Chemical Composition of Sedimentary Rocks in Alaska, Idaho, Oregon, and Washington

GEOLOGICAL SURVEY PROFESSIONAL PAPER 771

U.S. DEPARTMENT OF THE INTERIOR
March 3, 1849

Chemical Composition of Sedimentary Rocks in Alaska, Idaho, Oregon, and Washington

Compiled by THELMA P. HILL *and* MARIAN A. WERNER

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A compilation of 5,411 analyses
published before 1965

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TABLES

CONTENTS

ILLUSTRATIONS

CHEMICAL COMPOSITION OF SEDIMENTARY ROCKS IN ALASKA, IDAHO, OREGON, AND WASHINGTON

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ABSTRACT

The compilation of published chemical analyses of sedimentary rocks of the United States was undertaken by the U.S. Geological Survey in 1952 to make available scattered data that are needed for a wide range of economic and scientific uses. About 20,000–25,000 chemical analyses of sedimentary rocks in the United States have been published. This report brings together 5,411 of these analyses from the Northwestern States including Alaska.

A magnetic tape containing the analyses and some, but not all, of the descriptive material, was published in 1971. (See "Magnetic Tape," this publication.)

The samples are arranged by (1) general lithologic character; (2) locality; and (3) geologic age, formation, and relative stratigraphic order. Indexes of stratigraphy, rock name, commercial uses, and minor elements are provided.

The analyses are classified into groups and into categories. The groups (A through F_2) are modifications of the system proposed by Brian Mason in 1952 in which the main parameters are the three major components of sedimentary rocks: (1) uncombined silica, (2) clay ($R_2O_3 \cdot 3SiO_2 \cdot nH_2O$), and (3) calcium-magnesium carbonate. The categories are based on the degree of admixture of these three major components with other components, such as sulfate, phosphate, and iron oxide. Common-rock, mixed-rock, and special-rock categories are defined as 85 percent or more, 50–85 percent, and less than 50 percent, respectively.

Maps show distribution of sample localities by States; triangular diagrams show the lithologic character, classification group, and geologic age; cumulative frequency curves of each constituent in each classification group of the common- and mixed-rock categories are also included.

The numerous analyses may not adequately represent the geochemical nature of the rock types and formations of the region because of sampling bias. Maps showing distribution of sample localities indicate that many of the localities are in areas where, for economic or other reasons, special problems attracted interest.

Most of the analyzed rocks tended to be fairly simple in composition — mainly two-component mixtures of the three major components or a mixture of these and a fourth component such as phosphate, gypsum, or iron oxide.

A comparison of the analyses assembled here with rough estimates of the relative thickness of rock units of different lithologic types and geologic ages showed that the available analyses are far from equally representative of the sedimentary-rock column of the region.

GENERAL INFORMATION

The project of compiling published analyses of sedimentary rocks of the United States was undertaken by the U.S. Geological Survey in 1952. The first report, covering the States of Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, and Wyoming, was published as U.S. Geological Survey Professional Paper 561 (Hill and others, 1967). The present report covers another geographic area, but in most other respects is similar to the first report.

The classifying of the analyses into groups and categories was based on work done by computer. The cumulative frequency curves were also based on statistical work done by computer. The triangular diagrams were drawn by a computer-controlled plotter. (For analyses available on tape, see Hill, 1971, and Hill and Tourtelot, 1971.)

The chemical analyses of sedimentary rocks were taken from many publications, and as a result the constituents determined, as well as the methods used for determination, vary widely. Uniformity seemed desirable in presenting the analyses in this report, and several general rules were formulated. Although information concerning some of the analyses is probably inadequate for certain purposes, a more critical selection can be made by the reader. The chemical analyses are shown in tables 1–22.

GROUPS, CLASS, AND CATEGORIES

GROUPS

The analyses are classified into groups A through F_2, following a system modified from that proposed by Mason (1952, p. 130, 131) in which the relative proportions of the three major components of sedimentary rocks are utilized. These components are (1) uncombined silica, (2) an arbitrary clay molecule ($R_2O_3 \cdot 3SiO_2 \cdot nH_2O$), and (3) calcium and magnesium carbonate. When the proportions are plotted on a triangular diagram, the following symmetrical groups can be identified:

Group	*Identification*	*Explanation*
A	Silica	Uncombined silica, 75–100 percent.
B	Mixed silica and clay.	Uncombined silica and clay, each less than 75 percent; uncombined silica and clay, each more than carbonate.
C	Mixed silica and clay.	Uncombined silica and carbonate, each less than 75 percent; uncombined silica and carbonate, each more than clay.
D	Clay	Clay, 75–100 percent.
E	Mixed clay and carbonate.	Clay and carbonate, each less than 75 percent; clay and carbonate, each more than uncombined silica.
F_1	Carbonate	Carbonate, 75–90 percent.
F_2	Carbonate	Carbonate more than 90 percent.

Group F contains a large number of analyses; therefore, it is divided at 90 percent. Groups A and D contain a smaller number of analyses; therefore, they are not divided. (See fig. 1.)

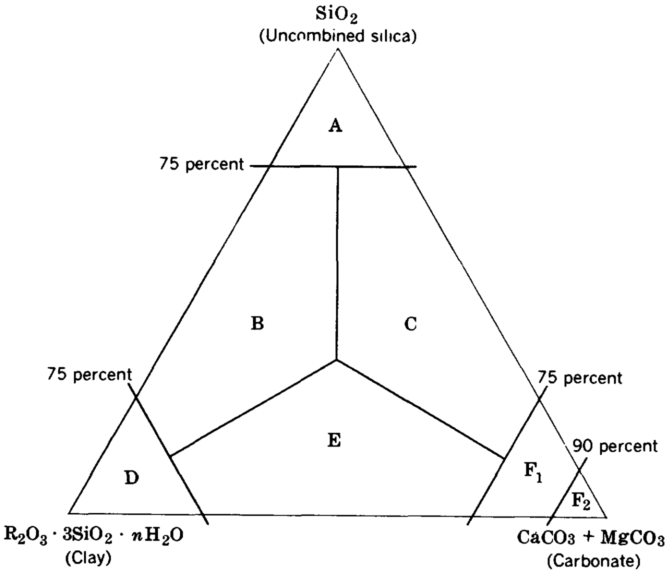

FIGURE 1. — Diagram of composition of sedimentary rocks, showing the seven fields into which the chemical analyses are grouped.

Assignment of an analysis to a compositional group is determined by calculating the three components from the analysis to 100 percent. These calculated figures are not given in the tables of analyses.

CLASS

The class figures are the calculated total amounts of the three basic components—silica, clay, and carbonate—in weight percent. These figures are given in the tables for each sample and follow the analysis.

Samples that contained 33 percent or more calcium-magnesium carbonate were given an additional notation to indicate the calculated ratio of calcite to dolomite, as follows:

Notation	$\frac{CaCO_3}{(Ca,Mg)CO_3}$ *molal ratio*	CaO/MgO *weight ratio*
Calcite	0.9:1.0	26.43 : ∞
Magnesian calcite	0.5:0.9	4.173:26.43
Calcareous dolomite	0.1:0.5	1.700: 4.173
Dolomite	0 :0.1	1.391: 1.700
Magnesitic dolomite		0.464: 1.391
Dolomitic magnesite		0.073: 0.464
Magnesite		0.0 : 0.073

The notation, based on the weight ratio, is given in the tables of analyses below the class figures.

CATEGORIES

The categories are based on the degree to which the three main components used to define the groups are admixed with other materials. The categories are defined by the following amounts of the three main components (silica, clay, and carbonate).

Percent	*Category*
85 or more	Common-rock
50–85	Mixed-rock
50 or less	Special-rock

The common- and mixed-rock categories are assembled by group, State, county, and position within the county. The mixed-rock category is designated by an asterisk, both on the chemical analysis and in the descriptive notes on the sample (tables 1–10), and a brief explanation of the mineralogy is given, suggesting the reason that the sample falls in the mixed-rock category.

The special-rock category is designated according to the kind of material admixed with the three main components—silica, clay, and carbonate (tables 11–22). The numerical limits of the special-rock category were not strictly observed for all samples included; unusual composition or other factors seemed to warrant inclusion in this category.

The relation of the three general categories to one another is clarified by the use of a four-cornered tetrahedron that represents a four-component classification system. (See fig. 2.) The base of the tetrahedron may be taken as the triangular diagram of figure 1, its three corners being, respectively, 100 percent uncombined silica, 100 percent clay, and 100 percent carbonate. The apex of the tetrahedron is then 100 percent of some component, or components, other than uncombined silica, clay, or carbonate The interior of the tetrahedron, the volume above the basal triangle, represents those rocks composed partly of the three components (uncombined silica,

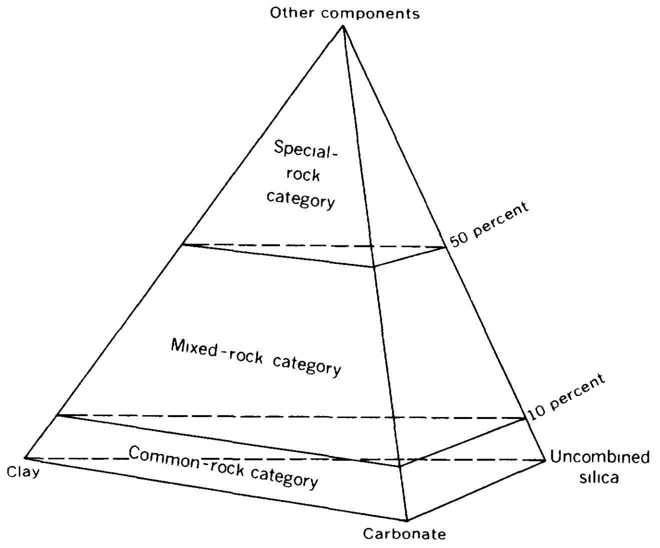

FIGURE 2. — Tetrahedron illustrating three categories of rock compositions: (1) common-rock samples consisting of more than 85 percent uncombined silica, clay, and carbonate, (2) mixed-rock samples that include one or more additional components, and (3) special-rock samples in which other components, such as gypsum or phosphate rock, make up more than 50 percent of the sample.

clay, and carbonate) and partly of one or more additional components. For example, the location within the tetrahedron of an analysis consisting of 19 percent uncombined silica, 19 percent clay, 57 percent carbonate, and 5 percent calcium sulfate is determined by recalculation of the composition to that of the basal triangle: 20 percent uncombined silica, 20 percent clay, and 60 percent carbonate. The analysis is located at this point on the basal plane and then projected toward the apex of the tetrahedron for a distance equivalent to 5 percent (the amount of calcium sulfate in the analysis). The point representing the sample will fall within the volume designated as common-rock category in figure 2.

An analysis that shows 15 percent uncombined silica, 30 percent clay, 15 percent carbonate, and 40 percent calcium phosphate is recalculated to the composition of the basal triangle—that is, 25 percent uncombined silica, 50 percent clay, and 25 percent carbonate. The sample is located at this point on the basal plane and then projected toward the apex for a distance equivalent to 40 percent (the amount of calcium phosphate in the analysis). The point representing the analysis will then fall in the upper part of the volume designated as mixed-rock category in figure 2. If the analysis had shown 60 percent calcium phosphate, the point representing it would have fallen in the lower part of the volume designated as special-rock category.

To keep the nomenclature of the classification scheme simple and reasonably consistent, the different special-rock categories are designated as "groups" by analogy with the use of that term for the different mixtures of the three main components of the basal plane of the tetrahedron. The nomenclature of the special-rock category is as follows:

Table	*Group*	*Description*
11	Hk	High-alumina, kaolinlike clays, no bauxite.
12	Hki	High-alumina, kaolinlike clays, no bauxite, containing iron.
13	Ha	High-alumina, kaolinlike clays, bauxite subordinate.
14	Hai	High-alumina, kaolinlike clays, bauxite subordinate, containing iron.
15	Hb	Bauxite and bauxitic clay.
16	Hbi	Bauxite and bauxitic clay, containing iron.
17	Fe	Iron-bearing rocks.
18	Mn	Manganese-bearing rocks.
19	G	Gypsum, gypsite or anhydrite.
20	S	Chloride-, sulfate-, carbonate-, and nitrate-bearing rocks.
21	P	Phosphorite.
22	M	Miscellaneous rocks.

ANALYSES

Analysis selection.—Analyses were taken only from reports published prior to 1965 and from open-file reports of the U.S. Geological Survey. Unpublished supplementary information on a published analysis is cited as written or oral communication. The analyses are generally recorded in this report as they are given in the original publication; the few recalculations made by the compilers are noted. Parentheses around amounts in tables indicate that amounts are not included in the totals. Information concerning the analyses supplied by the compilers is put in brackets.

Arrangement of analyses.—The 5,411 analyses compiled are presented in tables 1–22 of this report. The tables are arranged in sequence according to classification groups of the common- and mixed-rock categories. For groups A through F_1, each table lists the analyses by States, in alphabetical order, and contains all the analyses in the group. For group F_2, which contains several hundred analyses, the analyses for each State are given in a separate table. Each group in the special-rock category is in a separate table.

The user should note that the published analyses, despite their large number, are probably not truly representative of the composition of all sedimentary rocks of the region. Most of the analyzed rocks were selected because they are (or were thought to be) of special economic interest and are, hence, probably of rather unusual chemical composition. For example, limestone that contains 95 percent or more

$CaCO_3$ is grossly overrepresented in the published analyses; natural limestone analyses show a wide range in $CaCO_3$. But this geochemically unrepresentative or biased nature of the published analyses does not necessarily detract from the potential usefulness of these analyses for other purposes. Carbonate rocks of unusual purity were specially selected for analysis, which affords the potential manufacturer of lime, industrial fluxes, and other mineral commodities valuable information on localities where the best source materials for his particular purpose can most readily be obtained.

TYPES OF SAMPLES

Sedimentary, metamorphic, and igneous rocks.—The dividing line between sedimentary and metamorphic rocks is not a sharp one in nature, and some authors do not always clarify where a given analyzed sample lies in relation to this line. In this report, the usage of the individual author was followed wherever possible. Slightly altered rocks are generally included; considerably altered rocks are not. An "altered" rock is included if the "alteration" is interpreted to be due primarily to sedimentary or diagenetic processes, rather than to metamorphic or hydrothermal processes. In general, Precambrian sedimentary rocks have been greatly modified by pressure, heat, and circulating fluids; only those that seem from the description to have been slightly modified are included. If a sample is part of a series (as an igneous rock and its weathered and partly weathered products), the complete series or representative samples from the complete series are included. "Marble" is sometimes applied as a trade name to any carbonate rock that will take high polish, and for this reason analyses of some rocks called marble are also included. Analyses of some rocks of doubtful origin, or ones that have undergone an unknown amount of metamorphism, are included if the rock is of special economic interest.

Washed and purified samples.—Analyses of washed and purified samples are included if no more than 10 percent of the material was removed during the processing.

Weathered samples.—Analyses of weathered samples are included if the samples are parts of related suites—for example, the original rock, its partly weathered product, and the resulting soil. Also, analyses of redeposited weathered material are included, but unless the samples are a part of related suites, as above, analyses of weathered material at its source are not included.

Coal and oil-shale samples.—Coal analyses are generally excluded; however, analyses of coal and oil shale are included if analyses of the ash are also available. If the number of such analyses is large, a selection of representative analyses is given.

Pure samples.—Analyses of hand-picked samples of a certain color or of "pure" composition are not included. Analyses of samples thought to be representative of a part of a formation or a member are included.

Concretions and nodules.—Concretions and nodules may be typical of some formations or they may be of scientific interest. Analyses of such samples are included.

ANALYSES OF SAMPLES

Completeness.—No selection based on the known or inferred quality of the analyses was made except that the totals be in the range from 95 to 102.5 percent. Selection and grading of analyses based on quality and completeness are left to the reader. A few analyses are included that do not precisely meet the standards outlined above—that is, if the sample is part of a related suite, is the only one of a given formation, is of particular economic or scientific interest, or contains constituents not commonly determined, or if the sample information includes a spectrographic analysis. If a large number of incomplete analyses include complete spectrographic analyses, a few of these incomplete analyses were selected to show the upper and lower limits of various constituents in both the chemical and the spectrographic analyses.

No grading was made of the analyses into categories of superior, good, and fair. The date of original publication of the analyses affords the user a general means by which the reliability of such analyses might be appraised, and, where available, the analyst's name gives additional basis by which the quality of the work may be judged. A critical selection of truly superior analyses can probably best be made after the present, more inclusive compilation has become available.

Insoluble residues.—An analysis that records more than 25 percent of the rock as insoluble in acid, and that does not report SiO_2 separately, is not included.

Totals.—In general, an analysis is used if the total is within the range of 95 to 102.5 percent. In some analyses the percentage of a readily calculated constituent that had not previously been determined brings the total within these limits. For example, in some limestone and dolomite analyses, CO_2 was not determined, and the analysis total is accordingly too low to meet the 95-percent criterion. However, analyses of limestone and dolomite are included if the CO_2 calculated from the determined CaO and MgO brings the total within the 95-percent limit. If the total is not in the source reference, the amount has been added, in brackets, by the compilers.

Sample location.—Sample locations for Idaho, Oregon, and Washington are given by the township and range system. Only analyses that contain reasonably adequate information concerning locality are included. In Alaska, however, at the time the compilation was made, vast areas were not covered by the township and range system. A coordinate system, as set forth by Cobb and Kachadoorian (1961), was used on maps of the Alaska Reconnaissance Topographic Series. A few of the new Alaska Topographic Series maps were used, and coordinates of these maps and the older ones should be reasonably comparable.

The coordinates are given in brackets. The first number is the perpendicular distance, in inches, from the west boundary of the map to the sample location. The second number is the distance from the southwest corner of the map along the west boundary to its intersection with the perpendicular from the location. If only a general location is given for the sample, the coordinates include the extreme limits of the area.

EXPLANATION OF TERMS AND ARRANGEMENT OF TABLES

References.—Analyses utilized in this study were obtained mostly from readily available publications. In the descriptive notes of an individual table, the underscored page number given in the reference indicates the page on which the analysis is found in the cited report. If more than one reference is given for an analysis, the first given is generally the reference from which the analysis is taken. References other than the first supply additional information on the descriptive notes or on the analysis itself.

Many analyses are published and republished over the years. Most of these analyses are quoted exactly, but some are not consistent in constituents and amounts when republished. These inconsistencies may reflect the interpretation of a later author, or they may simply be the result of typographical errors. In either case, the reader's attention is called to the discrepancy by the statement: "Minor discrepancies occur in naming of constituents and in their amounts when more than one version of the analysis is found in the literature."

Identification numbers and code numbers of analyses.—Each analysis is assigned two numbers. The first is an identification number that serves to relate the analysis and the sample description in the tables. These identification numbers run in sequence through each table. An asterisk preceding this number indicates that the sample is in the mixed-rock category. (See p. 2.) The second number is a code that identifies the sample in permanent files and gives some information on the locality and rock type represented by the analysis. This number appears only in the column headings of the analytical tables. The code number 36D3–19, for example, is translated as follows:

36	Oregon. (See p. 6 for State codes.)
D	Clay group (See p. 2 for definition of groups.)
3	Clackamas County. (See p. 7 for county codes.)
19	Position of analysis in sequence of analyses from county.

Lithology.—The rock name given to a sample is that used in the original reference. Where the reference gives no name, or where the compilers thought there was some doubt as to the accuracy of the name, a name was supplied on the basis of either the position of the analysis in the classification system or the compilers' interpretation of the original publication. The name supplied by the compilers appears in brackets and is followed by the name, if any, given in the reference.

Treatment of stratigraphic nomenclature.—Because the stratigraphic nomenclature used in this report is from many published sources, the names and ages do not necessarily reflect the latest usage of the U.S. Geological Survey. The age and formation of each sample are given in the descriptive notes as reported in the published source of the analysis, unless the reported assignment is so out of date as to be misleading and better information could be conveniently obtained. The age is not repeated if more than one analysis of the same formation appears on the same page. For some of the analyses, age and the stratigraphic unit are not known because of complex structure or because the area has not been fully investigated.

Chemical analyses.—The lists of constituents in the tables were simplified as much as possible by the use of footnotes to indicate such information as: (1) the entry shown as SiO_2 was reported in the original published analysis as insoluble matter, (2) the figures for CaO and MgO are derived from an original analysis in which $CaCO_3$ and $MgCO_3$ were reported, or (3) an oxide figure was calculated from an original report of the element if the element amounted to more than 0.05 percent. The analyses are thus brought into a superficially similar form.

Minor elements such as arsenic, vanadium, and selenium were determined chemically for a few samples that were also analyzed spectrographically. Analyses for such minor elements are listed with the spectrographic analysis and are identified as chemical determinations by means of a footnote.

Spectrographic analyses.—Spectrographic analyses of minor constituents are given only for those samples for which chemical analyses of major constituents are also available. Some incomplete chemical analyses have been included if a spectrographic analysis is available; and if a great many incomplete chemical analyses and accompanying spectrographic determinations are available, a selection was made. The methods of spectrographic analysis and the constituents looked for vary considerably from one laboratory to another, and no attempt was made to evaluate the spectrographic data. The elements are in order by atomic weight.

Mineralogy.—The word "mineralogy," as used in this report, indicates that information on the mineralogy of the sample is available in the original publication.

Nil, None, Trace.—The words "nil," "none," "trace," and "slight trace" and similar terms are used in accordance with the original publications. These terms may have different meanings to different chemists, and it thus seemed unwise to attempt reduction to a more nearly uniform nomenclature.

Punctuation and footnotes.—Additional information not available in the original publication, but relating to the locality, formation, or rock name, is in brackets if it was supplied by the compilers. Information supplied by others is cited as written or oral communication. Parentheses are used in the tables of analyses to indicate those amounts not included in the total; a footnote for such amounts gives further information. Each set of facing pages with chemical analyses and accompanying descriptive notes is considered as a unit, and the footnotes, numbered accordingly, apply only to that unit.

Reported use of rock.—Generally, the information on the actual or potential economic use is given only if it is stated in the original publication. No effort was made to equate the different terms used nor to bring the information up to date.

MAGNETIC TAPE

Description of magnetic tape.—During the process of compilation, increasing use was made of computer technology to assemble the data, to make the calculations necessary for classification of the analyses, and to arrange the material for publication. The basic data are recorded on a magnetic tape in two parts: (1) Professional Paper 561 (Hill and others, 1967) and (2) this report. The data in this form can be useful to individuals or companies who seek information on the occurrence of rocks of particular chemical composition or to scientists who are concerned with broad geochemical problems of sedimentary rocks. A computer program for searching the tape and selectively retrieving data has been described (Roberts, 1971).

The magnetic tape includes the chemical analyses and related information, such as rock type, State, county, age, classification group, and use of the rock. For sample localities and detailed information, this compilation and Professional Paper 561 (Hill and others, 1967) must be seen.

CODES FOR PERMANENT NUMBERS ASSIGNED TO ANALYSES

Given in the following list are the code numbers of the States, of the quadrangles and other areas of Alaska, and of the counties in Idaho, Oregon, and Washington, respectively, represented by the sample data in this report.

STATE CODES

50.	Alaska	36.	Oregon
11.	Idaho	46.	Washington

QUADRANGLE CODES

Alaska

1.	Adak
5.	Anchorage
6.	Arctic
23.	Blying Sound
26.	Candle
29.	Chandler Lake
30.	Charley River
36.	Craig
40.	Dixon Entrance
42.	Fairbanks
52. 154. 155. 156.	Healy
55.	Howard Pass
57.	Icy Bay
61.	Juneau
66.	Kenai
68.	Killik River
70.	Kodiak
76.	Livengood
86.	Mount Fairweather
87.	Mount Hayes
88.	Mount Katmai
90.	Mount Michelson
95.	Nome
101.	Petersburg
105.	Port Alexander
109.	Rat Islands
114.	St. Michael
115.	Sagavanirktok
124.	Sitka
125.	Skagway
145.	Umnak
151.	Wainwright

MISCELLANEOUS CODES

Alaska

102.	Pribilof Islands	160.	Offshore sediments

COUNTY CODES

Idaho

3.	Bannock
4.	Bear Lake
5.	Benewah
6.	Bingham
7.	Blaine
8.	Boise
9.	Bonner
10.	Bonneville
12.	Butte
15. 45.	Caribou
16.	Cassia
17.	Clark
18.	Clearwater
19.	Custer
21.	Franklin
23.	Gem
25.	Idaho
28.	Kootenai
29.	Latah
30.	Lemhi
31.	Lewis
35.	Nez Perce
36.	Oneida
40.	Shoshone
41.	Teton
42.	Twin Falls
44.	Washington

Oregon

1.	Baker
2.	Benton
3.	Clackamas
4.	Clatsop
5.	Columbia
6.	Coos
7.	Crook
8.	Curry
9.	Deschutes
10.	Douglas
12.	Grant
13.	Harney
15.	Jackson
16.	Jefferson
17.	Josephine
18.	Klamath
19.	Lake
20.	Lane

Oregon — Continued

21.	Lincoln
23.	Malheur
24.	Marion
26.	Multnomah
27.	Polk
28.	Sherman
29.	Tillamook
32.	Wallowa
33.	Wasco
34.	Washington
35.	Wheeler
36.	Yamhill

Washington

1.	Adams
2.	Asotin
3.	Benton
4.	Chelan
5.	Clallam
6.	Clark
7.	Columbia
8.	Cowlitz
9.	Douglas
10.	Ferry
13.	Grant
14.	Grays Harbor
15.	Island
16.	Jefferson
17.	King
19.	Kittitas
21.	Lewis
22.	Lincoln
23.	Mason
24. 40.	Okanogan
25.	Pacific
26.	Pend Oreille
27.	Pierce
28.	San Juan
29.	Skagit
30.	Skamania
31.	Snohomish
32.	Spokane
33. 41. 42. 43.	Stevens
34.	Thurston
36.	Walla Walla
37.	Whatcom
38.	Whitman
39.	Yakima

Table 1.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent uncombined silica (Group A), common- and mixed-rock categories

[Samples of mixed-rock category indicated by an asterisk (*). Chemical analyses arranged by county and stratigraphic position]

Chemical analyses

	Alaska	Idaho						Oregon				
	1	2	3	4	5	6	7	8	9	10	11	12
	50A155-150	11A9-8	11A9-9	11A15-9	11A18-11	11A29-56	11A29-57	36A9-2	36A9-3	36A9-4	36A9-1	
SiO_2	96.31	96.6	97.3	98.90	94.36	96.28	99.072	86.00	86.26	88.51	83.18	93.03
Al_2O_3	1.59	3.4	1.4	.37	3.08	1.97	.564	1.06	3.22	1.28	2.66	2.97
Fe_2O_3	.40		1.3	.17	.02	.036	.026	.92	1.54	1.28	1.46	1.67
FeO	.18	------	------	------	------	------	------	------	------	------	------	------
MgO	.07	------	------	------	.036	.02	.086	.09	Trace	.91	.35	.39
CaO	.23	------	------	.56	.10	.08	.025	.27	.05	1.06	.80	.89
Na_2O	.05	------	------	------	------	------	------	------	------	------	.48	.53
K_2O	.35	------	------	------	------	------	------	------	------	------	.14	.16
H_2O+	.05	------	------	------	------	------	------	7.60	4.94	5.15	4.50	------
H_2O-	.31	------	------	------	------	------	------				[1]6.26	------
TiO_2	.06	------	------	------	------	------	------	------	------	------	.16	.18
P_2O_5	.15	------	------	------	------	------	------	------	------	------	------	------
MnO	.00	------	------	------	------	------	------	------	------	------	------	------
CO_2	.04	------	------	------	------	------	------	------	------	------	.08	.09
SO_3	------	------	------	------	------	------	------	------	------	------	.10	.11
Cl	------	------	------	------	------	------	------	------	------	------	.02	.02
Total	99.79	[100.0]	[100.0]	[100.00]	[97.60]	[98.39]	[99.773]	[2]95.94	[3]96.01	[98.19]	100.21	[3][4]100.04
Class	93,6,0	93,7,0	93,6,0	98,1,0	89,9,0	93,6,0	98,2,0	83,12,1	79,17,0	85,11,4	77,21,0	------

	Oregon—Continued										
	13	14	15	16	17	18	19	*20	*21	*22	*23
	36A9-7	36A9-8		36A9-5		36A9-14	36A10-7	36A10-19	36A10-12	36A10-11	36A10-8
SiO_2	85.83	86.74	90.75	92.49	95.40	87.6	98	44.27	48.82	48.21	59.44
Al_2O_3	3.98	4.64	4.91	.89	.91	3.76	.2	None	------	[5]1.38	.41
Fe_2O_3	2.19	1.46	1.54	1.46	1.40	1.39	1	.62	.06		6.40
FeO	------	------	------	------	------	------	------	.13	------	------	------
MgO	.41	.37	.38	.46	.45	Present	------	8.99	18.49	19.90	16.27
CaO	1.25	.85	.88	.63	.65	1.3	.05	.16	------	------	1.11
Na_2O	------	.00	0	------	------	Present	------	------	------	------	[6]5.91
K_2O	------	.00	0	------	------	------	------	------	------	------	
H_2O+	------	[7]5.80	------	[7]3.08	------	------	------	8.39	------	6.63	------
H_2O-	[1]4.68	------	------	------	------	------	------	4.58	[8]9.26		
TiO_2	------	------	------	------	------	.16	.3	------	------	------	------
P_2O_5	------	------	------	------	------	------	.005	------	------	------	------
CO_2	[9].73	[9].40	------	[9]1.01	------	[10]4.10	[10]Small	------	[10]3.03	------	[10]1.00
MnO	------	------	------	------	------	------	------	------	------	------	[11].33
NiO	------	------	------	------	------	------	------	33.05	19.04	23.88	8.23
H_2SO_4	------	------	------	------	------	------	------	------	------	------	.30
H_3AsO_3	------	------	------	------	------	------	------	------	------	------	[12].60
Organic matter	------	------	------	------	------	[13].48	------	------	Trace	------	------
Total	99.07	100.26	[4]98.46	100.02	[4]98.81	[98.8]	[100]	100.19	98.70	100.00	100.00
Class	76,21,2	77,22,1	------	89,9,2	------	79,17,2	97,3,0	44,14,0	49,9,6	46,10,0	52,16,0

	Oregon—Continued											
	24	25	26	27	28	29	30	31	32	33	34	35
	36A13-3		36A15-17	36A23-1		36A23-2		36A23-3		36A23-6		36A23-9
SiO_2	84.48	92.45	89.46	83.82	91.75	82.64	92.59	85.52	94.51	82.84	91.92	87.58
Al_2O_3	3.66	4.00	3.40	3.74	4.09	3.20	3.59	2.60	2.87	3.18	3.53	4.72
Fe_2O_3	1.46	1.60	2.31	1.99	2.18	1.88	2.11	1.04	1.15	1.14	1.27	.42
MgO	.18	.20	.33	.30	.33	.38	.42	.17	.19	.23	.25	.56
CaO	.80	.85	.38	.58	.63	.64	.72	.48	.53	.38	.42	.76
Na_2O	.22	.24	------	.34	.37	.04	.05	.28	.31	1.12	1.24	.27
K_2O	.16	.18	------	.20	.22	.14	.15	.04	.04	.14	.16	
H_2O+	4.24	------	------	5.06	------	5.40	------	4.44	------	5.52	------	[14]5.64
H_2O-	[1]4.90	------	------	[1]3.72	------	[1]4.92	------	[1]4.72	------	[1]5.68	------	------
TiO_2	.26	.28	[15].71	.19	.20	.18	.20	.14	.15	.18	.20	------
CO_2	.05	.06	[10]3.32	.09	.10	.09	.10	.14	.15	.05	.05	Trace
SO_2	.06	.07	------	.10	.13	.06	.07	.09	.10	.69	.76	.05
Cl	.06	.07	------	None	None	None	None	None	None	.18	.20	None
NO_3	------	------	------	------	------	------	------	------	------	------	------	None
Organic matter	------	------	------	------	------	------	------	------	------	------	------	None
Total	100.53	[4]100.00	99.91	100.13	[4]100.00	99.57	[4]100.00	99.66	[4]100.00	101.33	[4]100.00	[100.00]
Class	76,22,0	------	81,17,1	75,23,0	------	75,23,0	------	80,19,0	------	76,22,0	------	79,20,0

See following page for footnotes.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1. Healy quadrangle. Probably Triassic. [Sec. 2, T. 17 S., R. 7 W., unsurveyed], about 2/3 mile north of town of Windy, adjacent to Alaska Railroad. Analyst, H. M. Hyman. Sample 100. (Moxham, Eckhart, and Cobb, 1959, p. 69, 95, pl. 11.) Chert, black; stratigraphic thickness about 60 ft. Sample, fresh chips collected at 5-ft intervals across width of outcrop. Index and geologic maps. Use: Cement.

Idaho

2. Bonner County. Precambrian, Belt [Supergroup], Revett Formation. [T. 55 N., R. 2 E.], few miles west of town of Clark Fork. (Carter and Savage, 1964, p. 177, 179.) Quartzite. Index map.

3. Bonner County. Cambrian, Gold Creek Quartzite. [T. 53 N., R. 2 W.], south end of Pend Oreille Lake. (Carter and Savage, 1964, p. 177, 180.) Quartzite. Index map. Possible use: Source of silica for local uses.

4. Caribou County. Ordovician, Swan Peak Quartzite. [T. 9 S., Rs. 41, 42 E.], Soda Springs, Monsanto Chemical Co. quarry. (Carter and Savage, 1964, p. 177, 179.) Quartzite. Index map. Use: Flux.

5. Clearwater County. NE¼ sec. 32, NW¼ sec. 33, T. 40 N., R. 11 E., Cedars-Kelly Creek area. Deposit I-7. (Carter, Kelly, and Parsons, 1962, p. 14-17, 19, 21.) Sandstone, light-gray-white. Representative sample from outcrop. Index maps. Possible use: Glass sand.

6, 7. Latah County. NE¼ T. 40 N., R. 1 W., and SE¼ T. 41 N., R. 1 W. Bovill deposit. (Carter, Kelly, and Parsons, 1962, p. 19, 20, 21.) Sand, decomposition product of granitic rock; bed ranges from few inches to more than 20 ft thick. Typical analysis, head sample. Mineralogy. Possible use: Industrial uses, glass.

Oregon

8-10. Deschutes County. Early to middle Pliocene, Deschutes Formation(?) [Pliocene, Madras Formation]. Center sec. 16, T. 14 S., R. 12 E., about 6 miles west of town of Terrebonne. Western Diatomite Co. (Boyle, 1921, p. 152-155; Stearns, 1931, p. 127, 133, 152.) Diatomite, compact, banded; maximum thickness 40 ft; overburden thin to 12 ft thick. Volume estimated. Index and geologic maps. Logs of test pits.

8. Analyst, L. V. Hampton. Use: Filtration.

9, 10. Use: Filtration, insulation.

11, 12. Deschutes County. Deschutes Formation(?) [Madras Formation]. Sec. 16, T. 14 S., R. 12 E., 6 miles west of Terrebonne. Atomite Corp. quarry. Analyst, E. T. Erickson. Lab. No. Y4. (Moore, 1934a, p. 3, 4, 10, 11-13; Moore, 1937, p. 21, 27, 28, 30-32, 108, 114, pls. 1, 4; Wells, 1937, p. 45.) Diatomite; white when dry, ivory yellow when wet; earthy, loosely consolidated; for most part massive; sample from bed 12.5 ft thick; overburden. Ridgway color notation. Reserves estimated. Index and geologic maps, detailed measured section, microscopic examination, photomicrograph. Use: Concrete admixture, filtration, insulation.

13-17. Deschutes County. [T. 14 S., R. 12 E.], 7 miles west of Terrebonne. Atomite Co. (Eardley-Wilmot, 1928, p. 102, 103, 108, pl. 14.) Deposit: Diatomite; interbedded with other sediments; beds 1-5 ft thick, maximum thickness 45 ft, averages 30 ft; overburden. Photomicrograph.

13. Use: Filtration [implied].

14, 15. (Moore, 1937, p. 116, 117.) Possible use: Filtration, insulation.

16, 17. (Moore, 1937, p. 116, 117; Mason, 1951, p. 9, 10.) Sample 18 in. thick. Large deposit. Index map. Possible use: Lightweight aggregate, filler, filtration, insulation.

18. Deschutes County. [T. 15 S., R. 13 E.], near town of Redmond. Analyst, Mary Fletcher. (Norman and Ralston, 1942, p. 361, 362.) Diatomite. Purification tests.

19. Douglas County. Post-Miocene(?) silicification and alteration of Oligocene and Miocene tuffs. Sec. 2, T. 28 S., R. 1 E., 35 miles east of town of Roseburg. Owners, Roy and Gerald Rannells. (Ramp, 1960, p. 109, 110, 112, 113, 114.) General: Silica rock, grayish-white, cryptocrystalline, tough, massive. Mineralogy. Thin-section description. Index and geologic map. Possible use: Chemical, metallurgical, refractories.

*20. Douglas County. Probably Miocene. SE¼ sec. 17, T. 30 S., R. 6 W., near town of Riddle. Analyst, K. J. Murata. (Pecora, Hobbs, and Murata, 1949, p. 13-16, 18, 20.) Garnierite, dark-green; crusts on wall of vug. Mineralogy, microscopic examination, bulk density 2.92. Ridgway color notation. Index maps. X-ray patterns and differential thermal analysis. *Analysis shows 33.0 percent NiO, 9.2 percent more MgO and CaO than required for carbonate.

Oregon—Continued

21, 22. Douglas County. Tertiary. Sec. 17, T. 30 S., R. 6 W., northwest of Riddle, Nickel Mountain. Owner, E. F. Adams. (Pecora and Hobbs, 1942, p. 205-207, 212, 213, 215, 222, 223, 225, 226, pls. 37, 38.) Garnierite, yellowish- to apple- to blue-green; soft, brittle when dry. Deposit: Layered blanket from few feet to 60 or 70 ft thick; averages about 20 ft thick. Tonnage estimated. Index and geologic maps. Possible use: Source of nickel.

*21. Analyst, A. Grunow. (Foullon, 1B92, p. 271, 272.) *Analysis shows 19.0 percent NiO; suggests 15.8 percent more MgO than required for carbonate.

*22. Analyst, Hood. (Mining and Scientific Press, 1882, p. 416.) *Analysis shows 23.9 percent NiO, suggests 19.9 percent more MgO than required for carbonate.

*23. Douglas County. [T. 30 S., R. 6 W.], west of Riddle, Big Piney Mountain. Analyst, A. R. Ledoux. (Ledoux, 1901, p. 185-188.) Nickel silicate. Possible use: Source of nickel. *Analysis shows 8.2 percent NiO; suggests 17.4 percent more CaO and MgO than required for carbonate.

24, 25. Harney County. Miocene and Pliocene (?), Payette Formation. NW¼ NE¼ sec. 34, T. 19 S., R. 36 E., 7 miles northeast of town of Drewsey. Diatomite Products Co. Analyst, E. T. Erickson. Lab. No. 91. (Moore, 1934a, p. 8, 9, 11, 12; Moore, 1937, p. 95, 97-99, 103, 104-106, 111, 114, pls. 1, 10, 11; Wells, 1937, p. 45.) Diatomite; white when dry, buff when wet; massive; sample from bed 8 ft thick. Little overburden. Ridgway color notation. Tonnage estimated. Index and geologic maps, detailed measured section, microscopic examination, photomicrograph. Possible use: Concrete admixture, filtration, insulation.

