proj. # 98-07

A STAGE 2 ARCHAEOLOGICAL ASSESSMENT OF A PROPOSED QUARRY IN CARDEN TOWNSHIP, NEAR KIRKFIELD, ONTARIO

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Summary

In 1995 Mr. K. Swayze, a licenced archaeological consultant, was asked by Mr. D. Kennedy of Ferma Crushed Stone Inc. to prepare a stage 1 archaeological assessment of a proposed quarry to be developed on approximately 385 ha on lots 7, 8, 9 and parts of 6 and 10 in concession 9, Carden Twp., Victoria Co. The purpose of that background study was to determine the archaeological potential of the whole property; and it concluded that a stage 2 field assessment was warranted because of the property's micro-environmental diversity, and the probability that the relict strand of post-glacial Lake Algonquin crossed the property about 11,500 to 9,000 years ago, during the Palaeo-Indian and Early Archaic cultural periods. In addition there is a known site and two reported sites of the Late Woodland period (about 500 years ago) in the nearby vicinity.

In June 1998 Swayze was asked by Mr. J.S. Gourley, of Oliver Mangione McCalla & Assoc. Ltd., of Orillia, to proceed with a stage 2 archaeological assessment of that part of the property to be initially developed: phase 1 and the E½ of phase 2. The study area of this stage 2 report is approximately 89 ha located in the E½ of lots 8 and 9, concession 9, Carden Twp.

According to a reconstruction of the early post-glacial landscape of the property, the study area was initially under shallow waters of Lake Algonquin (during the Early Palaeo-Indian period) , after the water began to receed (about 10,500 to 9,000 years ago), it was on the littoral of a great lake. There is a ridge on the E½ of lot 8 that shows evidence of lacustrine modification, and it, and other topographic features related to the littoral became the focus of the field testing strategy. The greater part of the study area however, (mostly on lot 9) was determined to have low archaeological potential because of areas of exposed bedrock, regosolic overburden, and deflated, erosional, soil conditions. In addition, in early post-glacial times, it would have been a low, unattractive coastal plain; and, even in its pristine state, prior to pioneer deforestation, it would not have had features attractive for Late Woodland cultural period horticultural practices.

No archaeological deposits, artifacts, or cultural features were discovered during the stage 2 assessment, and the author recommends that OMCzCR issue a letter of clearance of heritage concern for the study area: phase 1 and E½ phase 2. It should be pointed out that other areas of the Ferma property will still warrant further stage 2 assessment, before other phases are developed.

Introduction

In 1995 the author prepared a stage 1 background assessment (Swayze 1995) of the "Ferma property" on lots 7, 8, 9 and parts of lots 6 and 10, concession 9, Carden Township, Victoria County. The purpose of that study was to estimate the archaeological potential of the property, because the owner, Ferma Crushed Stone Inc., of Rena Road, Mississauga, propose to quarry and crush limestone there. The stage 1 assessment concluded that, for the property as a whole, there is significant potential for archaeological deposits, particurarly for sites of the Palaeo-Indian and the Early Archaic cultural periods, approximately 11,500 to 9,500 years ago (see sections 1 and 6 below).

In June 1998 the author was asked by Mr. J. S. Gourley, of Oliver Mangione McCalla & Associates Ltd., of Orillia, to proceed with a stage 2 assessment of that part of the Ferma property scheduled for the initial stage of development; namely, phase 1 and the east half of phase 2 in the northern part of the proposed quarry (see Figure 8, and section 7). After receiving permission from Mr. Gourley to enter the property for the purpose of the assessment, the field testing was carried out, by the author, from August 21 to 28 1998.

In order that this stage 2 assessment may "stand alone" in accordance with the ministry's technical guidelines (OMCzCR 1993), the original stage 1 assessment (Swayze 1995) is re-produced below. However, a detailed description and evaluation of the archaeological potential of the study area itself is presented in section 7.

1 SUMMARY OF STAGE 1 BACKGROUND A ND ARCHAEOLOGICAL POTENTIAL

Ferma Crushed Stone Inc. is proposing a quarry development on lots 7, 8, 9, and parts of lots 6 and 10, Concession 9, Carden Township, Victoria County. The entire Ferma-Carden property (hereafter referred to as "the property") totals 384.5 ha, of which extraction is to occur in two segments totalling 205 ha.

This study considers the regional archaeological database, and specific aspects of the geology of the property and vicinity, in order to assess archaeological site discovery potential.

Based on these data, a Stage Two Archaeological Assessment is recommended. Three factors contribute to this conclusion:

1 The relict strand of glacial Lake Algonquin (circa 11,500 to 10,500 years ago) appears to cross the property, which suggests that Palaeo-Indian and/or Early Archaic period archaeological sites may be present.

2 In 1912 an archaeological site was reported from a lot adjacent the southwest corner of the property. Although that site has never been confirmed or relocated, there is no reason to doubt the veracity of the report. The property's most fertile land is in the contiguous lot.

3 The micro-environment of the property (first and second order streams, a springline, marshes, etc.) provides considerable bio-diversity (or would have in its pristine state), a condition known to increase archaeological site discovery potential.

2 PHYSIOGRAPHIC SETTING AND SURFICIAL GEOLOGY

The property lies to the ENE of Lake Simcoe in the upper, or western Trent Waterway basin. The basal bedrock stratum is Precambrian granite which begins to outcrop in exposed knobs to the north and east of the property. Above the granite are several Ordovician formations of limestone, shale and sandstone which contain the aggregate resource. In the study vicinity, these sedimentary deposits are in turn overlain by thin Pleistocene tills and glacio-fluvial and lacustrine deposits (see Figs. 1 and 2).

The general Lake Simcoe Lowlands region has a complex late Pleistocene and early Holocene geological history, dominated for more than two milenia by the fluctuations of glacial Lake Algonquin and its later Holocene lake stages. The relevance of these lakeshores to Palaeo-Indian and Early Archaic peoples is obvious and well demonstrated (Storck 1982; Jackson 1982; Stewart 1984); but the lacustrine deposits affected the environment subsequently and helped shape Woodland settlement patterns as well. In the Trent Waterway basin the complex geology is further complicated, from an archaeological point of view, by recent artificial control of the water level.

Glacial Lake Algonquin

Lake Algonquin existed between approximately 12,500 BP to 10,200 BP, and can be described according to four stages each defined by the location of the lake outlet and the elevation of the relict strand: Early, Kirkfield-Fenelon, Main, and North Bay (see Fig. 3).

Lake Algonquin originated with de-glaciation and, initially, the lake drained southwards from Port Huron at an elevation of 184 m a.s.l. At this time the study area was still ice-covered and it was not affected by the lake until about 11,500 BP when the eastern ice lobe melted and opened an outlet at Kirkfield in the immediate vicinity of the property. The Kirkfield stage of Lake Algonquin persisted for only a few centuries and in this time the water level dropped 15 to 30 m and large areas of the Simcoe Lowlands drained entirely (Karrow et al 1975). This lake stage coincides with the initial peopling of southern Ontario, but, although the study area was theoretically available for settlement, the local environment may not have been attractive with the ice-front still only a short distance to the north.

