Engineering Ltd. was retained in October 2017 to provide a Blast Compatibility Analysis for the proposed Gardens Communities Subdivision Development located on Part of Lot 30, Range East of Plank Road and Part of Lot 26, Registrar's Complied Plan 73 (Geographic Township of Oneida), Town of Hagersville, Haldimand County. Specifically, this study was undertaken to identify land use compatibility issues between the proposed residential development and the existing blasting operations ongoing at Lafarge Canada's Hagersville Quarry located to the North of the proposed subdivision.

On November 11, 2017, Explotech Engineering Ltd. completed a site visit of the development area and reviewed all available site maps and operational plans provided by Empire Communities. Our analysis of the predictable derivatives associated with the blasting concluded that the planned subdivision development can coexist with the adjacent mineral extraction operations at Lafarge Canada's Hagersville Quarry in a safe manner and within Ministry of the Environment, Conservation and Parks (MEPC) guidelines. Notwithstanding, Explotech did make note that the development of the residential subdivision may impose the need for operational changes at the Lafarge Hagersville Quarry, depending on the specific location of future blasting and standard blasting practices at the quarry.

On August 21, 2018, Explotech was advised that additional lands had been purchased by Gardens Communities (Hagersville) Ltd. for the purpose of increasing the size of the originally planned subdivision. The newly acquired land is located directly to the East of Phases 1 and 2 of the proposed subdivision and is bound by the Lafarge Hagersville Quarry to the North, King Street East to the South and open farm land and sparse residential homes to the East (refer to Appendix A). In light of this, Explotech has again been retained to discuss the impacts of the newly acquired land on the existing Lafarge Canada Hagersville Quarry and on the proposed subdivision development. This brief report summarizes our findings.

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INTRODUCTION

The comments contained within this report are supplemental to those provided in the Phase 1 and 2 study and report titled *Hagersville Subdivision Land Compatibility Study – Final Revision 1* submitted by Explotech on April 30, 2018. New land has been acquired by the developer for the purpose of constructing additional residential properties in the vicinity of the adjacent Lafarge Hagersville Quarry. This newly acquired land is situated directly to the East of Phases 1 and 2 of the original subdivision development and directly to the South of the Lafarge Hagersville Quarry.

This brief Blast Compatibility Analysis has been prepared to assess the potential for the newly acquired Gardens Communities Subdivision lands to coexist with the adjacent Lafarge Hagersville Quarry in accordance with requirements stipulated under the MEPC NPC 119 with regard to Guidelines for Blasting in Mines and Quarries. Additionally, we have investigated the need for any special provisions or operational changes required at either property in order to permit or maintain reasonable use.

IMPACTS OF NEWLY ACQUIRED LAND AREA

With this latest land purchase, the Gardens Communities Subdivision property now fronts onto the entirety of the Southern boundary of the Hagersville Quarry. Unfortunately to date, Explotech has not received current blasting parameters or specific locations of ongoing blasting operations at the quarry. As such, for the purposes of both reports, a maximum permissible load table and typical blasting parameters for given setback distances was developed to account for any given location at which blasting is currently being conducted. The setback distances as noted in the report from the perspective of the Hagersville Quarry can be found in Appendix C of the April 30, 2018 report. These same setback distances were also calculated from the perspective of the subdivision to illustrate the encroachment on blasting operations as the development expands and can be shown in Appendix D of the aforementioned report. The inclusion of the newly acquired land area has necessitated the need for a revised setback distance overview from the perspective of both the Hagersville Quarry and Gardens Communities Subdivision. These revised aerial overviews can be found attached to this report in Appendix B and C respectively.

At this time, Explotech is not in possession of any construction drawings relating to the exact location of the construction of residential properties in the newly acquired land area. As such, we have assumed that the approximate setback distances from the newly constructed homes to the Hagersville Quarry is the same as the drawings for Phase 2 of the originally proposed development. This would dictate that the closest point of blasting operations would be in the order of 60m from the closest proposed sensitive receptor (i.e. new residence). In light of this, ground vibration and air overpressure calculations remain the same as noted in the April 30, 2018 report.



We do note that in the previously submitted report, Explotech made mention of the escalation in drill and blast costs associated with the construction of Phase 2 of the proposed subdivision encroaching on the adjacent Hagersville Quarry. The development of residential properties on the newly acquired land will further increase these costs as maximum allowable loads will require reduction over a significantly greater footprint area as blasting operations progress across the quarry. To reiterate, any rock situated from 60m to 100m from the closest sensitive receptor in both proposed areas of the subdivision is likely to be sterilized due to economic reasons. Any excavation beyond a 100m setback distance is likely to remain economically feasible. However, costs associated with the drill and blast program are likely to be significantly elevated. Once again, the inclusion of the newly acquired lands for the Gardens Communities Subdivision significantly increases the surface area over which these escalated costs and sterilized rock factor into the Lafarge drill and blast program.

CONCLUSION

Based on the predicted peak particle velocities and overpressures at the Lafarge Hagersville Quarry as concluded in the *Hagersville Subdivision Land Compatibility Study – Final Revision 1* and the same assumed setback distances, it is the opinion of Explotech Engineering Ltd. that the planned development on the newly acquired Gardens Communities Subdivision lands can coexist with the Lafarge mineral extraction operations, within the requirements stipulated under the Ministry of the Environment, Conservation and Parks (MEPC) Model Municipal Noise Control By-law (NPC 119) with regard to Guidelines for Blasting in Mines and Quarries. However, while the above information holds true, the development of additional residential structures in the newly acquired area will cause to effect alterations to blasting parameters and subsequent increase in blasting costs over a significantly greater footprint area within the quarry to remain in compliance with MEPC guidelines than noted in the original April 30, 2018 report.

Appendix A

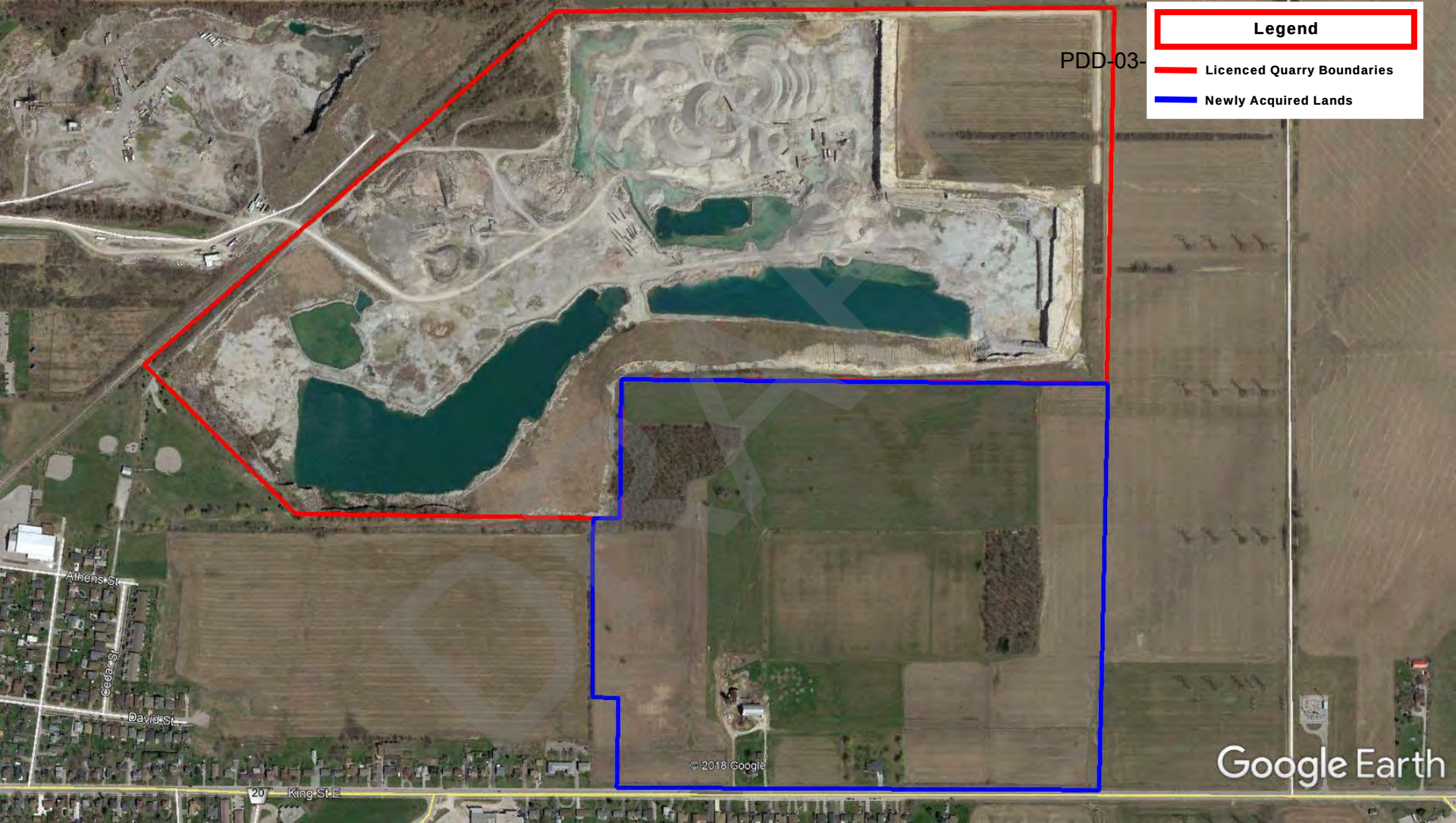
Newly Acquired Land Area

Legend

— Licenced Quarry Boundaries

— Newly Acquired Lands

PDD-03-

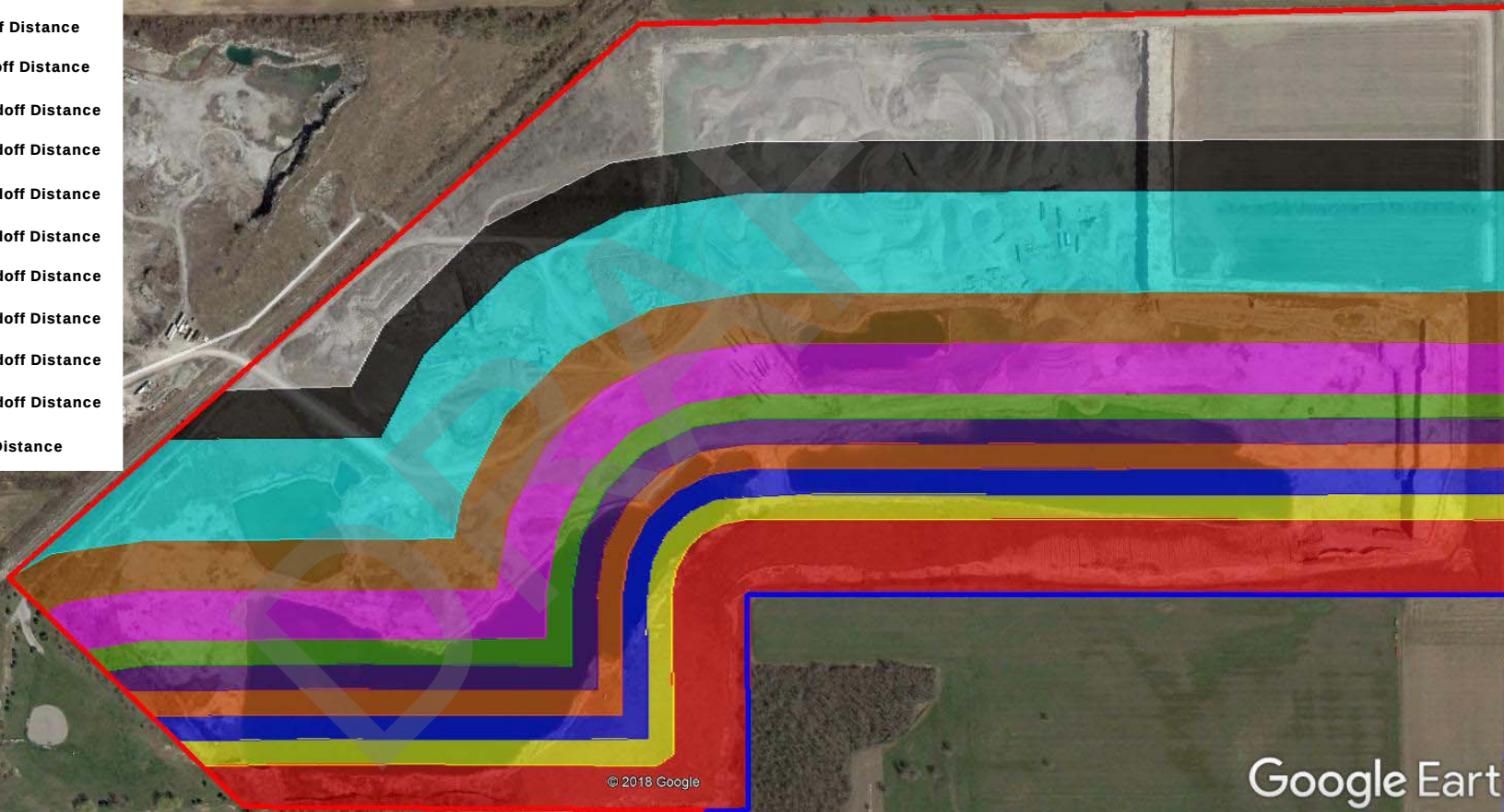


Appendix B

Hagersville Quarry Blasting Setback Distance Overview

Legend

- Licensed Quarry Boundaries
- Newly Acquired Lands
- 60m-75m Standoff Distance
- 75m-100m Standoff Distance
- 100m-125m Standoff Distance
- 125m-150m Standoff Distance
- 150m-175m Standoff Distance
- 175m-200m Standoff Distance
- 200m-250m Standoff Distance
- 250m-300m Standoff Distance
- 300m-400m Standoff Distance
- 400m-450m Standoff Distance
- 450m+ Standoff Distance

