

Core/Profile: AK-1

Location: Mississippi River Boat Landing Road

Legal description: SE ¼ SW ¼ NW ¼ Section 4 T52N R23W

County: Aitkin

Parent material: Alluvium/lacustrine sediments

Vegetation: Road bed (grass)

Slope: 0-2%

Elevation: 1246 feet

Topo. Map: Jacobson

Remarks: MnDOT core #3-2; Mississippi River north of Jacobson; on west side of river; on Aitkin County Parks road to campground and boat landing; at fork in road

Depth cm(ft)	Horizon or Zone	Description
0-20 (0-.7)	CA	dark brown (10YR3/3) loamy sand; single grain; loose; noneffervescent; clear lower boundary; sand is fine to coarse; rootlets; roots common; many small pebbles; charcoal; few medium to large pebbles.
20-58 (.7-1.9)	C1	dark yellowish brown (10YR4/4) fine to very fine sand; mottles are common, fine to medium, faint, dark brown (10YR3/3); single grain; loose; noneffervescent; clear lower boundary; rootlets; charcoal flecks; few roots; alluvial; 85% recovery.
58-107 (1.9-3.5)	C2	yellowish brown (10YR5/4) fine to very fine sand; single grain; loose; noneffervescent; gradual lower boundary; few roots and rootlets; alluvial; 85% recovery.
107-152 (3.5-5.0)	C3	yellowish brown (10YR5/6) fine to very fine sand; mottles are common, medium, faint, grayish brown (10YR5/2); single grain; loose; noneffervescent; clear lower boundary; more oxidized than C2; few roots and rootlets; lower boundary depth may be off due to poor recovery; part of fining upwards sequence with C4 and C5; alluvial; 60-80% recovery.
152-274 (5.0-9.0)	C4	light yellowish brown (10YR6/4) fine sand; mottles are few, medium, faint, yellowish brown (10YR5/6); single grain; loose; noneffervescent; unknown lower boundary (end of tube); coarser and less oxidized than C3; oxidized mottles; part of fining upwards sequence with C3 and C5; alluvial; 58% recovery.
274-390 (9.0-12.8)	C5	light olive brown (2.5Y5/4) medium sand; mottles are few, medium to coarse, faint, yellowish brown (10YR5/4); single grain; loose; noneffervescent; clear lower boundary; laminated sands; few slightly loamy laminations; part of fining upwards sequence with C4 and C3; alluvial; 56% recovery.
390-585 (12.8-19.2)	C6	brown (10YR5/3) fine to medium sand; mottles are very few, coarse, distinct, more porous, grayish brown (2.5Y5/2); single grain; loose; noneffervescent; abrupt lower boundary; very few rootlets; fining upwards sequence; some coarse sand grains near base; faintly laminated; alluvial; 32% recovery.
585-725 (19.2-23.8)	2C7	dark gray to gray (5Y4/1-10YR5/1) silt loam to silty clay loam; mottles are few, fine, distinct, light gray (5Y7/1); massive; firm; strongly effervescent; abrupt lower boundary; few thin light gray laminations; unit is "bedded," and alternates between silt loam and silty clay loam every 20-30 cm; more clay-rich units are generally darker; some fracturing, especially in clay-rich zones; few slickensides; few beds of silty clay; lacustrine-glacial lake sediments.
725-786 (23.8-25.8)	3C8	dark reddish brown (5YR3/3) silty clay loam; laminations are dark gray (5YR4/1) to dark reddish gray (5YR4/2); massive; firm; slightly effervescent; abrupt lower boundary; oxidized; laminated (possibly varved); laminations alternate between oxidized and unoxidized; oxidized laminations are more clay-rich and fractured; lacustrine-glacial lake sediments (possible Superior influence).
786-1021 (25.8-33.5)	3C9	dark gray (10YR4/1) silty clay loam, silt loam at top; laminations are dark reddish brown (5YR3/3); massive; firm; slightly effervescent; abrupt lower boundary; laminated; laminations alternate between oxidized and unoxidized; some fracturing along bedding planes; oxidation increases with depth; few fine sand laminations; few coarse sand grains, increasing with depth; lacustrine.
1021-1036 (33.5-34.0)	3C10	dark reddish brown (5YR3/3) silty clay loam; massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tubes); oxidized; few laminations (dark gray [5YR4/1]); some fracturing, especially along bedding planes; lacustrine-glacial lake sediments.

Core/Profile: AK-2

Location: Mississippi River Boat Landing Road

Legal description: NE ¼ NE ¼ SE ¼ Section 5 T52N R23W

County: Aitkin

Parent material: Alluvium/lacustrine sediments

Vegetation: Roadbed grass

Slope: 0-2%

Elevation: 1246 feet

Topo. Map: Jacobson

Remarks: MnDOT core #3-2; Mississippi River north of Jacobson; on inside bend of a meander; on west side of river; on north side of Aitkin County Parks road to campground and boat landing; at north end of boat landing; closest core (in transect) to river

Depth cm(ft)	Horizon or Zone	Description
0-46 (0-1.5)	C1	dark brown to brown to dark brown (10YR3/3-4/3) fine to coarse sand; single grain; loose; noneffervescent; clear lower boundary; alternating bands of fine to very fine sand and coarse sand with gravel; poor recovery (≈50%); PSA.
46-91 (1.5-3.0)	C2	dark brown, dark yellowish brown and strong brown (10YR3/3,4/4, and 7.5YR4/6) fine sand; single grain; loose; noneffervescent; clear lower boundary; more organic-rich bands in top 6 cm and bottom 12 cm; few roots, stems, grasses; charcoal near top; few pebbles; crudely laminated; poor recovery (≈50%); possible base of PSA.
91-320 (3.0-10.5)	C3	light brownish gray (2.5Y6/2) fine to very fine sand; mottles are many, coarse, prominent, yellowish brown (10YR5/6); single grain; loose; slightly effervescent; clear lower boundary; oxidized mottles; poor recovery (40-60%); alluvial.
320-418 (10.5-13.7)	C4	grayish brown (10YR5/2) fine to medium sand; mottles are common, coarse, distinct, yellowish brown (10YR5/6) and dark brown (7.5YR3/4); single grain; loose; strongly effervescent; clear lower boundary; oxidized mottles; poor recovery (72%); alluvial.
418-427 (13.7-14.0)	C5	gray (10YR5/1) silt to silt loam; massive; very friable; strongly effervescent; unknown lower boundary (end of tube); silt lens; few sand laminations; poor recovery (72%); alluvial.
427-570 (14.0-18.7)	C6	grayish brown (10YR5/2) fine to medium sand; single grain; loose; slightly to strongly effervescent; abrupt lower boundary; poor recovery (72%); alluvial.
570-579 (18.7-19.0)	C7	gray (10YR5/1) silt loam; massive; very friable; strongly effervescent; unknown lower boundary (end of tube); silt lens; finely laminated at base; poor recovery (72%); possibly lacustrine - connected to 2C - otherwise silt lens in alluvium.
579-640 (19.0-21.0)	C8	grayish brown (10YR5/2) fine to medium sand; mottles are few, coarse, gray (10YR5/1); single grain; loose; slightly to strongly effervescent; abrupt lower boundary; driller's note: "sand very likely coming from above and being picked up on following run"; possible slump; few mottles of silts.
640-722 (21.0-23.7)	2C9	gray (10YR5/1) silty clay loam; laminations are white (10YR8/1); massive; friable to firm; strongly effervescent; abrupt lower boundary; finely laminated; some fracturing in more clay-rich lenses (often dark gray); occasional ripples in laminations; few voids (≈1 cm across); few faults in laminations; lacustrine.
722-762 (23.7-25.0)	2C10	dark gray (10YR4/1) silty clay to silty clay loam; few laminations are gray (10YR5/1) massive; firm; strongly effervescent; abrupt lower boundary; finely laminated at top; more crudely laminated in rest of unit; more clay-rich than overlying unit; some fracturing; slickensides common; lacustrine - deep water or off-shore.
762-774 (25.0-25.4)	2C11	gray (10YR5/1) silt loam; laminations are white (10YR8/1); massive; firm; strongly effervescent; abrupt lower boundary; similar to 2C9; finely laminated; few fine sand laminations; some faulting (offset laminations); lacustrine.
774-884 (25.4-29.0)	3C12	dark reddish brown (5YR3/3) silt loam to silty clay loam; laminations are gray to reddish gray (5YR4/1-4/2); massive; firm; slightly effervescent; unknown lower boundary (end of tube); laminated (possibly varved); few sand laminations; laminations alternate between oxidized and unoxidized; oxidized laminations clay-rich; poor recovery (≈60%); lacustrine-glacial lake sediments (possible Superior influence).
884-1036 (29.0-34.0)	3C13	dark reddish gray to dark gray (5YR4/2-10YR4/1) silt loam to silty clay loam; laminations are dark reddish brown (5YR3/3), clay-rich; massive; friable to firm; slightly effervescent; unknown lower boundary (end of tubes); laminated; some fracturing along bedding planes; 82% recovery; lacustrine-glacial lake sediments.

Core/Profile: AK-3

Location: Mississippi River Boat Landing Road

Legal description: NW ¼ SW ¼ Section 5 T52N R23W

County: Aitkin

Parent material: Alluvium/lacustrine sediments

Vegetation: Roadbed grass

Slope: 0-2%

Elevation: 1246 feet

Topo. Map: Jacobson

Remarks: MnDOT core #3-3; Mississippi River north of Jacobson; west of river; near western end of Aitkin County Parks road to campground and boat landing; 150 feet east of County Road 10; no notes on elevation (assume elevation of road)

Depth cm(ft)	Horizon or Zone	Description
0-10 (0-.3)	CA	dark brown (10YR3/3) sandy loam; massive to single grain; friable to loose; slightly effervescent; abrupt lower boundary; sand is coarse; rounded pebbles common; roots common; rootlets; recent sediment - PSA.
10-73 (.3-2.4)	2CA	mottled dark brown (10YR3/3), yellowish brown (10YR5/4), strong brown (7.5YR4/6), and greenish gray (5G5/1-6/1) sandy loam; massive; friable; noneffervescent; gradual lower boundary; root zone - many roots and rootlets; gleyed and oxidized mottles; sand is very fine to fine; driller's notes: "heaving sand"; PSA.
73-104 (2.4-3.4)	2C1	grayish brown to light brownish gray (10YR5/2-2.5Y6/2) loamy sand to fine sand; mottles are common, medium, distinct, greenish gray (5GY5/1), strong brown (7.5YR4.6), and black (10YR2/1); massive to single grain; very friable to loose; noneffervescent; gradual lower boundary; few roots; omnidirectional rootlets; Mn oxides; gleyed and oxidized mottles; driller's notes: "heaving sand"; probably PSA.
104-180 (3.4-5.9)	2C2	yellowish brown (10YR5/6) fine sand; mottles are common, medium, distinct, grayish brown (10YR5/2); single grain; loose; noneffervescent; gradual lower boundary (color change); oxidized; 62% recovery; alluvial.
180-579 (5.9-19.0)	2C3	grayish brown to gray (10YR5/2-5/1) fine sand; single grain; loose; slightly to strongly effervescent; unknown lower boundary (end of tube); slightly coarser than 2C2; 58-75% recovery; alluvial.
579-732 (19.0-24.0)	3C4	dark gray (10YR4/1) silty clay loam; massive; friable to firm; strongly effervescent; unknown lower boundary (end of tube); top 5 cm is gray (10YR5/1), finely laminated; fractured; some slickensides; crudely laminated; more clay-rich in lower half; 60% recovery; lacustrine.
732-747 (24.0-24.5)	3C5	gray (10YR5/1) silt loam to silty clay loam; laminations are white (10YR8/1); massive; friable; strongly effervescent; abrupt lower boundary; similar to top 5 cm of 3C4; finely laminated; 68% recovery; lacustrine.
747-774 (24.5-25.4)	4C6	dark reddish brown to reddish brown (5YR3/3-4/3) silty clay loam; laminations are dark gray (5YR4/1); massive; firm; strongly effervescent; abrupt lower boundary; laminated; oxidized; oxidized laminations are more clay-rich and often fractured; few sand laminations; 68% recovery; lacustrine (possible Superior influence).
774-860 (25.4-28.2)	4C7	dark gray (5YR4/1) silt loam to silty clay loam; few laminations are reddish brown (5YR4/3); massive; friable to firm; slightly to strongly effervescent; clear lower boundary; few laminations; 68% recovery; lacustrine (possible Superior influence).
860-899 (28.2-29.5)	4C8	laminated dark reddish brown (5YR3/3) and dark gray to dark reddish gray (5YR4/1-4/2) silty clay loam; massive; friable to firm; slightly effervescent; clear lower boundary; oxidized laminations are more clay-rich; laminated (possible varves); lacustrine (possible Superior influence).
899-936 (29.5-30.7)	4C9	dark reddish brown (5YR3/3) silty clay loam; few laminations are dark gray (5YR4/1); massive; firm; slightly effervescent; abrupt lower boundary; few laminations; at least one pebble (mudstone?); lacustrine (possible Superior influence).
936-1036 (30.7-34.0)	4C10	dark gray (5Y4/1-10YR4/1) silty clay loam; massive; friable; slightly effervescent; unknown lower boundary (end of tubes); some coarse sand grains; faintly laminated; lacustrine.

