Stage 3 and 4 Archaeological Investigations of the Arabic, Cyrillic, and Colborne Street sites (AgHb-134, 135, 137), Sanitary Sewer Route for the Northwest Industrial Area, City of Brantford, Ontario

Submitted to

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STAGE 3 AND 4 INVESTIGATIONS OF THE ARABIC, CYRILLIC, AND COLBORNE STREET SITES (AgHb-134, 135, 137), SANITARY SEWER ROUTE FOR THE NORTHWEST INDUSTRIAL AREA, CITY OF BRANTFORD, ONTARIO

1.0 INTRODUCTION

This document reports on Stage 3 and 4 investigations at the Arabic site (AgHb-134), the Cyrillic site (AgHb-135), and the Colborne Street site (AgHb-137) in the City of Brantford, Ontario (see Figure 1). This research was designed to conform with the guidelines set forth by the **Ministry of Culture and Communications**. Fieldwork was carried out under an archaeological licence (91-15) issued to **Archaeological Services Inc.**

2.0 SUMMARY OF PREVIOUS RESEARCH

As a result of our initial archaeological survey of the proposed sanitary sewer route for Brantford Northwest Industrial Area (**Archaeological Services Inc.** 1990), it was recommended that three artifact findspots, and the Arabic, Cyrillic, Hebrew, Greek, and Linear A sites (AgHb-134, 135, 136, 137, 138) be subjected to more intensive investigations. After the three findspots were carefully re-examined and no additional material was recovered, it was recommended that each be considered clear of any further archaeological concern (**Archaeological Services Inc.** 1991).

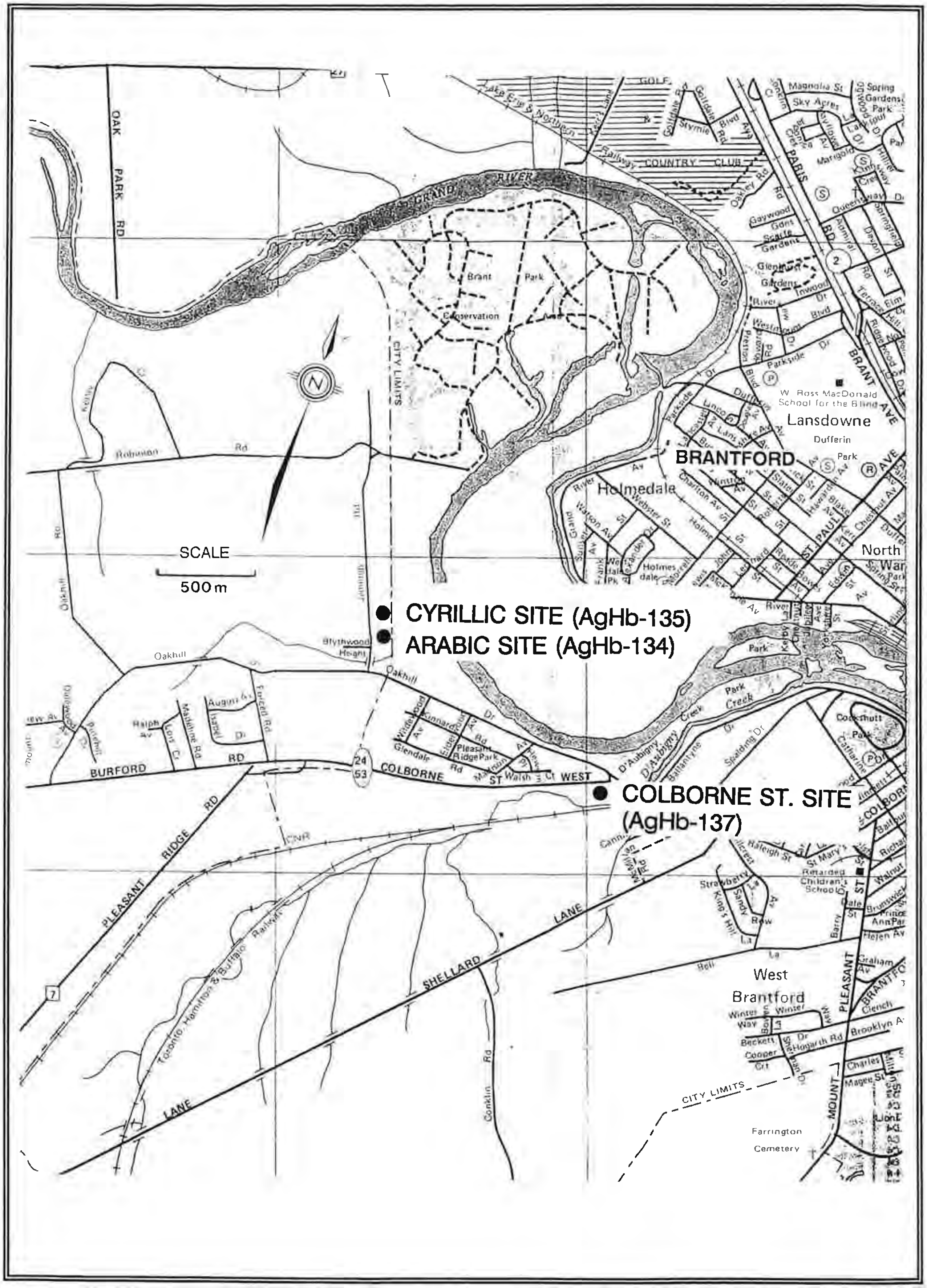
Also, Stage 2 controlled surface collections were conducted at the Hebrew, Arabic, and Cyrillic sites. As a result of those investigations, it was recommended that further study was unwarranted at the Hebrew site but that both the Arabic and Cyrillic sites should be subjected to comprehensive Stage 3 testing, involving the hand excavation of a series of one-metre square test units, the screening of all soil fills through 6mm wire mesh, and the examination of the subsoil in each square for evidence of post moulds or pit features (**Archaeological Services Inc.** 1991). It was also recommended that further research should be carried out at the Greek and Linear A sites (since redesignated the Colborne Street site [AgHb-137]), and that this work should commence with a controlled surface collection.

The following constitutes brief descriptions of the research, conducted previous to 1991, at the Arabic, Cyrillic and Colborne Street sites. It should be noted that all three sites have been assigned to the Middle Woodland period (*ca.* 400 B.C. to A.D. 800: see **Archaeological Services Inc.** 1990: Appendix A)

2.1 The Arabic Site (AgHb-134)

The Arabic site was documented in the level, cultivated fields between Oakhill Street and Robinson Road, immediately north of a small creek flowing into the Grand River. The site was initially estimated to extend across an area of approximately 8,000 square metres. Indeed, a large number

Figure 1: Site Locations



of artifacts, manufactured from a variety of exotic cherts, were observed within this area. There were also several bifacially retouched tool fragments. The recovered sample, consisting of formal tools, included a partial projectile point which was provisionally assigned to the Middle Woodland period (*ca.* 400 B.C. to A.D. 800) (**Archaeological Services Inc.** 1990: Plate 1:e.). This specimen was manufactured from either Selkirk chert or possibly a Mercer Formation variant. Also discovered were a thick unifacial cutting/scraping tool of chert from an Ordovician formation in the Ottawa Valley, a refined biface manufactured from Kettle Point chert and a blank or flat core of Onondaga chert.

The subsequent controlled surface collection of the ploughed and weathered site resulted in the recovery of only 74 artifacts. While most of the material is of Onondaga chert, two shatter fragments are of Haldimand chert, and a biface fragment is of Kettle Point chert. The latter specimen may have been abandoned during finishing or refurbishing of the tool. It is characterized by two crudely prepared shoulders and a retouched and squared tip, creating a narrow but sharp edge. It measures 47mm in length, 26mm in width and 8mm in thickness. While unretouched flakes and shatter constitute the majority of the remainder of the collection, 11 retouched and utilized flakes were recovered.

The disparity between the large number of flakes initially observed on the site and those subsequently recovered during the controlled surface collection is, unfortunately, attributable to the activities of unlicenced collectors. The site area showed clear signs of having been walked over, in a systematic manner, only a short time before the field crew arrived to conduct the surface collection. The irresponsible behaviour of these unknown individuals clearly hindered our understanding of this site.

2.2 Cyrillic Site (AgHb-135)

Another lithic scatter, the Cyrillic site (AgHb-135), was encountered approximately 50 metres from the northern edge of the Arabic site. A partial projectile point recovered from the site during the initial inspection (**Archaeological Services Inc.** 1990: Plate 1:h)., was characterized by an expanding stem, a carefully worked hafting element and a straight, thinned, and lightly ground base. The one intact corner notch appears to be a straight-sided expanding V while the shoulder is barbed and relatively small in comparison with the tang. The blade approximates an equilateral triangle with slightly convex edges, and edge sinuosity is carefully removed. It is biconvex in cross-section, with one face flattened and was made of Kettle Point chert. The form and basal smoothing, together with the flattened cross-section suggest a refined *Vanport* (Fox 1980) or a *Jacks Reef Corner Notched* point (Justice 1987:217-219), made during the Late Middle Woodland period (*ca.* A.D. 200-A.D. 800).

According to our initial assessment, the Cyrillic site lithic scatter, estimated to include between 50 and 75 artifacts, covered an area of approximately 5,000 square metres. Although the site area had been ploughed and allowed to weather through several successive rains, no evidence of lithic artifacts was observed during the second site visit. Like the Arabic site, the Cyrillic site appeared to have been systematically collected.

On the basis of the single diagnostic recovered artifact, the Cyrillic site was provisionally assigned a late Middle Woodland (*ca.* A.D. 200-A.D. 800) affiliation.

2.3 Colborne Street Site (AgHb-137)

Systematic testpitting of an unploughed pasture within the study corridor, directly south of Colborne Street and north of the treeline, initially yielded three primary chert flakes and two flakes of Onondaga chert, the larger of which bears evidence of utilization. In addition, two pieces of bone were recovered, including a diaphysis fragment from the proximal or distal end of a long bone of a large mammal, and a lumbar vertebra from a raccoon-sized mammal. While it appeared initially that two discrete components could be discerned, the data recovered during our Stage 3 and 4 investigations suggest that there is a single multicomponent site. Consequently, "Greek" (AgHb-137) and "Linear A" (AgHb-138) were redesignated as the Colborne Street site (AgHb-137).

3.0 1991 FIELD RESEARCH

3.1 Method

In advance of Stage 3 and 4 investigations at the Colborne Street site, the site area was ploughed and allowed to weather. A controlled surface collection was then undertaken and a graphic representation of the surface distribution of artifacts was generated, as had been done earlier for the Hebrew and Arabic sites (**Archaeological Services** 1991).

As noted above, an attempt was also made to conduct a controlled surface collection after the Cyrillic site was ploughed, however, no additional artifacts were recovered. Subsequent investigative activities at the site were guided, therefore, by the initial field notes and measurements taken when the site was first discovered.

The actual surface distribution of artifacts at the Colborne Street and Arabic sites (and that reconstructed for the Cyrillic site) were employed to guide the placement of hand-excavated one-metre square test units. At all three sites, the soil fills from each one-metre square were screened through 6mm wire mesh in order to maximize the recovery of small artifacts. In addition, the subsoil in each square was carefully inspected for evidence of post moulds or other cultural features.

The results of the earlier controlled surface collections and the excavation of test units at each of the sites formed the basis for subsequent investigative activities. These activities and their results are described below.

3.2 Arabic Site (AgHb-134)

Twelve one-metre squares were hand excavated at the Arabic site (Figure 2). A total of 145 artifacts were recovered from these units, including 144 Onondaga chert flakes and partial tools, and one unanalyzable ceramic body sherd.

As these test units yielded relatively few artifacts, the plough zone was removed mechanically, by Gradall, over the threatened portion of the site. While no cultural pit features were subsequently identified, eight isolated post moulds were documented (Figure 2).

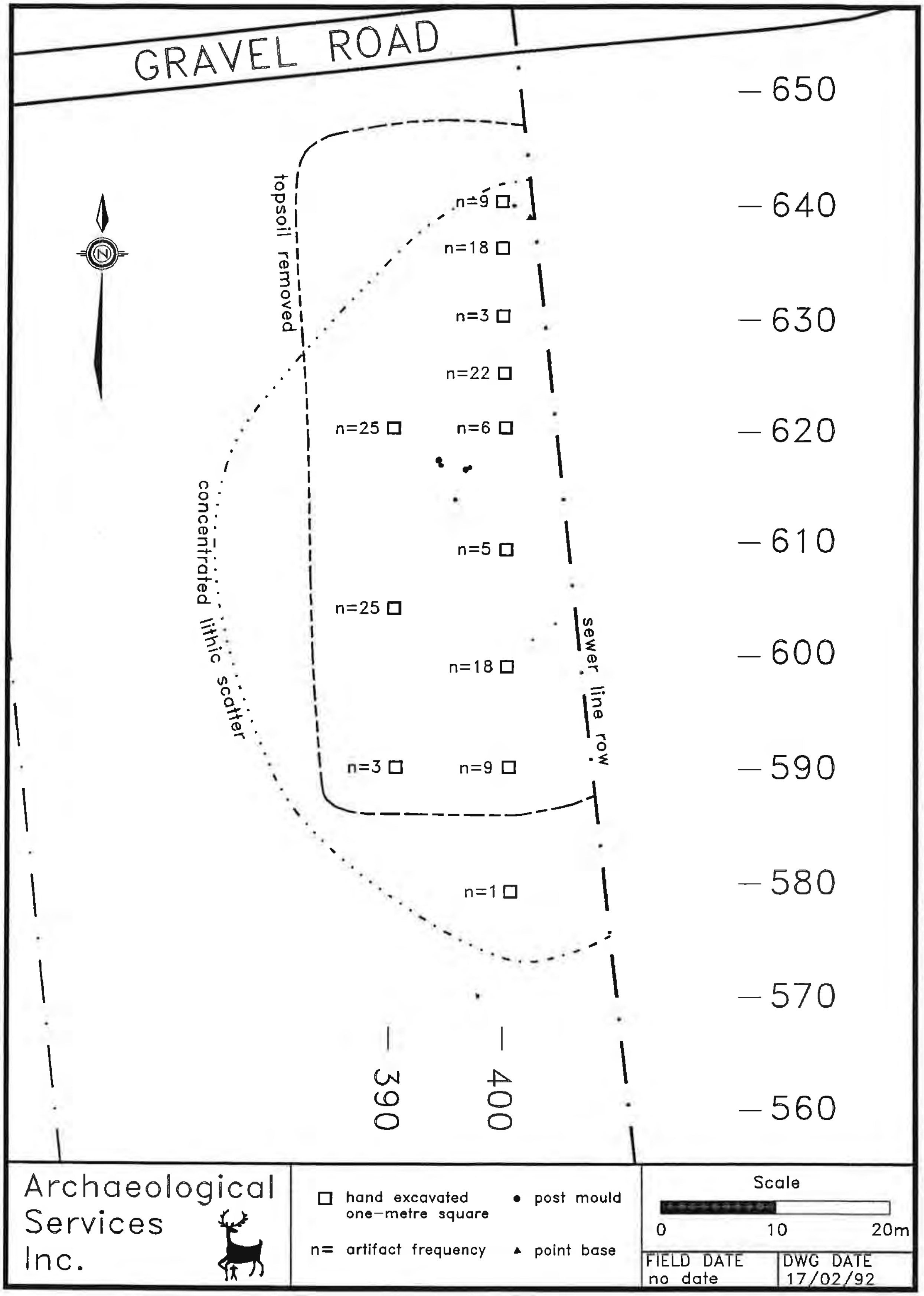


Figure 2: Arabic Site (AgHb-134)

These data are consistent with the earlier identification of the Arabic site as a Middle Woodland component (**Archaeological Services Inc.** 1991) and suggest that the site was occupied for only a brief period.

