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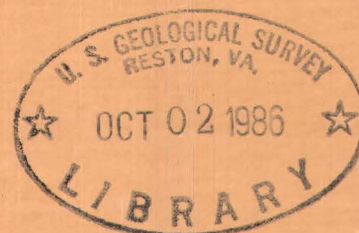
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# Stratigraphic Sections of the Phosphoria Formation in Idaho, 1950 - 51

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

This material contains information affecting the national defense of the United States within the meaning of the espionage laws, Title 18, U.S.C. Secs. 793 and 794, the transmission or revelation of which in any manner to an unauthorized person is prohibited by law.



*Trace Elements Investigations Report 376*

*GS-C-327.*

UNITED STATES DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

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Geology and Mineralogy

This document consists of 27 pages.  
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Series A

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION

IN IDAHO, 1950-51\*

By

R. A. Smart, R. G. Waring, T. M. Cheney,  
and R. P. Sheldon

October 1953

Trace Elements Investigations Report 376

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This preliminary report is distributed without editorial and technical review for conformity with official standards and nomenclature. It is not for public inspection or quotation.

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\*This report concerns work done partly on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

USGS - TEI-376

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## STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO, 1950-51

by R. A. Smart, R. G. Waring, T. M. Cheney and R. P. Sheldon

## INTRODUCTION

The U. S. Geological Survey has recently measured and sampled the Phosphoria formation at many localities in Idaho and other western states. These data will not be fully synthesized and analyzed for several years, but 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 many of the sections measured in southeastern Idaho (fig. 1), is one of this series and is the sixth report of data gathered in Idaho; it includes the data gathered in Idaho during 1950 and 1951. The field and laboratory procedures adopted in these investigations are described in a previous report (McKelvey and others, 1953a).

Many people have taken part in this investigation. E. R. Cressman, F. D. Frieske, R. A. Gulbrandsen, H. W. Peirce, J. A. Peterson, B. K. Replogle, and M. A. Warner participated in the description of the strata and the collection of samples referred to in this report. Crushing and splitting of samples in the field were done by T. K. Rigby. The laboratory preparation of samples for chemical analysis was done in Denver, Colo., under the direction of W. P. Huleatt.

Most of the  $P_2O_5$  and acid-insoluble analyses were made 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 remainder were made in the Trace Elements Section laboratory of the Survey

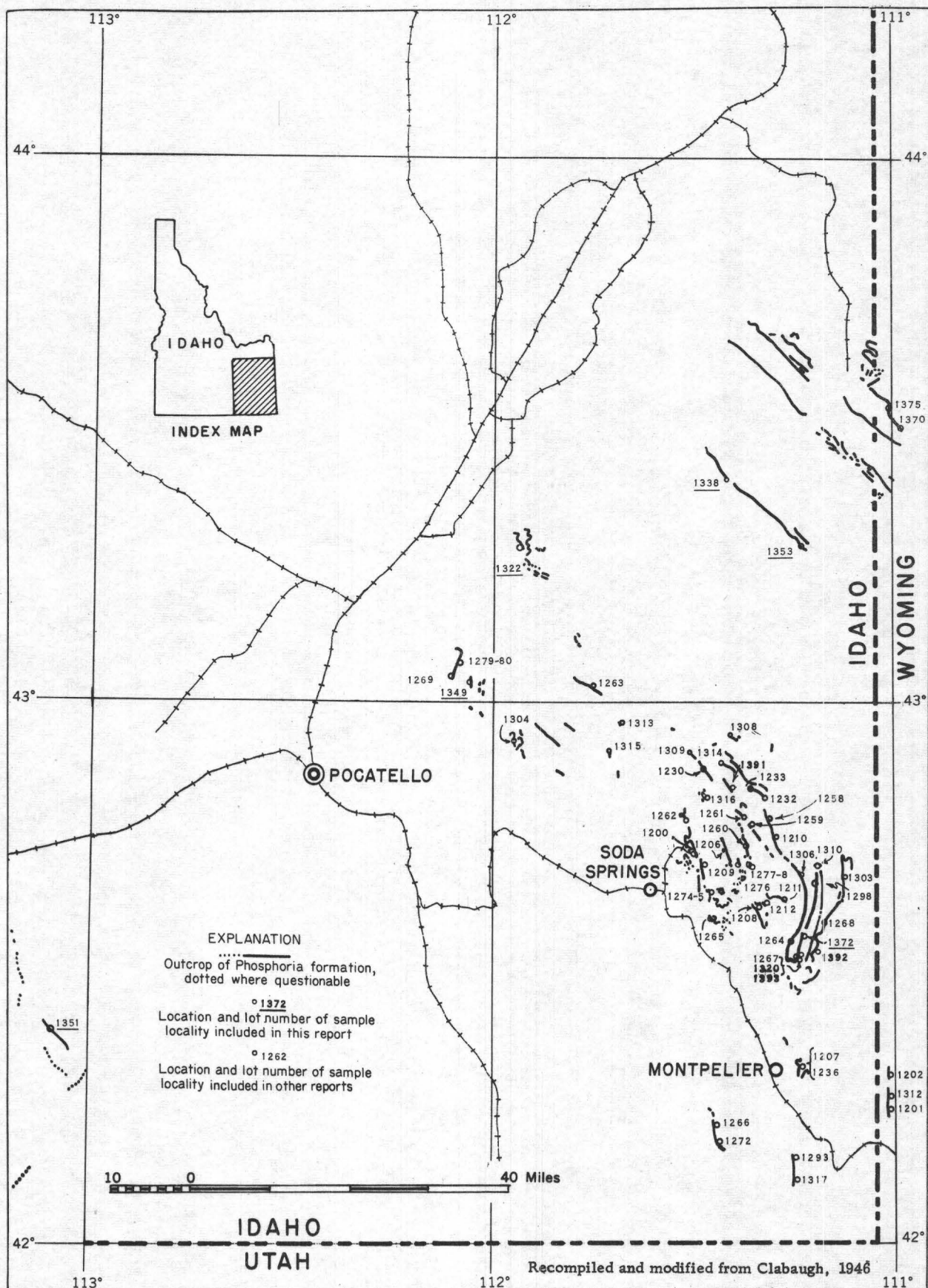


Figure 1. -- Outcrops of the Phosphoria formation in Idaho and localities sampled

in Denver, Colo., under the supervision of L. F. Rader, by chemists M. Appling, G. T. Burrow, N. Jammer, W. Mountjoy, and M. Stevens. The  $\text{Al}_2\text{O}_3$ ,  $\text{Fe}_2\text{O}_3$ , and loss-on-ignition analyses were made in the Trace Elements Section laboratory of the Survey in Washington, D. C., under the direction of J. C. Rabbitt, by chemists H. Alberty, I. Barlow, and C. Hoy. The radioactivity analyses were made in the Trace Elements Section laboratory in Denver, Colo., under the direction of L. F. Rader, by S. P. Furman and J. N. Rosholt, and chemical uranium analyses were made in this laboratory by Appling, Burrow, Jammer, Mountjoy, and Stevens.

The data were compiled largely by K. S. Bergman under the supervision of R. W. Swanson. Anita Wise organized the tabular data.

#### Acknowledgments

Special thanks are due W. W. Rubey, J. Steele Williams, and A. E. Weissenborn who have given much advice in planning and organizing the field program. The cost of both the field and laboratory investigations has been partly borne 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, property owners, and operating phosphate companies, who furnished information and services and gave access to property. A. J. Winters, Superintendent of the Montpelier Schools; E. M. Norris, C. T. Russell, and L. E. Traeger of the Anaconda Copper Mining Company; D. L. King of the San Francisco Chemical Company; G. A. McHugh of the Simplot Fertilizer Company; and O. A. Power of the

Westvaco Chemical Division, Food Machinery and Chemical Corporation, have been especially helpful in this connection.

#### STRATIGRAPHY OF THE PHOSPHORIA FORMATION IN SOUTHEASTERN IDAHO

At its type locality in southeastern Idaho (Richards and Mansfield, 1912), the Phosphoria formation consists of a lower member, the phosphatic shale, about 180 feet thick, and an upper member, the Rex chert, about 240 feet thick; another member, a thin-bedded cherty mudstone 15 to 75 feet thick, overlies the Rex chert in most of southeastern Idaho and western Wyoming, though it is not well defined at the type locality. Northward the phosphatic shale member thins to about 60 feet.

The Phosphoria formation overlies the Wells formation of Pennsylvanian age and underlies the Dinwoody formation of Triassic age. The upper 50 to 75 feet of the Wells formation consists of gray fossiliferous cherty limestone that contains some thin phosphatic layers and may be the correlative of the lowermost member (A member) of the Phosphoria formation in Montana and the lower limestone member of the Park City formation in Utah (McKelvey, 1949).

In southeastern Idaho most of the phosphatic beds are in the phosphatic shale member, and it is on this member that most of our studies have been focused. It consists of many thin layers, some of which persist over the whole area. They may be grouped into several broad units, as yet unnamed, as shown in figure 2.



## STRATIGRAPHIC SECTIONS

Abstracts of stratigraphic sections measured at six localities and the available analytical data are presented in the following pages. Their locations, as well as the locations of sections reported previously (McKelvey and others, 1953a and b, O'Malley and others, 1953, Sheldon and others, 1953, Davidson and others, 1953), are shown in figure 1.

