Phase I Archaeological Survey and Phase II Evaluation of Sites 21CR154, 21CR155, and 21CR156 for the TH101 / CSAH 61 Southwest Reconnection Project in Scott and Carver Counties, Minnesota

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Authorized and Sponsored by:
Minnesota Department of Transportation
and Carver County

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MANAGEMENT SUMMARY

The Minnesota Department of Transportation (MnDOT) and Carver County plan to replace and raise Trunk Highway (TH) 101 over the Minnesota River floodplain, north of the bridge at Shakopee, and reconstruct a connecting segment of County State Aid Highway (CSAH) 61 (Flying Cloud Drive) as part of a flood mitigation and road improvement project, designated the Southwest Reconnection Project. MnDOT is the lead agency, and the MnDOT Cultural Resources Unit is the delegated review agent.

Florin Cultural Resources Services, LLC was retained by MnDOT and Carver County to conduct a Phase I archaeological survey and Phase II evaluation of sites 21CR154, 21CR155, and 21CR156. A geomorphological investigation was conducted by Strata Morph Geoexploration to assess the geomorphic potential for archaeological sites and the landscape evolution.

The project area is located at the intersection of Archaeological Regions 2e – Prairie Lake East, 2n – Prairie Lake North, and 4s – Central Lakes Deciduous South in T116N, R23W, Sections 35 and 36, Carver County and T115N, R23W, Section 1, Scott County. The bridge and TH 101 segment is 1.0 mile long, and the CSAH 61 segment is 0.9 mile long. The survey area included the MnDOT right-of-way (ROW) along TH 101 and an area ten meters beyond the ROW along CSAH 61, excluding the east end, which was limited to the ROW. Additional survey outside of this area was conducted for a holding pond and fill disposal area along CSAH 61. The archaeological survey encompassed 63 acres. The Area of Potential Effect (APE) at the east end of the project along CSAH 61 was reduced by 315 meters after the archaeological survey was completed. The project area consists of multiple landforms within the Minnesota River Valley, including the bluff base along the margin of the valley and levee, floodplain, and floodplain lake/wetlands on the valley bottom.

Fieldwork was conducted from October 19, 2012 to January 10, 2013 and May 6, 2013 to July 2, 2013. Frank Florin was the principal investigator. The Phase I archaeological field methods included pedestrian survey, shovel tests, and deep auger tests. Five sites were identified, including four precontact period habitations (21CR154, 21CR155, 21CR156, and 21CR157) and one historic farmstead (276-3). Phase II testing was conducted at sites 21CR154, 21CR155, and 21CR156 to determine if they are eligible for listing on the National Register of Historic Places (NRHP). Site 21CR157 is outside of the project's current APE and was not evaluated. A total of 19 excavation units (XUs) were dug during Phase II evaluation of the sites.

Site 21CR154 is a precontact habitation with a small amount of lithic debris, fire-cracked rock (FCR), and animal bone. Site activities are inferred to include animal processing, cooking, and lithic reduction. No diagnostic artifacts were recovered. Artifacts were recovered from 0 to 135 cm below surface (cmbs). Four (1-x-1 meter) XUs were dug, but none of the units contained artifacts. The site lacks the potential to provide important information on the precontact period because of the sparse and limited artifact assemblage. Portions of the site also lack integrity as a result of soil disturbance from construction activities. The site is recommended not eligible for listing on the National Register of Historic Places (NRHP).

Site 21CR155 is an Early to Late Archaic habitation. Five radiocarbon dates were obtained from animal bone at the site, yielding calibrated radiocarbon dates of 6060 to 5990, 5320 to 5230, 5210 to 4940, 1300 to 1120, and 1370 to 1130 BC (2 Sigma, 95% probability). Artifacts include a moderate amount of animal bone, lithic debris, stone tools, and FCR. Animal remains include bison, catfish, and turtle. Some remains were thermally altered and butchered. Site activities are inferred to include animal processing, cooking, lithic reduction, and stone tool production. Artifacts were recovered from 20 to 380 cm below surface in a buried soil. Seven (1-x-1 meter) XUs were dug. Exotic lithic materials include Knife River Flint and Hixton Quartzite, which originate in western North Dakota

and west-central Wisconsin, respectively. The cultural deposits are well-preserved and have integrity. The site has the potential to provide important information on the Early to Late Archaic periods in southern Minnesota and is recommended eligible for listing on the NRHP under Criterion D. The current project design will directly impact the site. A Phase III data recovery is recommended to mitigate the project's adverse effects.

Site 21CR156 is a Late Paleoindian, Archaic, and Late Woodland habitation. Calcined turtle bone from a fire hearth in the western portion of the site yielded a radiocarbon date of 5990 to 5880 cal BC (2 Sigma, 95% probability), and Agate Basin-like and Eden-like projectile point bases were found in association with the fire hearth. In the central portion of the site, organic sediment from a buried soil containing lithic debris yielded a calibrated radiocarbon date of 5660 to 5570 BC (2 Sigma, 95% probability). Artifacts include a moderate amount of animal bone, ceramics, lithic debris, stone tools, and FCR. Animal remains include large mammal, fish, turtle, snake, and shell. Most of the remains are thermally altered. Site activities are inferred to include animal processing, cooking, lithic reduction, and stone tool production. Artifacts were recovered from 20 to 250 cmbs. Eight (1-x-1 meter) XUs were dug. The cultural deposits are well-preserved and have integrity. The site has the potential to provide important information on the Late Paleoindian, Archaic, and Late Woodland periods in southern Minnesota and is recommended eligible for listing on the NRHP under Criterion D. The project's APE has been reduced since the Phase II evaluation was completed, and the site is approximately 200 meters outside of the APE and will not be affected. If the project design changes or if other construction projects along CSAH 61 adversely affect the site, then a Phase III data recovery is recommended to mitigate the project's effects.

Site 21CR157 is a precontact habitation of unknown age and cultural affiliation. The site is buried below modern fill, and artifacts were recovered in two backhoe trenches and a deep auger test from 130 to 300 cmbs. Artifacts include lithic debris, FCR, and animal bone, indicating that site activities included animal processing, cooking, and lithic reduction. The project's APE has been reduced since the Phase I survey was completed, and the site is approximately 100 meters outside of the APE and will not be affected. If the project design changes or if other construction projects along CSAH 61 affect the site, then a Phase II evaluation is recommended.

Site FCRS 276-3 is a scatter of historic artifacts associated with a former farmstead that dates from c.1880 to the 1960s. The Minnesota Office of the State Archaeologist reviewed the site information and will not be assigning an official site number. The site is located on the Golf Zone property in a proposed fill disposal area. Artifacts include a small amount of fragmentary architectural and domestic items, including glass, whiteware, concrete, and square and round nails. The site has been disturbed by landscaping for the golf driving range and is not directly associated with historically significant persons or events, nor does it embody the distinctive characteristics of the agricultural period from the late 1800s to middle 1900s. The research potential of the site is low because of the lack of integrity and the limited artifact assemblage. The site is recommended not eligible for listing on the National Register of Historic Places because it lacks integrity and does not meet National Register Criteria A, B, C, or D.

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

Florin Cultural Resource Services conducted a Phase I archaeological survey and Phase II Evaluation of Sites 21CR154, 21CR155, and 21CR156 for the TH101/ CSAH 61 Southwest Reconnection Project in Scott and Carver Counties, Minnesota in in T116N, R23W, Sections 35 and 36, and T115N, R23W, Section 1. The bridge and TH 101 segment is 1.0 mile long, and the CSAH 61 segment is 0.9 mile long. The archaeological survey encompassed 63 acres. A geomorphological investigation was conducted by Strata Morph Geoexploration. The project area consists of multiple landforms within the Minnesota River Valley, including bluff base, levee, floodplain, and floodplain lake/wetlands. Five sites were identified, including four precontact period habitations (21CR154, 21CR155, 21CR156, and 21CR157) and one historic farmstead (276-3). Phase II testing was conducted at sites 21CR154, 21CR155, and 21CR156 to determine if they are eligible for listing on the National Register of Historic Places (NRHP). Site 21CR157 is outside of the project's current APE and was not evaluated. Sites 21CR155 and 21CR156 are recommended eligible for listing on the NRHP. These sites have deeply buried cultural deposits and contain Late Woodland, Archaic, and Late Paleoindian components.

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1.1 Overview

The Minnesota Department of Transportation (MnDOT) and Carver County plan to replace and raise Trunk Highway (TH) 101 over the Minnesota River floodplain, north of the bridge at Shakopee, and reconstruct a connecting segment of County State Aid Highway (CSAH) 61 (Flying Cloud Drive) as part of a flood mitigation and road improvement project, designated the Southwest Reconnection Project. MnDOT is the lead agency, and the MnDOT Cultural Resources Unit is the delegated review agent.

Florin Cultural Resources Services, LLC (FCRS) was retained by MnDOT and Carver County to conduct a Phase I archaeological survey and Phase II evaluation of sites 21CR154, 21CR155, and 21CR156. Fieldwork was conducted from October 19, 2012 to January 10, 2013 and May 6, 2013 to July 2, 2013. A geomorphological investigation was conducted by Strata Morph Geoexploration to assess the geomorphic potential for archaeological sites and the landscape evolution (Appendix A).

1.2 Project Setting

The project is located north of Shakopee, Minnesota in the Minnesota River Valley. The landscape includes a levee and floodplain adjacent to the Minnesota River and a large area of floodplain lakes and wetlands on the valley bottom along TH 101. Areas of higher ground occur at the bluff base and valley margin along CSAH 61 where colluvial and alluvial fan deposits are present. The wetland areas include woods, grasses, and cattails. The eastern portion of the CSAH 61 survey area has several paved commercial parcels, and there is one parcel in an agricultural field near the west end of the CSAH 61 survey area.

1.3 Project Area and Area of Potential Effect

The project area is located in T116N, R23W, Sections 35 and 36, Carver County and T115N, R23W, Section 1, Scott County (Figures 1 and 2). The bridge and TH 101 segment is 1.0 mile long, and the CSAH 61 segment is 0.9 mile long. The survey area included the right-of-way (ROW) along TH 101 and an area ten meters beyond the ROW along CSAH 61, excluding the east end, which was limited to the ROW. The archaeological survey encompassed 63 acres. The archaeological Area of Potential Effect (APE) for the project is contained within these 63 acres and extends three meters below the surface due to planned subcutting of the proposed road. The archaeological survey was guided by the results of the geomorphological investigation (Appendix A), which indicate that the potential for deeply buried sites is dependent upon landscape and environmental setting.

The survey area is bordered on the south by the bridge over the Minnesota River at the city of Shakopee. The northern boundary is CSAH 61, with a short survey segment extending north along Great Plains Blvd. The eastern boundary along CSAH 61 is a private driveway. The western survey boundary along CSAH 61 extends 230 meters west of Bluff Creek Drive. The UTM coordinates (1983 Datum, UTM Zone 15) for the survey area are the following: E456520 N4962085 for the west end along CSAH 61; E457932 N4962420 for the east end along CSAH 61; and E458390 N4960972 for the south end along TH 101.

After the Phase I survey and Phase II evaluations were completed, the project's APE along CSAH 61 was reduced by 315 meters at the east end and 72 meters at the west end (Figure 2). The project included state and county lands within the right-of-way and privately owned lands outside of the ROW.

1.4 Contract History

MnDOT contracted with FCRS in October 2012 to conduct a Phase I survey within the ROW along TH 101 and CSAH 61 east of the "Y", where TH 101 and CSAH 61 converge. The contract (02167) was amended to cover additional costs for evaluating sites 21CR154 and 21CR156 at the east end of the project area and to extend the project schedule and contract expiration date. A separate contract (03584) was authorized by MnDOT in May 2013 to conduct survey for project design modifications in four areas, including: 1) the archery range at south end of TH 101 where the alignment was shifted west; 2) a ponding area along CSAH 61; 3) a TH 101 segment north of CSAH 61 for a turn lane; and 4) a proposed fill storage area on the Golf Zone property. This contract also included funding for evaluating sites identified during the survey. A portion of 21CR155 was identified in the ponding area and adjacent wetlands during the survey, and the site was subsequently evaluated.

Short Elliot Hendrickson Inc. (SEH) was retained by Carver County to provide professional services for the project. In fulfillment of these services, SEH contracted with FCRS in November 2012 to conduct a Phase I survey extending ten meters beyond the ROW along CSAH 61 east and west of the "Y". Phase II evaluations were conducted for the portion of site 21CR155 in the agricultural field and for the portion of site 21CR154 outside the ROW.

1.5 Curation

Site 21CR156 and portions of 21CR154 and 21CR155 are located on Carver County land (ROW along CSAH 61) and will be curated at the Minnesota Historical Society (MHS). Site 21CR157 and portions of 21CR154 and 21CR155 are located on private lands. FCRS is working with the private landowners regarding the disposition of artifacts from their land. No artifacts were collected from historic site FCRS 276-3. Copies of project documentation are on file at the FCRS office in Boyceville, Wisconsin.

1.6 Permit and License

The Phase I archaeological survey was conducted under Minnesota Office of State Archaeologist (OSA) permit 12-047 and 13-044. Phase II evaluations at 21CR154, 21CR155, and 21CR156 were conducted under OSA permits 12-074 and 12-077, and 13-059. Copies of the permits are contained in Appendix B.

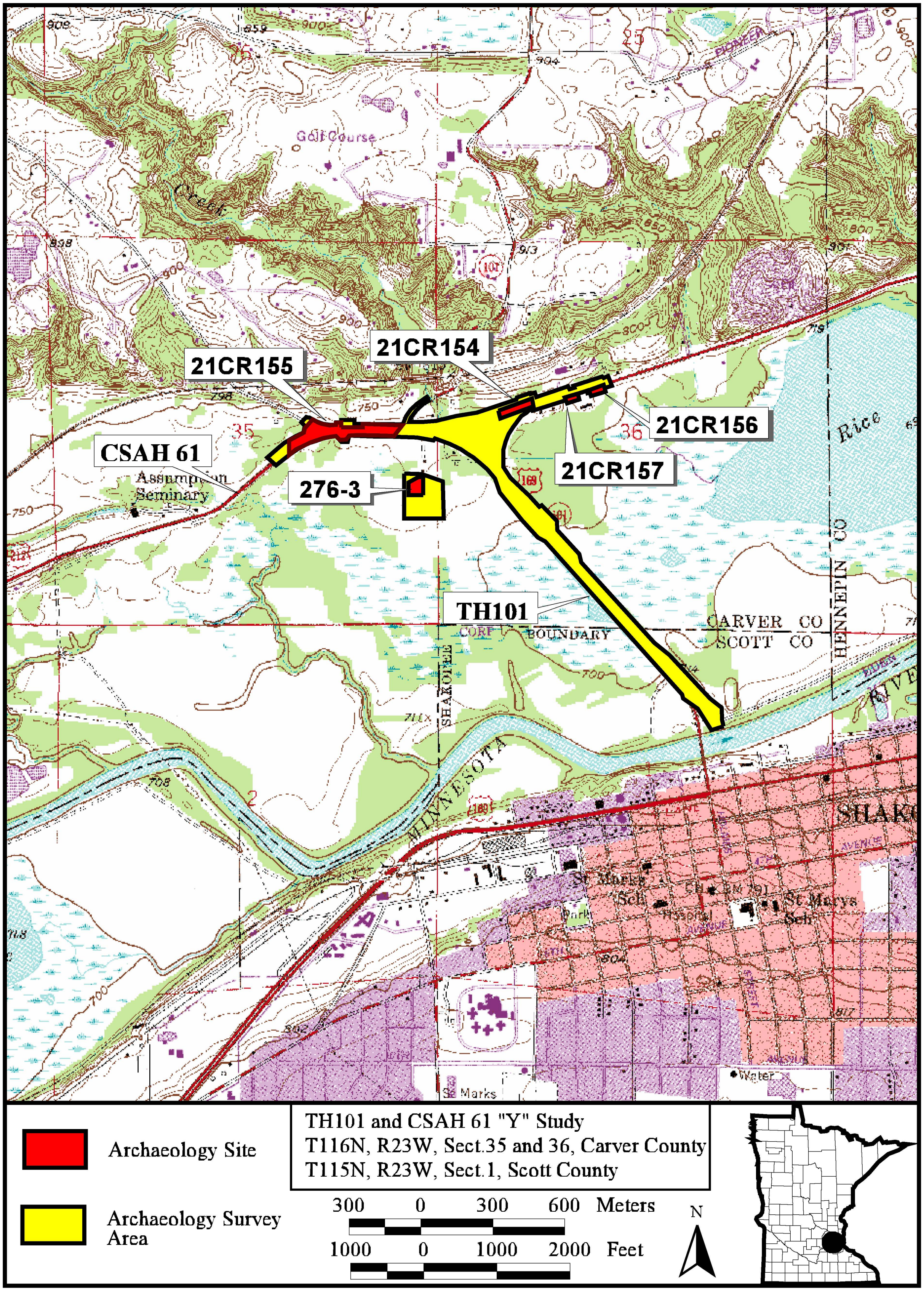


Figure 1. Location of Project Area and Archaeology Sites on USGS 7.5' Shakopee Quadrangle.

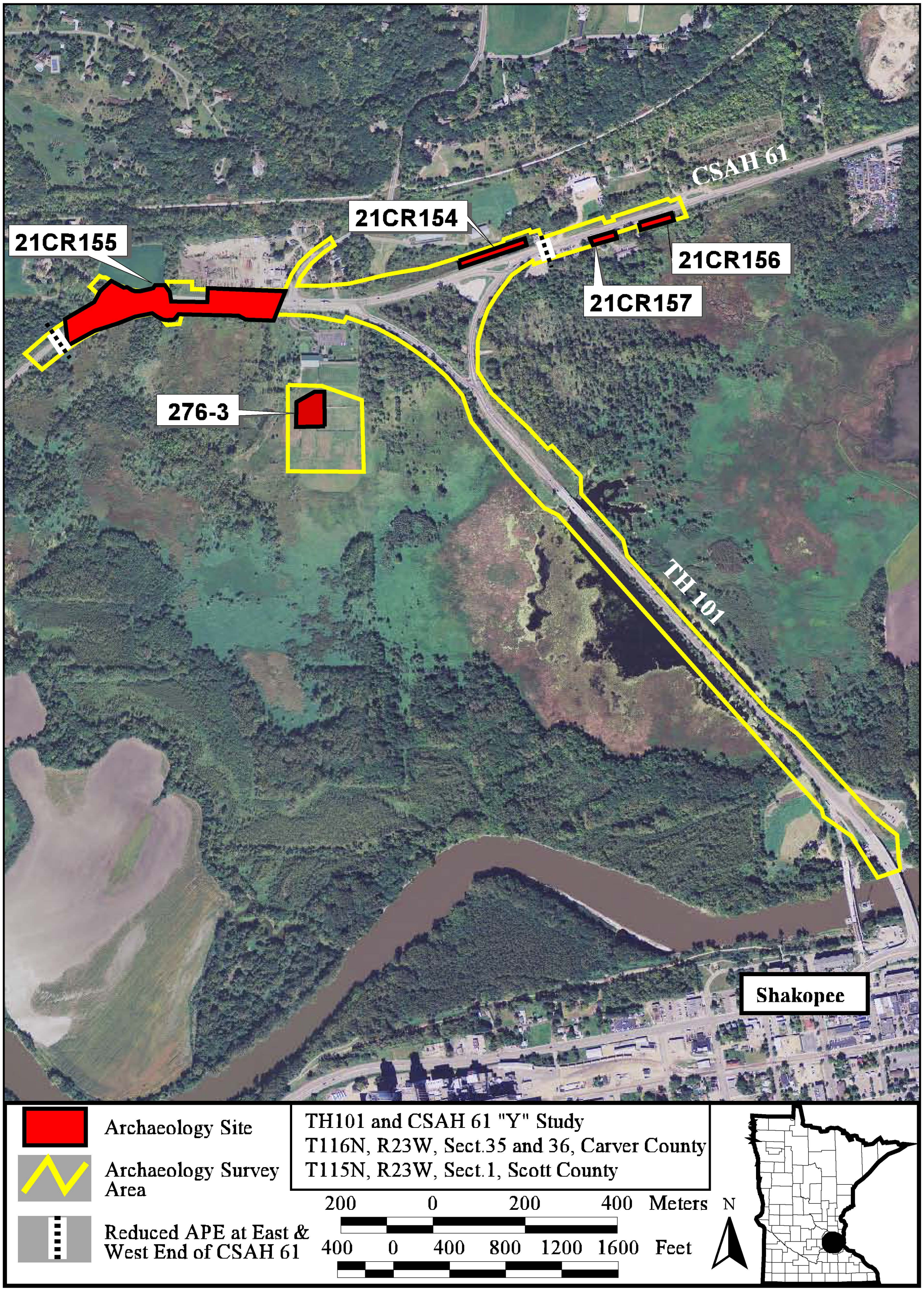


Figure 2. Location of Survey Area and Archaeology Sites on 2010 USDA Aerial Photograph.

2. RESEARCH DESIGN

2.1 Objectives

There are several objectives of the Phase I archaeological survey and Phase II site evaluations: 1) to aid project sponsors in complying with Section 106 of the National Historic Preservation Act and 36 CFR 800: Protection of Historic Properties; 2) to identify archaeological sites and assess their eligibility for listing on the National Register of Historic Places (NRHP); 3) to aid in project planning; and 4) to produce a report documenting the archaeological investigations.

2.2 Aspects of the Research Design

The research design was developed to meet project objectives, and it adhered to the research and field method guidelines established by the Minnesota State Historic Preservation Office (MnSHPO), OSA, and MnDOT. These methods, which included a literature search, fieldwork, analysis of data, and production of a technical report, are summarized below and discussed in greater detail in the following sections.

The literature search provided information on previous investigations, previously recorded sites, potential cultural resources depicted on historic maps, and the environmental setting.

Archaeological fieldwork included pedestrian survey, shovel tests, deep auger tests, excavation units (XUs), and backhoe trenching. Pedestrian survey was used to identify artifacts or archaeological remains that were present on the ground surface. Shovel tests and deep auger tests were used to identify artifacts that were present below the ground surface, characterize soils at the survey areas and archaeological sites, and provide information on the horizontal and vertical provenience of artifacts. XUs were used to recover artifacts, provide detailed information on artifact provenience and cultural stratigraphy, identify cultural features, assess site integrity, and provide exposures of soil profiles at the sites. Backhoe trenching was used to remove fill and historic-age deposits that overlay precontact land surfaces. Specific details of the field methods are presented in Section 3.1.

The analysis of artifacts was conducted using current methods appropriate to each artifact class. The analysis was oriented towards identifying specific attributes that would provide useful information for interpreting the function and historic context of the site. Specific analytical methods for each artifact class are discussed in detail in Section 3.2.

The report documents the results of research, fieldwork, and artifact analysis and provides interpretations of the data and recommendations for the sites and project.

2.3 Eligibility Criteria and Historic Contexts

Recommendations for the NRHP eligibility of sites 21CR154, 21CR155, 21CR156, 21CR157, and 276-3 are based on the National Register Criteria in 36 CFR Part 60.1 guidelines established by the National Park Service (1991) and Minnesota contexts for the Late Paleoindian, Archaic, Woodland, and historic periods (Anfinson 1994; Arzigian 2008; Dobbs 1988; Gibbon and Anfinson 2008; Granger and Kelly 2005). Archaeological sites that retain integrity may be eligible for the National Register under the following criterion:

A. if they are associated with events that have made a significant contribution to the broad patterns of our history; or

B. if they are associated with the lives of persons significant in our past; or

C. if they embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. if they have yielded, or may be likely to yield, information important in prehistory or history.

Integrity is comprised of seven aspects that include: location, design, setting, materials, workmanship, feeling, and association. Several of these aspects must be possessed for a property to retain sufficient integrity for listing on the NRHP. The three aspects of integrity that are specifically relevant to archaeological sites are location, materials, and association. NRHP Criteria A, B, and C do not apply to the precontact sites identified for this project but were considered for historic site 276-3. The precontact sites were evaluated for their NRHP eligibility under Criterion D.

Specific historic contexts for the precontact period in Minnesota have been developed to summarize the extent of knowledge for each context and provide a framework to aid in determining whether a site has the potential to yield information that is considered important to local and regional prehistory (Anfinson 1994; Arzigian 2008; Dobbs 1988; Gibbon and Anfinson 2008). These contexts propose specific research questions and themes relevant to each context. In order for the sites to be eligible for the NRHP under Criterion D, they must retain integrity and contain the potential to provide information on relevant research questions and themes that are applicable to the specific historic contexts present at the sites. These historic contexts are discussed in more detail below.

2.3.1 Late Paleoindian and Archaic Contexts

Sites 21CR155 and 21CR156 yielded radiocarbon dates and projectile points that place their site components in the Late Paleoindian and Archaic periods. Historic contexts and basic research questions for the Late Paleoindian and Archaic contexts have been developed and are presented together here because of the overlapping and similar research themes (Anfinson 1997; Dobbs 1988; Gibbon and Anfinson 2008). The very sparse and limited knowledge of these periods requires addressing basic research questions about this culturally and environmentally dynamic period. Based on a review of Late Paleoindian and Archaic contexts, several basic research questions are proposed for the sites. Sites 21CR155 and 21CR156 are likely to yield information to address the following research questions for the Late Paleoindian and Archaic periods.

<u>Basic Research Themes and Questions</u>

- What are the ages of the Late Paleoindian and Archaic components at the sites, and how do they fit within the established chronology of the region?

- What are the functions of sites and what activities occurred at the sites with regard to the Late Paleoindian and Archaic components?

- What specific Late Paleoindian and Archaic complexes are present at the sites, and how do these complexes relate to previously defined complexes in the region?

- What are the diagnostic artifact types (especially spear and dart points) from the Late Paleoindian and Archaic components at the sites, and are they similar to named types elsewhere or are there unique types in Minnesota or regional variants of named types in the state?

- What are the contents of Late Paleoindian and Archaic artifact assemblages? Are specific kinds of artifacts, features, and site types associated with these assemblages?

- What internal developments, changes, and adaptations occurred during the Late Paleoindian and Archaic periods and how do these relate to environmental changes occurring at that time?

- What were the lifeways, subsistence strategies, and settlement patterns during the Late Paleoindian and Archaic periods in the region? How did they change through time ? To what extent were they similar or dissimilar to contemporary lifeways in adjacent areas?

- What are the geomorphic contexts of the sites, and what site-specific environmental changes have occurred with respect to wetland development, soil formation, and site formation processes?

- What internal developments, changes, and adaptations occurred during the Late Paleoindian and Archaic period and how do these relate to environmental changes occurring at that time?

- What types of lithic technology were employed?

- What is the pattern of lithic material use and is there evidence for interaction and trade with other cultural groups from the Plains or Woodlands? How were exotic raw materials (e.g., stone) procured?

2.3.2 Woodland Period and the Southeast Minnesota Late Woodland Contexts: A.D. 500 to 1150

Site 21CR156 yielded Madison Ware ceramics that are affiliated with the Southeast Minnesota Late Woodland complex. Initial historic context and research questions were developed by Dobbs (1988). Updated Woodland Tradition contexts have been prepared for the National Register of Historic Places Multiple Property Documentation Form, including a Southeast Minnesota Late Woodland context (Arzigian 2008), which extends across southeastern and east-central Minnesota in the Eastern Broadleaf Forest province. Most of the research questions concern basic types of information because of the limited knowledge of this context. Site 21CR156 is likely to yield information to address the following research themes for the general Woodland Tradition and Southeast Minnesota Late Woodland complex:

Primary Statewide Woodland Research Themes

- *Technology and Material Culture*
  Besides identifying diagnostic artifacts, the full range of material culture for each complex needs to be described. In addition to artifacts typically considered diagnostic, such as rim sherds and projectile points, can other region- or complex-specific cultural items be identified, such as unique pottery designs, bone tools, or patterns of raw material use?

- *Lithics*
  Much more information is needed on the full range of Woodland lithic artifacts, both tools and manufacturing debris, and the raw materials used, both local and exotic.

- *Geographic Distribution*
  The boundaries and geographic distribution of individual complexes are poorly known, and the bases on which they were defined are often not explicit.

- *Regional Interaction*
  Research is needed into the full range of interregional interactions within and between peoples of contemporary cultures or complexes, as well as the relationships that helped to shape changes in cultures through time.

- *Defining the complex*
  Major research questions center on defining the context as something coherent, rather than as the time between two other cultures (Havana and Oneota). The relationship between effigy mounds and cord impressed ceramics also needs to be clarified. Understanding this period and context is critical for understanding the transition to agricultural systems in the region. But what do these cultures look like in Minnesota? Is there a tight association between Madison ware ceramics and effigy mounds? How widely are these ceramics distributed, and are they part of components associated with other artifacts and ecofacts, or are they added as minor elements of components that can be assigned to other complexes?

- *Chronology*
  Dates on materials in tight association with both diagnostic ceramics and individual mounds are necessary to evaluate the development of the culture and the period of mound construction, particularly effigy mounds.

- *Regional distribution of ceramics*
  Ceramics with single cords used as decoration over a cord-roughened surface are found across central and southern Minnesota, but the ceramics are not coded as such in the SHPO database and cannot be readily separated except by examination of the ceramics themselves. Detailed ceramic studies are needed for Late Woodland sites in Minnesota. The full range of ceramic types in southern Minnesota Late Woodland sites should be evaluated, along with a consideration of how they compare to series defined elsewhere in the Midwest. Because of the presence of a geographic reference in the complex name, archaeologists are likely to have identified this complex for the SHPO/OSA database only for sites in southeastern Minnesota, although the ceramics and other aspects of the complex might be found further west and north. Dobbs and Anfinson (1990:164) argue that, based on typical assemblages in Wisconsin and Iowa, "There are a number of ceramic 'types' that should be present in Minnesota. These include the Lane Farm, Madison, and Minott Cord Impressed series (see Baerreis 1953; Hurley 1975; Logan 1976; Benn 1978, 1979, 1980)." Are these types present? How do they fit within the total ceramic assemblage? Can these types be distinguished from other defined types? This is especially true in the case of Nininger Cordwrapped Stick Impressed and Madison Plain. Besides refining the definitions of existing types, older collections need to be reexamined to update typological information and interpretations. What kinds of regional interaction are evident beyond the broad similarities in ceramics?

- *Settlement and subsistence models*
  The draft context (Dobbs and Anfinson 1990:166–167) notes:

  > *So little is known about Late Woodland in Minnesota that even the most basic information is crucial at this time. However, since there are models in place for Late Woodland in Wisconsin and Iowa, one fruitful approach will be to take these models and test them in Minnesota. Thus, rather than simply looking for Late*

> *Woodland sites, it might be useful to take Theler's (1987) model of subsistence and settlement, and structure surveys to test this model. Similarly, it would be helpful to conduct detailed quantitative analyses of existing collections of Late Woodland ceramics to see how these fit within the broader sequences developed by workers in other states.*

Theler and Boszhardt's (2006) more recent interpretations of Late Woodland subsistence and settlement, population increase, and resource and population collapse offer particularly useful insights for evaluating Late Woodland in nearby regions.

2.3.3 Historic Contexts for Minnesota Farmsteads

A detailed overview of farmsteads is presented in *Historic Context Study of Minnesota Farmsteads, 1820-1960* (Granger and Kelly 2005) with regard to the history of agricultural development in the state; farm types and farm practices by geographic region; the design and building of farm structures; and the variety of physical elements present on farms. The overview delineates historic periods associated with changes in agricultural practices in Minnesota and addresses major influences that led to these changes. The defined historic farm periods are:

- Period 1: Early Settlement, 1820-1870
- Period 2: Development of a Wheat Monoculture, 1860-1885
- Period 3: Diversification and the Rise of Dairying, 1875-1900
- Period 4: Industrialization and Prosperity, 1900-1920
- Period 5: Developing the Cutover, 1900-1940
- Period 6: Development of Livestock Industries, 1900-1940
- Period 7: Depression and the Interwar Period, 1920-1940
- Period 8: World War II and the Postwar Period, 1940-1960

Specific research questions and themes have been developed for each of these periods (Terrell 2006), including general overarching research themes. Site 276-3 is an historic farmstead dating to ca. 1880-1960s, which falls within Periods 2 to 8. Because historic site FCRS 276-3 lacks integrity and cannot be eligible for listing on the NRHP, research questions and themes relating to historic farmsteads are not discussed in this report.

3. Field and Lab Methods

3.1 Archaeological Field Methods

The Phase I archaeological survey methods adhered to the MnSHPO and OSA guidelines for archaeological fieldwork. Specific field methods were discussed with MnDOT prior to conducting fieldwork. The survey design included an archaeological survey for the entire project APE.

3.1.1 Pedestrian Survey

The goal of the pedestrian survey was to identify and record archaeological sites that could be observed on the ground surface. Pedestrian survey was conducted within the entire survey area, except areas of deep standing water, by walking transects parallel to the roadways in intervals not exceeding five meters. The pedestrian survey was a practical method for identifying certain types of potential archaeological resources such as pits, earthworks, or historical foundations. No resources were identified by pedestrian survey.

3.1.2 Shovel Tests and Deep Auger Tests

Shovel/auger testing was used to identify artifacts and features not visible on the ground surface, characterize soils at survey areas and sites, and provide information on the horizontal and vertical provenience of artifacts at the sites. The shovel testing strategy was guided by the results of the geomorphological investigation, which ranked the potential of landforms in the project area for containing precontact sites (Table 1).

Shovel testing was conducted at ten-meter intervals in all moderate to high site potential areas. Areas of low potential were sampled at large intervals (20 to 50 meters) to characterize the soils and provide some comparative sampling for these areas.

Shovel test transects were placed parallel to the roadways. At the archaeological sites, close-interval shovel testing was conducted at 2.5 to 5.0-meter intervals in cardinal directions adjacent to positive shovel tests in order to assess the extent and density of artifacts.

Shovel tests were 35 to 40 cm in diameter and generally dug to 85 cmbs. Soil was typically dug and screened in 20 to 30 cm increments to provide vertical control of artifact provenience. A Seymour auger with a 20-cm (6-inch) diameter bucket was used for deep auger testing below 85 cmbs in each shovel test hole. Following the MnDOT protocol for deep-site testing, three deep auger tests were generally dug at each test location in moderate to high potential areas to recover a volume of soil equivalent to a standard shovel test. A single auger test was dug in areas with low site potential. At site 21CR156 double auger tests were dug, and sufficient site data had been obtained so that a third auger was not necessary. The number of auger tests at each test location is specified in the results section. The goal was to auger to a depth of 300 cmbs wherever possible. However, in the western portion of the Bluff Creek Alluvial Fan (east end of site 21CR155), the buried lacustrine soil extended below 300 cmbs, and testing was conducted to a maximum of 405 cmbs. In some areas, tests could not be augured to 300 cmbs because the water-saturated sandy soils slumped out of the auger and could not be recovered. In areas where the sandy alluvial fan deposits were deep but situated on top of peat, a metal casing (10-inch-diameter duct pipe) was placed in the test and worked down to the top of the peat, which prevented the sandy walls from slumping in. For the sake of brevity, auger tests will be referred to as shovel tests in this report.

All soil was screened through ¼-inch hardware mesh. Soil was screened through 1/8-inch hardware mesh in some tests at site 21CR156, as explained in the site discussion. The field crew returned all excavated soil to each shovel/auger test upon completion. All shovel test locations were recorded with a GPS unit and placed on project maps.

Table 1. Archaeological Potential of Depositional Units (from Appendix A).

Deposit Type	Depositional Environment	Characteristics	Soils	Potential For Buried Archaeological Deposits
Alluvial Fan	proximal alluvial fan	loams to sand, with gravel; occasionally interstratified with distal alluvial fan, alluvial and paludal sediment	weakly developed surface soil; weakly to moderately developed buried soils in small tributary fans	**low potential** in the Bluff Creek fan (young and high energy); **high potential** in the Eastern and Western alluvial fans
Alluvial Fan	distal alluvial fan	silty to loamy; poorly sorted; interstratified with coarser alluvial fan deposits or lacustrine deposits	weakly developed soils formed during short term intermittent subaerial exposure near the floodplain lake margin to almost entirely subaqueous away from lake margin	**moderate potential** within subaerial distal fan deposits; **low potential** in subaqueous alluvial fan/deltaic deposits
Lacustrine includes deltaic	floodplain lakes	silty clay and clay; graded very fine sand fraction at base of sequence	cumulic soil at surface or buried beneath alluvial fan and/or paludal deposits	**high potential** at lake margin where subaerially exposed; **low potential** where no paleosol is present
Alluvium	floodplain	silt and clay on the Minnesota River floodplain	hydric	**moderate potential** within vertical accretion sequence
Alluvium	levee	laminated silt and fine sand	weakly developed surface soils; buried soil at edge of levee backslope	**low potential** due to the historic age of the deposits
Colluvium	base of the slope at the valley margin and in small alluvial fans	poorly sorted gravelly loam, clay loam, silty clay loam, and clay.	moderately and weakly developed buried soils	**high potential**
Paludal	wetland at floodplain lake margins and along the base of the bluff at springs and seeps	organic sediment in various stages of decomposition (peat and muck)	surface soil or buried beneath fill and/or alluvial fan deposits; interbedded with fan or lacustrine deposits	**low potential** within the sequence but overlies a buried soil formed in the lacustrine deposits that has high potential

3.1.3 Excavation Units (XUs)

XUs were 1-x-1 meter in size. Excavation methods consisted of shovel skimming in one to two-cm increments. XUs at sites 21CR154 and 21CR156 were dug and recorded in 10-cm levels below an arbitrary datum that was established near the ground surface in the highest corner of the unit. XUs at site 21CR155 were dug and recorded in 10-cm levels within stratigraphic units to clearly delineate cultural stratigraphy in relation to soil stratigraphy. The extent and types of soil disturbance were recorded for each level to aid in assessing site integrity. All soil was screened through ¼-inch hardware mesh, although 1/8-inch hardware mesh was used in select areas at site 21CR156. The units were backfilled after excavation was complete.

3.1.4 Features

When cultural features were identified, the surface was scraped with a trowel to define the feature. The feature was then recorded in planview and profile with a sketch and photos. Field notes documented excavation methods and feature description. The feature fill was then excavated with a trowel. All soil from the feature fill was bagged for flotation. Feature profiles were drawn and photographed.

3.1.5 GPS Data Collection and Site Mapping in ArcView

The locations of subsurface tests were recorded with a Garmin® GPS unit, which provided a positional accuracy of within three meters. The data was collected in UTM coordinates using the 1983 North American datum format for Zone 15. The UTM coordinates were tabulated in a spreadsheet, imported into ArcView®, and digitally plotted on the USGS 7.5' quadrangle maps and air photos.

Sketch maps of the archaeological sites were drawn in the field to record all test locations in relation to fixed geographical features, such as road centerlines and edges, driveways, fences, and telephone poles. These maps were made using a tape measure, and distances were recorded on the shovel test forms. Site maps were created in ArcView® using the test locations from the sketch maps and the distance measurements from fixed geographical features to plot the tests on aerial imagery.

3.1.6 Field Documentation

A record of daily activities was recorded in a log that documented fieldwork and relevant information on the survey areas and sites. Air photo maps of the project area were used as a base maps for recording project information. Sketch maps were prepared for each archaeological site using a tape measure. Project information plotted on the site sketch maps included the locations of shovel tests, survey limits, significant landforms, geographical markers, and field conditions. Photographs were taken of archaeological sites, survey areas, walls of the XUs, and features. A record of the photographs was maintained in a project photo log.

Excavation level forms were maintained for each level of an XU and were filled out after the completion of each level. These forms contained information on excavation methods, soils, artifact counts, disturbances, and other relevant observations.

A soil profile was drawn for representative shovel tests and for each positive shovel test and XU. Soil colors, textures, horizons, and disturbances were recorded on the profile. Soil colors were described using the Munsell system, and the soils were slightly moistened prior to determining color.

3.2 Laboratory Methods and Artifact Analysis

Artifacts were analyzed and cataloged at the FCRS laboratory in Boyceville, Wisconsin. The artifact assemblage consisted of precontact ceramics, lithic debris, cores, stone tools, faunal remains, FCR, and botanical remains. Historic artifacts from 276-3 were analyzed in the field and were not collected or cataloged. Artifacts from public lands will be curated at MHS. FCRS is working with the private landowners regarding the disposition of artifacts from their land.

Frank Florin was the lab supervisor, and he conducted the artifact analysis. Dr. James Theler at the University of Wisconsin-LaCrosse conducted the faunal analysis of selected specimens that retained diagnostic features. David Mather also examined selected remains from 21CR156. Beth Wergin was the lab technician, and she cataloged artifacts, prepared data tables, and produced the cross-section maps and wall profiles. James Lindbeck conducted background research, edited the report, and compiled the culture history. Mike Beck illustrated the artifacts.

Artifact catalog numbers include a provenience bag number and a specimen number, following the Minnesota Historical Society (MHS) system. The provenience bag number is represented in the catalog database by the column titled “Prov # ”,and the specimen number is represented by the column titled “Specimen #”. The artifact catalogs for the sites are contained in Appendix C.

Provenience bag numbers were established by FCRS in the lab and consisted of a unique number assigned for each specific provenience by shovel test and depth. For example, Prov # 1 would represent Shovel Test 1 (ST 1), 0-20 cmbs, and Prov # 2 would represent ST 1, 20-40 cmbs. The specimen number is a unique sequential number(s) that was assigned to artifacts within a specific provenience bag number. Artifacts with similar attributes and size grades were grouped together, entered in one row of the database, and assigned sequential specimen numbers based on their count.

Information recorded in the catalog for each artifact included site number, provenience bag number, specimen number(s), provenience, artifact class, artifact descriptions, weight, and size. Additional artifact information was entered in the “Notes” column of the catalog. Specific descriptive attributes recorded for each artifact class are discussed below. The descriptive categories that apply to each artifact class are summarized in Table 2. All data was entered in a Microsoft® Access 2002 database. Fields left blank in the database indicate that the attribute does not apply or that the attribute is absent. The catalog uses the abbreviation “FS” for find spot, “ST” for shovel test, “cmbd” for cm below datum, and “cmbs” for cm below surface.

Table 2. Descriptive Categories for Artifact Classes in the Catalog.

Class	Description 1	Description 2	Description 3	Description 4	Description 5	Description 6
Lithic	Debris	Flake type	N/A	N/A	Lithic material	Presence/ Absence of cortex
Lithic	Tool	Tool category	Tool type	Discard stage	Lithic material	Presence/ Absence of cortex
Lithic	Core	Core type	Morphology	Prepared/ Unprepared	Lithic material	Presence/ Absence of cortex
Faunal	Class	Element/ Side	Portion	Burned/ Calcined	N/A	N/A
Other	FCR	N/A	N/A	N/A	Lithic material	N/A
Botanical	Material	Type	Portion	N/A	N/A	N/A

Gilson standard-testing, metal sieves were used for size grading. The following size grades (SG) were used to sort artifacts: ≥ 1.0 inch (SG1); <1.0 inch to ≥0.5 inch (SG2); <0.5 inch to ≥0.233 inch (SG3); and < 0.233 inch (SG4). During field recovery, all soils were screened through ¼-inch (actually ca. 0.233 inch) mesh; thus, artifacts <0.233 inch (SG4) in size were typically not recovered in the field, except at site 21CR156 where 1/8-inch screen was used at some test locations. The light fraction of flotation samples from the Feature 1 at 21CR156 was recovered in a 0.0165-inch mesh screen. A 1/16-inch mesh screen was used to water screen the heavy fraction sample from the feature. Weight was measured to the tenth of a gram with an electronic scale. Artifacts weighing less than 0.05g were given a weight of "0".

3.2.1 Lithic Analysis

The analysis of lithics was primarily concerned with the identification of tool types, debris types, raw materials, and lithic technology. Information on site function, lithic economy, lithic technologies, settlement patterns, and regional interaction may be inferred from this data. Raw material, weight, size grade, and presence/absence of cortex were recorded for all lithics. Lithic debris was examined for macroscopic evidence of modification, such as use-wear or retouch. All lithics were examined using a 10x magnification hand lens, which was useful for identifying micro-flaking, lithic material, and other features not visible without the aid of magnification.

Lithic raw material types were identified through the analyst's familiarity with the raw material types in the region, by comparison with FCRS's sample collections, and through the use of published guides to lithic resources of Minnesota, Wisconsin, North Dakota, and the Upper Midwest (Ahler 1977; Bakken 1997; Morrow 1984, 1994; Morrow and Behm 1986).

Lithic Resources Region

The project area is in the Hollandale Lithic Resource Region (Bakken 2011). The western portion of this region, including the project area, consists of Des Moines Lobe till with bedrock exposures of Prairie Du Chien Chert in stream valleys. Prairie Du Chien Chert and Swan River Chert are the primary lithic materials in this portion of the region. Minor lithic materials in the Hollandale Resource Region include Tongue River Silica, quartz, Knife River Flint, Red River Chert, and quartz. The most common exotic lithic materials in this region are Burlington Chert and Hixton Group Quartzite, with Knife River Flint being sparsely represented.

Underlying the Des Moines Lobe in the area is older till from the Superior Lobe (northeastern source material), and basalt and other stones from the northeast were commonly observed during testing. Superior Lobe lithic materials occur in very small amounts at the archaeological sites investigated during this project.

With the exception of exotic materials like Knife River Flint, Hixton Group Quartzite, and Burlington Chert, most of the lithic raw materials at the sites in the project area were likely procured from local sources where stones may have been exposed, such as erosional landscapes like ravines, river cuts, lakeshores, and bluff or terrace scarps.

The surficial geology map of the Shakopee area depicts the Prairie du Chien Group, which included the Shakopee and Oneota formation, within three meters of the surface on the lowest outwash terrace that borders the Minnesota River near Shakopee (Lusardi 1997). Prairie Du Chien bedrock was observed along an abandoned-channel terrace cut of the Minnesota River in Memorial Park on the east side of Shakopee, and it could also be exposed in stream valleys, gullies, and other erosional surfaces of the terrace. A cross-section map of Scott County depicts the Shakopee Formation directly below outwash and alluvium in the Minnesota River Valley (Harms 1959:52). Prairie du Chien Chert also occurs in the regional glacial till. In summary, it appears likely that Prairie du Chien Chert was available near the project area.

Heat Treatment

Lithic artifacts were classified as heat-treated only if they had surface crazing or potlid fractures. These attributes are the result of overheating or burning and are considered conclusive evidence of intentional or incidental thermal alteration, usually beyond the point that is beneficial for enhancing flaking properties.

Lithics subjected to less extreme heat often show less pronounced changes. Light-colored cherts often develop a pinkish, reddish, violet, or orangish color and a satiny to glossy luster. These artifacts were classified as possibly heat-treated because the evidence is not as conclusive as crazing and potlid fractures. However, some cherts may naturally have these characteristics without heating. Several pieces of Prairie du Chein Chert and Swan River Chert debitage were classified as possibly heat-treated, which would be expected given that heat treatment improves the flaking quality of these materials.

Lithic Debris

Lithic debris includes flakes, flake fragments, and pieces of shatter that were produced from cobble testing, core reduction, stone tool manufacturing, and stone tool maintenance. The analytical methods used in this report are based on the results of previous lithic studies and experimental replications (Callahan 1979; Cotterell and Kamminga 1987; Hayden and Hutchings 1989; Magne 1989; Odell 1989; Root 1992, 1997, 1999; Tomka 1989; Yerkes and Kardulias 1993). These studies indicate that lithic-reduction stages and technologies can be inferred from diagnostic flake attributes. The most promising results are derived from studies that consider a combination of several flake attributes from a large sample of lithic debris. Analytical methods relying on size grading (e.g., mass analysis) were not deemed useful for the current lithic analysis because soil was screened through ¼-inch mesh, and SG4 artifacts typically were not recovered. The recovery of SG4 debris is imperative for conducting mass analysis (Ahler 1989).

The lithic analysis for the project was accomplished by 1) identifying specific flake attributes; 2) comparing the attributes with those defined for specific flake types; and 3) making a determination as to flake type. Flake attributes examined in this analysis include the following morphological and technological characteristics: presence/absence of cortex; presence/absence of percussion bulb, number of dorsal flake scars; flake morphology; relative platform angle; flake thickness; and size grade. These attributes have been determined to be diagnostic of specific lithic-reduction stages and technologies. Lithic-reduction stages include the initial stages of reduction, initial shaping and thinning of a biface, and late-stage biface shaping and tool finishing/resharpening. If a flake contained traits of more than one flake type, the flake was assigned to the flake type that had the greatest number of similar traits. Types of lithic debris that are not amenable to reduction-stage classification include “other grade 4 flakes” and broken flakes. Specific flake types, flake attributes, and their associated lithic-reduction stages are defined below.

Primary flakes are associated with the initial stages of lithic reduction. This category includes flakes derived from decortification, edging on tabular cobbles, and the production of flake blanks or blades. Hard-hammer percussion is typically used in the removal of these flakes. Primary flakes typically have the following attributes: cortex on all or part of the dorsal surface and platform; large platform angle; pronounced bulb of percussion; $\geq$ ½ inch in size (SG1 or SG2); none to one or two flake scars on the dorsal surface; and a relatively thick cross-section.

Secondary flakes are associated with the initial shaping and subsequent thinning of a biface. Soft-hammer percussion using a billet is typically used in the removal of these flakes. Secondary flakes typically have the following attributes: little to no cortex; acute lateral and distal edge angles; thin, curved longitudinal sections; small diffuse bulb of percussion or bending initiation (lack of bulb) with lip on platform; <1 inch to ≥¼ inch in size (SG2 or SG3); two or more flake scars on the dorsal surface; evidence of bifacial edge on the platform; ground and prepared platforms; and expanding shape in planview.

Tertiary flakes are associated with late-stage biface shaping, bifacial and unifacial tool finishing, and tool resharpening (maintenance). Soft hammer percussion is typically employed in late-stage shaping, and pressure flaking is employed in final shaping/resharpening. Tertiary flakes typically have no cortex and have multifaceted ground platforms. Late-stage biface shaping flakes may have multiple dorsal scars, a slightly expanding shape in profile, and are typically <½inch in size (SG3 and SG4). Finishing/resharpening flakes (pressure flakes) typically have parallel sides and a single dorsal arris that runs from platform to distal tip; the cross-section is very thin; and they are generally are < ¼ inch in size (SG4). In order to ensure the accurate identification, all tertiary flakes had to have a platform. Tertiary flakes are likely to be underrepresented in the assemblage because their small size makes them less likely to be recovered.

Shatter is an angular or blocky piece of lithic debris that lacks a platform and bulb of percussion. Shatter is typically associated with cobble testing and core reduction during the initial stages of lithic reduction, but shatter may result from any stage of production and may range from >1 inch to < ¼ inch in size (SG1 to SG4).

"Other grade 4" flakes lack diagnostic traits and are < ¼ inch in size (SG4). These flakes are typically produced during all stages of lithic reduction, and most are probably produced during edge grinding and preparation. It was not possibly to assign them to a specific reduction stage because of their small size and lack of diagnostic traits. "Other grade 4" flakes are likely to be underrepresented in the assemblage because their small size makes them less likely to be recovered.

Broken flakes lack a bulb of percussion, platform, or other diagnostic features that would enable a determination of flake type. Such flakes are typically distal or medial flake fragments. Broken flakes are produced during all stages of lithic reduction.

Lithic Tools

Tool categories were defined by technological attributes (bifacial, unifacial, or pecked/groundstone) and by whether the tool was patterned or unpatterned. Patterned or formal tools include types in which the original shape of the flake blank or raw material has been substantially modified through a systematic sequence of reduction or retouch to produce a specific form that exceeds minimal functional requirements. In patterned tools, the shape of the tool reflects a distinctive style or cultural template. Projectile points, end scrapers, and bifaces are examples of patterned tools. Unpatterned or informal tools include types that were not substantially modified and still largely reflect the original shape of the flake blank or raw material. They lack the complex manufacturing methods of patterned tools and reflect an expedient technology. Flaking is typically restricted to the margin of the artifact. Utilized flakes and retouched flakes are examples of unpatterned tools.

Tool types and their inferred functions (e.g., projectile points, scrapers, cutting tools, etc.) were defined by technological attributes in conjunction with morphological attributes (form), general edge angle, size, and results from micro-wear studies that provide supporting evidence for general tool function (Root 2001; Kooyman 2000:164; Vaughan 1985; Yerkes 1987).

Numerous studies indicate that high powered magnification is necessary to accurately identify specific tool function, including the material that was worked and the motion in which the tool was used (Keeley 1980; Odell 2003; Semenov 1976; Vaughan 1985; Yerkes 1987). Microwear studies clearly indicate that there can be a low correlation between tool form and specific function, as tools from different form classes were used for the same task, and a single tool form was often used for multiple functions (Yerkes 1987:128). These studies reveal that there is much more functional variation than is typically assumed from the traditional form-based tool classification.

Micro-wear studies also indicate that there is some viability to inferring general tool function from the form-based classification, especially for certain tool types. For example, scrapers defined morphologically by a steep working edge often correlate with micro-wear studies that show tools with steep working edges were used for scraping bone, wood, and hide (Kooyman 2000:164; Root 2001; Vaughan 1985; Yerkes 1987). Of course, without microscopic examination of the micro-wear, there is no way to tell what material was scraped. Also, micro-wear analysis often reveals greater functional variation than can be inferred from typological and technological classification alone (Odell 1996; Vaughan 1985). For example, scrapers are also used for non-scraping tasks such as cutting, engraving, wedging, shaving, chopping, and shredding. In some cases “scrapers” bear no evidence of use as scrapers. Projectile points were in many cases also used for cutting, shaving, engraving, scraping, and drilling and that bifacial tools were used to saw bone, antler, or wood as often as they were used for cutting meat (Yerkes 1987:186).

Thin, sharp-edged flake and blade tools (such as utilized and retouched flakes) generally correlate with micro-wear studies confirming their use as cutting implements (Kooyman 2000:164; Odell 1996; Root 2001; Yerkes 1987). Again, the specific material worked or specific use cannot be determined without microscopic examination of wear patterns. Some studies that tested the accuracy of identifying utilized flakes without magnification indicated a low success rate, as the multiple processes (besides use as a tool) that can produce edge wear are not discernible without microscopic analysis (Young and Bamforth 1990; Shen 1999). These processes include wear caused by flake production, artifact trampling, excavation damage, and artifact movement in the soil. The studies show two primary causes of incorrect identification. First, utilized flakes that exhibit no macroscopic wear go unrecognized as tools. Second, use wear is incorrectly attributed to use as a tool when it is actually created by some other cause.

Despite the benefits of micro-wear analysis, there are several limitations that hinder its usefulness and practicality. The time and money needed for such analysis is often not available in contract work, few individuals have the necessary training and expertise, and microscopic equipment is not available in most labs. Further, experimental studies have not been conducted on many of the lithic materials that occur in the artifact assemblages in Minnesota. Micro-wear analysis does not necessarily produce conclusive results. Blind tests revealed the accuracy of tool function to be 76 percent for high-power technique and 68 percent for the low-power technique (Yerkes 1987:115). The accuracy of identifying the material worked was 62 percent for high-power technique and 32 percent for low-power technique. Also, micro-wear analysis may not clearly identify functions of a tool used for different tasks on the same edge, and it may not identify the function of tools that are used for a short time or on very soft materials that lack observable wear.

Stone Tool Techno-Morphological Categories and Descriptions

Stone tools were vital to prehistoric lifeways, and they were used for a variety of tasks: cutting, sawing, scraping, boring or drilling, graving, whittling or slicing, perforating, chopping, pounding, and abrading. Tool types from the sites are discussed below.

Utilized and retouched flakes are unpatterned flake tools that exhibit minimal modification. Primary and secondary flakes were the main flake types used for this expedient tool type. Utilized flakes have a series of micro-flakes (use-wear) along the flake edge that are assumed to have been removed through use of the flake as a tool. The micro-flakes are primarily distinguished from pressure flakes by their smaller size. Utilized flakes were not intentionally modified by pressure flaking. Retouched flakes have a series of intentional pressure flakes along the flake edge. The flaking is typically concentrated in one area on both utilized and retouched flakes and does not occur randomly. Use-wear and experimental studies indicate that these are typically light-duty cutting, slicing, scraping, and sawing tools that were used on soft materials (meat, hides, and plant material) or moderately resistant materials (wood and bone). These tools suggest that the following activities may have occurred at the site: butchering, animal/plant processing, hide working, and bone and woodworking.

Projectile points are bifacial or unifacial tools with a sharp-pointed distal end and proximal hafting elements. These tools were used for hunting, and larger points may have also been used as cutting tools. Published guides to projectile point types of Minnesota, Iowa, Wisconsin, the Upper Midwest, and the Northeastern Plains were consulted to aid in identifying the points at 21CR155 (Alex 2000; Boszhardt 2003; Gibbon 2008b; Kehoe 1966, 1973, 1974; Morrow 1984; Justice 1987; Goldstein and Osborn 1988). Projectile points indicate that site activities were associated with the procurement of game animals.

End scrapers are patterned flake tools that have been pressure flaked along a distal or lateral end to form a steeply beveled (wide-angled) edge. End scrapers have a distal working edge that is generally shorter or the same length as the lateral side and may have been hafted. Side scrapers have the working edge along the longest side of a flake and were likely not hafted. Scrapers are typically associated with scraping tasks on a variety of soft materials (meat, hides, and plant material) or moderately resistant materials (wood and bone).

Gravers are deliberately formed tools that have a short spur projecting from the tool edge, which was often created by pressure flaking. They are typically used for shallow engraving or incising of bone or wood.

Bifaces are classified into five stages after Callahan (1979), although Callahan's final stages are condensed in this scheme (Odell 2003; Root 1999). The unfinished bifaces could have been used as tools in an unfinished state, although it is likely that their intended final form would have been projectile points. The bifaces from the current project include broken and whole specimens.

A Stage 1 Biface is a flake blank, a tabular piece of material, or a cobble that is obtained for reduction. Stage 1 bifaces were not identified in the assemblage, as flake blanks are generally classified as primary flakes, and there were no unworked cobbles.

A Stage 2 Biface has initial edging that is characterized by the following: bifacially flaked edges in which relatively widely spaced scars produce a sinuous outline in lateral view; conchoidal flake scars with cones of force from hard-hammer percussion; minimal shaping; flakes often do not extend to the midline; irregular outline and cross section; and width to thickness ratio ranges from 2:1 to 3:1. Stage 2 Bifaces are coded as cores in this analysis.

A Stage 3 Biface has primary thinning that is characterized by the following: removing major projections and irregularities; straightening of edges so they are less sinuous; thinning by removal of ridges and humps; production of flakes with bending initiation from billet percussion; lack of cones of force; flakes that often extend to or past artifact midline; edge angles in the 40-60 degree range; and width to thickness ratios of 3:1 to 4:1.

A Stage 4 Biface has secondary thinning and shaping that is characterized by the following: a thin, flat to biconvex cross section; regular edge shape; edges with beveling and grinding; little to no cortex; production of flakes with bending initiation from billet percussion; lack of cones of force; flakes often extend to or past artifact midline; edge angles in the 25-40 degree range; and width to thickness ratios that range from 4:1 to 5:1.

A Stage 5 Biface consists of final shaping and hafting preparation that is characterized by the following: pressure flaking or light percussion flaking to a specific shape especially along margins; edge beveling or grinding; removal of percussion platforms; pressure flaking of notches and stem shape; and basal grinding.

Hammerstones are generally rounded stones that have pitting on one or more surface, which resulted from striking a hard material. They were used for flint knapping, processing foods such as acorns, or marrow extraction from animal bones.

Grooved abraders have linear grooves ground or incised into their surface by friction with another object such as wood, bone, or stone. The grooved abrader from 21CR156 is made from basalt and has several very fine, incised lines or grooves, indicating that the object ground into it was a hard material with a sharp edge, probably a chipped stone tool (e.g., biface, knife, or projectile point).

Polishing stones have a convex, smooth, burnished surface with bright polish and striations. These tools are inferred to have been rubbed against softer materials such as hides or unfired pottery.

Grinding stones typically have a flattened or convex working surface that has been smoothed through the action of rubbing it against another stone or hard object. Polish and striation may also be present. Grinding stones are often used grinding, crushing, and processing food or minerals.

Lithic Cores

Lithic cores were categorized according to their technological and morphological attributes. Core types were defined based on bifacial, non-bifacial, or bipolar percussion technology. Core morphology reflects the shape of the core.

3.2.2 Faunal Analysis

Data recorded for faunal remains included identification to the highest taxonomic level (class), element/side, element portion, and condition. Faunal condition included those attributes caused by human modification such as spiral fractures, impact fractures, cut marks, and thermal alteration. Most of the faunal assemblage was highly fragmented and not amenable to species-level identification. These faunal fragments were generally classified into broad taxonomic categories, including unidentified, mollusk, fish, bird, large mammal, medium/large mammal, medium mammal, and small mammal. Bones that contained diagnostic attributes were sent to faunal specialist Dr. Jim Theler at the University of Wisconsin-LaCrosse for analysis. His identifications have been incorporated into the artifact catalog and this report.

Large mammals included bison, moose, and deer-size animals. Some large mammal bones were complete enough to list as Artiodactyl, the taxonomic order that includes the families of Cervidae (deer, elk and moose) and the Bovidae (bison and cattle) (Hazard 1982). Medium mammals included coyote and fox-size animals, and small mammals included rodent-size animals.

3.2.3 FCR

Several criteria were established to provide a consistent method of identifying FCR. In order for a rock to be classified as fire-cracked, it must meet at least one of the following criteria: 1) the rock is associated with a fire hearth; or 2) the rock has angular fractures, spall fractures, or is excessively friable. The lack of cobble-size rocks in the site soils facilitated FCR identification.

3.2.4 Historical Artifacts

The analysis of historical artifacts was conducted based on the classification methods in manuals designed to aid in interpreting and dating historical materials (Peterson 1995; University of Utah et al. 1992). These manuals were used to establish date ranges for specific artifact types and to aid in site interpretation.

4. Literature Search

by James Lindbeck

4.1 Archival and Background Research

Archival and background research was conducted to determine whether any previously identified archaeological sites or potential historic sites are located within 1.5 miles of the project area. FCRS staff conducted an initial review of sites located near the project area prior to fieldwork. Additional research was conducted in March 2013 at the MnSHPO and the MHS Library in St. Paul. Site inventory files, USGS 7.5' quadrangle site location maps, and research reports were reviewed to provide information on previously recorded archaeological sites and previous investigations. Mr. Tom Cinadr, Survey and Information Management Coordinator at MnSHPO, also conducted a search of the site file database and provided a list of sites within 1.5 miles of the project area.

4.2 Previous Surveys and Sites

There are 18 previously recorded archaeological sites within a 1.5-mile radius of the project area (Figure 3). These sites, which are summarized in Table 3 below, include precontact period mounds (earthworks), precontact period lithic scatters and find spots, precontact and historic period artifact scatters, a historic Dakota village (21SC2), and historic sites dating to the founding of Shakopee in the 1840s and 1850s. Site 21SC2 was recommended as eligible for listing on the NRHP. A number of other sites, including earthworks, have also been recorded on the bluffs overlooking the Minnesota River outside of the 1.5 mile radius.

Table 3. Previously Recorded Sites within 1.5 Miles of the Project Area.

Site Number	Location	Site Type	Comments	Distance to Project Area (Meters)	Reference
21CR103	T116N, R23W, SE¼ NW¼ SE¼, Sec 27	Precontact lithic scatter	Two tertiary flakes found during pedestrian survey.	2020	Harrison (1988a)
21CR104	T116N, R23W, SW¼ NE¼ SE¼, Sec 27	Precontact lithic scatter	Lithic core and flakes found in shovel tests.	1970	Harrison (1988a)
21CR110	T116N, R23W, NW¼ SE¼ NE¼, Sec 25	Precontact lithic find spot	One tertiary flake and one piece of possible shatter found in fallow field along road.	1715	Harrison (1988a)
21CR140	T116N, R23W, SW¼ NE¼ SE¼, Sec 27	Historical artifact scatter	Structural and domestic debris associated with farmstead.	1905	Schoen (2006)
21CR141	T116N, R23W, SE¼ SW¼ NE¼, Sec 34	Precontact lithic and artifact scatter	Oneota sherds, flakes, and bone was recovered in Phase I shovel tests. Phase II recovered deeply buried lithics and bone that dated to the Middle Archaic period. Site is located near the head of an alluvial fan along a steeply-incised ravine.	1395	Schoen (2006)
21HE21	T116N, R22W, W½ SE¼ and E½ SW¼, Sec 30	Precontact earthworks and artifact scatter	Twenty mounds identified by Winchell. Subsequent surveys found many mounds destroyed. Ceramics and Archaic and Woodland projectile points. Numerous soil features that contain charcoal and burned artifacts.	1500	Winchell (1911), Chamberlin (1972), Nystuen (1973), Harrison (1997, 1998b, 1999), Madigan et al. (1998)

Table 3. Continued.

Site Number	Location	Site Type	Comments	Distance to Project Area (Meters)	Reference
21HE200	T116N, R22W, SE¼ NW¼ NW¼, Sec 30	Precontact lithic scatter	Two flakes identified on surface of plowed field near creek.	2195	Harrison (1988a)
21HE225	T116N, R22W, S½ SE¼, Sec 31	Historical and precontact artifact scatters	Lithic debitage and core, catlinite fragments, bone fragments, iron, glass, and ceramic fragments. Possible contact period site based on artifact styles and landowner report of Native American campsite. Site is in plowed field.	1700	Vogel et al. (1994)
21HE226	T116N, R22W, SE¼ SW¼ SW¼, Sec 31	Historical artifact scatter	Brick, glass, and ceramic debris in a plowed field associated with the location of 19th century meat-packing plant	1150	Vogel et al. (1994)
21HE264	T116N, R22W, SE¼ SE¼, Sec 30	Precontact earthworks	Two mounds reported on a bluff top, not formally verified, may be associated with 21HE21.	2180	Chamberlin (1972), Vogel et al. (1994)
21HE361	T116N, R22W, NW¼ SE¼ SE¼, Sec 30	Precontact lithic find spot	Flake of Prairie du Chien Chert from a shovel test.	2300	Harrison (2005)
21SC2	T115N, R22W, center of NE¼, Sec 6	Precontact earthworks and Dakota village site	Twenty-eight mounds and the site of "Shakopee Village." Kathio ceramics and human remains were recovered, site area is heavily disturbed. Also contains the location of 21SC40 - "Oliver Faribault Cabin."	1035	Winchell (1911), Wilford (1940), Dobbs (1987), Dobbs and Breakey (1989)
21SC22	T115N, R22W, E½ NE¼ NE¼, Sec 6 & N½ of NW¼ Sec 5	Precontact Earthworks and habitation	Twenty-eight mounds within Veteran's Memorial Park in Shakopee.	1970	Winchell (1911), Goltz (1993), Bakken (2003)
21SC34	T115N, R22W, S½ NW¼ NW¼, Sec 6	Historic site	Location of "Schroeder Brick Yard and Lime Kiln" dating to mid-19th century.	610	Breakey and Johnson (1989)
21SC40	T115N, R22W, SW¼ NE¼ NE¼, Sec 6	Historic site	Original location of "Oliver Faribault Cabin" dating to the 1840s	1700	Peterson (1985), Dobbs and Breakey (1989)
21SCao	T115N, R23W, NE¼ SW¼ NE¼, Sec 1	Historic site	Site of "Holmes Steamboat Landing" dating to 1851.	160	Hughes (1905)
21SCap	T115N, R23W, NE¼ SW¼ NE¼, Sec 1	Historic site	Location of "Holmes Trading Post" dating to 1851.	120	MnSHPO files
21SCo	T115N, R23W, Sec 1	Historic site	Location of "Prairieville," which was the name given by Rev. Samuel Pond ca. 1847 to the Dakota village that was in the location of what later became the platted Village of Shakopee.	150	MnSHPO files

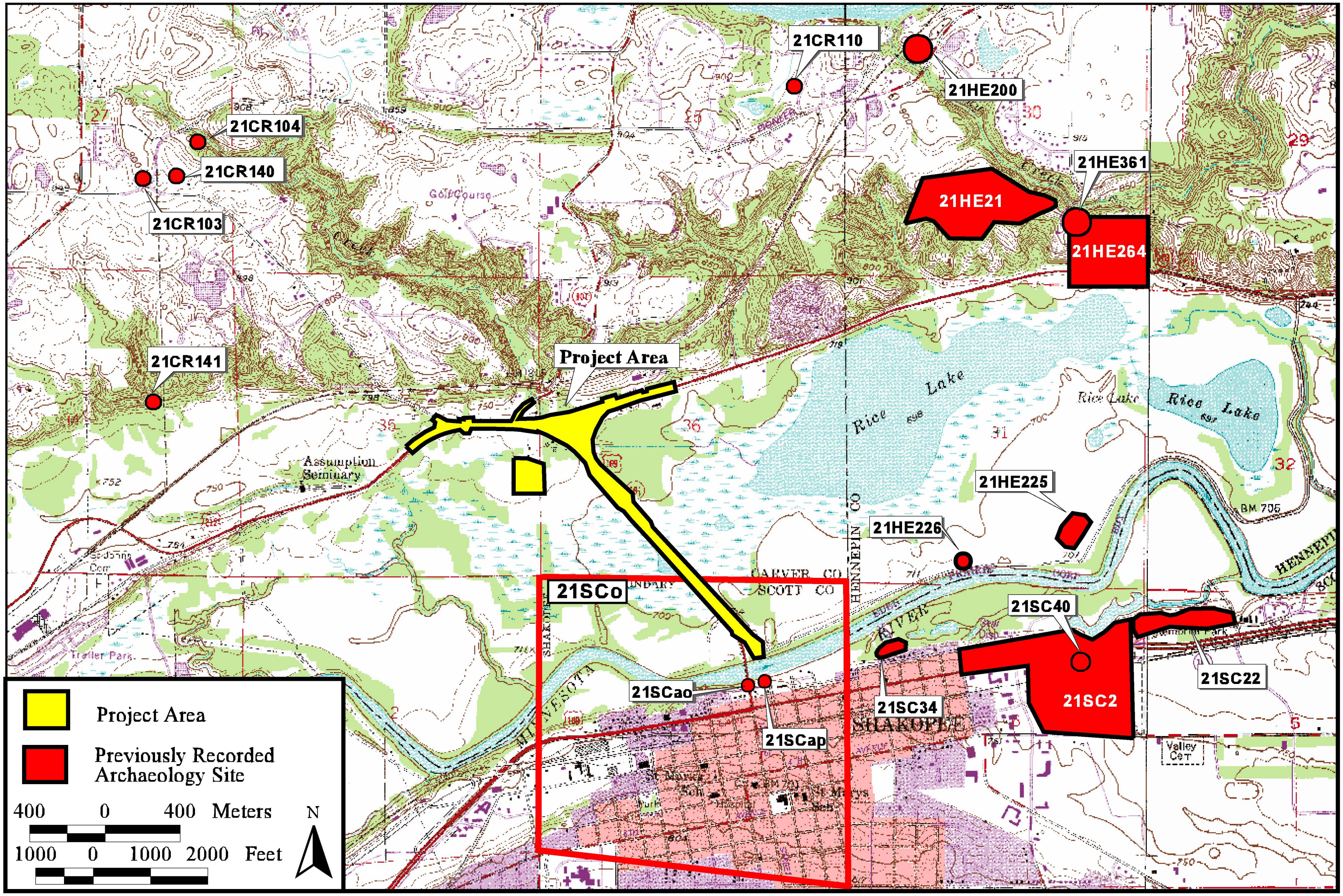


Figure 3. Location of Previously Recorded Sites within 1.5 Miles of Project Area on USGS 7.5' Shakopee and Eden Prairie Quadrangles.

4.2.1 Sites and Surveys Within a 1.5 Mile Radius

The Minnesota River Valley and the surrounding bluffs have been the subject of a number of formal archaeological investigations beginning with T.H. Lewis and the Northwestern Archaeological Survey (NWAS), which focused on recording mound groups. Lewis recorded the mounds at sites 21HE21 and 21SC2 during survey in 1882, and he returned to do additional work at 21SC2 in 1884. N.H. Winchell later compiled and published the original survey notes and maps from the NWAS survey (Winchell 1911).

The mounds at 21HE21 were formally investigated again during a 1971 survey by the Minnesota Archaeological Society during their *Hennepin County Mound Site Resurvey* (Chamberlain 1972). The 1972 survey noted that four of the originally-recorded 20 mounds were still extant with the rest destroyed by erosion and cultivation. The Minnesota Trunk Highway Archaeological Reconnaissance Survey (Nystuen 1973) found three mounds remaining during a 1972 survey for an alternate alignment of TH 169. Another round of surveys was initiated in 1997 for a proposed development in the site area. Harrison (1997, 1998b, and 1999) conducted Phase I survey and a partial data recovery adjacent to the mounds and found that portions of the area remained intact, containing Archaic through Woodland components, but no visible mound remnants. The site was recommended eligible for listing on the NRHP. Hemisphere Field Services (Madigan 1998) conducted geomorphological testing, geophysical survey, and archaeological testing at the loci of seven mounds and found no evidence of intact mound remnants. Soil staining and an intact habitation feature dating to the Archaic period were identified at the reported location of one mound. Bruce Koenen (SHPO site files 2001) notes that at least two mounds survived at the site despite the flurry of development in the area and that others of the original group may exist outside of the areas surveyed during the 1990s.

The location of the mounds and Dakota Village site at 21SC2 (along with 21SC40, the "Oliver Faribault Cabin, which is located within the 21SC2 site area) have been revisited during a number of subsequent investigations but the exact location of the village site remains unclear. The location of the (destroyed) mounds is more certain (Bruce Koenen, SHPO files 1998) and the OSA confirmed during a field visit in 1998 that almost the entire area has been disturbed by decades of construction and development. Wilford (1940) describes the location of the village in terms of features that are still extant, such as a ravine, terrace edge, and railroad tracks but little or no archaeological evidence of the village has been recovered. Dobbs (1987) and Dobbs and Breakey (1989) conducted surveys for a sewer corridor in the City of Shakopee that extended through the reported site area and found no evidence of the village or mounds. Site 21SC40, the "Oliver Faribault Cabin" was established following the 1989 survey. Within the property associated with the cabin is the reported location of historic Dakota graves. Koenen reports that the 1936 WPA Burials Survey lists four graves in a fenced cemetery near the cabin. Descendents of Faribault, who still own the property, reported to Dobbs and Breakey (1989) that the burials contained the remains of 10 to 12 individuals who were originally in mounds that were leveled to fill in the cabin yard.

Site 21SC22 is known as the "Pond Mounds" for the original landowner E.J. Pond. It was recorded by Lewis and reported in Winchell (1911). Twenty-eight mounds were mapped 25 feet above the river. Mr. Pond reported that the mounds had been "often dug into" and that they were near Shakopee's Village. The mounds are now located within Veteran's Memorial Park in Shakopee. J.W. Oothoudt from MHS visited the site in 1976 following the unearthing of human remains during landscaping at the park. He reported that two mounds had been dug into. The human remains were subsequently reinterred. The site area was surveyed again in 1993 for the Mn DNR (Goltz 1993). Nine of the mounds were included within the survey area, and four of these were reported as having their fill removed but subsurface burials likely were still intact. In 2003, Summit Envirosolutions conducted an archaeological investigation for the installation of a pad for a decommissioned helicopter in the park (Bakken 2003). A three meter by three meter block was excavated and flaking debris along with a small amount of faunal material was recovered. No diagnostic materials were found.

Sites 21HE225 and 21HE226 were identified by Bear Creek Archaeology (Vogel 1994) during a comprehensive city-wide cultural resources survey for the city of Eden Prairie. The survey included archaeological and historic landscape resources within the city limits. Other sites (21HE200, 21CR103, 21CR104, and 21CR110) within 1.5 miles of the project area were identified during a cultural resources investigation conducted by Archaeological Research Services (Harrison 1998a) as part of an EIS for TH 212.

Loucks and Associates (2000) conducted a survey for a 130-acre parcel located west of the current project area that was under consideration for the development of an amphitheater. This parcel included portions of the 21SC26 mound group and although the Loucks survey found no evidence of any mounds in the survey area, they did identify a precontact period lithic scatter (21SC64) that is more than one mile from the current project area.

In 2004, the Berger Group conducted a geomorphological and Phase I and Phase II archaeological investigations across a total of 45.8 miles of survey area within a 1000 foot-wide corridor for a number of alternative routes for TH 41 north and south of Chaska, a few miles west of the current project area. Three sites were identified during the Berger survey: 21CR140, 21CR141, and 21CR142 (Schoen 2006). No additional work was recommended for 21CR140 (a small scatter of historical materials) and 21CR142 (lithic debitage and FCR in the plowzone). Site 21CR141 is located on a broad alluvial fan in a steep, narrow drainage in the Minnesota River Valley. Shovel and auger testing conducted recovered Oneota sherds from 35 to 40 cmbs and a flake at 165 cmbs. A geomorphological investigation of a cutbank near the head of the alluvial fan in the site area identified a number of buried A horizons, including one at 315 to 340 cmbs, in which lithic debitage, bone fragments, and charcoal were recovered.

A phase II evaluation at 21CR141 included shovel and auger testing (17 tests) and four XUs totaling eight m^2. A small amount of faunal material and one flake were recovered from three of the XUs that contained buried soils on top of the alluvial fan (units 1, 2, and 4). The Oneota sherds recovered during the Phase I testing did not appear to be associated with any of the buried deposits and were considered to be an isolated find. In XU 3, which was positioned at the base of the alluvial fan, faunal material, lithic debitage, and charcoal were recovered. These materials were interpreted to represent an intact midden deposit that follows a buried soil horizon ranging in depth from 316 to 358 cmbs (where the surface is the top of the cutback). Lithic debris included seven flake fragments and a bifacial reduction flake of Prairie du Chien Chert along with one flake of Swan River Chert. A total of 203 pieces of faunal material were recovered. Charcoal samples were dated to 5285 to 4957 cal BC and 4777 to 4458 cal BC, placing the horizon in the Middle Archaic period. While pointing out the lack of recovered diagnostic artifacts and intact features, Berger recommended that the site is eligible for listing on the NRHP based on the discrete deposit of datable materials from the Archaic period, along with the potential for intact features and diagnostic materials from other parts of the site.

4.2.2 Comparative Regional Sites

Archaeological survey and site evaluation was conducted for the Northern Natural Gas Company across the Minnesota River Valley and adjacent uplands a few miles southwest of the current project area (Bailey et al. 1999). Eight precontact sites and six Euro-American historic sites were identified.

Precontact sites included earthworks, lithic scatters, lithic isolates, and artifact scatters, representing Woodland and undefined components. A lithic workshop possibly dating to the Late Paleoindian or Early Archaic period is inferred from the geomorphic context of site 21SC54. Prairie du Chien Chert was the dominant lithic material at the sites, with a small amount of other local materials and exotic materials such as Knife River Flint and Hixton Group Quartize. The relatively large number of sites attests to the importance of the river valley in the precontact and historic periods.

Sites 21NL63 and 21NL58, located farther west along the Minnesota River, are similar to sites 21CR155 and 21CR156 identified for the current project. These sites are on alluvial-colluvial fans with buried soils and Archaic components. The Fritsche Creek II site (21NL63) is located on an alluvial-colluvial fan in the Minnesota River Valley in Nicollet County, just upstream from the city of New Ulm (Roetzel et al. 1994). The site includes evidence of prehistoric occupation that spans from the Archaic to the Woodland periods, with an intact buried component that appears to date to the Early and Middle Archaic, based on carbon dating of bone collagen. The buried component may reflect a short-term occupation associated with a bison kill and processing site.

The dates from 21NL63 (Fritsche creek II) are 5610-5470 BC (calibrated) for the upper horizon from 85 to 150 cmbs (Middle Archaic) and 7160-7040 BC (calibrated) for the lower horizon from 140 to 240 cmbs (Early Archaic). Geophysical survey in the site area was inconclusive but trenching for geomorphological investigation allowed the researchers to focus …*on determining the sedimentological and stratigraphic relationships between the archaeological deposits and sediments that form the broad alluvial and colluvial fan on which the site lies. The results indicate that the upper portion of the fan was clearly derived from a combination of alluvial and colluvial depositional processes and is very old, while the lowest… toe was apparently composed of young alluvial and fluvial (floodplain) deposits related to the modern configuration of Fritsche Creek. The colluvial and alluvial fan processes were apparently most active during the early and middle Holocene and the fan was relatively stable, or possibly eroded, during the late Holocene* (Roetzel et al. 1994:(6) 19).

Site 21NL58 is located on a foot slope along the eastern edge of the Minnesota River Valley approximately 2.5 miles from 21NL63 (Terrell et al. 2005). Backhoe trenching was conducted at 21NL58 to a depth of approximately 1.9 meters, and faunal material, including bison, was recovered from the alluvial fan deposits. The dates from 21NL58 are from six collagen samples that were averaged and calibrated, with a final range of 4347-3935 BC (Middle Archaic) from 120 to 185 cmbs. The researchers concluded that:

> *Comparison of the faunal remains, tool kit, and geological setting of 21NL58 with site 21NL63 (Fritsche Creek II) indicate that small alluvial/colluvial fans within the Minnesota River Valley were being occupied during the Archaic period. These fans were likely formed within the Minnesota River Valley walls in response to the destabilization of sediments at the base of tributary ravines by outbursts of flood waters from Lake Agassiz through the River Warren channel. By the Archaic period these landforms had apparently become stable and dry enough for habitation. The use of both of these fans as procurement and processing sites indicates that these landforms were attractive locations for such activities. As both of these sites are located along the north edge of the river valley, it appears that the fans may have been selected in part as sheltered locations at the base of the river bluff. Furthermore, these sites provided ready access to water; and were proximate to game…the faunal assemblage indicates the hunting of individuals and may point to the harvesting of occasional animals that were coming to the water within the valley, or that were collected on the surrounding plains and subsequently processed at the site (Terrell et al. 2005:81-82).*

Site 21BE271 is an Archaic period lithic procurement site located on a terrace west of Minneopa Creek, approximately 60 miles from the current project area near the city of Mankato (Withrow 2003). The site is within the boundaries of the NRHP-listed "Historic Minneopa Park District". Other than remnants of a nineteenth-century railroad grade near the site, the area is otherwise undisturbed. The site was identified during survey for a proposed bicycle trail when 317 pieces of lithic debris and burned rock, designated as Feature 1, were recovered from a single shovel test. The survey area was expanded into a grid, and a total of 69 shovel tests were dug, of which 22 contained cultural materials. The site was delineated to include an area of approximately 2.5 acres.

The Phase II evaluation at 21BE271 included nine additional shovel tests and four 1-x-1 meter units, all of which were placed to investigate Feature 1. A total of 9,997 artifacts were recovered from the Phase I and Phase II excavations at the site, mostly within a zone approximately 15-cm thick at an average depth of approximately 25 cmbs, in the vicinity of Feature 1. No soil discoloration or other evidence of fire hearths or pits was identified at the site. The only diagnostic artifact was the base of Table Rock Cluster projectile point, dating from ca. 3,000 to 1,000 BC that was recovered in association with Feature 1. All of the other artifacts were pieces of lithic debris or shatter, except for two flake tools, three cores, and six unfinished bifaces. More than 98 percent of the lithics were of Shakopee Formation chert, and the site was interpreted to be a lithic procurement site. The site was recommended eligible for listing on the NRHP as a short-term resource procurement camp from the Mountain Lake phase that has the potential to yield significant information about lithic resource procurement and stone tool processing in the Prairie Lake region during the Archaic period.

4.3 Mn/Model Study of the Big Woods Subsection

The Mn/Model is a statewide GIS-based predictive model for pre-1837 archaeological site locations. The project area is located within Mn/Model's Minnesota Big Woods subsection, which is characterized by a presettlement vegetation of mesic deciduous forest comprised of oak woodland and maple-basswood (Big Woods) and a loamy end moraine associated with the Des Moines Lobe of Late Wisconsin Glaciation (Hudak et al. 2002). The Minnesota River flows southwest to northeast through the subsection. The Mn/Model depicts areas of high site potential along the Minnesota River, which flows through the center of the region. The high site potential area along the river coincides primarily with alluvium and to a lesser degree with terrace landforms (Hudak et al. 2002, Chapter 8.10; Figure 8.10.3 and 8.10.8). The site potential within the valley is variable and dependent on topography, alluvial history, and geomorphic processes.

Landscape Suitability Ranking (LSR) maps compiled as part of the Mn/Model Landscape Suitability Models for Geologically Buried Precontact Cultural Resources rank the potential of habitats or environments that could contain prehistoric cultural resources. Maps for the project area provided by MnDOT indicate the landscape suitability potential for sites is as follows:

From 0 to 1 meter below surface
Alluvial fans = high; floodplain and levee = moderate; wetland = low; and commercial/developed areas = none

From 1 to 2 meter below surface
Alluvial fans = high; floodplain and levee = moderate; wetland = low; and commercial/developed areas = none

From 2 to 5 meter below surface
Alluvial fans = high; floodplain and levee = low; wetland = none; and commercial/developed areas = none

4.4 Historic Map Review

Several historic maps were examined to aid in identifying potential historic period archaeological resources within the project area. The earliest map examined was the General Land Office (GLO) survey maps of 1855 (Figure 4), which was available online (http://www.mngeo.state. mn.us/glo/).

Copies of historic plat maps in Scott County were obtained for 1874, 1898, 1911, 1913, 1916, 1930, and 1944 (Andreas 1874a; North West Publishing Company 1898a; Rand, McNally, and Co. 1911; Webb Publishing Co. 1913; Hixson and Company 1916 and 1930; Dahlgren 1944). A historic building depicted on the 1944 plat was located just outside the project area on the east side of TH 101 on the floodplain between the Minnesota River and Rice Lake wetlands. This area is currently a water catchment basin, pumping station, and parking lot that is constructed on approximately 10 feet of fill. The building and property also appear on the 1937, 1947, and 1951 aerial photos.

Copies of historic plat maps in Carver County for 1874, 1880, 1898, 1916, and 1926 were also reviewed (Andreas 1874b; Warner & Foote 1880; North West Publishing Company 1898b; Hixson and Company 1916; Hudson Map Company 1926). One historic farmstead, which is depicted on the 1880 and all subsequent maps, is located in the project's fill disposal area on the Golf Zone property south of CSAH 61 and west of TH 101 in T116N, R23W, NW¼ SE¼ of Section 35.

A 1905 USGS topographic map (1:62,500 scale) was reviewed (Figure 5), and it depicts an extensive wetland from the "Y", where TH 101 and CSAH 61 currently converge, to the Minnesota River near Shakopee.

The Shakopee bridge crossing at the Minnesota River was shifted one block east sometime after 1951. Historic roads, near the current alignments of TH 101 and the section of CSAH 61 extending west from TH 101, are present as early as 1855 the GLO maps. However, the accuracy of the earliest historic maps is limited because of survey methods and tools of the era, so the exact location of these historic roads is undeterminable. Until about 1880, TH 101 was west of its current location because Rice Lake was much more extensive (1855 and 1874 plats), covering most of the south half of Section 36. The location of the current junction of TH 101 and CSAH 61 is east of the historic road junction, which was in Section 35 west of Bluff Creek until about 1916. No evidence of these historic roads was identified during survey for this project. The section of road (CSAH 61) extending east of TH 101 first appears on the 1905 map, and its current route was established between 1916 and 1925.

4.5 Aerial Photo Review

Aerial photos from 1937, 1947, and 1951 (Figures 6 to 8) were obtained online from the Borchert Map Library at the University of Minnesota (http://map.lib.umn.edu/mhapo/) and the Minnesota Department of Natural Resources online air photos (http://www.dnr.state.mn.us/maps/landview/index.html). The photos reveal landuse changes in the project area and also changing landscape conditions.

One historic farmstead that appears on all air photos is located near the project's fill disposal area at the Golf Zone property south of CSAH 61 and west of TH 101 in T116N, R23W, NW¼ SE¼ of Section 35. The air photos from 1947 and later also show development along CSAH 61 east of TH 101 in the project area. This development appears to be small-scale, commercial operations based on the presence of what appear to be parking lots and buildings on the south side of CSAH 61. The buildings are located on a filled area surrounded by wetlands. One of these development locations coincides with the location of site 21CR157. Currently there are commercial buildings in this location, which appear to have mid-1900s construction style.

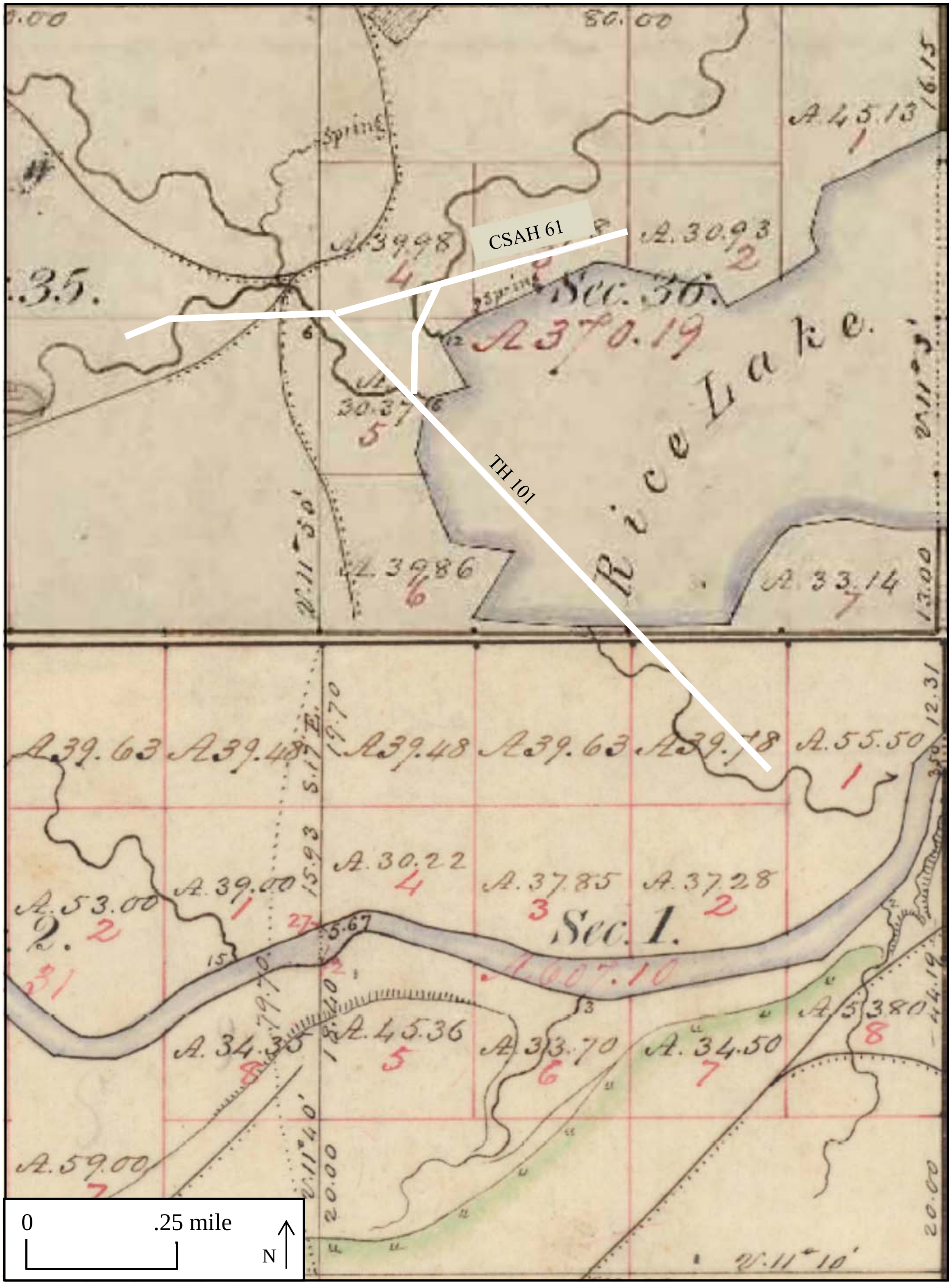


Figure 4. General Land Office Map 1855 of Project Area.

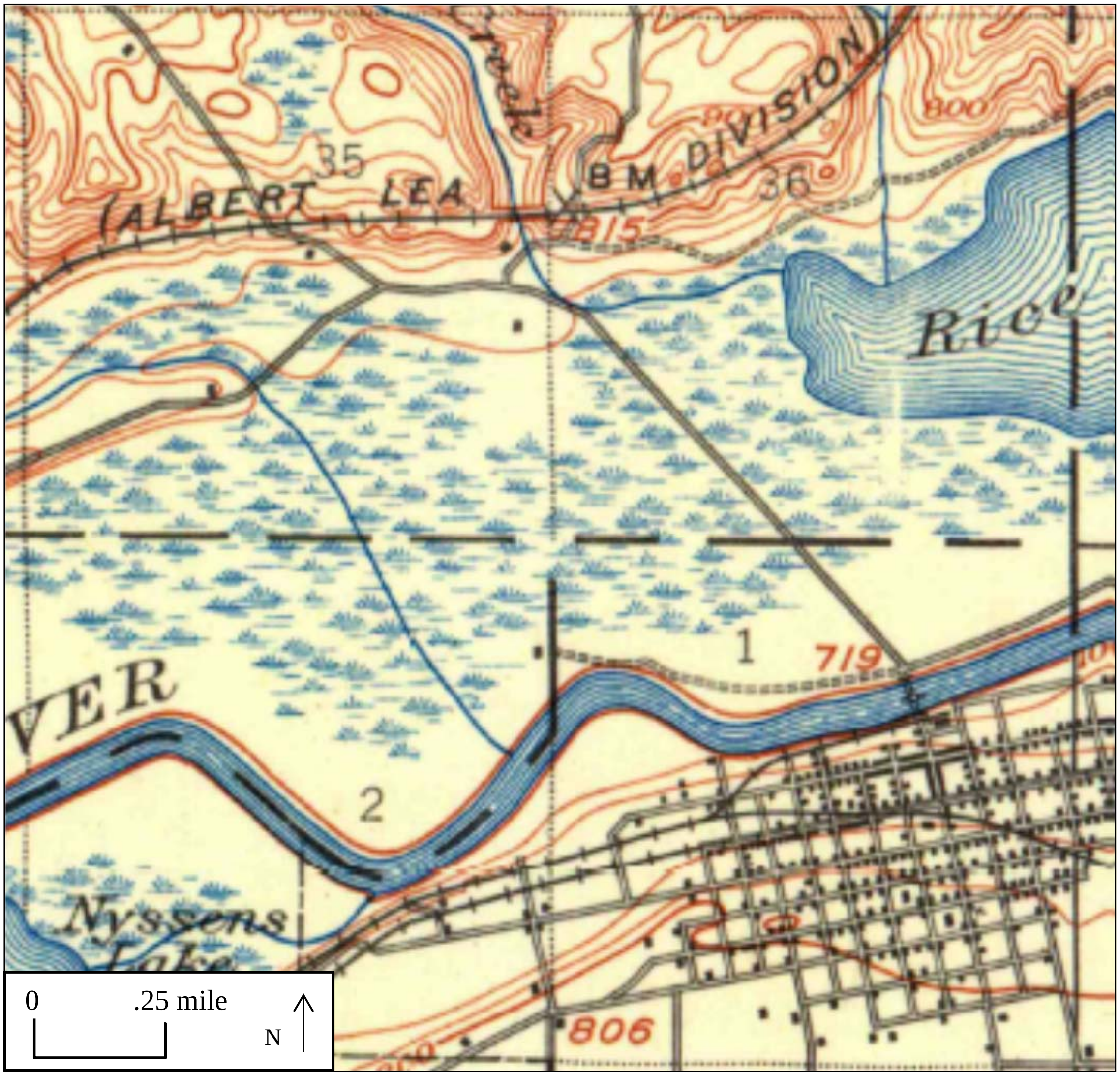


Figure 5. 1905 USGS Topographic Map (1:62,500 scale) of Project Area.

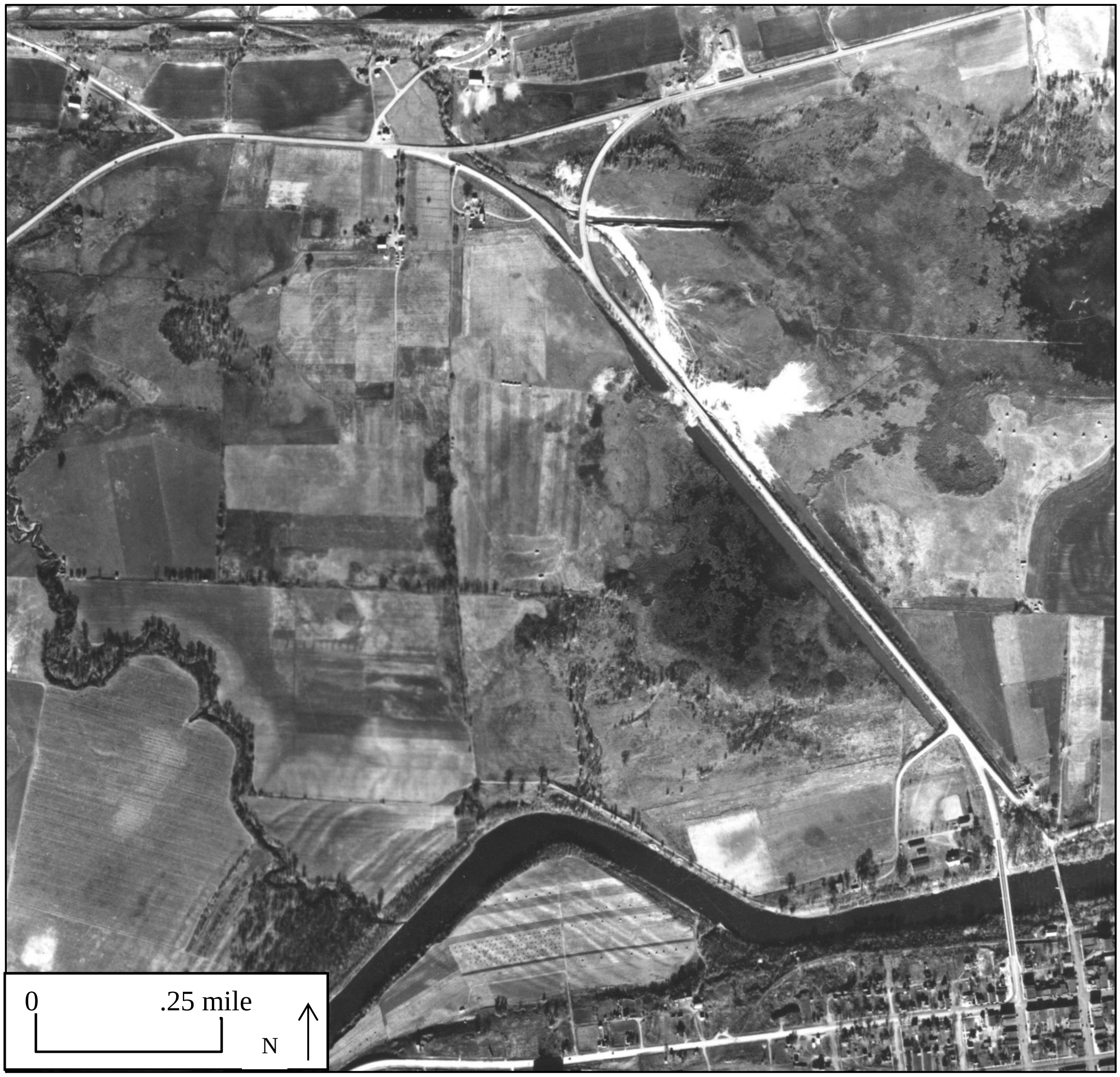


Figure 6. 1937 Aerial Photograph of Project Area.

Figure 7. 1947 Aerial Photograph of Project Area During High Water Period.

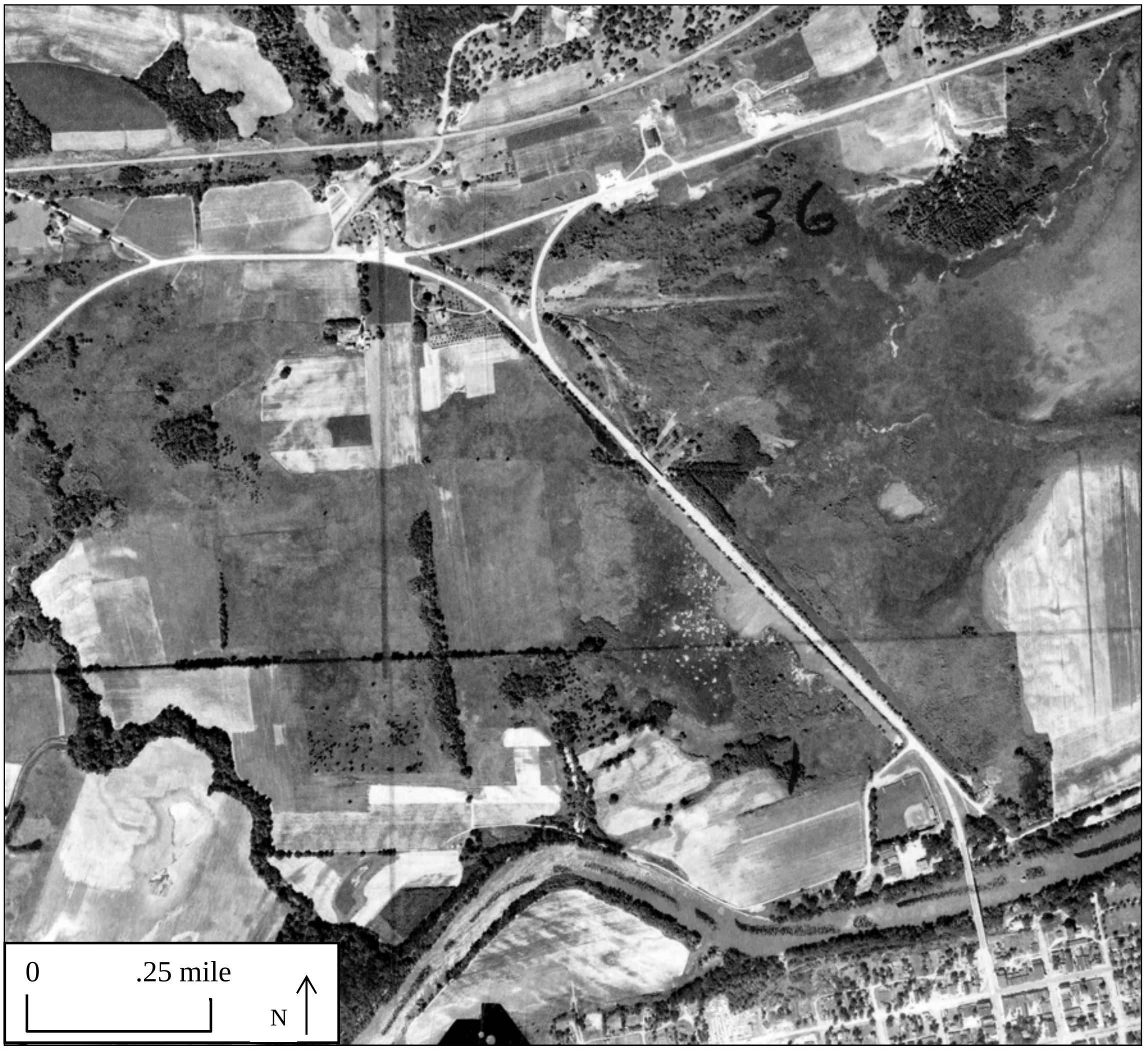


Figure 8. 1951 Aerial Photograph of Project Area.

5. CULTURE HISTORY

by James Lindbeck

The following culture history of the precontact period in the project area is derived primarily from *Archaeology of Minnesota: Prehistory of the Upper Mississippi Region* (Gibbon 2012); *Minnesota Archaeology: The First 13,000 Years* (Gibbon and Anfinson 2008); the *Minnesota Statewide Multiple Property Documentation Form for the Woodland Tradition* (Arzigian 2008); and *Outline of Historic Contexts for the Prehistoric Period (ca. 12,000 B.P. - A.D. 1700)* (Dobbs 1988). The discussion follows the organization of cultural periods used by Gibbon (2012) and uses calibrated dates that are 10 to 20 percent older than conventional dates often used in archaeological literature.

The culture history of the project area is complex for three reasons: 1) there is a lack of detailed information about most of the precontact period in the state; 2) the project area is located near the boundary of three different ecological zones (prairie, big woods, and oak savanna vegetation), which shifted during the Holocene in response to climate changes; and 3) the project area is located near the boundary of distinct physiographic settings (Late Wisconsin glacial deposits and loess plains). These complexities are reflected in the multiple MnSHPO Archaeological Regions that border the project area and in the archaeological record of the region.

The project area is located in south-central Minnesota at the intersection of MnSHPO Archaeological Regions 2e – Prairie Lake East, 2n – Prairie Lake North, and 4s – Central Lakes Deciduous South. The Prairie Lake regions extend across southwestern and south-central Minnesota and are characterized by 1) prairie vegetation with a mixture of oak savannah in the eastern portion, and 2) numerous lakes, wetlands, and rivers resulting from the Late Wisconsin glaciation.

The Central Lakes Deciduous South region occurs in central Minnesota and is characterized by 1) glacial moraines, till plains, and outwash plains, 2) hardwood and mixed deciduous-coniferous forests, and 3) numerous lakes, streams, and wetlands.

Archaeological Region 3w – Southeast Riverine West is located a short distance southeast of the project area and is also relevant to the culture history of the area because of its proximity. Also, Madison Ware ceramics recovered from site 21CR156 during current investigation are similar to types generally associated with the Southeast Riverine West Region. The Southeast Riverine West region is a loess-covered plain that covers the southeastern corner of Minnesota and borders the Mississippi River Valley. The region is characterized by 1) vegetation communities with a mixture of oak savannah, Big Woods, and prairie, and 2) a landscape that consists of a loess plain overlying Kansan till. Lakes and wetlands are largely absent in this region, and the landscape consists of rolling terrain in the west and more extensively-dissected and steeply-incised river valleys in the east.

5.1 Paleoindian Period (11,200 to 7500 BC)

The Paleoindian period was a time of rapid environmental change as the glaciers retreated from Minnesota (Wright 1974). Substantial changes in vegetation, wildlife, waterways, and the landscape occurred as a result of the ameliorating climate, and Paleoindian lifeways reflect adaptations to these rapidly changing landscapes. The first Paleoindian peoples in the southern Minnesota encountered a subarctic environment with no direct parallel in the modern world. It is not known what animals lived in the area at this time, but it can be assumed that mammoths, giant bison, and other now-extinct megafauna were present. Fish would have been present in the newly-formed lakes and rivers soon after the establishment of open water (e.g. Pielou 1991), and plants became established on the ice-free landscape.

It is presumed that Paleoindians were highly mobile and traveled in small bands. However, the lack of Paleoindian sites in Minnesota makes it difficult to identify settlement patterns, subsistence, or site types. Only one burial of this period is known, the Browns Valley site (21TR5) in the west-central part of the state. The known sites appear oriented toward current bodies of water, but these locations are also areas that have had a greater amount of archaeological survey. The locations of known sites therefore do not necessarily represent the actual settlement patterns. It is not clear whether the paucity of sites demonstrates that there was a small Paleoindian population in Minnesota, or whether the population was more numerous but the sites have not been identified because they have been destroyed, are deeply-buried, or lack diagnostic artifacts. It is likely that some of the lithic scatter sites that are scattered throughout the state belong to this period, but without the recovery of diagnostic artifacts or datable material, it is not possible to determine the cultural affiliation of these sites. Research in other parts of the country, where Paleoindian sites are more common, suggests that the margins of lakes and swamps were preferred habitation locations, and these landscapes were prevalent in the late-glacial and early Holocene periods of central Minnesota.

The Paleoindian period is divided into Early (11,200 to 10,500 BC) and Late (10,500 BC to 7500 BC) periods, as defined by the use of fluted (Early Period) or plano (Late Period) projectile points (spear points) for hunting and also possibly butchering. During the Early Paleoindian period, artifact typologies in Minnesota suggest that the culture was mostly related to the eastern Midwest. During the Late Paleoindian period, the cultural affiliation is clearly more related to the Plains, except in the Mississippi Valley region of southeastern Minnesota.

5.1.1 Early Paleoindian (11,200 to 10,500 BC)

The glaciers were gone from the southern half of the state by approximately 12,000 BC, and the Late Glacial and Early Holocene environments that followed were very dynamic, with rapidly-evolving climate, vegetation, animals, surface hydrology, and landforms. Within the project area, the most dramatic of these evolving landscapes was the cutting of the Minnesota River Valley by the Glacial River Warren. Glacial Lake Agassiz, which covered all of northwestern Minnesota, was the source of Glacial River Warren. The current Minnesota River Valley was formed by the catastrophic discharge of glacial meltwater that drained from the lake until approximately 10,700 BC, when eastern outlets to Lake Agassiz opened and the lake retreated to the northern Red River Valley. The southern outlet of the Glacial River Warren was abandoned for a period at this time, and the landscape of the valley began to stabilize and fill in (Matsch 1983). Vegetation in this post-glacial environment included boreal forest species, with a mix of deciduous tree such as larch and ash, reflecting a wetter and cooler climate than is seen today.

