

**APPENDIX C**  
**DEEP TEST TRENCH DESCRIPTIONS**

Trench descriptions are arranged in ascending order of trench numbers for each of the testing areas. Note that trench numbers within individual testing locales were assigned to each trench in the order it was excavated and may not reflect their relative position (either east-west or north-south) within the site. Trench locations are given as UTM coordinates (UTM Zone 15 extended; NAD83) at the center of the trench. The centers were determined based on trench location within the testing grid, which was set using a Garmin E-Trex Vista GPS unit with WAAS correction (estimated errors <3m horizontal). The trench length (meters), width (meters), altitude (in meters above sea level; masl), and depth (centimeters below surface [cmbs]) are listed below the trench number. A general description of the stratigraphy within the trench is also listed. Finally, the lithologies observed within the trench are listed. The depth (in cmbs) to the base of each unit is listed under *Base*. A '+' after the depth indicates the bottom of the unit was not observed. The lithology and sedimentology of each unit defined is listed under *Lithology and Description*. The first bold lithology is the primary lithology of the unit, while other bold lithologies describe secondary and/or minor lithologies observed within the unit. The contact defined between units is also described (i.e., erosional, sharp, gradational).

## Clement Test Locale

### Trench 1

Location: UTM:5037865N, 411418E, Zone 15  
 Dimensions: Length 6.5 m Width 1.2 m Depth 270 m Altitude 292.3 cm  
 Archaeology: FCR, debitage (71-120 cmbs)  
 Landform/Soil: Alluvial Terrace (levee)/Elkriver-Mosford Complex (mapped)  
 Age/Radiocarbon: Charcoal/90 cmbs 1510±90 BP (A.D. 380 to 680; Beta-200793)

#### *Base Lithology and Description*

- 25 **Sand (Plow Zone)**, Brown, massive, plow-disturbed sand; little silt. Surface (Plow Zone; Ap1) soil horizon.  
 ---- Sharp (plow zone) contact
- 40 **Sand**, Black-to-dark-gray, massive, bioturbated sand; little silt. Bioturbation common. Upper 10 cm is a cumulative surface (A) soil horizon.  
 ---- Sharp (plow zone) contact
- 60 **Sand**, tan/mottled light brown and gray, massive; little silt. Bioturbation common. Subsurface (C1) soil horizon.  
 ---- Gradational-to-abrupt contact
- 85 **Sand/Silt (Paleosol)**, Brown (upper 10 cm) and light brown/mottled tan/light gray (lower part of unit), massive, silty sand; few pebbles; occasional snails (aquatic and terrestrial). Unit represents part of a probable late Holocene flood sequence of Mississippi River. Paleosol: (Ab) soil horizon.  
 ---- Gradational-to-abrupt contact
- 125 **Sand/Silt (Paleosol)**, Dark brown-to-dark gray (upper 20 cm) and light brown/mottled tan/light gray (lower part of unit), massive, silty sand; few pebbles; occasional snails (aquatic and terrestrial). Unit includes possible archaeological features; includes burned bone, burned shell, possible FCR and quartz flake. Unit represents elements of a probable late Holocene flood sequence of Mississippi River (and probably represents beginning of stable levee

formation). Paleosol (Ab) soil horizon with distinct dark bands (relic surfaces?) mark upper 20 cm; lower part of unit (Bw soil horizon) grades sandy with discontinuous interbeds of medium-to-coarse sand.

----- Gradational contact

240 **Sand/Silt/Clay**, Brown-to-tan mottled reddish brown/orange, massive-to-bedded sand, silt, and clayey silt. Upper part of unit mainly massive-to-tabular bedded sand and silty sand; top of units includes discontinuous interbeds of medium-to-coarse grained sand and silty sand. Unit grades to relatively thin tabular beds of sandy silt and silty fine sand ca. 150 cmbs; snail shell common. Unit grades to thicker tabular beds of clayey silt and clayey sandy silt below ca. 200 cmbs; thin, discontinuous sand and silty fine sand within the lower part of the sequence; few pebbles in the sandy interbeds. Represents probable late Holocene alluvial deposits of Mississippi River (may be initiation of vertical accretion and levee formation). Unit represents subsurface (C2+) soil horizons.

----- Abrupt contact

270+ **Sand/Gravel**, Tan/brown mottled reddish/orange, cross-to-crudely-bedded sand and gravel; large cobbles and pebbles common. Unit represents probable late Holocene channel/bar deposits of Mississippi. Unit represents subsurface (2C) soil horizons.

## Trench 2

Location: UTM:5037910N, 411498E, Zone 15

Dimensions: Length 6.5 m Width 1.2 m Altitude 292 m Depth 200 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Elkriver-Mosford Complex (mapped)

### *Base Lithology and Description*

20 **Sand/Silt (Plow Zone)**, Black-to-dark-gray/brown, massive, plow-disturbed sandy silt; little clay. Surface (Plow Zone; Ap) soil horizon.

----- Sharp (plow zone) contact

100 **Sand/Silt/Clay**, Brown-to-tan mottled reddish brown/orange, massive-to-bedded sand, silt, and clayey silt. Tabular beds of sand, silty clayey sand, and sandy clayey silt; few pebbles. Tabular beds dip west (towards the Mississippi River). Represents probable late Holocene alluvial (overbank? levee?) deposits of Mississippi River. Unit represents subsurface (Bw and C) soil horizons and is probably different sediment and pedogenic from the overlying units. Top may have been eroded.

----- Abrupt contact

200+ **Sand/Gravel**, Tan/brown mottled reddish/orange, crossbedded sand (upper part of unit) and cross-to-crudely-bedded sand and gravel (lower part of unit); large cobbles and pebbles common near base of unit; crossbeds dip west and southwest (direction of flow). Occasional medium-grained sand and fine gravel interbeds; few discontinuous silty-sand interbeds; soft sediment deformation (flame structures, loading/dewatering features, etc) common in fine-grained interbeds. Unit represents probable middle-to-late Holocene channel/bar deposits of Mississippi. Subsurface (2C) soil horizons.

### Trench 3

Location: UTM:5037886N, 411444E, Zone 15

Dimensions: Length 7 m Width 1.2 m Altitude 292 m Depth 220 cm

Archaeology: N/A

Landform/Soil: Alluvial Terrace (backslope)/Elkriver-Mosford Complex (mapped)

#### *Base Lithology and Description*

- 25 **Sand/Silt (Plow Zone)**, Brown, massive, plow-disturbed silty sand; little clay. Surface (Plow Zone; Ap1) soil horizon.  
----- Sharp (plow zone) contact
- 35 **Sand/Silt (Plow Zone?)**, Black-to-dark-gray, massive, plow-disturbed silty sand; little clay; occasional bioturbation. Buried surface (probable buried Plow Zone; Ap2) soil horizon.  
----- Sharp (plow zone) contact
- 50 **Sand/Silt (Paleosol)**, Gray-to-brown, massive; little silt. Charcoal flecking common; occasional bioturbation. Probable paleosol surface (Ab) soil horizon; probably represents compressed paleosol sequence from Trench 1 (i.e. between 60 and 120 cm).  
----- Abrupt contact
- 140 **Sand/Silt/Clay**, Brown/tan-to-light gray mottled reddish brown/orange, massive-to-bedded sand, silt, and clayey silt. Upper part of unit mainly massive-to-tabular bedded sand and silty sand; top of units includes discontinuous interbeds of medium-to-coarse grained sand and silty sand. Unit grades to thicker tabular beds of clayey silty sand and sandy silt near base; drapes of silty fine sand common near base of unit; few pebbles in the sandy interbeds. Represents probable late Holocene alluvial deposits of Mississippi River; may correspond with units underlying paleosol sequence from Trench 1 (i.e., 120-240 cmbs). Unit represents subsurface (BC and C) soil horizons.  
----- Sharp (abrupt) contact
- 220+ **Sand/Gravel**, Tan/brown mottled reddish/orange, crossbedded sand (upper part of unit) and cross-to-crudely-bedded sand and gravel (lower part of unit); large cobbles and pebbles common near base of unit; crossbeds dip west and southwest (direction of flow). Occasional discontinuous silty-sand interbeds; soft sediment deformation (flame structures, loading/dewatering features, etc) common in fine-grained interbeds. Unit represents probable middle-to-late Holocene channel/bar deposits of Mississippi. Subsurface (2C) soil horizons.

#### Trench 4

Location: UTM:5037941N, 411479E, Zone 15

Dimensions: Length 6.5 m Width 1.2 m Altitude 291.75 m Depth 120 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Elkriver-Mosford Complex (mapped)

##### *Base Lithology and Description*

20 **Silt/Sand (Plow Zone)**, Brown, massive, plow-disturbed sandy silt; little clay. Surface (Plow Zone; Ap) soil horizon.

----- Sharp (plow zone) contact

100 **Sand/Silt**, Brown-to-tan mottled reddish brown/orange, massive-to-bedded sand and silty sand; little clay. Upper part (20-50 cmbs) mainly massive-to-faintly-bedded, silty sand; occasional pebbles. Lower part (50-100 cmbs) grades to mainly thick, crossbedded and discontinuous interbeds of medium-to-coarse-grained sand and tabular beds of silty sand; sand partings common in silty interbeds; few pebbles. Tabular beds dip west (towards the Mississippi River). Represents probable late Holocene alluvial (overbank? levee?) deposits of Mississippi River. Subsurface (BC and C) soil horizons.

----- Abrupt contact

120+ **Sand/Gravel**, Tan/brown mottled reddish/orange, cross-to-crudely-bedded sand and sand/gravel; large cobbles and pebbles common throughout unit; crossbeds dip west and southwest (direction of flow). Unit represents probable middle-to-late Holocene channel/bar deposits of Mississippi. Subsurface (2C) soil horizons.

#### Trench 5

Location: UTM:5037913N, 411460E, Zone 15

Dimensions: Length 6.5 m Width 1.2 m Altitude 292 m Depth 120 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Elkriver-Mosford Complex (mapped)

##### *Base Lithology and Description*

25 **Silt/Sand (Plow Zone)**, Brown-to-gray, massive, plow-disturbed sandy silt; little clay. Surface (Plow Zone; Ap) soil horizon.

----- Sharp (plow zone) contact

120 **Sand/Silt**, Brown-to-tan mottled reddish brown/orange, massive-to-bedded sand and silty sand; little clay. Upper part (25-60 cmbs) mainly massive-to-faintly-bedded, silty sand (Bw, BC soil horizons); occasional pebbles. Lower part (60-120 cmbs) grades to mainly thick, crossbedded and discontinuous interbeds of medium-to-coarse-grained sand and tabular beds of silty sand (C horizons); sand partings common in silty interbeds; few pebbles. Tabular beds dip west (towards the Mississippi River). Represents probable late Holocene alluvial (overbank? levee?) deposits of Mississippi River.