26. Jackson County. Probably post-middle Miocene. South-central part of sec. 19, T. 38 N., R. 3 E., east of town of Ashland, near Dead Indian Road. Field No. 44. (Wilson and Treasher, 1938, p. 1, 19, 24, 82, 84, 93.) Flint or chert; stained deep cream with iron oxide; conchoidal fracture. Index maps. Firing tests. Former use: Firebrick. Possible use: Silica brick.

27-34. Malheur County. Payette Formation. Harper district, Pacific Coast Diatom Corp. Analyst, E. T. Erickson. (Moore, 1934a, p. 6, 7, 10, 11, 12; Wells, 1937, p. 45.) Volume estimated. Index and geologic maps, correlated columnar sections, detailed measured section, microscopic examination, photomicrograph. Use: Cement admixture, filtration, insulation.

27, 28. W½ sec. 15, T. 18 S., R. 41 E. Lab. No. T3. (Moore, 1937, p. 68, 77-79, 87, 88, 89, 92, 94, 109, 114, pls. 1, 7, 8.) Diatomite; white when dry, buff when wet; compact; low apparent density; bed 8.5 ft thick. Ridgway color notation.

29, 30. N½ sec. 34, T. 18 S., R. 41 E. Lab. No. V2. (Moore, 1937, p. 68, 78, 80, 81, 87, 88, 89, 91, 92, 94, 109, 114, pls. 1, 7, 8.) Diatomite; white when dry; buff when wet; compact; low apparent density; bed 2 ft 11 in. thick. Ridgway color notation.

31, 32. NW¼ sec. 2, T. 19 S., R. 41 E. Lab. No. W4. (Moore, 1937, p. 68, 78, 81, 87, 88, 91, 92, 94, 110, 114, pls. 1, 8, 10.) Diatomite; white when dry, pale ivory yellow when wet; compact; low apparent density; 74.5 ft thick. Ridgway color notation.

33, 34. SE¼ SE¼ sec. 22, T. 19 S., R. 42 E. Lab. No. P4. (Moore, 1937, p. 68, 78, 83, 84, 87, 88, 91, 92, 94, 110, 114, pls. 1, 8, 10.) Diatomite; white when dry, pale buff when wet; compact, massive; low apparent density; 5.5 ft thick. Ridgway color notation.

35. Malheur County. Late Tertiary or Pleistocene. Portions of secs. 2-4, 9-11, T. 19 S., R. 41 E., and sec. 34, T. 18 S., R. 41 E., about 7 miles north of town of Harper. White Earth Products Corp. (Smith, 1932, p. 704, 707-710, 712-715.) Diatomite; conchoidal fracture; some bedding planes. Bulk density 1.25. Physical properties, index of refraction. Tonnage estimated. Index map, geologic sections. Possible general use: Abrasive, cement additive, filler, filtration, insulation, buildiug material, absorbent medium, chemical reagents.

Footnotes of analyses on preceding page:

[1] At 105° C.

[2] 99.96 percent in text.

[3] 100.00 percent in text.

[4] Reported as recomputed to a water-free basis.

[5] Iron and aluminum oxide.

[6] Undetermined, chiefly potash and soda.

[7] Above 105° C.

[8] At 120° F.

[9] Includes organic matter.

[10] Ignition loss.

[11] Reported as manganese peroxide.

[12] Reported as arsenious acid.

[13] Calculated from reported carbon.

[14] Combined water.

[15] Reported as TiO.

Table 1.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent uncombined silica (Group A), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington										
	36	37	38	39	40	41	42	43	44	45	46
	46A1-1	46A3-1	46A4-17	46A13-2	46A13-3	46A13-1		46A15-2	46A17-50	46A17-51	46A19-7
SiO_2	89.5	86.25	93.06	87.6	89.1	93.15	96.38	82.6	87.62	96.65	89.0
Al_2O_3	1.9	.62	4.30	1.2	2.0	1.04	1.08	3.9	7.59	.06	3.0
Fe_2O_3	1.3	.80	1.95	1.4	2.1	1.24	1.28	1.1	.73	.27	3.9
FeO	------	------	------	------	------	------	------	------	------	.63	------
MgO	------	.31	------	------	------	.31	.32	------	------	.22	------
CaO	------	.45	.13	------	------	.50	.52	------	.54	.63	------
$Na_2O + K_2O$	------	------	------	------	------	------	------	------	1.75	------	------
H_2O+	------	------	------	------	------	[1]3.09	------	------	------	[2]1.54	------
H_2O-	------	5.74	------	------	------	------	------	------	------	[3]Trace	------
Ignition loss	4.9	5.48	------	5.3	4.5	[4].41	------	11.5	1.18	------	4.4
Total	[97.6]	[99.65]	99.44	[95.5]	[97.7]	99.74	[5]99.58	[99.1]	99.41	[6]100.00	[100.3]
Class	85,13,0	84,14,1	83,17,0	84,12,0	83,15,0	90,9,1	------	74,25,0	73,24,0	96,2,0	79,21,0

	Washington—Continued									
	47	48	49	50	51	52	53	54	55	56
	46A19-8	46A19-9	46A19-10	46A19-11	46A19-12	46A19-2		46A27-3	46A28-16	46A32-9
SiO_2	88.7	88.3	91.1	89.6	90.5	86.60	93.07	98.11	90.21	89.5
Al_2O_3	2.3	3.9	1.3	2.9	2.0	2.62	2.82	.07	1.98	7.0
Fe_2O_3	3.1	2.9	2.0	2.1	2.0	2.58	2.77	.25	1.89	Trace
FeO	------	------	------	------	------	------	------	.64	1.75	------
MgO	------	------	------	------	------	.56	.60	.12	.81	.3
CaO	------	------	------	------	------	.57	.61	.22	.72	Trace
H_2O+	------	------	------	------	------	[1]5.08	------	[2].76	[2]1.73	------
H_2O-	------	------	------	------	------	------	------	------	[3].69	------
Ignition loss	5.4	4.8	5.1	4.2	3.6	[4].12	------	------	------	[7]2.8
Total	[99.5]	[99.9]	[99.5]	[98.8]	[98.1]	98.13	[5]99.87	[100.17]	99.78	99.6
Class	81,18,0	78,22,0	87,13,0	82,17,0	85,13,0	79,18,0	------	98,1,0	85,12,0	77,21,0

	Washington—Continued									
	57	58	59	60	61	62	63	64	65	66
	46A41-271	46A41-272	46A41-273	46A41-274	46A43-160	46A41-206	46A34-1	46A37-16	46A37-161	46A37-36
SiO_2	99.11	98.80	99.29	99.20	97.2	97.36	90.84	90.19	98	85.9
Al_2O_3	[8].63	[8].79	.39	.46	.03	1.48	1.85	1.92	------	5.6
Fe_2O_3	[9].072	[9].036	.099	.056	.054	.891	1.66	1.42	([10])	.8
FeO	------	------	------	------	------	------	1.72	2.08	------	------
MgO	.01	.01	Trace	Trace	.05	------	1.02	1.78	------	------
CaO	.02	.04	.07	.10	.05	.35	.65	.59	------	------
Na_2O	.02	.04	------	------	------	------	------	------	------	------
K_2O	.06	.06	------	------	------	------	------	------	------	------
H_2O+	------	------	------	------	------	------	[2]2.39	[2]1.53	------	------
H_2O-	------	------	------	------	------	------	[3]Trace	[3].97	------	------
TiO_2	------	------	.050	.070	------	------	------	------	------	------
Ignition loss	.04	.09	.08	.08	------	------	------	------	------	[11]5.9
Total	99.89	99.83	99.98	99.97	[97.4]	100.08	[12]100.13	[13]100.48	[98]	[98.2]
Class	98,2,0	97,20,0	98,1,0	98,1,0	97,0,0	94,6,0	86,11,0	85,11,0	98,0,0	75,23,0

[1] Above 105°C.

[2] Above 110°C.

[3] At 110°C.

[4] Reported as CO_2 and organic matter.

[5] Reported as recomputed to a water-free basis.

[6] 100.06 percent in text.

[7] Combined water, ignition.

[8] Iron and alumina.

[9] Not included in total.

[10] Reported as very little iron.

[11] Reported as 14.2 percent (Skinner and others, 1944, p. 31).

[12] 100.03 percent in text.

[13] 100.30 percent in text.

DESCRIPTIVE NOTES

[Underscored page nnmbers in reference indicate source of analysis]

Washington

36. Adams County. NE¼ sec. 25, T. 16 N., R. 30 E., about 11.8 miles east of town of Othello. Owner, G. W. Klephardt. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 20, 21, 22, 58, 65.) Diatomite, contains chert nodules; 10-15 ft thick; overburden at least 5 ft thick. Channel sample. Firing tests, physical properties, pH values. Index maps. Use: Formerly mined. Possible general use: Concrete admixture, filtration, heat insulation.

37. Benton County. Miocene. SE¼NW¼ sec. 15, T. 9 N., R. 26 E., 3.5 miles west of town of Kiona. (Glover, 1936, p. 38, 39, 40.) Diatomite, light-gray to pure-white, very fine grained; 20 ft thick. Possible use: Sound- and thermo-insulation, filtration, absorbent medium.

38. Chelan County. Late Cretaceous and Paleocene, Swauk Formation. SW¼ sec. 22, T. 22 N., R. 20 E. Browns silica sand quarry. Analysis 236-B. (Hodge, 1938c, p.3,22,100,104,105,107-111.) Sandstone, contains shale partings and ferruginous masses; about 100 ft thick; overburden. Index and geologic maps, geologic section. Use: Cement, steel foundry, molding sand.

39, 40. Grant County. T. 18 N., R. 23 E., 13-16 miles southwest of town of Quincy. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 21, 22, 23, 24, 65.) Firing tests, physical properties, index map. Possible use: Concrete admixture, filtration, heat insulation.

- 39. South-central part of sec. 9. Diatomite, contains chert nodules; bed 15 ft thick, overburden 1-8 ft. Channel sample from top of exposure, 0-3 ft.
- 40. S½ sec. 17. Diatomite; 10 ft thick; overburden 2-5 ft. Channel sample.

41, 42. Grant County. [About T. 18 N., R. 23 E.], near town of Burke, 2-4 miles east of Columbia River. Webley deposits. (Eardley-Wilmot, 1928, p. 104, 108; Moore, 1937, p. 116, 117.) Diatomite, contains nodules and ledges of flint, iron stain; from a few feet to at least 40 ft thick. Possible use: Filler, insulation.

43. Island County. SE¼ sec. 29, T. 29 N., R. 3 E., about 2.5 miles north of town of Maxwelton, Useless Bay. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 21, 27, 58, 65.) Diatomite. Physical properties, pH values. Index maps. Possible general use: Concrete admixture, filtration, heat insulation.

44. King County. Eocene, Kummer Series. N½NW¼ sec. 28, T. 21 N., R. 6 E., about 5 miles north of town of Enumclaw. Brooks farm. Analysis 161-A. (Hodge, 1938c, p. 3, 22, 129, 133, 140, 144; Wilson and others, 1942, p. 32.) Sand, overburden 10-15 ft of gravel. Index maps, detailed measured section. Possible use: Glass, molding sand.

45. King County. Sec. 28, T. 21 N., R. 7 E., Cumberland station. Eureka Coal Co. quarry, abandoned. Analyst, R. W. Thatcher. (Shedd, 1903, p. 65-67, 134, 136, 138, 141.) Sandstone, light-colored, uniform color and texture, medium-grained, firmly cemented; contains small seams of carbonaceous material and occasional iron nodules; 250 ft exposed. Mineralogy. Bulk density 2.628. Physical properties. Former use: Dimension stone.

46 - 48. Kittitas County. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 21, 27, 30, 58, 65.) Firing tests. Index maps. Possible general use: Concrete admixture, filtration, heat insulation.

- 46. W½ sec. 14, T. 15 N., R. 19 E., 13.8 miles north of town of Yakima, east of Roza station. Diatomite, some chert nodules; 10 ft exposed; overburden 5.75 ft thick. Channel sample. Physical properties, pH values.
- 47. NE¼ sec. 17, T. 15 N., R. 19 E., about 1.5 miles west of Roza station. Diatomite, 4 ft exposed; overburden 7 ft. Channel sample.
- 48. Sec. 10, T. 15 N., R. 20 E., about 16.2 miles south of town of Kittitas. Diatomite, contains chert nodules; 10 ft exposed.

49 - 51. Kittitas County. Sec. 15, T. 15 N., R. 20 E., 17.2 miles south of Kittitas. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4,21,27-29,30,58,65,76,80.) Firing tests, physical properties. Index maps. Possible general use: Concrete admixture, filtration, heat insulation.

- 49. Diatomite; 10-20 ft thick. Channel sample.
- 50. Diatomite, iron-stained. Photomicrographs, pH values.
- 51. Diatomite, pH values.

Washington—Continued

52, 53. Kittitas County. [T. 15 N., R. 20 E.],7 miles east of town of Roza, Kittitas Diatomite Co. (Eardley-Wilmot, 1928, p. 103, 108, 124, pl. 14; Moore, 1937, p. 116, 117.) Diatomite; yellow tinge when wet; contains yellow-green banded flint seams near top; deposit 8-15 ft thick; overburden. Photomicrograph. Possible use: Filler, insulation.

54. Pierce County. Eocene and Oligocene, Puget Group. NE¼ sec. 27, T. 19 N., R. 6 E., 1 mile north of Wilkeson. Walker Cnt Stone Co. quarry. Analyst, R. W. Thatcher. (Shedd, 1903, p. 68, 69, 70, 134, 136, 138, 141; Hodge, 1938c, p. 3, 129, 139, 142, 143, 144.) Sandstone, light-gray, coarse-grained; in three beds each 20 ft thick. Bulk density 2.649-2.652. Mineralogy. Physical properties. Index maps. Use: Pulp and paper industry, dimension stone. Possible use: Glass.

55. San Juan County. Cretaceous. [T. 38 N., R. 2 W.], Sucia Island. Analyst, R. W. Thatcher. (Shedd, 1903, p. 56, 72, 73, 136, 138, 141.) Sandstone, dark-brown, medium-grained, well-cemented. Bulk density 2.642. Mineralogy. Physical properties. Use: Dimension stone.

56. Spokane County. Sec. 1, T. 23 N., R. 44 E., town of Freeman. Washington Brick, Lime, and Sewer Pipe Co. No. 222. (Glover, 1941, p. 231, 233, 241, 348, 350, 351.) Kaolin(?), very sandy. Index and geologic map, generalized geologic section.

57 - 60. Stevens County. Lower Cambrian, Addy Quartzite. SE¼NW¼ and NW¼SW¼ sec. 13, T. 29 N., R. 39 E., 5.5 miles southwest of town of Springdale. Lyons Hill deposit. (Ladoo, 1948, p. 13, 33-35, 36.) [Sandstone] quartzite, white to grayish-white, some iron stain, friable, thin- to thick-bedded; 500 ft thick, little overburden. Mineralogy, thin-section description. Screen analysis. Tonnage estimated. Index map.

61. Stevens County. Secs. 22, 27, T. 31 N., R. 39 E., north slope of Lane Mountain. Deposit W-30. (Carter, Kelly, and Parsons, 1962, p. 43-45.) Sandstone, gray to yellowish-gray, friable; composite of three samples. Index maps.

62. Stevens County. NE¼NE¼ sec. 28, T. 32 N., R. 40 E., southwest of town of Chewelah. Waterman quartz sand pit. Analysis 246-B. (Hodge, 1938c, p. 3, 10, 15, 22, 31, 58-60, 63.) Sand, light-tan, fine-grained; uniform in grain size; mineralogy; overburden 0-1.5 ft or more. Tonnage estimated. Index and geologic maps, detailed measured section.

63. Thurston County. Eocene. Sec. 19, T. 16 N., R. 1 W., town of Tenino. Tenino Stone Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 57-61, 134, 136, 138, 141.) Sandstone, fine-grained, massive. Bulk density 2.861. Mineralogy. Physical properties. Use: Dimension stone.

64. Whatcom County. Eocene, Chuckanut Formation. Secs. 13, 24, T. 37 N., R. 2 E., about 3 miles south of town of Fairhaven. Chuckanut quarries. Analyst, R. W. Thatcher. (Shedd, 1903, p. 62-65, 136, 138, 141.) Sandstone, bluish-gray, fine-grained, well-cemented; about 40 ft thick. Bulk density 2.727. Mineralogy. Physical properties. Use: Dimension stone, ornamental stone.

65. Whatcom County. Chuckanut Formation. NW¼ sec. 17, T. 40 N., R. 5 E. (Glover, 1936, p. 96.) Conglomerate, contains many quartz pebbles; 80 ft thick. Possible use: Source of silica.

66. Whatcom County. SE¼ sec. 30, T. 38 N., R. 8 E., about 2 miles west of Baker Lake. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 21, 31, 58, 66.) Diatomite, auger sample. Firing tests, physical properties, pH values. Index maps. Possible general use: Concrete admixture, filtration, heat insulation.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories

[Samples of mixed-rock category indicated by an asterisk (*). Chemical analyses arranged by State, quadrangle or county, and stratigraphic position]

Chemical analyses

	Alaska												
	1	2	*3	4	5	6	7	8	9	10	11	12	13
	50B1-1	50B5-3	50B5-4	50B5-6	50B6-1	50B6-3	50B6-4	50B6-5	50B23-1	50B23-4	50B26-1		50B30-5
SiO_2	62.61	60.17	55.2	40.4	58.97	60.62	64.86	62.07	55.64	50.74	60.08	65.29	54.80
Al_2O_3	16.50	16.02	17.2	9.4	17.0	18.4	15.7	17.3	14.01	14.63	16.53	17.96	------
Fe_2O_3	2.90	1.29	3.1	3.0	2.57	4.30	5.01	3.79	6.66	7.27	7.60	8.26	26.68
FeO	2.31	5.14	4.2	------	------	------	------	------	------	------	.84	.91	------
MgO	2.46	3.17	3.7	1.1	2.40	2.65	3.22	3.17	3.76	3.36	1.05	1.14	2.66
CaO	4.82	2.33	7.4	8.2	1.89	.038	.10	.18	5.91	7.88	.51	.55	4.85
Na_2O	3.82	2.22	3.4	1.6	1.06	1.10	1.16	1.14	5.92	5.54	1.98	2.15	------
K_2O	1.66	2.72	1.0	.94	2.15	3.26	3.49	3.85			2.90	3.15	------
H_2O+	1.68	3.78	.24	------	------	------	------	------	------	------	------	------	------
H_2O-	.31	.64	.93	------	------	------	------	------	------	------	------	------	------
TiO_2	.68	.73	.74	------	.26	.23	.23	.27	.75	.79	.89	.97	------
P_2O_5	.31	.29	.30	------	------	------	------	------	[1].18	[1].17	------	------	------
MnO	.17	.15	.16	------	------	------	------	------	------	------	------	------	------
SO_2	------	------	1.5	------	------	------	------	------	------	------	------	------	------
S	------	.00	.60	------	.80	------	------	------	------	------	------	------	------
Cl	.11	------	------	------	------	------	------	------	------	------	------	------	------
F	.02	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	------	[2].77	[2]None	[3]36.6	9.96	4.60	4.18	4.83	[4]7.17	[4]9.72	[5]8.0	------	6.32
Total	100.36	[6]99.42	99.7	101.2	[7][97.1]	[7][95.2]	[7][98.0]	[7][96.6]	[100.00]	[100.10]	100.4	100.38	95.31
Class	30,54,0	30,52,2	21,55,0	20,61,17	26,58,8	23,65,0	31,58,0	27,61,0	23,58,4	17,61,9	22,68,3	------	25,63,0

	Alaska—Continued												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	50B 42-2	50B 42-6	50B 42-3		50B 52-47	50B 155-114	50B 155-115	50B 155-116	50B 52-233	50B 154-119	50B 154-120	50B 154-123	50B 156-115
SiO_2	68.52	66.09	59.5	64.3	69.3	62.4	64.2	62.9	74.0	80.0	64.4	77.6	68.0
Al_2O_3	12.19	14.24	12.9	13.9	14.7	14.8	16.8	17.9	6.60	3.32	6.44	4.73	16.6
Fe_2O_3	3.05	4.15	.8	.9	3.8	4.8	5.7	6.0	3.35	3.08	3.16	2.67	6.0
FeO	2.27	1.71	6.0	6.4	------	------	------	------	------	------	------	------	------
MgO	2.14	1.94	1.3	1.4	.80	1.9	1.3	1.3	1.75	1.4	1.7	.7	.14
CaO	2.60	2.32	3.0	3.2	.72	3.8	.72	1.0	2.1	4.3	9.8	5.8	1.4
Na_2O	2.01	1.93	3.2	3.4	.92	.85	.94	.84	------	------	------	------	[8].26
K_2O	1.88	1.98	5.6	6.1	2.6	2.2	2.4	2.7	2.65	------	------	------	
H_2O+	2.58	3.15	------	------	------	------	------	------	------	------	------	------	------
H_2O-	.70	.82	------	------	------	------	------	------	------	------	------	------	------
TiO_2	.86	.91	Present	Present	------	------	------	------	------	------	------	------	------
P_2O_5	.35	.23	------	------	.11	.14	1.4	.13	------	------	------	------	.28
MnO	.08	.08	------	------	------	------	------	------	------	------	------	------	------
SO_2	------	------	------	------	.99	------	------	------	.01	1.29	2.41	1.90	.22
Organic matter	[9].65	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	[2].06	[2].02	[5]7.3	------	5.4	7.9	5.9	6.6	------	------	------	------	3.8
Total	[10][99.94]	[99.57]	99.6	99.6	[99.3]	[98.8]	[99.4]	[99.4]	[90.5]	[93.4]	[87.9]	[93.4]	[96.7]
Class	44,44,0	36,52,0	36,41,8	------	39,53,2	31,56,6	28,64,1	24,68,1	59,28,7	71,17,9	49,27,18	66,21,9	32,62,0

	Alaska—Continued												
	27	28	29	30	31	32	33	34	35	36	37	38	39
	50B 156-116	50B 156-117	50B 156-118	50B 156-119	50B 155-153	50B 155-154	50B 155-155	50B 155-156	50B 155-157	50B 156-113	50B 156-114	50B 155-152	50B 156-120
SiO_2	69.0	72.2	69.8	70.0	77.30	70.59	70.91	64.86	64.58	70.2	76.2	70.31	74.4
Al_2O_3	16.6	12.4	16.2	15.0	9.58	13.37	13.73	16.63	16.37	12.9	12.2	15.94	13.9
Fe_2O_3	6.0	4.2	5.0	4.8	5.41	6.43	6.09	6.71	5.07	4.9	4.0	4.06	4.9
MgO	.43	.36	.43	.58	2.51	2.72	2.40	1.76	4.56	.21	.36	2.93	.21
CaO	.8	2.0	.8	.6	.90	.51	.40	1.59	1.66	4.0	1.6	.41	1.0
Na_2O	[8].34	[8].40	[8].58	[8].70	.65	.71	.46	2.53	1.16	[8].82	[8].76	.28	[8].84
K_2O					.43	.57	.37	.61	.72			.21	
P_2O_5	.16	.13	.32	.39	------	------	------	------	------	.28	.26	------	.30
SO_2	.21	.28	.20	.21	.55	.30	.35	.12	.10	.20	.21	.67	.21
Ignition loss	4.2	6.4	4.6	4.8	2.21	4.20	4.75	4.58	5.25	4.4	4.8	4.85	3.8
Total	[97.7]	[98.4]	[97.9]	[97.1]	[99.54]	[99.40]	[99.46]	[99.39]	[99.47]	[97.9]	[100.4]	[99.66]	[99.6]
Class	33,63,0	46,48,4	36,60,0	38,57,0	54,40,0	40,55,0	40,56,0	28,65,0	30,61,0	42,51,0	50,46,2	38,58,0	44,53,0

[1] Reported as P_2O_3.

[2] CO_3.

[3] Includes ignition loss due to oxidation of FeO.

[4] Reported as loss, CO_2, H_2O, organic.

[5] Sample dried at 110°F. Ignition loss includes organic matter, small amount of CO_3, H_2O, and sulfur.

[6] Contains some organic matter.

[7] All elements determined spectrochemically except Ca, Na, and K, which were determined by flame photometer and SiO_2 which was determined gravimetrically. Sample dried at 110°C.

[8] NaCl + KCl; by gravimetric determination.

[9] Calculated from reported total C.

[10] Sample dried at 110°C.

Spectrographic analysis

[Looked for but not detected: Cr, Zn, Pd, Pt, Bi]

	1
Be	0.000x
B	.003
V	.008
Ni	.006
Co	.001
Cu	.008
Ga	.002
Sr	.08
Zr	.01
Ba	.08
La	.002
Pb	.01

Minor elements and compounds

[Determined by using Morgan soil-testing system]

	3
B	Trace
Cl	Trace
Cu	Low
Zn	Trace
As	None
Mo	None
Hg	Trace
Pb	None
NO_3	None
NH_4	None

Spectrochemical analyses

[Values in ppm. ND = not detected (less than 1 ppm); e = extrapolated valne]

	5	6	7	8
V	e845	111	157	e232
Cr	408	91	16	61
Mn	142	430	675	1090
Ni	e159	e305	e202	e189
Co	6.0	14	27	26
Cu	134	51	34	87
Zn	e1680	e2810	e2630	e2920
Ga	8.2	18	15	27
Mo	5.2	ND	4.1	3.4
Sr	172	45	34	49
Sn	.35	2.8	2.5	3.4
Ba	1310	1540	2100	2130

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1\. Adak quadrangle. Pleistocene or Holocene. [About 9.3, 11.5], Kanaga Island. Analysts, A. C. Vlisidis, W. W. Brannock; spectrographic analyst, K. J. Murata. Specimen 46AC130. (Coats, 1952, p.487,488,492, 498,502,pl.2.) Andesite tuff or pumice, yellowish-gray, 1-2 ft thick. Mineralogy. Index maps. Norms, Niggli numbers, Niggli-Becke plots, triangular diagrams.

2\. Anchorage quadrangle. Early and Late Cretaceous, Matanuska Formation. [Sec. 16, T. 19 N., R. 4 E.], near mouth of Kings River, Knik Arm area, roadcut. Analyst, H. M. Hyman. (Eckhart and Plafker, 1959, p.9,35,36, 38,40,41,47-51,53-55,pl.7.) Shale, black, massive; locally few thin beds of graywacke. Mineralogy, thin-section description. Little overburden. Tonnage estimated. Index and geologic maps, geologic section. Firing tests, physical properties. Possible use: Lightweight aggregate.

*3. Anchorage quadrangle. Holocene. [T. 13 N., R. 3 W.], Anchorage. Analysts, F.S. Borris, Katrine White, H.F. Phillips. Minor element analyst, Paul Martin. (Wilcox, 1959, p.423,458,pl.55,fig.63.) Ash, 1/8-1/4 in. thick. Index map. *Analysis shows 4.2 percent FeO, 4.4 percent alkalies, 1.5 percent SO_3; MgO and CaO not calculated as carbonate.

4\. Anchorage quadrangle. Holocene. [Sec. 8, T. 17 N., R. 1 W.], west end of Lucile Lake, Knik Arm area. Analysts, E.A. Nygaard, S.M. Berthold. Auger hole 1; sample 7. (Moxham and Eckhart, 1956, p.3,6,8,14,17,19, pl.1.) Calcareous silt, dark-gray; depth 6 ft. Tonnage estimated. Index and geologic maps, columnar section. Possible use: Portland cement. [For another analysis from same auger hole, see sample 1, group F_1.]

5\. Arctic quadrangle. Permian and Triassic, part of undifferentiated Sadlerochit and Shublik Formations. [About 3.1, 13.7], north side of Porcupine Lake, Brooks Range. (Ugolini, Tedrow, and Grant, 1963, p.115-118,119-122.) Shale, black, massive. Mineralogy, pH values. C/N ratios, differential thermal analyses, cation-exchange capacity.

6 - B. Quadrangle, formation, reference, remarks as in sample 5. [About 3.6, 14.0], 1 mile north of eastern tip of Porcupine Lake. Shale, black.

9, 10. Blying Sound quadrangle. Holocene. Analyst, Willard Woodstock. (Tyler, 1931, p.12-15,16-20.) Mud, bottom sample; contains pebbles; fossiliferous. Mineralogy. Index maps.

  9\. Lat 59°38' N., Long 148°09' W., off southern Alaska coast. Depth of water 330 ft.

  10\. Lat 59°34' N., Long 148°32' W., off sonthern Alaska coast. Depth of water 336 ft.

11, 12. Candle quadrangle. Holocene. [0.0-0.6, 14.65-16.1], Candle Creek. Analysts, J.R. Keistler, T.C. Bruce, M.M. Moore, W.L. Hicks. (Taber, 1943, p. 1438, 1472, 1474, 1475, 1477-1480.) Silt. Mineralogy. Mechanical analysis. Index map.

  11\. [Calculated by compilers to include ignition loss.]

  12\. Analysis as reported in text, average of two or more determinations.

13\. Charley River quadrangle. Precambrian, Tindir Group. [About 20.1-22, 0.4-0.9], bank of Tatonduk River. Analyst, J.G. Fairchild. Sample 30AMt115. (Mertie, 1933, p.347,350,369,376-378,pl.7.) [Iron-bearing rock] brownish-red, hematitic, fine-grained; beds from 1 in. to 1 ft thick; deposit 36 ft thick. Mineralogy. Index and geologic maps.

14, 15. Fairbanks quadrangle. Quaternary. T. 1 S., R. 2 W., 10 miles west of town of Fairbanks. (Péwé, 1955, p.709,710,712,723,pl.1.) Index map.

  14\. [Probably] sec. 5, Eva Creek. Analysts, Israel and Charlotte Warshaw, S. M. Berthold. Sample 201. Silt. Mineralogy.

  15\. Sec. 8, Ester Island. Analyst, R. H. Stokes. Sample 158. Silt, uniform texture; 180 ft exposed. Cumulative frequency curve.

16, 17. Fairbanks quadrangle. Pleistocene, Kowak Clay or Yukon Silts. [T. 2 N. T. 2 S., R. 1 E.-R. 7 W.], Goldstream Creek, Fairbanks area. Analysts, M.D. Armstrong, Harold Hutto. (Taber, 1943, p.1438,1454,1467,1471, 1472,1474,1475,1478-1480,1484.) Silt, bedded, fossiliferous. Mineralogy. Mechanical analysis. Index maps; generalized section.

  16\. [Calculated by compilers to include ignition loss.]

  17\. Analysis as reported in text, average of two or more determinations.

18 - 21. Healy quadrangle. Devonian. Analysts, A. C. Vlisidis, Leonard Shapiro. (Moxham, Eckhart, and Cobb, 1959, p.69, 92, 93, 94, pl. 11.) Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

  18\. [About 6.75-7.35, 7.5-7.7], south side of West Fork, Windy Creek area. Lab. No. 1916C. Argillite, brown to black; 140 ft thick.

  19\. [7.4-7.8, 7.9-8.1], gully of Windy Creek. Lab. No. 1937C. Argillite, brown to black; outcrop 400 ft thick; little overburden.

  20\. [7.4-7.8, 7.9-8.1], gully of Windy Creek. Lab. No. 1938C. Argillite, brown to black; outcrop 100 ft thick; little overburden.

  21\. [7.4-7.8, 7.9-8.1], along upper valley slopes on north side of Windy Creek. Lab. No. 1939C. Shale, black; and slaty argillite; 100 ft thick.

22 - 25. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8,17, T. 17 S., R. 7 W., unsurveyed], Mount McKinley National Park. Northern Empire Development Co. Analyst, H.E. Peterson. (Rutledge and others, 1953, p.4, 91,93,97-99,106,112,123,figs.1,3,35,36,38,39,41.) Index and geologic maps, geologic section, log of drill hole. Possible use for deposit: Cement.

  22\. Drill hole 6. Shale, black, very soft; depth, 235-250 ft. Depth of diamond-drill hole 265 ft. [For other analyses from same drill hole, see samples 54-58, group F_1; samples 337-379, group F_2.]

  23 - 25. Drill hole 9. Depth of diamond-drill hole 620 ft. [For other analyses from same drill hole, see samples 4, 5, group C; sample 14, group E; samples 62, 63, group F_1; samples 492-608, group F_2.]

    23\. Shale, black, and light-gray limestone; depth 610-620 ft.

    24\. Limestone, black, silicified; depth 580-585 ft.

    25\. Quartzite, gray, fine-grained, and dark-gray limestone containing calcite veinlets; depth 565-570 ft.

26 - 30. Healy quadrangle. Jurassic. [Sec. 12, T. 17 S., R. 7 W., unsurveyed], near Cantwell, roadcut. Samples 660, 662, 663, 665, 666. (Warfield, 1962, p.3,12,13,20,22,25.) Shale, black. Channel sample, 50 ft in length. Index and geologic maps. Possible use: Portland cement, mineral wool.

31 - 35. Healy quadrangle. Jurassic (?). [Sec. 17, T. 17 S., R. 7 W., unsurveyed], about 4 miles southwest of Windy. Collector, R. E. Fellows. (Moxham, Eckhart, and Cobb, 1959, p.69,92,93,94,pl.11.) Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

  31\. Lab. No. 10372. Sandstone, dark-gray, fine-grained; 10 ft thick.

  32\. Lab. No. 10373. Sandstone, gray, argillaceous and claystone with carbonate veinlets; 145 ft thick.

  33\. Lab. No. 10374. Claystone, black, platy, siliceous; 50 ft thick.

  34\. Lab. No. 10375. Claystone, black, sandy, somewhat platy; 20 ft thick.

  35\. Lab. No. 10376. Claystone, black; 50 ft thick.

36, 37. Healy quadrangle. Jurassic. [Sec. 17, T. 17 S., R. 7 W., unsurveyed], limit of upper Little Windy Creek. (Warfield, 1962, p.3,12,13,20,22,25.) Shale, gray to black, interbedded with purple-gray graywacke. Channel sample from outcrop. Index and geologic maps. Possible use: Portland cement, mineral wool.

  36\. Sample, 75 ft in length. 37. Sample, 100 ft in length.

38\. Quadrangle, age, collector, reference, remarks, maps, and use as in samples 31-35. [Sec. 20, T. 17 S., R. 7 W., unsurveyed], about 4.5 miles southwest of Windy, on Windy Creek. Lab. No. 10380. Claystone, dark-gray, sandy, iron-stained; 70 ft thick.

39\. Quadrangle, age, reference, remarks, maps, and use as in samples 26-30. [Sec. 22, T. 17 S., R. 7 W., unsurveyed], roadcut, near confluence of Jack River and Windy Creek. Sample 667. Shale, black. Channel sample, 50 ft in length. From outcrop.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses— Continued

	Alaska—Continued												
	40	41	42	43	44	45	46	47	48	49	50	51	52
	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B
	156-122	156-123	155-159	155-162	155-160	156-107	156-99	156-100	156-101	156-102	156-103	156-104	155-151
SiO_2	70.0	72.0	60.61	62.90	60.61	70.3	66.5	63.8	64.7	64.0	64.4	63.4	64.4
Al_2O_2	17.2	14.0	14.79	17.75	15.74	19.0	15.2	17.9	17.0	16.9	17.45	16.2	15.6
Fe_2O_2	5.0	4.8	6.60	7.44	7.81	6.0	6.4	6.4	6.55	7.3	6.75	7.5	6.0
MgO	.07	.21	5.60	4.10	4.59	1.2	1.95	1.65	1.95	1.9	1.9	1.95	1.0
CaO	.8	1.4	3.20	.96	1.17	.20	<.05	<.05	<.05	<.05	<.05	<.05	2.0
Na_2O	[2].68	[2].58	1.25	1.55	.91	[1].41	[1].42	[1].38	[1].33	[1].24	[1].27	[1].30	1.4
K_2O			.70	.68	.59	[1].38	[1].44	[1].72	[1].62	[1].45	[1].51	[1].57	2.7
P_2O_5	.28	.28	------	------	.20	.32	.28	.30	.34	.34	.27	.40	.15
SO_2	.21	.22	.18	.07	------	.21	.19	.21	.28	.14	.17	.24	.34
Ignition loss	4.0	5.2	6.51	4.17	------	4.08	3.8	4.6	4.4	3.8	3.8	4.4	4.5
Total	98.2	98.7	[99.44]	[99.62]	[91.62]	102.1	95.2	96.0	96.2	95.1	95.6	95.0	98.1
Class	34,62,0	42,54,1	27,60,2	23,69,0	24,66,5	30,69,0	32,59,0	25,68,0	27,65,0	26,66,0	26,66,0	26,65,0	30,60,0

	Alaska—Continued												
	53	54	55	56	57	58	59	60	61	62	63	64	65
	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B	50B
	155-177	155-176	155-175	155-165	155-164	155-166	155-167	155-168	155-173	155-169	155-171	155-170	155-172
SiO_2	70.83	69.96	60.17	57.50	57.44	59.26	60.36	61.75	61.56	59.96	59.98	59.98	61.03
Al_2O_3	10.79	12.16	16.40	17.00	17.18	15.84	16.80	17.21	15.60	15.84	16.05	16.01	15.87
Fe_2O_2[3]	5.05	6.51	6.93	7.15	7.43	7.91	6.65	5.08	7.05	7.36	7.33	7.51	7.26
MgO	1.34	.51	1.94	2.42	2.25	1.69	1.47	2.32	1.72	1.61	1.69	1.76	1.62
CaO	.94	.60	1.16	2.03	2.02	1.62	1.42	1.47	.80	.98	1.00	.95	.84
Na_2O	.83	.28	.96	1.94	1.81	1.25	.84	1.56	.51	.46	.51	.34	.40
K_2O	2.02	1.12	2.48	2.57	2.82	2.16	2.11	2.40	2.86	3.03	3.46	3.30	3.35
H_2O+[4]	(3.00)	(3.91)	(4.16)	(3.63)	(4.32)	(3.28)	(4.22)	(2.80)	(3.30)	(3.05)	(3.78)	(4.15)	(3.23)
H_2O-[4]	(2.69)	(1.74)	(2.82)	(2.77)	(3.10)	(3.46)	(3.47)	(2.65)	(1.90)	(1.94)	(1.95)	(1.74)	(1.29)
TiO_2	.68	.72	.78	.80	.76	.82	.76	.76	.80	.81	.72	.80	.80
Ignition loss[5]	6.71	7.87	8.97	9.15	8.63	9.56	9.51	8.46	9.04	8.67	9.26	9.34	8.78
Total	99.19	99.73	99.79	100.56	100.34	100.11	[6]99.92	[7]101.01	[8]99.94	[9]98.72	100.00	99.99	99.95
Class	46,45,4	41,54,2	23,66,6	19,68,6	19,70,5	22,67,6	23,67,6	26,64,6	26,65,5	24,66,5	23,67,5	23,67,5	25,66,5

	Alaska—Continued											
	66	67	68	69	70	71	72	73	74	75	76	77
	50B155-189	50B66-1	50B70-2	50B76-1		50B76-2		50B86-1	50B87-1		50B88-16	50B88-18
SiO_2	59.1	71.02	72.16	58.81	63.48	66.33	70.05	69.9	65.14	67.70	75.78	76.91
Al_2O_2	17.0	6.96	13.85	16.94	18.28	12.98	13.71	11.6	14.42	14.98	11.81	12.18
Fe_2O_2	[3]6.6	3.84	2.85	[3]4.23	[3]4.56	5.10	5.38	4.9	2.00	2.08	.60	.48
FeO	------	------	------	------	------	1.76	1.86	------	3.75	3.89	.82	.92
MgO	2.8	------	.47	3.64	3.92	1.47	1.55	5.0	1.14	1.18	.02	None
CaO	2.3	------	3.80	1.57	1.69	1.38	1.46	2.6	3.18	3.30	.93	.92
Na_2O	1.2	------	3.86	3.28	3.54	2.58	2.72	.82	2.05	2.13	4.38	4.17
K_2O	3.0	------	2.43	2.85	3.07	1.63	1.72	2.4	2.47	2.57	3.12	3.15
H_2O+	------	------	------	------	------	------	------	------	------	------	1.70	.66
H_2O-	------	------	------	------	------	------	------	------	------	------	.26	.24
TiO_2	------	.37	Trace	1.20	1.29	.62	.66	------	.67	.70	.17	.18
P_2O_5	------	------	.36	------	------	------	------	------	------	------	.04	None
MnO	------	------	.41	------	------	------	------	------	------	------	.03	------
SO_2	------	------	.20	------	------	------	------	------	------	------	------	------
S	------	------	------	------	------	Trace	Trace	------	Trace	Trace	.04	None
Cl	------	------	------	------	------	------	------	------	------	------	.19	------
BaO	------	------	------	------	------	------	------	------	------	------	.06	------
SrO	------	------	------	------	------	------	------	------	------	------	Present	------
Ignition loss	[10]6.8	13.69	.65	[11]7.31	------	[11]5.26	------	------	[11]3.71	------	------	------
Total	98.8	95.88	[101.04]	99.83	99.83	99.11	99.11	[97.2]	98.53	98.53	[12]99.95	99.81
Class	22,67,2	54,41,0	44,45,0	24,62,4	------	38,55,2	------	44,45,0	37,48,0	------	54,36,0	55,36,0

[1] Gravimetric determination.

