GEOLOGICAL SURVEY CIRCULAR 305

STRATIGRAPHIC SECTIONS OF THE PHOSPHORIA FORMATION IN IDAHO, 1949, PART 2

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UNITED STATES LEPARTMENT OF THE INTERIOR
Doug as McKay, Secretary

GEOLOGICAL SURVEY
W. E Wra her, Director

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By D. F. Davidson, R. A. Smart, H. W. Peirce, and J. D. Weiser

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Washington, D. C., 1953

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

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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 is the fifth report of data containing abstracts of sections measured in southeastern Idaho (fig. 1); it includes about half the data gathered in Idaho in 1949. The field and laboratory procedures adopted in these investigations are described rather fully in a previous report (McKelvey and others, 1953a).

Many people have taken part in this investigation, which was organized and supervised by V. E. McKelvey. F. J. Anderson, A. L. Bush, R. S. Jones, K. B. Krauskopf, K. Lutz, M. E. Thompson, R. G. Waring, and M. A. Warner 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 collection, 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 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 of the Survey in Washington, D. C., under the direction of J. C. Rabbitt, by chemists H. Alberty, I. Barlow, A. Caemmerer, N. Guttag, C. Hoy, J. J. Rowe, and W. P. Tucker, and the spectrographic analyses were made in this laboratory by C. L. Waring and H. Worthing.

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

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 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 Co.; D. L. King of the San Francisco Chemical Co.; and G. A. McHugh and H. B. Fowler of the Simplot Fertilizer Co. have been especially helpful in this connection.

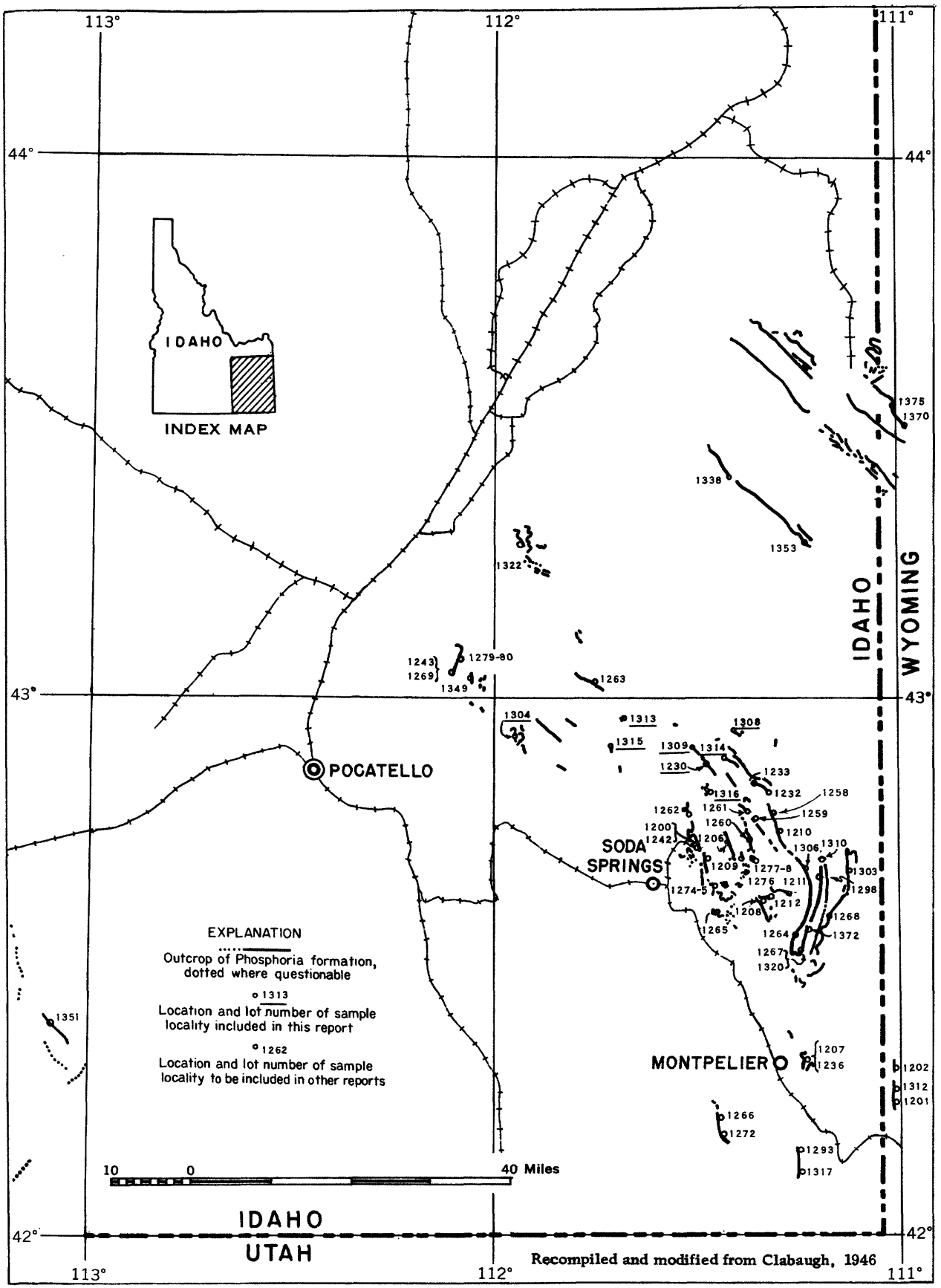
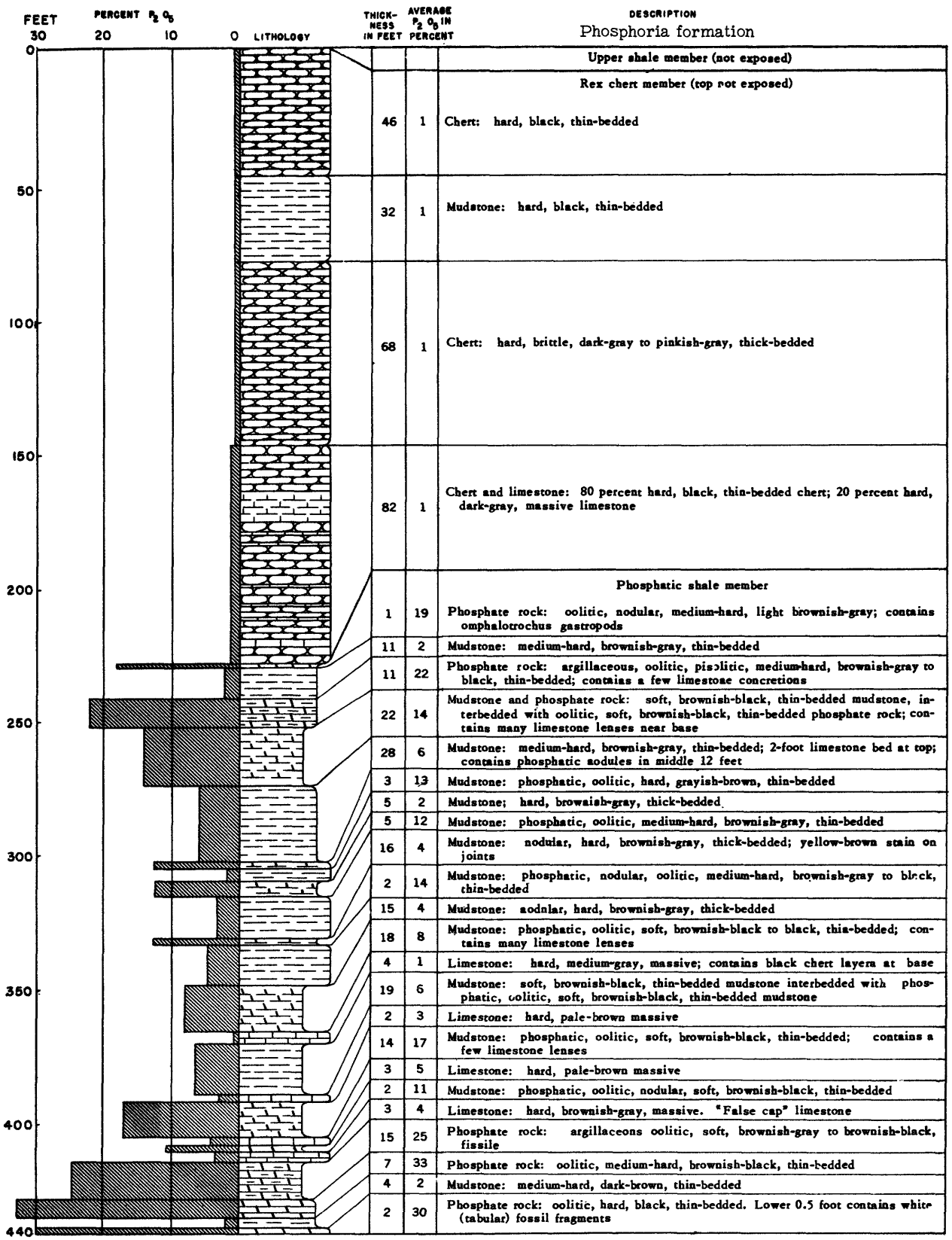


Figure 1.—Outcrops of the Phosphoria formation in Idaho and localities sampled.



THICKNESS IN FEET	AVERAGE P_2O_5 IN PERCENT	DESCRIPTION
		Phosphoria formation
		Upper shale member (not exposed)
		Rex chert member (top not exposed)
46	1	Chert: hard, black, thin-bedded
32	1	Mudstone: hard, black, thin-bedded
68	1	Chert: hard, brittle, dark-gray to pinkish-gray, thick-bedded
82	1	Chert and limestone: 80 percent hard, black, thin-bedded chert; 20 percent hard, dark-gray, massive limestone
		Phosphatic shale member
1	19	Phosphate rock: oolitic, nodular, medium-hard, light brownish-gray; contains omphalotrochus gastropods
11	2	Mudstone: medium-hard, brownish-gray, thin-bedded
11	22	Phosphate rock: argillaceous, oolitic, pisolitic, medium-hard, brownish-gray to black, thin-bedded; contains a few limestone concretions
22	14	Mudstone and phosphate rock: soft, brownish-black, thin-bedded mudstone, interbedded with oolitic, soft, brownish-black, thin-bedded phosphate rock; contains many limestone lenses near base
28	6	Mudstone: medium-hard, brownish-gray, thin-bedded; 2-foot limestone bed at top; contains phosphatic nodules in middle 12 feet
3	13	Mudstone: phosphatic, oolitic, hard, grayish-brown, thin-bedded
5	2	Mudstone; hard, brownish-gray, thick-bedded
5	12	Mudstone: phosphatic, oolitic, medium-hard, brownish-gray, thin-bedded
16	4	Mudstone: nodular, hard, brownish-gray, thick-bedded; yellow-brown stain on joints
2	14	Mudstone: phosphatic, nodular, oolitic, medium-hard, brownish-gray to black, thin-bedded
15	4	Mudstone: nodular, hard, brownish-gray, thick-bedded
18	8	Mudstone: phosphatic, oolitic, soft, brownish-black to black, thin-bedded; contains many limestone lenses
4	1	Limestone: hard, medium-gray, massive; contains black chert layers at base
19	6	Mudstone: soft, brownish-black, thin-bedded mudstone interbedded with phosphatic, oolitic, soft, brownish-black, thin-bedded mudstone
2	3	Limestone: hard, pale-brown massive
14	17	Mudstone: phosphatic, oolitic, soft, brownish-black, thin-bedded; contains a few limestone lenses
3	5	Limestone: hard, pale-brown massive
2	11	Mudstone: phosphatic, oolitic, nodular, soft, brownish-black, thin-bedded
3	4	Limestone: hard, brownish-gray, massive. "False cap" limestone
15	25	Phosphate rock: argillaceous oolitic, soft, brownish-gray to brownish-black, fissile
7	33	Phosphate rock: oolitic, medium-hard, brownish-black, thin-bedded
4	2	Mudstone: medium-hard, dark-brown, thin-bedded
2	30	Phosphate rock: oolitic, hard, black, thin-bedded. Lower 0.5 foot contains white (tabular) fossil fragments
		Wells formation

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

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 member in most of southeastern Idaho and western Wyoming, although it is not well defined at the type locality.

The Phosphoria formation overlies the Pennsylvanian Wells formation and underlies the Triassic Dinwoody formation. The upper 50 to 75 feet of the Wells formation consists of gray fossiliferous cherty limestone that contains some thin phosphatic layers. It may be the correlative 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 seven localities, and the available analytical data, are presented in the following pages. Their locations, as well as the locations of those reported previously (McKelvey and others, 1953a and b; O'Malley and others, 1953; and Sheldon and others, 1953), and of others to be reported later, are shown in figure 1.

