APPLICATION PACKAGE
CINNAMON QUARRY EXPANSION
PART OF LOT 2, CONCESSION 9
TOWNSHIP OF NORTH DUNDAS,
UNITED COUNTIES OF STORMONT, DUNDAS AND GLENGARRY

PREPARED FOR:

A.L. BLAIR CONSTRUCTION LTD.
MOOSE CREEK, ONTARIO
K0C 1W0

A. L.
BLAIR
CONSTRUCTION LTD.

WESA
A Better Environment For Business

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Prepared for:

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Prepared by:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 SITE PLANS

The following site plans were prepared by The Base Mapping Company Ltd. on behalf of A. L. Blair Construction Ltd. The plans were prepared in accordance with the MNR Provincial Standards for Aggregate Resources of Ontario (MNR, 1997) and include:

i. Existing Features (General);
ii. Existing Features;
iii. Operational Plan including Cross-sections;
iv. Rehabilitation;

2.0 SUMMARY STATEMENT

The following summary statement has been prepared by WESA Ltd. in cooperation with A. L. Blair Construction Ltd.

The following document is an application package for the proposed expansion of the A.L. Blair Construction Ltd. Cinnamon Quarry. The Cinnamon Quarry is located in part of Lot 3, Concession 9, Township of North Dundas in the United Counties of Stormont, Dundas and Glengarry. This quarry historically operated from 1990 under MNR License No. 5753. The proposed licensed expansion area will be 33.6 hectares, extending into Part Lot 2, Con 9, Township of North Dundas in the United Counties of Stormont, Dundas and Glengarry with a total operational area of 29.3 hectares.

2.1 PLANNING AND LAND USE CONSIDERATIONS

Land surrounding and part of the proposed extension of the Cinnamon Quarry is currently zoned as mineral extraction (SRQ) and agricultural (AG). This application will serve as a supporting documentation to amend the Official Plan of the United Counties of Stormont, Dundas and Glengarry, and consequently the former Township of Winchester Official Plan, to rezone the proposed expansion area to a mineral aggregate quarry (MQ).

2.2 AGRICULTURAL CLASSIFICATION

The agricultural classification of the proposed expansion area was prepared by Bryan Cook of Cropland Consulting using the Canada Land Inventory (Appendix A). The soils in the area have been classified as Grenville and Matilda loam. Course textured sand present as narrow bands across the property is also a possibility. The Canada Land Inventory system (CLI) indicates a land capability class of 4, with a shallow phase subclass. Soils in this class have moderately severe limitations that restrict the range of crops due to shallow soil depth to bedrock and possible stoniness. The applicant does not intend to rehabilitate the land for agricultural use but will develop the excavation as a lake.

2.3 QUALITY AND QUANTITY OF AGGREGATE ON THE SITE

The development area is underlain by shale and sandstone bedrock of the Rockliffe Formation (OGS, 1985). This is a thickly bedded grey-green shale containing lenses of fine grained grey sandstone. The lenses vary greatly in thickness and extent. At the basal layer the sandstone develops into a course grained almost fine conglomerate where it lies upon the limestone bedrock of the Oxford Formation. Aggregate from the quarry will be of granular A and B quality suitable for use in road construction. There are approximately 10,000,000 tones of quality aggregate in this proposed quarry expansion.

2.4 HAULAGE ROUTES

The primary haulage route used by the quarry will be from the north side of the site to Benson George Road west to County Road 31. The on-site road is packed gravel for approximately 1200 metres to the intersection with HWY 31 where it is continuous pavement towards both the north and south. Currently, there are no entrance permits associated with this site. The haulage routes and entrance permit status will not change for the proposed expansion.

2.5 PROGRESSIVE AND FINAL REHABILITATION

The progressive and final rehabilitation of the site will be completed in accordance with the Site Plans presented in Section 1.0. Once the quarry is depleted, the seasonal pumping required for operation will cease and the quarry will be left to fill and develop as a local lake. Historical quarries in the area have also been rehabilitated in this manner.

Tami J. Sugarman, B.Sc.
Hydrogeologist

Bryan Blanshard, B. Eng.

3.0 TECHNICAL REPORTS

The following technical reports must be completed for a Category 2 Class A application:

- Hydrogeological Assessment
- Natural Environment Assessment
- Cultural Heritage Resource
- Noise Assessment
- Blast Design Report

A Level 1 assessment is used to complete preliminary assessments of a site and to determine if a more detailed Level 2 assessment is required. For this application, WESA has completed a Level 1 & 2 Hydrogeological assessment; a Level 1 Natural Environment assessment for the site and surrounding area; a Stage 1 and Stage 2 Cultural Heritage Resource assessment was completed by Ken Swayze, an archaeological consultant; a Noise Assessment was completed by Hugh Williamson Associates Inc. and a Blast Design report was prepared by Explotech Engineering Ltd. The results of the assessments are presented below.

3.1 HYDROGEOLOGICAL ASSESSMENT- LEVEL 1 & LEVEL 2

As part of the application, a Level 1 Hydrogeological assessment was conducted for the area adjacent to the Cinnamon Quarry property and the proposed development area. This assessment was used to evaluate if a Level 2 Hydrogeological Assessment would be required.

In May 2002, WESA staff conducted a preliminary hydrogeologic evaluation of the area (Figure 1). Based on the MOE water well records, the number of domestic wells within 0.5 km of the site and the proposed final lift elevation of the quarry, WESA determined that a Level 2 Hydrogeological assessment was necessary. Work completed as part of the Level 1 and Level 2 assessments is discussed in detail below.

3.1.1 Background Information Review and Site Reconnaissance

As part of the Level 1 assessment, WESA collected background information from several sources. These included:

- available MOE water well records for an area of approximately 1.5 km surrounding the site (Appendix B) and are summarized in Table 1;
- topographic maps for local relief, grade and features; and
- geological maps and drift thickness maps to identify the regional geology and the potential for water bearing units in the area around the quarry site.

A complete list of these items is provided in Section 6.0.

To assess the potential adverse effects of the quarry on the groundwater and surface water in the area, WESA conducted a comprehensive site visit including observations on the locations of domestic wells within a 0.5 km radius of the quarry and locations and types of surface water bodies/courses and discharge areas. Based on the results of the visit, a detailed survey of on-site ditches to assess drainage pathways, discharge points and water table elevations at the quarry was conducted on May 28, 2002.

3.1.2 Hydrogeological/Hydrological Field Program

Following the site reconnaissance, WESA performed a baseline survey of 4 domestic water wells, one livestock well and two commercial wells within a 0.5 km radius of the Cinnamon Quarry (Figure 2). Each domestic residence was provided with an introductory letter outlining the proposed quarry expansion (Appendix C). All homeowners did respond to the letter outlining the baseline survey. WESA staff visited these residences to discuss the survey and sample the water. During the visit, WESA interviewed the residents and recorded information about the quality and quantity of groundwater from their domestic water sources. Water well records were also requested from the residents. The location of each domestic well was confirmed when possible and prior to sampling, WESA inspected and documented the pump, plumbing and water treatment methods of each water supply system (Appendix C).

On May 28, 2002, WESA staff documented and sampled 4 domestic water wells for major ions and selected bacteriological parameters listed below to provide baseline water quality data.

TABLE 1: MOE Water Well Records of Local Domestic Water Users
Cinnamon Quarry

B1905MOEwellrecords03.xls

Well No.	Record No.	Conc.	Lot	East	North	MOE Well ID	Surface Elevation	Well Depth	Elevation of Well Depth	Water Bearing Fractures		Static Water Level		Overburden Thickness		Pump Rate (GPM)
	on MOE List						(masl)	(m)	(masl)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	
1	4	9	24	468440	4995558	18-00526	75.08	12.19	62.88	10.51	64.56	1.80	73.27	0.00	75.1	20
2	5	9	24	468667	4995429	18-00527	75.08	16.76	58.31	13.51	61.56	2.70	72.37	8.41	66.7	25
3	11	10	24	468050	4995700	18-02426	76.58	18.29	58.29	15.02	61.56	2.70	73.87	7.81	68.8	10
4	12	10	24	467918	4995906	18-00532	75.08	31.39	43.68	30.93	44.14	6.01	69.07	13.21	61.9	7
5	35	8	3	471015	4994180	18-01048	72.07	15.54	56.53	14.11	57.96	0.60	71.47	5.11	67.0	10
6	37	8	3	470999	4994299	18-02487	75.08	18.90	56.18	17.42	57.66	0.60	74.47	6.01	69.1	20
7	38	8	4	471983	4994682	18-01049	73.57	39.32	34.25	36.04	37.54	6.01	67.57	1.80	71.8	5
8	39	8	4	471680	4994525	18-01408	73.57	15.54	58.03	14.41	59.16	1.50	72.07	6.01	67.6	10
9	40	8	4	471900	4994800	18-02097	75.08	54.25	20.82	53.45	21.62	3.00	72.07	1.20	73.9	4
10	41	8	4	471850	4994550	18-01279	73.27	33.22	40.05	32.73	40.54	2.40	70.87	5.71	67.6	20
11	51	9	1	469075	4995499	18-03960	76.20	48.77	27.43	44.14	32.06	9.61	66.59	0.90	75.3	12
12	52	9	1	468840	4995423	18-01661	73.57	21.64	51.93	21.32	52.25	1.50	72.07	6.91	66.7	15
13	53	9	1	468905	4995629	18-01769	73.57	17.07	56.50	16.82	56.76	0.30	73.27	7.81	65.8	18
14	54	9	1	469097	4995516	18-01061	75.08	37.80	37.28	36.94	38.14	6.31	68.77	1.20	73.9	7
15	55	9	1	469075	4995499	18-03332	76.50	74.07	2.43	69.97	6.53	4.50	72.00	2.10	74.4	10
16	56	9	2	469528	4995463	18-01062	74.77	24.69	50.09	21.32	53.45	2.70	72.07	0.60	74.2	20
17	58	9	3	470176	4996080	18-03517	72.50	15.85	56.65	14.71	57.79	2.40	70.10	4.20	68.3	45
18	59	9	3	470176	4996080	18-04159	72.50	49.38	23.12	46.25	26.25	2.40	70.10	0.00	72.5	25
19	68	10	1	467950	4997160	18-02037	76.58	13.72	62.86	10.51	66.07	1.20	75.38	10.51	66.1	1
20	71	10	1	468241	4996464	18-01075	75.08	24.69	50.39	12.31	62.76	2.70	72.37	9.91	65.2	20
21	72	10	1	467857	4997143	18-01074	75.08	23.77	51.30	22.82	52.25	4.80	70.27	12.01	63.1	5
22	73	10	1	468084	4996774	18-01076	75.08	20.12	54.96	18.02	57.06	4.20	70.87	8.11	67.0	16
23	76	10	1	467950	4997250	18-02436	75.08	19.20	55.87	15.92	59.16	2.40	72.67	9.31	65.8	5
24	77	10	1	467850	4997200	18-02352	75.08	26.52	48.56	17.72	57.36	3.00	72.07	11.11	64.0	5
25	78	10	2	468700	4997600	18-02439	78.08	25.30	52.78	21.92	56.16	4.20	73.87	12.31	65.8	5
26	81	10	2	468789	4997078	18-01077	75.68	11.58	64.09	11.41	64.26	4.50	71.17	0.00	75.7	8
27	85	10	3	469193	4997649	18-01788	76.58	58.52	18.05	57.06	19.52	10.21	66.37	22.52	54.1	12
28	86	10	3	469300	4997875	18-01461	75.08	30.48	44.60	28.53	46.55	0.60	74.47	8.41	66.7	5
29	88	10	3	469300	4997800	18-02247	73.57	16.76	56.81	15.32	58.26	0.30	73.27	8.11	65.5	20
30	90	10	4	469796	4998025	18-01078	74.47	23.77	50.70	23.12	51.35	7.81	66.67	20.42	54.1	8
31	91	10	4	469700	4998050	18-02085	75.08	17.98	57.09	16.82	58.26	6.01	69.07	14.71	60.4	10

Alkalinity	Manganese	Turbidity
Calcium	Nitrite	Total Dissolved Solids
Chloride	Potassium	Total Coliform
Iron	Sodium	E.Coli
Hardness	Sulphate	Conductivity
Magnesium	Fluoride	pH
Colour	H2S	Dissolved Organic Carbon
Nitrate	Ammonia	Phenols
Tannin & Lignin	TKN	Background colonies
Faecal Coliforms	Faecal Streptococcus	Heterotrophic Plate Count

Water samples were collected in sterilized bottles provided by Accutest Laboratories Ltd. of Nepean, Ontario. Taps sampled were allowed to run for at least 5 minutes to allow any stagnant water in the piping system to be flushed out. Samples were then sealed in a cooler and shipped to Accutest Laboratories Ltd. for chemical analyses. Samples were stored at approximately 4^0C and full chain of custody forms accompanied the samples from the site to the laboratory. All of the analytical results for the baseline survey were tabulated and compared with MOE Ontario Drinking Water Objectives (ODWO).

To evaluate the potential impact of the proposed quarry activities on groundwater resources in the area, a more detailed study of the hydrogeology of the quarry was conducted. On August 13 and 14, 2002 three test wells (MW1, MW2 and MW3) were drilled in a triangular configuration in the southeast corner of the site (Figure 2). Drilling was conducted by Bourgeois Well Drilling Ltd. using an air rotary drill rig. The test wells were first drilled to contact with bedrock using a 0.22 metre tri-cone bit, then instrumented with 0.15 metre diameter steel casing and the annular space backfilled with cement grout. The wells (open hole) were then completed to depths of between 22.86 and 53.34 metres below ground surface. During drilling, Bourgeois personnel and WESA staff documented any changes in bedrock stratigraphy based on the drilling advancement rate and the presence of any fractures or water bearing zones. The water well records for test wells MW1, MW2 and MW3 are located in Appendix D.

Following the test well drilling, an aquifer test was conducted on MW2 to determine the physical characteristics of the aquifer. The test was begun with a step discharge test to evaluate the optimum pumping rate of the test well. MW2 was pumped at three consecutively higher pumping rates (2, 2.5, and 3.4 IPGM) for approximately twenty minutes. Water level data during the test was then used to determine the pumping rate specifications for the aquifer test.

The constant discharge test was then conducted on test well MW2 at a pumping rate of approximately 3.6 IPGM for a period of 1 hour when the flow rate was reduced to 2.6 IGPM. At four (4) hours into the test the total drawdown was reaching critical levels and the flow was further reduced to 2.25 IGPM until the end of the test at 6 hours and 40 minutes. During the test, water level data was collected on a logarithmic time scale from the pumping well (MW2). Data from three observation wells (MW1, MW3, Old Well) was also collected. At the completion of the test, the pump was shut off and water levels in the pumping and observation wells were measured until 90 % recovery had been achieved.

The water level data from MW2 was plotted and analyzed using the Cooper-Jacob and Theis recovery methods for calculating the transmissivity (T) of the bedrock aquifer on–site (Kruseman, 1990). The water level data, Cooper-Jacob and Theis curves and related calculations are included in Appendix E.

The test wells on site were left without monitors based on the limited fracturing encountered during the drilling.

Cinnamon Drain/East Castor River Surface Water Quality Monitoring Program

The surface water in the Cinnamon Drain was first sampled in May 29, 2002 to collect background water quality at two locations upstream of the quarry operations along the Drain (see Figure 2). The water samples were analysed for major ions and selected bacteriological parameters listed below to provide baseline surface water quality data.

Alkalinity	Manganese	Turbidity
Calcium	Nitrite	Zinc
Aluminum	Silver	Total Dissolved Solids
Chloride	Potassium	Total Coliform
Iron	Sodium	E.Coli
Hardness	Sulphate	Conductivity
Magnesium	Fluoride	pH
Colour	H_2S	Dissolved Organic Carbon
Nitrate	Ammonia	Phenols
Tannin & Lignin	TKN	Background colonies
Faecal Coliforms	Faecal Streptococcus	Heterotrophic Plate Count
Boron	Barium	Beryllium
Cadmium	Cobalt	Chromium
Copper	Lead	V
Molybdenum	Nickel	Silica
Strontium	Tl	Ti
Total P		

Water samples were collected in sterilized bottles provided by Accutest Laboratories Ltd. of Nepean, Ontario. Samples were taken by inserting the untreated bottles into the water with bottle opening held upstream. Sampled water was transferred from clean collection bottles to pre-treated bottles. Samples were then sealed in a cooler and shipped to Accutest Laboratories Ltd. for chemical analyses. Samples were stored at approximately 4^0C and full chain of custody forms accompanied the samples from the site to the laboratory. All of the analytical results for the surface water survey were tabulated and compared with MOE Provincial Water Quality Objectives (PWQO).

Surface water monitoring was also conducted during site dewatering activities in August 2002. On August 21, 2002, WESA staff traversed the discharge pathway from the site. A 3" water pump had been running from the quarry since 11:00 am. The site drainage ditch had very little flow at 6:00pm and was completely dry approximately 1 km downstream (NE). The original SW1 sampling location, located on the Gaudet property, was observed to be completely dry. A 6" pump was scheduled to begin pumping on the morning of August 22, 2002.

A WESA employee returned to the site on August 22, 2002, to collect surface water samples, record observations and take photographs along the discharge flow path while pumping was in progress. Photographs were taken at all the surface water sampling sites, along the flow path, and at the quarry (See Figure 3, 4 and 5).

WESA staff documented and sampled 4 surface water sampling locations along the Cinnamon Drain and the East Castor River (see Figure 2). The method of collection and parameters sampled during this sampling event is the same as for the May 29, 2002 sampling event with the addition of two parameters, Total Suspended Solids and Ion Balance. Although there was heavy rainfall for most of the day, the original SW1 sampling location was still dry. A new SW1 sampling location was chosen from a culvert located upstream from Cinnamon Quarry and downstream from the original SW1 (See Figure 2). SW2 was taken just downstream of the quarry discharge to the ditch. SW3up and SW3down were taken from the intersection of the Cinnamon Quarry drainage ditch and the East Castor River, which is approximately 1.75 km NE of the Quarry. SW3up was taken upstream of the intersection and SW3down was taken downstream. All surface water samples were submitted to Accutest Labs in Ottawa on August 23, 2002 for analysis.

A Horriba multi-meter was used to take field measurements of pH, temperature, turbidity, conductivity, and dissolved oxygen (DO) readings measured in the Cinnamon Drain and the East Castor River.

3.1.3 Results

The following section describes the results of the Level 1 and 2 Hydrogeological Assessments.

3.1.3.1 Physiography

The area surrounding the existing quarry site is undulating to rolling topography (75 masl on-site), with ground surface elevations at ranging from 70 metres above sea level (masl) east of the site to 80 masl to the west. Local on-site topographic variations include the presence of the historical excavation, drainage ditches and berms. Land cover in the area is predominantly agricultural interspersed with rural residential.

3.1.3.2 Geology

Overburden

Overlying the bedrock on site are glacial plain and drumlinized till deposits described as dark grey soil underlain by dark grey brown loam over greyish brown calcareous soil. The soils are moderately stony. Locally, the overburden is approximately 1 to 5 metres thick. Based on MOE well records, overburden is present throughout the area up to depths of approximately 14 metres, but more commonly can be found within 5 metres of the ground surface. The soils that overlay the overburden were classified by Bryan Cook, a Certified Crop Advisor from Cropland Consulting. Using the Canadian Land Inventory these soils are classified as type 4 with a shallow phase subclassification (Appendix A). On the existing quarry site the overburden material has largely been removed in the historical operational area (Existing Features, section 1.0). The proposed expansion area is presently used for hay crop for livestock.

Bedrock

Locally, the area is underlain by interbedded quartz sandstone and shale bedrock of the Rockliffe Formation and the dolostone bedrock of the Oxford Formation (REIS, 1999). The Rockliffe Formation is a thickly bedded grey-green shale containing lenses of fine grained grey sandstone. The sandstone lenses vary greatly in thickness and extent. At the basal layer the sandstone develops into a course grained almost fine conglomerate where it lies upon the dolostone bedrock of the Oxford Formation. The Rockliffe Formation regionally is

approximately 43 to 45 metres thick, however at the Cinnamon quarry it may be relatively thin as most well records in the area. The existing Cinnamon quarry operation has only excavated the Oxford Formation dolostone.

Based on the test well drilling, bedrock on the site is found between 1.2 and 4.3 metres below ground surface at elevations between 71.2 and 71.4 masl. During test well drilling, bedrock at the quarry was observed as limestone with interbedded shale with discrete fracture zones. Fracture zones were observed at MW1 at depths of 49.26 and 38.34 masl however, little water was associated with these zones. Fracturing was also observed at MW2 and MW3. Water yielding fractures were noted in MW2 at 68.02, 66.72, 55.22 and 52.12 masl. Low yielding fractures were observed at MW3 at 46.47, 43.97 and 24.17 masl

3.1.3.3 Regional Hydrology

Regionally, surface water flow is towards the east to the East Castor River. The East Castor River is a tributary of the Castor River and ultimately the South Nation River. The East Castor River flows northeastwards to the Castor River. The Castor river flows east until it reaches its discharge point at the South Nation. The quarry is located approximately 2.8 km east of the East Castor River.

3.1.3.4 Local Hydrology

Locally, surface water flow is directed to a municipal drain (Cinnamon Drain) located across the expansion area site and along the north boundary of the existing quarry site which is situated along Benson George Road on the concession boundary between Concession 9 and Concession 10 in the Township. A roadside ditch was observed in the vicinity of the quarry along HWY 31 to the west of the site. Surface water was present in the roadside ditch and the Cinnamon Drain during the site visit in May 2002. Surface water flow is directed eastward along the Cinnamon Drain and is intermittent. The drain has very little flow immediately down-gradient from the quarry and was observed to be dry approximately 1 km downstream (NE) at a site visit in August 2002.

On site, surface water drainage is controlled by two extensions of the Cinnamon Drain in the area south and west of the expansion area. A section of the drain crosses the northwest corner of the expansion area and joins the George Benson road allowance roadside ditch along the north side of the existing quarry (refer to Site Plans and Figure 2). The two southwestern ends of ditch are approximately 600 metres long. These two extensions join at the western

boundary of the expansion area and cross the northwest area of the expansion for approximately 350 m until it reaches the George Benson Road. Based on a survey of the existing quarry drainage features conducted in May 2002 by WESA, the ditch is 2.3 metres deep and 5-6 m wide with a grade of approximately 0.05 m/m. The banks are grass covered and the base is silty clay and in some areas rock. In some areas the drainage tiles are visible along the drain.

In addition to natural drainage the drain is used for removing excess surface water from the site, primarily during de-watering of the quarry. The drain along the township road allowance east of where the George Benson Road ends is not well vegetated and should be fitted with hay bails at the main discharge area during dewatering to reduce total suspended solid concentrations from the quarry water (Figure 2).

As part of the future operations of the proposed Cinnamon Quarry expansion, A.L. Blair Construction Ltd. proposes to discharge groundwater from de-watering activities at the quarry to the east trending drain along the concession boundary. De-watering will occur once a year in the spring and once again in the fall when necessary. These surface water discharge events, due to quarrying operations, will occur following peak natural surface water flow, typically observed during spring melt and fall rainy season. Initially, approximately 555 IGPM (3634 m^3/day) will be pumped from the excavation over a period of four days after which time de-watering should be complete. The maximum pumping duration that may be required, given special hydrological conditions, would be 24 hours per day which equates to a maximum daily volume of 3,196,800 imperial gallons or 14,533 cubic meters. As the size of the quarry increases the length of time to dewater the excavation will increase. Intermittent pumping may be required after this time, however previously seepage rates into the quarry did not require any additional pumping.

Limited surface water was present on the site during May and August. In May the surface water in the drainage ditches at the site was lower than expected for that time of year. Surface water was not present in the on-site and roadside ditches during site inspections in August except downstream of the discharge point from the existing quarry as TPR Redimix was conducting a limited dewatering event. Very low flow was observed in the on-site drainage ditch in October and was attributed to a recent rain event. Surface water sampling was conducted at the site in May 2002 and during the dewatering event in August 2002.

WESA staff documented 4 surface water sampling locations along the Cinnamon Drain and the East Castor River (see Figure 2). A steady flow was observed from the quarry discharge to the East Castor River. The ditch is approximately 1.8 to 2.4 metres deep and with a water flow of approximately 15 to 30 cm. The ditch from the quarry to the river runs in a very straight

line and extensive vegetation along the ditch was observed. Because of these characteristics, the chances of erosion along the banks of the ditch would be minimal. No other discharges to the drain were observed between the quarry discharge and the river.

Surface Water Chemistry

The surface water in the Cinnamon Drain was first sampled at two locations in May 29, 2002 to collect background water quality at one location upstream (SW1) and one location downstream (SW2) of the quarry operations along the Drain (see Figure 2). The surface water was re-sampled during a de-watering event in August 2002 at four locations along the Cinnamon Drain and the East Castor River. SW1 was re-located to SW1 (new) due to dry conditions at SW1. The water samples were analysed for major ions and selected bacteriological parameters listed below to provide baseline surface water quality data.

Surface water chemistry results are included in Appendix F and summarized in Table 2. It may be noted that there was a heavy rainfall during the sampling event in August 2002. Aluminum, boron, cobalt, E.Coli., iron, molybdenum, ammonia, and total phosphorus exceeded the PWQO at sampling station SW2 after dewatering commenced.

Table 2: Summary of 2002 Surface Water Chemistry Results

LOCATION	PWQO	SW1	SW1 (new)	SW2		SW3up	SW3down
DATE		May 29	August 22	May 29	August 22	August 22	August 22
PARAMETER							
Aluminum (mg/L)		0.16	0.17	<0.05	0.61	0.22	0.43
Boron (mg/L)		<0.05	0.48	<0.05	0.52	0.30	0.37
Cobalt (mg/L)		0.0005	0.0009	0.0003	0.0010	0.0014	0.0011
E.Coli (ct/100ml)		70	5200	370	680	3500	7800
Total Coliform (ct/100ml)		4900	330000	4000	5200	52000	54000
Iron (mg/L)		0.70	0.26	0.06	0.79	0.42	0.53
Molybdenum (mg/L)		<0.01	0.033	<0.01	0.067	0.008	0.027
Ammonia (mg/L)		0.11	0.33	<0.02	0.03	10.5	5.26
Total Phosphorus (mg/L)		0.080	0.79	<0.003	0.08	0.73	0.75
Turbidity (NTU)		3.2	8.9	1.8	29.2	11.1	12.1

A discussion on each parameter is provided below.

The aluminum concentration at SW1 background in May 2002 and SW1 (new) background in August 2002 was comparable, however the concentration recorded at SW2 in May and August varied. The August concentration increased during the dewatering event at this location indicating an impact from the dewatering event. The aluminum concentration in the background sample SW1 (new) in August 2002 was 0.17mg/l while at SW2 the concentration was 0.61 mg/l indicating that the dewatering discharge was impacting the Cinnamon Drain at this location. The aluminum concentration in the East Castor River increased slightly from 0.22 mg/l up gradient from the Cinnamon Quarry discharge point to 0.43 mg/l down gradient from the discharge point. However, these results are from un-filtered samples and therefore cannot be compared to PWQO which are for filtered samples. The concentrations of aluminum are affected by the clay particles in the sample. Future sampling for aluminum will include filtering of the sample in the field and more precise commentary can be offered once these results are known.

The boron concentration increased only slightly in the Cinnamon Drain between SW1 and SW2 during the dewatering event and in the East Castor River between SW3up and SW3down. SW1 background and SW2 in May 2002 were both reported at <0.05 mg/l. In August, these concentrations were 0.48mg/l. and 0.52 mg/l, respectively. The boron concentration in the East Castor river increased slightly from 0.30 mg/l upgradient from the Cinnamon Quarry discharge point to 0.37 mg/l downgradient from the discharge point (both concentrations are above the emergency interim PWQO). The interim PWQO set for emergency purposes is 0.2 mg/l but since boron does not have a PWQO or an interim PWQO value, this limit should be employed with caution. Most of the increase in concentration detected for boron was relative to precipitation events. It should be noted that background concentrations in both the Cinnamon Drain and the East Castor River increased during the heavy rainfall event to levels above the PWQO set for emergency purposes for boron.

The cobalt concentration along the Cinnamon Drain appears to increase between the dry spring sampling and the rainy August sampling indicating an increase in cobalt within the surface water during a precipitation event. The concentration of cobalt between the up-gradient discharge and the down-gradient discharge during the dewatering event was comparable. This would suggest a source of the cobalt from within the natural soil sediments along the Drain and not the water from the quarry. This was substantiated in August 2002 results from the cobalt concentration in the East Castor River which decreased slightly downgradient from the Cinnamon Quarry discharge point compared to the upgradient levels (both locations' concentrations are above the PWQO). As an added observation, during the heavy rainfall event the cobalt concentration at SW2 was 0.0010 mg/l, which is above the PWQO of 0.0009 mg/l.

The E.Coli. concentration at SW2 during dewatering was reported as 680 ct/100 ml. It should be noted that the concentration of E.Coli. at the sampling station SW1 located upgradient of the dewatering discharge was 5200 ct/100ml, indicating that the source of increased E.Coli. is likely derived from the effects of the heavy rainfall on a source located upgradient from the quarry. It may be noted that the dewatering diluted this parameter in the drain. The E.Coli. concentration in the East Castor river increased from 3500 ct/100ml upgradient from the Cinnamon Drain discharge point to 7800 ct/100ml downgradient from the discharge point. These observations indicate that the Cinnamon Drain is contributing E.Coli to the East Castor river, but that the cause of increased E.Coli is not related directly to the dewatering operations, but natural precipitation run-off contributions to the drain from the surrounding livestock grazing fields.

The Total Coliform concentration at SW2 in May 2002 was reported at 400 cts/100ml and during dewatering in August 2002 the concentration increased to 5200 cts/100ml. It should be noted that the concentration of Total Coliform at the sampling station SW1 located upgradient of the dewatering discharge point recorded a concentration of 330 000 cts/100ml, indicating that the source of increased Total Coliform, like E.Coli., is likely derived from surface run-off of precipitation in the area during the heavy rainfall at the time of sampling. The Total Coliform concentration in the East Castor river increased from 52,000 cts/100ml upgradient from the Cinnamon Drain discharge point to 54,000 cts/100ml downgradient from the discharge point. These observations indicate that the Cinnamon Drain is contributing total coliforms to the East Castor river, but that the cause of increased bacteriological parameters is not related directly to the dewatering operations, but natural precipitation run-off contributions to the drain from the surrounding livestock grazing fields.

The iron concentrations increased in the surface water between SW1 and SW2 during dewatering in August, to levels above the PWQO of 0.3 mg/l. Previous sampling in May 2002 recorded iron concentrations at SW2 which were lower than concentrations found upstream in the Drain. The iron concentration in the East Castor river increased slightly from 0.42 mg/l up-gradient from the Cinnamon Drain discharge point to 0.53 mg/l down-gradient from the discharge point. Both concentrations are above the PWQO. These results indicate that the dewatering event has a slight increase effect on the iron levels in the Drain and the East Castor River.

The molybdenum concentrations at SW1 background and SW2 in May 2002 were reported at <0.01 mg/l and during the dewatering event in August 2002 the concentration at SW2 the molybdenum level was recorded as 0.067 mg/l, which is above the PWQO of 0.04 mg/l. The molybdenum concentration in the East Castor River during the dewatering event in August 2002

increased slightly from 0.008 mg/l, upgradient from the Cinnamon Quarry discharge point, to 0.027 mg/l, downgradient from the discharge point (both concentrations are below the PWQO). This indicates that dewatering is impacting the Cinnamon Drain and the East Castor River with respect to molybdenum concentrations found in the surface water.

The total ammonia N-NH3 concentration at SW2 in May 2002 was reported at 0.02 mg/l. The un-ionized ammonia concentration could not be calculated since no surface water temperatures or pH were recorded at this time. In August 2002 after the dewatering event, the ammonia (un-ionized) concentration at SW2 was 0.0014 mg/l, which is below the PWQO of 0.02 mg/l. It should be noted that the concentration of ammonia at the sampling station SW1 located upgradient of the dewatering discharge point recorded a concentration 0.0036 mg/l - a higher concentration than downstream. The ammonia (un-ionized) concentration in the East Castor river decreased from 0.399 mg/l upgradient from the Cinnamon Quarry discharge point to 0.189 mg/l downgradient from the discharge point (both concentrations are above the PWQO). The discharging of groundwater into the drain improved the surface water quality in the East Castor River in regards to ammonia (un-ionized).

In August 2002 the Total Phosphorus concentration upgradient (background) from the dewatering discharge point in the Cinnamon Drain is consistently higher in levels of total phosphorus than the downgradient location SW2 . There was also minimal increase in the total phosphorus concentrations recorded in the East Castor River downstream from the Cinnamon Drain discharge point than the levels recorded upstream from this point. It should be noted that the concentration of Total Phosphorus in the Cinnamon Drain and East Castor River is naturally above the PWQO (0.03 mg/l) even at the background locations. This suggests that the source of increased Total Phosphorus is likely derived from the general run-off from farmer fields.

The PWQO indicates that turbidity should not change the natural Secchi disk reading by more than 10%. In May 2002 the natural turbidity levels in the drainage ditch was 3.2 NTU (SW1 background) and 1.8 NTU (SW2). During dewatering in August 2002, the turbidity at SW1, located upgradient from the dewatering discharge point, was recorded at 8.9 NTU, while the turbidity at SW2 was recorded at 29.2 NTU, an increase of greater than 10%. However, the turbidity also increased at the background points in the Drain from May 2002 (dry conditions) to August 2002 (high rainfall conditions) suggesting that some of the increase in turbidity levels could also be attributed to the increase sediment in the Drain from the field run-off. The turbidity concentration in the East Castor River increased slightly from 11.1 NTU upgradient from the Cinnamon Quarry discharge point to 12.1 NTU downgradient from the discharge point, which is less than a 10% increase. This indicates that as the surface water in the Drain approaches the East Castor River the sediment has had time to settle out of the discharge water and is not having a negative effect of the East Castor River.

Based on the information presented above, the present dewatering operations may have an impact on the chemical concentrations in the Cinnamon Drain and eventually the East Castor River for the following parameters: boron, iron and molybdenum. The change in concentrations of these parameters in the East Castor River, at a point downgradient from the Cinnamon Drain discharge point, observed during this monitoring program are: a 23% increase for boron, a 26% increase for iron, and a 238% increase for molybdenum. For each of the first two parameters the East Castor river already contained concentrations above the PWQO, possibly indicating that these parameters may represent background concentrations related to the limestone bedrock found in the area. The large increase in molybdenum may indicate a direct impact. As expected the Cinnamon Drain experienced an increase in turbidity after the de-watering discharge point however, the turbidity levels decreased along the drain to the point where the discharge to the Castor River did not have any adverse effects. Although the testing revealed that there is an increase in aluminum concentrations in the surface water in the Drain downgradient from the discharge point the concentrations of aluminum are affected by the clay particles in the sample. Future sampling for aluminum will include filtering of the sample in the field and more precise commentary can be offered once these results are known.

To mitigate any possible adverse impacts on the surface water in the municipal drain and the East Castor River the following measures should be implemented:

- Straw bale check dams will be placed along the drainage ditch to reduce the amount of silt and the overall velocity of the water entering the Drain and leaving the property. The straw bales should be installed as soon as discharging begins and regularly checked, maintained and replaced when necessary.

Field Measurements

In the drain, field measurements were taken upgradient and downgradient from where the water from the quarry is discharged, and in the river, upgradient and downgradient from where the Cinnamon Drain discharges into it (Appendix F). A steady flow was observed from the quarry discharge to the East Castor River. The ditch is approximately 1.8 to 2.4 metres deep and with a water flow of approximately 15 to 30 cm. The ditch from the quarry to the river runs in a very straight line and extensive vegetation along the ditch was observed. Because of these characteristics, the chances of erosion along the banks of the ditch would be minimal. No other discharges to the drain were observed between the quarry discharge and the river.

The results of the field measurements indicate:

- An increase in dissolved oxygen in downgradient stations, in the Cinnamon Drain and in the East Castor River. The range in dissolved oxygen concentrations was from 2.36 to 5.63 mg/l. For warm water biota the PWQO recommend 4 mg/l at 20 degrees C. The only zone where this DO concentration was present at a concentration of at least 4 mg/l was at the discharge point of the water pumped from the quarry.
- A pH varying between 7.71 and 8.21.
- Temperature varying between 17.9 and 23.4 degrees Celsius
- Conductivity varying between 1.15 and 1.6 ms.

These variances in field parameters do not indicate negative impacts from the dewatering operations.

3.1.3.5 Regional Hydrogeology

The regional direction of groundwater flow in the bedrock aquifer is northeastwards towards the South Nation River at Casselman and then northwards to the Ottawa River Valley system. In the shallow bedrock, local variations in groundwater flow likely occur as a result of smaller surface water features such as the Castor and South Nation River. Typically, groundwater at the bedrock-overburden interface in southeastern Ontario is affected by surface topography and local climatic conditions.

3.1.3.6 Local Hydrogeology

One hundred and seventeen historical MOE Water Well Records were collected from the MOE for a 1.5 km radius surrounding the quarry (Appendix B). Thirty-one of these records included enough information to be compiled and analyzed statistically to determine the range of elevations for the bedrock potentiometric surface and the elevation of the water bearing zones in the vicinity of the quarry. A summary of the water well information is presented in Table 1.

Water Bearing Fracture Zones

A statistical analysis of thirty-one (31) historical MOE well records is graphically displayed in Figures 6 and 7. The histograms indicate that the depth to water bearing fractures in the 1.5 km radius surrounding the quarry ranges from 10 metres below ground surface (mbgs) to 70 mbgs (66 masl to 6 masl). Over 68 % of the wells have reported water bearing zones between

9 to 25 mbgs (66-50 masl) indicating that this is the primary zone of water use in the area. The remaining 32% of the wells encountered water bearing fractures below 49 masl. 26 % of the wells appear to draw water from elevations between 59 to 66 masl. Evaluation of this water bearing zone with respect to the proposed quarry expansion indicates that 74 % of all water wells within a 1.5 kilometre radius of the quarry site draw water from water bearing zones that are at elevations ***below*** the final lift elevation (59 masl).

This statistical portrait also included an evaluation of the water use of a nearby commercial operation. The TPR Redimix operation, located northeast of the proposed quarry expansion area, utilizes 5000 IGPday (15.8 L/min) of water for cement production at their site. This water is taken from a 6" diameter groundwater well located in the field on the southeast side of excavation TPR6Q. A back-up 8" diameter well (TPR8Q), located near the TPR Redimix building in the north end of the existing quarry, is also periodically used for this purpose especially if the quarry has been dewatered. According to MOE well records TPR6Q encountered a water bearing zone at approximately 15 m below ground surface (57.5 masl.) and TPR8Q encountered a water bearing zone at 47 m below ground surface (25.5 masl).

A baseline survey was completed for residents located within 0.5 km radius of the quarry. Well information obtained during the baseline survey was compiled and analyzed to locate the major water bearing zones. The locations and approximate well depths of the baseline survey residents are reported in Figure 2 and Table 3 respectively.

Table 3: Groundwater Data Of Existing Wells On And Around The Site

Well Owner	Ground Elevation (approximate)	Water Found (approximate)		Water Level in well May 28, 2002 (approx.)	
	(masl)	(mbgs)	(masl)	(mbgs)	(masl)
John/Linda Cinnamon	76.5	74	2.5	6.96	70.5
Barry Cinnamon Barn	76.2	45	31.2	5.48	70.5
Barry Cinnamon House	76.2	37.5	38.7	5.85	70.35
Leonard Vanderlaan (old well)	76.5	22	54.5	4.07	72.4
Blair Rental Guadet now tenants (formerly L. Vanderlaan)	75.0	90	-15	5.36	69.64
TRP Redimix 6"	72.5	15	57.5	5.3	67.2
TRP Redimix 8"	72.5	47	25.5	1 (3.05-3.66 when pumping)	71.5 (68.97-69.6 when pumping)

All the groundwater users interviewed during the survey had general information about the depth of their well. Information gathered during the survey was reasonably correlated with the MOE well records of the area. The depths of these wells range from 15.0 to 90.0 mbgs. Ground surface elevations at each well were estimated using the site plans and the elevations of the water bearing zones were estimated. The elevation of the principal water bearing zone within the 0.5 km radius, based on these calculations, range from 15 to 57.5 masl. Based on the results of the survey the elevation of the principal water bearing zones, in all of these wells, are located at elevations lower than the final lift of the proposed quarry expansion (59 masl). There are no residents/businesses, within a radius of 0.5 km, that extract water from water bearing zones that are above the proposed excavation elevation.

The current base of the existing Cinnamon Quarry excavation (66 masl) is approximately 7 metres below the bedrock/overburden interface. The quarry operational plan suggests a final base elevation of 59 masl. They are currently de-watering the quarry once a year, sometimes twice in order to operate. There are no comments in the file outlining nearby resident's concerns with the operating quarry. Based on discussions with residents and information in the MOE well records there are no noticeable water bearing fracture zones above 59 masl within a 0.5 km radius of the proposed quarry.

To expand upon the baseline survey, the well records within a 1.5 km radius of the proposed quarry operation (Figure 6) were also evaluated. Ninety-four percent (94%) of wells within a 1.5 km radius of the proposed quarry have fracture zones capable of producing yields greater than or equal to 5 IGPM. Seventy-four percent (74%) of the recorded water bearing zones in these wells are located below 59 masl (Figure 7).

Although the yield of the bedrock fractures above 59 masl is low, the proposed project intends to extract aggregate material from below the measured potentiometric surface and thus this proposal is rated as a Category 2 quarry operation. A Level 2 hydrogeological assessment was therefore a requirement of this quarry expansion.

Phase 2 Hydrogeological Assessment

In order to meet the requirements of a Category 2 application, WESA drilled three test wells on the quarry property. The wells were drilled in a triangular configuration in the southern corner of the expansion property. MW1 is located on the south side of the Blair Rental house just west of the drainage ditch along the farm field, MW2 is located approximately 120 m southeast of MW1 and MW3 is located west of MW2 and Southwest of MW1 at approximately equal distance from either well (Figure 2). Fracture zones encountered during on-site drilling are reported in Table 4.

Table 4: Fracture Depths of On-Site Test Wells

Well #	TOC Elevation	Ground Elevation	Water Found	
	(masl)	(masl)	(m.b.g.s)	(masl)
WESA-MW1	75.02	74.26	25 39	49.26 35.26main
WESA-MW2	74.39	73.72	5.7 18.5 21.6	68.02 55.22main 52.12
WESA-MW3	76.69	75.97	32.9	43.1
Old Well	77.64	77.17	22	54.5

The elevation of fractures, and assumed water bearing zones, were compared with the water well data (Table 1) to determine if the on-site hydrogeology is comparable to that of the general area surrounding the quarry. With the exception of the shallowest fracture encountered in MW2 at 5.7 mbgs (68 masl), all fractures zones found during drilling on site are located between 55–35 masl (18-30 mbgs), or 4–24 meters below the proposed base of the quarry.

As discussed in the description of the bedrock geology on site, significant water bearing fractures were noted during drilling at MW2. The elevations of these fractures are 35, 43 and 55 masl and fall within the range of other water bearing zones in the area as determined from the MOE Water Well Records. While one fracture was noted during drilling of MW2 at 68 masl, it was not documented as a significant water bearing fracture.

Static Water Table

Statistical compilation of the MOE well record data indicates that the static groundwater elevation across the 1.5 km radius study area ranges from approximately 66.37 to 75.38 masl (Figure 8). Static groundwater elevation on the project site (MW1, MW2, MW3 and Old Well) are found to be between 71 masl and 72 masl with an average static water elevation of 71.3 masl. Therefore, the proposed final excavation elevation (59 masl) would be approximately 12 to 14 metres below the local static groundwater elevations.

Groundwater Response to Aquifer Pumping

In order to evaluate the influence of quarry de-watering on the aquifer, WESA measured groundwater elevations in both groundwater wells (TPR6Q and TPR8Q) on the TPR Redimix property before and during pumping activities. On August 21, 2002, at 5:00 pm, groundwater

levels were measured at all on-site wells, at the quarry and at the wells located on the TPR Redimix . A WESA employee returned to the site at 4:00 pm on August 22, 2002 to re-measured groundwater levels at five on-site wells and within the quarry excavation. The 6" de-watering pump was started at 9:00 am on August 22, 2002, and a de-watering pump with a 3" diameter discharge pipe had been continually operating since 11:00 am on August 21, 2002. Both pumps had been running steadily all day.

The results of the groundwater monitoring are tabulated in Table 5 along with additional water level data collected on September 17, 2002. Well TPR6Q is the only well that experienced a notable drop in water level (0.9 m) during the dewater event between August 21 and 22, 2002.

Table 5: Groundwater Levels On Site

	Water Level from TOC (m)	**Water Level Elevation (masl)**	**Water Level from TOC (m)**	**Water Level Elevation (masl)**	**Water Level from TOC (m)**	**Water Level Elevation (masl)**
Well ID	***21-Aug-02***	***21-Aug-02***	***22-Aug-02***	***22-Aug-02***	***Sept. 17, 2002***	***Sept. 17, 2002***
TPR Redimix Well TPR8Q	1.87		1.84			
TPR Redimix Well TPR6Q	6.04		6.94			
Quarry Water Level	5.6		5.58			
MW1	3.07	71.95	3.04	71.98	3.67	71.35
MW2	2.33	72.06	2.33	72.06	3.17	71.22
MW3	4.74	71.95	4.71	71.98	5.32	71.37
Old well					6.24	71.40

Only one well drilled on site intersected a water bearing fracture zone above the elevation of the proposed quarry base (59 masl). MW2 encountered water bearing fractures at 68 masl and 55masl. The static groundwater elevation measured in MW2 was 71.22 masl. The proposed final excavation elevation (59 masl) would, therefore, be approximately 12.22 metres below the on-site static potentiometric elevations. The other two wells drilled on site encountered water bearing zones below 50 masl. Groundwater elevations measured in MW1, MW3, and Old Well were 71.35, 71.37, and 71.4 masl respectively. These static groundwater elevations vary only slightly and suggest that the fracturing of the bedrock below 50 masl is to some degree connected.

Transmissivity

A constant discharge pumping test was conducted at the site on September 17, 2002 in order to assess the physical properties of the on-site aquifer. The transmissivity (T) of the bedrock on-site was calculated using the water level data collected during the aquifer test at test well MW2. The water level data and the aquifer test results are presented in Appendix E. The pumping rate was established at 2.8 IGPM for most of the duration of the 6 hour test.

There were difficulties maintaining a constant discharge rate during the duration of the test and consequently during the last 2 hours the discharge rate was 2.25 IGPM. At this rate the fractures in the well were producing at a greater rate than the pumping rate and the water level in the well was recovering slowly. Water level data was analyzed using the Theis method for the recovery data.

During the aquifer test of September 17, 2002, groundwater elevations in the three open boreholes and one old existing well were measured. The results for the monitoring wells (MW1, MW3 and Old Well) are reported in Appendix E. Limited to no drawdown was observed in test wells MW1 and MW3 during the aquifer test. The old existing well registered a total drop in water level of .02 m throughout the test and did not respond until more that 4 hours into the test. Given none of the observations wells showed any significant response, the aquifer storativity (S) could not be calculated. Quantitatively this suggests that there is little hydraulic connection between the pumping well and the observation wells.

Results from the aquifer test performed on MW2 indicate that the transmissivity of the bedrock aquifer at the site is low. The transmissivity calculated using an average flow rate of 2.8 IPGM and the Theis recovery method is 0.43 m^2/day. As a matter of interest this value is comparable to 0.52 m^2/day determined using the Cooper-Jacob method with the recorded drawdown data.

Water Supply

As previously discussed, based on the MOE water well records and information obtained during the baseline survey, over 74 % of water wells in the area have water bearing fractures at elevations lower than the proposed final lift elevation (59 masl). Local residents within 500 metres of the quarry have wells that encounter water bearing fractures between 20.3 m and 74 meters ***below*** the base of the quarry and, as a result, are not likely to be impacted by the operation of the proposed quarry expansion. The commercial operation, TPR Redimix, has one well that intersects a water bearing fracture at 1.5 meters below the final depth of the quarry

excavation. Based on this information, this well will not likely be impacted by the quarry operations. Figure 9 is a cross section showing the location of selected domestic wells, of the on-site test wells and the geology. The proposed final elevation of the quarry expansion is also shown on the figure.

To evaluate the potential effects of de-watering the proposed excavation on the water supplies of local residents, the Ibrahim and Brutsaert method (1965) was used to estimate the potential draw down at the closest (240 m) resident (John Cinnamon) to the subject property. As well, the potential drawdown at the Old Well, the TPR Redimix 6" well and MW2, located on the A.L. Blair property 168 metres, 12 metres and 105 m, respectively, away from the proposed quarry excavation were of particular interest because their water bearing fractures are at elevations of 54.5, 57.5 and 55.2 masl respectively, which is close to the 59 masl proposed elevation of the quarry excavation. For completeness, all wells located on or adjacent to the subject property were included in the theoretical calculations. The cone of influence expected around the de-watered quarry is displayed on Figure 10. The drawdown cone has also been extrapolated onto Figure 9. Details of the calculations are provided in Appendix G and summarized in Table 6.

Table 6: Estimated Theoretical Drawdown At Given Distances From The Quarry Edge

Distance from Proposed Quarry Excavation Boundary	Representative Well	Expected Drawdown
0 m	TPR Redimix 8" Well	11.520
12 m	TPR Redimix 6" Well * (57.5 masl)	6.560
30 m	MW1 (35.3 masl)	4.540
105 m	MW2 * (55.22 masl)	1.560
105 m	Gaudet Well (15 mbsl)	1.560
129 m	MW3 (43.1 masl)	1.050
168 m	Old Well * (54.5 masl)	0.650
240 m	John Cinnamon Well (nearest neighbour, 2.5 masl)	0.310
411.8	Barry Cinnamon (31.2 masl)	0.098

** identifies well which takes water from depth close to proposed quarry floor elevation of 59 masl*

Figure 11 displays the relationship between the distance a well is located from the edge of the quarry excavation and the resulting drawdown expected in the well during the period when the quarry is in operation (i.e. de-watered). Therefore, based on a transmissivity of 0.43 m^2/day, a drawdown of 0.31 metres may occur in a well located approximately 240 metres from the

quarry excavation (John Cinnamon nearest resident). Assuming that the potentiometric elevation at this location is similar to those on site, the total drawdown available in this well is approximately 69 metres. The potential drawdown from de-watering the quarry would, therefore, represents <1 % reduction in the static water elevation of the domestic supply well.

The current daily drawdown in this domestic well is estimated to be approximately 4.8 metres using a typical homeowner water supply use of 4 IPGM during peak hours (Appendix E) and assuming a transmissivity of 0.43 m^2/day. The maximum combined effect of regular well usage and impact from the quarry would therefore not exceed 5.11 metres of total drawdown. This represents 7.4 % of the total available drawdown in the well. It should be noted that this calculation is very conservative and represents the largest potential impact to water supply users in the area. The J. Cinnamon domestic supply well is equipped with a submersible pump set at 60.5 masl (16 mbgs) and therefore should not be affected by the estimated maximum drawdown calculated for the well (66.2 masl).

In general, other wells located within 500 metres of the quarry are less likely to be affected by quarry operations due low transmissivity of the shallow water bearing zone and given there is 28 m of vertical separation between the water bearing fractures in these wells and the overlying final lift elevation.

It is important to note that during previous quarry activities, after the initial de-watering of the excavation was complete, additional pumping was required only required every two months to keep the excavation free of seepage water. This suggests that periodic pumping requirements will be minimal. Intermittent pumping events should lessen the potential impact of de-watering on the water supply of local residents. During non-operational months (Nov-April), water levels in the quarry will be allowed to recover further diminishing the potential of impacting water supply wells in the area.

Overall, the predicted impact of the proposed quarry expansion on the local groundwater supplies will be low. A groundwater monitoring program and planned contingency actions have been provided (see Section 3.2) and are included on the Site Operation Plan to verify the above-mentioned model calculations and to protect the local groundwater supply.

3.1.3.7 Quarry Floor Buckling

The excavation of flat lying, layered rock quarries can result in the heave or buckling of the quarry floor, under certain geologic conditions. Buckling is caused by high horizontal stresses in the rock below the quarry floor combined with the sudden release of strain energy following the removal of the overlying material. This phenomenon is not discussed in detail, however, the potential for buckling at the Cinnamon Quarry is briefly discussed below.