[2] NaCl + KCl, gravimetric determination.

[3] All iron calculated as Fe_2O_3.

[4] Not included in total.

[5] Includes water, CO_2, and possible loss of oxygen for Fe_2O_3.

[6] 99.12 percent in text.

[7] 99.62 percent in text.

[8] 100.13 percent in text.

[9] 100.32 percent in text.

[10] Includes gain due to oxidation of FeO.

[11] Sample dried at 110°F. Ignition loss includes organic matter, small amount of CO_2, H_2O, and sulfur.

[12] Microchemical examination, weight of ZnO = 0.0015. Approximate weight per 20 g of rock; based on the spectrographic analysis: CuO = 0.0002, As = 0.00005, Mo_2O_3 = 0.00035, Cd, present, SnO_2 = 0.0002, Sb = 0.00005, Tl, doubtful, PbO = 0.0004.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

40, 41. Healy quadrangle. Jurassic. [Sec. 22, T. 17 S., R. 7 W., unsurveyed], Cantwell to McKinley Park highway, near confluence of Jack River and Windy Creek. Samples 669, 670. (Warfield, 1962, p. 3, 12, 13, 20, 22, 25.) Shale, black; channel sample 50 ft in length, from roadcut. Index and geologic maps. Possible use: Portland cement, mineral wool.

42-44. Healy quadrangle. Jurassic(?). [Sec. 28, T. 17 S., R. 7 W., unsurveyed.] (Moxham, Eckhart, and Cobb, 1959, p. 69, 92, 93, 94, pl. 11.) Index and geologic maps, geologic sections. Possible use: Cement.

42. About 1.3 miles northwest of Cantwell. Collector, R. E. Fellows. Sample 310. Claystone, dark-gray, siliceous. Stratigraphic thickness 60 ft. Tonnage estimated.

43. Along Alaska Railroad, 1 mile southeast of Windy Creek. Collector, R. E. Fellows. Sample 311. Claystone, black, siliceous. Stratigraphic thickness 45 ft. Tonnage estimated.

44. Along Alaska Railroad, 1 mile southeast of Windy Creek. Analysts, A. C. Vlisidis, Leonard Shapiro. Sample C-1. Shale.

45-51. Healy quadrangle. Jurassic. Foggy Pass area. (Warfield, 1962, p. 3, 12, 13, 20, 21-23.) Shale, channel sample from outcrop 100 ft in length. Index and geologic maps. Possible use: Portland cement, mineral wool.

45. [Sec. 28, T. 17 S., R. 7 W., unsurveyed], cut on Alaska Railroad between mile 321-322. Sample 637. Shale, black; grading to a sandy phase.

46-51. [About 6.3-6.7, 7.2-7.4], tributary to the West Fork of Windy Creek.

46. Sample 606.
47. Sample 608.
48. Sample 609.
49. Sample 611.
50. Sample 612.
51. Sample 613.

52. Healy quadrangle. Jurassic(?). [About 6.3-6.7, 7.2-7.4], Windy Creek area. Analysts, A. C. Vlisidis, Leonard Shapiro. Lab. No. 1917 C. (Moxham, Eckhart, and Cobb, 1959, p. 69, 92, 93, 94, pl. 11.) Argillite, black, slaty; stratigraphic thickness 400 ft. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

53-65. Healy quadrangle. Tertiary. (Cobb, 1951, p. 139, 142, 165-167, 168, pls. 18, 19.) Index and geologic maps, columnar sections. Use: Portland cement.

53. Between secs. 10, 15, T. 12 S., R. 6 W., bank of Healy Creek. Lab. No. 42. Clay.

54. SW¼ sec. 15, T. 12 S., R. 6 W., Cripple Creek. Lab. No. 43. Clay, white, plastic; at least 4 ft thick.

55. NE¼ sec. 16, T. 12 S., R. 6 W., Cripple Creek. Lab. No. 44. Claystone; 12 ft thick.

56-60. Sec. 22, T. 12 S., R. 7 W., Healy Creek.

56. Lab. No. 39A. Claystone; 10 ft thick.
57. Lab. No. 39B. Claystone; 12 ft thick.
58. Lab. No. 39D. Claystone; 17 ft thick.
59. Lab. No. 39E. Claystone; 8 ft thick.
60. Lab. No. 40. Clay; 3 ft bed.

61-65. SE¼ sec. 23, T. 12 S., R. 7 W., Suntrana Creek, Healy Creek Valley.

61. Lab. No. 41A. Claystone, from exposure; 12 ft thick.
62. Lab. No. 41B. Claystone, from exposure; 8 ft thick.

Alaska—Continued

63. Lab. No. 41C. Claystone, from exposure; 12 ft thick.
64. Lab. No. 41D. Claystone, from exposure; 14 ft thick.
65. Lab. No. 41E. Claystone, from exposure; 10 ft thick.

66. Healy quadrangle. Pleistocene. [Probably sec. 9, T. 13 S., R. 7 W., unsurveyed], 353.3 mile, Alaska Railroad. Analysts, E. A. Nygaard, S. M. Berthold; collector, R. A. Eckhart. Report No. IWC-231. (Wahrhaftig, 1958, p. 35; Wahrhaftig and Black, 1958, p. 84-86, 114, pls. 1, 2, 7-10.) Clay, blue, varved. Index and geologic maps; geologic and structural sections.

67. Kenai quadrangle. Holocene. Sec. 21, T. 7 N., R. 12 W., 10.5 miles north of town of Kenai. (Plafker, 1956, p. 25, 26, 28, 29, 31, pls. 3, 5, 6.) Diatomaceous earth, representative sample. Deposit: When wet, mottled drab-brown to green; jellylike consistency. When dry, chalk-white to light-buff; massive, friable, homogeneous. Average thickness, 2-6 ft; maximum thickness, 12 ft. Average bulk density 0.4. Tonnage estimated. Photomicrographs of diatoms. Index and geologic maps, geologic section. Possible use: Construction, insulation.

68. Kodiak quadrangle. Holocene, 1912 eruption. Kodiak. Analyst, Elton Fulmer. (Griggs, 1918, p. 16.) Ash, highly magnetic.

69-72. Livengood quadrangle. Pleistocene. (Taber, 1943, p. 1438, 1454, 1467, 1472, 1474, 1475, 1477-1480, 1484, 1486, 1495.) Silt, fossiliferous. Mechanical analysis, mineralogy. Index maps, generalized cross section.

69, 70. Kowak Clay or Yukon Silts. [NE¼ T. 3 N., R. 1 E.], near town of Chatanika, Cleary Creek. Analysts, J. O. Berry, T. C. Bruce, A. T. Taylor. Silt, greenish-gray when wet; contains rock fragments and mica.

69. [Calculated by compilers to include ignition loss.]
70. Analysis as reported in text; average of two or more determinations.

71, 72. [SE¼ T. 4 N., R. 2 W., unsurveyed], cut on Livengood Road, above Cushman Creek. Analyst, L. Webb.

71. [Calculated by compilers to include ignition loss.]
72. Analysis as reported in text; average of two or more determinations.

73. Mount Fairweather quadrangle. [19.4-19.7, 11.6-12.4], Glacier Bay, Geikie Inlet area. (Seitz, 1959, p. 63, 73, 74, pl. 6.) Argillite, black, dense, hard; beds 1-6 in. thick. Mineralogy. Index and geologic maps.

74, 75. Mount Hayes quadrangle. [Holocene. About 10.0-10.3, 7.2], Castner Glacier, near Richardson Highway. Analyst, A. D. Harbin. (Taber, 1943, p. 1438, 1472, 1474-1480.) Glacial flour; grain size, mechanical analysis, mineralogy. Index map.

74. [Calculated by compilers to include ignition loss.]
75. Analysis as reported in text; average of two or more determinations.

76. Mount Katmai quadrangle. Holocene, 1912 eruption. [About 6-7.5, 4.5-7], Valley of Ten Thousand Smokes. Analyst, E. G. Zies; collector, C. N. Fenner. Sample A28. (Zies, 1929, p. 55, 56, 58.) Pumice, rhyolitic, light-gray. Apparent density about 0.85.

77. Mount Katmai quadrangle. Holocene, 1912 eruption. [About 9.1-9.6, 4.5-5], Katmai Volcano. Analyst, George Steiger. Record 2753. (Wright, 1915, p. 260; Clarke, 1915, p. 210.) Pumice. Norm.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common-and mixed-rock categories—Continued

Chemical analyses—Continued

	Alaska—Continued												
	78	79	80	81	*82	*83	84	85	*86	*87	88	*89	90
	50B88-2	50B88-3	50B88-4	50B88-5	50B88-6	50B88-7	50B88-8	50B88-9	50B88-10	50B88-11		50B88-12	50B88-13
SiO_2	76.53	75.56	71.92	69.37	64.61	65.98	68.00	67.43	60.85	57.99	75.08	63.56	64.36
Al_2O_3	12.31	12.10	13.30	14.28	15.40	14.93	14.58	[1]14.52	[1]16.28	17.39	[1]12.13	[1]15.72	15.81
Fe_2O_3	.46	.77	.81	1.44	1.97	1.91	1.66	.92	2.70	2.76	2.25	2.73	2.75
FeO	.96	1.06	1.97	2.54	3.50	3.11	2.75	2.95	4.68	4.75		3.67	2.50
MgO	.00	.59	1.11	1.66	2.24	2.07	1.65	1.53	3.17	3.42	.82	2.48	1.99
CaO	1.01	1.54	2.88	3.77	5.23	4.95	4.07	4.08	6.06	7.49	1.55	5.39	4.29
Na_2O	4.15	4.09	3.99	3.78	3.78	3.87	3.92	3.88	3.84	4.03	------	4.00	3.62
K_2O	3.05	3.00	2.53	2.18	1.77	1.74	1.98	2.16	1.35	1.06	------	1.62	1.56
H_2O+	.87	.73	.67	.56	.37	.37	.42	.67	.48	.36	------	.54	1.33
H_2O-	.25	.22	.16	.13	.16	.11	.13			.07	------		.73
TiC_2	.17	.19	.33	.47	.65	.59	.53	.55	.94	.81	.27	.72	.59
P_2O_5	.05	.01	.08	.16	.19	.13	.14	------	------	.22	------	------	.15
MnO	.04	.05	.07	.09	.09	.09	.07	------	------	.15	------	------	.10
S	.01	.01	.03	.03	.03	.04	.02	------	------	.07	------	------	.17
Cl	.23	.20	.17	.14	.15	.13	.13	------	------	.07	------	------	.09
BaO	.07	.07	.07	.08	.07	.06	.05	------	------	.05	------	------	------
Total	[2]100.16	100.19	100.09	100.68	100.21	100.08	100.10	[3]98.69	100.35	100.69	[92.10]	100.43	100.04
Class	54,36,0	53,36,0	48,39,0	42,43,0	35,47,0	37,46,0	40,44,0	41,43,3	29,51,0	24,54,0	------	33,50,0	33,52,0

	Alaska—Continued											Idaho	
	*91	92	*93	*94	*95	96	97	98	*99	100	101	102	103
	50B88-14	50B109-1	50B109-4	50B109-3	50B109-2	50B114-1		50B145-1	50B145-8	50B145-6	50B145-2	11B3-1	11B3-2
SiO_3	67.48	59.13	60.36	61.03	60.22	52.60	62.80	68.2	48.7	65.6	65.6	68.92	68.55
Al_2O_3	14.51	15.10	16.93	16.63	17.31	12.96	15.47	11.4	14.9	14.1	15.6	16.22	7.45
Fe_2O_3	1.46	2.14	2.53	1.73	1.90	[4]4.88	[4]5.82	2.3	4.7	2.0	2.1		[5]1.40
FeO	2.99	2.71	3.42	3.58	3.60	------	------	6.0	3.4	3.8	3.4	------	------
MgO	1.66	1.32	2.70	1.75	1.70	3.07	3.67	3.8	4.2	.49	.71	Trace	[6]2.43
CaO	4.02	3.76	6.08	4.43	4.28	6.41	7.65	.94	7.8	2.8	3.4	1.62	[6]4.77
Na_2O	3.88	3.76	3.72	4.52	4.34	1.17	1.40	3.5	2.1	4.3	4.2	1.56	------
K_2O	2.20	3.54	1.42	2.47	2.41	1.52	1.81	.51	.92	3.0	2.8	4.00	------
H_2O+	.47	5.75	1.39	2.29	1.55	------	------	------	------	------	.81	------	[7]4.26
H_2O-	.15	1.48	.17	.13	.75	------	------	------	------	------	.31	[8]1.60	
TiO_3	.52	.57	.72	.70	.74	Present	Present	.72	1.2	.64	.78	------	------
P_2O_5	.26	.27	.16	.24	.26	------	------	.08	.22	.16	.27	------	------
MnO	.09	.12	.13	.16	.17	------	------	.24	.20	.18	.12	------	------
S	.08	.02	------	------	------	------	------	------	------	------	------	------	------
F	------	.07	------	.07	.07	------	------	------	------	------	------	------	------
Cl	.14	.23	------	.18	.15	------	------	------	------	------	------	------	------
BaO	.06	------	------	.07	.07	------	------	------	------	------	------	------	------
Organic matter	------	------	------	------	------	------	------	------	------	------	------	------	4.74
Ignition loss	------	[9].01	[9].01	[9].00	[9].02	[10]16.01	[11](16.01)	[12]3.1	[12]10.1	[12]3.4	[9].07	6.00	[13]6.40
Subtotal	------	99.98	------	99.98	99.54	------	------	------	------	------	------	------	------
Less O	------	.03	------	.03	.03	------	------	------	------	------	------	------	------
Total	99.97	99.95	99.74	99.95	99.51	98.62	98.62	100.8	98.4	100.5	100.2	99.92	100.00
Class	40,44,0	30,54,0	28,54,0	30,52,0	27,54,0	24,54,18	------	45,40,0	17,56,11	38,47,0	36,49,0	42,50,3	54,33,14

[1] Includes P_2O_5.

[2] $ZrO_2 = 0.00$ percent.

[3] 98.35 percent in text.

[4] Total iron.

[5] Oxide of iron.

[6] Calculated from reported $MgCO_3$, $CaCO_3$.

[7] Reported as water and loss.

[8] At 105°C.

[9] CO_2.

[10] Sample dried at 110°F, ignition loss includes organic matter, small amounts of CO_3, H_2O, and sulfur.

[11] Not included in total.

[12] Ignition loss includes gain due to oxidation of FeO.

[13] CO_3, calculated from reported $MgCO_3$ and $CaCO_3$.

Spectrographic analyses

[Sample 92, elements looked for but not detected: Be, Zn, Ge, As, Cb, Ag, Cd, In, Sn, Sb, Cs, La, Ta, W, Pt, Au, Tl, Bi, Th, U. Samples 94, 95; Lab. Nos. 50-1852 SC and 50-1851 SC. Elements looked for but not detected: Be, Ni, La, Pb. Sample 101, elements looked for but not detected: Zn, Ge, As, Ag, Cd, In, Sn, Sb, Re, Tl, Bi]

	92	94	95	101		92	94	95	101
B	0.006	0.004	0.003	0.002	Sr	0.08	0.04	0.03	0.03
Sc	<.0005	.002	.002	------	Y	<.001	.01	.01	.006
V	.01	.01	.01	.002	Zr	.030	.02	.02	.02
Cr	.0005	.0002	.0003	------	Mo	.0005	------	------	------
Ni	< .0005	------	------	------	Ba	.20	.09	.08	.06
Co	.001	.002	.002	.0007	Yb	<.0001	------	------	------
Cu	.003	.004	.004	.003	Pb	.004	------	------	------
Ga	.002	.003	.004	.001					

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

78-90. Mount Katmai quadrangle. Holocene, 1912 eruption. [About 8.6-8.9, 2.9-3.2], western side of valley of Katmai River, a little north of where Mageik Creek enters Katmai River. (Fenner, 1950a, p. 608, 610, 614-616, 617-622.) Pumice. Index maps, detailed measured section, correlated measured sections.

78. About 7 miles south of Mount Katmai Crater, Fenner (1926). Analyst, C. N. Fenner. Sample A-175. (Fenner, 1926, p. 676, 677, 680, 681, 694, 695.) Pumice, white, coarse; mineralogy; almost free of phenocrysts; mixed with lapilli; 18 in. thick. Lithology. Norm; C.I.P.W. symbol.

79. Sample A-176. Pumice, terra cotta color, coarse to fine; 3.5 in. thick. Lithology.

80. Sample A-177. Pumice, buff, coarse; 11 in. thick. Lithology.

81. Sample A-178. Pumice, yellow; 2 in. thick. Lithology.

*82. Sample A-179. Pumice, buff or reddish-brown, coarse; 9 in. thick. Lithology. *Analysis shows 3.5 percent FeO, 5.6 percent alkalies; 7.5 percent CaO, MgO not calculated as carbonate.

*83. Sample A-180. Pumice, gray, grades from coarse to fine; 50 in. thick. Lithology. *Analysis shows 3.1 percent FeO, 5.6 percent alkalies; 7.0 percent CaO, MgO not calculated as carbonate.

84. Sample A-181. Pumice, light-gray, grades from coarse at bottom to grit at top; 8 in. thick. Lithology.

85. Sample A-182. Pumice, light-gray, fine; 8 mm thick.

*86. Sample A-183. Pumice, light-gray, grit or coarse sand; 10 mm thick. *Analysis shows 4.7 percent FeO, 5.2 percent alkalies; 9.2 percent CaO, MgO not calculated as carbonate.

87, 88. Analyst, C. N. Fenner. (Wilcox, 1959, p. 458, pl. 54.)

*87. Sample A-185. Pumice, light-gray. [Used for computations.] *Analysis shows 4.8 percent FeO, 5.1 percent alkalies; 10.9 percent CaO, MgO not calculated as carbonate.

88. Sample A-185X. Pumice, white; selected from sample A-185.

*89. Sample A-186. Pumice, light-gray; 28 mm thick. *Analysis shows 3.7 percent FeO, 5.6 percent alkalies; 7.9 percent CaO, MgO not calculated as carbonate.

90. Sample A-187. Pumice, dark-reddish-brown in lower part; purple above; 35 mm thick.

*91. Quadrangle, age, reference, maps, and sections as in samples 78-90. [About 9.3, 3.7], about 4 miles south of Mount Katmai Crater. Sample A-505. (Fenner, 1950b, p. 697.) Pumice, gray, coarse; 21 in. thick. Lithology. *Analysis shows 3.0 percent FeO, 6.1 percent alkalies; 5.7 percent CaO, MgO not calculated as carbonate.

92. Rat Islands quadrangle. Tertiary or older, Amchitka Formation. [About 14.0-14.3, 2.6], Amchitka Island, south of Constantine harbor. Analyst, E. J. Tomasi; spectrographic analyst, P. R. Barnett. Specimen 51-P-27. (Powers, Coats, and Nelson, 1960, p. 523, 533, 534, 535, pl. 69.) Obsidian tuff-breccia; more than 300 ft thick. Mineralogy, index of refraction, norms. Index and geologic maps.

*93. Rat Islands quadrangle. Quaternary, Patterson Point Formation. [5.5, 10.4], Little Sitkin Island, stream cut 0.9 mile north of summit of 1,980 ft mountain. Analyst, H. M. Hyman. (Snyder, 1959, p. 171, 192, 194, 195, pl. 23.) Dacitic tuff, light-brownish-gray, hypocrystalline. Mineralogy, norm. Index and geologic maps, geologic section. *Analysis shows 3.4 percent FeO, 5.1 percent alkalies; 8.6 percent CaO, MgO not calculated as carbonate.

94, 95. Rat Islands quadrangle. Late Pleistocene. Semisopochnoi Island. Spectrographic analyst, E. L. Hufschmidt. (Coats, 1959, p. 477, 479, 489, 492, 504, 505, 514, 515, pl. 59.) Tuff (dacitic pumice), light-gray, fine-grained; volume estimated. Norms and Niggli numbers. Index and geologic maps, geologic section.

*94. [17, 12], in gully about 2 miles south of Threequarter Cone. Analyst, W. J. Blake. Lab. No. ID-20150. Sample represents full thickness of deposit; 150 ft exposed. *Analysis shows 3.6 percent FeO, 7.0 percent alkalies; 6.2 percent CaO, MgO not calculated as carbonate.

*95. [17.2, 11.5], in old cone. Analyst, R. N. Eccher. Lab. No. ID-19550. Fragment of pumice from thin layer. Mineralogy. Index of refraction. *Analysis shows 3.6 percent FeO, 6.8 percent alkalies; 6.0 percent CaO, MgO not calculated as carbonate.

96, 97. St. Michael quadrangle. Holocene. [About 23.5, 9.0], St. Michael Island, old rifle range on point that encloses the harbor. Analyst, T. C. Brnce. (Taber, 1943, p. 1438, 1472, 1474, 1475, 1478-1480, 1481, 1484.) Siltlike mantle, fossiliferous; from depth of 20 in. Mechanical analysis, mineralogy. Index map.

96. [Calculated by compilers to include ignition loss.]
97. Analysis as reported in text; average of two or more determinations.

98-101. Umnak quadrangle. (Byers, 1959, p. 269, 280-282, 283-285, 289, pls. 39, 40.) Norms and Niggli values. Index and geologic maps.

98-100. Analysts, S. M. Berthold, R. L. Hill, Leonard Shapiro.

98. Early to middle Tertiary. [About 17.1, 2.6], 1 mile southwest of Russian Bay. Argillite; bulk density 2.71.

*99. Quaternary. [About 19.9, 7.9] northeast Umnak Island. Palagonitized tuff cone. Bulk density 2.49. *Analysis shows 3.4 percent FeO, 3.0 percent alkalies, 1.2 percent TiO_2; suggests 6.2 percent more CaO and MgO than required for carbonate.

100. Quaternary, Okmok Volcanics. [About 19.9, 9.7], seacliff southeast of Ashishik Point. Rhyodacite pumice lapilli. Bulk density 2.45.

101. Holocene. [About 13.7, 2.9], north slope of Mount Vsevidof. Analysts, W. W. Brannock, Leonard Shapiro; spectrographic analyst, A.T. Myers. Rhyodacite pumice. Bulk density 2.48.

Idaho

102. Bannock County. Pliocene. [Possibly T. 9 S., R. 36 E.], Marsh Creek Valley. Analyst, J. E. Whitfield. Sample 35889a. (Merrill, 1886, p. 201, 202; Merrill, 1906, p. 134; Clarke, 1915, p. 92, 93; Mansfield, 1920, p. 10, 11, 117, pl. 3.) Volcanic ash, gray, friable; mineralogy, screen size. Index and geologic maps, geologic sections. Possible use: Scouring and polishing preparations.

103. Bannock County. Holocene. T. 5 S., R. 33 E., near Fort Hall. (Fremont, 1845, p. 163; Mansfield, 1920, p. 10, 11, 118, pl. 3.) Alluvium (clayey soil mixed with fine sand), light-gray, fine. Index and geologic maps, geologic sections.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Idaho—Continued												
	*104	105	106	107	108	*109	110	111	112	113	*114	*115	*116
	11B4-99	11B4-6	11B4-9	11B4-18	11B5-2	11B6-3	11B9-1	11B9-7	11B9-3	11B10-1	11B15-137	11B45-44	11B45-42
SiO_2	45.53	45.4	54.8	73.20	67.3	37.7	69.06	54.2	67.80	72.5	[1]23.1	39.37	30.49
Al_2O_3	7.41	10.2	12.6	13.10	16.7	6.2	15.91	10.9	15.13	23.0	4.3	6.23	5.64
Fe_2O_3	------	1.7	3.9	.37	1.7	[2]2.4	1.21	1.2	4.61	.1	2.5	------	------
FeO	------	------	------	.36	------	------	3.17	2.5	------	------	------	------	------
MgO	1.44	------	------	.38	.2	.3	1.09	5.3	1.80	.05	------	1.18	.85
CaO	20.11	3.6	3.5	.30	2.0	23.8	None	8.8	1.19	1.6	------	21.96	25.75
Na_2O	------	------	------	6.20	------	------	[3]1.62	1.6	------	------	------	------	------
K_2O	------	------	------	.88	------	------	[4]3.96	2.6	------	------	------	------	------
H_2O	------	------	------	5.0	------	------	1.98	2.2	------	------	------	------	------
TiO_3	------	.6	------	.14	------	------	.75	.46	------	------	------	------	------
P_2O_5	[2]10.30	3.0	1.6	.03	------	17.0	Trace	.11	------	------	16.5	[2]13.37	[2]18.46
MnO	------	------	------	[5].004	------	------	[6]Trace	.08	------	------	------	------	------
CO_2	4.87	.4	.2	.06	------	------	None	9.9	------	------	------	3.87	2.50
S	------	2.1	.5	------	------	------	------	------	------	------	------	------	------
V_2O_5	[7].09	.86	.75	------	------	------	------	------	------	------	------	[7].07	[7].10
Cr	.05	------	------	------	------	------	------	------	------	------	------	.07	.06
MoO_3	------	.02	<.01	------	------	------	------	------	------	------	------	------	------
Organic matter	[2]10.35	14.4	4.2	------	------	3.8	------	------	------	------	------	[2]13.53	[2]10.91
Ignition loss	------	[8]13.3	13.0	------	9.3	[9]10.6	------	------	8.02	------	25.5	------	------
Total	[100.15]	[95.6]	[95.1]	[100.0]	[97.2]	[101.8]	[10]98.78	[11][100.6]	98.55	[97.2]	[71.9]	[99.65]	[94.76]
Class	32,31,11	25,60,0	28,60,0	49,42,0	36,57,4	24,35,3	40,49,2	34,35,21	36,57,6	32,67,0	(13,42)2	28,31,8	21,28,5

	Idaho—Continued												
	*117	*118	*118a	*119	*120	121	122	123	124	125	126	127	128
	11B15-268	11B15-8	11B15-7	11B15-6	11B15-14	11B16-8	11B16-9	11B16-10	11B16-16	11B19-21	11B19-17	11B23-1	11B28-8
SiO_3	[12]22.2	33.5	36.2	32.2	36.4	71.43	73.7	66.4	71.24	71.73	73.70	85.21	68.5
Al_2O_3	3.4	6.1	6.7	6.4	7.2	11.63	10.6	14.8	12.72	14.79	13.58	8.75	22.0
Fe_2O_3	1.4	[2]2.25	[2]2.59	[2]2.70	[2]2.63	.84	1.1	2.5	2.92	.30	1.60	.038	1.0
FeO	------	------	------	------	------	.95	.64	1.8	1.09	.38	.66	------	------
MgO	------	.44	.53	.42	3.10	.12	.14	1.9	.27	.21	.09	.00	.07
CaO	34.6	22.9	18.6	19.9	19.4	.65	1.0	1.1	2.0	.77	.20	.69	.0
Na_2O	------	------	------	------	------	1.10	.92	1.1	3.16	2.32	.91	2.00	[15].72
K_2O	------	------	------	------	------	6.22	5.0	6.1	4.47	5.98	5.02	3.14	
H_2O+	------	------	------	------	------	6.10	6.8	2.9	.18	1.38	3.53	------	------
H_2O-	[14]2.0	------	------	------	------	.39			.33	1.31	.85	------	------
TiO_3	------	------	------	------	------	.19	.18	.62	.51	.39	.12	.015	------
P_2O_5	20.4	15.3	10.2	11.0	9.3	.01	.02	.12	.09	.09	------	------	------
MnO	------	------	------	------	------	.03	.02	.04	.07	.01	------	------	------
CO_2	------	.80	------	1.66	7.35	------	<.05	.06	.40	.02	------	------	------
S	------	.65	.83	1.02	.37	.02	------	------	.01	------	------	------	------
V_2O_5	.02	[7].019	[7].024	[7].018	[7].028	------	------	------	------	------	------	------	------
F	2.08	------	------	------	------	.09	------	------	.03	------	------	------	------
Organic matter [13]	------	4.69	8.62	7.40	2.58	------	------	------	------	------	------	------	------
Ignition loss	[16]15.6	[9]13.6	[9]16.0	[9]19.2	[9]13.7	------	------	------	------	------	------	------	7.8
Subtotal	101.70	------	------	------	------	99.84	------	------	99.64	------	------	------	------
Less O	[2].88	------	------	------	------	[2].04	------	------	[2].01	------	------	------	------
Total	[100.8]	[100.2]	[100.3]	[101.9]	[102.1]	[17][99.80]	100.2	99.4	[18][99.63]	99.68	100.26	[99.84]	100.1
Class	(15,24)14	20,40,2	21,44,10	18,48,4	21,34,16	50,41,0	54,38,0	37,49,0	45,42,1	45,44,0	48,45,0	70,24,0	28,71,0

See following page for footnotes.

Spectrographic analyses

[C = 1-5 percent, D = 0.1-1 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent, G = < 0.001 percent, ND = not detected. Sample 107: Quantitative spectrographic analysis, Cr = 0.0002, Cu = 0.0017, Sr = 0.002; sample 114, elements looked for but not detected: Li,Ga,Ge,In,Sb,Ta,W,Pt,Au,Hg,Bi]

	109	114	118	118a	119	120
Be	------	ND	------	G	G	------
B	E	F	E	E	E	E
Na	D	E	D	D	D	D
Mg	------	D	------	------	------	------
Sc	------	------	------	F	------	------
Ti	D	D	D	D	D	D
V	D	C	------	------	------	------
Cr	D	D	D	E	D	D
Mn	E	F	E	E	E	C
Ni	E	E	E	D	D	D
Co	F	ND	------	F	F	------
Cu	F	E	F	F	F	F
Zn	E	E	E	E	E	------
As	D	ND	------	------	------	------
Sr	E	E	E	------	E	------
Y	------	------	E	E	E	F
Zr	F	E	E	E	E	E
Nb	------	ND	------	E	------	------
Mo	E	E	F	F	E	F
Ag	------	F	F	G	F	F
Cd	------	ND	------	E	------	------
Sn	------	ND	------	E	------	E
Ba	E	ND	E	E	E	------
Pb	E	ND	E	E	E	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

*104. Bear Lake County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. [T. 9 S., R. 45 E.], near Georgetown. Central Farmers mine. (Emigh, 1958, p. 27, 29-31, fig. 1.) General: When fresh, phosphatic dolomitic shale, black, fine-grained, dense; when weathered, shale, brown, soft; fossiliferous; 17-24 ft thick; contains pellets. Mineralogy, thin-section description. Sample: Phosphatic shale; 12 ft above bottom of bed. Index map. *Analysis suggests 23.9 percent phosphorite, 2.2 percent more MgO and CaO than required for carbonate.

105, 106. 8ear Lake County. [Phosphoria Formation, Meade Peak Phosphatic Shale Member. T. 14 S., R. 43 E.], Paris and Bloomington Canyons. (Ravitz and others, 1949, p. 308, 309, 320.) Use: Source of vanadium.
105. Siltstone. 106. Shale.

107. Bear Lake County. Jurassic, Twin Creek Limestone. [About T. 11 S., R. 45 E.], Preuss Creek. Analysts, S. D. Botts, M. D. Mack, H. H. Thomas; spectrographic analyst, Sol Berman. Lab. No. 152648. (Gnlbrandsen and Cressman, 1960, p. 458-461.) General: Altered tuff, pale-green or grayish-green, aphanitic; bed 5 ft thick. Sample: Chert. Mineralogy. Index map.

108. Benewah County. Miocene, Latah Formation. Sec. 11, T. 46 N., R. 3 W., railroad cut on east shore of Benewah Lake. Analyst, J. H. Jonte. (Skeels, 1920, p. 25, 26; Hubbard, 1956a, p. 23, 24, pl. 1.) General: Clay, white; 8 ft thick; overburden, 1 ft. Sample: Clay, gray, yellow, fine-grained. Physical properties, firing tests. Index map. Possible use: Face brick, terra cotta, pottery, refractories, stoneware.

*109. Bingham County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. Secs. 2, 11, 14, 15, 22, T. 4 S., R. 37 E., Fort Hall. Gay mine. Collector, A. L. Service. Sample 12. (Mabie and Hess, 1964, p. 2-4,7,8,9,12,13,47,58,59,78,79; Service and Popoff, 1964, p.6,11, 12,28,31-33,63.) Phosphorite, brown, fine-grained, argillaceous, siliceous; 11.3 ft thick. Mineralogy. Tonnage estimated. Index map, compositional classification triangle; cumulative curves of grain size; differential thermal curve. Physical properties, beneficiation tests. Possible use: Agricultural, chemical, metallurgical. *Analysis suggests 39.4 percent phosphorite. [For other analyses from same measured section, see samples 89, 90, group P.]

110. Bonner County. Precambrian, Prichard Formation. [T. 55 N., R. 1 W.], east shore of Pend Oreille Lake, north of Granite Point. Analyst, J. G. Fairchild. Record C-405. (Gillson, 1930, p. 111, 115; Wells, 1937, p. 28.) Argillite. Index map.

111. Bonner County. Precambrian, Wallace Formation. T. 56 N., R. 2 E., southeast end of Howe Mountain. Quarry. Analysts, P. L. D. Elmore, S. D. 8otts, I. H. Barlow, and Gillison Chloe. Lab. No. 155261. (Harrison and Jobin, 1963, p. K-3, K-15, K-37, pl. 1.) Calcareous interlaminated green siltite and argillite. Index and geologic maps, geologic sections.

112. Bonner County. [T. 54 N., R. 1 W.], about 6 miles east of town of Bayview, Pend Oreille Lake. International Portland Cement Co. (Shedd, 1913, p. 175, 176.) Shale. Use: Cement.

113. Bonneville County. Pliocene, Salt Lake Formation. Sec. 13, T. 1 N., R. 38 E., about 3 miles southeast of town of Ammon. (Savage, 1961, p. 58, 59, figs. 3, 9.) Pumice; in beds 60-80 ft thick. Geologic map, correlated columnar sections.

*114. Caribou County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. NW¼NE¼ sec. 10, T. 8 S., R. 44 E., Mabie Canyon. Spectrographic analyst, D. M. Mortimer. Sample VEM-319-47. (McKelvey and others, 1953b, p. 1, 2, 4, 14-18, 19, 23, pl. 1.) Phosphorite, argillaceous; 160.1-160.9 ft from top of member. Trench sample. Mineralogy. Index maps, detailed measured section. *Analysis suggests 38.2 percent phosphorite. [For other analyses from same measured section, see samples 260-284, gronp P.]

115, 116. Caribou County. Phosphoria Formation, [Meade Peak Phosphatic Shale Member. Secs. 2, 11, T. 8 S., R. 42 E.] Conda mine. (Emigh, 1958, p. 27, 28, 30, fig. 1.) General: When fresh, phosphatic dolomitic shale, black, fine-grained, dense; when weathered, shale, brown, soft; fossiliferous; 17-24 ft thick; contains pellets. Mineralogy, thin-section description.

*115. Sample S2. [Phosphatic shale], 4.5 ft above bottom of bed. *Analysis snggests 31.0 percent phosphorite.

*116. Sample S15. [Phosphatic shale], 12 ft above bottom of bed. *Analysis suggests 42.8 percent phosphorite.

*117. Caribou County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. S½SW¼ sec. 34, T. 9 S., R. 45 E., 15 miles by road northeast of Georgetown, Deer Creek-Wells Ganyon area. (Deiss, 1949, p.61,62,64,83,85,91,94,pls.5,6; Lowell, 1952, p.2,9,12,13,15,16, 21-27,36,46,47,pls.1,2.) Phosphorite, dark-gray, massive, ovulitic, nodular. Mineralogy. Photomicrographs. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections. Possible use: Source of elemental phosphorous and vanadinm. *Analysis suggests 47.3 percent phosphorite.

118 - 120. Caribou County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. Sec. 29, T. 10 S., R. 45 E., near Georgetown. (Town, 1966, p. 2-6, 7, 10, 12.) Phosphatic shale, black, nonfriable. Trench sample. Mineralogy, thin-section description. Geologic section. Compositional triangle. Beneficiation tests.

*118. Field No. CF-5. Phosphatic shale, dark-brown, nonfriable; 7.0 ft thick. *Analysis shows 0.6 percent S; suggests 36.3 percent phosphorite.

*118a. Field No. CF-6; 8.0 ft thick. *Analysis shows 0.8 percent S; suggests 23.6 percent phosphorite.

*119. Field No. CF-7; 7.5 ft thick. *Analysis shows 1.0 percent S; suggests 25.5 percent phosphorite.

*120. Field No. CF-11; 9.1 ft thick. *Analysis suggests 21.5 percent phosphorite.

121 - 124. Cassia County. Goose Creek district. Index and geologic maps, geologic sections, correlated columnar sections.

121. Late Miocene and early Pliocene(?), Payette(?) Formation. NE¼NW¼ sec. 2, T. 15 S., R. 20 E. Analysts, L.N. Tarrant, E. J. Tomasi. Sample B413. (Mapel and Hail, 1959, p. 225, 227, 231.) General: Volcanic ash, light-gray to white; friable; beds from a few inches to more than 100 ft thick; interbedded with shale.

122, 123. Pliocene, Salt Lake Formation. NE¼SE¼ sec. 24, T. 13 S., R. 21 E. Analysts, P. L. D. Elmore, K. E. White, S. D. Botts; collectors, N. M. Denson, J. R. Gill. Samples 147766 and 147767; drill hole C1. (Mapel and Hail, 1959, p. 230, 231, 232.) General: Volcanic ash, white to light-gray, friable. Photomicrograph.

124. Salt Lake Formation. Sec. 32, T. 14 S., R. 20 E. Analyst, Jean Theobald; collector, H. A. Powers. Sample B331. (Mapel and Hail, 1959, p. 218, 229-231, pls. 46, 47, 49.) General: Welded tuff, black to dark-reddish-brown, dense, stony; mineralogy. Photomicrograph.