Fluted point types such as Clovis, Folsom, and Gainey of the Early Paleoindian period are rare in Minnesota, and little archaeological evidence of Early Paleoindian people has been documented thus far. Isolated finds, primarily recovered from the surface of agricultural fields, have been recorded at scattered locations across Minnesota (Anfinson 1997:28-30; Buhta et al. 2011; Higginbottom 1996). In Wisconsin most fluted points occur in the southern portion of the state south of the most recent glacial ice margins (Mason 1997:87). These isolated finds are in themselves important contributions to the archaeology of the Early Paleoindians, but it is unfortunate that no other site data are available.

Early Paleoindian people are traditionally thought to have been nomadic big-game hunters, an interpretation derived from the dramatic and defining finds of lanceolate points at megafauna kill sites in the American southwest. These now-famous discoveries at places such as Blackwater Draw and Folsom in New Mexico initially established the antiquity of the Paleoindian tradition and the association of Clovis and Folsom points with mammoths and other extinct megafauna. Mason (1981:97) points out, however, that, “as eastern fluted point sites were found and investigated, and dramatic kill sites eluded discovery… enthusiasm for this idea waned. Because most Paleo-Indian sites east of the Mississippi are unaccompanied by preserved bones, it is now a popular notion that big-game hunting was a western specialization not indulged in by the easterners. But just as it is difficult to argue one way in the absence of evidence, so is it difficult to argue the other way."

While paleontological finds of extinct megafauna have been made in Minnesota, only the Itasca Bison Kill site (Shay 1971), which contained the extinct bison type *Bison occidentalis*, also contained cultural materials. The closest known megafauna kill (or possibly scavenging) sites are in Wisconsin, including several on beach ridges of Glacial Lake Michigan. The Boaz Mammoth site in southwestern Wisconsin is the nearest site. The site, which was discovered in the late nineteenth century, contains the remains of a mammoth in apparent association with a Hixton orthoquartzite fluted point (e.g., Overstreet 1993, 1996; Mason 1981, 1997). Anfinson (1997) suggests that Early Paleoindians in the Prairie Lake Region relied on a much wider variety of resources in their boreal environment, such as smaller animals, fish, and vegetal foods, than did the Paleoindians of the southwestern United States.

5.1.2 Late Paleoindian (10,500 BC to 7500 BC)

The transition from the Early Paleoindian to the Late Paleoindian period is indicated by the appearance of some groundstone tools, such as the adze, and by a variety of large, finely-crafted stemmed and lanceolate projectile point types that lack the distinctive fluted points of the early period. Some of the Late Paleoindian points in Minnesota and the Midwest are smaller and less-finely crafted than those from the Plains, which is perhaps a result of raw material quality and cultural changes through time (Florin 1996). Many of the points from Minnesota are extensively resharpened and reworked so that their original condition is no longer apparent. Another unique feature on points from the Midwest is the presence of basal ears on some specimens, particularly the stemmed forms. Gibbon (2012:73) suggests the Late Paleoindian may haver persisted in northern Minnesota until 6000 to 5000 BC and similar late dates have been suggested for northern Wisconsin (Mason 1997). Two projectile point bases that resemble Agate Basin and an Eden stemmed type were recovered at site 21CR156 for the current project. Radiocarbon dating of calcined bone associated with these artifacts yielded a calibrated age of 5990 to 5880 BC, indicating that the Late Paleoindian period overlaps Archaic period, as Gibbon (2012) has suggested. Late Paleoindian points have recovered in association with Archaic points at several sites in Wisconsin and adjacent areas in the Great Lakes region, confirming they are contemporaneous (Mason 1997; Pleger and Stoltman 2009). Hixton quartzite was used as a raw material throughout the eastern Midwest at this time.

Faunal assemblages from five Late Paleoindian sites in Wisconsin contain a variety of terrestrial and aquatic animal resources, including deer, bear, beaver, muskrat, porcupine, birds, turtle, and fish, indicating a generalized foraging subsistence base (Kuehn 2010). This data contrasts with the out-dated concept of Paleoindians being primarily hunters of a few select species of large game animals such as bison, moose, and caribou. The prevalence of wetland and aquatic animals is particularly noteworthy. Faunal material recovered from the Late Paleoindian component at site 21CR156 for the current project conforms to this generalized foraging pattern and the reliance on wetland and aquatic resources.

Glacial River Warren began to flow briefly again around 9000 BC following a refilling of the southern end of Glacial Lake Agassiz. This was a time of rapid environmental change, and deciduous tree species moved rapidly into the area from the south. Presumably, Late Paleoindians consisted of small, highly mobile groups that foraged widely and occupied territories only briefly.

Late Paleoindian points are found more frequently than Early Paleoindian points, probably reflecting increasing population levels in the post-glacial era. Numerous points have been recorded from private collections and also identified during archaeological investigations across the state (Florin 1996). Five points were reported in Carver County during a statewide survey of Plano points. The point types from Minnesota resemble the stemmed and lanceolate types defined from type sites on the Plains. Point types most commonly found in the Prairie Lake Region include the lanceolate Agate Basin and Browns Valley types and the subsequent stemmed Scottsbluff and Eden types.

One of the best-documented Late Paleoindian sites in the Prairie Lake Region is the Browns Valley Site (21TR5) at the southwestern edge of Lake Traverse in western Minnesota. The site contained human remains, which date to approximately 8000 BC, and several possibly associated lanceolate bifaces (Browns Valley type) that discovered from a gravel pit. Browns Valley points have also been recovered from site 21CP35 near Montevideo and from the Hildahl #3 site (21YM35) on a terrace of the Minnesota River Valley near Granite Falls, which also contained Early Archaic, Middle Woodland, and Late Woodland components. Scottsbluff points were recovered from the Goodrich site (21FA36) in Faribault County; Eden points from 21DL8 and 21DL54 in Douglas County; and a Dalton point from Lac qui Parle County is in the Minnesota Historical Society collection. Late Paleoindian points are also reported from the Pedersen site (21LN2).

Another important Late Paleoindian site is Bradbury Brook (21ML42) located in Mille Lacs County about 100 miles north of the project area. The site is a siltstone lithic procurement and initial reduction site associated with the Alberta Complex (Malik and Bakken 1993, 1999). A Phase III data recover was conducted at the site. One feature was identified, which produced the base of an Alberta point and an associated radiocarbon date of approximately 8500 BC. The site is the oldest radiometrically dated site in Minnesota, and provides a unique perspective on the Late Paleoindian period in central Minnesota.

The East Terrace site (21BN6) on the Mississippi River near St. Cloud, about 70 miles north of the project area, is described as a Plano site that represents an intermittently-occupied location (BRW, Inc. 1994). Diagnostic points recovered included Hell Gap, Alberta, and Scottsbluff, which were extensively reworked.

The Reservoir Lakes Complex of northeastern Minnesota is one of the best professionally documented sites. The complex consists of a cluster of surface collections along a chain of reservoir lakes near Duluth that contain a variety of stemmed and lanceolate points (Harrison et al. 1995; Steinbring 1974). Some of these points have basal ears, suggesting an eastern influence. A variety of stone tools also occur, including choppers, bifaces, crescentric blades, adzes, long heavy picks, retouched flakes, scrapers, drills, and asymmetrical knives. The sites are located along lake shores that have been eroded by fluctuating water levels. Because of the deflated nature of the sites, it is not possible to confidently characterize the site components, and some of the assemblages are mixed with later Archaic components.

The Cherokee Sewer site (13CK405) in northwestern Iowa provides some of the best information on the Late Paleodindian and Early to Middle Archaic period in the northeastern plains and adjacent prairie region. The site contained three distinct cultural horizons dating from 6400 to 4400 BC. The earliest component contained points resembling the Hell Gap type that were recovered with bison and other animal bone.

5.2 Archaic Period (10,500 BC to 500 BC)

The Archaic period is generally characterized by the following: 1) a subsistence base that relied on a variety of game animals and wild plant food resources; 2) the absence of agriculture, ceramics, and burial mounds except at the end of the period; and 3) an increasing variety of notched and stemmed projectile points (e.g., Raddatz, Little Sioux, Durst) and stone tools that included pecked and groundstone implements (adzes, axes, and mauls), native copper artifacts, and some exotic materials such as marine shell. As with Paleoindian sites, most recorded Archaic sites are small, short-term camps and activity areas. Most of the information from this period comes from sites in the southeastern part of the state or in neighboring Wisconsin and Iowa. A few significant Archaic sites have been recorded in the Prairie Lake Region. Geological processes resulting from the climatic changes of the Altithermal may have buried or eroded many Archaic sites, and there has been no comprehensive study of the Archaic on a statewide scale. For these reasons, our knowledge of Archaic period lifeways is still very limited.

The Archaic period spanned the time when the post-glacial environment of Minnesota continued to moderate, and ecosystems similar to those of modern times evolved. During this time, the northern hemisphere experienced an episode of warm and dry weather that is variously referred to as the Altithermal, the Middle Holocene Climatic Optimum, and the Prairie period. The peak of this warming period was reached around 5800 BC, by which time most of southern Minnesota, except the southeast corner, was dominated by a prairie landscape. The hot and dry conditions persisted at their maximum for about 1000 years before gradually giving way to a cooler and wetter climate that led to the evolution of ecological communities similar to those of the modern era by about 3000 BC. The dramatic environmental changes of the Altithermal would have caused major shifts in the lifeways of the people, as post-glacial animal species of the forest such as moose, caribou, and deer were replaced by prairie species such as bison. Plant communities also would have changed with the spread of the prairie, and wild rice may have been gathered during this time. Surface water significantly decreased during the Altithermal, as shallow lakes and wetlands dried up or were greatly reduced in size.

It is likely that Archaic period populations engaged in seasonal rounds of resource gathering as the climate stabilized following the retreat of the glaciers. Small bands would have returned to seasonal campsites, and territories may have been relatively limited. With the onset of prairie conditions, however, resources would have become less predictable, and populations would have been pushed into shrinking areas surrounding the larger lakes and streams. The appearance of groundstone milling tools suggests that there was a greater use of seeds and other plant foods. Domesticated dogs, used for transport, suggest that longer-distance travel was required to keep up with migratory bison herds. Group sizes appear to have remained small throughout the Archaic, and known site locations indicate that a high value was placed on a proximity to game, water, and supplies of wood.

The Archaic has traditionally been divided into Early, Middle, and Late periods, and Gibbon (2012) argues that the Early Archaic period in Minnesota overlapped the Late Paleoindian period for perhaps thousands of years. He emphasizes that this was not necessarily a time of transition from Paleoindian into Archaic, but that the two cultures were contemporaneous and may have interacted in various ways. When this overlapping period is included, the Archaic Period in Minnesota may be understood to extend back as far as 10,500 BC and the Paleoindian Period to as late as 6000 BC. There are a few sites in Wisconsin that have yielded Late Paleoindian points in association with Archaic notched points (Pleger and Stoltman 2009). The transition from Paleoindian to Archaic appears to have been more abrupt and of shorter duration in the eastern and southwestern United States than it was in Minnesota. Gibbon (2012) adds the modifier “Eastern” to his discussion of the Early Archaic in Minnesota for complexes presumed to be derived from the East, which distinguishes it from the “Prairie” Archaic period that is centered on the northeastern plains, including southwestern

Minnesota. Anfinson (1997:35) points out that the Prairie Archaic of the northeastern plains region began about 7500 years ago, and Archaic of the eastern Midwest may have begun as early as 10,000 years ago.

5.2.1 Early Eastern Archaic

Most of the information we have about the Early Eastern Archaic period in the upper Midwest (ca. 10,500 BC to 7500 BC) comes from sites in the mid-south and central Mississippi valley region. The chronology of the various Archaic periods is not firmly established, and dates from adjacent areas are later than those proposed by Gibbon (2012). The Early Archaic period in Iowa extends from 8000 to 6500 BC (Benn and Thompson 2009) and from 8500 to 5500 BC (Alex 2000). In Wisconsin the period extends from 9500 to 5500 BC (Pleger and Stoltman 2009). There has been no comprehensive study of Early Eastern Archaic sites and site distributions in Minnesota, and therefore Gibbon and Anfinson (2008: Chapter 5) state that there is "… little useful to say about that tradition's sites and their distributions in the state." Most Early Eastern Archaic projectile points recovered in Minnesota have come from the southeastern part of the state, although a St. Charles point was found in Martin County in the west.

Classic Early Eastern Archaic point types that have been recognized in Minnesota include Thebes, St. Charles, Kirk Serrated, Graham Cave, and Hardin. Except for the stemmed Hardin type, the Early Eastern Archaic points are generally medium to large size, side- or corner-notched points that lack the parallel flaking characteristic of Late Paleoindian points. The Kirk type is generally smaller than the other types. Gibbon and Anfinson (2008) state that Hardin is considered a likely Late Paleoindian/Early Archaic transitional point form that may have developed in the mid-continent.

Early Eastern Archaic points are often associated with thin scatters of non-diagnostic artifacts such as scrapers, blades, and point blanks. Other materials likely used by Early Eastern Archaic people such as wooden tools, textiles, and bone implements have not survived in the archaeological record.

5.2.2 Middle Archaic

The Middle Archaic in Minnesota spans the period of roughly 7500 BC to 3000 BC, although dates from adjacent areas are later than those proposed by Gibbon (2012). The Middle Archaic period in Iowa extends from 6500 to 2500 BC (Benn and Thompson 2009) and from 5500 to 3000 BC (Alex 2000). In Wisconsin the period extends from 5000 to 1700 BC (Pleger and Stoltman 2009). This period includes the peak of the Altithermal episode, and the climatological and ecological changes of that time had profound impacts on subsistence and settlement patterns. Warming and drying during the period would have been dramatic, with prairie spreading across northwestern and southern Minnesota, except for the southeastern corner. Eventually, deciduous forests would have been restricted to river valleys and lake edges in most of the southern part of the state. As the post-glacial landscape continued to stabilize, water flows through the Minnesota River Valley were reduced and water temperatures warmed. This allowed aquatic species to migrate up the river valley from the south, and waterfowl likely became abundant. Few Middle Archaic sites have been discovered in Minnesota compared to more southerly portions of the Midwest.

Gibbon (2012:73) summarizes a challenge in describing the Middle Archaic period in Minnesota:

> "Middle Archaic artifacts and sites are sparse or remain unrecognized at the moment, even though this time period … is well represented by sites and by growing populations farther south. In fact, there is some confusion in Minnesota archaeology about how non-Paleoindian artifact assemblages dating to this period should be

classified. The problem in part is the presence of an early Archaic time gradient, with the earlier appearance of Early Eastern Archaic assemblages to the south correlated with the earlier appearance of deciduous forests in that area."

The Prairie landscape and accompanying bison herds begin to enter Minnesota around 8500 BC at a time when Lake Agassiz still covered the northwestern corner of the state and the glacial River Warren was flowing through the Minnesota River Valley. Late Paleoindian people living on the plains likely followed bison herds with the advance of the prairie into Minnesota. By approximately 5800 BC at the peak of the warming and drying, prairie covered most of western and southern Minnesota, and the Archaic-period bison hunters who used medium-sized, side-notched points spread across the prairie regions of the state.

Middle Archaic projectile points are small to medium-sized and generally smaller and less well-made than the points from the Paleoindian period, and there is an increased use of local cherts. These points were most likely attached to atlatl darts rather than spears and were thrown with an atlatl. Diagnostic Middle Archaic point types common to Minnesota are divided into two broad categories (Eastern Woodlands and Plains), based on their presumed region of origin outside of Minnesota, and by the dates (*Early Phase* and *Late Phase*) of their presence in those regions (Gibbon 2012). *Early Phase* points from the Eastern Woodlands include the Raddatz, Fox Valley, and Osceola types. *Late Phase* Eastern Woodland types include Matanzas, Benton, and Elk River. Point types of the *Early Phase* in the Plains include Simonsen, Little Sioux, and Oxbow. *Late Phase* point types from the plains include McKean and Table Rock. Many of the Middle Archaic point types continued into the Late Archaic. Other artifacts that were developed in the later portion of this period, and more fully in the Late Archaic, include ground stone tools, such as grooved axes and mauls, manos, metates, and apparatus for the atlatl, including bannerstones, gorgets, and boat stones.

The most significant Middle Archaic site recorded in the state is the Itasca Bison Kill site (21CE1) near Lake Itasca in Clearwater County (Shay 1971). At this site a number of now-extinct *Bison occidentalis* were killed in a boggy area, and a campsite associated with the processing of the bison was on a hill overlooking the bog. Projectile points from the site include small to medium-size, side-notched types, which have been referred to as Little Sioux or Simonsen points, and also occur at the Cherokee Sewer (13CK405) and Simonsen (13CK61) sites in in northwest Iowa and the Soldow (13HB1), Ocheyeda (13OA401), and Arthur (13DK27) sites north-central Iowa (Alex 2000; Morrow 1984). The date for these points at the Cherokee Sewer site is 6200 to 5900 BC. Similar points have been found at the following sites in southwestern Minnesota: Granite Falls Bison Kill (21YM47), Goodrich (21FA36), Pederson (21LN2), and Hildahl #3 (21YM35) (Anfinson 1997; Christiansen 1990) and the Rustad Quarry site (32RI775) in southeastern North Dakota (Michlovic and Schmitz 1996). The Granite Falls Bison Kill site had four small, side-notched points (3.7 cm long by 2 cm wide, 4.5 cm long by 2 cm wide, and two bases that are similar in sizes to the others) and dates to between 6000 to 5000 BC from two radiocarbon dates (Lewis and Heikes 1990).

The Jackpot Junction site (21RW53) in the Minnesota River Valley near Redwood Falls contained bison, turtle, small mammal, and fish bone from depths of 1.5 to three meters along with stone flakes. No projectile points were recovered, but radiocarbon dates of about 3600 BC place the site in the Middle Archaic period. Closer to the project area, site 21NL63 (Fritsche Creek II), located on an alluvial-colluvial fan along the northern margin of the Minnesota River in Nicollet County, contains an intact buried component that dates to the Middle Archaic (ca. 5000 BC), or even earlier, based on dating of bone collagen (Roetzel et al. 1994). The buried component may reflect a short-term occupation associated with a bison kill and processing. Site 21NL58, located near 21NL63 and in a similar landscape setting, also contains a buried component with bison bone and other materials dating to about 5000 BC (Terrell et al. 2005). The dates from 21NL58 and 21NL63 are similar to the dates obtained from sites 21CR155 and 21CR156 for the current project.

A Middle Archaic component, dating to about 6000 to 5500 BC, was identified from a buried component on top of an alluvial fan at site 21CR141, which is approximately one mile north of the current project area (Schoen 2006). Faunal material (n=203), lithic debitage, and charcoal that were interpreted to represent an intact midden deposit from a buried soil, ranging in depth from 316 to 358 cmbs. The site was recommended as eligible for listing on the NRHP based on the discrete deposit of datable materials from the Archaic period, along with the potential for intact features and diagnostic materials from other parts of the site.

Anfinson (1997) proposed that an "Itasca Phase" be designated to describe the Middle Archaic (Prairie Archaic) adaptation to the widespread prairie landscape in the Prairie Lake region. The social organization during the period is poorly understood, but it is likely that the need to adapt to changing environments and the hunting of bison may have led, at least seasonally, to small family bands merging into larger groups that could more efficiently track and hunt the migratory animals. Burials from the period found in northwestern Iowa reveal that people were interred individually in pits with red ochre and ritual items.

5.2.3 Late Archaic

The Late Archaic in Minnesota begins around 3000 BC, as a cooler and moister climate ushered in the beginnings of today's environmental conditions and biomes; a sequence that was completed by around 500 BC. Late Archaic dates from adjacent regions are generally similar to those proposed by Gibbon (2012). In Iowa the period extends from 2500 to 500 BC (Benn and Thompson 2009) and from 3000 to 800 BC (Alex 2000). In Wisconsin the period extends from 1700 to 400 BC (Pleger and Stoltman 2009). During this time, smaller lakes that had dried up during the Altithermal once again filled in. Forests in the northern and southeastern part of the state expanded as the prairie retreated west and south. These climatic and environmental changes led to the decrease of bison as the main game animal in reforested areas and the arrival of forest animals into their historical ranges. Bison continued to be a primary species across most of southern Minnesota, except in the southeast.

The Late Archaic is defined by diagnostic side-notched and stemmed projectile point types along with groundstone tools (such as manos, matates, mauls, and axes), the use of communal burial sites without mounds (until the period of transition between Late Archaic and Early Woodland), and the increased presence of exotic raw materials (such as native copper and marine shell). Diagnostic Late Archaic point types are divided into regional clusters (Gibbon 2012:79). The *Upper Mississippi River Valley Region* includes the Large Side-Notched Cluster, the Durst Cluster, and the Late Archaic Stemmed Cluster among others. The *Central Mississippi River Valley Region* includes the Table Rock Cluster, the Etley Cluster, the Nebo Hill Cluster, and the Wadlow Cluster. The *Northern Plains region* includes the McKean and Oxbow Clusters. The *Southeast Region* includes the Eva Cluster, the Benton Cluster, the Ledbetter Cluster, and the Dickson Contracting Stem Cluster. As Gibbon notes, however, some Late Archaic point types overlap with the earlier Middle Archaic and later Initial Woodland occupations, and therefore the dating of Late Archaic occupations based solely on point typology is problematic.

The lifeways of the people during this period in Minnesota were marked by adaptations to the changing environmental conditions and to increasing influences from people and cultures in surrounding regions. It was a time of increasing population numbers and more diverse artifact assemblages, which together with the advent of communal burials and expanded exchange of exotic materials, indicate increased social complexity and changes in subsistence patterns.

In southern and central Minnesota, the people likely adapted to two distinct biomes: the prairies of the west and south and the forests of the north and southeast. To the west, the hunting of migratory bison continued, and sites such as Canning (21NR9) may represent seasonal habitations of people who moved east to the woodlands during the cold months. In the north and east, the people of the period became more adept at exploiting stabilized resources such as fish, forest animals, and wild rice. Woodworking tools and fishhooks begin to appear in the archaeological record during the Late Archaic.

Gibbon and Anfinson (2008) use the term Proto-Horticulturalist to describe the addition of garden produce into the resource base of the Late Archaic period, suggesting that this indicates the beginning of a fundamental social transition, although not a heavy reliance on cultivated foods. Fragments of squash (Cucurbit pepo) recovered from a probable Late Archaic context at the King Coulee site near Winona on the Mississippi River is an example of this type of early horticulture from Minnesota (Perkl 1998).

The people during this period likely inhabited a series of relatively stable “base camps” that shifted during the year to access seasonal resources. A variety of smaller special activity areas, such as quarries, butchering, and extraction sites, radiated from these base camps. Communal burials that appear during the Late Archaic period may indicate increasing territoriality associated with greater settlement permanence. Highly ornamented grave goods have been interpreted as an indication of increasing religious complexity; and the appearance of burial mounds at the transition of the Archaic-Woodland periods is perhaps an indication that it had become more important to make these territorial indicators more visible to outside populations.

As with the preceding Early and Middle Archaic periods, the Late Archaic period has been studied much more thoroughly in the central Mississippi Valley and eastern woodlands than in Minnesota, and a great deal of information about the period in Minnesota is still lacking. Artifact assemblages from the period in Minnesota are not as diverse or abundant as those found in other regions, where plant-processing tools are commonly found and exotic materials such as conch shell were widely-traded. Fiber-tempered pottery was present during the Late Archaic in the southeastern states but no such materials have been found in Minnesota.

Sites in the Prairie Lake region with confirmed or possible Late Archaic components include Pedersen (21LN2), Fox Lake (21MR2), and Mountain Lake (21CO2). Anfinson (1997) has proposed a Mountain Lake phase dating from 3800 BC to 200 BC, with 21CO2 as the type-site. Excavations at the site recovered small lanceolate points that more closely resemble forms to the east rather than to the west, and none of the distinctly northern-plains point types such as those of the McKean cluster were found at the site. In the prairies of southwestern Minnesota, the bison-centered lifeway continued until around AD 1000 with the advent of the Plains Village culture. The Pedersen site contained bison bone in all occupation levels, along with remains of other mammals, fish, and bird species. Bison bone is also the main component of the Archaic faunal assemblage at the Mountain Lake site.

There is little information about the Late Archaic period in the southeastern deciduous forest zone of Minnesota, but Gibbon (2012) suggests that it may be associated with the Durst phase in southwestern Wisconsin, suggesting that populations were moving into the state from the south and east during this time.

5.3 Woodland Period (500 BC to AD 1650)

While the Woodland period has traditionally been defined by the first appearance of pottery, burial mounds, and agriculture, Gibbon (2012:93) proposes that:

> Information gathered within the last twenty years has clearly demonstrated [that these traits] had already made their first appearance in areas of the Eastern Woodlands in the earlier Late and even Middle Archaic…. The result of these discoveries has been a redefinition of the Woodland tradition, a redefinition that now depends more on new socioeconomic adaptations than on shared diagnostic material traits. Still, the first associations of these three traits in about 700 BC in some areas of the Midwest do seem to mark the inception of these new adaptations. Misleading reconstructions of the culture history of other areas of the Midwest have resulted, however, from the assumption that the presence of pottery, burial mounds, or cultigens, or some combination of the three, necessarily means that similar socioeconomic adaptations were present in those areas, too.

The Woodland period in the Midwest has been divided into Early, Middle, and Late periods based on cultural developments that have been documented primarily in the lower Mississippi Valley region. Gibbon points out that these cultural developments occurred in Minnesota and other parts of the northern Midwest and plains much later or not at all. Furthermore, he argues (2012:93) that "…unique adaptations and artifacts appear in the prairies, Northwoods, and boreal forest of Minnesota that have no specific counterparts in the traditional lower tier zone to the south." To accommodate this distinction, Gibbon divides the Woodland Period into *Initial* and *Terminal* periods rather than Early, Middle, and Late in all but the southeastern corner of the state. He concludes that … "Although awkward at times, these concepts stress the unique accomplishments of Native Americans in our region rather than their marginality to events and processes that occurred in different environments to the south."

During the late Holocene, from the end of the Archaic period through the Initial Woodland period, the climate and landscape continued to evolve. These changes are well-documented through an extensive series of a series of pollen core studies from across the state and by correlation with other research on vegetation and climate change across the continent. Arzigian (2008:8) summarizes the climate and landscape developments of the Woodland period in Minnesota:

> Of greatest significance to the Woodland tradition is a period of cooler temperatures, the Sub-Boreal, that extended through the Early and Middle Woodland periods and was followed by the warmer Neo-Atlantic and Pacific periods, and then the cooler, moister Little Ice Age from about AD 1550 until 1915. During these broader climatic shifts and more local changes, the most noticeable changes would have been the local expansion or contraction of the prairie-forest ecotone and the prairie bison herds. Changes in local lake levels would have affected settlement patterns adjacent to the lakes, with some lakes drying up completely. Fires would have caused changes in the composition and distribution of forests as well as expansion of shrublands and savannas. Fire frequency would have been affected by local and regional climatic conditions, and possibly also by the human population. Starting about AD 1550, the Big Woods expanded at the expense of prairies as a result of changes in fire frequency in the cooler, moister Little Ice Age climate.

5.3.1 Initial Woodland

The Initial Woodland Period in Minnesota dates from approximately 500 BC to AD 700. This period begins around 500 BC in the southeastern corner of the state. In the rest of southern Minnesota, the Initial Woodland begins around 200 BC. In the Prairie Lake Region, the Initial Woodland is marked by the widespread appearance of Fox Lake Ceramics. The following discussion covers these various the different Woodland manifestations in these regions.

5.3.2 Initial Woodland in Southeastern Minnesota

Gibbon (2012) differentiates the Initial Woodland period in the southeastern part of the state (Southeast Riverine region) from the rest of the state by separating the period into *Early Woodland (*500 BC to 200 BC), the *Havana-Related Middle Woodland* (200 BC to AD 200), and the *Late Middle* (AD 200 to AD 500) sub-periods. These sub-periods reflect the Woodland period culture history of regions to the east and south, with which the people in southeast Minnesota appear to have been more closely associated than they were with cultures to the west. Outside of the Mississippi River Valley, the Initial Woodland period in southeastern Minnesota is not well known. Few sites have been excavated, and there has been little systemic research. Therefore, Gibbon cautions that the dates and content of the period remain tentative.

<u>Early Woodland</u>

The Early Woodland period is recognized by diagnostic La Moille Thick pottery, which resembles Marion Thick and other very early pottery types in the southern Midwest, and possibly with a somewhat later pottery type that is similar to Black Sand ware. La Moille Thick pottery is cordmarked and has distinct vertical to oblique exterior surface marking and horizontal to oblique cordmarking on the interior. A variety of straight-stemmed projectile points, most commonly the Kramer type, are associated with La Moille occupations. The later Black-Sand type wares are associated with Waubesa Stemmed points that have rounded, contracting stems. Arzigian (2008:30) states that it is unclear whether mounds are associated with the Early Woodland, and that the lack of data on the period in southeastern Minnesota "might reflect the gradual nature of the transition between Archaic and Woodland in this region, and the probable persistence of Archaic lifeways with the addition of ceramics that reflect intermittent contacts with other regional cultures."

Only a few sites have been recorded in Minnesota with La Moille pottery and these include the type-site La Moille Rockshelter (21WI1) in Winona County. The site, located in the bluffs along the Mississippi River, was a deeply-stratified rockshelter excavated by Wilford in 1939. The site was described as a "fishing camp" and in addition to ceramics it contained fish, turtle, and mammal bones along with charcoal and clam shell but few other artifacts. Other Early Woodland sites include Schilling (21WA1), Kunz (21WW8), Enno Schaeffer (21FA104), and NSP II (21GD59). Arzigian (2008) concludes that there is not enough information to speculate on Early Woodland lifeways or settlement patterns in southeastern Minnesota, although it is likely that the people followed as seasonal resource-gathering pattern similar to that of the Archaic period.

<u>Havana-Related Middle Woodland</u>

Gibbon (2012) describes two Havana-Related Middle Woodland period phases in Minnesota, *Howard Lake* and *Sorg*, although Arzigian (2008) adds a *Malmo* phase to the period. *Howard Lake,* with sites concentrated in the Anoka Sand Plain, is considered to be the northernmost regional variant of the Havana Hopewell culture from the Central Illinois River Valley. Significant sites include the type-site 21AN1 (Howard lake), Anderson (21AN8), and Long Lake (21HE100). Sites from the *Sorg*

Phase are found mainly in the northern portion of southeast Minnesota, with a concentration along the shores of Spring Lake near St. Paul. Significant sites include the type-site 21DK1 (Sorg), Lee Mill Cave (21DK2), and Hamm (21DK3). Malmo phase sites are the most common of the Havana-Related period and they are found across much of central and eastern Minnesota, with concentrations around the Mille Lacs area and from there to the west into Ottertail County and the plains. Arzigian (2008:37) suggests that there may be a significant underestimation of the distribution of Havana-Related occupations in Minnesota as the statewide database of archaeological sites lists many "Middle Woodland" sites that might be included following a careful examination of ceramic assemblages.

Havana-related ceramics are wide-mouthed jars with thick walls, straight rims, slightly constricted necks, and sub-conoidal bases. They are grit-tempered and are decorated with punctates, bosses, incised lines, slashes, cordwrapped-stick impressions, and dentate stamping. Lithics from the period include small notched and stemmed Manker and Snyders-like points. Most lithic raw materials are local but exotic raw materials such as obsidian, Hixton silicified sandstone, and Knife River Flint were also used. Burial Mounds are present at some *Howard Lake Phase* sites and some of these mounds are quite large and complex, with primary and secondary burials. The Indian Mounds Park site (21RA10) in St Paul contained burials with limestone crypts and exotic artifacts that included a perforated bear canine and hammered copper. Although subsistence and settlement patterns are little-understood, Arzigian (2008) suggests that the populations engaged in a pattern of seasonal mobility, with larger summer villages and dispersed winter camps. Havana-related cultures in Illinois were focused on riverine settings, while in Minnesota, sites are located in mixed habitats around wet prairies and oak openings, often bordered by mixed deciduous forest.

<u>Late Middle Woodland</u>

The Late Middle Woodland period in Minnesota is largely unknown and Arzigian (2008) does not cover it as a separate complex. Gibbon (2012) states that the period involved a gradual process of transition from the Havana-Related to the Late Woodland in southeastern Minnesota and the Upper Mississippi valley. He uses the closely-related Millville and Allamakee phases of northeastern Iowa and southwestern Wisconsin as surrogates for the period in Minnesota. The primary distinction of the Late Middle Woodland period is the appearance of thin-walled Linn ware ceramics in a series of seemingly more spatially-restricted occupations, as opposed the relatively widespread presence of Havana wares. Lithic assemblages are defined by the side-notched Steuben point and smaller Ansell points from later in the period. Scrapers, drills, knives, and groundstone tools are also present in assemblages. Some burials of the period continued to be in mounds, although they tend to be smaller and less complex than those of the Havana-Related period. Other burials have been found in pits. Gibbon (2012) suggests that the period represents a process of cultural differentiation or regionalization that occurred in a series of steps. Overall, it appears to have been a less materially-elaborate time than was the earlier Havana-Related period.

5.3.3 Initial Woodland in Southwestern Minnesota

The Initial Woodland period in southwestern Minnesota is marked by first presence in the prairies of a small amount of ceramic ware similar to La Moille thick. Such artifacts have also been found at sites in eastern South Dakota and north-central Iowa. The period becomes more well-defined with the appearance Fox Lake ceramics and the spread of the *Fox Lake Complex* throughout the Prairie Lake Region. Gibbon (2012) cautions that the dates for the Initial Woodland period in southwest Minnesota are based on relatively few secure radiocarbon dates and may be subject to revision.

Fox Lake

The Fox Lake Phase (200 BC to AD 700) is differentiated from the Late Archaic Mountain Lake Phase in the Prairie Lake region by the introduction of ceramics and the change to side-notched, corner-notched, and triangular points that may be associated with the bow and arrow. Fox Lake sites are generally situated along the margins of lakes, rivers, and streams and they appear to be part of a stable bison-hunting lifeway that began during the Archaic period. Fox Lake components have also been found at sites in eastern South Dakota and north-central Iowa. There is no evidence of mound burials during this phase in the region. Fox Lake (21MR2), Pedersen (21LN2), and Big Slough (21MU1) are examples of Fox Lake Phase sites in the region.

Fox Lake ceramic ware consists of moderate to small-sized conoidal to subconoidal vessels with thick-walls (Anfinson 1997). They are similar in appearance to Dane Incised and Black Sand vessels from Wisconsin and Illinois the east and southeast. Fox Lake ceramic temper varies from sand to sandy grit. Surface treatment consists of well defined exterior cordmarking that is usually vertically oriented but may be horizontal or oblique. Horizontally cordmarked vessels are often partially-smoothed with some rims being completely smoothed. Lip shape is round or flat, and rims may be everted or slightly inverted. Exterior rim decoration is common and includes, in order of frequency, trailing, bossing, punctating, and dentate or cord-wrapped stick stamping. Interior and lip decoration is not common, but includes tool and cord-wrapped stick impressions. Five Fox Lake types have been defined in a recent study of the Fox Lake Phase (Anfinson 1997). General trends that occur through time during the Fox Lake Phase include slight thinning of vessel walls, increase in surface smoothing, increase in use of narrow-trailed lines, appearance of horizontal cordmarking, decrease in use of bosses, and appearance of cord-wrapped stick impressions below the lip on vessel exteriors.

Four types of projectile points are associated with the Fox Lake Phase, including stemmed, side-notched, corner-notched, and isosceles triangular. The stemmed types occur early in the phase and are replaced by the notched and unnotched triangular. Stemmed types are primarily the expanding stem type similar to the Stueben and Durst types and have more eastern affinities. The side-notched types are quite variable resembling a variety of Plains types such as Avonlea, Besant, and Hanna, and Oxbow. The corner-notched types are similar to the Pelican Lake type from the Plains. Conspicuously absent are side-notched and corner-notched types from the east. The variety of point types may be the result of the change from using the atlatl to bow and arrow during this period.

Other artifacts recovered from Fox Lake sites include ground stone tools (mauls, celts, hammerstones, grinding stones, and abraders) although few examples of these tool types have been recovered. Bone awls and beads are also possibly associated with Fox Lake components. Lithic raw materials are dominated by local cherts with lesser amounts of quartzite, chalcedony, silicified sediment, and Knife River Flint. Gibbon (2012) points out that except for the distinctive ceramics, Fox Lake artifact assemblages have been difficult to isolate because of extensive component mixing at sites that usually also contain Archaic and later Woodland artifacts.

5.3.4 Terminal Woodland

The Terminal Woodland period in southern Minnesota dates from ca. AD 500-700 to AD 1650, the time of first European contact. The period is marked in the archaeological record by changes in the design and manufacture of ceramic vessels and projectile points. Throughout the period, population sizes continued to increase and dependence on domesticated plants was becoming more widespread. In southeastern Minnesota and nearby parts of Wisconsin, Iowa, and Illinois, the people of the Terminal Woodland also developed new forms of social organization, as evidenced by the disappearance of burials in large mounds that contained non-utilitarian items made of exotic materials. In southwestern Minnesota, the Terminal Woodland period evolved differently than in the southeast, as Gibbon (2012:137) explains:

> Many but not all of these cultural innovations and elaborations [of the southeast] reached southwestern Minnesota by at least A.D. 900. More dramatic changes occurred throughout the southern part of the state between A.D. 900 and 1100, when agricultural societies with large, often defended villages and new material equipment appeared. Later forms of these "Mississippian" cultures still occupied parts of southern Minnesota when European missionaries and adventurers first paddled the Mississippi and Minnesota rivers.

Terminal Woodland in Southeastern Minnesota

The period of change from Initial to Terminal Woodland in the southeastern part of the state remains poorly understood, but the main material features found in the archaeological record include the development of the bow and arrow, effigy mounds and elaborate mortuary rituals, increasing long-distance trade networks and the acquisition of exotic materials, an elaborate smoking-pipe complex, and possibly the development of socially-ranked societies (Gibbon 2012). Population sizes were increasing and appear to have begun to develop into more localized cultures with year-round settlements. Domesticated plant foods became an important part of the subsistence base and ceramic vessels developed thinner walls and a finer temper. Given the general lack of data from the period in Minnesota, Gibbon (2012) relies on information from sites in neighboring states and adopts the terminology used for the period in the driftless area, dividing the period into *Initial, Mature*, and *Final* Late Woodland sub-periods.

The Initial Late Woodland spans the period of AD 500 to AD 700 and includes the Mill phase and Lane Farm phases in Wisconsin and Iowa. The ceramic type, Lane Farm, is a cord-impressed ware with a somewhat rounded base and constricted neck. Decoration includes cord impressions on the rim and rocker stamping on the body. The walls are thin and use a fine grit temper. Small corner-notched projectile points (Steuben Stemmed and Manker Corner-Notched types), which may have been the first true "arrowheads" in the region, are associated with the early part of the phase. Other possible points from later in the phase include Scallorn, Klunk Side-Notched, and Koster Corner-Notched. The forms of these points vary greatly and can range for broad to slender, corner-notched to barbed, and straight to convex blade edges. Elongated linear mounds with a limited number of grave goods (including copper beads and clay pipe parts) were developed during the period.

The Mature Late Woodland, from AD 700 to AD 1000, is best known by the Effigy Mound Complex of Southern Wisconsin, with a smaller number of sites in Iowa, Minnesota, and Illinois. A primary ceramic component of the complex, Madison Cord-Impressed, extends throughout southeastern Minnesota to the vicinity of the Blue Earth River. Madison ware vessels are thin-walled and use a fine grit temper. The vessels are globular in shape with constricted necks and out-flaring rims. They have cord-impressed decorations on the exterior and most vessels found are similar in their design treatment, featuring geometrical patterns. Another ceramic type associated with the period is the Angelo Punctated, which is also thin-walled and cord-marked, but is decorated with punctates and fine trailing lines in complex patterns. Gibbon (2012) suggests that the Angelo ware shares traits with Great Oasis ceramics.

Arzigian (2008:105) discusses some considerations regarding the use of Madison Ware in evaluating the Mature Late Woodland period:

> Ceramics with single cords used as decoration over a cord-roughened surface are found across central and southern Minnesota, but the ceramics are not coded as such in the SHPO database and cannot be readily separated except by examination of the ceramics themselves. Detailed ceramic studies are needed for [Mature] Late Woodland sites in Minnesota. The full range of ceramic types in southern Minnesota [Mature] Late Woodland sites should be evaluated, along with a consideration of how they compare to series defined elsewhere in the Midwest. Because of the presence of a geographic reference in the complex name, archaeologists are likely to have identified this complex for the SHPO/OSA database only for sites in southeastern Minnesota, although the ceramics and other aspects of the complex might be found further west and north.

Other ceramic types that Arzigian suggests might be identified within the *Mature Late Woodland* period in Minnesota include Lane Farm, Madison, and Minott Cord-Impressed wares. Projectile points from the period are small, stemmed and side-notched or unnotched in form. Diagnostic types from early in the period include Scallorn, Klunk Side-Notched, and Koster Corner-Notched (the same as in the *Initial Late Woodland* period). The later part of the period (ca. AD 800) is marked by the widespread adoption of the simple unnotched triangular Madison Point throughout the eastern United States. Other lithic tools found in association with the Effigy Mound Complex include scrapers and utilized flakes along with a variety of groundstone tools (adzes, axes, celts, grinding stones, pounding stones). Bone awls, needles, punches, and harpoons have also been recovered, along with exotic or ritual goods such as cooper knives and points, clay pipe elbows, obsidian blades, cut mica, effigy pipes, ear spools, and worked shell. Gibbon (2012) points out that Havana-related artifacts are conspicuously absent from *Mature Late Woodland* assemblages.

Two significant *Mature Late Woodland* sites are Sorg (21DK1) at Spring Lake in Dakota County and the Prior Lake Mounds (21SC16) in Scott County, which is the only excavated effigy mound site in Minnesota. Middle and Late Woodland deposits were excavated at Sorg and a variety of Madison ware was recovered, including Cord-Impressed, Punctated, and Plain. The Prior Lake Mounds site is in an upland setting adjacent to the driftless area and is the only know Effigy Mound complex site in Minnesota not adjacent to the Mississippi River. It consisted of five bird effigies and four linear mounds when mapped in 1883. Madison Cord-Impressed and Madison Plain ceramics were recovered from 21NL140 (Falls habitation site), which is on a terrace overlooking the Minnesota River Valley west of Mankato, and from 21BE24, just south of the Minnesota River. These are the westernmost sites in Minnesota known to have *Mature Late Woodland* components. Site 21CR155 identified during the current project appears to have Madison ware ceramics.

The *Final Late Woodland* spans the period of AD 1000 to AD 1200 and is defined by significant changes in the archaeological record of southeastern Minnesota and the Upper Mississippi valley. Effigy mounds are no longer found, and stockaded sites with Mississippian traits become more common as it appears that large portions of the driftless area were abandoned. Corn horticulture and distinctive grit-tempered collared ceramics belonging to the Grant series are found throughout the area of western Wisconsin, southeastern Minnesota, northern Iowa, and northern Illinois. Grant series ceramics are cord-roughened globular vessels with prominent rims that feature collars castellations, and squared orifices. The rims are higher than those of Madison ware vessels and they flare out more. They have a broader shoulder, thicker cord-impressions, and less complex decoration. When present, exterior-surface decoration is generally a single-cord impression in a chevron or zigzag form. It has been suggested (Gibbon 2012:146) that the shape and size of Grant series vessels was designed for simmering large quantities of grain, which requires longer and more gradual heating than does the cooking of seeds and other foods from the time before corn horticulture. Projectile points common to the period include the Madison Triangular type along with Cahokia, Reed, Harrell, and Des Moines types of the Cahokia Side-Notched cluster. Bryan, King Coulee, and Mero I are significant sites from the *Final Late Woodland* in southeastern Minnesota and western Wisconsin.

Following the end of the *Final Late Woodland* period in the Upper Mississippi Valley, Oneota peoples seem to be the only cultural group that remained into the period of Euro-American contact in the seventeenth century. Gibbon and Anfinson (2008) discuss two hypotheses to explain the development of the Oneota culture. Under the first hypothesis (credited to Stoltman and Christiansen 2000), the Effigy Mound Culture of southern Wisconsin, which had established cultivation as a major form of subsistence while continuing a mobile lifestyle that involved regular gatherings at important ritual sites where social bonds were reinforced and territories were demarcated, was gradually influenced by the Middle Mississippian culture centered at Cahokia. As these influences continued to expand, the Effigy Mound peoples were drawn to central locations such as the Red Wing locality to facilitate contact with Cahokia. These newly-emerging Oneota peoples adopted an increasingly sedentary lifestyle focused on maize horticulture and along with it, new social and ceremonial behaviors associated with planting and harvesting.

A second hypothesis from Gibbon and Anfinson (2008) suggests that the cultural developments in the middle Mississippi Valley between A.D. 800 and 1000, which led to the emergence of Cahokia, also reached into the upper Mississippi and Missouri River Valleys and led to the development of maize-growing Oneota and of Plains Village cultures. Under this hypothesis, the widespread Oneota cultural influences found throughout the northern section of the Prairie Peninsula by AD 1200 represent a transformation rather than a displacement of Late Woodland peoples through the integration of Middle Mississippian influences and the migration of Oneota peoples from southern Wisconsin, where the culture had already emerged.

Terminal Woodland in Southwestern Minnesota – Lake Benton Phase

The transition from Initial to Terminal Woodland in southwestern Minnesota and the Prairie Lake Region occurred later and more gradually than in southeastern Minnesota. By the end of the Fox Lake Phase around AD 700, ceramic types in the region change significantly, projectile point technology reflects the onset of the bow and arrow, and burial mounds become more widespread. These shifts mark the beginning of the Lake Benton Phase.

The Lake Benton Phase (AD 700 to AD 1200) burial mounds are low, moderate-sized conical mounds that contained multiple secondary burials with few grave goods. Subsistence and settlement patterns show little change and are similar to the Fox Lake Phase. Pedersen (21LN2) is the type site for this phase. The Boy Scout Hill (21LN10), Gullickson (21YM2), and Big Sough (21MU1) sites are other examples of Lake Benton Phase sites within the region. Most of the sites from this period are located south of the Minnesota River and east of the Blue Earth River, though a few sites are north and east of these rivers and extend into eastern South Dakota and north-central Iowa.

Lake Benton ceramic ware is grit-tempered and the subconoidal vessels are moderately-sized with fairly thin walls. Surface treatment consists of exterior vertical cordmarking in the mid-body. Rims and upper shoulder are smoothed, with a small percentage of body sherds also being smoothed. Cord-wrapped stick impressions are common decorative elements on the rim and shoulder while bosses are rare and trailed lines do not occur. Dentates and punctates are less common but are also used as decorative elements. Cordmarking is present on nearly half of the lips. Lip shape is round or flat, and rims are slightly outflaring to slightly inflaring and have a slight curve in profile. Four Lake Benton types have been defined in a study of the Lake Benton Phase (Anfinson 1997). General trends that occur through time during the Lake Benton Phase include thinning of vessel walls, a more globular shape, a decrease in decorative on the exterior shoulder and rim, and an increase in decoration on the lip. Gibbon (2012:147) points out that Lake Benton ceramics are more difficult to identify than Fox Lake ceramics because of their strong similarity to the St. Croix/Onamia series of central Minnesota, and this association suggests that populations of the Lake Benton Phase (at least in the realm of ceramic technology) had a closer relationship with the hunters and gatherers of central and northern Minnesota than with the people to the east, south, and west.

Projectile point types include small, equilateral triangular and corner-notched forms, but the most common type is the small, side-notched style with straight to slightly concave bases. These points are similar to the small side-notched points of the Plains (Kehoe 1966). Stemmed point types are not associated with Lake Benton Phase. The relatively small size of the projectile points reflects their use for the bow and arrow. There are no other known lithic forms diagnostic of the Lake Benton Phase, although toolkits also include drilling and engraving tools.

5.3.5 Mississippian/Plains Village

The Woodland period in southern Minnesota ended between AD 900 and AD 1100 with the advent of cultures that began to live in larger settlements, which were often fortified. Distinctive ceramics of the period are identified by shell rather than grit temper, handles rather than collars, smoothed rather than cord-marked surfaces, and decoration on the shoulder rather than rim. These cultural complexes been grouped into a number of cultural subdivisions associated with the central Mississippi River Valley, based on material traits that are more similar to that region than to the earlier local Woodland cultures. The Mississippian cultural manifestation in the central Mississippi River Valley is known as the Middle Mississippian. The northern region has traditionally been known as the *Upper* Mississippian and in the prairie region as the *Plains Village* Mississippian, although Gibbon (2012:159) notes that this usage suggests that the peoples of the period inhabited either “fringe” societies or were migrants from the south. Instead, he argues that the processes of change between Terminal Woodland and Mississippian cultures in Minnesota were more complex and subtle than is suggested by a dependency on cultures to the south and east, and he proposes that the terms *Upper* and *Plains Village* be eliminated – although he acknowledges that it is necessary to continue their use in making comparisons to other areas.

Mississippian complexes in Minnesota include Silvernale, Great Oasis, Cambria, Big Stone, and Blue Earth phases. Archaeological sites from these phases are concentrated along the Minnesota River trench from Mankato to the Red River and at the confluence of the Cannon and Mississippi Rivers near Red Wing.

<u>Silvernale Phase</u>

The Silvernale Phase (AD 1050 to AD 1200) is the clearest example of the Middle Mississippian in Minnesota, Illinois, and southern Wisconsin, and it is strongly related to the cultural center at Cahokia, Illinois. The complex is characterized by large fortified villages that were often surrounded by conical burial mounds. Corn horticulture and subterranean storage pits were used. Ceramic vessels are shell-tempered and have rolled rimes and Ramey-scroll designs. Ceremonial objects made of exotic materials such as copper and marine shell from the southeast are found, along with ceramic mask carvings that resemble objects from sites in the southeast. Other artifacts found at Silvernale sites, such as stone tools, and many of the lithic raw material types, appear to be more related to Upper Mississippian cultures. Large Silvernale village sites include Sivlernale, Mero, and Adams.

Great Oasis Phase

Great Oasis (AD 950 to AD 1100) is considered to be the earliest and most widespread Plains Village phase. Ceramics are grit-tempered, globular vessels with a smooth exterior or cordmarked-smoothed and trailed line decorations and motifs. Decoration consists of bands of incised horizontal and oblique parallel lines along the rims, which are outflared and outcurved. The lips are thickened and beveled. Lithic assemblages include small notched and triangular projectile points; a variety of ground stone tools, (celts, abraders, hammerstones, manos, and mutates). A variety of bone and shell items such as awls, chisels, and beads are also found at Great Oasis sites. Corn horticulture was a component of the complex and settlements were focused along shallow lakes in southwestern and western Minnesota, Iowa, Nebraska, and the Dakotas. The Great Oasis site (21MU2) is the primary Great Oasis phase site in Minnesota. No Great Oasis sites have been identified in the southeastern Minnesota region.

Cambria Phase

The Cambria Phase (AD 1100 to AD 1200) includes Woodland, Middle Mississippian, and Plains Village characteristics. The ceramics are grit-tempered, globular vessels with a smooth surface. Lithic assemblages contain small side-notched and triangular projectile points; ground stone tools such as celts, abraders, and hammerstones. Bone and shell items such as scapula hoes, punches, and awls have been recovered. Evidence suggests that this phase was linked to the trade network centered at Cahokia. Settlement patterns include village sites on terraces of the upper Minnesota River and smaller habitation areas by lakes or rivers. Subsistence was based on hunting, fishing, gathering wild plant and aquatic foods, and the cultivation of maize and sunflower. The type site is 21BE2 (the Cambria site), which is located along the Minnesota River in Blue Earth County near Mankato.

5.3.6 Oneota Tradition

Oneota sites occur south of the Minnesota River and in the St. Croix River Valley in prairie and forested areas, dating from AD 1200 to 1700. Two main phases have been defined: the Blue Earth Phase and the Orr Phase, which is restricted to far southeastern Minnesota and the adjacent area in Iowa.

Blue Earth Phase

The Blue Earth Phase (AD 1200 to 1500) occurs across southern Minnesota, with notable sites at Red Wing (Bartron), near Stillwater (Sheffield), and also along the Blue Earth and Upper Minnesota rivers. This phase is characterized by smooth surfaced, shell-tempered ceramics and triangular unnotched arrow points. Agriculture is evident from bison scapula hoes and plant remains of maize, sunflower, squash, and beans. Sites consist of large village farming communities with smaller hunting and gathering camps .

5.4 Contact and Historic Period

Prior to direct contact with Europeans/Euro-Americans and their subsequent settlement of the region, Native American people were indirectly affected by the European presence in the eastern United States as trade goods, diseases, and displaced tribes (such as the Ojibwe) moved westward into the territory that became Minnesota. This period of first contact in the Prairie Lake and southeastern Minnesota regions is not well understood and there is little documentation from the time. It is known that Native groups in the area at the time of French contact included the Dakota, Oto, Ioway, and possibly the Illinois. The Ioway and Oto are believed to have derived from precontact Oneota groups in the region (Gibbon 1994).

In the mid 1600s, the Ioway occupied southern Minnesota along the Mississippi River and the eastern Dakota occupied much of central Minnesota (Dobbs ca. 1988). In the early 1700s, the Ioway were forced out of southern Minnesota as the Dakota began to occupy the area following years of warfare with the Ojibwe, a conflict that lasted to the mid-1800s.

The French began to explore the territory that became Minnesota in the mid-1600s and they engaged in trapping and trading activities with the Ojibwe and Dakota shortly after initial exploration. Although several forts were constructed along the Mississippi and other riverways in southern Minnesota during the French fur-trade era (ca. 1660 to 1763), including one built around 1700 near the confluence of the Blue Earth and Minnesota Rivers near the present day city of Mankato (Blegen 1975), little is known of this time period in south-central Minnesota. In 1762, the French ceded land west of the Mississippi River to Spain, and in 1763 under the Treaty of Paris the French ceded land east of the Mississippi to the British. The fur trade continued as the British gained control of the region (1763 to 1815). The British, ignoring Spain's claim to lands west of the Mississippi River, entered the Prairie Lake Region and established posts along the Minnesota River to aid in their fur trade interests. British trade continued until shortly after the War of 1812, when the Americans deprived them of licenses to trade within the United States. American fur trade companies replaced the British until the fur trade declined in the mid-1800s. After the war of 1812, the United States gained full control of the area and trading posts began to spread along the major riverways.

One of the most significant Dakota villages on the Minnesota River, and probably the largest, was the Mdewakanton village of Shakopee (21SC2), also known as "Tintowan's", "Shakpa's", "Taoapa's", and "Six's" Village. It is not known how long the village was occupied prior to Euro-American exploration, but it is likely that it was established in the mid-eighteenth century following removal of the Mdewakanton Dakota from the Mille Lacs area (SHPO files).

While the precise location of Shakopee's (Six's) village in its early years is uncertain, notes from the 1823 expedition of Colonel Stephen Long (Keating 1824:330) place the village on the north side of the river. Six's Village is also shown on the north bank of the river on an 1835 map created by Lawrence Taliaferro, the federally-appointed agent for the Indian Agency that included the Minnesota River. Mr. Willoughby Babcock, Curator of the Minnesota Historical Society Museum, found the Taliaferro map in the archives of the Indian Office in Washington D.C. in 1928 and published a study of it in the 1945 edition of *The Minnesota Archaeologist* (Babcock 1945a). Included in the same issue was a second article by Babcock entitled "Sioux Villages in Minnesota Prior to 1837" in which he describes Taoapa's village at the time of the Long expedition as containing 30 lodges, 60 warriors, and 300 souls (1945b:130).

Babcock's analysis of the Taliaferro map and of Keating's narrative confirms that Taopao's Village was initially located on the north bank, across from the location of present-day Shakopee, probably in an area of low ground near a swamp (Rice Lake) that extended from the back of the village to the bluffs (1945b:140). He notes, however (1945a:122), that Taliaferro's map was not rendered very accurately: "It can readily be seen that Agent Taliaferro was not much of an artist…No attempt was made to indicate distances by reduction to scale." Keating's (1824:330) account describes the location of the village as: "In the rear of the village of Taoapa, a swamp extends, and divides it from the bluffs" and "On the right [south] bank Major Long observed numerous ancient tumuli or artificial mounds". The location of these mounds likely corresponds with the location of the mounds reported at sites 21SC2 and 21SC22 on the south bank of the river on the east side of city of Shakopee, which is one mile east of the current project area. Taliaferro's map depicts the village near a prominent bend in the river, which matches this general area, as there is a prominent bend in the river at this location before it straightens for over a mile to the west. Previously recorded site 21HE225, which contains possible contract period artifacts, is located in this general area (Figure 3).

The village remained on the north side of the river until sometime around 1834, when it was moved to the south side in response to ongoing hostilities with Chippewa tribes to the north. The locations described by Long and Taliaferro place the original village on land in what is now Rice Lake, which is southeast of the current project area.

Shakopee's village was formally removed by the federal government in 1853, although Dakota people continued to live there and conflicts with the Chippewa continued until the Battle of Shakopee in 1858 (SHPO files, 21SC2 NRHP Registration). A fur trade post was built at the village site by Oliver Faribault in 1843-44 and he was subsequently appointed as the government farmer to the village. Faribault is considered to be the first permanent settler in what was to become the town of Shakopee and he was visited by the Reverend Samuel Pond, who soon established a mission site next to the village in 1846-47. The precise boundaries and location of Shakopee's Village on the south side of the river are unclear despite a number of archaeological investigations in the area (see Section 4.2 Previous Surveys and Sites). It is presumed that most of the village site has been destroyed by various development activities. The original location of Faribault's cabin is preserved as 21SC40 within the presumed boundaries of Shakopee's Village in NRHP site 21SC2.

5.5 Carver and Scott County History

Euro-Americans settlers began to claim land in the Minnesota River Valley in the early 1850s after the Dakota were removed under the Treaties of Traverse de Sioux and Mendota. The following discussion of early exploration and settlement is derived primarily from Neill (1882) and Roberts (1993). Small steamboats that were capable of traveling the river even during periods of low water facilitated settlement by providing relatively stable lines of supply for trading posts and individual settlers. Regular steamboat service between St. Paul and Mankato was established in 1853 and the landings for these steamboats were eventually incorporated into the sites of new towns such as Shakopee and Chaska. Steamboat service flourished for about 20 years until railroads became the dominant means of travel along the valley in 1871. The steamboats used large amounts of wood to fire their boilers, and early settlers reported that vast areas were cut-over for many miles on both sides of the river to supply these needs (Neetzel 1969).

The valley was also traversed by a number of trails including the Minnesota Valley Trail along the south side of the river, which was the principle trail to the Red River Valley in the 1840s. The trail became a stage route in 1853 with service between St. Paul and Shakopee following the establishment of an inn at Murphy's (steamboat) Landing in Shakopee. Despite the riverboats and stage service, the promoters of towns such as Shakopee along the south side of the river struggled with isolation during periods of low water and during the winters. Early travel was even more challenging on the north side of the river where settlers either had to follow the southern trail and then cross the river by ferry, which was also available at Murphy's Landing, or they had to cut their own roads out of the woods. A stage and mail road on the north side of the river connecting St. Paul to Hutchinson via Chaska was finally developed in 1856.

Early settlements were established nearly simultaneously between 1850 - 1855 along almost the entire length of the Minnesota River and the census of non-Indian inhabitants in the valley grew from less than 5,000 in 1849 to over 170,000 in 1860 (Roberts 1993:75). The towns of Shakopee and Chaska were both platted and promoted by Thomas Holmes, a trader and land speculator who arrived in the area in 1851 established interests in both locations, including a steamboat landing in Shakopee. He sold the rights for Chaska to David Fuller the following year and also made Fuller a partner in the development of Shakopee. Oliver Faribault's brother Davis platted a competing townsite just downriver from Shakopee to compete with Holmes, but his effort failed, as did those of many other speculators who acquired rights to landings and other locations that they hoped would eventually attract settlers to townsites along the river that were never actually developed. Other towns that were successful established during this period of rapid settlement eventually disappeared as the riverboats were replaced by railroads, which bypassed many settlements. Another blow to settlement along the river was the Panic of 1857, when financiers from the east were forced to call in loans during a financial crash. Minnesota was especially hard-hit during the panic because it was on the frontier of western expansion at the time and much of that settlement was financed by debt. Formal establishment of Scott County occurred in 1853 and Carver County in 1855.

Settlement along the Minnesota River resumed following the Panic of 1857 with a continued emphasis on agriculture and associated industries such as milling and food processing. The other major industry in the region was stone-quarrying and brick-making, which took advantage of abundant supplies of high quality clay in the river valley. The limestone that lines the river valley was used directly as a building material and was also burned in kilns to make lime for mortar and whitewashing. The Schroeder Brick Company, which operated in Shakopee from 1876 until after 1940, was the largest brick and lime facility in the area, although numerous other operations that quarried and processed limestone were constructed along the river in Carver and Scott Counties. Demand for brick increased with development from the 1850s on and the locally-produced variety that came to be known as Chaska Brick, made from the cream-colored clay on the north side of the river, can be found all around Chaska and surrounding communities.

Most farmers at the time practiced a form of subsistence agriculture until the late 1860s, when there developed a national demand for spring wheat from the region. Following a brief period of intensive wheat farming to fill this market, and subsequent troubles with blights and insects, most farmers in the area returned to raising a diversity of crops and animals. In the late 1850s a German immigrant farmer named Wendelin Grimm cultivated a strain of alfalfa that was able to endure the northern winters. His strain, which came to be known as Grimm Alfalfa, is credited with supporting a blossoming of dairy in the region and Carver County became a top dairy producer by the early twentieth century. Grimm Alfalfa is considered to have been instrumental in the success of dairy farming throughout the entire northern plains region. Significant agricultural entities in the county have included American Crystal Sugar Beet Company and Bongard's creamery. Although agricultural prices collapsed following the First World War, the intensive development of roads during the 1920s and 1930s allowed for a significant recovery in the 1940s as it became easier and less expensive for farmers to provide their products to outside markets.

The process of clearing the land for agriculture eliminated vegetation, ponds, and marshes in the river valley and on the bluffs above. All of this land modification reduced the storage capacity of the land and dramatically increased the flow of the water into the Minnesota River, which increased the frequency and severity of flooding (Neetzel 1969). Widespread livestock grazing on the hills and bluffs also caused a significant amount of erosion. Although soils in the river valley are very fertile, the severe erosion buried many areas with deep deposits of overburden, and this combined with the fact that many of the fields in the valley are too small to be easily farmed by modern equipment meant that many small farms were abandoned and the buildings removed. The decline of family farms increased rapidly in the 1970's as agriculture was consolidated into large corporate holdings and much of the production in the river valley is now centered on nursery and landscaping operations.

Neetzel (1969) explains that logging in the Minnesota River Valley was not as significant economically as it was in the northern parts of the state and, as mentioned earlier, much of the early timber harvest was used to supply riverboats. River valley tree species such as cottonwood were not commercially valuable in the larger regional market, although many of the early buildings in the towns and farms in the valley used locally-produced cottonwood lumber. Logging in the valley intensified during World War II to meet increased demand for wood products of all types in the war effort and following the war, an increasing demand for pallets made of low-grade wood opened a new commercial market for lumber from the valley.

A very significant land-use development in the Minnesota River Valley was the establishment of the Minnesota Valley National Wildlife Refuge in 1976. The refuge occupies much of the valley in Scott and Carver counties and has allowed recreational activities to flourish in the area. More recently, a great deal of development in the region has centered on residential development for commuters and businesses in the expanding twin cities metropolitan area.

6. Environmental Background

6.1 Modern Environment

The project area is located in the Minnesota River Valley in east-central Minnesota, extending across the northern edge of Scott County and southern edge of Carver County. The project is on the north side of the Minnesota River across from the City of Shakopee. The survey area includes the ROW areas along TH 101 and CSAH61, which are high-traffic highways servicing the outlying southwestern suburbs of Minneapolis.

The landscape in the project area includes a large area of floodplain wetlands on the Minnesota River bottom. The wetland areas include a mixture of woods, grasses, cattails, and open water. The north end of the project along CSAH 61 is on the slightly higher landscape along the bluff base at the margin of the river valley. The eastern portion of CSAH 61 has several commercial parcels with paved parking lots. There is one small parcel in an agricultural field near the west end of CSAH 61. The survey for the fill disposal area was on the driving range at the Golf Zone property.

6.2 Glacial History

The most recent glacial activity in the region occurred during the Late Wisconsin glaciation at the end of the Pleistocene when much of the Upper Midwest was buried beneath glaciers. The Des Moines lobe covered much of western and east-central Minnesota, receding and advancing several times between 13,000 and 9,700 years BC when it finally retreated (Clayton and Moran 1982; Gilbertson 1990). The project area is situated near the eastern extent of the Des Moines lobe. These glacial deposits shaped the surficial features of the landscape that characterize the region today. Meltwater from the glaciers established the drainage system through which many of the modern day streams in the region flow, including the Minnesota River.

6.3 Physiography

The project area is located in the Owatonna Moraine Area physiographic region, which is characterized by a series of moraines that formed along the eastern margin of the Des Moines lobe (Wright 1972). More specifically, the project is in the Minnesota River Valley physiographic region. The wide and deep valley was cut into the surrounding till plains and bedrock by the catastrophic discharge of Glacial Lake Agassiz floodwaters, which formed Glacial River Warren, the precursor to the Minnesota River. Primary landforms within the valley are attributed to a single catastrophic flood event, except for the meandering channel features of the Minnesota River. The project area in the valley is mapped as Holocene alluvium on the Geologic Map of Minnesota – Quaternary Geology (Hobbs and Goebel 1982).

Detailed mapping of landforms in the project area is presented in the geomorphological investigation for the project in Appendix A. Primary landforms include alluvial fans, colluvial slopes, the modern river levee and floodplain, and a floodplain lake. The “Y” area where TH 101 and CSAH 61 converge contains thick deposits of fill to raise the roadways above the surrounding wetland and stabilize the landscape.

6.4 Hydrology

The project is located within the Minnesota River Valley, which is the primary drainage for a large portion of southern Minnesota, extending from its headwater near the North and South Dakota border to its outlet at the Mississippi River in St. Paul. The Minnesota River’s broad drainage system provided a route for the transmission of people, goods, and ideas across distant areas and directly connected the prairie and Plains region of western Minnesota and the Dakotas with the woodlands in the eastern part of the state. Further connections across the country could be maintained via the Mississippi River and its tributaries as well as the Red River.

The Minnesota River flows within a large, steep-walled valley. On the valley floor in the project area is an extensive lake (Rice Lake) and adjacent wetlands. Bluff Creek flows into the Minnesota River Valley in the project area at the junction of TH 101 and CSAH 61. The creek has been channelized and flows through an artificial drainage channel that was likely created to stabilize the landscape along the highways in this area.

6.5 Ecology

The project lies within the Big Woods subsection of the Minnesota and Northeastern Iowa Morainal Section of the Eastern Broadleaf Forest Province (Minnesota DNR 1998). The primary characteristics are a loamy end moraine associated with the Des Moines Lobe of Late Wisconsin Glaciation and presettlement vegetation of mesic deciduous forest comprised of oak woodland and maple-basswood. The area has rolling terrain with scattered lakes.

Vegetation in the Minnesota River Valley bottom near Shakopee at the time of European settlement consisted of river bottom forest (silver maple, elm, ash, cottonwood, and willow) (Marschner 1974). The upland and terraces above the valley bottom consisted primarily of hardwood forest (oak, maple, basswood, and hickory), oak barrens, and smaller areas of prairie.

Several wetland plants are nutritious and edible, including cattails, water-lilies, American lotus, and great bulrush (Peterson 1977). The wide variety of plant resources would have provided food, medicine, and utilitarian items for the indigenous people in the area.

Changes in the regional vegetation during the Holocene have been inferred from pollen samples preserved in lake-bottom sediments from several lakes in eastern Minnesota (Amundson and Wright 1979; Gibbon 2012; Webb 1981; Webb et al. 1983; Wright 1976a, 1976b; Wright 1992; Wright and Watts 1969). These pollen samples show that in east-central Minnesota, spruce forest dominated the landscape during the retreat of the glaciers approximately 12,000 BC. Spruce forest was replaced by jack pine forest around 9600 BC in the southeastern corner of the state, which in turn was soon replaced by deciduous forest across most of southern Minnesota around 9000 BC. Continued warming and drying provided the climatic conditions for prairie and oak savannah to flourish by 8200 BC, and the types of vegetation zones that were encountered in the mid-1800s had developed, with prairie in the west, deciduous forest in the southeast, and coniferous forest in the north and northeast. Continued warming and drying after 8200 BC led to prairie expansion across most of southern Minnesota, with its eastward maximum extent reached around 5800 BC when it was 100 miles northeast of its historic limit. A cooler and wetter climate after 4900 BC caused a westward retreat of prairie, and this was followed by the gradual return and western expansion of oak forest near the project area by around 3890 BC. By 1200 BC the vegetation zones present at the time of European settlement became established. However, it wasn't until about 1700 AD that the Big Woods (elm, basswood, ironwood, hickory, maple, ash, butternut) became established in south central Minnesota. The wide variety of plant resources associated with these forest and prairie ecosystems would have provided food, medicine, and utilitarian items for the indigenous people in the area. Wild rice was present in many of the lakes and rivers of the region. Rice Lake was likely named for its stands or wild rice.

6.6 Fauna

Based on early historical accounts, a wide variety of mammalian game species were present in southern Minnesota, including bison, elk, deer, muskrat, rabbit, beaver, bear, and occasionally antelope (Anfinson 1997; Ernst and French 1977; Herrick 1892). The range and abundance of species has been altered by the loss of natural habitat and hunting so that some species are no longer present. Numerous lakes and rivers in the region attracted a variety of birds, including ducks, geese, cranes, and swans. Fish species included northern pike, gar, sucker, sunfish, perch, and buffalo fish. The wide variety of animal resources in the region would have provided a broad subsistence base for indigenous people of the region.

6.7 Soils

Soils in the project area formed in a variety of parent materials based on their landscape position (Web Soil Survey 2013). There are four primary soils mapped in the project area:

1) Blue Earth mucky silt loam is present in the wetlands along TH 101 from Shakopee to CSAH 61. These soils formed in fresh water on floodplains and consist of coprogenous earth (sedimentary peat) to a depth of 60 inches. The soils are associated with the wetlands that formed in and around Rice Lake. These soils primarily consist of decayed aquatic plant material and micro-fecal pellets.

2) Minneiska loam and Minneiska-Kalmarville complex formed in stratified sand and silt loam alluvium on floodplains to a depth of 60 inches. This soil is mapped in the area of the Bluff Creek alluvial fan.

3) Terril loam formed in colluvium over till on foot slopes of stream terraces in the valley. This soil is mapped west and east of the alluvial fan along CSAH 61.

4) Dorchester silty clay loam and generic alluvial land soils formed in alluvium on floodplains to a depth of 60 inches. These soils are mapped on the floodplain across from Shakopee on the levee.

The archaeological and geomorphological investigation (Appendix A) for the project provides more detailed information on the soils, as discussed in subsequent sections of this report.

7. PHASE I FIELDWORK SUMMARY

Archaeological fieldwork was conducted from October 19, 2012 to January 10, 2013 and May 6, 2013 to July 2, 2013. Frank Florin was the principal investigator and field supervisor. The FCRS field crew included Mike Beck, Bob Thompson, Mike Bradford, Geoff Jones, Frank Koep, Ryan Letterly, Don Lieske, James Lindbeck, and Jeff Shapiro.

The location of the Phase I archaeological survey area and sites identified during the survey are presented on a USGS 7.5' quadrangle map and aerial imagery in Figures 1 and 2. The locations of survey areas and shovel tests discussed in the subsequent section are depicted on aerial imagery in Figures 9 to 11.

A discussion of the field conditions, physical setting, survey methods, and results of the investigation is presented below. The field methods are described in Section 3.1. Four precontact archaeological sites and one historical archaeological site (276-3) were identified during the Phase I survey. Phase II evaluation was conducted at three sites (21CR154, 21CR155, and 21CR156). The sites are discussed in detail in Sections 8 to 12.

7.1 TH 101 Survey

The TH 101 survey area extends from the north side of the Minnesota River at Shakopee, across the river valley bottom to the valley margin, where it intersects with CSAH 61, forming a "Y" at the road junction to accommodate east and west bound traffic onto CSAH 61. A small area along the west side of TH101, north of the "Y" and CSAH 61, was surveyed for a turn lane. The following discussion is organized by landform starting at the south end of the survey area and extending north along TH 101. Survey areas are listed on the maps in Figures 9 to 11.

Levee

The south end of the survey area is on the levee adjacent to the river (Figure 9). The levee is a prominent ridge about 20 feet above the river. A sewer and paved boat ramp are on the east side of TH 101, preventing testing in this area. STs 77 to 79 (single auger tests) were placed on the west side of TH 101 in a small stand of trees. Historic debris (aside from the fill material) from these tests included: a metal wire from 140 to 150 cmbs; two rusty metal fragments from 130 to 160 cmbs; and a cut limestone rock fragment from 240 to 250 cmbs. The historic materials appear to have been redeposited in the alluvium, or they could be refuse material dumped along the river bank. No structures are depicted on the historic maps or air photos at this location. No presettlement land surface was identified in the soil profile, and it is likely that the soils, extending to a depth of at least three meters, are historic in age (Table 4).

Table 4. Typical Soil Profile from STs 77 to 79 on the Minnesota River Levee on the West Side of TH 101.

Depth Below Surface (cm)	Description
0-100	Fill
100-210	Dark grayish brown (10YR 4/2) fine sandy loam
210-220	Very dark grayish brown (10YR 3/2) silty clay loam
220-300	Dark grayish brown (10YR 4/2) fine sandy loam

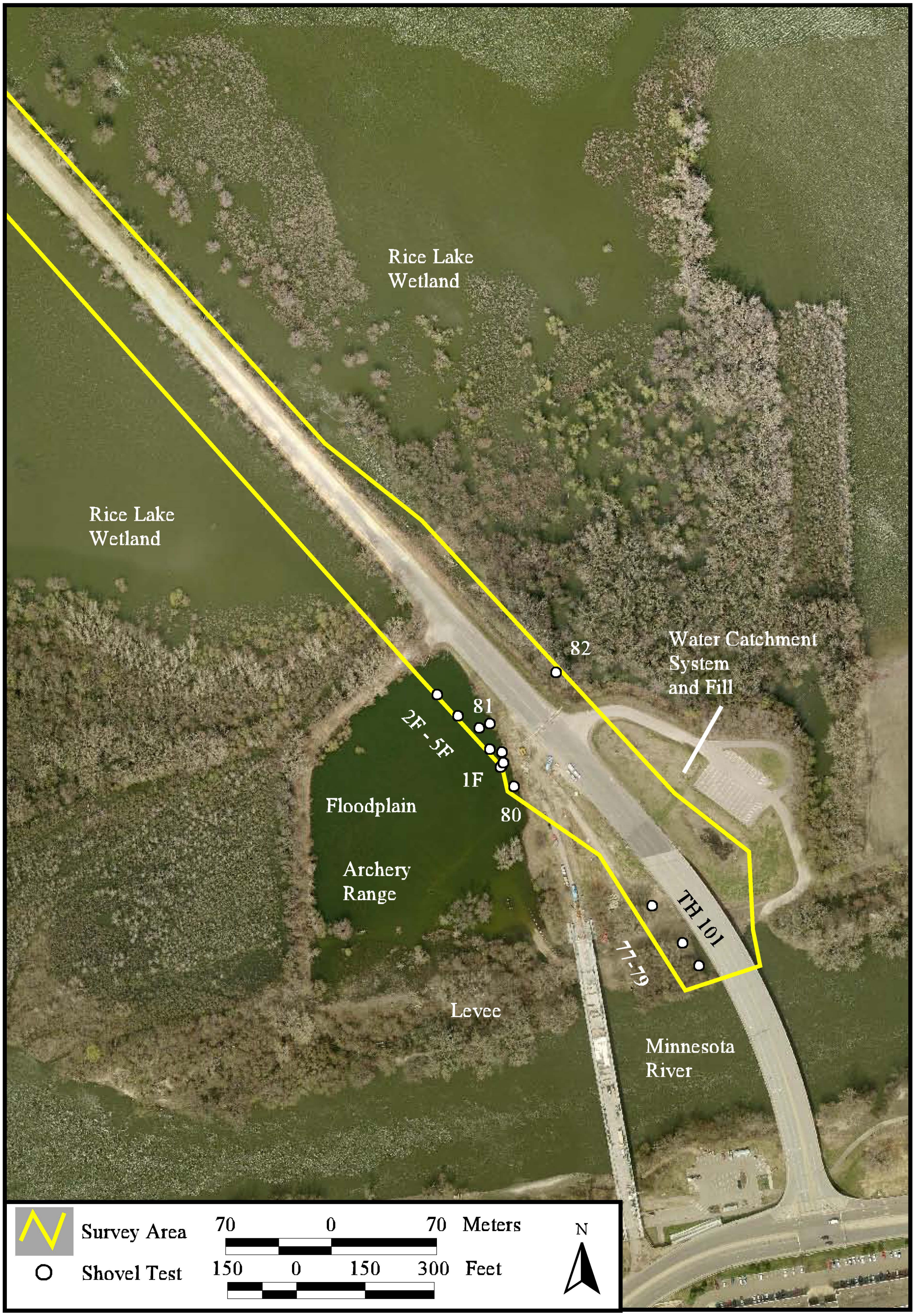


Figure 9. Survey Area Along TH 101 in Southern Portion of Project Area on 2011 Pictomerty Aerial Image.

Figure 10. Survey Area Along Eastern Portion of CSAH 61 and Northeastern Portion of TH 101 on 2011 Pictomerty Aerial Image.

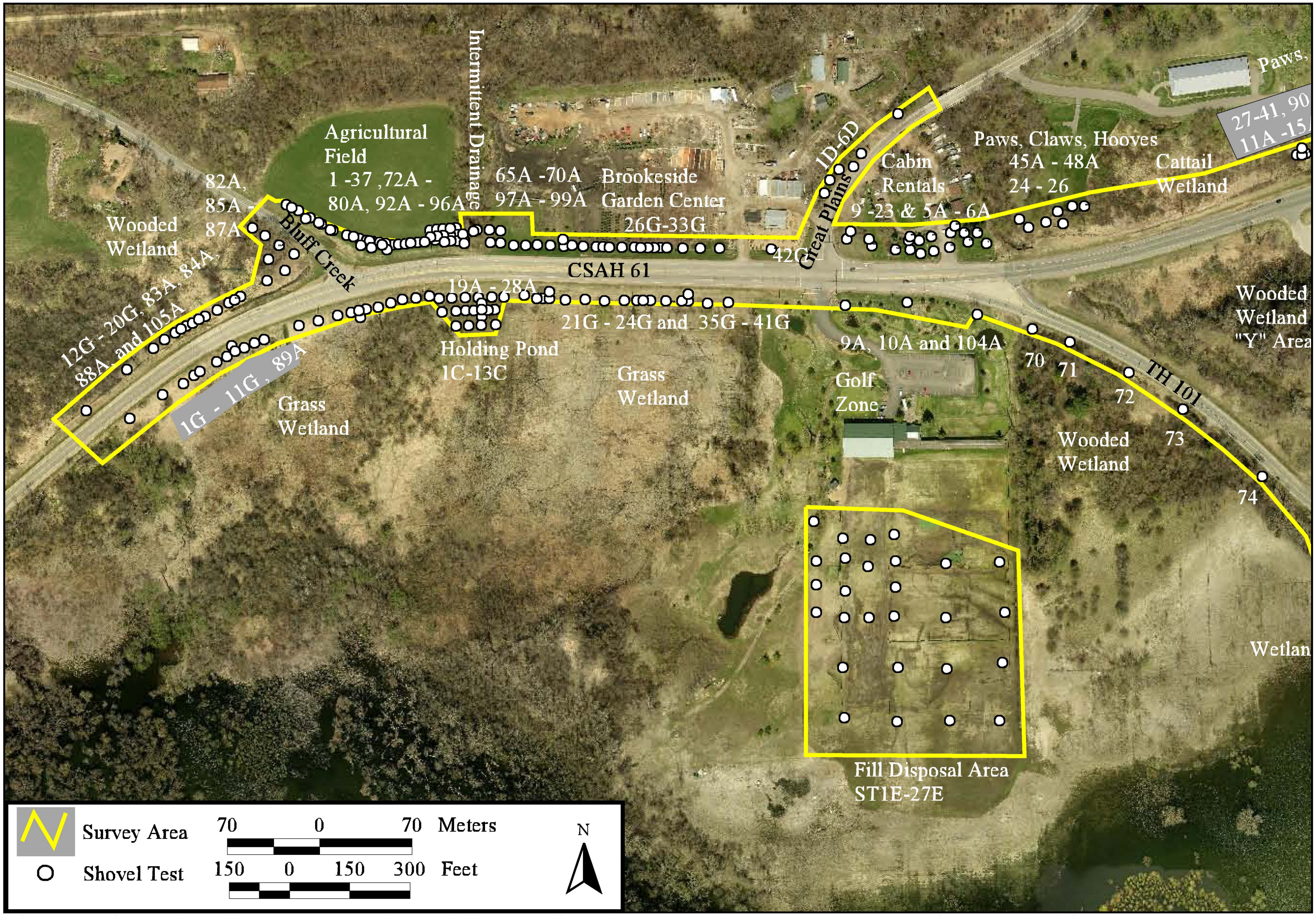


Figure 11. Survey Area Along Western Portion of CSAH 61 and Northwestern Portion of TH 101 on 2011 Pictomerty Aerial Image.

Geomorphological Cores C12 and C13 were located on the levee on the west side of TH101 near archaeological STs 77 to 79 (Appendix A). The cores contained stratified sands and silts to a depth of 5.75 meters that were deposited in the abandoned channel belt of the Minnesota River after it moved laterally to the south. No buried soils were present. The deposits are likely historic and late pre-contact.

Floodplain

The floodplain is a low-lying landscape on the backside (north) of the levee (Figure 9). On the east side of TH 101 is a water catchment and pumping station that is constructed on approximately three meters of fill. No tests were dug because of the thick fill. North of the water catchment area is a wooded floodplain where ST 82 (single auger test) was placed. The soil profile from this test is presented in Table 5. Soil characteristics indicate this area is a wetland, based on the gleyed colors and peat. Historic debris (aside from the fill material) from the test included a clear glass fragment from 90 to 100 cmbs and a rusty metal fragment and clinker from 140 to 150 cmbs. The historic materials appear to have been redeposited in the alluvium, or they could be refuse material. No structures are depicted on the historic maps or air photos at this location. No presettlement land surface was identified in the soil profile, and it is likely that the soil, extending to a depth of at least three meters, is historic in age.

Table 5. Soil Profile from ST 82 on the Floodplain on the East Side of TH 101.

Depth Below Surface (cm)	Description
0-25	Fill
25-60	Pale brown (10YR 6/3) gravelly sand or fill
60-100	Gray (Gley 5/N) silt loam
100-115	Black (10YR 2/1) peat
115-140	Black (Gley 2.5/N) mucky silty clay, massive
140-180	Dark gray (Gley 4/N) silty clay, massive
180-220	Very dark gray (Gley 3/N) clay, massive
220-270	Dark gray (Gley 4/N) clay, massive
270-300	Dark greenish gray (Gley 4/10Y) silt loam, massive

water table at 70 cmbs

The floodplain on the west side of TH 101 is an archery range. The north end of this area had standing water from May to July 2013. TH 101 is raised about 15 feet above the archery range and floodplain at this location. A presettlement land surface was not identified in any of the soil profiles, and it is likely that the soils, extending to a depth of at least three meters, are historic in age.

STs 80 (single auger test) was placed at the base of the road fill at the edge of the ROW. A soil profile for ST 80 is presented in Table 6. A brown glass fragment was recovered from the top of a buried soil at 140 to 150 cmbs and was probably redeposited in the alluvium, as no historic structures are depicted on the historic maps or air photos in this location, although the area was a baseball field from the 1930s through at least the 1950s.

Table 6. Soil Profile from ST 80 on Floodplain on West Side of TH 101.

Depth Below Surface (cm)	Description
0-85	Fill
85-110	Brown (10YR 4/3) sandy loam
110-135	Very dark gray (10YR 3/1) silty clay loam, moderate to weak, very fine structure
135-185	Very dark grayish brown (10YR 3/2) silt loam, massive
185-270	Dark grayish brown (10YR 4/2) loamy sand, loose
270-300	Dark gray (10YR 4/1) sandy loam, massive

ST 81 (single auger test) was 45 meters north of ST 80 and was also placed at the base of the road fill at the edge of the ROW. The soils are finer in texture than those of ST 80 and contain a 1.5- meter thick fill deposit. A soil profile for ST 81 is presented in Table 7. No artifacts were recovered.

Table 7. Soil Profile from ST 81 on Floodplain on West Side of TH 101.

Depth Below Surface (cm)	Description
0-150	Fill
150-250	Very dark gray (10YR 3/1) clay, massive
250-300	Dark gray (10YR 4/1) clay, massive

water table at 160 cmbs

STs 1F to 5F (triple augered) were placed in a transect along the western edge of the survey corridor in the vicinity ST 80 and 81. The soil profile from ST 1F is similar to ST 80, although it has a finer texture. Soil profiles from STs 2F to 4F are similar to ST 81, but the fill was only 50-cm thick. The soils along the test transect increase in clay content to the north. The soils are very weakly developed and are mostly massive, with no buried soils. Glass was found in several tests to a depth of one meter. The most northerly test (5F) was dug to only 45 cmbs because large boulders and fill were encountered. A piece of lithic debris was found in ST 1F at 100 to 120 cmbs. Four close-interval tests, each triple augered, were dug in cardinal directions adjacent to this test, and all of these tests contained modern debris (clay pigeon fragment, several pieces of clear glass, asphalt, and plastic) from the same soil horizon as the lithic debris and from below the depth of the lithic debris. These materials provide solid evidence that the piece of lithic debris was redeposited during flooding or is in the fill, and it is not an archaeological site.

Geomorphological Core C17 was located on the floodplain on the west side of TH101 near the south end of the archaeological tests (Appendix A). The core had a weakly developed, buried soil that formed in loam at 3.65 meters below the surface, which may be the presettlement land surface. The deposits are vertical accretion silts and clays.

<u>Wetlands - Rice Lake</u>

Wetlands that formed from the infilling of Rice Lake occur across the valley bottom north of the floodplain to CSAH 61 (Figure 9). The wetlands consist of cattails, grasses, woods, and areas of open water. No shovel testing was possible because of the high water table, and the archaeological site potential in this area is very low, as the area was formerly a lake or wetlands, and the southern margin borders the floodplain, which has thick, historic deposits.

Wetlands – Bluff Creek Alluvial Fan

In the northern portion of the TH 101 survey area is an alluvial fan deposited by Bluff Creek (Figure 10). The wetlands in this area are wooded. The archaeological site potential is very low because of the historic age of the deposits and wetland conditions. The area within and along the "Y" has been elevated with fill. Despite the fill, the water table is at or near the surface. No testing was conducted on the interior portion of the "Y" and limited testing was conducted on the Bluff Creek alluvial fan in this area, as the results the geomorphic testing in this this area (discussed below) and archaeological testing in the adjacent area of the ROW indicate that this area has very low to no potential for precontact sites because the alluvial fan is historic age and the underlying deposits were formed in wetland and shallow lake environments.

Geomorphological Cores 1 to 6, 9, 14, and 16 were placed in this area, and they provide a detailed record of the soils and archaeological site potential (Appendix A). The cores contain Bluff Creek alluvial fan deposits overlying wetland (paludal) deposits, with a few tests containing lacustrine basal deposits. Historic artifacts were located at depth of 2.2 meters. A date of AD 1480-1650 (310±30 RCYBP) was obtained from the top of the peat at 4.2 meters below the surface. This evidence indicates the Bluff Creek alluvial fan deposits are historic in age and overlie wetland (paludal) and subaqueous (underwater) lake deposits in this area.

ST 75 (single auger test) was placed in a wooded floodplain on the east side of TH 101 at the edge of the ROW south of the "Y". A soil profile is presented in Table 8. The test was terminated at 30 cmbs because of slumping from saturated soils. The water table was at 20 cmbs. No artifacts were recovered.

Table 8. Soil Profile from ST 75 on the Alluvial Fan on the East Side of TH 101.

Depth Below Surface (cm)	**Description**
0-30	Very dark grayish brown (10YR 3/2) silt loam, slumping soil, not recoverable below 30 cmbs

ST 76 (single auger test) was placed on the east side of TH 101, 65 meters south of the "Y" and 170 meters north of ST 75. A soil profile is presented in Table 9. No artifacts were recovered. The soil profile consists of historic alluvial fan deposits.

Table 9. Soil Profile from ST 76 on Alluvial Fan on East Side of TH 101.

Depth Below Surface (cm)	**Description**
0-50	Fill
50-65	Dark grayish brown (10YR 4/2) silt loam
65-80	Pale brown (10YR 6/3) gravelly sand
80-130	Dark gray (10YR 4/1) sandy loam
130-180	Dark gray (Gley 4/N) silty clay, massive
180-195	Black (10YR 2/1) sandy muck
195-205	Very dark gray (Gley 3/N) loamy sand, loose
205-220	Dark gray (10YR 4/1) gravelly sand, loose

water table at 60 cmbs

STs 1 to 8 (single auger tests) were placed on the east side of TH 101 in the “Y” area.   ST 1 was 170 meters north of ST 76. A small stream, which originates from a spring on the north side of CSAH 61, flows southward a short distance east of ST 8. The water table is higher near the stream and was at the surface in STs 6 to 8. No artifacts were recovered. A soil profile from STs 1 to 3 is presented in Table 10. These tests were terminated at 120 cmbs because of slumping soils. The soils are historic alluvial fan deposits.

Table 10. Soil Profile from STs 1 to 3 on Alluvial Fan on East Side of TH 101.

Depth Below Surface (cm)	Description
0-20	Very dark gray (10YR 3/1) silt loam
20-35	Dark grayish brown (10YR 5/4) mottled with light brownish gray (10YR 6/2) silty clay loam, redox
35-45	Dark grayish brown (10YR 5/4) mottled with light brownish gray (10YR 6/2) loamy sand, redox
45-60	Dark gray (5Y 4/1) sandy loam
60-75	Dark gray (5Y 4/1) silt loam
75-120	Dark gray (5Y 4/1) sand

water table at 50 cmbs

A soil profile from ST 4 (single auger test) is presented in Table 11. This test is similar to ST 1 to 3 but extends into peat layer within the historic alluvial fan deposits at 175 cmbs. No artifacts were recovered.

Table 11. Soil Profile from ST 4 on Alluvial Fan on East Side of TH 101.

Depth Below Surface (cm)	Description
0-15	Very dark gray (10YR 3/1) silt loam
15-30	Dark grayish brown (10YR 5/4) mottled with light brownish gray (10YR 6/2) loamy sand, redox
30-50	Dark gray (5Y 4/1) sandy loam
50-75	Dark gray (5Y 4/1) silt loam
75-160	Dark gray (5Y 4/1) gravelly sand
160-175	Dark gray (2.5Y 4/1) silt loam
175-200	Very dark grayish brown (2.5Y 3/2) peat

water table at 50 cmbs

STs 70 to 74 (single auger tests) were placed on the west side of TH 101 in the road ditch on the west side of the “Y” area. The tests were dug to maximum depths of 150 to 300 cmbs, and no artifacts were recovered. Soil profiles are presented in Tables 12 to 14. The soils consist of historic alluvial fan deposits.

Table 12. Soil Profile from ST 70 and 71 on Alluvial Fan on West Side of TH 101.

Depth Below Surface (cm)	Description
0-50	Fill
50-95	Dark grayish brown (10YR 4/2) mottled with yellowish brown (10YR 5/6) silty clay, massive, redox
95-105	Dark grayish brown (10YR 4/2) sand, loose
105-200	Very dark gray (2.5Y 3/1) silty clay loam, massive, with wood pieces
200-300	Very dark gray (Gley 3/N) sandy loam, massive

water table at 150 cmbs

Table 13. Soil Profile from ST 72 and 73 on Alluvial Fan on West Side of TH 101.

Depth Below Surface (cm)	Description
0-70	Fill
70-90	Dark gray (10YR 4/1) gravelly sand, loose
90-100	Dark gray (10YR 4/1) silty clay, massive
100-110	Dark brown (10YR 3/3) peat
110-160	Dark gray (10YR 4/1) silty clay with lenses of peat
160-180	Dark gray (10YR 4/1) loamy sand, loose, slumping soil not recoverable below 180 cmbs

water table at 60 cmbs

Table 14. Soil Profile from ST 74 on Alluvial Fan on West Side of TH 101.

Depth Below Surface (cm)	Description
0-37	Fill
37-45	Dark grayish brown (10YR 4/2) mottled with yellowish brown (10YR 5/6) silty clay, massive, redox
45-65	Dark gray (10YR 4/1) loamy sand, loose
65-120	Gray (10YR 5/1) sand, loose
120-130	Black (10YR 2/1) peat
130-140	Gray (10YR 5/1) sand, loose
140-150	Very dark gray (Gley 3/N) mucky silty clay, massive

water table at 60 cmbs

Brookside Garden Center – Bluff Creek Alluvial Fan

Shovel testing for a turn lane was conducted along the west side of TH 101 (Great Plains Blvd.) for a distance of 160 meters north of CSAH 61 (Figure 11). This area consists of the yard of the Brookside Garden Center, which is grassy with some small trees. The area is on the alluvial fan deposited by Bluff Creek.

STs 2D to 6D (single auger tests) were dug in 10 to 15 meter intervals just beyond the ROW along the property fence. The most northern test (1D) was placed 30 meters north of the other tests. Three of the tests were dug to 300 cmbs, but because of slumping the other three tests were only dug to about 210 cmbs. No artifacts were identified. The soils consist of stratified alluvium that lacks buried soils, and the stratigraphy is similar to that described in the geomorphological report (Appendix A).

Geomorphological Cores 32 and 33 were placed in this area (Appendix A). Stratigraphy consists of 4.87 meters of sand and gravelly sand alluvium over peat. These cores (and the survey area) may be in the buried Bluff Creek channel belt. The geologic potential for precontact archaeological sites is very low to none given the lack of buried soils, the high energy depositional environment, the historic age of the alluvial deposits, and the wetland environment below the alluvial fan deposits.

7.2 North Side CSAH 61

The CSAH 61 survey area extends 400 meters east and 750 meters west of its junction with TH 101 at the "Y" and generally follows the bluff base at the valley margin. The following discussion is organized by property type and land use starting at the east end of the survey area and extending west along the north side of CSAH 61.

<u>Road Cut Area – North Side CSAH 61</u>

The toe slope at the bluff base on the north side of CSAH 61 is a road cut for the highway (Figure 11). ST 68 (single auger test) was placed in this area to examine the soil. The soil contained fill to 85 cmbs and then an impenetrable layer of crushed rock or limestone that appeared to be road grade fill.

Geomorphological Cores 10 and 11 were placed in this area (Appendix A). The cores contained fill overlying truncated colluvial deposits (BC horizon) and lack buried soils. It is likely that several feet of soil was removed from this area during previous road construction.

ST 103A was placed on top of a hill cut near the top of a commercial driveway. There was fill and concrete that became impenetrable at 40 cmbs.

<u>Used Car Dealership – North Side CSAH 61</u>

A car dealership with a paved parking lot is east of a spring (Figure 11). Two STs (17B and 18B) were dug on the toe slope of the bluff in a wooded area north of the parking lot. No artifacts were identified. The soil profile is presented in Table 15. The soils formed in colluvium. There is no potential for deeply buried sites, so multiple deep auger tests were not necessary.

Table 15. Soil Profile from STs 17B and 18B North Side of CSAH 61 and North of Used Car Dealer Parking Lot.

Depth Below Surface (cm)	Description
0-25	Black (10YR 2/1) silty muck
25-45	Black (10YR 2/1) silty clay
45-75	Very dark gray (10YR 3/1) silty clay
75-85	Very dark grayish brown (10YR 3/2) sandy clay loam
85-120	Dark grayish brown (10YR 4/2) loamy sand, loose
120-150	Gray (10YR 5/1) gravelly sandy clay loam, massive, impenetrable

Geomorphological Core 29 was placed in the parking lot of the used car dealership (Appendix A). The core contains 1.82 meters of fill overlying a series of C horizons formed in stratified colluvial deposits to a depth of 3.09 meters, over lacustrine deposits to a depth of 3.96 meters.

Paws, Claws, & Hooves – North Side CSAH 61

West of the used car dealer is the "Claws, Paws, and Hooves" property, which is an animal boarding facility (Figures 10 and 11). The ROW consists of an undeveloped area of woods, brush, and grasses. The landscape in the eastern portion of this area consists of colluvium on the bluff toe slope, and the western portion consists of cattail wetlands on the valley floor. Bluff Creek flows near the western boundary of the property.

The head of a spring cuts through the eastern end of this area in a small gulley that is about two meters deep. In the eastern portion of the property, shovel test transects extended from the eastern property boundary to the wetland edge. One transect of tests was placed inside the ROW approximately 20 to 22 meters from the CSAH 61 road edge and included STs 27 to 41 and 90 (triple augered). Precontact artifacts were recovered from several shovel tests, and the area was designated site 21CR154. The site and soils in the area are discussed in detail in Section 8.

Another transect was placed four meters north of the ROW (approximately 26 meters from the CSAH 61 road edge) and included STs 1A to 4A, 11A to 15A, 30A to 35A, and 1B to 16B. STs 1B to 16B were dug outside the ROW at the east end of the property to accommodate an expanded construction work area. These tests were single augered, as the potential for deeply buried precontact sites is low to moderate in the colluvial soils in this area. No artifacts were recovered from this area.

In the western portion of the property, shovel test transects extended from the wetland edge to Bluff Creek, which is about 10 meters from the western property boundary. No testing was conducted in the wetlands because of standing water and the inferred historic age and wetland environment of the deposits, based on the soils data from nearby geomorphic Cores 9 and 15. One transect of tests was placed inside the ROW in an area of brush and grass, approximately 25 meters north of the CSAH 61 road edge, and included STs 24 to 26 (single auger tests). No artifacts were recovered from these tests. A soil profile from ST 25 is presented in Table 16, and the profile consists of fill overlying sandy historic alluvium. A soil profile from ST 26 is presented in Table 17. The profile consists of fill overlying peat. No artifacts were recovered from this area.

Geomorphological Core 15 was placed in the vicinity of STs 24 to 26 (Appendix A). The core contains fill overlying historic alluvium and peat to a depth of about three meters. The potential for precontact sites in this area is very low to none, based on the historic age of the alluvium and the wetland environment.

Table 16. Soil Profile from ST 25 at Claws, Paws, and Hooves on North Side of CSAH 61.

Depth Below Surface (cm)	**Description**
0-160	Fill
160-180	Dark gray (10YR 4/1) sand, loose, slumping soil not recoverable below 180 cmbs

water table at 170 cmbs

Table 17. Soil Profile from ST 26 at Claws, Paws, and Hooves on North Side of CSAH 61.

Depth Below Surface (cm)	Description
0-140	Fill
140-155	Dark yellowish brown (10YR 4/4) peat
155-170	Very dark grayish brown (10YR 3/2) peat

water table at 150 cmbs

Another transect was placed four meters north of the ROW (approximately 32 meters from the CSAH 61 road edge) on a grass lawn and included STs 45A to 48A (single auger tests). A soil profile from ST 45A is presented in Table 18. The profile consists of fill overlying peat and muck. Soil profiles from STs 46A and 47A were similar, but they were only augered to 200 cmbs. ST 48A was located near Bluff Creek. A soil profile from ST 48A is presented in Table 19. The soil consists of fill and historic alluvium overlying muck and peat. The potential for precontact sites in this area is very low to none, based on the historic age of the alluvium and the wetland environment. No artifacts were recovered from this area.

Table 18. Soil Profile from ST 45A at Claws, Paws, and Hooves on North Side of CSAH 61.

Depth Below Surface (cm)	Description
0-65	Fill
65-110	Dark yellowish brown (10YR 3/4) peat
110-170	Very dark grayish brown (10YR 3/2) peat
170-225	Black (10YR 2/1) peat
225-265	Very dark gray (10YR 3/1) peat
265-300	Very dark gray (5Y 3/1) mucky silt

Table 19. Soil Profile from ST 48A at Claws, Paws, and Hooves on North Side of CSAH 61.

Depth Below Surface (cm)	Description
0-90	Fill
90-110	Very pale brown (10YR 7/3) sand
110-150	Brown (7.5Y 4/4) sand
150-170	Grayish brown (2.5Y 5/2) silt
170-260	Dark gray (5Y 4/1) mucky silt
260-300	Dark brown (10YR 3/3) peat

Rental Cabins and Vacant Corner Lot– North Side CSAH 61

A rental cabin property is west of the Claws, Paws, and Hooves property and east of Great Plains Blvd/TH 101 (Figure 11). The ROW consists of a grass lawn and road ditch, with a row of small pine trees north of the ROW. Bluff Creek flows near the eastern boundary of the property. Two transects of tests were placed inside the ROW at 8 and 18 meters from the CSAH 61 road edge and included STs 9 to 23 (single auger tests). STs 5A and 6A (single auger tests) were placed four meters north of the ROW (approximately 22 meters from the CSAH 61 road edge). The soils were highly variable in this area, and it appears that most of the tests contained fill to a depth of 180 cmbs. In some tests it was not possible to determine if the soils were fill or stratified historic alluvium. No artifacts were recovered.

Geomorphological Cores 7 and 8 were placed in this area (Appendix A). The cores contain historic alluvium to a depth of about five meters. The potential for precontact sites is nil, based on the historic age of the alluvium.

Brookside Garden Center – North Side CSAH 61

The Brookside Garden Center property is west of Great Plains Blvd/TH 101 (Figure 11). The ROW is ditched along the property. The area along the ROW is an outdoor plant nursery, with the west end being grass. STs 26G to 33G (triple augered, except ST 26G and 42G) were dug about nine meters from the road edge on the north side of the fence that borders the ROW. ST 65A to 70A and 97A to 99A (single augered) were at the west end of the property in the western alluvial fan area, which also contained thick deposits of fill and historic debris to 150 cmbs. The ROW widens at the west end of this area, and tests were placed up to 19 meters from the road edge in this area. Artifacts were recovered from several tests and are part of site 21CR155, which is discussed in Section 9. Details of the soils in this area are discussed with site 21CR155.

Geomorphological Cores 18 to 22 were placed on this property (Appendix A). Cores 18 to 19 contain historic Bluff Creek alluvial fan deposits overlying a buried soil formed in lacustrine deposits. Cores 20 to 22, at the west end of the property, contain historic alluvial fan deposits (western fan) overlying precontact alluvial fan deposits with buried soils.

Agricultural Field – North Side CSAH 61

The agricultural field is located between Bluff Creek Drive and the Brookside Garden Center (Figure 11). The ROW is ditched along the property. There is a tree row perpendicular to the ROW along the property line between this property and the Brookside Garden Center to the east. A gulley that drains the uplands is located within the tree row, but the gulley has been filled in the ROW area. This gulley is along the center of the western alluvial fan in this area. The landowner denied survey consent for the field, and therefore all testing was restricted to the ROW, except for the tests along the Bluff Creek Drive ROW. STs 72A to 80A were dug in 10-meter intervals within the ROW along CSAH 61, and STs 92A to 96A (single auger tests) were dug in 5-meter intervals adjacent to positive tests. STs 33 to 37 (triple augered) were along the east side of Bluff Creek Drive just outside the ROW. Precontact period artifacts were recovered from several shovel tests and are part of site 21CR155. The site and soils in this area are discussed in detail in Section 9.

Wooded Wetlands West End – North Side CSAH 61

There are extensive wetlands with cattails and woods west of Bluff Creek Drive, and some areas have standing water (Figure 11). STs 82A and 85A to 87A (triple augered) were placed in a wooded area within the ROW at the base of the road fill along the west side Bluff Creek Drive. STs 83A, 84A, 88A, and 105A (single auger tests) and 12G to 20G (triple augered) were dug just outside the ROW (ca. 12 to 14 meters from road pavement), which is ditched. Artifacts were recovered from several tests and are part of site 21CR155. The site and soils in the area are discussed in detail in Section 9.

7.3 South Side CSAH 61

The following discussion is organized by property type and land use starting at the east end of the survey area and extending west along the south side of CSAH 61.

Undeveloped Grassy ROW Parcel – South Side CSAH 61
The east end of the survey area on the south side of CSAH 61 is a grassy alluvial and colluvial landform along the bluff base (Figure 10). A spring-fed stream flows southward at the east end of the project area and has deposited a small alluvial fan onto the toe slope and valley floor. Rice Lake wetlands are a short distance south of the survey area. STs 45 and 50 to 67 (double augered) were placed in ten meter intervals within the ROW on this landform. The survey area was limited to the ROW in this parcel. Several tests yielded precontact period artifacts, and the area was designated site 21CR156. The site and soils in this area is discussed in detail in Section 10.

Western Motel – South Side CSAH 61

The Western Motel is located west of site 21CR156 on a slightly higher colluvial landscape (Figure 10). The southern portion of the motel parcel, outside of the survey area, is filled to raise the land above the wetland. STs 44 to 49 (excluding 45) and 83 to 87 (single auger tests) were placed within the ROW on the lawn of the motel. One transect was placed 11 meters from the centerline, and one transect was placed 13 meters from the centerline. The survey area was limited to the ROW in this parcel. In general, the soils along the inner transect (11 meters from centerline) are extensively disturbed and filled to a depth of two meters. Soils in the outer transect (13 meters from centerline) have 70 to 90 cm of fill overlying what appear to be intact soils. ST 47 yielded a precontact period artifact that was designated site 21CR157. The site and soils in the area are discussed in detail in Section 11.

Geomorphological Core 27 was placed at the east end of this property (Appendix A). The core contains fill overlying intact soils formed in colluvium. The core was a few meters south of the ROW and therefore had less fill and soil disturbance than the archaeological tests.

Vacant Lot – South Side CSAH 61

A vacant, dirt lot is west of the motel property (Figure 10). STs 69 and 49A to 56A (single auger tests) were placed in this area, approximately 18 meters from the centerline, except for ST 69,which was 11 meters from the centerline. The tests indicate that the lot has extensive and deep fill, which contained concrete and other impenetrable materials. The crew was able to penetrate the fill in ST 50A and 55A, and intact soils were identified below the fill in ST 50A at 160 cmbs and in ST 55A at 220 cmbs. It was determined that backhoe trenching would be the most practical way to investigate the intact soil in this area.

Backhoe trenches were dug at three locations: 1) at ST 54A; 2) three meters east of ST 51A; and 3) three meters south of ST 52A. The backhoe trenches were approximately two meters wide and four meters long at the ground surface and narrowed to approximately one meter wide and two meters long at 3.5 meters below surface. Once the fill was removed, the backhoe excavated the intact soil in 50-cm increments and placed the intact soil in piles according to depth. The soil from these piles was then screened. Artifacts were recovered from the trenches at ST 54A and ST 51A. The artifacts were designated as part of site 21CR157 because of their proximity to ST 47 at the motel property. The site is discussed in detail in Section 11.

Geomorphological Core 26 was placed at the east end of this property (Appendix A). The core contains 1.8 meters of fill overlying intact soils formed in colluvium.

Used Car Dealership and Paved Lot – South Side CSAH 61

A car dealership with a paved parking lot is west of the vacant lot (Figure 10). No tests were dug in these areas because of the asphalt surface and the proposed construction impacts are limited to the far western ten meters of the parking lot and are mostly within the ROW, which has buried utilities. Geomorphological Core 25 was placed at the east end of this property (Appendix A). The core contains 0.67 meters of fill overlying historic alluvium and peat to 2.58 meters over a gleyed buried soil formed in colluvium. If the project design changes in this area and construction will impact the buried soil at 2.58 meters below surface across a larger portion of the lot, then deep auger tests should be dug to determine if sites are present in this area.

Golf Zone – South Side CSAH 61

The Golf Zone is west of the "Y" and consists of a miniature golf course and grass lawn along the ROW (Figure 11). STs 9A, 10A, and 104A (single auger tests) were placed nine meters from the road edge outside of the ROW, as the ROW contains multiple buried utilities. ST 9A and 10A contained fill to 200 cmbs. The soil profile from ST 104 is presented in Table 20. The soils consist of fill and historic alluvium to 270 cmbs overlying gleyed alluvium or lacustrine subaqueous deposits (Appendix A:26). No artifacts were recovered. The potential for buried sites is low based on the fill, historic age of the alluvium, and the underwater (subaqueous) environment of the lacustrine deposits.

Table 20. Soil Profile from ST 104A at Golf Zone on South Side of CSAH 61.