Several examples of quarry floor buckling have been documented in the geotechnical literature (Adams, 1982; Lo, 1978). While the potential for buckling depends on the geology, bedrock structures and existing horizontal stresses, it appears that they occur much less frequently at bedrock depths of 15 metres or less. The proposed Cinnamon Quarry expansion (16 m below ground surface) will be within this limit and buckling is unlikely to occur. Based on the limited number of fractures at depth in on-site test wells MW1, MW2 and MW3, should buckling occur and breach fractures below the excavation it would most likely not interfere with groundwater supplies in the area.

3.1.3.8 Chemical Hydrogeology

Water samples were collected from the following properties within a 0.5 km radius of the quarry:

- John Cinnamon – House well
- Barry Cinnamon – Barn well
- Barry Cinnamon – House well
- Blair Rental House – House well

The water samples were submitted to Accutest Laboratories Ltd. in Ottawa and, except for the Blair Rental House sample, were analyzed for the parameters outlined in Section 3.1.2

The sample collected from the Blair Rental House was only analyzed for DOC and turbidity since this well is located on the Blair property and will shortly be vacant and the well will no longer used for potable water. The blasting from quarry operations create bedrock fracturing which result in more turbid well water and consequently a decrease in oxygen within the groundwater. This leaves these two parameters as good indicators of impacts on the groundwater in the area.

The analytical results are in included in Appendix F and summarized for each well in Table 7 with Ontario Drinking Water Objectives (ODWO) for comparison. Generally, water quality in the area is acceptable with the exception of selected parameters discussed below.

Table 7: Baseline Survey Groundwater Chemistry

Parameters	ODWS	John Cinnamon	Barry Cinnamon Barn (Stock Well)	Barry Cinnamon House	Blair Rental
Background Colonies	200 ct/100ml (MAC)	4	>200	1	NA
Total Coliforms	0 (MAC)	0	Overgrown	0	NA
Colour	5 TCU (AO)	<2	2	9	NA
Hardness	80-100 mg/l as $CaCO_3$ (OG)	4	238	348	NA
Nitrate	10 mg/l (MAC)	1.91	4.54	11.2	NA
Sodium	200 mg/l (AO) 20 mg/l Medical Officer of Health notification	254	71	31	NA
Organic Nitrogen	0.15 mg/l (AO)	0.24	0.64	0.64	NA
Turbidity	5 NTU (AO) 1 NTU (MAC) for treated water	0.5	<0.1	2.6	8.7
TDS	500 mg/l (AO)	735	562	577	NA
DOC		1.1	1.5	4.5	4.6

AO = Aesthetic Objectives
MAC = Maximum Allowable Concentration
OG= Operational Guideline
NA= Not Analysed

The purpose of the wells testing is to establish a baseline for groundwater chemistry in the immediate area of the proposed quarry operation. These results indicate that the local groundwater is elevated in sodium, organic nitrogen, total dissolved solids (TDS), and hardness (since elevated concentrations were detected in all three wells tested).

- Elevated TDS usually indicates inorganic dissolved chloride, calcium, magnesium, and bicarbonates. The effects of TDS on drinking water quality depend on the levels of the individual components. Excessive hardness, taste, mineral deposition, or corrosion are common properties of highly mineralized water.

- Drinking water with sodium concentrations in excess of 200 mg/l will exhibit a salty taste. The medical officer of health should be notified when the sodium concentration exceeds 20 mg/l, so that this information may be passed on to local physicians.

- The operational guideline for organic nitrogen is 0.15 mg/l. High levels may be caused by septic tank or sewage effluent contamination. Taste and odour problems are common with organic nitrogen levels greater than 0.15 mg/l.

The proponent does not anticipate that the quarry operation will have any effect on the groundwater quality in the area, however, in the unlikely event of operations intercepting the groundwater supply in the area the established baseline will aid in assessing if and to what degree the quality has been affected.

3.1.4 Overall Hydrogeological/Hydrological Assessment

Based on the physical and chemical groundwater data, a survey of on-site surface water drainage and a comprehensive site investigation, the following assessments have been made:

- On-site surface water drainage is well controlled by the Cinnamon Drain ditches. De-watering during non-peak natural surface water levels, well vegetated drainage ditches, long flow distances and implementation of the mitigative measures outlined in section 3.1.3.4 should decrease any potential increase in surface water turbidity during quarry de-watering.

- Dewatering operations may have an impact on the chemical concentrations in the Cinnamon drain and eventually the East Castor River for the following parameters: boron, iron, turbidity and. molybdenum.

- For parameters boron and iron, the East Castor River already contained concentrations above the PWQO, possibly indicating that these parameters may represent background concentrations related to the limestone bedrock found in the area.

- The increase in molybdenum concentration in the May and August de-watering surface water sampling events may indicate a direct impact to the drainage ditch.

- The Cinnamon Drain experienced an increase in turbidity after the de-watering discharge point however the turbidity levels decreased along the drain to the point where the discharge to the Castor River did not have any adverse effects. The Cinnamon drain is not a classified surface water feature and is not a significant habitat for water species. The MNR and the South River Nation Conservation Authority have no concerns for this drain.

- There are no reported incidents of local residents being impacted by previous dewatering from the existing quarry.

- The water bearing zone found between 55-65 masl may be intersected by the proposed expansion. However, no residents within 500 metres of the quarry rely on this water bearing zone for their water supplies. Results of the Level 2 Hydrogeological assessment predicts that the impact of quarry operations on these domestic wells will be low due to the low transmissivity of the bedrock and the limited fracturing.

- The remaining water supply users are located at greater distances from the quarry and generally, rely on groundwater from a water bearing zone that is deeper than the final excavation depth of the proposed quarry expansion. It is not likely that the proposed excavation will adversely affect these wells.

- Chemical analyses of the local domestic groundwater supply show that groundwater in the area generally exceeds the ODWO for sodium, organic nitrogen, total dissolved solids (TDS), and hardness. High levels of hardness and TDS are common to groundwater aquifers in limestone bedrock of eastern Ontario and are not the result of historical quarry operations. The proposed quarry operations should, therefore, not adversely impact groundwater quality in the area.

Based on the assessment discussed above, a groundwater monitoring and contingency plan has been included in the quarry operational plans (refer to Site Plans, section 1.0). The groundwater monitoring plan includes monitoring of groundwater elevations at the on-site test wells, MW1, MW2 and MW3, as well as the old well at the Blair rental property and the two wells located at the existing quarry (TPR6Q and TPR8Q) at each blasting and/or groundwater pumping event and monthly during quarrying activities. A series of trigger mechanisms including extreme changes in on-site groundwater levels and reported changes in groundwater quality and quantity by local receptors will be used to initiate contingency actions. Monitoring and contingency action plans are outlined in detail below and are also presented on the Site Plans.

3.2 MONITORING AND CONTINGENCY PLANS

Surface Water Monitoring

- *Before the next operational season (i.e. before de-watering commences), the surface water in the Cinnamon Drain (SW1 new, SW2, SW3 upstream and SW3 downstream) should be sampled once for turbidity, iron, molybdenum and boron.*
- *Additional samples should be taken during de-watering of the quarry.*
- *If the data confirms that the de-watering event is impacting the drainage channel for any of the parameters, then the surface water sampling event should be repeated annually for the impacting parameter(s).*

Groundwater Monitoring

- *Before each groundwater pumping event the water levels in the monitors on site will be recorded.*
- *The groundwater levels will be recorded at least once during the dewatering event and monthly thereafter while the quarry is operating.*
- *All groundwater measurement will be recorded by a technician under professional supervision.*
- *Groundwater levels will be measured at the on site monitoring wells MW1, MW2, MW3, the old well, the TPR Redimix6Q well and within the quarry excavation.*
- *Groundwater levels will be recorded and kept on file for five years for reference purposes.*
- *Groundwater monitoring will not be required when the quarry is not in operation.*

Trigger Mechanisms

- *Extreme changes in the monitored groundwater levels (i.e. beyond that expected from seasonal fluctuations or regular domestic groundwater use). Trigger water elevation levels will be determined for the on site wells and will be included in the Permit to Take Water, as approved by the MOE, for the site.*
- *Changes in groundwater quality or quantity reported by the local receptors.*

Contingency Actions

- *Representative from A.L. Blair Construction Ltd. will be contacted immediately at (613) 538-2271.*
- *Representative from A. L. Blair Construction Ltd. will conduct a site visit immediately upon notification to assess the need for emergency measures. In the event that a domestic water supply has been adversely impacted, an alternative temporary source of potable water (i.e. water truck or tank) will be provided immediately and a representative from the MNR in Kemptville (613-258-8204) and the MOE in Cornwall (613-933-7402) should be notified.*

- *The source and level of impact should be assessed by a qualified professional and appropriate long term remedial actions will be recommended based on the results of the impact assessment. Contingency plans may include but will not necessarily be limited to:*
    - *Adjust pump settings or intake depth*
    - *Install new pump*
    - *Re-develop well*
    - *Drill new well in alternate water supply aquifer*
    - *Install water treatment equipment*
- *The baseline water quality/quantity will be re-established and the regular groundwater monitoring program described above will be resumed.*

The monitoring and contingency plan will be included on the Quarry Site Plans, and in the Permit to Take Water (PTTW). The histograms (Figures 6, 7, 8 and 9) and MOE wells records (Table 1) are presented in this report to demonstrate that an established deeper aquifer is available in the vicinity of the site in the event that the contingency plan is required. Table 3 and 5 outline the water elevations in neighbouring wells and test well monitors at the site, respectively.

3.3 NATURAL ENVIRONMENT ASSESSMENT – LEVEL 1

As part of the application process, a Level 1 Natural Environment assessment was conducted for the application. This assessment is used to determine if any of the following features exist in the proposed expansion area and whether they could be adversely affected by the proposed development:

- Significant wetlands
- Significant portions of habitats of endangered or threatened species
- Fish habitat
- Significant woodlands, significant valley lands
- Significant wildlife habitat, and
- Significant areas of natural and scientific interest.

The background information and results of the Level 1 assessment can be found in Appendix H are detailed in the sections below.

3.2.1 Background Information

In order to obtain information regarding the Level 1 items listed above, the following government agencies were contacted.

The South Nation Conservation Authority was contacted and requested Mr. Scott Smith and Mr. Richard Pilon to search for any pertinent documents specifying environmentally sensitive areas in the proposed quarry expansion area. Debbie Baker of the SNRCA provided information on the drain where it enters the East Castor River. There was no significance attached to this drain with respect to species habitat.

The Regional MOE office was also contacted by WESA and Mr. Mitch Seguin responded that MOE were not interested in commenting on quarry applications at this point in the study. They would only get involve in the application if invited to by the Ministry of Natural Resources (MNR). The MOE will become involved once the applications to take water and discharge water are filed.

The biology department of the MNR was contacted for an information request. WESA requested that the ministry provide information regarding any significant wetlands, wood lots, endangered or threatened species, fisheries or habitat within 120 metres of the proposed quarry expansion area. Mr. Shawn Thompson responded that according to his records there were no significant value lands or woodlands in the area but that the local township be contacted in regards to their Official Plan for designated significant land or woodlands. With respect to endangered and significantly sensitive species, ANSI and wetlands there are no concerns for the subject area. Mr. Scott Smithers commented that the Cinnamon drain was unclassified or undefined from the perspective of the MNR and that their files do not list the drain as a current fish habitat (Appendix H).

The Clerk for the United Counties of Stormont, Dundas and Glengarry as well as the Planner for the Township of North Dundas were contacted and asked by WESA for information regarding environmentally sensitive areas in the County and municipality. Mr. Calvin Pol, Zoning Administrator for The Township of North Dundas responded that the expansion area was not zoned for Quarry but was zoned Agricultural and would require a zoning amendment. As well, an amendment to the former Township of Winchester Official Plan would be required before the County Official Plan is approved. The United Counties of Stormont, Dundas and Glengarry have not responded to date.

The Ministry of Agriculture and Food responded by letter on November 25, 2002 that they have no comments or concerns with the proposal.

3.2.2 Results and Assessment

As described above, the Level 1 Assessment indicated that:

- Information obtained from the MNR indicates that there are no significant wildlife habitats, threatened or endangered species, wetlands or ANSI in the vicinity of the existing quarry site or the proposed expansion area.

- The Cinnamon municipal drain has not been identified as a fish habitat. Surface water drainage from the quarry will flow over 1.5 km before discharging into the East Castor River and should be representative of local surface water at this time.

As discussed in the Hydrogeological assessment, surface water from quarry de-watering will be discharged to the Cinnamon drainage ditch and will eventually flow to East Castor River. Based on the information reported from the various agencies and the mitigative measures discussed above, the proposed development will should not impact the natural environment features listed above.

3.4 Cultural Heritage Resource - Stage 1/Stage 2

WESA contacted the Regional Archaeologist at the Ministry of Citizenship, Culture and Recreation (MCCR) in Toronto, Ontario. A request was prepared for any information regarding culturally significant sites in the proposed quarry expansion area.

Over a period of six months the MCCR was contacted a total of four times to obtain the information requested in the fax as outlined above. Chris Anderson, regional archaeologist, indicated by email on December 4, 2002 that the information would be provided as soon as possible. On December 6, 2003, Mr. Anderson (Regional Archaeologist of the Ministry of Culture, Heritage Operations Unit) responded by email (see Appendix I) that the proponent carry out a cultural heritage resource assessment of the subject property. According to the Ministry's Archaeological Assessment Technical Guidelines the proponent must hire a licensed archaeological consultant to perform this assessment. As well, the assessment could not be performed while the property was covered in snow, therefore the assessment was delayed until the springtime of 2003.

WESA sub-contracted Mr. Ken Swayze of Cobden, Ontario a licensed archaeological consultant (Lic. # P039). Mr. Swayze began his Stage 1 assessment in late April 2003 and conducted a Stage 2 pedestrian survey of the subject property on May 2nd, 3rd, 9th and 10th, 2003. The complete archaeological assessment report including background historical research, methodology and results can be found in Appendix I.

Based on the Ministry of Culture, Heritage operations Unit's *'Archaeological Assessment Technical Guidelines: stage 1 to 3'* (OMCL 1993) the following Stage 1 and Stage 2 assessments were made;

Stage 1 - The Cinnamon Quarry proposed expansion area has moderate archaeological potential because it has well drained soil near a canalized first order stream of the East Castor River, a source of water for human habitation and because the lay of the land provides a keen vantage point across the ancient East Castor River drainage body. This ancient littorial environment offered plenty of resources for the hunter-gatherers. This finding warranted the Stage 2 assessment.

Stage 2 – Across the Cinnamon quarry expansion property a small collection of lithic tools of expediency were found widely distributed, the following significance of archaeological sites criteria were noted by Mr. Swayze in his report;

1. Historic Association – findings recorded under Borden Registration Number: BgFu-1 which has no historic association.
2. Representativeness – not representative.
3. Type/Function – kill site or temporary campsite.
4. Rarity – not rare
5. Integrity – none
6. Preservation – poor
7. Artifact and feature density – poor, isolated distribution
8. Human Remains and Burials – no evidence.

Mr. Swayze concluded that no further work was required on the subject property and that the proposed Cinnamon Quarry expansion site is not of any heritage concern.

3.5 NOISE ASSESSMENT

The location of the extraction and processing facilities of the proposed quarry expansion are within 500 metres of a sensitive receptor and as a result a noise assessment was completed. The assessment was conducted according to MOE guidelines by Dr. Williamson and Ms. Francis King, M.Sc. of Hugh Williamson Associates Inc. Dr Williamson is a professional engineer and a member of the Canadian Acoustical Association.

The complete noise assessment including methodology and results is included in Appendix J. The following section is a summary of the assessment presented in the report.

Based on class 3 area (rural) MOE sound level limits the following assessment was made:

- The major noise sources associated with the proposed quarry operations is the processing equipment (portable crushing system and the rock drill).
- To ensure that noise levels at the nearest residences to the west, northwest and southwest of the proposed quarry are below the MOE guidelines, the processing area should be located on the quarry floor, and the crushing plant should be moved down to the lower quarry floor at 58 meter elevation as soon as is possible. The crushing plant must remain within 30 meters of the lift face with the lift face advances to the south and west.
- Additional mitigation measures are required for the nearest receptors in the south-west corner of the site, these are;
- A 10 m berm is required along part of the west boundary of the quarry to protect receptors in this direction. The extent of the berm should restrict the line-of-sight for these receptors.
- A 4 m berm is required along the west and north boundaries of the proposed quarry to block the line-of-sight and to protect receptors in this direction.
- When extraction extends to the south west corner of the proposed quarry, the crushing plant should be kept in an area on the excavation floor that is approximately 400 m away from the nearest receptor in this area.
- When the rock drill is working on the surface during the first lift, the boundary berms should be in place. If it is located more than 50 m away from the boundary berm a rock pile or some other barrier of 2 m height should be place within 15m from the rock drill as an additional barrier for the receptor. Once the rock drill is located below grade additional barriers will not be required.
- The rock drill and crushing plant should only be operating during the day from 0700 to 1900.
- These measures will reduce noise levels at the nearest receptors to comply with class 3 (rural) MOE sound levels.

Based on the assessment discussed above, recommendations for the location of the processing area have been included in the quarry operational plans (refer to Site Plans, section 1.0).

3.6 BLAST DESIGN REPORT

Sensitive receptors are located within 500 metres of the limits of the proposed expansion area and as a result, a blast assessment was conducted. The blast assessment was performed, in accordance with MOE guidelines, by R. Morin at the consulting engineering firm, Explotech: Specialists in Explosives and Blasting. R. Morin is a professional engineer specializing in explosives and blasting.

The complete blast assessment report provided by Explotech is included in Appendix K. The following section is a summary of the assessment presented in the report.

- Based on inspection of the site and proximity of the proposed expansion to the nearest buildings, the predicted blast vibration and over pressure at the Cinnamon Quarry will be within the MOE suggested limits. For Lift 1 (approximately 69 masl) the explosive charges will vary from 12 to 35 kg. per period. Blasting can safely take place within 225 m of non-owned buildings or residences. The nearest residence is 200 m from the proposed quarry excavation boundary.
- During the Lift 2 mineral extraction process a maximum explosive charge of 66 kg per period will be used for production blasting. Due to the proximity of a barn and homes located to the south of the site, explosive charges will either have to be reduced by decking or by the use of smaller blast hole diameters when blasting comes to within 300 meters of non-owned building and residences.
- Blasting should be monitored at the nearest neighbouring properties to the southeast during the entire operation.
- Safety precautions will have to be taken if any of the TPR Redimix owned buildings are occupied during blasting operations.
- Blasting specifications for all TransCanada pipeline installations require a maximum Peak Particle Velocity of 50 mm/sec measured above the buried pipeline. The stringent MOE guidelines ensure that the TransCanada specifications will be adhered to. Blast vibrations will be monitored at the pipeline when blasting operations come to within 250 meters of the TransCanada Pipeline.
- Blasting methods used during previous quarrying operations were within the MOE limits and can continue for the proposed quarry expansion.

Based on the assessment discussed above, blasting for the proposed quarry expansion should not impact any of the structures in the vicinity of the quarry.

4.0 PRESCRIBED CONDITIONS

These conditions will be thoroughly evaluated following the technical review by the various regulating agencies.

A Permit To Take Water (PTTW) will be required by the MOE in order to allow for the discharging of groundwater from the proposed expansion area at this site. A PTTW application will be prepared following the approval of the application by the MNR.

The proponent is also required to apply to MOE for an OWRA Section 53 Industrial Sewage Works application which allows them to discharge water to the environment. This application will be submitted concurrently with the PTTW application.

5.0 NOTIFICATION AND CONSULTATION

The notification and consultation process will begin following the initial application review by the MNR. The process will include:

- A copy of Form 1 (Notice of Application for a license) and Form 2 (Notice of Information Session) will be sent to the landowners immediately adjacent to the quarry site;
- A sign will be posted at the property boundary of the site which will contain: the notice of application, type of category and class (Category 2, Class A), Applicants name, Lot and concession information, application is on file at the MNR and the date, time and location of the information session;
- Form 1 and Form 2 will be published in the local newspaper for regular circulation;
- Form 1, Form 2 and the application package will be circulated to the Township of North Dundas and the United Counties of Stormont, Dundas and Glengarry, the South Nation Conservation Authority, OMAFRA, MOE, MNR biologist/hydrogeologist and the MCCR for review.

A public meeting will be conducted within the 45 day notification period to present the details of the proposed development to the public and address any concerns which may be brought forward. Any person or agency objecting to the application will be asked to notify the applicant and the District Manager of the MNR with a written notice of objection to the issuance

of the expansion license with reasons within the 45 day notification period, after which it will be deemed no objections. A summary of the consultation and notification procedure will be prepared by WESA and submitted, as an addendum, to the MNR following the notification and consultation process.

6.0 REFERENCES

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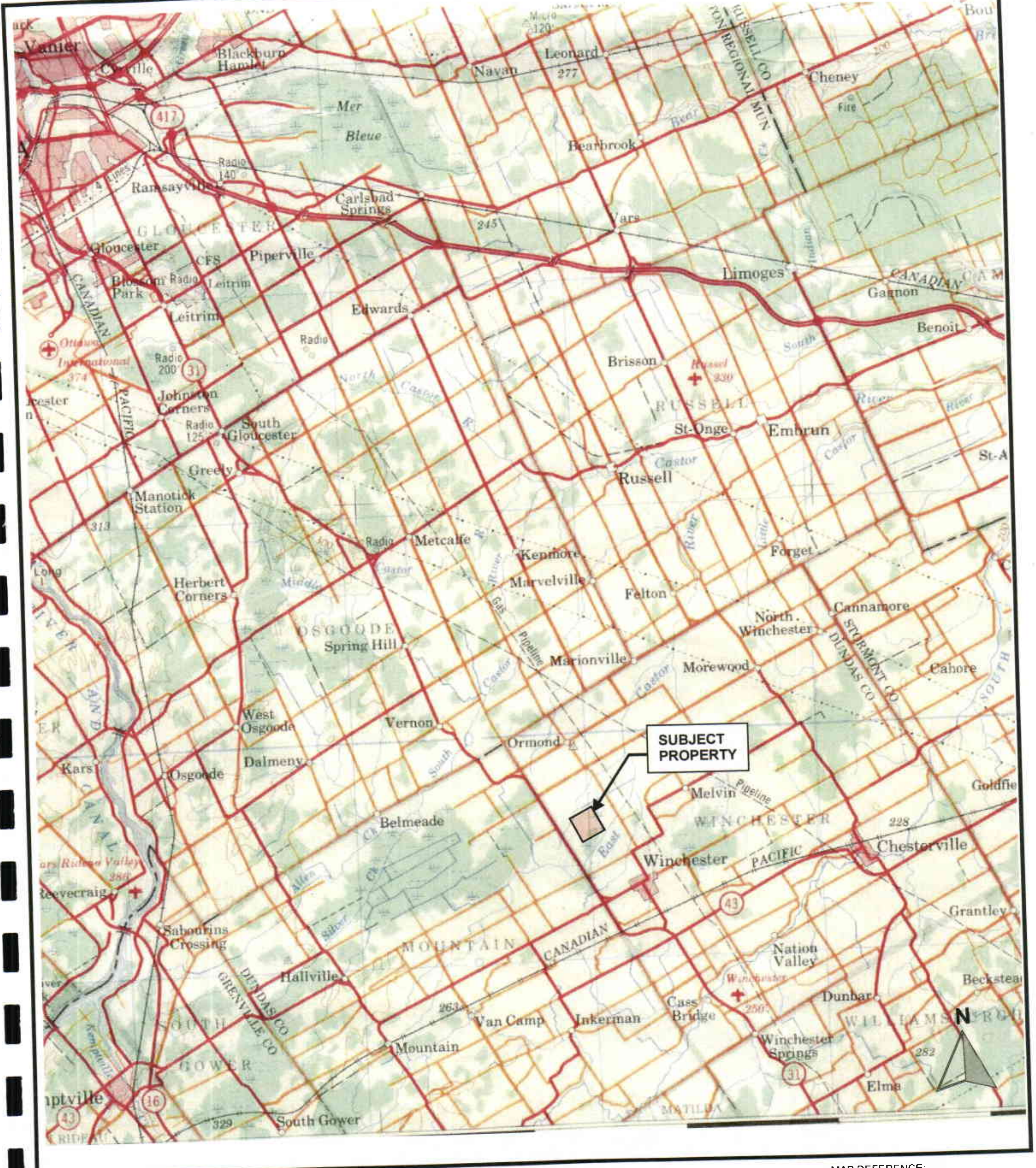

FIGURE: 1

MAP REFERENCE:
ENERGY, MINES AND RESOURCES
OTTAWA - 31G

SITE LOCATION MAP

B1905-FIG1

WESA
A Better Environment For Business

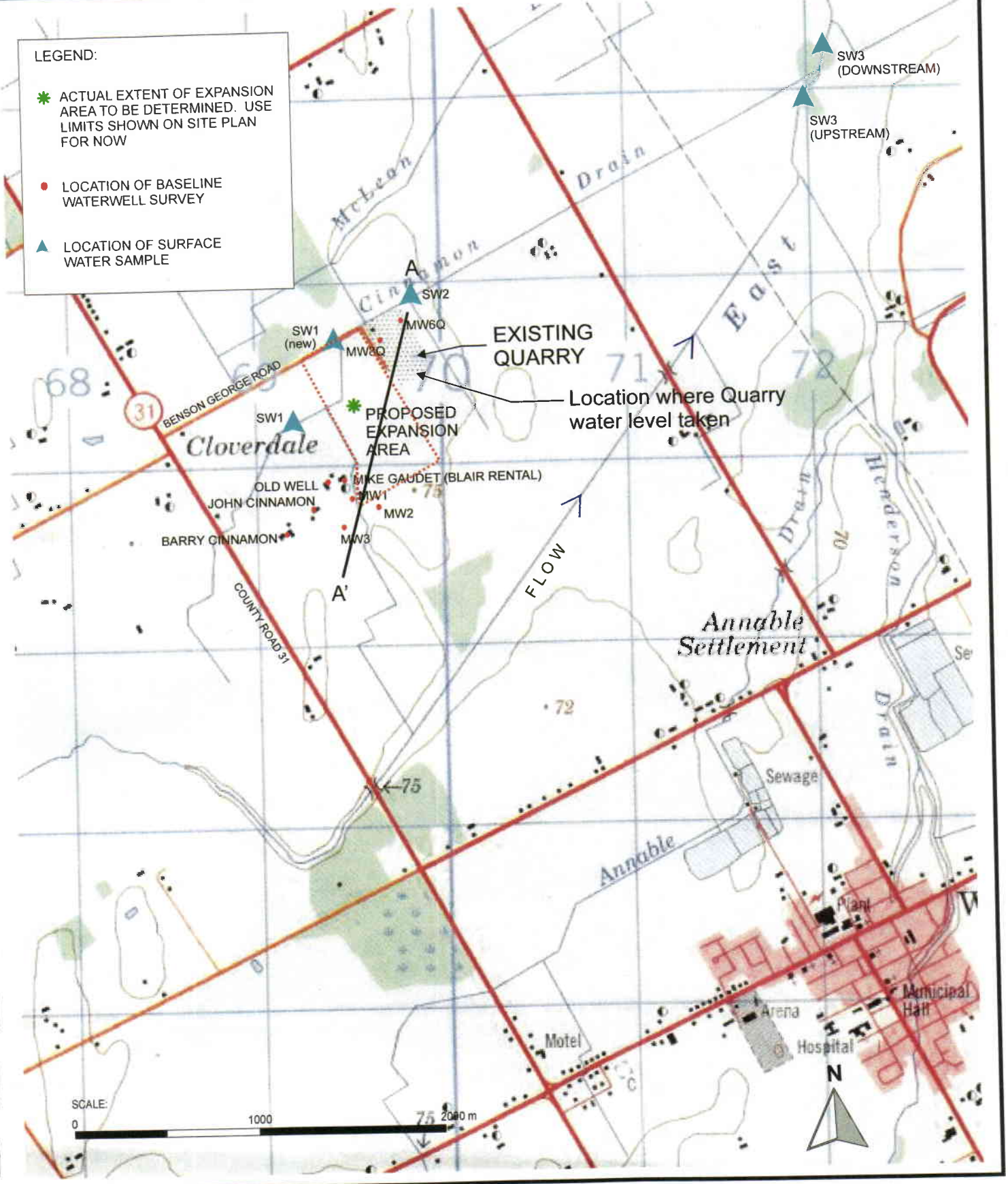

FIGURE: 2

SITE PLAN

A.L. BLAIR CONSTRUCTION LTD. - CINNAMON QUARRY

MAP REFERENCE:
NATURAL RESOURCES CANADA

B1905-SLM-03

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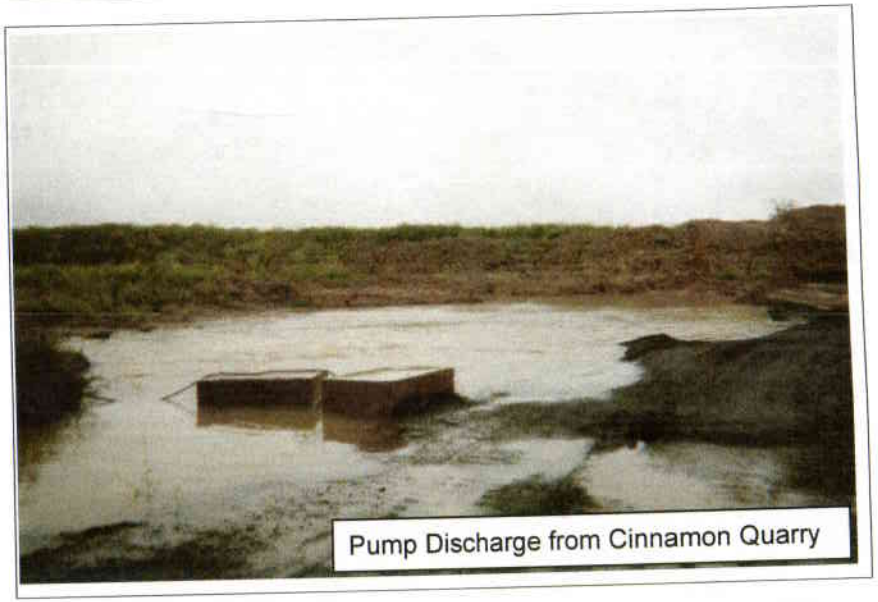
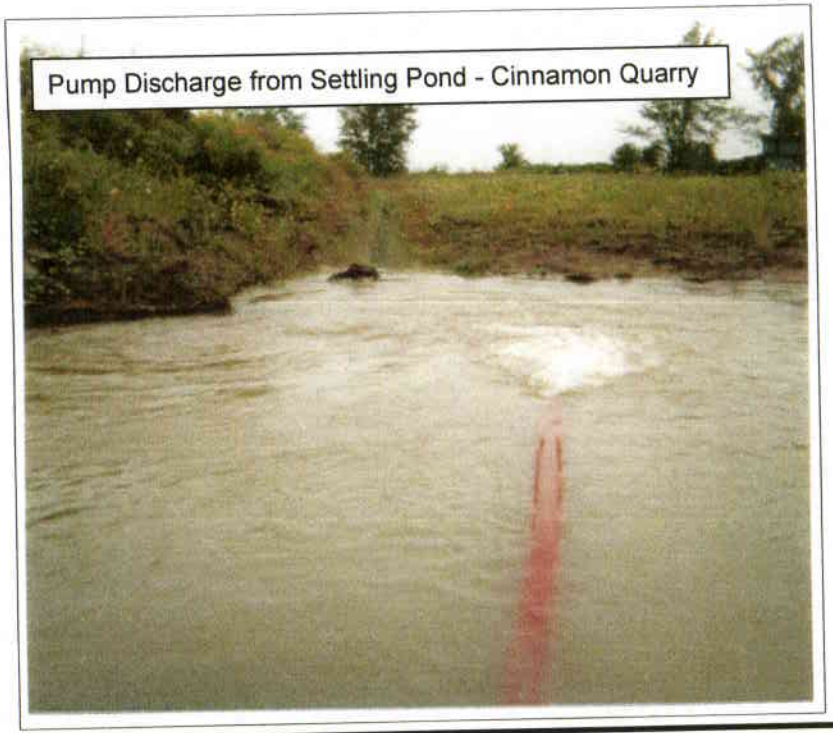
FIGURE: 3
PHOTOGRAPHS

WESA
A Better Environment For Business

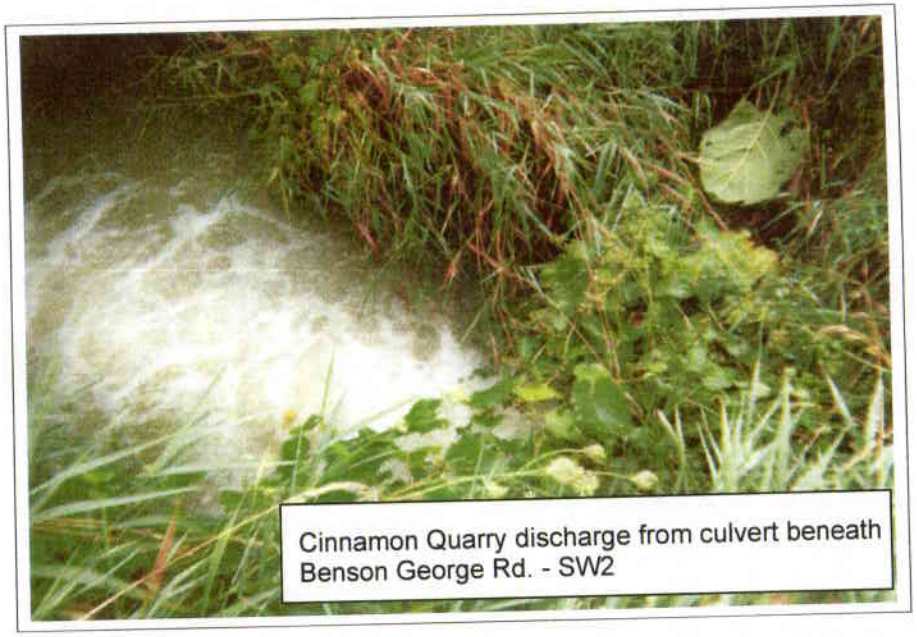
Cinnamon Quarry - August 22, 2002



Pump Discharge from Cinnamon Quarry

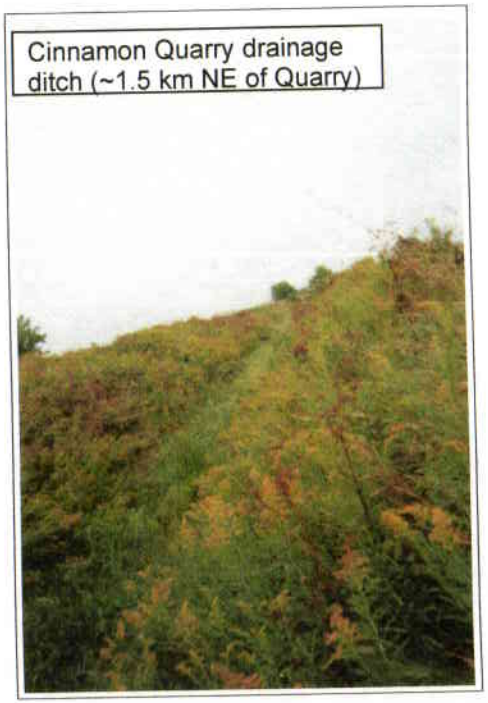


Pump Discharge from Settling Pond - Cinnamon Quarry



Cinnamon Quarry discharge from culvert beneath Benson George Rd. - SW2

FIGURE: 4
PHOTOGRAPHS



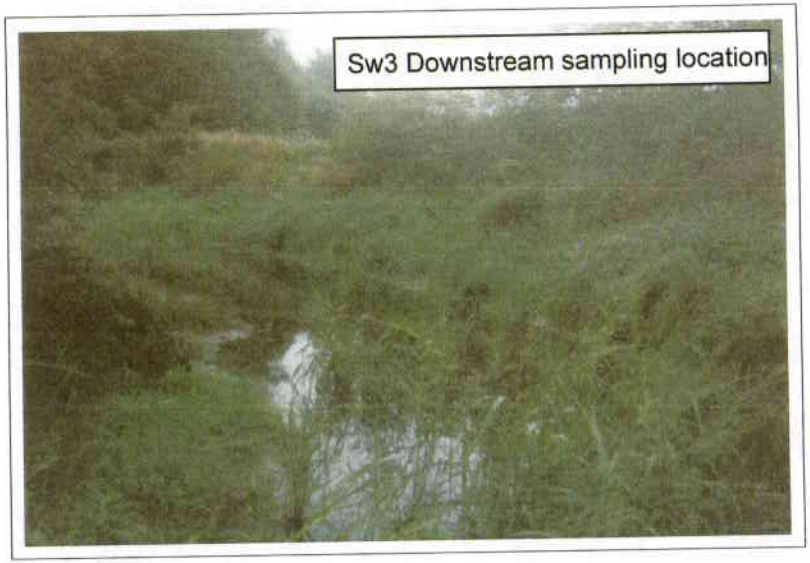
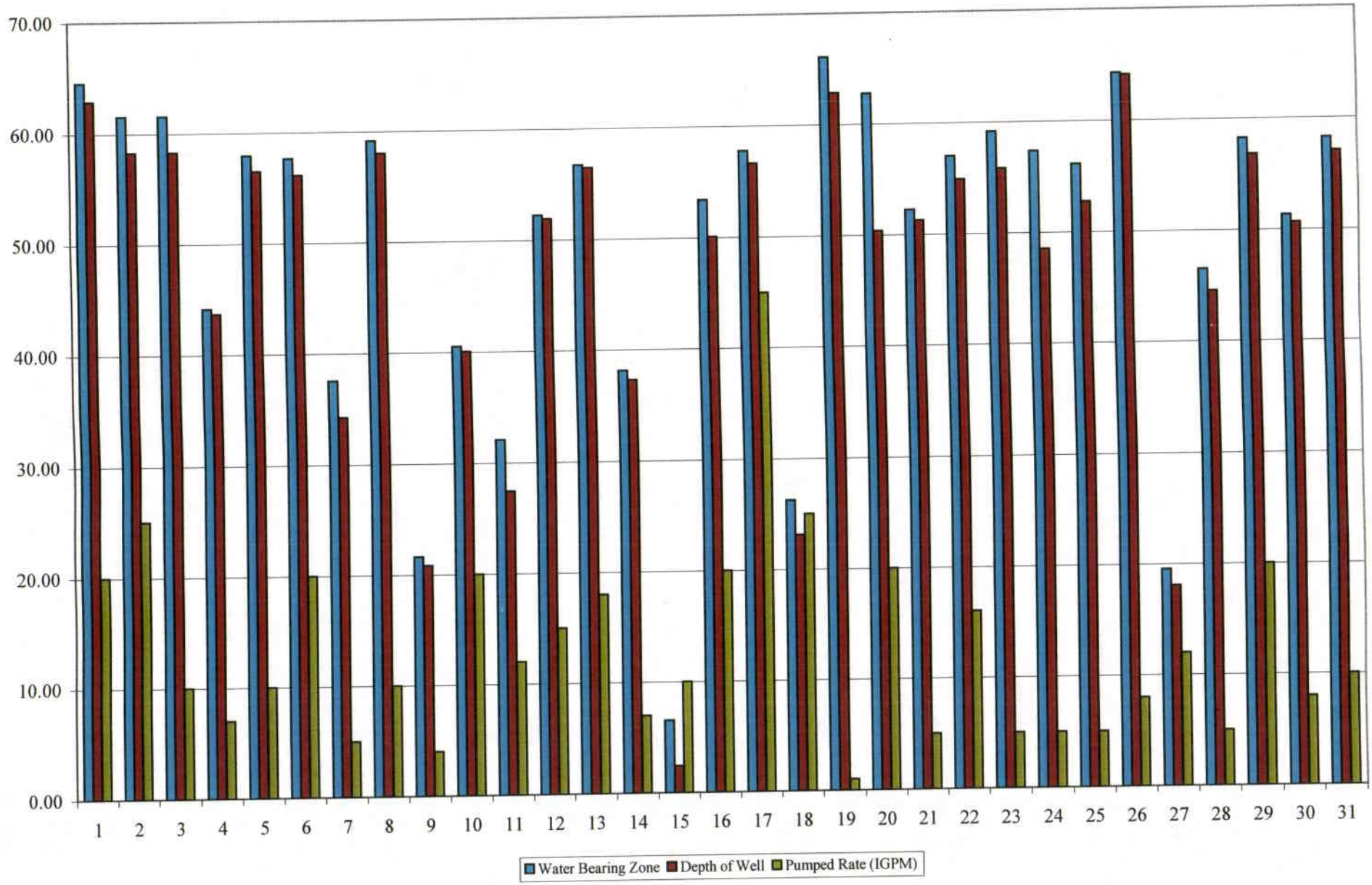


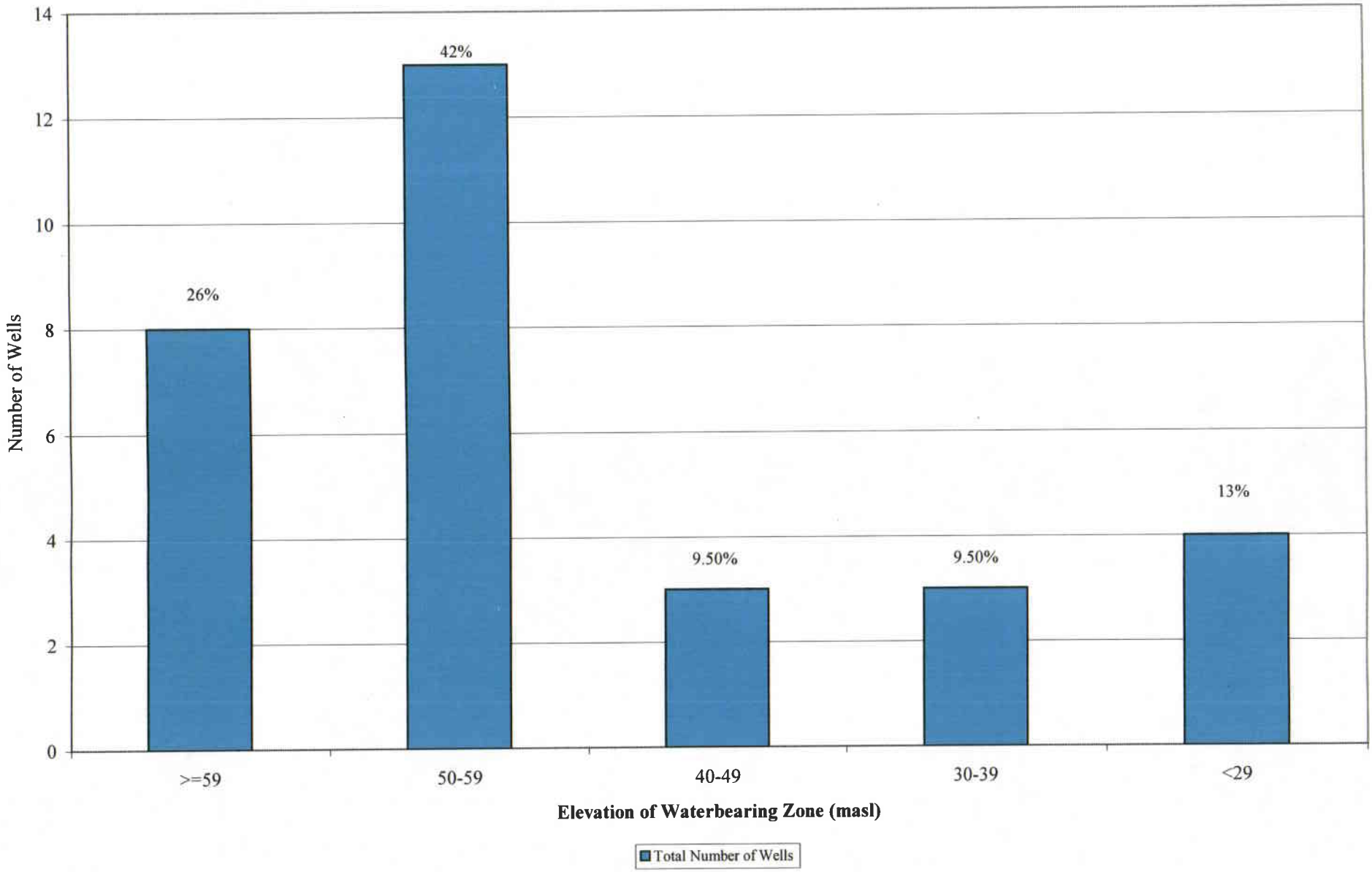
Figure 5:
PHOTOGRAPHS

Figure 6: Statistical Data from MOE Well Records found within 1 km of Quarry Site
Cinnamon Quarry



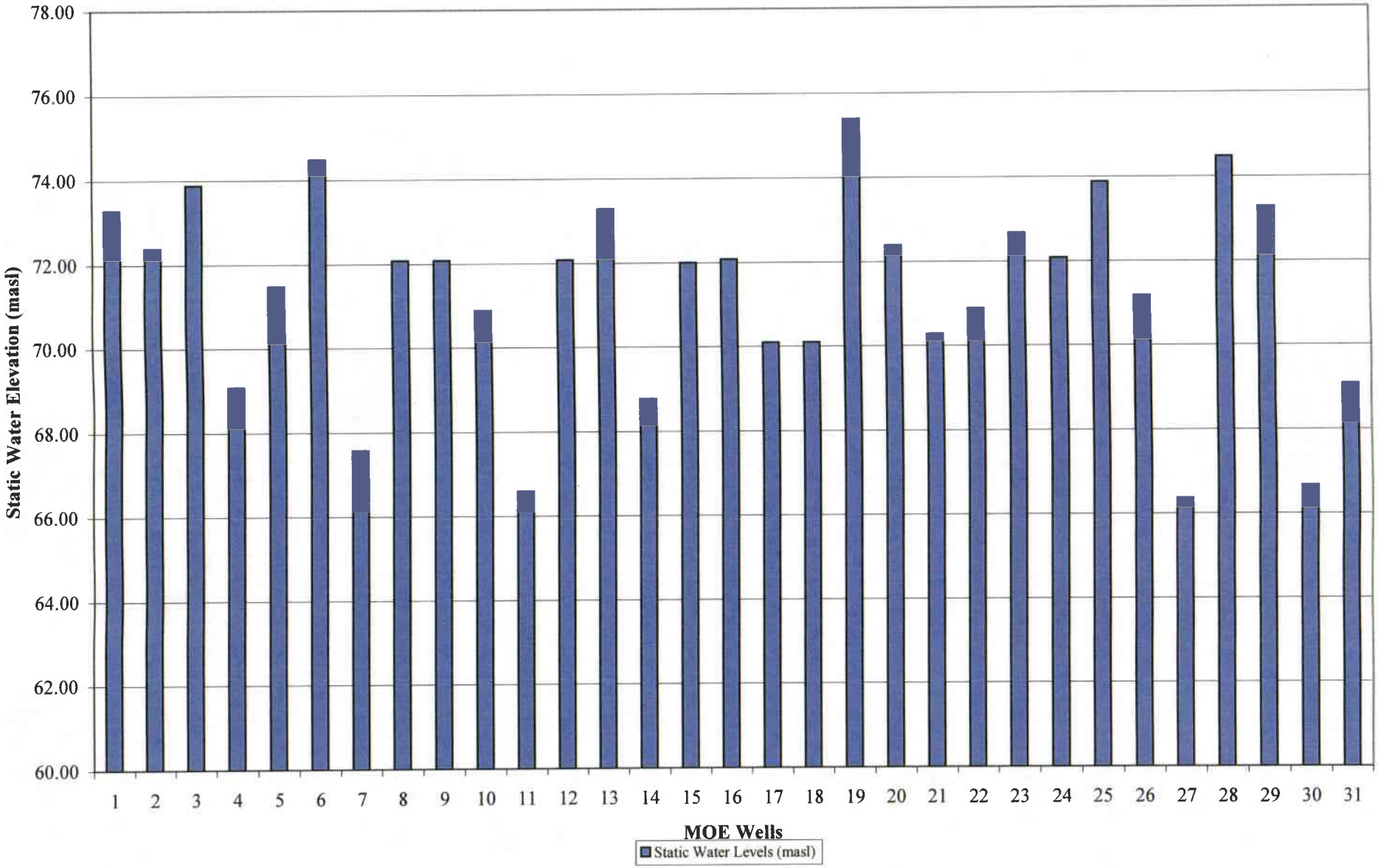
B1905MOE well records03.xls

Figure 7: Ditribution of Water Bearing Zone Elevations - MOE Well Records
Cinnamon Quarry



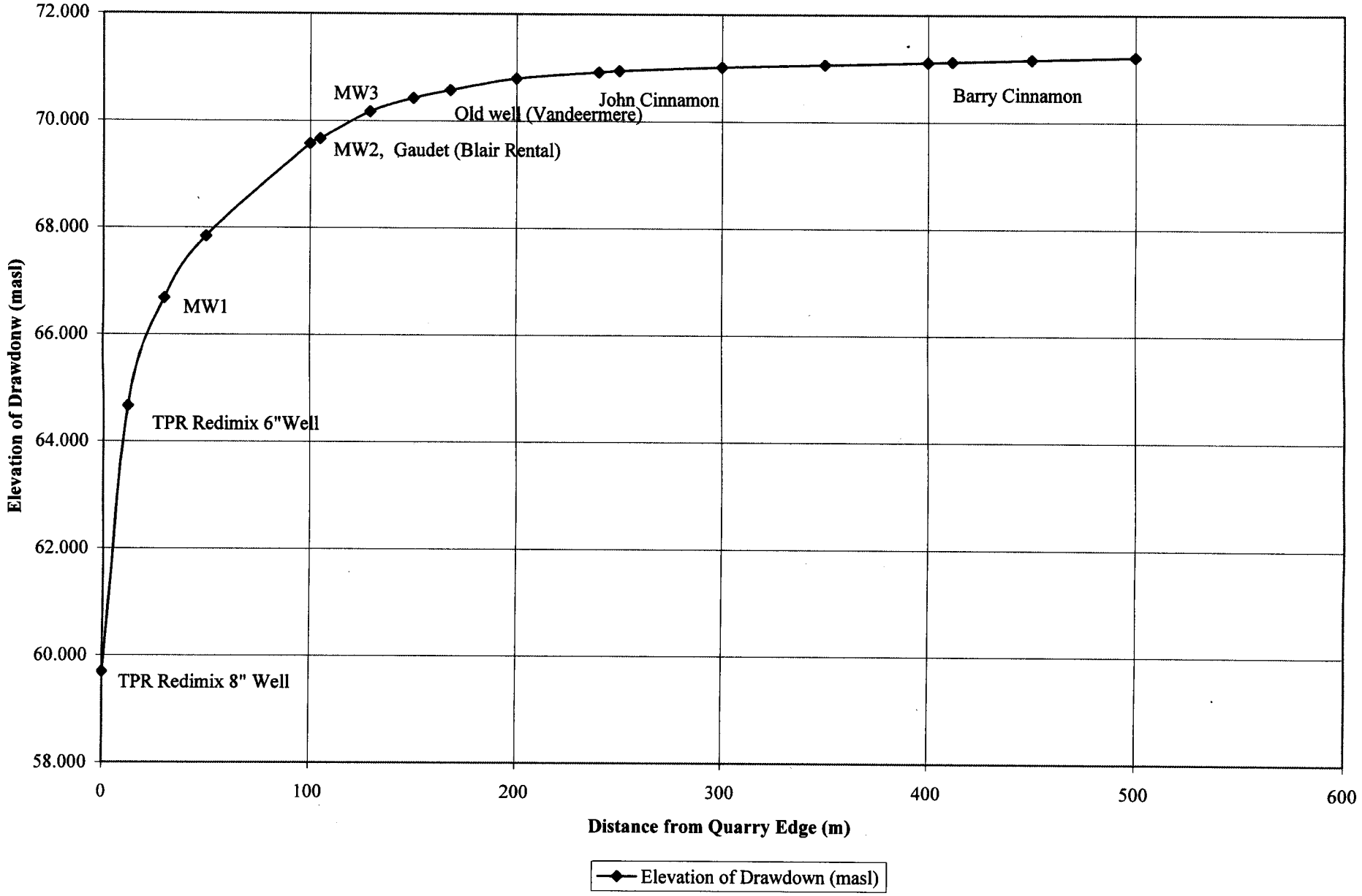
B1905MOE well records03.xls

Figure 8: Static Elevations Statistically Derived from MOE Well Records
Cinnamon Quarry



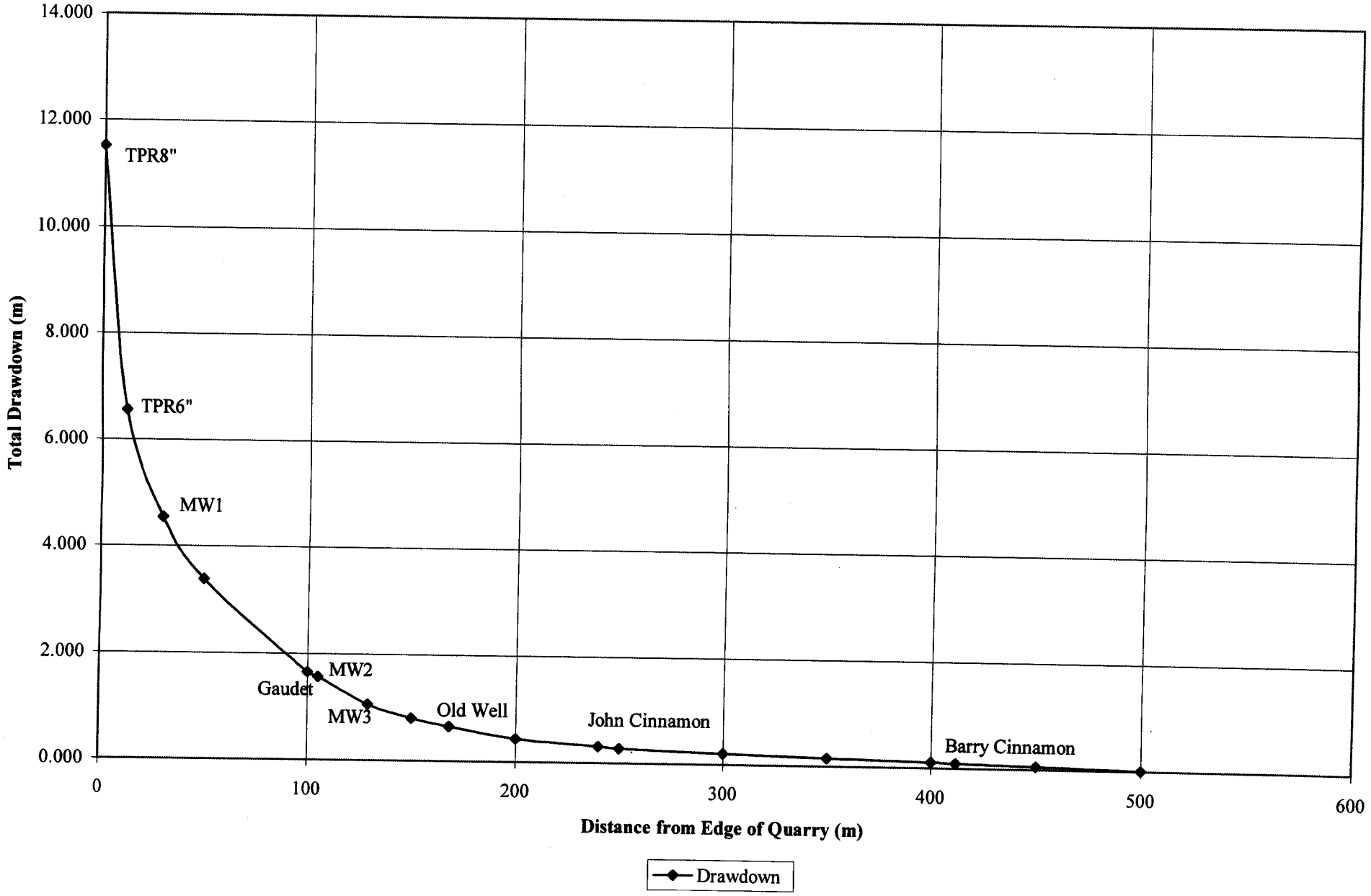
B1905MOE well records03.xls

Figure 10: Cone of Influence at the Cinnamon Quarry



B1905Theis*nfluenceCalculationsJan04.xls*

Figure 11: Radial Drawdown from Edge of Quarry Excavation
Cinnamon Quarry



B1905Theis*influenceCalculations-Jan04.xls*

APPENDIX A

Soil Classification Information

CROPLAND CONSULTING

R.R. #4, Prescott, Ontario K0E 1T0

Office: (613) 658-5580
Toll Free: 1-888-841-0219
Cellular Phone: (613) 294-4599
Fax: (613) 658-5656

November 21, 2002

Tami Sugarman.

