

WINTER ARCHAEOLOGY

A Technical Bulletin for Consultant Archaeologists in Ontario

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Adverse weather conditions can occur in Ontario at any time. Under adverse conditions, the risk is high that archaeological fieldwork will not meet all the required professional standards or best practices. Winter conditions, characterized by low temperatures, snow cover, frozen ground and altered drainage, are considered adverse for archaeological fieldwork. While these conditions typically occur between October and April, they may occur at other times of the year as well. These conditions can negatively affect fieldwork and the working conditions for field crews.

The *Standards and Guidelines for Consultant Archaeologists* (the *Standards and Guidelines*) do not permit archaeological fieldwork in adverse weather conditions. The options and considerations for mitigating adverse weather conditions to allow for winter fieldwork should be discussed with the ministry and the proponent for the project. If fieldwork is proposed, the reason the work cannot be carried out when conditions are more appropriate (e.g., an approaching critical development deadline) will need to be demonstrated.

If winter fieldwork is unavoidable, it will be necessary to create an artificial environment to mitigate these conditions and meet the fieldwork requirements of the *Standards and Guidelines*. Creating an artificial environment will significantly increase project costs. The logistical planning required may also take more time and may lead to delays in the project schedule. Careful consideration of all elements of the environment (e.g., lighting, temperature, soil conditions) is required to avoid increasing the risk of negatively impacting the archaeological site.

Aboriginal engagement

For many sites, Aboriginal engagement will be required by the *Standards*. Regardless of whether a standard applies, this Ministry recommends that Aboriginal communities be engaged whenever winter fieldwork is being considered for an Aboriginal site.

The licensed consultant archaeologist (Licensee) is responsible for ensuring that the *Standards and Guidelines* requirements are met. This includes developing appropriate measures to offset adverse conditions and ensuring that those measures do not negatively affect fieldwork. Once a strategy for excavation is implemented, the licensee must ensure fieldwork conditions continue to be adequate. For example, the artificial environment should strive in every way possible to be comparable to conditions that would typically exist during midday in late May. If winter archaeology is undertaken, the risks and consequences of non-compliance with the *Standards and Guidelines* and negative impacts to archaeological resources are assumed by the licensee.

Before proceeding with winter excavation, a Licensee **must** discuss and request confirmation of their proposed strategy with the Ministry of Tourism, Culture and Sport (Ministry). The request should be submitted in writing to the Ministry prior to the submission of a Project Information Form. A key aspect of any winter archaeology strategy will be thorough documentation of the fieldwork. Sufficient documentation of winter fieldwork may exceed the minimum requirements of the *Standards and Guidelines* for documenting non-winter fieldwork. This may include additional

information regarding project administration, management, infrastructure and scheduling. Additional documentation for any fieldwork carried out when there is snow on the ground or temperatures are approaching or below zero degrees Celsius will be required to demonstrate that all *Standards and Guidelines* requirements are met. Some of the information that should be documented in a proposed strategy, and the report, are discussed in the following sections.

1 Stage 1 and 2 Assessments

Stage 1 property inspection and Stage 2 pedestrian survey and test pitting cannot be carried out under winter conditions.

Snow cover will prevent pedestrian survey. Though test pits could be excavated through snow if the ground below is not frozen, heavy snow cover will inhibit visual inspection of the site such that local topography, ruins and other features may not be identified. There is an increased likelihood that the excavated soil would be wet and not screen well.

Test pit survey may be carried out when there is minimal snow cover. However, the onus is on the Licensee to demonstrate that the snow cover was minimal, the ground was not frozen, and the conditions were adequate.

Frozen ground will inhibit soil screening and thus prevent test pitting. It will also obscure visibility on ploughed fields where ice forms and will limit the ability to collect all artifacts appropriately. Therefore, neither pedestrian or test pit survey may be carried out when the ground is frozen.

What do the Standards and Guidelines say?

