GEOLOGICAL SURVEY CIRCULAR 306

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN UTAH, 1949–51

UNITED STATES DEPARTMENT OF THE INTERIOR
Douglas McKay, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

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By T. M. Cheney, R. A. Smart, R. G. Waring, and M. A. Warner

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Washington, D. C., 1953

Free on application to the Geological Survey, Washington 25, D. C.

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INTRODUCTION

As part of a comprehensive investigation of the phosphate deposits of the western field begun in 1947, the U. S. Geological Survey has measured and sampled the full thickness of the Permian Phosphoria formation and its partial correlative, the Park City formation, at many localities in Utah and other western states. Although these data will not be fully analyzed for several years, segments of the data, accompanied by little or no interpretation, are published as preliminary reports as they are assembled. This report, which contains abstracts of the sections measured in northeastern Utah (fig. 1) in 1949, 1950, and 1951, is one of this series and the second report of data gathered in Utah. The field and laboratory procedures adopted in these investigations are described rather fully in a previous report (McKelvey and others, 1953a).

A large number of people have taken part in this investigation. The program of which this work is a part was organized by V. E. McKelvey and the field program was supervised by R. W. Swanson. R. P. Sheldon assisted in the location and selection of sample localities and F. J. Anderson, McKelvey, Sheldon, and H. W. Peirce participated in the description of strata and the collection of samples referred to in this report. T. K. Rigby assisted in the preparation of trenches and the crushing and splitting of samples in the field. The laboratory preparation of samples for chemical analysis was done in Denver, Colo., under the direction of W. P. Huleatt.

The P_2O_5 and acid-insoluble analyses were made in part in the Trace Elements Section laboratory of the Survey in Denver, Colo., under the direction of L. F. Rader, by chemists M. Appling, J. Dufour, N. Jammer, H. Miskowiec, N. Morris, and M. Stevens and in part for the Survey by the U. S. Bureau of Mines at the Northwest Electrodevelopment Laboratory, Albany, Oreg., under the direction of S. M. Shelton and M. L. Wright. The Al_2O_3, Fe_2O_3, and loss-on-ignition analyses were made in the Trace Elements Section laboratory, in Washington, D. C., under the direction of J. C. Rabbitt, by H. Alberty, T. Farley, C. Hoy, F. Grimaldi, and M. Landers.

Compilation of the data has been largely by K. S. Bergman under the supervision of R. W. Swanson. Organization of the tabular data has been by Anita Wise.

ACKNOWLEDGMENTS

Special thanks are due J. Steele Williams and A. A. Baker who have given much advice and many suggestions in the field. The cost of these investigations has been borne partly by the Division of Raw Materials of the Atomic Energy Commission.

It is a pleasure to acknowledge the fine cooperation extended to the field parties by the local residents and property owners who furnished information and services and gave access to property. Special thanks are due the American Smelting and Refining Co. for permission to sample the open-pit mine under their lease.

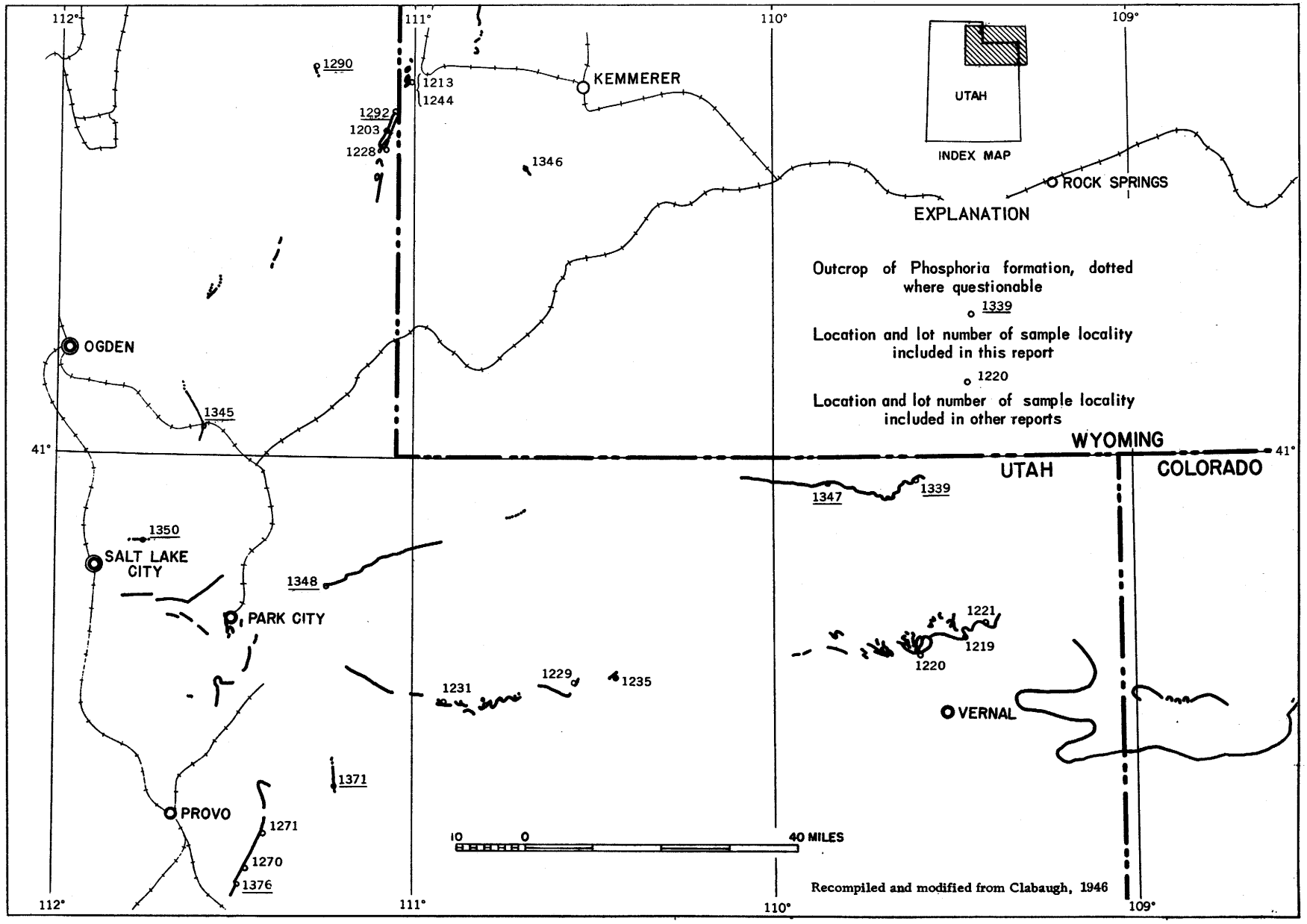

Figure 1.—Outcrops of the Phosphoria and Park City formations in Utah and localities sampled.

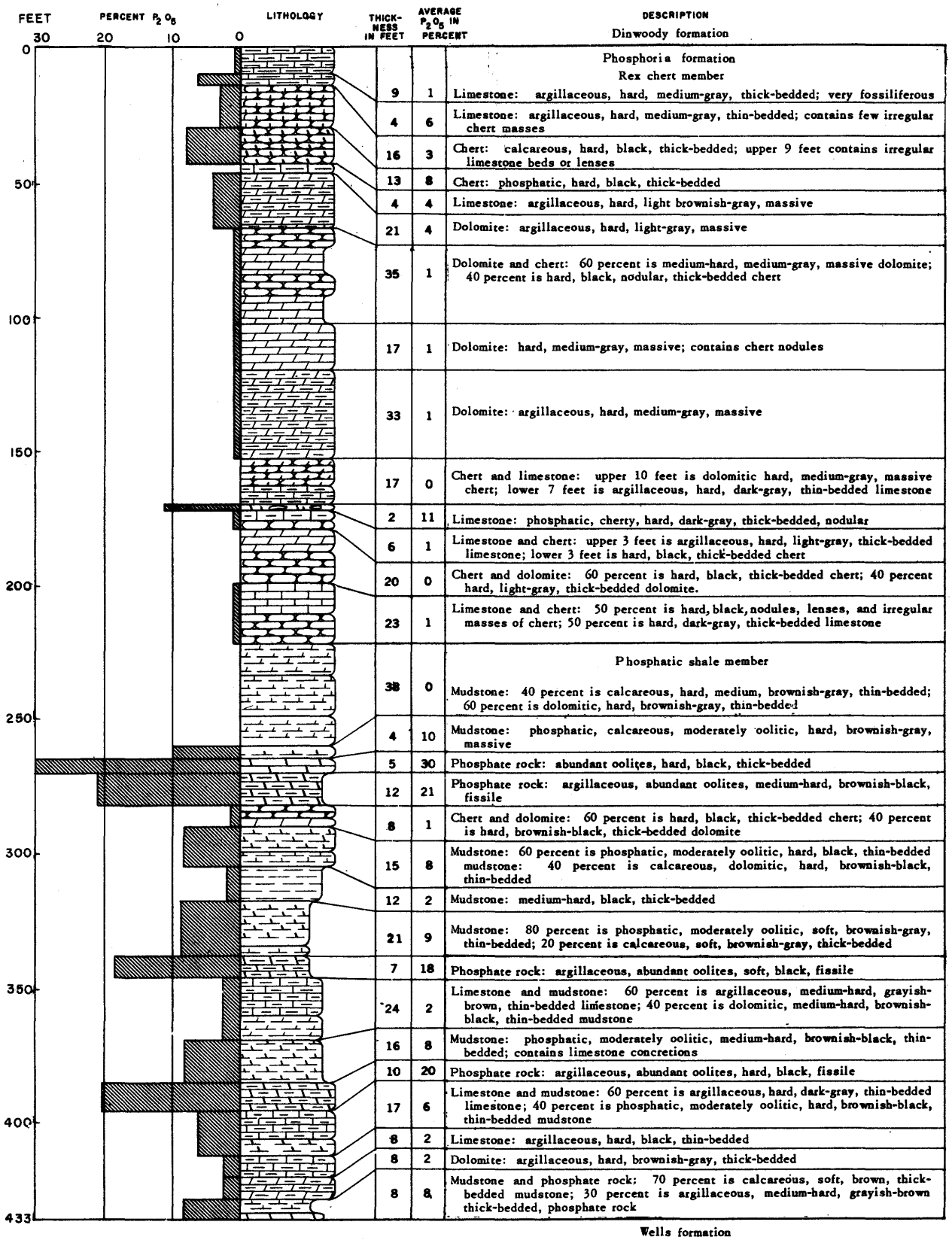

Figure 2.—Generalized section of the Phosphoria formation at Brazer Canyon, Utah, lot no. 1203.

STRATIGRAPHY OF THE PHOSPHORIA AND PARK CITY FORMATIONS IN UTAH

The stratigraphy of the Permian Phosphoria formation in the Crawford Mountains of northeastern Utah, near the Idaho-Wyoming corner, is very similar to that in the adjacent states and described in companion reports (McKelvey and others, 1953a, 1953b). It consists of the phosphatic shale member, about 210 feet thick, and the Rex chert member, for which this is the type locality, about 220 feet thick. The upper shale member, present in the adjacent region to the north, is not well defined in this area. Here, as well as to the north, the Phosphoria formation overlies the Pennsylvanian Wells formation, the upper part of which consists chiefly of cherty gray limestone with some thin phosphatic layers. The Phosphoria is overlain by the Triassic Dinwoody formation, consisting of limestone, calcareous siltstone, and sandstone. A generalized section of the Phosphoria formation at Brazer Canyon is shown in figure 2.

Farther south, along both the north and south flanks of the Uinta Range and in the general area of the Wasatch Range, the Park City formation is the partial stratigraphic equivalent of the Phosphoria formation. At Park City, its type locality, it is about 590 feet thick and consists of a lower limestone member, which may be stratigraphically equivalent to the upper part of the Wells formation in southeastern Idaho; a middle shale member (phosphatic but containing no high-grade phosphate beds) probably equivalent in major part to the phosphatic shale of Idaho; and an upper limestone member, equivalent to the Rex chert member to the north. Eastward the lower limestone member thins out and the middle shale and upper limestone members thin, are more clastic, and finally tongue out into nonmarine redbeds in eastern Utah and western Colorado. Westward the formation thickens markedly, attaining a thickness of several thousand feet, and contains a greater proportion of chemical precipitates.

More detailed correlations of the strata within Utah as well as between Utah and adjacent states will be discussed in subsequent publications.

STRATIGRAPHIC SECTIONS

Analytical data and abstracts of stratigraphic sections measured at nine localities follow. Their locations as well as the locations of sections previously reported (Smith and others, 1953) are shown in figure 1.

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Laketown Canyon, Utah, lot 1290

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench, sec. 32, T. 13 N., R. 6 E., Rich County, Utah, on an early Tertiary surface exhumed by erosion of the covering Wasatch formation. Phosphoria extensively leached by pre-Wasatch erosion. Beds strike N. 10° E. and dip 65° W. Section measured by R. P. Sheldon, F. J. Anderson, and R. G. Waring and sampled by Waring in July 1949. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines laboratory, Albany, Oreg., and for other constituents by Trace Elements Section laboratory, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Rex chert member of Phosphoria formation—basal bed only									
R- 1	Chert	3793- RPS	0.8	1.2	--	--	--	90.7	0.8	--
	Phosphatic shale member of Phosphoria formation									
P-58	Mudstone, phosphatic	3792- RPS	0.3	11.0	--	--	--	63.3	0.3	3.30
P-57	Mudstone	3791- RPS	2.6	1.6	--	--	--	75.8	2.9	7.46
P-56	Mudstone	5190- RPS	1.0	5.8	--	--	--	64.0	3.9	13.26
P-55	Phosphate rock	3789- RPS	1.0	35.8	0.99	0.71	2.18	4.0	4.9	49.06
P-54	Mudstone and argillaceous phosphate rock	3787- RPS	1.5	9.0	8.2	3.95	4.26	59.5	6.4	62.56
P-53	Phosphate rock	3877- FJA	1.0	31.0	3.1	1.93	4.10	11.7	7.4	93.56
P-52	Mudstone, phosphatic	3876- FJA	.9	15.6	7.0	3.08	4.80	42.9	8.3	107.60
P-51	Phosphate rock	3875- FJA	1.9	33.5	1.2	.43	3.62	7.4	10.2	171.25
P-50	Phosphate rock	3874- FJA	.5	36.3	1.3	.43	3.14	3.5	10.7	189.40
P-49	Phosphate rock	3873- FJA	1.4	31.4	2.1	.92	3.74	12.7	12.1	233.36
P-48	Phosphate rock	3872- FJA	1.3	36.5	.92	.63	3.24	2.2	13.4	280.81
P-47	Phosphate rock	3871- FJA	1.2	35.2	1.3	.37	3.78	4.7	14.6	323.05
P-46	Phosphate rock, argillaceous	3870- FJA	.7	27.5	4.3	1.27	4.20	20.7	15.3	342.30
P-45	Phosphate rock, argillaceous	3869- FJA	.6	25.6	3.6	.67	5.80	22.0	15.9	357.66
P-44	Mudstone and phosphate rock	3868- FJA	.9	21.5	6.0	2.08	6.24	27.2	16.8	377.01
P-43	Phosphate rock, argillaceous	3867- FJA	.9	16.4	6.6	2.60	7.02	37.1	17.7	391.77
P-42	Phosphate rock, argillaceous	3866- FJA	1.0	24.2	4.5	1.91	6.36	22.7	18.7	415.97
P-41	Phosphate rock	3865- FJA	.8	29.8	2.6	1.56	6.84	8.3	19.5	439.81
P-40	Phosphate rock	3864- FJA	.7	30.4	2.7	.71	5.18	11.3	20.2	461.09
P-39	Phosphate rock, argillaceous	3863- FJA	1.5	22.3	5.2	4.00	4.44	28.5	21.7	494.54
P-38	Phosphate rock, argillaceous	3862- FJA	2.0	21.9	5.5	2.14	4.34	32.2	23.7	538.34
P-37	Phosphate rock, argillaceous	3861- FJA	1.0	24.9	4.8	1.20	4.34	25.5	24.7	563.24
P-36	Phosphate rock, argillaceous	3860- FJA	2.2	19.2	6.1	3.15	4.40	36.9	26.9	605.48
P-35	Mudstone, phosphatic	3859- FJA	1.5	11.5	--	--	--	53.8	28.4	622.73
P-34	Mudstone, phosphatic	3858- FJA	1.8	13.5	--	--	--	51.8	30.2	647.03
P-33	Mudstone	3857- FJA	2.5	1.3	--	--	--	83.7	32.7	650.28

