THE CITY OF LONDON
ARCHAEOLOGICAL MASTER PLAN

Department of Planning and Development
Planning Division/Vision '96

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Volume 2: Sites Data

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1.0 EXECUTIVE SUMMARY

Following the 1992 annexation, the City of London, as part of its comprehensive "Vision '96" Planning Program, undertook the preparation of an Archaeological Master Plan to serve as a guideline document for the new Official Plan. The Master Plan provides specific, municipally approved direction with regard to archaeology for the preparation and review of development proposals, the identification of conditions of development approval, and the planning of improvements to public services and facilities.

The purpose of the Archaeological Master Plan is to ensure the identification, evaluation and conservation of archaeological resources through effective long-range planning. The Province now encourages greater responsibility at the municipal level with regard to heritage concerns within the land use planning process. As a result, the City of London Archaeological Master Plan is designed to effectively manage the City's archaeological heritage and streamline the development plans review process.

The goals of the City of London Archaeological Master Plan were to:

- inventory all known and suspected archaeological sites within the City of London;
- inventory all areas assessed for archaeological concerns;
- develop an archaeological predictive model to be employed by non-archaeological staff members of the City of London Planning Department in order to determine if a proposed development area requires an archaeological field assessment;
- develop protocols and procedures to facilitate the early recognition of archaeological sites and areas with archaeological potential by members of the development community;
- and develop appropriate procedures to ensure the implementation and maintenance of Master Plan.

The development of the Archaeological Potential Model was the primary goal of the Master Plan. Detailed potential mapping was generated through an examination of a range of biophysical and cultural-historical factors, any or all of which may have influenced past patterns of land use. The goal of this exercise was to identify parameters which could be utilized to restrict the area of the City requiring actual field examination without compromising valuable archaeological resources.

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With extensive utilization of the City of London GIS, it was possible to determine that 19,088.6 hectares (45.2% of the City) have high to moderate potential for the recovery of archaeological resources. The model which has been produced will allow a Planning Division staff member without archaeological expertise to make a simple yes/no determination of whether a development property requires an archaeological field assessment.

Beyond the creation of the inventories and the predictive model, the Archaeological Master Plan process also involved the creation of a series of procedures and protocols designed to enhance the protection of archaeological resources while expediting the development plans review process. Additionally, development proponents will no longer need to wait until the submission of a application in order to ascertain if an archaeological assessment will be required for their property; they can easily be made aware their obligations months or years in advance.

Procedures have been established which will allow members of the development community access to the City of London Archaeological Potential Mapping and Sites data base, which will allow developers to plan ahead, protecting sites and reducing last minute delays and expenditures.
2.0 THE CITY OF LONDON ARCHAEOLOGICAL MASTER PLAN

2.1 Introduction

Following the 1992 annexation, the City of London, as part of its comprehensive "Vision '96" Planning Program, undertook the preparation of an Archaeological Master Plan to serve as a guideline document for the new Official Plan. With the expansion of the City of London to include almost all of the former Township of Westminster and parts of West Nissouri, North Dorchester, Delaware, and London Townships, the City recognized the need to establish procedures and protocols which would enhance the long term protection and management of London’s archaeological resources. Funding to proceed with the Archaeological Master Plan using internal city staff was approved by Council in March 1994.

As a guideline document for the Official Plan, the City of London Archaeological Master Plan provides specific, municipally approved direction with regard to archaeology for the preparation and review of development proposals, the identification of conditions of development approval, and the planning of improvements to public services and facilities. The Master Plan is also consistent with provincially specified interests as detailed in the Ontario Heritage Act and Bill 163, the amended Planning Act.

2.2 What is Archaeology?

Archaeology is the study of past human activity through the careful, systematic documentation and analysis of the preserved remnants of material culture. These remnants can include soil stains left by house or palisade walls; stone, bone or wooden tools; ceramic vessels or pipes; remains of cooking hearths and storage features; animal bones; carbonized seeds from ancient meals; human burials, etc. Archaeological sites are the locations, ranging from isolated findspots of lost tools to villages covering several hectares, at which these remains can be identified. Unlike standing heritage structures, which provide recognizable and easily interpreted links to the past, archaeological sites are usually less visible to the untrained eye. Evidence of prehistoric Aboriginal camps and villages, as well as Euro-Canadian pioneer cabins, mills or inns, often lie unnoticed in backyards, agricultural fields, city parks and even beneath and around buildings in the downtown city core. It is through the careful analysis of the remains from these sites that archaeologists can begin to piece together the story of the prehistoric and historic settlement of the City of London.
2.3 The Value of Archaeological Resources

London’s archaeological heritage extends back at least 11,000 years, when following the retreat of the glaciers, humans first occupied Southwestern Ontario. As such, the archaeological record within the City of London can add significantly to our knowledge of the dynamic and culturally diverse heritage of Ontario’s Aboriginal communities, as well as the non-Aboriginal settlers who followed in the path of Lord Simcoe to the Forks of the Thames River. The discipline of archaeology, with established scientific methodologies designed to recover information concerning our collective past, is uniquely positioned to fill out our understanding of the peoples, times and events, about which there is little or no written record.

This past is not dead; it regularly emerges in our stories and narratives of the individuals and groups which have proceeded us. It is in this historical context that the actions of our own lives are situated, as we actively employ the past to validate and give meaning to the present, and to provide us with direction for the future. As London moves towards the 21st century there is a growing awareness of the need to protect and preserve our non-renewable archaeological heritage. As development spreads into the rural portions of the city, and as re-development projects occur in the historic city core, archaeological sites which have lain protected for hundreds or even thousands of years are vulnerable to disturbance or destruction.

London’s archaeological record is a valuable resource which can make a real and meaningful contribution to the social and economic fabric of our community and it is deserving of our protection. When an archaeological site is destroyed prior to its proper evaluation by a trained archaeologist, we are not only robbed of the contribution it could make to the understanding of our past, but we also lose potentially important opportunities for tourism, education, and recreation. As well, we cast aside the chance to foster the sense of community which invariably grows when the connections between our city’s past and present are brought to light. All too often little is known about an archaeological resource until irreparable damage has occurred, resulting in public debate and displeasure over an unnecessary loss.

2.4 Goals of the Archaeological Master Plan

The purpose of the Archaeological Master Plan is to ensure the identification, evaluation and conservation of archaeological resources through effective long-range planning. Archaeological master plans have been conducted by municipalities in Ontario since the mid-1980’s, however the City of London Master Plan is the first to be completed since the passage of the amendments to the Planning Act in 1995. While the specific archaeological implications of Bill 163 are detailed in Section 4.0, the Province now encourages greater responsibility at the municipal level
with regard to heritage concerns within the land use planning process. As a result, the City of London Archaeological Master Plan is designed to effectively manage the City’s archaeological heritage and streamline the development plans review process. The Provincial government supports the archaeological master plan concept as an effective means for managing archaeological resources by municipal governments.

Problems have repeatedly arisen in the past, both in London and other municipalities, when unanticipated archaeological material was uncovered in the course of development. These findings result in unnecessary delay, expense and controversy for municipalities, developers and heritage advocates. Recent examples of such developments in London include the Talbot Block, the Regional Art and Historical Museum, and the historic burials at Stirrup Court and in the yard of the London Jail. The development of a comprehensive archaeological master plan by the City of London provides a mechanism through which these types of last-minute concerns can be avoided.

In order to ensure the effective conservation of archaeological resources as well as expedite the development plans review process, the five goals of the City of London Archaeological Master Plan are:

- to inventory all known and suspected archaeological sites within the City of London;

- to inventory all areas which have received archaeological attention, including those which have received field survey as well as areas cleared by the Ministry of Citizenship, Culture and Recreation or the City of London Archaeologist with no requirement for field assessment;

- to develop an archaeological predictive model to be employed by non-archaeological staff members of the City of London Planning Department in order to determine if a proposed development area requires an archaeological field assessment;

- develop protocols and procedures to facilitate the early recognition of archaeological sites and areas with archaeological potential by members of the development community;
· develop appropriate procedures to ensure the implementation and maintenance of the City of London Master Plan, including regular updates of the archaeological "sites" and "properties" databases.

2.5 Archaeological Master Plan Strategies

In order to ensure the completion of the Master Plan, various goal specific strategies were designed and are detailed below. However, the creation of the Archaeological Master Plan, as part of the "Vision '96" Planning Process, also relied on input from the community, as generated through the "Vision Circle" and "Vision Forum" public consultation process. Feedback was also solicited from key stakeholder groups, including the London Museum of Archaeology, the London Chapter of the Ontario Archaeological Society, as well as the new London Advisory Committee on Heritage. Moreover, direction was provided from a Technical Steering Committee comprised of representatives from the University of Western Ontario Anthropology Department; the London Advisory Committee on Heritage; the Ministry of Citizenship, Culture and Recreation; the City of London Planning Division; the London Development Institute; the London Home Builders' Association, as well as "Vision '96" staff.

2.5.1 "Sites" Inventory Development Strategies

The development of an inventory of archaeological resources was a primary goal of the Archaeological Master Plan. A detailed description of the construction and content of the "Sites" inventory is presented in Section 5.0. As of July 1, 1995, there were 585 archaeological sites that had been documented. This inventory is maintained by the Planning Division as a dBase IV file, and has also been entered in the City of London GIS (ARC/INFO 7.03). While the Ministry of Citizenship, Culture and Recreation maintains a database of sites registered with CHIN (the Canadian Heritage Information Network), the City of London inventory is presently more up to date and maintains records on classes of sites not recorded in the provincial database, including: abandoned and active cemeteries, mills, schoolhouses, as well as unregistered and suspected prehistoric sites.

Development of the "Sites" inventory was greatly facilitated through the cooperation of management at the London Museum of Archaeology, who allowed access to their facility's extensive records. Additional valuable information was solicited from private archaeological consulting firms, local research archaeologists, artifact collectors, archival sources, the Ministry of Citizenship, Culture and Recreation (MCZCR) Archaeological Database Coordinator, as well as leads provided by the public.
2.5.2 "Property" Inventory Development Strategies

The development of the "Property" inventory was also a primary goal of the Archaeological Master Plan. At present, the Ministry of Citizenship, Culture and Recreation does not maintain systematic records of properties which have received archaeological attention. The City of London, with advanced GIS mapping, analysis, and data management capabilities, has been able to take the initiative in this regard. A detailed description of the construction and content of the "Property" data base is presented in Section 5.0. As of July 1, 1995, detailed records existed for 305 assessed properties. The "Property" database provides an extremely valuable archaeological resource management and planning tool. It is now possible to rapidly ascertain the status with regard to archaeology of a property within the development plans review process, as well as to maintain consistency in the evaluation of development applications which are forwarded on more than one occasion or in slightly different forms.

The "Property" database was prepared through a detailed review of all archaeological licence reports pertaining to work conducted in the City of London. In addition, development applications which were reviewed for archaeological concerns by the MCZCR Heritage Planner or the City of London Archaeologist/Planner and did not require field assessment, have also been entered in the "Property" data base.

2.5.3 Archaeological Resource Potential Model Development Strategies

The development of an archaeological potential model was also a primary goal of the Master Plan. Using the "Sites" and "Property" data bases in combination with the City of London GIS, the biophysical characteristics of known prehistoric archaeological resources were analyzed in order to generate a model that maps the City in terms of areas of prehistoric archaeological potential. Similarly, the GIS was used to buffer areas along historic roads and around historic communities to create a predictive model for historic resources. Once these areas of historic and prehistoric archaeological potential had been mapped, it was possible to overlay this information on a detailed coverage delineating areas of the City which have been disturbed to the extent that they no longer retain any potential for archaeological resources. The areas which have retained sufficient integrity to contain archaeological deposits, and which were determined in the modelling exercise to have a high likelihood of containing archaeological resources, have been mapped as areas of "Archaeological Resource Potential".

The potential model will allow a Planning Division staff member without archaeological expertise to make a simple yes/no determination of whether a development property requires an archaeological field assessment. If a determination of potential has been made for a development
property, a standard condition of archaeological assessment can be placed by the City. If a development property is determined not to have archaeological potential, it can be immediately cleared of any further archaeological concerns. When a condition of archaeological assessment is warranted, further review functions with regard to the development application will be conducted by the Ministry of Citizenship, Culture and Recreation. A complete description of the procedure followed in the creation of the predictive model is detailed in Section 6.0.

2.5.4 Procedure and Protocol Strategies

Beyond the creation of the "Sites" and "Properties" inventories and the predictive model, the Archaeological Master Plan process also involved the creation of a series of procedures and protocols designed to enhance the protection of archaeological resources while expediting the development plans review process. Through a consultative process involving representatives from the development community, the Ministry of Citizenship, Culture, and Recreation, the London Advisory Committee on Heritage, and the City of London Planning and Engineering Departments, the Implementation Guidelines outlined in Section 7.0 were created. These guidelines, which are consistent with current provincial initiatives, spell out in detail the rights and obligations of the above listed parties with regard to archaeological concerns in the development plans review process.
3.0 THE PREHISTORY AND EARLY HISTORY OF THE LONDON AREA

3.1 Introduction

While Lieutenant Governor John Graves Simcoe's visit to the Forks of the Thames represents the first European presence in the London area, native occupation dates back at least 11,000 years. In the following section the nature of both the Native and early European settlement are summarized in order to provide a working background for Sections 5.0 and 6.0.

In archaeological parlance, the distribution of sites across a landscape is termed a "settlement pattern". Just as our modern settlement pattern is characterised by large primate centres such as Toronto which are surrounded by secondary regional centres, each in turn servicing a number of smaller rural communities, so too can prehistoric settlement patterns be characterized through an analysis of site locations, size, and function.

Key to understanding the prehistory and early historical occupation of London is a realization that the settlement patterns have changed through time. In particular, the nature of Native occupation has been especially dynamic, as groups tailored their settlement patterns in response to altered environmental conditions, encroachment of neighbouring groups due to gradual region wide population growth, and also roughly 1,000 years ago to the introduction of agricultural crops such as corn, beans and squash. Consequently, during different time periods, local groups sometimes favoured different locations for their sites. From a cultural resource management perspective these changes in settlement patterns have important implications in that any model created to predict the location of archaeological resources must be designed to capture sites from each time period.

3.2 The Paleo-Indian Period (9,000-8,000 B.C.)

The first human occupation of the London area begins just after the end of the Wisconsin Glacial period. Although there was a complex series of ice retreats and advances which played a large role in shaping the local London topography, southwestern Ontario was finally ice free by 12,500 years ago. The first human settlement can be traced back 11,000 years, when this area was settled by Native groups which had been living south of the Great Lakes. These early Native inhabitants have been called "Paleo-Indians," which literally means old or ancient Indians.
During the Paleo-Indian period the environment of southwestern Ontario was very much different than that of today, and in many ways must have approximated the conditions presently found along the transition zone between the boreal forest and tundra. Pollen core analysis suggests that during the earliest part of this period the local London environment would have been a spruce parkland, while by the end the forest cover would have been more dense, with greater amounts of jack and red pine being found in association with some deciduous species such as birch and poplar. Animal species known to have been present in the area include mammoths, mastodons, caribou, musk ox and moose, as well as deer, fox and rabbits.

The Paleo-Indian period has been characterized as a time of big game hunting. This model was largely generated from communal kill sites of extinct bison species and mammoths which have been excavated on the American Plains. Due to the more acidic soils in the northeastern part of the continent, bone preservation has been far less spectacular. Fragments of caribou bone have been identified from several sites, although fox and rabbit bone from a site just north of Toronto suggests that smaller species were also being utilized. While Paleo-Indians must have used both bone and wooden tools, only their distinctive stone tools remain. Their spearheads are lance shaped in outline and lack notches or stems. Early Paleo-Indian projectile points (9,000-8,400 B.C.) are especially distinctive in that they have had a "channel flake" carefully removed from the base on each side in order to facilitate hafting. The removal of this channel flake to create the "flute" requires a high quality raw material and a great deal of skill on the part of the craftsman.

Our current understanding of Early Paleo-Indian settlement patterns suggest that small bands, consisting of probably no more than 25-35 individuals, followed a pattern of seasonal mobility extending over large territories. One of the most thoroughly studied of these groups followed a seasonal round which extended from as far south as Chatham to the Horseshoe Valley north of Barrie. Early Paleo-Indian sites tend to be located in elevated locations on well drained loamy soils. Many of the known sites were located on former beach ridges associated with Lake Algonquin, the post-glacial lake occupying the Lake Huron/Georgian Bay basin. There are a few extremely large Early Paleo-Indian sites, such as one located close to Parkhill, Ontario, which covered as much as six hectares. It appears that these sites were formed when the same general locations were occupied for short periods of time over the course of many years. Given their placement in locations conducive to the interception of migratory mammals such as caribou, it has been suggested that they may represent communal hunting camps. There are also smaller Early Paleo-Indian camps scattered throughout the interior of Southwestern Ontario, usually situated adjacent to wetlands.
The most recent research suggests that population densities were very low during the Early Paleo-Indian period, with all of Southwestern Ontario being occupied by perhaps only 100-200 people. Because this is the case, Early Paleo-Indian sites are exceedingly rare, and within the limits of London only four locations are known. Three of these sites are isolated findspots of the distinctive fluted points or channel flakes, while one site, located near Dingman Creek, represents a rare occupation area with a good deal of potential for contributing to our knowledge of this period. To date, all of the known Early Paleo-Indian sites in London are located south of the Main and South branches of the Thames River.

While the Late Paleo-Indian period (8,400-8,000 B.C.) is more recent, it has been less well researched, and is consequently more poorly understood. By this time the environment of Southwestern Ontario was coming to be dominated by closed coniferous forests with some minor deciduous elements. It seems that many of the large game species which had been hunted in the early part of the Paleo-Indian period had either moved further north, or as in the case of the mastodons and mammoths, become extinct.

Late Paleo-Indian projectiles lack the distinctive flutes of their predecessors, although they are still easily recognizable due to their lance shaped outlines. Like the Early Paleo-Indians, late Paleo-Indian peoples covered large territories as they moved about in response to seasonal resource fluctuations. Interestingly, no large communal hunting locations like the Early Paleo-Indian site near Parkhill have been documented for the Late-Paleo Indian period. This makes sense if the large game animals which had been the focus of these sites in earlier times were no longer present.

On a province wide basis Late Paleo-Indian projectile points are far more common than Early Paleo-Indian materials, suggesting a relative increase in population. However, within the limits of London, Late Paleo-Indian sites are still very rare. To date, only seven sites have been located, all of which represent isolated findspots of projectile points. All but one of Late Paleo-Indian sites within London are located south of the South and Main branches of the Thames River, in the former Township of Westminster. The exception is located just south of the London Airport.

3.3 The Archaic Period (8,000-900 B.C.)

The end of the Paleo-Indian period was heralded by numerous technological and cultural innovations which may be best explained in relation to the dynamic nature of the post-glacial environment and region-wide population increases.
Late Archaic Point Types in Southern Ontario.

Narrow Point
- Lamoka
- Normanskill
- 4500 B.P.

Broad Point
- Genesee
- Adder Orchard
- Perkiomen
- 4000 / 3800 B.P.

Small Point
- Crawford Knoll
- Innes
- "Ace of Spades"
- Hind
- 2800 B.P.

FIGURE 3.2
During the Early Archaic period (8,000-6,000 B.C.), the jack and red pine forests which characterized the Late Paleo-Indian environment were replaced by forests dominated by white pine with some associated deciduous elements. Not long ago many researchers believed that this Early Archaic environment would have had a low carrying capacity for game animals, therefore they proposed that the lower Great Lakes area had been largely abandoned by humans after the Late-Paleo Indian period. The proponents of this hypothesis suggested that southern Ontario and surrounding regions would have been repopulated by groups living to the south only after the environment had stabilized close to its modern form several thousand years later.

This hypothesis has recently fallen out of favour, as archaeologists recognized that at least some of the previously untyped local projectile points could be assigned to the Early Archaic period. While large Early Archaic sites have seldom been documented, it is necessary to realize that the Great Lakes water levels were much lower than they are at present, and many of the sites dating to this time must certainly be under water. Consequently, our understanding of Early Archaic settlement pattern is heavily biased towards small inland hunting camps and findspots of only one or a few artifacts.

One of the more notable changes in the Early Archaic period is the appearance of side and corner-notched projectile points. Other significant innovations include the introduction of ground stone tools such as celts and axes, suggesting the beginnings of a simple woodworking industry. The presence of these often large and not easily portable tools suggests there may have been some reduction in the degree of seasonal movement, although it is still suspected that population densities were quite low, and band territories large.

Presently there are sixteen Early Archaic sites recorded within the London city limits. Given that the Early Archaic period is twice as long as the preceding Paleo-Indian period (represented by ten sites), there appears to have been no increase in the local population. Unlike the Paleo-Indian period, Early Archaic sites are not exclusively located in south London. During the course of archaeological assessment surveys and research survey conducted by the London Museum of Archaeology, seven sites have been documented in northwest London.