The semiquantitative spectrographic analyses are based upon comparison with a standard plate representing known quantities of the elements tested for and made at the same exposure. Greater sensitivities for many elements can be obtained by additional exposure. The standard sensitivities for the elements noted in the report are listed below:

Spectrographic sensitivities

	Percent		Percent		Percent		Percent
Al	0.001	Gd	0.01	Nd	0.01	Na	*0.1
Sb	.01	Ga	.01	Ni	.01	Sr	.01
As	.1	Ge	.001	Nb	.01	Ta	.1
Ba	.0001	Au	.01	Os	.1	Te	.1
Be	.0001	Hf	.1	Pd	.01	Tb	.01
Bi	.001	Ho	.01	P	.1	Tl	.1
B	.001	In	.001	Pt	.01	Th	.1
Cd	.01	Ir	.1	K	*1.0	Tm	.01
Ca	.001	Fe	.001	Pr	.01	Sn	.01
Ce	.1	La	.01	Re	.1	Ti	.001
Cs	*1.0	Pb	.01	Rh	.01	W	.1
Cr	.001	Li	*.1	Rb	*10.0	V	.01
Co	.01	Lu	.01	Ru	.01	Yb	.0001
Cu	.0001	Mg	.0001	Sm	.1	Y	.001
Dy	.01	Mn	.001	Sc	.001	Zn	.01
Er	.01	Hg	.1	Si	.0001	Zr	.001
Eu	.01	Mo	.001	Ag	.0001		

* A greater sensitivity may be obtained by additional exposures.

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Reservoir Mountain, Idaho, lot 1313

Phosphatic shale member of Phosphoria formation sampled in bulldozer trench on Reservoir Mountain, sec. 20, T. 5 S., R. 41 E., Caribou County, Idaho, on east limb of Reservoir syncline. Beds strike 58° NW and dip 38° W. Section measured by J. D. Weiser, M. E. Thompson, K. B. Krauskopf, H. W. Peirce, and D. F. Davidson, and sampled by R. G. Waring and Peirce in September 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, 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		
	Rex chert member of Phosphoria formation—basal beds only									
R- 2	Mudstone	4730- JDW	4.1	0.3	--	--	--	86.4	4.1	--
R- 1	Chert, phosphatic	4706-HWP	1.0	7.1	--	--	--	60.5	5.1	--
	Phosphatic shale member of Phosphoria formation									
P-94	Phosphate rock, argillaceous	4729-HWP	1.3	28.8	--	--	--	20.6	1.3	37.44
P-93	Mudstone	4728- JDW	.6	5.4	--	--	--	68.2	1.9	40.68
P-92	Mudstone	4827- JDW	1.6	5.6	--	--	--	60.7	3.5	49.64
P-91	Mudstone	4726- JDW	1.0	1.2	--	--	--	79.0	4.5	50.84
P-90	Mudstone	4725- JDW	.6	.8	--	--	--	79.5	5.1	51.32
P-89	Mudstone	4724- JDW	.8	.8	--	--	--	79.5	5.9	51.96
P-88	Mudstone	4723- JDW	1.3	1.6	--	--	--	75.6	7.2	54.04
P-87	Mudstone	4722- JDW	2.4	4.0	--	--	--	68.5	9.6	63.64
P-86	Mudstone, phosphatic	4721- JDW	.5	15.2	5.80	2.78	4.10	49.5	10.1	71.24
P-85	Phosphate rock, argillaceous	4720- JDW	.5	29.9	1.44	1.00	2.35	18.5	10.6	86.19
P-84	Mudstone	4719- JDW	3.5	1.3	9.85	3.40	5.30	80.5	14.1	90.74
P-83	Phosphate rock	4718- JDW	2.1	34.8	1.17	.60	2.75	6.8	16.2	163.82
P-82	Phosphate rock	4717- JDW	.9	36.0	.95	.53	2.90	3.7	17.1	196.22
P-81	Mudstone	4716- JDW	1.0	7.0	7.92	3.28	10.15	68.4	18.1	203.22
P-80	Phosphate rock	4715- JDW	1.9	33.9	1.62	.88	2.95	8.0	20.0	267.63
P-79	Mudstone and phosphate rock	4714- JDW	.8	21.2	4.80	2.10	4.45	34.3	20.8	284.59
P-78	Phosphate rock	4713- JDW	2.0	34.5	1.34	.63	3.35	6.0	22.8	353.59
P-77	Phosphate rock	4686- KBK	3.0	29.0	2.94	1.19	7.15	12.8	25.8	440.59
	Thickness of bed P-77 uncertain because of crumpling.									
P-76	Phosphate rock, argillaceous	4685- KBK	5.0	22.0	1.12	1.85	9.10	28.7	30.8	550.59
P-75	Mudstone	4684- KBK	1.0	7.6	--	--	--	64.2	31.8	558.19
P-74	Mudstone	4683- KBK	.8	1.2	--	--	--	81.3	32.6	559.15
P-73	Mudstone, phosphatic	4682- KBK	3.5	9.4	--	--	--	52.2	36.1	592.05
P-72	Mudstone and argillaceous phosphate rock	4681- KBK	1.7	10.9	--	--	--	55.0	37.8	610.58

Reservoir Mountain—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-70	Mudstone and phosphate rock	4680-KBK	3.6	10.4	--	--	--	56.2	41.4	648.02
P-70	Mudstone, phosphatic	4679-KBK	3.9	9.4	--	--	--	61.5	45.3	684.68
P-69	Mudstone, phosphatic	4678-KBK	3.8	11.5	--	--	--	60.7	49.1	728.38
P-68	Mudstone	4677-KBK	3.5	4.4	--	--	--	75.5	52.6	743.78
P-67	Mudstone, phosphatic and phosphate rock	4676-KBK	1.7	20.4	--	--	--	36.9	54.3	778.46
P-66	Mudstone, phosphatic	4675-KBK	.8	10.2	--	--	--	62.8	55.1	786.62
P-65	Mudstone, phosphatic	4674-KBK	2.5	14.2	--	--	--	52.1	57.6	822.12
P-64	Phosphate rock, argillaceous, and phosphatic mudstone	4673-KBK	.7	15.6	--	--	--	42.1	58.3	833.04
P-63	Mudstone	4712-KBK	.8	7.2	--	--	--	66.2	59.1	838.80
P-62	Mudstone	4711-KBK	2.9	5.8	--	--	--	68.8	62.0	855.62
P-61	Mudstone	4710-KBK	1.1	3.3	--	--	--	78.4	63.1	859.25
P-60	Mudstone, phosphatic	4709-KBK	1.1	12.5	--	--	--	48.1	64.2	873.00
P-59	Mudstone, phosphatic	4708-KBK	.5	11.3	--	--	--	55.7	64.7	878.65
P-58	Mudstone, phosphatic	4707-DFD	1.2	12.8	--	--	--	44.3	65.9	894.01
--	Covered interval	--	9.	--	--	--	--	--	74.9	--
	True stratigraphic thickness and lithology unknown.									
P-57	Mudstone	4755-MET	3.2	6.2	--	--	--	72.1	78.1	*19.84
P-56	Mudstone, phosphatic	4754-MET	.6	13.9	--	--	--	45.7	78.7	28.18
P-55	Mudstone	4753-MET	2.0	3.7	--	--	--	80.2	80.7	35.58
P-54	Mudstone, siliceous, phosphatic	4752-MET	3.5	2.8	--	--	--	82.1	84.2	45.38
P-53	Mudstone	4751-MET	2.5	.2	--	--	--	83.9	86.7	45.88
P-52	Mudstone, phosphatic	4750-MET	1.3	14.4	--	--	--	45.4	88.0	64.60
P-51	Mudstone	4749-MET	1.0	.4	--	--	--	87.8	89.0	65.00
P-50	Mudstone, phosphatic	4748-MET	1.5	16.4	--	--	--	41.0	90.5	89.60
P-49	Mudstone	4747-MET	2.0	1.4	--	--	--	86.2	92.5	92.40
--	Covered interval	--	27.	--	--	--	--	--	119.5	--
	Stratigraphic interval along trench not exposed. True thickness and lithology of missing rock unknown.									
P-48	Mudstone	4784-MET	1.6	2.7	--	--	--	85.5	121.1	*4.32
P-47	Mudstone	4783-MET	1.3	2.5	--	--	--	79.2	122.4	7.57
P-46	Mudstone	4782-MET	1.7	2.7	--	--	--	73.7	124.1	12.16
P-45	Mudstone	4781-MET	.7	7.5	--	--	--	69.7	124.8	17.41
P-44	Mudstone	4780-MET	2.0	.9	--	--	--	89.2	126.8	19.21
P-43	Mudstone, phosphatic	4779-MET	1.7	14.7	--	--	--	46.9	128.5	44.20

P-42	Mudstone	4778-MET	1.0	4.1	--	--	--	73.8	129.5	48.30
P-41	Mudstone	4760-MET	.8	6.4	--	--	--	64.8	130.3	53.42
P-40	Mudstone	4759-MET	1.4	5.7	--	--	--	62.0	131.7	61.40
P-39	Mudstone, phosphatic	4758-MET	2.5	9.0	--	--	--	50.2	134.2	83.90
P-38	Mudstone, phosphatic	4757-MET	2.6	13.5	--	--	--	38.1	136.8	119.00
P-37	Mudstone	4756-MET	1.0	5.0	--	--	--	75.3	137.8	124.00
P-36	Phosphate rock and mudstone	4786-MET	3.6	20.8	6.20	2.76	5.85	34.1	141.4	198.88
P-35	Mudstone and phosphate rock	4785-MET	3.3	24.4	5.34	2.48	7.40	27.3	144.7	279.40
P-34	Carbonate rock	4746-MET	1.0	4.6	1.34	1.10	31.47	16.6	145.7	284.00
P-33	Phosphate rock, argillaceous	4745-MET	1.4	23.6	4.76	1.70	4.50	28.9	147.1	317.04
P-32	Mudstone, carbonatic	4744-MET	1.3	7.4	5.16	1.73	21.25	35.1	148.4	326.66
P-31	Phosphate rock	4743-MET	1.5	31.0	2.35	.93	4.05	10.8	149.9	373.16
P-30	Phosphate rock	4742-MET	1.1	33.1	1.47	1.05	3.50	6.8	151.0	409.57
P-29	Phosphate rock, argillaceous	4741-MET	.8	27.2	3.28	1.75	4.21	17.9	151.8	431.33
	Thickness of bed P-29 is uncertain because of crumpling.									
P-28	Phosphate rock, argillaceous	4740-MET	1.8	19.3	4.76	1.83	4.92	37.8	153.6	466.07
P-27	Carbonate rock, phosphatic	4739-MET	4.6	14.6	1.26	.65	24.25	11.1	158.2	533.23
P-26	Mudstone, phosphatic	4738-MET	.9	12.7	5.92	2.18	9.30	45.5	159.1	544.66
P-25	Carbonate rock	4737-MET	1.7	1.3	.60	.78	37.35	16.1	160.8	546.87
P-24	Phosphate rock	4736-MET	1.0	34.5	4.36	.90	2.65	7.5	161.8	581.37
P-23	Mudstone, phosphatic	4735-MET	2.0	14.9	2.57	1.85	8.90	40.3	163.8	611.17
P-22	Carbonate rock, argillaceous	4734-MET	1.1	5.2	3.80	1.35	22.55	34.0	164.9	616.89
P-21	Phosphate rock	4733-MET	2.8	30.9	1.78	.87	3.45	13.8	167.7	703.41
P-20	Phosphate rock, argillaceous	4732-MET	1.6	26.6	3.06	1.10	3.75	23.4	169.3	745.97
P-19	Phosphate rock, argillaceous	4731-MET	1.7	20.0	3.40	1.50	3.15	40.4	171.0	779.97
P-18	Phosphate rock	4788-MET	1.9	34.9	.95	.80	1.50	6.2	172.9	846.28
P-17	Phosphate rock	4787-MET	.8	30.8	2.04	1.20	2.60	14.1	173.7	870.92
P-16	Phosphate rock	4777-DFD	1.3	30.0	1.11	0.67	6.70	8.4	175.0	909.92
P-15	Phosphate rock, argillaceous, carbonatic	4776-DFD	1.6	14.1	3.32	1.65	17.35	23.2	176.6	932.48
--	Limestone concretion	4775-DFD	(.5)	--	--	--	--	--	--	--
P-14	Limestone, phosphatic	4774-DFD	2.5	8.1	1.30	.65	30.80	7.9	179.1	952.73
P-13	Phosphate rock	4773-DFD	1.8	28.2	1.84	.74	6.35	10.5	180.9	1,003.49
P-12	Phosphate rock	4772-DFD	1.3	28.2	2.50	.92	3.40	15.8	182.2	1,040.15
P-11	Phosphate rock, argillaceous	4771-DFD	2.4	23.1	2.83	1.33	6.90	24.4	184.6	1,095.59
	Thicknesses of beds P-11 and P-10 uncertain due to crumpling and weathering.									
P-10	Phosphate rock	4770-DFD	1.5	33.0	.78	.37	5.50	3.4	186.1	1,145.09
P- 9	Phosphate rock	4769-DFD	2.0	33.8	.67	.36	5.40	3.2	188.1	1,212.69

* Cumulative data incomplete due to missing information.