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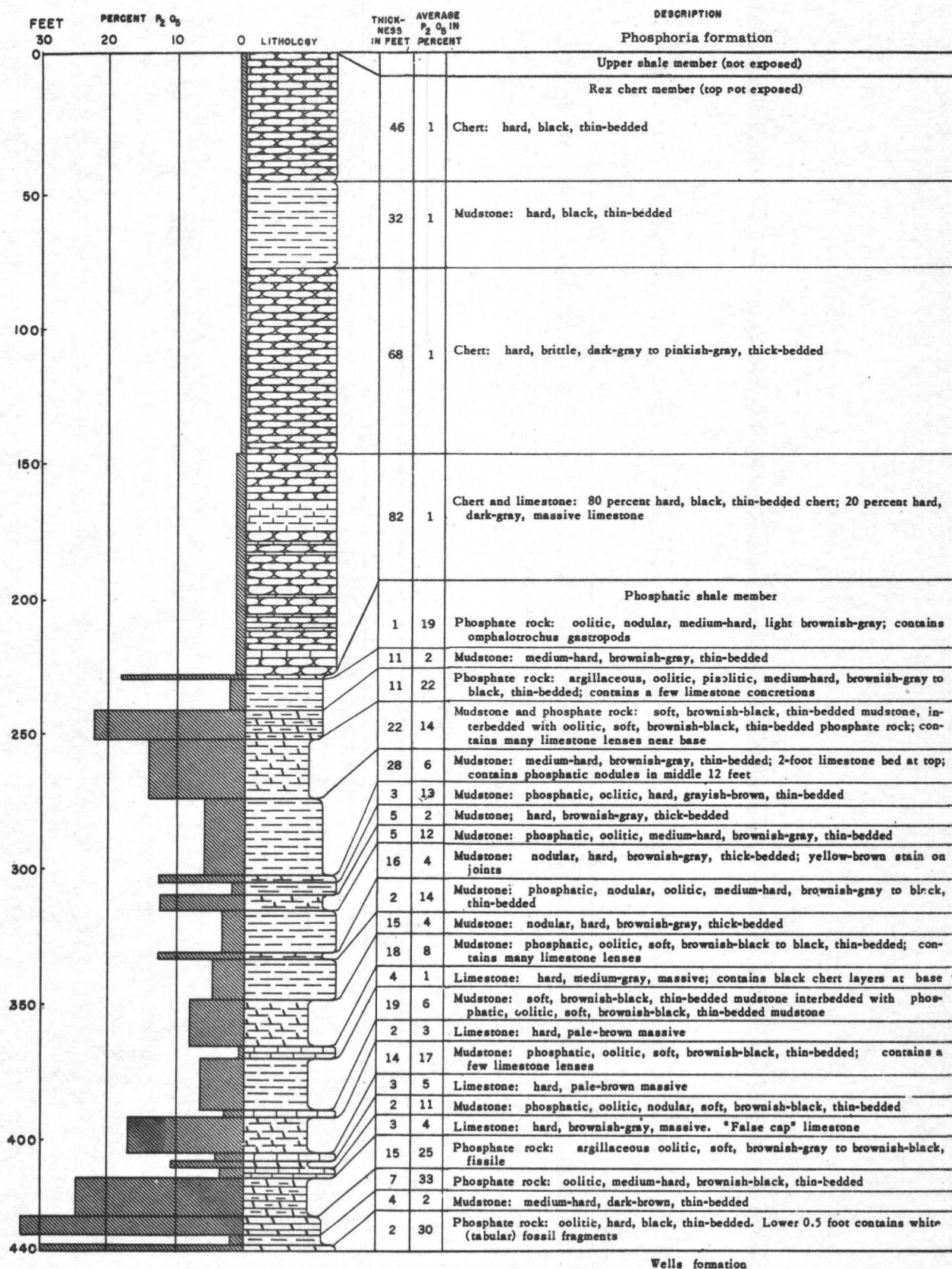


Figure 2. —Generalized section of the Phosphoria formation at Trail Canyon, Idaho (lot no. 1206).

Fall Creek, Idaho, lot 1338

Phosphoria formation measured and sampled in bulldozer trench and at natural exposure on north side of Fall Creek near Swan Valley, SW $\frac{1}{4}$  sec. 18, T. 1 N., R. 43 E., Bonneville County, Idaho, on the southwest limb of an anticline trending northwest. Beds strike N. 40° W. and dip 45° SW. Section measured and sampled by R. P. Sheldon, F. D. Frieske, T. M. Cheney and R. G. Waring in September 1950. Samples analyzed for P<sub>2</sub>O<sub>5</sub> 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.

Samples analyzed for eU and chem. U by the U. S. Geological Survey laboratory, Geochemistry and Petrology Branch.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU <sup>3</sup>	Chem. U	
Rex chert member of Phosphoria formation—top not exposed													
R-15	Chert -----	--	26.5	--	--	--	--	--	26.5	--	--	--	--
R-14	Limestone; fos. col. no. 12296 <sup>1</sup> -----	--	22.0	--	--	--	--	--	48.5	--	--	--	--
R-13	Mudstone, cherty, calcareous -----	--	31.0	--	--	--	--	--	89.5	--	--	--	--
R-12	Phosphate rock -----	--	.2	--	--	--	--	--	89.7	--	--	--	--
R-11	Sandstone; fos. col. no. 12295 -----	--	1.4	--	--	--	--	--	91.1	--	--	--	--
R-10	Limestone; fos. col. no. 12294 -----	--	1.9	--	--	--	--	--	93.0	--	--	--	--
R-9	Siltstone -----	--	5.2	--	--	--	--	--	98.2	--	--	--	--
R-8	Limestone, cherty -----	--	6.4	--	--	--	--	--	104.6	--	--	--	--
R-7	Chert -----	--	4.2	--	--	--	--	--	108.8	--	--	--	--
R-6	Phosphate rock -----	5339-RGW	.4	25.4	--	--	--	9.4	109.2	--	0.005	0.003	--
R-5	Mudstone -----	--	1.8	--	--	--	--	--	111.0	--	--	--	--
R-4	Chert -----	--	2.7	--	--	--	--	--	113.7	--	--	--	--
R-3	Chert -----	--	7.4	--	--	--	--	--	121.1	--	--	--	--
R-2	Chert, dolomitic -----	--	2.4	--	--	--	--	--	123.5	--	--	--	--
R-1	Chert -----	--	18.0	--	--	--	--	--	141.5	--	--	--	--
Phosphatic shale member of Phosphoria formation													
P-33	Carbonate rock -----	5338-RGW	1.0	0.8	--	--	--	14.3	1.0	0.80	0.000	--	0.000
P-32	Phosphate rock, argillaceous -----	5337-RGW	1.0	30.8	--	--	--	20.7 <sup>2</sup>	2.0	31.60	.008	0.006	.008
P-31	Phosphate rock; fos. col. no. 12293 -----	5336-RGW	1.4	34.3	--	--	--	35.3 <sup>2</sup>	3.4	79.62	.007	.008	.018
P-30	Carbonate rock, argillaceous -----	5335-RGW	.6	1.1	--	--	--	30.1	4.0	80.28	.002	--	.019
P-29	Phosphate rock, argillaceous -----	5334-RGW	.4	27.2	--	--	--	15.4	4.4	91.16	.010	.007	.023
P-28	Mudstone, carbonatic -----	5333-RGW	.7	1.0	--	--	--	53.4	5.1	91.86	.002	--	.024
P-27	Phosphate rock, argillaceous -----	5332-RGW	1.4	17.6	--	--	--	28.5	6.5	116.50	.009	.004	.037
P-26	Mudstone -----	5331-RGW	1.3	.5	--	--	--	70.6	7.8	117.15	.004	--	.042
P-25	Carbonate rock, argillaceous -----	5330-RGW	1.1	.6	--	--	--	31.0	8.9	117.81	.002	--	.044
P-24	Mudstone, carbonatic -----	5329-RGW	.6	4.1	--	--	--	50.5	9.5	120.27	.006	.004	.048
P-23	Mudstone -----	5328-RGW	2.1	6.0	--	--	--	66.2	11.6	132.87	.004	--	.056

<sup>1</sup> Fossil collection made by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.  
<sup>2</sup> Acid insoluble analysis probably too high.

<sup>3</sup> Equivalent uranium.

Fall Creek—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
P- 22	Carbonate rock, argillaceous-----	5327-RGW	2.8	0.7	--	--	--	25.8	14.4	134.83	0.001	--	0.059
P- 21	Mudstone, carbonatic-----	5326-RGW	2.2	.7	--	--	--	49.6	16.6	136.37	.001	--	.061
P- 20	Mudstone, phosphatic, carbonatic-----	5325-RGW	1.2	10.7	--	--	--	40.3	17.8	149.21	.008	0.007	.071
P- 19	Carbonate rock, argillaceous-----	5324-RGW	.9	1.5	--	--	--	24.9	18.7	150.56	.001	--	.072
P- 18	Mudstone, phosphatic, carbonatic-----	5323-RGW	.4	12.6	--	--	--	33.1	19.1	155.60	.009	.007	.076
P- 17	Carbonate rock-----	5322-RGW	.9	2.7	--	--	--	15.0	20.0	158.03	.002	--	.077
P- 16	Phosphate rock, argillaceous, and argillaceous carbonate rock-----	5321-RGW	1.4	13.2	--	--	--	26.4	21.4	176.51	.010	.009	.091
P- 15	Phosphate rock and carbonatic phosphate rock-----	5320-RGW	1.6	24.4	--	--	--	11.7	23.0	215.55	.016	.014	.117
P- 14	Limestone, argillaceous-----	5319-RGW	3.3	1.6	--	--	--	23.1	26.3	220.83	.001	--	.120
P- 13	Limestone, argillaceous-----	5318-RGW	.9	3.9	--	--	--	28.7	27.2	224.34	.004	--	.124
P- 12	Carbonate rock, argillaceous, and phosphatic mudstone, interbedded-----	5317- RPS	2.4	10.2	--	--	--	26.1	29.6	248.82	.007	.007	.141
P- 11	Phosphate rock, argillaceous and carbonate rock, interbedded; fos. col. no. 12292-----	5316- RPS	2.6	15.8	3.20	1.25	22.62	15.1	32.2	289.90	.007	.007	.159
P- 10	Phosphate rock and argillaceous phosphate rock-----	5315- RPS	2.1	24.2	2.77	1.46	15.60	12.0	34.3	340.72	.010	.010	.180
P- 9	Carbonate rock-----	5314- RPS	1.7	5.5	1.83	.51	37.88	6.7	36.0	350.07	.002	--	.183
P- 8	Phosphate rock and mudstone, interbedded-----	5313- RPS	.7	26.3	2.55	.92	10.54	12.6	36.7	368.48	.008	.007	.189
P- 7	Carbonate rock, argillaceous, contains small amounts of fluorite; fos. col. no. 12291-----	5312- RPS	1.0	2.4	.62	1.78	26.72	37.7	37.7	370.88	.002	--	.191
P- 6	Phosphate rock, calcareous-----	5311- FDF	.9	20.4	3.79	1.50	16.83	18.7	38.6	389.24	.007	.007	.199
P- 5	Phosphate rock, calcareous, and phosphatic mudstone; fos. col. no. 12290-----	5310- FDF	2.4	28.9	5.72	.75	9.02	6.7	41.0	458.60	.012	.011	.226
P- 4	Mudstone, carbonatic-----	5309- FDF	1.2	.6	5.36	1.80	19.78	55.0	42.2	459.32	.001	--	.227
P- 3	Phosphate rock-----	5308- FDF	.9	31.7	.62	.43	6.90	4.3	43.1	487.85	.016	.014	.242
P- 2	Mudstone-----	5307- FDF	.7	3.5	--	--	--	72.3	43.8	490.30	.006	.004	.246
P- 1	Carbonate rock, argillaceous and mudstone-----	5306- FDF	9.6	.9	--	--	--	35.9	53.4	498.94	.001	--	.255
	A fault near base of bed P-1 omits .5 to 5 feet of section.												