Most of London’s Early Archaic sites represent isolated projectile point finds or projectile points found in association with very few other non-diagnostic items, such as flakes of chert which was the preferred material for chipped stone tool manufacturing. No large Early Archaic sites have been recognized in the London area, although there are several larger multi-component sites at which individual Early Archaic items have been found. Limited excavations have been conducted at two such sites, however they did not produce additional material relating to the Early Archaic occupations. One small, single component Early Archaic site has been excavated.
by the London Museum of Archaeology, and it has been interpreted as a temporarily occupied hunting camp.

During the Middle Archaic period (6,000-2,500 B.C.) the trend to more diversified toolkits continued, as the presence of netsinkers suggest that fishing was becoming an important aspect of the subsistence economy. It was also at this time that "bannerstones" were first manufactured. Bannerstones are carefully crafted ground stone devices which served as a counterbalance for "atlatls" or spear-throwers. Another characteristic of the Middle Archaic is an increased reliance on local, often poor quality chert resources for the manufacturing of projectile points. It seems that during earlier periods, when groups occupied large territories, it was possible for them to visit a primary outcrop of high quality chert at least once during their seasonal round. However, during the Middle Archaic, groups inhabited smaller territories which often did not encompass a source of high quality raw material. In these instances lower quality materials which had been deposited by the glaciers in the local till and river gravels were utilized. This is particularly characteristic of the London area, as local, poor quality till cherts are quite common, while the nearest primary outcrop of high quality raw material is located at Kettle Point on the Lake Huron shore.

This reduction in territory size was probably the result of gradual region-wide population growth which led to the infilling of the landscape. This process forced a reorganization of Native subsistence practices, as more people had to be supported from the resources of a smaller area. During the later part of Middle Archaic, technological innovations such as fish weirs have been documented as well as stone tools especially designed for the preparation of wild plant foods. It is also during the later part of the Middle Archaic period that long distance trade routes began to develop, spanning the northeastern part of the continent. In particular, native copper tools manufactured from a source located northwest of Lake Superior were being widely traded. By 3,500 B.C. the local environment had stabilized in a near modern form.

The Middle Archaic is one of the most poorly understood time periods, especially in Southwestern Ontario. One of the unfortunate results of the dearth of research directed towards the Middle Archaic is an extremely limited understanding of the range of variation in projectile points styles. Moreover, even those Middle Archaic projectile points styles which have been documented lack characteristics which make them easily distinguishable from later projectile point types. Because this is the case, Middle Archaic components are often difficult to pick out of mixed site assemblages.
In London, only ten Middle Archaic sites have so far been identified. Nine of these sites are located between Dingman Creek to the south and the South and Main branches of the Thames River to the north. All ten of these sites are either quite small or comprise minor components at larger sites which predominantly date to another time period. Given the lack of research directed towards the Middle Archaic, it is hard to evaluate this relative paucity of sites. One possibility is that during the Middle Archaic there was very little occupation in the London area. Another possibility is that there has been a lack of Middle Archaic site recognition due to our poor understanding of Middle Archaic projectile point variation. A third possibility which cannot be discounted is that the major sites dating to the Middle Archaic are located in the river valleys, where there has been very little archaeological survey.

During the Late Archaic (2,500-900 B.C.) the trend towards decreased territory size and a broadening subsistence base continued. Late Archaic sites are far more numerous than either Early or Middle Archaic sites, and it seems that the local population had definitely expanded. It is during the Late Archaic that the first true cemeteries appear. Before this time individuals were interred close to the location where they died. During the Late Archaic, if an individual died while his or her group happened to be at some distance from their group cemetery, the bones would be kept until they could be placed in the cemetery. Consequently, it is not unusual to find disarticulated skeletons, or even skeletons lacking minor elements such as fingers, toes or ribs, in Late Archaic burial pits.

The appearance of cemeteries during the Late Archaic has been interpreted as a response to increased population densities and competition between local groups for access to resources. It is argued that cemeteries would have provided strong symbolic claims over a local territory and its resources. These cemeteries are often located on heights of well-drained sandy/gravel soils adjacent to major watercourses such as the Thames River.

This suggestion of increased territoriality is also consistent with the regionalized variation present in Late Archaic projectile point styles. It was during the Late Archaic that distinct local styles of projectile points appear. Also during the Late Archaic the trade networks which had been established during the Middle Archaic continued to flourish. Native copper from Northern Ontario and marine shell artifacts from as far away as the Mid-Atlantic coast are frequently encountered as grave goods. Other artifacts such as polished stone pipes and banded slate gorgets also appear on Late Archaic sites. One of the more unusual and interesting of the Late Archaic artifacts is the "birdstone". Birdstones are small, bird-like effigies usually manufactured from green banded slate. While the function of these artifacts is presently poorly understood, they are especially common in the London area.
A-D: Corner-notched Hind Points
E: T-Based Drill
F-G: Cache Blades
H: Bar Type Birdstone
I: Banded Slate Gorget
J: Circular Marinee Shell Gorget
K: "Sandle-Sole" Marine Shell Gorget with breakage and repair holes

FIGURE 3.3
Late Archaic sites are common in London, with 38 having been identified. In terms of their distribution, only the northeast corner of the city is lacking in sites dating to this time period. It is known from studies conducted elsewhere in the province that the bluffs overlooking major rivers and the valley floors provided a major focal point for Late Archaic settlement. Unfortunately, it is these areas in London which have seldom been surveyed, as archaeological reconnaissance has been concentrated around the periphery of the city where development pressures have been the most intense.

The sites which have been identified are predominately small camps or findspots of isolated diagnostic tools. However there are several larger Late Archaic sites which have been located along the Dingman Creek, one of which is over a hectare in size. In addition, one of the first archaeological sites ever reported within the city of London dates to the terminal part of the Late Archaic. This site, which was located on the bluff above the Noth Thames River near Blackfriars Bridge, was reported in 1849 when human remains were discovered while digging the foundation for a house. This burial contained numerous grave inclusions, including shell and copper artifacts as well as a rare quartzite birdstone.

3.4 The Early and Middle Woodland Periods (900 B.C.-900 A.D.)

The Early Woodland period (900-200 B.C.) is distinguished from the Late Archaic period primarily by the addition of ceramic technology. While the introduction of pottery provides a useful demarcation point for archaeologists, it may have made less difference in the lives of the Early Woodland peoples. The first pots were very crudely constructed, thick walled, and friable. It has been suggested that they were used in the processing of nut oils by boiling crushed nut fragments in water and skimming off the oil. These vessels were not easily portable, and individual pots must not have enjoyed a long uselife. There have also been numerous Early Woodland sites located at which no pottery was found, suggesting that these poorly constructed, undecorated vessels had yet to assume a central position in the day-to-day lives of Early Woodland peoples.

Other than the introduction of this rather limited ceramic technology, the lifeways of Early Woodland peoples show a great deal of continuity with the preceding Late Archaic period. For instance, birdstones continue to be manufactured, although the Early Woodland varieties have "pop-eyes" which protrude from the sides of their heads. Likewise, the thin, well-made projectile points which were produced during the terminal part of the Archaic period continue in use. However, the Early Woodland variants were side-notched rather than corner-notched, giving them a slightly altered and distinctive appearance. The trade networks which were established in the Middle and Late Archaic also continued to function, although there does not
appear to have been as much traffic in marine shell during the Early Woodland period. During the last 200 years of the Early Woodland period, projectile points manufactured from high quality raw materials from the American Midwest begin to appear on sites in the London area.

With regard to settlement patterns, Early Woodland sites are located in similar environmental settings as Late Archaic sites. Immediately west of London, in the Delaware/Komoka area, the largest Early Woodland sites are located on the bluff tops overlooking the Thames valley, while smaller sites are scattered across the floodplain and adjacent terraces. There are also a series of small upland sites situated in close proximity to localized resource patches such as wetlands or ponds. This pattern mirrors the distribution of Late Archaic sites, although Early Woodland sites are more common, suggesting an increase in population size.

Within London there has been very little archaeological investigation in areas where major Early Woodland occupations might be expected to be located. The bluffs overlooking the Thames valley had been extensively impacted prior to the review of development applications for archaeological concerns. Likewise, London's extensive network of valley parks surely encompasses several unknown but important Early Woodland sites.

This notwithstanding, 23 Early Woodland sites have been documented in the City. These sites consist of either findspots of distinctive Early Woodland projectile points, or projectile points found in association with a small number of lithic waste flakes. Most of these sites are situated on well-drained loamy soils adjacent to small streams or wetlands.

In terms of settlement and subsistence patterns, the Middle Woodland (200 B.C.-900 A.D.) provides a major point of departure from the Archaic and Early Woodland periods. While Middle Woodland peoples still relied on hunting and gathering to meet their subsistence requirements, fish were becoming an even more important part of the diet. This is especially true in the London area, where some Middle Woodland sites have produced literally thousands of bones of spring spawning species such as walleye and sucker. In addition, Middle Woodland vessels are often garishly decorated with hastily impressed designs covering the entire exterior surface and upper portion of the vessel interior. Consequently, even very small fragments of Middle Woodland vessels are easily identifiable.

It is also at the beginning of the Middle Woodland period that rich, densely occupied sites appear on the valley floor of major rivers. While the Thames River floodplain had been utilized by earlier peoples, Middle Woodland sites are significantly different in that the same location was occupied off and on for as long as several hundred years. Because this is the case, rich
deposits of artifacts often accumulated. Unlike earlier seasonally utilized locations, these Middle Woodland sites appear to have functioned as base camps, occupied off and on over the course of the year. There are also numerous small upland Middle Woodland sites, many of which can be interpreted as special purpose camps from which localized resource patches were exploited. This shift towards a greater degree of sedentism continues the trend witnessed from at least Middle Archaic times, and provides a prelude to the developments which follow during the Late Woodland period.

While the presence of large Middle Woodland sites in London’s valley park system is suspected, several significant tableland occupations have recently been investigated by the London Museum of Archaeology, and the forthcoming reports on these excavations should contribute significantly to our understanding of this time period. In total, there are 39 Middle Woodland sites in the City of London. It appears that many of the larger tableland sites were situated adjacent to kettle ponds or bogs, and seem to have been utilized on a seasonal basis. There are also numerous examples of smaller camps and findspots such as have been documented for the preceding Early Woodland and Archaic periods.

3.5 The Late Woodland (900-1650 A.D.)

A determination of just when the Late Woodland period begins is somewhat controversial. Many researchers, relying on innovations in ceramic construction and decoration techniques, changes in projectile point styles, and the absence of grave goods, suggest that the Late Woodland began by approximately 700 A.D. Although these are significant and measurable changes, in and of themselves they may have had very little impact on how these peoples went about making a living. While the sample of investigated sites dating between 700-900 A.D. is small, they are situated in environmental contexts similar to Middle Woodland sites.

Other researchers prefer a later date of approximately 900-950 A.D. for the beginning of the Late Woodland period, and this is the date which is adopted here. At this time there was a shift in settlement and subsistence patterns related to a reliance on corn horticulture. Corn was originally domesticated in the highlands of Mexico as early as 3,000 B.C., with the earliest corn cobs averaging only several centimetres in length. By 1,500 B.C. corn had reached a near modern size, providing the basis for the first agricultural villages in the New World.

While corn cultivation proved successful in Mexico, it did not immediately spread north to adjacent regions. For corn to grow successfully in more northerly latitudes, strains had to become acclimatized to the cooler temperatures and reduced growing seasons before they could be relied on to meet subsistence requirements. Corn may have been introduced into
Southwestern Ontario from the American Midwest as early as 600 A.D., however it did not become a dietary staple until at least three to four hundred years later.

The first agricultural villages in southwestern Ontario date to the 10th century A.D. Unlike the riverine base camps of the Middle Woodland period, these sites are located in the uplands, on well-drained sandy soils. Categorized as "Early Ontario Iroquoian" (900-1300 A.D.), many archaeologists believe that it is possible to trace a direct line from the Iroquoian groups which inhabited Southwestern Ontario at the time of first European contact, to these early villagers. Alternatively, other researchers believe that the groups which lived west of the Grand River in Southwestern Ontario were culturally and perhaps linguistically distinct from the proto-Iroquoian groups living in Southcentral and Southeastern Ontario. Proponents of this hypothesis believe that the peoples occupying Southwestern Ontario, including the occupants of the London area, were conquered by their eastern neighbours around 1300 A.D. If this hypothesis is correct, it is possible that the so called "Early Ontario Iroquoian" groups living in the London area may have actually been proto-Algonquians. More detailed site reports, along with field research conducted on a regional basis, are required to resolve this important question.

Nevertheless, sites dating between 900 and 1,300 A.D., share many attributes with the historically reported Iroquoian sites, including the presence of longhouses and sometimes palisades. However, these early longhouses were actually not all that large, averaging only 12.4 metres in length. It is also quite common to find the outlines of overlapping house structures, suggesting that these villages were occupied long enough to necessitate re-building. The Jesuits reported that the Huron moved their villages once every 10-15 years, when the nearby soils had been depleted by farming and conveniently collected firewood grew scarce. It seems likely that Early Ontario Iroquoians occupied their villages for considerably longer, as they relied less heavily on corn than did later groups, and their villages were much smaller, placing less demand on nearby resources.

Judging by the presence of carbonized corn kernels and cob fragments recovered from sub-floor storage pits, agriculture was becoming a vital part of the Early Ontario Iroquoian economy. However, it had not reached the level of importance it would in the Middle and Late Ontario Iroquoian periods. There is ample evidence to suggest that more traditional resources continued to be exploited, and comprised a large part of the subsistence economy. Seasonally occupied special purpose sites relating to deer procurement, nut collection, and fishing activities, have all been identified. While beans and squash are known to have been cultivated later in the Late Woodland period, they have yet to be identified on Early Ontario Iroquoian sites.
There are 20 sites which have been assigned to the Early Ontario Iroquoian period within the City of London. At seven of these twenty sites there were no ceramics found and they have been identified solely on the basis of projectile point typologies. This is not an entirely satisfactory methodology, as projectile points manufactured during the late Middle Woodland period and the Early Ontario Iroquoian period are often indistinguishable. Future research will likely result in the placement of at least some of these sites in the late Middle Woodland period.

Of the 13 sites definitely assignable to the Early Ontario Iroquoian period, all but one are located on the well-drained sandy soils in the Byron area. Development activities have resulted in the documentation of four major village sites, one of which has recently been completely excavated by the London Museum of Archaeology. These villages were surrounded by numerous smaller special purpose sites, six of which have been documented in the Byron area.

Interestingly, a seventh small Early Iroquoian camp was located on the grounds of the Thornwood estate just north of Oxford Street, atop the bluff overlooking Gibbon’s Park. Downtown London is situated on the only other large expanse of sandy soil within the City, and this site at Thornwood is located inside the northern limit of this area. A strong correlation between Early Ontario Iroquoian sites and light sandy soils has been noted by researchers in other parts of the province, as these light, easily worked soils seemed to be favoured for growing corn.

The Middle Ontario Iroquoian period (1,300-1,400 A.D.) witnessed several interesting developments in terms of settlement patterns and artifact assemblages. Changes in ceramic styles have been carefully documented, allowing the placement of sites in the first or second half of this 100-year period. Moreover, villages, which averaged approximately 0.6 hectares in extent during the Early Ontario Iroquoian period, now consistently range between one and two hectares.

House lengths also change dramatically, more than doubling to an average of 30 metres, while houses of up to 45 metres have been documented. This radical increase in longhouse length has been variously interpreted. The simplest possibility is that increased house length is the result of a gradual, natural increase in population. However, this does not account for the sudden shift in longhouse lengths around 1,300 A.D. Other possible explanations involve changes in economic and socio-political organization. One suggestion is that during the Middle Ontario Iroquoian period small villages were amalgamating to form larger communities for mutual defense. If this was the case, the more successful military leaders may have been able to absorb some of the smaller family groups into their households, thereby requiring longer structures. This hypothesis draws support from the fact that some sites had up to seven rows of palisades,
indicating at least an occasional need for strong defensive measures. There are, however, other Middle Ontario Iroquoian villages which had no palisades present. Another researcher has suggested that the longest houses may be associated with families that were more successful in trade and other forms of economic activity. More research is required to evaluate these competing interpretations.

The lay-out of houses within villages also changes dramatically by 1,300 A.D. During the Early Ontario Iroquoian period villages were haphazardly planned at best, with houses oriented in various directions. During the Middle Ontario Iroquoian period villages are organized into two or more discrete groups of tightly spaced, parallel aligned, longhouses. It has been suggested that this change in village organization may indicate the initial development of the clans which were a characteristic of the historically known Iroquoian peoples.

There are three documented Middle Ontario Iroquoian sites in London, all of which are located along the western edge of the City in Byron and Oakridge. These sites appear to have been special purpose occupations associated with an as yet undiscovered village or villages. There is a very good possibility that a Middle Ontario Iroquoian village was located in Oak Ridges, just north of Oxford Street, east of Hunt Club Road. The late Ernie Sackrider, a local collector, reported an Iroquoian village site in this location in the 1950’s. Sketches of ceramic vessels in his field notes are quite detailed, and this site can be tentatively assigned to the first half of the Middle Ontario Iroquoian. Unfortunately this location was destroyed by development and the location of the collections are unknown. There are also at least three Middle Ontario Iroquoian villages located just outside the western limit of the City, in London Township.

Initially at least, the Late Ontario Iroquoian period (1,400-1,650 A.D.) continues many of the trends which have been documented for the preceding century. For instance, between 1,400 and 1,450 A.D. house lengths continue to grow, reaching an average length of 62 metres. One longhouse excavated on a site southwest of Kitchener stretched an incredible 123 metres. After 1,450 A.D., house lengths begin to decrease, with houses dating between 1,500-1,580 A.D. averaging only 30 metres in length. Why house lengths decrease after 1,450 A.D. is poorly understood, although it is believed that the even shorter houses witnessed on historic period sites can be at least partially attributed to the population reductions associated with the introduction of European diseases such as smallpox.

Village size also continues to expand throughout the Late Ontario Iroquoian period, with many of the larger villages showing signs of periodic expansions. The Late Middle Ontario Iroquoian period and the first century of the Late Ontario Iroquoian period was a time of village amalgamation. One large village situated just north of Toronto has been shown to have
Sketch Map by Ernie Sackrider of a lost Middle Ontario Iroquoian Village in Oakridge.

FOSTER FARM
NOW SUBDIVIDED
BY SIFTON CONSTRUCTION

burials

old barn

ash beds

spring

LONDON HUNT &
COUNTRY CLUB

swamp

OXFORD STREET WEST

SANITARIUM

SANITARIUM ROAD

RIVERSIDE DRIVE

Byron Bog

gravel pit

HYDE PARK ROAD

Byron

COMMISIONERS RD.

Thames River

July 24, 1959
N.T.S.

FIGURE 3.4
The Lawson Late Ontario Iroquoian Village (Following Pearce 1984)
expanded on no fewer than five occasions. These large villages were often heavily defended with numerous rows of wooden palisades, suggesting that defense may have been one of the rationales for smaller groups banding together.

Late Ontario Iroquoian village expansion has been clearly documented in the London area. The ongoing excavations at the Lawson site, a large Late Iroquoian village located on the grounds of the London Museum of Archaeology, has shown that the original village was expanded by at least twenty percent to accommodate the construction of nine additional longhouses.

Research and salvage archaeology projects conducted by the London Museum of Archaeology have resulted in several other significant contributions to the understanding of the Late Ontario Iroquoian period. One of their most interesting discoveries has involved the excavation of numerous small "cabin sites", apparently associated with the Lawson village. It appears that these cabin sites, which normally consist of a single longhouse structure and an associated refuse disposal area, were primarily occupied during the summer months for the purpose of tending crops. Twelve such sites have so far been excavated, and several other potential locations have been identified on the basis of surface recoveries.

The Lawson site is not the only Late Ontario Iroquoian village located within the City of London; at least six others have so far been identified. Presently it is felt that these sites relate to at least two separate communities; one located in northwest London and the other located along Dingman Creek in south London. Cabin sites have also been located which appear to relate to some of these other village sites.

The London area was densely occupied by the Late Ontario Iroquoians until approximately 1,525 A.D., when these communities moved further east to the Hamilton area. During the late 1600’s and early 1700’s, the French explorers and missionaries reported a large population of Iroquoian peoples clustered around the western end of Lake Ontario. They called these people the "Neutral", because they were not involved in the ongoing wars between the Huron and the League Iroquois located in upper New York State. It has been satisfactorily demonstrated that the Late Ontario Iroquoian communities which were located in the London area were ancestral to at least some of the Neutral Nation groups. For this reason the Late Ontario Iroquoian groups which occupied southwestern Ontario prior to the arrival of the French are often identified as "Prehistoric Neutral".
3.6 Survey and Settlement Prior to 1826

The occupation of London between 1525 and Sir John Graves Simcoe’s 1793 visit to the Forks of the Thames, remains poorly understood. It is known that sometime after the departure of the Neutrals, probably no later than the late 17th or early 18th century, Algonquian speaking groups who had formerly lived in extreme Southwestern Ontario and Michigan, took up residence in the London area.