Core/Profile: AK-4

Location: Verdon Township Minimum Maintenance Road

Legal description: SE ¼ SE ¼ Section 23 T51N R24W

County: Aitkin

Parent material: Alluvium(?)/loess/lacustrine sediments

Vegetation:

Slope: 0-2%

Elevation: 1251 feet

Topo. Map: Ball Bluff

Remarks: MnDOT core Ait. Co. 5-1; Mississippi River; east of river along minimum maintenance road in Verdon Township; 102 feet west of T.H. 65; driller's notes specify north side of minimum maintenance road, although map indicates south side; no notes on elevation (assume same elevation as center line)

Depth cm(ft)	Horizon or Zone	Description
0-16 (0-.5)	A	black (10YR2/1) loam to silt loam; weak, fine, subangular blocky; friable; noneffervescent; abrupt lower boundary; many roots and rootlets.
16-45 (.5-1.5)	BA	dark grayish brown (10YR4/2) silty clay loam; mottles are few, medium, distinct, black (10YR2/1); weak, coarse, subangular blocky; clay coatings are thin, discontinuous, faint, coat ped faces; friable; very slightly effervescent; clear lower boundary; roots; few omnidirectional rootlets; 5 cm inferred (no recovery).
45-65 (1.5-2.1)	Bt	grayish brown and light gray to gray (10YR5/2 and 6/1) clay-rich silty clay loam; mottles are common, fine, distinct, yellowish brown (10YR5/6), and few, coarse, distinct, very dark grayish brown (10YR3/2); weak to moderate, coarse, subangular blocky; clay coatings are thin, discontinuous, faint, coat ped faces; firm; strongly effervescent; clear lower boundary; few rootlets; 5 cm inferred (no recovery).
65-80 (2.1-2.6)	Btk	white (10YR8/1) silty clay loam; mottles are common, fine, distinct, black to very dark gray (10YR2/1-3/1), and common, fine, faint, dark yellowish brown (10YR4/4-4/6); weak to moderate, coarse, subangular blocky, parting to fine subangular blocky; clay coatings are thin, very discontinuous, faint, coat few ped faces; firm; violently effervescent; abrupt lower boundary; carbonate-rich; 5 cm inferred (no recovery).
80-107 (2.6-3.5)	2C	light brownish gray (2.5Y6/1) very fine sand; mottles are common, coarse, distinct, yellowish brown (10YR5/6), in lower half of unit; single grain; loose; strongly effervescent; abrupt lower boundary; sand borders on coarse silt; 5 cm inferred (no recovery); eolian, possibly blow sands.
107-119 (3.5-3.9)	2Ck	pale brown (10YR6/3) silt loam to sandy loam; mottles are many, medium to coarse, prominent, white (10YR8/1) and strong brown (7.5YR4/6), and few, distinct, dark brown (7.5YR3/2); massive; friable; strongly to violently effervescent; clear lower boundary; carbonate-rich.
119-155 (3.9-5.1)	3C1	olive brown (2.5Y4/4) fine sand; mottles are few, coarse, faint, grayish brown (10YR5/2); single grain; loose; very slightly effervescent; clear lower boundary; few small rounded pebbles.
155-238 (5.1-7.8)	4C2	yellowish brown (10YR5/4) silt loam to silt; mottles are common, coarse, distinct, light brownish gray (2.5Y6/2); massive; friable; strongly effervescent; clear lower boundary; not laminated; fairly uniform; few sand grains (may be concretions); loess.
238-268 (7.8-8.8)	5C3	olive brown (2.5Y4/4) sandy loam; mottles are few, medium, distinct, light brownish gray (2.5Y6/2); massive; friable; strongly effervescent; abrupt lower boundary; laminated; many medium sand lenses; more clay-rich at top; possible weak structure (?); sand lens.
268-418 (8.8-13.7)	6C4	dark gray (10YR4/1) silty clay; laminations are grayish brown to light brownish gray (10YR5/2-6/2); massive; very firm to firm; strongly effervescent; clear lower boundary; fine laminations; few sand lenses near base; clay-rich; fractured into fine blocks, often with shiny faces; fractured blocks oriented into beds; lacustrine.
418-427 (13.7-14.0)	7C5	dark gray to dark grayish brown (10YR4/1-4/2) medium sand to sandy loam; massive to single grain; friable; slightly effervescent; unknown lower boundary (end of tubes); possibly just a large sand lens in 6C4 unit (core sample ends at 427 cm so it is difficult to tell); very small rounded pebbles common; possible shoreline environment(?).

Core/Profile: AK-5

Location: Verdon Township Minimum Maintenance Road

Legal description: SE ¼ SW ¼ Section 23 T51N R24W

County: Aitkin

Parent material: Loess/lacustrine sediments/till(?)

Vegetation:

Slope: 0-2%

Elevation: 1249 feet

Topo. Map: Ball Bluff

Remarks: MnDOT core Ait. Co. 5-2; Mississippi River; east of river along minimum maintenance road; on north side of road; 0.4 mile west of T.H. 65; 2.3 feet below center line; between AK-4 and AK-6

Depth cm(ft)	Horizon or Zone	Description
0-40 (0-1.3)	CA	dark grayish (2.5Y4/2) clay-rich silty clay loam; mottles are common, fine, distinct, yellowish brown (10YR5/6); weak, medium, granular; firm; noneffervescent; clear lower boundary; many rootlets; roots; sticky; poor recovery (≈60%).
40-61 (1.3-2.0)	2C1	grayish brown (2.5Y5/2) silt to fine sandy loam; mottles are few, medium, faint, yellowish brown (10YR5/6); massive; friable; noneffervescent; clear lower boundary; few roots and rootlets; poor recovery (≈60%).
61-134 (2.0-4.4)	2C2	yellowish brown (10YR5/4) silt loam; mottles are common, coarse, distinct, strong brown (7.5YR4/6) and brown to dark brown (7.5YR4/2); massive; friable; noneffervescent; gradual lower boundary; several lenses of medium oxidized sands; few bands of silt or silty clay loam; few omnidirectional rootlets; poor recovery (≈60%); eolian-loess(?).
134-183 (4.4-6.0)	2C3	yellowish brown to olive brown (10YR5/4-2.5Y4/4) silt loam; mottles are common, coarse, distinct, light brownish gray (10YR6/2); massive; friable; slightly to strongly effervescent; clear lower boundary; crudely laminated in top half of unit; loess.
183-253 (6.0-8.3)	3C4	grayish brown to dark grayish brown (2.5Y5/2-4/2) silty clay loam; mottles are few, fine, faint, strong brown (7.5YR4/6), and common, medium, faint, pale brown (10YR6/3); massive; friable to firm; strongly effervescent; gradual lower boundary; crudely laminated, especially near base; "clasts" of clay blocks; weathered or alluvially reworked lacustrine sediments.
253-314 (8.3-10.3)	3C5	dark gray (10YR4/1) silty clay to clay; massive; very firm; strongly effervescent; clear lower boundary; highly fractured; clay-rich; laminated; few sand partings; pebbles at lower boundary; lacustrine sediments.
314-427 (10.3-14.0)	4C6	dark gray (5Y4/1) clay loam to loam; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); very small pebbles common; few bands of pebble-rich sandy clay loam; till(?).

Core/Profile: AK-6

Location: Verdon Township Minimum Maintenance Road

Legal description: SW ¼ SW ¼ Section 23 T51N R24W

County: Aitkin

Parent material: Loess/lacustrine sediments

Vegetation:

Slope: 0-2%

Elevation: 1248 feet

Topo. Map: Ball Bluff

Remarks: MnDOT core Ait. Co. 5-3; Mississippi River; east of river at NE corner of two minimum maintenance roads; 21 feet north of E-W road; 55 feet east of N-S road; 1.5 feet below center line; core closest (in transect) to river

Depth cm(ft)	Horizon or Zone	Description
0-10 (0-.3)	A	black (10YR2/1) loam; mottles are common, medium, faint, brown to dark brown (10YR4/3); weak to moderate, fine to medium, granular; friable; noneffervescent; abrupt lower boundary; many rootlets; roots; 50% recovery.
10-15 (.3-.5)	C	grayish brown (10YR5/2) silt; mottles are few, medium, distinct, strong brown (7.5YR5/6) near base of unit; massive; friable; noneffervescent; clear lower boundary; rootlets and roots; voids; 50% recovery.
15-40 (.5-1.3)	2BC1	dark grayish brown (10YR4/2) silty clay loam; mottles are many, medium, prominent, strong brown (7.5YR5/6); weak, medium, subangular blocky; firm; noneffervescent; clear lower boundary; oxidized mottles; rootlets and roots; 50% recovery.
40-91 (1.3-3.0)	2BC2	light brownish gray to grayish brown (10YR6/2-2.5Y5/2) silty clay loam; mottles are common, fine, faint, yellowish brown (10YR5/4); weak, medium to coarse, subangular blocky; firm; noneffervescent; clear lower boundary; band of dark grayish brown (10YR4/2) more clay-rich sediment in top 4 cm; rootlets; roots; possibly a buried unit; 50% recovery.
91-149 (3.0-4.9)	3C1	grayish brown (2.5Y5/2) coarse silt to silt loam; mottles are common, medium, distinct, strong brown (7.5YR4/6); massive; friable; noneffervescent; clear lower boundary; omnidirectional rootlets; medium sand lens near base; borderline with very fine sand; loess.
149-268 (4.9-8.8)	3C2	light yellowish brown (10YR6/4) coarse silt; mottles are common, medium, distinct, light brownish gray (10YR6/2); massive; friable to firm; strongly effervescent below 168 cm; gradual lower boundary; omnidirectional rootlets; oxidized; sticky when wet; laminated near base (transition zone?); more silt-rich with depth (almost no clay); loess.
268-427 (8.8-14.0)	4C3	brown (10YR5/3) silty clay loam to silty clay; laminations are dark grayish brown (10YR4/2) and very pale brown (10YR7/3); mottles are few, fine, faint, dark yellowish brown (10YR4/4); massive; firm; strongly effervescent; unknown lower boundary (end of tubes); laminated; clay-rich; many clay laminations, often highly fractured; not as clearly laminated at top; lacustrine.

Core/Profile: AK-7

Location: T.H. 65

Legal description: SE ¼ NE ¼ Section 2 T50N R24W

County: Aitkin

Parent material: Lacustrine sediments

Vegetation:

Slope: 2-5%

Elevation: 1224 feet

Topo. Map: Libby

Remarks: MnDOT core Ait. Co. 8-1; Mississippi River; east side of river; along T.H. 65 north of County Road 36; 150 feet north of mile post 135; on east side of road; just north of an entering tributary

Depth cm(ft)	Horizon or Zone	Description
0-30 (0-1.0)	A	black (10YR2/1) clay loam; moderate, medium, granular; firm; noneffervescent; gradual lower boundary; sand is fine; roots common; many rootlets; 60% recovery.
30-52 (1.0-1.7)	AB	very dark gray (10YR3/1) clay loam; weak, medium, subangular blocky; firm; noneffervescent; clear lower boundary; sand is fine; roots and rootlets common; 60% recovery.
52-91 (1.7-3.0)	C1	grayish brown (2.5Y5/2) clay loam; mottles are common, fine, distinct, yellowish brown (10YR5/6); massive; friable to firm; noneffervescent; abrupt lower boundary; fractured conchoidally into coarse blocks; sand is fine; roots; 60% recovery.
91-101 (3.0-3.3)	C2	brown to dark brown (10YR4/3) very fine sand; single grain; loose; noneffervescent; abrupt lower boundary; sand lens; few roots; 60% recovery.
101-128 (3.3-4.2)	C3	grayish brown (2.5Y5/2) clay loam; mottles are common to many, fine, distinct, yellowish brown (10YR5/6); massive; friable to firm; slightly effervescent; clear lower boundary; similar to C1; few rootlets; oxidized mottles; sand is fine; 60% recovery.
128-259 (4.2-8.5)	2C4	dark gray (10YR4/1) silty clay to clay; mottles are common, medium to coarse, distinct, dark yellowish brown (10YR4/4-4/6); massive; very sticky; slightly to strongly effervescent; diffuse lower boundary; oxidized mottles; rootlets common; shiny; smooth; few oxidized concretions near top; moist to wet; lacustrine clays(?).
259-427 (8.5-14.0)	2C5	dark gray (10YR4/1) silty clay to clay; massive; very sticky; strongly effervescent; unknown lower boundary (end of tubes); shiny; extremely smooth; moist to wet; difficult to obtain fresh faces (too plastic), few rootlets; few silt partings; lacustrine clays(?).

