



K. Woida and M. L. Thompson: "Polygenesis of a Pleistocene paleosol in southern Iowa"

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Table 1. Quartz:plagioclase (Q/P) ratios from the coarse silt (20-62  $\mu\text{m}$ ) fraction of Profiles 3 and 5. Ratios were calculated from x-ray diffraction peak intensities for the two minerals.

Depositional Unit	Profile 3		Profile 5	
	Depth (cm)	Q/P	Depth (cm)	Q/P
1	175-191	2.5	213-234	2.6
	218-246	2.4	269-285	2.9
			361-376	2.8
2	275-287	3.7	376-389	2.0
			389-404	3.5
			404-422	4.5
3	315-330	4.3	422-442	4.8
	330-348	8.3		
	348-366	4.3	455-467	4.9
	366-384	5.4		
	384-391	6.8	480-493	5.2
	419-434	5.0	493-505	6.2
	483-498	4.1	518-531	4.2
	498-513	5.9		
	513-531	3.7	556-569	5.3
	561-574	4.6		
	587-599	3.5	582-594	4.9
4	599-615	7.3		
	615-630	4.9	610-625	3.9
	630-645	4.8	625-640	4.8
	660-676	2.3	640-655	7.1
	676-691	3.2	655-671	4.3
5			716-737	3.2
	691-716	3.5	828-853	3.6
			945-975	3.4
	777-802	3.6	1103-1128	3.5

Table 2. Partial lithologic makeup of 2-4 mm pebbles in the lower portion of Profile 2, showing a relative increase in mafic pebbles at the top of DU-5. "Schist/gneiss" includes pebbles composed dominantly of quartz and containing minor amounts of mafic minerals.

Depositional Unit	Depth (cm)	Quartz (%)	Greenstone/Basalt (%)	Schist/Gneiss (%)
4	704	31.1	2.7	5.4
	716	23.4	1.6	10.9
	728	25.0	2.9	16.2
	740	17.8	4.8	8.3
	752	17.5	7.0	17.5
	764	21.6	6.2	8.2
	776	23.7	6.5	15.1
	mean	22.9	4.5	11.6
	S.D.	4.6	2.1	4.6
5	788	11.5	17.2	19.7
	800	5.6	20.6	23.4
	812	10.5	15.7	25.4
	824	19.5	13.8	29.2
	836	13.3	23.3	18.4
	848	16.5	13.5	32.4
	860	8.6	25.0	34.4
	872	18.0	19.7	30.3
	884	11.0	22.8	26.5
	896	12.4	18.2	27.7
	908	4.2	10.9	26.0
	920	6.4	12.8	22.4
	mean	11.4	17.8	26.3
	S.D.	4.8	4.6	4.8

Table 9. Gravel content by weight percent for the lower portion of Profile 2. Gravel was extracted from 2 kg samples.

Depo. Unit	Depth (cm)	Gravel Content >2mm (%)
3	626–638	0.1
3	638–650	t
3	650–662	0.1
3	662–674	0.1
3	674–686	0.1
4	686–698	0.1
4	698–710	0.1
4	710–722	0.1
4	722–734	0.1
4	734–746	0.2
4	746–758	0.1
4	758–770	0.1
4	770–782	0.6
5	782–794	4.0
5	794–806	5.8
5	806–818	2.5
5	818–830	1.9
5	830–842	2.1
5	842–854	1.8
5	854–866	2.0
5	866–878	2.0
5	878–890	2.6
5	890–902	2.8
5	902–914	2.9
5	914–926	2.4
5	926–938	3.3

Table 10. Concentrations and ratios of zirconium, titanium, and yttrium in the coarse (20-62  $\mu\text{m}$ ) silt fraction, as determined by x-ray fluorescence.

Sample No.	Depo. Unit	Depth (cm)	Zr (ppm)	Ti (ppm)	Y (ppm)	$\frac{\text{Ti}}{\text{Zr}}$	$\frac{\text{Zr}}{\text{Y}}$
<u>PROFILE 3</u>							
3-14	1	175-191	574	3353	38	5.8	15.1
3-16	1	218-246	686	5090	39	7.4	17.6
3-17	1	246-275	767	9761	43	12.7	17.8
3-19	3	287-300	612	4551	32	7.4	19.1
3-22	3	330-348	816	4790	38	5.9	21.5
3-23	3	348-366	602	4431	29	7.4	20.8
3-24	3	366-384	844	5090	41	6.0	20.6
3-28	3	419-434	616	4132	31	6.7	19.9
3-32	3	483-498	694	4012	35	5.8	19.8
3-33	3	498-513	690	5389	37	7.8	18.6
3-37	3	561-574	604	4730	31	7.8	19.5
3-39	3	587-599	719	4790	35	6.7	20.5
3-40	3	599-615	524	4371	27	8.3	19.4
3-43	4	645-660	746	5210	38	7.0	19.6
3-46	5	691-716	439	4611	21	10.5	20.9
3-48	5	747-777	678	5988	37	8.8	18.3
3-52	5	853-884	528	4611	32	8.7	16.5
<u>PROFILE 5</u>							
5-16	1	213-234	504	3113	34	6.2	14.8
5-19	1	269-285	563	3293	39	5.8	14.4
5-24	1	361-376	746	7425	45	10.0	16.6
5-25	2	376-389	710	5988	38	8.4	18.7
5-26	2	389-414	614	5449	33	8.9	18.6
5-28	3	422-442	675	5449	30	8.1	22.5
5-32	3	480-493	558	4311	28	7.7	19.9
5-38	3	556-569	666	5209	35	7.8	19.0
5-45	4	655-671	589	5209	33	8.8	17.8
5-49	4	716-737	562	4790	32	8.5	17.6
5-51	5	762-792	689	4790	36	7.0	19.1
5-55	5	884-914	574	5629	33	9.8	17.4

Table 13. Quartz:feldspar and plagioclase:K-feldspar ratios for the fine (125-250  $\mu\text{m}$ ) sand fraction, determined from grain counts with a binocular microscope. (See Appendix L for procedure.)

Sample No.	Depo. Unit	Depth (cm)	<u>Quartz</u> Feldspar	<u>Plagioclase</u> K-feldspar
<u>PROFILE 1</u>				
1-25	2	394-404	7.0	1.0
1-27	2	425-446	7.5	0.9
1-29	3	467-488	7.6	1.1
1-31	3	509-530	7.2	0.9
1-37	3	635-656	5.8	1.3
1-39	4	677-698	6.1	1.1
1-41	4	719-740	5.3	1.4
1-46	5	797-827	2.8	2.1
<u>PROFILE 2</u>				
2-28	3	373-382	5.6	1.5
2-31	3	415-429	6.5	1.2
2-35	3	473-488	6.3	1.2
2-41	3	557-573	5.0	1.5
2-45	3	622-637	4.7	1.7
2-55	5	774-789	3.9	2.1
2-59	5	875-900	2.5	3.0
<u>PROFILE 3</u>				
3-19	3	287-300	6.7	0.9
3-21	3	315-330	6.4	1.3
3-26	3	391-404	7.8	1.3
3-29	3	434-452	6.3	1.2
3-33	3	498-513	4.7	1.6
3-39	3	587-599	4.8	1.4
3-44	4	660-676	3.1	1.4
3-47	5	716-747	2.9	2.0
<u>PROFILE 4</u>				
4-23	2	355-365	6.1	1.2
4-29	3	427-441	6.4	1.0
4-36	3	510-525	5.4	1.3
4-45	3	643-660	4.7	1.7
4-52	4	750-765	4.6	1.8
4-63	5	970-1000	3.3	2.1
<u>PROFILE 5</u>				
5-27	2	404-422	5.9	1.0
5-31	3	467-480	5.7	1.6
5-37	3	544-556	6.8	1.1
5-42	4	610-625	4.6	1.4
5-44	4	640-655	5.2	1.2
5-49	4	716-737	3.6	1.6
5-63	5	1128-1158	2.8	1.7

Table 15. Matrix calcite and dolomite contents of the Earlham Quarry diamicton.

Sample	Depth (m)	Calcite (%)	Dolomite (%)	C/D ratio	Total carbonates (%)
a	9.0	3.3	2.6	1.30	5.9
b	9.9	4.7	5.0	0.94	9.7
c	11.0	4.6	6.4	0.72	11.0
d	12.5	4.2	6.3	0.67	10.5

Table 16. Lithologies of 2-4 mm pebbles, Profile 2. "Schist/gneiss" includes pebbles composed dominantly of quartz and containing minor amounts of mafic minerals.

Depth (cm)	Quartz	Feldspar	Granite/Syenite	Diorite/Gabbro	Basalt/Greenst'n	Felsite	Schist/Gneiss	Quartzite	Siltstone/Sandst'n	Shale	Lime-stone	Dolomite	Chert	Other	Total no. of grains
632	33.3	26.7	26.7	0.0	0.0	0.0	6.7	6.7	0.0	0.0	0.0	0.0	0.0	0.0	15
644	27.8	16.7	38.9	0.0	0.0	0.0	5.5	5.5	0.0	0.0	0.0	0.0	5.5	0.0	18
656	21.4	0.0	50.0	0.0	0.0	0.0	10.7	3.6	3.6	0.0	3.6	0.0	3.6	3.6	28
668	17.3	5.7	40.4	0.0	0.0	0.0	7.6	5.7	11.5	0.0	0.0	0.0	11.5	0.0	52
680	15.8	2.6	34.2	0.0	0.0	0.0	7.9	7.9	13.1	0.0	5.3	0.0	13.1	0.0	38
692	28.2	7.7	38.5	0.0	0.0	0.0	0.0	0.0	10.3	0.0	0.0	2.6	12.8	0.0	39
704	31.1	2.7	23.0	5.4	2.7	1.3	5.4	9.4	2.7	0.0	0.0	0.0	13.5	1.5	74
716	23.4	3.1	28.1	4.7	1.6	1.6	10.9	7.8	0.0	0.0	0.0	0.0	17.2	1.5	64
728	25.0	7.3	26.5	2.9	2.9	0.0	16.2	5.9	1.5	0.0	0.0	0.0	8.8	3.0	68
740	17.8	5.9	26.2	3.6	4.8	0.0	8.3	1.2	6.0	0.0	0.0	0.0	23.8	2.4	84
752	17.5	5.3	31.6	3.5	7.0	0.0	17.5	1.7	1.7	0.7	0.0	0.0	4.3	4.3	57
764	21.6	10.3	22.7	3.1	6.2	2.1	8.2	4.1	5.2	0.0	0.0	0.0	11.3	0.0	97
776	23.7	16.5	18.0	5.0	6.5	2.9	15.1	2.2	0.7	0.7	0.0	0.0	4.3	4.3	139
788	11.5	3.3	25.4	3.3	17.2	1.6	19.7	2.5	0.8	0.0	0.0	0.0	13.1	1.6	122
800	5.6	0.0	20.6	5.6	20.6	6.5	23.4	5.6	2.8	0.0	0.0	0.0	7.5	0.9	107
812	10.5	2.0	24.2	2.6	15.7	0.6	25.4	3.9	5.9	0.0	0.0	0.0	9.2	0.0	153
824	19.5	4.0	11.4	5.7	13.8	1.6	29.2	4.1	3.3	0.0	0.0	0.0	5.7	1.6	123
836	13.3	5.8	15.0	3.3	23.3	2.5	18.4	3.3	1.7	0.8	0.0	0.0	12.5	0.8	120
848	16.5	0.8	12.0	4.5	13.5	3.0	32.4	4.5	4.5	0.0	0.0	0.0	6.8	1.5	133
860	8.6	0.8	10.1	0.0	25.0	0.8	34.4	4.7	2.3	0.0	0.0	0.0	9.4	3.9	128
872	18.0	2.4	4.1	4.1	19.7	3.3	30.3	4.9	4.9	0.0	0.0	0.0	7.4	0.8	122
884	11.0	2.2	5.9	4.4	22.8	0.7	26.5	6.6	4.4	2.9	0.0	0.0	11.0	1.5	136
896	12.4	2.2	4.4	1.4	18.2	2.2	27.7	6.6	7.3	1.4	8.0	0.0	6.6	1.4	137
908	4.2	1.7	5.0	5.9	10.9	1.7	26.0	5.9	8.4	4.2	17.6	0.0	9.2	1.7	119
920	6.4	0.0	2.1	0.0	12.8	4.3	22.4	5.3	6.4	1.1	12.8	0.0	24.5	2.1	124
932	17.1	1.7	6.8	2.6	6.8	0.8	22.2	3.4	12.8	1.7	7.7	2.6	12.0	1.7	117



## FIELD DESCRIPTIONS OF SOIL PROFILES

The following profile descriptions follow standard U.S.D.A. nomenclature (Soil Survey Staff, 1951) and Munsell color notation. Weathering-zone designations are from Hallberg et al. (1978). "Light" and "heavy" textures refer to the lower and upper clay contents in the range allowed for each U.S.D.A.-defined textural class. "Krotovinas" refer to cylindrically shaped pockets of material differing from the surrounding soil matrix in terms of color, consistence, and/or texture, interpreted to be infillings of animal burrows. Various types of iron oxides, including hematite ( $\text{Fe}_2\text{O}_3$ ), goethite ( $\text{FeOOH}$ ), and lepidocrocite ( $\text{FeOOH}$ ), are undifferentiated in the descriptions and collectively referred to as "Fe oxides." Manganese oxides, which may be amorphous or one of several minerals ranging in composition from  $\text{MnO}$  to  $\text{MnO}_2$ , are collectively referred to as "Mn oxides." Oxides intermediate in color between manganese and iron oxides are designated "Fe/Mn oxides."

Profiles 2-5 were described from 3-inch cores; Profile 1 was described from the north wall exposure. Blocky structure and very firm consistence in the A horizon of the modern soil (Profiles 2-5) was caused by compaction by quarry vehicles. The upper boundary of the Pre-Illinoian diamicton unit was gradual and could not be precisely placed in either the cores or the exposed face.

The horizon nomenclature indicated in these descriptions is the original nomenclature assigned in the field.

### Profile 1

Location: NE 1/4, NE 1/4, NW 1/4, Sec.8, T77N, R28W. The upper (West) section of the profile was described 8 meters east of the northwest corner of the quarry; the lower (East) section was described approximately 35 meters to the east of the upper section. The uppermost 2.5 meters of the Quaternary section had been stripped by quarry operations but the depths were recorded in a manner consistent with the other profiles.

Depth (cm)	Horizon or Zone	Description
<u>Upper (West) Section</u>		
255-290	MDU	Grayish brown (2.5Y 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6), common fine to coarse distinct strong brown (7.5YR 5/6), and many fine prominent dark reddish brown (5YR 3/2) mottles; massive; firm moist; few medium hard and few fine soft secondary carbonate concretions, the former with vertical long axes; matrix slightly effervescent; clear lower boundary.
290-326	MDU	Grayish brown (2.5Y 5/2) silt loam; yellowish brown and strong brown mottles as above; few fine prominent dark reddish brown (5YR 3/2) mottles; massive; firm moist; very few gastropod shells; effervescent; clear wavy lower boundary.
326-373	MDL	Grayish brown (2.5Y 5/2) silt loam; common fine to coarse distinct strong brown (7.5YR 5/6) mottles, some with prominent dark reddish brown (5YR 3/2) haloes; common fine to medium distinct yellowish brown (10YR 5/6) mottles, some with hard dark reddish brown (5YR 3/2) centers; massive; firm moist; few very dark gray (10YR 3/1) root channel fillings; noneffervescent; clear wavy boundary.
373-394	MDL	Grayish brown (2.5Y 5/2) silty clay loam; common fine and medium distinct strong brown (7.5YR 5/8) mottles; few fine charcoal flecks; strong coarse angular blocky aggregates (believed to be produced by exposure); firm moist; common thick strong brown (7.5YR 5/8) coatings and pipestems (5-10 mm diameter) along large channels; many thin continuous very dark gray (10YR 3/1) cutans on very fine channels; common dark brown (7.5YR 3/2) soft Fe/Mn oxide accumulations; few soft yellowish red (5YR 4/6) Fe oxide concretions; noneffervescent; involuted lower boundary.
394-404	2Ab	Dark gray (10YR 4/1) silty clay loam; common fine and medium prominent strong brown (7.5YR 4/6) and few fine faint very dark gray (10YR 3/1) mottles; few fine (1-3 mm) charcoal flecks; strong medium and coarse angular blocky aggregates (believed to be produced by exposure); firm moist; few thin continuous very dark gray (10YR 3/1) cutans on very fine (<1 mm) channels; noneffervescent; sharp wavy boundary.
404-425	2Bwb1	Gray (10YR 5/1) heavy silty clay loam; abundant fine and common

		medium distinct yellowish brown (10YR 5/8) mottles; common very fine prominent strong brown (7.5YR 5/8) and few very fine prominent red (2.5YR 4/6) mottles; very few fine (1-3 mm) charcoal flecks; moderate very fine granular structure; friable moist; few thin continuous very dark gray (10YR 3/1) cutans on very fine channels and few thick discontinuous dark reddish brown (5YR 2.5/2) Mn oxide patches; noneffervescent; gradual boundary.
425-467	2Bwb2	Gray (10YR 5/1) light silty clay; common fine and few medium distinct yellowish brown (10YR 5/8) mottles and very few very fine prominent red (2.5YR 4/6) mottles; strong very fine subangular blocky structure; friable moist; very few thin continuous black (5YR 2.5/1) cutans on fine (1-2 mm) channels; noneffervescent; gradual boundary.
467-532	3ABb	Gray (10YR 5/1) light silty clay; few fine prominent black (7.5YR 2/0) mottles; abundant krotovinas (about 10 m <sup>-1</sup> ) with mixed grayish brown (2.5Y 5/2) and very dark gray (2.5Y 3/0) interiors (2-4 cm in diameter, massive, very firm moist and brittle dry) and yellowish brown (10YR 5/4) exterior haloes (2-10 cm thick, weak subangular blocky structure) with many fine faint yellowish brown (10YR 5/8) coatings; strong fine and very fine subangular blocky structure; friable moist; many thin continuous yellowish brown (10YR 5/6) Fe oxide coatings on ped faces; many thin discontinuous strong brown (7YR 4/6-5/8) coatings on very fine (<1 mm) channels; few very fine (1-2 mm) charcoal flecks; noneffervescent; clear boundary.
532-616	3Btb1	Mixed strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) silty clay; few krotovinas near top of the horizon, similar to those above; strong fine and very fine subangular blocky structure; friable moist; abundant slickensides below 575 cm; common thin continuous brownish yellow (10YR 6/8) Fe oxide coatings on ped surfaces; few thin continuous grayish brown (2.5Y 5/2) argillans (stress cutans?); few white (10YR 8/1) 0.5-2 cm silt fillings; noneffervescent; gradual smooth boundary.
616-686	3Btb2	Gray (10YR 5/1) silty clay; many medium and coarse prominent yellowish red (5YR 5/6) mottles and few fine prominent black (7.5YR 2/0) mottles; moderate fine and very fine subangular blocky structure; moist friable; common fractures at bottom of horizon extend into horizon below; abundant large slickensides line the fractures; few reddish brown (5YR 4/4) Fe oxide coatings in small channels and along fracture planes; few thin continuous grayish brown (10YR 5/2) argillans (stress cutans?); few chert fragments; noneffervescent; gradual smooth boundary.
686-756	3Btgb1	Gray (5Y 6/1) silty clay; many medium and coarse prominent yellowish brown (10YR 5/8) mottles; common gray (10YR 5/1) krotovinas (about 6 m <sup>-1</sup> ), 1-5 cm in diameter; moderate medium, breaking to fine, subangular blocky structure in both matrix and krotovinas; firm moist; common slickensides oriented 45° from

horizontal; few small (<1 cm) pebbles; noneffervescent; gradual boundary.

756-791+      3Btgb2      Gray (5Y 6/1) silty clay; common fine and medium prominent yellowish brown (10YR 5/8) and strong brown (7.5YR 5/6) mottles; few krotovinas (about 1 m<sup>-1</sup>) similar to those above; moderate medium subangular blocky structure; very firm moist; common thin strong brown (7.5YR 5/6) Fe oxide coatings on very fine (1 mm) channels; common thin discontinuous dark brown (7.5YR 3/2) cutans and few thin continuous olive gray (5Y 5/2) argillans (stress cutans?) on ped surfaces; few 1-cm diameter white (5Y 8/1) barite nodules and thin barite coatings toward bottom of horizon; few small pebbles; noneffervescent.

#### Lower (East) Section

782-797      3BCb      Grayish brown (2.5Y 5/2) clay loam; common fine and medium prominent strong brown (7.5YR 5/6) mottles; strong fine and very fine angular blocky structure; firm moist; noneffervescent; gradual irregular boundary.

797-857      4BCb      Light brownish gray (2.5Y 6.2) and strong brown (7.5YR 5/6) loam; common pockets (about 8 m<sup>-2</sup>) of grayish brown (2.5Y 5/2) silty clay, resembling krotovinas, 2-5 cm in diameter, occasionally elongated (as much as 40 cm long), with strong fine and very fine angular blocky structure and few thick continuous and discontinuous dark grayish brown (10YR 4/2) argillans; surrounding material has weak medium subangular blocky structure; friable moist; common very thin discontinuous red (2.5YR 4/6) coatings on ped faces and planes of weakness; common coarse (1-2 cm long axis) granite and shale fragments; noneffervescent; gradual irregular boundary.

857-940      4C-MJOL      Yellowish brown (10YR 5/4) heavy loam; few pockets (about 2 per horizontal meter) of light olive gray (5Y 6/2) silty clay, resembling krotovinas, 3-5 cm in diameter, concentrated near top of the horizon (one tongue from horizon above is 5 cm wide and 40 cm long); surrounding material has weak fine and very fine subangular blocky structure plus weakly expressed vertical joints with light olive gray (5Y 6/2) zones along joints; friable moist; thin discontinuous yellowish red (5YR 5/6) and few thin continuous very dark gray (2.5Y 3/0) Fe and Mn oxide coatings; few thick discontinuous dark grayish brown (10YR 4/2) argillans; few 5-mm diameter white (5Y 8/1) barite nodules toward top of horizon; few weathered granite and shale fragments; noneffervescent; gradual wavy boundary.

940-1000      MJOU      Yellowish brown (10YR 5/4) heavy loam; strong medium angular blocky aggregates (believed to be produced by exposure); firm moist; thin continuous strong brown (7.5YR 4/6) Fe oxide coatings and thin discontinuous very dark gray (2.5Y 3/0) Mn oxide coatings on aggregate faces; light olive gray (5Y 6/2) matrix along vertical

joints; secondary carbonate concretions, 2-5 cm long axis, filling some vertical joints; coarse fragments include weathered, rotten 2-4 cm diameter granite and shale fragments and rounded gabbro fragments; strongly effervescent; clear smooth boundary.

1000-1075+ MJOU Yellowish brown (10YR 5/4) heavy loam; areas of thick platy matrix between strongly expressed joints spaced 10-15 cm apart; joints are dominantly horizontal with 0.1 to 1-cm-thick zones of light brownish gray (2.5Y 6/2) matrix along them; joints gradually become dominantly vertical with depth; thin continuous very dark gray (2.5Y 3/0) Mn oxide coatings; few yellowish red (5YR 5/8) Fe oxide nodules, about 1 cm in diameter; coarse fragments include weathered granite and shale fragments and rounded gabbro fragments, 1-5 cm long axis; secondary carbonate concretions occur in some joints; firm; strongly effervescent.

### Profile 2

Location: NE 1/4, NE 1/4, NW 1/4, Sec.8, T77N, R28W; 650 meters north of fence along gravel road, 3 meters west of overburden slope.

Depth (cm)	Horizon or Zone	Description
0-4	Ap	Black (10YR 2/1) silty clay loam; weak very fine to fine granular structure; loose dry; many very fine roots; noneffervescent; abrupt smooth boundary.
4-13	A2	Black (7.5YR 2/0) silty clay loam; common very fine dark yellowish brown (10YR 4/4) angularly-shaped mottles; moderate thin platy structure; very firm moist and very hard dry; common very fine and fine distinct dark yellowish brown (10YR 4/6) Fe oxide concretions and pipestems; many very fine roots; noneffervescent; clear boundary.
13-29	A3	Black (7.5YR 2/0) silty clay loam; abundant very fine and fine dark yellowish brown (10YR 4/4 and 4/6) angularly-shaped mottles; strong fine to medium angular blocky structure; very firm moist and very hard dry; few very fine distinct dark yellowish brown (10YR 4/6) Fe oxide concretions; common very fine roots; noneffervescent; gradual boundary.
29-46	Bt1	Mixed black (2.5Y 3/0), dark grayish brown (2.5Y 4/2), and dark yellowish brown (10YR 4/6) light silty clay; strong fine to medium angular blocky structure; very firm moist; few thin discontinuous very dark gray (10YR 3/1) and very few thin dark grayish brown (10YR 4/2) coatings; few very fine roots; noneffervescent; clear lower boundary.

