7.0 CITY PROPERTY TEST LOCALE

7.1 INTRODUCTION AND BACKGROUND

The City Property test locale is located on a relatively broad, sandy reach of the Minnesota River floodplain at the southern outskirts of the City of New Ulm, Brown County (Figures 3.3.1-2 and 7.1-1). The area chosen for study is situated where the Cottonwood River, a large tributary stream, flows into the Minnesota Valley. Consequently, at least some of the floodplain deposits are probably associated deposition from the Cottonwood River. Both the Cottonwood and the Minnesota rivers have sinuous meandering channel patterns. In addition, numerous lakes and wetlands that formed in abandoned channels indicate that both of these river systems probably regularly migrate laterally.

The City Property test locale measured 60 m × 80 m (197 ft × 263 ft) and is classified by the LfSAs as having moderate suitability for preservation of buried deposits at less than 2 m (6.6 ft) depths. It is owned by the city of New Ulm and is currently being returned to native prairie by the Rahr Malting Company. The area surveyed is generally flat with only a small bench of about 1 m (3.3 ft) difference separating a slightly higher and sandier area in the south from a finer grained, lower area in the north (Figure 7.1-1). Minneiska sandy loam (mollic udifluvent) (Christensen 1988) predominates at the City Property test locale. This soil is moderately well drained, has an A-C horizon sequence formed in sandy loam and sand, and is unleached (Christensen 1988).

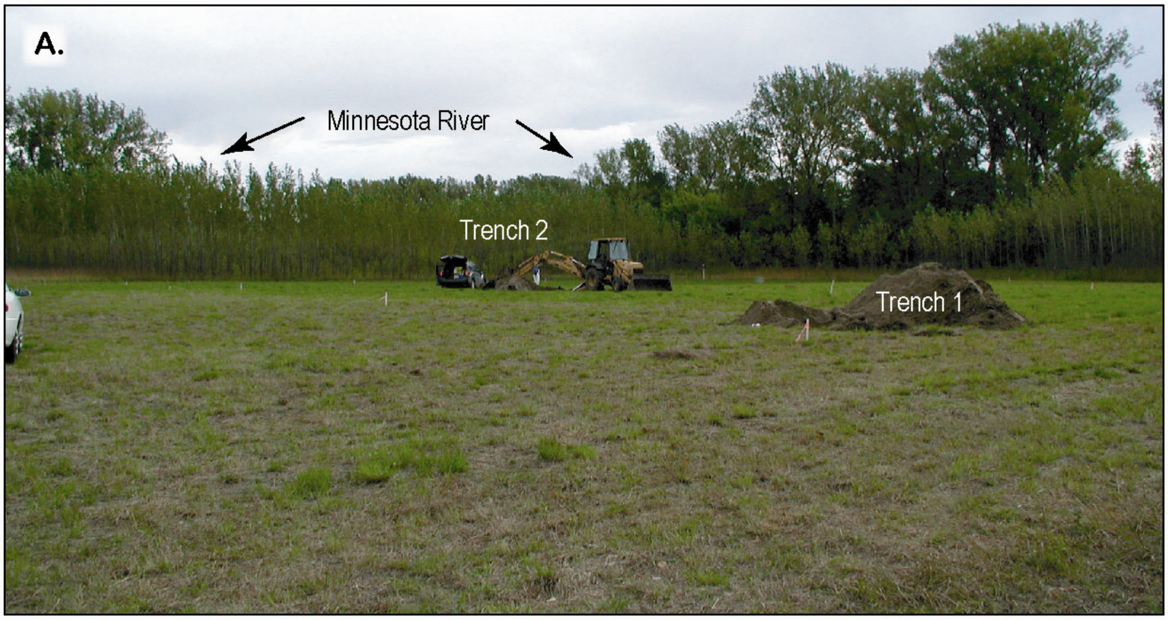
Subsurface investigations were conducted during the development of the Mn/Model LfSAs at Flandrau State Park in the Cottonwood River valley just upstream from the City Property test locale (Hudak and Hajic 2001). Cores collected on the floodplain of the Cottonwood River revealed predominately sandy deposits with weakly developed soils (A-C and A-Bw horizon sequences). Some of the sediment sequences had a loamy cap and all were calcareous near the surface as well as at deeper levels. Some shallowly buried soils were also encountered.

Significantly, while one archaeological site, 21BW0004, was identified less than a quarter mile from the test locale in a similar context (Figure 3.3.1-2), no buried archaeological deposits have been reported from the floodplain along either the lower Cottonwood River or the adjacent Minnesota River near the City Property test locale. Six trenches that extended 3 m to 4 m (9.8 ft to 13.1 ft) deep were excavated within the City Property test locale. In addition, 20 cores were drilled within the testing grid; no augering was performed. Surface conditions during the geophysical survey were satisfactory and the soil was generally dry. The test grid had been recently mowed and only minor grass stubble remained within the area.

7.2 RESULTS OF GEOPHYSICAL SURVEY

7.2.1 Magnetics

A magnetically quiet test locale, little patterning is apparent other than data attributable to recent agricultural activities such as plow furrows (Figure 7.2.1-1). Some very low intensity variation



