GSA Data Repository Item 2018240

McAdams, N.E.B., Cramer, B.D., Bancroft, A.M., Melchin, M.J., Devera, J.A., and Day, J.E., 2018, Integrated $\delta^{13}C_{carb}$, conodont, and graptolite biochemostratigraphy of the Silurian from the Illinois Basin and stratigraphic revision of the Bainbridge Group: GSA Bulletin, https://doi.org/10.1130/B32033.1.

Data Repository

Supplementary Data Repository Item DR-1: Stratigraphic Background of Underlying, Overlying and Correlative Units.

Figure S-1: Outcrop photographs of the Dongola Hollow (DHC) section. (A) St. Clair Formation showing lower and upper halves of the formation. (B) Close-up photograph of recessive clay-rich interval in the middle of the St. Clair Formation.

Figure S-2: Google Earth images of the Jackson, Interstate 55 (I-55) outcrop. (A) Entire outcrop exposure. The lower portion of the outcrop, at left in Panel A, was not sampled in this study. Clear exposure at right of Panel A shown in close up in Panel B. (B) Close up of sampled interval of the I-55 outcrop.

Figure S-3: Geophysical logs of the Schlamer #1 Core. Natural Gamma, in counts per second (cps) and SPR (logarithmic, 2 decades) on left, with Normal Resistivity in Ohm-meters (Ohm-m) of R8, R16, R32, and R64 Normal Resistivity shown at right. Original geophysical data sheets available below the core photographs.

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Table S1: Dongola Hollow (DHC) Isotope Data

Table S2: I-55 Northbound (I-55) Isotope Data

Table S3: Schlamer #1 Drill Core, Alexander County, Illinois, Isotope Data

Supplementary Data Repository Item DR-2: Paleontological Notes

Supplementary Data Repository Item DR-3: Paleontological Notes

Supplementary Data Repository Item DR-4

Supplementary Data Repository Item DR-1

Stratigraphic Background of Underlying, Overlying and Correlative Units.

Sexton Creek Limestone (IL, MO)

The Sexton Creek Limestone (Savage, 1909) was named for hard, dense, gray limestone interlayered with extensive chert in stringers, lenses, and beds. The type section is located along Sexton Creek near Gale, Illinois (Fig. 1C). The Sexton Creek is the oldest Silurian unit in southeastern Missouri and southwestern Illinois, where it is underlain unconformably by the Ordovician Leemon Fm. or Girardeau Limestone Formation. In older reports, the Girardeau was considered Silurian as well, but Thompson and Satterfield (1975) reidentified it as Ordovician based on conodont biostratigraphy, and erected the overlying Leemon Fm. (also Ordovician), the strata of which were previously miscorrelated as the Silurian Edgewood Group (also see Bergström et al., 2006). Strata in northeastern Missouri historically assigned to the Sexton Creek are younger than the type Sexton Creek and more closely correlate with the Joliet Limestone of Illinois (Thompson, 1993). The Sexton Creek unconformably underlies the Seventy-Six Shale. No reliable biostratigraphic information is available from the Sexton Creek in its type area. Conodont samples (Liebe, 1962; Satterfield and Thompson, 1975; Thompson and Satterfield, 1975) yielded only long-ranging coniform taxa, although these authors questionably assigned the formation to the *Icriodina irregularis* Assemblage Zone (Nicoll and Rexroad, 1968) of the lower Silurian. The Sexton Creek is generally considered to correlate with the Brassfield Fm. (Thompson, 1993), but the latter unit is poorly constrained and problematic as well, and therefore does not clarify the age of the Sexton Creek.

Lafferty Limestone Formation (AR)

The Lafferty Fm. (Miser, 1920) was named for an outcrop at Tom Tait Springs, Arkansas. It is a variegated unit that includes green-gray micrites and red argillaceous limestones, and it conformably overlies the St. Clair in Arkansas. Craig (1969) reported that it has a reciprocal thickness relationship with the underlying St. Clair. Biostratigraphic information is conflicted and inconclusive with regard to the age of the formation. A conodont fauna from the basal five feet of the Lafferty was reported to be coniform-dominated, but included the biostratigraphically important species *Kockelella variabilis* and *Polygnathoides siluricus* (Craig, 1969). No specimens were figured, but if these identifications are correct, the lower Lafferty Fm. represents the Ludfordian *Polygnathoides siluricus* Zone. However, Amsden (1968) and Barrick (1978) considered that this exposure should be assigned to the underlying St. Clair. Barrick (1978) sampled the same locality, but did not recover *P. siluricus* or *K. variabilis*, and attributed Craig's specimens to "stratigraphic leak". Barrick (1978) reported a non-diagnostic fauna from the base of the Lafferty at a different locality that contained *Belodella silurica*, which has a first appearance in the Homerian. The Lafferty reaches 80-90 feet [24-27 meters] of thickness (Barrick, 1978; Craig et al., 1984), so biostratigraphic information from the vast majority of the formation is unknown. It is overlain unconformably by the Penters Chert of unclear Lower Devonian position (Craig, 1993).

Bailey Limestone Formation (IL, MO)

The Bailey Fm. (Ulrich, 1904) is a thick (approximately 300-500 feet [91-152 meters]) dolomitic and highly cherty unit that conformably overlies the Bainbridge Group in Illinois and Missouri (Collinson and Atherton, 1975). Croneis (1944) designated a formal lectostratotype section (Type Bailey on Fig. 1C), but it does not include the contact with the underlying Bainbridge Group, which is typically considered gradational and arbitrarily drawn on the first appearance of diagenetic chert in the succession (Bounk, 1975). The age of the Bailey ranges from likely the Pridoli possibly into the Pragian (Collinson et al., 1967; Thompson, 1993), although virtually no reliable biostratigraphic evidence is available to support this tentative assignment. Further complicating matters, assessments of the chronostratigraphic assignment of the Bailey and the position of the Silurian–Devonian boundary depend on publications and numerous personal communications from C. Collinson, but this information is internally inconsistent as reported in the literature (cf. Collinson et al., 1967, p. 940; Satterfield, 1969, p. 25; Berry and Boucot, 1970, p. 118, 186; Norby, 1990, p. 184). Droste and Shaver (1987) proposed that the Bailey was largely Silurian. Mikulic et al. (2015) reported in an abstract that the Silurian–Devonian 'Klonk' positive carbon isotope excursion occurs at the Bainbridge-Bailey boundary in a core from White County, southeastern Illinois.

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Supplementary Figure Captions, Supplementary Figures S-1, S-2, S-3, S-4

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Figure S1 - McAdams et al. - Bainbridge