Laketown Canyon—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-32	Mudstone, phosphatic	3856- FJA	1.1	11.3	--	--	--	54.4	33.8	662.71
P-31	Phosphate rock	3855- FJA	1.2	33.2	--	--	--	8.3	35.0	702.55
P-30	Mudstone	3854- FJA	1.6	6.9	--	--	--	66.1	36.6	713.59
P-29	Mudstone	3853- FJA	3.5	2.5	--	--	--	80.0	40.1	722.34
P-28	Phosphate rock, argillaceous	3852- FJA	1.7	27.3	--	--	--	18.3	41.8	768.75
P-27	Mudstone	3851- FJA	1.8	5.3	--	--	--	69.9	43.6	778.29
P-26	Phosphate rock	3772- RPS	.85	27.7	--	--	--	15.0	44.45	801.84
P-25	Mudstone	--	?	--	--	--	--	--	--	--
P-24	Mudstone, phosphatic	3771- RPS	1.5	10.5	--	--	--	54.6	45.95	*15.75
P-23	Phosphate rock	3770- RPS	1.0	29.5	--	--	--	13.7	46.95	45.25
P-22	Phosphate rock, argillaceous	3769- RPS	1.6	19.1	--	--	--	32.8	48.55	75.81
P-21	Mudstone, phosphatic	3768- RPS	2.0	9.7	--	--	--	58.0	50.55	95.21
P-20	Phosphate rock, argillaceous	3767- RPS	2.0	23.1	--	--	--	30.7	52.55	141.41
P-19	Phosphate rock	3788- RPS	1.6	28.3	--	--	--	16.0	54.15	186.69
P-18	Phosphate rock, argillaceous	3766- RPS	.9	19.8	--	--	--	38.6	55.05	204.51
P-17	Mudstone	3765- RPS	1.6	3.8	--	--	--	76.4	56.65	210.59
P-16	Mudstone	3764- RPS	4.0	1.1	--	--	--	81.5	60.65	214.99
P-15	Phosphate rock	3763- RPS	1.0	34.5	--	--	--	6.8	61.65	249.49
P-14	Mudstone	3786- RPS	5.0	4.1	--	--	--	71.6	66.65	269.99
P-13	Mudstone	3785- RPS	5.0	3.7	--	--	--	69.7	71.65	288.49
P-12	Mudstone	3784- RPS	4.5	6.7	--	--	--	62.2	76.15	318.64
P-11	Phosphate rock and mudstone	3783- RPS	.5	23.9	6.2	2.52	4.04	28.0	76.65	330.59
P-10	Mudstone, phosphatic	3774- RPS	.8	17.3	6.9	2.76	3.68	44.0	77.45	344.43
P- 9	Phosphate rock, argillaceous	3773- RPS	.7	17.6	6.2	2.43	4.30	41.4	78.15	356.75
P- 8	Phosphate rock and mudstone	3832-RGW	2.3	19.1	6.7	2.37	4.18	39.1	80.45	400.68
P- 7	Phosphate rock, argillaceous	3831-RGW	1.7	22.7	5.1	1.58	5.46	28.2	82.15	439.27
P- 6	Mudstone	3830-RGW	.6	7.5	12.	7.15	6.58	53.9	82.75	443.77
P- 5	Phosphate rock, argillaceous	3829-RGW	1.5	18.5	6.9	3.88	5.58	34.4	84.25	471.52
P- 4	Phosphate rock, argillaceous	3828-RGW	1.0	23.1	4.9	3.61	4.90	25.4	85.25	494.62
P- 3	Phosphate rock, argillaceous	3827-RGW	2.4	27.6	4.4	1.54	5.08	16.2	87.65	560.86
P- 2	Phosphate rock and mudstone	3826-RGW	1.2	19.1	6.2	3.83	4.80	35.0	88.85	583.78
P- 1	Phosphate rock, argillaceous	3825-RGW	1.5	18.7	6.2	6.30	4.80	35.0	**90.35	**611.83
	Wells formation— upper part only									
Cw-1	Mudstone	3824-RGW	1.3	2.2	--	--	--	83.0	1.3	2.86
Cw-2	Sandstone, cherty	3823-RGW	1.2	2.0	--	--	--	86.2	2.5	5.26
Cw-3	Sandstone, cherty	3822-RGW	2.7	1.3	--	--	--	86.2	5.2	8.77
Cw-4	Sandstone, cherty	3821-RGW	1.4	1.3	--	--	--	84.9	6.6	10.59

* Cumulative data incomplete because of missing information. Cumulatives start from zero after interruption.
** Note incompleteness of cumulative data.

North Crawford, Utah, lot 1292

Phosphoria formation sampled in bulldozer trench in North Crawford Mountains, sec. 32, T. 12 N., R. 8 E., Rich County, Utah, on the west limb of the Crawford syncline. Section measured by V. E. McKelvey, R. G. Waring, M. A. Warner, and R. A. Smart and sampled by Waring, Warner, and Smart in July 1949. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines laboratory, Albany, Oreg., and for other constituents by Trace Elements Section laboratory, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Phosphatic shale member of Phosphoria formation									
P-104	Mudstone, carbonatic	3843-MAW	5.7	0.6	--	--	--	57.2	5.7	3.42
P-103	Mudstone, carbonatic	3842-MAW	5.9	.6	--	--	--	52.7	11.6	6.96
P-102	Mudstone, carbonatic	3933-VEM	2.8	.7	--	--	--	63.0	14.4	8.92
P-101	Phosphate rock, argillaceous	3932-VEM	1.4	17.1	--	--	--	35.7	15.8	32.86
P-100	Carbonate rock, argillaceous, and argillaceous phosphate rock	3931-VEM	1.5	9.1	--	--	--	32.0	17.3	46.51
P- 99	Mudstone, phosphatic	3930-VEM	.9	8.3	--	--	--	51.3	18.2	53.98
P- 98	Phosphate rock	3929-VEM	1.8	32.3	0.74	0.67	5.86	3.7	20.0	112.12
P- 97	Phosphate rock	3928-VEM	1.4	32.8	.49	.43	6.44	2.0	21.4	158.04
P- 96	Phosphate rock, argillaceous, and phosphatic mudstone	3927-VEM	.5	19.9	3.9	1.21	7.40	29.8	21.9	167.99
P- 95	Phosphate rock	3926-VEM	1.2	30.3	.49	.50	9.04	2.4	23.1	204.35
P- 94	Phosphate rock, phosphatic mudstone, and carbonatic phosphate rock	3925-VEM	.9	27.3	2.5	1.20	5.92	15.1	24.0	228.92
P- 93	Phosphate rock	3924-VEM	1.7	29.4	1.4	.38	6.78	9.3	25.7	278.90
P- 92	Phosphate rock	3923-VEM	.9	27.7	2.7	.82	4.80	19.7	26.6	312.14
P- 91	Phosphate rock, argillaceous	3922-VEM	1.3	19.0	3.4	1.27	9.26	27.0	27.9	331.14
P- 90	Mudstone, carbonatic	3921-VEM	2.8	2.6	6.1	1.94	19.40	47.3	30.7	338.42
P- 89	Phosphate rock	3841-MAW	2.0	25.6	3.3	1.00	4.34	23.4	32.7	389.62
P- 88	Phosphate rock	3840-MAW	.9	27.2	2.1	3.63	4.38	18.7	33.6	414.10
P- 87	Phosphate rock, argillaceous	3839-MAW	1.8	22.0	4.2	1.82	3.58	32.7	35.4	453.70
P- 86	Mudstone, phosphatic	3838-MAW	.5	9.5	6.2	2.45	8.50	52.8	35.9	458.45
P- 85	Phosphate rock	3837-MAW	1.1	27.7	1.7	1.60	6.00	13.7	37.0	488.92
P- 84	Carbonate rock	3836-MAW	1.2	.7	--	--	--	12.3	38.2	489.76
P- 83	Mudstone, cherty	3835-MAW	1.2	.9	--	--	--	81.1	39.4	490.84
P- 82	Phosphate rock, argillaceous, carbonatic	3834-MAW	1.4	17.3	--	--	--	19.1	40.8	515.06
P- 81	Mudstone, carbonatic	3833-MAW	3.0	2.3	--	--	--	44.0	43.8	521.96
P- 80	Mudstone, carbonatic	3986-RGW	1.9	4.0	--	--	--	55.3	45.7	529.56
P- 79	Mudstone	3985-RGW	.5	2.3	--	--	--	75.5	46.2	530.71
P- 78	Mudstone and phosphate rock	3984-RGW	.7	14.9	--	--	--	38.3	46.9	541.14
P- 77	Carbonate rock, argillaceous	3983-RGW	.6	.5	--	--	--	22.3	47.5	541.44

North Crawford—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-76	Mudstone, phosphatic, carbonatic	3982-RGW	0.5	10.3	--	--	--	36.3	48.0	546.59
P-75	Mudstone, carbonatic	3981-RGW	1.8	1.7	--	--	--	52.3	49.8	549.65
P-74	Phosphate rock, argillaceous	3980-RGW	1.1	25.6	--	--	--	16.3	50.9	577.81
P-73	Carbonate rock, argillaceous, phosphatic	3979-RGW	1.6	8.5	--	--	--	24.5	52.5	591.41
P-72	Carbonate rock	3940-VEM	3.2	.4	--	--	--	6.3	55.7	592.69
P-71	Mudstone, carbonatic	3939-VEM	.3	5.2	--	--	--	56.2	56.0	594.25
P-70	Mudstone	3938-VEM	.3	.4	--	--	--	78.9	56.3	594.37
P-69	Mudstone	3937-VEM	.5	.2	--	--	--	71.5	56.8	594.47
P-68	Mudstone	3936-VEM	.8	.2	--	--	--	75.3	57.6	594.63
P-67	Mudstone	3935-VEM	1.0	5.7	--	--	--	65.1	58.6	600.33
P-66	Mudstone, carbonatic	3934-VEM	2.2	1.1	--	--	--	52.8	60.8	602.75
P-65	Mudstone, phosphatic	3848- RAS	.6	11.4	--	--	--	53.3	61.4	609.59
P-64	Mudstone	3847- RAS	1.2	.9	--	--	--	77.3	62.6	610.67
P-63	Mudstone, carbonatic	3846- RAS	1.9	.7	--	--	--	59.8	64.5	612.00
P-62	Mudstone, phosphatic	3845- RAS	.6	10.8	--	--	--	50.2	65.1	618.48
P-61	Mudstone, phosphatic	3844- RAS	1.4	11.7	--	--	--	48.2	66.5	634.86
P-60	Mudstone, phosphatic	3900- RAS	1.8	10.1	--	--	--	50.2	68.3	653.04
P-59	Carbonate rock	3899- RAS	.8	2.9	--	--	--	9.5	69.1	655.36
P-58	Phosphate rock, argillaceous, carbonatic	3898- RAS	2.5	14.7	--	--	--	28.3	71.6	692.11
P-57	Mudstone, carbonatic	3897- RAS	1.6	5.1	--	--	--	47.5	73.2	700.27
P-56	Phosphate rock, argillaceous	3896- RAS	1.0	19.7	--	--	--	33.0	74.2	719.97
P-55	Carbonate rock	3895- RAS	.6	2.8	--	--	--	8.5	74.8	721.65
P-54	Phosphate rock, argillaceous, carbonatic	3894- RAS	.8	14.1	--	--	--	22.7	75.6	732.93
P-53	Mudstone, phosphatic, carbonatic	3893- RAS	1.8	10.4	--	--	--	35.8	77.4	751.65
P-52	Mudstone, phosphatic and argillaceous limestone	3892- RAS	1.7	9.4	--	--	--	49.0	79.1	767.63
P-51	Phosphate rock, argillaceous	3891- RAS	2.7	18.3	--	--	--	31.2	81.8	817.04
P-50	Phosphate rock, argillaceous	3890- RAS	1.4	20.6	--	--	--	20.9	83.2	845.88
P-49	Phosphate rock, argillaceous and mudstone	3889- RAS	1.1	21.8	--	--	--	29.7	84.3	869.86
P-48	Phosphate rock	3888- RAS	1.2	33.1	--	--	--	9.3	85.5	909.58
P-47	Phosphate rock, argillaceous	3978-RGW	1.0	23.7	--	--	--	29.0	86.5	933.28
P-46	Mudstone, phosphatic	3977-RGW	.8	14.3	--	--	--	38.3	87.3	944.72
P-45	Carbonate rock	3976-RGW	1.3	3.1	--	--	--	18.8	88.6	948.75
P-44	Mudstone	3975-RGW	3.3	6.9	--	--	--	51.3	91.9	971.52

