

**REPORT OF THE COMBINED AGGREGATE REVIEW TEAM (CART):  
REVIEW OF THE LAFARGE DUNDAS SOUTH QUARRY EXTENSION**

**NOVEMBER, 2017**

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## **1.0 Introduction**

Lafarge Canada Inc. has applied for an amendment to the Rural Hamilton Official Plan and City of Hamilton Zoning By-law No. 05-200 to permit an extension to the approved Lafarge Dundas South Quarry. Lafarge has also simultaneously applied for a Category 2, Class A license under the Provincial *Aggregate Resources Act* (ARA) to permit the quarry extension. The total area proposed to be licensed is 127.1 ha, with the proposed extraction area limited to 107.4 ha. The license application is for a 24 hour a day operation with no annual tonnage limit, which is consistent with the approved North and South Quarries. The proposed quarry extension would operate below the water table, meaning that dewatering activities would occur. Processing is not proposed on the extension lands. Extracted material would be transported to the existing South Quarry or to the Lafarge processing area south of Highway 5, via conveyor, for processing. The extension is proposed to operate in 5 phases.

A Combined Agency Review Team (CART) was formed to assist in the review of the applications. The CART process has been successfully used in previous quarry applications that the City has reviewed. The CART was comprised of staff from several City of Hamilton departments and divisions, as well as staff from the Hamilton Conservation Authority. Provincial staff, including Ministry of Environment and Climate Change (MOECC) and Ministry of Natural Resources and Forestry (MNR) were kept informed of the CART process and peer reviews, but did not participate as members of CART. Rather than have each agency with an interest in the proposed quarry conduct its own technical reviews, the CART process provides an opportunity for the agencies to be represented on a team that retains expert peer reviews, at the proponents expense. The CART approach provides a forum for the agencies to share views and perspectives on the applications, and a shared technical resource in the peer review team that they can draw from in reaching their independent positions and decisions.

Significant supporting studies have been prepared by the applicant and were submitted in support of the applications, including the following:

- Planning Report and Aggregate Resources Act Summary Statement;
- Level 1 & 2 Hydrogeology & Hydrology Technical Report;
- Level 1 & 2 Natural Environment Technical Report;
- Archaeological Assessment Consolidated Report;
- Noise Impact Assessment;
- Traffic Study;
- Air Quality Study;
- Blasting Impact Assessment; and,
- Cultural Heritage Impact Assessment.

The above noted studies have been reviewed by City staff and members of the Combined Aggregate Resources Team (CART). In addition, peer reviews have been completed of the Hydrogeology & Hydrology Report, Noise Study, Air Quality Study and

Blasting Study. A complete summary of these studies and peer review results is included herein.

## **2.0 Natural Heritage**

Natural heritage includes the natural features, such as woodlands, wetlands, and streams, the fish and wildlife that occupy these areas, and the ecological functions (e.g. clean water, biodiversity, flood control) that they provide. Natural heritage also relates to the landscape, soils, geology, air, and water, and how they interact to create an ecological system that supports life.

Within this section of the report, CART has included a summary of the existing information on the site and the surrounding area, which may be affected by the quarry expansion proposal. The main sources of information used for assessing natural heritage were:

- Natural Environment Technical Report which was completed by Golder Associates (Golder Report) on behalf of the applicant, Lafarge in August 2013;
- Nature Counts, 2003 Inventory of Natural Areas in Hamilton;
- Hydrogeology and Hydrology Technical Report by Golder Associates, 2013; and,
- Rural Hamilton Official Plan (RHOP).

This section will describe existing conditions of the natural environment at the subject property and lands within its vicinity, and outline the issues relating to natural heritage.

Given there are limited natural heritage features within and adjacent to the South Quarry Extension, it was decided that a peer review of the Natural Environment Technical Report (NETR) was not required. However, the NETR was reviewed by the Hamilton Conservation Authority (HCA), City of Hamilton Natural Heritage Planning, and the Environmentally Significant Areas Impact Evaluation Group (ESAIEG). CART also had the opportunity to review the natural heritage comments provided by the Ministry of Natural Resources and Forestry and the Ministry of Environment and Climate Change.

ESAIEG reviewed the Natural Environment Technical Report (NETR) at its meeting on June 12, 2014.

### **2.1 Physiography:**

The South Quarry Extension (SQE) is located on a flat-lying limestone plain (the Flamborough Plain), approximately 3 km north-northwest of the former Town of Dundas. The topography of the area is generally flat, with gently rolling hills sloping to the northwest. Elevations range between 255 to 265 metres above sea level (masl). The study area is located on the Flamborough Plain physiographic region (Chapman and Putnam, 1984), a flat-lying limestone plain with shallow, stony glacial till and gravels, and scattered drumlins. As a result of the flatness of the area, swampy wetlands have developed along many sections of the streams that drain the plain, including Beverly Swamp and the Hayesland Swamp. Most of the proposed SQE is covered by glacial-

lacustrine deposits with thin overburden in the western portion (0.2 m to 0.7 m thick) and thicker overburden (3 m to 15 m) in the south central and eastern sections.

The existing quarries adjacent to the SQE influence the local groundwater flow pattern. Overall the regional direction of groundwater flow is southward toward the escarpment, but locally, groundwater flows inward toward the quarries, as a result of dewatering activities.

## 2.2 Watersheds:

The SQE is located within the Spencer Creek watershed, and between two subwatersheds: Middle Spencer Creek and Logies Creek. The northeastern part of the site, consisting of approximately 40% of the drainage area, contributes runoff to Logies Creek via the Dundas Quarry. The southwest part of the site, which consists of 60% of the drainage area, contributes to Middle Spencer Creek watershed via culverts under Brock Road. Both subwatersheds are within the jurisdiction of the Hamilton Conservation Authority.

## 2.3 On-site Natural Heritage Features

The Hamilton Rural Hamilton Official Plan (RHOP) does not identify any Core Areas or Linkages on the SQE property.

Field studies were completed from May 2006 to May 2014 to identify amphibians, fish (electrofishing), plants, breeding birds, Ecological Land Classification (vegetation communities), incidental wildlife observations, bat habitat assessment and survey, aquatic habitat assessment, and a grassland breeding bird survey (Bobolink, Eastern Meadowlark, and Barn Swallow).