About 11,200 BP isostatic rebound, or an ice surge to the east, closed the Kirkfield outlet and the lake level rose until, again, the outlet was to the south at Port Huron. This, the Main Stage of Lake Algonquin, persisted for over a millennium, leaving prominent shoreline features (especially along north-facing slopes, such as the south side of Canal Lake). Quantities of clay and silt were deposited in deeper water, and sand and gravel in shallower waters (an example of the latter are the highlands of Carden Township northeast of Lake Dalrymple). Many archaeological sites have been located elsewhere in Ontario in association with the main strandlines, and, although not reported from the study area vicinity, there is ample reason to expect that they do exist. Due to differential isostatic uplift these strandlines are now found on an elevation plane increasing

from south to north. According to Deane (1950) these elevations are approximately 258 m a.s.l. at Bolsover, 263 m a.s.l. at Kirkfield, and 277 m a.s.l. at Uphill. A more specific consideration of these elevations and the property is presented below in the concluding statements.

As isostatic uplift continued, lake levels gradually dropped and about the commencement of the Holocene (10,500 BP) another series of outlets opened in succession in the North Bay areas leading to smaller bodies of water draining directly into the Champlain Sea (Ottawa River drainage). Strandlines for this stage were not well developed, and have not been systematically mapped. Although the study area was available for continued settlement at this time, it was removed from the lakeshore.

3 PREVIOUS ARCHAEOLOGICAL RESEARCH IN THE VICINITY

The history of archaeological research in the study area began early in this century when Col. George E. Laidlaw reported and described numerous sites in Victoria and neighbouring counties (1912 and 1917). Subsequent (ie. recent) research has mostly taken the form of surveys attemting to relocate Laidlaw's reported sites. Only Ramsden (1977; 1978; 1981) and his associates have conducted a programme of intensive excavation at several Late Woodland sites-some of them quite near the property. The archaeological work since Laidlaw's groundwork is summarized below in chronological order:

J.N. Emmerson (1954) tested middens at Benson BdGr-1 and Hardrock BdGr-2 in order to acquire comparative data for his doctoral dissertation.

Kenneth E. Kidd, of Trent University, supervised three field seasons of survey for the Trent Valley Archaeological Survey project (TVAS) carried out by three different field directors: Kettle 1966; Hakas 1967; and Richardson 1968.

Paul Sweetman (1969) submitted a preliminary report on Laidlaw sites in Victoria County but it is not clear if he carried out much field survey.

James Burns (1972) and Phill Wright (1972) conducted surveys at Balsam Lake and Indian Point Provincial Parks respectively as part of the CORTS Corridor study.

Peter Ramsden, of McMaster University carried out a programme of intensive excavation and field survey in the late 1970s (1977; 1978; 1981) to investigate the relationship between Huron and St. Lawrence Iroquois groups.

Peter Storck (1979), of the Royal Ontario Museum, is the only archaeologist yet to target the Lake Algonquin strand in an attempt to find Palaeo/Early Archaic sites-unfortunately Kirkfield was his terminus, so he barely penetrated the study area.

In 1984 Chris Ellis and Gary Foster undertook some property assessments in the area for Parks Canada. They provide a detailed record form for two sites in the study area: Summers BdGr-4, and Laidlaw Workshop #2 BdGr-5.

The only cultural resource management assessment previously conducted

in the study area was by M.T. Ambrose (1981), when she investigated the Hwy #503 road allowance from Kirkfield to McGee's Creek. No archaeological sites were found.

4 KNOWN ARCHAELOGICAL SITES IN THE VICINITY

For the purposes of this report "vicinity" and "study area" refer to nine Borden Blocks (or the parts therof in Victoria County), eight of which surround BdGr which contains the property. They are: BcGq, BcGr, BcGs, BdGq, BdGr, BdGs, BeGq, BeGr, BeGs. (Borden Blocks are the fundamental designation units used in the Canadian Heritage Inventory Network-CHIN-- and are defined by latitude and longitude coordinates. In this part of Ontario each block is approximately 11 km by 18 km. Archaeological sites are numbered sequentially within each block.)

The statistics calculated here must be seen as first approximations because of inconsistencies, ommissions, and duplications in the CHIN data. These are not addressed here, but have been identified and reported to MCzCR Furthermore, for the purpose of this discussion, Laidlaw's reported sites are here considered to be "existing" sites regardless of whether or not they have been relocated (and on or off CHIN), duplicated or destroyed since Laidlaw's day.

Laidlaw reported 77 sites in the vicinity, mostly by lot, concession, and township; only occasionally does he specify the approriate half, or any other specific locational details. In addition, he did not verify all his information, so many reports are unsubstantiated.

The total number of sites reported in the CHIN datafile is 36, and there are three known sites omitted. Of these 36, 16 are relocated Laidlaw sites, and most of the remaining are close to lots recorded by Laidlaw. The clearly relocated sites were almost all recorded on CHIN as a result of the TVAS and Ramsden programmes. To date very few sites have been recorded independently from Laidlaw's study.

The majority of the sites recorded are Late Woodland Huron villages and camps. This was largely a result of the visibility of such sites especially in Laidlaw's day (ie. recent ash pits with food remains and large easily recognizable artifacts like pot shards), when the pioneers sought the same arable land used previously by a horticultural indigenous population. Only two sites reported by Laidlaw, and subsequently relocated, are clearly Archaic: Quarry BdGr-5, and Laidlaw Workshop #2 BdGr-11; although sites he reported near Mud Lake (Lake Dalrymple) and Goose Lake, and on Long Point, are probably Archaic, in part, based upon his description of ground slate and copper artifacts. Only four sites are ascribed to the Middle Woodland (Point Peninsula) period: Cottage of the Year BdGq-1, and three small sites on Indian Point (not yet recorded in CHIN). Laidlaw notes that a few of his sites were also known to have been used within pioneer memory by the Mississaugi-notably the east shore of Lake Dalrymple. The paucity of sites of these periods can be explained by their low archaeological visibility, especially to the untrained eye. Furthermore, in the study area, many of this period may be inundated by the Waterway construction, or they might have been indistinct components of the Late Woodland sites.

(Neither period was recognized in Laidlaw's day.) No Palaeo-Indian or Early Archaic period sites have been reported , but this is not surprizing since they would not be expected below the Lake Algonquin strandline-and that is where most of the sites and survey activity took place. The environment of the study area, above the relict strand, was certainly inhabitable in that period and some sites were certainly created; but, if any have survived, they have certainly suffered attrition.

A few sites should be specified because of their prominence in the relevant literature, or because of their research potential. These include Benson BdGr-1 and Hardrock BdGr-2, because they were both tested by Emerson (1954) and Ramsden (1977; 1978; 1981); and Coulter BdGr-10, Kirche BdGr-3, and Wetback (BeGr block?), because Ramsden, or an associate, have conducted intensive test excavations. McClaren's Creek BcGq-1, Foster BcGr-5, and Summer's BdGr-4, deserve mention because of their research potential. The above mentioned Archaic and Middle Woodland sites are also important, as they represent the only data from those periods. (see Figure 2).

5 INTERVIEWS WITH LOCAL INFORMANTS

Jack McNamee - Mr. McNamee is an elderly man, now living in Kirkfield, who once owned and farmed the southern lots of the Ferma property, as well as surrounding land. He was aware that excavations had been carried out at Benson BdGr-1, but had never noticed any artifacts from the Ferma property. Jack stated that the only fields ever ploughed on a regular basis were those on the southern two lots.