----- Abrupt contact

200+ **Sand/Gravel**, Tan/brown mottled reddish/orange, cross-to-crudely-bedded sand and sand/gravel; large cobbles and pebbles common throughout unit; crossbeds dip west and southwest (direction of flow). Few discontinuous interbeds of

clayey silt and silty clay in upper part of unit; base grades to crudely bedded, coarse sand/gravel and cobble beds. Unit represents probable middle-to-late Holocene channel/bar deposits of Mississippi. Subsurface (2C) soil horizons.

#### Trench 6

Location: UTM:5037892N, 411401E, Zone 15

Dimensions: Length 6.5 m Width 1.2 m Altitude 292.3 m Depth 280 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace (levee)/Elkriver-Mosford Complex (mapped)

#### *Base Lithology and Description*

- 25 **Sand/Silt (Plow Zone)**, Brown, massive, plow-disturbed silty sand; little clay. Surface (Plow Zone; Ap1) soil horizon.  
----- Sharp (plow zone) contact
- 50 **Sand**, Brown-to-tan mottled gray, massive-to-very-faintly-bedded sand; little silt. Bioturbation common. Represents probable late Holocene-to-historic alluvial (overbank? levee?) deposits of Mississippi River. Unit represents subsurface (BC) soil horizon.  
----- Abrupt (erosional?) contact
- 75 **Silt/Sand (Paleosol)**, Dark brown (upper 15 cm) and light brown/mottled tan/light gray (lower part of unit), massive, silty sand; few pebbles. Unit represents part of a probable late Holocene flood sequence of Mississippi River. Paleosol (Ab) soil horizon, upper ca.15 cm; lower part subsurface (BC) soil horizon.  
----- Gradational-to-abrupt contact
- 90 **Silt/Sand (Paleosol)**, Brown-to-light gray (upper 10 cm) and light brown/mottled tan/light gray (lower part of unit), massive, silty sand; few pebbles. Unit represents part of a probable late Holocene flood sequence of Mississippi River. Paleosol (Ab) soil horizon, upper ca.10 cm; lower part subsurface (BC) soil horizon.  
----- Gradational contact
- 260 **Sand/Silt/Clay**, Brown-to-tan mottled reddish brown/orange, massive-to-bedded sand, silt, and clayey silt. Upper part of unit mainly massive-to-tabular bedded sand and silty sand; top of units includes discontinuous interbeds of medium-to-coarse grained sand and silty sand; grades to relatively thin tabular beds of sandy silt and silty fine sand with thicker, tabular beds of medium-to-fine sand ca. 130 cmbs; snail shell common. Unit grades to tabular beds of clayey silty and clayey sandy silt below ca. 160 cmbs; shell common. Lower part of sequence (below ca.200 cmbs) mainly thick alternating beds of massive silty sand and faintly tabular bedded medium-to-fine sand; few pebbles in the sandy interbeds. Base of unit grades to coarse sand and fine gravel beds. Represents probable late Holocene alluvial deposits of Mississippi River (may be initiation of vertical accretion and levee formation). Unit represents subsurface (C) soil horizons.  
----- Gradational contact

280+ **Sand/Gravel**, Tan/brown mottled reddish/orange, cross-to-crudely-bedded sand and gravel; large cobbles and pebbles common. Unit represents probable late Holocene channel/bar deposits of Mississippi. Subsurface (2C) soil horizons.

#### Trench 7

Location: UTM:5037902N, 411419E, Zone 15

Dimensions: Length 8 m Width 1.2 m Altitude 292.5 m Depth 250 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace (backslope)/Elkriver-Mosford Complex (mapped)

#### *Base Lithology and Description*

25 **Sand (Plow Zone)**, Brown, massive, plow-disturbed sand; little silt/clay. Surface (Plow Zone; Ap1) soil horizon.

----- Sharp (plow zone) contact

50 **Sand**, Brown-to-tan mottled gray, massive-to-very-faintly-bedded sand; little silt. Bioturbation common. Represents probable late Holocene-to-historic alluvial (overbank? levee?) deposits of Mississippi River. Unit represents subsurface (BC) soil horizon.

----- Abrupt (erosional?) contact

90 **Silt/Sand (Paleosol)**, Brown-to-light gray (upper 20 cm) and light brown/mottled tan/light gray (lower part of unit), massive, silty sand; few pebbles. Few flecks of charcoal in upper part of the unit. Unit represents part of a probable late Holocene flood sequence of Mississippi River. Paleosol (Ab) soil horizon upper ca. 20 cm; lower part subsurface (BC) soil horizon.

----- Gradational contact

260 **Sand/Silt/Clay**, Brown-to-tan mottled reddish brown/orange, massive-to-bedded sand, silt, and clayey silt. Upper part of unit mainly massive-to-tabular bedded sand and silty sand; top of units includes discontinuous interbeds of medium-to-coarse grained sand and silty sand; grades to relatively thin tabular beds of sandy silt and silty fine sand with thicker, tabular beds of medium-to-fine sand ca. 125 cmbs; gray mottling common; snail shell common. Unit grades to tabular beds of clayey silty and clayey sandy silt below ca. 160 cmbs; shell common. Lower part of sequence (below ca.200 cmbs) mainly thick alternating beds of massive silty sand and faintly tabular bedded medium-to-fine sand; few pebbles in the sandy interbeds. Base of unit grades to coarse sand and fine gravel beds. Represents probable late Holocene alluvial deposits of Mississippi River (may be initiation of vertical accretion and levee formation). Unit represents subsurface (C) soil horizons.

----- Gradational contact

280+ **Sand/Gravel**, Tan/brown mottled reddish/orange, cross-to-crudely-bedded sand and gravel; large cobbles and pebbles common. Unit represents probable late Holocene channel/bar deposits of Mississippi. Subsurface (2C) soil horizons.

## Root River Test Locale

### Trench 1

Location: UTM:4846662N, 608142E, Zone 15  
Dimensions: Length 5.3 m Width 1.2 m Altitude 211.5 m Depth 360 cmbs  
Archaeology: N/A  
Landform/Soil: Alluvial Terrace/Rawles Series Soil (mapped)  
Age/Radiocarbon: Charcoal/130 cmbs 850 $\pm$ 40 BP ( A.D. 1050 to 1100 and A.D. 1140 to 1270; Beta-200808) Wood/250-300 cmbs 1180 $\pm$ 60 BP (A.D. 690 to 990; Beta-200806)

#### *Base Lithology and Description*

- 20 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive, plow-disturbed silty fine sand; little sand. Few broken shells. Surface (Plow Zone; Ap1) soil horizon.  
----- Sharp (plow zone) contact
- 40 **Sand (Paleosol)**, Black-to-brown, massive, medium-to-coarse-grained sand and silty fine sand. Probably represents sandy alluvium of Root River. Accretionary surface (A1) soil horizon.  
----- Distinct (conformable) contact
- 55 **Sand (Paleosol)**, brown, massive, medium-to-coarse-grained sand and silty fine sand. Probably represents flood deposits of Root River. Accretionary surface (A2) soil horizon.  
----- Gradational contact
- 110 **Sand**, tan/mottled orange/brown, bedded, medium-to-coarse-grained sand; interbeds of fine gravel common; pebbles common; few discontinuous interbeds of silty fine sand. Probably represents sandy alluvium/flood deposits of Root River. Unit is subsurface (BC/C) soil horizons of overlying paleosols.  
----- Sharp (erosional) contact
- 260 **Sand/Silt (Paleosol?)**, Gray-to-brown (upper 10-20 cm) and Tan/mottled gray/reddish brown/orange (rest of unit), massive-to-bedded sand, silt, and clayey silt. Upper part of unit mainly massive silty sand; shell common; occasional fine charcoal pieces. Unit grades to thicker tabular beds of clayey silty sand in middle of unit; shell (aquatic and terrestrial snails) common. Grades massive-to-faintly-tabular-bedded organic-rich silt, sand and silty sand near base; wood fragments and shell common. Probably represents back-swamp (base) and accretionary alluvium within back-swamp (upper part) deposits of Root River. Top of unit is possible buried surface (ACb) soil horizon (probably wetland or seasonally wet conditions prevailed during soil formation). Lower part of unit represents subsurface (BC/Cg) soil horizons.  
----- Gradational contact
- 360+ **Sand/Silt**, Tan-to-brown/mottled gray/reddish brown, bedded sand, silt, and clayey silt. Upper part of unit mainly massive-to-faintly-tabular-bedded organic-rich silt, sand and silty sand near base; wood fragments and shell common. Unit grades to thicker tabular beds of medium-to-coarse-grained sand in lower part of unit; shell and wood common. Grades to include thin, discontinuous interbeds of bedded coarse sand and very fine gravel. Probably represents Root River



erosional channel/bar sand (base) that grade upwards into back-swamp/channel organic-rich, possible oxbow-like, accretionary wetland deposits (upper part). Unit represents subsurface (Cg) soil horizons.

## Trench 2

Location: UTM:4846662N, 608142E, Zone 15

Dimensions: Length 5.2 m Width 1.2 m Altitude 211 m Depth 220 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Rawles Series Soil (mapped)

### *Base Lithology and Description*

40 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive, plow-disturbed silty fine sand; little clay. Surface (Plow Zone; Ap) soil horizon.

----- Sharp (plow zone) contact

65 **Silt/Sand**, brown/mottled gray, interbedded, medium-to-fine-grained sand, silt, and silty fine sand; interbeds are discontinuous, 5 mm-2 cm thick; fine-grained beds are generally gray. Probably represents flood deposits of Root River. Unit is a series of short term (or accretionary) minimally weathered (C) soil horizons.

----- Distinct (conformable) contact

100 **Sand/Silt (Paleosol)**, Dark-gray-to-strong-brown, massive-to-faintly bedded, silty fine sand. Probably represents sandy alluvium and/or bioturbated flood deposits of Root River. Buried (or accretionary) surface (Ab or ACb) soil horizon.

----- Gradational contact

165 **Sand/Silt (Paleosol)**, Dark-gray-to-strong-brown, massive (top and base)-to-faintly bedded (middle), silty fine sand; unit grades to gray (gleyed?) clayey silt at base. Lower zone deformed (soft sediment loads, flames, injections). Probably represents sandy alluvium of Root River. Unit is buried (or accretionary) surface (Ab and/or ACb) soil horizon; base may be another buried surface (ACbg) soil horizon.