Figure S2 - McAdams et al. - Bainbridge

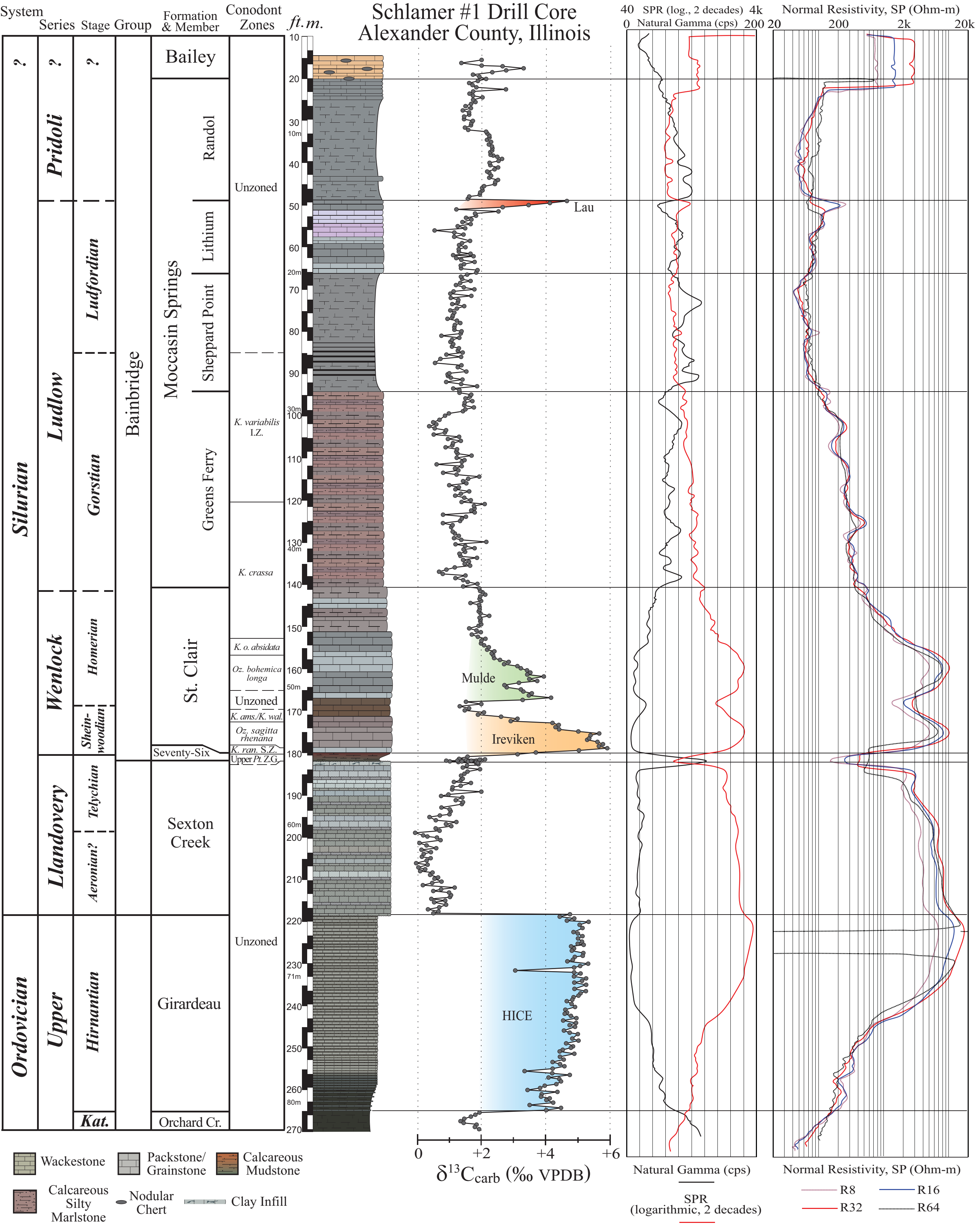

Figure S3 - McAdams et al. - Bainbridge

Figure S4 - McAdams et al. - Bainbridge

Table S1 - Dongola Hollow (DHC) Isotope Data

Sample #	Meter	$\delta^{13}C_{carb}$	$\delta^{18}O_{carb}$	Formation	Member
6678	5.95	2.26	-3.14	St. Clair	Dongola Hollow
6680	5.85	2.26	-2.16	St. Clair	Dongola Hollow
6666	5.70	2.46	-3.60	St. Clair	Dongola Hollow
6669	5.55	2.40	-4.23	St. Clair	Dongola Hollow
6655	5.40	2.42	-3.74	St. Clair	Dongola Hollow
6656	5.25	2.62	-2.67	St. Clair	Dongola Hollow
6672	5.25	2.72	-4.01	St. Clair	Dongola Hollow
6681	5.03	2.29	-3.89	St. Clair	Dongola Hollow
6682	4.88	2.58	-2.31	St. Clair	Dongola Hollow
6659	4.80	2.84	-3.10	St. Clair	Dongola Hollow
6683	4.73	2.49	-4.10	St. Clair	Dongola Hollow
6677	4.58	3.12	-3.79	St. Clair	Dongola Hollow
6676	4.43	3.33	-2.99	St. Clair	Dongola Hollow
6675	4.28	3.54	-3.04	St. Clair	Dongola Hollow
6674	4.13	3.45	-2.89	St. Clair	Dongola Hollow
6673	3.98	3.17	-3.81	St. Clair	Dongola Hollow
6671	3.83	3.39	-3.37	St. Clair	Dongola Hollow
6668	3.68	2.87	-3.91	St. Clair	Dongola Hollow
6667	3.53	2.85	-3.53	St. Clair	Dongola Hollow
6665	3.38	2.78	-3.57	St. Clair	Dongola Hollow
6664	3.23	3.03	-3.01	St. Clair	Dongola Hollow
6663	3.08	2.95	-2.71	St. Clair	Dongola Hollow
6662	3.00	2.98	-3.03	St. Clair	Dongola Hollow
6661	2.78	2.53	-2.95	St. Clair	Dongola Hollow
6658	2.70	3.24	-2.74	St. Clair	Dongola Hollow
6657	2.68	3.50	-2.24	St. Clair	Dongola Hollow
6654	2.60	3.82	-3.14	St. Clair	Dongola Hollow
6652	2.53	4.27	-3.21	St. Clair	Dongola Hollow
6651	2.45	3.53	-3.69	St. Clair	Dongola Hollow
6650	2.38	3.41	-3.68	St. Clair	Dongola Hollow
6649	2.30	2.31	-4.35	St. Clair	Dongola Hollow
6653	2.20	3.85	-2.91	St. Clair	Dongola Hollow
6646	2.08	3.76	-3.11	St. Clair	Dongola Hollow
6644	1.95	4.09	-2.01	St. Clair	Dongola Hollow
6643	1.80	4.38	-2.37	St. Clair	Dongola Hollow
6642	1.65	4.67	-1.87	St. Clair	Dongola Hollow
6641	1.50	4.85	-1.83	St. Clair	Dongola Hollow
6640	1.35	4.78	-1.74	St. Clair	Dongola Hollow
6639	1.20	4.61	-2.15	St. Clair	Dongola Hollow
6638	1.03	5.14	-1.67	St. Clair	Dongola Hollow
6637	0.75	4.53	-2.00	St. Clair	Dongola Hollow
6636	0.68	4.96	-2.93	St. Clair	Dongola Hollow
6635	0.53	5.42	-2.50	St. Clair	Dongola Hollow
6634	0.38	4.82	-4.10	St. Clair	Dongola Hollow
6633	0.23	5.29	-2.84	St. Clair	Dongola Hollow
6631	0.08	5.41	-1.82	St. Clair	Dongola Hollow

Table S2 - I-55 Northbound (I-55) Isotope Data

Sample #	Meter	$\delta^{13}C_{carb}$	$\delta^{18}O_{carb}$	Formation	Member
6605	0.00	0.81	-4.44	Moccasin Springs	Lithium
6606	0.30	0.27	-4.26	Moccasin Springs	Lithium
6607	0.60	0.74	-4.60	Moccasin Springs	Lithium
6608	0.90	0.60	-4.74	Moccasin Springs	Lithium
6609	1.20	0.26	-5.13	Moccasin Springs	Lithium
6610	1.50	-2.43	-5.66	Moccasin Springs	Lithium
6611	1.80	-0.75	-5.84	Moccasin Springs	Lithium
6612	2.10	0.02	-4.41	Moccasin Springs	Lithium
6613	2.40	1.05	-4.68	Moccasin Springs	Lithium
6614	2.70	0.62	-4.94	Moccasin Springs	Lithium
6615	3.00	0.64	-4.64	Moccasin Springs	Lithium
6616	3.30	-1.13	-5.30	Moccasin Springs	Lithium
6617	3.60	-2.64	-4.74	Moccasin Springs	Lithium
6618	3.90	-1.49	-4.53	Moccasin Springs	Lithium
6619	4.20	-0.50	-5.83	Moccasin Springs	Lithium
6620	4.50	-0.65	-5.88	Moccasin Springs	Lithium
6621	4.80	-2.61	-4.91	Moccasin Springs	Lithium
6622	5.10	-0.37	-5.39	Moccasin Springs	Lithium
6623	5.40	-0.48	-5.47	Moccasin Springs	Lithium
6624	5.70	-0.47	-6.20	Moccasin Springs	Lithium
6625	6.00	-1.47	-4.86	Moccasin Springs	Lithium
6626	6.30	-1.99	-4.73	Moccasin Springs	Lithium
6627	6.60	-1.12	-4.75	Moccasin Springs	Lithium
6628	6.90	-1.47	-5.47	Moccasin Springs	Lithium
6629	7.20	-0.48	-4.46	Moccasin Springs	Lithium
6630	7.50	-2.05	-5.90	Moccasin Springs	Lithium

Table S3 - Schlamer #1 Drill Core, Alexander County, Illinois, Isotope Data

Ft. Downcore	$\delta^{13}C_{carb}$	$\delta^{18}O_{carb}$	Group	Formation	Member
15.50	1.99	-4.27		Bailey	
16.25	1.35	-4.74		Bailey	
16.83	1.99	-4.45		Bailey	
17.00	2.65	-3.13		Bailey	
17.50	3.30	-3.64		Bailey	
18.00	2.76	-3.39		Bailey	
18.42	2.32	-4.06		Bailey	
19.00	1.72	-4.20	Bainbridge	Moccasin Springs	Randol
19.50	1.92	-4.49	Bainbridge	Moccasin Springs	Randol
20.00	2.13	-4.43	Bainbridge	Moccasin Springs	Randol
20.50	1.87	-4.61	Bainbridge	Moccasin Springs	Randol
21.00	1.60	-4.99	Bainbridge	Moccasin Springs	Randol
21.50	1.70	-4.12	Bainbridge	Moccasin Springs	Randol
22.00	1.82	-3.93	Bainbridge	Moccasin Springs	Randol
22.50	2.75	-3.41	Bainbridge	Moccasin Springs	Randol
23.00	1.72	-4.06	Bainbridge	Moccasin Springs	Randol
23.50	1.61	-4.12	Bainbridge	Moccasin Springs	Randol
24.00	1.72	-4.43	Bainbridge	Moccasin Springs	Randol
24.42	2.02	-4.01	Bainbridge	Moccasin Springs	Randol
25.00	1.72	-4.14	Bainbridge	Moccasin Springs	Randol
25.50	1.80	-4.09	Bainbridge	Moccasin Springs	Randol
26.00	1.66	-4.15	Bainbridge	Moccasin Springs	Randol
26.50	1.48	-5.04	Bainbridge	Moccasin Springs	Randol
27.00	1.66	-3.73	Bainbridge	Moccasin Springs	Randol
27.50	1.40	-4.79	Bainbridge	Moccasin Springs	Randol
28.00	1.60	-4.48	Bainbridge	Moccasin Springs	Randol
28.50	1.60	-4.41	Bainbridge	Moccasin Springs	Randol
29.00	1.44	-5.04	Bainbridge	Moccasin Springs	Randol
29.50	1.44	-4.99	Bainbridge	Moccasin Springs	Randol
30.00	1.71	-4.46	Bainbridge	Moccasin Springs	Randol
30.50	1.67	-4.02	Bainbridge	Moccasin Springs	Randol
31.00	1.66	-4.36	Bainbridge	Moccasin Springs	Randol
31.50	1.46	-3.93	Bainbridge	Moccasin Springs	Randol
32.00	1.57	-4.11	Bainbridge	Moccasin Springs	Randol
32.50	2.13	-4.22	Bainbridge	Moccasin Springs	Randol
33.00	2.17	-3.37	Bainbridge	Moccasin Springs	Randol
33.50	2.23	-3.54	Bainbridge	Moccasin Springs	Randol
34.00	2.24	-4.31	Bainbridge	Moccasin Springs	Randol
34.50	2.15	-4.20	Bainbridge	Moccasin Springs	Randol
35.00	2.28	-4.07	Bainbridge	Moccasin Springs	Randol
35.50	2.21	-3.93	Bainbridge	Moccasin Springs	Randol
36.00	2.31	-3.86	Bainbridge	Moccasin Springs	Randol
36.50	2.33	-3.84	Bainbridge	Moccasin Springs	Randol
37.00	2.32	-3.97	Bainbridge	Moccasin Springs	Randol