Core/Profile: AK-8

Location: T.H. 65

Legal description: NE ¼ Section 2 T50N R24W

County: Aitkin

Parent material: Alluvium/lacustrine sediments

Vegetation:

Slope: 5-9%

Elevation: 1239 feet

Topo. Map: Libby

Remarks: MnDOT core Ait. Co. 8-2; Mississippi River; east side of river; along T.H. 65 north of County Road 36; 0.3 mile north of mile post 135; on east side of road; 4.2 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-14 (0-.5)	AC	very dark brown (10YR2/2) sandy loam; massive; friable; noneffervescent; clear lower boundary; many roots and rootlets; organic-rich; many pebbles.
14-47 (.5-1.5)	C	dark gray (5Y4/1) sandy loam; mottles are few, fine, distinct, strong brown (7.5YR5/6); massive; friable; noneffervescent; abrupt lower boundary; few pebbles; one cobble; roots and rootlets common; several coarse sand lenses; alluvial.
47-104 (1.5-3.4)	2Oeb	black (10YR2/1) hemic material; massive; very friable; noneffervescent; clear lower boundary; peat; many rootlets; fibers present; not dense; 15 cm inferred (probably compacted).
104-116 (3.4-3.8)	2CAb	dark gray (10YR4/1) silty clay loam; massive to weak, fine, subangular blocky; friable to firm; noneffervescent; abrupt lower boundary (color change).
116-195 (3.8-6.4)	2Cg	greenish gray (5G5/1) silt loam; mottles are common, coarse, distinct, dark yellowish brown (10YR3/6); massive; friable; slightly effervescent; clear lower boundary; mollusk and gastropod shells; sand lens at base; some fracturing near top; oxidized mottles near base; alluvial(?).
195-235 (6.4-7.7)	3C	dark grayish brown (10YR4/2) silty clay to clay; mottles are common, coarse, distinct, dark yellowish brown to dark brown (10YR4/6-3/3); massive; firm to very firm; strongly effervescent; gradual lower boundary; laminated; oxidized mottles; lacustrine.
235-268 (7.7-8.8)	3Cg	very dark gray (10YR3/1) silty clay to clay; mottles are few, coarse, faint, dark brown (10YR3/3); massive; firm to very firm; strongly effervescent; abrupt lower boundary; finely laminated; clays fractured into small blocks, often aligned along bedding planes; lacustrine.
268-323 (8.8-10.6)	4C1	dark gray (10YR4/1) silt loam; massive; friable; slightly effervescent; clear lower boundary.
323-427 (10.6-14.0)	4C2	dark gray (10YR4/1) silty clay loam; massive; friable; slightly effervescent; unknown lower boundary (end of tubes); laminated (possibly varved); laminations are often very dark gray (10YR3/1) and clay-rich; lacustrine.

Core/Profile: AK-9

Location: T.H. 65

Legal description: NE ¼ NE ¼ Section 2 T50N R24W

County: Aitkin

Parent material: Alluvium

Vegetation:

Slope: 9-12%

Elevation: 1248 feet

Topo. Map: Libby

Remarks: MnDOT core Ait. Co. 8-3; Mississippi River; east side of river; along T.H. 65 north of County Road 36; 0.5 mile north of mile post 135; on west side of road; 4.5 feet below center line

Depth cm(ft)	Horizon or Zone	Description
0-24 (0-.8)	A	very dark brown (10YR2/2) sandy loam; weak, medium, granular; very friable; noneffervescent; abrupt lower boundary; many rootlets; roots.
24-76 (.8-2.5)	C1	brown to dark brown (10YR4/4) fine to coarse sand; single grain; loose; noneffervescent; unknown lower boundary (end of tubes); oxidized; slightly coarser at base; few small pebbles; few roots; alluvial.
76-122 (2.5-4.0)		no recovery.
122-311 (4.0-10.2)	C2	brown to dark brown (7.5YR4/4) fine to coarse sand; single grain; loose; noneffervescent; gradual lower boundary; oxidized; multiple fining upwards sequences (≈ 7); sequences run from coarse sand with pebbles (few large pebbles) to fine to medium sand; few rootlets; few lenses of very fine sand to silt; no recovery from 200-275 cm; alluvial.
311-351 (10.2-11.5)	C3	interbedded brown (7.5YR5/4) silts and strong brown (7.5YR4/6) fine to coarse sands; beds are ½ to 4 cm thick; single grain; loose to very friable; noneffervescent; unknown lower boundary (end of tubes); few beds contain small to medium pebbles; oxidized; laminated; alluvial.
351-427 (11.5-14.0)		no recovery.

Core/Profile: AK-10

Location: T.H. 65

Legal description: SE ¼ SE ¼ Section 35 T51N R24W

County: Aitkin

Parent material: Till

Vegetation:

Slope: 2-5%

Elevation: 1271 feet

Topo. Map: Libby

Remarks: MnDOT core Ait. Co. 8-4; Mississippi River; east side of river; along T.H. 65 north of County Road 36; 0.75 mile north of mile post 135; on east side of road; 3.5 feet below center line; northernmost core in transect

Depth cm(ft)	Horizon or Zone	Description
0-7 (0-.2)	A	dark brown (10YR3/3) sandy loam; weak, medium, granular; friable; noneffervescent; clear lower boundary; roots and rootlets; not very organic-rich; few pebbles.
7-42 (.2-1.4)	CB	brown (7.5YR5/4) clay-rich sandy loam; mottles are few, medium, faint, strong brown (7.5YR4/6); weak, coarse, subangular blocky; friable to firm; noneffervescent; clear lower boundary; rootlets; few larger roots; small to large pebbles common; oxidized; till.
42-241 (1.4-7.9)	C1	brown to dark brown to strong brown (7.5YR4/4-4/6) sandy clay loam diamicton; mottles are few, medium, faint, brown (7.5YR5/4) near base mainly; massive; firm; noneffervescent; clear lower boundary; pebbles common, small to large; clasts are rounded and angular and include exotics; few sand partings, especially near base; sand lens, last 10 cm; few rootlets near base; oxidized; till.
241-427 (7.9-14.0)	2C2	dark yellowish brown (10YR4/4) loam; massive; firm; noneffervescent; unknown lower boundary (end of tubes); pebbles common, mostly small to medium; few large pebbles; pebbles are rounded and angular and include exotics; Mn oxide coatings on few vertical fracture faces; oxidized; till.

Core/Profile: BL-22

Location: County Road 8 - Area 2A

Legal description: SW ¼ SE ¼ SE ¼ Section 14 T146N R33W

County: Beltrami

Parent material: Outwash and Shoreline Deposits

Vegetation: Grass

Slope: 0-2%

Elevation: 1376 feet

Topo. Map: Bemidji East

Remarks: MnDOT core 2A; on north side of Beltrami County Road 8; ¼ mile east of Little Norway Drive; ¼ mile west of Tyler Avenue SE; poor recovery

Depth cm(ft)	Horizon or Zone	Description
0-25 (0-.8)	Acum	black (10YR2/1) sandy loam; weak, fine, subangular blocky; friable; noneffervescent; clear lower boundary; cumulic horizon; medium sand lens at base with few medium pebbles; rootlets; coarse sand lens near top, dark grayish brown (10YR4/2); few scattered small pebbles.
25-54 (.8-1.8)	CA	dark yellowish brown (10YR4/4) loamy very fine to medium sand; laminations at top are very dark grayish brown (10YR3/2); massive to weak, fine, subangular blocky; very friable; noneffervescent; clear lower boundary; laminated; few medium sand partings near top; fining upwards sequence; few pebbles near base; rootlets - few.
54-62 (1.8-2.0)	C1	yellowish brown (10YR5/4) loamy very fine to fine sand; few dark yellowish brown (10YR4/4) laminations; massive; very friable; noneffervescent to very slightly effervescent; abrupt lower boundary; top of fining upwards sequence; faintly laminated.
62-67 (2.0-2.2)	C2	yellowish brown (10YR5/4) medium to coarse sand; single grain; loose; slightly to strongly effervescent; unknown lower boundary (end of tube).
67-122 (2.2-4.0)		no recovery.
122-183 (4.0-6.0)	C3	brown (10YR5/3) coarse sand and gravel; single grain; loose; strongly effervescent; clear lower boundary; small to medium pebbles common; few large pebbles.
183-198 (6.0-6.5)	C4	yellowish brown (10YR5/4) medium to coarse sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tube).
198-274 (6.5-9.0)		no recovery.
274-326 (9.0-10.7)	C5	yellowish brown (10YR5/4) coarse sand and gravel; single grain; loose; slightly to strongly effervescent; clear lower boundary; pebbles common, small to medium.
326-344 (10.7-11.3)	C6	dark yellowish brown and yellowish brown (10YR4/4&5/4) medium sand; single grain; loose; slightly to strongly effervescent; unknown lower boundary (end of tube); varying degrees of oxidation.
344-427 (11.3-14.0)		no recovery.
427-475 (14.0-15.6)	C7	strong brown (7.5YR4/6) medium sand; single grain; loose; strongly effervescent; gradual lower boundary; top 10 cm is loamy - possibly slump(?), next 12 cm are light brownish yellow (10YR6/4), and rest of unit is oxidized.
475-506 (15.6-16.6)	C8	strong brown and brown (7.5YR4/6&5/4) medium to coarse sand; single grain; loose; very strongly effervescent; abrupt lower boundary; alternating bands of oxidation.
506-512 (16.6-16.8)	C9	mottles (almost banded) red (2.5YR4/6), yellow (10YR7/6), and very pale brown (10YR8/3-7/3) coarse sand, partially cemented; massive to single grain; friable to loose; slightly effervescent; unknown lower boundary (end of tube); sand is partially cemented with iron oxides.
512-579 (16.8-19.0)		no recovery.
579-597 (19.0-19.6)	C10	brown to strong brown (7.5YR5/4-5/6) coarse sand; single grain; loose; very strongly effervescent; clear lower boundary; clast or bed (approximately 2-4 cm thick) of sandy clay loam diamicton, calcareous - possibly a till clast at base of unit; oxidized sands; few pebbles.
597-631 (19.6-20.7)	2C11	dark yellowish brown to brown (10YR4/4-7.5YR5/4) gravel; single grain; loose; very strongly effervescent; unknown lower boundary (end of tubes); mostly small pebbles with coarse sand; medium to large pebbles common; few till(?) clasts and clasts of brownish yellow (10YR6/6-6/8) silts; channel or shoreline deposits.
631-732 (20.7-24.0)		no recovery.

Mn/Model March 30, 1999

Core/Profile: BL-23

Location: NE side of County Road 50 in wetland

Legal description: SE ¼ NW ¼ Section 26 T146N R33W

County: Beltrami

Parent material: Shoreline Deposits and Outwash

Vegetation: Grass

Slope: 2-5%

Elevation: 1345 feet

Topo. Map: Bemidji East

Remarks: MnDOT core Belt.Co. 2B-1; on NE side of Beltrami County Road 50 in wetland(?); southeast of Bemidji; very poor recovery

Depth cm(ft)	Horizon or Zone	Description
0-8 (0-.3)	OA	black (10YR2/1) sandy loam; weak, medium, granular; friable; slightly effervescent; clear lower boundary; root mat; many roots; peaty muck.
8-43 (3-1.4)	C1	grayish brown to brown (10YR5/2-5/3) sandy loam diamicton; common, coarse, distinct, black to very dark gray (10YR2/4 3/2); massive to weak subangular blocky; friable; strongly effervescent; clear lower boundary; fill with tongues of black to very dark grayish brown (10YR2/1-3/2) throughout unit; roots common; pebbles common, small to medium; root zone.
43-73 (1.4-2.4)	C2	grayish brown (10YR-2.5Y5/2) sandy loam diamicton; few, coarse, faint, yellowish brown (10YR5/4); massive; friable; strongly effervescent; abrupt lower boundary; pebbles common, small to medium; few rootlets; fill.
73-104 (2.4-3.4)	2C3	brown to dark brown (10YR4/3) to brown (10YR5/3) to grayish brown (10YR5/2) medium sand; single grain; loose; slightly effervescent; unknown lower boundary (end of tube); well sorted; few subtle color variations with depth (less oxidized).
104-152 (3.4-5.0)		no recovery.
152-177 (5.0-5.8)	2C4	brown to dark brown (10YR4/3) medium to coarse sand; single grain; loose; slightly effervescent; abrupt lower boundary; few pebbles, small and large, and a small cobble at base of unit; sand coarsens slightly with depth; clasts are rounded.
177-180 (5.8-5.9)	3C5	very dark gray (10YR3/1) medium sand fringed by black (10YR2/1) organic coatings at top and bottom; single grain; loose; very slightly to noneffervescent; abrupt lower boundary; organics appear to have leached down into this zone, or less likely an old paleosol.
180-186 (5.9-6.1)	3C6	grayish brown (2.5Y5/2) medium to coarse sand; few, coarse, dark yellowish brown (10YR4/6); single grain; loose; slightly effervescent; abrupt lower boundary; pebbles common; coarse sand lens in middle; gleyed slightly; clay-rich lens at base (sandy clay loam).
186-201 (6.1-6.6)	3C7	yellowish brown to dark yellowish brown (10YR5/6-4/6) coarse sand; single grain; loose; slightly effervescent; unknown lower boundary (end of tube); pebbles common, small to medium; oxidized.
201-457 (6.6-15.0)		no recovery.
457-494 (15.0-16.2)	4C8	brown (10YR5/3) medium sand; single grain; loose; slightly effervescent; unknown lower boundary (end of tube); fairly well sorted (occasionally grades into medium to coarse sand); few blades of grass(?) near base; black (10YR2/1) organic-rich lamellae near base; collected for possible organic matter.
494-610 (16.2-20.0)		no recovery.
610-695 (20.0-22.8)	4C9	brown to pale brown (10YR5/3-6/3) medium to coarse sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tubes); coarsens slightly with depth; few medium to large pebbles near base; 2 cm lens(?) at base of unit; lens is stratified and contains very fine sand to coarse silt (and fine to medium sand) - slightly more carbonate-rich.
695-762 (22.8-25.0)		no recovery.