Through these field studies, the NETR found that the site contains:

- three small unevaluated wetlands;
- two locally rare plants (Meadow Horsetail and Fireberry Hawthorn);
- Significant Habitat of threatened species (Barn Swallow and Eastern Meadowlark); and,
- habitat for locally rare / uncommon breeding birds (Brown Thrasher and Clay-coloured Sparrow).

### *2.3.1 Wetlands:*

There are no Provincially Significant Wetlands (PSWs) on or adjacent to (within 120 metres) the proposed SQE site. The Hayesland-Christie Wetland Complex, a PSW, is located 0.9 kilometres northeast of the SQE. Another PSW, the Logies Creek-Parkside Drive Wetland Complex, is found 1.3 kilometres to the southeast of the SQE site. Since

these PSWs are outside of the influence of the SQE, CART was satisfied that the SQE will not impact PSWs.

Three small wetlands, not identified on Schedules B and B-4 of the City of Hamilton’s Rural Official Plan), are located on site. These wetlands total 1.8 hectares in area. The first wetland is found at the centre of the western boundary of the SQE area, the second wetland is near Concession 4 West and Moxley Road, and the third is on the eastern boundary of the SQE. All three of these wetlands are considered isolated and non-sensitive. Lafarge proposes to remove and compensate for all three wetlands. In its Rehabilitation Plan, Lafarge has committed to restoring 6.8 hectares of wetland on the SQE lands by creating shoreline wetland and lagoon features.

There is one non-PSW wetland mapped on Schedule B-4 in the RHOP which is located approximately 630 metres to the southwest of the SQE (OPF-2 on Figure 3 of the NETR). Please see discussion of this wetland in the Water Resources Section of this Report.

### *2.3.2 Locally Rare Plants*

On the SQE site, Meadow Horsetail was not found in its preferred habitat (shaded stream banks or moist thickets). The species is now considered common in Ontario, and the updated Hamilton Natural Heritage Database shows that it is now considered common in Hamilton. (At the time of the Golder Report, it was locally rare).

Fireberry Hawthorn is now locally uncommon in the Hamilton Natural Heritage Database. The Golder NETR noted that this hawthorn thrives on fallow lands and can withstand drought and soil compaction, so it does not require specialized habitat. It was found in the hedgerows and cultural thicket at the north end of the proposed SQE. Since there are areas for this species to grow within the adjacent farmland and hedgerows, the NETR concluded that its removal would not result in negative impacts. ESAIEG, HCA, and City of Hamilton Planning staff were satisfied with this conclusion.

### *2.3.3 Significant Habitat of Threatened Species - Eastern Meadowlark Habitat:*

Based on 2012 surveys, Eastern Meadowlark, a threatened bird species, was found breeding in the cultural meadows and meadow marshes on site. Lafarge is proposing to extract 8.9 hectares of habitat for this species. Under the *Endangered Species Act* (2007), up to 30 hectares of habitat can be removed subject to creation and management of habitat off-site. A Notice of Activity was submitted to MNR in October 2013 to create and manage equivalent grassland habitat off-site. Compensation for habitat would be done when the habitat is destroyed, as part of Phase 3 (in approximately 15 years). The Ontario Ministry of Natural Resources and Forestry (MNRF) is satisfied with this approach.

#### 2.3.4 Significant Habitat of Threatened Species - Barn Swallow Habitat:

Barn Swallow is listed as threatened under the *Endangered Species Act*. An agricultural structure with at least ten active nests was found within Phase 2 of the SQE lands. In February 2013, Lafarge informed MNRF that the structure was collapsing. MNRF agreed that the structure could be removed without an authorization under the *Endangered Species Act*, under the exemption for health and safety. Although habitat does not need to be replaced in this instance, in the Rehabilitation Plan, Lafarge offers to place three constructed Barn Swallow habitat structures to the east of the North Quarry Extension, adjacent to the Hayesland Christie Wetland Complex. It was anticipated that the habitat structures would be in place by 2017.

#### 2.4 Off-Site Natural Heritage Features

The following natural features were identified adjacent to (within 120 metres of) the SQE property:

- A pond shown as a Lake or Littoral Zone (Schedule B-5);
- Watercourses (Schedule B-8); and,
- Wetlands (identified from NETR, but not shown in RHOP Schedules).

The potential for off-site effects from the SQE was primarily related to hydrologic effects on wetlands, ponds, streams, and woodlands. Ground water drawdown, which influences surface water balance, can indirectly impact stream flows, wetland water levels, and vegetation communities.

##### 2.4.1 Lakes and Littoral Zones:

There is one pond identified on Schedule B-5 of the RHOP, which is adjacent to the SQE (OPF-1 on Figure 7 of the NETR). This man-made pond is within 60 metres of the SQE, with no inlet or outlet, and is not connected to other water features. Therefore, it was determined that it has limited ecological value.

There are five other ponds identified on Schedule B-5 which are not adjacent to the SQE, but were examined to determine if the proposed SQE would impact them. The NETR concluded that no ground or surface water impacts on these features are predicted from the SQE.

##### 2.4.2 Watercourses:

The City of Hamilton’s Rural Official Plan (Schedule B-8) identifies two watercourses which originate off-site, on the western boundary of the SQE. These watercourses are identified as SW-1(a and b) and SW-2 on Figure 7 of the NETR. Both watercourses have been classified as “undefined channels” and do not become defined until approximately 740 metres from the SQE boundary.



Other watercourses examined include SW-3, SW-4, and SW-5 which flow into Christie Lake. SW-6 is located to the southeast of the SQE and drains into Logie’s Creek.

To address concerns from agencies about impacts to the aquatic features, notes were added to the Site Plans to require ongoing surface and groundwater monitoring at all five watercourses. An annual monitoring report will be prepared by a qualified hydrogeologist and hydrologist for review by the agencies. For SW-1 and SW-2, the surface water assessment will evaluate the potential change in the flow regime downstream of the SQE. The baseline conditions will be used to develop appropriate triggers for flow rate reductions that are outside natural seasonal variability and may result in negative impact to fish habitat. If the triggers are reached and are determined to be caused by the SQE, Lafarge will be responsible for preparing a mitigation plan for approval by MNRF, in consultation with the City of Hamilton, the Ministry of the Environment and Climate Change, and HCA.