Mr. McNamee's information was corroborated by his son and Mrs. Vincent McNamee (lot 6 Con 8).

Charles Wylie - Mr. Wylie owns and farms land to the north and west of the Ferma property, and presently rents the Ferma property pasture. He too is aware of the excavations at Benson and shares Mr. McNamee's view of the potential of the Ferma property

These two informants were the only ones located by the author who could be expected to have any first hand knowledge of archaeological potential of the property.

6 ARCHAEOLOGICAL POTENTIAL OF THE FERMA PROPERTY

According to Deane (1950:Fig. 7) the Main Stage Lake Algonquin strand occurs at 258 m a.s.l. at Bolsover, and increases to 263 m a.s.l. at the latitude of Kirkfield. Since the Ferma property is a similar distance north of Kirkfield, as Kirkfield is north of Bolsover, it is reasonable (if not scientific) to expect another increase of approximately five metres at the property: 268 +/- 5 m a.s.l. The existence of the Algonquin strand across the property was corr-

oborated by a visit to the property (Oct. 13 1995) and stereoscopic examination of various aerial photograph series-A 26303 1-3 (E.M.R.), at 1:70,000 (July 1983) is particularly good. The current NTS topographic map (31D/10) shows the 270 m contour line approximating the position of the relict strand, suggesting that the Ferma property was once part of a peninsula or island on an indented, or drowned, coastline. Storck (1982:19) notes that Palaeo-Indian sites tend to occur near such "complex" strands.

Another feature of the property suggesting archaeological potential are the first and second order streams and a spring-line (Oliver, Mangione McCalla and Assoc. 1995:13). The author's own research in a similar situation along the north shore of Lake Ontario, suggests that, statistically, there is a higher likelihood of sites of all periods occuring in proximity to these features (Swayze 1987).

The only arable land on the property which would seem to lend itself to the horticultural practises of the Late Woodland people, occurs in the two southern lots, and despite local testimony there is a reasonable probability of a site there-especially since Laidlaw (1912:63 #37) reports a "village" on the east half of lot 5, Con. 8 kittycorners to the southwest corner of the property (Jack McNamee worked this farm too). A distinctive knobby hill, known locally as Daly Mountain, occupies this corner. It is an obvious look-out, and reportedly has deep well-drained soil (Charles Wylie,personal communication) and given its proximity to a Laidlaw "site", it too may have some potential (it is not within the area of proposed extraction however).

STAGE 2

7 Description and Archaeological Potential of the Study Area

According to the operational plan of the proposed quarry devised by Oliver Mangione McCalla & Associates Ltd. (1995), the property will be developed in five phases. Phases 1 to 3 will be in the quarry north of the Talbot River, and phases 4 and 5 in the southern quarry. In accordance with instructions from Mr. Gourley, this stage 2 assessment is defined as phase 1 and the east half of stage 2, where an interim berm will be constructed from north to south (see Fig. 5). The study area is approximately 730 x 1220 m (89 ha) and its southeast corner is by Hornecastle Road, 1200 m north of McNamee Sideroad in Carden Township.

The topographic features and relief of the study area are shaped by its bedrock and surficial deposits, and, in the author's opinion, the effects of post-glacial Lake Algonquin. There is only 7 m of relief over the entire 89 ha (265 to 272 m a.s.l.), and it is typical of "Carden Plains" terrain: slightly inclined terraces of fractured Bobcaygeon Limestone with thin deposits of till and boulder erratics. The study area has two terraces, one above 270 m a.s.l., and one below. Both are regosolic plains with extensive areas of exposed bedrock broken by pockets of shallow hummocky till (Fig. 10). The lower terrace is drained by two intermittent first order streams--sources of the Talbot River--bordered by bands of imperfectly drained sandy and silty loam.

In the south-central part of the study area is a slightly sinuous ridge feature which descends in low terraces to the west. This feature is not well defined in Figure 4 because of the 2 m contour interval, but it is apparent at eye-level (see Figs. 6 and 9). The ridge occupys the interfleuve between two primary sources of the Talbot River, and, although

created by a bedrock break-in-slope, it has, in the author's opinion, been modified by Lake Algonquin. This theory rests on an extrapolation from Deane's (1950) calculations of the maximum extent of Lake Algonquin at this latitude, which puts the strandline about 270 m a.s.l. The sinuous shape of the ridge, its rounded terraces, and sandy soil are consistent with lacustrine modification. However, at 270 m a.s.l., in the north part of the study area, is a limestone boulder which shows clear sign of wave erosion (Fig 10) and suggests that the study area was submerged during the period of maximum extent. Also not illustrated in Figure 4, but apparent to the eye, is a smaller intermittent stream crossing the southern third of the study area. A low stony knoll is situated on the interfleuve of the two streams, but at 267 m a.s.l. it could not have emerged until an early recessional stage of Lake Algonquin.

In terms of vegetation and land use, the study area is at present ranchland pasture of wildgrasses and wildflowers, with scattered pine stumps and thin open woodlots of poplar, birch and hawthorn. In the southwest corner the stream flows into an imperfectly drained woodlot with dense stands of cedar and balsam fir. According to Mr. Jack McNamee, whose ancestors were the pioneer farmers here, the original forest was white pine which was destryed (either before or after felling) by a fire that burned all winter, with the result that almost 2 feet (60 cm) of soil was lost. The effects of this fire are apparent from the exposed buttresses of the pine stumps (Fig. 9) and the collapsed structure of the soil. The original soil was undoubtedly covered by a thick organic duff which was completely consumed. The sandy soil on the top of the ridge is reddish-orange in places, like scorched sand. Although local informants say the study area was never ploughed, there are several large rockpiles which suggest that the pioneers may have experimented with cultivation.

The archaeological potential of the study area is clearly related to these topographic features, at least for the Palaeo-Indian and Early Archaic cultural periods (11,500 to 9,500 years ago) when the study area was part of the Lake Algonquin littoral. However, according to the author's reconstruction of the early landscape, the study area may not have been sufficiently emerged for human occupation until Late Palaeo-Indian or Early Archaic times (e.g. until about 10,000 years ago). The most attractive features for human occupation then would certainly have been the interfleuvial landforms, particularly the ridge. The lower interfleuve may not have become attractive until later recessional lake stages. Although not well drained the borders of the intermittent creek may have had some attraction. Most of the study area however, has low potential, either because of bedrock exposures and erosion, or imperfectly to poorly drained soil. Even in its original state, the soil would have been poorly suited for Late Woodland horticultural practises and habitation. Figure 8 illustrates the extent and area of the features with high and moderate archaeological potential.

8 Method and Procedure of Field Testing

The field testing was carried out entirely by excavating testpits by shovel and trowel. The property is not cultivatable because of exposed bedrock and excessive stoniness--indeed it is possible that it was never ploughed. The area of high archaeological potential--the ridge--was tested at 5 m intervals; the areas of moderate potential-- the lower terrace, knoll, and stream border--were tested at 10 m intervals (Fig. 8). In all areas tested there were places where exposed bedrock and shallow overburden inhibited, or prevented, testing. Where possible backdirt was passed through a 6 mm mesh screen, but the effectiveness of this operation was best on deeper pockets of sandy loam on the ridge.