Core/Profile: BL-24
 Location: NE side of County Road 50 in wetland
 Legal description: SE ¼ NW ¼ Section 26 T146N R33W
 County: Beltrami
 Parent material: Shoreline Deposits or Outwash
 Vegetation: Grass
 Slope: 2-5%
 Elevation: 1345 feet
 Topo. Map: Bemidji East
 Remarks: MnDOT core Bel-2b-2; on northeast side of Beltrami County Road 50 in wetland; southeast of Bemidji; farthest core from Bemidji in transect; 11.6 feet below center line of County Road 50

Depth cm(ft)	Horizon or Zone	Description
0-49 (0-1.6)	Oi	black (10YR2/0) fibric material; coarse granular to massive; very friable; noneffervescent; clear lower boundary; wood fibers, seeds; few sand grains, especially near very top; roots common; many rootlets near top; peat.
49-76 (1.6-2.5)	C&O	interbedded black to very dark gray (10YR2/1-3/1) and brown (10YR5/3) to grayish brown (10YR5/2) fine loamy sand and fine to medium sand and black (10YR2/0) peat; massive to single grain; friable; peat - noneffervescent, sands - slightly to strongly effervescent; clear lower boundary; few small pebbles in sandy layers; sand more common than peat.
76-104 (2.5-3.4)	2Oib1	black (10YR2/0) fibric material; massive to coarse granular; friable; noneffervescent; two sand partings near base; rootlets; seeds, fibers, wood; peat.
104-152 (3.4-5.0)		no recovery.
152-174 (5.0-5.7)	2Oib2	same as 2Oib1 only with more wood; clear lower boundary; basal sample collected.
174-190 (5.7-6.2)	2O & C	interbedded black (10YR2/0) organic sandy loam and dark brown (10YR3/3) fine to medium sand; massive to single grain; friable to loose; noneffervescent; clear lower boundary; few roots.
190-219 (6.2-7.2)	3Cg1	dark gray (5Y4/1) fine to medium sand; single grain; loose; noneffervescent; unknown lower boundary (end of tubes); few rootlets; few pebbles.
219-305 (7.2-10.0)		no recovery.
305-387 (10.0-12.7)	3Cg2	gray (5Y5/1) fine sand; few, medium, distinct, black (10YR2/1); single grain; loose; noneffervescent; clear lower boundary.
387-405 (12.7-13.3)	3Cg3	dark gray (5Y4/1) coarse sand; single grain; loose; very slightly effervescent to noneffervescent; clear lower boundary; very small pebbles; few rootlets.
405-430 (13.3-14.1)	3Cg4	dark gray (5Y4/1) medium sand; single grain; loose; slightly effervescent; clear lower boundary.
430-439 (14.1-14.4)	3Cg5	grayish brown to olive gray (2.5Y-5Y5/2) medium to coarse sand and gravel; single grain; loose; very strongly effervescent; unknown lower boundary (end of tube); many small to very small pebbles; possible base of fining upwards sequence.
439-457 (14.4-15.0)		no recovery.
457-533 (15.0-17.5)	3Cg6	dark gray (5Y4/1) fine to coarse sand; single grain; loose; slightly to strongly effervescent; unknown lower boundary (end of tube); fine sand in top 10 cm grading to coarse sand; lower 40 cm - very small pebbles common; few rootlets; possible fining upwards sequence.
533-610 (17.5-20.0)		no recovery.
610-683 (20.0-22.4)	3Cg7	dark gray (5Y4/1) medium sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tubes); mostly medium sand - some fine and coarse; very small pebbles, few to common, more plentiful in lower two-thirds of unit.
683-762 (22.4-25.0)		no recovery.

Core/Profile: BL-25

Location: County Road 407 and County Route 12

Legal description: NE ¼ NE ¼ NE ¼ Section 7 T146N R32W

County: Beltrami

Parent material: Outwash

Vegetation: Grass

Slope: 5-9%

Elevation: 1356 feet

Topo. Map: Bemidji East

Remarks: MnDOT core Bel 2C; at intersection of Beltrami County Road 407 and Beltrami County Route 12 - on SW corner; east of Lake Bemidji; poor recovery

Depth cm(ft)	Horizon or Zone	Description
0-31 (0-1.0)	AC	dark brown (10YR3/3) loamy sand; weak, fine, granular to single grain; loose; noneffervescent; gradual lower boundary; many rootlets, especially at top.
31-91 (1.0-3.0)	C1	yellowish brown (10YR5/4) fine sand; laminations are dark yellowish brown (10YR4/4); single grain; loose; noneffervescent; clear lower boundary; can see weak laminations in lower 30 cm (rest of unit is disturbed); few rootlets; oxidized; well sorted.
91-104 (3.0-3.4)	C2	yellowish brown to dark yellowish brown (10YR5/4-4/6) medium sand; single grain; loose; noneffervescent; unknown lower boundary (end of tube); well sorted; oxidized.
104-122 (3.4-4.0)		no recovery.
122-131 (4.0-4.3)		slump from above (loamy sand with roots and seedlings).
131-143 (4.3-4.7)	C2	dark yellowish brown (10YR4/4) medium sand; single grain; loose; noneffervescent; clear lower boundary; same unit as above; oxidized; well sorted.
143-180 (4.7-5.9)	C3	brown to dark brown (7.5YR4/4) coarse sand; single grain; loose; noneffervescent; clear lower boundary; moderately well sorted; oxidized.
180-192 (5.9-6.3)	C4	yellowish brown, pale brown and strong brown (10YR5/4, 10YR6/3, and 7.5YR4/6) very fine to fine sand interbedded with coarse silt loam; massive to single grain; friable to loose; very slightly effervescent; abrupt lower boundary; stratified fine sands and coarse silt loams; few medium to coarse sand partings; silt loam is clay-rich; oxidized.
192-198 (6.3-6.5)	C5	dark yellowish brown (10YR4/4) medium to coarse sand; single grain; loose; very slightly effervescent to noneffervescent; clear lower boundary; oxidized; moderately well sorted.
198-216 (6.5-7.1)	C6	yellowish brown (10YR5/4) fine sand; single grain; loose; very slightly effervescent; unknown lower boundary (end of tube); well sorted.
216-274 (7.1-9.0)		no recovery.
274-283 (9.0-9.3)		suspect slump (mottled with organics and rootlets).
283-305 (9.3-10.0)	C7	brown (10YR5/3) fine sand; few, thin bands of black (10YR2/1); single grain; loose; very strongly effervescent; clear lower boundary; medium sand at base.
305-329 (10.0-10.8)	C8	yellowish brown (10YR5/4) coarse sand; single grain; loose; strongly effervescent; gradual lower boundary; few small pebbles; black, organic(?) -rich laminae at 317 cm, no plant matter observed.
329-378 (10.8-12.4)	C9	yellowish brown (10YR5/4) coarse sand and gravel; single grain; loose; strongly effervescent; unknown lower boundary (end of tube); many small to medium pebbles; few large pebbles; fewer pebbles in last 20 cm.
378-579 (12.4-19.0)		no recovery.
579-600 (19.0-19.7)	C10	brown (10YR5/3) fine sand to yellowish brown (10YR5/4) coarse sand; single grain; loose; strongly effervescent; abrupt lower boundary (1 cm thick layer of black to olive gray [5Y3/2-2.5/1] at base of unit; resembles a weathered rock [metamorphic(?) mafic(?) rather than a thin soil]; fines upwards; gravely near base - small to medium pebbles common.
600-646 (19.7-21.2)	2Cg	dark gray (5Y4/1) silt to silty clay loam; massive; friable to firm; strongly effervescent; unknown lower boundary (end of tubes); ranges in texture from almost pure silt (top 4 cm and 614-621 cm) to silt loam to silty clay loam with changes in clay content; fracturing in few clay-rich zones; not visibly laminated (changes in clay content may relate to bedding (changes every 10-20 cm); sediments may be lacustrine or eolian(?).

Core/Profile: CE-1
 Location: County Road 40
 Legal description: NW ¼ NE ¼ Section 35 T145N R36W
 County: Clearwater
 Parent material: Alluvium/organic sediments
 Vegetation: Wetland
 Slope: 2-5%
 Elevation: 1396 feet
 Topo. Map: LaSalle Lake
 Remarks: MnDOT core Cl.Co. 9-1; on south side of Clearwater County Road 40 over Mississippi River; 89 feet west of west bridge abutment; 4.9 feet below centerline

Depth cm(ft)	Horizon or Zone	Description
0-5 (0-.2)	AC	dark brown (10YR3/3) sandy loam; weak, medium, granular; friable; strongly effervescent; abrupt to clear lower boundary; pebbles - few; rootlets common.
5-21 (.2-.7)	C	grayish brown (10YR5/2) sandy loam to sandy clay loam; mottles are fine, many, yellowish brown (10YR5/6); massive; friable; violently effervescent; abrupt lower boundary (color and texture change); oxidized; few pebbles; some banding (oxidation); rootlets; fill or ditch sediment - recent.
21-33 (.7-1.1)	2AC	black (10YR2/1) sandy loam; weak, medium, granular to massive; friable; strongly effervescent; abrupt lower boundary (woven mat at base); wood; few pebbles, all sizes; fibers present.
33-43 (1.1-1.4)	3Oi	wood; noneffervescent; unknown lower boundary (end of tube); wood and fibers - possibly recent - very little decomposition; dry.
43-122 (1.4-4.0)		no recovery.
122-149 (4.0-4.9)	4Oib	black (10YR2/1) fibric material and wood; massive; friable; slightly effervescent; abrupt lower boundary; very woody; peaty; fibric; slightly more decomposed than 3Oi; wood collected from base.
149-162 (4.9-5.3)	5Cg1	dark gray (10YR4/1) fine to medium sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tube); many shell fragments; few clasts of peat; few fibers in sands; alluvial.
162-274 (5.3-9.0)		no recovery.
274-341 (9.0-11.2)	5Cg2	dark gray to dark grayish brown (10YR4/1-4/2) fine to medium sand; single grain; loose; strongly effervescent; clear lower boundary; shells and shell fragments common, mostly mollusks; few small pebbles; few fibers; fining upwards; alluvial.
341-351 (11.2-11.5)	5Cg3	dark gray to dark grayish brown (10YR4/1-4.2) coarse sand; single grain; loose; strongly effervescent; abrupt lower boundary; few clasts of very dark brown (10YR2/2), organic, peaty sediments; alluvial.
351-369 (11.5-12.1)	6Ogb	dark grayish brown (10YR4/2) silt loam; mottles are few to common, medium, distinct, black (10YR2/1); massive; very friable; very strongly effervescent; unknown lower boundary (end of tube); highly decomposed organic sediment; not dense; many gastropod and mollusk shells; seeds (some collected); silt is coarse; muck; very few fibers visible.
369-427 (12.1-14.0)		no recovery.
427-451 (14.0-14.8)	7Cg(?)	dark gray to dark grayish brown (10YR4/1-4/2) medium to coarse sand; single grain; loose; very strongly effervescent; gradual lower boundary; driller's notes indicate that sand may have come from above; shells common, mollusks and gastropods.
451-512 (14.8-16.8)	7Og? & Cg(?)	dark grayish brown to grayish brown (10YR-2.5Y4/2-5/2) organic silt loam and medium sand; mottled sands and silt loam; massive and single grain; very friable and loose; very strongly effervescent; gradual lower boundary; driller's notes indicate that sand may have come from above; many gastropod and mollusk shells; sands and organic sediment swirled together.
512-530 (16.8-17.4)	7Ogb	grayish brown to dark grayish brown to dark gray (2.5Y5/2-4/2, 5Y4/1) organic silt loam; mottles are few, medium to large, distinct, very dark grayish brown (10YR-2.5Y3/2); massive; very friable; very strongly effervescent; unknown lower boundary (end of tubes); may be a continuation of 6Ogb; few fibers, mostly decomposed; many shells and shell fragments, gastropods and mollusks; soft; muck.
530-579 (17.4-19.0)		no recovery.