Depth Below Surface (cm)	Description
0-110	Fill
110-150	Yellowish brown (10YR 5/4) gravelly sand
150-160	Grayish brown (10YR 5/2) loamy sand
160-170	Pale brown (10YR 6/3) sand
170-200	Dark gray (2.5Y 4/1) sand
200-210	Greenish gray (Gley 1 5/10GY) silt
210-220	Black (10YR 2/1) peat
220-240	Dark gray (2.5Y 4/1) sand
240-255	Dark greenish gray (Gley 1 3/10GY) silty clay
255-270	Dark greenish gray (Gley 1 3/10GY) gravelly sand
270-300	Dark greenish gray (Gley 1 3/10GY) silty clay

Golf Zone – Fill Disposal Area on South Side CSAH 61

Survey of the driving range on the Golf Zone property was conducted for a fill disposal area (Figure 11). The survey area measured 190 by 165 meters, totaling 7.2 acres. The driving range was formerly an agricultural field that has been modified with artificial berms.

Six geomorphological cores (36-41) were placed in this area (Appendix A:26) prior to the archaeology survey. The cores contain stratified, coarse-grained historic Bluff Creek alluvial fan deposits ranging in thickness from 1.20 to 3.27 m thick over interstratified fine-grained lacustrine sediment, organic sediment (peat and muck), and sandy, even gravelly, alluvial fan channel sediment. Potential for precontact sites in the Golf Zone area is low because of the historic age of the alluvial fan deposits, and the paludal or alluvial fan deposits that overlie the lacustrine deposits are not subaerially weathered. Essentially, the Bluff Creek alluvial fan in this area prograded into a floodplain lake during historic or late pre-contact times.

STs 1E to 16E were placed in 40-meter intervals, based on the results of the geomorphological investigation that indicated the landscape has a low potential for precontact sites. The tests were dug to a depth of three meters and were only single augered because of the low site potential. The soil profiles were similar to the geomorphological cores 36 to 41 that are presented in Appendix A.

STs 17E to 27E were placed in 20-meter intervals at the north end of the survey area where the former farmstead was located. These tests were dug to 85 cmbs and were focused on the recovery of historic artifacts. Several shovel tests contained historic material from the former farmstead, and the site was designated 276-3 and is discussed in Section 12. The OSA reviewed the site information and decided the site did not warrant an official site number.

Wetlands West End – South Side CSAH 61

An extensive wetland extends from the Golf Zone to the west end of the project area (Figure 11). The eastern portion is covered by the Bluff Creek alluvial fan. The central portion is covered by an alluvial fan deposited from the intermittent drainage east of Bluff Creek Drive. The west end lacks alluvial fan deposits and has a thin layer of muck on the surface. Shovel tests in the wetlands included 1G to 11G, 21G to 24G, 35G to 41G, and 19A to 28A (triple augered) that were generally dug in 10-meter intervals. The tests were dug a few meters south of the ROW to avoid buried utilities.

STs 1C to 13C (triple augered) were dug for a holding pond adjacent to the ROW. The area is on the western alluvial fan. The area is wooded and slightly elevated above the surrounding wetland. Shovel tests were placed in 10-meter intervals and were one to three meters outside of the ROW, between 12 and 15 meters from the road pavement edge.

Artifacts were recovered from several tests in the wetland area and are part of site 21CR155. The site and soils in the area are discussed in detail in Section 9. Geomorphological Cores 23, 28, 30, and 31 were placed in the wetlands in this area (Appendix A). The cores contain historic alluvium overlying paludal deposits and a buried soil formed in lacustrine deposits.

8. Site 21CR154

8.1 Overview

Site 21CR154 is a precontact period habitation located along the CSAH 61 ROW. The age and cultural affiliation of the site are unknown because of the absence of diagnostic artifacts. The site is in T116N, R23W, SW, NW, Section 36, Carver County and occupies an area of 160 by 10 meters, encompassing 0.4 acre (Figure 2). The site's UTM coordinates are E457540 N4962315 (1983 NAD Zone 15). A map of the site on aerial imagery is presented in Figure 12. Photos of the site area are included in Figures 13 and 14.

8.2 Physical Setting

The site is situated in the CSAH 61 ROW, except at the east end where in ST 2A it extends slightly north of the ROW onto the adjacent Claws, Paws, and Hooves animal boarding property. The site occupies a toe slope landscape along the bluff base at the margin of the Minnesota River Valley. The landscape at the site is fairly level, but the grade increases significantly north (upslope) of the site.

A wetland with cattails borders the site to west. The wetlands south of the site in the "Y" area have been filled. The head of a spring that flows south within a narrow incised ravine is located at the east end of the site. The site area consists of a mixture of grasses and brush and is wooded at the east end along the ravine. A portion of the ROW along the road is ditched and contains standing water and cattails. A fence borders the ROW along most of the site area, except at the east and west ends.

8.3 Soils

Soils at the site formed primarily in colluvium. The textures are variable and include clays and loams (often with gravel), with sandier textures occurring at depth. Muck with snails is also present, perhaps related to natural seeps. The poorly sorted nature of the deposits is typical of colluvium. A thick dark-colored cumulic upper solum is the result of sediments accumulating on the footslope through slope processes (mass-wasting, overland flow, and creep).

The soils generally include three distinct strata: the upper stratum is loamy colluvium; the middle stratum is muck or colluvial mineral soil with snail shells; and the lower stratum is gleyed clayey, loamy, or sandy colluvium. It appears from the stratigraphy there were at least three primary depositional events, with the muck and snail shells representing a period when the area was poorly drained. The upper stratum may be mostly historic in age, consisting of colluvium that was deposited as a result of upslope soil erosion following logging and land clearing. The lower stratum in some tests has a marked increase in gravel and calcium carbonate nodules. There is considerable variation in the soil strata, depths, and textures across the site.

Many of the tests east of the spring had evidence of modern disturbances to a depth of 60 cmbs, including: abrupt soil changes; fill layers; very compacted soils; and modern and historic debris such as metal, glass, concrete, clinker, and asphalt shingle fragments. This area appears to have been used as a dump site, as no historic properties were observed on the historic maps or air photos. In ST1A a clinker was recovered from 60 to 70 cmbs, below a precontact period flake that was found at 30 to 50 cm.

8.4 Phase I and II Shovel Test Results

The site was first identified during shovel testing in ten-meter intervals within the ROW. Additional close-interval tests were placed at 2.5 and 5-meter intervals adjacent to Phase I tests that had artifacts. The Phase I ten-meter interval tests were triple augered to recover a volume of soil equivalent to a standard ST, but the close-interval tests were only single augered. Items recovered from some tests were later determined to be non-cultural upon analysis in the lab.

Shovel tests were dug into the lower stratum, which is a gleyed soil that is typically 4/1, 5/1, 6/3, 6/5GY, or 6/5GY in color. The depth of testing ranged from 150 to 280 cmbs, with most tests dug to about 190 cmbs. In some tests with sandy and loamy soils, water saturation caused soil slumpage and prevented recovery deeper than 150 cmbs. The depth of the water table ranged from 110 to 180 cmbs and was generally at about 150 cmbs.

Eleven shovel tests contained 12 precontact period artifacts, including five pieces of lithic debris, five faunal fragments, one utilized flake, and one piece of FCR (Table 21).

Table 21. Site 21CR154 Summary of Artifacts from Phase I and II Shovel Tests.

ST #	Depth (cmbs)	Count	Artifact Type
1A	30-50	1	Broken flake, Swan River Chert
2A	40-50	1	FCR, granite
32E	120-135	1	Broken flake, Swan River Chert
32CE	70-85	1	Other G4 flake, quartz
33CW	60-70	1	Faunal, mammalian medium/large, unidentifiable fragment
38	30-50	1	Utilized flake, unidentified chert
38E5	35-50	2	Faunal, mammalian medium/large, unidentifiable fragment
39	40-60	1	Faunal, mammalian, medium/large, unidentifiable fragment
39S	0-20	1	Faunal, turtle, shell fragment
39CW	50-60	1	Primary flake, Swan River Chert
90	70-100	1	Secondary flake, Swan River Chert
Total	**-**	**12**	**-**

Artifacts were recovered from fill in two STs at the western end of the site. ST 30 had a primary flake of Prairie du Chien Chert and an unidentifiable bone fragment from 30 to 50 cmbs. ST 30W had a primary flake of Red River Chert from 25 to 35 cmbs. The artifact from ST 90 may also be from fill, based on the fact that ST 30W (five meters to the east) had fill and disturbed soils to 100 cmbs and XU 2 (ten meters to the east) had fill to 82 cmbs.

8.5 XU 1 Results

XU 1 was placed at the east end of the site adjacent to ST 38, which yielded a piece of lithic debris. Excavation was conducted in 10-cm levels below an arbitrary unit datum that was placed above the ground surface. The landscape was fairly level. Excavation was terminated at a depth of 90 centimeters below datum (cmbd) because of the lack of artifacts in the XU, and no artifacts were recovered beneath 60 cmbs from shovel tests in this portion of the site. A shovel test was placed in the base of the unit and dug to 180 cmbd to examine the soils and ensure that no deeply buried archaeological deposits were present. No precontact period artifacts were recovered from the unit. A piece of historical whiteware recovered from 60 to 70 cmbd is likely an incidental deposit, as no historic materials were recovered from any shovel tests west of the ravine, although there is a refuse dump east of the ravine.

A wall profile and photograph of the soil horizons are presented in Figures 15 and 16. The soil profile consists of three strata: the upper stratum is silty clay loam colluvium; the middle stratum is mucky with snail shells that formed in wetland conditions; and the lower stratum has stratified clayey and sandy colluvium. Disturbance from rodent burrows was minimal to moderate. The depth of the historic white ware suggests that the upper 70 cm of soil is historic colluvium, or that the whiteware was displaced downward by rodent burrowing.

8.6 XU 2 Results

XU 2 was placed at the west end of the site adjacent to ST 30, which yielded a piece of lithic debris. Excavation was conducted in 10-cm levels below an arbitrary unit datum that was placed above the ground surface. The landscape was fairly level. Excavation was terminated at a depth of 100 cmbd because of the lack of artifacts, and artifacts from shovel tests did not extend deeper than 100 cmbs in this portion of the site and were recovered from fill. A shovel test was placed in the base of the unit and dug to 150 cmbd to examine the soils and ensure that no deeply buried archaeological deposits were present. No precontact period artifacts were recovered. One piece of coal was recovered from 90 to 100 cmbd, and it is likely an incidental deposit that was translocated down from the fill, as no historic materials were recovered from shovel test west of the ravine, although there is a refuse dump east of the ravine.

A wall profile and photograph of the soil horizons are presented in Figures 17 and 18. The soil profile consists of about 82 cm of fill overlying truncated but intact soils that formed in colluvium. A mucky stratum was not present, and it appears that the original topsoil and muck stratums were removed when fill was added to this area, as tests north of the ROW in this area had loamy topsoil and mucky stratums.

8.7 XU 3 Results

XU 3 was placed at the east end of the site adjacent to ST 1A, which yielded a piece of lithic debris. Excavation was conducted in 10-cm levels below an arbitrary unit datum that was placed above the ground surface. The landscape was fairly level. Excavation was terminated at a depth of 80 cmbd because of the lack of artifacts, and the artifact from ST 1A did not extend deeper than 50 cmbs. A shovel test was placed in the base of the unit and dug to 130 cmbd to examine the soils and ensure that no deeply buried archaeological deposits were present. No precontact period artifacts were recovered. Modern and historic debris were recovered from 0 to 30 cmbd, including tin foil, plastic pieces, an eyeglass frame, window glass fragments, milk bottle glass, a piece of wire, and a round nail. A modern garbage pile is located nearby, and adjacent shovel tests showed evidence of soil disturbances and a mixture of modern and historical debris, indicating that this area has been used as a dump.

A wall profile and photograph of the soil horizons are presented in Figures 19 and 20. The soil profile consists of three strata: the upper stratum is a silty clay loam colluvium; the middle stratum is clay with snail shells that formed in wetland conditions; and the lower stratum is sandy clay loam and clay loam colluvium. Disturbance from rodent burrows was minimal. Overall, there appears to be minimal disturbance below 20 or 30 cmbd.

8.8 XU 4 Results

XU 4 was placed at the east end of the site adjacent to ST 2A, which yielded a piece of FCR. Excavation was conducted in 10-cm levels below an arbitrary unit datum that was placed above the ground surface. The landscape was fairly level. Excavation was terminated at a depth of 80 cmbd because of the lack of artifacts, and the artifact from ST 2A did not extend deeper than 50 cmbs. A shovel test was placed in the base of the unit and dug to 115 cmbd to examine the soils and ensure that no deeply buried archaeological deposits were present. No precontact artifacts were recovered. Modern or historic debris, including a round nail and piece of slag, was recovered from 40 to 60 cmbd. These items may have been incidentally dumped at the site or may have translocated down from the fill.

A wall profile and photograph of the soil horizons are presented in Figures 21and 22. The soil profiles consist of three strata: the upper stratum is fill; the middle stratum is silt loam with snail shells that formed in wetland conditions; and the lower stratum is loamy sand colluvium. Disturbance from rodent burrows was minimal. The upper stratum has been removed in this area and replaced with 45 cm of fill. There appears to be minimal disturbance below the fill.

8.9 Artifact Summary

A total of 12 artifacts, including five pieces of lithic debris, five faunal fragments, one utilized flake, and one piece of FCR, were recovered from the site during Phase I survey and Phase II evaluation.

8.10 Lithic Analysis

The lithic assemblage consists of five pieces of lithic debris and one stone tool (Table 22). The lithic debris includes a primary flake, two broken flakes, a secondary flake, and an Other G4 flake. Although the sample size is small, the primary and secondary flakes suggest that initial reduction and bifacial shaping and thinning occurred at the site. Broken flakes and Other G4 flakes are not diagnostic of specific reduction stages. All debris is Size Grade 3 (<½inch to ≥ ¼ inch), with the exception of one piece that is Size Grade 4 (< ¼ inch). The stone tool is a utilized flake, which is a light-duty cutting and slicing tool used on animal remains, wood, and plants. Lithic materials consisted of Swan River Chert, Red River Chert, unidentified chert, and quartz. These lithic materials are locally available (Bakken 1997). The unidentified chert may be local or exotic.

Table 22. Site 21CR154 Summary of Lithic Artifacts.

Material	Primary Flake	Secondary Flake	Tertiary Flake	Other Grade 4	Shatter	Broken Flake	Bipolar Flake	Tool/Core	Total	%
Swan River Chert	-	1	-	-	-	2	-	-	**3**	**50**
Red River Chert	1	-	-	-	-	-	-	-	**1**	**17**
Unidentified chert	-	-	-	-	-	-	-	1 utilized flake -	**1**	**17**
Quartz	-	-	-	1	-	-	-	-	**1**	**17**
Total	**1**	**1**	**-**	**1**	**-**	**2**	**-**	**1**	**6**	
%	**17**	**17**	**-**	**17**	**-**	**33**	**-**	**17**	**-**	**100**

8.11 Faunal Analysis

Five faunal fragments were recovered from the site. The remains include one turtle shell fragment and four unidentified fragments from a medium to large-size mammal. All remains were Size Grade 3 (<½ inch - ≥¼ inch). The small size and fragmentary condition of the remains do not allow for specific identification of species or element.

The faunal material likely represents subsistence remains. However, the association of all the faunal material with the precontact occupation is not conclusive for several reasons. The artifact density at the site is low, and there is not a direct association between animal bones and other artifact types. Also, the site is located along a busy road, and it is possible that some of the bone could be from animals hit by cars.

8.12 FCR Analysis

One piece of FCR was recovered at the site. It is an angular piece of granitic rock. The presence of FCR suggests that fire hearths or cooking pits were present at the site, although none were identified. Cobbles used for heating and/or cooking were likely procured from local sources where rocks were exposed, such as the ravines that drain into the Minnesota Valley River.

8.13 Conclusions and Recommendations

Site 21CR154 is a precontact period habitation located along the CSAH 61 ROW. The age and cultural affiliation of the site are unknown because of the absence of diagnostic artifacts. Artifacts include a small amount of lithic debris, animal bone, and FCR. Site activities are inferred to have included lithic reduction, animal processing, and heating/cooking. Portions of the site lack integrity as a result of soil disturbance from previous construction activities. The site does not have the potential to provide important information on the precontact period in the region because of the sparse and limited artifact assemblage. The site is recommended not eligible for listing on the NRHP. No additional archaeological work is recommended at the site.

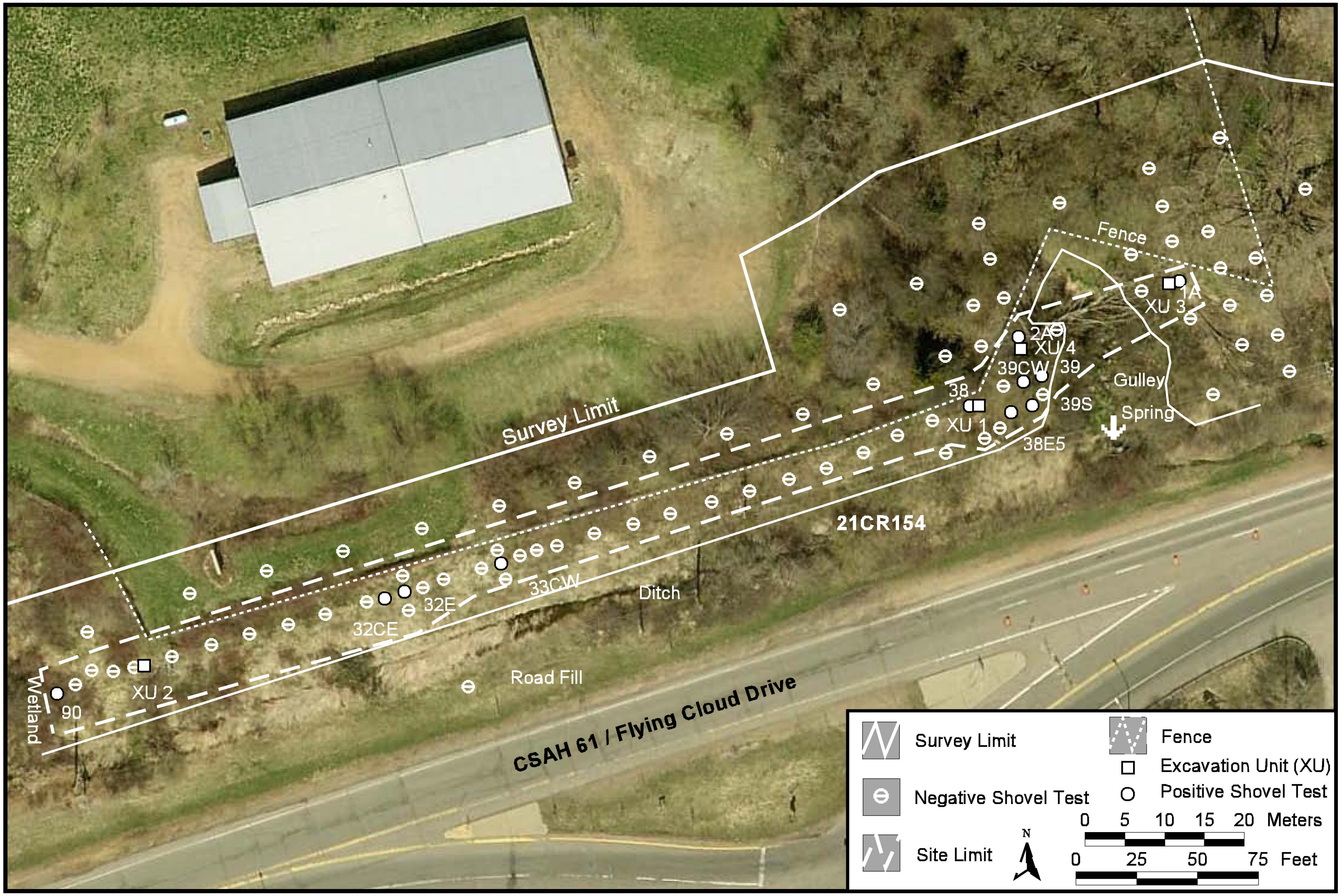


Figure 12. Site 21CR154 Map on 2011 Pictometry Aerial Image.

Figure 13. Site 21CR154 Photo of West Portion of Site, Facing West.

Figure 14. Site 21CR154 Photo of XU 1 Area in Eastern Portion of Site, Facing North.

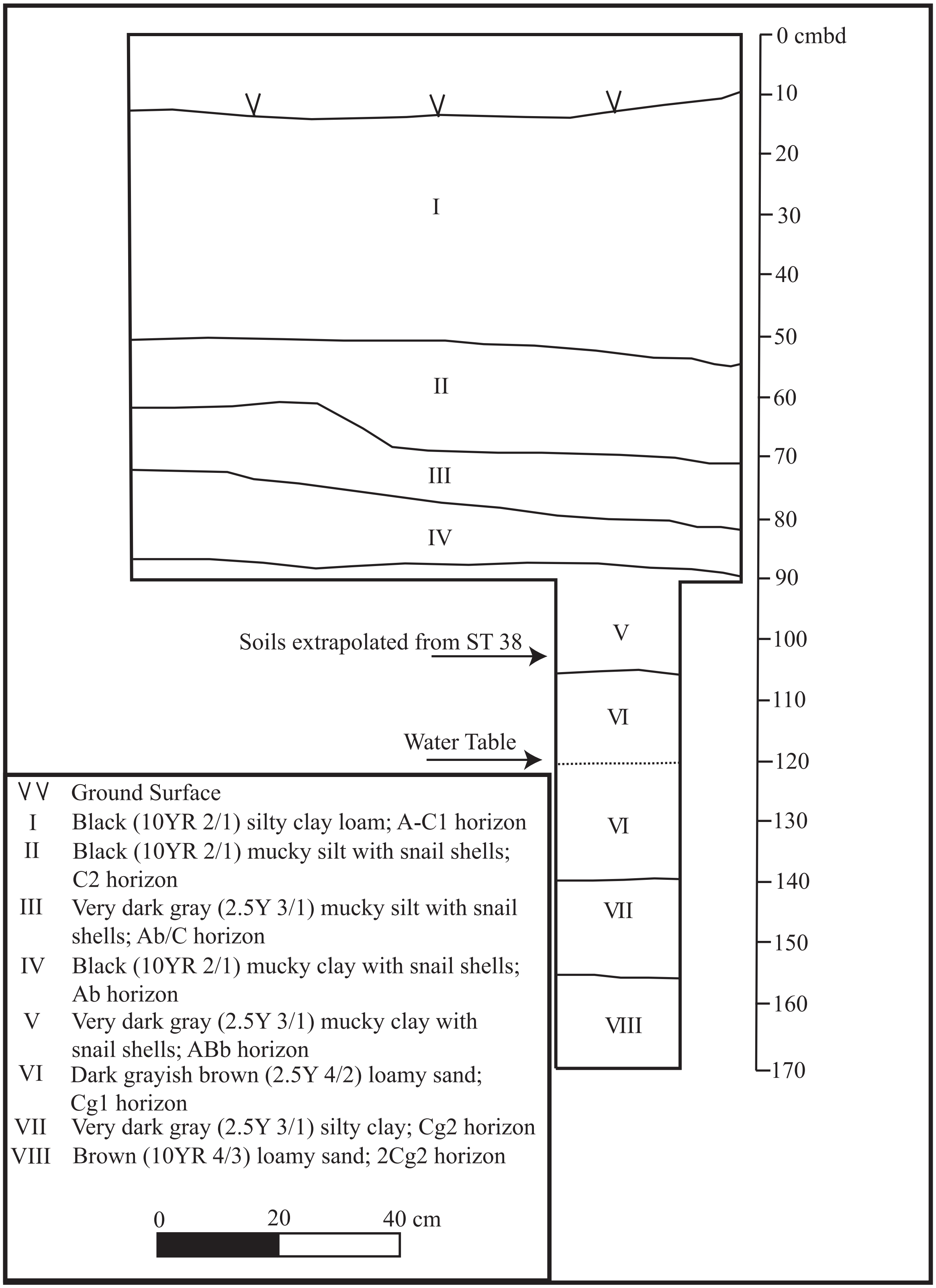


Figure 15. Site 21CR154 XU 1 East Wall Profile.

Figure 16. Site 21CR154 Photo of XU 1 East Wall Profile from 0 to 90 cmbd.

Figure 17. Site 21CR154 Photo of XU 2 North Wall Profile from 0 to 100 cmbd.

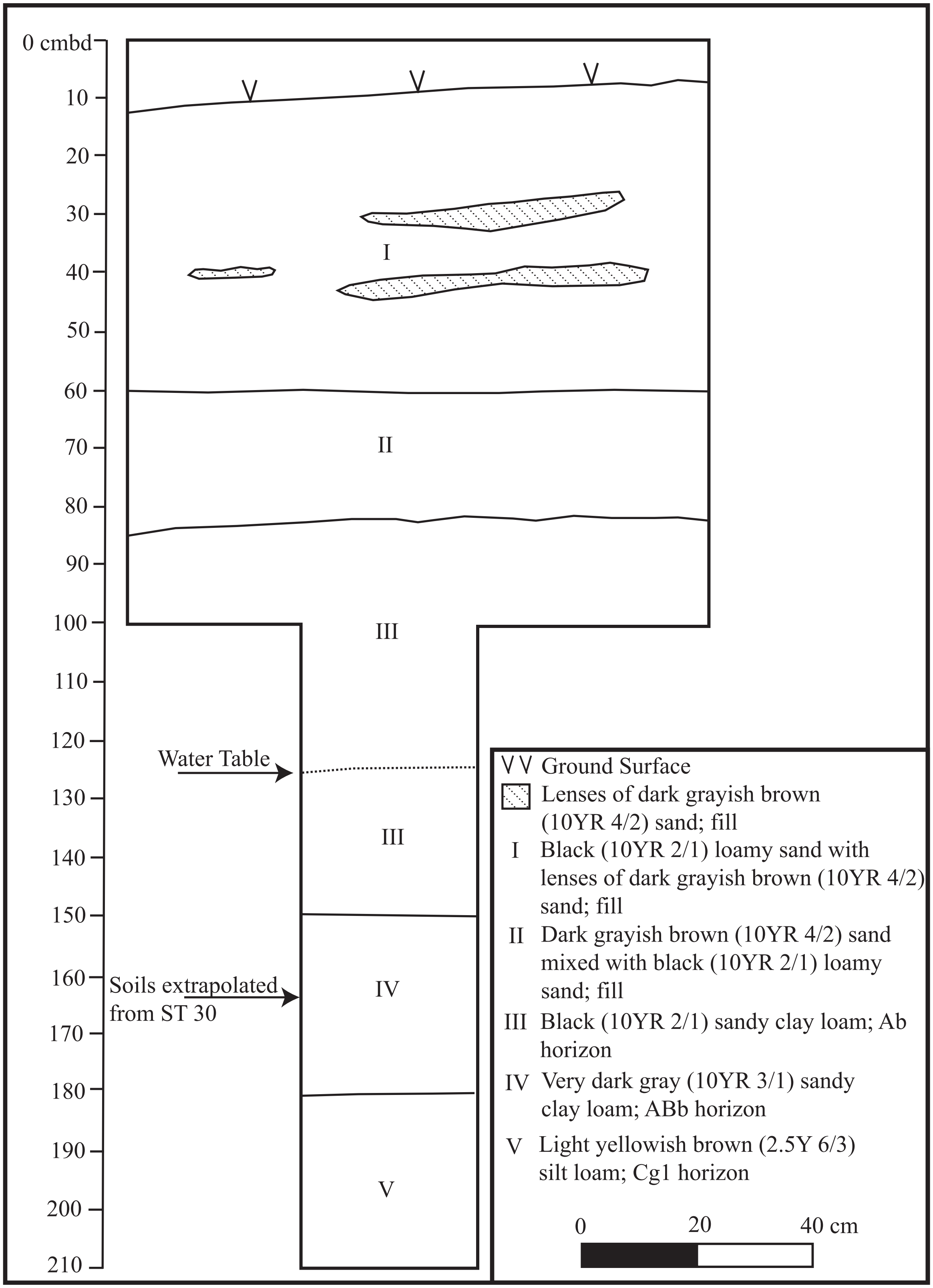


Figure 18. Site 21CR154 XU 2 North Wall Profile.

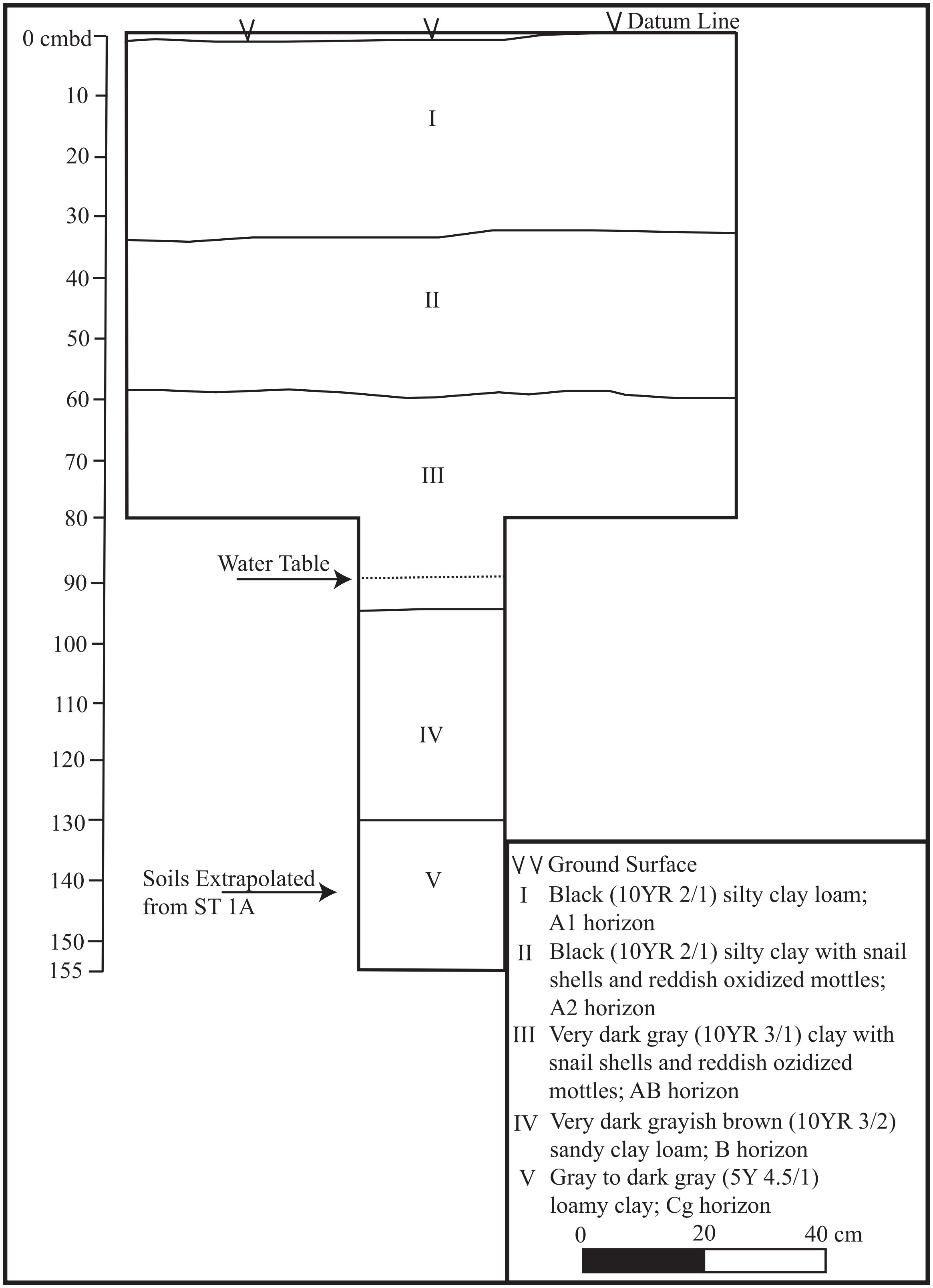


Figure 19. Site 21CR154 XU 3 Northeast Wall Profile.

Figure 20. Site 21CR154 Photo of XU 3 Northeast Wall Profile from 0 to 130 cmbd.

Figure 21. Site 21CR154 Photo of XU 4 North Wall Profile from 0 to 115 cmbd.

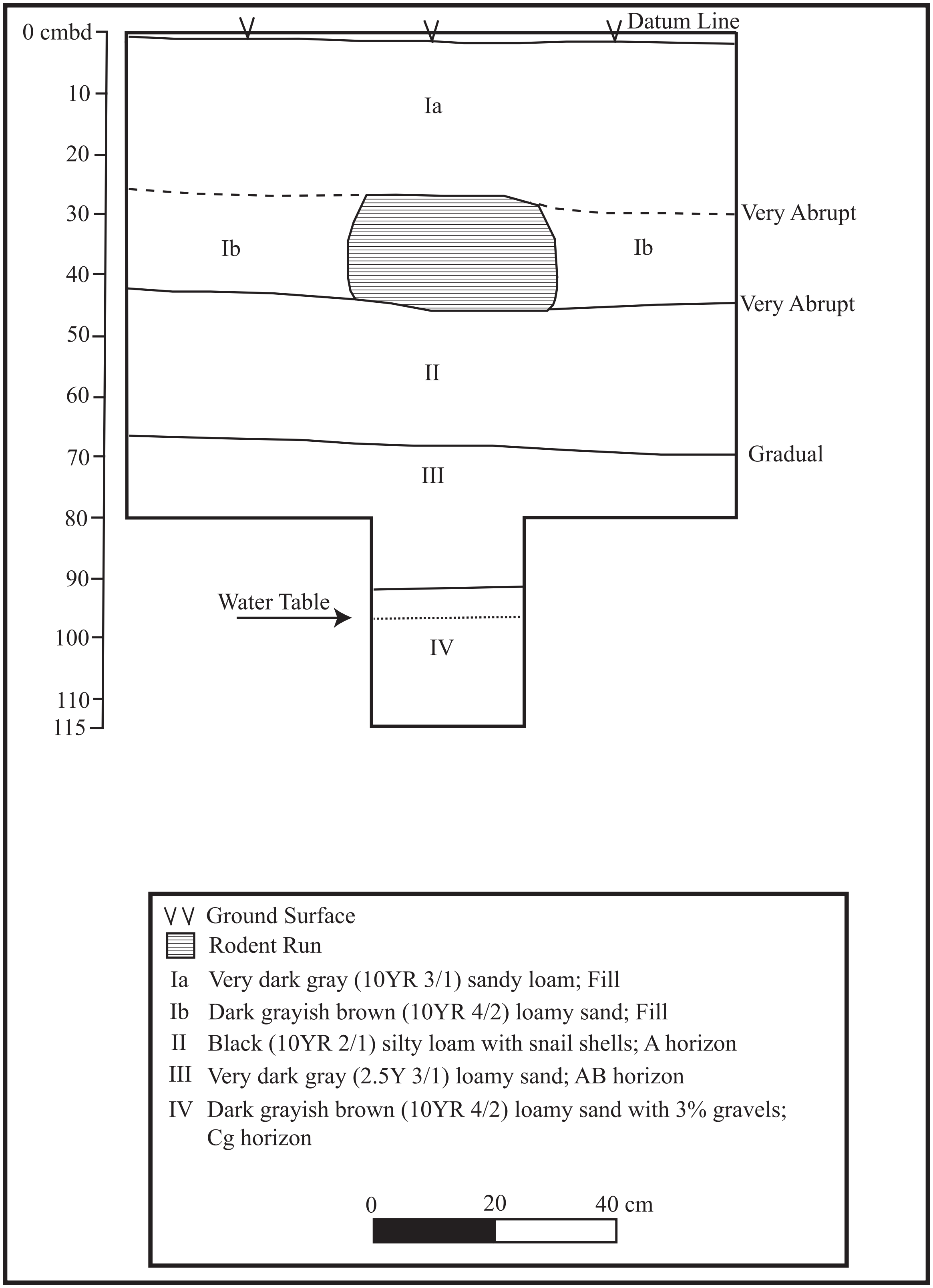


Figure 22. Site 21CR154 XU 4 North Wall Profile.

9. Site 21CR155

9.1 Overview

Site 21CR155 is an Early to Late Archaic habitation located along CSAH 61 (Flying Cloud Drive). The site is in T116N R23W, SE and NE, Section 35 (Figure 2) and occupies an area of approximately 480 by 60 meters, encompassing 6.6 acres. The UTM coordinates for the center of the site are E456830 N4962215 (1983 NAD Zone 15). Maps of the site on aerial imagery are presented in Figures 23 to 26. Photos of the site area are included in Figures 27 to 33.

9.2 Physical Setting

The site is on the north and south sides of CSAH 61 within and adjacent to the ROW and extends from 145 meters west of Bluff Creek Drive to Great Plains Blvd. The site may exist below the current CSAH 61 road bed. On the north side of CSAH 61, the site extends from east to west across the Brookside Garden Center, an agricultural field, and wetlands. The site area on the south side of CSAH 61 is in a wetland. Vegetation in the wetland includes a mixture of woods, grasses, and cattails. The water table is at or near the surface in the wetlands, with some areas containing standing water. The site is situated along the bluff base at the northern margin of the Minnesota River Valley. The site extends along the margin of a former floodplain lake on the valley floor.

9.3 Soils and Geomorphology

Cross-section maps of site stratigraphy are in Figures 34 to 36. An alluvial fan deposited by Bluff Creek overlies the eastern portion of the site, which is slightly elevated because of the thickness of these deposits. Another alluvial fan, deposited by an intermittent drainage located along the tree row on the east side of the agricultural field, overlies the central portion of the site. The western portion of the site contains marshy (paludal) and lacustrine deposits at the surface and lacks alluvial fan deposits.

The archaeological deposits are primarily contained in a buried, cumulic clayey lacustrine soil that formed in a floodplain lake, with vertical accretion occurring during flood events. This lacustrine soil is deeply buried across the eastern portion of the site by paludal and alluvial fan deposits. However, the lacustrine soil occurs near the surface in the western portion of the site where alluvial fan deposits are absent and paludal deposits are thinner. Archaeological deposits also occur in colluvial deposits along the toe-slope of the bluff base and in precontact alluvial fan deposits.

Three main depositional units are present across most of the site: 1) Historic alluvial fan deposits occur from the surface to a maximum depth of 2.5 meters, but are absent at the west end of the site. These deposits are gravelly sand with bands of silt and loam; 2) A peat and muck deposit of varying thickness is present in most areas below the alluvial fan deposit and occurs at the surface in areas lacking alluvial fans; and 3) A buried, cumulic, clayey lacustrine soil, which is up to 2.0 meters thick, is the basal unit underlying these deposits.

The site landscape was suitable for occupation from the early Middle Holocene (c. 7000 BC), after the floodplain lake had receded, to the Late Holocene, when wetter environmental conditions caused groundwater levels to rise, resulting in the expansion of wetlands that covered the site and deposited peat and muck. An approximate date for the expansion of wetlands over the site is 1300 to 1420 cal AD (2 Sigma) (early part of the Little Ice Age), based on a radiocarbon date from organic plant material in the muck that overlies the lacustrine soil. Additional major depositional events occurred during the early period of Euro-American settlement as the land was cleared and tilled, significant erosion occurred, and thick alluvial fans were deposited on the valley floor at the mouths of streams and intermittent drainages.

There are two primary stratigraphic profiles that occur across most of the site based on landscape position (Figures 23 and 34 to 36; see also Appendix A). The first primary profile is from the eastern and central portions of the site that is situated on the Bluff Creek alluvial fan in the area of STs 25G to 30G and 38G to 42G. Stratigraphy in these areas consists of historic age, coarse-grained alluvial fan deposits over paludal deposits (peat or muck) overlying a buried soil formed in clayey lacustrine deposits, with a sandy lacustrine or fluvial deposit at the base in some profiles. The second primary profile is from the western portion of the site in the area of STs 19A to 26A, 2C, 1G to 20G, excluding 12G to 14G, which have paludal deposits overlying the lacustrine deposit. These soils are similar to the first type but lack the alluvial fan deposits and contain paludal deposits overlying a buried soil formed in clayey lacustrine deposits, with a sandy fluvial or lacustrine deposit at the base in some profiles.

There are two minor stratigraphic sequences that occur in limited areas of the site based on landscape position. The first minor sequence occurs in the west-central portion of the site in the western portion of the agricultural field on the north side of CSAH 61 in the area of STs 22 to 35. The stratigraphy consists of thick, clayey cumulic soils that formed in colluvium and lack buried soils, overlying sandy fluvial or lacustrine sediment. The upper portion of the colluvium is historic in age. The second minor sequence, which has two variations, occurs near the central portion of the site at the east end of the agricultural field and at the west end of the Brookside Garden property, extending south across CSAH 61. The stratigraphy at the west end of the Brookside Garden property and to the south across CSAH 61 consists of stratified historic alluvial fan deposits (western fan) over precontact alluvial fan deposits overlying clayey lacustrine deposits in the area of STs 65A to 69A, 21G to 24G, 31G to 32G, and 35G. The stratigraphy at the east end of the agricultural field consists of stratified historic alluvial fan deposits (western fan) over precontact alluvial fan deposits overlying sandy lacustrine or fluvial deposits in the area of XUs 1-7 and STs 1-20.

9.4 Phase I Survey Methods and Results

The site was identified during Phase I shovel testing in 10 and 15-meter intervals west of Great Plains Blvd. Testing was conducted along CSAH 61 just outside the ROW, which contains buried utilities and is ditched along the north side of CSAH 61. The tests were 9.0 to 15.0 meters from the edge of the road pavement, with most between 10.0 and 13.0 meters. A total of 34 Phase I shovel tests contained artifacts, including lithic debris, stone tools, faunal material, and FCR (Tables 23 to 25). Artifacts were recovered from 20 to 375 cmbs. Maps illustrating the stratigraphic context of the artifacts are provided in Figures 34 to 36. Whenever possible, three deep auger tests were dug at each test location to recover a volume of soil equivalent to a standard shovel test. Positive tests where three auger tests were not dug are indicated in Tables 23 to 25. The negative Phase I tests in the agricultural field that were only single augered are not depicted on the site map.

9.5 Phase II Shovel Testing Methods and Results

The archaeological components were below the water table across most of the site. It was not practical or feasible to dig XUs in these areas because of the costs and time needed to conduct the deep excavations, which would have required a backhoe and dewatering system. The only location where components were not below the water table was the agricultural field on the north side of CSAH 61. Therefore, it was decided to dig XUs only in this portion of the site, and the remaining site area was evaluated by digging tests in 5-meter intervals adjacent to the positive Phase I tests.

The site area in the agricultural field has deep, historic alluvial fan deposits. It was determined that excavation with a backhoe to remove the historic-age deposits was the most practical and cost-effective way to conduct the Phase II evaluation in this area.

9.6 Phase II Backhoe Excavation and Shovel Testing

The backhoe excavation in the agricultural field was conducted in three stages. The first stage consisted of excavating an area approximately 25 meters east to west by six meters north to south within the ROW, which is referred to as the North Block (Figures 37 to 41). Excavation removed the historic alluvium to a depth of between 140 and 170 cmbs. STs 1 to 9 and 15 and XUs 1 to 7 were placed in this excavated area in 5-meter intervals. A deep, historic alluvial fan channel (western fan) was observed in the east wall of the North Block of the backhoe trench in this area (Figures 40 and 41).

The second stage consisted of excavating an area approximately 15 meters east to west by 2.5 meters north to south within the ROW, which is referred to as the South Block (Figures 42 and 43). Excavation removed the historic alluvium to a depth of between 155 and 170 cmbs within the ROW. STs 10 to 14 were placed in this excavated area in 5-meter intervals.

The third stage consisted of digging a trench from STs 16 to 28 (Figures 44 and 45). The trench depth was 170 cmbs at ST 16, and the depth decreased to the west, as the historic deposits were shallower going west. The trench depth was 70 cmbs at the west end at ST 28. This trench was approximately 65 meters long (east to west) by 2 meters wide (north to south). STs 16 to 38 were placed in this trench in 5-meter intervals. Three short, side trenches were dug perpendicular to this main trench to facilitate testing to the south. STs 29 to 31 were placed in these trenches, five meters from tests in the main trench.

A total of 32 Phase II shovel tests contained artifacts, including lithic debris, faunal material, and FCR (Tables 23, 24, and 26). Artifacts were recovered from 40 to 380 cmbs. Maps illustrating the stratigraphic context of the artifacts are provided in Figures 34 to 36. Whenever possible, three deep auger tests were dug at each test location to recover a volume of soil equivalent to a standard shovel test. Tests where three auger tests were not dug are indicated in Tables 23, 24, and 26.

In order to facilitate close-interval testing on the Garden Center property at STs 28G, 29G, and 31G, a small backhoe was used to remove the upper fill layer and the top of the post-settlement alluvium to a depth of about one meter (Figure 29).

Table 23. Site 21CR155 Summary of Artifact Count and Class from Shovel Tests on South Side of CSAH 61, West to East Across Site.

	West						ST #'s							L= Lithic B=Faunal Material F=FCR T=Lithic Tool									East			
Depth	10G	9G	7G **	6G	6GE5	2G	19A	20A	12C	11C	7C	2C	26A	21G **	22GW5	22G	22GE5 **	22GE5N5 *	23G	37GW5	37G	37GE5 *	38G **	39GW5 **	39G	41G
0 cmbs																										
10																										
20																										
30																										
40																										
50			1L		1L																					
60															1L											
70			2L																							
80				2L																						
90																										
100		1L	21L													1L										
110						1F																				
120																										
130																										
140														1L												
150																										
160								1L									1F		4F							
170												1T			1B	1L										
180							1F										1L 3F									
190										1L			1L													
200																				1L						
210									1F		1L						1L 2F									
220																		2L 1B 3F								
230														1L												
240																						1L 1B				
250																	7F									
260	1F																			1L				1B		
270																							1L			
280																									2L	
290																								1L 1B		1L
300																						1B				
310																					1B					
320																										
330																										
340																										
350																										
360																										
370																								1L		
380																										

*these tests were single augered so the volume of soil is 1/3 that of the other tests; **these tests were double augered so the volume of soil is 2/3 that of the other tests

Table 24. Site 21CR155 Summary of Artifact Count and Class from Shovel Tests on North Side of CSAH 61, West to East Across Site.

West — ST #'s — L= Lithic B=Faunal Material F=FCR T=Lithic Tool — East

Depth cmbs	18G	17G W5	17G	15G	14G	33	35	28	27	31	30	77A *	22	29	16	1	15	73A *	2	3	4	5	13	6	12	91A *	32G	31G W5	31G	31G E5	30G	29G W5	29G *	29G E5	28G W5	28G *	28G E5	27G	26G *	42G *
0																																								
10																																								
20																																								
30				1L																																				
40																																								
50		1L 1B					1B 1L																																	
60				1L	1L																																			
70						1L																																		
80																																								
90		3L 33B 5F	1L 1F							1L 1B																														
100																																								
110							1L																																	
120	1L							1F			1L																	1L												
130									2B			1T		1L																	1L									
140																											2L													
150																																								
160														2L																										
170									1L																1L				1F	1F	1L									
180															2T 7L						5B																			
190																																								
200													1L																											
210																2L 1F			2B	1L	1T 1L 2B	1L 1B		2F 1L 4B						1F										
220																	3L 2B	1L					1L						1L							1L				
230															1L											1T		1L					1L							
240																																								
250																													1L											
260																																	1L	1L						
270																											1L	1F												
280																																1B				1L	1B	2L		
290																												2L												
300																																1L								
310																																			1T 1L					
320																												1L 8F	1L	1L									2L	
330																																								
340																																								
350																																			1F					
360																																1B 2F								
370																																								1L
380																																								

* single augered test with the volume of soil 1/3 that of the other tests

Table 25. Site 21CR155 Summary of Artifacts from Phase I Shovel Tests.

ST #	Depth (cmbs)	Soil Context[1]	Count	Artifact Type
19A	170-190	L-ABb	1	FCR, angular, granite
20A	150-170	L-ABb	1	Other G4 flake, quartz
26A	180-200	L-ABb	1	Shatter, quartzite
73A*	220-230	AF-Ab	1	Primary flake, siltstone
77A*	130-140	C-A	1	Unfinished biface, stage 4, fragment, Hixton Group Quartzite
91A*	230-240	AF-Ab	1	Retouch flake, basalt
2C	165-190	L-Ab	1	End scraper, Prairie du Chien (oolitic)
7C	200-220	L-ABb	1	Broken flake, Blanding Chert
11C	185-200	L-BCb	1	Core, nonbifacial, irregular, igneous/metamorphic
12C	205-220	L-BCb	1	FCR, angular, unidentified material
2G	100-115	L-BCb	1	FCR, angular, granite
6G	70-100	L-ABb	1	Secondary flake, unidentified chert
			1	Other G4 flake, Prairie du Chien (oolitic)
7G**	40-60	L-ABb	1	Other G4 flake, Prairie du Chien (oolitic)
	70-85		1	Secondary flake, Prairie du Chien (oolitic)
			1	Broken flake, Prairie du Chien (oolitic)
	85-115	L-ABb & L-BCb	1	Bipolar flake, chalcedony
			1	Primary flake, Prairie du Chien (oolitic)
			3	Primary flake, Prairie du Chien (oolitic)
			1	Secondary flake, Prairie du Chien (oolitic)
			1	Secondary flake, Galena Chert
			1	Tertiary flake, Prairie du Chien (oolitic)
			1	Tertiary flake, quartz
			1	Broken flake, Hixton Group Quartzite
			1	Other G4 flake, Galena Chert
			1	Other G4 flake, quartz
			2	Broken flake, Prairie du Chien (oolitic)
			1	Other G4 flake, Prairie du Chien (oolitic)
			1	Broken flake, Prairie du Chien (oolitic)
			4	Other G4 flake, Prairie du Chien (oolitic)
			1	Shatter, Galena Chert
9G	90-110	L-ABb	1	Primary flake, unidentified chert
10G	240-270	L-ABb	1	FCR, angular, granite
14G	50-75	L-Ab	1	Shatter, unidentified chert
15G	20-45	L-A	1	Utilized flake, Prairie du Chien (oolitic)
	55-70		1	Utilized flake, basalt
17G	80-110	L-BCb	1	Other G4 flake, quartz
			1	FCR, angular, igneous
18G	115-135	L-BCb	1	Primary flake, basalt
21G**	130-150	L-ABb	1	Primary flake, unidentified material
	220-240	L-Bb	1	Broken flake, quartz
22G	90-110	L-Ab	1	Broken flake, unidentified material
	160-185	L-ABb	1	Primary flake, unidentified chert
23G	150-170	L-ABb	2	FCR, friable, metamorphic
			2	FCR, friable, metamorphic
26G*	300-340	L-ABb	1	Primary flake, Prairie du Chien (oolitic)
			1	Shatter, Swan River Chert

Table 25. Continued.

ST #	Depth (cmbs)	Soil Context[1]	Count	Artifact Type
27G	275-290	L-Ab	1	Other G4 flake, unidentified material
			1	Shatter, quartz
28G*	210-230	L-Ab	1	Tertiary flake, Swan River Chert
	270-285	L-ABb	1	Shatter, Prairie du Chien (oolitic)
29G*	220-240	L-Ab	1	Broken flake, Swan River Chert
	250-280		1	Primary flake, Prairie du Chien (oolitic)
30G	130-150	P-Ob	1	Primary flake, basalt
	150-180		1	Primary flake, Prairie du Chien (oolitic)
31G	160-190	L-Ab	1	FCR, angular, granite
	210-240	L-ABb	1	Other G4 flake, unidentified chert
	230-260		1	Shatter, quartz
	300-315	L-BCb	1	FCR, angular, granite
32G	130-150	AF-ABb	2	Other G4 flake, unidentified chert
	260-280	L-Bb	1	Shatter, unidentified material
37G	295-325	L-ABb	1	Faunal, mammalian, medium/large, unidentifiable fragment, calcined
38G**	255-285	L-ABb	1	Other G4 flake, Swan River Chert
39G	260-290	L-Ab	1	Tertiary flake, Knife River Flint
			1	Broken flake, unidentified material
41G	285-300	L-Ab	1	Broken flake, unidentified chert
42G*	360-375	L-ABb	1	Primary flake, quartzite
Total	**-**		**76**	**-**

* single augered tests with the volume of recovered soil 1/3 that of the other tests;
** double augered with the volume of recovered soil 2/3 that of the other tests;
[1] L = Lacustrine, C = Colluvial, AF = Alluvial Fan (precontact), and P = Paludal

Table 26. Site 21CR155 Summary of Artifacts from Phase II Shovel Tests.

ST #	Depth (cmbs)	Soil Context[1]	Count	Artifact Type
1	200-225	AF-Ab	2	Primary flake, Swan River Chert
			1	FCR, granite
2	200-225	AF-Ab	1	Faunal, mammalian, medium/large, unidentifiable fragment, burned
			1	Faunal, unidentified, fragment, calcined
3	200-220	AF-Ab	1	Shatter, basalt
4	170-205[2]	AF-C	3	Faunal, mammalian, medium/large, unidentifiable fragment
			2	Faunal, mammalian, large, unidentifiable fragment
	205-230	AF-Ab	1	Core, patterned bifacial, indeterminate, prepared, Prairie du Chien (oolitic)
			1	Broken flake, Prairie du Chien (oolitic)
			2	Faunal, unidentified, fragment, calcined
5	205-220	AF-Ab	1	Tertiary flake, Hixton Group Quartzite
			1	Faunal, mammalian, medium/large, unidentifiable fragment
6	200-210	AF-Ab	2	FCR, granite
	200-220	AF-Ab	1	Projectile point or knife, fragment, Prairie du Chien (oolitic)
			1	Tertiary flake, Knife River Flint
			4	Faunal, mammalian, large, unidentifiable fragment, burned
			2	Faunal, unidentified, fragment, burned

Table 26. Continued.

ST #	Depth (cmbs)	Soil Context[1]	Count	Artifact Type
12	170-180[3]	AF-C	1	Broken flake, Swan River Chert
13	200-240	AF-Ab	1	Secondary flake, Prairie du Chien (oolitic)
15	205-240	AF-Ab & AF-Bb	1	Primary flake, basalt
			1	Secondary flake, Hixton Group Quartzite
			1	Broken flake, Swan River Chert
			1	Faunal, mammalian, medium/large, unidentifiable fragment
			1	Faunal, unidentified, fragment, calcined
16	170-200	AF-Ab	1	Projectile point, Swan River Chert
			1	Graver, Prairie du Chien (oolitic)
			1	Bipolar flake, Swan River Chert
			1	Primary flake, Swan River Chert
			1	Secondary flake, Swan River Chert
			1	Broken flake, Swan River Chert
			1	Broken flake, Prairie du Chien (oolitic)
			1	Other G4 flake, Swan River Chert
			1	Other G4 flake, Prairie du Chien (oolitic)
	220-240	AF-Bb	1	Tertiary flake, Swan River Chert
22	190-210	C-B	1	Broken flake, Hixton Group Quartzite
27	120-155	C-A & AB	2	Faunal, unidentified, fragment, calcined
	165-175	C-B	1	Broken flake, Swan River Chert
28	110-125	C-A	1	FCR, granite
29	130-150	C-A	1	Broken flake, Swan River Chert
	150-170	C-AB & B	1	Broken flake, Prairie du Chien (oolitic)
			1	Broken flake, Swan River Chert
30	110-130	C-A	1	Broken flake, Hixton Group Quartzite
31	90-100	C-A	1	Secondary flake, Hixton Group Quartzite
			1	Faunal, unidentified, fragment, calcined
33	70-80	C-A	1	Broken flake, Hixton Group Quartzite
35	45-65	C-A	1	Broken flake, unidentified material
			1	Faunal, mammalian, medium/large, unidentifiable fragment
	100-125	C-AB	1	Shatter, quartz
6GE5	45-65	L-Ab	1	Shatter, unidentified material
17GW5	40-70	L-Ab	1	Other G4 flake, Swan River Chert
			1	Faunal, unidentified, fragment
	85-110	L-BCb	1	Secondary flake, Prairie du Chien (oolitic)
			1	Other G4 flake, unidentified chert
			1	Tertiary flake, unidentified chert
			4	Faunal, mammalian, large, unidentifiable fragment
			12	Faunal, mammalian, medium/large, unidentifiable fragment
			13	Faunal, unidentified, fragment
			5	FCR, angular, granite
			4	Faunal, mammalian, large unidentifiable fragment, exfoliated, gnawed
22GW5	50-70	P-Ob & L-Ab	1	Shatter, unidentified material
	150-185	L-ABb	1	Faunal, unidentified, fragment

Table 26. Continued.

ST #	Depth (cmbs)	Soil Context[1]	Count	Artifact Type
22GE5**	155-170	L-ABb	1	FCR, angular, basalt
	185-200		1	Broken flake, quartz
			3	FCR, angular, basalt
	200-225	L-Bb	1	Broken flake, unidentified chert
			1	FCR, angular, metamorphic
			1	FCR, angular, basalt
	245-260		1	FCR, angular, basalt
			6	FCR, angular, granite
22GE5N5*	200-235	L-Bb	1	Other G4 flake, Swan River Chert
			1	Other G4 flake, quartz
			1	Faunal, unidentified, fragment, calcined
			3	FCR, angular, granite
28GE5	270-290	L-ABb	1	Faunal, unidentified, fragment, calcined
28GW5	300-315	L-BCb	1	Awl, unidentified lithic material
			1	Primary flake, brown chalcedony
	340-360		1	FCR, angular, granite
29GE5	250-275	L-Ab	1	Primary flake, Prairie du Chien (oolitic)
29GW5	270-290	L-ABb	1	Faunal, unidentified, fragment, calcined
	300-310		1	Other G4 flake, Swan River Chert
	350-380	L-Bb	1	Faunal, unidentified, fragment, calcined
			2	FCR, angular, granite
31GW5	110-140	AF-Ab	1	Primary flake, unidentified material
	225-255	AF-Bb	1	Broken flake, Galena Chert
	265-280	L-ABb	1	FCR, spall, granite
	290-310		1	Primary flake, quartz
			1	Other G4 flake, unidentified chert
	310-335	L-BCb	1	Primary flake, basalt
			8	FCR, angular, granite
31GE5	160-190	L-Ab	1	FCR, angular, basalt
	200-220	L-ABb	1	FCR, angular, granite
	310-325	L-BCb	1	Shatter, quartz
37GW5	190-200	P-Ob & L-Ab	1	Secondary flake, unidentified material
	250-270	L-Ab	1	Primary flake, granite
37GE5*	225-255	L-Ab	1	Other G4 flake, unidentified material
			1	Faunal, unidentified, fragment, calcined
	295-310	L-ABb	1	Faunal, unidentified, fragment, calcined
39GN5*	280-310	L-ABb	1	Primary flake, quartz
	360-380	L/F-Cb	1	Broken flake, chalcedony
39GW5**	250-275	L-ABb	1	Faunal, unidentified, fragment, calcined
	285-300		1	Faunal, unidentified, fragment, calcined
Total	**-**		**162**	**-**

[1] L = Lacustrine, C = Colluvial, AF = Alluvial Fan (precontact), P = Paludal, and L/F = Lacustrine/Fluvial
[2] these are redeposited in alluvium and are probably not cultural as no other artifacts were recovered from this soil strata in XUs 5 and 6, which are located at ST 4; [3] recovered in historic alluvial fan deposits;
* single augered tests with the volume of recovered soil 1/3 that of the other tests; ** double augered with the volume of recovered soil 2/3 that of the other tests

9.7 Phase II XUs 1 and 2

XUs 1 and 2 were contiguous units placed adjacent to ST 5, which yielded a piece of Hixton Quartzite lithic debris and a bone fragment from a medium/large-size mammal. Excavation was conducted stratigraphically below an arbitrary unit datum that was established below the ground surface. Stratum 1 (historic alluvial fan deposits) was excavated as one unit and included the soil from the base of the backhoe excavation at 170 cmbs to the top of the buried soil at 195 cmbs. Stratum 2 was the buried soil in the precontact alluvial fan, and it was excavated in 10-cm levels from 195 to 225 cmbs in XU 1 and from 195 to 215 cmbs in XU 2. Excavation was terminated at these depths because of the lack of artifacts, and because artifacts from shovel tests did not extend deeper than the buried A horizon. A shovel test was placed in the base of the unit and dug to 243 cmbs to examine the soils and ensure that no deeply buried archaeological deposits were present. A summary of artifacts recovered in the units is presented in Table 27.

Table 27. Site 21CR155 Summary of Artifacts from XU 1 and 2.

Depth (cmbs)	Soil Context	Non-Thermally Altered Faunal	Lithic Debris	Clinker (Historic)	Total	%
170-195	Stratum 1 C2 and C3 Horizons	8	1	5	**14**	**44**
195-205	Stratum 2 4Ab Horizon	3	2	2	**7**	**22**
205-215	Stratum 2 4Ab Horizon	10	1	-	**11**	**34**
215-225	Stratum 2 4Bgb Horizon	-	-	-	**-**	**-**
Total		**21**	**4**	**7**	**32**	**-**
%		**66**	**13**	**22**	**-**	**100**

9.7.1 Artifact Summary and Vertical Distribution

A total of 32 artifacts were recovered from XUs 1 and 2, including 21 faunal fragments, 4 pieces of lithic debris, and seven clinkers (burned coal residue) (Table 27). Artifacts were recovered in Strata 1 and 2 between 170 and 215 cmbs. Artifact density was low in all levels, and the precontact artifacts consist mostly of small bone fragments less than ½inch in size (SG2). The historic clinkers were found in the upper levels from 170 to 205 cmbs where precontact artifacts also occur. The piece of lithic debris in Stratum 1 (historic alluvial fan) from 170 to 195 cmbs is interpreted to have been redeposited from an upslope position along the gulley. The soil profile clearly indicates soil deformation and disturbance in Stratum 2 (discussed more fully below), which explains the mixing of precontact and historic artifacts. Bone density in the units is somewhat misleading because all but one bone fragment is less than ½inch in size (SG3 and SG4).

9.7.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons and soil deformation are presented in Figures 46 to 48. The profiles consist of thick, historic alluvial fan deposits (Stratum 1), overlying a buried soil (Stratum 2) that formed in precontact alluvial fan deposits and was dated to 6980 to 6640 cal BC (2 Sigma) in XU 6. The buried soil in the unit correlates with the buried soil identified in the other units and occurs at a similar depth, but it had more clay than the other units. Gravel content was very low in the buried soil. The units contain an unusual soil deformation in which intrusive material from the alluvial fan was imbedded into the buried soil when it was in a saturated or nonsolid (plastic) state.

9.8 Phase II XUs 3 and 4

XUs 3 and 4 were contiguous units placed adjacent to ST 1, which yielded a piece of lithic debris and a piece of FCR. Excavation was conducted stratigraphically below an arbitrary unit datum that was established below the ground surface. Stratum 1 (sterile precontact alluvial fan deposit) was excavated as one unit and included the soil from the base of the backhoe excavation at 170 cmbs to the top of the buried soil at 215 cmbs in XU 3 and 212 cmbs in XU 4. Stratum 2 was the buried soil in the artifact-bearing, precontact alluvial fan deposit, and it was excavated in 10-cm levels. Excavation extended to 255 cmbs in XU 3 and 252 cmbs in XU 4. Excavation was terminated at these depths because of the significant decrease in artifacts, the soil was becoming water-saturated, and because artifacts from shovel tests in this area did not extend deeper than the buried A horizon. A summary of artifacts recovered in the units is presented in Table 28.

Table 28. Site 21CR155 Summary of Artifacts from XU 3 and 4.

Depth (cmbs)	Soil Context	Faunal	Faunal Thermally Altered	Lithic Debris	FCR	Total	%
XU 3 170-215 XU 4 170-212 Level 1	Stratum 1 3C3 Horizon	-	-	-	-	**-**	**-**
XU 3 215-225 XU 4 212-222 Level 2	Stratum 2 4Ab3 Horizon	23	10	7	-	**40**	**38**
XU 3 225-235 XU 4 222-232 Level 3	Stratum 2 4Ab3 Horizon	42	5	2	1	**50**	**47**
XU 3 235-245 XU 4 232-242 Level 4	Stratum 2 4Ab3 Horizon & 4Bgb Horizon	8	-	7	-	**15**	**14**
XU 3 245-255 Level 5	Stratum 2 4Bgb Horizon	-	-	1	-	**1**	**1**
Total		**73**	**15**	**17**	**1**	**106**	**-**
%		**69**	**14**	**16**	**1**	**-**	**100**

9.8.1 Artifact Summary and Vertical Distribution

A total of 106 artifacts were recovered from XUs 3 and 4, including 88 faunal fragments (15 thermally altered), 17 pieces of lithic debris, and one piece of FCR (Table 28). Artifacts were recovered in Stratum 2 between 212 and 255 cmbs. Artifact density was greatest in Levels 2 and 3 between 212 and 235 cmbs in the 4Ab3 Horizon, where 85 percent of artifacts were recovered. There was a slight increase in lithic debris in Level 4, compared to Level 3. The lithic material types and debris types in Level 4 are similar to those in the preceding levels. The artifact assemblage is interpreted as being from the same occupation and has a slight vertical dispersal as a result of natural processes, such as freeze-thaw cycles and bioturbation. It is also possible that the vertical distribution is from multiple occupations through time.

9.8.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons are presented in Figures 49 to 51. The profiles consist of thick, historic alluvial fan deposits, overlying two precontact buried soils (Stratum 1 and 2) that formed in the alluvial fan deposit. Stratum 2 was the deeper buried soil (4Ab3 horizon), which contains the archaeological deposit, and was dated to 6980 to 6640 cal BC (2 Sigma) in XU 6. The Stratum 2 buried soil in the units correlates with the buried soil identified in the other units and occurs at a similar depth, but was more silty than in XUs 1, 2, and 7.

9.9 Phase II XUs 5 and 6

XUs 5 and 6 were contiguous units placed adjacent to ST 4, which yielded a piece of lithic debris, a core, five bone fragments from a medium/large size mammal, and two calcined bones. Excavation was conducted stratigraphically below an arbitrary unit datum that was established below the ground surface. Stratum 1 (sterile precontact alluvial fan deposit) was excavated as one unit and included the soil from the base of the backhoe excavation at 175 cmbs to the top of the buried soil. Stratum 2 was the buried soil in the artifact-bearing, precontact alluvial fan deposit, and it was excavated in 10-cm levels. Excavation extended to 245 cmbs in the units. Excavation was terminated at this depth because of the significant decrease in artifacts, the soil was becoming water-saturated, and because artifacts from shovel tests in this area did not extend deeper than the buried A horizon. A summary of artifacts recovered in the units is presented in Table 29.

Table 29. Site 21CR155 Summary of Artifacts from XU 5 and 6.

Depth (cmbs)	Soil Context	Faunal	Faunal Thermally Altered	Lithic Debris	Lithic Tool	Total	%
175-210	Stratum 1 3C3 Horizon	-	-	-	-	**7**	**13**
210-220	Stratum 2 4Ab3 Horizon	2	3	2	-	**7**	**13**
220-230	Stratum 2 4Ab3 Horizon	29	-	8	1	**38**	**73**
230-240	Stratum 2 4Ab3 Horizon & 4Bgb Horizon	4	2	1	-	**7**	**13**
240-245	Stratum 2 4Bgb Horizon	-	-	-	-	**-**	**-**
Total		**35**	**5**	**11**	**1**	**52**	**-**
%		**67**	**10**	**21**	**2**	**-**	**100**

9.9.1 Artifact Summary and Vertical Distribution

A total of 52 artifacts were recovered from XUs 3 and 4 (Table 29), including 40 faunal fragments (5 thermally altered), 11 pieces of lithic debris, and one lithic tool (small blade fragment from a knife or projectile point). Artifacts were recovered in Stratum 2 between 210 and 240 cmbs. Artifact density was greatest between 220 and 230 cmbs in the 4Ab3 Horizon, where 73 percent of artifacts were recovered. The artifact assemblage is interpreted as being from the same occupation and has a slight vertical dispersal as a result of natural processes, such as freeze-thaw cycles and bioturbation.

9.9.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons are presented in Figures 52 and 53. The profiles consist of thick, historic alluvial fan deposits, overlying two precontact buried soils (Stratum 1 and 2) that formed in the alluvial fan deposit. Stratum 2 was the deeper buried soil from 215 to 227 cmbs (4Ab3 horizon), which contains the archaeological deposit, and was dated to 6980 to 6640 cal BC (2 Sigma) in XU 6. The Stratum 2 buried soil in the units correlates with the buried soil identified in the other units and occurs at a similar depth, but was more silty than in XUs 1, 2, and 7.

9.10 Phase II XU 7

XU 7 was placed adjacent to ST 13, which yielded a piece of lithic debris. Excavation was conducted stratigraphically below an arbitrary unit datum that was established below the ground surface. Stratum 1 (historic alluvial fan deposit) was excavated as one unit and included the soil from the base of the backhoe excavation at 160 cmbs to near the top of the buried soil at 178 cmbs. The next excavation level (178 to 188 cmbs) contained the base of Stratum 1 and included the top of Stratum 2 because soil conditions did not permit separating the strata during excavation. Stratum 2 was the buried soil in the artifact-bearing, precontact alluvial fan deposit, and it was excavated in 10-cm levels from 188 to 218 cmbs. The last level was terminated at 225 cmbs because water was filling in, and there was a lack of artifacts in the two previous levels. Also, artifacts from shovel tests did not extend deeper than the buried A horizon in Stratum 2. A summary of artifacts recovered in the unit is presented in Table 30.

Table 30. Site 21CR155 Summary of Artifacts from XU 7.

Depth (cmbs)	Soil Context	Faunal	Faunal Thermally Altered	Lithic Debris	Total	%
160-178	Stratum 1 C Horizon	-	-	-	-	-
178-188	Stratum 1 & 2 Interface C/Ab Horizon	-	2	1	3	27
188-198	Stratum 2 4Ab Horizon	5	-	3	**8**	**73**
198-208	Stratum 2 4Bgb Horizon	-	-	-	-	-
208-218	Stratum 2 4Bgb Horizon	-	-	-	-	-
218-225	Stratum 2 4Bgb Horizon	-	-	-	-	-
Total		**5**	**2**	**4**	**11**	**-**
%		**46**	**18**	**36**	**-**	**100**

9.10.1 Artifact Summary and Vertical Distribution

A total of 11 artifacts were recovered from XU 7, including 7 faunal fragments (2 calcined) and 4 pieces of lithic debris (Table 30). Artifacts were recovered between 178 and 198 cmbs. Artifact density was low in all levels and consisted mostly of small bone fragments less than ½inch in size (SG2). The artifacts from the Stratum 1 and 2 interface level were from the lower portion of the level and are likely from the Stratum 2 buried soil. The artifact assemblage is interpreted as being from a single component.

9.10.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons are presented in Figures 54 and 55. The profiles consist of thick, historic alluvial fan deposits (Stratum 1), overlying a buried soil (Stratum 2) that formed in a precontact alluvial fan deposit, which was dated to 6980 to 6640 cal BC (2 Sigma) in XU 6. The buried soil in Stratum 2 correlates with the buried soil identified in the other units and occurs at a similar depth, but it had more clay than XUs 3 to 6 and less clay than XU 1.

9.11 Radiocarbon Dating

Seven samples were submitted to Beta Analytic, Inc for AMS dating (Table 31; Appendix D). Five bone samples from across the site were submitted. A plant sample and a sediment sample were also submitted to aid in establishing the age of the components and stratigraphy at the site.

Table 31. Site 21CR155 Radiocarbon Dates.

Material/ Provenience	Beta Lab No.	$^{13}C/^{12}C$ Ratio (o/oo)	Conventional ^{14}C Age B.P.	2 Sigma Calibrated Results (95% Probability)
Plant material ST37GW5 165-180 cmbs	354002	-28.7 o/oo	570 ± 30 BP	Cal AD 1300 to 1360 (Cal BP 640 to 590) Cal AD 1380 to 1420 (Cal BP 570 to 530)
Bone collagen ST 17GW5 85-100 cmbs	353998	-19.5 o/oo	2970 ± 30 BP	Cal BC 1300 to 1120 (Cal BP 3250 to 3070)
Bone collagen ST 17GW5 85-100 cmbs	353996	-19.9 o/oo	3000 ± 30 BP	Cal BC 1370 to 1340 (Cal BP 3320 to 3290) Cal BC 1320 to 1190 (Cal BP 3270 to 3140) Cal BC 1180 to 1150 (Cal BP 3130 to 3100) Cal BC 1150 to 1130 (Cal BP 3100 to 3080)
Calcined (cremated) bone carbonate ST37G 295-325 cmbs	354000	-18.5 o/oo	6120 ± 40 BP	Cal BC 5210 to 4940 (Cal BP 7160 to 6890)
Calcined (cremated) bone carbonate ST 27 120-155 cmbs	345135	-23.5 o/oo	6320 ± 40 BP	Cal BC 5320 to 5300 (Cal BP 7270 to 7250) Cal BC 5240 to 5230 (Cal BP 7190 to 7180)
Bone collagen XU 6 220-230 cmbs	340997	-18.2 o/oo	7160 ± 30 BP	Cal BC 6060 to 5990 (Cal BP 8020 to 7940)
Organic sediment XU 6 215-227 cmbs	340998	-18.2 o/oo	7880 ± 40 BP	Cal BC 6980 to 6980 (Cal BP 8930 to 8920) Cal BC 6910 to 6880 (Cal BP 8860 to 8840) Cal BC 6830 to 6640 (Cal BP 8780 to 8590)

All of the bone samples submitted for dating were either thermally altered or directly associated with other artifacts. It is believed the samples are uncontaminated, and the dates accurately reflect site occupations. The five faunal dates (6060-5990, 5320-5230, 5210-4940, 1300-1120, and 1370-1130 cal BC) provide clear evidence of multiple occupations spanning the Early to Late Archaic periods. Dates for three of the five samples cluster between 6060 and 4940 cal BC. The other two faunal samples, which date 1370-1120 cal BC, are from the same provenience (ST 17GW; 85-100cmbs) and probably from the same animal.

The plant material from ST 37GW5 (165 to 180 cmbs) was submitted for dating to aid in determining the formation of paludal deposits over the lacustrine soils that contain the site components. The sample was recovered from a mucky clay horizon immediately above the clayey lacustrine buried A horizon (Table 32). The sample is overlain by about 15 cm of peat and 150 cm of stratified post-settlement alluvium. Because the sample is from 165 cmbs and appears to have been deposited in situ, it is less likely to have been contaminated with more recent plant material.

Table 32. Soil Profile from 21CR155 at ST 37GW5.

Depth Below Surface (cm)	**Description**
0-150	Stratified historic, post-settlement alluvium
150-165	Black (10YR 2/1) peat
165-210	Black (10YR 2/1) mucky silty clay – **RADIOCARBON SOIL SAMPLE**
210-280	Black (2.5Y 2/1) clay
280-325	Black (2.5Y 2/1) clay to very dark gray (2.5Y 3/1) clay
325-340	Very dark gray (2.5Y 3/1) clay
340-360	Dark gray (2.5Y 4/1) clay
360-370	Light olive brown (2.5Y 5/3) clay

The bone sample from XU 6 (220 to 230 cmbs) was directly associated with lithic debris and other faunal material, including bones that had evidence of butchering. A sediment sample from the soil (XU 6, 215 to 227 cmbs) that contained the bone sample yielded a date 580 to 990 years older than the bone. While the bone date is expected to be accurate, according to Ron Hatfield, Deputy Director and Quality Manager of Beta Analytic, Inc., there are circumstances that may cause inaccuracies in sediment dating:

> "sediment dates, due to the nature of their formation, may have a single source of carbon or multiple sources of different aged carbon combining together. Also with sediments there can be physical problems, reworking, redeposition and then chemical post-depositional problems such as the movements of humic acids (usually down through the profile from overlying younger sediments but occasionally from below with ground water table fluctuations and or lateral movements). Sediments may also form over a long period of time (hundreds of years). In general sediment dates if they don't yield an accurate result will tend to yield results that are somewhat more recent due to younger humic acids being present….this is not always the case as older humic acids can be brought up through the profile by the water table or older sediment redeposited or reworked into existing sediment layers" (Ron Hatfield, personal email communication, February 2013).

9.12 Artifact Summary

A total of 439 artifacts were recovered from the site during Phase I survey and Phase II evaluation (Table 33). Faunal material (n=222; 51%) was the most abundant artifact type followed by lithics (n=159; 36%) and significantly smaller amounts of FCR (n=51; 12%). A few historic clinkers (n=7; 2%) were recovered from the historic alluvium.

Table 33. Site 21CR155 Summary of Artifacts.

Artifact Type	Total	%
Faunal	**222**	**51**
Lithic	**159**	**36**
FCR	**51**	**12**
Clinker	**7**	**2**
Total	**439**	**-**
%	**-**	**100***

9.13 Faunal Analysis

A moderate amount of faunal material (n=222) was recovered from the site (Table 34). The most numerous remains were unidentified (n=95; 43%) and medium/large mammal (n=91; 41%), followed by smaller amounts of large mammal (n=22; 10%), molluscan (bivalve shell) (n=5; 2%), cf. Bison bison (n=2; 1%), turtle (n=2; 1%), bison or elk (n=2; 1%), catfish (2; 1%), and small mammal (n=1; 1%).

Table 34. Site 21CR155 Summary of Faunal Material.

Class	Unmodified	Thermally Altered	Rodent Gnawed	Fractured, Spiral	Total	%
Unidentified	68	27	-	-	**95**	**43**
Mammalian medium/large	71	14	6	-	**91**	**41**
Mammalian, large	11	4	4	3*	**22**	**10**
Molluscan	5	-	-	-	**5**	**2**
cf. Bison bison	2	-	-	-	**2**	**1**
Turtle	2	-	-	-	**2**	**1**
Bison or elk	-	-	-	2	**2**	**1**
Catfish family	2	-	-	-	**2**	**1**
Mammalian, small	1	-	-	-	**1**	**<1**
Total	**162**	**45**	**10**	**5**	**222**	**-**
%	**73**	**20**	**5**	**2**	**-**	**100***

* one is also gnawed

The faunal materials represent a variety of terrestrial and aquatic subsistence remains. The small size and fragmentary condition of most of the remains do not generally allow for specific identification to species or element.

The large mammal remains are likely bison, based on the presence of two probable (cf.) bison bones in the assemblage. It is expected that most of the medium/large mammal and unidentified remains are also bison, as they were recovered in close association with bison remains. However, they could also represent other animals such as elk, deer, or bear. The single small mammal bone may be from a natural death of a borrowing animal and is not interpreted to be part of the subsistence remains.

Direct evidence of processing was observed on five spirally, fractured large mammal bones that are likely bison (Figure 56). They were probably broken open to extract marrow. Approximately 20 percent of the faunal remains were thermally altered (burned or calcined) as a result of discarding bones into a fire hearth. No fire hearths were identified, but the thermally altered bones indicate that hearths are likely present at the site.

Size grade counts for the faunal material were as follows: SG1 ≥ 1.0 inch (n=4; 2%); SG2 <1.0 inch to ≥0.5 inch (n=21; 9%); SG3 <0.5 inch to ≥0.233 inch (n=110; 50%); and SG4 < 0.233 inch (n=87; 39%).

Identifiable elements are presented in Table 35. Most of the elements represent various portions of the skeletons of animals likely to be bison (but also possibly elk or deer), including teeth, vertebra, long bones, and leg bones (carpal). The skeletal portions that are present suggest the site is near or at the kill location. For example teeth, vertebra, and lower limbs (tibia and carpals) are skeletal portions that do not contain a significant amount of attached meat, and therefore are less likely to have been transported from kill site to camp. Turtle shell fragments, a catfish skull bone, and vertebrae from a medium/large mammal and a small mammal are also present.

Table 35. Site 21CR155 Summary of Faunal Identifiable Elements.

Provenience (cmbs)	Count	Class	Element
XU 1 195-205	1	Turtle	Shell fragment
XU 3 215-225	1	Turtle	Shell fragment
XU 3 225-235	1	Mammalian, large	Tooth enamel fragment
XU 3 235-245	1	Mammalian, medium/large	Probable vertebra fragment
XU 6 210-220	1	Mammalian, medium/large	Tooth enamel fragment
XU 6 220-230	1	Mammalian, small	Vertebra fragment
XU 6 220-230	1	Bison or elk	Longbone fragment
XU 6 220-230	1	Bison or elk	Tibia fragment
XU 3 225-235	2	Cf. Bison bison	Fused 2nd & 3rd carpal, right
XU 4 222-232	2	Catfish family	Basioccipital, left (cranial)

9.14 Lithic Analysis

The lithic assemblage consists of 147 pieces of lithic debris, ten stone tools, and two cores (Table 36). A variety of flake types, tools, and lithic materials are present in the assemblage.

Table 36. Site 21CR155 Summary of Lithic Artifacts.

Material	Primary Flake	Secondary Flake	Tertiary Flake	Other Grade 4	Shatter	Broken Flake	Bipolar Flake	Tool/Core	Total	%
Prairie du Chien (oolitic) Chert	10	6	1	10	2	9	-	1 projectile point/knife; 1 graver; 1 end scraper; 1 utilized flake; 1 bifacial core	**43**	**27**
Swan River Chert	7	1	2	6	1	12	1	1 projectile point; 1 utilized flake	**32**	**20**
Unidentified chert	2	1	1	6	2	4	-	-	**16**	**10**
Quartz	2	-	1	7	4	2	-	-	**16**	**10**
Unidentified material	2	1	-	2	3	3	-	1 awl	**12**	**8**
Hixton Group Quartzite	-	2	1	-	-	7	-	1 unfinished biface, stage 4	**11**	**7**
Basalt	4	-	-	-	3	-	-	1 utilized flake; 1 retouched flake	**9**	**6**
Knife River Flint	-	-	5	1	-	-	-	-	**6**	**4**
Galena Chert	-	1	-	1	1	1	-	-	**4**	**3**
Chalcedony	-	-	-	-	-	1	1	-	**2**	**1**
Quartzite	1	-	-	-	1	-	-	-	**2**	**1**
Blanding Chert	-	-	-	-	-	1	-	-	**1**	**<1**
Brown chalcedony	1	-	-	-	-	-	-	-	**1**	**<1**
Siltstone	1	-	-	-	-	-	-	-	**1**	**<1**
Granite	1	-	-	-	-	-	-	-	**1**	**<1**
Igneous/metamorphic	-	-	-	-	-	-	-	1 nonbifacial core	**1**	**<1**
Metamorphic	-	-	-	-	1	-	-	-	**1**	**<1**
Total	**31**	**12**	**11**	**33**	**18**	**40**	**2**	**12**	**159**	**-**
%	**19**	**8**	**7**	**21**	**11**	**25**	**1**	**8**	**-**	**100***

Size grade counts for the lithic debris were as follows: SG1 $\geq$ 1.0 inch (n=4; 3%); SG2 <1.0 inch to $\geq$0.5 inch (n=22; 15%); SG3 <0.5 inch to $\geq$0.233 inch (n=8; 55%); and SG4 < 0.233 inch (n=40; 27%).

Lithic Debris Types and Core Types

The lithic debris assemblage consists of broken flakes (n=40; 25%), other G4 flakes (n=33; 21%), primary flakes (n=31; 19%), shatter (n=18; 11%), tertiary flakes (n=11; 7%), secondary flakes (n=12; 8%), and bipolar flakes (n=2; 1%). Broken flakes and other G4 flakes, which are the most numerous debris types, are not diagnostic of a specific reduction stage. The relative abundance of primary flakes, in combination with two cores, indicates that initial reduction was a primary site activity. The secondary and tertiary flakes provide evidence of bifacial shaping and thinning and also late-stage tool manufacturing or tool maintenance. In summary, the lithic debris suggests that a full range of lithic activities occurred at the site.

Heat treatment was confirmed on one piece of Swan River Chert and three pieces of unidentified chert that showed evidence of excessive heating as indicated by crazing and potlid fractures. Probable heat treatment was observed on 19 other pieces of Swan River Chert and oolitic Prairie du Chien Chert, as indicated by color and texture.

Two cores were recovered from the site. One is a bifacial core of oolitic Prairie du Chien Chert that still retains some cortex. This core has an irregular shape, semi-patterned flake removal, and contains prepared edges for platform preparation. The other is a nonbifacial core of igneous or metamorphic stone. It has an irregular shape and unpatterned, multidirectional flake removal without prepared edges.

<u>Stone Tools</u>

Ten stone tools were recovered, including a projectile point blade with broken base, a projectile point or knife medial blade fragment, a late-stage biface, three utilized flakes, a retouched flake, an end scraper, an awl, and a graver (Figure 57; Catalog # 11.2). Tools were manufactured from Prairie du Chien Chert, Swan River Chert, basalt, and Hixton Group Quartzite.

A probable projectile point blade of Swan River Chert was recovered from ST 16 in a buried soil between 170 and 200 cmbs (Figure 57; Catalog # 11.1). The point is unifacial (made on a flake) and has pressure flaking along the edges of both sides. There is no evidence of bifacial thinning. The point has a thin, lenticular cross-section and measures 22.8 mm in length, 18.8 mm in width, and 3.3 mm in thickness. The artifact cannot be classified to a specific type because of its fragmentary condition. The point was contained in the same buried soil as the archaeological component in XU 6 that yielded a date on faunal material of 6060 to 5990 cal BC (2 Sigma). The size of the point blade compares favorably with the Early/Middle Archaic medium-sized, side-notched point types classified as the Little Sioux or Simonsen type in the prairie region.

Projectile points are used for hunting and indicate that site activities were associated with the procurement of game animals, an interpretation that is supported by the presence of animal remains at the site. The late-stage, unfinished biface could have been used as a cutting tool in its unfinished state, although it is likely that its intended final form would have been a projectile point. Utilized flakes, retouched flakes, and projectile points/knives are primarily light-duty cutting and slicing tools used on animal remains, wood, and plants. The large, basalt retouched flake seems more suited to heavier work, such as animal processing or wood working. Scrapers are typically associated with scraping tasks on a variety of soft materials (meat, hides, and plant material) or moderately resistant materials (wood and bone). Gravers are typically used for incising and working bone or wood. Awls are used for piercing soft materials like leather. These tools suggest that site activities included hunting, butchering, animal/plant processing, hide working, and bone and woodworking.

<u>Lithic Material Types</u>

Lithic materials consisted primarily of Prairie du Chien Chert (oolitic) (n=43; 27%) and Swan River Chert (n=32; 20%), with smaller amounts of unidentified chert (n=16; 10%), quartz (n=16; 10%), unidentified material (n=12; 8%), Hixton Group Quartzite (n=11; 7%), basalt (n=9; 6%), Knife River Flint (n=6; 4%), Galena Chert (n=4; 3%), chalcedony (n=2; 1%), quartzite (n=2; 1%), Blanding Chert (n=1; <1%), brown chalcedony (n=1; <1%) , granite (n=1; <1%), siltstone (n=1; <1%), igneous/ metamorphic rock (n=1; <1%), and metamorphic rock (n=1; <1%).

Exotic materials include Knife River Flint, which originates from west-central North Dakota (Ahler 1977), and Hixton Group Quartzite, which is derived from west-central Wisconsin (Boszhardt 1998).

These high-quality, exotic lithic materials were procured though long-distance trade networks or possibly travel to source areas.

Non-local materials include Galena and Blanding cherts. Blanding Chert outcrops in northeastern Iowa, and Galena Chert is available in lag deposits and bedrock exposures in southeastern Minnesota and adjacent areas of Wisconsin, Iowa, and Illinios (Morrow 1994). The other lithic materials are locally available (Bakken 1997), with bedrock sources of Prairie du Chien Chert probably available in the vicinity (Lusardi 1997). The unidentified chert and materials could be local or exotic.

Because site components are not clearly defined across the site, it is not possible to draw conclusions regarding lithic material use for each component. However, some relevant general trends in raw material use are apparent. The lithic debris (n=24) in ST 7G appears to be associated with the Late Archaic component directly across the road. The raw materials in ST 7G are mostly Prairie du Chien Chert along with three pieces of Galena Chert and one piece of Hixton Group Quartzite, but Knife River Flint is absent. The raw materials recovered in the vicinity of XUs 1-7 and ST 1-35, which are likely associated with the Middle Archaic component, include moderate amounts of Prairie du Chien Chert and Swan River Chert, along with small amounts Knife River Flint, Hixton Group Quartzite, and basalt.

Lithic Material Use

The lithic data indicates that the lithic raw materials have different debris profiles resulting from differential use, quality of the material, and cobble size. The most notable lithic use characteristics are discussed below and focus on diagnostic flake types (primary, secondary, and tertiary).

Basalt, chalcedony, quartzite, granite, and siltstone are represented mainly by primary flakes. The prevalence of primary flakes from these materials suggests that they were locally procured and utilized primarily for initial reduction. In some materials, such as basalt and granite, the prevalence of primary flakes may indicate a poorer quality of stone that would not be conducive for bifacial tool production.

Prairie du Chien Chert and Swan River Chert have a high proportion of primary flakes, but they also have a wide variety of other debris types, suggesting that they were used for all stages of lithic reduction, including biface and tool production. It is noteworthy that Prairie du Chien Chert, but not Swan River Chert, had a modest amount of secondary flakes, indicating this material was selected for biface production presumably because of its superior flaking qualities compared to Swan River Chert. The basalt and quartz assemblages contain modest amounts of shatter, which may indicate their relatively poor flaking qualities.

Knife River Flint occurs primarily as tertiary flakes, and Hixton Group Quartzite occurs as secondary flakes and a single tertiary flake. Neither of these materials is represented by primary flakes or shatter. It is likely these exotic, high quality materials were brought to the site as reduced blanks, bifaces, or tools. The other non-local materials, Galena and Blanding cherts, also do not occur as primary flakes. This use pattern is consistent with what is expected from lithic materials transported far from their source.

9.15 FCR

Fifty-one pieces of FCR were recovered. Most of these are granitic (n=37), but other materials include basalt (n=7), metamorphic (n=5), unidentified igneous (n=1), and unidentified material (n=1). FCR was confidently identified because of its distinctive characteristics (angular fractures, spalling, friable condition, etc) and because of the lack of naturally occurring cobbles in most of the soils at the site. Nearly all of the FCR consists of angular pieces, with only a small amount of friable or spall pieces. Size grade counts for the FCR were as follows: SG1 ≥ 1.0 inch (n=10; 19%); SG2 <1.0 inch to ≥0.5 inch (n=23; 45%); SG3 <0.5 inch to ≥0.233 inch (n=18; 36%).

The presence of FCR and thermally altered faunal material suggests that fire heaths or cooking pits were present, although none were identified. The cobbles used for heating and/or cooking, which became fire-cracked, were likely procured from local sources where rocks were exposed, such as ravines or streams.

9.16 Artifact Patterning and Geomorphic Context

The horizontal distribution of artifact classes is fairly similar across the site, suggesting that site activities were similar in many areas, with more intensive activities of animal processing and lithic reduction occurring at some locations (Table 23 and 24). Lithic debris was the most widespread artifact, and it occurs in each positive shovel test. Faunal material and FCR are less widespread than lithic debris and occur in 15 to 25 percent of the positive shovel tests in scattered locations across the site. The most notable pattern in artifact distribution is the absence of faunal material from the west end of the site on the south side of CSAH 61.

Artifact density is relatively low, based on the shovel test data. However, four moderate to high density areas were identified, including two large mammal (cf. bison) kill/processing areas at the west end of the site at ST 17GW5 and also in the central portion of the site in the area of XUs 3 to 6. Two concentrations of lithic debris occur at the west end of the site at ST 7G and in the central portion of the site at ST 16. There are two notable areas (ST 22 and ST 31) in the central portion of the site that have moderate artifact density, including lithics, faunal, and FCR,

The vertical distribution of artifacts ranges from 20 to 380 cmbs (Tables 23 to 26; Figures 34 to 36). This extensive range is the result of two factors: 1) the eastern and central portions of the site have thick, historic alluvial fan deposits that are absent at the west end of the site; and 2) there are multiple occupations over a long time span on an accreting land surface. Additional study of the site soils is needed to more clearly understand the processes that affected soil and landscape formation at the site.

The site is mostly contained within a clayey, lacustrine soil, which occurs across most of the site area and is buried by paludal and alluvial fan deposits (except at west end). The lacustrine soil is buried 2.5 meters of deep at the east end (ST 41G), 1.5 meters deep in the central portion (ST 2C), and is near the surface in the western portion of the site (ST 15G to 17GW5). The central portion of the site on the north side of CSAH 61 lacks the lacustrine deposits and consists of precontact alluvial fan and colluvial deposits that contain artifacts. In one test (ST 30G) artifacts were also recovered from paludal deposits, but the profile from this test was anomalous, and the soils may be disturbed. In a few tests artifacts were recovered between the base of the paludal deposits and the top of the lacustrine deposits.

Multiple components are clearly represented in some portions of the site, as artifact depths spanned as much as 1.6 meters in some tests, with artifacts being recovered from multiple soil horizons (e.g., Ab, ABb, and BCb) (Tables 25 and 26).

The soil formation processes in the lacustrine soil were variable across the site, with the west end and south central portions of the site (ST 2G to 10G, 17GW5, 18G, 2C to 12C) having combined A and AB horizons (2.5Y 2/1 and 3/1) that are relatively thin (0.4 to 0.7 meters), compared to the other site areas that that have A and AB horizons that are much thicker (1.0 to 1.7 meters), probably from greater rates of accretion. Also, the age of artifacts within the lacustrine deposits are not correlated with soil horizon (or soil color) as indicated by the faunal material from ST 37G, 295 to 325 cmbs in the ABb horizon (2.5Y 3/1 clay – 140 cm below the top of the lacustrine soil) that dated to 5210 to 4940 cal BC, while faunal material from ST 17GW, 85-100 cmbs in the BCb horizon (2.5Y 4/1 silty clay – 50 cm below the top of the lacustrine soil) dated to 1370 to 1120 cal BC. These two dates indicate that the age of artifacts and soil are correlated with the depth below the surface of the lacustrine soil.

The lacustrine soil, which is thick and well developed in most areas, appears to have been a stable and inhabitable landscape for thousands of years. Artifacts occur from the upper portion of the lacustrine soil to about 1.6 meters below the surface of this soil. Radiocarbon dates from faunal material in the lacustrine soil range from 5210 to 4940 cal BC to 1370 to 1120 cal BC, and it is likely that younger and older components are also present. Muck overlying the lacustrine soil was dated at 1300 to 1420 cal AD, providing a likely terminal date for habitation on this landscape.

In contrast, the precontact alluvial fan soil (Figure 36; 4Ab horizon) in the agricultural field in the north central portion of the site appears to have had a much more limited duration, as the soil is thinner and artifacts were confined to a much smaller vertical range. This soil yielded a date of 6980 to 6640 cal BC, and faunal material in the soil yielded a date of 6060 to 5990 cal BC. In the area of XUs 1, 2, and 7, historic alluvial fan deposits directly overlie this soil. However, a culturally sterile, precontact alluvial fan soil overlies this soil in the area of XUs 3 to 6. A small area of alluvial fan deposits also occurs in the Brookside Garden property east of agricultural field and in the adjacent area on the south side of CSAH 61. These soils consist of stratified historic alluvial fan deposits (western fan) over precontact alluvial fan deposits overlying clayey lacustrine deposits in the area of ST 65A to 69A, 21G to 24G, 31G to 32G, and 35G. Artifacts were recovered from a wide range of depths in the precontact alluvial fan soil (50 to 260 cmbs), representing multiple components that are currently undefined and undated.

A small area of thick, colluvial deposits occur in the agricultural field west of the alluvial fan and east of Bluff Creek Drive (Figure 36). Artifacts were recovered from a wide range of depths in the colluvium (45 to 210 cmbs). A date of 5320 to 5230 cal BC was obtained from faunal material recovered from 120 to 155 cmbs. It is probable that younger and older components are also present based on artifacts recovered above and below the dated faunal material.

9.17 Site Integrity

There was no evidence in our tests of modern disturbances to the archaeological components, and only a small amount of rodent runs and bioturbation was observed in the tests. The soil is dense clay that seems to inhibit vertical displacement of artifacts. The vertical patterning of artifacts in the excavation units was generally tightly clustered within a 20 to 25 cm zone, indicating that there is only minimal artifact displacement from natural causes. A high degree of integrity is expected in the other site areas, based on the similar soils and site formation processes. Faunal material is moderately well-preserved. In summary, the site has well-preserved cultural deposits that have integrity.

9.18 Conclusions

Site 21CR155 is a multicomponent Early to Late Archaic habitation located along the bluff base at the northern margin of the Minnesota River Valley. The site extends along the margin of a former floodplain lake on the valley floor. The site is bisected by CSAH 61 and extends to private lands beyond the ROW. Radiocarbon dates from five faunal samples provide evidence for three main occupational periods at about 6000, 5300-4900, and 1300-1130 cal BC. The site likely contains additional occupations that cannot be defined from current site data.

The Phase I and II investigations included 66 positive shovel tests and seven 1-x-1 meter XUs. Artifacts were recovered from 20 to 380 cmbs, primarily in a cumulic lacustrine soil that is buried below historic alluvium and paludal deposits across most of the site. This range in artifact depths reflects the varying depths of this buried soil. Small portions of the site also occur in precontact alluvial fan, paludal, and colluvial deposits. Multiple components are clearly represented in some portions of the site. The site has high degree of integrity and well-preserved cultural deposits, and the soils are conducive to faunal preservation.

Artifacts recovered from the site include faunal remains, lithic debris, stone tools, and FCR. Site activities are inferred to include hunting, animal/plant processing, cooking/heating, lithic reduction, and stone tool production and resharpening. The presence of FCR and thermally altered faunal material suggests that fire heaths or cooking pits were present, although none were identified. The site has well-preserved cultural deposits that have integrity. Faunal remains include cf. bison, turtle, catfish, and possibly other unidentified medium or large mammals. Approximately 20 percent of the faunal remains were burned or calcined and a few bones contain evidence of butchering.

The lithic debris assemblage suggests that a full range of lithic activities occurred at the site. While initial reduction of cobbles appears to have been a primary activity, there is also a moderate amount of flake types from bifacial shaping/thinning and late-stage tool manufacturing or tool maintenance. A wide variety of lithic materials occur at the site. Locally available materials are most common, with oolitic Prairie du Chien Chert and Swan River Chert being most abundant. High-quality, exotic materials included Knife River Flint and Hixton Quartzite, which were procured though long-distance trade networks or possibly travel to source areas. Other non-local materials (Galena and Blanding chert) from northeastern Iowa and southeastern Minnesota were also recovered. A variety of stone tools were recovered that are indicative of hunting, butchering, animal/plant processing, hide working, and bone and woodworking activities.

9.19 Recommendations

The site is recommended eligible for listing on the NRHP under Criterion D because it has integrity and is likely to yield important information on the Archaic Period. The site contains data that could provide significant information on the following Archaic period research themes:

- Age and regional chronology
- Relationship to other regional Archaic complexes
- Developments and changes during the Archaic period
- Artifact assemblage
- Subsistence strategy and settlement pattern
- Site function
- Environmental adaptation
- Lithic technology and raw material use
- Regional interaction and trade
- Site environment
- Site formation processes and geomorphology

A discussion of these themes is presented in Section 2.3.1. A Phase 3 data recovery to mitigate adverse project effects is recommended if the site can't be avoided. A data recovery plan for the site is in Appendix E.

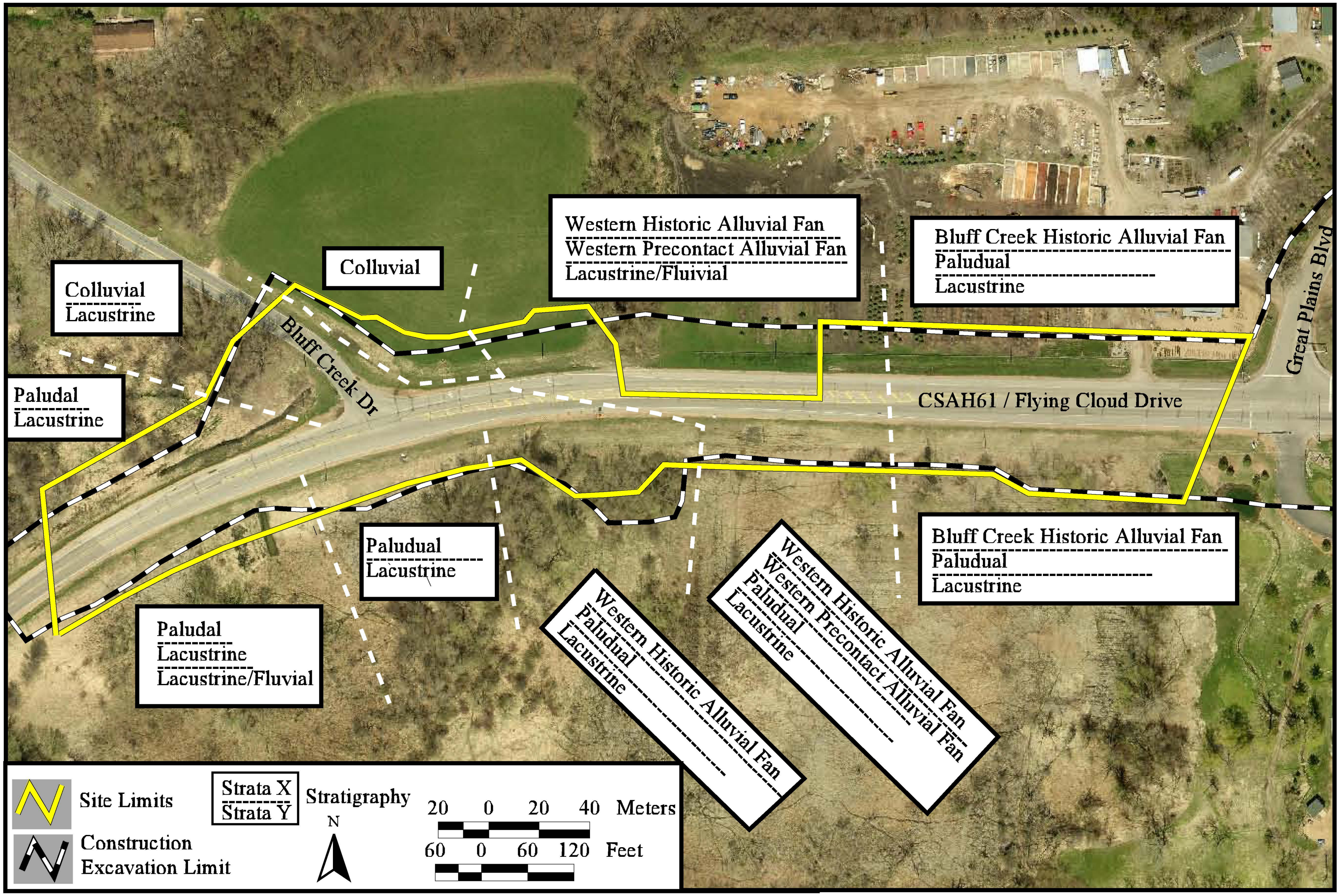


Figure 23. Site 21CR155 Landforms and Stratigraphy on 2011 Pictometry Aerial Image.

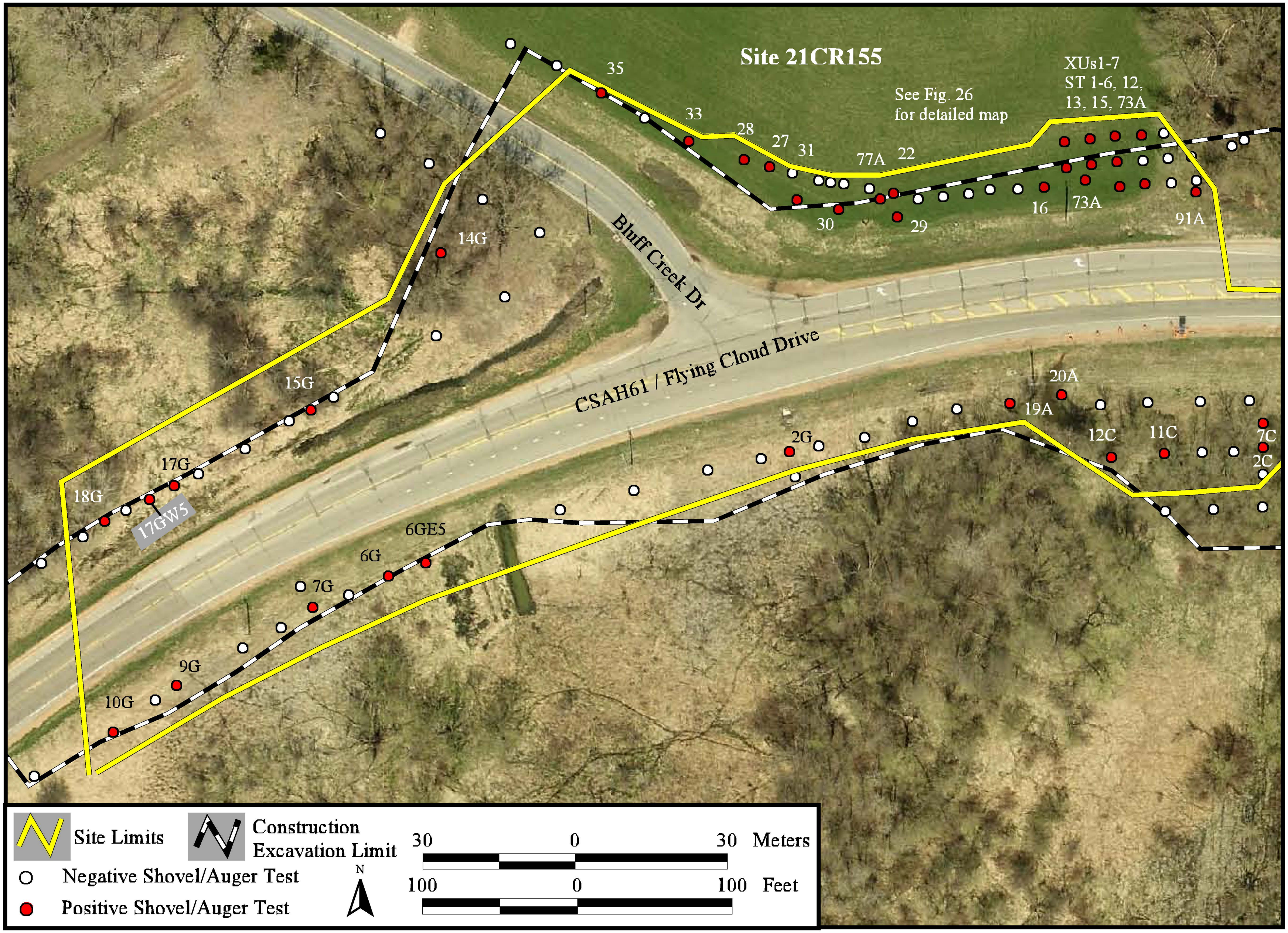


Figure 24. Western Portion of Site 21CR155 Map on 2011 Pictometry Aerial Image.

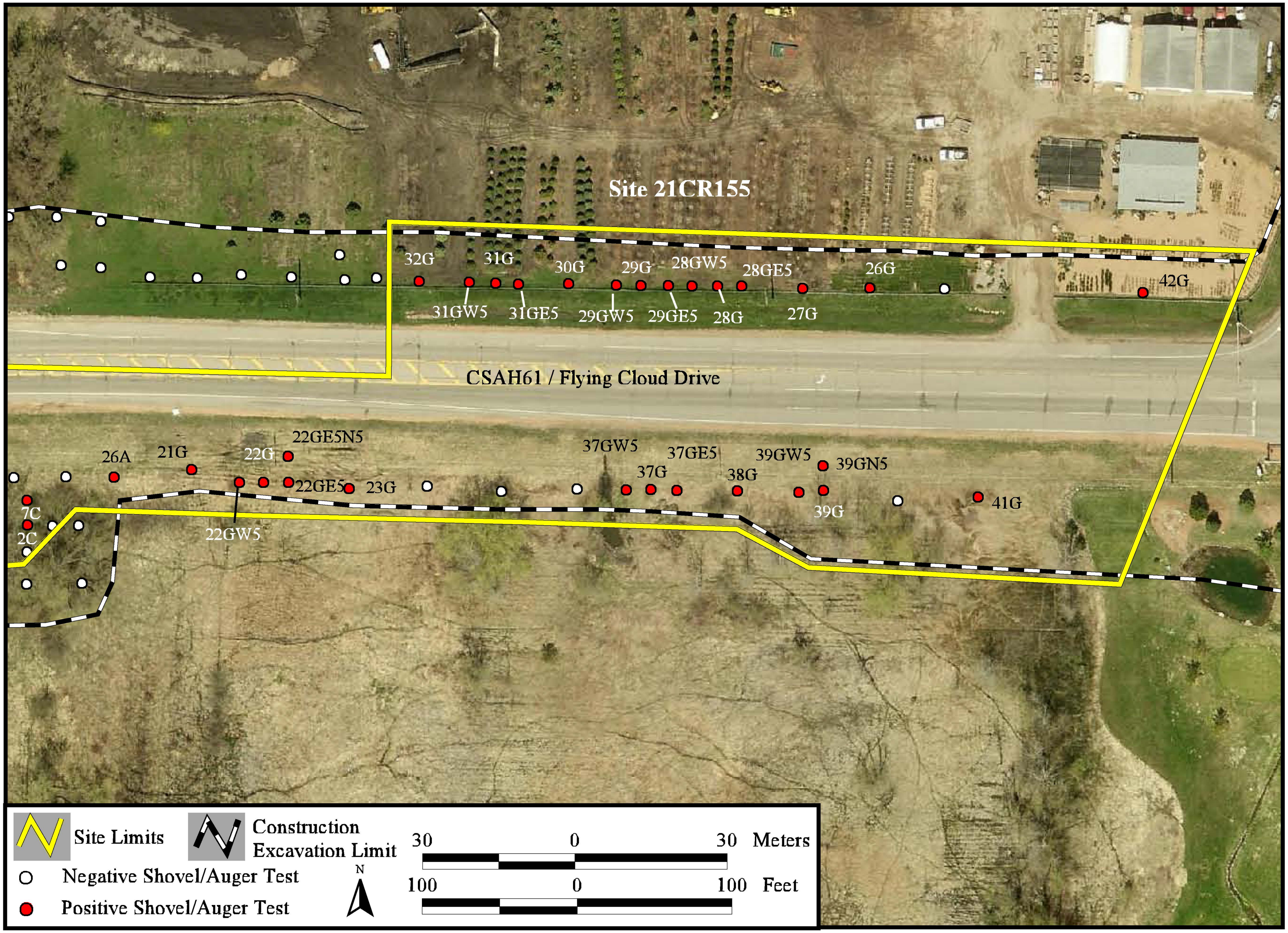


Figure 25. Eastern Portion of Site 21CR155 Map on 2011 Pictometry Aerial Image.