46-72	Bt2	Mixed dark yellowish brown (10YR 4/4), grayish brown (2.5Y 5/2), and very dark gray (5Y 3/1) silty clay loam; few very fine prominent yellowish red (5YR 4/6) mottles; moderate medium prismatic, breaking to weak medium angular blocky structure; firm moist; common thin continuous dark gray (5Y 4/1) argillans on ped faces; few thick discontinuous dark grayish brown (2.5Y 4/2) coatings on horizontal fracture planes; few very fine roots; noneffervescent; clear lower boundary.
72-106	BCt	Olive gray (5Y 5/2) silty clay loam; 4-cm thick strong brown (7.5YR 4/6) band below 96 cm; common fine to coarse prominent strong brown (7.5YR 4/6) and few fine to medium yellowish brown (10YR 5/6) mottles; weak medium to coarse prismatic structure; firm moist; thin continuous dark grayish brown (2.5Y 4/2) argillans on prism faces; many very thick (up to 2 mm) continuous very dark gray (10YR 3/1) organs on root channels; few very fine prominent dark brown (7.5YR 3/2) Mn oxide accumulations; few very fine roots; many very fine channels; noneffervescent; clear lower boundary.
106-128	BC	Olive gray (5Y 5/2) silty clay loam; common fine faint light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) mottles; weak medium to coarse prismatic structure; firm moist; common thick continuous very dark gray (10YR 3/1) organs on channel walls; abundant very fine channels both vertical and horizontal; few very fine prominent dark brown (7.5YR 3/2) Mn oxide accumulations; noneffervescent; gradual lower boundary.
128-205	C-MDL	Olive gray (5Y 5/2) light silty clay loam; many fine faint light yellowish brown (2.5Y 6/4) and light olive brown (2.5Y 5/4) mottles; few fine prominent strong brown (7.5YR 5/8) mottles, abundant between 145-175 cm; massive; firm moist; very thick continuous black (10YR 2/1) organs on channel walls; few very fine dark reddish brown (5YR 2.5/2) MnO oxide accumulations; noneffervescent; gradual lower boundary.
205-281	MDL	Olive gray (5Y 5/2) heavy silt loam; mottles as in above horizon; massive, with lenticular structure in top 15 cm; firm moist; coatings as above; very fine fine dark reddish brown (5YR 2.5/2) Mn oxide accumulations; noneffervescent; clear lower boundary.
281-300	MDL	Light brownish gray (2.5Y 6/2) heavy silt loam; common coarse prominent strong brown (7.5YR 5/8) and common fine to medium distinct brownish yellow (10YR 6/6) mottles; massive; firm moist; many thick continuous black (10YR 2/1) organs on channel walls; noneffervescent; clear lower boundary.
300-361	MDL	Gray (5Y 5/1) light silty clay loam; common medium and coarse prominent strong brown (7.5YR 5/8), common medium faint light olive brown (2.5Y 5/4), and few fine prominent yellowish red (5YR 4/6) mottles; massive; firm moist; common thick continuous black (10YR 2/1) organs on channel walls; few fine prominent dark

		reddish brown (5YR 2.5/2) Mn oxide accumulations; few strong brown (7.5YR 5/8) pipestems; noneffervescent; clear lower boundary.
361-370	2Ab1	Olive gray (5Y 5/2) silty clay loam; massive; very firm moist; common thick black (7.5YR 2/0) organs; few thin continuous strong brown (7.5YR 5/8) Fe oxide coatings on channel walls; common strong brown (7.5YR 5/8) and dark red (2.5YR 3/6) Fe oxide concretions and pipestems; noneffervescent; abrupt wavy lower boundary.
370-373	2Ab2	Very dark brown (10YR 2/2) heavy silty clay loam; massive; very firm moist; few pipestems (1-2 mm in diameter) at base; noneffervescent; abrupt lower boundary.
373-382	3Bgb1	Mixed dark gray (10YR 4/1) and dark yellowish brown (10YR 4/4) light silty clay; few very fine prominent yellowish red (5YR 5/8) and few medium faint dark yellowish brown (10YR 4/6) mottles; 1 yellowish brown (10YR 5/6) horizontal band (2-3 cm thick) at center of horizon; weak to moderate very fine subangular blocky structure; firm moist; noneffervescent; abrupt lower boundary.
382-401	3Bgb2	Gray (5Y 5/1) silty clay; few medium faint grayish brown (10YR 5/2) and few medium faint very dark gray (10YR 3/1) mottles; weak to moderate very fine subangular blocky structure; firm moist; very few root channels (1-2 mm in diameter); few thin very dark gray (10YR 3/1) organs on channel walls; few thin white (10YR 8/1) siltans on ped faces below 395 cm; noneffervescent; clear lower boundary.
401-443	3Bgb3	Mixed gray (5Y 5/1) and light olive brown (2.5Y 5/4) silty clay; moderate very fine subangular blocky structure in top of horizon, grading to strong fine subangular blocky structure below; firm to friable moist; common very thin discontinuous prominent dark red (2.5YR 3/6) and yellowish red (5YR 5/8) coatings on ped faces and very small channels; few thin very dark gray (10YR 3/1) organs on fine (1-2 mm) channel walls; noneffervescent; gradual lower boundary.
443-488	3Btgb1	Gray (5Y 5.5/1) silty clay; common medium and coarse distinct light olive brown (2.5Y 5/4) mottles; strong fine angular blocky structure; firm moist; few slickensides; many thin continuous grayish brown (2.5Y 5/2) argillans on ped faces; common very thin discontinuous yellowish red (5YR 5/8) Fe oxide coatings on very small channels; very few very fine black (5YR 2.5/1) Mn oxide accumulations; noneffervescent; clear lower boundary.
488-513	3Btgb2	Mixed gray (5Y 5/1) and light olive brown (2.5Y 5/4) silty clay; moderate medium prismatic breaking to strong fine angular blocky structure; firm moist; common slickensides; many thick continuous strong brown (7.5YR 4/6) Fe oxide coatings on prism faces and 5-10 cm long root traces; very few thin continuous black (10YR 2/1)

		organs on channel walls; common light olive brown (2.5Y 5/4) stress coatings on slickensides; few very coarse sand (1-2 mm) grains; noneffervescent; gradual lower boundary.
513-541	3Btb3	Olive (5Y 5/3) silty clay; moderate medium prismatic breaking to strong fine to medium angular blocky structure; firm moist; common slickensides; few thin discontinuous dark brown (7.5YR 3/4) coatings on prism faces; many thick continuous strong brown (7.5YR 4/6) Fe oxide coatings on prism faces and fine root traces; common olive gray (5Y 5/2) and light olive brown (2.5Y 5/4) stress coatings on slickensides; few fine soft white (5Y 8/1) barite nodules; noneffervescent; gradual lower boundary.
541-607	3BCb1	Gray (5Y 5/1) silty clay; many fine to medium prominent strong brown (7.5YR 5/6 and 5/8) mottles; moderate medium breaking to moderate very fine angular blocky structure; firm moist; common slickensides; thin continuous gray (5Y 6/1) stress coatings on slickensides; many thin continuous strong brown (7.5YR 5/8) coatings on ped faces; few thin discontinuous dark brown (7.5YR 3/4) coatings on ped faces and fine channels; very few white (5Y 8/1) barite coatings on fine channels; few very coarse sand grains, common toward bottom; noneffervescent; clear lower boundary.
607-684	3BCgb2	Gray (5Y 5/1) silty clay; many medium distinct yellowish brown (10YR 5/6-5/8) mottles; weak fine angular blocky structure; firm moist; common slickensides; few gray (5Y 6/1) stress coatings on slickensides; few thin discontinuous yellowish red (5YR 5/8) and few thin continuous black (7.5YR 2/0) coatings on ped faces; very few thin continuous dark reddish brown (5YR 3/3) coatings on very small channels; abundant coarse sand grains; few fine pebbles; noneffervescent; clear lower boundary.
684-810	3BCgb3	Gray (5Y 5.5/1) silty clay; many medium distinct yellowish brown (10YR 5/6) and few fine and very fine prominent strong brown (7.5YR 4/6) mottles; weak very fine subangular blocky structure; moist firm; common slickensides; few thin discontinuous dark brown (7.5YR 3/4) coatings on ped faces and very small channels; common thin continuous black (7.5YR 2/0) Mn oxide coatings on ped and joint faces, abundant to 700 cm; few fine soft white (5Y 8/1) barite nodules; few small (2-8 mm) pebbles; non-effervescent; gradual lower boundary.
810-899	4C-MOL	Yellowish brown (10YR 5/8) clay loam; few medium distinct light olive gray (5Y 6/2) mottles; very weak fine subangular blocky structure, massive below 835 cm; very firm moist; few thin continuous light gray (5Y 6/1) coatings around pebbles; very few fine black (7.5YR 2/0) Mn oxide accumulations; few medium soft white (5Y 8/1) barite nodules; few small (3-20 mm) pebbles, mainly quartz and feldspar; noneffervescent; clear lower boundary.
899-914	MOU	Yellowish brown (10YR 5/8) heavy loam; mottles as in above



horizon; massive; very firm moist; coatings as in above horizon; few small (2-10 mm) pebbles; effervescent.

### Profile 3

Location: SE1/4, NE 1/4, NW 1/4, Sec.8, T77N, R28W; 525 meters north of fence along gravel road, 3 meters west of overburden slope.

Depth (cm)	Horizon or Zone	Description
0-8	A1	Black (10YR 2/1) silty clay loam; moderate very fine to fine granular structure; friable; many fine and very fine roots; noneffervescent; abrupt lower boundary.
8-15	A2	Black (2.5Y 2/0) silty clay loam; strong medium angular blocky structure; very firm, compact; few fine roots; noneffervescent; abrupt lower boundary.
15-28	A3	Black (2.5Y 2/0) heavy silty clay loam; strong medium to coarse angular blocky structure; firm, compact; few thin discontinuous dark grayish brown (2.5Y 4/2) cutans; few fine roots; noneffervescent; abrupt lower boundary.
28-38	A4	Black (2.5Y 2/0) heavy silty clay loam; common fine faint dark grayish brown (2.5Y 4/2) mottles; strong medium to coarse angular blocky structure; firm, compact; few fine prominent strong brown (7.5YR 5/8) soft Fe oxide concretions; few fine roots; noneffervescent; abrupt lower boundary.
38-52	BA	Black (2.5Y 2.5/0) and dark grayish brown (2.5Y 4/2) heavy silty clay loam; strong medium to coarse angular blocky structure; very firm, compact; few fine prominent strong brown (7.5YR 5/8) soft Fe oxide concretions; few fine roots; noneffervescent; clear lower boundary.
52-65	Bw	Black (2.5Y 2/0) heavy silty clay loam; few fine faint dark grayish brown (2.5Y 4/2) mottles; strong medium angular blocky structure; firm; few fine prominent strong brown (7.5YR 5/8) soft Fe oxide concretions; this horizon appears to be composed largely of krotovina material; noneffervescent; abrupt lower boundary.
65-89	Bt	Grayish brown (2.5Y 5/2) heavy silty clay loam to silty clay; many fine distinct brownish yellow (10YR 6/8) mottles; moderate fine to medium prismatic, parting to weak to moderate fine to medium angular blocky structure; firm; irregular thin dark grayish brown (10YR 4/2) streaks and patches of argillans on ped surfaces; irregular thin black (2.5Y 2/0) patches of organs on ped surfaces; few thin continuous dark grayish brown (10YR 4/2) clay fillings and coatings along subvertical root channels; few fine prominent strong brown (7.5YR 5/8) soft Fe oxide concretions and few fine distinct black (2.5Y 2/0) spherical to ellipsoid soft Mn oxide accumulations;

		very few subhorizontal caplike coatings on peds; noneffervescent; clear lower boundary.
89-112	CBt1	Grayish brown (2.5Y 5/2) silty clay loam; many fine distinct brownish yellow (10YR 6/8) mottles; moderate medium to coarse prismatic, parting to very weak very fine angular blocky structure; firm; common very thin continuous dark grayish brown (10YR 4/2) cutans on vertical prism faces; few thin continuous dark grayish brown (10YR 4/2) clay fillings and coatings along root channels; few fine prominent strong brown (7.5YR 5/8) hard Fe oxide concretions and pipestems; common fine to medium soft Mn oxide accumulations; noneffervescent; abrupt lower boundary.
112-122	CBt2	Grayish brown (2.5Y 5/2) silty clay loam; many coarse distinct brownish yellow (10YR 6/8) mottles; moderate medium to coarse prismatic, parting to very weak very fine angular blocky structure; friable; very thin continuous dark grayish brown (10YR 4/2) cutans on vertical prism faces and along root channels; common fine black (2.5Y 2/0) spherical soft Mn oxide concentrations and few fine dark reddish brown (5YR 2.5/2) soft Fe/Mn oxide concretions; roots common along prism faces; noneffervescent; abrupt lower boundary.
122-158	CBt3	Grayish brown (2.5Y 5/2) light silty clay loam; many fine distinct brownish yellow (10YR 6/8) mottles; moderate medium to coarse prismatic, parting to very weak very fine angular blocky structure; friable; cutans as in above horizon; few fine prominent dark reddish brown (5YR 2.5/2) soft Fe/Mn oxide concretions; roots common along prism faces; noneffervescent; abrupt lower boundary.
158-191	C-MDL	Grayish brown (2.5Y 5/2) light silty clay loam; many coarse distinct brownish yellow (10YR 6/8) and many coarse prominent strong brown (7.5YR 4/6) mottles; massive; friable; thin continuous dark grayish brown (10YR 4/2) clay fillings and coatings along subvertical root channels; many fine dark reddish brown (5YR 2.5/2) spherical soft Fe/Mn oxide concretions; noneffervescent; clear lower boundary.
191-275	MDL	Grayish brown (2.5Y 5/2) heavy silt loam; many coarse prominent strong brown (7.5YR 4/6) mottles; massive; friable; coatings as in above horizon; common fine dark reddish brown (5YR 2.5/2) spherical soft Fe/Mn oxide concretions; noneffervescent; abrupt wavy lower boundary.
275-287	2Ab	Black (10YR 2/1), very dark grayish brown (10YR 3/2), and grayish brown (10YR 5/2) light silty clay (the colors are in faint but discrete 2-5 mm horizontal bands); many fine distinct yellowish brown (10YR 5/4) angular flecks (inclusions?); massive except for weak irregular blockiness evident from few shiny pressure faces; firm; few thin continuous dark gray (10YR 4/1) and very dark gray (10YR 3/1) cutans along root channels; few fine (1-2 mm) charcoal flecks; noneffervescent; clear lower boundary.

287-297	2ABb	Dark gray (10YR 4/1) heavy silty clay; many coarse prominent yellowish brown (10YR 5/8) mottles in a diffuse band at top of horizon; 1 black (10YR 2/1) krotovina which contains few fine prominent yellowish red (5YR 4/6) mottles (inclusions?); weak fine to very fine subangular and angular blocky structure in both matrix and krotovina; firm; thin continuous olive brown (2.5Y 4/4) cutans (stress cutans?) in mottled band at top of horizon; noneffervescent; clear lower boundary.
297-330	3Ab	Mixed dark gray (10YR 4/1) and brown to dark brown (10YR 4/3) silty clay, very finely mixed in top 20 cm; 1 black (7.5YR 2/0) inclusion at 320 cm; 2 or 3 krotovinas (2-5 cm) in top of horizon, with dark gray (10YR 4/1) interiors and dark yellowish brown (10YR 4/6) outer halos; moderate very fine subangular blocky structure in both matrix and krotovinas; firm; many thin yellowish red (5YR 4/6) Fe oxide coatings and fillings in very fine channels; noneffervescent; gradual lower boundary.
330-348	3ABb	Mixed dark gray (10YR 4/1) and brown to dark brown (10YR 4/3) silty clay; moderate very fine subangular blocky structure; firm; many thin yellowish red (5YR 4/6) Fe oxide coatings and fillings in very fine channels; noneffervescent; clear lower boundary.
348-366	3Btgb1	Gray (10YR 5/1) silty clay; few fine distinct dark brown (7.5YR 3/2) mottles; 1 dark gray (10YR 4/1) 1-cm diameter krotovina with massive structure; moderate very fine subangular blocky structure; firm; few thin continuous gray (5Y 5/1) argillans (stress cutans?) on peds; few thin yellowish red (5YR 4/6) Fe oxide coatings and fillings in very fine channels; noneffervescent; gradual lower boundary.
366-384	3Btgb2	Gray (10YR 5/1) silty clay; strong fine subangular block structure; firm; common thin continuous gray (5Y 5/1) argillans (stress cutans?) on peds; mottles and Fe oxides as in above horizon; noneffervescent; gradual lower boundary.
384-404	3Btgb3	Gray (10YR 5/1) heavy silty clay; few fine faint light olive brown (2.5Y 5/4) mottles; strong fine subangular to angular blocky structure; firm; common thin continuous dark gray (2.5Y 4/0) argillans (stress cutans?) on ped faces; thin continuous dark yellowish brown (10YR 4/6) Fe oxide films coating some argillans, particularly toward bottom of horizon; noneffervescent; gradual lower boundary.
404-452	3Btgb4	Gray to dark gray (10YR 4.5/1) heavy silty clay; strong fine angular blocky structure in top half of horizon; strong medium angular blocky, parting to strong fine angular blocky structure in bottom half of horizon; firm; common slickensides; few thin continuous olive brown (2.5Y 4/4) argillans on ped faces (common in top 12 cm); many thin continuous dark gray (2.5Y 4/0) argillans (stress cutans?) on ped faces and slickensides; very few thin continuous dark

- reddish brown (5YR 2.5/2) Fe/Mn oxide coatings and fillings in very fine channels; thick continuous yellowish red (5YR 5/8) fillings along medium root channels (2-4 mm in diam., 5-10 cm long); noneffervescent; abrupt lower boundary.
- 452-549      3Btgb5      Gray (5Y 5/1) silty clay, with increasing sand toward bottom; common (many below 520 cm) fine to medium light olive brown (2.5Y 5/4) and strong brown (7.5YR 4/6) mottles; 1 dark gray (N 4/) 2-cm diameter krotovina with moderate very fine angular blocky structure; moderate fine to medium columnar or prismatic, parting to moderate fine angular blocky structure; firm; common slickensides; common thin continuous dark gray (2.5Y 4/0) argillans (stress cutans?) on ped faces and slickensides; few thin continuous dark gray (5Y 4/1) argillans on joint planes in top 12 cm; few fine dark reddish brown (5YR 2.5/2) Fe/Mn oxide accumulations or patchy coatings; 1 quartz pebble; noneffervescent; gradual lower boundary.
- 549-574      3Btgb6      Gray (5Y 5/1) and light olive gray (5Y 6/2) silty clay; moderate to weak very fine and fine subangular blocky structure; firm; common slickensides; few thin continuous dark gray (5Y 4/1) argillans (stress cutans?) on joints and slickenside faces; few fine dark reddish brown (5YR 2.5/2) Fe/Mn oxide accumulations or patchy coatings; very few medium and coarse strong brown (7.5YR 4/6) soft Fe oxide concretions; few very coarse sand grains (1-2 mm); noneffervescent; clear lower boundary.
- 574-617      3BCgb1      Gray (5Y 5/1) and light olive gray (5Y 6/2) silty clay, sandier than above horizon; common coarse prominent strong brown (7.5YR 4/6) mottles and coatings; moderate medium prismatic, parting to weak medium subangular blocky structure; firm; abundant slickensides oriented 45°-60° from horizontal; thick continuous dark gray (5Y 4/1) argillans (stress cutans?) on slickenside faces; common thin dusky red (2.5YR 3/2) Fe/Mn oxide coatings; common very coarse sand; noneffervescent; clear lower boundary.
- 617-645      4BCgb2      Gray (5Y 5/1) light silty clay, with abundant very coarse sand; common coarse prominent strong brown (7.5YR 4/6) mottles and coatings; common fine faint olive (5Y 5/4) mottles below 630 cm; weak medium subangular blocky structure to massive; firm; few thin continuous black (7.5YR 2/0) coatings on very fine channels; common thin dusky red (2.5YR 3/2) Fe/Mn oxide coatings; noneffervescent; clear lower boundary.
- 645-693      4CBgb      Light gray to gray (5Y 6/1) and yellowish brown (10YR 5/6) light silty clay, with abundant very coarse sand; few fine prominent red (2.5YR 4/8) mottles; 1 dark gray (10YR 4/1) krotovina which is less sandy than surrounding matrix; massive, with few vertical joint faces; firm consistence; common slickensides above 675 cm, absent below; common thin continuous (10-12 cm in length) dusky red (2.5YR 3/2) Fe/Mn oxide coatings along joint faces; few thin continuous yellowish brown (10YR 5/8) argillans on slickenside faces;

noneffervescent; clear lower boundary.

693-716	5Cg	Light gray to gray (5Y 6/1) and yellowish brown (10YR 5/6) clay loam, much sandier than above horizon; few fine prominent red (2.5YR 4/8) mottles; massive; firm; many thin continuous dusky red (2.5YR 3/2) Fe/Mn oxide coatings along subvertical joint faces; common pebbles; noneffervescent; gradual lower boundary; diamicton.
716-820	MOL	Strong brown (7.5YR 5/8) heavy loam; common medium prominent light gray (5Y 7/2) subspherical mottles; massive; firm; light gray (5Y 7/2) coatings (3-7 mm wide) and common very fine discontinuous very dark gray (10YR 3/1) coatings along subvertical root traces; noneffervescent; abrupt lower boundary; diamicton.
820-848	OJL	Strong brown (7.5YR 5/8) heavy loam; common medium faint strong brown (7.5YR 4/6) mottles; massive, with few small joint faces; firm; thin continuous strong brown (7.5YR 4/6) coatings on joint faces; few thin discontinuous very dark gray (10YR 3/1) coatings on very fine subvertical root traces; few fine prominent reddish brown (5YR 4/4) subspherical Fe oxide concretions; noneffervescent; abrupt lower boundary; diamicton.
848-887	OJU	Strong brown (7.5YR 5/8) heavy loam; massive, jointed; firm to friable; thin continuous yellowish red (5YR 4/6) Fe oxide coatings and black (N 2/0) irregular patchy Mn oxide coatings on joint faces; few very dark gray (10YR 3/1) coatings along subvertical root channels which have 1-3 mm wide grayish brown (10YR 5/2) rinds; effervescent; abrupt lower boundary; diamicton.
887-965	OJU	Strong brown (7.5YR 5/8) heavy loam; massive, jointed; firm to friable; joints are reduced; some joint faces have thin continuous black (N 2/0) Mn oxide coatings; other joint faces have thin grayish brown (10YR 5/2) coatings and many very fine very dark gray (10YR 3/1) coatings along root channels; effervescent; diamicton.

#### Profile 4

Location: NE1/4, SE 1/4, NW 1/4, Sec.8, T77N, R28W; 315 meters north of fence along gravel road, 3 meters west of overburden slope.

Depth (cm)	Horizon or Zone	Description
0-5	Ap	Black (10YR 2.5/1) heavy silt loam; weak very fine to fine granular structure; loose dry; many fine and very fine roots; noneffervescent; abrupt lower boundary.
5-16	A2	Black (10YR 2.5/1) heavy silty clay loam; moderate fine angular blocky and moderate to strong thin platy structure; very hard dry;

		many very fine roots; noneffervescent; clear lower boundary.
16-31	A3	Black (10YR 2.5/1) light silty clay; abundant very fine and fine faint dark yellowish brown (10YR 4/4 and 10YR 4/6) angularly-shaped mottles (inclusions?); weak medium angular blocky, parting to strong fine angular blocky structure; very hard dry; few very fine faint dark yellowish brown (10YR 4/6) soft Fe oxide concretions; common very fine roots; noneffervescent; clear lower boundary.
31-47	AB	Black (10YR 2.5/1) and dark yellowish brown (10YR 4/4) (approximately 75:25%) light silty clay; moderate medium to coarse angular blocky, parting to strong fine angular blocky structure; very hard dry; few very fine distinct strong brown (7.5YR 4/6) soft Fe oxide concretions; common very fine roots; noneffervescent; clear lower boundary.
47-63	B	Very dark gray (10YR 3/1), dark yellowish brown (10YR 4/4), and dark grayish brown (2.5Y 4/2) light silty clay; very few very fine prominent yellowish red (5YR 4/6) mottles; weak medium prismatic, breaking to strong medium to coarse angular blocky structure; firm moist; very few fine dark reddish brown (5YR 2.5/1) Fe/Mn oxide accumulations with yellowish red (5YR 4/6) halos; common very fine roots; noneffervescent; clear lower boundary.
63-84	Bt	Dark grayish brown (2.5Y 4/2) heavy silty clay loam; common very fine distinct strong brown (7.5YR 5/6), few fine distinct yellowish brown (10YR 5/8) and few very fine prominent dark reddish brown (5YR 2.5/1) mottles; common fine faint very dark gray (10YR 3/1) angularly-shaped mottles or inclusions; strong medium prismatic, parting to strong medium angular blocky structure; firm moist; thin continuous very dark grayish brown (2.5Y 3/2) cutans on blocky ped faces; thick continuous dark grayish brown (2.5Y 3/2) siltans on platy ped faces; few very fine roots; noneffervescent; clear lower boundary.
84-136	BC	Grayish brown (2.5Y 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) subhorizontal bands or stringers; moderate medium prismatic, parting to weak coarse angular blocky structure; firm moist; common thick continuous very dark grayish brown (2.5Y 3/2) and dark gray (10YR 4/1) cutans on prism faces and vertical channels; common fine prominent dark reddish brown (5YR 2.5/1) soft Fe/Mn oxide accumulations and few medium to coarse prominent yellowish red (5YR 4/6) soft Fe oxide concretions; very few very fine roots; abundant very fine root-sized channels; noneffervescent; gradual lower boundary.
136-167	C-MDL	Light grayish brown to grayish brown (2.5Y 5.5/2) silty clay loam; many fine to medium distinct yellowish brown (10YR 5/8) and common fine to medium prominent strong brown (7.5YR 4/6) mottles; massive; firm moist; common thick continuous very dark gray (5YR 3/1) coatings on vertical channels and common thin

		discontinuous black (5YR 2.5/1) coatings on vertical joints or fracture planes; many fine prominent dark reddish brown (5YR 2.5/2) soft Fe/Mn oxide accumulations; common fine root channels; at base of the horizon is a 2-cm thick strong brown (7.5YR 5/8) band; noneffervescent; clear lower boundary.
167-247	MDU	Light grayish brown to grayish brown (2.5Y 5.5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 4/6) mottles; massive; firm moist; common thick continuous very dark gray (5YR 3/1) and few thin continuous dark reddish brown (2.5YR 2.5/4) cutans on subvertical and subhorizontal channels; few fine prominent dark reddish brown (5YR 2.5/2) soft Fe/Mn oxide accumulations and discontinuous coatings, increasing to many in lower 23 cm of the horizon; few strong brown (7.5YR 4/6) soft pipestems; few gastropod shell fragments; effervescent; gradual lower boundary.
247-306	MDU	Grayish brown (2.5Y 5/2) heavy silt loam; few fine to medium prominent strong brown (7.5YR 4/6) mottles and common medium faint yellowish brown (10YR 5/4) mottles and channel fillings; massive; firm moist; few fine prominent dark reddish brown (5YR 2.5/2) soft Fe/Mn oxide accumulations; few soft yellowish red (5YR 4/6) pipestems and few gastropod shell fragments; at middle of horizon is a 3-cm thick dark yellowish brown (10YR 4/6) band with few fine prominent dark red (2.5YR 3/6) mottles and dark brown (7.5YR 3/2) mottles and coatings; effervescent; clear lower boundary.
306-341	MDL	Light grayish brown to grayish brown (2.5Y 5.5/2) light silty clay loam; common medium to coarse faint yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/8) mottles; massive; firm moist; few fine prominent black (5YR 2.5/1) soft Mn oxide accumulations and thin discontinuous coatings along channels; noneffervescent; abrupt wavy or irregular boundary (contact dips 50° from horizontal, may be upper boundary of an involution).
341-346	2Ab1	Dark gray (10YR 4/1) and dark yellowish brown (10YR 3/4) silty clay; few fine distinct strong brown (7.5YR 4/6) mottles; weak very fine to fine granular structure; firm moist; few thin continuous yellowish red (5YR 4/6) cutans on very fine channels; noneffervescent; wavy, very abrupt lower boundary (contact dips 20° from horizontal).
346-355	2Ab2	Mixed dark brown (7.5YR 3/4) and very dark gray (10YR 3/1) silty clay; several 0.5-1.0 mm thick subhorizontal black (10YR 2/1) bands or stringers appear to be depositional features; few fine distinct dark reddish brown (5YR 3/3) mottles in material adjacent to bands; weak very fine to fine granular structure; very firm moist; noneffervescent; abrupt, wavy lower boundary.
355-365	2Bwb1	Dark brown (10YR 4/3) heavy silty clay; many fine and medium faint