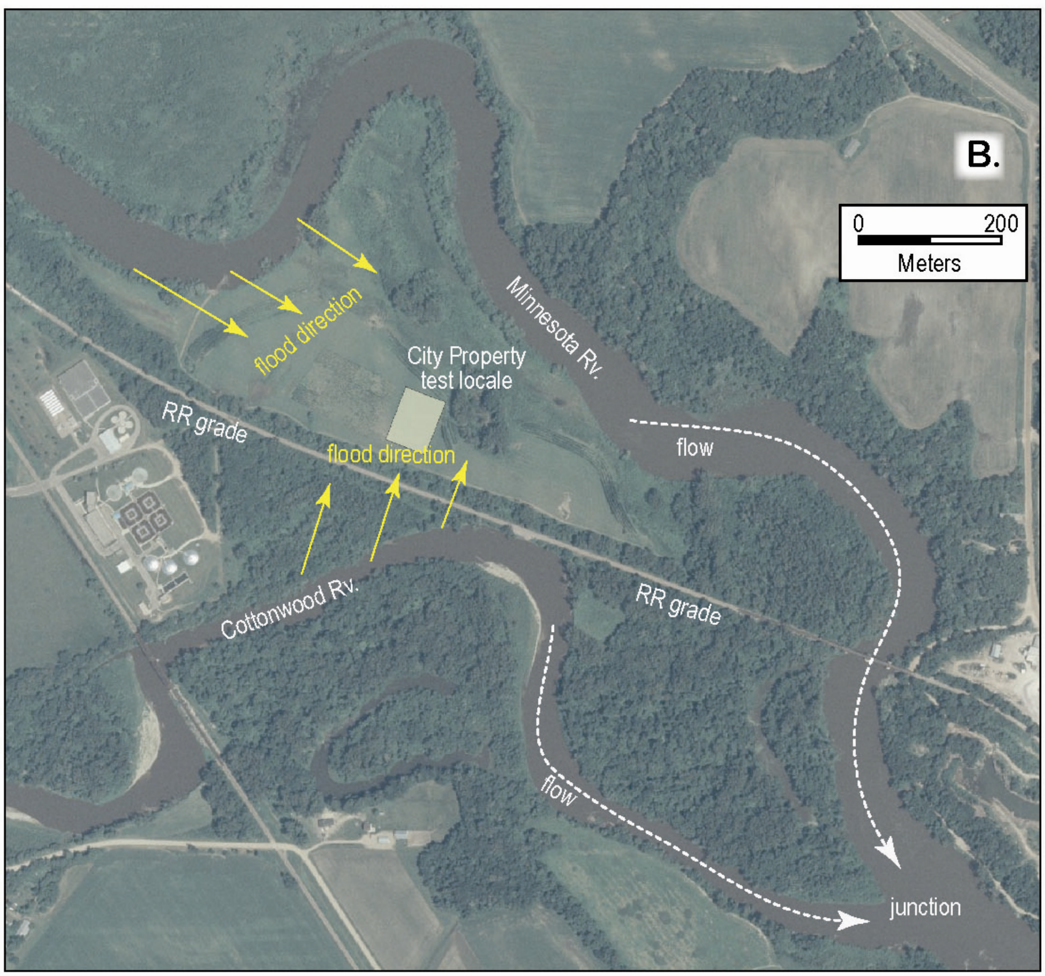


Figure 7.1-1. City Property Test Locale Overviews: (A) Testing Grid; (B) Test Locale Vicinity

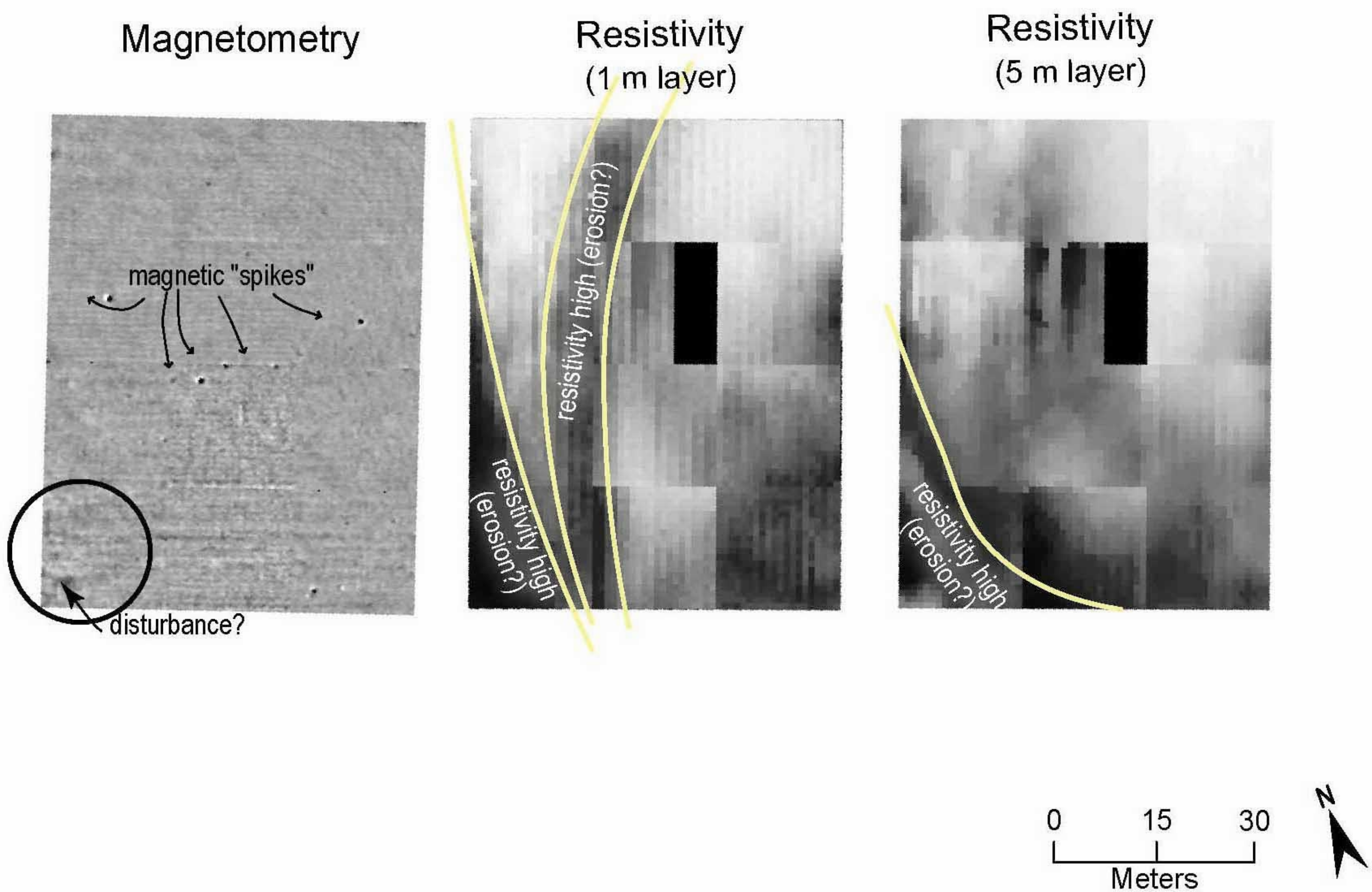


Figure 7.2.1-1. Magnetometry and Resistivity Data Plots, City Property Test Locale

is apparent throughout the survey area, probably due to near surface soil variation. A few small dipolar spikes from modern objects are present. A small area in the southwest corner shows low intensity magnetic highs, which may indicate subsurface disturbances by cultural features, or possibly soil features.

7.2.2 Resistivity

Although resistivity data for a 7 m × 20 m (23.0 ft × 65.6 ft) area near the center of the survey grid are not included because of instrument malfunction, interesting resistivity patterns emerge from the survey. These deviations in the resistivity across the survey grid are principally related to variations in the properties and distribution of soil, sediment, and groundwater conditions. No clear cultural features or disturbances are evident.

The southwest corner of the City Property test locale is highly resistive at all depths, although resistivity actually does decrease somewhat with depth (Figure 7.2.1-1). Clearly, this indicates more highly resistive soil and sediment overlying more conductive layers. The resistive sediment probably is coarse-grained (sand and gravel) sediment, which is also present on the surface of the grid within the southwest quadrant. The increased conduction with depth probably reflects that these coarse-grained sediments become more saturated with groundwater near the base of the resistivity profile. In addition, slightly less resistive anomalies are evident along the eastern edge of the test locale. These may indicate that fine-grained, or wetter, sediments predominate here, as opposed to the coarse-grained deposits in the southwest. Significantly, a ca. 6-m (19.7-ft) wide arcuate band of similar resistive soils extends from the southwest corner of the grid, northward to nearly the northern grid margin (Figure 7.2.1-1). This zone is probably an alluvial cut and fill feature and is clearly related to the high resistivity anomaly in the southwestern corner of the grid.