Core/Profile: CE-2
 Location: County Road 40
 Legal description: SW ¼ NE ¼ Section 35 T145N R36W
 County: Clearwater
 Parent material: Organic sediments
 Vegetation: Wetland
 Slope: 2-5%
 Elevation: 1396 feet
 Topo. Map: LaSalle Lake
 Remarks: MnDOT core Cl.Co. 9-2; on south side of Clearwater County Road 40 over Mississippi River; on west side of river, 410 feet west of west bridge abutment; 4.6 feet below centerline

Depth cm(ft)	Horizon or Zone	Description
0-8 (0-.3)	Oi	black (10YR2/1) fibric matter; weak, medium, granular to massive; friable; slightly effervescent to strongly effervescent; abrupt lower boundary; root mat; lot of plant matter and fibers, slightly sandy.
8-72 (3-2.4)	2C	yellowish brown (10YR5/4) sandy clay loam diamicton; mottles are many, medium to coarse, gray (10YR5/1), dark yellowish brown (10YR4/4) and black (10YR2/1); massive, may be weak, medium, subangular blocky at top; firm; very strongly effervescent; gradual lower boundary (color change); roots and rootlets common; all sizes of pebbles common; dense; fill.
72-104 (2.4-3.4)	2Cg	greenish gray (5GY5/1) sandy clay loam diamicton; mottles are common, coarse, grayish brown (2.5Y5/2) to pale brown (10YR6/3); massive; firm; very strongly effervescent; abrupt lower boundary; plastic mat at base of unit; all sizes of pebbles common; few roots and rootlets; dense; fill.
104-122 (3.4-4.0)		no recovery.
122-137 (4.0-4.5)	3Oib	black (10YR2/1) wood; very slightly effervescent; clear lower boundary; very little decomposition; may be recent wood chips; very little matrix, mostly wood.
137-152 (4.5-5.0)	4Oeb	black (10YR2/1,2/0) hemic material; massive; very friable; slightly effervescent; unknown lower boundary (end of tube); shells and shell fragments common; gastropods and mollusks; not dense; peaty.
152-274 (5.0-9.0)		no recovery.
274-363 (9.0-11.9)	4Oib1	black (10YR2/1,2/0) fibric material; massive; very friable; very slightly effervescent to noneffervescent; unknown lower boundary (end of tube); few gastropod and mollusk shells; shells more plentiful near top; fiber content increases slightly with depth; basal sample collected; peat.
363-427 (11.9-14.0)		no recovery.
427-442 (14.0-14.5)	4Oib2	brown to dark brown (10YR4/3) fibric material; mottles are common, coarse, black (10YR2/1); massive; very friable; strongly effervescent; transition zone from 4Oib1 to 4Oigb (slow color change, mottles of peat); seeds, fibers; peaty; seeds collected.
442-482 (14.5-15.8)	4Oigb	dark grayish brown (10YR-2.5Y4/2) fibric material; massive; very friable; strongly effervescent; gradual lower boundary; fibers; mollusk and gastropod shells and shell fragments; peat.
482-506 (15.8-16.6)	4Oegb	very dark gray (10YR3/1) hemic matter; massive; very friable; strongly effervescent to violently effervescent at base; abrupt lower boundary; sand content increases with depth; many shell fragments, amount increases with depth; wood, seeds, fibers; basal sample collected; peaty muck.
506-549 (16.6-18.0)	5Oagb	dark gray (10YR-5Y4/1) sapric material, organic silt loam; massive; very friable; very strongly effervescent; unknown lower boundary (end of tubes); decomposed; still few fibers; not dense; mollusk and gastropod shells common; soft; muck to peaty muck.
549-579 (18.0-19.0)		no recovery.

Core/Profile: HB-1
 Location: County Road 36
 Legal description: NE ¼ NW ¼ Section 1 T145N R33W
 County: Hubbard
 Parent material: Alluvium
 Vegetation: Conifer
 Slope: 2-5%
 Elevation: 1345 feet
 Topo. Map: Bemidji East
 Remarks: MnDOT core HD. Co. 1-1; Hubbard County Road 36; 82 feet south of County Road 2; on west side of 36; 3.6 feet below centerline; on north side of Necktie River; may be multiple fining upwards sequences; recovery is poor

Depth cm(ft)	Horizon or Zone	Description
0-7 (0-.2)	A	black (10YR2/1) sandy loam; weak, medium, granular to single grain; friable; slightly effervescent; clear lower boundary; root mat in sands with some fines; many rootlets.
7-17 (.2-.6)	AC	very dark grayish brown to very dark brown (10YR3/2-2/2) loamy sand; weak, medium, granular to single grain; friable to loose; slightly effervescent; clear to abrupt lower boundary; rootlets common; small to medium pebbles, few to common.
17-67 (.6-2.2)	C1	dark yellowish brown (10YR4/4) coarse sand; single grain; loose; strongly effervescent; clear lower boundary; rootlets few to common; slightly oxidized; small pebbles common.
67-82 (2.2-2.7)	C2	brown (10YR5/3) fine to medium sand; single grain; loose; strongly effervescent; few pebbles; some coarse sand in lenses; rootlets common; few twigs.
82-122 (2.7-4.0)		no recovery.
122-152 (4.0-5.0)	C2	grayish brown (2.5Y5/2) fine to medium sand; same as above; clear lower boundary.
152-204 (5.0-6.7)	C3	grayish brown (2.5Y5/2) coarse sand; mottles are very few, medium, black (10YR2/1) near base (may be clasts of organic sands?); single grain; loose; strongly effervescent; unknown lower boundary (end of tube); cobble at base (quartz); slightly gleyed at base; very small to small pebbles common; few large pebbles/small cobbles; possibly base of fining upwards sequence.
204-274 (6.7-9.0)		no recovery.
274-329 (9.0-10.8)	Cg1	gray (5Y5/1) fine to medium sand to coarse sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tubes); possible fining upwards sequence; no sample recovered on first push; driller's's notes say "sand heaving 5 feet on second run."
329-427 (10.8-14.0)		no recovery.
427-466 (14.0-15.3)	Cg2	dark gray (5Y4/1) fine to medium sand; single grain; loose; strongly effervescent; clear lower boundary; possible top of fining upwards sequence; few lenses of coarse sand.
466-482 (15.3-15.8)	Cg3	dark gray (5Y4/1) coarse sand; single grain; loose; strongly effervescent; clear lower boundary; small to medium pebbles common; few large pebbles near base; possible base of fining upwards sequence.
482-488 (15.8-16.0)	Cg4	dark gray to gray and greenish gray (5Y4/1-5/1, 5GY5/1) fine sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tube); few medium to large pebbles; banded at base (may be variations based on amount of carbonate).
488-579 (16.0-19.0)		no recovery.
579-588 (19.0-19.3)	Cg5	dark gray (5Y4/1) fine sand; single grain; loose; strongly effervescent; clear lower boundary; possibly fining upwards sequence with Cg6; few very small pebbles.
588-634 (19.3-20.8)	Cg6	dark gray (5Y4/1) medium to coarse sand; single grain; loose; strongly effervescent; unknown lower boundary (end of tubes); possibly a fining upwards sequence with Cg5 (and Cg4?); few very small pebbles.
634-732 (20.8-24.0)		no recovery.

Core/Profile: HB-2
 Location: County Road 36
 Legal description: NE ¼ NW ¼ Section 1 T145N R33W
 County: Hubbard
 Parent material: Organic sediments/alluvium
 Vegetation: Wetland/conifer
 Slope: 2-5%
 Elevation: 1335 feet
 Topo. Map: Bemidji East
 Remarks: MnDOT core HD.Co. 1-2; Hubbard County Road 36; 998 feet south of County road 2; on west side of road; 2.2 feet below centerline of County Road 36; extremely poor recovery

Depth cm(ft)	Horizon or Zone	Description
0-152 (0-5.0)		no recovery; driller's note: "peat"
152-162 (5.0-5.3)	Oa	mottled black (10YR2/1), very dark gray (10YR3/1), and very dark grayish brown (10YR3/2) silt-rich sandy loam and sapric material; massive; very friable; strongly effervescent; clear lower boundary; shell fragments; wood; seeds; organic; soft; not dense; rootlets.
162-171 (5.3-5.6)	OC	very dark grayish brown to dark brown (10YR3/2-3/3) sandy loam; mottles are few, coarse, black (10YR2/1); massive; friable; slightly effervescent; clear lower boundary; sand-rich; pebbles common; many roots and stems; wood; few shell fragments; sand is coarse.
171-204 (5.6-6.7)	Oi1	mottled black (10YR2/1), very dark brown (10YR2/2), and very dark grayish brown (10YR3/2) fibric material; massive; very friable; very strongly effervescent; clear to gradual lower boundary; peat; fibric; wood; shell fragments; soft; not dense.
204-241 (6.7-7.9)	Oi2	black (10YR2/1) fibric material; massive; very friable; very slightly effervescent to noneffervescent; abrupt lower boundary; peat; fibric; wood; sample collected from base; soft; not dense.
241-262 (7.9-8.6)	2Cg	very dark gray (10YR3/1) fine to medium sand; single grain to massive; loose; very strongly effervescent; unknown lower boundary (end of tubes); few fibers, especially at top; few small pebbles; gleyed; probably alluvium.
262-762 (8.6-25.0)		no recovery; driller's notes: "sand heaving three feet on way back down" (at 15 feet), "small traces of highly saturated sand" (15-20 feet).

Core/Profile: HB-3
 Location: County Road 36
 Legal description: SE ¼ NW ¼ Section 1 T145N R33W
 County: Hubbard
 Parent material: Alluvium/till
 Vegetation: Conifer
 Slope: 2-5%
 Elevation: 1361 feet
 Topo. Map: Bemidji East
 Remarks: MnDOT core HD. Co. 1-3; Hubbard County Road 36; 1584 feet south of County Road 2; on west side of road; 3.3 feet below center line of County Road 36; poor recovery; driller's notes indicate boulders in top 13 feet

Depth cm(ft)	Horizon or Zone	Description
0-18 (0-.6)	AC	dark yellowish brown (10YR3/4) loamy sand; single grain; loose; slightly effervescent to strongly effervescent; clear lower boundary (color change); sand is fine to coarse; few small to medium pebbles; rootlets common.
18-43 (.6-1.4)	C1	yellowish brown (10YR5/4) fine to coarse sand and gravel; single grain; loose; violently effervescent; unknown lower boundary (end of tube); unsorted; small to medium pebbles common; large pebbles and small cobbles few to common; slightly oxidized.
43-107 (1.4-3.5)		no recovery.
107-140 (3.5-4.6)	C2	dark yellowish brown (10YR4/4) medium to coarse sand and gravel; single grain; loose; strongly effervescent to violently effervescent; gradual lower boundary; coarser than C1, finer than C3; small to medium pebbles common; large pebbles and small cobbles few to common; slightly oxidized; alluvial.
140-192 (4.6-6.3)	C3	dark yellowish brown to brown (10YR4/4-7.5YR4/4) coarse sand and gravel; single grain; loose; strongly effervescent; unknown lower boundary (end of tube); coarser than C2; small to medium pebbles common; large pebbles and small cobbles few to common; unsorted; oxidized; alluvial.
192-411 (6.3-13.5)		no recovery.
411-442 (13.5-14.5)	C4	brown (10YR5/3) fine to medium sand; single grain; loose; strongly effervescent; clear to gradual lower boundary; coarsens with depth; may be top of a fining upwards sequence; slightly oxidized, alluvial.
442-454 (14.5-14.9)	C5	brown to yellowish brown (10YR5/3-5/4) coarse sand and gravel; single grain; loose; strongly effervescent; coarsens with depth; may be part of a fining upwards sequence; many small pebbles; medium to large pebbles common; slightly oxidized; alluvial.
454-564 (14.9-18.5)		no recovery.
564-573 (18.5-18.8)	C5	same as above; abrupt lower boundary.
573-655 (18.8-21.5)	2Cg	olive gray (5Y5/2) sandy loam diamicton; massive; friable; strongly effervescent; unknown lower boundary (end of tubes); sand is fine to medium; clasts are common, all sizes (including small cobbles); unsorted; dense; few sand partings; till.
655-716 (21.5-23.5)		no recovery.

Core/Profile: IC-1

Location: T.H. 6 over Mississippi River

Legal description: NE ¼ SW ¼ Section 22 T55N R27W

County: Itasca

Parent material: Alluvium/organic sediments/lacustrine sediments/till

Vegetation: Grass

Slope: 2-5%

Elevation: 1279 feet

Topo. Map: Sugar Lake

Remarks: T.H. 6 over Mississippi River; north of junction with Itasca County Road 162 on west side of road; on north side of Mississippi River; 1.5 feet below centerline; northernmost core in transect