37.50	2.26	-4.21	Bainbridge	Moccasin Springs	Randol
38.00	2.27	-3.74	Bainbridge	Moccasin Springs	Randol
38.20	2.35	-3.86	Bainbridge	Moccasin Springs	Randol
38.50	2.48	-3.09	Bainbridge	Moccasin Springs	Randol
39.00	2.63	-3.98	Bainbridge	Moccasin Springs	Randol
39.50	2.52	-3.84	Bainbridge	Moccasin Springs	Randol
40.00	2.24	-4.00	Bainbridge	Moccasin Springs	Randol
40.50	2.26	-4.18	Bainbridge	Moccasin Springs	Randol
41.00	2.51	-4.52	Bainbridge	Moccasin Springs	Randol
41.50	2.39	-4.58	Bainbridge	Moccasin Springs	Randol
42.00	2.16	-4.27	Bainbridge	Moccasin Springs	Randol
42.50	2.24	-3.97	Bainbridge	Moccasin Springs	Randol
43.00	2.28	-4.04	Bainbridge	Moccasin Springs	Randol
43.50	2.23	-2.78	Bainbridge	Moccasin Springs	Randol
44.00	2.50	-4.29	Bainbridge	Moccasin Springs	Randol
44.50	2.42	-3.93	Bainbridge	Moccasin Springs	Randol
45.00	2.40	-3.91	Bainbridge	Moccasin Springs	Randol
45.50	2.06	-3.81	Bainbridge	Moccasin Springs	Randol
46.00	2.00	-3.84	Bainbridge	Moccasin Springs	Randol
46.50	2.02	-3.84	Bainbridge	Moccasin Springs	Randol
47.00	1.94	-3.91	Bainbridge	Moccasin Springs	Randol
47.50	1.93	-3.76	Bainbridge	Moccasin Springs	Randol
48.00	1.60	-3.23	Bainbridge	Moccasin Springs	Randol
48.50	1.56	-3.73	Bainbridge	Moccasin Springs	Randol
49.00	4.66	-3.08	Bainbridge	Moccasin Springs	Lithium
49.50	4.12	-3.01	Bainbridge	Moccasin Springs	Lithium
50.00	3.46	-4.09	Bainbridge	Moccasin Springs	Lithium
50.50	2.65	-3.81	Bainbridge	Moccasin Springs	Lithium
51.00	1.20	-3.21	Bainbridge	Moccasin Springs	Lithium
51.50	2.51	-3.34	Bainbridge	Moccasin Springs	Lithium
52.00	1.78	-4.09	Bainbridge	Moccasin Springs	Lithium
52.50	1.81	-4.35	Bainbridge	Moccasin Springs	Lithium
53.00	1.50	-3.29	Bainbridge	Moccasin Springs	Lithium
53.50	1.67	-4.48	Bainbridge	Moccasin Springs	Lithium
54.00	1.39	-3.60	Bainbridge	Moccasin Springs	Lithium
54.50	1.65	-4.05	Bainbridge	Moccasin Springs	Lithium
55.00	1.24	-3.87	Bainbridge	Moccasin Springs	Lithium
55.50	1.48	-4.14	Bainbridge	Moccasin Springs	Lithium
56.00	0.52	-3.92	Bainbridge	Moccasin Springs	Lithium
56.50	1.13	-3.99	Bainbridge	Moccasin Springs	Lithium
57.00	1.42	-4.18	Bainbridge	Moccasin Springs	Lithium
57.50	1.13	-4.60	Bainbridge	Moccasin Springs	Lithium
58.50	1.62	-4.88	Bainbridge	Moccasin Springs	Lithium
59.00	1.38	-4.54	Bainbridge	Moccasin Springs	Lithium
59.50	1.28	-3.81	Bainbridge	Moccasin Springs	Lithium
60.00	1.48	-4.21	Bainbridge	Moccasin Springs	Lithium
60.50	1.27	-4.09	Bainbridge	Moccasin Springs	Lithium

61.00	1.27	-4.43	Bainbridge	Moccasin Springs	Lithium
61.50	1.64	-4.53	Bainbridge	Moccasin Springs	Lithium
62.00	1.10	-4.08	Bainbridge	Moccasin Springs	Lithium
62.17	1.74	-4.34	Bainbridge	Moccasin Springs	Lithium
62.50	1.19	-4.31	Bainbridge	Moccasin Springs	Lithium
63.00	1.35	-4.59	Bainbridge	Moccasin Springs	Lithium
63.50	1.77	-4.44	Bainbridge	Moccasin Springs	Lithium
64.00	1.44	-4.51	Bainbridge	Moccasin Springs	Lithium
64.50	1.33	-4.88	Bainbridge	Moccasin Springs	Lithium
65.00	1.34	-4.05	Bainbridge	Moccasin Springs	Lithium
65.50	1.86	-4.46	Bainbridge	Moccasin Springs	Lithium
66.00	1.82	-4.32	Bainbridge	Moccasin Springs	Lithium
66.50	1.54	-4.23	Bainbridge	Moccasin Springs	Lithium
67.00	1.34	-4.05	Bainbridge	Moccasin Springs	Lithium
67.50	1.38	-4.58	Bainbridge	Moccasin Springs	Lithium
68.00	1.64	-4.75	Bainbridge	Moccasin Springs	Lithium
68.50	1.31	-4.33	Bainbridge	Moccasin Springs	Lithium
69.00	1.18	-4.62	Bainbridge	Moccasin Springs	Sheppard Point
69.50	1.43	-4.59	Bainbridge	Moccasin Springs	Sheppard Point
70.00	1.76	-4.16	Bainbridge	Moccasin Springs	Sheppard Point
70.50	1.11	-4.39	Bainbridge	Moccasin Springs	Sheppard Point
71.00	1.01	-4.39	Bainbridge	Moccasin Springs	Sheppard Point
71.50	1.67	-4.54	Bainbridge	Moccasin Springs	Sheppard Point
72.00	1.02	-3.87	Bainbridge	Moccasin Springs	Sheppard Point
72.50	1.26	-3.80	Bainbridge	Moccasin Springs	Sheppard Point
73.00	1.24	-4.38	Bainbridge	Moccasin Springs	Sheppard Point
73.50	1.07	-4.06	Bainbridge	Moccasin Springs	Sheppard Point
74.00	1.45	-3.82	Bainbridge	Moccasin Springs	Sheppard Point
74.50	1.21	-3.91	Bainbridge	Moccasin Springs	Sheppard Point
75.00	1.01	-4.62	Bainbridge	Moccasin Springs	Sheppard Point
75.50	1.14	-4.71	Bainbridge	Moccasin Springs	Sheppard Point
76.00	1.09	-4.93	Bainbridge	Moccasin Springs	Sheppard Point
76.50	1.07	-4.31	Bainbridge	Moccasin Springs	Sheppard Point
77.00	0.92	-4.59	Bainbridge	Moccasin Springs	Sheppard Point
77.50	1.21	-5.20	Bainbridge	Moccasin Springs	Sheppard Point
78.00	1.32	-4.43	Bainbridge	Moccasin Springs	Sheppard Point
78.50	1.15	-4.27	Bainbridge	Moccasin Springs	Sheppard Point
79.00	1.13	-4.49	Bainbridge	Moccasin Springs	Sheppard Point
79.50	1.13	-4.03	Bainbridge	Moccasin Springs	Sheppard Point
80.00	1.36	-4.97	Bainbridge	Moccasin Springs	Sheppard Point
80.50	1.33	-4.86	Bainbridge	Moccasin Springs	Sheppard Point
81.00	0.73	-4.38	Bainbridge	Moccasin Springs	Sheppard Point
81.50	1.29	-4.62	Bainbridge	Moccasin Springs	Sheppard Point
82.00	1.06	-4.51	Bainbridge	Moccasin Springs	Sheppard Point
82.50	1.01	-4.35	Bainbridge	Moccasin Springs	Sheppard Point
83.00	1.10	-4.63	Bainbridge	Moccasin Springs	Sheppard Point
83.50	1.06	-4.96	Bainbridge	Moccasin Springs	Sheppard Point