## 2.5 Rehabilitation Plan

The rehabilitation plan for the South Quarry Extension is for a lake and associated features, as rehabilitation to an agricultural standard is not possible or desirable due to the extensive below water table extraction which will occur. The plan includes creation of the following:

- Approximately 80.5 ha of lakes, including 2 ha of shoals (underwater fish habitat);
- Approximately 6.8 ha of wetlands;
- Approximately 3.9 ha of grasslands;
- Approximately 17.6 ha of woodlands; and,
- Approximately 18.4 ha of vegetated area.

The Rehabilitation Plan was reviewed by members of CART. Through the review process, the Plan was enhanced to allow for greater habitat diversity and function, and to improve integration and connectivity with the broader surrounding landscape.

## 2.6 Conclusion:

The natural heritage features and functions on and adjacent to the proposed Lafarge SQE property were assessed by Golder Associates in a Natural Environment Technical Report, dated August 2013. CART agreed that the NETR would be reviewed by Hamilton Conservation Authority and City of Hamilton staff, as well as ESAIEG.

The main issues were:

- Potential impacts to Habitat for Threatened bird species (Eastern Meadowlark and Barn Swallow);
- Potential impacts to three unevaluated wetlands on site;
- Potential impacts to wetlands, streams, and ponds located off site; and,

- Review of the Rehabilitation Plan to increase diversity and connectivity with the surrounding environment.

Through discussions and site visits with Golder Associates staff, the CART is satisfied that the issues related to natural heritage features and functions have been addressed.

### **3.0 Water Resources & Hydrogeology**

Dillon Consulting Limited (Dillon) was retained by the City of Hamilton to provide a technical peer review of the hydrogeological and hydrological technical report prepared by Golder Associates Inc. (Golder) for the Lafarge’s proposed South Quarry Extension (SQE). This summary provides an overview of the issues identified in the peer review and by members of CART and how these issues were resolved with the proponent.

The quarry (and SQE) is located in an elevated limestone plain (Flamborough Plain) above the Niagara Escarpment and is approximately 7 km north-northwest of Dundas. The main surface water features in the vicinity of the proposed SQE are Grindstone Creek to the northeast, Logie’s Creek to the southeast and Middle Spencer Creek to the west. The regional geology of the area consists of thin overburden over the bedrock plain (overburden thickness increases at West Grindstone Creek and the Waterdown Moraine located east and southeast of the proposed extension). Regionally, the bedrock consists of a 30 m to 60 m thick sequence consisting of the Guelph and Lockport formations. At the quarry, the two main formations are the Guelph and the Eramosa Member of the Lockport Formation. As proposed by Lafarge, the SQE will consist of an upper bench (Guelph Formation and portion of the Upper Eramosa Member) and a lower bench (remaining Upper Eramosa Member and portion of Lower Eramosa). As part of on-going operations, the progressive rehabilitation of the quarry walls will be completed and the final landform will be a lake (following operations and rehabilitation of the final slopes).

Extensive hydrological investigations and assessments were completed by Golder for the SQE which supplemented existing investigations and monitoring data collected for the larger existing quarry. The South Quarry, while licenced, has not been completed and therefore the SQE impact assessment used, as the existing baseline conditions, predicted conditions once the South Quarry has been fully developed. Three major issues were identified in the peer review by Dillon and are discussed below.

#### **3.1 Earthfx Modelling Review**

Earthfx Incorporated (Earthfx) was retained to conduct a model assessment and review of the proposed Dundas South Quarry Extension (SQE) using the newly developed Greensville Tier 3 (GT3) model (Earthfx, 2014) that supported the development of Source Water Protection studies (*Clean Water Act*, 2006). The GT3 model encompasses a 165 sq. km area with significant features including the Niagara Escarpment, Dundas Valley, Flamborough Plain, the Christie Lake reservoir, numerous wetlands, and two large limestone quarries. Comparison of the extents of the GT3 model and the Golder (2013) quarry model shows that the GT3 model fully encompasses the Golder quarry model within its boundaries.

This fully integrated surface water / groundwater model provided the City of Hamilton and partner agencies with an advanced quantitative assessment tool, and offered an opportunity to review the modelling analysis conducted by Golder Associates (Golder,

2013) on behalf of Lafarge. Under Phase 1 of this study, new quarry monitoring and field investigation data from the Golder report were used to locally refine the model to incorporate the new site-specific geological information. The updated GT3 model was tested by conducting simulations of current conditions to serve as a baseline for comparison with simulations of future scenarios.

Once the baseline was established, the Phase 2 work applied the updated GT3 model to analyze groundwater and surface water flow in the vicinity of the proposed SQE at various stages of the construction, including the full quarry build-out and the final rehabilitation stage.

The use of an integrated surface water / groundwater model for assessing incremental and cumulative effects of land development is an improvement in many respects from a simpler, steady-state groundwater-only assessment such as the one used in the Golder report. With a transient, integrated assessment, the effects of quarry development on both surface water and groundwater features can be evaluated under a range of seasonal and inter-annual (wet year / dry year) conditions.

The four scenarios that were simulated are as follows:

**Scenario A:** Full build out of the existing licensed areas.

**Scenario B:** Full build out of the existing licensed area plus the SQE.

**Scenario C:** Rehabilitation of the quarries with flooding of the fully built out quarries to naturally controlled levels.

**Scenario D:** Three separate sub-scenarios representing interim stages of SQE build-out.

Results from each of the above scenarios were analyzed over a 10-year period with a focus on groundwater levels in three key aquifers: the weathered Guelph bedrock, Upper Eramosa, and Goat Island/Gasport aquifers. Simulated average groundwater levels were determined at the two Greensville municipal wells (FDG01 and FDG02), private wells in the study area, and average streamflow over the simulation period. Overall, grounded on the very detailed analyses under the above mentioned scenarios, the Earthfx study concluded that the cumulative drawdowns under Scenario A and Scenario B are likely to extend farther than indicated in the Golder analysis. Impacts to wetlands and flow in headwater tributaries are likely to be impacted within these zones. Accordingly, an expanded monitoring program which includes groundwater levels, streamflow, and wetland stage / groundwater levels was recommended.