Wells formation—upper part only

Cw- 1	Chert, sandy, calcareous, and calcareous sandstone -----	--	1.3	--	--	--	--	--	1.3	--	--	--	--
Cw- 2	Chert, sandy, and calcareous sandstone -----	--	.9	--	--	--	--	--	2.2	--	--	--	--
Cw- 3	Dolomite, argillaceous, sandy-----	--	5.8	--	--	--	--	--	8.0	--	--	--	--
Cw- 4	Dolomite, silty and chert; fos. col. no. 12289 -----	--	11.0	--	--	--	--	--	19.0	--	--	--	--
Cw- 5	Limestone, argillaceous -----	--	9.8	--	--	--	--	--	28.8	--	--	--	--
Cw- 6	Siltstone and calcareous siltstone -----	--	1.2	--	--	--	--	--	30.0	--	--	--	--
Cw- 7	Siltstone -----	--	5.5	--	--	--	--	--	35.5	--	--	--	--
Cw- 8	Siltstone, calcareous -----	--	5.0	--	--	--	--	--	40.5	--	--	--	--
Cw- 9	Siltstone, sandy -----	--	18.0	--	--	--	--	--	58.5	--	--	--	--
Cw-10	Sandstone -----	--	14.0	--	--	--	--	--	72.5	--	--	--	--
Cw-11	Covered interval -----	--	32.	--	--	--	--	--	104.5	--	--	--	--
Cw-12	Sandstone, calcareous -----	--	4.0	--	--	--	--	--	108.5	--	--	--	--
Cw-13	Covered interval -----	--	5.	--	--	--	--	--	113.5	--	--	--	--
Cw-14	Limestone -----	--	4.0	--	--	--	--	--	117.5	--	--	--	--
Cw-15	Covered interval -----	--	15.	--	--	--	--	--	132.5	--	--	--	--
Cw-16	Limestone -----	--	5.0	--	--	--	--	--	137.5	--	--	--	--
Cw-17	Limestone, cherty -----	--	5.0	--	--	--	--	--	142.5	--	--	--	--
Cw-18	Dolomite -----	--	2.0	--	--	--	--	--	144.5	--	--	--	--
Cw-19	Limestone -----	--	5.0	--	--	--	--	--	149.5	--	--	--	--
Cw-20	Limestone, sandy -----	--	5.0	--	--	--	--	--	154.5	--	--	--	--
Cw-21	Limestone, cherty -----	--	2.0	--	--	--	--	--	156.5	--	--	--	--
Cw-22	Limestone -----	--	3.0	--	--	--	--	--	159.5	--	--	--	--
Cw-23	Sandstone, calcareous -----	--	1.4	--	--	--	--	--	160.9	--	--	--	--
Cw-24	Limestone -----	--	22.6	--	--	--	--	--	183.5	--	--	--	--
Cw-25	Dolomite, sandy, argillaceous -----	--	11.0	--	--	--	--	--	194.5	--	--	--	--

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Wolverine Canyon, Idaho, lot 1322

Phosphatic shale member of Phosphoria formation sampled in a bulldozer trench in Wolverine Canyon, SE $\frac{1}{4}$  NW $\frac{1}{4}$  sec. 31, T. 1 S., R. 39 E., Bingham County, Idaho. Beds strike north-south and dip 65° W. Section measured and sampled by R. A. Gulbrandsen, J. W. Hill, B. K. Replogle, E. R. Cressman, and H. W. Peirce in June 1950. Samples analyzed for P<sub>2</sub>O<sub>5</sub> 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.

Samples analyzed for eU and chem. U by the U. S. Geological Survey laboratory, Geochemistry and Petrology Branch.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent chem. U (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
Rex chert member of phosphoria formation—lower bed only, base not exposed													
R- 1	Limestone -----  Thrust and normal faults occur at Rex-phosphatic shale contact; thickness of missing strata unknown.	--	0.8	--	--	--	--	--	0.8	--	--	--	--
Phosphatic shale member of Phosphoria formation—top not exposed													
P- 48	Phosphate rock -----	4840-HWP	0.6	29.5	--	--	--	11.2	0.6	17.70	0.010	0.010	0.006
P- 47	Phosphate rock -----  Bed P-47 is highly crumpled and weathered.	4839-HWP	1.4	25.3	--	--	--	10.3	2.0	53.12	.007	.009	.019
P- 46	Phosphate rock -----	4838-HWP	1.0	32.5	--	--	--	6.0	3.0	85.62	.012	.015	.034
P- 45	Limestone; fos. col. no. 12115 -----	4837-HWP	.7	2.2	--	--	--	3.6	3.7	87.16	.001	.002	.035
P- 44	Phosphate rock, argillaceous -----	4836-HWP	.8	23.3	--	--	--	18.9	4.5	105.80	.009	.010	.043
P- 43	Mudstone -----	4835-HWP	1.2	6.4	--	--	--	57.1	5.7	113.48	.004	.003	.047
P- 42	Limestone, argillaceous; fos. col. no. 12114 -----	4834-HWP	1.0	1.2	--	--	--	25.8	6.7	114.68	.001	.001	.048
P- 41	Phosphate rock, argillaceous -----	4833-HWP	.7	19.9	--	--	--	29.8	7.4	128.61	.005	.005	.051
P- 40	Phosphate rock, argillaceous -----	4832-HWP	1.5	19.0	--	--	--	33.8	8.9	157.11	.005	.004	.057
P- 39	Mudstone, phosphatic; fos. col. no. 12113 -----	4831-HWP	1.3	13.8	--	--	--	48.3	10.2	175.05	.003	.004	.062
P- 38	Phosphate rock, argillaceous -----	4830-HWP	1.0	17.3	--	--	--	40.5	11.2	192.35	.004	.004	.066
P- 37	Phosphate rock, argillaceous -----	4829-HWP	.7	24.1	--	--	--	22.1	11.9	209.22	.003	.003	.068
P- 36	Limestone, argillaceous -----	4828-HWP	.9	2.7	--	--	--	34.1	12.8	211.65	.001	.001	.069
P- 35	Phosphate rock, argillaceous -----	4827-HWP	.6	23.2	--	--	--	23.5	13.4	225.57	.005	.006	.073
P- 34	Mudstone, phosphatic; fos. col. no. 12112 -----	4826-BKR	4.8	12.7	--	--	--	43.4	18.2	286.53	.006	.005	.097
P- 33	Mudstone, phosphatic -----	4825-BKR	3.7	10.5	--	--	--	48.0	21.9	325.38	.004	.004	.112
P- 32	Phosphate rock, argillaceous and mudstone -----	4824-BKR	2.4	19.7	--	--	--	26.7	24.3	372.66	.006	.007	.128

Due to structural complications, the stratigraphic interval between beds P-31 and P-32 is unknown.

P- 31	Limestone (lens?) -----	4823-RAG	1.3	1.6	--	--	--	6.6	25.6	*2.08	.000	.001	*.001
P- 30	Mudstone, phosphatic, carbonatic; fos. col. no. 12111 -----	4822-RAG	3.0	12.6	--	--	--	24.0	28.6	39.88	.004	.004	.013
P- 29	Phosphate rock, carbonatic -----	4821-RAG	.9	20.5	--	--	--	13.2	29.5	58.33	.005	.006	.019
P- 28	Phosphate rock, argillaceous, carbonatic -----	4820-RAG	.6	16.1	--	--	--	15.7	30.1	67.99	.003	.004	.021
P- 27	Limestone; fos. col. no. 12110 -----	4819-RAG	1.3	5.9	--	--	--	7.5	31.4	75.66	.002	.002	.024
P- 26	Phosphate rock, argillaceous -----	4818-RAG	1.8	23.1	4.35	1.52	10.72	24.3	33.2	117.24	.004	.005	.033
P- 25	Mudstone, phosphatic -----	4817-RAG	.5	11.8	7.06	2.19	11.99	46.3	33.7	123.14	.004	.003	.034
P- 24	Limestone, argillaceous -----	4816-RAG	.8	5.2	3.23	1.10	33.08	18.0	34.5	127.30	.002	.002	.036
P- 23	Phosphate rock and argillaceous phosphate rock -----	4815-RAG	1.0	28.3	2.29	.88	9.98	13.9	35.5	155.60	.003	.006	.042
P- 22	Limestone -----	4814-RAG	.7	3.7	2.77	.88	36.36	15.2	36.2	158.19	.001	.002	.043
P- 21	Phosphate rock -----	4813-RAG	1.5	27.9	2.83	.90	11.66	11.7	37.7	200.04	.006	.006	.052
P- 20	Phosphate rock -----	4812-RAG	.7	24.6	2.30	.96	15.48	10.6	38.4	217.26	.007	.008	.058
P- 19	Limestone -----	4811-RAG	1.7	1.5	.87	.27	43.41	4.3	40.1	219.81	.001	.001	.060
P- 18	Phosphate rock -----	4810-RAG	1.1	27.4	2.84	1.15	11.22	12.9	41.2	249.95	.010	.012	.073
P- 17	Phosphate rock, argillaceous -----	4809-RAG	.7	20.1	5.56	1.92	10.96	24.7	41.9	264.02	.006	.007	.078
P- 16	Limestone (lens?) -----	4808-RAG	.7	3.0	1.97	.75	38.86	9.7	42.6	266.12	.001	.002	.079
P- 15	Phosphate rock, argillaceous -----	4807-RAG	1.2	23.4	4.04	1.52	12.98	19.6	43.8	294.20	.009	.012	.093
P- 14	Phosphate rock, argillaceous -----	4806-RAG	1.6	26.3	2.29	.83	12.15	14.6	45.4	336.28	.010	.013	.114
P- 13	Limestone, phosphatic -----	4805-ERC	.7	9.2	1.54	.37	32.61	10.1	46.1	342.72	.002	.004	.117
P- 12	Mudstone, phosphatic -----	4804-ERC	2.4	13.4	5.44	1.81	13.32	40.1	48.5	374.88	.009	.009	.139
P- 11	Limestone, argillaceous -----	4803-ERC	.8	.3	3.15	1.17	33.63	22.4	49.3	375.12	.001	.001	.139
P- 10	Phosphate rock, argillaceous -----	4802-ERC	.4	16.4	6.10	.18	13.82	39.7	49.7	381.68	.009	.008	.143
P- 9	Phosphate rock -----	4801-ERC	1.3	33.0	.74	.54	6.87	5.0	51.0	424.58	.012	.012	.158
P- 8	Phosphate rock -----	4800-ERC	1.0	29.6	2.29	.73	9.16	12.9	52.0	454.18	.012	.016	.174
P- 7	Mudstone, phosphatic -----	4799-ERC	.5	11.5	6.28	1.91	12.69	43.7	52.5	459.93	.006	.006	.177
P- 6	Phosphate rock and mudstone, interbedded -----	4798-ERC	2.0	23.4	3.99	1.13	7.82	26.0	54.5	506.73	.013	.017	.211
P- 5	Limestone, argillaceous; fos. col. no. 12109 -----	4797-ERC	1.3	5.4	2.35	.86	30.60	17.9	55.8	513.75	.001	.002	.214
P- 4	Phosphate rock; contains limestone lens 0.05 foot above base -----	4796-ERC	1.9	34.2	1.12	.55	6.01	5.2	57.7	578.73	.020	.030	.271
P- 3	Phosphate rock -----	4795-ERC	1.1	36.2	.69	.44	4.10	3.1	58.8	618.55	.017	.022	.295
P- 2	Phosphate rock -----	4794-ERC	1.0	37.4	.38	.35	3.29	1.7	59.8	655.95	.019	.021	.316
P- 1	Phosphate rock -----	4793-ERC	.8	24.3	.40	.23	15.69	5.7	60.6	**675.39	.009	.013	** .326

## Wells formation—top beds only

Cw- 1	Limestone, cherty -----	4792-BKR	2.4	0.7	--	--	27.8	27.8	2.4	1.68	0.002	0.001	0.002
Cw- 2	Limestone, cherty -----	4791-BKR	2.6	1.0	--	--	--	78.6	5.0	4.28	.001	.001	.005

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

\* Cumulative data incomplete due to of missing information.