P-43	Mudstone, carbonatic	3974-RGW	4.7	1.6	--	--	--	48.3	96.6	979.04
P-42	Carbonate rock, argillaceous	3973-RGW	1.3	2.2	--	--	--	37.3	97.9	981.90
P-41	Mudstone, cherty	3972-RGW	1.4	5.1	--	--	--	64.7	99.3	989.04
P-40	Carbonate rock, argillaceous	3971-RGW	1.1	1.6	--	--	--	31.3	100.4	990.80
P-39	Mudstone, carbonatic and limestone	3970-RGW	.9	.7	--	--	--	21.3	101.3	991.43
P-38	Mudstone, carbonatic	3969-RGW	1.1	2.9	--	--	--	58.1	102.4	994.62
P-37	Chert	3968-RGW	.7	3.4	--	--	--	70.3	103.1	997.00
P-36	Carbonate rock, argillaceous	3967-RGW	2.0	.8	--	--	--	22.8	105.1	998.60
P-35	Chert and calcareous chert	3966-RGW	.6	2.6	--	--	--	77.7	105.7	1,000.16
P-34	Chert	3965-RGW	.7	3.1	--	--	--	78.0	106.4	1,002.33
P-33	Mudstone	3964-RGW	1.1	4.7	--	--	--	67.3	107.5	1,007.50
P-32	Carbonate rock, argillaceous	3963-RGW	2.0	1.5	--	--	--	31.7	109.5	1,010.50
P-31	Mudstone	3962-RGW	.9	4.5	--	--	--	68.3	110.4	1,014.55
P-30	Mudstone, phosphatic	3961-RGW	.6	9.9	--	--	--	56.4	111.0	1,020.49
P-29	Mudstone, phosphatic	3960-RGW	1.1	11.6	--	--	--	53.5	112.1	1,033.25
P-28	Phosphate rock and mudstone	3887- RAS	1.1	11.9	--	--	--	52.8	113.2	1,046.34
P-27	Mudstone, carbonatic	3886- RAS	1.0	1.2	--	--	--	47.3	114.2	1,047.54
P-26	Phosphate rock, argillaceous	3885- RAS	.6	20.5	--	--	--	37.8	114.8	1,059.84
P-25	Mudstone and phosphate rock	3884- RAS	.5	18.0	--	--	--	39.7	115.3	1,068.84
P-24	Phosphate rock, argillaceous	3883- RAS	.5	22.3	--	--	--	28.5	115.8	1,079.99
--	Carbonate rock lens	3882- RAS	(.7)	.8	--	--	--	14.7	--	--
P-23	Carbonate rock, argillaceous	3881- RAS	1.8	1.4	--	--	--	28.5	117.6	1,082.51
P-22	Mudstone, phosphatic	3880- RAS	.6	14.1	--	--	--	48.1	118.2	1,090.97
P-21	Mudstone, phosphatic	3879- RAS	1.4	14.1	--	--	--	52.1	119.6	1,110.71
P-20	Mudstone, phosphatic	3878- RAS	.7	13.2	--	--	--	52.1	120.3	1,119.95
P-19	Mudstone, carbonatic	3794- RAS	1.4	1.5	--	--	--	52.7	121.7	1,122.05
P-18	Phosphate rock, argillaceous	3795- RAS	1.9	27.2	2.4	1.20	3.38	22.0	123.6	1,173.73
P-17	Phosphate rock, argillaceous	3796- RAS	2.5	24.8	--	--	--	27.9	126.1	1,235.73
P-16	Phosphate rock, argillaceous	3797- RAS	1.2	25.1	2.3	.42	3.26	27.8	127.3	1,265.85
P-15	Phosphate rock, argillaceous	3798- RAS	1.7	28.9	1.8	.46	3.20	18.7	129.0	1,314.98
P-14	Phosphate rock, argillaceous	3799- RAS	1.9	19.1	--	--	--	35.7	130.9	1,351.27
P-13	Limestone, argillaceous	3959-RGW	1.2	4.8	1.2	.26	25.18	30.1	132.1	1,357.03
P-12	Mudstone and argillaceous phosphate rock	3958-RGW	.9	19.7	3.6	.77	5.64	35.6	133.0	1,374.76
P-11	Mudstone	3957-RGW	.8	7.4	--	--	--	57.0	133.8	1,380.68
P-10	Carbonate rock, argillaceous	3956-RGW	.7	7.2	--	--	--	37.7	134.5	1,385.72
P- 9	Chert, mudstone and phosphatic mudstone	3955-RGW	.8	8.1	--	--	--	58.2	135.3	1,392.20
P- 8	Phosphate rock, argillaceous	3954-RGW	.6	15.7	--	--	--	36.3	135.9	1,401.62
P- 7	Carbonate rock	3953-RGW	1.2	1.1	--	--	--	16.7	137.1	1,402.94
P- 6	Carbonate rock, argillaceous	3952-RGW	1.2	3.4	--	--	--	28.0	138.3	1,407.02
P- 5	Mudstone, carbonatic and cherty carbonate rock	3951-RGW	1.4	3.7	--	--	--	44.2	139.7	1,412.20
P- 4	Carbonate rock, argillaceous	3951-RGW	1.1	2.1	--	--	--	20.3	140.8	1,414.51

North Crawford—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P- 3	Carbonate rock and chert	3949-RGW	1.6	2.6	--	--	--	36.8	142.4	1,418.67
--	Carbonate rock lens	--	(.5)	--	--	--	--	--	--	--
P- 2	Limestone, argillaceous and phosphate rock	3948-RGW	2.4	13.8	--	--	--	28.5	144.8	1,451.79
P- 1	Phosphate rock, argillaceous, carbonatic	3947-RGW	.3	18.4	--	--	--	22.3	145.1	1,457.31
	Wells formation—top beds only									
Cw-1	Mudstone, carbonatic	3946-RGW	2.2	2.1	--	--	--	49.0	2.2	--
Cw-2	Carbonate rock, argillaceous	3945-RGW	1.2	2.8	--	--	--	36.7	3.4	--
Cw-3	Carbonate rock, argillaceous	3944-RGW	1.0	3.1	--	--	--	40.7	4.4	--
Cw-4	Carbonate rock, argillaceous	3943-RGW	2.2	--	--	--	--	--	6.6	--
Cw-5	Carbonate rock	3942-RGW	2.2	--	--	--	--	--	8.8	--
Cw-6	Carbonate rock, argillaceous	3941-RGW	1.2	--	--	--	--	--	10.0	--

Devils Slide, Utah, lot 1345

Park City formation measured and phosphatic beds sampled in bulldozer trench and natural outcrop 4 miles east of Morgan in Weber Canyon, sec. 26(?), T. 4 N., R. 3 E., Morgan County, Utah. The section is on the east limb of an anticline. Beds strike N. 40° E. and dip 20° E. Section measured by M. A. Warner, T. M. Cheney, R. G. Waring, and R. A. Smart and sampled by T. K. Rigby, Smart, and Warner in June 1951. Samples analyzed by U. S. Bureau of Mines Laboratory, Albany, Oreg.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Woodside shale—basal bed only						
Trw-1	Sandstone	--	--	--	--	--	--
	Upper member of Park City formation						
U-17	Carbonate rock	--	4.0	--	--	4.0	--
U-16	Covered interval	--	78.0	--	--	82.0	--
U-15	Carbonate rock	--	7.0	--	--	89.0	--
U-14	Carbonate rock	--	4.7	--	--	93.7	--
U-13	Covered interval	--	25.6	--	--	119.3	--
U-12	Carbonate rock, sandy	--	15.1	--	--	134.4	--
U-11	Chert	--	3.5	--	--	137.9	--
U-10	Carbonate rock, sandy and chert	--	5.8	--	--	143.7	--
U-9	Sandstone, carbonatic	--	6.1	--	--	149.8	--
U-8	Carbonate rock, cherty	--	9.6	--	--	159.4	--
U-7	Carbonate rock, cherty	--	8.2	--	--	167.6	--
U-6	Covered interval	--	17.4	--	--	185.0	--
U-5	Sandstone	--	19.8	--	--	204.8	--
U-4	Carbonate rock; fos. col. nos. 12487 and 12488[1]	--	28.0	--	--	232.8	--
U-3	Covered interval	--	6.0	--	--	238.8	--
U-2	Chert	--	2.0	--	--	240.8	--
U-1	Carbonate rock, cherty	--	1.2	--	--	242.0	--
	Phosphatic shale member of Park City formation (?)						
P-139	Mudstone, carbonatic	--	7.2	--	--	7.2	--
P-138	Mudstone, phosphatic	6182-RGW	3.2	10.8	53.8	10.4	34.56
P-137	Mudstone, carbonatic	6181-RGW	1.3	2.75	47.6	11.7	38.14
P-136	Mudstone	6180-RGW	1.4	3.65	73.6	13.1	43.24
P-135	Mudstone	6179-RGW	.9	3.70	66.0	14.0	46.58
P-134	Mudstone, phosphatic	6178-RGW	1.8	13.9	38.0	15.8	71.60

[1] Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Devils Slide—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-133	Mudstone, phosphatic	6177-RGW	2.2	10.8	46.5	18.0	95.36
P-132	Mudstone, phosphatic	6176-RGW	1.2	13.8	44.6	19.2	111.92
P-131	Mudstone, carbonatic	6175-RGW	1.9	4.05	40.5	21.1	119.61
P-130	Mudstone	6174-RGW	1.7	4.15	79.0	22.8	126.66
P-129	Mudstone	6173-RGW	1.7	4.10	78.3	24.5	133.64
P-128	Mudstone	6172-RGW	1.4	7.00	60.6	25.9	143.44
P-127	Mudstone	6171- RAS	2.4	3.95	65.8	28.3	152.92
P-126	Mudstone	6170- RAS	4.3	2.65	71.6	32.6	164.31
P-125	Mudstone, phosphatic	6169- RAS	1.9	13.5	49.8	34.5	189.96
P-124	Mudstone	6168- RAS	2.5	2.45	79.5	37.0	196.08
P-123	Phosphate rock, argillaceous	6167- RAS	1.5	19.9	41.3	38.5	225.94
P-122	Carbonate rock, argillaceous	6166- RAS	1.1	1.10	29.6	39.6	227.14
P-121	Mudstone	6165- RAS	3.1	6.05	73.1	42.7	245.90
P-120	Mudstone, carbonatic	6164- RAS	.7	1.10	45.7	43.4	246.67
P-119	Mudstone, phosphatic	6163- RAS	1.3	10.6	61.6	44.7	260.45
P-118	Mudstone, carbonatic	6162- RAS	2.2	1.90	55.3	46.9	264.63
P-117	Mudstone, phosphatic	6161- RAS	1.1	10.1	59.8	48.0	275.74
P-116	Carbonate rock	6160- RAS	1.0	1.30	15.2	49.0	277.04
P-115	Mudstone, phosphatic	6159- RAS	2.4	10.2	63.0	51.4	301.52
P-114	Carbonate rock, argillaceous	6158-TMC	1.5	1.25	32.4	52.9	303.40
P-113	Mudstone, phosphatic	6157-TMC	1.8	11.4	56.8	54.7	323.92
P-112	Mudstone, carbonatic	6156-TMC	.7	4.90	53.6	55.4	327.34
P-111	Carbonate rock	6155-TMC	.8	1.55	18.5	56.2	328.58
P-110	Mudstone	6154-TMC	1.2	4.97	68.7	57.4	334.55
P-109	Phosphate rock, argillaceous, phosphatic mudstone, mudstone and phosphate rock	6153-TMC	.9	19.4	29.5	58.3	352.01
P-108	Mudstone, carbonatic, phosphate rock and mudstone	6152-TMC	1.4	7.20	51.5	59.7	362.09
P-107	Mudstone, calcareous	6151-TMC	3.4	2.45	43.7	63.1	370.42
P-106	Mudstone, calcareous, phosphatic	6150-TMC	1.8	6.05	64.4	64.9	381.31
P-105	Phosphate rock, argillaceous and phosphatic mudstone	6149-TMC	1.8	23.5	28.2	66.7	423.61
P-104	Carbonate rock, argillaceous	6148-TMC	2.1	.50	25.0	68.8	424.66
P-103	Phosphate rock and phosphatic mudstone	6147-TMC	.8	17.4	32.4	69.6	438.58
P-102	Mudstone and calcareous mudstone	6146-TMC	1.7	3.30	40.2	71.3	444.19
P-101	Phosphate rock, argillaceous	6145-TMC	.5	18.8	25.3	71.8	453.59
P-100	Mudstone, carbonatic and phosphatic mudstone	6144-TMC	1.0	4.80	56.2	72.8	458.39

P- 99	Phosphate rock, argillaceous, carbonatic --	6143-TMC	.9	15.0	23.2	73.7	471.89
P- 98	Phosphate rock----------	6142-TMC	.9	23.4	21.5	74.6	492.95
P- 97	Mudstone, phosphatic, mudstone, and argillaceous carbonate rock----------	6141-TMC	2.0	2.70	17.4	76.6	498.35
P- 96	Phosphate rock, argillaceous----------	6140-TMC	1.0	22.4	28.2	77.6	520.75
P- 95	Mudstone, phosphatic, phosphate rock, and mudstone----------	6139-TMC	.4	15.0	45.0	78.0	526.75
P- 94	Phosphate rock, argillaceous----------	6138-TMC	1.0	22.1	31.3	79.0	548.85
P- 93	Carbonate rock, argillaceous----------	6137-TMC	2.6	.45	33.7	81.6	550.02
P- 92	Carbonate rock, argillaceous----------	6136-TMC	.5	2.15	35.5	82.1	551.09
P- 91	Phosphate rock, argillaceous----------	6135-TMC	.9	25.8	27.2	83.0	574.31
P- 90	Mudstone----------	6134-TMC	2.3	.75	86.8	85.3	576.04
P- 89	Mudstone----------	6133-TMC	.4	1.05	85.8	85.7	576.46
P- 88	Mudstone----------	6130-TMC	.6	.75	81.8	86.3	576.91
P- 87	Mudstone----------	6129-TMC	1.8	1.15	83.7	88.1	578.98
P- 86	Mudstone and phosphate rock ----------	6128-TMC	.6	13.4	52.4	88.7	587.02
P- 85	Phosphate rock and mudstone----------	6127-TMC	.4	20.8	35.6	89.1	595.34
P- 84	Phosphate rock, argillaceous ----------	6126-TMC	.6	22.8	26.4	89.7	609.02
P- 83	Mudstone, phosphatic----------	6125-TMC	.9	17.5	46.0	90.6	624.77
P- 82	Mudstone----------	6124-TMC	.7	6.20	75.2	91.3	629.11
P- 81	Brecciated zone (possible fault zone) ------	--	4.2	--	--	95.5	--
P- 80	Siltstone, calcareous ----------	--	1.9	--	--	97.4	--
P- 79	Carbonate rock; fos. col. no. 12485--------	--	3.0	--	--	100.4	--
P- 78	Sandstone, carbonatic ----------	--	22.8	--	--	123.2	--
P- 77	Breccia (possible fault zone) ----------	--	28.2	--	--	151.4	--
P- 76	Sandstone, carbonatic ----------	--	3.7	--	--	155.1	--
P- 75	Mudstone ----------	--	1.0	--	--	156.1	--
P- 74	Mudstone, phosphatic ----------	6132-MAW	.7	10.0	53.1	156.8	--
P- 73	Mudstone, carbonatic ----------	6131-MAW	2.9	4.65	40.1	159.7	--
P- 72	Mudstone----------	--	2.3	--	--	162.0	--
P- 71	Mudstone----------	--	4.1	--	--	166.1	--
P- 70	Mudstone----------	--	3.4	--	--	169.5	--
P- 69	Mudstone----------	--	3.4	--	--	172.9	--
P- 68	Mudstone and chert ----------	--	2.9	--	--	175.8	--
P- 67	Mudstone----------	--	3.4	--	--	179.2	--
P- 66	Mudstone----------	--	3.2	--	--	182.4	--
P- 65	Mudstone, carbonatic ----------	6123-MAW	3.2	2.25	58.1	185.6	*7.20
P- 64	Mudstone, carbonatic ----------	6122-MAW	2.7	2.00	52.2	188.3	12.60
P- 63	Mudstone, carbonatic ----------	6121-MAW	.5	8.85	46.9	188.8	17.02
P- 62	Mudstone, carbonatic ----------	6120-MAW	1.5	3.45	52.1	190.3	22.20
P- 61	Mudstone, carbonatic ----------	6119-MAW	2.3	5.70	50.8	192.6	35.31
P- 60	Mudstone, carbonatic ----------	6118-MAW	2.5	4.70	38.2	195.1	47.06

* Cumulative data incomplete because of missing information. Cumulatives start from zero after interruption.