125. Custer County. Eocene(?), Oligocene and early(?) Miocene, Challis Volcanics. [T. 6 N., R. 22 E., unsurveyed], about 25 miles due west of town of Darlington, near Ramey Creek. Analyst, F. H. Nenerburg. Lab. No. E 1805. (Ross, 1962, p. 73, 80, figs. 1, 2.) Rhyolite tuff. Index maps.

126. Custer-Lemhi-Valley County. Challis Volcanics, possibly Germer Tuffaceous Member. [T. 13 N., R. 16 E., unsurveyed], near town of Bonanza, head of Yankee Fork. Analyst, J. G. Fairchild. Records C-983 and C-1003. (Wells, 1937, p. 26, 27; Ross, 1962, p. 73, 83, 86, figs. 1, 2.) Tnff. Index maps.

127. Gem County. [T. 6 N., R. 1 W.], about 3 miles south of town of Emmett. Gem Silica Co. (Kelly and others, 1956, p. 54; Carter, Kelly, and Parsons, 1962, p. 20, 21.) Sand. Index map. Possible nse: Glass.

128. Kootenai County. Miocene. SE¼ sec. 8, or SW¼ sec. 9, T. 50 N., R. 4 W., about 2-3 miles northwest of town of Coeur d'Alene. Roadcut, Stockton deposit. Analyst, R. V. Lindquist. (Scheid, 1952, p.5,6,8,9, 14-16,18,20,pls.1,2,fig.1,table 2.) Clay, pink, tan, and white; abont 10-20 ft thick; overburden 1-2 ft of soil. Mineralogy. Index and geologic maps, geologic section. Physical properties, firing tests. Possible use: Source of aluminum, brick, terra cotta, draintile.

Footnotes of analyses on preceding page:

[1] Acid insoluble.

[2] Calculated from reported Fe, P, C, or F.

[3] Soda.

[4] Potash.

[5] Reported as recalculated from Mn.

[6] Manganese oxide.

[7] Reported as V.

[8] Ignition loss less calculated organic.

[9] At 1,000° C.

[10] Cl, F, None; ZrO_2, 0.03 percent, accuracy of determination, 0.005 percent; contains organic carbon, probably graphitic.

[11] Contains FeS_2, 0.76 percent.

[12] Insoluble.

[12] Contains sodium; most of alkali thought to be potassium.

[14] Moisture at 105°C.

[15] Noncarbonate carbon.

[16] Ignition loss an approximate measure of organic matter content if the rock does not contain carbonates(Lowell, 1952, p. 45).

[17] 8aO = 0.07 percent.

[16] 8aO = 0.10 percent; Cl = 0.02 percent.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Idaho—Continued											
	129	130	131	132	133	134	135	136	137	138	139	140
	11B29-1	11B29-20	11B29-21	11B29-23	11B29-22	11B29-24	11B29-25	11B29-9	11B29-43	11B29-41	11B29-46	11B29-18
SiO_2	70.6	66.5	68.3	71.9	71.1	72.8	69.1	68.60	73.9	69.9	65.9	66.79
Al_2O_3	11.8	22.2	20.5	19.7	20.0	19.5	20.0	20.25	17.8	19.7	20.6	22.44
Fe_2O_3	2.58	1.4	1.9	.29	.6	.71	1.9	.77	2.5	2.6	3.6	1.10
FeO	------	------	------	------	------	------	------	.02	------	------	------	.07
MgO	.58	.21	.36	.14	.22	.07	.07	.38	------	------	------	.40
CaO	1.74	.45	.38	.19	.28	.09	.38	.24	------	------	------	.83
Na_2O	------	.26	.32	.00	.37	.03	.05	.10	------	------	------	.04
K_2O	6.32	1.15	1.59	1.01	.58	1.28	.17	1.95	------	------	------	.84
H_2O-	------	[1].78	[1].57	[1]1.19	[1].45	[1].79	[1]1.07	[2].52	------	------	------	[2].76
TiO_2	------	------	------	------	------	------	------	.91	.1	.3	.7	.35
P_2O_5	------	------	------	------	------	------	------	.02	------	------	------	.02
SO_3	------	------	------	------	------	------	------	.02	------	------	------	.01
MnO_2	------	------	------	------	------	[3].00	------	.009	------	------	------	.004
Ignition loss	7.8	8.7	7.2	7.3	7.4	6.0	7.7	6.14	[4]4.5	[4]6.3	[4]6.8	6.30
Total	[·101.4]	101.6	101.1	101.7	101.0	101.3	[100.4]	99.93	[98.8]	[98.8]	[97.6]	99.95
Class	47,44,4	26,73,1	30,68,1	37,63,1	35,64,1	38,62,0	31,68,1	32,64,1	40,59,0	32,66,0	25,71,0	26,71,1

	Idaho—Continued												
	141	142	143	144	145	146	147	148	149	150	151	152	153
	11B29-34	11B29-33	11B35-7	11B35-41	11B35-8	11B40-1	11B40-2	11B40-3	11B40-4	11B40-5	11B40-6	11B40-8	11B42-1
SiO_2	68.57	72.04	57.30	[5]52.4	68.95	70.4	62.9	74.7	70.3	81.7	66.0	54.2	52.48
Al_2O_3	22.51	20.01	12.51	11.2	14.33	17.6	17.6	13.6	15.3	9.4	17.1	13.2	7.10
Fe_2O_3	2.28	1.24	3.55		1.17	2.2	1.7	2.8	3.6	1.9	1.8	1.1	[6]2.63
FeO			------	------	1.23	.27	3.8	.60	.62	.27	1.2	3.1	
MgO	------	.09	3.02	3.3	.47	.26	2.9	1.3	.71	1.0	3.9	6.0	2.93
CaO	.23	.31	11.66	16.7	2.13	.17	.79	.18	.52	.23	.22	5.6	14.60
Na_2O	------	------	[7].22	------	5.08	1.2	1.6	2.8	1.4	3.1	.70	.80	.93
K_2O	------	------			2.58	4.9	4.3	3.1	4.1	2.0	5.6	3.8	1.76
H_2O+	------	------	------	------	[8]3.63	2.2	2.8	1.2	1.5	.51	3.1	2.6	4.96
H_2O-	[9].64	------	------	------	[2].28								
TiO_2	------	------	------	------	.42	.64	.69	.48	.59	.34	.67	.56	.38
P_2O_5	------	------	------	------	.10	.06	.16	.07	.20	.11	.10	.14	.20
MnO	------	------	------	------	Trace	.01	.04	.01	.01	.01	.01	.14	Trace
CO_2	[10]6.61	[11]6.76	[12]11.74	[13]13.8	------	.05	.84	.05	.81	.05	.05	8.6	12.40
Total	100.84	100.45	100.00	97.4	[14]100.48	100.0	100.1	100.9	99.7	100.6	100.4	[15]100.2	100.37
Class	26,74,0	35,64,1	31,42,26	(34,33)24	42,46,0	37,56,0	30,55,2	48,45,0	39,52,2	63,31,0	34,54,0	30,41,18	37,30,27

	Idaho—Continued			Oregon		
	154	155	156	157	158	159
	11B42-4		11B44-2	36B1-46		36B4-4
SiO_2	68.29	73.52	70	72.50	81.27	64.98
Al_2O_3	13.25	11.85	16	9.93	11.13	21.27
Fe_2O_3	1.62	.71	.0	4.58	5.02	[16]3.63
MgO	.82	.13	------	.54	.61	.62
CaO	2.17	.65	1.0	.60	.66	.57
Na_2O	2.79	2.27	------	.33	.36	.90
K_2O	4.92	6.16	------	.16	.18	------
H_2O+	2.34	2.87	------	5.83	------	------
H_2O-				[2]4.78	------	------

	Idaho—Continued			Oregon—Continued		
	154	155	156	157	156	159
	11B42-4		11B44-2	36B1-46		36B4-4
TiO_2	------	------	------	0.45	0.50	------
CO_2	------	------	[10]13	.09	.10	[10]8.11
SO_3	------	------	------	.03	.03	------
Cl	------	------	------	.04	.04	------
Total	[96.20]	------	[100]	99.86	99.90	100.08
Class	43,42,6	------	42,56,2	50,48,0	------	23,74,2

[1] Moisture below 100°C.
[2] At 105°C.
[3] MnO.
[4] At 1,000°C.
[5] Acid insoluble.
[6] Total Fe.
[7] Alkalies and undetermined.
[8] Above 105°C.
[9] At 212°F.
[10] Ignition loss.
[11] Ignition loss, includes moisture at 212°F.
[12] Includes water.
[13] Loss on ignition, chiefly CO_2.
[14] S, Li_2O, SrO, reported as trace; ZrO_2=0.03 percent; BaO = 0.08 percent; Cl and F reported as ?.
[15] FeS_2 = 0.31 percent.
[16] Includes FeO.

Semiquantitative spectrographic analyses

	146	147	148	149	150	151
Be	0.000x	0.000x	0.000x	0.000x	0	0.00x
B	.00x	.00x	.00x	.0x	.00x	.00x
Sc	.00x	.00x	.000x	.00x	.000x	.00x
V	.00x	.00x	.00x	.0x	.00x	.00x
Cr	.00x	.00x	.00x	.00x	.00x	.00x
Ni	.00x	.00x	.00x	.00x	.000x	.00x
Co	.000x	.00x	.000x	.000x	0	0
Cu	.00x	.000x	.000x	0	.000x	0
Sr	0.00x	0.00x	0.00x	0.00x	0.00x	0.00x
Y	.00x	.00x	.00x	.00x	.00x	.00x
Zr	.0x	.0x	.0x	.0x	.00x	.00x
Ba	.0x	.x	.0x	.x	.0x	.0x
La	.00x	0	0	0	0	0
Yb	.000x	.000x	.000x	.000x	.000x	.000x
Pb	.00x	.00x	.00x	0	.00x	0

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

129\. Latah County. [Miocene.] SW¼ sec. 11, T. 39 N., R. 1 W., or SE¼ sec. 6, T. 39 N., R. 1 E., about 5 miles south of town of Helmer, railroad cut. (Hubbard, 1956a, p. 19, 20, pls. 1, 2.) Clay. Index and geologic maps.

130 - 133. Latah County. Miocene. [T. 39 N., R. 3 W.], near town of Troy. Analyst, R. V. Lundquist. (Tullis and Laney, 1933, p.481,483,485-491,493,495.) Clay, white or tan. Mineralogy. Index map. Use: Face brick, firebrick, terra cotta, sewer pipe, stoneware, draintile, roofing tile, structural tile.

134, 135. County, age, analyst, reference, map, and use as in samples 130-133. [T. 39 N., R. 4 W.], near town of Joel. Clay, white. Mineralogy.

136\. Latah County. Miocene, Latah Formation. NE¼NW¼ sec. 16, T. 40 N., R. 1 W., 0.5 mile north of Helmer. A. P. Green Co. pit. Sample SC-2. (Ponder and Keller, 1960, p. 44-47, 50, 53-55, 57, 58.) Clay, white, sandy; 15 ft exposed. Mineralogy, microscopic description. Index and geologic map, diagrammatic section. Size analyses, mineralogical analyses. Possible use: Fire clay.

137 - 139. Latah County. Sec. 24, T. 40 N., R. 3 W., about 3 miles southwest of town of Deary. (Hosterman and others, 1960, p. 2, 3, 7-10, 16, 17, 19, 20, 21, 24, 29, 37, 89, 111, 112, pls. 1, 2, 6.) Clay, micaceous. Mineralogy. Weighted composite sample; sample taken at about 5 ft intervals or where clay showed a marked change; overburden averages 15.9 ft. Tonnage estimated. Index and geologic maps, correlated columnar sections, geologic sections. Log of drill hole. Possible use: Source of alumina, refractory brick, draintile.

137\. [Miocene.] NE¼ sec. 24. Drill hole O1-108. Clay, gray and tan-gray, sandy; depth 91.3-135.4 ft.
138\. [Miocene.] NE¼ sec. 24. Drill hole O1-209. Clay, varicolored, sandy; depth 68-114.2 ft.
139\. Middle to late Miocene, upper part of Latah Formation. SE¼ sec. 24. Drill hole O1-209. Clay, varicolored, some beds sandy; includes 0.6 ft bed of limonite; depth 10.5-84.6 ft.

140\. Latah County. Miocene. NW¼NW¼ sec. 33, T. 40 N., R. 3 W., about 4 miles northeast of town of Troy. (Ponder and Keller, 1960, p. 44, 45, 47-50, 54, 55, 57, 58.) Clay, white to cream, poorly indurated; overburden, 1-20 ft. Mineralogy, microscopic description. Index and geologic map, size distribution analyses. Possible use: Fire clay. [For analysis of parent rock, see sample 68, group M.]

141, 142. Latah County. Miocene. Northwest corner sec. 33, T. 40 N., R. 3 W., about 4 miles north of Troy. Idaho Firebrick and Clay Co., Benson pit. (Hodge, 1938e, p.495,496,503,610,639-643,644,646,649.) General: Kaolin, white, fine-grained; maximum depth in pit, 80 ft; overburden, mineralogy. Tonnage estimated. Index and geologic maps, geologic section. Use: Brick. Possible use: Paper filler, ceramic whiteware.

141\. Sample: Clay, gray. 142. Sample: Clay, white.

143\. Nez Perce County. Late Triassic, Martin Bridge Formation, shaly member. NW¼ sec. 34, T. 32 N., R. 5 W., about 30 miles south of town of Lewiston, Lime Point. Analyst, A. B. Lort; collector, H. S. Gale. Lab. No. 3745. (Eckel, 1913, p. 136-138; Hubbard, 1956b, p. 12, 13, fig. 2; Savage, 1965, p. 18a, 20, pls. 1, 2, fig. 1.) Shale; average of 45 samples from exposures. Tonnage estimated. Index and geologic maps, geologic section. Use: Portland cement.

144\. Nez Perce County. Late Triassic, Hurwal Formation. Sec. 14, T. 32 N., R. 5 W., 1.5 miles up Billy Creek. Analyst, George Hsn. Sample 3Dh S L 166. (Savage, 1965, p. 18a, 18b, 18c, 19, 20, pl. 1, fig. 1.) Shale, calcareous. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Portland cement.

145\. Nez Perce County. Holocene. [T. 30 N., R. 1 W.] Cottonwood Canyon, Cottonwood Creek. Analyst, W. F. Hillebrand. Record 1906. (Russell, 1901a, p. 33,34,pls.1,2; Clarke, 1904, p.158.) Volcanic dust, white, fine; from few inches to 6 ft or more thick. Index and geologic maps.

Idaho—Continued

146 - 151. Shoshone County. Precambrian. Analysts, H. F. Phillips, P. L. D. Elmore, K. E. White; spectrographic analyst, J. D. Fletcher. (Ross, 1963, p. 27, 28, 48, 50, 57; Hobbs and others, 1965, p. 5, 23-28, 35, pls. 1, 3, 4, 6.) General mineralogy. Index and geologic maps, geologic sections. Triangular diagram.

146\. Upper part of Prichard Formation. Probably secs. 9, 10, T. 48 N., R. 5 E., unsurveyed, near town of Burke. Lab. No. 54-418SC. Argillite and quartzite, laminated.
147\. Prichard Formation. Probably T. 47 or 48 N., R. 2 E., Pine Creek Road. Lab. No. 54-423SC. Argillite.
148\. Burke Formation. [NW¼ T. 48 N., R. 6 E.] Glidden Lakes. Lab. No. 54-417SC. Quartzite or subgraywacke. Generalized measured section.
149\. St. Regis Formation. Probably sec. 32, T. 48 N., R. 5 E. At portal of Rock Creek adit. Lab. No. 54-416SC. Argillite, medium-gray. Surface sample.
150\. St. Regis Formation. [Sec. 8, T. 50 N., R. 5 E.], near Murray, Little Baldy Mountain. Lab. No. 54-429SC. Argillite, quartzose, or subgraywacke; medium gray.
151\. Lower part of Wallace Formation. Probably sec. 3, T. 47 N., R. 4 E., or secs. 27, 34, T. 48 N., R. 4 E., Placer Creek Road. Lab. No. 54-420SC. Argillite interbedded with quartzite.

152\. Shoshone County. Wallace Formation. Sec. 31 or 32, T. 55 N., R. 2 E., outcrop along road from Summit Campground. Analysts, P.L.D. Elmore, S. D. Botts, I. H. Barlow, and Gillison Chloe. Lab. No. 155262. (Harrison and Jobin, 1963, p. K3, K15, K37, pl. 1.) Blue-gray interlaminated dolomitic siltite and dolomitic argillite. Index and geologic maps, geologic sections.

153\. Twin Falls County. [T. 9 S., R. 18 E.], near town of Shoshone Falls. Analyst, W. F. Hillebrand. Record 1950. (Russell, 1902, p. 136, 137-139; Clarke, 1904, p. 367.) Aeolian sand, light-yellow, fine, homogeneous. Physical properties. Index and geologic map.

154, 155. Twin Falls County. [T. 10 S., R. 13 E.], town of Castleford. (Williamson and Burgin, 1960, p. 4.) Pumice. Mineralogy.

154\. Pumice. 155. Glass fraction of the pumice.

156\. Washington County. [T. 11 N., R. 6 W.], 10 miles west of town of Weiser; exposed in creek bank. Sample 79. (Skeels, 1920, p. 67, 69.) Shale, gray, fine-grained; 6-ft bed; overburden, 10 ft. Index map. Physical properties, firing tests. Possible use: Face brick, pottery, terra cotta.

Oregon

157, 158. Baker County. Miocene, probably correlative of Mascall Formation. SE¼NW¼ sec. 11, T. 8 S., R. 42 E., about 20 miles east of town of Baker, on Clover Creek. Analyst, E. T. Erickson. (Moore, 1934a, p. 5, 6, 11; Moore, 1937, p. 53-55, 109, 114, pls. 1, 6; Wells, 1937, p. 45.) Diatomite; white when dry, yellow when wet; contains pebbles; from bed 9 ft thick; section, 15 ft thick. Ridgway color notation. Index map, detailed measured section, microscopic examination; photomicrograph. Possible use: General uses of diatomite [concrete admixture, filtration, insulation].

157\. Analysis used in computations.
158\. Analysis recomputed to a water-free basis.

159\. Clatsop County. Sec. 35, T. 8 N., R. 10 W., southwest of town of Astoria. Gladding, McBean and Co. (Hodge, 1938f, p. 842, 844, 845, 848.) Clay; contains thin beds of organic matter; sectioned from top to bottom, as follows:

	Feet
Overburden	4
Clay, brownish	3.5
Clay, buff to gray	4.5+

Use: Sewer pipe, draintile.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington,containing uncombined silica and clay each less then 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Oregon—Continued												
	160	161	162	163	164	165	166	167	168	169	170	171	172
	36B4-5	36B5-81	36B6-12	36B6-11	36B6-7	36B6-8	36B6-9	36B6-6	36B6-5	36B7-2	36B9-12	36B9-6	36B9-13
SiO_2	67.62	58.0	68.4	68.1	82.90	81.90	83.16	82.42	82.42	67.15	71.72	84.32	80.5
Al_2O_3	[1]14.38	16.5	------	------	[1]9.69	[1]9.58	[1]9.65	9.87	9.17	13.30	13.77	5.20	7.7
Fe_2O_3	5.22	[3]5.3	[2]8.79	[2]8.08	.628	.896	.653	.747	.78	1.36	.55	2.42	2.72
FeO	------		------	------	------	------	------	------	------	------	1.34	------	------
MgO	------	1.6	------	------	------	------	------	.58	.08	.62	.52	.39	Present
CaO	------	3.3	------	------	------	------	------	1.68	1.68	3.88	Trace	1.53	2.3
Na_2O	------	2.8	------	------	------	------	------	2.74	------	3.03	4.54	------	Present
K_2O	------	------	------	------	------	------	------	1.72	------	1.63	3.75	------	------
H_2O-	------	[4](27.0)	[5]15.0	[5]15.0	------	------	------	------	------	------	[6]3.22	[7]3.92	------
TiO_2	------	------	.8	.8	------	------	------	.153	------	------	.25	------	.38
P_2O_5	------	------	------	------	------	------	------	------	------	------	.06	------	------
MnO	------	------	------	------	------	------	------	------	------	------	.02	------	------
SO_3	------	[8]2.3	------	------	------	------	------	------	------	------	------	------	------
Cr_2O_3	------	------	4.03	3.58	------	------	------	------	------	------	------	------	------
ZrO_2	------	------	.25	.25	------	------	------	------	------	------	------	------	------
Au + Pt	------	------	[9]<.001	[9]<.001	------	------	------	------	------	------	------	------	------
Organic matter	------	------	------	------	------	------	------	------	------	------	------	[10].70	[2].51
Ignition loss	------	6.8	------	------	------	------	------	.58	------	9.67	[10]None		3.96
Total	[87.22]	[96.6]	[97.3]	[95.8]	[93.22]	[92.38]	[93.46]	[11]100.49	[94.13]	[100.64]	99.74	[12]98.48	[98.1]
Class	36,56,0	23,62,3	59,36,0	59,34,0	65,31,0	64,31,0	65,31,0	64,30,0	65,30,3	42,46,8	47,43,0	72,25,2	64,30,3

	Oregon—Continued												
	173	174	*175	*176	*177	*178	*179	*180	*181	*182	183	184	185
	36B9-11	36B10-5	36B10-13	36B10-18	36B10-15	36B10-16	36B10-17	36B10-20	36B10-14	36B10-10	36B10-37	36B10-36	36B10-24
SiO_2	77.1	55.15	42.01	44.39	47.09	45.6	42.68	42.18	46.48	44.73	80.84	83.62	66.95
Al_2O_3	16.0	[15]9.75	.28	None	None	None	None	None	.16	1.18	[1]10.47	[1]9.41	14.86
Fe_2O_3	.3	7.76	3.39	.06	2.81	2.2	.22	1.51	3.54		.949	.609	6.92
FeO	------	------	.72	------	------	------	------	------	------	------	------	------	------
MgO	------	2.22	36.36	15.62	25.94	27.7	18.79	5.28	29.79	10.56	------	------	2.18
CaO	------	10.48	.24	.16	.50	None	.27	.13	None	------	------	------	2.43
Na_2O	[14].3	1.00	13.28	------	------	------	------	------	------	------	------	------	------
K_2O		.50	1.58	------	------	------	------	------	------	------	------	------	------
H_2O+	------	[16]6.59	------	9.04	10.09	11.0	10.30	8.16	10.76	6.99	------	------	------
H_2O-	------	[16]2.70	------	6.45	5.40	5.3	6.82	5.32	4.62	[16]8.87	------	------	------
TiO_2	.5	------	------	------	------	------	------	------	------	------	------	------	------
NiO	------	------	2.62	24.22	8.52	9.0	20.44	37.08	5.42	27.57	------	------	------
Ignition loss	5.8	[15]3.64	------	------	------	------	------	------	------	------	------	------	[15]4.08
Total	100.0	99.79	100.48	99.94	100.35	100.8	99.52	99.66	100.77	[17]99.90	[92.26]	[93.64]	97.42
Class	48,51,0	29,53,8	38,23,0	44,16,0	44,21,0	43,21,0	42,18,1	40,17,1	42,23,0	43,19,0	61,34,0	66,30,0	33,58,8

	Oregon—Continued												
	*186	*187	187a	*188	*189	*190	*191	*192	*193	*194	*195	*196	*197	*198
	36B10-41	36B10-47	36B10-48	36B10-42	36B10-43	36B10-44	36B10-45	36B10-46	36B10-39	36B10-49	36B10-31	36B10-27	36B10-32	36B10-34
SiO_2	45.9	48.3	62.2	46.4	46.7	46.4	46.4	48.1	44.8	46.5	46.00	40.00	46.6	47.8
Al_2O_3	2.06	2.6	.71	1.9	.94	2.2	3.4	3.5	3.1	1.5	2.00	2.00	1.2	1.2
Fe_2O_3[2]	12.9	15.4	7.2	12.94	18.9	16.0	18.2	17.2	21.7	13.2	12.04	12.01	7.9	9.2
Fe^{++}	------	------	------	------	------	------	------	------	------	------	------	------	4.0	2.9
MgO	24.9	22.3	16.9	31.0	27.2	27.6	19.0	19.2	17.8	27.7	29.40	29.00	26.2	27.7
CaO	.95	2.0	.50	1.3	2.7	.21	1.1	1.0	.7	.7	.20	.04	.7	.8
H_2O	------	------	------	------	------	------	------	------	------	------	------	4.0	------	------
P_2O_5[2]	.03	------	.030	.07	.04	.06	------	.09	.14	.034	.005	.005	.06	.03
MnO	------	------	------	------	------	------	------	------	------	------	[2].22	[2].22	------	------
S	.001	------	.001	.003	.047	.17	------	.01	.02	.011	.01	.01	.016	.008
Cr	.26	.93	.29	.54	.68	.58	.81	[18]1.05	1.0	.64	.59	[18].80	.7	.5
Ni	1.8	3.0	2.9	1.46	1.38	1.46	1.5	1.4	1.4	1.65	1.37	[19]1.40	1.50	1.65
Co	.004	.009	.004	.002	------	------	------	------	------	------	.01	------	------	------
Cu	------	------	------	------	------	------	------	------	------	------	.02	.02	------	------
As	------	------	------	------	------	------	------	------	------	------	------	Nil	------	------
Ba	------	------	------	------	------	------	------	------	------	------	Nil	Nil	------	------
Ignition loss	------	------	------	------	------	------	------	7.8	------	7.20	7.5	7.5	[20]7.4	[20]7.2
Total	[88.8]	[94.5]	[90.7]	[95.6]	[98.6]	[94.7]	[90.4]	[99.4]	[90.7]	[99.1]	[21][99.4]	[97.0]	[96.3]	[99.0]
Class	28,37,14	26,44,2	53,19,14	28,37,1	24,44,0	24,45,1	20,54,8	23,51,5	15,61,6	29,36,7	29,35,8	23,35,7	36,22,10	35,25,9

See following page for footnotes.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

160. Clatsop County. SE¼ sec. 12, T. 8 N., R. 11 W., Fort Stevens area. (Carter and others, 1964, p.2,5,12,19,20.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible use: Glass.

161. Columbia County. Late Eocene and early Oligocene, Keasey Shale. [T. 4 N., R. 5 W.] near town of Keasey. (Mason, 1951, p. 11, 12.) Siltstone, tuffaceous, fossiliferous. Index map. Use: Aggregate.

162, 163. Coos County. [Holocene or Pleistocene.] S½ sec. 33, T. 26 S., R. 14 W., 13.5 miles north of town of Bandon, Coos Bay area. Analyst, under direction of A. C. Rice. Samples 33-1, 33-2. (Hundhausen, 1947, p. 2-4, 7-13, figs. 1, 4-6.) General: Alternating layers of black, brown, and gray sands; composite samples of black sand from drill holes and pits; represent the mine-run sand. Mineralogy. Deposit: Chromiferous sand layers range from 14 to 18 ft thick; overburden, 0-21 ft. Index and geologic maps, geologic sections. Beneficiation tests. Use: Source of chromite.

164 - 166. Coos County. (Carter and others, 1964, p. 2, 5, 6, 9, 12, 19-21.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible use: Glass.
    164. NW¼ sec. 13, T. 23 S., R. 13 W., Tenmile Creek area. Owner, Maurice Duval. Sample J-2.
    165. Secs. 10, 15, 16, 21, 22, 30, 33, T. 24 S., R. 13 W., North Coos Bay area. Sample K-Comp. Composite sample.
    166. Sec. 15, T. 24 S., R. 13 W., Hauser area. Owner, Maurice Duval. Sample L-Comp. Composite sample. Mineralogy. Geologic map.

167. Coos County. Sec. 27, T. 24 S., R. 13 W., Rogers area. Owner, Maurice Duval. (Carter and others, 1964, p. 2, 5, 7, 9, 13-19, 21.) Sand, composite sample. Mineralogy. Index maps. Beneficiation tests; screen analysis. Possible use: Glass.

168. Coos County. W½ secs. 15, 27, T. 24 S., R. 13 W., near town of Rogers. Deposit O-1, sample C. (Carter and others, 1962, p. 27-29, 30.) Sand, from top of dune. Mineralogy. Screen analysis. Index map. Possible use: Glass, ceramic ware.

169. Crook County. Sec. 21, T. 16 S., R. 17 E., southeast of town of Prineville. Analyst, L.L.Hoagland. (Oregon Dept. Geology and Mineral Industries, 1950a, p. 27-29; Mason, 1951, p. 16-18.) Rhyolite tuff, white, dense; uniform texture. Physical properties, mineralogy; bulk density 1.82. Index of refraction. Index map. Possible use: Dimension stone.

170. Deschutes County. Late Tertiary and Quaternary. Sec. 30, T. 21 S., R. 13 E., pumice cone on southwest shore of East Lake. Analyst, J. J. Fahey. Record D-114. (Moore, 1937, p. 155, 167, 168-170, 173, pls. 1, 16.) Pumice, light-gray, finely vesicnlar; mineralogy. Estimate of cnbic yards. Physical properties, mechanical analysis. Index and geologic maps. Possible use: Abrasives, lightweight concrete aggregate, carrier, insulating material, acoustic plasters.

171. Deschutes County. [T. 14 S., R. 12 E.],7 miles west of town of Terrebonne. Atomite Co. (Eardley-Wilmot, 1928, p. 102, 103, 108, pl. 14.) Diatomite interbedded with other sediments; beds 1-5 ft thick; maximum thickness 45 ft, averages 30 ft. Overburden. Photomicrograph. Use: Concrete admixture [implied].

172. Deschutes County. [T. 15 S., R. 13 E.],near town of Redmond. Analyst, Mary Fletcher. (Norman and Ralston, 1942, p. 361, 362.) Diatomite. Purification tests.

173. Deschutes County. [T. 17 S., R. 12 E.],town of Bend. Analyst, Anthony Centenero; collector, R. L. Nichols. Sample B-1. (Pask and Davies, 1943, p. 3, 10, 20, 22, 23, 26.) Clay, contains free quartz. Mineralogy; thermal analysis curve.

174. Douglas County. Eocene, Wilbur Tuff Lentil. Sec. 33, T. 25 S., R. 5 W., a few miles northeast of town of Wilbur. Analyst, H.N. Stokes. Record 1737. (Diller, 1898, p. [2],[4]; Clarke, 1915, p. 202.) Tuff. Index and geologic maps, geologic sections. Former use: Cement.

175 - 181. Douglas County. Probably Miocene. T. 30 S., R. 6 W., near town of Riddle. Analyst, K. J. Murata. (Pecora and others, 1949, p. 13-16, 18, 20.) General: Garnierite, greenish, claylike; lower deposit 50-75 ft thick; upper deposit probably 100-200 ft thick. Mineralogy, microscopic examination, Ridgway color notation. Index maps. X-ray patterns and differential thermal analysis. *Samples contain varying amounts of NiO; MgO and CaO not calculated as carbonate.
    *175. SW¼ sec. 16, roadcut. Clay, light-colored; bulk density 2.57.
    *176. SW¼ sec. 17. Quartz garnierite, veinlike mass, bluish-green; bulk density 2.69.
    *177. SE¼ sec. 17. Garnierite quartz veinlets, yellowish-green; bulk density 2.58.
    *178. SE¼ sec. 17. Garnierite quartz veinlets, yellowish-green.
    *179. SE¼ sec. 17. Quartz garnierite, veinlike mass, bluish-green, bulk density 2.67.
    *180. SE¼ sec. 16. Garnierite, dark-green; thin veinlet; bulk density 2.98.
    *181. NE¼ sec. 20. Garnierite quartz veinlets, yellowish-green; bulk density 2.55.

*182. Douglas County. Late Tertiary. Sec. 17, T. 30 S., R. 6 W., about 3 miles northwest of Riddle, Nickel Mountain. Owner, E. F. Adams. Analyst, F. W. Clarke. Record 792. (Clarke, 1888, p. 483, 484-487; Pecora and Hobbs, 1942, p. 205-207, 212, 213, 215, 222-226.) Genthite, dark-apple-green, compact, amorphous; deposit from a few feet to 60-70 ft thick, averages about 20 ft. Mineralogy. Tonnage estimated. Index and geologic maps; sketch of a vertical section. Possible use: Source of nickel. *Analysis shows 27.6 percent NiO; MgO not calculated as carbonate.

183, 184. Douglas County. (Carter and others, 1964, p. 2, 5, 12, 19-21.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible use: Glass.
    183. N½ sec. 32, T. 20 S., R. 12 W., Tahkenitch Lake area. Sample H-2.
    184. Sec. 25, T. 22 S., R. 13 W., Umpqua River area. Sample I-Comp. Composite sample.

185. Douglas County. [T. 27 S., R. 6 W.],near town of Roseburg. Analyst, W. Michaelis. (Eckel, 1913, p. 308.) Shale, dark-gray; contains calcite seams. Physical properties. Possible use: Cement.

186 - 193. Douglas County. [T. 29 or 30 S., R. 6 W.], about 5 miles northwest of Riddle, Nickel Mountain. Owner, Hanna Development Co. (Cremer, 1954, p. 2, 5, 6.) Nickeliferous iron-bearing rock. Mineralogy. Tonnage estimated. Possible use: Source of ferronickel. *Samples contain varying amounts of Ni; MgO and CaO not calculated as carbonate.
    *186. Lot C-1.   *187. Lot C-2.
    187a. Lot C-3.
    *188. Lot D.
    *189. Lot E-3. From 100-ft test shaft.
    *190. Lot E-5. From 100-ft test shaft.
    *191. Lot F-3. From surface trench.
    *192. Lot F-5. (Hundhausen and others, 1954, p. 1, 11, fig. 1.) From surface trench.
    *193. Lot F-6. From surface trench.

*194 - *196. Douglas County. T. 30 S., R. 6 W., 3-5 miles northwest of Riddle. Nickel Mountain deposit. (Zapffe, 1949, p. 83-85, 86.) Laterite, reddish; average thickness about 20 ft. Mineralogy. Possible use: Source of nickel. *Samples contain varying amounts of Ni or NiO; MgO and CaO not calculated as carbonate.
    *195. Analyst, H. E. Peterson. (Ravitz, 1947, p. 4, 5, 6, 8, 9, 37, 39.) Deposit: Nickeliferous weathered peridotite, little overburden. Tonnage estimated. 8eneficiation tests. Possible use: Source of ferronickel.

*197, *198. Douglas County. [T. 30 S., R. 6 W.],near Riddle. Analyst, H. E. Peterson. (Ravitz, 1947, p. 4, 5, 6, 8, 9, 10, 37, 39.) Nickeliferous weathered peridotite, little overburden. Mineralogy. Tonnage estimated. Beneficiation tests. Possible use: Source of ferronickel. *Samples contain varying amounts of Ni; MgO and CaO not calculated as carbonate.

Footnotes of analyses on preceding page:

[1] Includes TiO_2.

[2] Calculated from reported Fe, Fe^{+++}, P, Mn, or C.

[3] Iron oxide.

[4] Not included in total.

[5] Moisture content averages about 15 percent as mined.

[6] H_2O.

[7] At 105°C.

[8] Sulfate.

[9] Ounces per ton.

[10] CO_2.

[11] 99.82 percent in text.

[12] 99.51 percent in text.

[13] Includes TiO_2 and P_2O_5.

[14] Mainly alkalies and alkaline earth.

[15] Above 110°C.

[16] At 110°C.

[17] Lime, sulfates, chromium, and cobalt could not be detected.

[18] Cr_2O_3.

[19] NiO.