84.00	1.27	-4.96	Bainbridge	Moccasin Springs	Sheppard Point
84.50	1.24	-3.60	Bainbridge	Moccasin Springs	Sheppard Point
85.00	1.39	-3.76	Bainbridge	Moccasin Springs	Sheppard Point
85.50	0.89	-3.87	Bainbridge	Moccasin Springs	Sheppard Point
86.00	1.34	-4.55	Bainbridge	Moccasin Springs	Sheppard Point
86.50	0.70	-3.80	Bainbridge	Moccasin Springs	Sheppard Point
87.50	0.53	-4.25	Bainbridge	Moccasin Springs	Sheppard Point
88.00	1.36	-4.51	Bainbridge	Moccasin Springs	Sheppard Point
88.50	1.24	-4.26	Bainbridge	Moccasin Springs	Sheppard Point
89.50	1.51	-4.36	Bainbridge	Moccasin Springs	Sheppard Point
90.00	0.98	-4.73	Bainbridge	Moccasin Springs	Sheppard Point
90.25	0.92	-3.73	Bainbridge	Moccasin Springs	Sheppard Point
90.50	0.94	-4.04	Bainbridge	Moccasin Springs	Sheppard Point
91.00	1.02	-2.77	Bainbridge	Moccasin Springs	Sheppard Point
91.50	1.39	-4.37	Bainbridge	Moccasin Springs	Sheppard Point
92.00	0.88	-3.80	Bainbridge	Moccasin Springs	Sheppard Point
92.50	1.35	-5.22	Bainbridge	Moccasin Springs	Sheppard Point
93.00	1.85	-4.15	Bainbridge	Moccasin Springs	Sheppard Point
93.50	1.10	-4.42	Bainbridge	Moccasin Springs	Sheppard Point
94.00	1.29	-4.70	Bainbridge	Moccasin Springs	Sheppard Point
94.50	1.30	-4.79	Bainbridge	Moccasin Springs	Greens Ferry
95.00	1.66	-4.67	Bainbridge	Moccasin Springs	Greens Ferry
95.50	1.62	-4.54	Bainbridge	Moccasin Springs	Greens Ferry
96.00	1.48	-4.27	Bainbridge	Moccasin Springs	Greens Ferry
96.50	1.70	-4.40	Bainbridge	Moccasin Springs	Greens Ferry
97.00	1.45	-4.23	Bainbridge	Moccasin Springs	Greens Ferry
97.50	1.44	-4.36	Bainbridge	Moccasin Springs	Greens Ferry
98.00	1.74	-4.15	Bainbridge	Moccasin Springs	Greens Ferry
98.50	1.48	-3.99	Bainbridge	Moccasin Springs	Greens Ferry
99.00	1.41	-4.15	Bainbridge	Moccasin Springs	Greens Ferry
99.50	0.96	-4.18	Bainbridge	Moccasin Springs	Greens Ferry
100.00	0.85	-2.98	Bainbridge	Moccasin Springs	Greens Ferry
101.00	0.67	-3.68	Bainbridge	Moccasin Springs	Greens Ferry
101.50	0.47	-3.27	Bainbridge	Moccasin Springs	Greens Ferry
102.00	0.57	-3.23	Bainbridge	Moccasin Springs	Greens Ferry
102.50	0.35	-3.86	Bainbridge	Moccasin Springs	Greens Ferry
103.00	0.52	-3.23	Bainbridge	Moccasin Springs	Greens Ferry
103.50	0.88	-3.33	Bainbridge	Moccasin Springs	Greens Ferry
104.00	0.84	-3.63	Bainbridge	Moccasin Springs	Greens Ferry
104.50	0.49	-3.76	Bainbridge	Moccasin Springs	Greens Ferry
105.00	1.28	-3.77	Bainbridge	Moccasin Springs	Greens Ferry
105.50	0.93	-4.12	Bainbridge	Moccasin Springs	Greens Ferry
106.00	1.34	-4.58	Bainbridge	Moccasin Springs	Greens Ferry
106.50	1.09	-4.45	Bainbridge	Moccasin Springs	Greens Ferry
107.00	1.07	-4.54	Bainbridge	Moccasin Springs	Greens Ferry
107.50	0.86	-4.12	Bainbridge	Moccasin Springs	Greens Ferry
108.00	1.22	-4.23	Bainbridge	Moccasin Springs	Greens Ferry

108.50	1.19	-4.41	Bainbridge	Moccasin Springs	Greens Ferry
109.00	1.23	-4.13	Bainbridge	Moccasin Springs	Greens Ferry
109.50	1.67	-4.10	Bainbridge	Moccasin Springs	Greens Ferry
110.00	1.21	-3.79	Bainbridge	Moccasin Springs	Greens Ferry
110.50	1.45	-4.57	Bainbridge	Moccasin Springs	Greens Ferry
111.00	1.37	-4.68	Bainbridge	Moccasin Springs	Greens Ferry
111.50	0.57	-3.77	Bainbridge	Moccasin Springs	Greens Ferry
112.00	1.36	-4.21	Bainbridge	Moccasin Springs	Greens Ferry
112.50	1.15	-3.93	Bainbridge	Moccasin Springs	Greens Ferry
113.00	1.26	-4.82	Bainbridge	Moccasin Springs	Greens Ferry
113.50	0.78	-3.74	Bainbridge	Moccasin Springs	Greens Ferry
114.00	1.21	-4.08	Bainbridge	Moccasin Springs	Greens Ferry
114.50	1.92	-3.73	Bainbridge	Moccasin Springs	Greens Ferry
115.00	1.57	-3.83	Bainbridge	Moccasin Springs	Greens Ferry
115.50	1.41	-4.32	Bainbridge	Moccasin Springs	Greens Ferry
116.00	1.51	-4.13	Bainbridge	Moccasin Springs	Greens Ferry
116.50	0.97	-5.34	Bainbridge	Moccasin Springs	Greens Ferry
117.00	1.28	-3.43	Bainbridge	Moccasin Springs	Greens Ferry
117.50	1.17	-3.82	Bainbridge	Moccasin Springs	Greens Ferry
118.00	1.60	-4.07	Bainbridge	Moccasin Springs	Greens Ferry
118.50	1.34	-4.49	Bainbridge	Moccasin Springs	Greens Ferry
119.00	1.16	-3.90	Bainbridge	Moccasin Springs	Greens Ferry
119.50	1.44	-4.07	Bainbridge	Moccasin Springs	Greens Ferry
120.00	1.65	-3.79	Bainbridge	Moccasin Springs	Greens Ferry
120.50	1.36	-3.51	Bainbridge	Moccasin Springs	Greens Ferry
121.00	2.08	-4.03	Bainbridge	Moccasin Springs	Greens Ferry
121.50	1.75	-3.79	Bainbridge	Moccasin Springs	Greens Ferry
122.00	1.77	-3.64	Bainbridge	Moccasin Springs	Greens Ferry
122.50	1.66	-3.78	Bainbridge	Moccasin Springs	Greens Ferry
123.00	1.77	-3.97	Bainbridge	Moccasin Springs	Greens Ferry
123.50	0.78	-3.94	Bainbridge	Moccasin Springs	Greens Ferry
124.00	1.50	-4.16	Bainbridge	Moccasin Springs	Greens Ferry
124.50	1.37	-4.17	Bainbridge	Moccasin Springs	Greens Ferry
125.00	1.31	-4.15	Bainbridge	Moccasin Springs	Greens Ferry
125.50	0.78	-3.98	Bainbridge	Moccasin Springs	Greens Ferry
126.00	1.08	-3.34	Bainbridge	Moccasin Springs	Greens Ferry
126.50	1.04	-4.30	Bainbridge	Moccasin Springs	Greens Ferry
127.50	1.08	-3.37	Bainbridge	Moccasin Springs	Greens Ferry
128.00	1.15	-3.04	Bainbridge	Moccasin Springs	Greens Ferry
128.50	1.28	-3.94	Bainbridge	Moccasin Springs	Greens Ferry
129.00	1.13	-3.60	Bainbridge	Moccasin Springs	Greens Ferry
129.50	1.35	-3.60	Bainbridge	Moccasin Springs	Greens Ferry
130.00	2.14	-4.00	Bainbridge	Moccasin Springs	Greens Ferry
130.50	1.17	-4.33	Bainbridge	Moccasin Springs	Greens Ferry
131.00	1.47	-4.03	Bainbridge	Moccasin Springs	Greens Ferry
131.50	1.77	-4.13	Bainbridge	Moccasin Springs	Greens Ferry
131.75	1.42	-4.26	Bainbridge	Moccasin Springs	Greens Ferry

132.25	1.48	-4.26	Bainbridge	Moccasin Springs	Greens Ferry
132.83	1.30	-4.17	Bainbridge	Moccasin Springs	Greens Ferry
133.33	1.32	-4.45	Bainbridge	Moccasin Springs	Greens Ferry
133.75	1.84	-4.34	Bainbridge	Moccasin Springs	Greens Ferry
134.25	1.41	-4.18	Bainbridge	Moccasin Springs	Greens Ferry
134.75	1.59	-4.45	Bainbridge	Moccasin Springs	Greens Ferry
135.17	1.46	-4.36	Bainbridge	Moccasin Springs	Greens Ferry
135.58	1.62	-4.25	Bainbridge	Moccasin Springs	Greens Ferry
136.08	1.15	-4.29	Bainbridge	Moccasin Springs	Greens Ferry
136.58	0.88	-3.84	Bainbridge	Moccasin Springs	Greens Ferry
137.08	0.66	-3.66	Bainbridge	Moccasin Springs	Greens Ferry
137.58	0.77	-3.78	Bainbridge	Moccasin Springs	Greens Ferry
138.00	1.48	-4.09	Bainbridge	Moccasin Springs	Greens Ferry
138.50	1.17	-4.09	Bainbridge	Moccasin Springs	Greens Ferry
139.00	1.41	-4.01	Bainbridge	Moccasin Springs	Greens Ferry
139.50	1.55	-4.32	Bainbridge	Moccasin Springs	Greens Ferry
140.00	1.86	-3.82	Bainbridge	Moccasin Springs	Greens Ferry
140.50	1.41	-4.23	Bainbridge	Moccasin Springs	Greens Ferry
141.00	1.91	-4.11	Bainbridge	St. Clair	
141.50	1.94	-3.95	Bainbridge	St. Clair	
142.00	2.02	-4.01	Bainbridge	St. Clair	
142.50	2.11	-4.20	Bainbridge	St. Clair	
143.00	1.94	-3.95	Bainbridge	St. Clair	
143.50	1.92	-4.00	Bainbridge	St. Clair	
144.00	1.97	-4.09	Bainbridge	St. Clair	
144.50	1.64	-4.51	Bainbridge	St. Clair	
145.00	1.90	-3.74	Bainbridge	St. Clair	
145.50	1.93	-3.79	Bainbridge	St. Clair	
146.00	1.93	-3.95	Bainbridge	St. Clair	
146.50	1.90	-3.62	Bainbridge	St. Clair	
147.00	1.96	-3.69	Bainbridge	St. Clair	
147.50	2.22	-3.64	Bainbridge	St. Clair	
148.00	1.93	-3.76	Bainbridge	St. Clair	
148.50	1.96	-3.72	Bainbridge	St. Clair	
149.00	1.95	-3.69	Bainbridge	St. Clair	
149.50	1.97	-3.79	Bainbridge	St. Clair	
150.00	1.89	-3.70	Bainbridge	St. Clair	
150.50	1.60	-3.76	Bainbridge	St. Clair	
151.00	1.83	-3.43	Bainbridge	St. Clair	
151.50	1.97	-3.30	Bainbridge	St. Clair	
152.00	1.68	-3.53	Bainbridge	St. Clair	
152.50	1.87	-3.48	Bainbridge	St. Clair	
153.00	2.11	-3.53	Bainbridge	St. Clair	
153.50	1.98	-3.39	Bainbridge	St. Clair	
154.00	1.97	-3.75	Bainbridge	St. Clair	
154.50	2.06	-3.51	Bainbridge	St. Clair	
155.00	2.21	-3.24	Bainbridge	St. Clair	