Devils Slide—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-59	Mudstone, carbonatic	6117-MAW	1.5	3.50	42.2	196.6	52.31
P-58	Mudstone, carbonatic	6116-MAW	1.5	1.75	40.2	198.1	54.94
P-57	Mudstone, carbonatic	6115-MAW	1.4	4.00	45.7	199.5	60.54
P-56	Phosphate rock, carbonatic, argillaceous	6114-MAW	.35	17.2	22.6	199.85	66.56
P-55	Mudstone	--	2.7	--	--	202.55	--
P-54	Mudstone	--	3.0	--	--	205.55	--
P-53	Mudstone	--	3.6	--	--	209.15	--
P-52	Mudstone, cherty and mudstone	--	1.3	--	--	210.45	--
P-51	Mudstone, cherty	--	1.4	--	--	211.85	--
P-50	Mudstone, cherty	--	2.8	--	--	214.65	--
P-49	Mudstone	--	1.9	--	--	216.55	--
P-48	Mudstone, cherty	--	.9	--	--	217.45	--
P-47	Mudstone	--	2.3	--	--	219.75	--
P-46	Mudstone	--	.9	--	--	220.65	--
P-45	Mudstone, carbonatic	6113-MAW	.8	1.30	54.8	221.45	*1.04
P-44	Mudstone, carbonatic	6112-MAW	3.0	.04	47.4	224.45	1.16
P-43	Mudstone	6111-MAW	.9	1.35	83.7	225.35	2.38
P-42	Mudstone	6110-MAW	1.8	3.15	78.5	227.15	8.04
P-41	Mudstone	6109-MAW	1.3	4.90	73.2	228.45	14.42
P-40	Mudstone, carbonatic	6108-MAW	2.2	1.15	55.0	230.65	16.94
P-39	Mudstone, carbonatic	6107-MAW	5.5	.40	59.3	236.15	19.14
P-38	Mudstone, carbonatic	6106-MAW	3.7	.50	63.6	239.85	21.00
P-37	Carbonate rock	6105-MAW	1.1	.55	7.3	240.95	21.60
P-36	Mudstone	6104-MAW	1.6	1.25	72.5	242.55	23.60
P-35	Mudstone	6103-MAW	1.5	6.60	66.5	244.05	33.50
P-34	Mudstone	6102-MAW	2.6	.70	81.6	246.65	35.32
P-33	Mudstone	6101-MAW	2.9	1.20	82.8	249.55	38.80
P-32	Mudstone	6100-MAW	3.1	6.60	67.2	252.65	59.26
P-31	Mudstone, carbonatic	6099-MAW	3.2	4.85	55.4	255.85	74.78
P-30	Mudstone, carbonatic	6098-MAW	1.1	2.25	65.2	256.95	77.26
P-29	Mudstone	6097-MAW	1.2	3.30	74.7	258.15	81.22
P-28	Limestone; fos. col. no. 12484	6096-MAW	4.1	.70	16.5	262.25	84.08
P-27	Limestone, argillaceous; fos. col. no. 12484	6095-MAW	1.9	.80	27.3	264.15	85.60
P-26	Mudstone, carbonatic	6094-MAW	2.0	5.45	54.3	266.15	96.51
P-25	Mudstone, carbonatic	6093-MAW	1.4	5.35	46.9	267.55	104.00
P-24	Carbonate rock and phosphate rock	6092-MAW	1.0	8.00	12.8	268.55	112.00

P-23	Mudstone and phosphatic mudstone	6091-MAW	.7	11.2	43.1	269.25	119.84
P-22	Carbonate rock, phosphatic	6090-MAW	.9	14.2	10.6	270.15	132.62
P-21	Phosphate rock, argillaceous	6089-MAW	1.0	16.3	32.9	271.15	148.92
P-20	Mudstone, carbonatic	6088-MAW	1.8	4.70	52.1	272.95	157.38
P-19	Mudstone, phosphatic	6087-MAW	2.3	14.7	37.4	275.25	191.18
P-18	Carbonate rock, phosphatic, argillaceous	6086-MAW	.9	9.25	23.4	276.15	199.51
P-17	Mudstone, carbonatic, phosphatic	6085-MAW	1.9	8.10	40.8	278.05	214.90
P-16	Mudstone, phosphatic	6084-MAW	2.1	13.5	47.2	280.15	243.25
P-15	Phosphate rock, carbonatic, argillaceous	6083-MAW	.8	14.6	24.7	280.95	254.93
P-14	Carbonate rock	6082-MAW	1.0	2.60	7.7	281.95	257.53
P-13	Phosphate rock, carbonatic, argillaceous	6081-MAW	1.2	18.1	22.6	283.15	279.25
P-12	Carbonate rock, phosphatic, argillaceous	6080-MAW	.9	10.4	23.5	284.05	288.61
P-11	Brecciated mudstone containing much calcite and chert	--	2.2	--	--	286.25	--
P-10	Carbonate rock, argillaceous; fos. col. no. 12483	6079-MAW	2.0	1.35	33.3	288.25	*2.70
P- 9	Mudstone, carbonatic	6078-MAW	1.4	2.15	58.9	289.65	5.71
P- 8	Mudstone, phosphatic	6077-MAW	1.0	10.5	57.9	290.65	16.21
P- 7	Carbonate rock, argillaceous	6076-MAW	1.2	3.95	26.7	291.85	20.95
P- 6	Carbonate rock; fos. col. no. 12482	6075-MAW	.7	4.75	14.5	292.55	24.28
P- 5	Carbonate rock; fos. col. no. 12482	6074-MAW	1.2	7.50	12.5	293.75	**33.28
P- 4	Mudstone	--	1.4	--	--	295.15	--
P- 3	Mudstone, carbonatic	--	2.3	--	--	297.45	--
P- 2	Carbonate rock, argillaceous	--	3.9	--	--	301.35	--
P- 1	Mudstone, phosphatic, and argillaceous phosphate rock	6185- RAS	1.7	11.6	45.9	303.05	--
	Lower member of Park City formation (?)						
L-41	Mudstone, carbonatic	--	3.3	--	--	3.3	--
L-40	Clay containing fragments of cherty carbonate rock	--	11.0	--	--	14.3	--
L-39	Carbonate rock	--	3.5	--	--	17.8	--
L-38	Mudstone	--	1.9	--	--	19.7	--
L-37	Mudstone	--	.7	--	--	20.4	--
L-36	Mudstone	--	2.2	--	--	22.6	--
L-35	Mudstone	--	1.5	--	--	24.1	--
L-34	Mudstone	--	1.9	--	--	26.0	--
L-33	Mudstone	--	1.6	--	--	27.6	--
L-32	Mudstone	--	2.8	--	--	30.4	--
L-31	Mudstone, phosphatic	6184- RAS	.8	15.9	42.3	31.2	--
L-30	Quartzite, argillaceous	--	1.8	--	--	33.0	--
L-29	Carbonate rock, cherty	--	2.0	--	--	35.0	--

* Cumulative data incomplete because of missing information. Cumulatives start from zero after interruption.
** Note incompleteness of cumulative data.

Devils Slide—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
L-28	Carbonate rock, cherty	--	3.6	--	--	38.6	--
L-27	Carbonate rock	--	2.5	--	--	41.1	--
L-26	Mudstone, carbonatic	--	2.9	--	--	44.0	--
L-25	Mudstone and phosphate rock	6183- RAS	(1.1)	16.4	47.5	--	--
L-24	Mudstone, carbonatic	--	(2.2)	--	--	--	--
L-23	Mudstone, carbonatic; fos. col. no. 12481	--	(2.3)	--	--	--	--
L-22	Mudstone	--	(.8)	--	--	--	--
L-21	Mudstone, carbonatic	--	(1.7)	--	--	--	--
L-20	Mudstone; fos. col. no. 12480	--	(.8)	--	--	--	--
L-19	Mudstone, carbonatic, chert, and mudstone	--	(.6)	--	--	--	--
L-18	Carbonate rock	--	(2.9)	--	--	--	--
L-17	Mudstone, carbonatic; fos. col. no. 12479	--	(.9)	--	--	--	--
L-16	Mudstone	--	(.8)	--	--	--	--
L-15	Mudstone	--	(3.9)	--	--	--	--
L-14	Mudstone, carbonatic	--	(2.3)	--	--	--	--
L-13	Mudstone, carbonatic; fos. col. no. 12478	--	(2.5)	--	--	--	--
L-12	Carbonate rock	--	(2.4)	--	--	--	--
L-11	Mudstone	--	(.9)	--	--	--	--
L-10	Carbonate rock, argillaceous	--	(3.3)	--	--	--	--
	Section possibly faulted, remainder measured on north side of canyon. Bed L-25 correlated with beds L-6, 7, and 8; beds L-10 through L-24 represent upper part of L-5. Beds below L-6 poorly exposed and not described in detail.						
L- 9	Mudstone	--	(.7)	--	--	--	--
L- 8	Mudstone, phosphatic	6188-RGW	1.2	14.4	44.3	45.2	--
L- 7	Mudstone	6187-RGW	.5	6.10	68.3	45.7	--
L- 6	Carbonate rock, argillaceous	6186-RGW	.7	4.15	33.4	46.4	--
L- 5	Mudstone	--	65.0	--	--	111.4	--
L- 4	Mudstone	--	77.0	--	--	188.4	--
L- 3	Carbonate rock, chert, and cherty carbonate rock	--	27.0	--	--	215.4	--
L- 2	Covered	--	97.0	--	--	312.4	--

L- 1	Sandstone----------	--	164.0	--	--	476.4	--
			Weber formation—top bed only (?)				
Cw-1	Sandstone----------	--	--	--	--	--	--

Franson Canyon (Pinon Canyon), Utah, lot 1347

Park City formation measured and sampled at natural exposure on the north flank of the Uinta Mountains axis in Franson Canyon, sec. 14, T. 1 S., R. 6 E., Summit County, Utah. Beds strike N. 80° E. and dip 30° N. Section measured and sampled by T. M. Cheney, R. A. Smart, M. A. Warner, and R. G. Waring in June 1951. Samples analyzed by Trace Elements Section laboratory, Denver, Colo.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—top not exposed						
	Woodside-Park City contact covered; approximate thickness of covered interval	--	15.0	--	--	15.0	--
U-70	Carbonate rock; fos. col. no. 12500[1]	--	2.8	--	--	17.8	--
U-69	Carbonate rock, argillaceous; fos. col. no. 12500	--	3.2	--	--	21.0	--
U-68	Carbonate rock; fos. col. no. 12500	--	3.1	--	--	24.1	--
U-67	Carbonate rock; fos. col. no. 12500	--	3.2	--	--	27.3	--
U-66	Carbonate rock, argillaceous; fos. col. no. 12500	--	2.7	--	--	30.0	--
U-65	Carbonate rock; fos. col. no. 12500	--	1.9	--	--	31.9	--
U-64	Siltstone, carbonatic; fos. col. no. 12500	--	2.5	--	--	34.4	--
U-63	Siltstone, carbonatic; fos. col. no. 12500	--	1.7	--	--	36.1	--
U-62	Siltstone, carbonatic	--	1.2	--	--	37.3	--
U-61	Siltstone, carbonatic	--	2.9	--	--	40.2	--
U-60	Siltstone, carbonatic	--	1.9	--	--	42.1	--
U-59	Siltstone, carbonatic; fos. col. no. 12499	--	2.1	--	--	44.2	--
U-58	Carbonate rock	--	2.0	--	--	46.2	--
U-57	Carbonate rock, silty	6320- RAS	.4	6.9	31.3	46.6	--
U-56	Sandstone, carbonatic	--	4.7	--	--	51.3	--
U-55	Carbonate rock	--	2.8	--	--	54.1	--
U-54	Carbonate rock	--	4.4	--	--	58.5	--
U-53	Mudstone, carbonatic	--	1.3	--	--	59.8	--
U-52	Mudstone, carbonatic	--	1.8	--	--	61.6	--
U-51	Mudstone, carbonatic	--	1.2	--	--	62.8	--
U-50	Carbonate rock, argillaceous	--	3.1	--	--	65.9	--
U-49	Siltstone	--	7.2	--	--	73.1	--
U-48	Siltstone, carbonatic	--	12.4	--	--	85.5	--
U-47	Carbonate rock, argillaceous	--	1.2	--	--	86.7	--
U-46	Mudstone, carbonatic	--	.7	--	--	87.4	--

U-45	Carbonate rock, argillaceous	--	8.1	--	--	95.5	--
U-44	Siltstone	--	3.9	--	--	99.4	--
U-43	Sandstone, carbonatic	--	2.2	--	--	101.6	--
U-42	Sandstone	--	8.7	--	--	110.3	--
U-41	Sandstone, carbonatic	--	12.9	--	--	123.2	--
U-40	Siltstone, carbonatic	--	5.3	--	--	128.5	--
U-39	Mudstone, carbonatic	6319-MAW	2.2	0.60	64.7	130.7	--
U-38	Carbonate rock, argillaceous	6318-MAW	1.5	6.00	30.9	132.2	--
U-37	Carbonate rock, sandy, and argillaceous carbonate rock	--	3.4	--	--	135.6	--
U-36	Carbonate rock, argillaceous	--	5.6	--	--	141.2	--
U-35	Carbonate rock; fos. col. no. 12498	--	3.0	--	--	144.2	--
U-34	Sandstone; fos. col. no. 12498	--	2.3	--	--	146.5	--
U-33	Sandstone, carbonatic; fos. col. no. 12498	--	2.0	--	--	148.5	--
U-32	Chert and carbonatic sandstone; fos. col. no. 12498	--	1.9	--	--	150.4	--
U-31	Chert	--	1.9	--	--	152.3	--
U-30	Siltstone	--	1.7	--	--	154.0	--
U-29	Siltstone, cherty	--	1.9	--	--	155.9	--
U-28	Siltstone, carbonatic	--	1.5	--	--	157.4	--
U-27	Siltstone; fos. col. no. 12497	--	3.9	--	--	161.3	--
U-26	Siltstone, carbonatic	--	1.5	--	--	162.8	--
U-25	Carbonate rock, argillaceous; fos. col. no. 12496	--	1.9	--	--	164.7	--
U-24	Sandstone, carbonatic	--	1.0	--	--	165.7	--
U-23	Carbonate rock	--	.5	--	--	166.2	--
U-22	Chert and cherty carbonate rock	--	1.0	--	--	167.2	--
U-21	Chert	--	1.0	--	--	168.2	--
U-20	Sandstone, carbonatic	--	1.8	--	--	170.0	--
U-19	Chert	--	1.8	--	--	171.8	--
U-18	Chert	--	2.3	--	--	174.1	--
U-17	Carbonate rock, sandy	--	4.0	--	--	178.1	--
U-16	Carbonate rock	--	3.6	--	--	181.7	--
U-15	Chert	--	3.7	--	--	185.4	--
U-14	Chert and carbonate rock	--	3.8	--	--	189.2	--
U-13	Carbonate rock, cherty	--	5.4	--	--	194.6	--
U-12	Chert	--	1.2	--	--	195.8	--
U-11	Carbonate rock, sandy	--	5.2	--	--	201.0	--
U-10	Siltstone, carbonatic; fos. col. no. 12495	--	5.3	--	--	206.3	--
U- 9	Siltstone, carbonatic; fos. col. no. 12495	--	4.3	--	--	210.6	--
U- 8	Siltstone, carbonatic; fos. col. no. 12495	--	4.7	--	--	215.3	--