		dark gray (10YR 4/1) and few medium faint very dark gray (10YR 3/1) mottles; moderate very fine subangular blocky structure; firm moist; noneffervescent; abrupt lower boundary.
365-375	2Bwb2	Strong brown (7.5YR 4/6) clay; common fine and medium distinct dark gray (5YR 4/1) mottles; moderate very fine subangular structure; firm moist; few thin discontinuous black (7.5YR 2/0) cutans; noneffervescent; abrupt lower boundary.
375-403	3Btb1	Dark gray (10YR 4/1) heavy silty clay or clay; common medium faint dark yellowish brown (10YR 4/4) and few medium faint very dark gray (10YR 3/1) mottles; 1 dark gray (10YR 4/1) krotovina in topmost 3 cm of the horizon (pod-shaped, 2x3 cm, with horizontal long axis, massive structure; surrounded by faint very dark gray (10YR 3/1) halo); common thick discontinuous black (10YR 2/1) fragments of coatings (organs?) or inclusions, concentrated in 2-3 cm of material below the krotovina; moderate very fine subangular blocky structure; firm moist; few very fine thin discontinuous light brownish gray (10YR 6/2) cutans on ped faces; noneffervescent; clear lower boundary.
403-415	3Btb2	Dark yellowish brown (10YR 4/4) heavy silty clay; few fine to medium and many very fine faint gray (10YR 5/1) mottles; 3 very dark gray (10YR 3/1) krotovina (2 cm in diameter, circular in cross-section, with same structure as surrounding material); common fine prominent black (10YR 2/1) inclusions or fragments of coatings; strong, very fine subangular blocky structure; firm moist, friable dry; noneffervescent; clear lower boundary.
415-427	3Btb3	Grayish brown (2.5Y 5/2) heavy silty clay; common fine prominent black (10YR 2/1) inclusions in upper 5 cm; strong very fine subangular blocky structure; firm moist, friable dry; many thin discontinuous dark reddish brown (5YR 3/4) and strong brown (7.5YR 4/6) Fe oxide coatings on ped faces and along channels; common thin discontinuous dark brown (7.5YR 3/2) argillans; very few fine pebbles; noneffervescent; clear lower boundary.
427-441	3Btb4	Mixed grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) heavy silty clay; common fine faint gray (10YR 5/1) and few fine prominent black (10YR 2/1) mottles; strong very fine angular and subangular blocky structure; friable moist; many thin discontinuous yellowish red (5YR 4/6) argillans on ped faces, few on very fine channels; very few thin continuous grayish brown (2.5Y 5/2) argillans on ped faces; noneffervescent; clear lower boundary.
441-453	3Btb5	Grayish brown (2.5Y 5/2) silty clay; 1 very dark gray (10YR 3/1) krotovina (1.5 cm in diameter) at 443 cm, with many very fine distinct light brownish gray (10YR 6/2) mottles or inclusions; strong very fine subangular and angular blocky structure in both matrix and krotovina; friable to firm moist; few thick continuous light gray (10YR 7/1) siltans and few thin continuous dark brown (7.5YR 3/2) argillans



- on joint surfaces; few thin very fine continuous gray (10YR 5/1) argillans on ped faces and common thin continuous yellowish brown (10YR 5/6) and yellowish red (5YR 4/6) mottles and coatings on peds and along channels; noneffervescent; gradual lower boundary.
- 453-482      3Btb6      Grayish brown (2.5Y 5/2) silty clay; common fine prominent strong brown (7.5YR 4/6-5/8) mottles, increasing to many below 463 cm; moderate very fine subangular and angular blocky structure; firm to very firm moist; common thin continuous yellowish brown (10YR 5/6) mottles and coatings on peds and along channels; few thin continuous gray (10YR 5/1) argillans on ped faces; noneffervescent; gradual lower boundary.
- 482-555      3Btb7      Grayish brown (2.5Y 5/2) silty clay; few fine faint gray (5Y 5/1) and few coarse faint dark gray (5Y 4/1) mottles throughout the horizon and also concentrated in a zone at 531 cm; strong medium prismatic, parting to strong fine to medium angular blocky structure; firm to friable moist; common slickensides oriented 40°-50° from horizontal; common thick yellowish red (5YR 5/8 and 4/6) Fe oxide coatings on prism faces and vertical root traces (root traces extend for several cm between peds); few thin discontinuous black (5YR 2.5/1) Mn oxide coatings on prism faces; common thin continuous light olive brown (2.5Y 5/4) argillans on angular blocky peds; few thin continuous grayish brown (2.5Y 5/2) argillans (stress cutans?) on slickenside faces; coatings are more concentrated in a pod-shaped zone between 492 and 505 cm; very few very small (2-3 mm) pebbles, increasing toward the bottom; noneffervescent; gradual lower boundary.
- 555-610      3Btb8      Mixed grayish brown (2.5Y 5/2) and dark yellowish brown (10YR 4/6) silty clay; few fine faint dark gray (10YR 4/1) mottles; weak medium prismatic, parting to strong very fine and fine angular blocky structure; firm moist; common slickensides; few thin continuous dark reddish brown (5YR 3/2) Mn oxide coatings on prism faces and along channels; common thin continuous gray (10YR 5/1) argillans (stress cutans?) on angular blocky peds; few thin discontinuous yellowish red (5YR 4/6) Fe oxide coatings on peds, common thick continuous along channels; few fine yellowish red (5YR 4/6) soft Fe oxide concretions; common very small (2-3 mm) pebbles; noneffervescent; gradual lower boundary.
- 610-677      3Btb9      Grayish brown (2.5Y 5/2) silty clay; common coarse distinct yellowish brown (10YR 5/6), few fine faint light brownish gray (2.5Y 6/2), and few fine prominent yellowish red (5YR 4/6) mottles; strong, fine angular blocky structure; firm to friable moist; common slickensides; many thin continuous gray (10YR 5/1) to dark gray (10YR 4/1) argillans on ped faces; few thin discontinuous dark reddish brown (5YR 3/4) Fe oxide coatings on prism faces; thin continuous gray (5Y 5/1) argillans on slickenside surfaces; common very small (2-5 mm) pebbles; noneffervescent; clear lower boundary.

677-736	3Btgb10	Gray (5Y 5/1) silty clay; common medium prominent strong brown (7.5YR 4/6) and few fine prominent dark reddish brown (5YR 3/4) mottles; 2 dark gray (10YR 4/1) krotovinas at 684 cm have dark reddish brown (5YR 3/3) mottles and very fine angular blocky structure; moderate to strong fine to medium angular blocky structure; firm to friable moist; abundant slickensides, oriented 40°-50° from horizontal; thin continuous gray (5Y 5/1) argillans (stress cutans?) on slickenside faces; common thin discontinuous black (7.5YR 2/0) Mn oxide coatings on slickenside and ped faces; common 1-cm diam. barite nodules below 700 cm; common very small to small (2-10 mm) pebbles; noneffervescent; gradual lower boundary.
736-780	3Btgb11	Light olive gray (5Y 6/1) light silty clay; few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine to medium angular blocky structure; firm moist; abundant slickensides; common thin discontinuous black (7.5YR 2/0) Mn oxide coatings on peds and 1-4 cm long channels; few thin discontinuous strong brown (7.5YR 5/8) Fe oxide coatings on peds; many thin continuous gray (5Y 6/1) cutans on slickenside faces; few thin continuous dark reddish brown (5YR 3/4) cutans on channels; common barite nodules; noneffervescent; clear lower boundary.
780-826	4BCtgb	Light olive gray (5Y 6/1) light clay, with abundant small to medium (2-16 mm) pebbles and common medium quartzite clasts; common fine faint yellowish brown (5YR 5/8) and few fine to medium distinct strong brown (7.5YR 5/8) mottles; band of concentrated medium 7.5YR 5/8 mottles between 787 and 792 cm; weak fine to medium angular blocky structure; very firm moist; common slickensides; common thin discontinuous black (7.5YR 2/0) Mn oxide coatings on peds and slickensides; few thin continuous gray (5Y 5/1) argillans on ped faces; common fine to medium prominent black (7.5YR 2/0) soft MnO concretions; common barite nodules; noneffervescent; gradual lower boundary.
826-927	4Cg	Light olive gray (5Y 6/1) clay loam; few coarse faint light olive brown (2.5Y 5/4), few fine faint light yellowish brown (2.5Y 6/4), and few fine distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure, becoming massive below 860 cm; firm moist; very few thin discontinuous dark reddish brown (5YR 2/3) Fe/Mn oxide coatings on peds; few thin discontinuous black (7.5YR 2/0) MnO oxide coatings in uppermost 10 cm of horizon; very few very dark gray (5Y 3/1) soft concretions at 864 cm; abundant small and few medium pebbles; noneffervescent; gradual lower boundary.
927-969	5Cg	Light olive gray (5Y 6/1) to olive gray (5Y 5/2) clay loam; common fine to medium distinct strong brown (7.5YR 5/8) and few very fine prominent yellowish red (5YR 4/6) mottles; massive, with pockets of weak fine subangular blocky structure; firm moist; few thin continuous black (5YR 2.5/1) cutans along very fine channels; abundant small to large pebbles; noneffervescent; clear lower

		boundary; diamicton.
969-990	MOL	Strong brown (7.5YR 5/8) clay loam; many medium to coarse distinct olive gray (5Y 5/2) and few fine prominent dark reddish brown (5YR 3/3) mottles; few fine to medium very dark gray (5Y 3/1) mottles (weathered pebbles?); massive; very firm moist; few thin continuous black (5YR 2.5/1) coatings along channels; noneffervescent; clear lower boundary; diamicton.
990-1010	MOL2	Strong brown (7.5YR 5/8) clay loam; common medium to coarse distinct gray (5Y 6/1) mottles; massive; very firm moist; common thin continuous black (7.5YR 2/0) Mn oxide coatings on root-sized channels; few black (7.5YR 2/0) soft Mn oxide accumulations; few soft secondary carbonate concretions; many large pebbles; matrix noneffervescent; clear lower boundary; diamicton.
1010-1036	MOU	Strong brown (7.5YR 5/8) clay loam; as above, but matrix is effervescent; diamicton.

#### Profile 5

Location: SE 1/4, SE 1/4, NW 1/4, Sec.8, T77N, R28W; 95 meters north of fence along gravel road, 3 meters west of overburden slope.

Depth (cm)	Horizon or Zone	Description
0-13	A1	Black (10YR 2/1) silty clay loam; few fine distinct dark brown (7.5YR 3/4) mottles; moderate thin platy structure; friable; many fine roots; noneffervescent; clear lower boundary.
13-28	A2	Black (10YR 2/1) silty clay loam; common fine faint dark grayish brown (10YR 4/2) and few fine distinct dark brown (7.5YR 3/4) mottles; moderate fine to medium angular blocky structure; very hard dry; many fine roots; noneffervescent; abrupt lower boundary.
28-41	AB	Very dark gray (10YR 3/1) heavy silty clay loam; many very fine faint brown to dark brown (10YR 4/3) mottles; weak fine angular blocky and thin platy structure; very hard dry;; few fine prominent red (2.5YR 4/6) soft Fe oxide concretions; many fine and very fine roots; noneffervescent; clear lower boundary.
41-66	Bt1	Yellowish brown (10YR 5/6) heavy silty clay loam to silty clay; moderate angular blocky structure parting to weak fine angular blocky structure; hard dry; many continuous very dark grayish brown (10YR 3/2) coatings and fillings along channels; few fine faint strong brown (7.5YR 4/6) soft Fe oxide concretions and few fine prominent black (7.5YR 2/0) Mn oxide accumulations; common very fine roots; noneffervescent; clear lower boundary.

66-84	Bt2	Brown (10YR 5/3) heavy silty clay loam; many fine faint yellowish brown (10YR 5/8) mottles; strong medium prismatic structure parting to moderate fine subangular blocky structure; firm; thin continuous dark gray (10YR 4/1) and very dark gray (10YR 3/1) cutans on prism faces; common medium prominent black (7.5YR 2/0) Mn oxide accumulations; few very fine roots; noneffervescent; clear lower boundary.
84-140	BC	Brown (10YR 5/3) silty clay loam; as above, but has weak medium prismatic structure; gradual lower boundary.
140-170	C-MDL	Grayish brown (2.5Y 5/2) light silty clay loam; many coarse prominent strong brown (7.5YR 4/6) mottles; massive; firm; thin continuous very dark gray (7.5YR 2.5/0) fillings and coatings along root channels; few fine prominent black (7.5YR 2/0) Mn oxide accumulations; noneffervescent; abrupt lower boundary.
170-254	MDU	Grayish brown (2.5Y 5/2) heavy silt loam; mottles and structure as above; firm; very few thin continuous black (10YR 2/1) fillings and coatings along root channels; few medium prominent black (7.5YR 2/0) Mn oxide accumulations; few gastropod shell fragments; effervescent; clear lower boundary.
254-285	MDU	Brown (10YR 5/3) heavy silt loam; many fine distinct yellowish brown (10YR 5/8) and common fine distinct strong brown (7.5YR 5/8) mottles; massive; firm; many fine to medium distinct black (7.5YR 2/0) Mn oxide accumulations; effervescent; clear lower boundary.
285-361	MDL	Light brownish gray (2.5Y 6/2) heavy silt loam; common medium prominent yellowish brown (10YR 5/6) and common fine to medium prominent strong brown (7.5YR 4/6) mottles; weak lenticular structure from 287-307 cm, remainder of horizon massive; firm; few thin continuous black (7.5YR 2.5/0) Mn oxide coatings along very fine root channels; noneffervescent; gradual lower boundary.
361-376	MDL	Olive gray (5Y 5/2) light silty clay loam; many medium to coarse distinct brown (10YR 5/3) and common fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; common yellowish red (5YR 5/8) Fe oxide fillings or coatings along very fine subhorizontal root channels; noneffervescent; abrupt lower boundary.
376-389	2Ab1	Dark gray (10YR 4/1) and dark yellowish brown (10YR 4/4) silty clay loam; common faint very dark grayish brown (10YR 3/2) mottles (inclusions?) with angular outlines; many fine to medium distinct yellowish brown (10YR 5/6) subspherical mottles; massive; very firm; common thin continuous black (7.5YR 2.5/0) organs on channels; few fine (1-5 mm) charcoal flecks; few very small and small (2-10 mm) pebbles; noneffervescent; abrupt lower boundary.
389-404	2Ab2	Dark gray (10YR 4/1) silty clay loam; common medium faint

yellowish brown (10YR 5/4) and few fine prominent yellowish brown (10YR 5/6) mottles; massive; very firm; few thin strong brown (7.5YR 4/6) coatings along channels; few very fine charcoal flecks; noneffervescent; abrupt lower boundary. (This horizon was twice as thick in an adjacent core taken approx. 2 meters away and may be part of an involution structure.)

404-413	2Bwb1	Mixed grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) heavy silty clay loam; many very fine faint strong brown (7.5YR 5/8) mottles; weak very fine subangular blocky structure; friable; common thin continuous strong brown (7.5YR 5/8) Fe oxide fillings or coatings along fine channels; few thin discontinuous light gray (10YR 7/2) siltans on ped surfaces; noneffervescent; clear lower boundary.
413-422	2Bwb2	Mixed grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) heavy silty clay loam; abundant very fine faint strong brown (7.5YR 5/8) mottles; weak very fine subangular blocky structure; friable; many thin continuous strong brown (7.5YR 5/8) Fe oxide coatings and fillings along fine channels; few siltans as in above horizon; noneffervescent; gradual lower boundary.
422-442	2Bwb3	Mixed grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) heavy silty clay loam; many fine to coarse faint strong brown (7.5YR 5/8) mottles; weak very fine subangular blocky structure; friable; few thin discontinuous yellowish red (5YR 5/8) Fe oxide coatings; common discontinuous light gray (10YR 7/2) siltans; common fine charcoal flecks; noneffervescent; clear lower boundary.
442-490	3Btb1	Grayish brown (10YR 5/2) silty clay; moderate to strong fine subangular and angular blocky structure; friable; many thin discontinuous yellowish red (5YR 5/8) and yellowish brown (10YR 5/6) cutans; few thin continuous dark grayish brown (10YR 4/2) argillans (stress cutans?) on ped surfaces; common very thick light gray (10YR 7/2) siltans on peds; few very small (2-5 mm) pebbles; noneffervescent; gradual lower boundary.
490-544	3Btb2	Grayish brown (2.5Y 5/2) light clay; as above, but without siltans and with common black (5YR 2.5/1) Mn oxide coatings.
544-594	3Btb3	Grayish brown (2.5Y 5/2) heavy silty clay; common medium to coarse prominent strong brown (7.5YR 4/6) mottles and few fine prominent red (2.5YR 4/6) mottles and coatings; moderate medium, parting to moderate fine subangular blocky structure; very firm; few slickensides; common gray (10YR 5.5/1) argillans (stress cutans?) on ped faces; common black (5YR 2.5/1) Mn oxide coatings on channels and ped faces; noneffervescent; clear irregular or wavy lower boundary.
594-670	3BCtgb1	Gray (5Y 5/1) (75% of matrix) and strong brown (7.5YR 5/6) silty clay; three black (7.5YR 2/0) 1-5 cm diam. krotovinas; moderate

		medium subangular blocky structure; very firm; common slickensides oriented 30°-60° from horizontal which cut across full width of the core; common thin continuous brown (7.5YR 5/2) argillans (stress cutans?) on ped surfaces; common black (7.5YR 2/0) coatings, nodules, and channel fillings; few soft white 1-2 cm diam. nodules and coatings of secondary barite below 615 cm; common very small and small (2-10 mm) pebbles; noneffervescent; gradual lower boundary.
670-737	3BCtgb2	Gray (5Y 5/1) and strong brown (7.5YR 5/6) silty clay, with increasing sand toward bottom; weak medium subangular blocky structure; very firm; slickensides, argillans, channel fillings, and secondary barite nodules as in above horizon; common very small and small pebbles; noneffervescent; gradual lower boundary.
737-864	4C-MOL	Yellowish brown (10YR 5/6) (80% of matrix) and grayish brown (10YR 5.5/2) clay loam; massive; very firm; common slickensides; thin patchy black (7.5YR 2/0) Mn oxide coatings; common very small to large (2 mm-3 cm) pebbles; noneffervescent; abrupt wavy or irregular lower boundary; diamicton.
864-887	MJOL2	Yellowish brown (10YR 5/8) heavy loam; common coarse faint dark yellowish brown (10YR 4/6) mottles; massive, jointed; very hard dry; common thick continuous dark gray (5Y 4/1) Mn oxide coatings along joints; common soft secondary carbonate concretions (2-5 mm in diameter) and discontinuous coatings along joint faces; matrix slightly effervescent; clear lower boundary; diamicton.
887-1156	MJOU	Yellowish brown (10YR 5/6 and 10YR 5/8) heavy loam; massive; very hard dry; common thick continuous Mn oxide coatings; common soft 5-15 mm secondary carbonate concretions; matrix violently effervescent; clear lower boundary; diamicton.
1156-1301	MJOU	Yellowish brown (10YR 5/5 and 10YR 5/6) heavy loam; many coarse prominent gray (10YR 5/1) and light gray (10YR 7/2) mottles form a zone in top 12 cm; massive; very hard dry; common thick continuous black (7.5YR 2/0) Mn oxide coatings on joints; common soft 3-10 mm secondary carbonate concretions; 1 gastropod shell; few carbonate lithic clasts; matrix violently effervescent; abrupt lower boundary; diamicton.
1301-1312+	OU	Yellowish brown (10YR 5/6) silt loam; very friable; oxidized; effervescent; fluvial deposit.

## SOIL THIN SECTION DESCRIPTIONS

Thin sections were described in the terminology of Bullock et al. (1985). A few terms from Brewer (1976) were also used, notably "argillans" (clay coatings), "ferrans" (Fe oxide coatings and hypocoatings), and "ferriargillans" (Fe oxide hypocoatings superimposed on clay coatings). The term "siltans" refers to coatings and pore fillings composed of silt-sized grains, regardless of mineralogical composition. Brewer's term "silans" was not used because it implies a strictly silicic composition. See the "Methods" section in Chapter IV for further explanation of terms.

All thin sections were observed under plane-polarized and cross-polarized light; selected sections were observed under reflected light as well.

## Profile 1

#636b (406-413 cm) 2Bwb1

Peds - granules (60-70% of total area), moderate grade, 0.3-1.5 mm in diameter, mostly smooth unaccommodated walls, moderately coalesced;

Pores - total porosity 10-20%; compound packing voids (80%), 200-500  $\mu\text{m}$  across, irregular shape, unaccomm. smooth walls; channels (20%), approx. 500  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - spongy;

Coarse materials (c/f<sub>20 $\mu\text{m}$</sub> ) - nearly 100% quartz grains, 1 chert grain;

20-900  $\mu\text{m}$  in diameter, moderate sorting, subangular to rounded; 1 charcoal fleck (1 mm);

Groundmass - double-spaced porphyric RDP; circular striated b-fabric (20  $\mu\text{m}$  wide continuous strands around and within granules;

Textural pedofeatures - rare dark brown clayey patches, nonlaminated, diffuse extinction, high birefringence; occasional concentrations of coarse silt in packing voids;

Amorphous pedofeatures - occasional ferrug. aggregate mottles (0.5-2 cm), weakly to moderately impregnated, clustered in 3 zones; rare ferrug. nodules, typic and double-ring types, 1-2 mm in diameter, moderately impregnated; common ferrug. hypocoatings (20-30  $\mu\text{m}$  thick) along channel and granule walls.

#633c (427-434 cm) 2Bwb2

Peds - granules (60-70% of total area), moderate grade, 0.1-2.5 mm in diameter (most are <1.5 mm), smooth or undulating unacc. walls, moderately coalesced;

Pores - total porosity 15-25%; compound packing voids (85%), 300-1000  $\mu\text{m}$  dimensions, mammillated in shape, smooth to rough walls; channels (15%), 300-600  $\mu\text{m}$  in diameter, undulating to rough walls;

Microstructure - spongy;

Coarse materials (c/f<sub>20 $\mu\text{m}$</sub> ) - mostly quartz, few chert grains, 1 epidote; 20-700  $\mu\text{m}$  in diameter, moderate sorting, subangular to rounded; 2 charcoal flecks;

Groundmass - double-spaced porphyric RDP; stipple speckled b-fabric within peds, circular striated around granules (20  $\mu\text{m}$  wide discontinuous strands, apparently disrupted);

Textural pedofeatures - rare impure clay hypocoatings (50-100  $\mu\text{m}$  thick) along channel walls, nonlaminated, typic, diffuse extinction, moderate birefringence; occasional microlaminated embedded argillans (100-500  $\mu\text{m}$  thick), moderate to high birefringence, diffuse extinction; occasional dark brown clayey patches (100-400  $\mu\text{m}$  dimensions), very dark yellowish brown (10YR 3/4) in PPL and XPL, clustered in one group; occasional silt infillings (200-400  $\mu\text{m}$ ), diffuse boundaries with matrix, composed mainly of coarse silt;

Amorphous pedofeatures - none.

#632b (434-441 cm) 2Bwb2

Peds - granules (60-70% of total area), moderate to strong grade, 0.1-2.5 mm in diameter (most are <1.5 mm), smooth walls, moderately coalesced;

Pores - total porosity 20-25%; compound packing voids (90%), 200-300  $\mu\text{m}$  wide, elongate and mammillated (some join to form continuous zigzagging pores extending the length of the section); channels (10%), 100-600  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - spongy;



Coarse materials (c/f<sub>20µm</sub>) - mainly quartz, few feldspar and chert fragments, few hornblende grains; 20 µm to 1 mm in diameter, moderate sorting, subrounded; 6-8 disintegrated charcoal flecks;

Groundmass - double-spaced porphyric RDP; circular striated b-fabric (see #633c);

Textural pedofeatures - rare dark brown clayey patches (see #633c); pore argillans, embedded argillans, and silt fillings as in #633c;

Amorphous pedofeatures - rare ferrug. coatings, 20-500 µm wide, dark brown (7.5YR 3/2) in PPL; rare Mn nodules (100-200 µm in diameter, sharp boundaries with matrix.

#### #632c (434-441 cm) 2Bwb2)

Same as #632b with the addition of:

Amorphous pedofeatures - 1 pseudomorphic ferrug. nodule (50 x 300 µm), appears to be an impregnated plant fragment, probably lignified tissue of wood, nonopaque.