Details of the Golder Report and the Dillon and Earthfx reviews in relation to impacts on wells and surface and groundwater features is provided herein.

### 3.2 Potential Impacts on Greensville Municipal Wells

The Greensville Municipal Wells are located a significant distance from the SQE. The Golder assessment concluded that the development of the SQE will not influence the

Greensville municipal wells. The South Quarry extends closer to the Greensville wells than the SQE. Dillon agrees with this conclusion which is further supported by additional study completed by Earthfx.

### 3.3 Potential Impact on Nearby Residential Wells

The existing quarry has impacted residential wells in close vicinity to the quarry (less than 500 m). The development of the SQE was determined by Golder to also have the potential to impact residential wells in close vicinity to the quarry. The mitigation proposed by Golder for these impacts is consistent with the approach used for the presently permitted quarry areas. This plan consists of three zones with increased mitigation based on zone: Zone 1 is less than 500 m from the quarry; Zone 2 is between 500 m and 1000 m from the quarry; and Zone 3 is greater than 1000 m from the quarry.

The Earthfx Report identified a greater area of influence than that proposed by Golder. The Report identified that potential impacts to private wells under Scenarios A and B have been identified. Golder (2013) included a well survey, but their efforts were focussed on the area likely to be affected by incremental drawdowns from the SQE rather than the cumulative impacts. Based on the results of the Earthfx Report, City of Hamilton staff recommended that the area identified as Zone 1 be expanded to at least 1000 m from the proposed quarry extension, and the well survey which is required to be completed prior to extraction be increased to an area of 1400 m from the extension limits (whereas Golder had proposed a limit of 600 m from the quarry). The Complaint Action Plan should also expand Zone 1 to 1000 m, and a greater radius of notification of property owners should be provided. In response to these comments, Lafarge agreed to include additional wells within the limits of Zone 1 and within the well survey which is required prior to extraction, and further, to increase the desktop well survey to the requested 1400 m.

Further, the Dillon review identified that Zone 3 was originally designated as to not warrant a mitigation response. However, based on comments made by Dillon, it was agreed that complaints within Zone 3 would be addressed on a case-by-case basis. In particular, complaints in Zone 3 would be assessed if there is both a pattern of complaints and impacts in Zone 1 and Zone 2 which are “in line” with the Zone 3 complaint. Dillon supported this change in the mitigation plan.

Overall, it was determined by Golder that the development of the SQE would not result in impacts more significant than similar impacts that have resulted from the development of the currently licenced areas. Through the recommendations of the Earthfx and Dillon reviews, the mitigation plan (Complaint Action Plan) has been improved to respond adequately to potential complaints.

### 3.4 Potential Impacts on Wetland OPF-2

Wetland OPF-2 is located west of the SQE and impacts to the wetland could occur if the development of the SQE would decrease the amount of groundwater base flow to this surface water feature. In response to this issue, Golder demonstrated that OPF-2 is predominately a surface water feature and does not receive a significant amount of groundwater base flow. The Golder Report indicated that potential impacts resulting from the SQE development on this surface water feature are limited.

However, the expanded review conducted by Earthfx indicated that there could be some impact to OPF-2 at full quarry build out, and recommended additional monitoring to be required. In response, the Hamilton Conservation Authority noted that while OPF-2 is not being monitored directly, there are surface water monitoring stations (SW1B and SW2) downstream of OPF-2 that are part of the monitoring program and which will be monitored to help document any changes to the watercourses that are part of the Spencer Creek system to the west of the SQE. The Site Plan monitoring notes require baseline conditions and trigger (impact threshold) levels to be established for these stations prior to operation of the SQE, and for mitigation measures to be implemented if monitoring results show triggers are exceeded as a result of operations.

It is also understood that surface water monitoring stations SW6 (water flow) and SW6A and 6B (water quality) at Logies Creek and Oldfield Road are part of the existing quarry monitoring program, and that data / results from these stations will be considered in a comprehensive manner in conjunction with the monitoring stations being added through the SQE. There are no further concerns in this regard.

### 3.5 Potential Impacts to Logies Creek

Issues associated with Logies Creek relate to potential flooding and erosion as a result of quarry discharge during quarry operations and potential downstream effects once the quarries have been rehabilitated and flooded. The Hamilton Conservation Authority and Lafarge resolved these issues directly. It is noted, however, that it will be many years (50+) before the quarries are fully flooded, and there are many variables that may change in that period (e.g. climate change effects). It is preferred that there be an explicit acknowledgement that hydrologic modelling be completed at the time of the final design of the outlet control structures and operating regime of the flooded quarries to address both flood conditions as well as low flow conditions, which were identified by as a potential concern by Earthfx. This has been agreed to by Lafarge and appropriate notes have been included on the Operational Plan.

### 3.6 Conclusion

Through the peer review by Dillon and the modelling review by Earthfx, members of CART are satisfied that appropriate mitigation measures to address surface and groundwater impacts have been identified and included as required notes on the ARA Operational Plan. Further, the improvements to the Complaint Action Plan will ensure

that all potentially impacted wells will be included in the Action Plan and that appropriate response to the well owner's concern will be provided.

#### **4.0 Noise**

HGC Engineering prepared a noise assessment of the proposed quarry extension entitled “Noise Impact Assessment for Proposed Lafarge Dundas South Quarry Extension, Category 2 – Class “A” Quarry, Part of Lots 7, 8, & 9, Concession III (Geographic Township of West Flamborough) City of Hamilton”, dated August 19, 2013. The study assesses the potential noise impact at surrounding sensitive receptors, in accordance with MOECC Guideline NPC-205.

The Study considered all non-Lafarge owned sensitive receptors, including homes along Moxley Road, Brock Road and Concession 4 West. Eight residences were selected as points of reception representing the locations with the most potential to be impacted as a result of the quarry extension.