Section 1.2 Standard 2:

Inspect the property when weather conditions permit good visibility of land features. Do not inspect when weather conditions (e.g., snow cover, frozen ground, excessive rain or drought) may reduce the chances of observing features of archaeological potential.

Section 2.1 Standard 3:

Survey the property when weather conditions permit good visibility of land features. Do not survey when weather and lighting conditions (e.g., snow cover, frozen ground, conditions of excessive rain or drought, heavy fog) reduce the chance of finding evidence of archaeological resources.

Stage 2 mechanical test trenching to assess the potential for deeply buried archaeological remains may also pose a challenge. The Licensee, in proposing this work, must anticipate the logistical concerns and assess the risk of negative impacts to the archaeological site that may arise. If trenching is being carried out to confirm the presence or absence of deeply buried archaeological remains (as required under Section 2.1.7), neither test pitting nor pedestrian survey following standard 2 may be possible due to snow cover or frozen ground. Trenching will not be permitted until this has been carried out. Mechanical test trenching may be acceptable practice provided the strategy has been discussed with the Ministry in advance.

2 Stage 3 Assessment

Many of the *Standards and Guidelines* requirements for Stage 3 fieldwork will be difficult to meet under winter conditions. While it may be possible to take measures to establish appropriate conditions for some Stage 3 methods, other Stage 3 work will not be possible. This is particularly the case where Stage 3 assessments must be carried out over an extensive area.

Doing the fieldwork component of smaller Stage 3 assessments may be possible. However, the sequence of activities may prohibit winter work. In particular, the requirement to complete the additional controlled surface pickup (CSP) is subject to conditions that may not be achievable in winter.

A CSP requires good surface visibility, which is prevented by snow cover and frozen ground. While several methods of snow removal and thawing of the ground have been proposed, no method has been demonstrated to create the appropriate conditions (thawed and dry) or to prevent the surface from re-freezing before the CSP is complete. CSP should not be carried out when the ground is covered with snow.

What do the Standards and Guidelines say?

Section 3.2 Standard 2:

Carry out the archaeological site assessment when weather and lighting conditions permit good visibility of all parts of the archaeological site. Do not carry out the archaeological site assessment when weather and lighting conditions (e.g., snow cover, frozen ground, excessive rain or drought, heavy fog) reduce the ability to identify and document any part of the archaeological site.

Based on the results of a CSP or the distribution of positive test pits completed under acceptable conditions, it may be possible to complete Stage 3 test excavations. The proposed approach for carrying out Stage 3 test excavations in winter must meet the *Standards and Guidelines* requirements for Stage 4 (see following section).

Mechanical test trenches also pose a challenge under winter conditions. Often the size of the equipment being used will prohibit erecting a protective structure over the area of the trench. Without a structure, it is difficult to create a controlled environment that simulates the conditions required by the *Standards and Guidelines*. Approaches similar to those undertaken for Stage 2 mechanical trenching may be proposed.

3 Stage 4 Mitigation

Stage 4 mitigation of development impacts includes both *Avoidance and Protection* (Section 4.1) and *Excavation* (Section 4.2). Consultant archaeologists may propose to conduct fieldwork under winter conditions related to in both.

What do the Standards and Guidelines say?

Section 4.2.1 Standard 3:

3. Carry out excavation when weather and lighting conditions permit identification of subsurface cultural features and safe recovery of artifacts. Do not carry out excavation when weather and lighting conditions (e.g., snow cover, frozen ground, conditions of excessive rain or drought, heavy fog) may cause damage to artifacts or reduce the opportunity to identify and document any part of the archaeological site.

Section 4.1.2, Standards 1 and 2:

1. Prior to allowing access by heavy machinery in winter (e.g., vehicle crossings, time harvesting), the ground must be frozen to a depth of 10 cm or more
2. In the field season following any activity, the proponent must engage a consultant archaeologist to monitor and assess impacts on the protected area.