[20] At 1,000°C.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

Oregon—Continued

	*199	*200	*201	*202	*203	*204	*205	*206	*207	*208	*209	*210	*211
	36B10-35	36B10-33	36B12-9	36B12-12	36B12-6	36B12-8	36B12-17	36B12-13	36B12-11	36B12-16	36B12-15	36B12-14	36B12-4
SiO_2	44.2	47.8	55.7	56.0	55.0	55.3	59.2	56.2	55.9	56.9	56.6	56.5	54.2
Al_2O_3	1.6	1.3	17.9	16.9	17.3	17.4	16.9	17.1	17.7	17.7	16.6	17.4	17.1
Fe_2O_3	[1]8.2	[1]8.7	2.6	2.4	2.1	2.2	1.6	1.8	2.3	2.4	2.1	2.4	2.2
FeO	[2]4.5	[2]2.2	4.3	4.6	5.4	4.9	4.2	5.3	4.4	3.7	4.6	4.1	4.5
MgO	28.0	27.2	3.1	3.8	3.7	3.9	2.1	3.5	3.3	2.8	3.6	2.9	3.2
CaO	.8	.8	4.7	5.8	5.4	6.1	5.2	4.8	6.0	5.7	5.3	5.5	5.9
Na_2O	------	------	4.1	3.1	4.2	3.4	3.9	4.3	3.7	3.6	3.9	3.2	4.0
K_2O	------	------	1.7	2.2	1.8	1.5	1.8	1.5	1.5	2.0	2.2	3.6	2.8
H_2O	------	------	3.7	3.3	3.2	3.3	3.1	3.5	3.3	3.1	3.2	2.8	4.4
TiO_2	------	------	.91	1.0	.86	.80	.82	.87	.83	.65	.82	.88	.81
P_2O_5	[1].05	[1].02	.14	.15	.13	.13	.16	.16	.17	.15	.14	.24	.25
MnO	------	------	.087	.085	.096	.095	.083	.090	.080	.083	.089	.12	.11
CO_2	[3]5.7	[3]7.7	.32	.28	.78	.49	.52	.67	.40	.51	.62	.26	.37
S	.01	.01	.28	.16	.17	.12	.11	.14	.13	.13	.14	.12	.07
Ni	1.52	2.26	------	------	------	------	------	------	------	------	------	------	------
Cr	.8	.6	------	------	------	------	------	------	------	------	------	------	------
Total	[95.4]	[98.6]	99.5	99.8	100.1	99.6	99.7	99.9	99.7	99.4	99.9	100.0	99.9
Class	32,24,6	36,25,10	21,59,1	23,55,1	22,56,2	22,56,1	28.53,1	24,55,1	22,57,1	23,57,1	25,54,1	23,56,1	21,56,1

Oregon—Continued

	*212	*213	*214	*215	216	217	218	219	220	221	222	223	224
	36B12-5	36B12-3	36B12-10	36B12-7	36B12-19	36B12-21	36B12-26	36B12-27	36B12-20	36B12-22	36B12-23	36B12-24	36B12-25
SiO_2	54.4	53.2	55.8	55.2	68.3	70.9	76.0	76.2	69.0	73.0	74.0	74.4	75.2
Al_2O_2	17.2	17.4	17.3	17.6	13.6	13.1	13.6	12.9	13.1	14.2	14.0	13.5	13.7
Fe_2O_3	2.2	2.7	2.1	1.8	1.3	1.1	1.0	1.4	1.1	.75	1.0	1.5	.44
FeO	4.5	4.8	3.6	3.9	1.3	1.6	.13	.18	.90	.43	.70	.26	.17
MgO	3.1	3.2	2.3	2.3	1.3	1.0	.02	.53	.76	.39	.44	.11	.05
CaO	6.0	5.9	5.4	5.9	2.9	1.6	.62	.64	3.2	.85	.52	.74	.82
Na_2O	4.0	3.6	3.8	4.0	1.2	5.4	7.0	5.9	1.3	7.1	7.2	7.7	7.8
K_2O	2.7	2.3	3.5	3.8	3.0	1.7	.14	.60	2.8	1.3	.14	.36	.19
H_2O	4.2	4.9	3.8	3.7	6.3	2.1	.72	1.0	6.3	1.0	1.0	.75	.47
TiO_2	.83	.93	.80	.80	.34	.42	.29	.30	.40	.38	.36	.32	.35
P_2O_5	.25	.26	.28	.27	.075	.14	.046	.058	.072	.13	.056	.087	.054
MnO	.12	.12	.10	.10	.039	.032	.018	.021	.028	.010	.033	.018	.011
CO_2	.37	.37	.71	.33	.13	[4].87	.15	.13	.38	.23	.16	.10	.30
S	.07	.10	.16	.14	.04	.22	.005	.005	.014	.005	.006	.005	.005
Total	99.9	[5]99.8	99.6	99.8	99.8	100.2	99.7	99.9	99.4	99.8	99.6	99.8	99.6
Class	25,56,1	19,59,1	23,56,2	22,56,1	43.47,0	47,41,2	51,41,0	52,40,0	45,45,1	47,42,0	48,42,0	49,41,0	51,39,1

Oregon—Continued

	225	226	227	228	229	230	231	232	233	234	235	236	237
	36B12-28	36B12-2		36B12-18	36B13-1		36B13-2		36B15-1	36B15-16	36B15-18	36B15-28	36B15-7
SiO_2	78.9	68.22	74.22	66.64	81.68	90.31	82.78	90.89	65.98	68.02	71.48	81.10	67.78
Al_2O_3	11.4	12.41	13.50	13.93	5.93	6.56	4.61	5.05	17.20	19.45	19.77	12.89	19.14
Fe_2O_3	.57	1.00	1.09	.95	1.20	1.32	1.77	1.93	1.49	3.90	2.27	1.64	.56
FeO	.13	1.36	1.49	1.46	------	------	------	------	2.68	------	------	.15	2.68
MgO	.07	.16	.19	1.14	.30	.33	.22	.23	2.46	.40	.18	.07	.52
CaO	.55	.95	1.03	2.61	.54	.60	.44	.47	.11	1.91	.70	.10	1.57
Na_2O	6.5	3.38	3.69	5.66	.24	.27	.62	.67	2.18	------	------	.28	1.65
K_2O	.29	3.97	4.33	2.64	.10	.11	.24	.26	3.96	------	------	.30	1.46
H_2O+	.61	[6]4.82	------	[6]3.81	5.10	------	4.78	------	[7]2.56	------	------	[7]4.16	[7]3.12
H_2O-		[8]3.42	------	[8]1.19	[9]4.62	------	[9]4.74	------	[10].12	------	------	[10].12	[10].38
TiO_2	.31	.34	.35	.18	.31	.34	.26	.28	1.40	[11].13	[11].30	------	------
P_2O_5	.044	.11	.11	.12	------	------	------	------	------	------	------	------	------
MnO	.011	------	------	------	------	------	------	------	------	------	------	------	------
CO_2	.27	------	------	------	.09	.10	.06	.06	------	[12]6.26	[12]5.64	------	.70
S	.005	------	------	------	[13].05	[13].06	[13].15	[13].16	------	------	------	------	------
Cl	------	------	------	------	None	None	None	None	------	------	------	------	------
Total	99.7	100.16	100.00	100.33	100.16	100.00	100.67	100.00	100.14	100.07	100.34	100.81	99.56
Class	58,33,1	45,45,0	------	41,46,0	70,29,0	------	73,26,0	------	34,54,0	29,68,1	34,65,0	56,43,0	33,58,2

[1] Calculated from reported Fe^{+++}, or P.
[2] Reported as Fe^{++}.
[3] Ignition loss at 1,000°C.
[4] Includes organic matter.
[5] 99.5 percent in text.
[6] Above 110°C.
[7] Above 100°C.
[8] At 110°C.
[9] At 105°C.
[10] Below 100°C.
[11] TiO.
[12] Ignition loss.
[13] SO_3.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

199, 200. Douglas County. [T. 30 S., R. 6 W.],near town of Riddle. Analyst, H. E. Peterson. (Ravitz, 1947, p. 4, 6, 8, 9, 10, 37, 39.) Nickeliferous weathered peridotite, little overburden. Mineralogy. Tonnage estimated. Beneficiation tests. Possible use: Source of ferronickel.

*199. *Analysis shows 4.5 percent Fe^{++}, 1.5 percent Ni, 0.8 percent Cr; suggests 25.9 percent more MgO and CaO than required for carbonate.

*200. *Analysis shows 2.3 percent Ni, 2.2 percent Fe^{++}; suggests 23.2 percent more MgO and CaO than required for carbonate.

201-209. Grant County. Early Jurassic, Hyde Formation. [T. 17 S., R. 28 E.],near town of Izee, South Fork of John Day River. Analyst, E. L. P. Mercy. (Dickinson, 1962b, p. 482-491, 493.) Tuff, medium-grained, massive. Mineralogy. Outcrop sample. Index and geologic maps, columnar section. Photomicrograph.

*201. Field No. FC-500. *Analysis shows 5.8 percent alkalies, 4.3 percent FeO, 0.9 percent TiO_2; suggests 7.4 percent more MgO and CaO than required for carbonate.

*202. Field No. CC-200. *Analysis shows 5.3 percent alkalies, 4.6 percent FeO, 1.0 percent TiO_2; suggests 9.3 percent more MgO and CaO than required for carbonate.

*203. Field No. SF-400. *Analysis shows 6.0 percent alkalies, 5.4 percent FeO, 0.9 percent TiO_2; suggests 8.2 percent more MgO and CaO than required for carbonate.

*204. Field No. SF-500. *Analysis shows 4.9 percent FeO, 4.9 percent alkalies, 0.8 percent TiO_2; suggests 9.5 percent more MgO and CaO than required for carbonate.

*205. Field No. 3-49-18. *Analysis shows 5.7 percent alkalies, 4.2 percent FeO, 0.8 percent TiO_2; suggests 6.7 percent more MgO and CaO than required for carbonate.

*206. Field No. 3-49-31. *Analysis shows 5.8 percent alkalies, 5.3 percent FeO, 0.9 percent TiO_2; suggests 7.6 percent more MgO and CaO than required for carbonate.

*207. Field No. 3-49-29. *Analysis shows 5.2 percent alkalies, 4.4 percent FeO, 0.8 percent TiO_2; suggests 8.8 percent more MgO and CaO than required for carbonate.

*208. Field No. 3-49-28. *Analysis shows 5.6 percent alkalies, 3.7 percent FeO; suggests 7.9 percent more MgO and CaO than required for carbonate.

*209. Field No. 3-49-27. *Analysis shows 6.1 percent alkalies, 4.6 percent FeO, 0.8 percent TiO_2; suggests 8.2 percent more MgO and CaO than required for carbonate.

210-215. Grant County. Middle Jurassic, Snowshoe Formation. [T. 17 S., R. 28 E.], near Izee, South Fork of Beaver Creek. Analyst, E. L. P. Mercy. (Dickinson, 1962b, p. 482-492.) Tuff, medinm-grained, massive. Mineralogy. Index and geologic maps, columnar section. Photomicrograph.

*210. Field No. 4-36-19. Bulk density 2.72. *Analysis shows 6.8 percent alkalies, 4.1 percent FeO, 0.9 percent TiO_2; suggests 8.1 percent more MgO and CaO than required for carbonate.

*211. Field No. 8-20-6. Bulk density 2.69. *Analysis shows 6.8 percent alkalies, 4.5 percent FeO, 0.8 percent TiO_2; suggests 8.7 percent more MgO and CaO than required for carbonate.

*212. Field No. 8-19-6. Bulk density 2.70. *Analysis shows 6.7 percent alkalies, 4.5 percent FeO, 0.8 percent TiO_2; suggests 8.7 percent more MgO and CaO than required for carbonate.

*213. Field No. B-19-7. Bulk density 2.66. *Analysis shows 5.9 percent alkalies, 4.8 percent FeO, 0.9 percent TiO_2; suggests 8.7 percent more MgO and CaO than required for carbonate.

*214. Field No. 4-45-4. Bulk density 2.66. *Analysis shows 7.3 percent alkalies, 3.6 percent FeO, 0.8 percent TiO_2; suggests 6.9 percent more MgO and CaO than required for carbonate.

*215. Field No. B-19-1. Bulk denisty 2.70. *Analysis shows 7.8 percent alkalies, 3.9 percent FeO, 0.8 percent TiO_2; suggests 7.8 percent more MgO and CaO than required for carbonate.

Oregon—Continued

216-225. Grant County. Jurassic, Trowbridge Formation, (Buck Creek Felsite Tuff). [T. 17 S., R. 28 E.],near Izee. Analyst, E. L. P. Mercy. (Dickinson, 1962a, p. 250, 251, 253-256, 259, 261.) Mineralogy. Index and geologic map. Photomicrograph.

216-219. Lewis Creek. Altered tuff, dark-gray-green, finely crystalline, splintery or subconchoidal fracture.
216. Sample 385.
217. Sample 384.
218. Sample 382.
219. Sample 381.

220. Pole Canyon. Sample 2481. Altered tuff, dull-green, finely crystalline, splintery or subconchoidal fracture.

221. Pole Canyon. Sample 2489. Altered tuff, gray, brittle.

222. South Fork of John Day River. Sample 1452. Altered tuff, pale-gray, brittle.

223. Rosebud Creek. Sample 1462. Altered tuff, tan, brittle. Profile columnar section.

224. Buck Creek. Sample 1456. Altered tuff, pale-buff, brittle.

225. Buck Creek. Sample 6486. Altered tuff, cream-colored, brittle.

226, 227. Grant County. Late Miocene, Mascall Formation. [Sec. 13, T. 13 S., R. 28 E.],John Day basin. Belshaws Ranch. Analyst, F. C. Calkins. (Calkins, 1902-1904, p. 167.) Rhyolitic tuff, gray, friable. Mineralogy.
226. Analysis used in computations.
227. Analysis recomputed to a water-free basis.

228. Grant County. Holocene. [T. 13 S., R. 28 E.],John Day basin. Analyst, F. C. Calkins. (Calkins, 1902-1904, p. 168, 169.) Volcanic ash, cream-white, friable, very fine grained. Mineralogy.

229-232. Harney County. Miocene and Pliocene(?), Payette Formation. SW¼SE¼ sec. 14, T. 20 S., R. 36 E., 7 miles northeast of town of Drewsey. Diatomite Products Co. Analyst, E. T. Erickson. (Moore, 1934a, p.8, 9, 11, 12; Moore, 1937, p. 95, 97-99, 103, 104-106, 111, 114, pls. 1, 10, 11; Wells, 1937, p. 45.) Diatomite, beds as much as 31.5 ft thick, maximum thickness about 500 ft; little overburden. Tonnage estimated. Index and geologic maps, detailed measured section. Microscopic examination, photomicrograph. Ridgway color notation. Possible use: Concrete admixture, sawed bricks and other forms, filtration, insulation.

229, 230. Lab. No. Z4. Diatomite; pale buff when dry; laminated; weathers to a papery shale; from bed 22 ft thick.
229. Analysis used in computations.
230. Analysis recomputed to a water-free basis.

231, 232. Lab. No. Z10. Diatomite; pale buff when dry; pale cream buff when wet; from bed 18 ft thick.
231. Analysis used in computations.
232. Analysis recompnted to a water-free basis.

233. Jackson County. Probably Paleozoic. Sec. 36, T. 37 S., R. 3 W., about 1.5 miles west of town of Jacksonville. Opp mine. Analyst, S.W. French. Sample 164. (Winchell, 1914, p. 14, 15, 39, 42, 68, 141, 149, 151, fig. 1.) Argillite. Mineralogy. Index maps. Use: Road metal.

234, 235. Jackson County. Probably post-middle Miocene. (Wilson and Treasher, 1938, p. 1, 19, 24, 80, 81, 84, 92.) Index map. Firing tests.

234. SW¼ sec. 20, T. 33 S., R. 1 W., roadcut. Gaines property. Field No. 38. Clay. Possible use: Face brick.

235. SE¼ sec. 25, NE¼ sec. 36, T. 33 S., R. 1 W., near town of Rogue-Elk. Rogers property. Field No. 39. Clay. Possible use: Probably none.

236. Jackson County. [T. 39 S., R. 1 E.],southeast of town of Ashland, Walker Creek. Analyst, S. W. French. Sample 44. (Winchell, 1914, p. 14, 15, 39, 40, 42, 55, fig. 1.) Laterite; claylike mass interbedded with lava flows. Mineralogy. Index maps. Possible use: Pottery.

237. Jackson County. [T. 40 S., Rs. 1 W., 1, 2, E.],southeast of Ashland, railroad cut south of Siskiyou tunnel. Analyst, S. W. French. Sample 9. (Winchell, 1914, p. 14, 15, 17, 39, 40, 42, 59, fig. 1.) Argillite, light-gray, well-bedded, extremely fine grained. Mineralogy. Index maps.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Oregon—Continued												
	238	239	240	241	242	243	244	245	246	247	248	249	250
	36B16-1	36B16-2	36B18-1		36B18-2		36B18-3		36B18-4	36B18-5	36B18-7	36B18-6	
SiO_2	71.58	83.5	65.52	74.41	75.56	83.39	75.30	82.68	68.56	69.50	66.38	76.00	88.76
Al_2O_3	11.09	8.3	14.44	16.39	8.64	9.54	8.42	9.24	14.22	15.18	15.74	5.96	6.96
Fe_2O_3	1.57	2.9	3.34	3.78	2.66	2.94	2.89	3.17	1.42	1.24	.64	2.03	2.37
FeO	------	------	------	------	------	------	------	------	1.49	1.42	2.12	------	------
MgO	.88	------	.87	.97	.37	.41	.63	.69	.83	.83	.74	.23	.27
CaO	1.28	------	1.56	1.77	1.20	1.33	1.90	2.08	2.35	2.08	2.68	.38	.44
Na_2O	3.98	------	.91	1.02	1.08	1.19	.71	.78	5.18	4.78	4.11	.33	.39
K_2O	4.10	------	.42	.48	.26	.29	.32	.35	2.47	2.18	2.37	.15	.17
H_2O+	------	------	7.40	------	5.40	------	5.67	------	3.32	2.51	4.00	9.18	------
H_2O-	------	------	[1]5.20	------	[1]3.76	------	[1]3.80	------			.50	[1]5.20	------
TiO_2	.38	------	.86	.98	.64	.71	.45	.49	.58	.41	.48	.13	.14
P_2O_5	------	------	------	------	------	------	------	------	.10	.21	.05	------	------
MnO	------	------	------	------	------	------	------	------	.03	.03	Nil	------	------
CO_2	[2]2.14	[2]3.6	.04	.05	.11	.12	.10	.12	None	None	------	.20	.23
SO_3	------	------	.03	.03	.06	.07	.03	.03	------	------	------	.17	.20
Cl	------	------	.10	.12	None	None	.34	.37	------	------	------	.06	.07
Total	[97.00]	[98.3]	100.69	100.00	99.74	99.99	100.56	100.00	100.55	100.37	99.81	[3]100.02	100.00
Class	50,36,0	66,33,0	36,60,0	------	57,39,0	------	57,39,0	------	42,46,0	41,47,0	38,49,0	63,35,0	------

	Oregon—Continued												
	251	252	253	254	255	256	257	258	259	260	261	262	263
	36B20-17	36B20-23	36B20-18	36B20-19	36B20-20	36B20-27	36B20-21	36B20-26	36B20-25	36B21-4	36B21-5	36B21-3	36B21-1
SiO_2	80.20	71.0	79.54	71.07	78.17	77.10	75.69	81.72	80.04	60.8	55.2	50.1	72.45
Al_2O_3	14.88	14.8	15.63	18.68	15.53	[4]11.38	14.89	[4]10.53	[4]11.53	13.9	15.3	13.3	12.60
Fe_2O_3	1.70	2.0	.74	2.82	1.37	2.74	1.52	.813	.877	4.0	4.3	4.5	[5]10.80
FeO		.49	------			------		------	------	2.0	2.0	9.3	------
MgO	------	.40	.31	.01	.13	------	.05	------	------	2.2	2.4	3.8	Trace
CaO	.52	1.8	.32	.17	.08	------	.18	------	------	1.0	3.5	8.1	4.10
Na_2O	------	3.8	------	------	------	------	------	------	------	2.2	3.2	3.2	------
K_2O	------	3.6	------	------	------	------	------	------	------	1.7	.85	.75	------
H_2O+	------	1.6	------	------	------	------	------	------	------	4.7	4.8	1.1	------
H_2O-	------									5.0	6.4	1.6	------
TiO_2	------	.38	[6].13	------	------	------	------	------	------	.74	.84	3.0	------
P_2O_5	------	.04	------	------	------	------	------	------	------	.25	.33	.65	------
MnO	.007	.06	------	------	------	------	------	------	------	.04	.12	.21	------
CO_2	[2]3.50	.06	[2]3.23	[2]6.97	[2]4.57	------	[2]5.43	------	------	.58	1.0	.06	------
Total	100.81	100.0	99.90	99.72	99.85	[91.22]	97.76	[93.06]	[92.45]	[99.1]	[100.2]	[99.7]	99.95
Class	52,48,0	43,47,0	51,48,0	35,65,0	49,50,0	54,41,0	48,50,0	62,34,0	59,37,0	32,57,1	23,63,2	22,49,0	50,48,0

	Oregon—Continued												
	264	265	266	267	268	269	270	271	272	273	274	275	276
	36B21-2	36B23-4		36B23-5		36B23-7		36B23-12	36B24-78	36B24-74	36B24-75	36B28-4	36B29-2
SiO_2	81.84	78.12	88.08	77.96	88.20	74.78	83.39	68.70	62.42	63.98	72.73	59.40	78.20
Al_2O_3	[4]10.14	6.29	7.09	3.93	4.45	6.69	7.46	13.50	18.28	20.24	15.96	16.34	[4]10.86
Fe_2O_3	.858	1.88	2.12	2.92	3.30	1.98	2.21	1.00	[7]3.47	[7]3.78	[7]3.86		1.88
MgO	------	.41	.46	.67	.76	.65	.72	.41	.65	.23	.15	[8].87	------
CaO	------	.96	1.08	1.26	1.43	.88	.98	.80	3.91	2.28	.48	[8]11.23	------
Na_2O	------	.34	.38	.98	1.08	1.44	1.61	5.65	------	------	------	------	------
K_2O	------	.20	.22	.16	.18	.32	.35	4.55	------	------	------	------	------
H_2O+	------	6.80	------	8.16	------	6.56	------	------	------	------	------	------	------
H_2O-	------	[1]4.72	------	[1]6.22	------	[1]6.48	------	------	------	------	------	[9]1.41	------
TiO_2	------	.33	.36	.27	.30	.27	.30	------	------	------	------	------	------
CO_2	------	.13	.15	.15	.17	.13	.14	[2]5.49	[2]11.35	[2]9.57	[2]5.35	[8]9.76	------
SO_3	------	.04	.04	.10	.11	.88	.98	------	------	------	------	------	------
Cl	------	None	None	.02	.02	1.66	1.86	------	------	------	------	------	------
Total	[92.84]	100.22	99.98	100.80	100.00	102.72	100.00	[100.10]	100.08	100.08	98.53	[99.01]	[90.94]
Class	63,33,0	65,33,0	------	68,29,0	------	61,36,0	------	44,44,3	26,66,8	24,72,5	40,57,1	32,45,22	57,37,0

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[1] At 105°C.

[2] Ignition loss.

[3] Contains organic matter.

[4] Includes TiO_2.

[5] Oxide of iron.

[6] TiO.

[7] Includes FeO.

[8] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[9] Ignition loss, used as H_2O in computations.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

238. Jefferson County. Sec. 9, T. 9 S., R. 15 E., 3 miles south of Willowdale post office. Analyst, L. L. Hoagland. (Mason, 1951, p. 16-18.) Rhyolite tuff, reddish-brown, fine-grained, some banding. Little overburden. Bulk density 1.66-1.89. Index map. Physical properties. Use: Building stone.

239. Jefferson County. NW¼ sec. 25, T. 11 S., R. 11 E., Warm Springs Indian Reservation. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1, 2, 4, 32, 35, 36, 66, 74.) Diatomite; about 45 ft thick; overburden 3-15 ft thick. Channel sample of upper 5 ft. Index maps. Physical properties, firing tests. Photomicrograph. Possible general use: Concrete admixture, filtration, heat insulation.

240-245. Klamath County. Analyst, E. T. Erickson. (Moore, 1934a, p. 3, 5, 11; Moore, 1937, p. 37, 41, 42, 43, 44, 47, 48, 108, 109, 114, pls. 1, 4-6; Wells, 1937, p. 45.) Index and geologic maps. Microscopic examination, photomicrograph. Ridgway color notation. Possible use: Clay-bonded bricks. Samples 240, 242, 244 used in computations; samples 241, 243, 245 recomputed to a water-free basis.

240, 241. Pliocene. SW¼ sec. 11, T. 36 S., R. 10 E., north of town of Sprague River, roadcut. Lab. No. 227. Diatomite, buff, massive; interbedded with other sediments; beds 5-15 ft thick, deposit 105 ft thick.

242, 243. Pliocene(?). SW corner, NW¼ sec. 13, T. 39 S., R. 8 E., 4.5 miles southwest of town of Klamath Falls. Lab. No. 187. Diatomite, pale-buff, massive, thick-bedded with a few very thin ash partings. Sample from 42 ft bed. Detailed measured section. Possible use: Insulation.

244, 245. Pliocene. NW¼SE¼ sec. 13, T. 40 S., R. 11 E., near town of Malin, roadcut. Lab. No. 232. Diatomite, pale-buff; interbedded with other sediments. Deposit abont 50 ft thick. Possible use: Concrete admixture, insulation.

246, 247. Klamath County. Late Tertiary and Quaternary. Analyst, J. J. Fahey. Record D-114. Mineralogy. Index and geologic maps. Physical properties, mechanical analysis.

246. Sec. 8, T. 27 S., R. 8 E., near town of Chemult. (Moore, 1934b, p. 359, 360, 362, 363, 366; Moore, 1937, p. 155, 158, 159, 160, pls. 1, 16; Oregon Dept. Geology and Mineral Industries, 1950b, p. 41, 42.) Pumice, white, fine to coarsely granular; weathers light yellow; averages 6 ft thick. Volume estimated. Possible use: Abrasives, concrete aggregate, insulation, acoustic plasters.

247. Sec. 17, T. 28 S., R. 8 E., south of Chemult. (Moore, 1934b, p. 359-362, 365; Moore, 1937, p. 155, 157, 160, 161, pls. 1, 16.) Pumice, light-gray; weathers pink and yellow.

248. Klamath County. Holocene. [T. 32 S., R. 6 E.], Crater Lake National Park, Sun Creek Canyon. Analyst, W. H. Herdsman. Sample 29. (Williams, 1942, p. 13, 18, 70, 114, 145, 146, 151, 152, pls. 2, 3.) Dacite lump pumice, pale-gray, buff, and white. General mineralogy. Index and geologic maps, general geologic sections. Norms and Niggli values.

249, 250. Klamath County. Holocene. NW¼NE¼ sec. 31, T. 35 S., R. 14 E., North Fork of Sprague River. Analyst, E. T. Erickson. Sample 222. (Moore, 1934a, p. 3, 5, 11; Moore, 1937, p. 45, 47, 109, 114, pls. 1, 5, 6; Wells, 1937, p. 45.) Diatomite, buff; interbedded with other sediments. Index and geologic maps. Microscopic examination, photomicrograph. Ridgway color notation. Possible use: None, deposit small.

249. Analysis used in computations.

250. Analysis recomputed to a water-free basis.

251. Lane County. Oligocene. NE¼NW¼ sec. 2, T. 18 S., R. 4 W., about 2 miles southwest of town of Eugene. West property. USED sample 270 A. (Hodge, 1938f, p. 817, 869, 887.) Kaolin, white, sandy; 10 ft thick; overburden 5 ft thick. Index map. Firing tests. Possible use: Ceramic products.

252. Lane County. Oligocene(?), Little Butte Volcanic Series. NW¼NE¼ sec. 34, T. 21 S., R. 4 E., 1.5 miles west of McCredie Springs, roadcut. Analysts, P. L. D. Elmore, S. D. Botts, H. H. Thomas, M. D. Mack. Sample DLP-56-128A. (Peck and others, 1964, p. 2, 8, 13, 45, 46, pl. 1.) Rhyodacite tuff, pinkish-gray, massive. Bulk density 2.58. Index of refraction. Mineralogy, thin-section description. Index and geologic maps, geologic sections, generalized columnar section. Norms and modes.

253. Lane County. Probably post-middle Miocene. NW¼ sec. 36, T. 17 S., R. 4 W., west of Eugene. Rice property. Field No. 31 C. (Wilson and Treasher, 1938, p. 1, 19, 65, 84, 91.) Clay, sandy. Firing tests. Former use: Brick. Use: Molding sand.

Oregon—Continued

254. Lane County. SW¼NW¼ sec. 31, T. 15 S., R. 5 W., abont 7.7 miles west of Junction City. Jennings property. (Hodge, 1938f, p. 817, 885, 887.) Clay, gray; upper 2 ft, fine clay; lower part sandy. Overburden 7 ft. Index map.

255. Lane County. SW¼NE¼ sec. 34, T. 17 S., R. 4 W., 2.8 miles west of Eugene. Eugene Clay Products pit. (Hodge, 1938f, p. 817, 870, 871, 887.) Kaolin, plastic, sandy, micaceous; possibly 90 ft thick, overburden 2-5 ft thick. Index map. Firing tests. Former use: Structural brick. Possible use: Ceramics, if washed.

256. Lane County. E½ sec. 27, T. 17 S., R. 12 W., Heceta Beach area. Sample E-1. (Carter and others, 1964, p. 2, 5, 12, 19, 20.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible use: Glass.

257. Lane County. SW¼SE¼ sec. 31, T. 18 S., R. 1 E., near town of Lowell. (Hodge, 1938e, p. 817, 886, 887.) Andesitic tuff, white to rust-colored. Index map. Firing tests. Possible use: Grog.

258, 259. Lane County. Samples F-1, G-2. (Carter and others, 1964, p. 2, 5, 12, 19, 20.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible use: Glass.

258. Center sec. 34, T. 18 S., R. 12 W., near town of Florence.

259. SW¼ sec. 33, T. 19 S., R. 12 W., Siltcoos Lake area.

260, 261. Lincoln County. Miocene. T. 11 S., R. 11 W., Yaquina Bay, offshore. Analysts, P. L. D. Elmore, S. D. Botts, Gillison Chloe, Lowell Artis, H. Smith. (Snavely and others, 1964, p. 134, 135, 140, 142, 143.) Index and geologic map, columnar section.

260. Nye Mudstone. SW¼ sec. 9, near McLean Point. [Mudstone.] Core sample.

261. Astoria Formation. SE¼ sec. 18, near mouth of Yaquina Bay. Tuff.

262. Lincoln County. Miocene, unnamed unit overlying Astoria Formation. [T. 8 S., R. 11 W.], 14 miles north of town of Newport, Government Point. Analyst, D. F. Powers. (Snavely and others, 1964, p. 134, 135, 140, 142, 143.) Volcanic debris.

263. Lincoln County. [T. 10 S., R. 9 W.], town of Chitwood. Victor Sandstone Co. quarries. Analyst, J. W. Reilly. (Day, 1898, p. 277.) Sandstone. Physical properties.

264. Lincoln County. SW¼ sec. 18, T. 13 S., R. 11 W., Alsea Bay. Sample D-1. (Carter and others, 1964, p. 2, 5, 12, 19, 20.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible nse: Glass.

265-270. Malheur County. Miocene and Pliocene(?), Payette Formation. Harper district, Pacific Coast Diatom Corp. Analyst, E. T. Erickson. (Moore, 1934a, p. 6, 7, 10, 11, 12; Moore, 1937, p. 68, 78, 81-83, 86-88, 89, 91, 92, 94, 110, 114, pls. 1, 7, 8, 10; Wells, 1937, p. 45.) Diatomite, compact; low apparent density. Volume estimated. Index and geologic maps, correlated columnar sections, detailed measured section. Microscopic examination, photomicrograph. Ridgway color notation. Use: Cement additive, filtration, insulation. Samples 265, 267, 269 used in computations; samples 266, 268, 270 recomputed to a water-free basis.

265, 266. NW¼NE¼ sec. 10, T. 19 S., R. 41 E., Lab. No. X8. Diatomite, buff; 5.5 ft thick.

267, 266. NE¼ sec. 23, SE¼ sec. 14; T. 19 S., R. 41 E., Lab. No. S7. Diatomite; white when dry; buff when wet; bed 3 ft 10 in. thick.

269, 270. SE¼ sec. 34, T. 19 S., R. 42 E., in bluff on Malheur River. Lab. No. U4. Diatomite; white when dry; cinnamon buff when wet; in beds 4-10 ft thick. Sample 56 ft above base of 59.5 ft unit.

271. Malheur County. E½SE¼ sec. 33, T. 21 S., R. 46 E., town of Adrian. Analyst, L. L. Hoagland. Lab. No. P-8519. (Jacobs, 1950, p. 2, 5-8, 15.) Volcanic ash. Firing tests. Possible use: Ceramic glaze.

272-274. Marion County. (Hodge, 1938f, p. 817, 864-867.) Index map.

272. [T. 6 S., R. 1 E.], 1 mile east of town of Scott Mills, roadcut. Clay, white, sandy, slightly kaolinized. Firing tests.

273. [T. 6 S., R. 1 W.], 2.65 miles from town of Silverton. Clay, white, plastic; 2 ft exposed, overburden 1-2 ft.

274. [T. 7 S., R. 1 E.], 6.7 miles from Silverton, on Silver Creek Falls Road. Weathered andesitic tuff, whitish, clayey; upper part vesicular grading into firmer rock below; deposit at least 6 ft thick, overburden 2-2.5 ft.

275. Sherman County. T. 2 N., R. 16 E., south of town of Rufus. Analyst, R.S. Edwards. (Eckel, 1913, p. 309.) Volcanic ash. Possible use: Cement.

276. Tillamook County. SE¼ sec. 7, T. 3S., R. 10W., Sand Lake area. Sample B-1. (Carter and others, 1964, p. 2, 5, 12, 19, 20.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible use: Glass.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Oregon—Continued												Washington
	277	278	279	280	281	282	283	284	285	286	287	288	289
	36B29-1	36B35-11	36B35-10	36B35-3	36B35-9	36B35-8	36B35-1	36B36-4	36B36-2	36B36-3	36B36-5	36B36-11	46B2-6
SiO_2	81.34	66.35	66.49	55.36	60.92	71.67	64.36	63.46	69.40	65.6	63.86	70.40	72.56
Al_2O_3	^{1}9.91	12.12	11.78	10.45	12.52	11.58	16.43	22.86	20.27	18.5	14.68	19.41	12.04
Fe_2O_3	1.19	3.12	2.67	8.71	3.92	1.46	2.23	.56	.46	.4	3.68	.19	1.38
FeO	------	.62	.26	Trace	1.55	.28	------	------	------	------	------	------	------
MgO	------	.85	.61	1.96	1.24	.44	1.27	1.47	.59	1.0	1.06	.58	2.10
CaO	------	1.37	1.77	3.23	3.37	2.01	2.60	1.39	1.58	1.4	2.53	1.00	3.16
Na_2O	------	1.70	2.11	1.69	2.30	1.67	7.10	------	------	3.1	1.70	------	------
K_2O	------	3.67	2.80	1.64	2.64	3.38	2.26	------	------	3.0	.97	------	------
H_2O+	------	5.56	5.81	5.64	5.99	3.51	------	------	------	------	^{2}4.09	------	------
H_2O-	------	3.92	4.62	9.03	4.51	3.39	------	------	------	------	^{3}5.59	^{4}.32	------
TiO_2	------	.45	.54	1.18	.82	.57	------	^{5}.13	^{5}.14	------	.60	1.02	------
P_2O_5	------	.08	.10	.38	.20	.01	------	------	------	------	.20	------	------
MnO	------	.04	.02	.13	.07	.05	------	------	------	------	Trace	------	------
CO_2	------	Trace	Trace	.30	.11	Nil	^{6}3.72	^{6}8.72	^{6}5.10	^{6}5.0	.82	^{6}4.43	^{6}6.15
Cl	------	------	------	------	------	------	------	------	------	------	.30	------	------
SO_4^{-2}	------	------	------	------	------	.19	------	------	------	------	------	------	------
Total	[92.44]	99.85	99.58	99.70	100.16	100.21	[99.97]	98.59	97.54	[98.0]	100.08	97.35	97.39
Class	82,33,0	41,50,0	43,49,1	27,62,1	34,53,0	50,42,0	33,54,0	22,70,6	33,62,0	32,57,1	34,58,2	36,59,0	50,40,6

	Washington—Continued												
	290	291	*292	*293	294	295	296	297	298	299	300	301	302
	46B4-21	46B4-70	46B4-31	46B4-30	46B4-43	46B4-37	46B4-57	46B4-15	46B5-7	46B7-2	46B7-3	46B7-4	46B7-6
SiO_2	73.33	49.62	54.39	42.76	62.27	46.98	69.72	59.84	65.05	64.52	63.25	63.06	65.89
Al_2O_3	15.27	16.81	13.89	9.82	15.85	14.37	22.16	16.40	13.89	14.58	15.34	13.00	22.19
Fe_2O_3	3.25	3.39	3.88	4.39	5.08	2.89	.72	4.10	.74	4.47	5.91	5.53	
FeO	.11	------	------	------	------	------	------	------	2.60	------	------	------	------
MgO	.15	1.51	1.58	2.45	3.05	1.36	.32	.36	1.22	1.50	1.26	1.03	1.85
CaO	.09	12.66	17.52	24.17	6.79	19.72	1.59	5.84	5.62	2.35	2.34	2.47	2.36
Na_2O	.09	^{7}6.12	------	------	------	------	------	2.84	3.13	1.78	1.31	1.62	2.08
K_2O	1.38							1.62	1.41	1.86	1.50	1.82	2.36
H_2O+	5.30	------	------	------	------	------	------	------	2.30	------	------	------	------
H_2O-	.35	------	------	------	------	------	------	^{3}.74	.28	^{3}1.70	^{3}2.63	^{3}2.68	------
TiO_2	.70	------	------	------	------	------	------	1.20	.46	1.15	1.20	1.30	------
P_2O_5	.07	------	------	------	------	------	------	^{9}1.32	.08	^{9}2.53	.17	.25	------
MnO	------	------	------	------	------	------	------	------	.11	------	------	------	------
S	------	------	------	------	------	------	------	------	.05	------	^{10}.43	^{10}.15	------
V_2O_5	------	------	------	------	------	------	------	------	------	------	.18	.08	------
Cr_2O_3	------	------	------	------	------	------	------	------	------	------	.09	.04	------
SrO	------	------	------	------	------	------	------	------	------	------	.16	.40	------
ZrO_2	------	------	------	------	------	------	------	------	------	------	.19	.10	------
BaO	------	------	------	------	------	------	------	------	------	------	Trace	.04	------
Ignition loss	------	8.87	6.29	12.44	3.01	11.96	.57	^{11}5.51	^{12}2.83	^{11}3.57	^{11}3.96	^{11}6.58	^{13}2.60
Total	[100.09]	[98.98]	97.55	96.03	96.05	97.28	95.08	99.77	99.77	100.01	99.92	100.15	99.33
Class	43,55,0	16,59,9	25,51,4	20,40,20	29,58,0	18,50,17	30,63,0	26,60,1	40,43,6	34,55,0	29,62,0	34,55,4	29,62,0

	Washington—Continued					
	303	304	305	306	307	308
	46B7-5	46B9-2	46B13-4	46B13-5	46B13-6	46B13-7
SiO_2	63.58	62.50	84.8	82.2	77.7	65.43
Al_2O_3	22.36	16.85	4.1	6.7	9.4	13.96
Fe_2O_3		5.09	6.9	5.2	6.2	5.35
MgO	1.82	2.55	------	------	------	1.54
CaO	2.76	5.20	------	------	------	2.90
Na_2O	2.02	3.26	------	------	------	2.42
K_2O	2.27					2.08
H_2O+	------	------	------	------	------	^{14}2.42
H_2O-	------	^{3}.38	------	------	------	^{15}2.32
TiO_3	------	------	------	------	------	0.87
P_2O_5	------	------	------	------	------	.20
C(Organic)	------	------	------	------	------	.49
Ignition loss	^{13}4.37	^{11}3.63	4.1	4.2	5.5	^{12}None
Total	99.18	99.51	[99.9]	[98.3]	[98.8]	99.98
Class	26,64,0	27,62,0	70,30,0	64,34,0	54,45,0	35,55,0

[1] Includes TiO_3.

[2] Combined water (+105°C).

[3] Moisture (-105°C).

[4] Moisture loss, H_2O - at 110°C.

[5] TiO.

[6] Ignition loss.

[7] Alkali or alkalies.

[8] Sample air dried; moisture at 110°C.

[9] Includes Cr_2O_3, SO_3, SrO, BaO, ZrO_2, V_2O_5.

[10] SO_3.

[11] Combined water, ignition.

[12] CO_2.

[13] Principally organic matter; sample dried at 100°C.

[14] At redness.

[15] At 110°C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

277. Tillamook County. S½ sec. 18, T. 4 S., R. 10 W., Pacific City area. Sample C-1. (Carter and others, 1964, p. 2, 5, 12, 19, 20.) Sand, from dunes. Index maps. Screen analysis, beneficiation tests. Possible use: Glass.

278-282. Wheeler County. Late Oligocene and early Miocene, John Day Formation. North of town of Mitchell. (Hay, 1963, p. 200, 213, 234, 235, figs. 2, 4, 5, 8.) Mineralogy. Index and geologic maps, geologic section.

278. NE¼SE¼ sec. 13, T. 10 S., R. 20 E. Analyst, H. Asari. Tuff, yellowish-gray, medium- to coarse-grained.

279. NW¼SW¼ sec. 31, T. 10 S., R. 21 E. Analyst, H. Asari. Tuff, yellowish-gray, medium- to coarse-grained. Composite of two samples. Correlated columnar sections.

280. Center SW¼ sec. 33, T. 10 S., R. 21 E. Analyst, H. Asari. Claystone, yellow. Thin-section description.

281. Center S½SW¼ sec. 22, T. 10 S., R. 22 E. Analyst, H. Asari. Tuff, grayish-green, medium- to coarse-grained. Composite of two samples. Correlated columnar sections.

282. Center north edge NE corner sec. 1, T. 11 S., R. 20 E. Analyst, W. H. Herdsman. Tuff, white, fine-grained. Thin-section description.

283. Wheeler County. [T. 8 S., R. 24 E.],3 miles west of town of Spray. Analyst, L. L. Hoagland. Lab. No. P-8373. (Jacobs, 1950, p. 2, 6, 15.) Volcanic ash. Firing tests. Possible use: Ceramic glaze.

284-286. Yamhill County. Probably post-middle Miocene. SW¼SE¼ sec. 36, T. 5 S., R. 7 W., 0.8 miles north of town of Willamina. Willamina Clay Products Co. (Wilson and Treasher, 1938, p. 1, 19, 34-37, 38, 84, 86, 88.) General: Clay, white, gray, and black; contains calcite crystals; plastic; at least 50 ft thick; overburden. Firing tests. Former use: Brick, face brick, bond in firebrick mix, stoneware. Use: Pottery.