Re: Vandrlaan Quarry

Project # B1905

The location map provided indicates the land specified is known as the Vandrlaan, not Vandeermere land. Please confirm that this discrepancy may exist. The following information is relative to the Vandrlaan land location.

Using the Canada Land Inventory system (CLI), the Vandrlaan location specified by your map indicates a land capability class of 4, with a shallow phase subclass. Soils in this class have moderately severe limitations that restrict the range of crops or require conservation practices due to shallow soil depth to bedrock and possible stoniness.

The soil type in this area is a mixture of Grenville and Matilda Loam. Soil maps also indicate the possibility of course textured sand present as narrow bands throughout the subject property.

Grenville loam soil is a very dark gray soil running to a depth of 6", underlain by dark gray brown loam over grayish brown calcareous soil. The topography is normally undulating to rolling and moderately stony.

Matilda loam is a gray brown loam running to a depth of 8", underlain by brown loam, underlain by mottled brown loam, underlain by gray loamy calcareous soil. The topography is normally undulating.

Bryan Cook, BSc. Agr.
Certified Crop Advisor,
Cropland Consulting

APPENDIX B

MOE Domestic Water Well Records

Appendix B
MOE Water Well Records

B1905well stats.xls

Well No.	Conc.	Lot	MOE Well ID	Surface Elevation (m)	Water Bearing Fractures		Static Water Level		Overburden Thickness		Pump Rate (GPM)
					Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	
1	8	24	18-04117		6.91		1.20		0.00		20
2	8	24	18-00510	75.08	55.56	19.52	5.41	69.67	11.41	63.7	12
3	9	22	18-00525	73.57	30.03	43.54	4.50	69.07	10.21	63.4	3
4	9	24	18-00526	75.08	10.51	64.56	1.80	73.27	0.00	75.1	20
5	9	24	18-00527	75.08	13.51	61.56	2.70	72.37	8.41	66.7	25
6	10	22	18-00530	76.58	33.03	43.54	4.50	72.07	14.71	61.9	12
7	10	23	18-01152	75.08	14.41	60.66	1.50	73.57	10.51	64.6	10
8	10	23	18-01423	75.08	15.02	60.06	1.50	73.57	11.41	63.7	10
9	10	23	18-02050	75.08	16.22	58.86	3.00	72.07	7.81	67.3	10
10	10	24	18-03949		16.52		4.50		13.81		12
11	10	24	18-02426	76.58	15.02	61.56	2.70	73.87	7.81	68.8	10
12	10	24	18-00532	75.08	30.93	44.14	6.01	69.07	13.21	61.9	7
13	11	24	18-02751		21.92		2.40		3.60		15
14	11	24	18-04133		33.33		3.60		6.91		20
15	11	24	18-04228		0.00		0.00				
16	11	24	18-04682		12.61		3.30		4.50		20
17	11	24	18-03183		21.02		4.50		6.01		7
18	11	24	18-03430		19.52		1.50		5.11		50
19	11	24	18-03507		9.91		0.30		6.61		30
20	11	24	18-03508		12.31		1.50		8.11		7
21	11	24	18-03538		0.00		0.00		6.31		20
22	11	24	18-03539		12.91		3.00		6.91		15
23	11	24	18-03540		15.62		0.00		0.30		20
24	11	24	18-04132		27.03		4.20		6.91		20
25	7	3	18-02839		0.00		1.20		7.51		20
26	7	4	18-01345	73.87	30.63	43.24	5.41	68.47	2.40	71.5	3
27	7	4	18-03985		27.03		5.41		5.41		2
28	7	4	18-02733		24.02		6.01		7.21		40
29	7	4	18-02198	75.08	72.07	3.00	3.00	72.07	2.40	72.7	2
30	7	4	18-01965	73.57	0.00	73.57	0.00	73.57	6.61	67.0	
31	7	4	18-01032	74.47	9.61	64.86	5.41	69.07	6.01	68.5	17
32	7	6	18-01035	82.28	27.03	55.26	10.51	71.77	11.41	70.9	8
33	8	1	18-03522		13.51		3.00		9.01		5
34	8	2	18-04492		14.41		1.50		0.00		12
35	8	3	18-01048	72.07	14.11	57.96	0.60	71.47	5.11	67.0	10
36	8	3	18-04572		58.56		4.50		2.40		10
37	8	3	18-02487	75.08	17.42	57.66	0.60	74.47	6.01	69.1	20
38	8	4	18-01049	73.57	36.04	37.54	6.01	67.57	1.80	71.8	5
39	8	4	18-01408	73.57	14.41	59.16	1.50	72.07	6.01	67.6	10
40	8	4	18-02097	75.08	53.45	21.62	3.00	72.07	1.20	73.9	4
41	8	4	18-01279	73.27	32.73	40.54	2.40	70.87	5.71	67.6	20
42	8	5	18-02331	75.08	15.92	59.16	3.60	71.47	5.11	70.0	6
43	8	6	18-03115		21.92		3.60		3.60		6
44	8	6	18-04406		30.03		3.60		5.11		4
45	8	6	18-01999	76.58	16.52	60.06	6.01	70.57	9.61	67.0	5
46	8	6	18-2245	75.08	16.82	58.26	2.10	72.97	8.11	67.0	7
47	8	6	18-03657		44.44		6.01		6.61		6
48	8	6	18-03910		32.43		6.01		5.41		8
49	8	7	18-02435	75.08	40.24	34.83	3.60	71.47	2.70	72.4	2
50	8	7	18-02434	75.08	0.00	75.08	0.00	75.08	3.90	71.2	
51	9	1	18-03960		44.14		9.61		0.90		12
52	9	1	18-01661	73.57	21.32	52.25	1.50	72.07	6.91	66.7	15
53	9	1	18-01769	73.57	16.82	56.76	0.30	73.27	7.81	65.8	18.00
54	9	1	18-01061	75.08	36.94	38.14	6.31	68.77	1.20	73.9	7
55	9	1	18-03332		69.97		4.50		2.10		10
56	9	2	18-01062	74.77	21.32	53.45	2.70	72.07	0.60	74.2	20
57	9	2	18-03088		88.59		7.51		1.20		5
58	9	3	18-03517		14.71		2.40		4.20		45
59	9	3	18-04159		46.25		2.40		0.00		25
60	9	5	18-04124		11.11		2.40		10.21		25
61	9	5	18-04504		21.02		5.41		1.80		20
62	9	6	18-01063	72.07	15.02	57.06	3.00	69.07	0.90	71.2	7
63	9	6	18-01296	73.57	38.44	35.14	4.80	68.77	5.71	67.9	20
64	9	6	18-03990		13.81		1.50		4.20		25

Appendix B
MOE Water Well Records

B1905well stats.xls

Well No.	Conc.	Lot	MOE Well ID	Surface Elevation (m)	Water Bearing Fractures		Static Water Level		Overburden Thickness		Pump Rate (GPM)
					Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	Depth (m)	Elevation (m)	
65	9	7	18-02595	75.08	21.92	53.15	3.60	71.47	4.80	70.3	5
66	9	7	18-02908		15.92		2.70		4.80		10
67	9	7	18-01064	73.57	33.93	39.64	4.20	69.37	2.70	70.9	13
68	10	1	18-02037	76.58	10.51	66.07	1.20	75.38	10.51	66.1	1
69	10	1	18-04157		35.44		6.01		15.02		6
70	10	1	18-04140		62.16		19.52		16.22		4
71	10	1	18-01075	75.08	12.31	62.76	2.70	72.37	9.91	65.2	20
72	10	1	18-01074	75.08	22.82	52.25	4.80	70.27	12.01	63.1	5
73	10	1	18-01076	75.08	18.02	57.06	4.20	70.87	8.11	67.0	16
74	10	1	18-04063		34.53		6.01		1.20		6
75	10	1	18-03450		28.53		2.10		0.60		5
76	10	1	18-02436	75.08	15.92	59.16	2.40	72.67	9.31	65.8	5
77	10	1	18-02352	75.08	17.72	57.36	3.00	72.07	11.11	64.0	5
78	10	2	18-02439	78.08	21.92	56.16	4.20	73.87	12.31	65.8	5
79	10	2	18-03090		21.92		7.21		24.92		10
80	10	2	18-04066		33.03		6.01		0.90		5
81	10	2	18-01077	75.68	11.41	64.26	4.50	71.17	0.00	75.7	8
82	10	2	18-03444		6.61		3.60		3.90		6
83	10	2	18-03587		24.92		3.30		3.90		5
84	10	2	18-03449		15.02		3.60		9.31		5
85	10	3	18-01788	76.58	57.06	19.52	10.21	66.37	22.52	54.1	12
86	10	3	18-01461	75.08	28.53	46.55	0.60	74.47	8.41	66.7	5
87	10	3	18-04064		29.43		6.91		1.20		7
88	10	3	18-02247	73.57	15.32	58.26	0.30	73.27	8.11	65.5	20
89	10	3	18-03473		30.03		3.60		4.80		3
90	10	4	18-01078	74.47	23.12	51.35	7.81	66.67	20.42	54.1	8
91	10	4	18-02085	75.08	16.82	58.26	6.01	69.07	14.71	60.4	10
92	10	4	18-04014		29.13		4.80		0.90		6
93	10	4	18-03448		27.03		1.80		3.00		3
94	10	4	18-03377		33.03		3.00		18.02		30
95	10	5	18-01079	72.07	13.21	58.86	4.20	67.87	0.00	72.1	8
96	10	5	18-04010		0.00		0.00		0.00		12
97	10	5	18-02512	70.57	20.12	50.45	1.20	69.37	3.00	67.6	10
98	10	6	18-03443		5.41		1.50		6.91		5
99	10	7	18-03472		18.02		2.40		14.71		6
100	10	7	18-04011		0.00		5.71		0.00		15
101	10	8	18-01081	72.07	12.61	59.46	6.01	66.07	12.01	60.1	5
102	10	8	18-04012		23.42		5.71		5.71		8
103	10	8	18-04033		23.42		9.01		23.42		7
104	11	8	18-01080	72.07	23.12	48.95	4.50	67.57	0.00	72.1	3
105	11	2	18-03083		16.52		7.51		10.51		10
106	11	2	18-01373	75.08	33.03	42.04	10.51	64.56	11.11	64.0	7
107	11	2	18-03292		25.83		2.40		2.40		2
108	11	3	18-03711		22.52		4.50		9.31		30
109	11	4	18-03827		21.62		3.00		13.51		10
110	11	4	18-04520		21.62		6.01		13.51		15
111	11	4	18-01107	76.58	25.23	51.35	3.60	72.97	12.01	64.6	10
112	11	4	18-01937	78.08	27.63	50.45	0.90	77.18	8.11	70.0	10
113	11	4	18-04070		37.84		9.61		1.80		18
114	11	4	18-03089		11.11		1.50		10.51		20
115	12	1	18-02511	75.08	10.81	64.26	2.40	72.67	1.50	73.6	10
116	12	2	18-02058	73.57	12.61	60.96	1.20	72.37	7.51	66.1	30
117	12	2	18-01869	75.08	11.71	63.36	1.80	73.27	10.21	64.9	10

APPENDIX C

Baseline Survey Letter and Information Sheets

WESA
A Better Environment For Business

May 21, 2002
Project No. B1905

Dear Homeowner,

WESA (Water and Earth Science Associates Ltd.), an environmental consulting firm based in Carp, Ontario has been retained by A.L. Blair Construction Ltd. to conduct a groundwater assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. The property is located adjacent to the existing Cinnamon Quarry that is licensed by the Ministry of Natural Resources (MNR). A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include the additional property. The completion of this groundwater study is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

The objectives of the groundwater assessment are outlined below, and are based on standard Ministry of Environment requirements:

- Determine the physical nature of the surface water and groundwater systems in the vicinity of the subject property;
- Characterize the quality of the surface water and groundwater in the vicinity of the subject property; and
- Identify the possible sources of impact of the proposed development on the neighbours within a 0.5 km radius of the subject property.

As a result, WESA staff would like to interview the residence owners within the 0.5 km radius of the property to obtain information on the water supply equipment and collect a groundwater sample from the local domestic water wells. This information will be used to define the current quantity and quality of the groundwater surrounding the quarry property. According to our site plan, your residence is located within the study area.

In order to schedule a time to meet with you, I ask that you take a moment to contact me at one of the numbers listed below. Please feel free to leave a message if I am not available.

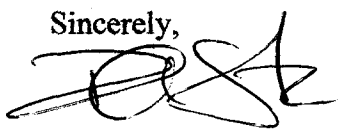
Philippa Smith (613)-290-1244

Water and Earth Science Associates Ltd.
3108 Carp Road, P.O. Box 430, Carp (Ottawa), ON Canada K0A 1L0
Tel: (613) 839-3053 Fax: (613) 839-5376
E-mail: wesacarp@wesa.ca Web Site: www.wesa.ca

The interview will take approximately ten to fifteen minutes and can be conducted at your home at any time during the day, evenings, weekdays or weekends. For your information, a copy of the chemical analyses of your groundwater will be forwarded to your home within approximately 8 weeks of the interview. The groundwater analyses will include 17 general groundwater parameters and a brief description of each parameter.

As I mentioned above, this interview is a vital part of the groundwater assessment and, on behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,



Philippa Smith, B.Sc.
Project Hydrogeologist

WATER AND EARTH SCIENCE ASSOCIATES LTD.

BASELINE ASSESSMENT OF RESIDENTIAL WATER SUPPLY

Resident/Owner: Barrie and Connie Cinnamon Info. Provided By: Barry Cinnamon

Address: Hwy 31, RR#1, Winchester, Ontario K0C 2K0

Phone: Home 774-3571 Work

Part I: Well Construction Details

Location of Well: two wells (A- house well on west side of house, B- Barn/stock well on north side of barn)

Record Available?: no (attach copy) Construction Date: A-1992 B-1962

Well Depth (m): A- 38.4 m B- 56.7 m Diameter (cm): A- 10.15 cm B-15.24 cm

Casing Length (m): Diameter (cm):

Screen Installed?

Details (slot size, diameter, length, depth)

Depth to Bedrock: Bedrock Type:

Part II: Pump Installation Details

Pump Type (submersible, centifugal, jet, etc.): A- submersible B- submersible

Manufacturer/Model No.: A- Jetpump CT B-unknown Power: B- 1/2 HP A - (1/3 to 1/2 HP),

Design Pumping Rate (units): Design Head (m):

Setting Depth (m): unkown Discharge Line (materials, diameter):

Pitless Adaptor (type, depth) :

Storage Details (pressure or holding tanks, filters or other treatment, operating pressures, etc.):

A- UV installed and well softener

B- water softener

Project No.

Part III: Groundwater Usage

What is groundwater used for (specify for each well)?

A- domestic B- Stock

Water quantity (problems, amounts)

hardness

did have bacteria problem at house well, extended well casing to above ground

Water Discharge (septic system, settling ponds, other surface water, age, location, etc.)

septic system

Water Quality Tested ?: yes (attach results if available)

Water quality (odour, taste, colour, hardness)

no comment

Diagram:

Comments:

Interviewed By: Philippa Smith Date: 28-May-02

WATER AND EARTH SCIENCE ASSOCIATES LTD.

BASELINE ASSESSMENT OF RESIDENTIAL WATER SUPPLY

Resident/Owner: A.L. Blair Construction Ltd. Info. Provided By: Barry Cinnamon

Address: Benson George Road, old well on Blair Rental property

Phone: Home _____ Work _____

Part I: Well Construction Details

Location of Well: South side of white and green steel shed barn on property boundary between Balir Rental and John Cinnamon's property

Record Available?: no (attach copy) Construction Date: unknown

Well Depth (m): > 30m Diameter (cm): 15.24 cm

Casing Length (m): _____ Diameter (cm): _____

Screen Installed? _____

Details (slot size, diameter, length, depth) _____

Depth to Bedrock: _____ Bedrock Type: _____

Part II: Pump Installation Details

Pump Type (submersible, centifugal, jet, etc.): no installation

Manufacturer/Model No.: _____ Power: _____

Design Pumping Rate (units): _____ Design Head (m): _____

Setting Depth (m): _____ Discharge Line (materials, diameter): _____

Pitless Adaptor (type, depth) : _____

Storage Details (pressure or holding tanks, filters or other treatment, operating pressures, etc.):

Project No.

Part III: Groundwater Usage

What is groundwater used for (specify for each well)?
not used

Water quantity (problems, amounts)

Water Discharge (septic system, settling ponds, other surface water, age, location, etc.)
no discharge

Water Quality Tested ?: _____ (attach results if available)

Water quality (odour, taste, colour, hardness)

Diagram:
Comments:

Interviewed By: Philippa Smith Date: 28-May-02

WATER AND EARTH SCIENCE ASSOCIATES LTD.

BASELINE ASSESSMENT OF RESIDENTIAL WATER SUPPLY

Resident/Owner: Rhonda and Mike Gaudet Info. Provided By: Rhonda Gaudet

Address: 12085 Benson George Drive
Winchester, Ontario, K0C 2K0

Phone: Home 774-1608 Work _____

Part I: Well Construction Details

Location of Well: At front of home on south side of building

Record Available?: no (attach copy) Construction Date: unknown

Well Depth (m): >30 m Diameter (cm): 15.24 cm

Casing Length (m): _____ Diameter (cm): _____

Screen Installed? _____

Details (slot size, diameter, length, depth) _____

Depth to Bedrock: _____ Bedrock Type: _____

Part II: Pump Installation Details

Pump Type (submersible, centifugal, jet, etc.): submersible pump

Manufacturer/Model No.: _____ Power: _____

Design Pumping Rate (units): _____ Design Head (m): _____

Setting Depth (m): _____ Discharge Line (materials, diameter): _____

Pitless Adaptor (type, depth) : _____

Storage Details (pressure or holding tanks, filters or other treatment, operating pressures, etc.):

Project No.

Part III: Groundwater Usage

What is groundwater used for (specify for each well)?

domestic

Water quantity (problems, amounts)

none

Water Discharge (septic system, settling ponds, other surface water, age, location, etc.)

septic system

Water Quality Tested ?: limited (attach results if available)

Water quality (odour, taste, colour, hardness)

none

Diagram:

Comments:

Interviewed By: Philippa Smith Date: 28-May-02

WATER AND EARTH SCIENCE ASSOCIATES LTD.

BASELINE ASSESSMENT OF RESIDENTIAL WATER SUPPLY

Resident/Owner: John and Linda Cinnmon Info. Provided By: John Cinnamon

Address: Brockdale Farms Hwy 31 RR#1 Winchester, Ontario
K0C 2K0

Phone: Home _____ Work _____

Part I: Well Construction Details

Location of Well: On south side of house beside spruce tree

Record Available?: No (attach copy) Construction Date: _____

Well Depth (m): > 31m Diameter (cm): 15.24 cm

Casing Length (m): _____ Diameter (cm): _____

Screen Installed? _____

Details (slot size, diameter, length, depth) _____

Depth to Bedrock: _____ Bedrock Type: _____

Part II: Pump Installation Details

Pump Type (submersible, centifugal, jet, etc.): submersible

Manufacturer/Model No.: sofhome -16m Power: _____

Design Pumping Rate (units): _____ Design Head (m): _____

Setting Depth (m): _____ Discharge Line (materials, diameter): _____

Pitless Adaptor (type, depth) : _____

Storage Details (pressure or holding tanks, filters or other treatment, operating pressures, etc.):

Project No.

Part III: Groundwater Usage

What is groundwater used for (specify for each well)?
domestic

Water quantity (problems, amounts)
no comment

Water Discharge (septic system, settling ponds, other surface water, age, location, etc.)
septic system

Water Quality Tested ?: yes (attach results if available)

Water quality (odour, taste, colour, hardness)

Diagram:
Comments:

Interviewed By: Philippa Smith Date: 28-May-02

WATER AND EARTH SCIENCE ASSOCIATES LTD.

BASELINE ASSESSMENT OF RESIDENTIAL WATER SUPPLY

Resident/Owner: A.L. Blair Construction Ltd. Info. Provided By: George (TRP Redimix)

Address: Benson George Road

Phone: Home _____ Work 774-5278 (5277)

Part I: Well Construction Details

Location of Well: A- in field east side of pit (NE corner of site)
B- in shop on east side of building

Record Available?: no (attach copy) Construction Date: unknown

Well Depth (m): A -13.71m B-53.34 m Diameter (cm): A- 15.24 cm B-20.3 cm

Casing Length (m): _____ Diameter (cm): _____

Screen Installed? _____

Details (slot size, diameter, length, depth) _____

Depth to Bedrock: _____ Bedrock Type: _____

Part II: Pump Installation Details

Pump Type (submersible, centifugal, jet, etc.): A - unknown B- Submersible

Manufacturer/Model No.: _____ Power: A- unknown
B- 1 HP

Design Pumping Rate (units): _____ Design Head (m): _____

Setting Depth (m): _____ Discharge Line (materials, diameter): _____

Pitless Adaptor (type, depth) : _____

Storage Details (pressure or holding tanks, filters or other treatment, operating pressures, etc.):

water softener for boiler system

Project No.

Part III: Groundwater Usage

What is groundwater used for (specify for each well)?

A- main use domestic and operations B- back -up well

Water quantity (problems, amounts)

A- good if quarry is not pumped dry

B- good amount of water

Water Discharge (septic system, settling ponds, other surface water, age, location, etc.)

"- de-watering of quarry take place into cilvert along municipal drain on north side of quarry by 3inch ppe pipe and 3-4 HP submersible pump.

"- supply wells discgharge to septic system

Water Quality Tested ?: no (attach results if available)

Water quality (odour, taste, colour, hardness)

A- little sulfur, hard

B- very sulfurous, hard

Diagram:

Comments:

Interviewed By: Philippa Smith Date: 28-May-02

APPENDIX D

On-Site Test Well Logs

Project No: B1905
Project: Vandeermere Quarry
Client: Blair Contruction
Location: Winchester, Ontario

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Well ID: MW1

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE

Depth (ft / m)	Elevation	Symbol	Description	Well Construction	Comments
0	74.261		Ground Surface		6" Carbon steel casing cement grouted into bedrock
0	73.956		***Overburden***		
2	73.347		***Weathered Bedrock***		Elevation from Top of Casing
4 / 1					Ground Surface Elevation 74.26 masl
7 / 2					
10 / 3					
13 / 4			***Limestone Bedrock*** Grey Limstone Hard to medium density varying		6" open rock borehole
17 / 5					
20 / 6					
23 / 7	66.641				
27 / 8					
30 / 9					
33 / 10					
36 / 11					
40 / 12			***Limestone*** Grey Limestone Hard and Soft zones varying		
43 / 13					
46 / 14					
48					

Hole Size: 6"

Datum:

Drill Date: August 13, 2002

Sheet: 1 of 4

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: B1905
Project: Vandeermere Quarry
Client: Blair Contruction
Location: Winchester, Ontario

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Well ID: MW1

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE

Depth	Elevation	Symbol	Description	Well Construction	Comments
15–29	57.497				
			Limestone Grey Limestone Soft, broken shaley zones		
	54.449				
	53.535		***Limestone*** Grey Limestone Shaley soft zones		
			Limestone Grey limestone, Hard		
	50.487				
	49.267		***Limestone*** Grey Limestone Shaley soft zone		Shaley fracture zone Small quantity of water
			Limestone Grey limestone, Hard		

Hole Size: 6"
Datum:
Drill Date: August 13, 2002

Sheet: 2 of 4

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: B1905
Project: Vandeermere Quarry
Client: Blair Contruction
Location: Winchester, Ontario

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Well ID: MW1

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE				Well Construction	Comments
Depth	Elevation	Symbol	Description		
98–148 (30–45)	43.781		***Limestone*** Grey Limestone Hard and soft zones varying		Thin black shale layer (39 m) Small quantity of water

Hole Size: 6"
Datum:
Drill Date: August 13, 2002

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: B1905
Project: Vandeermere Quarry
Client: Blair Contruction
Location: Winchester, Ontario

Well ID: MW1

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE

Depth	Elevation	Symbol	Description	Well Construction	Comments
46	28.541				
47–49			***Limestone*** Grey limestone Hard and medium density varying		
53	20.921				
54			End of Borehole		

Hole Size: 6"

Datum:

Drill Date: August 13, 2002

Sheet: 4 of 4

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Ontario Ministry of the Environment

II 1

The Ontario Water Resources Act
WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

County or District	Township/Borough/City/Town/Village	Con block tract survey, etc.	Lot
Dundas	north Dundas	9	2

Owner's surname	First Name	Address	Date completed
Construction	BLAIR	office moose creek Winchester site	14 day / 08 month / 02 year

Zone | Easting | Northing

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Till	Boulders	Dense	0	4
Grey	limestone Rock	Shale	Layered	4	114
Grey	limestone Rock		Hard	114	175

WATER RECORD

Water found at - feet	Kind of water
110	☑ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas
	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals ☐ Gas

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
8 3/4	☐ Steel ☐ Galvanized ☐ Concrete ☑ Open hole ☐ Plastic		0	9
6 1/4	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	188	+2	9
6"	☐ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic		9	175

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet

Material and type	Depth at top of screen feet

PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	To	Material and type (Cement grout, bentonite, etc.)
0	9	Cement grout

PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
☐ Pump ☐ Bailer — Air	1/2 GPM	1 Hours 0 Mins

Static level	Water level end of pumping	Water levels during ☐ Pumping ☑ Recovery: 15 minutes	30 minutes	45 minutes	60 minutes
40 feet	175 feet	165 feet	160 feet	155 feet	150 feet

If flowing give rate	Pump intake set at	Water at end of test
GPM	175 feet	☐ Clear ☑ Cloudy

Recommended pump type	Recommended pump setting	Recommended pump rate
☐ Shallow ☑ Deep	170 feet	1/2 GPM

FINAL STATUS OF WELL

☐ Water supply ☐ Observation well ☑ Test hole ☐ Recharge well ☐ Abandoned, insufficient supply ☐ Abandoned, poor quality ☐ Abandoned (Other) ☐ Dewatering ☐ Unfinished ☐ Replacement well

WATER USE

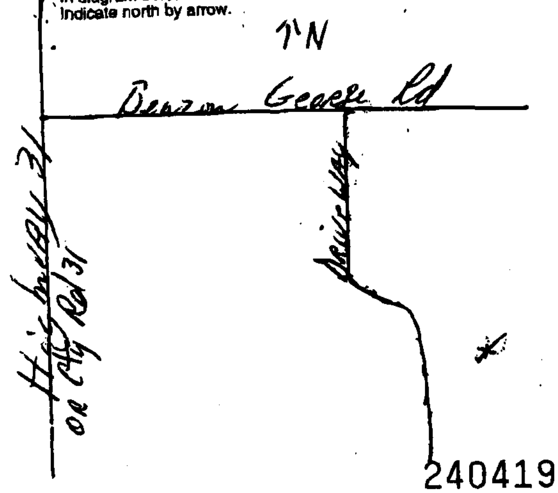
☐ Domestic ☐ Stock ☐ Irrigation ☐ Industrial ☑ Commercial ☐ Municipal ☐ Public supply ☐ Cooling & air conditioning ☐ Not use ☐ Other

METHOD OF CONSTRUCTION

☐ Cable tool ☐ Rotary (conventional) ☐ Rotary (reverse) ☑ Rotary (air) ☐ Air percussion ☐ Boring ☐ Diamond ☐ Jetting ☐ Driving ☐ Digging ☐ Other

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



240419

Name of Well Contractor	Well Contractor's Licence No.
Gilles Bourgeois Well Drill	1414

Address: St-Albert Ont.

Name of Well Technician	Well Technician's Licence No.
Jacques Raymond	0264

Signature of Technician/Contractor	Submission date
[signature]	14 day 08 mo 02 yr

MINISTRY USE ONLY

Project No: B1905
Project: Vandeermere Quarry
Client: Blair Construction
Location: Winchester, Ontario

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Well ID: MW2

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE

Depth (ft / m)	Elevation	Symbol	Description	Well Construction	Comments
	73.722		Ground Surface		6" Carbon steel casing cement grouted into bedrock
0 ft / 0 m			***Overburden*** Topsoil over silty clay, wet from 3 - 4 m.		Elevation From Top of Casing Ground Surface Elevation 73.72 masl
13 ft / 4 m	69.455		***Limestone Bedrock*** Grey Limestone Hard and soft zones varying		6" open rock borehole Fracture (5.7m), water Soft shaley zone (7m)
29 ft / 9 m	64.578		***Limestone*** Grey Limestone Hard and medium zones varying		
46 ft / 14 m	59.092				

Hole Size: 6"
Datum:
Drill Date: August 14, 2002

Sheet: 1 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: B1905
Project: Vandeermere Quarry
Client: Blair Construction
Location: Winchester, Ontario

Well ID: MW2

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE					
Depth	Elevation	Symbol	Description	Well Construction	Comments
15			***Limestone*** Grey Limestone Hard to medium density varying		Fracture (18.5m), water
16					
17					
18					
19					
20					
21					
22					Fracture (21.6m), water
23	50.862				
			End of Borehole		
24					
25					
26					
27					
28					
29					
30					

Hole Size: 6"
Datum:
Drill Date: August 14, 2002

Sheet: 2 of 2

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Ontario Ministry of the Environment

#2

The Ontario Water Resources Act

WATER WELL RECORD

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Dundas	north Dundas.	9				2

Owner's surname: Blair — First Name: Construction — Address: Winchester — Date completed: 14 day / 08 month / 02 year

Zone | Easting | Northing

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Clay		Dense	0	5
Grey	"		Soft	5	12
Grey	Till	Boulders	Dense	12	14
Grey	Limestone Rock	Shale	Layered	14	75

WATER RECORD

Water found at feet	Kind of water		
45	☑ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	
	☐ Fresh ☐ Salty	☐ Sulphur ☐ Minerals ☐ Gas	

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
8 3/4"	☐ Steel ☐ Galvanized ☐ Concrete ☑ Open hole ☐ Plastic		0	14
6 1/4"	☑ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	1.88	+2	14
6"	☐ Steel ☐ Galvanized ☐ Concrete ☑ Open hole ☐ Plastic		14	75

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet
Material and type	Depth at top of screen feet	

PLUGGING & SEALING RECORD

☑ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	14	Cement grout

PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
☐ Pump ☐ Bailer	5 GPM	1 Hours 0 Mins

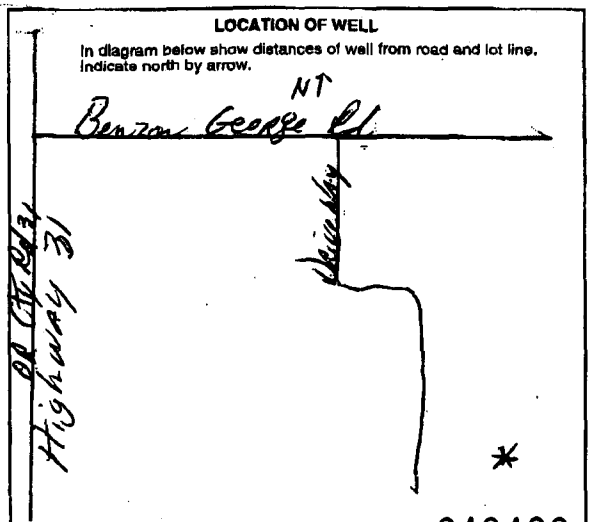
Static level feet	Water level end of pumping feet	Water levels during ☐ Pumping ☐ Recovery: 15 minutes feet	30 minutes feet	45 minutes feet	60 minutes feet

If flowing give rate	Pump intake set at	Water at end of test
GPM	feet	☐ Clear ☐ Cloudy

Recommended pump type	Recommended pump setting	Recommended pump rate
☐ Shallow ☐ Deep	feet	GPM

LOCATION OF WELL

In diagram below show distances of well from road and lot line. Indicate north by arrow.



240433

STATUS OF WELL

☐ Water supply ☐ Abandoned, insufficient supply ☐ Unfinished
☐ Observation well ☐ Abandoned, poor quality ☐ Replacement well
☑ Test hole ☐ Abandoned (Other)
☐ Recharge well ☐ Dewatering

WATER USE

☐ Domestic ☑ Commercial ☐ Not use
☐ Stock ☐ Municipal ☐ Other
☐ Irrigation ☐ Public supply
☐ Industrial ☐ Cooling & air conditioning

METHOD OF CONSTRUCTION

☐ Cable tool ☐ Air percussion ☐ Driving
☐ Rotary (conventional) ☐ Boring ☐ Digging
☐ Rotary (reverse) ☐ Diamond ☐ Other
☑ Rotary (air) ☐ Jetting

Name of Well Contractor	Well Contractor's Licence No.
Gilles Bourgeois Well Drill	1414
Address: St-Albert Ont.	
Name of Well Technician: Dennis Raymond	Well Technician's Licence No. T-0264
Signature of Technician/Contractor	Submission date: 14 day 08 mo 02 yr

MINISTRY USE ONLY

0506 (07/00) Front Form 9

1 CONTRACTOR'S COPY

Project No: B1905
Project: Hyrology Investigation
Client: Blair Construction
Location: Winchester, Ontario

Well ID: MW3

Enclosure:

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Field Personnel: BM

SUBSURFACE PROFILE

Depth (ft / m)	Elevation	Symbol	Description	Well Construction	Comments
0 ft / 0 m	75.97		Ground Surface		
			Overburden		6" Carbon steel casing cement grouted into bedrock
2 ft	75.056		Silty sand with gravel		
4 ft / 1 m					Elevation From Top of Casing
7 ft / 2 m					Ground Surface Elevation 75.97 masl
10 ft / 3 m					
13 ft / 4 m					6" open rock borehole
17 ft / 5 m					
20 ft / 6 m					
23 ft / 7 m			***Limestone Bedrock*** Grey Limestone Hard and medium density varying		
27 ft / 8 m					
30 ft / 9 m					
33 ft / 10 m					
36 ft / 11 m					
40 ft / 12 m					
43 ft / 13 m					
44 ft	62.254				
46 ft / 14 m					
48 ft					

Hole Size: 6"

Datum:

Drill Date: August 14, 2002

Sheet: 1 of 4

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: B1905
Project: Hyrology Investigation
Client: Blair Construction
Location: Winchester, Ontario

Well ID: MW3

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE					
Depth	Elevation	Symbol	Description	Well Construction	Comments
48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 — 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29	53.11 47.928 46.709		***Limestone*** Grey Limestone Hard and medium density varying ***Limestone*** Grey Limestone Hard to medium density varying ***Sandstone***		Layer of fractured limestone (29.5m), little or no water

Hole Size: 6"
Datum:
Drill Date: August 14, 2002

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: B1905
Project: Hyrology Investigation
Client: Blair Construction
Location: Winchester, Ontario

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Well ID: MW3

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE				Well Construction	Comments
Depth	Elevation	Symbol	Description		
98–148 (30–45)			***Limestone*** Grey Limestone Hard and soft density varying		Small water bearing fracture (32m)
	39.394				
			Limestone Grey Limestone Hard and soft density varying		

Hole Size: 6"

Datum:

Drill Date: August 14, 2002

Sheet: 3 of 4

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Project No: B1905
Project: Hyrology Investigation
Client: Blair Construction
Location: Winchester, Ontario

Drilled By: Bourgeois Well Drilling
Drill Method: Air Rotary

Well ID: MW3

Enclosure:
Field Personnel: BM

SUBSURFACE PROFILE				Well Construction	Comments
Depth	Elevation	Symbol	Description		
46	30.25				
47–60			***Limestone*** Grey Limestone Hard and soft density varying		Black shaley seam (51.8m)
	22.63		End of Borehole		

Hole Size: 6"
Datum:
Drill Date: August 14, 2002
Sheet: 4 of 4

W.E.S.A.
WATER & EARTH SCIENCE ASSOCIATES LTD.

Ontario Ministry of the Environment

The Ontario Water Resources Act

WATER WELL RECORD

#3

Print only in spaces provided.
Mark correct box with a checkmark, where applicable.

County or District	Township/Borough/City/Town/Village	Con	block	tract	survey, etc.	Lot
Dundas	north Dundas	9				2

Owner's surname	First Name	Address	Date completed (day / month / year)
Blais Construction		winchester	14/08/02

Zone | Easting | Northing

LOG OF OVERBURDEN AND BEDROCK MATERIALS (see instructions)

General colour	Most common material	Other materials	General description	Depth - feet From	Depth - feet To
Brown	Top soil		Packed	0	2
Brown	Till	Boulders	Dense	2	5
Grey	limestone Rock		Hard	5	118
Grey	limestone Rock	Shale	Layered	118	175
White	Sand stone		Hard	90	94

WATER RECORD

Water found ft - feet	Kind of water			
108	☒ Fresh	☐ Sulphur	☐ Salty	☐ Minerals	☐ Gas
	☐ Fresh	☐ Sulphur	☐ Salty	☐ Minerals	☐ Gas
	☐ Fresh	☐ Sulphur	☐ Salty	☐ Minerals	☐ Gas
	☐ Fresh	☐ Sulphur	☐ Salty	☐ Minerals	☐ Gas
	☐ Fresh	☐ Sulphur	☐ Salty	☐ Minerals	☐ Gas

CASING & OPEN HOLE RECORD

Inside diam inches	Material	Wall thickness inches	Depth - feet From	Depth - feet To
8 3/4"	☐ Steel ☐ Galvanized ☐ Concrete ☒ Open hole ☐ Plastic		0	9
6 1/4"	☒ Steel ☐ Galvanized ☐ Concrete ☐ Open hole ☐ Plastic	188	+2	9
6"	☐ Steel ☐ Galvanized ☐ Concrete ☒ Open hole ☐ Plastic		9	175

SCREEN

Sizes of opening (Slot No.)	Diameter inches	Length feet
Material and type	Depth at top of screen feet	

PLUGGING & SEALING RECORD

☐ Annular space ☐ Abandonment

Depth set at - feet From	Depth set at - feet To	Material and type (Cement grout, bentonite, etc.)
0	9	Cement grout

PUMPING TEST

Pumping test method	Pumping rate	Duration of pumping
☐ Pump ☒ Bailer	3 GPM	1 Hours 0 Mins

Static level	Water level end of pumping	Water levels during ☐ Pumping ☒ Recovery			
		15 minutes	30 minutes	45 minutes	60 minutes
40 feet	175 feet	100 feet	80 feet	60 feet	40 feet

If flowing give rate	Pump intake set at	Water at end of test
GPM	175 feet	☐ Clear ☒ Cloudy
Recommended pump type ☐ Shallow ☒ Deep	Recommended pump setting 170 feet	Recommended pump rate 3 GPM

FINAL STATUS OF WELL

☐ Water supply ☐ Abandoned, insufficient supply ☐ Unfinished
☐ Observation well ☐ Abandoned, poor quality ☐ Replacement well
☒ Test hole ☐ Abandoned (Other)
☐ Recharge well ☐ Dewatering

WATER USE

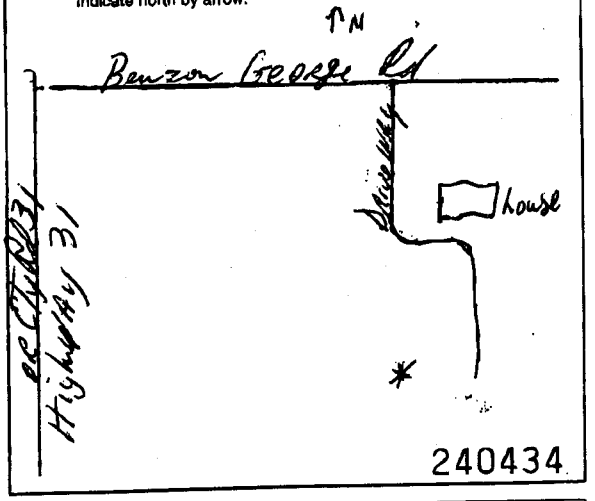
☐ Domestic ☒ Commercial ☐ Not use
☐ Stock ☐ Municipal ☐ Other
☐ Irrigation ☐ Public supply
☐ Industrial ☐ Cooling & air conditioning

METHOD OF CONSTRUCTION

☐ Cable tool ☐ Air percussion ☐ Driving
☐ Rotary (conventional) ☐ Boring ☐ Digging
☐ Rotary (reverse) ☐ Diamond ☐ Other
☒ Rotary (air) ☐ Jetting

LOCATION OF WELL

In diagram below show distances of well from road and lot line.
Indicate north by arrow.