3.1 Protection and avoidance

Section 4.1.1, Standards 2 and 3 set out the requirements for inspecting and monitoring grading and other soil-disturbing activities adjacent to archaeological sites being protected by avoidance. When this work is undertaken in winter, the Licensee must take reasonable precautions to ensure that the ability to complete monitoring to a professional standard is not compromised by adverse conditions. These conditions must be reported in detail as set out in Section 7.10 of the *Standards and Guidelines*.

3.2 Frozen ground access

In general there are two instances which may require the Licensee to complete fieldwork as part of the protection and avoidance of an archaeological site in winter conditions: vegetation removal and frozen ground access.

Frozen ground access to archaeological site areas for temporary access or (above-ground) vegetation removal does not require the active involvement of a consultant archaeologist during winter. However, Section 4.1.2, Standard 2 requires that the Licensee complete a review in the following year to evaluate the level of disturbance, if any, that resulted from the activity. The Licensee should ensure that recommendations for avoidance and protection made at the end of Stage 3 include direction regarding frozen ground access and vegetation removal. For example: the ground must be frozen to at least 10 cm; vegetation must be cut only to ground level with no

stump removal, etc. As best practice, any frozen ground access of an archaeological site should be facilitated and monitored by a licensed archaeologist.

Landowners may also want to perform property maintenance, such as vegetation removal, on an archaeological site that has been protected and avoided. In these situations, the Ministry recommends that the work be completed when the ground is frozen, following Section 4.1.2 so as to not disturb the archaeological deposits. The removal should be completed by hand and stumps should not be pulled out. Brush should be cut with a chainsaw or hand-operated trimmer. The removal should be photographed and documented in a protection and avoidance report as outlined in Section 7.10.

3.3 Planning winter excavation

At the conclusion of Stage 3, the extent of the archaeological site to be mitigated should be known and detailed strategies for Stage 4 recommended. If the Licensee determines that Stage 4 excavation must be carried out under winter conditions, the Licensee **must** meet the *Standards and Guidelines*. There are no exceptions.

Therefore, a primary limiting factor in deciding whether a site can be excavated is the ability to erect a structure that is sufficient to contain the archaeological site and maintain appropriate conditions. In many cases, the archaeological site may be too large to be contained within a single enclosure. Here, additional logistical planning will be required to address concerns such as, which areas will be excavated underneath the structure and how additional potential impacts to unexcavated site areas outside the structure will be mitigated. More considerations are listed in Section 5 of this technical bulletin.

3.4 Hand excavation

The objectives of excavation are to:

- document the site for features and artifacts present
- document the excavation itself, and
- preserve a record of the site for future study.

Hand excavation is the most common excavation method used in an artificial environment. These excavations work best when there is a well-defined limit that is generally predictable and over which a structure can be erected.

Unless the Stage 4 mitigation strategy is full avoidance and protection of the archaeological site, the *Standards and Guidelines* require hand excavation. The exception is where hand excavation is preceded by mechanical topsoil removal. Fieldwork conditions must allow the site to be

documented to at least the requirements of the *Standards and Guidelines*.

Hand excavation can only be carried out effectively if the proper conditions and environment are created. For example:

- soils should be unfrozen (either maintained unfrozen, or thawed only once during the course of excavation) and relatively and uniformly dry (to facilitate screening)
- temperatures and humidity levels in the artificial environments must be moderate
- lighting must be sufficient to mimic normal daylight, and
- ground water and backdirt must be managed within the enclosed structure.

In addition, concerns for damage to the archaeological site resulting from the construction, maintenance and removal of the structure must be considered.

3.5 Mechanical topsoil removal

The large size of the equipment being used for mechanical topsoil removal or the large area to be assessed in this manner may prohibit erecting a structure to achieve appropriate field conditions. While it may be possible to remove the topsoil without a structure, removing frozen ground in a greenfield situation may impact the subsoil and damage features. Therefore, mechanical topsoil removal for sites in a greenfield **is not** recommended in winter.