Reservoir Mountain—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- 8	Phosphate rock	4768-DFD	1.3	33.9	1.01	0.45	4.35	4.0	189.4	1,256.76
P- 9	Phosphate rock	4767-DFD	1.1	33.0	1.10	.45	2.40	7.8	190.5	1,293.06
P- 6	Mudstone	4766-DFD	1.1	2.2	--	--	--	72.8	191.6	1,295.48
P- 5	Carbonate rock, argillaceous	4765-DFD	1.7	.1	--	--	--	42.4	193.3	1,295.65
P- 4	Mudstone	4764-DFD	.5	.3	--	--	--	67.6	193.8	1,295.80
P- 3	Mudstone	4763-DFD	.7	.5	--	--	--	74.9	194.5	1,296.15
P- 2	Mudstone, carbonatic	4762-DFD	1.3	.7	--	--	--	56.2	195.8	1,297.06
P- 1	Phosphate rock	4761-DFD	.2	29.1	--	--	--	6.0	196.0	**1,302.88

** Note incompleteness of cumulative data.

Rocky Canyon, Idaho, lot 1304

Phosphatic shale member of Phosphoria formation sampled in two adjacent bulldozer trenches on the west limb of the Rock Creek syncline, in Rocky Canyon, NE¼ sec. 1, T. 6 S., R. 38 E., Bannock County, Idaho. Beds strike N. 40° W. and dip 20° E. Section measured by F. J. Anderson, R. A. Smart, R. S. Jones and H. W. Peirce and sampled by Smart and Peirce in August 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, 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		
	Rex chert member of Phosphoria formation									
R- 6	Chert and cherty mudstone	4320- FJA	3.4	0.8	--	--	--	86.8	3.4	2.72
R- 5	Chert and cherty mudstone	4319- FJA	2.8	2.1	--	--	--	83.1	6.2	8.60
R- 4	Chert and cherty mudstone	4318- FJA	2.2	.5	--	--	--	86.4	8.4	9.70
R- 3	Mudstone, cherty	4317- FJA	.2	.4	--	--	--	86.0	8.6	9.78
R- 2	Mudstone	4316- FJA	2.8	.4	--	--	--	87.3	11.4	10.90
R- 1	Mudstone	4315- FJA	2.3	1.5	--	--	--	82.3	13.7	14.35
	Phosphatic shale member of Phosphoria formation									
P-94	Phosphate rock, argillaceous and mudstone	4314- FJA	0.9	4.3	--	--	--	72.4	0.9	3.87
P-93	Mudstone	4313- FJA	1.4	6.5	--	--	--	68.7	2.3	12.97
P-92	Mudstone, carbonatic	4312- FJA	.9	.4	--	--	--	44.7	3.2	13.33
P-91	Mudstone, phosphatic	4311- FJA	2.5	15.1	--	--	--	42.6	5.7	51.08
P-90	Mudstone	4310- FJA	.7	1.0	--	--	--	82.4	6.4	51.78
P-89	Mudstone	4309- FJA	.6	1.9	--	--	--	73.0	7.0	52.92
P-88	Mudstone, carbonatic	4308- FJA	2.5	.8	--	--	--	47.9	9.5	54.92
	Bed P-88 is highly weathered.									
P-87	Mudstone, carbonatic	4307- FJA	.8	2.3	--	--	--	58.5	10.3	56.76
P-86	Mudstone, phosphatic	4306- FJA	.9	8.5	--	--	--	55.2	11.2	64.41
P-85	Mudstone	4305- FJA	1.2	3.6	--	--	--	69.7	12.4	68.73
P-84	Mudstone	4304- FJA	2.9	1.0	--	--	--	77.0	15.3	71.63
P-83	Mudstone, carbonatic	--	1.0	--	--	--	--	--	16.3	--
	Fault between beds P-82 and P-83, unexposed strata probably thin.									
P-82	Phosphate rock, argillaceous	4303- FJA	.7	24.7	--	--	--	25.1	17.0	*17.29
P-81	Mudstone, phosphatic, carbonatic	4302- FJA	.7	8.6	--	--	--	44.3	17.7	23.31

* Cumulative data incomplete because of missing information.

Rocky 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-80	Phosphate rock	4301- FJA	1.1	35.3	--	--	--	2.9	18.8	62.14
P-79	Phosphate rock, argillaceous	4360- FJA	1.3	18.1	--	--	--	38.9	20.1	85.67
P-78	Phosphate rock	4359- FJA	1.6	31.7	--	--	--	10.4	21.7	136.39
P-77	Phosphate rock, argillaceous	4358- FJA	1.2	17.8	--	--	--	40.2	22.9	157.75
P-76	Phosphate rock and mudstone	4357- FJA	1.6	15.1	--	--	--	43.7	24.5	181.91
P-75	Mudstone, phosphatic	4356- FJA	1.9	14.5	--	--	--	44.9	26.4	209.46
P-74	Phosphate rock, argillaceous	4355- FJA	.8	20.8	--	--	--	28.0	27.2	226.10
P-73	Phosphate rock and phosphatic mudstone	4354- FJA	2.2	15.9	--	--	--	38.0	29.4	261.08
P-72	Mudstone, phosphatic	4353- FJA	2.4	9.6	--	--	--	58.3	31.8	284.12
P-71	Mudstone, phosphatic	4352- FJA	1.9	12.6	--	--	--	48.4	33.7	308.06
P-70	Phosphate rock, argillaceous	4351- FJA	1.1	16.9	--	--	--	37.8	34.8	326.65
P-69	Mudstone, phosphatic	4325- FJA	.5	11.8	--	--	--	39.9	35.3	332.55
P-68	Phosphate rock, argillaceous	4324- FJA	.9	17.3	--	--	--	24.7	36.2	348.12
P-67	Phosphate rock, argillaceous	4323- FJA	1.4	18.2	--	--	--	22.7	37.6	373.60
P-66	Phosphate rock, argillaceous	4322- FJA	1.6	21.8	--	--	--	22.4	39.2	408.48
P-65	Mudstone, carbonatic	4321- FJA	1.0	3.9	--	--	--	53.1	40.2	412.38
P-64	Mudstone	4350- RAS	3.0	5.4	--	--	--	68.3	43.2	428.58
	There is a possible overlap between beds P-63 and P-64 due to difficult correlation across shear zone.									
P-63	Phosphate rock, argillaceous	4349- RAS	1.3	23.0	--	--	--	30.1	44.5	458.48
P-62	Mudstone, phosphatic, and argillaceous phosphate rock	*4348- RAS	2.0	22.7	--	--	--	22.2	46.5	503.88
P-61	Mudstone	4347- RAS	1.0	3.3	--	--	--	73.0	47.5	507.18
P-60	Mudstone, phosphatic	4346- RAS	1.7	9.8	--	--	--	59.2	49.2	523.84
P-59	Carbonate rock, argillaceous	4345- RAS	3.2	.5	--	--	--	40.2	52.4	525.44
P-58	Mudstone	4332- RSJ	.6	8.5	--	--	--	65.6	53.0	530.54
P-49	Mudstone	4332- RSJ	1.4	2.3	--	--	--	66.6	54.4	533.76
P-56	Mudstone	4331- RSJ	2.4	.6	--	--	--	84.6	56 8	535.20
P-55	Phosphate rock, argillaceous	4330- RSJ	.4	25.4	--	--	--	27.3	57.2	545.36
P-54	Mudstone	4329- RSJ	2.6	3.3	--	--	--	78.6	59.8	553.94
P-53	Mudstone and phosphatic mudstone	4328- RSJ	1.1	7.7	--	--	--	47.5	60.9	562.41
P-52	Mudstone	4327- RSJ	2.6	5.1	--	-	--	72.5	63.5	575.67
P-51	Phosphate rock and mudstone	4326- RSJ	.2	20.8	--	--	--	28.9	63.7	579.83
P-50	Mudstone, phosphatic	4368- RAS	.7	9.8	--	--	--	58.4	64.4	586.69

P-49	Mudstone	4367- RAS	2.8	.7	--	--	--	83.5	67.2	588.65
P-48	Mudstone	4366- RAS	2.7	.5	--	--	--	85.6	69.9	590.00
P-47	Mudstone	4365- RAS	.6	7.3	--	--	--	66.3	70.5	594.38
P-46	Phosphate rock and mudstone	4364- RAS	1.0	3.7	--	--	--	68.6	71.5	598.08
P-45	Phosphate rock, argillaceous	4363- RAS	1.1	19.7	--	--	--	34.7	72.6	619.75
P-44	Phosphate rock and mudstone	4362- RAS	1.7	22.9	--	--	--	27.0	74.3	658.68
P-43	Mudstone, carbonatic	4361- RAS	2.5	1.0	--	--	--	46.2	76.8	661.18
P-42	Mudstone	4344-HWP	1.4	3.7	--	--	--	71.7	78 2	666.36
P-41	Phosphate rock, argillaceous	4343-HWP	1.7	26.4	--	--	--	22.2	79.9	711.24
P-40	Mudstone, phosphatic	4342-HWP	2.0	8.1	--	--	--	67.0	81.9	727.44
P-39	Mudstone, phosphatic	4341-HWP	1.2	10.5	--	--	--	61.0	83.1	740.04
P-38	Mudstone	4340-HWP	2.0	3.8	--	--	--	77.1	85.1	747.64
P-37	Phosphate rock	4339-HWP	1.0	29.4	--	--	--	16.3	86.1	777.04
--	Mudstone	4338-HWP	(1.3)	2.4	--	--	--	80.9	--	--
--	Phosphate rock, argillaceous	4337-HWP	(.7)	17.0	--	--	--	41.5	--	--
--	Phosphate rock, argillaceous	4336-HWP	(2.6)	19.4	--	--	--	30.1	--	--
--	Mudstone	4395-HWP	(1.5)	4.3	--	--	--	66.0	--	--
--	Mudstone	4394-HWP	(1.2)	3.8	--	--	--	77.5	--	--
--	Mudstone	4393-HWP	(1.6)	6.4	--	--	--	70.5	--	--
--	Phosphate rock, argillaceous	4392-HWP	(.3)	28.1	--	--	--	18.1	--	--
	Correlation between trenches is uncertain but sample 4392-HWP probably equals sample 4339-HWP.									
P-36	Mudstone	4391-HWP	1.2	3.1	--	--	--	72.2	87.3	780.76
P-35	Phosphate rock, argillaceous	4390-HWP	1.3	27.0	--	--	--	17.3	88.6	815.86
P-34	Phosphate rock, argillaceous	4389-HWP	2.4	22.7	--	--	--	22.4	91.0	870.34
P-33	Phosphate rock, argillaceous	4388-HWP	1.6	22.5	--	--	--	22.0	92.6	906.34
P-32	Carbonate rock	4400- RAS	1.0	1.1	--	--	--	10.1	93.6	907.44
P-31	Phosphate rock, argillaceous	4399- RAS	.7	24.4	--	--	--	16.0	94.3	924.52
P-30	Carbonate rock, argillaceous	4398- RAS	1.0	6.6	--	--	--	29.4	95.3	931.12
P-29	Phosphate rock, argillaceous	4397- RAS	1.6	22.0	--	--	--	23.1	96.9	966.32
P-28	Phosphate rock, argillaceous	4396- RAS	1.7	21.0	--	--	--	24.3	98.6	1,002.02
P-27	Phosphate rock, argillaceous	4379- RAS	1.2	14.7	--	--	--	35.2	99.8	1,019.66
P-26	Mudstone	4377- RAS	1.4	6.7	--	--	--	58.2	101.2	1,029.04
--	Carbonate rock concretion in bed P-26	4378- RAS	(1.0)	.7	--	--	--	3.4	--	---
P-25	Mudstone, phosphatic, carbonatic	4376- RAS	1.2	8.6	--	--	--	44.6	102.4	1,039.36
P-24	Mudstone	4375- RAS	.9	5.4	--	--	--	58.9	103.3	1,044.22
P-23	Mudstone, phosphatic	4374- RAS	1.9	13.3	--	--	--	33.4	105.2	1,069.49
P-22	Mudstone, phosphatic	4373- RAS	1.7	14.1	--	--	--	36.7	106.9	1,093.46
P-21	Carbonate rock	4372- RAS	2.0	7.3	--	--	--	10.0	108.9	1,108.06
P-20	Phosphate rock	4371- RAS	.6	28.5	0.51	0.52	11.88	3.8	109.5	1,125.16
P-19	Phosphate rock	4370- RAS	1.0	32.6	1.0	.50	7.34	5.1	110.5	1,157.76
P-18	Phosphate rock, contains concretions at base	4369-RAS	1.3	32.6	1.0	.55	7.24	6.2	111.8	1,200.14

Rocky 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-17	Phosphate rock, argillaceous	4387-HWP	0.7	28.1	2.0	0.83	7.80	17.7	112.5	1,219.81
P-16	Mudstone and carbonate rock	4386-HWP	2.2	4.9	3.6	1.36	26.50	29.2	114.7	1,230.59
P-15	Phosphate rock and mudstone	4385-HWP	1.1	26.7	2.1	.84	9.58	16.7	115.8	1,259.96
P-14	Phosphate rock, argillaceous	4384-HWP	1.3	20.5	3.6	1.40	9.50	29.8	117.1	1,286.61
P-13	Carbonate rock, argillaceous	4383-HWP	.7	5.3	3.1	1.24	27.80	27.6	117.8	1,290.32
P-12	Phosphate rock, argillaceous	4382-HWP	1.2	17.4	5.2	2.04	9.02	39.9	119.0	1,311.20
P-11	Phosphate rock, carbonatic	4381-HWP	1.3	23.8	.32	.26	17.78	4.7	120.3	1,342.14
P-10	Mudstone, phosphatic, and argillaceous phosphate rock	4380-HWP	3.0	20.3	2.4	1.50	8.24	34.3	123.3	1,403.04
P- 9	Phosphate rock	4335-HWP	1.0	28.8	1.3	.55	11.34	10.3	124.3	1,431.84
P- 8	Phosphate rock, argillaceous	4334-HWP	1.7	26.8	2.7	1.08	10.46	17.5	126.0	1,477.40
P- 7	Phosphate rock, argillaceous, contains carbonate rock concretion	4407- RAS	2.6	19.6	3.2	1.16	14.24	31.1	128.6	1,528.36
P- 6	Phosphate rock, argillaceous	4406- RAS	1.3	24.7	2.6	.87	10.12	18.6	129.9	1,560.47
P- 5	Carbonate rock, phosphatic	4405- RAS	1.4	8.3	.65	.30	31.50	10.9	131.3	1,572.09
P- 4	Phosphate rock	4404- RAS	2.0	33.0	.85	.50	6.40	4.5	133.3	1,638.09
P- 3	Phosphate rock	4403- RAS	2.0	35.7	.35	.28	6.20	1.5	135.3	1,709.49
P- 2	Phosphate rock, argillaceous	4402- RAS	1.0	20.2	3.9	1.37	8.80	29.7	136.3	1,729.69
P- 1	Phosphate rock	4401- RAS	2.0	35.3	1.1	.57	4.56	4.1	138.3	1,800.29

Spectrographic Analyses—Rocky Canyon, Idaho, lot 1304

Semiquantitative analyses of samples of the Phosphoria formation, Rocky Canyon, Idaho (see immediately preceding pages for location of section, thickness and description of strata, and chemical analyses of samples), made by U. S. Geological Survey, Geochemistry and Petrology Branch, Washington, D. C. In addition to the elements listed in the table below, Sb, As, Bi, Ce, Cs, Eu, Ge, Au, Hf, In, Ir, Li, Hg, Os, Pd, Pt, Pr, Re, Rh, Rb, Ru, Ta, Te, Tb, Tl, Th, and W were looked for in all samples but were not detected.