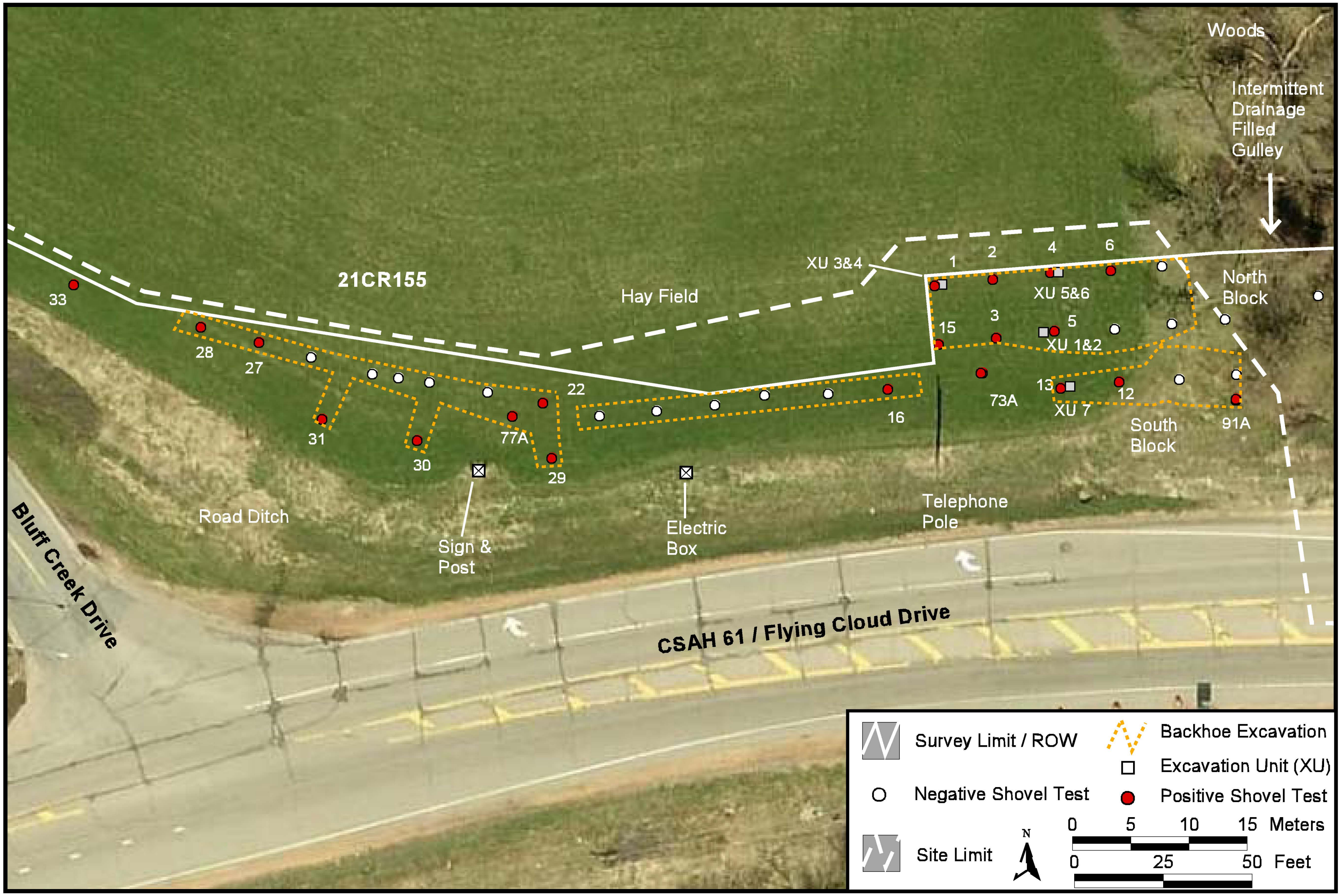


Figure 26. Site 21CR155 Detailed Map in Agricultural Field on North Side of CSAH 61; Area of XUs 1-7 and ST 1-37, 73A, 77A, and 91A.

Figure 27. Site 21CR155 Photo of Agricultural Field on North Side of CSAH 61; Area of XUs 1-7 and ST 1-37, Facing West From Tree Line.

Figure 28. Site 21CR155 Photo of Brookside Garden Center on North Side of CSAH 61; Area of ST 26G-32G, Facing West From Driveway.

Figure 29. Site 21CR155 Photo of Auger Testing in Backhoe Trench at Brookside Garden Center on North Side of CSAH 61 at ST 31G, Facing West.


Figure 30. Site 21CR155 Photo of Wetland on South Side of CSAH 61 with ST 39G-22G, Facing West.


Figure 31. Site 21CR155 Photo of Wetland on South Side of CSAH 61 Area of ST 2G-7G, Facing West.

Figure 32. Site 21CR155 Photo of Wetland on North Side of CSAH 61 at ST 17GW5, Facing Northwest.

Figure 33. Site 21CR155 Photo of Auger Testing in Wetland on Northside of CSAH 61 at ST 22G, Facing East.

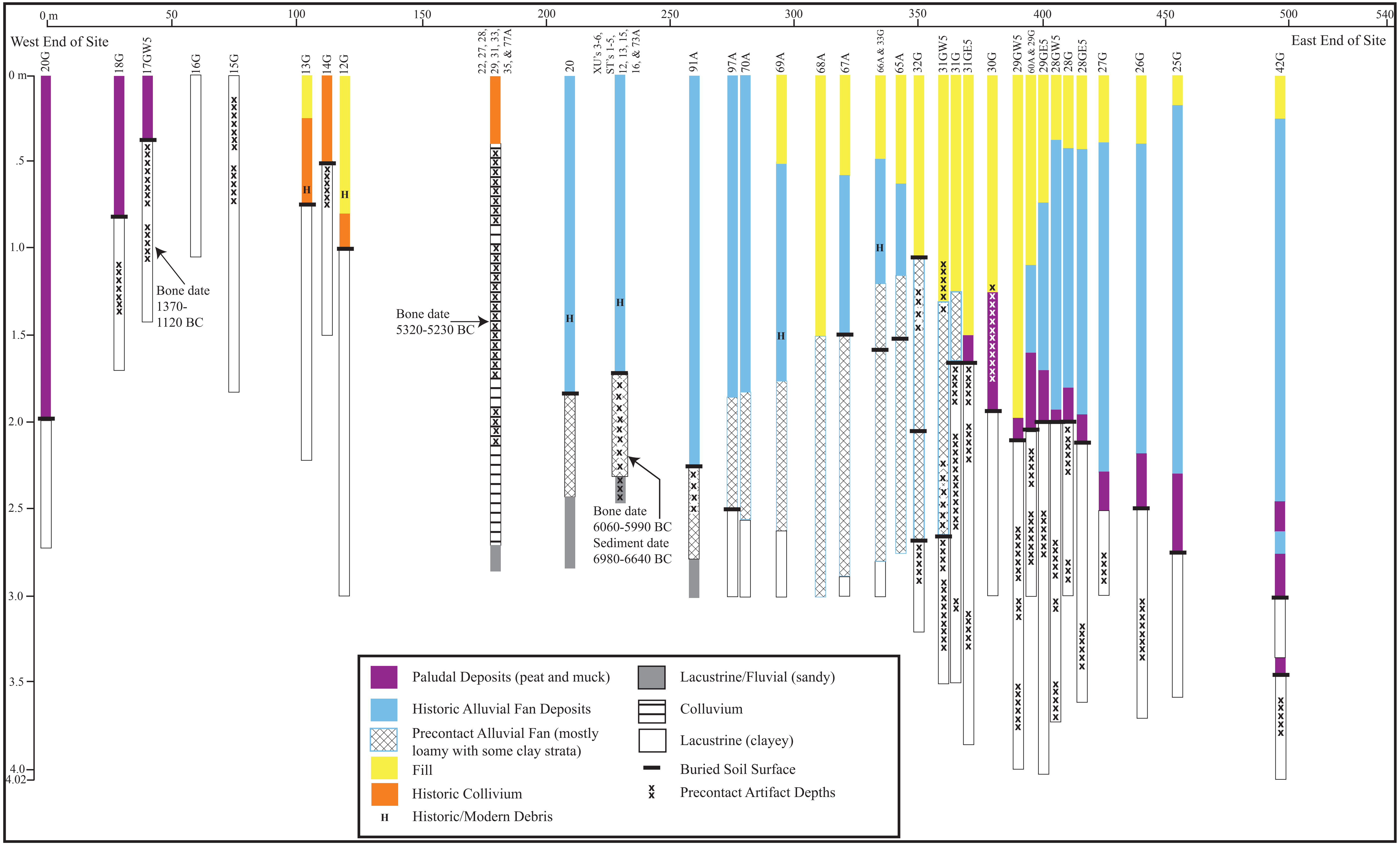


Figure 34. Site 21CR155 Cross Section Map on North Side of CSAH 61.

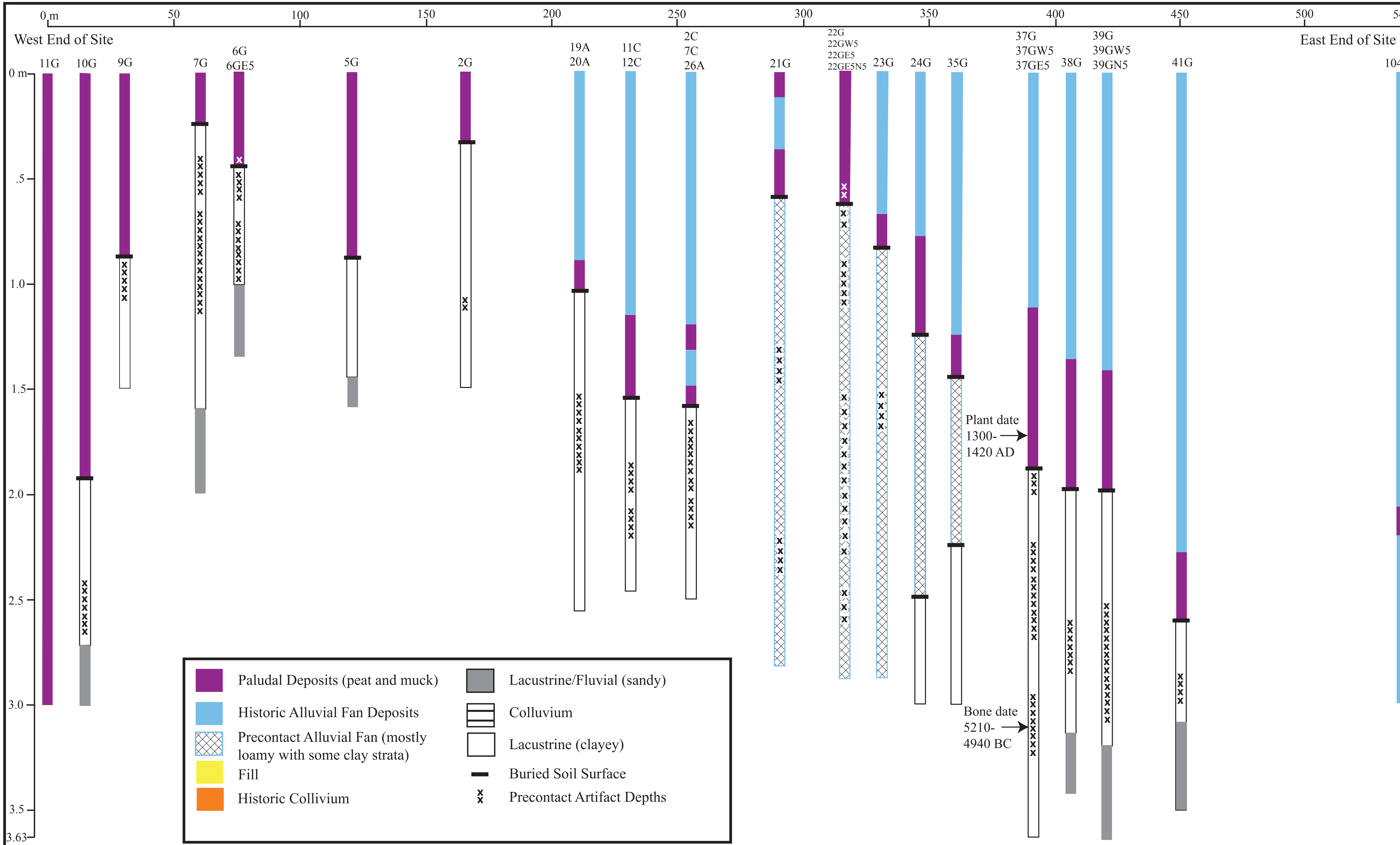


Figure 35. Site 21CR155 Cross Section Map on South Side of CSAH 61.

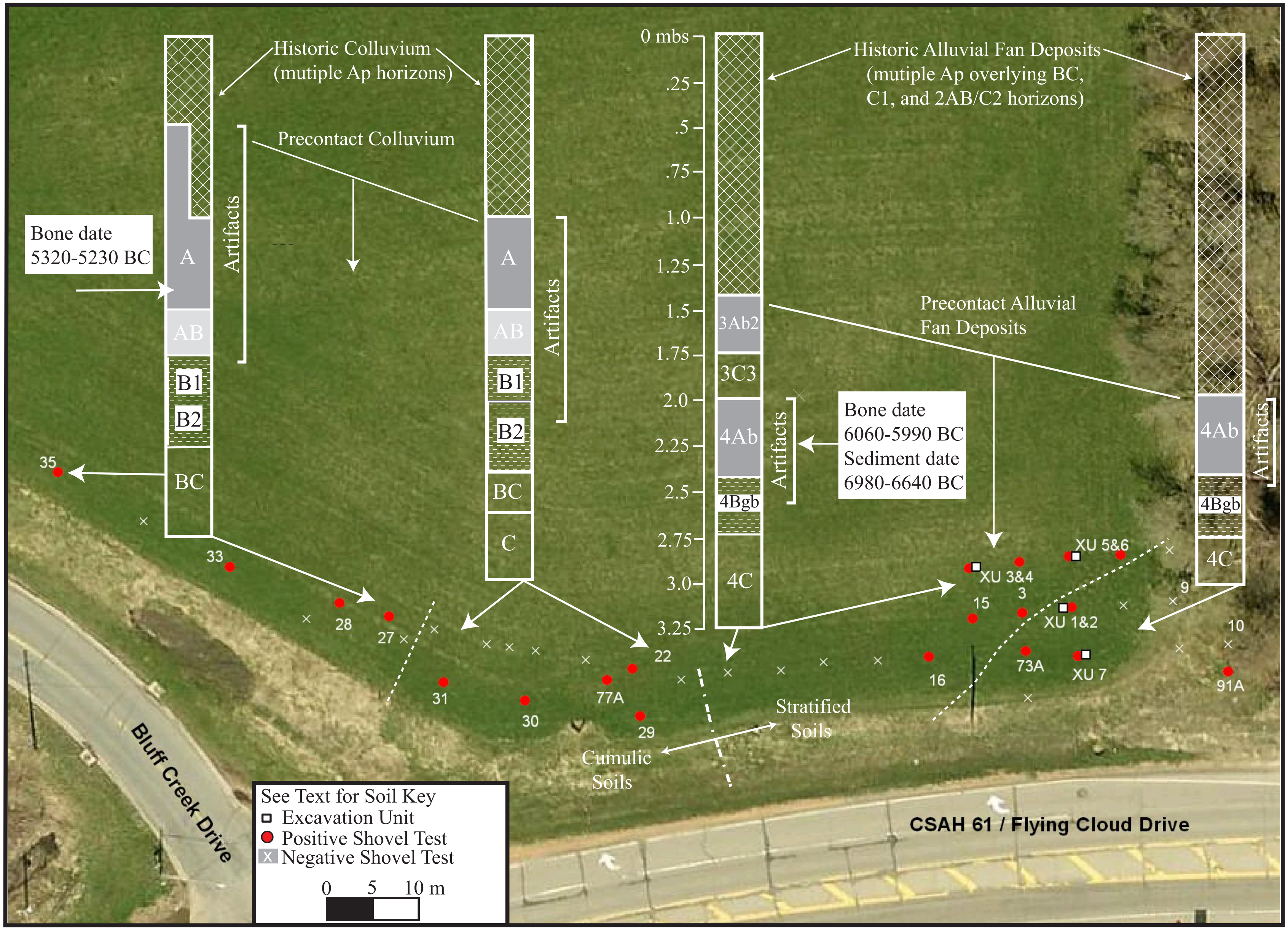


Figure 36. Site 21CR155 Detailed Cross Section Map in Agricultuural Field on North Side of CSAH 61; XUs 1-7 and ST 31- 35 Area.

Figure 37. Site 21CR155 Photo of North Block of Backhoe Excavation in Agricultural Field; Area of XUs 3 to 6, Facing West.

Figure 38. Site 21CR155 Photo of North Block of Backhoe Excavation in Agricultural Field; Area of XUs 3 to 6, Facing West.

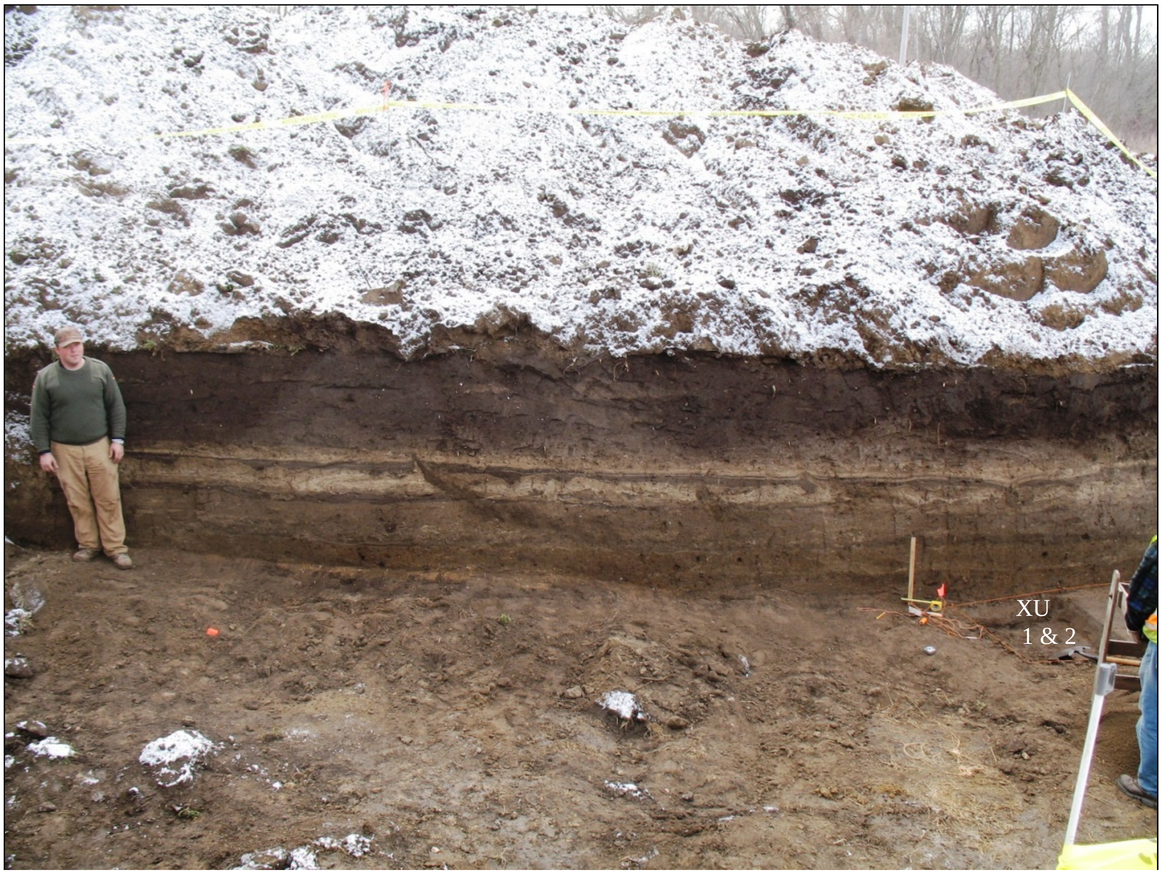


Figure 39. Site 21CR155 Photo of South Wall in North Block of Backhoe Excavation in Agricultural Field; Area of XUs 1 and 2, Facing South.

Figure 40. Site 21CR155 Photo of Western Alluvial Fan Channel in East Wall of North Block of the Backhoe Excavation in Agricultural Field; Area of STs 8 and 9, Facing East.

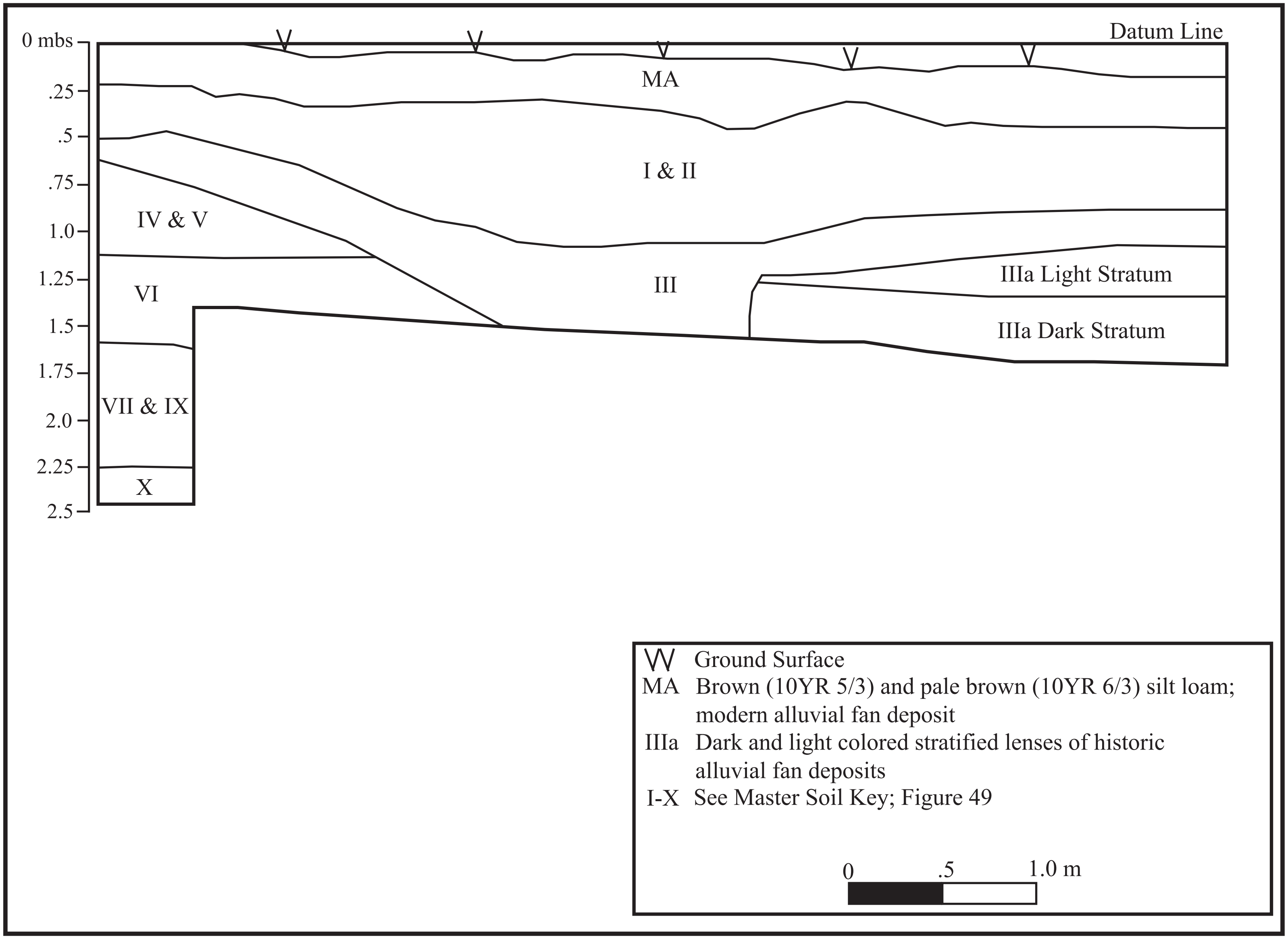


Figure 41. Site 21CR155 Profile of East Wall in North Block.

Figure 42. Site 21CR155 Photo of South Block of Backhoe Excavation in Agricultural Field; Area of XU 7 and ST 11 to 13, Facing West.

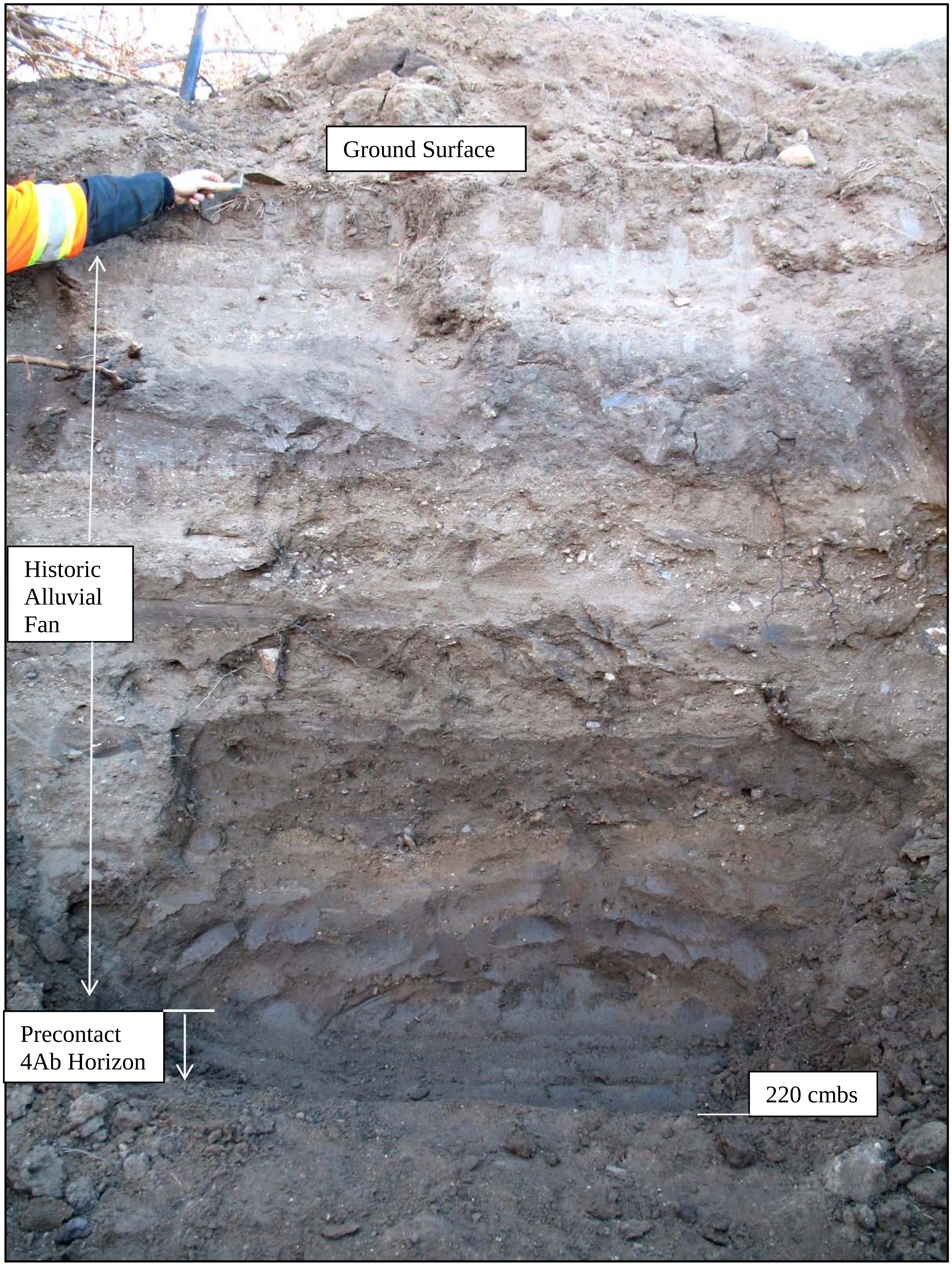


Figure 43. Site 21CR155 Photo of East Wall in South Block of Backhoe Excavation in Agricultural Field; Area of ST91A, Facing East.

Figure 44. Site 21CR155 Photo of Backhoe Trench in Agricultural Field; Area of STs 16 to 20, Facing West.

Figure 45. Site 21CR155 Photo of Backhoe Trench in Agricultural Field; Area of STs 25 to 28, Facing East.

Figure 46. Site 21CR155 Photo of East Wall of XU 1 from 170 to 225 cmbs, Showing Soil Deformation.

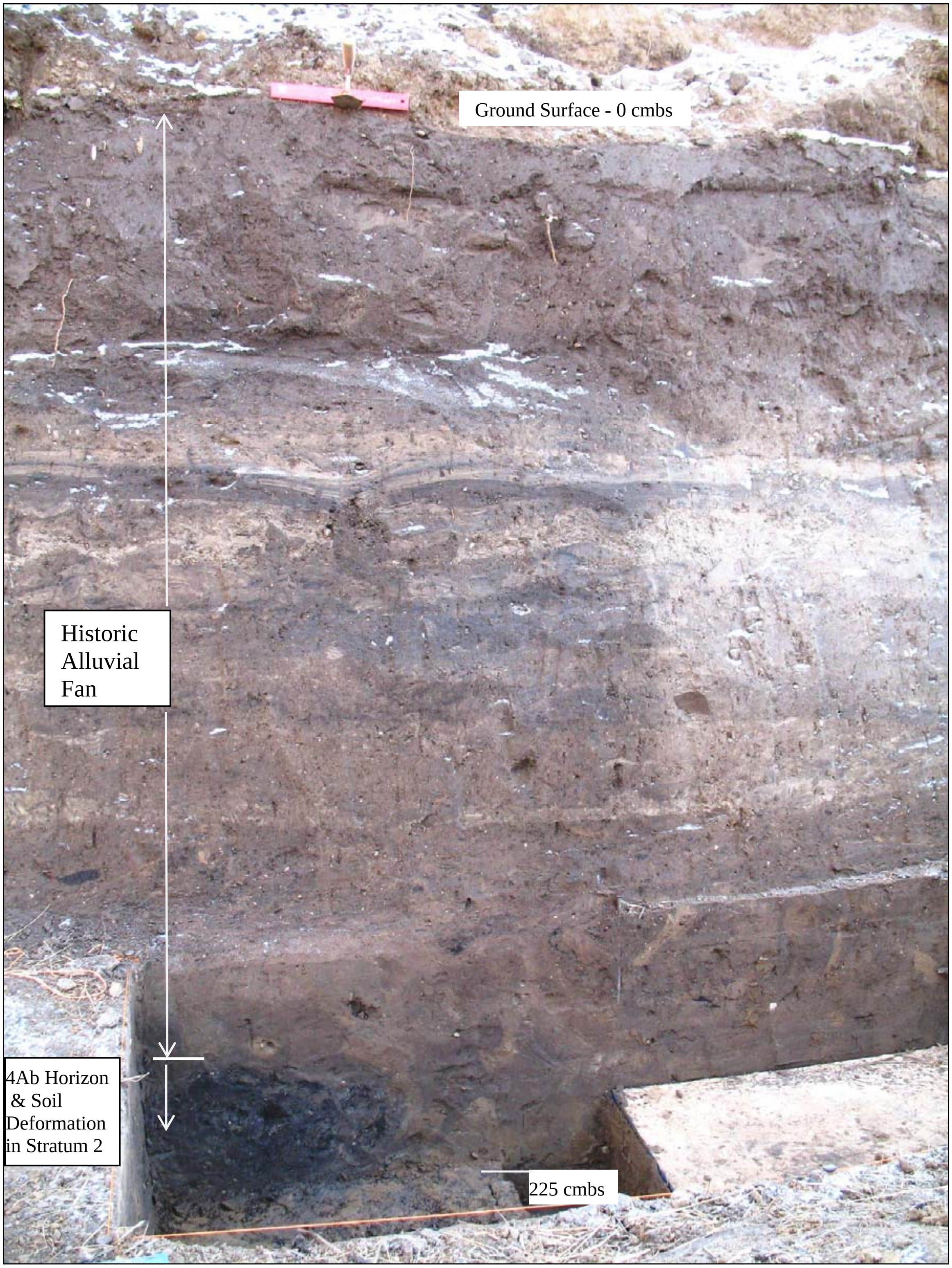


Figure 47. Site 21CR155 Photo of South Wall of XU 1 (with soil deformation) and South Wall of North Block of Backhoe Excavation from 0 to 243 cmbs.

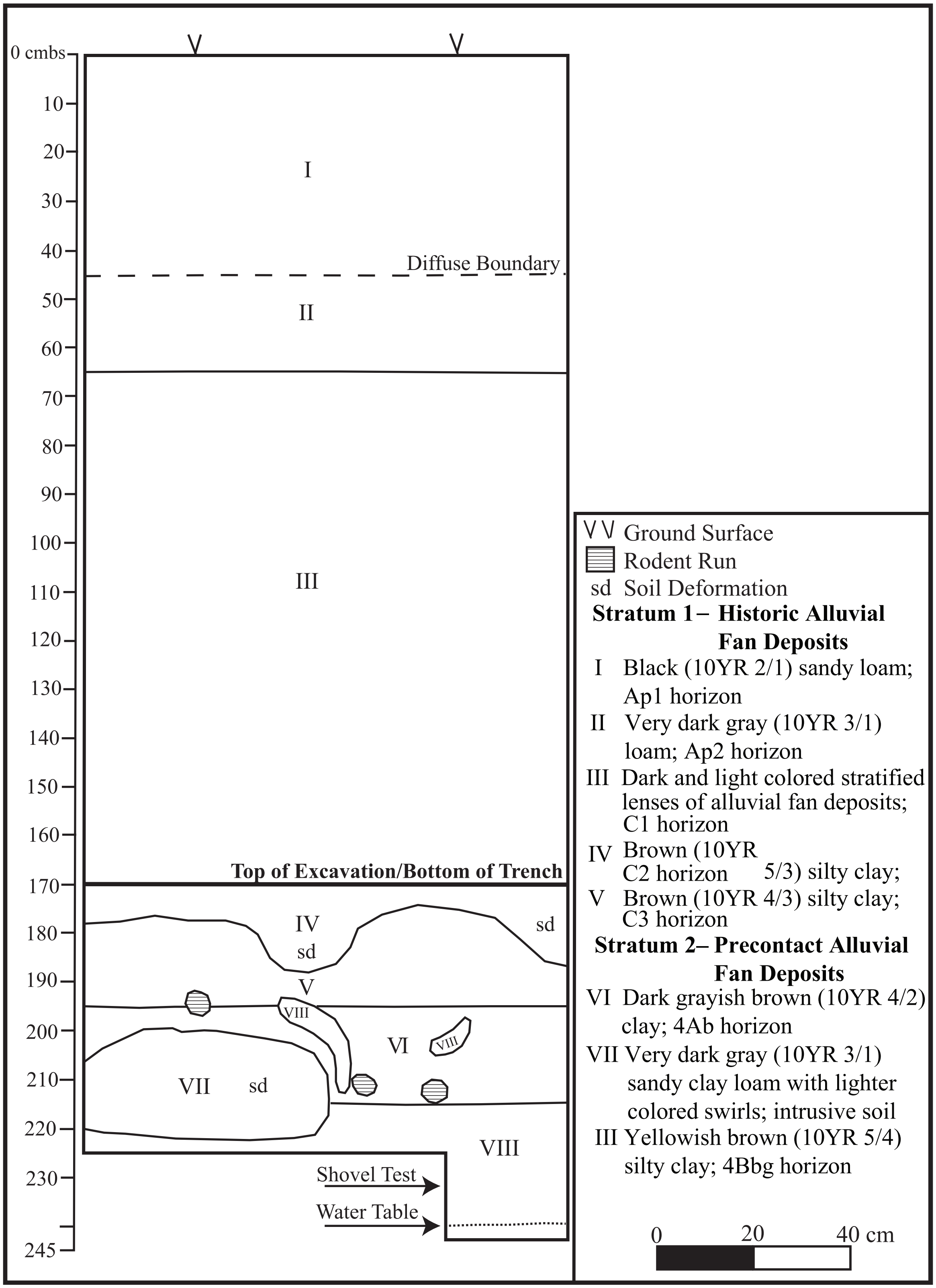


Figure 48. Site 21CR155 XU 1 South Wall Profile.

Figure 49. Site 21CR155 Master Soil Key for XUs 3, 4, 5, and 6.

Key #	Horizon	Description*
I	Ap1	***Historic Alluvial Fan Deposits*** black-very dark gray (10YR 2/1-3/1) SANDY LOAM, ±5% gravel; leached; abrupt smooth boundary.
II	Ap2	Very dark grayish brown (10YR 3/2) LOAM; ±5% gravel; leached; abrupt smooth boundary.
III	Ap3	Very dark gray and very dark grayish brown (10YR 3/1 and 3/2) LOAM; ±3-5% gravel; leached; abrupt wavy boundary
IV	BC	Brown to dark yellowish brown (10YR 4/3-4/4) SANDY LOAM TO LOAM, ± 10% gravel that is occasionally in lenses; unleached; weak coarse angular blocky structure parting to medium angular blocky structure; abrupt wavy boundary.
V	C1	Brown (10YR 4/3-5/3) SANDY LOAM; ± 5% gravel; occasional white carbonate nodules; unleached; very weak angular blocky structure; abrupt smooth boundary.
VI	2Ab/C	Stratified deposits with incipient buried soils Ab: dark grayish brown (10YR 4/2) LOAM TO SANDY LOAM; unleached C: brown (10YR 5/3) GRAVELLY SANDY LOAM
VII	3Ab2	***Precontact Distal Alluvial Fan Deposits*** Dark grayish brown to very dark grayish brown (10YR 4/2-3/2) heavy silt loam with ± 3 % very fine sand, < 1% fine gravel; unleached; weak medium angular blocky structure; abrupt smooth boundary.
VIII	3C3	Brown (10YR 4/3) heavy SILT LOAM; unleached; very abrupt smooth boundary.
IX	4Ab3	Dark brown (10YR 3/3) SILTY CLAY LOAM with ±10% very fine sand; weak medium prismatic structure parting to medium angular blocky structure; clear boundary.
X	4Bgb	Olive brown - light olive brown (2.5Y 4/3-5/3) LOAM; sand is all very fine textured; occasional large carbonate nodules; weak to moderate medium prismatic parting to medium and fine angular blocky structure; many faint redox features.

*XUs 1 and 7 include Historic Alluvial Fan Deposits I-V overlying Distal Alluvial Fan IX and X.
Soils described by project geomorphologist Michael Kolb

Figure 50. Site 21CR155 Photo of North Wall of XUs 3 and 4 from 170 to 255 cmbs.

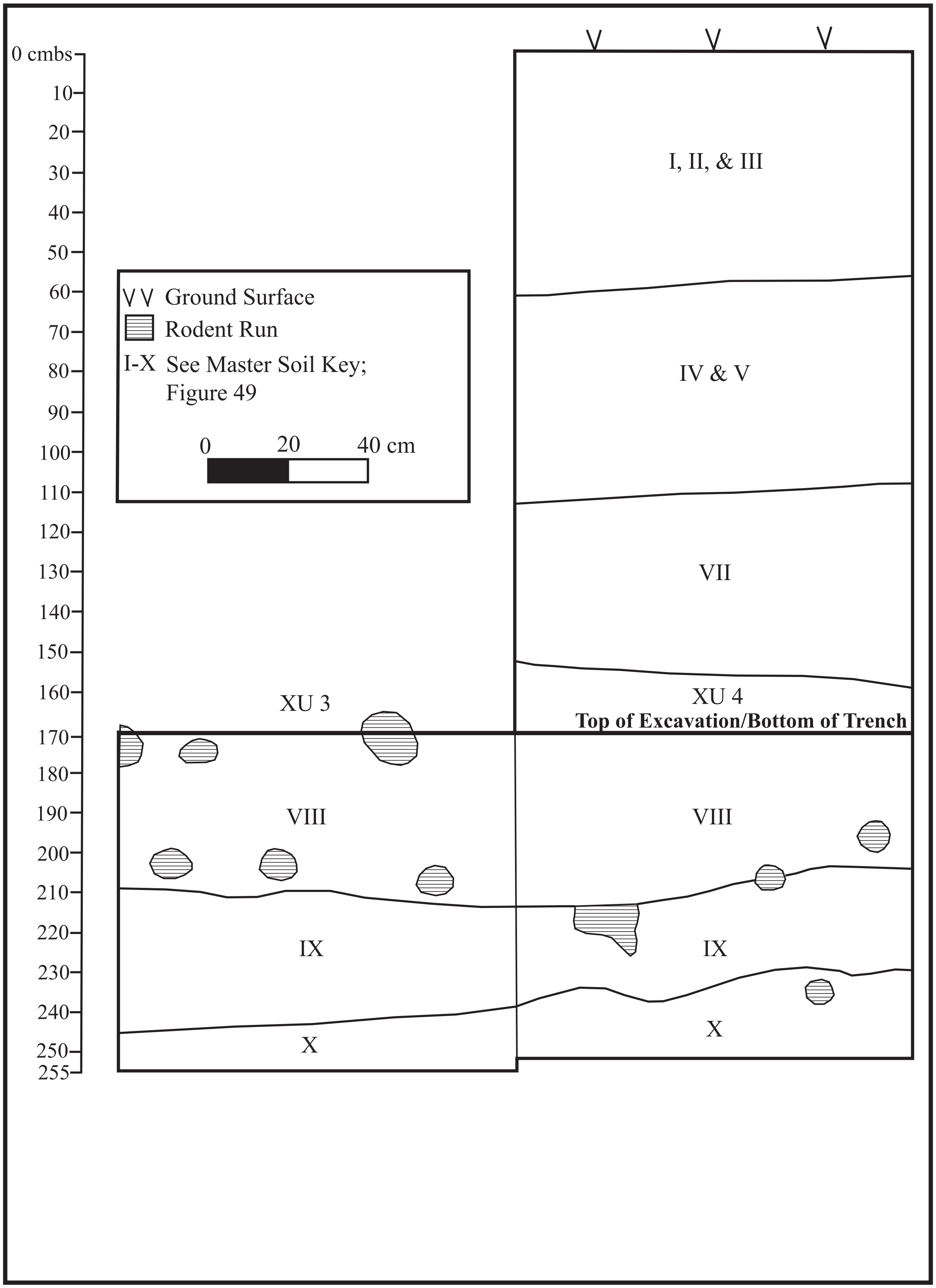


Figure 51. Site 21CR155 XU 3 and 4 East Wall Profile.

Figure 52. Site 21CR155 Photo of North Wall of XUs 5 and 6 and North Wall of North Block of Backhoe Excavation from 0 to 245 cmbs.

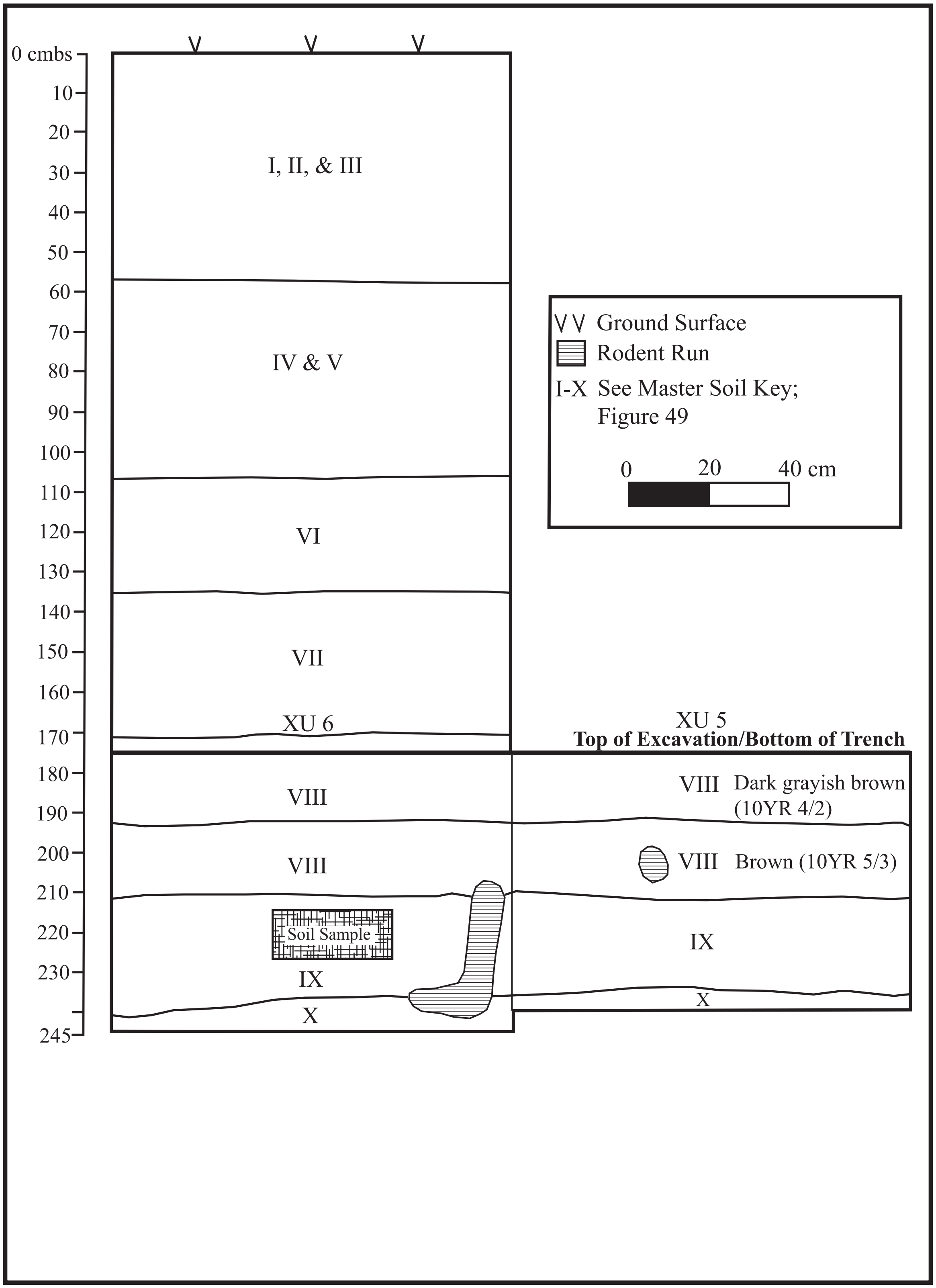


Figure 53. Site 21CR155 XU 5 and 6 North Wall Profile.

Figure 54. Site 21CR155 Photo of West Wall of XU 7 from 165 to 225 cmbs in South Block of Backhoe Excavation, Facing West.

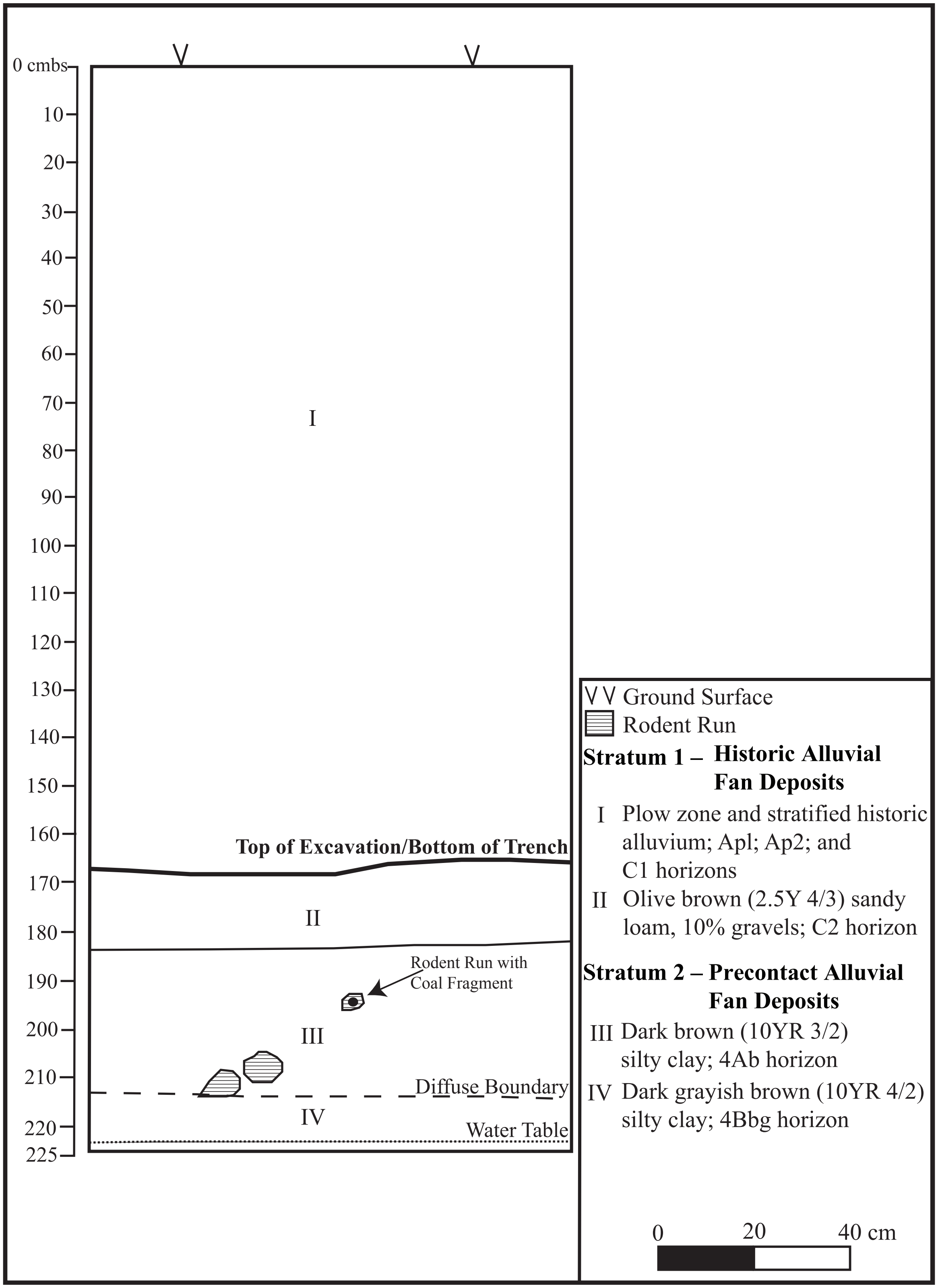


Figure 55. Site 21CR155 XU 7 West Wall Profile.

Figure 56. Site 21CR155 Bison or Elk Bones with Spiral Fractures in XU 6 from 220 to 230 cmbs.

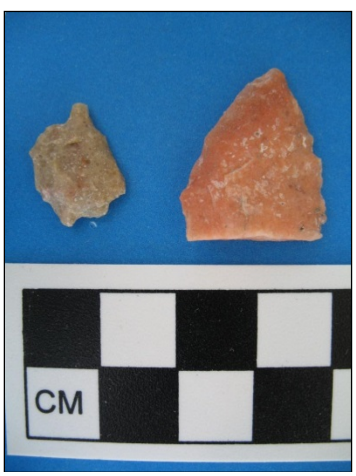


Figure 57. Site 21CR155: Graver (left, Cat. #11.2) and Projectile Point Blade (right, Cat. #11.1) in ST 16 from 170 to 200 cmbs.

10. SITE 21CR156

10.1 Overview

Site 21CR156 is a Late Paleoindian, Archaic, and Late Woodland habitation located within the CSAH 61 ROW. The site is in T1116N R23W, N, SE, SE, NW, Section 36 (Figure 2) and occupies an area of 70 by 10 meters, encompassing 0.2 acre. The UTM coordinates for the center of the site are E457882 N4962388 (1983 NAD Zone 15). A map of the site on aerial imagery is presented in Figure 58, and a photo of the site is included in Figure 59.

10.2 Physical Setting

The site is situated on the south side of CSAH 61 within the ROW. The site likely extends south of the ROW, but no testing was conducted outside of the ROW. The south side of CSAH 61 is not ditched, but the roadway is raised slightly above the natural land surface. The ROW consists of tall grasses. The site is bordered on the east by a small stream that flows from an upslope spring. The driveway to the Western Motel borders the site on the west, and the driveway also marks a landscape change to a more elevated colluvial slope. The Rice Lake wetland is located 20 meters south of the site. The site occupies a toe slope landscape at the bluff base along the margin of the Minnesota River Valley. An alluvial fan from a small stream and intermittent drainage covers the site area. The site landscape slopes slightly down to the south towards the wetland and to the east towards the stream.

10.3 Soils

Soils at the site consist of stratified alluvial fan and colluvial deposits (see Appendix A). While it is difficult to distinguish between these deposits at the site, it appears that the alluvial fan deposits are dominant in the eastern portion of the site near the center/channel of the fan, and that colluvium is more prevalent in the western portion of the site. Buried soils were identified in all of the XUs and many of the shovel tests. However, there is considerable stratigraphic variability in soil profiles across the site that reflects landscape position in relation to the stream at the east end of the site and the elevation changes along the north to south slope.

10.3.1 Soil Profiles from XUs

The eight excavation units at the site provided a detailed record of soils, with shovel tests providing only generalized soil data. The project geomorphologist examined the soils in all of the XUs and provided descriptions of the soils for XUs 3, 4, 5, 6, and 8. Soils in XUs 1, 2, and 7 at the east end of the site along the southern transect have a single buried A horizon from 90 to 120 cmbs (Figures 60 and 61). Soils in XUs 3 and 4, near the mid-section of the site along the northern transect, are cumulic and have two buried soils. The lowest buried soil contains a Middle Archaic component in the Bt(Ab) horizon (180 to 200 cmbd) that yielded a date of 5660 to 5570 cal BC (2 Sigma) (Figures 62 and 63). The Ab1 horizon from the upper buried soil (120 to 140 cmbd) was dated to 3590 to 3530 cal BC (2 Sigma), but no archaeological component is associated with this buried soil. Soils in XUs 5, 6, and 8, at the west end of the site along the southern transect, are cumulic and have a buried A horizon from 200 to 215 cmbs that dated to 6500 to 6420 cal BC (2 Sigma) (Figure 64 to 67), but no archaeological component is associated with this buried soil.

10.3.2 Soil Stratigraphy Across Site

The site stratigraphy is complex and not well understood. The site area was not accessible for the geomorphological coring rig, but the geomorphologist examined wall profiles from the excavation units at the site. Stratigraphic changes along the east-west axis of the site appear to be largely dependent on proximity to the center of the alluvial fan at the east end of the site. Stratigraphic variability was also observed across the north-south axis of the site, which is related to the elevation grade of the toe slope. Therefore it was not possible to construct detailed maps of the site stratigraphy from the available soils data. A generalized cross-section map showing buried soil horizons at the site was constructed from shovel test and XU soil data (Tables 37 to 39). The soil data from shovel tests is considered approximate and generalized, as interpreting soil data from deep auger tests has inherent limitations. For example thin, buried soils may not always be recognized, and dark-colored soil disturbances, like rodent runs, may be misidentified as a buried soil. However, the collective shovel test data, in conjunction with the XU wall profiles, appears to provide relatively accurate information on the approximate locations and extents of the buried soils.

The profiles were compiled from soil data along the northern, middle, and southern shovel test transects, which extend from higher (north) to lower (south) landscape positions across the site. The profiles indicate that in some areas there are different soil profiles along the north to south slope. For example, a buried soil(s) is present between 140 and 220 cmbs in the southern and middle transects at the west end of the site (9 to 29 meters east of motel driveway), but it appears to be absent along the northern transect in this area. Also, there are buried soils between 190 and 230 cmbs on the northern transect in the eastern and mid-sections of the site (34 to 69 meters east of motel driveway) that are not apparent in the middle and southern transects in this area. In contrast to these soil variations, the middle portion of the site (39 to 69 meters east of motel driveway) contains a buried soil(s) between about 100 and 150 cmbs in all transects.

The soil profiles and geomorphic setting indicate that the landscape in the western portion of the site during the Holocene was more elevated and received less deposition than the eastern portion of the site, which is closer to the alluvial fan center and stream. The western portion therefore has older soils nearer the ground surface, which is supported by radiocarbon dates and the provenience of diagnostic artifacts. This pattern is most prominent at the east end of the site near the stream, where there is more active alluvial deposition, resulting in thick, historic-age buried soils, as indicated by slag in ST 60 at 120 cmbs.

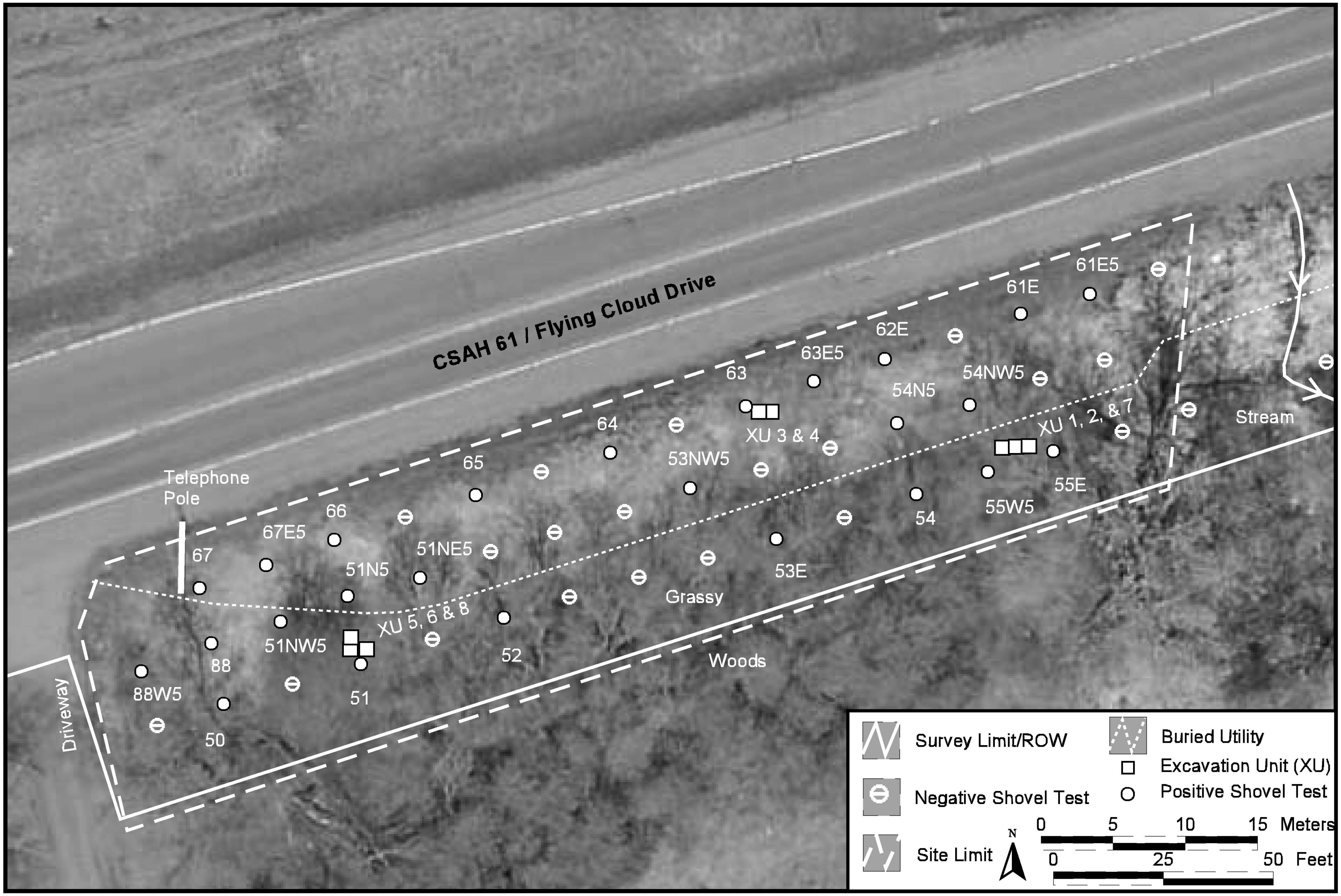


Figure 58. Site 21CR156 Map on 2011 Pictometry Aerial Image.

West End of Site						Soil Data from STs and XUs						East End of Site
Depth (cmbs)	67	66	65	65E5	64	63	XU 3 & 4	63E5	62	61	60	59
0												
10												
20												
30												
40												
50												
60												
70												
80												
90												
100												
110												
120							3590 to 3530 cal BC*				Slag	
130												
140												
150												
160												
170												
180							5660 to 5570 cal BC*					
190												
200												
210												
220												
230												
240												
250												
Meters East of Motel Driveway	9	19	29	34	39	49	50	54	59	69	79	99
ST Depth (cmbs)	270	280	300	270	250	265	220	270	250	230	195	210

Confirmed Buried A Horizon in XU
***Sediment Date**

Probable Buried A Horizon Defined from Shovel Test

Table 37. Site 21CR156 Profile of Probable Buried A horizons from West to East along the Northern Transect.

West End of Site				Soil Data from STs				East End of Site		
Depth (cmbs)	88	51N5	52N5	45N5	53NW	53N5	54N5	55NW5	55N5	55NE
0										
10										
20										
30										
40										
50										
60										
70										
80						■		■		
90						■		■		
100					■	■		■		
110					■	■	■	■		
120					■	■	■			
130					■	■	■			
140					■	■	■			
150					■	■	■			
160							■			
170			■				■			
180		■	■							
190		■	■							
200		■								
210		■								
220		■								
230										
240										
250										
Meters East of Motel Driveway	9	19	29	39	44	49	59	64	69	74
ST Depth (cmbs)	205	275	245	230	230	215	200	200	200	190

■ **Probable Buried A Horizon Defined from Shovel Test**

Table 38. Site 21CR156 Profile of Buried A horizons from West to East along the Middle Transect.

West End of Site				Soil Data from STs and XUs								East End of Site
Depth (cmbs)	50	XU 5,6,&8	52	45	53	53E5	54	XU 1,2 & 7	55	56	57	58
0												
10												
20								Late Woodland Ceramics ca. A.D. 500 – 1150				
30												
40											Fill	
50												
60												
70												
80												
90												
100												
110												
120		Bone date 5990 - 58780 cal BC										
130												
140												
150												
160												
170												
180												
190												
200		6500-6420 cal BC*										
210												
220												
230												
240												
250												
Meters East of Motel Driveway	9	19	29	39	49	54	59	66	69	79	89	99
ST Depth (cmbs)	225	225	210	190	200	230	220	280	180	185	260	230

Confirmed Buried A Horizon in XU
*****Sediment Date

Probable Buried A Horizon Defined from Shovel Test

Table 39. Site 21CR156 Profile of Buried A horizons from West to East along the Southern Transect.

10.4 Phase I Survey Methods and Results

The site was first identified during shovel testing in ten-meter intervals, when artifacts were recovered from several shovel tests between 0 and 250 cmbs. Each Phase I test was double-augered. Sufficient cultural material was recovered from double augering, and a third auger test was deemed unnecessary. If three auger tests had been dug at each location, then the volume of soil recovered would have been equivalent to a standard shovel test, and the artifact counts could have increased by a factor of 1.5. Soil was screened through 1/8-inch hardware mesh in one of the auger tests at STs 45, 50, 51, 52, 53, 63, 64, 65, 66, 67, and 88. Several of these tests yielded Other G4 flakes (< ¼ inch in size) that probably would not have been recovered using ¼-inch mesh. A total of 58 artifacts was recovered from 0 to 250 cmbs, including lithic debris, FCR, ceramics, and faunal material (Table 40).

Table 40. Site 21CR156 Summary of Artifacts from Phase I Shovel Tests.

Shovel Test #	Depth (cmbs)	Count	Artifact Type
50	0-25	1	Primary flake, Prairie du Chien (oolitic) Chert
		1	Shatter, unidentified material
	25-50	1	Broken flake, basalt
		1	Other G4 flake, Swan River Chert
	40-60	1	FCR, granite
	50-75	3	FCR, granite
	80-100	1	Broken flake, quartz
	100-125	1	Primary flake, quartzite
	125-150	2	FCR, granite
51	0-25	1	Broken flake, Prairie du Chien (oolitic) Chert
	25-40	1	Secondary flake, Prairie du Chien (oolitic) Chert
	30	2	FCR, gabbro
	120-135	1	Faunal, unidentified, fragment, calcined
	150-165	1	Faunal, turtle shell fragment, calcined
	150-175	2	FCR, granite
	175-200	1	Broken flake, unidentified chert
		1	Other G4 flake, quartz
52	40-60	1	FCR, granite
	75-100	1	FCR, granite
	100-125	1	Other G4 flake, quartz
53	125-140	1	Retouched flake, igneous
54	175-200	1	FCR, basalt
55	25-35	1	Ceramic, body, grit temper, cord/fabric impressed
	50-80	1	Ceramic, body, grit temper, cord/fabric impressed
		1	Other G4 flake, quartz
61	30-45	1	FCR, granite
		2	FCR, gabbro
	80-90	1	Other G4 flake, quartz
	120-145	2	FCR, granite
62	220-250	1	Primary flake, unidentified chert
63	40-50	1	Primary flake, unidentified material
	175-200	1	Primary flake, Prairie du Chien (oolitic) Chert
	200-210	1	Primary flake, Prairie du Chien (oolitic) Chert
64	45-65	3	Faunal, unidentified, fragment
		1	FCR, granite
	50-55	2	FCR, granite

Table 40. Continued

Shovel Test #	Depth (cmbs)	Count	Artifact Type
65	0-25	1	Broken flake, Swan River Chert
	25-50	1	Other G4 flake, basalt
	100-120	2	FCR, granite
	100-125	1	FCR, gabbro
	150-175	1	FCR, granite
66	20-40	1	Broken flake, basalt
67	80-90	1	FCR, granite
	110-130	1	FCR, granite
	175-200	1	Other G4 flake, Swan River Chert
88	0-25	1	Primary flake, basalt
		1	Primary flake, quartz
Total	**-**	**58**	**-**

10.5 Phase II Shovel Testing Methods and Results

Phase II shovel testing was conducted in 5-meter intervals adjacent to the positive Phase I tests. Only one auger test was dug at each Phase II test location in order to reduce unnecessary site impacts. If three auger tests had been dug at each location, then the volume of soil recovered would have been equivalent to a standard shovel test, and the artifact counts could have increased by a factor of three. A total of 29 artifacts was recovered from 0 to 210 cmbs, including lithic debris, FCR, ceramics, and faunal material (Tables 41). A summary of all artifacts from shovel tests across the site is in Table 42.

Table 41. Site 21CR156 Summary of Artifacts from Phase II Shovel Tests.

Shovel Test #	Depth (cmbs)	Count	Artifact type
51N5	0-25	1	FCR, granite
	50-75	1	Primary flake, Swan River Chert
		1	FCR, basalt
		4	FCR, granite
51NE5	25-40	1	Secondary flake, Prairie du Chien (oolitic) Chert
51NW5	50-75	2	FCR, granite
53NW5	25-50	3	FCR, granite
54N5	60-80	1	Cobble tool, abrader (grooved) & polishing stone, basalt
		1	FCR, granite
	80-95	1	Faunal, molluscan, unidentifiable fragment
55W5	0-25	1	Ceramic, body, grit temper, cord/fabric impressed
	25-50	1	FCR, granite
	100-120	1	Utilized flake, basalt
		2	FCR, granite
55NW5	110-135	1	FCR, granite
61E5	60-80	1	FCR, granite
63E5	25-50	1	Utilized flake, unidentified chert
	110-130	2	Ceramic, body, grit temper, cord/fabric impressed
	190-210	1	Broken flake, quartz
67E5	90-100	1	Secondary flake, Prairie du Chien (oolitic) Chert
88W5	50-60	1	Primary flake, unidentified chert
Total	**-**	**29**	**-**

Table 42. Site 21CR156 Summary of Artifact Count and Class from Shovel Tests, West to East Across Site.

ST #'s — L= Lithic B=Faunal Material F=FCR T=Lithic Tool C=Ceramic

Depth cmbs	88W5*	88**	50**	67**	51NW5*	67E5*	51**	51N5*	66**	51NE5*	52**	65**	64**	53NW5*	53**	63**	63E5*	54**	54N5*	62**	55W5*	55NW5*	55**	61**	61E5*
0		2L	2L					1F				1L									1C				
10																									
20							1L 2F		1L	1L				3F			1T				1F		1C		
30			2L 1F									1L												3F	
40											1F		3B 3F			1L									
50	1L				2F			1L 5F															1C 1L		
60			3F																1T 1F						1F
70											1F														
80			1L	1F																				1L	
90						1L													1B						
100											1L	3F									1T 2F				
110			1L	1F													2C					1F			
120							1B								1L									2F	
130			2F																						
140																									
150							1B 2F					1F													
160																									
170				1L												1L		1F							
180							2L																		
190																	1L								
200																									
210																1L									
220																				1L					
230																									
240																									
250																									

* single augered tests with volume of soil 1/3 that of standard shovel test; ** double augered tests with volume of soil 2/3 that of standard shovel test

10.6 Phase II XUs 1, 2, and 7

XUs 1, 2, and 7 were contiguous units placed between, but 40 cm north of, STs 55 and 55W5, which yielded three ceramic sherds, three pieces of FCR, a piece of lithic debris, and a utilized flake. Excavation was conducted in 10-cm levels below an arbitrary unit datum that was placed above the ground surface. It was not possible to excavate stratigraphically because the subtle horizon changes were not easy to distinguish in the dark colored soils during excavation. The landscape sloped downward to the south. Excavation was terminated at a depth of 150 cmbd in XU 1 and 110 cmbd in XUs 2 and 7 because of the lack of artifacts. Shovel tests were placed in the base of each XU and dug to 230 cmbd in XU 1 and 285 cmbd in XUs 2 and 7 to examine the soils and ensure that no deeply buried archaeological deposits were present. A summary of artifacts recovered in the units is presented in Table 43.

Table 43. Site 21CR156 Summary of Artifacts from XUs 1, 2 and 7.

Depth (cmbd)	Soil* Context	FCR		Lithic Debris	Lithic Tool/ Core	Faunal	Faunal Thermally Altered	Ceramic	Total	%
		Weight (g)	Count							
0-10	A	-	-	-	-	-	-	-	**0**	**0**
10-20	A	-	-	1	-	-	-	-	**1**	**1**
20-30	A	18.2	1	1	-	-	-	4	**6**	**7**
30-40	A	2.8	2	2	-	-	1	5	**10**	**12**
40-50	A/AB	32.5	7	2	-	-	1	11**	**21**	**26**
50-60	A/AB	77.8	12	2	-	1	-	1	**16**	**20**
60-70	AB	-	-	3	-	-	-	1	**4**	**5**
70-80	AB/BC	440.8	4	3	-	-	-	-	**7**	**9**
80-90	BC/2Ab	-	-	1	3***	-	-	1	**5**	**6**
90-100	BC/2Ab	61.3	1	1	-	1	-	-	**3**	**4**
100-110	2Ab	149.2	4	1	-	-	2	-	**7**	**9**
110-120	2Ab	21.0	1	-	-	-	-	-	**1**	**1**
120-130	2Ab/ 2Bgb	-	-	-	-	-	-	-	**0**	**0**
130-140	2Ab/ 2Bgb	-	-	-	-	-	-	-	**0**	**0**
140-150	2Bgb/ 2BCgb	-	-	-	-	-	-	-	**0**	**0**
Total		**803.6 g**	**32**	**17**	**3**	**2**	**4**	**23**	**81**	**-**
%		**-**	**40**	**21**	**4**	**2**	**5**	**28**	**-**	**100**

*soil horizons follow land slope and were about ten cm deeper in the southern portion of XUs; **includes 2 fragments of fired clay; *** included grinding stone, retouched flake, and tested cobble

10.6.1 Artifact Summary and Vertical Distribution

A total of 81 artifacts were recovered from XUs 1, 2, and 7, including 32 pieces of FCR, 23 ceramic sherds, 17 pieces of lithic debris, six faunal fragments, two stone tools, and a tested cobble (Tables 43). Stone tools included a grinding stone and retouched flake. One piece of wood charcoal was recovered from 40 to 50 cmbd.

Artifacts were recovered between 0 and 120 cmbd. Artifact density was greatest within a zone between 30 and 60 cmbd, which contained 58 percent of the units' artifacts. The ceramics in this zone, which include a Madison Ware rimsherd recovered from XU 2 at 30 to 40 cmbd, indicate that this zone is a Late Woodland occupation. The artifacts from 10 to 30 cmbd and 60 to 70 cmbd are also interpreted to be part of this occupation. The Late Woodland component, which occurs from 20 to 70 cmbd, is in the A horizon and upper portion of the AB horizon.

There was a small amount of lithic debris, stone tools, FCR, and a ceramic sherd below 70 cmbd in the BC and 2Ab horizons, and the cultural affiliation of this material is uncertain. It could be associated with the Late Woodland occupation above it, having been displaced downward through natural process, or it could be an earlier occupation that predates the Late Woodland. There was a minimum to moderate amount of rodent burrows, which likely caused some displacement of artifacts.

10.6.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons are presented in Figures 60 and 61. The profiles consist of fine-textured, stratified soils that formed in alluvial fan and colluvial deposits. The soil horizons are about 10 cm deeper on the south side of the units because they follow the natural slope of the terrain down to the south. The top of the 2Ab horizon occurred between 87 and 100 cmbd in the units.

10.7 Phase II XUs 3 and 4

XUs 3 and 4 were contiguous units placed 50 cm southeast of ST 63, which yielded three pieces of lithic debris, including two pieces from 175 to 210 cmbd. Excavation was conducted in 20-cm levels below an arbitrary unit datum from 0 to 60 cmbd, then in 10-cm levels from 60 to 120 cmbd. A dense clayey soil was present at 120 cmbd and excavation from 120 to 200 cmbd was done in 20-cm levels to aid in digging the clay. Excavation was conducted in 10-cm levels from 200 to 220 cmbd. The landscape sloped downward to the south. Excavation was terminated at a depth of 220 cmbd because of the lack of artifacts and water saturated soil. A summary of artifacts recovered in the units is presented in Table 44.

10.7.1 Artifact Summary and Vertical Distribution

A total of 47 artifacts were recovered from XUs 3and 4, including 21 pieces of lithic debris, 19 pieces of FCR, four cores, two stone tools, and a ceramic sherd (Table 44). Stone tools included a utilized flake and a hammerstone or pecked stone.

Artifacts were recovered between 40 and 220 cmbd. Artifact density is greatest in two zones. The upper zone (bottom of A horizon and AB horizon) between 40 and 80 cmbd contained 41 percent of the units' artifacts. This zone contained a small amount of FCR and lithic debris, three cores, and a thin, cord/fabric impressed ceramic sherd that is probably Late Woodland ware. This zone is interpreted as a Late Woodland occupation and it occurs in the lower portion of the A horizon, AB horizon, and the upper portion of the B1 horizon.

The lower zone between 180 and 220 cmbd (Bt/Ab horizon) contained 49 percent of the units' artifacts. This zone contained a small amount of FCR, a moderate amount of lithic debris, two stone tools, and a core. This zone is interpreted as a Middle Archaic occupation based on a radiocarbon date obtained from the soil, which provided a date of 5660 to 5570 cal BC (2 Sigma).

The small amount of artifacts outside of these primary artifact zones were likely displaced by natural processes, but could also represent other ephemeral occupations. There were some rodent burrows, which likely caused displacement of artifacts. Soil disturbance from rodent runs was assessed as minimum in the lower zone and minimum to moderate in the upper zone.

Table 44. Site 21CR156 Summary of Artifacts from XUs 3 and 4.

Depth (cmbd)	Soil Context	FCR	Lithic Debris	Lithic Tool	Lithic Core	Ceramic	Total	%
0-20	A	-	-	-	-	-	**0**	**0**
20-40	A	-	-	-	-	-	**0**	**0**
40-60	A/AB	3	1	-	-	1	**5**	**11**
60-70	AB	2	5	-	1	-	**8**	**17**
70-80	AB	4	1	-	1	-	**6**	**13**
80-90	AB	1	-	-	1	-	**2**	**4**
90-100	AB/Bw	-	-	-	-	-	**0**	**0**
100-110	Bw	1	-	-	-	-	**1**	**2**
110-120	Bw	-	-	-	-	-	**0**	**0**
120-140	Ab1	1	-	-	-	-	**1**	**2**
140-160	Ab1	1	-	-	-	-	**1**	**2**
160-180	Btj	-	-	-	-	-	**0**	**0**
180-200	Bt(Ab)	2	10	2	1	-	**15**	**32**
200-210	Bwb	4	2	-	-	-	**6**	**13**
210-220	Bwb	-	2	-	-	-	**2**	**4**
Total	**-**	**19**	**21**	**2**	**4**	**1**	**47**	**-**
%	**-**	**40**	**45**	**4**	**9**	**2**	**-**	**100**

10.7.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons are presented in Figures 62 and 63. The profiles consist of stratified soils that formed in alluvial fan and colluvial deposits. The soil horizons are about five cm deeper on the south side of the units because they follow the natural slope of the terrain down to the south. Two buried soils are present, with the lowest buried soil associated with a Middle Archaic occupation.

10.8 Phase II XUs 5, 6, and 8

XUs 5, 6, and 8 were contiguous units placed between STs 51 and 51N5, which yielded ten pieces of FCR, five pieces of lithic debris, and two calcined bones. Excavation was conducted in 10-cm levels below an arbitrary unit datum that was placed above the ground surface. The landscape sloped downward to the south. Excavation was terminated at a depth of 160 cmbd because of the lack of artifacts. Shovel tests were placed in the base of each XU and dug to 232 cmbd to examine the soils and ensure that no deeply buried archaeological deposits were present. The water table was at about 225 cmbd. A summary of artifacts recovered in the units is presented in Table 45.

Table 45. Site 21CR156 Summary of Artifacts from XUs 5, 6, and 8.

Depth (cmbd)	Soil Context	FCR	Lithic Debris	Lithic Tool	Faunal	Faunal Thermally Altered	Total	%
0-30	A1	-	1	-	-	-	**1**	**<1**
30-40	A1-AB	3	1	-	-	1	**5**	**1**
40-50	A1-AB	3	1	2	-	-	**6**	**2**
50-60	A1-AB-Bw	6	1	-	-	-	**7**	**2**
60-70	AB-Bw	20	6	-	-	-	**26**	**7**
70-80	AB-Bw	9	1	-	-	-	**10**	**3**
80-90	Bw-BE	7	-	1	-	-	**8**	**2**
90-100	Bw-BE-Bt-C1	3	1	-	-	-	**4**	**1**
100-110	BE-Bt-C1	4	1	-	1	-	**6**	**2**
110-120	Bt-C1	5	1	-	1	-	**7**	**2**
120-130*	C1	6	-	1	3	7	**17**	**5**
130-140*	C1	3	5	2	5	233	**248**	**70**
140-150	C1	1	-	-	2	3	**6**	**2**
150-160	C1	-	1	-	2	-	**3**	**1**
Total		**70**	**20**	**6**	**14**	**244**	**354**	**-**
%		**20**	**6**	**2**	**4**	**69**	**-**	**100***

*includes Feature 1

10.8.1 Artifact Summary and Vertical Distribution

A total of 354 artifacts were recovered from XUs 5, 6, and 8, including 70 pieces of FCR, 20 pieces of lithic debris, six stone tools, 14 unmodified faunal fragments, and 244 thermally altered faunal fragments (Table 45). Stone tools included two projectile point bases, two utilized flakes, a grinding stone, and an abrader/polishing stone.

Artifacts were recovered between 0 and 160 cmbd. Artifact density was greatest in a narrow zone from 130 to 140 cmbd, which also likely includes the adjacent levels above and below it. This zone and the adjacent levels (120 to 130 cmbd and 140 to 150 cmbd in the C1 horizon) contained 77 percent of the units' artifacts, including a fire hearth (Feature 1, discussed in Section 10.9) and a high density of thermally-altered faunal material along with a small amount of FCR, lithic debris, and stone tools. This zone is interpreted as a Late Paleoindian occupation based on two broken Late Paleoindian point bases (an Agate Basin-like and an Eden-like type) and a radiocarbon date of 5990 to 5880 cal BC (2 Sigma) obtained from calcined turtle shell. Non-feature soil in this component was screened through 1/8-inch mesh in XU 5 from 140 to 145 cmbd, in XU 6 from 130 to 145 cmbd, and in XU 8 from 120 to 140 cmbd. Soil disturbance from rodent runs was assessed at minimum to moderate in the component.

A few artifacts are present above this zone, and these likely represent subsequent occupations, possibly including the Late Woodland component that was identified in the east half of the site. There were some rodent burrows, which likely caused displacement of a small amount of artifacts.

10.8.2 Soils and Stratigraphy

Wall profiles and photographs from the units that depict the soil horizons are presented in Figures 64 to 67. The profiles consist of stratified soils that formed in colluvium and alluvial fan deposits. The soil horizons are about five cm deeper on the south side of the units because they follow the natural terrain slope down to the south. A buried soil is present at 185 to 195 cmbd.

10.9 Feature 1

Feature 1 was initially identified as two dark, oval-shaped soil stains in XUs 5 and 6. A thin layer of the upper portion of the feature was excavated in XUs 5 and 6 prior to feature identification. Feature 1 West was the western stain in XU 5, and Feature 1 East is the eastern stain in XUs 5 and 6. Calcined and burned animal bone was found within and adjacent to the feature. No FCR, charcoal, or ash were observed in the feature fill. Several pieces of FCR were recovered from the soil adjacent to the feature. The dark color of the feature was likely organic staining from charcoal that had decomposed. The feature appears to have been a fire hearth, based on its shape, dark color, and thermally altered fauna.

Soil samples from the feature and associated shell and bone recovered from soil adjacent to the feature were dated. A discussion of the dating is presented in in Section 10.10. The most reliable date for the feature is the calcined bone in XU 5 from 130-140 cmbd that yielded a date of 5990 to 5880 cal BC (see Section 10.10).

The botanical material from the light fraction and faunal remains from the heavy fraction were sent to the Archaeology Department at the University of Wisconsin-La Crosse for analysis. The results of this analysis are included in the discussion of Feature 1 West and East below.

A small number of Succineidae family gastropod shells were also recovered from the feature. They are a family of small to medium-sized, air-breathing land snails that usually live in damp habitats such as marshes. These creatures can burrow deeply, and therefore they are not interpreted to be associated with the site component.

The planview of Feature 1 West at 131 cmbd and Feature 1 East at 135 cmbd was recorded in illustrations and photos, and the profile of Feature 1 West is clearly outlined in the north wall of XU 5 (Figures 68 to 70).

Feature 1 West

Soil from Feature 1 West in XU 5 was hand troweled and screened through 1/8-inch mesh from 131 to 138 cmbd. The feature fill (7.5 liters) in XU 8 from 128 to 138 cm was recovered for flotation and was processed at the FCRS lab. Feature 1 West was oval in planview and had a maximum size of 65 cm by 80 cm and was ten cm deep. In profile, Feature 1 West had a shallow, basin shape. Several rodent runs were observed in Feature 1 West.

Artifacts recovered from the Feature 1 West included 35 faunal fragments, one piece of lithic micro-debitage (<¼ inch in size), and a very small piece of unidentifiable wood charcoal (Table 46). The faunal material includes a wide variety of remains including fish, turtle, snake, mollusk, medium mammal (possibly muskrat), small mammal, unidentified mammal, and unidentified.

Table 46. Site 21CR156 Feature 1 West in XUs 5 and 8 Artifact Summary.

Depth (cmbd)	Faunal	Lithic	Botanical	Total	%
XU 8 128-138	10	-	1	**11**	**30**
XU 5 130-140	25	1	-	**26**	**70**
Total	**35**	**1**	**1**	**37**	**-**
%	**95**	**3**	**3**	**-**	**100***

Faunal: n=27 are less than ¼ inch in size; lithic is less than ¼ inch in size;
Botancial: unidentified wood charcoal that is less than ¼ inch in size and weighs less than .001 gram

Feature 1 East

Soil from Feature 1 East in XUs 5 and 6 was hand troweled and screened through 1/8-inch mesh from 131 to 138 cmbd. The feature fill (8.0 liters) in XU 5 and 6 from 138 to 140 cmbd was recovered for flotation. The small base of the feature from 140 to 144 cmbd was screened through 1/8-inch mesh, but no artifacts were recovered. Feature 1 East was oval in planview and had a maximum size of 70 cm by 55 cm and was 13 cm deep. In profile Feature 1 East had a shallow, basin shape.

Artifacts recovered from the Feature 1 West included 64 faunal fragments, two pieces of lithic micro-debitage (<¼ inch in size), and three charred botanical remains (Table 47). The faunal material includes a wide variety of remains including fish (gar), turtle, mollusk, medium mammal (possibly muskrat), and unidentified mammal.

The charred botanical remains include unidentified wood charcoal (0.022 gram), one fragment of nutshell, Juglandaceae (<0.001 gram), and one fragment of starchy material (<0.001 gram). The analysis and interpretation of these materials from Constance Arzigian (personal communication 2013) is:

> "The nutshell is a very small fragment from the Juglandaceae family, and is either hickory, black walnut, or butternut, but is too small for species identification. Environmental interpretations are limited, except that there would have been at least some wooded land nearby. The nutshell might have been the result of consumption of nuts for food, but could also have been an accidental inclusion in the fire. The piece of starchy material also cannot be identified further, but may come from the burning of a number of different things, including either nutmeat, any sort of tuberous root, or a fragment of a larger starchy seed such as a grass. It may not be subsistence remain, but instead could have been from a root still attached to plant material thrown into the fire."

Table 47. Site 21CR156 Feature 1 East XUs 5 and 6 135 to 140 cmbd Artifact Summary.

Depth (cmbd)	Faunal	Lithic	Botanical	Total	%
135-140	52	-	-	**52**	**75**
138-140	12	2	3	**17**	**25**
Total	**64**	**2**	**3**	**69**	**-**
%	**93**	**3**	**4**	**-**	**100***

Faunal: n=55 are less than ¼ inch in size;

Lithic Debris: n= 2 are less than ¼ inch in size;

Botanical: wood charcoal, nutshell, and starchy material that are less than ¼ inch in size and less than 0.1 gram

10.10 Radiocarbon Dating

Eight samples from the site were submitted to Beta Analytic, Inc for AMS dating (Appendix D). The samples were collected for the purpose of determining the age of the site components.

XUs 3 and 4 and Middle Archaic Component

A buried soil sample from 130 to 140 cmbd in the Ab1 horizon of XU 3 yielded a date of 3650 to 3630 cal BC (2 Sigma) (Table 48). This soil is not directly associated with a specific site component, but was dated to provide additional site data.

The Archaic component in XUs 3 and 4 was in the Bt(Ab) horizon from 180 to 210 cmbd. This component contained only lithics, so the only material to date was sediment. The soil sample was collected from 180 to 190 cmbd in the Bt(Ab) horizon of XU 3, and it yielded a date of 5660 to 5610 cal BC (2 Sigma) (Table 48). It is probable that the soil date is younger than the archaeological component contained in the soil, based on soil dates from XUs 5, 6, and 8, which were 700 to 2,000 years younger than the archaeological component. However, nearby site 21CR155 yielded a soil date that was 580 to 990 years older than the archaeological component.

Table 48. Site 21CR156 Radiocarbon Dates from Component in XUs 3 and 4.

Material/ Provenience	Beta Lab No.	$^{13}C/^{12}C$ Ratio (o/oo)	Conventional ^{14}C Age B.P.	2 Sigma Calibrated Results (95% Probability)
Organic sediment XU 3 130-140 cmbs	341002	-17.3 o/oo	4810 ± 30 BP	Cal BC 3650 to 3630 (Cal BP 5600 to 5580) Cal BC 3590 to 3530 (Cal BP 5540 to 5480)
Organic sediment XU3 180-190 cmbs	341001	-16.4 o/oo	6710 ± 30 BP	Cal BC 5660 to 5610 (Cal BP 7610 to 7560) Cal BC 5590 to 5570 (Cal BP 7540 to 7520)

Late Paleoindian Component in XUs 5, 6, and 8

The target component in XUs 5, 6, and 8 was from 130 to 140 cmbd. This component includes Feature 1 (fire hearth), calcined animal bone, shell, lithic debris, and two Late Paleoindian projectile point bases. Six samples were submitted for dating, and the results are summarized in Table 49.

The calcined animal bone recovered in XU 5 from 130 to 140 cmbs yielded a date of 5990 to 5880 cal BC (2 Sigma). The bone date is interpreted as being accurate because it was very unlikely to have been contaminated, and calcined bone typically yields very accurate results, according to Ron Hatfield, Deputy Director and Quality Manager of Beta Analytic, Inc.

The shell recovered in XU 6 from 130 to 140 cmbs yielded a date of 7520 to 7340 cal BC (2 Sigma). This date is probably too old because of reservoir effects. According to Ron Hatfield, Deputy Director and Quality Manager of Beta Analytic, Inc. (personal email communication, February 2013):

> "Conventional Radiocarbon Age (CRA) does not take into account specific differences between the activity of different carbon reservoirs. In order to ascertain the ages of samples which were formed in equilibrium with different reservoirs to these materials, it is necessary to provide an age correction. Implicit in the Conventional Radiocarbon Age BP is the fact that it is not adjusted for this correction. Radiocarbon samples which obtain their carbon from a different source (or reservoir) than atmospheric carbon may yield what is termed apparent ages. A shellfish alive today in a lake within a limestone catchment, for instance, will yield a radiocarbon date which is excessively old. The reason for this anomaly is that the limestone, which is weathered and dissolved into bicarbonate, has no radioactive carbon. Thus, it dilutes the activity of the lake meaning that the radioactivity is depleted in comparison to 14C activity elsewhere. The lake, in this case, has a different radiocarbon reservoir than that of the majority of the radiocarbon in the biosphere**,** and therefore an accurate radiocarbon age requires that a correction be made to account for it"

Organic sediment collected from three separate depths in Feature 1 was dated. The sample in XU 8 Feature 1 West from 128 to 138 cmbs yielded a date of 3960 to 3800 cal BC (2 Sigma). The sample in XUs 5 and 6 Feature 1 East from 138 to 140 cmbs yielded a date of 4790 to 4690 cal BC (2 Sigma). The sample in XU 6 Feature 1 East 140 to 144 cmbs yielded a date of 5210 to 4990 cal BC (2 Sigma).

Organic sediment was collected from below the target component in a buried soil in XU 6 from 205 to 215 cmbs. The sample yielded a date of 6500 to 6420 cal BC (2 Sigma).

The soil dates are all internally consistent, as the age increases at a relatively steady rate with depth. However, the soil dates do no correlate with the calcined bone sample date, which is approximately 700 to 2,000 years older than the sediment dates in Feature 1. The bone date is likely more accurate than the sediment dates, according to Ron Hatfield, Deputy Director and Quality Manager of Beta Analytic, Inc. Mr. Hatfield described some of the circumstances that may cause inaccuracies in sediment dating (personal email communication, February 2013):

> "Sediment dates, due to the nature of their formation, may have a single source of carbon or multiple sources of different aged carbon combining together. Also with sediments there can be physical problems, reworking, redeposition and then chemical post-depositional problems such as the movements of humic acids (usually down through the

profile from overlying younger sediments but occasionally from below with ground water table fluctuations and or lateral movements). Sediments may also form over a long period of time (hundreds of years). In general sediment dates if they don't yield an accurate result will tend to yield results that are somewhat more recent due to younger humic acids being present….this is not always the case as older humic acids can be brought up through the profile by the water table or older sediment redeposited or reworked into existing sediment layers".

Table 49. Site 21CR156 Radiocarbon Dates from the Late Paleoindian Component in XUs 5, 6, and 8.

Material/ Provenience	**Beta Lab No.**	**$^{13}C/^{12}C$ Ratio (o/oo)**	**Conventional ^{14}C Age B.P.**	**2 Sigma Calibrated Results (95% Probability)**
Calcined (cremated) bone carbonate XU 5 130-140 cmbd	341000	-16.4 o/oo	7040 ± 30 BP	Cal BC 5990 to 5880 (Cal BP 7940 to 7830)
Shell XU 6 130-140 cmbd	340999	-10.0 o/oo	8360 ± 40 BP	Cal BC 7520 to 7340 (Cal BP 9470 to 9290)
Organic sediment XU 8 Feature 1 West 128-138 cmbd	341006	-18.7 o/oo	5090 ± 30 BP	Cal BC 3960 to 3890 (Cal BP 5910 to 5840) Cal BC 3880 to 3800 (Cal BP 5830 to 5750)
Organic sediment XU 5 & 6 Feature 1 East 138-140 cmbd	341005	-21.5 o/oo	5870 ± 30 BP	Cal BC 4790 to 4690 (Cal BP 6740 to 6640)
Organic sediment XU 6 Feature 1 East 140-144 cmbd	341004	-22.0 o/oo	6130 ± 30 BP	Cal BC 5210 to 4990 (Cal BP 7160 to 6940)
Organic sediment XU 6 205-215 cmbd	341003	-18.2 o/oo	7610 ± 40 BP	Cal BC 6500 to 6420 (Cal BP 8450 to 8370)

10.11 Artifact Summary

A total of 569 artifacts were recovered from the site during Phase I survey and Phase II evaluation (Table 50). Faunal material (n=270; 47%) was the most abundant artifact type followed by FCR (n=165; 29%), lithics (n=105; 18%), and ceramics (n=29; 5%).

Table 50. Site 21CR156 Summary of Artifacts.

Artifact Type	Total	%
Faunal	**270**	**47**
FCR	**165**	**29**
Lithic	**105**	**18**
Ceramic	**29**	**5**
Total	**569**	**-**
%	**-**	**100**

10.12 Faunal Analysis

There were 270 faunal fragments recovered from the site (Table 51). The most numerous remains were turtle (n=137; 51%, includes cf. turtle and Trionyx sp.) and unidentified (n=95; 35%). The turtle remains are largely unidentified to species except for a small amount of Trionyx sp. (soft-shelled turtle) and "pond" turtle variety in XU 5 from 120 to 140 cmbd. The unidentified remains were generally small, fragmentary pieces (most are < ¼ inch) that could not be identified.

Remains that were more sparsely represented, which comprise 16 percent of the assemblage, include molluscan (bivalve shell), mammal, Colubridae (nonpoisonous snake), Lepisosteus sp. (gar fish), fish, small mammal, medium mammal (possibly muskrat), medium/large mammal, and large mammal.

Table 51. Site 21CR156 Summary of Faunal Material.

Class	Thermally Altered	Unmodified	Total	%
Turtle	104	-	**104**	**39**
Unidentified	92	3	**95**	**35**
Cf. turtle	28	-	**28**	**10**
Molluscan (bivalve)	1	14	**15**	**6**
Mammalian	7	-	**7**	**3**
Trionyx sp. (soft shell turtle)	5	-	**5**	**2**
Mammalian, small or reptile	2	-	**2**	**1**
Colubridae (nonpoisonous snake)	2	-	**2**	**1**
Lepisosteus sp. (gar)	2	-	**2**	**1**
Mammalian, small	2	-	**2**	**1**
Mammalian/turtle	2	-	**2**	**1**
Mammalian, medium (possibly muskrat)	2	-	**2**	**1**
Mammalian medium/large	-	2	**2**	**1**
Fish	1	-	**1**	**<1**
Mammalian, large	-	1	**1**	**<1**
Total	**250**	**20**	**270**	**-**
%	**93**	**7**	**-**	**100***

Size grade counts for the faunal material were as follows: SG1 ≥ 1.0 inch (n=1; <1%); SG2 <1.0 inch to ≥0.5 inch (n=4; 2%); SG3 <0.5 inch to ≥0.233 inch (n=53; 20%); and SG4 < 0.233 inch (n=212; 78%).

The faunal assemblage represents aquatic and terrestrial remains that were likely obtained from the local river valley environment that includes Rice Lake and adjacent wetlands and uplands. The faunal assemblage probably represents subsistence remains and not natural deaths at the site, as most (93 percent) were thermally altered (burned or calcined) as a result of discarding the bones into a fire, and most of the remains were recovered in direct association with archaeological materials and a fire hearth (Feature 1). The only faunal material not thermally altered included several mollusk fragments, which generally do not show clear thermal alteration, a few unidentified fragments, a large mammal tooth, and two medium/large mammal fragments.

Identifiable elements are presented in Table 52. Most of these elements are turtle shell fragments, with a turtle phalange and phalanx also present. Other elements include a fish spine, a tooth fragment from a large mammal, a small mammal or reptile long bone fragment, vertebrae from a medium mammal (possibly muskrat) and a snake, and an innominate fragment and talus from a small mammal.

Table 52. Site 21CR156 Summary of Identifiable Faunal Elements.

Provenience (cmbd)	Count	Class	Element
ST 51; 150-165 cmbs	1	Turtle	Carapace (shell) fragment
XU 1; 90-100 cmbd	1	Mammalian, large	Tooth, fragment
XU 5 120-130 cmbd	1	Trionyx sp.	Carapace (shell) fragment
	2	Turtle	Carapace (shell) fragment
XU 5 130-140 cmbd	1	Mammalian, small or reptile	Longbone fragment
	68	Turtle	Carapace (shell) fragment
	4	Trionyx sp.	Carapace (shell) fragment
XU 5 Feature 1 West 130-140 cmbd	1	Fish	Spine fragment
	2	Cf. Turtle	Carapace fragment
	1	Mammalian, medium (possibly muskrat)	Vertebra, caudal fragment
	2	Turtle	Phalange, proximal fragment
XU 6; 130-140 cmbd	1	Mammalian, small or reptile	Longbone fragment
	25	Turtle	Carapace fragment
XU 5&6 Feature 1 East 135-140 cmbd	25	Cf. Turtle	Carapace fragment
	1	Mammalian, medium (possibly muskrat)	Vertebra, caudal fragment
XU 5&6 Feature 1 East 138-140 cmbd	4	Turtle	Shell fragment
	1	Turtle	Phalanx
	1	Molluscan	Shell fragment
	1	Turtle	Shell fragment
XU 8 Feature 1West 128-138 cmbd	1	Mammalian, small	Talus (foot/ankle bone)
	1	Mammalian, small	Innominate (pelvis) fragment
	2	Colubridae (nonpoisonous snake)	Vertebra
	1	Mammalian	Caudal vertebrae

Of the 270 faunal fragments at the site, 255 (94%) are associated with the Late Paleoindian component from 120 to 150 cmbd in XUs 5, 6, and 8. These remains are summarized in Table 53.

Nearly all (99 percent) of these remains were thermally altered (burned or calcined) as a result of discarding bones into a fire hearth, which was identified as Feature 1 East and West. The remains include a wide variety of aquatic and terrestrial animals, and it is notable that no large mammal remains and only one medium to large mammal bone were present in this assemblage. A similar pattern of generalized foraging with a reliance on wetland and aquatic resources was identified at several Late Paleoindian sites in Wisconsin (Kuehn 2010).

Table 53. Site 21CR156 Summary of Faunal Material from Late Paleoindian Component in XUs 5, 6, and 8 from 120 to 160 cmbd.

Class	Thermally Altered	Unmodified	Total	%
Turtle	103	-	**103**	**40**
Unidentified	86	-	**86**	**34**
Cf. turtle	28	-	**28**	**11**
Molluscan (bivalve)	-	12	**12**	**5**
Mammalian	7	-	**7**	**3**
Trionyx sp. (soft shell turtle)	5	-	**5**	**2**
Mammalian, small or reptile	2	-	**2**	**<1**
Mammalian, medium (possibly muskrat)	2	-	**2**	**<1**
Mammalian/turtle	2	-	**2**	**<1**
Colubridae (nonpoisonous snake)	2	-	**2**	**<1**
Lepisosteus sp. (gar fish)	2	-	**2**	**<1**
Mammalian, small	2	-	**2**	**<1**
Mammalian medium/large	-	1	**1**	**<1**
Fish	1	-	**1**	**<1**
Total	**243**	**10**	**255**	**-**
%	**96**	**4**	**-**	**100***

10.13 FCR Analysis

A total of 165 pieces of FCR were recovered. Most of these are granitic (n=135), but other materials include basalt (n=7), gabbro (n=6), unidentified igneous (n=6), unidentified material (n=6), limestone (n=3), metamorphic (n=1), and quartzite (n=1).

FCR was confidently identified because of its distinctive characteristics (angular fractures, spalling, friable condition, etc) and because of the lack of naturally occurring cobbles in most of the soil at the site. Nearly all of the FCR consists of angular pieces, with only a small amount of friable or spall pieces. Size grade counts for the FCR were as follows: SG1 ≥ 1.0 inch (n=77; 47%); SG2 <1.0 inch to ≥0.5 inch (n=69; 42%); and SG3 <0.5 inch to ≥0.233 inch (n=19; 11%).

The presence of FCR and thermally altered faunal material suggests that fire heaths or cooking pits were present, and one hearth feature was identified. The cobbles used for heating and/or cooking, which became fire-cracked, were likely procured from local sources where rocks were exposed, such as ravines or streams.

10.14 Lithic Analysis

The lithic assemblage from the site consists of 86 pieces of lithic debris, 14 stone tools, and five cores (Table 54). A variety of flake types, tools, and lithic materials are present in the assemblage. While some of the lithic assemblage is directly associated with specific site components defined from radiocarbon dating and diagnostic artifacts (see component discussions below), most of the assemblage could not be associated with specific site components based on the limited excavation and complex site stratigraphy. Some of the unassociated lithic materials likely belong to the defined components, but some may also be associated with other unrecognized site components.

Table 54. Site 21CR156 Summary of Lithic Artifacts.

Material	**Primary Flake**	**Secondary Flake**	**Tertiary Flake**	**Other Grade 4**	**Shatter**	**Broken Flake**	**Bipolar Flake**	**Tool/Core**	**Total**	**%**
Prairie du Chien (oolitic) Chert	8	9	2	1	1	7	-	3 utilized flakes, 1 nonbifacial core, and 1 bifacial core	**33**	**31**
Quartz	4	-	-	6	1	6	1	1 projectile point and 1 tested cobble	**20**	**19**
Swan River Chert	1	1	-	4	1	6	-	-	**13**	**12**
Unidentified chert	4	1	-	-	-	1	-	1 utilized flake	**7**	**7**
Basalt	2	-		1		2	-	1 utilized flake and 1 abrader/polishing stone	**7**	**7**
Unidentified material	5	-	-	1	1	-	-	-	**7**	**7**
Granite	-	-					-	1 hammerstone/pecked stone, 2 grinding stones, 1 bifacial core, and 1 bipolar core	**5**	**5**
Hixton Group Quartzite	-	1	-	1	-	-	-	-	**2**	**2**
Galena Chert	-	1	1	-	-	-	-	-	**2**	**2**
Red River Chert	2	-	-	-	-	-	-	-	**2**	**2**
Igneous	-	-	-	-	-		-	2 retouched flakes	**2**	**2**
Burlington White Mottled Chert	-	1	-	-	-	-	-	-	**1**	**1**
Kakabeka Chert	-	-	-	-	-	-	1	-	**1**	**1**
Quartzite	1	-	-	-	-	-	-	-	**1**	**1**
Chalcedony	-	-	-	-	-	-	-	1 projectile point	**1**	**1**
Limestone	-	-	-	-	-	-	-	1 abrader/polishing stone	**1**	**1**
Total	**27**	**14**	**3**	**14**	**4**	**22**	**2**	**19**	**105**	**-**
%	**26**	**13**	**3**	**13**	**4**	**21**	**2**	**18**	**-**	**100**

Size grade counts for the lithic debris were as follows: SG1 ≥ 1.0 inch (n=1; 1%); SG2 <1.0 inch to ≥0.5 inch (n=16; 19%); SG3 <0.5 inch to ≥0.233 inch (n=53; 62%); and SG4 < 0.233 inch (n=16; 18%).

Lithic Debris Types and Core Types

The lithic debris assemblage consists of primary flakes (n=27; 26%), broken flakes (n=22; 21%), secondary flakes (n=14; 13%), other G4 flakes (n=14; 13%), shatter (n=4; 4%), tertiary flakes (n=3; 3%), and bipolar flakes (n=2; 2%). The abundance of primary flakes, in combination with four cores and a tested cobble, indicates that initial reduction was a primary site activity. A moderate amount of secondary flakes was recovered, indicating bifacial shaping and thinning also occurred. A small amount of tertiary flakes were present, indicating that late-stage tool manufacturing or tool maintenance was a minor site activity, although they may be underrepresented because of their small size. Broken flakes and other G4 flakes are not diagnostic of a specific reduction stage. In summary, the lithic debris suggests that a full range of lithic activities occurred at the site. Probable heat treatment was observed on seven pieces of lithic debris, as indicated by their color and texture, including Swan River Chert, Prairie du Chien Chert, and Hixton Group Quartzite.

Four cores and one tested cobble were recovered. The cores include two bifacial cores (Prairie du Chien Chert and granite) with edges prepared for flaking platforms. The nonbifacial core (Prairie du Chien Chert) has unpatterned multidirectional flaking and lacks prepared edges. One bipolar core of granite and a tested quartz cobble were also recovered.

Stone Tools

Fourteen stone tools were recovered, including five utilized flakes, two abraders/polishing stones, two grinding stones, two projectile point fragments, two retouched flakes, and a hammerstone/pecked stone. The chipped stone tools were manufactured from a variety of materials, including Prairie du Chien Chert, quartz, chalcedony, basalt, igneous, and unidentified chert. The hammerstone and groundstone tools were manufactured from basalt, granite, and limestone.

Projectile points are used for hunting and indicate that site activities were associated with the procurement of game animals. Utilized flakes, retouched flakes, and projectile points/knives are primarily light-duty cutting and slicing tools used on animal remains, wood, and plants. The abraders/polishing stones were likely rubbed against softer materials, such as hides or wood, to make them more pliable or smooth. One of the abraders is made of basalt and has several very finely incised lines or grooves, indicating that the object ground into it was made of a hard material with a sharp edge, probably a chipped stone tool (e.g., biface, knife, or projectile point). The hammerstones were used for flint knapping, processing foods such as acorns, or marrow extraction from animal bones. Grinding stones were typically used grinding, crushing, and processing food or minerals. These tools suggest that site activities included hunting, butchering, animal/plant processing, hide working.

Lithic Material Types

Lithic materials consisted primarily of Prairie du Chien Chert (oolitic) (n=33; 31%) followed by quartz (n=20; 19%) and Swan River Chert (n=13; 12%), with smaller amounts of unidentified chert (n=7; 7%), basalt (n=7; 7%), unidentified material (n=7; 7%), granite (n=5; 5%), Galena Chert (n=2; 2%), Hixton Group Quartzite (n=2; 2%), Red River Chert (n=2; 2%), igneous (n=2;

2%), Burlington White Mottled Chert (n=1; 1%), Kakabeka Chert (n=1; 1%), quartzite (n=1; 1%), chalcedony (n=1; <1%), and limestone (n=1; 1 %).