1 Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Franson Canyon—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
U- 7	Siltstone, carbonatic; fos. col. no. 12494 ----	--	1.4	--	--	216.7	--
U- 6	Siltstone, carbonatic; fos. col. no. 12494 ----	--	1.1	--	--	217.8	--
U- 5	Siltstone; fos. col. no. 12494 ----------	--	1.1	--	--	218.9	--
U- 4	Covered interval; fos. col. no. 12494--------	--	7.6	--	--	226.5	--
U- 3	Carbonate rock; fos. col. no. 12494 ---------	--	2.5	--	--	229.0	--
U- 2	Carbonate rock, argillaceous; fos. col. no. 12493----------	--	12.9	--	--	241.9	--
U- 1	Limestone, argillaceous ----------	--	1.7	--	--	243.6	--
	Phosphatic shale member of Park City formation (?)						
P-50	Siltstone, carbonatic ----------	--	2.3	--	--	2.3	--
P-49	Mudstone, carbonatic; fos. col. no. 12492 ---	--	.5	--	--	2.8	--
P-48	Carbonate rock, cherty ----------	--	1.1	--	--	3.9	--
P-47	Carbonate rock, phosphatic; fos. col. no. 12492 ----------	6317- RAS	1.0	7.85	8.7	4.9	7.85
P-46	Carbonate rock, argillaceous ----------	6316- RAS	1.1	2.80	39.3	6.0	10.93
P-45	Carbonate rock; fos. col. no. 12491 ---------	6315- RAS	.3	7.20	12.1	6.3	13.09
P-44	Siltstone, cherty, carbonatic ----------	6314- RAS	2.6	2.15	47.8	8.9	18.68
P-43	Mudstone, carbonatic ----------	6313- RAS	.4	4.30	45.9	9.3	20.40
P-42	Siltstone, cherty, carbonatic ----------	--	1.3	--	--	10.6	--
P-41	Carbonate rock ----------	--	1.5	--	--	12.1	--
P-40	Carbonate rock, cherty ----------	--	5.4	--	--	17.5	--
P-39	Mudstone, phosphatic, carbonatic ----------	6312- RAS	1.1	12.6	39.2	18.6	13.86
P-38	Carbonate rock, argillaceous ----------	6311- RAS	1.5	2.95	33.6	20.1	18.28
P-37	Mudstone, carbonatic, phosphatic ----------	6310- RAS	.8	9.80	47.5	20.9	26.12
P-36	Mudstone, carbonatic ----------	6309- RAS	1.0	2.65	68.8	21.9	28.78
P-35	Carbonate rock ----------	--	3.4	--	--	25.3	--
P-34	Carbonate rock ----------	--	2.9	--	--	28.2	--
P-33	Carbonate rock ----------	--	2.3	--	--	30.5	--
P-32	Carbonate rock ----------	--	1.1	--	--	31.6	--
P-31	Carbonate rock ----------	--	1.7	--	--	33.3	--
P-30	Mudstone, cherty----------	--	1.8	--	--	35.1	--
P-29	Carbonate rock ----------	--	1.3	--	--	36.4	--
P-28	Siltstone----------	--	1.7	--	--	38.1	--
P-27	Siltstone, carbonatic and chert----------	--	4.2	--	--	42.3	--
P-26	Siltstone, carbonatic and chert----------	--	1.8	--	--	44.1	--

P-25	Chert	--	1.8	--	--	45.9	--
P 24	Siltstone and chert	--	8.4	--	--	54.3	--
P-23	Mudstone	6308-TMC	.4	2.55	78.0	54.7	1.02
P-22	Carbonate rock, argillaceous	6307-TMC	1.0	.95	26.1	55.7	1.97
P-21	Carbonate rock, argillaceous	6306-TMC	1.9	3.25	38.7	57.6	8.14
P-20	Carbonate rock, argillaceous	6305-TMC	.8	1.40	26.7	58.4	9.26
P-19	Mudstone, carbonatic	6304-TMC	4.9	2.75	45.8	63.3	22.74
P-18	Siltstone, carbonatic	6303-TMC	2.0	1.70	51.3	65.3	26.14
P-17	Siltstone, carbonatic	6302-RGW	2.2	2.05	60.7	67.5	30.65
P-16	Siltstone, carbonatic	6301-RGW	1.5	5.30	42.2	69.0	38.60
P-15	Carbonate rock	6300-RGW	1.9	.90	17.9	70.9	40.31
P-14	Siltstone, carbonatic	6299-RGW	4.3	3.65	66.8	75.2	56.01
P-13	Siltstone	6298-RGW	1.5	4.25	70.9	76.7	62.38
P-12	Sandstone, carbonatic	6297-RGW	1.5	.40	46.4	78.2	62.98
P-11	Siltstone, carbonatic	6296-RGW	3.8	5.75	56.1	82.0	84.83
P-10	Siltstone, carbonatic	6295-RGW	2.2	6.90	50.9	84.2	100.01
P- 9	Siltstone, carbonatic, phosphatic	6294-RGW	1.7	10.1	45.7	85.9	117.18
P- 8	Siltstone, carbonatic, phosphatic	6293-RGW	1.9	8.45	41.8	87.8	133.24
P- 7	Carbonate rock, argillaceous, phosphatic	6292-RGW	2.7	9.75	30.0	90.5	159.56
P- 6	Phosphate rock, argillaceous, carbonatic	6291-RGW	1.8	17.0	31.4	92.3	190.16
P- 5	Carbonate rock	6290-RGW	1.8	2.65	10.6	94.1	194.93
P- 4	Carbonate rock, argillaceous, phosphatic	6289-RGW	1.6	9.15	36.5	95.7	209.57
P- 3	Siltstone and argillaceous phosphate rock	6288-RGW	1.2	16.2	18.9	96.9	229.01
P- 2	Phosphate rock, carbonatic	6287-RGW	.6	24.5	18.3	97.5	243.71
P- 1	Phosphate rock; fos. col. no. 12490	6286-RGW	.5	29.5	16.6	98.0	258.46
	Lower member of Park City formation (?)						
L- 5	Sandstone, calcareous; fos. col. no. 12490	--	11.9	--	--	11.9	--
L- 4	Sandstone	--	8.5	--	--	20.4	--
L- 3	Chert and calcareous sandstone	--	1.2	--	--	21.6	--
L- 2	Sandstone; fos. col. no. 12489	--	10.0	--	--	31.6	--
L- 1	Sandstone, calcaroues	--	13.0	--	--	44.6	--

Horseshoe Canyon, Utah, lot 1339

Park City formation measured and sampled in hand trenches and at natural exposure in Horseshoe Canyon on the north side of the Green River, sec. 36, T. 3 N., R. 20 E., Daggatt County, Utah. Beds strike S. 50° E. and dip 15° N. Section measured and sampled by R. G. Waring, R. A. Smart, H. W. Peirce, and T. M. Cheney in September 1950. Samples analyzed by U. S. Bureau of Mines laboratory, Albany, Oreg.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—top not exposed						
U-30	Carbonate rock; fos. col. no. 12287[1]	--	4.0	--	--	4.0	--
U-29	Carbonate rock; fos. col. no. 12287	--	3.6	--	--	7.6	--
U-28	Carbonate rock, argillaceous	--	2.6	--	--	10.2	--
U-27	Carbonate rock	--	15.0	--	--	25.2	--
U-26	Carbonate rock; fos. col. no. 12286	--	25.	--	--	50.2	--
U-25	Carbonate rock; fos. col. no. 12286	--	4.1	--	--	54.3	--
U-24	Carbonate rock; fos. col. no. 12286	--	7.3	--	--	61.6	--
U-23	Carbonate rock	--	6.3	--	--	67.9	--
U-22	Carbonate rock, argillaceous	--	9.0	--	--	76.9	--
U-21	Carbonate rock	--	4.2	--	--	81.1	--
U-20	Carbonate rock	--	4.2	--	--	85.3	--
U-19	Covered interval; dominantly carbonate rock float	--	26.	--	--	111.3	--
U-18	Gypsum	--	1.0	--	--	112.3	--
U-17	Mudstone, carbonatic, gypsiferous	--	1.8	--	--	114.1	--
U-16	Sandstone, carbonatic	5305-RGW	3.6	0.2	68.8	117.7	0.72
U-15	Sandstone, carbonatic	5304-RGW	1.9	.2	68.0	119.6	1.10
U-14	Sandstone	5303-RGW	2.9	.2	74.5	122.5	1.68
U-13	Sandstone	5302-RGW	2.1	.2	73.6	124.6	2.10
U-12	Sandstone	5301-RGW	3.1	.4	70.7	127.7	3.34
U-11	Sandstone, carbonatic	--	4.0	--	--	131.7	--
U-10	Carbonate rock, sandy; fos. col. no. 12285	5300-RGW	3.3	1.1	41.3	135.0	--
U- 9	Carbonate rock, sandy; fos. col. no. 12285	5299-RGW	2.9	1.0	42.9	137.9	--
U- 8	Sandstone, carbonatic; fos. col. no. 12285	--	12.0	--	--	149.9	--
U- 7	Carbonate rock; fos. col. no. 12284	--	3.2	--	--	153.1	--
U- 6	Mudstone, cherty	--	4.7	--	--	157.8	--
U- 5	Carbonate rock	--	5.2	--	--	163.0	--
U- 4	Gypsum	--	.3	--	--	163.3	--
U- 3	Mudstone	--	.5	--	--	163.8	--
U- 2	Carbonate rock	--	4.0	--	--	167.8	--
U- 1	Carbonate rock; fos. col. no. 12283	--	7.6	--	--	175.4	--

	Phosphatic shale member of Park City formation						
P-28	Carbonate rock, phosphatic, argillaceous; fos. col. no. 12282	5298-RGW	1.5	8.4	24.4	1.5	12.60
P-27	Carbonate rock, phosphatic, argillaceous; fos. col. no. 12281	5297-RGW	1.3	9.1	25.8	2.8	24.43
P-26	Mudstone, carbonatic; fos. col. no. 12280	5296-RGW	1.9	8.1	36.8	4.7	39.82
P-25	Carbonate rock and chert; fos. col. no. 12279	5295-RGW	3.0	2.7	58.0	7.7	47.92
P-24	Phosphate rock, argillaceous and dolomite; fos. col. no. 12278	5294-RGW	1.4	16.0	30.2	9.1	70.32
P-23	Phosphate rock, argillaceous, carbonatic; fos. col. no. 12277	5293-RGW	1.2	14.3	25.3	10.3	87.48
P-22	Carbonate rock; fos. col. no. 12276	5292-HWP	.7	6.8	10.9	11.0	92.24
P-21	Mudstone, phosphatic, carbonatic; fos. col. no. 12275	5291-HWP	2.2	10.2	36.2	13.2	114.68
P-20	Mudstone, carbonatic; fos. col. no. 12274	5290-HWP	2.0	6.8	43.9	15.2	128.28
P-19	Mudstone, carbonatic	5289- RAS	3.1	6.8	50.7	18.3	149.36
P-18	Mudstone, phosphatic	5288- RAS	2.0	11.1	44.0	20.3	171.56
P-17	Mudstone, carbonatic	5287- RAS	1.1	6.3	52.3	21.4	178.49
P-16	Phosphate rock, argillaceous	5286- RAS	1.5	20.1	30.8	22.9	208.64
P-15	Phosphate rock, carbonatic; fos. col. no. 12273	5285- RAS	.9	18.0	10.8	23.8	224.84
P-14	Phosphate rock, argillaceous; fos. col. no. 12273	5284- RAS	.5	22.4	15.3	24.3	236.04
P-13	Mudstone, phosphatic, carbonatic	5283- RAS	1.6	8.7	36.8	25.9	249.96
P-12	Mudstone, carbonatic	5282- RAS	1.8	4.6	40.3	27.7	258.24
P-11	Mudstone, phosphatic, carbonatic	5281- RAS	1.2	8.7	35.8	28.9	268.68
P-10	Carbonate rock, phosphatic	5280- RAS	1.4	13.0	10.4	30.3	286.88
P- 9	Phosphate rock, argillaceous	5279- RAS	1.5	24.6	26.0	31.8	323.78
P- 8	Phosphate rock, argillaceous	5278- RAS	1.9	20.1	18.8	33.7	361.97
P- 7	Mudstone, carbonatic	5277- RAS	1.1	5.6	39.8	34.8	368.13
P- 6	Phosphate rock, argillaceous	5276- RAS	.6	19.8	30.2	35.4	380.01
P- 5	Mudstone, phosphatic	5275- RAS	1.7	7.8	53.6	37.1	393.27
P- 4	Phosphate rock, argillaceous	5274- RAS	1.4	23.8	16.8	38.5	426.59
P- 3	Phosphate rock	5273- RAS	3.6	26.7	11.4	42.1	522.71
P- 2	Phosphate rock, argillaceous	5272- RAS	1.1	16.0	36.6	43.2	540.31
P- 1	Mudstone, phosphatic, carbonatic	5271- RAS	.5	7.9	43.7	43.7	544.26
	Lower member of Park City formation						
L-27	Sandstone, carbonatic; fos. col. no. 12272	--	3.3	--	--	3.3	--
L-26	Carbonate rock, silty	--	1.5	--	--	4.8	--

[1] Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Horseshoe Canyon—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
L-25	Sandstone, carbonatic	--	1.4	--	--	6.2	--
L-24	Carbonate rock, quartzitic; fos. col. no. 12271	--	4.3	--	--	10.5	--
L-23	Sandstone, carbonatic	--	20.6	--	--	31.1	--
L-22	Covered interval	--	4.	--	--	35.1	--
L-21	Sandstone, carbonatic	--	10.8	--	--	45.9	--
L-20	Sandstone, carbonatic	--	5.3	--	--	51.2	--
L-19	Carbonate rock and carbonatic mudstone	--	.8	--	--	52.0	--
L-18	Carbonate rock	--	1.3	--	--	53.3	--
L-17	Sandstone, carbonatic	--	1.2	--	--	54.5	--
L-16	Sandstone, carbonatic	--	16.8	--	--	71.3	--
L-15	Carbonate rock, sandy	--	6.3	--	--	77.6	--
L-14	Carbonate rock	--	.4	--	--	78.0	--
L-13	Siltstone, carbonatic	--	1.1	--	--	79.1	--
L-12	Carbonate rock	--	.3	--	--	79.4	--
L-11	Carbonate rock; fos. col. no. 12270	--	2.2	--	--	81.6	--
L-10	Sandstone, carbonatic	--	3.5	--	--	85.1	--
L- 9	Carbonate rock, sandy	--	3.2	--	--	88.3	--
L- 8	Carbonate rock, sandy	--	8.2	--	--	96.5	--
L- 7	Carbonate rock, quartzitic	--	2.8	--	--	99.3	--
L- 6	Sandstone and carbonate rock	--	.9	--	--	100.2	--
L- 5	Carbonate rock, sandy	--	1.0	--	--	101.2	--
L- 4	Sandstone, carbonatic	--	.5	--	--	101.7	--
L- 3	Carbonate rock, sandy	--	4.3	--	--	106.0	--
L- 2	Sandstone, carbonatic	--	1.4	--	--	107.4	--
L- 1	Carbonate rock, sandy	--	1.2	--	--	108.6	--
	Weber formation—top bed only						
Cw-1	Sandstone, carbonatic	--	6.0	--	--	6.0	--