Explanation of symbols

A = more than 10 percent
B' = 1-10 percent[1]
D = 0.1-1 percent
E = 0.01-0.1 percent
F = 0.001-0.01 percent
G = less than 0.001 percent
ND = not detected
Vanadium[2]

Bed no.	Sample no.	Al	Ba	Be	B	Cd	Ca	Cr	Cu	Dy	Er	Gd	Ga	Ho	Fe	La	Pb	Lu	Mg	Mn	Mo	Nd	Ni	Nb	P	K	Sm	Sc	Si	Ag	Na	Sr	Tm	Sn	Ti	V	Yb	Y	Zn	Zr
R- 6	4320- FJA	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	F	F	ND	D	E	F	ND	E	ND	D	B'	ND	F	A	ND	D	E	ND	F	D	0.01	G	F	F	E
R- 5	4319- FJA	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	F	E	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	ND	D	E	ND	E	D	.01	G	F	E	F
R- 4	4318- FJA	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	ND	D	B'	ND	F	A	ND	D	E	ND	F	E	.01	G	F	E	E
R- 3	4317- FJA	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	ND	D	B'	ND	ND	A	G	D	E	ND	F	E	.02	G	F	ND	E
R- 2	4316- FJA	B'	E	G	E	ND	B'	E	E	E	E	E	F	F	B'	ND	F	F	D	E	F	ND	E	E	D	B'	ND	F	A	ND	D	E	E	F	E	.01	F	D	E	E
R- 1	4315- FJA	B'	E	G	E	ND	B'	E	E	E	E	E	F	F	B'	ND	F	F	D	E	F	ND	E	E	D	B'	ND	ND	A	ND	D	E	E	F	E	.02	E	D	F	E
P-93	4314- FJA	B'	E	ND	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	ND	B'	B'	ND	ND	A	ND	D	E	ND	F	E	0.01	G	F	ND	E
P-92	4313- FJA	B'	E	ND	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	ND	B'	B'	ND	ND	A	G	B'	E	ND	F	E	.006	G	F	E	E
P-91	4312- FJA	B'	E	ND	E	ND	B'	E	E	E	E	ND	F	F	D	ND	F	ND	B'	E	F	ND	E	E	D	B'	ND	ND	A	ND	B'	D	E	F	E	.007	E	E	E	E
P-90	4311- FJA	B'	E	ND	E	ND	B'	E	E	E	E	E	F	F	B'	E	F	ND	B'	E	F	ND	E	F	B'	B'	ND	ND	A	G	D	D	F	F	E	.01	F	D	E	E
P-89	4310- FJA	A	E	G	E	ND	B'	E	E	E	E	E	F	F	B'	ND	F	ND	D	E	F	ND	E	F	D	B'	ND	F	A	ND	B'	E	F	F	D	.01	F	D	E	E
P-88	4309- FJA	B'	E	G	E	ND	B'	E	E	E	E	E	F	F	B'	ND	F	F	B'	E	F	ND	E	E	D	B'	ND	F	A	ND	B'	E	E	F	D	.007	F	D	E	E
P-87	4308- FJA	B'	E	ND	E	ND	B'	E	E	E	E	E	F	F	B'	ND	F	ND	B'	E	F	ND	E	E	D	B'	ND	ND	A	ND	D	E	E	F	E	.007	E	D	ND	E
P-86	4307- FJA	B'	E	G	E	ND	B'	E	E	E	E	E	F	F	B'	ND	F	ND	B'	E	F	ND	E	E	D	B'	ND	F	A	G	D	E	E	F	E	.02	F	D	E	E
P-85	4306- FJA	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	B'	E	F	ND	E	ND	B'	B'	ND	F	A	G	D	E	ND	F	E	.02	F	E	E	E
P-84	4305- FJA	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	F	F	ND	E	ND	B'	B'	ND	F	A	G	B'	E	ND	F	E	.02	G	E	E	E
P-83	4304- FJA	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	ND	ND	B'	E	F	ND	E	F	D	B'	ND	F	A	ND	B'	E	ND	F	D	.01	G	F	ND	E
P-82	4303- FJA	B'	E	ND	E	ND	A	E	E	ND	ND	ND	F	ND	D	E	F	ND	D	ND	F	ND	E	ND	A	B'	ND	ND	B'	G	D	E	ND	F	E	.01	F	E	ND	F
P-81	4302- FJA	B'	E	ND	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	B'	E	F	ND	E	ND	B'	B'	ND	ND	A	G	B'	E	ND	F	E	.02	G	E	F	F
P-80	4301- FJA	D	E	ND	E	ND	A	E	E	E	E	D	ND	E	E	E	F	F	D	E	F	ND	E	E	A	E	ND	ND	B'	G	D	D	E	ND	F	.01	E	D	ND	F
P-79	4360- FJA	B'	E	ND	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	G	B'	F	ND	F	D	.01	F	E	E	E
P-78	4359- FJA	B'	E	G	E	ND	A	E	E	E	ND	ND	F	ND	D	E	F	ND	E	F	F	ND	E	E	A	D	ND	F	B'	ND	B'	F	ND	F	D	.02	F	E	E	E
P-77	4358- FJA	B'	E	G	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	F	F	ND	E	ND	B'	B'	ND	F	A	ND	B'	F	ND	F	D	.03	F	E	E	E
P-76	4357- FJA	B'	E	G	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	G	B'	F	ND	F	D	.03	F	E	E	E
P-75	4356- FJA	B'	E	G	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	ND	D	F	ND	F	D	.04	F	E	E	E
P-74	4355- FJA	B'	E	G	E	ND	A	D	E	E	ND	ND	F	ND	B'	E	F	ND	D	F	F	ND	E	ND	B'	B'	ND	F	B'	ND	B'	F	ND	F	D	.04	F	E	E	E
P-73	4354- FJA	B'	E	ND	E	ND	B'	D	E	E	ND	ND	F	ND	B'	E	F	ND	D	F	F	ND	E	ND	B'	B'	ND	F	A	G	B'	F	ND	F	D	.03	F	E	E	E
P-72	4353- FJA	B'	E	ND	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	G	B'	F	E	F	D	.03	F	E	E	E
P-71	4352- FJA	B'	E	G	E	ND	B'	D	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	D	ND	B'	B'	ND	F	A	ND	B'	F	ND	F	D	.03	F	E	E	E
P-70	4351- FJA	B'	E	ND	E	ND	B'	D	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	G	B'	F	E	F	D	.03	F	E	E	E
P-69	4325- FJA	B'	E	G	E	ND	B'	D	E	F	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	A	G	B'	E	ND	F	D	.05	F	E	E	E
P-68	4324- FJA	B'	E	G	E	ND	A	D	E	ND	ND	ND	F	ND	B'	E	F	ND	D	F	E	ND	E	F	B'	B'	ND	F	B'	G	B'	E	ND	F	E	.08	E	E	E	F
P-67	4323- FJA	B'	E	G	E	F	A	D	E	E	ND	E	F	F	B'	E	F	ND	D	E	E	E	E	F	B'	B'	ND	F	B'	G	B'	E	E	F	E	.08	E	D	E	F
P-66	4322- FJA	B'	E	G	E	ND	A	D	E	F	ND	F	F	ND	D	E	F	ND	D	F	F	ND	E	ND	B'	B'	ND	F	B'	G	B'	E	ND	F	E	.05	F	E	E	F
P-65	4321- FJA	B'	E	G	E	ND	B'	E	E	F	ND	ND	F	ND	B'	F	F	ND	B'	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	E	E	F	D	.05	E	E	E	E
P-64	4350- RAS	B'	E	ND	E	ND	B'	D	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	G	B'	F	ND	F	D	.02	F	E	E	E
P-63	4349- RAS	B'	E	ND	E	ND	A	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	E	A	B'	ND	F	B'	G	B'	F	E	F	D	.02	F	E	E	E
P-62	4348- RAS	B'	E	G	E	ND	A	D	E	F	ND	ND	F	ND	B'	E	F	ND	D	F	F	ND	E	ND	B'	B'	ND	ND	B'	G	D	E	ND	F	E	.02	F	E	E	E
P-61	4347- RAS	A	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	E	B'	B'	ND	ND	A	G	B'	E	ND	F	D	.02	F	E	E	E
P-60	4346- RAS	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	ND	B'	B'	ND	ND	A	G	B'	E	ND	F	D	.01	E	E	E	E
P-59	4345- RAS	B'	E	ND	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	B'	E	F	ND	E	ND	D	D	ND	ND	A	ND	B'	E	ND	F	E	.005	G	F	ND	E

[1] B' is equivalent to B and C of Bureau of Mines analyses as recorded in other reports.
[2] Vanadium determined by a "quickie" quantitative method, accuracy estimated at ± 10-15 percent of vanadium present.