Most of these lithic materials are locally available (Bakken 1997), with bedrock sources of Prairie du Chien Chert probably available in the vicinity (Lusardi 1997). Galena Chert, a non-local material, is available in lag deposits and bedrock exposures in southeastern Minnesota and adjacent areas of Wisconsin, Iowa, and Illinois (Morrow 1994). The unidentified materials could be local or exotic. Exotic materials include Burlington White Mottled Chert that was likely acquired through trade networks or travel to its source areas in southeastern Iowa and west-central Illinois (Morrow and Behm 1986) and Hixton Group Quartzite, which is derived from west-central Wisconsin (Boszhardt 1998). The unidentified chert and materials could be local or exotic.

10.14.1 Lithic Assemblage in the Late Paleoindian Component in XUs 5, 6, and 8

The lithic assemblage associated with the Late Paleoindian component is very sparse and consists of six pieces of lithic debris and three stone tools (Table 55). This component occurs in XUs 5, 6, and 8 from 120 to 160 cmbd and in ST 51 from 175 to 200 cmbs.

Table 55. Site 21CR156 Lithic Artifacts from Late Paleoindian Component.

Material	**Other Grade 4**	**Broken Flake**	**Tool/Core**	**Total**	**%**
Swan River Chert	1	3	-	**4**	**36**
Quartz	2	-	1 projectile point	**3**	**27**
Chalcedony	-	-	1 projectile point	**1**	**9**
Limestone	-	-	1 abrader / polishing stone	**1**	**9**
Unidentified Chert	-	1	-	**1**	**9**
Unidentified Material	1	-	-	**1**	**9**
Total	**4**	**4**	**3**	**11**	**-**
%	**36**	**36**	**27**	**-**	**100**

Lithic Debris Types

The lithic debris assemblage consists of broken flakes (n=4; 36%) and other G4 flakes (n=4; 36%). Neither of these debris types is diagnostic of specific lithic activities. All of the lithic debris lacks cortex. The size grades are SG3 <0.5 inch to ≥0.233 inch and SG4 <0.233 inch, except for one piece that is SG2 <1.0 inch to ≥0.5 inch. The lack of cortex and small size of the debris indicate that the debris is probably from later stages of reduction and not initial reduction.

Stone Tools

Stone tools include an abrader/polisher and two point bases. The abrader or polishing stone is limestone and has a smoothed surface. It was likely rubbed against softer materials, such as hides or wood, to make them more pliable or smooth.

Eden-Like Stemmed Point Base

The base of a stemmed projectile point made of quartz was recovered in XU 5 from 130 to 140 cmbd (Figure 71 and 72; Cat.# 65.1). The point is bifacially flaked, with some pressure flakes extending towards the midline. However, the flaking pattern and technology is not clear because of the difficulty is seeing the flake scars on the quartz material. The point has a thick, biconvex cross-section. The base is straight, and the stem sides are parallel. The base and stem are heavily ground. The point base measures 23.3 mm in length, 15.6 mm in width, 8.8 mm wide between the notches, and 7.6 mm in thickness. The artifact is slightly encrusted with calcium carbonate accretions. The point appears to have been extensively reworked, as the blade segment beyond the stem is quite small. The breakage on the stem is a lateral snap or bend-break type that is located near where the stem would have connected to the blade. The breakage is consistent with an impact fracture or prying force, such as removing the point embedded in carcass. Interestingly, the type of fracture and angle of fracture is nearly identical to the Agate Basin base recovered nearby in the same component.

The fragmentary condition of the point base does not allow a conclusive classification. The age and the association with an Agate Basin-like point indicate a Late Paleoindian designation. The extensive basal grinding and general shape suggest that it is stemmed base, generally similar to the Scottsbluff Cluster (Justice 1987; Morrow 1984), although it is smaller. It most closely resembles the Eden type, which is narrower and more biconvex in cross-section than the Scottsbluff type. The Scottsbluff and Eden points date from approximately 9,000 to 7,500 cal BC at sites in the Plains region (Frison 1991), and may be considerably younger in the Great Lakes region, perhaps as late at 6000-5000 cal BC in the northern Minnesota (Gibbon 2012:73). The type occurs across the Plains, typically west of the Mississippi River, but also extending into Minnesota and Wisconsin. They are reported from scattered locations across Minnesota, Wisconsin, and Iowa (Alex 2000; Florin 1996; Gibbon 2012; Mason 1997). None are reported in Carver County, but they occur in small amounts in adjacent counties.

Agate Basin-like Point Base

The base of a lanceolate projectile point made from a whitish to clear-colored, fine-grained chalcedony was recovered in XU 6 from 130 to 140 cmbd (Figures 71 and 72; Catalog # 71.1). The point is bifacially flaked, and both faces have percussion flake scars. The fragmentary condition and small size inhibits a determination of flaking pattern and technology. Semi-patterned pressure flaking is present along some portions of the artifact, with some of the flakes extending to the midline. The point has a biconvex cross-section and measures 23.5 mm in length, 23.7 mm in width, and 7.9 mm in thickness. The original length was probably about 80.0 mm or more. The base is straight with expanding sides and lacks grinding. The lateral basal edges have slight crushing and small hinge fractures or short pressure flakes. The lack of grinding and broken condition suggests that either: 1) the point was broken in manufacture; 2) the point was finished without grinding and was broken during use; or 3) the point was finished with grinding and the base was resharpened or used as a bipolar core, after its usefulness as spear point was exhausted because of breakage.

The breakage on the base appears to be a lateral snap or bend-break type that is located low on the base within the hafting area. This type of fracture could have been caused by impact shock energy (end shock), causing a snap within the haft (Meltzer 2006:285). Interestingly, the type of fracture and angle of fracture plane is nearly identical with the Eden-like stemmed point base recovered nearby in the same component.

The point is most similar to the Agate Basin type, based on its shape, size, and technological attributes (Justice 1987; Morrow 1984; Frison and Stanford 1982). The Agate Basin type dates from approximately 10,500 to 9,000 cal BC at sites in the Plains region (Frison 1991), and may be considerably younger in the Great Lakes region, perhaps as late at 6000-5000 cal BC in the northern Minnesota (Gibbon 2012:73). The Agate Basin type occurs across a wide area of the United States, ranging from the Plains to the Eastern Woodlands. They are reported from scattered locations across Minnesota, Wisconsin, and Iowa (Alex 2000; Florin 1996; Gibbon 2012; Mason 1997). Five Agate Basin types have been documented from unprovenienced private collections in Carver County.

Projectile points are hunting weapons but were also used for cutting and slicing animal remains, wood, or plants. The broken point bases indicate that site activities are associated with the procurement of game animals. However, it is curious that none of the associated animal remains are from medium or large size animals.

Lithic Material Types

Lithic materials consisted of Swan River Chert (n=4; 44%), quartz (n=; 22%), chalcedony (n=1; 11%), limestone (n=1; 11%), and unidentified chert (n=1; 11%). The lithic materials are locally available (Bakken 1997). The source of the chalcedony is uncertain, as cobbles big enough to make a large spear point are not common in the regional till, and so it is likely that this material was obtained from a more distant source. The unidentified chert could be local or exotic.

10.14.2 Middle Archaic Component in XUs 3 and 4 Area

The lithic assemblage associated with the Early/Middle Archaic component consists of 18 pieces of lithic debris, two stone tools, and a core (Table 56). This component occurs in XUs 3 and 4 from 180 to 220 cmbd and STs 62, 63, and 63E5 from 175 to 250 cmbs.

Table 56. Site 21CR156 Middle Archaic Component Lithics.

Material	**Primary Flake**	**Secondary Flake**	**Other Grade 4**	**Shatter**	**Broken Flake**	**Tool/Core**	**Total**	**%**
Prairie du Chien (oolitic) Chert	6	-	-	-	3	1 bifacial core & 1 utilized flake	**11**	**52**
Quartz	-	-	-	-	3	-	**3**	**14**
Swan River Chert	-	1	-	1	-	-	**2**	**10**
Hixton Group Quartzite	-	1	1	-	-	-	**2**	**10**
Unidentified Chert	1						**1**	**5**
Granite	-	-	-	-	-	1 hammerstone or pecked stone	**1**	**5**
Red River Chert	1	-	-	-	-	-	**1**	**5**
Total	**8**	**2**	**1**	**1**	**6**	**3**	**21**	**-**
%	**38**	**10**	**5**	**5**	**29**	**14**	**-**	**100***

Lithic Debris Types and Core Types

The lithic debris assemblage consists of primary flakes (n=8; 38%), broken flakes (n=6; 29%), secondary flakes (n=2; 10%), other G4 flakes (n=1; 5%), and shatter (n=1; 5%). Debris types from the limited assemblage of this component suggest a range of lithic activities, including initial reduction and bifacial shaping and thinning. However, there was no evidence for late-stage tool manufacturing or tool maintenance. Heat treatment was not confirmed on any of the artifacts.

The core is bifacial with an irregular shape and has multidirectional flake removal with prepared edges for platform preparation. The core material is oolitic Prairie du Chien Chert. The core supports the interpretation that initial reduction occurred in this component.

Stone Tools

Two stone tools were recovered, including a utilized flake made of Prairie du Chien Chert and a granite hammerstone (or pecked stone). The utilized flakes are primarily light-duty cutting and slicing tools used on animal remains, wood, and plants. The hammerstone was likely used for the initial reduction of lithic materials, and this use is supported by the primary flakes and core that it is associated with.

Lithic Material Types

Lithic materials consisted primarily of oolitic Prairie du Chien Chert (n=11; 52%) with small amounts of quartz (n=3; 14%), Swan River Chert (n=2; 10%), Hixton Group Quartzite (n=2; 10%), unidentified chert (n=1; 5%), granite (n=1; 5%), and Red River Chert (n=1; 5%).

Hixton Group Quartzite is an exotic material that was likely acquired through trade networks or travel to the source areas in west-central Wisconsin (Boszhardt 1998). The other lithic materials are locally available (Bakken 1997), with bedrock sources of Prairie du Chien Chert probably available in the vicinity (Lusardi 1997). The unidentified chert could be local or exotic.

10.14.3 Late Woodland Component

The lithic assemblage associated with the Late Woodland component consists of 18 pieces of lithic debris and two cores (Table 57). This component occurs (based on ceramic distribution) in XUs 1, 2, and 7 from 0 to 70 cmbd and XUs 3 and 4 from 40 to 80 cmbd.

Table 57. Site 21CR156 Late Woodland Component Lithics.

Material	Primary Flake	Secondary Flake	Tertiary Flake	Other Grade 4	Shatter	Bipolar Flake	Broken Flake	Tool/Core	Total	%
Quartz	2	-	-	1	1	1	2	-	**7**	**35**
Prairie du Chien (oolitic) Chert	-	1	-	1	-	-	1	1 nonbifacial core	**4**	**20**
Unidentified material	3	-	-	-	-	-	-	-	**3**	**15**
Galena Chert	-	1	1	-	-	-		-	**2**	**10**
Burlington White Mottled Chert	-	1	-	-	-	-	-	-	**1**	**5**
Swan River Chert	-	-	-	-	-	-	1	-	**1**	**5**
Basalt	1	-	-	-	-	-	-	-	**1**	**5**
Granite	-	-	-	-	-	-	-	1 bifacial core	**1**	**5**
Total	**6**	**3**	**1**	**2**	**1**	**1**	**4**	**2**	**20**	**-**
%	**30**	**15**	**5**	**10**	**5**	**5**	**20**	**10**	**-**	**100***

Lithic Debris Types

The lithic debris assemblage consists of primary flakes (n=6; 30%), broken flakes (n=4; 20%), secondary flakes (n=3; 15%), other G4 flakes (n=2; 10%), tertiary flakes (n=1; 5%), bipolar flakes (n=1; 5%), and shatter (n=1; 5%). Debris types from the limited assemblage of this component suggest a range of lithic activities, including bipolar reduction, initial reduction, bifacial shaping and thinning, and late-stage tool manufacturing or tool maintenance. Heat treatment was not confirmed on any of the artifacts.

The cores include bifacial and nonbifacial types that support the interpretation of initial reduction in this component. The bifacial core is granite, has an irregular shape, and contains prepared edges for platform preparation. The nonbifacial core has multidirectional flaking, unprepared edges, and is oolitic Prairie du Chien Chert.

Lithic Material Types

Lithic materials consisted of quartz (n=7; 35%), oolitic Prairie du Chien Chert (n=4; 20%) unidentified material chert (n=3; 15%), Galena Chert (n=2; 10%), Burlington White Mottled Chert (n=1; 5%) Swan River Chert (n=1; 5%), basalt (n=1; 5%), and granite (n=1; 5%).

The lithic materials are mostly locally available (Bakken 1997), with bedrock sources of Prairie du Chien Chert probably available in the vicinity (Lusardi 1997). Galena Chert, a non-local material, is available in lag deposits and bedrock exposures in southeastern Minnesota and adjacent areas of Wisconsin, Iowa, and Illinois (Morrow 1994). The unidentified materials could be local or exotic. Burlington White Mottled Chert is an exotic material that was likely acquired through trade networks or travel to its source areas in southeastern Iowa and west-central Illinois (Morrow and Behm 1986).

10.15 Ceramic Analysis

A total of 27 ceramic sherds were recovered at the site, including 26 body sherds and one rim sherd. The rim sherd, which was recovered from XU 2 between 30 and 40 cmbd, has a tool-impressed, "U" shaped notch on the lip with vertical cordmarking below the lip (Figure 73). The rim sherd is most similar to the Madison Ware Plain type described by Hurley (1975). Varieties of lip decoration on this type include impressions made by the following objects: cord-wrapped stick; twisted cord; fingernail; and stick.

Twenty sherds are cord/fabric impressed and seven have an unidentified surface treatment (mostly exfoliated sherds). Except for one sherd where the cordage was clearly woven, no distinctive weaving pattern was observed on the sherds, which are simply described as cord-marked. All of the sherds are grit tempered.

A total of 18 sherds retained their interior and exterior surfaces. The thicknesses of these sherds were the following (in mm): 3.2, 4.1, 4.2, 3.5, 3.9, 5.4, 3.7, 3.0, 3.3, 3.7, 3.6, 2.9, 5.4, 3.1, 2.9, 3.2, 2.8, and 4.7. The average thickness of the sherds is 3.7 mm.

The sherds were all recovered from the east half of the site in two areas. Most of the ceramics were recovered from XUs 1, 2, and 7 and adjacent STs 55 and 55W5. A smaller amount of ceramics was recovered from XU 3 and ST 63E5. These two concentrations of ceramics may represent separate occupations, but the sherds are interpreted to be Late Woodland ware, based on the thin walls, grit temper, cord-marked surfaces, and a decorated Late Woodland Madison ware rim shed. Two pieces of fired clay were also recovered with the ceramic concentration in the area of XUs 1, 2 and 7, suggesting that ceramic vessel manufacture may have occurred at the site.

10.16 Artifact Patterning and Geomorphic Context

The horizontal distribution of artifact classes is fairly similar across the site, suggesting that site activities were similar in many areas (Table 42). Lithic debris and FCR were the most widespread artifacts, occurring in almost every positive shovel test. Faunal material is less widespread and occurs in about 12 percent of the positive shovel tests in scattered locations across the site. The most notable pattern in artifact distribution is that ceramics occur only in the eastern portion of the site.

Artifact density across the site is moderate based on the shovel test data, with most positive tests containing multiple artifacts. This is especially noteworthy given that only two auger tests were dug at each test location, so the volume of soil was only about two-thirds that of a standard shovel test. The area of highest density is ST 50, which contained six pieces of lithic debris and six pieces of FCR.

The vertical distribution of artifacts ranges from 0 to 250 cmbs (Tables 40 to 42). This extensive range is the result of multiple occupations over a long time span on an accreting land surface, which contains alluvial fan and colluvial deposits. Additional study of the site soils is needed to more clearly understand the stratigraphy and processes that affected landscape formation at the site.

Site geomorphology is complex because of variations in the landscape setting in relation to slope position and distance from the stream and alluvial fan center at the east end of the site. The western portion of the site received less alluvium and has older soils nearer the ground surface because of its greater distance from the stream and alluvial fan center at the east end of the site.

Radiocarbon dates, diagnostic artifacts, and soil profiles indicate that the ages of soils decrease from west to east across the site. It appears that the alluvial fan deposits are dominant in the eastern portion of the site, and that colluvium is more prevalent in the western portion of the site.

Buried soils are present across the site, but they cannot be confidently correlated with each other or with the archaeological components at this time, except in limited areas where excavation units were dug. A Late Woodland component is present in the upper soil stratum (0 to 70 cmbd) of XUs 1, 2, and 7 in the eastern portion of the site. In the central portion of the site in XUs 3 and 4, an Early/Middle Archaic component was present in a second buried soil (Bt/Ab horizon) at 180 to 220 cmbd. In the western portion of the site in XUs 5, 6, and 8, a Late Paleoindian component occurs in the C1 horizon at 120 to 150 cmbd in the upper stratum above a buried soil. Other undefined components are present above this component.

Multiple components are clearly represented across the site based on the vertical patterning of artifacts, which span as much as 1.8 meters in some tests, with artifacts being recovered from multiple soil horizons and strata.

10.17 Site Integrity

There was no evidence in our tests of modern disturbances to the archaeological components, and only a minimum to moderate amount of rodent runs and bioturbation was observed. The vertical patterning of artifacts for the Late Paleoindian and Archaic components in XUs 3-5 and 8 was generally tightly clustered within a 10 to 20 cm zone, indicating that there has been only minimal artifact displacement from natural causes. Some faunal material is preserved, especially the thermally altered remains. In summary, the site has moderately well-preserved cultural deposits that have integrity.

10.18 Conclusions

Site 21CR156 is a multicomponent Late Paleoindian, Archaic, and Late Woodland site on an alluvial fan and colluvial toe slope along the bluff base in the Minnesota River Valley near the margin of a former shoreline of Rice Lake. The site is within the ROW on the south side of CSAH 61. In the western portion of the site, a radiocarbon date of 5990 to 5880 cal BC (2 Sigma) was obtained from calcined faunal material associated with two Late Paleoindian point bases and a fire hearth feature. In the central portion of the site, a radiocarbon date of 5660 to 5570 cal BC (2 Sigma) was obtained from a buried soil associated with lithic debris.

Phase I and II investigations included deep auger tests and eight 1 by 1 meter XUs. Artifacts were recovered from 0 to 250 cm below ground surface. Artifacts recovered from the site include faunal remains, ceramics, lithic debris, stone tools, and FCR. Site activities are inferred to include hunting, animal processing, cooking, lithic reduction, and stone tool production and resharpening. The site has a high degree of integrity and moderately well-preserved cultural deposits. The presence of FCR and thermally altered faunal material suggests that fire heaths or cooking pits were present, and one hearth feature was identified.

The faunal remains are mostly turtle, with smaller amounts of fish, molluscan (bivalve shell), mammal, Colubridae (nonpoisonous snake), small mammal, medium mammal (possibly muskrat), medium/large mammal, and large mammal. Nearly all the remains are thermally altered (calcined and burned) and are associated with a fire hearth. Most of the remains are associated with the Late Paleoindian component.

Lithic debris types recovered from the site indicate that a full range of lithic activities occurred, including initial reduction, bifacial shaping and thinning, and late-stage tool manufacturing or tool maintenance. Lithic debris types from the Late Woodland and Middle Archaic components suggest a focus on initial reduction and bifacial shaping and thinning. Lithic debris in the Late Paleoindian component is very sparse but suggests later stages of reduction.

The site's lithic material assemblage is dominated by oolitic Prairie du Chien Chert, which may have been recovered from bedrock sources in the vicinity, and Swan River Chert and quartz, which were available in local till. Exotic lithic materials Hixton Group Quartzite and Burlington White Mottled Chert comprise a small amount (four percent) of the lithic assemblage. These high-quality materials that originate in west-central Wisconsin, southeastern Iowa, and west-central Illinois (Morrow and Behm 1986) were likely acquired through trade networks or travel to those areas. In the Middle Archaic component, Prairie du Chien Chert is most abundant followed by quartz. Exotic materials include Hixton Group Quartzite. In the Late Woodland component, quartz is dominant followed by Prairie du Chien Chert. Exotic/nonlocal materials include Burlington White Mottled Chert and Galena Chert. The Late Paleoindian component is very sparse and contains Swan River Chert with smaller amounts of quartz, chalcedony, and unidentified materials.

Stone tools recovered from the site suggest that a variety of activities occurred, including hunting, butchering, animal/plant processing, hide working, and bone and woodworking.

10.19 Recommendations

The site is recommended eligible for listing on the NRHP under Criterion D because it has integrity and is likely to yield important information on research themes presented in Section 2.3.1.

The site contains data that could provide significant information relating to the following Late Paleoindian and Archaic research themes:

- Age and regional chronology
- Relationship to other contemporary regional complexes
- Developments and changes during Late Paleoindian and Archaic Period
- Artifact assemblage
- Subsistence strategy and settlement pattern
- Site function
- Environmental adaptation
- Lithic technology and raw material use
- Regional interaction and trade
- Site environment
- Site formation processes and geomorphology

The site contains data that could provide significant information relating to the following Southeastern Minnesota Late Woodland research themes:

- Chronology/age
- Technology and material culture
- Ceramic attributes and typology

- Lithics (technology, tools, point types, and raw material use)
- Subsistence
- Geographic distribution and settlement patterns
- Regional interaction.

The project's APE has been reduced since the Phase II evaluation was completed, and now the site is approximately 200 meters outside of the APE and will not be affected. If the project design changes and the site will be affected, then a Phase 3 data recovery is recommended to mitigate the project's adverse effects.

Figure 59. Site 21CR156 Photo in ROW along the South Side of CSAH 61, Facing West.

Figure 60. Site 21CR156 Photo of XU 1 and 2 North Wall Profile from 0 to 150 cmbd.

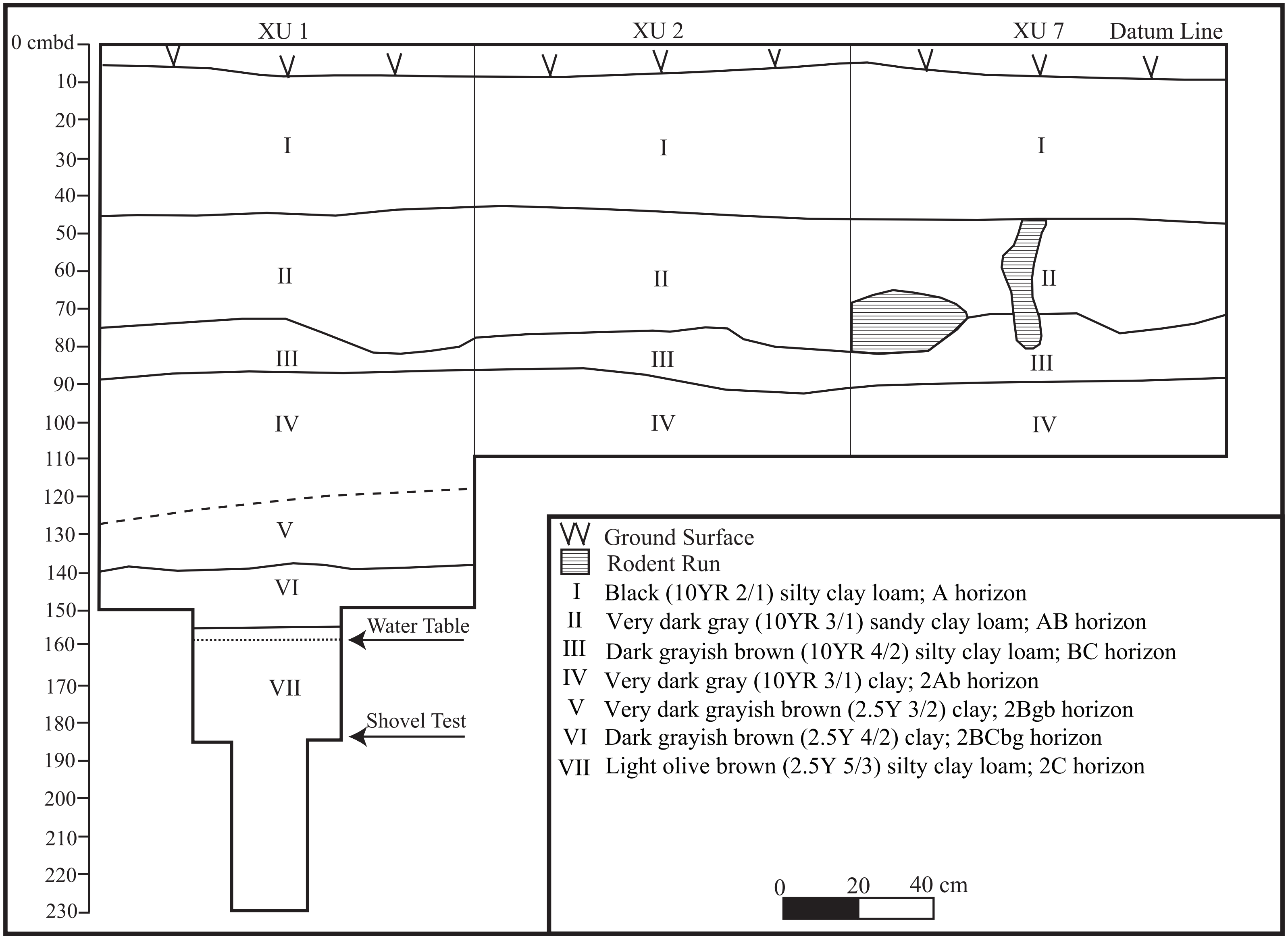


Figure 61. Site 21CR156 XU 1, 2, and 7 North Wall Profile.

Figure 62. Site 21CR156 Photo of XU 3 West Wall Profile from 0 to 220 cmbd.

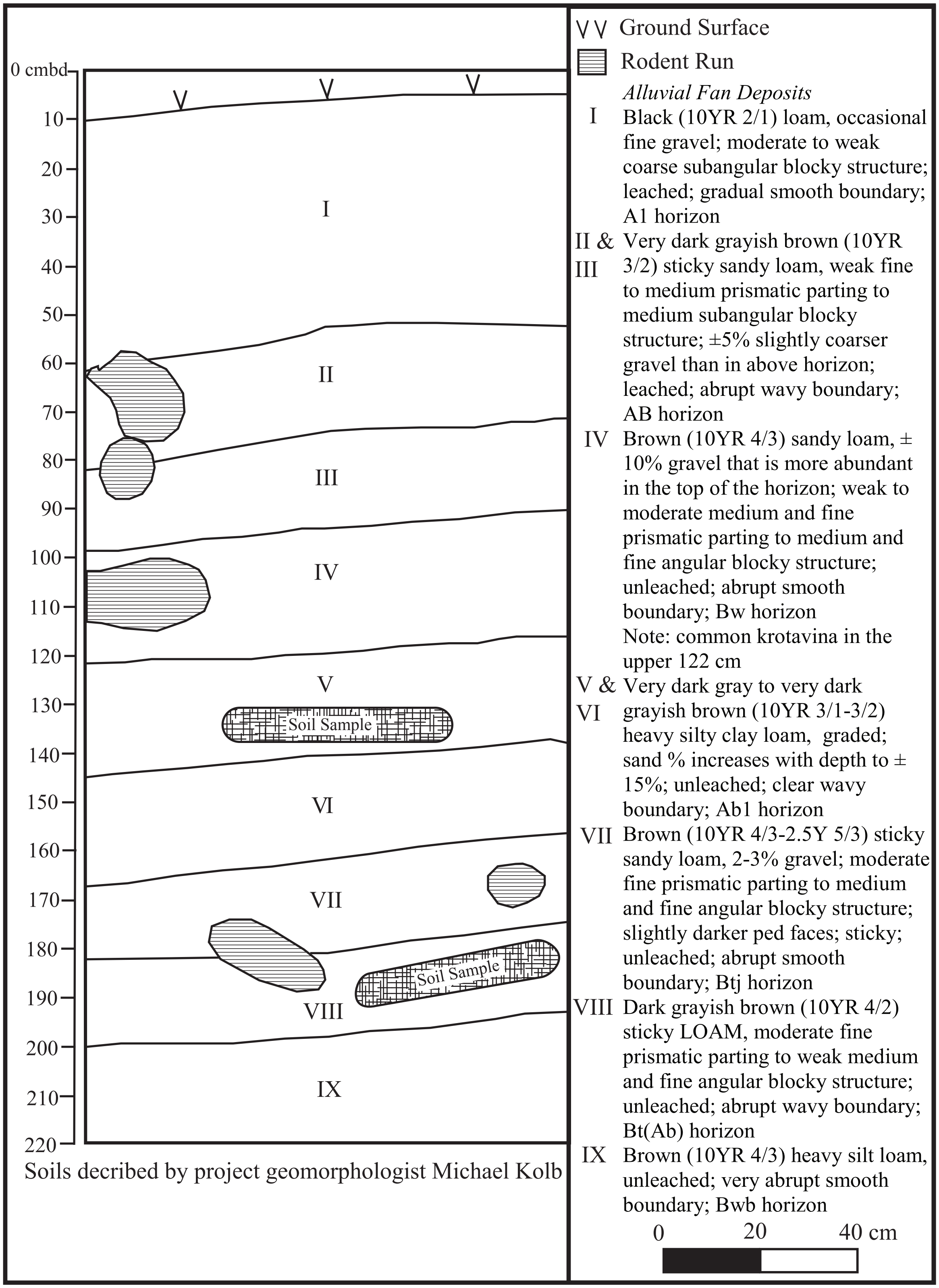


Figure 63. Site 21CR156 XU 3 West Wall Profile.

Figure 64. Site 21CR156 Photo of XU 5 West Wall Profile from 0 to 160 cmbd.

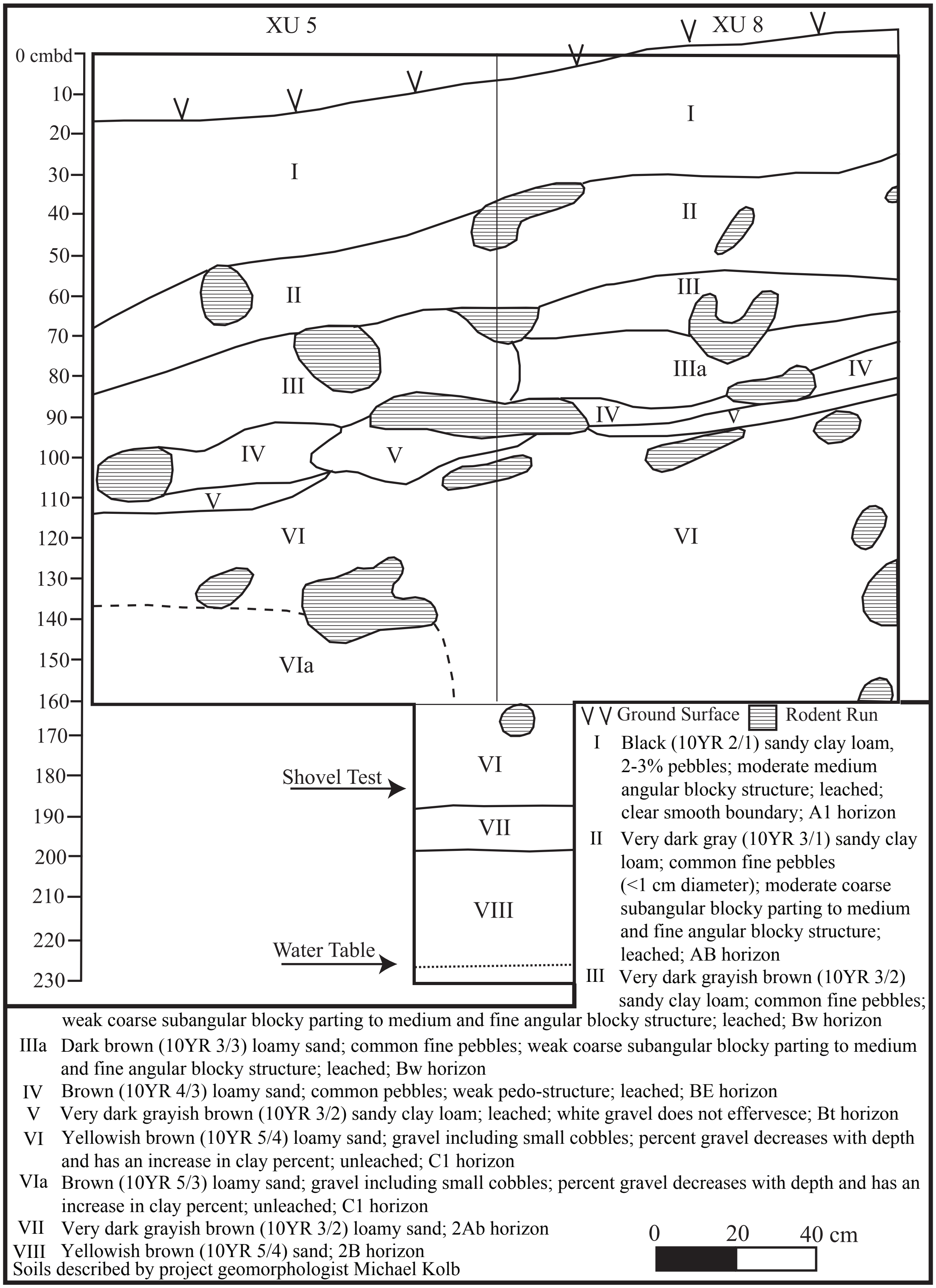


Figure 65. Site 21CR156 XU 5 and 8 West Wall Profile.

Figure 66. Site 21CR156 Photo of XU 6 East Wall Profile from 0 to 160 cmbd.

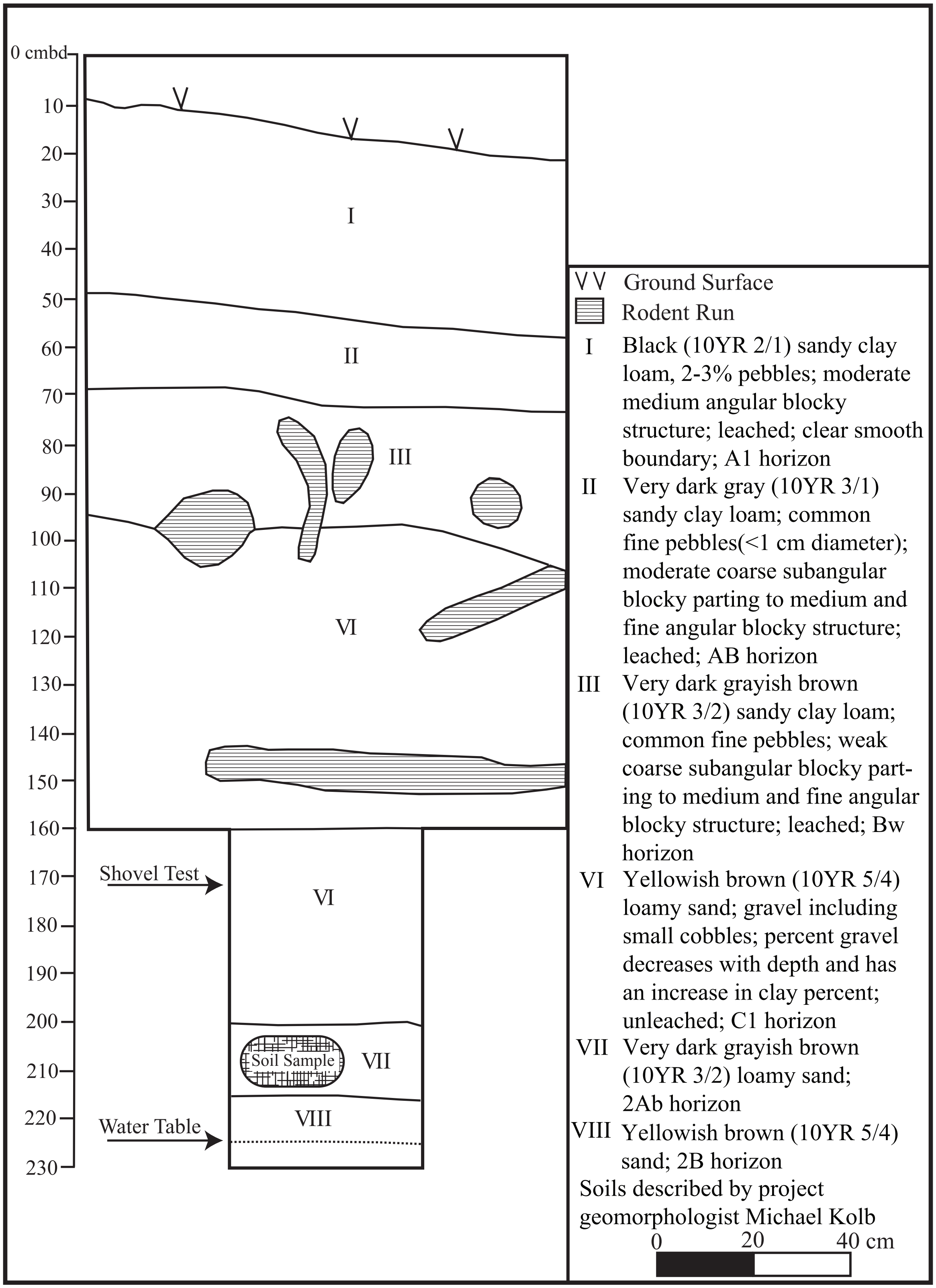


Figure 67. Site 21CR156 XU 6 East Wall Profile.

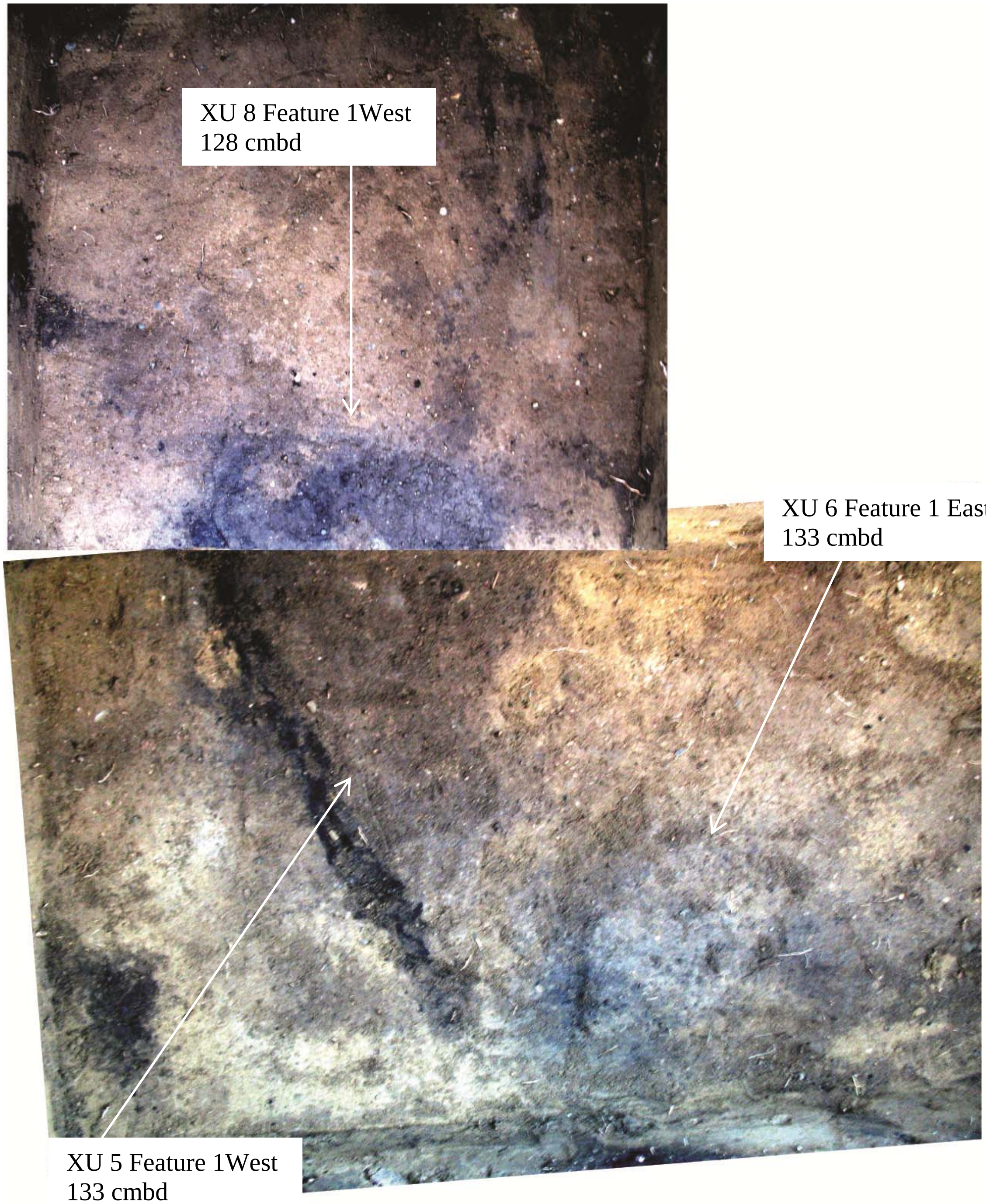


Figure 68. Site 21CR156 Photo of Feature 1 East and West Planview at 133 cmbd in XUs 5, 6, and 128 cmbd in XU 8.

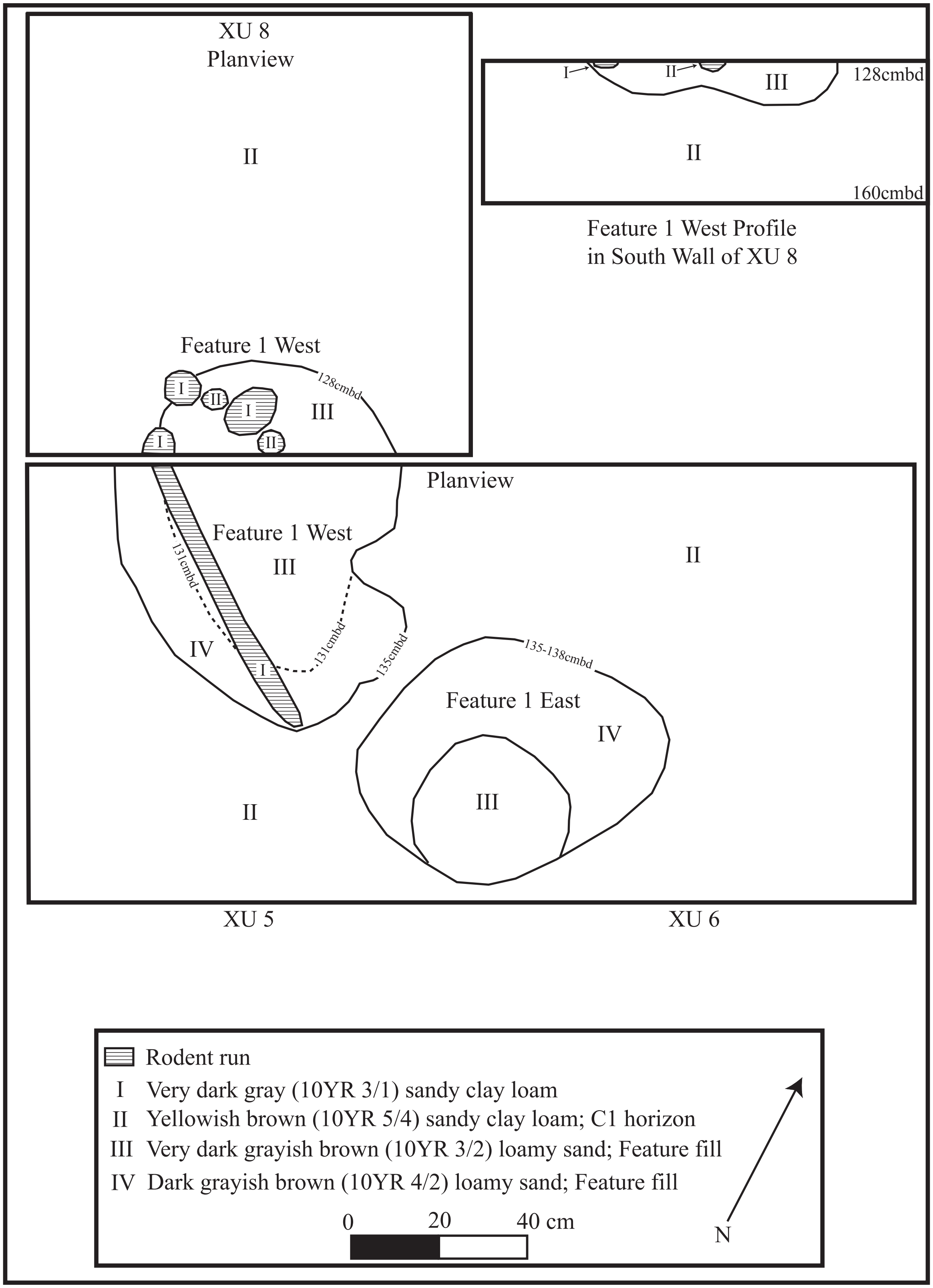


Figure 69. Site 21CR156 Feature 1 West Planview and Profile at 128 cmbd and 131-135 cmbd and Feature 1 East Planview at 135-138 cmbd.

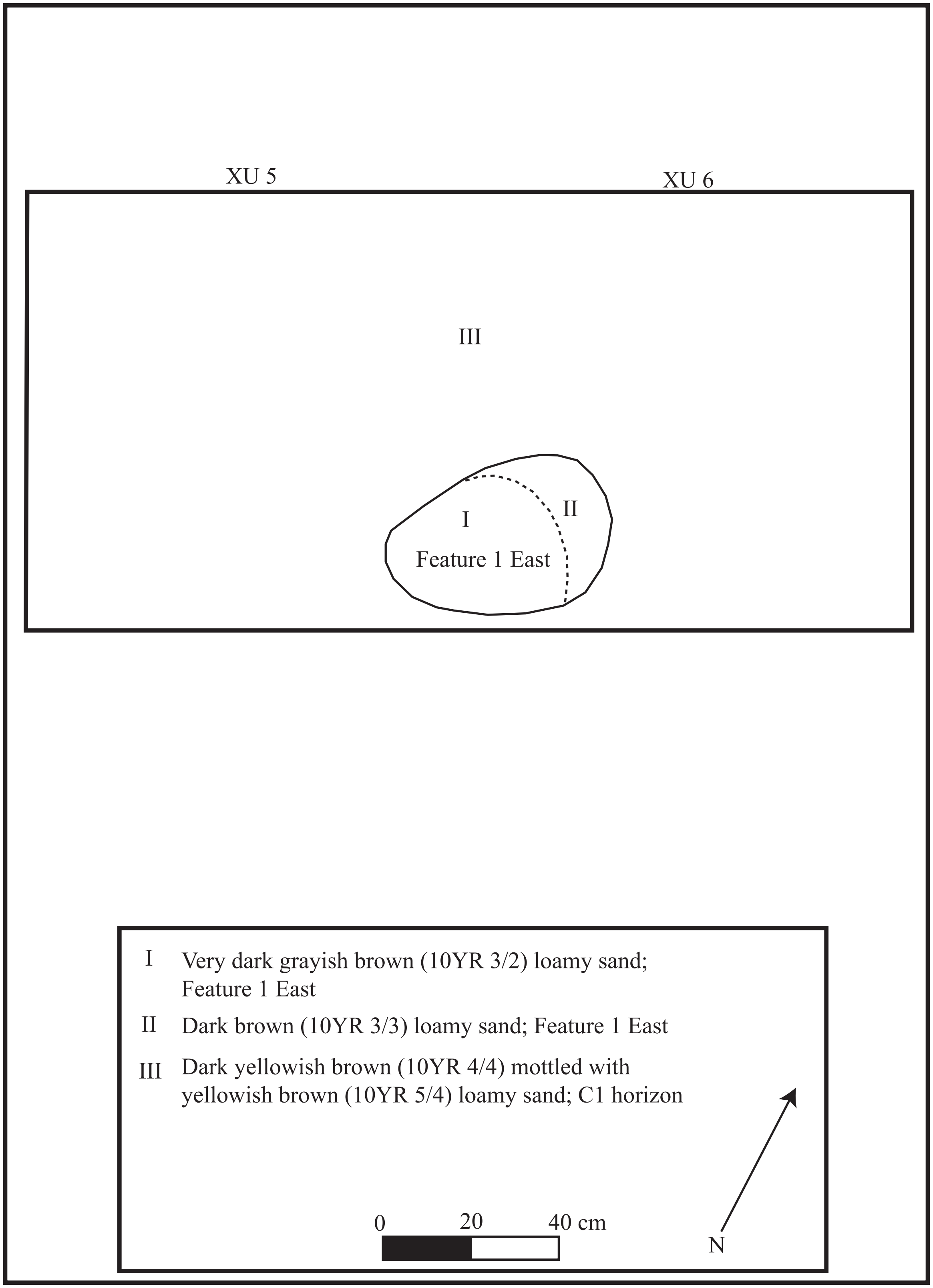
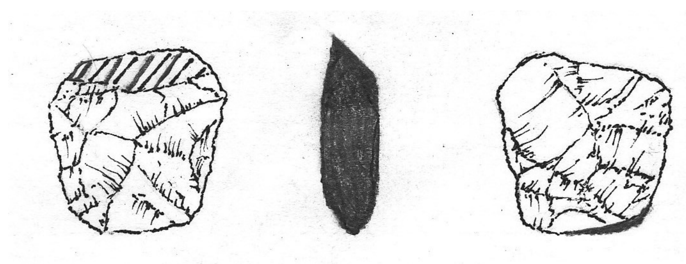


Figure 70. Site 21CR156 XU 5 and 6 Feature 1 East Planview at 140cmbd.

Figure 71. Site 21CR156 Photo of Late Paleoindian Projectile Point Bases in XUs 5 and 6 at 130 to 140 cmbd – Agate Basin-like (left, Cat.# 71.1) and Eden-like (right, Cat.# 65.1).

Catalog # 65.1; XU 5 (130-140 cmbd); Eden-like



Catalog # 71.1; XU 6 (130-140 cmbd); Agate Basin-like

Figure 72. Site 21CR156 Illustrations of Late Paleoindian Projectile Point Bases in XUs 5 and 6 at 130 to 140 cmbd - Agate Basin-like (lower, Cat.# 71.1) and Eden-like (upper, Cat.# 65.1).

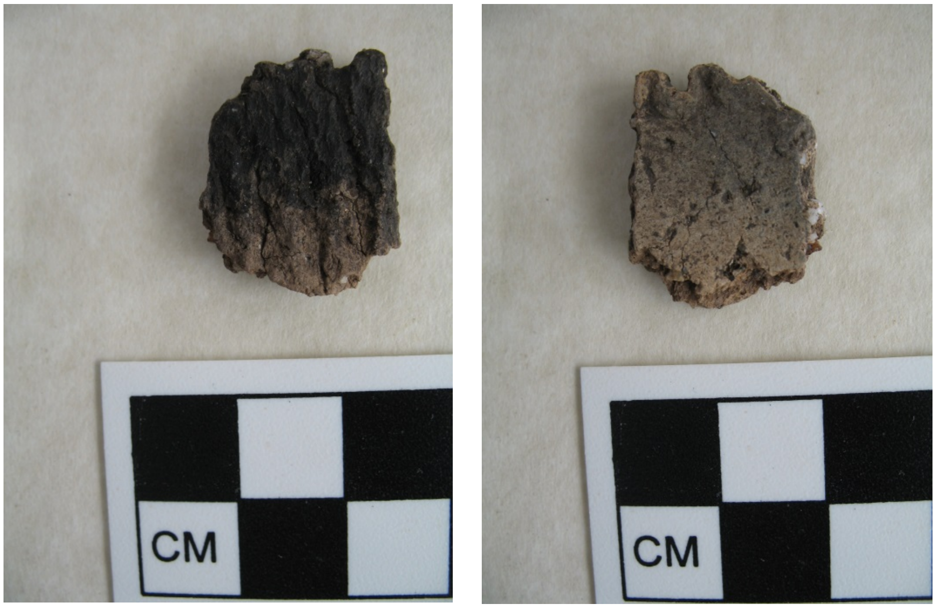


Figure 73. Site 21CR156 Photo of Madison Ware Decorated Rim (left, exterior and right, interior Cat.# 45.1).

11. SITE 21CR157

11.1 Overview

Site 21CR157 is a precontact period habitation located along the CSAH 61 ROW. The age and cultural affiliation are unknown because of the absence of diagnostic artifacts. The site is in T116N, R23W, N, SW, SE, NW, Section 36, Carver County (Figure 2) and occupies an area of 60 by 10 meters, encompassing 0.1 acre. The site's UTM coordinates are E457755 N4962340 (1983 NAD Zone 15). A map of the site on aerial imagery is presented in Figure 74. Photos of the site area are included in Figures 75 to 78.

11.2 Physical Setting

The site is situated along the south side CSAH 61, south of the ROW. The eastern portion of the site is in the yard of the Western Motel, and the western portion of the site area is in a vacant dirt lot. The site probably extends into the ROW, but testing was not possible in the ROW because of buried utilities. The site occupies a colluvial slope at the bluff base in the Minnesota River Valley. Part of the hill slope was cut during CSAH 61 road construction, and there is a six-meter-high vertical cut along the ROW directly across the road from the site. The landscape at the site is level from filling and grading. The original land surface probably sloped down to the south.

Visual inspection of the landscape in the site area indicates that the motel and vacant lots have been filled, with the greatest amount of fill having been added to the south end of the lots where the original land surface was much lower. Soil profiles confirm that there are significant amounts of fill at the site area. The filling and cutting make it difficult to reconstruct the original land surface. The Rice Lake wetland borders the site to south.

11.3 Soils

Soils at the site were defined from shovel test profiles, soils exposed in the backhoe trenches, and the geomorphological coring. The profiles consist of fill overlying sandy and loamy soils formed in colluvium. Geomorphological Core 26 was placed on the west side of the motel driveway at the east end the site (Appendix A). The core contains 1.8 meters of fill overlying intact soils formed in colluvium.

A soil profile from ST 47 is presented in Table 58, and these soils are sandier and have less fill than soils to the west.

Table 58. Site 21CR157 Soil Profile from ST 47.

Depth Below Surface (cm)	Description
0-90	Fill
90-160	Black (10YR 2/1) loamy sand; Ab horizon
160-175	Very dark gray (10YR 3/1) loamy sand; ABb horizon
175-190	Very dark grayish brown (10YR 3/2) sand; Bb1 horizon
190-255	Brown (10YR 4/3) sand; Bb2 horizon
255-300	Pale brown (10YR 6/3) sand; C horizon

A soil profile from the backhoe trench at ST 51A is presented in Table 59.

Table 59. Site 21CR157 Soil Profile from Backhoe Trench 1 at ST 51A.

Depth Below Surface (cm)	Description
0-250	Fill
250-275	Black (10YR 2/1) silt loam; Ab horizon
275-300	Very dark gray (10YR 3/1) silt loam; ABb horizon
300-330	Very dark grayish brown (10YR 3/2) sandy clay loam; Bb1 horizon
330-370	Dark brown (10YR 3/3) sandy clay loam; Bb1 horizon

A soil profile from the backhoe trench at ST 54A is presented in Table 60.

Table 60. Site 21CR157 Soil Profile from Backhoe Trench 2 at ST 54A.

Depth Below Surface (cm)	Description
0-200	Fill
200-260	Black (10YR 2/1) silt loam; Ab horizon
260-280	Very dark gray (10YR 3/1) silt loam; ABb horizon
280-300	Very dark grayish brown (10YR 3/2) sandy clay loam; Bb1 horizon
300-325	Dark brown (10YR 3/3) sandy clay loam; Bb1 horizon
325-335	Dark grayish brown (10YR 4/2) loamy sand; Bb2 horizon
335-350	Dark yellowish brown (10YR 4/6) loamy sand; C horizon

11.4 Phase I Shovel Test and Backhoe Trenching Results

The site was first identified during shovel testing at 10-meter intervals in the yard of the Western Motel and the vacant dirt lot. Shovel testing was conducted to a depth of 300 cmbs in the motel yard, and ST 47 (single auger) yielded a piece of FCR. STs 69 and 49A to 56A (single augers) were placed in the vacant lot. The tests revealed extensive and deep fill, which contained concrete and other impenetrable materials. Intact soil below the fill was reached at 160 cmbs in ST 50A and at 220 cmbs in ST 55A. The fill was impenetrable in the other tests. It was determined that backhoe trenching would be the most practical way to investigate the intact soil in this area.

Backhoe trenches were dug three meters east of ST 51A (Backhoe Trench 1), at ST 54A (Backhoe Trench 2), and three meters south of ST 52A (Backhoe Trench 3). The backhoe trenches were approximately two meters wide and four meters long at the top and narrowed with depth to approximately one meter wide and two meters long at 3.5 meters below surface (Figure 77). Once the fill was removed, the backhoe excavated the intact soil in 50 cm increments and placed the intact soil in piles according to depth (Figure 78). The soil from these piles was then screened. The amount of soil screened at Backhoe Trench 1 was 0.6 cubic meters from 250 to 300 cmbs and 0.5 cubic meters from 300 to 370 cmbs. The amount of soil screened at Backhoe Trench 2 was 1.04 cubic meters from 200 to 280 cmbs, 0.36 cubic meters from 280 to 325 cmbs, and 0.16 cubic meters from 325 to 350 cmbs. Backhoe Trench 3 consisted of fill to 320 cmbs and 0.3 cubic meters was screened from 320 to 350 cmbs (Bb2 horizon). The volume of soil screened in the trenches was equivalent to about 22 shovel tests. Testing in the trenches extended into the B and C horizons to a depth of 370 cmbs in Backhoe Trench 1 and 350 cmbs in Backhoe Trenches 2 and 3.

Precontact period artifacts and modern/historic debris were recovered from ST 47 and Backhoe Trenches 1 and 2 (Table 61). It was not possible to determine whether the precontact materials were all found below the modern/historic debris or whether the materials were mixed within the 50-cm levels removed by the backhoe. While 50-cm levels are not ideal, they were acceptable for the Phase I investigation, given the circumstances of very difficult excavation. The area contained deep fill with large concrete blocks, and therefore it was not possible to open up longer trenches that could be excavated in smaller increments without considerable expense and time. The soils beneath the fill appeared to be relatively undisturbed, and it is possible that the precontact materials were from undisturbed soil beneath the modern/historic debris.

Table 61. Site 21CR157 Phase II Summary of Precontact Artifacts and Modern/Historic Debris.

Provenience	Depth (cmbs)	Count	Artifact Type
ST 47	130-160	1	FCR, granite
Backhoe Trench 1	250-300	1	Secondary flake, Prairie du Chien (oolitic) Chert
		1	Broken flake, quartz
		1	Faunal, unidentified, unidentifiable fragment, calcined
		4	Glass, clear, window fragment
		2	Glass, amber, bottle fragment
		1	Ceramic, stoneware, unidentified fragment
		1	Metal, aluminum, unidentified fragment
Backhoe Trench 2	200-250	1	Metal, iron, nail, square
		1	Metal, iron, nail, round
		2	Glass, clear, window fragment
	250-300	1	Other G4 flake, Swan River Chert
		1	Faunal, mammalian, large, unidentifiable fragment, fractured, spiral
		1	Glass, aqua, unidentified fragment
		8	Glass, clear, unidentified fragment
		2	Metal, iron, nail, square
		3	Metal, iron, unidentified fragment
		2	Metal, iron, wire fragment
		2	Slag fragment
		1	Ceramic, whiteware, unidentified fragment
		3	Ceramic, clay, brick fragment
		6	Plastic, unidentified fragment
Total	-	**46**	-

11.5 Artifact Summary

A total of six precontact period artifacts were recovered, including two animal bones, three pieces of lithic debris, and one piece of FCR (Table 61). Forty modern/historic items were also recovered.

11.6 Modern/Historic Dump Debris

Materials found below the fill include a variety of household and architectural items. There appears to be mixing of older and younger materials, as plastic occurs below the square nail in Backhoe Trench 2. Household items included two amber bottle glass fragments, one whiteware fragment, one stoneware fragment, and an aluminum fragment. Architectural items included three brick fragments, six window glass fragments, one round nail, and three square nails. Items that belong to the household or architecture class include three unidentified rusty metal fragments, eight unidentified clear glass fragments, one aqua glass fragment, and two pieces of metal wire. Two pieces of slag from smelting belong to the household/industrial class, which includes items associated with either domestic or workshop related activities. Six unidentified pieces of plastic were also recovered.

Approximate manufacturing ages for the glass artifacts are as follows: clear glass (1875 to present); amber (brown) glass (1860 to present); and aqua glass (1800 to 1910) (Peterson 1995; University of Utah et al. 1992). Square nails were in use from about 1830 to 1890, and were replaced by round nails around 1890. The plastic is likely post WWII (1945), when plastic production increased dramatically. The plastic may even be modern (post 1963). The other items are not datable to specific time period, having long term manufacturing and use periods extending to modern times.

11.7 Lithic Analysis

Lithic debris includes a secondary flake of Prairie du Chien (oolitic) Chert, an Other G4 flake of Swan River Chert, and a broken quartz flake. Secondary flakes are associated with the initial shaping and subsequent thinning of a biface. Broken flakes and Other G4 flakes are not diagnostic of specific reduction stages. None of the pieces of lithic debris have cortex. All of these materials are locally available (Bakken 2011).

11.8 Faunal Analysis

Faunal material includes an unidentifiable, calcined bone fragment and a spirally fractured bone fragment from a large mammal. These remains are likely associated with the precontact component. The faunal material likely represents subsistence remains.

11.9 FCR Analysis

One piece of granitic FCR was recovered. The presence of FCR suggests that fire heaths or cooking pits are present at the site. Rocks used for heating and/or cooking were likely procured from local sources, such as in the bottoms of ravines and streams that drain into the Minnesota Valley River.

11.10 Map and Air Photo Review

Historic Carver County plat maps from 1874, 1880, 1898, 1916, and 1926 were reviewed (Andreas 1874b; Warner & Foote 1880; North West Publishing Company 1898b; Hixson and Company 1916; Hudson Map Company 1926). None of these maps depicts buildings in the site area. The road (CSAH 61) near the site was established between 1898 and 1905. The 1937 air photo does not depict any buildings or development at the site location (Figure 6). The 1947 air photo shows buildings and a parking lot adjacent to the site that indicate commercial development in the area (Figure 7).

The refuse materials do not appear to be directly associated with the commercial development property that is present in this area after 1937. The site area appears to have been a dump for modern and historic debris, based on the mixed ages of the debris (late 1800s to mid 1900s) and the variety of household, household/industrial, and architectural materials.

11.11 Conclusions and Recommendations

Site 21CR157 is a precontact period habitation of unknown age and cultural affiliation located along the south side of CSAH 61. The site is buried below modern fill, and artifacts were recovered in two backhoe trenches and a deep auger test from 130 to 300 cm below surface. Artifacts include lithic debris, FCR, and animal bone, indicating that site activities included animal processing, cooking, and lithic reduction. A sparse, modern/historic refuse dump was also found beneath the fill. Integrity of the precontact component is uncertain and needs to be assessed through Phase II evaluation. The site has the potential to provide important information on the precontact period in the region. The project's APE has been reduced since the Phase I survey was completed, and the site is approximately 100 meters outside of the APE and will not be affected. If the project design changes or if other construction projects along CSAH 61 affect the site, then a Phase II evaluation is recommended.

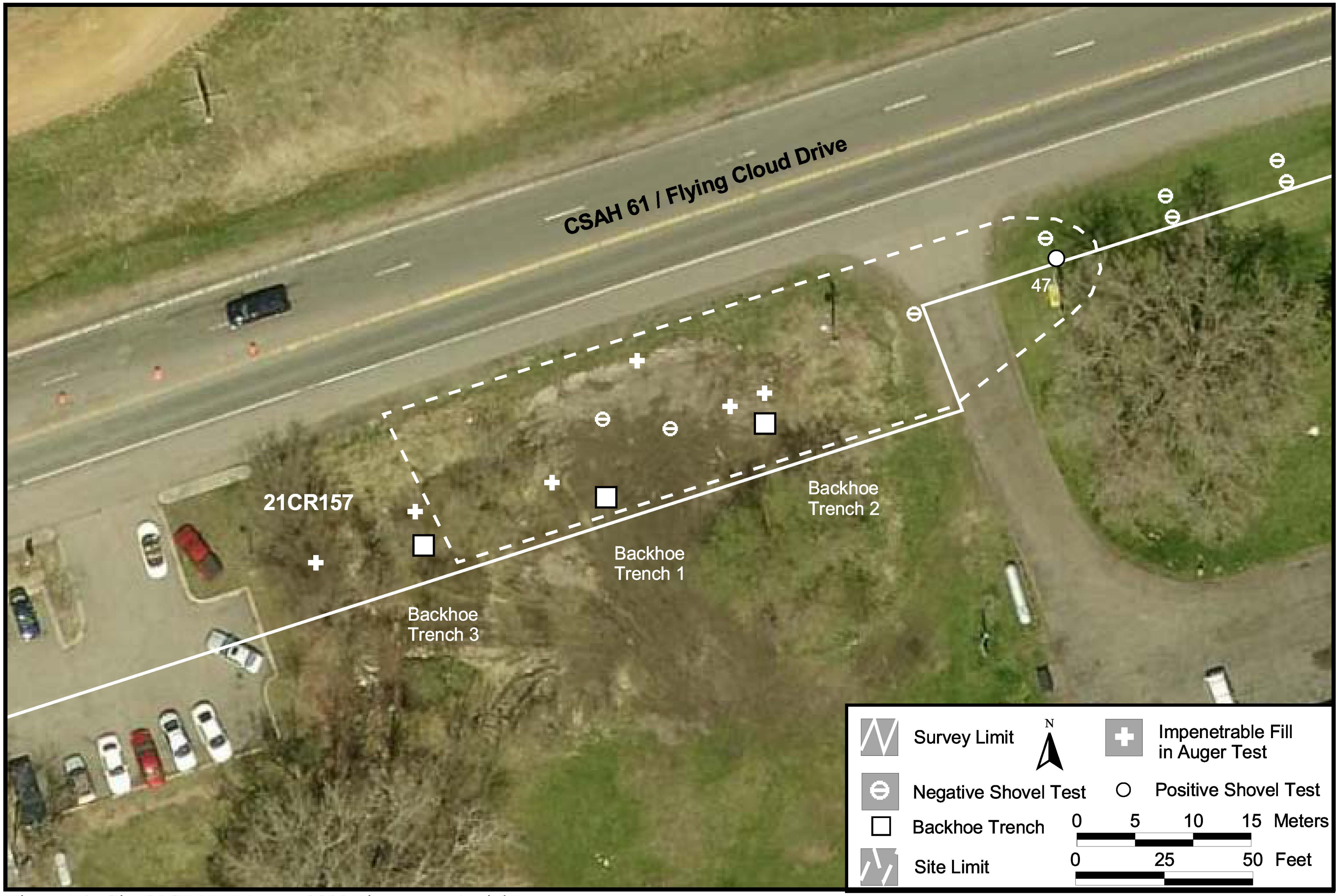


Figure 74. Site 21CR157 Map on 2011 Pictometry Aerial Image.

Figure 75. Site 21CR157 Photo of Western Motel Lawn, Facing West.

Figure 76. Site 21CR157 Photo of Vacant Lot, Facing West.

Figure 77. Site 21CR157 Photo of Backhoe Trench.

12. SITE 276-3

12.1 Overview

Site 276-3 is a historic artifact scatter associated with a former farmstead that dates from ca.1880 to the 1960s. The MnOSA reviewed the site information and will not be assigning an official site number. The site is located in the proposed fill disposal area on the Golf Zone property, 175 meters south of CSAH 61. The former farmstead house has been incorporated into the modern Golf Zone building complex, and the other structures have been razed. The site is in T116N, R23W, SE, NE, SE Section 35, Carver County (Figure 2) and occupies an area of 60 by 75 meters, encompassing 1.1 acre. A map of the site on aerial imagery is presented in Figure 79. A photo of the site area is included in Figure 80.

12.2 Physical Setting

The site is located on the driving range of the Golf Zone property, which was a former agricultural field and farmstead on the Bluff Creek alluvial fan. The area consists of a well-maintained lawn, and some areas have been landscaped to create raised ridges. The owner indicated that topsoil was bulldozed to create these features.

12.3 Soils

Soils at the site consist of stratified, historic Bluff Creek alluvial fan deposits. There was considerable variability in the soils, and even adjacent tests had slightly different profiles. Fill and disturbed soils were observed in most shovel tests, particularly in the upper portions of the profiles. In general, the soils consist of a very dark grayish brown (10YR 3/2) loamy sand Ap horizon, overlying a brown to pale brown (10YR 4/3 to 6/3) gravelly sand. A layer of silt loam is present in some tests at varying depths below the Ap horizon.

12.4 Phase I Survey Methods and Results

Shovels tests were dug in 20-meter intervals, and 20 historic artifacts were recovered from seven shovel tests. The artifacts were recovered from 0 to 60 cmbs and included a variety of domestic and architectural items (Table 62).

Table 62. Site 276-3 Phase I Summary of Artifacts.

ST #	Depth (cmbs)	Count	Artifact Type and Count
9E	30-40	2	1 Whiteware fragment, 1 clear glass fragment
12E	10-20	1	Square nail
13E	0-20	1	Clear bottle glass fragment
14E	10-20	1	Milk glass
20E	0-45	5	1 Green glass fragment, 1 chimney glass fragment, 1 Clear glass fragment, 2 asphalt pieces
21E	0-25	2	1 Whiteware fragment, 1 concrete piece
26E	0-20	7	1 Whiteware fragment, 1 round nail, 4 rusty metal pieces, 1 rusty metal button
	50-60	1	Milk glass
Total		**20**	

12.5 Artifact Analysis

The artifact assemblage included a small amount of architectural and domestic items, including glass, nails, concrete, and whiteware. Approximate manufacturing dates for the glass artifacts are as follows: clear glass (1875 to present) and green glass (1860 to present) (Peterson 1995; University of Utah et al. 1992). Square nails were in use from about 1830 to 1890, and were replaced by round nails around 1890. The other items are not datable to specific time period, having long term manufacturing and use periods extending to modern times. The artifacts are all small, fragmentary pieces that are less than one inch in size. None of the artifacts had diagnostic elements that would allow for a narrow date range to be determined, as all the materials have long manufacturing periods. The research potential of the artifacts at the site appears to be very low based on the sparse and limited amount of materials, the fragmentary condition of the assemblage, and the lack of diagnostic items (such as maker's marks or datable elements).

12.6 Map Review and Research

Carver County plat maps from 1874, 1880, 1898, 1916, and 1926 were reviewed (Andreas 1874b; Warner & Foote 1880; North West Publishing Company 1898b; Hixson and Company 1916; Hudson Map Company 1926). The farmstead at 276-3 is depicted on the 1880 plat map and all subsequent maps and air photos (Figures 5 to 8). The farmstead house has been incorporated into the modern Golf Zone building complex, and the other structures have been razed. The artifacts are inferred to be associated with the farmstead based on their proximity.

The ownership of the land that contains the farmstead is as follows (from the plat maps): 1880 - Charles Drucke;1898 - Chas/Charles Drucke; 1916 - illegible; and 1926 - Wilmar Teich. The county history (Neill 1892) was reviewed, and the newspaper index at the Carver County Historical Society in Waconia was searched for references to the names of landowners to determine if they or their farm was locally significant. There was no mention of these names in either source.

12.7 Conclusion and Recommendation

Site 276-3 is a sparse, subsurface scatter of historic artifacts that are associated with a former farmstead dating from ca.1880 to 1960s. Artifacts recovered from shovel tests included a small amount of architectural and domestic items, including glass, whiteware, concrete, and square and round nails. The site is interpreted to be a deposit of domestic and architectural refuse. The site has been extensively disturbed by landscaping for the construction of the golf driving range and lacks integrity.

A review of the local and regional history indicates that the site is not directly associated with historically significant persons or with events that have made a significant contribution to the broad patterns of our history (NRHP Criteria A and B). The site does not embody the distinctive characteristics of the agricultural period from the early to middle 1900s (NRHP Criterion C). The research potential of the site is low because of the lack of integrity and the sparse and limited artifact assemblage. The site is not capable of providing information important to relevant research themes under NRHP Criterion D (See Section 2.3 Research Themes).

The site is recommended not eligible for listing on the National Register of Historic Places because it lacks integrity and does not meet National Register Criteria A, B, C, or D. No further archaeological work is recommended at the site.

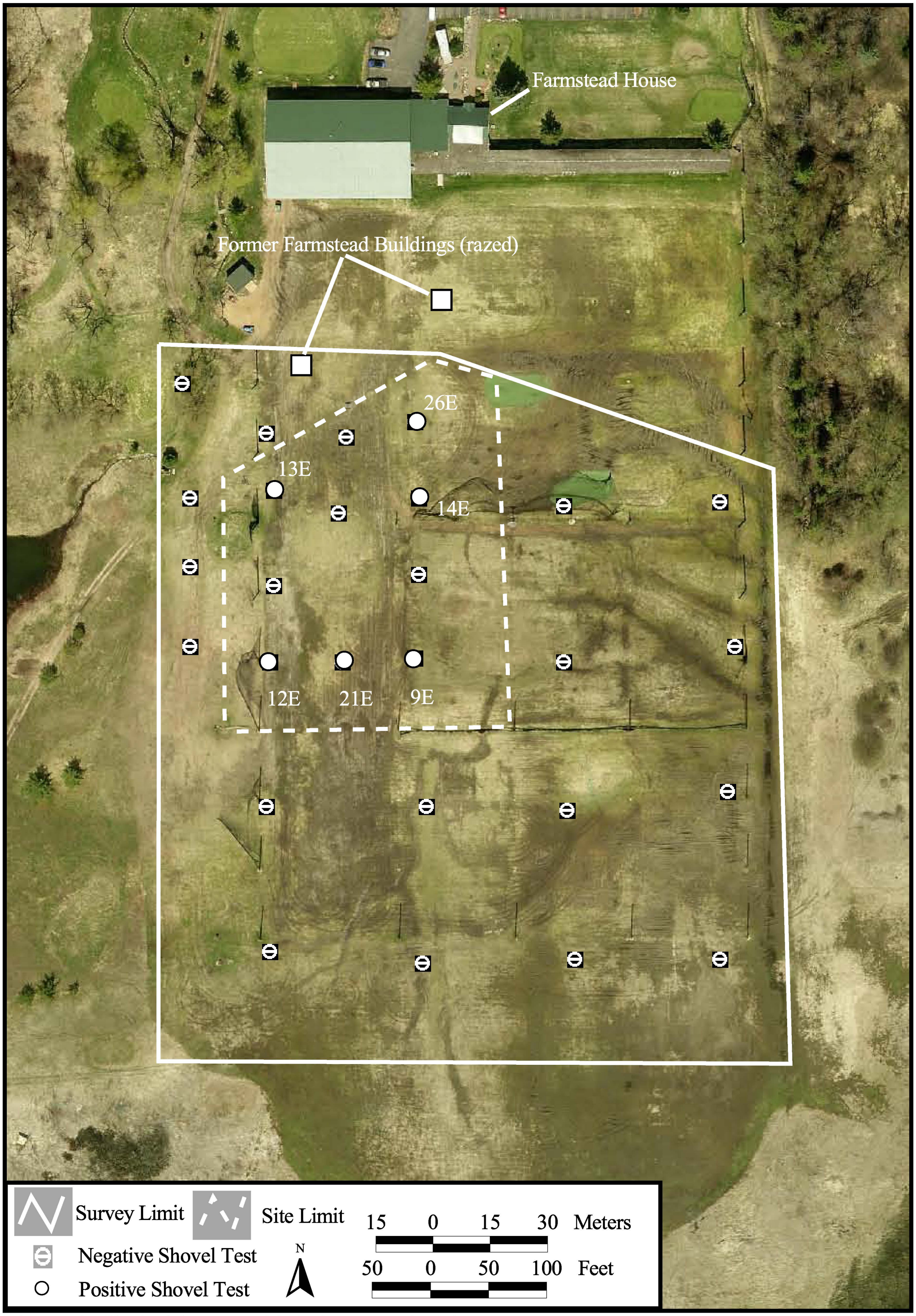


Figure 79. Site 276-3 Map on 2011 Pictometry Aerial Image.

Figure 80. Site 276-3 Photo of Driving Range at Golf Zone Property, Facing North.

13. SUMMARY AND RECOMMENDATIONS

Five sites were identified during survey for the project, including four precontact period habitations (21CR154, 21CR155, 21CR156, and 21CR157) and one historic farmstead (276-3). Phase II testing was conducted at sites 21CR154, 21CR155, and 21CR156 to determine if they are eligible for listing on the National Register of Historic Places (NRHP). As a result of project modifications following Phase I survey, Site 21CR157 is now outside of the project's APE and was not evaluated. A summary of the sites, their NRHP status, and recommendations is presented in Table 63.

Table 63. Site Summary and Recommendations.

Site	Cultural Context, Type, & Function	Evaluated	Eligible for NRHP	Project Affect	Recommendation
21CR154	Indeterminate precontact period, artifact scatter, habitation	Yes	No	No affect	No further work
21CR155	Early to Late Archaic, artifact scatter, habitation	Yes	Yes	Adverse affect	Data Recovery
21CR156	Late Paleoindian, Archaic, & Late Woodland, artifact scatter, habitation	Yes	Yes	No affect - Avoided	No further work
21CR157	Indeterminate precontact period, artifact scatter, habitation	No	Potentially	No affect - Avoided	No further work
276-3	Historic farmstead, c.1880 to 1960s, artifact scatter	Yes	No	No	No further work

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APPENDIX A:
GEOMORPHOLOGICAL INVESTIGATION
BY STRATA MORPH GEOEXPLORATION, INC.

PHASE I GEOMORPHOLOGICAL INVESTIGATION FOR THE TH101/CSAH 61 “Y” STUDY IN SCOTT AND CARVER COUNTIES, MINNESOTA

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INTRODUCTION

The project area is along the bridge that carries TH 101 across the Minnesota River Valley and along portions of CSAH 61 (Flying Cloud Drive) at the north edge of the valley (Figure 1). The landscape consists of (1) the Minnesota River channel and associated levee and floodplain on the south end of the project area at Shakopee, MN, (2) lakes and wetland in the central portion of the valley, (3) alluvial fans and colluvial slopes at the northern end of the project area. Field investigations were conducted at the southern and northern ends of the project area.

The purpose of the geomorphological investigation was to locate soil-stratigraphic contexts that have geologic potential for buried archaeological deposits. Soil-stratigraphic contexts with low-moderate, moderate, or high potential were targeted for archaeological testing. Potential is a qualitative measure of the likelihood that a particular geologic environment will contain archaeological deposits in a primary context. Three major geologic criteria are used when assigning a level of potential: (1) age of the deposits, (2) depositional environment, and (3) post-depositional modifications (Hudak and Hajic 2002). Human occupation within the project area may have occurred from the Late Pleistocene through the Holocene (<14,000 ^{14}C RCYBP). Consequently, sediments deposited during this time span are considered as having chronological potential. In the TH 101 project area, the depositional environments most conducive to burying and preserving the primary context of the archaeological assemblage in the alluvial valley setting are vertical accretion alluvium on floodplains and levees. In the valley marginal setting, conducive depositional environments include alluvial fans, colluvial slopes, and floodplain lake margins. Post-depositional modifications that may have disturbed the context of the archaeological deposits are pedogenic processes such as bioturbation, shrink-swell in clayey soils, and historic anthropogenic activities such as mining, agriculture, and urbanization.

The three levels of potential and the criteria for their selection are listed below (modified from Hudak and Hajic 2002, Monaghan et al. 2006, Eigenberger et. al. 2009):

> **High Potential:** landforms where sediment has accumulated in the last 14,000 years in depositional environments where archaeological deposits could be buried and preserved in primary context. Depositional style yields stratigraphic sequences that are conducive to preserving buried archaeological deposits in primary contexts and with the potential for separation of some of the archaeological components in stacked paleosols or in accretionary deposits with relatively high sedimentation rates.

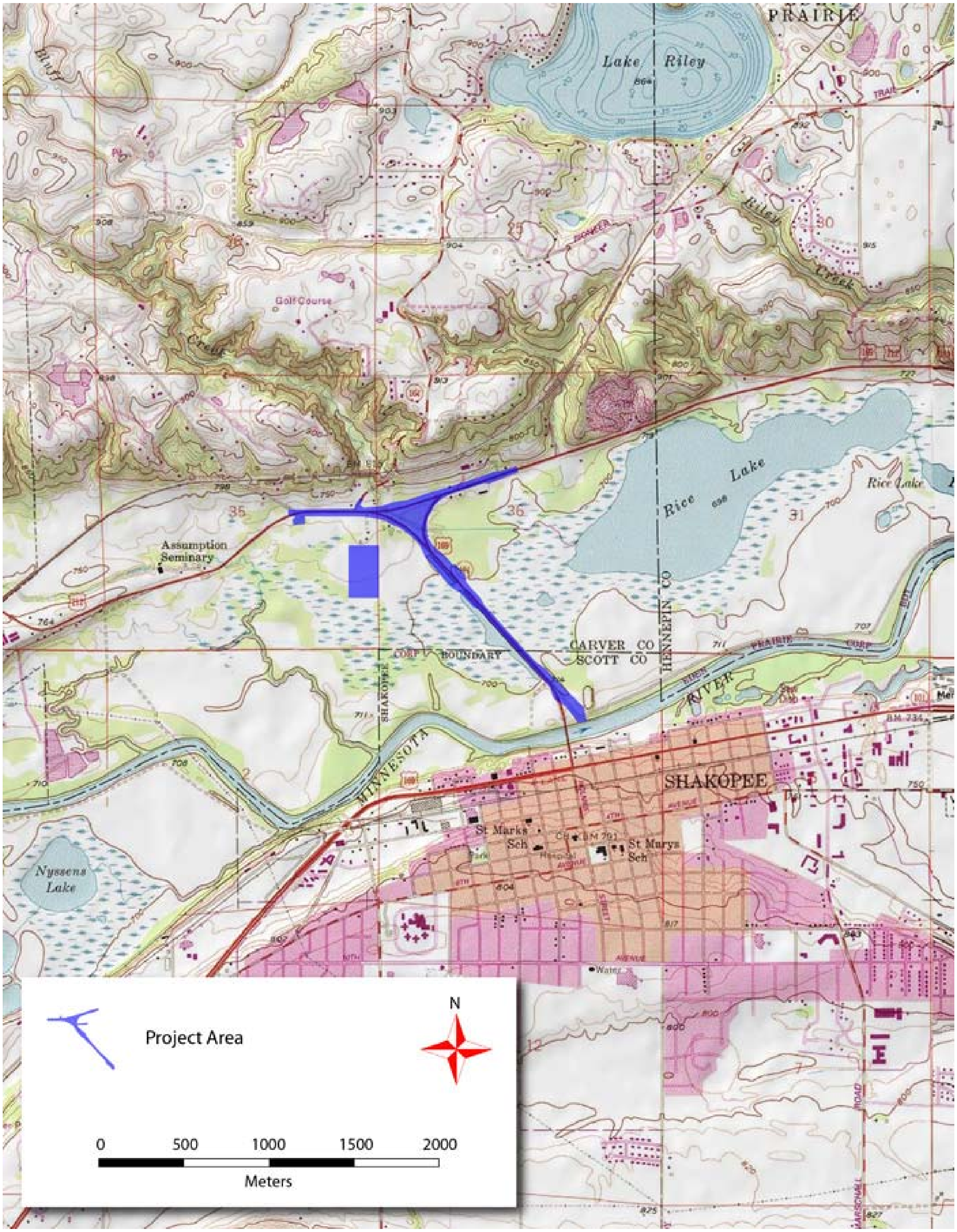

Figure 1 Project location on 1:24,000 topographic map.

Moderate Potential: landforms with limiting factors such as long-term wet conditions, short duration of sedimentation, young deposits, potential for gaps in the record due to erosion. A depositional style that yields stratigraphic sequences that are conducive to preserving buried archaeological deposits but with possible physical modifications to the primary cultural context. Or landforms that are likely to have potential for buried archaeological deposits but the stratigraphic contexts of these landforms are unknown or geographically variable.

Low Potential: deposits that are too old or too thin to contain buried archaeological deposits in primary context or deposits that accumulated in high-energy depositional environments, fluvial channels for example, where any contained archaeological deposits are likely not in primary context.

Mn Model Sensitivity

Landscape Suitability Maps indicating levels of potential at specific depth intervals in the project area are as follows.

<u>0-1 meter and 1-2 meter depths</u>: high potential for the alluvial fans on the north side of the Minnesota River Valley, no potential at the base of the bluffs east of Bluff Creek, low potential for the floodplain/wetlands in the center of the valley, and moderate potential along the south side of the Minnesota River Valley along the main channel levees.

<u>2-5 meter depth:</u> potential is high beneath the alluvial fan on the north side of the valley, none at the base of the bluffs east of Bluff Creek; none in the wetland/floodplain in the center of the valley and low along the main channel of the Minnesota River on the south side of the valley

During the archaeological survey, buried sites were identified on small alluvial fans within the upper 2 m and beneath a large alluvial fan (Bluff Creek fan) on buried soils that formed in paludal and lacustrine deposits, as predicted by MnModel. No buried sites were located within the Bluff Creek alluvial fan because it is very young. This is contrary to the MN Model prediction because it assumes the fan deposits span all or a large part of the Holocene. Sites buried between 1 and 2 meters below the surface in colluvium were located just north and east of the “Y” in the areas designated on the suitability maps as having no potential. The Mn Model may have assumed this area was excavated out as borrow and/or destroyed by filling and road construction. The portions of the Bluff Creek alluvial fan investigated for this project are historic in age and overlie paludal and lacustrine deposits that are considered to have low potential for buried sites. A soil formed at the top of the lacustrine deposits indicates that they were exposed at the landscape surface for a long period of time, however, and therefore have high potential.

The low rating for buried potential within lacustrine sequences is because they are subaqueous and cannot normally be occupied until they are exposed at the surface at least intermittently.

PREVIOUS RESEARCH

Quaternary Deposits

The Quaternary deposits map of Minnesota indicates the project area is Holocene alluvium (Hobbs and Goebel 1982). North of the project area, up to the edge of the Minnesota River Valley, is an end moraine of the Grantsburg sublobe. The end moraine topography is the result of the Grantsburg sublobe deposits being draped over the underlying St Croix end moraine deposits. The watersheds that contribute sediment to the alluvial fans in the project area drain this end moraine. The southern margin of the valley is mapped as an outwash terrace.

Lusardi (1997) mapped the surficial geology in the project area (from north to south) as: alluvial fans (Qa), organic deposits (Qo), floodplain alluvium (Qf), and just across the Minnesota River channel at Shakopee as Ordovician dolostone (Opc). North of Flying Cloud Drive along the bluff slopes and in the Bluff Creek watershed the deposits are mapped as Holocene colluvium along the valley slopes and in the tributary valleys and as low-and high-relief gravelly loam to clay loam tills north of the valley margin. The low-relief tills in the upland along the valley margins overlie thick deposits of sand and gravel (Meyer and Jirsa 1982).

Minnesota River Valley

The development of the current landscape in the project area begins with the advance and retreat of the De Moines Lobe and the Grantsburg sublobe. The chronology of ice retreat in the Minnesota River Valley must be estimated from dates obtained in Iowa. The youngest Des Moines Lobe recessional moraine in northern Iowa is Algona recessional moraine (Kemmis 1981). It was abandoned around 12,000-12,500 ^{14}C yrs BP (Kemmis 1981). Ice was at the Gary moraine northwest of the project area in Minnesota by 12,500 ^{14}C BP and the Big Stone moraine yet further northwest by 11,700 ^{14}C yrs BP (Patterson 1997). Thus the project area was deglaciated approximately 12,500 years ^{14}C yrs BP.

With further retreat of the Des Moines Lobe ice, Glacial Lake Agassiz formed in front of the ice sheet. When Glacial Lake Agassiz drained through its southern outlet, catastrophic floods in River Warren formed the Minnesota River Valley. The large volumes of water carried by

River Warren down cut through the till and outwash that filled the valley. The initial incision began about 11,800 ^{14}C yrs B.P. when Glacial Lake Agassiz first began draining through the southern outlet (Teller 1985) and was completed by 10,800 ^{14}C yrs B.P. (Fisher 2003). The southern outlet was then abandoned and possibly re-occupied between 9900 and 9400 ^{14}C yrs B.P. as River Warren re-occupied the spillway with minimal further modification (Fisher 2003). Wright et al (1998) suggest that perhaps the re-occupation did not occur, based on data from Lake Pepin and Lake St Croix. The question remains unresolved. In either case, at some point in the early Holocene Lake Pepin extended up the Mississippi River valley to St Anthony Falls and presumably some distance up the Minnesota River Valley as well.

The lowest base levels from the River Warren down-cutting would have occurred between the last flood from Lake Agassiz and the incursion of Lake Pepin into the valley mouth (±9500 BP). Incision in the main valley also caused incision and head cutting in the tributary valleys, which initiated alluvial fan construction. Initially fan construction was rapid and only slowed when the tributary channels became adjusted to the lower base level and as the base level rose with back flooding and alluvial aggradation in the main valley. Radiocarbon dates from nearby fan and sub-fan contexts (Hudak and Hajic 2002) indicate the construction of fans began between 10,800 and 10,400 ^{14}C yrs B.P. The primary fan or highest fan surface may have quickly stabilized with continued adjustment to the incision and aggradation in the Minnesota River that was taking place in the fan channel belt and on the secondary fans farther out in the valley.

Paleoenvironment

A number of local and regional paleoenvironmental studies are relevant to the interpretation of the stratigraphy and paleoenvironmental conditions in the project area. A study at Roberts Creek in northeast Iowa (Chumbley et al. 1990) and re-evaluation of other studies from the Midwest (Baker et al. 1992) have suggested a sharp ecotone (prairie-forest boundary) between the northern Great Plains and central Iowa (prairie) and northeast Iowa and Wisconsin (open forest or savanna) during the middle to late Holocene. The dynamic nature of the ecotone is demonstrated by presence of prairie in central Iowa about 1500 years sooner than in northeast Iowa (Baker et al. 1992). Vegetation histories from a few selected (not comprehensive) studies in Iowa and Minnesota indicate a very similar pattern of vegetation history over a broad area.

Paleoenvironmental investigations closest to the project area were conducted at Kirchner Marsh and Lake Carlson (Wright et al. 1963, and Watts and Winter 1966) located approximately 25 km southeast of the project area in Dakota County. They are to the west or prairie side of the middle Holocene prairie-forest boundary described in Baker et al. (1992). The postglacial vegetation history is as follows: Between 10,200 and 9300 yrs BP, the spruce forest is replaced by a closed forest dominated first by birch and alder and then by pine. . Between 9300 and 7100 yrs BP, elm and oak forest dominated as condition become drier. Between about 7100 and 5200 yrs BP, the oak forest is replaced by prairie. After 5200 yrs BP, oak again becomes dominant but the exact nature of the forest is not known.

Expected periods of widespread effective regional geomorphic instability based on the known geomorphic and paleoenvironmental history are: (1) early Holocene instability due to valley degradation resulting in tributary head-cutting and primary alluvial fan construction, (2) climatically driven geomorphic instability in the middle Holocene resulting in secondary fan construction, and (3) historic instability due to extensive land clearing and agriculture.

Valley Margins: Alluvial Fans and Colluvial Slopes

Geomorphological investigations were conducted in conjunction with a Phase I archaeological survey for a number of proposed TH 41 Bridge crossing of the Minnesota River in Scott and Carver counties (Schoen 2006). Two stratigraphic patterns identified during that project are relevant to the TH 101 project. A near channel lithofacies was defined that has similar characteristic to the levee at the south end of the TH 101 project area (Kolb in Schoen 2006). It shares the following similarities: (1) it is adjacent to the Minnesota River channel, (2) it has a thick sequence of stratified very fine sand and silt that is pedogenically unaltered, and (3) it is young (likely historic). And, similar to the TH101 project area, an alluvial fan at the mouth of East Creek contains a number of buried soils and the lower fan progrades out over a floodplain lake. The stratigraphy consists of young (historic) alluvial fan deposits over interstratified mineral sediment and organic sediment deposited in a floodplain lake with a fluctuating water level.

A number of other archaeological and geomorphological studies have illustrated the potential for alluvial fans to contain buried archaeological deposits in the Minnesota River Valley. In the New Ulm area, buried sites in alluvial fan contexts are present at Fritsche Creek

(Monaghan et al. 2006), in small fans along Highway 14 (Kolb in Terrell et al. 2005), and in a small alluvial fan downstream of New Ulm (Kolb 2007, Hudak and Hajic 2002).

METHODS

Cores were used to collect subsurface data and construct a stratigraphic framework. This framework was used to determine where in the project area there is potential for buried archaeological sites. Cores measuring 5 cm (2 inches) in diameter were extracted with a Geoprobe® mounted on a pick-up truck. Cores were described in the field using standard systems for soils (Soil Survey Staff 1974, Schoeneberger et al. 1998) and geology (Collinson and Thompson 1982, Folk 1974). Excavated soils were photographed and returned to the borehole. Standard core log descriptions are in Appendix A.

RESULTS: DEPOSITS

Deposition has occurred in five major depositional environments: (1) Alluvial Fan, (2) Alluvial, (3) Colluvial, (4) Lacustrine, and (5) Paludal in the TH101/CSAH61 project area (Table 1).

Alluvial Fan Deposits

Alluvial fans are widespread at the north end of the project area. Alluvial fan deposits vary with the size of the alluvial fan, which is directly tied to the size of the contributing basin and the distance from the apex of the fan. In the project area there are two small alluvial fans and one large alluvial fan. Alluvial fan depositional environments include distal and proximal facies but the differences between the facies are much greater in the large alluvial fans (Table 1). Deposits in the large alluvial fan at mouth of Bluff Creek are predominately stratified, coarse-grained, sandy and loamy, with varying percentages of gravel and interbeds of silt loam and silty clay loam especially in more distal fan positions.

The sand and gravelly sands are channel deposits that accumulated during large floods. The finer-grained interbeds are distal fan deposits that accumulated during smaller floods or are lacustrine deposits that accumulated when the toe of the fan was inundated during high water (see section on “Lacustrine Deposits” below). Fine-grained strata are more numerous down fan.

Table 1. Deposit Characteristics and Archaeological Potential in the TH101 Project Area.

Deposit Type	Depositional Environment	Characteristics	Soils	Potential For Buried Archaeological Deposits
Alluvial Fan	proximal alluvial fan	loams to sand, with gravel; occasionally interstratified with distal alluvial fan, alluvial and paludal sediment	weakly developed surface soil; weakly to moderately developed buried soils in small tributary fans	**low potential** in the Bluff Creek fan (young and high energy); **high potential** in the Eastern and Western alluvial fans
Alluvial Fan	distal alluvial fan	silty to loamy; poorly sorted; interstratified with coarser alluvial fan deposits or lacustrine deposits	weakly developed soils formed during short term intermittent subaerial exposure near the floodplain lake margin to almost entirely subaqueous away from lake margin	**moderate potential** within subaerial distal fan deposits; **low potential** in subaqueous alluvial fan/deltaic deposits
Lacustrine includes deltaic	floodplain lakes	silty clay and clay; graded very fine sand fraction at base of sequence	cumulic soil at surface or buried beneath alluvial fan and/or paludal deposits	**high potential** at lake margin where subaerially exposed; **low potential** where no paleosol is present
Alluvium	floodplain	silt and clay on the Minnesota River floodplain	hydric	**moderate potential** within vertical accretion sequence
Alluvium	levee	laminated silt and fine sand	weakly developed surface soils; buried soil at edge of levee backslope	**low potential** due to the historic age of the deposits
Colluvium	base of the slope at the valley margin and in small alluvial fans	poorly sorted gravelly loam, clay loam, silty clay loam, and clay.	moderately and weakly developed buried soils	**high potential**
Paludal	wetland at floodplain lake margins and along the base of the bluff at springs and seeps	organic sediment in various stages of decomposition (peat and muck)	surface soil or buried beneath fill and/or alluvial fan deposits; interbedded with fan or lacustrine deposits	**low potential** within the sequence but overlies a buried soil formed in the lacustrine deposits that has high potential

The small alluvial fans are located at the eastern and western ends of the project area. Deposits from these fans, as observed at sites 21CR155 (west) and 21CR156 (east), are poorly sorted loams, sandy loam, and silty clay loams with variable percentages of gravel that generally get coarser grained with depth. Deposition on these small fans is predominately by both mass-wasting (debris flows and hyper-concentrated flow) fluvial activity.

Alluvium

Minnesota River alluvium is present at the south end of the project area. It consists of laminated sand and silts to depth of 5.8 m beneath the levee (Table 1). Silty and clayey vertical accretion alluvium is present on the floodplain north of the levee. Sands at the base of the sequences along the northern end of the project area may be alluvial (fluvial) in origin.

Colluvium

Colluvial deposit lithology in the project area is variable depending on depositional processes and sediment source. Colluvial deposits and alluvial fan deposits that result from debris flow processes are difficult to distinguish in small excavations or cores. Sediment source is likely variable given the complex glacial depositional environments upslope of the project area. Colluvial/alluvial fan deposits are located along the footslope at the east end of the project area, as observed at 21CR156. These deposits are loam, clay loam and clay, and some sandy clay loam with poorly-sorted silty clay loam and clay loam interbeds. Small amounts of gravel are commonly present.

Lacustrine

Lacustrine deposits have a fine-grained upper facies and a graded coarser-grained lower facies (Table 1). The upper lacustrine deposits are clay, silty clay, and silty clay loam that often include a small percentage of sand and/or fine gravel. The lower facies grades up into the upper facies from a well-sorted very fine sand, through loam, to sandy clay and clay with low percentages of very fine sand. The sand is almost always very fine-textured. The grading may be the result of deposition from the tributary valleys into standing water along the lake margin (basically forming a delta) or it may be alluvial, predating the lake environment. This process seems to have occurred during the initial formation of the tributary valleys, perhaps when the Minnesota River Valley was occupied by a lake. The upper facies formed over time at the margin of a floodplain lake during high water. A prominent buried hydric soil is formed in the upper lacustrine facies.

Paludal

Paludal deposits accumulate in wetlands in shallow basins, along slopes at springs and seeps, and along the fringes of floodplain lakes. They consist of organic sediment in varying stages of decomposition and with varying mineral sediment content (Table 1). Layering can occur within the organic sequences as a result of varying degrees of decomposition of the plant remains and due to the accumulation of different types of wetland plants. Paludal sequences can also include thin interbeds of sand, silt, or clay.

RESULTS: NORTH END

LANDFORMS

The north end project area is located at the northern edge of the Minnesota River Valley (Figure 1). The east-west portion of the project APE (along Flying Cloud Drive) is on alluvial fans, colluvial slopes, and wetland/lacustrine settings at the valley margin (Figure 2). The north-south portion of the APE extends south from the valley margin along TH 101 and is located on the Bluff Creek alluvial fan. Additional areas were also investigated for placement of fill at the Golf Zone property near the intersection of TH101 and CSAH 61 and for a retention pond near the intersection of Bluff Creek Drive and CSAH 61. Both of the additional areas are on alluvial fans.

Alluvial Fans

Bluff Creek is a large fourth-order stream that drains high and low relief terrain on an end moraine of the Grantsburg sublobe (Lusardi 1997, Hobbs and Goebel 1982). The upper two thirds of the drainage basin contains flat areas of wetland along the main trunk stream and some of the tributaries. In the lower third of the basin the trunk channel is deeply incised with many short steep tributaries. Watershed characteristics and land-use types through historic time combined to create large floods. The Bluff Creek alluvial fan covers a large portion of the project area (Figure 2). Historic artifacts buried within the fan deposits, a lack of soil development, and ^{14}C dates in the underlying peat indicate the fan is historic and/or late pre-contact in age. At the mouth of the valley at the apex of the alluvial fan, there are three to five meters of proximal alluvial fan deposits. No buried soils were encountered. The fan progrades south and west over a buried soil formed in lacustrine deposits and then slightly downslope over thin paludal deposits, marking a buried wetland/lake edge environment over the same buried soil formed in the lacustrine deposits.

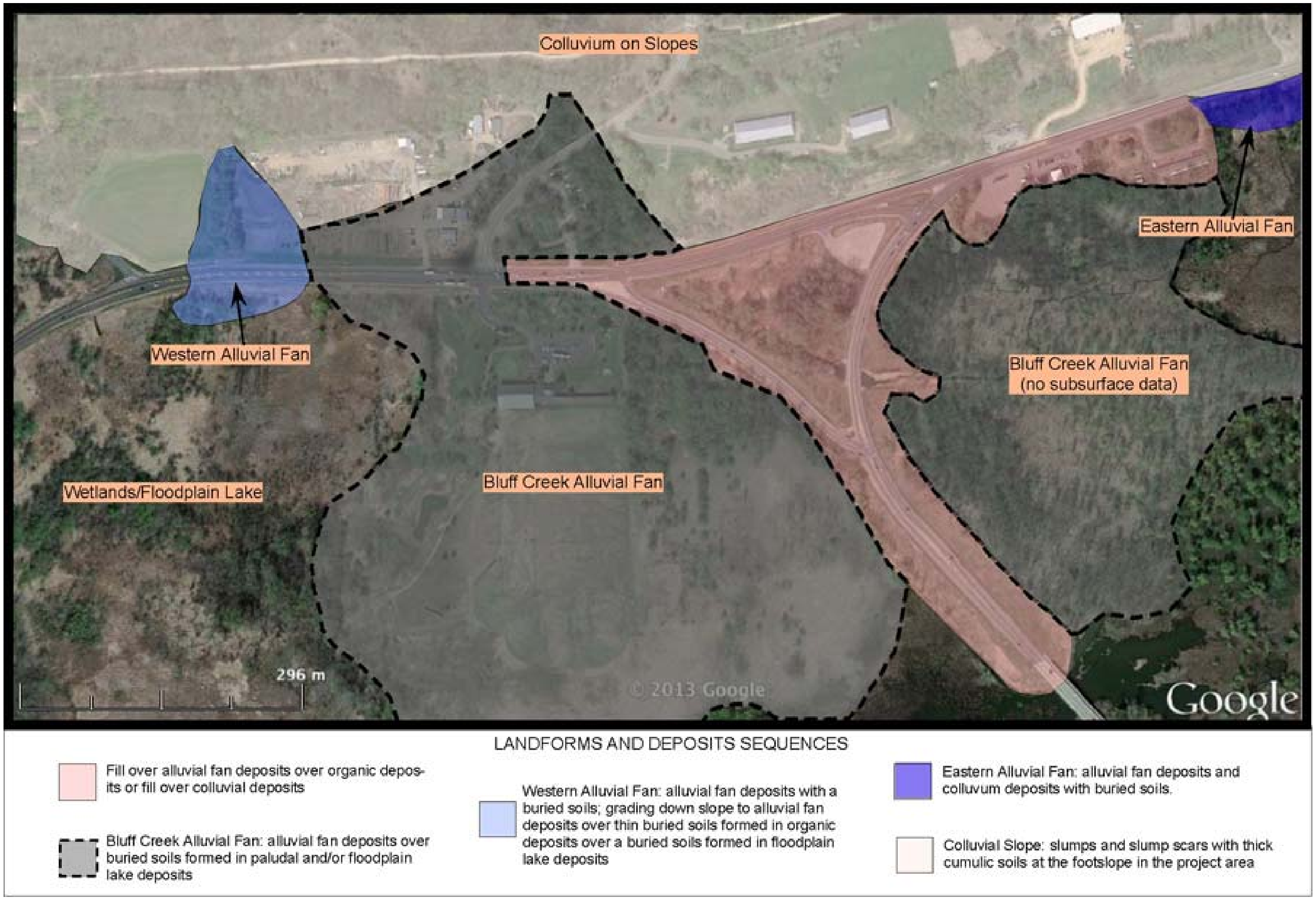

Figure 2 North End landforms.

The more distal Bluff Creek Alluvial Fan extends south of Flying Cloud Drive into the Golf Zone and along TH 101 (Figure 2). In the Golf Zone property, alluvial fan sediments overlie either paludal deposits or floodplain lake deposits or they are interbedded paludal and floodplain lake deposits/distal alluvial fan deposits. Out along Highway 101 in Core 5, historic artifacts were located at depth of 2.2 m in a weakly-developed buried soil formed in loamy sand within the Bluff Creek Alluvial fan deposit sequence. Two radiocarbon dates were obtained from Core 3 (Figure 3). The younger date of AD 1480-1650 (310±30 RCYBP, Appendix B) is from the top of the peat sequence just below the Bluff Creek Alluvial Fan deposits at 4.2 m below the surface. The older date of AD 610-670 (1390±30 RCYBP, Appendix B) is from peat 5.5 m below the surface. The dates and the historic artifacts indicate that the Bluff Creek alluvial fan deposits burying the peat were deposited after AD 1480-1650 and were still in the process of being deposited during historic times (there is also air photo evidence of this). The size of the fan and the large caliber of the sediment within the fan indicate it was constructed by large flood flows. Geomorphic instability combined with large rainfall events during historic times would have resulted in high sediment loads and large flash floods. Most of the Bluff Creek Fan was likely deposited during historic times.

At the east and west ends along the northern edge of the project area, the slopes are dissected by intermittent first and second order streams. Small alluvial fans are present at the mouths of these drainages. Two of these fans are within the project APE. The Western Alluvial Fan is at the west end of the project area at the mouth of a second order valley (Figure 2). Stratigraphy varies north and south of Flying Cloud Drive. North of Flying Cloud Drive, the western alluvial fan/colluvial slope forms a somewhat better-drained landscape position. Stratigraphy (exposed in cores and archaeological excavations at 21CR155) consists of silty and loamy alluvial fan deposits with buried soils. The soils are moderately to weakly developed and have a large amount of free carbonate. The carbonate tends to dampen or slow soil forming processes associate horizon development. The buried soils mark periods of non-deposition on the distal alluvial fan surface. In this area, archaeological site 21CR155 is located in a buried soil that marks a buried landscape surface, ranging from 0.35-2.0 m below the modern surface. The landscape is wetter and lower on the south side of Flying Cloud Drive, especially in the mouth of the tributary valleys where the alluvial fan is forming. Stratigraphy consists of coarse-grained

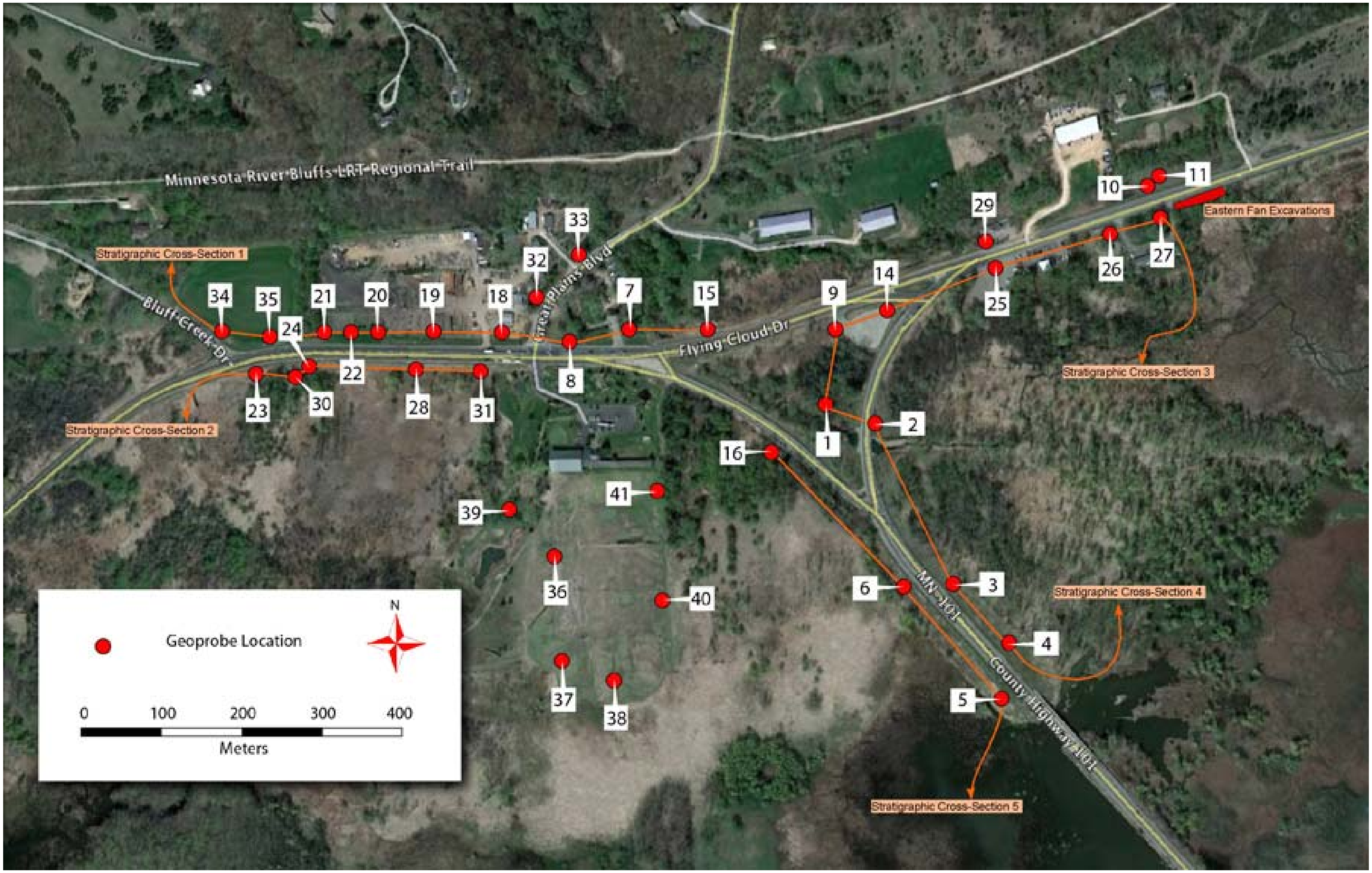

Figure 3 Locations of cores and stratigraphic cross sections on North End.

alluvial fan deposits over a buried soil or a sequence of buried soils formed in paludal deposits (thin beds of peat or muck) over a buried soil formed in floodplain lake deposits. In this area, archaeological site 21CR155 is in the buried lacustrine soil that has a thick dark cumulic Ab horizon. The top of this soil is 1.45-1.60 m below the surface.