3.3 Cyrillic Site (AgHb-135)

Despite the fact that no artifacts were recovered as a result of the controlled surface collection, five one-metre test units were placed across the area where late Middle Woodland artifacts (c. A.D. 200-A.D. 800) were observed in 1990 (**Archaeological Services** 1990). No additional artifacts or subsurface settlement feature data were recovered from the test units (Figure 3). It would appear that this site was also only briefly occupied.

3.4 Colborne Street Site (AgHb-137)

The controlled surface collection resulted in the recovery of 106 Onondaga, Ancaster, Kettle Point chert, and Flint Ridge chalcedony flakes, tools, and flake fragments. The hand excavation of 15 one-metre squares in the treeless and previously ploughed portion of the site yielded 240 chert flakes, tools, and flake fragments, and two unanalyzable ceramic body sherds. The remaining topsoil on this portion of the site was removed mechanically in order to expose subsurface post moulds and features (Figure 4).

Thirty-three one-metre squares were also hand excavated in the potentially undisturbed woodlot adjacent to D'Aubigny Creek, resulting in the recovery of over 2,700 chert flakes, tools, and flake fragments.

In total, seven ceramic vessel fragments were recovered. The maximum diameters of these sherds range from 15-25mm. Summary information is provided in Table 1, below. It should be noted that although few fragments were recovered, they were found from across the site including units adjacent to Features 8 and 9. Two fragments may be assigned confidently to the Middle Woodland period.

TABLE 1: Colborne Street Site Ceramic Sherd Summary

Provenience	Description	Sample	Decorative Motif and Technique
Square 466-396	Body Sherds; Both Exfoliated on One Side; Grit Tempered	2	One Specimen Exhibits Faint Rocker Stamp
Square 470-389	Body Sherd; Exfoliated on One Side; Grit Tempered	1	Uncertain
Square 470-399	Body Sherd; Exfoliated on One Side; Grit Tempered	1	Uncertain
Square 491-390	Body Sherds; Exteriors Exfoliated; Grit Tempered	2	Interior Combed on One Specimen
Square 466-398	Body Sherd; Grit Tempered	1	Interior Lightly Wiped; Exterior Reddened, Exhibits Small Dentates, Possibly Rocker Stamped

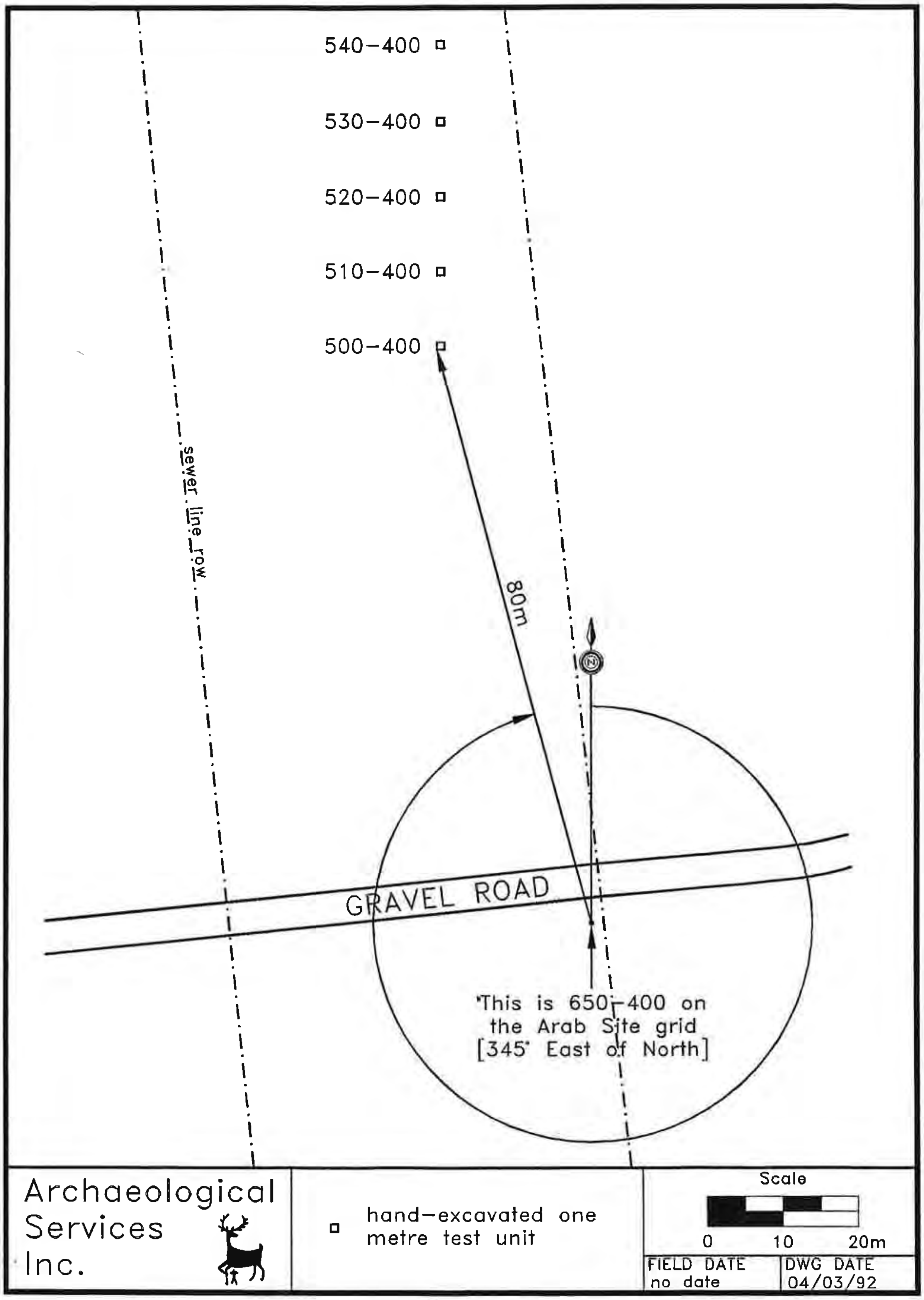


Figure 3: Cyrillic Site (AgHb-135)

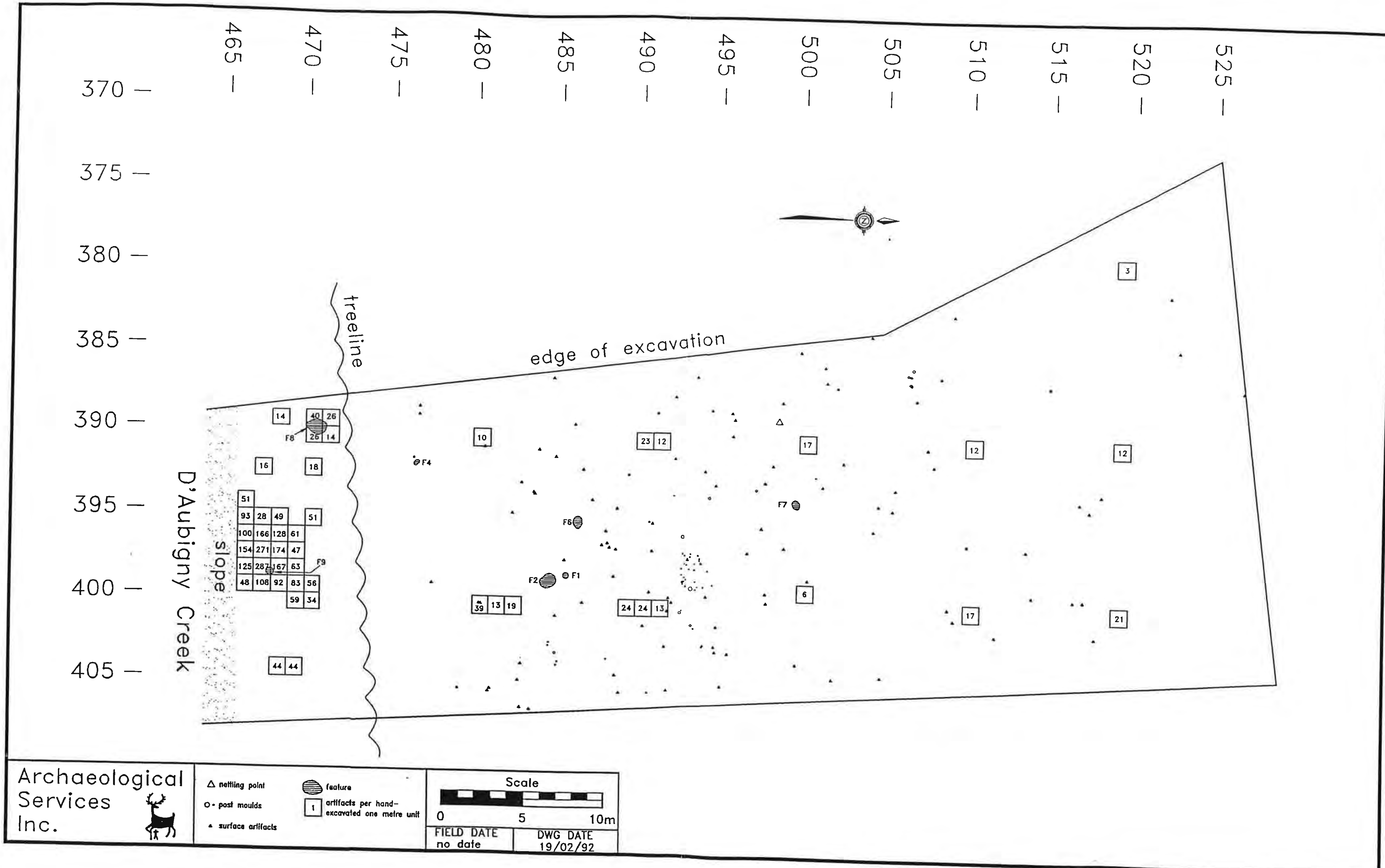


Figure 4: Colborne Street Site (AgHb-137)

In total, seven prehistoric cultural features were identified throughout the site: three refuse pits, two hearths, and two cache pits filled with leaf-shaped blades or biface preforms. Table 2 provides summary data for each of these features (see also Figures 5-8). Plate 1 illustrates the nature and extent of Feature 9, situated within the woodlot. This feature may have constituted the spatial focus of the lithic reduction activities as evidenced in the recovered assemblage from within the south area of the site.

TABLE 2: Colborne Street Site Feature Summary

Feature	Unit	Shape	Dimensions (length x width x depth) (cm)	Profile	Comments
1	485-395	circular	30 x 30 x 27	conical	cache; 43 bifaces; 1 biface fragment, stacked vertically as if in a bag; charcoal (Figure 5)
2	480-395	oval	97 x 86 x 18	basin	pit; abundant fire-cracked rock; charcoal (Figure 6)
4	475-390	oval	36 x 24 x 29	conical	pit; no cultural contents
6	485-400	oval	75 x 56 x 6	shallow, flat	hearth
7	500-390	oval	56 x 44 x 15	shallow basin	pit; no cultural contents
8	470-390	oval	110 x 86 x 100+	irregular (disturbed)	cache; 125 preforms and 15 preform fragments; feature outline badly disturbed by rodent burrows (Figure 8)
9	467-398	circular	48 x 48 x 14	basin	possible hearth; fire-cracked rock; 287 flakes; 1 biface fragment

Three hundred and twenty-eight faunal elements were recovered from the test units, representing: butchered oxen and other large domestic mammals (n=220); woodchucks and other rodents (n=106); foxes and medium-sized mammals (n=2). Given the extensive burrowing disturbance recorded within Feature 8 (see Section 4.0 below), it is not surprising that a woodchuck radius was recovered from this provenience. The balance of the faunal elements in this sample were recovered from ploughzone contexts at various locations across the site and for the most are assumed to be intrusive.

Three soil samples were also taken from Features 1, 2, and 9. The double bucket method of water separation provided an efficient system of plant remains recovery. A screen of 0.297mm aperture size was employed to collect the light fractions. After 48 hours of drying, the light fractions were passed through 2.00 and 0.297mm screens. Material in the coarse screen was separated into categories of organic uncharred, mineral, and wood charcoal. Only seeds were removed from the lower screen. Material which fell through the fine screen is primarily mineral dust. Removal of the latter helps to further concentrate the light fraction.

Feature 9 contained the largest amount of material (7.60g). A single grape (*Vitis* sp.) seed constitutes the only seed material in the samples. Wood charcoal consisted of 27% ironwood (*Ostrya virginiana*), 24% oak (*Quercus* sp.), 4% elm (*Ulmus* sp.), 2% ash (*Fraxinus* sp.), and 37% unidentifiable. The other samples contained wood charcoal only. Analysis of wood charcoal from Feature 2 revealed red oak only (4.7g). The wood charcoal from Feature 1 was unidentifiable.

