

FERMA-CARDEN QUARRY

Preliminary Geological Evaluation

Project Location:
Lots 6, 7, 8, 9, 10 Concession 9,
Carden Township, Kawartha Lakes City

Prepared for:
Ferma Aggregates Inc.
1 Steinway Boulevard Unit 11
Etobicoke, ON

November 17, 2011

MTE File No.: 36123-100

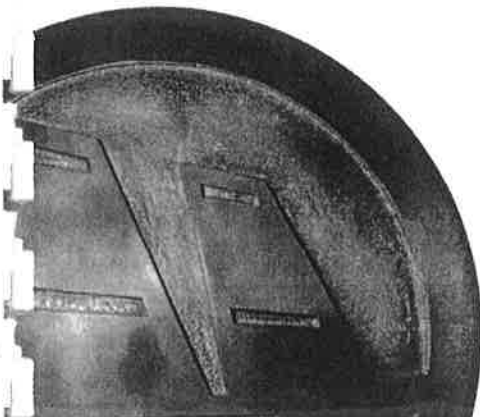


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1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was retained by Ferma Aggregates Inc. to complete a geological evaluation for the purpose of assessing bedrock quality and quantity at the Ferma-Carden quarry. This quarry is located on Lots 6, 7, 8, 9, 10 Concession 9, in Carden Township, Kawartha Lakes City, hereby referred to as the "Site". The Site is found approximately three kilometers northwest of the Town of Victoria Road, Ontario (Figure 1).

There are three criteria for determining the value of a quarry operation:

- The quality of the bedrock and if it is suitable for hot-mix paving uses, concrete, and/or granular base/sub-base materials;
- The quantity of the bedrock and if it is significant enough in depth and aerial extent to provide many years of aggregate supply; and
- The thickness of the overburden atop the bedrock and if it is sufficiently thin to make the extraction of the bedrock economically viable.

The purpose of this report is to examine the attributes of the Ferma-Carden quarry in comparison with these criteria.

The scope of work for this evaluation included:

- Reviewing technical reports documenting the geology and hydrogeology of the Site;
- Reviewing existing information on file with Geological Survey of Canada and the Ontario Geological Survey;
- Drilling two exploratory boreholes on the Site for the purpose of obtaining bedrock core samples;
- Examination and logging recovered core in the field by MTE's Geologist;
- Selecting core sections for submission to a laboratory (exp. Services Inc. [formerly Trow Associates Inc.]) for aggregate quality testing;
- Review of the aggregate quality testing results by DaVroc's Testing Laboratories Inc (DaVroc). and comparison of the results against current Provincial Standards; and
- Calculations on the quantity of rock available for aggregate extraction and processing.

This report begins with a brief description of the Site and surrounding land uses. Information obtained from the Geological Survey of Canada and the Ontario Geological Survey is presented followed by the results of the drilling program. A description of the aggregate quality testing program is then presented followed by a discussion of how the results compared to the Ontario Standards for asphalt. The next section presents the thickness of overburden and briefly discusses the economic viability of removing the overburden to extract the bedrock. The last section presents the conclusions.

1.1 Site Description

Ferma Aggregates Inc. owns and operates a Class "A" quarry under license number 108268. The licensed area is 427.2 hectares (ha) and the extraction area is 186.2 ha separated into two segments with five phases in total (Figure 2). The quarry is licensed to extract to a depth of 35 meters, on average.

The Site is bounded by an unopened road allowance to the North (Line 10/11), Line 5/6 (McNamee Road) to the south, Concession 10 to the east, and Concession 9 to the west. Figure 3 is an aerial photograph of the Site showing surrounding land uses consisting of open pasture and swamp/woodlots. Scattered around the Site are occasional private dwellings. Figure 3 shows three residences opposite the western boundary, three opposite the southwest corner, and one across from the southern boundary. Located approximately one kilometer southwest of the Site is the Preston Quarry operated by LaFarge on Lot 4, Concession 8 (Figure 1).

2.0 REGIONAL BEDROCK GEOLOGY

The following is a description of the general bedrock geology of the Lake Simcoe Region as reported by the Geological Survey of Canada and Ontario Geological Survey.

There are four bedrock units present in the Lake Simcoe Area. These include three sedimentary bedrock formations, the Bobcaygeon, the Gull River, and the Shadow Lake Formations, underlain by Precambrian gneiss. Table 1 provides a general description of the lithology of these units as determined by the Geological Survey of Canada.

Table 1: Regional Bedrock Lithology

System	Group	Formation		Lithology
ORDOVICAN	Simcoe	Bobcaygeon	Upper member	Calcarenites and sublithographic limestone
			Middle member	Sublithographic limestone
			Lower Member	Argillaceous limestone and calcarenite
		Gull River	Upper member	Lithographic semicrystalline limestone
			Middle	Lithographic limestone
			Lower	Dolomitic limestone and lithographic limestone
CAMBRIAN	Basal	Shadow Lake		Red and green shale, arkose
PRECAMBRIAN				

2.1 Bobcaygeon Formation

The Bobcaygeon Formation is divided into three members. Essentially the lower member consists of grey, fine-grained limestone, but encloses calcarenite in its uppermost few feet. The middle member consists of sublithographic limestone. The upper member alternates between sublithographic and medium calcarenite limestone, but also includes some brown lithographic limestone and bluish fine-grained limestone in minor thicknesses. Shaley partings (up to 2 mm thick) have been observed in this formation. Shaley partings are commonly stylonitic and occasionally undulating.

Contact

The lower contact of the Bobcaygeon formation is defined where the typical grey-brown, fine- and medium-grained argillaceous limestone with shaley beds overlies the more finely grained dolomitic limestone of the Gull River Formation. This contact in many places is marked by a transitional boundary. The Ontario Geological Survey defines this contact as the Moore Hill beds which are a dark brown fossiliferous limestone (OGS, 2000)

2.2 Gull River Formation

The Gull River Formation is divided into three members. The lower member consists of fine-grained limestone, lithographic limestone, and fine-grained dolomitic limestone. The middle member is composed almost entirely of lithographic limestone; the upper member lithographic, sublithographic, and semi-crystalline limestone.

Contact

The lower contact of the Gull River Formation is defined where the limestone and dolomitic limestone overlie the red and green shales of the Shadow Lake Formation. The upper contact is defined as the top of the highest development of lithographic limestone and argillaceous limestone of the Bobcaygeon Formation. On gross lithology, the Gull River is lithographic dolomitic limestone; the Bobcaygeon is grey, fine-grained, argillaceous limestone.

The upper contact of the lower member of this Formation is marked in places by a green grey sandy dolostone horizon which is known as the "upper green marker bed". A similar horizon near the bottom of the lower member is referred to as the lower green marker bed".

The contact between the Gull River Formation and the underlying Shadow Lake Formation is gradational from carbonate to sandstone and shale. It is convenient to define this contact as the uppermost extent of the gradation because of the deleterious effects of the sandstone and shale content on the potential aggregate quality of the Gull River Formation.

2.3 Shadow Lake Formation

The Shadow Lake Formation consists of greenish grey, coarse-grained, calcareous arkose overlain by several feet of red and green arenaceous shales. The shales are locally calcareous and commonly contain frosted, rounded to angular quartz grains that are as much as 1.25 cm long. The formation also includes some transitional red mottled green shale. Where the Cambrian formations are present, the Shadow Lake Formation may include reworked Cambrian sediments, such as purplish sandstone and shale. In well cuttings the formation appears to be more arkosic and sandy (with greenish and reddish shale fragments) than it actually is, because the softer shale is washed away by the drilling mud.

Contact

The upper contact of the Shadow Lake formation is defined where the main shale section of the Shadow Lake Formation is overlain by the limestone sequence of the Simcoe Group. The lower member of the Gull River Formation consists of grey and brown, fine- and medium-grained limestone and dolomitic limestone, and grey and brown, dense, sublithographic to lithographic limestone.

3.0 DRILLING PROGRAM

The purpose of the drilling program was to obtain bedrock core samples to ascertain the type, thickness, and quality of each formation under the Site. The focus for the drilling program was on Phase 1. Two 37.5 mm diameter exploratory boreholes were drilled on the Site in September 2011 to depths of approximately 47 m. Their locations are labeled BH1-11 and BH2-11 on Figures 2 and 3. Boreholes were also drilled on the Site for previous investigations completed by Trow Consulting Engineers Ltd. (1994 and 2002). Monitoring wells were installed in these boreholes and their locations are also shown on Figures 2 and 3.

The new exploratory boreholes were continuously cored through the limestones of the Bobcaygeon and Gull River Formation and into the shales and arkose of the Shadow Lake Formation. The cores provided unweathered, stratigraphically well-contained samples for petrography, and aggregate quality analysis. Borehole logs are presented in Appendix A and a photographic log of the core samples are found in Appendix C.

3.1 Site-Specific Bedrock Geology (Boreholes BH1-11 and BH2-11)

The geology of the Site was determined based primarily on the results of the drilling program. Comparisons were made to the results of the drilling program used for previous studies completed by Trow Consulting Engineers Ltd. (1994 and 2002) hereby referred to as the Trow reports. Table 2 summarizes the lithology observed while drilling at BH1-1 and BH2-11.

Table 2: Observed Bedrock Lithology

Formation	Approximate Thickness (m)		General Geological Observations
	BH1-11	BH2-11	
Bobcaygeon	23	21	Argillaceous, thinly bedded, lithographic, slightly fossiliferous at depth
Gull River	19	18	More abundant stylolites, fossiliferous zones, dolomitic, medium to thick beds up to 24 – 32 inches thick, sublithographic, lower green marker bed present at base of unit
Shadow Lake Formation	4*	5*	Red, green shales

* Borehole was terminated before full thickness was observed

The Bobcaygeon Formation was observed as argillaceous, thinly bedded (6-8 inches or less) fine grained to lithographic, grey to medium dark to grey-brown limestone. The Bobcaygeon Formation was about 23 m thick at BH1-11 and 21 m thick at BH2-11. The Moore Hill beds, which are described as a dark brown fossiliferous limestone, were not observed on the Site. By comparison, The Trow report (1994) showed that the Bobcaygeon Formation was up to 19 m thick.

The Gull River Formation was observed as a grey, medium grey to tan-grey fine grained sublithographic limestone. The beds were medium to thick (24 to 32 inches thick). Stylolites occurred within this unit in greater abundance than in the overlying Bobcaygeon Formation and it was more fossiliferous in places. This formation was approximately 19 m thick at BH1-11 and 18 m thick at BH2-11. By comparison, The Trow report (1994) showed that the Gull River Formation was up to 17 m thick.

The upper green marker bed was not observed in the Gull River Formation at either of the new borehole locations but the lower green marker bed was observed near the lower contact with the Shadow Lake Formation. The lower green marker bed was observed at 41.5 m in BH1-11 and approximately 41 m in BH2-11.

The full thickness of the Shadow Lake Formation was not observed at either drilling location. Only four meters of this formation was observed at BH1-11 and five meters at BH2-11. This formation had a distinctive greenish grey/reddish brown mottled colouration. The rock graded downward from a shale rich limestone to shale.

The core samples were segmented into four sections, two samples from the Bobcaygeon Formations (1-9 m and 9-18 m), one transitional sample from the Bobcaygeon Formation to the Gull River Formation (18-27 m), and one from the Gull River Formation (27-39 m). No core samples were submitted from the Shadow Lake Formation because it is not considered an aggregate resource due to the deleterious effects of the sandstone and shale.

Core samples were submitted to exp Services Inc. for analysis. The results of the laboratory testing were interpreted by DaVroc and are presented in Section 6.0. The following section describes the physical and chemical tests completed on the core samples to assess the aggregate quality.

4.0 AGGREGATE QUALITY TESTING METHODS

Aggregate quality is an issue which is fundamental to the use of aggregate products and therefore the sale of the material. Most of the aggregate materials consumed in Ontario are keyed to the Ontario Provincial Standards – a set of specifications which is established by the Ontario Ministry of Transportation. The Ontario Provincial Standards govern most Ontario government supply projects, and they also apply to most municipal projects.

Aggregate products can be divided into three main groups: concrete aggregates, asphalt aggregates, and granular aggregates. The distinction between these groups is made largely on the basis of the physical/chemical durability of the rock fragments comprising the aggregate. Grain size is an important consideration, but this aspect can commonly be addressed with crushing, screening and blending procedures. Specifications for individual products within each of these three groupings vary, but generally the physical/chemical specifications are most demanding for concrete aggregate, at moderate to high levels for asphalt aggregates, and at lower levels for granular aggregates.

Following is a brief description of the tests that have been employed in assessing the aggregate at the Site:

Wash Pass 75 um Sieve: A measure of the amount of silt in the sample.

Absorption by Mass Test: A specific weight of aggregate material is immersed in water for 24 hours. The sample is surface dried, weighed, and the weight increase is expressed as a percentage. The results give an indication of the porosity of the material.

Magnesium Sulphate Soundness Test: A graded aggregate sample of known weight is alternately immersed in a saturated solution of magnesium sulphate and dried. After 5 cycles the sample is received and the weight loss is determined as a percent. The crystallization action of the magnesium sulphate is similar to the freezing and thawing action of water and the test gives an indication of the material's ability to resist freeze-thaw action.

Percent Crushed Particles:

Flat and Elongated Particles: Flat and elongated particles can cause problems because they tend to reorient and break under compaction. Therefore, they are typically restricted to some maximum percentage. An elongated particle is most often defined as one that exceeds a 4:1 length-to-width ratio.

Petrographic Number: The percentage of various rock types present in a sample are assessed and recorded as a percentage. A numerical factor is applied to each of the rock types in accordance with that type's ability to resist physical/chemical breakdown. The resulting number gives an indication of the overall quality of the aggregate and the identification of the specific lithographic rock types is a helpful diagnostic tool for assessing quality concerns.

Unconfined Freeze-Thaw Test: A known weight of a specific grain size of aggregate material is immersed in a weak salt and water solution and repeatedly frozen and thawed over a ten day period. The sample is then received and the weight loss is calculated. The test is a new procedure designed to measure an aggregate's ability to withstand the freezing and thawing action of water.