7.2.3 Ground Penetrating Radar

Results from the GPR indicate that the City Property test locale has many features and suggestions of human activity in the southwest part of the survey grid and rather nondescript GPR data in the north (Figure 7.2.3-1). The southwest portion shows several good reflecting units from 0.5 m to 1.5 m (1.6 ft to 4.9 ft). A stray reflector dips sharply to the east in the southwest corner but then disappears northward. This may be due to increased clay content or possibly water table effects. In the extreme southwestern part of the survey grid, numerous tight parabolas and disruptions of strong reflectors occur, thus implying human activity because it probably is an area of disturbance. Whether this indicates historic or prehistoric activity is not clear. A major vertical feature also occurs in the southwestern part of the survey grid (Figure 7.2.3-1). It extends from the surface to more than 2 m (6.6 ft) in depth. This area deserves further attention. A basin occurs to the north and east. Numerous bed forms occur at depths in the southwestern portion of the test locale.

Shallow two-dimensional maps (Figure 7.2.3-1) are dominated by recent farm activity but interesting features near the middle of the grid also appear, including unusual 3 m (9.8 ft), wave-like forms on the shallow slices. The cross section features shown on the two-dimensional maps

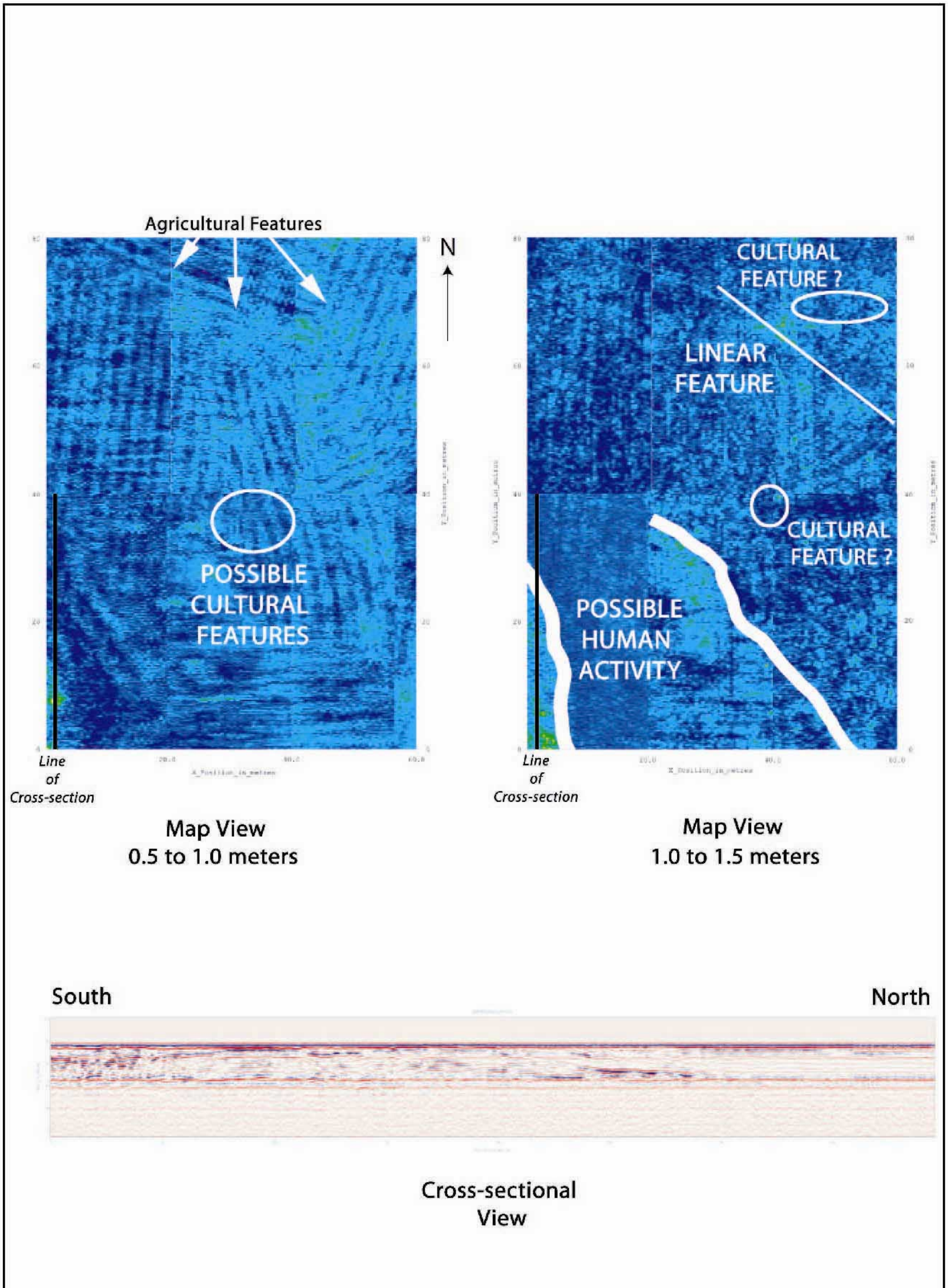


Figure 7.2.3-1. GPR Data Plots, City Property Test Locale

may correspond with a number of probable geologic features in the northwest part of the grid and probable loci of human activity, especially in the extreme southwest and central portions of the grid.

7.2.4 Discussion of Geoarchaeological Significance of the Geophysical Survey

The geophysical survey data from the City Property test locale is particularly informative concerning the geological and sedimentological environment and contexts, but less clear as to the presence of archaeological deposits. Only limited and cautious suggestions about the presence of buried archaeological material can be put forth. Data from the City Property test locale also highlight some of the problems and uncertainties of remote sensing data and show how multi-method surveys allow better analysis of the results by redressing the ambiguity of some methods with the strengths of others.

The magnetic survey data exhibits little patterning and includes a few indications of metal objects. The only noteworthy feature present is a small area in the southwest corner of the grid that indicates significant subsurface disturbances or other dramatic changes in soil-sediment properties. Interestingly, the GPR data also shows that substantial probable sedimentary structures, as well as some indications of disturbances that may be cultural in origin, are apparent in the southwestern part of the grid. Although the geometry and spatial distribution of these structural elements is generally clear, their origin(s) is (are) not obvious based on either the GPR or magnetic survey results. These features may be natural erosional in-filled troughs or bars, as might be expected in a complex depositional environment like the City Property test locale, or might also be cultural, either prehistoric or historic. Clearly, determining which of these scenarios is true is important from a cultural resource management standpoint.

Resistivity data from the City Property test locale may actually aid in determining the origins of the deposits in the southwestern part of the grid. The fact that this area includes highly resistive deposits throughout the resistance profile implies the presence of sand and gravel and suggests that this area may be an erosional channel. Such a conclusion is supported by the presence a ca. 6-m (19.7-ft) wide arcuate band of similar resistive deposits extending north from the southwest corner, which probably is indicative of the extension of this cut and fill erosional feature; a cultural origin is unlikely.