Depth cm(ft)	Horizon or Zone	Description
0-19 (0-.6)	A	very dark grayish brown to very dark brown (10YR3/2-2/2) sandy loam; moderate, medium to coarse, granular; very friable; slightly effervescent; clear to gradual lower boundary; many roots and rootlets; few small pebbles.
19-32 (.6-1.0)	AC	very dark grayish brown (10YR3/2) sandy loam to loamy sand; mottles are increasingly common with depth, medium to coarse, brown (10YR5/3); weak, medium, granular to massive; very friable; very slightly effervescent; gradual lower boundary; roots and rootlets common; sand is mostly fine, some coarse.
32-68 (1.0-2.2)	C	dark grayish brown to brown (10YR3/2-5/3) very fine to fine sand to loamy sand; mottles are many, medium, dark yellowish brown (10YR3/4,3/6), and few strong brown (7.5YR4/6) mottles; single grain to massive; very friable to loose; very slightly effervescent; clear lower boundary; laminated at base (very dark grayish brown [10YR3/2]); recent sediments(?).
68-79 (2.2-2.6)	2CA	black to very dark gray (10YR2/4 3/1) loamy sand; massive to single grain; very friable to loose; noneffervescent; clear lower boundary; more organic-rich than overlying horizon; few rootlets; few wood fragments; may be depositional only (i.e., not a buried soil).
79-125 (2.6-4.1)	2C	grayish brown (2.5Y5/2) very fine to fine sand; mottles are few to common, medium, very dark gray to black (10YR3/1-2/1); single grain; loose; noneffervescent; unknown lower boundary (end of tube); wet; roots and rootlets common.
125-152 (4.1-5.0)		no recovery.
152-165 (5.0-5.4)	3Oeb	black (10YR2/1) hemic material; mottles are few, coarse, dark to very dark gray (10YR4/1-3/1); massive to weak, medium, granular; very friable; noneffervescent; gradual lower boundary; some sand swirled in with peat - only on outside of core, so it may be contamination from above; fibers; organic; peat.
165-201 (5.4-6.6)	3Oib	black (10YR2/1) fibric material; massive to weak, medium, granular; very friable; noneffervescent; clear lower boundary; peat; wood/bark/other plant matter; fibers, rootlets; last 3 cm not as organic as rest of unit; basal sample collected (190-198 cm).
201-207 (6.6-6.8)	4C	dark grayish brown (10YR4/2) fine sand; single grain; loose; noneffervescent; abrupt lower boundary; rootlets common; sand lens.
207-213 (6.8-7.0)	5ACb	black to very dark gray (10YR2/4 3/1,2.5Y3/1) loam; massive to weak, medium, granular; friable; noneffervescent to very slightly effervescent; abrupt lower boundary; may not be an AC, may be depositional; top cm is darker than rest of unit; faint laminations; rootlets common.
213-221 (7.0-7.3)	5Cg	mottled grayish brown to dark gray (10YR5/2-4/1), dark greenish gray (5G4/1), and light brownish gray (10YR6/2) loam; massive; friable; noneffervescent; abrupt lower boundary; few small sand lenses (approximately 2-3 cm in width, ½-1 cm thick); sand parting at base; few rootlets; highly mottled.
221-226 (7.3-7.4)	6CA	black to very dark gray (5Y2.5/1-3/1) loam to clay loam; massive; friable; noneffervescent; abrupt lower boundary; probably depositional in origin(?) (no structure).
226-238 (7.4-7.8)	6Cg1	dark greenish gray to gray (5BG4/1-5Y5/1) silty clay loam; mottles are few to common, fine, slightly darker than surrounding sediment; massive; friable to firm; noneffervescent to 230 cm, then strongly effervescent; faint laminations visible below 230 cm.
238-305 (7.8-10.0)		no recovery.
305-427 (10.0-14.0)	6Cg1	gray (5Y5/1) silty clay loam and dark to very dark gray (5Y3/1-4/1) silty clay; massive; friable to firm; strongly effervescent; clear to gradual lower boundary; continuation of above; laminations becoming increasingly more distinct, darker laminations are more clay-rich; laminations are rhythmic, 3-5mm thick; lacustrine.

Depth cm(ft)	Horizon or Zone	Description
IC-1 (continued)		
427-448 (14.0-14.7)	6Cg2	dark gray (5Y4/1) silt loam; massive; friable; strongly effervescent; clear lower boundary; laminations less rhythmic; many very fine laminations; few clay laminations (darker); few sand partings; resembles alluvium and lacustrine sediments - may be transitional(?).
448-457 (14.7-15.0)	7Cg3	dark gray (5Y4/1) sandy clay loam diamicton; massive; firm; strongly effervescent; clear lower boundary; coarse sand and gravel lens at top; small pebbles common; thin unit; resembles till.
457-472 (15.0-15.5)	8C1	grayish brown (2.5Y5/2) medium sand; single grain; loose; strongly effervescent; gradual lower boundary; fairly well sorted.
472-497 (15.5-16.3)	8C2	grayish brown to gray (2.5Y5/2-5Y5/1) coarse sand and gravel; single grain; loose; strongly effervescent; clear lower boundary; small to medium pebbles common; few large pebbles and small cobbles; till clasts and clay lamellae present; poorly sorted.
497-567 (16.3-18.6)	9Cg1	dark gray (5Y4/1) sandy loam; massive; friable; strongly effervescent; abrupt to clear lower boundary; more dense at top; small to medium pebbles common; few large pebbles and small cobbles; cobble at base; glacial drift.
567-576 (18.6-18.9)	9Cg2	dark gray (5Y4/1) loam; massive; friable; strongly effervescent; unknown lower boundary (end of tube); silt-rich; pebbles common, mostly small to medium.
576-610 (18.9-20.0)		no recovery.
610-668 (20.0-21.9)	9Cg3	gray to dark gray (5Y5/1-4/1) sandy loam; massive; friable; strongly effervescent; clear lower boundary; sand is often coarse; not very dense; sand partings; pebbles common, mostly small to medium; 4 cm medium sand at top; glacial drift(?).
668-680 (21.9-22.3)	9Cg4	gray to dark gray (5Y5/1-4/1) sandy loam; massive; friable; strongly effervescent (slower to react); unknown lower boundary (end of tubes); sands are finer than 9Cg3; dense; pebbles few to common, mostly small to medium; glacial drift.
680-762 (22.3-25.0)		no recovery.

Core/Profile: IC-2

Location: T.H. 6 over Mississippi River

Legal description: NE ¼ SW ¼ Section 22 T55N R27W

County: Itasca

Parent material: Alluvium/lacustrine sediments/till/outwash(?)

Vegetation: Grass

Slope: 2-5%

Elevation: 1275 feet

Topo. Map: Sugar Lake

Remarks: T.H. 6 over Mississippi River; on north side of river; south of County Road 162; 9.5 feet below centerline; on west side of T.H. 6; 277 feet north of north bridge abutment

Depth cm(ft)	Horizon or Zone	Description
0-12 (0-.4)	A(p?)	black (10YR2/1) sandy loam; weak to moderate, medium, granular; friable; very slightly effervescent; abrupt lower boundary; root mat; wood fragments; organic.
12-39 (.4-1.3)	CA(p?)	mottled grayish brown to light olive brown (2.5Y5/2-5/4) very fine to fine sand and black to very dark grayish brown (10YR2/1-3/2) sandy loam - mottles are coarse; weak, medium, granular to subangular blocky; sands are massive; friable; very slightly effervescent; abrupt lower boundary; may be recent sediment/fill; quite mottled - coarse mottles; many roots and rootlets; sand lens at base.
39-52 (1.3-1.7)	2A	black (10YR2/1) loam to fine sandy loam; mottles are few, fine, very dark grayish brown (10YR3/2) near base; weak, fine to medium, granular to massive; friable; slightly effervescent; abrupt lower boundary; organic; many rootlets; roots common; almost organic enough to be a muck.
52-89 (1.7-2.9)	2C1	grayish brown (10YR5/2) very fine to fine sand; mottles are few, fine, very dark grayish brown to black (10YR3/2-2/1) near top; few, medium, dark yellowish brown (10YR4/6) near base; single grain; loose; very slightly effervescent to noneffervescent; clear lower boundary; oxidized mottles; slightly darker at top (dark grayish brown [10YR4/2]); few rootlets.
89-120 (2.9-3.9)	2C2	dark grayish brown (2.5Y4/2) very fine to fine loamy sand to sandy loam; mottles are few, coarse, gray (5Y5/1), and common, medium, dark yellowish brown (10YR3/6-4/6); massive; friable; very slightly effervescent to noneffervescent; abrupt lower boundary; oxidized mottles; medium sand partings at 111 cm and 120 cm; more oxidized near base (last 10 cm) - mottles are more common and coarser.
120-131 (3.9-4.3)	3C3	gray to olive gray (5Y5/1-5/2) clay loam; mottles are fine, few to common, faint, light olive brown to olive brown (2.5Y5/4-4/4), and few to common, fine, distinct, white (10YR8/1); possibly weak, fine, subangular blocky (may be fracturing) to massive; firm; slightly to strongly effervescent; unknown lower boundary (end of tube); sand-sized 'clasts' may be clay; accumulation of carbonates at base (white mottles); possibly weak structure - may be a buried soil (weakly developed); lacustrine.
131-152 (4.3-5.0)		no recovery.
152-162 (5.0-5.3)		very fine to fine sand; suspect sands came from above (unit below sand is similar to base of 3C3).
162-177 (5.3-5.8)	3C4	grayish brown to dark gray (2.5Y5/2-5Y4/1) clay loam to silty clay loam; mottles are common, fine, distinct, white (10YR8/1), and common, medium, olive brown (2.5Y4/4); massive (some fracturing of clays); firm; strongly to violently effervescent; gradual lower boundary; similar to 3C3; clay 'clasts'; carbonate-rich masses; few rootlets.
177-341 (5.8-11.2)	3C5	dark gray to very dark gray (5Y4/1-3/1) and grayish brown (2.5Y5/2) silty clay loam (alternates between clay-rich and silt-rich); mottles are few, common, fine, distinct, white (10YR8/1) at top, and common, fine to medium, olive brown (2.5Y4/4); massive; firm; strongly to violently effervescent; clear lower boundary; laminated rhythmically (approximately ½ cm thick laminations); alternates light and dark laminations; dark laminations are more clay-rich and fractured; lighter laminations are more silt-rich; few fine rootlets; few carbonate masses, concentrated in top 20-30 cm; medium sand lens at 233-241 cm, beneath a silt lens (229-233 cm) - laminations continue beneath sand lens; few fine sand partings.
341-357 (11.2-11.7)	3C6	dark to very dark grayish brown (2.5Y3.5/2) silty clay loam; massive (some fracturing); friable to firm; strongly effervescent; clear lower boundary; laminations are very fine and faint; sand parting at base.

Depth cm(ft)	Horizon or Zone	Description
IC-2 (continued)		
357-399 (11.7-13.1)	3Cg1	very dark to dark gray (5Y3.5/1) silty clay loam to silty clay; lighter laminations are very dark grayish brown (10YR3/2); massive (fracturing along bedding planes and in clays); firm; strongly effervescent; clear lower boundary; fine, light laminations in darker clay-rich matrix changing to more rhythmic laminations (approximately ½ cm thick, dark and light alternating); few, fine sand partings, light brownish gray (2.5Y6/2).
399-415 (13.1-13.6)	3Cg2	dark gray (5Y4/1) silty clay loam to silty clay; massive; firm; strongly to violently effervescent; clear lower boundary; laminations not observed; more massive unit.
415-424 (13.6-13.9)	3Cg3	grayish brown to olive gray (2.5Y5/2-5Y4/2) silt loam; massive; friable to firm; strongly effervescent; clear lower boundary; finely laminated (~1mm); few fine sand laminations, light brownish gray (2.5Y6/2).
424-485 (13.9-15.9)	3Cg4	laminated dark grayish brown (2.5Y4/2) silty clay loam to silt loam, and very dark gray to dark gray (5Y3/1-4/1) silty clay; massive (fracturing in clay-rich zones); firm; strongly effervescent; clear to gradual lower boundary; laminated - similar to 3Cg1; rhythmic laminations approximately 0.5 cm thick; lacustrine.
485-512 (15.9-16.8)	4Cg5	dark gray (5Y4/1) silt loam to very fine sandy loam (borderline); massive; friable; strongly effervescent; clear lower boundary; finely and faintly laminated; sand laminations near base; ends in thin, coarse sand and gravel lens; resembles alluvium.
512-527 (16.8-17.3)	5Cg6	very dark gray (5Y3/1) clay loam diamicton; massive; firm; strongly effervescent; abrupt to clear lower boundary; pebbles common, all sizes; slightly darker than 4Cg5; resembles till.
527-619 (17.3-20.3)	6C	grayish brown (2.5Y5/2) medium to coarse sand and gravel, poorly sorted; single grain; loose; strongly effervescent; abrupt lower boundary; clasts range from small pebbles to small cobbles; poorly sorted; fluvial or outwash(?).
619-707 (20.3-23.2)	7Cg	gray to dark gray (5Y5/1-4/1) sandy loam; massive; friable; strongly effervescent; unknown lower boundary (end of tubes); few sand partings; pebbles common, all sizes; few cobbles; till.
707 -762 (23.2-25.0)		no recovery.

Core/Profile: IC-3

Location: T.H. 6 over Mississippi River

Legal description: NE ¼ SW ¼ Section 22 T55N R27W

County: Itasca

Parent material: Alluvium/lacustrine sediments/till/outwash

Vegetation: Grass

Slope: 2-5%

Elevation: 1272 feet

Topo. Map: Sugar Lake

Remarks: T.H. 6 over Mississippi River; on north side of river; 93 feet north of north bridge abutment; 12.3 feet below centerline; on west side of road