Bed no.	Sample no.	Al	Ba	Be	B	Cd	Ca	Cr	Cu	Dy	Er	Gd	Ga	Ho	Fe	La	Pb	Lu	Mg	Mn	Mo	Nd	Ni	Nb	P	K	Sm	Sc	Si	Ag	Na	Sr	Tm	Sn	Ti	V	Yb	Y	Zn	Zr
P-58	4333- RSJ	B'	E	G	E	ND	B'	E	E	E	ND	E	F	F	B'	F	E	ND	D	E	F	E	E	F	B'	B'	ND	ND	A	G	B'	E	E	E	D	0.01	E	D	F	ND
P-57	4332- RSJ	B'	E	G	E	ND	B'	E	E	F	ND	E	F	F	B'	F	F	ND	B'	E	F	ND	E	F	D	B'	ND	ND	A	ND	B'	E	E	F	D	.008	E	E	F	E
P-56	4331- RSJ	A	E	G	E	ND	B'	E	E	E	ND	E	F	F	B'	F	F	ND	D	E	F	ND	E	E	D	B'	ND	ND	A	ND	B'	E	E	F	D	.02	E	D	ND	E
P-55	4330- RSJ	B'	E	G	E	ND	A	E	E	E	ND	E	F	F	B'	E	F	ND	D	F	F	ND	E	ND	A	B'	F	F	B'	ND	D	D	E	ND	E	.008	E	D	ND	E
P-54	4329- RSJ	A	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	F	E	ND	D	E	F	ND	E	F	B'	B'	ND	ND	A	ND	B'	E	ND	E	D	.03	G	F	ND	E
P-53	4328- RSJ	B'	E	G	E	ND	B'	D	E	F	ND	F	F	ND	B'	F	F	ND	D	F	F	E	E	F	B'	B'	ND	F	A	G	D	E	E	F	D	.03	E	E	ND	F
P-52	4327- RSJ	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	F	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	G	B'	E	ND	F	D	.03	G	F	E	E
P-51	4326- RSJ	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
P-50	4368- RAS	B'	E	G	E	ND	B'	D	E	F	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	F	E	F	D	.008	F	E	E	E
P-49	4367- RAS	A	E	G	E	ND	B'	D	E	F	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	D	B'	ND	F	A	ND	B'	F	E	F	D	.01	F	E	E	E
P-48	4366- RAS	A	E	G	E	ND	B'	E	E	F	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	D	B'	ND	F	A	ND	B'	F	E	F	D	.008	F	E	E	E
P-47	4365- RAS	A	E	G	E	ND	B'	E	E	F	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	E	B'	B'	ND	F	A	G	B'	F	E	F	D	.008	F	E	E	E
P-46	4364- RAS	B'	E	G	E	ND	B'	D	E	F	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	F	E	F	D	.01	F	E	E	E
P-45	4363- RAS	B'	E	G	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	ND	B'	F	ND	F	D	.04	F	E	E	E
P-44	4362- RAS	B'	E	G	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	F	A	ND	B'	F	ND	F	D	.03	F	E	E	E
P-43	4361- RAS	B'	E	G	E	ND	B'	F	E	E	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	ND	D	B'	ND	F	A	ND	D	F	ND	F	D	.005	F	E	E	E
P-42	4344-HWP	A	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	E	B'	B'	ND	ND	A	G	B'	E	ND	F	D	02	F	E	E	E
P-41	4343-HWP	B'	E	G	E	ND	A	E	E	ND	ND	ND	F	ND	D	E	F	ND	D	F	F	ND	E	ND	A	B'	ND	ND	B'	G	D	E	ND	F	E	.007	F	E	F	E
P-40	4342-HWP	B'	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	ND	A	G	B'	E	ND	E	D	.01	F	E	E	E
P-39	4341-HWP	B'	E	ND	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	ND	A	G	B'	E	ND	F	D	.01	F	E	F	E
P-38	4340-HWP	A	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	E	B'	B'	ND	ND	A	G	B'	E	ND	F	D	.01	F	E	F	E
P-37	4339-HWP	B'	E	ND	E	ND	A	E	E	F	ND	ND	F	ND	D	ND	F	ND	D	E	F	ND	E	ND	A	B'	ND	ND	B'	G	D	E	ND	F	D	.006	F	E	ND	E
P-36	4338-HWP	A	E	G	E	ND	B'	E	E	ND	ND	ND	F	ND	B'	ND	F	ND	D	E	F	ND	E	E	D	B'	ND	ND	A	G	B'	E	ND	F	D	.01	E	E	F	E
P-35	4337-HWP	B'	E	G	E	ND	B'	D	E	ND	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	ND	B'	B'	ND	ND	A	G	B'	E	ND	F	D	.02	F	E	E	E
P-34	4336-HWP	B'	E	G	E	ND	B'	E	E	F	ND	ND	F	ND	B'	E	F	ND	B'	E	F	ND	E	ND	B'	B'	ND	ND	A	G	B'	E	ND	F	D	.02	F	E	E	E
--	4395-HWP	B'	E	G	E	ND	B'	D	E	ND	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	F	ND	F	D	.03	F	E	E	E
--	4394-HWP	B'	E	ND	E	ND	B'	D	E	ND	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	F	ND	F	D	.02	F	E	E	E
--	4393-HWP	B'	E	ND	E	ND	B'	E	E	ND	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	F	ND	F	D	.006	F	E	E	E
--	4392-HWP	B'	E	ND	E	ND	A	E	E	ND	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	ND	D	.005	F	E	E	E
--	4391-HWP	B'	E	ND	E	ND	B'	E	E	E	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	F	D	B'	ND	ND	A	G	B'	F	E	F	D	.01	F	E	E	E
--	4390-HWP	B'	E	G	F	ND	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	A	B'	ND	ND	B'	G	B'	F	E	F	D	.02	F	E	E	F
--	4389-HWP	B'	E	G	F	ND	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.03	F	E	E	E
P-33	4388-HWP	B'	E	ND	E	ND	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.03	F	E	E	E
P-32	4400- RAS	B'	E	ND	F	ND	A	E	E	ND	ND	ND	E	F	D	F	E	ND	B'	E	F	ND	E	F	D	D	ND	ND	B'	G	D	E	ND	F	D	.005	G	F	E	ND
P-31	4399- RAS	B'	E	ND	E	ND	A	D	E	ND	ND	ND	F	F	B'	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	ND	F	D	.03	F	E	E	E
P-30	4398- RAS	B'	E	ND	E	ND	A	E	E	ND	ND	ND	F	F	B'	E	F	ND	B'	ND	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	ND	F	D	.03	F	E	E	E
P-29	4397- RAS	B'	E	ND	E	F	A	D	E	ND	ND	ND	F	F	D	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.06	F	E	E	E
P-28	4396- RAS	B'	E	ND	E	F	A	D	E	ND	ND	ND	F	F	D	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.06	F	E	E	E
P-27	4379- RAS	B'	E	ND	E	F	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.20	F	E	E	E
--	4378- RAS	D	F	ND	ND	F	A	E	E	ND	ND	ND	ND	F	D	ND	ND	ND	D	E	F	ND	F	F	D	D	ND	ND	B'	G	D	F	E	F	E	.03	ND	ND	F	E
P-26	4377- RAS	B'	E	ND	E	F	B'	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	A	G	B'	F	E	F	D	2	F	E	E	F
P-25	4376- RAS	B'	E	G	E	F	B'	D	E	F	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	F	E	F	D	.34	F	E	E	E
P-24	4375- RAS	B'	E	ND	E	F	B'	D	E	F	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	FA	A	G	B'	F	E	F	D	.31	F	E	E	E
P-23	4374- RAS	B'	E	ND	E	F	B'	D	E	F	ND	ND	F	ND	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	A	G	B'	F	E	F	D	.28	F	E	E	E
P-22	4373- RAS	B'	E	ND	E	F	B'	D	E	F	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	E	B'	B'	ND	F	A	G	B'	F	E	F	D	.30	F	E	E	E
P-21	4372- RAS	B'	E	ND	E	F	A	D	E	F	ND	ND	F	F	B'	ND	F	ND	B'	E	F	ND	E	F	B'	B'	ND	F	B'	G	D	F	E	F	D	.04	F	E	E	F
P-20	4371- RAS	B'	E	ND	E	F	A	D	E	F	ND	ND	ND	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	E	F	E	.05	F	E	E	E
P-19	4370- RAS	B'	E	ND	E	F	A	D	E	F	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	E	F	E	.22	F	E	E	E
P-18	4369- RAS	B'	E	ND	E	F	A	D	E	F	ND	ND	F	F	B'	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	E	F	E	.25	F	E	E	E
P-17	4387-HWP	B'	E	ND	F	F	A	E	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.20	F	E	E	E
P-16	4386-HWP	B'	E	ND	F	F	A	E	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.05	F	E	E	E
P-15	4385-HWP	B'	E	ND	F	F	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	D	B'	ND	ND	B'	G	B'	F	E	F	D	.05	F	E	E	E

P-14	4384-HWP	B'	E	ND	E	F	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.20	F	E	E	E
P-13	4383-HWP	B'	E	ND	F	F	A	E	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	D	F	E	F	D	.05	F	E	E	E
P-12	4382-HWP	B'	E	ND	E	F	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.20	F	E	E	E
P-11	4381-HWP	D	E	ND	F	F	A	E	E	ND	ND	ND	ND	F	D	E	ND	ND	D	E	F	ND	F	ND	B'	D	ND	ND	D	G	B'	F	E	F	E	.05	F	E	F	F
P-10	4380-HWP	B'	E	ND	E	F	A	D	E	E	ND	ND	F	F	B'	E	F	ND	D	E	F	ND	E	F	B'	B'	ND	ND	B'	G	B'	F	E	F	D	.20	F	E	E	E
P- 9	4335-HWP	B'	E	ND	E	E	A	E	E	ND	ND	ND	ND	ND	D	ND	F	ND	D	F	F	ND	E	ND	A	D	ND	ND	B'	G	D	E	ND	F	E	.06	G	E	E	F
P- 8	4334-HWP	B'	E	G	E	E	A	E	E	ND	ND	ND	F	ND	B'	E	F	ND	D	F	E	ND	E	ND	A	D	ND	F	B'	G	D	E	ND	F	E	.2	G	E	E	F
P- 7	4407- RAS	B'	E	ND	E	F	A	D	E	ND	ND	ND	F	F	B'	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.05	F	E	E	E
P- 6	4406- RAS	B'	E	ND	E	F	A	D	E	ND	ND	ND	F	F	B'	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.01	F	E	E	E
P- 5	4405- RAS	D	E	ND	F	F	A	E	E	ND	ND	ND	F	F	D	E	F	ND	B'	E	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.01	F	E	E	E
P- 4	4404- RAS	B'	E	ND	E	F	A	E	E	ND	ND	ND	F	F	B'	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.04	F	E	E	E
P- 3	4403- RAS	D	E	ND	F	F	A	E	E	ND	ND	ND	F	F	D	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.05	F	E	E	E
P- 2	4402- RAS	B'	E	ND	E	F	A	E	E	ND	ND	ND	F	F	B'	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	F	D	.06	F	E	E	E
P- 1	4401- RAS	D	E	ND	E	F	A	E	E	ND	ND	ND	F	F	D	E	F	ND	D	F	F	ND	E	F	B'	B'	ND	F	B'	G	B'	F	ND	ND	D	.05	F	E	E	E

Gravel Creek Divide, Idaho, lot 1308

Phosphatic shale member of Phosphoria formation measured and sampled in a trench on south limb of Gray anticline on Gravel Creek Divide, sec. 34, T. 5 S., R. 43 E., Caribou County, Idaho. Beds strike N. 50° W. and dip 45° S. Section measured by R. G. Waring, H. W. Peirce, and R. A. Smart and sampled by Peirce and M. A. Warner in August 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, 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		
	Rex chert member of Phosphoria formation—basal bed only									
R- 1	Chert and mudstone	--	1.7	--	--	--	--	--	1.7	--
	Phosphatic shale member of Phosphoria formation									
P-74	Mudstone	5849-RGW	1.1	2.0	--	--	--	72.7	1.1	2.20
P-73	Mudstone	5848-RGW	.8	1.4	--	--	--	74.4	1.9	3.32
P-72	Mudstone	5847-RGW	1.8	.4	--	--	--	78.5	3.7	4.04
P-71	Mudstone	5846-RGW	1.8	.1	--	--	--	81.3	5.5	4.22
P-70	Mudstone	5844-RGW	2.3	2.1	--	--	--	72.1	7.8	9.05
--	Mudstone lens in bed P-70	5845-RGW	(1.3)	5.4	--	--	--	78.9	--	--
P-69	Mudstone	5843-RGW	1.8	5.5	--	--	--	64.6	9.6	18.95
P-68	Mudstone	5842-RGW	1.2	6.5	--	--	--	59.5	10.8	26.75
P-67	Mudstone	5841-RGW	1.7	1.1	--	--	--	81.4	12.5	28.62
P-66	Mudstone	5840-RGW	.5	2.7	--	--	--	66.4	13.0	29.97
P-65	Mudstone and chert	5839-RGW	1.1	2.2	--	--	--	84.4	14.1	32.39
P-64	Chert	5838-RGW	1.3	2.1	--	--	--	89.6	15.4	35.12
P-63	Phosphate rock, cherty	5837-RGW	.6	25.7	—	--	--	29.8	16.0	50.54
P-62	Mudstone	5821-HWP	.9	4.7	--	--	--	72.2	16.9	54.77
P-61	Mudstone	5820-HWP	1.3	1.3	--	--	--	81.6	18.2	56.46
P-60	Mudstone	5819-HWP	.7	1.3	--	--	--	79.2	18.9	57.37
P-59	Phosphate rock	5818-HWP	1.1	36.8	0.54	0.59	2.69	4.5	20.0	97.85
P-58	Phosphate rock	5817-HWP	.8	35.2	.82	.70	2.33	8.7	20. 8	126.01
P-57	Phosphate rock	5816-HWP	1.0	36.6	.75	.50	3.20	4.3	21.8	162.61
P-56	Phosphate rock	5815-HWP	1.3	34.0	1.2	.59	2.20	10.3	23.1	206.81
P-55	Phosphate rock	5814-HWP	1.0	37.2	.76	.34	3.26	2.3	24.1	244.01
P-54	Phosphate rock	5813-HWP	2.0	32.0	2.0	.80	7.48	9.0	26.1	308.01
P-53	Phosphate rock, argillaceous	5812-HWP	1.5	28.2	2.6	1.52	8.27	16.7	27.6	350.31
P-52	Mudstone, phosphatic	5811-HWP	1.5	9.6	--	--	--	57.7	29.1	364.71
P-51	Carbonate rock	5810-HWP	1.4	.6	--	--	--	12.0	30.5	365.55
P-50	Phosphate rock, argillaceous	5870-RAS	1.3	16.8	—	--	--	39.2	31.8	387.39
P-49	Phosphate rock, argillaceous	5869-RAS	1.3	16.4	--	--	--	41.3	33.1	408.71
P-48	Mudstone	5868-RAS	1.4	6.7	--	--	--	64.7	34.5	418.09
P-47	Mudstone, phosphatic	5867-RAS	1.7	14.1	--	--	--	46.5	36.2	442.06