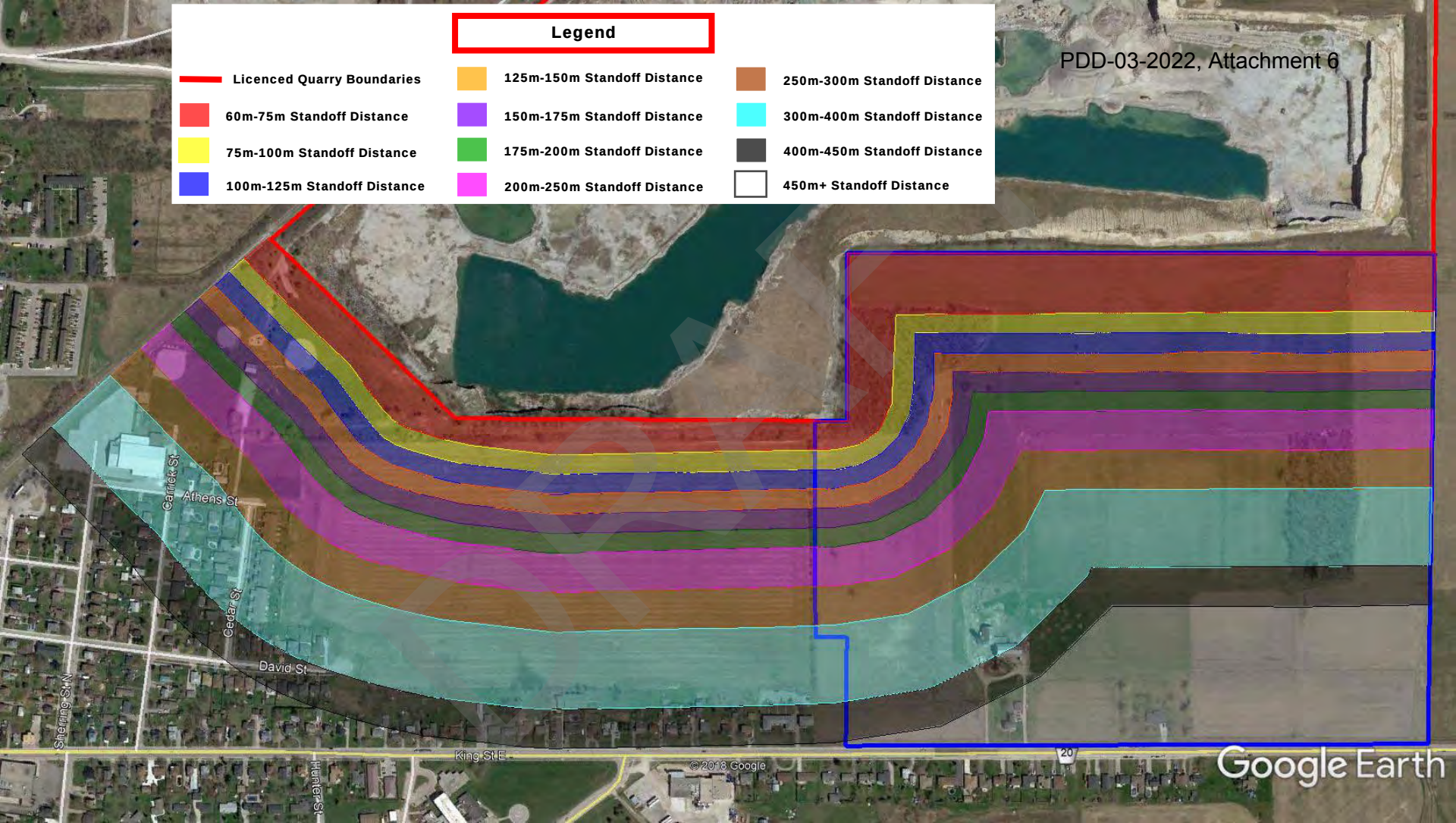


Appendix C

Subdivision Setback Distance Overview

Legend

— Licenced Quarry Boundaries	 125m-150m Standoff Distance	 250m-300m Standoff Distance
 60m-75m Standoff Distance	 150m-175m Standoff Distance	 300m-400m Standoff Distance
 75m-100m Standoff Distance	 175m-200m Standoff Distance	 400m-450m Standoff Distance
 100m-125m Standoff Distance	 200m-250m Standoff Distance	 450m+ Standoff Distance



LAND USE IMPACT ASSESSMENT OF GARDEN COMMUNITIES (HAGERSVILLE) LTD.
DRAFT PLAN OF SUBDIVISION AND LAFARGE HAGERSVILLE QUARRY

Prepared for Garden Communities (Hagersville) Ltd.

APPENDIX E

Haldimand Gardens AQ – Noise-Vibration Report, Prepared by RWDI, dated April 30, 2018

April 30, 2018

David Sisco
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
T: 519.585.2255
david.sisco@ibigroup.com

**Re: Haldimand Gardens AQ-Noise-Vibration
RWDI Reference No. 1802414**

Dear Mr. Sisco,

RWDI completed air quality and noise modelling of operations at the Lafarge quarry in Hagersville, Ontario. The objective was to predict impacts on a residential development adjacent to the quarry site, proposed by Garden Communities (Hagersville) Ltd., and recommend mitigation measures. This letter briefly describes the modelling and summarizes the findings.

OVERVIEW OF LAFARGE OPERATIONS

The quarry adjacent to the lands held by Garden Communities (Hagersville) Ltd. is operated under Amended Licence 4443, issued by the Ministry of Natural Resources and Forestry in 2015. The licence permits removal of 862,000 tonnes per year. Blasting is limited to the period between 8:00am and 6:00pm. The licence does not otherwise limit the hours of operation.

The plans allow for extraction to a depth of approximately 197 m ASL. Much of the southernmost part of the quarry has already been extracted to this depth, but the possibility exists for Lafarge to extend the lowest lift northward, westward and eastward. This would entail dewatering, drilling, blasting, loading and processing operations in this part of the quarry.

The latest site plans, dated 2009, designate a processing/stockpiling area, but the notes indicate that processing can occur seasonally at the active face, subject to a 90m separation distance from any part of the licence boundary that abuts land zoned for residential purposes.

Lafarge has another licence, 607801, located adjacent to and northwest of Licenced quarry 4443, issued in 2007. This licence allows for drilling, blasting and operation of a portable processing plant on the quarry floor. Hours of operation for licenced quarry 607801 are 7:00am to 7:00pm.

LAFARGE'S AIR QUALITY AND NOISE REGULATORY OBLIGATIONS

Prescribed conditions under the Aggregate Resources Act (ARA) require dust to be mitigated on site, water or an approved dust suppressant to be applied to internal haul roads and processing areas as needed to mitigate dust, and processing equipment located within 300 m of a sensitive receptor to be equipped with dust control devices. In addition, Ontario Regulation 419/05 (Local Air Quality) prohibits

Lafarge from discharging any air contaminant in an amount that exceeds its standard at any point on or outside the property boundaries of the quarry. Regulation 419/05 also prohibits Lafarge from emitting an air contaminant (including noise) that causes discomfort to persons, loss of enjoyment of normal use of property, interference with normal conduct of business or damage to property.

Section 9 of the Environmental Protection Act (EPA) prohibits Lafarge from constructing, altering or operating anything that discharges an air contaminant without first obtaining an Environmental Compliance Approval (ECA) from the Ontario Ministry of Environment and Climate Change (MOECC). A potentially important exception to this rule is a mobile processing plant that is operated below grade. In this context, the term “mobile” refers to an aggregate processing plant that operates at any one site for no more than 60 days in a calendar year. When operated below grade, on the floor of a pit or quarry, a mobile plant is exempt from Section 9 of the EPA.

If Lafarge intends to operate a plant at this site for more than 60 days per year, then it must have an appropriate ECA. Such an ECA would include conditions requiring the equipment to comply with the provinces Environmental Noise Guideline (NPC-300). If the plant operates at this site for less than 60 days per year, then an ECA for the plant is not required and Lafarge is not necessarily subject to NPC-300. However, non-compliance with NPC-300 would put Lafarge at risk of causing discomfort to persons and loss of enjoyment of normal use of property at nearby residences, which is prohibited under Regulation 419/05. Therefore, compliance with NPC-300 is in Lafarge’s best interest.

The operational plans for Licence 607801 include noise mitigation measures, consisting of three options for noise barriers, primarily intended to address noise from drilling. The plans for Licence 4443 contain no noise mitigation measures.

SCOPE OF MODELLING

The modelling focussed on the operation of a processing plant within the section of the Lafarge quarry that is closest to the lands held by Garden Communities (Hagersville) Ltd. (Areas 1 and 2 shown on the operational plan that was originally approved by MNR in 2009). Area 2 is a designated processing and stockpiling area, but a temporary plant could operate in Area 1. As we have no information on the actual equipment that Lafarge would use, we have made reasonable assumptions about the size and make-up of the equipment, based on our experience with other quarries.

We conducted air quality modelling to determine whether or not Lafarge would need to adopt a setback from the property boundary for the processing plant, above and beyond any setbacks already noted on the site plans, in order to comply with provincial point of impingement standards for air contaminants. The provincial air quality standards apply at and beyond the quarry property boundary, regardless of whether the lands held by Garden Communities (Hagersville) Ltd. are developed.

The modelling focussed on a single, worst-case air contaminant, total oxides of nitrogen (NO_x) emitted by the diesel engine on the processing plant. The assumed parameters of the diesel engine are listed in Table 1.

Table 1: Parameters of the Processing Plant Engine for the Air Quality Modelling

Gross power rating (kW)	610
Exhaust temperature (°C)	478
Exhaust flow rate (m ³ /s)	2.2
Exhaust pipe diameter (m)	0.3
Stack height above grade (m)	4.0
Base elevation of the processing plant (m ASL)	197
Exhaust pipe configuration	Both horizontal and vertical discharge were tested in the computer simulation
NO _x emission rate (g/kW-h)	6.4
NO _x emission rate (g/s)	1.1

We ran AERMOD Version 16216r, which is a computer simulation of air pollutant dispersion, and is the preferred dispersion model for regulatory applications in Ontario. The model incorporated a meteorological data set for rural locations in southwestern Ontario, which we obtained from the Ontario Ministry of Environment and Climate Change (MOECC). The meteorological data are based on five years of hourly surface weather observations at London Airport and daily upper air weather observations from an upper air observing station at White Lake, Michigan.

The model incorporated digital terrain data. When interpreting the model results, consideration was given to the fact that Garden Communities (Hagersville) Ltd. intends to import fill at the development site, which will increase the terrain elevation by approximately 1.3 m.