Major Edward B. Littlehales, who travelled with Governor Simcoe on his overland journey from Niagara to Detroit, maintained a diary which provides two interesting references relating to this occupational period. On February 12, 1793, during the outward journey to Detroit, Simcoe’s party camped along the Thames somewhere in west London. Littlehales writes:

"We went between an irregular fence of stakes made by the Indians to intimidate the Deer, and facilitate their hunting. After crossing the main branch of the Thames, we halted, to observe a beautiful situation, formed by a bend of the River--a grove of Hemlock, Pine, and a large Creek. We passed some deep ravines and made our wigwam by a stream on the brow of a hill, near a spot where Indians were interred. The burying ground was of raised earth, nearly covered with leaves; and whickered over--adjoining it was a large pole, with painted hieroglyphics on it denoting the nation, tribes and achievements of the deceased, either as Chiefs, Warriors, or Hunters."

On March 2, 1793, during their return, Simcoe once again stopped in London, camping near the Forks of the Thames. Littlehales diary records that:

"(v)arious figures were delineated on the trees at the forks of the River Thames, done with charcoal and vermilion; the most remarkable were the imitations of men with deer’s heads."

In addition to these two references, an 1800 preliminary survey map of the "Site of London" compiled by A. Jones and Lewis Grant, illustrates "Old Indian Cornfields" on the flats of the Thames just south of present day Labatt’s Park (Figure ). Unfortunately, no further physical evidence of these site locations has been discovered.

Initial European settlement of the greater London area began shortly after Simcoe’s 1793 visit, and all of what constitutes present-day London was officially surveyed prior to 1826. Delaware Township was the first to be surveyed, and the village of Delaware, complete with a mill, was
THE SITE OF LONDON

REMARKS - THE RIVER AT THESE FORKS IS TWO CHAINS BROAD, ABOUT TWO FEET DEEP WHERE RAPID, AND ABOUT FOUR FEET AND A HALF WHERE STILL WATER - THE WATER RISES IN THE SPRING OF THE YEAR FROM SIX TO SEVEN FT. THE PLAINS ARE HIGH AND DRY WITH NARROW FLATS SKIRTING THE RIVER - THE GREATEST BODY OF WATER RUNS THROUGH THE NEW FORMED PASSAGE AT THE NECK OF THE ISLAND WHICH SEEMS FORMERLY TO HAVE BEEN A PENINSULA - ON THIS ISLAND THE LAND IS LEVEL AND LOW IN THE SPRING IT IS OVERFLOWED.

COMPILLED FIELD NOTES OF MR. A JONES BY LEWIS GRANT D.P.S.

FIGURE 3.7
established by 1800. The earliest roads opened by the government were Longwoods Road, Commissioners Road, and North Talbot Road, and it was along these routes that the first settlement took place.

Following the survey of Delaware Township, Westminster Township was surveyed by Mahlon Burwell and the first settlement was supervised by Colonel Talbot. The earliest settlement was concentrated in the southwest corner of the Township along North Talbot Road. Later settlement in Westminster occurred along Commissioners Road, with the southeast portion of the Township being taken up last.

By the beginning of the War of 1812, Delaware and Westminster Townships had been only sparsely settled. With one notable exception, the area encompassing the present day City saw very little of the war. At Snake Hill just east of the village of Byron, in October of 1813, a small group of retreating Canadians and British defended the hill from an attack by the advance guard of the American army. They were successful in beating back the American assault, and continued their retreat unmolested along Commissioners Road to the east.

Following the War of 1812, the pace of settlement increased. London Township was surveyed by Mahlon Burwell between 1812 and 1815, but there was no occupation until 1817 or 1818 when Colonel Talbot settled a group of Irish immigrants. In 1815, John Applegarth was sent by the government to attempt the cultivation of hemp on the Petersville flats, but this experiment proved to be a failure, lasting only one year.

Although much of what now constitutes London was taken in title by 1826, only a small degree of clearing had been accomplished in what was otherwise remained an unbroken bush.

3.7 The Growth of the City of London

Prior to 1826, the 3,850 acres reserved by Lieutenant-Governor Simcoe for the future town of London had been held vacant, with settlement occurring in a doughnut pattern around this block. In 1826, Mahlon Burwell surveyed out the town plot and settlers began to take up lots in the village. The earliest settlement was centred on the Forks of the Thames along Ridout Street and the Talbot Block. The District Seat for the Western District was moved to London in 1827 and the courthouse was constructed under the supervision of Colonel Talbot.

The settlement of London occurred rapidly after the building of the courthouse, with the population reaching 400 in 1832, and over 1,000 in 1835. By 1840 the young settlement had grown to 1,816 souls, at which time London was incorporated as a village. In the winter of
1839, the fall of 1844, and once again in the spring of 1845, fires swept through the village. The great fire of 1845 destroyed over three hundred wood frame buildings, and provided the impetuous for the development of London's brick industry.

In 1847 London had recovered from the destruction of the fires and was incorporated as a town. In 1855, with a population which had grown to 10,000, London officially became a city.

London's rapid rate of growth can be at least partially attributed to the Upper Canada Rebellion of 1837-1838. As a result of this uprising the government stationed the 32nd Regiment in London in 1838. They established their centre of operations just north of the town, in the area bounded by Dufferin, Waterloo, Richmond/Clarence and Piccadilly. A considerable military base was established, the archaeological remains of part of which are almost certainly preserved in Victoria Park. In fact, during the construction of the current bandshell, remains dating from the military use of the park were recorded.

London's growth can also be attributed to the development of a strong industrial base, the earliest component of which centred on saw, cordage and grist mills, powered by the Thames River and Medway Creek. The arrival of the railways, including the Great Western Railway in 1853, the London Port Stanley Railway in 1856, the Grand Trunk Railway in 1858, and the London, Huron and Bruce Railway in 1876, also contributed greatly to the local economy. A number of associated industries sprang up to service the rail industry, including the Ontario Car Works in East London.

The local economy was also stimulated by the discovery of oil in Lambton County, with an oil boom taking place between 1862 and 1865. London became the centre of speculation in the buying and selling of oil properties, and oil refineries were constructed in east London, which continued in operation until the 1870's.

While the arrival of the military, railways and the oil boom provided significant boosts to growth, it was London's position as a financial and commercial centre for the surrounding region that provided it with steady growth. There were also numerous general manufacturing concerns within the City, with notable examples including the Carling and Labatt's breweries and the London cigar industry.

Regrettably, there has been very little historical archaeology done within the City of London. The London Museum of Archaeology has investigated four interesting historic components as part of their consulting archaeological activities in the City. Additionally, Mayer, Poulton and Associates investigated a former tavern site as well as a possible blacksmith shop as part of the extension of Highbury Avenue south.
4.0 ARCHAEOLOGICAL RESOURCE MANAGEMENT: 
LEGISLATION AND PRACTICE

4.1 Current Legislation

The management of Ontario’s archaeological resources is affected by several different pieces of 
Provincial legislation, including: the Ontario Heritage Act, the Planning Act, the Environmental 
Assessment Act, the Aggregate Resources Act and the Cemeteries Act. The following Section of 
the Master Plan reviews the portions of these Acts which pertain to archaeological resource 
management.

4.2 The Ontario Heritage Act

The Ontario Heritage Act provides for the conservation of Ontario’s cultural heritage resources, 
and regulates archaeological activities through licensing. The Act enables municipalities to 
establish Local Architectural Conservation Advisory Committees for the purpose of reviewing 
matters involving Parts IV and V of the Act. These parts involve built heritage, including 
individual buildings and groups of buildings in Heritage Conservation Districts. However, 
LACACs in many municipalities, including London, have expanded their activities to include 
other aspects of heritage, including archaeology. In 1995, in anticipation of a new Ontario 
Heritage Act, London’s LACAC was officially disbanded and reorganized as the London 
Advisory Committee on Heritage. Final drafts of the proposed Heritage Act have been 
circulated, although it has not yet been passed by the Provincial Legislature.

Archaeology is dealt with under Part VI of the current Ontario Heritage Act, which addresses 
the "Conservation of Resources of Archaeological Value". There are specific requirements for:

- licensing to perform archaeological work;
- designation of archaeological properties and their protection;
- the ability to carry out a stop work order where a property of archaeological or 
historical significance is to be impacted.
Moreover, the *Ontario Heritage Act* provides the Ministry of Citizenship, Culture and Recreation with the mandate for the "conservation, protection and preservation of the heritage of Ontario" (Part 1, S.2). It is this power combined with protocols established with other Provincial ministries, including the Ministry of Municipal Affairs, Ministry of the Environment and Energy, the Ministry of Natural Resources and the Ministry of Transportation that provides the Ministry of Citizenship, Culture and Recreation with the authority to require archaeological assessment of properties and mitigation of sites to be impacted by development.

At present, the *Ontario Heritage Act* is flawed in that it provides no specific policies or guidelines for managing the vast majority of archaeological resources which have not been officially designated. However, the amendments to the *Planning Act*, discussed below, have created stronger legislation concerning the conservation of archaeological resources.

4.3 The Planning Act

The *Planning Act* places heritage conservation issues within the broader context of decision-making regarding land use planning. The *Planning Act* also places increased responsibility for management of archaeological concerns at the municipal level. The impact of municipal decisions on archaeological resources is critical since municipalities are responsible for the majority of land use activity. Without adequate control at the municipal level, the Provincial government is unable to ensure protection for archaeological resources. From this perspective, archaeological protection cannot be implemented without municipal involvement.

The *Planning Act* was amended as of March 28, 1995 by Bill 163. This amendment has resulted in significant changes for archaeological resource management in Ontario. This includes changes in the Act itself along with accompanying Policy Statements, Implementation Guidelines, Technical Manual and Technical Guidelines.

4.3.1 Content of the Planning Act

The amended *Planning Act* contains the following sections which directly impact the management of archaeological resources in the development approval process:

1) "2. The Minister, the council of a municipality, a local board and Municipal Board, in carrying out their responsibilities under this Act, shall have regard to, among other matters, matters of provincial interest such as... (d) the conservation of features of significant architectural, cultural, historical, archaeological and scientific interest."

Vision '96
2) "34(1) Zoning by-laws may be passed by councils of local municipalities:...3.3 (f)or prohibiting all or any use of land and erecting, locating or using of all or any class or classes of buildings or structures on the land that is the site of a significant archaeological resource."

Prior to the passage of the amendments to the Planning Act, only Official Plans, Plans of Subdivision, Plans of Condominium, and Official Plan Amendments were subject to review for potential impact to archaeological resources. As of March 28, 1995, the Province began to review consents and zoning by-laws, including holding by-laws and interim control by-laws. For municipalities which do not have provincially approved archaeological potential mapping, the Ministry of Citizenship, Culture and Recreation (MCZCR) has circulated guidelines to serve as basic screening criteria for selecting which applications should be circulated to their Heritage Planner's for comment.

4.3.2 Planning Act Policy Statements

The Province has prepared seven Policy Statements to explain and interpret the Planning Act. It is expected that all municipalities will make decisions concerning developments and infrastructure which are consistent with these policies. Policy Statement "B" has a general goal, "(t)o manage growth and change to foster communities that are socially, economically, environmentally, and culturally healthy, and that make efficient use of land, new and existing infrastructure, and public services and facilities."

Section "B" includes a Policy Statement that speaks directly to archaeological resource conservation. Policy Statement 15 states that:

"(d)evelopment and infrastructure may be permitted on sites containing significant archaeological resources and on sites with medium to high potential if the site is studied and the archaeological resources are removed, catalogued and analyzed prior to development or construction. Where significant archaeological resources must be preserved on site to ensure their heritage integrity, only development and infrastructure which maintains the heritage integrity of the site will be permitted."

Section "G" is also relevant to archaeological resource management in that it provides general direction on the use of the policies in Sections "A" through "F". In particular, part of Section "G" provides a useful discussion of the manner of implementation of the Policy Statements. The Policy Statements are issued under Section 3 of the Act by the Ministry of Municipal Affairs, in conjunction with other ministries. Section 3 of the old Planning Act required that, in
exercising any authority that affects planning matters, the planning authorities "shall have regard to" policies adopted under the Act. In the amended Act, "shall have regard to" is replaced by "shall be consistent with". Policy 1 of Section "G" states that "(p)olicy statements will be implemented by municipalities and other planning jurisdictions through their decisions on official plans, subdivisions, consents, zoning by-laws, minor variances, and other planning matters". The application of "shall be consistent with" means that if the policy intent has been met, practical and innovative implementation measures are possible.

4.3.3 Planning Act Implementation Guidelines

The Ministry of Citizenship, Culture and Recreation has prepared a combined Implementation Guideline for policies B14 and B15, Cultural Heritage Landscapes, Built Heritage Resources and Archaeological Resources.

The Implementation Guideline states that "(a)s explained elsewhere in these compiled guidelines, and despite the various definitions provided by the Comprehensive Set of Policy Statements for 'Development', it is expected that the decisions made for all types of development will consider cultural heritage resource conservation needs arising from the potential impacts associated with those development activities." The Implementation Guideline provides a strong statement of the goal of heritage resource conservation.

"Since every municipality contains cultural heritage resources of potential significance, and all land use activities have the potential to impact these resources, municipal approval authorities and development proponents need to address and conserve Ontario's heritage. Within a land use planning process, conserving cultural heritage resources means being able to address heritage resource concerns, while still enabling well-planned development. This goal is accomplished either by preserving the resource while development proceeds around it, or by fully documenting the resource in advance of development and construction disturbances."

The Implementation Guideline also suggests that the creation of an inventory of all known archaeological resources within a municipality as a good first step in addressing conservation concerns. In addition to resource inventories, the Implementation Guidelines also support the development of potential mapping as a means for addressing archaeological concerns for previously uninvestigated portions of a municipality.
4.3.4 Planning Act Technical Manual

The Ministry of Citizenship, Culture and Recreation is currently preparing a Technical Manual which is intended to complement the Implementation Guidelines. While only drafts of this document are presently available, the Technical Manual will provide further specific direction for municipalities on how they can address policies B14 and B15. In all drafts to date, the creation of archaeological resource inventories and the development of Ministry approved potential mapping have both figured prominently.

4.4 The Environmental Assessment Act

The Environmental Assessment Act (1980) includes archaeological resources in its definition of the "environment". Part I(1)(b and c) state that the environment means "the social, economic and cultural conditions that influence the life of man or a community" and "any building, structure, machine or other device or thing made by man." The Ministry of Citizenship, Culture and Recreation requires documentation of the heritage aspects of the affected environment as part of the description required in Section 5(3)(c) of the Environmental Assessment Act. Currently, the Ministry of Citizenship, Culture and Recreation reviews all Class B and C environmental assessments as well as individual environmental assessments for heritage concerns.

4.5 The Aggregate Resources Act

The Aggregate Resources Act regulates aggregate operations on private and Crown lands. The Ministry of Citizenship, Culture and Recreation is currently involved in negotiations with the Ministry of Natural Resources to develop protocols and procedures to ensure the review of aggregate resource applications for heritage concerns. It is anticipated that this protocol will be in place no later than the end of 1996. In the interim, the MCCR comments on most new aggregate sites through the review of by-law zoning amendments and official plan amendments.

4.6 The Cemeteries Act

The requirements for properly caring for, disinterring and re-interring human remains are set out in the Cemeteries Act (RSO 1990), which is managed by the Cemeteries Branch of the Ministry of Consumer and Commercial Relations. The provisions of the Cemeteries Act apply to both Aboriginal and non-Aboriginal remains.
5.0 THE "SITES" AND "PROPERTY" INVENTORIES

5.1 Archaeological Resource Inventories

Detailed archaeological site and assessed properties inventories comprise the two basic prerequisites for effective archaeological resource management. Therefore, the compilation of all available information concerning known archaeological sites and assessed properties constituted an important first step in the Master Plan process. While the "Sites" and "Properties" databases are in and of themselves effective resource management tools, their creation was also necessary for the development of the Archaeological Potential Model, described in Section 6.0.

5.2 Provincial Archaeological Data Management

Since 1952 Canadian archaeologists have been variously requested or required to submit site registration forms detailing the location and nature of the sites they have discovered. This data base is maintained in Ontario by the Ministry of Citizenship, Culture and Recreation, and a great deal of useful information is available for both municipalities and archaeological consultants through the MCZCR, Data Coordinator. Regrettably, with the growth of consulting archaeology in the mid-1980's, and the concomitant increase in the number of sites being reported, this data base is, by MCZCR's own estimate, 3-5 years out of date.

In terms of municipal archaeological resource management, the data entry backlog provides a serious encumbrance. This is however, not the only problem with the Provincial data base. Unfortunately, a situation has arisen in which site registration forms have not been required to be submitted for all types of archaeological sites. The genesis of this problem once again springs from the rapid growth of archaeological consulting in the mid-1980's. With the incredible increase in the number of sites being reported, the Ministry did not require archaeologists to complete site registration forms for small sites (find spots). It was only required that these small sites, which normally consist of five or less artifacts, be described in the text of licence reports.

To further complicate this matter, not all licensed archaeologists divested themselves of the responsibility to register small sites. Because this is the case, the provincial data base is often replete with small sites registered by one consultant, while areas surveyed by other firms appear as if they were almost site free.
Of additional concern for municipal archaeological resource management, the Province maintains no records concerning a wide range of potentially important resources, including: abandoned cemeteries, mills, schoolhouses, and suspected prehistoric sites documented from archival sources.

Current Ministry of Citizenship, Culture and Recreation archaeological data management practices are also problematic in that they maintain no easily accessible records or maps detailing properties which have been field assessed by archaeologists. The MCZCR also does not maintain systematic records of properties which their Heritage Planners have reviewed but which were judged not to require assessment.

Given this lack of a Provincial assessed properties data base, as well as the problems with the Provincial sites data base, it was essential to systematically compile these data, both for ongoing effective resource management purposes and to enable the construction of the Archaeological Potential Model.

5.3 Archaeological Resource Areas (ARA's)

Because it was desirable to compile records for classes of archaeological resources not found in the Provincial data base, a system was developed which would enable the City to assign unique identifiers to archaeological sites.

This was accomplished through the creation of a City-wide framework consisting of 22 Archaeological Resource Areas (ARAs). The idea of using Archaeological Resource Areas for municipal heritage management was first developed in the Alexandria, Virginia Archaeological Master Plan, and was adapted for use in London.

While the Archaeological Resource Areas are not intended to represent actual cultural boundaries, they can provide avenues for exploring the differential prehistoric and historic utilization of the City. The City of London encompasses widely varying characteristics, ranging from densely urban to completely rural. Biophysical criteria vary from the broken topography of the easternmost extension of the Caradoc sand plan in Byron, to the gravelly soils and kettle ponds of the Ingersoll Moraine, to the Thames River valley bottom lands and the flat tablelands above. Also, as suggested in Section 3.0, different areas of the City experienced different types and degrees of prehistoric and historic utilization. While the Archaeological Resource Areas were primarily constructed to allow for efficiencies in the sorting and organization of large amounts of data, both biophysical and cultural/historic factors were taken into consideration when delimiting their boundaries.
5.4 The City of London "Sites" Data Base

The "Sites" data base was developed in dBase IV, and was subsequently exported to the City of London GIS (ARC/INFO 7.3). The City of London "Sites" data base differs from the Provincial data base with regard to numerous features, the key elements of which are outlined below. A complete description of all data base fields, along with a "Data Base Dictionary", is presented in Appendix 1.

As presented in Section 5.3, Archaeological Resource Areas provide the organizational framework for both the "Sites" and "Property" data bases. The primary site reference is provided by the ARANUMBER, which is comprised of a two-letter abbreviation representing the ARA the site is located in and a four digit sequential suffix. For instance, the third site recorded in the Kettle Creek ARA would receive the designation KC0003, the fourth site KC0004, and so on.

The data base also records Borden numbers of provincially registered sites where applicable; however, entries have been made for a wide range of resources, concerning which the Province maintains no records. In addition to non-registered prehistoric sites, the "Sites" data base also includes records for all known active and abandoned cemeteries, historic schoolhouse locations, historic mills, and suspected sites reported from archival or high quality oral accounts. The "Sites" data base can be organized using the DOCUMENTED field, into four categories: Registered, Listed, Documented and Suspected, each of which corresponds to the nature and quality of the data presently available for the site (see Appendix 1).

The City of London "Sites" data base is also easily sorted by temporal phase. Eighteen categories, ranging from Early Paleo-Indian to Late Victorian are represented. The data base also contains a reference to the licence report (when applicable), as well as numerous fields relating to the nature of work conducted at a site. The data base can provide information on a site's status with the development plans review process.

5.4.1 "Sites" Data Base Construction Procedures and Data Sources

The "Sites" data base was intended to include relevant data concerning all known archaeological sites within the City, as well as suspected prehistoric and historic resources. Information was collected from a wide variety of sources, including:
1. The London Museum of Archaeology. By far the largest proportion of archaeological research and consulting in London has been conducted by the LMA. Museum staff provided us with mapping of all of their assessed property and site location information.

2. Archaeological consultants who have worked in the city, including: Archaeological Services Incorporated; Mayer, Pihl and Poulton; Mayer, Poulton and Associates; Mayer Heritage Consultants; and, D.R. Poulton and Associates.