P-46	Phosphate rock, argillaceous	5866- RAS	1.4	19.3	--	--	--	36.6	37.6	469.08
P-45	Carbonate rock, argillaceous	5865- RAS	1.4	2.8	--	--	--	31.8	39.0	473.00
P-44	Mudstone	5864- RAS	.9	6.4	--	--	--	71.2	39.9	478.76
P-43	Mudstone, phosphatic	5863- RAS	2.1	12.1	--	--	--	54.4	42.0	504.17
P-42	Mudstone, phosphatic	5862- RAS	1.0	8.9	--	--	--	64.3	43.0	513.07
P-41	Mudstone	5861- RAS	1.8	--	--	--	--	--	44.8	--
P-40	Carbonate rock, argillaceous	5860- RAS	.8	1.2	--	-	--	39.2	45.6	*.96
P-39	Mudstone, phosphatic	5859- RAS	.9	13.3	--	--	--	41.8	46.5	12.93
P-38	Phosphate rock, argillaceous	5858- RAS	1.0	17.1	--	--	--	32.5	47.5	30.03
P-37	Mudstone, carbonatic	5857- RAS	.8	5.4	--	--	--	43.5	48.3	34.35
P-36	Phosphate rock, argillaceous, carbonatic	5856- RAS	1.6	16.6	--	--	--	23.2	49.9	60.91
P-35	Phosphate rock, argillaceous	5855- RAS	1.5	17.5	--	--	--	28.8	51.4	87.16
P-34	Mudstone	5854- RAS	1.7	2.2	--	--	--	70.9	53.1	90.90
P-33	Phosphate rock, argillaceous	5853- RAS	1.3	17.6	--	--	--	34.0	54.4	113.78
P-32	Mudstone, phosphatic and phosphate rock	5852- RAS	1.1	20.5	--	--	--	26.8	55.5	136.33
P-31	Carbonate rock, argillaceous	5851- RAS	1.0	4.5	--	--	--	24.1	56.5	140.83
P-30	Phosphate rock, argillaceous	5809- HWP	.9	20.5	--	--	--	22.8	57.4	159.28
P-29	Phosphate rock, argillaceous	5808- HWP	.8	17.0	--	--	--	38.2	58.2	172.88
P-28	Carbonate rock	5807- HWP	1.7	1.3	--	--	--	6.4	59.9	175.09
P-27	Carbonate rock	5806- HWP	3.0	1.4	--	--	--	6.7	62.9	179.29
P-26	Mudstone, phosphatic	5805- HWP	2.5	8.1	--	--	--	62.4	65.4	199.54
P-25	Phosphate rock, argillaceous	5804- HWP	1.0	26.1	2.2	1.01	10.05	18.9	66.4	225.64
P-24	Mudstone, carbonatic	5803- HWP	1.0	2.8	10.5	3.34	21.85	48.0	67.4	228.44
P-23	Phosphate rock	5802- HWP	3.0	28.1	2.9	1.12	10.00	13.2	70.4	312.74
P-22	Phosphate rock and mudstone	5801- HWP	1.9	18.7	3.6	1.65	14.08	29.7	72.3	348.27
P-21	Phosphate rock	5836- RGW	2.0	27.1	2.2	.98	11.32	14.7	74.3	402.47
P-20	Phosphate rock, argillaceous	5835- RGW	2.4	24.7	2.4	1.00	11.53	18.3	76.7	461.75
P-19	Phosphate rock, argillaceous	5834- RGW	1.9	16.6	4.2	1.61	12.75	35.9	78.6	493.29
P-18	Phosphate rock, argillaceous	5833- RGW	1.4	16.3	4.6	1.92	12.03	36.3	80.0	516.11
P-17	Phosphate rock, argillaceous, carbonatic	5832- RGW	.9	13.8	2.2	.94	23.10	17.4	80.9	528.53
P-16	Phosphate rock, argillaceous	5831- RGW	2.0	16.9	4.7	1.68	10.53	37.4	82.9	562.33
--	Carbonate rock lens in bed P-16	5830- RGW	(1.5)	6.4	--	--	--	10.4	--	--
P-15	Mudstone, phosphatic	5829- RGW	2.1	12.9	5.0	2.23	13.50	39.9	85.0	589.42
P-14	Phosphate rock	5828- RGW	.8	34.9	.59	.51	7.81	2.6	85.8	617.34
P-13	Phosphate rock, argillaceous	5827- RGW	1.6	27.6	2.3	1.03	9.72	15.8	87.4	661.50
P-12	Carbonate rock, argillaceous	5826- RGW	2.1	2.1	2.8	1.06	34.35	22.1	89.5	665.91
P-11	Phosphate rock, argillaceous	5889- HWP	2.8	19.5	3.8	1.63	9.15	32.4	92.3	720.51
P-10	Mudstone, phosphatic	5888- HWP	1.2	16.8	5.1	2.09	6.50	43.2	93.5	740.67
P- 9	Carbonate rock, argillaceous	5887- HWP	1.6	5.8	3.2	1.11	29.22	24.2	95.1	749.95
P- 8	Phosphate rock	5886- HWP	3.0	28.8	2.0	1.01	8.80	12.8	98.1	836.35
P- 7	Phosphate rock	5885- HWP	2.4	33.6	1.0	.58	6.50	5.3	100.5	916.99

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

Gravel Creek Divide—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- 6	Phosphate rock, argillaceous	5881-MAW	0.7	27.7	2.2	1.32	6.93	18.2	101.2	936.38
P- 5	Phosphate rock	5880-MAW	1.7	35.2	.74	.48	5.96	2.1	102.9	996.22
P- 4	Phosphate rock	5879-MAW	1.7	33.8	.85	.69	7.12	3.6	104.6	1,053.68
P- 3	Phosphate rock	5878-MAW	2.4	30.6	1.7	1.26	6.35	10.4	107.0	1,127.12
P- 2	Carbonate rock, argillaceous	5877-MAW	4.8	.80	4.0	1.80	29.80	32.8	111.8	1,130.96
P- 1	Phosphate rock	5876-MAW	.4	34.5	.74	.56	4.19	4.7	112.2	1,144.76

Corral Creek, Idaho, lot 1315

Lower part of phosphatic shale member of Phosphoria formation measured and sampled in a bulldozer trench in SE¼ sec. 12, T. 6 S., R. 40 E., Caribou County, Idaho. Beds strike approximately north-south and dip 40° E. Section is incomplete due to faulting and weathering. Section measured by K. Lutz and A. L. Bush and sampled by H. W. Peirce and R. G. Waring in October 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, 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 Phosphoria formation—lower part only									
P-7	Phosphate rock, argillaceous	4565- KL	0.6	23.1	6.4	2.51	6.98	25.6	0.6	13.86
P-6	Phosphate rock	4564- KL	1.9	34.5	1.3	.64	4.04	5.1	2.5	79.41
P-5	Phosphate rock	4563- KL	.6	35.6	1.0	.61	3.91	3.4	3.1	100.77
P-4	Phosphate rock	4562- KL	1.2	35.8	.91	.58	3.88	2.3	4.3	143.73
P-3	Phosphate rock	4561- KL	1.8	34.3	1.5	.80	4.23	5.3	6.1	205.47
P-2	Mudstone and carbonate rock	--	4.3	--	--	--	--	--	10.4	--
	Bed P-2 is slightly crumpled and weathered.									
P-1	Phosphate rock	4544-ALB	.4	31.7	.64	.37	5.10	10.7	10.8	218.15

Henry, Idaho, lot 1309

Phosphatic shale member of Phosphoria formation measured and sampled in bulldozer trench on the east limb of the Wooley Valley anticline, SE¼ sec. 10, T. 6 S., R. 42 E., Caribou County, Idaho. Beds strike N. 50° W. and dip 50-75° E. Section measured by M. E. Thompson, J. D. Weiser and R. A. Smart and sampled by Smart in August and September 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, 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		
	Rex chert member of Phosphoria formation—basal beds only									
R- 4	Mudstone and chert	--	1.9	--	--	--	--	--	1.9	--
R- 3	Mudstone, cherty	--	3.7	--	--	--	--	--	5.6	--
R- 2	Mudstone	--	3.5	--	--	--	--	--	9.1	--
R- 1	Chert	--	5.0	--	--	--	--	--	14.1	--
	Phosphatic shale member of Phosphoria formation									
P-119	Mudstone	4477-MET	1.6	0.80	--	--	--	84.3	1.6	1.28
P-118	Mudstone	4476-MET	3.9	2.55	--	--	--	68.6	5.5	11.23
P-117	Phosphate rock, argillaceous	4475-MET	1.3	21 40	--	--	--	35.9	6.8	39.05
P-116	Mudstone	4474-MET	1.8	5.35	--	--	--	61.0	8.6	48.68
P-115	Mudstone	4473-MET	2.0	2.00	--	--	--	72.8	10.6	52.68
P-114	Mudstone	4281-JDW	4.0	1.10	--	--	--	78.6	14.6	57.08
P-113	Mudstone	4280-JDW	1.6	2.20	--	--	--	83.1	16.2	60.60
P-112	Mudstone	4279-JDW	.7	4 65	--	--	--	63.6	16.9	63.85
P-111	Mudstone	4278-JDW	1.0	1 25	--	--	--	78.9	17.9	65.10
P-110	Mudstone	4500-JDW	1.2	.45	--	--	--	80.7	19.1	65.64
P-109	Mudstone	4499-JDW	3.1	5.00	--	--	--	63.0	22.2	81.14
P-108	Mudstone	4498-JDW	1 3	2.60	--	--	--	72.2	23.5	84.52
P-107	Limestone, argillaceous	4497-JDW	1.2	2.60	--	--	--	35.5	24.7	87.64
P-106	Carbonate rock	4496-JDW	1.4	1 10	--	--	--	15.1	26.1	89.18
P-105	Mudstone, phosphatic	4276-RAS	.3	14.30	--	--	--	36.3	26.4	93.47
P-104	Mudstone	4275-RAS	.8	2.30	--	--	--	77.5	27.2	95.31
P-103	Mudstone	4274-RAS	.7	3.60	--	--	--	64.9	27.9	97.83
P-102	Mudstone	4273-RAS	3.0	1.80	--	--	--	83.5	30.9	103.23
P-101	Phosphate rock, argillaceous	4272-RAS	.7	28.40	1.2	1.56	3.92	20.6	31.6	123.11
P-100	Mudstone	4271-RAS	1.7	3.10	8.3	2.88	5.78	76.7	33.3	128.38
P- 99	Mudstone	4270-RAS	2.0	1.40	8.8	2.80	9.15	73.4	35.3	131.18
P- 98	Phosphate rock	4269-RAS	.8	34.00	.65	0.31	2.15	12.3	36.1	158.38
P- 97	Phosphate rock, contains carbonate rock lenses	4268-RAS	1.2	36.00	.76	.57	5.14	2.7	37.3	201.58
P- 96	Phosphate rock	4267-RAS	.6	36.00	.66	.35	7.30	3.4	37.9	223.18
P- 95	Mudstone, phosphatic	4266-RAS	.7	8.50	8.5	3.36	4.27	67.2	38.6	229.13

P- 94	Phosphate rock	4265- RAS	1.9	34.80	.76	.50	5.88	5.0	40.5	295.25
P- 93	Phosphate rock, argillaceous	4277- RAS	.7	21.9	5.6	.20	5.15	34.5	41.2	310.58
P- 92	Phosphate rock	4472-MET	1.5	34.9	.81	.49	5.55	4.4	42.7	362.93
P- 91	Phosphate rock	4471-MET	1.0	33.8	1.2	.56	5.95	4.9	43.7	396.73
P- 90	Phosphate rock	4470-MET	1.2	29.6	2.0	.70	8.90	10.6	44.9	432.25
--	Carbonate rock concretion in bed P-89	4469-MET	(.8)	4.05	--	--	--	2.1	--	--
P- 89	Phosphate rock	4468-MET	1.6	30.7	--	--	--	7.2	46.5	481.37
P- 88	Phosphate rock, argillaceous	4467-MET	1.6	22.6	--	--	--	23.0	48.1	517.53
P- 87	Phosphate rock, argillaceous	4466-MET	1.9	23.95	--	--	--	21.9	50.0	563.04
P- 86	Phosphate rock, argillaceous	4465-MET	1.6	19.4	--	--	--	28.1	51.6	594.08
P- 85	Mudstone, phosphatic	4464-MET	1.8	8.75	--	--	--	54.2	53.4	609.83
P- 84	Limestone, argillaceous	4463-MET	2.3	1.9	--	--	--	25.3	55.7	614.20
P- 83	Mudstone, phosphatic	4462-MET	4.2	9.3	--	--	--	52.1	59.9	653.26
P- 82	Carbonate rock and phosphatic mudstone	4461-MET	1.1	5.85	--	--	--	19.5	61.0	659.69
P- 81	Mudstone, phosphatic	4460-MET	2.2	15.0	--	--	--	42.7	63.2	692.69
P- 80	Mudstone	4300-MET	3.0	5.2	--	--	--	67.0	66.2	708.29
P- 79	Mudstone, phosphatic	4299-MET	1.9	12.2	--	--	--	48.1	68.1	731.47
P- 78	Mudstone, phosphatic	4298-MET	1.1	9.1	--	--	--	58.7	69.2	741.48
P- 77	Mudstone, phosphatic	4297-MET	1.1	12.9	--	--	--	49.9	70.3	755.67
P- 76	Phosphate rock, argillaceous	4296-MET	2.0	21.8	--	--	--	34.2	72.3	799.27
P- 75	Limestone, cherty	4495- JDW	2.1	1.2	--	--	--	42.2	74.4	801.79
P- 74	Mudstone	4494- JDW	.9	4.8	--	--	--	77.0	75.3	806.11
P- 73	Mudstone, phosphatic	4493- JDW	1.5	16.4	--	--	--	45.5	76.8	830.71
P- 72	Mudstone, phosphatic	4492- JDW	1.5	14.6	--	--	--	45.7	78.3	852.61
P- 71	Mudstone, phosphatic	4491- JDW	5.0	8.5	--	--	--	61.8	83.3	895.11
P- 70	Phosphate rock, argillaceous	4490- JDW	.9	20.7	--	--	--	33.7	84.2	913.74
P- 69	Mudstone, phosphatic	4489- JDW	1.0	13.3	--	--	--	50.8	85.2	927.04
P- 68	Mudstone	4488- JDW	2.2	6.0	--	--	--	68.6	87.4	940.24
P- 67	Mudstone	4487- JDW	5.0	4.3	--	--	--	72.0	92.4	961.74
P- 66	Mudstone	4486- JDW	1.0	7.3	--	--	--	55.1	93.4	969.04
P- 65	Phosphate rock, argillaceous	4485- JDW	.8	27.2	--	--	--	16.3	94.2	990.80
P- 64	Mudstone, phosphatic	4484- JDW	1.0	9.2	--	--	--	60.2	95.2	1,000.00
P- 63	Mudstone, phosphatic	4483- JDW	.8	13.1	--	--	--	40.9	96.0	1,010.48
P- 62	Phosphate rock, argillaceous	4482- JDW	1.5	17.5	--	--	--	33.6	97.5	1,036.73
P- 61	Mudstone, phosphatic	4481- JDW	1.8	8.3	--	--	--	62.5	99.3	1,051.67
P- 60	Mudstone, phosphatic	4480- JDW	.5	14.2	--	--	--	49.6	99.8	1,058.77
P- 59	Mudstone	4264- RAS	.5	3.6	--	--	--	82.1	100.3	1,060.57
P- 58	Phosphate rock, contains fluorite	4263- RAS	.7	32.0	--	--	--	10.7	101.0	1,082.97
P- 57	Mudstone, phosphatic	4262- RAS	1.7	8.65	--	--	--	64.3	102.7	1,097.68
P- 56	Mudstone	4261- RAS	1.3	3.3	--	--	--	79.1	104.0	1,101.97
P- 55	Mudstone, phosphatic	4260- RAS	1.2	8.4	--	--	--	60.9	105.2	1,112.05
P- 54	Mudstone, carbonatic	4259- RAS	1.2	.9	--	--	--	59.0	106.4	11113.13
P- 53	Mudstone	4258- RAS	1.8	2.65	--	--	--	76.3	108.2	1,117.90