We set up the air quality model to test several possible locations for the processing plant within the Lafarge quarry. In each case, the model predicted the maximum 1-hour and 24-hour concentration of NO_x at a grid of off-site impact locations (receptors), including receptors on the proposed development lands. We compared the predicted concentrations to the provincial standards for NO_x concentration.

After completing the air quality modelling, we conducted noise modelling, using a commercially available computer noise simulation called CADNA/A, a commercially available implementation of the ISO 9613 algorithms. The model accounts for the various factors that influence sound propagation, including the sound power levels of the equipment, separation distances from the receptors, the effects of topography, effects of barriers, ground and atmospheric attenuation, etc. We adopted a global ground absorption coefficient of 0.7 to represent the area surrounding the quarry, and for the quarry floor itself, we adopted a local ground absorption coefficient of 0.1.

In the absence of site-specific information for the Lafarge site, we assumed as a starting point that the processing plant would have multiple crushers and screens, powered by a single diesel engine. The sound power levels for the equipment were based on a previous project at another quarry, where RWDI measured the sound emissions from the equipment.

The processing plant was represented in a simplified fashion, as a single point source with an overall sound power level of 127 dBA. As with the air quality simulation, we tested several possible processing plant locations in the noise simulation. In all cases, we assumed the plant would be located on the quarry floor, at an elevation of 197 m ASL, and that the ground elevation on the Garden Communities (Hagersville) Ltd. lands would be approximately 223 m ASL, taking into account the proposed addition of 1.3 m of clean fill over the site. Receptors were placed throughout the proposed development lands. We assumed that residential buildings within the proposed development would have a maximum of 2 storeys, and adopted 4.5m as the receptor height, representing the typical height of a 2nd storey window.

Lastly, we assumed that the proposed development would be in a Class 2 area, as defined in Ontario's Environmental Noise Guideline (NPC-300). A Class 2 area is one in which the daytime sound environment is dominated by the activities of people, especially road traffic, and the nighttime sound environment is dominated by natural sounds. We assumed that the background sound levels would be no higher than 50 dBA during daytime and 45 dBA at night. In that case, the Environmental Noise Guideline specifies limits of 50 dBA during daytime and 45 dBA at night for the impact of noise from stationary sources, such as Lafarge's processing plant, at residential windows.

RESULTS

The preliminary air quality modelling indicates that a processing plant operating in the quarry will comply with provincial standards for 1-hour and 24-hour concentrations of NO_x at and beyond the property boundary under the following conditions:

- The diesel engine on the processing plant meets US EPA Tier 2 emission limits or better;
- The diesel engine remains at least 90m away from the nearest part of the property boundary.

These conditions are unaffected by the proposed Garden Communities (Hagersville) Ltd. development, as the provincial air quality standards apply regardless of the type of surrounding land use.

The preliminary noise modelling indicates that mitigation measures are needed in order for noise from the processing plant to be compliant with provincial noise guidelines (NPC-300).

Without the proposed development in place, the following mitigation would achieve compliance with NPC-300:

- the processing plant should be operated during daytime hours only (7am to 7pm);
- If Lafarge can select equipment for the plant with a combined sound power level of 120 dBA or less, then no other mitigation would be required;
- Otherwise, if the combined sound power level is above 120 dBA (we estimated it to be 127 dBA, based on past experience at other sites), then a noise barrier would be needed around the processing plant. This could be achieved by maintaining 11m high (approx.) stockpiles between the processing equipment and the proposed development lands.
- Drilling operations could have a similar magnitude of noise emissions to a processing plant, and would be subject to similar mitigation requirements to the plant.

With Phase 1 of the proposed development, the measures to achieve compliance would be the same as above. Development of Phase 1 does not trigger any additional measures to meet NPC-300.

With Phase 2 and 3 of the proposed development in place, the following mitigation would achieve compliance with NPC-300:

- the processing plant should be operated during daytime hours only (7am to 7pm);
- If Lafarge can select equipment for the plant with a combined sound power level of 120 dBA or less, then a 7 m high berm (approx.) adjacent to the property boundary between the proposed development lands and the Lafarge lands is required.
- If the combined sound power level is above 120 dBA (we estimated it to be 127 dBA, based on past experience at other sites), then a noise barrier would be needed around the processing plant. This could be achieved by maintaining 13m high stockpiles (approx.). In addition, a 7 m higher berm (approx.) adjacent to the property boundary between the proposed development lands and the Lafarge lands is required.
- Note that the berm may not afford adequate protection to Block 45 and the eastern leg of Block 20 of the proposed development, depending on where the Lafarge processing plant is located (see Figure 1).
- Drilling operations could have a similar magnitude of noise emissions to a processing plant, and would be subject to similar mitigation requirements to the plant.

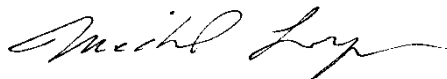
Based on the above findings, Phase 2 of the proposed development requires a perimeter berm, and depending on the level of noise emissions from the Lafarge equipment, may also require a higher local barrier around the processing plant and drill rig than would otherwise be needed for the benefit of existing residences and Phase 1 of the proposed development.

Subject to Lafarge's cooperation, we recommend that these findings be refined by measuring specific sound power levels associated with the actual equipment that Lafarge's uses at this quarry, and by modelling the specific anticipated layout of the equipment that Lafarge would operate in the Areas 1 or 2 of the quarry.

We trust that this information meets your present needs.

Yours truly,

RWDI



Mike Lepage, M.Sc., ACM, CCM
Senior Consultant / Principal



Peter VanDelden, P.Phys., INCE
Technical Director – Noise & Vibration / Associate



Alain Carrière, B.A., Dipl. Ecotox
Senior Project Manager / Associate

ML/AJC/PV/klm
Attach.

LAND USE IMPACT ASSESSMENT OF GARDEN COMMUNITIES (HAGERSVILLE) LTD.
DRAFT PLAN OF SUBDIVISION AND LAFARGE HAGERSVILLE QUARRY

Prepared for Garden Communities (Hagersville) Ltd.

APPENDIX F

Haldimand Gardens AQ – Noise-Vibration Report, Prepared by RWDI, dated November 14, 2018

November 14, 2018

David Sisco
IBI Group
410 Albert Street, Suite 101
Waterloo, ON N2L 3V3
T: 519.585.2255
david.sisco@ibigroup.com

**Re: Haldimand Gardens AQ-Noise-Vibration
RWDI Reference No. 1802414**

Dear Mr. Sisco,

RWDI completed air quality and noise modelling of operations at the Lafarge quarry in Hagersville, Ontario. The objective was to predict impacts on a residential development adjacent to the quarry site, proposed by Garden Communities (Hagersville) Ltd., and recommend mitigation measures. This letter is an addendum to RWDI's previous letter dated May 14th, 2018 focusing on the further development of Lot 30 situated southeast of the previously assessed development site. For the purposes of this letter, RWDI has defined this extension of the development as Lot "B" and the property assessed in the May 14th letter as Lot "A". The locations of these lots, in relation to the adjacent quarry, are detailed in the attached Figure 1. Details regarding Lafarge operations and the scope of modelling are consistent with that of the Lot "A" assessment within the May 14th, 2018 letter and thus have not been repeated in this memo.

RESULTS

The previous preliminary air quality modelling with respect to Lot "A" indicated that a processing plant operating in the quarry will comply with provincial standards for 1-hour and 24-hour concentrations of NO_x at and beyond the property boundary under the following conditions:

- The diesel engine on the processing plant meets US EPA Tier 2 emission limits or better;
- The diesel engine remains at least 90m away from the nearest part of the property boundary.

These conditions apply equally to the development being considered in this memo. The conditions are unaffected by the proposed Garden Communities (Hagersville) Ltd. development, as the provincial air quality standards apply regardless of the type of surrounding land use. Based on these air quality findings, the noise modelling assumes that the diesel engine for any processing plant at the quarry will not be located any closer to the property boundary than 90m.

The preliminary noise modelling indicates that mitigation measures are needed in order for noise from the processing plant to be compliant with provincial noise guidelines (NPC-300).

Without the proposed development in place, the following mitigation would achieve compliance with NPC-300 at existing residences along King Street East:

- the processing plant should be operated during daytime hours only (7am to 7pm);
- If Lafarge can select equipment for the plant with a combined sound power level of 120 dBA or less, then no other mitigation would be required;
- Otherwise, if the combined sound power level is above 120 dBA (we estimated it to be 127 dBA, based on past experience at other sites), then a noise barrier would be needed around the processing plant. This could be achieved by maintaining 13m high (approx.) stockpiles between the processing equipment and the proposed development lands.
- Drilling operations could have a similar magnitude of noise emissions to a processing plant and would be subject to similar mitigation requirements to the plant.

With the proposed development in place, additional mitigation measures may be needed, depending on the ultimate extent of the development. The following mitigation would achieve compliance with NPC-300:

- the processing plant should be operated during daytime hours only (7am to 7pm);
- If Lafarge can select equipment for the plant with a combined sound power level of 120 dBA or less, then a berm ranging in height from 5.75 to 7.0 m is required along the boundary between the quarry and the development land. This berm is an extension to the 7 m high berm required for compliance at lot "A", as detailed in the May 14th, 2018 letter. The location and heights of the required berm are detailed in Figure 2. This berm is required only for a portion of the property that is relatively close to the quarry. The area that is compliant without the berm is illustrated in Figure 3.
- If the combined sound power level is above 120 dBA (we estimated it to be 127 dBA, based on past experience at other sites), then a noise barrier would be needed around the processing plant in addition to the aforementioned berm. This could be achieved by maintaining 13m high stockpiles (approx.). As in the previous case, the berm is only required for a portion of the development site that is relatively close to the quarry. Locations that are compliant without the berm, but with the 13m high barrier around the plant, are illustrated in Figure 4.

Subject to Lafarge's cooperation, we recommend that these findings be refined by measuring specific sound power levels associated with the actual equipment that Lafarge's uses at this quarry, and by modelling the specific anticipated layout of the equipment that Lafarge would operate in the Areas 1 or 2 of the quarry.

We trust that this information meets your present needs.

Yours truly,

RWDI

A handwritten signature in black ink, appearing to read "Mike Lepage".

Mike Lepage, M.Sc., ACM, CCM
Senior Consultant / Principal

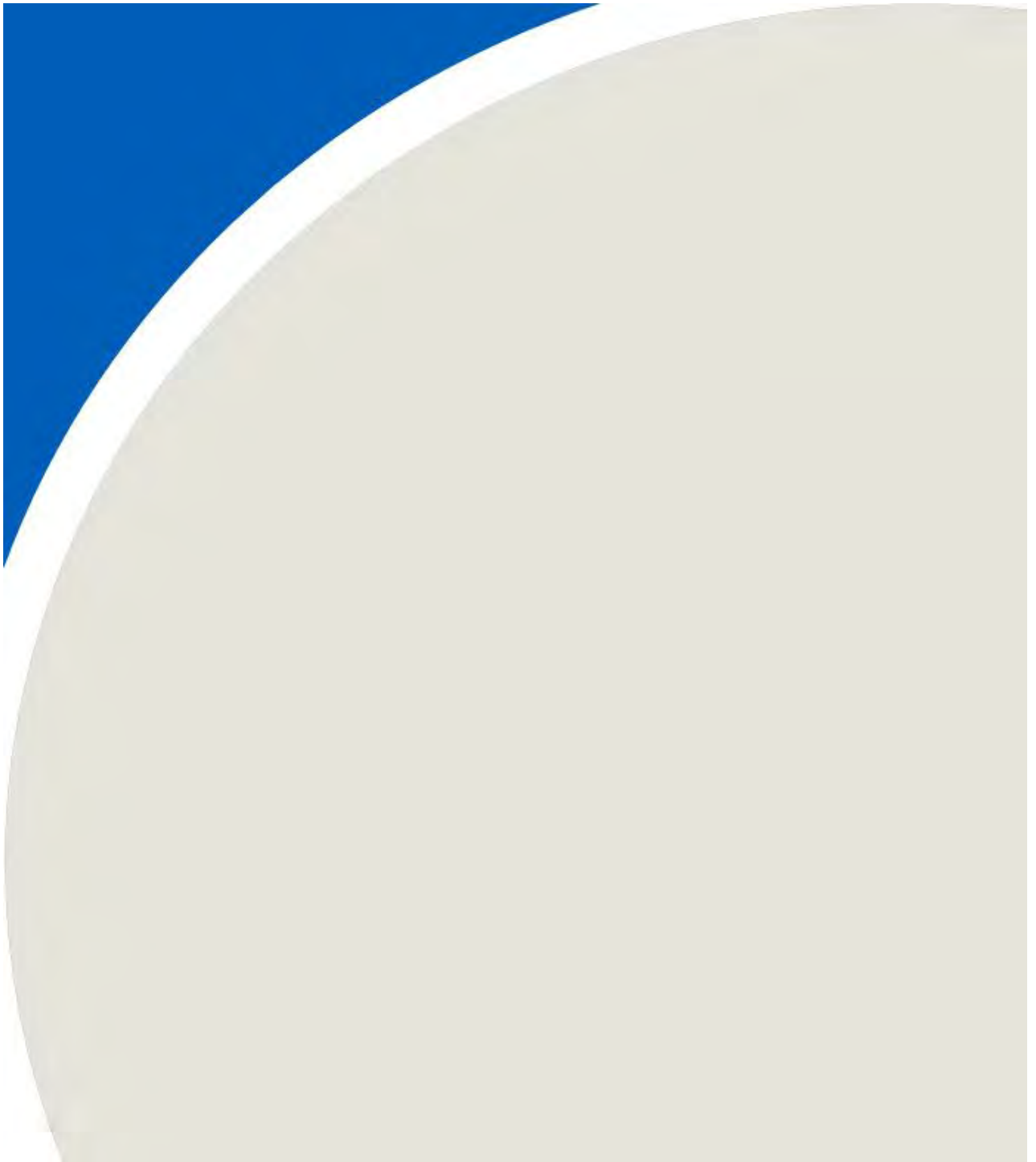
A handwritten signature in black ink, appearing to read "Alain Carrière".