#### #630d (490-497 cm) 3ABtb

Peds - subangular blocks (90% of total area), strong grade, very fine (200 µm-3 mm), partially accommodated, smooth and undulating walls; granules (10%) occurring in clusters, moderate grade, 200-750 µm, smooth or undulating walls, moderately coalesced;

Pores - total porosity 30-35%; planar voids (40%), 10-200 µm wide, curved and zig-zag, partially accommodated, smooth and undulating, many follow continuous tortuous vertical paths; compound packing voids (30%); channels (10%), 300-800 µm in diameter, smooth walls; vughs or chambers (20%), 1-4 mm wide, some with mammillated walls, often connected to channels;

Microstructure - strong subangular blocky;

Coarse materials (c/f<sub>20µm</sub>) - mainly quartz, some feldspar grains, 1 granitic rock fragment; 20 µm-1.5 mm in diameter, moderate sorting, subangular to subrounded; 1 charcoal fleck;

Groundmass - double-spaced porphyric RDP; porostriated (along small intra-aggregate pores) and random striated (within peds) b-fabrics;

Textural pedofeatures - many microlaminated embedded argillans, 100-250 µm thick with individual laminae about 10 µm thick, highly disrupted, sharp to diffuse extinction, high birefringence, light brownish yellow (10YR 6/6) in PPL; many clay hypocoatings and quasicoatings (ferriargillans) lining most ped surfaces, 20-150 µm thick, high birefringence, diffuse or wavy extinction; common dark brown clayey patches, 250 µm thick, with 50 µm thick laminae, very diffuse extinction and low birefringence;

Amorphous pedofeatures - occasional typical ferruginous nodules (400-500 µm in diameter, rough edges, nonspherical, moderately impregnated) and occasional very small ferruginous nodules (mod. to strongly impregnated, 20-40 µm in diameter); rare Mn oxide nodules (100-200 µm), very dark to black in reflected light, ringed by goethite, clear boundaries with matrix; common typical ferrug. hypocoatings (ferriargillans) along planar voids and channels, 50-100 µm thick, discontinuous, purely impregnated.

#### #630a (490-497 cm) krotovina from 3ABtb

Peds - exterior rim (1-10 mm thick) has very fine subangular blocky peds, weak to moderate grade, superimposed by a laminated structure of the impregnating Fe oxides; the krotovina interior (approx. 7 cm in diameter) is apedal;

Pores - total porosity 10-20% in rim and 30-40% in interior (some of the pores in the interior

appear to be grinding and/or drying artifacts); compound packing voids (50%), 100 µm across, rough-walled; planar voids (50%), 100-300 µm wide, curved and zig-zag, unaccommodated rough walls;

Microstructure - subangular blocky;

Coarse materials (c/f<sub>20µm</sub>) - quartz and polycrystalline quartz, 1 shale fragment; 20-700 µm diameter, moderate sorting, subrounded;

Groundmass - double-spaced porphyric RDP; dominant b-fabric is undifferentiated (hidden by dense impregnation by Fe oxides), with random striated and stipple speckled b-fabrics in unimpregnated areas;

Textural pedofeatures - common dark brown clayey patches (60-200 µm across) in unimpregnated areas of interior, diffuse extinction, low birefringence; occasional microlaminated clay quasiccoatings and hypocoatings embedded in matrix, diffuse extinction, high birefringence, typically <150 µm long;

Amorphous pedofeatures - most of interior consists of dense very small (20-40 µm) ferruginous nodules, strongly impregnated, 5YR 4/6 and 4/3 in PPL; exterior strongly impregnated by laminated Fe oxides, 7.5YR 6/8 in PPL.

#### #629a (497-504 cm) 3ABtb

Peds - subangular blocks (>95% of total area), strong grade, 1-4 mm in diameter, smooth, partially accommodated walls; granules (<5%), strong grade, 600 µm in diameter, clustered in one area on the slide;

Pores - total porosity 20-25%; planar voids (50%), 50-150 µm wide, curved and zig-zag, smooth partially accommodated walls; compound packing voids (30%), 250-750 µm across, rough unaccommodated walls; channels (10%), 250-750 µm in diameter, smooth walls; vughs or chambers (10%), 1-2 mm across, rough walls;

Microstructure - strong subangular blocky;

Coarse materials (c/f<sub>20µm</sub>) - mainly quartz and weather feldspar grains; 20 µm-1.5 mm in diameter, moderate sorting, subangular to subrounded;

Groundmass - double-spaced porphyric RDP; porostriated and random striated b-fabrics (see #630d);

Textural pedofeatures - similar to #630d;

Amorphous pedofeatures - Fe and Mn nodules and ferriargillans similar to those in #630d, but all are slightly more abundant in this section.

#### #631b (574-581 cm) 3Btb1

Peds - angular blocks (100%), moderate to strong grade, 1.5-6 mm in diameter, smooth walls, fully to partially accommodated;

Pores - total porosity 20-25%; planar voids (85%), 25-400 µm wide, straight, zig-zagged and curved, fully accommodated smooth walls, most are uncoated; compound packing voids (10%); channels (5%), 100-500 µm in diameter, smooth walls, about half have associated clay and/or Fe oxide coatings;

Microstructure - strong angular blocky;

Coarse materials (c/f<sub>20µm</sub>) - mainly quartz and weathered feldspar grains; 20 µm-2 mm diameter, somewhat poorly sorted, subangular;

Groundmass - double-spaced porphyric RDP (open porphyric RDP, c/f<sub>62µm</sub>); random striated (strands 15-20 µm long) and porostriated b-fabrics (see fabric pedofeatures); rare parallel striated b-fabric within a few peds;

Textural pedofeatures - common embedded microlaminated clay coatings, 50-200  $\mu\text{m}$  thick with laminae about 10  $\mu\text{m}$  thick, sharp boundary with matrix, sharp extinction and very high birefringence; common clay hypoclastings and quasiclastings (35-100  $\mu\text{m}$  thick), probably stress-oriented, along some ped surfaces, diffuse extinction, high birefringence; rare dark brown clayey patches, 200-700  $\mu\text{m}$  across, diffuse boundaries with matrix, diffuse extinction, moderate birefringence;

Fabric pedofeatures - 2 macroslickenside zones of striated clay along planar voids that traverse entire width of the section and are oriented 35-45° from horizontal; clay zone is 50  $\mu\text{m}$ -1 mm wide; numerous microslickensides;

Amorphous pedofeatures - common ferrug. mottles, approx. 3-7 mm in diameter, weakly impregnated; many ferrans on channel and ped walls, 50-150  $\mu\text{m}$  thick, strongly impregnated, occasionally juxtaposed with clay coatings (ferriargillans).

#### #634 (637-644 cm) 3Btb2

Peds - angular blocks (90% of area), strong grade, 3-4 mm breaking to smaller abk peds (500-1500  $\mu\text{m}$ ), smooth partially to fully accomm. walls; subangular blocks or deformed granules (10%), moderate grade, 300-1200  $\mu\text{m}$  in diameter;

Pores - total porosity 20-25%; planar voids (85%), 15-200  $\mu\text{m}$  wide, mainly curved, fully accommodated walls; channels (10%), 100-300  $\mu\text{m}$  in diameter; compound packing voids (5%), 100-500  $\mu\text{m}$  across, mammillated;

Microstructure - strong angular blocky;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz and feldspar grains, rare sandstone and shale lithic clasts; 20  $\mu\text{m}$ -1.2 mm in diameter, somewhat poorly sorted;

Groundmass - double-spaced porphyric RDP (open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); monostriated b-fabric dominant, minor circular striated b-fabric associated with granular peds;

Textural pedofeatures - common microlaminated clay coatings on planar pores, 50-100  $\mu\text{m}$  thick (laminae 15-30  $\mu\text{m}$  thick), somewhat diffuse extinction, high birefringence, some engulf medium silt grains; occasional embedded microlaminated clay coatings, 50-150  $\mu\text{m}$  thick, diffuse extinction, very high birefringence, sharp boundary with matrix;

Amorphous pedofeatures - common ferrug. mottles (150  $\mu\text{m}$ -1 mm), with rough boundaries, moderately impregnated; common ferrug. quasiclastings (100-200  $\mu\text{m}$  wide) with sharp outer edges and diffuse inner boundaries, strongly impregnated, grading to weakly impregnated toward ped interior, occurring mainly along planar voids; rare superimposed ferrug. coatings, engulfing microlaminated clay coatings (ferriargillans) on a few channels.

#### #635 (644-651 cm) 4Atb

Peds - granules (about 60% of total area), moderate to weak grade due to strong coalescence, 250-1200  $\mu\text{m}$  in diameter, undulating walls; subangular blocks (40%), 2-8 mm, some are overprinted on granules;

Pores - total porosity 15-20%; compound packing pores (40%), 100-200  $\mu\text{m}$  across, mammillated walls; channels (30%), 100-600  $\mu\text{m}$  in diameter, smooth walls; planar voids (30%), 50-400  $\mu\text{m}$  wide, curved and zig-zag, unaccomm. to partially accomm., smooth to rough walls;

Microstructure - granular and subangular blocky;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - dominantly quartz and chert, occasional shale, granite, basalt fragments; 20  $\mu\text{m}$ -1.3 mm in diameter, somewhat poorly sorted, angular to rounded;

Groundmass - double-spaced porphyric RDP (open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominantly circular striated b-fabric, minor monostriated within peds;

Textural pedofeatures - many microlaminated clay coatings and hypocoatings on channel and packing void walls, 50-250  $\mu\text{m}$  thick (laminae about 15  $\mu\text{m}$  thick), fairly sharp extinction, high birefringence, highly variable in continuity, some are geopetal; many microlaminated clay bodies embedded in ped interiors, most are approx. 100  $\mu\text{m}$  thick, somewhat diffuse extinction and moderate birefringence;

Amorphous pedofeatures - common ferrug. mottles, 1-1.5 mm in diameter, weakly impregnated; occasional ferrug. nodules, typic, 200  $\mu\text{m}$ -2 mm in diameter, moderately impregnated; occasional ferrug. coatings and hypocoatings, about 30  $\mu\text{m}$  thick, continuous, grading from strongly to weakly impregnated with distance from void wall; common superimposed ferrug. coatings (ferriargillans), moderately impregnated; occasional manganese coatings.

#### #637b (686-693 cm) 4Btgb1

Peds - angular blocks (nearly 100% of area), strong grade, 1-5 mm in diameter, smooth fully accomm. walls;

Pores - total porosity 15-20%; planar voids (80%), 15-500  $\mu\text{m}$  wide (widest pores appear to be artifacts from the drying procedure), smooth, dominantly straight, but some curved walls; channels (20%), 100-600  $\mu\text{m}$  in diameter, smooth walls, about half have associated ferriargillans;

Microstructure - strong angular blocky;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - dominantly quartz, feldspar and chert, occasional lithic fragments of polycrystalline quartz, ferruginous sandstone, shale, granite and basalt; 20  $\mu\text{m}$ -4 mm in diameter, poorly sorted, subangular;

Groundmass - double-spaced porphyric RDP (also double-spaced porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominant porostriated b-fabric (strands are 5-50  $\mu\text{m}$  wide, 500-3000  $\mu\text{m}$  long); secondary monostriated b-fabric (strands are 20-50  $\mu\text{m}$  wide and 1-2 mm long); minor granostriated b-fabric;

Textural pedofeatures - common microlaminated clay coatings on channel walls, 70-100  $\mu\text{m}$  thick, sharp boundary with matrix, very high birefringence; occasional embedded microlaminated clay coatings, 50-150  $\mu\text{m}$  thick, diffuse extinction, high birefringence;

Fabric pedofeatures - 1 macroslickenside with a 20-100  $\mu\text{m}$  wide zone of oriented clay that extends into matrix beyond the open planar void, perhaps where the pore had been open in the past; numerous microslicks.;

Amorphous pedofeatures - common ferrug. mottles, 2-4 mm in diameter, weakly impregnated; rare ferrug. nodules, 2-3 mm in diameter, somewhat diffuse boundaries, weakly impregnated; common ferrug. hypocoatings and quasiccoatings on channel walls and a few short planar voids, 25-100  $\mu\text{m}$  wide, sharp boundaries with matrix; occasional opaque Mn oxide coatings and fillings, 50-200  $\mu\text{m}$  thick, along walls of channels.

#### #672 (797-803 cm) 5BCb

Peds - angular blocks (nearly 100% of area), moderate grade overall with some areas of weak grade, 1-2.5 mm in diameter, undulating walls due to protruding sand grains, fully accommodated;

Pores - total porosity 20-25%; vughs (50%), 100-250  $\mu\text{m}$  across, undulating walls; channels (30%), both intraaggregate and interaggregate, 150-750  $\mu\text{m}$  in diameter, smooth walls; planar voids (20%), 50-150  $\mu\text{m}$  wide, zig-zag and curved, undulating walls;

Microstructure - moderate angular blocky;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz and feldspar dominant, but lithic fragments make up 15-20%

of total coarse grains (chert, ferruginous and sandstone, shale, granite, basalt, schist and quartzite); 20  $\mu\text{m}$ -6mm in diameter (poorly sorted to unsorted), angular to subrounded;  
Groundmass - single-spaced porphyric RDP (also single-spaced porphyric RDP,  $c/f_{62\mu\text{m}}$ ); mozaic speckled b-fabric dominant, with minor granostriated b-fabric;  
Textural pedofeatures - occasional microlaminated clay coatings along channels, approx. 100  $\mu\text{m}$  thick, crescentic or typic, moderately sharp extinction, very high birefringence; occasional microlaminated embedded clay coatings or quasicocoatings, 100-200  $\mu\text{m}$  thick, very disrupted and discontinuous, moderate birefringence; occasional anisotropic nonlaminated clay patches, 100  $\mu\text{m}$ -1 mm across, pale brown in PPL, gradual boundary with matrix, diffuse to wavy extinction, low birefringence;  
Amorphous pedofeatures - abundant ferrug. mottles (2-5 mm in diameter), diffuse boundaries, moderately impregnating clays and fine silts in the matrix; occasional manganese coatings (50-100  $\mu\text{m}$  thick).

#### #676 (830-837 cm) krotovina from 5BCb

Peds - subangular blocks (80% of total area), strong grade, 1-3 mm in diameter, unaccommodated walls; some sbk peds break to angular blocks (20% of area), moderate grade, 2-3 mm in diameter;  
Pores - total porosity 35-40%; compound packing voids (70%), 0.5-6 mm across, smooth walls thickly coated with clay; channels (20%), 200-600  $\mu\text{m}$  in diameter; planar voids (10%), 10-40  $\mu\text{m}$  wide, fully accomm.;  
Microstructure - strong subangular blocky;  
Coarse materials ( $c/f_{20\mu\text{m}}$ )- nearly all quartz and feldspar; 20  $\mu\text{m}$ -1mm in diameter, moderately sorted, angular to rounded;  
Groundmass - single-spaced porphyric RDP (open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); mozaic speckled b-fabric;  
Textural pedofeatures - abundant microlaminated clay coatings on walls of packing voids, 100-750 $\mu\text{m}$  thick (with laminae 9-12  $\mu\text{m}$  thick), typic and crescentic, sharp boundaries with matrix, sharp extinction, very high birefringence, many are geopetal;  
Amorphous pedofeatures - common ferrug. mottles, 1-2 mm in diameter, very weakly impregnated; rare ferrug. nodules, 250-350  $\mu\text{m}$  in diameter, typic, single-ring and double-ring types; occasional ferrug. hypocoatings, 60  $\mu\text{m}$  thick, moderately impregnated.

#### #674 (840-847 cm) 5BCb

Peds - subangular blocks (100% of area), weak grade, 2-5 mm in diameter, undulating, partially accommodated walls;  
Pores - total porosity 25%; channels and vughs (60%), 150-650  $\mu\text{m}$  across, smooth walls; planar voids (40%), 15-250  $\mu\text{m}$  wide, most are curved, unaccommodated;  
Microstructure - weak subangular blocky;  
Coarse materials ( $c/f_{20\mu\text{m}}$ )- quartz dominant, with 10-20% rock fragments (see #672); 20  $\mu\text{m}$ -3.5mm, unsorted; angular to rounded;  
Groundmass - single-spaced porphyric RDP (also single-spaced porphyric RDP,  $c/f_{62\mu\text{m}}$ ), contains pockets (approx. 1 cm in diameter) with closed porphyric RDP ( $c/f_{20\mu\text{m}}$ ) consisting of concentrated, well-sorted sand (90-200  $\mu\text{m}$ ); mozaic-speckled b-fabric dominant, with secondary granostriated (oriented clay bands (15-20  $\mu\text{m}$  wide) around some sand grains;  
Textural pedofeatures - rare microlaminated clay coatings, 100-200  $\mu\text{m}$  thick, crescentic, and typic, very disrupted and discontinuous but have sharp boundary with matrix, diffuse to

moderate extinction, very high birefringence, mainly paralleling walls of planar voids;  
Amorphous pedofeatures - similar to #672, but no Mn oxide coatings.

#### #675 (860-867 cm) 5C

Peds - subangular blocks (30% of total area), very weak grade, 2-8 mm in diameter, rough walls; remaining area is apedal;

Pores - total porosity 25%; channels/packing pores/artifacts(?) (60%), 0.5-1.5 mm, many are very irreg.-shaped; planar pores (40%), 50-500  $\mu\text{m}$  wide, curved, zig-zag, and straight (extremely variable, probably nonpedogenic);

Microstructure - weak subangular blocky to massive;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - see #674;

Groundmass - see #674;

Textural pedofeatures - occasional microlaminated clay coatings, 100-200  $\mu\text{m}$  thick, crescentic and typic, moderate extinction, very high birefringence, on channel walls; rare embedded clay coatings, discontinuous and disrupted, roughly paralleling planar voids, diffuse extinction, high birefringence;

Amorphous pedofeatures - abundant ferrug. mottles similar to those in #672 and #674; rare ferrug. hypocoatings (ferrans), 30-60  $\mu\text{m}$  wide, with diffuse boundaries with matrix, occur along very narrow planar voids, skeleton grains, and a few channels.

### Profile 2

#### #732 (369-376 cm) 2Ab2

Peds - apedal (100%);

Pores - total porosity 10-15%; planar voids (60%), 30-200  $\mu\text{m}$  wide, undulating, accommodated walls, most about 1 cm long; channels (40%), 200-800  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - channel and crack;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - single mineral grains, predominantly quartz; most are in the 20-50  $\mu\text{m}$  range, with a couple grains up to 750  $\mu\text{m}$  in diameter, well-sorted, subrounded to subangular;

Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric dominant, with very minor monostriated fabric;

Textural pedofeatures - common thin (20-50  $\mu\text{m}$  thick) microlaminated clay coatings on channel walls; rare embedded argillans;

Amorphous pedofeatures - occasional ferrug. mottles, 1-7 mm in diameter, weakly impregnated, diffuse boundaries; occasional ferrug. nodules, 200-800  $\mu\text{m}$  in diameter, double-ring and single-ring, highly variable impregnation.

#### #733 (420-427 cm) 3Ab

Peds - granules (approx. 80% of total area), strong grade, 400  $\mu\text{m}$ -2 mm in diameter, moderately coalesced, smooth, unaccomm. walls; subangular blocks (20%), moderate grade, 0.5-5 mm wide, undulating walls, may consist of completely coalesced granules;

Pores - total porosity 30-35%; compound packing voids (90%), 0.5-2 mm across, irregularly shaped, mammillated; channels (5%), 200-1000  $\mu\text{m}$  in diameter, smooth walls; planar voids

(5%), 20-150  $\mu\text{m}$  wide, 1-5 mm long, partially accommodated, smooth walls;

Microstructure - strong granular;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - solely quartz and chert, 20  $\mu\text{m}$ -1.5 mm in diameter, moderately sorted, anhedral, subangular to subrounded;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric (strands of oriented clay are 20-50  $\mu\text{m}$  wide);

Textural pedofeatures - same as #632b except has common dark brown clayey patches;

Amorphous pedofeatures - same as #632b.

#### #734 (465-472 cm) 3Btgb1

Peds - subangular blocks (>95% of area), strong grade, 1-4 mm in diameter; occasional granules (or rounded sbk peds?);

Pores - total porosity 20-25%; planar voids (50%), 25-250  $\mu\text{m}$  wide, curved, partially accommodated, smooth walls; compound packing voids (35%), 200-400  $\mu\text{m}$  across, irregular, rough walls; channels (15%), 100-400  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - strong sbk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz, chert, and polycrystalline quartz, 20-600  $\mu\text{m}$  in diameter, moderately sorted;

Groundmass - double-spaced porphyric RDP; random-striated b-fabric (omnisepic plasmic fabric) dominant, with secondary porostriated fabric;

Textural pedofeatures - abundant embedded microlaminated argillans, diffuse extinction, high birefringence; many microlaminated clay coatings (pore argillans) and fillings, 50-500  $\mu\text{m}$  wide, typic and crescentic, sharp extinction, somewhat disrupted, associated with planar voids; many dark brown clayey patches, 100-600  $\mu\text{m}$  across, embedded in the matrix, irregularly-shaped; 1 silty pocket (approx. 2x3mm) of well-sorted fine silt (krotovina?);

Amorphous pedofeatures - rare ferrug. nodules; occasional ferrug. hypocoatings; occasional superimposed chocolate-brown ferrans (Fe engulfing clay).

#### Profile 3

#### #687 (15-21 cm) A3

Peds - angular blocks (100% of area), strong grade, 0.5-1 cm in diameter;

Pores - total porosity 10-15%; planar voids (95%), 20-750  $\mu\text{m}$  wide, straight and zigzagged, fully accommodated, smooth walls; channels (5%), 250-1000  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - strong abk (due to recent compaction);

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - predominantly quartz and feldspar, few heavy mineral grains; 20-150  $\mu\text{m}$  in diameter, very well-sorted, angular to subangular;

Groundmass - single-spaced porphyric RDP; stipple-speckled b-fabric;

Coarse organics - one leaf fragment (750x250  $\mu\text{m}$ ) and occasional root fragments in root channels, all are yellow in PPL;

Fine organics - abundant unidentifiable specks, 1-10  $\mu\text{m}$  across, black to dark brown, very few sections of undecomposed plant fragments;

Textural pedofeatures - none;

Amorphous pedofeatures - none;

#688 (76-83 cm) Bt

Peds - angular blocks (100% of area), weak grade, 5 mm in diameter, smooth, partially accommodated walls; about 1/3 of the slide area consists of a krotovina, approx. 2 cm by 5 cm;

Pores - total porosity 15%; channels (80%), 100-500  $\mu\text{m}$  in diameter; planar voids (20%), undulating, partially accommodated walls;

Microstructure - weak abk;

Coarse materials ( $c/t_{20\mu\text{m}}$ ) - quartz and feldspars, few heavy heavy minerals; 20-250  $\mu\text{m}$  in diameter (most are  $<100 \mu\text{m}$ ), very well-sorted, angular to subangular;

Groundmass - single-spaced porphyric RDP; mozaic-speckled b-fabric, minor monostriated b-fabric;

Fine organics - abundant specks of black to dark brown material in the krotovina interior;

Textural pedofeatures - occasional discontinuous pore argillans, 20-40  $\mu\text{m}$  thick, diffuse extinction, high birefringence;

Excrement pedofeatures - many granules (fecal pellets?) in the krotovina (about 40% of total krotovina area); granules are 250  $\mu\text{m}$  to 2 mm in diameter, roughly spherical, with rough edges, contain much less fine organic matter and are lighter in color than the surrounding krotovina material;

Amorphous pedofeatures - common ferrug. nodules, strongly impregnated, 2-4 mm in diameter, about half have smooth, rounded edges; abundant ferrug. mottles, very weakly impregnated, irregularly shaped, 2-4 mm in diameter.

#689 (112-119 cm) BC

Peds - apedal; krotovina (2-4 mm wide) contains many granules or subangular blocky peds (these may be fragments of the matrix wall rather than peds);

Pores - total porosity 20%; channels (50%), 100-250  $\mu\text{m}$  in diameter, elongated or circular, with smooth walls; planar voids (50%), 20-600  $\mu\text{m}$  wide, curved and straight;

Microstructure - channel;

Coarse materials ( $c/t_{20\mu\text{m}}$ ) - 20-150  $\mu\text{m}$  in diameter, most are  $<50 \mu\text{m}$ , very well-sorted, angular to subangular;

Groundmass - single-spaced porphyric RDP; mozaic-speckled b-fabric in most of slide area, stipple-speckled in some areas as well;

Fine organics - abundant in the krotovina;

Textural pedofeatures - occasional discontinuous, microlaminated clay coatings along channel walls, 15-30  $\mu\text{m}$  thick, sharp extinction, high birefringence; occasional thin ferriargillans along channels, 20-40  $\mu\text{m}$  wide; common embedded argillans, microlaminated, wavy extinction, high birefringence, disrupted and discontinuous, egg yellow in PPL;

Excrement pedofeatures - see peds;

Amorphous pedofeatures - common aggregate ferrug. nodules, 2-4 mm in diameter, moderately to strongly impregnated, all have diffuse boundaries with the soil matrix; common ferrug. mottles, 3-10 mm in diameter, weakly impregnated.

#690 (223-229 cm) C (MDL)

Peds - apedal;

Pores - total porosity 5-10%; planar voids (50%), appear to be drying artifacts; channels (50%), 150-500  $\mu\text{m}$  in diameter, undulating walls, about 1/4 have associated ferrug. hypocoatings;

Microstructure - massive or weak channel microstructure;



Coarse materials (c/f<sub>20µm</sub>) - dominantly quartz; 20-500 µm in diameter (at least 99% are <100 µm), very well sorted, angular to subangular;

Groundmass - single-spaced porphyric RDP; stipple-speckled b-fabric, consisting of clay segregations approx. 25 µm x 50 µm;

Textural pedofeatures - none;

Amorphous pedofeatures - occasional ferrug. mottles, 300 µm-1mm, weakly impregnated, yellow and/or orange-brown in PPL; common Mn oxide nodules, 0.5-1 mm in diameter, black at all magnifications, very rough boundaries with matrix, but sharp contrast; common ferrug. hypocoatings, approx. 150 µm thick, strongly impregnated near channel walls and decreasing impregnation away from pore walls.

#### #691 (275-280 cm) 2Ab

Peds - apedal;

Pores - total porosity 10-15%; planar voids (50%), some may be drying artifacts; channels (50%), 250-500 µm in diameter, unaccomm. smooth walls;

Microstructure - crack;

Coarse materials (c/f<sub>20µm</sub>) - dominantly quartz and feldspar, very few heavy mineral grains (epidote, hornblende); 20 µm-1mm (99% are <200 µm), well-sorted, angular to subrounded;

Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric dominant, with a few areas of mosaic-speckled b-fabric;

Textural pedofeatures - occasional microlaminated clay coatings and hypocoatings on channel walls, 50-200 µm thick, most are geopetal, sharp boundaries with the matrix, sharp extinction, high birefringence, most have associated superimposed ferrans;

Amorphous pedofeatures - common ferrug. mottles, weakly impregnated; occasional ferrug. nodules contained within the mottles, strongly impregnated, diffuse boundary with matrix; occasional ferrug. hypocoatings (superimposed on clay coatings), 50-200 µm thick; rare Mn oxide nodules (or pore fillings?), 500-600 µm across, opaque.