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-52	Phosphate rock, argillaceous	4257- RAS	1.6	15.0	--	--	--	28.8	109.8	1,141.90
P-51	Mudstone, carbonatic	4256- RAS	1.2	5.2	--	--	--	46.6	111.0	1,148.14
P-50	Mudstone, phosphatic	4255- RAS	2.0	14.8	--	--	--	37.6	113.0	1,177.74
P-49	Phosphate rock, argillaceous	4665- JDW	.8	19.7	--	--	--	27.3	113.8	1,193.50
P-48	Carbonate rock and carbonatic mudstone	4664- JDW	3.1	7.6	--	--	--	29.9	116.9	1,217.06
P-47	Limestone	4663- JDW	5.0	.8	--	--	--	15.4	121.9	1,221.06
P-46	Mudstone	4662- JDW	5.0	2.3	--	--	--	78.0	126.9	1,232.56
P-45	Mudstone	4661- JDW	2.4	7.4	--	--	--	68.0	129.3	1,250.32
P-44	Mudstone	4660- JDW	1.7	3.2	--	--	--	81.1	131.0	1,255.76
P-43	Phosphate rock, argillaceous	4295-MET	1.8	17.6	--	--	--	39.9	132.8	1,287.44
P-42	Mudstone	4294-MET	3.4	6.8	--	--	--	62.6	136.2	1,310.56
P-41	Mudstone, phosphatic, carbonatic	4170-MET	2.5	11.6	2.0	0.70	8.90	36.6	138.7	1,339.56
P-40	Mudstone, phosphatic, carbonatic	4169-MET	1.9	10.6	.44	.15	39.78	25.3	140.6	1,359.70
P-39	Carbonate rock	4168-MET	.9	1.5	1.5	.58	9.55	1.8	141.5	1,361.05
P-38	Mudstone and phosphate rock	4167-MET	1.9	11.2	3.8	1.45	11.68	40.2	143.4	1,382.33
P-37	Phosphate rock, argillaceous	4166-MET	1.0	16.6	3.2	1.26	10.65	39.9	144.4	1,398.93
P-36	Carbonate rock, argillaceous	4165-MET	1.6	1.0	--	--	--	18.7	146.0	1,400.53
P-35	Mudstone, phosphatic	4164-MET	.7	8.2	--	--	--	54.6	146.7	1,406.27
P-34	Phosphate rock, argillaceous	4163-MET	2.5	21.2	5.8	2.56	8.87	27.7	149.2	1,459.27
P-33	Phosphate rock	4162-MET	1.8	26.4	3.5	1.73	9.93	13.8	151.0	1,506.79
P-32	Phosphate rock	4161-MET	1.3	30.0	2.1	1.12	7.23	9.5	152.3	1,545.79
P-31	Phosphate rock, argillaceous	4119-MET	1.3	24.0	3.7	1.48	10.13	20.5	153.6	1,576.99
P-30	Phosphate rock	4118-MET	2.0	29.4	2.0	1.50	8.92	10.4	155.6	1,635.79
P-29	Mudstone, phosphatic	4117-MET	1.3	15.4	5.3	2.00	12.90	37.4	156.9	1,655.81
P-28	Phosphate rock, argillaceous	4116-MET	1.1	18.1	4.3	1.57	10.70	38.4	158.0	1,675.72
P-27	Phosphate rock, argillaceous	4659- JDW	1.4	17.7	4.5	1.63	12.37	33.9	159.4	1,700.50
P-26	Carbonate rock, phosphatic	4658- JDW	1.6	10.7	1.3	.34	30.70	9.3	161.0	1,717.62
P-25	Phosphate rock, argillaceous	4657- JDW	2.2	22.3	2.8	1.01	10.50	24.0	163.2	1,766.68
P-24	Mudstone	4656- JDW	1.2	2.05	6.9	2.43	7.25	76.0	164.4	1,769.14
P-23	Phosphate rock	4655- JDW	.9	33.6	1.0	.37	7.57	5.5	165.3	1,799.38
P-22	Phosphate rock, argillaceous	4654- JDW	3.6	27.2	2.8	.67	7.53	19.2	168.9	1,897.30
P-21	Mudstone, carbonatic	4653- JDW	2.2	3.7	6.3	2.38	14.03	59.8	171.1	1,905.44
P-20	Phosphate rock, argillaceous	4652- JDW	2.0	26.8	2.6	.96	7.65	20.6	173.1	1,959.04
P-19	Mudstone, phosphatic	4651- JDW	2.3	17.0	5.0	2.44	7.20	43.9	175.4	1,998.14
P-18	Carbonate rock, argillaceous	4115-MET	1.8	2.9	3.3	1.10	29.52	26.5	177.2	2,003.36
P-17	Phosphate rock, argillaceous	4114-MET	2.2	27.5	2.3	1.19	7.72	18.3	179.4	2,063.86
P-16	Phosphate rock and argillaceous phosphate rock	4113-MET	1.5	26.1	3.0	.93	7.85	20.9	180.9	2,103.01

P-15	Phosphate rock----------	4112-MET	2.8	29.8	1.8	.83	6.44	13.6	183.7	2,186.45
P-14	Phosphate rock----------	4111-MET	2.8	30.6	1.5	1.31	7.67	10.6	186.5	2,272.13
P-13	Mudstone, carbonatic ----------	4110-MET	.7	6.0	5.9	1.99	15.85	52.2	187.2	2,276.33
P-12	Phosphate rock----------	4109-MET	1.3	29.2	2.2	1.13	6.50	15.8	188.5	2,314.29
P-11	Carbonate rock----------	4108-MET	1.1	4.6	2.1	.57	35.55	11.5	189.6	2,319.35
P-10	Phosphate rock----------	4254- RAS	2.5	29.3	2.4	.62	7.18	13.6	192.1	2,392.60
P- 9	Phosphate rock----------	4253- RAS	1.1	28.0	.71	.89	6.42	14.9	193.2	2,423.40
P- 8	Phosphate rock----------	4252- RAS	1.8	34.0	.78	.47	6.15	3.5	195.0	2,484.60
P- 7	Phosphate rock----------	4251- RAS	1.7	33.8	.90	.45	6.80	3.3	196.7	2,542.06
P- 6	Phosphate rock----------	4250- RAS	1.5	33.5	.75	.57	6.55	3.5	198.2	2,592.31
	Beds P-6 through P-8 are slightly crumpled and weathered.									
P- 5	Phosphate rock----------	4249- RAS	1.0	32.4	1.2	.74	4.85	8.1	199.2	2,624.71
P- 4	Mudstone, phosphatic ----------	4248- RAS	.8	8.1	--	--	--	52.9	200.0	2,631.19
P- 3	Mudstone, carbonatic ----------	4247- RAS	2.6	.55	--	--	--	62.5	202.6	2,632.62
P- 2	Mudstone ----------	4246- RAS	1.0	1.35	--	--	--	64.5	203.6	2,633.97
P- 1	Phosphate rock----------	4245- RAS	.3	34.5	--	--	--	4.2	203.9	2,644.32

Enoch Valley, Idaho, lot 1314

Phosphoria formation sampled on west limb of Snowdrift anticline on west flank of Rasmussen Ridge in Enoch Valley, sec. 16, T. 6 S., R. 43 E., Caribou County, Idaho. Beds strike N. 65° E. and dip 40° W. Section measured by J. D. Weiser, R. A. Smart, K. B. Krauskopf, M. A. Warner, H. W. Peirce, and D. F. Davidson and sampled by Peirce and R. G. Waring in August 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, 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		
	Rex chert member of Phosphoria formation—basal beds only									
R- 2	Chert	6050- JDW	0.4	0.2	--	--	--	90.9	0.4	--
R- 1	Chert and phosphatic mudstone	6049- JDW	.8	8.4	--	--	--	66.1	1.2	--
	Phosphatic shale member of Phosphoria formation									
P-106	Phosphate rock and argillaceous phosphate rock	6048- JDW	0.7	24.3	--	--	--	25.3	0.7	17.01
P-105	Mudstone	6073- RAS	1.5	1.1	--	--	--	81.3	2.2	18.66
P-104	Phosphate rock	6072- RAS	1.6	35.7	0.96	0.46	3.57	5.9	3.8	75.78
P-103	Phosphate rock and argillaceous phosphate rock	6071- RAS	1.0	29.3	2.74	1.28	4.70	16.8	4.8	105.08
P-102	Phosphate rock	6070- RAS	1.8	35.2	1.11	.76	3.05	6.9	6.6	168.44
P-101	Mudstone, phosphatic	6069- RAS	.8	16.8	--	--	--	45.7	7.4	181.88
P-100	Mudstone	4283- KBK	.9	6.5	--	--	--	60.6	8.3	187.73
P- 99	Mudstone	4282- KBK	1.8	2.7	--	--	--	67.8	10.1	192.59
P- 98	Mudstone	3919- KBK	1.1	2.6	--	--	--	71.1	11.2	195.45
P- 97	Mudstone	3918- KBK	1.6	.8	--	--	--	77.3	12.8	196.73
P- 96	Mudstone	3917- KBK	1.8	.8	--	--	--	78.1	14.6	198.17
P- 95	Mudstone	3916- KBK	1.6	.9	--	--	--	76.6	16.2	199.61
P- 94	Mudstone	3915- KBK	2.6	4.1	—	--	--	65.4	18.8	210.27
P- 93	Carbonate rock	3914- KBK	2.0	1.2	--	--	--	13.4	20.8	212.67
P- 92	Mudstone and phosphatic mudstone	3913- KBK	1.4	6.5	--	--	--	65.7	22.2	221.77
P- 91	Mudstone, carbonatic	3912- KBK	.8	1.5	--	--	--	58.5	23.0	222.97
P- 90	Phosphate rock, argillaceous	3911- KBK	1.1	20.9	--	--	--	39.6	24.1	245.96
P- 89	Mudstone	3910- KBK	1.9	1.8	--	--	--	78.1	26.0	249.38
P- 88	Phosphate rock	6068-MAW	1.9	34.7	.92	.48	3.30	4.5	27.9	315.31
P- 87	Phosphate rock	6067-MAW	1.2	32.8	1.76	.71	5.48	7.8	29.1	354.67
P- 86	Phosphate rock	6025-MAW	2.2	27.2	3.00	1.14	10.90	13.4	31.3	414.51
P- 85	Phosphate rock, argillaceous	6024-MAW	1.8	27.0	2.83	.96	9.88	15.9	33.1	463.11
P- 84	Phosphate rock, argillaceous	6023-MAW	1.9	23.6	--	--	--	23.9	35.0	507.95
P- 83	Mudstone, phosphatic	6022-MAW	1.9	9.3	--	--	--	57.1	36.9	525.62
P- 82	Mudstone, carbonatic	6021-MAW	1.7	1.8	--	--	--	49.6	38.6	528.68