Fort Douglas, Utah, lot 1350

Part of Park City formation measured and sampled in outcrop and bulldozer trench near Fort Douglas, E½NE¼ sec. 17, T. 1 N., R. 2 E., Salt Lake County, Utah. Beds strike N. 73° E. and dip 68° S. Section measured and sampled by M. A. Warner, R. A. Smart, and T. M. Cheney. Samples analyzed by Trace Elements Section laboratory, Denver, Colo.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Phosphatic shale member of Park City formation (?)						
P-242	Siltstone	--	4.6	--	--	4.6	--
P-241	Siltstone	--	4.3	--	--	8.9	--
P-240	Mudstone	--	7.5	--	--	16.4	--
P-239	Mudstone	--	7.2	--	--	23.6	--
P-238	Chert	--	2.8	--	--	26.4	--
P-237	Mudstone, cherty	--	1.8	--	--	28.2	--
P-236	Mudstone, cherty	--	1.5	--	--	29.7	--
P-235	Chert, argillaceous	--	1.5	--	--	31.2	--
P-234	Siltstone	--	2.7	--	--	33.9	--
P-233	Chert, argillaceous	--	1.5	--	--	35.2	--
P-232	Chert, argillaceous	--	13.1	--	--	48.5	--
P-231	Shear zone; brecciated siltstone	--	4.5	--	--	53.0	--
P-230	Siltstone	--	4.1	--	--	57.1	--
P-229	Mudstone	6406-MAW	4.1	6.50	64.2	61.2	26.65
P-228	Carbonate rock	6405-MAW	1.0	1.70	6.90	62.2	28.35
P-227	Phosphate rock, argillaceous	6404-MAW	.6	20.9	30.0	62.8	40.89
P-226	Siltstone, carbonatic	--	.9	--	--	63.7	--
P-225	Mudstone, cherty	--	8.3	--	--	72.0	--
P-224	Mudstone	--	3.4	--	--	75.4	--
P-223	Siltstone	--	1.9	--	--	77.3	--
P-222	Siltstone	--	2.6	--	--	79.9	--
P-221	Mudstone	--	2.0	--	--	81.9	--
P-220	Siltstone	--	2.5	--	--	84.4	--
P-219	Chert	--	2.5	--	--	86.9	--
P-218	Mudstone	--	4.9	--	--	91.8	--
P-217	Mudstone, cherty	--	1.6	--	--	93.4	--
P-216	Mudstone	--	2.4	--	--	95.8	--
P-215	Mudstone	--	1.4	--	--	97.2	--
P-214	Mudstone	--	1.0	--	--	98.2	--
P-213	Mudstone, phosphatic	6403-MAW	.5	17.3	44.9	98.7	8.65
P-212	Mudstone	6402-MAW	1.3	1.20	86.9	100.0	10.21
P-211	Mudstone and phosphate rock	6401-MAW	1.0	15.5	51.7	101.0	25.71

Fort Douglas—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-210	Carbonate rock, silty	6400-MAW	1.1	0.95	35.3	102.1	26.76
P-209	Mudstone, carbonatic	6399-MAW	1.0	2.15	68.5	103.1	28.90
P-208	Mudstone, carbonatic	6398-MAW	.8	1.95	73.9	103.9	30.46
P-207	Mudstone, phosphatic	6397-MAW	.5	9.35	63.9	104.4	35.14
P-206	Mudstone	--	3.8	--	--	108.2	--
P-205	Phosphate rock, argillaceous	6396-MAW	14.0	17.4	38.8	122.2	--
P-204	Mudstone, phosphatic	--	.9	--	--	123.1	--
P-203	Siltstone, carbonatic	--	.8	--	--	123.9	--
P-202	Mudstone, siliceous	--	.6	--	--	124.5	--
P-201	Mudstone	--	.9	--	--	125.4	--
P-200	Mudstone, phosphatic	6407-MAW	.3	9.50	64.6	125.7	--
P-199	Siltstone, carbonatic	--	2.4	--	--	128.1	--
P-198	Carbonate rock, argillaceous; fos. col. no. 12528[1]	--	7.9	--	--	136.0	--
P-197	Carbonate rock, argillaceous	--	18.7	--	--	154.7	--
P-196	Carbonate rock and carbonatic sandstone	--	9.2	--	--	163.9	--
P-195	Carbonate rock and carbonatic sandstone	--	9.5	--	--	173.4	--
P-194	Carbonate rock	--	4.7	--	--	178.1	--
P-193	Not described	--	26.0	--	--	204.1	--
P-192	Mudstone, carbonatic	--	.6	--	--	204.7	--
P-191	Chert, mudstone, and carbonate rock	--	8.2	--	--	212.9	--
P-190	Mudstone	--	2.3	--	--	215.2	--
P-189	Mudstone	--	1.1	--	--	216.3	--
P-188	Mudstone	--	.9	--	--	217.2	--
P-187	Mudstone	--	3.1	--	--	220.3	--
P-186	Mudstone, carbonatic; fos. col. no. 12527	--	1.8	--	--	222.1	--
P-185	Mudstone, carbonatic	--	3.6	--	--	225.7	--
P-184	Carbonate rock, argillaceous	--	1.0	--	--	226.7	--
P-183	Mudstone; fos. col. no. 12526	--	1.5	--	--	228.2	--
P-182	Mudstone	--	2.9	--	--	231.1	--
P-181	Mudstone	--	1.9	--	--	233.0	--
P-180	Mudstone	--	2.6	--	--	235.6	--
P-179	Chert and mudstone; fos. col. no. 12525	--	3.2	--	--	238.8	--
P-178	Chert	--	1.8	--	--	240.6	--
P-177	Mudstone, carbonatic and phosphatic mudstone	--	1.1	--	--	241.7	--
P-176	Mudstone	--	2.5	--	--	244.2	--
P-175	Mudstone	--	2.0	--	--	246.2	--
P-174	Mudstone	--	1.6	--	--	247.8	--

P-173	Mudstone	--	4.2	--	--	252.0	--
P-172	Mudstone	6395-TMC	1.9	1.35	82.7	253.9	2.56
P-171	Mudstone, phosphatic	6394-TMC	1.9	9.90	55.8	255.8	21.38
P-170	Mudstone, carbonatic	6393-TMC	.8	1.85	66.3	256.6	22.86
P-169	Mudstone, carbonatic and cherty mudstone	6392-TMC	.8	5.85	58.0	257.4	27.54
P-168	Mudstone, carbonatic and carbonatic chert; fos. col. no. 12524	6391-TMC	2.6	1.90	63.6	260.0	32.48
P-167	Mudstone, carbonatic	6390-TMC	2.9	1.70	54.1	262.9	37.40
P-166	Mudstone, carbonatic	6389-TMC	1.5	1.70	52.1	264.4	39.96
P-165	Mudstone, carbonatic	6388-TMC	2.9	2.25	52.7	267.3	105.20
P-164	Mudstone, carbonatic	6387-TMC	1.6	2.50	61.0	268.9	109.20
P-163	Mudstone, carbonatic	6386-TMC	1.1	2.75	55.5	270.0	112.23
P-162	Mudstone, carbonatic	6385-TMC	1.9	2.75	48.2	271.9	117.46
P-161	Mudstone, phosphatic, carbonatic; fos. col. no. 12523	6384-TMC	.6	13.3	46.6	272.5	125.44
P-160	Siltstone	--	5.2	--	--	277.7	--
P-159	Siltstone	--	7.3	--	--	285.0	--
P-158	Mudstone; fos. col. no. 12522	--	3.8	--	--	288.8	--
P-157	Mudstone	--	4.5	--	--	293.3	--
P-156	Mudstone, carbonatic	6383-MAW	.4	4.65	52.0	293.7	1.86
P-155	Mudstone, carbonatic	6382-MAW	1.4	2.50	47.5	295.1	5.36
P-154	Mudstone, phosphatic	6381-MAW	.3	15.5	47.9	295.4	10.01
P-153	Siltstone	--	10.0	--	--	305.4	--
P-152	Siltstone	--	3.3	--	--	308.7	--
P-151	Siltstone	--	5.8	--	--	314.5	--
P-150	Siltstone	--	8.0	--	--	322.5	--
P-149	Siltstone	--	2.0	--	--	324.5	--
P-148	Siltstone, cherty	--	3.8	--	--	328.3	--
P-147	Siltstone	--	2.2	--	--	330.5	--
P-146	Siltstone	--	3.2	--	--	333.7	--
P-145	Siltstone; fos. col. no. 12521	--	7.3	--	--	341.0	--
P-144	Siltstone	--	1.8	--	--	342.8	--
P-143	Siltstone	--	1.5	--	--	344.3	--
P-142	Mudstone, cherty	--	.5	--	--	344.8	--
P-141	Siltstone, carbonatic	--	1.0	--	--	345.8	--
P-140	Siltstone	--	.7	--	--	346.5	--
P-139	Mudstone; fos. col. no. 12520	6380-MAW	.8	4.70	79.5	347.3	3.76
P-138	Siltstone	6379-MAW	3.4	2.35	78.0	350.7	11.75
P-137	Carbonate rock, argillaceous	6378-MAW	5.2	1.00	45.7	355.9	16.95
P-136	Siltstone, carbonatic	6377-MAW	1.2	.85	64.7	357.1	17.97
P-135	Mudstone, carbonatic	6376-MAW	1.4	2.80	65.8	358.5	21.89

[1] Fossil collection made by Harold I. Saunders, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-134	Mudstone	6375-MAW	1.0	2.00	73.5	359.5	23.89
P-133	Mudstone	6374-MAW	1.4	4.35	70.3	360.9	29.98
P-132	Carbonate rock, argillaceous, phosphatic	6373-MAW	.7	9.95	31.7	361.6	36.94
P-131	Carbonate rock, argillaceous	6372-MAW	1.1	6.65	44.3	362.7	44.26
P-130	Mudstone and phosphate rock	6371-MAW	.8	18.5	35.4	363.5	59.06
P-129	Mudstone, carbonatic	6370-MAW	1.2	1.65	43.0	364.7	61.04
P-128	Mudstone	6369-MAW	1.2	6.50	70.3	365.9	68.84
P-127	Mudstone, phosphatic	6368-MAW	1.3	13.9	48.1	367.2	86.91
P-126	Mudstone, phosphatic	6367-MAW	3.3	11.5	61.4	370.5	124.86
P-125	Mudstone, carbonatic	6366-MAW	2.3	7.55	54.3	372.8	142.22
P-124	Mudstone, phosphatic	6365-MAW	1.2	12.0	52.6	374.0	156.62
P-123	Mudstone, phosphatic; fos. col. no. 12519	6364-MAW	1.5	13.2	53.0	375.5	176.42
P-122	Carbonate rock; fos. col. no. 12518	6363-MAW	1.0	4.85	15.9	376.5	181.28
P-121	Phosphate rock, argillaceous, carbonatic	6362-MAW	2.8	18.4	33.1	379.3	232.80
P-120	Carbonate rock	6361-MAW	1.2	3.65	12.6	380.5	237.18
P-119	Phosphate rock, argillaceous	6360-MAW	2.6	21.9	25.0	383.1	294.12
P-118	Phosphate rock, argillaceous	6359-MAW	2.1	21.9	24.2	385.2	340.10
P-117	Mudstone	--	3.0	--	--	388.2	--
P-116	Chert and calcite	--	1.2	--	--	389.4	--
P-115	Carbonate rock	6358-MAW	.7	.80	18.0	390.1	0.56
P-114	Carbonate rock, argillaceous	6357-MAW	.6	4.55	27.6	390.7	3.29
P-113	Phosphate rock	6356-MAW	2.4	26.9	18.4	393.1	67.85
P-112	Phosphate rock; fos. col. no. 12514	6355-MAW	.6	29.7	15.9	393.7	85.67
P-111	Mudstone	--	5.0	--	--	398.7	--
P-110	Mudstone	--	2.4	--	--	401.1	--
P-109	Mudstone, phosphatic	6354-MAW	1.3	9.85	58.1	402.4	--
P-108	Siltstone	--	6.0	--	--	408.4	--
P-107	Mudstone	--	.9	--	--	409.3	--
P-106	Mudstone	--	1.6	--	--	410.9	--
P-105	Mudstone	--	2.9	--	--	413.8	--
P-104	Mudstone	--	2.7	--	--	416.5	--
P-103	Mudstone	--	4.6	--	--	421.1	--
P-102	Mudstone	--	2.0	--	--	423.1	--
P-101	Mudstone	--	2.1	--	--	425.2	--
P-100	Mudstone	--	2.3	--	--	427.5	--
P- 99	Mudstone	--	3.5	--	--	431.0	--
P- 98	Mudstone	--	6.6	--	--	437.6	--

P- 97	Mudstone, cherty	--	.6	--	--	438.2	--
P- 96	Mudstone	--	2.1	--	--	440.3	--
P- 95	Mudstone	--	2.9	--	--	443.2	--
P- 94	Siltstone	--	2.3	--	--	445.5	--
P- 93	Mudstone	--	1.4	--	--	446.9	--
P- 92	Siltstone	--	.7	--	--	447.6	--
P- 91	Mudstone, phosphatic	6353-MAW	.4	14.3	53.1	448.0	--
P- 90	Siltstone; fos. col. no. 12513	--	3.5	--	--	451.5	--
P- 89	Chert	--	2.2	--	--	453.7	--
P- 88	Mudstone	6352- RAS	.5	4.05	78.6	454.2	--
P- 87	Carbonate rock	--	.7	--	--	454.9	--
P- 86	Carbonate rock	--	1.7	--	--	456.6	--
P- 85	Chert	--	.4	--	--	457.0	--
P- 84	Mudstone	--	1.1	--	--	458.1	--
P- 83	Carbonate rock	--	3.6	--	--	461.7	--
P- 82	Mudstone, carbonatic	6350- RAS	.8	1.75	52.6	462.5	--
P- 81	Chert	--	4.8	--	--	467.3	--
P- 80	Mudstone	--	1.2	--	--	468.5	--
P- 79	Chert, argillaceous	--	1.7	--	--	470.2	--
P- 78	Mudstone, calcareous	--	3.2	--	--	473.4	--
P- 77	Chert, argillaceous	--	6.1	--	--	479.5	--
P- 76	Mudstone, calcareous and chert; fos. col. no. 12512	--	1.6	--	--	481.1	--
P- 75	Mudstone, carbonatic	6349- RAS	1.1	4.10	63.3	482.2	--
P- 74	Mudstone, carbonatic and chert	--	1.6	--	--	483.8	--
P- 73	Chert, argillaceous	--	1.3	--	--	485.1	--
P- 72	Carbonate rock, argillaceous; fos. col. no. 12511	6348- RAS	.8	5.35	35.3	485.9	4.28
P- 71	Chert	6347- RAS	.8	3.95	70.8	486.7	3.16
P- 70	Mudstone, carbonatic	--	2.3	--	--	489.0	--
P- 69	Mudstone, carbonatic	--	1.1	--	--	490.1	--
P- 68	Mudstone, carbonatic and chert	--	4.3	--	--	494.4	--
P- 67	Mudstone, cherty, carbonatic	--	1.1	--	--	495.5	--
P- 66	Limestone	--	2.4	--	--	497.9	--
P- 65	Mudstone, carbonatic	6346- RAS	.9	4.65	65.6	498.8	--
P- 64	Mudstone, carbonatic and chert	--	1.8	--	--	500.6	--
P- 63	Mudstone	--	1.3	--	--	501.9	--
P- 62	Mudstone, carbonatic	--	1.8	--	--	503.7	--
P- 61	Mudstone, carbonatic, phosphatic	6345- RAS	.4	8.85	44.8	504.1	--
P- 60	Mudstone, carbonatic and chert	--	1.3	--	--	505.4	--
P- 59	Mudstone, carbonatic	--	1.4	--	--	506.8	--
P- 58	Carbonate rock; fos. col. no. 12510	--	1.8	--	--	508.6	--
P- 57	Mudstone, carbonatic	6344- RAS	.5	7.25	40.9	509.1	--
P- 56	Mudstone, carbonatic	--	1.3	--	--	510.4	--