----- Gradational contact

200 **Sand/Silt (Paleosol?)**, Tan-to-gray/mottled orange/gray (gleyed?), massive-to-bedded sand, silt, and clayey silt. Upper part of unit mainly massive silty sand; deformed (soft sediment loads, flames, injections). Grades massive-to-faintly-tabular-bedded sand and silty sand near base. Probably represents back-swamp and/or accretionary alluvium within back-swamp deposits of Root River. Top of unit is possible buried surface (ACbg) soil horizon (probably wetland or seasonally wet conditions prevailed during soil formation). Base of unit represents subsurface (Cg) soil horizons.

----- Gradational contact

220+ **Sand/Gravel**, Tan-to-gray, bedded, coarse sand and fine gravel. Probably represents Root River erosional channel/bar sand. Unit is subsurface (C) soil horizon.

### Trench 3

Location: UTM:4846756N, 608103E, Zone 15  
Dimensions: Length 5.4 m Width 1.2 m Altitude 211.5 m Depth 250 cmbs  
Archaeology: N/A  
Landform/Soil: Alluvial Terrace/Rawles Series Soil (mapped)  
Age/Radiocarbon: Charcoal/110-120 cmbs 770±90 BP (A.D. 1040 to 1400; Beta-200807)

#### *Base Lithology and Description*

- 30 **Sand/Silt (Plow Zone)**, Gray-to-brown, massive, plow-disturbed silty fine sand; little clay. Surface (Plow Zone; Ap) soil horizon.  
----- Sharp (plow zone) contact
- 50 **Silt/Sand**, brown/mottled gray, interbedded, medium-to-fine-grained sand, silt, and silty fine sand; interbeds are discontinuous, 5 mm-2 cm thick; fine-grained beds are generally gray; occasional shell fragments in matrix and bedding planes. Probably represents minimally weathered (C soil horizon) flood deposits of Root River.  
----- Abrupt (erosional?) contact
- 125 **Sand/Silt (Paleosol)**, Dark-gray-to-brown, massive-to-faintly bedded, silty fine sand, little clay. Basal 20 cm tan/mottled gray/light brown, faintly interbedded, medium-to-fine-grained sand, silt, and silty fine sand, interbeds are discontinuous. Probably represents flood deposits of Root River. Upper 55 cm represents a series of short term (or accretionary) surface (A or Ab) soil horizons: thickness may reflect origin as part of mollic epipedon; charcoal common and forms lineations that may mark erosional surfaces in accretionary sequence; shell also noted below 85 cmbs. Basal 20 cm grades into minimally weathered alluvium (Bw horizon).  
----- Abrupt contact
- 250+ **Sand/Gravel**, Tan/brown mottled reddish/orange, crossbedded sand (upper part of unit) and cross-to-crudely-bedded sand and gravel (lower part of unit); large cobbles and pebbles common near base of unit. Occasional medium-grained sand and fine gravel interbeds; few discontinuous silty-sand interbeds. Unit represents probable Holocene channel/bar deposits of Root River; subsurface (2C) soil horizons.

### Trench 4

Location: UTM:4846706N, 608141E, Zone 15  
Dimensions: Length 5.4 m Width 1.2 m Altitude 211.5 m Depth 220 cmbs  
Archaeology: N/A  
Landform/Soil: Alluvial Terrace/Rawles Series Soil (mapped)

#### *Base Lithology and Description*

- 30 **Silt/Clay (Plow Zone)**, Gray-to-brown, massive, plow-disturbed clayey silt; little fine sand. Surface (Plow Zone; Ap) soil horizon.  
----- Sharp (plow zone) contact
- 45 **Silt/Sand/Clay**, brown/mottled gray, interbedded, silty fine sand, silt, and clayey silt; interbeds are discontinuous; fine-grained beds are generally gray; occasional

shell fragments in matrix and bedding planes. Probably represents flood deposits of Root River. Unit is a series of short term (or accretionary) surface/subsurface (AC) soil horizons.

----- Gradational contact

60 **Silt/Sand/Clay**, Gray-to-light-brown, laminated and thinly interbedded, silty fine sand, silt, and clayey silt; interbeds are discontinuous; fine-grained beds are generally gray; occasional shell fragments in matrix and bedding planes. Probably represents flood deposits of Root River. Unit is a series of short term (or accretionary) surface/subsurface (AC) soil horizons.

----- Gradational contact

105 **Silt/Clay (Paleosol)**, Dark-gray-to-black, massive-to-faintly bedded, clayey silt; little fine sand. Grades gray, silty clay near base. Grades massive-to-faintly-tabular-bedded silty clay near base. Probably represents back-swamp and/or accretionary alluvium within back-swamp deposits of Root River; unit represents accretionary buried surface (ACgb) soil horizon (probably wetland or seasonally wet conditions prevailed during soil formation); some of thickness of soil horizon may reflect origin as part of mollic epipedon or as gradual, regular accretion in a wetland environment.

----- Gradational contact

150 **Sand/Silt**, Gray-to-brown/mottled gray/reddish brown, bedded sand, silt, and clayey silt. Upper part of unit mainly massive-to-faintly-tabular-bedded organic-rich silt, sand and silty sand near base; occasional wood fragments and shell; deformed (soft sediment loads, flames, injections). Probably represents the upper part of an accretionary back-swamp/alluvial fill sequence within a probably eroded channel (oxbow-like) wetland setting deposits (upper part). Unit represents subsurface (Cg) soil horizons

----- Gradational contact

220+ **Sand/Silt**, Gray/mottled bluish gray/brown, bedded sand, silt, and clayey silt. Interbedded medium-to-coarse-grained sand, organic-rich sand, and organic silt; shell and wood common. Probably represents basal part of an accretionary Root River erosional channel/bar infilling sequence. Unit represents subsurface (Cg) soil horizons

#### Trench 5

Location: UTM:4846725N, 608105E, Zone 15

Dimensions: Length 5.4 m Width 1.2 m Altitude 211.5 m Depth 260 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Rawles Series Soil (mapped)

#### *Base Lithology and Description*

15 **Silt (Plow Zone)**, Gray-to-brown, massive, plow-disturbed clayey silt; little sand. Surface (Plow Zone; Ap1) soil horizon.

----- Sharp (plow zone) contact

35 **Silt (Plow Zone)**, Gray-to-brown, massive, plow-disturbed clayey silt; little sand. Surface (Plow Zone; Ap2) soil horizon.

----- Sharp (plow zone) contact

- 75 **Silt/Sand (Paleosol)**, Dark-gray-to-brown, massive-to-faintly bedded, fine sandy silt and silty fine sand; little clay; occasional charcoal and discontinuous lenses and partings of sand within sequence; shell common. Bioturbation common. Unit fining upwards with base marked by a variably thick (<10 cm) bedded, medium-to-coarse-grained sand. Upper 30 cm probably represents fining accretionary sequence of alluvium (A horizon); basal 10 cm represents minimally weathered flood deposits (C horizon). Thickness of A horizon may reflect origin as part of mollic epipedon.
- Gradational (conformable) contact
- 105 **Silt/Sand (Paleosol)**, Gray-to-brown, massive-to-faintly bedded, fine sandy silt and silty fine sand; little clay; occasional discontinuous lenses and partings of sand within sequence; shell common. Bioturbation common. Unit in fining upwards with base marked by a variably thick (<10 cm) bedded, medium-to-coarse-grained sand. Probably represents fining accretionary sequence of alluvium (top) and flood deposits (base) of Root River. Buried (or accretionary) surface (Ab or ACb) soil horizon marks upper 20 cm.
- Gradational (conformable) contact
- 130 **Sand/Silt (Paleosols?)**, Tan/mottled gray/light brown, faintly interbedded, medium-to-fine-grained sand, silt, and silty fine sand; interbeds are discontinuous; shell common. Bioturbation common. Probably represents flood deposits of Root River. Unit is a series of short term (or accretionary) surface/subsurface (AC) soil horizons.
- Gradational contact
- 160+ **Sand/Gravel**, Tan/brown mottled reddish/orange, crossbedded sand and cross-to-crudely-bedded sand and gravel; occasional large cobbles and pebbles; shell common. Unit represents probable Holocene channel/bar deposits of Root River. Unit represents subsurface (2C) soil horizons.

## Anderson Test Locale

### Trench 1

Location: UTM: 5010959N, 496919E, Zone 15  
 Dimensions: Length 5.5 m Width 1.3 m Altitude 277 m Depth 220 cmbs  
 Archaeology: Debitage, FCR, ceramics (0-47 cmbs)  
 Landform/Soil: Outwash Plain-dune/Soderville Series Soil (mapped)  
 Age/Radiocarbon: Charcoal/55 cmbs 210±40 BP (A.D. 1640 to 1690, A.D. 1730 to 1810 and A.D. 1920 to 1950; Beta-200792)

### *Base Lithology and Description*

- 25 **Sand (Plow Zone)**, Black-to-strong-brown, massive, plow-disturbed silty fine sand. Includes a few artifacts (FCR) and charcoal. Surface plow zone (Ap horizon).
- Sharp (plow zone) contact
- 110 **Sand**, Gray-to-tan/mottled orange/gray, massive, silty fine sand. Bioturbation common in upper 65 cm, rare in lower part of the unit. Grades to medium-coarse sand near base of the unit. Soil pendants (orange and gray) common. Probable

feature in upper part of unit; top of feature truncated by plow zone. Bioturbation common, with root voids and burrows filled with Ap sediment. Unit probably partly eolian and probably mixed by bioturbation (including potentially human) processes. Soil horization: E/Bw1/Bw2 horizon sequence.

----- Gradational contact

220+ **Sand**, tan-to-light brown/mottled reddish brown, massive-to-faintly bedded medium-to-coarse-grained sand; little silt. Faint cross- and tabular bedding within lower part of sequence. Unit probably shallow lacustrine or glaciolacustrine. Upper part of unit forms strong, partly cemented, orange-to-reddish brown subsurface (Bt) soil horizon, lower part indicates poorly-to-unweathered sediments and forms subsurface (Cox and Cu) soil horizons.