#### #693 (280-285 cm) 2Ab

Peds - apedal, but with small areas of primary laminae (75-100 µm thick, separated by planar voids or bedding planes filled with Mn oxides);

Pores - total porosity 5-10%; planar voids (50%), a few may be drying artifacts, 25-750 µm wide, straight, a few curved, fully accommodated walls; channels (50%), 150-400 µm in diameter, smooth walls, many have thin clay coatings;

Microstructure - crack;

Coarse materials (c/f<sub>20µm</sub>) - primarily quartz and feldspar, a few hornblende grains; 20-600 µm diameter, well-sorted, angular to subrounded;

Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric;

Textural pedofeatures - occasional microlaminated clay coatings on channel walls, 30-100 µm thick, sharp extinction, high birefringence, moderately sharp boundary with matrix (also sharp contrast in PPL), at least 50% are geopetal;

Amorphous pedofeatures - rare ferrug. mottles, moderately impregnated, 5x7 mm, contains a few strongly impregnated constituent nodules, diffuse boundary; occasional Mn oxide "nodules" in which Mn oxides fill pores, 2-3 mm in diameter, diffuse irregular boundary; rare ferrug. hypocoatings (superimposed on clay).

#694 (289-296 cm) 3Ab

Peds - granules (nearly 100% of total area), 0.5-1 mm in diameter, strong grade, strongly coalesced; angular blocks (10-20mm) overprinted on the granules, moderate grade, undulating (mammillated) walls where planar voids pass between granules (some of these angular blocks may be drying artifacts);

Pores - total porosity 20-25%; compound packing voids (50%), 100-300  $\mu\text{m}$  across, mammillated shape, smooth walls; channels (25%), 100-600  $\mu\text{m}$  in diameter, very smooth, most have thin clay coatings; planar voids (25%), continuous, 50-500  $\mu\text{m}$  wide, straight and curved, fully accommodated, do not have associated clay coatings;

Microstructure - spongy;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - mainly quartz and chert, few feldspar grains; 20-600  $\mu\text{m}$  in diameter, moderately well-sorted, significant increase (at least 10X) from #693 in the number of  $>100 \mu\text{m}$  grains; most grains  $>100 \mu\text{m}$  are subangular to subrounded, smaller grains are angular;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric, with minor random striated within granules;

Textural pedofeatures - common fragments of microlaminated clay embedded in matrix, 25-100  $\mu\text{m}$  thick, somewhat diffuse boundary with matrix, variable extinction (diffuse to sharp), high birefringence; occasional microlaminated clay coatings on channel walls, 25-40  $\mu\text{m}$  thick with 10-15  $\mu\text{m}$  thick laminae, moderate extinction, very high birefringence, most are geopetal; occasional dark brown clayey patches, 150-750  $\mu\text{m}$  across, irregularly shaped, not associated with pores, uniformly fine-grained, diffuse extinction, low birefringence;

Amorphous pedofeatures - rare ferrug. mottles; occasional ferrug. nodules, spherical to elongated, 50-200  $\mu\text{m}$  in diameter, strongly impregnated, all have oriented clay smeared around their perimeters (granostriated b-fabric); occasional ferrug. hypocoatings superimposed on the channel argillans; rare Mn oxide nodules.

#695 (302-309 cm) 3Ab

Peds - see #694;

Pores - total porosity 20-30%; compound packing voids (50%), planar voids (35%), channels (15%); see #694 for descriptions of each type;

Microstructure - spongy;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - mainly quartz and chert; 20-750  $\mu\text{m}$  in diameter, moderately well-sorted;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric, stipple-speckled within peds;

Textural pedofeatures - same as #694, with addition of occasional silty infillings and coatings in compound packing voids, 30-90  $\mu\text{m}$  thick, discontinuous, most silt grains are 20-30  $\mu\text{m}$  in diameter;

Amorphous pedofeatures - rare ferrug. nodules similar to those in #694; common ferrug. hypocoatings as in #694; occasional Mn oxide "nodules" (packing pore fillings that occur along a vertical zone 0.5 cm wide by 5 cm long), each filling is 70-500  $\mu\text{m}$  in diameter, has sharp boundaries except where combined with Fe oxides.

#696 (317-323 cm) 3Atb

Peds - subangular blocks (90% of total area), weak to moderate grade, 1-5 mm, some are composed of granules in their interiors; granules (10-20%), partially coalesced, 0.5-1 mm;

Pores - total porosity 15-25%; planar voids (35%), channels (35%), and compound packing voids (35%); see #697 for descriptions;

Microstructure - weak subangular blocky, and spongy;

Coarse materials ( $c/f_{20\mu m}$ ) - quartz, chert, and polycrystalline quartz; 20  $\mu m$ -1.5 mm in diameter, somewhat poorly sorted, larger grains are subangular to subrounded, smaller grains (<100  $\mu m$ ) are angular;

Groundmass - double-spaced porphyric RDP; random-striated b-fabric dominant, with secondary circular-striated;

Textural pedofeatures - same as #694 but with slightly more abundant microlaminated clay coatings on channel walls and common dark brown clayey patches;

Amorphous pedofeatures - rare ferrug. nodules and common ferrug. hypocoatings as in #695; many ferrug. coatings (simple ferrans), 200-300  $\mu m$  wide.

#### #697 (331-337 cm) 3Atb

Peds - see #696;

Pores - total porosity 10-15%; planar voids (40%), 50-100  $\mu m$  wide, straight and curved, fully accommodated, smooth walls; compound packing voids (40%), 100-500  $\mu m$  across, occur within angular blocky peds and between granules; channels (20%), 150-750  $\mu m$  in diameter, very smooth walls, most are coated with clay/Fe oxide coatings;

Microstructure - weak subangular blocky, and spongy;

Coarse materials ( $c/f_{20\mu m}$ ) - quartz, feldspar, and chert; 20-750  $\mu m$  in diameter, poorly sorted, angular to rounded grains;

Groundmass - see #696;

Textural pedofeatures - occasional microlaminated clay bodies embedded in matrix; common microlaminated pore argillans; occasional dark brown clayey patches; (see #694 for detailed descriptions of each type);

Amorphous pedofeatures - rare ferrug. nodules and occasional superimposed ferrug. hypocoatings (see #695); common Mn oxide nodules and pore infillings, 150-500  $\mu m$  in diameter, occurring in clusters that are 0.5-1 cm in diameter.

#### #698 (357-363 cm) 3ABtb

Peds - subangular blocks (95%), moderate to strong grade, 0.5-2.5 mm; coalesced granules (5%), 0.5-1 mm in diameter;

Pores - total porosity 25-30%; compound packing voids (65%) (many may be grinding artifacts), 100-300  $\mu m$  across; planar voids (20%), 50-500  $\mu m$  wide, straight, zigzagged and curved, smooth or undulating walls, partially accommod., most are uncoated; channels (15%), 200-500  $\mu m$  in diameter, smooth walls, most have thin clay/Fe oxide coatings;

Microstructure - moderate sbk and spongy;

Coarse materials ( $c/f_{20\mu m}$ ) - see #697;

Groundmass - see #696;

Textural pedofeatures - many embedded microlaminated clay coatings (50-500  $\mu m$  wide), diffuse extinction, high birefringence, diffuse boundaries; occasional microlaminated clay coatings on channels (30-200  $\mu m$  thick), moderate extinction, high birefringence; occasional dark brown clayey patches (see #694);

Amorphous pedofeatures - rare ferrug. nodules; 250-500  $\mu m$  in diameter, mainly the aggregate type, strongly impregnated; occasional ferrug. hypocoatings superimposed on pore argillans; rare Mn nodules, 50-200  $\mu m$  in diameter, opaque at all magnifications.

#699 (372-378 cm) 3ABtb

Peds - subangular blocks (nearly 100%), moderate grade 1-3 mm in diameter, smooth walls; occasional granules, strongly coalesced;

Pores - total porosity 10-15%; compound packing voids (50%); planar voids (30%); channels (20%) - see descriptions in #698;

Microstructure - moderate sbk;

Coarse materials ( $c/f_{20\mu m}$ ) - quartz, feldspar, and chert; 20  $\mu m$ -1 mm in diameter, somewhat poorly sorted, subangular to subrounded;

Groundmass - see #696;

Textural pedofeatures - abundant microlaminated clay bodies embedded in matrix (see #698); many voids argillans on all types of voids, 50-350  $\mu m$  thick, moderate extinction, high birefringence; common dark brown clayey patches (see #694);

Fabric pedofeatures - 1 slickenside along a straight planar void that transects the width of the thin section, 45-60° from horizontal, 150-250  $\mu m$  wide, with individual strands of oriented clay that are 15-20  $\mu m$  thick;

Amorphous pedofeatures - common ferrug. nodules, aggregate, typic, pseudomorphic and nucleic types, 250-400  $\mu m$  in diameter, strongly impregnated; many ferrug. hypocoatings (15-40  $\mu m$  thick) on packing void walls and some very narrow planar voids (<30  $\mu m$  wide), strongly impregnated, some are nearly opaque; occasional ferrug. hypocoatings (50-350  $\mu m$  thick) superimposed on clay coatings, weakly impregnated; occasional Mn oxide nodules (see #698).

#700 (392-399 cm) 3Btb1

Peds - subangular blocks (100%), strong grade, 1-5 mm;

Pores - total porosity 15-20%; planar voids (65%), 25-200  $\mu m$  wide, curved, smooth, fully accommodated walls; compound packing voids (25%), 250-500  $\mu m$  across, undulating or rough walls, intraaggregate; channels (10%), 100-350  $\mu m$  in diameter, smooth walls, intra- and interaggregate;

Microstructure - strong sbk;

Coarse materials ( $c/f_{20\mu m}$ ) - quartz, feldspar, chert, polycrystalline quartz; 20-750  $\mu m$  in diameter, somewhat poorly sorted, angular to rounded;

Groundmass - double-spaced porphyric RDP, (open porphyric RDP,  $c/f_{62\mu m}$ ); dominantly random-striated b-fabric, consisting of strands of oriented clay 300  $\mu m$ -1.5mm long; secondary porostriated b-fabric;

Textural pedofeatures - abundant thick (200-300  $\mu m$ ) microlaminated clay coatings on all types of pores, sharp extinction, high birefringence; abundant microlaminated clay bodies embedded in matrix, 30-500  $\mu m$  thick, diffuse extinction, high birefringence, diffuse edges; common dark brown clayey patches (see #694);

Amorphous pedofeatures - occasional ferrug. nodules (see #699); occasional ferrug. mottles, 1.5-3 mm wide, moderately impregnating both matrix (brown in PPL) and microlaminated clay textural pedofeatures (yellow to orange in PPL); occasional ferrug. quasi- and hypocoatings, moderately impregnative, 1 prominent ferran is associated with an elongated worm burrow (3.5 mm long); occasional ferrug. hypocoatings superimposed on pore argillans (engulfing the entire argillan), chocolate brown in PPL, nonopaque, 200-300 wide; rare Mn oxide nodules (see #698);

#701 (423-430 cm) 3Btb1

Peds - subangular blocks (100%), moderate to strong grade, 1-15 mm in diameter;

Pores - total porosity 20-25%; planar voids (65%), 50-300  $\mu\text{m}$  wide, straight and curved, smooth walls, most are fully accommodated, vertical planes are more continuous than horizontal planes; channels (35%), noticeably more abundant than in #700, 50-450  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - strong sbk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz, feldspar, chert, polycrystalline quartz, rare granitic rock fragments; 20-1500  $\mu\text{m}$  in diameter, somewhat poorly sorted, subangular to rounded;

Groundmass - same as #700;

Textural pedofeatures - abundant pore argillans, many embedded argillans, and occasional dark brown clayey patches (see #700 for descriptions); occasional anisotropic nonlaminated clay patches, 0.5-1.5 mm across, diffuse boundaries with microlaminated clay coatings, wavy extinction, low birefringence;

Amorphous pedofeatures - rare ferrug. nodules, moderately to strongly impregnating, about 250  $\mu\text{m}$  in diameter, diffuse border with matrix; occasional chocolate brown hypocoatings (see #700).

#702 (488-495 cm) 3Btgb2

Peds - angular blocks (nearly 100%), moderate grade, 10-20  $\mu\text{m}$  in diameter, fully accommodated undulating or rough walls; rare coalesced granules, 500-750  $\mu\text{m}$  in diameter, clustered in upper left corner of slide;

Pores - total porosity 15-20%; planar voids (65%), 15  $\mu\text{m}$ -2 mm wide, most are straight but some curved; compound packing voids (20%), rough walls (some may be grinding artifacts); channels (15%), 50-300  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - moderate abk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - same composition as #701; 20  $\mu\text{m}$ -3 mm in diameter, somewhat poorly sorted, rounded to subangular;

Groundmass - same as #700;

Textural pedofeatures - many pore argillans, many embedded argillans, and common dark brown clayey patches (see #700 for descriptions);

Fabric pedofeatures - 2 slickenside zones (see #699 for description);

Amorphous pedofeatures - same as #701, with addition of rare ferrug. hypocoatings (ferrans), 100-150  $\mu\text{m}$  thick, along channels.

#703 (559-566 cm) 3Btgb3

Peds - subangular blocks (100%), moderate grade, 1.5-3 mm in diameter;

Pores - total porosity 15-20%; planar voids (70%), 15-750  $\mu\text{m}$  wide, zigzagged and curved, partially and fully accommodated, smooth walls; channels (25%), 250-750  $\mu\text{m}$  in diameter, smooth walls; vughs (5%), 0.5-1 mm across, unaccommod. undulating walls;

Microstructure - moderate sbk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - same composition as #701; 20  $\mu\text{m}$ -1.6 mm in diameter, poorly sorted, angular to rounded;

Groundmass - double-spaced porphyric RDP, (open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominantly porostriated b-fabric, secondary random-striated b-fabric;;

Textural pedofeatures - common microlaminated clay coatings on channels, vughs, and some

planar voids, 40-100  $\mu\text{m}$  thick, crescentic and typic, sharp boundaries, sharp extinction, very high birefringence; occasional microlaminated clay bodies (argillans) embedded in matrix; occasional anisotropic nonlaminated clay patches, 50-150  $\mu\text{m}$  across, diffuse boundaries, diffuse extinction, high birefringence;

Amorphous pedofeatures - abundant ferrug. mottles, lack definite external shape and have very diffuse boundaries, 2-4 mm across, weakly impregnated; common ferrug. nodules (see #701); rare ferrug. hypocoatings (ferrans), 100-150  $\mu\text{m}$  thick, along channels; occasional chocolate brown superimposed ferrans (see #700); rare Mn oxide nodules.

#### #704 (580-587 cm) 3BCgb

Peds - subangular blocks (50%), weak grade, 1.5-3 mm in diameter;

Pores - total porosity 15-20%; planar voids (65%), 15-750  $\mu\text{m}$  wide, curved and straight, smooth; channels (20%), 250-750  $\mu\text{m}$  in diameter, smooth walls; compound packing voids (15%), 200  $\mu\text{m}$ -1 mm across, rough walls;

Microstructure - crack and weak sbk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - see #703;

Groundmass - double-spaced porphyric RDP, (also double-spaced porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominant porostriated b-fabric, secondary monostriated and granostriated fabric;

Textural pedofeatures - same as #703 except has fewer microlaminated clay coatings on void walls;

Fabric pedofeatures - 1 slickenside (see #699 for description);

Amorphous pedofeatures - common ferrug. mottles; rare ferrug. nodules; common ferrug. hypocoatings; rare chocolate-brown superimposed ferrans; rare Mn oxide nodules (see #703 for descriptions).

#### #705 (633-640 cm) 4BCgb

Peds - angular blocks (90% of area), moderate grade, 1-6 mm in diameter, fully accommodated; subangular blocks (10%), moderate grade, 1-2.5 mm in diameter, partially accommodated walls (concentrated in lower left corner);

Pores - total porosity 15-20%; planar voids (70%), 20-500  $\mu\text{m}$  wide, zig-zag and straight, smooth walls; compound packing voids (20%), 150-750  $\mu\text{m}$  across; channels (10%), 150-600  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - moderate abk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - slight increase in abundance from #704; mostly quartz and chert, few plagioclase, 1 garnet grain, 1 highly weathered mica(?) grain (parallel linear weathering), few rock fragments including granite, basalt, and sandstone; 20  $\mu\text{m}$ -1.5 mm in diameter, poorly sorted, rounded to angular;

Groundmass - double-spaced porphyric RDP, (also double-spaced porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominantly mozaic-speckled, also granostriated;

Textural pedofeatures - occasional microlaminated clay coatings on various void types, 150-350  $\mu\text{m}$  thick, typic and crescentic, sharp extinction, very high birefringence; rare embedded clay coatings;

Fabric pedofeatures - 1 slickenside, poorly expressed, with thin (100-150  $\mu\text{m}$ ) zone of oriented clay along a very straight planar void;

Amorphous pedofeatures - abundant ferrug. mottles, weakly impregnated, 2-4 mm in diameter; rare ferrug. nodules, 1-1.5 mm in diameter, typic and single-ring, moderately impregnated, sharp boundary with matrix; common Fe oxide coatings (ferrans), 50-300  $\mu\text{m}$  thick, strongly

impregnated, mainly on walls of channels and packing pores; rare superimposed ferrans (chocolate-brown); rare very thin (15-20  $\mu\text{m}$ ), juxtaposed ferrans, overlying clay coatings; occasional Mn oxide nodules; rare Mn oxide coatings, 50-150  $\mu\text{m}$  thick, discontinuous, in upper left corner only, some are juxtaposed with clay coatings.

#### #706 (697-704 cm) 5Cg

Peds - apedal;

Pores - total porosity 8-10%; vughs or chambers (70%), 1-1.5 mm across, many are probably grinding or drying artifacts; channels (20%), 150-600  $\mu\text{m}$  in diameter, smooth walls; planar voids (10%);

Microstructure - massive; very weak sbk in portions of the slide;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - great increase in abundance from #705; dominantly quartz and feldspar, but also includes occasional heavy minerals and lithic fragments (schist, granite, basalt, siltstone); 20  $\mu\text{m}$ -9 mm in diameter, unsorted, rounded to angular;

Groundmass - double-spaced porphyric RDP, (single-spaced porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominantly mosaic-speckled, also granostriated;

Textural pedofeatures - rare microlaminated clay coatings on channel walls, diffuse extinction, high birefringence;

Amorphous pedofeatures - very abundant ferrug. mottles (>50% of total area is mottled), moderate impregnation, a few small (3-4 mm) mottles are strongly impregnated; occasional Mn oxide nodules and coatings.

### Profile 4

#### #735 (343-351 cm) 2Ab1

Peds - granules (25% of area), weak grade, 250  $\mu\text{m}$ -1.5mm, occur in clusters; apedal (75%);

Pores - total porosity 5-10%; planar voids (50%), compound packing voids (25%), channels (25%);

Microstructure - crack or massive;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz and feldspar; 20-500  $\mu\text{m}$  in diameter, well-sorted, subrounded;

Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric, with some areas of circular-striated;

Textural pedofeatures - occasional microlaminated clay bodies, discontinuous fragments embedded in matrix, diffuse extinction, high birefringence; very rare, very thin (25-50  $\mu\text{m}$ ) microlaminated clay coatings on a few channels, sharp extinction, high birefringence;

Amorphous pedofeatures - common ferrug. hypocoatings, impregnating matrix along edges of granules and matrix between granules (outlines granules), 50-300  $\mu\text{m}$  wide, weakly to moderately impregnated.

#### #736 (352-358 cm) 2Bb2

Peds - granules (50%), almost completely coalesced; apedal (50%);

Pores - total porosity 5-10%; compound packing voids (50%), planar voids (25%), channels (25%);

Microstructure - massive;

Coarse materials (c/f<sub>20µm</sub>) - quartz and feldspar; 20 µm-1 mm in diameter, moderately well-sorted, subrounded to subangular;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric, with stipple-speckled fabric in interiors of granules;

Textural pedofeatures - common disrupted microlaminated clay coatings (?), embedded in matrix, typically only 200-600 µm long;

Amorphous pedofeatures - occasional ferrug. hypocoatings, weakly to moderately impregnated, see #735 for description; rare aggregate Mn oxide "nodules," consisting of small (1-1.5 mm in diameter) areas of Mn fillings and coatings, each of which is 30-200 µm thick.

#### #737 (365-372 cm) 3Ab

Peds - granules (100% of area), strongly coalesced, 250 µm-2 mm in diameter;

Pores - total porosity 10-15%; compound packing voids (40%), planar voids (40%), channels (10%);

Microstructure - granular (more accurately, massive due to strong coalescence of granules);

Coarse materials (c/f<sub>20µm</sub>) - see #736;

Groundmass - see #736; ringlets of birefringent clay around granules are up to 70 µm wide (with individual strands 15-30 µm thick), and have diffuse boundaries with matrix of ped interior;

Textural pedofeatures - common embedded argillans, microlaminated; occasional dark brown clayey patches;

Amorphous pedofeatures - rare ferrug. nodules and abundant ferrug. hypocoatings (see #735); occasional Mn oxide nodules/fillings, 750-1250 µm in diameter (see #736).

#### #738 (403-409 cm) 3ABb1

Peds - granules (100% of area), moderately coalesced, 300 µm-1.5 mm in diameter; Pores - total porosity 10-15%; compound packing voids (60%), planar voids (30%), channels (10%);

Microstructure - spongy;

Coarse materials (c/f<sub>20µm</sub>) - 20-850 µm in diameter, moderately well-sorted;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric;

Textural pedofeatures - common microlaminated, embedded argillans;

Amorphous pedofeatures - abundant thin ferrug. hypocoatings, (15-30 µm thick) along edges of granules; rare Mn oxide "nodules," opaque, 1.5-2 mm in diameter.

#### #740 (419-426 cm) 3ABb2

Peds - granules (80% of total area), strongly coalesced, 500 µm-1.5 mm in diameter; many appear subangular, may be deformed granules;

Pores - total porosity 20-25%; compound packing voids (75%); planar voids (20%), most are <100 µm wide, curved, smooth walls; channels (5%);

Microstructure - spongy or weak sbk;

Coarse materials (c/f<sub>20µm</sub>) - 20-750 µm in diameter, moderately well-sorted;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric;

Textural pedofeatures - common embedded clay argillans; occasional dark brown clayey patches;

Amorphous pedofeatures - common ferrug. nodules, 50-60 µm in diameter, weak to moderately



impregnated, lining very small pores; the nodules are clustered in "mottles" that have diffuse boundaries and are irregularly-shaped; many Mn oxide nodules (1.5-2 mm in diameter), see #736 for description.

## Profile 5

### #595 (13-20 cm) A2

Peds - angular blocks (100%), strong grade, medium (20-25 mm in diameter), smooth walls; breaking to very fine (0.5-1.5mm) angular/subangular blocks, moderate grade, smooth walls;

Pores - total porosity 10-15%; planar voids (40%), 25-300  $\mu\text{m}$  wide, up to 5cm long, straight; compound packing voids and/or vughs (50%), at intersections of planar voids, 0.5-3 mm across; intraped channels (10%), 200-600  $\mu\text{m}$  in diameter, undulating and smooth walls;

Microstructure - strong abk (due to recent compaction);

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - predominantly quartz, K-feldspar and plagioclase, few heavy mineral grains; 20-100  $\mu\text{m}$  in diameter, well-sorted, subangular, a few acicular grains;

Groundmass - single-spaced porphyric RDP; stipple-speckled b-fabric, with minor granostriated fabric around some Fe oxide nodules;

Coarse organics - occasional root fragments, clear or light yellow in color, up to 300  $\mu\text{m}$  long; 1 charcoal fleck, opaque in XPL and PPL, 250  $\mu\text{m}$  in diameter;

Textural pedofeatures - none;

Fabric pedofeatures - few pockets (1-10 mm across) with mozaic-speckled b-fabric, irregular but distinct boundaries, probably burrows of large earthworms or other soil fauna;

Excrement pedofeatures - a cluster of oribatid mite fecal pellets in a compound packing void; each pellet is ellipsoidal in shape, approx. 70x40  $\mu\text{m}$ , yellow-brown and reddish brown in PPL, nearly opaque in XPL;

Amorphous pedofeatures - many concentric ferrug. nodules, 50  $\mu\text{m}$ -2 mm in diameter, strongly impregnated, opaque at low magnif. (PPL) and reddish-brown at higher mags., 80-90% of the nodules have sharp boundaries; occasional single-ring and double-ring ferrug. nodules, 200-600  $\mu\text{m}$  in diameter, most have sharp boundaries.

### #596a (33-40 cm) AB

Peds - angular and subangular blocks (100%), moderate grade, 2-8 mm in diameter, smooth walls;

Pores - total porosity 15-20%; vughs/compound packing voids (45%), 1-3 mm across, rough walls; planar voids (45%), 50-200  $\mu\text{m}$  wide, curved, partially accommodated; channels (10%), 100-1000  $\mu\text{m}$  in diameter, smooth walls, nonrandomly distributed (clustered), many associated with thin Fe oxide hypocoatings;

Microstructure - moderate abk to sbk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - 20-75  $\mu\text{m}$  in diameter; see #595;

Groundmass - single-spaced porphyric RDP; mozaic-speckled b-fabric;

Coarse organics - rare roots cross-sectioned in their channels;

Textural pedofeatures - common, very thin (10-30  $\mu\text{m}$ ), microlaminated clay hypocoatings along channel walls, diffuse extinction, moderate birefringence, most are engulfed by Fe oxides; occasional short (80-500  $\mu\text{m}$  long) fragments of microlaminated clay coatings, with moderate extinction and birefringence, embedded in matrix, appear to have been disrupted/broken by bioturbation;

Amorphous pedofeatures - many impregnative ferrug. nodules, 100  $\mu$ m-2 mm in diameter, 80-90% have sharp boundaries with matrix.