Name of Well Contractor	Well Contractor's Licence No.
Gilles Bourgeois Well Drill	1414
Address: St-Albert Ont.	
Name of Well Technician: Jacques Raymond	Well Technician's Licence No. T-0264
Signature of Technician/Contractor	Submission date (day / mo / yr) 14 08 02

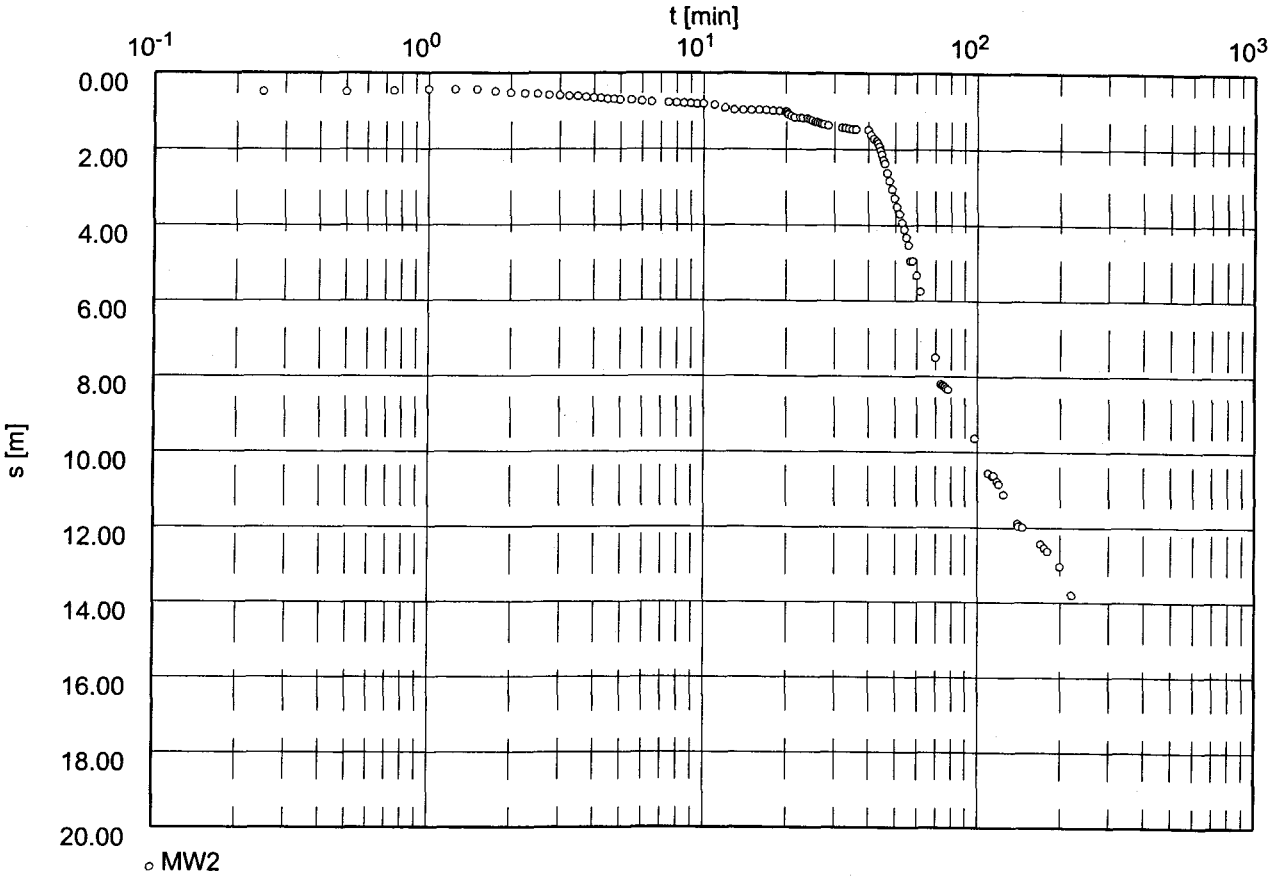
MINISTRY USE ONLY

APPENDIX E

Aquifer Test Data and Transmissivity Calculations

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 24.09.2002 Page 1 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	
Discharge 0.21 l/s	



Transmissivity [m²/min]: 3.63×10^{-4}

Hydraulic conductivity [m/min]: 1.59×10^{-5}

Aquifer thickness [m]: 22.860

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 24.09.2002 Page 2 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	MW2
Discharge 0.21 l/s	Distance from the pumping well 0.100 m

Static water level: 3.170 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
2	0.25	3.660	0.490	
3	0.50	3.670	0.500	
4	0.75	3.630	0.460	
5	1.00	3.600	0.430	
6	1.25	3.600	0.430	
7	1.50	3.600	0.430	
8	1.75	3.650	0.480	
9	2.00	3.680	0.510	
10	2.25	3.700	0.530	
11	2.50	3.720	0.550	
12	2.75	3.740	0.570	
13	3.00	3.760	0.590	
14	3.25	3.765	0.595	
15	3.50	3.780	0.610	
16	3.75	3.800	0.630	
17	4.00	3.815	0.645	
18	4.25	3.830	0.660	
19	4.50	3.850	0.680	
20	4.75	3.850	0.680	
21	5.00	3.870	0.700	
22	5.50	3.885	0.715	
23	6.00	3.910	0.740	
24	6.50	3.925	0.755	
25	7.00	0.500	-2.670	
26	7.50	3.945	0.775	
27	8.00	3.955	0.785	
28	8.50	3.965	0.795	
29	9.00	3.970	0.800	
30	9.50	3.980	0.810	
31	10.00	3.980	0.810	
32	11.00	4.000	0.830	
33	12.00	4.090	0.920	
34	13.00	4.135	0.965	
35	14.00	4.135	0.965	
36	15.00	4.135	0.965	
37	16.00	4.135	0.965	
38	17.00	4.140	0.970	
39	18.00	4.155	0.985	
40	19.00	4.160	0.990	
41	20.00	4.170	1.000	
42	20.25	4.180	1.010	
43	20.30	4.230	1.060	
44	20.45	4.260	1.090	
45	21.00	4.290	1.120	
46	21.50	4.330	1.160	
47	22.50	4.340	1.170	
48	23.00	4.345	1.175	
49	24.00	4.360	1.190	
50	24.50	4.375	1.205	

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 24.09.2002 Page 3 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	MW2
Discharge 0.21 l/s	Distance from the pumping well 0.100 m

Static water level: 3.170 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]	
51	25.00	4.410	1.240	
52	25.50	4.440	1.270	
53	26.00	4.460	1.290	
54	26.50	4.480	1.310	
55	27.00	4.500	1.330	
56	27.50	4.520	1.350	
57	28.50	4.540	1.370	
58	32.00	4.600	1.430	
59	33.00	4.610	1.440	
60	34.00	4.630	1.460	
61	35.00	4.640	1.470	
62	36.00	4.645	1.475	
63	40.00	4.660	1.490	
64	41.00	4.785	1.615	
65	42.00	4.885	1.715	
66	43.00	4.950	1.780	
67	43.50	5.005	1.835	
68	44.00	5.085	1.915	
69	44.50	5.195	2.025	
70	45.00	5.300	2.130	
71	45.50	5.450	2.280	
72	46.00	5.540	2.370	
73	47.00	5.785	2.615	
74	48.00	6.000	2.830	
75	49.00	6.220	3.050	
76	50.00	6.445	3.275	
77	51.00	6.670	3.500	
78	52.00	6.855	3.685	
79	53.00	7.090	3.920	
80	54.00	7.270	4.100	
81	55.00	7.480	4.310	
82	56.00	7.680	4.510	
83	57.00	8.105	4.935	
84	58.00	8.105	4.935	
85	60.00	8.500	5.330	
86	62.00	8.915	5.745	
87	70.00	10.670	7.500	
88	73.50	11.360	8.190	
89	74.50	11.390	8.220	
90	75.00	11.400	8.230	
91	76.00	11.440	8.270	
92	77.00	11.475	8.305	
93	78.00	11.515	8.345	
94	98.00	12.800	9.630	
95	110.00	13.715	10.545	
96	114.00	13.805	10.635	
97	115.00	13.775	10.605	
98	118.50	13.940	10.770	
99	120.00	14.010	10.840	
100	125.00	14.285	11.115	

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown-method after COOPER & JACOB Confined aquifer	Date: 24.09.2002 Page 4 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

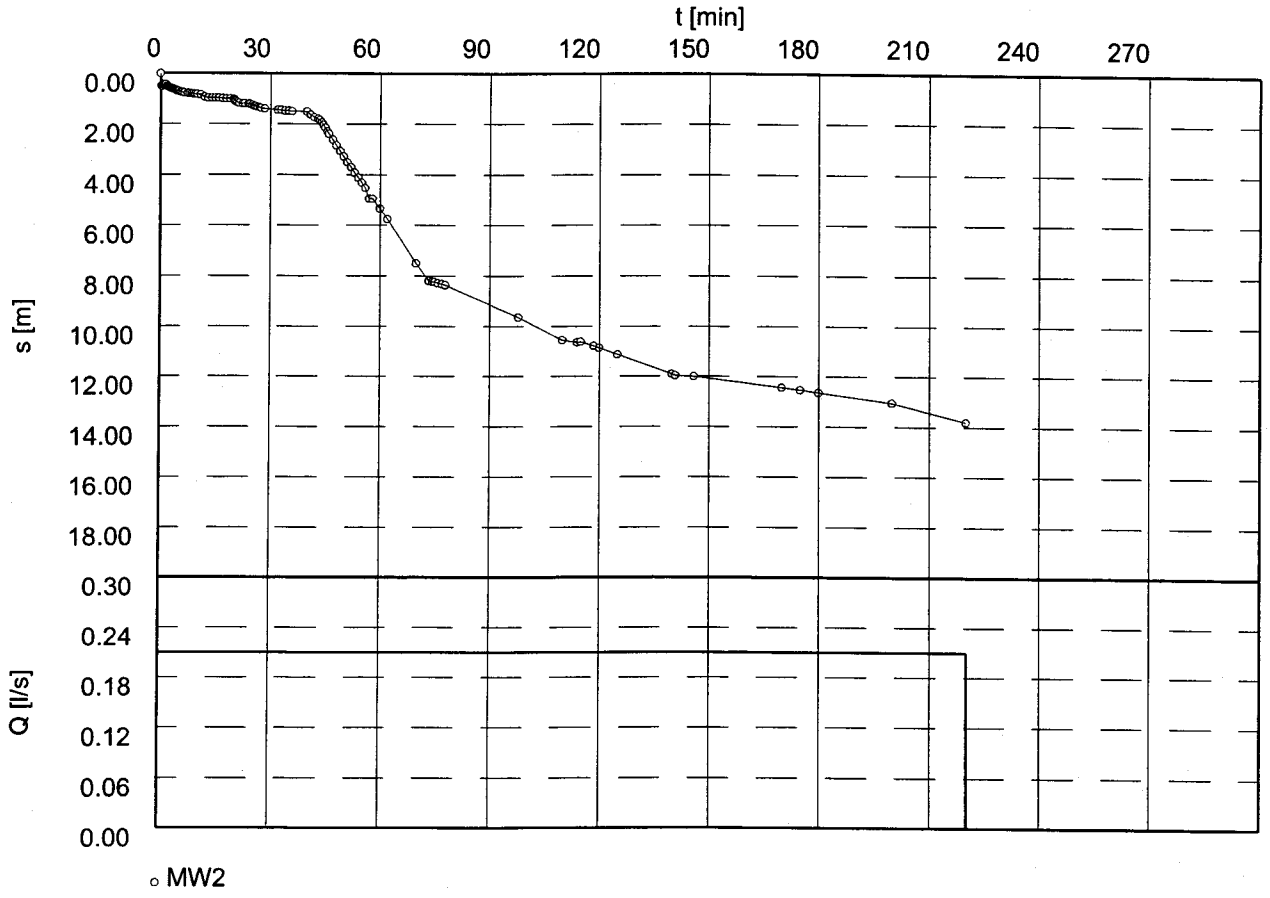
Pumping Test No.	Test conducted on: September 17,2002
MW2	MW2
Discharge 0.21 l/s	Distance from the pumping well 0.100 m

Static water level: 3.170 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]
101	140.00	15.065	11.895
102	141.00	15.130	11.960
103	146.00	15.160	11.990
104	170.00	15.600	12.430
105	175.00	15.700	12.530
106	180.00	15.800	12.630
107	200.00	16.200	13.030
108	220.00	16.960	13.790

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown plot with discharge	Date: 24.09.2002 Page 1 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	
Discharge 0.21 l/s	



WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown plot with discharge	Date: 24.09.2002 Page 2 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	MW2
Discharge 0.21 l/s	Distance from the pumping well 0.100 m

Static water level: 3.170 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]
1	0.00	3.170	0.000
2	0.25	3.660	0.490
3	0.50	3.670	0.500
4	0.75	3.630	0.460
5	1.00	3.600	0.430
6	1.25	3.600	0.430
7	1.50	3.600	0.430
8	1.75	3.650	0.480
9	2.00	3.680	0.510
10	2.25	3.700	0.530
11	2.50	3.720	0.550
12	2.75	3.740	0.570
13	3.00	3.760	0.590
14	3.25	3.765	0.595
15	3.50	3.780	0.610
16	3.75	3.800	0.630
17	4.00	3.815	0.645
18	4.25	3.830	0.660
19	4.50	3.850	0.680
20	4.75	3.850	0.680
21	5.00	3.870	0.700
22	5.50	3.885	0.715
23	6.00	3.910	0.740
24	6.50	3.925	0.755
25	7.00	0.500	-2.670
26	7.50	3.945	0.775
27	8.00	3.955	0.785
28	8.50	3.965	0.795
29	9.00	3.970	0.800
30	9.50	3.980	0.810
31	10.00	3.980	0.810
32	11.00	4.000	0.830
33	12.00	4.090	0.920
34	13.00	4.135	0.965
35	14.00	4.135	0.965
36	15.00	4.135	0.965
37	16.00	4.135	0.965
38	17.00	4.140	0.970
39	18.00	4.155	0.985
40	19.00	4.160	0.990
41	20.00	4.170	1.000
42	20.25	4.180	1.010
43	20.30	4.230	1.060
44	20.45	4.260	1.090
45	21.00	4.290	1.120
46	21.50	4.330	1.160
47	22.50	4.340	1.170
48	23.00	4.345	1.175
49	24.00	4.360	1.190
50	24.50	4.375	1.205

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown plot with discharge	Date: 24.09.2002 Page 3 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	MW2
Discharge 0.21 l/s	Distance from the pumping well 0.100 m
Static water level: 3.170 m below datum	

	Pumping test duration [min]	Water level [m]	Drawdown [m]
51	25.00	4.410	1.240
52	25.50	4.440	1.270
53	26.00	4.460	1.290
54	26.50	4.480	1.310
55	27.00	4.500	1.330
56	27.50	4.520	1.350
57	28.50	4.540	1.370
58	32.00	4.600	1.430
59	33.00	4.610	1.440
60	34.00	4.630	1.460
61	35.00	4.640	1.470
62	36.00	4.645	1.475
63	40.00	4.660	1.490
64	41.00	4.785	1.615
65	42.00	4.885	1.715
66	43.00	4.950	1.780
67	43.50	5.005	1.835
68	44.00	5.085	1.915
69	44.50	5.195	2.025
70	45.00	5.300	2.130
71	45.50	5.450	2.280
72	46.00	5.540	2.370
73	47.00	5.785	2.615
74	48.00	6.000	2.830
75	49.00	6.220	3.050
76	50.00	6.445	3.275
77	51.00	6.670	3.500
78	52.00	6.855	3.685
79	53.00	7.090	3.920
80	54.00	7.270	4.100
81	55.00	7.480	4.310
82	56.00	7.680	4.510
83	57.00	8.105	4.935
84	58.00	8.105	4.935
85	60.00	8.500	5.330
86	62.00	8.915	5.745
87	70.00	10.670	7.500
88	73.50	11.360	8.190
89	74.50	11.390	8.220
90	75.00	11.400	8.230
91	76.00	11.440	8.270
92	77.00	11.475	8.305
93	78.00	11.515	8.345
94	98.00	12.800	9.630
95	110.00	13.715	10.545
96	114.00	13.805	10.635
97	115.00	13.775	10.605
98	118.50	13.940	10.770
99	120.00	14.010	10.840
100	125.00	14.285	11.115

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Time-Drawdown plot with discharge	Date: 24.09.2002 Page 4 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

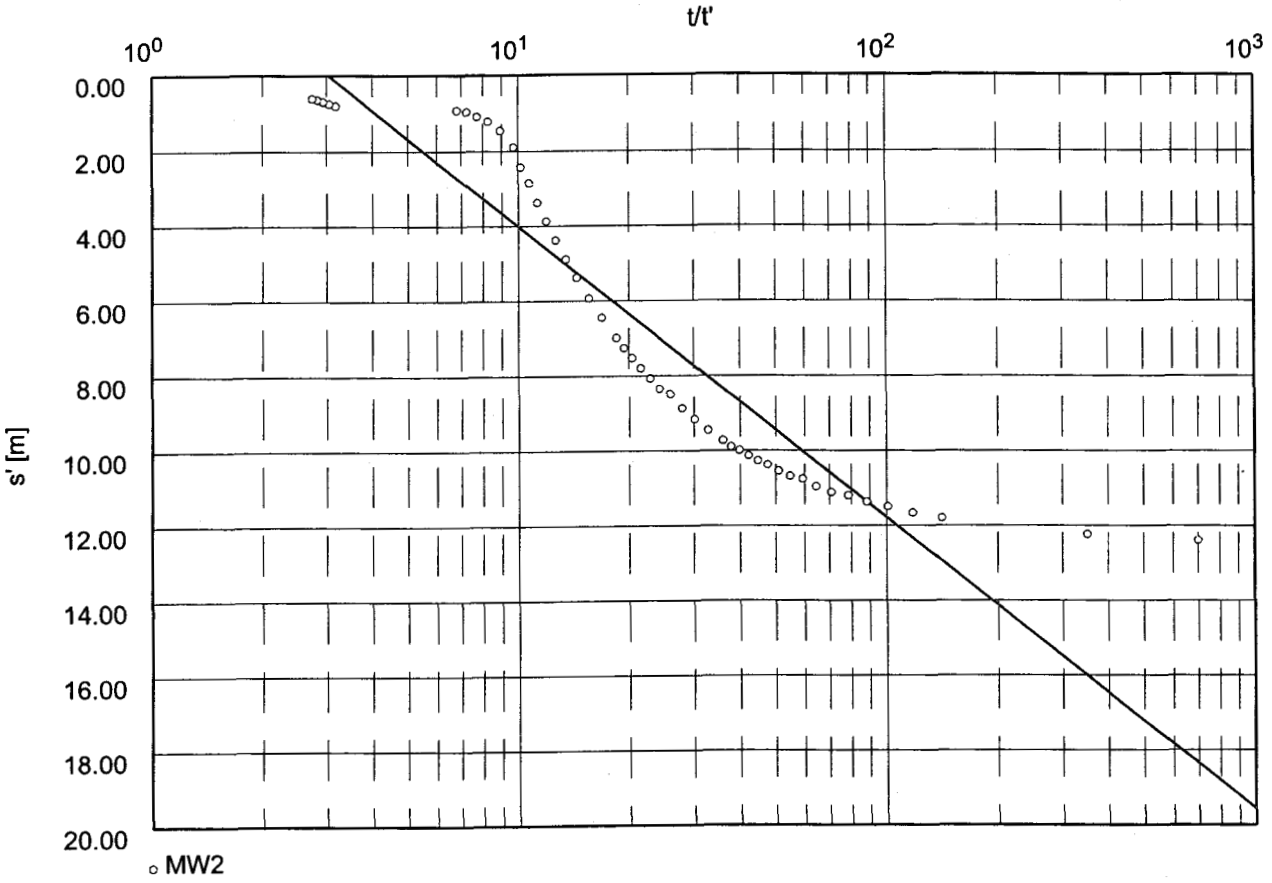
Pumping Test No.	Test conducted on: September 17,2002
MW2	MW2
Discharge 0.21 l/s	Distance from the pumping well 0.100 m

Static water level: 3.170 m below datum

	Pumping test duration [min]	Water level [m]	Drawdown [m]
101	140.00	15.065	11.895
102	141.00	15.130	11.960
103	146.00	15.160	11.990
104	170.00	15.600	12.430
105	175.00	15.700	12.530
106	180.00	15.800	12.630
107	200.00	16.200	13.030
108	220.00	16.960	13.790

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 24.09.2002 Page 1 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	
Discharge 0.21 l/s	
	Pumping test duration: 175.00 min



Transmissivity [m²/min]: 2.96×10^{-4}

Hydraulic conductivity [m/min]: 1.29×10^{-5}

Aquifer thickness [m]: 22.860

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 24.09.2002 Page 2 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	MW2
Discharge 0.21 l/s	Distance from the pumping well 0.100 m
Static water level: 3.170 m below datum	Pumping test duration: 175.00 min

	Time from end of pumping [min]	Water level [m]	Residual drawdown [m]
1	0.25	15.560	12.390
2	0.50	15.400	12.230
3	1.25	14.970	11.800
4	1.50	14.840	11.670
5	1.75	14.670	11.500
6	2.00	14.545	11.375
7	2.25	14.375	11.205
8	2.50	14.290	11.120
9	2.75	14.130	10.960
10	3.00	13.930	10.760
11	3.25	13.850	10.680
12	3.50	13.715	10.545
13	3.75	13.550	10.380
14	4.00	13.440	10.270
15	4.25	13.305	10.135
16	4.50	13.155	9.985
17	4.75	13.060	9.890
18	5.00	12.890	9.720
19	5.50	12.625	9.455
20	6.00	12.330	9.160
21	6.50	12.030	8.860
22	7.00	11.650	8.480
23	7.50	11.510	8.340
24	8.00	11.245	8.075
25	8.50	10.965	7.795
26	9.00	10.695	7.525
27	9.50	10.425	7.255
28	10.00	10.160	6.990
29	11.00	9.620	6.450
30	12.00	9.100	5.930
31	13.00	8.540	5.370
32	14.00	8.050	4.880
33	15.00	7.545	4.375
34	16.00	7.035	3.865
35	17.00	6.545	3.375
36	18.00	6.020	2.850
37	19.00	5.595	2.425
38	20.00	5.060	1.890
39	22.00	4.630	1.460
40	24.00	4.380	1.210
41	26.00	4.245	1.075
42	28.00	4.120	0.950
43	30.00	4.075	0.905
44	80.00	3.965	0.795
45	85.00	3.910	0.740
46	90.00	3.850	0.680
47	95.00	3.805	0.635
48	100.00	3.770	0.600

WESA 3108 Carp Rd. Carp ON ph.(613) 839-3053	Pumping test analysis Recovery method after THEIS & JACOB Confined aquifer	Date: 24.09.2002 Page 3 Project: Vandeermere Quarry Evaluated by: Rochelle Drumm

Pumping Test No.	Test conducted on: September 17,2002
MW2	
Discharge 0.21 l/s	

Pumping test duration: 175.00 min

	Pumping test duration [min]	Discharge [l/s]		
1	0.00	0.21		

APPENDIX F

Laboratory Reports

2002 Surface Water Chemistry

B1905Tables03.xls

Parameteres	Units	MDL	SW1		SW2		SW3-Upstream	SW3-Downstream
			29-May-02	22-Aug-02 (N)	29-May-02	22-Aug-02	22-Aug-02	22-Aug-02
Alkalinity	mg/L	5	244	187	246	157	338	254
Ag	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Al	mg/L	0.01	0.16	0.17	<0.05	0.61	0.22	0.43
B	mg/L	0.05	<0.05	0.48	<0.05	0.52	0.3	0.37
Ba	mg/L	0.01	0.09	0.13	0.07	0.06	0.1	0.1
Be	mg/L	0.001	<0.002	<0.001	<0.002	<0.001	<0.001	<0.001
Ca	mg/L	1	78	148	78	84	74	88
Cd	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cl	mg/L	1	71	239	66	106	149	123
Conductivity	µs/cm	5	821	1900	844	1240	1260	1250
Co	mg/L	0.0002	0.0005	0.0009	0.0003	0.001	0.0014	0.0011
Colour	tcu	2	14	35	17	3	146	92
Cr	mg/L	0.001	0.002	0.001	0.001	0.001	<0.001	<0.001
Cu	mg/L	0.001	0.003	0.003	0.002	0.003	0.003	0.004
DOC	mg/L	0.5	4.7	8.8	4.5	1.8	26.9	17.7
F	mg/L	0.1	0.26	0.8	0.27	0.7	0.27	0.34
Fe	mg/L	0.01	0.7	0.26	0.06	0.79	0.42	0.53
H2S	mg/L	0.01	<0.01	0.02	<0.01	0.06	0.05	0.06
Hardness	mg/L	1	327	588	331	416	374	397
Ion Balance		0.01		1.01		1.07	1.1	1.09
Pb	mg/L	0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Mg	mg/L	1	32	53	33	50	46	43
Mn	mg/L	0.005	0.03	0.446	<0.01	0.039	0.391	0.239
Mo	mg/L	0.005	<0.01	0.033	<0.01	0.067	0.008	0.027
Ni	mg/L	0.005	<0.01	<0.005	<0.01	<0.005	<0.005	<0.005
N-NH3	mg/L	0.02	0.11	0.33	<0.02	0.03	10.5	5.26
N-NO2	mg/L	0.10	0.72	<0.10	0.16	<0.10	<0.10	<0.10
N-NO3	mg/L	0.10	14.7	3.12	8.79	5.28	0.21	1.77
pH			8.14	7.93	8.44	8.2	8.01	7.93
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001
K	mg/L	1	<1	33	5	12	35	31
Si	mg/L	0.1	3.14	9.4	2.4	3.4	8.6	8.6
Na	mg/L	2	35	162	39	119	108	104
Sr	mg/L	0.002	0.414	6.76	0.746	8.01	1.63	2.78
SO4	mg/L	1	28	421	69	307	75	180
Tannin & Lignin	mg/L	0.1	0.2	0.7	0.4	<0.1	4.3	2.2
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ti	mg/L	0.01	0.01	<0.01	<0.01	0.03	0.01	0.02
Total Kjelkahl Nitrogen	mg/L	0.05	1.2	1.46	0.8	0.32	19.2	9.54
Total P	mg/L	0.01	0.08	0.79	<0.003	0.08	0.73	0.75
TSS	mg/L	2		9		57	13	37
Turbidity	NTU	0.1	3.2	8.9	1.8	29.2	11.1	12.1
V	mg/L	0.001	0.004	0.004	0.002	0.002	0.004	0.005
Zn	mg/L	0.005	0.01	<0.005	<0.01	<0.005	0.009	<0.005
TDS	mg/L	5	534	1330	549	868	819	813

2002 Surface Water Chemistry

B1905Tables03.xls

Parameteres	Units	MDL	SW1		SW2		SW3-Upstream	SW3-Downstream
			29-May-02	22-Aug-02 (N)	29-May-02	22-Aug-02	22-Aug-02	22-Aug-02
Background Colonies	ct/100mL		42000		>50000			
Escherichia Coli	ct/100mL		70	5200	370	680	3500	7800
Faecal Coliforms	ct/100mL		70	7500	550	680	5700	9500
Faecal Streptococcus	ct/100mL		170	3500	270	1200	4200	4000
Heterotrophic Plate Count	ct/100mL		>500	>500	>500	>500	>500	>500
Total Coliforms	ct/100mL		4900	330000	4000	5200	52000	54000
Field Parameters								
Field pH				7.71		8.21	7.92	7.89
Field Temperature	oC			17.9		23.4	20.1	18.8
Turbidity				16		56	23	19
Field Conductivity	ms/cm			1.6		1.22	1.2	1.15
DO	mg/L			2.36		5.63	3.36	3.89

Baseline Survey Groundwater Chemistry

B1905Tables03.xls

Parameters	Units	MDL	John Cinnamon	Barry Cinnamon		Blair Rental
				Barn	House	
			29-May-02	29-May-02	29-May-02	29-May-02
Alkalinity	mg/L	5	297	271	315	
Ca	mg/L	1	<1	54	90	
Cl	mg/L	1	118	62	41	
Conductivity	µS/cm	5	1130	865	887	
Colour	TCU	2	<2	2	9	
DOC	mg/L	0.5	1.1	1.5	4.5	
F	mg/L	0.10	0.44	0.49	0.16	4.6
Fe	mg/L	0.01	0.03	0.01	0.03	
H2S	mg/L	0.01	<0.01	<0.01	0.01	
Hardness	mg/L	1	4	238	348	
Mg	mg/L	1	1	25	30	
Mn	mg/L	0.01	<0.01	<0.01	<0.01	
N-NO3	mg/L	0.02	<0.02	0.03	<0.02	
N-NO2	mg/L	0.10	0.34	0.10	0.29	
N-NO3	mg/L	0.10	1.91	4.54	11.2	
pH			8.18	8.04	8.03	
Phenols	mg/L	0.001	<0.001	<0.001	<0.001	
K	mg/L	1	2	20	26	
Na	mg/L	2	254	71	31	
SO4	mg/L	1	94	75	57	
Tannin & Lignin	mg/L	0.1	<0.1	<0.1	0.2	
Total Kjeldahl Nitrogen	mg/L	0.05	0.24	0.64	0.64	
Turbitity	NTU	0..1	0.5	<0.1	2.6	8.7
TDS	mg/L	5	735	562	577	
Background Colonies	ct/100mL		4	>200	1	
Escheridhia Coli	ct/100mL		0	0	0	
Faecal Coliforms	ct/100mL		0	0	0	
Faecal Streptococcus	ct/100mL		0	0	0	
Heterotrophic Plate Count	ct/100mL		64	53	29	
Total Coliforms	ct/100mL		0	O/G	0	

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: WESA - Carp

ATT: Ms. Philippa Smith

Kingston Report: K2-1021
Report Number: 2207229
Date: 2002-06-19
Date Submitted: 2002-05-29

Project: B1905

P.O. Number:
Matrix: Groundwater

			LAB ID:	186103	186104	186105	186106	
			Sample Date:	2002-05-29	2002-05-29	2002-05-29	2002-05-29	
			Sample ID:	John Cinnamon	Barry Cinnamon-Barn	Barry Cinnamon-House	Blair Rental	
PARAMETER	**UNITS**	**MDL**						
Alkalinity as CaCO3	mg/L	5		297	271	315		
Background Colonies	ct/100mL			4	>200	1		
Ca	mg/L	1		<1	54	90		
Cl	mg/L	1		118	62	41		
Conductivity	uS/cm	5		1130	865	887		
Colour	TCU	2		<2	2	9		
DOC	mg/L	0.5		1.1	1.5	4.5	4.6	
Escherichia Coli	ct/100mL			0	0	0		
F	mg/L	0.10		0.44	0.49	0.16		
Faecal Coliforms	ct/100mL			0	0	0		
Faecal Streptococcus	ct/100mL			0	0	0		
Fe	mg/L	0.01		0.03	0.01	0.03		
H2S	mg/L	0.01		<0.01	<0.01	0.01		
Hardness as CaCO3	mg/L	1		4	238	348		
Mg	mg/L	1		1	25	30		
Mn	mg/L	0.01		<0.01	<0.01	<0.01		
N-NH3	mg/L	0.02		<0.02	0.03	<0.02		
N-NO2	mg/L	0.10		0.34	0.10	0.29		
N-NO3	mg/L	0.10		1.91	4.54	11.2		
pH				8.18	8.04	8.03		
Phenols	mg/L	0.001		<0.001	<0.001	<0.001		
K	mg/L	1		2	20	26		
Na	mg/L	2		254	71	31		
Heterotrophic Plate Count	ct/1mL			64	53	29		
SO4	mg/L	1		94	75	57		
Tannin & Lignin	mg/L	0.1		<0.1	<0.1	0.2		
Total Coliforms	ct/100mL			0	O/G	0		
Total Kjeldahl Nitrogen	mg/L	0.05		0.24	0.64	0.64		
Turbidity	NTU	0.1		0.5	<0.1	2.6	8.7	
TDS (COND - CALC)	mg/L	5		735	562	577		

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

608 Norris Court, Kingston, ON, K7P 2R9

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: WESA - Carp

ATT: Ms. Philippa Smith

Kingston Report: K2-1021
Report Number: 2207230
Date: 2002-06-21
Date Submitted: 2002-05-29

Project: B1905

P.O. Number:
Matrix: Surfacewater

	LAB ID:	186107	186108			
	Sample Date:	2002-05-29	2002-05-29			
	Sample ID:	SW1	SW2			
PARAMETER	**UNITS**	**MDL**				
Alkalinity as CaCO3	mg/L	5	244	246			
Ag	mg/L	0.0001	<0.0001	<0.0001			
Al	mg/L	0.05	0.16	<0.05			
B	mg/L	0.05	<0.05	<0.05			
Ba	mg/L	0.01	0.09	0.07			
Background Colonies	ct/100mL		42000	>50000			
Be	mg/L	0.002	<0.002	<0.002			
Ca	mg/L	1	78	78			
Cd	mg/L	0.0001	<0.0001	<0.0001			
Cl	mg/L	1	71	66			
Conductivity	uS/cm	5	821	844			
Co	mg/L	0.0002	0.0005	0.0003			
Colour	TCU	2	14	17			
Cr	mg/L	0.001	0.002	0.001			
Cu	mg/L	0.001	0.003	0.002			
DOC	mg/L	0.5	4.7	4.5			
Escherichia Coli	ct/100mL		70	370			
F	mg/L	0.10	0.26	0.27			
Faecal Coliforms	ct/100mL		70	550			
Faecal Streptococcus	ct/100mL		170	270			
Fe	mg/L	0.01	0.70	0.06			
H2S	mg/L	0.01	<0.01	<0.01			
Hardness as CaCO3	mg/L	1	327	331			
Pb	mg/L	0.001	<0.001	<0.001			
Mg	mg/L	1	32	33			
Mn	mg/L	0.01	0.03	<0.01			
Mo	mg/L	0.01	<0.01	<0.01			
Ni	mg/L	0.01	<0.01	<0.01			
N-NH3	mg/L	0.02	0.11	<0.02			
N-NO2	mg/L	0.10	0.72	0.16			

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL:

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

608 Norris Court, Kingston, ON, K7P 2R9

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: WESA - Carp

ATT: Ms. Philippa Smith

Kingston Report: K2-1021
Report Number: 2207230
Date: 2002-06-21
Date Submitted: 2002-05-29

Project: B1905

P.O. Number:
Matrix: Surfacewater

			LAB ID:	186107	186108			
			Sample Date:	2002-05-29	2002-05-29			
			Sample ID:	SW1	SW2			
PARAMETER	**UNITS**	**MDL**						
N-NO3	mg/L	0.10		14.7	8.79			
pH				8.14	8.44			
Phenols	mg/L	0.001		<0.001	<0.001			
K	mg/L	1		<1	5			
Si	mg/L	0.01		3.14	2.40			
Na	mg/L	2		35	39			
Heterotrophic Plate Count	ct/1mL			>500	>500			
Sr	mg/L	0.003		0.414	0.746			
SO4	mg/L	1		28	69			
Tannin & Lignin	mg/L	0.1		0.2	0.4			
Tl	mg/L	0.001		<0.001	<0.001			
Ti	mg/L	0.01		0.01	<0.01			
Total Coliforms	ct/100mL			4900	4000			
Total Kjeldahl Nitrogen	mg/L	0.05		1.20	0.80			
Total P	mg/L	0.003		0.080	<0.003			
Turbidity	NTU	0.1		3.2	1.8			
V	mg/L	0.001		0.004	0.002			
Zn	mg/L	0.01		0.01	<0.01			
TDS (COND - CALC)	mg/L	5		534	549			

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

608 Norris Court, Kingston, ON, K7P 2R9

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: WESA - Carp

ATT: Mr. Patrick Grout

Report Number: 2211549
Date: 2002-09-09
Date Submitted: 2002-08-23

Project: B1905

P.O. Number:
Matrix: Water

			LAB ID:	200668	200669	200670	200671	
			Sample Date:	2002-08-22	2002-08-22	2002-08-22	2002-08-22	
			Sample ID:	SW1 (NEW)	SW2	SW3 Upstream	SW3 Downstream	
PARAMETER	**UNITS**	**MDL**						
Alkalinity as CaCO3	mg/L	5		187	157	338	254	
Ag	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	
Al	mg/L	0.01		0.17	0.61	0.22	0.43	
B	mg/L	0.05		0.48	0.52	0.30	0.37	
Ba	mg/L	0.01		0.13	0.06	0.10	0.10	
Be	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	
Ca	mg/L	1		148	84	74	88	
Cd	mg/L	0.0001		<0.0001	<0.0001	<0.0001	<0.0001	
Cl	mg/L	1		239	106	149	123	
Conductivity	uS/cm	5		1900	1240	1260	1250	
Co	mg/L	0.0002		0.0009	0.0010	0.0014	0.0011	
Colour	TCU	2		35	3	146	92	
Cr	mg/L	0.001		0.001	0.001	<0.001	<0.001	
Cu	mg/L	0.001		0.003	0.003	0.003	0.004	
DOC	mg/L	0.5		8.8	1.8	26.9	17.7	
Escherichia Coli	ct/100mL			5200	680	3500	7800	
F	mg/L	0.10		0.80	0.70	0.27	0.34	
Faecal Coliforms	ct/100mL			7500	680	5700	9500	
Faecal Streptococcus	ct/100mL			3500	1200	4200	4000	
Fe	mg/L	0.01		0.26	0.79	0.42	0.53	
H2S	mg/L	0.01		0.02	0.06	0.05	0.06	
Hardness as CaCO3	mg/L	1		588	416	374	397	
Ion Balance		0.01		1.01	1.07	1.10	1.09	
Pb	mg/L	0.001		<0.001	0.001	<0.001	<0.001	
Mg	mg/L	1		53	50	46	43	
Mn	mg/L	0.005		0.446	0.039	0.391	0.239	
Mo	mg/L	0.005		0.033	0.067	0.008	0.027	
Ni	mg/L	0.005		<0.005	<0.005	<0.005	<0.005	
N-NH3	mg/L	0.02		0.33	0.03	10.5	5.26	
N-NO2	mg/L	0.10		<0.10	<0.10	<0.10	<0.10	

MDL = Method Detection Limit INC = Incomplete
Comment:

APPROVAL: _____

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1 608 Norris Court, Kingston, ON, K7P 2R9

ACCUTEST LABORATORIES LTD.

REPORT OF ANALYSIS

Client: WESA - Carp

ATT: Mr. Patrick Grout

Report Number: 2211549
Date: 2002-09-09
Date Submitted: 2002-08-23

Project: B1905

P.O. Number:
Matrix: Water

	LAB ID:	200668	200669	200670	200671	
	Sample Date:	2002-08-22	2002-08-22	2002-08-22	2002-08-22	
	Sample ID:	SW1 (NEW)	SW2	SW3 Upstream	SW3 Downstream	
PARAMETER	UNITS	MDL				
N-NO3	mg/L	0.10	3.12	5.28	0.21	1.77
pH			7.93	8.20	8.01	7.93
Phenols	mg/L	0.001	<0.001	<0.001	0.002	<0.001
K	mg/L	1	33	12	35	31
Si	mg/L	0.1	9.4	3.4	8.6	8.6
Na	mg/L	2	162	119	108	104
Heterotrophic Plate Count	ct/1mL		>500	>500	>500	>500
Sr	mg/L	0.002	6.76	8.01	1.63	2.78
SO4	mg/L	1	421	307	75	180
Tannin & Lignin	mg/L	0.1	0.7	<0.1	4.3	2.2
Tl	mg/L	0.001	<0.001	<0.001	<0.001	<0.001
Ti	mg/L	0.01	<0.01	0.03	0.01	0.02
Total Coliforms	ct/100mL		330000	5200	52000	54000
Total Kjeldahl Nitrogen	mg/L	0.05	1.46	0.32	19.2	9.54
Total P	mg/L	0.01	0.79	0.08	0.73	0.75
Total Suspended Solids	mg/L	2	9	57	13	37
Turbidity	NTU	0.1	8.9	29.2	11.1	12.1
V	mg/L	0.001	0.004	0.002	0.004	0.005
Zn	mg/L	0.005	<0.005	<0.005	0.009	<0.005
TDS (COND - CALC)	mg/L	5	1330	868	819	813

MDL = Method Detection Limit INC = Incomplete

Comment:

APPROVAL: _____

8-146 Colonnade Road, Ottawa, ON, K2E 7Y1

608 Norris Court, Kingston, ON, K7P 2R9

APPENDIX G

Calculations Used to Estimate Theoretical Drawdown At Given Distances from the Quarry and Influence

Ibrahim and Brutsaert (1965)

CINNAMON QUARRY

Ibrahim and Brutsaert Method (1965) b(m)= 1.000 T (m^2/d) = 0.43

Sy= 0.001 Perimeter length (m) = 2458.5

L= 500 m (arbitrary distance from edge of quarry)

K=T/b= 0.43 m^2/day

H= 12.22 m (maximum drawdown to keep water table at bottom of quarry)

TP=Q= 1057.155 m^3/day

Potentiometric Elevation 71.22 masl

~~y~~= $(SyL/KH^2)*q$

~~y~~= 8.23

From ~~y~~ vs ~~T~~ plot (pg. 495 Freeze and Cherry)

~~T~~ = 0.025 curve

Therefore, ong L, h/H can be found from h/H vs x/L plot (pg. 495 Freeze and Cherry)

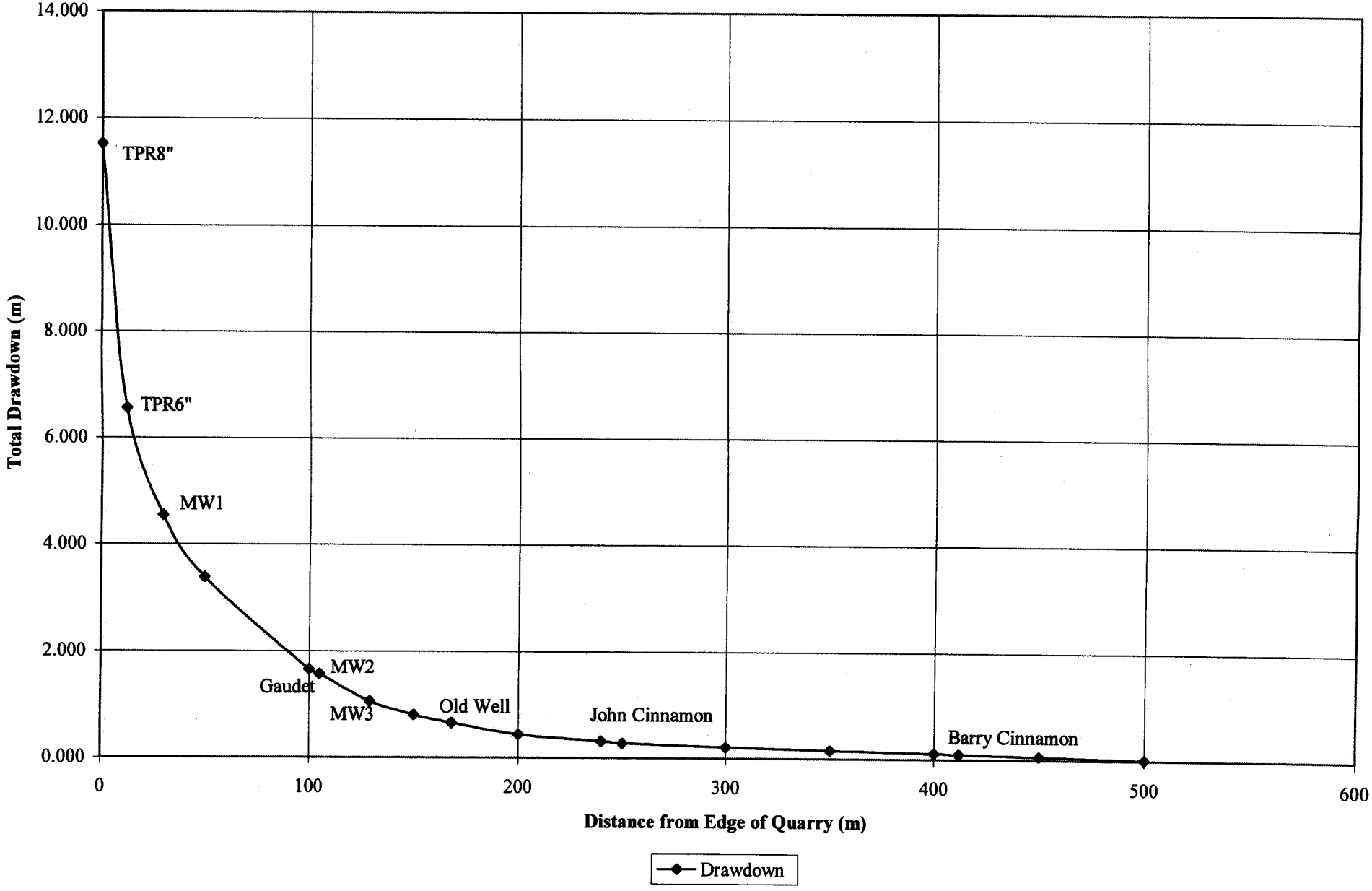
and since ho = H-h, ho can be found

Heading North from Quarry boundary

Well #	Name	x	h/H	h	Drawdown = ho	Elevation Drawdown (masl)
1	TPR Redimix 8" well	0	0.057	0.700	11.520	59.700
2	TPR Redimix 6" well	12	0.463	5.660	6.560	64.660
3	MW1	30	0.628	7.680	4.540	66.680
		50	0.723	8.841	3.379	67.841
		100	0.865	10.570	1.650	69.570
4	MW2	105	0.872	10.660	1.560	69.660
5	Mike Gaudet (Blair Rental)	105	0.872	10.660	1.560	69.660
	MW3	129	0.914	11.170	1.050	70.170
		150	0.935	11.420	0.800	70.420
6	Old Well (Vandeermere)	168	0.947	11.570	0.650	70.570
		200	0.965	11.790	0.430	70.790
7	John Cinnamon	240	0.975	11.910	0.310	70.910
		250	0.977	11.939	0.281	70.939
		300	0.983	12.012	0.208	71.012
		350	0.987	12.061	0.159	71.061
		400	0.991	12.110	0.110	71.110
8	Barry Cinnamon	411.8	0.992	12.122	0.098	71.122
		450	0.995	12.159	0.061	71.159
		500	0.999	12.208	0.012	71.208

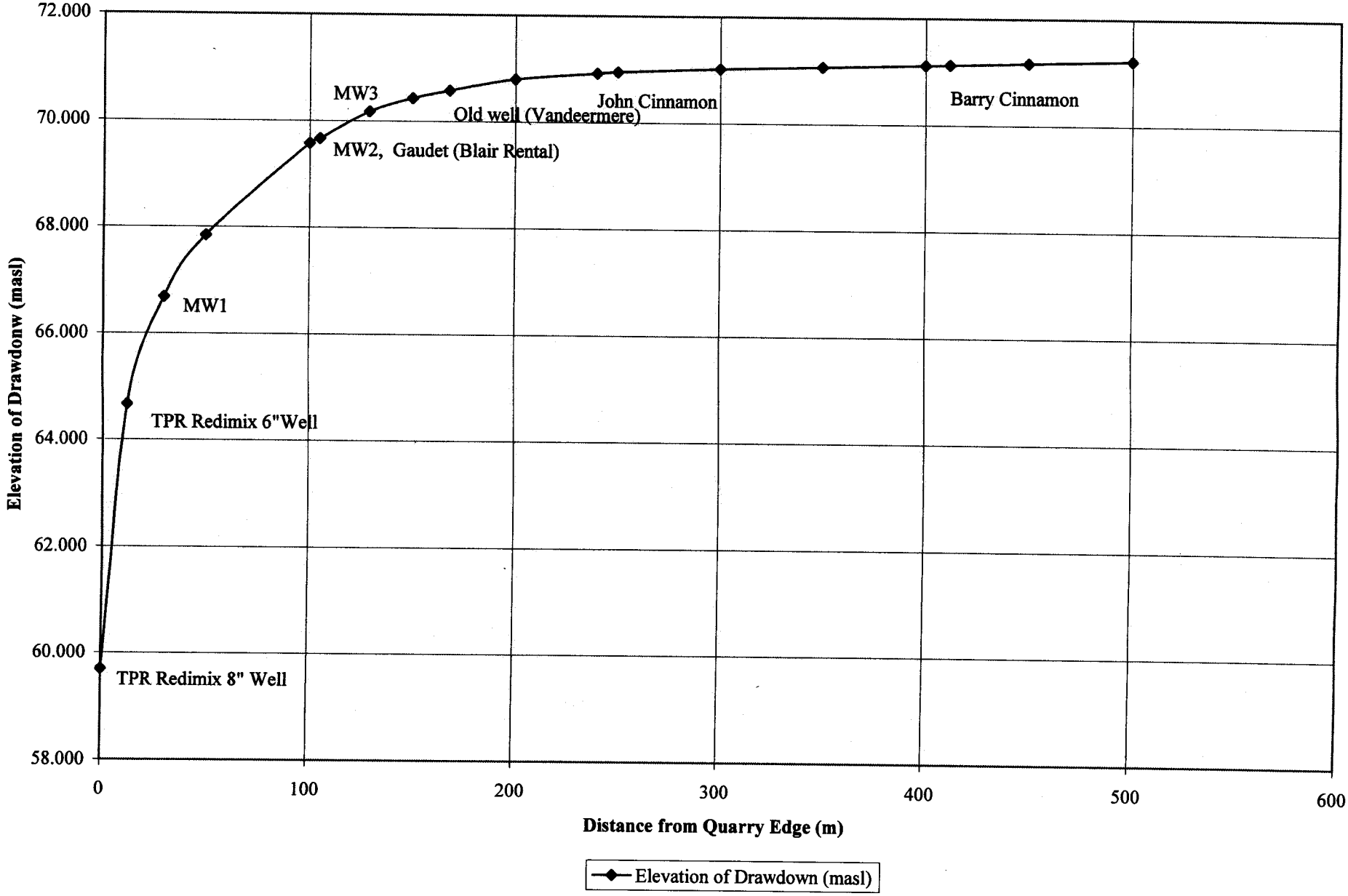
Reference:Ibrahim, H.A., and W. Brutsaert. 1965. Inflow hydrograph from large unconfined aquifers. J. Irr. Drain. Div., Proc. Amer. Soc. Civil Engrs., 91 (IR2), pp. 21-38.

Figure 11: Radial Drawdown from Edge of Quarry Excavation
Cinnamon Quarry



B1905Theis*nfluenceCalculations-Jan04.xls*

Figure 10: Cone of Influence at the Cinnamon Quarry



APPENDIX H

Natural Environment
Information Requests and Response Letters

left message
Sept 4 2002

June 19, 2002
File No. B1905

Mr. Gary McTavish
Rural Planner
OMAFRA
ORC Government Building
Kemptville College
Box 2004
Kemptville, Ontario
KOG 1JO

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. McTavish:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

i) Hydrogeological Assessment
ii) Natural Environment Assessment
iii) Cultural Heritage Resource Assessment
iv) Noise Assessment
v) Blast Design Report

At this point, WESA would like to notify your agency of the proposed expansion and request any and all information you may have about the site and surrounding area. The information that is collected during this Level 1 Assessment period will be used to identify possible sources of impact of the proposed quarry on the local environment (and vise vera) and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to psmith@wesa.ca or by mail to the address listed below.

Philippa Smith
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

October 7, 2002
File No. B1905

Mr. Gary McTavish, Rural Planner
OMAFRA
ORC Government Building
Kemptville College
Box 2004
Kemptville, Ontario
KOG 1JO

Re: Preliminary Assessment for Quarry Expansion Application
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 3, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. McTavish:

For your information a review of our files has revealed that although the existing quarry operation is found on Lot 3, Con. 9, Twp. of North Dundas (formerly Winchester Twp.). The expansion of this quarry operation will extend onto land that is formally located on part of Lot 2, Concession 9, Twp. of North Dundas (formerly Winchester Twp.). If this information highlights any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
3108 Carp Road, P.O. Box 430
Carp, Ontario
K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905LetOct-02.doc

November 15, 2002
File No. B1905

Gary Mctavish, Rural Planner
OMAFRA
ORC Government Building
Kemptville College
Box 2004
Kemtpville, Ontario K0G 1J0

Re: Quarry Expansion Application – Draft Report
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 2, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. Mctavish

WESA is in the process of producing a draft report on the above captioned project. To this date we have not received any comments in regards to the environmental sensitivity of this project as it applies to the mandates of your organization. We would appreciate any comments as soon as possible so that they can be addressed in the draft report. Additionally, please express your interest in reviewing this draft report before November 30, 2002, and WESA will forward a copy of the draft to your office in December.

If you have any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
P.O. Box 430, 3108 Carp Road
Carp, Ontario K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905 Nov15-02Mtavish.doc/ts1

Ministry of Agriculture & Food

Concession Rd. , ORC Building
Box 2004
Kemptville, Ontario K0G 1J0
Tel: (613) 258-8306
Fax: (613) 258-8392
gary.mctavish@omaf.gov.on.ca

Ministere de l'Agriculture et de l'Alimentation

Rue Concession
B.P. 2004
Kemptville, Ontario K0G 1J0
Tel.: (613) 258-8306
Telec.: (613) 258-8392

Ontario

Agriculture and Rural Division

November 25, 2002

Tami J. Sugarman, Hydrogeologist
Water and Earth Science Associates Ltd.
P.O. Box 430, 3108 Carp Road
Carp, Ontario
K0A 1L0

Dear Ms. Sugarman:

Re: Quarry Expansion Application – Draft Report
Cinnamon (Vandermere) Quarry, License No. 5753
Part Lot 2, Concession 9, Twp of North Dundas
United Counties of Stormont, Dundas and Glengarry

Staff of this Ministry have completed a review of the above-noted proposal. Consideration has been given to the matter in terms of the goals and objectives of this Ministry and the criteria and policies contained in the Provincial Policy Statement, specifically Policy 2.1 which deals with planning for agriculture.

Staff have no comments or concerns with the proposal.

While the above proposal represents this Ministry's interpretation of the provincial policy with regard to the agricultural land base, it does not reflect an overall provincial position. There may be planning concerns or interests of other agencies that should be considered, in addition to any municipal planning policies.

Should you have any questions or wish to discuss this matter further, please contact this office.

Yours truly,

Gary McTavish, MCIP, RPP
Rural Planner

June 19, 2002
File No. B1905

Mr. Scott Smith
Planning Administrator
The South Nation River Conservation Authority
15 Union Street
Berwick, Ontario
KOC 1GO

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. Smith:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

i) Hydrogeological Assessment
ii) Natural Environment Assessment
iii) Cultural Heritage Resource Assessment
iv) Noise Assessment
v) Blast Design Report

At this point, WESA would like to notify your agency of the proposed expansion and request any and all information you may have about the site and surrounding area. The information that is collected during this Level 1 Assessment period will be used to identify possible sources of impact of the proposed quarry on the local environment (and vise vera) and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to psmith@wesa.ca or by mail to the address listed below.

Philippa Smith
P.O. Box 430
3108 Carp Road

Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

June 19, 2002
File No. B1905

Mr. Rheal Delaquis
Ministry of Environment and Energy
Southeastern Region
113 Amelia Street
Cornwall, Ontario
K6H 3P1

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. Delaquis:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

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Philippa Smith
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

Ref:B1905Jn19-02d.doc

October 7, 2002
File No. B1905

Mr. Rheal Delaquis
Ministry of Environment and Energy
Southeastern Region
113 Amelia Street
Cornwall, Ontario
K6H 3P1

Re: Preliminary Assessment for Quarry Expansion Application
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 3, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. Delaquis:

For your information a review of our files has revealed that although the existing quarry operation is found on Lot 3, Con. 9, Twp. of North Dundas (formerly Winchester Twp.). The expansion of this quarry operation will extend onto land that is formally located on part of Lot 2, Concession 9, Twp. of North Dundas (formerly Winchester Twp.). If this information highlights any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
3108 Carp Road, P.O. Box 430
Carp, Ontario
K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905LetOct-02.doc

Not necessary until you apply for permit to take water

November 15, 2002
File No. B1905

Mr. Rheal Delaquis
Ministry of Environment
Southeastern Region
113 Amelia Street
Cornwall, Ontario
K6H 3P1

Re: Quarry Expansion Application – Draft Report
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 2, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. Delaquis:

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If you have any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
P.O. Box 430, 3108 Carp Road
Carp, Ontario K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905 Nov15-02Delaquis.doc/ts1

June 20, 2002
File No. B1905

Mr. Chris Anderson
Regional Archaeologist
Ministry of Citizenship, Culture and Recreation
400 University Ave. 4th Floor.
Toronto, Ontario
M7A 2R9

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. Anderson:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

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v) Blast Design Report

At this point, WESA would like to notify your agency of the proposed expansion and request any and all information you may have about the site and surrounding area. The information that is collected during this Level 1 Assessment period will be used to identify possible sources of impact of the proposed quarry on the local environment (and vise vera) and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to psmith@wesa.ca or by mail to the address listed below.

Philippa Smith
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

Ref:B1905jn19-02g.doc

Stefanie Goure

From: Chris.Andersen@mczcr.gov.on.ca
Sent: Wednesday, September 04, 2002 4:00 PM
To: sgoure@wesa.ca
Subject: RE: Cinnamon Quarry

Hi Stefanie:

While it looks like this will require at least a stage 1 cultural heritage assessment due to the presence of a water course within 200 m, please provide a map showing the exact location and extent of the subject property. For the sake of a speedy response, a sketch map appended to an e-mail will suffice.

For future reference, it would definitely be helpful if you could always provide at least a relatively detailed sketch map showing the location and extent of any property about which you are enquiring. It would also be helpful in cases such as this, where township names and boundaries have changed due to municipal restructuring, if you would be sure to indicate on your correspondence the full lot/concession and original township name information for the subject lands.

I apologise for the delay in responding.

Regards,

Chris J.-Andersen
Regional Archaeologist
Ministry of Culture
Heritage Operations Unit
400 University Ave., 4th Floor
Toronto, Ontario, Canada M7A 2R9

Tel.: 416-314-7159 Fax: 416-314-7362 /-7175
e-mail: chris.andersen@mczcr.gov.on.ca

-----Original Message-----
From: Stefanie Goure [mailto:sgoure@wesa.ca]
Sent: September 4, 2002 3:25 PM
To: Chris J. Andersen (E-mail)
Cc: Rochelle Drumm (E-mail)
Subject: Cinnamon Quarry

Hi Chris,

Here is the original letter previously faxed, as requested. Please let me know if you would like a site map.