## Trench 2

Location: UTM:5011089N, 496903E, Zone 15

Dimensions: Length 10 m Width 1.3 m Altitude 274.8 m Depth 330 cmbs

Archaeology: Debitage, FCR, ceramics (0-80 cmbs)

Landform/Soil: Outwash Plain-dune/Zimmerman Series Soil (mapped)

Age/Radiocarbon:Charcoal/74 cmbs 1170 $\pm$ 40 BP (A.D. 960 to 1110; Beta-200797)

### *Base Lithology and Description*

20 **Sand (Plow Zone)**, Dark-gray-to-strong-brown, massive, plow-disturbed fine sand; little silt. Includes a few artifacts (FCR, ceramic) and charcoal. Surface plow zone (Ap horizon).

----- Sharp (plow zone) contact

105 **Sand**, Gray/mottled tan, massive, fine sand; little silt. Bioturbation common. Grades to medium-coarse sand near base of the unit; few soil lamella mark base of sequence. Possible cultural features in northern end of unit trench truncated by plow zone. Unit and features includes abundant artifacts (FCR, ceramic, flakes) and charcoal. Bioturbation common. Unit probably partly eolian and mixed by bioturbation (including human) processes. Top of unit displays depleted (E) soil horizon; with depth pedogenic lamellae increase in frequency and thickness (E'+Bt soil horizon).

----- Gradational contact

330+ **Sand**, tan-to-light brown/mottled reddish brown, massive-to-faintly bedded fine-to-coarse-grained sand; little silt; sand texture coarsens with depth. Faint cross- and tabular bedding within lower part of sequence. Unit probably shallow lacustrine or glaciolacustrine. Top of unit displays relatively thick discontinuous, strong, partly cemented, orange-to-reddish brown (Bt) soil horizon: these are staggered with depth within Fe-depleted tan sands, (E'+Bt)<sub>2</sub> soil horizon. Unit grades gray (partly gleyed?) below 260cm (Cu horizon).

### Trench 3

Location: UTM: 5011009N, 496900E, Zone 15  
Dimensions: Length 6.5 m Width 1.3 m Altitude 275.5 m Depth 350 cmbs  
Archaeology: FCR, (90-95 cmbs)  
Landform/Soil: Outwash Plain-dune/Zimmerman Series Soil (mapped)

#### *Base Lithology and Description*

- 20 **Sand (Plow Zone)**, Dark-gray-to-strong-brown, massive, plow-disturbed medium-to-fine sand; little silt. Includes a few artifacts (FCR, ceramic) and charcoal. Surface plow zone (Ap horizon).  
Sharp (plow zone) contact
- 80 **Sand**, Gray/mottled tan, massive, medium-to-fine sand; little silt. Includes few discontinuous ca.5-10 cm thick layers of “firm” silty fine sand; unit base marked by one of these “firm” zones. Bioturbation (root and rodent burrows) common. Unit includes abundant artifacts (FCR, few flakes) and fine charcoal flecking. Unit probably partly eolian and mixed by bioturbation (including human) processes. Soil horizonation: E/Bw1/Bw2 horizon sequence.  
----- Abrupt contact
- 330+ **Sand**, tan-to-light brown/mottled reddish brown, massive-to-faintly bedded fine-to-coarse-grained sand; little silt; sand texture coarsens with depth. Faint cross-and tabular bedding within lower part of sequence; distinct very coarse-grained sand and very fine gravel crossbeds mark base of sequence. Unit probably shallow lacustrine or glaciolacustrine. Top of unit displays relatively thick discontinuous, strong, partly cemented, orange-to-reddish brown (Bt) soil horizon: these are staggered with depth within Fe-depleted tan sands (E'+Bt) soil horizon.

### Trench 4

Location: UTM:5010960N, 496900E, Zone 15  
Dimensions: Length 5 m Width 1.3 m Altitude 275 m Depth 240 cmbs  
Archaeology: Debitage, FCR, ceramics (0-82 cmbs)  
Landform/Soil: Outwash Plain-dune/Soderville Series Soil (mapped)

#### *Base Lithology and Description*

- 15 **Sand (Plow Zone)**, Black-to-strong-brown, massive, plow-disturbed silty, medium-to-fine sand; little silt; little charcoal flecking. Surface plow zone (Ap1 horizon).  
----- Sharp (plow zone) contact
- 45 **Sand (Plow Zone)**, Dark-gray-to-strong-brown, stratified, moderately disturbed silty medium-to-fine sand; little silt; little charcoal flecking; may include plow-drag or fill sediments. Surface plow zone (Ap2 horizon).  
----- Sharp (plow zone) contact
- 62 **Sand (Plow Zone)**, Dark-gray-to-strong-brown, massive, plow-disturbed silty medium-to-fine sand; little silt; little charcoal flecking. Buried (?) plow zone (Apb1 horizon).  
----- Clear (plow zone) contact

- 75 **Sand (Plow Zone?)**, Dark-gray-to-strong-brown, massive, plow-disturbed silty medium-to-fine sand; little silt; little charcoal flecking. Buried (?) plow zone (Apb2 horizon).  
 ----- Sharp (plow zone) contact  
 240+ **Sand**, tan-to-light brown/mottled reddish brown, massive-to-faintly bedded fine-to-coarse-grained sand; little silt; sand texture coarsens with depth. Faint cross- and tabular bedding within lower part of sequence. Unit probably shallow lacustrine or glaciolacustrine. Upper 40 cm part of unit forms partly cemented, orange-to-reddish brown subsurface (Bw) soil horizon; lower part poorly-to-unweathered and forms subsurface (Cu) soil horizons.

#### Trench 5

Location: UTM:5011088N, 496927E, Zone 15  
 Dimensions: Length 4 m Width 1.3 m Altitude 276.25 m Depth 180 cm  
 Archaeology: Debitage, FCR (0-100 cmbs)  
 Landform/Soil: Outwash Plain-dune/Zimmerman Series Soil (mapped)

#### *Base Lithology and Description*

- 20 **Sand (Plow Zone)**, Brown-to-gray, massive, plow-disturbed medium-to-fine sand; little silt. Includes a few artifacts (FCR, flakes) and charcoal. Surface plow zone (Ap horizon).  
 ----- Sharp (plow zone) contact  
 105 **Sand**, Gray(top)-to-light brown(base)/mottled tan/brown, massive, medium-to-fine sand; little silt. Bioturbation (root and rodent burrows) common. Unit includes abundant artifacts (FCR, few flakes) and fine charcoal flecking. Artifacts concentrated near top and base of unit. Unit probably partly eolian and mixed by bioturbation (including human) processes. Top of unit (upper 10 cm) is brown and may represent depleted sub-plow zone (E) soil horizon; lower part of the unit mainly subsurface (Bw1, and Bw2) soil horizons.  
 ----- Abrupt contact  
 180+ **Sand**, tan-to-light brown/mottled reddish brown/orange, massive-to-faintly bedded fine-to-coarse-grained sand; little silt; sand texture coarsens with depth. Unit probably shallow lacustrine or glaciolacustrine. Top of unit displays relatively thick discontinuous, strong, partly cemented, orange-to-reddish brown (Bt) soil horizon; these are staggered with depth within Fe-depleted tan sands (E'+Bt) soil horizon.

#### Trench 6

Location: UTM:5011025N, 496919E, Zone 15  
 Dimensions: Length 4 m Width 1.3 m Altitude 275.75 m Depth 150 cmbs  
 Archaeology: FCR (0-80 cmbs)  
 Landform/Soil: Outwash Plain-dune/Zimmerman Series Soil (mapped)

*Base Lithology and Description*

- 20 **Sand (Plow Zone)**, Brown-to-gray, massive, plow-disturbed fine sand; little silt. Includes little charcoal flecking. Surface plow zone (Ap horizon).  
----- Sharp (plow zone) contact
- 80 **Sand**, Tan-to-light brown/mottled brown, massive, medium-to-fine sand; little silt. Bioturbation (root and rodent burrows) common. Unit includes abundant artifacts (FCR, few flakes). Unit probably partly eolian and mixed by bioturbation (including human) processes. Top of unit (upper 10 cm) is brown and may represent depleted sub-plow zone (E) soil horizon; lower part of the unit mainly subsurface (Bw1, and Bw2) soil horizons.  
----- Abrupt contact
- 150+ **Sand**, tan-to-light brown/mottled reddish brown/orange, massive-to-faintly bedded fine-to-coarse-grained sand; little silt; sand texture coarsens with depth. Unit probably shallow lacustrine or glaciolacustrine. Top of unit displays relatively thick discontinuous, strong, partly cemented, orange-to-reddish brown (Bt) soil horizon; these are staggered with depth within Fe-depleted tan sands (E'+Bt) soil horizon.

### Fritsche Creek Test Locale

#### Trench 1

Location: UTM:4911472N, 383206E, Zone 15  
Dimensions: Length 5.3 m Width 1.1 m Altitude 249 m Depth 320 cmbs  
Archaeology: N/A  
Landform/Soil: Alluvial Terrace/Minneiska Series Soil (mapped)  
Age/Radiocarbon:Charcoal/120 cmbs 220<sub>±</sub>40 BP (A.D. 1640 to 1680, A.D. 1730 to 1810, and A.D. 1930 to 1950; Beta-200794)

*Base Lithology and Description*

- 50 **Silt/Sand (Plow Zone)**, Black-to-strong brown, massive, organic-rich, plow-disturbed sandy silt (upper 20 cm); lower part of sequence (20-30 cm) is brown-to-tan; discontinuous, thin interbeds of tan, medium-to-coarse-grained sand and massive-to-faintly tabular bedded silty sand; few pebbles occur at contact with sand and sandy silt. Charcoal flecking common in upper 20 cm but rare below 20 cmbs. Unit represents probable historic flood sequence of Fritsche Creek. Upper 20 cm is Plow Zone (Ap) soil horizon; lower part of sequence is Cox soil horizon.  
----- Abrupt (erosional) contact
- 75 **Sand/Silt (buried Plow Zone)**, Brown, massive, organic-rich, probable plow-disturbed silty sand (upper 20 cm); lower part of sequence (5 cm) is brown-to-tan; discontinuous, thin interbeds of tan, medium-to-coarse-grained sand and massive-to-faintly tabular bedded silty sand; few pebbles occur at contact with sand and sandy silt. Occasional fine charcoal flecking throughout unit; rare small pieces of bone found in upper part of unit. Unit represents probable late Holocene-to-historic flood sequence of Fritsche Creek; top is marked by buried plow zone. Upper 20 cm is Plow Zone (A<sub>pb</sub>) soil horizon; lower part of sequence is Cox soil horizon.