Also, a single cluster of 30 posts, measuring approximately 2.5 metres in length and 2.0 metres in width, may indicate the presence of a temporary structure or concentrated activity area, located in the central portion of the excavated area of the site. A further 20 post moulds scattered throughout

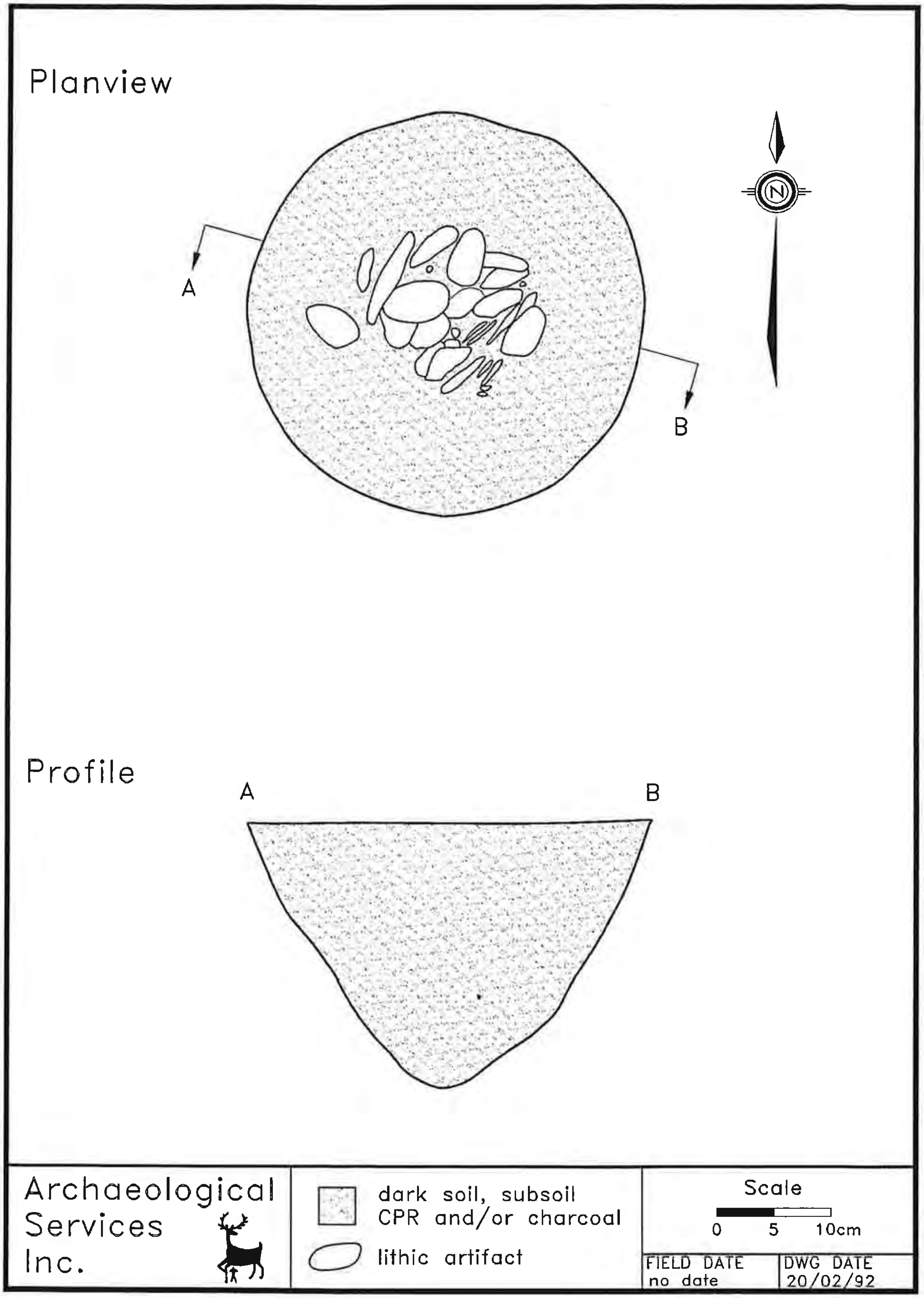


Figure 5: Feature 1 (Cache Feature)

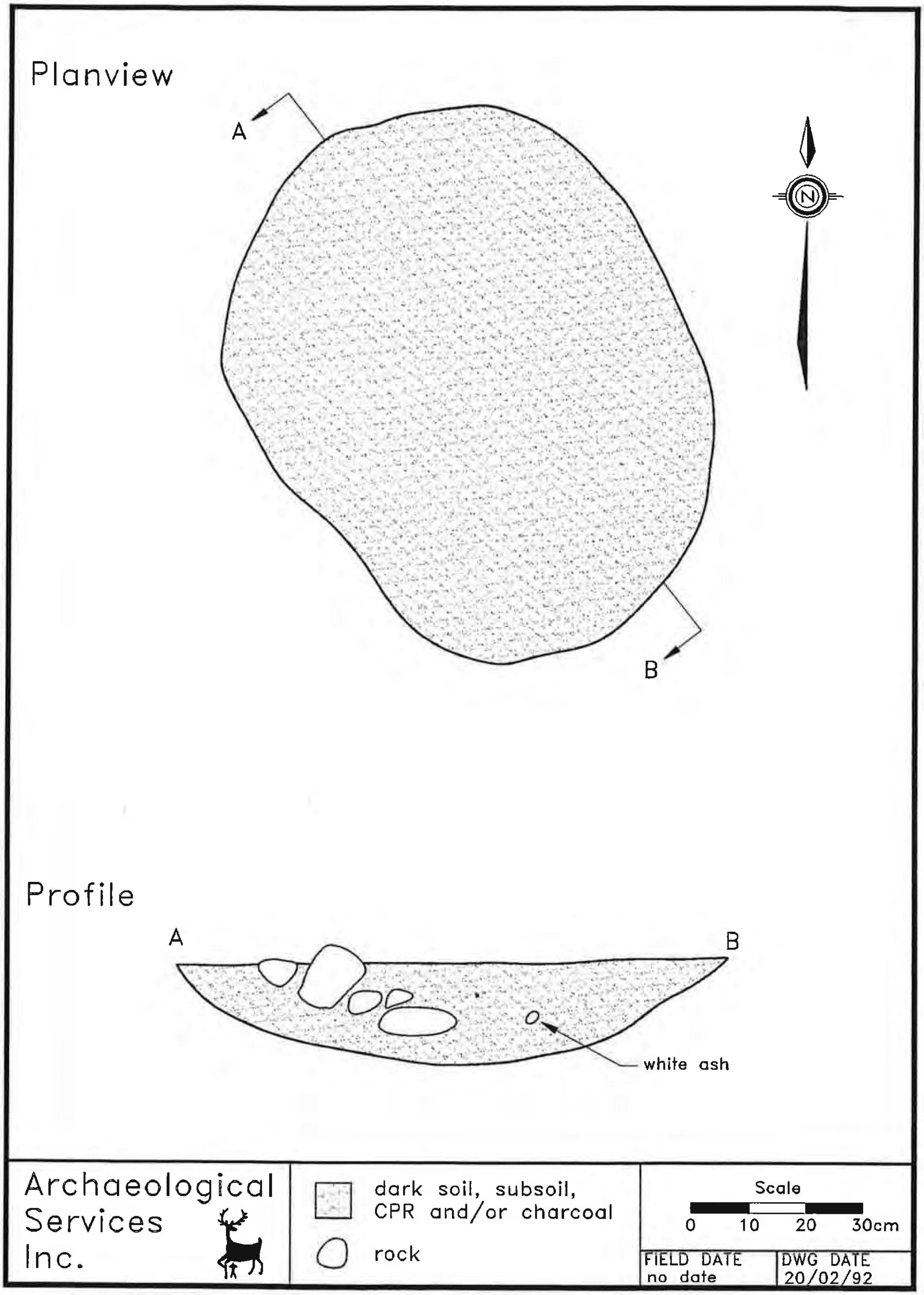


Figure 6: Feature 2

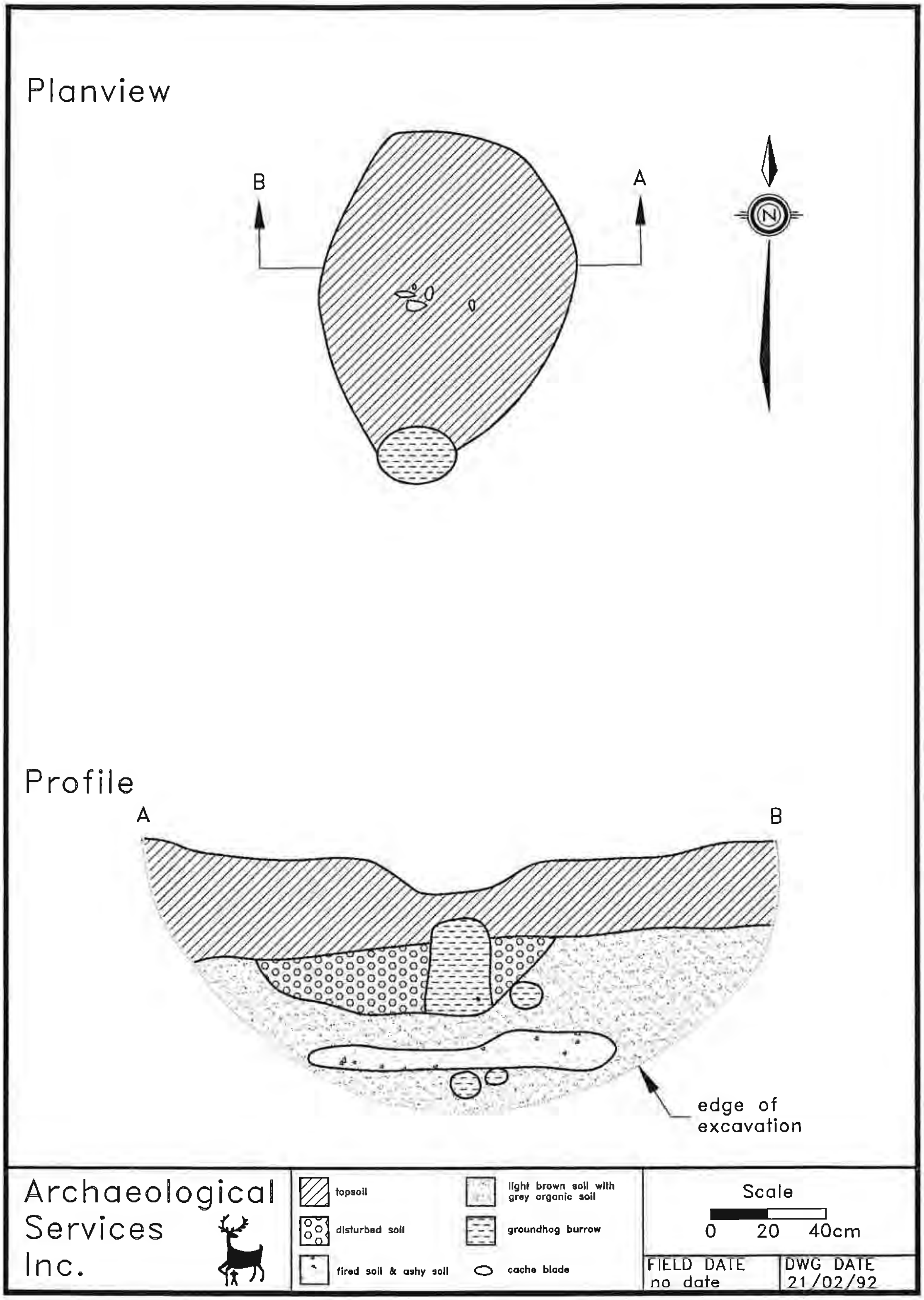


Figure 7: Feature 8 (Cache Feature)

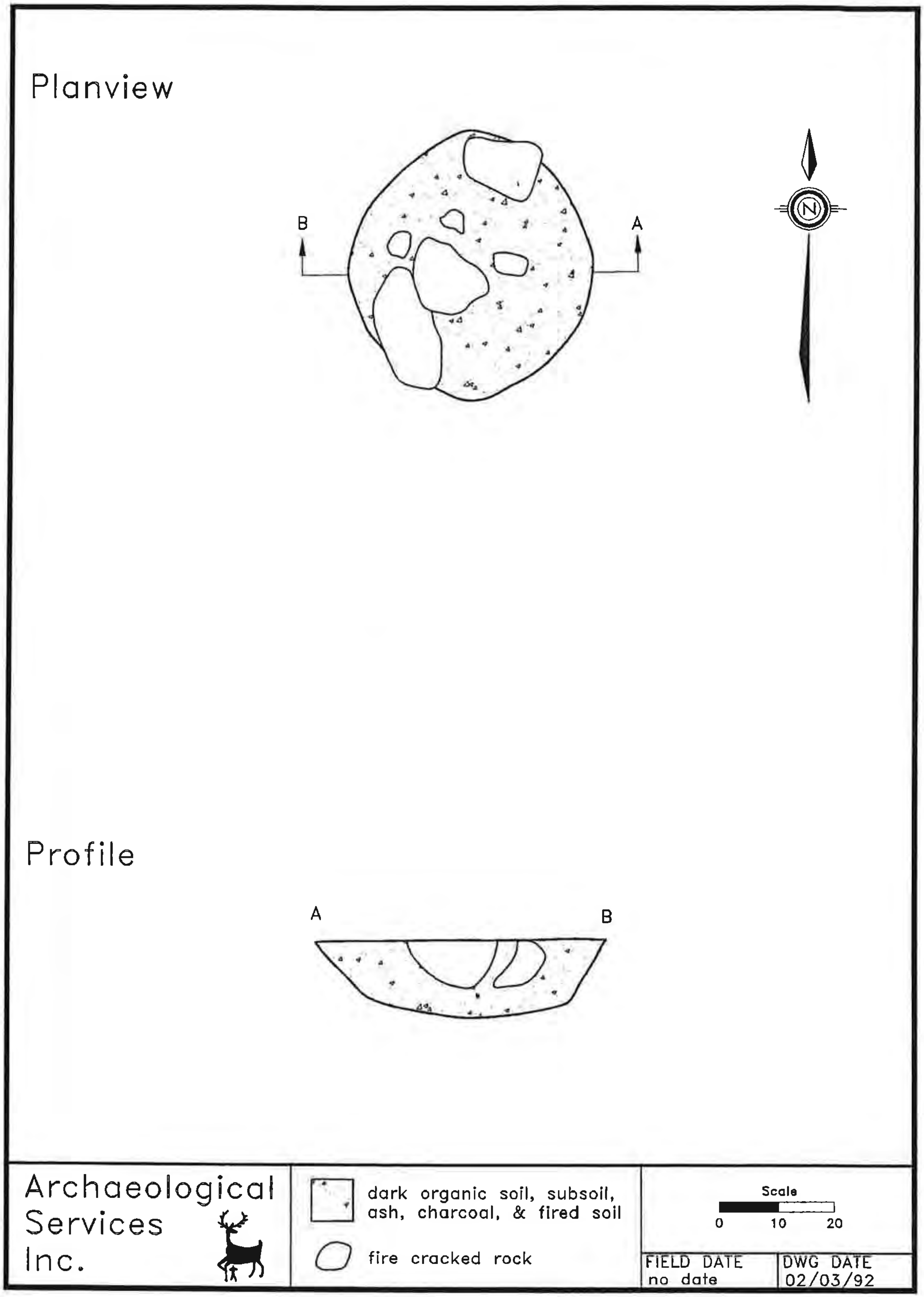


Figure 8: Feature 9

the area suggest that additional structures, and rather more diffuse activity areas may also have been present.

Plate 1: Colborne Street Site: Feature 9

Over 160 complete or near complete bifaces were recovered from the two cache features. Together with the ceramics and projectile points, these two caches suggest that the Colborne Street site dates predominantly to the late Middle Woodland Period (*ca.* A.D. 200 - A.D. 800).

Biface caches are very rare finds in southern Ontario, most commonly occurring in Early and Middle Woodland contexts (*ca.* 900 B.C.-A.D. 800). Not surprisingly, the technological, socio-economic, and possible ideological implications of caching behaviour are poorly understood at present. It was therefore necessary to submit the recovered bifaces to a sophisticated use-wear analysis so as to help elucidate this little known cultural behaviour.

4.0 USE-WEAR ANALYSIS OF SAMPLES OF PREFORMS FROM COLBORNE STREET CACHES

4.1 Aim and Objectives

Middle Woodland caches, such as those encountered at the Colborne Street site, afford a rare opportunity to examine the technological organization of a prehistoric social group.