155.50	2.16	-3.03	Bainbridge	St. Clair
156.00	2.39	-2.81	Bainbridge	St. Clair
156.50	2.30	-2.77	Bainbridge	St. Clair
157.00	2.35	-3.32	Bainbridge	St. Clair
157.50	2.38	-3.24	Bainbridge	St. Clair
158.00	2.57	-2.75	Bainbridge	St. Clair
158.50	2.84	-2.99	Bainbridge	St. Clair
159.00	2.69	-2.84	Bainbridge	St. Clair
159.50	3.11	-3.27	Bainbridge	St. Clair
160.00	3.22	-2.46	Bainbridge	St. Clair
160.50	3.41	-2.70	Bainbridge	St. Clair
161.00	3.51	-2.90	Bainbridge	St. Clair
161.50	3.41	-2.99	Bainbridge	St. Clair
162.00	3.94	-2.42	Bainbridge	St. Clair
162.50	3.48	-2.82	Bainbridge	St. Clair
163.00	3.73	-2.80	Bainbridge	St. Clair
163.50	3.16	-2.38	Bainbridge	St. Clair
164.00	2.71	-2.99	Bainbridge	St. Clair
164.50	2.77	-3.64	Bainbridge	St. Clair
165.00	3.22	-3.35	Bainbridge	St. Clair
165.50	3.30	-3.10	Bainbridge	St. Clair
166.00	3.56	-3.16	Bainbridge	St. Clair
166.50	3.46	-3.18	Bainbridge	St. Clair
167.00	4.16	-3.12	Bainbridge	St. Clair
167.50	3.27	-3.23	Bainbridge	St. Clair
168.00	1.50	-2.87	Bainbridge	St. Clair
168.50	1.98	-3.58	Bainbridge	St. Clair
169.00	1.30	-3.73	Bainbridge	St. Clair
169.50	1.60	-4.07	Bainbridge	St. Clair
170.00	1.46	-3.88	Bainbridge	St. Clair
170.50	2.06	-3.26	Bainbridge	St. Clair
171.00	1.87	-3.85	Bainbridge	St. Clair
171.50	2.60	-3.03	Bainbridge	St. Clair
172.00	3.12	-3.15	Bainbridge	St. Clair
172.50	2.90	-4.46	Bainbridge	St. Clair
173.00	4.21	-2.55	Bainbridge	St. Clair
173.50	4.41	-2.58	Bainbridge	St. Clair
174.00	4.30	-2.61	Bainbridge	St. Clair
174.50	4.41	-3.43	Bainbridge	St. Clair
175.00	5.02	-2.55	Bainbridge	St. Clair
175.50	5.67	-2.30	Bainbridge	St. Clair
175.92	5.40	-2.56	Bainbridge	St. Clair
176.50	5.36	-2.67	Bainbridge	St. Clair
177.00	5.29	-2.46	Bainbridge	St. Clair
177.50	5.62	-2.50	Bainbridge	St. Clair
178.00	5.79	-2.24	Bainbridge	St. Clair
178.50	5.66	-2.55	Bainbridge	St. Clair

179.00	5.92	-2.23	Bainbridge	St. Clair
179.50	5.04	-3.51	Bainbridge	St. Clair
180.00	3.69	-3.52	Bainbridge	St. Clair
180.50	3.11	-3.95	Bainbridge	Seventy-Six
181.00	1.55	-4.13	Bainbridge	Seventy-Six
181.50	1.28	-2.55	Bainbridge	Seventy-Six
181.67	2.08	-1.88	Bainbridge	Seventy-Six
181.75	1.92	-2.37	Bainbridge	Seventy-Six
181.83	1.99	-2.26	Bainbridge	Seventy-Six
181.88	1.50	-2.96	Bainbridge	Seventy-Six
181.92	0.88	-2.26	Bainbridge	Seventy-Six
181.96	1.24	-2.99	Bainbridge	Seventy-Six
182.00	1.66	-3.08	Bainbridge	Seventy-Six
182.04	1.82	-2.54	Bainbridge	Seventy-Six
182.08	1.57	-4.60	Bainbridge	Seventy-Six
182.13	1.38	-2.29	Bainbridge	Seventy-Six
182.17	0.99	-2.83	Bainbridge	Seventy-Six
182.25	1.25	-2.44	Bainbridge	Seventy-Six
182.33	1.82	-4.72		Sexton Creek
182.67	1.88	-3.68		Sexton Creek
183.00	1.53	-3.81		Sexton Creek
183.50	1.40	-3.85		Sexton Creek
184.00	1.94	-4.48		Sexton Creek
184.50	1.54	-4.39		Sexton Creek
185.00	1.45	-4.57		Sexton Creek
185.50	1.34	-4.63		Sexton Creek
186.00	1.38	-4.83		Sexton Creek
186.42	1.35	-4.68		Sexton Creek
187.00	1.12	-4.75		Sexton Creek
187.25	1.65	-4.12		Sexton Creek
187.92	1.33	-3.88		Sexton Creek
188.33	1.08	-4.87		Sexton Creek
188.83	1.06	-3.63		Sexton Creek
189.33	1.98	-5.63		Sexton Creek
190.00	0.94	-4.67		Sexton Creek
190.33	0.72	-4.57		Sexton Creek
190.75	1.39	-4.32		Sexton Creek
191.25	1.18	-4.66		Sexton Creek
191.83	1.41	-4.38		Sexton Creek
192.25	1.37	-3.85		Sexton Creek
193.00	0.73	-4.72		Sexton Creek
193.50	0.99	-3.95		Sexton Creek
194.08	1.02	-3.98		Sexton Creek
194.58	0.99	-3.96		Sexton Creek
195.00	0.68	-3.35		Sexton Creek
195.33	0.35	-4.69		Sexton Creek
196.08	0.55	-3.80		Sexton Creek

196.50	1.20	-3.94	Sexton Creek
197.00	0.87	-3.58	Sexton Creek
197.50	1.04	-3.81	Sexton Creek
198.00	0.55	-4.00	Sexton Creek
198.58	0.67	-4.36	Sexton Creek
199.08	-0.09	-5.81	Sexton Creek
199.67	0.16	-3.84	Sexton Creek
200.00	0.29	-3.66	Sexton Creek
200.25	0.59	-4.56	Sexton Creek
200.83	0.70	-3.81	Sexton Creek
201.42	0.04	-4.28	Sexton Creek
202.00	0.27	-4.35	Sexton Creek
202.75	0.57	-4.79	Sexton Creek
203.08	0.10	-4.71	Sexton Creek
203.67	0.40	-4.26	Sexton Creek
204.08	0.18	-3.95	Sexton Creek
204.75	0.12	-4.56	Sexton Creek
205.08	0.39	-4.63	Sexton Creek
205.67	0.27	-6.12	Sexton Creek
206.25	-0.07	-4.23	Sexton Creek
206.58	0.30	-3.88	Sexton Creek
207.17	0.01	-5.40	Sexton Creek
207.67	0.22	-4.42	Sexton Creek
208.00	0.07	-4.08	Sexton Creek
208.50	0.45	-4.65	Sexton Creek
209.08	0.38	-4.64	Sexton Creek
209.75	0.63	-4.35	Sexton Creek
210.17	0.50	-4.43	Sexton Creek
210.67	0.73	-4.52	Sexton Creek
211.00	0.44	-4.53	Sexton Creek
211.50	0.15	-4.41	Sexton Creek
212.08	1.14	-5.06	Sexton Creek
212.50	0.72	-4.70	Sexton Creek
212.92	0.48	-4.16	Sexton Creek
213.33	0.97	-3.96	Sexton Creek
214.00	1.03	-3.60	Sexton Creek
214.25	1.00	-4.12	Sexton Creek
214.75	0.41	-4.16	Sexton Creek
215.17	0.85	-4.52	Sexton Creek
215.58	0.50	-3.78	Sexton Creek
216.17	0.88	-4.20	Sexton Creek
216.75	0.66	-3.89	Sexton Creek
217.25	0.31	-4.31	Sexton Creek
217.67	0.64	-4.08	Sexton Creek
218.17	0.48	-3.68	Sexton Creek
218.42	4.75	-2.45	Girardeau
219.00	4.43	-3.01	Girardeau

219.42	4.89	-2.72	Girardeau
219.92	4.66	-3.02	Girardeau
220.25	5.34	-2.45	Girardeau
220.70	5.06	-3.20	Girardeau
221.20	5.05	-3.06	Girardeau
221.80	5.16	-3.10	Girardeau
222.20	5.12	-3.09	Girardeau
222.70	4.87	-3.65	Girardeau
223.20	5.01	-3.39	Girardeau
223.80	5.16	-3.19	Girardeau
224.20	4.99	-3.31	Girardeau
224.70	5.09	-3.26	Girardeau
225.20	4.99	-3.42	Girardeau
225.70	5.18	-3.33	Girardeau
226.20	4.79	-3.69	Girardeau
226.67	4.88	-4.06	Girardeau
227.20	4.81	-4.03	Girardeau
227.70	5.18	-3.58	Girardeau
228.20	5.15	-3.50	Girardeau
228.70	4.91	-4.22	Girardeau
229.30	4.84	-4.36	Girardeau
229.63	4.67	-4.46	Girardeau
230.25	5.33	-3.58	Girardeau
230.70	5.06	-3.96	Girardeau
231.17	4.88	-4.48	Girardeau
231.75	3.03	-5.33	Girardeau
232.20	4.88	-4.46	Girardeau
232.63	5.09	-3.90	Girardeau
233.33	4.87	-4.61	Girardeau
233.70	5.25	-3.91	Girardeau
234.25	5.13	-3.98	Girardeau
234.70	4.88	-4.43	Girardeau
235.20	5.26	-3.84	Girardeau
235.70	5.23	-3.73	Girardeau
236.20	4.89	-4.26	Girardeau
236.70	5.26	-3.89	Girardeau
237.20	5.08	-3.98	Girardeau
237.70	5.03	-4.08	Girardeau
238.20	4.87	-3.64	Girardeau
238.70	4.83	-4.54	Girardeau
239.20	4.65	-4.39	Girardeau
239.70	4.81	-4.27	Girardeau
240.20	4.81	-4.22	Girardeau
240.70	4.91	-3.91	Girardeau
241.20	4.59	-4.57	Girardeau
241.70	4.66	-4.27	Girardeau
242.20	4.59	-3.84	Girardeau