- Abrupt (erosional?) contact
- 135 **Sand/Silt (Paleosol)**, Brown-to-tan; thin, discontinuous interbeds of tan, medium-to-coarse-grained sand and massive-to-tabular bedded sandy silt and silty sand; faintly blocky soil structure in upper part of sequence. Sandy interbeds become thicker in lower part of sequence; a few fine gravel and coarse sand beds mark the base of sequence. Represents probable late Holocene flood deposits of Fritsche Creek. Upper 15 cm probable paleosol (ACb soil horizon) and lower part probable BC soil horizon.
- Abrupt (erosional) contact
- 150 **Sand/Silt (Eroded Paleosol?)**, Brown-to-tan; thin, discontinuous interbeds of tan, medium-to-coarse-grained sand and massive-to-tabular bedded sandy silt and silty sand; a few fine gravel and coarse sand beds mark the base of sequence. Upper part includes discontinuous, eroded remnants of dark brown-to-dark-gray, organic-rich silty sand and sandy silt blocks. Represents probable late Holocene flood and channel deposits of Fritsche Creek. Upper 10 cm probable eroded paleosol (ACb soil horizon) and lower part probable Cg soil horizons.
- Gradational contact
- 290 **Sand/Gravel**, Brown-to-tan mottled reddish/orange; discontinuous interbeds of silty sand and sand in upper part. Grades to cross- and tabular bedded sand and gravel; base marked by large cobble and pebble lag. Unit represents probable late Holocene channel deposits of Fritsche Creek and C soil horizons.
- Sharp (erosional) contact
- 320+ **Silt/Clay**, Gray-to-brown; massive-to-faintly tabular bedded clayey silt and clay. A few discontinuous interbeds of silty sand and sand partings occur in the lower part of the sequence. Pebbles common. Unit probably represents probable Holocene alluvium of Minnesota River, River Warren, or basal alluvial fan deposits. C soil horizons. Trench abandoned when filled with water and walls began to collapse.

## Trench 2

Location: UTM:4911511N, 383197E, Zone 15

Dimensions: Length 6 m Width 1.1 m Altitude 250.7 m Depth 310 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Fan/Terril Series Soil (mapped)

Age/Radiocarbon: Charcoal/250 cmbs 8100 $\pm$ 40 BP (B.C. 7160 to 7040; Beta-200795)

### *Base Lithology and Description*

40 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive organic-rich, plow-disturbed silty sand. Surface plow zone (Ap horizon).

80 **Sand/Silt, ("buried" soil)**, Dark-brown-to-brown, massive with occasional pebbles; organic-rich, sandy silt. Bioturbation common. Lower part of sequence (10 cm) grades sandy and is darker than upper part; carbonate content increases near the base of the sequence. Occasional burned and unburned bone, flakes, FCR and possible core near base of unit. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan

construction; basal 10 cm soil (Ab1) horizon may represent period of relative stasis or deflation, with upper (A) horizon representing a cumulative mollisol.

----- Abrupt contact

95 **Sand/Gravel**, Light brown-to-tan; massive-to-crudely bedded, sand and gravel. Discontinuous interbeds of cobbles and gravel common; typically framework supported. Unit probably represents middle-to-late Holocene sheet-washing or colluvial erosion/deposition related to alluvial fan construction. Carbonate concretions and precipitates near the base of the sequence. Subsurface BC soil horizon.

----- Abrupt contact

265 **Silt/Clay (Paleosol)**, Dark-brown-to-brown (upper 130 cm) and brown/dark brown, Ca-mottled (lower 40 cm), massive with occasional pebbles; organic-rich, carbonate-rich, clayey silt. Cumulative unit likely consists of basal early Holocene alluvial deposits that over time included increasing quantities of fan and sheetwash sediment. Upper section marked by stacked series of carbonate-rich Bk horizons; lower section of unit marked by a silt-rich, remnant surface soil (Ab1+Ab2) horizon overlying a well developed Btk horizon.

----- Gradation contact

350+ **Silt/Clay**, Brown-to-gray/green, mottled reddish brown, clayey silt, clay, and silty sand. Carbonate concretions and precipitates common in upper part of the unit. Discontinuous interbeds of silty sand and sand partings occur in the lower part of the sequence. Pebbles common. Unit probably represents probable early Holocene river and fan accumulations. Subsurface (BC/Cg) soil horizons. Trench abandoned when filled with water and walls began to collapse.

### Trench 3

Location: UTM:4911560N, 383183E, Zone 15

Dimensions: Length 5 m Width 1.1 m Altitude: 254.1 m Depth 340 cmbs

Archaeology: Lithic debitage (95-105 cmbs).

Landform/Soil: Alluvial Fan/Terril Series Soil (mapped)

Age/Radiocarbon: Charcoal/105-120 cmbs 6570±40 BP (B.C. 5610 to 5470; Beta-200796)

#### *Base Lithology and Description*

30 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive organic-rich, plow-disturbed silty sand. Surface plow zone (Ap horizon).

----- Sharp (plow zone) contact

85 **Silt/Sand ("buried" soil)**, Dark-brown-to-brown, massive with occasional pebbles; organic-rich, sandy silt. Bioturbation common. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction. Occasional burned and unburned bone, and carbonate concretions and precipitates near base of unit. Soil (A1/A2 horizons) may represent cumulative mollisol.

----- Abrupt contact

140 **Silt/Clay (Paleosol?)**, Dark-brown-to-brown (upper 35 cm) and brown (below upper 20 cm), massive silty clay and clayey silt with occasional pebbles. Upper

ca. 35 cm organic-rich; base marked by a few discontinuous interbeds of medium-to-coarse-grained sand. Bioturbation common. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction; top of unit has well-developed soil that includes possible archaeological feature, bone (burned and unburned) and common charcoal. Carbonate concretions and precipitates common throughout the sequence. Top of unit is paleosol surface (Ab1, Ab2) soil horizon, lower sequence reflects Bk soil horizon.

----- Gradational contact

340+ **Sand/Silt/Gravel/Cobbles**, Light brown-to-tan; bedded-to-massive sand, sand/silt and sand/gravel. Upper part of unit includes discontinuous interbeds of sand and gravel; grades to tabular bedded silty fine-to-medium sand ca.200 cmbs; grades to cross- and tabular bedded sand and gravel ca. 230 cmbs; grades to tabular bedded silty sand with sand partings and few sand and gravel interbeds ca. 260 cmbs; grades to massive-to-crudely bedded sand and gravel ca. 320 cmbs. Carbonate concretions and precipitates found in upper part of the sequence. Unit probably represents early-middle Holocene sheet-washing or colluvial erosion/deposition related to alluvial fan construction (minimally weathered BC and Cox soil horizons).

#### Trench 4

Location: UTM: 4911489N, 383202E, Zone 15

Dimensions: Length 5.5 m Width 1.1 m Altitude 249.8 m Depth 220 cmbs

Archaeology: Debitage and FCR (50-94 cmbs); quartz shatter (145 cmbs)

Landform/Soil: Alluvial Fan/Terril Series Soil (mapped)

#### *Base Lithology and Description*

30 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive organic-rich, plow-disturbed silty sand. Surface plow zone (Ap horizon).

----- Sharp (plow zone) contact

90 **Silt/Sand ("buried" soil)**, Dark-brown-to-brown, massive with occasional pebbles; organic-rich, sandy silt. Bioturbation common. Lower part of sequence (15 cm) grades sandy and is darker than upper part; carbonate concretions and precipitates increase near the base of the sequence. Occasional burned and unburned bone, flakes, FCR and possible core near base of unit. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction; basal 15 cm soil (Ab) horizon may represent period of relative stasis or deflation, with upper (A) horizon representing a cumulative mollisol.

----- Abrupt contact

140 **Silt/Clay**, brown-to-mottled reddish brown, massive silty clay and clayey silt; occasional pebbles (erosional?) lags in upper part of sequence. Carbonate concretions and precipitates common in upper part of the unit. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction. Soil weathering reflects Bk horizon formation.

----- Abrupt contact

- 220+ **Silt/Sand (paleosol)**, Dark brown-to-gray (upper 20 cm) and tan/mottled reddish brown, massive silty sand and silt; occasional pebbles (erosional?) lags in sequence. Carbonate concretions and precipitates common in upper part of the unit. Grades to tabular beds of silt and fine sandy silt in lower part of unit; fissile to blocky structure. Cumulative unit likely consists of basal early Holocene alluvial deposits that over time included increasing quantities of fan and sheetwash sediment; uppermost 20 cm marked by a silt-rich, remnant surface soil (Ab) horizon; lower part includes Bk soil horizon grading into minimally weathered BC soil horizons.
- Gradation contact
- 330+ **Silt/Clay**, Brown-to-gray/green, mottled reddish brown, clayey silt, clay, and silty sand. Carbonate concretions and precipitates common in upper part of the unit. Discontinuous interbeds of silty sand and sand partings occur in the lower part of the sequence. Pebbles common. Unit probably represents probable early Holocene river and fan accumulations. Subsurface (BC/Cg) soil horizons.

#### Trench 5

Location: UTM:4911534N, 383197E, Zone 15  
 Dimensions: Length 4 m Width 1.1 m Altitude 250 m Depth 320 cm  
 Archaeology: Debitage and FCR (65-75 cmbs)  
 Landform/Soil: Alluvial Fan/Terril Series Soil (mapped)

#### *Base Lithology and Description*

- 30 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive organic-rich, plow-disturbed silty sand. Surface plow zone (Ap horizon).
- Sharp (plow zone) contact
- 70 **Silt/Sand ("buried" soil)**, Dark-brown-to-brown, massive with occasional pebbles; organic-rich, sandy silt. Bioturbation common. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction. Lower part of sequence grades sandy and is darker than upper part; carbonate concretions and precipitates near the base of the sequence. Occasional burned and unburned bone and FCR near base of unit; grades sandy near base of the unit. Soil (A1 horizon) may represent cumulative mollisol.
- Abrupt (erosional?) contact
- 320+ **Sand/Silt/Gravel/Cobbles**, Light brown-to-tan; bedded-to-massive sand, sand/silt and sand/gravel. Upper part of unit includes discontinuous interbeds of sand and gravel; grades to tabular bedded silty fine-to-medium sand ca.150 cmbs; grades to cross- and tabular bedded sand and gravel ca. 230 cmbs; grades to tabular bedded silty sand with sand partings and few sand and gravel interbeds ca. 220 cmbs; grades to massive-to-crudely bedded sand and gravel ca. 250 cmbs; grades to massive silt and silty-fine-sand at base of the unit. Carbonate concretions and precipitates found in upper part of the sequence. Unit probably represents early-middle Holocene sheet-washing or colluvial erosion/deposition related to alluvial fan construction (minimally weathered BC and Cox soil horizons).