3. Government agencies, including: the Ministry of Citizenship, Culture and Recreation (formerly the Ministry of Culture Tourism and Recreation, the Ministry of Culture and Recreation, and the Ministry of Culture and Communications); and, the Ministry of Transportation Ontario (formerly the Ministry of Transportation and Communications).

4. Private informants. These included a wide range of individuals ranging from former Archaeological Conservation Officers, private collectors, and property owners who have reported artifacts from their property. An especially important contribution was made by Mr. Jim Keran, who provided information concerning assessed areas in the southern half of the city, including large parts of the annexed portions of Westminster, West Nissouri and North Dorchester Townships.

5. Historic Maps, which ranged from the 1793 McNiff, Jones and Simcoe Survey map of the River La Tranche, to the 1927 Military Topographic Maps of Middlesex County.

Archaeological licence reports were acquired relating to any previous work which had been conducted within the expanded City limits. A bibliography of these reports is presented in Appendix 3. A complete licence report "library" is maintained by Planning Division. Data entry screens have been created in dBase IV in order to facilitate data entry and for the purpose of facilitating future updates.

Along with computer maintained data base, data entry forms, and maps of each assessed property were placed in a paper file system housed in Planning Division. These paper files will also include photocopies of available Borden forms or CHIN printouts, any correspondence relating to the site, photocopied segments of historic maps, relevant newspaper clippings, photographs, or copies of pertinent research articles.
5.5 The Assessed Properties Data Base

In order to assist with the efficient review of development applications and to proceed with the site potential modelling, it was necessary to compile an assessed properties ("Property" data base. Assessed properties are those which have either been:

1. Field surveyed by licensed archaeologists, or

2. Reviewed for archaeological concerns by the Ministry of Citizenship, Culture, and Recreation Heritage Planner, and/or the City of London Archaeologist/Planner.

The "Properties" data base provides a vehicle for keeping track of where archaeologists have surveyed, what field techniques they have employed, and the progress of a property through the development plans review process.

In addition to properties which have been field assessed by an archaeologist, many development applications are judged by the reviewing authorities to have low potential for the discovery of archaeological resources, and consequently no field assessment is required. These properties are recorded in the "Property" data base along with those properties with sufficient archaeological potential to warrant the attachment of a standard archaeological condition. The decision was made to include these low potential areas in order to maintain a complete inventory of all properties which have been commented on for archaeological concerns. In this way it is possible to maintain consistency in the evaluation of development liaisons which are forwarded on more than one occasion or in slightly altered forms. When the Archaeological Potential Model is fully implemented, it may no longer be necessary to maintain formal data base records for applications which do not warrant field assessment.

An "ASSIDNUM" (Assessed Property Number) is the primary reference for an assessed property. The first portion of an ASSIDNUM is comprised of a two-letter abbreviation, identifying the Archaeological Resource Area. For instance, "CL" stands for "Central London". The second portion of the ASSIDNUM is the two-letter abbreviation, "AP" to indicate that the number refers to an Assessed Property, not a site designation. For instance, all assessed property numbers in the Stoney Creek Archaeological Resource Area will begin with "SCAP....". The third part of the ASSIDNUM is a three digit sequential suffix, i.e. the fourth assessed property in the Stoney Creek Archaeological Resource Area will be designated as "SCAP004", the fifth "SCAP005", and so on.
The "Properties" data base was developed in dBase IV, and subsequently has been exported to the City of London GIS (ARC/INFO 7.3). A complete description of all of the fields, along with a "Data Base Dictionary", is presented in Appendix 2.
6.0 THE ARCHAEOLOGICAL POTENTIAL MODEL

6.1 Potential Modelling Goals

Because there is no immediate knowledge concerning the presence or absence of archaeological resources across the majority of the City, the development of a potential model was a central goal of the Archaeological Master Plan. As a result of this modelling exercise, easily interpreted and implemented potential mapping can now allow a Planning Division staff member, without archaeological expertise, to make a simple yes/no determination of whether a development property requires a field assessment.

Prior to the implementation of this model, the determination of archaeological potential for London development plans was made on an application by application basis by Heritage Planners at the Ministry of Citizenship, Culture and Recreation. Because of the combination of judgement and experience required to evaluate a property, determinations of archaeological potential could only be made by professional archaeologists. While the Ministry of Citizenship, Culture and Recreation has developed a broad set of criteria to assist their Heritage Planners in making determinations of potential (see Section 6.4), in the absence of a rigorous, quantitatively based model, the evaluation of development properties for archaeological concerns has often been inconsistent. This inconsistency has sometimes resulted in confusion, both in the development and archaeological communities, concerning which properties require archaeological assessment in advance of development, and for what reasons.

The Ministry of Citizenship, Culture and Recreation recognizes the problems inherent in their current system, and as such are actively encouraging municipalities to develop comprehensive archaeological potential mapping. Once municipal potential mapping has been approved by the Ministry of Citizenship, Culture and Recreation, only development applications which require archaeological field assessment need be liaised to the Heritage Planners for review of subsequent archaeological field work. Therefore, potential mapping expedites the development plans review process, reduces the unnecessary review of files by the MCZCR Heritage Planners, and provides enhanced protection for archaeological resources.

In addition to these advantages, proponents will no longer need to wait until the submission of a development application in order to ascertain if an archaeological assessment will be required; they can easily be made aware their obligations months or years in advance. Specific procedures to allow members of the development community and licensed archaeologists access to the City of London Archaeological Potential Maps and "Sites" data base are laid out in Section 7.0.
When a determination of “potential” has been made for a development property, a standard archaeological assessment will be required by the City as a condition of approval or as part of the development agreement. When a condition of archaeological assessment is warranted, further review functions with regard to the archaeological component of the development application will be conducted by a Ministry of Citizenship, Culture and Recreation Heritage Planner. A detailed description of the procedures to be followed in the assessment of a development application are presented in Section 7.0.

6.2 The Development of Potential Modelling

Archaeological potential modelling owes its advancement in large part to the rise of Cultural Resource Management (CRM) in the United States in the early 1970’s. Prior to this time regional studies were largely oriented towards explanations of broad based cultural behaviour rather than specifically oriented to predicting site locations.

While CRM activities have allowed archaeologists the opportunity to acquire funding and discover far more sites than ever before, the economic needs of the funding sources (i.e. government or private developers) have moulded the framework within which most archaeologists work. At present, survey areas are rarely selected on the basis of criteria which could lead to the development of a systematic overview of a region's history or prehistory. Rather, most areas receiving archaeological attention have boundaries identical to those of areas to be developed.

With the rapid growth of consulting archaeology, potential modelling has developed as a way in which effective resource management can be reconciled with cost-effectiveness. Early modelling efforts were typically site-specific, utilising environmental characteristics as independent variables and then measuring the degree of correlation between site locations and significant variables (Green 1972; Barber and Roberts 1979; Mierendorf et al 1981).

More recent studies have made clear that site locations alone should not provide the sole basis for the construction of a potential model (Kvamme 1990a). In order for a potential model to be appropriately verified it is necessary to randomly generate a comparative data base of locations or parcels where sites are not located. In this way it is possible to determine in a quantifiable fashion, which environmental variables are truly useful for model construction (see Section 6.7).
6.3 Previous Potential Modelling in Ontario

In Ontario, the MCZCR Heritage Planners, through their review of development applications, operationalize the archaeological potential model described in detail in Section 6.4. Unfortunately this model, which provides the guidelines for the elimination of areas from the requirement of archaeological assessment, has never been subject to a quantifiable test of its validity. To a planner or developer who does not possess a detailed understanding of the nature of archaeological resources, this model can sometimes provide an effective and satisfactory means of reducing archaeologically associated costs. However, the model is too complex to allow easy pre-mapping of areas for archaeological potential, and in most instances planners and developers do not find out until quite late in the development process if an archaeological assessment will be required for their property.

The current MCZCR model is also considered problematic by many within the archaeological community. The major concern stems from the fact that there is as yet no clear proof that valuable archaeological resources are not being lost in areas which have been determined to be low potential and which are consequently not surveyed.

There have been several other attempts at potential modelling in Ontario. In 1986, John Peters of Ontario Hydro, in conjunction with first the London Museum of Archaeology, and later the archaeological consulting firm of Mayer, Pihl, Poulton and Associates, collaborated to produce a model for predicting areas of archaeological potential (Peters 1986:1). Various biophysical data types were compiled for 615 sites in southwestern Ontario, and upon evaluation it was determined that areas within 150 metres of a water source possessed high archaeological potential (Peters 1986:1).

Recently, predictive modelling in Ontario has become increasingly complex. Though Campbell and Campbell (1992) have studied broad patterns of Iroquoian settlement for research purposes, the impetus for the majority of modelling work in Ontario has been development pressure. While most modelling ventures have remained site-specific, recent projects have considered a wider range of predictor variables. The work of Archaeological Services Inc. (1988a, 1988b) Burgar (1990), Dalla Bona (1990), the Regional Municipality of Waterloo (1989), and the former Ministry of Culture, Tourism and Recreation (1993), all address the relationship between the archaeological potential of land parcels, selected environmental features and archaeological events. Nevertheless, these efforts still rely on a subjective assessment of the type and weighted importance of the predictor variables.
6.4 Current Provincial Archaeological Potential Criteria

When development plans are reviewed by the Ministry of Citizenship, Culture and Recreation, potential is determined through a map based evaluation of the property in question, along with a review of available data bases and heritage resource inventories. If necessary, Heritage Planners will visually inspect properties, most often to determine the extent of past land disturbances. While Heritage Planners rely heavily on their own archaeological field expertise, the Ministry has established a broad set of criteria for the evaluation of a development application, in which potential is indicated by the presence of any one of Criteria 1, 2, 3, 4, or 5, or the presence of two or more of Criteria 6, 7, or 8 (MCCR 1995).

(1) Distance (within 300 metres) from primary sources of water, such as rivers, lakes, and large creeks; or from relict or ancient primary sources of water, such as glacial shorelines (as indicated by raised beach ridges), relict river channels or lakeshores, or relict larger creek beds.

(2) Distance (within 200 metres) from secondary sources of water, such as smaller creeks, streams, seasonally wet creek and stream beds, springs, marshes, and swamps; or from relict or ancient secondary sources of water, such as relict creek and stream beds (usually visible as a channelized dip in the topography), or drained and/or filled former marshes and swamps.

(3) Presence of known heritage resources within or adjacent (i.e. 1 kilometre or less) to the development proposal, such as built features of known heritage significance, cultural landscapes or known archaeological sites.

(4) Presence of rolling or elevated topography, sandy soils, or unusual land formations.

(5) Evidence from documentary sources, local knowledge or Aboriginal oral history associating the property in question with historic events, activities or occupations.

(6) Capacity of the land to accommodate large-scale settlements or resource-specific extractive camps. This includes a consideration of current and past availability of plant, animal and raw materials.
(7) Presence of historic settlement, land use, industrial or economic activity areas in the vicinity of the development proposal. This can include the older core or initial settlement area of hamlets, villages, towns and cities; early military or pioneer settlement in the region; heritage conservation districts, presence of a pioneer church and/or an early cemetery, etc.

(8) Association of the development proposal to historic transportation routes, such as historic waterways, roads, or portage routes; Aboriginal or early pioneer trail systems.

(9) Extent and type of previous land disturbance to have occurred on the subject property.

These criteria have been forwarded as a tool by which municipal planners can make evaluations of archaeological potential (MCZCR 1995:15). However, from a municipal perspective this is extremely impractical without in-house archaeological expertise. To comprise an effective planning tool, the criteria used to delimit areas of potential need to be easily mapped and interpreted by planners with no archaeological expertise.

Moreover, while the list is quite comprehensive, it also suffers in that it has not been subjected to a quantitative evaluation of its efficacy. Its comprehensive nature makes it difficult to operationalize in a time efficient and practical fashion, and in practice, most provincial determinations of potential are based on Criteria 1, 2, 3, 4, 8, and 9.

6.5 Archaeological Potential Model Strategies

Potential is established by determining the likelihood that archaeological resources may be present on a subject property. Archaeological potential mapping for the City of London was generated through an examination of a range of biophysical and cultural-historical factors, any or all of which may have influenced past patterns of land use. The goal of this exercise was to identify parameters which could be utilized to restrict the area of the City requiring actual field examination without compromising valuable archaeological resources.

The City of London Archaeological Potential Model required the development of three separate components to allow a simple yes/no determination to be made:
1. Prehistoric resource potential mapping;
2. Historic resource potential mapping;
3. Integrity mapping.

In order to generate the prehistoric potential model, a set of "biophysical characteristics" from all Registered and Listed prehistoric sites were analyzed (Section 6.9). This allowed for the generation of a list of criteria which could be used in combination with the GIS to produce a graphic representation of areas with prehistoric archaeological potential. Similarly, the GIS was used to buffer areas along historic roads and historic communities to create a model designed to capture historic archaeological resources.

Once the areas of historic and prehistoric archaeological potential had been combined by the GIS into a single coverage, it was possible to overlay an "Integrity" coverage. "Integrity", in relation to archaeological resource management, relates to the nature of past soil disturbance activities, and hence to the degree of likelihood that sites may have survived. Loss of integrity can result from natural processes such as erosion, however the majority of impacts are cultural; including quarries, land fills, and housing, commercial or industrial subdivisions. Areas retaining sufficient integrity to contain archaeological resources were mapped using the GIS.

Those portions of the City which have retained sufficient integrity, along with the areas determined to have a good likelihood of containing archaeological resources, were then merged into a single coverage in the GIS. The combination of 1) prehistoric potential mapping, 2) historic potential mapping; and, 3) integrity mapping, comprises the final product of the potential modelling exercise.

The development of the prehistoric and historic potential models, as well as the integrity mapping, is described in greater detail below.

6.6 The Prehistoric Potential Model

The construction of the prehistoric potential model proved to be the most challenging component of the overall potential modelling project. In an attempt to determine if site locations could be correlated with specific features in the natural environment, the biophysical characteristics of all 427 "Registered" and "Listed" prehistoric archaeological sites were analyzed. Analysis was restricted to Registered and Listed resources, as precise locational data were available for these sites (see Appendix 1). Upon completion of this analysis, areas of prehistoric archaeological
potential were mapped based on the presence of the biophysical characteristics determined to be correlated with known site locations (see Section 6.9).

6.7 Methods of Analysis

Analysis of the GIS data was based on two assumptions central to the formulation of any useful potential model. The first assumption is that the sample of known site locations used "to train" our quantitative model is reasonably representative of the pattern of site distribution throughout the remainder of the City (Kvamme 1988:327). The second assumption is that "the site locations are nonrandomly distributed with respect to environmental or social factors under investigation" (Ibid).

While the sample of sites used to generate the model does not constitute a true random sample of all areas of the City, London is fortunate in that a great deal of research survey has been conducted by the London Museum of Archaeology, including areas which otherwise would not have been surveyed as part of the development plans review process. Moreover, the areas within and adjacent to the portion of the City which will be impacted by development within the next 20 years is exceptionally well represented. With regard to the second assumption, "it is a basic premise of modern archaeology that human behaviour is patterned"; and that these patterns can be elucidated through careful, systematic, quantifiable, analysis (Kvamme 1988:327-328).

One problem faced in constructing a potential model to be used for cultural resource management purposes is that the model must be designed to capture a satisfactory percentage of sites from all time periods, rather than be specifically tailored to capture a particular type of site. This proves problematic in that Native settlement/subsistence patterns have changed remarkably over the last 11,000 years. Consequently, during different time periods, local groups sometimes favoured different locations for their sites.

However, dynamic settlement patterns are not an insurmountable problem. Kvamme (1988:331) provides a useful discussion of models designed to capture all sites within a region. While grouping all sites together will unavoidably mask a great deal of interesting variability, it must be stressed that the goal of the potential modelling exercise was not to explain patterns of prehistoric behaviour. If this were the case it would be indefensible to lump all sites, regardless of time period or type. Rather, the goal of the potential model was to map areas of the City which had the greatest potential to contain archaeological resources in order that they could be surveyed in advance of development. The potential model was designed to function first and foremost as a planning tool; although the data bases have been structured in such a way to facilitate future research oriented analysis.
Kvamme (1988:331) suggests that general models, such as the one developed for London, map "activity space".

"(I)t is possible on the basis of a general model to define significant portions of a region that are unlikely to contain sites of any kind. If we lump together all environmental and other variation at all site locations, the resultant characteristics might define activity space, a subset of the whole environment within which the bulk of human activity (aside from moving from one activity place to another) is performed. Although different functional activities might be conducted in entirely different situational contexts within the activity space, the activity space can be a useful construct for locational modelling purposes if it is substantially smaller than the whole environmental range of a region."

While the City of London potential model attempts to define what Kvamme calls "activity space", for the purposes of analysis it was useful to examine smaller subsets of the site data. These subsets were not based on time periods, but rather on the nature of the response which would be required when a site was identified during an archaeological assessment of a subject property. Three site "types" were defined based on the content of their surface assemblages. "Type 1" sites consist of isolated findspots of a single artifact; "Type 2" sites consist of sites at which 2-8 artifacts were identified on the surface; while "Type 3" sites are those at which more than 8 artifacts were surface collected.

These categories are useful, because for the London area, they approximate the cut off points at which the MCZCR, Heritage Planners determine if further archaeological investigation is required prior to development. While all archaeological sites are significant, in practice, decisions must be made concerning the allocation of time, effort and money, directed towards preserving our archaeological heritage. These three categories attempt to capture the essence of how the MCZCR is presently dealing with archaeological resources identified during the assessment process.

As the practice of Cultural Resource Management has developed in Ontario, after the initial discovery and examination of a new resource, all Type 1 and virtually all Type 2 sites, require no further evaluation before development proceeds. Type 3 sites, which are those at which more than eight artifacts have been collected during the surface investigation, usually require some form of further examination before a decision can be made regarding the need for mitigative action.
6.8 Constructing and Testing the Prehistoric Potential Model

In absence of the opportunity for actual field evaluation, other approaches were designed to test the usefulness of the selected variables for mapping areas of archaeological potential. To date, potential models constructed in Ontario have been based on intuitive assessments concerning which biophysical characteristics possess the greatest utility to predict potential archaeological sites. While some models have been tested using statistical procedures (Roberts 1980, Burgar 1990), these tests have only utilized known site locations. Tests relying on actual site locations can provide some verification of a model, however it is only partial at best.

In an effort to test our results, a "non-site" biophysical database was established and subjected to the same analytic procedures as the known sites. Non-sites are points which have been artificially generated by the GIS within assessed properties which have been surveyed up to the current MCZCR Archaeological Assessment Technical Guidelines. Sufficient non-sites for comparative purposes were generated using a 150 metre grid pattern (N=490). In order to ensure that non-sites were not generated in areas containing known archaeological resources, the GIS was programmed to eliminate non-sites falling within a 150 metre radius of an identified archaeological site centroid (see Figure 6.1). Each non-site was then automatically assigned a unique identifier by the GIS, and the same data classes extracted for the known site locations were generated for the non-sites.

The use of non-sites provides a vehicle to test the relationship between known sites and individual biophysical characteristics. In effect, the non-site biophysical data base provides a randomly selected comparative data set or "control group" (Kvamme 1988). Non-site testing is required because the potential exists that only some biophysical characteristics may be useful for constructing the archaeological potential model. The useful characteristics are those which occur with greater frequency at known site locations than they do in the surrounding environment. For example, sites may be positively correlated with sandy loam soils. However, if sandy loam soils comprise a similar or greater percentage of the non-site locations, then the presence/absence of sandy soil cannot be utilized to help reduce the area of the City with archaeological potential.

6.8.1 The Gain Statistic

One way to determine if a proposed potential model is working, is to use what Kvamme (1988:329) has termed the "Gain" statistic. The "Gain" of a potential model is equal to:

\[
1-(\% \text{ of the total area covered by the model/ } \% \text{ of total sites within the model area}).
\]
For instance, if a model required the survey of 51% of the City, and captured 67.4% of all known sites, the net gain would be equal to 1-(51/67.4), or .304. The closer the gain is to 1.0, the greater the predictive utility of the model. For instance, a model which captured 99% of all sites within 1% of a study area, would have a gain of .990. Alternatively, if the gain approaches 0 (or actually has a negative value), the model has little predictive utility.

The gain statistic provides an extremely useful vehicle for quickly assessing a proposed model. It is easy to interpret and facilitates meaningful comparisons. Using the GIS, various models can be mapped and their area rapidly calculated. Net gains can then be readily ascertained, and the model's degree of usefulness objectively evaluated.

6.9 Analysis Results

The biophysical characteristics chosen for analysis include: distance to various types of water source, soil texture, soil drainage, glacial geomorphology, slope, aspect, and the general topographic variability in the area surrounding a site. This information was automatically extracted for each site location using the City of London GIS (ARC INFO 7.3). These biophysical characteristics, along with the results of their analysis, are described below.

6.9.1 Distance to Water

That the proximity to water impacts upon the location of human occupation areas is widely accepted. Roper (1979) suggests "some resources, such as water, are so vital that the distance to obtain them must be minimized." Joehin (1976:55) has likewise demonstrated that distance to water is a central factor in determining hunter-gatherer site placement.