284. Field No. 5A.
285. Field No. 5B.
286. Clay, black. Mineralogy.

287. Yamhill County. Tertiary. [T. 5 S., R. 4 W.],divide between towns of Amity and Hopewell. (Schenck, 1927, p. 565-567.) Shale, gray, tuffaceous, sandy. Mineralogy. Photomicrographs.

288. Yamhill County. [Ts. 4, 5 S., R. 5 W.],Willamina. Analyst, H. R. Shell. (Speil and others, 1945, p. 31, 32.) Clay, black. Mineralogy. Thermal analysis curve.

Washington

289. Asotin County. Probably Late Triassic (Mills, 1962, p. 240). [T. 7 N., R. 47 E.],near town of Anatone, Lime Hill. Analyst, A. A. Hammer. (Shedd, 1913, p. 250, pl. 21.) Shale, red and green. Index map.

290. Chelan County. Late Cretaceous and Paleocene, Swauk Formation. [T. 22 N., R. 20 E.],town of Wenatchee. Analyst, E. H. Kane. (Coombs, 1952, p. 197, 202, 204.) Arkose, buff.

291. Chelan County. South central part sec. 15 and SE¼ sec. 9, T. 26 N., R. 19 E., 18 miles by road from town of Entiat. Gold Ridge deposit. (Danner, 1966, p. 82, 398, 406-408.) Limestone, white, fine- to medium-grained, crystalline; contains quartz and mica schist. Composite sample. Index and geologic maps, geologic sections. Possible use: Roofing granules, decorative stone.

Washington—Continued

*292,*293. Chelan County. N½ sec. 10, SE¼ sec. 3, T. 27 N., R. 15 E. Soda Springs deposit. Drill hole 53. (Danner, 1966, p. 82, 387-390, 392, 397.) Limestone, light-gray to white, medium to coarsely crystalline. Mineralogy. Index and geologic maps. Former use: Cement. *Samples suggest about 16 percent more MgO and CaO than required for carbonate. [For other analyses from same drill hole, see sample 127, group D; samples 59, 60, group E; and sample 121, group F_1.]

292. Depth 41.5-44 ft. 293. Depth 15-41.5 ft.

294-296. Chelan County. NW¼ sec. 14, T. 27 N., R. 15 E. Rainy Creek deposit. (Danner, 1966, p. 82, 387, 393-396, 397.) Limestone, white to gray, medium to coarsely crystalline. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

294, 295. Drill hole 54. [For other analyses from same drill hole, see samples 128, 129, group D; samples 61-63, group E; sample 122, group F_1.]
294. Depth 163-218 ft.
295. Depth 50-61 ft.
296. Drill hole 56. Depth 116-131.2 ft. [For other analyses from same drill hole, see samples 69, 70, group E; samples 127, 128, group F_1; samples 37, 38, group F_2.]

297. Chelan County. [T. 27 N., R. 22 E.],town of Chelan. Owner, H. E. Dunham. Analyst, W. R. Bloor. (Shedd, 1910, p. 235, 236, 307, 318, 319; Shedd, 1913, p. 174, 175, 248, pl. 21.) Clay, light-gray, not very plastic; 40 ft thick; overburden 1-3 ft. Index map. Physical properties, firing tests. Use: Brick. Possible use: Portland cement, tile.

298. Clallam County. Eocene. [Possibly T. 28 or 29 N., R. 9 W.],near Solduc. (Pettijohn, 1957, p.306; Pettijohn, 1963, p.S7.) Graywacke.

299-301. Columbia County. Pleistocene. [T. 10 N., R. 39 E.],town of Dayton. E. L. Dexter brick yard. Analyst, W. R. Bloor. (Shedd, 1910, p. 227-229, 307, 318, 319; Glover, 1941, p. 49, 73, 336, 342, 343.) Physical properties, firing tests. Use: Brick. Possible use: Tile.

299. Clay, yellow, plastic; 4-6 ft below surface.
300. Clay, 2-4 ft from top of bank; total depth worked 6 ft.
301. Clay, dark-brown, not plastic; contains organic matter; total depth worked 6 ft. Surface sample.

302, 303. Columbia County. [T. 10 N., R. 39 E.],Dayton. Analyst, G. P. Merrill. (Russell, 1901a, p. 43, 44.)

302. Residual lava subsoil, dull-yellow or brownish-yellow; depth 30 ft.
303. Residual lava soil, dark color; depth 2 ft.

304. Douglas County. [T. 29 N., R. 25 E.],near town of Bridgeport. T.P.Hopp property. Analyst, W.R. Bloor. (Shedd, 1910, p.307,318,319; Glover, 1941, p.336,342,343.) Clay. Firing tests. Possible use: Brick, tile.

305-307. Grant County. T. 18 N., R. 23 E., 13-16 miles southwest of town of Quincy. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 21, 22, 24-26, 27, 65.) Diatomite, channel sample. Physical properties, firing tests. Index maps. Possible general use: Concrete admixture, filtration, heat insulation.

305, 306. SE¼ sec. 29. Deposit 10-40 ft thick, overburden 1-8 ft; contains chert nodules.
307. SE¼ sec. 32.

308. Grant County. [T. 22 N., R. 31 E.],south of town of Krupp. Analyst, George Steiger. Record 2028. (Clarke, 1904, p. 370; Calkins, 1905, p. 47, pl. 1.) [Loess], soil. Index and geologic map.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	309	310	311	312	313	314	315	316	317	318	319	320	321
	46B14-5	46B17-6	46B17-29	46B17-11	46B17-13	46B17-52	46B17-18	46B17-21	46B17-44	46B17-36	46B17-35	46B17-37	46B17-38
SiO_2	69.93	64.34	73.50	61.58	78.60	58.50	62.11	72.30	70.4	69.50	81.3	73.67	70.74
Al_2O_3	[1]12.59	20.78	19.15	17.46	13.08	19.02	17.59	19.95	21.8	18.92	14.7	17.07	18.48
Fe_2O_3		1.58	.65	6.69	.114	3.10	4.77	.71	2.88	3.27	.72	1.39	1.62
FeO	------	------	------	------	2.29	------	------	------	------	------	------	------	------
MgO	1.85	.54	.12	1.37	.648	[2]1.13	2.26	Trace	------	.37	------	.51	.67
CaO	8.69	.68	.98	.40	1.22	[2]4.37	1.53	.52	------	.56	------	.83	.55
Na_2O	------	[3]3.66	[3]2.40	.78	------	2.12	1.65	[4]3.094	------	------	------	------	------
K_2O	------			2.80	------		2.30						
H_2O+	------	[5]8.63	[5]3.50	------	[6]3.30	------	------	[6]3.50	------	------	------	------	------
H_2O-	------			[7]1.16		6.80	1.63						
TiO_2	------	------	------	.65	------	------	.51	------	------	------	------	------	------
P_2O_5	.300	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	[8]7.22	------	------	[9]7.00	------	[10]4.66	[9]5.60	------	------	[9]7.55	------	[9]6.47	[9]8.11
Total	[100.58]	100.21	100.30	99.89	[99.25]	99.70	99.95	[100.07]	[95.1]	100.17	[96.7]	[99.94]	[100.17]
Class	49,37,9	26,70,0	38,59,0	23,70,2	55,40,2	21,66,10	26,66,0	36,60,0	29,71,0	32,66,2	55,46,0	42,55,3	36,62,2

	Washington—Continued												
	322	323	324	325	326	327	328	329	330	331	332	333	334
	46B17-39	46B17-42	46B17-43	46B17-65	46B17-45	46B17-34	46B17-49	46B17-32	46B17-17	46B17-27	46B17-30	46B17-20	46B17-28
SiO_2	78.0	66.69	81.40	81.2	58.96	70.44	74.9	69.71	63.08	69.50	73.60	62.42	72.27
Al_2O_3	17.0	21.01	10.65	12.5	16.57	15.33	19.4	18.39	17.26	16.36	19.80	17.98	16.16
Fe_2O_3	1.16	1.14	1.90	1.16	6.10	3.59	1.86	[11]1.44	4.63	4.53	.40	4.34	1.56
MgO	------	.32	.18	------	2.97	1.29	------	.15	1.96	.47	Trace	1.84	.29
CaO	------	.33	.50	------	2.37	2.52	------	.35	1.32	.95	.67	1.34	.00
Na_2O	------	4.20	3.00	------	3.24	2.90	------	.83	[3]3.98	[3]2.25	2.65	1.56	1.68
K_2O	------				.83	.86	------	.19				2.78	2.90
H_2O+	------	------	------	------	------	------	------	------	[5]7.64	[5]6.35	------	------	------
H_2O-	------	[7].62	[7].20	------	[7]3.58	------	------	------				[7]1.44	[7]1.20
TiO_2	------	------	------	------	[12].65	------	------	------	------	------	------	.68	.68
MnO	------	------	------	------	[12]1.15	------	------	------	------	------	------	------	------
Ignition loss	------	[9]5.87	[9]2.42	------	[9]3.36	[9]2.19	------	8.94	------	------	3.10	[9]5.74	[9]3.58
Total	[96.2]	100.18	100.25	94.9	99.78	[99.12]	[96.2]	100.00	99.87	100.41	100.22	100.12	100.32
Class	47,53,0	28,67,1	60,36,0	58,40,0	23,66,0	39,52,0	39,61,0	36,62,1	27,65,0	35,61,0	38,59,0	26,66,0	42,53,0

	Washington—Continued												
	335	336	337	338	339	340	341	342	343	344	345	346	347
	46B17-26	46B17-31	46B21-1	46B21-4	46B21-5	46B40-156	46B40-162	46B25-5	46B26-75	46B26-48	46B26-47	46B26-73	46B26-74
SiO_2	68.98	74.77	58.08	58.75	72.50	62.62	65.66	60.01	71.00	81.16	78.00	65.72	66.50
Al_2O_3	15.56	16.06	15.48	18.27	13.05	19.14	16.66	12.37	[13]13.20	[13]11.06	[13]11.24	[13]17.84	[13]13.32
Fe_2O_3	4.90	.70	5.05	3.86	4.53	3.26	6.56	8.99					
FeO	------	------	2.52	------	------	------	------	------	------	------	------	------	------
MgO	.36	.56	2.21	1.68	.70	2.79	3.76	4.20	[2]3.16	[2]1.29	[2]1.63	[2]1.82	[2]4.16
CaO	.50	.00	4.09	.86	.60	5.15	3.10	2.13	[2]3.33	[2].79	[2]1.22	[2]2.45	[2]4.54
Na_2O	1.64	1.64	2.33	1.53	.89	3.07	.71	------	------	------	------	------	------
K_2O	2.30	2.34	1.67	2.18	1.84		Trace	------	------	------	------	------	------
H_2O+	------	------	3.78	------	------	------	------	------	------	------	------	------	------
H_2O-	[7].18	[7].18	2.84	[7]2.12	[7]2.00	[7].48	------	------	------	------	------	------	------
TiO_2	.34	.50	1.04	.85	.42	------	------	------	------	------	------	------	------
P_2O_5	------	------	.17	------	------	------	------	------	------	------	------	------	------
MnO	------	------	.08	1.20	------	------	------	------	------	------	------	------	------
Organic matter	------	------	[2].68	------	------	------	------	------	------	------	------	------	------
Ignition loss	[9]5.54	[9]3.08	[14].07	[9]8.66	[9]4.24	[9]3.46	[9]3.40	[9]11.68	6.40	2.04	3.80	7.44	8.42
Total	100.30	99.83	100.09	99.96	100.77	99.97	99.85	[99.38]	[97.09]	[96.34]	[95.89]	[95.27]	[96.94]
Class	36,59,1	46,49,0	25,61,0	22,65,5	44,52,0	25,64,0	29,63,0	28,59,13	49,39,6	63,32,0	59,33,2	36,52,6	44,39,11

[1] R_2O_3.

[2] Calculated from reported $MgCO_3$, $CaCO_3$, and(or) C.

[3] Alkalies.

[4] Reported as alkalies, 0.114 percent; soda and potash, 2.98 percent.

[5] Combined water.

[6] Common water.

[7] Sample air dried; moisture at 110°C.

[8] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[9] Combined water, ignition.

[10] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[11] Iron oxide.

[12] TiO_2, 1.15 percent; MnO, 0.65 percent (Shedd, 1910, p. 319).

[13] Alumina and iron oxide.

[14] CO_2.

Spectrochemical analysis

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2]

	309		309		309		309		309		309
Na_2O	5.07	TiO_2	0.62	Cr_2O_3	3.20	NiO	0.024	CuO	0.020	ZrO_2	0.020
K_2O	.40	V_2O_5	.031	MnO	.18	CoO	.0053	SrO	.016		

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

309. Grays Harbor County. Early(?) and middle Eocene, Crescent Formation. NW¼ sec. 13, T. 23 N., R. 7 W., about 11.5 miles by road north of town of Grisdale. Schofield Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample GH 2. (Danner, 1966, p. 16, 19, 82, 421, 423, 447, 456.) Limestone, red; contains calcite veins; 25-30 ft exposed. Mineralogy. Chip sample. Index and geologic maps.

310. King County. Cretaceous. Sec. 27, T. 21 N., R. 6 E., Green River. Pacific Stoneware Co. (Geijsbeek, 1911, p. 753, 755, 759, 760, 763, 764.) Clay, plastic. Index map. Use: Stoneware.

311. King County. Cretaceous. Sec. 34, T. 23 N., R. 7 E., town of Taylor. Gladding, McBean, and Co. (Geijsbeek, 1911, p. 755, 759, 763, 764; Wilson, 1934, p. 98-100; Hodge, 1938e, p. 777, 778-783.) Clay or kaolin rock, buff; 3-20 ft thick; main body of clay 24-36 ft thick. Mineralogy. Measured section. Physical properties, firing tests. Use: Face brick, firebrick, flue lining, sewer pipe, roofing tile.

312, 313. King County. Eocene and Oligocene, Puget Group. NE¼ sec. 26, T. 21 N., R. 6 E., near town of Kummer. Gladding, McBean, and Co. (Glover, 1941, p. 128, 344, 345.)

  312. Analyst, W. R. Bloor. (Shedd, 1910, p. 256, 257, 261, 262, 307, 318, 319.) Shale, gray, fine-grained, not plastic. Measured section. Physical properties, firing tests. Possible use: Sewer pipe.

  313. Analyst, W. J. Rattle. (Roberts, 1902b, p. 14, 15.) Sand, fine. Use: Brick.

314. King County. Puget Group. [T. 23 N., R. 4 E.], 0.5 mile north of Black River jnnction. Beacon Coal Mining Co. Sample 395. (Glover, 1941, p. 112, 117, 118, 334, 337, 345.) Shale, light-gray, very fine and uniform in texture, conchoidal fracture. Measured section. Physical properties, firing tests. Use: Structural wares.

315. King County. Puget Group. [T. 23 N., R. 5 E.], 0.5 mile east of town of Renton. Gladding, McBean, and Co. quarry. Analyst, C. C. Todd. Sample 15. (Shedd, 1910, p. 249, 250, 318, 319; Glover, 1941, p. 112-115, 344, 345.) Shale, light-gray, fine-grained, plastic; 150 ft thick; overburden 6-10 ft. Measured section. Physical properties, firing tests. Use: Brick, refractories, structural ware.

316. King County. Puget Group. Sec. 34, T. 23 N., R. 7 E., near Taylor. Gladding, McBean, and Co. Analyst, W. J. Rattle. (Roberts, 1902b, p. 15; Shedd, 1910, p. 263, 266, 318, 319; Wilson, 1934, p. 98-100.) Clay or kaolin rock, white; 24-36 ft thick. Mineralogy. Use: Face brick, fine lining, sewer pipe, roofing tile. Possible use: China.

317-325. King County. Miocene, Hammer Bluff Formation. T. 21 N., R. 6 E., 10 miles east of town of Anburn, Hammer Bluff. (Glover, 1941, p. 137-139, 144-147, 337, 342, 343-345.)

  317. NE¼ sec. 28, roadcut. Sample 158. Clay, white, sandy; uniform coarse texture; 12 ft bed. Mineralogy. Physical properties, firing tests. Possible use: Refractories.

  318. NE¼ sec. 2B. Hammer prospect. Clay, gray, sandy.

  319. SE¼ sec. 28. Gladding, McBean, and Co. pits. Sample 164. Clay, gray, fine- to coarse-texture, plastic; about 30 ft thick; overburden. Measured section, generalized geologic section. Physical properties, firing tests. Use: Terra cotta, pottery, structural ware. Possible use: Brick.

  320, 321. SE¼ sec. 28. Gladding, McBean, and Co. pits. Clay, gray; about 30 ft thick; overburden. Measured section, generalized geologic section. Use: Terra cotta, pottery.

  322. SE¼ sec. 28. Northern Clay Co. Clay, gray, iron-stained. Surface sample with coarse grains of quartz and quartzite. Physical properties, firing tests. Possible use: Terra cotta, refractories, structural ware.

  323. SE¼ sec. 28. Gladding, McBean, and Co. pits. Analyst, W. R. Bloor. Sample 24. (Shedd, 1910, p. 269, 270, 307, 318, 319, 321.) Clay, white; contains very fine grit; 9 ft thick. Deposit 30 ft thick. Measured section, generalized geologic section. Physical properties, firing tests. Use: Stoneware. Possible use: Terra cotta, pottery, structural ware.

  324. SE¼ sec. 28. Gladding, McBean, and Co. pits. Analyst, W. R. Bloor. (Shedd, 1910, p. 269, 270, 307, 31B, 319, 321.) Sand. Measured section, generalized geologic section. Use: Ceramics, refractories.

  325. Old Northern Clay Co. pit. Sand, gray, clayey.

326. King County. Pleistocene. [T. 24 N., Rs. 3, 4 E.], town of Seattle. Seattle Brick and Tile Co. Analyst, W. R. Bloor. Sample 26. (Shedd, 1910, p. 239-241, 243, 307, 318, 319; Glover, 1941, p. 51, 338, 344, 345.) Clay; blue when wet, gray when dry; stratified, fairly plastic; weathers yellow; 20 ft exposed. Physical properties, firing tests. Use: Brick, tile.

327. King County. Tertiary and Quaternary. Sec. 19, T. 19 N., R. 10 E., 5 miles southeast of Greenwater. Road quarry. Sample 83. (Glover, 1941, p. 108, 337, 344, 345.) Shale, yellow. Use: Probably none.

328. King County. Tertiary and Quaternary. [T. 20 N., R. 8 E.], 8 miles east of town of Enumclaw. Sample 185. (Glover, 1941, p. 108-110, 337, 345.) Clay, nonuniform in color and texture; 15 ft thick. Physical properties, firing tests. Use: Probably none.

329. King Connty. [Probably T. 21 N., R. 6 E.], Green River, MacIntosh bed. Analyst, G. A. Bethune. (Bethune, 1891, p. 106; Glover, 1941, p. 344, 345.) Clay. Firing test. Possible use: Refractories.

330. King County. [T. 23 N., R. 5 E.], Renton. Denny Renton Clay and Coal Co. (Geijsbeek, 1911, p. 755, 759, 763, 764.) Shale clay. Index map. Use: Face brick, paving brick, sewer brick.

331-336. King County. Sec. 34, T. 23 N., R. 7 E., near Taylor. Gladding, McBean, and Co. (Hodge, 1938e, p. 777, 778-783.) Mineralogy. Measured section. Physical properties, firing tests. Possible use: China, pottery, and other ceramic ware.

  331. (Geijsbeek, 1911, p. 755, 759, 763, 764.) Clay, purple. Index map. Former nse: Brick, terra cotta.

  332. (Wilson, 1934, p. 98-100.) Clay or kaolin rock, white; 3-20 ft thick; main body of clay, 24-36 ft thick. Former use: Face brick, terra cotta.

  333-336. Analyst, W. R. Bloor. Samples 16-19. (Shedd, 1910, p. 263-266, 307, 318, 319, 321; Wilson, 1934, p. 98-100.) Use: Brick, flue lining, sewer pipe, roofing tile.

    333. Clay, light-yellow, plastic. Microscopic description.

    334. Clay, light-buff, almost white, rather coarse grained, not very plastic, refractory.

    335. Clay, purple, sandy, not very plastic.

    336. Clay, white, sandy, refractory; 3-20 ft thick; main body of clay, 24-36 ft thick.

337. Lewis County. Late Eocene to early Miocene, Lincoln Creek Formation. NE¼NW¼ sec. 35, T. 15 N., R. 3 W., 3 miles northwest of town of Centralia. Analyst, R. N. Eccher. (Snavely and others, 1958, p. 3, 41-43, pl. 1.) General: Siltstone, tuffaceous, brownish-gray, fine-grained, massive, fossiliferous. Mineralogy. Index and geologic maps, detailed measured section.

338, 339. Lewis County. Pleistocene. [SE¼ T. 14 N., R. 2 W.], north of town of Chehalis. Chehalis Brick and Tile Co. Analyst, W. R. Bloor. (Shedd, 1910, p. 296, 297, 307, 318, 319; Glover, 1941, p. 186, 187, 344, 345, app. 3, table 2.) Physical properties, firing tests. Use: Hollow block, brick, draintile.

  338. Sample 29. Clay, dark-colored, plastic.

  339. Clay, yellow, surface sample.

340. Okanogan County. Pleistocene. [T. 33 N., R. 26 E., town of] Alma. C. C. Parkman property. Analyst, W. R. Bloor. Sample 35. (Shedd, 1910, p. 307, 318, 319; Glover, 1941, p. 192, 193, 346, 347.) Clay.

341. Okanogan County. Pleistocene. T. 38 N., R. 31 E., north of town of Wauconda. Analyst, A. A. Hammer. Sample 36. (Shedd, 1910, p. 318, 319; Shedd, 1913, p. 170; Glover, 1941, p. 192, 193, 346, 347.) Clay, light-yellow, some grit. Possible use: Portland cement.

342. Pacific County. Eocene, Oligocene, or Miocene. [T. 9 N., R. 9 W.], town of Knappton. Sample 106. (Glover, 1941, p. 195, 346, 347.) Shale, gray, concretionary.

343-347. Pend Oreille County. Paleozoic. [T. 38 N., R. 43 E.], 5 miles south of town of Metaline Falls, Sand Creek. Inland Portland Cement Co. (Bancroft, 1911, p. 188, 190, 192; Eckel, 1913, p. 366, 367.) Shale, dark-blue or black. Index map. Use: Cement.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued											
	348	349	350	351	352	353	354	355	356	357	358	359
	46B26-43	46B26-37	46B26-44	46B26-45	46B26-38	46B26-39	46B26-41	46B26-42	46B26-46	46B26-40	46B26-49	46B26-51
SiO_2	74.12	65.64	65.96	67.08	65.72	66.48	70.68	71.12	71.40	[1]68.40	57.02	63.40
Al_2O_3	12.16	11.20	12.64	10.84	8.84	12.08	12.80	13.36	14.04	12.04	20.62	16.10
Fe_2O_3												[2]4.10
MgO	[3]2.90	[3]4.51	[3]4.18	[3]4.11	[3]4.85	[3]4.02	[3]3.40	[3]2.53	[3]3.26	[3]3.05	3.67	2.75
CaO	[3]2.80	[3]5.43	[3]5.56	[3]5.35	[3]7.28	[3]6.40	[3]3.42	[3]2.98	[3]3.07	[3]5.35	7.01	5.34
CO_2	[3]5.36	[3]9.20	[3]8.93	[3]8.69	[3]11.01	[3]9.40	[3]6.40	[3]5.11	[3]5.96	[3]7.54	------	[4]5.00
Total	[97.34]	[95.98]	[97.27]	[96.07]	[97.70]	[98.38]	[96.70]	[95.10]	[97.73]	[96.38]	[88.32]	96.69
Class	54,35,11	47,33,19	45,37,19	49,32,18	51,26,23	46,34,20	49,37,13	49,39,11	48,40,12	48,35,16	23,60,14	30,58,0

	Washington—Continued											
	360	361	362	363	364	365	366	367	368	369	370	371
	46B26-50	46B26-2	46B26-15	46B26-14	46B26-5	46B26-16	46B26-8	46B26-9	46B26-7	46B26-10	46B26-6	46B27-2
SiO_2	63.20	74.23	68.33	66.32	71.74	68.94	76.00	76.52	70.90	77.95	71.58	67.24
Al_2O_3	20.20	19.03	22.71	24.48	20.56	21.64	17.02	16.38	20.04	15.53	17.93	19.23
Fe_2O_3		1.07	------	------	------	------	------	------	------	------	------	2.50
MgO	2.75	.54	2.55	2.68	2.23	2.24	1.66	1.77	1.99	1.26	1.67	.49
CaO	5.34	Trace	1.88	1.96	1.97	1.36	1.46	1.36	1.30	1.61	1.46	.34
Na_2O	------	.47	------	------	------	------	------	------	------	------	------	------
K_2O	------											.88
H_2O-	------	[5].20	------	------	------	------	------	------	------	------	------	[5]2.12
TiO_2	------	------	------	------	------	------	------	------	------	------	------	.25
Ignition loss	------	[6]4.52	------	------	------	------	------	------	------	------	------	[6]6.66
Total	[91.49]	100.06	[95.47]	[95.44]	[96.50]	[94.18]	[96.14]	[96.03]	[94.23]	[96.35]	[92.64]	[7]99.71
Class	29,59,7	39,60,0	30,65,0	25,70,0	37,58,0	33,63,1	48,49,0	49,48,0	37,59,2	52,45,0	42,52,6	30,67,2

	Washington—Continued												
	372	373	374	375	376	377	878	379	380	381	382	383	384
	46B27-9	46B27-6	46B27-4	46B29-65	46B29-71	46B29-114	46B30-1	46B31-62	46B31-4	46B32-15	46B32-13	46B32-3	46B32-4
SiO_2	67.3	74.24	62.43	60.21	73.5	75.58	62.70	63.94	61.6	59.59	76.96	75.04	72.68
Al_2O_3	13.8	[8]16.89	18.79	16.21	15.1	[9]7.03	17.46	5.94	[8]25.4	18.93	16.39	19.18	13.15
Fe_2O_3	2.4		4.20	5.10	3.9		1.12	2.14		4.69	.31	.76	2.01
FeO	------	------	------	------	------	------	3.06	------	------	------	------	------	------
MgO	------	1.10	1.53	4.15	------	.90	1.96	1.30	[3]1.1	1.14	.08	------	1.21
CaO	------	2.04	2.12	2.90	------	8.39	4.64	15.16	[3]4.0	.83	.40	------	.59
Na_2O	------	------	------	1.51	------	------	4.07	------	[10]2.94	.34	Trace	.45	1.51
K_2O	------	------	------	2.10	------	------	1.24	------		3.10	.20		.34
H_2O+	------	[12]5.72	------	------	------	------	[11]2.02	------	------	------	------	------	------
H_2O-	------						[11].70	------	------	[5]2.20	[5].29	[5].36	------
TiO_2	------	------	------	------	------	------	.54	------	------	.65	.44	.15	------
P_2O_5	------	------	------	------	------	.175	.16	------	------	------	------	------	------
MnO	------	------	------	------	------	------	Trace	------	------	------	------	------	------
CO_2	------	------	------	------	------	------	Nil	------	[3]4.4	------	------	------	------
S	------	------	------	------	------	------	------	------	1.6	------	------	------	------
BaO	------	------	------	------	------	------	.06	------	------	------	------	------	------
Ignition loss	10.9	------	10.93	7.10	4.3	[13]7.45	------	11.74	------	[6]8.94	[6]5.48	[6]4.54	[14]8.49
Total	[94.4]	[99.99]	[100.00]	99.28	[96.8]	[99.52]	99.73	[100.22]	[101.0]	[15]100.41	100.55	100.48	99.98
Class	40,54,0	46,51,0	24,69,7	26,61,4	42,54,0	64,21,13	31,53,1	51,23,22	19,68,10	21,72,4	48,51,1	40,60,0	47,47,4

[1] 68.04 percent (Shedd, 1913, p. 251).

[2] 4.01 percent (Shedd, 1913, p. 248).

[3] Calculated from reported $MgCO_3$ and(or) $CaCO_3$.

[4] Ignition loss.

[5] Sample air dried; moisture at 110°C.

[6] Combined water, ignition.

[7] 99.79 percent in text.

[8] Sample 373, iron and alumina; sample 380, iron and aluminum oxides.

[9] R_2O_3.

[10] Alkalies.

[11] 105°C.

[12] Water and alkalies.

[13] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[14] Also reported as moisture, combined water, ignition.

[15] 100.48 percent in text.

Spectrochemical analysis

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_2, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_3, UO_2]

	377		377		377		377
Na_2O	3.50	V_2O_5	0.042	NiO	0.0052	SrO	0.010
K_2O	1.35	Cr_2O_3	.00067	CoO	.0036	ZrO_2	.015
TiO_2	.76	MnO	.12	CuO	.024	Ag_2O	.0019

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

348 - 357. Pend Oreille County. T. 38 N., R. 43 E., about 4 miles from town of Metaline Falls, Sand Creek. Inland Portland Cement Co. qnarry. Samples 15, 17-25. (Shedd, 1913, p. 180, 194, 195, 251, pl. 21.) Shale. Index maps. Use: Portland cement.

358 - 360. Pend Oreille County. [T. 39 N., R. 43 E.], Metaline Falls. Inland Portland Cement Co. Samples 9, 32, 33. (Shedd, 1913, p. 180, 195, 196, 249, pl. 21; Glover, 1941, p. 201, 346, 347.) Clay, blue or gray, fine-grained; free from grit, some sandy layers. Index maps. Possible use: Portland cement.

360. Pleistocene. T. 38 N., R. 43 E., Sand Creek.

361. Pend Oreille County. Pleistocene. [T. 38 N., R. 42 E.], southeast of town of Newport. Analyst, W. R. Bloor. Sample 82. (Shedd, 1910, p. 212, 213, 307, 321; Wilson, 1934, p. 64, 146; Glover, 1941, p. 201, 205, 346, 347.) Clay, white, sandy, little plasticity; stratified; microscopic description. Use: Filler, pottery, refractories.

362 - 370. Pend Oreille County. Pleistocene. T. 38 N., R. 43 E., near town of Cement. Jordan property. Analyst, C. M. Fassett. Samples 14-22. (Shedd, 1913, p. 180, 187, 188, 248, pl. 21; Glover, 1941, p. 201, 346, 347.) Clay, buff or blue, fine-grained, plastic; some grit. Index maps.

371. Pierce County. [Miocene or later. SW¼ T. 16 N., R. 4 E.], town of LaGrande. Denny-Renton Clay and Coal Co. Analyst, W. R. Bloor. Sample 37. (Shedd, 1910, p. 274, 275, 307, 318, 319; Glover, 1941, p. 205-207, 339, 346, 349.) Clay, light-colored with a touch of yellow, fairly plastic, medium-fine-grained; 12 ft exposed; overburden. Physical properties, firing tests. Use: Terra cotta.

372. Pierce Connty. E½ sec. 8, T. 19 N., R. 3 E., 2 miles west of town of Parkland. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 21, 30, 31, 58, 65.) Diatomite; brown when dry, black when wet; bog deposit; auger sample 15-30 ft thick. Index maps. Physical properties, firing tests; pH values. Possible general use: Concrete admixture, filtration, heat insulation.

373. Pierce County. Probably near center sec. 22, T. 19 N., R. 6 E., near town of Pittsburg. (Hodge, 1938c, p. 3, 129, 139, 140.) Sand; contains gravel, clay, or decomposed sandstone; about 3 ft thick; overburden. Index maps. Possible use: Concrete.

374. Pierce County. [T. 20 N., R. 3 E., near] town of Tacoma. Analyst, L. J. Clark. (Ries, 1895, p. 570, 571.) Clay, white. Use: Brick [implied].

375. Skagit County. Pleistocene. [T. 35 N., R. 8 E.], near town of Concrete, about 2 miles above mouth of Jackman Creek. Analyst, A. A. Hammer. Sample 57. (Shedd, 1913, p. 226, 227, 249, pl. 21; Glover, 1941, p. 220, 348, 349.) Deposit: Clay, light-gray when dry; slightly bluish tinge when wet; stratified, free from sandy layers; uniform, very fine grained. Index map. Possible use: Portland cement.

376. Skagit County. SE¼ sec. 25, T. 34 N., R. 4 E., about 1 mile southeast of Big Lake post office. Analysts, K. A. Johnson, Anthony Centenero. (Skinner and others, 1944, p. 1-4, 21, 31, 65, 77, 81.) Diatomite, white; 6 ft exposed; samples taken about every 25 ft for a distance of 200 ft. Index maps. Physical properties, firing tests. Photomicrographs. Possible general use: Concrete admixture, filtration, heat insulation.

377. Skagit County. SW¼NE¼ sec. 30, T. 34 N., R. 10 E. Sauk River Bridge deposit, roadcut. Analyst, under supervision of Mark Adams; spectrochemical analyst, C./E. Harvey. Sample St 25-1. (Danner, 1966, p. 16, 19, 82, 303, 451, 463.) Shale, calcareous. Chip sample taken across 100 ft. Index and geologic maps.

378. Skamania County. Pleistocene. [T. 8 N., R. 5 E.], Mount St. Helens, eastern base of cone. Analyst, W. H. Herdsman. Sample 2. (Verhoogen, 1937, p. 264, 267, 270, 277, 278, 293; Coombs, 1960, p. 11, 12, 15.) Tuff, white, porous; in layers 5 ft thick. Thin-section description. Index and geologic maps, geologic section. Photomicrograph. Norm.

379. Snohomish County. Permian. Sec. 16, T. 32 N., R. 6 E., about 6.5 miles by road east of town of Bryant. (Danner, 1966, p. 82, 306, 309, 310.) Shale, calcareous; contains calcite veinlets; composite sample. Index and geologic maps, geologic section. Possible use: None, rock impure.

380. Snohomish County. Pleistocene. [T. 30 N., R. 7 E.], near town of Granite Falls. Analyst, A. H. Cederberg. (Landes, 1905 [1906], p. 380; Glover, 1941, p. 225, 349.) Clay. Possible use: Cement, structural materials, red ware.

381, 382. Spokane County. Middle to late Miocene, Latah Formation. Analyst, W. R. Bloor. (Shedd, 1910, p. 169-171, 172, 175, 178-180, 181, 307, 320, 321; Glover, 1941, p. 231, 233, 253, 254, 256, 267, 350, 351.) Mineralogy. Index and geologic map, generalized geologic section. Physical properties, firing tests; microscopic description.

381. SW corner sec. 24, T. 25 N., R. 42 E., near town of Spokane. Dishman pit. Sample 69. Shale, light-gray, fossiliferous, very fine grained, little grit, fairly plastic; 75-100 ft exposed; overburden. Use: Brick.

382. SE¼ sec. 35, T. 25 N., R. 44 E., 2.5 miles east of town of Chester. Sommers pit. Sample 61. Clay, white; some sand; fairly plastic; maximum thickness, 45 ft; overburden 1-6 ft. Use: Face brick, firebrick, sewer pipe.

383, 384. Spokane County. T. 24 N., R. 44 E., near town of Mica. Gladding, McBean, and Co. pit. (Shedd, 1910, p. 182-186, 307, 320, 321.) Index and geologic maps. Use: Face brick, firebrick, electric conduits, terra cotta, sewer pipe, vitrified structural ware.

383. Probably Miocene. Sec. 23. Analyst, W. R. Bloor. Sample 52. (Wilson, 1934, p. 14, 16, 34, 36-39, 40; Hodge, 1938e, p.495, 496, 503, 510, 512, 516, 519, 526, 527, 529, 533, 534, 547, 548, 552.) Clay, white, coarse-grained, fairly plastic. Mineralogy. Physical properties, firing tests; microscopic description.

384. Analyst, O. A. Thomle. Sample 54. (Glover, 1941, p. 231, 233, 348, 349.) Clay, light-gray, fine-grained, very plastic; some grit. Generalized geologic section. Physical properties.

Table 2.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and clay each less than 75 percent; uncombined silica and clay each greater than carbonate (Group B), common and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued										
	385	386	387	388	389	390	391	392	393	394	395
	46B32-40	46B32-6	46B32-42	46B32-51	46B32-7	46B32-43	46B32-8	46B32-50	46B32-54	46B32-55	46B32-16
SiO_2	60.53	73.83	64.98	79.59	77.00	65.96	73.58	61.72	67.16	71.28	69.75
Al_2O_3	[1]16.15	15.54	15.57	11.58	13.80	18.28	17.29	18.53	19.26	17.46	20.91
Fe_2O_3	[1]6.28	2.00	5.34	[2]2.15	1.70	4.80	1.73	2.01	3.26	1.80	1.34
MgO	1.93	.44	.94	.05	.54	.72	.32	[3]1.47	1.13	.05	.76
CaO	2.60	.64	1.64	.12	.93	1.51	Trace	[3]3.82	.47	.40	.43
Na_2O	1.08	.76	1.60	1.03	1.42	3.52	.40	2.01	1.63	.28	.21
K_2O	3.23	1.74	1.40	.94	.28			2.19		2.74	
H_2O-	[4]1.36	.90	[4]2.75	[5].40	------	[4]1.70	.86	------	[4]1.76	.70	------
TiO_2	.57	.30	1.15	.23	.50	.11	.04	------	------	------	------
Ignition loss	[6]5.76	[6]4.48	[6]4.33	4.44	[7]4.40	[6]3.44	[6]5.44	[8]8.31	[6]5.32	[9]5.50	[6]6.60
Total	99.49	100.63	99.70	100.53	100.57	100.04	99.66	100.06	99.99	100.21	100.00
Class	25,65,0	44,53,0	31,62,0	57,41,0	51,46,1	28,66,0	41,57,1	27,61,7	29,67,0	38,57,1	31,66,2

	Washington—Continued										
	396	397	398	399	400	401	402	403	404	405	406	407
	46B41-184	46B41-182	46B43-159	46B41-201	46B41-197	46B41-172	46B41-173	46B41-174	46B41-215	46B41-239	46B41-193	46B41-119
SiO_2	65.66	69.2	61.6	62.74	59.76	69.12	59.24	54.41	72.01	72.64	66.68	82.64
Al_2O_3	21.98	18.7	14.5	16.45	17.29	23.40	7.36	16.83	12.52	12.70	10.82	7.52
Fe_2O_3	1.92	1.5	2.7	2.62	5.71	.96	3.00	3.21	4.35	4.66	5.02	5.26
FeO	------	------	1.5	1.91	------	------	------	------	------	------	------	------
MgO	.90	.9	2.3	2.41	4.11	.92	2.80	Trace	1.99	1.97	1.31	.96
CaO	------	.5	4.8	3.68	2.94	Trace	11.08	12.54	2.02	1.64	4.62	.99
Na_2O	.80	------	2.1	3.05	1.81	.15	------	------	1.36	1.30	------	------
K_2O			2.0	3.53	1.51	.17	------	------	1.80	1.43	------	------
H_2O+	------	------	7.8	2.69	------	------	------	------	------	------	------	------
H_2O-	[4]1.68	------										
TiO_2	------	------	.64	------	------	------	------	------	------	------	------	------
P_2O_5	------	------	.22	------	------	------	------	------	------	------	------	------
MnO	------	------	.08	Trace	------	------	------	------	------	------	------	------
CO_2	------	------	.05	.65	------	------	------	------	------	------	------	------
SrO	------	------	------	Trace	------	------	------	------	------	------	------	------
Ignition loss	[6]6.66	[6]7.4	------	------	[6]6.86	4.92	15.91	12.83	3.18	3.54	7.22	2.23
Total	99.60	[98.2]	100.3	99.73	99.99	99.64	99.39	99.82	99.23	99.88	95.67	99.60
Class	25,73,1	34,61,3	33,54,0	31,54,1	23,66,2	27,72,0	43,31,26	21,58,18	45,47,0	45,49,0	42,45,7	63,34,0

	Washington—Continued											
	408	409	410	411	412	413	414	415	416	417	418	419
	46B41-190	46B41-188	46B41-244	46B34-2	46B34-4	46B37-121	46B37-120	46B37-21	46B37-26	46B37-32	46B39-1	46B39-4
SiO_2	65.80	65.90	65.34	74.00	59.45	58.32	68.25	69.31	54.16	72.69	72.60	59.5
Al_2O_3	18.78	16.26	13.01	13.51	15.49	15.98	13.20	12.37	14.97	22.19	12.44	15.1
Fe_2O_3	5.42	3.95	8.51	[10]6.65	4.29	5.21	6.15	2.11	7.91		7.43	4.6
FeO	------	------	------	------	2.12	------	------	------	------	------	------	------
MgO	2.46	1.98	.53	1.65	1.83	2.92	------	.54	4.15	[11]1.18	1.28	------
CaO	------	1.36	6.30	3.61	2.83	4.88	.90	.57	2.62	[11]1.21	2.59	------
Na_2O	3.39	1.92	[12]5.14	------	2.09	------	[13](3-4)	2.03	------	------	1.26	------
K_2O		3.04			1.89	------						
H_2O+	------	------	------	------	5.02	------	------	5.93	------	------	1.52	------
H_2O-	[4]1.38	1.08	[14]Trace	------	2.51	------	------					
TiO_2	------	.85	------	------	.83	------	------	------	------	------	------	------
P_2O_5	------	------	------	None	.14	------	------	------	------	------	.04	------
MnO	------	.10	------	------	.07	------	------	------	------	------	------	------
CO_2	------	------	------	------	.10	------	------	------	------	[11]2.24	------	------
SO_3	------	------	------	None	------	------	------	------	------	------	------	------
Organic matter	------	------	------	------	[11]1.56	------	------	------	------	------	------	------
Ignition loss	[6]3.14	[6]3.28	1.17	------	------	12.63	7.05	[6]6.74	13.46	------	------	9.9
Total	100.37	[15]99.72	100.00	[99.42]	100.22	[99.94]	[95.55]	99.60	[16][97.27]	[99.51]	99.16	[89.1]
Class	26,68,0	33,58,0	33,55,0	43,52,0	27,61,0	24,61,15	38,56,2	45,45,2	19,65,13	36,60,5	42,52,2	28,62,0

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[1] Al_2O_3, 16.28 percent; Fe_2O_2, 6.15 percent (Shedd, 1910, p. 321).