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-55	Mudstone	--	3.3	--	--	513.7	--
P-54	Mudstone	--	4.2	--	--	517.9	--
P-53	Mudstone, carbonatic; fos. col. no. 12509	--	4.1	--	--	522.0	--
P-52	Mudstone	--	3.5	--	--	525.5	--
P-51	Mudstone	--	4.7	--	--	530.2	--
P-50	Mudstone	--	1.2	--	--	531.4	--
P-49	Mudstone, carbonatic	--	3.6	--	--	535.0	--
P-48	Carbonate rock; fos. col. no. 12508	--	1.5	--	--	536.5	--
P-47	Mudstone, carbonatic; fos. col. no. 12507	--	2.9	--	--	539.4	--
P-46	Covered interval	--	11.8	--	--	551.2	--
P-45	Carbonate rock	--	1.9	--	--	553.1	--
P-44	Mudstone, carbonatic; fos. col. no. 12506	--	4.6	--	--	557.7	--
P-43	Carbonate rock	--	1.8	--	--	559.5	--
P-42	Carbonate rock, argillaceous; fos. col. no. 12505	--	3.6	--	--	563.1	--
P-41	Mudstone, cherty; fos. col. no. 12505	--	4.5	--	--	567.6	--
P-40	Mudstone, cherty; fos. col. no. 12504	--	5.5	--	--	573.1	--
P-39	Mudstone, carbonatic	--	5.3	--	--	578.4	--
P-38	Mudstone, carbonatic	--	2.9	--	--	581.3	--
P-37	Mudstone, carbonatic	--	1.2	--	--	582.5	--
P-36	Mudstone, carbonatic; fos. col. no. 12503	--	2.9	--	--	585.4	--
P-35	Mudstone, carbonatic; fos. col. no. 12502	--	5.9	--	--	591.3	--
P-34	Mudstone	--	2.3	--	--	593.6	--
P-33	Carbonate rock, argillaceous	--	2.6	--	--	596.2	--
P-32	Carbonate rock, cherty	--	2.4	--	--	598.6	--
P-31	Carbonate rock, argillaceous	--	4.1	--	--	602.7	--
P-30	Mudstone	--	3.7	--	--	606.4	--
P-29	Mudstone	--	11.0	--	--	617.4	--
P-28	Mudstone	--	1.6	--	--	619.0	--
P-27	Mudstone	--	2.0	--	--	621.0	--
P-26	Mudstone, carbonatic	--	2.9	--	--	623.9	--
P-25	Mudstone, carbonatic	--	3.8	--	--	627.7	--
P-24	Mudstone, carbonatic	--	5.2	--	--	632.9	--
P-23	Mudstone, carbonatic	--	4.8	--	--	637.7	--
P-22	Mudstone, carbonatic	--	.9	--	--	638.6	--
P-21	Mudstone, carbonatic	--	5.1	--	--	643.7	--
P-20	Mudstone, carbonatic	--	2.3	--	--	646.0	--
P-19	Carbonate rock, argillaceous	6343-TMC	1.4	6.25	23.1	647.4	8.75
P-18	Carbonate rock, argillaceous	6342-TMC	1.1	7.75	24.1	648.5	17.28
P-17	Phosphate rock, carbonatic	6341-TMC	1.5	21.1	16.1	650.0	48.92

P-16	Carbonate rock, argillaceous	6340-TMC	2.7	7.60	31.2	652.7	69.44
P-15	Mudstone, carbonatic	--	2.6	--	--	655.3	--
P-14	Mudstone, carbonatic	--	5.3	--	--	660.6	--
P-13	Mudstone, carbonatic	--	1.3	--	--	661.9	--
P-12	Mudstone, carbonatic; fos. col. no. 12517	--	1.1	--	--	663.0	--
P-11	Mudstone, carbonatic	--	4.6	--	--	667.6	--
P-10	Mudstone, carbonatic	--	2.2	--	--	669.8	--
P- 9	Carbonate rock, argillaceous, phosphatic	6339-TMC	.4	10.1	23.7	670.2	--
P- 8	Mudstone, carbonatic	--	2.6	--	--	672.8	--
P- 7	Mudstone, carbonatic	--	2.1	--	--	674.9	--
P- 6	Mudstone	--	.9	--	--	675.8	--
P- 5	Mudstone, carbonatic	--	3.2	--	--	679.0	--
P- 4	Mudstone	--	1.3	--	--	680.3	--
P- 3	Mudstone, carbonatic	--	.7	--	--	681.0	--
P- 2	Covered interval	--	.6	--	--	681.6	--
P- 1	Phosphate rock, carbonatic	--	1.2	--	--	682.8	--
	Lower member of Park City formation (?)						
L-19	Carbonate rock	--	60.0	--	--	60.0	--
L-18	Carbonate rock	--	28.0	--	--	88.0	--
L-17	Sandstone	--	14.0	--	--	102.0	--
L-16	Siltstone	--	16.0	--	--	118.0	--
L-15	Siltstone	--	31.0	--	--	149.0	--
L-14	Sandstone	--	54.0	--	--	203.0	--
L-13	Sandstone	--	30.0	--	--	233.0	--
L-12	Carbonate rock	--	7.0	--	--	240.0	--
L-11	Covered interval	--	(?)	--	--	--	--
L-10	Sandstone	--	52.0	--	--	*52.0	--
L- 9	Carbonate rock	--	1.5	--	--	53.5	--
L- 8	Sandstone	--	6.5	--	--	60.0	--
L- 7	Carbonate rock	--	7.0	--	--	67.0	--
L- 6	Sandstone	--	18.0	--	--	85.0	--
L- 5	Sandstone	--	38.0	--	--	123.0	--
L- 4	Sandstone	--	60.0	--	--	183.0	--
L- 3	Sandstone and sandy carbonate rock	--	30.0	--	--	213.0	--
L- 2	Carbonate rock	--	25.0	--	--	238.0	--
L- 1	Sandstone	--	7.0	--	--	**245.0	--
	Weber formation						
Cw-1	Sandstone	--	100.	--	--	100.	--

* Cumulative data incomplete because of missing information. Computations start from zero after interruption.
** Note incompleteness of cumulative data.

Sols Canyon, Utah, lot 1348

Park City formation measured and sampled in outcrop and hand trench on east side of Sols Canyon, NW¼SW¼ sec. 2, T. 2 N., R. 18 E., Daggett County, Utah. Beds strike N. 80° E. and dip 38° N. Section measured and sampled by R. A. Smart, T. M. Cheney, and M. A. Warner in June 1951. Samples analyzed by Trace Elements Section laboratory, Denver, Colo.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Upper member of Park City formation—top not exposed						
U- 7	Carbonate rock, cherty	--	9.1	--	--	9.1	--
U- 6	Carbonate rock	--	5.4	--	--	14.5	--
U- 5	Covered interval	--	4.0	--	--	18.5	--
U- 4	Carbonate rock	--	1.8	--	--	20.3	--
U- 3	Covered interval	--	3.8	--	--	24.1	--
U- 2	Carbonate rock	--	1.6	--	--	25.7	--
U- 1	Covered interval	--	3.0	--	--	28.7	--
	Phosphatic shale member of Park City formation						
P-47	Siltstone, carbonatic	--	4.0	--	--	4.0	--
P-46	Mudstone and chert	--	.5	--	--	4.5	--
P-45	Mudstone, carbonatic	--	2.5	--	--	7.0	--
P-44	Mudstone, carbonatic	--	2.5	--	--	9.5	--
P-43	Carbonate rock, argillaceous	6285-MAW	1.7	3.60	39.8	11.2	--
P-42	Mudstone	6484-MAW	.6	--	--	11.8	--
P-41	Mudstone, carbonatic	6283-MAW	1.7	2.10	58.7	13.5	**3.57
P-40	Mudstone, carbonatic	6282-MAW	1.2	7.25	44.5	14.7	12.27
P-39	Mudstone, carbonatic	6281-MAW	3.4	2.75	60.3	18.1	21.62
P-38	Weathered zone	--	1.1	--	--	19.2	--
P-37	Carbonate rock, argillaceous, phosphatic	6280-MAW	1.6	11.7	35.6	20.8	*18.72
P-36	Carbonate rock, phosphatic	6279-MAW	.8	14.2	12.7	21.6	30.08
P-35	Carbonate rock	6278-MAW	1.0	7.45	10.3	22.6	37.53
P-34	Mudstone, carbonatic, and phosphatic, carbonatic mudstone	6277-MAW	1.0	10.7	27.9	23.6	48.23
P-33	Carbonate rock, argillaceous, phosphatic	6276-MAW	.6	9.00	27.4	24.2	53.63
P-32	Phosphate rock and phosphatic, carbonatic mudstone	6275-MAW	.5	15.8	32.5	24.7	61.53
P-31	Mudstone, carbonatic	6274-MAW	.5	7.25	43.5	25.2	65.16
P-30	Mudstone, carbonatic, and carbonatic phosphate rock	6273-MAW	.7	13.8	32.6	25.9	74.82
P-29	Mudstone, carbonatic	6272-MAW	1.2	6.80	51.0	27.1	82.98
P-28	Mudstone, silty	--	1.4	--	--	28.5	--

P-27	Carbonate rock	--	1.1	--	--	29.6	--
P-26	Mudstone, carbonatic	6271- RAS	1.2	5.45	57.0	30.8	--
P-25	Mudstone, carbonatic	--	2.0	--	--	32.8	--
P-24	Mudstone, carbonatic	6270- RAS	1.4	4.60	59.6	34.2	--
P-23	Mudstone, carbonatic	6269- RAS	1.7	4.85	58.0	35.9	--
P-22	Brecciated zone	--	1.3	--	--	37.2	--
P-21	Mudstone, phosphatic	6268- RAS	.4	7.80	62.8	37.6	--
P-20	Mudstone	6267- RAS	.8	6.80	72.4	38.4	--
P-19	Carbonate rock, phosphatic, argillaceous	6266- RAS	.7	10.9	25.6	39.1	--
P-18	Mudstone, carbonatic	--	1.3	--	--	40.4	--
P-17	Mudstone, carbonatic	6265- RAS	2.2	5.05	43.7	42.6	--
P-16	Mudstone	--	.7	--	--	43.3	--
P-15	Mudstone, carbonatic	--	2.4	--	--	45.7	--
P-14	Mudstone, carbonatic	6264- RAS	1.2	7.25	46.1	46.9	--
P-13	Carbonate rock	--	1.8	--	--	48.7	--
P-12	Carbonate rock, argillaceous	6263- RAS	1.9	7.60	35.4	50.6	--
P-11	Carbonate rock, phosphatic, argillaceous	6262- RAS	.8	11.9	24.3	51.4	--
P-10	Carbonate rock	--	2.1	--	--	53.5	--
P- 9	Carbonate rock, phosphatic	6261- RAS	.4	13.3	12.2	53.9	--
P- 8	Mudstone, carbonatic	6260- RAS	.8	7.50	46.8	54.7	--
P- 7	Carbonate rock, argillaceous	6259- RAS	.6	8.62	24.4	55.3	--
P- 6	Covered interval	--	1.3	--	--	56.6	--
P- 5	Carbonate rock, phosphatic, argillaceous	6258- RAS	1.1	10.4	24.1	57.7	*11.44
P- 4	Carbonate rock, phosphatic, argillaceous	6257- RAS	1.2	11.3	22.0	58.9	25.00
P- 3	Carbonate rock, phosphatic	6256- RAS	1.7	16.4	4.2	60.6	52.88
P- 2	Mudstone, phosphatic	6255- RAS	1.3	13.7	36.2	61.9	70.69
	Beds P-2 through P-7 are highly weathered and of questionable thickness and continuity.						
P- 1	Carbonate rock, phosphatic	6254- TMC	1.3	16.8	8.2	63.2	**92.53
	Lower member of Park City formation						
L-17	Sandstone, carbonatic	--	17.6	--	--	17.6	--
L-16	Mudstone, carbonatic	--	3.4	--	--	21.0	--
L-15	Sandstone, carbonatic	--	6.4	--	--	27.4	--
L-14	Sandstone, carbonatic	--	15.0	--	--	42.4	--
L-13	Sandstone, carbonatic	--	10.5	--	--	52.9	--
L-12	Sandstone, argillaceous	--	3.5	--	--	56.4	--
L-11	Sandstone, carbonatic	--	10.5	--	--	66.9	--
L-10	Siltstone, carbonatic	--	2.5	--	--	69.4	--
L- 9	Sandstone, carbonatic	--	8.5	--	--	77.9	--

* Cumulative data incomplete because of missing information. Computations start from zero after interruption.
** Note incompleteness of cumulative data.