7.3 RESULTS OF CORING SURVEY

7.3.1 Deposits and Soils

Sediments at the City Property test locale are divided into top stratum and bottom stratum deposits, although the top stratum deposits are not well developed and do not have the strong contrast between fine-grained suspended overbank deposits and the coarse bedload deposits often encountered in meandering rivers (Appendix B). Bottom stratum deposits are sand with some gravel. The sand is medium to very coarse textured. Top stratum deposits consist of sandy loams that grade up to silt loams, and they conformably overlie bottom stratum deposits (Figures 7.3.1-1 and 7.3.1-2). The silt loam is sometimes overlain by sandy loam, especially in the southwest portion of the grid. Most of the silt loams contain a large percentage of sand.

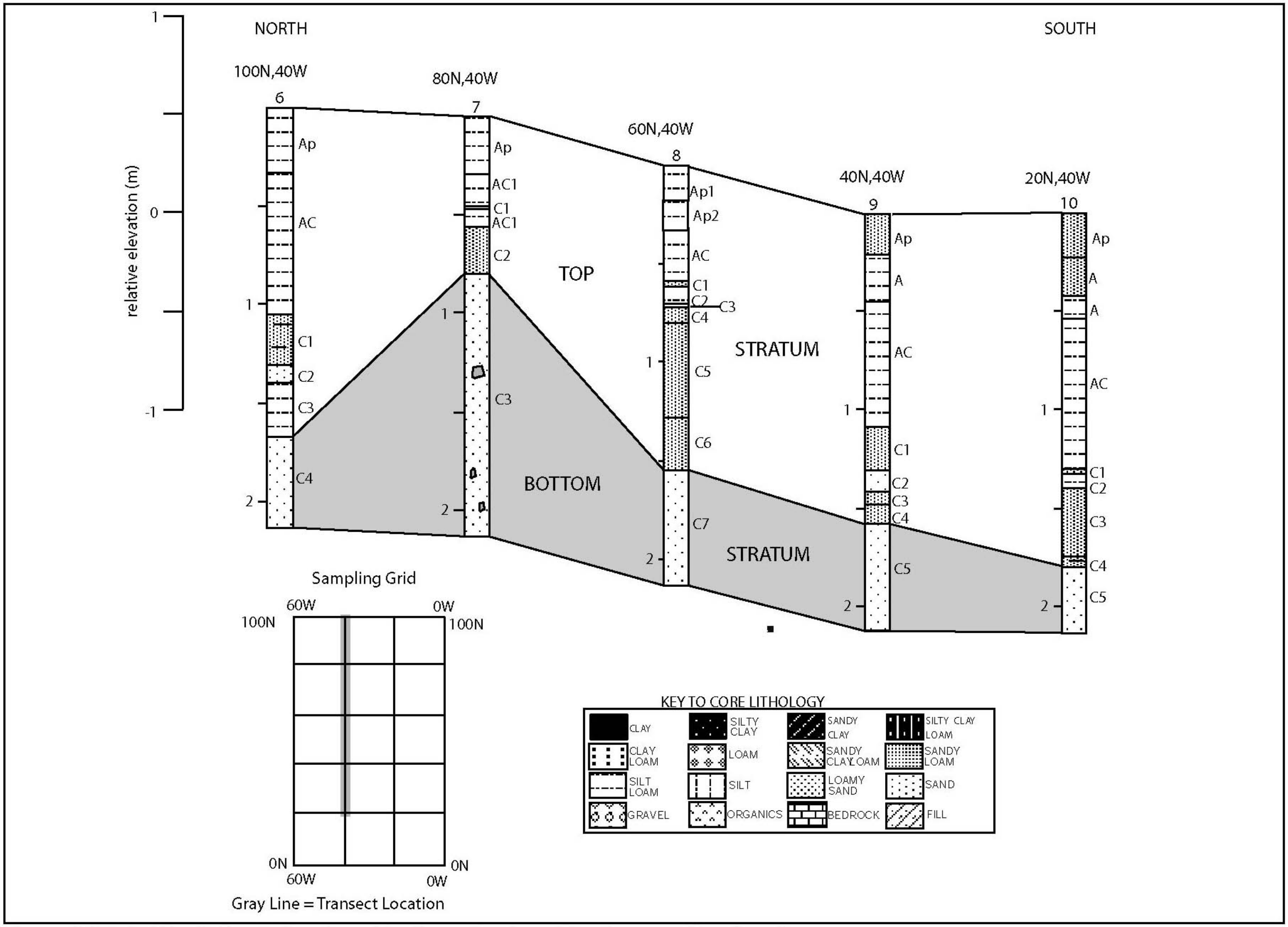


Figure 7.3.1-1. North-South Stratigraphic Cross-Section, City Property Test Locale