Under MOECC Guideline NPC-205, the subject lands are classified as a semi-urban environment. A quarry is considered a ‘stationary noise source’ under the guideline. In evaluating noise impact from a stationary source, NPC-205 states that the sound level limit from a stationary source which operates during day and night hours in a semi-urban environment is the greater of the background (ambient) sound level, or the limits established in the Guideline of 50 dBA during daytime hours and 45 dBA during evening hours. For the purposes of the noise study, the Guideline limits of 50 dBA and 45 dBA were employed. The study notes that preparation and rehabilitation activities on extraction sites do not need to comply with the guideline, nor does the initial stripping of top soil or building of berms.

The Study provides a description of the quarry operations that were used as the basis for evaluation of noise impact, including the phasing and extraction sequence in each of the five phases. Important considerations in the noise evaluation are noted:

- Quarry operations (but not blasting) take place up to 24 hours a day;
- The extension is divided into 5 phases, with extraction occurring in 2 benches, each of a depth of 14 – 15 m;
- Sound emissions from equipment in the approved South Quarry and the Main Processing Area have been included in the analysis although they are not part of the subject approval;
- No quarrying will occur in the North Quarry at the same hour as the South Quarry; and,
- Equipment considered in the analysis: 2 rock drills; 2 front end loaders; 3 rock trucks; portable crusher; primary crusher; and material conveyors.

The Study found that with the recommended Noise Control Measures in place, the sound levels at all sensitive points of reception would be within the MOECC recommended sound level limits during quarry operation. The Noise Control Measures must be identified and detailed on the ARA Operational Plan. The measures are separated into those required overall and those required per each individual phase. At a high level, the measures relate to:



- berming requirements (nine berms are required over all of the phases, ranging in height from 5 to 9 m);
- restrictions on operating hours of certain equipment / activities;
- restrictions on certain equipment being prohibited from operation simultaneously with other equipment;
- maximum sound power levels of equipment; and,
- placement and height of primary crusher.

The Noise Study also addresses two specific issues. The first is the heritage residence at 565 Moxley Road. As this residence will be retained, but vacant during extraction, berms are required on the west and north sides of this property. The second issue is the potential closure of Moxley Road. The Study notes that sound levels at all sensitive receptors will still be met under the scenario of the Moxley Road closure. Berming requirements would need to be reconfigured, and this information has been provided in the Study.

In addition to the Noise Study, a supplementary letter prepared by HGC Engineering, dated June 4, 2014 was provided in response to questions raised by the CART peer reviewer (Jade Acoustics) during the preliminary site visit at the subject lands. The June 4 letter summarizes origins of sound source data, clarifies that the cemetery on Concession 4 West was not considered a sensitive point of reception in the Noise Study, and provides a commentary on compliance with the newly released MOECC Guideline NPC-300.

The Noise Study and the supplementary June 4, 2014 letter were peer reviewed by Jade Acoustics, dated September 18, 2014. The peer review finds that the Noise Study was generally prepared in accordance with MOECC guidelines. The peer review makes some specific recommendations, including:

- updating the Study as per NPC-300 Guideline (as opposed to NPC-205), including confirmation on receptor height;
- assessing noise impacts from construction and rehabilitation even though these activities are not mandated by the MOECC;
- ensuring a procedure is in place to ensure that equipment used in quarry operations is consistent with that modelled in the Noise Study;
- ensuring that berm length, truck trips and frequency, sound power levels, crusher mitigation, and scenario mitigation information is included on the ARA Operation Plan; and,
- incorporation of a sound monitoring program or protocol for complaint response.

A response to the peer review was provided by HGC Engineering on January 30, 2015. The response from HGC addresses the points raised in the peer review, as noted above, as follows:

- the only difference between NPC-205 and NPC-300, as related to the subject noise study, is the NPC-300 requirement to consider vacant lots as points of reception. HGC indicates that only one vacant lot exists in the vicinity which could be impacted by the proposed extension during Phase 3. To mitigate, the visual berms identified during this phase would need to be increased in height. This is only required if the vacant lot becomes occupied during extraction. A note has been placed on the site plan to this effect.
- Regarding noise during construction activities, HGC notes that a note has already been included on the Operational Plan stating that all construction equipment must comply with MOECC Guideline NPC-115. Further, an additional note will be added that requires berms to be constructed as soon as possible during site preparation to provide acoustical shielding. HGC notes that this is standard industry practice.
- HGC provides confirmation that the receptor heights used in the noise study are consistent with NPC-300.
- Regarding sound power levels of equipment, HGC notes that the ARA Operational Plan governs only the proposed South Quarry Extension, and not the existing licensed South Quarry. Sound power levels of the South Quarry equipment cannot be controlled through this license application.
- Lafarge has agreed to complete a Sound Survey following commencement of full operations to verify that sound power levels comply with applicable limits. A note to this effect has been added to the Operational Plan.
- Berm lengths have been added to the Operational Plan.
- Information on rock truck movements cannot be included on the Operational Plan as this is variable due to distances changing between the extraction face and processing plant. The information included in the noise study represents the worst case scenario.
- The Operational Plan already includes all required recommendations and mitigation requirements.
- Lafarge already employs a complaint response protocol for all Dundas Quarry operations.

The CART peer reviewer, Jade Acoustics, reviewed the response from HGC in a letter dated July 7, 2015. Jade notes that the responses above are satisfactory, with the following additional comments:

- The noise study should be updated to incorporate responses to the previous comments per review for ease of review moving forward.
- The Operational Plan should be updated to include the equipment analyzed in the existing licensed South Quarry. A note could be placed on the Plan to indicate that the equipment is located in the South Quarry.

Finally, in response to Jade Acoustics' July 7, 2015 letter, HGC provided the following reply:

- The January 30, 2015 letter should be considered as an addendum to the original noise study. All recommendations are included on the Operational Plan.