Two Faces Crushed Particles:

Alkali-Carbonate Test: Some aggregate materials have been known to create an expansive chemical reaction with Portland cement. A chemical analysis of an aggregate can be carried out to identify the CaO:MgO ratio and the insoluble residue. These data are then plotted on a graph of the two parameters and the potential for expansion can be assessed. More exhaustive testing is required for materials considered potentially expansive.

Micro-Deval Abrasion Test: A known amount of graded aggregate is rotated with small metal spheres and water in a small drum for a specific length of time. The material is then received and the percentage loss is determined.

Accelerated Mortar Bar Test: An aggregate is mixed with cement to form a mortar bar of specific length. The bar is kept in controlled conditions for 14 days and then the bar is measured. The amount of expansion measured in the bar over the time period is a measure of the chemical reactivity between the cement and the aggregate materials.

Potential Alkali-Carbonate Reactivity: Aggregate may react with alkali elements in cement, causing expansion and cracking of the resultant concrete. Potential alkali-carbonate reactive samples are identified using a geochemical screening technique. Sample results are plotted on a graph of CaO/MgO versus some measure of siliciclastic content, such as Al_2O_3 content. The potentially alkali-carbonate reactive field corresponds to dolomitic limestone and expands to include more dolomitic and calcareous compositions with increasing argillaceous content.

All of the tests described above are surrogates for the actual field performance of an aggregate in its intended application. They are a prediction of how an aggregate will perform in a specific application. In practice, the Ministry of Transportation grants approval based on product specifications by stock pile and the aggregate producer is responsible for maintaining a rigorous quality testing program.

5.0 LABORATORY TESTING RESULTS AND BEDROCK SUITABILITY

5.1 Quality

As previously mentioned, drilled core samples were submitted to exp Services Inc. for analysis. The test results are summarized in Table 3. Unabbreviated analytical reports are found in Appendix B. The results of the laboratory testing were interpreted by DaVroc. The results were compared to OPSS 1003 Material Specification for Aggregate for use in Hot Mix Asphalt, hereby referred to as the 'Ontario Standard'. DaVroc's interpretation is found in Appendix D. The following section presents a preliminary interpretation on the aggregate quality of the core samples with respect to asphalt uses.

Table 3: Aggregate Quality Test Data Summary

Laboratory Test	OPSS 1003 Specification For Asphalt	BH1-11				BH2-11*			
		Bobcaygeon		Transi tional	Gull River	Bobcaygeon		Transi tional	Gull River
		3-31'	31-59'	59-89'	89- 129'	9- 39'2"	39'2"- 51'4"	51'4"- 83'	83- 126'
** Wash Pass 75um Sieve	1.3/2.0	2.4	2.2	2.1	2.3	2.2	2.1	2.1	2.5
Absorption by mass	1.75 or 2.0	1.48	0.93	0.74	2.10	0.85	0.66	0.50	1.23
** MgSo4 Soundness loss	12 or 15	6.7	3.2	3.6	10.0	12.7	4.7	3.2	15.6
** Percent Crushed Particles	60 or 100 or 95	100	100	100	100	100	100	100	100
** Flat & Elongated Particles (4:1)	20 or 15	9.5	16.2	9.8	13.9	13.6	14.2	10.4	14.8
** Petrographic Number	-	111	109	107	113	110	104	106	110
Unconfined Freeze Thaw Loss	6 or 15	22.4	17.5	18.4	24.0	16.6	13.7	9.6	13.2
2 Faces Crushed Particles	95 or 80	100	100	100	100	100	100	100	100
** Micro-Deval Abrasion loss	17 or 21	17.7	13.5	12.7	20.1	17.1	13.8	11.5	16.1

* Due to late submission, DaVroc was not able to provide an interpretation of the results

** Test is designed for stockpiled material. Any exceedances may be due to the test being run on crushed drilled core samples

Bold = exceedance observed compared to the Ontario Standard

Some of the aggregate quality tests are designed for stockpiled material and so exceedances may have occurred due to testing on crushed drilled core samples. The tests were completed because the results are a useful indication of rock quality to be expected. Even though Table 3 shows test results for both BH1-11 and BH2-11, DaVroc was unable to interpret the test results

for BH2-11 due to the late submission. Nevertheless, the results for BH2-11 are comparable to the results for BH1-11. The following is a summary of DaVroc's analysis on BH1-11 test results only. An interpretation of the BH2-11 results is pending and will be presented in an addendum report.

The wash passing the 75 um sieve size results for all samples failed to meet the Ontario Standard for asphalt aggregate, however these results should be considered non-representative, due to the fact tests were performed on crushed drilled rock core samples.

The absorption results meet the requirements with the exception of the Gull River sample 89 to 129 feet, which marginally exceeded the Ontario Standard.

The magnesium soundness results for all samples were within the Ontario Standards for all asphalt types.

As expected, all samples were within the Ontario Standards for percentage crushed particles.

For flat and elongated particles, the sample for Bobcaygeon 31 to 59 feet from BH1-11 marginally failed to meet the Ontario Standard for HDBC, SMA and MDBC asphalt, the remaining samples met the requirements for all asphalt types. This test should not have been performed, due to the fact that the samples were prepared by crushing drilled rock core, rather than actual production samples testing.

The petrographic examination performed on the coarse aggregate portion of the samples indicates the stone is primarily Carbonate Rock, in the good category. There may be a requirement to blend rock types to lower the amount of carbonate rock in the asphalt mix.

The results of the unconfined freeze-thaw tests fail to meet the Ontario Standards for all types of asphalt mixes. However, these requirements shall be waived by the Owner when as the aggregate meets the alternative magnesium sulphate soundness requirements. The aggregate tests results for the alternative magnesium sulphate met the Ontario Standard.

As expected, all samples meet the Ontario Standard for two face crushed particles since the samples were prepared by crushing drilled rock core.

The Micro-Deval abrasion results for Bobcaygeon 31 to 59 feet and transitional 59 to 89 feet from BH1-11 meet the Ontario Standards for all types of Asphalt. The Micro-Deval abrasion results for Bobcaygeon 3 to 31 feet is marginally outside the limits for Surface Course Asphalt mixes, and meets the requirements for other asphalt mixes. The Gull River 89 to 129 feet sample results would only meet the requirement for HL-4 Binder and HL-8 and Superpave 19.0, 25.0, and 37.5 mm, HDBC and SMA 19 mm, and MDBC and transitional 59 to 89 feet meet the requirements for all types of asphalt. Note that in the regard the results are affected by the fact that the samples were prepared by crushing drilled rock core.

5.2 Quantity

The volumes of bedrock or estimates of reserves are "gross" volumes. They are based on two exploratory boreholes. The volume of the bedrock under the Site was estimated using the borehole locations, average depths, and the extraction area. No allowances were made for slopes, operational considerations or rehabilitation allowances.

The resource estimates are divided into three geographic areas and into two rock quality units. Borehole data indicated that the Bobcaygeon Formation was 22 m thick on average. The Gull River Formation is approximately 18.5 m thick, on average. Materials below these units comprise the Shadow Lake Formation and the Precambrian gneiss, which are generally poor quality and not considered a potential resource.

Table 4: Bedrock Quantity Calculations

Location	Formation	Area (m ²)	Avg. Thickness (m)	Calculated Volume (m ³)	Tonnes*
North Parcel	Bobcaygeon	1,252,247	22	28,100,000	74,465,000
	Gull River		18.5	23,700,000	62,805,000
Southern Parcel	Bobcaygeon	576,879	22	12,800,000	33,920,000
	Gull River		18.5	10,800,000	28,620,000
			Grand Total	75,400,000	199,810,000

* Multiplied by a density factor of 2.65 tonnes per cubic meter for dolostone rock. This density factor is used by the Province in its Aggregate Resource Inventory reports.

The quantity of bedrock suitable for the production of asphalt aggregate is estimated to be almost 200 million tonnes. The Bobcaygeon Formation represents 108,385,000 tonnes, while about the Gull River Formation represents 91,425,000 tonnes.

6.0 OVERBURDEN THICKNESS AND ECONOMIC VIABILITY

The majority of the Site was reported to be covered by unsorted sand, stones, silt, and clay till (Oliver, et al, 1994). Drilling at the new borehole locations showed similar overburden. The overburden was reported in the Trow report to be thickest in the southeast corner of the Site where it varied between two and five meters in depth. The remainder of the Site consists of a thin veneer of topsoil and overburden between 0.15 m to 0.6 m deep (Oliver, et al, 1994). This thickness is consistent with the observations made at the new drilling locations. At BH1-11 the overburden was 0.6 m, while at BH2-11 it was 2.7 m thick. In some areas of the Site the bedrock was exposed at the surface.

To make an extraction economically viable, the Site should not have an overburden thickness greater than about 8 meters. The thicker the overburden, the more costly it is to extract the bedrock resource. Since the overburden was reported to be less than five meters thick, its removal can be done at a minimal cost. In fact, the bedrock is exposed at the surface in some places on the Site. The thickness of the overburden on the Site will not affect the economic viability of the resource.

7.0 CONCLUSIONS

Based on the work conducted for the Scope of Work as outlined in Section 1.0, MTE offers the following conclusions:

1. The Site geology consists of bedrock of the Bobcaygeon and Gull River and Shadow Lake Formations. The Bobcaygeon Formation is 22 m thick on average, while the Gull River Formation is approximately 18.5 m thick, on average. Based on the preliminary lab results, both formations are capable of producing asphalt quality aggregates according to the aggregate quality specifications employed in 2011. The Shadow Lake Formation is generally poor quality and not considered a potential resource at this time.
2. The upper green marker bed was not observed in the core samples of the Gull River Formation.
3. The extraction area is approximately 186 ha, the quantity of bedrock suitable for the production of aggregate is estimated to be almost 200 million tonnes. All of which is suitable for asphalt quality aggregates.
4. The overburden was reported to be less than five meters thick on the Site. Soil overburden of this thickness can be removed or managed at a minimal cost.

8.0 LIMITATIONS

Services provided by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Geological Consulting profession. No other warranty or representation, expressed or implied, as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of MTE and their client. It was completed in accordance with the scope of work identified in the introduction of the text. As such, this report may not deal with all issues potentially applicable to the Site and may omit issues, which are, or may be, of interest to the reader. All findings and conclusions presented in this report are based on Site conditions, as they existed during the time period of the investigation.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such third parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by any third party as a result of decisions made or actions taken, based upon this report. Others with interest in the Site should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may re-assess the contents of this report.

We trust this meets your current requirements. If you have any questions or comments, please do not hesitate to contact the undersigned directly at (519) 743-6500.

Respectfully submitted,

MTE CONSULTANTS INC.



Jay Flanagan, B.E.S., B.Ed
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Peter A. Gray, P.Geo. QP_{ESA}
VP, Senior Geologist



JBF:plw

9.0 REFERENCES

Geological Survey of Canada, "Palaeozoic Geology of the Lake Simcoe Area, Ontario", Department of Energy, Mines and Resources, 1969.

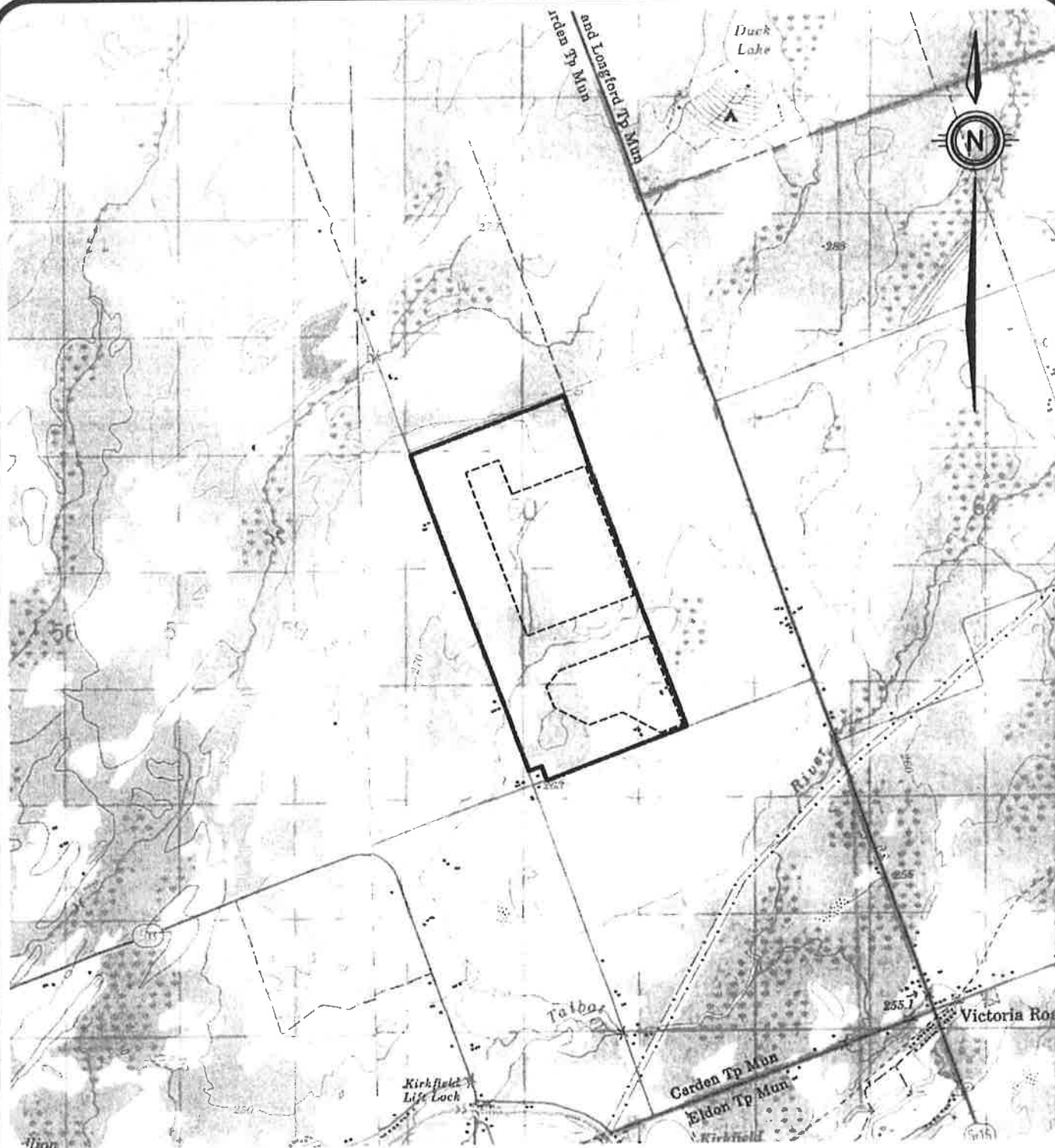
Oliver Mangione McCalla & Associates Limited. "Hydrotechnical Report, Ferma-Carden Quarry, Ferma Crushed Stone Inc", December 1994.