The 1:10,000 OBM mapping provided the base watercourse data (air photography 1985). In addition to the currently mapped watercourses, a concerted effort was made to include former, or "paleo-watercourses" in the analysis (see Figure 6.2). Paleo-watercourse locations were established through an examination of historic maps of the City of London, ranging from the 1793 McNiff, Jones, and Simcoe survey map of the "River La Tranche" to the 1927 military topographic maps. Any former streams or abandoned courses of the Thames were digitized into the 10,000 streams coverage in the GIS. In addition to the inclusion of these former water sources, recent water sources such as gravel quarry ponds, were removed from the coverage. Similarly the old course of the Thames River through Lake Fanshawe was digitized and the current lake margins were eliminated.
Early in the analysis it became apparent that distance to water would play a central role in the construction of the potential model. A comparison of the average minimum distance to any mapped water source for the 327 sites located within the assessed properties used for the generation of the non-site-locations, suggested that there was a very significant difference between sites and non-sites. Using a standard T-test for unequal samples, a Z-value of 4.35 was returned. Even with five degrees of freedom, a Z-value of 4.35 is significant at the .01 confidence level.

Figure 6.3 graphs the distribution of the minimum distance to water for: 1) all sites, 2) non-sites; and, 3) those sites located in the assessed properties which non-sites were also generated. As was described in Section 6.8, non-sites were only generated in assessed properties which have been surveyed up to the current MCZCR guidelines. Because this is the case, when doing direct comparisons between the site and non-site data, it is necessary to use the subset of sites which are located in the assessed properties used to generate non-sites, not the entire site data base. For the purposes of this report, this subset of sites is referred to as the "Guideline Sites".

The non-site data confirm, for London at least, the hypothesis that archaeological resources are not randomly distributed with regard to water. Water, as a limiting criteria for the potential model is attractive for two important reasons. The first reason is that distance to water, as a continuous variable, can be meaningfully applied over the entire area of the City, i.e. all points in the City have a distance to water. Second, and perhaps equally important in terms of practically applying the model, is that buffers around items such as water are easily constructed and mapped using the GIS.

With these considerations in mind, 29 separate models, based strictly on distance to the nearest water source, were created using the GIS. The first buffer distance was set at 60 metres, with each subsequent test incorporated an additional ten metres of buffer, to a maximum of 340 metres. Once these models were generated, it was possible to establish the percentage of the City they encompassed, as well as the percentage of archaeological resources they would capture (see Table 6.1). With these figures in hand, it was possible to calculate the net gain for "all sites" and Type 3 sites for each test model (Table 6.1 and Figure 6.4).

The results of the gain analysis of these models is quite informative. The highest gain for all archaeological resources is at only 90 metres from water (G = .289). However, a 90 metre buffer would only capture 37.7% of all sites and 36.2% of Type 3 sites in 26.8% of the City. The highest gain for Type 3 sites fell at 200 metres (G = .312). At this distance from water, 77.2% of the mitigatable sites were captured within a buffer encompassing 53.1% of the City. Distance to water buffers of greater than or less than 200 metres were far less efficient in capturing these highly significant resources. Based on these results, a decision was made to
## Minimum Distance to Water Gain Analysis

<table>
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<th>Buffer Distance Metres</th>
<th>Percentage of All Sites</th>
<th>Percentage of Type 3 Sites</th>
<th>Buffer Area (ha)</th>
<th>Buffer % of City</th>
<th>Gain for All Sites</th>
<th>Gain for Type 3 Sites</th>
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C = Not Calculated

Table 6.1
Minimum Distance to Water

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<th>Category</th>
<th>N</th>
<th>Average</th>
<th>St. Dev.</th>
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<td>All Sites</td>
<td>427</td>
<td>169.2</td>
<td>145.37</td>
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<tr>
<td>Guideline Sites</td>
<td>310</td>
<td>170.9</td>
<td>140.6</td>
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</table>

Figure 6.3
Gain Analysis Results

![Graph showing net gain versus water buffer distance in metres for Type 3 Sites and All Sites.]

Water Buffer Distance in Metres

Figure 6.4
employ a 200 metre buffer from water as the starting point for the potential model. The gain statistic could then be utilized to determine if alterations based on other variables could improve the efficiency (i.e. gain) of the model.

6.9.2 Water Source Class

It has also been proposed that the size and nature of water sources played an important role in determining prehistoric settlement patterns. For instance, large rivers, intermittent streams, and swamps, will each differ in terms of their transportation capacities and levels of resource productivity. In an attempt to account for this variability, water source type has been included in many archaeological predictive models (Kvamme 1990:335).

Six classes of water source were used for the City of London analysis: 1) the Thames River; 2) larger streams including Dingman Creek, Medway Creek, Stoney Creek from Fanshawe Park Road southwards, and Pottersburg Creek from Dundas Street southwards; 3) streams fed by other streams; 4) initial feeder streams; 5) swamps/wetlands; and, 6) ditches or artificial watercourses (see Figure 6.5). This system was used as opposed to the strict Strahler (1964) classification, based on our understanding of the variety and nature of water sources in the London area.

The GIS was programmed to automatically extract the nearest straight line distance from each site to each water source class. It was then possible to sort the site data into separate categories based on which stream class provided the minimum distance to water figure for a particular site. For instance, the Thames River was the proximate water source for 10 sites. These 10 sites were placed in their own data base for the purposes of analyzing this variable.

With the establishment of the five separate data categories based on water source (no sites were primarily oriented to ditches or artificial water courses), they could be individually sorted from lowest to highest, based on the minimum distance to water field. After this basic sorting of the data had been accomplished, it proved possible to quickly examine the data to establish if the general 200 metre to water figure could be raised or lowered for a particular water source.

For example, 31 prehistoric sites have a Type 2 source as their nearest form of water (average distance = 108.1 metres). Examination of the data indicated that 29 of these sites were encompassed within the 200 metre buffer; however, no sites were located between 195-200 metres and only one isolated findspot was located between 177-200 metres. Based on these observations, it was possible to map alternative models using the GIS which incorporated individualized criteria for this source class. The gain statistic could then be employed to
ascertain if the overall model efficiency had been improved, using the basic 200 metre buffer gain (G = 0.312 for Type 3 sites) as a baseline.

Only 10 known sites have the Thames River as their nearest water source. This small sample results more from a bias towards archaeological survey around the perimeter of the City, than any lack of sites in the valley bottom. Evaluation of different buffer settings for Source Class 1 indicated that the buffer around the Thames River could be dropped to 186 metres without any loss of sites. While this setting would increase the overall gain of the model, the buffer distance was left at 200 metres due to the extremely small sample of sites in this category, and also due to the fact that portions of the Thames River valley just west of London have been demonstrated to be exceptionally rich in archaeological resources.

One additional site would have been captured with a Source Class 1 setting of 235 metres; two additional sites at 270 metres, and three additional sites at 379 metres. However, the additional area encompassed if these settings were utilized outweighed the capture of the additional resources, and the overall "gain" of this model declined.

The buffer setting for Source Class 2, as described above, was set at 177 metres. This entailed the loss of one findspot, however the reduction in the area requiring survey was warranted by the increase in the net gain.

A total of 93 sites were found to have Source Class 3 as their nearest water supply (average distance = 111.7 metres). To capture one additional Type 3 site the buffer would have to be increased to 263 metres. The concomitant increase in model area could not be sufficiently outweighed by the capture of the single additional site. However, a minor buffer reduction to 198 metres, could be made with no loss of resources.

Source Class 4 was the proximate supply of water for 226 sites (average distance = 183.4). It was found that a modest increase in buffer distance to 220 metres resulted in the capture of an additional four Type 3 sites, as well as a further six Type 1 and 2 sites.

Class 5 water sources such as ponds and wetlands, were the nearest source class for 67 sites (average distance = 207 m). Any reduction in buffer distance for Source Class 5 resulted in an unacceptably rapid loss of archaeological resources and very little decrease in the area requiring survey. Alternatively, the capture of a single additional Type 3 site would require increasing the buffer to 230 metres, negatively effecting the overall gain of the model. Consequently, the buffer for Source Class 5 was left at 200 metres.
With the buffer for the five Source Classes set at: 200 metres for Class 1, 177 metres for Class 2, 198 metres for Class 3, 220 metres for Class 4, and 200 metres for Class 5, the overall capture rate for Type 3 sites jumped to 80.4%, while "all sites" captured rose to 72.8% in 54.5% of the City's area. These buffer settings include a further 605 hectares of the City within the model, when compared to the straight 200 metre from water model. However, the additional archaeological resources captured offset this increase in area, with the "Type 3" Gain rising to .321 and the "all sites" gain increasing to .252.

6.9.3 Soil Texture

Lighter soils are generally believed to have been more conducive for prehistoric utilization than heavier clay soils, especially for early agricultural communities. In addition, lighter soils are often better drained than heavier clay soils, and may have been attractive for this reason. There is also a well established correlation between sandy soils and attractive natural resources such as nut bearing trees and prime deer habitats.

In order to test the relationship between known sites and archaeological resources, it was necessary to acquire soil texture information from two sources. The more recent Ontario Ministry of Agriculture and Food (OMAF) soils map is very detailed, however the portion of the City within the pre-annexation limits was not mapped. In order to create a complete soils coverage, the 1937 Middlesex soils mapping was used to fill in the central portion of the City. Because of changes in soil classification systems between 1937 and the present, and in order to reconcile the inconsistencies between the two data sets, soil textures were grouped into five basic types: clay loams, silt loams, loams, sandy loams, and organic soils. These soil texture types could then be consistently applied to both data sets.

Soil texture data was digitized into the GIS as a polygon coverage and automatically extracted for each site location. Analysis of these data resulted in the conclusion that, for London, soil texture could not be effectively employed to reduce the portion of the City requiring survey in advance of development.

It is possible, using the GIS, to differentially buffer water sources, using soil texture as the controlling variable. However, when soil texture driven alterations to the water source buffers presented in Section 6.9.2 were tested, no increase in "Gain" resulted. One of the problems in attempting to use soil texture as a limiting criteria in London is that the City encompasses no significant areas of low quality soils. Using a standard chi square and Srinthall's (1990:300-301) compensation factor for employing percentages, the only significant difference in actual and expected distributions of guideline sites was fewer than expected sites on silt loam soils.
### All Prehistoric Sites: Soil Texture and Distance to Water

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<th>Soil Texture</th>
<th>Number of Sites</th>
<th>Percentage of Sites</th>
<th>Expected % of Sites</th>
<th>Distance to Water Average (m)</th>
<th>Standard Deviation</th>
<th>Maximum Distance (m)</th>
<th>Minimum Distance (m)</th>
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<td>Sandy Loam</td>
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<td>14.3</td>
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Table 6.2

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<th>Expected % of Sites</th>
<th>Distance to Water Average (m)</th>
<th>Standard Deviation</th>
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<td>0.2</td>
<td>0.02*</td>
<td>69.7</td>
<td>NA</td>
<td>69.7</td>
<td>69.7</td>
</tr>
</tbody>
</table>

Table 6.3

### Guideline Sites: Soil Texture and Distance to Water

<table>
<thead>
<tr>
<th>Soil Texture</th>
<th>Number of Sites</th>
<th>Percentage of Sites</th>
<th>Expected % of Sites</th>
<th>Distance to Water Average (m)</th>
<th>Standard Deviation</th>
<th>Maximum Distance (m)</th>
<th>Minimum Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loam</td>
<td>116</td>
<td>37.4</td>
<td>29.8*</td>
<td>153.23</td>
<td>121.92</td>
<td>782</td>
<td>5</td>
</tr>
<tr>
<td>Sandy Loam</td>
<td>44</td>
<td>14.2</td>
<td>15.8*</td>
<td>137.6</td>
<td>98.45</td>
<td>421.1</td>
<td>2.9</td>
</tr>
<tr>
<td>Silt Loam</td>
<td>62</td>
<td>26.5</td>
<td>37.4*</td>
<td>165.84</td>
<td>149.49</td>
<td>666.2</td>
<td>0.45</td>
</tr>
<tr>
<td>Clay Loam</td>
<td>68</td>
<td>21.9</td>
<td>16.7*</td>
<td>228.7</td>
<td>164</td>
<td>679.3</td>
<td>10.8</td>
</tr>
</tbody>
</table>

Table 6.4

* expected percentage if the sites are distributed randomly with regard to soil texture
Another obvious problem stems from the fact that the potential model is attempting to capture sites of all types and time periods. It may very well be possible to employ soil texture in more specific models attempting to capture sites of a single type or time period, however, that is not an acceptable goal for a general purpose potential model.

6.9.4 Glacial Geomorphology

Landforms, such as till plains, sand plains, kames, moraines, drumlins, strandlines and spillways, have also been suggested to be correlated with certain types of archaeological sites. For instance, in Southwestern Ontario there is a demonstrated correlation between large Paleo-Indian sites and former glacial lake margins, while terminal archeaic burials are so regularly encountered in kame deposits that this terminal archeaic cultural horizon is referred to as "Glacial Kame".

In order to test for correlations between known site locations and glacial features within London, the Ontario Geological Survey Map P.2715 (Chapman and Putnam 1984), was digitized and entered into the GIS as a polygon coverage. The GIS then automatically compiled the geomorphological data for each archaeological site. As was the case with the soil texture data, it was found that Glacial Geomorphological features could not be effectively utilized to limit the area of the City requiring archaeological examination prior to development.

Attempts to employ Glacial Geomorphology as a limiting variable suffer from the same problems as soil texture regarding general purpose models. It may be possible to use geomorphological features to model for sites of a particular type or time period, and the City of London data bases are organized in such a way as to facilitate the exploration of such questions. However, it was not possible to increase the "Gain" of our general model by buffering differential for glacial features.

6.9.5 Soil Drainage

Areas of well drained soils are generally believed to provide more attractive site locations than poorly drained soils, and soil drainage was demonstrated to be a useful variable in the Fort Drum prehistoric predictive model (Klein et al 1985:16-18). Unfortunately, digitized soil drainage data for the City of London will not be available until later this year. The GIS has been programmed to extract soil drainage information, and when the data become available it will be possible to evaluate their potential for predicting areas of archaeological potential.
### All Prehistoric Sites: Geomorphology and Distance to Water

<table>
<thead>
<tr>
<th>Geomorphology Type</th>
<th>Number of Sites</th>
<th>Percentage of Sites</th>
<th>Expected % of Sites</th>
<th>Distance to Water Average (m)</th>
<th>Standard Deviation</th>
<th>Maximum Distance (m)</th>
<th>Minimum Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Plain</td>
<td>4</td>
<td>0.9</td>
<td>NA</td>
<td>195.9</td>
<td>178.1</td>
<td>392.8</td>
<td>16.2</td>
</tr>
<tr>
<td>Spillway</td>
<td>145</td>
<td>34</td>
<td>NA</td>
<td>144.8</td>
<td>125.2</td>
<td>731.8</td>
<td>0.5</td>
</tr>
<tr>
<td>Till Plain</td>
<td>107</td>
<td>25.1</td>
<td>NA</td>
<td>171.4</td>
<td>169.4</td>
<td>822.3</td>
<td>4.3</td>
</tr>
<tr>
<td>Till Moraine</td>
<td>171</td>
<td>40</td>
<td>NA</td>
<td>187.9</td>
<td>141.1</td>
<td>679.3</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Table 6.5

### Non-Sites: Geomorphology and Distance to Water

<table>
<thead>
<tr>
<th>Geomorphology Type</th>
<th>Number of Non-Sites</th>
<th>Percentage of Non-Sites</th>
<th>Expected % of Sites</th>
<th>Distance to Water Average (m)</th>
<th>Standard Deviation</th>
<th>Maximum Distance (m)</th>
<th>Minimum Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Plain</td>
<td>75</td>
<td>15.3</td>
<td>8.5*</td>
<td>405.1</td>
<td>205.4</td>
<td>824.8</td>
<td>11.8</td>
</tr>
<tr>
<td>Spillway</td>
<td>204</td>
<td>41.6</td>
<td>38.2*</td>
<td>154.2</td>
<td>106.9</td>
<td>429.5</td>
<td>1.1</td>
</tr>
<tr>
<td>Till Plain</td>
<td>93</td>
<td>19</td>
<td>21.8*</td>
<td>223.8</td>
<td>170.3</td>
<td>782.8</td>
<td>3.75</td>
</tr>
<tr>
<td>Till Moraine</td>
<td>118</td>
<td>24.1</td>
<td>31.3*</td>
<td>177</td>
<td>128.3</td>
<td>538.5</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Table 6.6

### Guideline Sites: Geomorphology and Distance to Water

<table>
<thead>
<tr>
<th>Geomorphology Type</th>
<th>Number of Sites</th>
<th>Percentage of Sites</th>
<th>Expected % of Sites</th>
<th>Distance to Water Average (m)</th>
<th>Standard Deviation</th>
<th>Maximum Distance (m)</th>
<th>Minimum Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand Plain</td>
<td>2</td>
<td>0.7</td>
<td>8.5*</td>
<td>373.6</td>
<td>19.2</td>
<td>392.8</td>
<td>354.4</td>
</tr>
<tr>
<td>Spillway</td>
<td>110</td>
<td>35.5</td>
<td>38.2*</td>
<td>142.1</td>
<td>116.59</td>
<td>524.3</td>
<td>0.5</td>
</tr>
<tr>
<td>Till Plain</td>
<td>64</td>
<td>20.6</td>
<td>21.8*</td>
<td>151.9</td>
<td>139.9</td>
<td>782</td>
<td>5</td>
</tr>
<tr>
<td>Till Moraine</td>
<td>134</td>
<td>43.2</td>
<td>31.3*</td>
<td>200.6*</td>
<td>151.5</td>
<td>679.3</td>
<td>2.9</td>
</tr>
</tbody>
</table>

Table 6.7

* expected percentage if the sites are distributed randomly with regard to glacial geomorphology
6.9.6 Slope

Ground slope has also been widely explored in relation to potential mapping, as common sense combined with practical field observations suggest that most Native occupations are situated on relatively level ground (Kvamme 1990:333). The slope of all known site locations was automatically determined by the GIS through a calculation of the average of the slope of all tin triangles within ten metres of a site centroid. TIN triangles only partially within the 10 metre radius were trimmed and weighted according to their remaining area within that radius. This calculation resulted in an integer ranging from zero to ninety, corresponding to the degree of slope.

Table 6.8 presents the distribution of sites and non-sites according to the slope of their centroids. While there is no significant difference between the site and non-site distributions, 98.12% of all known sites are situated on slopes of less than ten degrees (non-sites = 97.04%). It is possible to use the GIS to map out areas of greater than 10 degrees slope, and eliminate them from further consideration. This process would likely increase the overall "Gain" of the potential model, as only eight known resources would be adversely impacted.

As a trial, one 1:10,000 map sheet was "tinned" by the GIS in order to map areas with greater than 10 degrees slope (see Figure 6.8). However, the areas which would be "eliminated" from the model consisted of small, irregular, portions of properties already being routinely ignored by archaeologists during field assessments. Therefore any increase in "Gain" which would result from excising these areas from the model would, in terms of practical application, be largely illusory. Moreover, the process of "tinning" 1:10,000 map sheets with the GIS is extremely demanding in terms of computer time, especially in terms of creating a seamless coverage for an area the size of London. While these difficulties are not insurmountable, a decision was made, that at this time, the results would not warrant the effort required to produce a slope coverage necessary to operationalize this variable. Figure 6.8 provides a sample of the types of areas which would be eliminated if areas of greater than 10 degrees slope were utilized in model construction.

While the decision was made not to employ slope in creating the potential model mapping, the analysis of the slope data does make quite clear that areas of greater than 10 degrees slope can be considered to have extremely low potential for archaeological sites.
Degree Slope of All Sites

Figure 6.8
Site Slope Data Summary

<table>
<thead>
<tr>
<th>Range in Degrees</th>
<th>Frequency All Sites</th>
<th>Percentage All Sites</th>
<th>Frequency Non-Sites</th>
<th>Percentage Non-Sites</th>
<th>Frequency Guideline Sites</th>
<th>Percentage Guideline Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 2</td>
<td>211</td>
<td>49.41</td>
<td>322</td>
<td>65.71</td>
<td>155</td>
<td>50.00</td>
</tr>
<tr>
<td>2 - 4</td>
<td>120</td>
<td>28.10</td>
<td>94</td>
<td>19.18</td>
<td>89</td>
<td>28.71</td>
</tr>
<tr>
<td>4 - 6</td>
<td>60</td>
<td>14.05</td>
<td>38</td>
<td>7.76</td>
<td>38</td>
<td>12.26</td>
</tr>
<tr>
<td>6 - 8</td>
<td>21</td>
<td>4.92</td>
<td>16</td>
<td>3.27</td>
<td>17</td>
<td>5.48</td>
</tr>
<tr>
<td>8 - 10</td>
<td>7</td>
<td>1.64</td>
<td>6</td>
<td>1.22</td>
<td>5</td>
<td>1.61</td>
</tr>
<tr>
<td>10 - 12</td>
<td>4</td>
<td>0.94</td>
<td>4</td>
<td>0.82</td>
<td>3</td>
<td>0.97</td>
</tr>
<tr>
<td>12 - 14</td>
<td>2</td>
<td>0.47</td>
<td>3</td>
<td>0.61</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>14 - 16</td>
<td>1</td>
<td>0.23</td>
<td>2</td>
<td>0.41</td>
<td>1</td>
<td>0.32</td>
</tr>
<tr>
<td>16 - 18</td>
<td>0</td>
<td>0.00</td>
<td>5</td>
<td>1.02</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>18 - 20</td>
<td>0</td>
<td>0.00</td>
<td>N/A</td>
<td>N/A</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>20 - 22</td>
<td>1</td>
<td>0.23</td>
<td>N/A</td>
<td>N/A</td>
<td>1</td>
<td>0.32</td>
</tr>
</tbody>
</table>

Table 6.8

6.9.7 Aspect

Aspect is the compass direction of the slope on which a site is situated. It has often been assumed that a south facing aspect may have been preferred for most site locations; however, it is possible that patterns of prevailing winds could have also affected the choice of aspect.