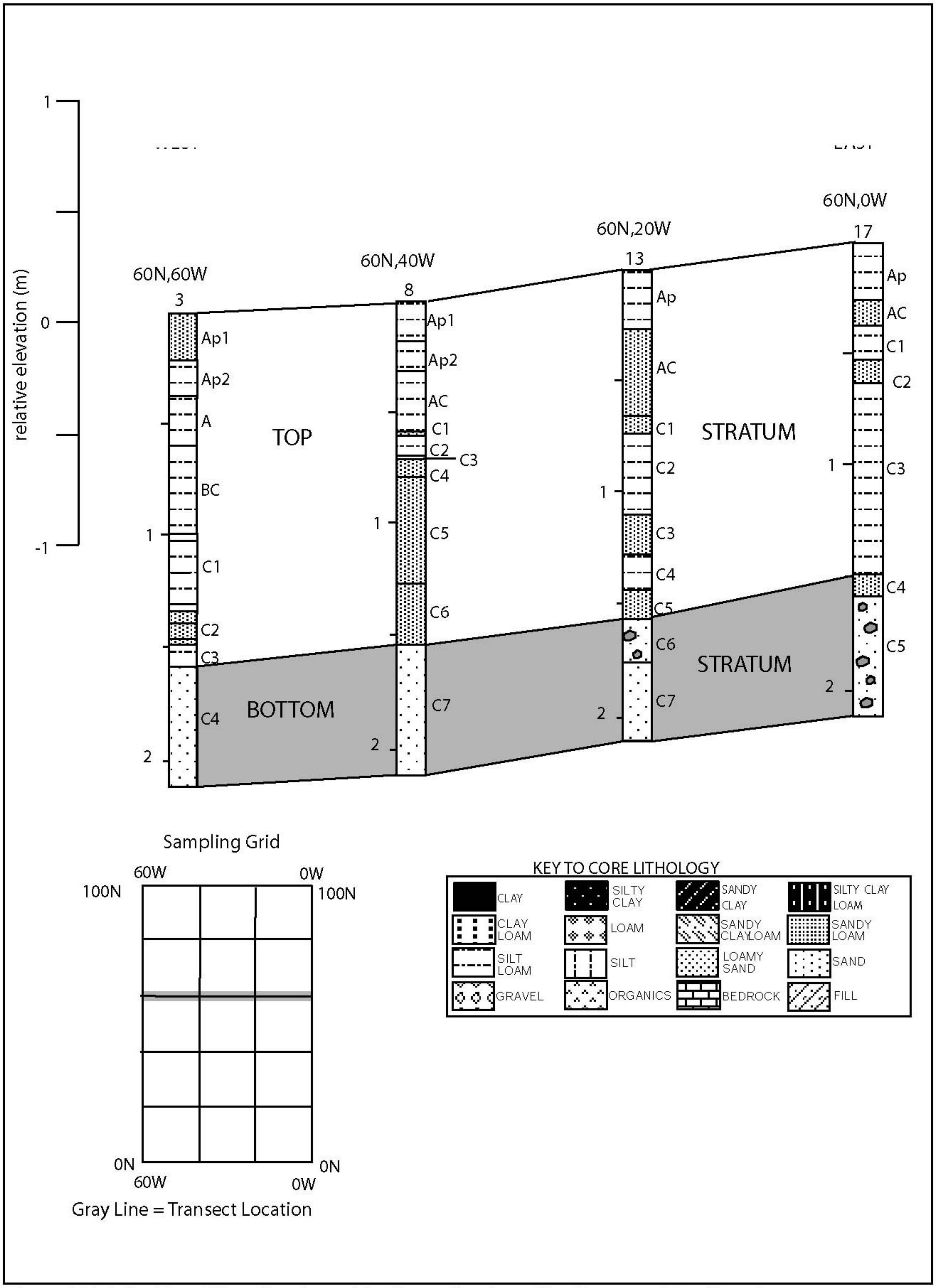


Figure 7.3.1-2. East-West Stratigraphic Cross-Section, City Property Test Locale

Soils are weakly developed with A-C profiles over most of the test locale, except at the northwest corner in Cores 3 and 4 where weakly developed B horizons occur. In most cores soils are unleached from the surface down. The exceptions to this pattern are a few cores where a Bw horizon has formed and leaching has occurred, and some cores where leaching of the Ap or A horizon has occurred.

7.3.2 Stratigraphy

Stratification is present from just below the plow zone down into the bottom stratum deposits. The contact between the bottom stratum and the top stratum deposits is conformable but abrupt, and there is a change in the grain size from the coarser sand with some gravel to a finer sand/sandy loam or silt loam. No buried soils were identified.

7.3.3 Discussion of Geoarchaeological Significance from Coring

Targets for archaeological sampling (buried soils) were not identified and no auguring was undertaken. The lack of any well sorted fine-grained sediment on the surface indicated the locale is: (1) in a high energy environment where overbank deposits do not accumulate; (2) the deposits are young and not enough time has passed to allow an overbank cap to accumulate; and/or (3) overbank deposits have been eroded away or mechanically removed. The potential for deeply buried sites is low at this locality. Other localities in similar settings, such as Flandrau State Park, investigated by Hudak and Hajic (2001) have buried soils and, therefore, much greater potential for buried archaeological deposits.

7.4 RESULTS OF TRENCHING SURVEY

7.4.1 Stratigraphy of Soils and Sediments

Because few geomorphological distinctions were noted at the City Property test locale, trenching did not focus on any particular portion of the locale. Rather trenches were distributed across the landscape in such a manner as to allow development of a cross-sectional reconstruction of the subsurface (Figures 7.4.1-1 and 7.4.1-2). The results of these excavations reveal that a relatively complex sequence of very late Holocene fluvial and alluvial deposits characterizes the bulk of the sediments (Figures 7.4.1-2 and 7.4.1-3). The apparent sedimentological complexity of the area is probably linked to the fact that the City Property not only lies along the Minnesota River, but is also at the mouth of the Cottonwood Creek. Consequently, during the prehistoric period, the area was influenced by fluvial, alluvial, and flooding processes that relate to both large (Minnesota River) and small (Cottonwood Creek) drainage systems. Additionally, prior to the construction of a railroad causeway just south of the testing grid, active fluvial systems could have inundated the site from any direction (Figure 7.4.1-1). The resultant deposits include a sequence of bedded sand and gravel clearly related to a very young cut and fill channel sequence (Trench 1), as well as a more typical abandoned channel cut that has been filled with a vertical accretionary sequence of wetland and alluvial deposits. The latter includes a series of late Holocene flood deposits in the upper 100 cm to 150 cm (39.4 in to 59.1 in), the tops of which typically include discontinuous, ephemeral A/C paleosols derived from either the Minnesota River or Cottonwood Creek.