Alain Carrière, B.A., Dipl. Ecotox
Senior Project Manager / Associate

MFL/AJC/klm
Attach.



FIGURES





Locations of Proposed Development Lots in Relation to Adjacent Quarry

Haldimand Gardens - Hagersville, Ontario

True North



Project #1802414

Drawn by: KAMH Figure: **1**

Scale: 1:12000

Date: Nov. 5, 2018





Location and Heights of Required Property Berm

Haldimand Gardens - Hagersville, Ontario

True North



Project #1802414

Drawn by: KAMH Figure: **2**

Scale: 1:12000

Date: Nov. 5, 2018





Limit of Compliance
Plant PWL of 120 dBA, No Perimeter Berm, No Processing Plant Barrier

Haldimand Gardens - Hagersville, Ontario

True North



Project #1802414

Drawn by: KAMH Figure: **3**

Scale: 1:12000

Date: Nov. 8, 2018





Limit of Compliance
Plant PWL of 127 dBA, No Perimeter Berm, 13m High Processing Plant Barrier

Haldimand Gardens - Hagersville, Ontario

True North



Project #1802414

Drawn by: KAMH Figure: **4**

Scale: 1:12000

Date: Nov. 8, 2018



LAND USE IMPACT ASSESSMENT OF GARDEN COMMUNITIES (HAGERSVILLE) LTD.
DRAFT PLAN OF SUBDIVISION AND LAFARGE HAGERSVILLE QUARRY

Prepared for Garden Communities (Hagersville) Ltd.

APPENDIX G

Reduced Copies of Lafarge Hagersville Quarry Site Plans – Licence 4443

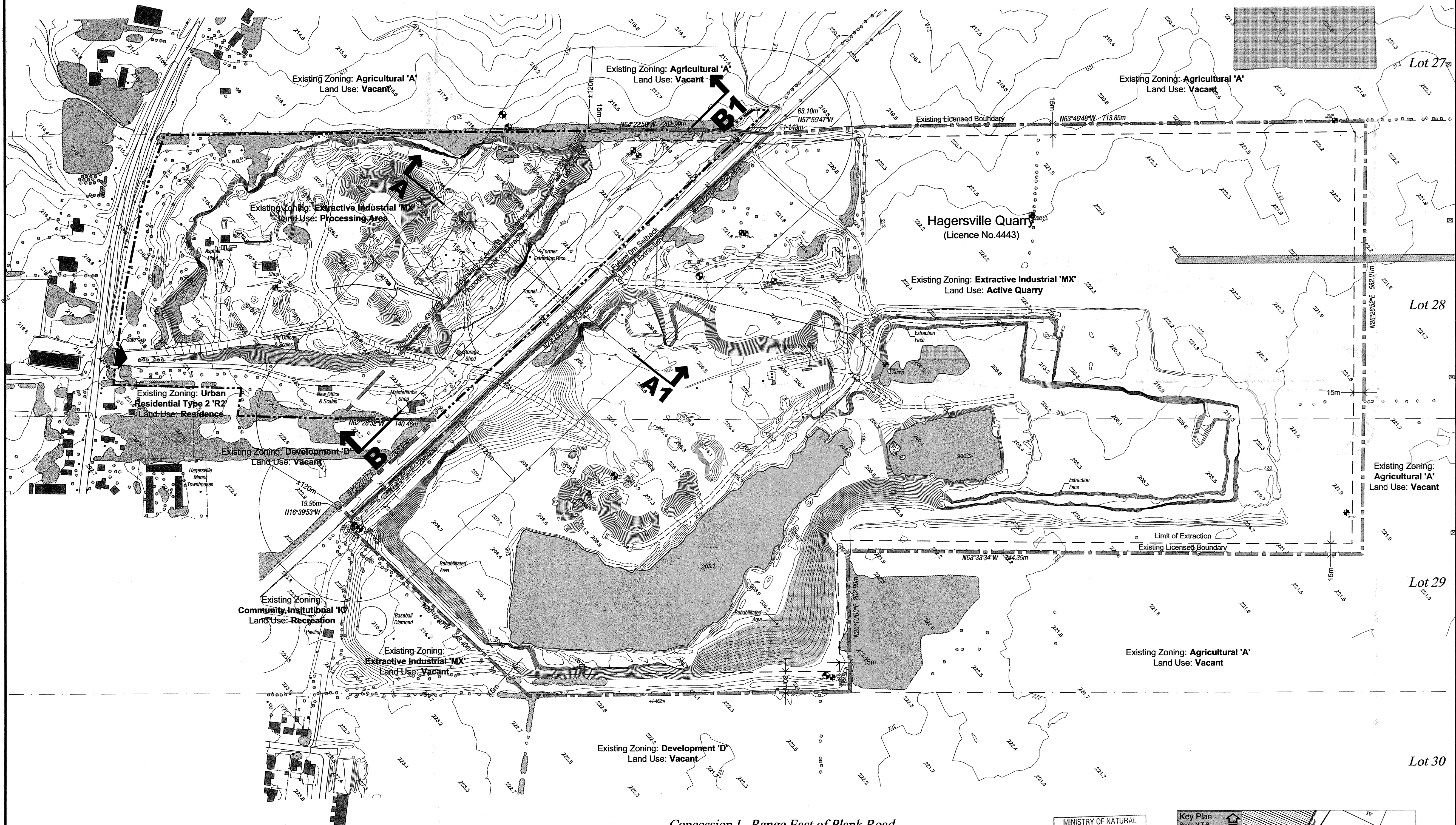
Existing Features

Legend

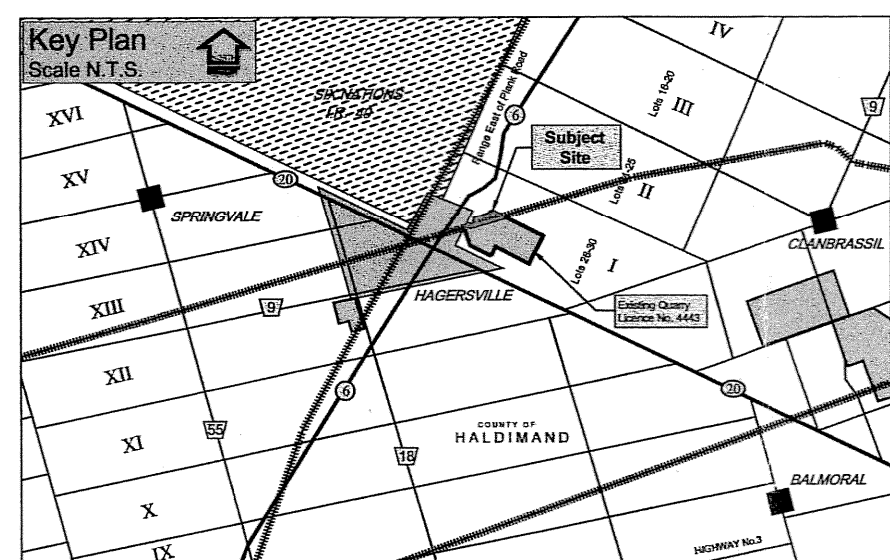
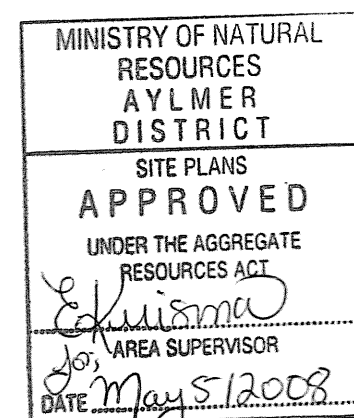
- | | | | |
|--|--|--|--|
| | Boundary of Area to be Licensed | | Other Lands owned by Lafarge |
| | Limit of Extraction | | Existing Limit of Extraction
(LICENSE NO. 444.3) |
| | Other Licensed Boundary
(LICENSE NO. 444.3) | | Hydro Pole Line |
| | Building/Structure
SEE PLAN FOR DESCRIPTION AND DIMENSIONS OF ONSITE BUILDINGS. | | Existing Ditch and/or Swale
ARROW INDICATES DIRECTION OF FLOW IF ANY |
| | Entrance / Exit
EXISTING ENTRANCE / EXIT WILL BE USED FOR ACCESS ONTO PUBLIC ROAD SYSTEM | | Elevation, Contour
METRES ABOVE MEAN SEA LEVEL |
| | Existing Spot Elevation
METRES ABOVE MEAN SEA LEVEL | | Existing Post and Wire Fence
1.2M POST & WIRE FENCE UNLESS OTHERWISE NOTED |
| | Existing Water Feature
AS INDICATED | | Existing Vegetation |
| | Water Well
MDE WELL RECORDS, GARNIER LEE LIMITED & LICENSEE RECORDS | | Hydrogeological Monitoring
(MONITORING AND DOMESTIC WELLS) |
| | Cross Sections
SEE PAGE 4 OF 4 FOR DESCRIPTION AND REHABILITATED CROSS SECTIONS | | Rehabilitated Area |

Notes:

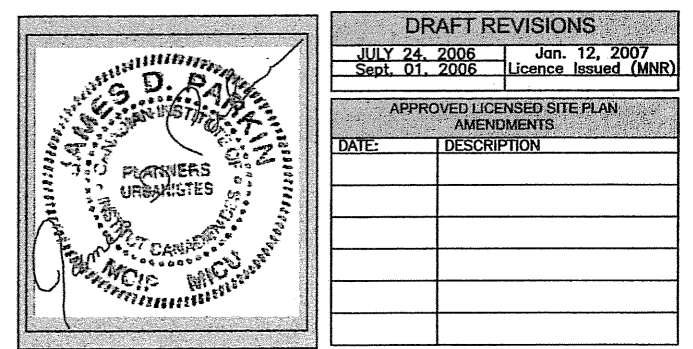
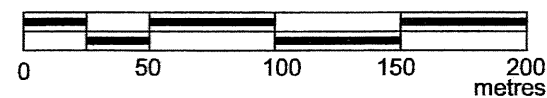
1. THESE SITE PLANS ARE PREPARED FOR SUBMISSION TO THE MINISTRY OF NATURAL RESOURCES IN CONJUNCTION WITH AN APPLICATION FOR A CLASS "A" LICENCE (CATEGORY 2) UNDER THE AGGREGATE RESOURCES ACT AND ITS REGULATIONS.
2. TOPOGRAPHIC INFORMATION PROVIDED BY NORTHWAY-PHOTOGRAPH INC. JUNE 2005, DERIVED FROM APRIL 2000 AERIAL PHOTOGRAPHY, CONTROL ESTABLISHED BY MINISTRY OF NATURAL RESOURCES AT 1:50,000 SCALE MAP SHEETS AND FIELD SURVEY. SITE AND TAILP PILE LOCATION BASED ON 2002 PHOTOGRAPHY PROVIDED BY GOLDEN ASSOCIATES. CONTOUR INTERVAL IS 10 METRE. ALL ELEVATIONS ARE GEODETIC.
3. PROPERTY BOUNDARY LOCATION AND DIMENSIONS OBTAINED FROM AGGREGATE RESOURCES HAGERSVILLE QUARRY SITE PLAN No. 4443, PREPARED BY HARRINGTON AND HOTLE LTD. IN JAN 1993.
4. SUBJECT LANDS ARE PRESENTLY ZONED "EXTRACTIVE INDUSTRIAL" (X1). ZONING INFORMATION OBTAINED FROM THE TOWN OF HALLAMHURD ZONING BY-LAW 1-H-88, SCHEDULES "AB" & "AF", CONSOLIDATED MAY 2004.
5. THERE ARE NO SURFACE WATER DRAINAGE FEATURES ON THE SITE.
6. LAND USE INFORMATION COMPILED FROM (1) AREA SITE PLANS FOR ADJACENT LICENCE No. 4443, AND (2) SITE VISIT DATED JULY 2005.
7. AREA TO BE LICENCED 9.11 ha. (22.51 ac.)
8. AREA TO BE EXTRACTED 6.77 ha. (16.73 ac.)
9. ELEVATION OF ESTABLISHED GROUND WATER TABLE ON THE SITE RANGES FROM +215.0m a.s.l. to +218.0m a.s.l. (SOURCE: LEVEL 1 HYDROGEOLOGY REPORT, PROPOSED HAGERSVILLE QUARRY EXTENSION, GOLDEN ASSOCIATES, JUNE 2006).
10. ALL MEASUREMENTS SHOWN ON THIS PLAN ARE IN METRES.
11. REFERS TO SHEETS 4 of 4 FOR CROSS SECTIONS, 3 of 4 FOR REHABILITATION PLAN AND TO SHEET 2 of 4 FOR OPERATIONS PLAN.



Concession I Range East of Plank Road



Scale 1:3000



171 Victoria Street North, Kitchener, Ontario, N2H 5C5
Telephone (519) 576-3650 Fax (519) 576-0121
www.mhbcplan.com

Licence No. 607801
PROJECT NAME:

Job No.	9526AN Lafarge Hagersville Quarry Extension	
Dwn. By	I.C.	Chkd. By J.P.
File No.	K:\9526AN_LAFARGE_HAGERSVILLE_QUARRY_EXT\WIDEPLAN.dwg	

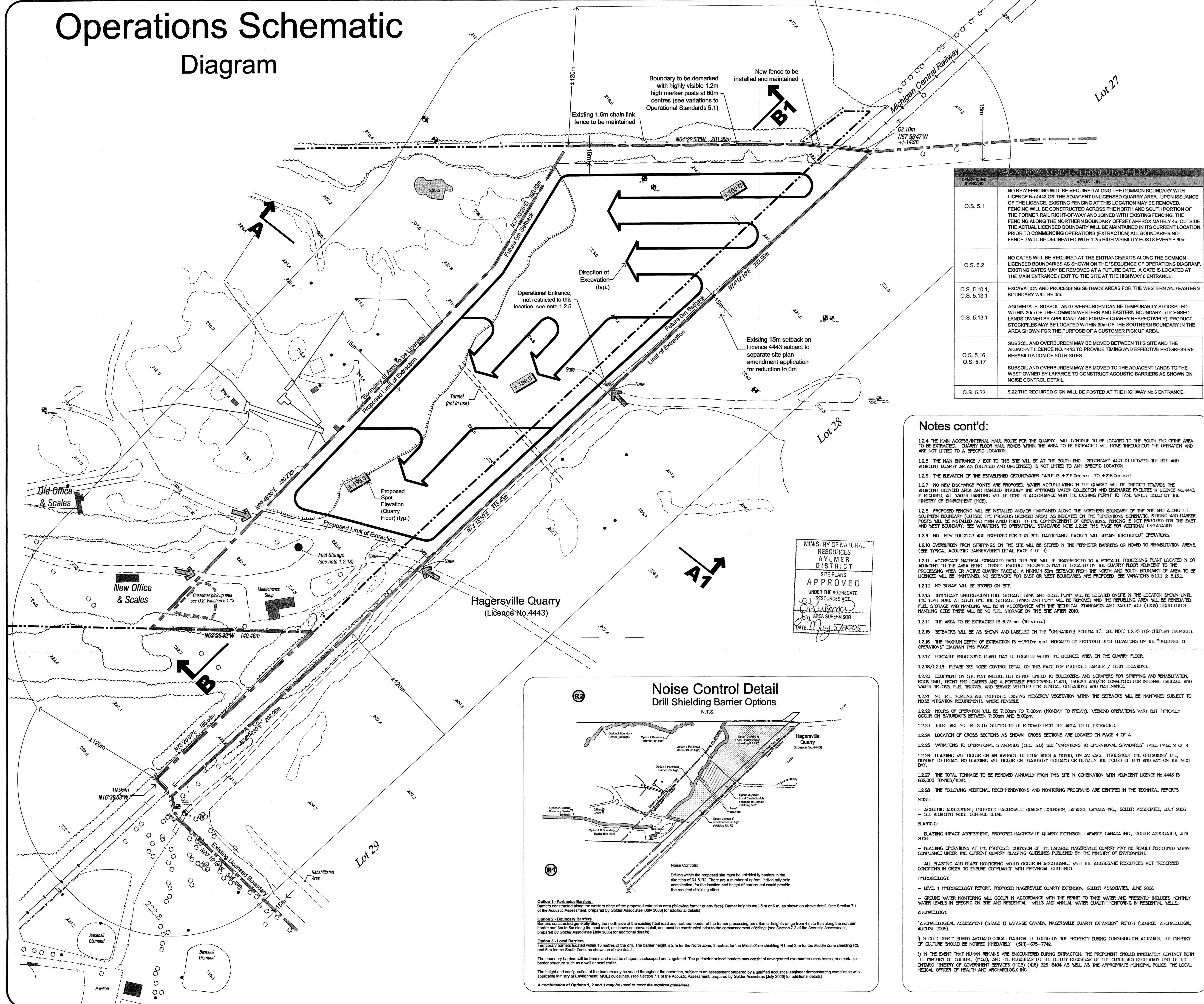
Hagersville Quarry Extension

*Part Lots 28 & 29
Range East of Plank Road
(former Township of Oneida,
Town of Haldimand)
Haldimand County*



7880 Keele Street, 3rd Floor
Concord, Ontario L4K 1G7
phone: (905) 738-7070
fax: (905) 738-7097

Operations Schematic Diagram



Operations 2 of 4 Plan

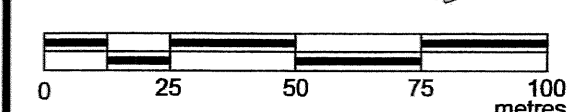
Legend

	Boundary of Area to be Licensed		Other Lands owned by Lafarge
	Limit of Extraction		Hydro Pole Line
	Other Licensed Boundary (LICENSE NO. 4443)		Proposed Spot Elevation (METRES ABOVE MEAN SEA LEVEL)
	Existing Limit of Extraction (LICENSE NO. 4443)		Existing Ditch and/or Swale (ARROW INDICATES DIRECTION OF FLOW IF ANY)
	Building/Structure (SEE PLAN FOR DESCRIPTION AND DIMENSIONS OF ON-SITE BUILDINGS)		Elevation, Contour (METRES ABOVE MEAN SEA LEVEL)
	Property/Service Entrance/Exit (REFER TO VARIATIONS TO OPERATIONAL STANDARDS 5.2 REGARDING GATES)		Existing Post and Wire Fence (1.2m POST & WIRE FARM FENCE UNLESS OTHERWISE NOTED)
	Existing Spot Elevation (METRES ABOVE MEAN SEA LEVEL)		Proposed Fence (1.2m POST & WIRE FARM FENCE UNLESS OTHERWISE NOTED)
	Existing Water Feature (AS INDICATED)		Hydrogeological Monitoring (MONITORING AND DOMESTIC WELLS) JAGGER HIMS LIMITED
	Water Well (MODE WELL RECORDS, GARTNER LEE LIMITED & LICENSEE RECORDS)		Direction of Excavation
	Existing Vegetation		Cross Sections (SEE PAGE 4 OF 4 FOR EXISTING AND REHABILITATED CROSS SECTIONS)

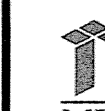
Notes:

- THIS PLAN DEPICTS A SCHEMATIC OPERATIONS SEQUENCE FOR THE PROPERTY BASED ON THE BEST INFORMATION AVAILABLE AT THE TIME OF PREPARATION. EXTRACTION, STRIPPING AND REHABILITATION AREAS SHOWN ARE SCHEMATIC AND MAY VARY SLIGHTLY. PHASES DO NOT REPRESENT ANY SPECIFIC OR EQUAL PERIOD. ANY MAJOR DEVIATION FROM THE OPERATIONS SEQUENCE SHOWN WILL REQUIRE THE APPROVAL OF PMR.
 - THE EXISTING ON SITE USES OUTSIDE THE LIMIT OF EXTRACTION WILL CONTINUE DURING THE LIFE OF THE OPERATION.
 - NUMBERING SCHEME USED FOR OPERATIONAL NOTES REFERS TO AGGREGATE RESOURCES ACT PROVINCIAL STANDARDS FOR A CATEGORY 2 LICENSE APPLICATION.
 - THE EXTENSION LANDS WILL SUPPLEMENT THE DEPLETING RESERVES IN THE ADJACENT QUARRY, AND EXTRACTION OF THE EXTENSION LANDS WILL BE INTEGRATED WITH THE HAGERSVILLE QUARRY SUCH THAT IT SHOWS ITS ENTRANCE AND TONNAGE LIMIT AND OPERATES IN CONJUNCTION WITH LICENSE NO. 4443.
- OPERATIONAL NOTES:
- 1.2.1 THE QUARRY WILL BE DEVELOPED FROM THE EXISTING LICENSED AREA TO THE EAST. EXTRACTION WILL COMMENCE AT THE NORTH END OF THE AREA TO BE EXTRACTED AND PROCEED GENERALLY SOUTHWARD AS INDICATED BY THE DIRECTION OF EXCAVATION ARROWS.
- 1.2.2 WITHIN THE LIMIT OF EXTRACTION, THE SITE WILL BE STRIPPED OF SUBSOIL AND OVERBURDEN IN STAGES IF ENCOUNTERED. THE SITE IS PREVIOUSLY DISTURBED AND THERE ARE NO DISTINGUISHABLE SEPARATE LAYERS. SUBSOIL AND OVERBURDEN REMOVED FROM AREAS TO BE EXTRACTED WILL BE USED FOR BARRIER CONSTRUCTION AROUND THE EDGE OF THE EXTRACTION AS DISCLOSED UNDER NOISE (SEE NOTE 1.2.28). STORED AND/OR USED DIRECTLY IN REHABILITATION OF THIS SITE. SUBSOIL AND OVERBURDEN MAY BE MOVED BETWEEN THIS SITE AND THE ADJACENT LICENSE NO. 4443 (SEE SITE PLAN OVERLIES 1.2.29).
- 1.2.3 EXTRACTION WILL OCCUR IN UP TO FOUR LIFTS AT ±8.0m OR LESS. MAXIMUM DEPTH OF EXTRACTION IS ±199.0m A.S.L.

Scale 1:1500



DRAFT REVISIONS	
DATE	REVISION
JULY 24, 2006	Rev. 1: Initial Design
SEP. 01, 2006	Rev. 2: Licensee Review
APPROVED FOR CONSTRUCTION	
LAFARGE CANADA INC.	
PROJECT MANAGER	
DESIGNED BY	
CHECKED BY	
DATE	



171 Victoria Street North, Kitchener, Ontario, N2H 5C5
Telephone (519) 576-3650 Fax (519) 576-0121
www.mhbcplan.com

Licence No. 607801

PROJECT NAME:

Hagersville Quarry Extension

Part Lots 28 & 29
Range East of Plank Road
(former Township of Oneida,
Town of Haldimand)
Haldimand County

LAFARGE
CANADA INC.