\*\* Note incompleteness of cumulative data.

Wolverine Canyon—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent chem. U (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
Cw- 3	Limestone, cherty -----	4790-BKR	3.8	1.0	--	--	--	68.9	8.8	8.08	0.001	0.001	0.009
Cw- 4	Limestone, cherty -----	4789-BKR	2.3	.8	--	--	--	62.8	11.1	9.92	.001	.001	.011

RESTRICTED

RESTRICTED  
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Bear Creek, Idaho, lot 1353

Phosphatic shale and upper shale members of the Phosphoria formation sampled near Bear Creek, NE $\frac{1}{4}$  sec. 31, T. 1 S., R. 45 E., Bonneville County, Idaho, on the west limb of an anticline trending N. 35° W. and plunging southeast. Beds strike N. 70° W. and dip from 45° to 75° S. Section measured by R. P. Sheldon, T. M. Cheney, R. G. Waring, and M. A. Warner in August 1951. Samples analyzed for P<sub>2</sub>O<sub>5</sub> 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.

Samples analyzed for eU and chem. U by the U. S. Geological Survey laboratory, Geochemistry and Petrology Branch.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
Dinwoody formation—lower beds only													
Td-4	Mudstone, carbonatic; fos. col. no. 12535 <sup>1</sup>	--	70.5	--	--	--	--	--	70.5	--	--	--	--
Td-3	Mudstone, carbonatic-----	--	32.0	--	--	--	--	--	102.5	--	--	--	--
Td-2	Mudstone, carbonatic and mudstone-----	--	13.0	--	--	--	--	--	115.5	--	--	--	--
Td-1	Mudstone-----	--	1.2	--	--	--	--	--	116.7	--	--	--	--
Upper shale member of Phosphoria formation													
U- 3	Mudstone-----	--	0.9	--	--	--	--	--	0.9	--	--	--	--
U- 2	Mudstone-----	--	1.2	--	--	--	--	--	2.1	--	--	--	--
U- 1	Phosphate rock, argillaceous-----	6571-MAW	.9	23.8	--	--	--	28.5	3.0	--	0.003	--	--
Rex chert member of Phosphoria formation													
R- 4	Chert; fos. col. no. 12536-----	--	24.0	--	--	--	--	--	24.0	--	--	--	--
R- 3	Covered interval; rocks probably faulted---	--	(?)	--	--	--	--	--	--	--	--	--	--
R- 2	Mudstone, cherty-----	--	2.3	--	--	--	--	--	26.3	--	--	--	--
R- 1	Mudstone, cherty-----	--	1.4	--	--	--	--	--	27.7	--	--	--	--
Phosphatic shale member of Phosphoria formation													
P-61	Phosphate rock-----	6567-MAW	0.6	31.1	0.82	0.70	10.33	15.4	0.6	19.08	0.008	0.007	0.005
P-60	Phosphate rock-----	6566-MAW	2.3	29.5	1.94	.90	9.41	13.5	2.9	86.93	.009	.008	.026
P-59	Phosphate rock-----	6565-MAW	1.0	35.4	.57	.68	7.72	6.9	3.9	122.83	.009	.005	.034
P-58	Phosphate rock-----	6564-MAW	1.9	35.8	.88	.46	9.07	5.8	5.8	192.18	.002	--	.038
P-57	Phosphate rock; fos. col. no. 12534-----	6563-MAW	1.1	34.2	.72	.51	8.65	3.5	6.9	230.46	.004	--	.043
P-56	Phosphate rock; fos. col. no. 12534-----	6562-MAW	1.6	35.4	.23	.15	5.85	2.3	8.5	288.38	.003	--	.048
P-55	Phosphate rock; fos. col. no. 12534-----	6561-MAW	1.3	35.6	.30	.25	7.89	2.4	9.8	334.66	.004	--	.053
P-54	Phosphate rock and mudstone; fos. col. no. 12534-----	6560-MAW	1.2	24.2	3.78	1.70	4.03	30.2	11.0	363.46	.006	.005	.060
P-53	Phosphate rock; fos. col. no. 12534-----	6559-MAW	1.4	34.8	.56	.30	11.04	4.3	12.4	412.74	.004	--	.066
P-52	Phosphate rock-----	6558-MAW	.3	31.5	1.80	1.28	11.52	11.9	12.7	422.43	.007	.006	.068
P-51	Mudstone and phosphate rock-----	6557-MAW	.6	12.2	--	--	--	57.1	13.3	429.69	.007	.003	.072
P-50	Mudstone-----	6556-MAW	1.3	3.7	--	--	--	79.0	14.6	434.44	.001	--	.073

<sup>1</sup> Fossil collection by J. E. Smedley, Paleontology and Stratigraphy Branch, U. S. Geological Survey.

Bear Creek—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
P-49	Phosphate rock and mudstone-----	6555-MAW	0.5	24.8	--	--	--	23.3	15.1	446.90	0.009	0.006	0.078
P-48	Mudstone -----	6554-MAW	.5	4.1	--	--	--	74.0	15.6	448.94	.003	--	.079
P-47	Phosphate rock, argillaceous -----	6553-MAW	.7	21.7	--	--	--	26.1	16.3	463.78	.006	.006	.083
P-46	Mudstone, phosphatic -----	6552-MAW	1.0	10.0	--	--	--	48.7	17.3	473.78	.009	.005	.092
P-45	Mudstone -----	6551-MAW	2.0	.3	--	--	--	76.6	19.3	474.38	.004	--	.100
P-44	Mudstone -----	6550-MAW	2.6	5.8	--	--	--	68.0	21.9	489.46	.006	.002	.116
P-43	Mudstone -----	6549-RGW	.9	1.0	--	--	--	82.9	22.8	490.36	.003	--	.119
P-42	Mudstone -----	6548-RGW	.5	4.5	--	--	--	75.0	23.3	492.60	.001	--	.119
P-41	Mudstone -----	6547-RGW	1.5	.4	--	--	--	84.9	24.8	493.20	.002	--	.122
P-40	Mudstone -----	6546-TMC	1.3	7.7	--	--	--	55.3	26.1	503.22	.007	.003	.131
P-39	Mudstone, carbonatic -----	6545-TMC	1.6	5.1	--	--	--	54.3	27.7	511.38	.002	--	.134
P-38	Mudstone -----	6544-TMC	.6	6.6	--	--	--	64.2	28.3	515.34	.004	--	.137
P-37	Mudstone -----	6543-TMC	1.2	3.0	--	--	--	78.9	29.5	518.94	.003	--	.140
P-36	Mudstone, phosphatic -----	6542-TMC	1.3	14.1	--	--	--	44.5	30.8	537.26	.006	.004	.148
P-35	Mudstone -----	6541-TMC	.5	5.9	--	--	--	71.1	31.3	540.22	.003	--	.150
P-34	Mudstone, phosphatic -----	6540-TMC	.7	13.7	--	--	--	43.5	32.0	549.80	.002	--	.151
P-33	Mudstone, phosphatic -----	6539-TMC	.4	9.4	--	--	--	61.1	32.4	553.56	.004	--	.153
P-32	Phosphate rock, argillaceous and mudstone -----	6538-TMC	.7	17.5	--	--	--	35.4	33.1	565.82	.008	.005	.158
P-31	Mudstone, phosphatic -----	6537-TMC	.7	8.4	--	--	--	47.3	33.8	571.70	.007	.005	.163
P-30	Mudstone and phosphate rock -----	6536-TMC	1.3	14.6	--	--	--	35.7	35.1	590.68	.007	.006	.172
P-29	Phosphate rock -----	6535-TMC	.9	28.4	--	--	--	9.7	36.0	616.24	.013	.013	.184
P-28	Phosphate rock -----	6534-TMC	1.2	26.8	--	--	--	12.5	37.2	648.40	.010	.011	.196
P-27	Mudstone -----	6533-TMC	1.0	3.4	--	--	--	77.3	38.2	651.80	.004	--	.200
P-26	Mudstone -----	6532-TMC	.7	2.9	--	--	--	78.7	38.9	653.82	.004	--	.203
P-25	Mudstone -----	6531-TMC	.5	7.5	--	--	--	56.1	39.4	657.58	.005	.003	.205
P-24	Mudstone -----	6530-TMC	.8	5.0	--	--	--	69.0	40.2	661.58	.004	--	.208
P-23	Mudstone and phosphatic mudstone -----	6529-TMC	.7	10.0	--	--	--	46.5	40.9	668.58	.008	.005	.214
P-22	Mudstone and phosphatic mudstone -----	6528-TMC	.7	13.0	--	--	--	40.5	41.6	677.68	.009	.008	.220
P-21	Mudstone, carbonatic -----	6527-TMC	.4	4.9	--	--	--	57.3	42.0	679.64	.005	.003	.222
P-20	Phosphate rock, argillaceous -----	6526-TMC	.7	19.2	5.48	2.29	11.96	27.5	42.7	693.08	.009	.008	.229
P-19	Phosphate rock, argillaceous -----	6525-TMC	.4	19.3	5.44	2.36	11.23	28.3	43.1	700.80	.010	.007	.233
P-18	Mudstone, phosphatic and mudstone -----	6524-RPS	.5	12.2	8.60	3.18	14.54	40.9	43.6	706.90	.010	.010	.238
P-17	Phosphate rock, argillaceous -----	6523-RPS	1.0	24.8	3.70	1.50	9.83	17.4	44.6	731.70	.007	.007	.245
P-16	Phosphate rock, argillaceous -----	6522-RPS	.9	22.8	4.94	1.70	10.02	22.9	45.5	752.22	.013	.012	.256
P-15	Phosphate rock, argillaceous -----	6521-RPS	.6	20.4	6.64	2.18	10.12	27.0	46.1	764.46	.010	.012	.262
P-14	Phosphate rock, argillaceous -----	6520-RPS	.9	18.4	5.80	2.65	12.36	30.5	47.0	781.02	.009	.009	.270
P-13	Phosphate rock -----	6519-RPS	1.3	27.1	2.60	1.29	9.40	11.7	48.3	816.24	.010	.011	.284