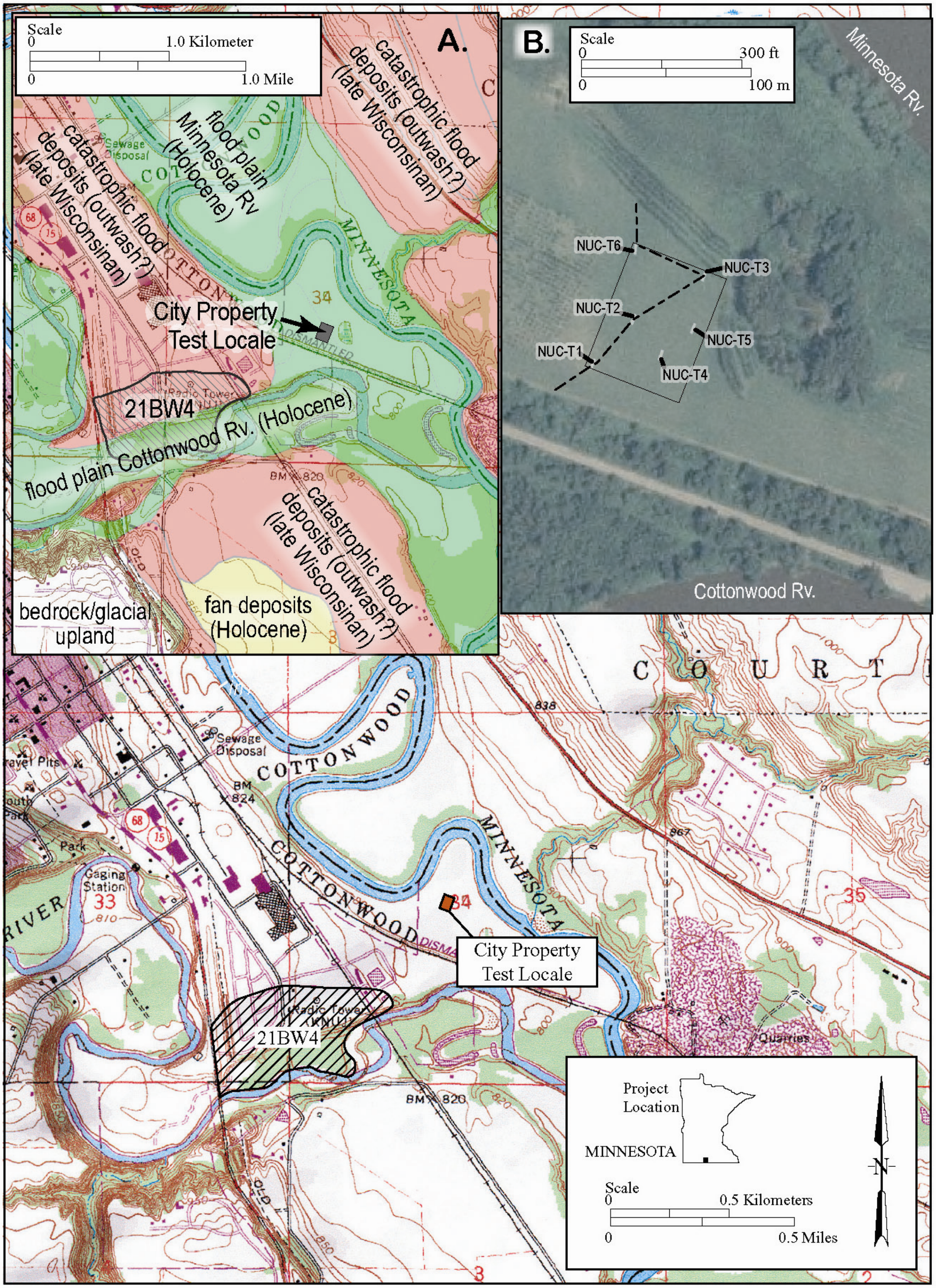


Figure 7.4.1-1. Trench Locations at the City Property Test Locale

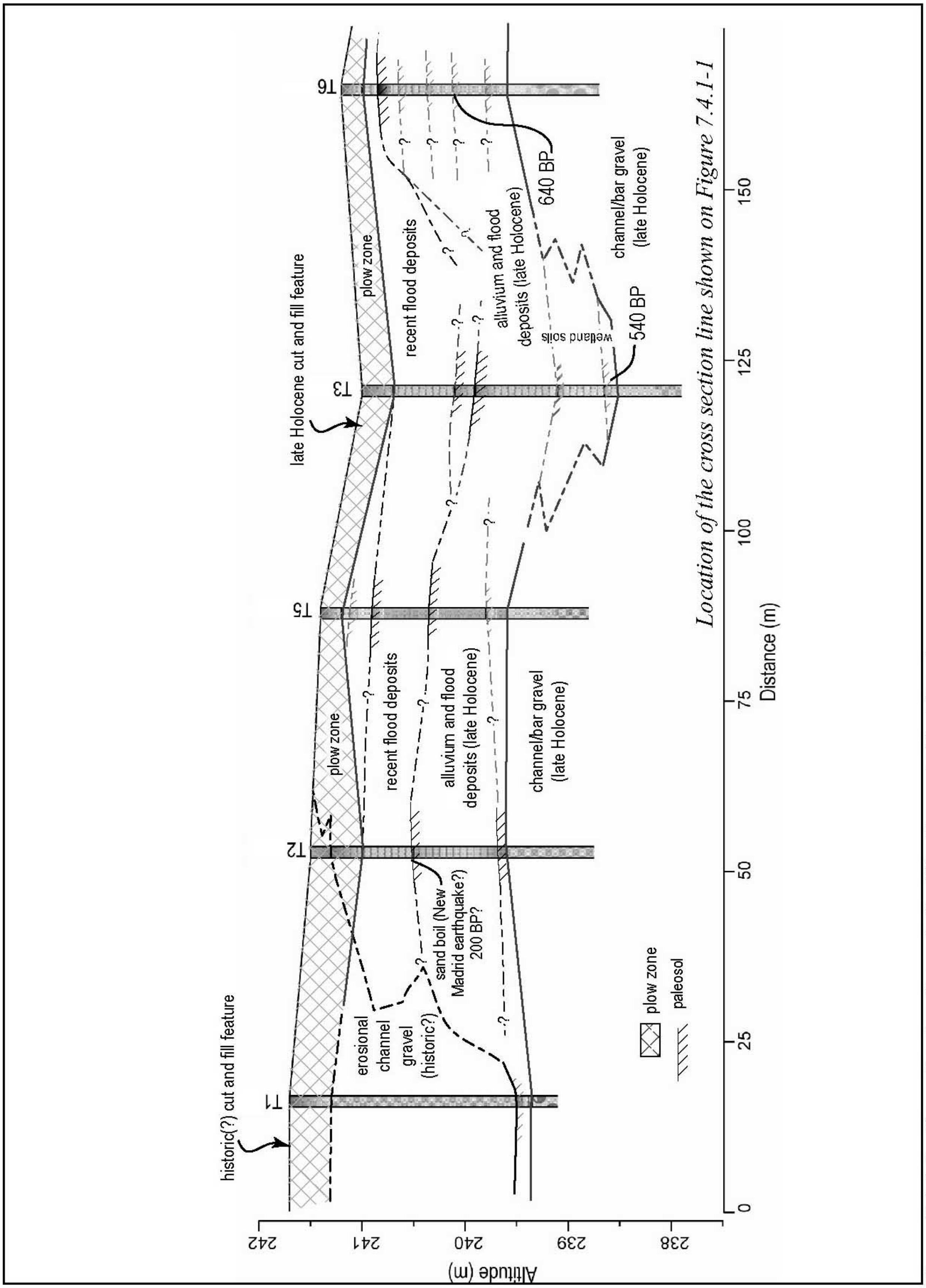


Figure 7.4.1-2. Cross Section through the City Property Test Locale

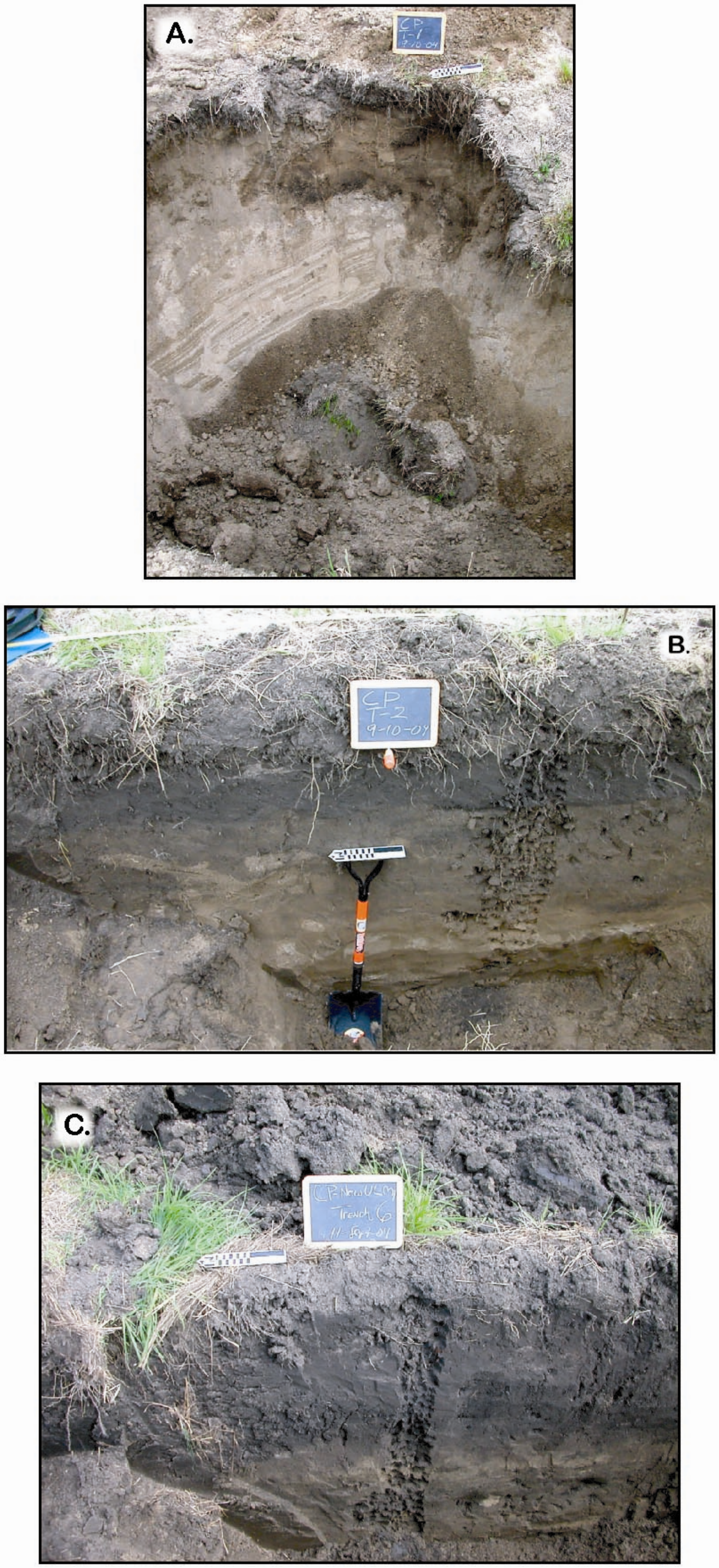


Figure 7.4.1-3. Trenches at the City Property Test Locale: (A) Trench 1, Sand and Gravel; (B) Trench 2, Cumulative Soil Sequences; (C) Trench 6, 640 BP Soil Sequence

The youngest sequence at the City Property locale occurs within Trench 1 and consists of about 2 m (6.7 ft) of tan and brown, mottled reddish/orange sand. The upper part of unit is mainly cross-bedded medium to course grained sand, but grades into more crudely bedded sand, gravel, and pebbles in the lower part (Figure 7.4.1-2; Appendix C). Large cobbles and pebbles are common near the base of the unit, forming an erosional lag and contact with the underlying unit. In fact, occasional rip-ups of dark silt/clay are incorporated into cross-beds in the lower part of the unit and were probably eroded as clasts from the top of the underlying alluvium. This thick gravel sequence extends to the surface and has been incorporated into the plow zone, which is very light colored and sand-rich. The gravel was probably deposited within a very late Holocene erosional channel or bar cut into the site by the Minnesota River or Cottonwood Creek. The light color and minimal development of the plow zone at Trench 1 attests to the young age of this sequence, which may even have developed during historic times.

The sand and gravel are underlain by an older, massive to bedded, fine sandy and clayey silt and bedded sand. The top of this sequence is brown, mainly silty, and indicates the Ab horizon of an eroded paleosol. It grades into tan/mottled reddish brown/brown, bedded, medium- to coarse-grained sand that also includes a few inter-beds of fine gravel. Together these probably are a sandy alluvium or flood deposit sequence of the Minnesota River or Cottonwood Creek.

Elsewhere, complex sequences of alluvial and flood deposits occur across the City Property test locale (Figure 7.4.1-2). These sedimentary sequences also include discontinuous, stacked and ephemeral paleosols whose relationship is not clear from one trench to the next. For example, the upper meter in Trench 2 consists of massive to faintly bedded, silty fine sand that probably represents stacked flood sequences (Appendix C). These grade from being more massive and sandy near the base of the unit to less so toward the top of the unit, which is truncated by and incorporated into the modern plow zone. In fact, the plow zone (Apb; Appendix C) in Trench 2 was actually buried by a sandy and unplowed (AC) horizon. The increased sand content in sediment overlying the plow zone may be related to the erosional channel discussed for Trench 1 and, if so, supports a historic time frame for the cutting of this channel.