Ontario Geological Survey, Open File Report 6011, "Paleozoic Geology of the Northern Lake Simcoe Area", South-Central Ontario, 2000.

Trow Consulting Engineers Ltd. "Hydrotechnical Report Update, Ferma Aggregates Inc., Carden Quarry", May 22, 2002.



FIGURES



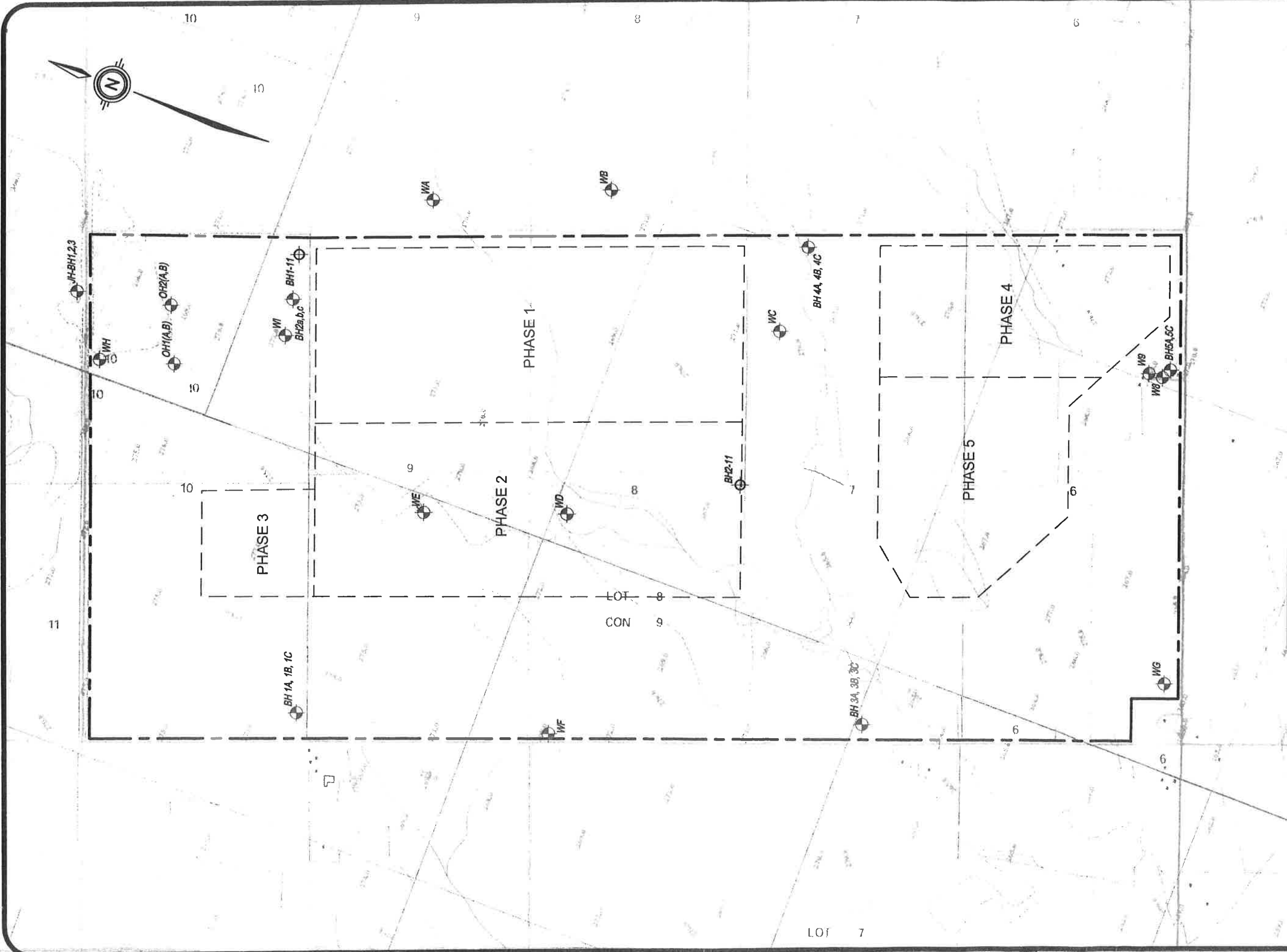
LEGEND

————— LICENSED AREA - - - - - EXTRACTION AREA

Figure 1 KEY MAP



Project Name Ferma Carden Quarry			
Site Carden Township, Kawartha Lakes, Ontario		Client Ferma Aggregates Inc.	
Scale 1:50,000	MTE Project No. 36123-100	Date November 2011	Layout No. EV3.1



LEGEND

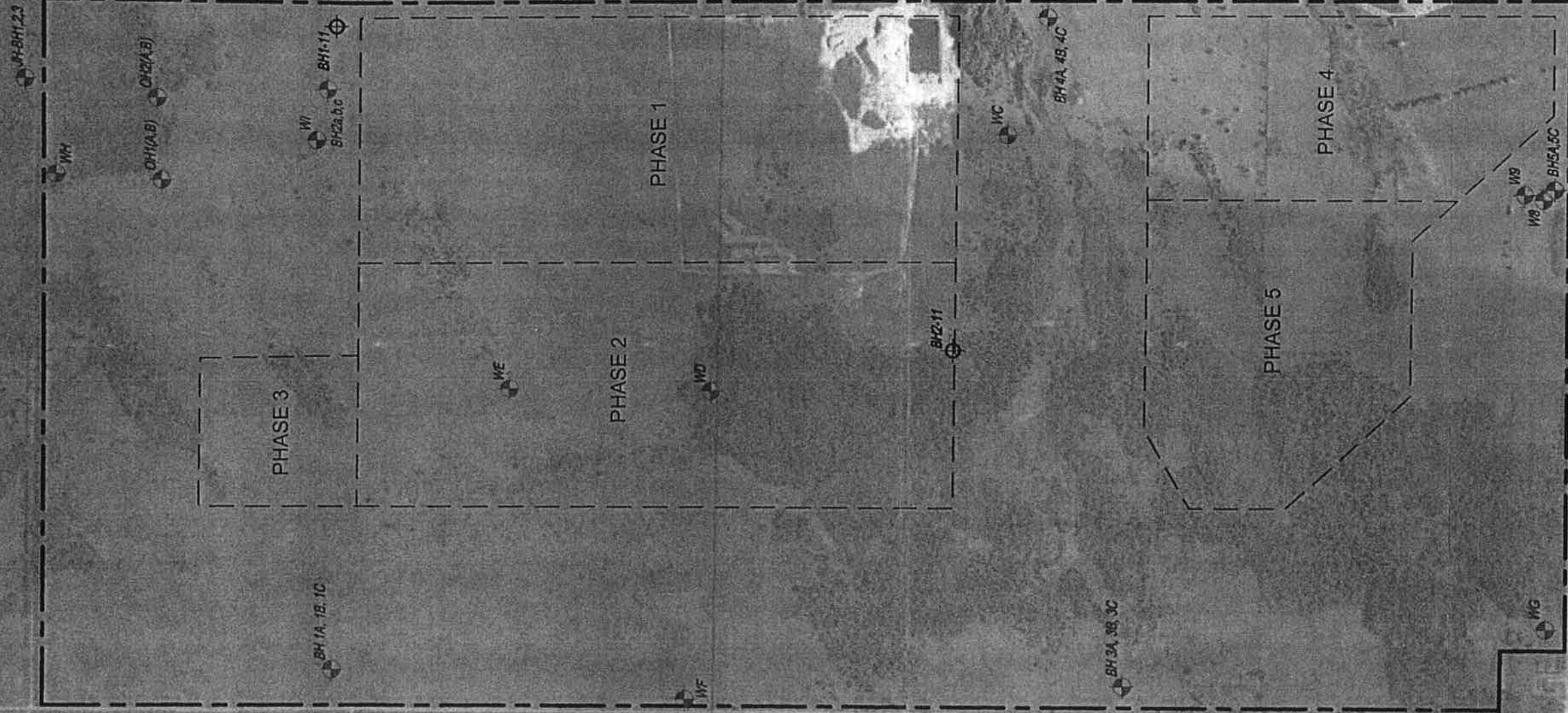
- LICENSED AREA
- EXTRACTION AREA
- W10 EXISTING MONITOR LOCATION
- BH2-11 NEW EXPLORATORY BOREHOLE LOCATION



ENVIRONMENTAL DIVISION

Figure 2 STUDY AREA MAP

Project Name		Client	
Ferma Carden Quarry		Ferma Aggregates Inc.	
Site		Date	
Carden Township, Kawartha Lakes, Ontario		November 2011	
Scale		Layout No.	
1:10,000		EV3.2	
MTE Project No.			
36123-100			



795 m

LICENSED AREA



WG

EXISTING MONITOR LOCATION

NEW EXPLORATORY
BOREHOLE LOCATION

ENVIRONMENTAL DIVISION

Project Name
Ferma Carden Quarry

Site
Carden Township, Kawartha Lakes, Ontario

Forma Aggregates Inc.

Date	November 2011
Layout No.	EV3.3



APPENDIX A

BOREHOLE LOGS

Client: Ferma Aggregates Inc.

Borehole Number: BH1-11

Project: Carden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 6, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
	271.18														
		OVERBURDEN topsoil, clay, stones													
	270.57		1		0										
		BOBCAYGEON FORMATION weathered (moderately to highly) limestone, all bedding planes were < 5 cm, thinly bedded													
	269.73														
2.00		medium dark grey limestone, medium to fine grained, thinly bedded, friable minor shale, few stylolites	2	95	0										
	268.21														
		medium dark grey limestone, vertical fracture with calcite crystals 4 m to 5.2 m, shaly partings at 3.7m, thinly bedded	3	96	0		J	90	W	RU	M				
4.00															
	266.86														
		thinly bedded but core becoming more competent below 5.2 m. Bottom 0.6 m pieces 15 - 20 cm	4	96	29										
	265.34														
6.00		medium dark grey limestone, thinly bedded stylolite partings, competent pieces 25 cm long, weathered (slightly) shaly bedding partings, fine grained	5	100	69										
	263.81														
		medium dark grey limestone, thinly laminated stylolite, competent, weathered (slightly) bedding, shaly partings 8.9 m. No sign of fossils	6	100	74										
8.00															
			7	100	74										
10.00															
	260.76														
		medium grey limestone, fine grained crystalline, low shale %, shaly partings at 11.6 m, thinly bedded	8	100	73										

Backfilled with Bentonite

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 1 of 4

Client: Ferma Aggregates Inc.

Borehole Number: BH1-11

Project: Carden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 6, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
13.00	259.24	medium grey limestone, weathered wavy shale partings, brown layered bedding at 12.8 m, minor shaly layering at weathered partings	9	95	87										
15.00	257.72	tan layer at 13.7 m, weathered bedding 14.0 - 14.4 m	10	100	77										
17.00	256.19	medium grey limestone, medium to fine crystalline, stylolite wavy bedding 5 - 8 cm, weathered bedding at 15 m	11	95	79			F	M	RU	M	O			
19.00	254.67	brown-grey limestone, mottled in places, vertical fracture filled with calcite from 16.5 - 17.1 m, fossiliferous 17.4 - 18 m	12	95	85		J	V	M						
21.00	253.14	grey limestone, fine grained, competent core, thick beds, weathered partings, rough, very little shale, fossiliferous layers	13	100	95										
23.00	251.62	grey limestone, fine grained, thick beds, fossil layers, few partings, rough undulating bedding planes	14	100	99										
	250.10	grey limestone, fine grained stylolites, medium bed, fossiliferous 22.25 - 22.6 m, shaly partings at 22.25m	15	100	79										
	248.57	grey limestone, some brown, breaks, minor weathering, thick bedding	16	100	94										

Backfilled with Bentonite

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 2 of 4

Client: Ferma Aggregates Inc.

Borehole Number: BH1-11

Project: Carden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 6, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
	247.41	GULL RIVER FORMATION													
	247.05														
25.00		medium to dark grey limestone, stylolites, fine to very fine crystalline	17	100	96										
	245.52	medium grey limestone, few stylolites, very competent	18	100	97										
27.00	244.00	break at 28.2 m, grey to brown	19	100	85										
	242.99	grey limestone, fine grained crystalline, competent	20	100	100										
29.00	241.46	grey limestone, fine grained crystalline, stylolite, break at 29.4 m	21	100	100										
	240.90	grey limestone, thick bedding	22	100	90					RU					
31.00	239.38	grey-tan limestone, weathered at 33.2 m, no shale evident	23	100	97										
33.00	237.96	tan limestone, competent, brown stylolites at 33.5 m at rough break, thick bedding	24	100	90		B	F		RU					
35.00	236.59	change near 34.4 m, thick bedding, calcite filled dipping fracture 34.6 - 34.9 m, weather zone 36 m (zone takes up water)	25		87										

Backfilled with Bentonite

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 3 of 4

Client: Ferma Aggregates Inc.

Borehole Number: BH1-11

Project: Carden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 6, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
37.00	235.01	grey-tan limestone, competent, thick bedding	26	100	100										
39.00	233.49	grey-tan limestone, shaly lense at 38.7 m	27	100	97										
41.00	231.96	dark grey limestone, stylolite, crystalline, shaly mud layer at 40.3 m, fossiliferous	28	95	87										
43.00	230.36	green and purplish dolostone and sandstone, laminated, coarse grained (lower green marker bed at 41.5 m)	29	100	95										
43.00	228.84	SHADOW LAKE FORMATION laminated, dark grey-tan limestone, coarse grained	30	100	94										
45.00	227.29	red, mottled green shale	31		100										
47.00	225.76	red, mottled green shale	32	100	100										
47.00	224.55	Hole Terminated													

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 4 of 4

Client: Ferma Aggregates Inc.