P-12	Phosphate rock, argillaceous -----	6518- RPS	1.0	22.6	5.10	2.20	8.97	21.9	49.3	838.84	.006	.005	.290
P-11	Phosphate rock, argillaceous -----	6517- RPS	1.0	25.2	3.84	1.60	7.45	19.0	50.3	864.04	.008	.007	.298
P-10	Mudstone -----	6516- RPS	.8	7.0	8.92	3.43	8.85	64.5	51.1	869.64	.005	.003	.301
P- 9	Phosphate rock -----	6515- RPS	1.4	27.2	2.64	1.37	8.49	6.2	52.5	907.72	.006	.008	.310
P- 8	Phosphate rock -----	6514- RPS	1.0	32.8	1.14	.84	4.61	4.6	53.5	940.52	.013	.015	.323
P- 7	Phosphate rock, argillaceous -----	6513- RPS	.3	26.5	3.74	1.30	7.28	15.0	53.8	948.48	.014	.014	.327
P- 6	Phosphate rock -----	6512- RPS	1.8	31.5	.72	.60	4.27	9.1	55.6	1,005.18	.012	.014	.349
P- 5	Mudstone -----	6511- RPS	1.6	.9	8.48	3.83	6.73	83.1	57.2	1,006.62	.002	--	.352
P- 4	Phosphate rock -----	6510- RPS	1.0	31.2	.74	.56	5.82	6.5	58.2	1,037.82	.013	.014	.365
P- 3	Mudstone -----	6509- RPS	1.3	5.0	6.48	3.18	8.73	69.1	59.5	1,044.32	.005	.005	.371
P- 2	Phosphate rock -----	6508- RPS	.4	31.7	.80	.73	5.68	6.6	59.9	1,057.00	.019	.020	.379
P- 1	Carbonate rock, argillaceous -----	6570- RPS	2.0	1.7	--	--	--	36.3	61.9	1,060.40	.000	--	.379

Wells formation—upper beds only

Cw-24	Carbonate rock, sandy; fos. col. no. 12531 -----	--	2.7	--	--	--	--	--	2.7	--	--	--	--
Cw-23	Chert, phosphatic, and cherty phosphate rock -----	6569- TMC	.5	8.8	--	--	--	61.9	3.2	--	0.002	--	--
Cw-22	Sandstone, carbonatic -----	--	3.1	--	--	--	--	--	6.3	--	--	--	--
Cw-21	Chert, siltstone, and cherty, carbonatic siltstone -----	--	3.9	--	--	--	--	--	10.2	--	--	--	--
Cw-20	Mudstone -----	--	.5	--	--	--	--	--	10.7	--	--	--	--
Cw-19	Chert -----	--	3.0	--	--	--	--	--	13.7	--	--	--	--
Cw-18	Mudstone, cherty, argillaceous carbonate rock, and chert -----	--	1.2	--	--	--	--	--	14.9	--	--	--	--
Cw-17	Mudstone, phosphatic -----	6568- TMC	.5	8.1	--	--	--	66.9	15.4	--	.004	--	--
Cw-16	Sandstone -----	--	22.0	--	--	--	--	--	37.4	--	--	--	--
Cw-15	Sandstone; fos. col. no. 12530 -----	--	10.0	--	--	--	--	--	47.4	--	--	--	--
Cw-14	Carbonate rock -----	--	12.0	--	--	--	--	--	59.4	--	--	--	--
Cw-13	Covered interval -----	--	52.0	--	--	--	--	--	111.4	--	--	--	--
Cw-12	Carbonate rock -----	--	13.0	--	--	--	--	--	124.4	--	--	--	--
Cw-11	Quartzite, carbonatic -----	--	39.0	--	--	--	--	--	163.4	--	--	--	--
Cw-10	Sandstone, cherty, carbonatic and carbonate rock -----	--	9.0	--	--	--	--	--	172.4	--	--	--	--
Cw- 9	Carbonate rock, cherty -----	--	9.0	--	--	--	--	--	181.4	--	--	--	--
Cw- 8	Carbonate rock -----	--	42.0	--	--	--	--	--	223.4	--	--	--	--
Cw- 7	Covered interval -----	--	20.0	--	--	--	--	--	243.4	--	--	--	--
Cw- 6	Sandstone, carbonatic -----	--	3.0	--	--	--	--	--	246.4	--	--	--	--
Cw- 5	Sandstone -----	--	47.0	--	--	--	--	--	293.4	--	--	--	--
Cw- 4	Sandstone, cherty -----	--	12.0	--	--	--	--	--	305.4	--	--	--	--
Cw- 3	Carbonate rock -----	--	15.0	--	--	--	--	--	320.4	--	--	--	--
Cw- 2	Carbonate rock -----	--	10.0	--	--	--	--	--	330.4	--	--	--	--
Cw- 1	Quartzite, carbonatic -----	--	25.0	--	--	--	--	--	355.4	--	--	--	--

Fort Hall Indian Reservation, Idaho, lot 1349

Upper portion of phosphatic shale member of Phosphoria formation sampled in bulldozer trench of the Westvaco Chemical Division, Food Machinery and Chemical Corporation, on Fort Hall Indian Reservation, sec. 23 (?), T. 4 S., R. 37 E., Bingham County, Idaho. Beds strike N. 50° W. and dip 25° SW. Section measured and sampled by M. A. Warner and R. A. Smart in July 1951. Samples analyzed by Trace Elements Section laboratory, U. S. Geological Survey, Denver, Colo.

Samples analyzed for eU and chem. U by the U. S. Geological Survey laboratory, Geochemistry and Petrology Branch.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Acid insoluble			eU	Chem. U	
Rex chert member of Phosphoria formation—basal bed only										
R- 1	Mudstone, cherty -----	--	2.5	--	--	2.5	--	--	--	--
Phosphatic shale member of Phosphoria formation—upper part only										
P-67	Mudstone -----	--	0.6	--	--	0.6	--	--	--	--
P-66	Mudstone and mantle -----	--	11.5	--	--	12.1	34.02	--	--	--
P-65	Phosphate rock, argillaceous -----	6337- RAS	1.8	18.9	42.1	13.9	34.02	0.006	0.006	0.011
P-64	Mudstone -----	6336- RAS	2.6	5.25	73.0	16.5	47.67	.004	--	.021
	Beds P-64 through P-67 badly weathered and slumped.									
P-63	Mudstone -----	6335- RAS	1.6	1.40	84.7	18.1	49.91	.003	--	.026
P-62	Phosphate rock and mudstone -----	6334- RAS	1.5	28.0	16.3	19.6	91.91	.008	.009	.038
P-61	Mudstone -----	6333- RAS	3.5	6.80	72.3	23.1	115.71	.003	--	.048
P-60	Mudstone -----	6332- RAS	2.5	7.65	70.6	25.6	134.84	.003	--	.056
P-59	Phosphate rock, argillaceous -----	6331-MAW	2.3	20.0	37.4	27.9	180.84	.007	.006	.072
	Beds P-59 through P-61 badly weathered.									
P-58	Phosphate rock -----	6330-MAW	.6	29.5	16.8	28.5	198.54	.009	.010	.078
P-57	Mudstone, phosphatic -----	6329-MAW	2.8	8.15	66.5	31.3	221.36	.004	--	.089
P-56	Phosphate rock, argillaceous -----	6328-MAW	.6	26.8	23.7	31.9	237.44	.008	.008	.094
P-55	Phosphate rock, argillaceous -----	6327-MAW	2.1	18.0	42.0	34.0	275.24	.006	.007	.106
P-54	Mudstone, phosphatic -----	6326-MAW	1.5	10.8	58.7	35.5	291.44	.005	.004	.114
P-53	Mudstone, phosphatic -----	6325-MAW	2.6	15.4	44.2	38.1	331.48	.006	.006	.129
P-52	Mudstone, phosphatic -----	6324-MAW	3.0	17.0	44.4	41.1	382.48	.006	.005	.147
P-51	Phosphate rock -----	6323-MAW	1.1	32.8	9.14	42.2	418.56	.011	.013	.159
P-50	Mudstone -----	6322-MAW	.6	6.85	72.0	42.8	422.66	.005	.002	.162
P-49	Phosphate rock -----	6321-MAW	1.5	33.0	11.8	44.3	472.16	.009	.008	.176
	Bed P-49 (sample 6321-MAW) correlates with bed P-49 (sample 2720-WOM) of lot 1269.									

<sup>1</sup> See O' Malley and others, 1953.



Snowdrift Mountain, Idaho, lot 1372

Phosphatic shale member of Phosphoria formation measured and sampled on Snowdrift Mountain, NW $\frac{1}{4}$ NW $\frac{1}{4}$ , sec. 8, T. 10 S., R. 45 E., Caribou County, Idaho, on the east limb of the Georgetown syncline. Beds strike N. 20° E. and dip 65° W. Section measured and sampled by T. M. Cheney, J. A. Peterson, R. G. Waring, R. A. Smart, and E. R. Cressman in September 1951. Samples analyzed for P<sub>2</sub>O<sub>5</sub> 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.