Sols Canyon—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
L- 8	Siltstone, carbonatic	--	5.0	--	--	82.9	--
L- 7	Sandstone, carbonatic	--	23.0	--	--	105.9	--
L- 6	Covered interval	--	3.5	--	--	109.4	--
L- 5	Sandstone, carbonatic	--	6.0	--	--	115.4	--
L- 4	Sandstone, carbonatic	--	23.0	--	--	138.4	--
L- 3	Covered interval	--	20.0	--	--	158.4	--
L- 2	Sandstone	--	25.0	--	--	183.4	--
L- 1	Covered interval	--	23.0	--	--	206.4	--
	Weber formation—upper part only						
Cw-1	Sandstone, carbonatic	--	205.0	--	--	205.0	--

Strawberry Valley, Utah, lot 1371

Park City formation measured and sampled in outcrop and bulldozer trenches in Willow Creek Canyon, NW¼ sec. 14, T. 2 S., R. 12 W., Wasatch County, Utah. Beds strike N. 30° W. and are overturned toward the west; dips range from 35° W. to near vertical. Section measured and sampled by R. A. Smart, T. M. Cheney, and R. G. Waring in September 1951. Samples analyzed by U. S. Bureau of Mines laboratory, Albany, Oreg.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
	Woodside formation—not measured						
	Upper member of Park City formation						
U-17	Carbonate rock	--	75.0	--	--	75.0	--
U-16	Chert breccia	--	1.0	--	--	76.0	--
U-15	Carbonate rock	--	7.0	--	--	83.0	--
U-14	Covered interval	--	48.0	--	--	131.0	--
U-13	Sandstone, carbonatic	--	12.0	--	--	143.0	--
U-12	Carbonate rock	--	19.0	--	--	162.0	--
U-11	Carbonate rock and chert	--	10.0	--	--	172.0	--
U-10	Covered interval	--	90.0	--	--	262.0	--
U- 9	Sandstone, carbonatic	--	142.0	--	--	404.0	--
U- 8	Chert and carbonate rock	--	44.0	--	--	448.0	--
U- 7	Carbonate rock	--	41.0	--	--	489.0	--
U- 6	Sandstone and sandy carbonate rock	--	39.7	--	--	528.7	--
U- 5	Sandstone, carbonatic	--	6.3	--	--	535.0	--
U- 4	Chert, sandstone, and phosphatic sandstone; fos. col. no. 12625[1]	--	7.5	--	--	542.5	--
U- 3	Sandstone	--	.9	--	--	543.4	--
U- 2	Sandstone	--	.8	--	--	544.2	--
U- 1	Sandstone and chert	--	2.4	--	--	546.6	--
	Phosphatic shale member of Park City formation (?)						
P-96	Siltstone	--	4.5	--	--	4.5	--
P-95	Siltstone	--	6.3	--	--	10.8	--
P-94	Siltstone	--	2.1	--	--	12.9	--
P-93	Siltstone	--	5.5	--	--	18.4	--
P-92	Siltstone	--	14.5	--	--	32.9	--
P-91	Siltstone	6618-RGW	1.2	3.3	67.5	34.1	*3.96
P-90	Phosphate rock, carbonatic and mudstone	6617-RGW	1.1	16.1	34.4	35.2	21.67
P-89	Siltstone	6616-RGW	2.5	2.8	66.0	37.7	28.67
P-88	Mudstone, phosphatic, carbonatic and mudstone	6615-RGW	1.0	4.4	62.5	38.7	33.07

[1] Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

* Note incompleteness of cumulative data because of missing information.

Strawberry Valley—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P-87	Siltstone and phosphate rock	6614-RGW	1.0	12.6	42.5	39.7	*45.67
P-86	Siltstone, carbonatic	--	1.2	--	--	40.9	--
P-85	Mudstone	--	1.1	--	--	42.0	--
P-84	Chert and mudstone	--	.9	--	--	42.9	--
P-83	Mudstone	--	2.2	--	--	45.1	--
P-82	Mudstone	--	5.3	--	--	50.4	--
P-81	Mudstone	--	.5	--	--	50.9	--
P-80	Mudstone, phosphatic and phosphate rock	6613-TMC	.5	14.4	46.2	51.4	--
P-79	Mudstone, carbonatic	--	4.9	--	--	56.3	--
P-78	Mudstone, carbonatic	--	3.4	--	--	59.7	--
P-77	Siltstone	--	9.1	--	--	68.8	--
P-76	Siltstone, carbonatic	--	3.0	--	--	71.8	--
P-75	Siltstone, carbonatic	6612-RGW	1.2	7.2	45.7	73.0	*8.64
P-74	Phosphate rock, argillaceous	6611-RGW	.4	22.5	23.9	73.4	17.64
P-73	Carbonate rock, silty, and carbonatic mudstone	6610-RGW	1.7	6.2	39.1	75.1	28.18
P-72	Mudstone, phosphatic	6609-RGW	.6	12.7	38.5	75.7	35.80
P-71	Phosphate rock	6608-RGW	.5	25.6	12.9	76.2	*48.60
P-70	Siltstone, carbonatic	--	1.9	--	--	78.1	--
P-69	Carbonate rock, silty	6607-RGW	1.7	4.5	31.0	79.8	--
P-68	Carbonate rock	--	.8	--	--	80.6	--
P-67	Siltstone, carbonatic, siltstone, and chert	--	3.5	--	--	84.1	--
P-66	Mudstone, phosphatic, carbonatic	6606-RGW	1.1	12.3	35.8	85.2	--
P-65	Phosphate rock and mudstone	6605-RGW	1.5	16.5	30.0	86.7	--
P-64	Phosphate rock	6604-RGW	.5	26.1	12.5	87.2	--
P-63	Carbonate rock	--	1.5	--	--	88.7	--
P-62	Mudstone	--	.5	--	--	89.2	--
P-61	Carbonate rock	--	1.5	--	--	90.7	--
P-60	Siltstone	--	.7	--	--	91.4	--
P-59	Siltstone, cherty	--	2.7	--	--	94.1	--
P-58	Siltstone, cherty	--	1.8	--	--	95.9	--
P-57	Mudstone and chert breccia	--	1.8	--	--	97.7	--
P-56	Siltstone, carbonatic, and carbonatic chert breccia	--	1.3	--	--	99.0	--
P-55	Chert and phosphatic mudstone	--	.9	--	--	99.9	--
P-54	Siltstone	--	.9	--	--	100.8	--
P-53	Siltstone, chert, and mudstone	--	1.8	--	--	102.6	--
P-52	Chert	--	1.9	--	--	104.5	--
P-51	Siltstone, carbonatic	--	1.7	--	--	106.2	--
P-50	Chert	--	1.0	--	--	107.2	--

P-49	Siltstone, cherty	--	2.5	--	--	109.7	--
P-48	Chert and siltstone	--	1.6	--	--	111.3	--
P-47	Phosphate rock, carbonatic and siltstone	6603-RGW	.4	17.9	32.1	111.7	--
P-46	Siltstone	--	2.5	--	--	114.2	--
P-45	Siltstone and argillaceous, carbonatic phosphate rock	--	1.0	--	--	115.2	--
P-44	Siltstone and carbonatic phosphate rock	--	.6	--	--	115.8	--
P-43	Mudstone	--	3.9	--	--	119.7	--
P-42	Mudstone	--	1.1	--	--	120.8	--
P-41	Mudstone	--	1.1	--	--	121.9	--
P-40	Mudstone	--	1.0	--	--	122.9	--
P-39	Mudstone and phosphatic mudstone	--	1.1	--	--	124.0	--
P-38	Phosphate rock, carbonatic	6602- RAS	.6	18.5	14.6	124.6	--
P-37	Mudstone, phosphatic, carbonatic	6601- RAS	1.7	8.7	36.0	126.3	--
P-36	Mudstone	--	1.8	--	--	128.1	--
P-35	Mudstone, carbonatic	--	1.5	--	--	129.6	--
P-34	Phosphate rock, argillaceous	6600- RAS	.5	23.9	17.3	130.1	*11.95
P-33	Carbonate rock, argillaceous	6599- RAS	1.6	2.4	31.0	131.7	15.79
P-32	Phosphate rock, argillaceous	6598- RAS	1.1	20.7	24.9	132.8	38.56
P-31	Mudstone, phosphatic	6597- RAS	.9	12.7	40.5	133.7	49.99
P-30	Carbonate rock, argillaceous	6596- RAS	1.1	4.3	36.5	134.8	54.72
P-29	Mudstone	--	1.5	--	--	136.3	--
P-28	Mudstone	--	2.1	--	--	138.4	--
P-27	Mudstone	--	1.5	--	--	139.9	--
P-26	Mudstone	--	2.5	--	--	142.4	--
P-25	Mudstone, carbonatic	--	.6	--	--	143.0	--
P-24	Mudstone	--	1.1	--	--	144.1	--
P-23	Mudstone	--	4.5	--	--	148.6	--
P-22	Mudstone, phosphatic	6595- RAS	.9	8.3	53.0	149.5	*7.47
P-21	Mudstone, phosphatic	6594- RAS	.5	15.7	42.4	150.0	15.32
P-20	Mudstone, carbonatic	6593- RAS	.8	2.8	63.3	150.8	17.56
P-19	Mudstone, phosphatic	6592- RAS	.5	8.3	58.5	151.3	*21.71
P-18	Siltstone	--	1.2	--	--	152.5	--
P-17	Siltstone, carbonatic	--	1.0	--	--	153.5	--
P-16	Carbonate rock; fos. col. no. 12626	--	2.9	--	--	156.4	--
P-15	Siltstone	--	3.0	--	--	159.4	--
P-14	Siltstone	--	2.3	--	--	161.7	--
P-13	Siltstone	--	.7	--	--	162.4	--
P-12	Siltstone	--	.9	--	--	163.3	--
P-11	Siltstone	--	1.5	--	--	164.8	--
P-10	Siltstone	--	2.7	--	--	167.5	--
P- 9	Siltstone	--	.8	--	--	168.3	--

* Note incompleteness of cumulative data because of missing information.

Strawberry Valley—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Acid insoluble		
P- 8	Chert, argillaceous	--	3.5	--	--	171.8	--
P- 7	Mudstone, cherty	--	3.4	--	--	175.2	--
P- 6	Mudstone, cherty	--	1.7	--	--	176.9	--
P- 5	Chert, argillaceous	--	2.9	--	--	179.8	--
P- 4	Mudstone	--	1.5	--	--	181.3	--
P- 3	Mudstone	6591- RAS	.7	7.3	68.1	182.0	--
P- 2	Siltstone	--	1.4	--	--	183.4	--
P- 1	Siltstone	--	3.3	--	--	186.7	--
	Lower member of Park City formation (?)						
L-62	Covered interval	--	1.8	--	--	1.8	--
L-61	Sandstone	--	1.1	--	--	2.9	--
L-60	Sandstone	--	5.7	--	--	8.6	--
L-59	Sandstone	--	5.1	--	--	13.7	--
L-58	Sandstone	--	8.0	--	--	21.7	--
L-57	Covered interval	--	22.0	--	--	43.7	--
L-56	Sandstone, carbonatic	--	40.0	--	--	83.7	--
L-55	Covered interval	--	13.0	--	--	96.7	--
L-54	Sandstone, carbonatic	--	8.0	--	--	104.7	--
L-53	Sandstone, carbonatic	--	19.5	--	--	124.2	--
L-52	Covered interval	--	11.0	--	--	135.2	--
L-51	Covered interval	--	50.0	--	--	185.2	--
L-50	Carbonate rock, cherty	--	13.0	--	--	198.2	--
L-49	Covered interval	--	15.0	--	--	213.2	--
L-48	Carbonate rock	--	3.8	--	--	217.0	--
L-47	Siltstone	--	1.1	--	--	218.1	--
L-46	Carbonate rock, cherty	--	3.0	--	--	221.1	--
L-45	Covered interval	--	10.0	--	--	231.1	--
L-44	Covered interval	--	10.0	--	--	241.1	--
L-43	Covered interval	--	9.0	--	--	250.1	--
L-42	Carbonate rock	--	15.0	--	--	265.1	--
L-41	Sandstone, carbonatic	--	16.0	--	--	281.1	--
L-40	Covered interval	--	3.0	--	--	284.1	--
L-39	Carbonate rock, cherty	--	1.3	--	--	285.4	--
L-38	Carbonate rock	--	5.4	--	--	290.8	--
L-37	Siltstone, carbonatic	--	4.0	--	--	294.8	--
L-36	Chert and carbonatic siltstone	--	2.4	--	--	297.2	--

L-35	Covered interval	--	12.0	--	--	309.2	--
L-34	Siltstone, carbonatic	--	1.5	--	--	310.7	--
L-33	Carbonate rock, sandy	--	1.7	--	--	312.4	--
L-32	Siltstone	--	3.4	--	--	315.8	--
L-31	Mudstone, carbonatic	--	1.7	--	--	317.5	--
L-30	Siltstone	--	2.2	--	--	319.7	--
L-29	Siltstone	--	1.9	--	--	321.6	--
L-28	Siltstone	--	1.3	--	--	322.9	--
L-27	Covered interval	--	7.0	--	--	329.9	--
L-26	Siltstone	--	.9	--	--	330.8	--
L-25	Siltstone	--	1.7	--	--	332.5	--
L-24	Siltstone	--	1.2	--	--	333.7	--
L-23	Siltstone	--	4.2	--	--	337.9	--
L-22	Mudstone	--	1.8	--	--	339.7	--
L-21	Siltstone	--	.9	--	--	340.6	--
L-20	Carbonate rock, sandy	--	2.2	--	--	342.8	--
L-19	Carbonate rock, sandy	--	4.7	--	--	347.5	--
L-18	Siltstone, carbonatic	--	.8	--	--	348.3	--
L-17	Sandstone, carbonatic	--	1.7	--	--	350.0	--
L-16	Siltstone, carbonatic	--	2.9	--	--	352.9	--
L-15	Carbonate rock, sandy	--	1.1	--	--	354.0	--
L-14	Carbonate rock, sandy	--	3.3	--	--	357.3	--
L-13	Carbonate rock	--	18.0	--	--	375.3	--
L-12	Carbonate rock, sandy	--	13.0	--	--	388.3	--
L-11	Sandstone	--	6.0	--	--	394.3	--
L-10	Carbonate rock	--	20.0	--	--	414.3	--
L- 9	Covered interval	--	70.0	--	--	484.3	--
L- 8	Carbonate rock	--	29.0	--	--	513.3	--
L- 7	Carbonate rock	--	50.0	--	--	563.3	--
L- 6	Covered interval	--	12.0	--	--	575.3	--
L- 5	Carbonate rock, sandy	--	16.0	--	--	591.3	--
L- 4	Carbonate rock	--	22.0	--	--	613.3	--
L- 3	Covered interval	--	18.0	--	--	631.3	--
L- 2	Carbonate rock	--	32.0	--	--	663.3	--
L- 1	Carbonate rock	--	20.0	--	--	683.3	--
	Diamond Creek sandstone (?)						
D- 1	Sandstone, calcareous	--	(?)	--	--	--	--

Little Diamond Creek, Utah, lot 1376

Lower part of phosphatic shale member of Park City formation measured and sampled in old open pit mine under lease to American Smelting and Refining Company of Little Diamond Creek, S½SE¼ sec. 22, T. 8 S., R. 4 E., Utah County, Utah. Beds strike N. 20° W. and dip 30° NE. Section measured by T. M. Cheney and sampled by R. G. Waring in October 1951. Samples analyzed for P_2O_5 and acid insoluble by U. S. Bureau of Mines laboratory Albany, Oreg., and for other constituents by Trace Elements Section laboratory, U. S. Geological Survey, Washington, D. C.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P_2O_5 (cumulative)
				P_2O_5	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
	Phosphatic shale member of Park City formation—basal part only									
--	Covered interval	--	--	--	--	--	--	--	--	--
P-5	Phosphate rock	6798-TMC	1.7	30.1	0.98	0.74	8.20	5.4	1.7	51.17
P-4	Phosphate rock	6797-TMC	1.4	30.1	.84	.77	8.87	6.6	3.1	93.31
P-3	Phosphate rock	6796-TMC	1.5	27.8	1.08	.76	6.73	7.9	4.6	135.01
P-2	Phosphate rock	6795-TMC	1.2	26.7	.64	2.98	6.80	10.8	5.8	167.05
	Beds P-1 and P-2 measured 60 feet apart. The 0.5-1.5 feet of strata missing is probably similar to bed P-2.									
P-1	Dolomite	--	.6	--	--	--	--	--	6.4	--
--	Covered interval	--	--	--	--	--	--	--	--	--

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