## Trench 6

Location: UTM:4911546N, 383160E, Zone 15  
Dimensions: Length 6 m Width 1.1 m Altitude 250 m Depth 200 cmbs  
Archaeology: N/A  
Landform/Soil: Alluvial Fan/Terril Series Soil (mapped)

### *Base Lithology and Description*

- 50 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive, organic-rich, plow-disturbed silty sand. Surface plow zone (Ap1/Ap2 horizon).  
----- Sharp (plow zone) contact  
200+ **Sand/Silt/Gravel/Cobbles**, Light brown-to-tan/mottled reddish brown; bedded-to-massive sand/silt and sand/gravel. Upper part of unit includes crossbedded and discontinuous interbeds of sand and gravel and sand; grades to tabular bedded silty fine-to-medium sand ca. 120 cmbs; grades to massive silt and silty-fine-sand at base of the unit. Carbonate concretions and precipitates common in upper part of the sequence. Unit probably represents middle-to-late Holocene sheet-washing or colluvial erosion/deposition related to alluvial fan construction; soil development in upper 20 cm reflects weak Bw soil horizon with underlying tabular beds largely unweathered (Cox and Cu horizons).

## Trench 7

Location: UTM:4911503N, 383222E, Zone 15  
Dimensions: Length 5.5 m Width 1.1 m Altitude 250 m Depth 280 cmbs  
Archaeology: Debitage and FCR (74-94 cmbs)  
Landform/Soil: Alluvial Fan/Terril Series Soil (mapped)

### *Base Lithology and Description*

- 30 **Sand/Silt (Plow Zone)**, Black-to-dark-brown, massive organic-rich, plow-disturbed silty sand. Surface plow zone (Ap horizon).  
----- Sharp (plow zone) contact  
75 **Silt/Sand**, Dark-brown-to-brown, massive with occasional pebbles; organic-rich, sandy silt. Bioturbation common. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction; soil (A horizon) may represent cumulative mollisol.  
----- Abrupt contact  
100 **Silt/Clay (Buried soil?)**, Dark-brown-to-brown (upper 10-20 cm) and brown (below upper 20 cm), massive silty clay and clayey silt with occasional pebbles. Upper ca. 20 cm organic-rich; base marked by a few discontinuous interbeds of medium-to-coarse-grained sand. Bioturbation common. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction; top of unit has well-developed soil that includes possible archaeological feature, bone (burned and unburned) and charcoal common. Carbonate concretions and precipitates common throughout the sequence. Top of

unit represents paleosol surface (Ab) soil horizon; lower part of sequence is Btk horizon.

----- Abrupt contact

150 **Silt/Clay**, brown-to-mottled reddish brown, massive silty clay and clayey silt; occasional pebbles (erosional?) lags in upper part of sequence. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction. Carbonate concretions and precipitates common in upper part of the unit. Unit weathered into series of Bk soil horizons.

----- Abrupt contact

200 **Silt/Sand**, Brown and tan/mottled reddish brown, massive-to-bedded silty sand and sand; occasional pebbles (erosional?) lags in sequence. Carbonate concretions and precipitates common in upper part of the unit. Grades down into tabular beds of clayey silt with sand partings on the tabs and includes a few discontinuous gravelly zones near base of unit. Unit probably represents middle-to-late Holocene sheet-washing or colluvial deposition related to alluvial fan construction. Unit weathered into series of Bk soil horizons.

----- sharp contact

290+ **Silt/Clay (Paleosol)**, +Dark gray (upper 15 cm) and tan/mottled light brown, massive (upper 15 cm)-to-bedded (lower part of unit) clayey silt (upper part) and silt and silty sand (lower part); occasional pebbles. Carbonate concretions and precipitates common in upper part 20-30 cm of the unit. Grades down into tabular beds of silt. Unit probably represents early Holocene sheet-washing or colluvial deposition related to alluvial fan construction. Upper 15 cm of unit is buried surface (ABtb) soil horizon; lower section includes (Bk/Cox) horizons.

## City Property Test Locale

### Trench 1

Location: UTM:4904866N, 386447E, Zone 15

Dimensions: Length 5.0 m Width: 2.0 m Altitude 241.7 m Depth 250 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Minneiska Series Soil (mapped)

#### *Base Lithology and Description*

20 **Sand/Gravel (Plow Zone)**, Tan-to-gray/mottled gray/brown, massive, plow-disturbed silty fine sand; includes few pebbles, few broken shells. Surface plow zone (Ap horizon).

----- Sharp (plow zone) contact

220 **Sand/Gravel**, Tan/brown mottled reddish/orange, crossbedded sand (upper part of unit) and cross-to-crudely-bedded sand and gravel (lower part of unit); large cobbles and pebbles common near base of unit. Occasional medium-grained sand and fine gravel interbeds; few discontinuous silty-sand interbeds. Includes a few rip-ups of dark silt/clay (probably eroded alluvium). Unit represents probable late Holocene channel/bar deposits of Minnesota River or Cottonwood Creek. Subsurface (BC/Cox horizon sequence).

----- Sharp (erosional) contact

- 235 **Silt/Clay/Sand (Paleosol)**, brown, massive-to-bedded, fine sandy silt and clay. Probably represents eroded paleosol formed in an earlier alluvial sequence. Grades sandy near base of unit. Unit is buried, eroded surface (ACb) soil horizon.
- Gradational contact
- 260+ **Sand**, tan/mottled reddish brown/brown, bedded, medium-to-coarse-grained sand; few interbeds of fine gravel; pebbles common. Probably represents basal sandy alluvium/flood deposits or upper part of channel infilling sequence of Minnesota River or Cottonwood Creek. Subsurface (BC/Cu horizon sequence).

## Trench 2

Location: UTM:4904893N, 386472E, Zone 15

Dimensions: Length 5.0 m Width 1.1 m Altitude 241.7 m Depth 270 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Minneiska Series Soil (mapped)

### *Base Lithology and Description*

- 20 **Sand**, Black-to-brown/mottled tan, massive-to-faintly bedded, silty fine sand and sand; few discontinuous interbeds of sand and silt. Probably represents recent flood deposits of the Minnesota River. Ephemeral surface (AC) soil horizon.
- Sharp (erosional) contact
- 50 **Silt/Clay/Sand (buried Plow Zone)**, Black-to-brown, massive, fine sandy silt and clay. Buried plow zone (Apb horizon).
- Sharp (plow zone) contact
- 100 **Sand/Silt**, Brown, massive-to-faintly bedded, silty fine sand; little clay. Includes few discontinuous interbeds of sand and silt. Probably represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Grades sandy near base of unit; includes discontinuous interbeds of medium-to-fine-grained sand. Unit consists of subsurface (BC) soil horizons,
- Sharp contact
- 190 **Sand/Silt (paleosols)**, Brown-to-gray, massive-to-faintly, silty fine sand; little clay. Includes few discontinuous interbeds of sand and silt; shell common. Probably represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit includes soft sediment deformations (flame-structure injections); top of unit marked by sand boil injection from underlying sand and gravel unit; may represent liquefaction feature related to an earthquake. Unit includes a few discontinuous paleosol sequences (AC-Cox) marking short-term stabilization of landform between flood events. Base of unit shows faint and ephemeral, discontinuous surface (AC) soil horizon development; top of unit marked by relatively distinct and continuous, charcoal-bearing buried surface (AC) soil horizon. Unit consists of serial AC/Cox horizons.
- Sharp contact
- 275+ **Sand/Gravel**, Tan/brown mottled reddish/orange, crossbedded sand (upper part of unit) and cross-to-crudely-bedded sand and gravel (lower part of unit below ca. 230-240 cmbs); large cobbles and pebbles common near base of unit. Occasional medium-grained sand and fine gravel interbeds; few discontinuous silty-sand

interbeds. Includes a few rip-ups of dark silt/clay (probably eroded alluvium). Unit represents probable Holocene channel/bar deposits of Minnesota River or Cottonwood Creek. Subsurface (2C+) soil horizons.

### Trench 3

Location: UTM:4904919N, 386514E, Zone 15

Dimensions: Length 6.2 m Width 1.1 m Altitude 241 m Depth 310 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Minneiska Series Soil (mapped)

Age/Radiocarbon: Charcoal/230 cmbs 580±40 BP (A.D. 1300 to 1420; Beta-200798)

#### *Base Lithology and Description*

30 **Silt/Sand (Plow Zone)**, Black-to-brown, massive, fine sandy silt; little clay. Surface plow zone (Ap horizon).

----- Sharp (plow zone) contact

90 **Sand/Silt**, Brown-to-gray/mottled tan/brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Includes few discontinuous interbeds of sand and silt in the upper part of the sequence; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is subsurface (BC/C) soil horizons.

----- Sharp contact

100 **Sand/Silt (paleosol)**, Brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is ephemeral surface (AC) soil horizon of paleosol.

----- Sharp contact

110 **Sand/Silt (paleosol)**, Brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is ephemeral surface (AC) soil horizon of paleosol.

----- Sharp contact

190 **Silt/Sand/Clay (paleosol)**, Gray-to-strong brown, massive-to-blocky, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly clayey silt; lower part of the sequence grades sandy; includes discontinuous interbeds of cross- and tabular bedded sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Top of the unit buried surface (ACb) soil horizon of paleosol; lower part of unit represents minimally weathered (BC-Cox) soil horizons.

----- Sharp (erosional) contact

235 **Sand/Silt (paleosol)**, Gray-to-brown, massive-to-faintly bedded, sand, silty fine sand and sandy clayey silt. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota



River or Cottonwood Creek; may also represent “wetland” infilling of abandoned channel. Top of the unit is ephemeral surface (AC) soil horizon of paleosol; lower part mainly minimally weathered (BC/Cu) soil horizons.

----- Gradational contact

310+ **Sand**, tan/mottled reddish brown/brown, bedded, medium-to-coarse-grained sand. Shell common throughout sequence. May represent sandy, wetland infilled channel or part of a Holocene channel/bar deposit of Minnesota River or Cottonwood Creek. Unweathered subsurface (Cu) soil horizons.

#### Trench 4

Location: UTM:4904872N, 386488E, Zone 15

Dimensions: Length 6.5 m Width 1.1 m Altitude 241.6 m Depth 320 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Minneiska Series Soil (mapped)

#### *Base Lithology and Description*

25 **Silt/Sand (Plow Zone)**, Black-to-brown, massive, fine sandy silt; little clay. Surface plow zone (Ap horizon).