However, if conditions allow topsoil to be mechanically removed, proper planning is needed to ensure that there are no negative impacts to the artifacts and cultural features that are exposed. Depending on the size of the area, it may be possible to erect a structure large enough to allow for heavy equipment to operate and stockpile soils. Alternatively, monitoring of topsoil stripping may occur in open-air conditions when the temperatures are reasonable and only the surface is frozen (e.g., less than 5 cm deep). Exposed features must be immediately protected with insulating blankets or equivalents until a structure can be erected or weather conditions are suitable.

4 Reporting on winter archaeology

The Licensee is responsible to ensure that winter conditions have been appropriately addressed so that the fieldwork conducted meets *Standards and Guidelines* requirements. The *Standards and Guidelines* set out minimum standards for reporting archaeological fieldwork; however, it will be necessary for the report to exceed these minimum standards to fully document the strategy followed and results achieved. The report must include a discussion of how the requirements of this strategy were met in the field, and document any additional or extraordinary fieldwork over and above the requirements of the *Standards and Guidelines* for optimal conditions.

Additional documentation for any fieldwork carried out when there is snow on the ground or temperatures are approaching or below zero degrees Celsius will also be required. This reporting is part of the process of demonstrating that all required standards have been met, thereby reducing the risk to the consultant archaeologist's licensing status.

What do the Standards and Guidelines say?

Stage 3 Reporting

Section 7.9.1, Standard 1:

Confirm that the fieldwork was conducted according to the archaeological fieldwork standards and guidelines, including those related to weather and lighting conditions.

Section 7.9.6, Standard 1a:

Provide images documenting...Field conditions for each instance of CSP or of test unit excavation...Provide a minimum of two images for each instance.

Stage 4 Reporting

Section 7.11.1, Standard 1a:

Confirm that the fieldwork was conducted according to the archaeological fieldwork standards and guidelines, including those related to weather and lighting conditions.

Section 7.11.5, Standard 3:

Provide clear colour photographs or digital images documenting: a. field conditions at the times of excavation, minimum of two images from different directions.

Among the additional documentation necessary, more photographs should be taken than in optimal conditions. Photographs should show the conditions encountered in the field, both in relation to the archaeological site excavation and artifacts and features encountered, and also document conditions resulting from the conduct of archaeology in winter.

The methods used to create the artificial environment—such as the erection of the structure, methods for heating, dewatering and lighting, and logistical challenges such as humidity control

and backdirt management—should be reported. This should form part of the required reporting of field methods. Observations on the effectiveness of, or challenges arising from, winter archaeology may be discussed in the analysis and conclusions section of the report. In both cases, the discussions of winter archaeology should be kept separate from the balance of the reporting and there should be no recommendations made in regard to winter archaeology or the strategies employed.

Photographs must be included for Stage 4 protection and avoidance of the location at the start of the activity, frozen ground access or vegetation removal and after the vegetation has been removed. For frozen ground access, it will also be necessary to include images of the conditions observed in the field season following the activity in order to satisfy Section 4.1.2, Standard 2.

5 Considerations when proposing winter fieldwork

The Licensee is considered to have full control and responsibility for the fieldwork and it is expected that optimal conditions will be established. The conditions should be comparable to those that would normally prevail in that geographical location during midday in late May. To verify that appropriate conditions were achieved, the Ministry will require more information in the report than would normally be provided for other projects about such matters as: project administration, management, infrastructure and scheduling. These are discussed below.

5.1 Structure design

A protective structure will be needed to achieve the required conditions to enable fieldwork. It will have to be large enough to accommodate the site area and high enough to install adequate lighting. The frame will have to be strong enough to support the lights and to withstand any stresses from winds or snow load. Local bylaws may require that the structure have a foundation, which should be placed to avoid the site and possible cultural resources.