Elsewhere, between bedrock and rootmat, there was insufficient soil matrix to screen. Testpits were approximately 40 x 40 cm and were excavated to a maximum depth of 30 cm, along the creek border, but most averaged 10 to 20 cm, often less. Throughout the study area there are numerous bedrock exposures, and soil exposures resulting from cattle wallows. In the areas of high and moderate potential all exposures were visually inspected; and many of the larger exposures in the area of low potential were also visually inspected, on a judgemental basis. Similarly most of the larger rockpiles were visually inspected, with an eye for fire-cracked rock.

9 Results

No archaeological sites, artifacts, or cultural features were discovered.

10 Recommendations

The author recommends that OMCzCR issue a letter Oliver Mangione McCalla & Associates, Ltd. clearing the study area (phase 1 and east half of phase 2) of heritage concerns. Although it seems unlikely, given the shallow overburden of the study area, it is still possible that deeply buried archaeological deposits, or human remains, were not recognized by this assessment. If the former should be disturbed during development OMCzCR should be notified immediately; if the latter should be disturbed both OMCzCR and the Registrar, or Deputy Registrar, of the Cemeteries Regulation Unit of the Ministry of Consumer and Commercial Relations should also be notified (416-326-8392).

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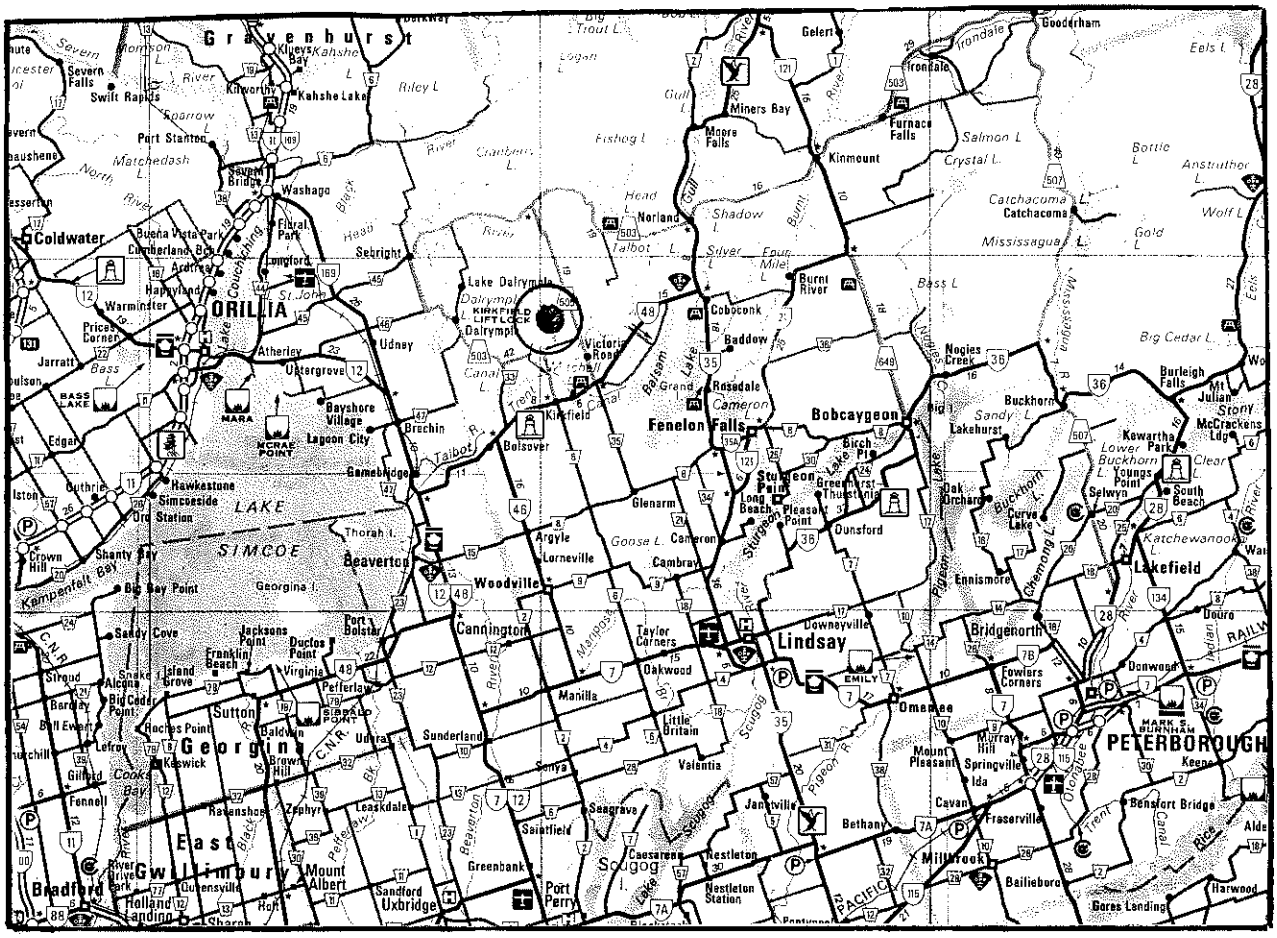