#### #597a (56-63 cm) Bt1

Peds - subangular blocks (30-40% of area), weak grade, 1-10 mm in diameter;

Pores - total porosity 30-35%; channels (40%), 100-500  $\mu$ m in diameter, unaccommodated, smooth walls; compound packing voids (40%), 0.5-1.5 mm wide, 1-4 mm long, typically occur at intersection of 2 or 3 peds; planar voids (20%), 100-500  $\mu$ m wide, 1-3 cm long, curved, partially accommodated;

Microstructure - channel, partially weak sbk;

Coarse materials (c/f<sub>20 $\mu$ m</sub>) - see #596a;

Groundmass - single-spaced porphyric RDP; mosaic-speckled, with minor mono-striated b-fabric;

Textural pedofeatures - many microlaminated, typic clay hypocoatings, 50-100  $\mu$ m thick, sharp extinction, high birefringence, mostly along channels (typically geopetal), rarely on planar voids; common microlaminated, crescentic clay coatings in channels, 100-150  $\mu$ m thick, sharp extinction, high birefringence; common disrupted fragments of microlaminated clay as in #596a;

Amorphous pedofeatures - many ferrug. nodules, typic and aggregate, 100  $\mu$ m-2.5 mm in diameter, strongly impregnated, some are crosscut by planar voids and channels, approx. 40% have sharp boundaries with matrix, 60% diffuse boundaries; many ferrug. mottles, 1-4 mm in diameter, weakly impregnated, diffuse boundaries, yellowish brown in PPL.

#### #598 (66-73 cm) Bt2

Peds - subangular blocks (100%), moderate grade, 1-10 mm in diameter (most are 5-10 mm), unaccommodated walls;

Pores - total porosity 35-40%; similar distribution to #597a, but with more channels;

Microstructure - channel, and moderate sbk;

Coarse materials (c/f<sub>20 $\mu$ m</sub>) - see #596a;

Groundmass - see #597a;

Textural pedofeatures - many microlaminated clay coatings, typic and crescentic, 100-150  $\mu$ m thick, sharp extinction, high birefringence, most are associated with channels; many microlaminated clay hypocoatings, 50-100  $\mu$ m thick, primarily on channels, a few on planar voids;

Amorphous pedofeatures - see #597a.

#### #599 (97-104 cm) BC

Peds - apedal;

Pores - total porosity 25-30%; channels (95% of total porosity), 100  $\mu$ m-1.2 mm in diameter, smooth or undulating walls, many channels crosscut one another; planar voids (5%);

Microstructure - channel;

Coarse materials (c/f<sub>20 $\mu$ m</sub>) - dominantly quartz; 20-150  $\mu$ m in diameter, with 1 600  $\mu$ m quartz grain, well-sorted, subangular;

Groundmass - single-spaced porphyric RDP; stipple-speckled b-fabric;

Coarse organics - 1 soil insect (mite?), black and opaque, in a channel, 1 root fragment, reddish brown in PPL;

Textural pedofeatures - occasional microlaminated clay coatings and common clay hypocoatings (see #598 for descriptions);

Amorphous pedofeatures - many Fe oxide nodules, mostly aggregate type, few are typical, nearly all have diffuse boundaries with the matrix, 0.5-4 mm in diameter, moderate to strong impregnation; common ferrug. mottles, 1-5 mm in diameter, very diffuse boundaries.

#### #600 (147-154 cm) C (MDL)

Peds - horizontal lenticular peds (60%), weak grade, 500-750  $\mu\text{m}$  thick, undulating walls; apedal (40%);

Pores - total porosity 15-20%; channels (80%), 100-1000  $\mu\text{m}$  in diameter; planar voids (20%), 10-100  $\mu\text{m}$  wide, curved, fully accommodated, parallel to lenticular ped walls, many are partially filled by silt grains and hence difficult to see in PPL;

Microstructure - platy (lenticular), and weak channel;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - 20-80  $\mu\text{m}$  in diameter, well-sorted, angular to subrounded;

Groundmass - single-spaced porphyric RDP; stipple-speckled b-fabric;

Textural pedofeatures - occasional microlaminated clay hypocoatings and quasicocoatings, 20-60  $\mu\text{m}$  thick, typical, discontinuous, diffuse extinction, high birefringence;

Amorphous pedofeatures - abundant Fe oxide nodules, same description as in #599; abundant ferrug. mottles, 3-6 mm in diameter, diffuse boundaries.

#### #601 (173-180 cm) C (MDU)

Peds - apedal (100%);

Pores - total porosity 10-15%; channels (90%), see #600; planar voids (10%), 50-150  $\mu\text{m}$  wide, zigzagged and curved, fully accommodated, smooth, most are oriented horizontally (may be drying artifacts);

Microstructure - channel;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - see #600;

Groundmass - single-spaced porphyric RDP; stipple-speckled b-fabric;;

Coarse organics - 1 gastropod shell, 1.5x2 mm, shell is approximately 30-40  $\mu\text{m}$  thick, highly birefringent; interior is partially filled with soil matrix identical to surrounding matrix;

Textural pedofeatures - see #600;

Amorphous pedofeatures - see #600.

#### #604 (325-332 cm) C (MDL)

Peds - apedal;

Pores - total porosity 8-12%; channels (35%), 100-1200  $\mu\text{m}$  in diameter, smooth walls, many are seen in longitudinal cross-section; planar voids (35%), zigzagged, partially accommodated, very few have associated coatings (most may be drying artifacts); vughs (30%), 200-400  $\mu\text{m}$  dimensions, irregularly shaped, rough walls, about half have associated ferrug. hypocoatings, occur in roughly linear zones (1-2 cm long);

Microstructure - weak channel;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - 20-500  $\mu\text{m}$  in diameter (very few grains >100  $\mu\text{m}$ ), well-sorted, angular to subrounded;

Groundmass - single-spaced porphyric RDP; stipple-speckled b-fabric;

Textural pedofeatures - rare microlaminated clay infillings, 200-350  $\mu\text{m}$  thick, moderate

extinction, moderate birefringence, very disrupted (bioturbated?) and concentrated in a zone of roughly spherical aggregates (fecal pellets?) and many compound packing voids; occasional microlaminated clay hypo- and quasiccoatings, 30-100  $\mu\text{m}$  thick, moderate birefringence, speckled extinction, occur juxtaposed with (overlying) ferrug. coatings (see Amorphous pedofeatures);

Amorphous pedofeatures - occasional ferrug. coatings composed of goethite rosettes (50-100  $\mu\text{m}$  in diameter) lining channel walls, and surrounded by ferrug. hypocoatings in the adjacent soil matrix; many typic ferrug. hypocoatings along channel and vugh walls, 40-200  $\mu\text{m}$  thick, moderately impregnated, surrounded by weakly impregnated haloes; common ferrug. mottles, 0.5-1 cm, very weakly impregnated, very diffuse boundaries; many Mn oxide accumulations (300  $\mu\text{m}$ -1.5 cm), composed of irregularly shaped mangans (10-40  $\mu\text{m}$  thick) and small (10-100  $\mu\text{m}$  in diameter) nodules.

#### #605 (332-338 cm) MDL

Peds - apedal;

Pores - total porosity 5-10%; planar voids (50%), zigzag, undulating, most are probably artifacts (no associated coatings of any kind and they are concentrated near edges of the section); channels (30%), 300-700  $\mu\text{m}$  in diameter, many have associated ferrug. hypocoatings; vughs (20%), 200-600  $\mu\text{m}$  across, rough walls;

Microstructure - massive;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - see #605;

Groundmass - see #604;

Textural pedofeatures - none;

Amorphous pedofeatures - many typic ferrug. hypocoatings (see #604); rare ferrug. nodules; common ferrug. mottles, 0.5-2 cm (see #604); many Mn oxide accumulations (see #604).

#### #606a (371-378 cm) MDL

Peds - apedal;

Pores - total porosity 5-10%; planar voids (60%), 25-500  $\mu\text{m}$  wide, 1-20  $\mu\text{m}$  long, zigzagged and curved, about half are oriented subparallel to one another, approx. 30° from horizontal (related to involution structure?); channels (40%), 200  $\mu\text{m}$ -1.3 mm in diameter, smooth walls;

Microstructure - crack, or massive;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - dominantly quartz; 20  $\mu\text{m}$ -1 mm in diameter (very few grains >100  $\mu\text{m}$ ), well-sorted, subangular;

Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric;

Coarse organics - 1 charcoal fleck, 0.5-1.5 mm in diameter;

Textural pedofeatures - rare nonlaminated(?), typic clay hypocoatings, 30-60  $\mu\text{m}$  thick, diffuse extinction, low birefringence;

Amorphous pedofeatures - occasional ferrug. mottles, weakly impregnated, 3-20 mm in diameter, typically elongated in wide zones around channels and their associated ferrug. hypocoatings; common ferrug. hypocoatings on channel walls, 40  $\mu\text{m}$ -3 mm thick, moderately to strongly impregnated; rare superimposed ferrans (on clay hypocoatings); rare Mn oxide nodules, 50  $\mu\text{m}$ -1.5 mm in diameter, nonspherical.

#607 (384-391 cm) 2Ab1

Peds - very weakly expressed platy peds (50% of total area), 2-5 mm thick;

Pores - total porosity 5-10%; horizontal planar voids (50%), 1-2 cm long, undulating, crosscut amorphous pedofeatures; channels (50%), 200-1250  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - very weak platy, and massive;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - mainly quartz and feldspar, few hornblende grains; 20  $\mu\text{m}$ -1 mm in diameter (only a few hundred grains  $>100 \mu\text{m}$ ), moderately well-sorted, subrounded to subangular;

Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric;

Coarse organics - approx. 10 charcoal flecks, 0.5-5 mm in diameter, opaque with reddish edges in PPL at high magnifications;

Textural pedofeatures - rare microlaminated clay coatings, 10-100  $\mu\text{m}$  thick (laminae  $<10 \mu\text{m}$  thick), crescentic, discontinuous, sharp extinction, high birefringence, occur along channel walls;

Excrement pedofeatures - rare fecal pellets, strongly coalesced;

Amorphous pedofeatures - occasional ferrug. nodules, geodic, double-ring and single-ring, 200-800  $\mu\text{m}$  in diameter, weakly to strongly impregnated; occasional ferrug. mottles (haloes), 1-7 mm in diameter, weakly impregnated, surrounding small channels and their associated ferrug. hypocoatings; common typic ferrug. hypocoatings, 25-400  $\mu\text{m}$  thick, weakly to moderately impregnated, lining channel walls; rare juxtaposed ferrug. hypocoatings overlying thin clay coatings; rare Mn oxide nodules.

#608 (391-396 cm) 2Ab2

Peds - very weakly expressed platy peds (65% of total area), 1-3 mm thick;

Pores - total porosity 5%; planar voids (40%), 20-250  $\mu\text{m}$  wide, 2-21 mm long, about 90% are horizontal, wavy, fully accommodated; channels (40%), 200-1000  $\mu\text{m}$  in diameter, smooth walls; compound packing voids (10%), mammillated; vughs (10%), rough walls, 1-2 mm across;

Microstructure - very weak platy, and massive;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - see #607;

Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric, minor granostriated b-fabric around amorphous nodules;

Coarse organics - 10 charcoal flecks, 200  $\mu\text{m}$ -2 mm in diameter;

Textural pedofeatures - none;

Excrement pedofeatures - rare (approx. 15) fecal pellets, 0.5-1.5 mm in diameter, spherical to ellipsoidal;

Amorphous pedofeatures - similar to #607, except ferrug. mottles are rare and juxtaposed ferrug. hypocoatings are absent.

#609 (401-406 cm) 2Bwb

Peds - granules (5% of total area), 100-300  $\mu\text{m}$  in diameter, surrounded by apedal matrix;

Pores - total porosity 5%; channels (65%), 100-500  $\mu\text{m}$  in diameter; planar voids (15%), no preferred orientation, may be drying artifacts; compound packing voids (10%); vughs (10%), 500-700  $\mu\text{m}$  across, irregularly-shaped, rough walls;

Microstructure - channel;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - predominantly quartz, few plagioclase (some show parallel linear alteration to clays), few hornblende, polycrystalline quartz, 1 kyanite(?) grain; 20  $\mu\text{m}$ -1 mm in

diameter, except for 1 3-mm pebble, moderately well-sorted, well-rounded to angular;  
Groundmass - double-spaced porphyric RDP; stipple-speckled, with minor circular-striated b-fabric around fecal pellets;  
Coarse organics - about 12 charcoal flecks, somewhat fragmented;  
Textural pedofeatures - occasional microlaminated clay coatings and hypocoatings on channel walls, 20-30  $\mu\text{m}$  thick, typic, discontinuous, diffuse extinction, weak birefringence; rare dark brown clayey patches, 150-600  $\mu\text{m}$  dimensions; 1 microlaminated, crescentic clay filling a channel, 200  $\mu\text{m}$  thick, high birefringence, sharp extinction, dark yellowish brown in PPL;  
Amorphous pedofeatures - occasional ferrug. nodules, typic, single-ring and concentric, 0.5-2.0 mm in diameter, moderately to strongly impregnated; occasional ferrug. hypocoatings around channel walls, superimposed with clay coatings; rare bright red-orange ferrug. coatings, non-impregnative, 50-200  $\mu\text{m}$  thick, consist of goethite rosettes; occasional Mn oxide nodules.

#### #610 (409-414 cm) 2Bwb

Peds - granules (30-40% of total area), weak grade (little pore space between granules and surrounding matrix; seen best in circularly polarized light), 100-750  $\mu\text{m}$  in diameter, most are 200-400  $\mu\text{m}$ ; apedal (60-70% of area);  
Pores - total porosity 5-10%; compound packing voids (45%), 20-200  $\mu\text{m}$  across; planar voids (30%), may be artifacts; channels (25%), 60-600  $\mu\text{m}$  in diameter;  
Microstructure - spongy, and channel;  
Coarse materials (c/f<sub>20 $\mu\text{m}$</sub> ) - mostly quartz, few chert and plagioclase grains; 20  $\mu\text{m}$ -1.5 mm in diameter, moderately well-sorted;  
Groundmass - double-spaced porphyric RDP; stipple-speckled b-fabric dominant, with secondary circular-striated fabric around granules;  
Coarse organics - occasional charcoal flecks, some replace by Fe oxides, 100  $\mu\text{m}$ -2.5 mm in diameter; a obliquely sectioned conifer needle (?), 1.4x0.5 mm.  
Textural pedofeatures - rare microlaminated clay coatings, on channel walls, 60  $\mu\text{m}$  thick, sharp extinction, high birefringence; rare clay quasicocoatings, embedded in matrix, 20-50  $\mu\text{m}$  thick, discontinuous, diffuse extinction, moderate birefringence; occasional dark brown clayey patches, 1 mm x 200  $\mu\text{m}$ , dark yellowish brown in PPL, diffuse (speckled) extinction, moderate birefringence; occasional siltans, about 0.5 mm across, occur in compound packing voids, composed of medium silt grains (approx. 20-30  $\mu\text{m}$  in diameter).  
Amorphous pedofeatures - common ferrug. nodules, common ferrug. hypocoatings, and rare ferrans superimposed on clay coatings (see #609 for descriptions).

#### #611 (414-419 cm) 2Bwb

Peds - granules (40-60% of total area), most are 200-500  $\mu\text{m}$  in diameter, strongly coalesced; apedal (50-60);  
Pores - total porosity 10-20%; compound packing voids (50%), 1-5 mm across, very irregularly shaped; planar voids (40%), most are about 15  $\mu\text{m}$  wide, 3-30 mm long, zigzagged, rough walls; channels (10%), 300-900  $\mu\text{m}$  in diameter;  
Microstructure - spongy;  
Coarse materials (c/f<sub>20 $\mu\text{m}$</sub> ) - see #610;  
Groundmass - double-spaced porphyric RDP; circular-striated b-fabric, with rings of oriented clay that are 20  $\mu\text{m}$  wide; minor granostriated b-fabric;  
Coarse organics - few charcoal fragments, 1-1.5 mm long, most are pseudomorphic ferrug. nodules (Fe oxide replacement seen under reflected light);

Textural pedofeatures - see #610;

Amorphous pedofeatures - many ferrug. nodules, typic and single-ring, strongly impregnated, most are 1-1.5 mm in diameter, sharp boundaries with matrix, some have associated rings of birefringent clay (granostriated b-fabric), rounded, with 1-2 angular nodules that appear to have been broken; rare ferrug. mottles, weakly impregnated, 0.5-2 mm in diameter; occasional ferrug. hypocotings, 150-500  $\mu\text{m}$  wide, clear boundaries with matrix, moderately impregnated, 1 crosscuts a ring nodule.

#### #612 (432-437 cm) 3Ab

Peds - granules (75% of area), 250  $\mu\text{m}$ -1.1 mm in diameter, partially coalesced, smooth walls;  
Pores - total porosity 20-30%; compound packing voids (90%), mammillated shape; channels (10%), within granular peds, 300-700  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - spongy;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - primarily quartz and plagioclase, few chert and polycrystalline quartz grains; 20  $\mu\text{m}$ -1.4 mm in diameter, moderately well-sorted, subangular to rounded;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric; rare areas of parallel-striated fabric, where streaks are 50-75  $\mu\text{m}$  thick, and oriented 45° from horizontal, crosscutting granules;

Coarse organics - 4 charcoal flecks, 0.5-2 mm in diameter;

Textural pedofeatures - see #610;

Amorphous pedofeatures - many ferrug. nodules (see #611 for description); rare ferrug. coatings, 20-30  $\mu\text{m}$  thick, composed of goethite rosettes, lining a few packing voids, deep reddish brown in PPL.

#### #613b (447-452 cm) 3Ab

Peds - granules (90% of area), strong grade, 250  $\mu\text{m}$ -2.5 mm in diameter, partially coalesced;  
Pores - total porosity 25-35%; compound packing voids (80%), 100-750  $\mu\text{m}$  across, mammillated; planar voids (10%), 20-100  $\mu\text{m}$  wide, curved, partially accommodated, smooth walls; channels (10%), 150-600  $\mu\text{m}$  in diameter;

Microstructure - spongy, and granular;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - see #612;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric;

Coarse organics - 3-4 pseudomorphic nodules, composed of charcoal impregnated with Fe oxides, 1.5-4.5 mm in diameter;

Textural pedofeatures - rare microlaminated clay pore argillans, occurring in channels, discontinuous, 1-1.5 mm long, 50-100  $\mu\text{m}$  thick (individual laminae are 10-20  $\mu\text{m}$  thick), sharp extinction, high birefringence; occasional clay quasicotings embedded in matrix, moderate extinction and birefringence; occasional dark brown clayey patches, 200-400  $\mu\text{m}$  across, non-laminated, diffuse extinction, moderate birefringence; occasional silt coatings, 100-150  $\mu\text{m}$  thick, somewhat diffuse boundaries;

Amorphous pedofeatures - abundant ferrug. nodules, typic, compound, concentric, and pseudomorphic, 25  $\mu\text{m}$ -1.5 mm in diameter, most have sharp external boundaries, moderately to purely impregnated; occasional ferrug. mottles, diffuse external boundaries, 0.5-1.0 mm in diameter, weakly impregnated; common ferrug. hypocotings, 50-200  $\mu\text{m}$  thick, clear boundaries, coating packing void walls.

#614 (462-467 cm) 3Ab

Peds - granules (90% of area), 0.5-2.5 mm in diameter, strong grade, smooth walls; subangular blocks (25% of area), 1-5 mm in diameter, interior of peds composed largely of coalesced granules, undulating walls;

Pores - total porosity 30-40%; compound packing voids (80%), 0.5-2.5 mm across, mammillated shape; channels (10%), 300-700  $\mu\text{m}$  in diameter, up to 5.5 mm long, smooth walls; planar voids (5%), 20-100  $\mu\text{m}$  wide, 1-6mm long, zigzagged, smooth walls; vughs (5%), 0.5-2 mm across, undulating walls;

Microstructure - granular, and minor sbk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - see #612;

Groundmass - double-spaced porphyric RDP; circular-striated b-fabric, few areas of parallel-striated b-fabric;

Textural pedofeatures - occasional microlaminated clay coatings on channel walls; rare dark brown clayey patches; occasional silt coatings and fillings (see #613 for descriptions of all textural pedofeatures);

Amorphous pedofeatures - many ferrug. nodules, rare ferrug. mottles, common ferrug. hypocoatings (see #614 for descriptions); rare manganese oxide nodules.

#615a (493-498 cm) 3Btb1

Peds - angular blocks (100%), moderate grade, 15-25 mm, fully accommodated, undulating walls;

Pores - total porosity 10-15%; planar voids (80%), 20-200  $\mu\text{m}$  wide, straight and curved, undulating; channels (20%), 100-300  $\mu\text{m}$  in diameter;

Microstructure - moderate abk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz, hornblende, orthoclase, few mica grains, few shale and sandstone fragments; 20  $\mu\text{m}$ -1 mm in diameter, moderately sorted, subrounded to angular;

Groundmass - double-spaced porphyric RDP, (open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); random-striated b-fabric (omnisepic plasmic fabric);

Textural pedofeatures - rare microlaminated clay coatings on void walls, 50-100  $\mu\text{m}$  thick; abundant clay quasiccoatings embedded in matrix, disrupted, discontinuous, 100-200  $\mu\text{m}$  thick, diffuse extinction, high birefringence; rare silt fillings, 50-150  $\mu\text{m}$  thick, composed of silt grains (20-40  $\mu\text{m}$  in diameter) and some fine silt or clay, clear boundaries with matrix, occur mainly in vertical planar voids;

Amorphous pedofeatures - many ferrug. nodules, typic, 0.5-1 mm in diameter, strongly impregnated, clear smooth boundaries; occasional ferrug. mottles, aggregate type, 4-7 mm in diameter, composed of small (200  $\mu\text{m}$ ) concentrations of Fe oxides, weakly to strongly impregnated; rare Mn oxide coatings.

#616a (521-526 cm) 3Btb1

Peds - subangular blocks (80-90% of total area), 5-7 mm in diameter, moderate grade; sbk peds break to angular blocks (75% of total area), moderate grade, 1-3 mm in diameter, smooth walls;

Pores - total porosity 10-15%; planar voids (90%), 30-1200  $\mu\text{m}$  wide (most are 100-300  $\mu\text{m}$ ), straight and curved, partially to fully accommodated; channels (10%), 200-300  $\mu\text{m}$  in diameter, smooth walls; 1 large channel, 1.5 mm in diameter by 10 mm long, filled with birefringent clay;

Microstructure - moderate abk;



Coarse materials (c/f<sub>20µm</sub>) - mainly single mineral grains of quartz and feldspar, 1-2% of coarse fraction consists of sandstone, chert and polycrystalline quartz fragments; 20 µm-1.2 mm in diameter, moderately-sorted, subrounded to subangular;

Groundmass - double-spaced porphyric RDP, (open porphyric RDP, c/f<sub>62µm</sub>); random-striated b-fabric (masepic plasmic fabric); porostriated b-fabric, consisting of continuous (3-4 cm long by 50-300 µm wide) zones of stress-oriented clay along most planar voids;

Textural pedofeatures - occasional thin microlaminated clay coatings along channel walls, moderate extinction and birefringence; abundant microlaminated clay quasiccoatings embedded in matrix of peds, 150-350 µm thick, diffuse extinction, high birefringence; occasional nonlaminated clay bodies, wavy extinction, moderate birefringence;

Fabric pedofeatures - 1 slickenside, consists of zone (400 µm-wide by 20 µm long) zone of strands of oriented clay on either side of a straight planar void, oriented 45° from horizontal;

Excrement pedofeatures - rare fecal pellets in 2-3 clusters, each granule is 400-800 µm in diameter, strongly coalesced;

Amorphous pedofeatures - common ferrug. nodules, typic, 0.5-1 mm in diameter, roughly spherical, clear boundaries with matrix, moderately to strongly impregnated; common ferrug. mottles, 3-7 mm in diameter, composed of small (50-200 µm in diameter), weakly to strongly impregnated concentrations of Fe oxides, diffuse boundaries, irregularly shaped (could also be considered aggregate nodules); occasional ferrug. coatings, 20-30 µm thick, continuous; occasional juxtaposed ferrans, overlying argillans in channels; rare Mn oxide coatings.

#### #617 (559-565 cm) 3Btb2

Peds - angular blocks (nearly 100% of area), moderate grade, most have 1 rounded side, 2-5 mm in diameter, smooth walls;

Pores - total porosity 15-20%; planar voids (70%), 20-250 µm wide, straight and curved, fully accommodated; compound packing voids (20%), 0.5-1.5 mm across, typically triangular in shape and occur at triple junction of 3 peds; channels (10%), 200-750 µm in diameter, smooth walls;

Microstructure - moderate abk;

Coarse materials (c/f<sub>20µm</sub>) - see #616;

Groundmass - see #616;

Textural pedofeatures - common microlaminated (weakly laminated) clay coatings along channel walls, 100-200 µm wide, diffuse extinction, high birefringence; many embedded clay quasiccoatings (see #616); rare dark brown clayey patches, 250 µm across, diffuse extinction, moderate birefringence; occasional nonlaminated clay bodies, wavy extinction, moderate birefringence;

Fabric pedofeatures - 1 slickenside (see #616);

Excrement pedofeatures - 1 cluster of coalesced granules, each is 200-700 µm in diameter, smooth walls;

Amorphous pedofeatures - occasional ferrug. nodules, typic strongly impregnated, approx. 1 mm in diameter; common ferrug. mottles, 5-10 mm in diameter (see #616 for description); common ferrug. coatings, 20-30 µm thick; many Mn oxide coatings and pore fillings, 50-300 µm thick, continuous, black and opaque at all magnifications, most of the coatings are juxtaposed with clay coatings.