Aspect was determined automatically by the GIS for each site location by ascertaining the orientation of the TIN triangle in which the site centroid was located. Analysis of the aspect data suggests that the centroids of 60.2% of all known archaeological sites are located on south facing slopes. However, the majority of non-site locations (55.5%) are similarly oriented. In terms of interpretation, this suggests that the majority of archaeological assessment which has taken place within the City has been conducted in areas where the general direction of the slope has been to the south (see Figure 6:10 A and B).
Archaeological Site and Non-Site Aspects

All Sites

Non-Sites

Guideline Sites

Type 3 Sites

Figure 6.10
There is however, a trend for archaeological resources to be located on south facing slopes. Nevertheless, the difficulties described in Section 6.9.6 with regard to mapping areas of significant slope, pertain equally to mapping for aspect. Therefore, given the somewhat equivocal nature of the results, combined with the difficulties in effectively operationalizing this variable, aspect was not employed as a limiting factor in the archaeological potential model.

6.9.8 Topographic Variability

Other measures of landform have also been used to evaluate site locations. Topographic variability can be determined through examination of elevational differences in a catchment zone around a site. The examination of local topographic variability in most potential models has been designed to test the hypothesis that extremely steep or hilly areas are "poorly suited for settlement because they increase energy and time expenditures in travel to food and water resources" (Kvamme 1990:217). Alternatively, it has been suggested that a certain amount of topographic variability may have been a desirable feature in that it can affect the view of surrounding terrain as well as the degree of protection from or access to prevailing winds.

In order to generate a measure of the local topographic variability, the slope measurements of the TIN triangles located within 200 metres of a site centroid were utilized to calculate the variance in elevation. In this way it was possible to express numerically the degree of topographic variability within a predetermined distance from a site centroid. Variance was automatically calculated by the GIS using the equation, \( V = \text{the sum of the total of (elevations squared)/the number of elevations} - \text{(the mean of the elevations)} \text{ squared.} \)

Analysis of the topographic variability data failed to reveal any significant patterns which could be utilized to restrict the area necessary for survey prior to development. In general, the terrain encompassed within the new City limits tends to be quite flat. However, 84.7% of the non-sites, opposed to only 73.7% of the known site locations, had less than 10 metres of topographic variability within 200 metres of their centroids. This suggest a slight trend towards sites being located in areas of moderate topographic relief, while non-sites cluster more heavily in areas with very little topographic relief.

6.9.9 Prehistoric Potential Model Summary

The analysis of the biophysical data for the 427 known prehistoric site locations and the 490 non-site locations resulted in the generation of a prehistoric potential model which encompasses 54.4% of the City by area. Using the "Gain" statistic to establish which variables could be effectively utilized to limit the areas of the City which need to be examined, it was determined
that distance to water, and in particular, distance to different water sources, provided the basis for the most efficient model.

The water source buffer was set at 200 metres for Class 1 streams, 177 metres for Class 2 streams, 198 metres for Class 3 streams, 220 metres for initial feeder streams, and 200 metres for ponds and wetlands. With these buffer limits, the overall capture rate for sites which would require some form of mitigation sites reached 80.4%, while "all sites" captured rose to 72.8%. While this model results in the capture of the vast majority of known archaeological resources in the City, it would still fail to capture close to 20% of the very important Type 3 resources. Measures which can be taken to ensure the capture of this additional 20% of sites are discussed with regard to the implementation of the potential model in Section 7.0.

Other variables, including soil texture, glacial geomorphology, aspect, and topographic variance, may prove useful in modelling for specific site types or sites from a given time period. However, they ultimately proved to be less useful in creating a general purpose archaeological potential model. It was demonstrated that slope could be employed to limit the area requiring survey; however, difficulties pertaining to the mapping of this variable, in conjunction with limited increase in efficiency which it would impart in the model, led to the decision not to employ slope in the creation of the final, potential mapping.

6.10 The Historic Archaeological Potential Model Goals

While the prehistoric potential mapping comprised a major portion of the over all archaeological resource potential model, it was still necessary to define criteria which would capture sites relating to the early stages of London's historic development. The prehistoric potential mapping will, by default, capture some historic resources, especially rural domestic sites. However, a separate historic model was required to create unified archaeological potential mapping.

Although a historic potential model needs to be uniquely tailored to the community in which it will employed, there are several general criteria which have been established for capturing historic archaeological resources. The following section provides a review of three pertinent attempts at mapping historic archaeological potential.

6.11 Sources of Comparison for the Historic Potential Model

Three studies of particular relevance to London's historic archaeological potential model include; Hasenstab and Resnick's (1990) work at Fort Drum in upper New York state, Cooper and Robertson's (1994) model developed for the district of Muskoka, and the Regional Municipality of Waterloo's archaeological potential criteria (1989).
6.11.1 Historic Fort Drum

Hasenstab and Resnick developed a historical potential model for the 2712 hectare Fort Drum military base in northern New York state, based on the historically mapped locations of farmsteads, related rural sites and historic roadways (1990:291). Critical buffer zones surrounding these features were defined as the basis for the model. High potential zones were defined simply as areas within 400 feet (122 metres) of a mapped historic site location. Moderate potential zones ranged between 400 feet (122 metres) and 700 feet (213 metres) from a mapped site or within 300 feet of an historic road. Hasenstab and Resnick tested their model using field survey of areas at each level of historic potential.

Statistical testing of the model found that "mapped historic sites, most of which are farmsteads, are by far most patterned toward roadways" and the "(f)ield-identified farmsteads show a similar tendency" (Hasenstab and Resnick 1990:300). Interestingly, the attempt to use mapped structure locations as a means of determining the potential for actual sites was less reliable than using proximity to historic roads. Hasenstab and Resnick assigned the cause for this result to cartographic error and/or to sites which were simply never illustrated on the maps. This is extremely important in that many non-mapped sites will represent structures destroyed or abandoned prior to the generation of the early maps, and thus comprise some of the most interesting resources.

Another significant problem that Hasenstab and Resnick identified was their assumption that low-lying areas in stream floodplains would not contain historic sites. In the field test of their model, a significant number of historic sites were documented in these areas. In the context of the overall City of London archaeological resource potential mapping, the potential for missing historic sites in low lying areas will be avoided due to the distance to water criteria built into the prehistoric archaeological resource mapping.

6.11.2 District of Muskoka

The District of Muskoka heritage resources master plan separated historical potential into two phases. For the early historic period (1600-1830), it was concluded that "the location of sites can...be expected to largely conform to the same environmental constraints which operated in the prehistoric period" (Cooper and Robertson 1994:184). For the "expansion and in-filling" phase (1830-1900), it was concluded "historic occupations become increasingly focused upon the newly developed transportation and communication networks formed by surveyed roads (Ibid).

Cooper and Robertson suggest that:
"Corridors of moderate to high archaeological potential should be placed along all colonization roads. In order to ensure the discovery of nineteenth century structures along these early travel ways, it is recommended that 300 metre corridors be delineated along either side of major roads and 100 metres wide along side roads. It is further proposed that a 500 metre zone of high archaeological potential be established around all known historic industrial sites and crossroad communities."

Cooper and Robertson 1994:184

Cooper and Robertson (1994:185) conclude that:

"(f)or a number of reasons, the predictive modelling of historic Euro-Canadian sites does not require as stringent a theoretical approach as that for prehistoric site potential modelling. In the first place, historic sites, in contrast to prehistoric ones, frequently remain highly visible in the modern landscape as structural ruins or areas of physical disturbance. Clearings in the bush or relict garden plots which may also indicate former occupation sites are also readily identifiable. A further consideration is the fact that only those historic sites which date to the early period of Euro-Canadian settlement in a region (which can be expected to form only a very small percentage of the total) are considered to be archaeologically significant. The more numerous sites of relatively recent date seldom yield data which usefully contribute to an archaeological understanding of a study area’s past."

In their final analysis, Cooper and Robertson felt that for the District of Muskoka, it was not necessary to carry out detailed potential mapping for historic archaeological resources. They suggest "this is particularly true in light of the fact that sufficient historic documentation exists in the form of censuses, assessment roles, historic atlases and other maps". These data sources can allow the "actual pattern of settlement to be reconstructed, superseding the need to develop a model of predicted site distributions." For the Muskoka District, therefore, it was recommended that such documentary and cartographic review take place as required during the development plans review process (Cooper and Robertson 1994:185).

6.11.3 Regional Municipality of Waterloo

The Regional Municipality of Waterloo has developed archaeological potential mapping which includes a historic potential component. Several variables were utilized, including:
1. Distance to water

The Waterloo model assigned high historic archaeological potential to areas within 150 metres of a water source and moderate potential to all areas within 300 metres. With regard to the City of London, these areas will require survey based on the results of the prehistoric potential model.

2. Documented historic centres

Early urbanized centres and areas settled at a higher density than strictly rural portions of the study area were mapped and held "in reserve" until the research required to confirm their status as areas of archaeological potential could be conducted (Regional Municipality of Waterloo 1989:32-33). Such areas included villages, towns and cities.

3. Structures indicated on early maps

Areas within 100 metres of structures indicated on the 1861 Tremaine and the 1881 Parsell maps were assigned high historic potential.

4. Historic roads

Moderate potential was assigned to areas 100 metres on either side of a pre-1856 road.

6.12 City of London Historic Criteria

Cooper and Robertson (1994:185) are correct in suggesting that historic archaeological resources do "not require as stringent a theoretical approach as...prehistoric potential modelling." However, in order to create an overall archaeological potential model which could provide yes/no determinations of the need for an archaeological assessment, it was necessary to create a mappable historic potential coverage.

In constructing the historic coverage the decision was made not to model for rural residential sites. Rural 19th century homesteads are both quite common, and should be discovered in sufficient quantities based on the criteria developed for the prehistoric resource coverage. Additionally, homestead sites are often mapped in easily accessible sources, routinely checked by consulting archaeologists as part of a standard assessment. Therefore it was concluded that there was no need to specifically consider these resources when developing the historic coverage.
In delimiting the areas which would be mapped in the historic potential coverage the earliest resources in the City were targeted.

1. The Early Urban Core

All areas within the identified limits of early historic London (pre-1845). This includes the portion of the City bounded by Wellington Street to the east, the Thames River to the south and west and Dufferin Avenue to the north. Only small portions of this area still retain sufficient integrity to possess mitigatable archaeological sites, however there are various important resources known to be present, ranging from historic cemeteries to the Talbot Block.

2. East London Industrial District

All areas between Adelaide and Egerton and between Dundas and the south Branch of the Thames. This area comprised a historically significant area of oil refining and railways, along with supporting industries.

3. Historic Roads

Early historic roads were the foci for the earliest settlement. Each of the following roadways was given a 200 meter buffer (see Figure 6.12).

Commissioners Road Hamilton Road
Dundas Street Colonel Talbot Road
Kilworth Road Longwoods Road
Wharncliffe Road Blackfriars

4. Identified Early Historic Communities

There are a number of early historic communities identified which may retain the potential for intact archaeological deposits. The limits of each of these communities were digitized and added to the historic coverage.
The City of London Archaeological Master Plan

In total, the historic model covers 1,828 hectares, or 4.3% of the City by area.

6.13 Integrity Mapping

In relation to archaeological resource management, "Integrity" relates to the nature of past soil disturbance activities, and hence to the degree of likelihood that sites may have survived. Loss of integrity can result from natural processes such as erosion, however the majority of impacts are cultural, including quarries, land fills, and housing, commercial or industrial subdivisions.

Integrity was hand mapped on 1:10,000 OBM paper sheets, based on the criteria listed in 6.11.1 (see Figure 6.13). The 1:10,000 OBM mapping for the London area is based on 1985 air photography, therefore in an attempt to update the integrity coverage, all areas along the periphery of the City, where development pressures have been concentrated were double checked against the 1993 air photo coverages.

Because of the need to produce a potential model which could provide straightforward, yes/no determinations of the need for archaeological assessment, the assignment of integrity levels were restricted to "sufficient" or "insufficient". Further determinations of the level of integrity of a property will be established in the field by licensed archaeologists at the time of assessment.

6.13.1 Integrity Criteria

Areas with sufficient integrity to contain reasonably undisturbed archaeological resources include:

- woodlots;
- ploughed land;
- areas that have experienced use as parkland since 1900 or earlier;
CITY OF LONDON INTEGRITY MAPPING

LEGEND

- Areas with sufficient integrity to retain archaeological resources
- Areas with insufficient integrity to retain archaeological resources

Scale = NTS

31,480.3 ha
74.5%

10,748.7 ha
25.5%
• playing fields which have not experienced severe grading;

• open areas of more than .25 hectares within pre-1960 residential areas;

• substantial areas of open ground surrounding twentieth-century structures;

• modern surface parking lots which have not experienced severe grading.

In total, 31,480.3 hectares (74.5%) of the City were found to have sufficient integrity to retain intact archaeological deposits.

6.14 Combined Archaeological Potential Model Mapping

Upon completion of: 1) the prehistoric potential mapping; 2) the historic potential mapping; and, 3) the integrity mapping, these coverages were merged in the GIS into a unified coverage mapping areas of the City which require assessment in advance of development. Additionally, assessed properties which have already been assessed and cleared of all archaeological concerns by the Ministry of Citizenship, Culture and Recreation, were also removed from the model. The combination of these coverages into the "Archaeological Potential Model", resulted in 19,088.6 hectares (45.2%) of the City being determined to have high to moderate potential for the recovery of archaeological resources.

6.15 Limitations of the Potential Model

The criteria on which the Archaeological Potential Model is based were generated from the best archaeological understanding of the London prehistoric and historic record as of July 1/1995. As more data are acquired and our understanding of the local archaeological record improves, it will be possible to refine the Archaeological Potential Model.

This type of objective potential model has been developed to only a limited degree elsewhere in Canada, and as a consequence, it is difficult to determine if it will be sufficiently precise to ensure the protection of archaeological resources. Various uncontrollable factors detract from any attempt to produce a "perfect" model. Contributing biases including:
1. Past variability in the intensity of field survey.

Properties have been field examined at different survey intervals, as well as with different techniques. Moreover, field directors have made varying judgments concerning the degree of intensity at which different properties and different parts of properties were surveyed. Additionally, in many early licence reports the level of reporting was insufficient to control for these variables in creation of the Master Plan.

2. MCZCR’s past determinations of archaeological potential.

Another problem in trying to generate potential mapping criteria based upon the biophysical locations of known sites is that the MCZCR has only required archaeological survey in areas which, based on their criteria list, had moderate to high archaeological potential. As a result, areas distant from a source of potable water have been inadequately sampled. This is not as serious a problem in London as it would be in other municipalities because the London Museum of Archaeology, as part of their ongoing City of London Archaeological Survey, has examined large areas without regard to Ministry potential criteria.

3. Past archaeological research interests.

The research interests of archaeologists working in the London area have sometimes focused on locating archaeological sites dating to certain periods of interest. In these instance their survey efforts have been based on assumptions concerning the typical locations of sites from a certain time period (e.g. Late Woodland). As a consequence, certain types of locations have experienced much more survey than have others.

4. Foci of development.

Since the addition of the review for heritage concerns in the plans review process, development pressure has occurred on the periphery of the already urbanized portion of the City. This too has contributed to certain types of environment being underrepresented in the sample of assessed properties. For instance, very little archaeological research has been carried out on the floodplain of the Thames River, even though archaeological research conducted just west of the City suggests that this environment should be rich in archaeological resources.
The present inability to be certain of the model’s accuracy requires that the model be applied in such a manner that the loss of archaeological resources will be minimized and future testing of the model can be provided for. Therefore, it will be required that any property where all or a portion of the development area is determined to have potential to impact archaeological resources, be completely assessed. Using this method of implementation, 100% of all known Type 3 sites in the City would have been recovered during the assessment process. Complete details regarding the implementation of the potential model are presented in Section 7.0.
7.0 IMPLEMENTATION

7.1 Introduction

In order for the Archaeological Master Plan to function effectively, it will require that the City of London Planning Division work in close cooperation with the Ministry of Citizenship, Culture and Recreation, the London Advisory Committee on Heritage, other divisions within the Corporation of the City of London, as well as with members of the development and archaeological communities. The following Section presents the policies and procedures required to implement the archaeological potential model.

7.2 The Review Process

All development applications, with the exception of plans of condominium, site plans, and variances, will be reviewed by Planning Division for their potential impact to archaeological resources. This review will include:

1. Plans of Subdivision
2. Official Plan Amendments
3. Zoning By-Law Amendments
4. Temporary Use By-Laws
5. Consents
6. City of London Development Projects

7.2.1 Placement of a Condition for Archaeological Assessment

Upon submission of a development application, the assigned Planning Division staff member will review the property for the presence of archaeological potential and/or the presence of known resources. This will be accomplished through an evaluation of the archaeological potential mapping on the GIS.

If all or any part of a proposed development area possesses archaeological potential or known archaeological resources, a condition of assessment will be placed on the entire property, by the City of London (see Figure 7.1). If, after review of the potential mapping, a property is determined to possess only low potential for archaeological resources, no further review will be required.
If an assessment of a property is required, a copy of the development application will be forwarded by the City to the Ministry of Citizenship, Culture and Recreation, Heritage Planner. The City of London Planning department will notify the proponent of the requirement for an archaeological assessment through the placement of a standard condition of application approval.

The proponent shall carry out an archaeological resource assessment of the entire subject property and mitigate, through avoidance or documentation, adverse impacts to any significant archaeological resources found, to the satisfaction of the Ministry of Citizenship, Culture and Recreation, and the City of London. No grading or other soil disturbances shall take place on the subject property prior to the issuance of a letter of clearance by the City of London, Planning Division.

The property will be assessed by a consultant archaeologist, licensed by the Ministry of Citizenship, Culture and Recreation under the provisions of the Ontario Heritage Act (R.S.O. 1990); and any significant sites found will be properly mitigated (avoided or excavated), prior to the initiation of construction, servicing, landscaping or other land disturbances.

Upon receipt of such notification from the City of London, it will be necessary for the applicant to retain a licensed archaeologist to conduct an archaeological assessment. All fieldwork done in the City of London as a result of a condition of archaeological assessment, must be performed according to the established provincial guidelines.

Once the archaeological field assessment has been completed, a report will be submitted by the archaeological consultant to the MCZCR. The MCZCR will review the report to ascertain if the field work met the current version of the Provincially mandated standards. If this is not the case, further archaeological assessment will be required.

If the initial fieldwork did meet the Provincial guidelines, and no archaeological resources requiring additional investigation were found, the MCZCR Heritage Planner will inform the City that all Provincial archaeological conservation and licensing requirements have been met. When the City is in receipt of this information, Planning Division will clear the existing archaeological condition for the subject property. If archaeological sites requiring further attention are located on a development property, it will be necessary for mitigation measures to be completed, and all resulting reports reviewed by the MCZCR Heritage Planner, before the archaeological condition can be cleared. The nature and extent of any subsequent mitigation measures will be prescribed by the MCZCR, Heritage Planner.
7.2.2 Applications not Requiring Archaeological Assessment

As a matter of course, all plans of subdivision will require an archaeological assessment if all or any portion of the development area is determined to possess the potential for containing archaeological resources. However, there will be applications, including some official plan amendments, zoning by-law amendments, temporary use by-laws, and consents, which will not require the placement of an archaeological condition even though the area affected is determined to possess archaeological potential.

The critical factor in determining which of these types of applications requires an archaeological assessment is, if as a result of application approval, landscape modifications can occur without any further chance of review by the City for archaeological resources.

For instance, some official plan amendments, such as the creation of the "Coves Special Policy Area", would not require the immediate archaeological survey of the properties effected. In this case, the appropriate time for archaeological assessment will arise when proponents forward property specific development applications (i.e. zoning by-law amendments, plans of subdivision, etc.). If, however, the approval of an official plan amendment could allow for any ground disturbance activities to proceed, an archaeological condition will be required.