----- Sharp (plow zone) contact

30 **Sand**, Brown/mottled tan, massive-to-faintly bedded, medium-to-fine-grained sand. Probably represents recent flood deposits of the Minnesota River. Minimally weathered subsurface (Cox) soil horizon.

----- Sharp (erosional) contact

65 **Sand/Silt (paleosol)**, Gray-to-Brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is discontinuous ephemeral surface (AC) soil horizon of paleosol.

----- Sharp contact

90 **Sand/Silt (paleosol)**, Brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is discontinuous ephemeral surface (AC) soil horizon of paleosol.

----- Sharp contact

110 **Sand/Silt (paleosol)**, Gray-to-brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is discontinuous ephemeral surface (AC) soil horizon of paleosol.

----- Sharp contact

135 **Sand/Silt (paleosol)**, Gray-to-brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the

sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is discontinuous ephemeral surface (AC) soil horizon of paleosol.

----- Gradational contact

200 **Sand/Gravel**, tan/mottled reddish brown/brown, crossbedded medium-to-coarse-grained sand (upper part) and crossbedded sand and gravel (base); pebbles common in lower part of sequence. The unit includes pieces of broken shell near the base of the sequence. Represents Holocene channel/bar deposits of Minnesota River or Cottonwood Creek. Minimally weathered subsurface (Cox) soil horizons.

----- Sharp contact

235 **Sand/Silt (paleosol)**, Very dark grayish brown, massive-to-faintly bedded, sand, silty fine sand and sandy clayey silt. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base, and occasional snails. Upper part of unit includes occasional fine pieces of charcoal and Fe-staining along root channels. Unit probably represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek; may also represent "wetland" infilling of abandoned channel. Top of the unit is ephemeral surface (ACb) soil horizon of paleosol; lower part mainly minimally weathered subsurface (BC) soil horizons.

----- Gradational contact

275 **Sand/Gravel**, tan/mottled reddish brown/brown, crossbedded medium-to-coarse-grained sand and gravel; pebbles common throughout sequence. The unit commonly includes pieces of broken shell within the sequence. Represents Holocene channel/bar deposits of Minnesota River or Cottonwood Creek; unweathered subsurface (C) soil horizon.

## Trench 5

Location: UTM:4904888N, 386508E, Zone 15

Dimensions: Length 5.5 m Width 1.1 m Altitude 241.4 m Depth 260 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Minneiska Series Soil (mapped)

### *Base Lithology and Description*

20 **Silt/Sand (Plow Zone)**, Black-to-brown, massive, fine sandy silt; little clay. Surface plow zone (Ap horizon).

----- Sharp (plow zone) contact

28 **Sand**, Brown/mottled tan, massive-to-faintly bedded, medium-to-fine-grained sand. Probably represents recent flood deposits of the Minnesota River. Minimally weathered subsurface (Cox) soil horizon.

----- Sharp (erosional) contact

50 **Sand/Silt (paleosol)**, Gray-to-Brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the

sequence grades sandy; little charcoal in unit; includes discontinuous interbeds of medium-to-fine-grained sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is discontinuous ephemeral surface (AC) soil horizon of paleosol.

----- Sharp contact

85 **Sand/Silt (paleosol)**, Brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base; includes few pebbles near base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is discontinuous ephemeral surface (AC) soil horizon of paleosol.

----- Sharp contact

105 **Sand/Silt (paleosol)**, Gray-to-brown, massive-to-faintly bedded, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base. Probably represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Unit is discontinuous ephemeral surface (AC) soil horizon of paleosol

----- Sharp contact

185 **Silt/Sand/Clay (paleosol)**, Gray-to-strong brown, massive-to-blocky, sand, silty fine sand and sandy silt; little clay. Top of sequence mainly clayey silt; lower part of the sequence grades sandy; includes discontinuous interbeds of cross- and tabular bedded sand at base. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Top of the unit buried surface (ACb) soil horizon of paleosol; lower part of unit represents minimally weathered (BC/Cox) soil horizons.

----- Sharp contact

210 **Sand/Silt (paleosol)**, Very dark grayish brown, massive-to-faintly bedded, sand, silty fine sand and sandy clayey silt. Top of sequence mainly silty; lower part of the sequence grades sandy; includes discontinuous interbeds of medium-to-fine-grained sand at base, and occasional snails. Upper part of unit includes occasional fine pieces of charcoal and Fe-staining along root channels. Unit probably represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek; may also represent "wetland" infilling of abandoned channel. Top of the unit is ephemeral surface (ACb) soil horizon of paleosol; lower part mainly minimally weathered subsurface (BC) soil horizons.

----- Sharp (Abrupt) contact

260+ **Sand/Gravel**, tan/mottled reddish brown/brown, massive-to-bedded, medium-to-coarse-grained sand (upper part) and cross-to-tabular-bedded sand and gravel (base). Shell common throughout sequence. Base includes a few interbeds of fine gravel; pebbles common. Probably represents Holocene channel/bar deposits of Minnesota River or Cottonwood Creek; unweathered (2Cu) soil horizons.

## Trench 6

Location: UTM:4904888N, 386508E, Zone 15

Dimensions: Length 5.5 m Width 1.1 m Altitude 241.4 m Depth 250 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/Minneiska Series Soil (mapped)

Age/Radiocarbon:Charcoal/110 cmbs 650±40 BP (A.D. 1280 to 1400; Beta-200799)

*Base Lithology and Description*

- 20 **Silt/Sand (Plow Zone)**, Dark gray-to-brown, massive, silty sand ; little clay. Surface plow zone (Ap horizon).  
----- Sharp (plow zone) contact
- 35 **Silt/Sand**, Dark gray-to-gray, massive (top)-to-faintly-bedded (base) silty sand and sand; little clay. Faint, discontinuous beds of sand near base of the sequence. Probably represents recent flood deposits. Accretionary surface (AC) soil horizon  
----- Sharp (erosional) contact
- 95 **Silt/Clay/Sand (paleosol)**, Black-to-dark-gray (upper 20 cm) and brown/mottled gray and tan (base) massive (top)-to-bedded (base) silt, clayey silt, and sand. Sequence fines upwards; top of sequence mainly silty clay; lower part of the sequence grades sandy and includes discontinuous interbeds and pockets of medium-to-fine-grained sand at base. Little charcoal in upper part of unit. Represents sandy alluvium/flood deposits of Minnesota River or Cottonwood Creek. Upper part of the unit forms a cumulative, mollic (A) soil horizon; lower part of unit is minimally to unweathered subsurface (BC-Cox) soil horizons.  
----- Sharp contact
- 160 **Silt/Sand/Clay (paleosol)**, Gray-to-strong brown, massive-to-bedded, sand, silty fine sand and sandy silt; little clay. Unit consists of another series of fining upward, discontinuous flood deposits; the top 20 cm is silty and marked a buried ephemeral paleosol (ACb) with occasional charcoal, the base represents a sandy (BC/Cox) sequence.  
----- Gradational contact
- 250+ **Sand/Gravel**, tan/mottled reddish brown/brown, massive-to-bedded, medium-to-coarse-grained sand (upper part) and cross-to-tabular-bedded sand and gravel (base). Shell common throughout sequence. Base includes a few interbeds of fine gravel; pebbles common. Represents Holocene channel/bar deposits of Minnesota River or Cottonwood Creek; relatively unweathered (2C) soil horizons.

## Hoff Deep Test Locale

### Trench 1

Location: UTM:5230783N, 210391E, Zone 15  
Dimensions: Length 7 m Width 1.2 m Altitude 265.25 m Depth 330 cmbs  
Archaeology: Debitage, FCR and calcined bone (94.5-110 cmbs).  
Landform/Soil: Alluvial Terrace/ Wahpeton Series Soil (mapped)  
Age/Radiocarbon: Charcoal/45-65 cmbs 2680±40 BP (B.C. 900 to 800; Beta-200800)  
Charcoal/100 cmbs 2020±40 BP (B.C. 110 to A.D. 70; Beta-200801)

#### *Base Lithology and Description*

- 20 **Silt/Clay (Plow Zone)**, Black-to-strong-brown, massive, plow-disturbed clayey silt; little sand. Surface (Plow Zone; Ap1) soil horizon.  
----- Sharp (plow zone) contact
- 25 **Silt/Clay**, dark gray, massive, clayey silt; little sand; gleyed (Cg) soil horizon.  
----- Abrupt contact
- 45 **Silt/Clay (Plow Zone)**, Black-to-strong-brown, massive, plow-disturbed clayey silt; little sand. Buried surface (Buried Plow Zone; Ap2) soil horizon.  
----- Sharp (plow zone) contact
- 70 **Silt/Clay**, dark gray, massive, clayey silt; little sand. Cumulative surface (A) soil horizon truncated by plowing; contains bone fragments near upper contact, charcoal and infilled voids: base of unit gleyed (Cg) soil horizon.  
----- Abrupt (erosional?) contact
- 90 **Clay/Silt (Paleosol?)**, Dark-gray-to-strong-brown (top) and light brown/mottled gray/tan (base), massive, silty clay and clayey silt. Includes occasional charcoal flecking and small pieces of bone near base of unit. Unit alluvial (overbank?) from Red River. Top of unit probably surface (Ab) soil horizon; this horizon is discontinuous and may have been partly eroded. Lower part of unit is subsurface (Cg) soil horizon.  
----- Abrupt (erosional?) contact
- 250 **Clay/Silt (Paleosol)**, Black-to-strong-brown (upper 20 cm) and light brown/mottled gray/tan (rest of unit), massive(top)-to-faintly-laminated(base), silty clay and clayey silt. Top of unit probably surface soil horizon of paleosol and includes FCR, lithic debitage, occasional charcoal flecking, and small pieces of bone including calcined bone. Carbonate-rich throughout. Unit become faintly laminated and/or varved near the base. Unit probably mainly glaciolacustrine (Lake Agassiz); upper part of unit may represent early Red River alluvium. Top of unit is buried surface (2Ab) soil horizon; this horizon is discontinuous and may have been partly eroded. Lower part of unit includes subsurface (2Bk/2BC2C) soil horizonation.  
----- Gradational contact
- 330+ **Clay/Silt**, Tan-to-light-brown/mottled reddish brown/gray, laminated (varved?) silty clay and clayey silt; includes fine sand drapes and lamina between silty/clayey beds (varved couplet?). Unit glaciolacustrine (Late Agassiz?).