7880 Keele Street, 3rd Floor
Concord, Ontario L4K 1G7
phone: (905) 738-7070
fax: (905) 738-7087

Rehabilitation 3 of 4 Plan

Legend

- Boundary of Area to be Licensed
- Limit of Extraction
- Other Licensed Boundary (Licence No. 4443)
- Building/Structure (SEE PLAN FOR DESCRIPTION AND DIMENSIONS OF ON-SITE BUILDINGS)
- Property/Service Entrance/Exit (MAINTAINED AND REGULATED BY A GATE UNLESS OTHERWISE NOTED ON THIS PLAN)
- Existing Water Feature (AS INDICATED)
- Proposed Vegetation
- Cross Sections (SEE PAGE 4 OF 4 FOR EXISTING AND REHABILITATED CROSS SECTIONS)
- Other Lands owned by Lafarge
- Existing Limit of Extraction (Licence No. 4443)
- Hydro Pole Line
- Existing Ditch and/or Swale (ARROW INDICATES DIRECTION OF FLOW IF ANY)
- Elevation, Contour (METRES ABOVE MEAN SEA LEVEL)
- Proposed Contour (METRES ABOVE MEAN SEA LEVEL)
- Existing Post and Wire Fence (1.2m POST & WIRE FENCE UNLESS OTHERWISE NOTED)
- Existing Vegetation
- Rehabilitated Area

Notes:

TOPOGRAPHIC INFORMATION PROVIDED BY NORTHWAY-PHOTOMAP INC. JUNE 2005. DERIVED FROM APRIL 2000 AERIAL PHOTOGRAPHY. CONTROL ESTABLISHED BY MINISTRY OF NATURAL RESOURCES 1:10,000 SCALE MAP SHEETS AND FIELD SURVEY. CONTOUR INTERVAL IS 1.0 METRE. ALL ELEVATIONS ARE GEODETIC.

PROPERTY BOUNDARY LOCATION AND DIMENSIONS OBTAINED FROM AGGREGATE RESOURCES HAGERSVILLE QUARRY SITE PLAN LICENCE NO. 4443, PREPARED BY HARRINGTON AND HOYLE LTD. IN JAN 1993.

LAND USE INFORMATION COMPILED FROM (i) A.R.A. SITE PLANS FOR ADJACENT LICENCE NO. 4443, AND (ii) SITE VISIT DATED JULY 5, 2005.

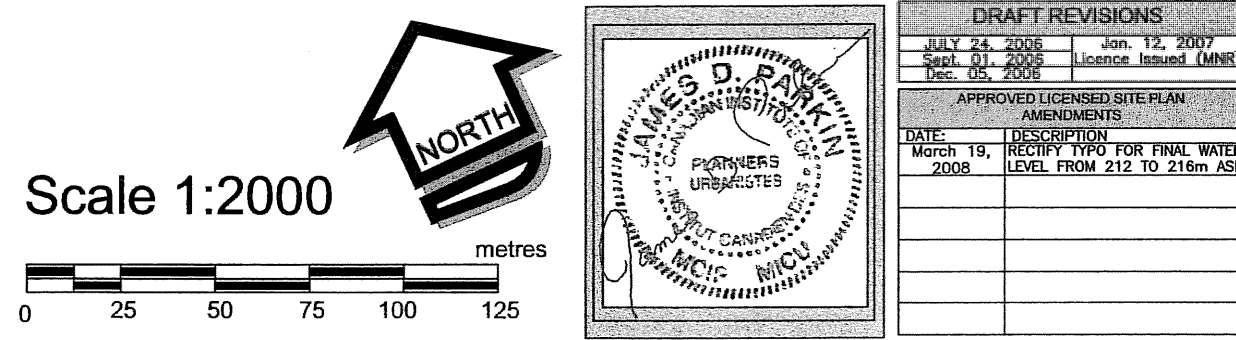
AREA TO BE LICENSED 9.11 ha. (22.57 ac.)

AREA TO BE REHABILITATED 6.77 ha. (16.73 ac.)

ALL MEASUREMENTS SHOWN ON THIS PLAN ARE IN METRES.

AFTER USES WILL INCLUDE: (i) LAKE (ii) SIDE SLOPES, (iii) RECREATION

ELEVATION OF ESTABLISHED GROUND WATER TABLE VARIES FROM $\pm 216.0m$ a.s.l. TO $\pm 215.0m$ a.s.l. (SOURCE: LEVEL 1 HYDROGEOLOGY REPORT, PROPOSED HAGERSVILLE QUARRY EXTENSION, GOLDER ASSOCIATES, JANUARY 2006.)



MHBC 171 Victoria Street North, Kitchener, Ontario, N2H 5C5
Telephone (519) 576-3650 Fax (519) 576-0121
www.mhbcplan.com

Licence No. 607801
PROJECT NAME:

Hagersville Quarry Extension

Part Lots 28 & 29
Range East of Plank Road
(former Township of Oneida,
Town of Haldimand)
Haldimand County

LAFARGE CANADA INC.

7880 Keele Street, 3rd Floor
Concord, Ontario L4K 1G7
phone: (905) 738-7070
fax: (905) 738-7087

Notes cont'd:

NUMBERING SCHEME USED FOR REHABILITATION NOTES REFERS TO AGGREGATE RESOURCES ACT PROVINCIAL STANDARDS FOR A CATEGORY 2 LICENCE APPLICATION.

1.3.1 REHABILITATION WILL BE PROGRESSIVE AND PROCEED AS LIMITS OF EXTRACTION ARE REACHED. THE SEQUENCE OF REHABILITATION WILL FOLLOW THE OPERATIONAL PHASING SEQUENCE (NOTE 1.2.1) AND 'OPERATIONS SCHEMATIC' DIAGRAM LOCATED ON PAGE 2 OF 4.

1.3.2 THE AREA WILL BE STRIPPED OF SUBSOIL AND OVERBURDEN IN STAGES. WHEREVER POSSIBLE, SUBSOIL AND OVERBURDEN WILL BE MOVED TO A REHABILITATION LOCATION. OTHERWISE THIS WILL OCCUR WHEN NOISE BARRIERS ARE NO LONGER REQUIRED. ALL SUBSOIL AND OVERBURDEN WILL BE RETAINED AND USED IN REHABILITATION OF THIS SITE OR THE ADJACENT LICENCE NO.4443 (SEE VARIATION TO OPERATIONAL STANDARDS 5.1.6 PAGE 2 OF 4). SOILS (SUBSOIL AND OVERBURDEN) WILL BE REPLACED AT VARIABLE DEPTHS ON REHABILITATED AREAS.

1.3.3/1.4.3 AFTER USES WILL INCLUDE: (i) LAKE (ii) SIDE SLOPES, (iii) RECREATION. THE FOLLOWING VEGETATION WILL BE PLANTED:

WOOD VEGETATION: PLANTED IN CLUSTERS AS SHOWN AND MAY INCLUDE SUGAR MAPLE, WHITE ASH, BLACK CHERRY, HACKBERRY, RED OAK AND TREMBLING ASPEN. THE FOLLOWING ARE APPROPRIATE CAROLINIAN SPECIES THAT COULD BE PLANTED IF READILY AVAILABLE FROM LOCAL NURSERIES: PIN OAK, BITTERNUT HICKORY, SHAGBARK HICKORY AND SYCAMORE.

ALL VEGETATION PLANTED DURING THE OPERATION OF THIS LICENCE WILL BE MAINTAINED IN A HEALTHY VIGOROUS GROWING CONDITION. DEAD PLANTS WILL BE REPLACED WITHIN TWO YEARS.

1.3.4/1.4.2 SIDE SLOPES (min. 2:1 AND max. 3:1) WILL BE ESTABLISHED BY CUT/FILL AND/OR BACKFILLING METHODS. AREAS WITH SLOPES LESS THAN 3:1 (GENTLER) ARE PROVIDED ON THE ADJACENT LICENCE TO ALLOW FOR SAFE ACCESS TO AND FROM THE LAKE AREA. REHABILITATION OF THE LAKE WILL INCLUDE VERTICAL AND 2:1 UNDERWATER SLOPES. UNDERWATER HABITAT ENHANCEMENT ON THE QUARRY FLOOR WILL UTILIZE OVERSIZE AND WASTE ROCK.

REHABILITATION OF SLOPES SHALL BE BY BACKFILLING USING OVERBURDEN AND TOPSOIL WITHIN THE LICENSED BOUNDARY OR WITH CLEAN FILL FROM AN APPROVED OFFSITE SOURCE (IN CONFORMITY WITH SECTION 23(a) OF THE AGGREGATE RESOURCES ACT). OVERBURDEN ON SIDE SLOPES AND RECREATIONAL AREAS SHALL BE A MINIMUM OF 200mm THICK AND TOPSOIL SHALL BE A MINIMUM OF 100mm THICK. SIDE SLOPES AND RECREATION AREAS SHALL BE SEEDED WITH A LOW MAINTENANCE GRASS LEGUME MIXTURE AT A RATE OF 125kg/ha.

1.3.5 PROGRESSIVE REHABILITATION WILL BE ONGOING AND WILL FOLLOW THE SOUTHEASTERN TO NORTHWESTERN SEQUENCE. AS STRIPPING AND EXTRACTION PROGRESSES, SIDE SLOPE AND QUARRY FLOOR AREAS NOT BEING UTILIZED AS PART OF ACTIVE OPERATIONS WHERE EXTRACTION HAS BEEN COMPLETED WILL BE REHABILITATED. (see note 1.2.2, 1.3.2 and Operations Schematic Page 2 of 4).

1.3.6/1.4.1 CLEAN INERT FILL MAY BE IMPORTED TO FACILITATE REHABILITATION AND THE ESTABLISHMENT OF 2:1 AND 3:1 (HORIZONTAL : VERTICAL) SLOPES ON THE QUARRY FACES. 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 MINISTRY OF THE ENVIRONMENT'S PARAMETERS UNDER TABLE 11 OF MOES SOILS, GROUNDWATER AND SEDIMENT STANDARDS FOR USE UNDER PART XV.1 OF THE ENVIRONMENTAL PROTECTION ACT. SAMPLING RESULTS WILL BE PROVIDED TO THE MINRADE UPON REQUEST. THE FINAL LANDFORM (see note 1.3.3/1.4.3 this page) WILL DEPEND ON ACTUAL RESOURCE ENCOUNTERED AND FINAL DEPTHS OF EXTRACTION.