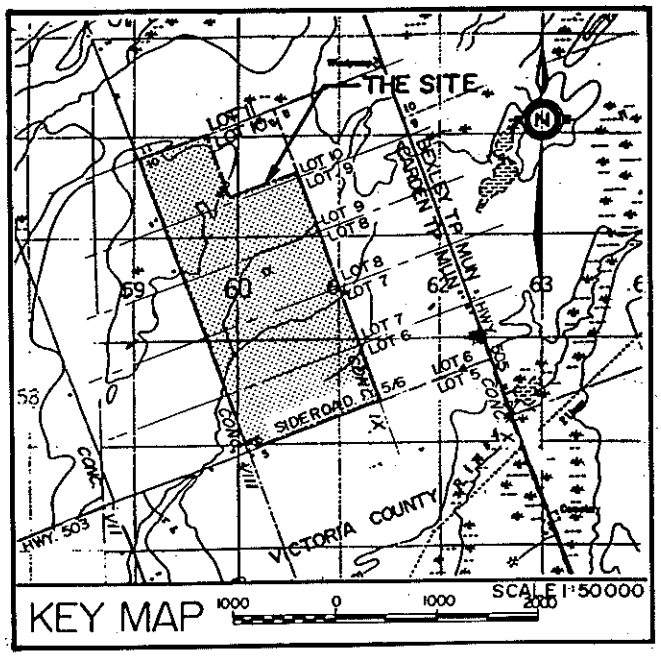
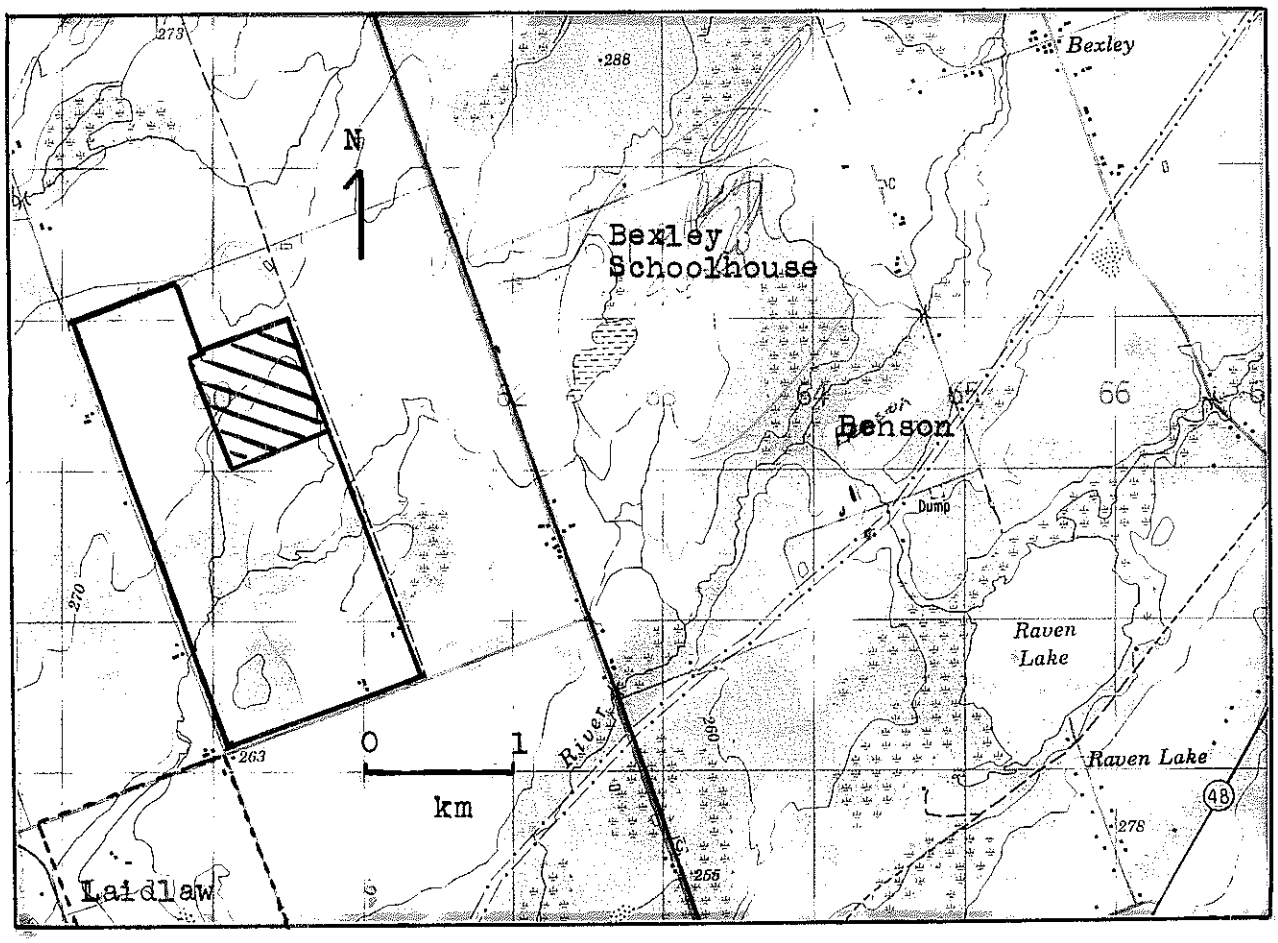


Figure 1: Location of the Ferma Prperty, Carden Twp., Victoria Co.



- Study Area (phase 1 & Eℓ 2)

- Ferma Property Boundary

Figure 2: The Ferma property and Vicinity at 1:50,000 (31 D/10) and known or reported archaeological sites in vicinity.

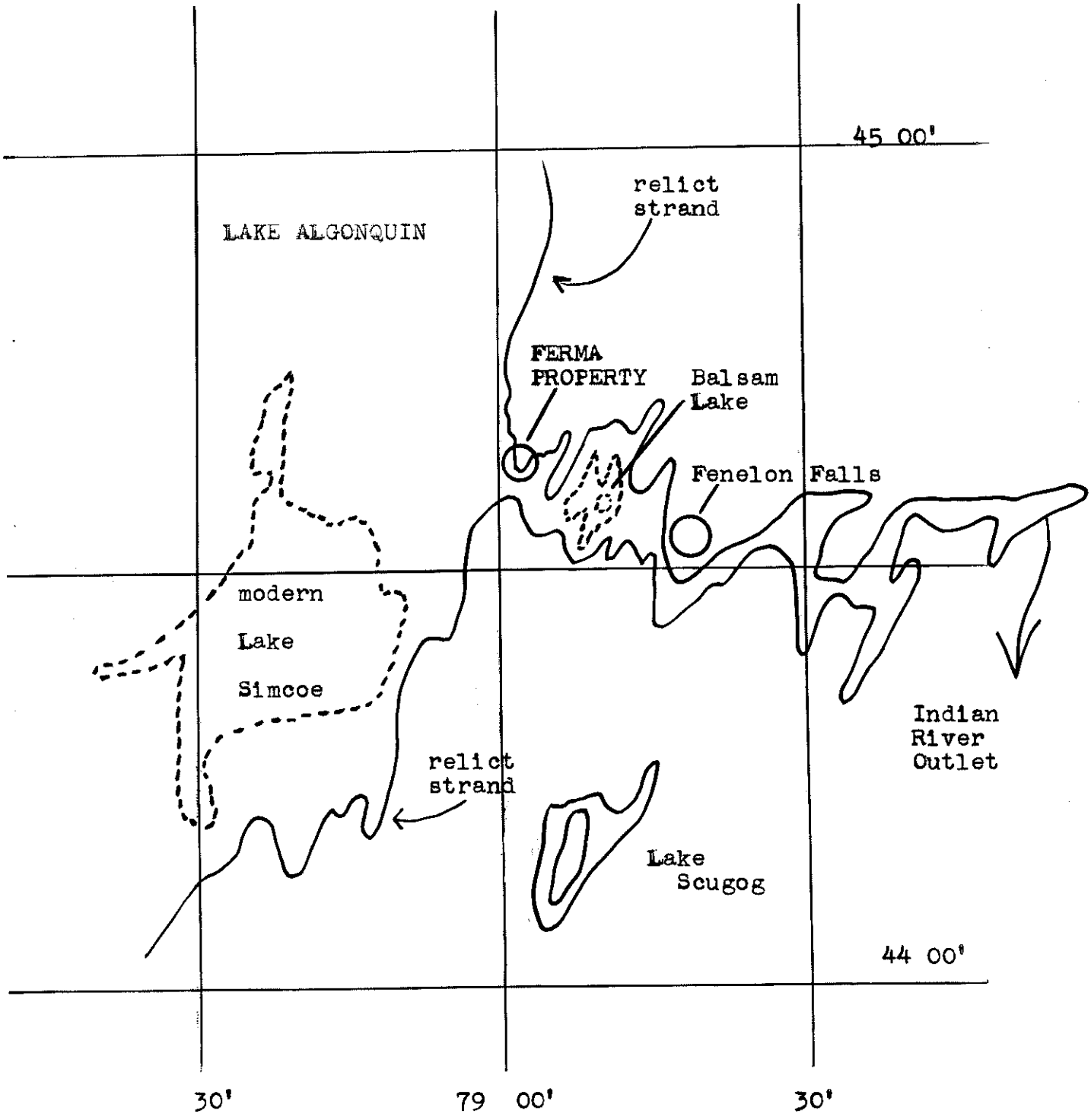


Figure 3: Ferma Property in relation to post-glacial Lake Algonquin (from Deane 1950).