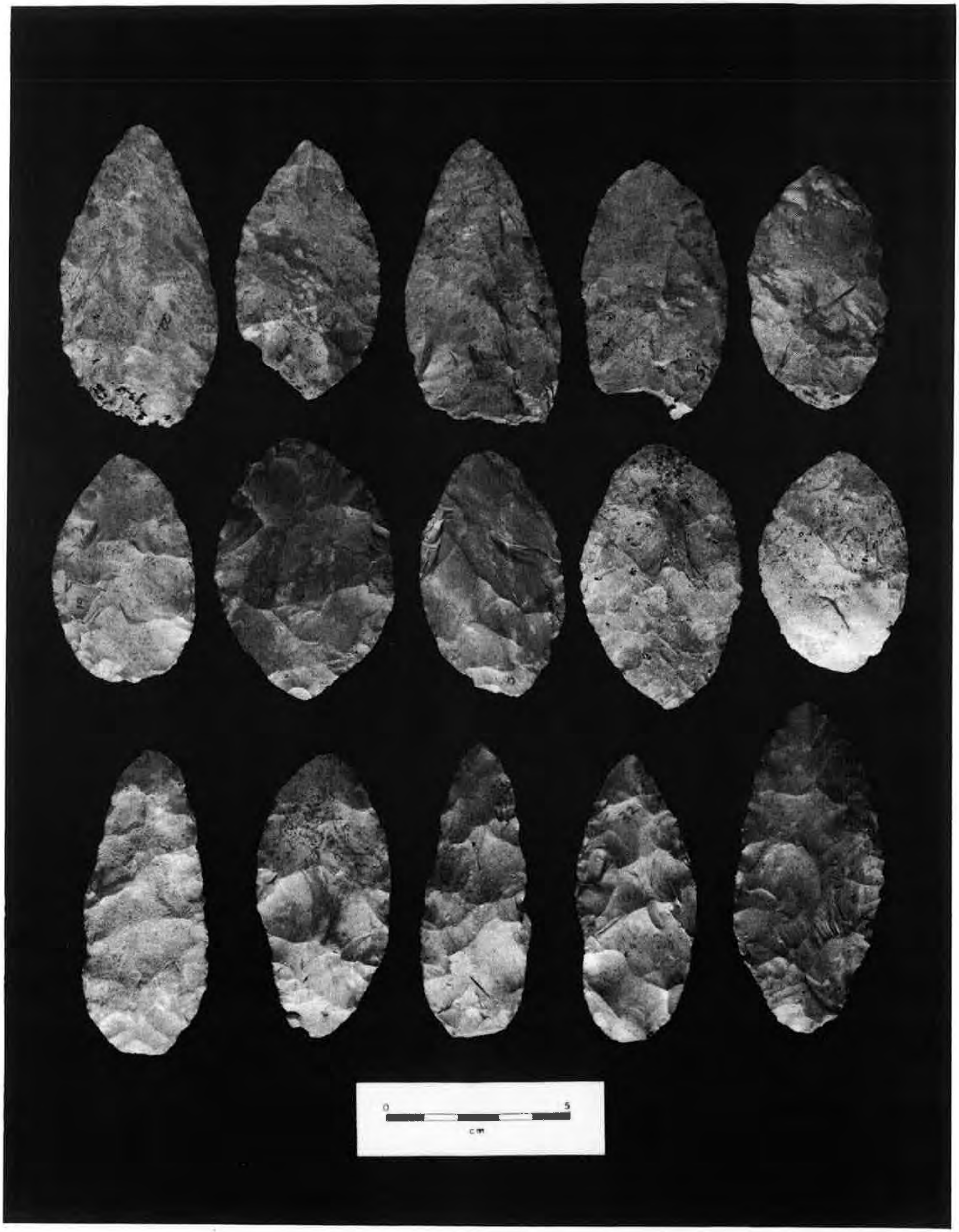
Apart from rodent burrowing in parts of Feature 8, the two caches, for the most part, had escaped significant disturbance. Indeed, Feature 1 was completely undisturbed such that it was possible to infer that the bifaces had been placed within the pit in a bag thereby accounting for their largely vertical clustered orientation (Plate 2).

Plate 2: Colborne Street Site: Feature 1, Cache 1

This cache comprises one fragmentary and 43 complete bifaces, all of which are in a remarkably good state of preservation, manifesting minimal pedological alteration of surfaces and edges (Plate 3).

Feature 8, on the other hand, had been badly disturbed by a complex of rodent burrowing (Plate 4), such that the assemblage was recovered at various depths from within the various burrows.

Plate 3: Sample of Cached Bifaces from Feature 1 at the Colborne Street Site



This cache comprises a total of 125 complete unifacial and bifacial preforms together with 15 broken and fragmentary specimens (Plates 5 and 6). Most of the breakage and spalling observed on the affected specimens can be attributed to natural diurnal and seasonal thermal and hydrological stresses. In contrast to Feature 1, 97 specimens or 69.3 percent of the studied sample from Feature 8 had become rust stained or coated with a limonite deposit. Only 47 or 30.7 percent are in relatively pristine condition.

Plate 4: Colborne Street Site: Feature 8

A use-wear analysis was performed on the two caches in order to assess their interrelationship. Of primary concern was a resolution of the question of whether the storage and retrieval of cached specimens could be detected and secondarily, to what extent the practice could be documented at the Colborne Street site. The opportunity to pursue these objectives was afforded by the serendipitous presence of two distinct coatings of rust on a number of specimens from Feature 8. It appears that one coating was partially eroded before the second was deposited, suggesting that evidence may exist on such pieces that they were retrieved from a similar deposit and used prior to their final deposition in Feature 8.

Indirect secondary evidence for specimen retrieval and use was sought in the patterns of variability of morphological and surface changes as a consequence of the duration of specimen manipulation and use.

Plate 5: Colborne Street Site: Feature 8, Cache 2

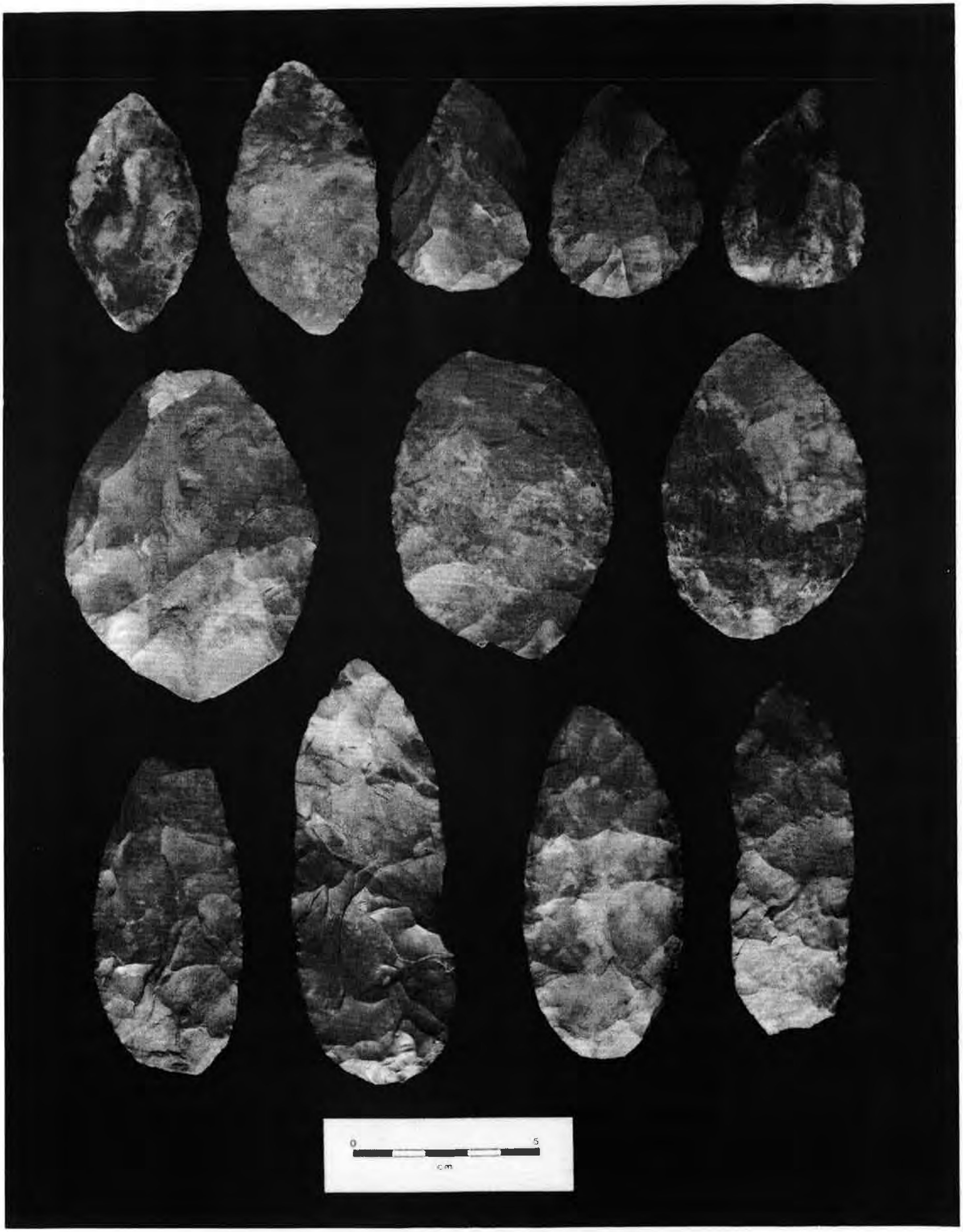
Features sensitive to the duration of specimen manipulation (such as the index of asymmetry and the point gloss density) will be discussed below.

4.2 Functional Assessment of Features 1 and 8

The 44 foliate bifaces comprising Feature 1 can be resolved into 83 employed units. Tabulations of frequencies of different activity sets are based on the number of employed units rather than on specimen counts. Justification for this procedure derives from the fact that in some cases only one of two or more possible edges is utilized while in other instances, all are utilized, occasionally on different substances. The tabulation of frequencies and the computation of percentages based on individual specimens (instead of the utilized portions of specimens) would obviously distort the relative importance of the various activities represented.

A sample of 53 bifacial and unifacial preforms from Feature 8 were examined for evidence of wear. Limonitic coating or staining was either absent or was chemically removed from the surface of each specimen selected for use-wear analysis. The sample represents a total of 104 employed units which form the basis of the tabulations of the varying proportions of different activities or tasks. An

Plate 6: Sample of Cached Bifaces from Feature 8 at the Colborne Street Site



additional 35 specimens still coated with limonite were also examined. The purpose of the latter exercise was to ascertain whether evidence existed beneath the limonitic encrustations for previous episodes of utilization, storage, and retrieval. Since these 35 specimens have yet to be chemically treated to remove the most recent of the rust deposits and then to be reanalyzed, the results of their initial use-wear assessment will not be included in the following discussion.

All specimens were scrutinized for wear using a Wild M8 stereo-microscope and a Nikon Bophot binocular microscope. Preliminary observations were made at magnifications of 25X to 50X. Detailed examinations of use-wear traces were conducted at magnifications of 200X to 400X. Photographic documentation of the diagnostic use-wear features were performed at the higher range of magnification while distributional information relating to wear traces was recorded on film at the lower magnifications.

Table 3 summarizes the results of the use-wear study of the samples of foliate bifaces and unifaces from the two caches employing the so-called high power approach developed by Keeley (1980) and others such as Vaughan (1985). As most of the specimens analyzed were bifacial preforms, the parametric use-wear method developed by Tomenchuk (1985) could not be employed. Roughly 30 percent of the employed units from both caches lack conclusive evidence of prior use in the form of (1) differentially abraded microchips, (2) invasive zonal polish along the service element, and (3) decreasing intensities of the abrasion of the perpendicular-to-edge seams (or borders) of flaking scars with increasing distance away from the edge. In about 13 to 15 percent of cases from both caches, the evidence of use was ambiguous. The utilization status of these employed units is designated *undetermined.*

One type of wear is related to preform production rather than to use and is labelled *intentional blunting.* Such wear patterns manifest a number of distinctive features, the most prominent of which is the rounding and smoothing of the edge, presumably by means of an abrader made of limestone or some other sedimentary rock. Owing to the rigidity of the presumed abrader material, the most intense points of contact occur at prominences, or lateral protrusions, which become markedly rounded. The formation of solitary sleeks and clusters of sleeks, oriented parallel to the edge, are generally discernible at the sites of the abraded prominences or in their immediate vicinity. The general lack of uniform contact between an abrader and all points along an edge tends to produce a discontinuous band of polish and abrasion.

At least seven different activities have been identified from the wear traces occurring on the remaining specimens from the two caches. These include (1) antler working, (2) bone working, (3) butchering, (4) dry-hide working, (5) plant processing, (6) skin and/or meat slicing, and (7) wood working. Distinguishing traits of each type of polish have been summarized in Keeley (1980) and Vaughan (1985) and will not be reiterated here.

Interestingly, butchering is the most frequently represented task in both caches comprising 25.3 percent of the sample from Feature 1 and 11.6 percent of the sample from Feature 8. Since the use-wear features associated with butchering may on occasion mimic the features correlated with weak forms of intentional blunting, it is necessary to inject a cautionary note against the uncritical acceptance of these percentages.

At this juncture, we note a marked divergence between the two caches in terms of the proportional representation of the other six tasks. Of the remaining tasks, only wood working and dry-hide processing are detected in Feature 1. By contrast, wear traces of the remaining six identified task are represented on the preforms from Feature 8. As will soon become apparent, the eclectic range of activities revealed in Feature 8 is mirrored in other aspects of the sample.

TABLE 3: Varying Proportions of Employed Units from Features 1 and 8, the Colborne Street Site, Used in Different Tasks

Task or Activity	Feature 1		Feature 8	
	n	%	n	%
Antler working	0	0.0	5	4.9
Butchering	22	25.3	12	11.6
Bone working	0	0.0	2	1.9
Dry hide working	1	1.1	4	3.9
Plant processing	0	0.0	6	5.8
Skin/meat slicing	0	0.0	7	6.8
Wood working	12	13.8	4	3.9
Intentionally blunted	13	14.9	13	12.6
Non-used	26	29.9	35	34.0
Undetermined	11	12.6	15	14.6
Totals	**85**	**99.9**	**103**	**100.0**

4.3 Preform Asymmetry as an Indicator of Prior Use

The blunting process during use, but especially subsequent retouch intended to refurbish a blunted or spent edge, will inevitably reduce the specimen's width. However, the lack of an effective means of predicting where the initial, or pristine, edge position on a bifacial preform would have been precludes the development of an appropriate analytical technique and protocol. On the other hand, if only one lateral edge of a bilaterally symmetrical tool is selectively pressed into service, the net effect will be an increase in specimen asymmetry through time. By assuming that pristine bifacial preforms will tend to be bilaterally symmetrical about their longitudinal axis, we are then equipped with a form of reference against which to compare the archaeological specimens.