Brown to gray, massive to faint, silty fine sand, also the result of another series of flood deposits from the Minnesota River and/or Cottonwood Creek, underlie upper deposits in Trench 2. This underlying sequence includes a few discontinuous paleosol sequences that mark short-term stabilization of the landform between flood events. Those in the upper part of unit are faint and discontinuous while a more distinct and continuous, buried paleosol marks the base of unit (Figure 7.4.1-2). The flood deposits grade downward to include discontinuous inter-beds of silty sand, as well as sand and fine gravel. These, in turn, grade to cross- and crudely bedded sand and gravel near the base of Trench 2. Soft sediment deformations, particularly a prominent flame-structure or sand boil injection derived from the sand and gravel, also occur within the overlying alluvium (Figure 7.4.1-2). Interestingly, discontinuous sand lenses that appear to derive from the sand boil occur just above the uppermost paleosol within this flood sequence, which was apparently also the ground surface when the sand boil formed. Sand boils like these often are liquefaction features that typically are associated with earthquakes. Although speculative, given the very young age for the entire City Property sequence, this sand boil liquefaction feature may have been formed during the New Madrid earthquake of 1811-1812

(Figure 7.4.1-2) and, if true, indicates just how active sedimentation has been over the past 200 years.

Similar sequences of fluvial and alluvial flood deposits, which also include stacked paleosols, were noted in nearly every trench at the City Property test locale. In Trench 6, for example, basal sand and gravel grades into an approximately 1-m (3.3-ft) thick series of fining upward, discontinuous flood deposits (Figure 7.4.1-4). The bases of these flood episodes are typically sandy while the tops are silty and often marked by an ephemeral paleosol that includes occasional charcoal fragments. One of these yielded a ^{14}C age of 650±40 BP (Beta-200799; calibrated cal yrs A.D. 1280 to A.D. 1400; Appendix D). These flood sequences are overlain by fining upwards clayey to sandy silt. The unit is vertical accretionary alluvium composed of tan, faintly bedded sandy deposits at the base that grade upward into black, massive clayey silt that forms the lower part of an accretionary mollisol. The upper 30 cm (11.8 in) of the mollisol has been incorporated into the plow zone.

The upper part of Trench 3 is similar to the Trench 6 sequence and includes a series of poorly formed paleosols within an accreting flood sequence. The lower part, however, is somewhat different and includes about 150 cm (59.1 in) of sandy to clayey silt that grades down into fluvial, bedded sand and gravels. The Trench 3 sequence probably represents an eroded, abandoned channel that was infilled with a sequence of wetland and vertical accretionary deposits (Figure 7.4.1-2). It was probably formed in a similar manner to that outlined for Trenches 1 and 4 at the Root River test locale (see Chapter 9.0). Additionally, a few ephemeral paleosols occur within these deposits and include fragments of detrital charcoal, one of which yielded a ^{14}C age of 580±40 BP (Beta-200798; calibrated cal yrs A.D. 1300 to A.D. 1420; Appendix D). This date is statistically indistinguishable from the 650 BP age of the paleosols in the Trench 6 sequence, which implies that all deposits at the City Property test locale are quite young.