Many thanks,
Stefanie Goure
WESA - A Better Environment For Business

Water & Earth Science Associates Ltd.
3108 Carp Road
Carp (Ottawa), Ontario, CANADA
K0A 1L0
Phone: 613-839-3053 ext: 261

Fax: 613-839-5376
e-mail: sgoure@wesa.ca

October 7, 2002
File No. B1905

Mr. Chris Anderson
Regional Archaeologist
Ministry of Citizenship, Culture and Recreation
400 University Ave. 4th Floor
Toronto, Ontario
M7A 2R9

Re: Preliminary Assessment for Quarry Expansion Application
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 3, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. Anderson:

For your information a review of our files has revealed that although the existing quarry operation is found on Lot 3, Con. 9, Twp. of North Dundas (formerly Winchester Twp.). The expansion of this quarry operation will extend onto land that is formally located on part of Lot 2, Concession 9, Twp. of North Dundas (formerly Winchester Twp.). If this information highlights any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
3108 Carp Road, P.O. Box 430
Carp, Ontario
K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905LetOct-02.doc

November 15, 2002
File No. B1905

Mr. Chris Anderson, Regional Archaeologist
Ministry of Citizenship, Culture and Recreation
400 University Avenue, 4th Floor
Toronto, Ontario
M7A 2R9

Re: Quarry Expansion Application – Draft Report
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 2, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. Anderson:

WESA is in the process of producing a draft report on the above captioned project. To this date we have not received any comments in regards to the environmental sensitivity of this project as it applies to the mandates of your organization. We would appreciate any comments as soon as possible so that they can be addressed in the draft report. Additionally, please express your interest in reviewing this draft report before November 30, 2002, and WESA will forward a copy of the draft to your office in December.

If you have any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
P.O. Box 430, 3108 Carp Road
Carp, Ontario K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905 Nov15-02Anderson.doc/ts1

WESA
A Better Environment For Business

Water and Earth Science Associates Ltd.
3108 Carp Rd, Box 430, Carp (Ottawa)
Ontario Canada K0A 1L0
Telephone: 613-839-3053
Fax: 613-839-5376
E-mail: wesacarp@wesa.ca

FACSIMILE COVER SHEET

DATE: December 4, 2002

FAX NO: 416 - 314 - 7175

TO: Ministry of Culture
Chris J. Andersen, Regional Archaeologist

PROJECT NO.: B1905

SUBJECT: Vandeermere Quarry

MESSAGE:

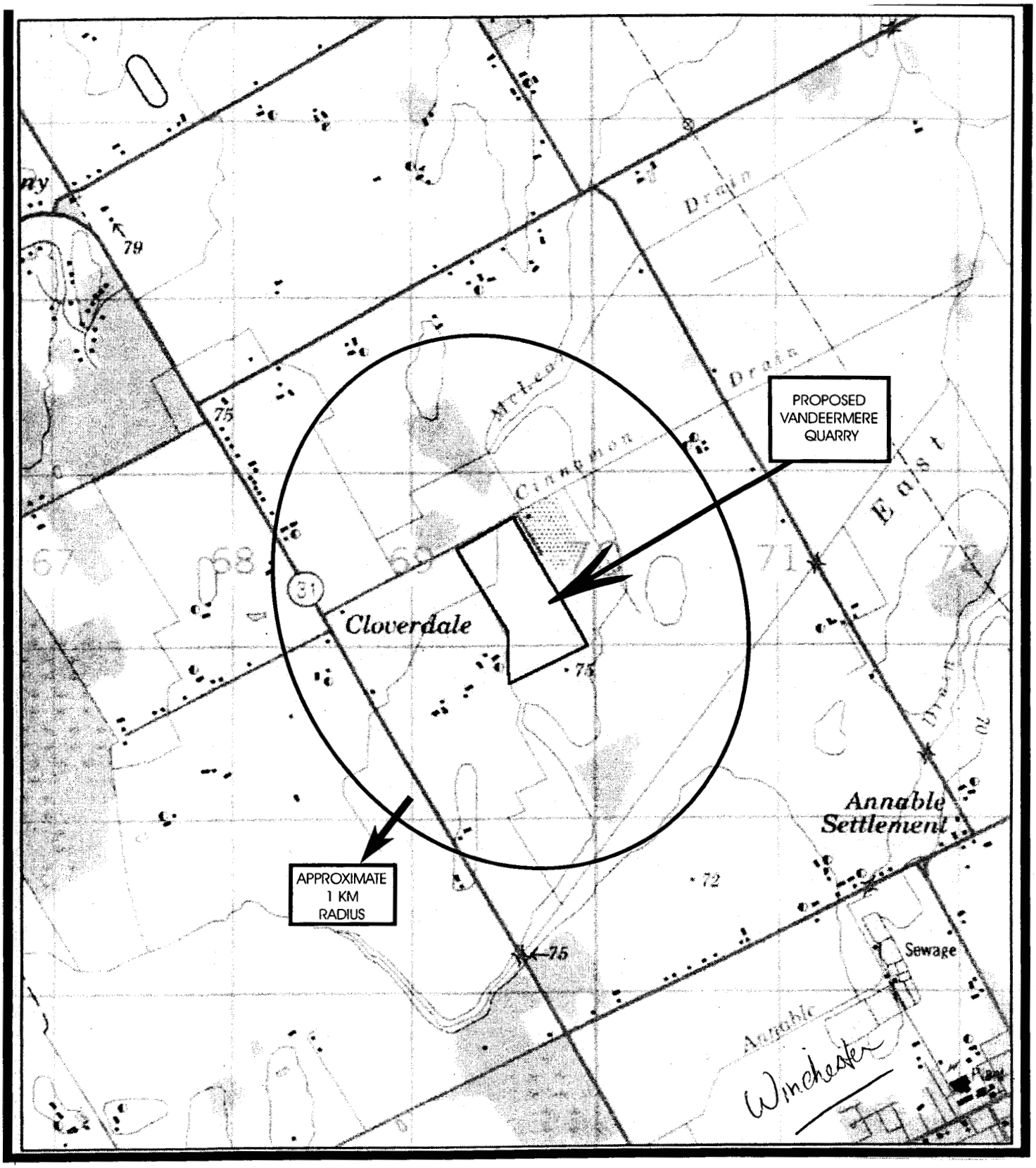
Map of quarry expansion area as requested.
Twp. of N. Dundas (formerly Winchester Twp.), Part Lot 2, Con. 9
Stormont Dundas + Glengarry County. (Just north of
Winchester Ontario).

FROM: Tami Sugarman 839-3053 ext 229 e mail tsugarman@wesa.ca
839-5376 (fax)

Total pages transmitted, including cover sheet: 2

If all pages are not received, please call 613-839-3053.

Originals to follow? by Mail ☐
by Courier ☐
by E-mail ☐
No ☑



SITE PLAN :

WESA
A Better Environment For Business

FEATURES WITHIN AT LEAST A 1 KM RADIUS

0 m 750 m 1500 m
Scale 1 : 30 000

PROPOSED VANDEERMERE QUARRY
TPR READY MIX

Ref:wesaking/corelfiles/B1905-sp

Tami Sugarman

From: Chris.Andersen@mczcr.gov.on.ca
Sent: Friday, December 06, 2002 2:05 PM
To: tsugarman@wesa.ca
Subject: RE: A.L. Blair- Vandeermere/Cinnamon Quarry Expansion

Dear Ms. Sugarman:

Re: Proposed Vandermeere Quarry, Part Lot 2, Con 9, Twp. of N. Dundas (Winchester Geo. Twp.), Stormont, Dundas & Glengarry

Thank you for your letter regarding the above-named project. We appreciate the opportunity to comment.

A principal concern of this office is for the adverse effects that development projects may have on our irreplaceable cultural heritage resources. If a proposed project is determined to have the potential to have an impact on cultural heritage resources, then this office recommends that a cultural heritage resource assessment be undertaken at the earliest available opportunity. If any significant cultural heritage features are identified, then any possible negative impacts on these resources would have to be mitigated either by avoidance or by documentation and removal (excavation).

Using the available heritage databases and mapping in this office, it has been determined that the subject property has a moderate to high potential for the presence of significant archgaeological and/or other cultural heritage resources. This determination is primarily based on the proximity of water, topography suitable for settlement, and/or an absence of modern land disturbance to a substantial proportion of the property.

Consequently, this Ministry recommends that the proponent carry out a cultural heritage resource assessment of the affected lands and, if it should prove necessary, mitigate, through either avoidance or documentation and removal (excavation), adverse impacts to any significant cultural heritage resources found, including archaeological sites, built heritage (structures) and cultural heritage landscape resources or features. No demolition, grading, filling, or any form of soil disturbances, should take place on the subject lands prior to the issuance of a letter from the Ministry of Citizenship, Culture and Recreation indicating that all heritage resource concerns have been satisfactorily addressed for the subject property and that the consultants' work has met all licensing, reporting, and resource conservation requirements.

All archaeological work must be performed by a licensed archaeological consultant according to this Ministry's Archaeological Assessment Technical Guidelines, a copy of which is available from this office. The local historical board, historical society and/or Local Architectural Conservation Advisory Committee (L.A.C.A.C.) should be consulted concerning the historical background of the property and any heritage buildings that may be present thereon. Prior to the issuance of a letter of clearance, this office requires an opportunity to review the results of the cultural heritage resource assessment, as well as the results of any subsequent mitigation programmes.

We regret any inconvenience caused by the delay in our comments. Should you wish to discuss this matter further, please do not hesitate to contact the undersigned.

Sincerely,

<signed>

Chris J.-Andersen
Regional Archaeologist

-----Original Message-----
From: Andersen, Chris (CZR)
Sent: December 4, 2002 11:48 AM
To: 'tsugarman@wesa.ca'
Subject: RE: A.L. Blair- Vandeermere/Cinnamon Quarry Expansion

Please accept my apologies for the delay in responding. Could you please fax me a map of the property in question, with your contact information (telephone, etc.).

Chris J.-Andersen
Regional Archaeologist
Ministry of Culture
Heritage Operations Unit
400 University Ave., 4th Floor
Toronto, Ontario, Canada M7A 2R9

Tel.: 416-314-7159 Fax: 416-314-7175
e-mail: chris.andersen@mczcr.gov.on.ca

-----Original Message-----
From: Tami Sugarman [mailto:tsugarman@wesa.ca]
Sent: December 3, 2002 4:34 PM
To: 'chris.andersen@mczcr.gov.on.ca'
Subject: A.L. Blair- Vandeermere/Cinnamon Quarry Expansion

Hello Mr. Andersen

WESA on behalf of our client, A.L. Blair Construction Ltd. sent your office two letters (June 20, 2002, and October 7, 2002) to request your input on a MNR quarry application located in North Dundas Twp. (formerly Winchester Twp.), Part Lot 2, Con. 9, United Counties of Stormont, Dundas and Glengarry. We have not recieved any comments from your office to date. We would appreciate your Ministry's input as soon as possible since we are attempting to formalize the application to the MNR in January 2003. Could you please contact me in regards to this matter?

Sincerely,

Tami J. Sugarman
Hydrogeologist

Tami Sugarman

From: Chris.Andersen@mczcr.gov.on.ca
Sent: December 20, 2002 8:12 PM
To: tsugarman@wesa.ca
Subject: RE: A.L. Blair- Vandeermere/Cinnamon Quarry Expansion


ATT00001.htm (12 KB)


Sugarman.doc (869 KB)


Outlook.bmp (1 MB)

Dear Ms Sugarman:

Again, I can only express our sincere regrets for the delay in responding to your inquiries.

Our databases and available mapping were fully reviewed prior to comment. As to whether the property in question has archaeological potential, please be advised that agricultural activities are not deemed to constitute significant disturbance of a property. As well, you should be aware that the "proximity to water" criteria for the determination of potential include any property or portion thereof that comes within 300 m of a major body of water, such as a lake or river, or 200 m of any other smaller stream, creek, wetland, etc. As can be seen from the attached OBM and historical mapping, Lot 2 Con IX, Winchester, is (or was) crossed by several streams and is in very close proximity to headwater areas with which ancient archaeological remains are commonly associated. Current OBM mapping suggests that the original watercourses in this area have been significantly modified by diversion, ditching and draining but that does not alter the fact that traces of the original watercourses should still be evident and may be associated with significant archaeological or other cultural heritage resources. Finally, it should also be noted that historic trails/roads and buildings are deemed to be significant cultural heritage resources that must be conserved. As can be seen from the historical mapping (below), Lot 2, Con IX, is shown as having both a trail and a building on the lot and close to the subject lands. If these or any associated cultural heritage resources will be in any way impacted by the proposed quarry, mitgiation of such impacts by means of either preservation and protection in situ, or documentation and removal by means of controlled archaeological excavation, may be necessary. Without first undertaking a cultural heritage resource assessment it is impossible to say whether any such resources may be impacted by the proposed quarry.

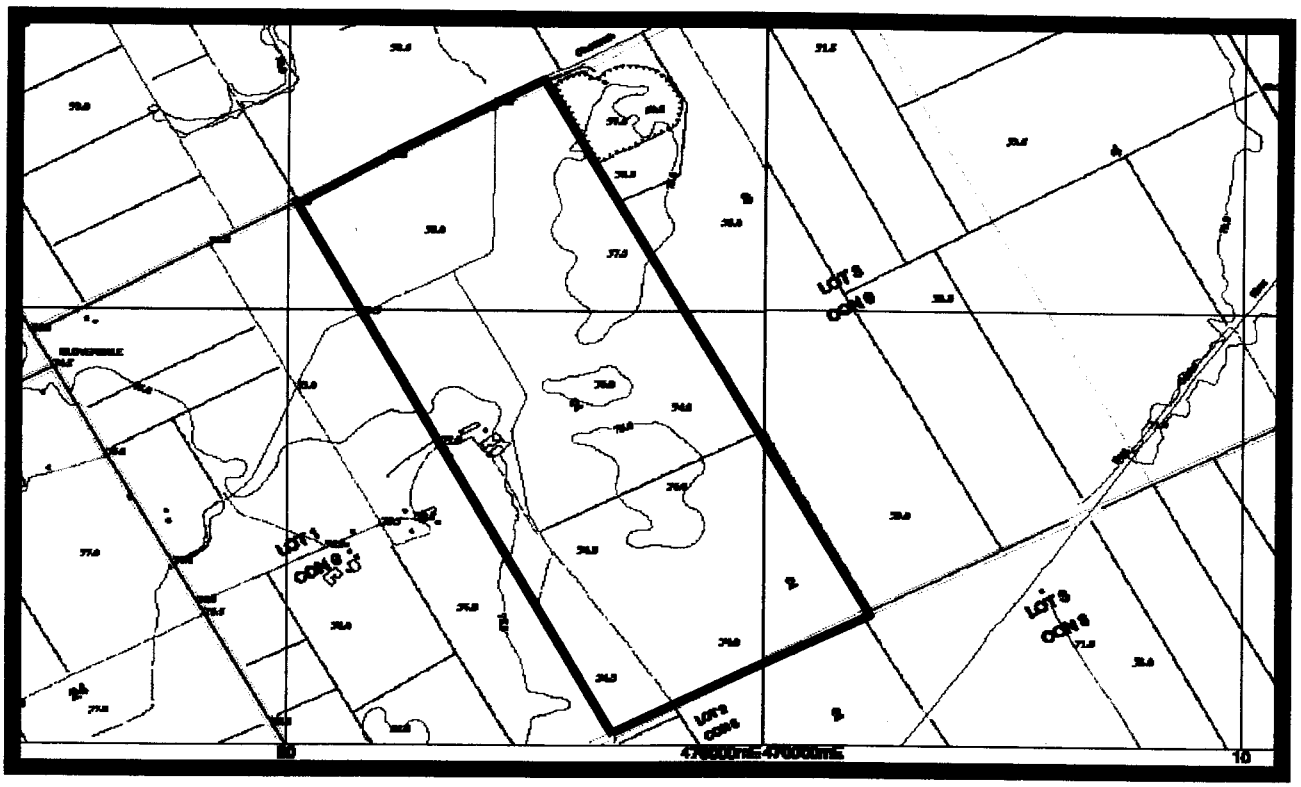
While it is true that a Stage 2 archaeological heritage assessment cannot take place while the property is snow-covered, it may not be as time-consuming a task as you may imagine. If all or most of the subject property can be assessed by means of pedestrian survey under ploughed/disked field conditions, then, depending on the size of the property in question, the actual field work may not require the consultant to be in the field for any more than a day or two. However, if the property is heavily overgrown or in bush, then test-pitting at 5 or 10 m intervals is the normal method of assessment, which, however, is considerably more time and labour intensive. Of course, the consultant, upon inspection of the property, may decide that it does not, in fact, have much in the way of potential. In which case s/he would submit a report so stating.

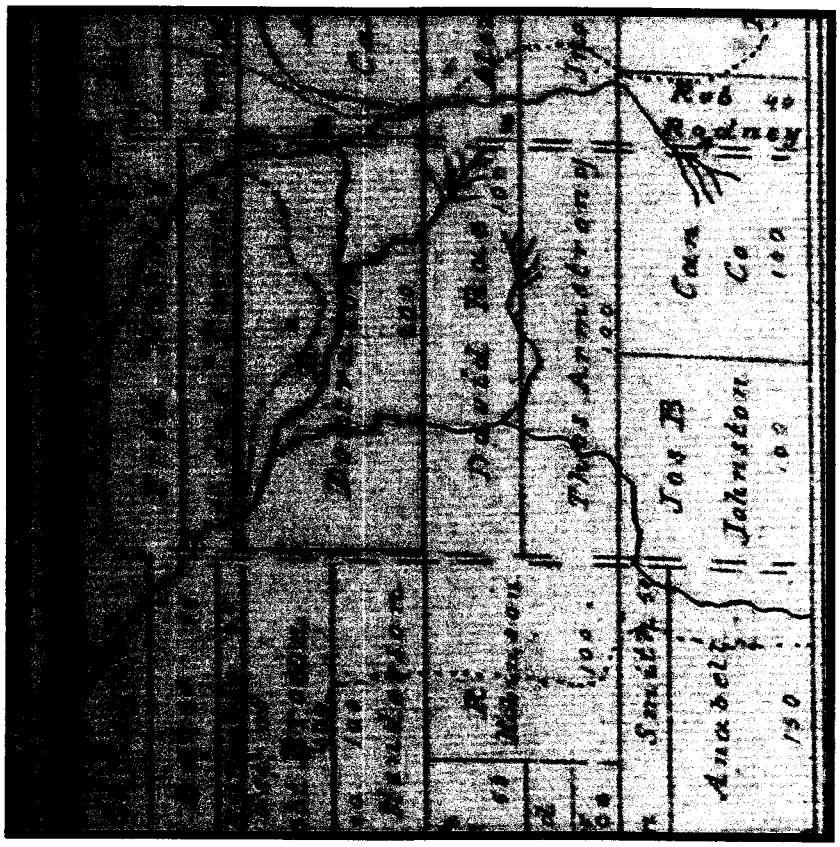
In order to help minimize any further delay, this office will give the highest priority to providing expeditious review of the consultant's report, once it has been submitted.

Again, please accept our apologies for the delay in commenting. Please feel free to call if you wish to discuss this matter further.

Sincerely,

Chris J.-Andersen
Regional Archaeologist & Heritage Planner
Ministry of Culture
Heritage Operations Unit
400 University Ave., 4th Floor
Toronto, Ontario, Canada M7A 2R9


LOT 5
CON 9
LOT 4
CON 9
LOT 5
CON 8
9
10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Rodney
Cox
Co
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Thos Armitage
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Jos B
Johnston
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Samuel
Annabel
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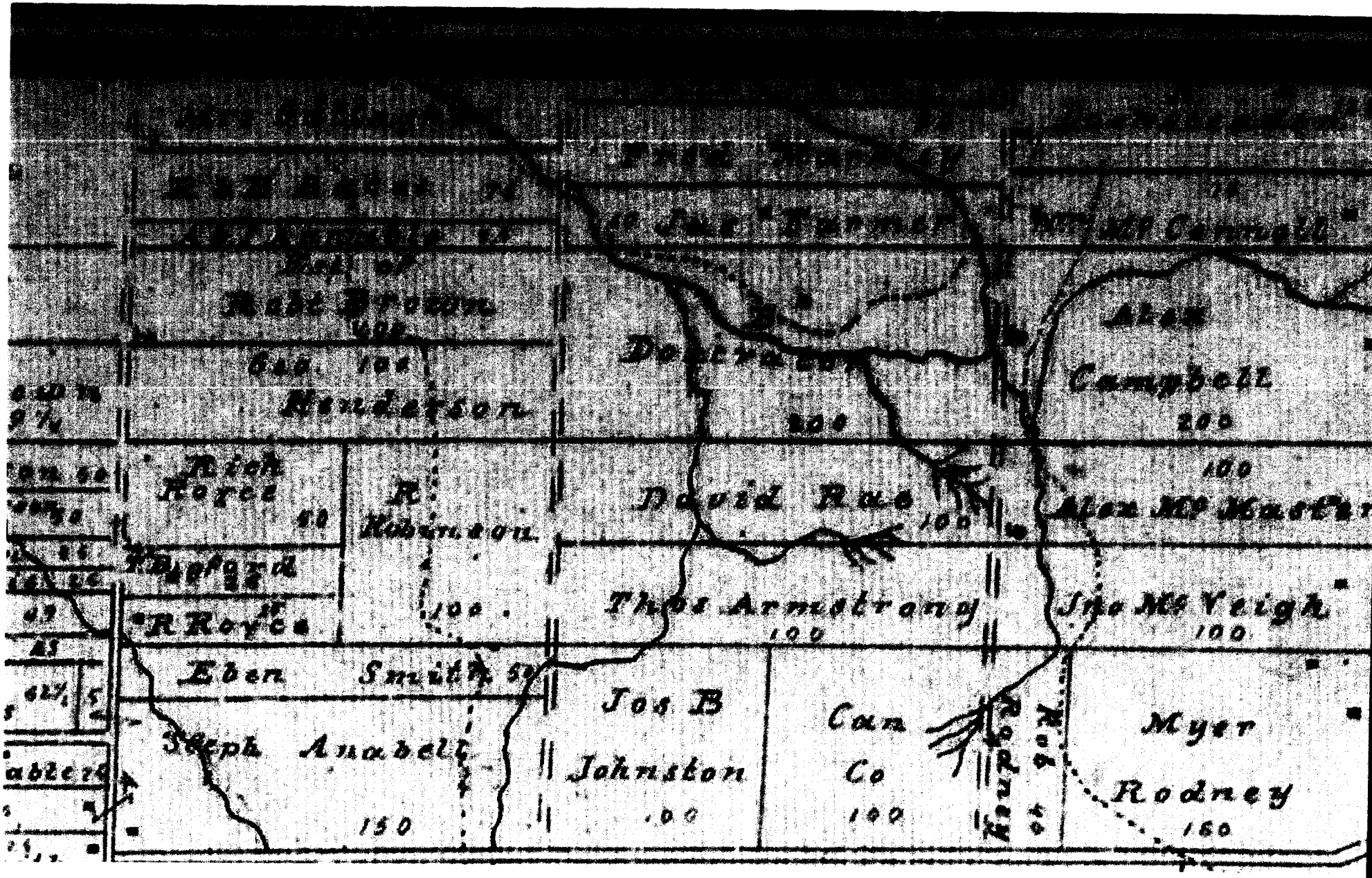

Rich Royce
R Royce
Eben Smith
Joseph Anabell
150
Jos B Johnston
100
David Rue
100
Thos Armstrong
100
Alex
Campbell
200
100
Jno Mc Veigh
100
Myer
Rodney
160

June 20, 2002
Project No. B1905

Mr. D. J. McDonald,
Roads Superintendent & Engineer
The United Counties of Stormont, Dundas and Glengarry
20 Pitt Street,
Cornwall, Ontario
K6J 3P2

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. McDonald:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

i) Hydrogeological Assessment
ii) Natural Environment Assessment
iii) Cultural Heritage Resource Assessment
iv) Noise Assessment
v) Blast Design Report

At this point, WESA would like to notify your Department of the proposed expansion and request any and all information you may have about the site and surrounding area. The information that is collected during this Level 1 Assessment period will be used to identify possible sources of impact of the proposed quarry on the local environment (and vise vera) and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to psmith@wesa.ca or by mail to the address listed below.

Philippa Smith
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

Ref:B1905ju19-02c.doc

October 7, 2002
File No. B1905

Mr. D. J. McDonald
Roads Superintendent & Engineer
The United Counties of Stormont, Dundas and Glengarry
20 Pitt Street
Cornwall, Ontario
K6J 3P2

Re: Preliminary Assessment for Quarry Expansion Application
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 3, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. McDonald:

For your information a review of our files has revealed that although the existing quarry operation is found on Lot 3, Con. 9, Twp. of North Dundas (formerly Winchester Twp.). The expansion of this quarry operation will extend onto land that is formally located on part of Lot 2, Concession 9, Twp. of North Dundas (formerly Winchester Twp.). If this information highlights any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
3108 Carp Road, P.O. Box 430
Carp, Ontario
K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905LetOct-02.doc

November 15, 2002
Project No. B1905

Drainage Superintendent
Township of North Dundas
P.O. 489
457 St. Lawrence St.
Winchester, Ontario
K0C 2K0

Attention: Brent Copeland

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. Copeland:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication.

In June 2002 WESA requested background preliminary information on the subject area from your records. Thank you for the information you provided on the Cinnamon Drain. A section of the drain crosses the proposed expansion area. I would like to inquire at this point about the possibility of re-routing the drain to run along the western boundary of the expansion area (please refer to map attached). Could you offer information as to the direction A.L. Blair Construction Ltd. would be required to take for this once the expansion area is approved? I would appreciate your comments on this at your earliest convenience.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami Sugarman
P.O. Box 430,3108 Carp Road
Carp (Ottawa), ON,K0A 1L0

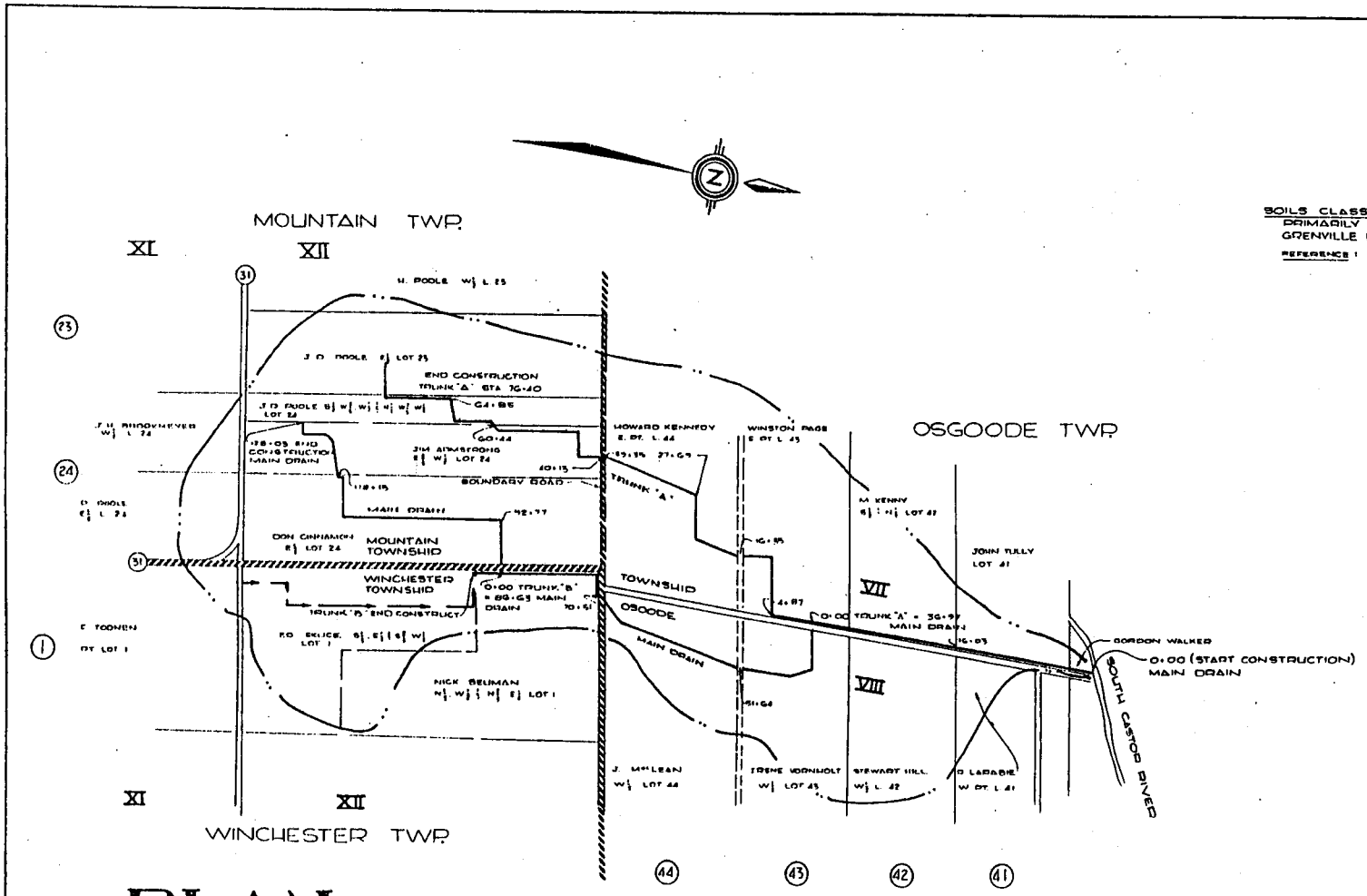
Phone: (613) 839-3053, ext. 229

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Tami Sugarman, B.Sc.
Hydrogeologist

Ref:B1905 Nov15-02DrainSup.doc/ts1



PLAN

1" - 600'

SOILS CLASSIFICATION

PRIMARILY NORTH GOWER CLAY LOAM AND GRENVILLE LOAM IN THE AREA OF CONSTRUCTION.

REFERENCE : MINISTRY OF AGRICULTURE SOIL SURVEY DUNDAS COUNTY, & CARLETON COUNTY.

FOR INFORMATION ONLY
NOT TO BE USED FOR CONSTRUCTION

ANNEX "F"

REV.

OSGOODE C 7+8, L 40 TO 44
WINCHESTER C 11, LOT 1
MOUNTAIN C 11, L 23+24

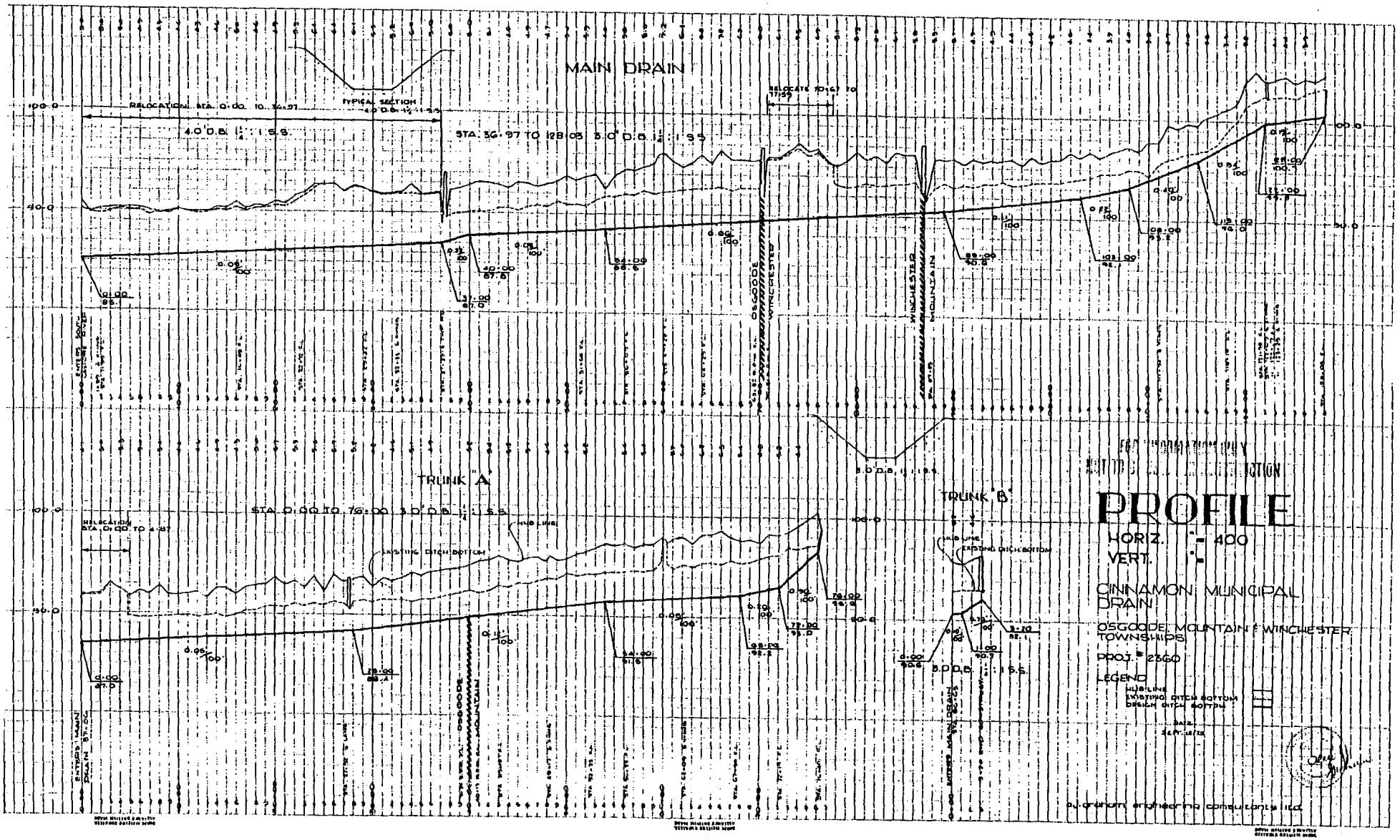
CINNAMON MUNICIPAL DRAIN

Date: MAY 13/78
Scale: AS SHOWN
Project No. 7360
Design: C.A.
Drawing No. 7360-1

GEC — g.i. gratton engineering consultants ltd. agricultural department — st. thomas ottawa pembroke

LEGEND

REVISIONS	DATE


MAIN DRAIN
RELOCATION STA. 0.00 TO 4+97
TYPICAL SECTION
4.0 D.B. 1:4 1:1 S.S.
STA. 36+97 TO 128+05 3.0' D.B. 1:1 S.S.
RELOCATE TO (C) TO
TRUNK "A"
STA. 0.00 TO 76.00 3.0' D.B. 1:1 S.S.
RELOCATION STA. 0.00 TO 4+97
EXISTING DITCH BOTTOM
TRUNK "B"
3.0' D.B. 1:1 S.S.
EXISTING DITCH BOTTOM
PROFILE
HORIZ. 1" = 400
VERT. 1" =
CINNAMON MUNICIPAL DRAIN
OSGOODE, MOUNTAIN & WINCHESTER TOWNSHIPS
PROJ. # 2360
LEGEND
D.J. drainage engineering consultants ltd.

X PROFILE

	ELEVATION	GRADE
MAIN	95-91	0.5' - 100'
	91-89.6	0.28 - 100'
95' - 82.56'	89.6-82.56	0.06-100'

TRUNK A.

91.22' - 84.84' 0.06'-100'

TRUNK B 96.6 - 88.5	96.6-92	0.30'-100'
	92-88.5	0.14'-100'

BM @ d/s outlet SW corner of bridge
91.39'

~~long~~ width ~~8.0 - 8.1~~ ✓

With ~~depth~~ ~~width~~ 20-8

depth ~~width~~ ~~depth~~ 2-6

By-law 10-73

ENGINEER'S REPORT

FOR THE REPAIR AND IMPROVEMENT OF THE

CINNAMON MUNICIPAL DRAIN

TOWNSHIPS OF WINCHESTER AND MOUNTAIN

Project #22107

A. J. Graham Engineering Consultants Ltd.
Suite 208
2277 Riverside Drive
Ottawa, Ontario
K1H 7X6

January 10, 1973
Revised February 19, 1973

January 10, 1973
Revised February 13, 1973

The Reeve and Members of Council
Township of Winchester
Morewood, Ontario

Gentlemen:

Report of the Proposed Repair and Improvements
To the Cinnamon Municipal Drain

In accordance with the request of Council dated August 4, 1972, we are pleased to submit our report under Sections 49 and 53 of the Drainage Act 1972 as amended, on the proposed Repair and Improvements to the Cinnamon Municipal Drain in lots 2 to 7, Concession 10 and lots 1 to 2, Concession 9, Township of Winchester.

Title:

This project shall be known as the Repair and Improvement of the Cinnamon Municipal Drain.

History:

We were not able to determine from the Township records the date that this project was originally constructed. However, the drain has been repaired and umproved under the provisions of reports submitted by D. H. Weir, C.E. in 1932 and again in 1946 under a report submitted by W. H. Magwood, M.E.I.C.

Inspection:

A visual inspection of the area indicated that considerable sedimentation had occured since the drain was last maintained. In several areas, the cattle had broken down the banks of the drain and impeded the flow.

Several culverts and timber bridges in the upper regions of the drain were in poor repair and require replacement.

Recommendations:

It is our recommendation that the drain be repaired and improved in accordance with the accompanying plan, profile and specifications dated January 10, 1973.
The drain commences in lot 1, Concession 9, Township of Winchester immediately east of Highway #31 and runs in a north easterly direction to the Township road allowance in lot 2 between Concessions 9 and 10. From this point, the drain flows east following the existing centreline inside the Township right-of-way to its eventual outlet in the Castor River.

The grade has been lowered to provide improved outlet for surface drainage, and an outlet for tile from the E. Pt. of lot 1 to lot 7, Concession 9 and 10, within the limits of the drainage basin.

Additional allowances have been made to the property owners in Con. 2 where the fence line is to be removed. This allowance is shown in Annex "B". The property owners indicated are to remove fence upon notification from the contractor.

Cost:

The cost of this drainage system has been estimated at $15,076.00 and is shown in detail in Annex "A" attached hereto.

Laterals:

It should be noted that the proposed drainage system herein reported, will not immediately improve all wet areas unless lateral drains are constructed by the individual property owners.

ALLOWANCES

Land or Crop Damage: Section 8(1) The Drainage Act

Allowances for land or Crop Damage as detailed in Annex "B", hereto will, in our opinion, adequately compensate the property owners indicated for land or crop damage, if any, caused by the construction of this drainage project.

Land Allowance: Section 8(8) The Drainage Act

Allowances for land, as detailed in Annex "C" hereto will, in our opinion, adequately compensate the property owner indicated for the land required for the construction or improvement of this Drainage Works.

BRIDGES OR CULVERTS

Road Culverts: Section 8(2) The Drainage Act

An existing 48" x 20' C.S.P. through the Township Road at station 98+34 of the Main Drain is insufficient both in size and elevation for its location on the drain. It is our recommendation that it be replaced by a 66" x 24' C.S.P. (12 gauge) installed one tenth its diameter below design grade.

In order to minimize the possibility of erosion and reduce the possibility of future maintenance expenditures, it is our recommendation that both ends of this culvert be rip-rapped.

Estimated Cost

Supply	$575.00
Install	192.00
Rip-Rap	140.00
Total	$907.00

The cost of this installation has not been included in the estimated cost, as it has been assumed that the Township of Winchester will accept this responsibility as part of its maintenance programme.

Access Culverts: Section 8(4) The Drainage Act

Access culverts as detailed in Annex "D" hereto, will be supplied by the Township of Winchester, installed by the Contractor and paid for by the Drain.

Future maintenance of these culverts will be the responsibility of the Township in which they are located.

Farm Crossings: Section 8(5) The Drainage Act

Farm crossings as detailed in Annex "E" hereto, will be supplied by the Township of Winchester, installed by the Contractor and paid for by the Drain.

Future maintenance of these culverts will be the responsibility of the respective property owners on whose lands they are installed.

Centreline:

Centreline for this project shall follow the existing centreline insofar as is practical.

Distribution of Costs:

The estimated costs for this construction are apportioned to the properties responsible for Benefit and Outlet as determined by their areas, locations and run-off.

The detailed estimated Schedule of Assessment is attached in Annex "F" hereto, together with estimated abatements of grant and allowances, and our estimate of the net cost to each landowner in this project.

Interest:

Interest has not been shown in the estimated cost as it is difficult to determine the rate and the term of the loan required by the Municipality.

Grants:

Under Sections 62, 64, 65 of the Drainage Act 1972, as amended, a Provincial Grant of 33 1/3% of the cost of the project, assessable to Agricultural Lands may be obtained.

A subsequent Federal A.R.D.A. Grant, administered through the Provincial Grant Administration Media, will further reduce Agricultural Assessments by another one-third.

Agricultural assessments are then payable two-thirds by Grant and one-third by property assessment.

Future Maintenance:

Future maintenance of this drainage project will be the responsibility of the respective township through which it passes. The cost of future maintenance will be apportioned to the property owners in the same relative proportions as in this report.

Future maintenance of the Mountain portion of the Main Drain, North Branch and South Branch shall be apportioned to the properties in the same proportions as the now current by-law.

ANNEX "G"

REV. A B

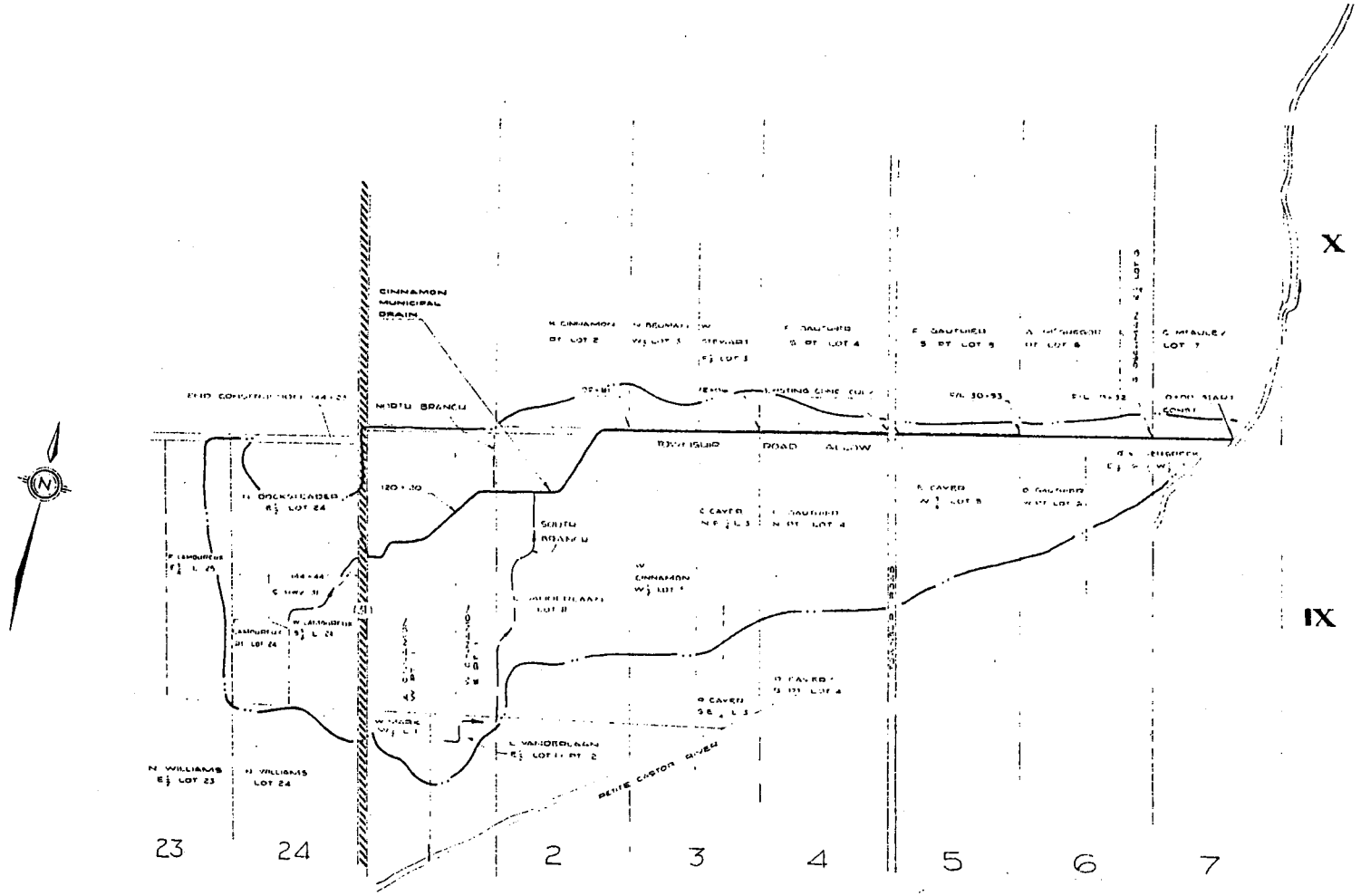
TOWNSHIP OF WINCHESTER

CINNAMON MUNICIPAL DRAIN

GEC

LEGEND

REVISIONS | DATE

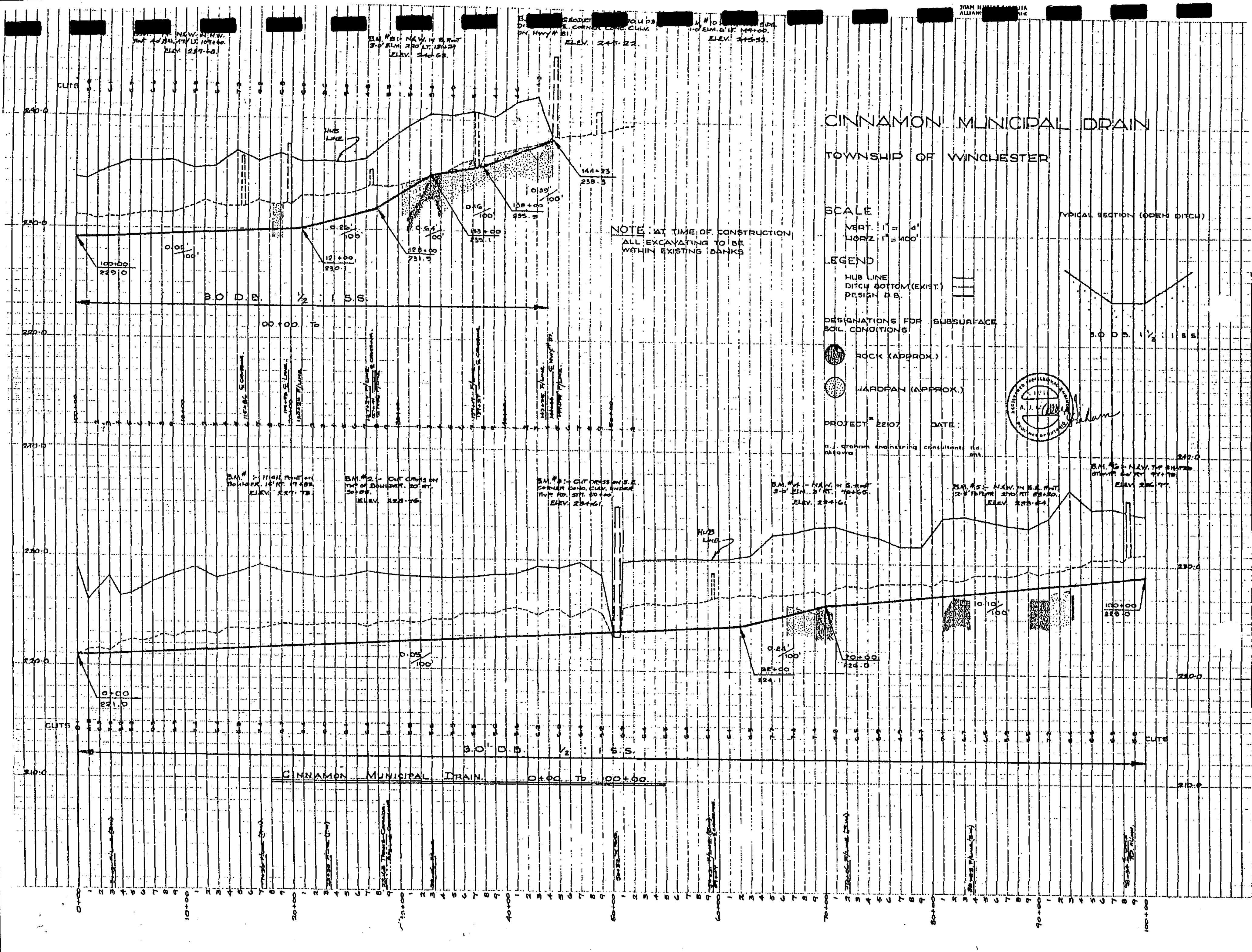


MOUNTAIN TOWNSHIP WINCHESTER TOWNSHIP

SCALE 1" = 800'

SOILS CLASSIFICATION:
SURROUNDING HEIGHTS PRIMARILY GRENVILLE LOAM, BASIN AREAS PRIMARILY NORTH GOWER CLAY

REFERENCE: MINISTRY OF AGRICULTURE SOILS SURVEY, S.D.G.


CINNAMON MUNICIPAL DRAIN
TOWNSHIP OF WINCHESTER
SCALE
VERT. 1" = 4'
HORIZ. 1" = 400'
LEGEND
HUB LINE
DITCH BOTTOM (EXIST.)
DESIGN D.B.
DESIGNATIONS FOR SUBSURFACE SOIL CONDITIONS
ROCK (APPROX.)
HARDPAN (APPROX.)
PROJECT # 22107
DATE:
a.j. graham engineering consultants ltd.
ottawa
ont.
TYPICAL SECTION (OPEN DITCH)
3.0 D.B. 1½ : 1 S.S.
NOTE: AT TIME OF CONSTRUCTION ALL EXCAVATING TO BE WITHIN EXISTING BANKS
3.0 D.B. ½ : 1 S.S.
00+00 To
CINNAMON MUNICIPAL DRAIN 0+00 To 100+00
CUTS
HUB LINE
B.M. #1:- 11 G11 POINT ON BOULDER, 15' RT. 17+02. ELEV. 227.73
B.M. #2:- CUT CROSS ON TOP OF BOULDER, 20' RT. 30+07. ELEV. 228.76
B.M. #3:- CUT CROSS ON S.E. CORNER CONC. CULV. UNDER TWP. RD. STN. 50+00. ELEV. 234.61
B.M. #4:- N.& W. IN S. ROOT 3.0' ELM. 3' RT. 70+65. ELEV. 234.61
B.M. #5:- N.& W. IN S.E. ROOT 2.5' TAMAR. 270' RT. 88+80. ELEV. 233.64
B.M. #6:- N.& W. T.P. SHAPED OTTAWA 60' RT. 97+70. ELEV. 226.77
B.M. #8:- N.& W. IN S. ROOT 3.0' ELM. 220' LT. 131+21. ELEV. 240.63
ELEV. 237.60
ELEV. 241.22
ELEV. 246.53
0+00 221.0
0.05'/100'
62+00 224.1
0.26'/100'
70+00 226.0
0.10'/100'
100+00 228.0
100+00 229.0
0.05'/100'
121+00 230.1
0.26'/100'
128+00 231.5
0.64'/100'
133+00 233.1
0.16'/100'
138+00 235.5
0.39'/100'
144+23 238.3
240.0
230.0
220.0
210.0
0+00
10+00
20+00
30+00
40+00
50+00
60+00
70+00
80+00
90+00
100+00

ANNEX "A"

ESTIMATED COSTS

Construction:

Earth Excavation and Spreading	7969 c.y.	$6,432.00	
Hardpan Excavation	102 c.y.	256.00	
Farm Crossings		1,240.00	
Access Crossings		808.00	
Brushing (Lump Sum)		615.00	
Total Construction Estimate		$9,351.00	$ 9,351.00

Allowances:

Land or Crop Damage	$1,222.00	
Land Allowance	606.00	
	$1,828.00	1,828.00

Administration:

Contingencies	$ 792.00	
Engineer's Fees (Survey, Plan and Report)	1,950.00	
Clerk's Fees	300.00	
Printing of Report and By-law	80.00	
Attend Reading of Report	75.00	
Attend Court of Revisions	100.00	
Tender Call	100.00	
Administration of Contract	500.00	
	$3,897.00	3,897.00
Estimated Cost		$15,076.00

ANNEX "B"

Land or Crop Damage: Section 8(1) The Drainage Act

Township of Winchester

Con.	Lot	Name	Allowance
9	W½, 7	G. Verspeek	88.00
9	E½, 6	G. Verspeek	90.00
9	W. Pt. 6	O. Gauthier	89.00
9	2	L. Vanderlaan	268.00
9	E. Pt. 1	W. Cinnamon	99.00
9	W. Pt. 1	A. Cinnamon	54.00
10	S. Pt. 5	F. Gauthier	120.00
10	W½, 3	N. Beuman	89.00
10	Pt. 2	K. Cinnamon	40.00

Allowance for Fence Removal

10	S. Pt. 5	F. Gauthier	155.00
10	W½, 3	N. Beuman	~~80.00~~
10	Pt. 2	K. Cinnamon	~~50.00~~
		TOTAL	$1,222.00

ANNEX "C"

Land Allowance: Section 8(8) The Drainage Act

Township of Winchester

Con.	Lot	Name	Allowance
9	2	L. Vanderlaan	319.00
9	E. Pt. 1	W. Cinnamon	96.00
9	W. Pt. 1	A. Cinnamon	191.00
		TOTAL	606.00

ANNEX "D"

Access Culverts: Section 3(4) The Drainage Act

Township of Winchester

Con.	Lot	Station	Size	Name	Cost
9	2	119+93	Extension 48"x6' (12 ga.)	L. Vanderlaan	$290.00
9	E.Pt. 1	127+29	48" x 20' (12 ga.)	W. Cinnamon	518.00
				TOTAL	$808.00

Estimated Cost includes Rip-Rap both ends.