The Eastern Fan is located at the east end of the project area at the mouth of a first order valley that contains a perennial spring. Archaeological site site 21CR156 is buried within the fan. Stratigraphy indicates that the fan's western edge has been geomorphically relatively stable. The western portion has buried soils, indicating periods of stability and instability.

Colluvial Slopes

A long complex slope ascends to the north for about 350 m from the valley bottom to the edge of the upland moraine (Figures 1 and 2). The slope exhibits a number of changes in gradient and morphological evidence of mass-wasting. Colluvial slopes are present at the base of the slope where permanent channels have not formed or are not preserved. Soils mapped on these landscape segments are the Lester and Kilkenny loams on the upper slope and the Terril loams and Minneiska sandy loams on the footslope (USDA n.d.). The spatial arrangement of the soils is the result of ongoing slope process. The Lestre and Kilkenny series are formed in eroded slopes cut in till, the Terril series is formed in colluvium derived from the Lester and Kilkenny soils, and the Minneiska series is formed in alluvium at the base of the footslope. Observations in test units and shovel tests at 21CR154 along the base of the slope indicate that textures are variable and include clay, sandy clay, and loams, often with gravel, with sandier textures at depth. Muck with snails is also present, probably at seeps. The poorly sorted nature of the deposits is typical of colluvium. A thick dark-colored cumulic upper solum is the result of sediment accumulating at the footslope through slope processes (mass-wasting, overland flow, creep).

Floodplain Lake and Wetlands

Floodplain lakes are common in the lower Minnesota River Valley. They occupy the center of the Minnesota River Valley and divide the north and south ends of the TH 101 project area. Wetlands are present at the edges of the lakes and along the valley margins at springs and seeps. Lacustrine deposits consisting of silt and clay accumulate in these lakes. A soil formed in these deposits along the margins of the lakes after the deposits were exposed at the landscape surface (subaerial vs. subaqueous). This soil is no longer at the surface, having been buried by paludal and/or alluvial fan deposits. Archaeological site 21CR155 is located in that soil.

STRATIGRAPHY

The project area is a relatively small area with a long north-south axis and a short east-west axis. It is located at the base of a slope and across a number of alluvial fans of varying size. Because of the landscape position, and in spite of the small area, stratigraphy is variable laterally as well as up and down slope.

Stratigraphic Cross-Section 1 and the Western Alluvial Fan

Stratigraphic Cross-Section 1 is located on the north side of Flying Cloud Drive. It crosses (from west to east) the colluvial slope, western alluvial fan, the Bluff Creek alluvial fan, and a small paludal basin (Figures 3 and 4). Stratigraphy beneath the western alluvial fan and colluvial slope was observed in cores and in the profiles in the archaeological test excavation at 21CR155. The colluvial slope stratigraphy west of the modern channel of the western alluvial fan consists of a thick (1.27 m) cumulic Ap/A formed in gravelly silt loam colluvium (Core 34) over an AB-Bw-BC-C1 soil horizon sequence that formed in silt loam and silty clay loam colluvium to a depth of 2.25 m. This sequence overlies a series of C horizons formed in very fine, sandy loam lacustrine or fluvial deposits. The archaeological excavation and Core 35 are at the edge of the western alluvial fan.

Surface deposits consist of a series of Ap horizons formed in silty clay loam colluvium (Core 35) to a depth of 0.6 m, grading laterally to a series of Ap horizons formed in gravelly loam alluvial fan deposits to a depth of 0.58 m, as exposedin the archaeological excavation. Stratigraphy in the core and the excavation are similar, consisting of a gravelly silt loam to sandy loam colluvium with an intermittent incipient A horizon over a buried soil at depths of 1.53 and 1.67 m. The buried soil (Ab2 horizon) is formed in heavy silt loam with a small percentage of gravel. A second buried soil (Ab3) is present at depths of 1.92 m and 2.22 m, separated from the Ab2 horizons by silt loam or sandy loam colluvium. A portion of archaeological site 21CR155 is located in this buried soil. Beneath the Ab3 horizon are loamy alluvial or lacustrine deposits (in the excavation) and loam grading to very fine sandy loam and sand in the core. The sand likely also underlies the loam in the excavation.

East of the modern western fan channel, historic fill occupies what is likely the original channel of the western fan. Beneath the fill in Cores 20 and 22 is a buried soil with an Ab-ABb-C or Cg horizon sequence that formed in silt loam and silty clay loam over poorly-sorted loam alluvial fan deposits (Appendix A, Figure 4). In Core 20, a second buried soil that formed in

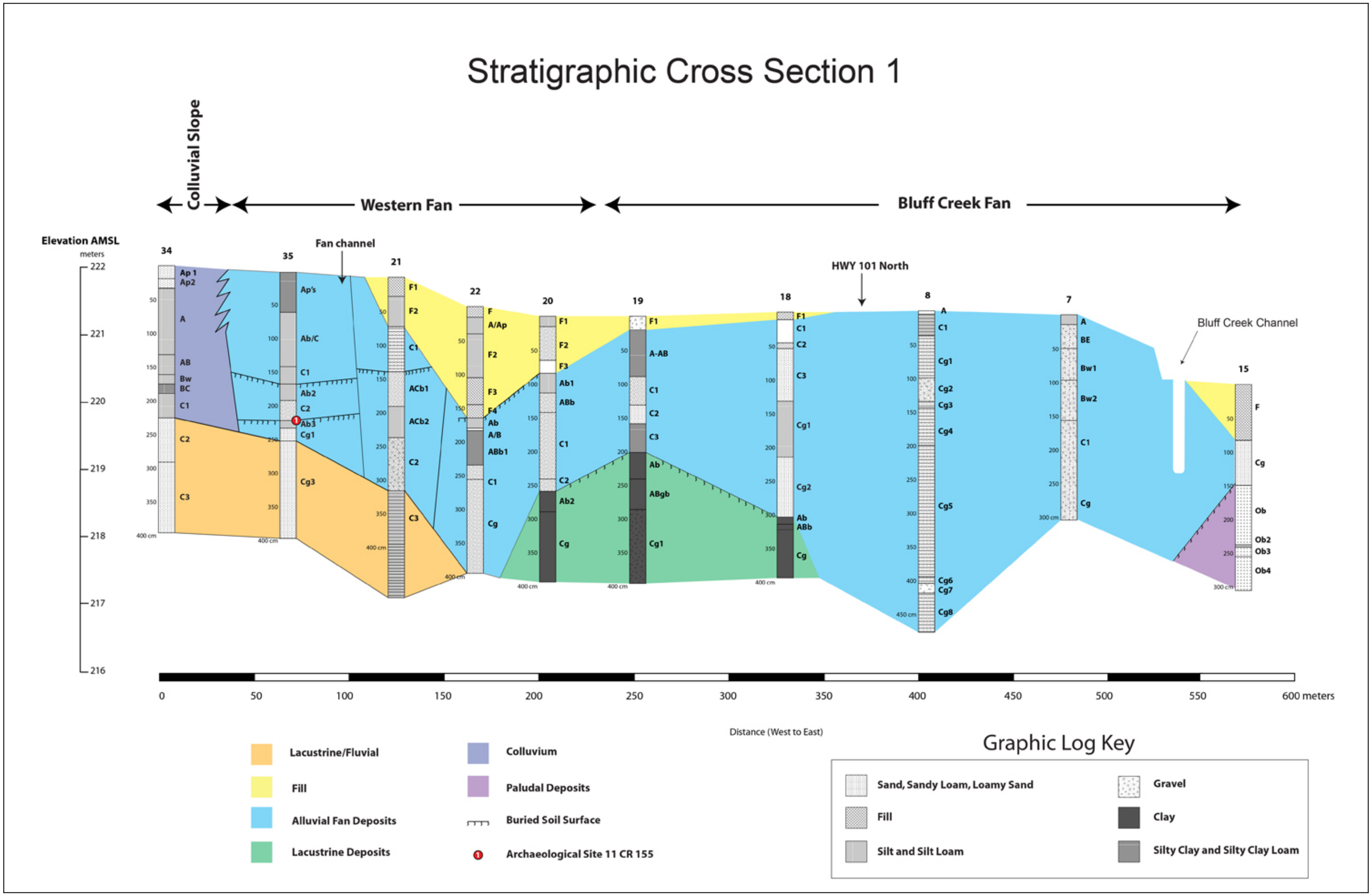

Figure 4 Stratigraphic Cross-Section 1 (Cores 7, 8, 15, 18-22, 35 & 35)

lacustrine clay is present at a depth of 2.6 m. The lacustrine deposits are not present in Core 22 within the upper 4 m of deposits. Stratigraphy in Core 21 consists of 0.78 m of historic fill over laminated very fine sand and silt to a depth of 1.4 m, over a weakly developed buried soil with an ACb1-ACb2 horizon sequence that formed in loam over sandy loam to a depth of 2.38 m. This sequence overlies clay loam with a small percentage of gravel over silt loam to sandy loam to a depth of 4.87 m. The sand fraction is well-sorted very fine sand with more fine sand at depth.

Core 19 separates the western alluvial fan from the Bluff Creek alluvial fan (Figure 4). Stratigraphy in Core 19 consists of a weakly developed soil formed in colluvium and alluvial fan deposits over a buried soil formed in clayey lacustrine deposits. East of Core 18, beneath the Bluff Creek alluvial fan, stratigraphy in Cores 7 and 8 consists of weakly developed surface soils formed in sand and gravelly sand deposits to 4.8 meters. Sedimentary structures in the form of bedding and lamination are common and often are at or near the modern surface. Core 15, at the eastern end of the cross-section, consists of fill over alluvial fan deposits over peat and muck.

Cores 32 and 33 (not included in the cross-section) were extracted along the west side of TH101/Great Plains Boulevard north of Flying Cloud Drive (Figure 3). Core 32 consists of coarse-grained alluvial fan/channel deposits to a depth of 4.87 m. A silty interval with a black sand laminae and roots that is present at a depth of 1.60 m may mark a short period of stability and overbank sediment accumulation. Core 33 is north (up valley) from Core 32 (Figure 3). Stratigraphy consists of coarse-grained alluvial fan channel deposits to a depth of 2.23 m over a thin peat stratum, over mixed sand and peat to a depth of 4.87 m. A thin silt-loam bed at a depth of 1.51 m correlates with the silty bed in Core 32. Both of these cores have thick coarse-grained alluvial sequences that characterize the load of the Bluff Creek channel.

Stratigraphic cross-section 1 illustrates the relationships among the different depositional environments north of Flying Cloud Drive and east of Bluff Creek. The surface deposits beneath the historic fill consist of the Bluff Creek alluvial fan deposits, western alluvial fan deposits, and colluvial deposits. The Bluff Creek fan deposits infill the Bluff Creek valley, overlie paludal deposits at the east end of the section, overlie the lacustrine deposits, and grade laterally into the upper western alluvial fan deposits. The western alluvial fan deposits are inset into the incised mouth of a tributary valley, overlapping and cutting into the lacustrine deposits and adjacent colluvial deposits. A number of buried soils mark former stable landscape surfaces within the tributary valley and on the lacustrine deposits outside of the valley. These buried soils mark buried landscape surfaces that were utilized by Native American populations at various times in the past, based on artifacts recovered during the project's archaeological survey.

Stratigraphic Cross-Section 2

Stratigraphic Cross-Section 2 is on the south side of Flying Cloud Drive, opposite and down slope of Stratigraphic Cross-Section 1 (Figure 3). It crosses the north-south axis of the western alluvial fan and the Bluff Creek alluvial fan. Stratigraphy consists of a thin unit of fill on the surface of the western alluvial fan (Figure 5). The next oldest units are the sandy and gravelly alluvial fan deposits, which underlie the fill or are the surface deposits, except at the west end of the cross-section where they are not present. Paludal (peat and muck) deposits are present beneath the alluvial fan deposits in all of the cores except Core 23 at the west end of the profile. The paludal deposits (Ob horizons) are thin, and in Core 24 beneath the western alluvial fan, they are interbedded with silt loam or loam.

The organic sediment is the result of paludification, a process where rising groundwater levels allow wetland plants to migrate upslope, resulting in the accumulation of organic sediment. The water level rise can be caused by local geomorphic/depositional conditions or by the onset of overall wetter climatic conditions. Underlying the paludal deposits and at the surface in Core 23 are sandy clay to clay lacustrine deposits. These deposits contain varying amounts of very fine sand, generally less than 10%, except in the sandy clay. They are also graded at the base and contain some matrix–supported gravels. The sands/gravels and the grading may be due to low energy shoreline processes and/or colluvium or alluvial fan accumulation in standing water (small low-energy deltas). A cumulic hydric soil formed in the lacustrine deposits marks a buried landscape surface where sediment accumulated slowly over time as the surface was being modified by pedogenesis. Archaeological site 21CR155 is located on this buried landscape surface. The clayey lacustrine deposits are underlain by very fine sand or sandy loam lacustrine/deltaic deposits or by medium to coarse sand fluvial deposits.

Stratigraphic Cross-Section 3 and Cores 10, 11 and 29

Stratigraphic Cross-Section 3 is located south of Flying Cloud Drive (Figure 3). It crosses the Bluff Creek alluvial fan and the colluvial slope up to the eastern alluvial fan. Fill is present

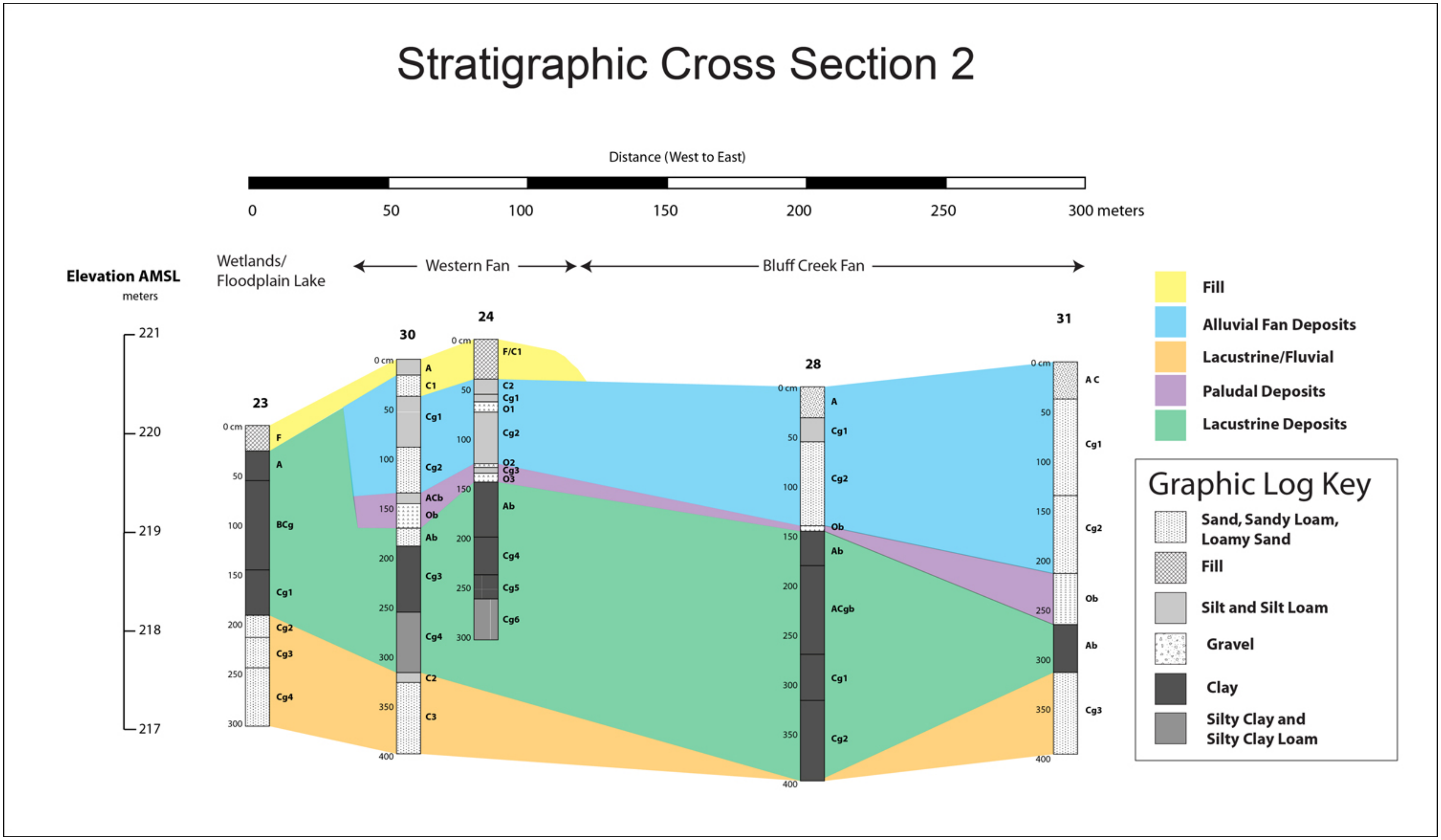

Figure 5 Stratigraphic Cross-Section 2 (Cores 23, 24, 28, 30 & 31)

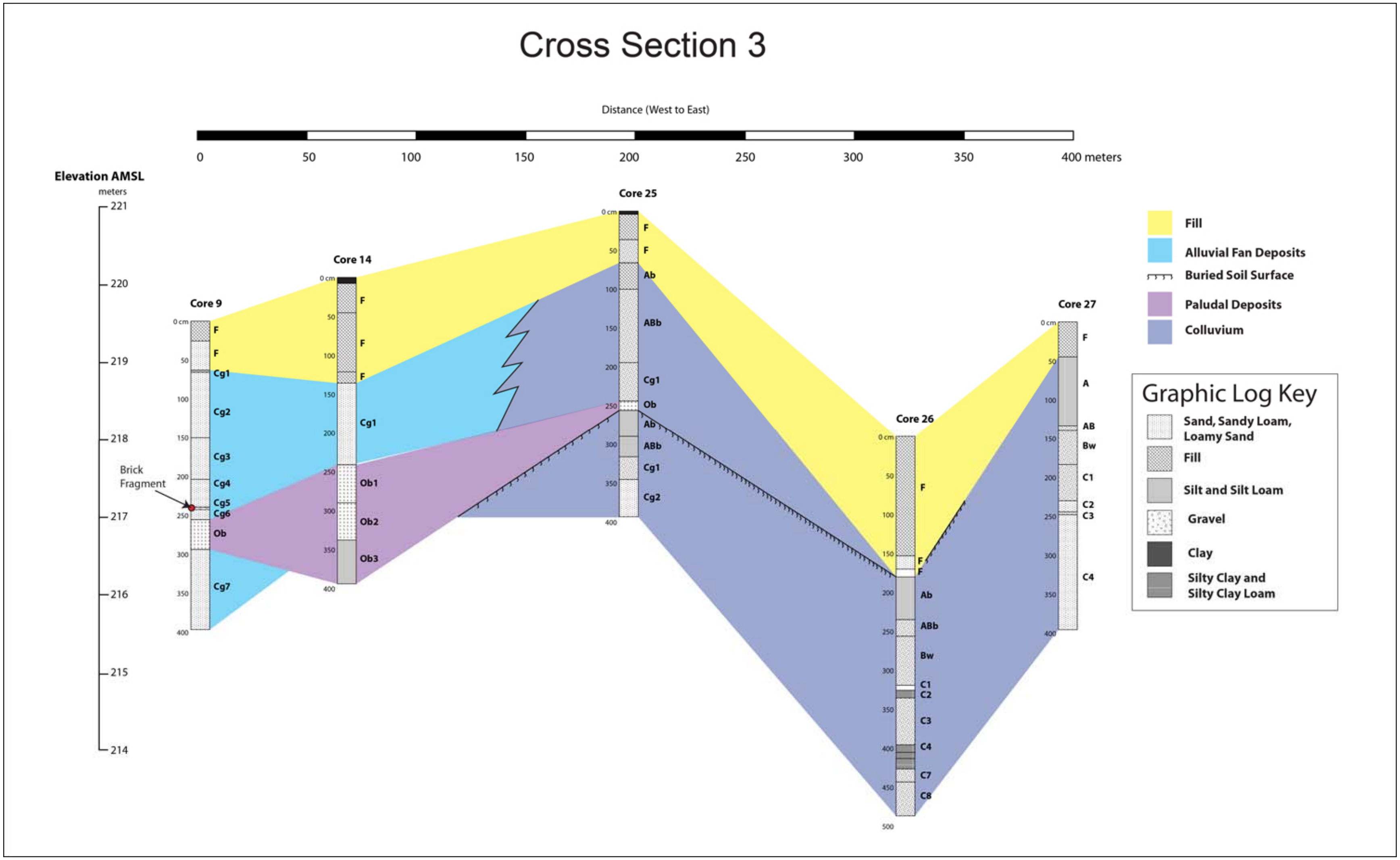

Figure 6 Stratigraphic Cross-Section 3 (Cores 9, 14, 25-27)

across the entire area (Figure 6). Beneath the fill at the western end (Cores 9 and 14), Bluff Creek Fan deposits are present. A brick fragment was found in Core 9 at a depth of 2.4 m. Soil formed in the alluvial fan deposits is very weakly developed or eroded away. Laterally to the east, the alluvial fan deposits grade to colluvial deposits in Cores 25-27. This is most likely due to the cross-section getting closer to the bluff base. The colluvium comprises poorly-sorted stratified deposits with a weakly-developed soil formed at the top of the sequence. A number of springs are present along the base of the bluff.

Cores 10, 11 and 29 are closer to the footslope of the bluff, on the side of Flying Cloud Drive opposite of Stratigraphic Cross-Section 3 (Figure 3). Cores 10 and 11 are on a landform that was modified, resulting in a truncated soil, and then filled. Stratigraphy in Core 10 consists of fill to 0.62 m over sandy loam colluvium to 1.37 m, over a thin clay loam colluvial strata to 1.44 m, over laminated very fine and fine sand to a depth of 3.04 m (Appendix A). Core 11 stratigraphy consists of fill to 1.36 m over very fine sand to 2.13 m (Appendix A). The footslope of the bluff base was excavated and leveled at this location. Core 29 is located at the base of the bluff west of Cores 10 and 11 (Figure 3). Stratigraphy consists of fill to a depth of 1.82 m over a series of C horizons formed in stratified sandy loam and loam alluvial fan deposits to a depth of 3.09 m, over silt loam lacustrine deposits to a depth of 3.96 m. A large spring is present 10 m to the west of the core location. It appears the small valley created by the spring was filled to facilitate road and business construction.

Stratigraphic Cross-Section 4

Stratigraphic Cross-Section 4 extends down the Bluff Creek fan out into the Minnesota River Valley (Figure 3) along TH 101. Fill is present at the top of the entire cross-section (Figure 7). Beneath the fill is the Bluff Creek alluvial fan sequence. It consists of stratified sand and gravelly sand with a few finer-grained interbeds. In Core 9, a brick fragment was found at depth of 2.38 m. The base of the alluvial fan deposits is very abrupt where they overlie the paludal deposits that consist of strata of organic sediment in varying stages of decomposition (peat and muck). These deposits often consist of interstratified organic sediment and sandy and silty mineral sediment or mixes of either (silty muck or mucky silt for example). The non-organic strata are the result of floodwaters carrying sediment into the wetland and/or into standing water in a lake or flooded wetland.

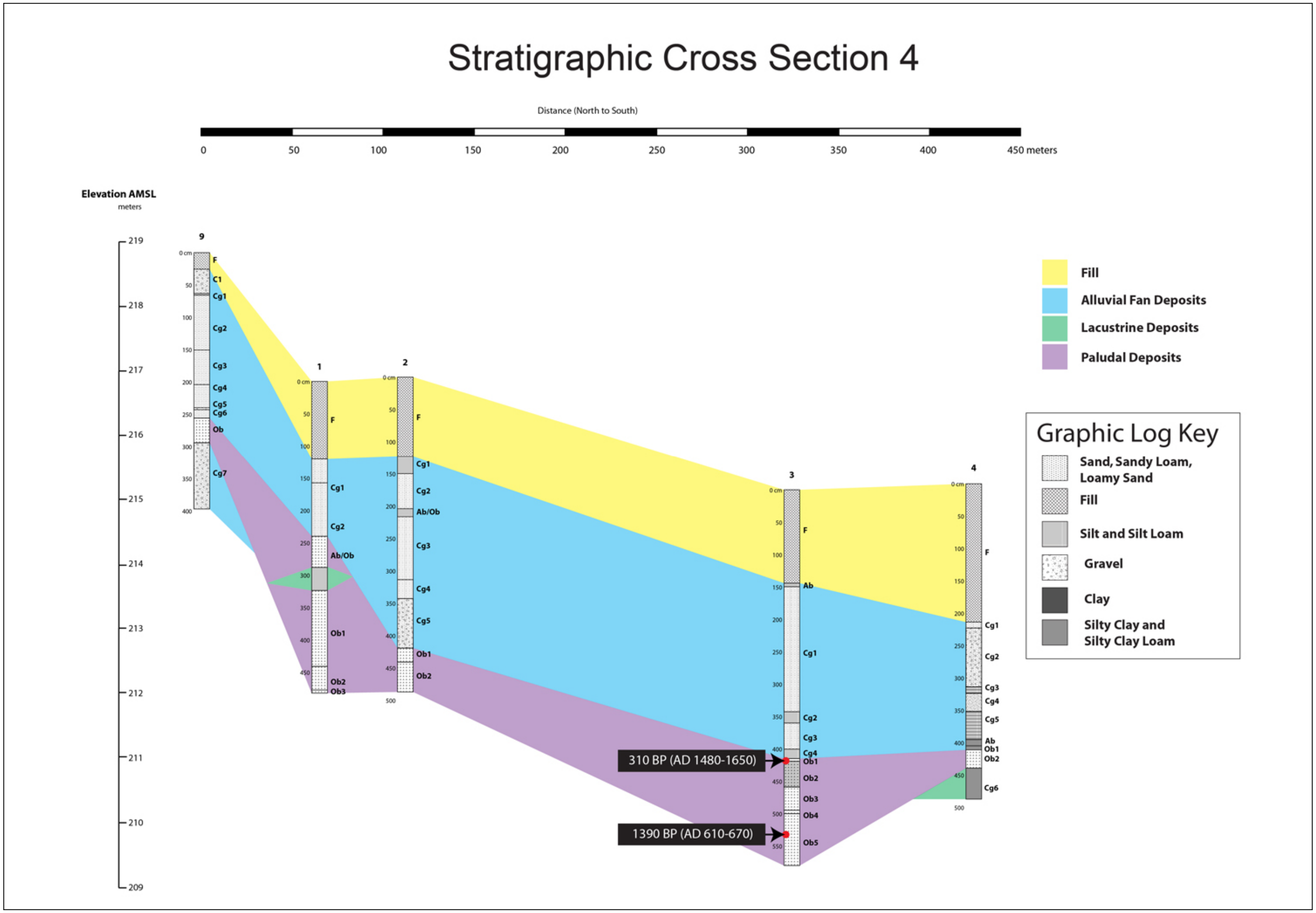

Figure 7 Stratigraphic Cross-Section 4 (Cores 1-4 and 9)

Two radiocarbon assays were obtained from the paludal deposits in Core 3 (Appendix B). The stratigraphically youngest sample is peat from the top of the paludal sequence at a depth of 4.16 m. It dates to 310 ± 30 RCYBP (Cal AD 1480- 1650) and indicates the paludal deposits were buried by alluvial fan deposits sometime after AD 1480-1650 (Figure 7). The stratigraphically older sample came from stratified organic sediment at a depth of 5.50 m. It dates to 1390 ± 30 RCYBP (Cal AD 610-670). For at least the last 1300 years, fluctuating water levels along the margin of a floodplain lake have resulted in the accumulation of organic sediment in wetlands at low water and the accumulation of mineral sediments during floods and during periods of high water. The sandy sediment likely came from floods out of Bluff Creek. The fine-grained sediments could have settled out of floodplain lake waters with tributary and Minnesota River Valley sources.

Stratigraphic Cross-Section 5

Stratigraphic Cross-Section 5 extends down the Bluff Creek alluvial fan parallel to Stratigraphic Cross-Section 4 but on the west side of TH101 (Figure 3). Stratigraphy consists of fill over alluvial fan deposits over lacustrine and paludal deposits (Figure 8). A buried soil in Core 5 at a depth of between 2.21 and 2.31 m contains a broken red glass bead (identified by its conchoidal fracture) and two pieces of amber glass with a slight curvature that were probably deposited during flooding. A correlative buried soil is present in Core 6 at a depth of 2.36 m. Both of these buried soils are weakly developed, consisting of a thin A horizon over a Cg horizon. Both buried soils are also within the alluvial fan deposit sequence that is historic in age. Beneath the alluvial fan sequence in Cores 5 and 6 are silty clay loam and peaty silty clay loam lacustrine deposits. The lack of organic sediment indicates the depositional environment was shallow lacustrine. These cores are farthest from the bluff base and presumably farthest out into the lake/wetland basin, below the zone of fluctuating water levels. Upslope in Core 16, a stratum of stratified organic sediment, silt loam, and coarse sand over peat that is below the alluvial fan sequence represents paludal and alluvial fan deposits closer to the lake shore.

Eastern Alluvial Fan

The eastern alluvial fan is located at the east end of the project area at the mouth of a first order valley that contains a perennial spring. At site 21CR156, stratigraphy varies over the area of the small fan. On the west edge of the fan, in Units 5, 6 and 8 away from the fan axis, the

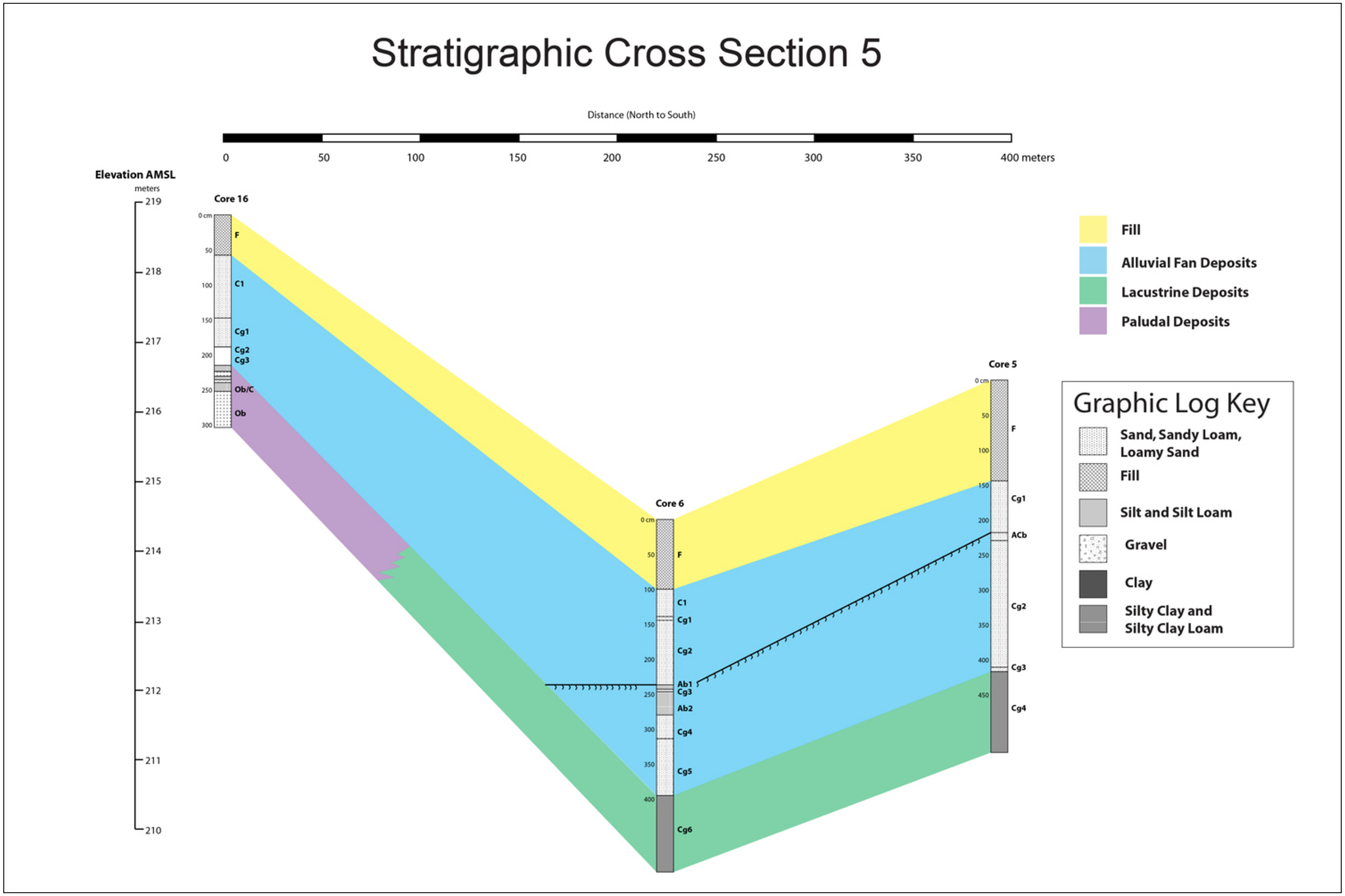

Figure 8 Stratigraphic Cross-Section 5 (Cores 5, 6 and 16)

stratigraphy consists of a relatively well-developed soil formed in sandy loam with 2-5% gravel. A buried soil is present at 1.85 meters below surface. To the east in Units 3 and 4, stratigraphy consists of a moderate-weakly developed soil formed in gravelly sandy loam alluvial fan deposits to a depth of 1.22 m. A second buried soil consisting of a Bt horizon welded over an A horizon is present 1.75 m below the surface. Buried archaeological deposits (21CR156) are present in the eastern alluvial fan.

Golf Zone Cores

The Golf Zone is located on the Bluff Creek alluvial fan. Cores 36 through 41 were extracted around the driving range behind the buildings (Figure 3). Stratigraphy is consistent with other cores extracted from the Bluff Creek alluvial fan. It consists of stratified coarse-grained alluvial fan deposits ranging in thickness from 1.20 to 3.27 m over interstratified fine-grained lacustrine sediment, organic sediment (peat and muck), and sandy, and even gravelly, alluvial fan channel sediment. Stratification types range from lamina scale in the silts and very fine sands to medium sands to medium beds of organic sediment and silts and clays. This type of sedimentary sequence is the result of the interaction and spatial juxtaposition of water level fluctuation in the floodplain lake, floods in the Minnesota River valley, and flooding where a tributary stream enters the valley. The depositional environment fluctuates among (1) subaqueous/subaerial - marked by weakly-developed hydric buried soils formed in mucky silts and clays (Cores 37 and 40) that were deposited in deeper lake water and subjected to minor pedogenic modification during episodic periods of low water, (2) shallow subaqueous - marked by thicker peats and mucks (Core 36), and (3) subaqueous lacustrine and alluvial - marked by fine to medium stratified sandy alluvial and fine-grained lacustrine sediments (Cores 36-41). This stratigraphic sequence is likely unique to settings where permanent lakes exist in a large alluvial valley in which water levels in the lakes are tied, in part, to flooding in the main valley and flooding in the tributaries. This also may be strongly linked to the same regional climatic patterns that cause the main valley flooding. Potential for deeply buried sites in the Golf Zone area is low because the young Bluff Creek paludal deposits and/or alluvial fan deposits that overlie predominately lacustrine deposits that are not subaerially weathered. Essentially, the Bluff Creek alluvial fan prograded into a floodplain lake during historic or late pre-contact time.

RESULTS: SOUTH END

The south end of the TH101 project area is located on a levee/scroll bar and floodplain adjacent to the Minnesota River channel (Figure 1). Most of the area inside the ROW is thick fill capped by roadway and parking lots. Cores were extracted along the edges of the fill or in the few areas where no fill is present.

Landforms

Two landforms are present in the project area at the south end: (1) levee/scroll bar, and (2) floodplain (Figure 9). The Levee/Scroll bar is a low ridge adjacent to and north of the Minnesota River channel. Secondary flood channels that are perpendicular to the Minnesota River channel are visible on the levee backslope in air photos from the 1960's and earlier, indicating that it was still accreting laterally and vertically. The channel cannot move farther south due to bedrock along the south bank. The floodplain is a relatively flat landscape between the levee and a floodplain lake to the north.

Stratigraphy

Core 12 is located on the backslope of the levee (Figure 9). Stratigraphy consists of 0.31 m of fill over silt, very fine sand, silt loam, and very fine sandy loam to a depth of 5.78 m (Appendix A). Laminations are present immediately beneath the fill and none of the deposits are altered by soil forming processes. Core 13 is farther north down the backslope of the levee (Figure 9). Stratigraphy consists of fill to 0.42 m, over a thin A horizon formed in silt loam to a depth of 0.53 m, over laminated silt, very fine sand, silt loam, and very fine sandy loam to a depth of 5.78 m. Except for the thin A horizon, the sequence is pedogenically unaltered. Core 17 is still farther north near the floodplain levee backslope boundary (Figure 9). Stratigraphy consists of fill to a depth of 0.60 m, over a soil with and Ab-ABb-BCb horizon sequence formed in very fine sandy loam and loam to a depth of 2.3 m, over a C1-Cg1-Cg2 horizon sequence formed in very fine sand and coarse silt, over sticky loam to a depth of 3.68 m. This entire sequence overlies a weakly developed buried soil (Ab horizon) formed in loam.

No radiocarbon dates are available for chronology on the south end but cut limestone at a depth of 2.5 m and assorted historic artifacts within the upper 1.5 m indicates the levee is historic in age (see archaeological report). The lack of pedogenic modification in Cores 12 and 13 also indicates the deposits are very young. The levee formed after the Minnesota River channel

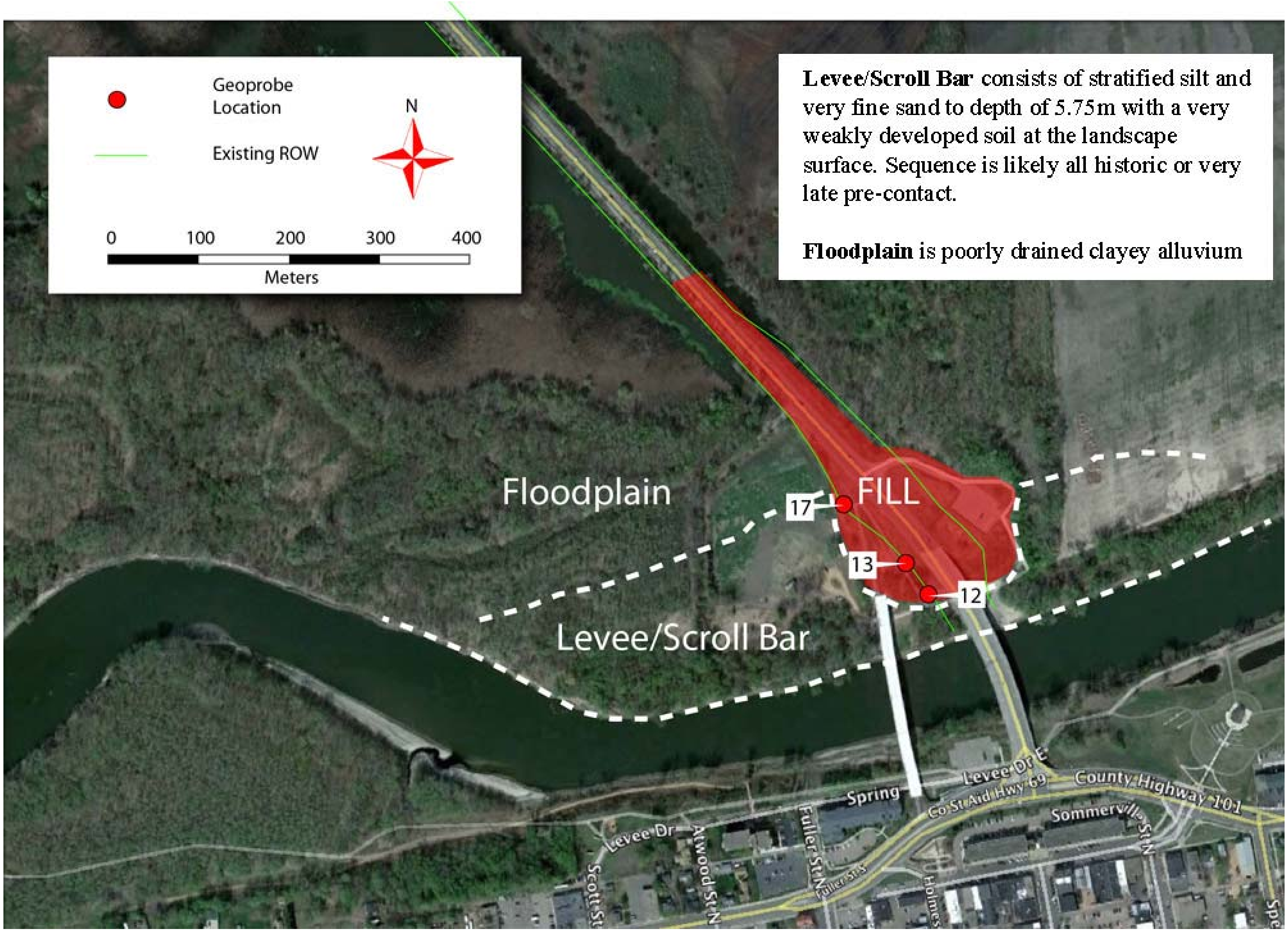

Figure 9 Landforms and Core locations South End

shifted laterally to the south. The stratigraphic sequences in Cores 12 and 13 are inset into and overlap the slightly older deposits exposed in Core 17. A soil is formed in the surface deposits (before filling) in Core 17 and a weakly-developed hydric buried soil is present at a depth of 3.68m below the surface. In areas without truck access, shovel tests and hand probes from the floodplain surface indicate that vertical accretion silts and clays are present. Core 17 may be located in one of the overflow channels on the levee backslope observed on aerial photographs. This location may account for the coarser-grained stratigraphic sequence.

DISCUSSION AND CONCLUSIONS

The Holocene evolution of the project area is discussed in the context of a series of regional and local events that elicited geomorphic response. The Holocene geomorphic evolution of the project area begins between 10,000 and 11,000 years ago with the creation of the Minnesota River valley. Large floods issuing from Glacial Lake Aggassiz flowed down the Glacial River Warren and incised the valley. Incision of the main valley then led to development of the tributaries as they adjusted to the new lower base level by down cutting and headward extension of their channels. This created incised valleys not only in the uplands but along the bluff margins and possibly out into the trunk valley proper, depending on the position of the spillway relative to the project area.

Back flooding of the lower Minnesota River in response to the damming that created Lake Pepin in the Mississippi River valley created a large lake at the mouth of the Minnesota River that is an arm of Lake Pepin. This occurred sometime around 9500 BP and lasted long enough for 2.1 m (7 feet) of lake sediment to accumulate at St Paul. This sediment was subsequently buried by 19.8 m (65 feet) of alluvium (Zumberge 1952 cited in Wright et al. 1998). Recent work in the St. Paul area did not locate definitive lacustrine deposits and Hudak et al. (2011) indicates the nature and extent (including elevation) of the lake is unknown. Also at this time, the Minnesota River floodplain was aggrading and prograding into the flooded area at its mouth. Eventually the aggradation stopped and the valley bottom stabilized into a pattern of a single channel flowing among large floodplain lakes. It is unlikely the project area was flooded by the waters of the Minnesota River valley arm of Lake Pepin, but the lake waters would have raised the base level of the tributaries in a trend that would have continued as the floodplain of the Minnesota River continued to aggrade.

With retreat of the glacial ice and the cessation of flooding from proglacial lakes, changes in the geomorphic system were more directly controlled by climate. The eastern and western alluvial fans formed in the early Holocene and are preserved along the valley margin. They are both at the mouth of small first or second order valleys. Buried soils in these fans also formed during the early to middle Holocene and were buried during the late Holocene. Both of these fans have buried archaeological components. All segments of the Bluff Creek alluvial fan that were encountered in the cores and excavations appear to be historic or late pre-contact in age. Relatively large floods that deposited the sands and gravels in the historic Bluff Creek fan may not have occurred earlier, and smaller floods would have created much smaller, more subdued alluvial fans constructed of finer grained sediment. If such a fan still exists, it was not identified as a fan during the coring, possibly because without the fan morphology, in a buried context, distal alluvial fan deposits could be mistaken for lacustrine deposits.

Water levels in the floodplain lakes fluctuated on a number of time scales in response to regional climatic and geomorphic changes over millennia and, on the scale of months to decades, to more local weather-related phenomena such as droughts and floods. Lacustrine deposits occur at the modern surface, but they are mostly buried in the project area. Just north and south of Flying Cloud Drive, these deposits have a thick cumulic A or Ab horizon formed in the clayey lake deposits. This soil marks a former sub-aerial landscape surface. Archaeological deposits in this soil indicate that it was a loci of occupation from the Early to Late Holocene. On the millennial scale, the best-fit explanation is that the lake sediments began to accumulate when the water was relatively high during the early Holocene (11,700 BP-9000 BP), and the soils formed during the drier middle Holocene (8000-3500 BP).

Away from the valley margin, lacustrine deposits are interbedded with alluvial fan and paludal deposits without buried soils. These deposits accumulated in a subaqueous environment. The soils that formed in lacustrine deposits along the valley margin south of Flying Cloud Drive were buried by paludal deposits as water tables rose during the late Holocene. A radiocarbon date of AD 1375 from the top of the lacustrine deposits indicates that the expansion of the wetland occurred near the beginning of the Little Ice age, a period of climatic cooling that ended around AD ±1900. The paludal deposits are, in turn, buried by alluvial fan deposits that are primarily historic in age. North of Flying Cloud Drive, the paludal deposits are patchy, so the historic alluvial fan deposits sometimes directly overlie the buried soil formed in the lacustrine deposits. Urbanization and agriculture caused changes in the Bluff Creek watershed morphology and hydrology that resulted in large frequent floods during the historic period. These floods created a large coarse-grained Bluff Creek alluvial fan that dominates the project area.

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APPENDIX A CORE LOGS

(gray fill indicates buried landscape surfaces)

Core 1: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-120	F	*FILL* Pebbly Sand Fill.
120-156	Cg1	*ALLUVIAL FAN* Dark greenish gray (5GY 4/1) stratified very fine SAND and fine SAND; very thin bedded and laminated; cinder; abrupt gradational boundary.
156-238	Cg2	Dark greenish gray (5GY 4/1) and greenish gray (10Y 5/1) very fine SAND and SANDY LOAM over medium SANDY LOAM; very abrupt boundary.
238-278	Ab/Ob	*PALUDAL/LACUSTRINE* PEAT with silt loam fraction; fibric.
278-324	Ob/Cg1	Dark greenish gray (5GY 4/1) laminated SILT LOAM with peat interbedded below 316 cm; few shell fragments.
324-448	Ob1	Very dark grayish brown (7.5YR 2.5/2) fibric PEAT; snail shell fragments; whole small snails.
448-468	Ob/Cg2	Laminated PEAT and SANDY LOAM; peat is slightly sandy.
468-470	Ob2	Fibric PEAT.

Core 2: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-122	F	Gravelly sand *FILL*.
122-150	Cg1	*ALLUVIAL FAN DEPOSITS* Light olive brown – light brownish gray (2.5Y 5/3 – 6/2) SILT LOAM; laminated; disturbed; very abrupt boundary.
150-202	Cg2	Dark greenish gray (5GY 4/1) medium SAND with small % gravel; possible silt laminae.
202-217	Ab/Ob	*PALUDAL/LACUSTRINE* Very dark brown (2.5Y 2.5/2) peaty SILT; very abrupt boundary.
217-315	Cg3	*ALLUVIAL FAN DEPOSITS* Dark greenish gray (5GY 4/1) medium SAND with 2-5% gravel; abrupt gradational boundary.
315-343	Cg3	Dark greenish gray (10GY 3/1) medium – coarse SAND with very coarse sand – granular fraction; wood at top and base; very abrupt boundary.
343-420	Cg4	Dark greenish gray (10GY 3/1 – 4/1) fine – medium SAND; indistinct laminae; few fine pebbles.
420-439	Ob1	*PALUDAL DEPOSITS* PEAT interbedded with SILTY MUCK; common very fine shell fragments.
439-487	Ob2	Fibric PEAT.

Core 3: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-146	F	Oxidized sand *FILL* over Gleyed colored at 65 cm; few gravel clasts.
146-150	Ab	*ALLUVIAL FAN DEPOSITS* Very dark gray (10YR ¾) heavy SILT LOAM; 15% sand; very abrupt boundary.
150-342	Cg1	Dark greenish gray (5GY 4/1) stratified SAND; very abrupt boundary.
342-360	Cg2	Very dark gray (N3/) interlaminated very fine SANDY LOAM – SILT LOAM & loamy fine SAND; wood and roots; very abrupt boundary.
360-400	Cg3	Dark greenish gray (5GY 4/1) medium SAND; few laminae; very abrupt boundary.
400-416	Cg4	Laminated greenish gray (10Y 5/1) SILT LOAM; coarse silt at base.
416-420	Ob1	*PALUDAL DEPOSITS* Fibric PEAT; **[310±30 BP, AD1480-1650]**
420-460	Ob2	Very dark gray – black (N3/ - N2.5/) silty MUCK; abundant organic fragments; platy parting.
460-495	Ob3	Stratified PEAT & MUCK; laminated; very thin bedded.
495-500	Ob4	Fibric PEAT; wood.
500-580	Ob5	Stratified organics in various stages of decomposition; **[550 cm. 1390±30 BP, AD 610-670]**

Core 4: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-213	F	*FILL*; loose.
213-222	Cg1	*ALLUVIAL FAN DEPOSITS* Greenish gray (5GY 6/1) laminated medium SAND & very fine SAND; very abrupt boundary.
222-312	Cg2	Dark greenish gray (10Y 3/1) coarse and very coarse SAND with fine gravel; very dark gray (10N/) silt loam laminae.
312-325	Cg3	*LACUSTRINE* Dark greenish gray (10GY 4/1) laminated SILT LOAM with fine sandy loam interbeds; organic fragments; roots.
325-352	Cg4	Stratified dark greenish gray – greenish gray (5GY 4/1 – 5/1) sticky LOAM over coarse and very coarse SAND; very abrupt boundary.
352-396	Cg5	Greenish gray (5GY 5/1) very thin laminated SILT LOAM; organics.
396-407	Cg6	Mucky SILTY CLAY LOAM; few laminae of organics.
407-413	Ob/Cg1	*PALUDAL/LACUSTRINE* Interlaminated SILTY CLAY LOAM and MUCK; very abrupt boundary.
413-440	Ob	PEAT with silt loam fraction.
440-487	Cg7	Peaty SILTY CLAY LOAM.

Core 5: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-143	F	*FILL*; sand; layering at laminae scale; occasional gravel.
143-221	Cg1	*ALLUVIAL FAN DEPOSITS* Dark greenish gray (10Y 4/1) fine gravel and medium and coarse SAND; very abrupt boundary.
221-231	ACb	Black (N2.5/) coarse loamy SAND with fine pebbles; piece of glass; wood and twigs; silt loam laminae at 228cm; very abrupt boundary.
231-410	Cg2	Dark greenish gray (5GY 4/1) medium – coarse SAND – coarse SAND; few pebbles; weakly graded; abrupt gradational boundary.
410-418	Cg4	Very coarse SAND and gravel; few pebbles; very abrupt boundary.
418-436	2Cg5	*LACUSTRINE* Very dark gray – dark greenish gray (N3/ - 10Y 3/1) heavy SILTY CLAY LOAM; laminated silt loam in upper 2cm.

Core 6: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-100	F	*FILL* gravelly SAND.
100-139	C1	Brown (10YR 4/3) medium – very coarse SAND; few fine pebbles.
139-145	Cg1	Greenish gray (10Y 4/1) SANDY LOAM; common pebbles; gleyed.
145-236	Cg2	Stratified SAND with gravel.
236-241	**Ab1**	Very dark gray (N3/) SILT LOAM; twigs; roots; very abrupt boundary.
241-248	Cg3	Dark greenish gray (5GY 4/1) sticky SANDY LOAM; few organic fragments.
248-280	**Ab2**	Very dark gray (2.5Y 3/1) SILT LOAM; sticky; twigs; roots.
280-315	Cg4	Laminated sticky (10YR 4/1) SANDY LOAM; abrupt boundary.
315-396	Cg5	Coarse and very coarse SAND.
396-425	Cg6	*LACUSTRINE* SILTY CLAY LOAM; 2% sand.

Core 7: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-16	A	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown (10YR 3/2) SILT LOAM and very fine SAND; abrupt boundary.
16-50	BE	Brown (10YR 4/3) gravelly very fine SAND.
50-98	Bw1	Brown – dark yellowish brown (10YR 4/3) gravelly medium SAND.
98-156	Bw2	Brown (10YR 4/3) medium – coarse gravelly SAND.
156-304	C1-Cg	Brown (10YR 4/3 – 5/3) fine gravelly SAND; few gravel beds; color is darker and more hydric with depth.

Core 8: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-5	A	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown (10YR 3/2) sandy loam.
5-38	C1	Brown (10YR 4/3) laminated SILT LOAM and very fine SAND; occasional fine pebbles; redox below 41 cm; abrupt boundary.
38-100	Cg1	Grayish brown – dark grayish brown (2.5Y 5/2 – 4/2) very fine SANDY LOAM; weak platy parting; faint redox features along bed planes.
100-132	Cg2	Grayish brown (2.5Y 5/2) medium SAND; few fine pebbles.
132-144	Cg3	Thin bedded fine SAND and medium SAND over very coarse SAND with prominent high chroma redox; abrupt color boundary.
144-200	Cg4	Dark greenish gray (5GY 4/2) coarse SAND with SILT LOAM interbeds.
200-396	Cg5	Stratified fine SANDY LOAM, medium and coarse SAND with few silt loam interbeds (laminae); organic laminae at 324 cm.
396-408	Cg6	*ALLUVIAL FAN/LACUSTRINE* Dark greenish gray (5GY 4/5 – 3/2) very fine SANDY LOAM; few organic laminae.
408-420	Cg7	Coarse gravel.
420-480	Cg8	Dark greenish gray (5GY 3/2) very fine SANDY LOAM with organic fragments and few laminae.

Core 9: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-27	F1	*FILL* Fill mixed with topsoil and gravel. Silt loam matrix.
27-62	F2	Brown (10YR 4/3) medium sand fill over oxidized alluvium; loose; dry.
62-64	Cg1	Greenish gray (10Y 5/1) SILT LOAM with fine gravel; very abrupt boundary.
64-150	Cg2	Dark greenish gray (10Y 4/1) gravelly coarse and very coarse SAND; abrupt boundary.
150-205	Cg3	*ALLUVIAL FAN DEPOSITS* Dark greenish gray (10Y 4/1) medium SANDY LOAM; occasional gravel; few laminated silt loam interbeds.
205-238	Cg4	Dark greenish gray (10Y 4/1) SANDY LOAM diamicton; very abrupt boundary.
238-243	Cg5	Gravel clast in loam matrix; brick; very abrupt boundary.
243-257	Cg6	Dark greenish gray (10Y 4/1) SANDY LOAM diamicton; very abrupt boundary.
257-295	Ob	*PALUDAL DEPOSITS* Fibric PEAT.
295-396	Cg7	ALLUVIAL FAN DEPOSITS Dark greenish gray (10Y 4/1) gravelly very coarse and coarse SAND.

Core 10: Colluvial Slope

Depth	Horizon	Description
0-6	A/F	*FILL* Topsoil; unleached.
6-24	F1	Gravelly fill; silt loam matrix; unleached; very abrupt boundary.
24-62	F2	Layered black and very dark grayish brown (10YR 2/1 and 3/2) LOAM – SILT LOAM and SANDY LOAM; few pebbles; unleached; very abrupt boundary.
62-137	BC1	*COLLUVIAL DEPOSITS* Brown (10YR 4/3) SANDY LOAM; occasional fine gravel; weak pedo-structure; unleached; very abrupt boundary.
137-144	BC2	Brown (10YR 5/3) CLAY LOAM; few pebbles; sand laminae at base; unleached; very abrupt boundary.
144-225	BC3	*ALLUVIAL/LACUSTRINE* Dark yellowish brown (10YR 4/6) very fine – fine SAND; moderate plate parting; weakly graded from silty very fine – fine sand to very fine to fine sand; unleached; very abrupt boundary.
225-304	C1	Pale brown (10YR 6/3) laminated very fine SAND; unleached.

Core 11: Colluvial Slope

Depth	Horizon	Description
0-15	A/F	*FILL* Loose very dark gray – very dark grayish brown (10YR 3/1 – 3/2) very fine SANDY LOAM; clear boundary.
15-100	F1	Brown – pale brown (10YR 5/3 – 6/3) gravelly very fine SAND – fine SAND; 2% gravel; unleached.
100-136	F2	Brown (10YR 4/3) fine SAND with 2% gravel and granules; over-compacted; platy; few laminae; unleached; very abrupt boundary.
136-150	BC	*?* Brown (7.5YR 4/4) very fine SAND; moderate platy; unleached; very abrupt boundary.
150-213	CB	Yellowish brown – dark yellowish brown (10YR 5/6 – 4/6) very fine SAND; loose; leached.

Core 12: Levee

Depth	Horizon	Description
0-15	F1	*FILL*; unleached.
15-20	A/F	Very dark grayish brown (10YR 3/2) very fine loamy SAND; unleached.
20-31	F2	*ALLUVIUM* Dark grayish brown (10YR 4/2) very fine SAND; unleached; very abrupt boundary.
31-134	C1	Laminated light brownish gray (10YR 6/2) very fine SAND and dark grayish brown – brown (10YR 4/2 – 4/3) silty very fine SAND; unleached.
134-160	C2	Interval of darker colored laminae
160-210	C5	Ditto C1
210-420	C6	Darker colored silty very fine SAND; laminae; unleached.
420-442	C7	Dark grayish brown (10YR 4/2) very fine SANDY LOAM; common faint redox features; laminated; lighter colored laminae; unleached.
442-496	C8	Dark grayish brown (10YR 4/2) laminated very fine SANDY LOAM – LOAM; unleached; common faint high chroma redox features; very abrupt gradational boundary.
496-527	C9	Very dark gray (10YR 4/1 – 4/2) heavy SILT LOAM with large very fine sand mode; very tin laminated; common faint redox features; very fine sand laminae; unleached; very abrupt boundary.
527-578	C10	Pale brown (10YR 6/3) very fine SAND; loose; unleached.

Core 13: Levee

Depth	Horizon	Description
0-19	F	*FILL* Gravel mixed with topsoil; unleached.
19-29	F/C1	Yellowish brown (10YR 5/4) platy SILT; unleached.
29-33	F/C2	Very dark gray (10YR 3/1) SILT; unleached.
33-42	F/C3	Yellowish brown (10YR 5/4) platy SILT; unleached.
42-53	A	*ALLUVIAL DEPOSITS* Very dark gray and very dark grayish brown (10YR ¾ - 3/2) SILT LOAM – very fine SANDY LOAM; unleached; clear boundary.
53-100	C1	Dark grayish brown (10YR 4/2) SILT LOAM – very fine SANDY LOAM; unleached; few lighter very fine sand laminae.
100-126	C2	Dark grayish brown – brown (10YR 4/2 – 4/3) light very fine SANDY LOAM; platy parting; unleached; very abrupt boundary.
126-200	C3	Very dark grayish brown (10YR 4/3) light very fine SANDY LOAM; incipient A horizon; unleached; organic float on bedding; plume at 135.
200-220	C4	Dark grayish brown and brown (10YR 4/2 – 5/3) very fine LOAMY SAND; unleached; very abrupt boundary.
220-228	C5	Dark grayish brown – very dark grayish brown (10YR 4/2 – 3/2) light very fine SANDY LOAM; unleached.
228-233	C6	Very fine LOAMY SAND; unleached.
233-282	C7	Very dark grayish brown (10YR 4/3) light very fine SANDY LOAM; incipient A horizon; unleached; organic float on bedding; very fine sand laminae.
282-325	C8	Brown (10YR 4/3) very fine LOAMY SAND; unleached; very abrupt boundary.
325-396	C9	Dark grading to light (10YR 3/2 – 4/3); unleached.
396-418	C10	Dark grayish brown (10YR 4/2) very fine SANDY LOAM; platy parting; unleached; abrupt boundary.
418-450	C11	Dark grayish brown (10YR 4/2) very fine SANDY LOAM – SILT LOAM; common faint high and low chroma redox features; unleached.
450-578	C12	Dark grayish brown – grayish brown (10YR 5/2 – 4/2) SILT LOAM; common distinct redox features; few Ca CO3 nodules; platy parting; grades to grayish brown (7.5Y 5/2) with less distinct redox features.

Core 14: Alluvial Fan

Depth	Horizon	Description
0-7		*ASPHALT*
7-45	F1	*FILL* Sandy oxidized fill subcourse.
45-121	F2	Dark greenish gray (10Y 4/1) sand and gravel fill with compacted loam and clay layers; very abrupt boundary.
121-134	F3	Greenish black (10Y 2.5/1) CLAY LOAM; very abrupt boundary.
134-242	Cg1	*ALLUVIAL FAN DEPOSITS* Dark greenish gray (10Y 4/1) LOAM & SANDY LOAM; graded; layered in lower 3 cm; very abrupt boundary.
242-290	Ob1	*PLAUDAL DEPOSITS* Black (7.5YR 2.5/1) organic sediment (fibric PEAT); common snail shells and shell fragments.
290-338	Ob2	PEAT; more sopric, less fibric; indistinct layers; sandy muck at 338cm.
338-396	Ob3	CLAYEY muck.

Core 15: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-80	F	*FILL* Gravelly SAND with silty clay loam layer from 28-36 cm.
80-150	Cg	*ALLUVIAL FAN DEPOSITS* Dark greenish gray (10Y 4/1) bedded medium and coarse SAND.
150-238	Ob	*PALUDAL DEPOSITS* Very dark brown (7.5YR 2.5/2) PEAT; layered fibric organics; common fine snail shells.
238-240	Ob2	Silty MUCK.
240-257	Ob3	Fibric organics.
257-304	Ob4	Sapric organics; few fine shell fragments.

Core 16: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-58	F	*FILL* SANDY LOAM with gravel fill.
58-149	C1	ALLUVIAL FAN DEPOSITS Brown (10YR 5/3 – 4/3) medium SAND; indistinct stratification; 1% gravel; heavy FeO and MnO accumulations at base; very abrupt gradational color boundary.
149-217	Cg1	Greenish gray (5GY 5/1) laminated very fine and fine SAND over very fine SANDY LOAM.
217-226	Ob/C1	PALUDAL DEPOSITS Very dark brown (7.5YR 2.5/2) silty MUCK; layered; very abrupt boundary.
226-230	Ob1	Fibric PEAT.
230-237	Ob2	Mucky SILT LOAM.
237-240	Cg2	Dark greenish gray (10GY 4/1) coarse SAND.
240-252	Ob/C2	Dark gray and gray (2.5Y 4/1 & 5/1) peaty heavy SILT LOAM with coarse sand interbeds; laminated; very abrupt boundary.
252-304	Ob3	Layered fibric PEAT.

Core 17: Levee

Depth	Horizon	Description
0-60	F	*FILL* Sandy fill; very abrupt boundary.
60-100	**Ab**	*ALLUVIUM* Black – very dark gray (10YR 2/1 – 3/1) very fine SANDY LOAM; leached.
100-142	AB	Very dark grayish brown (10YR 3/2) light very fine SANDY LOAM; weak medium angular blocky structure; leached; clear boundary.
142-230	BC	Brown (10YR 4/3) loamy very fine and fine SAND; moderate platy parting; leached above 165cm.
230-280	C1	Very dark grayish brown – dark grayish brown (10YR 3/2 – 4/2) very fine SAND and coarse SILT; massive; common faint redox features.
280-348	Cg1	Dark grayish brown (2.5Y 4/2) sticky LOAM; sand is very fine textured; massive; few faint redox features; clear boundary.
348-368	Cg2	Very dark gray – dark gray (2.5Y 4/1 – 3/1) sticky LOAM; sand is very fine textured; abrupt gradational boundary.
368-396	**Ab**	Very dark gray (2.5Y 3/1) LOAM – SILT LOAM; slightly looser and stickier than above.

Core 18: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-10	F	Gravel.
10-45	C1	*ALLUVIAL FAN DEPOSITS* Brownish gray; laminated below 39cm; very abrupt boundary.
45-56	C2	Very dark gray – very dark grayish brown (10YR 3/1 – 3/2) LOAM – SANDY LOAM; few fine pebbles; abrupt gradational boundary.
56-131	C3	Interstratified fine – medium SAND and heavy SILT LOAM with 5% sand; sand is all bright high chroma mottles (5YR hue); silt loam is grayish brown and dark yellowish brown (10YR 5/2 & 5/4); very abrupt gradational boundary.
131-217	Cg1	Greenish gray – dark greenish gray (10Y 5/1 – 4/1) stratified SILT LOAM with large very fine sand mode and SAND with varying abundances of gravel; black silty clay inclusion; abrupt gradational boundary.
217-304	Cg2	Dark greenish gray (10Y 4/1) gravelly coarse SAND; very abrupt boundary.
304-311	**Ab**	*LACUSTRINE* Black (N 2.5/) CLAY; ± 10% sand; very abrupt boundary.
311-321	ABb	Dark gray (N 3/) CLAY; ± 2% sand; poorly sorted; abrupt boundary.
321-396	Cg	Dark greenish gray (5GY 4/1) CLAY; ± 20% sand.

Core 19: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-21	C/F	Gravel and fill.
21-91	A→AB	*COLLUVIUM & ALLUVIAL FAN DEPOSITS* Very dark gray – black (10YR 3/1 – 2/1) SILTY CLAY LOAM; poorly sorted; occasional gravel; moderate – weak fine prismatic parting to medium and fine subangular blocky structure; slight increase in sand and gravel; grayer with depth; very abrupt boundary.
91-131	C1	Very dark grayish brown – dark grayish brown (10YR 3/2 – 4/2) LOAM; sticky; few pebbles.
131-158	C2	Laminated and very thin bedded gray – grayish brown (10YR 5/1 – 5/2) very fine – fine SAND and SILT LOAM; coarse sand beds of high chroma colors.
158-200	C3	*LACUSTRINE* Gray (7.5Y 5/1) SILTY CLAY LOAM with plant fragments; abrupt boundary.
200-242	**Ab**	Black (10YR 2/1) CLAY; homogeneous color; clear boundary.
242-285	ABgb	Greenish black (5GY 2.5/1) CLAY; homogeneous color; roots.
285-396	Cg1	Dark gray (N 4/) CLAY; increase in sand %; few floating pebbles; 2-3% sand with depth; roots.

Core 20: Western Alluvial Fan

Depth	Horizon	Description
0-15	F1	Very dark gray – very dark grayish brown (10YR 3/1 – 3/2) SILT LOAM – LOAM; fine gravel underlain by laminae of very fine sand.
15-64	F2	Very dark grayish brown (10YR 3/2) LOAM; occasional gravel; unleached.
64-85	F3	Mixed light and dark soil; very abrupt boundary.
85-115	**Ab1**	Very dark gray (10YR 3/1) SILT LOAM; ± 10% sand; unleached.
115-142	ABb	Very dark grayish brown (10YR 3/2) heavy LOAM; few pebbles; unleached; abrupt boundary.
142-246	C1	Stratified heavy LOAM – CLAY LOAM; few gravelly beds; saturated; unleached; abrupt boundary.
246-260	C2	Dark gray – dark grayish brown (10YR 4/1 – 4/2) CLAY LOAM – CLAY; poorly sorted; unleached; abrupt boundary.
260-290	**Ab2**	Very dark gray – very dark grayish brown (10YR 3/1 – 3/2) CLAY; 20% very fine sand; unleached.
290-396	Cg	Light olive brown (2.5Y 5/4) CLAY; 10% sand; unleached.

Core 21: Western Alluvial Fan

Depth	Horizon	Description
0-30	F1	*FILL* Very dark gray (10YR 3/1) SILT LOAM – LOAM; weak pedo-structure.
30-76	F2	Very dark grayish brown (10YR 3/2) SILT LOAM; common fine gravel; weak pedo-structure; white carbonate grains; matrix is leached.
76-140	C1	Laminated brown and dark grayish brown (10YR 5/3 & 4/2) and grayish brown very fine SAND & SILT LOAM; unleached; very abrupt litho boundary.
140-190	ACb1	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown (10YR 3/2) heavy LOAM; massive; violent effervescence; unleached; carbonate in pores.
190-238	ACb2	Very dark grayish brown (10YR 3/2) SANDY LOAM with slightly lighter interval in upper 5cm; carbonate in pores; unleached; clear boundary.
238-318	C2	Dark grayish brown (10YR 4/2) CLAY LOAM; occasional gravel; unleached; very abrupt color boundary.
318-396	C3	Light olive brown (2.5Y 5/3) heavy SILT LOAM; sand is fine textured; unleached; grades to 487 cm with increase in sand %; homogeneous color.

Core 22: Western Alluvial Fan

Depth	Horizon	Description
0-13	F1	*FILL* Fine gravel and silt loam fill.
13-41	F/Ap	Very dark brown (10YR 2/2) SILT LOAM; moderate very coarse angular – prismatic parting to medium angular blocky structure; leached.
41-105	F2	Dark grayish brown (10YR 4/2) SILT LOAM; 20% very fine sand; broken very fine sand laminae at base; laminae from 41-54cm; few redox features along pores; unleached.
105-145	F3	Very dark grayish brown (10YR 3/2) SILTY CLAY LOAM; few inclusions; mixed; common faint redox features; unleached; abrupt boundary.
145-166	F4	Mixed very dark gray, brown, and very dark brown (10YR 3/1, 4/3 and 3/2) heavy SILT LOAM – LOAM; unleached; very abrupt boundary.
166-178	**Ab**	*ALLUVIAL FAN DEPOSITS* Very dark gray (10YR 3/1) heavy SILT LOAM; poorly sorted; 15% sand; leached; very abrupt boundary.
178-182	A/Bb	Layered soil (mixed) of A & B horizon material; leached; abrupt boundary.
182-236	ABb	Very dark grayish brown (10YR 3/2) SILTY CLAY LOAM – LOAM; occasional fine gravel; poorly sorted; massive; leached; very abrupt boundary.
236-255	C1	Dark grayish brown (10YR 4/3) heavy LOAM; occasional fine gravel; poorly sorted; massive; unleached; krotavina from 246-255cm.
255-396	Cg	Light olive brown (2.5YR 5/3) heavy LOAM grading down to loamy fine SAND; light olive mottling.

Core 23: Western Alluvial Fan

Depth	Horizon	Description
0-27	F	*FILL*
27-54	A	*LACUSTRINE DEPOSITS* Black (N 2.5/) CLAY; clear boundary.
54-147	BCg	Dark greenish gray (10GY 4/1) CLAY; homogeneous color; lightens to 5/1 with depth; leached; clear boundary.
147-190	Cg1	Olive (5Y 5/3) CLAY; leached; carbonate masses from 167-177cm; abrupt boundary.
190-213	Cg2	Olive (5Y 5/3) very fine SANDY LOAM; leached.
213-244	Cg3	Olive brown (2.5Y 4/3) very fine SAND – fine SAND; unleached.
244-304	Cg4	ALLUVIUL DEPOSITS Medium and coarse SAND.

Core 24: Western Alluvial Fan

Depth	Horizon	Description
0-41	F/C1	*FILL* Medium and coarse loamy sand fill; abrupt gradational boundary.
41-56	C2	*LACUSTRINE/PALUDAL* Very thin bedded and laminated dark grayish brown and very dark gray (10YR 4/2 & 3/1) SILT LOAM and SAND; unleached; very abrupt boundary.
56-64	Cg1	Dark greenish gray (10GY 3/1) heavy SILT LOAM; laminated; single sandy loam laminae; unleached; very abrupt boundary.
64-71	O1	Black (N2.5/) sapric MUCK; very abrupt boundary.
71-125	Cg2	Very dark gray (2.5Y 3/1) SILT LOAM – LOAM.
125-128	O2	Sapric MUCK; very abrupt boundary.
128-134	Cg3	Very dark grayish brown (2.5Y 3/2) heavy SILT LOAM; 15% sand; very abrupt boundary.

134-145	O3	Black (N2.5/) MUCK; very abrupt boundary.
145-200	**Ab**	*LACUSTRINE* Black (N 2.5/) – dark greenish gray (10Y 3/1) CLAY; roots; grades to CLAY with a trace of sand; leached.
200-238	Cg4	Dark greenish gray (10GY 4/1) SANDY CLAY; homogeneous color; leached; single piece of gravel 221-224.
238-262	Cg5	Greenish gray – dark greenish gray (10GY 5/1 – 4/1) SANDY CLAY; sandier with depth; unleached; clear boundary.
262-304	Cg6	Light olive brown – olive brown (2.5Y 5/3 – 4/3) SILTY CLAY LOAM; unleached.

Core 25: Alluvial Fan/Colluvial Slope

Depth	Horizon	Description
0-6		Asphalt.
6-36	F1	*FILL* Subcourse fill; mixed sandy loam and loam; very abrupt boundary.
36-67	F2	Dark greenish gray (10Y 4/1) very dark gray and gray (10YR 3/1 & 5/1) light LOAM; mixed; very abrupt boundary.
67-100	**Ab**	*ALLUVIAL FAN DEPOSITS* Black (10YR 2/1) LOAM; sticky.
100-195	ABb	Very dark gray – dark greenish gray (N3/ - 10Y 3/1) SANDY CLAY LOAM; very sticky.
195-244	Cg1	Dark greenish gray (5GY 3/1) SANDY CLAY LOAM; homogeneous color.
244-258	Ob	*PALUDAL DEPOSITS* Black (N 2.5/) sopric MUCK; snail shell and fragments; very abrupt boundary.
258-290	**Ab**	*COLLUVIUM* Black (N2.5/) mucky heavy SILT LOAM – LOAM; few pebbles; poorly sorted; few fine shell fragments.
290-314	ABb	Very dark gray (N3/) SILTY LOAM; clear boundary.
314-345	Cg1	Dark greenish gray (10Y 4/1) sticky LOAM with gravel – SANDY CLAY LOAM; clear gradational boundary.
345-396	Cg2	*ALLUVIUM* Dark greenish gray (10Y 4/1) fine SANDY LOAM.

Core 26: Alluvial Fan/Colluvial Slope

Depth	Horizon	Description
0-152	F1	*FILL* Mixed natural source fill; very abrupt boundary.
152-170	A/F2	Very dark grayish brown (10YR 3/2) fine SANDY LOAM; lighter colored soil inclusions; platy parting.
170-180	F3	Concrete.
180-234	**Ab**	COLLUVIUM Very dark grayish brown – black (10YR 3/2 – 3/1) SILT LOAM – LOAM; few fine pebbles; clear gradational boundary.
234-256	ABb	Very dark grayish brown (10YR 3/2) LOAM; weak fine prismatic parting to medium and fine angular blocky structure; clear boundary.
256-320	Bwb	Brown (10YR 4/3) LOAM; increased sand %; weak medium subangular blocky parting to fine subangular blocky structure; very abrupt boundary.
320-327	C1	Very dark gray & black (10YR 3/1 & 2/1) LOAM & SILT LOAM; shell fragments; very abrupt boundary.
327-337	C2	Brown – dark grayish brown (10YR 4/3 – 4/2) SILTY CLAY LOAM; 10% sand; sand bed at base.
337-396	C3	Green brown (10YR 5/2) LOAM; massive.

396-406	C4	Grayish brown (2.5Y 5/2) SILTY CLAY; very abrupt boundary.
406-414	C5	Dark gray (2.5Y 4/1) SILTY CLAY LOAM; 20% sand; poorly sorted.
414-428	C6	Grayish brown and dark grayish brown (2.5Y 5/2 & 4/2) SILTY CLAY LOAM and LOAM.
428-444	C7	Olive brown (2.5Y 4/3) CLAY LOAM.
444-487	C8	Dark grayish brown (2.5Y 4/2) LOAM – SANDY LOAM; occasional fine gravel.

Core 27: Colluvial Slope

Depth	Horizon	Description
0-45	F	*FILL* Fill
45-132	A	*COLLUVIUM* Very dark gray (10YR 3/1) SILT LOAM – LOAM; leached.
132-141	AB	Very dark gray (10YR 3/2) LOAM; weak medium angular blocky parting to fine angular blocky structure; leached; clear boundary.
141-185	Bw	Brown (10YR 4/3) LOAM; weak medium prismatic parting to medium and fine angular blocky structure; leached.
185-230	C1	Olive brown – light olive brown (2.5Y 4/3 – 5/3) sticky LOAM; unleached.
230-246	C2	Light olive brown – light yellowish brown (2.5Y 5/3 – 6/3) medium – coarse SAND; unleached; very abrupt boundary.
246-248	C3	Dark grayish brown (2.5Y 4/2) LOAM; very abrupt boundary.
248-396	C4	*ALLUVIAL DEPOSITS* Light olive brown (2.5Y 5/3) medium SAND; few darker sandy loam interbeds; some carbonate; unleached.

Core 28: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-31	A	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown – dark gray – very dark grayish brown (10YR 3/2 – 3/1 – 3/2) LOAM; abrupt gradational boundary.
31-55	Cg1	Very thin bedded & laminated dark greenish gray (10GY 4/1) heavy SILT LOAM and SANDY LOAM; one medium and coarse sand bed; abrupt gradational boundary.
55-141	Cg2	Greenish gray (5GY 5/1) coarse SAND with very coarse – granule mode; few silt loam interbeds; very abrupt boundary.
141-147	Ob	*PALUDAL* Black – very dark brown (10YR 2/1 – 2/2) sapric MUCK; abrupt gradational boundary.
147-180	**Ab**	*LACUSTRINE DEPOSITS* Black (N2.5/) CLAY; ± 10% sand; roots; clear boundary.
180-270	ACgb	Very dark gray (N3/) CLAY; trace of sand.
270-318	Cg1	Dark gray (2.5Y 4/1) CLAY; homogeneous color; very abrupt boundary.
318-396	Cg2	Olive brown – light olive brown (2.5Y 4/3 – 5/3) CLAY with 1% very fine sand at base; common distinct redox.

Core 29: Colluvial Slope

Depth	Horizon	Description
0-90	F1	*FILL* Mixed clayey fill and gravel.
90-141	F2	Mixed sandy fill.
141-182	Cg1	*ALLUVIAL FAN DEPOSITS* Grayish brown (10YR 5/2) LOAM; occasional gravel; common prominent redox features; mixed with 10Y hue soil at base.
182-309	Cg2	Dark greenish gray (10GY 4/1) SANDY LOAM and LOAM with silt loam interbeds; occasional fine gravel.
309-396	Cg3	*LACUSTRINE* Dark gray (N4/) heavy SILT LOAM; few roots; 1-2% sand.

Core 30: Western Alluvial Fan

Depth	Horizon	Description
0-14	A	*ALLUVIAL FAN DEPOSITS* Very dark gray – very dark grayish brown (10YR 3/1 – 3/2) SILT LOAM; 5% sand; clear boundary.
14-43	C1	Stratified dark grayish brown (10YR 4/2) medium SANDY LOAM with brown – dark grayish brown (10YR 4/3 – 4/2) medium to coarse sand; abrupt gradational boundary.
43-90	Cg1	Stratified (N5/ - N4/) SILT LOAM & graded SAND of SILT LOAM with gravel.
90-134	Cg2	Dark greenish gray (10Y 3/1) SANDY CLAY LOAM; very abrupt boundary.
134-148	**ACb**	*PALUDAL* Very dark gray (2.5Y 3/1) SILT LOAM; massive; few shell fragments at lower boundary; leached.
148-161	Ob	Black (N 2.5/) muck; leached; very abrupt boundary.
161-188	Ab	*LACUSTRINE* Black (N2.5Y/) CLAY 3% sand; few matrix supported pebbles; leached.
188-253	Cg3	Dark gray (2.5Y 4/1) CLAY; 5% very fine sand; leached; clear gradational boundary.
253-316	Cg4	(2.5Y 6/2) SILTY CLAY LOAM – SILT LOAM; 15% very fine sand; homogeneous color; unleached; abrupt boundary.
316-326	C2	*ALLUVIAL FAN DEPOSITS* Stratified SILT LOAM and gravelly SAND; unleached.
326-396	C3	Brown (10YR 4/4) poorly sorted medium – coarse SAND; unleached.

Core 31: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-33	A -C	*ALLUVIAL FAN DEPOSITS* Dark grayish brown (10YR 4/2) LOAM over mixed and layered oxidized SAND; few gravel clasts.
33-135	Cg1	Dark greenish gray (10Y 4/1) stratified medium and medium – coarse SAND.
135-213	Cg2	Finer gravelly medium SAND.
213-260	Ob	*PALUDAL DEPOSITS* Black (N 2.5/) MUCK.
260-310	Ab	*LACUSTRINE DEPOSITS* Black (N 2.5/) – very dark gray (N 3/) SANDY CLAY – CLAY; very abrupt boundary.
310-396	Cg3	*ALLUVIAL DEPOSITS* Dark greenish gray (10Y 4/1) graded medium – coarse SAND.

Core 32: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-24	A	*ALLUVIAL FAN DEPOSITS* Very dark gray (10RY 3/1) SANDY LOAM topsoil with single coarse sand bed.
24-150	C1	Stratified dark grayish brown & dark grayish brown – grayish brown (10YR 4/2 – 5/2) very fine LOAMY SAND, medium – coarse SAND and SILT LOAM – very fine SANDY LOAM; occasional gravel from 141-157 cm.
150-162	Cg1	Greenish gray (10YR 5/1) heavy SILT LOAM; black very abrupt boundary.
162-164		Black SAND with few roots.
164-200	Cg2	Gray – dark gray (5Y 4/1 – 5/2) fine gravelly SAND.
200-396	Cg3	Loose SAND & GRAVEL.
396-406	ACgb	Dark gray (N 4/) laminated fine SAND; two organic laminae; abrupt gradational boundary.
406-487	C2	Fine gravelly medium – coarse SAND.

Core 33: Bluff Creek Alluvial Fan

Depth	Horizon	Description
0-80	F1	*FILL*
80-151	Cg1	*ALLUVIAL FAN DEPOSITS* Stratified oxidized SANDY LOAM; abrupt gradational boundary.
151-160	Cg2	Dark gray (5Y 4/1) SILT LOAM; very abrupt gradational boundary.
160-323	Cg3	Olive gray (5Y 4/3) fine and fine – medium SAND with coarser coarse – very coarse sand laminae; all gleyed with few – common distinct redox features.
323-396	Ob	*PALUDAL DEPOSITS* PEAT; low recovery possibly much thinner
396-487	O/C	PEAT in sand.

Core 34: Colluvial Slope

Depth	Horizon	Description
0-20	Ap1	*COLLUVIUM* Very dark grayish brown (10YR 3/2) gravely SANDY LOAM; very abrupt boundary.
20-32	Ap2	Very dark grayish brown (10YR 3/2) SANDY LOAM; very abrupt boundary.
32-129	A	Black (10YR 2/1) SILT LOAM; occasional fine pebbles or granules; weak medium prismatic parting to medium subangular blocky structure; dark yellowish brown inclusions at 93cmbs; cumulic A horizon; clear boundary.
129-162	AB	Very dark grayish brown (10YR 3/2) SILT LOAM; weak pedo-structure; ped faces are slightly darker; clear boundary.
162-176	Bw	Brown – dark grayish brown (10YR 4/3 – 4/2) heavy SILT LOAM; weak pedo-structure; abrupt boundary.
176-188	BC	Brown (10YR 4/3) heavy SILT LOAM – SILTY CLAY LOAM; massive; increase in very fine sand %; abrupt boundary.
188-225	C1	Dark yellowish brown (10YR 4/4) SILT LOAM 20% very fine SAND; massive.
225-290	C2	*LACUSTRINE/ALLUVIAL DEPOSITS* Brown (10YR 5/3) very fine SANDY LOAM (all coarse silt and very fine sand) common faint redox features; massive; well-sorted; large carbonate nodule at 228cm.
290-396	C3	Yellowish brown (10YR 5/4) very fine SANDY LOAM; common distinct redox features.

Core 35: Western Alluvial Fan

Depth	Horizon	Description
0-60	Ap-A	*COLLUVIAL DEPOSITS* Very dark gray (10YR 3/1) SILTY CLAY LOAM; weak pedo-structure; cumulic A/Aps; unleached; abrupt boundary.
60-139	Ab/C	Very dark gray (10YR 3/1) heavy SILT LOAM with light soil inclusions interbedded with lighter dark grayish brown (10YR 4/2) SILT LOAM; unleached; very abrupt boundary.
139-167	C1	Brown – pale brown (10YR 5/3 – 6/3) heavy SILT LOAM; few fine white nodules; massive; unleached; very abrupt boundary.
167-189	**Ab2**	Very dark grayish brown (10YR 3/2) heavy SILT LOAM; 20% very fine sand and rounded pebbles; unleached.
189-222	C2	Light olive brown (2.5Y 5/3) very fine SANDY LOAM – light LOAM.
222-229	Ab3	Olive brown (2.5Y 4/3) very fine SANDY LOAM – SILT LOAM; unleached; very abrupt boundary.
229-250	Cg1	Light olive brown (2.5Y 5/3) very fine SANDY LOAM – LOAM; unleached; common distinct redox features; clear boundary.
250-396	Cg3	LACUSTRINE/ALLUVIAL DEPOSITS Olive brown – light olive brown (2.5Y 4/3 – 5/3) indistinct beds of very fine SAND and coarse SILT (60/40); sand coarsens downward to fine textured at base; unleached.

Core 36: Bluff Creek Alluvial Fan (Golf Zone)

Depth	Horizon	Description
0-20	Ap	*ALLUVIAL FAN DEPOSITS* Dark grayish brown (10YR 4/2) fine SAND with gravel; abrupt boundary.
20-42	C1	SAND & GRAVEL.
42-138	C2	Medium – coarse SAND; few very fine pebbles.
138-245	C3	Stratified medium – coarse SAND and coarse – very coarse with granules; distinct redox features; very abrupt boundary.
245-260	Cg1	(5GY 5/1) laminated SILT LOAM, very fine SANDY LOAM, and very fine SAND; homogeneous color.
260-313	Cg2	(5GY 5/2) coarse and very coarse SAND with granular medium – coarse SAND; very abrupt boundary.
313-321	Cg3	Laminated black (N2/) SILT LOAM & heavy SILT LOAM & (5GY 4/1) very fine SANDY LOAM; very abrupt boundary.
321-327	Cg4	Coarse and very coarse SAND and few fine pebbles; very abrupt boundary.
327-396	Ob	*PALUDAL DEPOSITS* Black (N 2.5/) MUCK; 2% sand.

Core 37: Bluff Creek Alluvial Fan (Golf Zone)

Depth	Horizon	Description
0-26	Ap	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown (10YR 3/2) SANDY LOAM – LOAM with gravel.
26-85	C1	SAND & GRAVEL; common distinct redox features.
85-137	Cg1	Laminated olive brown – light olive brown (2.5YR 4/3 – 5/3) fine SAND; very abrupt boundary of organic laminae.
137-156	Cg2	*LACUSTRINE DEPOSITS* Dark gray and dark greenish gray (N5/ & 5GY 6/1) laminated SILTY CLAY LOAM with few organic laminae.
156-185	ACg1	Very dark gray – dark greenish gray (N3/ - 10Y 3/1) mucky SILT; plant fragments and roots.
185-314	Cg3	*ALLUVIAL FAN DEPOSITS* (N5/ - N 6/) very thin bedded and laminated medium SAND with bed of medium – coarse sand and very dark gray (N 3/) heavy SILT LOAM laminae; very abrupt boundary.
314-396	ACg2	LACUSTRINE DEPOSITS Very dark gray and dark gray (N3/ & N 4/) heavy SILTY CLAY LOAM; roots and plant fragments; matrix supported sand grains.

Core 38: Bluff Creek Alluvial Fan (Golf Zone)

Depth	Horizon	Description
0-26	Ap	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown (10YR 3/2) SANDY LOAM; poorly sorted; abrupt boundary.
26-38	C1	Mixed SAND and SANDY LOAM; abrupt boundary.
38-132	C2	Dark grayish brown – grayish brown (10YR 4/2 – 5/2) medium sand; indistinct lamination; few distinct redox features; very abrupt boundary.
132-143		Gravel lag
143-265	Cg1	LACUSTRINE/ALLUVIAL FAN Interstratified very thin beds and laminae of very fine through coarse – very coarse SAND, very fine SANDY LOAM and organic laminae.
265-310	Cg2	Interstratified medium and coarse SAND and black (N2.5Y) muck.
310-329	Cg3	Laminated organic SILT LOAM (10Y 3/1) and muck (N 2.5Y); bed of carbonate stems between 320 & 325; abrupt gradational boundary.
329-353	Cg4	Very dark gray (N 3/) SILTY CLAY LOAM; abrupt boundary.
353-396	Cg5	(5GY 4/1) SILT LOAM with few muck laminae.

Core 39: Bluff Creek Alluvial Fan (Golf Zone)

Depth	Horizon	Description
0-38	Ap	ALLUVIAL FAN DEPOSITS Very dark grayish brown (10YR 3/2) SANDY LOAM; abrupt boundary.
38-136	C1	SANDY LOAM
136-149	Cg1	N4/) laminated very fine SAND, very fine SANDY LOAM & coarse SILT.
149-160	Cg2	(N4/) fine – medium SAND with gravelly sand inclusions; unleached; very abrupt boundary.
160-222	Ob1	*PALUDAL DEPOSITS* Laminated (N5/) gray silty MUCK and black (2.5Y 2.5/1) PEAT.
222-248	Ob2	Black (N 2.5/) PEAT.
248-265	Cg3	*LACUSTRINE/ALLUVIAL FAN* Bedded dark gray (2.5Y 4/1) fine SANDY LOAM & coarse SAND with single organic laminae; many roots.
265-316	Cg4	Laminated and bedded dark greenish gray (10Y 4/1) very fine SANDY LOAM with black (N 2.5/) organic (muck); roots.
316-320	Cg5	Dark greenish gray (10Y 3/1) CLAY; very abrupt boundary.
320-396	Cg6	5GY 4/1 fine loamy SAND.

Core 40: Bluff Creek Alluvial Fan (Golf Zone)

Depth	Horizon	Description
0-18	Ap	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown (10YR 3/2) SANDY LOAM; few fine gravel clasts; very abrupt boundary.
18-140	Cg1	Brown (10YR 4/3) coarse and very coarse SAND; many prominent redox features.
140-190	Cg2	(5GY 5/1) stratified very fine SANDY LOAM, medium SAND and coarse SAND.
190-222	Cg3	Very dark gray – dark gray (2.5Y 3/1 – 4/1) SILT LOAM; abrupt boundary.
222-396	Ob	*PALUDAL/LACUSTRINE* (5GY 4/1 – 5/1) SILT LOAM over very dark gray (N 3/) mucky CLAY.

Core 41: Bluff Creek Alluvial Fan (Golf Zone)

Depth	Horizon	Description
0-19	Ap1	*ALLUVIAL FAN DEPOSITS* Very dark grayish brown (10YR 3/2) compact LOAM with light soil inclusions; very abrupt boundary.
19-28	Ap2	Dark gray (2.5Y 4/1) compact SANDY LOAM; very abrupt boundary.
28-90	Cg1	Laminated dark greenish gray (2.5Y 4/1) and dark gray (2.5Y 4/1) and dark greenish gray (10GY 5/1) very fine SANDY LOAM and LOAMY SAND; fine sand and gravel bed at 58cm.
90-137	Cg2	Laminated fine SAND & SANDY LOAM (5GY 6/1 – N 6/); very abrupt boundary.
137-238	Cg3	(N4/) coarse and very coarse SANDY LOAM; slightly sticky; grades to medium and coarse sand.
238-270	Cg4	(5 GY 4/1) SILT LOAM.
270-396	Cg5	(5 GY 4/1) SILT LOAM.

APPENDIX B
RADIOCARBON ASSAY DATA SHEETS

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD

4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Dr. Michael F. Kolb — Report Date: 3/18/2013

Strata Morph Geoexploration, Incorporated — Material Received: 3/8/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 344274	490 +/- 30 BP	-26.8 o/oo	460 +/- 30 BP
SAMPLE : 63C3D350			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1420 to 1450 (Cal BP 530 to 500)			
Beta - 344275	330 +/- 30 BP	-26.1 o/oo	310 +/- 30 BP
SAMPLE : 101C3D416			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 1480 to 1650 (Cal BP 470 to 300)			
Beta - 344276	1390 +/- 30 BP	-25.1 o/oo	1390 +/- 30 BP
SAMPLE : 101C3D550			
ANALYSIS : AMS-Standard delivery			
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid			
2 SIGMA CALIBRATION : Cal AD 610 to 670 (Cal BP 1340 to 1280)			

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.8:lab. mult=1)

Laboratory number: **Beta-344274**

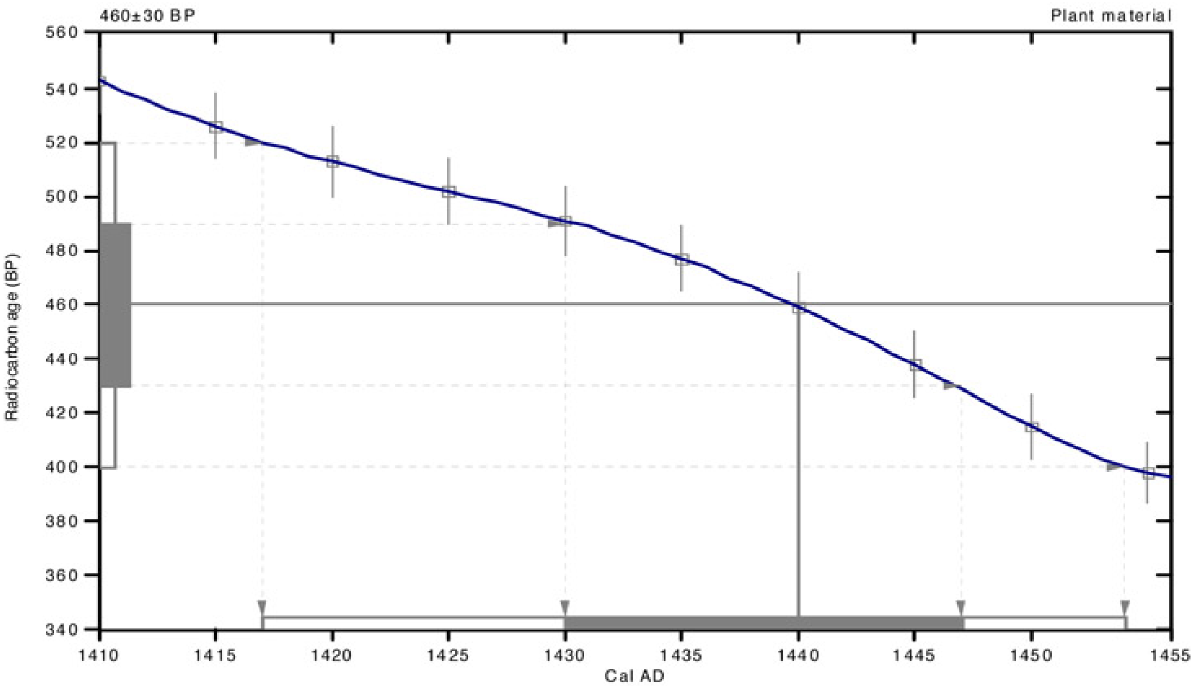
Conventional radiocarbon age: **460±30 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1420 to 1450 (Cal BP 530 to 500)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 1440 (Cal BP 510)

1 Sigma calibrated result: (68% probability) Cal AD 1430 to 1450 (Cal BP 520 to 500)



References:
Database used
INTCAL09
References to INTCAL09 database
Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192
Mathematics used for calibration scenario
A Simplified Approach to Calibrating C14 Dates
Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

Beta Analytic Radiocarbon Dating Laboratory

4985 S.W. 74th Court, Miami, Florida 33155 • Tel: (305)667-5167 • Fax: (305)663-0964 • E-Mail: beta@radiocarbon.com

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-26.1:lab. mult=1)

Laboratory number: **Beta-344275**

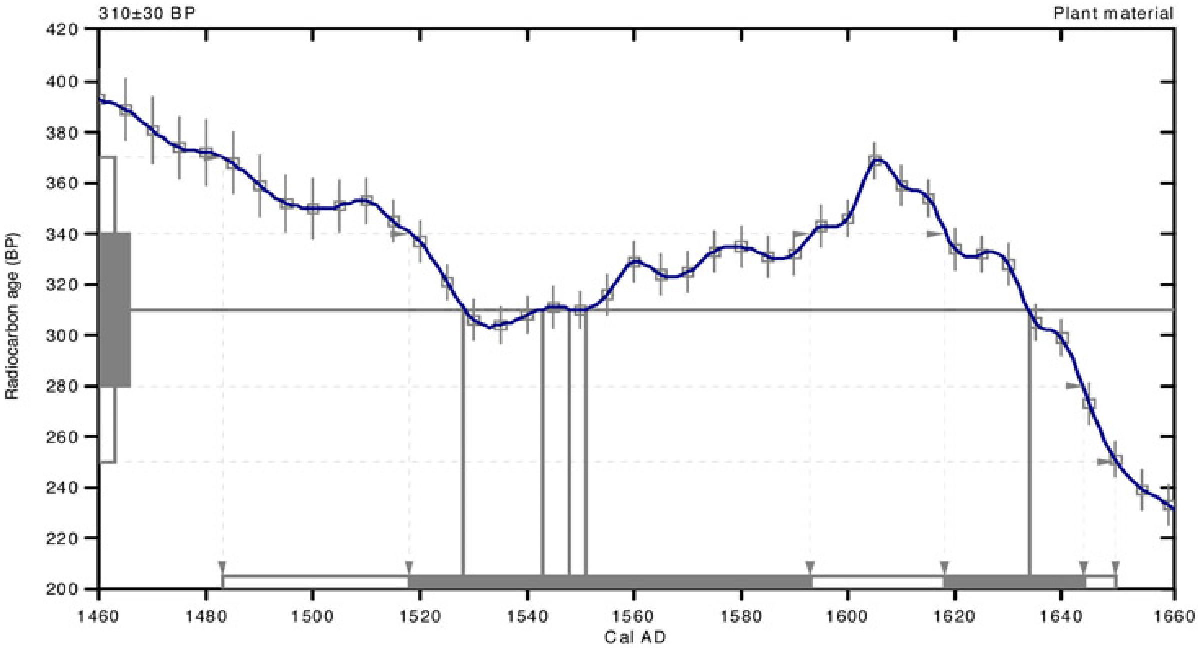
Conventional radiocarbon age: **310±30 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 1480 to 1650 (Cal BP 470 to 300)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal AD 1530 (Cal BP 420) and
Cal AD 1540 (Cal BP 410) and
Cal AD 1550 (Cal BP 400) and
Cal AD 1550 (Cal BP 400) and
Cal AD 1630 (Cal BP 320)

1 Sigma calibrated results: (68% probability) Cal AD 1520 to 1590 (Cal BP 430 to 360) and
Cal AD 1620 to 1640 (Cal BP 330 to 310)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-25.1:lab. mult=1)

Laboratory number: **Beta-344276**

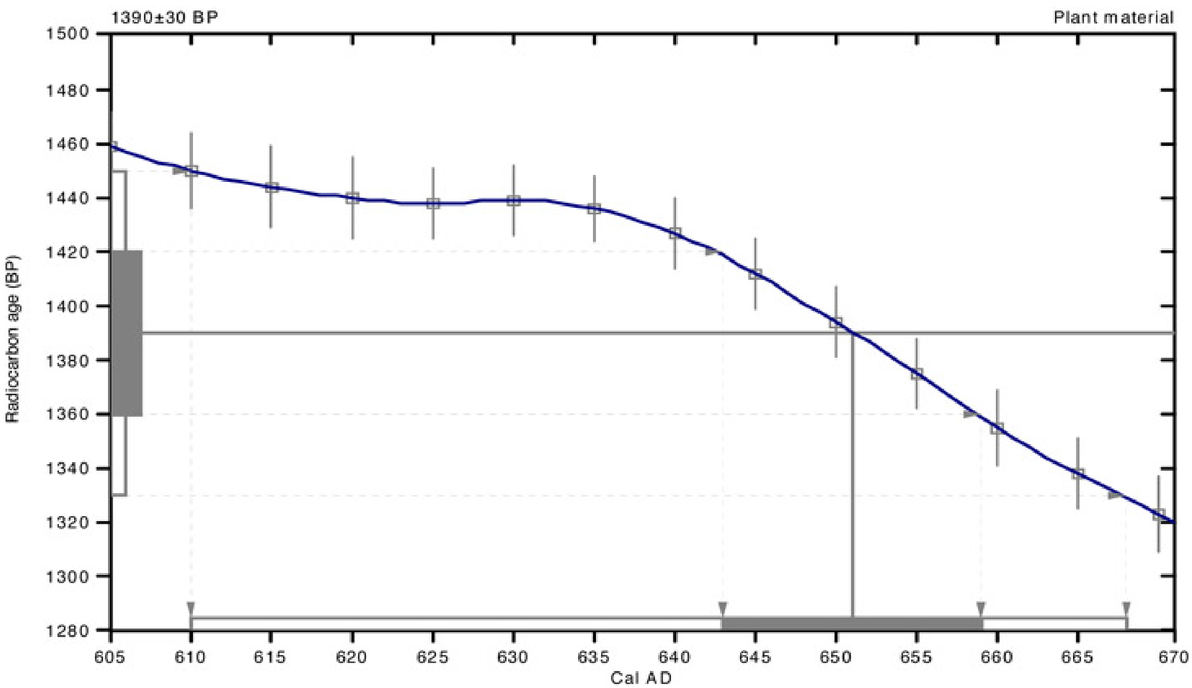
Conventional radiocarbon age: **1390±30 BP**

2 Sigma calibrated result: (95% probability) **Cal AD 610 to 670 (Cal BP 1340 to 1280)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal AD 650 (Cal BP 1300)

1 Sigma calibrated result: (68% probability) Cal AD 640 to 660 (Cal BP 1310 to 1290)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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APPENDIX B:
OFFICE OF STATE ARCHAEOLOGIST LICENSES

APPLICATION FOR MINNESOTA
ANNUAL ARCHAEOLOGICAL RECONNAISSANCE SURVEY LICENSE

This license only applies to reconnaissance (Phase I) surveys conducted under Minnesota Statutes 138.31-.42 during calendar year _2012_. Separate licenses must be obtained for site evaluation (Phase II) surveys, for major site investigations (Phase III), for burial site authentications under Minnesota statutes 307.08, and for survey work that will continue into another calendar year. Only the below listed individual is licensed as a Principal Investigator, not the institution/agency/company or others who work for that entity. The licensed individual is required to comply with all the conditions attached to this license form. Permission to enter land for the purposes of archaeological investigation must be obtained from the landowner or land manager.

Name: Frank Florin

Institution/Agency/Company Affiliation: Florin Cultural Resource Services, LLC

Title/Position: Owner and Principal Investigator

Address: N12902 273rd Street, Boyceville, WI 54725

Work Phone: (715) 643-2918 E-Mail: florin@pressenter.com

Name of Advanced Degree Institution: U of MN, Minneapolis Year: 1996

Name of Department: Interdisciplinary Archaeological Studies Degree: _X_MA __MS __PhD

Purpose: (check all that may apply)
CRM X Academic Research ___ Institutional Field School ___

Type of Land: (check all that may apply)
State Owned _X_ County Owned _X_ Township/City Owned _X_
Other non-federal public ___ List: ______________________

MHS Repository Agreement # __564______ Other Approved Curation Facility:____________

Previous License: Year 2011 Type: Annual Number: 11-49

Signed (applicant):_ Frank Florin _________ Date: __4/9/12_________

Required Attachments: *Curriculum Vita* ___ and Documentation of Appropriate Experience ___ for previously unlicensed individuals.

Submit one copy of this form and attachments to:
Office of the State Archaeologist, Ft. Snelling History Center, St. Paul, MN 55111
612-725-2411 612-725-2729 FAX 612-725-2427 email: mnosa@state.mn.us

Minnesota Historical Society Approval: Pat Gaarder Date: 4/13/12
State Archaeologist Approval: [signature] Date: 4/10/12

License Number: 12-047

Form Date: 4/9/12

APPLICATION FOR MINNESOTA
EVALUATION/PHASE II SURVEY ARCHAEOLOGICAL LICENSE

This license only applies to evaluation investigations/Phase II surveys conducted under the provisions of Minnesota Statutes 138.31 - .42 at the specific site or locality listed on the application during calendar year 2012. Separate licenses must be obtained for reconnaissance (Phase I) surveys, for major investigation (Phase III) work, for burial site work under Minnesota statutes 307.08, for fieldwork that will continue into another calendar year, for fieldwork conducted at locations other than those listed below, and for fieldwork that significantly exceeds the Phase II specifications of the *SHPO Manual for Archaeological Projects in Minnesota*. Only the listed individual is licensed as a Principal Investigator, not the institution/agency/company or others who work for that entity. The licensed individual and the sponsoring entity are required to comply with all the conditions attached to the license.

Name: Frank Florin

Institution/Agency/Company Affiliation: Florin Cultural Resource Services, LLC

Title/Position: owner & PI

Address: N12902 273rd St

Work Phone: (715) 643-2918 E-Mail: florin@pressenter.com

Name of Advanced Degree Institution: U of MN Year: 1996

Name of Department: Interdisciplinary Archaeological Studies Degree: X MA __MS __PhD

21CR0154

Site Number: FCRS 275-132 Project: TH101

Type of Land: (check all that may apply)
State Owned X County Owned __ Township/City Owned __ Manager: MnDOT
Other non-federal public__ List: ____

Purpose: (check all that may apply)
CRM X Academic Research ___ Institutional Field School ___

Expected Period Components/Contexts: Precontact X Contact___ Post-Contact___

MHS Repository Agreement # 564 Other Approved Curation Facility:____

Signed (applicant): [signature] Date: 10/27/12

Required Attachments: 1) *Curriculum Vita* X 2) Documentation of Appropriate Experience X
3) Research Design X
Previous License: Year 2012 Type Phase I Number 12-047

Submit one copy of this form and attachments to:
Office of the State Archaeologist, Ft. Snelling History Center, St. Paul, MN 55111
612-725-2411 612-725-2729 FAX 612-725-2427 email: mnosa@state.mn.us

Minnesota Historical Society Approval: [signature] Date: 10/5/12
State Archaeologist Approval: [signature] Date: 10/29/12
License Number: 12-074

Form Date: 2/15/11

APPLICATION FOR MINNESOTA
EVALUATION/PHASE II SURVEY ARCHAEOLOGICAL LICENSE

This license only applies to evaluation investigations/Phase II surveys conducted under the provisions of Minnesota Statutes 138.31 - .42 at the specific site or locality listed on the application during calendar year 2012. Separate licenses must be obtained for reconnaissance (Phase I) surveys, for major investigation (Phase III) work, for burial site work under Minnesota statutes 307.08, for fieldwork that will continue into another calendar year, for fieldwork conducted at locations other than those listed below, and for fieldwork that significantly exceeds the Phase II specifications of the *SHPO Manual for Archaeological Projects in Minnesota*. Only the listed individual is licensed as a Principal Investigator, not the institution/agency/company or others who work for that entity. The licensed individual and the sponsoring entity are required to comply with all the conditions attached to the license.