Samples analyzed for eU and chem. U by the U. S. Geological Survey laboratory, Geochemistry and Petrology Branch.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent chem. U (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
Rex chert member of Phosphoria formation—basal bed only													
R- 1	Chert and mudstone	6775- JAP	2.6	2.3	--	--	--	75.3	2.6	--	0.002	--	--
Phosphatic shale member of Phosphoria formation													
P-156	Phosphate rock, argillaceous -----	6774- JAP	0.5	29.5	--	--	--	21.3	0.5	14.75	0.011	0.010	0.006
P-155	Mudstone -----	6773- JAP	.8	2.4	--	--	--	75.5	1.3	16.67	.003	--	.008
P-154	Mudstone -----	6772- JAP	1.0	7.3	--	--	--	60.8	2.3	23.97	.005	.004	.013
P-153	Mudstone; fos. col. no. 12595 -----	6771- JAP	1.9	1.2	--	--	--	81.4	4.2	26.25	.002	--	.017
P-152	Mudstone; fos. col. no. 12595 -----	6770- JAP	6.0	1.6	--	--	--	78.5	10.2	35.85	.002	--	.029
P-151	Mudstone -----	6769- JAP	6.2	3.6	--	--	--	73.0	16.4	58.17	.004	--	.054
P-150	Mudstone, carbonatic -----	6768- JAP	1.2	6.5	--	--	--	53.4	17.6	65.97	.003	--	.057
	Bed P-150 highly weathered.												
P-149	Mudstone; fos. col. no. 12594 -----	6767- JAP	1.4	6.4	--	--	--	68.9	19.0	74.93	.004	--	.063
P-148	Mudstone -----	6766- JAP	2.1	1.8	--	--	--	80.7	21.1	78.71	.003	--	.069
P-147	Mudstone, phosphatic -----	6765- JAP	.6	9.3	--	--	--	51.0	21.7	84.29	.007	.006	.073
P-146	Phosphate rock -----	6764- JAP	.5	30.9	--	--	--	12.6	22.2	99.74	.007	.008	.077
P-145	Mudstone; fos. col. no. 12593 -----	6763- JAP	2.0	1.5	--	--	--	80.4	24.2	102.74	.002	--	.081
P-144	Mudstone -----	6762- JAP	.7	2.7	--	--	--	73.4	24.9	104.63	.002	--	.082
P-143	Phosphate rock -----	6761- JAP	1.0	36.2	0.49	0.37	5.52	2.5	25.9	140.83	.011	.009	.093
P-142	Phosphate rock -----	6760- JAP	.5	35.7	.98	.53	4.41	2.8	26.4	158.68	.009	.008	.098
P-141	Phosphate rock -----	6759- JAP	.9	34.7	.95	.55	5.58	5.2	27.3	189.91	.012	.009	.108
P-140	Mudstone -----	6758- JAP	1.6	4.4	10.24	3.43	6.04	71.1	28.9	196.95	.004	--	.115
P-139	Phosphate rock and mudstone -----	6757- ERC	1.1	23.4	4.84	1.81	5.45	28.2	30.0	222.69	.009	.008	.125
P-138	Phosphate rock, argillaceous -----	6756- ERC	1.9	27.4	3.63	1.24	5.68	20.6	31.9	274.75	.010	.009	.144
P-137	Phosphate rock -----	6755- ERC	.8	32.0	2.02	.88	4.81	10.03	32.7	300.35	.016	.014	.156
P-136	Phosphate rock -----	6754- ERC	1.7	33.6	1.80	.75	5.28	6.63	34.4	357.47	.016	.013	.184
P-135	Phosphate rock -----	6753- ERC	.9	30.3	2.74	1.24	6.22	13.3	35.3	384.74	.016	.014	.198
P-134	Phosphate rock, argillaceous -----	6752-RGW	.6	17.7	7.04	2.23	6.92	40.6	35.9	395.36	.005	.006	.201
P-133	Phosphate rock, argillaceous and phosphatic mudstone -----	6751-RGW	.8	23.4	5.92	1.56	7.44	26.5	36.7	414.08	.010	.010	.209
P-132	Phosphate rock -----	6750-RGW	.6	34.6	1.67	.65	4.11	6.3	37.3	434.84	.012	.010	.216

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

## Snowdrift Mountain—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
P-131	Phosphate rock -----	6749-RGW	0.8	29.9	3.66	1.18	5.37	14.6	38.1	458.76	0.012	0.010	0.226
P-130	Phosphate rock -----	6748-RGW	.8	36.7	.78	.40	4.95	1.2	38.9	488.12	.018	.014	.240
P-129	Phosphate rock -----	6747-RGW	.8	36.6	1.18	.53	5.49	2.3	39.7	517.40	.023	.016	.259
P-128	Phosphate rock -----	6746-RGW	.7	34.5	1.74	.75	5.75	7.7	40.4	541.55	.018	.016	.271
P-127	Phosphate rock, argillaceous -----	6745-RGW	1.1	26.9	4.44	1.38	10.98	16.6	41.5	571.14	.015	.014	.288
P-126	Phosphate rock -----	6744-RGW	1.4	31.6	2.27	1.04	14.79	8.2	42.9	615.38	.015	.015	.309
P-125	Phosphate rock -----	6743-RGW	1.4	28.5	3.10	1.40	10.72	12.9	44.3	655.28	.013	.012	.327
P-124	Phosphate rock, argillaceous -----	6742-RGW	1.2	26.5	3.88	1.20	11.88	15.4	45.5	687.08	.011	.010	.340
P-123	Phosphate rock, argillaceous -----	6741-RGW	1.5	25.8	4.72	1.39	12.76	16.8	47.0	725.78	.011	.010	.357
P-122	Phosphate rock, argillaceous -----	6740-RGW	.8	23.6	4.30	1.65	14.39	19.2	47.8	744.66	.009	.010	.364
P-121	Phosphate rock, argillaceous -----	6739-RGW	1.3	18.6	--	--	--	30.2	49.1	768.84	.007	.007	.373
P-120	Mudstone, phosphatic -----	6738-RGW	.7	11.7	--	--	--	50.3	49.8	777.03	.005	.004	.376
P-119	Mudstone -----	6737-RGW	1.7	5.3	--	--	--	68.7	51.5	786.04	.003	--	.382
P-118	Mudstone, phosphatic -----	6736-RGW	1.0	12.4	--	--	--	47.9	52.5	798.44	.003	--	.385
P-117	Phosphate rock, argillaceous -----	6735-RGW	.8	14.9	--	--	--	34.7	53.3	810.36	.006	.006	.389
P-116	Phosphate rock, argillaceous -----	6734-RGW	1.6	19.6	--	--	--	34.3	54.9	841.72	.005	.006	.397
P-115	Mudstone, phosphatic -----	6733-RGW	.7	11.4	--	--	--	54.1	55.6	849.70	.004	--	.400
P-114	Phosphate rock, argillaceous -----	6732-RGW	1.5	18.6	--	--	--	38.9	57.1	877.60	.005	.005	.408
P-113	Mudstone, phosphatic -----	6731-RGW	.6	15.7	--	--	--	43.2	57.7	887.02	.005	.006	.411
P-112	Phosphate rock, argillaceous -----	6730-RGW	1.3	26.9	--	--	--	19.2	59.0	921.99	.006	.005	.418
P-111	Mudstone -----	6729-RGW	.6	3.2	--	--	--	80.2	59.6	923.91	.003	--	.420
P-110	Mudstone, phosphatic -----	6728-RGW	1.3	7.8	--	--	--	69.4	60.9	934.05	.003	--	.424
P-109	Phosphate rock, argillaceous -----	6727-RGW	.7	23.6	--	--	--	25.2	61.6	950.57	.007	.007	.429
P-108	Mudstone, phosphatic; fos. col. no. 12592 -----	6726-RGW	1.4	12.7	--	--	--	55.3	63.0	968.35	.002	--	.432
P-107	Mudstone, phosphatic -----	6725-RGW	1.8	8.7	--	--	--	64.9	64.8	984.01	.003	--	.437
P-106	Mudstone -----	6724-RGW	1.4	5.6	--	--	--	69.0	66.2	991.85	.002	--	.440
P-105	Phosphate rock, argillaceous and mudstone -----	6723-RGW	1.0	13.5	--	--	--	48.7	67.2	1,005.35	.004	--	.444
P-104	Phosphate rock, argillaceous -----	6722-RGW	.6	22.8	--	--	--	30.8	67.8	1,019.03	.004	--	.446
P-103	Mudstone, phosphatic and mudstone -----	6721-RGW	1.9	8.1	--	--	--	59.9	69.7	1,034.42	.003	--	.452
P-102	Mudstone -----	6720-RGW	2.5	3.8	--	--	--	76.06	72.2	1,043.92	.003	--	.460
P-101	Mudstone -----	6719-RAS	1.3	7.4	--	--	--	58.5	73.5	1,053.54	.004	--	.465
P-100	Mudstone -----	6718-RAS	1.7	5.5	--	--	--	67.0	75.2	1,062.89	.003	--	.470
P-99	Mudstone -----	6717-RAS	.9	2.2	--	--	--	78.3	76.1	1,064.87	.003	--	.473
P-98	Mudstone -----	6716-RAS	3.3	3.3	--	--	--	72.0	79.4	1,075.76	.003	--	.483
P-97	Phosphate rock, argillaceous -----	6715-RAS	.7	15.7	--	--	--	35.0	80.1	1,086.75	.008	.005	.488
P-96	Mudstone, phosphatic; fos. col. no. 12591 -----	6714-RAS	1.3	8.4	--	--	--	64.0	81.4	1,097.67	.004	--	.493
P-95	Mudstone, phosphatic -----	6713-RAS	.5	10.3	--	--	--	47.7	81.9	1,102.82	.005	.004	.496
P-94	Phosphate rock, argillaceous -----	6712-RAS	.6	18.3	--	--	--	32.9	82.5	1,113.80	.005	.004	.499