[2] Includes FeO.

[3] MgO, 3.82 percent, CaO, 1.47 percent (Shedd, 1910, p. 321).

[4] Sample air dried; moisture at 110°C.

[5] Moisture at 212°F.

[6] Combined water, ignition.

[7] Reported as volatile.

[8] Moisture, combined water, ignition.

[9] Moisture, combined water, ignition; sample air dried.

[10] Oxide of iron.

[11] Calculated from reported $MgCO_2$, $CaCO_3$, and(or) C.

[12] Alkalies and undetermined, by difference.

[13] Alkali, not included in total.

[14] At 110°C.

[15] 99.62 percent in text.

[16] Contains organic matter.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

385. Spokane County. Pleistocene. [NW¼NE¼ T. 26 N., R. 43 E.],near town of Mead. J. T. Davie Brick Co. pit. Analyst, W. R. Bloor. Sample 68. (Shedd, 1910, p. 174, 175, 307, 320, 321; Glover, 1941, p. 231, 233, 278, 279, 340, 350, 351.) Clay, light-yellow, fine-grained, fairly plastic; stratified, some sandy layers; 20 ft thick. Mineralogy. Composite sample. Index and geologic map, generalized geologic section. Physical properties, firing tests. Use: Brick. Possible use: Tile.

386. Spokane County. T. 21 N., R. 45 E., town of Latah. Owner, L.C. White. Sample 60. (Shedd, 1910, p. 320,321; Glover, 1941, p.231,233,350, 351.) Clay. Index and geologic map, geologic section.

387. Spokane County. T. 23 N., R. 41 E., near town of Cheney. Analyst, W. R. Bloor. Sample 59. (Shedd, 1910, p. 194,195,196,307,321; Glover, 1941, p.231,233,350,351.) Clay, light-yellow, fairly plastic. Mineralogy. Index and geologic map, geologic section. Physical properties, firing tests, microscopic description. Possible use: Brick, draintile.

388. Spokane County. Sec. 1, T. 23 N., R. 44 E., Freeman station. Washington Brick, Lime, and Sewer Pipe Co. pit. (Hodge, 1938e, p. 495, 496, 503, 517, 529, 570, 571, 573, 574, 577.) Kaolin, white, crystalline; 30 ft thick; overburden 10-20 ft. Mineralogy. Tonnage estimated. Index and geologic maps. General use: Structural terra cotta, sewer pipe, pottery, refractories.

389 - 392. Spokane County. Sec. 1, T. 23 N., R. 44 E., town of Freeman. Washington Brick, Lime,and Sewer Pipe Co. pit. (Glover, 1941, p.231,233,241,339, 348,350,351.) Index and geologic map, generalized geologic section.

  389. (Wilson, 1923, p. 65, 68, 69; Hosterman and Livingston, 1966, p. 180, 181, 184.) Clay, white; about 45 ft thick. Mineralogy. Physical properties, firing tests. Use: Refractories. Possible use: Paper filler.

  390. Analyst, W. R. Bloor. Sample 57. (Shedd, 1910, p. 190, 191, 193, 307, 320, 321.) Clay, deep-reddish-brown; uniform in color, texture, and composition; some sand; fairly plastic; 60 ft thick, worked to a depth of 30 ft. Mineralogy. Physical properties, firing tests, microscopic description. Use: Brick.

  391. Sample 58. (Shedd, 1910, p. 320, 321.) Kaolin, sandy.

  392. Analyst, A. A. Hammer. Sample 65. (Shedd, 1910, p. 189, 191, 193, 320, 321.) Clay, 75-100 ft thick, 25-30 ft exposed. Use: Brick.

393. Spokane County. T. 26 N., R. 42 E., 6 miles north of Spokane. W. G. Lake farms. Analyst, W. R. Bloor. Sample 55. (Shedd, 1910, p. 172, 173, 174, 307, 320, 321; Glover, 1941, p. 231, 233, 350, 351.) Clay, light-cream, fairly plastic, almost free from grit; stratified; fossiliferous; 6-10 ft thick. Mineralogy. Index and geologic map, generalized geologic section. Physical properties, firing tests, microscopic description. Possible use: Brick.

394. Spokane County. [T. 26 N., R. 44 E.],Trent railroad station. Analyst, W. R. Bloor. Sample 64. (Shedd, 1910, p. 197, 198, 307, 320, 321.) Clay, almost white, plastic, fine-grained. Physical properties, firing tests. Possible use: Stoneware.

395. Spokane County. SW¼ sec. 27, T. 27 N., R. 44 E. Fuher prospect. Analyst, Elton Fulmer. Sample 245. (Glover, 1941, p. 231, 233, 258, 350, 351.) Clay, gray, fine. Index and geologic map, generalized geologic section.

396, 397. Stevens County. Miocene, probably correlative of Latah Formation. NE¼NW¼ sec. 32, T. 30 N., T. 42 E., about 7 miles by road north of town of Clayton. Washington Brick, Lime,and Sewer Pipe Co., A.B. pit. (Glover, 1941, p.233,287,350,351.) Clay, nearly white. Index and geologic map.

  396. Analyst, W.R. Bloor. Sample 75. (Shedd, 1910, p.207-209,210, 307,320,321.) Clay, plastic, stratified; 20 ft exposed; overburden 10-12 ft. Physical properties, firing tests, microscopic description. Use: Pottery, stoneware. Possible use: Refractories.

  397. Sample 268.

398. Stevens County. Oligocene, Gerome Volcanics. Sec. 36,T. 29 N., R. 36 E., north side of McCoy Lake. Analysts, P.L.D. Elmore, M.D. Mack. Lab. No. 152008. (Becraft and Weis, 1963, p.3,35-37.) Tuff. Mineralogy, calculated norm. Index and geologic maps, geologic section.

399. Stevens County. Pleistocene. [T. 36 N., R. 38 E.],town of Kettle Falls, Rickey Hill. Analyst, W. F. Hillebrand. Record 1428. (Clarke and Hillebrand, 1897, p.301; Glover, 1941, p.295,296,352,353.) General: Clay, plastic, well-bedded. Possible use: Common red-firing products.

400. Stevens County. Pleistocene. Sec. 17, T. 39 N., R. 40 E., 2.5 miles south of town of Northport. Trumbulls farm. Analyst, A.A.Hammer. Sample 85. (Shedd, 1910, p.216,320,321; Shedd, 1913, p.156,157, 249,pl.21; Weaver, 1920, p.338,343,pl.1.) Clay, very light yellow, fine-grained, free from grit, plastic, stratified, uniform throughout; 30 ft exposed. Index and geologic maps, geologic sections. Former use: Brick. Possible use: Portland cement.

Washington—Continued

401. Stevens County. Probably Tertiary. NW¼ sec. 20, T. 31 N., R. 41 E., about 2 miles east of town of Valley. Iron prospect. Analyst, A. A. Hammer. Sample 83. (Shedd, 1910, p.211,320,321; Weaver, 1920, p.343,344, pl.1; Hodge, 1938e, p.495,496,503,604,605; Glover, 1941, p.293,294, 350,351.) Clay, white, plastic, fine-grained. Index and geologic maps, geologic sections. Possible use: Face brick, terra cotta.

402 - 407. Stevens County. Tertiary [implied]. Analyst, A. A. Hammer. (Shedd, 1913, p.251,pl.21; Glover, 1941, p.280,351-353.) Shale. Index map.

  402. Sec. 24, T. 34 N., R. 38 E., near town of Addy. Sample 32. (Shedd, 1913, p.140,141.) Shale, dark-gray, fine-grained, laminated.

  403. Secs. 19,30, T. 34 N., R. 39 E., 7 miles northeast of Addy. Railroad cut. Sample 35. (Shedd, 1913, p.131.) Shale, light-gray, fine-grained, thinly laminated. Possible use: Portland cement.

  404. T. 35 N., R. 37 E., about 4.5 miles south of Kettle Falls. Sample 27. (Shedd, 1913, p.144,145.) Shale, medium-gray, fine-grained; surface sample, weathered.

  405. [T. 37 N., R. 39 E.],7 miles northeast of town of Colville, on Clugston Creek. Sample 30. (Shedd, 1913, p. 138, 139.) Shale, almost black, compact; average sample. Possible use: Portland cement.

  406. [T. 38 N., R. 38 E.],1 mile east of town of Bossburg. Sample 33. (Shedd, 1913, p. 151, 152.) Shale, blue-gray, soft; in thin layers. Possible use: Portland cement.

  407. [T. 39 N., R. 40 E.],about 1 mile from Northport. Sample 36. (Shedd, 1913, p. 158, 159.) Shale, dark-gray, fine-grained, thinly laminated; some grit; surface sample, weathered.

408, 409. Stevens County. Sec. 19, T. 29 N., R. 42 E., Clayton. Washington Brick, Lime,and Manufacturing Co. (Shedd, 1910, p.200,202,203, 205,206,307,320,321; Glover, 1941, p.233,282,284,350,351.) Index and geologic map, generalized geologic section.

  408. Analyst, W. R. Bloor. Sample 73. Clay, dark-yellow, fine-grained, plastic, some grit. Mineralogy. Physical properties, firing tests. Use: Face brick, terra cotta.

  409. Sample 74. General: Clay, yellow, sandy, plastic; 5-8 ft thick; generalized measured section. Use: Brick.

410. Stevens County. Sec. 30, T. 38 N., R. 39 E., 7 miles northeast of Bossburg. Washington Monumental and Cut Stone Co. Analyst, R. W. Thatcher. (Shedd, 1903, p.52,53,54,134,136,138,141.) Tuff, light-gray, fine- to coarse-grained. Mineralogy. Bulk density 2.621. Physical properties. Possible use: Dimension stone.

411. Thurston County. Eocene. [T. 16 N., R. 1 E.],0.5 mile northeast of Tenino railroad station. (Roberts, 1902a, p.7,8,10.) Sandstone, light-greenish-gray, fine-grained, even texture. Mineralogy, physical properties. Use: Concrete aggregate, refractories, dimension stone.

412. Thurston County. Late Eocene to early Miocene, Lincoln Creek Formation. NW¼NW¼ sec. 7, T. 15 N., R. 3 W., 4 miles north of town of Centralia. Analyst, R. N. Eccher. (Snavely and others, 1958, p.3, 41-43,pl.1.) General: Tuffaceous siltstone, brownish-gray, fine-grained, massive, fossiliferous. Mineralogy. Index and geologic maps, detailed measured section.

413, 414. Whatcom County. Early Pennsylvanian part of Chilliwack Group. NE¼SW¼, NW¼SE¼, NE¼ sec. 14, T. 40 N., R. 5 E., Red Mountain. Permanente Cement Co., Kendall quarries. Analyst, E. J. Baldwin. (Danner, 1966, p.82,209,210,213,214,218,219.) Shale. Index and geologic maps. Use: Cement. Former use: Hydrated lime.

415. Whatcom County. Eocene, Chuckanut Formation. SE¼ sec. 12, T. 40 N., R. 4 E., 3 miles southeast of town of Sumas. Denny-Renton Clay and Coal Co. mine. Analyst, H.K. Benson. Sample 90. (Shedd, 1910, p. 286-288,320,321; Glover, 1941, p.306,311,312,352,353.) Clay. Index map, detailed measured section. Former use: Terra cotta, refractories.

416. Whatcom County. Pleistocene. Sec. 34, T. 40 N., R. 5 E., town of Kendall. J. J. Eason farm. Analyst, A. A. Hammer. Sample 62. (Shedd, 1913, p. 209, 214, 215, 250, pl. 21; Glover, 1941, p. 319, 352; Moen, 1962, p. 85, 86, pl. 1.) Clay; dark blue when wet; dark gray when dry; fine grained. Index and geologic maps, geologic sections. Possible use: Brick.

417. Whatcom County. [T. 40 N., R. 5 E.],near Kendall. Analyst, A. H. Cederberg. Sample 6. (Landes, 1905, [1906],p.379; Glover, 1941, p. 352, 353.) Argillite. Possible use: Cement [implied].

418. Yakima County. Pliocene to Holocene. T. 10 N., R. 22 E., Snipes Mountain. Sample 53. (Hodge, 1938c, p. 3, 22, 159, 160, 162, 163.) Gravel and sand; more than 50 ft thick. Mineralogy. Index maps. Possible use: Source of silica, ball mill pebbles.

419. Yakima County. NE¼ sec. 2, T. 10 N., R. 22 E., northwest of town of Sunnyside. Analysts, K.A. Johnson, Anthony Centenero. (Skinner and others, 1944, p.1-4,21,31,32,66.) Diatomite, 4 ft exposed; about 15 ft thick. Channel sample. Index maps. Physical properties, firing tests. Possible general use: Concrete admixture, filtration, heat insulation.

Table 3.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and carbonate each less than 75 percent; uncombined silica and carbonate each greater than clay (Group C), common- and mixed-rock categories

[Samples of mixed rock category indicated by an asterisk(*). Chemical analyses arranged by State, quadrangle or county, and stratigraphic position]

Chemical analyses

	Alaska						Idaho						
	1	2	3	4	5	6	7	8	9	10	11	12	13
	50C 5-11	50C 30-7	50C 52-110	50C 154-122	50C 154-126	50C 155-2	11C 9-6	11C 45-45	11C 35-38	11C 35-39	11C 35-42	11C 40-12	11C 40-7
SiO_2	18.6	26.42	61.3	29.4	41.5	29.0	29.0	18.69	[1]30.7	[1]40.7	[1]55.0	51.62	35.4
Al_2O_3	.24	------	4.30	4.50	2.93	4.35	4.6	1.79	5.6	7.6	6.3	5.26	5.2
Fe_2O_3	1.4	------	2.10	2.10	1.47	2.05	.9	------				------	.4
FeO	------	------	------	------	------	------	.65	------	------	------	------	[2]1.67	2.9
MgO	1.1	14.03	1.05	2.3	1.9	1.3	14.0	10.01	1.6	3.5	1.9	[2].21	11.6
CaO	37.8	21.94	15.4	31.2	27.0	33.1	18.7	28.64	33.1	26.0	19.0	[2]20.18	16.0
Na_2O	.67	------	------	------	------	------	.55	------	------	------	------	3.00	.80
K_2O	.37	------	------	------	------	------	1.4	------	------	------	------		1.2
H_2O	------	------	------	------	------	------	1.1	------	------	------	------	------	.53
TiO_2	------	------	------	------	------	------	.20	------	------	------	------	.19	.14
P_2O_5	------	------	------	------	------	------	.06	[2]5.68	------	------	------	------	.07
MnO	------	------	------	------	------	------	.06	------	------	------	------	[2].72	.16
SO_3	------	------	.01	1.76	.77	.94	[3].43	------	------	------	------	------	------
Ignition loss	35.8	32.84	------	------	------	------	[5]28.2	[5]28.75	[6]27.6	[6]20.5	[6]16.9	[7]17.28	[5]24.0
Total	[96.0]	95.23	[84.2]	[71.3]	[75.6]	[70.7]	[8]99.8	[9][98.17]	[98.6]	[98.3]	[99.1]	[100.13]	[8]98.4
Class	17,9,70	26,069	51,18,30	19,19,58	35,12,52	19,18,62	20,16,59	16,10,60	21,16,59	28,22,41	44,18,34	42,15,38	26,16,50
CaO/MgO	Calcite	Dolomite	------	Magnesian calcite	Magnesian calcite	Magnesian calcite	Dolomite	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Dolomite

	Idaho—Continued		Oregon					Washington			
	14	15	16	17	18	*20	21	23	24	25	26
	11C40-10	11C40-11	36C1-6	36C1-9	36C3-31	36C10-51	36C15-23	46C2-8	46C4-75	46C4-74	46C4-48
SiO_2	42.79	20.88	44.86	38.23	46.22	63.81	25.21	21.68	27.27	21.24	21.94
Al_2O_3	8.55	4.36	.77	1.74	5.31	2.51	------	[10]1.75	[10]1.27	1.37	3.41
Fe_2O_3	------	------	.60	1.33						.65	1.06
FeO	[2]3.67	[2]1.78	None	------	------	------	------	------	------	------	------
MgO	[2]7.48	[2]14.98	.79	.70	[2].49	12.86	[2].62	.50	.38	3.60	.63
CaO	[2]15.67	[2]21.66	29.72	32.17	[2]25.56	Trace	[2]39.11	40.61	39.62	40.50	40.56
Na_2O	3.00	1.60	.10	------	------	------	------	------	------	.12	------
K_2O			.25	------	------	------	------	------	------	.12	------
H_2O	------	------	.10	------	[11]1.26	------	------	------	------	------	------
TiO_2	.25	.20	Trace	------	------	------	------	------	------	------	------
P_2O_5	------	------	.10	.05	------	------	------	.045	.035	------	------
MnO	[2].04	[2].32	.10	------	------	------	------	------	------	------	------
SO_3	------	------	None	[12].02	------	------	------	------	------	------	------
Ignition loss	[7]17.09	[7]33.94	[5]23.10	[5]25.71	[7]20.57	7.86	[7]31.39	[13]33.92	[13]31.01	32.25	31.47
Total	[98.54]	[99.72]	[14]100.49	99.95	[99.41]	[15]99.29	96.33	[98.50]	[99.58]	[99.85]	99.07
Class	28,25,36	13,12,71	43,4,52	34,8,58	37,15,47	60,7,14	25,0,71	19,6,74	25,4,70	18,6,71	15,13,69
CaO/MgO	Calcareous dolomite	Dolomite	Calcite	Calcite	Calcite	------	Calcite	Calcite	Calcite	Magnesian calcite	Calcite

[1] Acid insoluble (chiefly SiO_2).

[2] Calculated from reported $FeCO_3$, $MgCO_3$, $CaCO_3$, Fe, P, $MnCO_3$, and(or) C.

[3] Sulfur soluble in aqua regia, calculated as FeS_2.

[4] Includes ignition loss due to oxidation of FeO.

[5] CO_2.

[6] Loss on ignition (chiefly CO_2).

[7] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[8] Sample 7, total 100 percent in text; sample 13, total 98 percent in text.

[9] V =0.01 percent, Cr =0.04 percent, organic matter =4.56 percent, calculated from reported C.

[10] R_2O_3.

[11] Reported as ignition loss.

[12] S.

[13] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[14] Organic matter, Li_2O =trace, FeS_2 =none, SrO =none, mere traces not determined (Wells, 1937, p. 59).

[15] Phosphorus, sulfur, or arsenic not detected, NiO = 12.25 percent.

Semiquantitative spectrographic analysis

	13		13
Be	0	Sr	0.0X
B	.00X	Y	.00X
Sc	.000X	Zr	.00X
V	.00X	Ba	.0X
Cr	.000X	La	0
Ni	.00X	Yb	.000X
Co	0	Pb	.00X
Cu	000X		

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_3, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, CeO_2, Pr_2O_3, UO_2; sample 24, BaO =0.14 percent]

	23	24		23	24
Na_2O	0.16	0.29	MnO	0.095	0.11
K_2O	------	.25	NiO	.001	.0024
TiO_2	.045	.07	CuO	.0026	.0075
V_2O_5	.025	------	SrO	.011	.0084
Cr_2O_3	.014	.00087	ZrO_2	------	.002

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1\. Anchorage quadrangle. Holocene. [Sec. 12, T. 17 N., R. 1 W.],Knik Arm area, Wasilla Lake. Edlund deposit. Analysts, E. A. Nygaard, S. M. Berthold. Auger hole 1-GS. (Moxham and Eckhart, 1956, p. 3, 6, 8, 13, 14, 15, 18, 19, pl. 1.) Marl; mostly light gray to cream colored when wet, white when dry; fine grained; 21 ft thick near center of deposit. Sample at depth of 20 ft. Tonnage estimated. Index and geologic maps, isopachous map, geologic section, columnar sections. Possible use: Portland cement. [For analyses from same drill hole, see sample 2, group F_1; sample 14, group F_2.]

2\. Charley River quadrangle. Precambrian, Tindir Group. [About 20.1-22, 0.4-0.9],north side of Tatonduk River. Analyst, J. G. Fairchild. Record D-31, Sample 30AMt104. (Mertie, 1933, p. 350, 369, 372-374, 378, pl. 7.) Dolomite, siliceous, massive; bed 160 ft thick. Mineralogy. Index and geologic maps.

3-6. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 96, 98-101, 105, 111, 112, 114, 123, figs. 1, 3, 35-37, 39-41.) Log of drill hole. Index and geologic maps, geologic section. Possible use: Portland cement(magnesia content often high so that complex mining and thorough blending may be required).

  3. Drill hole 4. Limestone, gray, fine-grained; sandy; total depth of diamond-drill hole 629 ft. Sample depth 605-610 ft. [For other analyses from same drill hole, see samples 48-53, group F_1; samples 221-336, group F_2.]
  4, 5. Drill hole 9. Total depth of diamond-drill hole 620 ft. [For other analyses from same drill hole, see samples 54-58, group F_1; samples 337-379, group F_2.]
    4. Limestone, black, silicified; depth 570-575 ft.
    5. Sandstone, gray, fine-grained; depth 552-555 ft. Limestone, gray; contains calcite veinlets and brown claylike residue; depth 550-552 ft.
  6. Drill hole 11. Limestone, black, fine-grained; total depth of diamond-drill hole 284 ft. Sample depth 275-280 ft. [For other analyses from same drill hole, see sample 15, group E; sample 64, group F_1; samples 649-702, group F_2.]

Idaho

7\. Bonner County. Precambrian, Striped Peak Formation. T. 54 N., R. 3 E., between Dry Creek and main south branch of Dry Creek. Analysts, P.L.D. Elmore, S.D. Botts, I.H. Barlow, Gillison Chloe. Lab. No. 155263. (Harrison and Jobin, 1963, p. K3, K15, K36, K37, pl. 1.) Dolomite, blue-gray, silty. Index and geologic maps, geologic sections. Possible use: Cement.

8\. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. [Secs. 2, 11, T. 8 S., R. 42 E.] Conda mine. Sample S1. (Emigh, 1958, p. 27, 28, 30, fig. 1.) General: When fresh, phosphatic dolomitic shale, black, fine-grained, dense; when weathered, shale, brown, soft; fossiliferous; 17-24 ft thick. Mineralogy, thin-section description. Index map.

9-11. Nez Perce County. Late Triassic, Hurwal Formation. (Savage, 1965, p. 18a, 18b, 18c, 19, 20, pl. 1, fig. 1.) Limy shale. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Portland cement.

  9. [Probably] sec. 14, T. 32 N., R. 5 W., 0.5 mile up Billy Creek. Analyst, George Hsu. Sample 3Gh.
  10. [Probably] sec. 23, T. 32 N., R. 5 W., Camp Creek area. Analyst, Huey-rong Hsi. Sample 3Ah.
  11. SE¼ sec. 36, T. 33 N., R. 5 W., near mouth of Madden Creek. Analyst, George Hsu. Sample 3Eh.

12\. Shoshone County. Precambrian, Revett Quartzite. [NW¼ T. 48 N., R. 6 E.], Glidden Lakes, Miltary Gulch. Analyst, J. G. Fairchild. Specimen 25. (Hobbs and others, 1965, p. 5, 26, 27, 38, pl. 6.) Quartzite. Mineralogy. Index and geologic maps.

13, 14. Shoshone County. Precambrian, Wallace Formation. Probably sec. 12 or 13, T. 47 N., R. 5 E., Stevens Lake. (Hobbs and others, 1965, p. 5, 23-27, 28, pls. 5, 6.) Mineralogy. Index and geologic maps, geologic sections.

Idaho—Continued

  13. Analysts, H. F. Phillips, P. L. D. Elmore, K. E. White; spectrographic analyst, J. D. Fletcher. Lab. No. 54-419SC. (Ross, 1963, p. 28, 48, 50, 57.) Dolomite, argillaceous, gray, dense. Differential thermal analysis curve. Triangular diagram.
  14. Analyst, J. G. Fairchild. Specimen 89. Quartzite, dolomitic, pitted.

15\. Shoshone County. Age, reference, maps,and sections as in samples 13, 14. Striped Peak Formation. Sec. 7, T. 47 N., R. 4 E., Striped Peak. Analyst, J. G. Fairchild. Specimen 103. Dolomite, arenaceous.

Oregon

16, 17. Baker County. Probably pre-Carboniferous, limestone interbedded in Burnt River Schist. Sec. 11, T. 12 S., R. 43 E., 3.75 miles south of town of Durkee. Nelson deposit. (Hodge, 1938d, p. 154, 199, 236-238, 240.) General: Limestone, interbedded with chert and argillite; beds 600-700 ft thick. Index and geologic maps.

  16. Analyst, J. G. Fairchild; collectors, R. W. Richards, B. N. Moore. Record D-63. (Moore, 1937, p.141,142,pl.1; Wells, 1937, p.58, 59.) Limestone, nearly black, crystalline. Bulk density 2.68. Tonnage estimated. Former use: Lime. Possible use: Cement.
  17. USED sample 18.

18\. Clackamas County. [T. 5 S., R. 1 E.],about 1 mile from town of Marquam. Analyst, R. S. Edwards. (Eckel, 1913, p. 308, 309.) Limestone. Possible use: Cement.

*20. Douglas County. Mostly sec. 17, T. 30 S., R. 6 W., about 3 miles west of Riddle, Piney Mountain. Oregon Nickel Mines Co. (Austin, 1894, 1895, 1896, p. 174, 175, 178, 180, 181, 190-193.) Genthite, green veinlets. Bulk density 2.20-2.58. Mineralogy, thin-section description. Index and geologic maps. *Analysis shows 12.2 percent NiO; suggests 6.2 percent more MgO than required for carbonate.

21\. Jackson County. Devonian. Sec. 16, T. 36 S., R. 3 W., 0.25 mile west of town of Gold Hill. Analyst, P. H. Bates. (Darton, 1909, p. 29; Diller, 1914, p. 10, 11, 15, 16, pl. 4; Winchell, 1914, p. 14, 15, 58, 158, 159, fig. 1.) Limestone, 50-200 ft thick. Index and geologic maps. Possible use: Portland cement [implied].

Washington

23\. Asotin County. Probably Late Triassic. SW¼ sec. 19, T. 7 N., R. 47 E., about 25 miles south of town of Clarkston, Lime Hill. Ideal Cement Co. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample A-6. (Mills, 1962, p. 12, 13, 239-243, 244, 252, 264, pl. 1.) General: Limestone, gray to light-gray, cryptocrystalline to fine-grained; beds 1/16 in.-4 ft thick. Total thickness of limestone in area 3,143 ft. Most units siliceous and (or) slightly argillaceous. Chip sample of outcrop represents 50 ft. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

24, 25. Chelan County. W½ sec. 22, T. 26 N., R. 19 E., about 16 miles by road from town of Entiat. Indian Creek deposit. (Danner, 1966, p.16,19,82, 398,406,407,447,455.) Limestone, white, crystalline. Index and geologic maps, geologic sections, measured section. Possible use: Decorative stone.

  24. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Cn 6-2. Chip sample taken across 12 ft.
  25. Sample taken from float boulders.

26\. Chelan County. NW¼ sec. 14, T. 27 N., R. 15 E. Rainy Creek deposit. Drill hole 55. (Danner, 1966, p.82,387,393-396,397.) Limestone, white to gray, medium to coarsely crystalline. Sample depth 91.8-142.5 ft. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Portland cement. [For other analyses from same drill hole, see samples 64-68, group E; samples 123-126, group F_1.]

Table 3.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and carbonate each less than 75 percent; uncombined silica and carbonate each greater than clay (Group C), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued											
	27	28	29	30	31	32	33	34	35	36	37	38
	46C10-15	46C10-16	46C10-11	46C10-12	46C10-13	46C10-14	46C24-7	46C24-47	46C24-265	46C24-269	46C24-270	46C24-279
SiO_2	25.50	35.92	36.05	37.83	39.45	28.99	25.86	54.90	20.96	23.82	20.45	20.90
R_2O_3	1.35	1.35	3.87	2.20	3.53	.98	[1]4.70	[1]9.34	[1]3.56	[1]3.99	[1]3.90	[1]4.39
MgO	5.57	2.56	1.58	1.08	2.00	.76	[2]3.63	[2]7.71	[2]14.98	[2]15.08	[2]15.17	[2]15.04
CaO	39.69	33.71	31.33	32.06	29.43	37.83	34.66	11.00	24.54	22.76	24.60	24.24
P_2O_5	.071	.060	.173	.153	.330	.060	------	------	------	------	------	------
Ignition loss	[3]28.09	[3]26.30	[3]26.77	[3]26.61	[3]25.48	[3]31.12	[4]31.15	[4]17.05	[4]35.96	[4]34.35	[4]35.88	[4]35.43
Total	[100.27]	[99.90]	[99.77]	[99.93]	[100.22]	[99.74]	100.00	100.00	100.00	100.00	100.00	100.00
Class	23,4,61	34,4,58	30,11,58	34,6,59	34,10,55	27,3,69	18,14,67	39,27,31	15,10,74	17,12,70	14,11,74	14,13,72
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	------	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued											
	39	40	41	42	43	44	45	46	47	48	49	50
	46C40-6	46C40-14	46C40-48	46C40-49	46C40-59	46C40-60	46C40-62	46C40-68	46C40-69	46C40-90	46C40-168	46C40-169
SiO_2	28.08	21.74	21.00	31.42	39.20	29.26	42.86	22.40	22.42	23.18	23.86	27.29
R_2O_3	[1]4.34	[1]3.24	[1]3.46	[1]3.80	[1]5.26	[1]5.38	[1]6.09	[1]4.02	[1]3.24	[1]3.76	2.62	3.23
MgO	[2]13.12	[2]15.37	[2]15.31	[2]12.88	[2]10.67	[2]12.86	[2]10.11	[2]14.78	[2]15.02	[2]13.77	1.56	1.08
CaO	22.52	24.04	24.38	21.18	18.62	21.56	16.74	23.88	24.04	24.78	39.68	37.80
P_2O_5	------	------	------	------	------	------	------	------	------	------	.082	.116
Ignition loss	[4]31.94	[4]35.61	[4]35.85	[4]30.72	[4]26.25	[4]30.94	[4]24.20	[4]34.92	[4]35.28	[4]34.51	[3]31.91	[3]30.42
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	[99.71]	[99.94]
Class	21,13,65	16,9,73	15,10,74	25,11,63	30,15,53	20,16,62	33,18,48	16,12,71	17,9,73	17,11,71	19,8,70	22,9,67
CaO/MgO	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Magnesian calcite	Calcite

	Washington—Continued											
	51	52	53	54	55	56	57	58	59	60	61	62
	46C 40-170	46C 40-186	46C 40-171	46C 40-172	46C 28-51	46C 28-67	46C 28-75	46C 28-42	46C 28-130	46C 28-131	46C 28-129	46C 28-125
SiO_2	39.27	19.83	32.30	29.40	26.04	45.45	30.10	45.07	43.06	44.74	41.75	28.29
Al_2O_3	[5]6.27	[5]3.93	[5]6.29	[5]5.48	.36	[5]3.00	[5]1.92	[5]1.08	[5]1.59	[5]2.18	[5]2.57	[5]3.64
Fe_2O_3					.82							
MgO	1.00	1.50	.92	5.32	.02	.21	.34	.27	.24	.62	.47	.59
CaO	29.71	41.25	34.40	30.53	40.56	28.08	37.52	30.00	30.65	28.57	30.73	36.80
P_2O_5	.064	.098	.074	.096	------	.054	.028	.032	.040	.040	.082	.059
Ignition loss	[3]23.36	[3]32.98	[3]26.09	[3]28.72	32.08	[3]23.07	[3]29.95	[3]23.74	[3]24.39	[3]23.01	[3]24.58	[3]30.24
Total	[99.67]	[99.59]	[100.07]	[99.55]	[99.88]	[99.86]	[99.86]	[100.19]	[99.97]	[99.16]	[100.18]	[99.62]
Class	29,18,49	13,11,72	22,18,55	20,16,60	24,3,72	40,9,51	27,6,67	43,3,53	40,5,54	41,6,51	37,8,54	22,11,66
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Iron and alumina.

[2] By difference.

[3] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[4] 950°-1,000°C; also called CO_2.

[5] R_2O_3.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, CoO, ZnO, Ga_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, GeO_2, As_2O_3, UO_2; sample 56, PbO = 0.038 percent]

	27	28	29	30	31	32	49	50	51	52	53	54	56
Na_2O	0.21	0.78	0.14	0.05	------	0.082	0.30	0.23	0.17	0.06	0.29	------	0.06
K_2O	------	1.95	.90	------	------	------	------	------	.25	------	.25	------	------
TiO_2	.18	.095	.14	.12	0.062	.084	.14	.096	.16	.068	.17	0.075	.084
V_2O_5	.0053	.011	.068	.038	.034	.0095	.056	.018	.0078	.0059	.013	------	.003
Cr_2O_3	.0032	.0014	.0048	.0022	.0028	.00093	.0057	.0044	.0043	.0039	.0055	.0012	.0019
MnO	.16	.14	.082	.03	.038	.035	.053	.10	.21	.18	.20	.049	.09
NiO	.0022	.002	.007	.004	.004	.0028	.005	.0044	.0048	.0036	.0056	.001	.0026
CuO	.004	.0069	.027	.016	.012	.0046	.011	.012	.029	.016	.018	.014	.014
SrO	.032	.025	.038	.028	.034	.046	.07	.083	.021	.014	.02	.013	.013
ZrO_2	.002	------	.0039	.002	.0033	------	.011	.0072	.03	.026	.032	.012	------
Ag_2O	------	------	------	.0014	------	------	------	------	------	------	.0015	------	.0015
BaO	------	------	.25	.18	------	.15	------	------	------	------	------	------	------

Spectrochemical analyses—Continued

	57	58	59	60	61	62		57	58	59	60	61	62
Na_2O	0.25	------	0.075	------	0.082	1.00	NiO	0.0038	0.0022	0.002	0.004	0.0034	0.002
K_2O	------	------	------	------	------	------	CuO	.0099	.016	.013	.0075	.013	.017
TiO_3	.053	0.019	.025	0.034	.047	.14	SrO	.011	.0092	.015	.014	.0098	.024
V_2O_5	.005	------	------	.003	------	------	ZrO_2	------	------	------	------	.003	.002
Cr_2O_3	.0017	.0012	.0015	.0062	.0010	.0028	Ag_2O	------	------	------	------	------	------
MnO	.045	.50	.15	.18	.44	.30	BaO	------	------	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

27-32. Ferry County. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 186-188, 207, 209, 210, 244, 252, 253, 264, pl. 1.) Chip sample of outcrop. Index and geologic maps. Possible use: None, rock impure.

27, 28. Triassic. SE¼NE¼ sec. 18, T. 40 N., R. 34 E., about 2.5 miles southwest of town of Danville. Samples F-4, F-6. Limestone, white to light-gray, medium-grained.

29-32. Pre-Permian or late Paleozoic. NE¼SW¼ sec. 9, T. 35 N., R. 32 E., Sheep Mountain area. Samples F-24 to F-26, F-29. Limestone, dark-gray to black, fine- to medium-grained, thin-bedded.

33-48. Okanogan County. Triassic. Near town of Riverside. (Bennett, 1944, p. 6-9, 11, 14-17, 22-24, pls. 1, 4, 7; Bennett, 1945, p. 6, 7, 12, 13.) Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone.

33. NW¼SE¼ sec. 8, T. 34 N., R. 26 E., about 4.5 miles southwest of Riverside. Owner, Beechenow. Sample 448a. [Dolomitic limestone.] Deposit: Dolomitic marble, white; contains chert veins and limy dolomite.

34. SE¼NW¼ sec. 10, T. 35 N., R. 26 E., about 4 miles northwest of Riverside. Owner, S. J. Booher. Sample 397. Deposit: Dolomite, dark-gray, dense.

35-39. T. 35 N., R. 26 E., about 2.5 miles northwest of Riverside. Deposit: Dolomite, gray, massive; some siliceous beds.

35-38. NE¼NE¼ sec. 22. Owner, R. E. Smith. Samples 165, 169, 170, 179.

39. NW¼NE¼ sec. 22. Owner, Mrs. W. V. West. Sample 162.

40. SE¼NE¼ sec. 22, 2 miles northwest of Riverside. Sample 133. Deposit: Dolomite, gray, thick-bedded to massive; contains quartz veinlets.

41-48. T. 35 N., R. 26 E., about 1.25 miles northwest of Riverside. Deposit: Dolomite, light-gray to brownish-gray.

41, 42. NE¼SE¼ sec. 22. Owner, W. R. Forbes. Samples 125, 126.

43-47. NW¼SW¼ sec. 23. Samples 110, 115, 117, 123, 124.