Name: Frank Florin

Institution/Agency/Company Affiliation: Florin Cultural Resource Services, LLC

Title/Position: owner & PI

Address: N12902 273rd St

Work Phone: (715) 643-2918 E-Mail: florin@pressenter.com

Name of Advanced Degree Institution: U of MN Year: 1996

Name of Department: Interdisciplinary Archaeological Studies Degree: X MA __MS __PhD

Site Number: FCRS 276-1 Project: TH101

Type of Land: (check all that may apply)
State Owned X County Owned __ Township/City Owned __ Manager: MnDOT
Other non-federal public__ List: ____

Purpose: (check all that may apply)
CRM X Academic Research ___ Institutional Field School ___

Expected Period Components/Contexts: Precontact X Contact__ Post-Contact___

MHS Repository Agreement # 564 Other Approved Curation Facility:____

Signed (applicant): Frank Florin Date: 12/8/12

Required Attachments: 1) *Curriculum Vita* X 2) Documentation of Appropriate Experience X
3) Research Design X
Previous License: Year 2012 Type Phase I Number 12-047

Submit one copy of this form and attachments to:
Office of the State Archaeologist, Ft. Snelling History Center, St. Paul, MN 55111
612-725-2411 612-725-2729 FAX 612-725-2427 email: mnosa@state.mn.us

Minnesota Historical Society Approval: [signature] Date: 12/13/12
State Archaeologist Approval: [signature] Date: 12/11/12
License Number: 12-077

Form Date: 2/15/11

APPLICATION FOR MINNESOTA
ANNUAL ARCHAEOLOGICAL RECONNAISSANCE SURVEY LICENSE

This license only applies to reconnaissance (Phase I) surveys conducted under Minnesota Statutes 138.31-.42 during calendar year _2012_. Separate licenses must be obtained for site evaluation (Phase II) surveys, for major site investigations (Phase III), for burial site authentications under Minnesota statutes 307.08, and for survey work that will continue into another calendar year. Only the below listed individual is licensed as a Principal Investigator, not the institution/agency/company or others who work for that entity. The licensed individual is required to comply with all the conditions attached to this license form. Permission to enter land for the purposes of archaeological investigation must be obtained from the landowner or land manager.

Name: Frank Florin

Institution/Agency/Company Affiliation: Florin Cultural Resource Services, LLC

Title/Position: Owner and Principal Investigator

Address: N12902 273rd Street, Boyceville, WI 54725

Work Phone: (715) 643-2918 E-Mail: florin@pressenter.com

Name of Advanced Degree Institution: U of MN, Minneapolis Year: 1996

Name of Department: Interdisciplinary Archaeological Studies Degree: _X_MA __MS __PhD

Purpose: (check all that may apply)
CRM X Academic Research ___ Institutional Field School ___

Type of Land: (check all that may apply)
State Owned _X_ County Owned _X_ Township/City Owned _X_
Other non-federal public ___ List: ____________________

MHS Repository Agreement # __603______ Other Approved Curation Facility:____________

Previous License: Year 2012 Type: Annual Number: 12-47

Signed (applicant):_ Frank Florin _________ Date: __3/26/13__________

Required Attachments: *Curriculum Vita* ___ and Documentation of Appropriate Experience ___ for previously unlicensed individuals.

Submit one copy of this form and attachments to:
Office of the State Archaeologist, Ft. Snelling History Center, St. Paul, MN 55111
612-725-2411 612-725-2729 FAX 612-725-2427 email: mnosa@state.mn.us

Minnesota Historical Society Approval: [signature] Date: 3-28-13
State Archaeologist Approval: [signature] Date: 3/27/13
License Number: 13-044

Form Date: 4/9/12

APPLICATION FOR MINNESOTA
EVALUATION/PHASE II SURVEY ARCHAEOLOGICAL LICENSE

This license only applies to evaluation investigations/Phase II surveys conducted under the provisions of Minnesota Statutes 138.31 - .42 at the specific site or locality listed on the application during calendar year 2013. Separate licenses must be obtained for reconnaissance (Phase I) surveys, for major investigation (Phase III) work, for burial site work under Minnesota statutes 307.08, for fieldwork that will continue into another calendar year, for fieldwork conducted at locations other than those listed below, and for fieldwork that significantly exceeds the Phase II specifications of the *SHPO Manual for Archaeological Projects in Minnesota*. Only the listed individual is licensed as a Principal Investigator, not the institution/agency/company or others who work for that entity. The licensed individual and the sponsoring entity are required to comply with all the conditions attached to the license.

Name: Frank Florin

Institution/Agency/Company Affiliation: Florin Cultural Resource Services, LLC

Title/Position: Owner & PI

Address: N12902 273rd St. Boyceville, WI 54725

Work Phone: (715) 643-2918 E-Mail: florin@pressenter.com

Name of Advanced Degree Institution: U of MN Year: 1996

Name of Department: IAS Degree: X MA __MS __PhD

Site Number: 21CR155 Project: TH101/CSAH 61

Type of Land: (check all that may apply)
State Owned X County Owned __ Township/City Owned __ Manager: MnDOT
Other non-federal public__ List: ____

Purpose: (check all that may apply)
CRM X Academic Research ___ Institutional Field School ___

Expected Period Components/Contexts: Precontact X Contact___ Post-Contact___

MHS Repository Agreement # 603 Other Approved Curation Facility:____

Signed (applicant): Frank Florin Date: 6/15/13

Required Attachments: 1) *Curriculum Vita* X 2) Documentation of Appropriate Experience X
3) Research Design X
Previous License: Year 2012 Type Phase 1 Number 12-047

Submit one copy of this form and attachments to:
Office of the State Archaeologist, Ft. Snelling History Center, St. Paul, MN 55111
612-725-2411 612-725-2729 FAX 612-725-2427 email: mnosa@state.mn.us

Minnesota Historical Society Approval: [signature] Date: 6-17-13
State Archaeologist Approval: [signature] Date: 6/17/13
License Number: 13-059

Form Date: 2/15/11

APPENDIX C:
ARTIFACT CATALOGS

21CR154 Catalog

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 5	Descript 6	Descript 7	Size Grade	Weight (g)	Notes	Date
1.1	1	I	ST 1A	30-50	Lithic	debris	broken flake		Swan River Chert	cortex absent		3 (1/2"-1/4")	0.3		11/29/2012
	1	I	ST 2A	40-50	Other	fire-cracked rock			granite			2 (1"-1/2")	14.3		11/28/2012
4.1	1	I	ST 32E	120-135	Lithic	debris	broken flake		Swan River Chert	cortex present		3 (1/2"-1/4")	0.3		11/6/2012
5.1	1	II	ST 32CE	70-85	Lithic	debris	other G4 flake		quartz	cortex absent		4 (<1/4")	0.8		11/7/2012
6.1	1	II	ST 33CW	60-70	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.6		11/7/2012
7.1	1	I	ST 38	30-50	Lithic	tool	unpatterned flake tool	utilized flake	unidentified chert	cortex present		3 (1/2"-1/4")	0.4		10/25/2012
8.1-2	2	I	ST 38E5	35-50	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	1.4	refit	11/26/2012
9.1	1	I	ST 39	40-60	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.5		11/26/2012
10.1	1	I	ST 39S	0-20	Faunal	turtle	shell	fragment				3 (1/2"-1/4")	0.3		11/7/2012
11.1	1	I	ST 90	70-100	Lithic	debris	secondary flake		Swan River Chert	cortex absent	poss. heat treated	3 (1/2"-1/4")	1.9		11/7/2012
12.1	1	II	ST 39CW	50-60	Lithic	debris	primary flake		Swan River Chert	cortex present		3 (1/2"-1/4")	0.7		11/21/2012

21CR155 Catalog

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
1.1	1	II	ST 1	200-225	Lithic	debris	primary flake			Swan River Chert	cortex present	2 (1"-1/2")	6.2		12/18/2012
1.2	1	II	ST 1	200-225	Lithic	debris	primary flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	1.9		12/18/2012
	1	II	ST 1	200-225	Other	fire-cracked rock				granite		2 (1"-1/2")	6.2		12/18/2012
2.1	1	II	ST 2	200-225	Faunal	mammalian, medium/large	unidentifiable	fragment	burned			3 (1/2"-1/4")	0.2		12/18/2012
2.2	1	II	ST 2	200-225	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.1		12/18/2012
3.1	1	II	ST 3	200-220	Lithic	debris	shatter			basalt	cortex present	2 (1"-1/2")	3.9		12/18/2012
4.1-3	3	II	ST 4	170-205	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.5		12/18/2012
4.4-5	2	II	ST 4	170-205	Faunal	mammalian, large	unidentifiable	fragment				2 (1"-1/2")	3.4		12/18/2012
5.1	1	II	ST 4	205-230	Lithic	core	patterned bifacial	indeterminate	prepared	Prairie du Chien (oolitic)	cortex present	2 (1"-1/2")	11		12/18/2012
5.2	1	II	ST 4	205-230	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	1.3		12/18/2012
5.3-4	2	II	ST 4	205-230	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.2		12/18/2012
6.1	1	II	ST 5	205-220	Lithic	debris	tertiary flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.2	fine grained; clear	12/18/2012
6.2	1	II	ST 5	205-220	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.3		12/18/2012
	2	II	ST 6	200-210	Other	fire-cracked rock				granite		2 (1"-1/2")	33.5		12/18/2012
7.1	1	II	ST 6	200-220	Lithic	tool	patterned bifacial	projectile point or knife	fragment	Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.6	blade fragment	12/19/2012
7.2	1	II	ST 6	200-220	Lithic	debris	tertiary flake			Knife River Flint	cortex absent	4 (<1/4")	0.1		12/19/2012
7.3-6	4	II	ST 6	200-220	Faunal	mammalian, large	unidentifiable	fragment	burned			3 (1/2"-1/4")	2.9	partially calcined	12/19/2012

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
7.7-8	2	II	ST 6	200-220	Faunal	vertebrate	unidentifiable	fragment	burned			4 (<1/4")	0.2	partially calcined	12/19/2012
8.1	1	II	ST 12	170-180	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.1		1/7/2013
9.1	1	II	ST 13	200-240	Lithic	debris	secondary flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.7		1/7/2013
10.1	1	II	ST 15	205-240	Lithic	debris	primary flake			basalt	cortex present	3 (1/2"-1/4")	0.8		1/8/2013
10.2	1	II	ST 15	205-240	Lithic	debris	secondary flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.7	fine grained; clear	1/8/2013
10.3	1	II	ST 15	205-240	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.4		1/8/2013
10.4	1	II	ST 15	205-240	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.5		1/8/2013
10.5	1	II	ST 15	205-240	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.2		1/8/2013
11.1	1	II	ST 16	170-200	Lithic	tool	patterned bifacial	projectile point		Swan River Chert	cortex absent	2 (1"-1/2")	1.9	recovered at 170-180 cmbs; base broken	1/8/2013
11.2	1	II	ST 16	170-200	Lithic	tool	patterned flake tool	graver		Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.7		1/8/2013
11.3	1	II	ST 16	170-200	Lithic	debris	bipolar flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.5		1/8/2013
11.4	1	II	ST 16	170-200	Lithic	debris	primary flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	1.7		1/8/2013
11.5	1	II	ST 16	170-200	Lithic	debris	secondary flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	1.4		1/8/2013
11.6	1	II	ST 16	170-200	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.2		1/8/2013
11.7	1	II	ST 16	170-200	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.3		1/8/2013
11.8	1	II	ST 16	170-200	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0		1/8/2013
11.9	1	II	ST 16	170-200	Lithic	debris	other G4 flake			Prairie du Chien (oolitic)	cortex absent	4 (<1/4")	0.1		1/8/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
12.1	1	II	ST 16	220-240	Lithic	debris	tertiary flake			Swan River Chert	cortex absent	4 (<1/4")	0.1		1/8/2013
13.1	1	II	ST 22	190-210	Lithic	debris	broken flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.1	fine grained; clear	1/10/2013
14.1-2	2	II	ST 27	120-155	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.9		1/9/2013
15.1	1	II	ST 27	165-175	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	1		1/9/2013
	1	II	ST 28	110-125	Other	fire-cracked rock				granite		1 (>1")	176		1/9/2013
16.1	1	II	ST 29	130-150	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.7		1/10/2013
17.1	1	II	ST 29	150-170	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.1		1/10/2013
17.2	1	II	ST 29	150-170	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.5		1/10/2013
18.1	1	II	ST 30	110-130	Lithic	debris	broken flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.1		1/10/2013
19.1	1	II	ST 31	90-100	Lithic	debris	secondary flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	1.2	moderate grain; clear	1/10/2013
19.2	1	II	ST 31	90-100	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.1		1/10/2013
20.1	1	I	ST 73A	220-230	Lithic	debris	primary flake			siltstone	cortex present	2 (1"-1/2")	2.8		12/7/2012
21.1	1	I	ST 77A	130-140	Lithic	tool	patterned bifacial	unfinished biface, stage 4	fragment	Hixton Group Quartzite	cortex absent	2 (1"-1/2")	2.8	fine grained; honey colored	1/8/2013
22.1	1	I	ST 91A	230-240	Lithic	tool	unpatterned flake tool	retouch flake		basalt	cortex present	1 (>1")	18.7	possible artifact impact from auger	12/12/2012
23.1	1	II	XU 1	170-195	Lithic	debris	secondary flake			Prairie du Chien (oolitic)	cortex absent	2 (1"-1/2")	1.9		12/19/2012
23.2-4	3	II	XU 1	170-195	Faunal	vertebrate	unidentifiable	fragment				3 (1/2"-1/4")	1		12/19/2012
23.5-7	3	II	XU 1	170-195	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0.1		12/19/2012

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	3	II	XU 1	170-195	Other	organic	coal, clinker	clinker fragment				3 (1/2"-1/4")	0.3		12/19/2012
24.1	1	II	XU 1	195-205	Lithic	debris	secondary flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.3		12/19/2012
24.2	1	II	XU 1	195-205	Lithic	debris	broken flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.1	fine grained; clear	12/19/2012
24.3	1	II	XU 1	195-205	Faunal	turtle	shell	fragment				4 (<1/4")	0.1		12/19/2012
	2	II	XU 1	195-205	Other	organic	coal, clinker	clinker fragment				3 (1/2"-1/4")	0.2		12/19/2012
25.1-2	2	II	XU 2	170-195	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	1.5		12/19/2012
	2	II	XU 2	170-195	Other	organic	coal, clinker	clinker fragment				3 (1/2"-1/4")	0.2		12/19/2012
26.1-2	2	II	XU 2	195-205	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.5	refit	12/19/2012
27.1	1	II	XU 2	205-215	Lithic	debris	shatter			basalt	cortex absent	3 (1/2"-1/4")	0.8		12/19/2012
27.2	1	II	XU 2	205-215	Faunal	mammalian, medium/large	unidentifiable	fragment				2 (1"-1/2")	1.7		12/19/2012
27.3-7	5	II	XU 2	205-215	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	1.4		12/19/2012
27.8-11	4	II	XU 2	205-215	Faunal	mammalian, medium/large	unidentifiable	fragment				4 (<1/4")	0.5		12/19/2012
28.1	1	II	XU 3	215-225	Lithic	debris	primary flake			Swan River Chert	cortex present	2 (1"-1/2")	2.9		12/20/2012
28.2	1	II	XU 3	215-225	Lithic	debris	primary flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	1.4		12/20/2012
28.3	1	II	XU 3	215-225	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.3		12/20/2012
28.4	1	II	XU 3	215-225	Lithic	debris	other G4 flake			Prairie du Chien (oolitic)	cortex absent	4 (<1/4")	0.2		12/20/2012
28.5-6	2	II	XU 3	215-225	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.2		12/20/2012
28.7	1	II	XU 3	215-225	Faunal	mammalian, medium/large	unidentifiable	fragment	burned			2 (1"-1/2")	1.3		12/20/2012

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
28.8-9	2	II	XU 3	215-225	Faunal	mammalian, medium/large	unidentifiable	fragment	burned			3 (1/2"-1/4")	1.2		12/20/2012
28.10-18	9	II	XU 3	215-225	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	2.3		12/20/2012
28.19-20	2	II	XU 3	215-225	Faunal	mammalian, medium/large	unidentifiable	fragment				4 (<1/4")	0.1		12/20/2012
28.21	1	II	XU 3	215-225	Faunal	turtle	shell	fragment				2 (1"-1/2")	1		12/20/2012
28.22-23	2	II	XU 3	215-225	Faunal	vertebrate	unidentifiable	fragment	burned			3 (1/2"-1/4")	0.3		12/20/2012
28.24	1	II	XU 3	215-225	Faunal	vertebrate	unidentifiable	fragment	burned			4 (<1/4")	0.1		12/20/2012
28.25-26	2	II	XU 3	215-225	Faunal	vertebrate	unidentifiable	fragment				3 (1/2"-1/4")	0.3		12/20/2012
28.27-33	7	II	XU 3	215-225	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0.3		12/20/2012
29.1	1	II	XU 3	225-235	Faunal	mammalian, large	tooth enamel	fragment				3 (1/2"-1/4")	0.4		12/20/2012
29.2	1	II	XU 3	225-235	Faunal	mammalian, large	unidentifiable	fragment		fractured, spiral		3 (1/2"-1/4")	2.1		12/20/2012
29.3-4	2	II	XU 3	225-235	Faunal	mammalian, medium/large	unidentifiable	fragment	burned			3 (1/2"-1/4")	0.6		12/20/2012
29.5	1	II	XU 3	225-235	Faunal	mammalian, medium/large	unidentifiable	fragment	calcined			3 (1/2"-1/4")	1.2		12/20/2012
29.6	1	II	XU 3	225-235	Faunal	mammalian, medium/large	unidentifiable	fragment	calcined			4 (<1/4")	0.2		12/20/2012
29.7-8	2	II	XU 3	225-235	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.8		12/20/2012
29.9-11	3	II	XU 3	225-235	Faunal	mammalian, medium/large	unidentifiable	fragment				4 (<1/4")	0.7		12/20/2012
30.1	1	II	XU 3	235-245	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	1.3		12/20/2012
30.2	1	II	XU 3	235-245	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.5		12/20/2012
30.3	1	II	XU 3	235-245	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.3		12/20/2012

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
30.4-5	2	II	XU 3	235-245	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.8		12/20/2012
30.6	1	II	XU 3	235-245	Faunal	mammalian, medium/large	unidentifiable	fragment				4 (<1/4")	0		12/20/2012
30.7-10	4	II	XU 3	235-245	Faunal	molluscan	unidentifiable	fragment				4 (<1/4")	0.3		12/20/2012
30.11	1	II	XU 3	235-245	Faunal	mammalian, medium/large	vertebra?	fragment				2 (1"-1/2")	7		12/20/2012
31.1	1	II	XU 3	245-255	Lithic	debris	broken flake			Swan River Chert	cortex absent	2 (1"-1/2")	2.5		12/20/2012
32.1	1	II	XU 4	212-222	Lithic	debris	other G4 flake			quartz	cortex present	4 (<1/4")	0.2		12/19/2012
32.2-3	2	II	XU 4	212-222	Faunal	mammalian, medium/large	unidentifiable	fragment	burned			3 (1/2"-1/4")	1.4		12/19/2012
32.4-5	2	II	XU 4	212-222	Faunal	mammalian, medium/large	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.7		12/19/2012
32.6	1	II	XU 4	212-222	Faunal	molluscan	unidentifiable	fragment				3 (1/2"-1/4")	0.4		12/19/2012
33.1	1	II	XU 4	222-232	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.8	potlidding	12/20/2012
33.2	1	II	XU 4	222-232	Lithic	debris	other G4 flake			Prairie du Chien (oolitic)	cortex absent	4 (<1/4")	0		12/20/2012
33.3-7	5	II	XU 4	222-232	Faunal	mammalian, medium/large	unidentifiable	fragment		gnawed		3 (1/2"-1/4")	3.8		12/20/2012
33.8	1	II	XU 4	222-232	Faunal	mammalian, medium/large	unidentifiable	fragment		gnawed		4 (<1/4")	0.2		12/20/2012
33.9	1	II	XU 4	222-232	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.3		12/20/2012
33.10-16	7	II	XU 4	222-232	Faunal	vertebrate	unidentifiable	fragment				3 (1/2"-1/4")	1.7		12/20/2012
33.17-34	18	II	XU 4	222-232	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	1.3		12/20/2012
	1	II	XU 4	222-232	Other	fire-cracked rock				granite		1 (>1")	349		12/20/2012

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
34.1-2	2	II	XU 4	232-242	Lithic	debris	primary flake			Prairie du Chien (oolitic)	cortex present	2 (1"-1/2")	27.5		12/20/2012
34.3	1	II	XU 4	232-242	Lithic	debris	primary flake			Swan River Chert	cortex present	2 (1"-1/2")	12.4		12/20/2012
34.4	1	II	XU 4	232-242	Lithic	debris	primary flake			Swan River Chert	cortex absent	2 (1"-1/2")	7.6		12/20/2012
35.1	1	II	XU 5	220-230	Lithic	debris	shatter			basalt	cortex present	1 (>1")	217		12/21/2012
35.2	1	II	XU 5	220-230	Lithic	tool	unpatterned flake tool	utilized flake		Swan River Chert	cortex absent	3 (1/2"-1/4")	0.8		12/21/2012
35.3	1	II	XU 5	220-230	Lithic	debris	tertiary flake			Knife River Flint	cortex absent	4 (<1/4")	0.1		12/21/2012
35.4	1	II	XU 5	220-230	Lithic	debris	other G4 flake			Knife River Flint	cortex absent	4 (<1/4")	0		12/21/2012
35.1	1	II	XU 5	220-230	Lithic	debris	broken flake			unidentified chert	cortex absent	3 (1/2"-1/4")	0.1		12/21/2012
36.6	2	II	XU 5	230-240	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0		12/21/2012
37.1	1	II	XU 6	210-220	Lithic	debris	tertiary flake			Knife River Flint	cortex absent	3 (1/2"-1/4")	0.1		12/21/2012
37.2	1	II	XU 6	210-220	Lithic	debris	broken flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.2	fine grained; violet color	12/21/2012
37.3	1	II	XU 6	210-220	Faunal	mammalian, large	unidentifiable	fragment		fractured, spiral		2 (1"-1/2")	2.2		12/21/2012
37.4	1	II	XU 6	210-220	Faunal	mammalian, medium/large	tooth enamel	fragment				3 (1/2"-1/4")	0.2		12/21/2012
37.5-7	3	II	XU 6	210-220	Faunal	vertebrate	unidentifiable	fragment	calcined			1 (>1")	0.1		12/21/2012
38.1	1	II	XU 6	220-230	Lithic	debris	tertiary flake			Knife River Flint	cortex absent	4 (<1/4")	0.1		12/21/2012
38.2	1	II	XU 6	220-230	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0.1		12/21/2012
38.3	1	II	XU 6	220-230	Lithic	debris	other G4 flake			unidentified chert	cortex absent	4 (<1/4")	0.1		12/21/2012

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
38.4	1	II	XU 6	220-230	Lithic	debris	shatter			metamorphic	cortex present	2 (1"-1/2")	1.7		12/21/2012
38.5	1	II	XU 6	220-230	Faunal	mammalian, large	unidentifiable	fragment				2 (1"-1/2")	1.8		12/21/2012
38.6-8	3	II	XU 6	220-230	Faunal	mammalian, large	unidentifiable	fragment				3 (1/2"-1/4")	3.2		12/21/2012
38.9-21	13	II	XU 6	220-230	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	3.6		12/21/2012
38.22-25	4	II	XU 6	220-230	Faunal	mammalian, medium/large	unidentifiable	fragment				4 (<1/4")	0.8		12/21/2012
38.26	1	II	XU 6	220-230	Faunal	mammalian, small	vertebra	fragment				3 (1/2"-1/4")	0.1		12/21/2012
38.27-31	5	II	XU 6	220-230	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0.2		12/21/2012
38.32	1	II	XU 6	220-230	Faunal	Bison or elk	longbone	fragment		fractured, spiral		1 (>1")	77.6		12/21/2012
38.33-34	1	II	XU 6	220-230	Faunal	Bison or elk	tibia	fragment		fractured, spiral		2 (1"-1/2")	51.3	refit; one piece sent to Beta (Sample# 340997)	12/21/2012
39.1	1	II	XU 6	230-240	Lithic	debris	broken flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.1	fine grained; light violet color	12/21/2012
39.2	1	II	XU 6	230-240	Faunal	mammalian, medium/large	unidentifiable	fragment				4 (<1/4")	0.2		12/21/2012
39.3-4	2	II	XU 6	230-240	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0		12/21/2012
39.5	1	II	XU 6	230-240	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0		12/21/2012
40.1	1	II	XU 7	178-188	Lithic	debris	broken flake			unidentified chert	cortex absent	4 (<1/4")	0.2	possible graver	1/8/2013
40.2	1	II	XU 7	178-188	Faunal	mammalian, medium/large	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.4		1/8/2013
40.3	1	II	XU 7	178-188	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.1		1/8/2013
41.1	1	II	XU 7	188-198	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.2		1/8/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
41.2	1	II	XU 7	188-198	Lithic	debris	shatter			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.3		1/8/2013
41.3	1	II	XU 7	188-198	Lithic	debris	shatter			unidentified chert	cortex absent	3 (1/2"-1/4")	1.7		1/8/2013
41.4	1	II	XU 7	188-198	Faunal	vertebrate	unidentifiable	fragment				3 (1/2"-1/4")	0.1		1/8/2013
41.5-8	4	II	XU 7	188-198	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0.3		1/8/2013
28.34	1	II	XU 3	215-225	Faunal	mammalian, large	unidentifiable	fragment		fractured, spiral & gnawed		2 (1"-1/2")	12.2		12/20/2012
29.12-13	2	II	XU 3	225-235	Faunal	cf. Bison bison	fused 2nd & 3rd carpal, right					2 (1"-1/2")	7	refit	12/20/2012
33.35-36	2	II	XU 4	222-232	Faunal	catfish family	basioccipital, left					2 (1"-1/2")	2.6		12/20/2012
42.1	1	II	ST 33	70-80	Lithic	debris	broken flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	1.4		6/4/2013
43.1	1	II	ST 35	45-65	Lithic	debris	broken flake			unidentified material	cortex present	3 (1/2"-1/4")	0.2		6/4/2013
43.2	1	II	ST 35	45-65	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	0.8		6/4/2013
44.1	1	II	ST 35	100-125	Lithic	debris	shatter			quartz	cortex absent	3 (1/2"-1/4")	1.1		6/4/2013
	1	I	ST 19A	170-190	Other	fire-cracked rock	angular			granite		1 (>1")	73.9		5/31/2013
45.1	1	I	ST 20A	150-170	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.1		5/31/2013
46.1	1	I	ST 26A	180-200	Lithic	debris	shatter			quartzite	cortex absent	3 (1/2"-1/4")	0.7	clear; medium grain	6/3/2013
47.1	1	I	ST 2C	165-190	Lithic	tool	patterned flake tool	end scraper		Prairie du Chien (oolitic)	cortex absent	2 (1"-1/2")	3		5/21/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
48.1	1	I	ST 7C	200-220	Lithic	debris	broken flake			Blanding Chert	cortex absent	3 (1/2"-1/4")	0.4	chalky texture, white color w/ chrinoid & brachiopod fossils	5/23/2013
49.1	1	I	ST 11C	185-200	Lithic	core	unpatterned nonbifacial	irregular		igneous/metamorphic	cortex absent	1 (>1")	22.2	multidirectional, grayish-black color with various minerals	6/4/2013
	1	I	ST 12C	205-220	Other	fire-cracked rock	angular			unidentified material		2 (1"-1/2")	2.8		6/27/2013
	1	I	ST 2G	100-115	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	15.1		6/10/2013
50.1	1	I	ST 6G	70-100	Lithic	debris	secondary flake			unidentified chert	cortex absent	3 (1/2"-1/4")	0.5		6/11/2013
50.2	1	I	ST 6G	70-100	Lithic	debris	other G4 flake			Prairie du Chien (oolitic)	cortex absent	4 (<1/4")	0.1		6/11/2013
51.1	1	I	ST 7G	40-60	Lithic	debris	other G4 flake			Prairie du Chien (oolitic)	cortex present	4 (<1/4")	0.2		6/11/2013
52.1	1	I	ST 7G	70-85	Lithic	debris	secondary flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.6		7/2/2013
52.2	1	I	ST 7G	70-85	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.5		7/2/2013
53.1	1	I	ST 7G	85-115	Lithic	debris	bipolar flake			chalcedony	cortex present	2 (1"-1/2")	3		7/2/2013
53.2	1	I	ST 7G	85-115	Lithic	debris	primary flake			Prairie du Chien (oolitic)	cortex present	2 (1"-1/2")	3.2		7/2/2013
53.3-5	3	I	ST 7G	85-115	Lithic	debris	primary flake			Prairie du Chien (oolitic)	cortex present	3 (1/2"-1/4")	1.3		7/2/2013
53.6	1	I	ST 7G	85-115	Lithic	debris	secondary flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.9		7/2/2013
53.7	1	I	ST 7G	85-115	Lithic	debris	secondary flake			Galena Chert	cortex absent	3 (1/2"-1/4")	0.9		7/2/2013
53.8	1	I	ST 7G	85-115	Lithic	debris	tertiary flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.2		7/2/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
53.9	1	I	ST 7G	85-115	Lithic	debris	tertiary flake			quartz	cortex absent	3 (1/2"-1/4")	0.2		7/2/2013
53.10	1	I	ST 7G	85-115	Lithic	debris	broken flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	0.7	white clear color; fine grain	7/2/2013
53.11	1	I	ST 7G	85-115	Lithic	debris	other G4 flake			Galena Chert	cortex absent	4 (<1/4")	0.2		7/2/2013
53.12	1	I	ST 7G	85-115	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.1		7/2/2013
53.13-14	2	I	ST 7G	85-115	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	1.8		7/2/2013
53.15	1	I	ST 7G	85-115	Lithic	debris	other G4 flake			Prairie du Chien (oolitic)	cortex absent	4 (<1/4")	0.1		7/2/2013
53.16	1	I	ST 7G	85-115	Lithic	debris	broken flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.2		7/2/2013
53.17-20	4	I	ST 7G	85-115	Lithic	debris	other G4 flake			Prairie du Chien (oolitic)	cortex absent	4 (<1/4")	0.3		7/2/2013
53.21	1	I	ST 7G	85-115	Lithic	debris	shatter			Galena Chert	cortex present	3 (1/2"-1/4")	1.6		7/2/2013
54.1	1	I	ST 9G	90-110	Lithic	debris	primary flake			unidentified chert	cortex present	3 (1/2"-1/4")	0.7		6/11/2013
	1	I	ST 10G	240-270	Other	fire-cracked rock	angular			granite		1 (>1")	30.3		6/11/2013
55.1	1	I	ST 14G	50-75	Lithic	debris	shatter			unidentified chert	cortex present	3 (1/2"-1/4")	1.2		6/12/2013
56.1	1	I	ST 15G	20-45	Lithic	tool	unpatterned flake tool	utilized flake		Prairie du Chien (oolitic)	cortex present	3 (1/2"-1/4")	5.2		6/12/2013
57.1	1	I	ST 15G	55-70	Lithic	tool	unpatterned flake tool	utilized flake		basalt	cortex present	1 (>1")	19.4		6/12/2013
58.1	1	I	ST 17G	80-110	Lithic	debris	other G4 flake			quartz	cortex present	4 (<1/4")	0.1		6/13/2013
	1	I	ST 17G	80-110	Other	fire-cracked rock	angular			igneous		1 (>1")	43.6		6/13/2013
59.1	1	I	ST 18G	115-135	Lithic	debris	primary flake			basalt	cortex present	2 (1"-1/2")	6.1		6/13/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
60.1	1	I	ST 21G	130-150	Lithic	debris	primary flake			unidentified material	cortex present	1 (>1")	31.2	SRC-like w/ black mineral inclusions	6/13/2013
61.1	1	I	ST 21G	220-240	Lithic	debris	broken flake			quartz	cortex absent	3 (1/2"-1/4")	0.5		6/13/2013
62.1	1	I	ST 22G	90-110	Lithic	debris	broken flake			unidentified material	cortex absent	2 (1"-1/2")	2.5	quartzite-like but w/ black mineral inclusions	6/13/2013
63.1	1	I	ST 22G	160-185	Lithic	debris	primary flake			unidentified chert	cortex present	4 (<1/4")	0.1		6/13/2013
	2	I	ST 23G	150-170	Other	fire-cracked rock	friable			metamorphic		2 (1"-1/2")	11.1		6/17/2013
	2	I	ST 23G	150-170	Other	fire-cracked rock	friable			metamorphic		3 (1/2"-1/4")	2.6		6/17/2013
64.1	1	I	ST 26G	300-340	Lithic	debris	primary flake			Prairie du Chien (oolitic)	cortex absent	2 (1"-1/2")	1.6		6/17/2013
64.2	1	I	ST 26G	300-340	Lithic	debris	shatter			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.6		6/17/2013
65.1	1	I	ST 27G	275-290	Lithic	debris	other G4 flake			unidentified material	cortex absent	4 (<1/4")	0.1		6/14/2013
65.2	1	I	ST 27G	275-290	Lithic	debris	shatter			quartz	cortex absent	3 (1/2"-1/4")	0.3		6/14/2013
66.1	1	I	ST 28G	210-230	Lithic	debris	tertiary flake			Swan River Chert	cortex absent	4 (<1/4")	0.1		6/14/2013
67.1	1	I	ST 28G	270-285	Lithic	debris	shatter			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	1.5		6/14/2013
68.1	1	I	ST 29G	220-240	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.2		6/14/2013
69.1	1	I	ST 29G	250-280	Lithic	debris	primary flake			Prairie du Chien (oolitic)	cortex present	3 (1/2"-1/4")	1.7		6/14/2013
70.1	1	I	ST 30G	130-150	Lithic	debris	primary flake			basalt	cortex absent	1 (>1")	20.5		6/14/2013
71.1	1	I	ST 30G	150-180	Lithic	debris	primary flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	3.2		6/17/2013
	1	I	ST 31G	160-190	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	4.1		6/18/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
72.1	1	I	ST 31G	210-240	Lithic	debris	other G4 flake			unidentified chert	cortex absent	4 (<1/4")	0.1		6/18/2013
73.1	1	I	ST 31G	230-260	Lithic	debris	shatter			quartz	cortex present	3 (1/2"-1/4")	0.3		6/18/2013
	1	I	ST 31G	300-315	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	10		6/18/2013
74.1-2	2	I	ST 32G	130-150	Lithic	debris	other G4 flake			unidentified chert	cortex absent	4 (<1/4")	0.2		6/18/2013
75.1	1	I	ST 32G	260-280	Lithic	debris	shatter			unidentified material	cortex absent	2 (1"-1/2")	2.6	quartz-like w/black mineral inclusions	6/19/2013
76.1	1	I	ST 37G	295-325	Faunal	mammalian, medium/large	unidentifiable	fragment	calcined			2 (1"-1/2")	1.5	Sample ID# 37G-1	6/19/2013
77.1	1	I	ST 38G	255-285	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0.1		6/19/2013
78.1	1	I	ST 39G	260-290	Lithic	debris	tertiary flake			Knife River Flint	cortex absent	3 (1/2"-1/4")	0.2		6/19/2013
78.2	1	I	ST 39G	260-290	Lithic	debris	broken flake			unidentified material	cortex absent	3 (1/2"-1/4")	0.5	quartz-like w/dark bluish green mineral inclusions	6/19/2013
79.1	1	I	ST 41G	285-300	Lithic	debris	broken flake			unidentified chert	cortex absent	3 (1/2"-1/4")	0.5		6/20/2013
80.1	1	I	ST 42G	360-375	Lithic	debris	primary flake			quartzite	cortex present	2 (1"-1/2")	15.2	black color; fine grain	6/20/2013
81.1	1	II	ST 6GE5	45-65	Lithic	debris	shatter			unidentified material	cortex absent	3 (1/2"-1/4")	0.9		7/1/2013
82.1	1	II	ST 17GW5	40-70	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0.1		6/12/2013
82.2	1	II	ST 17GW5	40-70	Faunal	vertebrate	unidentifiable	fragment				3 (1/2"-1/4")	0.3		6/12/2013
83.1	1	II	ST 17GW5	85-110	Lithic	debris	secondary flake			Prairie du Chien (oolitic)	cortex absent	3 (1/2"-1/4")	0.3		6/21/2013
83.2	1	II	ST 17GW5	85-110	Lithic	debris	other G4 flake			unidentified chert	cortex absent	4 (<1/4")	0.1		6/21/2013
83.3	1	II	ST 17GW5	85-110	Lithic	debris	tertiary flake			unidentified chert	cortex absent	3 (1/2"-1/4")	0.3		6/21/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
83.4-5	2	II	ST 17GW5	85-110	Faunal	mammalian, large	unidentifiable	fragment				2 (1"-1/2")	5.9		6/21/2013
83.6-7	2	II	ST 17GW5	85-110	Faunal	mammalian, large	unidentifiable	fragment				3 (1/2"-1/4")	3.2		6/21/2013
83.8-19	12	II	ST 17GW5	85-110	Faunal	mammalian, medium/large	unidentifiable	fragment				3 (1/2"-1/4")	7.8		6/21/2013
83.20-23	4	II	ST 17GW5	85-110	Faunal	vertebrate	unidentifiable	fragment				3 (1/2"-1/4")	0.5		6/21/2013
83.24-32	9	II	ST 17GW5	85-110	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0.9		6/21/2013
	2	II	ST 17GW5	85-110	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	17.1		6/21/2013
	3	II	ST 17GW5	85-110	Other	fire-cracked rock	angular			granite		3 (1/2"-1/4")	1.7		6/21/2013
83.33-34	2	II	ST 17GW5	85-110	Faunal	mammalian, large	unidentifiable	fragment	exfoliated	gnawed		2 (1"-1/2")	12.5	Sample ID# 17GW-1	6/21/2013
83.35-36	2	II	ST 17GW5	85-110	Faunal	mammalian, large	unidentifiable	fragment	exfoliated	gnawed		2 (1"-1/2")	11.2	Sample ID# 17GW-2	6/21/2013
84.1	1	II	ST 22GW5	50-70	Lithic	debris	shatter			unidentified material	cortex present	3 (1/2"-1/4")	1.1		7/1/2013
85.1	1	II	ST 22GW5	150-185	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0.2		7/1/2013
	1	II	ST 22GE5	155-170	Other	fire-cracked rock	angular			basalt		1 (>1")	19.7		7/1/2013
86.1	1	II	ST 22GE5	185-200	Lithic	debris	broken flake			quartz	cortex absent	3 (1/2"-1/4")	0.2		7/1/2013
	1	II	ST 22GE5	185-200	Other	fire-cracked rock	angular			basalt		1 (>1")	63		7/1/2013
	2	II	ST 22GE5	185-200	Other	fire-cracked rock	angular			basalt		2 (1"-1/2")	18.8		7/1/2013
87.1	1	II	ST 22GE5	200-225	Lithic	debris	broken flake			unidentified chert	cortex absent	3 (1/2"-1/4")	0.2		7/1/2013
	1	II	ST 22GE5	200-225	Other	fire-cracked rock	angular			metamorphic		1 (>1")	59.5		7/1/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	ST 22GE5	200-225	Other	fire-cracked rock	angular			basalt		3 (1/2"-1/4")	0.3		7/1/2013
	1	II	ST 22GE5	245-260	Other	fire-cracked rock	angular			basalt		1 (>1")	3		7/1/2013
	6	II	ST 22GE5	245-260	Other	fire-cracked rock	angular			granite		3 (1/2"-1/4")	12.4		7/1/2013
88.1	1	II	ST 22GE5N5	200-235	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0.2		7/1/2013
88.2	1	II	ST 22GE5N5	200-235	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.2		7/1/2013
88.3	1	II	ST 22GE5N5	200-235	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.1		7/1/2013
	3	II	ST 22GE5N5	200-235	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	53.6		7/1/2013
89.1	1	II	ST 28GE5	270-290	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.1		6/29/2013
90.1	1	II	ST 28GW5	300-315	Lithic	tool	unpatterned flake tool	awl		unidentified material	cortex absent	4 (<1/4")	0.3		6/29/2013
90.2	1	II	ST 28GW5	300-315	Lithic	debris	primary flake			brown chalcedony	cortex present	3 (1/2"-1/4")	0.1		6/29/2013
	1	II	ST 28GW5	340-360	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	4.9		6/29/2013
91.1	1	II	ST 29GE5	250-275	Lithic	debris	primary flake			Prairie du Chien (oolitic)	cortex present	2 (1"-1/2")	1.9		6/29/2013
92.1	1	II	ST 29GW5	270-290	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.5		6/28/2013
93.1	1	II	ST 29GW5	300-310	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0.1		6/28/2013
94.1	1	II	ST 29GW5	350-380	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.2		6/29/2013
	2	II	ST 29GW5	350-380	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	15.9		6/29/2013
95.1	1	II	ST 31GW5	110-140	Lithic	debris	primary flake			unidentified material	cortex present	3 (1/2"-1/4")	0.7		6/27/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
96.1	1	II	ST 31GW5	225-255	Lithic	debris	broken flake			Galena Chert	cortex absent	3 (1/2"-1/4")	0.7		6/27/2013
	1	II	ST 31GW5	265-280	Other	fire-cracked rock	spall			granite		2 (1"-1/2")	10.1		6/28/2013
97.1	1	II	ST 31GW5	290-310	Lithic	debris	primary flake			quartz	cortex absent	2 (1"-1/2")	9.5		6/27/2013
97.2	1	II	ST 31GW5	290-310	Lithic	debris	other G4 flake			unidentified chert	cortex absent	4 (<1/4")	0.1		6/27/2013
98.1	1	II	ST 31GW5	310-335	Lithic	debris	primary flake			basalt	cortex present	1 (>1")	67.2		6/27/2013
	3	II	ST 31GW5	310-335	Other	fire-cracked rock	angular			granite		2 (1"-1/2")	9.4		6/27/2013
	5	II	ST 31GW5	310-335	Other	fire-cracked rock	angular			granite		3 (1/2"-1/4")	2.5		6/27/2013
	1	II	ST 31GE5	160-190	Other	fire-cracked rock	angular			basalt		1 (>1")	46.7		6/28/2013
	1	II	ST 31GE5	200-220	Other	fire-cracked rock	angular			granite		3 (1/2"-1/4")	0.4		6/28/2013
99.1	1	II	ST 31GE5	310-325	Lithic	debris	shatter			quartz	cortex absent	3 (1/2"-1/4")	0.9		6/28/2013
100.1	1	II	ST 37GW5	190-200	Lithic	debris	secondary flake			unidentified material	cortex absent	2 (1"-1/2")	5.2		6/30/2013
101.1	1	II	ST 37GW5	250-270	Lithic	debris	primary flake			granite	cortex present	2 (1"-1/2")	9.8		6/30/2013
102.1	1	II	ST 37GE5	225-255	Lithic	debris	other G4 flake			unidentified material	cortex absent	4 (<1/4")	0.2	quartz-like w/ dark bluish gray mineral inclusions	6/30/2013
102.2	1	II	ST 37GE5	225-255	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.4		6/30/2013
103.1	1	II	ST 37GE5	295-310	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.3		6/30/2013
104.1	1	II	ST 39GW5	250-275	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.2		7/2/2013
105.1	1	II	ST 39GW5	285-300	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.5		7/2/2013

Prov. #	Count	Phase	Location	Depth (cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
106.1	1	II	ST 39GN5	280-310	Lithic	debris	primary flake			quartz	cortex present	3 (1/2"-1/4")	0.7		7/2/2013
107.1	1	II	ST 39GN5	360-380	Lithic	debris	broken flake			chalcedony	cortex present	3 (1/2"-1/4")	0.5		7/2/2013

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Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	I	ST 50	40-60 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	20.6		10/29/2012
1.1	1	I	ST 50	80-100 cmbs	Lithic	debris	broken flake			quartz	cortex absent	3 (1/2"-1/4")	0.3		10/29/2012
2.1	1	I	ST 50	0-25 cmbs	Lithic	debris	primary flake			Prairie du Chien (oolitic) Chert	cortex present	3 (1/2"-1/4")	4		11/1/2012
2.2	1	I	ST 50	0-25 cmbs	Lithic	debris	shatter			unidentified material	cortex present	3 (1/2"-1/4")	1		11/1/2012
3.1	1	I	ST 50	25-50 cmbs	Lithic	debris	broken flake			basalt	cortex absent	2 (1"-1/2")	2.6		11/1/2012
3.2	1	I	ST 50	25-50 cmbs	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0.1		11/1/2012
	1	I	ST 50	50-75 cmbs	Other	fire-cracked rock				granite		1 (>1")	61.6		11/1/2012
	2	I	ST 50	50-75 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	41		11/1/2012
4.1	1	I	ST 50	100-125 cmbs	Lithic	debris	primary flake			quartzite	cortex present	3 (1/2"-1/4")	1.7		11/1/2012
	2	I	ST 50	125-150 cmbs	Other	fire-cracked rock				granite		1 (>1")	35.5	moderate grain; clear	11/1/2012
5.1	1	I	ST 51	25-40 cmbs	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	1.9		10/29/2012
	2	I	ST 51	30-30 cmbs	Other	fire-cracked rock				gabbro		1 (>1")	34.2		10/29/2012
6.1	1	I	ST 51	120-135 cmbs	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.2		10/29/2012
7.1	1	I	ST 51	150-165 cmbs	Faunal	turtle	carapace	fragment	calcined			3 (1/2"-1/4")	0.2		10/29/2012
8.1	1	I	ST 51	0-25 cmbs	Lithic	debris	broken flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.4		11/1/2012
9.1	1	I	ST 51	175-200 cmbs	Lithic	debris	broken flake			unidentified chert	cortex absent	3 (1/2"-1/4")	0.5		11/1/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
9.2	1	I	ST 51	175-200 cmbs	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.2		11/1/2012
	2	I	ST 51	150-175 cmbs	Other	fire-cracked rock				granite		1 (>1")	84		11/1/2012
	1	II	ST 51N5	0-25 cmbs	Other	fire-cracked rock				granite		1 (>1")	64.3		11/9/2012
10.1	1	II	ST 51N5	50-75 cmbs	Lithic	debris	primary flake			Swan River Chert	cortex present	2 (1"-1/2")	9.3		11/9/2012
	1	II	ST 51N5	50-75 cmbs	Other	fire-cracked rock				basalt		1 (>1")	238		11/9/2012
	4	II	ST 51N5	50-75 cmbs	Other	fire-cracked rock				granite		1 (>1")	131		11/9/2012
11.1	1	II	ST 51NE5	25-40 cmbs	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	2 (1"-1/2")	1.5		11/9/2012
	2	II	ST 51NW5	50-75 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	29.1		11/9/2012
	1	I	ST 52	40-60 cmbs	Other	fire-cracked rock				granite		1 (>1")	7.4		10/29/2012
	1	I	ST 52	75-100 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	5.7		11/2/2012
12.1	1	I	ST 52	100-125 cmbs	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.1		11/2/2012
13.1	1	I	ST 53	125-140 cmbs	Lithic	tool	unpatterned flake tool	retouch flake		igneous	cortex present	2 (1"-1/2")	16	prob. Felsite	11/2/2012
	3	II	ST 53NW5	25-50 cmbs	Other	fire-cracked rock				granite		1 (>1")	508		11/9/2012
	1	I	ST 54	175-200 cmbs	Other	fire-cracked rock				basalt		2 (1"-1/2")	3.6		11/9/2012
14.1	1	II	ST 54N5	60-80 cmbs	Lithic	tool	cobble	abrader (grooved) & polishing stone		basalt	cortex present	1 (>1")	62.4	3 grooves cut into one side & other side has many fine striations	11/8/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	ST 54N5	60-80 cmbs	Other	fire-cracked rock				granite		1 (>1")	48.2		11/8/2012
15.1	1	II	ST 54N5	80-95 cmbs	Faunal	molluscan	unidentifiable	fragment				3 (1/2"-1/4")	0.1		11/8/2012
16.1	1	I	ST 55	25-35 cmbs	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	0.7	3.2 mm	11/5/2012
17.1	1	I	ST 55	50-80 cmbs	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	0.5	4.1 mm	11/5/2012
17.2	1	I	ST 55	50-80 cmbs	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0		11/5/2012
18.1	1	II	ST 55W5	0-25 cmbs	Ceramic	body	grit temper	cord/fabric impressed				2 (1"-1/2")	1.7	4.2 mm	11/8/2012
	1	II	ST 55W5	25-50 cmbs	Other	fire-cracked rock				granite		1 (>1")	76.7		11/8/2012
19.1	1	II	ST 55W5	100-120 cmbs	Lithic	tool	unpatterned flake tool	utilized flake		basalt	cortex present	1 (>1")	60.6		11/8/2012
	2	II	ST 55W5	100-120 cmbs	Other	fire-cracked rock				granite		3 (1/2"-1/4")	3.1		11/8/2012
	1	II	ST 55NW5	110-135 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	4		11/8/2012
	1	I	ST 61	30-45 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	2.3		11/5/2012
	2	I	ST 61	30-45 cmbs	Other	fire-cracked rock				gabbro		3 (1/2"-1/4")	2.2		11/5/2012
21.1	1	I	ST 61	80-90 cmbs	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0		11/5/2012
	2	I	ST 61	120-145 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	14.1		11/5/2012
	1	II	ST 61E5	60-80 cmbs	Other	fire-cracked rock				granite		1 (>1")	20.8		11/8/2012
22.1	1	I	ST 62	220-250 cmbs	Lithic	debris	primary flake			unidentified chert	cortex present	3 (1/2"-1/4")	0.8		11/5/2012
23.1	1	I	ST 63	40-50 cmbs	Lithic	debris	primary flake			unidentified material	cortex present	3 (1/2"-1/4")	1.1		11/5/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
24.1	1	I	ST 63	175-200 cmbs	Lithic	debris	primary flake			Prairie du Chien (oolitic) Chert	cortex present	2 (1"-1/2")	2.2		11/2/2012
25.1	1	I	ST 63	200-210 cmbs	Lithic	debris	primary flake			Prairie du Chien (oolitic) Chert	cortex present	2 (1"-1/2")	2.6		11/2/2012
26.1	1	II	ST 63E5	25-50 cmbs	Lithic	tool	unpatterned flake tool	utilized flake		unidentified chert	cortex present	3 (1/2"-1/4")	1.1		11/8/2012
27.1	1	II	ST 63E5	110-130 cmbs	Ceramic	body	grit temper	cord/fabric impressed				2 (1"-1/2")	2.9	3.5 mm	11/8/2012
27.2	1	II	ST 63E5	110-130 cmbs	Ceramic	body	grit temper	cord/fabric impressed				2 (1"-1/2")	1.3	3.9 mm	11/8/2012
28.1	1	II	ST 63E5	190-210 cmbs	Lithic	debris	broken flake			quartz	cortex absent	2 (1"-1/2")	2.3		11/8/2012
29.1-3	3	I	ST 64	45-65 cmbs	Faunal	vertebrate	unidentifiable	fragment				4 (<1/4")	0.2		11/8/2012
	1	I	ST 64	45-65 cmbs	Other	fire-cracked rock				granite		1 (>1")	116		11/8/2012
	1	I	ST 64	50-55 cmbs	Other	fire-cracked rock				granite		1 (>1")	118		11/2/2012
	1	I	ST 64	50-55 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	13.3		11/2/2012
	2	I	ST 65	100-120 cmbs	Other	fire-cracked rock				granite		1 (>1")	54.5		11/2/2012
30.1	1	I	ST 65	0-25 cmbs	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.2		11/2/2012
31.1	1	I	ST 65	25-50 cmbs	Lithic	debris	other G4 flake			basalt	cortex absent	4 (<1/4")	0.1		11/2/2012
	1	I	ST 65	100-125 cmbs	Other	fire-cracked rock				gabbro		2 (1"-1/2")	3		11/2/2012
	1	I	ST 65	150-175 cmbs	Other	fire-cracked rock				granite		2 (1"-1/2")	4.2		11/2/2012
32.1	1	I	ST 66	20-40 cmbs	Lithic	debris	broken flake			basalt	cortex absent	3 (1/2"-1/4")	1.8		11/2/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	I	ST 67	80-90 cmbs	Other	fire-cracked rock				granite		1 (>1")	50		10/30/2012
	1	I	ST 67	110-130 cmbs	Other	fire-cracked rock				granite		1 (>1")	133		10/30/2012
33.1	1	I	ST 67	175-200 cmbs	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0		11/1/2012
34.1	1	II	ST 67E5	90-100 cmbs	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	1.3		11/9/2012
35.1	1	I	ST 88	0-25 cmbs	Lithic	debris	primary flake			basalt	cortex present	3 (1/2"-1/4")	0.4		11/1/2012
35.2	1	I	ST 88	0-25 cmbs	Lithic	debris	primary flake			quartz	cortex present	3 (1/2"-1/4")	0.9		11/1/2012
36.1	1	II	ST 88W5	50-60 cmbs	Lithic	debris	primary flake			unidentified chert	cortex present	3 (1/2"-1/4")	0.6		11/9/2012
37.1	1	II	XU 1	10-20 cmbd	Lithic	debris	broken flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.3		11/12/2012
38.1	1	II	XU 1	20-30 cmbd	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	1.3	5.4 mm	11/12/2012
38.2	1	II	XU 1	20-30 cmbd	Ceramic	body	grit temper	unidentified		interior absent		3 (1/2"-1/4")	0.6		11/12/2012
39.1	1	II	XU 1	30-40 cmbd	Lithic	debris	primary flake			basalt	cortex present	2 (1"-1/2")	3.4		11/13/2012
39.2	1	II	XU 1	30-40 cmbd	Lithic	debris	primary flake			unidentified material	cortex present	3 (1/2"-1/4")	0.2		11/13/2012
40.1	1	II	XU 1	40-50 cmbd	Lithic	debris	primary flake			unidentified material	cortex present	2 (1"-1/2")	8.1		11/13/2012
40.2	1	II	XU 1	40-50 cmbd	Lithic	debris	primary flake			unidentified material	cortex present	3 (1/2"-1/4")	1		11/13/2012
40.3	1	II	XU 1	40-50 cmbd	Botanical	wood charcoal	unidentifiable	fragment				3 (1/2"-1/4")	0.1		11/13/2012
	4	II	XU 1	40-50 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	25.2		11/13/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	XU 1	40-50 cmbd	Other	fire-cracked rock				granite		3 (1/2"-1/4")	0.7		11/13/2012
	7	II	XU 1	50-60 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	60.5		11/13/2012
41-1-2	2	II	XU 1	70-80 cmbd	Lithic	debris	primary flake			unidentified chert	cortex present	3 (1/2"-1/4")	2		11/14/2012
41.3	1	II	XU 1	70-80 cmbd	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.5		11/14/2012
	1	II	XU 1	70-80 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	9.5		11/14/2012
42.1	1	II	XU 1	90-100 cmbd	Faunal	mammalian, large	tooth, unidentifiable	fragment				2 (1"-1/2")	4.4		11/14/2012
	1	II	XU 1	90-100 cmbd	Other	fire-cracked rock				granite		1 (>1")	61.3		11/15/2012
43.1	1	II	XU 1	100-110 cmbd	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	1.2	friable; poss. heat treated	11/14/2012
	1	II	XU 1	110-120 cmbd	Other	fire-cracked rock				granite		1 (>1")	21		11/15/2012
44.1-2	2	II	XU 2	20-30 cmbd	Ceramic	body	grit temper	unidentified		exterior absent		3 (1/2"-1/4")	0.5		11/12/2012
44.3	1	II	XU 2	20-30 cmbd	Lithic	debris	primary flake			quartz	cortex present	3 (1/2"-1/4")	1.8		11/12/2012
	1	II	XU 2	20-30 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	18.2		11/12/2012
45.1	1	II	XU 2	30-40 cmbd	Ceramic	rim	grit temper	cord/fabric impressed	tool impressed lip			2 (1"-1/2")	2.1	3.7 mm; Madison Ware Type; "u" shaped lip notches; vertical cordmarking below lip; folded lip on interior	11/13/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
45.2-3	2	II	XU 2	30-40 cmbd	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	0.5	3.0 & 3.3 mm	11/13/2012
45.4-5	2	II	XU 2	30-40 cmbd	Ceramic	body	grit temper	cord/fabric impressed		interior absent		3 (1/2"-1/4")	0.4		11/13/2012
45.6	1	II	XU 2	30-40 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.1		11/13/2012
	2	II	XU 2	30-40 cmbd	Other	fire-cracked rock				granite		3 (1/2"-1/4")	2.8		11/13/2012
46.1	1	II	XU 2	40-50 cmbd	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	0.7	3.7 mm	11/13/2012
46.2	1	II	XU 2	40-50 cmbd	Ceramic	body	grit temper	cord/fabric impressed		interior absent		3 (1/2"-1/4")	0.9		11/13/2012
46.3-4	2	II	XU 2	40-50 cmbd	Ceramic	body	grit temper	unidentified		exterior absent		3 (1/2"-1/4")	0.6		11/13/2012
	1	II	XU 2	40-50 cmbd	Other	fire-cracked rock				granite		3 (1/2"-1/4")	2.7		11/13/2012
47.1	1	II	XU 2	50-60 cmbd	Lithic	debris	secondary flake			Burlington white mottled Chert	cortex absent	3 (1/2"-1/4")	0.6	chrinoid columnals present	11/13/2012
47.2	1	II	XU 2	50-60 cmbd	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	0.7	3.6 mm	11/13/2012
47.3	1	II	XU 2	50-60 cmbd	Faunal	mammalian, medium/large	unidentifiable	fragment				2 (1"-1/2")	1.2		11/13/2012
	1	II	XU 2	50-60 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	4.4		11/13/2012
	1	II	XU 2	50-60 cmbd	Other	fire-cracked rock				granite		3 (1/2"-1/4")	1		11/13/2012
48.1	1	II	XU 2	60-70 cmbd	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	1	2.9 mm; cordage is woven	11/13/2012
	1	II	XU 2	70-80 cmbd	Other	fire-cracked rock				granite		1 (>1")	336		11/14/2012
49.1-2	2	II	XU 2	100-110 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0		11/19/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	XU 2	100-110 cmbd	Other	fire-cracked rock				granite		1 (>1")	110		11/19/2012
	2	II	XU 2	100-110 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	27		11/19/2012
50.1	1	II	XU 3	40-60 cmbd	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	1.6	5.4 mm	11/13/2012
50.2	1	II	XU 3	40-60 cmbd	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.7	poss. heat treated	11/13/2012
	2	II	XU 3	40-60 cmbd	Other	fire-cracked rock				granite		1 (>1")	169		11/13/2012
	1	II	XU 3	40-60 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	7.6		11/13/2012
51.1	1	II	XU 3	60-70 cmbd	Lithic	debris	bipolar flake			quartz	cortex absent	3 (1/2"-1/4")	2.9		11/13/2012
51.2	1	II	XU 3	60-70 cmbd	Lithic	debris	secondary flake			Galena Chert	cortex absent	3 (1/2"-1/4")	1.5		11/13/2012
51.3	1	II	XU 3	60-70 cmbd	Lithic	debris	tertiary flake			Galena Chert	cortex absent	4 (<1/4")	0.1		11/13/2012
51.4	1	II	XU 3	60-70 cmbd	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.1		11/13/2012
51.5	1	II	XU 3	60-70 cmbd	Lithic	debris	shatter			quartz	cortex absent	3 (1/2"-1/4")	0.9		11/13/2012
	1	II	XU 3	60-70 cmbd	Other	fire-cracked rock				granite		1 (>1")	75.4		11/13/2012
	1	II	XU 3	60-70 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	22.4		11/13/2012
52.1	1	II	XU 3	70-80 cmbd	Lithic	debris	primary flake			quartz	cortex present	2 (1"-1/2")	12.9		11/13/2012
	1	II	XU 3	70-80 cmbd	Other	fire-cracked rock				basalt		2 (1"-1/2")	15.5		11/13/2012
	1	II	XU 3	70-80 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	16.1		11/13/2012
	1	II	XU 3	100-110 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	3.5		11/14/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	XU 3	120-140 cmbd	Other	fire-cracked rock				granite		1 (>1")	226		11/14/2012
	1	II	XU 3	140-160 cmbd	Other	fire-cracked rock				granite		1 (>1")	4.9		11/14/2012
53.1	1	II	XU 3	180-200 cmbd	Lithic	core	unpatterned bifacial	irregular	prepared	Prairie du Chien (oolitic) Chert	cortex present	1 (>1")	47.8	multidirectional	11/15/2012
53.2	1	II	XU 3	180-200 cmbd	Lithic	tool	pecked/ground stone	hammerstone or pecked stone		granite	cortex present	1 (>1")	44		11/15/2012
53.3	1	II	XU 3	180-200 cmbd	Lithic	tool	unpatterned flake tool	utilized flake		Prairie du Chien (oolitic) Chert	cortex present	2 (1"-1/2")	6.5		11/15/2012
53.4	1	II	XU 3	180-200 cmbd	Lithic	debris	primary flake			Red River Chert	cortex present	3 (1/2"-1/4")	1		11/15/2012
53.5-7	3	II	XU 3	180-200 cmbd	Lithic	debris	primary flake			Prairie du Chien (oolitic) Chert	cortex present	2 (1"-1/2")	17.9		11/15/2012
53.8	1	II	XU 3	180-200 cmbd	Lithic	debris	primary flake			Prairie du Chien (oolitic) Chert	cortex present	3 (1/2"-1/4")	1.6		11/15/2012
53.9	1	II	XU 3	180-200 cmbd	Lithic	debris	secondary flake			Hixton Group Quartzite	cortex absent	3 (1/2"-1/4")	1.1	fine grained; honey colored	11/15/2012
53.10	1	II	XU 3	180-200 cmbd	Lithic	debris	other G4 flake			Hixton Group Quartzite	cortex absent	4 (<1/4")	0.3	fine grained; orangish red colored; poss. heat treated	11/15/2012
53.11	1	II	XU 3	180-200 cmbd	Lithic	debris	broken flake			Prairie du Chien (oolitic) Chert	cortex present	3 (1/2"-1/4")	0.3		11/15/2012
53.12-13	2	II	XU 3	180-200 cmbd	Lithic	debris	broken flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.6		11/15/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	XU 3	180-200 cmbd	Other	fire-cracked rock				granite		3 (1/2"-1/4")	2.8		11/15/2012
54.1	1	II	XU 3	200-210 cmbd	Lithic	debris	secondary flake			Swan River Chert	cortex absent	2 (1"-1/2")	0.9		11/16/2012
	1	II	XU 3	200-210 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	5		11/16/2012
	3	II	XU 3	200-210 cmbd	Other	fire-cracked rock				granite		3 (1/2"-1/4")	1.5		11/16/2012
55.1	1	II	XU 4	60-70 cmbd	Lithic	core	bifacial	irregular	prepared	granite	cortex present	1 (>1")	54.5		11/13/2012
56.1	1	II	XU 4	70-80 cmbd	Lithic	core	nonbifacial	irregular	unprepared	Prairie du Chien (oolitic) Chert	cortex absent	2 (1"-1/2")	16.3	multidirectional	11/13/2012
	2	II	XU 4	70-80 cmbd	Other	fire-cracked rock				granite		1 (>1")	1114		11/13/2012
57.1	1	II	XU 4	80-90 cmbd	Lithic	core	bipolar			granite	cortex absent	1 (>1")	88		11/13/2012
	1	II	XU 4	80-90 cmbd	Other	fire-cracked rock				basalt		2 (1"-1/2")	3.7		11/13/2012
	1	II	XU 4	180-200 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	5.7		11/13/2012
58.1	1	II	XU 4	200-210 cmbd	Lithic	debris	shatter			Swan River Chert	cortex absent	2 (1"-1/2")	18		11/16/2012
59.1-2	2	II	XU 4	210-220 cmbd	Lithic	debris	broken flake			quartz	cortex absent	3 (1/2"-1/4")	0.5		11/16/2012
60.1	1	II	XU 5	40-50 cmbd	Lithic	tool	unpatterned flake tool	utilized flake		Prairie du Chien (oolitic) Chert	cortex absent	2 (1"-1/2")	3.2		11/16/2012
60.2	1	II	XU 5	40-50 cmbd	Lithic	tool	unpatterned flake tool	utilized flake		Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.9		11/16/2012
	1	II	XU 5	40-50 cmbd	Other	fire-cracked rock				unidentified material		2 (1"-1/2")	9.3		11/16/2012
	1	II	XU 5	40-50 cmbd	Other	fire-cracked rock				granite		1 (>1")	120		11/16/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	XU 5	50-60 cmbd	Other	fire-cracked rock				unidentified material		2 (1"-1/2")	6.8		11/16/2012
61.1	1	II	XU 5	60-70 cmbd	Lithic	debris	tertiary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.2		11/19/2012
	1	II	XU 5	60-70 cmbd	Other	fire-cracked rock				granite		1 (>1")	53.3		11/19/2012
62.1	1	II	XU 5	70-80 cmbd	Lithic	debris	primary flake			unidentified material	cortex present	1 (>1")	282		11/19/2012
	1	II	XU 5	70-80 cmbd	Other	fire-cracked rock				unidentified material		3 (1/2"-1/4")	2.2		11/19/2012
	4	II	XU 5	70-80 cmbd	Other	fire-cracked rock				granite		1 (>1")	1133		11/19/2012
63.1	1	II	XU 5	90-100 cmbd	Lithic	debris	other G4 flake			Swan River Chert	cortex present	4 (<1/4")	0.3	poss. heat treated	11/20/2012
	1	II	XU 5	90-100 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	18.4		11/20/2012
	1	II	XU 5	100-110 cmbd	Other	fire-cracked rock				granite		1 (>1")	54.4		11/20/2012
	2	II	XU 5	100-110 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	15.6		11/20/2012
	1	II	XU 5	100-110 cmbd	Other	fire-cracked rock				gabbro		1 (>1")	86		11/20/2012
64.1	1	II	XU 5	120-130 cmbd	Faunal	mammalian, medium/large	unidentifiable	fragment				4 (<1/4")	0.4		11/20/2012
64.2-5	4	II	XU 5	120-130 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.4		11/20/2012
64.6	1	II	XU 5	120-130 cmbd	Faunal	molluscan	unidentifiable	fragment				4 (<1/4")	0.8	many fragments	11/20/2012
	2	II	XU 5	120-130 cmbd	Other	fire-cracked rock				igneous		3 (1/2"-1/4")	3.2		11/20/2012
64.7	1	II	XU 5	120-130 cmbd	Faunal	Trionyx sp.	carapace	fragment	calcined			3 (1/2"-1/4")	0.2		11/20/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
64.8-9	2	II	XU 5	120-130 cmbd	Faunal	turtle	carapace	fragment	calcined			3 (1/2"-1/4")	0.3		11/20/2012
65.1	1	II	XU 5	130-140 cmbd	Lithic	tool	patterned bifacial	projectile point		quartz	cortex absent	2 (1"-1/2")	3.8		11/20/2012
65.2	1	II	XU 5	130-140 cmbd	Lithic	debris	broken flake			Swan River Chert	cortex absent	2 (1"-1/2")	4.2		11/20/2012
65.3	1	II	XU 5	130-140 cmbd	Faunal	molluscan	unidentifiable	fragment				1 (>1")	17.6	many fragments	11/20/2012
65.4	1	II	XU 5	130-140 cmbd	Faunal	mammalian, small or reptile	longbone	fragment	calcined			3 (1/2"-1/4")	0.3		11/20/2012
65.5	1	II	XU 5	130-140 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.1		11/20/2012
65.6-17	12	II	XU 5	130-140 cmbd	Faunal	turtle	carapace	fragment	calcined			3 (1/2"-1/4")	1.6		11/20/2012
65.18-73	56	II	XU 5	130-140 cmbd	Faunal	turtle	carapace	fragment	calcined			4 (<1/4")	2.9		11/20/2012
65.74-77	4	II	XU 5	130-140 cmbd	Faunal	Trionyx sp.	carapace	fragment	calcined			3 (1/2"-1/4")	0.6	refit to 2 fragments	11/20/2012
	1	II	XU 5	130-140 cmbd	Other	fire-cracked rock				basalt		3 (1/2"-1/4")	1		11/20/2012
	1	II	XU 5	130-140 cmbd	Other	fire-cracked rock				unidentified material		3 (1/2"-1/4")	1.9		11/20/2012
66.1	1	II	XU 51W	130-140 cmbd	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0		11/20/2012
66.2	1	II	XU 5 F 1W	130-140 cmbd	Faunal	fish	spine	fragment	calcined			4 (<1/4")	0		11/20/2012
66.3-4	2	II	XU 5 F 1W	130-140 cmbd	Faunal	cf. turtle	carapace	fragment	calcined			3 (1/2"-1/4")	0.2		11/20/2012
66.5-21	17	II	XU 5 F 1W	130-140 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.6		11/20/2012
66.22	1	II	XU 5 F 1W	130-140 cmbd	Faunal	molluscan	unidentifiable	fragment				4 (<1/4")	0.2		11/20/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
66.23	1	II	XU 5 F 1W	130-140 cmbd	Faunal	mammalian, medium (possibly muskrat)	vertebra, caudal	fragment	calcined			3 (1/2"-1/4")	0.1		11/20/2012
66.24-25	2	II	XU 5 F 1W	130-140 cmbd	Faunal	turtle	phalange, proximal	fragment	calcined			3 (1/2"-1/4")	0.3		11/20/2012
66.26	1	II	XU 5 F 1W	130-140 cmbd	Faunal	cf. turtle	unidentifiable	fragment	calcined			4 (<1/4")	0.1		11/20/2012
67.1	1	II	XU 6	0-30 cmbd	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	1.1		11/16/2012
	1	II	XU 6	30-40 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	4.1		11/16/2012
68.1	1	II	XU 6	40-50 cmbd	Lithic	debris	broken flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.5		11/16/2012
	1	II	XU 6	40-50 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	11.8		11/16/2012
	1	II	XU 6	50-60 cmbd	Other	fire-cracked rock				granite		1 (>1")	136		11/19/2012
69.1	1	II	XU 6	60-70 cmbd	Lithic	debris	primary flake			Prairie du Chien (oolitic) Chert	cortex present	3 (1/2"-1/4")	1.8		11/19/2012
69.2	1	II	XU 6	60-70 cmbd	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	1.4	poss. heat treated	11/19/2012
69.3	1	II	XU 6	60-70 cmbd	Lithic	debris	secondary flake			unidentified chert	cortex absent	2 (1"-1/2")	3.3	Swan River Chert or Cedar Valley Chert translucent variety	11/19/2012
	1	II	XU 6	60-70 cmbd	Other	fire-cracked rock				unidentified material		2 (1"-1/2")	7.4		11/19/2012
	1	II	XU 6	60-70 cmbd	Other	fire-cracked rock				granite		1 (>1")	101		11/19/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	3	II	XU 6	60-70 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	15		11/19/2012
	1	II	XU 6	70-80 cmbd	Other	fire-cracked rock				granite		3 (1/2"-1/4")	1.3		11/19/2012
70.1	1	II	XU 6	80-90 cmbd	Lithic	tool	unpatterned groundstone	grinding stone		granite	cortex present	1 (>1")	127	fire-cracked	11/19/2012
	3	II	XU 6	80-90 cmbd	Other	fire-cracked rock				igneous		1 (>1")	482		11/19/2012
	1	II	XU 6	80-90 cmbd	Other	fire-cracked rock				granite		1 (>1")	23.3		11/19/2012
	3	II	XU 6	80-90 cmbd	Other	fire-cracked rock				limestone		1 (>1")	206	reddish orange color; oxidized from fire	11/19/2012
	1	II	XU 6	90-100 cmbd	Other	fire-cracked rock				metamorphic (gneiss)		1 (>1")	37.6		11/20/2012
	5	II	XU 6	110-120 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	50.2		11/20/2012
	4	II	XU 6	120-130 cmbd	Other	fire-cracked rock				granite		1 (>1")	106		11/20/2012
71.1	1	II	XU 6	130-140 cmbd	Lithic	tool	patterned bifacial	projectile point		chalcedony	cortex absent	2 (1"-1/2")	4.6		11/20/2012
71.2	1	II	XU 6	130-140 cmbd	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	1.3		11/20/2012
71.3	1	II	XU 6	130-140 cmbd	Faunal	molluscan	unidentifiable	fragment				3 (1/2"-1/4")	1.9	many fragments	11/20/2012
71.4	1	II	XU 6	130-140 cmbd	Faunal	mammalian, small or reptile	longbone	fragment	calcined			3 (1/2"-1/4")	0.4		11/20/2012
71.5	1	II	XU 6	130-140 cmbd	Faunal	molluscan	unidentifiable	fragment				4 (<1/4")	0.1		11/20/2012
71.6	1	II	XU 6	130-140 cmbd	Faunal	turtle	carapace	fragment	calcined			3 (1/2"-1/4")	3.1		11/20/2012
71.7-16	10	II	XU 6	130-140 cmbd	Faunal	turtle	carapace	fragment	burned			4 (<1/4")	0.8		11/20/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
71.17-19	3	II	XU 6	130-140 cmbd	Faunal	turtle	carapace	fragment	calcined			3 (1/2"-1/4")	0.8		11/20/2012
71.20-30	11	II	XU 6	130-140 cmbd	Faunal	turtle	carapace	fragment	calcined			4 (<1/4")	0.7		11/20/2012
71.31-56	26	II	XU 6	130-140 cmbd	Faunal	vertebrate	unidentifiable	fragment	burned			4 (<1/4")	1		11/20/2012
71.57-66	10	II	XU 6	130-140 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.6		11/20/2012
	1	II	XU 6	130-140 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	15.6	possible FCR	11/20/2012
72.1-3	3	II	XU 6	140-145 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.8	1/8" screen	11/20/2012
72.4	1	II	XU 6	140-145 cmbd	Faunal	molluscan	unidentifiable	fragment				4 (<1/4")	0.3	1/8" screen; many fragments	11/20/2012
73.1	1	II	XU 6	145-150 cmbd	Faunal	molluscan	unidentifiable	fragment				3 (1/2"-1/4")	1.9	many fragments	11/20/2012
	1	II	XU 6	145-150 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	22.5		11/20/2012
74.1-2	2	II	XU 6	150-160 cmbd	Faunal	molluscan	unidentifiable	fragment				2 (1"-1/2")	1	from rodent run	11/28/2012
75.1	1	II	XU 5&6 F1E	135-140 cmbd	Faunal	molluscan	unidentifiable	fragment				4 (<1/4")	0.1		11/21/2012
75.2-6	5	II	XU 5&6 F1E	135-140 cmbd	Faunal	cf. turtle	carapace	fragment	burned			4 (<1/4")	0.4		11/21/2012
75.7-9	3	II	XU 5&6 F1E	135-140 cmbd	Faunal	cf. turtle	carapace	fragment	calcined			3 (1/2"-1/4")	1.1		11/21/2012
75.10-26	17	II	XU 5&6 F1E	135-140 cmbd	Faunal	cf. turtle	carapace	fragment	calcined			4 (<1/4")	1.2		11/21/2012
75.27-35	8	II	XU 5&6 F1E	135-140 cmbd	Faunal	vertebrate	unidentifiable	fragment	burned			4 (<1/4")	0.4		11/21/2012
75.36-53	17	II	XU 5&6 F1E	135-140 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.9		11/21/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
75.54	1	II	XU 5&6 F1E	135-140 cmbd	Faunal	mammalian, medium (possibly muskrat)	vertebra, caudal	fragment	burned			3 (1/2"-1/4")	0.2		11/21/2012
76.1	1	II	XU 7	40-50 cmbd	Ceramic	body	grit temper	cord/fabric impressed				2 (1"-1/2")	2.5	3.1 mm	11/20/2012
76.2-4	3	II	XU 7	40-50 cmbd	Ceramic	body	grit temper	cord/fabric impressed				3 (1/2"-1/4")	1.9	2.9, 3.2, & 2.8 mm	11/20/2012
76.5	1	II	XU 7	40-50 cmbd	Ceramic	body	grit temper	unidentified		exterior absent		3 (1/2"-1/4")	0.9		11/20/2012
76.6	1	II	XU 7	40-50 cmbd	Ceramic	fired clay						2 (1"-1/2")	7.5		11/20/2012
76.7	1	II	XU 7	40-50 cmbd	Ceramic	fired clay						3 (1/2"-1/4")	1		11/20/2012
76.8	1	II	XU 7	40-50 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.3		11/20/2012
	1	II	XU 7	40-50 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	3.9		11/20/2012
77.1	1	II	XU 7	50-60 cmbd	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.3	poss. heat treated	11/20/2012
	1	II	XU 7	50-60 cmbd	Other	fire-cracked rock				unidentified material		2 (1"-1/2")	2.3		11/20/2012
	2	II	XU 7	50-60 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	9.6		11/20/2012
78.1-2	2	II	XU 7	60-70 cmbd	Lithic	debris	broken flake			quartz	cortex absent	3 (1/2"-1/4")	1.5		11/20/2012
78.3	1	II	XU 7	60-70 cmbd	Lithic	debris	other G4 flake			Prairie du Chien (oolitic) Chert	cortex absent	4 (<1/4")	0.1		11/20/2012
	2	II	XU 7	70-80 cmbd	Other	fire-cracked rock				granite		1 (>1")	95.3		11/20/2012
79.1	1	II	XU 7	80-90 cmbd	Ceramic	body	grit temper	unidentified				3 (1/2"-1/4")	0.4	4.7 mm	11/20/2012
79.2	1	II	XU 7	80-90 cmbd	Lithic	tool	unpatterned groundstone	grinding stone		granite	cortex present	1 (>1")	197	fire-cracked	11/20/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
79.3	1	II	XU 7	80-90 cmbd	Lithic	core	tested cobble			quartz	cortex present	1 (>1")	54.6		11/20/2012
79.4	1	II	XU 7	80-90 cmbd	Lithic	tool	unpatterned flake tool	retouch flake		igneous	cortex present	1 (>1")	26.1		11/20/2012
79.5	1	II	XU 7	80-90 cmbd	Lithic	debris	bipolar flake			Kakabeka Chert	cortex absent	3 (1/2"-1/4")	1.7		11/20/2012
80.1	1	II	XU 7	90-100 cmbd	Lithic	debris	primary flake			Red River Chert	cortex present	3 (1/2"-1/4")	1		11/20/2012
	1	II	XU 7	100-110 cmbd	Other	fire-cracked rock				granite		1 (>1")	12.2		11/20/2012
81.1	1	II	XU 8	30-40 cmbd	Lithic	debris	primary flake			quartz	cortex absent	3 (1/2"-1/4")	1.4		11/26/2012
81.2	1	II	XU 8	30-40 cmbd	Faunal	vertebrate	unidentifiable	fragment	calcined			4 (<1/4")	0.1		11/26/2012
	2	II	XU 8	30-40 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	27.6		11/26/2012
82.1	1	II	XU 8	50-60 cmbd	Lithic	debris	tertiary flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	0.4		11/26/2012
	2	II	XU 8	50-60 cmbd	Other	fire-cracked rock				granite		1 (>1")	139		11/26/2012
	2	II	XU 8	50-60 cmbd	Other	fire-cracked rock				basalt		1 (>1")	332		11/26/2012
83.1	1	II	XU 8	60-70 cmbd	Lithic	debris	secondary flake			Prairie du Chien (oolitic) Chert	cortex absent	4 (<1/4")	0.1		11/27/2012
83.2	1	II	XU 8	60-70 cmbd	Lithic	debris	broken flake			Prairie du Chien (oolitic) Chert	cortex absent	3 (1/2"-1/4")	1.2		11/27/2012
	8	II	XU 8	60-70 cmbd	Other	fire-cracked rock				granite		1 (>1")	793		11/27/2012
	6	II	XU 8	60-70 cmbd	Other	fire-cracked rock				granite		2 (1"-1/2")	36.5		11/27/2012
	1	II	XU 8	70-80 cmbd	Other	fire-cracked rock				granite		1 (>1")	195		11/27/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
	1	II	XU 8	70-80 cmbd	Other	fire-cracked rock				quartzite		1 (>1")	49.5		11/27/2012
	1	II	XU 8	70-80 cmbd	Other	fire-cracked rock				igneous		2 (1"-1/2")	5.4		11/27/2012
	1	II	XU 8	90-100 cmbd	Other	fire-cracked rock				granite		1 (>1")	111		11/27/2012
84.1	1	II	XU 8	100-110 cmbd	Lithic	debris	shatter			Prairie du Chien (oolitic) Chert	cortex present	3 (1/2"-1/4")	1.8		11/27/2012
84.2	1	II	XU 8	100-110 cmbd	Faunal	molluscan	unidentifiable	fragment				3 (1/2"-1/4")	1.6	many fragments	11/27/2012
85.1	1	II	XU 8	110-120 cmbd	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.2		11/27/2012
85.2	1	II	XU 8	110-120 cmbd	Faunal	molluscan	unidentifiable	fragment				3 (1/2"-1/4")	2	many fragments	11/27/2012
86.1	1	II	XU 8	120-130 cmbd	Faunal	molluscan	unidentifiable	fragment				3 (1/2"-1/4")	16.8	many fragments	11/27/2012
86.2	1	II	XU 8	120-130 cmbd	Lithic	tool	unpatterned groundstone	abrader / polishing stone		limestone	cortex present	1 (>1")	321		11/27/2012
87.1	1	II	XU 8	150-160 cmbd	Lithic	debris	broken flake			Swan River Chert	cortex absent	3 (1/2"-1/4")	0.2	poss. heat treated	11/28/2012
88.1	1	II	XU 5&6 F1E	138-140 cmbd	Lithic	debris	other G4 flake			quartz	cortex absent	4 (<1/4")	0.1	Feature fill flotation heavy fraction	11/21/2012
88.2	1	II	XU 5&6 F1E	138-140 cmbd	Lithic	debris	other G4 flake			unidentified material	cortex absent	4 (<1/4")	0.1	Feature fill flotation heavy fraction	11/21/2012
89.1-4	4	II	XU 5&6 F1E	138-140 cmbd	Faunal	turtle	shell	fragment	burned/calcined			3 (1/2"-1/4")	0.6	Feature fill flotation light fraction	11/21/2012
89.5	1	II	XU 5&6 F1E	138-140 cmbd	Faunal	mammalian	unidentifiable	fragment	burned			3 (1/2"-1/4")	0.1	Feature fill flotation light fraction	11/21/2012
89.6	1	II	XU 5&6 F1E	138-140 cmbd	Faunal	turtle	phalanx		burned			4 (<1/4")	0.1	Feature fill flotation light fraction; #10 screen	11/21/2012
89.7-8	2	II	XU 5&6 F1E	138-140 cmbd	Faunal	Lepisosteus sp. (gar)	unidentifiable	fragment	calcined			4 (<1/4")	0.1	Feature fill flotation light fraction	11/21/2012

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
89.9	1	II	XU 5&6 F1E	138-140 cmbd	Faunal	molluscan	shell	fragment	burned			4 (<1/4")	0	Feature fill flotation light fraction	11/21/2012
89.10	1	II	XU 5&6 F1E	138-140 cmbd	Faunal	turtle	shell & bone	fragment	burned/calcined			4 (<1/4")	1.6	Feature fill flotation light fraction; numerous pieces (approx. 50)	11/21/2012
89.11	1	II	XU 5&6 F1E	138-140 cmbd	Faunal	mammalian	unidentifiable	fragment	burned/calcined			4 (<1/4")	3.1	Feature fill flotation light fraction; numerous pieces (approx. 125)	11/21/2012
89.12	1	II	XU 5&6 F1E	138-140 cmbd	Faunal	mammalian	unidentifiable	fragment	burned/calcined			4 (<1/4")	0.2	Feature fill flotation light fraction; numerous pieces (approx. 100); #20 screen	11/21/2012
89.13	1	II	XU 5&6 F1E	138-140 cmbd	Botanical	wood charcoal	unidentifiable	fragment				4 (<1/4")	0	Feature fill flotation light fraction	11/21/2012
89.14	1	II	XU 5&6 F1E	138-140 cmbd	Botanical	Juglandaceae (nutshell)		fragment				4 (<1/4")	0	Feature fill flotation light fraction	11/21/2012
89.15	1	II	XU 5&6 F1E	138-140 cmbd	Botanical	starchy material	unidentifiable	fragment				4 (<1/4")	0	Feature fill flotation light fraction	11/21/2012
90.1-3	3	II	XU 8 F1W	128-138 cmbd	Faunal	mammalian	unidentifiable	fragment	burned			3 (1/2"-1/4")	0.3	Feature fill flotation heavy fraction	11/21/2012
90.4	1	II	XU 8 F1W	128-138 cmbd	Faunal	mammalian, small	talus		burned			4 (<1/4")	0.1	Feature fill flotation heavy fraction	11/21/2012
90.5	1	II	XU 8 F1W	128-138 cmbd	Faunal	mammalian, small	innominate	fragment	burned			4 (<1/4")	0.2	Feature fill flotation heavy fraction; joining fragments	11/21/2012
90.6-7	2	II	XU 8 F1W	128-138 cmbd	Faunal	Colubridae (nonpoisonous snake)	vertebra		burned			4 (<1/4")	0.1	Feature fill flotation heavy fraction	11/21/2012
90.8	1	II	XU 8 F1W	128-138 cmbd	Faunal	mammalian	caudal vertebrae		burned			4 (<1/4")	0.1	Feature fill flotation heavy fraction	11/21/2012

21CR156 Catalog

Prov. #	Count	Phase	Location	Depth	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Notes	Date
90.9	1	II	XU 8 F1W	128-138 cmbd	Faunal	mammalian/turtle	unidentifiable	fragment	burned/calcined			4 (<1/4")	2.4	Feature fill flotation heavy fraction; numerous pieces (approx. 100)	11/21/2012
90.10	1	II	XU 8 F1W	128-138 cmbd	Faunal	mammalian/turtle	unidentifiable	fragment	burned/calcined			4 (<1/4")	0.1	Feature fill flotation heavy fraction; numerous pieces (approx. 25); #20 screen	11/21/2012
90.11	1	II	XU 8 F1W	128-138 cmbd	Botanical	wood charcoal	unidentifiable	fragment				4 (<1/4")	0	Feature fill flotation light fraction	11/21/2012

21CR157 Catalog

Prov. #	Count	Phase	Location	Depth (Cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Date
	1	I	ST 47	130-160	Other	fire-cracked rock				granite		1 (>1")	76.9	12/17/2012
1.1	1	I	Backhoe Trench 1	250-300	Lithic	debris	secondary flake			Prairie du Chien (oolitic)	cortex absent	2 (1"-1/2")	2.7	12/17/2012
1.2	1	I	Backhoe Trench 1	250-300	Lithic	debris	broken flake			quartz	cortex absent	2 (1"-1/2")	1.2	12/17/2012
1.3	1	I	Backhoe Trench 1	250-300	Faunal	vertebrate	unidentifiable	fragment	calcined			3 (1/2"-1/4")	0.2	12/17/2012
	1	I	Backhoe Trench 1	250-300	Historic	glass	clear	window fragment				1 (>1")	10.2	12/17/2012
	3	I	Backhoe Trench 1	250-300	Historic	glass	clear	window fragment				3 (1/2"-1/4")	3.5	12/17/2012
	1	I	Backhoe Trench 1	250-300	Historic	glass	amber	bottle	fragment			2 (1"-1/2")	10.8	12/17/2012
	1	I	Backhoe Trench 1	250-300	Historic	glass	amber	bottle	fragment			3 (1/2"-1/4")	0.5	12/17/2012
	1	I	Backhoe Trench 1	250-300	Historic	ceramic	stoneware	unidentified	fragment			2 (1"-1/2")	5.5	12/17/2012
	1	I	Backhoe Trench 1	250-300	Historic	metal	aluminum	unidentified	fragment			3 (1/2"-1/4")	0.2	12/17/2012
	1	I	Backhoe Trench 2	200-250	Historic	metal	iron	nail, square				2 (1"-1/2")	9.7	12/17/2012
	1	I	Backhoe Trench 2	200-250	Historic	metal	iron	nail, round				2 (1"-1/2")	3.5	12/17/2012
	2	I	Backhoe Trench 2	200-250	Historic	glass	clear	window fragment				3 (1/2"-1/4")	0.5	12/17/2012
2.1	1	I	Backhoe Trench 2	250-300	Lithic	debris	other G4 flake			Swan River Chert	cortex absent	4 (<1/4")	0	12/17/2012
2.2	1	I	Backhoe Trench 2	250-300	Faunal	mammalian, large	unidentifiable	fragment		fractured, spiral		2 (1"-1/2")	10.7	12/17/2012
	1	I	Backhoe Trench 2	250-300	Historic	glass	aqua	unidentified	fragment			2 (1"-1/2")	7.2	12/17/2012
	1	I	Backhoe Trench 2	250-300	Historic	glass	clear	unidentified	fragment			2 (1"-1/2")	6.7	12/17/2012

21CR157 Catalog

Prov. #	Count	Phase	Location	Depth (Cmbs)	Class	Descript 1	Descript 2	Descript 3	Descript 4	Descript 5	Descript 6	Size Grade	Weight (g)	Date
	7	I	Backhoe Trench 2	250-300	Historic	glass	clear	unidentified	fragment			3 (1/2"-1/4")	4.9	12/17/2012
	2	I	Backhoe Trench 2	250-300	Historic	metal	iron	nail, square				3 (1/2"-1/4")	6.4	12/17/2012
	3	I	Backhoe Trench 2	250-300	Historic	metal	iron	unidentified	fragment			3 (1/2"-1/4")	1.4	12/17/2012
	2	I	Backhoe Trench 2	250-300	Historic	metal	iron	wire	fragment			2 (1"-1/2")	4	12/17/2012
	2	I	Backhoe Trench 2	250-300	Historic	composite	slag		fragment			3 (1/2"-1/4")	0.5	12/17/2012
	1	I	Backhoe Trench 2	250-300	Historic	ceramic	whiteware	unidentified	fragment			3 (1/2"-1/4")	0.2	12/17/2012
	3	I	Backhoe Trench 2	250-300	Historic	ceramic	clay	brick	fragment			2 (1"-1/2")	2.2	12/17/2012
	6	I	Backhoe Trench 2	250-300	Historic	composite	plastic	unidentified	fragment			2 (1"-1/2")	2.2	12/17/2012

APPENDIX D:
RADIOCARBON DATING REPORTS FROM BETA ANALYTIC INC.

Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
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Fax: 305 663 0964
Beta@radiocarbon.com
www.radiocarbon.com

BETA

Consistent Accuracy . . .
. . . Delivered On-time

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

February 11, 2013

Mr. Frank Florin
Florin Cultural Resource Services
N12902 273rd Street
Boyceville, WI 54725
USA

RE: Radiocarbon Dating Results For Samples 21CR155-1, 21CR155-2, 21CR156-1, 21CR156-2, 21CR156-5, 21CR156-6, 21CR156-7, 21CR156-8, 21CR156-9, 21CR156-10

Dear Mr. Florin:

Enclosed are the radiocarbon dating results for ten samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

As always, no students or intern researchers who would necessarily be distracted with other obligations and priorities were used in the analyses. We analyzed them with the combined attention of our entire professional staff.

If you have specific questions about the analyses, please contact us. We are always available to answer your questions.

Thank you for prepaying the analyses. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA

BETA ANALYTIC INC.

DR. M.A. TAMERS and MR. D.G. HOOD

4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Frank Florin — Report Date: 2/11/2013

Florin Cultural Resource Services — Material Received: 1/25/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 340997	7050 +/- 30 BP	-18.2 o/oo	7160 +/- 30 BP

SAMPLE : 21CR155-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 6060 to 5990 (Cal BP 8020 to 7940)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 340998	7770 +/- 40 BP	-18.2 o/oo	7880 +/- 40 BP

SAMPLE : 21CR155-2
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 6980 to 6980 (Cal BP 8930 to 8920) AND Cal BC 6910 to 6880 (Cal BP 8860 to 8840)
Cal BC 6830 to 6640 (Cal BP 8780 to 8590)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 340999	8110 +/- 40 BP	-10.0 o/oo	8360 +/- 40 BP

SAMPLE : 21CR156-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (shell): acid etch
2 SIGMA CALIBRATION : Cal BC 7520 to 7340 (Cal BP 9470 to 9290)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 341000	6900 +/- 30 BP	-16.4 o/oo	7040 +/- 30 BP

SAMPLE : 21CR156-2
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (cremated bone carbonate): bone carbonate extraction
2 SIGMA CALIBRATION : Cal BC 5990 to 5880 (Cal BP 7940 to 7830)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD

4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Frank Florin

Report Date: 2/11/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 341001	6570 +/- 30 BP	-16.4 o/oo	6710 +/- 30 BP

SAMPLE : 21CR156-5
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 5660 to 5610 (Cal BP 7610 to 7560) AND Cal BC 5590 to 5570 (Cal BP 7540 to 7520)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 341002	4680 +/- 30 BP	-17.3 o/oo	4810 +/- 30 BP

SAMPLE : 21CR156-6
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 3650 to 3630 (Cal BP 5600 to 5580) AND Cal BC 3590 to 3530 (Cal BP 5540 to 5480)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 341003	7500 +/- 40 BP	-18.2 o/oo	7610 +/- 40 BP

SAMPLE : 21CR156-7
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 6500 to 6420 (Cal BP 8450 to 8370)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 341004	6080 +/- 30 BP	-22.0 o/oo	6130 +/- 30 BP

SAMPLE : 21CR156-8
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 5210 to 4990 (Cal BP 7160 to 6940)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

BETA ANALYTIC INC.
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beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Frank Florin

Report Date: 2/11/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 341005	5810 +/- 30 BP	-21.5 o/oo	5870 +/- 30 BP

SAMPLE : 21CR156-9
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 4790 to 4690 (Cal BP 6740 to 6640)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 341006	4990 +/- 30 BP	-18.7 o/oo	5090 +/- 30 BP

SAMPLE : 21CR156-10
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (organic sediment): acid washes
2 SIGMA CALIBRATION : Cal BC 3960 to 3890 (Cal BP 5910 to 5840) AND Cal BC 3880 to 3800 (Cal BP 5830 to 5750)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-18.2:lab. mult=1)

Laboratory number: **Beta-340997**

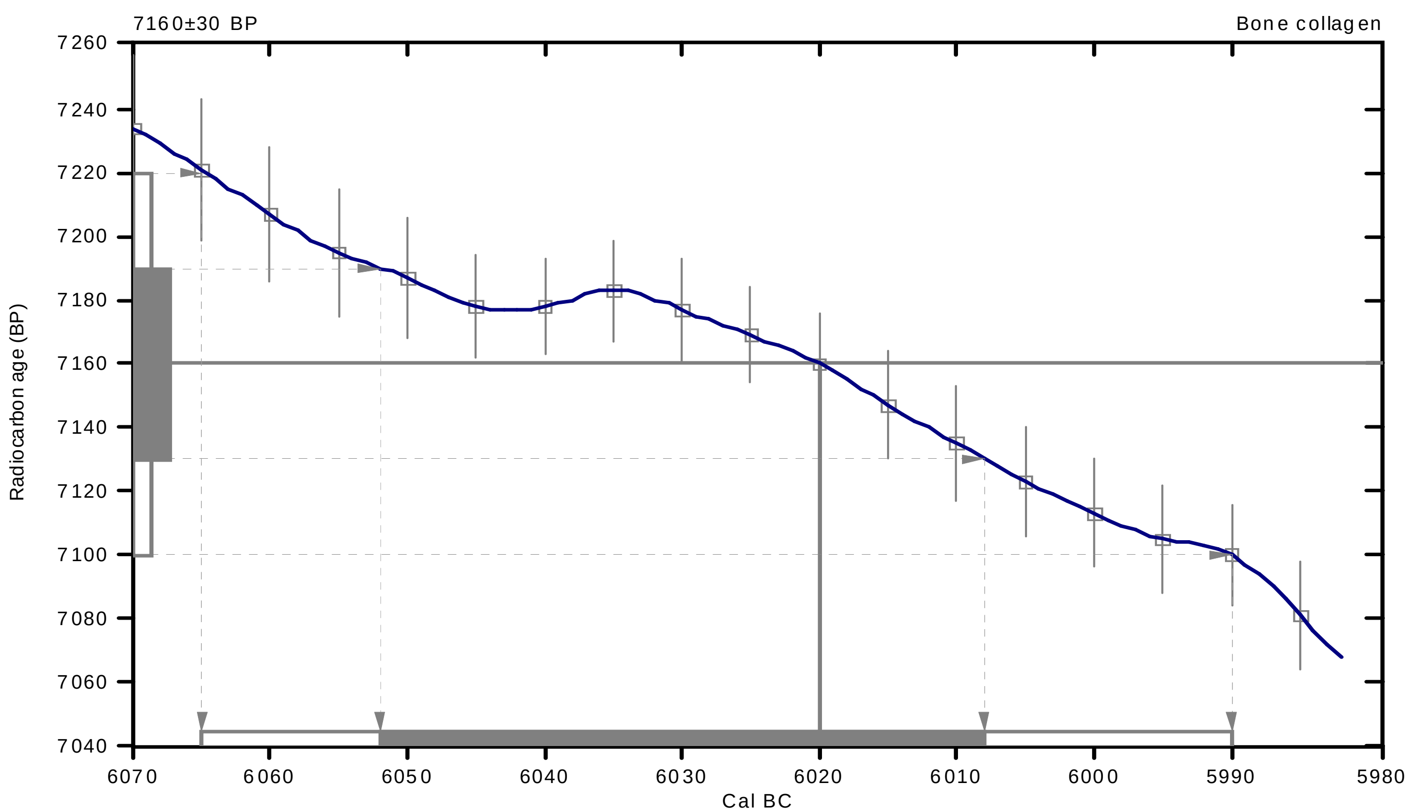
Conventional radiocarbon age: **7160±30 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 6060 to 5990 (Cal BP 8020 to 7940)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 6020 (Cal BP 7970)

1 Sigma calibrated result: (68% probability) Cal BC 6050 to 6010 (Cal BP 8000 to 7960)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

Beta Analytic Radiocarbon Dating Laboratory

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-18.2:lab. mult=1)

Laboratory number: **Beta-340998**

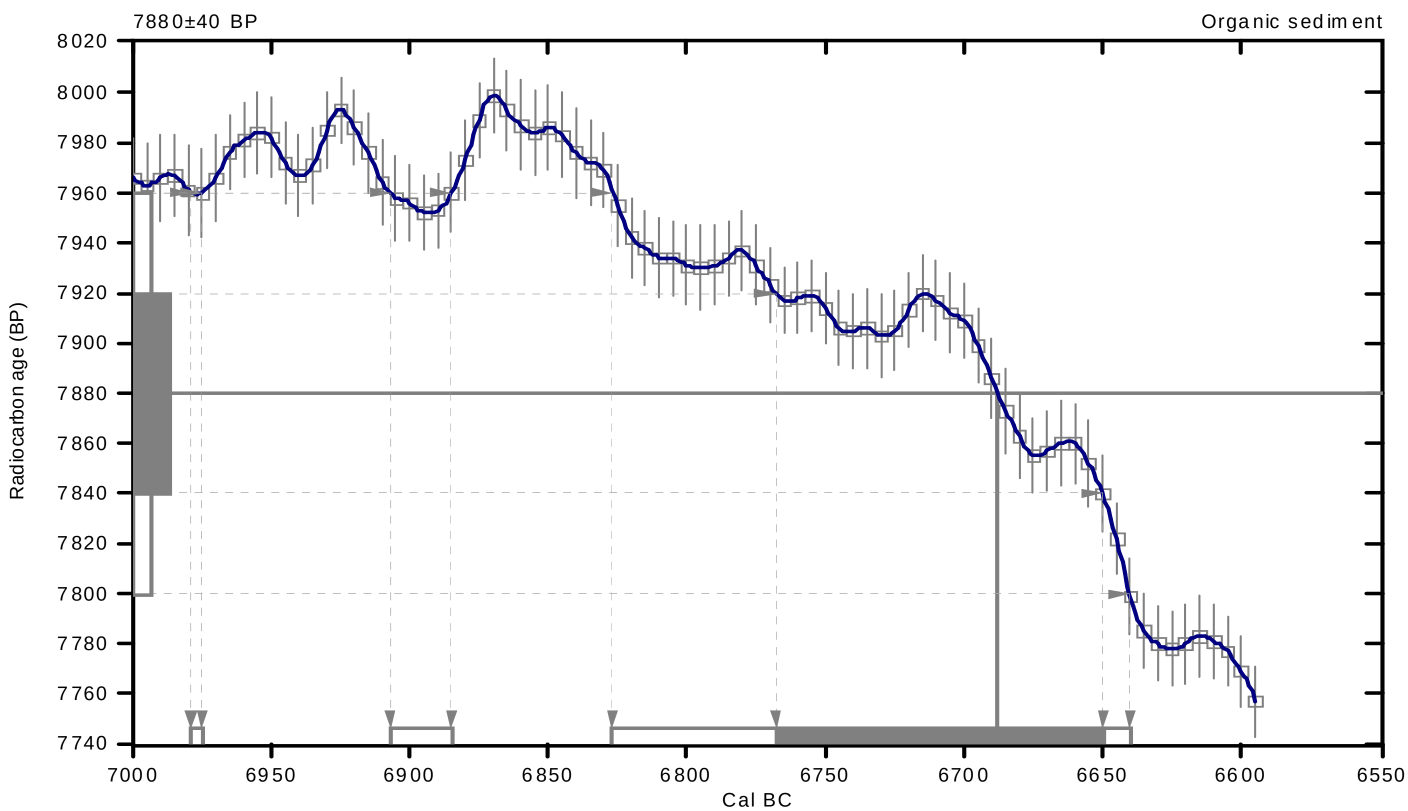
Conventional radiocarbon age: **7880±40 BP**

2 Sigma calibrated results: (95% probability) **Cal BC 6980 to 6980 (Cal BP 8930 to 8920) and Cal BC 6910 to 6880 (Cal BP 8860 to 8840) and Cal BC 6830 to 6640 (Cal BP 8780 to 8590)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 6690 (Cal BP 8640)

1 Sigma calibrated result: (68% probability) Cal BC 6770 to 6650 (Cal BP 8720 to 8600)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-10:lab. mult=1)

Laboratory number: **Beta-340999**

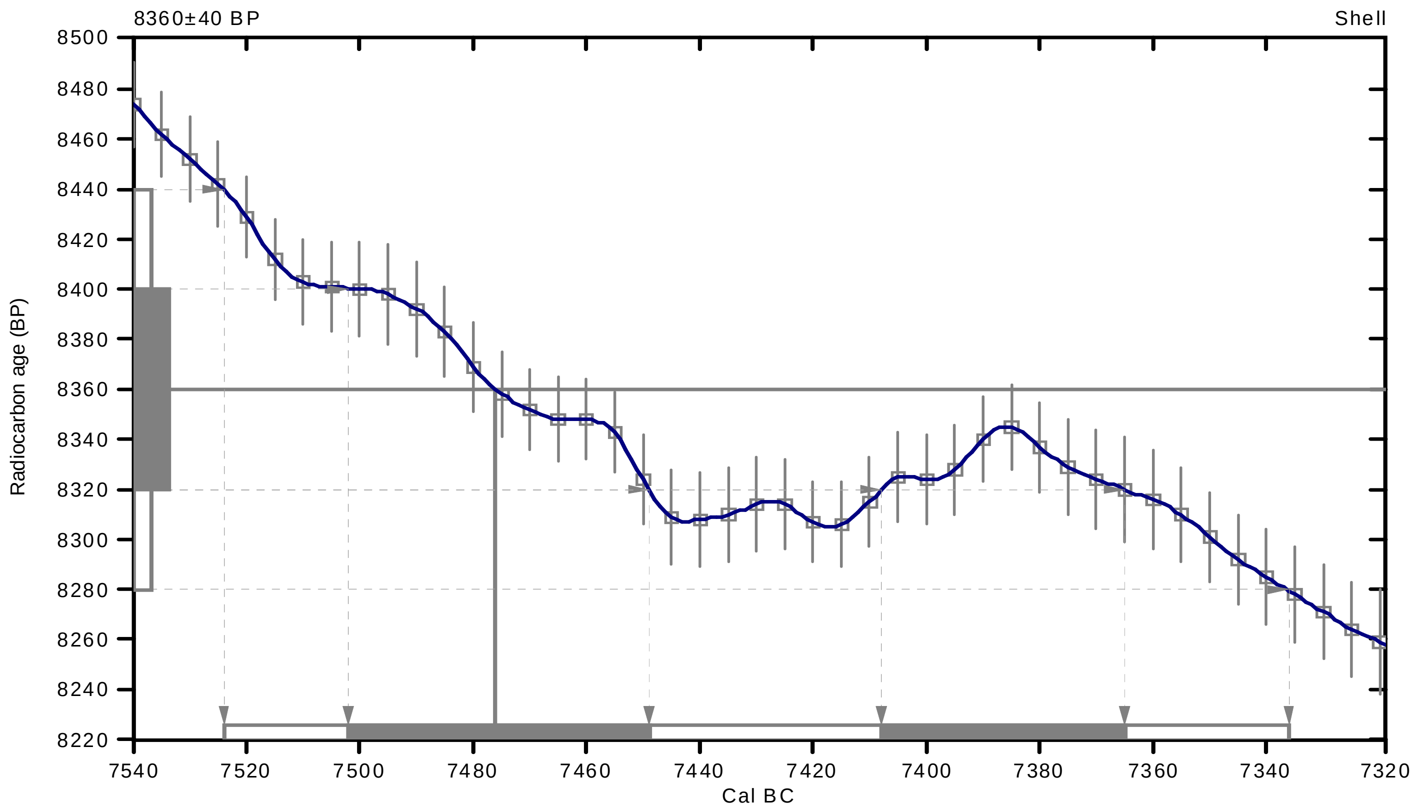
Conventional radiocarbon age: **8360±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 7520 to 7340 (Cal BP 9470 to 9290)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 7480 (Cal BP 9430)

1 Sigma calibrated results: (68% probability) Cal BC 7500 to 7450 (Cal BP 9450 to 9400) and Cal BC 7410 to 7360 (Cal BP 9360 to 9320)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-16.4:lab. mult=1)

Laboratory number: **Beta-341000**

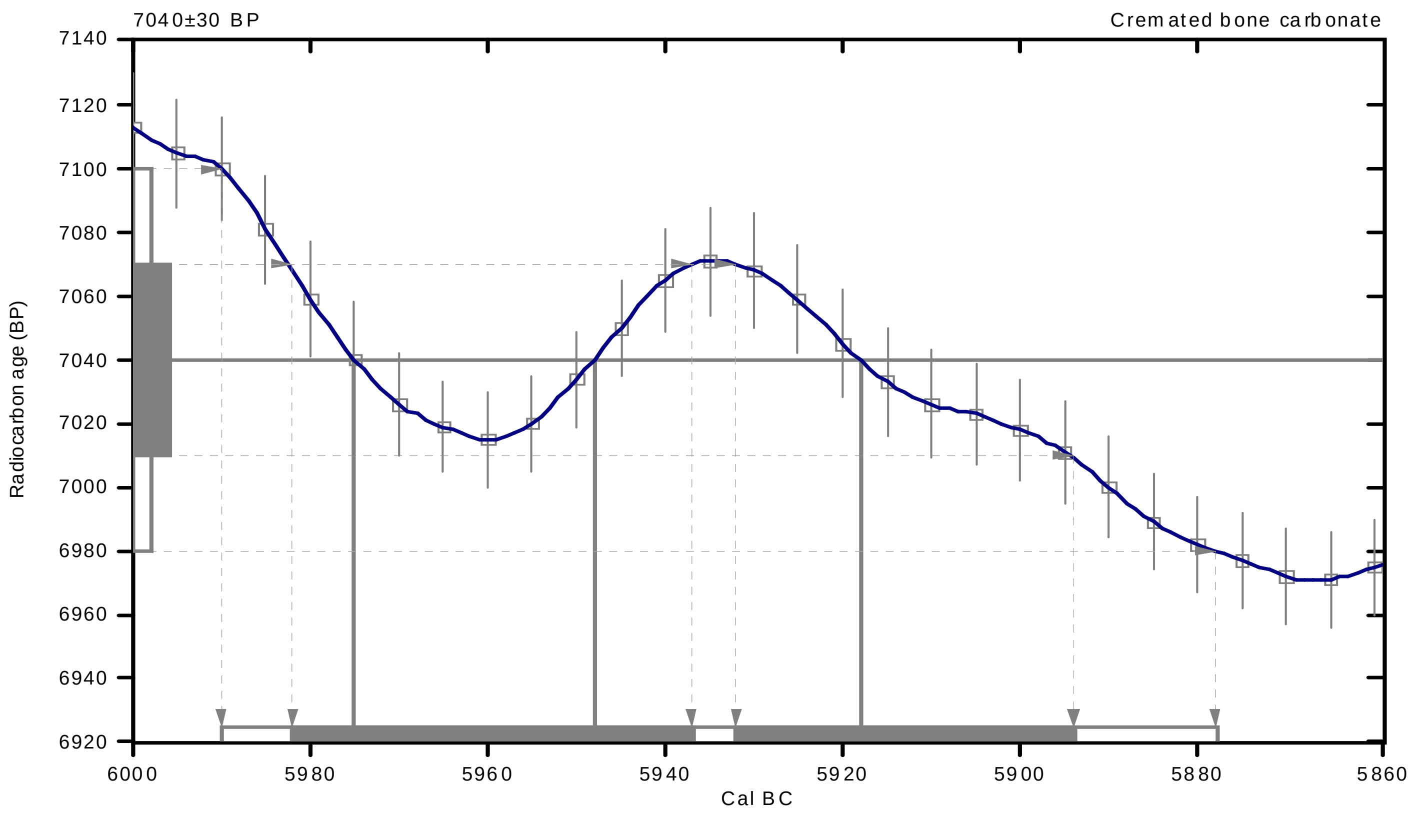
Conventional radiocarbon age: **7040±30 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 5990 to 5880 (Cal BP 7940 to 7830)**