The procedure adopted to generate a measure of bilateral asymmetry involves the overlaying of obverse and reverse images of the preform, pivoted at the distal or the most acute extremity. In the case of perfect symmetry, the obverse and reverse images will no longer coalesce. Instead, a combined image will be produced in which increasingly larger portions of the image are no longer common to the profile of both the inverse and obverse aspects. (The analytical protocol dictates that in the absence of perfect coalescence of obverse and reverse aspects, the overlays are rotated about their pivoted extremities such that the area of the combined images and residual areas are minimized.) Measuring the aggregate area of these residuals and dividing the aggregate by the planar area of specimen yields the desired index. Appropriately, it is designated the Index of Asymmetry in Tables 4 and 5.

Statistical comparisons of the means (i.e., Feature 1, 0.1076; Feature 8, 0.11610 and variances (i.e., Feature 1, 0.0040; Feature 8, 0.0048) of the Asymmetry Indices of the two caches reveals little if any difference. The F-test value of 1.1944 (with $v_1 = 138$ and $v_2 = 43$) possesses a probability, Q(F), of 0.2539, which signifies equivalent variances. Similarly, the Student's t-test result of 0.7174 (with $v = 181$) possesses a probability, P(t), of 0.7630 indicating statistically identical means.

4.4 Point Gloss Density as an Indicator of Prior Use

Small, localized patches of highly reflective polish occur on the surfaces of many chipped stone tools. Occasionally, such points of gloss are sufficiently large as to be visible to the naked eye. Bordes (1950; 1969) refers to such patches of gloss on flint tools as "poli en miroir". Shepherd (1972:120-121) refers to the same features as *friction gloss*, speculating that "if two flints are rubbed together, the contact being maintained in the same small area, mirror like facets may be formed in a very short time" (1972:120). Bordes (1969) also mentions that "oriented, small cupulae" are sometimes associated with "poli en miroir". Based on our understanding of hard asperity indentation, the formation of small cupulae belies a plastic deformation and, therefore, implies a mechanism similar to that responsible for the formation of sleeks (see Kamminga 1979:148). Unless located in close proximity to the edge of a service element, gloss patches can probably be attributed to non-use-related processes and events. Because many of the factors responsible for point gloss formation are stochastic in nature, our expectations should be tempered with a measure of caution.

At the outset, the number of gloss points on any given artifact will vary *directly* as the surface area of the piece. The larger the piece, the larger the number of gloss points; conversely, the smaller the piece, the smaller will be the gloss point count. A direct increase in gloss patch count is expected to occur with the duration of specimen manipulation during manufacture and use, the cumulative distance of transport, and the size of the cache from which the specimen is derived.

In order to normalize the effects of specimen size, raw point gloss counts are divided by the area of the face, or aspect, from which they originate. The derived parameter is the Point Gloss Density. Tables 4 and 5 list the point gloss densities for the studied samples. Here we find significant differences between Features 1 and 8. For example the mean point gloss density of Feature 1 is $1.0500/cm^2$ and for Feature 8, $2.1850/cm^2$. Differences between the variances are even more dramatic. For example the variance of Feature 1 is 14.9617 and of Feature 8, 189.5582. The F-test equals 7.2640 (with $v_1 = 75$ and $v_2 = 43$) signifying heteroscedastic variances in which $Q(F) << 0.001$. Because the variances are unequal, the t'-rather than the t-test is used to test for the equivalence of means. A t'-test value of 4.5508 and $v_1 = 75$ and $v_2 = 43$ clearly reveals statistically significant differences in the means at $P9(t') << 0.001$.

TABLE 4: Feature 1 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm^2)	Asymmetry Index	Gloss Density ($/cm^2$)
1	78.80	38.10	13.85	20.55	0.102	0.292
2	74.35	43.95	14.70	24.70	0.065	0.587
3	67.50	44.25	10.45	20.95	0.110	0.621
4	82.45	34.10	12.90	21.30	0.075	1.432

TABLE 4: Feature 1 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm^2)	Asymmetry Index	Gloss Density ($/cm^2$)
5	57.00	37.40	10.00	15.25	0.046	1.541
6*	>53.70	>31.35	>10.75	11.45	0.341	0.699
7	78.00	38.25	11.35	22.20	0.036	0.653
8	66.90	39.00	11.80	18.75	0.037	1.200
9	79.75	43.70	15.60	25.50	0.155	0.696
10	66.00	37.00	10.85	17.45	0.029	0.917
11	71.00	35.05	11.00	18.60	0.194	0.645
12	68.05	39.35	10.70	19.35	0.078	0.620
13a	60.90	39.00	11.65	17.40	0.195	1.495
13b	67.00	36.55	11.15	17.60	0.136	1.137
15	>70.15	39.75	11.90	20.90	0.153	1.842
16	71.55	30.85	9.00	16.70	0.156	0.480
17	>77.60	41.80	11.80	22.25	0.112	2.989
18	65.35	38.80	11.00	18.80	0.177	0.479
19	61.70	38.00	10.75	17.55	0.063	0.998
20	65.00	33.10	11.25	16.00	0.200	1.563
21	84.00	44.30	12.55	29.55	0.064	0.677
22a	77.20	36.20	11.70	20.65	0.044	0.485
22b	>81.00	42.45	14.15	24.05	0.087	1.768
23	81.00	29.80	11.45	17.75	0.118	0.451
24	71.90	44.40	10.90	22.95	0.031	1.177
25	76.60	39.70	9.30	20.75	0.092	1.494
26	70.75	38.75	10.20	18.20	0.055	0.687
27	69.90	35.45	10.25	17.75	0.220	1.240
28	84.85	47.00	17.40	26.15	0.195	0.880
29	70.30	48.30	13.20	23.45	0.081	1.279
30a	64.90	36.60	7.85	15.95	0.094	0.596
30b	74.60	36.85	14.60	20.10	0.070	1.070
32	78.50	33.00	11.15	19.35	0.098	1.060
33	60.80	28.15	10.50	14.15	0.021	2.615
34	57.85	41.40	12.80	18.80	0.085	2.075
35	70.50	41.70	11.85	22.45	0.138	1.069
36	68.75	36.00	10.65	18.45	0.081	1.139
37	64.60	37.20	11.15	17.90	0.067	0.754
38	70.80	34.35	11.00	17.55	0.063	0.342
39	67.00	36.00	13.90	16.80	0.071	1.517
40	60.45	40.50	10.40	17.40	0.126	1.379

TABLE 4: Feature 1 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm^2)	Asymmetry Index	Gloss Density ($/cm^2$)
41	89.30	40.55	14.75	25.05	0.156	0.659
42	82.00	38.80	14.65	22.35	0.139	0.403
43	69.35	39.25	10.50	18.95	0.079	0.502

Notes: * = broken specimens.
Minimal dimensions are denoted by a prefix ">".
Estimated dimensions are enclosed in parentheses.

TABLE 5: Feature 8 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm^2)	Asymmetry Index	Gloss Density ($/cm^2$)
1	67.10	40.75	13.30	22.20	0.135	--
2	57.00	35.20	10.25	15.90	0.063	0.503
3	62.00	37.60	8.30	16.00	0.088	--
4	79.30	42.70	10.65	23.00	0.148	--
5	60.80	41.70	9.80	18.70	0.075	--
6	98.20	52.50	15.00	37.20	0.090	--
7	77.30	31.10	11.70	16.55	0.054	3.112
8	68.50	40.00	14.00	21.20	0.340	--
9	62.40	44.00	16.80	21.80	0.092	3.257
10	pebble fragment					
11	59.10	41.90	15.33	19.65	0.117	4.631
12	62.00	34.55	13.00	15.95	0.094	3.630
13	60.50	40.20	12.25	17.70	0.045	2.260
14	54.40	40.70	17.30	16.40	0.049	5.335
15	64.65	42.80	14.00	21.10	0.085	3.413
16	>40.55	33.95	12.15	fragmentary		
17	55.70	38.10	19.25	15.55	0.170	--
18	59.80	40.25	17.40	16.95	0.265	--
19	55.00	34.00	11.70	12.40	0.113	3.589
20	59.05	41.15	11.40	16.95	0.088	2.213
21	56.40	42.05	15.65	16.20	0.086	--
22	59.00	33.95	13.10	15.10	0.198	1.623
23	59.20	39.20	10.40	17.25	0.064	--
24	56.35	38.30	14.85	15.50	0.103	--
25	58.40	33.40	9.80	15.25	0.125	--
26	60.60	38.85	12.55	14.90	0.121	0.671
27	54.40	31.90	10.60	13.05	0.130	--
28	61.00	33.95	10.40	15.45	0.278	1.521

TABLE 5: Feature 8 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm^2)	Asymmetry Index	Gloss Density ($/cm^2$)
29	53.20	37.70	13.10	13.80	0.145	--
30	64.55	40.55	15.05	17.25	0.075	0.435
31	63.10	39.00	16.85	17.80	0.095	--
32	62.65	39.60	13.80	18.10	0.033	0.994
33	72.70	42.00	15.65	20.75	0.236	1.494
34	56.50	38.80	9.45	15.80	0.114	--
35	65.00	41.00	13.75	18.95	0.142	--
36	60.70	40.00	11.00	16.90	0.047	1.448
37	75.90	46.85	14.90	25.55	0.226	1.879
38	55.85	32.95	10.10	13.85	0.051	0.758
39*	67.70	39.80	11.60	19.90	0.040	--
40*	58.20	43.80	13.55	17.95	0.106	--
41	56.00	42.65	11.60	15.95	0.232	2.163
42	63.60	36.75	11.75	17.65	0.119	--
43	68.25	36.85	13.25	17.45	0.063	0.745
44	65.75	34.60	10.10	16.65	0.198	--
45	68.30	35.45	10.40	17.50	0.080	--
46	77.55	37.30	9.65	20.95	0.043	1.623
47	72.10	38.15	12.15	20.60	0.108	1.699
48	63.30	39.80	10.70	18.60	0.118	1.264
49	62.20	42.25	14.15	19.85	0.116	2.519
50*	81.80	(46.30)	16.60	27.90	0.057	--
51*	74.70	46.70	13.10	25.25	0.107	--
52	72.70	52.15	13.95	27.40	0.177	--
53	72.60	49.65	13.70	26.40	0.167	3.031
54	79.65	51.50	17.65	28.90	0.131	0.415
55	81.85	55.55	17.30	34.15	0.091	2.255
56	85.50	61.50	21.20	36.00	0.139	--
57	85.20	61.10	18.30	36.00	0.139	--
58	90.70	75.80	15.20	35.80	0.050	--
59*	(104.60)	(59.00)	17.40	42.65	0.152	--
60	(71.40)	49.75	14.30	26.15	0.088	--
61	60.00	44.00	16.80	19.90	0.060	2.538
62	97.85	45.00	14.25	31.30	0.128	0.352
63	70.55	33.90	9.80	17.10	0.047	--
64	72.05	38.40	9.40	20.60	0.029	0.874
65	85.15	42.90	12.90	26.75	0.079	1.626

TABLE 5: Feature 8 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm^2)	Asymmetry Index	Gloss Density ($/cm^2$)
66	62.45	33.15	9.50	14.35	0.091	1.464
67	63.90	39.40	10.80	18.00	0.022	--
68	64.65	36.10	12.75	16.70	0.036	1.018
69	63.00	33.75	10.20	14.15	0.064	3.887
70	63.80	36.10	11.00	15.00	0.053	1.867
71	62.00	34.40	13.20	13.95	0.251	4.229
72	67.60	39.30	10.25	18.15	0.110	2.369
73	69.95	40.00	13.10	20.20	0.020	2.352
74	72.40	40.90	11.50	21.20	0.094	1.793
75	59.20	35.50	9.30	14.55	0.062	--
76	71.65	43.40	9.85	21.90	0.055	--
77*	(63.75)	(38.35)	10.70	17.10	0.082	--
78*	(81.35)	(50.90)	12.70	29.10	0.055	--
79*	63.30	35.35	10.05	17.35	0.190	--
80*	61.00	38.80	11.40	18.90	0.095	--
81	73.70	39.15	10.20	20.30	0.227	--
82	72.75	37.10	12.30	19.65	0.076	2.341
83	67.45	36.80	11.60	18.90	0.063	1.508
84	56.00	31.10	13.80	13.45	0.082	1.450
85	60.90	31.90	12.80	15.15	0.125	--
86	72.20	41.00	15.35	20.35	0.143	--
87	85.00	39.50	11.60	23.65	0.089	1.586
88	81.50	40.95	132.00	24.90	0.088	0.623
89	90.75	42.50	12.20	26.50	0.075	--
90	95.65	44.35	11.70	30.30	0.231	1.023
91	79.90	44.10	11.20	26.20	0.061	0.821
92	90.25	44.70	14.00	31.20	0.083	1.555
93	88.50	39.70	14.75	26.55	0.041	--
94	86.10	38.40	14.65	22.50	0.203	1.534
95	57.00	26.30	11.65	11.45	0.131	--
96	65.25	26.35	10.25	12.70	0.300	1.260
97	65.90	28.30	9.00	13.25	0.249	--
98	62.55	25.60	11.65	11.15	0.224	0.269
99	64.40	21.60	10.35	13.55	0.089	--
100	60.40	28.25	9.80	11.59	0.159	2.934
101	64.00	29.50	10.60	14.45	0.201	--
102	66.10	28.45	11.30	13.80	0.051	6.123

TABLE 5: Feature 8 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm^2)	Asymmetry Index	Gloss Density ($/cm^2$)
103	65.90	29.05	11.85	14.10	0.071	3.015
104	66.80	29.30	11.35	14.20	0.169	7.852
105	71.20	28.85	11.45	15.30	0.144	6.111
106	72.00	29.90	10.70	16.20	0.074	2.778
107*	>60.60	31.75	13.10	16.60	0.060	--
108	70.00	33.05	11.80	16.65	0.078	2.342
109	74.55	33.30	12.30	18.15	0.226	1.185
110	65.70	30.00	11.25	12.80	0.391	7.657
111	96.75	33.20	14.00	24.65	0.215	1.217
112*	102.45	(39.80)	17.39	30.60	0.059	--
113	115.80	42.65	17.45	37.25	0.067	1.880
114	56.40	29.40	9.25	11.70	0.154	4.701
115	66.05	36.10	19.20	17.90	0.268	1.369
116	61.35	33.10	13.00	15.25	0.138	--
117*	67.60	31.70	15.60	17.50	0.069	0.686
118	59.00	33.25	14.65	14.80	0.216	2.466
119	70.00	39.65	17.35	22.30	0.081	--
120	67.70	35.70	13.35	19.25	0.119	1.221
121	57.10	35.35	15.60	16.25	0.031	--
122	63.00	37.10	14.95	18.25	0.104	--
123	73.50	34.70	13.85	19.55	0.118	1.432
124	72.75	38.10	13.45	20.25	0.189	--
125	75.25	43.80	12.40	22.60	0.080	0.929
126*	>59.55	35.20	11.10	17.25	0.145	--
127*	>51.95	39.60	11.00	16.90	0.095	--
128*	>55.40	34.40	12.50	16.60	0.084	--
129	57.35	40.55	15.85	17.95	0.084	2.340
130	64.40	41.25	18.05	20.55	0.087	1.922
131	80.00	47.95	18.30	29.25	0.051	--
132	107.40	56.40	17.85	47.90	0.046	--
133	53.60	33.00	12.70	13.45	0.230	--
134	50.90	36.00	9.00	14.15	0.064	0.530
135	61.90	39.35	11.70	19.30	0.114	--
136	57.60	36.20	11.20	15.20	0.171	1.053
137	56.00	36.80	8.05	15.65	0.096	2.652
138	48.00	40.80	13.20	14.55	0.048	0.928
139	70.45	52.30	16.60	26.15	0.073	3.920

TABLE 5: Feature 8 Bifaces

Specimen No.	Length (mm)	Width (mm)	Thickness (mm)	Planar Area (cm²)	Asymmetry Index	Gloss Density (/cm²)
140	84.35	59.20	12.85	37.45	0.058	--
141	87.90	67.95	21.55	42.15	0.050	--

Notes: * = broken specimens.
Minimal dimensions are denoted by a prefix ">".
Estimated dimensions are enclosed in parentheses.