242.70	4.79	-3.83	Girardeau
243.20	4.96	-3.91	Girardeau
243.70	4.52	-3.73	Girardeau
244.30	4.95	-3.83	Girardeau
244.80	4.73	-3.89	Girardeau
245.08	4.91	-3.77	Girardeau
245.60	4.71	-3.82	Girardeau
246.08	4.56	-3.89	Girardeau
246.60	4.74	-3.87	Girardeau
247.04	5.00	-3.88	Girardeau
248.08	4.82	-3.99	Girardeau
248.60	5.02	-3.69	Girardeau
249.08	4.63	-3.85	Girardeau
249.60	4.84	-3.92	Girardeau
250.17	4.79	-3.96	Girardeau
250.67	4.53	-4.06	Girardeau
251.10	4.42	-3.96	Girardeau
251.60	4.90	-3.80	Girardeau
252.10	4.43	-3.96	Girardeau
252.60	4.57	-3.84	Girardeau
253.00	4.55	-3.88	Girardeau
253.50	4.20	-4.26	Girardeau
254.08	4.44	-3.83	Girardeau
254.60	4.58	-3.97	Girardeau
255.08	4.21	-4.12	Girardeau
255.67	3.33	-4.01	Girardeau
256.25	4.19	-4.06	Girardeau
256.70	4.75	-3.85	Girardeau
257.20	4.08	-4.15	Girardeau
257.70	4.44	-4.07	Girardeau
258.20	4.47	-3.89	Girardeau
258.88	4.32	-3.86	Girardeau
259.17	3.96	-4.09	Girardeau
259.88	3.81	-4.09	Girardeau
260.17	3.42	-4.05	Girardeau
260.67	4.37	-4.05	Girardeau
261.17	3.87	-3.83	Girardeau
261.63	3.83	-4.15	Girardeau
262.20	4.12	-3.94	Girardeau
262.75	4.01	-3.94	Girardeau
263.30	4.23	-3.99	Girardeau
263.80	3.49	-3.98	Girardeau
264.50	4.47	-3.82	Girardeau
264.90	4.00	-3.84	Girardeau
265.50	1.91	-2.72	Orchard Creek
266.00	1.78	-2.72	Orchard Creek
266.50	1.64	-2.76	Orchard Creek

267.00	1.44	-2.94	Orchard Creek
267.50	1.32	-3.39	Orchard Creek
268.00	1.41	-2.89	Orchard Creek
268.50	1.83	-2.39	Orchard Creek
269.00	1.76	-2.25	Orchard Creek
269.50	1.91	-2.08	Orchard Creek

Supplementary Data Repository Item DR-2

Paleontological Notes

Graptolites

Michael J. Melchin

The following are brief notes and remarks on the biostratigraphically useful graptolite taxa found in this study. 2TRD refers to the two-theca repeat distance (Howe, 1983), a measure the distance between two successive thecal apertures. In the case of proximal 2TRD, the measurement has been made from the aperture of th1 (theca 1) to that of th3.

Colonograptus colonus (Barrande, 1850) (Figure 9L, M)

Our collection contains two well-preserved, mature specimens of this species. Some of the dimensions are as follows: length of sicula – 1.7-1.8 mm; width at th1 – 0.8-0.9 mm (1.0-1.2 mm, including lappets); width at th5 – 1.3-1.55 mm; width at th10 – 1.85-1.95 mm; distal width –2.2 mm; proximal 2TRD – 1.4-1.6 mm; distal 2TRD – 1.7-1.9 mm. The rhabdosome is weakly ventrally curved proximally, becoming straight or very slightly dorsally curved distally. Sicula reaches to the base of th3-4 and aperture possesses a dorsal tongue. Thecae are straight tubes overlapping 2/3-3/4 of their length. Proximal two thecae possess well-developed, hooked lateral lappets. On one specimen weaker lappets are visible on the 3rd and 4th thecae. The remaining thecae appear to show straight to concave apertural margins. In addition, there are transverse thickenings observed at levels of the bases of the thecae, which are sometimes visible pressed through on compressed specimens. These likely represent thickenings of the bases of the interthecal septa.

The characters of the rhabdosomal shape, sicula and particularly the hook-shaped lappets on the proximal theca all indicate that our specimens belong to the species *Colonograptus colonus*. In terms of dimensions, our specimens match well with those described as *C. colonus heathcotensis* by Lenz and Kozłowska (2004). The original description of this subspecies, however, suggests that weak lateral lappets are present on all of the mesial and distal thecae (Rickards and Sanford, 1998), a feature not seen in our specimens. One of the illustrations of from the type collection, however, show distal thecae with concave apertural margins (Rickards and Sanford, 1998, fig. 9d), suggesting that these lappets may be variably developed or preserved within this subspecies. Some of the specimens illustrated by Lenz and Kozłowska (2004, pl. 35, fig. 4, pl . 43, fig. 28) also show distal thecal apertural margins similar to those seen in our specimens. Specimens previously assigned to *Colonograptus colonus colonus* and *C. colonus compactus* also appear to show variation in the shape of the apertures of the distal theca (e.g. Taylor, 1998). Taylor (1998) also noted that the type specimen of *C. colonus compactus* is not sufficiently well preserved or distinct from *Colonograptus colonus colonus* to merit recognizing the former as a distinct subspecies. Our material differs from the type material of *C. colonus colonus* (remeasured by Taylor, 1998) in its significantly greater width at th10 (1.5 mm in the type specimen) and slightly wider thecal spacing (2TRD 1.1 mm proximally and 1.6 mm distally in the type), but the specimens described by Wood (1900), show similar distal width and thecal spacing values as our specimens, as well as similar distal thecal forms. Therefore, whereas our specimens clearly belong to *C. colonus*, it is not clear whether they should be assigned to *C. colonus colonus* or *C. colonus heathcotensis*. Both *C. colonus colonus* and *C. colonus heathcotensis* are known to occur in the *N. nilssoni* and *L. scanicus* zones (e.g. Lenz and Kozłowska, 2004; Zalasiewicz et al., 2009).

Saetograptus incipiens (Wood, 1990) (Figure 9N-R)

Our collections contain numerous specimens of this species representing all growth stages. Some of the dimensions are as follows: length of sicula – 1.7-1.9 mm; width at th1 – 0.7-0.9 mm; width at th5 – 1.25-1.4 mm; width at th10 – 1.65-1.95 mm; distal width – 1.75-2.2 mm; proximal 2TRD – 1.15-1.3 mm; distal 2TRD – 1.7-1.9 mm. The rhabdosome is weakly ventrally curved proximally, becoming straight distally. The sicula is straight to weakly ventrally curved with a weak dorsal apertural tongue. Sicular apex reaches to the base of th3-4. Thecae are straight tubes showing about 2/3 overlap with apertures that are approximately normal to the ventral thecal wall. The proximal four thecae possess pronounced, curved lateral apertural spines up to almost 0.5 mm long.

Our specimens match well with the type material (Wood, 1990; Zalasiewicz, 2000). The specimens identified as *Saetograptus incipiens*? by Štorch et al. (2014) differ from our material only in that their specimens have lateral apertural spines on up to eight proximal thecae, rather than four. At the present time there is insufficient information to determine if this is within the normal range of intraspecific variation for this species.

Saetograptus sp. aff. *leintwardinensis* (Lapworth, 1880) (Figure 9S)

Our collection contains one well-preserved, mature specimen of this species. Some of the dimensions are as follows: length of sicula – 2.0 mm; width at th1 – 0.9 mm (1.1 mm, including spines); width at th5 – 0.95 mm; width at th10 – 1.15 mm; distal width –1.55 mm; proximal 2TRD – 1.3 mm; distal 2TRD -1.6 mm. Sicula is straight, 2.0 mm long, and shows a slightly expanded aperture, the virgella pointing slightly ventrally and a dorsal apertural process pointing more dorsally. The first four thecal show paired lateral spines with widened bases up to 0.3 mm long. Otherwise the thecae are straight tubes with 2/3 to 3/4 overlap and straight to slightly concave apertural margins. The rhabdosome is mostly straight with a very slight ventral curvature mesially.

In contrast with other species of *Saetograptus*, our specimen shares the following distinctive attributes with *S. leintwardinensis*: the diverging processes from the sicular aperture, and relatively straight rhabdosome. However, our specimen differs from *S. leintwardinensis* in that the paired lateral thecal spines are restricted to the proximal thecae rather than being present throughout. In addition, our specimen seems to be wider at the first thecal pair than is typical for *S. leintwardinensis* (see Taylor, 1998; Storch et al., 2014), but then it widens more slowly.

Pseudomonoclimacis antiqua Štorch, Manda and Loydell, 2014 (Figure 9U)

Our collection contains two well-preserved, mature specimens as well as a few less complete fragments questionably assigned to this species. Some of the dimensions are as follows: length of sicula – 1.8 mm; width at th1 – 0.65 mm; width at th5 – 1.0 mm; width at th10 – 1.1-1.35 mm; distal width – 1.9 mm; proximal 2TRD – 1.2-1.6 mm; 2TRD th10 – 1.6-2.1 mm; 2TRD distal – 1.8 mm. The sicula is slightly ventrally curved with dorsal apertural lobe. Thecae have a pronounced geniculum that is fairly sharp proximally but more gently rounded distally, and straight to slightly convex, supragenicular walls that are weakly inclined proximally, becoming more strongly inclined distally. Thecae overlap about 1/2 their length proximally and mesially, about 2/3 distally and apertures are everted. Rhabdosome is straight beyond the sicula.