#### #618 (582-589 cm) 3Bgb

Peds - angular blocks (90% of slide), moderate grade, most have 1 rounded side, 1-5 mm in

diameter, smooth, fully accommodated walls;

Pores - total porosity 15-20; planar voids (70%), 50-400  $\mu\text{m}$  wide (a few planar voids up to 1000  $\mu\text{m}$  wide are probably drying artifacts), straight and curved, smooth walls; compound packing voids or vughs (25%), 200-400  $\mu\text{m}$  across, rough walls; channels (5%), 400-1200  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - moderate abk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz, feldspar, chert, sandstone, shale, polycrystalline quartz; 20  $\mu\text{m}$  to 1.2 mm, poorly-sorted, angular to rounded;

Groundmass - double-spaced porphyric RDP, (open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); porostriated, along planar voids; also random-striated (masepic plasmic fabric), with individual streaks 5-20  $\mu\text{m}$  thick by 50-200  $\mu\text{m}$  long;

Textural pedofeatures - occasional microlaminated clay coatings along channel walls, 60-100  $\mu\text{m}$  thick, diffuse extinction, moderate birefringence, some have associated ferrans; occasional embedded microlaminated clay bodies, 50-500  $\mu\text{m}$  thick, oblate to linear, sharp extinction, high birefringence;

Fabric pedofeatures - 1 slickenside, zone of oriented clay is 5 cm long and 1.5 mm wide, on either side of a straight planar void - the void contains a well-rounded aggregate (fecal pellet?);

Excrement pedofeatures - 3-4 clusters of strongly coalesced fecal pellets surrounded by Fe oxide stained matrix; each pellet is 400-800  $\mu\text{m}$  in diameter;

Amorphous pedofeatures - occasional ferrug. nodules, typic and aggregate, 0.5-3.5 mm in diameter, moderately to strongly impregnated, typic nodules have smooth, clear boundaries, aggregate nodules have rough diffuse edges; occasional ferrug. mottles, weakly impregnated; common ferrug. hypocoatings, 50-150  $\mu\text{m}$  thick, superimposed with clay coatings; common Mn oxide coatings, about half are juxtaposed with clay coatings.

#### #619 (604-610 cm) 3Bgb

Peds - angular blocks (70% of area), moderate grade, most have 1 rounded side, 1-5 mm in diameter; angular blocks (30% of area), weak to strong grade, 5-15 mm in diameter;

Pores - total porosity 15-20%; planar voids (90%), 0.5-5 cm long, zigzag and curved, partially accommodated; compound packing voids (5%), 0.5-3 mm across, join planar voids; channels (5%), 400-800  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - moderate abk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz, feldspar, hornblende, granite, sandstone, chert, iron-cemented sandstone, numerous weathered grains; 20  $\mu\text{m}$  to 5.5 mm in diameter, very noticeable increase in sand (>2mm) from #618, poorly-sorted, angular to subrounded;

Groundmass - double-spaced porphyric RDP, (open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); porostriated, as slickensides and microslickensides along walls of planar voids; monostriated in ped interiors;

Textural pedofeatures - see #618;

Fabric pedofeatures - 1 slickenside, similar to the one in #618;

Amorphous pedofeatures - common ferrug. nodules, typic and aggregate, rough boundaries with matrix, 1.5-2 mm in diameter, moderately impregnated; common ferrug. mottles, 2-30 mm in diameter, diffuse boundaries, very weakly impregnated; many ferrug. hypocoatings, 10-50  $\mu\text{m}$  thick, nearly opaque, occur along channel walls; occasional Mn oxide nodules, very rough edges, 1-5 mm in diameter, opaque; common Mn oxide coatings.

#### #620 (610-616 cm) 4Btgb

Peds - angular blocks (80% of area), moderate grade, 1.5-6 mm in diameter, partially to fully

accommodated, rough walls; common granular peds (5% of area), many are coalesced, 500-1000  $\mu\text{m}$  in diameter, smooth walls, best seen in PPL where surrounded by Fe oxide impregnated matrix; large angular blocky peds (1-1.5 cm) superimposed over the entire slide may be drying artifacts;

Pores - total porosity 15-20%; planar voids (40%), 50-200  $\mu\text{m}$  wide (a few are up to 1 mm wide but have probably been widened during preparation, fully accommodated, zigzag and curved; channels (40%), very noticeable increase from above horizon, 250-500  $\mu\text{m}$  in diameter, smooth walls; compound packing voids (20%), 250-500  $\mu\text{m}$  across;

Microstructure - moderate abk, and channel;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz, feldspar, chert; 20  $\mu\text{m}$  to 1.2 mm (less sand than #619), poorly-sorted, subrounded;

Groundmass - open porphyric RDP, (also open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominantly porostriated b-fabric along walls of planar voids, also monostriated and random-striated within peds, with individual streaks of clay 10-30  $\mu\text{m}$  wide and 250-1000  $\mu\text{m}$  long; most of the streaks of oriented clay within peds are curved, some are circular, a few are straight;

Textural pedofeatures - many microlaminated clay coatings and hypocoatings along channel walls, moderate extinction and birefringence; common embedded microlaminated clay bodies;

Excrement pedofeatures - common fecal pellets (see granular peds above);

Amorphous pedofeatures - occasional ferrug. nodules and common ferrug. mottles (see #619 for descriptions); common ferrug. hypocoatings along channel walls, common superimposed ferrans (impregnating clay coatings); abundant Mn oxide coatings, occur mainly along wide planar voids, some are juxtaposed with clay coatings.

#### #621 (620-625 cm) 4Btgb

Peds - angular blocks (100% of area), moderate to strong grade in 80% of slide, weak in rest, a few of the blocks have 1 rounded side, 1.5-6 mm in diameter;

Pores - total porosity 20-25%; planar voids (70%), 50-400  $\mu\text{m}$  wide, zigzag and curved, partially to fully accommodated; compound packing voids (20%), 0.5-1 mm across, rough, irregular walls; channels (10%), 200-500  $\mu\text{m}$  in diameter, smooth walls; complex packing voids (<1%), encircling small pebbles, 100-150  $\mu\text{m}$  wide, probably drying artifacts;

Microstructure - moderate abk;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - single mineral grains of quartz and feldspar, and rock fragments of chert, sandstone, shale, polycrystalline quartz; 20  $\mu\text{m}$ -8 mm, most are < 3 mm, poorly-sorted;

Groundmass - open porphyric RDP, (also open porphyric RDP,  $c/f_{62\mu\text{m}}$ ); dominantly porostriated, with secondary granostriated and minor random-striated (omnisepic plasmic fabric) b-fabrics;

Textural pedofeatures - common microlaminated clay coatings (pore argillans), occur mostly on channel walls, many are disrupted, high birefringence, diffuse extinction; occasional embedded argillans, 300-1000  $\mu\text{m}$  wide, most are disrupted, diffuse extinction, high birefringence;

Amorphous pedofeatures - occasional ferrug. nodules, occasional ferrug. mottles, occasional ferrans (see #619 for descriptions); common Mn oxide coatings, some juxtaposed with clay coatings.

#### #623 (645-650 cm) 4Btgb

Peds - angular blocks (100% of area), moderate to strong grade, 1-3 mm in diameter, smooth edges;

Pores - total porosity 15-20%; planar voids (85%), 30-200  $\mu\text{m}$  wide, zigzag and curved, partially to fully accommodated; channels (15%), 250-750  $\mu\text{m}$  in diameter, smooth walls;

Microstructure - moderate to strong abk;

Coarse materials (c/f<sub>20µm</sub>) - same composition as #621, but significant increase in sand-sized grains; 20 µm-5.5 mm, poorly-sorted, angular to rounded;

Groundmass - single-spaced porphyric RDP, (double-spaced porphyric RDP, c/f<sub>62µm</sub>); dominantly porostriated b-fabric, consisting of 0.5-1.5 mm long strands of clay in 100-200 µm wide zones; secondary granostriated b-fabric, rings of clay are 30-50 µm wide;

Fabric pedofeatures - 1 slickenside, traverses entire width of slide, zone of oriented clay is 50-300 µm wide, consists of individual strands 10-15 µm wide, parallel to straight planar voids oriented 45° from horizontal;

Textural pedofeatures - many microlaminated clay coatings, parallel to planar voids and channels, 60-300 µm thick, sharp boundary with matrix, sharp extinction, high birefringence, some are overlain by Mn oxides; common microlaminated clay bodies (argillans) embedded in matrix, high birefringence, moderate extinction, extremely variable sizes; occasional nonlaminated clay bodies;

Amorphous pedofeatures - very rare ferrug. nodules, typic, rounded, strongly impregnated; abundant ferrug. mottles, distinct contrast, irregularly shaped, diffuse boundaries, encompass 50% of total area, occur in roughly vertical bands approx. 1.5 cm wide; common juxtaposed Mn oxide coatings or hypoc coatings, 30-60 µm wide, opaque, sharp boundaries, typically overlie clay coatings or impregnate outer edge of clay coating, concentrated in 3-4 pockets.

#### #624 (670-676 cm) 4BCtgb

Peds - subangular blocks (100% of total area), weak grade, 2-5 mm in diameter;

Pores - total porosity 15-20%; planar voids (80%), 20-150 µm wide (median width of 50 µm), partially accommodated, smooth, curved walls; channels (15%), 200-300 µm in diameter, rough walls due to disrupted juxtaposed Mn and Fe oxide coatings; vughs (5%), 250-1000 µm across, very rough walls, no associated coatings;

Microstructure - weak sbk;

Coarse materials (c/f<sub>20µm</sub>) - quartz, feldspar, hornblende, epidote, garnet, chert, shale, sandstone, basalt, polycrystalline quartz; 20 µm to 4 mm, poorly-sorted, rounded (most large grains) to angular (smaller grains); many grains show evidence of weathering;

Groundmass - see #623;

Textural pedofeatures - see #623;

Amorphous pedofeatures - see #623.

#### #625 (709-716 cm) 4BCtgb

Peds - very weak subangular blocks, to apedal (poor quality of slide hindered accurate descriptions);

Pores - total porosity 15-20%; planar voids (80%), 25 µm to 1 mm wide, most are curved, some are zigzagged; channels and/or vughs (20%), 0.5-5 mm in diameter;

Microstructure - very weak subangular, or massive;

Coarse materials (c/f<sub>20µm</sub>) - see #624; unsorted;

Groundmass - single-spaced porphyric RDP, (also single-spaced porphyric RDP, c/f<sub>62µm</sub>); dominantly mozaic-speckled b-fabric, consisting of flecks of oriented clay 15-20 µm wide by 15-70 µm long; secondary granostriated b-fabric, with bands of oriented clay up to 40 µm wide around coarse grains;

Textural pedofeatures - see #623;

Amorphous pedofeatures - abundant ferrug. mottles, weakly impregnated, 2-7 mm in diameter, most touch adjacent mottles; occasional juxtaposed Mn oxide coatings.

#626 (808-815 cm) 5C

Peds - apedal;

Pores - total porosity 5-10%; planar voids (70%), 15-600  $\mu\text{m}$  wide, fully accommodated, most are subhorizontal, many appear to be drying artifacts; vughs (15%); channels (5%); complex packing voids (10%), 10-30  $\mu\text{m}$  wide, smooth walls, occur between large sand grains and the soil matrix, probably drying artifacts;

Microstructure - massive;

Coarse materials ( $c/f_{20\mu\text{m}}$ ) - quartz, plagioclase, K-feldspar, biotite, granite, basalt, schist, quartzite, chert, sandstone, limestone; 20  $\mu\text{m}$  to 4 mm in diameter, unsorted, subangular to subrounded;

Groundmass - see #625;

Textural pedofeatures - rare microlaminated clay coatings (significantly fewer than in #625);

Crystalline pedofeatures - calcitic crack fillings in upper part of thin section, 250-1500  $\mu\text{m}$  wide, with individual crystals 10-20  $\mu\text{m}$  in diameter, very high birefringence;

Amorphous pedofeatures - occasional ferrug. nodules, highly variable in size and degree of impregnation; abundant ferrug. mottles (see #625 for description); common Mn oxide mottles; occasional Mn oxide coatings.

#627 (909-914 cm) 5C

Peds, pores, microstructure, and coarse materials same as #626;

Groundmass - single-spaced porphyric RDP, (also single-spaced porphyric RDP,  $c/f_{62\mu\text{m}}$ ); mozaic-speckled and crystallitic b-fabrics;

Textural pedofeatures - none;

Crystalline pedofeatures - typic calcitic nodules, 80  $\mu\text{m}$ -1.2 mm in diameter, rounded, spherical or prolate, sharp boundaries with soil matrix; crystals are equigranular, anhedral, 10-50  $\mu\text{m}$  in diameter, but of uniform size within a given nodule; a few of the nodules are cracked or vughy;

Amorphous pedofeatures - occasional ferrug. nodules (see #626); occasional Mn oxide nodules.

Table 8. Particle-size and organic carbon data, Profiles 1-5.

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)					Particle size distribution (%)					Fine Clay <0.2µm %	Silt Ratios			Gravel Content >2mm %	Organic Carbon %
			2mm - 1mm	1mm - 500µm	500µm - 250µm	250µm - 106µm	106µm - 62µm	Sand 2mm - 62µm	Silt 62µm - 20µm	20µm - 2µm	Clay <2µm	2-20µm		20-62µm	16-31µm	31-62µm		
PROFILE 1 (West Section)																		
1-20	1	255-290	*	*	*	*	*	0.6	34.8	38.9	25.7	*	*	1.1	*	*	*	
1-21	1	290-323	*	*	*	*	*	0.5	36.2	39.2	24.0	*	*	1.1	2.0	*	*	
1-22	1	323-350	*	*	*	*	*	0.5	37.7	39.8	22.0	*	*	1.1	2.2	*	*	
1-23	1	350-373	*	*	*	*	*	0.4	33.2	40.8	25.5	*	*	1.2	2.8	*	*	
1-24	1	373-394	*	*	*	*	*	1.2	27.1	41.4	30.3	19.0	*	1.5	3.5	*	*	
1-25	2	394-404	*	*	*	*	*	1.1	22.7	41.9	34.3	23.5	*	1.9	*	*	*	
1-26	2	404-425	*	*	*	*	*	2.6	23.5	34.4	39.4	28.3	*	1.5	2.2	*	*	
1-27	2	425-446	*	*	*	*	*	2.7	23.4	33.0	40.9	32.4	*	1.4	2.0	*	*	
1-28	2	446-467	*	*	*	*	*	2.7	23.0	32.5	41.8	30.6	*	1.4	2.0	*	*	
1-29	3	467-488	*	*	*	*	*	2.3	23.0	32.5	42.1	31.9	*	1.4	2.1	*	*	
1-30	3	488-509	*	*	*	*	*	4.0	23.2	30.5	42.2	29.8	*	1.3	2.1	*	*	
1-31	3	509-530	*	*	*	*	*	2.4	21.4	30.9	45.2	34.9	*	1.4	1.8	*	*	
1-32	3	530-551	*	*	*	*	*	2.7	18.4	27.2	51.7	34.8	*	1.5	1.9	*	*	
1-33	3	551-572	0.6	9.1	24.6	45.3	20.4	2.9	18.5	26.7	51.8	38.1	*	1.4	2.0	*	*	
1-34	3	572-593	1.8	6.3	25.2	46.2	20.4	3.0	20.3	28.7	47.9	29.0	*	1.4	1.9	*	*	
1-35	3	593-614	2.2	8.1	26.3	44.1	19.3	4.7	20.1	27.3	47.9	28.2	*	1.4	2.0	*	*	
1-36	3	614-635	1.6	6.4	28.4	46.0	17.6	4.7	19.7	26.6	49.0	33.7	*	1.4	1.7	*	*	
1-37	3	635-656	2.0	8.2	26.9	45.2	17.7	5.0	21.0	26.3	47.7	33.2	*	1.3	1.7	*	*	
1-38	4	656-677	1.7	7.5	27.5	45.7	17.6	5.9	19.5	26.5	48.1	30.0	*	1.4	2.1	*	*	
1-39	4	677-698	1.0	6.8	27.3	46.7	18.1	5.9	19.3	28.8	45.9	32.1	*	1.5	1.9	*	*	
1-40	4	698-719	0.5	7.3	27.2	47.1	17.9	6.6	19.0	27.0	47.4	26.5	*	1.4	2.0	t	*	
1-41	4	719-740	0.5	7.1	28.0	47.1	17.2	8.8	18.9	25.6	46.6	*	*	1.4	1.7	*	*	
1-42	4	740-761	1.6	7.3	27.0	47.8	16.2	10.9	18.7	26.1	44.2	32.2	*	1.4	1.8	0.1	*	
1-43	4	761-782	1.5	7.0	27.9	47.8	15.7	15.6	15.1	25.7	43.6	*	*	1.7	1.6	t	*	
1-44	4	782-797	1.4	7.0	27.4	47.4	16.9	17.8	14.7	26.3	41.2	26.5	*	1.8	*	1.0	*	
PROFILE 1 (East Section)																		
1-45	4	782-797	5.0	11.0	25.4	43.1	15.6	33.5	14.8	19.4	32.2	*	*	1.3	1.4	*	*	
1-46	5	797-827	6.5	12.4	27.4	41.1	12.6	44.7	13.5	16.9	24.9	15.1	*	1.3	1.0	5.1	*	
1-47 (Krot)		797-827	4.1	8.8	25.9	44.8	16.3	21.6	14.1	25.7	38.6	*	*	1.8	*	*	*	

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)				Particle size distribution (%)				Fine Clay		Gravel Content >2mm %	Organic Carbon %		
			Sand size fractions (%)				Particle size distribution (%)				Fine Clay					
			2mm-1mm	1mm-500µm	500µm-250µm	250µm-106µm	106µm-62µm	Sand 2mm-62µm	Silt 62-20µm	Clay <2µm	Clay <0.2µm					
PROFILE 1 (East Section) - continued																
1-48	5	827-857	4.9	11.4	27.9	43.1	12.6	43.5	13.3	17.9	25.2	*	1.3	1.1	2.0	*
1-49	5	857-876	5.1	11.4	27.6	43.3	12.6	45.8	13.4	17.8	23.0	*	1.3	0.9	3.4	*
1-50	5	876-899	3.8	10.6	27.1	44.7	13.8	40.8	14.3	18.5	26.4	*	1.3	1.0	1.9	*
1-51	5	899-925	4.7	9.9	26.1	45.1	14.3	39.8	14.8	19.1	26.2	*	1.3	1.1	*	*
1-52	5	925-951	5.4	9.9	25.5	45.4	14.0	37.9	15.9	20.8	25.4	*	1.3	1.1	4.1	*
1-53	5	951-977	3.7	8.8	24.6	48.1	14.7	36.3	15.7	21.2	26.8	*	1.4	*	*	*
1-54	5	977-1000	4.6	10.1	22.6	47.4	15.2	36.6	17.8	21.3	24.3	*	1.2	0.8	3.5	*
1-55	5	1000-1023	*	*	*	*	*	35.4	18.1	22.2	24.2	*	1.2	*	*	*
1-56	5	1023-1046	*	*	*	*	*	35.6	19.0	22.5	22.9	*	1.2	0.9	3.4	*
1-57	5	1046-1069	*	*	*	*	*	34.7	17.9	23.0	24.2	*	1.3	*	*	*
PROFILE 2																
2-1	1	0-4	*	*	*	*	*	1.6	29.5	31.6	37.3	*	1.1	*	*	*
2-2	1	4-13	*	*	*	*	*	1.0	25.7	35.0	38.3	*	1.4	*	*	*
2-3	1	13-29	*	*	*	*	*	1.1	25.3	33.8	39.8	*	1.3	*	*	*
2-4	1	29-46	*	*	*	*	*	1.0	26.2	31.7	41.0	*	1.2	*	*	*
2-5	1	46-59	*	*	*	*	*	1.5	27.2	34.0	37.3	*	1.3	*	*	*
2-6	1	59-72	*	*	*	*	*	0.8	29.4	33.7	36.0	*	1.2	*	*	*
2-7	1	72-89	*	*	*	*	*	1.0	27.8	35.7	35.4	*	1.3	*	*	*
2-8	1	89-106	*	*	*	*	*	0.5	28.3	35.2	35.9	*	1.2	*	*	*
2-9	1	106-117	*	*	*	*	*	0.4	29.7	36.2	33.6	*	1.2	*	see	*
2-10	1	117-128	*	*	*	*	*	0.4	31.3	35.0	33.3	*	1.1	*	Table	*
2-12	1	145-160	*	*	*	*	*	0.2	33.3	37.0	29.5	*	1.1	*	*	*
2-14	1	175-190	*	*	*	*	*	0.3	32.6	39.8	27.3	*	1.2	*	*	*
2-17	1	220-235	*	*	*	*	*	0.5	37.2	36.5	25.8	*	1.0	*	9	*
2-20	1	265-281	*	*	*	*	*	0.9	38.0	38.4	22.7	*	1.0	2.3	*	*
2-23	1	315-330	*	*	*	*	*	0.2	32.3	40.9	26.6	*	1.3	2.7	*	*
2-24	1	330-345	*	*	*	*	*	0.4	29.9	42.5	27.2	*	1.4	2.9	0.10	0.10
2-25	1	345-361	*	*	*	*	*	0.6	24.7	41.7	33.0	*	1.7	4.6	0.12	0.12
2-26	2	361-370	*	*	*	*	*	0.8	23.8	44.3	31.0	*	1.9	*	0.14	0.14
2-27	2	370-373	*	*	*	*	*	1.0	21.5	40.5	36.9	*	1.9	3.3	0.20	0.20

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)					Particle size distribution (%)				Fine Clay		Gravel Content >2mm %	Organic Carbon %	
			2mm-1mm	500µm	1mm-500µm	500-250µm	250-106µm	106-62µm	Sand 2mm-62µm	Silt		Clay <2µm	Clay <0.2µm %			
										62-20µm	20-2µm					
PROFILE 2 - continued																
2-28	3	373-382	*	*	*	*	*	2.2	21.9	33.6	42.3	*	1.5	*		0.11
2-29	3	382-401	*	*	*	*	*	2.4	20.5	32.5	44.5	*	1.6	2.9		0.07
2-30	3	401-415	*	*	*	*	*	2.4	20.3	29.7	47.5	*	1.5	2.5		0.07
2-31	3	415-429	*	*	*	*	*	2.5	20.2	31.5	45.7	*	1.6	2.5		0.04
2-32	3	429-443	*	*	*	*	*	3.2	27.0	28.3	41.5	*	1.1	2.2		0.02
2-33	3	443-458	*	*	*	*	*	2.8	20.0	27.8	49.3	*	1.4	1.8		0.03
2-34	3	458-473	*	*	*	*	*	2.1	17.3	26.1	54.5	*	1.5	2.0		0.04
2-35	3	473-488	*	*	*	*	*	2.2	18.8	25.5	53.5	*	1.4	*		0.03
2-36	3	488-500	*	*	*	*	*	2.3	18.0	26.1	53.5	*	1.5	2.3		0.02
2-37	3	500-513	*	*	*	*	*	2.7	19.9	26.6	50.8	*	1.3	*		0.04
2-38	3	513-527	*	*	*	*	*	3.4	20.8	28.0	47.7	*	1.4	1.9		0.03
2-39	3	527-541	*	*	*	*	*	3.6	21.8	28.0	46.6	*	1.3	*		0.03
2-40	3	541-557	*	*	*	*	*	3.6	21.1	28.9	46.4	*	1.4	1.9	see	0.05
2-41	3	557-573	*	*	*	*	*	3.8	21.2	28.1	46.8	*	1.3	*		0.04
2-42	3	573-590	*	*	*	*	*	3.8	20.6	28.5	47.0	*	1.4	2.2	Table	0.03
2-43	3	590-607	*	*	*	*	*	4.1	20.6	29.1	46.2	*	1.4	*		0.03
2-44	3	607-622	*	*	*	*	*	4.8	19.3	28.3	47.5	*	1.5	2.0	9	0.02
2-45	3	622-637	*	*	*	*	*	5.2	18.3	28.8	47.7	*	1.6	*		0.02
2-46	3	637-652	*	*	*	*	*	6.7	18.4	27.5	47.4	*	1.5	2.1		0.02
2-47	3	652-668	*	*	*	*	*	6.7	18.5	28.1	46.7	*	1.5	2.3		0.02
2-48	3	668-684	*	*	*	*	*	8.8	18.8	26.8	45.5	*	1.4	2.2		0.02
2-49	4	684-699	*	*	*	*	*	11.0	19.0	25.4	44.6	*	1.3	2.0		0.04
2-50	4	699-714	*	*	*	*	*	12.6	18.7	24.6	44.1	*	1.3	1.9		0.04
2-51	4	714-729	*	*	*	*	*	12.4	18.5	24.3	44.8	*	1.3	2.3		0.02
2-52	4	729-744	*	*	*	*	*	12.6	18.2	24.7	44.4	*	1.4	1.8		0.01
2-53	4	744-759	*	*	*	*	*	13.5	15.0	25.0	46.5	*	1.7	2.0		0.03
2-54	4	759-774	*	*	*	*	*	16.1	15.0	24.4	44.5	*	1.6	*		0.03
2-55	5	774-789	*	*	*	*	*	17.9	15.5	23.6	42.9	*	1.5	1.7		0.01
2-56	5	789-810	*	*	*	*	*	21.1	15.6	22.9	40.4	*	1.5	1.7		0.03
2-57	5	810-850	*	*	*	*	*	32.1	13.8	16.6	37.4	*	1.2	1.2		0.03
2-58	5	850-875	*	*	*	*	*	39.1	13.0	18.0	29.9	*	1.4	1.0		*



Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)				Particle size distribution (%)				Fine Clay <0.2µm %	Silt Ratios			Gravel Content >2mm %	Organic Carbon %
			2mm-1mm	500µm-1mm	250µm-500µm	106µm-250µm	62µm-106µm	Sand 2mm-62µm	Silt 62-20µm	20-2µm		Clay <2µm	2-20µm	16-31µm		
PROFILE 2 – continued																
2-59	5	875-900	*	*	*	*	*	40.5	13.6	18.0	27.9	*	*	1.3	*	*
2-60	5	900-920	*	*	*	*	*	41.0	14.2	18.7	26.1	*	*	1.3	0.9	*
PROFILE 3																
3-1	1	0-8	*	*	*	*	*	3.6	30.9	30.2	35.3	*	*	1.0	*	2.34
3-2	1	8-15	*	*	*	*	*	0.6	32.0	31.0	36.4	*	*	1.0	1.4	2.49
3-3	1	15-28	*	*	*	*	*	0.2	30.7	31.0	38.1	*	*	1.0	1.5	0.86
3-4	1	28-38	*	*	*	*	*	0.2	29.9	31.8	38.1	*	*	1.1	2.2	0.91
3-5	1	38-52	*	*	*	*	*	0.3	29.5	32.1	38.0	*	*	1.1	1.9	0.55
3-6	1	52-65	*	*	*	*	*	0.4	29.6	30.4	39.5	*	*	1.0	1.8	0.87
3-7	1	65-76	*	*	*	*	*	0.5	29.9	29.3	40.3	*	*	1.0	1.8	0.27
3-8	1	76-89	*	*	*	*	*	0.8	31.5	30.4	37.2	*	*	1.0	2.0	0.17
3-9	1	89-112	*	*	*	*	*	0.6	32.5	32.4	34.4	*	*	1.0	2.0	0.13
3-10	1	112-122	*	*	*	*	*	1.0	31.9	33.6	33.5	*	*	1.1	2.0	0.11
3-11	1	122-140	*	*	*	*	*	0.5	34.3	34.0	31.2	*	*	1.0	2.0	0.09
3-12	1	140-158	*	*	*	*	*	0.5	35.9	34.5	29.1	*	*	1.0	2.3	0.09
3-13	1	158-175	*	*	*	*	*	2.1	32.9	34.5	30.5	*	*	1.1	2.1	0.11
3-14	1	175-191	*	*	*	*	*	3.7	35.9	33.6	26.8	*	*	0.9	1.8	0.09
3-15	1	191-218	*	*	*	*	*	0.8	37.2	36.2	25.8	*	*	1.0	2.4	0.06
3-16	1	218-246	*	*	*	*	*	1.9	31.0	40.0	27.0	*	*	1.3	2.9	0.11
3-17	1	246-275	*	*	*	*	*	0.1	23.4	45.5	31.0	*	*	1.9	3.8	0.15
3-18	2	275-287	1.1	6.9	18.3	35.2	38.6	0.4	18.8	37.7	43.0	*	*	2.0	2.3	0.29
3-19	3	287-300	*	*	*	*	*	1.0	15.5	30.0	53.5	*	*	1.9	2.0	0.26
3-20	3	300-315	1.7	7.9	23.6	42.1	24.6	1.4	16.3	30.9	51.3	*	*	1.9	2.1	0.16
3-21	3	315-330	*	*	*	*	*	1.9	18.5	30.7	48.8	*	*	1.7	2.1	0.14
3-22	3	330-348	1.9	6.4	23.9	44.4	23.4	2.3	19.6	27.6	50.4	*	*	1.4	1.9	0.08
3-23	3	348-366	1.4	6.9	23.2	44.0	24.5	2.2	17.3	27.2	53.3	*	*	1.6	1.9	0.08
3-24	3	366-384	0.8	5.2	20.7	44.3	29.1	2.4	21.9	26.6	49.0	*	*	1.2	1.9	0.07
3-25	3	384-391	0.3	7.2	23.3	44.0	25.3	2.6	19.3	25.4	52.7	*	*	1.3	1.9	0.06
3-26	3	391-404	0.9	7.5	24.9	43.6	23.1	2.8	18.0	25.9	53.2	*	*	1.4	1.9	0.08

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)				Particle size distribution (%)				Fine Clay <0.2μm %	Silt Ratios			Gravel Content >2mm %	Organic Carbon %	
			2mm-1mm	1mm-500μm	500-250μm	250-106μm	Sand 2mm-62μm	Silt 62-20μm	20-2μm	Clay <2μm		2-20μm	16-31μm	31-62μm			
PROFILE 3 - continued																	
3-27	3	404-419	1.4	6.5	25.7	44.6	21.8	3.1	16.2	24.3	56.4	*	1.5	1.9	*	0.07	
3-28	3	419-434	1.3	6.4	24.4	45.0	22.9	2.5	16.2	26.3	55.0	*	1.6	1.9	*	0.06	
3-29	3	434-452	2.6	6.8	26.1	43.4	21.0	2.8	17.7	27.3	52.1	*	1.5	2.1	*	0.04	
3-30	3	452-467	2.5	7.8	25.8	43.6	20.3	3.2	19.1	26.3	51.4	*	1.4	2.0	*	0.02	
3-31	3	467-483	0.3	6.9	27.6	45.4	19.8	3.1	20.3	26.3	50.3	*	1.3	2.0	*	0.02	
3-32	3	483-498	1.6	8.4	26.3	43.5	20.2	3.1	22.8	26.8	47.3	*	1.2	2.0	*	0.03	
3-33	3	498-513	1.9	7.2	28.0	44.5	18.4	3.7	17.8	27.4	51.1	*	1.5	1.8	*	0.02	
3-34	3	513-531	1.7	8.5	28.2	44.9	16.6	5.6	21.2	26.9	46.3	*	1.3	1.7	†	0.01	
3-35	3	531-549	1.9	9.0	28.2	44.6	16.3	6.5	21.2	25.8	46.5	*	1.2	1.7	†	0.02	
3-36	3	549-561	2.2	8.9	28.1	44.9	16.0	6.6	19.7	25.2	48.4	*	1.3	1.5	†	0.07	
3-37	3	561-574	2.2	8.8	27.5	43.2	18.3	6.8	19.6	25.3	48.2	*	1.3	1.4	†	0.07	
3-38	3	574-587	3.8	10.4	29.7	40.7	15.4	9.9	16.0	26.5	47.5	*	1.7	1.4	0.3	0.01	
3-39	3	587-599	1.9	9.2	30.7	47.2	10.9	9.2	17.9	24.8	48.1	*	1.4	1.4	†	0.02	
3-40	3	599-615	2.6	9.8	28.1	45.2	14.2	12.1	20.2	21.1	46.6	*	1.0	1.2	0.1	0.02	
3-41	4	615-630	3.2	10.4	28.9	44.3	13.2	15.7	20.0	20.8	43.5	*	1.0	1.2	0.2	0.01	
3-42	4	630-645	3.3	10.9	30.2	45.0	10.7	14.6	19.1	22.0	44.3	*	1.2	1.4	0.4	0.02	
3-43	4	645-660	1.3	9.1	28.5	44.0	17.1	16.8	17.3	22.0	43.9	*	1.3	1.2	0.1	0.01	
3-44	4	660-676	2.7	9.6	30.2	45.1	12.4	18.7	18.9	20.2	42.2	*	1.1	1.1	0.1	0.01	
3-45	4	676-691	2.9	11.2	29.5	43.0	13.4	24.5	18.3	17.9	39.3	*	1.0	1.1	0.4	0.01	
3-46	5	691-716	17.2	18.9	22.1	32.6	9.2	40.2	16.1	12.1	31.5	*	0.8	0.7	4.0	0.00	
3-47	5	716-747	7.0	14.6	27.0	40.7	10.7	44.8	15.5	13.7	26.0	*	0.9	0.6	2.3	0.03	
3-48	5	747-777	6.3	11.2	28.2	43.9	10.4	41.6	17.8	13.9	26.7	*	0.8	0.6	1.5	0.03	
3-49	5	777-803	4.2	10.4	27.3	44.4	13.6	38.5	16.6	16.1	28.8	*	1.0	0.7	*	*	
3-50	5	803-826	4.6	10.7	25.7	43.7	15.3	39.9	15.5	17.8	26.7	*	1.2	0.6	2.1	0.01	
3-51	5	826-853	*	*	*	*	*	41.3	15.1	18.0	25.6	*	1.2	0.6	1.9	*	
3-52	5	853-884	4.3	10.7	26.7	42.8	15.5	39.8	16.3	19.1	24.7	*	1.2	*	*	*	
3-53	5	884-914	*	*	*	*	*	39.1	16.1	19.5	25.3	*	1.2	0.7	2.7	*	
3-54	5	914-945	*	*	*	*	*	40.0	15.7	19.2	25.1	*	1.2	*	*	0.01	
3-55	5	945-975	5.0	9.6	24.9	44.9	15.6	37.4	16.7	18.5	27.3	*	1.1	*	2.0	*	

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)					Particle size distribution (%)					Fine Clay		Gravel Content >2mm %	Organic Carbon %	
			2mm-1mm	1mm-500µm	500-250µm	250-106µm	106-62µm	Sand 2mm-62µm	Silt		Clay <2µm	Clay <0.2µm %					
									62-20µm	20-2µm							
PROFILE 4																	
4-1	1	0-5	*	*	*	*	*	4.3	28.1	42.5	25.0	*	1.5	*	*	*	
4-2	1	5-16	*	*	*	*	*	1.1	27.2	31.7	40.0	*	1.2	*	*	*	
4-3	1	16-31	*	*	*	*	*	1.3	26.0	31.8	40.8	*	1.2	*	*	*	
4-4	1	31-47	*	*	*	*	*	1.2	26.1	31.8	40.9	*	1.2	*	*	*	
4-5	1	47-63	*	*	*	*	*	1.0	24.6	31.4	42.9	*	1.3	*	*	*	
4-6	1	63-84	*	*	*	*	*	1.5	26.1	32.6	39.8	*	1.3	*	*	*	
4-7	1	84-101	*	*	*	*	*	0.9	27.9	33.4	37.7	*	1.2	*	*	*	
4-8	1	101-118	*	*	*	*	*	0.9	29.4	32.9	36.7	*	1.1	*	*	*	
4-9	1	118-136	*	*	*	*	*	0.7	31.9	32.5	34.9	*	1.0	*	*	*	
4-10	1	136-164	*	*	*	*	*	0.4	33.9	34.2	31.4	*	1.0	*	*	*	
4-11	1	164-167	*	*	*	*	*	0.7	30.7	32.5	36.1	*	1.1	*	*	*	
4-12	1	167-186	*	*	*	*	*	0.3	33.3	36.3	30.0	*	1.1	*	*	*	
4-13	1	186-205	*	*	*	*	*	0.3	32.7	36.8	30.1	*	1.1	*	*	*	
4-15	1	226-247	*	*	*	*	*	0.4	36.2	35.2	28.1	*	1.0	*	*	*	
4-17	1	267-287	*	*	*	*	*	0.5	37.0	36.2	26.3	*	1.0	*	*	*	
4-18	1	287-306	*	*	*	*	*	0.6	37.0	36.6	25.8	*	1.0	2.0	*	*	
4-19	1	306-323	*	*	*	*	*	0.2	30.3	39.4	30.1	*	1.3	*	*	*	
4-20	1	323-341	*	*	*	*	*	0.2	29.0	42.2	28.6	*	1.5	2.9	*	0.12	
4-21	2	341-346	*	*	*	*	*	0.9	19.0	34.6	45.5	*	1.8	2.3	*	0.31	
4-22	2	346-355	*	*	*	*	*	0.8	18.2	33.6	47.3	*	1.9	*	*	0.32	
4-23	2	355-365	*	*	*	*	*	1.4	14.5	24.8	59.2	*	1.7	1.6	*	0.18	
4-24	3	365-375	*	*	*	*	*	1.3	14.1	24.5	60.0	*	1.7	*	*	0.18	
4-25	3	375-389	*	*	*	*	*	1.4	14.5	24.5	59.6	*	1.7	2.0	*	0.19	
4-26	3	389-403	*	*	*	*	*	1.4	14.5	24.5	60.1	*	1.7	*	*	0.18	
4-27	3	403-415	*	*	*	*	*	1.8	13.6	27.7	56.8	*	2.0	1.6	*	0.16	
4-28	3	415-427	*	*	*	*	*	1.8	16.2	24.9	57.0	*	1.5	*	*	0.12	
4-29	3	427-441	*	*	*	*	*	1.7	14.5	26.8	57.0	*	1.9	1.9	*	0.11	
4-30 (krot)	441-446		*	*	*	*	*	1.9	15.8	27.0	55.2	*	1.7	*	*	0.21	
4-31	3	441-453	*	*	*	*	*	2.3	17.0	26.5	54.1	*	1.6	1.8	*	0.11	
4-32	3	453-468	*	*	*	*	*	2.9	18.5	27.3	51.2	*	1.5	*	*	0.08	

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)				Particle size distribution (%)				Fine Clay		Silt Ratios		Gravel Content >2mm %	Organic Carbon %	
			2mm-1mm	500µm	250µm	106µm	250-106µm	Sand 2mm-62µm	Silt 62-20µm	20-2µm	Clay <2µm	Clay %	2-20µm	16-31µm			
PROFILE 4 - continued																	
4-33	3	468-482	*	*	*	*	*	2.9	17.6	25.1	54.3	*	*	1.4	1.7	*	0.07
4-34	3	482-496	*	*	*	*	*	2.8	18.5	27.3	51.3	*	*	1.5	*	*	0.08
4-35	3	496-510	*	*	*	*	*	3.3	20.9	27.6	48.1	*	*	1.3	1.9	*	0.07
4-36	3	510-525	*	*	*	*	*	4.0	21.3	27.4	47.2	*	*	1.3	*	*	0.04
4-37	3	525-540	*	*	*	*	*	3.8	20.8	27.4	47.9	*	*	1.3	1.9	*	0.07
4-38	3	540-555	*	*	*	*	*	4.1	21.5	28.1	46.3	*	*	1.3	*	*	0.05
4-39	3	555-569	*	*	*	*	*	5.0	20.6	28.1	46.3	*	*	1.4	2.0	*	0.07
4-40	3	569-582	*	*	*	*	*	5.6	20.4	27.5	46.5	*	*	1.4	*	*	0.08
4-41	3	582-596	*	*	*	*	*	5.8	20.9	27.4	45.8	*	*	1.3	1.6	*	0.06
4-42	3	596-610	*	*	*	*	*	6.9	19.2	27.8	46.1	*	*	1.5	*	*	0.06
4-43	3	610-626	*	*	*	*	*	7.0	18.4	29.1	45.4	*	*	1.6	1.8	0.1	0.06
4-44	3	626-643	*	*	*	*	*	7.9	18.2	27.5	46.3	*	*	1.5	*	*	0.07
4-45	3	643-660	*	*	*	*	*	6.7	18.4	28.8	46.1	*	*	1.6	1.9	†	0.05
4-46	3	660-677	*	*	*	*	*	6.7	18.8	28.9	45.6	*	*	1.5	*	0.1	*
4-47	4	677-692	*	*	*	*	*	10.4	19.2	25.0	45.3	*	*	1.3	1.5	0.1	*
4-48	4	692-707	*	*	*	*	*	10.1	19.1	25.8	45.0	*	*	1.4	*	†	0.05
4-49	4	707-722	*	*	*	*	*	10.8	17.9	27.0	44.2	*	*	1.5	1.7	0.1	*
4-50	4	722-736	*	*	*	*	*	11.3	17.2	26.9	44.5	*	*	1.6	*	0.1	*
4-51	4	736-750	*	*	*	*	*	12.5	17.0	26.5	44.0	*	*	1.6	1.5	†	0.05
4-52	4	750-765	*	*	*	*	*	16.9	17.7	23.2	42.1	*	*	1.3	*	0.1	*
4-53	4	765-780	*	*	*	*	*	20.1	17.0	21.2	41.7	*	*	1.3	1.1	0.1	*
4-54	5	780-795	*	*	*	*	*	*	*	*	*	*	*	*	*	0.4	0.05
4-55	5	795-810	*	*	*	*	*	26.7	15.0	16.4	41.9	*	*	1.1	1.1	0.9	*
4-57	5	830-850	*	*	*	*	*	31.8	15.6	15.6	37.0	*	*	1.0	*	0.4	0.04
4-58	5	850-870	*	*	*	*	*	*	*	*	*	*	*	*	*	1.0	*
4-59	5	870-890	*	*	*	*	*	33.5	16.5	16.2	33.8	*	*	1.0	1.0	1.9	*
4-60	5	890-920	*	*	*	*	*	*	*	*	*	*	*	*	*	2.8	*
4-61	5	920-950	*	*	*	*	*	34.0	15.2	17.0	33.7	*	*	1.1	*	2.5	*
4-62	5	950-970	*	*	*	*	*	*	*	*	*	*	*	*	*	2.0	*
4-63	5	970-1000	*	*	*	*	*	38.9	15.4	15.2	30.4	*	*	1.0	*	1.4	*
4-65	5	1020-1040	*	*	*	*	*	38.6	15.5	17.2	28.7	*	*	1.1	*	2.2	*

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)				Particle size distribution (%)				Fine Clay		Gravel Content >2mm %	Organic Carbon %		
			2mm-1mm	500µm-1mm	Sand size fractions (%)		Sand 2mm-62µm	Silt		Clay <2µm	Clay <0.2µm %					
					250µm-500µm	106µm-250µm		62µm-106µm	20µm-62µm			2µm-20µm				
PROFILE 5																
5-1	1	0-13	*	*	*	*	*	*	3.0	29.5	34.3	33.2	*	1.2	*	2.38
5-2	1	13-28	*	*	*	*	*	*	1.6	26.2	35.2	37.0	*	1.3	1.5	1.84
5-3	1	28-41	*	*	*	*	*	*	1.8	25.4	33.4	39.3	*	1.3	*	1.12
5-4	1	41-51	*	*	*	*	*	*	1.2	24.6	33.8	40.4	*	1.4	1.5	0.84
5-5	1	51-66	*	*	*	*	*	*	1.7	25.7	33.1	39.5	*	1.3	*	0.47
5-6	1	66-74	*	*	*	*	*	*	1.0	26.8	34.1	38.1	*	1.3	1.8	0.36
5-7	1	74-84	*	*	*	*	*	*	1.4	27.3	34.2	37.0	*	1.3	*	0.29
5-8	1	84-102	*	*	*	*	*	*	1.1	27.1	35.7	36.1	*	1.3	2.0	0.23
5-9	1	102-119	*	*	*	*	*	*	1.4	29.5	35.1	33.9	*	1.2	*	0.14
5-10	1	119-140	*	*	*	*	*	*	0.9	30.9	37.0	31.2	*	1.2	1.8	0.07
5-11	1	140-155	*	*	*	*	*	*	0.7	33.4	36.0	29.9	*	1.1	*	0.08
5-12	1	155-170	*	*	*	*	*	*	1.2	36.2	35.6	27.0	*	1.0	1.9	0.04
5-13	1	170-183	*	*	*	*	*	*	0.5	33.7	38.6	27.2	*	1.2	*	0.08
5-14	1	183-198	*	*	*	*	*	*	0.7	34.4	38.5	26.4	*	1.1	2.3	0.05
5-15	1	198-213	*	*	*	*	*	*	0.5	35.5	37.4	26.5	*	1.1	*	0.07
5-16	1	213-234	*	*	*	*	*	*	0.6	35.6	38.6	25.2	*	1.1	1.8	0.05
5-17	1	234-254	*	*	*	*	*	*	0.3	37.4	36.8	25.4	*	1.0	*	0.06
5-18	1	254-269	*	*	*	*	*	*	1.0	38.4	36.5	24.1	*	1.0	2.0	0.06
5-19	1	269-285	*	*	*	*	*	*	0.7	37.0	37.0	25.3	*	1.0	1.9	0.08
5-20	1	285-305	*	*	*	*	*	*	0.8	39.2	35.7	24.2	*	0.9	2.0	0.06
5-21	1	305-325	*	*	*	*	*	*	0.5	44.2	32.6	22.7	*	0.7	2.1	0.12
5-22	1	325-343	*	*	*	*	*	*	0.7	38.7	34.8	25.8	*	0.9	2.6	0.05
5-23	1	343-361	*	*	*	*	*	*	0.5	32.8	39.6	27.1	14.5	1.2	3.2	0.08
5-24	1	361-376	*	*	*	*	*	*	0.2	28.3	42.3	29.2	17.8	1.5	2.9	0.11
5-25	2	376-389	*	*	*	*	*	*	0.6	23.2	44.7	31.5	18.8	1.9	3.0	0.14
5-26	2	389-414	0.7	10.0	26.0	42.3	21.0	*	1.9	26.7	39.7	31.6	21.4	1.5	2.5	0.14
5-27	2	404-422	4.9	13.4	25.0	37.3	19.4	*	3.1	24.9	35.2	36.8	24.7	1.4	2.0	0.12
5-28	3	422-442	7.6	16.1	24.2	34.9	17.2	*	4.2	24.4	32.7	38.7	27.0	1.3	2.3	0.09
5-29	3	442-455	*	*	*	*	*	*	4.0	23.5	30.2	42.3	29.2	1.3	2.1	0.08
5-30	3	455-467	6.7	11.6	22.1	38.9	20.8	*	3.3	21.2	29.0	46.4	34.4	1.4	2.0	0.06

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)					Particle size distribution (%)					Fine Clay		Gravel Content >2mm %	Organic Carbon %	
			2mm-1mm	500µm		250µm		106-62µm	Sand 2mm-62µm	Silt		Clay <2µm	Clay <0.2µm %	Silt Ratios			
				1mm-500µm	1mm-500µm	500µm-250µm	250µm-106µm			62-20µm	20-2µm			2-20µm			16-31µm
PROFILE 5 - continued																	
5-31	3	467-480	*	*	*	*	*	3.7	23.7	30.3	42.3	29.7	1.3	2.0	*	0.08	
5-32	3	480-493	6.1	11.6	22.5	38.4	21.5	3.3	23.1	30.1	43.4	32.8	1.3	2.2	*	0.16	
5-33	3	493-505	*	*	*	*	*	2.8	17.6	22.8	56.7	38.2	1.3	1.9	*	0.10	
5-34	3	505-518	5.4	12.0	23.8	38.3	20.6	3.8	21.0	23.9	51.2	39.0	1.2	2.0	*	0.14	
5-35	3	518-531	*	*	*	*	*	3.6	21.3	26.1	49.0	31.6	1.2	2.2	*	0.08	
5-36	3	531-544	*	*	*	*	*	3.3	19.4	24.3	52.9	39.3	1.3	2.2	*	0.03	
5-37	3	544-556	3.1	11.5	25.4	40.8	19.1	3.4	19.1	24.0	53.4	31.6	1.3	2.0	*	0.05	
5-38	3	556-569	5.4	11.5	24.4	40.0	19.1	4.1	20.5	24.4	51.0	*	1.2	1.9	*	0.03	
5-39	3	569-582	5.7	12.2	25.2	39.7	17.2	4.8	20.4	24.5	50.2	32.8	1.2	2.1	0.2	0.03	
5-40	3	582-594	6.0	12.5	26.0	39.6	15.9	5.4	20.6	24.5	49.4	*	1.2	1.7	0.4	0.02	
5-41	3	594-610	7.3	13.2	26.3	38.5	14.7	6.8	22.3	24.1	46.7	21.8	1.1	1.7	0.4	0.02	
5-42	4	610-625	6.9	12.2	26.3	39.9	14.7	7.8	21.5	23.9	46.7	*	1.1	1.5	0.4	0.01	
5-43	4	625-640	4.8	13.1	26.2	40.9	15.1	8.8	22.2	23.8	45.1	29.8	1.1	1.5	0.3	0.03	
5-44	4	640-655	5.5	12.4	26.9	40.3	14.8	9.4	20.8	23.9	45.8	*	1.2	1.8	0.3	0.02	
5-45	4	655-671	5.5	13.6	26.7	40.6	13.6	9.8	21.1	23.2	45.8	23.4	1.1	1.7	0.6	0.01	
5-46	4	671-686	6.3	10.1	26.7	41.9	15.0	10.7	30.3	23.0	46.0	*	1.1	1.5	2.7	0.02	
5-47	4	686-701	9.7	13.7	25.3	37.5	13.7	13.3	19.0	21.0	46.6	*	1.1	1.4	0.7	0.03	
5-48	4	701-716	12.4	14.1	24.5	37.1	11.9	17.2	17.9	18.6	46.3	31.5	1.0	1.1	1.2	0.03	
5-49	4	716-737	7.2	14.5	27.0	39.9	11.3	23.3	16.8	17.4	42.5	*	1.1	1.3	1.5	0.01	
5-50	5	737-762	7.2	12.4	25.1	41.3	14.0	30.0	15.6	15.3	39.1	*	1.0	0.8	2.0	0.00	
5-51	5	762-792	5.5	10.8	26.4	42.9	14.4	36.9	15.5	15.7	31.8	21.4	1.0	0.8	2.4	0.02	
5-52	5	792-823	5.9	10.6	26.2	42.9	14.4	39.7	17.0	16.4	26.9	*	1.0	0.9	2.6	*	
5-53	5	823-853	4.0	9.9	27.8	43.2	15.0	37.5	16.2	15.9	30.4	*	1.0	0.9	2.0	*	
5-54	5	853-884	4.0	10.4	26.8	44.1	14.6	39.7	17.5	18.0	24.7	*	1.0	0.9	2.5	0.00	
5-55	5	884-914	6.8	10.6	25.9	41.9	14.9	40.0	16.9	18.0	25.1	*	1.1	*	*	*	
5-56	5	914-945	*	*	*	*	*	39.5	17.5	18.0	25.0	*	1.0	0.9	3.5	*	
5-57	5	945-975	5.6	11.2	25.5	42.4	15.3	39.3	17.5	18.2	25.0	*	1.0	*	*	0.00	
5-58	5	975-1006	*	*	*	*	*	39.3	17.7	18.3	24.7	*	1.0	0.9	2.4	*	
5-59	5	1006-1036	*	*	*	*	*	38.8	18.1	18.0	25.1	*	1.0	*	*	*	
5-60	5	1036-1067	8.6	10.9	25.5	40.9	14.0	39.4	17.3	18.9	24.3	*	1.1	*	2.3	0.01	

Table 8--continued

Sample No.	Depo. Unit	Depth (cm)	Sand size fractions (%)				Particle size distribution (%)				Fine Clay		Gravel Content >2mm %	Organic Carbon %	
			2mm - 1mm	1mm - 500μm	500 - 250μm	250 - 106μm	106 - 62μm	Sand 2mm - 62μm	Silt		Clay <2 μm	Clay <0.2μm %			
									62 - 20μm	20 - 2μm					
PROFILE 5 - continued															
5-61	5	1067-1097	*	*	*	*	*	37.4	17.7	17.7	27.1	*	1.0	*	*
5-62	5	1097-1128	*	*	*	*	*	38.7	17.2	18.3	25.7	*	1.1	*	*
5-63	5	1128-1158	*	*	*	*	*	38.9	17.5	18.3	25.3	*	1.0	*	0.01
5-64	5	1158-1168	*	*	*	*	*	38.2	17.1	18.9	25.7	*	1.1	*	2.2
5-65	5	1168-1209	*	*	*	*	*	39.8	17.1	18.4	24.7	*	1.1	*	*
5-66	5	1209-1240	*	*	*	*	*	38.6	17.5	18.8	25.1	*	1.1	*	0.02
5-67	5	1240-1270	*	*	*	*	*	38.7	17.3	18.2	25.7	*	1.1	*	*
5-68	5	1270-1300	*	*	*	*	*	37.8	17.2	18.4	26.6	*	1.1	*	3.5
5-69	5	1300-1316	*	*	*	*	*	37.9	40.3	11.4	10.4	*	0.3	*	0.01

\* Data not available