Because site dimensions are often not precisely known, alternative measures for protection of outlying areas should be considered. This allows larger areas to be ready should the site dimensions expand, and to account for the 10 meter buffer from all cultural features required by the *Standards and Guidelines* when conducting monitored topsoil stripping. Areas of possible site enlargement and buffering for topsoil stripping can be protected through the use of:

- insulating blankets (e.g., concrete curing blankets) with a sufficient R-value
- covering areas with stacked hay bales
- heated blankets, or
- erecting a structure larger than the site's known dimensions by a buffer of at least 20 metres.

For crew comfort and site security, the structure will need to be enclosed and provide for a reasonable temperature.

The ability to secure the structure from theft and vandalism will also be important. Given that equipment, some of it expensive (particularly heaters and lights), may be left in or adjacent to the structure, it may be wise to carefully secure the building. Security guards should also be considered and can serve the additional purpose of ensuring that the heat and other conditions are maintained while the structure is unoccupied.

5.2 Maintaining adequate viewing conditions

Work within a structure will require light levels comparable to what would normally be found outdoors at that location under optimal conditions (midday in late May). Focused viewing of localized areas such as the walls or floors of excavation units may be improved through the use of mobile or adjustable lights. Providing technical specifications in the report for the light intensity produced is recommended to demonstrate that optimal conditions were achieved. The supplementary documentation should specify the lighting equipment, the intensity of the light that the equipment is designed to produce (in lumens), and measurements in lux within various parts of the site as measured using a light meter.

Condensation within the structure may result in a haze or mist forming which may reduce visibility or condense on the inner walls and onsite equipment. This haze must be taken into account when photographing the site or features, or in making visual observations generally. These can be mitigated with appropriate ventilation.

5.3 Frozen soil

In some instances, the soil will already be frozen and will require thawing and drying before excavation can take place. Even if the soil at the surface level appears unfrozen, it may be frozen at a short distance below the surface. It is important that any soils, once thawed to a suitable condition for excavating and screening, must not be allowed to refreeze. Heating blankets may assist with this.

Depending on soil conditions, it may be necessary not only to thaw the soil but to dry it out as well. To ensure that any variations in the soil or any stratigraphy that is present remain observable, the soil must be allowed to thaw and dry in situ. Soil should not be excavated while frozen or wet and moved to other locations to be processed. This increases the risk that information will be lost.

Management of heating can pose challenges. Initial thawing and the removal of moisture from the soil can require large amounts of heat. Fuel must be provided in significant volumes on a continuous basis and this can pose challenges in remote or inaccessible locations. Backup heating should be available to avoid delays caused by freezing of the site in the event that the main heating source fails.

Further challenges arise in terms of maintaining warm temperatures overnight, over weekends and during holidays. Most importantly, in considering whether to proceed with winter fieldwork, consistent temperature conditions can be expensive to maintain in temporary structures, especially if the outside temperature gets very cold.

5.4 Drainage and soil moisture

High moisture content in the soil will affect visibility of artifacts and features and hinder effective screening. Heat may have to be applied for some time to achieve satisfactorily dry soil conditions at all levels and locations within the site. Since heat rises, this may pose a considerable challenge if the soil has frozen to greater depths prior to applying heat. Screening wet soils will require additional effort: soils may be wet screened or will need to be dried before being screened.

It may also be necessary to employ measures to prevent flooding. Excavations may create sumps for any water in the area. This water may result from the structure's heat loss melting the snow and ice in the surrounding soil, or water could migrate through the soil from areas possessing higher water tables, especially where normal flows have been blocked by frozen ground. The risk of these problems is heightened where excavations are in low-lying areas or clay soils. Project planning should take such factors into account.

Problems posed by drainage and wetness can be mitigated by:

- the design of the structure
- the use of insulation on the ground
- the use of boardwalks
- setting up the excavation and structure before the ground freezes, and
- installing a sump pit system and pumps.

In some situations, it may be worthwhile to obtain expert advice from an engineer.