1.4.4 NO BUILDINGS OR STRUCTURES ARE PROPOSED OR WILL REMAIN ON SITE AFTER EXTRACTION IS COMPLETE.

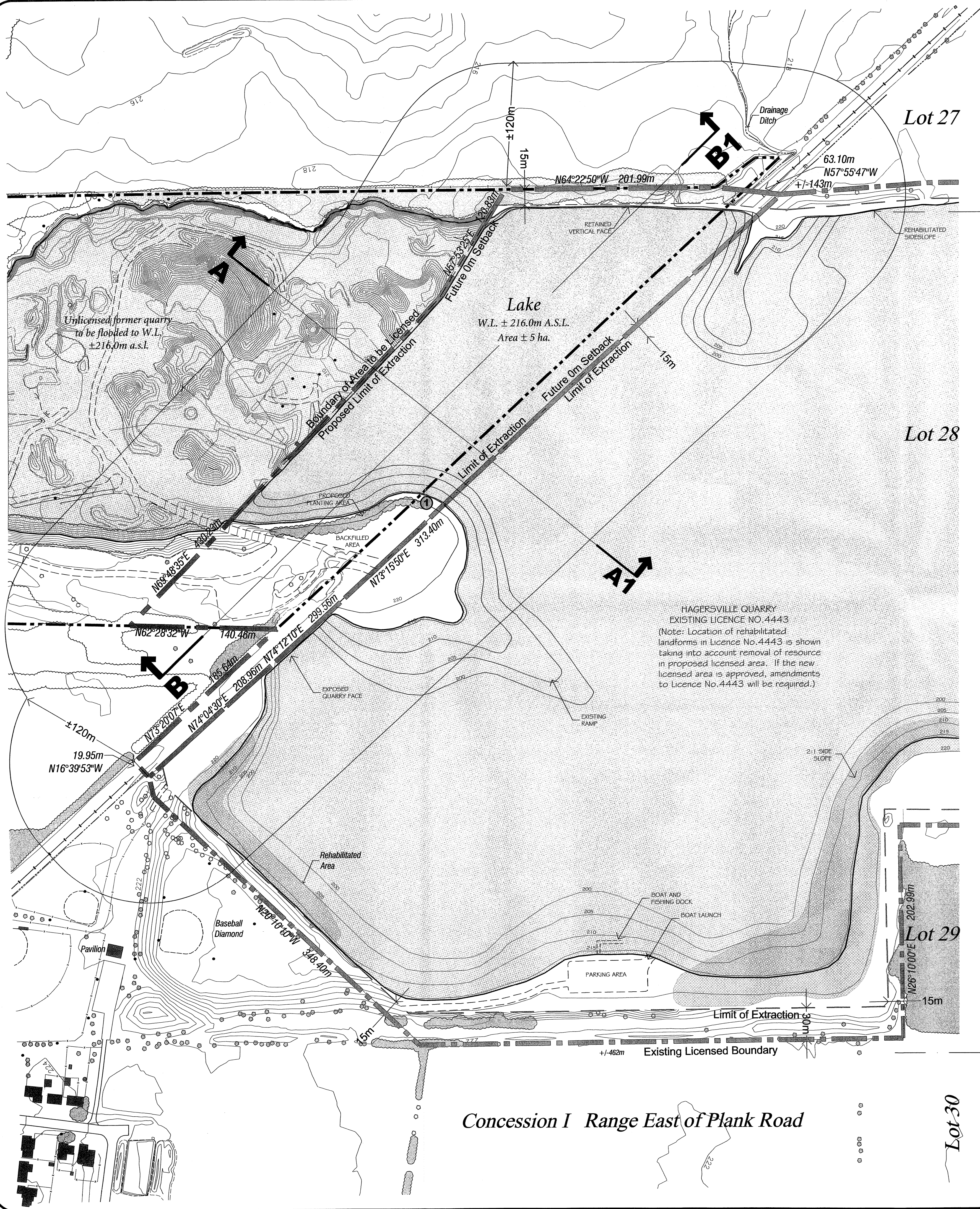
1.4.5 FINAL WATER LEVEL IS EXPECTED TO BE APPROXIMATELY $\pm 216.0m$ a.s.l.

1.4.6 ALL INTERNAL HAUL ROADS WILL BE REMOVED AS PART OF THE QUARRY FLOOR REHABILITATION.

1.4.7 SURFACE DRAINAGE (IF ANY) FROM THE SITE WILL BE DIRECTED TOWARDS THE PROPOSED LAKE AREA.

PROPOSED VEGETATION		
NO.	SPECIES	MATURE SIZE
①	SUGAR MAPLE (<i>Acer saccharum</i>) WHITE ASH (<i>Fraxinus americana</i>) BLACK CHERRY (<i>Prunus serotina</i>) HACKBERRY (<i>Celtis occidentalis</i>) RED OAK (<i>Quercus rubra</i>) TREMBLING ASPEN (<i>Populus tremuloides</i>)	1 - 20 METRES
OPTIONAL SPECIES (see 1.3.3 / 1.4.3)		
	PIN OAK (<i>Quercus palustris</i>) BITTERNUT HICKORY (<i>Carya cordiformis</i>) SHAGBARK HICKORY (<i>Carya ovata</i>) SYCAMORE (<i>Platanus occidentalis</i>)	

MINISTRY OF NATURAL RESOURCES
AYLMER DISTRICT
SITE PLANS
APPROVED
UNDER THE AGGREGATE RESOURCES ACT
J. G. GORMAN
AREA SUPERVISOR
DATE: May 5, 2008



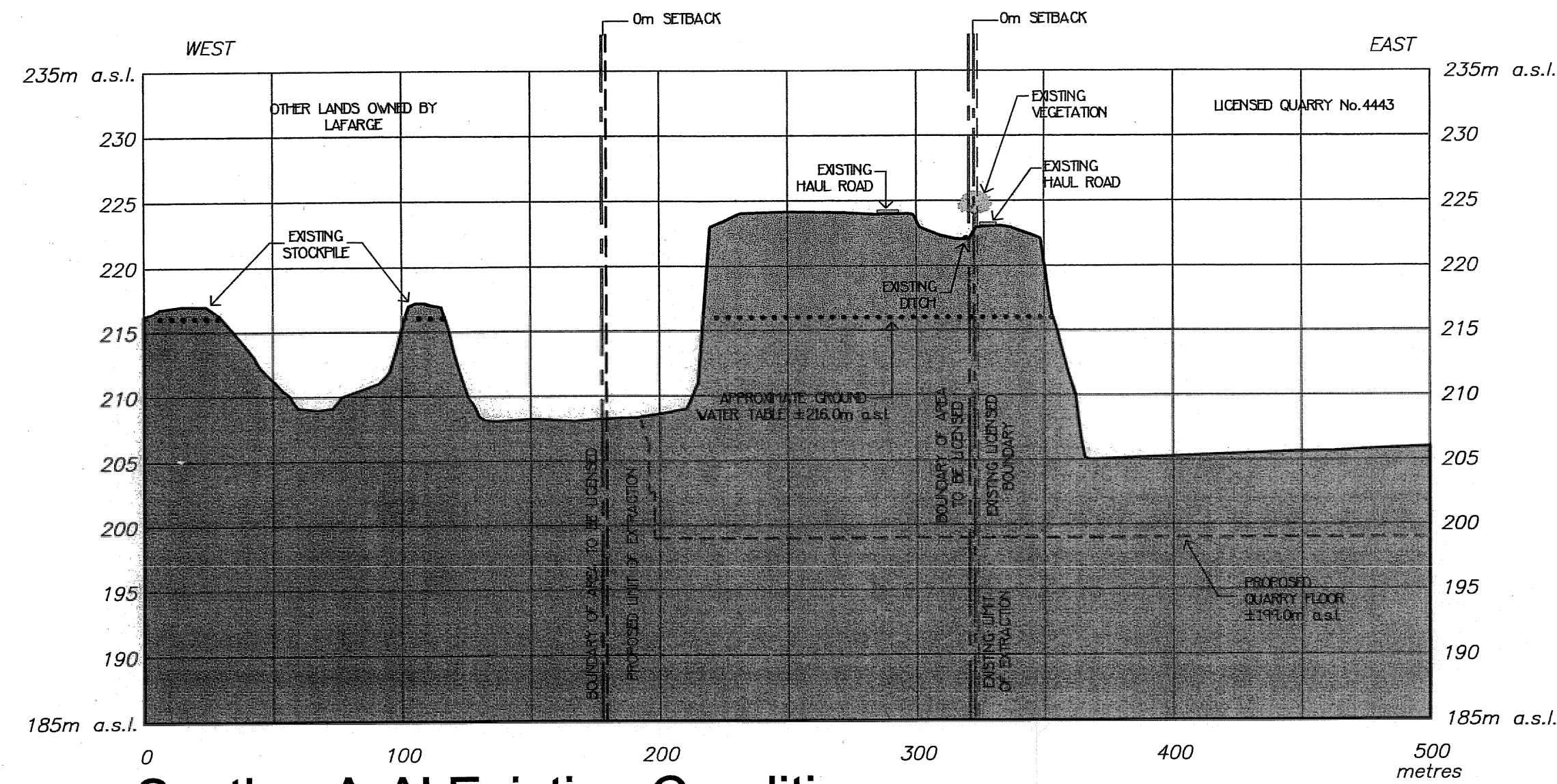
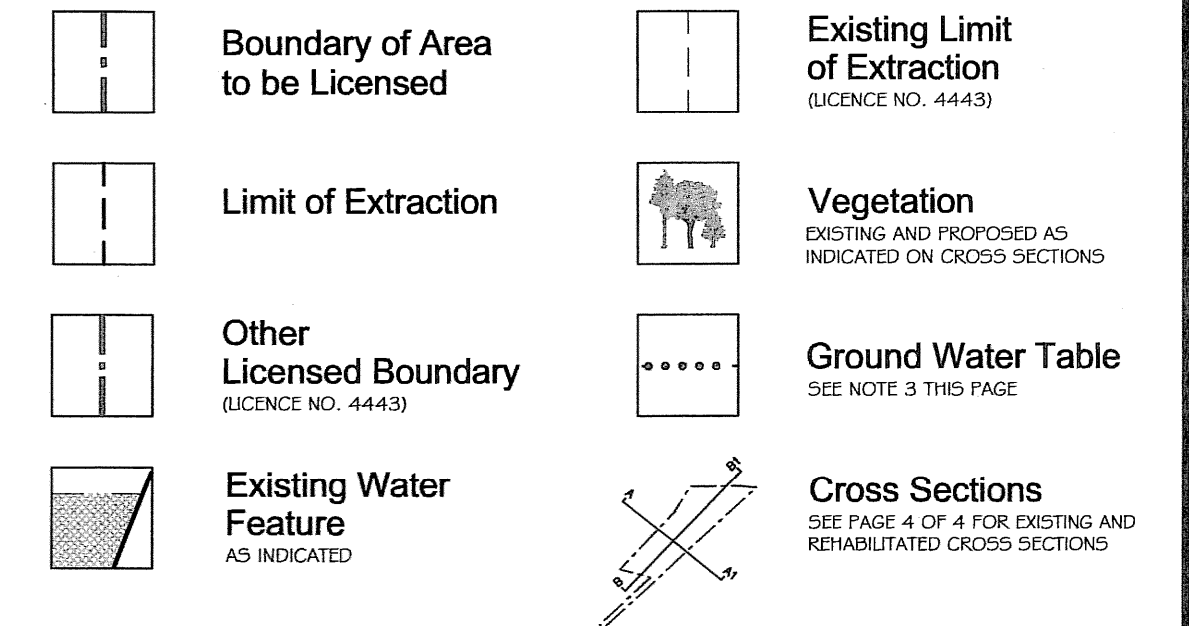
Concession I Range East of Plank Road