Borehole Number: BH2-11

Project: Carden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 7, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
2.00	265.57	OVERBURDEN													 Backfilled with Bentonite
4.00	262.83	BOBCAYGEON FORMATION grey limestone, argillaceous, medium to coarse grained, weathered, thin beds	1	85	35										
	261.30	grey limestone, argillaceous, shaley partings, medium beds	2	90	72										
6.00	259.78	grey limestone, argillaceous, shaley partings, weathered breaks - one piece 30 cm, thin beds	3	95	65										
8.00	258.10	medium to dark grey lithographic limestone, medium to coarse grained, argillaceous, thin beds	4	98	65										
10.00	256.58	less argillite below 9.8 m, thin beds	5	100	53										
	254.95	dark grey, less argillaceous, few stylolites, shaley partings pieces <25 cm, thin beds	6	98	69										

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 1 of 4

Client: Ferma Aggregates Inc.

Borehole Number: BH2-11

Project: Carden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 7, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
13.00	253.38	grey-some tan lithographic to sub-lithographic limestone, less argillaceous, medium to fine grained	7	100	65										
15.00	251.85	medium coarse grained limestone, shaley partings	8	95	55										
	250.33	conglomerate type break at 15.65 m													
	249.92	grey-tan limestone, stylolites, finer grained, longer core pieces, less or few shaley partings	9	100	73										
17.00	248.65	grey-tan limestone, fossils at 18 to 18.15 m (crinoids?) fewer shaley partings, less argillaceous, thick beds	10	100	94										
19.00	247.08	grey limestone, fine grained, competent, minor argillite, few stylolites, thick beds	11	100	92										
21.00	245.55	grey limestone, fine grained, very little shale, competent, few stylolites, thick beds	12	95	100										
	244.03	grey limestone, fine grained, competent, little weathering, minor argillite, thick beds	13	100	100										
23.00	242.46	tan to light grey limestone, fine to very fine grained, more argillaceous towards base, small vertical fracture at 24 m, mottled													
	242.10														

Backfilled with Bentonite

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 2 of 4

Client: Ferma Aggregates Inc.

Borehole Number: BH2-11

Project: Garden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 7, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
		GULL RIVER FORMATION	14	95	100										
25.00	240.88	light grey to tan limestone, very fine grained, competent, faint stylolites, thick beds	15	100	100										
27.00	239.33	tan-grey limestone, few stylolites, thick beds	16	100	100										
29.00	237.78	tan-grey limestone, few stylolites, greenish from 28 to 28.3 m	17	100	100										
	236.31	grey limestone, tan 29.3 to 30.1 m, mottled, solid core to 30.8 m, thick beds	18	100	100										
31.00	234.79	light grey limestone, very fine grained, few stylolites, minor weathering, thick beds	19	100	100										
33.00	233.26	light grey limestone, very fine grained, occasional stylolite, thick beds	20	100	100										
35.00	231.69	darker grey limestone, very fine grained, competent, more argillaceous, thick beds	21	100	100										
	230.11														

Backfilled with Bentonite

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 3 of 4

Client: Ferma Aggregates Inc.

Borehole Number: BH2-11

Project: Carden Quarry

Job Number: 36123-100

Location: Carden Quarry, Carden Township, ON

Drill Date: September 7, 2011

Depth (m)	Elevation (masl)	Geological Description	Run #	% Recovery	% RQD	No. of Sets	Types (s)	Orientation	Spacing	Roughness	Aperture	Filling	Staining	Fractures	Groundwater Observations and Well Details
37.00	228.54	darker grey near top, mottled from 34.75 to 35.4 m, less argillaceous, below 34.75 m very fine grained, thick beds	22	100	100										
	226.96	grey-brown limestone, very fine grained, competent, very minor to few stylolites, massive, more argillaceous	23	100	95										
39.00	226.33	more argillaceous													
	225.39	break at 39.25 m, drop in circulation at clay seam at 40 m	24	100	92		B	F	VC	SU	W	SC			
41.00	223.81	brown to purplish limestone into mottled green, coarse grained, fossiliferous at 40.8 m, lower green marker bed at 40.8 m	25	95	95										
43.00	222.24	SHADOW LAKE FORMATION coarse grained, gritty, mottled, argillaceous	26	100	85										
	221.47	grey limestone and shale, pinkish lenses to purple and green													
45.00	220.76	green-purple limestone/shale, dense, medium fine grained, back to very fine grained near base	27	95	79										
		purple green limestone/shale, dense, finer grained than previous	28	100	90										
47.00	218.63	Hole Terminated													

Reviewed By: PAG

Logged By: PAG

Method: Continuous Core Sampling (Contractor: Marathon Drilling)

Notes: Very little water lost. Drilling was hard. No soft spots encountered.

Sheet: 4 of 4



APPENDIX B

LABORATORY TEST RESULTS AND CHEMICAL ANALYSIS (BY EXP. SERVICES INC.)



The new identity of Trow Associates

Reference No. BRM-00500911-A0

November 2, 2011

Mr David W. Kennedy
CLA – Centre Line Aggregates
R.R. #3, Box 34
Creemore, Ontario
L0M 1G0

via email:
cla-dwk@bell.net

Dear Mr. Kennedy:

This letter is reporting test results on samples of rock cores received in our laboratory on September 21, 2011.

Testing has been carried out as per your instructions. The material was given the following designation:

Borehole #1-11

Bobcaygeon Formation – box #1 & 2 tested together, 3 ft to 31 feet of depth

Bobcaygeon Formation – box #3 & 4 tested together, 31 ft to 59 feet of depth

Gull River Formation – box #5 & 6 tested together, 59 ft to 89 feet of depth

Gull River Formation – box #7, 8 & 9 tested together, 89 ft to 129 feet of depth

Test Program

The samples were crushed in a jaw crusher set to 19mm. The following tests were performed in accordance with the test methods shown in Table 1 as below:

Table 1

LS-601	Wash Pass 75µm Sieve % maximum
LS-604	Absorption by mass, % maximum
LS-606	MqSO ₄ Soundness loss, % maximum
LS-607	Percent Crushed Particles, % minimum
LS-608	Flat & Elongated Particles (4:1) % maximum
LS-609	Petrographic Number (HL), maximum
LS-614	Unconfined Freeze-Thaw loss, % maximum
LS-617	2 Faces Crushed Particles, % minimum
LS-618	Micro-Deval Abrasion loss, % maximum
LS-620	Accelerated Mortar Bar Expansion, %max. @ 14 days
CSA A23.2 – 26A	Potential Alkali-Carbonate Reactivity, Carbonate Rock
AASHTO T304	Uncompacted Voids, % minimum
ASTM D5821	Fractured Particles, % minimum
ASTM D4791	Flat & Elongated Particles (5:1), % maximum

Please note: Samples were tested for LS-609 Petrographic Analysis on material passing 4.75mm.

Sincerely,



Ammanuel Yousif, C.E.T.
Lab Supervisor- Concrete & Aggregates
Geotechnical Division (Brampton)

/Encl.: Notes – Appendix 1003-C



The new identity of **exp Services Inc.**
exp Associates Inc.
1595 Clark Boulevard
Brampton, Ontario, L6T 4V1
Tel: (905) 793-9800
Fax: (905) 793-0641
www.exp.com

Centre Line Aggregates Borehole #1-11

Project no.: BRM-00500911-A0

Requirement: HL3, HL 3HS, HL 3F, HL 4, HL 4F, HL 8, HD8C, MD8C, SMA 19.0, and Superpave 4.75, 9.5 12.5, 19.0 25.0, and 37.5										Sample			
Laboratory Test & No.	HL 3, HL 3HS, HL 3F, and Superpave 9.5, 4.75, and 12.5	HL 4 Surface	HL 4 Binder, and HL 8, and Superpave 19.0, 25.0, and 37.5	HD8C and SMA 19.0	MD8C	Bobcaygeon 3-31'	Bobcaygeon 31-59'	Gull River 59-89'	Gull River 89-129'				
Wash Pass 75µm Sieve, % maximum, LS-601	1.3/2.0	1.3/2.0	1.3/2.0	1.3/2.0	1.3/2.0	2.4	2.2	2.1	2.3				
Absorption by mass, % maximum, LS-604	1.75	2.0	2.0	2.0	2.0	1.48	0.93	0.74	2.10				
MgSO ₄ Soundness loss, % maximum, LS-606	12	12	15	15	15	6.7	3.2	3.6	10.0				
Percent Crushed Particles, % minimum LS-607	60	60	60	100	95	100	100	100	100				
Flat & Elongated Particles (4:1), % maximum, LS-608	20	20	20	15	15	9.5	16.2	9.8	13.9				
Petrographic Number (HL), maximum, LS-609	-	-	-	-	-	111	109	107	113				
Unconfined Freeze Thaw loss, % maximum, LS-614	6	6	15	15	15	22.4	17.5	18.4	24.0				
2 Faces Crushed Particles % minimum LS-617	-	-	-	95	80	100	100	100	100				
Micro-Deval Abrasion loss, % maximum, LS-618	17	17	21	21	21	17.7	13.5	12.7	20.1				
Accelerated Mortar Bar Expansion, % maximum @ 14 days, LS-620 or CSA A23.2-25A	-	-	-	-	-	0.109	0.082	0.018	0.021				
Potential Alkali-Carbonate Reactivity, Carbonate Rock, CSA A23.2-26A	-	-	-	-	-	- See attached charts -							

Borehole 1-11 which is predominately carbonate, is not a designated rock type for HL1, SMA 9.5 & 12.5, DFC, and Superpave 12.5 FC1 & 12.5 FC2


Ammanuel Yousif, C.E.T.

November 2, 2011
Date



exp Services Inc.
The new identity of Trow Associates Inc.
1595 Clark Boulevard
Brampton, Ontario, L6T 4V1
Tel: (905) 793-9800
Fax: (905) 793-0641
www.exp.com

Centre Line Aggregates Borehole #1-11

Superpave – Consensus Properties

FINE AGGREGATE

Laboratory Test and Number		Requirement					Sample			
		Traffic Level Category					Bobcaygeon 3-31'	Bobcaygeon 31-59'	Gull River 59-89'	Gull River 89-129'
		A	B	C	D	E				
Uncompacted Voids, % minimum, AASHTO T304	≤100 mm (Note 1)	-	40	45	45	45	52.5	52.8	52.6	52.6
	>100 mm (Note 1)	-	40	40	40	100/100				

Note 1. Denotes the depth of the top of lift below final pavement surface. If less than 25% of a layer is within 100 mm of the surface, the layer may be considered to be below 100 mm.

COARSE AGGREGATE

Laboratory Test and Number	Requirement					Sample			
	Traffic Level Category					Bobcaygeon 3-31'	Bobcaygeon 31-59'	Gull River 59-89'	Gull River 89-129'
	A	B	C	D	E				
Fractured Particles, % minimum, ASTM D5821	≤100 mm (Note 1)	75/-	85/80	95/90	100/100	100	100	100	100
	>100 mm (Note 1)	50/-	60/-	80/75	100/100				
Flat and Elongated Particles (5:1), % maximum, ASTM D4791	-	10				7.2	12.0	6.9	9.8

Ammanuel Yousif C.E.T.

November 2, 2011
Date

Appendix 1003-C

Notes:

1. Enter the type of rock or material used in the mix as follows:
 - G - gravel, HL 1 only
 - DS - dolomitic sandstone
 - T - traprock, diabase, andesite
 - M - meta-arkose, gneiss
2. HL 1, SMA, DFC, Superpave 12.5 FC1 and 12.5 FC2 only: When control charts for $n > 20$ are used for LS-601, the average value shall not exceed the specification maximum of 1.0%, with no single value greater than 1.4%.
3. These physical requirements for HL 4 apply when the HMA forms the surface upon which vehicular traffic will directly travel, otherwise, the physical requirements for HL 4 binder apply.
4. HL 3, HL 4, HL 8, HDBC, and MDBC only: When control charts for $n > 20$ are used for LS-601, the average value shall not exceed 1.3% with no single value greater than 1.7%. When quarried rock is used, a maximum of 2.0% passing the 75 μ m sieve is permitted. When control charts for $n > 20$ are used for LS-601 for quarried rock, the average value shall not exceed 2.0%, with no single value greater than 2.4%.
5. For traffic categories D and E, Superpave 19.0 shall be 15% maximum.
6. This requirement is applicable to surface course aggregates in the area to the north and west of a boundary defined as follows: the north shore of Lake Superior, the north shore of the St Mary's River, the south shore of St. Joseph Island, the north shore of Lake Huron easterly to the north and east shore of Georgian Bay, excluding Manitoulin Island, along the Severn River to Washago and a line easterly passing through Norland, Burnt River, Burleigh Falls, Madoc, and hence easterly along Highway 7 to Perth and northerly to Calabogie and easterly to Arnprior and the Ottawa River.

When the aggregate for surface course mix is obtained from a gravel or quarry source containing more than 40% carbonate rock type, limestone and dolostone in the retained 4.75 mm portion, blending with non-carbonate aggregate is required to increase the non-carbonate rock type content to a minimum of 60% of the retained 4.75 mm portion. The method of blending shall be such as to produce a uniform product and is subject to approval by the Owner. In cases of dispute, the acid insoluble residue test LS-613 shall be used with a minimum acid insoluble residue of 60%. When the aggregate for surface course mix is obtained from a non-carbonate gravel or quarry source, blending with carbonate rock types shall not be permitted.
7. This only applies to aggregate crushed from gravel sources.
8. This requirement may be waived by the Owner when the aggregate meets the alternative magnesium sulphate soundness requirements, LS-606.