ANNEX "E"

Farm Crossings: Section 8(5) The Drainage Act

Township of Winchester

Con.	Lot	Station	Size	Name	Cost
9	N.Pt. 4	59+47	72" x 20' (12 ga.)	F. Gauthier	742.00
9	2	115+86	48" x 20' (12 ga.)	L. Vanderlaan	498.00
				TOTAL	$1,240.00

Estimated Cost includes Rip-Rap both ends.

ANNEX "F"

SCHEDULE OF ASSESSMENT

CINNAMON MUNICIPAL DRAIN

TOWNSHIPS OF WINCHESTER AND MOUNTAIN

Con.	Lot	Name	Estimated Acres Assessed	MAIN DRAIN Benefit	MAIN DRAIN Outlet	Estimated Total Assessment	Estimated Cost Less Est. Grant	Allowances 8(1)	Allowances 8(8)	Estimated Net Cost
	Township of Winchester									
10	7	C. McAuley ✓	5	250.00	-	250.00	76.40			76.40
10	E½, 6	~~G. Oschman~~	3	200.00	2.00	202.00	61.73			61.73
10	Pt. 6	A. McGregor ✓	10	350.00	8.00	358.00	109.90			109.90
10	S.Pt. 5	~~F. Gauthier~~ H DOORNBOS	10	575.00	20.00	595.00	181.83	275.00		93.17
10	S.Pt. 4	~~F. Gauthier~~ A GERN	20	400.00	37.00	437.00	133.54			133.54
10	E½, 3	~~W. Stewart~~ ART KERR	10	200.00	20.00	220.00	67.23			67.23
10	W½, 3	~~N. Beuman~~ B CUMMINGS	10	200.00	20.00	220.00	67.23			67.23
10	Pt. 2	K. Cinnamon	26	225.00	50.00	275.00	84.04			84.04
9	W½, 7	G. Verspeek ✓	10	250.00	-	250.00	76.40	88.00		11.60
9	E½, 6	G. Verspeek ✓	10	250.00	6.00	256.00	78.23	90.00		11.77
9	W.Pt. 6	~~G. Gauthier~~ H. DOORNBOS	20	450.00	16.00	466.00	142.31	89.00		53.31
* 9	W 3/4, 5	~~E. Coyer~~ (R. COYER)	59	900.00	59.00	959.00	293.07			163.96
9	N.Pt., 4	~~F. Gauthier~~ A GERN	112	1,375.00	207.00	1,582.00	483.05			483.05
9	N.E.¼, 3	~~E.~~ CLIDE Coyer (Gordon)	59	485.00	113.00	598.00	182.21			182.21
9	W½, 3	~~JOHN~~ K. Cinnamon	~~63~~ 46	784.00	122.00	906.00	276.37			276.37
9	2	L. Vanderlaan	141	2,691.00	351.00	3,042.00	931.09	268.00	319.00	344.09
9	E.Pt. 1	~~J. W.~~ Cinnamon	66	1,012.00	215.00	1,227.00	374.97	99.00	96.00	179.97
9	W.Pt. 1	~~B.~~ Cinnamon	134	1,130.00	543.00	1,673.00	511.26	54.00	191.00	266.26
8	2	L. VanderLaan ✓	3		5.00	5.00	1.52			1.52
8	E. Pt. 1	L VanDerLaan ✓	17		40.00	40.00	12.22			12.22
8	W. Pt. 1	W. Mark ✓	33		83.00	83.00	25.36			25.36
	Twp. Road Allow. Bet. Con. 9 & 10		20		65.00	65.00	59.59			59.59
	Twp. Road Bet. Lots 4 & 5		2		15.00	15.00	13.75			13.75
	Kings Highway #31		12		333.00	333.00	305.29			305.29
	SUB-TOTAL - Carried Forward			$11,727.00	2,330.00	14057.00	4149.75	1192.00	606.00	

*notices sent to:
R. Coyer 26 ac - 129.11
F. Gauthier 33 - 163.96 pd.

Amended to dec. 1, 1917

ANNEX "F" (Cont'd)

SCHEDULE OF ASSESSMENT

CINNAMON MUNICIPAL DRAIN

TOWNSHIPS OF WINCHESTER AND MOUNTAIN

Con.	Lot	Name	Estimated Acres Assessed	MAIN DRAIN Benefit	MAIN DRAIN Outlet	Estimated Total Assessment	Estimated Cost Less Est. Grant	Allowances 8(1)	Allowances 8(8)	Estimate Net Cost
SUB-TOTAL - Brought Forward				$11,727.00	2,330.00	~~14057.00~~	4169.75	1,222.00	606.00	
Township of Mountain										
9	E½, 24	N. Docksteader	75		347.00	347.00	106.00			106.00
9	Pt. 24	F. Lamoureux	25		116.00	116.00	35.44			35.44
9	S 3/8, 24	W. Lamoureux	75		347.00	347.00	106.00			106.00
9	E 3/8, 23	F. Lamoureux	33		153.00	153.00	46.75			46.75
8	24	N. Williams	12		56.00	56.00	17.11			17.11
			1,078 ac.	$11,727.00	3,349.00	15,076.00	4481.05	1092.00	606.00	311.30

SUMMARY OF THE WORK

Physical Description

Total Area Assessed 1,073 Acres (Approx.)
Length of Drain 14,500 ft. (Open)

Construction	$ 7,303.00
Allowances	1,822.00
Survey, Plan and Report	1,950.00
Bridges and Culverts	2,048.00
Administration	1,953.00
TOTAL	$15,076.00

SUMMARY OF ASSESSMENT

Lands

1. Publicly-Owned

(i)	Ontario	$333.00
(ii)	Municipal	$ 80.00

2. Privately-Owned

(i)	Used for Agricultural Purposes	$14,663.00

Estimated Provincial Grant of 33 1/3%	=	$4,887.66
Estimated Federal A.R.D.A. Grant of 33 1/3%	=	$4,887.66
Estimated Assessment to Agricultural Lands	=	$4,887.68

SPECIAL PROVISIONS

CINNAMON MUNICIPAL DRAIN

TOWNSHIPS OF WINCHESTER AND MOUNTAIN

Project 22107

A. J. Graham Engineering Consultants Ltd.
Suite 208
2277 Riverside Drive
Ottawa, Ontario
K1H 7X6

January 10, 1973
Revised February 19, 1973

(C) SPECIAL PROVISIONS:

(i) Construction is to take place within the existing ditch banks.

(ii) Material excavated between stations 50+50 to 82+54 is to be spread evenly on the road allowance.

(iii) Farm crossing station 137+27 to remain in place.

(iv) Farm crossings and access culverts are to be Rip-Rapped both ends.

(v) Access culvert station 119+93 is to be lowered and extended an additional 6 feet. Payment for lowering to be included in unit price bid for installation of access culverts.

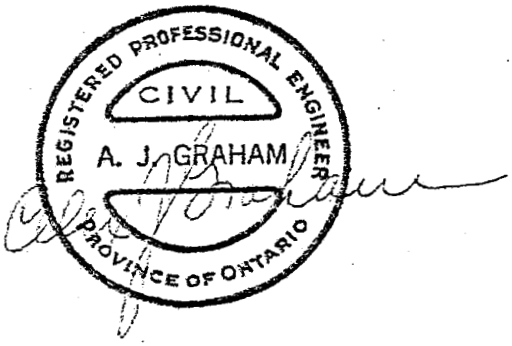
(vi) All brush and branches are to be placed in piles and then burned by the contractor. Necessary permits must be obtained by the contractor. Payment for this work to be included in the tender item "Brushing".

(vii) Property owners are to remove fence line right of drain between stations 30+53 to 50+50 and 82+54 to 98+00. The contractor is to alert property owners responsible for removing the fence prior to the commencement of work in these locations.

Plans, Profiles and Specifications:

The plans, profiles and special provisions form a part of this report and are attached in Annex "G". The construction of this drainage project shall be in accordance with the Specifications which are available for reference at the Township Offices.

Respectfully submitted this 10th day of January 1973. and revised February 19, 19



June 20, 2002
File No. B1905

Mr. Richard Pilon
Water Resources Engineer
The South Nation River Conservation Authority
15 Union Street
Berwick, Ontario
KOC 1GO

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. Pilon:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

i) Hydrogeological Assessment
ii) Natural Environment Assessment
iii) Cultural Heritage Resource Assessment
iv) Noise Assessment
v) Blast Design Report

At this point, WESA would like to notify your agency of the proposed expansion and request any and all information you may have about the site and surrounding area. Specifically, the SNRCA has previously provided fish classification information for local drainage ditches and information regarding other classified lands in our project areas. In this case, we are particularly interested in information regarding the Cinnamon Drain and the Winchester Bog, if available. The information that is collected during this Level 1 Assessment period will be used to identify possible sources of impact of the proposed quarry on the local environment (and vise vera) and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to psmith@wesa.ca or by mail to the address listed below.

Philippa Smith
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

Ref:B1905jn10-02f.doc

SOUTH NATION
CONSERVATION
DE LA NATION SUD
613-984-2948

July 4, 2002

Water and Earth Science Associates Ltd
3108 Carp Road, Box 430
CARP, ON
K0A 1L0

ATTN: Phillippa Smith, B. Sc.

Dear Phillippa,

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Enclosed you will find information on the Cinnamon Drain that the South Nation Conservation has collected.

If you have any questions, please do not hesitate to call.

Yours truly,

Debbie Baker

Debbie Baker,
Planning and Engineering
Administrative Assistant.

DB/

Encl.

Municipal Drain Classification

Date June 21/01 Data Collectors Chantale Lauzon, Norm Langlois

Township Winchester Drain Name Cinnamon

Sampling Location Cayer

Adjacent Landowners unknown

Drain Super. _____ Sub-Watershed Petit Castor River

Map Must Be Attached Depth Measurement (nearest pool): < 15cm

Flow: intermittent Date Flow Checked June 21/01

Suitable Pike Spawning Habitat no, not enough cover

Fish Sampling Method Used — Date of Fish Sampling —

In-stream Cover grasses

Bank Cover grasses, burdock, elm, Ash

Substrate clay

General Land Use Crops

Comments There is evidence of a muskrat living in the drain. There is also evidence that water levels increase dramatically in the spring given the size of the culvert + the debris on the banks.

Fish Captured (indicate sampling method, date):

Species	Adult #	YOY #

Top Predators: (circle)

Brook Trout
Brown Trout
Walleye
Northern Pike
Muskellunge
Yellow Perch
Black Crappie
Largemouth Bass
Smallmouth Bass
Rock Bass

COMMENTS: (observations: disease, tumors, breeding colors, health, etc...)

Thermal Regime

Drain Name: Shannon Location: _____

_____

Thermometer Identifier: _____ Sampler: _____

Date Thermometer Set: _____ Air Temperature _____

Date Thermometer Read _____ Thermometer Adjustments: _____

Max. Water Temp.: _____ °C

Min. Water Temp.: _____ °C

% Cover: _____

Site Description / Comments: _____

_____

_____

_____

NRVIS (compressed)

Impoundments: Beaver, natural or man-made, etc... none observed

Uses: Baitfish, recreation, hydro power, etc... drainage

Stresses: 1) yes or no
2) level: low, moderate or severe
3) Extent: local or widespread

Artificial barriers no	Invasive Species no	Water Level Flows yes
Cattle access no	Non point source pollution no	Water Level Fluctuations yes
Contaminants no	Overexploitation no	Water Taking no
Deforestation yes, m, w	Point Source pollution no	Winter Kill no
Erosion/sedimentation yes, m, l	Shoreline Alteration ~~yes~~ channelized	Other/ Comments:
Eutrophication no	Timber Harvesting no	
Forest fire events no	Water Crossings yes, culvert	

Exotic Species: Purple Loosestrife, European Frogbit, Flowering Rush, Eurasian Watermilfoil, Curly Pondweed, Zebra Mussels, Three-spine Stickleback, etc....

Presence: none observed

Municipal Drain Sampling - Incidental Catch

Indicate if sample preserved for later identification.

SPECIES	CAPTURE METHOD	NUMBER	COMMENTS
riffle beetle	observed	2	golden color 2 cm length

Municipal Drain Observations: degree of potential for naturalization

Channel Form: riffle/pool sequence? no, channelized

Bank Integrity: erosion, slope, ... banks eroded, thick clay

Sediments/ Turbidity: thick clay sediments

Flow Rate: slow flow

Over-head Cover: very little, mainly grasses, some shrubs < 5%

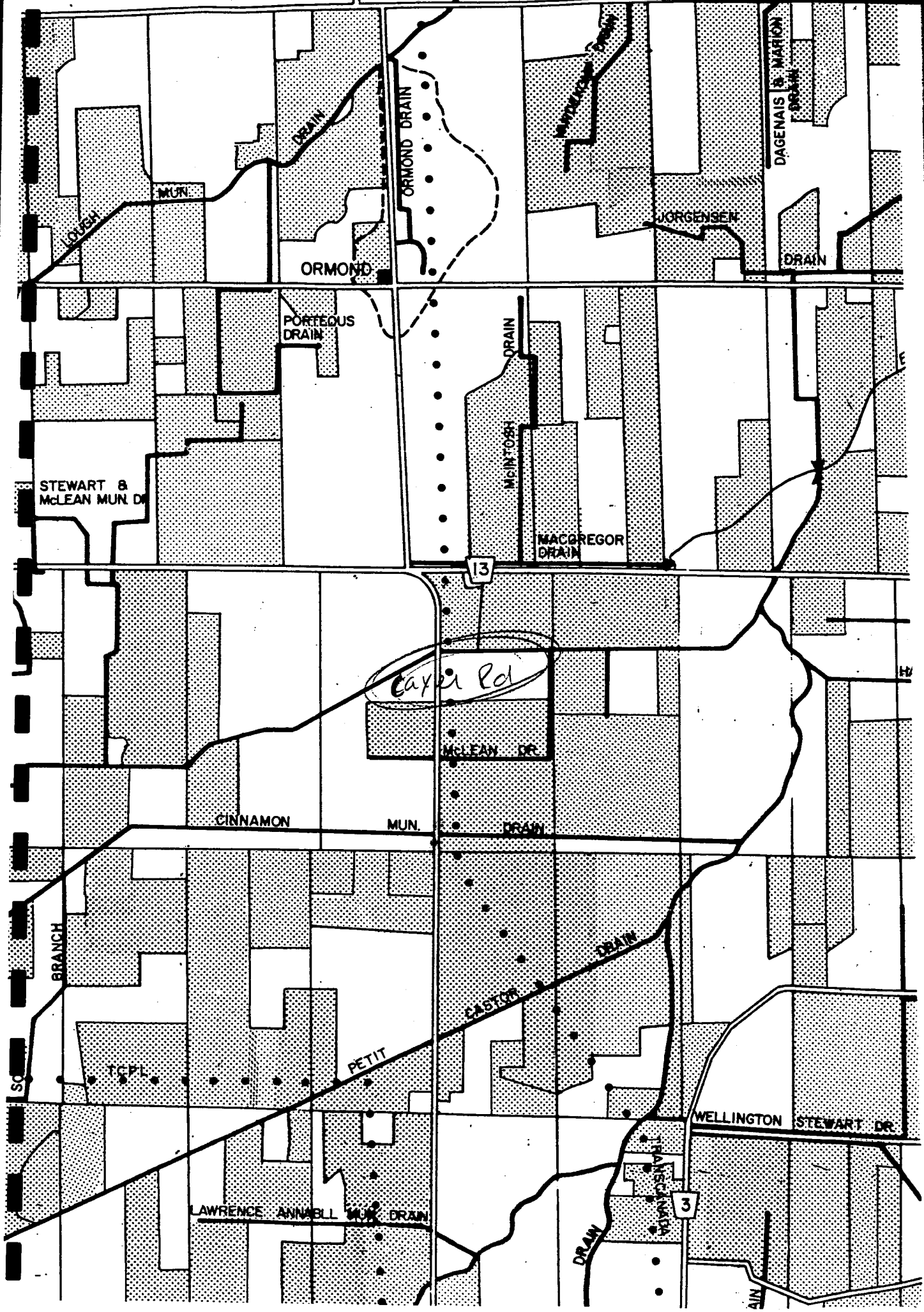
Culvert: size, placement, perched,... huge box cement culvert 6 metres wide

Tile Outlets: several observed, some flush to ground, others have signs of erosion

Protection Measures: cattle fencing, rip-rap, ... none observed

Drain Maintenance: last clean-out? 1993-99

Other:


DRAIN
MUN
LOUGH
ORMOND DRAIN
ORMOND
DAGENAIS & MARION DRAIN
JORGENSEN
DRAIN
PORTEOUS DRAIN
DRAIN
McINTOSH
STEWART & McLEAN MUN. DR.
MACGREGOR DRAIN
13
Cayer Rd
McLEAN DR.
CINNAMON
MUN.
DRAIN
BRANCH
CASTOR
DRAIN
PETIT
T.C.P.L.
WELLINGTON STEWART DR.
TRANSCANADA
3
LAWRENCE ANNABELL MUN. DRAIN
DRAIN

October 7, 2002
File No. B1905

Mr. Richard Pilon
Water Resources Engineer
The South Nation River Conservation Authority
15 Union Street
Berwick, Ontario
KOC 1GO

Re: Preliminary Assessment for Quarry Expansion Application
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 3, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. Pilon:

For your information a review of our files has revealed that although the existing quarry operation is found on Lot 3, Con. 9, Twp. of North Dundas (formerly Winchester Twp.). The expansion of this quarry operation will extend onto land that is formally located on part of Lot 2, Concession 9, Twp. of North Dundas (formerly Winchester Twp.). If this information highlights any concerns or additional information that your department might have in regards to this application, please contact me at the number listed below. Alternatively, you may also forward any information by e-mail to tsugarman@wesa.ca or by mail to the address listed below.

Tami J. Sugarman
3108 Carp Road, P.O. Box 430
Carp, Ontario
K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905LetOct-02.doc

June 20, 2002
File No. B1905

Mr. Calvin Pol
Township of North Dundas
P. O. Box 489
547 Lawrence Street
Winchester, Ontario
KOC 2KO

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Mr. Pol:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

i) Hydrogeological Assessment
ii) Natural Environment Assessment
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iv) Noise Assessment
v) Blast Design Report

At this point, WESA would like to notify the Municipality of the proposed expansion and request any and all information you may have about the site and surrounding area. The information that is collected during this Level 1 Assessment period will be used to identify possible sources of impact of the proposed quarry on the local environment (and vise vera) and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to psmith@wesa.ca or by mail to the address listed below.

Philippa Smith
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

Ref:B1905jn18-02a.co/ps61

October 7, 2002
File No. B1905

Mr. Calvin Pol
Township of North Dundas
P. O. Box 489
547 Lawrence Street
Winchester, Ontario
KOC 2KO

Re: Preliminary Assessment for Quarry Expansion Application
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 3, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry

Dear Mr. Pol:

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Tami J. Sugarman
3108 Carp Road, P.O. Box 430
Carp, Ontario
K0A 1L0

Phone: (613) 839-3053 ext.229

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905LetOct-02.doc

WESA
A Better Environment For Business

Water and Earth Science Associates Ltd.
3108 Carp Rd, Box 430, Carp (Ottawa)
Ontario Canada K0A 1L0
Telephone: 613-839-3053
Fax: 613-839-5376
E-mail: wesacarp@wesa.ca

FACSIMILE COVER SHEET

DATE: October 11, 2002

FAX NO: **(613) 774-5699**

TO: Mr. Calvin Pol
Township of North Dundas

PROJECT #: **B1905**

SUBJECT: **Vandeermere (Cinnamon/Winchester) Quarry Expansion**
A. L. Bruce Construction

MESSAGE:

Dear Mr. Pol:

Please find attached a map of the quarry expansion area. I understand through conversations with Mr. Bryan Blanshard, A. L. Bruce Construction, that you are aware of this expansion application. WESA has already contacted you by letter on June 20, 2002 and I apologize that no figure was included at that time. My letter of October 7, 2002 was to clarify that although the existing quarry is on Part Lot 3, Con. 9, the expansion will proceed into Part of Lot 2, Con. 9, a point that was not evident in the June 20, 2002 correspondence. Mr. Blanshard and WESA are aware of the zoning change that will be necessary for this application. I understand that those details are being discussed between Mr. Blanshard and your office. I apologize for any confusion. If you have any additional questions or concerns please do not hesitate to contact me.

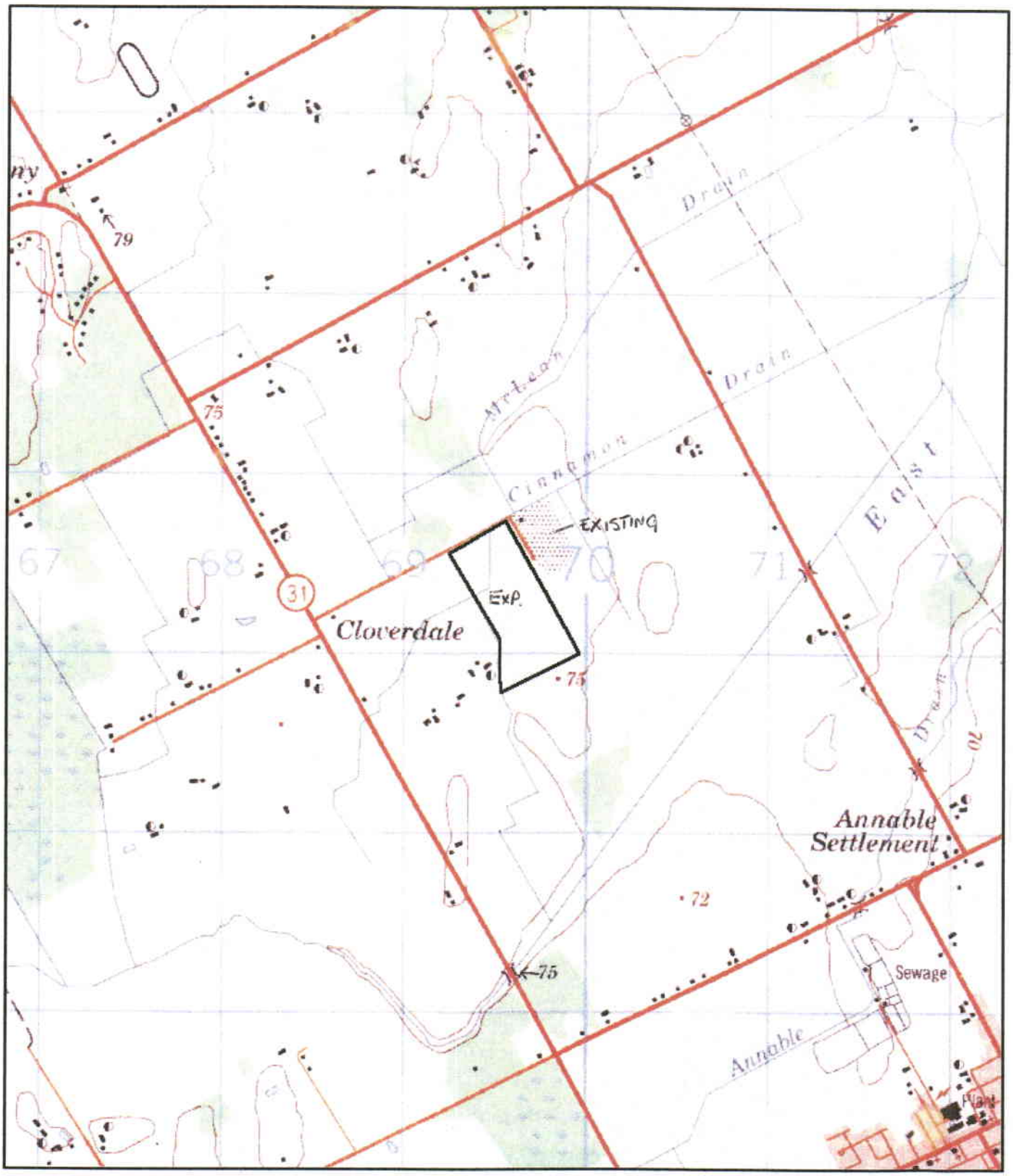
Regards,

Tami J. Sugarman, B.Sc.
Hydrogeologist

FROM:

Total pages transmitted, including cover sheet: 2
If all pages are not received, please call 613-839-3053.

Originals to follow? by Mail ☐
by Courier ☐
by E-mail ☐
No ☑


79
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Annable
Plant

TRANSMISSION VERIFICATION REPORT

TIME : 10/11/2002 10:01
NAME : WESA CARP
FAX : 16138395376
TEL : 16138393053

DATE,TIME	10/11 10:01
FAX NO./NAME	16137745699
DURATION	00:00:48
PAGE(S)	02
RESULT	OK
MODE	STANDARD ECM

WESA
A Better Environment For Business

Water and Earth Science Associates Ltd.
3108 Carp Rd, Box 430, Carp (Ottawa)
Ontario Canada K0A 1L0
Telephone: 613-839-3053
Fax: 613-839-5376
E-mail: wesacarp@wesa.ca

FACSIMILE COVER SHEET

DATE: October 11, 2002

FAX NO: **(613) 774-5699**

TO: Mr. Calvin Pol
Township of North Dundas

PROJECT #: **B1905**

SUBJECT: **Vandeermere (Cinnamon/Winchester) Quarry Expansion**
A. L. Bruce Construction

MESSAGE:

Dear Mr. Pol:

Please find attached a map of the quarry expansion area. I understand through conversations with Mr. Bryan Blanshard, A. L. Bruce Construction, that you are aware of this expansion application. WESA has already contacted you by letter on June 20, 2002 and I apologize that no figure was included at that time. My letter of October 7, 2002 was to clarify that although the existing quarry is on Part Lot 3, Con. 9, the expansion will proceed into Part of Lot 2, Con. 9, a point that was not evident in the June 20, 2002 correspondence. Mr. Blanshard and WESA are aware of the zoning change that will be necessary for this application. I understand that those details are being discussed between Mr. Blanshard and your office. I apologize for any confusion.

TOWNSHIP OF
North Dundas

October 16, 2002

Water and Earth Science Associates Ltd.
3108 Carp Road, P.O. Box 430
Carp, Ontario K0A 1L0

Attention: Tami J. Sugarman, Hydrogeologist

Dear Ms. Sugarman:

Subject: **Preliminary Assessment for Quarry Expansion Application**
Cinnamon (Vandeermere) Quarry, License No. 5753
Part Lot 3, Concession 9, Twp. of North Dundas (formerly Twp. of Winchester)
United Counties of Stormont, Dundas and Glengarry
Your File No. B1905

In response to your letter dated October 7th, 2002, please be advised that the subject property is not zoned for a quarry, thus, requiring a zoning amendment. Also, an amendment to the former Township of Winchester Official Plan will be required should you wish to proceed before the County Official Plan is approved.

If you have any questions, please contact me at (613) 774-2105.

Yours sincerely,

Calvin Pol, BES, RPP, MCIP
Zoning Administrator

CP/js

P.O. Box 489, 547 St. Lawrence Street, Winchester, Ontario K0C 2K0
Tel. (613) 774-2105 Fax (613) 774-5699

June 20, 2002
File No. B1905

Mr. Dave Willis
The Ministry of Natural Resources
Aggregate Division
P. O. Box 2002, Concession Road
Kemptville, Ontario
KOG 1JO

RE: Environmental Assessment for Quarry Expansion
Cinnamon Quarry, License No. 5753
Part of Lot 3, Concession 9 within the Township of North Dundas

Dear Dave:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct an environmental assessment of the property located on Part of Lot 3, Concession 9 within the Township of North Dundas. A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

i) Hydrogeological Assessment
ii) Natural Environment Assessment
iii) Cultural Heritage Resource Assessment
iv) Noise Assessment
v) Blast Design Report

At this point, WESA would like to notify your agency of the proposed expansion and request any and all information you may have about the site and surrounding area. In particular, we anticipate that the Ministry Biologist may have some information about the surface water drainage ditches in the area. The information that is collected during this Level 1 Assessment period will be used to identify possible sources of impact of the proposed quarry on the local environment (and vise vera) and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to psmith@wesa.ca or by mail to the address listed below.

Philippa Smith
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053
Cell: (613) 290-1244

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Philippa Smith, B.Sc.
Hydrogeologist

Ref:B1905jn19-20b.doc

October 7, 2002
File No. B1905

Mr. Shaun Thompson
District Ecologist
Kemptville District
Ministry of Natural Resources
Kemptville, Ontario
KOG 1JO

Re: Natural Environment Level 1 Assessment for Quarry Expansion
Cinnamon (Vandeermere) Quarry, License No. 5753
Parts of Lots 2 and 3, Concession 9 within the Township of North Dundas

Dear Mr. Thompson:

WESA (Water and Earth Science Associates Ltd) has been retained by A.L. Blair Construction Ltd. to conduct a technical assessment of the property located on Part of Lot 2, Concession 9 within the Township of North Dundas (formerly Winchester Township). A.L. Blair Construction Ltd. is proposing an expansion of the Cinnamon (Vandeermere) Quarry site to include this property; located immediately west of the existing quarry. Based on a preliminary review of the water level data from the area, the license expansion would proceed as a Category 2 – Class A *Quarry Below Water a*pplication. The following technical reports are therefore required for this expansion:

i) Hydrogeological Assessment
ii) Natural Environment Assessment
iii) Cultural Heritage Resource Assessment
iv) Noise Assessment
v) Blast Design Report

At this point, WESA would like to notify your agency of the proposed expansion and request any and all information you may have about the natural environment of the site and surrounding area (120 metres radius). Information pertaining to significant wildlife (animal and fish) habitat, habitat/occurrences of vulnerable, threatened of endangered species, significant wetlands, significant woodlands, significant valley lands and significant areas of natural and scientific interest or ANSI is required. The information that is collected during this initial assessment period will be used to identify possible sources of impact of the proposed quarry on the local natural environment and will be used to determine whether a more detailed on-site investigation (Level 2) should proceed. The collection of all available information at this point is a vital first step in the quarry expansion application process to ensure that the site is developed in an environmentally acceptable manner.

If you have any questions regarding this letter or wish to contact me with any information that you may have, please contact me at one of the numbers listed below. Alternatively, you may also forward any information by e-mail to tsugarman@cyberus.ca or by mail to the address listed below.

Tami J. Sugarman
P.O. Box 430
3108 Carp Road
Carp (Ottawa), ON
K0A 1L0

Phone: (613) 839-3053 ext. 229

On behalf of A.L. Blair Construction Ltd., I would like to thank you in advance for your assistance in this task. I look forward to hearing from you in the near future.

Sincerely,

Tami J. Sugarman, B.Sc.
Hydrogeologist

Ref:B1905LetOct04-02b.doc

WESA
A Better Environment For Business

Water and Earth Science Associates Ltd.
3108 Carp Rd, Box 430, Carp (Ottawa)
Ontario Canada K0A 1L0
Telephone: 613-839-3053
Fax: 613-839-5376
E-mail: wesacarp@wesa.ca

TELEPHONE LOG – FILE NO. B1905

DATE: October 22, 2002

TIME: 4:25 pm

FROM: Shawn Thompson – Biologist with MNR

RE: Vandeermere/Cinnamon Quarry

Checked Vandeermere/Cinnamon Quarry with regards to:

1) Significant value lands (usually in valleys) – no problem with proposed site

2) Significant woodlands - no problem with proposed site
   – **but** should also check with Official Plan of Township to see if they have any designated sites in the area.
   (this is not a municipal jurisdiction)

3) With regards to endangered / significant and sensitive species, ANSI and wetlands – no problem with proposed site.

He will send letter and e-mail once he collects information from Scott Smithers.

Ref: B1905 Oct22-02 Telephone Log.doc

WESA
A Better Environment For Business

Water and Earth Science Associates Ltd.
3108 Carp Rd, Box 430, Carp (Ottawa)
Ontario Canada K0A 1L0
Telephone: 613-839-3053
Fax: 613-839-5376
E-mail: wesacarp@wesa.ca

TELEPHONE LOG - FILE NO. B1905

DATE: November 20, 2002

TIME: 4:05 pm

FROM: Shawn Thompson

RE: Vandeermere Quarry – Cinnamon Drain

Conversation with MNR biologist about Cinnamon Drain classification in regards to fish habitat. MNR stated that,

- MNR have not tested creek for fish species
- unclassified or undefined from their perspective
- as far as MNR is concerned there are no indications from their files that any fish habitat the Cinnamon Drain.
- MNR has no concerns with proposed project.

Ref: B1905 Nov20-02 Telephone Log.doc

Tami Sugarman

From: shaun.thompson@mnr.gov.on.ca
Sent: Wednesday, December 18, 2002 4:05 PM
To: tsugarman@wesa.ca
Subject: FW: Natrual Environment Level 1 Assessment for Cinnamon Quarry

> -----Original Message-----
> From: Thompson, Shaun (MNR)
> Sent: December 18,2002 3:37 PM
> To: 'tsugarman@cyberus.ca'
> Subject: Natrual Environment Level 1 Assessment for Cinnamon Quarry
>
> Dear Tami,
>
> As promised I am sending you this brief note for your file reiterating
> comments from our office regarding natural environment information for the
> Cinnamon Quarry expansion area, Part Lots 2&3 , Concession 9, North Dundas
> Township (formerly Winchester).
>
> As discussed over the phone, staff checked the area for information on
> file relating to wetlands, ANSI, rare species and known fish habitat
> related values.
>
> There was no information indicating any information relating to the above
> values known for the study area and its vicinity.
>
> Please contact us again if you have further questions or requests.
>
> Sincerely,
>
> Shaun Thompson
> District Ecologist
> Kemptville District
> Ministry of Natural Resources
>
> Tel. (613) 258-8235

APPENDIX I

Ken Swayze
Stage 1 and Stage 2 Archeological Assessment - Report

CIF P039-05

WESA Project B1905

A STAGE 1&2 ARCHAEOLOGICAL ASSESSMENT OF PART OF LOT 2 CONCESSION 9 WINCHESTER TOWNSHIP (GEO) UNITED COUNTIES OF STORMONT DUNDAS & GLENGARRY VANDEERMERE QUARRY

prepared for: Ms Tami Sugarman, Consultant
Water and Earth Sciences Associates Ltd.
3108 Carp Road
P.O. Box 430, Carp Ontario K0A 1L0
Tel.: (613) 839-3053 ext. 229 Fax.: (613) 839-5376

prepared by: Ken Swayze
Archaeological Consultant (Lic. # P039)
R. R. # 5 Cobden, Ontario K0J 1K0
Tel.: (613) 791-4391 Fax.: (613) 646-2700

July 4 2003

TABLE OF CONTENTS

LIST OF FIGURES

Summary: K. Swayze CIF P039-05 WESA Project B1905 July 4 2003

A STAGE 1&2 ARCHAEOLOGICAL ASSESSMENT OF PART OF LOT 2 CONCESSION 9 WINCHESTER TOWNSHIP (GEO) UNITED COUNTIES OF STORMONT DUNDAS&GLENGARRY VANDEERMERE QUARRY

In late April 2003, Ken Swayze, a licenced archaeological consultant, was asked by Ms Tami Sugarman, of Water and Earth Science Associates Ltd., Carp (WESA), to prepare a Stage 1&2 archaeological assessment part of lot 2 concession 9 Winchester Township (Dundas Co. Geo), United Counties of Stormont Dundas and Glengarry as *per* the *Archaeological Assessment Technical Guidelines: stage 1 to 3* produced by (OMCL. The 'Vandeermere Quarry', is approximately 24 ha (60 A) and is located about 3 km northwest of the town of Winchester. A.L. Blair Construction Ltd. have proposed to expand their existing quarry (on lot 3) westward onto this property. Because some archaeological sites have been recorded in the vicinity and because the proposed Vandeermere quarry has a well drained situation overlooking an upper tributary of the East Castor River, OMCL has called for an archaeological assessment prior to excavation.

A Stage 1 assessment is a review of surficial geology, post-glacial landscape evolution, historical land use and present condition, and previous archaeological studies—as interpreted through the eyes of an archaeologist. The objective of the Stage 1 review is to develop at an informed opinion about the archaeological potential of a the property. A Stage 2 archaeological assessment is a field test to determine the presence or absence of archaeological material, features, or human remains in a specified area—except where poor drainage, exposed bedrock, *etc.* prohibit—particularly sectors estimated to have moderate or high archaeological potential. Another objective, if field results are 'positive' for cultural material, is to determine, the extent, cultural affiliation, and condition of the deposit. The principal method of field assessment in this case was 'pedestrian survey' of cultivated fields. The Ministry's technical guidelines stipulate that previously cultivated land in the proposed development area must be recultivated to allow pedestrian survey.

With the permission of Bryan Blanshard, of A.L. Blair Construction Ltd., the writer carried out the pedestrian survey over four days (May 2nd, 3rd, 9th, 10th). The first appraisal was conducted in rainy weather, when observation conditions are best, and the second after a rainy interval. The crew consisted of Marc Larivée, Carmen Bauer, and Jarrod Goldsmith and their field work was directed by Ian Badgley and the writer.

The terrain of the vicinity is clay plain which surround drumlinized north-south oriented till deposits. Many of the larger islands of till are bordered by equally large deposits of peat, marl, and muck. The excavation of the Vandeermere Quarry expansion property, a rectanguloid parcel approximately 800 x 380 m is typical of this terrain. The central eastern part is dominated by a crested drumlin, aligned north-south, and the southern third is composed of another till deposit of slightly less relief, which overlooks a large bog , and a canalized first-order stream forms the south-western border of the excavation area and cuts diagonally across the northwest corner, through flat clay plain terrain. The parcel ranges in elevation from 71.9 to 77.5 m a.s.l., on the crest of the drumlin where there is a low crescentic escarpment of bedrock exposure. Although the relief is only 5.6 m the drumlin and till plain offer low viewpoints over the upper reaches of the East Castor River. As the historical aerial photograph (1945) illustrates, the expansion area has been cultivated continuously. In recent decades some of the fence lines have been removed and the canalized stream was realigned to cut directly north-south across the parcel.

The Vandeermere Quarry expansion land emerged from the receding Champlain Sea during the Late Palaeo-Indian/Early Archaic cultural period, about 10,000 years ago in the (modern) early Holocene epoch. For several millennia, when the Ancestral Ottawa River was a larger lacustrine body of water and the valley floor bedrock was compressed lower than today, the East Castor region must have been a littorial environment of islands and marshy channels. But even after water levels and drainage patterns became modern (about 4,700 BP) and up until the recent Contact Period, the Vandeermere Quarry area would have been at the edge of the East Castor littoral.

The Vandeermere Quarry expansion property has moderate archaeological potential because it has well drained soil near a potable water source and it provides a vantage point overlooking a larger drainage body which provided a larger littorial environment, with greater biomass and biodiversity and hence greater economic attraction to hunter-gatherers.

Sixteen artifacts of quartz and slate, ten bones, and a fragment of mussel shell were recovered from the surface of the ploughed fields. Of the six slate flakes recovered, one has been modified by a (spoke shave) notch and the same lateral edge shows signs of use (scraping). Some of the other slate pieces have characteristics of direct percussion flakes, or bipolar shatter fragments, variously. The quartz artifacts are bipolar core tools or (bipolar) shatter fragment tools The Vandeermere collection includes two spall scrapes one—made of diorite—has a lateral edge with combined notch and perforator modification and the other is of a rhyolite raw material which the writer has noted from several other archaeological find spots in the Ottawa area. Mr. Swayze suggests the bones are moose. They could be cow or ox but cultural modifications like these would be out of place in a Euro-Canadian context. The fact that they exist at all (in such acidic soils in a continuously cultivated environment) suggests that they cannot be very old—Contact period (300 years ago or Late Woodland. The artifacts, which Mr. Swayze categorizes as 'tools of expediency', were recovered sporadically throughout the parcel and not from concentrations in any particular spot. Although not a result of random activity on the part of prehistoric, the artifact distribution forms no distinct pattern; so, the writer interprets it as 'frequent isolated finds', rather than a specific 'kill site' or a 'campsite', although those are the types of activities suggested by the artifacts.

The small collection of lithic tools found widely distributed throughout the Vandeermere Quarry expansion area, have been recorded under one Borden registration number: BgFu-1. The significance of archaeological sites discovered in the course of Stage 2 assessments are normally rated according to eight criteria: Historic Association – BgFu-1 has none; Representativeness – sporadic isolated artifacts are not representative; Type/Function – kill site or temporary campsite is suggested, but sample is small; Rarity – rare in the sense that little archaeological work has so-far produced few sites but more Stage 2 work will probably reproduce these results frequently, so in that sense BgFu-1 is not rare. Integrity – none Preservation – poor, only largest parts of hardest bone elements persist. Artifact and feature density – poor, no features noted, isolated artifact distribution; Human Remains and Burials - no evidence of such.

Mr. Swayze concludes that BgFu-1 archaeological finds have been adequately recorded and no further work is required and he recommends that the OMCL issue a letter to Ms Tami Sugarman of WESA (representing A.L. Blair Construction Ltd.) clearing the proposed Vandeermere Quarry expansion of any heritage concern. However, given the nature of archaeological phenomena, it is possible that deeply buried archaeological deposits, or human remains may yet be disturbed during construction. If the former are discovered the Heritage Operations Unit should be notified immediately (416-314-7123); if human remains are disturbed, the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ministry of Consumer and Commercial Relations should be notified (416-326-8392).

K. Swayze CIF P039-05 WESA Project B1905 July 4 2003

A STAGE 1&2 ARCHAEOLOGICAL ASSESSMENT OF PART OF LOT 2 CONCESSION 9 WINCHESTER TOWNSHIP (GEO) UNITED COUNTIES OF STORMONT DUNDAS & GLENGARRY VANDEERMERE QUARRY

Introduction

In late April 2003, Ken Swayze, a licenced archaeological consultant, was asked by Ms Tami Sugarman, of Water and Earth Science Associates Ltd., Carp (WESA), to prepare a Stage 1&2 archaeological assessment part of lot 2 concession 9 Winchester Township (Dundas Co. Geo), United Counties of Stormont Dundas and Glengarry (Figure 1) as *per* the *Archaeological Assessment Technical Guidelines: stage 1 to 3* produced by the Heritage Operations Unit of the Ministry of Culture (OMCL 1993). This property, called the 'Vandeermere Quarry', is approximately 24 ha (60 A) and is located about 3 km northwest of the town of Winchester. A.L. Blair Construction Ltd. have proposed to expand their existing quarry (on lot 3) westward onto this property (Figure 2). Because some archaeological sites have been recorded in the vicinity and because the proposed Vandeermere quarry has a well drained situation overlooking an upper tributary of the East Castor River, OMCL has called for an archaeological assessment prior to excavation.

A Stage 1 assessment is a review of surficial geology, post-glacial landscape evolution, historical land use and present condition, and previous archaeological studies—as interpreted through the eyes of an archaeologist. The objective of the Stage 1 review is to develop at an informed opinion about the archaeological potential of a the property. A Stage 2 archaeological assessment is a field test to determine the presence or absence of archaeological material, features, or human remains in a specified area—except where poor drainage, exposed bedrock, *etc.* prohibit—particularly sectors estimated to have moderate or high archaeological potential. Another objective, if field results are 'positive' for cultural material, is to determine, the extent, cultural affiliation, and condition of the deposit. The principal method of field assessment in this case was 'pedestrian survey' of cultivated fields. The Ministry's technical guidelines stipulate that previously cultivated land in the proposed development area must be recultivated to allow pedestrian survey.

With the permission of Bryan Blanshard, of A.L. Blair Construction Ltd., the writer carried out the pedestrian survey over four days (May 2nd, 3rd, 9th, 10th). The first appraisal was conducted in rainy weather, when observation conditions are best, and the second after a rainy interval. The crew consisted of Marc Larivée, Carmen Bauer, and Jarrod Goldsmith and their field work was directed by Ian Badgley and the writer.

1.0 Description of the Property and Land Use History

The terrain of the vicinity is clay plain—Champlain Sea deep water sediments—which surround drumlinized north-south oriented till deposits. Many of the larger

islands of till are bordered by equally large deposits of peat, marl, and muck. The excavation of the Vandeermere Quarry expansion property, a rectanguloid parcel approximately 800 x 380 m is typical of this terrain. The central eastern part is dominated by a crested drumlin (Figure 6b), aligned north-south, and the southern third is composed of another till deposit of slightly less relief, which overlooks a large bog—only about 300 m from the southern boundary—which is part of the upper East Castor River (Figures 2 and 3). A tributary source of the same river—a canalized first-order stream—forms the south-western border of the excavation area and cuts diagonally across the northwest corner, through flat clay plain terrain. The parcel ranges in elevation from 71.9 (in a slight depression in the northwest corner, to 77.5 m a.s.l., on the crest of the drumlin where there is a low crescentic escarpment of bedrock exposure. Although the relief is only 5.6 m the drumlin and till plain offer low viewpoints over the upper reaches of the East Castor River.

As the historical aerial photograph (1945) in Figure 4 illustrates, the expansion area has been cultivated continuously for at least 130 years although the northeastern corner may not have been drained until the early 20th century. In recent decades some of the fence lines shown in Figure 4 have been removed and the canalized stream was realigned to cut directly north-south across the parcel.

2.0 Previous Archaeological Research and Known Sites in the Vicinity

The Vandeermere Quarry is in Borden Block BgFu, where no prior sites have been recorded. Six sites have been recorded in BgFt (the 'Borden block' bordering BgFu) and two in BhFs, near Casselman.

- BgFt-1 Winchester Springs Cemetery, a possible(?) Historic Period cemetery, (lot 2&3 con I Win. Twp) recorded by Daechsel 1980.

- BgFt-2 Shane - historical Euro-Canadian house site in ploughed field near Winchester Springs (lot 34 con VIII Win. Twp). Recorded by Daechsel 1980, collection at OMCL Ottawa office (?).

- BgFt-3 Kittle Creek 1 - Recorded by Daechsel 1980, but first described by Wintemberg 1912. Middle Woodland village site on South Nation River near Chesterville (lot 15&16 con IV Win. Twp). According to Daechsel, it is presumed destroyed. Wintemberg (1912) has several notes about other discoveries that are probably related to BgFt-3: *"On Mr. Walter Bogart's farm, lot 14 con IV on the north side of South Nation River, near Chesterville, Mr. Bogart has found celts made of stone."*; and, *"On lot 17 con IV, north of the South nation River, near Chesterville a natural piece or core of dark coloured chert cat. No. VIII-F-9040, and a triangular scraper chipped from chert, cat. No. VIII-F-9062, were found on the surface by Mr. W.J. Wintemberg on archaeological expedition of the Geological Survey of Canada."*

- BgFt-4 Chesterville 1 - small campsite, undetermined affiliation, just east of the South Nation River near CPR bridge (lot 21 con 3 Win. Twp) . Recorded by Daechsel 1980; chert, quartz and faunal at OMCL Ottawa office (?). According to Daechsel site is all but destroyed. Wintemberg (1912) describes a site on the adjacent lot that may be related, or the same: *"On the farm of Edward MacLean, on the east half of lot 20 con III, on the edge of the north bank of the South nation River...on a bench of several acres between 10 and 20 feet above the river, is a spot of black soil, about twenty feet in diameter. Part of this spot has been exposed by cultivation and indicates a lodge site. The bank is sheltered by a low hill extending along some distance back from the bank. No ashes were seen here. High water has washed out archaeological specimens at this place, and Mr. Wintemberg found, a pebble showing signs of workmanship Cat. No. VIII-F-9056; a piece of chipped felsite showing secondary chipping along one edge, possibly used as a scraper, Cat. No. VIII-F-9041; two pieces of chipped chert, possibly part of a drill, Cat No. VIII-F-9447 and VIII-F-9449; an artifact chipped from chert, Cat. No. VIII-F-9044; a point chipped from chalcedony for an arrow, with base broken, cat. No. VIII-F-9045; a point chipped from stone for an arrow, cat.No.VIII-F-9046; a point chipped from grey slate for a spear, with point broken off, Cat. No. VIII-F-9042; five fragments of pottery of Iroquoian type, cat. No. VIII-F-9050-9052a-c; four smooth fragments, cat. No. VIII-F-9053a-d; an adze chipped from what appears to be limestone, since water worn, cat. No. VIII-F-9054; an object, possibly an unfinished celt, with edges abraded and rubbed, cat. No. VIII-F-9055; a fragment of the stem of an earthenware pipe, cat. No. VIII-F-9057; Two fragments of earthenware pipe bowls, cat. No. VIII-F-9058-9059. One of the fragments of pottery is very much like that found in Oxford County (and since at Roebuck, Ontario). A celt made of stone was found here by Mr. MacLean. A human skull was ploughed up in this field by Mr. MacLean in 1907, but it fell to pieces. Finger bones were also found."*

- BgFt-5 Forward 1 - On the south bend of the South Nation River, (lot 15 con IV Win. Twp) an undetermined type of site, of undetermined affiliation. First described by Wintemberg 1912, recorded by Daechsel 1980 who considers it probably destroyed by construction. Wintemberg (1912) has two notes concerning discoveries on this lot: *"On a bench of several acres, sheltered by low hills on the north, on the north bank of the South Nation River, on lot 15 con IV, near Chesterville, is an Algonquin village or camp site for which the site is very suitable. Near a bend in the stream a little west of where it is joined by a small creek from the north, three fragments of Algonquin pottery, VIII-F-9060a-c have been found washed out by high water. Across the river Mr. Wintemberg found a celt made of stone, cat. No. VIII-F-9061."*; and, *"On lot 15 con IV, north of the South Nation River, near Chesterville, a scraper chipped from chert, Cat. No. VIII-F-9063, was found on the surface by Mr. Wintemberg..."*

- BgFt-6 Chesterville 2 - An undetermined type of site of Archaic and Late Woodland affiliation on the north bank of the South Nation River just east of

Chesterville (lot 3 con III Win. Twp). Described by Wintemberg 1914, recorded by Daechsel 1980, condition unknown.

Wintemberg (1912) has two other notes concerning archaeological finds in Winchester Twp: *"On lot 11 con III, on the north side of South Nation River near Chesterville, Mr. J.W. Elliott has found gouges made of stone in which the groove of the bit was less than the length of the object."*; and, *"On heavy clay land on the farm of Mr. Robert Henderson, on lot 5 con II, on the south side of the South Nation River...where the small creek flowing from the south enters, within two miles of Winchester Springs, Mr. Henderson, the hotelkeeper there, says he found celts made of stone*

- BhFs-1 Casselman - an undetermined type of site, of Middle Woodland affiliation, on east bank of South Nation River just north of Casselman (lot 11 con VI Cambridge Twp). Described by Wintemberg 1912; Pendergast 1959 (CMC Acc. No. 1288), recorded by Daechsel 1980 who found nothing but recommends excavation.

- BhFs-2 Casselman Dam - a historic generating station spanning the South Nation River just north of Casselman (lot 10 con VI Cambridge Twp).