4.5 Bivariate Investigation of the Index of Asymmetry and the Point Gloss Density

Figures 9 and 10 illustrate the bivariate distribution of the studied samples of preforms from Features 1 and 8 respectively. With the exception of three outliers in the case of Feature 1, one of which is the solitary fragment, the remaining bifaces form a relatively well defined cluster. By contrast, the bivariate data points representative of Feature 8 coalesce into two, possibly three distinct groups. The greater complexity in the apparent duration of manipulation of the Feature 8 sample members is entirely consistent with the functional evidence discussed previously. Whether the complexity is also a reflection of differences in the number of episodes of retrievals and reuses remains to be determined.

4.6 Summary and Conclusions

The differences between the two caches at the Colborne Street site transcend the obvious differences in form and chert type from which the preforms were fabricated. The evidence for a difference in the duration of manipulation of specimens from each of the caches supports the notion that the caches occupied different roles in the technological organization of the Middle Woodland occupants of the Colborne Street site. More incisive interpretations will accrue upon completion of the remaining investigation.

5.0 OTHER TOOL AND DEBITAGE ANALYSES

5.1 Objectives

The principal objective was to describe the lithic assemblage recovered from the site and to explore possible relationships between the analyzed material and the two major concentrations of bifaces found in Features 1 and 8. An attempt was also made to examine the relationships between the southern end of the site close to D'Aubigny Creek, where the lithic material was found to be highly concentrated, and the northern end of the site, where lithic artifact density was substantially lower (see Figure 4).

Figure 9: Feature 1 (Cache 1), Bivariate Distribution of the Asymmetry Index and Point Gloss Density

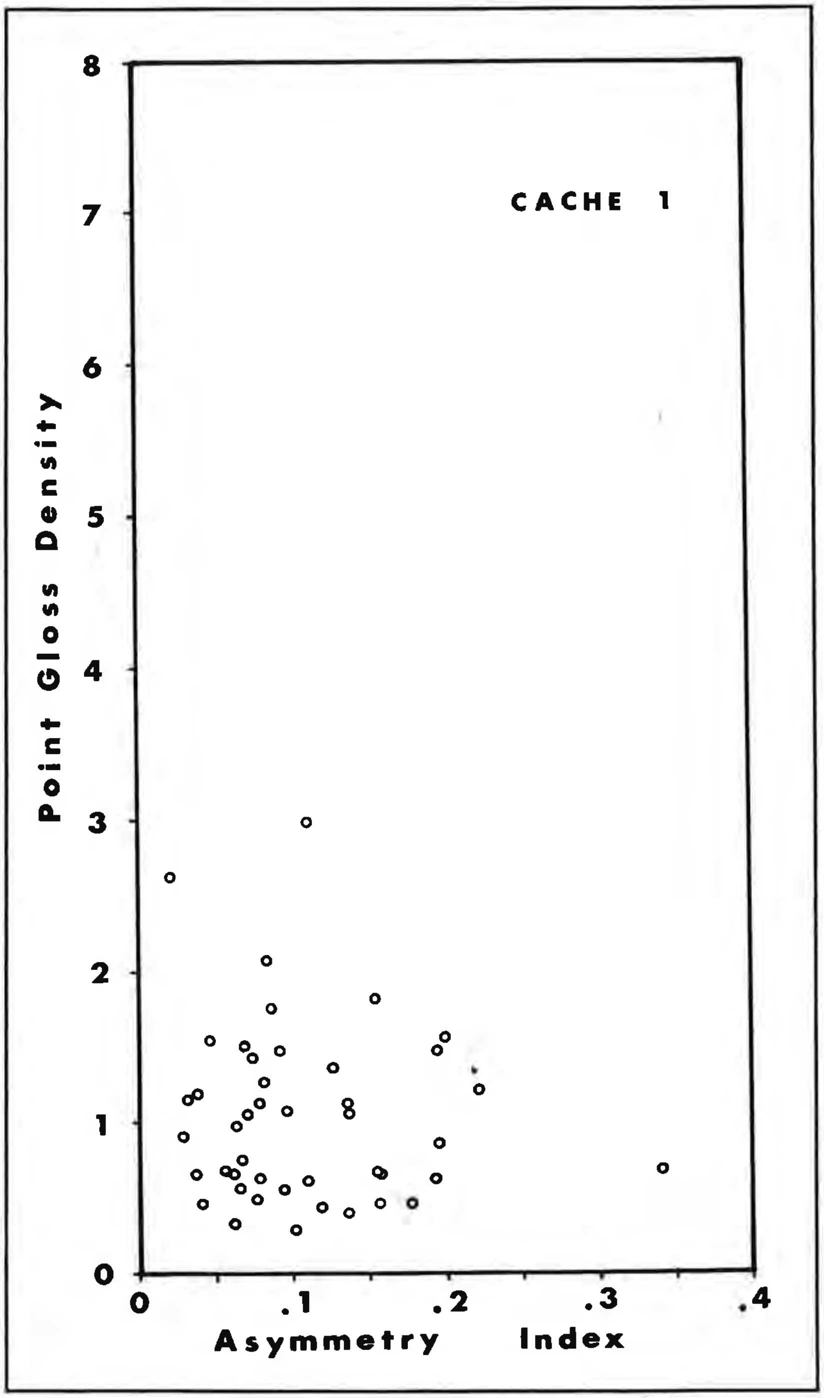
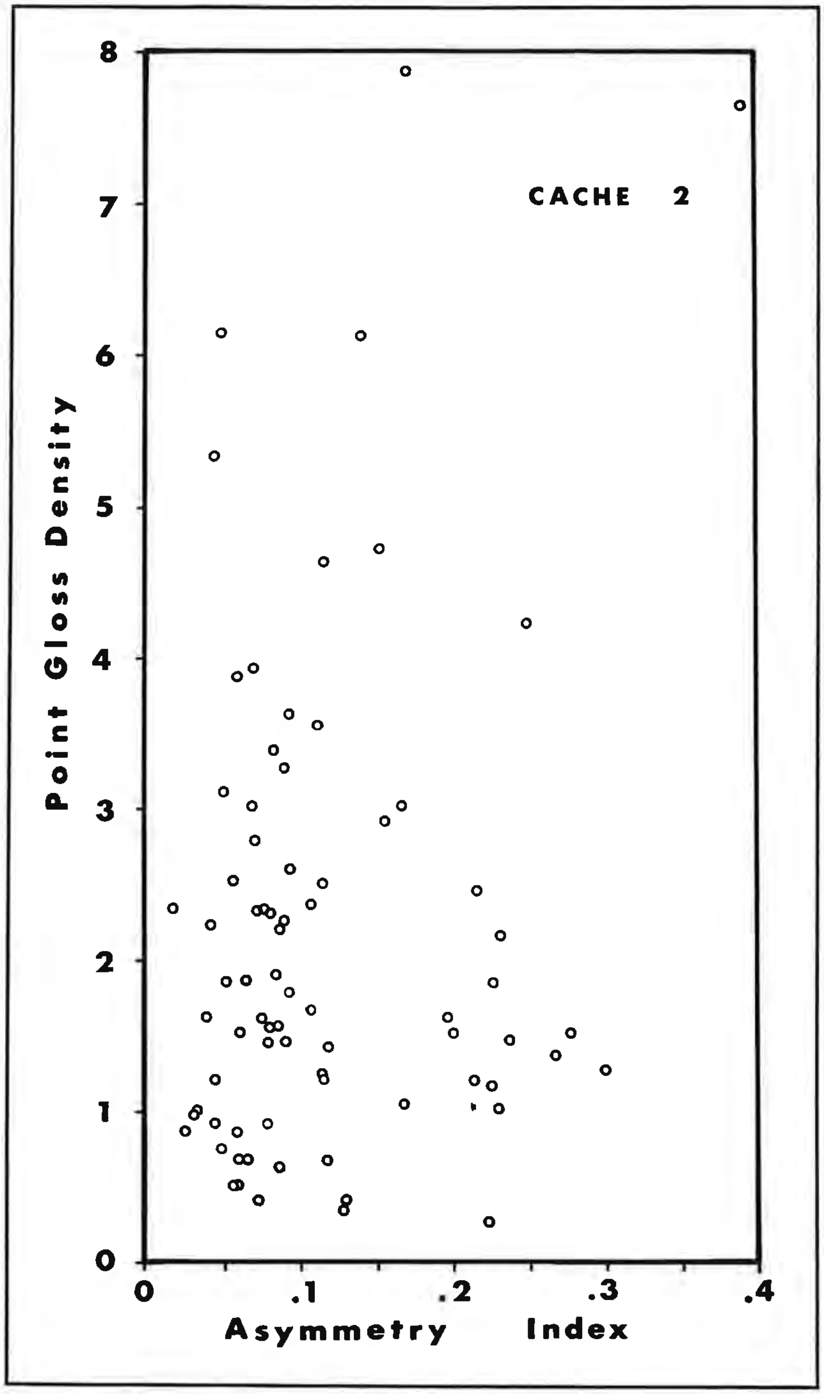


Figure 10: Feature 8 (Cache 2), Bivariate Distribution of the Asymmetry Index and Point Gloss Density



5.2 Method of Analysis

All non-cached lithic artifacts were cleaned, sorted (on a preliminary basis), and assigned a single series of catalogue numbers, from 0001 to infinity. Each analyzed provenience unit was assigned a unique range of catalogue numbers. Each implement, core fragment, and debitage flake was numbered individually, while fire- cracked rock and groups of shatter which shared similar attributes were given group numbers. Gaps were intentionally left between blocks of numbers to accommodate additional specimens in the eventuality that new identifications were made.

The procedure, constituting a streamlined version of ASI's standard lithic analysis system, includes 12 analytical fields into which are entered codes for lithic types and attributes, measurements, and a key-worded specimen description (Thomas 1992). Because of the potential connection between the analyzed assemblage with the recovered cache blades, particular attention was given to colouration variants of the principal lithic type, Onondaga chert. In addition, special attention was attributed to iron staining since John Tomenchuk, in his analysis of the cache blades, proposed that the staining might be analytically significant.

Low power magnification, 7X and 10X, was used to examine use wear patterns on all formal tools, and as an aid in identification of expedient tools. Steel implement spalling (from plough and shovel blades, etc.) was observed on some of the specimens and obvious and probable steel implement spalling was not accepted as expedient tool retouch or utilization.

5.3 General Observations

The collection consists of 1,978 culturally altered lithic artifacts, including: 24 formal tools (implements with standardized shape); 109 expedient tools (chert flakes or fragments with a shape appropriate for use with minimal or no prior modification); 15 cores (the pieces of raw chert from which formal and expedient tools are made); 724 analyzable flakes (entire flakes & proximal flake fragments); and 1106 pieces of shatter and distal flake fragments. The collection also includes 8 pieces of fire-cracked rock. A breakdown of specimens by artifact category and site area is presented below in Table 6 and Appendix A comprises a catalogue of the lithic assemblage.

The collection was derived from 40 1-metre excavated squares and 2 features. Following removal of the topsoil in the north end of the site, exposed artifacts were also collected, accounting for two additional 5-metre square units. While most of the recovered assemblage was subjected to detailed analysis, the remainder was examined and inventoried (Table 7). All formal tools were analysed in detail.

No ground stone artifacts were encountered, nor were non-chert expedient tools found (such as abrading stones, mortar stones, net sinkers). Eight fire-cracked cobble spalls were recovered. These tended to be concentrated in features, with 4 in Feature 1 and 2 in Feature 8.

TABLE 6: Colborne Site Artifact Distribution Profile

Artifact Category	North Portion		South Portion		Site Total	
	Count	Percent	Count	Percent	Count	Percent
Projectile Point	4	57.1	6	35.3	10	41.7
Modified Projectile Point	1	14.3	0	0	1	4.2
Refined Biface	1	14.3	6	35.3	7	29.2
Crude Biface	1	14.3	1	5.9	2	8.3
Unclassified Biface	0	0	2	11.8	2	8.3
Perforator / Grooving Tool	0	0	1	5.9	1	4.2
Formal Scraper	0	0	1	5.9	1	4.2
CURATED TOOL TOTAL	7	100.0	17	100.1	24	100.1
Retouched Expedient Tool	11	55.0	23	25.8	34	31.2
Utilized Expedient Tool	9	45.0	66	74.2	75	68.8
EXPEDIENT TOOL TOTAL	20	100.0	89	100.0	109	100.0
Core / Quarry Blank	2		13		15	
Primary Flake	18	15.7	146	24.0	164	22.7
Secondary Flake	97	84.3	451	74.1	548	75.7
Unclassified Flake	0	0.0	12	2.0	12	1.7
FLAKE TOTAL	115	100.0	609	100.1	724	100.1
Shatter / Distal Flake Frag.	131		975		1106	

TABLE 7: Lithic Artifacts (inventoried only)

Provenience	Projectile Point	Refined Biface	Crude Biface	Drill	Expedient Tools		Cores, Core Fragments, Core Trimming Flakes	Primary Flakes	Secondary Flakes	Shatter	Fire-Cracked Rock (Cobble Spalls)
					Retouched Flakes & Shatter	Utilized Flakes & Shatter					
470-400	1					1		1	9	18	
470-392					1	1		1	3	12	
467-397					2	2	1	36	76	146	4
468-404					1	1	2	12	10	19	
467-398			1	1	3		3	40	84	146	6
CSP	1	2			8	1	1	15	25	54	
468-389					1	1			4	9	
467-395		*			1	2		5	5	15	
TP#4, on slope of treeline										1	
466-394	1				1			8	19	21	
466-397		2			1	3		32	51	62	
466-396		1	1					17	38	42	
467-392			1		1			1	7	4	

Onondaga chert was clearly the predominant chert type accounting for 97.8% of the chert assemblage. Traces were found of Ancaster chert (16), Haldimand chert (10), Selkirk chert (1), Trent Valley chert (1), and an unidentified chert. These trace value cherts constituted a greater proportion of the northern than the southern sub-assemblages — 4.4% and 0.8%, respectively.