Likewise, consent applications for which there is no potential for ground disturbance activities will not require an archaeological assessment. Similarly, temporary use by-laws which do not result in earth moving activities, such as the extension of an existing parking lot designation, will not require archaeological assessments. However, some temporary use by-laws, such as the creation of a new parking facility or a golf driving range, can involve some degree of earth disturbance activity, and will necessitate an archaeological assessment.

As is the case with consent and temporary use by-law applications, many zoning by-law amendments do not have potential for ground disturbance activities. Any zoning by-law amendments which will not result in ground disturbance activities need not be subject to an archaeological condition. However, if the potential exists for future alterations to the subject property to be made on the basis of the approved amendment (even though the proponent may not be presently proposing the alterations), the property must be subject to the standard review process.
7.2.3 Impacts to Properties by the Corporation of the City of London

Actions taken to conserve archaeological resources by the Corporation of the City of London must be consistent with the policies outlined in the amended Planning Act and its associated policy statements and the policies outlined for the private sector in the City of London Archaeological Master Plan.

Therefore, it is important that the Corporation of the City of London follow the lead of the local development community and conserve archaeological resources wherever possible. In order for this to occur, all City sponsored projects should be reviewed with regard to their potential impact to archaeological resources. There will be no need to attach archaeological conditions to improvements or repairs to the City’s existing infrastructure. However, any new City-sponsored or implemented projects, such as the construction of new playing fields or other ground disturbance activities in the City’s parks, or the widening and/or extension of the existing road network, will require the attachment of an archaeological condition if areas predetermined to have archaeological potential will be impacted. Many City projects are already reviewed as part of the Environmental Assessment (EA) process, however protocols must be established between the Planning and Building Divisions and the Engineering Department, to ensure all appropriate work plans are reviewed for archaeological concerns.

7.2.4 A Proponent’s Right of Appeal

A development proponent can appeal to the Ministry of Citizenship, Culture and Recreation Heritage Planner, if they believe that the placement of an archaeological condition on their property is inappropriate. The only basis for such an appeal will be if the proponent can convincingly demonstrate that the development area has already been significantly impacted by ground disturbance activities. If the MCZCR Heritage Planner is convinced that the subject property no longer retains any potential to contain archaeological resources, the City of London will remove the archaeological condition.

In the absence of any staff member with archaeological expertise within the City of London Planning Division, all appeals must be reviewed by the MCZCR Heritage Planner.

7.3 Provision of Information Concerning Archaeological Resources

The Planning Division staff member responsible for making determinations of archaeological potential will also be responsible for providing information to archaeological consultants, planners, and the general public.
Information concerning site locations is protected by provincial policy, and is not fully subject to the Freedom of Information Act. While this information needs to be supplied for planning purposes, specific site locations cannot be released to the public, since in the past this has led to looting or various forms of illegally conducted site destruction. All requests for site data will be processed through the staff member assigned to implement the Archaeological Master Plan.

Confidentiality of information covers all media which are capable of conveying location, including maps, drawings, or textual descriptions of a site location. Moreover, license reports are considered to be the property of the proponent and the consulting archaeologist. The MCZCR holds copies of all archaeological licence reports and only disseminates this information to parties with legitimate interests.

The City of London will provide information concerning site location to:

1. The party or an agent of the party holding title to the property.

2. A licensed archaeologist with relevant CRM interests in a site or group of sites.

3. City of London Planning Division staff for internal use.

Complete copies of the Archaeological Master Plan can be made available for sale to licensed archaeologists. Copies of Volume 1 of Master Plan as well as potential mapping without known site locations, can be made available to the private sector for planning purposes. Private sector requests for site specific data can be made via the Planning Division staff member responsible for implementing the Master Plan.

7.4 Process for Data Base Maintenance

All consultants and researchers working in within the City of London will be requested to submit to the City of London Planning Department: 1) a copy of any MCZCR contract information forms, 2) a copy of each licence report, 3) a "Site Form" and associated map segment, and 4) an "Assessed Property Form" and associated map segment. Copies of the Sites and Assessed Property forms are presented in Appendix 1 and 2, respectively.

Work conducted by archaeological consultants can be monitored through the development approval process. The acquisition of information concerning non-consulting work will rely on the co-operation of the individual researcher, the MCZCR, and the awareness of the members of the London Advisory Committee on Heritage Stewardship Sub-Committee.
The responsible City of London staff member will add any planning information not provided by the researcher and assign City of London "Sites" and "Assessed Property" numbers. The GIS and dBase data bases can then be updated, and paper files created for the new sites and assessed properties. Specific directions for updating the inventories is presented in Appendix 1 and Appendix 2.

On an annual basis, updated versions of the Sites and Property data bases will be supplied to the MCZCR, and can be made available for licensed archaeological consultants.

7.5 Annual Report

On an annual basis, the City of London Planning Division will prepare a report for review by the Ministry of Citizenship, Culture and Recreation Heritage Planner. This report will list and map all development applications processed by the City during that calendar year. The report should clearly indicate which properties were determined to require the placement of an archaeological condition, as well as those which did not.

Additionally, the report should comment on any problems encountered in implementing the Master Plan, as well as any recommendations for improving either the potential model or protocols and procedures.

7.6 Role of the London Advisory Committee on Heritage

The London Advisory Committee on Heritage will have several different functions in relation to the Archaeological Master Plan, including:

1. forwarding recommendations for the addition of archaeological resources to the Sites data base.

2. Ensuring the maintenance and the quality of the data bases and the information entered into the GIS.

3. Monitoring the implementation of the procedures and policies in the Master Plan, and providing recommendations on the ways in which they might be improved.

4. Reviewing the annual report prepared by Planning Division for the MCZCR.

5. Playing a lead role in the five-year detailed review of the Master Plan.
ARCHAEOLOGICAL REVIEW OF DEVELOPMENT APPLICATIONS

CITY OF LONDON PLANNING DIVISION

DEVELOPMENT APPLICATION SUBMITTED FOR REVIEW

REVIEW OF ARCHAEOLOGICAL POTENTIAL

Q: DEVELOPMENT IMPACT POTENTIAL?

NO? YES?

ARCHAEOLOGICAL CONDITION APPLIED TO THE DEVELOPMENT APPLICATION

ARCHAEOLOGICAL ASSESSMENT CONDUCTED / REPORT PRODUCED

CITY OF LONDON PLANNING DIVISION RECEIVES A COPY OF THE ASSESSMENT REPORT

MCZCR RECEIVES COPIES OF PLAN AND APPROVAL AUTHORITY COMMENTS FOR MONITORING PURPOSES

REPORT SUBMITTED TO MCZCR FOR REVIEW

Q: ACTIVITIES CONDUCTED AND REPORT SUBMITTED MEET LICENSING AND PROFESSION STANDARDS?

NO? YES?

Q: ARCHAEOLOGICAL RESOURCES FOUND?

NO? YES?

MCZCR NOTIFIES THE CITY OF LONDON PLANNING DIVISION THAT ARCHAEOLOGICAL CONSERVATION AND LICENSING REQUIREMENTS HAVE BEEN MET

CITY OF LONDON PLANNING DIVISION CLEAR THE ARCHAEOLOGICAL CONDITION

FIGURE 7.1
7.7 Role of the London Museum of Archaeology

Given the mandate of the London Museum of Archaeology, and their long-term involvement in every aspect of archaeology in London, the London Museum of Archaeology should be consulted with and involved in policy recommendations by the London Advisory Committee on Heritage (LACH) that affect archaeological matters. City staff, LACH and the London Museum of Archaeology should work towards the maximum effectiveness of the London Museum of Archaeology. For example, heritage activities involving tourism and education should involve and make use of the facilities and expertise present at the London Museum of Archaeology.

In accordance with the policies proposed in the new Ontario Heritage Act, it would be of benefit to the residents of the City of London if artifacts recovered within the City are held in London. Given that the London Museum of Archaeology is a sophisticated curatorial facility, and given its long history of research within the City, it is proposed that the London Museum of Archaeology should serve as the ultimate repository for artifacts recovered within London and for supporting documentation. It is recognized that researchers may wish to retain artifacts for analysis for prolonged periods. However, there should be a commitment to eventually donate their collections and supporting documentation to the London Museum of Archaeology or some other suitable public institution, notwithstanding current archaeological licensing regulations under the Ontario Heritage Act.

7.8 Periodic Review of the Archaeological Master Plan

It is recommended that the Archaeological Master Plan receive a comprehensive review on the same schedule as the City of London Official Plan (five years). In the same fashion as the Official Plan, the Archaeological Master Plan needs to remain responsive to the changing needs and pressures on the City’s archaeological resources.

This review should include:

1. A review of the Sites and Property Data Bases. The sites should be reviewed in terms of changes in the MCZCR criteria for site significance, and in terms of sites which may have been missed during the original preparation of the Archaeological Master Plan and during the regular update and maintenance process.
2. A review of the Archaeological Potential Model. The criteria for determining prehistoric potential, historic potential and the integrity mapping should all be reviewed in term of their effectiveness over the previous five-year period.

3. All policies and procedures should be reviewed in order to determine if the Master Plan is functioning effectively to streamline the development plans review process and to enhance the protection of archaeological resources.

A licensed consulting archaeologist should be retained to prepare the review. Any recommended changes to the Archaeological Master Plan should be presented to both London Advisory Committee on Heritage and the Ministry of Citizenship, Culture and Recreation for ultimate acceptance or rejection.
8.0 References Cited

Archaeological Services Inc.


Barber, R. and M. Roberts

Burger, R.W.C.
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Green, E. L.

Hasenstab, R. J. and Benjamin Resnick

Jochim, Michael A.

Kvamme, K. L.

Mierendorf, R. R., T. Kelly, D. Carlevato, and P. McLeod

Peters, John H.

Regional Municipality of Waterloo
Roberts, A.  

Roper, D.C.  

Strahler, A.N.  
APPENDIX 1

SITES DATA BASE DICTIONARY AND DATA ENTRY PROCEDURE
SITES DATABASE DATA ENTRY PROCEDURE

The following pages provide a detailed description of the procedure to be followed when entering new data into the "SITES" database. The database is designed in order to facilitate the recording of site location information, specifics about the nature of the resource, and the status of a site within the development plan review process. Constructed in dBase IV, the database is also designed for easy search and sort functions for research and cultural resource management inquiries.

The established recording procedure for each new archaeological site involves:

1. The completion of a "Sites Database Data Entry Form".
2. Data entry in the "SITES" database.
3. Updating the 1:10,000 "SITES" maps housed in Planning Division.
4. The creation of a paper file, minimally containing a completed "sites database entry form" and a 1:10,000 or 1:2,000 map segment detailing the site location. Additionally, the site file may contain correspondence relating to the site or any activities conducted there, photocopied segments of historic maps, relevant newspaper clippings, photographs, copies of research articles relating to the site, etc. Detailed archaeological license reports are NOT kept in the site file; they are catalogued and added to the library of archaeological license reports housed in the Planning Division.

Completing a Sites Database Form

The following is a step-by-step guide designed to facilitate the completion of a "Sites Database Form".

ARANUMBER: An "ARANUMBER" (Archaeological Research Area Number) is the primary reference designation by which an individual archaeological site is identified.
An ARANUMBER is comprised of two parts. The first portion consists of a two-letter abbreviation. There are twenty-two different two-letter abbreviations, each of which identifies a specific Archaeological Resource Area. For instance, "CL" stands for "Central London". A listing of these abbreviations and their corresponding Archaeological Resource Areas is provided below.

The second portion of the ARANUMBER is a four digit sequential suffix. When assigning a new ARANUMBER it is imperative that it consist of a two-letter abbreviation followed immediately by a four-digit sequential suffix. For example, the third site recorded within the Kettle Creek Archaeological Resource Area would receive the designation KC0003, the fourth site KC0004, and so on.

When entering a new site in the database it is necessary to check the map delimiting the boundaries of the Archaeological Resource Areas. To ascertain the next available number use the "Organize" function in dBase IV to sort the records by ARANUMBER. The next number can also be established by checking the paper files housed in Planning Division, which are organized by Archaeological Resource Area.

<table>
<thead>
<tr>
<th>Code</th>
<th>Area</th>
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<tbody>
<tr>
<td>BD</td>
<td>Bradley</td>
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<tr>
<td>BS</td>
<td>Brick Street</td>
</tr>
<tr>
<td>BY</td>
<td>Byron</td>
</tr>
<tr>
<td>CL</td>
<td>Central London</td>
</tr>
<tr>
<td>CR</td>
<td>Crumlin</td>
</tr>
<tr>
<td>DC</td>
<td>Dodd Creek</td>
</tr>
<tr>
<td>EL</td>
<td>East London</td>
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<tr>
<td>GO</td>
<td>The Gore</td>
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<tr>
<td>GV</td>
<td>The Grove</td>
</tr>
<tr>
<td>HP</td>
<td>Hyde Park</td>
</tr>
<tr>
<td>KC</td>
<td>Kettle Creek</td>
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<tr>
<td>LM</td>
<td>Lambeth</td>
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<tr>
<td>ME</td>
<td>Medway</td>
</tr>
<tr>
<td>NL</td>
<td>North London</td>
</tr>
<tr>
<td>OR</td>
<td>Oakridge</td>
</tr>
</tbody>
</table>
PM .................................................. Pond Mills
PB .................................................. Pottersburg
SL .................................................. South London
SC .................................................. Stoney Creek
TP .................................................. Tennants Pond
WL .................................................. West London
WO .................................................. White Oaks

ASSIDNUM:

An ASSIDNUM, or "Assessed Property Number", is a combination of letters and numbers which provides a reference to a property which has either been: 1) field surveyed by licensed archaeologists, or 2) been reviewed for archaeological concerns by an MCZCR Archaeological Plans Review Officer and/or the City of London Archaeologist/Planner.

There is a separate "PROPERTY" database which maintains an updated inventory of assessed properties within the City of London, and a more complete "ASSIDNUM" description can be found in the detailed instructions for completing an "Assessed Property Form".

The vast majority of archaeological sites which will be entered in the "SITES" database will have been located during an archaeological resource assessment or research survey. In these cases there will be an assessed property number.

In some instances archaeological sites are reported when no formal assessment has been conducted. For instance, a site located by an individual in their backyard or artifacts found eroding from a riverbank would not have an ASSIDNUM. In these instances the ASSIDNUM field is left blank.

The ASSIDNUM field also provides a "link" between the "SITES" database and the "PROPERTY" database. By using this common point the two separate databases can be easily linked in either dBase IV or in Report Writer.
BORDENUM:
The BORDENUM (Borden Number) system is used by the provincial government to inventory archaeological sites. The Ministry of Culture Tourism and Recreation maintains a database of all "registered" archaeological sites within the province. In the past this system has been applied inconsistently, in that some archaeological sites were registered while other, usually small sites, were not. Consequently, there are many known archaeological sites within the City of London which do not have provincial Borden Numbers.

All of these unregistered sites have been assigned ARA numbers during the preparation of the Master Plan. However, a situation could still arise in which it will be necessary to enter an unregistered site in the "SITES" database. In such instances the Borden Number field is left blank. In all other cases the licensed archaeologist reporting the site will provide the Borden Number.

The database is set up in such a way that the four-letter Borden prefix should be entered in upper case, followed immediately by a four-digit numeral suffix. For instance, the Borden Number AfHi-140 would be entered in the "SITES" database as AFHI0140.

The site registration system works by dividing Canada up into a series of large rectangular units, each of which is 10 minutes by 10 minutes in size. Each of these large units are subdivided into smaller blocks of approximately 80 square miles. These units are referred to as "Borden Blocks", after Charles Borden, who devised the system, and each sub-unit has a unique four letter identifier (ie. AfHi). Each new site registered in a Borden block receives a sequential numerical designation (i.e. AfHi-141), which is often referred to as a Borden Number.

DOCUMENTED:
The DOCUMENTED field provides additional information on the degree of detail to which a site has been reported. There are four possible classifications, each of which has a three-letter upper case abbreviation:
1. REGISTERED (REG): indicates that the site is registered. In this case it will have a Borden Number.

2. LISTED (LIS): indicates that there is precise locational information and actual physical evidence of an archaeological site, such as an unregistered findspot. In many cases there is a decision made on the part of the reporting archaeologist not to register small sites. At the time of writing this document there were no clear directives from the MCZCR regarding what types of sites had to be registered.

3. DOCUMENTED (DOC): indicates a precise site location is known from archival or oral sources but archaeological investigation has yet to produce any direct physical evidence. For instance, the location of historic rural school houses have been entered into the "SITES" database as "DOC" sites.

4. SUSPECTED (SUS): indicates that there is a firm lead to an archaeological site; however, there is no precise locational information. If only a lot and concession reference is available, map the site in the centre of the lot. If the location can be pinned down more precisely, map the site as close to the suspected location as possible. The COMMENTS field can be utilized to explain the placement of the site.

CENTEAST:

The UTM centroid easting coordinate for the location of a site at 10 metre accuracy, following the CHIN (Canadian Heritage Information Network) system [6 digits, i.e. 4______]. In the case of registered sites, this information should be available on the provincial site registration form (Borden Form). For all other site categories, this information is most easily derived from the 1:10,000 Ontario Base Maps.
CENTNORTH: The UTM centroid northing coordinate for the location of an archaeological site at 10 metre accuracy, following the CHIN system [7 digits, i.e. 47____].

ONETOTEN: The identification number for the 1:10,000 OBM map sheet. For instance, map sheet 10 17 4800 47550 will be recorded as 8055. If the site extends onto more than one map sheet, record the map sheet on which the centroid of the site is located.

ONETOTWO: The identification number for the 1:2,000 OBM map sheet. For instance, map sheet 10 17 4810 47560 will be recorded as 8156. If the site extends onto more than one map sheet, record the map sheet on which the centroid of the site is located.

ADDRNUMB: The ADDRNUMB (Address Number) field is used to record the street number at which an archaeological site is located. If the site spans several municipal street numbers, use a hyphen to indicate the range (eg.356-368). If a site is located where there is no applicable municipal address, "NA" should be entered in this field.

STREETNAME: This field is used to record the street name in upper case letters. The street name recorded should be the closest street from which the site can be accessed.

LOTPART: The LOTPART field is used to indicate within which part of a lot a site is located. There are eight possibilities: S, N, E, W, SW, SE, NW, NE. If it is possible to determine within which quarter lot a site is located, then the more precise indicator should be used.

LOT: This field is used for recording the lot number of a site. If a site extends onto more than one lot, the lot in which the centroid of the site is located should be recorded. A note can be made in the COMMENTS field to indicate that the site extends over more than one lot. There are several locations in the city where lots are designated by letters rather than numbers. In these instances upper case letters should be used.
CONCESSION: This field is used for recording the concession number. Within London concessions have been labelled using several different systems. Therefore, the concession reference may be alphabetic or numeric, depending on where a site is located in the city. There are also four three-letter abbreviations which are listed below which account for all other possibilities which can be encountered in London.

West of Talbot Road .................. WTR
East of Talbot Road .................. ETR
Gore .................................. OR
Broken Front .......................... BRF

TOWNSHIP: This field is utilized to indicate the township within which a site is located. London now encompasses parts of five townships. The three-letter abbreviations for the townships are provided below. These abbreviations must be entered in upper case letters.

WST ................................. Westminster
LND ................................ London
DEL .................................. Delaware
NIS .................................. West Nissouri
DOR ................................ North Dorchester

NAME: The field is used to enter the colloquial site name. Site names are assigned by the researchers, although not all sites are assigned colloquial names. If no site name is provided, leave this field blank. Use upper case letters.

ALTNAME: This field is used only if there have been alternative colloquial names assigned to a site. For instance, the Lawson site is also referred to as the Shaw's Woods site in some early literature. If there are no alternative names this field will be left blank. Use uppercase letters.
RESEARCHER:

This field is used to indicate the primary researcher or license holder who conducted work at, or initially reported a site. If multiple researchers have conducted work at a site this can be indicated in the COMMENTS field. A series of three-letter abbreviations have been developed to account for all researchers who have so far conducted work within the City of London. In the future this list may have to be expanded.

ASI ..................... Archaeological Services, Inc.
CAR ..................... Art Cary
CRK ..................... Raymond Crinklaw
FER ..................... Neal Ferris, MCZCR
FOX ..................... William Fox, MCZCR
JUR ..................... Wilfrid Jury
KER ..................... Jim Keron
LMA ..................... London Museum of Archaeology
MHC ..................... Mayer Heritage Consultants
MPA ..................... Mayer, Poulton and Associates
MPP ..................... Mayer, Pihl, Poulton
POL ..................... Poulton and Associates
SAC ..................... Ernie Sackrider
SPN ..................... Michael Spence
STO ..................... David Stothers
STM ..................... Tom Arnold
WJW ..................... W.J. Wintemberg

REPORTREF:

This field is used to enter the reference number of the report in which the detailed description of the activities conducted at a site can be found. All archaeological license reports pertaining to fieldwork conducted within the City of London have been compiled by the Planning Division, and assigned catalogue numbers. These numbers consist of a three-letter researcher abbreviation, followed by the year the report was submitted to the MCZCR. For instance, the first licence report submitted by the London Museum of Archaeology in 1994 was catalogueued as LMA1994A. The second report they produced within the same calender year was catalogueued as LMA1994B, and so on. It will prove necessary to assign new licence reports catalogue numbers.
as they are made available to the city by the researchers. A bibliography of all licence reports is provided in an Appendix to the Master Plan, and is also available on WordPerfect 5.1 in Planning Division.