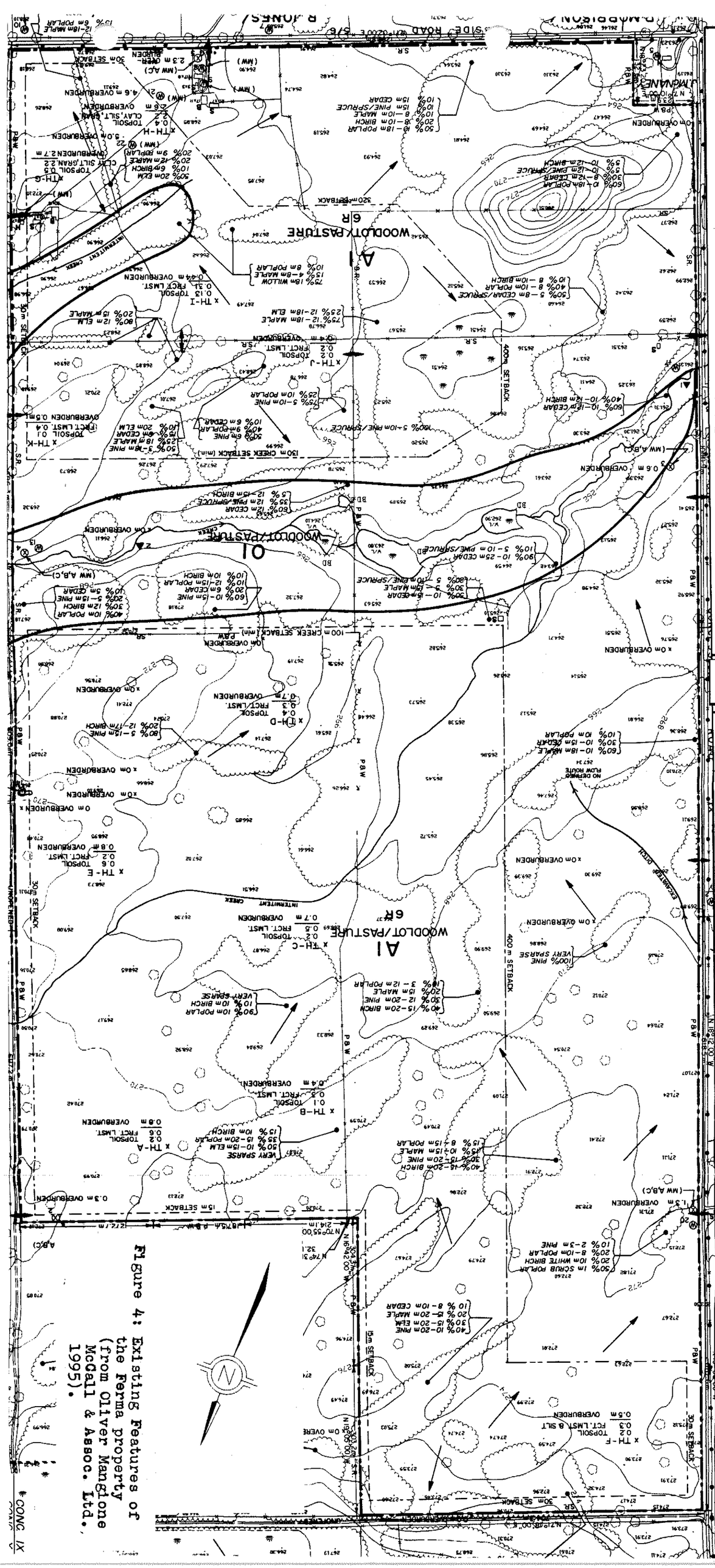


Figure 4: Existing Features of the Ferma property (from Oliver Mangione McCall & Assoc. Ltd., 1995).

LEGEND

- 266.20 — EXISTING ELEVATION
- 270 — 2.0m CONTOUR INTERVAL
- TREES / BUSH
- CREEK — DRAINAGE COURSE & FLOW DIRECTIONS
- GENERAL SURFACE DRAINAGE DIRECTION
- BD — BEAVER DAM
- SWAMP
- W/L 270.10 — POND AND WATER LEVEL
- WELL LOCATION AND NUMBER
- SURFACE WATER MONITORING POINT
- BUILDINGS (HOUSE-BARN-SHED-GARAGE-COTTAGE) DIMENSIONS
- C.WYLIE / W.GOULD — OWNER / TENANT
- P&W — 1.2m — S.R. — FENCE TYPE & HEIGHT (P & W - POST & WIR (S.R. - SPLIT RAIL)
- GATE
- ASSUMED ROAD
- UNASSUMED ROAD
- TRAIL
- ENTRANCE / EXIT
- LOT / CONCESSION LINE
- ZONE BOUNDARY
- A1 O1 — ZONING (A1 - RURAL GENERAL) (O1 - OPEN SPACE)
- PASTURE/WOODLOT — LAND USE
- 6R — AGRICULTURAL LAND CLASSIFICATION
- BOUNDARY OF AREA TO BE LICENSED METES AND BOUNDS
- LIMIT OF PROPOSED EXTRACTION
- 30m SETBACK — PROPOSED SETBACK DISTANCE
- 500m INFORMATION AREA LIMIT LINE
- CROSS SECTION/PROFILE NUMBER & LOCAT
- BOREHOLE NUMBER AND LOCATION
- xTH-C — TEST HOLE LOCATION AND NUMBER
- 70% 10-15m POPULAR — AVERAGE TREE SPECIES % COVERAGE & HEIGHT
- HYDRO / TELEPHONE POLES
- (MW) — MONITORING WELL
- A,B,C — PIEZOMETER

100 0 100 200 300 400m

FERMA CRUSHED STONE INC.
2666 RENA ROAD
MISSISSAUGA, ONTARIO
L4T 3C8
Telephone: (905) 677-9241 Fax: (905) 677-9817

SIGNATURE OF LICENSEE DATE

AMENDMENTS	DATE APPROVI

SITE PLANS APPROVED BY MINISTRY OF NATURAL RESOURCES

SIGNATURE DATE

REGISTERED PROFESSIONAL ENGINEER J.S. GOURLEY PROVINCE OF ONTARIO

THESE PLANS WERE DESIGNED TO ENSURE COMPLETE PRACTICALITY DURING THE OPERATION PROGRESSIVE REHABILITATION AND FINAL REHABILITATION OF THE LICENSED PROPERTY

OLIVER MANGIONE McCALLA & ASSOCIATES LIMITED
Consulting Engineers Nepean, Ontario
89 Colborne Street East, Orillia, Ontario L3V 1T8
Telephone: (705) 327-0272 Fax: (705) 327-1063

92-85

FERMA-CARDEN QUARRY

LOTS 6, 7, 8, 9, & WEST HALF OF LOT 10
CONCESSION IX
TOWNSHIP OF CARDEN
COUNTY OF VICTORIA

EXISTING FEATURES

PAGE 1 OF 5				
PHOTO SCALE 1:16000	ROLL No. 87-4426	PHOTO Nos. 188 - 190	LINE No. 3	PHOTO DAT MAY 1987
MAP SCALE AS SHOWN	CONTOUR INTERVAL 2.0m	DATE OF SITE PLAN APRIL 1995		