The collection appeared to contain two colour variants of Onondaga chert. Predominantly, the material was of a beige to light grey mottled with white colour. The designation "ON1" for Onondaga 1 was assigned to this variant. Also present was a more homogenous darker grey to grey-black coloured chert, with less mottling. The designation "ON7" was assigned to this variant. Any Onondaga specimen that differed in colour from these two variants were classified simply as Onondaga ("ON").

Excluding the fire-spalled cobbles, 300 items in the assemblage were thermally altered, or 17.8% of all chert items including shatter. Only Onondaga chert was effected. Thermal alteration was unevenly distributed among the two colour variants and the unclassified category. The thermal alteration frequencies were 1.7% for unclassified Onondaga, 1.2% for Onondaga-1, and 48.8% for Onondaga-7. Because each variant was well represented in the assemblage, with 117, 976, and 845 specimens respectively, the difference between Onondaga-7 and the other two variants is meaningful.

There is evidence that the three variants were also treated differently with respect to tool production. Table 8 presents the implement assemblages of the two best represented types, Onondaga 1 and 7, and for undifferentiated Onondaga as well. The data show a bias in the ON7 population for formal tools, and, conversely, in the ON1 population for expedient tools.

TABLE 8: Comparison of Onondaga Chert Colouration Variants Showing Different Patterns of Industrial Use

Colouration Variant	Formal Tools		Expedient Tools		Total
	Percent	n	Percent	n	
Onondaga-1	10%	9	90%	77	86
Onondaga-7	29%	12	71%	29	41
Undifferentiated Onondaga	---	2	---	2	-- 4

Onondaga chert is noteworthy for its colour variation. The observed difference between Onondaga 1 and 7 may be due to the natural variation found among different outcrops, or among different batches from the same outcrop. It is worth considering, however, that colour variation in chert can be caused by thermal alteration. In a major study of the effect of thermal alteration on chert, Lavin (1983) experimented on 22 chert types and type-variants, including both heat treated and control samples. Colour changes were observed, but there was no clear tendency in the direction of the colour shift. Most lightened or faded, some shifted to gray, and several reddened.

Accidental thermal alteration, due to the proximity of some chert knapping events to hearths, is expected in most assemblages. However, the possibility that some of the inferred ON7 thermal alteration was due to intentional heat treatment is suggested by the relatively stronger representation of formal tools among the Onondaga 7 group in comparison with the unclassified Onondaga and Onondaga 1 cherts. If, indeed there was a formal tool bias in the Onondaga 7 subassemblage, it is worth noting that none of the earliest production stage material (including cores, core fragments, and quarry blanks) were thermally altered.

Heat treated chert might be preferentially used for formal tool, but not expedient tool production, because, as demonstrated by experiment, it improves the working quality (Crabtree and Butler 1964; Mandeville 1973; Purdy 1974; Bleed and Meier 1980.) In stone knapping experiments, Callahan found that heat treatment might raise the working grade of a coarser chert to that of a finer chert 1979:16). Heat treated material might, therefore, be better suited for more intensively shaped, formal tools. However, because less force is required to remove flakes from heat treated chert (Bleed and Meier 1980:505-506), it may be less suitable for expedient tools, which are generally thinner. Generally, thinner chert objects survive heat treatment without developing fatal cracks from thermal shock (Crabtree and Butler 1964:3). One would expect, therefore, that heat treatment would be more successfully applied to partially worked blanks and preforms rather than large, blocky cores.

5.4 Implement Descriptions

5.4.1 Projectile Points

A major question posed by the Colborne collection is whether the cache blades and Middle Woodland ceramics are related to at least a substantial portion of the remaining lithic assemblage, or whether the associated material is only a coincidental juxtaposition. Data concerning projectile points may prove especially helpful in this regard since they are the most chronologically sensitive lithic artifacts.

It should be noted, however, that studies of microscopic edge wear demonstrate that some "projectile points" functioned as knives either exclusively or in conjunction with projectile tip function (Ahler 1971). Generally, transverse impact fractures, little edge wear, or both are indicative of projectile point function. Edge crushing, grinding, edge polish, and oblique edge-initiated spalling are indicative of cutting or non-projectile functions.

The projectile points listed below are made of Onondaga chert, except where another chert type is specified. A fragmentary biface is judged to be a projectile point based on haft element morphology, including the presence of one or two shoulders, actually the distal portions of the notches.

0202 (N468 E399):

Projectile point, or bifacial drill, base and stem. Base convex, stem slightly expanded, base and stem ground. Configuration and basal grinding consistent with *Innes* type (Lennox 1986), and resembles base of projectile point specimen 0880. Neck width = 10mm or less. Transverse fracture at neck was initiated near midline of face.

0880 (N469 E396):

Projectile point, major portion less corner of base, joined to tip portion (0464 from square N466 E398). Base convex, stem slightly and asymmetrically expanded, base and stem ground. One shoulder rounded, the other is pointed. Configuration strongly resembles *Innes* type (Lennox 1986). Length = 32mm, Width = 20mm, Thickness = 5mm, estimated Stem Width is just under 12mm. There is no obvious edge wear. The longitudinal base fracture and oblique tip fracture are from thermal shock, and the texture has been altered by thermal alteration. The raw material does not resemble at all that used to make the cache blades (J. Tomenchuk: pers.comm.) (Plate 7:f).

1348 (N481 E400):

Projectile point, or bifacial drill, base and stem. Base convex, stem slightly expanded, base and stem ground. Configuration and basal grinding consistent with *Innes* type (Lennox 1986), and resembles projectile point specimen 0880. Approximate neck width = 12mm. Texture indicates thermal alteration. Break at neck is transverse, and, while fracture type is obscure, it preceded the thermal alteration.

0721 (N468 E398):

Projectile point, less distal blade. Base slightly convex with steep, mostly unifacial retouch and some light grinding or smoothing with light polish in one corner. The possibility should be considered that the base was recycled as a scraper. The polished corner may be a remnant of an incompletely resharpened working edge. One side has a wide expanding V-shaped corner notch and sharp shoulder; the other side has an expanding U-shaped corner notch and rounded shoulder. Appears closest to *Crawford Knoll* type. Length (incomplete) = 24mm, Width = 22mm, 7mm thick, Neck Width = 12mm. (Plate 7:g)

1409 (N489 E390):

Projectile point, less distal blade and a minor portion of the proximal base. Edge wear is present in the form of localized crushing and rounding. Closely resembles an *Adena Stemmed* point (Justice 1987:196). Made of Ancaster chert, the execution is crude. Length (incomplete) = 45mm, width = 36mm, thickness = 10mm, and neck width = 23mm. The distal break is complex, including at least two separate fractures, each of which appears to be a hard hammer blow (Hertzian fracture), and initiated from opposite faces. This specimen is typical in quality of the poorest of the cache blade collection (J.Tomenchuk: pers.comm.) (Plate 7:a).

Plate 7: Formal Tools from the Colborne Street Site

Uncat. (N470-400):

Projectile point, less distal blade and one side of the base. Crude execution, due to calcareous nature of the chert. Base is straight and possibly ground. On the surviving side of the base, the side notch is wide and the shoulder rounded. The blade is short, triangular, and plano-convex in cross-section. The shape is imperfectly developed, and, due to breakage from thermal shock spalling, the configuration of this point is ambiguous and difficult to assess. The configuration is generally consistent with the small *Saugeen* point, presented as a typical Middle Woodland form in Spence, Pihl, and Murphy (1990: Figure 5.6-E). It also approaches a short, narrow variant of several Late Archaic points, including the *Susquehanna* (Ritchie 1971: Plate 31). Length (incomplete) = 22mm, Width (incomplete) = 16mm, Thickness = 6mm. Basal breaks may be face-initiated, blade break is a thermal shock fracture.

0540 (N469-399):

Projectile point, entire. Base straight, carefully retouched but not ground, broad, expanding V and U-shaped side to corner notches, pointed barbs. Very similar to 1383 except smaller, squat isosceles blade, and slightly more barbed shoulders. Most similar to *Affinis Snyders* (Justice 1987:204). Base straighter & notches more barbed than Vanport (Fox 1980). Appears to have been made by corner notching a triangular preform. Length = 33mm, Width = 26mm, Thickness = 7mm, Neck Width = 13mm. Edges sharp with discontinuous microflaking, rounding on one edge near tip, tiny 7mm edge spall from other tip edge. Natural cavity occurring in middle of one edge did not affect edge shape. The raw material is similar to some of the cache blades in colouration, granularity and irregular banding (J. Tomenchuk: pers.comm.) (Plate 7:d).

0607 (N466 E394):

Projectile point, less distal blade. Base convex with slight central incurvation (similar to *Jack's Reef Corner Notched* illustrated in Justice 1987: Figure 47-a). Carefully retouched but not ground, U-shaped corner notches, sharply pointed barbs approaching those of *Jack's Reef* illustrated in Ritchie 1971:Plate 11. Also similar to *Affinis Snyders* (Justice 1987:204). Appears to have been made by corner notching a round-based preform. Length (incomplete) = 20mm, Width = 29mm, Thickness = 7mm, Neck Width = 16mm. Transverse blade fracture is face-initiated (Plate 7:e).

1391 (N480 E395):

Projectile point, base and proximal blade, base convex, carefully retouched but not ground, corner-notched, sharp barbs. Most similar to *Snyders* (Justice 1987:201-204). Appears to have been made by corner notching a round-based preform. Distal end unifacially retouched into convex scraper edge which has slight rounding. Length (incomplete) = 24mm, Width = 30mm, Thickness = 7.6mm, Neck width = 16.4mm. (Similar to Brewerton Corner-notched, although this type tends to have basal grinding, a straighter base, the appearance of derivation from a triangular preform, and more rounded barbs (Plate 7:b).)

1381 (N485-395):

Projectile point, major portion less small spalls from tip and one shoulder with a straight base. Carefully retouched but not ground, broad, expanding V and U-shaped side to corner notches with a pointed shoulder. Resembles "*Chesser Notched*" (Justice 1987:213-214), having a triangular blade with slight "*Jacks Reef*" type incurvation approximately one-third from tip. Appears to have been made by corner notching a triangular preform. Length (incomplete) = 38mm, Width = 28mm, Thickness = 6mm, Neck Width = 15mm. Edges sharp with discontinuous, mostly bifacial, microflaking. End spall apparently face-initiated (Plate 7:c).

1668 (N519 E400):

Projectile point blade fragment, less base and tip, but with both shoulders. There is little obvious edge wear. The proximal break is a transverse hinge fracture, the distal fracture is recent. Although the presence of both shoulders indicates presence of a projectile point hafting element, the lack of the base element precludes a type assessment.

The majority of the securely identifiable projectile points, together with the impressive cache blade deposits and the ceramics, indicate a significant Middle Woodland presence. This and other evidence such as chert type and the nature of the debitage (see Section 5.5 below) suggests that the most substantial occupation, and, by inference, most of the non-diagnostic lithic material, is also attributable to the Middle Woodland. This assumes, however, that the Late Archaic and Early Woodland presence is equivalent with a relatively thin lithic scatter and isolated points, and that the earlier occupations were not substantial enough to account for a significant portion of the recovered lithic collection. It is also possible that the earlier points had been incorporated into the Middle Woodland assemblage.

5.4.2 Generalized Bifaces

The generalized biface category includes bifacially worked items which have no obvious modification for hafting. By definition, projectile point tips and unnotched edge fragments, may find their way into this category, as well as bifacial cores intended to produce blank flakes for use as expedient tools. Indeed it is perhaps preferable to include a nondiagnostic portion of a projectile point in a more generalized category of formal tool, and to use the projectile point category conservatively. As for inclusion of bifacial cores with generalized bifaces, only rarely were major portions of bifacial cores encountered without evidence of some, generally heavy duty, use wear.

The collection included 2 entire bifaces (i.e. Plate 7:i), substantial portions of 4 specimens (Plate 7:j,k,l), and 4 minor fragments. Seven of these were classified as refined bifaces, with quality of flaking generally no worse than some of the cruder projectile points. These correspond to Johnson's and Morrow's "finished biface". Two were classified as crude bifaces, a broad category which corresponds to Johnson's and Morrow's Bifacial Blank, Preform 1, and Preform 2 stages (Johnson 1989:122-4). Two other specimens were placed in the unclassified biface category, either because it was an intermediate form (1686) or because it was too fragmentary to place in a specific category (0927).

Given the prominence of generalized bifaces in the analyzed assemblage, particularly in light of the large numbers of cache blades recovered from Features 1 and 8, it is worth considering this category in detail.

The first question to be addressed is the relationship of the 10 analyzed generalized bifaces and biface fragments to the cache blades. John Tomenchuk, who undertook a detailed analysis of the cache blades (see Section 4.0) was able to inspect 6 of the specimens. All were judged to be made of chert within the range of variation observed for the cache blades. Items 0082 and 1686 were judged to represent the top third of the quality range observed in the cache blade collection, and items 0926, 0927, 1265, and 1426 were described as being of good quality relative to the cache blade norm. In addition, item 1265 was described as very similar to the chert in Cache 1 (Feature 1). This comparison, while favourable, does not constitute proof of a connection between the generalized bifaces and the cache blades, but it does mean that such a connection cannot be rejected on the basis of physical appearance.

The average dimensions of the only two generalized bifaces in our sample, item 0268 - a refined biface, and 1686 - an unclassified biface, are 51mm long, 28mm wide, and 10mm thick. Most of the other fragmentary specimens appear to have been derived from bifaces in this general size range. It appears, therefore, that the bifaces in this sample are generally smaller than the cache blades. If the bifaces in this sample originated as cache blades, then their relatively smaller size suggests that they were substantially reduced by resharpening, and were at or near the end of their use-lives when broken, discarded, or lost.

On the balance of the above evidence and without sophisticated chert source analysis, it is not possible to demonstrate a cultural link between the cache blades from Features 1 and 8 with the generalized bifaces. However, given that other evidence indicates that the Middle Woodland occupation was more intense than the Late Archaic or Early Woodland occupations, it is still possible to tentatively infer that some, if not most, of the analyzed bifaces are also attributable to the Middle Woodland presence.

Setting aside the question of cultural attribution, the generalized biface is a technologically important tool category. A biface takes far longer to produce than an expedient flake tool, and this investment in effort makes it valuable to the user, and worthy of consideration. Kelly (1988) has proposed three separate, but not mutually exclusive reasons for biface production. First, as a core for the production of flake blanks, the biface is an extremely efficient source of useable tool edge length per volume of stone. Next, and perhaps of greatest importance here, the biface represents a long use-life tool which may be resharpened and re-used many times. A biface is versatile, and can be reworked to better suit it to a new task. Lastly, bifacial tools are used for tasks which require precisely shaped tools, or where a precise hafting configuration is needed to fit a pre-existing haft (Kelly 1988:718-719). This point applies, by definition, only to specialized bifaces. One additional role of the biface which Kelly did not discuss relates to the often ceremonial context, in which many caches are found.