Although our two well-preserved specimens differ from each other, particularly in their thecal spacing, both fit in every aspect of form and dimensions within the range of variation of the type material (Štorch et al., 2014).

Pseudomonoclimacis sp. (? = "*Monograptus*" sp. *sensu* Rickards and Palmer, 1977) (Fig. 9V)

Our collection contains one well-preserved mature specimen and several other mesial-distal fragments of this taxon. Some of the dimensions are as follows: width at th1 – 0.65 mm; width at th5 – 1.0mm; width at th10 – 1.4 mm; maximum width (based on distal fragments) – 2.4 mm; proximal 2TRD – 1.2 mm; TRD distal – 2.1 mm. The sicula is slightly ventrally curved with dorsal apertural lobe. Thecae have a pronounced geniculum that is fairly sharp proximally but more gently rounded distally, and straight to slightly convex, supragenicular walls that are weakly inclined proximally, becoming more strongly inclined distally. Thecae overlap about 1/2 their length proximally, about 2/3 mesally and distally, and apertures are everted. Rhabdosome is weakly ventrally curved up to th7, straight distally.

These specimens closely resemble forms described as "*Monograptus*" sp. by Rickards and Palmer, (1977), although our one complete specimen shows slightly closer proximal thecal spacing. This species differs from *Pseudomonoclimacis antiqua* primarily in its greater distal width and its more strongly inclined and more overlapping mesial thecae.

Neocolonograptus parultimus (Jaeger, 1975) (Figure 9F-K)

Our collections contain numerous specimens of this species representing all growth stages. Some of the dimensions are as follows: length of sicula – 1.75-1.95 mm (not including dorsal tongue); width at th1 – 0.7-0.9 mm; width at th5 – 1.15-1.4 mm; distal width – 1.55-1.75 mm, proximal 2TRD – 1.5-1.8 mm; distal 2TRD – 1.9-2.3 mm. The rhabdosomes show a weak dorsal curvature, usually becoming straight distally. The sicula is ventrally curved and possesses a pronounced dorsal apertural tongue. Some well-preserved specimens show three distinct, thickened rings on the metasicula (9I, J), a feature regarded by Urbanek (1997) as characteristic of species of *Neocolonograptus* and some latest Ludfordian-early Pridoli representatives of the *P. dubius* group. The first one to three thecae normally show development of weak lateral apertural lappets (e.g. Fig. 9F, G, K), although the development of these lappets is variable and their appearance may be obscured by compression. Variable development of these lappets was also noted by other authors (e.g. Kříž et al., 1986; Urbanek, 1997; Lenz and Kozłowska-Dawidziuk, 2004), and those specimens in which the lappets are inconspicuous (e.g. Fig. 9H) would, on their own, be difficult to distinguish from some members of the *Pristiograptus dubius* group. The ventral walls of the thecae are weakly convex proximally, becoming straight distally. In addition, there are transverse thickenings observed at levels of the bases of the thecae, which are sometimes visible pressed through on compressed specimens. These were also illustrated by Koren' and Sujarkova (1997) and Urbanek (1997) and likely represent thickenings of the bases of the interthecal septa.

Neocolonograptus parultimus differs from other species of that genus by the very weak development of its lateral thecal apertural lappets. *Pristiograptus dubius labiatus* (Urbanek, 1997) also shows development of weak lateral apertural lobes on the proximal thecae. However, it differs from *N. parultimus* in that the thecal apertural rims of the former are strongly thickened, producing a distinct, protruding lip upon compression (Urbanek, 1997), and it is significantly narrower mesially and distally than *N. parultimus*.

"*Monograptus*" *ulrichi* (Ruedemann, 1908) (Figure 9B-E)

Our collections contain numerous specimens of this species representing all growth stages. Some of the dimensions are as follows: length of sicula – 1.4-1.7 mm; width at th1 – 0.25 mm; width at th5 – 0.4-0.6 mm; width at th10 – 0.9-1.0 mm; distal width – 1.5-1.6 mm; proximal 2TRD – 2.5-2.8 mm (one specimen 1.8 mm); distal 2TRD

– 2.2-2.6 mm. The rhabdosome is weakly ventrally curved proximally, moderately so mesially, becoming very gently ventrally curved to straight distally. Thecae are strongly geniculate with very small, semicircular apertural excavations. Some specimens show evidence of very slight genicular hoods. Supragenicular walls are straight and parallel to very slightly inclined. In many specimens the apertures are nearly impossible to see as a result of compression and incomplete preservation. Thecal overlap appears to be about ½ proximally 2/3 or more distally. At the distal end of the rhabdosome the distal-most thecal tubes appear to have grown well ahead of the succeeding prothecae producing a significant gap between the isolated distal thecal tubes and the nema.

Although the original type material was described from specimens missing complete proximal ends (Ruedemann, 1908, regarded the specimens as broken cladia of *Cyrtograptus*) all other aspects of the type material, which was from the "upper part of the Bainbridge Limestone" (Ruedemann, 1908, p. 460) match well with the present specimens, so we are confident that these represent the same species. Berry and Satterfield (1972) identified material as belonging to this species from several stratigraphic levels in the upper part of the Bainbridge Formation in Missouri. One of those levels also contained specimens identified as *Monograptus angustidens*, suggesting a late Pridoli age. However, most of their illustrated specimens identified as *Monograptus ulrichi* (e.g. Berry and Satterfield, 1972, pl. 1, figs 4, 6-8) differ from our specimens (and the type material, some of which was re-illustrated by Berry and Satterfield, 1972, pl. 1, fig. 5) in that the thecae show pronounced genicular hoods, and the rhabdosomes tend to be narrower throughout their length when the hoods are not included in the width. The distal thecal spacing is also closer in Berry and Satterfield's material. Thus, the Berry and

Satterfield specimens (except the re-illustrated types) may not represent the same species. Berry and Satterfield (1972) also suggested that the specimens described as *Monograptus butovicensis* (Boucek) by Ross (1962) belong to *Monograptus ulrichi*. However, Ross's specimens also show pronounced genicular hoods and are significantly wider at the first thecal pair than our material.

Linograptus posthumus tenuis Jaeger, 1959? (Figure 9A)

Our collections contain only a single fragmentary specimen that is questionably assigned to this species. It contains a single stipe fragment that appears to originate from the apertural margin of a sicula, although the preservation of this part of the specimen is not complete. Nevertheless, the thecae on the cladial fragment show all of the characteristic features of *L. posthumus*: elongate prothecae that flare slightly near the aperture; convex apertural margins; no thecal overlap. The dorsoventral width (0.35-0.45 mm) and thecal spacing (two thecae repeat distance - 2TRD is 3.0 mm) are characteristic of *L. posthumus tenuis*, as compared with *L. posthumus posthumus*, which has somewhat broader, more closely spaced thecae (Lenz and Kozłowska-Dawidzuik, 2004).

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Supplementary Data Repository Item DR-3

Paleontological Notes

Conodonts

Bradley D. Cramer, Neo E.B. McAdams, Alyssa M. Bancroft

The following are brief remarks on two conodont species found in this study as well as comments on the revisions to the conodont zonation included in Figure 4 in the manuscript.

Kockelella ortus absidata Barrick and Klapper, 1976 (Figure 7I, L)

Kockelella ortus sardoa Serpagli and Corradini, 1999 (not figured)

Our collections contain many specimens of this species. There have been several taxonomic revisions to this species since it was erected as *Kockelella absidata* by Barrick and Klapper (1976). This species was made a subspecies of *Kockelella ortus* (Walliser, 1964) as *Kockelella ortus absidata* by Jeppsson in Calner and Jeppsson (2003). Serpagli and Corradini (1999) re-elevated *absidata* to species level and erected two subspecies, *Kockelella absidata absidata* and *Kockelella absidata sardoa*. Subsequent usage (e.g. Corradini et al., 2015) has placed both subspecies back within *ortus* as *Kockelella ortus absidata* and *Kockelella ortus sardoa*. We use these designations throughout the manuscript.

Comments on Figure 4 include changes in the conodont zonation between this manuscript and the original of this figure, which appeared in Cramer et al. (2011). Comments are in stratigraphic order starting in the Rhuddanian Stage.

1) The *Asp. expansa* Zone is now the *Ps. expansa* Zone. This is due to the revision of the generic assignment of *expansa* from *Aspelundia* to *Pseudolonchodina*. See Waid and Cramer (2017) for further discussion.

2) The upper Sheinwoodian zonation of Cramer et al. (2011) included *K. walliseri* and *K. ortus ortus* zones. The rarity of *Kockelella ortus ortus* in many sections globally makes this zonation difficult to apply. Furthermore, many regions, particularly in North America, contain *Kockelella amsdeni* and *K. stauros*, rather than *K. walliseri*. It has been discussed at great length in Jeppsson (1997) that the first appearance of *K. amsdeni* is contemporaneous with the first appearance of *K. walliseri* globally (see also Cramer et al. 2010). In an effort to expand the geographic utility of this zone, we have revised it herein as the *K. amsdeni/K. walliseri* Superzone, the base of which is marked by the first occurrence of either *K. amsdeni* or *K. walliseri*.

3) The *O. snajdri* Interval Zone of the Ludfordian Stage is herein designated the *Ped. latialata/O. snajdri* I.Z. as suggested in Corradini et al. (2015). *Pedavis latialata* appears to be an excellent marker for the Lau positive carbon isotope excursion interval and the zone as designated by Corradini et al. (2015) corresponds precisely with the previous *O. snajdri* I.Z. of Cramer et al. (2011).