- With regard to the comment about including notes on the Operational Plan about the existing licensed South Quarry, HGC notes that Lafarge will be submitting a Site Plan Amendment application for the existing licensed South Quarry. This is required in order to integrate the operations with the proposed South Quarry extension. As part of the Site Plan Amendment, Lafarge has committed to include notes on the South Quarry Operation Plan related to a restriction on drilling activities in the South Quarry during operation of the South Quarry extension; a maximum of 3 rock trucks permitted to deliver material from the South Quarry extension to the primary crusher in the South Quarry; maximum sound power levels for the South Quarry equipment; location of the primary crusher; limitation on hours of operation of the portable crusher; and the timing of construction of berms.

All information and notes recommended for inclusion on the Operation Plan related to the Noise Study and mitigation requirements have been included on the final Operation Plan.

## **5.0 Air Quality**

BCX Environmental Consulting prepared an air quality study entitled “Air Quality Study for the Lafarge Dundas South Quarry Extension”, dated August 2013. The report reviews potential air quality emissions resulting from the South Quarry extension, and compares them to provincial standards to determine if there will be any health or nuisance impacts arising from the proposed extension.

The report reviews the following potential contaminants:

- Total Suspended Particulate (TSP) – can contribute to loss of visibility;
- Fine Particulate Matter (PM10 and PM2.5) – can contribute to health impacts;
- Nitrogen Oxides (NOx) – can contribute to health impacts;
- Sulphur Dioxide (SO2) – can contribute to health and vegetation impacts; and,
- Carbon Monoxide (CO) – can contribute to health impacts.

The Study compares the predicted off-site maximum ground level concentrations of these contaminants to Provincial Air Quality Criteria and Standards for a range of 14 maximum operating scenarios. The scenarios are deemed to represent the worst case operating scenarios based on the assumptions used. The Study includes scenarios which incorporate the closure of Moxley Road.

The Study estimated existing background concentrations of each of the contaminants using nearby monitoring stations. Consideration of the existing aggregate and agricultural operations in the study area was included.

Air dispersion modelling was undertaken based on AERMOD, the MOECC-approved plume dispersion model, including consideration of meteorological data.

The Air Quality Study found the following in relation to the studied contaminants:

- TSP Average Annual Concentrations – below criterion for all phases.
- TSP 24-hour Average Concentration – some exceedances at a few residential locations and agricultural lands – mitigation through berming required.
- PM10 24-hour Average Concentration – below criterion at all residential receptors – minor exceedances at the South Quarry Extension / South Quarry property line – no mitigation is proposed because of conservative nature of model, the lack of accounting of the planned berms which would reduce the levels, and the agricultural nature of the adjacent properties with limited public access.
- PM2.5 24-hour Average Concentration – below criterion at all residential receptors – minor exceedances at the South Quarry Extension / South Quarry property line – no mitigation is proposed because of conservative nature of model, the lack of accounting of the planned berms which would reduce the levels, and the agricultural nature of the adjacent properties with limited public access.

- NO<sub>x</sub> – below criterion for both 24-hour and 1-hour averages.
- SO<sub>2</sub> – below criterion for both 24-hour and 1-hour averages.
- CO – below criterion for both 24-hour and 1-hour averages.

Based on all of the above, the Study concludes that there are no health impacts expected from the proposed quarry extension. With regard to nuisance dust impacts, the Study finds that there is a small number of residences that could be impacted, but that the planned noise and dust berms will provide adequate mitigation.

The Study also notes that Lafarge must post on-site and implement the MOECC-approved Best Management Practices Plan for the Control of Fugitive Dust Emissions.

The Air Quality Study was peer-reviewed by Church & Trought, CART peer reviewer, in a letter dated September 18, 2014. The peer review identified a number of items requiring clarification / revision, including:

- Inclusion of the Best Management Practices Plan (BMPP) as an appendix to the Study;
- Explanation of why the North Quarry is outside the study area;
- Inclusion of silica as an additional contaminant to be studied;
- Clarification as to the use of different monitoring stations for different contaminants in the calculation of background level, and clarification as to how the background levels for all contaminants were derived;
- Documentation on manufacturer information for equipment;
- Supporting information regarding dust management efficiency rates should be provided;
- Impacts of implementing the berm mitigation should be assessed; and,
- The minor excesses at the property line should be addressed.

The peer review also noted a number of areas in which they are in agreement with the Air Quality Study, and noted that overall the Air Quality Study presented a thorough assessment of potential air quality impacts.

BCX Consulting responded to the peer review in a letter dated January 30, 2015. The overall responses include the following:

- The BMPP will be updated to include mitigation for site preparation and rehabilitation, including silt fencing, visual monitoring and dust suppressants;
- The North Quarry is 1,500 m from the South Quarry Extension and will be largely complete;
- Modelling of silica was completed. All concentrations are below criterion;
- Additional information on monitoring stations and background levels provided;
- Information on manufacturer equipment is confidential, but the emission factors were incorporated into Lafarge’s ECA for the North Quarry and approved by the MOECC;

- Information on dust management efficiency rates and techniques; and,
- Additional information on the impact of berm mitigation provided, including the conclusion that with the berm mitigation taken into account, the Particulate Matter concentrations would be below criterion.

Church & Trought, CART peer reviewer, provided a response to the BCX reply, in a letter dated April 8, 2015. The Church & Trought comment focussed on the BMPP. The letter noted that the BMPP should be provided for review. In the absence of providing the BMPP, BCX should ensure that the BMPP includes the following: identification of main sources of fugitive dust emissions; causes for high emissions; preventative and control measures; implementation and corrective action; training of personnel; record keeping; inspection and maintenance; and complaint protocol.

Finally, in response, BCX provided a letter dated September 21, 2015. The letter indicates that the BMPP will be in keeping with existing Lafarge BMPP for the North Quarry, North Quarry Extension, South Quarry and Processing Area. This has been approved by the MOECC and generally in keeping with the requirements noted by Church & Trought above. The requirement to post and implement the BMPP at the quarry site has been included as a note on the Operational Plan.

## **6.0 Blasting and Vibration**

Golder Associates prepared a blasting impact assessment entitled "Proposed Dundas South Quarry Extension Blasting Impact Assessment Lafarge Canada Inc.", dated August 2013. The Report reviews the environmental effects from future blasting operations within the proposed quarry extension, specifically whether or not MOECC guidelines related to ground and air vibration effects can be met. The report also reviews the impact of vibration on the existing Imperial Oil Pipeline which is within the study area.