P- 93	Phosphate rock-----	6711- RAS	.5	31.5	--	--	--	8.4	83.0	1,129.55	.005	.007	.501
P- 92	Phosphate rock, argillaceous and phosphate rock-----	6710- RAS	.5	19.9	--	--	--	26.9	83.5	1,139.50	.008	.007	.505
P- 91	Mudstone, phosphatic-----	6709- RAS	.4	14.1	--	--	--	47.2	83.9	1,145.14	.005	.004	.507
P- 90	Mudstone, phosphatic-----	6708- RAS	.4	11.3	--	--	--	54.4	84.3	1,149.66	.005	.003	.509
P- 89	Phosphate rock, argillaceous-----	6707- RAS	.7	21.9	--	--	--	32.7	85.0	1,164.90	.005	.004	.513
P- 88	Mudstone-----	6706- RAS	1.8	4.2	--	--	--	79.4	86.8	1,172.55	.003	--	.518
P- 87	Carbonate rock, argillaceous-----	6705- RAS	3.5	1.3	--	--	--	18.7	90.3	1,177.10	.002	--	.525
P- 86	Mudstone, cherty, phosphatic-----	6704- RAS	.5	9.6	--	--	--	64.6	90.8	1,181.90	.003	--	.527
P- 85	Mudstone-----	6703- RAS	.9	2.7	--	--	--	82.6	91.7	1,184.33	.003	--	.530
P- 84	Phosphate rock, argillaceous, cherty; fos. col. no. 12590-----	6702- RAS	.8	22.7	--	--	--	32.5	92.5	1,202.49	.006	.005	.534
P- 83	Mudstone, phosphatic-----	6701- RAS	.9	9.5	--	--	--	64.0	93.4	1,211.04	.005	.002	.539
P- 82	Phosphate rock, argillaceous-----	6700- RAS	.4	19.3	--	--	--	33.6	93.8	1,218.76	.006	.008	.541
P- 81	Mudstone-----	6699- RAS	2.2	13.0	--	--	--	77.4	96.0	1,225.36	.002	--	.546
P- 80	Mudstone and phosphatic mudstone-----	6698-TMC	.7	12.9	--	--	--	38.4	96.7	1,234.39	.007	.006	.550
P- 79	Phosphate rock, argillaceous, calcareous-----	6697-TMC	1.0	15.4	--	--	--	28.9	97.7	1,249.79	.010	.010	.560
P- 78	Mudstone and calcareous, argillaceous phosphate rock-----	6696-TMC	.5	18.6	--	--	--	26.8	98.2	1,259.09	.014	.013	.568
P- 77	Mudstone-----	6695-TMC	1.0	6.3	--	--	--	64.2	99.2	1,265.39	.005	.003	.572
P- 76	Phosphate rock-----	6694-TMC	.7	22.3	--	--	--	18.5	99.9	1,281.00	.016	.012	.584
P- 75	Mudstone, phosphatic, calcareous-----	6693-TMC	.7	11.3	--	--	--	45.6	100.6	1,288.91	.007	.007	.589
P- 74	Phosphate rock, argillaceous-----	6692-TMC	.5	15.9	--	--	--	38.2	101.1	1,296.86	.006	.006	.592
P- 73	Mudstone, phosphatic-----	6691-TMC	.6	9.4	--	--	--	52.5	101.7	1,302.50	.004	--	.594
P- 72	Phosphate rock, argillaceous; phosphatic mudstone, and mudstone-----	6690-TMC	1.1	12.9	--	--	--	38.4	102.8	1,316.69	.004	--	.598
P- 71	Phosphate rock, argillaceous and mudstone-----	6689-TMC	.7	16.3	--	--	--	33.2	103.5	1,328.10	.005	.005	.602
P- 70	Mudstone, calcareous, phosphatic-----	6688-TMC	.8	9.5	--	--	--	42.1	104.3	1,335.70	.005	.004	.606
P- 69	Mudstone, phosphatic, mudstone and argillaceous phosphate rock-----	6687-TMC	.5	16.8	--	--	--	55.9	104.8	1,344.10	.005	.004	.608
P- 68	Mudstone, phosphatic-----	6686-TMC	.8	14.7	--	--	--	39.1	105.6	1,355.86	.005	.005	.612
P- 67	Mudstone, phosphatic-----	6685-TMC	2.2	11.6	--	--	--	45.7	107.8	1,381.38	.004	--	.621
P- 66	Mudstone-----	6684-TMC	2.0	2.6	--	--	--	71.7	109.8	1,386.58	.003	--	.627
P- 65	Mudstone-----	6683-TMC	3.1	.5	--	--	--	92.5	112.9	1,388.13	.002	--	.633
P- 64	Mudstone, cherty-----	6682-TMC	1.2	.3	--	--	--	88.5	114.1	1,388.49	.002	--	.636
P- 63	Mudstone-----	6681-TMC	1.6	2.4	--	--	--	74.6	115.7	1,392.33	.002	--	.639
P- 62	Mudstone-----	6680-TMC	2.2	3.9	--	--	--	69.3	117.9	1,400.91	.003	--	.646
P- 61	Mudstone-----	6679-TMC	4.5	4.4	--	--	--	70.9	122.4	1,420.71	.004	--	.664
P- 60	Mudstone-----	6678-TMC	2.0	2.2	--	--	--	71.8	124.4	1,425.11	.002	--	.668
P- 59	Mudstone, phosphatic-----	6677-TMC	1.9	12.4	--	--	--	48.9	126.3	1,448.67	.004	--	.675
P- 58	Phosphate rock, argillaceous-----	6676-TMC	.7	18.7	--	--	--	35.6	127.0	1,461.76	.003	--	.677

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

## Snowdrift Mountain—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)					Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative)	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	Loss on ignition	Acid insoluble			eU	Chem. U	
P-57	Mudstone, phosphatic -----	6675-TMC	1.7	9.4	--	--	--	59.1	128.7	1,477.74	.004	--	0.684
P-56	Phosphate rock, argillaceous -----	6674-TMC	.8	20.2	--	--	--	30.1	129.5	1,493.90	.004	--	.687
P-55	Phosphate rock, argillaceous -----	6673-TMC	1.0	20.8	--	--	--	27.7	130.5	1,514.70	.004	--	.691
P-54	Phosphate rock, argillaceous, calcareous -----	6672-TMC	.5	17.7	--	--	--	29.3	131.0	1,523.55	.006	0.004	.694
P-53	Phosphate rock, argillaceous and calcareous mudstone -----	6671-TMC	.5	17.1	--	--	--	33.4	131.5	1,532.10	.006	.002	.697
P-52	Phosphate rock, argillaceous and phosphatic mudstone; fos. col. no. 12589 -	6670-TMC	1.1	17.5	--	--	--	37.1	132.6	1,551.35	.006	.002	.704
P-51	Mudstone -----	6669-TMC	.7	7.6	--	--	--	65.8	133.3	1,556.67	.003	--	.706
P-50	Mudstone, phosphatic -----	6668-TMC	.9	13.6	--	--	--	45.9	134.2	1,568.91	.003	--	.709
P-49	Mudstone, phosphatic -----	6667-TMC	1.2	14.4	--	--	--	42.5	135.4	1,586.19	.003	--	.712
P-48	Mudstone, phosphatic and mudstone -----	6666-TMC	.9	19.2	--	--	--	30.5	136.3	1,603.47	.003	--	.715
P-47	Phosphate rock, argillaceous -----	6665-TMC	.5	19.1	--	--	--	29.7	136.8	1,613.02	.003	--	.716
P-46	Phosphate rock, argillaceous -----	6664-TMC	1.0	16.7	--	--	--	34.5	137.8	1,629.72	.003	--	.720
P-45	Mudstone, phosphatic -----	6663-TMC	2.6	12.4	--	--	--	46.6	140.4	1,661.96	.003	--	.727
P-44	Mudstone, phosphatic -----	6662-TMC	.9	13.1	--	--	--	47.3	141.3	1,673.75	.003	--	.730
P-43	Phosphate rock, argillaceous -----	6661-TMC	.7	21.9	6.08	2.02	11.78	25.4	142.0	1,689.08	.005	.003	.734
P-42	Phosphate rock, argillaceous -----	6660-TMC	1.1	19.1	6.92	1.30	11.25	32.2	143.1	1,710.09	.004	--	.738
P-41	Phosphate rock, calcareous -----	6659-TMC	.6	23.4	4.48	1.73	14.82	18.7	143.7	1,724.13	.005	.005	.741
P-40	Phosphate rock -----	6658-TMC	.5	25.2	3.80	1.20	12.80	14.1	144.2	1,736.73	.005	.004	.743
P-39	Phosphate rock -----	6657-TMC	1.3	25.0	4.20	1.58	12.57	16.7	145.5	1,769.23	.006	.004	.751
P-38	Phosphate rock, argillaceous -----	6656-TMC	.8	24.6	4.08	1.62	9.36	21.1	146.3	1,788.91	.005	.004	.755
P-37	Phosphate rock -----	6655-TMC	1.1	31.2	1.65	.90	10.55	6.9	147.4	1,823.23	.006	.004	.762
P-36	Phosphate rock -----	6654-TMC	.7	25.5	3.72	1.64	9.59	18.9	148.1	1,841.08	.007	.005	.767
P-35	Mudstone, calcareous -----	6653-TMC	.4	3.5	7.70	4.34	25.43	47.1	148.5	1,842.48	.004	--	.768
P-34	Phosphate rock -----	6652-TMC	.7	23.7	3.22	1.77	13.74	18.1	149.2	1,859.07	.015	.012	.779
P-33	Phosphate rock -----	6651-TMC	.6	26.4	2.54	1.43	12.20	11.4	149.8	1,874.91	.016	.013	.788
P-32	Phosphate rock, argillaceous and mudstone -----	6650-TMC	.6	21.8	4.04	1.65	11.56	25.3	150.4	1,887.99	.011	.009	.795
P-31	Phosphate rock -----	6649-TMC	.6	24.8	3.33	1.28	10.14	20.1	151.0	1,928.27	.009	.006	.800
P-30	Mudstone, phosphatic -----	6648-JAP	2.0	12.7	7.20	2.35	8.98	52.9	153.0	1,961.87	.005	.003	.810
P-29	Mudstone, phosphatic -----	6647-JAP	3.0	11.2	8.94	2.84	7.89	53.5	156.0	1,980.87	.005	.003	.825
P-28	Mudstone -----	6646-JAP	2.5	7.6	9.22	3.38	6.74	64.8	158.5	2,006.67	.003	--	.833
P-27	Phosphate rock, argillaceous -----	6645-JAP	1.2	21.5	3.62	1.28	5.89	29.5	159.7	2,036.27	.005	.007	.839
P-26	Phosphate rock -----	6644-JAP	1.0	29.6	2.14	.78	6.89	15.2	160.7	2,114.86	.009	.007	.848
P-25	Phosphate rock -----	6643-JAP	2.9	27.1	2.76	.84	8.39	18.1	163.6	2,156.62	.014	.009	.888
P-24	Phosphate rock, argillaceous -----	6642-JAP	1.8	23.2	4.36	1.45	6.86	28.4	165.4	2,180.56	.009	.007	.905
P-23	Mudstone, phosphatic -----	6641-JAP	1.9	12.6	7.76	2.12	6.85	52.9	167.3	2,276.11	.005	.007	.914
P-22	Phosphate rock; fos. col. no. 12558 -----	6640-JAP	3.5	27.3	2.60	.95	7.22	19.3	170.8		.010	.008	.949