4) The *O. eosteinhornensis* s.l. I.Z. is now the *'O.' eosteinhornensis* s.l. I.Z. The quotation marks around *'O.'* designate the fact that conodonts that were traditionally identified as belonging to *eosteinhornensis* have been divided into a plexus of species within several genera (Murphy & Valenzuela-Ríos, 1999; Murphy et al., 2004; Carls et al., 2007). The species *eosteinhornensis* itself has been proposed to belong to 'genus W' as gen. W *eosteinhornensis* (Murphy et al. 2004). Carls et al. (2007) provide an excellent review of the concept and history of *eosteinhornensis* sensu lato and sensu stricto, and the use of an *eosteinhornensis* Zone. The *'O.' eosteinhornensis* s.l. I.Z. is not changed in concept or definition herein. We are only highlighting the taxonomic uncertainty of the index species of this zone.

5) *Caudicriodus hesperius* was used as the basal Devonian zone herein following Becker et al. (2012) in the GTS 2012.

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Supplementary Data Repository Item DR-4

Description of whole core of Schlamer #1 well

Location: 1,950’ FEL x 750’ FSL, Sec, 2, T15S, R3W, Thebes 7.5’ Quadrangle
Latitude: 37.23558°N, Longitude: 89.406761°W
Just south of Bean Ridge Road and north of Sammons Creek
API # 12-003-2072800
Landowners: Sam and Mary Schlamer
Targets: Silurian/Devonian boundary and total Silurian System
Descriptions by Joe Devera 8/21/2014 from uncut core; modified by Neo McAdams 5/15/18 with information from cut core.

0–13.5’ Surficial alluvium and chert gravel

Bailey Formation (basal section only, 4.5’ thick)
13.5’–18.0’ Dolomitic limestone, tan-gray, thin bedded, with frequent large gray chert nodules interrupting bedding. Trilobite fragment (*Huntoniatonia*?) at 14.7’. Contact with Randol Mbr. of Bainbridge Fm. gradational; Bailey becomes much less cherty and less dolomitic ~17.5’–18.0’.

Moccasin Springs Formation (122.6’ thick)
18.0’–140.6’

Moccasin Springs Fm., Randol Member (30.8’ thick)
18.0’–48.8’ Calcareous shale (18.0’–25.0’), gray, with lighter gray more calcareous ~1–2” thick irregular bands and infrequent chert nodules in upper ~6 feet. 25.0’–48.8’ greenish gray with thin, irregular dark gray burrows both parallel to and cross-cutting bedding, pyrite films visible on some bedding surfaces, bedding generally thinner. Contact subtle but sharp (unconformable) at 48.8’.

Moccasin Springs Fm., Lithium Member (19.8’ thick)
48.8’–68.6’ Lime mudstone and wackestone with occasional packstone lenses, heavily bioturbated, gray to green gray, with strong reddish purple mottling from 51.0’–55.2’; more sporadic, lighter red-purple and gray mottling in lighter green-gray matrix down section. Interval from 48.8’–51.0’ is more calcareous, better indurated, and more competent that overlying and underlying units. Sporadic small brachiopods throughout. Contact gradational, purple mottling decreases and dark burrow fills become more common.

Moccasin Springs Fm., Sheppard Point Member (25.7’ thick)
68.6’–94.3’ Calcareous shale, olive green, dark burrows common 68.6’–78’. Black organic-rich layers at 81.0’, 84.8’, 85.7’, 86.5’, 87.0’, 88.6’, and 90.2’, each ~1 inch

thick. Layers contain carbonized monograptid graptolites. *Zoophycos* in the olive green lime mudstone at 73.0', also occurs in black organic-rich layers. Small brachiopod at 77.5'. Contact distinct at 94.3', dense green calcareous shale changes to red silty calcareous marlstone down section.

Moccasin Springs Fm., Greens Ferry Member (46.4' thick)

94.3'–140.7' Calcareous silty marlstone, heavily bioturbated, red with gray mottling, with common 1–3" gray more calcareous irregular interbeds. Fossiliferous, with <10% trilobite fragments, corals, and brachipod debris. Small tabulate coral (*Pleurodictyum*?) at 94.8'. Few whole calymenid trilobites and gastropods below 140.0'. Contact gradational and conformable, drawn at highest competent carbonate bed of underlying St. Clair Fm.

St. Clair Formation (39.4' thick)

140.7'–180.1' Shaly lime mudstone to crinoid wackestone/packstone, brick red to gray to pink alternating, mottled, heavily bioturbated, medium to massive bedded. Dark red intervals more clay-rich; light gray and pink intervals more calcareous and dense, stylolitic (horizontal; also vertical below 170', all with green clay partings). Crinoid ossicles common throughout. Straight-shelled cephalopod with geopetal lime mud at 166.9'. Abrupt but conformable contact with Seventy-Six Fm. at 180.1'.

Seventy-Six Formation (2.2' thick)

180.1'–182.3' Calcareous shale, dominantly brick red with some light gray mottling in top 8–9 inches, gray-green from 181.9' to base; sparsely fossiliferous. Basal contact abrupt, unconformable.

Sexton Creek Limestone (35.9' thick)

182.3'–218.2' Limestone, light gray with tan patches in upper few feet and darker gray down section; dense lime mudstone to wackestone/grainstone with common crinoid ossicles, irregularly wavy-bedded to nodular with shaly partings, stylolitic. Clay infill in top few inches. Favositid coral at 190.5'. Large pyrite nodule at 202.0'. Large gray chert bands and nodules, become increasingly common down section. Contact abrupt (unconformity) at 218.2'.

Girardeau Limestone (46.7' thick)

218.2'–264.9' Lime mudstone, gray, dense, lithographic, with alternating thinner, darker shaly lime mudstone interbeds. Interbeds wavy and irregular from 218.2'–235', then thicker and more regular in shape. Thin intervals of intraformational breccia at 218.4' and 219.5' encased in the darker shale lithology. Occasional gray-brown chert nodules 220.5'-225.5'. Thin vertical fractures common 223'-233'; larger calcite-filled vertical fracture 251.1'-255.1'. Shaly limestone beds become siltier and less calcareous from 274.6' down section; gradational contact with Orchard Creek Shale. Fossils generally rare, occur in darker shaly lithology when present; strophomenid brachiopods at 223.9'; tentaculites at 248.2'. Thin, densely fossiliferous horizon at ~264.8’ (crinoid stems, encrusting bryozoans, and a tabulate coral). Soft sediment deformation features common throughout formation.

Orchard Creek Shale (upper section only, 9.7’ thick)
264.9’–274.6’
Calcareous shale (carbonate content decreases down section), medium to dark gray (gray interbedded with green from 271.45’ down section), heavily bioturbated, burrowed, thin bedded. Small black phosphatic nodules (few mm–few cm diameter) embedded in olive green non-calcareous, silty shale from 270.5’–271’. Some light-colored partings from 270.5’ down section.

Total Depth 275’ (0.4’ of Orchard Creek snapped off down hole)

Split core photographs included below. Whole core photographs available from corresponding author upon request.


15'
Bailey
Moccasin
Springs
Randol


25'


35'


451
Lau
Randol
Lithium


55'
Run


Lithium
Sheppard
Point
65'


75'
80


83.5-83.6
85.7-85.8
90
90.2-90.3


Sheppard
Point
Greens
Ferry
100


110


120


130'


Moccasin
Springs
Greens Ferry
St. Clair
140


150


160'


Mulde
170'
74.0-74.2
To Landowner
74-74.2'


St. Clair
180'
Seventy Six
Seventy Six
Ireviken
Sexton Creek


190'


197


205'


215'
Run 23
Sexton Creek
Girardeau


225'


235'


245


250


Girardeau
260
Orchard Creek


270'
275TD

ILLINOIS STATE GEOLOGICAL SURVEY
PRAIRIE RESEARCH INSTITUTE

TYPE LOG

NATURAL GAMMA & 8-16-32-64 INCH NORMAL RESISTIVITY, SP, SPR

API # 120032072800
UNIT # Excursion
PROBE #
SYSTEM 4WNA-1000
STE IL
FILING No NA

COMPANY ISGS
WELL TYPE Exploratory Corehole
PROJECT Bedrock Mapping
COUNTY Alexander STATE IL

LATITUDE 37.235580
LONGITUDE 89.406761
DATUM NAD83
ADDRESS 27236 Bean Ridge Rd., Thebes, IL
LOCATION 990' N, 2,150' W, SE/c Sec. 2
SECTION 2 TWP 15S RGE 3W

OTHER INFORMATION
Between creek and Bean Ridge Rd.

DATE LOGGED	August 18, 2014	G.S. ELEVATION	400' AMSL
RUN NUMBER	1	ELEVATION SOURCE	7.5' Topo on Cell Phone
DRILLER DEPTH	275.0' BGS		
LOGGER DEPTH	275.1' BGS		
LOGGED INTERVAL	5.3' BGS TO 275.1' BGS	TYPE FLUID IN HOLE	FORMATION H2O
LOG DEPTH REFER.	Top of Casing	SALINITY	
HEIGHT ABOVE G.S.	2.0'	DENSITY	
START DOWN DEPTH	5.3' BGS	LEVEL	~9.4' BGS
START RECORD DEPTH	275.1' BGS	MAX. REC. TEMP.	
END RECORD DEPTH	' BGS		
API NUMBER	120032072800		
RECORDED BY	T. Young		
WITNESSED BY	J. Aud		
WELL NAME	Schlamer TH1		

RUN	BOREHOLE RECORD			CASING RECORD			
NO.	BIT	FROM	TO	SIZE	WGT.	FROM	TO
1	HQ Diamond	0	275.0' BGS	HW Steel		2.0' AGS	14.0' BGS

TYPE LOG

NATURAL GAMMA & 8-16-32-64 INCH NORMAL RESISTIVITY, SP, SPR

ILLINOIS STATE GEOLOGICAL SURVEY
PRAIRIE RESEARCH INSTITUTE

API #	120032072800
UNIT #	Excursion
PROBE #	
SYSTEM	4WNA-1000
STE	IL
FILING No	NA

COMPANY ISGS
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