Depth cm(ft)	Horizon or Zone	Description
0-24 (0-.8)	AO	black (10YR2/1) loam; moderate, medium to coarse, granular; friable; noneffervescent; clear lower boundary; many roots and rootlets; root mat; fibers/grasses; few pockets with coarse sand; few small pebbles; mucky peat to peaty muck.
24-44 (.8-1.4)	A	black (10YR2/1) loam; weak, medium, granular to fine subangular blocky; friable; noneffervescent; clear lower boundary; many roots and rootlets; few pockets with coarse sand and few small pebbles; peaty muck.
44-207 (1.4-6.8)	Oi	black (10YR2/1) fibric material; few mottles of lighter peat (very dark gray to very dark grayish brown [10YR3/1-3/2]) in lower 30 cm; granular to massive; friable; noneffervescent; clear lower boundary; many rootlets; fibers; grasses; basal sample collected; no recovery from 110-122 cm; peat.
207-216 (6.8-7.1)	Oa	black (10YR2/1) sapric material and loam; massive; friable; noneffervescent; clear lower boundary; some fibers present - most organic matter is decomposed; more dense than overlying peat - greater mineral component; some grasses; more clay-rich than overlying peat; roots common; muck.
216-229 (7.1-7.5)	2Cg	gray to greenish gray (5Y5/1-5GY5/1) very fine to fine sand; few, coarse, distinct, black (10YR2/1) mottles; massive to single grain; very friable to loose; noneffervescent; abrupt lower boundary; roots common.
229-235 (7.5-7.7)	3CO	very dark gray (10YR3/1) sandy loam to loam; massive; friable; noneffervescent; clear lower boundary; roots common; few fibers.
235-241 (7.7-7.9)	3Cg1	dark greenish gray (5G4/1) very fine to fine loamy sand; massive; very friable; noneffervescent; clear lower boundary; transitional zone (clay content decreases with depth).
241-244 (7.9-8.0)	3Cg2	greenish gray (5GY5/1) very fine to fine sand; massive to single grain; loose; very slightly effervescent to noneffervescent; few roots and rootlets.
244-274 (8.0-9.0)		no recovery.
274-300 (9.0-9.8)	3Cg2	same as above; abrupt to clear lower boundary.
300-347 (9.8-11.4)	4Cg3	gray (5Y5/1) silty clay loam, with dark gray (5Y4/1) silty clay to clay laminations; massive; friable to firm; strongly effervescent; clear lower boundary; roots/rootlets common to few; rhythmically laminated; dark/light couplets approximately 0.5-0.7 cm thick; lacustrine.
347-377 (11.4-12.4)	5Cg4	dark gray to gray (5Y4/1-5/1) very fine sand to silt loam; massive; very friable; strongly effervescent; abrupt lower boundary; finely and faintly laminated; few roots and rootlets; alluvium.
377-463 (12.4-15.2)	6Cg5	dark gray (5Y4/1) sandy clay loam diamicton; mottles are few, coarse, very dark gray (5Y3/1) near top; massive; friable to firm; strongly effervescent; gradual lower boundary; few roots/rootlets; dense; small to medium pebbles common; few large pebbles/small cobbles; shale present; no recovery 411-427 cm; till.
463-524 (15.2-17.2)	6Cg6	grayish brown to light brownish gray (2.5Y5/2-6/2) sandy loam with gravel; massive to single grain; friable to loose; strongly effervescent; unknown lower boundary (end of tubes); sand and gravel (pebbles, all sizes, and small cobbles) mixed in with sandy loam (similar to 6Cg5 only less clay); sandy loam is fairly dense; till/outwash.
524-762 (17.2-25.0)		no recovery.

Core/Profile: IC-4
 Location: T.H. 6 over Mississippi River
 Legal description: SE ¼ SW ¼ Section 22 T55N R27W
 County: Itasca
 Parent material: Alluvium/till
 Vegetation: Grass
 Slope: 2-5%
 Elevation: 1276 feet
 Topo. Map: Sugar Lake
 Remarks: T.H. 6 over Mississippi River; on south side of river, 272 feet south of south bridge abutment; 9.3 feet below centerline; on west side of road

Depth cm(ft)	Horizon or Zone	Description
0-17 (0-.6)	A	very dark grayish brown to dark gray (10YR3/2-4/1) sandy loam; weak, medium to coarse, granular; friable; noneffervescent; abrupt lower boundary (color change); many roots and rootlets; sand is mostly fine with a few medium to coarse pockets; weakly developed soil.
17-41 (.6-1.3)	C1	dark yellowish brown to brown to dark brown (10YR4/4-4/3) very fine to fine sand; mottles are common, medium, pale brown (10YR6/3) and dark yellowish brown (10YR3/4); single grain; loose; noneffervescent; clear lower boundary; few roots and rootlets.
41-54 (1.3-1.8)	C2	pale brown (10YR6/3) very fine to fine loamy sand; mottles are common, medium, distinct, dark yellowish brown (10YR4/4); massive; very friable; noneffervescent; clear lower boundary; top of fining upwards sequence; alluvium.
54-64 (1.8-2.1)	C3	yellowish brown (10YR5/4) fine to medium sand; mottles are common, medium, faint, dark yellowish brown (10YR3/4); single grain; loose; noneffervescent; gradual lower boundary; fining upwards sequence with C2 and C4; alluvium.
64-92 (2.1-3.0)	C4	dark yellowish brown to yellowish brown (10YR3/4-5/4) coarse sand; single grain; loose; very slightly effervescent to noneffervescent; clear lower boundary; very small pebbles common near base; lighter with depth; base of fining upwards sequence; alluvium.
92-189 (3.0-6.2)	C5	dark yellowish brown (10YR4/4) medium to coarse sand; single grain; loose; very slightly effervescent to noneffervescent; unknown lower boundary (end of tube); band of very fine sand near top of unit (approximately 2 cm thick, pale brown [10YR6/3]); no recovery from 110-122 cm; alluvium.
189-274 (6.2-9.0)		no recovery.
274-297 (9.0-9.7)	C6	dark yellowish brown (10YR4/4) medium to coarse sand; single grain; loose; very slightly effervescent to noneffervescent; abrupt lower boundary; small to medium pebbles common; few clay lamellae (may be from coring - unit is disturbed); pebbles most plentiful near base; lag deposit; oxidized; alluvium.
297-362 (9.7-11.9)	2Cg1	olive gray to dark gray to gray (5Y4/2-4/1-5/1) very fine sand to silt loam; massive; very friable; strongly effervescent; abrupt lower boundary; faintly and finely laminated; sediment fluctuates between very fine sand and coarse silt (every 5-20 cm); (different facies of) alluvial deposit.
362-390 (11.9-12.8)	3Cg2	dark gray to gray (5Y4/1-5/1) sandy loam; massive; friable; strongly effervescent; small to medium pebbles common; few large pebbles; some pockets of sand mixed in; few sand partings; sands are often lighter (grayish brown to light brownish gray [2.5Y5/2-6/2]); glacial drift.
390-427 (12.8-14.0)		no recovery.
427-515 (14.0-16.9)	3Cg2	same as above; driller's notes specify "boulders."
515-579 (16.9-19.0)		no recovery.
579-613 (19.0-20.1)	3Cg2	same as above; clear lower boundary; sand lens from 579-594 cm.
613-762 (20.1-25.0)	3Cg3	dark gray (5Y4/1) sandy loam to sandy clay loam diamicton; massive; friable; strongly effervescent; unknown lower boundary (end of tubes); dense (more so than overlying unit); small to medium pebbles common; few large pebbles; mostly sandy clay loam; till.

Core/Profile: IC-5

Location: T.H. 6 over Mississippi River

Legal description: SE ¼ SW ¼ Section 22T55N R27W

County: Itasca

Parent material: Alluvium/lacustrine sediments

Vegetation: Grass

Slope: 2-5%

Elevation: 1285 feet

Topo. Map: Sugar Lake

Remarks: T.H. 6 over Mississippi River; on south side of river, 804 feet south of south bridge abutment; southernmost core in transect; on west side of road; 4.6 feet below centerline

Depth cm(ft)	Horizon or Zone	Description
0-15 (0-.5)	A1	black (10YR2/1) loam; moderate, medium to coarse, granular; friable; noneffervescent; clear lower boundary; root mat; many rootlets and roots.
15-27 (.5-.9)	A2	black (10YR2/1) sandy loam; mottles are common, medium, distinct, dark brown to dark yellowish brown (10YR3/3-4/4); weak, medium, granular to fine subangular blocky; very friable; very slightly effervescent to noneffervescent; clear lower boundary; fewer roots and rootlets.
27-66 (.9-2.2)	C1	brown to dark brown (7.5YR4/4) in top two-thirds changing to brown (10YR5/3) (with common, many, medium, dark reddish brown (5YR3/4) mottles) very fine to fine sand; massive to single grain; very friable to loose; very slightly effervescent; clear lower boundary; oxidized more heavily at top; few roots and rootlets; small iron concretions common (oxidation dots).
66-131 (2.2-4.3)	C2	light brownish gray (10YR6/2) clay loam; mottles are many, fine to medium, distinct, yellowish brown (10YR5/8) to strong brown (7.5YR4/6); massive; friable to firm; noneffervescent; unit has higher clay content than surrounding units.
131-152 (4.3-5.0)		no recovery.
152-157 (5.0-5.2)	C2	same as above; gradual lower boundary.
157-176 (5.2-5.8)	C3	light brownish gray (10YR6/2) sandy clay loam to sandy loam; mottles are common, fine to medium, distinct, strong brown (7.5YR4/6); massive; friable to very friable; noneffervescent; gradual lower boundary; transitional unit; clay content decreases with depth.
176-241 (5.8-7.9)	C4	light brownish gray (10YR6/2) very fine to fine sand; mottles are many, fine to coarse, distinct, yellowish brown (10YR5/4) to strong brown (7.5YR4/6); single grain; loose; slightly effervescent to 230 cm, then strongly effervescent; alluvial or eolian(?).
241-305 (7.9-10.0)		no recovery.
305-309 (10.0-10.1)	C4	same as above; abrupt lower boundary; abrupt boundary on top of clays, but a lens of sand is found from 315-320 cm, just below top of next unit.
309-436 (10.1-14.3)	2Cg1	dark gray to dark grayish brown (10YR4/1-2.5Y4/2) clay to silty clay and silty clay loam; massive; firm; strongly effervescent; clear lower boundary; clay to silty clay is the dominant matrix; zones (approximately 10-15 cm thick) where silty clay loam dominates with lenses/laminations of silty clay; clays are fractured into blocks; faint laminations occasionally visible; much of unit is disturbed (highly fractured - not very cohesive); lacustrine.
436-762 (14.3-25.0)	2Cg2	very dark gray (10YR3/1) clay to silty clay and grayish brown (2.5Y5/2) silty clay loam; massive; firm; strongly effervescent; unknown lower boundary (end of tubes); rhythmically laminated (possibly varved); lamination couplets approximately 1-2 cm thick; clays are fractured; finer laminations in silty clay laminations; few sand partings and a pebble from 500-570 cm; few sand partings from 756-762 cm; occasionally rhythmic laminations become less clear, but generally they are quite evident; massive silty clay loam unit from 741-750 cm; lacustrine.

Core/Profile: MO-1
 Location: County Road 26
 Legal description: Section 32 T39N R32W
 County: Morrison
 Parent material: Alluvium
 Vegetation:
 Slope: 0-2%
 Elevation: 1035 feet
 Topo. Map: Royalton
 Remarks: MnDOT core Mor. Co. 6-1; County Road 26 east of Mississippi River; just north of Morrison-Benton county line; on north side of road; 3.0 feet below center line; closest core (in transect) to river; approximately 0.2 mile east of river bridge

Depth cm(ft)	Horizon or Zone	Description
0-15 (0-.5)	A	black (10YR2/1) sandy loam; weak, medium, granular; friable; noneffervescent; clear lower boundary; roots and rootlets common.
15-23 (.5-.8)	AC	very dark brown (10YR2/2) sandy loam; weak platy; friable; noneffervescent; clear lower boundary; few rootlets.
23-34 (.8-1.1)	C	dark brown (7.5YR3/4) fine sand; single grain; loose; noneffervescent; abrupt lower boundary.
34-44 (1.1-1.4)	2CA	dark brown (7.5YR3/2) loamy sand; massive; friable; noneffervescent; clear lower boundary; few rootlets.
44-66 (1.4-2.2)	2C	dark brown (7.5YR3/4) fine sand; single grain; loose; noneffervescent; gradual lower boundary.
66-82 (2.2-2.7)	3CA	brown to dark brown (7.5Y4/2) loamy sand; massive; very friable; very slightly effervescent; gradual lower boundary; possibly weak blocky structure (may be fracturing); few rootlets.
82-110 (2.7-3.6)	3C1	dark brown (10YR3/3) sandy loam; mottles are few, medium, faint, very dark grayish brown (10YR3/2); massive; friable; strongly effervescent; abrupt lower boundary; sand is fine to very fine; changes to a silt loam near base; sand lens at base; few roots.
110-122 (3.6-4.0)	4C2	brown to dark brown (10YR4/3) loamy sand and gravel; single grain; loose; slightly to strongly effervescent; clear lower boundary; many rounded pebbles, all sizes; 56% recovery.
122-244 (4.0-8.0)	4C3	brown to dark brown (10YR4/3) coarse sand and gravel; single grain; loose; very slightly effervescent; unknown lower boundary (end of tube); many rounded pebbles, all sizes; cobbles are few to common; 56% recovery.
244-262 (8.0-8.6)	4C4	dark yellowish brown (10YR4/4) medium to coarse sand; single grain; loose; slightly to strongly effervescent; clear lower boundary; may be a fining upwards sequence with 4C5.
262-299 (8.6-9.8)	4C5	brown to dark brown (7.5YR4/4) coarse sand and gravel; single grain; loose; slightly effervescent; unknown lower boundary (end of tube); many rounded pebbles, all sizes; few to common cobbles; may be a fining upwards sequence with 4C4.
299-396 (9.8-13.0)		no recovery.
396-418 (13.0-13.7)	4C6	dark brown (10YR3/3) medium sand; single grain; loose; strongly effervescent; clear lower boundary; may be a fining upwards sequence with 4C7; 52% recovery.
418-466 (13.7-15.3)	4C7	dark brown (10YR3/3) coarse sand and gravel; single grain; loose; strongly effervescent; clear lower boundary; many pebbles, all sizes; few cobbles, especially near base; may be a fining upwards sequence with 4C6; 52% recovery.
466-500 (15.3-16.4)	4Cg1	dark grayish brown (10YR4/2) fine to medium sand; single grain; loose; strongly effervescent; clear lower boundary; may be the top of a fining upwards sequence; 60% recovery.
500-701 (16.4-23.0)	4Cg2	dark gray to dark grayish brown (10YR4/1-4/2); coarse sand and gravel; single grain; loose; strongly effervescent; unknown lower boundary (end of tubes); many rounded pebbles, all sizes; few small cobbles; 60% recovery.