5.5 Limits of excavation

Positioning of the structure will be a critical decision. If the intent is to complete the excavation before winter is over, the Licensee should plan for a structure that is large enough to cover the entire known extent of the site, plus, a buffer to allow for the possibility that the site extends further than predicted. Since the structure will likely be quite large, any need to move it will be a significant consideration.

In some instances, the intent may be to get some of the work done during the winter and complete it in the spring. Whether this is the case, or whether the site extended further than predicted, no part of the site should be excavated unless optimal conditions have been established. This includes any part of the site that is completely outside the structure and any part located under or at the edge of the structure. Areas along the edge of the structure may have remained partly frozen or wet even when optimal conditions were achieved for areas fully contained within the structure.

5.6 Timing winter fieldwork

If it is likely that a project will need to be carried out under winter conditions, the Licensee will need to erect structures and achieve desired internal working conditions before the ground freezes. If work cannot begin until later in the winter, plan the work as much as possible before the start of winter to minimize the work required to achieve good conditions when fieldwork starts. Consideration should be given to whether late-winter fieldwork could be accomplished as equally effective in the spring.

5.7 Health and safety

The Ministry does not review or approve projects for health and safety matters. Consultant archaeologists should be aware of the health and safety concerns and effectively manage a health and safety program to reduce potential and severe workplace injuries and illnesses.. For example, preventing slippage due to ice and below-freezing temperatures, or developing a well-ventilated structure to disperse odour, fumes or potential carbon monoxide that are the by-products of heating, and carry away molds in wet straw, chaff, or organic soils.

It will also be important to maintain a comfortable temperature within the structure in order to allow field crew to perform optimally. Crew who are cold or wet are less likely to work carefully and make careful observations.

5.8 Project management

Winter fieldwork requires thoughtful and detailed management of matters that do not require such close attention when done during the typical field season. Project management concerns can include:

- managing backdirt, particularly in larger volumes, which may present challenges within the restricted confines of a structure
- minimizing soil disturbance in the archaeological site caused by erecting a structure and other infrastructure
- developing and implementing a contingency or backup plan for equipment failure
- monitoring conditions inside the structure to ensure that heat and dryness are maintained
- planning for possible expansion of the work area
- maintaining site security.

6 References

Government of Ontario

1990 *Ontario Heritage Act* (R.S.O). Available from:
www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90o18_e.htm

Ministry of Tourism, Culture and Sport

2011 *Standards and Guidelines for Consultant Archaeologists*. Queen's Printer for Ontario.
Available from: www.ontario.ca/archaeologystandards

7 Glossary

Aboriginal communities

Used inclusively in this technical bulletin to refer to First Nation communities (also known as “bands” under the *Indian Act*), Métis communities, and communities of other Aboriginal peoples who identify themselves as a community. Examples are: those living in urban centres or those belonging to an indigenous Nation or tribe that encompasses more than one community (e.g., the Pottawatomi, Mississauga, or Mohawk).

archaeological project

All aspects of the archaeological assessment (Stages 1-4), including background study, property survey, site assessment, mitigation and reporting.

archaeological site

Ontario Regulation 170/04 under the *Ontario Heritage Act* defines an archaeological site as “any property that contains an artifact or any other physical evidence of past human use or activity that is of cultural heritage value or interest”.

consultant archaeologist

An archaeologist who enters into an agreement with a client to carry out or supervise archaeological fieldwork on behalf of the client, produce reports for or on behalf of the client and provide technical advice to the client. A consultant archaeologist must hold a Professional licence issued by the Ministry of Tourism, Culture and Sport. (O.Reg. 8/06).

cultural feature

The physical remains of human alteration at a given location that cannot be removed intact and are not portable in the way that artifacts can be removed and are portable. Typically, a cultural feature must be documented in the field, although samples can be taken. Examples include post moulds, pits, living floors, middens, earthworks, and various historic structural remains and ruins.

Contact us: If you have any questions or concerns about the information in this bulletin, please email us at Archaeology@Ontario.ca.