The Report describes the provincial guidelines under which vibration impacts are measured. The two impacts most commonly associated with blasting operations are ground and air vibrations. MOECC Guideline NPC-119 identifies the criteria which must be met in the measurement of both ground and air vibration. Ground vibration is measured in mm/s, and NPC-119 sets the ground vibration limit at the nearest structure off the quarry property at 12.5 mm/s, under conditions where monitoring of blasting is routinely carried out. Air vibration is measured in dBL, and NPC-119 sets the air vibration limit at the nearest structure off the quarry property at 128 dBL, under conditions where monitoring of blasting is routinely carried out. The Report notes that there are four permanent monitoring stations around the quarry property. All blasting is routinely monitored.

The Report notes that the distance from the blast and amount of explosive detonated per delay are the critical parameters in controlling ground and air vibration effects. The Report uses blast monitoring information from the nearby North Quarry to predict the ground and air vibration impacts resulting from the South Quarry Extension blasting. The Report concludes that the provincial guidelines of 12.5 mm/s for ground vibration and 128 dBL for air vibration will be complied with for all blasting beyond a distance of 225 m from adjacent private residences. This represents a majority of the planned extension and is based on blasting procedures in use at the North Quarry. When blasting approaches to within 225 m, the maximum explosive weight detonated per delay period must be reduced by one of the following:

- Reducing borehole diameter;
- Introducing decked charges; or,
- Reducing borehole length.

With regards to potential structural impacts, the Report notes several studies which have examined structural impacts resulting from blasting. The studies concluded that repeated blasting over several decades in excess of the provincial guideline would be required to cause an impact. As all blasting at the site will be below the guideline limit, the Report concludes that there will not be any noticeable cumulative structural effects resulting from the blasting.

With regards to water wells, the Report reviews several studies regarding potential impacts on wells resulting from blasting. Overall, the studies note that ground vibrations

less than 25 mm/s will result in only a slight temporary variation in water level, and that a limit of 50 mm/s is adequate to protect wells from significant damage. As the blasting on site will be below the provincial guideline of 12.5 mm/s, the Report finds that the blasting operations will have no effect on neighbouring wells.

Finally, with regard to the Imperial Oil Pipeline, the Report identifies the procedures of Imperial Oil as related to blasting in the vicinity of the pipeline:

- Quarry must notify Imperial Oil when blasting approaches within 300 m of pipeline;
- Routine monitoring of ground vibration effects must be carried out when blasting within 60 m of pipeline. Copies of monitoring to be submitted to Imperial Oil; and,
- Ground vibration levels limited to 50 mm/s at the ground surface immediately closest to pipeline.

Based on these requirements, the Report notes that changes to blasting procedures would be required within 100 m of the pipeline. Extraction can occur as close as 60 m to the pipeline. Lafarge has committed to monitor pipeline impacts within 150 m of the pipeline (which exceeds the Imperial Oil requirement of 60 m). Further, the Report notes that Lafarge is proposing to relocate the pipeline subject to approval from Imperial Oil.

The Report concludes by stating that blasting operations may be readily performed within the limits of the proposed quarry extension in compliance with current blasting guidelines by the MOECC and Imperial Oil.

The Blasting Impact Assessment was peer reviewed by DST Consulting Engineers, the CART peer reviewer, dated May 20, 2014. The peer review was in agreement with the findings of the Blasting Impact Assessment, and agrees with the assessment of structural impacts and water well impacts. The review notes that it is imperative that on-going monitoring of blasting occur throughout the quarry operation to ensure that compliance is achieved.

Notes have been included on the Operation Plan related to the Imperial Oil requirements and the on-going monitoring of blasts.



## **7.0 Built Heritage**

MHBC prepared a “Cultural Heritage Impact Assessment, Dundas South Quarry Extension, Lafarge Canada”, dated August 20, 2013. To prepare the Cultural Heritage Impact Assessment (CHIA), a field survey was undertaken to identify potential heritage properties in the study area, including both built heritage resources and cultural landscapes. The survey resulted in the identification of 13 built heritage resources and 9 cultural landscapes. The built heritage resources included primarily residences, including two former school sites, as well as agricultural buildings. The cultural landscapes included roadsides, agricultural lands and a cemetery.

Following identification of the heritage resources and cultural landscapes, an evaluation of each resource was undertaken to identify their cultural heritage value or interest and derive a measure of their heritage significance. Criteria contained in Ontario Regulation 9/06 of the *Ontario Heritage Act* were applied for the purpose of evaluation. The criteria are generally summarized as a property having: design or physical value; historical or associative value; or contextual value.

The evaluation identifies three of the built heritage resources and one cultural landscape as being of significant or limited significant cultural heritage value. Two of the properties (798 Concession 4 W and 582/588 Moxley Road) identified as having limited significance had undergone significant alteration or demolition. As such, two resources – the existing dwelling at 565 Moxley Road and the Glenwood Cemetery – were identified as requiring conservation measures.

The following recommendations were identified in the CHIA:

- 798 Concession 4 W – former schoolhouse identified as limited significance, has been considerably altered. Documentation and salvage is warranted.
- 582/588 Moxley Road – mid to late 19<sup>th</sup> Century farm residence with limited value. Was subject to a demolition permit and has been removed. Key building materials were salvaged and photo-documentation occurred during field work.
- 565 Moxley Road – significant mid to late 19<sup>th</sup> Century farm house which is owned by Lafarge and still occupied. Multiple options identified in report include retaining the entire farm parcel, retaining core area only, reusing the building, mothballing the building, relocating the building, abandoning the building or demolishing the building.
- Glenwood Cemetery – located outside of the extraction site, but appropriate edge treatments should be provided to interface with the licensed area. This will include a berm and the retention of existing plantings.
- Commemorative plaquing and interpretive panels should be installed at the intersection of Brock Road and Concession 4 W and at 565 Moxley Road.
- Documentation be provided to the City of Hamilton and Waterdown-East Flamborough Heritage Society & Archives.