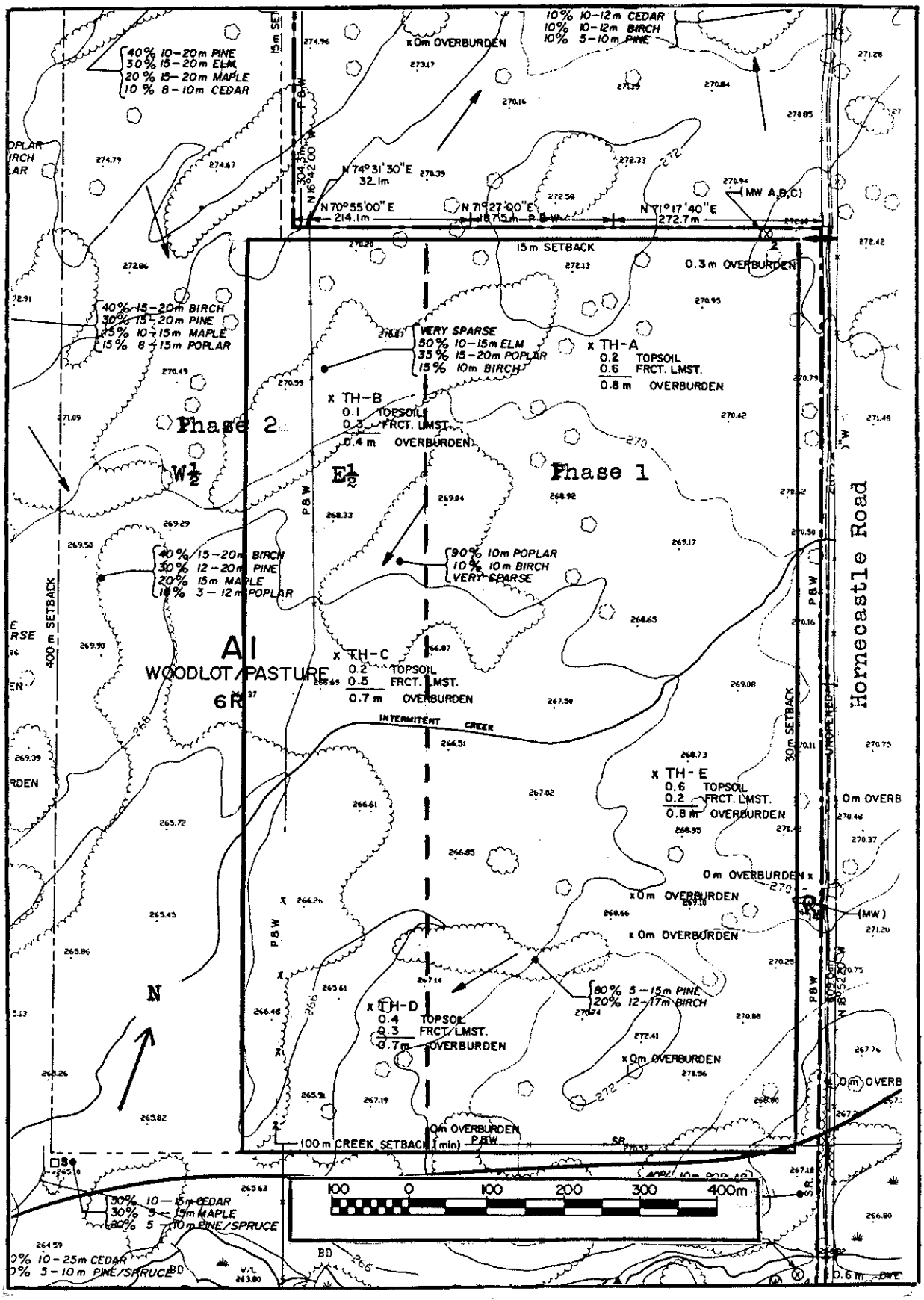
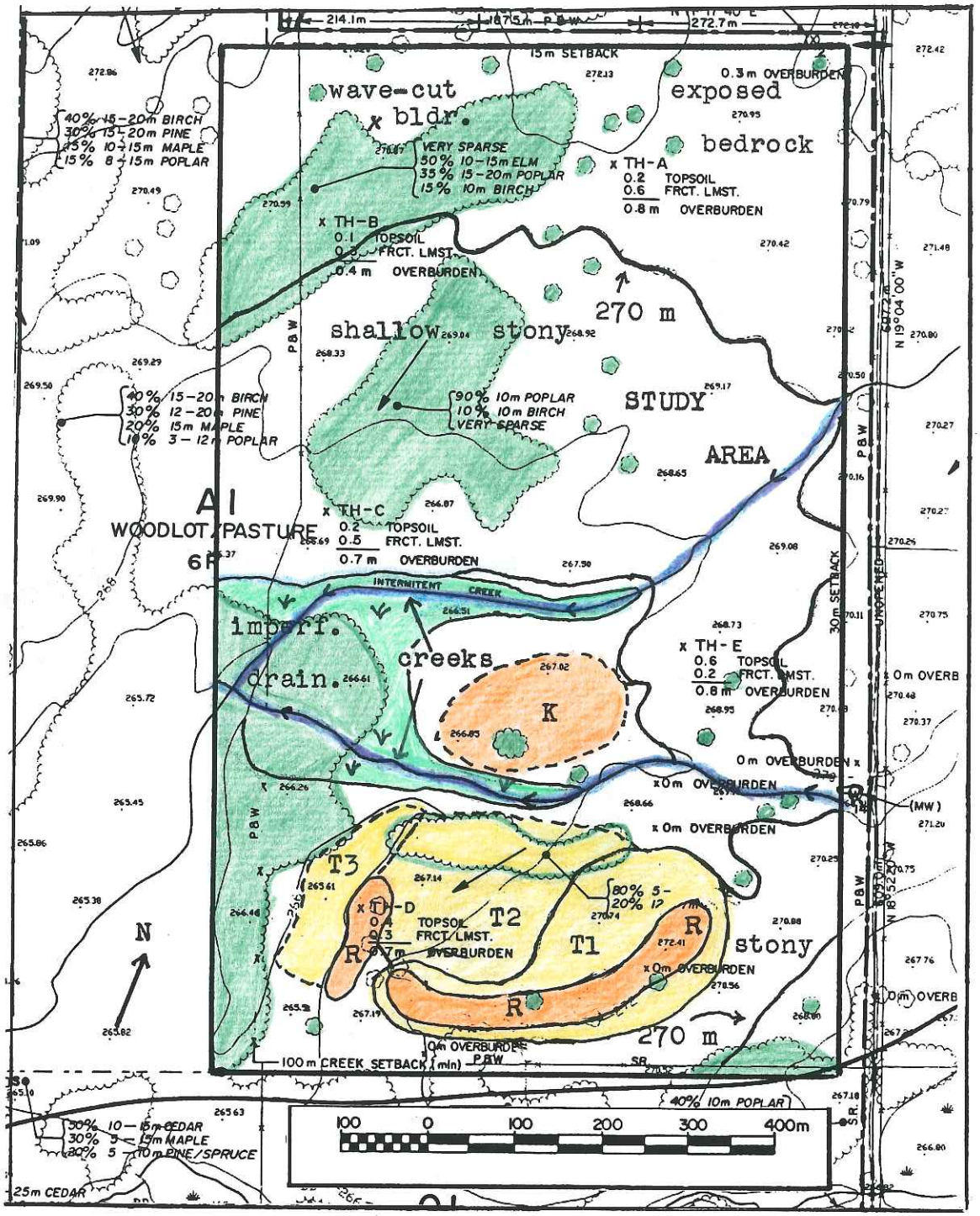


Figure 5: The stage 2 study area.