PHASE:

The PHASE fields are used to indicate whether a site has produced artifacts assignable to one or more of the eighteen designated phases. If material from one of the designated phases has been reported place a "1" in the appropriate field. If no artifacts are reported pertaining to a phase, place a "0" in the appropriate field. If no diagnostic artifacts have been reported from the site, place a "0" in all fields except "PRE" if the site is prehistoric, or "HIS" if the site is historic. The LWD field is used only when artifacts have been recovered which are definitely Late Woodland in origin, but cannot be definitively assigned to one of the more refined PHASE fields. A list of the phases and their three-letter abbreviations is presented below. It is desirable that these phase identifications be made by the licensed archaeologist who conducted research at the site.

EPI . . . . . . . . . . . . . Early PaleoIndian (9600-9000 B.C.)
LPI . . . . . . . . . . . . . Late PaleoIndian (9,000-8,400 B.C.)
EAR . . . . . . . . . . . . . Early Archaic (8,400-7,500 B.C.)
MAR . . . . . . . . . . . . . Middle Archaic (6000-2500 B.C.)
LAR . . . . . . . . . . . . . Late Archaic (2500-900 B.C.)
EWD . . . . . . . . . . . . . Early Woodland (900 B.C.-200 B.C.)
MWD . . . . . . . . . . . . . Middle Woodland (200 B.C.-900 A.D.)
EOI . . . . . . . . . . . . . Early Ontario Iroquoian (900-1300 A.D.)
MOI . . . . . . . . . . . . . Middle Ontario Iroquoian (1300-1400 A.D.)
LOI . . . . . . . . . . . . . Late Ontario Iroquoian (1400-1652 A.D.)
LWD . . . . . . . . . . . . . Late Woodland (general, covering EOI, MOI, LOI)
PRE . . . . . . . . . . . . . Undetermined Prehistoric
HNV . . . . . . . . . . . . . Historic Native (1652-1790 A.D.)
PIO . . . . . . . . . . . . . Early Pioneer (1790-1825 A.D.)
ELO . . . . . . . . . . . . . Early London (1826-1845 A.D.)
EVC . . . . . . . . . . . . . Early Victorian (1846-1866)
LVC . . . . . . . . . . . . . Late Victorian (1867-1913)
HIS . . . . . . . . . . . . . Undetermined Historic
FUNCTION: Some of the historic sites within the city can be assigned definite functions. A list of four-letter upper case abbreviations have been provided to deal with these possibilities. In the future it may prove necessary to expand this list to account for unforeseen possibilities.

CHCH .................. Church
MILL .................... Mill
SCHL ..................... Schoolhouse
BLSM .................... Blacksmith’s Shop
CEMT .................... Historic Cemetery
FACT ..................... Factory
CABN ..................... Log Cabin

SITEAREA: This field is used to record the area of the site in hectares. Entries can be made up to three decimal places. If the size of a site is unknown, this field should be left blank.

DELIMITED: The DELIMITED field is used to record whether or not the entire site area has been defined. A single upper case entry of "Y" for yes or "N" for no is all that is required.

BURIALS: The BURIALS field is used to indicate if human remains are known to be located at a site. Four upper case abbreviations have been developed to account for all situations which have been encountered to date.

NONE ................ No Known Internments
PREHIS ................ Prehistoric Burials
INACTV ............ Inactive Historic and Modern Cemeteries/Burials
ACTIVE ............. Active Historic and Modern Cemeteries

EXCAVATED: The EXCAVATED field is only used for registered and listed resources. In all other cases it will be left blank. This field is designed for recording information pertaining to the level of work which has been conducted at the site. The "Stage 3" and "Stage 4" options relate to the 1993 Ministry of Culture, Tourism and Recreation "Archaeological Assessment Technical Guidelines", a copy of which is provided in an Appendix to the Master Plan.
IDENTONLY . Identified Only
STAG3PART . Stage Three Assessment Partially Complete
STAG3COMP . Stage Three Assessment Complete
STAG4PART . Stage Four Assessment Partially Complete
STAG4COMP . Stage Four Assessment Complete
RESPART . Partial Research Excavation of a Site
RESCOMP . Total Research Excavation of a Site
AMAPART . Partial Amateur Excavation of a Site
AMACOMP . Total Amateur Excavation of a Site
AVOIDE . Site Avoided After Negotiation with the MCZCR

SITEINTEG: The SITEINTEG (Site Integrity) field is used to indicate if some or all of a site remains intact. There are three possible entry options; "Y" for yes, "N" for no and "?" for unknown.

CONTNCNCRN: The CONTNCNCRN (Continuing Concerns) field is used to indicate whether or not the site requires any further attention from a resource management perspective. This field should be completed with either a "Y" for yes or "N" for no.

MITCOND: The MITCOND (Mitigation Condition) field indicates if the Ministry of Citizenship, Culture and Recreation or the City of London have placed a mitigation condition on a site. An upper case "Y" is used to indicate the presence of a condition and a "N" is used to indicate that no condition has been placed.

MITAUTH: The MITAUTH (Mitigation Authority) field indicates which agency placed the mitigation condition on a site. There are four options:

MCZCR . Ministry of Citizenship, Culture and Recreation
CITLON . City of London
LACH . London Advisory Committee on Heritage
NA . Not Applicable

COLLECTION: This is a memo field used to describe the nature of the collections from the site.
<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>COLLOCATION</td>
<td>COLLOCATION (Collection Location) is a memo field used to list where the collections from the site are currently housed.</td>
</tr>
<tr>
<td>RELEVLT</td>
<td>RELEVLT (Relevant Literature) is a memo field used to list additional licence reports, journals or newspaper articles relating the site.</td>
</tr>
<tr>
<td>COMMENTS</td>
<td>This memo field can be used for any additional information which may be relevant to the site.</td>
</tr>
</tbody>
</table>
APPENDIX 2

ASSESSED PROPERTY DATA BASE DICTIONARY AND DATA ENTRY PROCEDURE
ASSESSED PROPERTY DATA ENTRY PROCEDURE

Assessed properties are those which have either been: 1) field surveyed by licensed archaeologists, or 2) reviewed for archaeological concerns by the Ministry of Citizenship, Culture and Recreation Archaeological Plans Review Officer, and/or the City of London Archaeologist/Planner.

In many instances a development property is judged by the reviewing authorities to have low potential for the discovery of archaeological resources and is consequently not field assessed. These properties are recorded in the "PROPERTY" data base along with those properties with sufficient archaeological potential to warrant the attachment of a standard archaeological condition. The decision was made to include these low potential areas in the database in order to maintain a complete inventory of all properties which have been commented on for archaeological concerns. In this way it will be possible to maintain consistency in the evaluation of development liaisons which are forwarded on more than one occasion or in slightly altered forms.

The following pages provide a detailed description of the procedure to be followed when entering new data into the "PROPERTY" database. The database is designed to facilitate the recording of property size and locational information as well as the status of a property within the development plan review process. Easy search and sort functions to facilitate cultural resource management and research inquires. All alphabetic entries in the "Property database must be made in uppercase letters.

The established recording procedure for each new assessed property involves:

1. The completion of an "Assessed Property Form".
2. Updating the 1:10,000 "PROPERTY" maps housed in the Planning Division.
3. Data entry in the "PROPERTY" database.
4. The creation of a paper file, minimally containing a completed "Assessed Property Form" and a 1:10,000 or 1:2,000 map segment showing the precise location of the assessed property. In addition, the paper file may contain a copy of the development application liaison (if applicable), copies of relevant correspondence relating to any archaeological concerns, relevant newspaper
clippings, photographs, photocopied segments of historic maps or airphotos, etc. Detailed archaeological licence reports are NOT kept in the "PROPERTY" file, they are catalogued and added to the library of licence reports housed in Planning Division.

Completing an Assessed Property Data Entry Form

ASSIDNUM: An "ASSIDNUM" (Assessed Property Number) is the primary reference designation by which an assessed property is identified in the "PROPERTY" database.

The first portion of an ASSIDNUM is comprised of a two-letter abbreviation. There are twenty-two different two-letter abbreviations, each of which identifies a specific Archaeological Resource Area (see the Archaeological Resource Area map). For instance, "CL" stands for "Central London". A listing of the abbreviations along with their corresponding Archaeological Resource Areas is provided below.

The second portion of the ASSIDNUM is the two-letter abbreviation, AP" (Assessed Property). "AP" is placed immediately after the Archaeological Resource Area abbreviation to indicate that the number refers to an Assessed Property, not a site. For instance, all assessed property numbers in the Stoney Creek Archaeological Resource Area will begin with "SCAP......".

The third part of the ASSIDNUM is a three digit sequential suffix. For example, the fourth assessed property in the Stoney Creek Archaeological Resource Area will be designated as "SCAP004", the fifth "SCAP005", and so on.

When entering a new assessed property in the database it is necessary to check the map delimiting the boundaries of the Archaeological Resource Areas to ascertain the appropriate two-letter abbreviation. Once the correct Archaeological Resource Area has been identified it will be possible to establish the next
The City of London Archaeological Master Plan

sequential numeric suffix by using the "Organize" function in dBase IV to order the records by ARANUMBER. This number can also be established by checking the paper files which are organized alphabetically by Archaeological Resource Area.

BR ............................................. Bradley
BS ............................................. Brick Street
BY ............................................. Byron
CL ............................................. Central London
CR ............................................. Crumlin
DC ............................................. Dodd Creek
EL ............................................. East London
GO ............................................. The Gore
GV ............................................. The Grove
HP ............................................. Hyde Park
KC ............................................. Kettle Creek
LM ............................................. Lambeth
ME ............................................. Medway
NL ............................................. North London
OR ............................................. Oakridge
PM ............................................. Pond Mills
PB ............................................. Pottersburg
SL ............................................. South London
SC ............................................. Stoney Creek
TP ............................................. Tennants Pond
WL ............................................. West London
WO ............................................. White Oak

ONETOTWO:

Identification number for the 1:2,000 OBM map sheet on which the assessed property is located. For instance, map sheet 10 17 4810 47560 will be recorded as 8156. If the assessed property extends onto more than one 1:2,000 map sheet, record the map sheet number on which the centroid of the assessed property is located.

ADDRNUMB:

The ADDRNUMB (Address Number) field is used to enter the street number at which an assessed property is located. If a property spans several municipal street numbers, use a hyphen to
indicate the range (eg. 356-368). If an assessed property is located
where there is no applicable municipal address, then "NA" should
be entered in this field.

**STREETNAME:**
This field is used to record the street name. The street name
recorded should be the closest street from which the property can
be accessed.

**LOT:**
The lot field is used to record the lot number of an assessed
property. If an assessed property extends onto more than one lot,
the lot in which the centroid of the assessed property is located
should be recorded. A note can be made in the COMMENTS
field to indicate that the property extends over more than one lot.
There are several locations in the City where lots are designated
by letters rather than numbers. In these instances the appropriate
uppercase letter should be entered in this field.

**CONCESSION:**
This field is used for recording the concession on which an
assessed property is located. Concessions within London have
been labelled using several different systems. Therefore the
concession reference may be either alphabetic or numeric. There
are also four three-letter abbreviations listed below which account
for all other possibilities which can be encountered within the new
city limits.

West of Talbot Road ......................... WTR
East of Talbot Road ......................... ETR
Gore ........................................... GOR
Broken Front ................................. BRF
TOWNSHIP: This field is utilized to indicate the township within which a site is located. London now encompasses parts of five townships. The three-letter abbreviations for the townships are provided below. These abbreviations must be entered in uppercase letters.

WST ....................... Westminster
LND ....................... London
DEL ....................... Delaware
NIS ....................... West Nissouri
DOR ....................... North Dorchester

REPORTREF: This field is used to enter the reference number of the licence report detailing the activities conducted on an assessed property. All archaeological license reports pertaining to fieldwork conducted within the City of London have been compiled by the Planning Division, and assigned a catalogue number. These numbers consist of the three-letter RESEARCHER abbreviation followed by the year in which the report was submitted to the MCZCR. For instance, the first licence report submitted by the London Museum of Archaeology in 1994 was catalogued as LMA1994A. The second report the London Museum of Archaeology produced within the same calendar year was catalogued as LMA1994B, and so on. It will prove necessary to assign catalogue numbers to new licence reports as they are made available to the City by the researchers. A bibliography of all licence reports is provided in Appendix ___ to the Master Plan and is also available on Wordperfect 5.1 in the Planning Division.

If the report on an assessed property is still outstanding, leave this field blank until the report is submitted and catalogued. If there is no report expected, as for properties which did not require field assessment, enter "NA" in this field.

ADDNREPORT: ADDNREPORT (Additional Report References) is a memo field used to list any additional archaeological reports which have been produced relating to an assessed property.
TNUMBER: This field is used to enter the Ministry of Municipal Affairs T-Number for Subdivisions or OP numbers for Official Plan Amendments. If there is no T-Number or OP number, place "NA" in this field.

SOZ: The SOZ field is used to record the City of London file number for development applications. Only the numeric portion of the file number is recorded. For instance, Z-4798 would be entered as 4798. If there is more than one file number associated with an assessed property, enter the additional number in the ADDPLANFILE memo field.

ADDPLANFIL: The ADDPLANFIL (Additional Planning Files) memo field is used to record the entire planning file number of an assessed property, including the alphabetic prefix, as well as any additional planning file numbers which relate to the assessed property.

PROJECTNAM: This field is used to list the project name. If there is no project name the developer name should be entered in this field.

DEVAREA: The DEVAREA (Development Area) field is used to enter the size of the assessed property in hectares. Entries can be made up to three decimal places.

MCZCRPOT: The MCZCRPOT (Ministry of Citizenship, Culture, and Recreation Potential) field is used to indicate the MCZCR Archaeological Plans Review Officer has commented on the potential of a property, and if so, what the results of the evaluation were. The three possible entries are listed below.

Y . . . . . . . . . . Yes (determined there was potential)
N . . . . . . . . . . No (determined there was not potential)
NA . . . . . . . . . . Not reviewed

LONPOT: The LONPOT (City of London Potential) field is used to indicate whether the City of London Archaeologist/Planner has commented on the potential of a property, and if so, what the results of the evaluation were. The three possible entries for this field are listed below.
Y ................. Yes (determined there was potential)
N .................. No (determined there was not potential)
NA .................. Not reviewed

**ASSESSCOND:**
The ASSESSCOND (Assessment Condition) field is used to record which agency placed an assessment condition on a property. The six possible entries for this field are presented below.

NONE ................. Reviewed but no condition placed
MCZCR ............... Ministry of Citizenship, Culture and Recreation
CITLON ................ City of London
VOLUNTARY . Surveyed prior to the placement of a condition
RESEARCH ............. Surveyed for research purposes
ONTHYDRO ............ Survey required by Ontario Hydro

**ASSESSRAT:**
The ASSESSRAT (Assessment Rationale) memo field should be used to explain the reason why an assessment was or was not required.

**ASSESSSTAT:**
The ASSESSSTAT (Assessment Status) field is used to indicate the current status of a property within the development plan review process.

NONE ... No requirement (not assessed, no condition placed)
PEND . Pending (condition placed, property not yet surveyed)
COMP . Complete/cleared (property surveyed and cleared)
NOCON ............... Property surveyed without requirement
ASNCL ............... Property surveyed/condition not yet cleared by MCZCR
NA .................. Unknown

**ASSESSDATE:**
The ASSESSDATE (Assessment Date) field is used to indicate the year in which an assessed property was surveyed by an archaeologist. If an assessed property did not require a field survey, then use this field to indicate the year the development liaison was reviewed by the MCZCR Archaeological Plans Review Officer and/or the City of London.
MEETGUID: The MEETGUID (Meet Guidelines) field is used to indicate whether the assessment type met or exceeded the 1993 Ministry of Culture, Tourism and Recreation "Archaeological Assessment Technical Guidelines". Use a "Y" or "N" as applicable.

ASSESSTYPE: The ASSESSTYPE (Assessment Type) field is used to indicate which type of archaeological assessment technique was employed.

PED Pedestrian transects
PIT Shovel test pits
PED-PIT A combination of test pits and pedestrian transects
CASUAL A non-systematic examination of a property

Any other technique (such as strip ploughing); note technique in the COMMENTS field.

RESEARCHER: This field is used to indicate the primary researcher or licence holder who conducted work on an assessed property. If multiple researchers have conducted work on a property, this can be indicated in the COMMENTS field. A series of three-letter abbreviations have been developed to account for all researchers who have so far conducted work within the City of London. In the future this list may have to be expanded. If no archaeological field work has been conducted on an assessed property this field should be left blank.

ASI Archaeological Services, Inc.
CAR Art Cary
FER Neal Ferris, MCZCR
FOX William Fox, MCZCR
JUR Wilfrid Jury
KER Jim Keron
LMA London Museum of Archaeology
MHC Mayer Heritage Consultants
MPA Mayer, Poulton and Associates
MPP Mayer, Pihl, Poulton
POL Poulton and Associates
SAC Ernie Sackrider
SPN Michael Spence
STO David Stothers
STM ........................................ Tom Arnold
WJW ........................................ W.J. Wintenburg

SITSPRESNT: The SITSPRESNT (Sites Present) field is used to indicate whether there are known archaeological resources on an assessed property. An "Y" should be used to indicate yes and "N" should be used to indicate that there are no known resources.

NUMBRSITEs: The NUMBRSITEs (Number of Sites) field is used to indicate the number of known archaeological sites on an assessed property.

MITSTATUS: The MITSTATUS (Mitigation Status) field is designed to flag any existing mitigation condition. The three options which are applicable to this field are:

NONE ...................................... No condition placed
PEND ................................. A condition placed but not yet cleared
COMP ................................. A condition placed and cleared

CONTNCNCN: The CONTNCNCN (Continuing Concerns) field indicates whether there are any further archaeological concerns for an assessed property. If there are no known sites on an assessed property or the property has been cleared by the MCZCR, an "N" should be placed in this field. If the property has not received clearance from the MCZCR, place a "Y" in this field.

COMMENTS: This memo field can be used to record any additional information which may be relevant to the assessed property.
APPENDIX 3

BIBLIOGRAPHY OF ARCHAEOLOGICAL REPORTS
FOR THE CITY OF LONDON
BIBLIOGRAPHY OF ARCHAEOLOGICAL REPORTS FOR THE CITY OF LONDON

Archaeological Research Associates Ltd. [ARA]

Archaeological Services Inc. [ASI]

1984a Investigation of the Gravestone Recovered from Parkwood Hospital.


Ellis, Christopher [ELL]

Heller, Emily [HEL]
Henderson, Heather M. [HEN]


Keron, James R. [KER]


1983a  Archaeological Survey of the Townships of Westminster and North Dorchester: License Number 81-74. Unpublished manuscript.


1986a  The Iroquoian Occupation of Southeast Middlesex County, Ontario. Unpublished Honours Essay, Department of Anthropology, University of Waterloo.

London Museum of Archaeology [LMA]


1985a  Report on Licence 84-73. By Robert J. Pearce. [Includes discussion of 1) Survey of Westmount Phase 6 Subdivision; 2) Surface Collection of the Woodholme Site (AgHh-36); 3) Surface Collection of the Labatt Site (AgHh-64); 4) Surface Collection of the Thomas Lewis Site (AfHi-47); 5) Investigation of the Hyde Park Sites (AfHi-79 and 80); 6) Salvage excavation of the Pincombe 2 (AfHh-24), Pincombe 5 (AfHh-71), and Pincombe 6 (AfHh-72) Sites.


1990e Phase 1 Mitigation of Seven Archaeological Sites in the Jackson District, City of London. Part 1 of 2. By Angele Smith. Museum of Indian Archaeology. Submitted to the Ministry of Culture and Communications as part of Consulting Licence 89-160B. Museum Project 89-160B-33.
1990f Phase 1 Mitigation of Seven Archaeological Sites in the Jackson District, City of London. Part 2 of 2. By Angele Smith. Museum of Indian Archaeology. Submitted to the Ministry of Culture and Communications as part of Consulting Licence 89-160B. Museum Project 89-160B-33.


of Archaeology. Consulting Licence 93-017. Museum Project 93-017-08. Submitted to Cultural Programs Branch, Ministry of Culture, Tourism and Recreation.


1994a  Archaeological Assessment (Stages 1 and 2), 155 Tweedsmuir Avenue, City of London, Ontario. Submitted to Ben Lansink, City of London, and Ontario Ministry of Culture, Tourism and Recreation.

1987a  Mayer, Poulton and Associates Incorporated [MPA]


1991a Survey of the Proposed Highway 126 Interchange at Bradley Avenue and Mitigation of the Pondview Sites, WP 228-87-00. Ministry of Transportation, Ontario, Environmental Unit, Planning and Design, Southwest Region. Licence 89-182c.


1993a Tausky, Nancy Z. [TAU] Documentation of the Historic Homestead (Site AfHh-92) South of Meadowlily Woods. [Included with LMA 1993h]