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 1-11, Box 1 and 2, 3 to 31 ft
 FRACTION: 9.5 to 19 mm
 ANALYST: H, Lohse

PROJECT No. BRM-00500911-AO
 SAMPLE No. n.a.
 Date October 31, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	967.7	95.3	-	-
CARBONATE (slightly cherty: <5% chert)	21	2.7	0.3	-	-
TOTAL GOOD AGGREGATE		970.4	95.6	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	38.1	3.8	x 2	7.6
TOTAL FAIR AGGREGATE		38.1	3.8		
CARBONATES (shaley; clayey; silty; clayey)	43	4.2	0.4	-	-
TOTAL POOR AGGREGATE		4.2	0.4		
SHALE	61	2.2	0.2	-	-
TOTAL DELETERIOUS AGGREGATE		2.2	0.2		
TOTALS		1014.9	100.0		7.6

PERCENT GOOD	95.6	x	1	=	95.6
PERCENT FAIR	3.8	x	3	=	11.4
PERCENT POOR	0.4	x	6	=	2.4
PERCENT DELETERIOUS	0.2	x	10	=	2.0

HOT MIX, MULCH AND CONCRETE P.N.	111
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	104

NOTES:

1. ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
2. THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

Fine Aggregate Petrographic Analysis

Source: BH 1-11, Box 1 and 2, 3 to 31 ft
 Lab No.: n.a.
 Analyst: H. Lohse

Project No.: BRM-00500911-AO
 Date: November 1, 2011

	Sieve Size									
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150	
	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	198	97.5	196	96.6	206	99.0	198	98.0	252	94.4
Shale, Argillite(soft), Clay , Ochre	5	2.5	6	3.0	2	1.0	4	2.0	15	5.6
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	0	0.0	1	0.5	0	0.0	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	203	100.0	203	100.0	208	100.0	202	100.0	267	100.0
Percent Retained on Individual Sieve	43.2		25.0		13.5		8.3		6.1	
									3.9	

Weighted Average Percent Shale = 2.7

Weighted Average Percent Chert = 0.1



exp Services Inc.
The new identity of Trow Associates
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-73

Report No.: 167095-73

Date Reported: 11/01/2011

Client Sample ID #1-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location: Ferma-Carden Quarry, Bobcaygeon Formation

Sampled By: Client

Sample Description: BH1-11; 3'-31'; Box 1 & 2

Sample Remark:

Aggregate Type:

Normal Size/Type:

Aggregate Source:

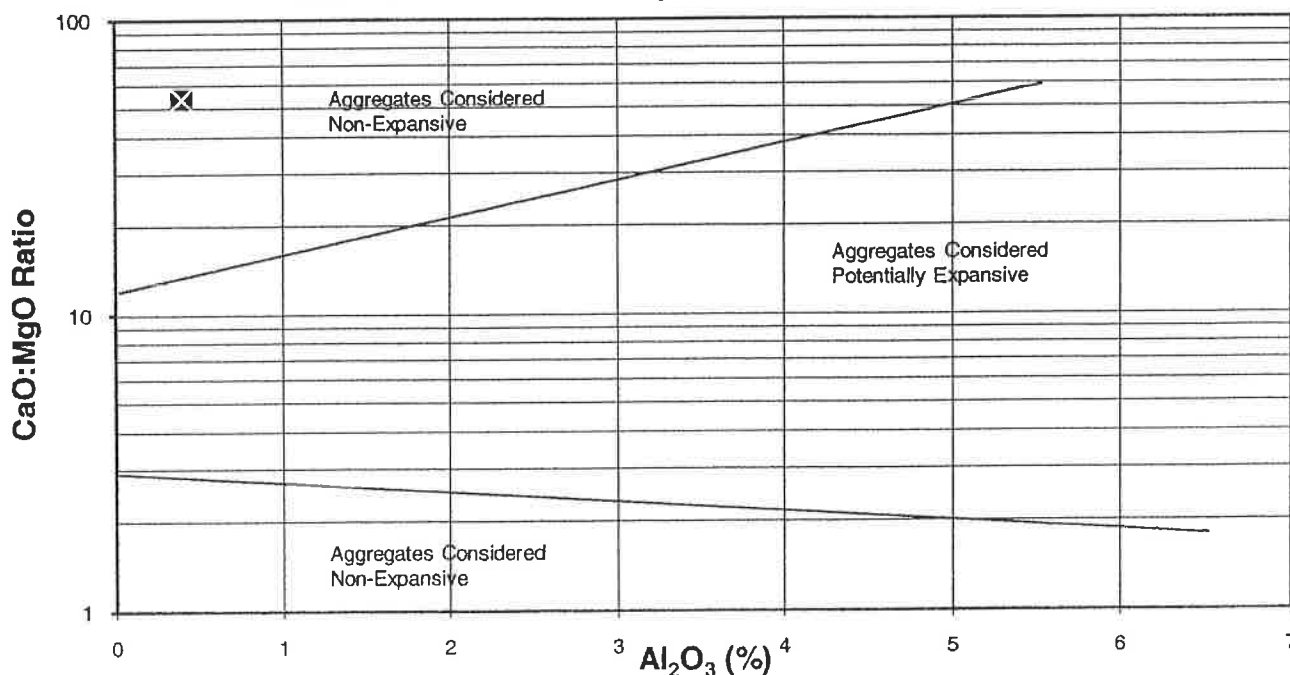
Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
48.5	0.9	53.9	0.4

Determination of Potential Alkali-Carbonate Reactivity of
Quarried Carbonate Rocks by Chemical Composition



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: _____

Approved By: _____

Date Approved: 10/28/2011

Lab Supervisor

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 1-11, Box 3 and 4, 31 to 59 ft
 FRACTION: 9.5 to 19 mm
 ANALYST: H, Lohse

PROJECT No. BRM-00500911-AO
 SAMPLE No. n.a.
 Date October 31, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	987.0	97.2	-	-
TOTAL GOOD AGGREGATE		987.0	97.2	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	21.8	2.1	x 2	4.2
TOTAL FAIR AGGREGATE		21.8	2.1		
CARBONATES (shaley; clayey; silty; clayey)	43	4.9	0.5	-	
TOTAL POOR AGGREGATE		4.9	0.5		
SHALE	61	2.2	0.2	-	-
TOTAL DELETERIOUS AGGREGATE		2.2	0.2		
TOTALS		1015.9	100.0		4.2

PERCENT GOOD	97.2	x	1	=	97.2
PERCENT FAIR	2.1	x	3	=	6.3
PERCENT POOR	0.5	x	6	=	3.0
PERCENT DELETERIOUS	0.2	x	10	=	2.0

HOT MIX, MULCH AND CONCRETE P.N.	109
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	104

NOTES:

1. ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
2. THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

Fine Aggregate Petrographic Analysis

Source: BH 1-11, Box 3 and 4, 31 to 59 ft
 Lab No.: n.a.
 Analyst: H. Lohse

Project No.: BRM-00500911-AO
 Date: October 31, 2011

	Sieve Size									
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150	
	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	204	96.2	192	94.1	207	95.0	214	96.4	200	97.6
Shale, Argillite(soft), Clay , Ochre	8	3.8	12	5.9	11	5.0	8	3.6	5	2.4
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	212	100.0	204	100.0	218	100.0	222	100.0	205	100.0
Percent Retained on Individual Sieve	44.4		25.4		13.8		7.7		5.3	
									3.4	

Weighted Average Percent Shale = 4.4

Weighted Average Percent Chert = 0.0



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Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-74

Report No.: 167095-74

Date Reported: 11/01/2011

Client Sample ID: #1-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location: Ferma - Carden Quarry, Bobcaygeon Formation

Sampled By: Client

Sample Description: BH 1-11; 31'-59'; Box 3 & 4

Sample Remark:

Aggregate Type:

Normal Size/Type:

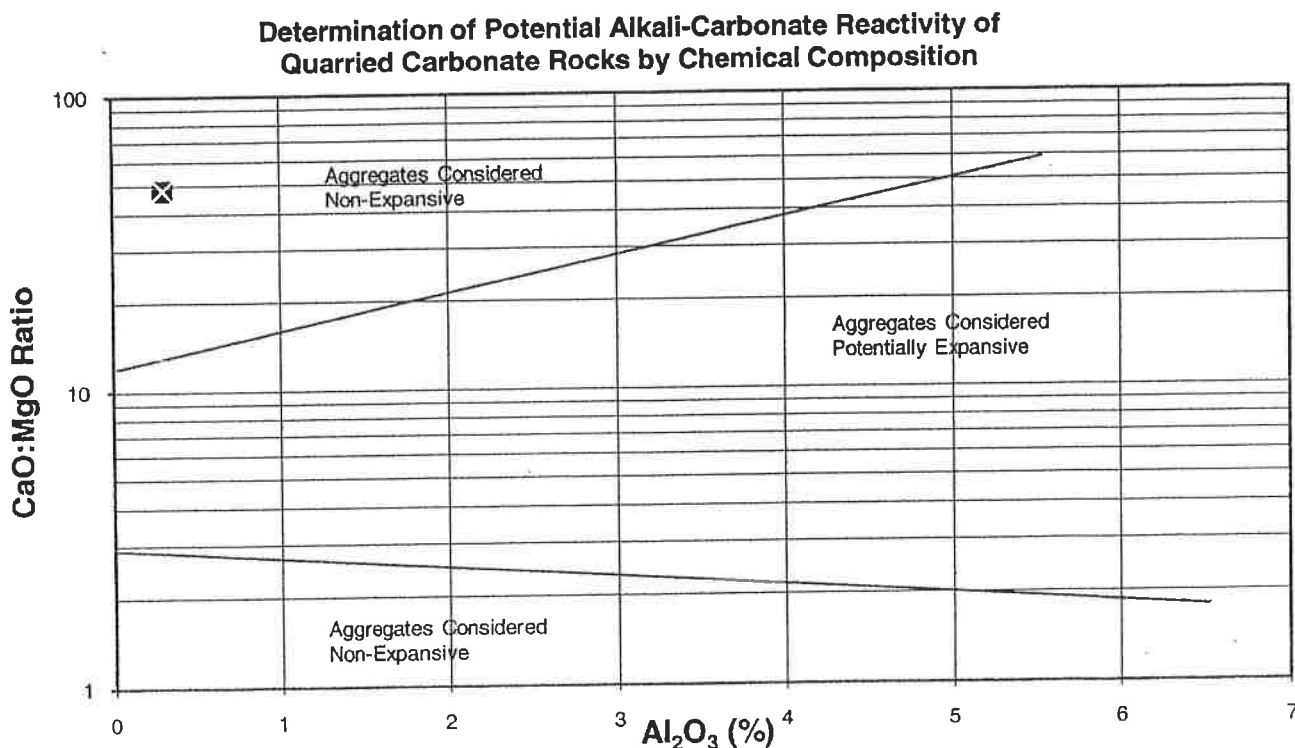
Aggregate Source:

Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
38.5	0.8	48.1	0.3



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: _____

Approved By: _____

Date Approved: 10/28/2011

Lab Supervisor

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 1-11, Box 5 and 6, 59 to 89 ft
 FRACTION: 9.5 to 19 ft
 ANALYST: H, Lohse

PROJECT No. BRM-00500911-AO
 SAMPLE No. n.a.
 Date October 27, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	982.2	97.5	-	-
TOTAL GOOD AGGREGATE		982.2	97.5	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	22.0	2.2	x 2	4.4
TOTAL FAIR AGGREGATE		22.0	2.2		
CARBONATES (shaley; clayey; silty; clayey)	43	1.7	0.2	-	-
TOTAL POOR AGGREGATE		1.7	0.2		
SHALE	61	2.2	0.2	-	-
TOTAL DELETERIOUS AGGREGATE		2.2	0.2		
TOTALS		1008.1	100.1		4.4

PERCENT GOOD	97.5	x	1	=	97.5
PERCENT FAIR	2.2	x	3	=	6.6
PERCENT POOR	0.2	x	6	=	1.2
PERCENT DELETERIOUS	0.2	x	10	=	2.0

HOT MIX, MULCH AND CONCRETE P.N.	107
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	103

NOTES:

- ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
- THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

Fine Aggregate Petrographic Analysis

Source: BH 1-11, Box 5 and 6, 59 to 89 ft
 Lab No.: n.a.
 Analyst: H. Lohse

Project No.: BRM-00500911-AO
 Date: November 1, 2011

	Sieve Size											
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150		150 - 75	
	#	%	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	196	98.0	193	96.5	203	97.6	195	97.5	219	98.6	207	97.2
Shale, Argillite(soft), Clay , Ochre	4	2.0	7	3.5	5	2.4	5	2.5	3	1.4	6	2.8
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	200	100.0	200	100.0	208	100.0	200	100.0	222	100.0	213	100.0
Percent Retained on Individual Sieve	46.5		25.8		13.4		7.4		4.5		2.4	

Weighted Average Percent Shale = 2.4

Weighted Average Percent Chert = 0.0



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Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-75

Report No.: 167095-75

Date Reported: 11/01/2011

Client Sample ID: #1-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location: Ferma - Carden Quarry, Gull River Formation

Sampled By: Client

Sample Description: BH1-11; 59'-89'; Box 5 & 6

Sample Remark:

Aggregate Type:

Normal Size/Type:

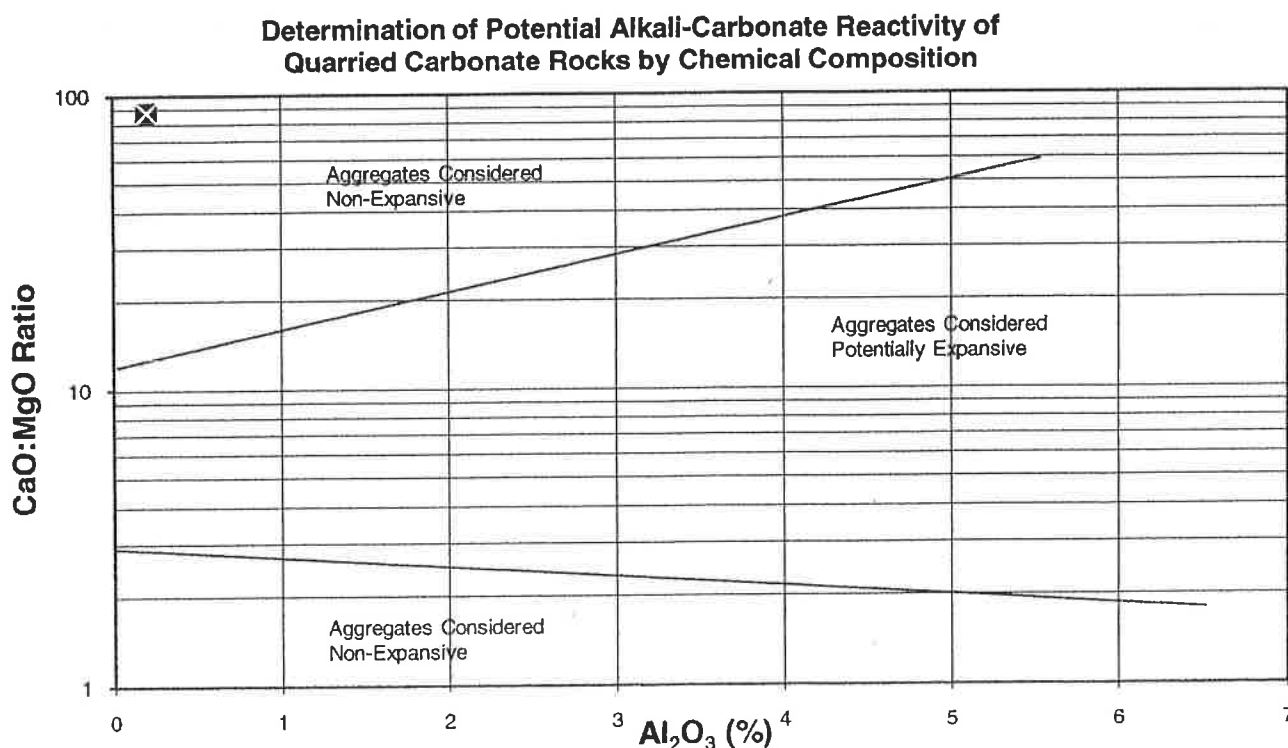
Aggregate Source:

Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
43.8	0.5	87.6	0.2



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: _____

Approved By: _____

Date Approved: 10/28/2011

Lab Supervisor

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 1-11, Box 8 and 9, 89 to 129 ft
 FRACTION: 9.5 to 19 mm
 ANALYST: H, Lohse

PROJECT No. BRM-00500911-AO
 SAMPLE No. n.a.
 Date October 31, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	949.0	94.3	-	-
TOTAL GOOD AGGREGATE		949.0	94.3	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	50.8	5.1	x 2	10.2
TOTAL FAIR AGGREGATE		50.8	5.1		
CARBONATES (shaley; clayey; silty; clayey)	43	6.2	0.6	-	-
TOTAL POOR AGGREGATE		6.2	0.6		
TOTAL DELETERIOUS AGGREGATE		0.0	0.0		
TOTALS		1006.0			10.2

PERCENT GOOD	94.3	x	1	=	94.3
PERCENT FAIR	5.1	x	3	=	15.3
PERCENT POOR	0.6	x	6	=	3.6
PERCENT DELETERIOUS	0.0	x	10	=	0.0

HOT MIX, MULCH AND CONCRETE P.N.	113
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	103

NOTES:

- ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
- THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

Fine Aggregate Petrographic Analysis

Source: BH 1-11, Box 7, 8 and 6, 89 to 129 ft

Lab No.: n.a.

Analyst: H. Lohse

Project No.: BRM-00500911-AO
Date: November 1, 2011

	Sieve Size									
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150	
	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	209	99.5	199	97.1	258	100.0	200	100.0	199	99.5
Shale, Argillite(soft), Clay , Ochre	0	0.0	6	2.9	0	0.0	0	0.0	1	0.5
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	210	100.0	205	100.0	258	100.0	200	100.0	200	100.0
Percent Retained on Individual Sieve	43.9		26.3		14.5		7.7		4.7	
									2.9	

Weighted Average Percent Shale = 0.8

Weighted Average Percent Chert = 0.2



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Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-76

Report No.: 167095-76

Date Reported: 11/01/2011

Client Sample ID: #1-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location: Ferma - Carden Quarry, Gull River Formation

Sampled By: Client

Sample Description: BH1-11; 89'-129'; Box 7,8,9

Sample Remark:

Aggregate Type:

Norminal Size/Type:

Aggregate Source:

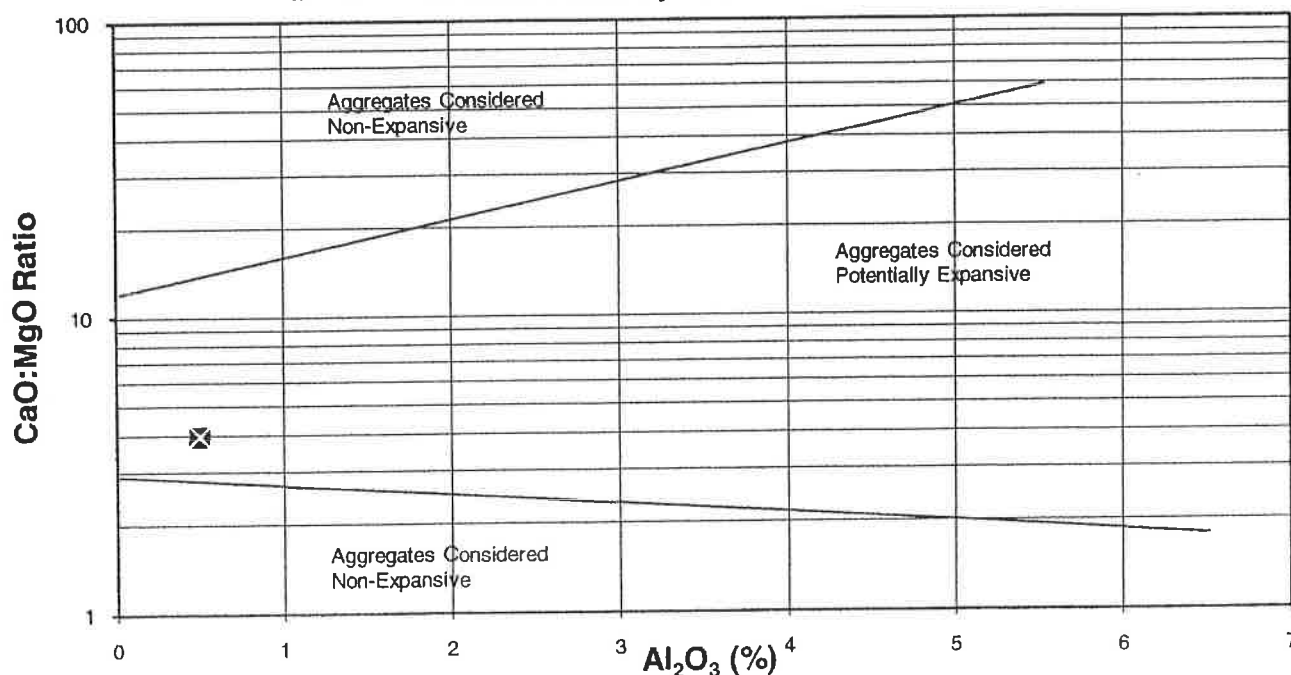
Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
31.3	7.9	4.0	0.5

Determination of Potential Alkali-Carbonate Reactivity of
Quarried Carbonate Rocks by Chemical Composition



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: _____

Approved By: _____

Date Approved: 10/28/2011

Lab Supervisor



The new identity of Trow Associates

Reference No. BRM-00500911-A0

November 17, 2011

Mr David W. Kennedy
CLA – Centre Line Aggregates
R.R. #3, Box 34
Creemore, Ontario
L0M 1G0

via email:
cla-dwk@bell.net

Dear Mr. Kennedy:

This letter is reporting test results on samples of rock cores received in our laboratory on September 21, 2011.

Testing has been carried out as per your instructions. The material was given the following designation:

Borehole #2-11

Bobcaygeon Formation – box #1 & 2 tested together, representing 9 ft to 39'2" feet of depth

Bobcaygeon Formation – box #3 tested separate, representing 39'2" to 51'4" feet of depth

Gull River Formation – box #4 & 5 tested together, representing 54'6" to 83 feet of depth

Gull River Formation – box #6, 7 & 8 tested together, representing 83 ft to 126 feet of depth

Test Program

The samples were crushed in a jaw crusher set to 19mm. The following tests were performed in accordance with the test methods shown in Table 1 as below:

Table 1

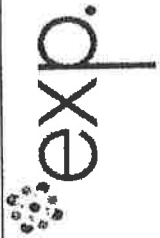
LS-601	Wash Pass 75µm Sieve % maximum
LS-604	Absorption by mass, % maximum
LS-606	MqSO ⁴ Soundness loss, % maximum
LS-607	Percent Crushed Particles, % minimum
LS-608	Flat & Elongated Particles (4:1) % maximum
LS-609	Petrographic Number (HL), maximum
LS-614	Unconfined Freeze-Thaw loss, % maximum
LS-617	2 Faces Crushed Particles, % minimum
LS-618	Micro-Deval Abrasion loss, % maximum
LS-620	Accelerated Mortar Bar Expansion, %max. @ 14 days
CSA A23.2 – 26A	Potential Alkali-Carbonate Reactivity, Carbonate Rock
AASHTO T304	Uncompacted Voids, % minimum
ASTM D5821	Fractured Particles, % minimum
ASTM D4791	Flat & Elongated Particles (5:1), % maximum

Please note: Samples were tested for LS-609 Petrographic Analysis on material passing 4.75mm.

Sincerely,



Ammanuel Yousfi, C.E.T.
Lab Supervisor- Concrete & Aggregates
Geotechnical Division (Brampton)



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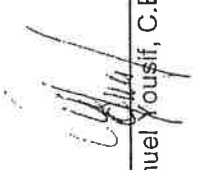
Centre Line Aggregates Borehole #2-11

Project no.: BRM-00500911-A0

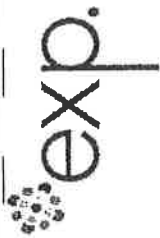
Requirement: HL3, HL4, HL8, HD8C, MDBC & Superpave 9.5, 12.5, 19.0, 25.0, 37.5					Sample				
Laboratory Test & No.	HL3	HL4 Surface & 12.5	HL4 Binder, HL8 & 9.5, 19.0, 25.0, 37.5	HD8C	MDBC	Bobcaygeon 9-39'2"	Bobcaygeon 39'2"-51'4"	Gull River 54'6"-83'	Gull River 83-126"
Wash Pass 75µm Sieve, % maximum, LS-601	1.3/2.0	1.3/2.0	1.3/2.0	1.3/2.0	1.3/2.0	2.2	2.1	2.1	2.5
Absorption by mass, % maximum, LS-604	1.75	2.0	2.0	2.0	2.0	0.85	0.66	0.50	1.23
MgSO ₄ Soundness loss, % maximum, LS-606	12	12	15	15	15	12.7	4.7	3.2	15.6
Percent Crushed Particles, % minimum LS-607	60/80	60/80	60/80	-	-	100	100	100	100
Flat & Elongated Particles (4:1), % maximum, LS-608	20	20	20	15	15	13.6	14.2	10.4	14.8
Petrographic Number (HL), maximum, LS-609	-	-	-	-	-	110	104	106	110
Unconfined Freeze Thaw loss, % maximum, LS-614	6	6	15	15	15	16.6	13.7	9.6	13.2
2 Faces Crushed Particles % minimum LS-617	-	-	-	95	80	100	100	100	100
Micro-Deval Abrasion loss, % maximum, LS-618	17	17	21	21	21	17.1	13.8	11.5	16.1
Accelerated Mortar Bar Expansion, % maximum @ 14 days, LS-620 or CSA A23.2-25A	-	-	-	-	-	0.077	0.074	0.032	0.031
Potential Alkali-Carbonate Reactivity, Carbonate Rock, CSA A23.2-26A	-	-	-	-	-	- See attached charts -			

*Reported upon completion.

Borehole 2-11 which is predominately carbonate, is not a designated rock type for HL1, HL3Mod, SMA, DFC, OFC and Superpave 12.5FC1, 12.5FC2


Ammanuel Yousif, C.E.T.

November 17, 2011
Date



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Centre Line Aggregates Borehole #2-11

Superpave – Consensus Properties

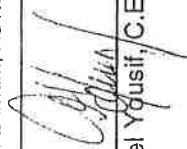
FINE AGGREGATE

Laboratory Test and Number	Requirement					Sample			
	Traffic Level Category					Bobcaygeon 9-39'2"	Bobcaygeon 39'2"-51'4"	Gull River 54'6"-83'	Gull River 83-126'
	A	B	C	D	E				
Uncompacted Voids, % minimum, AASHTO T304	-	40	45	45	45	54.0	52.8	52.4	54.0
	-	40	40	40	100/100				

Note 1. Denotes the depth of the top of lift below final pavement surface. If less than 25% of a layer is within 100 mm of the surface, the layer may be considered to be below 100 mm.

COARSE AGGREGATE

Laboratory Test and Number	Requirement					Sample			
	Traffic Level Category					Bobcaygeon 9-39'2"	Bobcaygeon 39'2"-51'4"	Gull River 54'6"-83'	Gull River 83-126'
	A	B	C	D	E				
Fractured Particles, % minimum, ASTM D5821	55/-	75/-	85/80	95/90	100/100	100	100	100	100
	-	50/-	60/-	80/75	100/100				
Flat and Elongated Particles (5:1), % maximum, ASTM D4791	-		10			10.2	9.6	7.4	12.0


Ammanuel Yousif, C.E.T.