### Trench 2

Location: UTM:5230807N, 210367E, Zone 15  
 Dimensions: Length 7 m Width 1.2 m Altitude 263.75 m Depth 450 cmbs  
 Archaeology: Ceramic, calcined bone (115-127 cmbs).  
 Landform/Soil: Alluvial Terrace/ Cashel Series Soil (mapped)  
 Age/Radiocarbon: Charcoal/60-68 cmbs 1130±40 BP (A.D. 790 to 1000; Beta-200802)  
 Charcoal/115-128 cmbs 1980±40 BP (B.C. 50 to A.D. 100; Beta-200803)  
 Charcoal/400 cmbs 3420±40 BP (B.C. 1870 to 1840 and B.C. 1780 to 1620; Beta  
 -200804)

*Base Lithology and Description*

- 22 **Silt/Clay (Plow Zone)**, Black-to-strong-brown, massive, plow-disturbed clayey silt; little sand. Includes occasional bone (unburned). Surface (Plow Zone; Ap1) soil horizon.  
 ----- Sharp (plow zone) contact
- 26 **Silt/Clay**, dark gray, massive, clayey silt; little sand; gleyed (Cg) soil horizon.  
 ----- Abrupt contact
- 45 **Silt/Clay**, Black-to-strong-brown, massive, plow-disturbed clayey silt; little sand. Includes occasional charcoal flecking and small pieces of bone near base of unit. Cumulative surface (A) soil horizon.  
 ----- Abrupt (erosional?) contact
- 60 **Silt/Clay**, Dark-gray, massive, clayey silt; little sand; gleyed (Cg) soil horizon.  
 ----- Abrupt (conformable) contact
- 88 **Clay/Silt (paleosol?)**, Dark-gray-to-strong-brown (top) and light brown/mottled gray/tan (base), massive, silty clay and clayey silt. Includes occasional charcoal flecking. Unit alluvial (overbank?) from Red River. Top of unit probably surface (Ab) soil horizon; this soil (Ab) horizon is discontinuous and may have been partly eroded. Lower part of unit is subsurface (Cg) soil horizon.  
 ----- Abrupt (conformable) contact
- 115 **Clay/Silt (paleosol)**, Dark-gray-to-brown, massive, silty clay. Includes occasional charcoal flecking. Unit alluvial (overbank?) from Red River. Unit probably buried surface (Ab) soil horizon; may have been partly eroded. Lower part of unit is subsurface (Cg) soil horizon.  
 ----- Abrupt (conformable) contact
- 300 **Clay/Silt (paleosol)**, Dark-gray-to-brown (upper 10 cm) and light brown/mottled gray/tan (rest of unit), massive(top)-to-faintly-laminated(base), silty clay and clayey silt. Top of unit probably surface soil horizon of paleosol and charcoal flecking, and small pieces of bone (burned and unburned) and a ceramic artifact; a few charcoal pieces occur through unit (including base). Some pieces of bone on top of unit may have been eroded and redeposited. Unit became faintly laminated and/or varved near the base. Carbonate-rich throughout. Unit probably mainly glaciolacustrine (Lake Agassiz); upper part of unit may represent early Red River alluvium. Top of unit is buried surface (2Ab) soil horizon; this horizon is discontinuous and may have been partly eroded. Lower part of unit includes subsurface (2Bk/2BC/2C) soil horizonation.  
 ----- Gradational contact

- 450+ **Clay/Silt**, Tan-to-light-brown/mottled reddish brown/gray, laminated (varved?) silty clay and clayey silt; includes fine sand drapes and lamina between silty/clayey beds (varved couplet?). Few pieces of charcoal occur throughout unit; piece collected near base. Unit glaciolacustrine (Late Agassiz?).

### Trench 3

Location: UTM:5230750N, 210426E, Zone 15

Dimensions: Length 15 m Width 1.2 m Altitude 265 m Depth 250 cmbs

Archaeology: Ceramic (20-42 cmbs).

Landform/Soil: Alluvial Terrace/ Wahpeton Series Soil (mapped)

Age/Radiocarbon: Charcoal/110 cmbs 3420±40 BP (B.C. 1870 to 1840 and B.C. 1780 to 1620; Beta-200805)

#### *Base Lithology and Description*

- 20 **Silt/Clay (Plow Zone)**, Black-to-strong-brown, massive, plow-disturbed clayey silt; little sand. Includes occasional bone (unburned). Surface (Plow Zone; Ap1) soil horizon.  
----- Sharp (plow zone) contact
- 65 **Silt/Clay**, Black-to-dark-gray, massive, clayey silt; little sand. Includes occasional very fine charcoal flecking and pieces of bone (burned and unburned). Unit probably resulted from progressive accretion of Red River alluvium (overbank?); the thick nature of the soil A horizon may reflect that derived as mollic epipedon during accretionary process. Unit is cumulative surface (A) soil horizon.  
----- Abrupt (erosional)? contact
- 110 **Silt/Clay (Paleosol)**, Black-to-dark-gray, massive, clayey silt; little sand. Includes occasional very fine charcoal flecking and pieces of bone (burned and unburned). Unit probably resulted from progressive accretion of Red River alluvium (overbank?); the thick nature of the soil A horizon may reflect that derived as mollic epipedon during accretionary process. Unit is buried surface (Ab) soil horizon.  
----- Abrupt (erosional?) contact
- 125 **Silt/Clay (Paleosol)**, Black-to-dark-gray, massive, clayey silt; little sand. Includes occasional charcoal flecking and small pieces of bone (burned). Buried surface (Ab) soil horizon.  
----- Distinct (conformable) contact
- 135 **Clay/Silt (paleosol?)**, Dark-gray (top 5-10 cm) and light brown/mottled gray/tan (base), massive, silty clay and clayey silt. Includes occasional charcoal flecking. Unit alluvial (overbank?) from Red River. Top of unit is discontinuous and probably buried surface (Ab) soil horizon; base of unit is subsurface (C) soil horizon.  
----- Distinct (conformable) contact
- 145 **Clay/Silt (paleosol?)**, Dark-gray (top 5-10 cm) and light brown/mottled gray/tan (base), massive, silty clay and clayey silt. Includes occasional charcoal flecking. Unit alluvial (overbank?) from Red River. Top of unit is discontinuous and

probably buried surface (Ab) soil horizon; base of unit is subsurface (C) soil horizon.

----- Distinct (conformable) contact

165 **Clay/Silt (paleosol?)**, Dark-gray (top 5-10 cm) and light brown/mottled gray/tan (base), massive, silty clay and clayey silt. Includes occasional charcoal flecking. Unit alluvial (overbank?) from Red River. Unit deformed (thrust fault?) in northwestern end of trench. Top of unit is discontinuous and probably buried surface (Ab) soil horizon; base of unit is subsurface (C) soil horizon.

----- Gradational contact

180 **Clay/Silt**, light brown/mottled gray/tan, massive(top)-to-faintly-laminated(base), silty clay and clayey silt. Unit becomes faintly laminated and/or varved near the base. Unit deformed (thrust fault?) in northwestern end of trench. Unit probably mainly glaciolacustrine (Lake Agassiz); upper part of unit may represent early Red River alluvium. Unit is carbonate-rich subsurface (2Bk) soil horizon.

----- Gradational contact

250+ **Clay/Silt**, Tan-to-light-brown/mottled reddish brown/gray, laminated (varved?) silty clay and clayey silt; includes fine sand drapes and lamina between silty/clayey beds (varved couplet?). Few pieces of charcoal occur throughout unit; piece collected near base. Unit glaciolacustrine (Late Agassiz).

#### Trench 3x

Location: UTM:5230750N, 210426E, Zone 15

Dimensions: Length 10 m Width 1.2 m Altitude 265 m Depth 200 cmbs

Archaeology: N/A

Landform/Soil: Alluvial Terrace/ Wahpeton Series Soil (mapped)

#### *Base Lithology and Description*

25 **Silt/Clay (Plow Zone)**, Black-to-strong-brown, massive, plow-disturbed clayey silt; little sand. Surface (Plow Zone; Ap1) soil horizon.

----- Sharp (plow zone) contact

80 **Silt/Clay**, Black-to-dark-gray, massive, clayey silt; little sand. Includes occasional very fine charcoal flecking. Unit probably resulted from progressive accretion of Red River alluvium (overbank?); the thick nature of the soil "A" horizon may reflect that derived as mollic epipedon during accretionary process. Unit is cumulative surface (A) soil horizon.

----- Abrupt (erosional?) contact

200+ **Clay/Silt (Paleosol)**, Dark-gray-to-strong-brown (upper 10-15 cm) and light brown/mottled gray/tan (rest of unit), massive (top)-to-faintly-laminated(base), silty clay and clayey silt. Top of unit probably surface soil horizon of paleosol and includes possible FCR, occasional charcoal flecking, and small pieces of bone. Unit become faintly laminated and/or varved near the base. Unit probably mainly glaciolacustrine (Lake Agassiz). Top of unit is buried surface (2Ab) soil horizon; this horizon is discontinuous and may have been partly eroded. Lower part of unit includes carbonate-rich subsurface (2Bk/BC) soil horizons.

#### Trench 4

Location: UTM:5230790N, 210432E, Zone 15



Dimensions: Length 10 m Width 1.2 m Altitude 265 m Depth 150 cmbs  
Archaeology: Ceramic (69-88 cmbs).  
Landform/Soil: Alluvial Terrace/Wahpeton Series Soil (mapped)

*Base Lithology and Description*

26 **Silt/Clay (Plow Zone)**, Black, massive, plow-disturbed clayey silt; little sand. Surface (Plow Zone; Ap1, Ap2) soil horizons.

----- Sharp (plow zone) contact

75 **Silt/Clay**, Black-to-gray (base of unit), massive, clayey silt; little sand. Unit probably resulted from progressive accretion of Red River alluvium (overbank?); the thick nature of the soil A horizon may reflect that derived as mollic epipedon during accretionary process. Unit is a cumulative surface (A) soil horizon. Lower 10 cm of unit is subsurface (Cg) soil horizon.

----- Abrupt (erosional?) contact

150+ **Clay/Silt (Paleosol)**, Dark-gray-to-strong-brown (upper 10-15 cm) and light brown/mottled gray/tan (rest of unit), massive(top)-to-faintly-laminated (near base), silty clay and clayey silt. Top of unit probably surface soil horizon of paleosol and includes ceramic artifact and small pieces of bone. Unit become laminated and/or varved near the base. Unit probably mainly glaciolacustrine (Lake Agassiz). Top of unit is buried surface (2Ab) soil horizon. Lower part of unit includes carbonate rich and gleyed subsurface (2Bkg/2Bkg2) soil horizonation.