P-21	Phosphate rock -----	6639- JAP	.6	28.8	2.22	.59	7.95	15.9	171.4	2,293.39	.010	.009	.955
P-20	Phosphate rock -----	6638- JAP	.8	29.5	2.04	.60	7.80	14.2	172.2	2,316.99	.009	.008	.962
P-19	Phosphate rock -----	6637- JAP	2.2	28.1	2.52	.74	7.05	17.1	174.4	2,378.81	.012	.010	.989
P-18	Phosphate rock, argillaceous -----	6636- JAP	2.1	21.7	4.86	1.30	7.77	30.1	176.5	2,424.38	.006	.007	1.001
P-17	Phosphate rock -----	6635- JAP	.6	30.6	3.10	.93	6.37	15.7	177.1	2,442.74	.008	.009	1.006
P-16	Mudstone, phosphatic -----	6634- JAP	.7	11.5	8.34	1.88	7.43	50.3	177.8	2,450.79	.005	.005	1.010
P-15	Phosphate rock, argillaceous; fos. col. no. 12587 -----	6633- JAP	2.7	23.3	.92	1.20	5.97	27.9	180.5	2,513.70	.004	--	1.020
P-14	Phosphate rock, argillaceous and phosphatic mudstone -----	6632- JAP	1.4	17.7	5.72	2.22	5.94	39.4	181.9	2,538.48	.004	--	1.026
P-13	Phosphate rock -----	6631- JAP	.9	32.6	1.70	.53	6.56	6.7	182.8	2,567.82	.008	.009	1.033
P-12	Phosphate rock -----	6630- JAP	.9	33.7	1.00	.33	7.04	3.3	183.7	2,598.15	.009	.007	1.041
P-11	Phosphate rock -----	6629- JAP	1.5	33.4	1.03	.37	7.42	3.5	185.2	2,648.25	.007	.008	1.052
P-10	Phosphate rock -----	6628- JAP	1.5	34.9	.46	.50	6.34	2.3	186.7	2,700.60	.017	.014	1.077
P- 9	Phosphate rock -----	6627- JAP	2.2	32.3	1.19	.69	5.89	6.0	188.9	2,771.66	.016	.009	1.113
P- 8	Limestone, argillaceous -----	6626- JAP	2.6	1.0	--	--	--	38.0	191.5	2,774.26	.002	--	1.118
P- 7	Limestone, argillaceous -----	6625- JAP	2.0	.4	--	--	--	34.1	193.5	2,775.06	.001	--	1.120
P- 6	Limestone, argillaceous -----	6624- JAP	2.0	.9	--	--	--	45.7	195.5	2,776.86	.001	--	1.122
P- 5	Phosphate rock -----	6623- JAP	.5	33.8	--	--	--	6.5	196.0	2,793.76	.013	.012	1.128
P- 4	Limestone -----	6622- JAP	.9	1.2	--	--	--	2.8	196.9	2,794.84	.001	--	1.129
P- 3	Phosphate rock, calcareous; fos. col. no. 12585 -----	6621- JAP	.7	29.4	--	--	--	4.1	197.6	2,815.42	.009	.007	1.136
P- 2	Dolomite, argillaceous; fos. col. no. 12584- -----	6620- JAP	1.2	.7	--	--	--	27.8	198.8	2,816.26	.000	--	1.136
P- 1	Phosphate rock; fos. col. no. 12583 -----	6619- JAP	.7	32.3	--	--	--	6.2	199.5	2,838.87	.011	.009	1.143

Wells formation—not measured

Cw-1	Dolomite, siliceous -----	--	--	--	--	--	--	--	--	--	--	--	--
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\*\* Note incompleteness of cumulative data.



Mud Spring, Idaho, lot 1351

Phosphatic shale member of Phosphoria formation measured and sampled near Mud Spring, sec. 7, T. 12 S., R. 29 E., Cassia County, Idaho. Beds strike N. 75° W. and dip 30° S. Section measured and sampled by T. M. Cheney, R. A. Smart, R. G. Waring, and M. A. Warner in July 1951. Samples analyzed by Trace Elements Section laboratory, U. S. Geological Survey, Denver, Colo.

Samples analyzed for eU and chem. U by the U. S. Geological Survey laboratory, Geochemistry and Petrology Branch.

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative) <sup>5</sup>	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Acid insoluble			eU	Chem. U	
Rex chert member of Phosphoria formation—lower part only										
R-13	Mudstone; fos. col. no. 12642 <sup>1</sup> made 3.5 feet higher -----	--	1.4	--	--	1.4	--	--	--	--
R-12	Mudstone -----	--	2.1	--	--	4.1	--	--	--	--
R-11	Mudstone -----	--	7.3	--	--	11.4	--	--	--	--
R-10	Mudstone -----	--	5.6	--	--	17.0	--	--	--	--
R- 9	Mudstone -----	--	3.0	--	--	20.0	--	--	--	--
R- 8	Mudstone -----	--	3.5	--	--	23.5	--	--	--	--
R- 7	Mudstone -----	--	5.6	--	--	29.1	--	--	--	--
R- 6	Mudstone -----	--	5.0	--	--	34.1	--	--	--	--
R- 5	Mudstone -----	--	4.6	--	--	38.7	--	--	--	--
R- 4	Mudstone -----	--	3.6	--	--	42.3	--	--	--	--
R- 3	Mudstone -----	--	3.8	--	--	46.1	--	--	--	--
R- 2	Mudstone -----	--	2.9	--	--	49.0	--	--	--	--
R- 1	Mudstone -----	--	3.8	--	--	52.8	--	--	--	--
Phosphatic shale member of Phosphoria formation										
P-47	Mudstone, phosphatic -----	6454-RGW	1.4	10.2	52.6	1.4	14.28	0.007	0.009	0.010
P-46	Mudstone -----	6453-RGW	.9	6.95	62.8	2.3	20.54	.005	.005	.014
P-45	Mudstone -----	6452-RGW	2.0	3.10	75.1	4.3	26.74	.003	--	.020
P-44	Mudstone -----	6451-RGW	2.0	2.65	79.1	6.3	32.04	.002	--	.024
P-43	Mudstone -----	6450-RGW	2.0	4.50	73.2	8.3	41.04	.004	--	.032
P-42	Mudstone and argillaceous phosphate rock --	6449-RGW	1.0	10.8	59.2	9.3	51.84	.005	.006	.037
P-41	Mudstone, phosphatic -----	6448-RGW	1.0	11.6	57.4	10.3	63.44	.003	--	.040
	Beds P-41 through P-45 highly crumpled, slumped, and weathered. Thicknesses are only approximate.									
P-40	Mudstone -----	6447-RGW	5.2	4.85	71.8	15.5	88.66	.003	--	.056
P-39	Mudstone, phosphatic -----	6446-RGW	2.3	9.50	58.7	17.8	110.51	.005	.007	.067
P-38	Mudstone, phosphatic -----	6445-RGW	2.4	10.4	57.2	20.2	135.46	.003	--	.075
P-37	Mudstone, phosphatic; fos. col. no. 12641 ---	6444-RGW	1.4	9.65	58.7	21.6	148.98	.004	--	.080

P-36	Mudstone, cherty, phosphatic -----	6443-RGW	1.9	9.05	62.1	23.5	166.17	.003	--	.086
P-35	Mudstone -----	6442-TMC	2.2	7.50	69.0	25.7	182.67	.004	--	.095
P-34	Mudstone and chert; fos. col. no. 12639 -----	6441-TMC	.6	7.20	66.1	26.3	186.99	.006	.005	.098
P-33	Mudstone -----	6440-TMC	2.0	5.70	70.0	28.3	198.39	.004	--	.106
P-32	Phosphate rock, argillaceous; fos. col. no. 12640 -----	6439-TMC	.9	21.8	33.0	29.2	218.01	.004	--	.110
P-31	Phosphate rock -----	6438-TMC	2.0	28.4	17.6	31.2	274.81	.007	.011	.124
P-30	Phosphate rock, argillaceous -----	6437-TMC	1.4	23.3	32.5	32.6	307.43	.006	.008	.132
P-29	Mudstone, phosphatic and argillaceous phosphate rock -----	6436-TMC	1.0	19.2	42.2	33.6	326.63	.004	--	.136
P-28	Mudstone, phosphatic -----	6435-TMC	2.2	10.4	64.4	35.8	349.51	.004	--	.145
P-27	Phosphate rock, argillaceous -----	6434-RAS	2.0	19.5	40.4	37.8	388.51	.004	--	.153
P-26	Mudstone, phosphatic -----	6433-RAS	.7	16.4	46.2	38.5	399.99	.005	.004	.157
P-25	Mudstone, phosphatic -----	6432-RAS	1.0	9.35	66.8	39.5	409.34	.001	--	.158
P-24	Mudstone, phosphatic -----	6431-RAS	1.1	10.0	64.1	40.6	420.34	.003	--	.161
P-23	Mudstone -----	6430-RAS	.8	7.75	71.6	41.4	426.54	.003	--	.163
P-22	Mudstone -----	6429-RAS	3.2	2.20	86.7	44.6	433.58	.002	--	.170
P-21	Mudstone -----	6428-RAS	2.5	4.90	78.1	47.1	445.83	.003	--	.177
P-20	Mudstone -----	6427-RAS	1.4	2.20	86.1	48.5	448.91	.002	--	.180
P-19	Mudstone -----	6426-RAS	1.0	6.50	71.1	49.5	455.41	.002	--	.182
P-18	Mudstone -----	6425-MAW	2.2	.75	84.8	51.7	457.06	.003	--	.189
Beds P-18 and P-19 highly weathered.										
P-17	Mudstone, phosphatic -----	6424-MAW	3.5	9.15	61.9	55.2	489.08	.006	.006	.210
P-16	Mudstone -----	6423-MAW	4.0	6.75	70.5	59.2	516.08	.004	--	.226
P-15	Mudstone -----	6422-MAW	4.0	1.80	88.7	63.2	523.28	.001	--	.230
P-14	Mudstone -----	6421-MAW	3.9	.95	92.0	67.1	526.99	.001	--	.234
P-13	Phosphate rock -----	6420-MAW	1.0	32.3	15.9	68.1	559.29	.004	--	.238
P-12	Phosphate rock, argillaceous -----	6419-MAW	1.5	26.0	26.6	69.6	598.29	.005	.006	.245
P-11	Mudstone, phosphatic -----	6418-RAS	5.2	9.40	63.9	74.8	647.17	.002	--	.255
P-10	Phosphate rock, argillaceous -----	6417-RAS	1.1	19.9	38.3	75.9	669.06	.004	--	.260
P-9	Phosphate rock, argillaceous -----	6416-RAS	.9	30.1	15.7	76.8	696.15	.005	.008	.264
P-8	Phosphate rock, argillaceous -----	6415-RAS	.6	21.5	33.8	77.4	709.05	.005	.006	.267
P-7	Phosphate rock -----	6414-RAS	.9	28.2	18.9	78.3	734.43	.006	.008	.273
P-6	Phosphate rock, argillaceous -----	6413-RAS	.6	27.1	23.4	78.9	750.69	.005	.008	.276
P-5	Mudstone, phosphatic -----	6412-RAS	.8	11.9	57.0	79.7	760.21	.006	.004	.280
P-4	Mudstone; fos. col. no. 12638 -----	6411-RAS	1.0	.90	93.6	80.7	761.11	.001	--	.282
P-3	Phosphate rock, argillaceous; fos. col. no. 12638 -----	6410-RAS	.7	19.7	42.8	81.4	774.90	.004	--	.284
P-2	Mudstone, phosphatic -----	6409-RAS	1.3	12.8	55.6	82.7	791.54	.003	--	.288
P-1	Mudstone and phosphate rock; fos. col. no. 12637 -----	6408-RAS	.9	28.0	24.9	83.6	816.74	.006	.008	.294

Mud Spring—Continued

Bed no.	Rock description	Sample no.	Thickness (feet)	Chemical analyses (percent)		Cumulative thickness (feet)	Thickness x percent P <sub>2</sub> O <sub>5</sub> (cumulative) <sup>5</sup>	Uranium content (percent)		Thickness x percent eU (cumulative)
				P <sub>2</sub> O <sub>5</sub>	Acid insoluble			eU	Chem. U	
Wells formation										
	Formation present but not measured; fos. col. no. 12636 taken 37 feet below bed P-1; fos. col. no. 12635 taken 83 feet below bed P-1.	--	--	--	--	--	--	--	--	--

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