Intercept data

Intercepts of radiocarbon age with calibration curve: Cal BC 5980 (Cal BP 7920) and
Cal BC 5950 (Cal BP 7900) and
Cal BC 5920 (Cal BP 7870)

1 Sigma calibrated results: (68% probability) Cal BC 5980 to 5940 (Cal BP 7930 to 7890) and
Cal BC 5930 to 5890 (Cal BP 7880 to 7840)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):1-244, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-16.4:lab. mult=1)

Laboratory number: **Beta-341001**

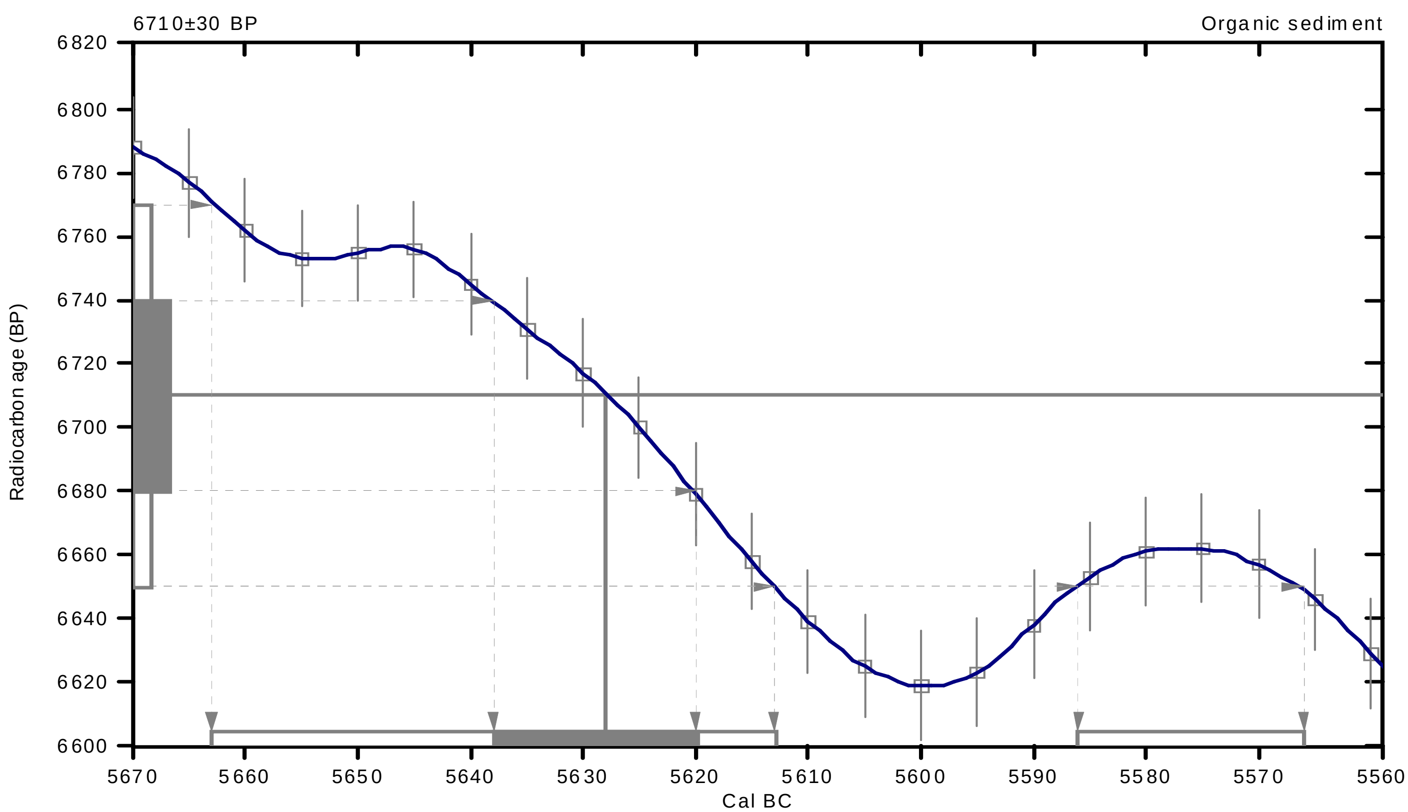
Conventional radiocarbon age: **6710±30 BP**

2 Sigma calibrated results: (95% probability) **Cal BC 5660 to 5610 (Cal BP 7610 to 7560) and Cal BC 5590 to 5570 (Cal BP 7540 to 7520)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 5630 (Cal BP 7580)

1 Sigma calibrated result: (68% probability) Cal BC 5640 to 5620 (Cal BP 7590 to 7570)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-17.3:lab. mult=1)

Laboratory number: **Beta-341002**

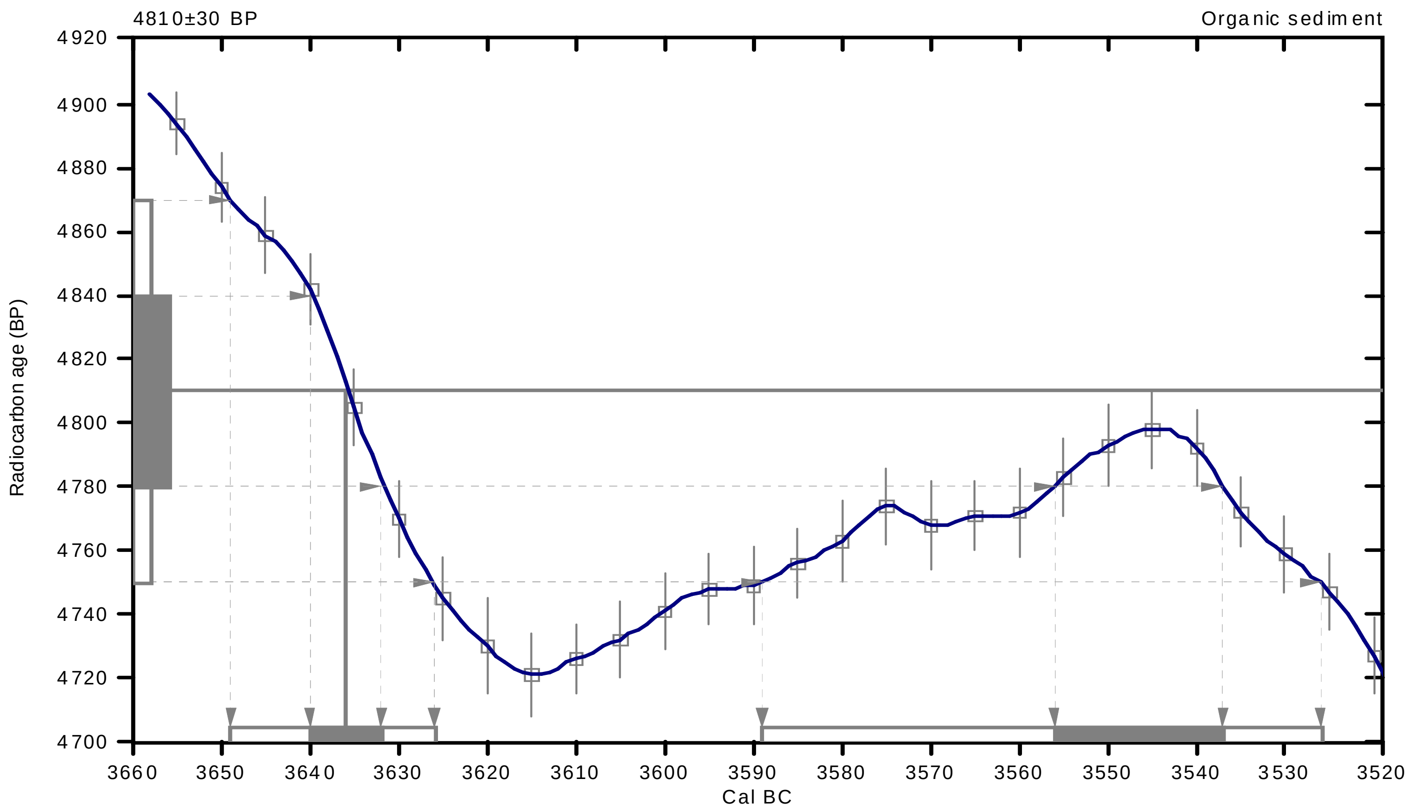
Conventional radiocarbon age: **4810±30 BP**

2 Sigma calibrated results: **Cal BC 3650 to 3630 (Cal BP 5600 to 5580) and**
(95% probability) **Cal BC 3590 to 3530 (Cal BP 5540 to 5480)**

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 3640 (Cal BP 5590)

1 Sigma calibrated results: Cal BC 3640 to 3630 (Cal BP 5590 to 5580) and
(68% probability) Cal BC 3560 to 3540 (Cal BP 5510 to 5490)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2):317-322

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-18.2:lab. mult=1)

Laboratory number: **Beta-341003**

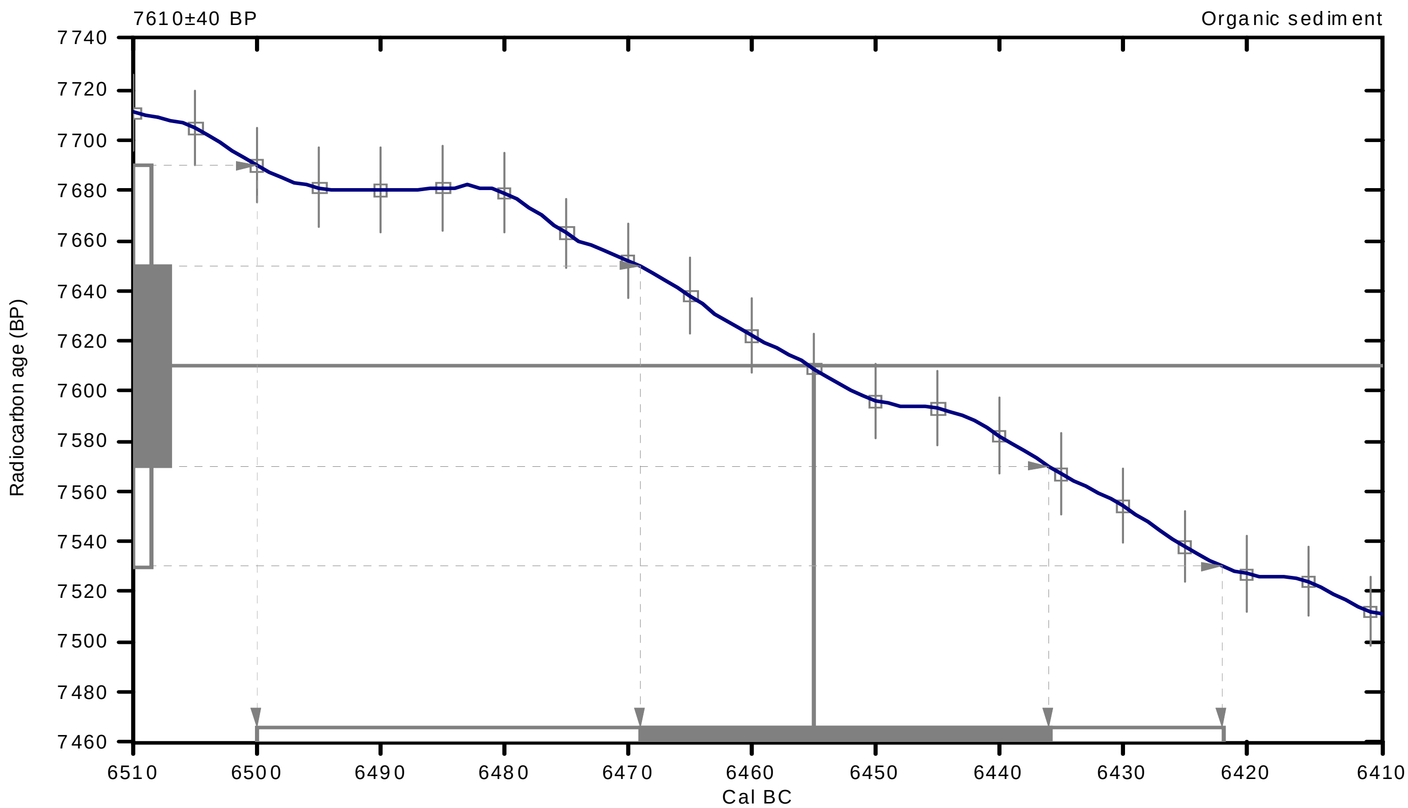
Conventional radiocarbon age: **7610±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 6500 to 6420 (Cal BP 8450 to 8370)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 6460 (Cal BP 8400)

1 Sigma calibrated result: (68% probability) Cal BC 6470 to 6440 (Cal BP 8420 to 8390)



References:

Database used

INTCAL09

References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-22:lab. mult=1)

Laboratory number: **Beta-341004**

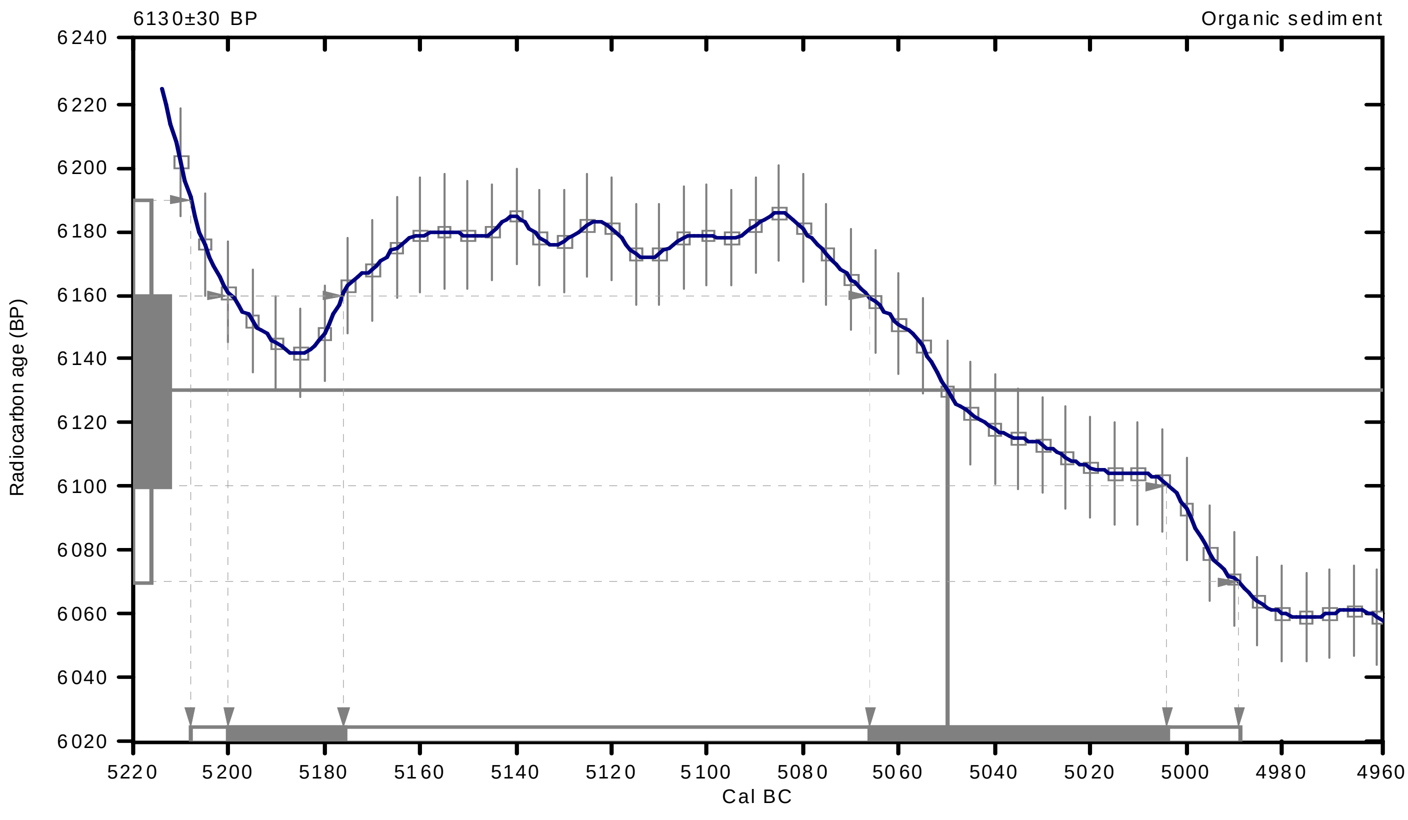
Conventional radiocarbon age: **6130±30 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 5210 to 4990 (Cal BP 7160 to 6940)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 5050 (Cal BP 7000)

1 Sigma calibrated results: (68% probability) Cal BC 5200 to 5180 (Cal BP 7150 to 7130) and Cal BC 5070 to 5000 (Cal BP 7020 to 6950)



References:

Database used

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References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-21.5:lab. mult=1)

Laboratory number: **Beta-341005**

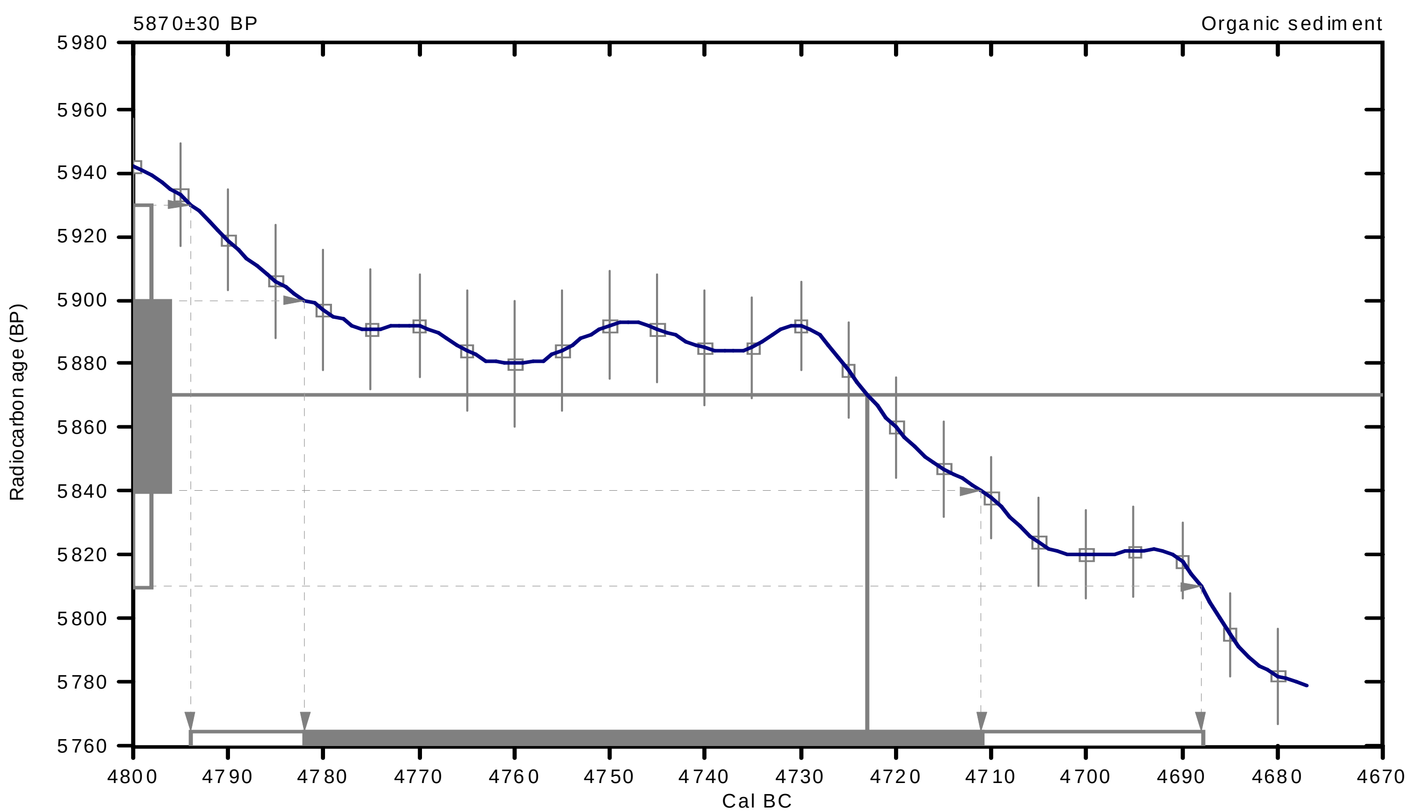
Conventional radiocarbon age: **5870±30 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 4790 to 4690 (Cal BP 6740 to 6640)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 4720 (Cal BP 6670)

1 Sigma calibrated result: (68% probability) Cal BC 4780 to 4710 (Cal BP 6730 to 6660)



References:

Database used

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References to INTCAL09 database

Heaton,et.al.,2009, Radiocarbon 51(4):1151-1164, Reimer,et.al, 2009, Radiocarbon 51(4):1111-1150, Stuiver,et.al,1993, Radiocarbon 35(1):137-189, Oeschger,et.al.,1975,Tellus 27:168-192

Mathematics used for calibration scenario

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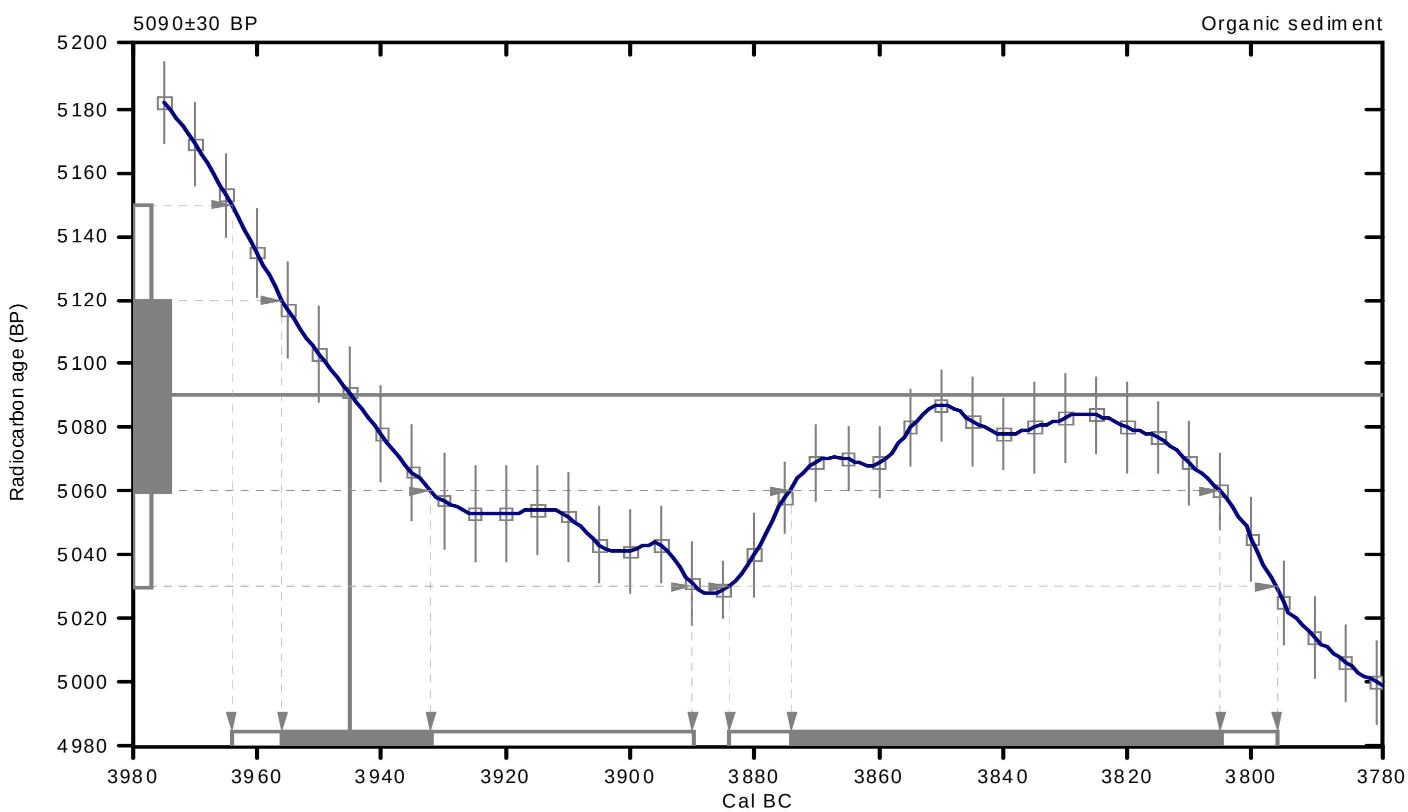
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-18.7:lab. mult=1)

Laboratory number:	**Beta-341006**
Conventional radiocarbon age:	**5090±30 BP**
2 Sigma calibrated results: (95% probability)	**Cal BC 3960 to 3890 (Cal BP 5910 to 5840) and Cal BC 3880 to 3800 (Cal BP 5830 to 5750)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal BC 3940 (Cal BP 5900)
1 Sigma calibrated results: (68% probability)	Cal BC 3960 to 3930 (Cal BP 5910 to 5880) and Cal BC 3870 to 3800 (Cal BP 5820 to 5760)



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Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

April 5, 2013

Mr. Frank Florin
Florin Cultural Resource Services
N12902 273rd Street
Boyceville, WI 54725
USA

RE: Radiocarbon Dating Result For Sample 21CR155-3

Dear Mr. Florin:

Enclosed is the radiocarbon dating result for one sample recently sent to us. The sample provided plenty of carbon for accurate measurement and the analysis proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

The web directory containing the table of all your results and PDF download also contains pictures including, most importantly the portion actually analyzed. These can be saved by opening them and right clicking. Also a cvs spreadsheet download option is available and a quality assurance report is posted for each set of results. This report contains expected vs measured values for 3-5 working standards analyzed simultaneously with your sample.

The reported result is accredited to ISO-17025 standards and the analysis was performed entirely here in our laboratories. Since Beta is not a teaching laboratory, only graduates trained in accordance with the strict protocols of the ISO-17025 program participated in the analyses. When interpreting the result, please consider any communications you may have had with us regarding the sample.

If you have specific questions about the analyses, please contact us. Your inquiries are always welcome.

The cost of the analysis was charged to the VISA card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD

4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Frank Florin — Report Date: 4/5/2013

Florin Cultural Resource Services — Material Received: 3/21/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 345135	6300 +/- 40 BP	-23.5 o/oo	6320 +/- 40 BP

SAMPLE : 21CR155-3
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (cremated bone carbonate): bone carbonate extraction
2 SIGMA CALIBRATION : Cal BC 5370 to 5220 (Cal BP 7320 to 7170)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-23.5:lab. mult=1)

Laboratory number: **Beta-345135**

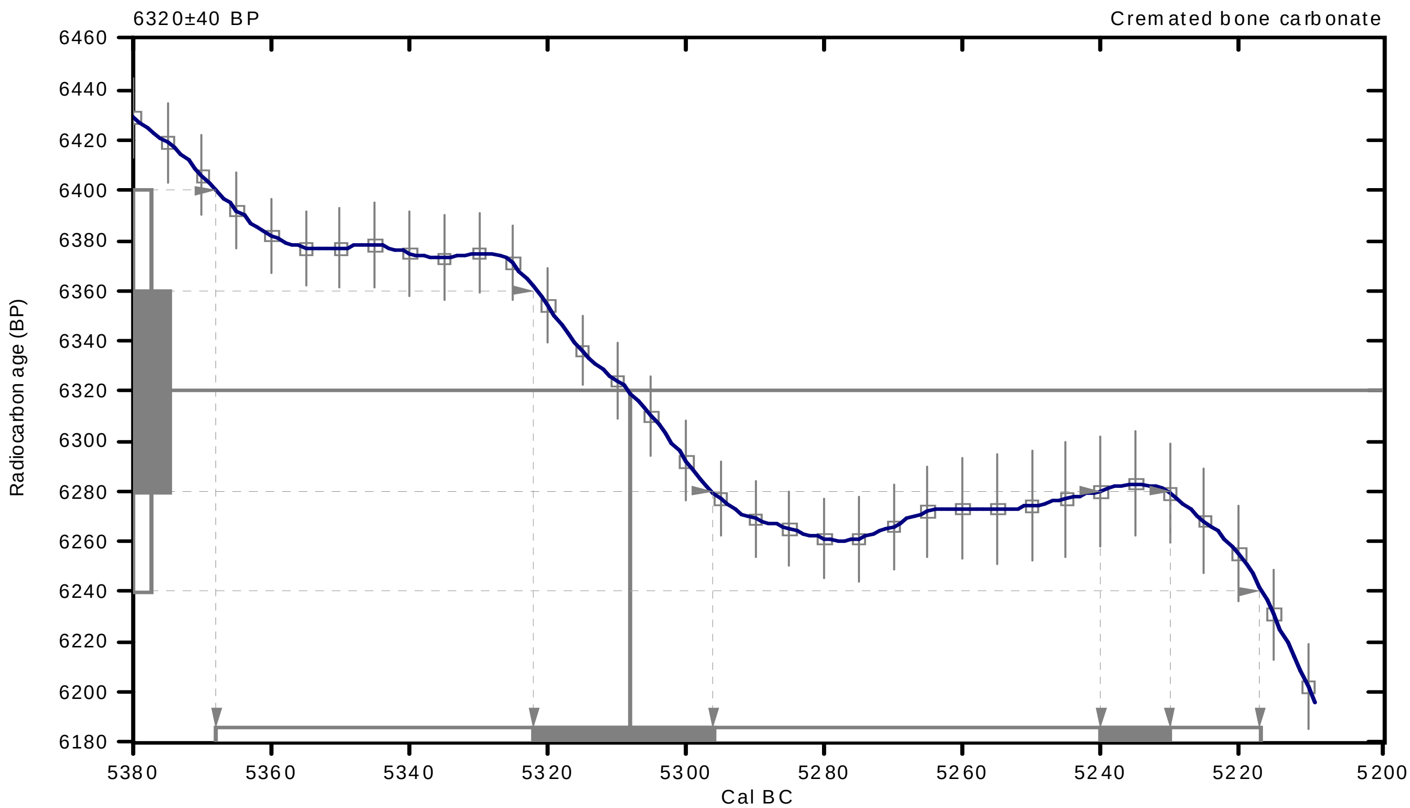
Conventional radiocarbon age: **6320±40 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 5370 to 5220 (Cal BP 7320 to 7170)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 5310 (Cal BP 7260)

1 Sigma calibrated results: (68% probability) Cal BC 5320 to 5300 (Cal BP 7270 to 7250) and Cal BC 5240 to 5230 (Cal BP 7190 to 7180)



References:

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Mathematics used for calibration scenario

A Simplified Approach to Calibrating C14 Dates

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www.radiocarbon.com

Darden Hood
President

Ronald Hatfield
Christopher Patrick
Deputy Directors

August 1, 2013

Mr. Frank Florin
Florin Cultural Resource Services
N12902 273rd Street
Boyceville, WI 54725
USA

RE: Radiocarbon Dating Results For Samples 17GW-1, 17GW-2, 37G-1, 37GW5-1

Dear Mr. Florin:

Enclosed are the radiocarbon dating results for four samples recently sent to us. They each provided plenty of carbon for accurate measurements and all the analyses proceeded normally. As usual, the method of analysis is listed on the report with the results and calibration data is provided where applicable.

The web directory containing the table of results and PDF download also contains pictures including, most importantly the portion actually analyzed. These can be saved by opening them and right clicking. Also a cvs spreadsheet download option is available and a quality assurance report is posted for each set of results. This report contains expected versus measured values for 3-5 working standards analyzed simultaneously with your samples.

All results reported are accredited to ISO-17025 standards and all analyses were performed entirely here in our laboratories. Since Beta is not a teaching laboratory, only graduates trained in accordance with the strict protocols of the ISO-17025 program participated in the analyses. When interpreting the results, please consider any communications you may have had with us regarding the samples.

If you have specific questions about the analyses, please contact us. Your inquiries are always welcome.

The cost of the analysis was charged to the VISA card provided. Thank you. As always, if you have any questions or would like to discuss the results, don't hesitate to contact me.

Sincerely,

Darden Hood
Digital signature on file

BETA ANALYTIC INC.
DR. M.A. TAMERS and MR. D.G. HOOD
4985 S.W. 74 COURT
MIAMI, FLORIDA, USA 33155
PH: 305-667-5167 FAX:305-663-0964
beta@radiocarbon.com

REPORT OF RADIOCARBON DATING ANALYSES

Mr. Frank Florin — Report Date: 8/1/2013

Florin Cultural Resource Services — Material Received: 7/15/2013

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 353996	2920 +/- 30 BP	-19.9 o/oo	3000 +/- 30 BP

SAMPLE : 17GW-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 1370 to 1340 (Cal BP 3320 to 3290) AND Cal BC 1320 to 1190 (Cal BP 3270 to 3140)
Cal BC 1180 to 1150 (Cal BP 3130 to 3100) AND Cal BC 1150 to 1130 (Cal BP 3100 to 3080)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 353998	2880 +/- 30 BP	-19.5 o/oo	2970 +/- 30 BP

SAMPLE : 17GW-2
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (bone collagen): collagen extraction: with alkali
2 SIGMA CALIBRATION : Cal BC 1300 to 1120 (Cal BP 3250 to 3070)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 354000	6010 +/- 40 BP	-18.5 o/oo	6120 +/- 40 BP

SAMPLE : 37G-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (cremated bone carbonate): bone carbonate extraction
2 SIGMA CALIBRATION : Cal BC 5210 to 4940 (Cal BP 7160 to 6890)

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 354002	630 +/- 30 BP	-28.7 o/oo	570 +/- 30 BP

SAMPLE : 37GW5-1
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (plant material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1300 to 1360 (Cal BP 640 to 590) AND Cal AD 1380 to 1420 (Cal BP 570 to 530)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-19.9:lab. mult=1)

Laboratory number: **Beta-353996**

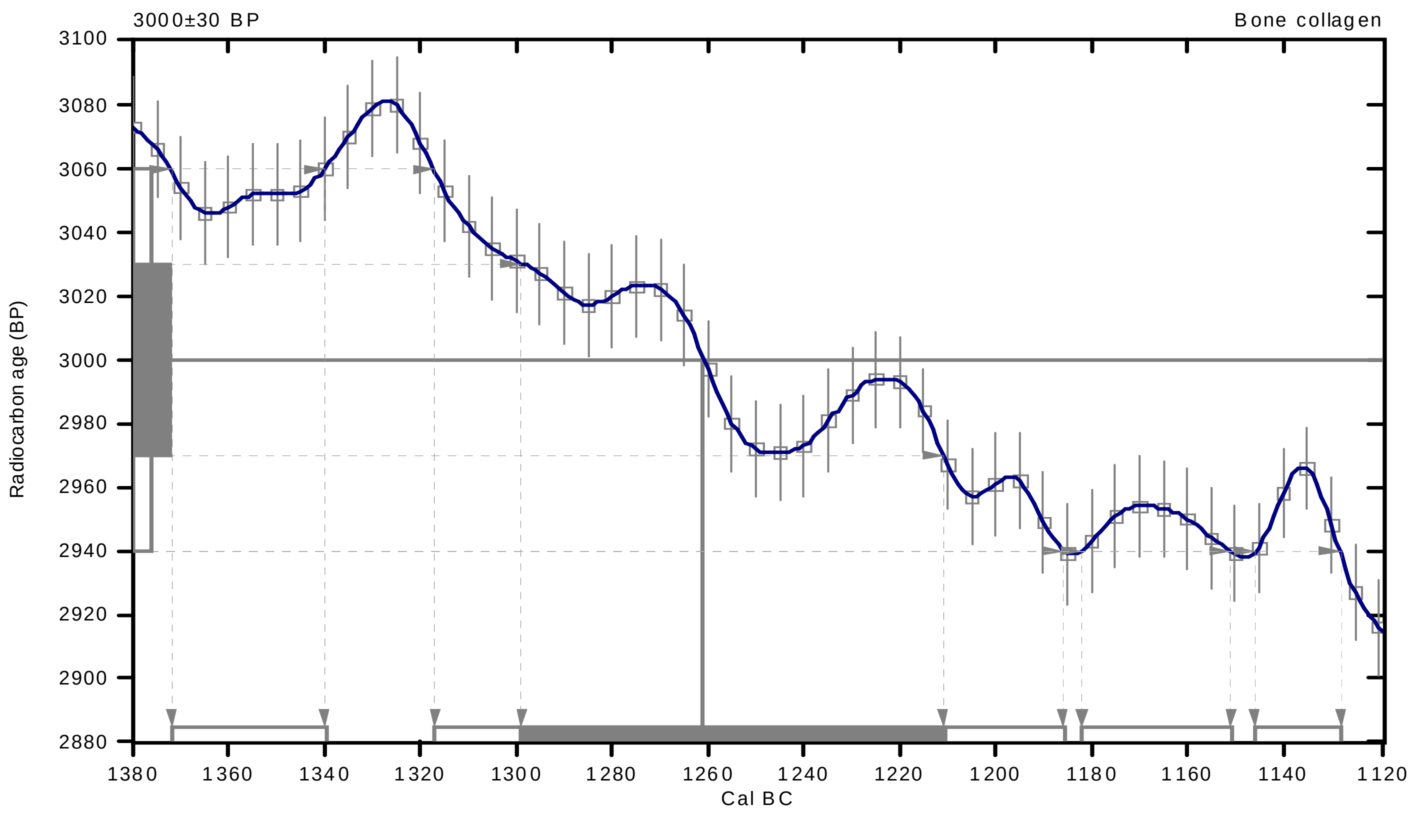
Conventional radiocarbon age: **3000±30 BP**

2 Sigma calibrated results: (95% probability) **Cal BC 1370 to 1340 (Cal BP 3320 to 3290) and Cal BC 1320 to 1190 (Cal BP 3270 to 3140) and Cal BC 1180 to 1150 (Cal BP 3130 to 3100) and Cal BC 1150 to 1130 (Cal BP 3100 to 3080)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1260 (Cal BP 3210)

1 Sigma calibrated result: (68% probability) Cal BC 1300 to 1210 (Cal BP 3250 to 3160)



References:

Database used

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Mathematics used for calibration scenario

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-19.5:lab. mult=1)

Laboratory number: **Beta-353998**

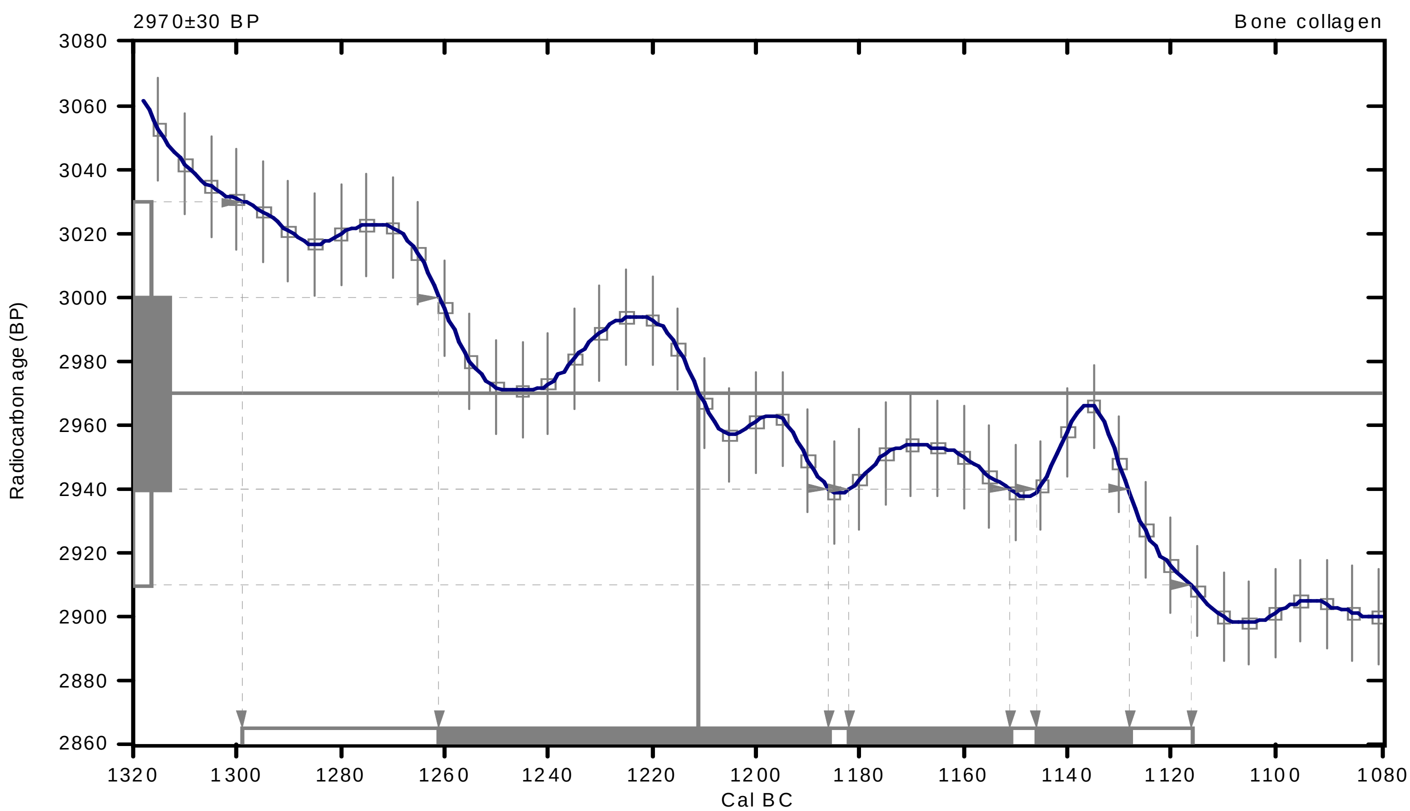
Conventional radiocarbon age: **2970±30 BP**

2 Sigma calibrated result: (95% probability) **Cal BC 1300 to 1120 (Cal BP 3250 to 3070)**

Intercept data

Intercept of radiocarbon age with calibration curve: Cal BC 1210 (Cal BP 3160)

1 Sigma calibrated results: (68% probability) Cal BC 1260 to 1190 (Cal BP 3210 to 3140) and
Cal BC 1180 to 1150 (Cal BP 3130 to 3100) and
Cal BC 1150 to 1130 (Cal BP 3100 to 3080)



References:

Database used

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References to INTCAL09 database

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Mathematics used for calibration scenario

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CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-18.5:lab. mult=1)

Laboratory number: **Beta-354000**

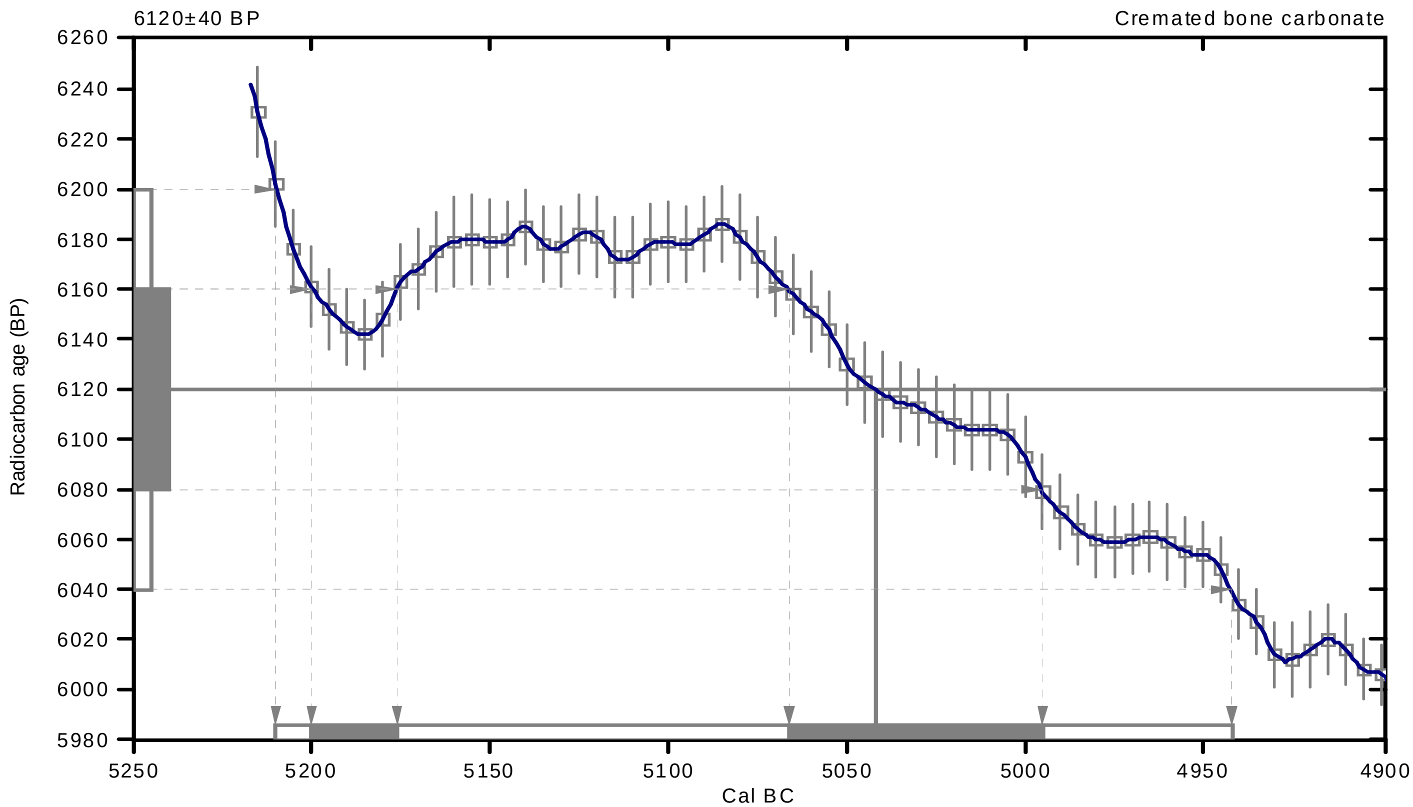
Conventional radiocarbon age: **6120±40 BP**

2 Sigma calibrated result: **Cal BC 5210 to 4940 (Cal BP 7160 to 6890)**
(95% probability)

Intercept data

Intercept of radiocarbon age
with calibration curve: Cal BC 5040 (Cal BP 6990)

1 Sigma calibrated results: Cal BC 5200 to 5180 (Cal BP 7150 to 7130) and
(68% probability) Cal BC 5070 to 5000 (Cal BP 7020 to 6940)



References:

Database used
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Mathematics used for calibration scenario
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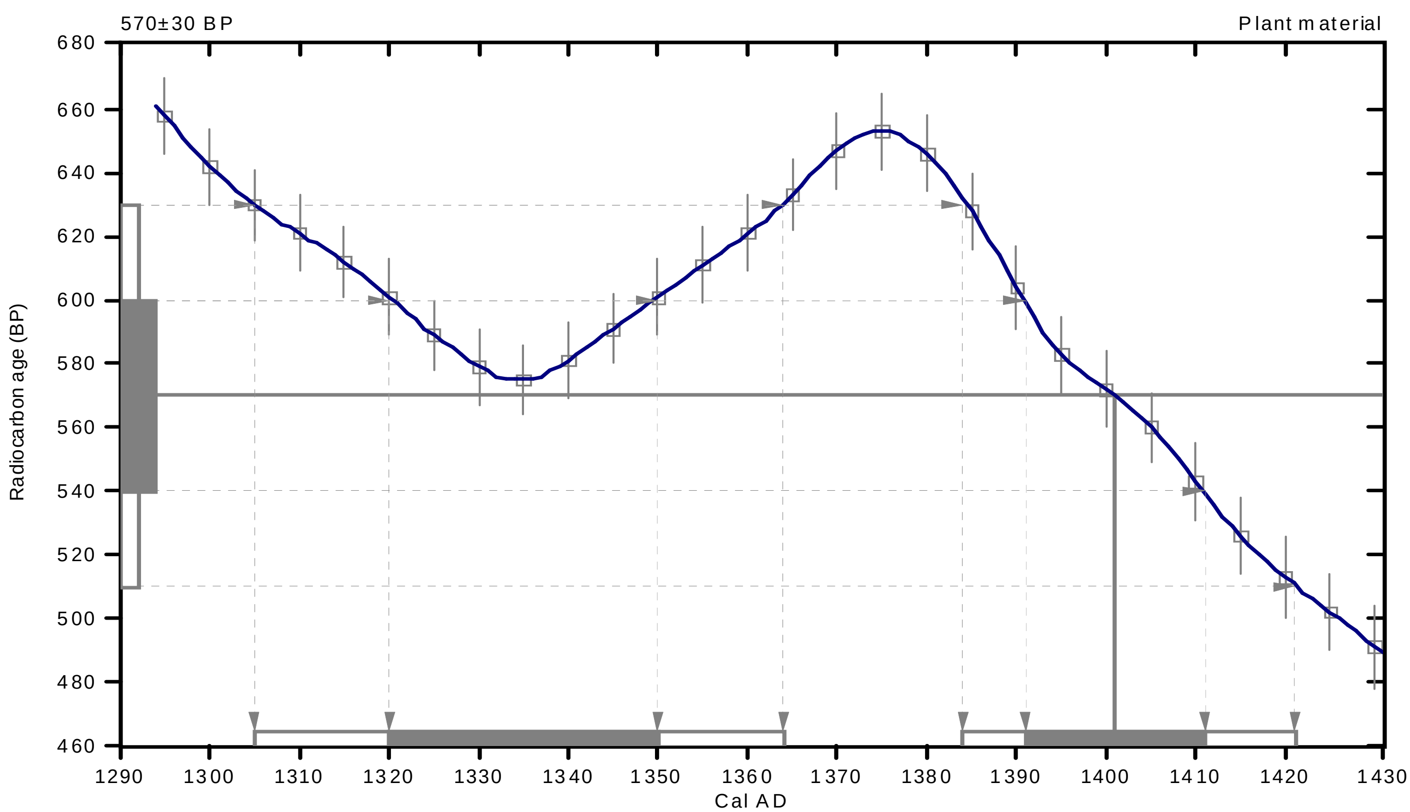
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-28.7:lab. mult=1)

Laboratory number:	**Beta-354002**
Conventional radiocarbon age:	**570±30 BP**
2 Sigma calibrated results: **(95% probability)**	**Cal AD 1300 to 1360 (Cal BP 640 to 590) and** **Cal AD 1380 to 1420 (Cal BP 570 to 530)**

Intercept data

Intercept of radiocarbon age with calibration curve:	Cal AD 1400 (Cal BP 550)
1 Sigma calibrated results: (68% probability)	Cal AD 1320 to 1350 (Cal BP 630 to 600) and Cal AD 1390 to 1410 (Cal BP 560 to 540)



References:

Database used

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References to INTCAL09 database

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Mathematics used for calibration scenario

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APPENDIX F:
SITE 21CR155 DATA RECOVERY PLAN

DATA RECOVERY PLAN FOR SITE 21CR155
SOUTHWEST RECONNECTION PROJECT ALONG CSAH 61
CARVER COUNTY, MINNESOTA

by

Frank Florin, M.A.
Principal Investigator

Submitted by:

Florin Cultural Resource Services, LLC
N12902 273rd Street
Boyceville, WI 54725
Phone/Fax (715) 643-2918

Prepared for:

Carver County
600 East 4th Street
Chaska, MN 55318

August 2013

Table of Contents

List of Figures

PROJECT OVERVIEW

The Minnesota Department of Transportation (Mn/DOT) and Carver County plan to replace and raise TH 101 (SP 1009-24) over the Minnesota River floodplain north of the bridge at Shakopee and reconstruct a connecting segment of CSAH 61 (Flying Cloud Drive) as part of a flood mitigation and road improvement project, designated the Southwest Reconnection Project. The project is in T116N, R23W, Sections 35 and 36, Carver County and T115N, R23W, Section 1, Scott County. There is no federal funding for this project. However, Mn/DOT and Carver County are obtaining wetland permits from the U.S. Army Corps of Engineers (Corps), and therefore the project is reviewed under Section 106 of the National Historic Preservation Act. Also, portions of the site are located within public lands along the CSAH 61 right-of-way (ROW) and are regulated under the Minnesota Field Archaeology Act (Minnesota Statutes 138:31-42).

Florin Cultural Resources Services, LLC (FCRS) was retained to conduct a Phase 1 archaeological survey and Phase 2 evaluation for the project. Fieldwork was conducted between October 19, 2012 and July 2, 2013. A geomorphological investigation of the project area was conducted by Strata Morph Geoexploration to interpret the Holocene stratigraphy and assess the geomorphic potential for archaeological sites. In order to expedite the permitting process, the archaeological results and recommendations were submitted to the Corps in a summary report in July 2013 (Florin 2013), pending completion of final report in August 2013.

Five sites were identified during the survey. Site 21CR155, which is located in the Carver County portion of the project, is recommended eligible for listing on the National Register of Historic Places (NRHP) under Criterion D and will be affected by the project. This document presents a data recovery plan to mitigate the adverse effects of the project on site 21CR155, as site avoidance is not feasible. The data recovery follows the Minnesota State Historic Preservation Office (SHPO) and Minnesota Office of State Archaeologist OSA *Manual for Archaeological Projects in Minnesota* (Anfinson 2001 and 2011) and the *Secretary of the Interior's Standards and Guidelines Archeology and Historical Preservation (*48 FR 44716-42).

SITE SUMMARY

Site 21CR155 is a multicomponent Middle and Late Archaic habitation site situated at the intersection of Archaeological Regions 2e – Prairie Lake East, 2n – Prairie Lake North, and 4s – Central Lakes Deciduous South. A map of the site on the USGS 7.5' topo and on aerial imagery is presented in Figures 1 to 4. The site is located within the construction limits along CSAH 61 (Flying Cloud Drive), which extend beyond the ROW and will include construction excavation to a depth of three meters under the existing road (Figures 3 and 4). Radiocarbon dating of culturally modified faunal material provided dates for three site occupations of approximately 8000, 7100, and 3100 Cal BP.

The site is in T116N R23W, SE and NE, Section 35 and occupies an area of approximately 480 by 60 meters, encompassing 6.6 acres (26,800 m^2). The UTM coordinates for the center of the site are E456830 N4962215 (1983 NAD Zone 15). The site is bisected by CSAH 61, and a portion of the site is either under the road or has been destroyed by previous road construction. The total site area is approximately 14,410 m^2, excluding the portion of the site which may exist below the road. However, portions of the site are devoid of cultural deposits, and the area of the site containing cultural deposits is approximately 7,930 m^2, of which 6,763 m^2 (85%) will be directly impacted by road construction excavation to a depth of three meters (Figures 3 and 4). Artifact density across most of the site is fairly low and has limited research potential. The data recovery plan includes excavation of 67 m^2 in areas of the site that offer the greatest research potential.

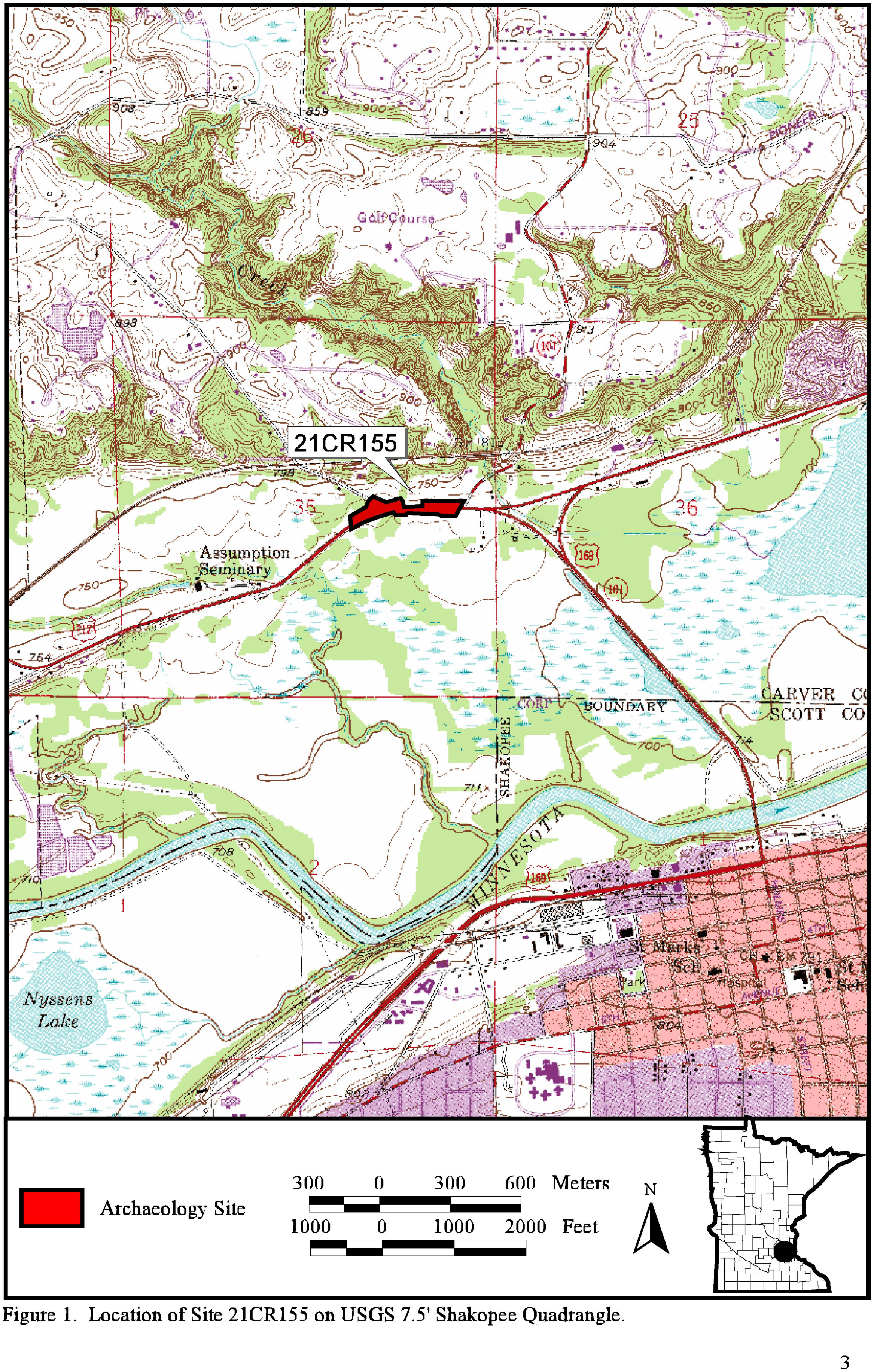

Figure 1. Location of Site 21CR155 on USGS 7.5' Shakopee Quadrangle.

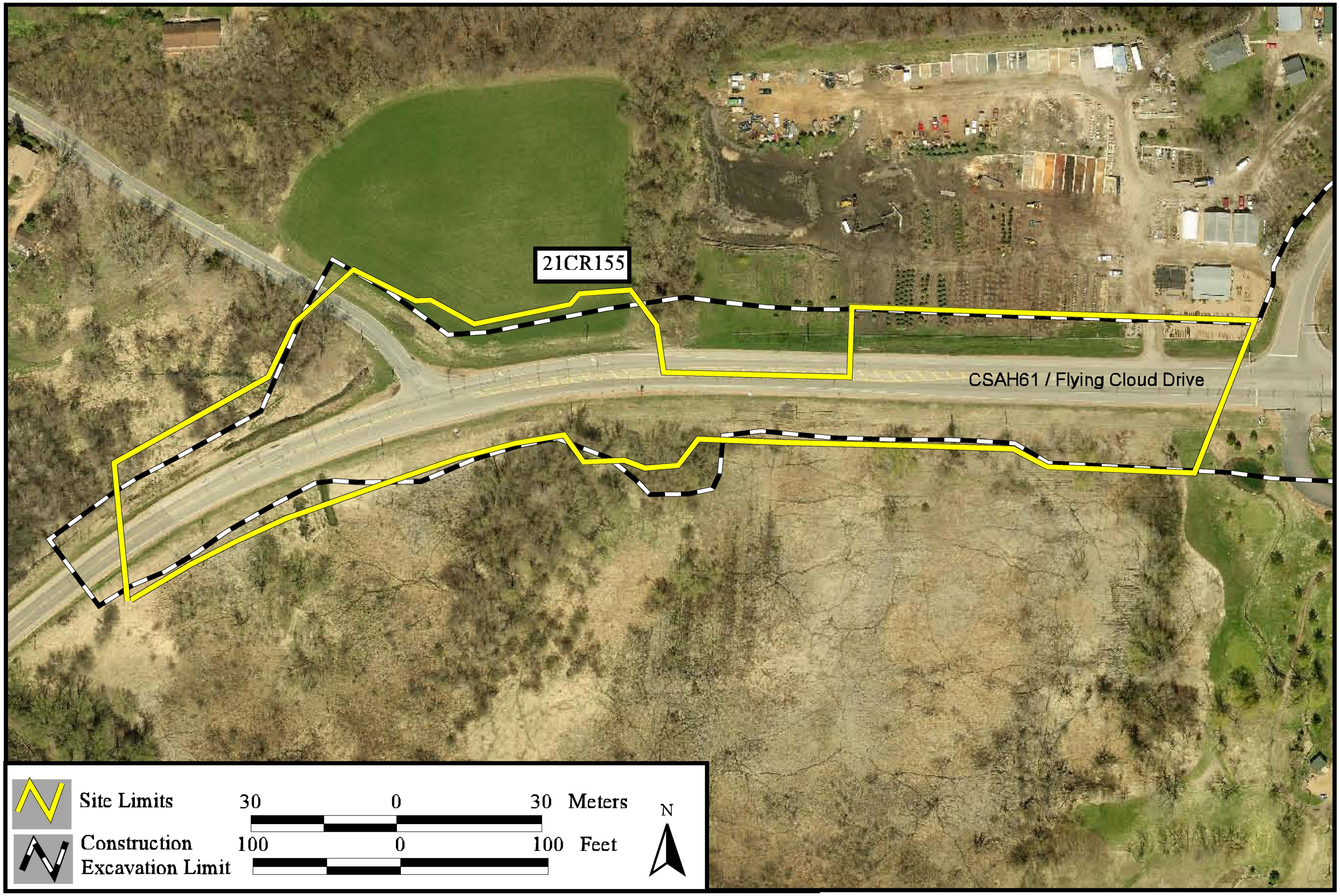

Figure 2. Site 21CR155 Map on 2011 Pictometry Aerial Image.

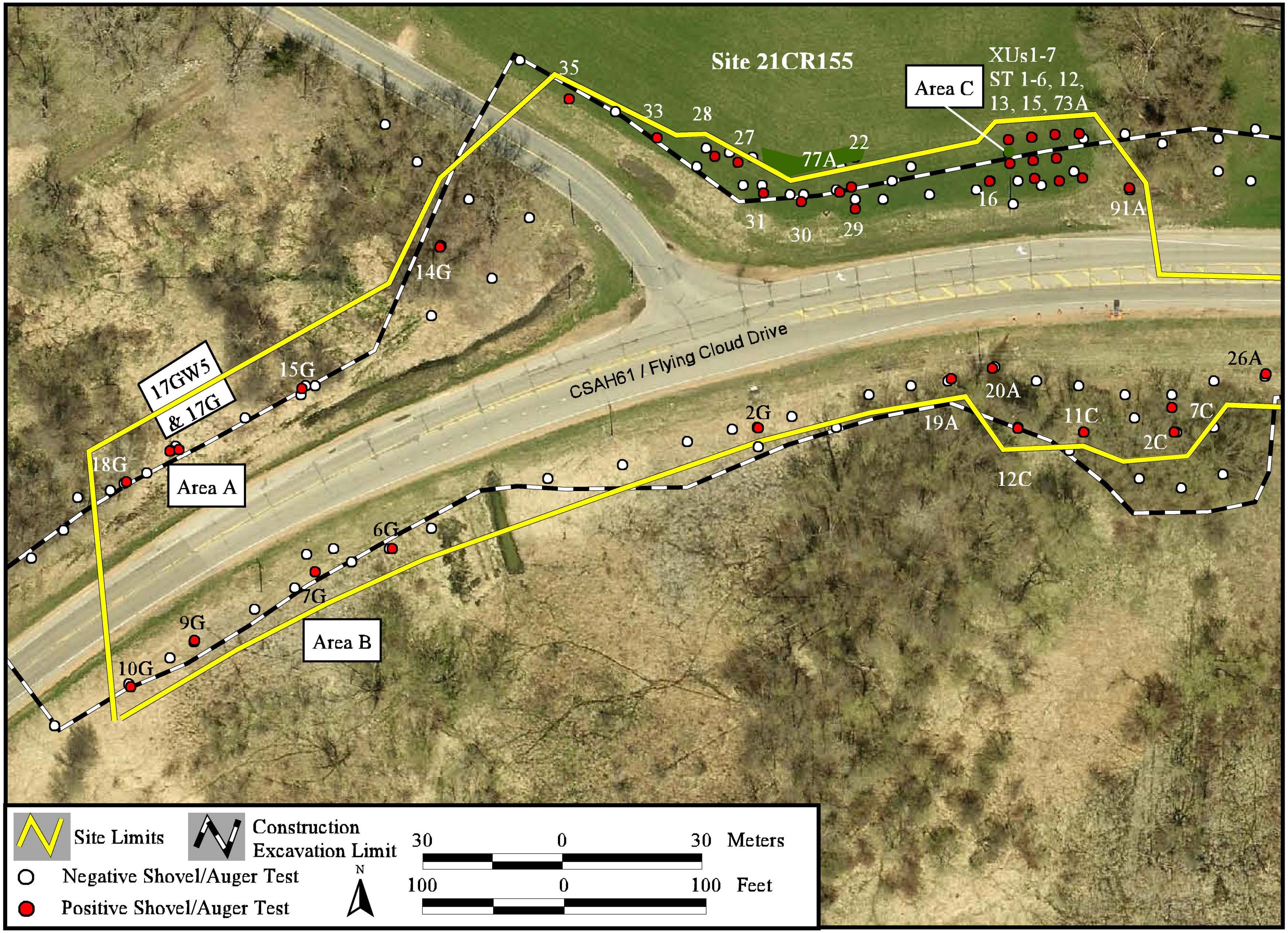

Figure 3. Western Portion of Site 21CR155 Map on 2011 Pictometry Aerial Image.

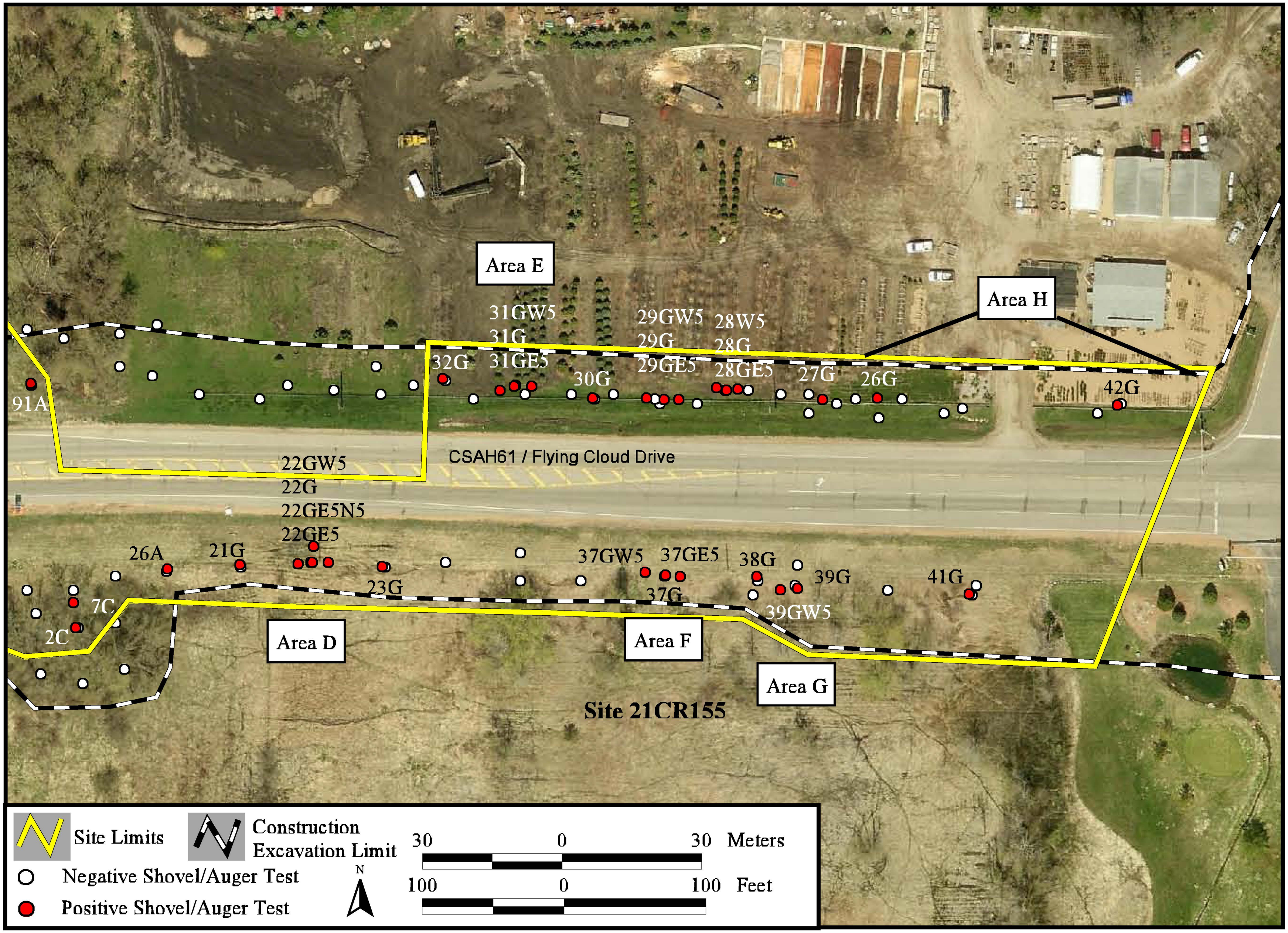

Figure 4. Eastern Portion of Site 21CR155 Map on 2011 Pictometry Aerial Image.

SETTING

Site 21CR155 is located along the northern margin of the Minnesota River valley bottom, north of Shakopee, Minnesota on the north and south sides of CSAH 61. The site extends from Great Plains Blvd to 145 meters west of Bluff Creek Drive within the CSAH 61 ROW and also on private lands adjacent to the ROW. On the north side of CSAH 61, the site extends from east to west across the Brookside Garden Center (plant nursery), an agricultural field, and wetlands. The site area on the south side of CSAH 61 is in a wetland. Vegetation in the wetland includes a mixture of woods, grasses, and cattails. The water table is at or near the surface in the wetlands, with some areas containing standing water. Much of the upland landscape was prairie during the middle Holocene occupations, although riparian forests and wetlands were present in the river valley.

GEOMORPHOLOGY AND SOILS

The archaeological components at 21CR155 are primarily contained in a cumulic clayey lacustrine soil that formed in a former valley-bottom lake deposit, which is deeply buried across most of the site by paludal (marshy) and alluvial fan deposits. However, this lacustrine soil occurs near the surface in the western portion of the site where alluvial fan deposits are absent and paludal deposits are thinner. A small portion of the site also exists within colluvial toe-slope deposits.

Three main depositional units are present across most of the site. Historic alluvial fan deposits occur from the surface to a maximum depth of 2.5 meters, but are absent at the west end of the site. These deposits are gravelly sand with bands of silt and loam. A peat and muck deposit of varying thickness is present below the alluvium and occurs at the surface in areas lacking alluvium. A cumulic, clayey lacustrine soil, which is up to 2.0 meters thick, is the basal unit underlying these deposits. Artifacts were recovered in this soil unit from 0.2 to 3.8 meters below the surface.

The site landscape was initially suitable for occupation during the Early to Middle Holocene, after the valley-bottom lake had receded. Subsequent to the occupation of the site, wetter environmental conditions caused ground-water levels to rise, resulting in the expansion of wetlands that covered the site and deposited peat and muck. An approximate date for the expansion of wetlands over the site is Cal AD 1375, based on radiocarbon dating of organic material in the muck that overlies the lacustrine soil. Additional major deposits occurred during the early Euro-American settlement. As the land was cleared and tilled, significant erosion caused alluvium to be deposited in alluvial fans on the valley floor at the mouths of streams and intermittent drainages.

PREVIOUS PHASE 1 AND 2 INVESTIGATIONS

No previously recorded sites were reported at the location of 21CR155, based on a review of site maps and the site record database at the Minnesota State Historic Preservation Office. Site 21CR155 was first identified in the fall of 2012, and Phase 2 evaluation was conducted on a portion of the site in fall/winter of 2012. Additional areas of the site were identified during Phase 1 survey in the summer of 2013, and a Phase 2 evaluation of these areas was completed in summer 2013. Field methods adhered to the SHPO and OSA guidelines for archaeological fieldwork and the MnDOT protocol for deep-site testing.

Site testing included seven (1 x 1 meter) excavation units and 118 deep auger test locations, with 67 test locations containing artifacts. Whenever possible, three deep auger tests were dug at each test location to recover a volume of soil equivalent to a standard shovel test. The testing interval ranged from 5 to 15 meters. It was not feasible to dig excavation units in most areas of the site because of the high water table. These areas were instead tested using close-interval auger tests to bracket positive Phase 1 tests.

Artifacts were recovered from 20 to 380 cm below surface, and nearly all artifacts were recovered from a buried cumulic lacustrine soil. This range in depths reflects the varying depth of this buried soil. Also, multiple components are present in some areas of the site, as artifacts were recovered from multiple soil horizons, and artifacts were separated by as much as 1.6 meters in some tests.

Artifact Summary
A total of 439 artifacts were recovered from the site during the Phase 1 survey and Phase 2 evaluation. Faunal material (n=222; 51%) was the most abundant artifact type followed by lithics (n=159; 36%) and significantly smaller amounts of fire-cracked rock (FCR) (n=51; 12%). A few historic clinkers (n=7; 2%) were recovered from the historic alluvium. A plot of the artifact types by depth across the site is presented in Figures 5 and 6.

Faunal
Select faunal material was analyzed by Jim Theler at the University of Wisconsin-LaCrosse. The most numerous faunal remains were classified as unidentified vertebrate (n=95; 43%) and medium/large mammal (n=91; 41%), followed by smaller amounts of large mammal (n=22; 10%), molluscan (bivalve shell) (n=5; 2%), cf. Bison bison (n=2; 1%), turtle (n=2; 1%), bison or elk (n=2; 1%), catfish (2; 1%), and small mammal (n=1; 1%). The large mammal remains are likely bison, based on the presence of two probable (cf.) bison bones in the assemblage. It is also expected that most of the medium/large mammal and vertebrate remains are also bison as they were recovered in close association with bison remains but were too small and fragmentary to identify. However, some of these remains could also represent other animals such as elk, deer, or bear. Direct evidence of processing was observed on three spirally fractured large mammal bones that are likely bison. Approximately 20 percent of the faunal remains were thermally altered (burned or calcined) as a result of discarding bones into a fire hearth. The high density of faunal material in some areas, along with the skeletal portions present (teeth, vertebra, long bones, and lower limbs) suggest that these areas represent kill sites with subsequent butchering activities.

Lithics
The lithic assemblage consists of 147 pieces of lithic debris, ten stone tools, and two cores (Table 1). A variety of flake types, tools, and lithic materials are present in the assemblage. The lithic debris suggests that a full range of lithic activities occurred at the site, including initial reduction, bifacial shaping and thinning, and late-stage tool manufacturing or tool maintenance. Ten chipped stone tools were recovered, including a projectile point blade with broken base, a projectile point/knife medial blade fragment, a late-stage biface, three utilized flakes, a retouched flake, an end scraper, an awl, and a graver.

Lithic materials consisted primarily of Prairie du Chien Chert (oolitic) and Swan River Chert, with smaller amounts of other materials. Exotic materials include Knife River Flint, which has its source in west-central North Dakota, and Hixton Group quartzite, which is derived west-central Wisconsin. Non-local materials include Galena and Blanding cherts. Blanding Chert outcrops in northeastern Iowa, and Galena Chert is available in lag deposits and bedrock exposures in southeastern Minnesota and adjacent areas of Wisconsin, Iowa, and Illinios. The other lithic materials are locally available, with bedrock sources of Prairie du Chien Chert available in the vicinity. The unidentified materials could be either local or non-local materials.

*these tests were only single augered so the volume of recovered soil is 1/3 that of the other tests

Shovel Test #'s L= Lithic B=Faunal Material F=Fire-Cracked Rock T=Lithic Tool

Depth cmbs	18G	17G W5	17G	15G	14G	33	35	28	27	31	30	77A *	22	29	30	16	1	15	73A *	2	3	4	5	13	6	12	91A *	32G	31G W5	31G	31G E5	30G	29G W5	29G *	29G E5	28G W5	28G *	28G E5	27G	26G *	42G *
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Figure 5. Site 21CR155 Summary of Artifacts from Shovel Tests on North Side of CSAH 61from West to East Across Site.

* single augered tests with volume of recovered soil 1/3 that of the other tests; ** double augered tests with volume of recovered soil is 2/3 that of the other tests

Shovel Test #'s — L= Lithic B=Faunal Material F=Fire-Cracked Rock T=Lithic Tool

Depth	10G	9G	7G **	6G	6GE5	2G	19A	20A	12C	11C	7C	2C	26A	21G **	22GW5	22G	22GE5 **	22GE5N5 *	23G	37GW5	37G	37GE5 *	38G **	39GW5 **	39G	41G
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170												1T			1B	1L										
180							1F										1L 3F									
190										1L			1L							1L						
200																										
210									1F		1L						1L 2F	2L 1B 3F								
220																										
230														1L												
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Figure 6. Site 21CR155 Summary of Artifacts from Shovel Tests on South Side of CSAH 61from West to East Across Site.

Table 1. Site 21CR155 Summary of Lithic Artifacts.

Material	Primary Flake	Secondary Flake	Tertiary Flake	Other Grade 4	Shatter	Broken Flake	Bipolar Flake	Tool/Core	Total	%
Prairie du Chien (oolitic) Chert	10	6	1	10	2	9	-	1 projectile point/knife; 1 graver; 1 end scraper; 1 utilized flake; 1 bifacial core	**43**	**27**
Swan River Chert	7	1	2	6	1	12	1	1 projectile point; 1 utilized flake	**32**	**20**
Unidentified chert	2	1	1	6	2	4	-	-	**16**	**10**
Quartz	2	-	1	7	4	2	-	-	**16**	**10**
Unidentified material	2	1	-	2	3	3	-	1 awl	**12**	**8**
Hixton Group Quartzite	-	2	1	-	-	7	-	1 unfinished biface, stage 4	**11**	**7**
Basalt	4	-	-	-	3	-	-	1 utilized flake; 1 retouched flake	**9**	**6**
Knife River Flint	-	-	5	1	-	-	-	-	**6**	**4**
Galena Chert	-	1	-	1	1	1	-	-	**4**	**3**
Chalcedony	-	-	-	-	-	1	1	-	**2**	**1**
Quartzite	1	-	-	-	1	-	-	-	**2**	**1**
Blanding Chert	-	-	-	-	-	1	-	-	**1**	**<1**
Brown chalcedony	1	-	-	-	-	-	-	-	**1**	**<1**
Siltstone	1	-	-	-	-	-	-	-	**1**	**<1**
Granite	1	-	-	-	-	-	-	-	**1**	**<1**
Igneous/metamorphic	-	-	-	-	-	-	-	1 nonbifacial core	**1**	**<1**
Metamorphic	-	-	-	-	1	-	-	-	**1**	**<1**
Total	**31**	**12**	**11**	**33**	**18**	**40**	**2**	**12**	**159**	**-**
%	**19**	**8**	**7**	**21**	**11**	**25**	**1**	**8**	**-**	**100***

FCR

Fifty-one pieces of FCR were recovered. Most of these are granitic (n=37), but other materials include basalt (n=7), metamorphic (n=5), igneous (n=1), and unidentified material (n=1). Nearly all of the FCR consists of angular pieces, with only a small amount of friable or spalled pieces.

Radiocarbon Dates

Five bone samples were submitted to Beta Analytic, Inc for AMS dating (Table 2). The bones had evidence of cultural modification and were in direct association with other artifacts. It is believed the samples are uncontaminated, and the dates accurately reflect site occupations. Two dates on soil and peat were also obtained.

Table 2. Site 21CR155 Radiocarbon Dates on Faunal Material.

Material/ Provenience	Beta Lab No.	$^{13}C/^{12}C$ Ratio (o/oo)	Conventional ^{14}C Age B.P.	2 Sigma Calibrated Results (95% Probability)
Bone collagen XU 6 220-230 cmbs	340997	-18.2 o/oo	7160 +/- 30 BP	Cal BC 6060 to 5990 (Cal BP 8020 to 7940)
Calcined (cremated) bone carbonate ST 27 120-155 cmbs	345135	-23.5 o/oo	6320 +/- 40 BP	Cal BC 5320 to 5300 (Cal BP 7270 to 7250) and Cal BC 5240 to 5230 (Cal BP 7190 to 7180)
Calcined (cremated) bone carbonate ST37G 295-325cmbs	354000	-18.5 o/oo	6120 +/- 40 BP	Cal BC 5210 to 4940 (Cal BP 7160 to 6890)
Bone collagen ST17GW 85-100cmbs	353996	-19.9 o/oo	3000 +/- 30 BP	Cal BC 1370 to 1340 (Cal BP 3320 to 3290)/Cal BC 1320 to 1190 (Cal BP 3270 to 3140)/Cal BC 1180 to 1150 (Cal BP 3130 to 3100)/Cal BC 1150 to 1130 (Cal BP 3100 to 3080)
Bone collagen ST17GW 85-100cmbs	353998	-19.5 o/oo	2970 +/- 30 BP	Cal BC 1300 to 1120 (Cal BP 3250 to 3070)

Site Integrity

There was no evidence in our tests of modern disturbances to the archaeological components, and only a small amount of rodent runs and bioturbation was observed in the tests. The soil is dense clay that seems to inhibit vertical displacement of artifacts. The vertical patterning of artifacts in the excavation units from a single component was generally tightly clustered within a 20 to 25 cm zone, indicating there is only minimal artifact displacement from natural causes. Faunal material is moderately well-preserved. In summary, the site has well-preserved cultural deposits that have integrity.

Conclusions and NRHP Eligibility

Site 21CR155 is a multicomponent Middle and Late Archaic habitation located along the margin of a former valley-bottom lake in the Minnesota River valley. Radiocarbon dating of faunal material provided dates for three occupations of approximately 8000, 7100, and 3100 Cal BP. The site likely contains additional occupations that cannot be defined from current site data. Most of the site is deeply buried below alluvial fan and paludal deposits.

Artifacts recovered from the site include faunal remains, lithic debris, stone tools, and FCR. Artifact density is generally low to moderate. However, four moderate to high density areas were identified, including two large mammal (cf. bison) kill/processing areas and two lithic concentrations. Two other locations have moderate density and multiple components. Site activities are inferred to include hunting, animal/plant processing, cooking/heating, lithic reduction, and stone tool production and resharpening.

Faunal remains include cf. bison, turtle, catfish, and possibly other unidentified medium or large mammals. Approximately 20 percent of the faunal remains were thermally altered (burned or calcined) and a few bones contain evidence of butchering.

The lithic debris assemblage suggests that a full range of lithic activities occurred at the site. While initial reduction of cobbles appears to have been a primary activity, there is also a moderate amount of flake types from bifacial shaping/thinning and late-stage tool manufacturing or tool maintenance. A wide variety of lithic materials occur at the site. Locally available materials are most common, with oolitic Prairie du Chien Chert and Swan River Chert being most abundant. High-quality, exotic materials included Knife River Flint and Hixton Quartzite, which were procured though long-distance trade networks or possibly travel to source areas. Other non-local materials (Galena and Blanding chert) from northeastern Iowa and southeastern Minnesota were also recovered. A variety of stone tools were recovered that are indicative of hunting, butchering, animal/plant processing, hide working, and bone and woodworking activities.

The presence of FCR and thermally altered faunal material suggests that fire heaths or cooking pits were present, although none were identified. The site has well-preserved cultural deposits that have integrity.

Site 21CR155 is recommended eligible for listing on the NRHP under Criterion D because it has integrity and can provide important information on several important research themes for the Archaic Period in southern Minnesota. Therefore a data recovery is needed to mitigate the adverse effects of the project on site 21CR155, as site avoidance is not feasible.

RESEARCH THEMES

Relevant historic contexts and basic research questions for the Archaic Period are presented in multiple documents (Anfinson 1997; Dobbs 1988; Gibbon 2012; Gibbon and Anfinson 2008). Because of the very sparse and limited knowledge of the Archaic Period in southern Minnesota, it is important to address basic research questions that are fundamental to understanding this culturally and environmentally dynamic period. Site 21CR155 has the potential to provide important information on the Archaic Period and appears capable of addressing several important research themes, including:

- Age and regional chronology
- Relationship to other regional Archaic complexes
- Climatic and cultural changes during the Archaic Period
- Artifact assemblage
- Subsistence strategy and settlement pattern
- Site function
- Environmental adaptation
- Lithic technology and raw material use
- Regional interaction and trade
- Site environment
- Site formation processes and geomorphology

RESEARCH DESIGN

Site 21CR155 is a multicomponent Middle and Late Archaic habitation site that is recommended eligible for listing on the NRHP under Criterion D, which includes properties that have yielded, or may be likely to yield, information important in prehistory or history. The site cannot be avoided and will be affected by the Carver County portion of the Southwest Reconnection Project. The primary objective is to aid Carver County in fulfilling its Section 106 obligations by conducting a data recovery at 21CR155 to mitigate the project’s adverse effects to the site. As part of this objective, a detailed and comprehensive technical report documenting the data recovery will be submitted to OSA and SHPO, and the results will also be disseminated to the professional archaeological community and the public (see Dissemination of Project Information Section for details).

The research design for the data recovery was developed to meet these project objectives, and it adheres to the archaeological guidelines established by the SHPO and OSA. The primary components of the data recovery research design are background research, development of specific site research questions, fieldwork to recover data, analysis of site data, production of a technical report, publication of results, and public outreach. These are discussed in greater detail in the following sections.

The data recovery at 21CR155 will focus on recovering site data that will be used to address important research themes for the Archaic Period in southern Minnesota. The Archaic Period occurs during a time of significant environmental changes associated with a warming and drying episode during the middle Holocene. Site 21CR155, which contains multiple components spanning the early to late Holocene, has the potential to provide important information on Archaic life ways and adaptations to the environmental changes at this time.

Research Questions
The following research questions, which are based on the important themes listed above, will guide the data recovery and research at the site. The site has demonstrated that it has or is likely to have the data necessary to address these research questions. These questions will be answered by 1) fieldwork to recover data, 2) the analysis of the artifacts, ecofacts, soils, and site data obtained from the excavation, and 3) research on the Archaic period in the region.

1) What are the ages and cultural affiliations of the components at the site ? How do these components relate to other regional complexes in Minnesota and adjacent states ? What specific diagnostic artifact types are associated with each component ?

   Radiocarbon dating of faunal material and recovering diagnostic artifacts (projectile points) will provide data on the age and affiliation of the site components. The dates and points will be placed within a regional context by comparing them with other Archaic sites. The site contains ample and suitable faunal material for dating, and projectile points may also be present. The artifact assemblage from each component will be analyzed to identify specific diagnostic artifacts.

2) What subsistence remains are associated with each component and is there any change through time ? What do the remains indicate about the site environment and the use of and adaptation to the local environment ? Do the remains indicate a season when the site was occupied ? How do subsistence remains relate to the settlement pattern as indicated by the site's location ?

   The faunal assemblage from each component will be analyzed and compared with the other site components to identify specific subsistence patterns with regard to types of animals and determine if there are any changes through time. The analysis of faunal material will provide direct information on the environment near the site, the available animal resources in the area, and how Archaic peoples interacted with and adapted to the environment. The remains may provide information on seasonality. The types of animal resources at the site will provide evidence to help explain why settlement occurred at this location, which is likely partially based on the resources in the area.

3) What information on lithic technology and lithic activities can be inferred from the lithic debris and cores from each component ? What is the pattern of lithic raw material use for each component ? Are there any changes in lithic technology or raw material use through time ?

   An analysis of the lithic debris and cores will provide direct information on lithic technology with regard to bifacial or unifacial reduction and on the stages of lithic reduction for each component. The lithic assemblage from each component will be analyzed and compared with the other site components *to identify any differences with regard to technology and raw material use through time. Raw material use will be established by examining the lithic debris types and tool types by raw material type.*

4) Is there evidence of regional interaction or trade ? Are there any notable changes through time ?

   Lithic materials are probably the most likely source of evidence for regional interaction and trade. The site contains exotic raw materials from western North Dakota, west-central Wisconsin, and south eastern Minnesota, and north-eastern Iowa.

5) What was the vegetation and environment like in the site area during the time it was occupied ? Is there any notable change through time ?

   Soil samples will be analyzed for pollen and phytoliths which, if preserved, will provide information on vegetation in the site area. Faunal remains at the site will also provide data on the environment in the river valley bottom and adjacent uplands. An assessment of the geomorphology of the area that includes an examination of site soils and a literature and map review for the river valley will also provide information on the environmental setting.

6) What is the geomorphic setting of the site and what are the site formation processes ? What does the geomorphology tell us about the Holocene landscape evolution and the potential for sites in similar geomorphic settings in Minnesota River valley ? What methods would be most useful for identifying and excavating sites in these deeply buried landscapes ?

   Soil profiles at the site will be examined and interpreted by a geomorphologist to determine the setting and geologic processes that occurred over time and how they relate to changing climatic and environmental conditions during the Holocene. This data will inform us about the geomorphic processes and archaeological potential of similar landscapes in the Minnesota River valley. The methods employed during survey at 21CR155 and adjacent project areas indicate that an understanding of geomorphology, combined with deep testing using a bucket auger, is successful at identifying sites on these deeply buried landscapes, even if they are currently in wetlands. The benefits and drawbacks of the survey and excavation methods for deeply buried sites in wetlands will be presented based on the results of the data recovery.

EXCAVATION PLAN

The primary method of answering the proposed research questions will be through the recovery (excavation) and analysis of site data. Hand excavation will be conducted in contiguous 1x1 meter units dug in a blocks that are 2x2 or 3x3 meters in size. The blocks will be placed in areas of the greatest research potential as determined from the Phase 1 and 2 tests results. Eight areas (A-H), totaling 67 m^2, will be excavated. These areas are depicted on the site map in Figures 3 and 4.

Area A is defined by artifacts from Shovel Test 17GW5, which contained 33 faunal fragments and three pieces of lithic debris from 85 to 110 cmbs. Some of the faunal fragments are large mammal remains (probably bison or elk). The high density of faunal material suggests that this location is a kill or butchering area. Two radiocarbon dates were obtained from the bones, yielding dates of between 3320 and 3070 Cal BP. The associated lithic artifacts indicate that lithic activities also occurred at this location. Five granitic rocks similar to FCR were also recovered. This area is the densest faunal deposit identified by shovel tests at the site and represents a Late Archaic occupation at the site. Projectile points may be associated with remains. A 2x2-meter excavation block is proposed in this area and will be expanded if needed based on artifact density and features. Area A has the potential to answer Research Questions 1, 2, 3, 5, and 6.

Area B is defined by artifacts from Shovel Test 7G, which contained 23 pieces of lithic debris from 70 to 110 cmbs. Raw materials were primarily (oolitic) Prairie du Chien Chert, with smaller amounts of Hixton Group Quartzite and Galena Chert. The high density of lithic debris suggests that this location is a lithic workshop. A range of debris types are present, including initial reduction flakes, bifacial shaping and thinning flakes, and late-stage tool manufacturing or tool maintenance flakes. Area B is directly across the road from Area A, and the artifacts from both of these areas were recovered from a similar depth and soil horizon, suggesting they are probably contemporaneous. It is likely that this lithic workshop dates around the same time as the faunal materials from Area A. This area is the densest lithic deposit identified at the site and represents the Late Archaic occupation. A 2x2-meter excavation block is proposed in this area and will be expanded if needed based on artifact density and features. Area B has the potential to answer Research Questions 1, 3, 4, 5, and 6.

Area C contains two locales areas where excavation is proposed. The first locale is defined by artifacts from Shovel Tests 1-6 and Excavation Units 3-6, which contained a total of 146 pieces of faunal material (cf. bison, catfish, turtle with about 20% thermally altered), 38 pieces of lithic debris, a projectile point or knife blade fragment, a utilized flake, and four pieces of FCR. Raw materials were primarily Swan River Chert and (oolitic) Prairie du Chien Chert, with smaller amounts of exotic materials including Hixton Group Quartzite and Knife River Flint. Flaking debris is mostly initial reduction flakes with a smaller amount of late-stage tool manufacturing or tool maintenance flakes. Artifacts were recovered from a buried soil between about 180-220 cmbs. A radiocarbon date on butchered cf. bison bone yielded a date of Cal 8020 to 7940 BP. This area has a moderate artifact density, including a variety of subsistence remains, lithic debris, stone tools, and exotic lithic material. The presence of FCR and thermally-altered bone suggests that fire hearths are present. Three 2x2-meter excavation blocks are proposed in this area, which will be expanded if needed based on artifact density and features. Area C has the potential to answer Research Questions 1, 2, 3, 4, 5, and 6.

The second locale in Area C is defined by artifacts from Shovel Test 16, which contained eight pieces of lithic debris, a graver, and a projectile point tip from 170-200 cmbs. The raw material was primarily Swan River Chert with a smaller amount of (oolitic) Prairie du Chien Chert. The high density of lithic debris suggests that this location was a lithic workshop. A range of debris types are present, including initial reduction flakes, bifacial shaping and thinning flakes, and late-stage tool manufacturing or tool maintenance flakes. The stone tools suggest that other activities also occurred in this area. The artifacts from this component were recovered from the same depth and buried soil as the artifacts from nearby Excavation Units 1-6, and this locale also likely dates to ca. 8000 Cal BP. A 2x2-meter excavation block is proposed in this area, which will be expanded if needed based on artifact density and features.

Area D is defined by artifacts from four adjacent tests, Shovel Tests 22G, 22GE5, 22GE5N5, and 22GW5, which contained a total of 25 artifacts, including seven pieces of lithic debris, two pieces of faunal material (one is calcined), and 16 pieces of FCR. Only two auger tests could be dug at the location of Shovel Test 22GE5, and only one auger test at the location of Shovel Test 22GE5N5. Artifact counts likely would have approximately doubled if three auger tests could have been dug at these locations to recover a volume of soil equivalent to a standard shovel test. Artifacts were recovered from 50 to 260 cmbs, and multiple components are present. The component from 50 to 100 cmbs is very sparse and consists of two lithic pieces of debris. A greater density of material is present from 150 to 260 cmbs. The area has a high artifact density that includes a variety of artifact types related to lithic reduction and cooking or heating. There is also sparse evidence for animal processing. The presence of numerous FCR and thermally altered bone suggests a fire hearth may be present. A 2x2-meter excavation block is proposed in this area, which will be expanded if needed based on artifact density and features. Area D has the potential to answer Research Questions 1, 2, 3, 5, and 6.

Area E is defined by artifacts from Shovel Tests 31G, 31GW5, and 31GE5, which contained a total of nine pieces of lithic debris and 13 pieces of FCR. Artifacts were recovered from 110 to 335 cmbs, and multiple components are present. The artifact from 100-150 cmbs is a piece of lithic debris from disturbed soil or fill. The area has a moderate artifact density that includes a variety of artifact types related to lithic reduction and cooking or heating. The presence of FCR suggests that a fire hearth may be present. A 2x2-meter excavation block is proposed in this area, which will be expanded if needed based on artifact density and features. Area E has the potential to answer Research Questions 1, 2, 3, 5, and 6.

Area F is defined by artifacts from Shovel Test 37GE5, which contained one piece of lithic debris and two pieces of calcined faunal material. Only a single auger test could be dug at this location and therefore artifact counts would likely have approximately tripled to a count of nine in volume of soil equivalent to a standard shovel test. Artifacts were recovered from 225 to 310 cmbs, and multiple components appear to be present. Artifact types are related to lithic reduction and cooking or heating. The presence of thermally altered bone suggests that a fire hearth may be present. A 2x2-meter excavation block is proposed in this area, which will be expanded if needed based on artifact density and features. Area F has the potential to answer Research Questions 1, 2, 3, 5, and 6.

Area G is defined by artifacts from Shovel Test 39GW5, which contained two pieces of lithic debris and two calcined faunal pieces. Only two auger tests could be dug at this location and it is likely that the artifact count would be about six if the volume of soil was equivalent to a standard shovel test. Artifacts were recovered from 250 to 380 cmbs, and multiple components appear to be present. Artifact types are related to lithic reduction and cooking or heating. The presence of thermally altered bone suggests that a fire hearth may be present. A 2x2-meter excavation block is proposed in this area, which will be expanded if needed based on artifact density and features. Area G has the potential to answer Research Questions 1, 2, 3, 5, and 6.

Area H, at the east end of the project on the north side of CSAH 61, was not fully investigated during the Phase 2 because the sandy, alluvial fan deposits in this area are very deep and caused the auger tests to slump. After several attempts, two single auger tests in this area were completed to the target depth. Two pieces of lithic debris were recovered from the auger at Shovel Test 26G between 300 to 340cmbs, and one piece of lithic debris was recovered from the auger at Shovel Test42G between 360 to 375cmbs. The historic alluvial fan deposits will be removed with a backhoe, and additional shovel tests dug to determine if significant archaeological deposits are present, in which case a 2x2-meter excavation block is proposed for this area, which will be expanded if needed based on artifact density and features. Area H has the potential to answer Research Questions 1, 3, 5, and 6.

Controlled stripping with a backhoe to look for features within the construction excavation area is not feasible in most site areas because of the high water table and time and budget constraints. The only portion of the site that contains archaeological deposits above the water table is in the vicinity of Area C, including the areas from Shovel Tests 16 to 91A and Shovel Tests 29 to 31. The possibility of features exists in this area based on the recovery of thermally altered bone and FCR. Controlled stripping and monitoring in this area within the construction excavation zone will be conducted if there is available time and budget. Soil will be mechanically removed with a backhoe in approximately 20 cm increments at depths where artifacts were identified during Phase 1 and 2 investigations. All work will be monitored, and mechanical digging will cease if any features or significant cultural deposits are identified. The deposits will then be excavated using standard excavation methods.

FIELDWORK METHODS

Field methods and documentation will adhere to guidelines established by the SHPO and OSA in the *Manual for Archaeological Projects in Minnesota*. All excavation work will comply with OSHA regulations. A utility locate will be filed with Gopher State One Call prior to excavation. A backhoe will be used to remove the culturally sterile soil overlying the archaeological deposits in the excavation blocks, as this is the most cost effective method of removing the soil. Appropriate benching, sloping, and shoring of walls will be implemented per OSHA regulations. Because most of the archaeological deposits are below the water table, a dewatering system using sump pumps and/or coffer dams will be necessary. All soil excavated for sump pits or drainage trenches will be recorded and screened for artifacts.

Permits and Access
Part of the site is within the ROW on Carver County lands, and a permit from the OSA will be obtained prior to excavation. The site also extends across four privately owned parcels where most of the excavation will occur. Carver County will obtain landowner permissions prior to excavation.

Unexpected Find of Human Remains
There is no current evidence to suggest that human burials are present at the site. However, if human remains are discovered during fieldwork, work will cease in that area of the site. The remains will be left *in situ,* covered up with the original soil, and immediately reported to the State Archaeologist and local law enforcement authorities.

Excavation Units
Excavation will generally be conducted in 2x2 or 3x3 meter blocks. Excavation within the blocks will be in 1x1 meter units that will be dug and recorded in 10-cm levels below a datum or ground surface. Excavation will consist of shovel skimming in one to two-cm increments. All artifacts recovered from a level will be collected, recorded on level forms, and bagged with their respective level and unit information.

The artifacts are contained within a single soil stratum, so it will not be necessary to excavate by stratigraphic layer. Soil will be screened through ¼" hardware mesh. It is anticipated that most of the soils will be water-screened by using the water that is pumped out of the units. The water screening methodology will involve filling a shallow stock tank with water and soaking the clayey soil in ¼" mesh screens until it softens and partially dissolves. The use of a finer-meshed screen is not feasible because the clayey soils would be exceedingly difficult and cost-prohibitive to screen. However, a 10 percent sample from one unit in each excavation area (A-H) will be screened through 1/8" mesh. If significant finds are recovered from the 1/8" mesh, additional fine screening will implemented. The units will be backfilled after excavation of each block is complete, and the area restored as close as possible to pre-excavation conditions.

Shovel Tests
Shovel tests in Area H will be 40 cm in diameter and dug to culturally sterile soil. Soil will be screened in 20 to 30 cm increments to provide vertical control of artifact provenience. A Seymour auger with a 20-cm (6-inch) diameter bucket will be used for deep testing if the shovel tests do not reach sterile soil. Following the MnDOT protocol for deep-site testing, three deep auger tests will be dug at each shovel test location to recover a volume of soil equivalent to a shovel test.

Features
If cultural features are identified, the surface will be scraped with a trowel to define the feature. The feature will be recorded in planview with a sketch and photos. Field notes will record feature excavation methods and relevant observations and descriptions. The feature fill will be excavated with a trowel. All soil from the feature fill will be bagged for flotation. Feature profiles will be drawn and photographed once half of the feature is excavated.

Geomorphologic Investigation
The project geomorphologist will visit the site to examine soil profiles in the excavation blocks and record soil profiles and descriptions that will be used for site interpretation and environmental reconstruction.

Soil Samples
Soil samples for pollen and phytolith studies will be collected from representative levels of the excavation units.

Field Documentation
A record of daily activities will be recorded in a log that documents fieldwork progress, notable finds, and any other relevant information. Maps will be prepared to illustrate the location of all backhoe excavations, excavation units, and shovel tests. Photographs will be taken of the site area, excavation areas, wall profiles, and features. A record of the photographs will be maintained in a project photo log. The locations of all excavation units and shovel tests will be recorded with a Trimble Geoexplorer 6000 GPS unit, which provides a horizontal and vertical position accuracy of about one cm.

Excavation level forms will be filled out for each 10-cm level, after the completion of each level. These forms will contain information on excavation methods, soil colors and textures, artifact counts, disturbances, and other relevant observations. Soil profiles, using the Munsell colors, will be drawn for each excavation unit wall or representative walls within a block for each area.

Curation
FCRS is in the process of establishing a curation agreement with MHS for the data recovery artifacts and documentation. Artifacts from public lands will be curated at MHS, and private landowners will be encouraged to donate the artifacts to MHS.

LABORATORY METHODS AND ARTIFACT ANALYSIS

Artifacts will be washed, analyzed, and cataloged at the FCRS laboratory in Boyceville, Wisconsin. The artifact assemblage is expected to consist of precontact ceramics, lithic debris, cores, stone tools, faunal remains, and fire-cracked rock.

Artifact cataloging will follow the Minnesota Historical Society (MHS) system. Information recorded in the catalog for each artifact will include site number, provenience bag number, specimen number(s), provenience, artifact class, artifact descriptions, weight, and size. Additional artifact information will be entered in the “Notes” column. Specific descriptive attributes to be recorded for each artifact class are summarized below. All catalog data will be entered in a Microsoft® Access 2010 database. The following size grade sieves (SG) will be used to sort artifacts: ≥ 1.0” (SG1); <1.0” to ≥0.5” (SG2); <0.5” to ≥0.233” (SG3); and < 0.233” (SG4). Each artifact will be weighed to the tenth of a gram with an electronic scale.

Lithic Analysis
The analysis of lithics will be concerned primarily with the identification of tool types, debris types, raw materials, and lithic technology. Information on site function, stage of lithic reduction, lithic economy, lithic technologies, settlement patterns, and regional interaction may be inferred from this data. Raw material, weight, size grade, and presence/absence of cortex will be recorded for all lithics. Lithic debris will be examined for macroscopic evidence of modification, such as use-wear or retouch. All lithics will be examined using a 10x magnification hand lens, which is useful for identifying micro-flaking, lithic material, and other features not visible without the aid of magnification.

Lithic raw material types will be identified through the analyst's familiarity with the raw material types in the region, by comparison with FCRS's sample collections, and through the use of published guides to lithic resources of Minnesota, Wisconsin, North Dakota, and the Upper Midwest.

The lithic debris analysis methods for the project are based on the results of previous lithic studies and experimental replications (Callahan 1979; Cotterell and Kamminga 1987; Hayden and Hutchings 1989; Magne 1989; Odell 1989; Root 1992, 1997, 1999; Tomka 1989; Yerkes and Kardulias 1993). These studies indicate that lithic-reduction stages and technologies can be inferred from diagnostic flake attributes. The most promising results are derived from studies that consider a combination of several flake attributes from a large sample of lithic debris. Analytical methods relying on size grading (e.g., mass analysis) may not be useful for the lithic analysis because most of the soil will be screened through ¼" mesh, and therefore SG4 (<¼") artifacts typically will not be recovered. The recovery of SG4 debris is imperative for conducting mass analysis (Ahler 1989). If the quantity of SG4 lithics recovered from 1/8" screening is sufficient, then mass analysis will be conducted.

Tool categories will be defined by technological attributes (bifacial, unifacial, or pecked/groundstone) and by whether the tool was patterned or unpatterned. Tool types and their inferred functions (e.g., projectile points, scrapers, utilized flakes, etc.) will be defined by technological attributes in conjunction with morphological attributes (form), general edge angle, size, and comparison with results from micro-wear studies that provide supporting evidence for general tool function (Root 2001; Kooyman 2000:164; Vaughan 1985; Yerkes 1987). Lithic cores will be categorized according to their technological and morphological attributes. Core types will be defined based on bifacial, non-bifacial, or bipolar percussion technology. Pattern of flake removal and presence or absence of edge preparation will be recorded.

Faunal Analysis
Data recorded for faunal remains will include identification to the highest taxonomic level (class), element/side, element portion, and condition. Faunal condition includes those attributes caused by human modification such as spiral fractures, impact fractures, cut marks, and thermal alteration. All faunal material will be weighed and size graded. Faunal specialist Dr. Jim Theler of University of Wisconsin-LaCrosse will be retained to analyze remains that are potentially identifiable. If human remains are identified, they will be reported to the State Archaeologist and set aside in a secure, respectful location.

FCR
FCR is relatively easy to identify in the site area because cobble-sized stones generally do not naturally occur in the soil. Attributes recorded for pieces of FCR will include lithic material and type of fracture or condition, such as angular fracture, spall fracture, or excessively friable. All FCR will be weighed and size graded.

Radiocarbon Dating
The project budget includes funds for obtaining eight additional radiocarbon dates. In addition, we will seek outside funding through a grant from Minnesota Legacy Funds for an additional eight dates. Samples will be sent to Beta Analytic, Inc. Seven radiocarbon dates have already been obtained from the site, including five on faunal material and two on the soil/peat samples.

PROJECT SCHEDULE

Fieldwork is anticipated to extend from mid September to mid November 2013. Lab work, analysis of data and artifacts, research, and reporting will occur from the fall 2013 to summer 2014. The final report will be submitted by July 1, 2014.

KEY PERSONNEL

Frank Florin, FCRS - Principal Investigator, Field and Lab Supervisor, Artifact Analyst
Kent Bakken, FCRS - Co-Field and Lab Supervisor, Artifact Analyst
Dr. James Theler, University of Wisconsin-LaCrosse - Faunal Analyst
Mike Kolb, Strata Morph Geoexploration - Geomorphologist

DISSEMINATION OF PROJECT INFORMATION

The Corps is responsible for tribal consultations. FCRS will provide project information to Carver County, who will authorize release of site information during excavation to the public, interested parties, and media. It is expected that there will be local newspaper coverage, and FCRS will accommodate reporters. The site results will be published in a professional journal, and we will seek outside funding through a grant from Minnesota Legacy Funds to publish the results in a monograph. Public outreach will be accomplished by having an open house at the local public library following the excavation, as the site locale is not conducive to a tour because of heavy traffic and wetlands. A summary of the data recovery, including profiles of the geology and photos of the artifacts, will be available to the public on the FCRS website (construction in process). A detailed and comprehensive technical report documenting the archaeological investigations will be submitted to Carver County, Corps, OSA, and SHPO within seven months of fieldwork completion.

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