Core/Profile: MO-2
 Location: County Road 26
 Legal description: NE ¼ Section 32 T39N R32W
 County: Morrison
 Parent material: Alluvium
 Vegetation:
 Slope: 0-2%
 Elevation: 1036 feet
 Topo. Map: Royalton
 Remarks: MnDOT core Mor. Co. 6-2; County Road 26 east of Mississippi River; on north side of road; 1.7 feet below center line; approximately 0.6 mile east of river bridge; NE of MO-1

Depth cm(ft)	Horizon or Zone	Description
0-15 (0-.5)	A	black (10YR2/1) sandy loam; weak, fine, subangular blocky; friable; noneffervescent; abrupt lower boundary; few small pebbles; rootlets common; roots.
15-34 (.5-1.1)	AC	dark brown (10YR3/3) sandy loam to loamy sand; massive; friable; noneffervescent; abrupt lower boundary; sand lens at base; few small to medium pebbles; sandier with depth; few rootlets.
34-60 (1.1-2.0)	2A1	black (10YR2/1) loam; weak, fine, subangular blocky; friable; noneffervescent; gradual lower boundary; rootlets common; 7 cm inferred.
60-94 (2.0-3.1)	2A2	very dark grayish brown (10YR3/2) loam; weak, fine, subangular blocky; friable; noneffervescent; gradual lower boundary; few rootlets; 8 cm inferred.
94-137 (3.1-4.5)	2C1	dark brown (10YR3/3) sandy loam; mottles are few, fine, faint, dark brown (7.5YR3/4-3/2); massive; friable; noneffervescent; clear lower boundary; sand is fine; rootlets common; moist; 72% recovery.
137-168 (4.5-5.5)	2C2	dark grayish brown (10YR4/2) sandy loam; mottles are common, medium, distinct, dark brown (7.5YR3/4-3/2) and strong brown (7.5YR4/6); massive; friable; noneffervescent; abrupt lower boundary; laminated (laminations are 3-6 cm thick on average); some laminations are sandier or siltier than surrounding sediment; few rootlets; moist; 72% recovery.
168-229 (5.5-7.5)	3C3	dark reddish brown (5YR3/4) medium sand; mottles are few, very coarse, prominent, grayish brown (10YR5/2); single grain; loose; noneffervescent; clear lower boundary; oxidized bands; 72% recovery.
229-244 (7.5-8.0)	3C4	grayish brown (10YR5/2) coarse sand and gravel; single grain; loose; noneffervescent; unknown lower boundary (end of tube); many small to medium pebbles; 72% recovery.
244-268 (8.0-8.8)	3C5	dark brown (10YR3/3) medium sand; single grain; loose; very slightly effervescent; clear lower boundary; may be a fining upwards sequence with 3C6.
268-290 (8.8-9.5)	3C6	dark brown (10YR3/3) coarse sand and gravel; single grain; loose; very slightly effervescent; unknown lower boundary (end of tube); many rounded pebbles, all sizes; cobbles common; may be a fining upwards sequence with 3C5.
290-396 (9.5-13.0)		no recovery.
396-424 (13.0-13.9)	3Cg1	dark grayish brown (2.5Y4/2) medium sand; single grain; loose; slightly effervescent; clear lower boundary; may be top of fining upwards sequence; 60% recovery.
424-549 (13.9-18.0)	3Cg2	dark grayish brown (10YR4/2) coarse sand and gravel; single grain; loose; slightly effervescent; unknown lower boundary (end of tubes); many pebbles, all sizes; small cobbles common; 60% recovery.
549-701 (18.0-23.0)		no recovery; driller's notes: "rough augering; appears to be sand and gravel."

Core/Profile: MO-3
 Location: County Road 26 - meander scar
 Legal description: NW ¼ Section 33 T39N R32W
 County: Royalton
 Parent material: Alluvium/organics
 Vegetation:
 Slope: 0-2%
 Elevation: 1037 feet
 Topo. Map: Royalton
 Remarks: MnDOT core Mor. Co. 6-3; County Road 26 east of Mississippi River; on north side of road; 5.2 feet below center line; approximately one mile east of river bridge

Depth cm(ft)	Horizon or Zone	Description
0-61 (0-2.0)		no recovery; 3 cm of sand on top of next sample - much of top 60 cm may be sand.
61-91 (2.0-3.0)	Oib	black (10YR2/1) fibric material; massive; very friable; noneffervescent; clear lower boundary; peat; fibric; many rootlets; wood; 66% recovery.
91-168 (3.0-5.5)	C/O	very dark gray and dark gray (10YR3/1 and 4/1) fine sandy loam; massive; very friable; noneffervescent; sands are very slightly effervescent; abrupt lower boundary; muck with few lenses (2-7 cm thick) of coarse sand and gravel; fibers present; few beds of peat; 66% recovery.
168-183 (5.5-6.0)	2Oeb	black (10YR2/1) hemic material; massive; very friable; noneffervescent; abrupt lower boundary; peat; fibers present; wood; some sand; few small pebbles; sand lens at base; half-core of peat collected; 66% recovery.
183-210 (6.0-6.9)	2Oab	very dark gray (10YR3/1) silt loam to silt-rich sandy loam; massive; friable; noneffervescent; abrupt lower boundary; few medium sand lenses; peaty muck to muck; few fibers; wood; few small pebbles; 66% recovery.
210-244 (6.9-8.0)	3C1	dark gray (10YR4/1) medium sand; single grain; loose; slightly effervescent; clear lower boundary; few rootlets; alluvial.
244-305 (8.0-10.0)	3C2	dark yellowish brown to dark brown (10YR-7.5YR3/4) coarse sand and gravel; single grain; loose; slightly effervescent; unknown lower boundary (end of tubes); pebbles common, all sizes; slightly oxidized; alluvial.
305-366 (10.0-12.0)		no recovery.
366-405 (12.0-13.3)	3C3	dark yellowish brown (10YR4/4-3/4) coarse sand; single grain; loose; slightly effervescent; clear lower boundary; slightly oxidized; alluvial.
405-421 (13.3-13.8)	3C4	dark yellowish brown (10YR4/4-3/4) coarse sand and gravel; single grain; loose; slightly to strongly effervescent; unknown lower boundary (end of tube); many pebbles, all sizes; few cobbles, including one 9 cm across at base of unit; slightly oxidized; alluvial.
421-518 (13.8-17.0)		no recovery.
518-570 (17.0-18.7)	3C5	same as 3C4 only slightly coarser.
570-671 (18.7-22.0)		no recovery.

Core/Profile: MO-4

Location: T.H. 10 over Mississippi River

Legal description: SW ¼ Section 27 T41N R32W

County: Morrison

Parent material: Alluvium

Vegetation: Grass

Slope: 0-2%

Elevation: 1113 feet

Topo. Map: Belle Prairie

Remarks: MnDOT core MOR 7-1; T.H. 10 over Mississippi River; on east side of river north of Little Falls; 2.7 feet below center line; on low floodplain near river

Depth cm(ft)	Horizon or Zone	Description
0-11 (0-.4)	A	black (10YR2/1) sandy loam; weak, medium, granular to massive; very friable; noneffervescent; abrupt lower boundary; rootlets and roots; top half of unit is sandier.
11-23 (.4-.8)	AC	dark brown to very dark brown (7.5YR3/2-10YR2/2) loamy sand; massive to single grain; loose; noneffervescent; clear lower boundary; few pebbles; rootlets.
23-94 (.8-3.1)	C1	dark brown (7.5YR3/4) fine to coarse sand, unsorted; single grain; loose; noneffervescent; gradual lower boundary; very small pebbles common; few small to medium pebbles; greater concentration of clasts from 37-47 cm; oxidized; lighter with depth; alluvial.
94-134 (3.1-4.4)	C2	brown to dark brown (10YR4/3) fine to medium sand; single grain; loose; noneffervescent; clear lower boundary; alluvial.
134-430 (4.4-14.1)	C3	brown to dark brown to strong brown (7.5YR4/4-4/6) medium to coarse sand; mottles are few, coarse, dark brown (7.5YR3/2-3/4); single grain; loose; noneffervescent to approximately 275 cm, then strong for approximately 30 cm, then slightly to very slightly effervescent; clear lower boundary; very small pebbles common; few small to medium pebbles; band of sand with Mn oxide staining from 256-259 cm; oxidized; 2 cm of fine sand at base; no recovery from 175-244 cm, 314-396 cm; alluvial.
430-439 (14.1-14.4)	2C4	brown to dark brown to dark brown (10YR4/3-3/3) gravel; mottles are few, coarse, very dark gray (10YR3/1) to dark grayish brown (10YR4/2), finer sand; single grain; loose; strongly effervescent; clear lower boundary; rounded pebbles and cobbles; some fine to coarse sand between clasts; alluvial.
439-701 (14.4-23.0)	3C5	brown to brown to dark brown (10YR5/3-4/3) coarse sand; single grain; loose; slightly to strongly effervescent; unknown lower boundary (end of tubes); no recovery from 445-550 cm, 616-701 cm; alluvial.

Core/Profile: MO-5

Location: T.H. 10 over Mississippi River

Legal description: SE ¼ Section 27 T41N R32W

County: Morrison

Parent material: Alluvium - outwash/till

Vegetation: Grass

Slope: 2-5%

Elevation: 1122 feet

Topo. Map: Belle Prairie

Remarks: MnDOT core MOR 7-2; T.H. 10 over Mississippi River north of Little Falls; on east side of river; on next step higher than low floodplain; no notes on elevation given

Depth cm(ft)	Horizon or Zone	Description
0-31 (0-1.0)	C	dark brown to dark yellowish brown (7.5-10YR3/4) fine to coarse sand and gravel; single grain; loose; noneffervescent; abrupt lower boundary; spoil; clasts of asphalt; sand is unsorted; oxidized.
31-46 (1.0-1.5)	2A	black (10YR2/1) sandy loam; mottles are few, medium, faint, very dark grayish brown (10YR3/2); massive to weak, fine, subangular blocky; friable; noneffervescent; abrupt lower boundary; few pebbles; few roots; rootlets.
46-53 (1.5-1.7)	2C1	yellowish brown and brown to dark brown (10YR5/4 and 4/3) fine sand; single grain; loose; very slightly effervescent; unknown lower boundary (end of tube); faintly laminated; alluvial.
53-91 (1.7-3.0)		no recovery.
91-101 (3.0-3.3)	2C2	dark brown to very dark brown (10YR3/3-2/2) medium sand; mottles are few, coarse, brown to dark brown (10YR4/3); single grain; loose; slightly effervescent; clear lower boundary; slightly darker than 2C1; alluvial.
101-137 (3.3-4.5)	3C3	brown to dark brown (10YR4/3) coarse sand and gravel; single grain; loose; strongly effervescent; gradual lower boundary; unsorted; many rounded pebbles, all sizes; darker in top half; alluvial.
137-162 (4.5-5.3)	3C4	dark brown to dark yellowish brown (7.5YR3/4-10YR4/4) coarse sand and gravel; few, coarse, carbonate-rich, white and light brownish gray (10YR8/1,6/2), finer sand masses; single grain; loose; strongly to violently effervescent; clear lower boundary; cobbles common; many rounded pebbles, all sizes; coarser than 3C3; alluvial.
162-183 (5.3-6.0)	4C5	olive brown to light olive brown (2.5Y4/4-5/4) fine to medium sand; single grain; loose; very strongly effervescent; few very small pebbles; sorted; very few rootlets; alluvial.
183-244 (6.0-8.0)		no recovery.
244-305 (8.0-10.0)	4C5	same as above; clear lower boundary.
305-329 (10.0-10.8)	4C6	olive brown (2.5Y4/4) medium sand; single grain; loose; very strongly effervescent; clear lower boundary; few lenses of coarse sand and gravel (small to medium pebbles); coarser than 4C5; may be base of a fining upwards sequence; alluvial.
329-357 (10.8-11.7)	5C7	dark yellowish brown (10YR4/4) coarse sand; mottles are few, coarse, distinct, dark brown to dark reddish brown (7.5-5YR3/4); single grain; loose; strongly effervescent; very small pebbles common; few medium pebbles; color patterns similar to 3C4 (bands of oxidation).
357-396 (11.7-13.0)		no recovery.
396-424 (13.0-13.9)	5C8	brown to dark brown (10YR4/3) medium to coarse sand; single grain; loose; strongly effervescent; abrupt lower boundary; similar to 5C8 only with fewer pebbles.
424-430 (13.9-14.1)	6C9	brown to dark brown to dark yellowish brown (10YR4/3-4/4) coarse sand and gravel; single grain; loose; strongly effervescent; many rounded pebbles, all sizes; few small cobbles.
430-549 (14.1-18.0)		no recovery.
549-555 (18.0-18.2)	6C9	same as above; clear lower boundary.
555-655 (18.2-21.5)	7C10	dark brown (10YR3/3) sandy loam diamicton; massive; friable; strongly effervescent; unknown lower boundary (end of tubes); dense; pebbles common, all sizes; no shale found; clasts include mainly igneous and metamorphic rocks; few red sandstones; unit is not oxidized; few sand partings; till - origin not known.
655-701 (21.5-23.0)		no recovery.