3.0 Surficial Geology and Post-Glacial Landscape Evolution

The following account references the dates of geological episodes to cultural time periods in order to underline the effect of these processes upon the relative attractiveness of the property for human use, either for habitation or specific resource exploitation activities. The cultural periods referred to, and their approximate dates before present (BP) are:

- Period I Palaeo-Indian 11,500-10,000 BP;
- Period II Central Early Archaic/Early Great Lakes-St.Lawrence 10,000-6,000 BP;
- Period III Middle Great Lakes-St.Lawrence 6,000-3,000 BP;
- Period IV Late Great Lakes-St.Lawrence 3,000-1,500 BP;
- Periods V and VI Woodland and Historic 1,500-300 BP.

(The writer is aware of recent movements to relate corrected and re-calibrated carbon-dated events to calendar dates (e.g. Fiedel 1999) but, for the purposes of this report, he prefers the standard chronological framework (Gadd 1987; Fulton and Richard 1987; Wright 1995) expressed as 'years ago', or 'BP' synonymously. BP means Before Present, the 'present' being 1950 AD.)

The most significant and dramatic effect of deglaciation, in eastern Ontario, was the creation of the Champlain Sea, and its gradual recession, over several millennia, through a series of post-glacial riverine lakes. Beginning about 12,700 BP the entire St Lawrence Lowlands was submerged under the Champlain Sea (Gilbert 1994:6). The northwestern arm of this sea (Barnett 1988) occupied the upper Ottawa Valley

(Figure 5). The maximum extent of the Champlain Sea has been radio-carbon dated (from shells) to 11,400 BP, at 170 m a.s.l. near Shawville; and to 11,000, at 160 m near Martindale in the Gatineau Valley—dates are approximate—and, at Almonte and Rigaud, the high water level has been dated, at 11,200 BP, at 154 m, and 160 m a.s.l., respectively (*ibid.*: Table 7). Thus, the period of maximum extent of the Champlain Sea corresponded with Period I (Clovis) Palaeo-Indian period and over the next millennium the delta of an enormous river prograded down the Ottawa Valley from Petawawa to Hawksbury. But then, as the sea level rose, the land rebounded from the weight of the ice-sheet until, by 10,000 BP—Period II Late Palaeo-Indian/Early Central Archaic—the Ancestral Ottawa River was more riverine/lacustrine body of water. This post-glacial lake was still much higher than the Ottawa River today. According to Fulton and Richard (1987:25) the level of this body of water was still as high as 94 m a.s.l. at Deschênes in 10,100 BP. It has been dated from three locations in the Ottawa vicinity to between 7,870 BP and 8,830 BP at 60 to 70 m a.s.l. (Fulton and Richard 1987:26, Table 7).

There is some indirect evidence, however, that the entire Ottawa Valley may have been an unpleasant and dangerous environment for intervals during the Late Palaeo-Indian/Early Archaic cultural period. As Teller (1988) points out, this evidence has come to light relatively recently, and earth scientists, and others, have not yet considered the impact of those catastrophic years on the environment of the Ottawa/St.Lawrence basin, let alone their effect on human populations and archaeological deposits. There is growing evidence, however, to support the theory of Lake Agassiz 'slugs'—see Gilbert (1994).

During the Palaeo-Indian and Early Archaic periods, the entire Upper Great Lakes, and northern Ontario and northern Québec, drained through the Ottawa Valley, first debouching solely through the Barron and Petawawa Rivers, and later also *via* the North Bay/Mattawa route. The volume of water through the Ottawa system was enormous—almost inconceivable—relative to today. This gargantuan flow was compounded at intervals, between 10,800-10,000 BP and again between 9,500-8,000 BP, by 'slugs' of flood water from post-glacial Lake Agassiz, which then occupied much of the prairie provinces (Teller 1988). These 'slugs', with additional volumes of 500 km^3 to 4,000 km^3 (!), would obviously have been of a catastrophic nature, and would have affected the habitability of the shorelines of the recessional stages of the Champlain Sea and the Ancestral Ottawa River. Lewis and Anderson (1989) have estimated that the flow of the Ancestral Ottawa River during one of these slugs was 200,000 m^3/s, or 200 times the average flow today! Not only that, the floodwaters must have wreaked havoc upon the archaeological record—assuming there was one—scouring some away, and deeply burying others.

The Vandeermere Quarry expansion land emerged from the receding Champlain Sea during the Late Palaeo-Indian/Early Archaic cultural period, about 10,000 years ago in the (modern) early Holocene epoch. For several millennia, when the Ancestral Ottawa River was a larger lacustrine body of water and the valley floor bedrock was compressed lower than today, the East Castor region must have been a littorial

environment of islands and marshy channels. But even after water levels and drainage patterns became modern (about 4,700 BP) and up until the recent Contact Period, the Vandeermere Quarry area would have been at the edge of the East Castor littoral.

4.0 Archaeological Potential of the Property

The Vandeermere Quarry expansion property has moderate archaeological potential because it has well drained soil near a potable water source and it provides a vantage point overlooking a larger drainage body which provided a larger littorial environment, with greater biomass and biodiversity and hence greater economic attraction to hunter-gatherers.

STAGE 2

5.0 Objective of Stage 2 Field Assessment

A Stage 2 archaeological assessment is a field test to determine the presence or absence of archaeological material, or features. Since the OMCL technical guidelines specify that low potential areas be tested too, the entire quarry licence excavation area was assessed, even though in pre-Contact times the northeastern part of the parcel, below 74 m a.s.l., would have been too poorly drained to be habitable.

6.0 Method and Procedures

The primary method of field testing was pedestrian survey of cultivated ground, fresh and weathered. The survey itself was carried out by walking transects across the fields at least every 10 m as required for moderate potential areas, and scrutinizing the exposed soil surface carefully for indications of past cultural activity. This procedure was conducted twice, the first time (May 2-3) during rain and the second time (May 9-10) after more heavy rains had weathered the cultivated surface.

7.0 Observations and Description

Sixteen artifacts of quartz and slate, ten bones, and a fragment of mussel shell were recovered from the surface of the ploughed fields. Of the six slate flakes (Figure 7a) recovered, one has been modified by a (spoke shave) notch and the same lateral edge shows signs of use (scraping). Some of the other slate pieces have characteristics of direct percussion flakes, or bipolar shatter fragments, variously. The quartz artifacts are bipolar core tools or (bipolar) shatter fragment tools. Fresh sharp near right-angled edges of both are commonly used for scraping and acutely angled edges shows signs of cutting use wear or are made into graver spurs. Fortuitously pointed shatter fragments, with trihedral cross sections are often used as perforators or drills or are unifacially modified for that purpose. Notches and denticulate edges are common on steep edges of both cores and shatter, and the former sometimes provides edges and mass suitable for chopper tools. The Vandeermere collection includes two spall scrapes one—made of diorite—has a lateral edge with combined notch and perforator

modification and the other is of a rhyolite raw material which the writer has noted from several other archaeological find spots in the Ottawa area. The bones—which could all have come from one individual—have not been analysed against a comparative zoological collection but by their size and general characteristics and the presence of butchering marks (Figure 7b) and a spiral fracture (a distinctive cultural modification done when the bone is fresh to extract the marrow, the writer suggests they are moose bones. They could be cow or ox but cultural modifications like these would be out of place in a Euro-Canadian context. The fact that they exist at all (in such acidic soils in a continuously cultivated environment) suggests that they cannot be very old—Contact period (300 years ago or Late Woodland.

The artifacts (Figure 8), which the writer categorizes as 'tools of expediency', were recovered sporadically throughout the parcel and not from concentrations in any particular spot. Although not a result of random activity on the part of prehistoric, the artifact distribution (Figure 5) forms no distinct pattern; so, the writer interprets it as 'frequent isolated finds', rather than a specific 'kill site' or a 'campsite', although those are the types of activities suggested by the artifacts.

8.0 Results and Conclusions

The small collection of lithic tools of expediency found widely distributed throughout the Vandeermere Quarry expansion area, have been recorded under one Borden registration number: BgFu-1. The significance of archaeological sites discovered in the course of Stage 2 assessments are normally rated according to eight criteria:

1. Historic Association – BgFu-1 has none;
2. Representativeness – sporadic isolated artifacts are not representative
3. Type/Function – kill site or temporary campsite is suggested, but sample is small
4. Rarity – rare in the sense that little archaeological work has so-far produced few sites but more Stage 2 work will probably reproduce these results frequently, so in that sense BgFu-1 is not rare.
5. Integrity - none
6. Preservation – poor, only largest parts of hardest bone elements persist.
7. Artifact and feature density – poor, no features noted, isolated artifact distribution
8. Human Remains and Burials - no evidence of such.

The writer concludes that BgFu-1 archaeological finds have been adequately recorded and no further work is required.

9.0 Recommendations

The writer recommends that the Heritage Operations Unit of OMCL issue a letter to Ms Tami Sugarman of WESA (representing A.L. Blair Construction Ltd.) clearing the proposed Vandeermere Quarry expansion of any heritage concern.

However, given the nature of archaeological phenomena, it is possible that deeply buried archaeological deposits, or human remains may yet be disturbed during construction. If the former are discovered the Heritage Operations Unit should be notified immediately (416-314-7123); if human remains are disturbed, the Registrar or Deputy Registrar of the Cemeteries Regulation Unit of the Ministry of Consumer and Commercial Relations should be notified (416-326-8392).

10.0 References

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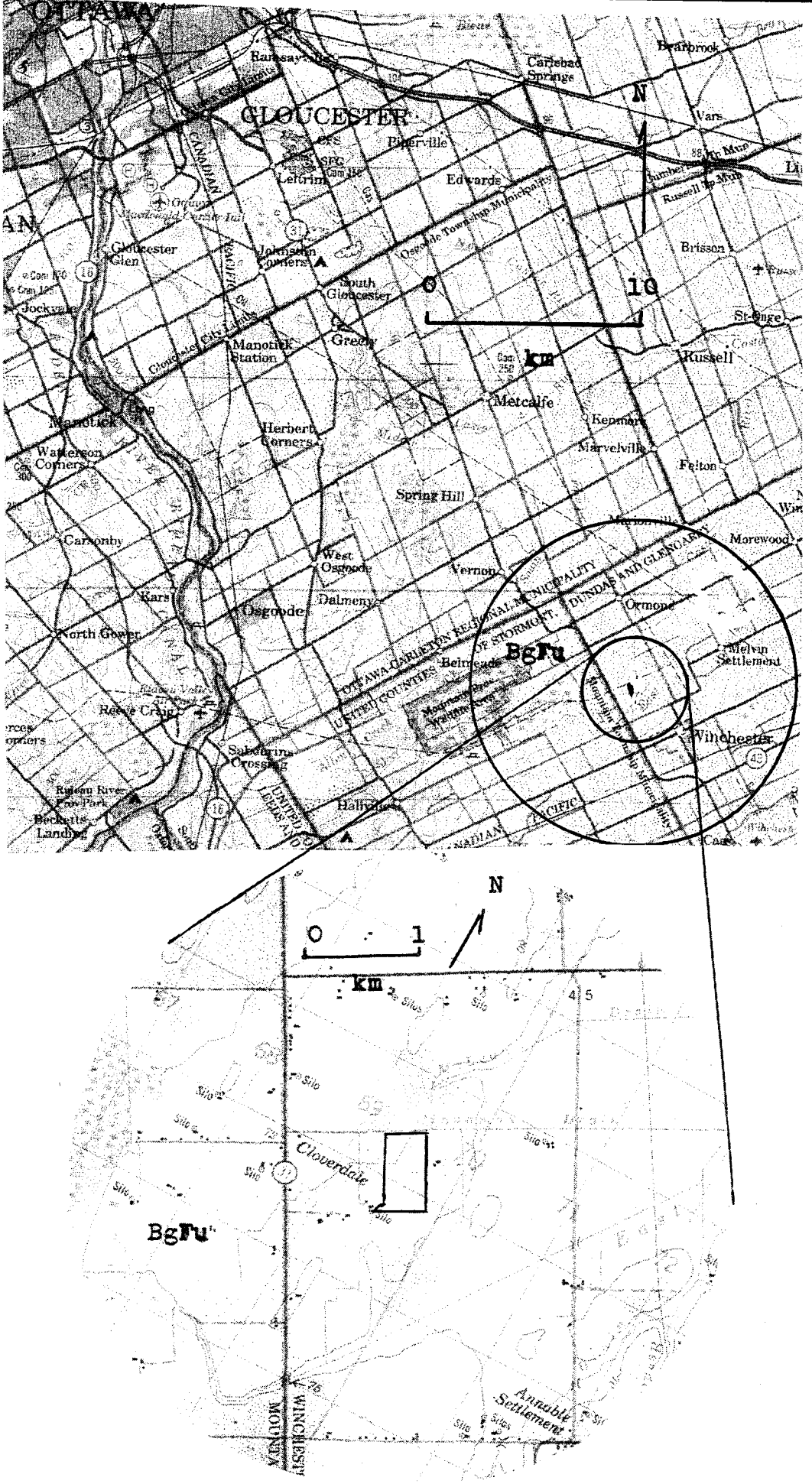


Figure 1: Location of the Vandeermere Quarry, from NTS 31 and 31 G/3

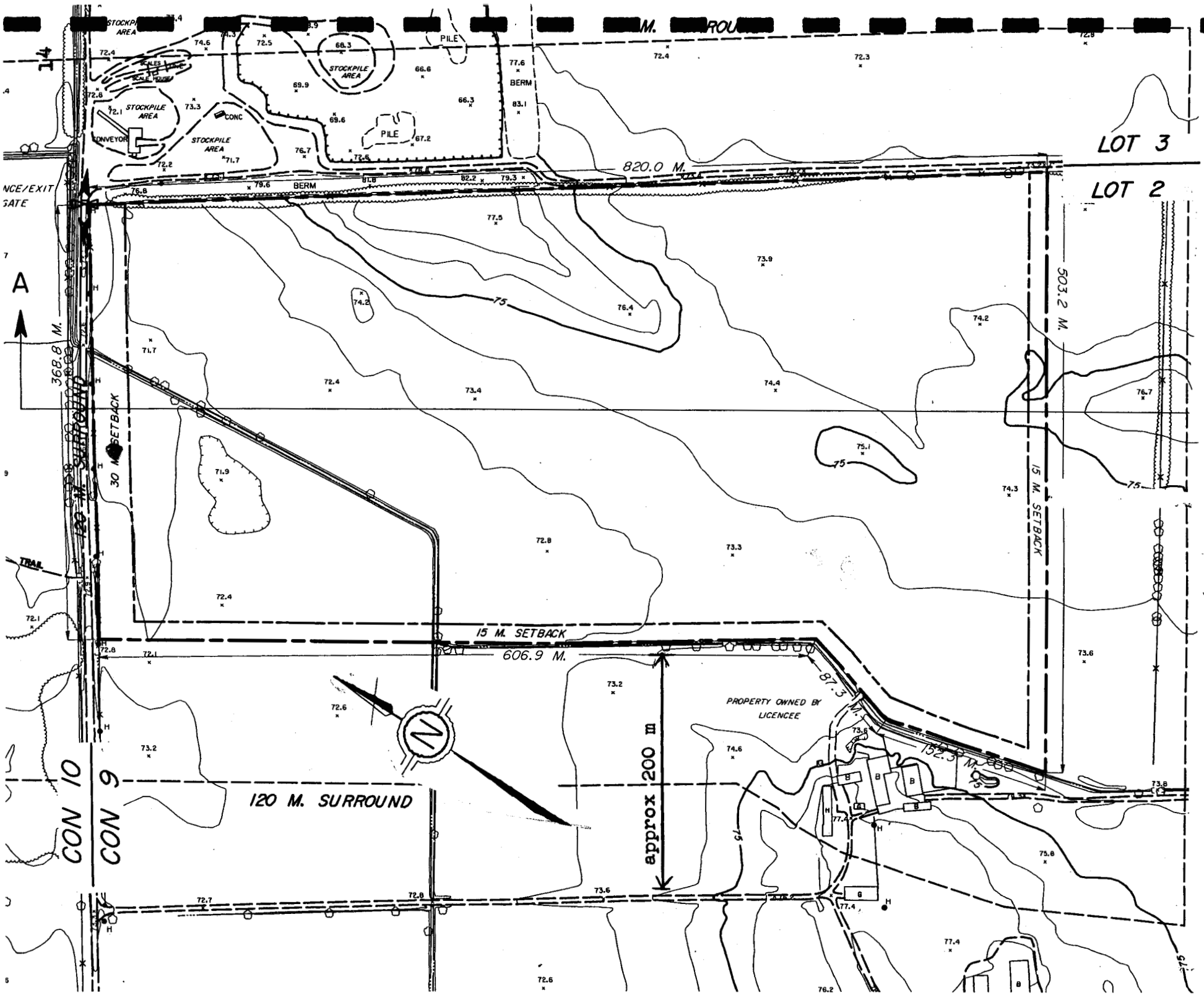


Figure 2: Existing features and topography of Vandeermere Quarry

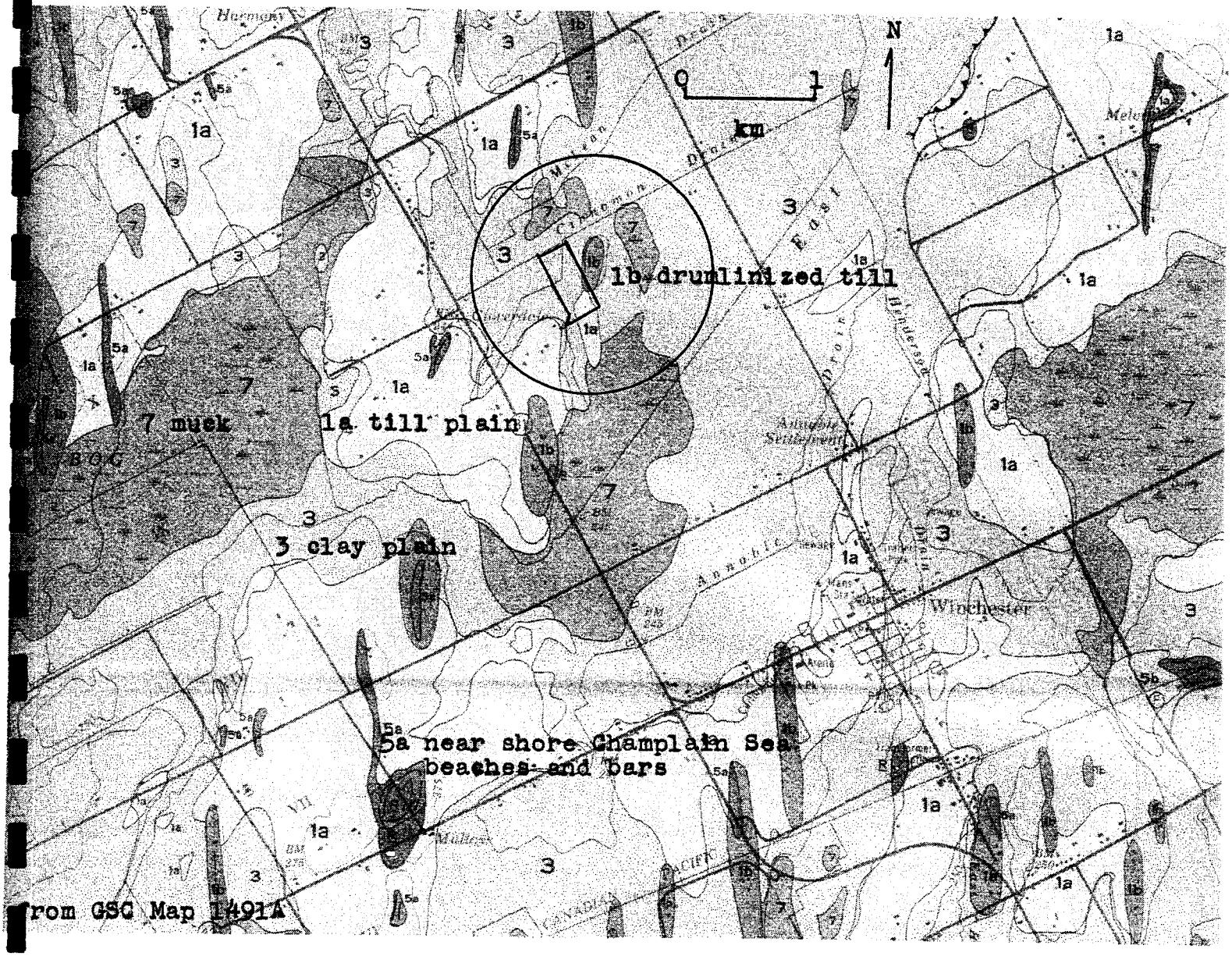


Figure 3: Surficial geology of the Vandeermere Quarry and vicinity

Figure 4: Historical aerial photograph taken 1945 of Vandeermere Quarry

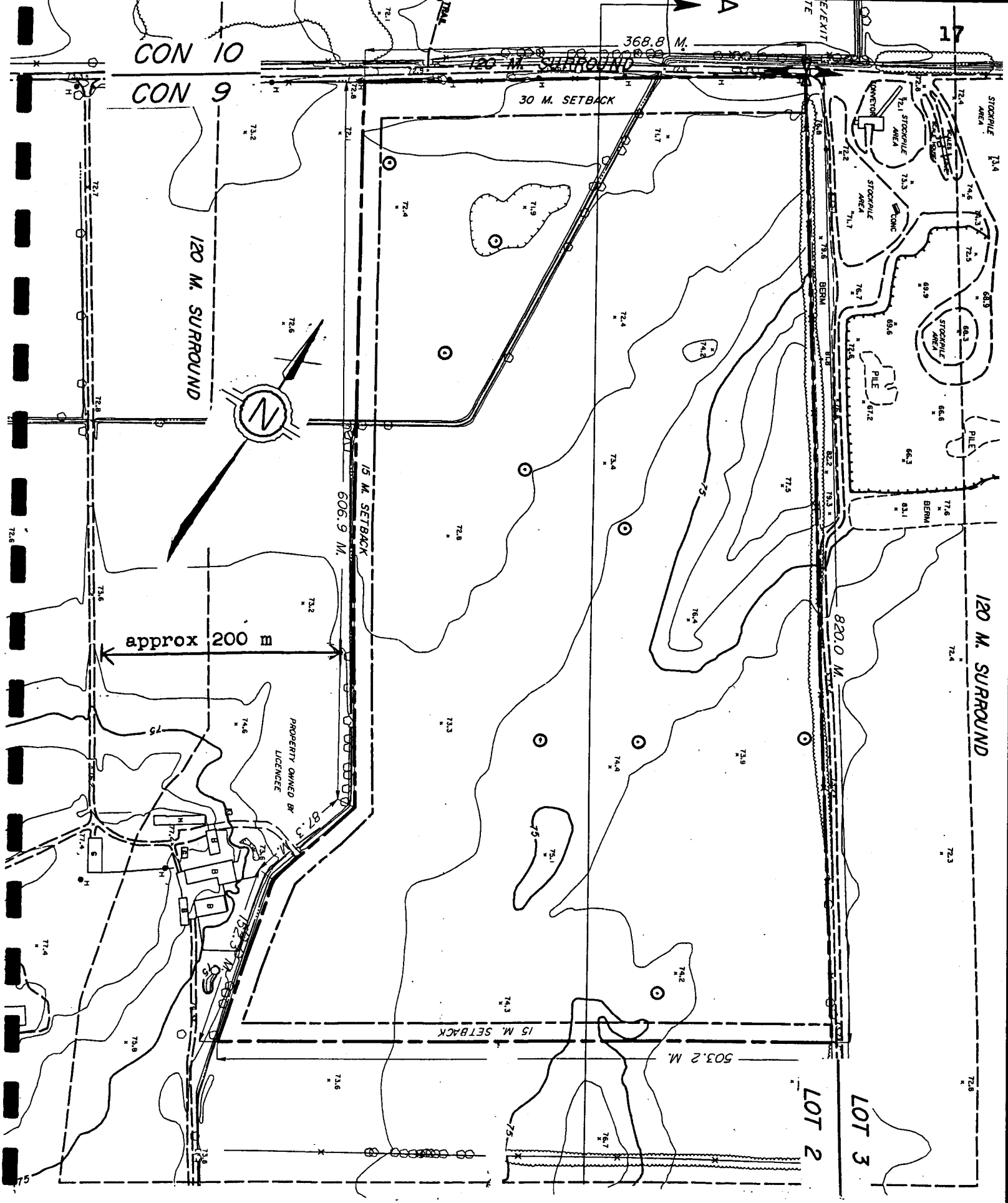
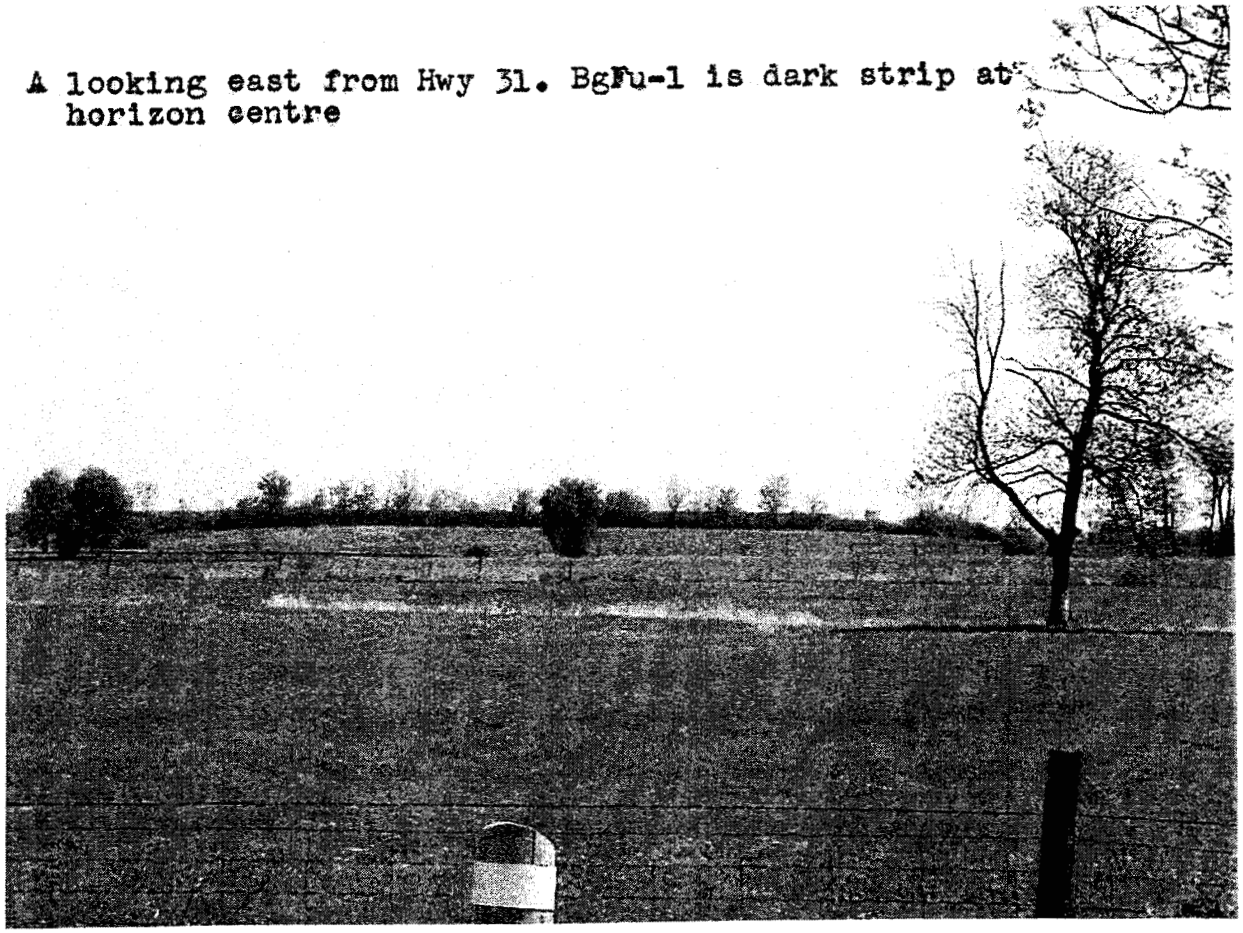


Figure 5: Location of isolated finds BgFu-1 Vandeermere Quarry

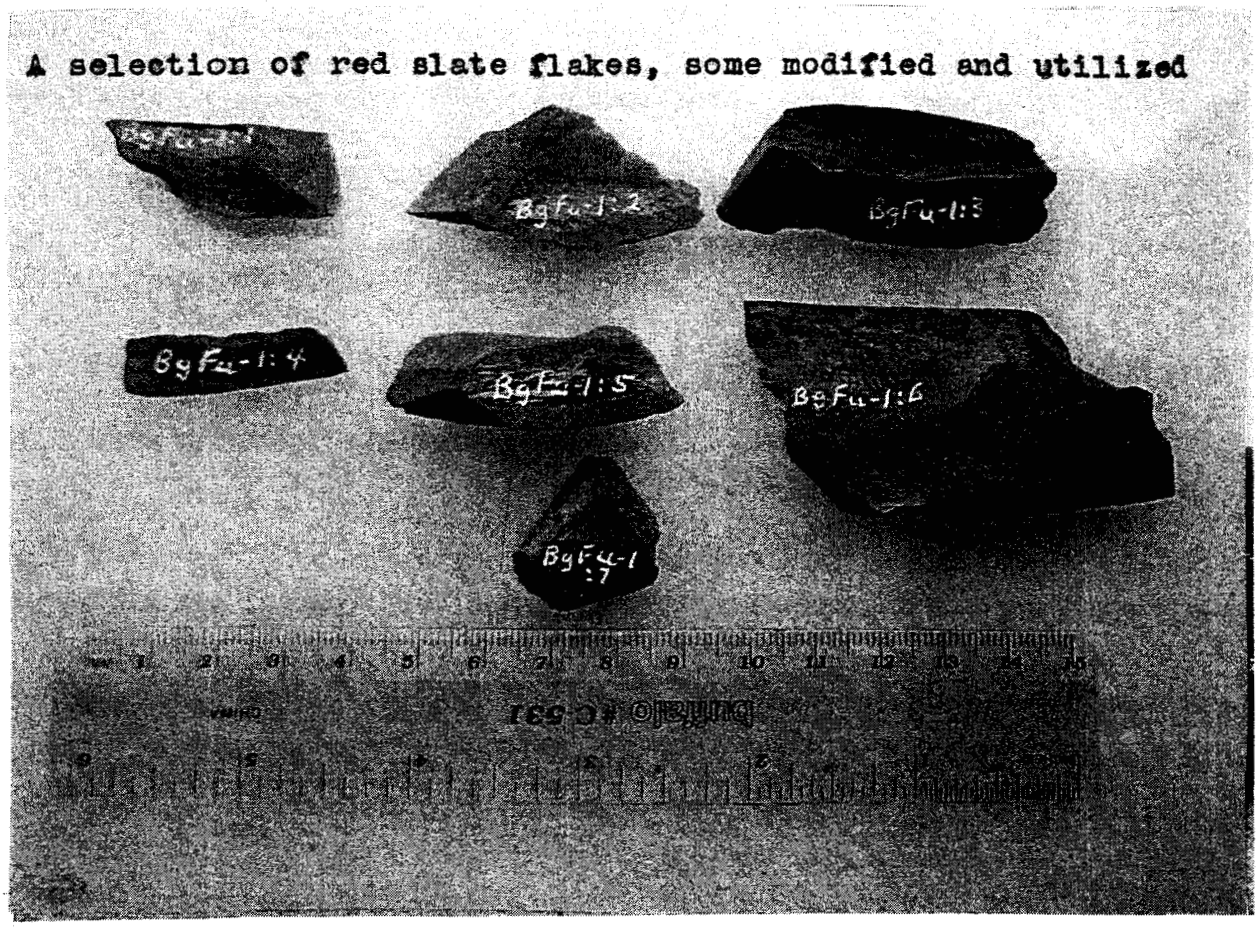
A looking east from Hwy 31. BgFu-1 is dark strip at horizon centre



B looking southeast from Benson George Road. Artifacts were scattered in the ploughed ground, not concentrated.

Figure 6: Landscape photographs of BgFu-1 Vandeermere Quarry isolated find

A selection of red slate flakes, some modified and utilized



B Two bones showing cut marks

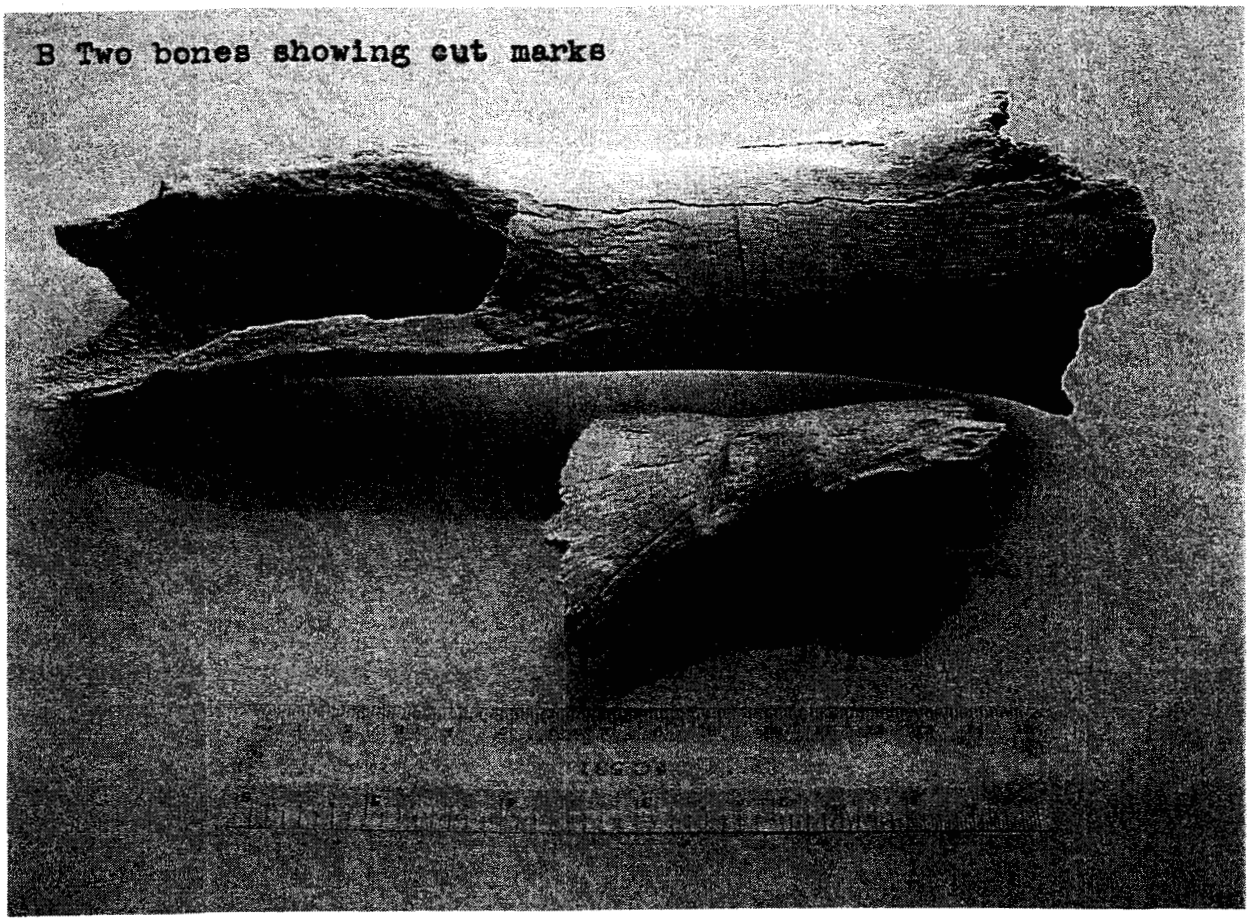


Figure 7: photographs of some of the artifacts from BgFu-1 Vandeermere

BgFu-1 Vandeermere Site K. Swayze CIF 2003-P039-05 Vandeermere Quarry Stage 1&2

#	*Prov*	*Lev*	*Qty*	*Mat*	*C/F*	*Category*	*Comments*
1	IB1	Surface	1	Slate	F	Flake tool	Reddish slate flake with incipient hole or notch from use wear
2	ML1b	"	1	"	F	Flake	Reddish colour
3	ML1	"	1	"	F	"	"
4	ML4b	"	1	"	F	"	"
5	ML3b	"	1	"	F	"	"
6	ML2b	"	1	"	F	"	" one end notched and utilized
7	IB2	"	1	"	F	"	Reddish colour
8	JG3	"	1	Quartz	C	Core tool	Large, one lateral utilized
9	JG4	"	1	"	C	"	Small, one notched lateral
10	JG5	"	1	"	C	"	Utilized as scraper
11	JG2	"	1	"	C	"	Utilized lateral, rose tinted
12	JG1	"	1	"	C	Core	Small battered pebble
13	ML1	"	1	"	F	Flake	utilized
14	ML3	"	1	"	F	Shatter tool	Trihedral cross section, possibly tip of perforator
15	CB1	"	1	Diorite?	C	Spall scraper	Also one lateral notched&perforator
16	ML8	"	1	Rhyolite	C	Spall scraper	
17	ML2	"	1	Shell	F	Faunal?	Very small
18	ML6	"	1	Bone	F	Faunal	Rib frag of large mammal, w. cut marks
19	ML7	"	1	"	F	"	Small unident cranial frag, large mammal
20	ML8	"	1	"	C	"	Phalanx of large mammal (cow or moose)
21	Ml9	"	1	"	F	"	Innominate frag, large mammal, deep butchering marks
22	ML9	"	1	"	F	"	Long bone diaphysis frag,
23	ML11	"	1	"	C	"	Phalanx like #20, w. deep cut mark
24	ML2b	"	1	"	F	"	Phalanx, like #20
25	ML4a	"	1	"	F	"	Small, mammalian
26	ML4b	"	1	"	C	"	Hoof bone (cow or moose)
27	CB1	"	1	"	F	"	Longbone shaft (no diaphyses), w. deep cut marks and spiral fracture

Figure 8: Artifact catalogue of BgFu-1 Vandeermere Quarry isolated finds

APPENDIX J

Hugh Williamson Associates Inc.
Noise Assessment Report

HUGH WILLIAMSON ASSOCIATES INC.
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ACOUSTICAL STUDY

OF THE

CINNAMON QUARRY
NORTH DUNDAS TOWNSHIP

Prepared for

Water and Earth Science Associates Ltd.
on behalf of
A. L. Blair Construction Ltd.

By

Hugh Williamson Associates Inc.

19 January 2004

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ACOUSTICAL STUDY OF THE CINNAMON QUARRY NORTH DUNDAS TOWNSHIP

Table of Contents

ACOUSTICAL STUDY OF THE CINNAMON QUARRY NORTH DUNDAS TOWNSHIP

1.0 Introduction

A. L. Blair Construction Ltd. wishes to expand the licence area for their Cinnamon Quarry in North Dundas Township, Ontario. Water and Earth Science Associates Ltd., WESA, is carrying out and co-ordinating various environmental studies associated with the proposed quarry expansion. This report describes the results of an acoustical study of the quarry carried out by Hugh Williamson Associates Inc. The primary aim of the study is to assess the potential impact of noise from the quarry on residences in the vicinity, in accordance with Ontario Ministry of Environment, MoE, noise guidelines[1-4]. The study is required in support of a licence application to the Ontario Ministry of Natural Resources, MNR, for the proposed quarry.

In this study, the impacts of noise from the proposed quarry are assessed according to MoE principles and guidelines[1-4]. This methodology is summarised below.

- Identify the noise sensitive receptors in the vicinity of quarry. Potential noise sensitive receptors include any residences, schools and hospitals.
- Determine the MoE sound level limits which will apply at each of the noise sensitive receptors.
- Identify the sources of noise which will arise from the quarry and associated on-site operations. The strengths of the various noise sources are quantified by noise measurements of existing operations.
- Based on noise measurements, predict the noise levels at nearby noise sensitive receptors due to quarry activities. The MoE methodology requires that compliance be assessed under 'worst case' conditions.
- Assess compliance with MoE sound level limits. If appropriate, develop mitigation measures required to achieve compliance with MoE sound level limits.

This study assesses the impacts of all on-site noise except that due to blasting.

The legal description of the land occupied by the quarry is as follows.

Part of Lot 2, Concession 9
North Dundas Township

The location of the proposed quarry is shown on the SITE LOCATION MAP in Figure 1.1 Details of the quarry and surrounding lands are shown in the following plans which accompany this report.

- Existing Features Plan, Cinnamon Quarry
- Operational Plan, Cinnamon Quarry

As shown in the Zoning Plan in Appendix A.1, the land surrounding the proposed quarry within 1 km has zoning of agriculture and mineral extraction.

The major noise sources associated with the proposed quarry will be the crushing plant and the rock drill. In the operation of the quarry, a rock drill is used to prepare a section of the rock for blasting. Blasting breaks the rock into a variety of sizes. The blasted rock is transported to the crushing plant where it is crushed and separated into various grades of aggregate. Conveyers deposit the aggregate in stockpiles surrounding the crushing plant. A loader fills gravel trucks from the stockpiles for shipment off-site. The typical list of equipment at the Cinnamon Quarry will include a primary crusher, secondary crushers, a tertiary crusher, hydraulic rock drill, conveyors, diesel generator, loaders and water pump.

The annual output from the quarry is expected to be 50,000 tonnes typically.

Figure 1.2 shows the seven closest noise sensitive receptors within 1 km of the proposed quarry. Details of the receptors are shown in Table 1.1. The Blair Rental Building next to the quarry will not be occupied when the extraction starts and is not included in the noise impact study.

Nearest Houses	Location	Nearest Distance from Quarry Boundary (m)
R1	SW corner of quarry	280
R2	SW corner of quarry	450
R3	SW corner of quarry	870
R4	West of quarry	800
R5	West of quarry	910
R6	West of quarry	750
R7	NW of quarry	900

Table 1.1 Nearest Receptors around the Cinnamon Quarry

Equipment Description	No.
Primary Crusher: Cedar Rapids 2248 crusher, diesel powered, Detroit Diesel 8V71	1
Secondary Crusher: E.L. Jay 54" roller cone crusher, diesel powered, Detroit Diesel V12-71	1
Tertiary Crusher: Cedar Rapids 4136 crusher, diesel powered, Caterpillar D353	1
Diesel Generator, Caterpillar 3306, 150 kW	1
Conveyors	4 (approximately)
Loaders	2

Table 1.2 Major Components of the Portable Crushing Plant

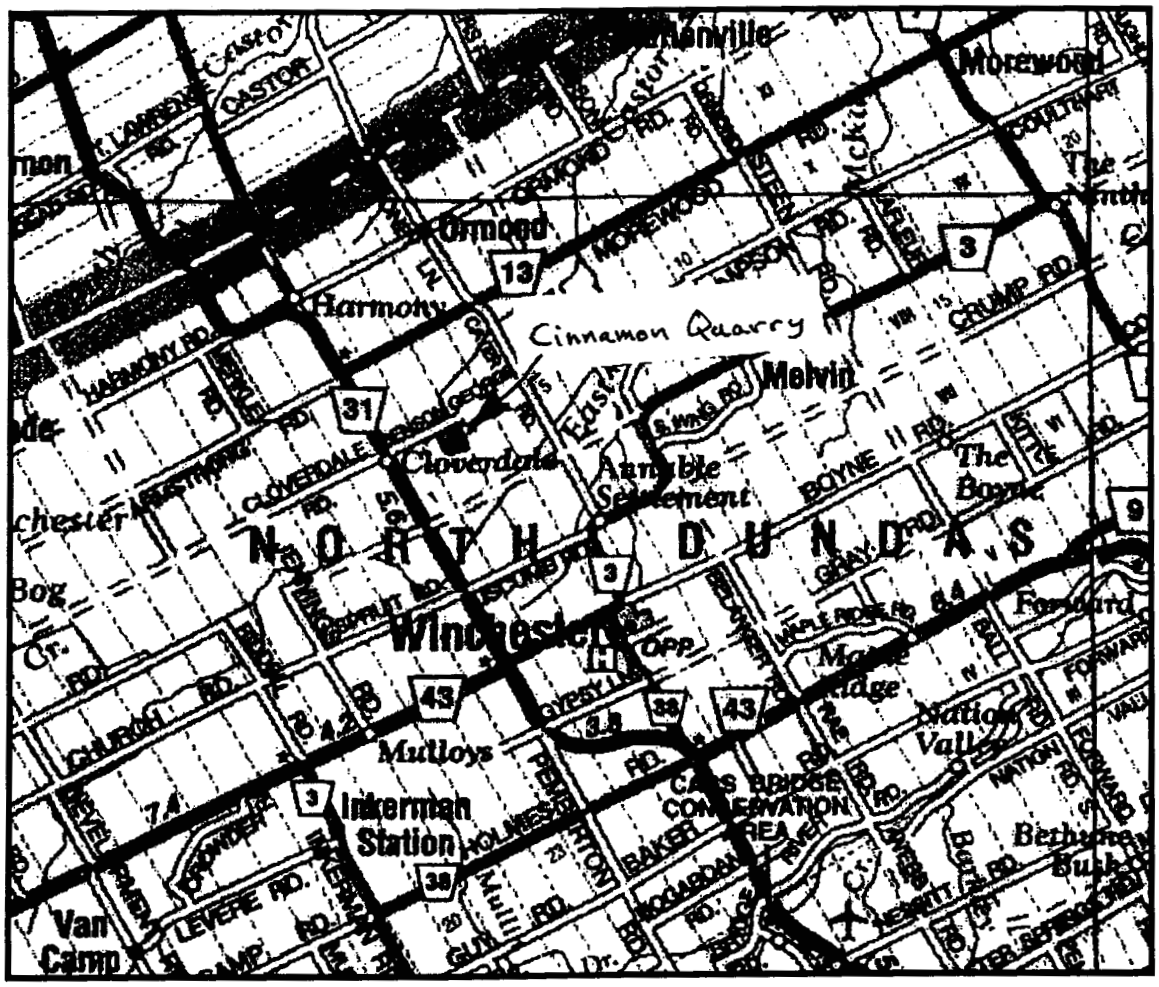


Figure 1.1 Site Location Map of the Cinnamon Quarry

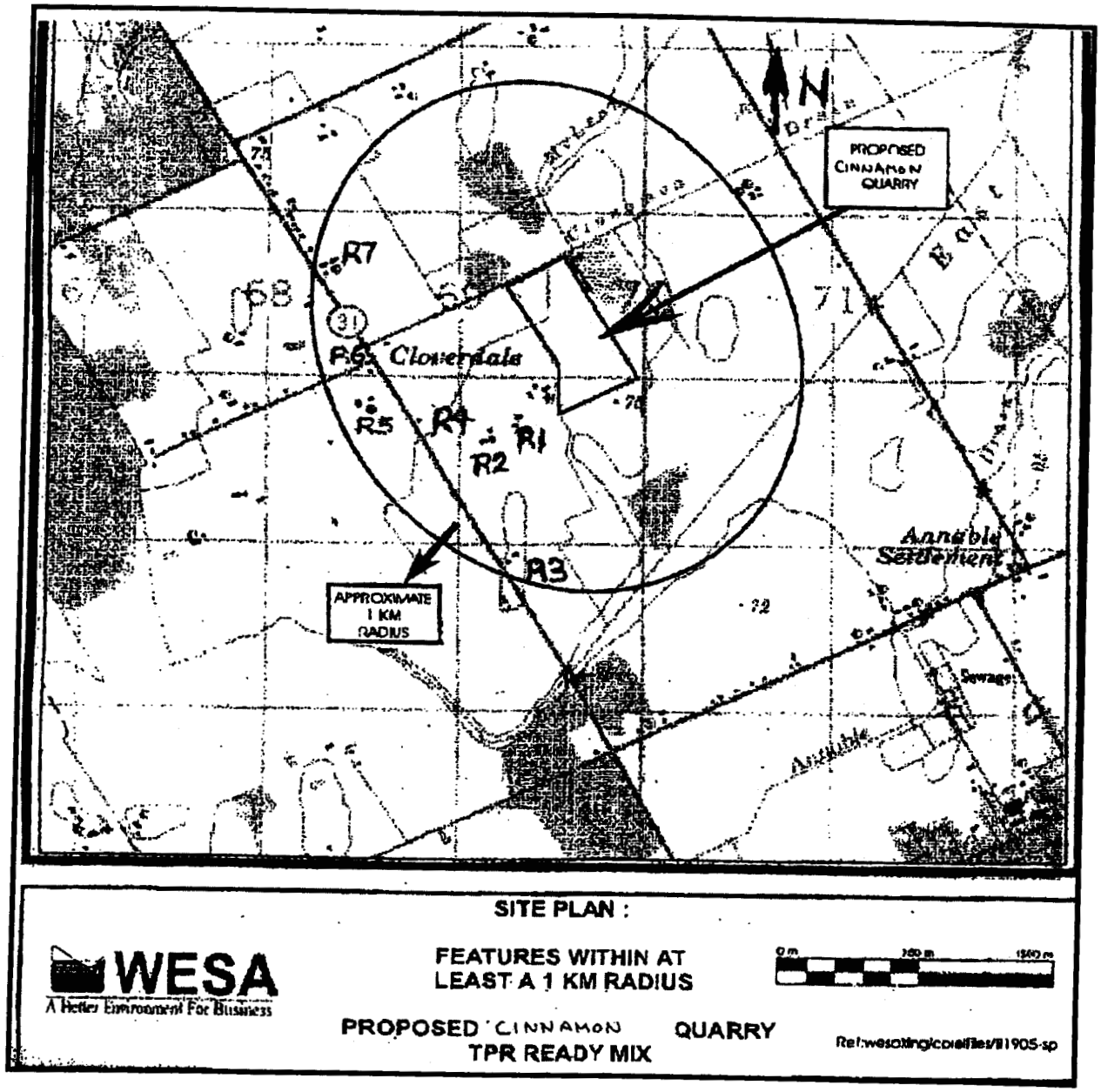


Figure 1.2 Closest Noise Sensitive Receptors Around the Cinnamon Quarry

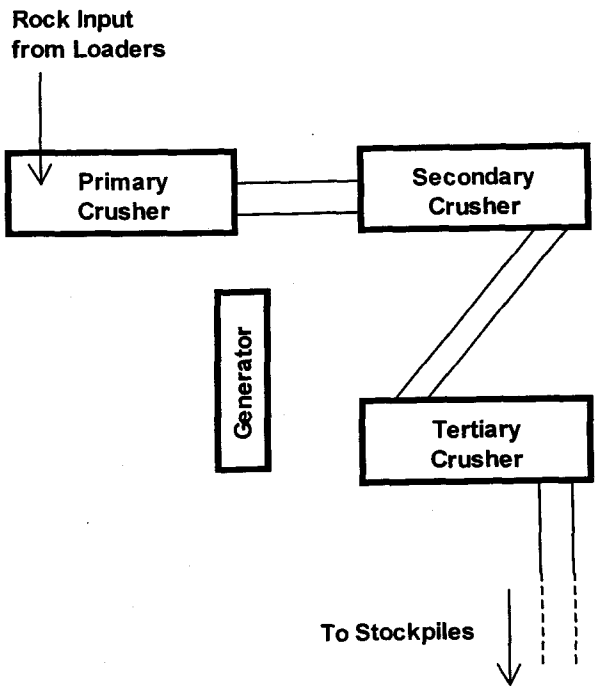


Figure 1.3 Sketch of Portable Crushing Plant

2.0 Quantification of Noise Sources

Noise source measurements made at the original Winchester Quarry are used in this study as noise source data for predicting noise levels for receptors at the proposed Cinnamon Quarry. The equipment will be the same at both quarries and the limestone rock is similar. Noise measurements at the Winchester Quarry were made on 29 September 2000.

As shown in Figure 2.1, the portable crushing plant was located on the floor of the Winchester Quarry, approximately 6 m below the surrounding land. Measurements were made at various points around the rim of the quarry, P1, P2, P3, P4, P5 and P7. All measurement points had an uninterrupted view of the crushing plant.