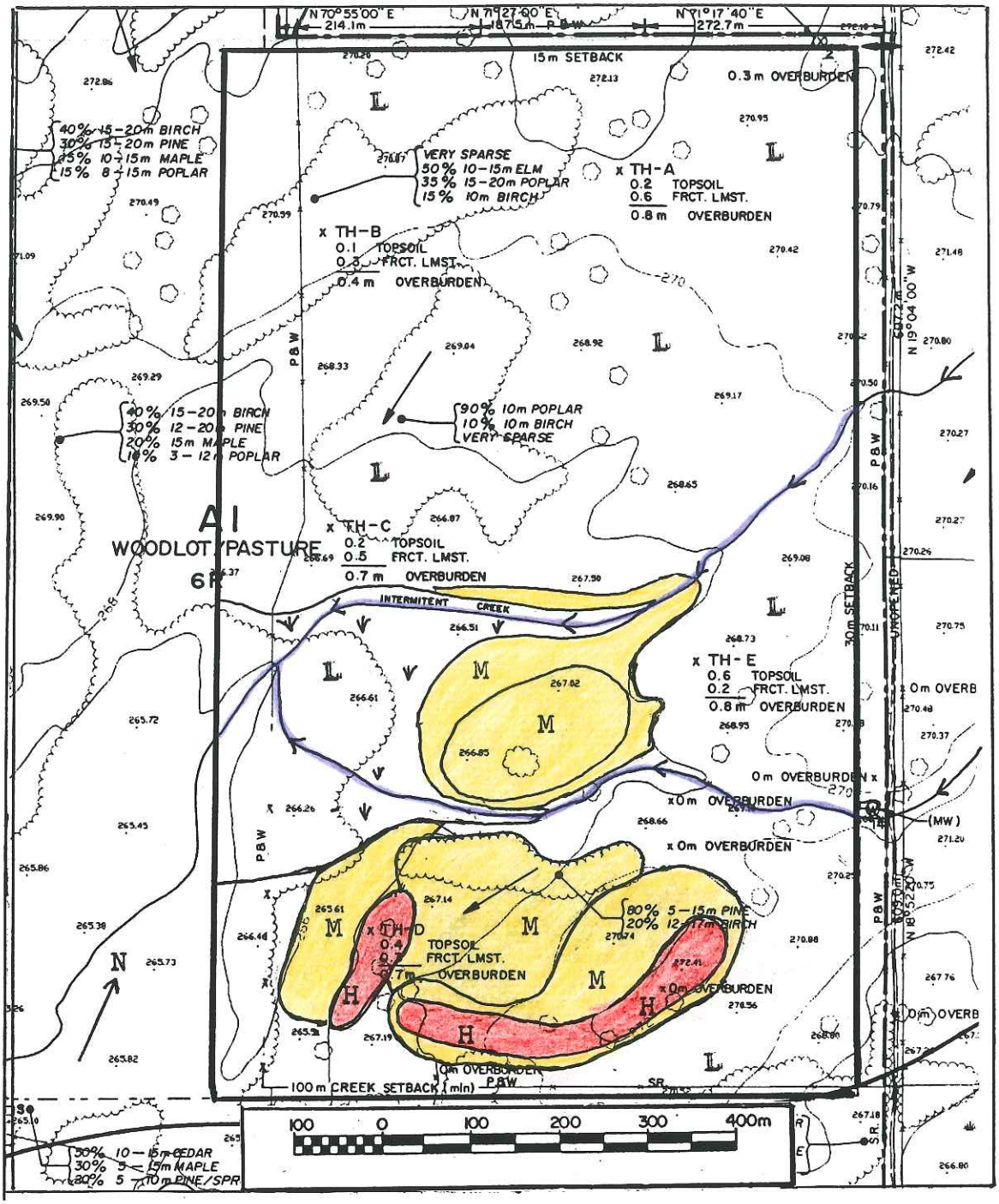
K - interfleuvial knoll feature

R - lucustrine (?) ridge feature

T1/T2 - terraces descending from lacustrine ridge feature

Figure 6: Topographic features and vegetation of study area

Figure 7: Aerial Photograph of the study area from A 18798-15 (1965)



archaeological potential

2.2 ha	H	- high (5 m interval)
12.8 ha	M	- moderate (10 m interval)
74.0 ha	L	- low (visual and random)

15 ha tested (16.8%)

Figure 8: Archaeological potential of the study area and area tested.

a) lacustrine ridge, high potential; from SE corner, looking NW

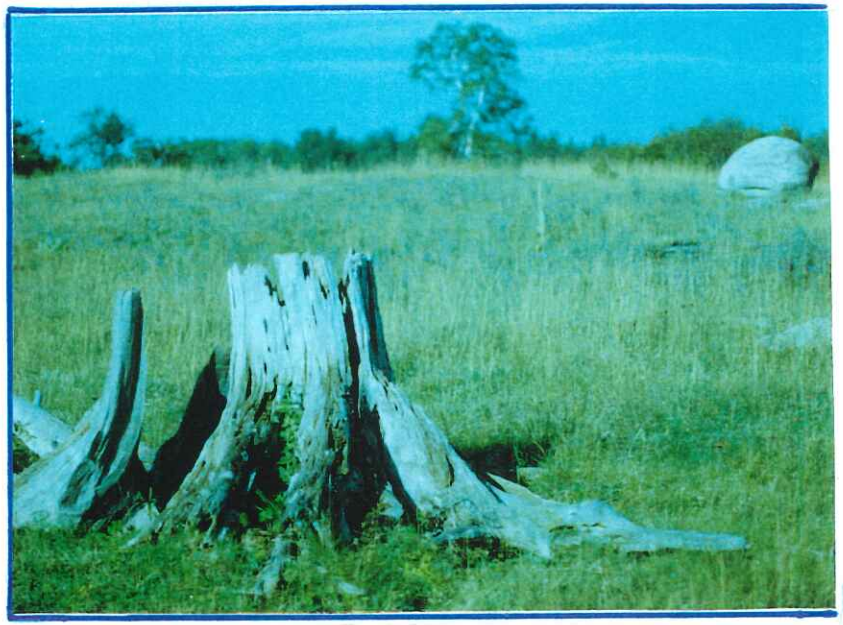
b) lacustrine ridge (H) and terraces (M), looking SW

c) interfluvial knoll (M), looking N from creekbed

Figure 9: Photographs of areas tested in the study area.

Figure 10: Photographs of study area terrain features.

a) Typical "Carden Plains", exposed bedrock; from Hornecastle Road, looking west to northern creek (M)(band of willows, background).



b) Pine stump buttresses show soil deflation; lacustrine ridge, erratic boulder behind.

c) Limestone boulder showing wave-cut erosion; NW corner of study area.