As for the first of Kelly's proposed roles for the biface, that of a highly efficient core for the production of flake blanks, there is equivocal evidence at this site. Large, deep flake scars noted on items 0605 (Plate 7:j) and 1686 could have been removed for production of flake blanks for small expedient tools. However, of the 65 items securely identified as flakes of bifacial reduction, only 7, approximately 11%, had been made into expedient tools. The operational definition used for flake of bifacial reduction included: a faceted striking platform, a pattern of dorsal flake scars oriented more or less parallel to each other and roughly perpendicular to the striking platform, and an angle between the dominant planes of the striking platform and the ventral surface consistent with removal from a lenticular core, seldom exceeding 70° (Thomas 1992:21). If bifacial reduction flakes were deliberately produced for use as expedient tools, it was a minor feature of Colborne lithic technology. The weight of the evidence does not support this role for these particular bifaces.

The second motivation for biface production is to create a tool with long use-life which is suited for a wide range of tasks, traits which touch on the concept of "curated" technology. There is evidence for both extensive biface maintenance and versatility. If, as suggested above, the Colborne generalized bifaces were in the size range of cache blades at the start of their use-lives, the comparatively small size of the recovered tools is evidence of having been resharpened many times. A wide range of use wear patterns was identified from which it is inferred that these tools were used to preform a wide variety of tasks. The following use-related attributes were observed in several combinations: end shock spalling, edge crushing, edge rounding and smoothing, edge polish, and microspalling. Combinations of edge wear attributes ranged from detachment of substantial end shock spalls together with edge crushing or rounding (0926 and 0931), indicative of a heavy duty chopper function, through smoothing and rounding overlain by polish (0268 and 1265), indicative of lighter duty tasks such as hide working.

5.4.3 Other Formal Tools

The only specialized biface identified in the analyzed assemblage, aside from the projectile points, was a bifacial drill end fragment (item 0369, Plate 7:h). Within the first 5mm of the tip, the edges were rounded and had a frosted appearance. The remaining edges were rounded with discontinuous areas of glossy polish. Either the tip had been recently retouched, and had yet to develop a polish, or the extra pressure on the edge resulted in a duller surface finish. The wear extending up the drill shaft presumably indicates deep penetration of the subject matter for at least 30mm.

The only formal end scraper recovered is item 0903. Made from a secondary knapping flake 4mm thick, it had steep, regular edge retouch and typical scraper edge wear and polish.

5.4.4 Expedient Tools

A total of 109 expedient tools was identified, which included retouched and utilized flakes, shatter, and a core fragment. The latter is a prismatic core fragment with one active flake removal face, which had a 26mm sub-serrated retouched edge and a 5mm utilized edge. There are 34 tools which have at least one retouched edge, and 75 tools which have one or two utilized edges. The ratio of retouched to utilized expedient tools appears to be biased towards utilized tools which involve less energy investment. One would expect such a bias in an assemblage well supplied with chert.

Relatively few expedient tools had more than one edge, and none were found to have more than two edges. The edge allocation pattern for the expedient tool assemblage, presented in Table 9, shows that expedient tools were not intensively used. In other words, there is a bias towards less energy investment per tool which is reflected in a bias towards utilized rather than retouched edges

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TABLE 9: Expedient Tools, Distribution of Edge Types

Type	Single-edged	Double-edged
At Least One Retouched Edge	27	7
Utilized Edge	71	4

5.5 Debitage

Colborne produced a large amount of debitage, including 724 analyzable flakes, including entire flakes and proximal fragments, and 1106 pieces of shatter, including distal flake fragments. Table 10 summarizes the representation of flake types and selected flake attributes.

The reduction stage-oriented flake types include primary reduction (thick, with angular cross-section, dorsal surface generally covered with deep, unaligned flake scars or cortex), primary thinning, secondary knapping (lenticular cross section with shallow dorsal scars which tend to be oriented perpendicular to the striking platform), and secondary retouch (generally in fingernail size range, very thin, dorsal flake scars aligned perpendicular to the striking platform)—see Thomas 1992:21 for full definitions. Because of their diminutive size, we may assume incomplete recovery for secondary retouch flakes, given that the excavation screens were equipped with 6 mm mesh.

Various lithic materials types have different working characteristics. Onondaga chert is clearly the predominant lithic type among debitage flakes in both parts of the site. Population sizes of other types are insufficient for comparative purposes, so the following review of Colborne debitage will focus exclusively on Onondaga chert.

The ratio of primary to secondary flakes is relatively low, and is lowest in the southern part of the site.

The fracture initiation types described by Cotterell and Kamminga (1987) have been found to be easier to implement and have a stronger association with industrial processes than such attributes as rings of force, distal termination, etc. Bending initiation is associated with pressure flaking or soft hammer percussion (Cotterell and Kamminga 1987:686-690). Hertzian, or conchoidal initiation is associated with hard hammer percussion (686). Related to hertzian initiation and hard hammer percussion, is multiple concentric secondary fracturing (687, Figures 8, 9). Jelinek, Bradley, and throughout the site. It appears that the best explanation for these apparently conflicting data is that the most frequently used type of percussor was a soft hammer, such as antler or wood, applied with force, because a soft hammer can behave much like a hard hammer given sufficient power behind the blow (Cotterell and Kamminga 1987: 686).

Dorsal cortex observations included tabular cortex and "flat cortex". Flat cortex refers to the flat, somewhat rectilinear joint fracture cleavage planes which often occur in tabular layers of Onondaga chert. The flat planes with matte lustre contrast sharply with the curved surfaces and waxier lustre of culturally fractured surfaces. Because this type of surface is characteristic of cores and other primary objects taken from quarry sites, it is the analytical equivalent of real cortex. (See Thomas 1992:63-65 for a detailed discussion.)

Combined values for tabular and flat cortex ranged from 5.9% in the southern part of the site to 17.2% in the northern part, with an average value of 16.0%, and was strongly associated with primary flakes. Both tabular and flat cortex behaved similarly with respect to distribution within parts of the site and among flake types.

Flake size data, taken for entire Onondaga debitage flakes, show a strong tendency for flakes to be thinner and smaller in the southern part of the site. This may explain the unusually skewed ratio of entire flakes and proximal flake fragments to shatter (including distal flake fragments) observed in the south. It seems reasonable that smaller flakes would have a higher rate of breakage, and result in proportionally more shatter.

5.5.1 Discussion of the Debitage

The flake type distribution indicates that stone working at the north end of the site was more retouch-oriented, while it was more production-oriented in the south. This impression is reinforced by the relatively higher values for dorsal cortex in the south, which indicate more reduction of primary material. These data appear, however, to conflict with the flake metric data which present a picture of thinner, smaller flakes in the south.

We are unable to support the hypothesis that the Colborne debitage is related to cache blade manufacture on the basis of the frequency of identified bifacial reduction flakes. However, the operational definition used for this type is restrictive, being more geared to the conservative identification of refined biface retouch. It may not be sufficiently sensitive to the primary stages of biface reduction, characterized by large platform angles and deeper and more random dorsal flake scars. In retrospect, it may have been useful to record striking platform description and striking platform measurement fields. Given the data at hand, we can say that the debitage pattern observed in the southern part of the site is unusual. It apparently involved the reduction of semi-refined quarried material. However, the flake size data, indicate that the industrial process, whatever was being manufactured, operated with a degree of refinement. Nevertheless, flake type and cortex data indicate a primary orientation. In summary, given the quantity and nature of the debitage and the narrow spectrum of tools recovered from the site, it is suggested that the debitage relates to the production of the bifaces.

TABLE 10: Colborne Site Debitage Summary
North 475 is the dividing line between north and south parts of site.

Artifact Category	North Portion		South Portion		Site Total	
	Count	Percent	Count	Percent	Count	Percent
Debitage Flake Types (All Chert Types)						
Primary Reduction	4	3.5	36	5.9	40	5.5
Primary Thinning	14	12.2	110	18.1	124	17.1
Secondary Knapping	61	53.0	321	52.7	382	52.8
Secondary Retouch	36	31.3	130	21.3	166	22.9
Unclassified Flakes	0	0.0	12	2.0	12	1.7
Debitage Flake Totals	115	100.0	609	100.0	724	100.0
Non-Onondaga Debitage Flakes	3	2.6	7	1.1	10	0.1
Onondaga Chert Debitage Flakes, Selected Attributes						
Fracture Initiation Types						
Hertzian	108	96.4	573	95.2	681	95.4
Bending Initiation	4	3.6	23	3.8	27	3.4
Intermediate	0	0.0	5	0.8	5	0.7
Multiple Concentric Secondary Fractures	1	0.9	16	2.7	17	2.4
Dorsal Cortex >25% (Note 1)						
Primary Flakes	1	5.9	25	17.2	26	16.0
Secondary Flakes	0	0.0	5	1.3	5	0.9
Average Thickness (Note 2)						
Primary Flakes	9	9mm	87	5mm	96	6mm
Secondary Flakes	47	3mm	263	2mm	310	2mm
Average Surface Area (Note 2)						
Primary Flakes	9	700mm²	87	360mm²	96	391mm²
Secondary Flakes	47	204mm²	264	186mm²	310	189mm²
Ratio of Flakes to Shatter	1:1.1		1:1.6		1:1.5	

Note 1: Percentages calculated per lumped flake category–primary reduction joined with primary thinning, and secondary knapping joined with secondary retouch.

Note 2: Flake categories lumped as in Note 1. Only entire flakes averaged. Surface Area = Length x Width.

5.6 Discussion

The Colborne lithic assemblage is noteworthy for its size because it has produced such a narrow range of artifact types. There are no ground stone items, ornamental or utilitarian. The perforating and grooving category is represented by a single drill fragment; there are no flake drills, gravers, beaks, or burins. There is only one formal end scraper, and no spokeshaves. There are no expedient non-chert tools such as abrading stones, hammerstones, netsinkers, manos, etc. To a certain extent, the narrow range of tool types may have been compensated for by a focus on generalized bifaces, which, upon cursory examination, were found to exhibit a broad range of edge wear.

Bamforth (1986) proposes that the relationship between curatable and expedient technology is affected more by the availability of chert resources than by mobility patterns. At Colborne, except for the cache blade finds, there appears to be an emphasis on expedient technology. However, there are significant intra-site differences consistently expressed in several ways. For our purposes here, the site was divided into north and south portions at the N475 grid line. The southern portion contains the squares with dense concentrations of lithic artifacts, close to the bank of D'Aubigny Creek. The northern portion, further from the water supply, generally has a more diffuse artifact distribution. However, features and deposits of cache blades were found in both portions as were diagnostics of the Middle Woodland period. It is nevertheless acknowledged that there is no reliable way of assessing the contemporaneity of the two areas.

One way to assess the level of energy investment in an assemblage is by the ratio of formal, curatable, tools to expedient tools. At Colborne, the site-wide ratio is 24:109, or 1:4.5. In the south part of the site, this ratio is 17:89, or 1:5.2. This contrasts with the ratio in the northern part the site, 7:20, or 1:2.9. The ratios suggest that chert supply was less of a constraint to lithic technology in the southern part of the site.

Edge allocation patterns among expedient tools are not distributed evenly across the site (Table 11). Although data are sparse for the northern end of the site, use of expedient tools seems to have been more extensive. If the data at hand are a true reflection of the expedient tool population, there would have been relatively more emphasis on retouched than utilized edges, and perhaps even more emphasis on multi-edged tools.

TABLE 11: Expedient Tools, Distribution of Edge Types, an Intra-site Comparison (Dividing line is N475.)

Type	North End		South End	
	1 Edge	2 Edges	1 Edge	2 Edges
At Least One Retouched Edge	8	3	19	4
Utilized Edge	9	0	62	4

The contrast in edge allocation patterns suggests there is a greater conservatism in tool use patterns in the northern part of the site with respect to chert supply. Conversely, the pattern suggests that the chert supply in the southern end of the site was so plentiful that it was more efficient, from the tool user's viewpoint, to pick up a new blank flake than to resharpen a dull one.

Table 6 shows that within the formal tool category, there was a low emphasis on the lower energy investment end of the spectrum. This group includes formal tools usually made from flakes, which are standardized in shape, or at least shape of the working edge, but which involve less overall modification than bifaces. They are also less curatable in that, they generally cannot be maintained over as long a use life as most bifaces, and they generally cannot be readily converted to other tasks. This part of the tool type spectrum is represented by one formal scraper and one bifacial drill. There are no denticulates, flake perforators, burins, gravers, formal side scrapers, or spokeshaves.

There was enough debitage available to result in low intensity use of expedient tools. If the debitage had been produced intentionally as blank flakes for expedient tools, one would expect less flake production and a more intensive exploitation of the expedient tools. A possible explanation is that the debitage was produced as a byproduct of formal tool manufacture on a large scale. According to Kelly's model, long use-life tools may be manufactured in anticipation of subsistence operations in areas where dependable supplies of lithic resources are unavailable. An extension of this is to concentrate manufacturing efforts in the production of multi-purpose tools. This sort of technological strategy makes most sense in anticipation of long, broad spectrum search-and-encounter subsistence operations rather than target-specific forays. Of course, the biface exemplifies the ideal choice for a multi-functional, long use-life tool (1988:720-721).

In summary, the Colborne assemblage presents a paradox. The formal tool assemblage appears to have involved conservative use of multi-purpose long use-life tools, generalized bifaces. In contrast, the expedient tool assemblage emphasized utilized rather than retouched edges. Also there was little conservation of expedient tools, as few multi-edged tools were encountered. How can it be efficient to concentrate on bifacial formal tools, which require a relatively high energy investment to manufacture, while an abundant supply of blank flakes is at hand? According to Bamforth, there are several aspects of efficiency, and the supply of lithic resources plays a major role in determining which aspect of efficiency is more relevant. In a lithic source area, it may be more efficient to focus on expedient, short use-life tools than to expend effort manufacturing and resharpening long use-life tools. Outside of the source area, however, when it is necessary to manage the supply of heavy lithic materials, it may be more efficient to focus on curatable, versatile, long-use life tools (Bamforth 1986:39-40).

Thus, the hypothesis that Colborne was a locus of biface manufacturing would fit the available data. The profuse amounts of debitage would result in light exploitation of the expedient tool assemblage because there would be no incentive to conserve flakes. However, bifaces would constitute a valuable resource and would be used conservatively.

6.0 RECOMMENDATIONS

1.0 Due to the lack of additional data recovered from the controlled surface collection and placement of one-metre test units at the Cyrillic site (AgHb-135), it is recommended that no further archaeological investigations are warranted at this location.

2.0 The threatened portions of the Arabic site (AgHb-134) and Colborne Street site (AgHb-137) have been completely salvage excavated, and may therefore be considered free from any further archaeological concern.

Nevertheless, earth moving activities related to the sewer line, in the wooded area adjacent to D'Aubigny Creek should take place only within the bounds of the corridor.

3.0 Any future disturbance to the lands adjacent to the corridor in the vicinity of these sites, should be preceded by detailed archaeological assessments.

4.0 In the event that deeply buried archaeological deposits (e.g., human burials) are encountered at any time during the development, the **Ministry of Culture and Communications** must be notified immediately.

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