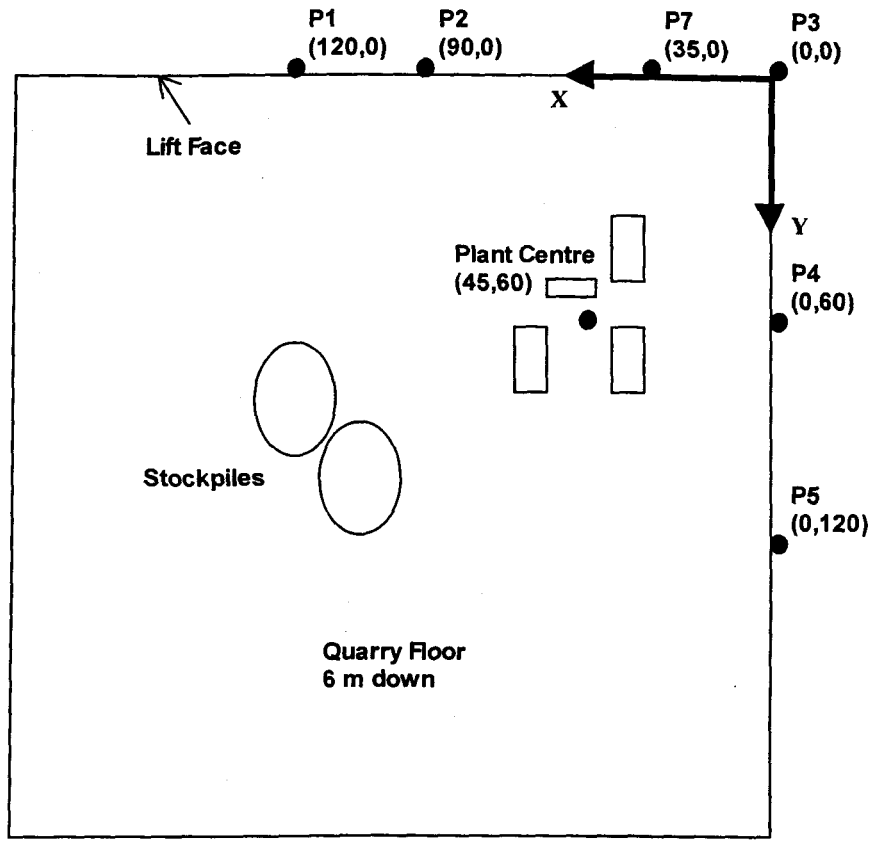


Figure 2.1 Schematic of Winchester Quarry, not to scale, position co-ordinates (X, Y) in metres.

For each measurement, sound levels were averaged over 5 minutes. At most points, the results of several measurements were combined giving averaging times of 10 to 25 minutes. Detailed measurement results are presented in Appendix A.3. Instrumentation and measurement procedures are described in Appendix A.2.

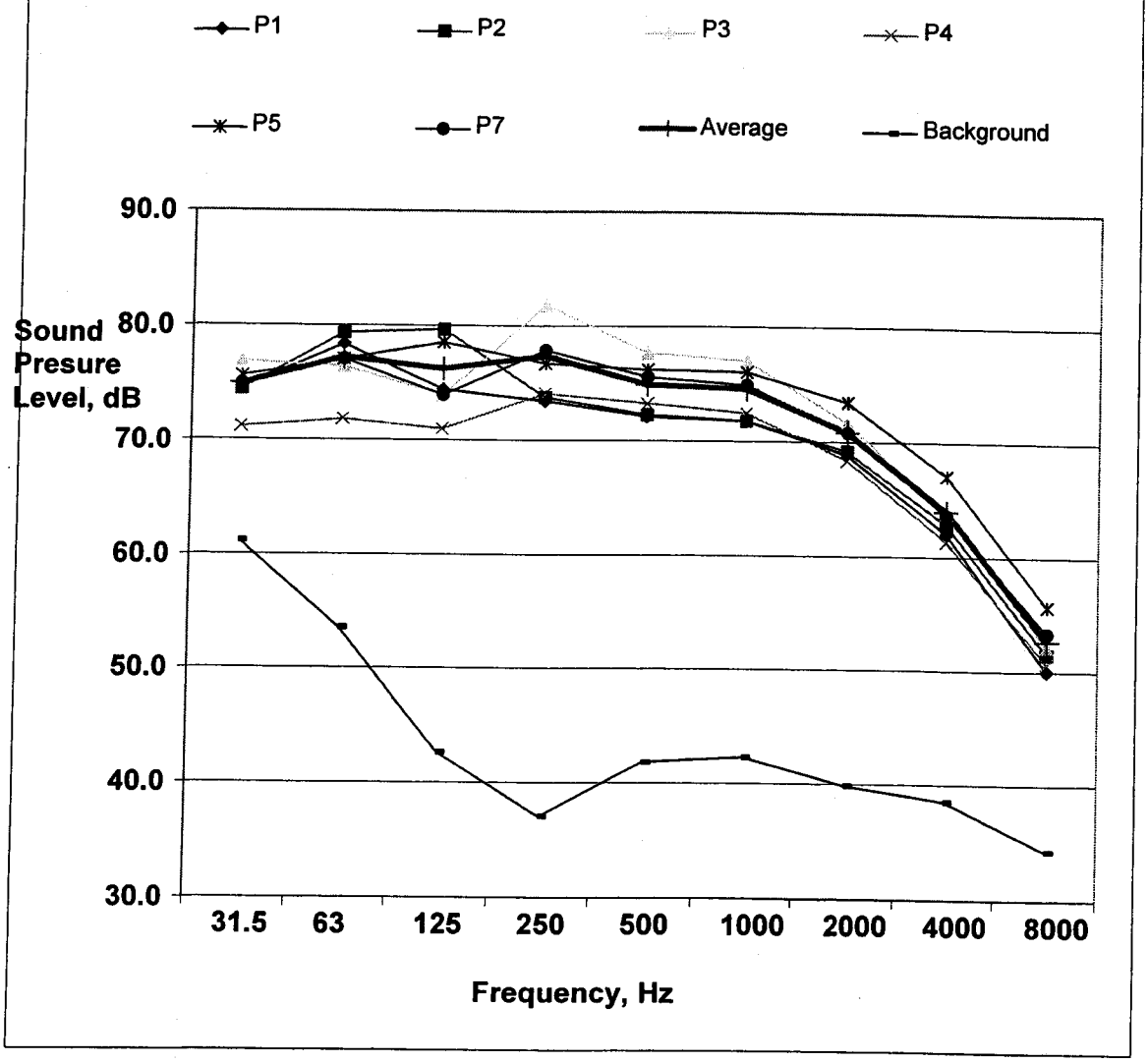
Since the measurement locations are at different distances from the crushing plant, the resultant sound levels were corrected to a common distance of 90 m using the following distance correction. The correction assumes geometric spreading of sound.

$$\text{Distance correction} = 20*\text{Log}_{10}(d/90)$$

where d = actual measurement distance

The results of this correction process are shown in Appendix A.3. The measured noise spectra, corrected to 90 m distance, are shown in Figure 2.2. The measurements show little tendency for directionality in the sound from the crushing plant. The average sound pressure level is 78.5 dBA at 90 m.

Figure 2.2
Sound Levels for Blair Portable Crushing Plant
Corrected to 90 m
Based on Measurements at Winchester Quarry
29 September 2000



3.0 Applicable MoE Sound Level Limits

Sound level limits in the MoE guidelines[3,4] depend on the classification of the area as Class 1, 2 or 3.

> **Class 1 Area (Urban)** 'an area with an acoustical environment typical of a major urban area, where the background noise is dominated by urban hum (primarily road traffic noise)'
>
> **Class 2 Area (Urban)** 'an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 Areas, and in which a low ambient sound level, normally occurring between 2300 and 0700 hours in Class 1 areas, will typically be realised as early as 1900 hours.
>
> **Class 3 Area (Rural)** 'acoustical environment that is dominated by natural sounds having little or no road traffic ....'

Since road traffic volumes are minimal, the appropriate classification for the nearby residences is Class 3 Area (Rural).

In a Class 3 Area (Rural), for sound from a stationary source, including quasi-steady impulsive sound, the sound level limit at a point of reception, expressed in terms of the one hour equivalent sound level, L_{AEQ}, is the lower of the background one hour equivalent sound level, L_{AEQ}, and the one hour ninetieth percentile sound level plus 10 dB, L_{A90} + 10 dB.

However, in a Class 3 Area (Rural) no restrictions apply to a stationary sound source resulting in a one hour equivalent sound level (L_{AEQ}) lower than the minimum L_{AEQ} value for that time period as specified in Table 5.2. These minimum levels are known as the **exclusion limits**.

Time of Day	One Hour L_{AEQ} (dBA)
Day (0700 - 1900)	45
Evening (1900 - 2300)	40
Night (2300 - 0700)	40

Table 5.2 Minimum Values (Exclusion Limits) for One Hour L_{AEQ} by Time of Day for a Class 3 Area (Rural)[5.4]

Since background sound levels are generally low in the vicinity of the quarry, it has been taken that the above exclusion limits apply at the nearby residences and that the day-time sound level limit is 45 dBA.

4.0 Noise Assessment and Mitigation Measures

Based on the noise source data given in Section 2.0, noise levels were predicted at the nearest receptors around the quarry. Some aspects of the analysis are:

- The sound propagation model used is based on ISO 9613-2[5]. This model takes into account increased propagation due to wind and temperature inversions and is regarded as very conservative.

- Noise source data, see Section 2.0, are based on actual measurements of equipment which is similar to the equipment planned for use in the quarry.

Details of the predictions are contained in Appendix 3. Due to the proximity of some of the residences, a variety of mitigation measures will be required to bring the operations into compliance with the noise limits set out in Section 3.0. The extraction plan was developed on the basis of the worst case predictions of noise from the operation at the receptors.

It is envisaged that all operations take place only in the day, 0700 to 1900, when the noise limit is 45 dBA at all receptors.

It can be noted in the predicted noise levels for the rock drill in Appendix 3, that for a few locations and receptors, noise from the rock drill exceeds 45 dBA by up to 1.8 dBA. Human perception of sound is such that an increase in sound level of this order is generally imperceptible. Hence these small excesses, which will occur only occasionally during the life of the quarry, are considered to be acceptable.

4.1 Mitigation Measures for the Crushing Plant

Crushing is to take place only during the day, 0700 to 1900. Extraction is to commence near the north-east boundary of the quarry and proceed in a southerly and westerly direction. Both lifts are to be extracted simultaneously, with a small bench at the level of the first lift. As soon as is practical, the crushing plant should be moved down to the lower quarry floor at 58 m elevation. During the extraction, the crushing plant must remain within 30 m of the lift face with the face advancing to the south and west as shown in Figure 4.1. The following mitigation measures will be required to bring the operations into compliance with the noise limits set out in Section 3.0.

- A 10 m berm is required along part of the west boundary of the quarry to protect receptors R1, R2 and R3. The extent of the berm should be such as to block the line-of-sight for receptors R1, R2 and R3 as shown in Figure 4.1.

- A 4 m berm is required along the west and north boundaries of the quarry to protect receptors R4, R5, R6 and R7. The extent of the berm should be such as to block the line-of-sight for receptors R4, R5, R6 and R7 as shown in Figure 4.1.

- During the extraction of the south west corner of the quarry, the crushing plant should be kept at least 400 m away from receptor R1 and protected by the berm and lift face. That is, the crusher should not enter the south west corner but be located on the quarry floor next to the berm on the western boundary as indicated in Figure 4.1.

4.2 Mitigation Measures for the Rock Drill

The rock drill should only be operating during the day from 0700 to 1900. When the rock drill is working on the surface at 69 to 71 m elevation, the boundary berms described in section 4.1 should be in place. A rock pile, or other barrier, of 2 m height should be placed within 15 m from the rock drill as an additional noise barrier for the nearby receptors. Once the rock drill is less than 50m away from the boundary berm, the rock pile will not be required. No nearby barrier is required when the rock drill is working below grade, i.e. on the first lift.

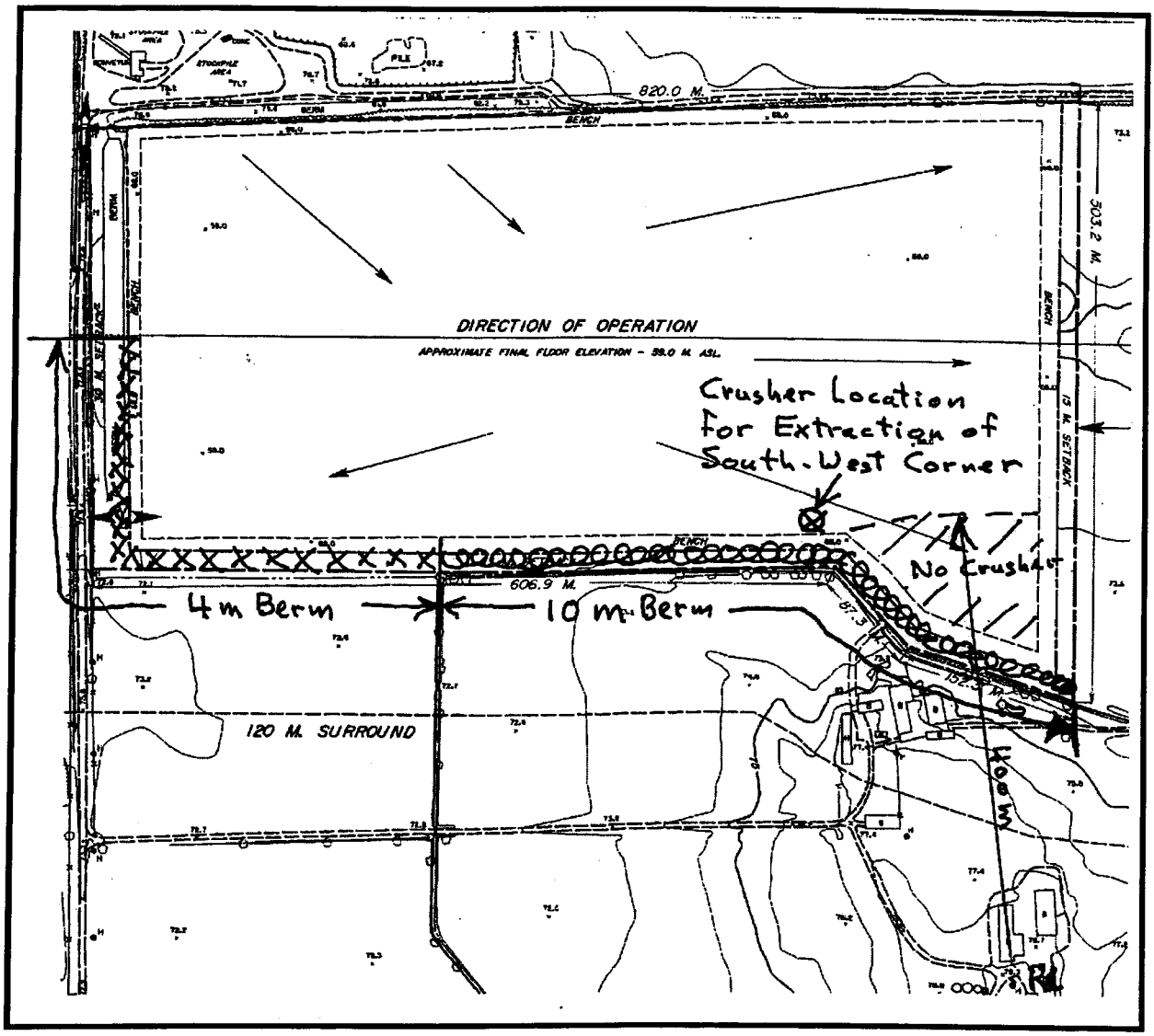


Figure 4.1 Mitigation Measures

5.0 Conclusions

A noise study of the Cinnamon Quarry has been carried out according to MoE guidelines[1-4]. This assessment has included a characterisation of the significant noise source, the crushing plant and the rock drill, and an evaluation of noise levels at the nearest residences. The following conclusions have been reached.

5.1 The applicable MoE noise limits are those for a Class 3 Areas (Rural). For day-time operation of the crushing plant, the sound level limit at the nearby residences is 45 dBA.

5.2 Mitigation measures have been developed for the quarry which will allow the quarry to meet the MoE noise limits at the nearest residences for day-time operation, 0700 to 1900. The mitigation measures include berms and restrictions. Details of the mitigation measures are contained in Section 4.

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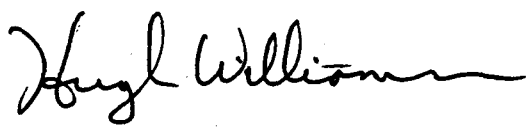
Member, Canadian Acoustical Society



Hugh Williamson, Ph.D., P.Eng.
Member, Canadian Acoustical Society

References

1 Ministry of Environment, Guide to Applying for Approval (Air): Noise and Vibration, November 1995.

2 Ministry of Environment Publication NPC-233, Information to be Submitted for Approval of Stationary Sources of Sound, October 1995.

3 Ministry of Environment Publication NPC-205, Sound Limits for Stationary Noise Sources in Class 1 & 2 Areas (Urban), October 1995.

4 Ministry of Environment Publication NPC-232, Sound Limits for Stationary Noise Sources in Class 3 Areas (Rural), October 1995.

5 ISO Standard 9613-2, Acoustics - Attenuation of Sound During Propagation Outdoors - Part 2: General Method of Calculation, 1966.

6 Ministry of Environment Publication NPC-101, Technical Definitions, August 1978.

7 Ministry of Environment Publication NPC-102, Instrumentation, August 1978.

8 Ministry of Environment Publication NPC-103, Procedures, August 1978.

Appendix A.1

Zoning Plan

Symbols:

SQR	**Special Rural Quarry**
AG	**Agriculture**

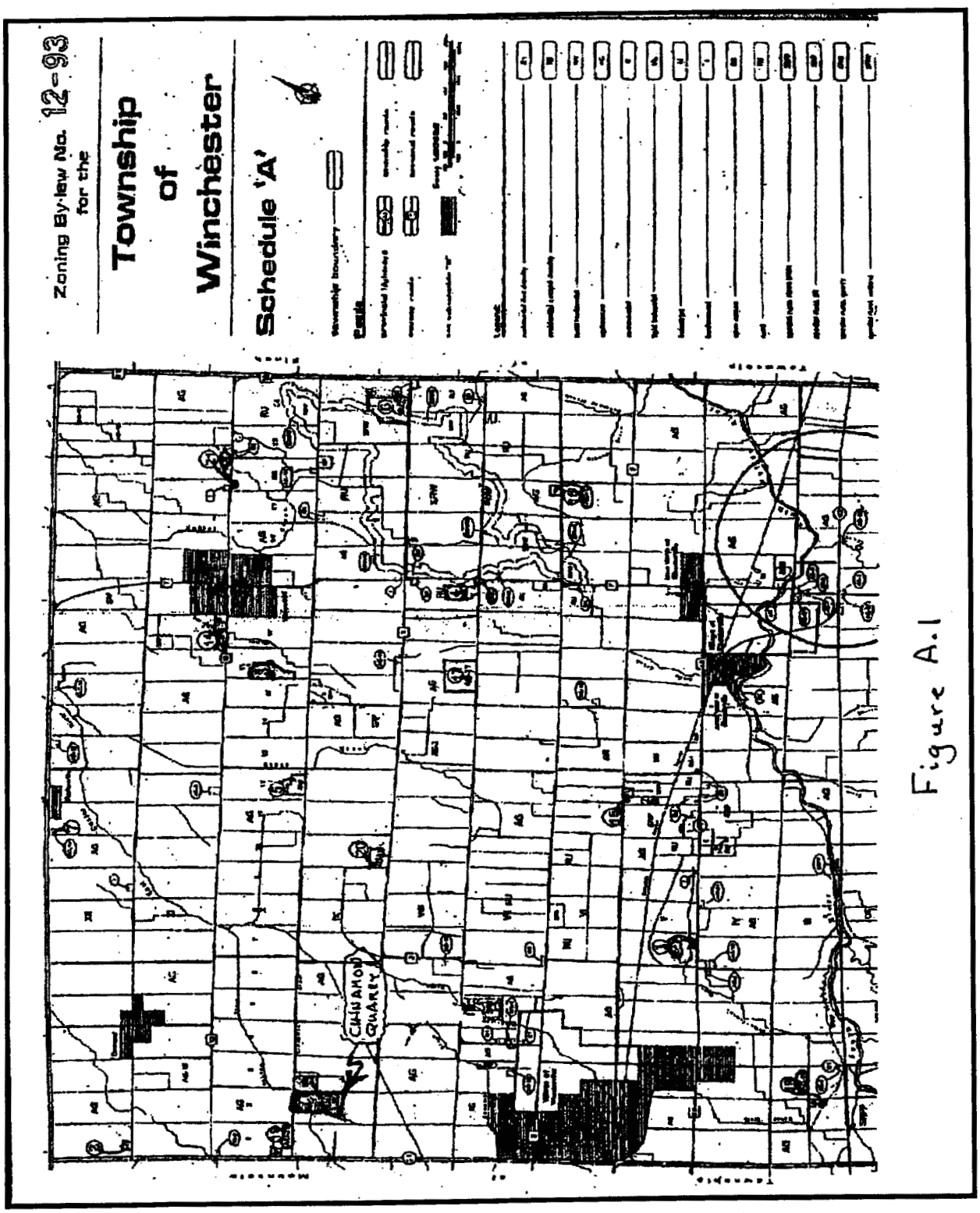

Zoning By-law No. 12-93
for the
Township
of
Winchester
Schedule 'A'
CINNAMON QUARRY

Figure A.1

Appendix A.2

Measurement Instrumentation and Procedures

Instrumentation and measurement procedures used meet the requirements for the measurement of noise from stationary sources as set out in the Ontario MoE publications[6-8].

Instrumentation

Sound measurement instrumentation used is set out below.

a) Brüel & Kjær Modular Precision Sound Analyser, Type 2260B, Serial No. 1772180
b) Brüel & Kjær Prepolarized Free-field ½" Microphone, Type 4189, Serial No. 1783705
c) Brüel & Kjær Enhanced Sound Analysis Software, Type BZ7202
d) Brüel & Kjær Sound Level Calibrator, Type 4231, Serial No. 2122785
e) Brüel & Kjær 90 mm Windscreen, Type UA0237
f) Tripod

Items a, b, and d above were calibrated by Brüel & Kjær on 20 September 2000.

Procedures

All measurements were attended. Care was taken to ensure that measurement positions at the points of reception were at least 1 m above the ground and no closer than 3 m from any other sound reflective surfaces. Dimensioned sketches, photographs and field notes document all measurements and are available on request. Unless otherwise noted, extraneous noise events, e.g. aircraft flyovers, barking dogs, etc., were eliminated by pausing measurement and back erasing where necessary. Field notes also record the results of calibrations and battery checks which were carried out before and after each measurement. In no case did the calibration vary by more than 0.1 dB over the series of measurements.

Appendix A.3

Sound Measurements and Noise Predictions for Nearest Receptors

Appendix A.3
Sound Measurement Results

Sound Measurement Results, Blair Crushing Plant at the Winchester Quarry

Client: WESA, A. L. Blair Construction Ltd.
Project: Cinnamon Quarry
Date of Measurements: 29 September 2000

Source File: **D:\HWA Data\WESA\Finch Quarry**

Octave band results

File No.	Position Note 1	Recorded sound level, L_{LEQ} 31.5	63	125	250	500	1000	2000	4000	8000	A	L
17	P1	70.9	75.4	71.6	71.7	69.8	69.1	65.9	59.0	47.8	73.2	81.8
18	P1	74.2	77.3	73.4	71.7	71.0	70.9	68.0	61.2	49.5	74.9	83.6
19	P1	74.4	77.7	74.6	72.8	71.7	71.4	68.8	62.1	50.3	75.6	84.0
38	P1	73.9	77.9	73.7	73.2	71.6	71.2	68.2	61.0	49.1	75.3	83.9
39	P1	73.7	78.0	73.8	73.3	71.5	71.2	68.0	60.8	49.0	75.2	84.3
	P1 avg.	74.0	77.7	73.9	72.8	71.4	71.1	68.3	61.3	49.5	75.3	84.0
20	P2	75.8	80.7	81.0	74.8	73.6	73.3	70.9	64.4	53.1	77.7	86.6
21	P2	76.0	81.1	81.3	75.8	73.9	73.4	70.7	64.2	53.1	77.8	86.6
	P2 avg.	75.9	80.9	81.1	75.3	73.7	73.3	70.8	64.3	53.1	77.8	86.6
22	P3	78.4	78.0	75.2	83.7	79.4	79.0	73.4	65.3	53.4	83.0	90.7
23	P3	78.3	78.0	75.8	83.0	78.9	78.2	72.9	65.2	54.1	82.3	90.0
	P3 avg.	78.4	78.0	75.5	83.4	79.2	78.6	73.1	65.2	53.7	82.7	90.4
24	P4	77.1	78.0	77.0	79.9	79.1	78.2	74.3	67.3	57.0	82.1	88.3
25	P4	77.2	77.7	76.8	80.1	79.3	78.7	74.3	67.1	56.5	82.4	89.2
	P4 avg.	77.1	77.8	76.9	80.0	79.2	78.5	74.3	67.2	56.8	82.3	88.8
26	P5	76.9	78.7	80.2	78.9	78.2	78.0	75.4	69.0	57.5	82.1	89.1
27	P5	77.0	78.9	79.8	78.5	77.9	77.8	75.2	68.9	57.7	81.9	89.0
28	P5	77.5	78.3	80.1	77.4	76.9	76.8	74.3	67.7	56.2	80.9	89.6
	P5 avg.	77.1	78.7	80.0	78.3	77.7	77.5	75.0	68.6	57.2	81.7	89.2
31	P7	78.3	80.4	77.3	81.3	78.9	78.3	74.1	67.0	56.7	82.1	90.9
40	B/G	61.1	53.6	42.6	37.1	41.8	42.4	39.9	38.6	34.3	47.0	78.5

Average sound data Corrected to 90 m, correction = 20 Log (d/90)

Position	Distance d	Sound levels corrected to 90 m 31.5	63	125	250	500	1000	2000	4000	8000	A	L
P1	96.0	74.6	78.3	74.5	73.4	72.0	71.7	68.8	61.9	50.0	75.8	84.5
P2	75.0	74.4	79.3	79.6	73.7	72.2	71.8	69.2	62.7	51.5	76.2	85.0
P3	75.0	76.8	76.4	73.9	81.8	77.6	77.0	71.6	63.6	52.1	81.1	88.8
P4	45.0	71.1	71.8	70.9	74.0	73.2	72.4	68.3	61.2	50.7	76.2	82.8
P5	75.0	75.5	77.1	78.5	76.7	76.1	76.0	73.4	67.0	55.6	80.1	87.7
P7	60.8	74.9	77.0	73.9	77.9	75.5	74.9	70.7	63.6	53.3	78.7	87.5
dB avg. at 90 m		74.8	77.2	76.2	77.4	74.9	74.5	70.7	63.8	52.6	78.5	86.5

APPENDIX A.3
Noise Predictions

Project: Cinnamon Quarry, North Dundas Township
Client: WESA/Blair
Location: Cinnamon Quarry, North Dundas Township

ISO Attenuation Calculations for Double Barriers

Calculation of sound level at a receiver from single source due to double perpendicular barriers

Comment: Two lifts extraced together, crusher on lower lift

	Source data		Source/barrier/Receiver input Geometry											Sound data		Geometric calculations								Results			
		Ref.	Horizontals			Ground elevations				Heights above ground										LOS	LOS					Receiver
Descriptio	Level	Dist.	S-Rx	B1-Rx	B2-Rx	E@S	E@B1	E@B2	E@R	SH	B1H	B2H	RH	f	λ	d	dsr	dss	e	P.L.D. z	Ch 2	Ch 1	Kmet	Dist. Att.	Bar. Att.	Atm. Att	Level
	dBA	m	m	m	m	m	m	m	m	m	m	m	m	Hz	m	m	m	m	m	m	?	?		dB	dB	db	dBA
Crusher along SW list face - Crusher on second lift floor, 59 m, and 30 m from upper lift face																											
R1	78.5	90	400	370	280	59	69	74	79	3	0	10	1.5	500	0.688	400.4	280.0	30.8058	91.24	1.6416	1	1	0.599	13.0	19.468	0.9	45.2
R1	78.5	90	500	470	280	59	69	74	79	3	0	10	1.5	500	0.688	500.3	280.0	30.8058	190.6	1.0768	1	1	0.493	14.9	16.923	1.1	45.6
R1	78.5	90	600	570	280	59	69	74	79	3	0	10	1.5	500	0.688	600.3	280.0	30.8058	290.4	0.9302	1	1	0.434	16.5	15.823	1.3	44.9
R1	78.5	90	800	770	280	59	69	74	79	3	0	10	1.5	500	0.688	800.2	280.0	30.8058	490.2	0.8434	1	1	0.364	19.0	14.734	1.8	43.0
R2	78.5	90	530	500	450	59	70	74	77	3	0	10	1.5	500	0.688	530.3	450.0	31.1809	51.92	2.865	1	1	0.566	15.4	21.557	1.2	40.4
R2	78.5	90	600	570	450	59	70	74	77	3	0	10	1.5	500	0.688	600.2	450.0	31.0483	120.8	1.869	1	1	0.453	16.5	18.375	1.3	42.3
R2	78.5	90	800	770	450	59	70	74	77	3	0	10	1.5	500	0.688	800.2	450.0	31.0483	320.3	1.2179	1	1	0.343	19.0	15.953	1.8	41.8
R3	78.5	90	945	915	870	59	71	74	83	3	0	10	1.5	500	0.688	945.3	870.0	31.3209	46.84	2.8934	1	1	0.348	20.4	19.539	2.1	36.5
4, R5, R6	78.5	90	850	820	750	59	70	74	77	3	0	4	1.5	500	0.688	850.2	750.0	31.0483	70.46	1.344	1	1	0.257	19.5	15.190	1.9	41.9
4, R5, R6	78.5	90	1000	970	750	59	70	74	77	3	0	4	1.5	500	0.688	1000	750.0	31.0483	220.1	1.0578	1	1	0.19	20.9	13.128	2.2	42.3
4, R5, R6	78.5	90	1200	1170	750	59	70	74	77	3	0	4	1.5	500	0.688	1200	750.0	31.0483	420.1	1.0113	1	1	0.156	22.5	12.239	2.6	41.1
R7	78.5	90	975	945	900	59	71	74	75	3	0	4	1.5	500	0.688	975.1	900.0	31.3209	45.54	1.7555	1	1	0.247	20.7	16.060	2.1	39.6
Rock Drill on surface at 69 to 71 m elevation, various distances away from boundary berm, with rock pile or barrier, 2 m high, less than 15 m from drill																											
R1	80.0	47	1000	985	280	69	69	74	79	0.3	2	10	1.5	500	0.688	1000	280.0	15.096	705.1	0.175	1	1	0.176	26.6	7.548	2.2	43.7
R1	80.0	47	800	785	280	69	69	74	79	0.3	2	10	1.5	500	0.688	800.1	280.0	15.096	505.2	0.2068	1	1	0.239	24.6	8.643	1.8	45.0
R1	80.0	47	600	585	280	69	69	74	79	0.3	2	10	1.5	500	0.688	600.1	280.0	15.096	305.3	0.2903	1	1	0.352	22.1	10.756	1.3	45.8
R1	80.0	47	500	485	280	69	69	74	79	0.3	2	10	1.5	500	0.688	500.1	280.0	15.096	205.4	0.4043	1	1	0.446	20.5	12.718	1.1	45.6
R1	80.0	47	400	385	280	69	69	74	79	0.3	2	10	1.5	500	0.688	400.2	280.0	15.1605	105.8	0.813	1	1	0.6	18.6	16.574	0.9	43.9
R1	80.0	47	350	345	280	69	69	74	79	0.3	2	10	1.5	500	0.688	350.2	280.0	5.2811	66.29	1.4111	1	1	0.807	17.4	20.078	0.8	41.7
R2	80.0	47	800	780	450	70	70	74	77	0.3	2	10	1.5	500	0.688	800	450.0	20.0721	330.2	0.2818	1	1	0.167	24.6	8.513	1.8	45.1
R2	80.0	47	600	585	450	70	70	74	77	0.3	2	10	1.5	500	0.688	600.1	450.0	15.096	135.5	0.6059	1	1	0.4	22.1	13.819	1.3	42.7
R2	80.0	47	550	540	450	70	70	74	77	0.3	2	10	1.5	500	0.688	550.1	450.0	10.1435	90.8	0.9124	1	1	0.556	21.4	16.734	1.2	40.7
R3	80.0	47	1500	1480	870	71	71	74	83	0.3	2	10	1.5	500	0.688	1500	870.0	20.0721	610.1	0.1134	1	1	0.005	30.1	4.837	3.3	41.8
R3	80.0	47	1400	1380	870	71	71	74	83	0.3	2	10	1.5	500	0.688	1400	870.0	20.0721	510.1	0.1287	1	1	0.008	29.5	4.894	3.1	42.5
R3	80.0	47	1200	1194	870	71	71	74	83	0.3	2	10	1.5	500	0.688	1200	870.0	6.23618	324.2	0.3504	1	1	0.218	28.1	9.848	2.6	39.4
R3	80.0	47	970	964	870	71	71	74	83	0.3	2	10	1.5	500	0.688	970.1	870.0	6.23618	94.64	0.7879	1	1	0.401	26.3	14.841	2.1	36.7
R4	80.0	47	1200	1194	800	70	70	74	77	0.3	2	4	1.5	500	0.688	1200	800.0	6.23618	394.1	0.254	1	1	0.18	28.1	8.439	2.6	40.8
R4	80.0	47	900	894	800	70	70	74	77	0.3	2	4	1.5	500	0.688	900	800.0	6.23618	94.2	0.3903	1	1	0.301	25.6	11.216	2.0	41.2
R5	80.0	47	1200	1194	910	70	70	74	76	0.3	2	4	1.5	500	0.688	1200	910.0	6.23618	284.1	0.2781	1	1	0.174	28.1	8.582	2.6	40.6
R5	80.0	47	1010	1004	910	70	70	74	76	0.3	2	4	1.5	500	0.688	1010	910.0	6.23618	94.19	0.402	1	1	0.263	26.6	10.863	2.2	40.3
R6	80.0	47	1100	1094	750	70	70	74	74	0.3	2	4	1.5	500	0.688	1100	750.0	6.23618	344.1	0.2804	1	1	0.22	27.4	9.231	2.4	41.0
R6	80.0	47	900	894	750	70	70	74	74	0.3	2	4	1.5	500	0.688	900	750.0	6.23618	144.1	0.3503	1	1	0.294	25.6	10.776	2.0	41.6
R6	80.0	47	850	844	750	70	70	74	74	0.3	2	4	1.5	500	0.688	850	750.0	6.23618	94.19	0.4157	1	1	0.335	25.1	11.795	1.9	41.2
R7	80.0	47	1100	1094	900	71	71	74	75	0.3	2	4	1.5	500	0.688	1100	900.0	6.23618	194.1	0.2896	1	1	0.195	27.4	8.994	2.4	41.2
R7	80.0	47	1000	994	900	71	71	74	75	0.3	2	4	1.5	500	0.688	1000	900.0	6.23618	94.13	0.3568	1	1	0.246	26.6	10.268	2.2	41.0

Sound data:

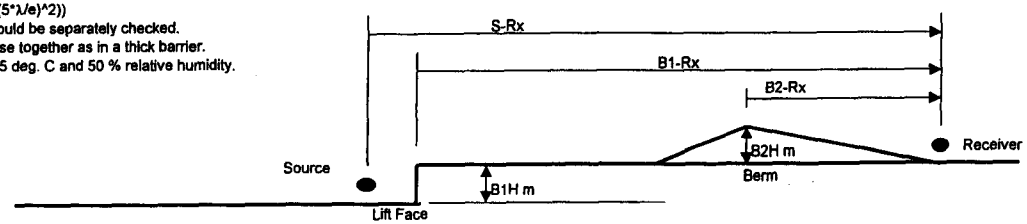
f		Hz, centre band frequency
c	344	m/s, speed of sound in air
λ	c/λ	m, wavelength

Symbols:

S-Rx	m, Source to receiver horizontal distance	SH	m, Source height	e	m, 1st to 2nd barrier distance
B1-Rx	m, 1st barrier to receiver horizontal distance	B1H	m, 1st barrier height	z	m, path length difference = dss + dsr - d
B2-Rx	m, 2nd barrier to receiver horizontal distance	B2H	m, 2nd barrier height		
E@S	m, Ground elevation at source	RH	m, Receiver height		
E@B1	m, Ground elevation at base of 1st barrier	d	m, Source to receiver distance		
E@B2	m, Ground elevation at base of 2nd barrier	dsr	m, 2nd barrier to receiver distance		
E@R	m, Ground elevation at receiver	dss	m, Source to 1st barrier distance		

Notes:

1. Ground attenuation is ignored.
2. Attenuation calculated according to ISO 9613-2:1996(E), barriers are assumed to be perpendicular to a line joining source and receiver.
   ISO formulas: Bar. Att. = 10*log10(3+(20/λ)*C3*z*Kmet), z = P.L.D. for perpendicular barriers, Kmet = exp(-0.0005*SQRT(d*dsr*dss/(2*z))), if z< 0, Kmet = 1,
   C3 = (1 + (5*λ/e)^2)/(1/3 + (5*λ/e)^2))
3. Assumes that both barriers block line of sight, N. B. this should be separately checked.
4. When barriers are close together, assumes heights are close together as in a thick barrier.
3. Atmospheric attenuation based on attenuation at 500 Hz, 15 deg. C and 50 % relative humidity.



APPENDIX A.3
Noise Predictions

ISO Barrier Attenuation Calculations (Based on A weigted levels and 500 Hz barrier calculations)

Calculates sound level at a receiver from a single source for a perpendicular single thin barrier

Project: Cinnamon Quarry, North Dundas Township
Client: WESA/Blair
Location: Cinnamon Quarry, North Dundas Township
Comment: Rock Drill noise prediction and Crushing Plant noise prediction during the last stage of extraction

Description	Source data		Source/barrier/Receiver Input Geometry								Sound data		Geometric calculations						Results			
			Horizontals		Elevations			Heights								LoS	P.L.D.				Atm.	Receiver
	Level	ref. Dis	S-Rx	B-Rx	E@S	E@B	E@R	SH	BH	RH	f	λ	d	dsr	dss	Block	z	Kmet	Dist. Att.	Bar. Att.	Att	Level
	dBA	m	m	m	m	m	m	m	m	m	Hz	m	m	m	m	?	m		dB	dB	db	dBA
Keeping Crushing Plant within 30 m of lift face and 400 m from nearest receptor R1, single barrier protection only during last stage of extraction																						
R1	78.5	90	400	370	59	74	79	3	10	1.5	500	0.688	400.4	370	37.2	1	6.791	0.727	13.0	20.0	0.9	44.7
R2	78.5	90	480	450	59	74	77	3	10	1.5	500	0.688	480.3	450	37.2	1	6.952	0.684	14.5	20.0	1.1	42.9
R3	78.5	90	900	870	59	74	83	3	10	1.5	500	0.688	900.3	870	37.2	1	6.921	0.484	20.0	20.0	2.0	36.5
R4	78.5	90	830	800	59	74	77	3	4	1.5	500	0.688	830.2	800	34	1	3.836	0.424	19.3	17.0	1.8	40.4
R5	78.5	90	940	910	59	74	76	3	4	1.5	500	0.688	940.1	910	34	1	3.872	0.379	20.4	16.6	2.1	39.5
R6	78.5	90	780	750	59	74	74	3	4	1.5	500	0.688	780.1	750	34	1	3.887	0.449	18.8	17.3	1.7	40.7
R7	78.5	90	930	900	59	74	75	3	4	1.5	500	0.688	930.1	900	34	1	3.888	0.384	20.3	16.7	2.0	39.5
Rock Drill on surface at 69 m elevation within 50m of the boundary berms																						
R1	80	47	330	280	69	74	79	0.3	10	1.5	500	0.688	330.2	280	52.12	1	1.948	0.573	16.9	15.5	0.7	46.8
R1	80	47	315	280	69	74	79	0.3	10	1.5	500	0.688	315.2	280	37.96	1	2.785	0.679	16.5	17.6	0.7	45.1
R1	80	47	290	280	69	74	79	0.3	10	1.5	500	0.688	290.2	280	17.78	1	7.585	0.857	15.8	20.0	0.6	43.5
R2	80	47	500	450	69	74	77	0.3	10	1.5	500	0.688	500.1	450	52.12	1	2.065	0.431	20.5	14.6	1.1	43.8
R3	80	47	920	870	69	74	83	0.3	10	1.5	500	0.688	920.1	870	52.12	1	1.991	0.198	25.8	11.6	2.0	40.5
R4	80	47	850	800	69	74	77	0.3	4	1.5	500	0.688	850	800	50.75	1	0.702	0.084	25.1	6.7	1.9	46.3
R5	80	47	960	910	69	74	76	0.3	4	1.5	500	0.688	960	910	50.75	1	0.716	0.062	26.2	6.3	2.1	45.4
R6	80	47	800	750	69	74	74	0.3	4	1.5	500	0.688	800	750	50.75	1	0.731	0.102	24.6	7.1	1.8	46.5
R7	80	47	950	900	69	74	75	0.3	4	1.5	500	0.688	950	900	50.75	1	0.725	0.065	26.1	6.4	2.1	45.4

Sound data:

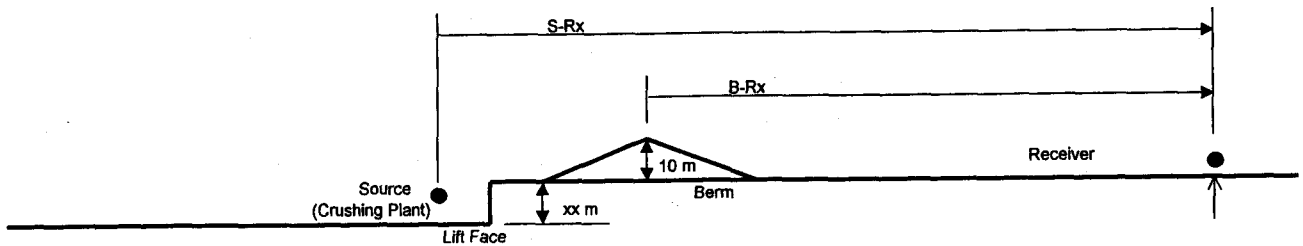
f		Hz, centre band frequency
c	344	m/s, speed of sound in air
λ	c/λ	m, wavelength

Symbols:

S-Rx	m, Source to receiver horizontal distance
B-Rx	m, Barrier to receiver horizontal distance
E@R	m, Ground elevation at receiver
E@B	m, Ground elevation at base of barrier
E@S	m, Ground elevation at source
SH	m, Source height above ground
RH	m, Receiver height above ground
BH	m, Barrier height above ground
d	m, Source to receiver distance
dsr	m, Barrier to receiver distance
dss	m, Source to barrier distance
z	m, path length difference = dss + dsr - d

Notes:

1. Ground attenuation is ignored.
2. Barrier attenuation calculated according to ISO 9613-2:1996(E), barrier assumed to be perpendicular to a line joining source and receiver.
   ISO formulas: Bar. Att. = 10*log10(3+(20/λ)*z*Kmet), z = P.L.D. for a perpendicular barrier, Kmet = exp(-0.0005*SQRT((S-Rx)*(B-Rx)*(S-B)/(2*z))), if z< 0, Kmet = 1
   LoS (line of sight), 1 = if blocked by barrier, 0 = if not blocked thus z = -P.L.D.
3. Atmospheric attenuation, 2.2 dB/km, based on attenuation at 500 Hz, 15 deg. C and 50 % relative humidity.



APPENDIX K

Explotech Specialists in Explosives and Blasting
Blast Design Report

EXPLOTECH

Specialists in Explosives and Blasting
Consulting Engineers

September 18, 2003

Water & Earth Sciences
Box 430,
3108 Carp Road
Carp, Ontario
KOA 1L0

Attn: Ms. Tammy Sugarman, P. Eng.

Subject: Blast Impact Analysis – Cinnamon Quarry

Dear Tammy;

As requested, we enclose one copy of the BIA for the Cinnamon quarry, We have sent a copy to Brian Blanshard of A.L. Blair Construction Ltd. as well.

It has been a pleasure working with you on this project.

Yours truly,

René A. (Moose) Morin, P. Eng.

Explotech Engineering Ltd.
58 Antares Drive, Unit 5, Ottawa, Ontario K2E 7W6
Tel.: 613-723-2494 Toll Free: 1-866-397-5683 www.explotech.com

EXPLOTECH

Specialists in Explosives and Blasting
Consulting Engineers

BLAST IMPACT ANALYSIS

PROPOSED CINNAMON QUARRY

Lot 2, Concession IX
Winchester Township

Prepared for:

TPR Ready Mix
5 Labrosse
Moose Creek, Ontario
KOC 1W0

René A. (Moose) Morin, P. Eng.,
Specialist in Explosives and Blasting

September 23, 2002

Explotech Engineering Ltd.
58 Antares Drive, Unit 5, Ottawa, Ontario K2E 7W6
Tel.: 613-723-2494 Toll Free: 1-866-397-5683 www.explotech.com

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PROPOSED CINNAMON QUARRY

Executive Summary

Explotech Engineering Ltd. was retained in May 2002, by TPR Ready Mix, to provide a blast impact analysis for the proposed extension to the Cinnamon quarry, Lot 2, Concession IX, Winchester Township.

We have visited the site, monitored one blast and reviewed the site plans and are of the opinion that mineral extraction on the proposed site extension can be carried out productively and safely within MOEE guidelines.

INTRODUCTION

This blast impact analysis of the proposed Cinnamon quarry extension, Lot 2, Concession IX, Winchester Township is based on recent site visits and monitoring of blasting operations in the existing quarry. This analysis has been prepared in order to comply with the requirements of applying for a Class A, Category 4 Quarry Licence under the Aggregate Resources of Ontario Provincial Standards, pursuant to the Aggregate Resources Act.

This Blast Impact Analysis is based on the Ministry of Environment and Energy's Model Municipal Bylaw (NPC119) with regard to guidelines for blasting in Mines and Quarries. We have assessed the area surrounding the proposed license with regard to potential damage from blasting operations.

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

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PROPOSED CINNAMON QUARRY

BLAST VIBRATION AND OVER PRESSURE LIMITS

The Ministry of the Environment and Energy's guidelines for blasting in quarries are amongst the most stringent in North America.

Studies by the U.S. Bureau of Mines have shown that normal temperature and humidity changes, particularly in this area, can cause more damage to residences than blast vibrations and over pressure in the range permitted by the MOEE.

MOEE suggested vibration limits	12.5 mm/sec
MOEE suggested over pressure limits	128 dB

The above guidelines apply when blasts are being monitored and all blasts will be monitored for vibrations and overpressure at this site.

DEFINITIONS

Peak Particle Velocity

The rate of change of the amplitude, usually measured in mm/sec or in/sec. This is the speed or excitation of the particles in the ground resulting from vibratory motion.

Blast Over Pressure

A compressional wave in air caused by:

a) The direct action of the unconfined explosive, or

b) The direct action of confining material subjected to explosive loading.

BLAST VIBRATION AND OVER PRESSURE DATA

Blast vibration and blast over pressure data used in this report was collected from locations in and around Eastern Ontario quarries during the past several years. Data comes primarily from limestone quarries using various lengths of blast holes with diameters ranging from 63 mm to 150 mm in diameter.

EXPLOTECH

PROPOSED CINNAMON QUARRY

Instantel's "state of the art" self-triggering Digital Blasting seismographs were used to collect the data.

All data was plotted using square root scaling for blast vibrations and cube root scaling for blast over pressure.

This composite data has been used as start up guidelines for many quarries and is generally more conservative than site-specific data.

This data has recently been compared to an existing large diameter blast hole operation in southern Ontario and was very close to site-specific data for that quarry.

Results of monitoring a blast on August 30 show that our blast vibration composite data and site specific blast vibration data correlate very well. As future blasts are monitored, both blast vibration and overpressure data from this site will be used to govern blasting operations.

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PROPOSED CINNAMON QUARRY

PROPOSED MINERAL EXTRACTION – Lift 1

The first lift of the quarry extension will be extracted to approximately Elevation 69. Extraction will proceed to the West of the existing quarry then towards the South of the proposed site. Bench height will vary from 3 meters at the North end to 6 meters at the South end of the proposed quarry.

Explosive charges will vary from 12 to 35 kg. per period. Based on our current blast vibration data, extraction can safely take place to within 225 meters of non-owned buildings or residences while respecting MOEE guidelines for drilling and blasting in mines and quarries. Safety precautions will have to be taken if any of the TPR owned buildings are occupied during blasting operations.

PROPOSED MINERAL EXTRACTION – Lift 2

The second lift will be approximately 10 meters in height which suggests that a maximum explosive charge of 66 kg per period will be used for production blasting.

This means that standard drill blast patterns may be used until blasting comes to within 300 meters of non-owned buildings and residences. Explosive charges will either have to be reduced by decking or by the use of smaller diameter holes as mineral extraction encroaches on non-owned structures. Since all blasts will be monitored at the nearest residence or structure, designing blasts to conform to MOEE guidelines will be a simple matter.

TRANSCANADA PIPELINES INSTALLATION

TransCanada Pipelines has an installation running parallel to and approximately 200 meters south of the South boundary of the proposed quarry extension. Blasting specifications for all TransCanada pipeline installations require a maximum Peak Particle Velocity of 50 mm/sec measured above the buried pipeline.

It will definitely not be a problem to conform to these specifications because of the stringent MOEE guidelines. In any case, blast vibrations will be monitored at the pipeline when blasting operations come to within 250 meters of it.

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PROPOSED CINNAMON QUARRY

MOEE RECOMMENDED VIBRATION and OVER PRESSURE LIMITS

Blast Vibration Limit - 12.5 mm/sec

Distance to Receptor	Allowable Explosives per Period - kg	
Meters	Front of Blast	Back of Blast
150	39	17
200	69	30
250	108	48
300	156	68
350	213	94
400	278	122
500	434	190
600	625	275
700	851	374
800	1111	477
900	1406	604
1000	1831	746
1100	2216	903
1200	2500	1075

Blast Over Pressure Limits — 128 dB

Distance to Receptor	Allowable Explosives per Period - kg	
Meters	Front of Blast	Back of Blast
150	8	38
200	20	88
250	38	171
300	67	296
350	106	470
400	158	702
500	308	1,372
700	846	3,764
900	1,799	8,000
1200	4,264	18,962

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PROPOSED CINNAMON QUARRY

DETAILS OF BLASTING OPERATIONS

Contact:	TPR Ready Mix Representative
Blast Pattern:	2100 x 2100 to 4500 x 4500 mm
Number of holes;	Varies
Hole depth:	3 - 10 meters
Hole Diameter:	76 to 152 mm
Collar Length:	1000 - 2500 mm
Toe Load:	ANFO/ANFO WR
Column Load:	ANFO/ANFO WR
Maximum Charge per hole:	65 kg.
Total Explosives per blast:	Varies
Toe Burden:	See pattern above
Crest Burden:	See pattern above
Material being blasted:	Limestone
Tonnage per blast:	Varies
Number of blasts per year	Varies with production required

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PROPOSED CINNAMON QUARRY

PREVAILING METEOROLOGICAL CONDITIONS

Medians provided by Environment Canada

Date	Wind Direction	Wind Velocity	Temperature ^0C
Jan	WNW	16.2 km/hr	-10.9
Feb.	WNW	16.2	- 9.5
March	WNW	16.7	- 3.0
April	WNW	16.8	5.6
May	NNW	14.8	12.8
June	NNW	13.2	18.0
July	NNW	15.6	20.6
Aug	WNW	11.5	19.2
Sept	WNW	12.8	14.3
Oct	NNW	14.1	8.1
Nov	WNW	15.2	1.2
Dec	WNW	15.5	- 7.7

** Data is not available specifically for the proposed quarry location.

Nearest weather station is Ottawa airport

EXPLOTECH

PROPOSED CINNAMON QUARRY

RECOMMENDATIONS

An independent engineering firm specializing in blast monitoring and blast design shall monitor a minimum of one blast per season in order to obtain the site specific data needed to ensure that subsequent blasts continue within MOEE guidelines.

CONCLUSIONS

The existing quarry has been operating well within MOEE guidelines and there is no reason to expect that this will not continue. Modern blasting techniques will permit blasting to take place with explosives charges below allowable charge weights ensuring that blast vibrations and overpressure will be below MOEE guidelines at the nearest residence.