Regarding 565 Moxley Road, it was determined, in consultation with City of Hamilton staff, that the preferred option would be to retain the primary core area of the residence, which will be mothballed during extraction. This will include the provision of a minimal level of servicing to the structure and other measures to ensure the structural integrity of the building is maintained.

The CHIA was reviewed by the City of Hamilton Policy & Design Sub-committee of the Hamilton Municipal Heritage Committee (HMHC), and the recommendations of the Policy & Design Sub-committee were confirmed by the HMHC. The Sub-committee recommended that the property at 565 Moxley Road should be added to the Municipal Register. Enquiry into alternative uses of the property was also made. The Sub-committee also noted that the closure of Moxley Road should produce a positive impact on the retained house. The HMHC minutes were endorsed by Planning Committee on September 3, 2014. The property at 565 Moxley Road has been listed in the Municipal Register, approved by Council in 2014.

The CHIA was accepted by City staff. Notes are included on the Operational Plan regarding:

- Retention and mothballing of 565 Moxley Road;
- Berming and retention of trees adjacent to Glenwood Cemetery;
- Salvage of materials from 582/588 Moxley Road, former barn of 565 Moxley Road and 798 Concession 4 West, and incorporation into commemorative display;
- Provision of documentation and records to City of Hamilton and Waterdown-East Flamborough Heritage Society & Archives; and,
- Commemorative display plaques.

Further, in relation to the Glenwood Cemetery on Concession 4 West, it was identified during the review of the application that a portion of the cemetery is located on lands owned by Lafarge at 580 Moxley Road. Upon this discovery, Lafarge has agreed to amend the ARA Operational Site Plan to remove the cemetery lands from the licensed boundary. Further, a 15 m extraction setback will be applied to the entirety of the cemetery boundary, and additional protection will be afforded to the cemetery by applying the Open Space (P4) Zone to the entirety of the cemetery lands. Berming and retention of the existing trees around the entirety of the cemetery lands will be provided.

## **8.0 Archaeology**

Golder Associates prepared a report entitled "Archaeological Assessment Consolidated Report, Dundas South Quarry Extension", dated August 2013. This report represents a consolidation of several Stage 1 through 4 Archaeological Assessments that were completed for different portions of the subject lands between the years 2006 through 2013. Collectively, the reports completed an archaeological assessment of the entire South Quarry Extension lands.

The first report in 2006 was a Stage 1 to 3 assessment of the largest portion of the study area at 114 ha. 34 locations were identified in the Stage 2 report as producing archaeological material. Of these, two Euro-Canadian sites and ten Aboriginal sites warranted Stage 3 investigation. The Stage 3 assessment identified 4 sites that would require Stage 4 investigation (2 Euro-Canadian and 2 Aboriginal). In 2007, the Stage 4 investigation of these sites resulted in documentation of two small Aboriginal camp sites, a late 19<sup>th</sup> century farm homestead complex, and a small concentration of early to mid 19<sup>th</sup> century material. Based on the Stage 4 mitigation, the lands have been appropriately researched and documented.

In 2011, a Stage 1 and 2 assessment was conducted on 9 properties totaling 7.5 ha. One archaeological location was identified, and a Stage 3 assessment was recommended. The Stage 3 assessment was completed in 2012 and resulted in the recovery of late 19<sup>th</sup> to early 20<sup>th</sup> century artifacts. No further archaeological assessment was recommended.

In 2012, a Stage 1 and 2 assessment was completed for six residential properties totalling 2.6 ha along Brock Road and Concession 4 W. Two archaeological locations were identified, and one was recommended for a Stage 3 assessment. To date, the Stage 3 assessment has not been completed for the location (identified as Location 2 AhGx-698). This location, which is at the north-west corner of Phase 3 and is planned to be developed into a berm, and a 20 m buffer around this location has been identified on the Operational Plan as a No Site Disturbance Zone. A note has been added to the Operational Plan indicating that no disturbance of this area may occur until the Stage 3 report has been completed and cleared by the Ministry of Tourism, Culture and Sport. If this clearance is not received before extraction is to commence, the location of the berm will need to be altered. This is noted on the Plan.

In 2013, Stage 1 and 2 archaeological assessments were completed for 2 properties on Moxley Road (0.78 ha) and one property on Brock Road (0.17 ha). No resources of cultural heritage value or interest were recovered and no additional assessment was recommended.

All of the above noted Archaeological Assessments have received clearance from the Ministry of Tourism, Culture and Sport.

## **9.0 Traffic**

Paradigm Transportation Solutions Limited prepared a report entitled “Lafarge Dundas SQE (South Quarry Extension) Traffic Study”, dated July 2013. The report notes the following salient points regarding traffic operations:

- There are no changes planned to the quarry access, plant operations or haul routes currently in place for the existing quarry operations.
- The extension to the existing quarry is proposed on lands north of Highway 5. Extracted aggregate materials will be transported to the processing plant on the south side of Highway 5 by the existing conveyor system which travels below Highway 5. Truck activities will continue via the existing driveway connection to the south side of Highway 5.
- The production capacity of the plant will not change as a result of the proposed quarry extension and therefore truck activity will continue without change.
- The study area intersections are currently operating with no capacity issues.
- Under projected year 2030 traffic volumes, the study area intersections are anticipated to continue to operate with no capacity issues.
- The existing form of traffic control at the site driveway intersection with Highway 5 is considered to be fully acceptable for the operation of the Lafarge Plant. Side street delays are estimated to be 31 seconds or less per vehicle.
- The site driveway connection with Highway 5 is currently operating with no capacity issues and is forecast to continue to operate with acceptable levels of service. No improvements are required to improve the capacity of the intersection. However, ongoing monitoring of the site driveway intersection should be undertaken to ensure that damage from heavy truck traffic is recognized and addressed. A note to this effect is on the Operations Plan.

Highway 5 is a Provincial Highway, and therefore the Ministry of Transportation provided comments on the proposal and the traffic study. The MTO reviewed the Traffic Study and requested clarification on certain matters related to trip generation and frequency. Lafarge responded and provided the requested clarification.