November 17, 2011
Date



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Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-77

Report No.: 167095-77

Date Reported: 11/01/2011

Client Sample ID: #2-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location: Ferma - Carden Quarry, Bobcaygeon Formation

Sampled By: Client

Sample Description: BH2-11; 9'-39'2"; Box 1 & 2

Sample Remark:

Aggregate Type:

Norminal Size/Type:

Aggregate Source:

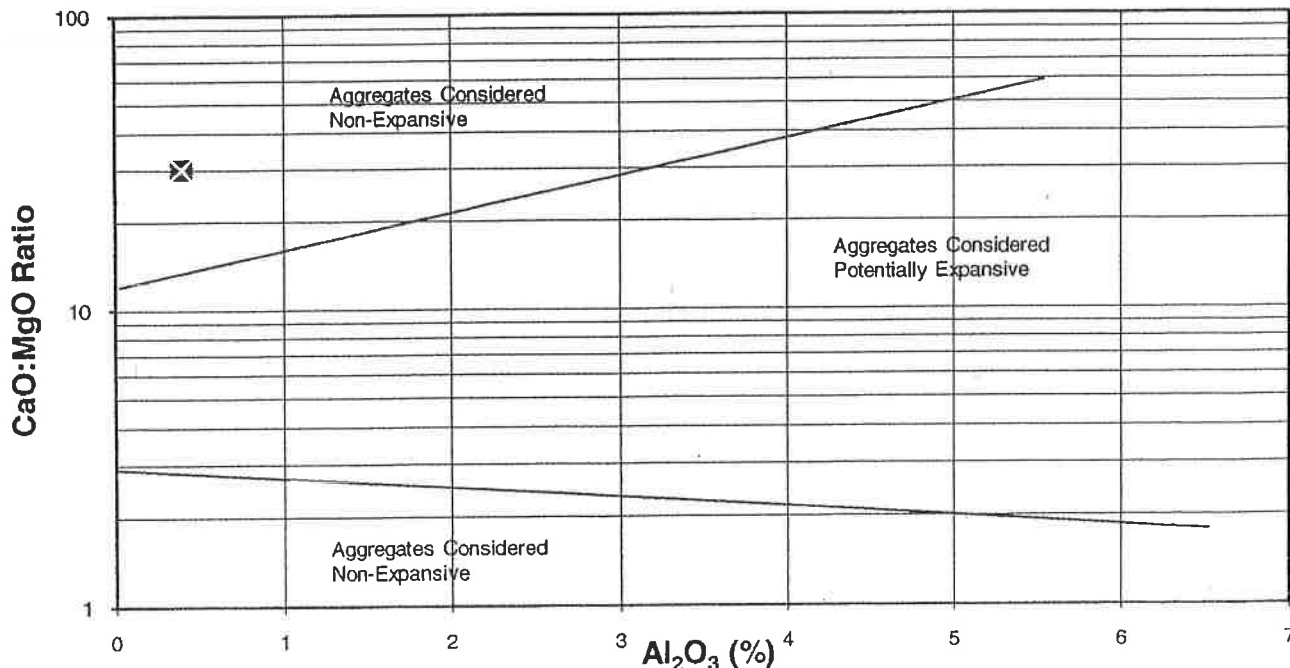
Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
39.2	1.3	30.2	0.4

Determination of Potential Alkali-Carbonate Reactivity of
Quarried Carbonate Rocks by Chemical Composition



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: A. Young

Approved By: [Signature]

Lab Supervisor

Date Approved: 10/28/2011



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Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-78

Report No.: 167095-78

Date Reported: 11/01/2011

Client Sample ID: #2-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location:

Ferma - Carden Quarry, Bobcaygeon Formation

Sampled By:

Client

Sample Description:

BH 2-11; 39'2" - 51'4"; Box 3

Sample Remark:

Aggregate Type:

Normal Size/Type:

Aggregate Source:

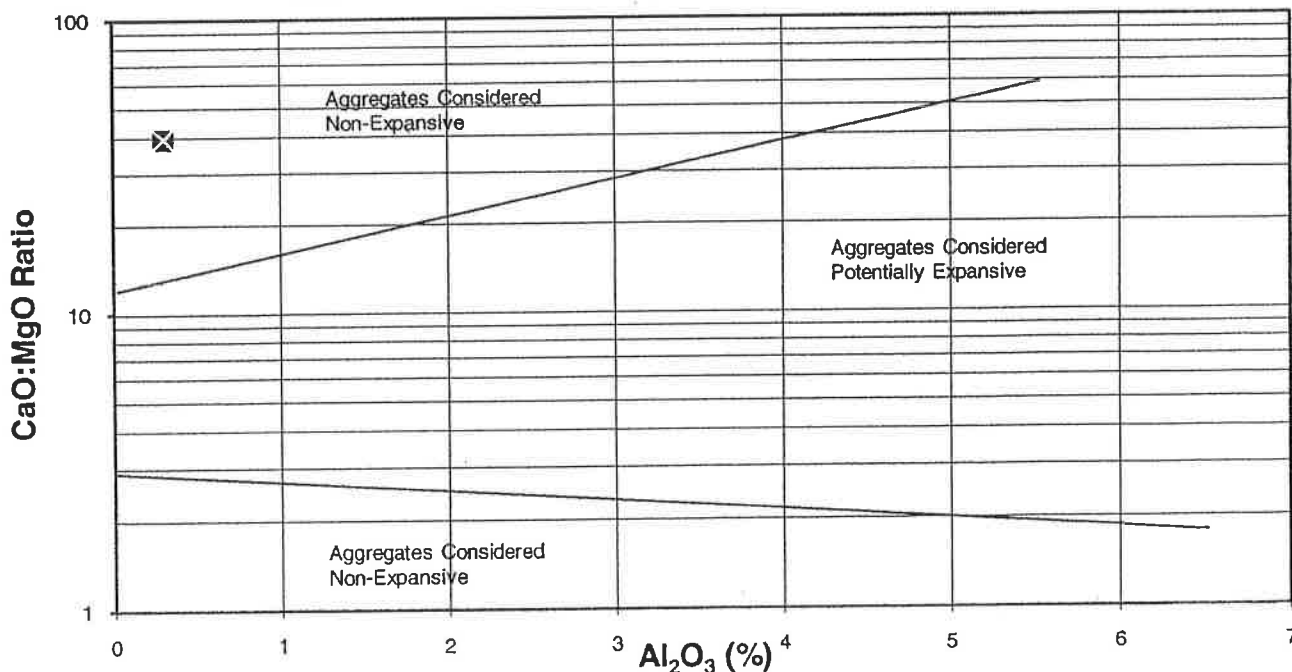
Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
47.3	1.2	39.4	0.3

Determination of Potential Alkali-Carbonate Reactivity of
Quarried Carbonate Rocks by Chemical Composition



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: A. Yousif

Approved By: [Signature]

Lab Supervisor

Date Approved: 10/28/2011



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Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-79

Report No.: 167095-79

Date Reported: 11/01/2011

Client Sample ID: #2-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location: Ferma - Carden Quarry, Gull River Formation

Sampled By: Client

Sample Description: BH 2-11; 54' 6" - 83'; Box 4 & 5

Sample Remark:

Aggregate Type:

Normal Size/Type:

Aggregate Source:

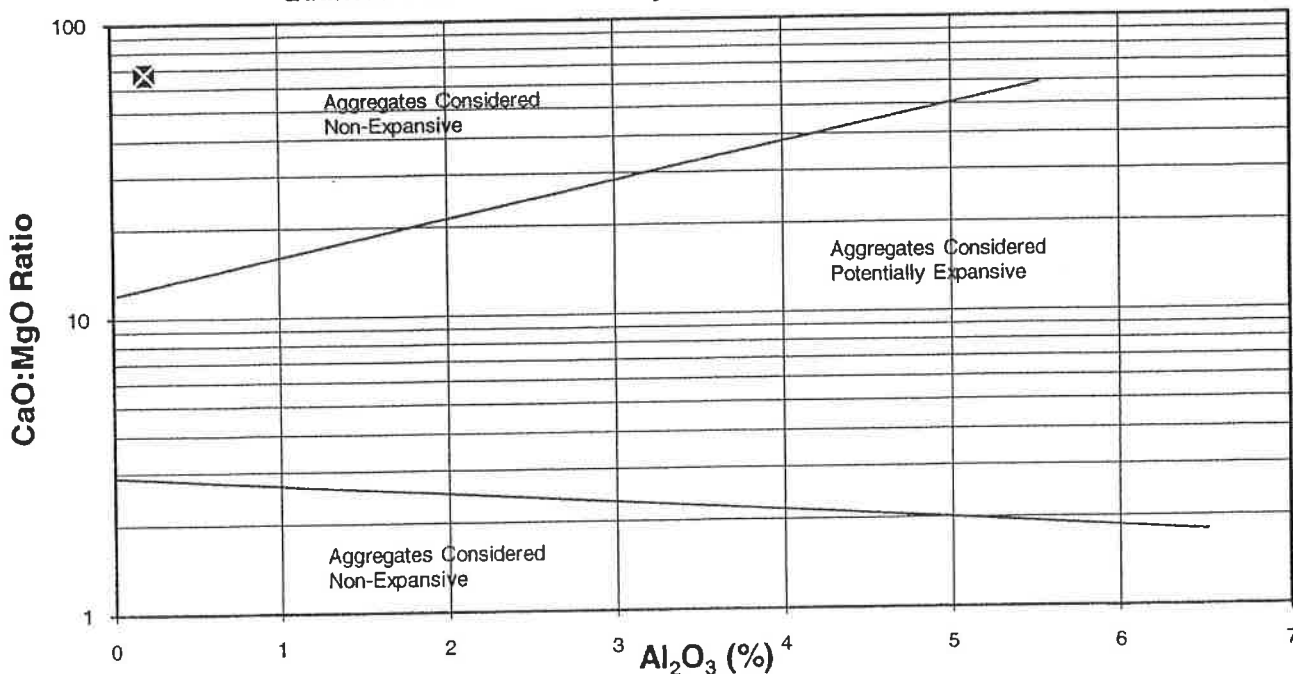
Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
40.5	0.6	67.5	0.2

Determination of Potential Alkali-Carbonate Reactivity of Quarried Carbonate Rocks by Chemical Composition



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: A. Y. [Signature]

Approved By: [Signature]

Lab Supervisor

Date Approved: 10/28/2011



exp Services Inc.
The new identity of Trow Associates
1595 Clark Boulevard, Brampton
Ontario, Canada, L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

Potential Alkali-Carbonate Reactivity of Carbonate Rocks Test Report

CA32

Sample Test No.: 167095-80

Report No.: 167095-80

Date Reported: 11/01/2011

Client Sample ID: #2-11

Project No.: brm-00500911-a0

Date Sampled:

Date Received: 09/21/2011

Sample Location: Ferma - Carden Quarry, Gull River Formation

Sampled By: Client

Sample Description: BH 2-11; 83' - 126'; Box 6,7,8

Sample Remark:

Aggregate Type:

Normal Size/Type:

Aggregate Source:

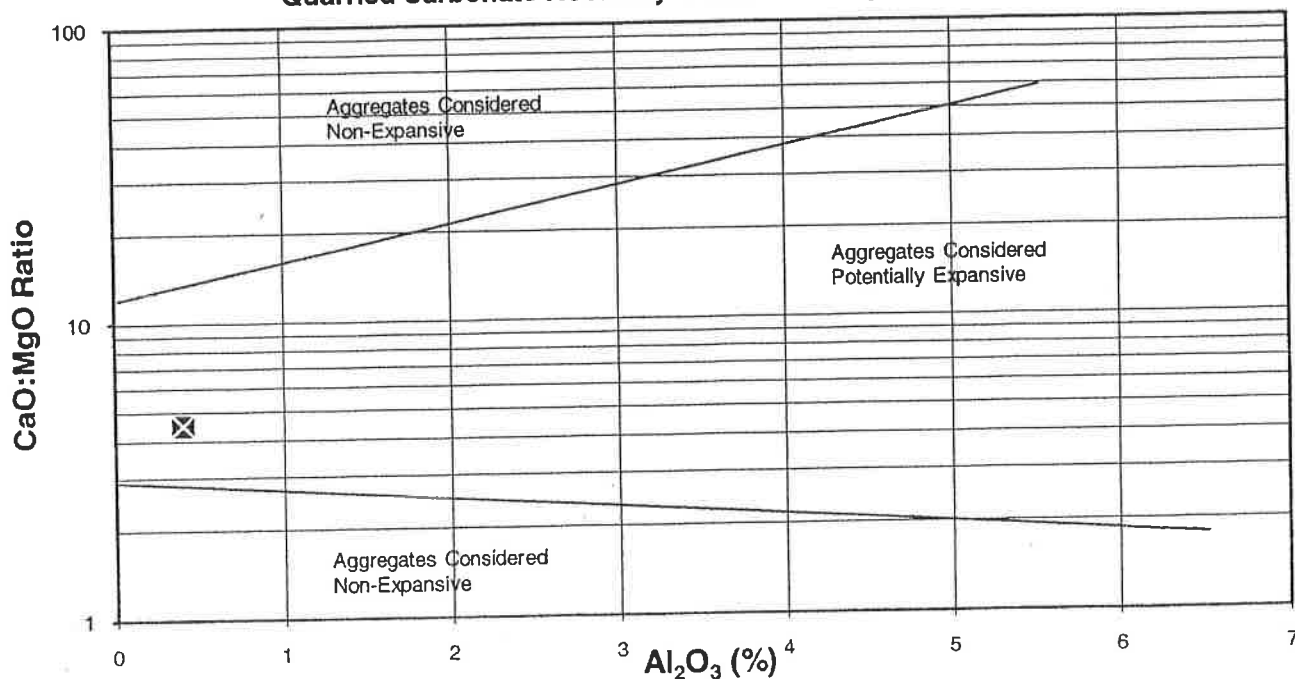
Source Code:

Method of Analysis:

Results of Analysis:

CaO (%)	MgO (%)	CaO:MgO Ratio	Al ₂ O ₃ (%)
33.3	7.4	4.5	0.4

Determination of Potential Alkali-Carbonate Reactivity of
Quarried Carbonate Rocks by Chemical Composition



Remark: We hereby certify the testing procedure in accordance with CAN/CSA A23.2-26A

Project Manager: A. J. J. J.