Lot 30

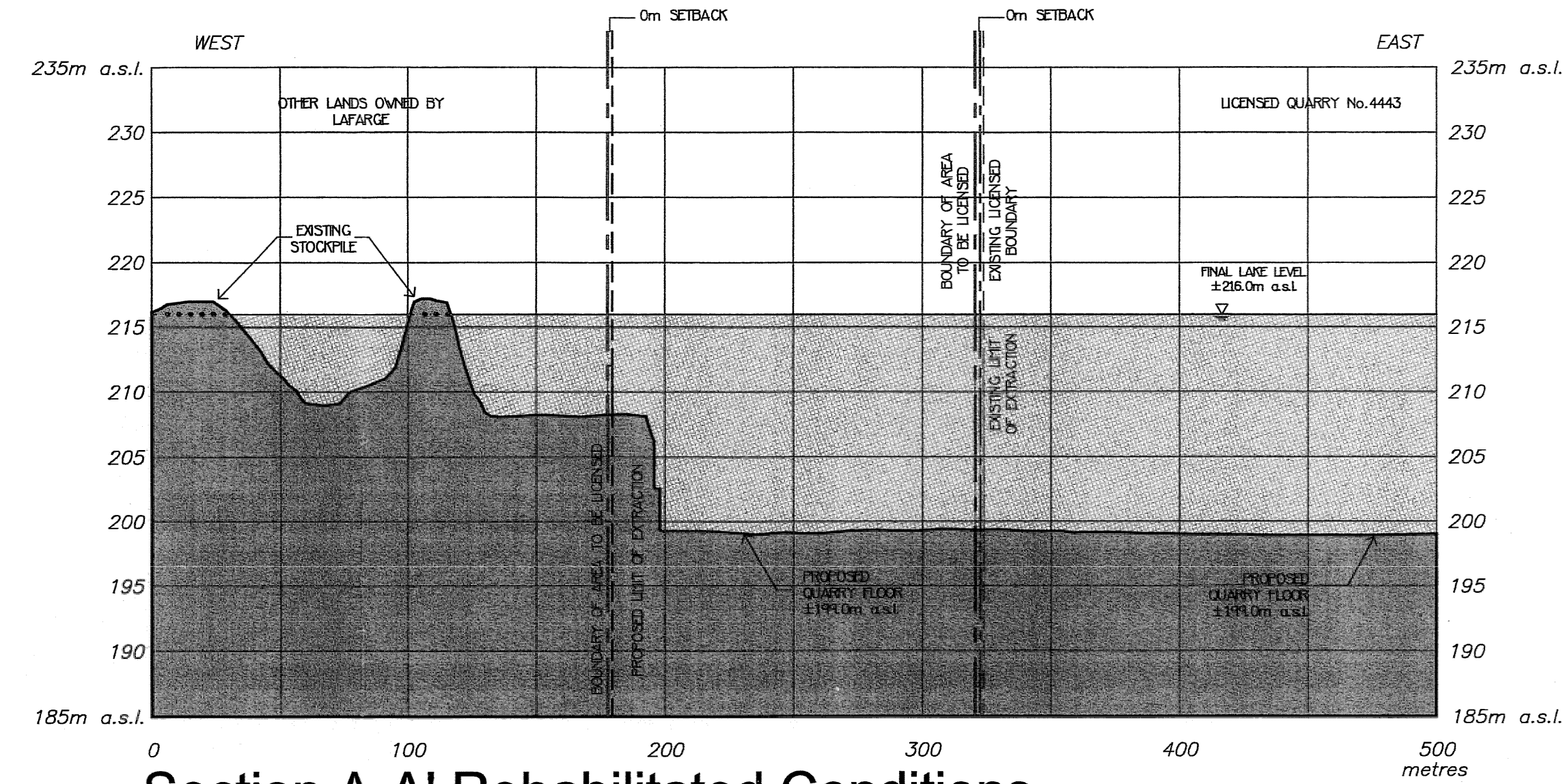
Cross Sections

4 of 4

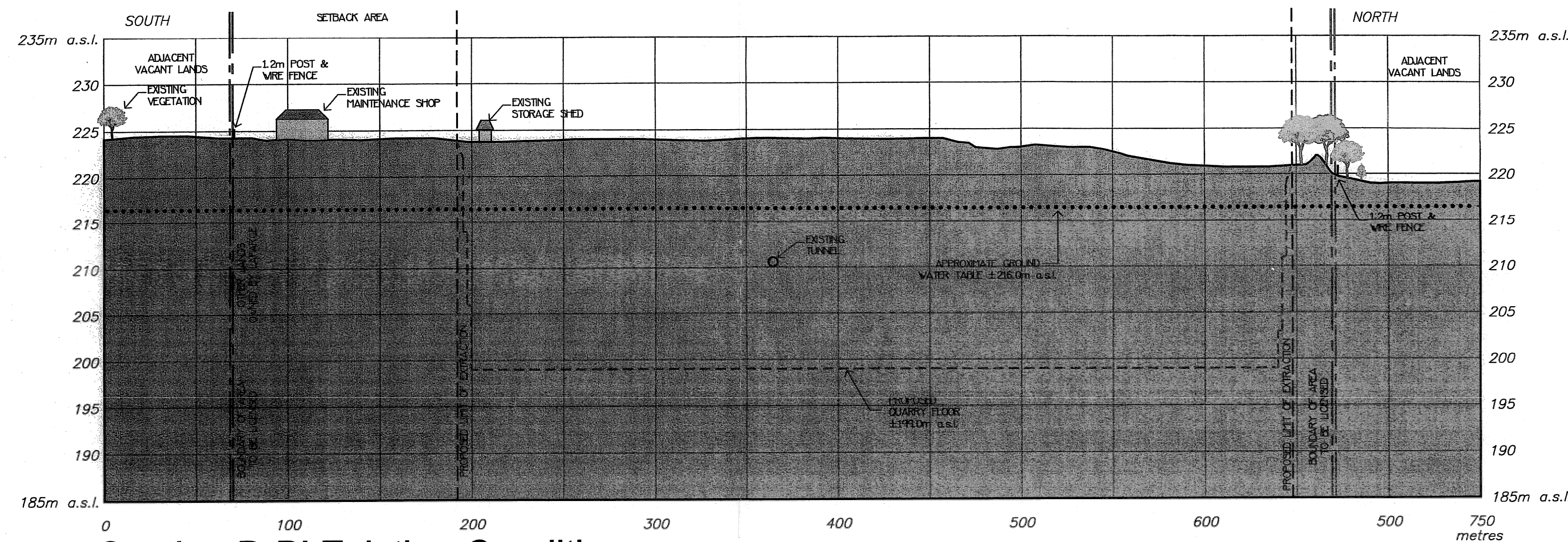
Legend



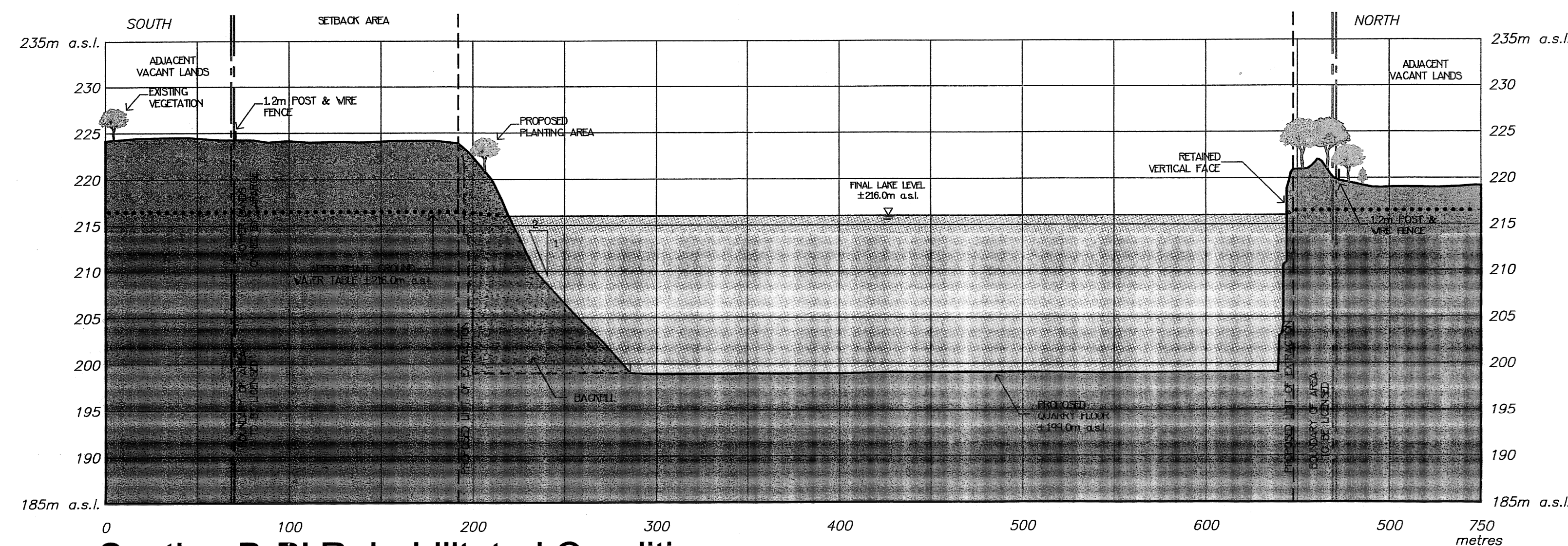
Section A-A' Existing Conditions



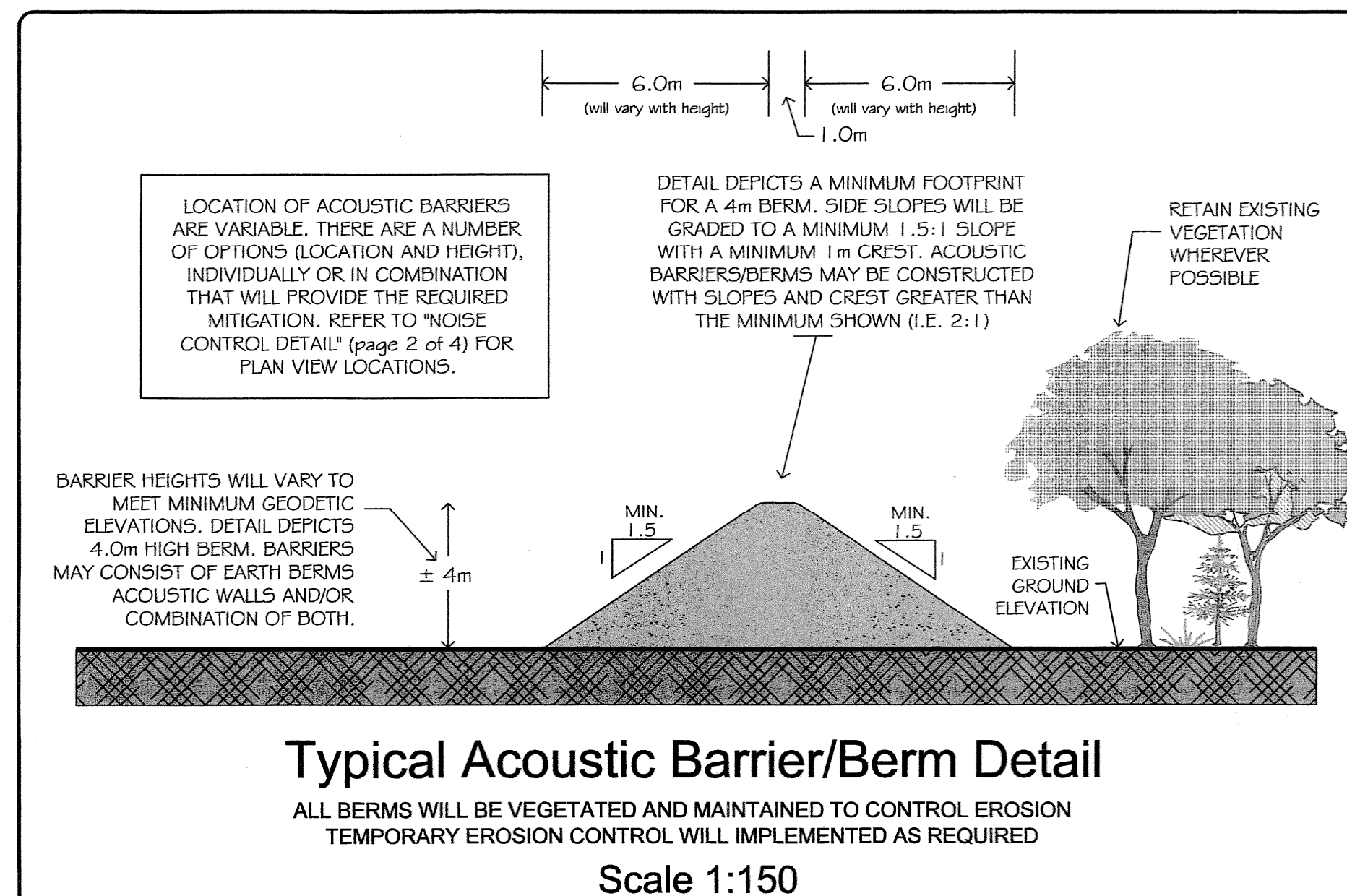
Section A-A' Rehabilitated Conditions



Section B-B' Existing Conditions



Section B-B' Rehabilitated Conditions

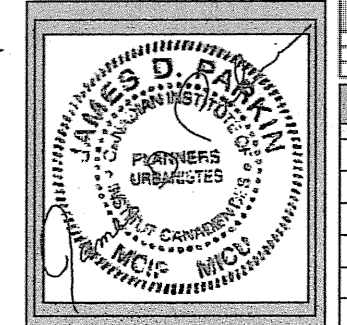
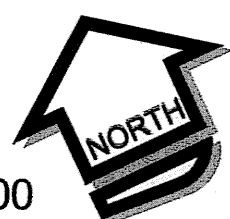
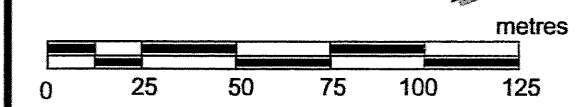


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Scale

Vertical 1:400
Horizontal 1:2000



DRAFT REVISIONS	
DATE	DESCRIPTION



171 Victoria Street North, Kitchener, Ontario, N2H 5C5
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www.mhbcplan.com

Licence No. 607801
PROJECT NAME:

Job No.	5826/AN Lafarge Hagersville Quarry Extension
Drawn By	L.C. (Cred. By J.P.)
File No.	K10038/AN_LAFARGE_HAGERSVILLE_QUARRY_EXTENSION/PLAN/001

Hagersville Quarry Extension

Part Lots 28 & 29
Range East of Plank Road
(former Township of Oneida,
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Haldimand County



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