7.4.2 Discussion of Geoarchaeological Significance from Trenching

Although no archaeological material was discovered at the City Property test locale, several buried, typically ephemeral, paleosols were observed in the alluvial sedimentary sequences (Figure 7.4.1-2). Based on two ^{14}C age estimates of 580 BP and 650 BP (Beta-200798 and Beta-200799, respectively; Appendix D) on wood and wood charcoal collected from soils within the trenches, the entire sequence at the City Property locale is quite late (Figure 7.4.1-2). This may at least partly explain the absence of archaeological deposits within the floodplain at the City Property test locale. The observed depositional sequences are so young and span a relatively short duration of time and, therefore, have a low potential for containing archaeological deposits.

7.5 RESULTS OF ARCHAEOLOGICAL TESTING

7.5.1 Previous Investigations

No previous surface or subsurface survey has been undertaken on the floodplain near the City Property test locale. The most significant nearby site, Brian (21BW4), is a Middle Woodland

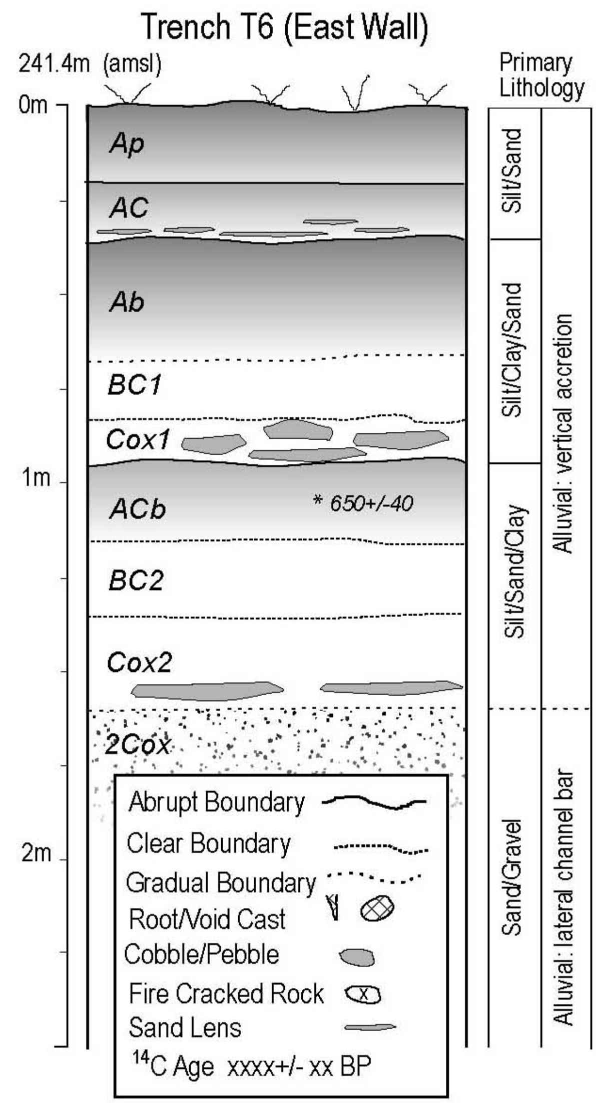


Figure 7.4.1-4. Soils and Sediments within Trench 6 at the City Property Test Locale

site that includes both domestic refuse and an earthwork/mound (Figure 7.4.1-1). It was identified through shovel testing proximate to the City Property test locale, and part of the site apparently lies on the Cottonwood River floodplain. Even so, no buried deposits have been reported from the Brian site. The presence of the nearby Brian Site, partly on a floodplain, and the fact that the LfSA classification by Mn/Model assigns the City Property locale a moderate suitability for preservation of buried archaeological deposits less than 2 m (6.6 ft) deep, indicates that archaeological material might be present at a relatively shallow depth.

7.5.2 Current Investigations

The ground surface within the City Property test locale was examined by pedestrian survey at a 5 m (16.4 ft) interval, and no archaeological materials were identified on the surface. The coring failed to identify any target horizons that merited sampling through augering. Trenching did, however, identify a series of ephemeral paleosols. While no cultural material was identified in the trench walls, test units were excavated at Trenches 2, 3, 4, 5, and 6 (Figures 8.5.1-1a and 8.5.1-1b). These units were positioned in locations that were identified by the study team's geomorphologists as having ephemeral paleosols. No cultural materials were identified in the test units. The one piece of bone recovered from Test Unit 1 is an incidental inclusion and not indicative of an archaeological site.

7.6 SYNTHESIS AND INTEGRATION OF GEOPHYSICAL SURVEY, CORING, AND TRENCHING

The original interpretation of the magnetic data did not change after reviewing the coring and trenching data. This is because of the generally homogenous alluvial fill at this site that produced small (1 m to 5 m [3.3 ft to 16.4 ft]) narrow irregular magnetic highs and lows in no apparent pattern. These data, however, did confirm the presence of a significant disturbance in the southwestern part of the testing grid. This is related to the erosional channel noted in Trench 1 (Figure 7.4.1-3A).

The resistivity surveys at the City Property test locale showed broad scale changes, generally between the north and south portions of the survey area. Coring and trenching revealed generally homogenous alluvial fill across the site except for a filled erosional channel in the southwest. This is the resistivity high detected at all depths and was successfully predicted. Large (~20 m × 50m [66 ft × 164 ft]) low resistivity "peninsulas" trending from northeast to southwest may be also related to erosional channel fill. Such erosional channels probably relate to flooding and alluvial fan processes from Cottonwood Creek and, if so, resistivity survey may allow such channels to be mapped. Within alluvial archaeological sites, the production of such a map may help guide excavation by showing erosional areas that may have destroyed or disturbed parts of the archaeological deposits.

The results at the City Property test locale emphasize a simple, but important distinction between the *potential* for an archaeological site to occur within a stratigraphic horizon and the *probability* that it will actually include buried archaeological material. The former (potential) refers to whether the environmental conditions during horizon formation could have, under any circumstances, permitted human occupation. The latter (probability), on the other hand, assesses the likelihood that such occupation could have occurred based on time, environmental conditions, and an understanding of human choice. To make these assessments, the deep-test landform must be placed into its environment of deposition and stratigraphic time.

Axiomatically, any subaerially exposed surface could allow human occupation, even if only exposed for a few days or weeks. Consequently, based on the reconstructed landform positions of depositional or soil units described above, the young, vertical accretion deposits forming the upper parts of the depositional sequence at the City Property test locale have the potential for including archaeological material within them. The deeper, fluvial and/or infilled oxbow/wetland deposits that make up the lower units, however, do not. By the same token, the relatively recent age of the upper, higher potential deposits at the City Property locale (i.e., mainly <600 BP) suggests that they have a relatively low probability of including archaeological remains because the time span during which they accumulated was relatively short. This assertion assumes: 1) that even within the most desirable areas for human settlement, not all parts of the landform will be occupied simultaneously; 2) the longer a landscape remains exposed and available for occupation the higher the probability that any one portion will contain an archaeological site. This distinction is important to understand when making probabilistic statements regarding the presence of archeological resources, because such an evaluation must consider the probability that buried archaeological materials are actually present within the landform, but were missed during deep testing.