P- 81	Mudstone, phosphatic	6020-MAW	2.0	12.7	--	--	--	44.9	40.6	554.08
P- 80	Mudstone, phosphatic	6019-MAW	1.1	10.6	--	--	--	57.4	41.7	565.74
P- 79	Phosphate rock, argillaceous	6018-MAW	1.6	16.4	--	--	--	37.7	43.3	591.98
P- 78	Mudstone	6017-MAW	2.1	6.4	--	--	--	59.8	45.4	605.42
P- 77	Mudstone, phosphatic	6016-MAW	2.3	15.5	--	--	--	42.1	47.7	641.07
P- 76	Phosphate rock, argillaceous	6015-MAW	1.6	24.4	--	--	--	30.3	49.3	680.11
P- 75	Mudstone, phosphatic	6014-MAW	1.0	9.9	--	--	--	61.9	50.3	690.01
P- 74	Mudstone, phosphatic	6043- JDW	2.2	12.6	--	--	--	56.6	52.5	717.73
P- 73	Mudstone, phosphatic	6042- JDW	1.7	8.7	--	--	--	64.5	54.2	732.52
P- 72	Mudstone, phosphatic	6041- JDW	2.2	12.7	--	--	--	53.9	56.4	760.46
P- 71	Mudstone	6040- JDW	.6	4.7	--	--	--	60.6	57.0	763.28
P- 70	Mudstone, phosphatic	6039- JDW	.9	8.1	--	--	--	63.5	57.9	770.57
P- 69	Mudstone	6038- JDW	.9	5.4	--	--	--	69.8	58.8	775.43
P- 68	Mudstone	6037- JDW	1.4	6.9	--	--	--	66.0	60.2	785.09
P- 67	Phosphate rock, argillaceous	6036- JDW	.5	23.3	--	--	--	25.6	60.7	796.74
P- 66	Mudstone, phosphatic	6035- JDW	.6	10.3	--	--	--	63.9	61.3	802.92
P- 65	Phosphate rock, argillaceous	6034- JDW	2.2	24.1	--	--	--	22.3	63.5	855.94
P- 64	Phosphate rock, argillaceous	6033- JDW	.8	26.7	--	--	--	26.4	64.3	877.30
P- 63	Phosphate rock	6032- JDW	1.2	32.9	--	--	--	12.0	65.5	916.78
	Beds P-63 and P-64 are slightly crumpled.									
P- 62	Phosphate rock, argillaceous	6031- JDW	.6	18.5	--	--	--	42.5	66.1	927.88
P- 61	Mudstone	6030- JDW	2.0	6.6	--	--	--	71.1	68.1	941.08
P- 60	Mudstone, phosphatic	6029- JDW	.5	15.7	--	--	--	41.1	68.6	948.93
P- 59	Mudstone, phosphatic	6028- JDW	2.0	7.8	--	--	--	65.4	70.6	964.53
P- 58	Phosphate rock, argillaceous	6027- JDW	1.1	16.5	--	--	--	37.7	71.7	982.68
P- 57	Mudstone, phosphatic	6026- JDW	.5	9.0	--	--	--	62.7	72.2	987.18
P- 56	Phosphate rock, argillaceous	6013-MAW	2.3	18.2	--	--	--	39.7	74.5	1,029.04
P- 55	Mudstone, phosphatic	6012-MAW	3.4	14.4	--	--	--	42.8	77.9	1,078.00
P- 54	Carbonate rock	6011-MAW	3.4	.6	--	--	--	11.8	81.3	1,080.04
P- 53	Mudstone	6010-MAW	1.9	3.2	--	--	--	72.4	83.2	1,086.12
P- 52	Mudstone	6009-MAW	1.2	1.2	--	--	--	81.6	84.4	1,087.56
P- 51	Mudstone, phosphatic	6008-MAW	1.9	8.5	--	--	--	63.1	86.3	1,103.71
P- 50	Mudstone	6007-MAW	.6	.8	--	--	--	87.8	86.9	1,104.19
P- 49	Mudstone	6006-MAW	1.3	1.8	--	--	--	83.0	88.2	1,106.53
P- 48	Phosphate rock, argillaceous	6005-MAW	2.0	17.5	--	--	--	38.5	90.2	1,141.53
P- 47	Mudstone, phosphatic	6004-MAW	1.1	7.8	--	--	--	64.5	91.3	1,150.11
P- 46	Mudstone, phosphatic	6003-MAW	2.3	12.6	--	--	--	49.7	93.6	1,179.09
P- 45	Mudstone, phosphatic	6002-MAW	2.8	9.7	--	--	--	44.1	96.4	1,206.25
P- 44	Mudstone, phosphatic, carbonatic	6001-MAW	2.5	9.4	--	--	--	30.5	98.9	1,229.75
P- 43	Mudstone, phosphatic, carbonatic	6000-MAW	2.8	8.5	--	--	--	39.6	101.7	1,253.55
P- 42	Carbonate rock, argillaceous	6066- RAS	2.5	1.0	--	--	--	34.2	104.2	1,256.05
P- 41	Mudstone, phosphatic	6065- RAS	1.0	11.7	--	--	--	44.8	105.2	1,267.75

Enoch 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	Al_2O_3	Fe_2O_3	Loss on ignition	Acid insoluble		
P-40	Carbonate rock	6064- RAS	0.5	0.8	--	--	--	3.3	105.7	1,268.15
P-39	Mudstone, phosphatic	6063- RAS	.9	10 6	--	--	--	46.6	106.6	1,277.69
P-38	Carbonate rock	6062- RAS	.6	.2	--	--	--	13.1	107.2	1,277.81
P-37	Phosphate rock, argillaceous	6061- RAS	2.3	17.3	--	--	--	31.2	109.5	1,317.60
P-36	Phosphate rock	6060- RAS	1.1	30.4	--	--	--	6.8	110.6	1,351.04
P-35	Phosphate rock	6059- RAS	1.3	29.5	--	--	--	14.4	111.9	1,389.39
P-34	Phosphate rock	6058- RAS	2.0	28.5	--	--	--	13.2	113.9	1,446.39
P-33	Phosphate rock, argillaceous and phosphate rock	6057- RAS	1.5	27.0	--	--	--	15.7	115.4	1,486.89
P-32	Phosphate rock, argillaceous	6056- RAS	1.1	19.6	--	--	--	31.3	116.5	1,508.45
P-31	Mudstone, phosphatic	6055- RAS	1.4	15.7	--	--	--	40.1	117.9	1,530.43
P-30	Phosphate rock, argillaceous	6054- RAS	1.3	19.7	--	--	--	31.2	119.2	1,556.04
	Beds P-30 and P-31 are slightly crumpled.									
P-29	Phosphate rock, argillaceous	6053- RAS	1.9	16.1	--	--	--	38.7	121.1	1,586.63
P-28	Phosphate rock, argillaceous	6052- RAS	1.1	21.3	--	--	--	35.1	122.2	1,610.06
P-27	Phosphate rock, argillaceous	6051- RAS	.9	22.3	--	--	--	29.8	123.1	1,630.13
P-26	Phosphate rock	4692- HWP	2.7	33.2	--	--	--	7.1	125.8	1,719.77
P-25	Phosphate rock, argillaceous	4691- HWP	2.0	26.9	--	--	--	19.6	127.8	1,773.57
P-24	Mudstone	4690- HWP	1.5	6.4	--	--	--	69.2	129.3	1,783.17
P-23	Mudstone, phosphatic, and argillaceous phosphate rock	4689- HWP	1.4	13.1	--	--	--	50.7	130.7	1,801.51
P-22	Phosphate rock, argillaceous	4688- HWP	2.0	25.9	--	--	--	25.5	132.7	1,853.31
P-21	Phosphate rock and mudstone	4687- HWP	1.6	18.3	--	--	--	41.6	134.3	1,882.59
P-20	Mudstone, carbonatic	4666- KBK	4.4	4.5	--	--	--	41.4	138.7	1,902.39
P-19	Phosphate rock and argillaceous phosphate rock	4292- KBK	1.9	27.6	--	--	--	17.7	140.6	1,954.83
	Bed P-19 is slightly crumpled.									
P-18	Mudstone, carbonatic	4291- KBK	3.8	5.4	--	--	--	46.0	144.4	1,975.35
P-17	Phosphate rock	4290- KBK	2.0	29.3	1.40	0.77	8.95	11.4	146.4	2,033.95
P-16	Phosphate rock	4289- KBK	1.2	34.5	1.06	.68	5.45	5.6	147.6	2,075.35
P-15	Phosphate rock	4288- KBK	2.6	35.4	1.01	.49	3.85	5.7	150.2	2,167.39
P-14	Phosphate rock	4287- KBK	1.5	34.4	1.27	.76	4.10	7.6	151.7	2,218.99
P-13	Phosphate rock	4286- KBK	2.0	29.9	2.12	1.14	5.50	16.2	153.7	2,278.79
P-12	Carbonate rock, argillaceous	4672- DFD	1.4	6.4	2.44	.91	30.58	19.7	155.1	2,287.75

P-11	Phosphate rock, argillaceous	4671-DFD	1.4	27.0	2.50	1.03	8.98	16.3	156.5	2,325.55
	Bed P-11 is slightly crumpled.									
P-10	Carbonate rock	4670-DFD	1.2	5.4	1.66	.51	34.95	8.9	157.7	2,332.03
P- 9	Phosphate rock	4669-DFD	2.7	28.6	1.86	.86	8.63	10.7	160.4	2,409.25
P- 8	Phosphate rock, argillaceous	4668-DFD	.8	28.2	1.96	1.08	6.85	16.3	161.2	2,431.81
P- 7	Phosphate rock	4667-DFD	1.0	33.7	.69	.41	6.18	2.4	162.2	2,465.51
P- 6	Phosphate rock	4285-DFD	.8	33.4	.54	.52	36.60	3.2	163.0	2,492.23
P- 5	Phosphate rock	4284-DFD	1.5	32.4	.75	.59	7.72	3.7	164.5	2,540.83
	Bed P-5 is slightly crumpled and weathered.									
P- 4	Phosphate rock	5825-HWP	1.4	31.3	1.31	.83	5.90	7.2	165.9	2,584.65
P- 3	Mudstone, carbonatic	5824-HWP	2.9	.4	5.10	1.98	23.72	44.3	168.8	2,585.81
P- 2	Mudstone	5823-HWP	1.5	4.2	7.40	2.61	8.57	62.5	170.3	2,592.11
P- 1	Phosphate rock	5822-HWP	.5	35.1	.62	.53	3.30	3.9	170.8	2,609.66

Ballard Trench, Idaho, lot 1316

Lower portion of the phosphatic shale member of the Phosphoria formation sampled in bulldozer trench on the west limb of the Wooley Valley anticline, sec. 7, T. 7 S., R. 43 E., Caribou County, Idaho. Section measured and sampled by H. W. Peirce and R. G. Waring in September 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, 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 Phosphoria formation									
P-18	Carbonate rock, phosphatic	4579-HWP	1.1	15.1	0.88	0.42	25.88	10.1	1.1	16.61
P-17	Phosphate rock	4578-HWP	.7	36.4	.37	.49	5.22	2.0	1.8	42.09
P-16	Phosphate rock	4577-HWP	1.0	35.4	.74	.49	5.68	3.3	2.8	77.49
P-15	Phosphate rock	4576-HWP	1.5	32.1	1.8	.85	5.81	9.5	4.3	125.64
--	Carbonate rock, argillaceous, phosphatic lens	4775-HWP	(.7)	7.9	3.0	1.15	27.73	23.1	--	--
P-14	Phosphate rock	4574-HWP	.8	35.6	.78	.54	6.31	2.1	5.1	154.12
P-13	Phosphate rock and mudstone lens	4573-HWP	2.7	27.3	3.0	1.21	15.38	19.9	7.8	227.83
P-12	Phosphate rock and argillaceous carbonate rock	4572-HWP	1.5	16.2	2.0	.83	22.75	12.5	9.3	252.13
P-11	Carbonate rock	4571-HWP	.5	2.0	2.9	.38	41.21	9.4	9.8	253.13
P-10	Phosphate rock	4570-RGW	1.5	27.8	2.5	.95	8.64	13.3	11.3	294.83
P- 9	Carbonate rock, phosphatic	4569-RGW	1.6	10.4	1.1	.49	30.90	12.0	12.9	311.47
P- 8	Carbonate rock, phosphatic	4568-RGW	.7	12.9	1.0	.63	29.50	6.9	13.6	320.50
P- 7	Phosphate rock	4567-RGW	1.6	34.7	.64	.40	6.49	2.4	15.2	376.02
P- 6	Phosphate rock	4566-RGW	1.0	33.5	.94	.50	7.72	3.6	16.2	409.52
P- 5	Phosphate rock	4549-RGW	1.8	32.3	.73	.48	6.98	4.8	118.0	467.66
P- 4	Phosphate rock	4548-RGW	.7	31.5	1.4	.57	5.47	9.0	18.7	489.71
P- 3	Carbonate rock, argillaceous	4547-RGW	2.3	.5	3.9	1.43	29.24	35.1	21.0	490.86
P- 2	Carbonate rock, argillaceous	4546-RGW	1.2	.7	5.3	1.87	23.33	43.9	22.2	491.70
P- 1	Phosphate rock	4545-RGW	.6	32.2	.35	.33	7.51	4.5	22.8	511.02