Approved By: [Signature]

Lab Supervisor

Date Approved: 10/28/2011

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 2-11, Box 1 & 2. 9' to 39' 2"
 FRACTION: 9.5 to 19 mm
 ANALYST: H, Lohse

PROJECT No. BRM-000500911-AO
 SAMPLE No. N.A.
 Date November 11, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	1003.9	96.3	-	-
CARBONATE (slightly cherty: <5% chert)	21	1.9	0.2	-	-
TOTAL GOOD AGGREGATE		1005.8	96.4	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	22.3	2.1	x 2	4.2
CHERT-CHERTY CARBONATE (<20% leached chert)	26	7.0	0.7	x 2	1.4
TOTAL FAIR AGGREGATE		29.3	2.8		
TOTAL POOR AGGREGATE		0.0	0.0		
SHALE	61	7.9	0.8	-	-
TOTAL DELETERIOUS AGGREGATE		7.9	0.8		
TOTALS		1043.0	100.0		5.6

PERCENT GOOD	96.4	x	1	=	96.4
PERCENT FAIR	2.8	x	3	=	8.4
PERCENT POOR	0.8	x	6	=	4.8
PERCENT DELETERIOUS	0	x	10	=	0.0

HOT MIX, MULCH AND CONCRETE P.N.	110
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	104

NOTES:

- ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
- THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 2-11, Box 3, 39'2" to 51'4"
 FRACTION: 9.5 to 19 mm
 ANALYST: H, Lohse

PROJECT No. BRM-000500911-AO
 SAMPLE No. N.A.
 Date November 11, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	996.8	98.6	-	-
TOTAL GOOD AGGREGATE		996.8	98.6	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	3.7	0.4	x 2	0.8
CHERT-CHERTY CARBONATE (<20% leached chert)	26	4.6	0.5	x 2	1.0
TOTAL FAIR AGGREGATE		8.3	0.9		
CARBONATES (shaley; clayey; silty; clayey)	43	5.1	0.5	-	-
TOTAL POOR AGGREGATE		5.1	0.5		
SHALE	61	0.4	0.0	-	-
TOTAL DELETERIOUS AGGREGATE		0.4	0.0		
TOTALS		1010.6	100.0		1.8

PERCENT GOOD	98.6	x	1	=	98.6
PERCENT FAIR	0.9	x	3	=	2.7
PERCENT POOR	0.5	x	6	=	3.0
PERCENT DELETERIOUS	0	x	10	=	0.0

HOT MIX, MULCH AND CONCRETE P.N.	104
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	103

NOTES:

- ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
- THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 2-11, Box 4 & 5 54' 6" to 88'
 FRACTION: 9.5 to 19 mm
 ANALYST: H, Lohse

PROJECT No. BRM-000500911-AO
 SAMPLE No. N.A.
 Date November 11, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	1002.9	97.2	-	-
TOTAL GOOD AGGREGATE		1002.9	97.2	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	16.1	1.6	x 2	3.2
CHERT-CHERTY CARBONATE (<20% leached chert)	26	12.8	1.2	x 2	2.4
TOTAL FAIR AGGREGATE		28.9	2.8		
TOTAL POOR AGGREGATE		0.0	0.0		
TOTAL DELETERIOUS AGGREGATE		0.0	0.0		
TOTALS		1031.8	100.0		5.6

PERCENT GOOD	97.2	x	1	=	97.2
PERCENT FAIR	2.8	x	3	=	8.4
PERCENT POOR	0.0	x	6	=	0.0
PERCENT DELETERIOUS	0.0	x	10	=	0.0

HOT MIX, MULCH AND CONCRETE P.N.	106
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	100

NOTES:

- ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
- THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

Fine Aggregate Petrographic Analysis

Source: BH 2-11, Box 1 and 2, 9 ' to 39' 2"
 Lab No.: n.a.
 Analyst: H. Lohse

Project No.: BRM-00500911-AO
 Date: November 19, 2011

	Sieve Size											
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150		150 - 75	
	#	%	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	191	91.8	186	93.0	207	96.3	215	97.3	186	93.0	198	99.0
Shale, Argillite(soft), Clay , Ochre	17	8.2	14	7.0	8	3.7	6	2.7	14	7.0	2	1.0
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	208	100.0	200	100.0	215	100.0	221	100.0	200	100.0	200	100.0
Percent Retained on Individual Sieve	42.4		25.9		13.9		8.0		5.8		4.0	

Weighted Average Percent Shale = 6.7

Weighted Average Percent Chert = 0.0

Fine Aggregate Petrographic Analysis

Source: BH 2-11, Box 3, 39' 2" to 51' 4"
 Lab No.: n.a.
 Analyst: H. Lohse

Project No.: BRM-00500911-AO
 Date: November 17, 2011

	Sieve Size											
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150		150 - 75	
	#	%	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	192	96.0	195	97.5	192	96.0	213	97.7	204	97.6	198	99.0
Shale, Argillite(soft), Clay , Ochre	5	2.5	4	2.0	5	2.5	4	1.8	5	2.4	2	1.0
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	3	1.5	1	0.5	3	1.5	1	0.5	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	200	100.0	200	100.0	200	100.0	218	100.0	209	100.0	200	100.0
Percent Retained on Individual Sieve	38.8		26.0		15.3		9.2		6.6		4.1	

Weighted Average Percent Shale = 2.3

Weighted Average Percent Chert = 1.0

Fine Aggregate Petrographic Analysis

Source: BH 2-11, Box 4 and 5, 54'6" to 83 ft
 Lab No.: n.a.
 Analyst: H. Lohse

Project No.: BRM-00500911-AO
 Date: November 12, 2011

	Sieve Size											
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150		150 - 75	
	#	%	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	197	98.5	192	96.0	200	98.5	110	96.5	213	96.8	198	99.0
Shale, Argillite(soft), Clay, Ochre	3	1.5	7	3.5	3	1.5	4	3.5	7	3.2	2	1.0
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	0	0.0	1	0.5	0	0.0	0	0.0	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	200	100.0	200	100.0	203	100.0	114	100.0	220	100.0	200	100.0
Percent Retained on Individual Sieve	34.1		27.9		17.3		10.0		6.7		4.0	

Weighted Average Percent Shale = 2.4

Weighted Average Percent Chert = 0.1

COARSE AGGREGATE PETROGRAPHIC ANALYSIS

SAMPLE DESCRIPTION: BH 2-11, Box 6, 7 & 8. 83' to 126'
 FRACTION: 9.5 to 19 mm
 ANALYST: H, Lohse

PROJECT No. BRM-000500911-AO
 SAMPLE No. N.A.
 Date November 11, 2011

TYPE	TYPE NO.	MASS	%	GRANULAR CORRECTION	
CARBONATE (hard; silty, hard)	01	973.8	95.1	-	-
TOTAL GOOD AGGREGATE		973.8	95.1	-	-
CARBONATE (soft; silty soft; slightly shaley)	35	50.3	4.9	x 2	9.8
TOTAL FAIR AGGREGATE		50.3	4.9		
TOTAL POOR AGGREGATE		0.0	0.0		
TOTAL DELETERIOUS AGGREGATE		0.0	0.0		
TOTALS		1024.1	100.0		9.8

PERCENT GOOD	95.1	x	1	=	95.1
PERCENT FAIR	4.9	x	3	=	14.7
PERCENT POOR	0	x	6	=	0.0
PERCENT DELETERIOUS	0	x	10	=	0.0

HOT MIX, MULCH AND CONCRETE P.N.	110
CORRECTED GRANULAR AND 16 mm CRUSHED P.N.	100

NOTES:

1. ANALYSIS CARRIED OUT ACCORDING TO MTO METHOD OF TEST LS-609.
2. THIS ANALYSIS DOES NOT TAKE INTO ACCOUNT THE POTENTIAL FOR ALKALI-AGGREGATE REACTIVITY.

Fine Aggregate Petrographic Analysis

Source: BH 2-11, Box 6 and 7, 83' to 126 ft
 Lab No.: n.a.
 Analyst: H. Lohse

Project No.: BRM-00500911-AO
 Date: November 12, 2011

	Sieve Size									
	4.75 - 2.36		2.36 - 1.18		1.18 - 600		600 - 300		300 - 150	
	#	%	#	%	#	%	#	%	#	%
Silicate Rocks and Associated Minerals	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Carbonate Rocks and Associated Minerals	215	97.7	193	96.5	221	99.5	197	98.5	197	98.5
Shale, Argillite(soft), Clay , Ochre	5	2.3	7	3.5	1	0.5	3	1.5	3	1.5
Mica (and schist)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Chert, Flint, Jasper	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Contamination, i.e. glass, slag, coal	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Cemented Particles	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	220	100.0	200	100.0	222	100.0	200	100.0	200	100.0
Percent Retained on Individual Sieve	36.7		29.2		16.5		8.8		5.2	
									3.5	

Weighted Average Percent Shale = 2.2

Weighted Average Percent Chert = 0.0

**BEDROCK CORE – PHOTOGRAPHIC LOG
LABORATORY TEST RESULTS AND CHEMICAL
ANALYSIS**



MTE

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APPENDIX D

DAVROC TESTING LABORATORY INC. – DRILLED CORE TEST DATA REVIEW

File: L11-0431MT

MTE Consulting Inc.
520 Gingemans Centre Dr.
Kitchener, Ontario
N4B 3X9

November 17, 2011

Attn.: Mr. Jay B. Flanagan, B.E.S., B.Ed.
Project Manager
jflanagan@mte85.com

Dear Sir;

*Carden Quarry
Drilled Rock Core Test Data Review*

As per your request, Davroc Testing Laboratories Inc., have reviewed the Rock Core tests data as detailed in exp Services Inc. report dated November 2, 1011, and we provide you with the following comments:

From the exp Services Inc. report provided, we note that four (4) separate samples of rock core were tested. The samples tested were identified as Borehole #1-11 from the following locations:

1. Bobcaygeon Formation – Box 1 & 2 tested together, 3 foot. to 31 feet of depth.
2. Bobcaygeon Formation – Box 3 & 4 tested together, 31 feet. to 59 feet of depth.
3. Gull River Formation – Box 5 & 6 tested together, 59 feet. to 89 feet of depth.
4. Gull River Formation – Box 7, 8 & 9 tested together, 89 feet. to 129 feet of depth.



Test Program

The tests performed by exp Services Inc. have been listed in the following Table. In addition we have identified the relevant tests required to be performed for Asphalt Aggregate use with an Asterisk *. It should be noted that some of the tests performed, as identified with two Asterisks ** provide for some useful data, however if the tests show the samples tested fail to meet the requirements for asphalt use, it may be due to the fact that the tests were performed on crushed drill core samples, rather than being performed on stockpiled material.

Table No. 1
Summary of Tests Conducted

Laboratory Tests Conducted		MTO/CSA/ASTM Laboratory Test Number	Tests Not Required or Non-Representative Due to Drill Core Samples Being Used
1.	Material Finer Than 75µm Sieve in Mineral Aggregates by Washing	*LS-601	**
2.	Absorption by Mass	*LS-604	-
3.	MgSO ₄ Soundness Loss	*LS-606	**
4.	Percent Crushed	*LS-607	**
5.	Flat & Elongated Particles (4:1 Ratio)	*LS-608	**
6.	Petrographic Number (coarse aggregate)	*LS-609	**
7.	Unconfined Freeze-Thaw Loss	*LS-614	-
8.	2 Face Crushed Particles Percentage	*LS-617	-
9.	Micro-Deval Abrasion Loss	*LS-618	**
10.	Accelerated Mortar Bar Expansion	LS-620	**
11.	Potential Alkali-Carbonate Reactivity, Carbonate Rock	CSA A23.2-26A	**
12.	Uncompacted Voids Percentage	*AASHTO T304	**
13.	Fractured Particles Percentage	*ASTM D5821	**
14.	Flat & Elongated Particles (5:1 Ratio)	*ASTM D4791	**
15.	Petrographic Examination (fine aggregate)	LS-609	**

Summary Comments

Based on the results of the exp Services Inc.'s tests, the following provides you with a summary of our preliminary comments.

1. The wash passing the 75 μ m sieve size results for all samples fail to meet the requirements for Asphalt Aggregate use, however these results should be considered non-representative, due to the fact tests were performed on crushed drilled rock core samples.
2. The absorption results meet the requirements with the exception to the Gull River sample 89 to 129 feet, which is very marginally outside the 2.0% maximum requirement for HL-4 Surface and Binder, and Superpave 19.0, 25.0, and 37.5mm, HDBC and SMA 19.0mm, and MDBC.
3. The magnesium soundness results for all samples meets the requirements for all Asphalt Types.
4. The percentage crushed particles results for all samples meets the requirements for all Asphalt Types, as expected since the samples were prepared by crushing drilled rock core.
5. For the flat and elongated particles results, with the exception to the Bobcaygeon 31 to 59 foot sample which marginally fails to meet the requirements for HDBC, SMA and MDBC asphalt, the remaining sample results meet the requirements for all Asphalt Types. Note that this test should not have been performed, due to the fact that the samples were prepared by crushing drilled rock core, rather than actual production samples testing.
6. The petrographic examination performed on the coarse aggregate portion of the samples indicates the stone is primarily Carbonate Rock, in the good category. It should be noted that since the aggregate is primarily Carbonate Rock, there are restrictions in the amount of carbonate rock that can be contained in some asphalt mixes, and as such there may be a requirement to blend rock types to lower the amount of carbonate rock in the asphalt mix. This will require further review.
7. The results of the unconfined freeze-thaw tests fails to meet the requirements for all types of asphalt mixes, however these requirements shall be waived by the Owner when the aggregate meet the alternative magnesium sulphate soundness requirements. You will note that the aggregate tests results meet the alternative magnesium sulphate soundness requirements.

8. 2 face crushed particle percentage crushed particles results for all samples meets the requirements for all Asphalt Types, as expected since the samples were prepared by crushing drilled rock core.
9. The Micro-Deval abrasion results for Bobcaygeon 31 to 59 feet and Gull River 59 to 89 feet meet the requirements for all types of Asphalt. The Micro-Deval abrasion result for Bobcaygeon 3 to 31 feet is marginally outside the limits for Surface Course Asphalt mixes, and meets the requirements for other Asphalt mixes. The Gull River 89 to 129 feet samples results would only meet the requirements for HL-4 Binder and HL-8 and Superpave 19.0, 25.0, and 37.5mm, HDBC and SMA 19.0mm, and MDBC and Gull River 59 to 89 feet meet the requirements for all types of Asphalt. Note that in this regard the tests results are affected by the fact that the samples were prepared by crushing drilled rock core.
10. With regard to the Accelerated Mortar Bar Expansion and Potential Alkali-Carbonate Reactivity testing, no comments are being made with regard to Asphalt use, since there are no requirements for these tests for asphalt use.
11. With regard to the Superpave Consensus Property tests that were performed, no comments are being made since tests results would have been affected by the fact that the samples were prepared by crushing drilled rock core.
12. No comment being made on the fine aggregate Petrographic Examination, since this data is no required for Asphalt use, and also due to the fact that the samples were prepared by crushing drilled rock core.

We trust these preliminary comments are sufficient for your purposes at this time. If you have any questions, please do not hesitate to contact the undersigned.

Yours very truly,
Davroc Testing Laboratories Inc.



Sal Fasullo C.E.T
Vice President

MTE enhances the value of our clients' projects by providing innovative solutions and management expertise, in a personal, cost effective, and timely manner.



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