48. SW¼SW¼ sec. 23. Owners, Emmett and Omar Smith. Sample 104.

49. Okanogan County. SE¼ sec. 1, T. 35 N., R. 25 E., southeast side of Dunn Mountain. Scholz property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample O-50. (Mills, 1962, p. 12, 13, 232, 233, 234-236, 245, 246, 255, 264, pl. 1.) Limestone, white to light-gray, medium-grained. Chip sample of three outcrops, represents 52 ft. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

50. County, analysts, reference, and maps as in sample 49. SW¼SW¼ sec. 7, T. 35 N., R. 26 E., Dunn Mountain area. McCain property. Sample O-57. Limestone, dark-gray, fine- to medium-grained, siliceous. Chip sample of outcrop, represents 43 ft. Possible use: None, rock impure.

Washington—Continued

51-54. Okanogan County. Sec. 26, T. 35 N., R. 26 E., 1 mile northwest of Riverside. Brown property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 236-238, 246, 256, 264, pl. 1.) Limestone, gray, fine-grained, siliceous, argillaceous, bedded. Chip sample. Index and geologic maps. Possible use: None, rock impure.

51. NW¼NE¼ sec. 26. Sample O-73 represents 58 ft.
52. NE¼NW¼ sec. 26. Sample O-71 represents 50 ft.
53. NE¼NW¼ sec. 26. Sample O-72 represents 75 ft.
54. NE¼NW¼ sec. 26. Sample O-74 represents 70 ft.

55. San Juan County. Early Pennsylvanian or Late Mississippian. N½SE¼ sec. 20, T. 37 N., R. 2 W., Orcas Island. Englehartson deposit. (Danner, 1966, p. 82, 141, 161, 162.) Limestone, light-gray, organoclastic to crystalline; contains jasperoid. Thin-section description. Tonnage estimated. Index and geologic maps.

56. San Jnan County. Early Pennsylvanian. SE¼SW¼ sec. 16, T. 37 N., R. 1 W., Orcas Island. Mount Constitution deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 77-4. (Danner, 1966, p. 16, 19, 82, 141, 198, 199, 450, 460.) Limestone, dark-gray, dense to fragmental, fossiliferous; weathers buff; contains interbedded argillaceous material. Chip sample, single specimen. Tonnage estimated. Index and geologic maps. Possible use: None, rock impure.

57. County, age, analysts, maps, and use as in sample 56. NE¼NE¼ sec. 19, T. 37 N., R. 1 W., Orcas Island, about 4 miles from town of East Sound. Wright deposit. Sample SJ 80-1. (Danner, 1966, p. 16, 19, 82, 141, 203, 450, 461.) Limestone, argillaceous, dark-gray-buff, dense, fossiliferous; weathers brownish buff. Thin-section description. Chip sample taken across 80 ft.

58. County, analysts, maps, and use as in sample 56. Early Permian. SE¼ sec. 15, T. 37 N., R. 2 W., Orcas Island, about 0.75 mile west of town of East Sound. Double Hill deposit. Sample SJ 17-1. (Danner, 1966, p. 16, 19, 82, 141, 151-153, 448, 457.) Limestone, largely replaced by jasperoid. Chip sample taken across 250 ft.

59. County, analysts, maps, and use as in sample 56. Permian. NE¼ sec. 18, T. 36 N., R. 3 W., San Juan Island. Limestone Point quarry, abandoned. Sample SJ 61-1. (Danner, 1966, p. 16, 19, 82, 94, 119, 120, 121, 449, 459.) Limestone, gray, bedded, fossiliferous; interbedded with ribbon chert; beds range from 1 in. to several ft thick. Thin-section description. Chip sample taken across 100 ft. Former use: Lime.

60-62. San Juan County. San Juan Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 94, 95, 100, 101, 121, 122, 123, 447, 449, 456, 459.) Chip sample. Index and geologic maps. Possible use: None, deposit small.

60. Permian(?). SE¼NE¼ sec. 29, T. 36 N., R. 3 W. Bell quarry, abandoned. Sample SJ 2-1. Limestone, light-blue-gray, finely crystalline; contains calcite veinlets, chert; taken across 15 ft. Thin-section description. Tonnage estimated.

61. Permian(?). SE¼SE¼ sec. 19, T. 36 N., R. 4 W. Rouleau deposit. Sample SJ 54-1. Limestone, light-gray; contains calcite veinlets and argillaceous material; taken across 20 ft. Tonnage estimated.

62. Late Triassic, Haro Formation. NE¼ sec. 14, NW¼ sec. 13, T. 36 N., R. 4 W. Davison Head deposit, Roche Harbor Lime and Cement Co. Sample SJ 50-1. Limestone, argillaceous, fossiliferous; taken across 38 ft. Detailed measured section.

Table 3.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and carbonate each less than 75 percent; uncombined silica and carbonate each greater than clay (Group C), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued											
	63	64	65	66	67	68	69	70	71	72	73	74
	46C28-83	46C28-119	46C28-87	46C29-91	46C29-90	46C29-76	46C29-11	46C29-121	46C29-111	46C29-115	46C29-113	46C31-71
SiO_2	44.12	68.03	32.87	32.92	25.05	23.22	39.9	31.07	30.71	36.43	63.89	28.68
Al_2O_3	[1]1.89	[1]4.51	[1]6.51	[1]4.62	[1]3.44	[1]2.24	.8	[1]1.29	[1]1.53	[1]1.55	[1]6.41	[1]3.36
Fe_2O_3							.7					
MgO	.27	.77	8.60	1.29	.55	.57	.6	.46	3.03	.49	.64	.94
CaO	29.80	14.10	24.21	33.24	40.11	41.73	32.0	37.63	35.03	33.82	14.91	36.46
P_2O_5	.027	.205	.265	.018	.015	.060	------	.066	.021	.049	.200	.041
Ignition loss	[2]23.75	[2]11.33	[2]28.26	[2]28.15	[2]31.30	[2]32.69	25.4	[2]29.82	[2]30.23	[2]27.22	[2]13.33	[2]30.17
Total	[3][99.86]	[4][98.94]	[100.72]	[100.24]	[100.46]	[5][100.51]	[99.4]	[100.34]	[100.55]	[99.56]	[99.38]	[99.65]
Class	41,6,53	60,13,23	22,19,57	25,14,61	19,10,69	19,7,73	38,4,57	29,4,67	28,4,67	34,5,61	53,19,26	23,10,66
CaO/MgO	Calcite	------	Calcareous dolomite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	------	Calcite

	Washington—Continued											
	75	76	77	78	79	80	81	82	83	84	85	86
	46C31-89	46C31-107	46C31-97	46C31-20	46C31-100	46C31-99	46C31-98	46C33-8	46C41-59	46C41-77	46C41-287	46C43-130
SiO_2	62.00	22.32	34.24	24.3	54.97	50.56	60.65	[6]21.1	[6]19.4	[6]22.8	[6]31.2	[7]44.37
Al_2O_3	1.23	1.41	[1]7.33	1.1	[1]7.42	[1]8.11	[1]6.81	2.5	3.9	3.9	3.7	[8]1.50
Fe_2O_3	.66	.87		.6								
MgO	Trace	1.42	23.22	41.0	1.97	1.15	1.29	.6	[9]24.2	[9]22.6	[9]20.6	[9]23.43
CaO	20.00	43.30	4.64		18.53	21.50	16.18	41.7	16.6	17.4	14.6	10.54
Na_2O	.08	------	------	------	------	------	------	------	------	------	------	------
K_2O	.02	------	------	------	------	------	------	------	------	------	------	------
P_2O_5	------	------	.006	------	.100	.096	.068	------	------	------	------	------
Ignition loss	15.38	30.85	[2]30.51	[10]32.2	[2]16.50	[2]18.46	[2]14.92	[11]32.5	[11]35.9	[11]33.3	[11]29.9	[10]20.16
Total	[99.37]	[100.17]	[99.95]	[99.2]	[99.49]	[99.88]	[12][99.92]	[98.4]	100.0	100.0	100.0	100.00
Class	59,5,34	19,6,68	22,21,56	22,5,72	43,22,33	37,24,37	49,20,30	17,7,72	13,11,71	16,11,66	25,11,59	42,4,40
CaO/MgO	Calcite	Calcite	Dolomitic magnesite	Calcite	Magnesian calcite	Magnesian calcite	------	Calcite	Magnesian dolomite	Magnesian dolomite	Magnesian dolomite	Dolomitic magnesite

	Washington—Continued										
	87	88	*89	*90	91	92	*93	*94	95	*96	97
	46C43-131	46C43-132	46C43-53	46C43-55	46C43-58	46C43-60	46C43-67	46C33-122	46C43-68	46C33-123	46C43-74
Insoluble[7]	38.11	48.43	35.08	32.54	22.93	32.20	43.09	20.15	36.32	20.20	28.00
R_2O_3[8]	1.14	2.27	.73	.80	2.37	2.72	.73	.80	1.20	1.93	.72
MgO[9]	22.39	17.72	18.65	17.90	16.88	14.85	35.53	36.20	19.01	28.38	36.42
CaO	11.93	14.65	22.42	24.22	22.50	19.87	3.48	15.21	19.75	19.67	3.47
Ignition loss[10]	26.43	16.93	23.12	24.54	35.32	30.36	17.17	27.64	23.72	29.82	31.39
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	36,3,53	45,7,34	34,2,48	31,2,51	19,7,73	28,8,62	42,2,33	19,2,55	34,4,48	17,6,60	27,2,61
CaO/MgO	Magnesian dolomite	Magnesian dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Magnesian dolomite	Magnesian dolomite	Dolomitic magnesite

[1] R_2O_3.

[2] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[3] With samples 300,301 group F_1 and sample SJ 76-4, not recorded; Na_2O=160 ppm, K_2O=420 ppm, TiO=260 ppm, S=240 ppm.

[4] With samples 844,845 group F_2, Na_2O=330 ppm, K_2O=565 ppm, TiO_2=1,250 ppm, S=143 ppm.

[5] With sample 330 group F_1 and sample 905 group F_2, Na_2O=185 ppm, K_2O=490 ppm, TiO_2=250 ppm, S=325 ppm.

[6] Insoluble, mainly SiO_2.

[7] Insoluble, includes silica and insoluble silicates.

[8] Iron and alumina.

[9] By difference.

[10] At 950°C.

[11] Mainly CO_2.

[12] Na_2O=310 ppm, K_2O=625 ppm, TiO_2=800 ppm, S=915 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2]

	63	64	65	66	67	68	70	71	72	73	74
Na_2O	------	0.98	------	0.53	1.42	0.05	0.05	0.12	0.22	2.9	0.57
K_2O	------	.75	------	.70	------	------	------	------	------	1.88	------
TiO_2	0.035	.052	0.059	.08	.18	.047	.022	.037	.041	.65	.096
V_2O_5	.0033	------	.0034	------	.013	.0056	.0045	.0051	.003	.033	------
Cr_2O_3	.0016	.0067	.0021	.0012	.0014	.0013	------	------	------	.0015	.0013
MnO	.062	.097	.55	.12	.092	.024	.042	.04	.03	.14	.13
NiO	.0024	.0072	.0034	.0024	.0018	.0016	.002	.0016	.001	.0028	------
CoO	------	.0014	------	------	------	------	------	------	------	.0024	------
CuO	.010	.024	.023	.0070	.012	.008	.0039	.0070	.0043	.024	.0040
SrO	.017	.022	------	.021	.0098	.012	.024	.013	.025	.016	.0098
ZrO_2	------	.011	.0036	------	.0045	------	------	------	------	.011	------
Ag_2O	------	------	------	.0005	.00071	.0002	------	------	------	.0015	------

Spectrochemical analyses—Continued

	77	79	80	81		77	79	80	81
Na_2O	------	1.47	2.28	2.28	NiO	0.04	0.003	0.0048	0.0026
K_2O	------	------	1.73	1.13	CoO	.0077	.001	.0022	.0013
TiO_2	0.01	.16	.84	.32	CuO	.018	.019	.028	.016
V_2O_5	------	.0078	.029	.012	SrO	.0048	.012	.014	.0063
Cr_2O_2	.12	.0051	.0050	.0022	ZrO_2	.008	.0063	.011	.0081
MnO	.18	.12	.19	.17	Ag_2O	.00099	.00066	.0015	.0014

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

63. San Juan County. NE¼ sec. 17, T. 37 N., R. 1 W., Orcas Island. Buck Mountain deposit. Sample SJ 76-3. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. (Danner, 1966, p.16, 19,82,141,197,198,450,460.) Limestone, white to buff, finely crystalline. Chip sample taken across 65 ft. Tonnage estimated. Index and geologic maps. Possible use: Cement.

64. County, analysts, and maps as in sample 63. NE¼ sec. 25, T. 37 N., R. 2 W., Orcas Island. Langdon deposit. Sample SJ 67-3. (Danner, 1966, p. 16,19,82,190,191,450,460.) Limestone, gray, crystalline. Chip sample taken across 20 ft. Former use: Lime. Possible use: None, deposit small.

65. County, analysts, and maps as in sample 63. NW¼SW¼ sec. 29, T. 37 N., R. 1 W., Orcas Island. Moran State Park deposit. Sample SJ 92-1. (Danner, 1966, p. 16,19,82,141,180,450,461.) Limestone, buff, sugary to dense; weathers orange and rusty brown; poorly bedded layers 1-2 in. thick. Chip sample taken across 80 ft. Possible use: None, deposit small and impure.

66, 67. Skagit County. Devonian(?) part of Chilliwack Group. T. 35 N., R. 10 E. Meiklejohn and Brown Co., Portland claim. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. Samples St 17-5, St 18-3. (Danner, 1966, p. 16,19,82,269,271,283,284,287,288,451,463.) Limestone, thin-bedded, fossiliferous; contains interbedded shales. Chip sample taken across 150 ft. Tonnage estimated. Index and geologic maps.

66. SE¼ sec. 9.

67. NE¼ sec. 16.

68. County, analysts, and maps as in samples 66,67. Early Pennsylvanian part of Chilliwack Group. E½ sec. 1, T. 36 N., R. 7 E., about 17 miles from town of Concrete. Washington Monument Co. Sample St 22-2. (Danner, 1966, p. 16,19,82,259,260,264,265,268,451,463.) Limestone, massive to thin-bedded; oolitic, organoclastic and crystalline. Chip sample, composite. Possible use: Portland cement.

69. Skagit County. Devonian to Early Permian, Chilliwack Group. NE¼SE¼ sec. 19, T. 35 N., R. 10 E., on Sutter Creek, Sauk Mountain between towns of Rockport and Marblemount. Analysts, K.A. Johnson, Anthony Centenero. (Popoff, 1948, p. 2,6,10,fig. 1; Danner, 1966, p. 82, 269,290,295-297.) Limestone, black, fine-grained; carbonaceous, siliceous. Thin-section description. Index and geologic maps. Possible use: Cement.

70. Skagit County. Devonian to Early Permian, Chilliwack Group. NW¼ sec. 20, T. 35 N., R. 10 E. Sutter Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. Sample St 11-1. (Danner, 1966, p. 16,19,82,269,290,295-298,451,462.) Limestone, dark-gray to gray, massive to well-bedded to laminated, dense to finely crystalline; contains calcite veinlets, interbeds of black shale. Thin-section description. Chip sample taken across 50 ft. Index and geologic maps. Possible use: Cement.

71, 72. County, age, group, analysts, reference, and maps as in sample 70. S½ sec. 21, T. 35 N., R. 10 E., 4 miles east of town of Rockport. Rocky Creek deposit, railroad cut. Limestone, blue-gray, dense. Chip sample. Possible use: None, impure rock.

71. Sample St 12-2. Limestone, about 6 ft thick; taken across 40 ft.

72. Sample St 12-4. Limestone, thin-bedded; maximum thickness 5 ft. Composite sample.

73. County and analysts as in sample 70. SW¼NE¼ sec. 30, T. 34 N., R. 10 E. Sauk River Bridge deposit, roadcut. Sample St 25-2. (Danner, 1966, p. 16, 19,82,303,451,463.) Shale, calcareous. Chip sample taken across 100 ft. Index and geologic map.

74. Analysts and maps as in sample 70. Snohomish County. Probably Early Pennsylvanian. NW¼ and SW¼ sec. 18, T. 31 N., R. 11 E., southeast of town of Darrington. Whitechuck River deposit. Sample Sh 3-1. (Danner, 1966, p. 16,19,82,333,337,338,339,452,464.) Limestone, dark-blue-gray, oolitic and finely crystalline; weathers light blue gray; interbedded with shale. Chip sample taken across 13 ft. Measured section. Possible use: None, deposit small.

75. Snohomish County. Possibly Jurassic or Early Cretaceous. SE¼SW¼ sec. 11, T. 27 N., R. 8 E., about 2 miles south of town of Startup. Sultan deposit. Analyst, T. Baldwin. (Danner, 1966, p. 82,343-345,346.) Chert, gray, fossiliferous; thin beds 0.5-12 in. thick interbedded with limestone. Hand specimen. Tonnage estimated. Index and geologic maps.

Washington—Continued

76. Snohomish County. Jurassic and Cretaceous. NE¼ sec. 21, T. 27 N., R. 9 E., near town of Gold Bar. Proctor Creek deposit. Drill hole 3. (Danner, 1966, p. 82, 353-356, 358.) Limestone, black to gray; weathers light gray; contains calcite veinlets. Sample length 29 ft. Tonnage estimated. Index and geologic maps. Log of drill hole. Possible use: Agricultural, decorative stone; deposit small. [For other analyses from same drill hole, see samples 333-335, group F_1.]

77. Snohomish County. Sec. 33, T. 30 N., R. 7 E., southeast of town of Granite Falls. Menzel Lake deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Sh 13-1. (Danner, 1966, p. 16, 19, 82, 318, 324, 333, 337, 452, 464.) Limestone, vuggy. Chip sample. Index and geologic maps.

78. Snohomish County. NW¼NE¼ sec. 25, T. 32 N., R. 8 E., south of town of Fortson. Hi Hi deposit. Sample BM 1. (Popoff, 1949b, p. 2, 4, 8, figs. 1, 3; Danner, 1966, p. 82, 326-328, 329.) Limestone, gray to nearly black, finely crystalline, massive. Index and geologic maps. Possible use: Probably none, deposit small and impure.

79-81. County, analysts, reference and maps as in sample 77. Sec. 35, T. 32 N., R. 10 E., Conn Creek. Samples Sh 11-4 to Sh 11-6. Limestone, chip sample.

82-85. Stevens County. Precambrian, [Edna Dolomite]. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 9, 12, 18-24, pls. 1, 2.) General mineralogy. Index and geologic maps.

82. Sec. 36, T. 30 N., R. 37 E., Turk area. Sample 25. Limestone.

83. Sec. 11, T. 30 N., R. 38 E., 1.25 miles southeast of U.S. Magnesite quarry. Sample 15. Magnesitic dolomite.

84, 85. Sec. 31, T. 31 N., R. 39 E., Red Marble area. Samples 11, 12. Magnesitic dolomite, dark-gray; outcrop sample.

86-97. Stevens County. Precambrian, Stensgar Dolomite. SE¼SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under supervision of W. W. Holbrook. (Bennett, 1943, p. 3-6,9-11,12,13,19,21,pl.1.) General mineralogy. Tonnage estimated. Index map, geologic section. Possible use of magnesite: Source of magnesium for light-metal construction [implied].

86-88. Channel sample, old mine adit.

86. Lab. No. 305, sample U-17. [Dolomitic magnesite.]

87. Lab. No. 307, sample U-18. [Magnesian dolomite.]

88. Lab. No. 315, sample U-38-41. [Magnesian dolomite.]

89-92. Log of drill hole 2. [For other analyses from same drill hole, see samples 355-360, group F_1; samples 1052-1085, group F_2.]

*89. Lab. No. 196. Dolomite, gray; contains serpentine and white silicate; depth 244.5-246.5 ft. *Analysis suggests 16.2 percent more MgO and CaO than required for carbonate.

*90. Lab. No. 158. Dolomite, white; contains serpentine; depth 181.5-182 ft. *Analysis suggests 15.5 percent more MgO and CaO than required for carbonate.

91. Lab. No. 151. Dolomite, brown, pink; contains chalcedony; depth 155-156 ft.

92. Lab. No. 149. Dolomite, dark-brown; contains chalcedony; depth 152-154 ft.

93-96. Log of drill hole 3. [For other analyses from same drill hole, see samples 361, 362 group F_1; samples 1086-1094, group F_2.]

*93. Lab. No. 295. Dolomitic magnesite, white; depth 258.5-259 ft. *Analysis suggests 23.0 percent more MgO and CaO than required for carbonate.

*94. Lab. No. 292. [Dolomitic magnesite] magnesite, light-gray to white; depth 175-184.5 ft. *Analysis suggests 24.0 percent more MgO and CaO than required for carbonate.

95. Lab. No. 290. [Magnesitic dolomite] dolomite; depth 93-100 ft.

*96. Lab. No. 228. [Magnesitic dolomite] dolomitic magnesite, white, brown; depth 73-76 ft. *Analysis suggests 17.7 percent more MgO and CaO than required for carbonate.

97. Drill hole 5. [Dolomitic magnesite] magnesite, white, medium-coarse texture; contains serpentine; depth 66-71 ft. Log of drill hole. [For other analyses from same drill hole, see samples 365-371, group F_1; samples 1111-1117, group F_2.]

Table 3.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and carbonate each less than 5 percent; uncombined silica and carbonate each greater than clay (Group C), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued											
	*98	99	100	*101	*102	103	104	*105	106	107	108	109
	46C33-190	46C43-79	46C43-80	46C33-193	46C43-81	46C43-82	46C33-197	46C43-83	46C43-85	46C43-87	46C43-88	46C43-90
Insoluble [1]	18.94	27.27	36.68	36.24	37.46	29.10	22.74	35.92	39.68	27.02	34.19	42.77
R_2O_3 [2]	2.13	.72	.96	2.27	2.27	1.64	1.48	2.21	1.98	1.54	2.24	.74
MgO [3]	39.55	17.74	21.45	31.50	19.72	21.50	38.51	33.05	10.78	14.53	8.42	16.68
CaO	11.88	24.13	17.98	11.29	19.27	20.89	5.15	7.04	25.83	30.09	29.53	18.1
Ignition loss [4]	27.50	30.14	22.93	18.70	21.28	26.87	32.12	21.78	21.73	26.82	25.62	21.71
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.0
Class	15,6,53	26,2,63	35,3,47	32,7,36	34,7,43	26,5,55	20,4,62	32,6,42	36,6,45	24,5,56	30,7,54	42,2,45
CaO/MgO	Dolomitic magnesite	Dolomite	Magnesian dolomite	Dolomitic magnesite	Magnesian dolomite	Magnesian dolomite	Dolomitic magnesite	Dolomitic magnesite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Magnesian dolomite

Washington—Continued

	110	*111	*112	113	*114	115	116	*117	*118	119	*120	121
	46C43-91	46C33-204	46C43-93	46C43-97	46C43-102	46C43-104	46C43-106	46C43-107	46C43-108	46C43-109	46C43-110	46C43-111
Insoluble [1]	40.05	21.17	48.23	32.92	19.47	43.68	44.84	26.59	28.75	50.25	28.48	44.55
R_2O_3 [2]	.88	1.33	1.41	.41	1.74	2.70	4.88	.57	3.00	3.58	5.12	.96
MgO [3]	18.01	28.11	17.28	17.58	36.18	34.06	16.87	34.26	35.75	15.11	29.14	24.77
CaO	18.72	21.43	16.15	20.92	10.73	6.54	15.47	15.41	11.18	15.36	14.16	3.12
Ignition loss [4]	22.34	27.96	16.93	28.17	31.88	13.02	17.94	23.17	21.32	15.70	23.10	26.60
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	39,3,46	19,4,56	46,4,34	32,1,58	17,5,62	39,8,24	37,14,34	26,2,46	24,9,41	44,10,31	20,15,44	43,3,51
CaO/MgO	Magnesian dolomite	Magnesian dolomite	Magnesian dolomite	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Magnesian dolomite	Dolomitic magnesite	Dolomitic magnesite	Magnesian dolomite	Magnesian dolomite	Dolomitic magnesite

Washington—Continued

	122	*123	*124	125	*126	127	128	129	130	131	132
	46C43-117	46C43-121	46C43-122	46C41-2	46C41-7	46C41-286	46C41-283	46C41-285	46C41-284	46C43-1	46C42-14
Insoluble	[1]37.43	[1]21.83	[1]34.11	[1]24.33	[1]23.62	[5]37.9	[5]24.8	[5]33.5	[5]35.5	[6]30.88	[6]22.07
Al_2O_3	[2]4.52	[2]1.01	[2]3.51	[2]2.05	[2]1.85	1.3	1.9	4.0	4.3	[2]1.34	1.78
Fe_2O_3											.26
MgO	[3]16.67	[3]19.20	[3]24.96	[3]23.78	[3]45.56	25.9	16.6	18.3	18.0	[5]9.45	.57
CaO	18.68	29.06	17.32	19.57	1.58	3.0	21.4	15.3	14.9	26.90	42.96
Ignition loss	[4]22.70	[4]28.90	[4]20.10	[4]30.27	[4]27.39	[7]31.0	[7]35.0	[7]28.3	[7]27.3	[8]31.43	32.54
Total	100.00	100.00	100.00	100.00	100.00	[99.1]	[99.7]	[99.4]	[100.0]	100.00	[100.18]
Class	30,13,45	20,3,60	28,10,39	21,6,61	21,5,52	36,4,60	22,6,72	27,12,56	28,13,54	29,4,67	19,6,73
CaO/MgO	Magnesian dolomite	Dolomite	Magnesian dolomite	Magnesian dolomite	Magnesite	Dolomitic magnesite	Dolomite	Magnesian dolomite	Magnesian dolomite	Calcareous dolomite	Calcite

---

[1] Includes silica and insoluble silicates.

[2] Iron and alumina.

[3] By difference.

[4] At 950°C.

[5] Mainly SiO_3.

[6] SiO_2.

[7] Mainly CO_2.

[8] 950°-1,000°C; also called CO_3.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

98-105. Stevens County. Precambrian, Stensgar Dolomite. SE¼SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. Drill hole 10. (Bennett, 1943, p. 3-7, 9, 14, 21, pl. 1.) Medium-coarse texture. General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. Possible use of magnesite: Source of magnesium for light-metal construction [implied]. [For other analyses from same drill hole, see samples 372-374, group F_1; samples 1148-1155, group F_2.]

*98. Lab. No. 340. [Dolomitic magnesite] magnesite, dark-gray, white; depth 295-297 ft. *Analysis suggests 25.0 percent more MgO and CaO than required for carbonate.
99. Lab. No. 335. Dolomite, grayish-white; depth 239-244 ft.
100. Lab. No. 334. [Magnesitic dolomite] dolomite, white to gray; depth 224-226 and 228-234 ft.
*101. Lab. No. 333. Dolomitic magnesite, gray, white, banded; depth 206-222 ft. *Analysis suggests 24.9 percent more MgO and CaO than required for carbonate.
*102. Lab. No. 332. [Magnesitic dolomite] dolomite, multicolored; contains serpentine; depth 150-161 ft. *Analysis suggests 17.0 percent more MgO and CaO than required for carbonate.
103. Lab. No. 331. Magnesitic dolomite, multicolored; depth 134-150 ft.
104. Lab. No. 326. [Dolomitic magnesite] magnesite, white, multicolored; depth 67-74 ft.
*105. Lab. No. 323. Dolomitic magnesite, brown; depth 3-25 ft. *Analysis suggests 19.6 percent more MgO and CaO than required for carbonate.

106-108. County, age, formation, locality, analyst, reference, and use as in samples 98-105. Drill hole 11. Medium-coarse texture. General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see samples 375-377, group F_1; sample 1156, group F_2.]

106. Lab. No. 358. [Calcareous dolomite] dolomite, gray; contains serpentine; depth 137-150 ft.
107. Lab. No. 351. [Calcareous dolomite] dolomite, gray-green; contains calcite; depth 74-83 ft.
108. Lab. No. 350. [Calcareous dolomite] dolomite, dark; contains serpentine; depth 68-71 ft.

109-113. County, age, formation, locality, analyst, and use as in samples 98-105. Drill hole 12. (Bennett, 1943, p. 3-6, 9, 14, 15, 21, pl. 1.) General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see samples 378-380, group F_1; samples 1157-1179, group F_2.]

109. Lab. No. 399. [Magnesitic dolomite] dolomite, white; contains serpentine; depth 419.5-422 ft.
110. Lab. No. 398. [Magnesitic dolomite] dolomite, white; contains serpentine; depth 409-414 ft.
*111. Lab. No. 397. [Magnesitic dolomite] dolomitic magnesite, banded; depth 398-403 ft. *Analysis suggests 20.7 percent more MgO and CaO than required for carbonate.
*112. Lab. No. 395. [Magnesitic dolomite] dolomite, brown, white; contains serpentine; depth 334-349 ft. *Analysis suggests 15.9 percent more MgO and CaO than required for carbonate.
113. Lab. No. 382. Dolomite, white; contains serpentine; depth 216-229 ft.

114, 115. County, age, formation, locality, analyst, and use as in samples 98-105. Drill hole 13. (Bennett, 1943, p. 3-7, 9, 15, 16, 21, pl. 1.) General: Magnesite, light-gray to yellowish, medium-crystalline, mostly massive; mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see samples 381-385, group F_1; samples 1180-1206, group F_2.]

*114. Lab. No. 437. [Dolomitic magnesite] magnesite, gray, white; contains serpentine; depth 222-232 ft. *Analysis suggests 16.1 percent more MgO and CaO than required for carbonate.
115. Lab. No. 426. Dolomitic magnesite, white, gray; contains serpentine; depth 155-157 ft.

Washington—Continued

116-121. County, age, formation, locality, analyst, and use as in samples 98-105. Drill hole 14. (Bennett, 1943, p. 3-7, 9, 16, 21, pl. 1.) General: Magnesite, predominantly white, mostly massive; mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see samples 386, 387, group F_1; samples 1207-1217, group F_2.]

116. Lab. No. 458. [Magnesitic dolomite] dolomite, white, banded; depth 196-203 ft.
*117. Lab. No. 457. Dolomitic magnesite, gray, white; depth 194-196 ft. *Analysis suggests 26.6 percent more MgO and CaO than required for carbonate.
*118. Lab. No. 456. Dolomitic magnesite, banded; depth 182-194 ft. *Analysis suggests 26.7 percent more MgO and CaO than required for carbonate.
119. Lab. No. 452. [Magnesitic dolomite] dolomite, banded, argillaceous; depth 136-157 ft.
*120. Lab. No. 451. [Magnesitic dolomite] dolomitic magnesite, white, gray; depth 120-136 ft. *Analysis suggests 21.3 percent more MgO and CaO than required for carbonate.
121. Lab. No. 440. [Dolomitic magnesite] magnesitic dolomite, white, brown; depth 23-33 ft.

122. County, age, formation, locality, analyst, and use as in samples 98-105. Drill hole 16. Lab. No. 500. (Bennett, 1943, p. 3-7, 9, 17, 21, pl. 1.) General: Magnesite, light-gray to yellowish, medium crystalline, mostly massive; mineralogy. Sample: [Magnesitic dolomite] dolomite, banded, argillaceous; depth 278-285 ft. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see samples 394-396, group F_1; samples 1236-1247, group F_2.]

123-126. County, age, formation, locality, analyst, and use as in samples 98-105. Drill hole 17. (Bennett, 1943, p. 3-7, 9, 17, 21, pl. 1.) General: Magnesite, predominantly white, mostly massive; mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see sample 397, group F_1; samples 1248-1259, group F_2.]

*123. Lab. No. 517. Dolomite, white; contains serpentine; depth 222-224.5 ft. *Analysis suggests 16.7 percent more MgO and CaO than required for carbonate.
*124. Lab. No. 515. Magnesitic dolomite, gray, brown, banded; depth 211-219 ft. *Analysis suggests 22.4 percent more MgO and CaO than required for carbonate.
125. Lab. No. 514. Magnesitic dolomite, gray, white, banded; depth 127-157 ft.
*126. Lab. No. 509. Magnesite, gray, brown, white; depth 83-86 ft. *Analysis suggests 22.2 percent more MgO and CaO than required for carbonate.

127-130. Stevens County. Stensgar Dolomite. NW¼ sec. 10, T. 30 N., R. 38 E., west and north of town of Springdale, U.S. Magnesite area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 19, 20, 23, 24, 25.) General: Magnesite, some dolomite; from quarry; mineralogy. Index and geologic maps.

127. Sample 56. [Magnesite.]	129. Sample 47. [Dolomite.]
128. Sample 44. [Dolomite.]	130. Sample 45. [Dolomite.]

131. Stevens County. Cambrian, Old Dominion Limestone. NE¼NW¼ sec. 35, T. 34 N., R. 38 E., about 11 miles northwest of town of Addy. Owner, W. G. Merryweather. Sample 511. (Bennett, 1944, p. 7, 31-33, pl. 10; Bennett, 1945, p. 15.) Deposit description: Dolomite, light-gray to white, some banding, medium to coarsely crystalline. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Former use: Building stone. Possible use: General uses of dolomite; refractories, crushed stone.

132. Stevens County. Cambrian(?), Northport Limestone. SW¼SW¼ sec. 26, T. 39 N., R. 39 E., 6 miles southwest of town of Northport. Ideal Cement Co. Diamond-drill hole 4, drilled at inclination of -70°. (Mills, 1962, p. 74, 96, 100, 102, pls. 1, 4.) Unit description: Limestone, gray, fine-grained, bedded; total thickness at least 800 ft. Sample depth 96-108 ft. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Cement. [For other analyses from same drill hole, see samples 1601-1609, group F_2.]

Table 3.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing uncombined silica and carbonate each less than 75 percent, uncombined silica and carbonate each greater than clay (Group C), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	133	134	135	136	137	138	*139	*140	141	142	143	144	145
	46C42-16	46C42-5	46C42-6	46C42-7	46C42-8	46C42-9	46C43-158	46C43-157	46C43-156	46C37-110	46C37-132	46C37-69	46C37-75
SiO_2	20.35	30.60	25.01	48.94	27.12	27.16	40.35	27.11	23.98	24.20	34.58	34.53	37.38
Al_2O_3	3.22	2.76	1.10	[1]4.68	[1]3.64	[1].95	None	1.90	------	3.10	[1]2.62	2.70	[1]6.62
Fe_2O_3	.61	.28	.34				.00	[2]1.90	.96	1.17			
FeO	------	------	------	------	------	------	1.66	[2]2.44	.44	------	------	------	------
MgO	2.03	1.83	2.22	1.51	14.80	.27	22.07	15.45	16.43	------	1.08	1.08	1.74
CaO	42.04	36.41	39.93	26.22	27.87	40.08	11.85	23.68	22.51	38.38	33.95	34.04	29.50
H_2O	------	------	------	------	------	------	[3]6.85	[4]8.32	[5].26	------	------	------	------
P_2O_5	------	------	------	.061	.042	.030	------	------	------	------	.047	.046	.013
Ignition loss	31.93	28.53	32.06	[6]18.71	[6]26.65	[6]31.64	[7]17.22	[7]19.30	[8]35.61	31.83	[6]27.72	27.72	[6]24.52
Total	[100.18]	[100.41]	[100.66]	[100.12]	[100.12]	[100.13]	100.00	[100.10]	100.19	[98.68]	[9][100.00]	[100.12]	[99.77]
Class	14,11,70	25,9,62	23,4,71	41,14,39	21,11,55	26,3,71	40,7,35	22,18,41	23,2,75	17,13,69	30,8,61	30,8,61	26,19,51
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Calcite	Calcite	Dolomite	Dolomite	Calcite	Calcite	Calcite	Magnesian calcite

[1] R_2O_3.

[2] Fe_2O_3 = 2.44 percent, FeO = 1.80 percent (Shedd, 1903, p. 142).

[3] Water above 110°C and undetermined, by difference.

[4] H_2O and undetermined matter, by difference.

[5] At 110°C.

[6] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[7] CO_2.

[8] CO_2, reported as 33.61 percent (Shedd, 1903, p. 142).

[9] Na_2O = 220 ppm, K_2O = 440 ppm, TiO_2 = 700 ppm, S = 1,770 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 136, K_2O = 2.78 percent; sample 137, CoO = 0.001 percent]

	136	137	138	143	145
Na_2O	1.25	------	------	0.13	0.70
TiO_2	.24	0.105	0.033	.058	.16
V_2O_3	.0048	------	------	------	.0064
Cr_2O_3	.0038	.0011	.0010	.0012	.0028
MnO	.23	.23	.066	.10	.15
NiO	0.003	0.001	------	0.0034	0.0094
CuO	.0013	.021	0.0019	.0078	.0073
SrO	.014	.011	.018	.017	.015
ZrO_2	.014	.014	------	.002	.010
Ag_2O	.00047	------	------	------	.0002

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

133-135. Stevens County. Cambrian(?), Northport Limestone. SW¼SW¼ sec. 26, T. 39 N., R. 39 E., 6 miles southwest of town of Northport. Ideal Cement Co. Diamond-drill hole 4A, drilled at inclination of +15°. (Mills, 1962, p.74,96,97,100,101,102,pls.1,4.) General: Limestone, white to light-gray, medium- to coarse-grained, relatively massive; estimated thickness 750 ft. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Cement. [For other analyses from same drill hole, see samples 430-435, group F_1; samples 1610-1622, group F_2.]

133. Interval, 214-229 ft.

134. Interval, 313-430 ft.

135. Interval, 441-570 ft.

136. Stevens County. Paleozoic(?) probably Cambrian. NE¼NE¼ sec. 19, T. 27 N., R. 38 E., west side of Cayuse Mountain. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample S-212. (Mills, 1962, p. 12,13,176,177,251,264,pl.1.) Limestone, gray, fine-grained, thin-bedded; 65 ft thick. Few thin interbeds of limy shale. Chip sample from outcrop. Index and geologic map. Possible use: None.

137. County, analysts, map, and use as in sample 136. Mississippian and (or) Pennsylvanian. SE¼NW¼ sec. 7, T. 32 N., R. 41 E., 1.5 miles east of town of Chewelah. Sample S-168. (Mills, 1962, p.12,13,163,164,250,262,264,pl.1.) Calcareous dolomite, greenish-gray, brittle, well-bedded. Combination of 25 grab samples.

138. County, analysts, maps, and use as in sample 136. Permian. NE¼SW¼ sec. 15, T. 37 N., R. 38 E., about 1 mile south of town of Evans. Ideal Cement Co. Sample S-60. (Mills, 1962, p. 12,13,123,125,126,248,259,264,pl.1.) Limestone, thin-bedded. Chip sample from outcrop.

*139. Stevens County. [T. 31 N., R. 40 E.], near town of Valley. North American Marble and Onyx Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 97,98,100,142.) Dolomite, light-colored, fine-grained, stratified; contains serpentine. Thin-section description. Possible use: Ornamental stone. *Analysis shows 1.7 percent FeO; suggests 16.4 percent more MgO and CaO than required for carbonate.

*140. Stevens County. Sec. 18, T. 31 N., R. 41 E., 2 miles east of Valley. Pacific Coast Marble, Tiling, and Manufacturing Co. Analyst, R. W. Thatcher. (Shedd, 1903, p.103,104,105,142.) Deposit: [Dolomite] marble, mixture of white and green; massive; contains serpentine and calcite; at least 40 ft thick. Surface sample. Mineralogy, thin-section description. Possible use: Ornamental stone. * Analysis shows 2.4 percent FeO; suggests 17.8 percent more MgO and CaO than required for carbonate.

141. Stevens County. [T. 32 N., R. 40 E.], 1.5 miles west of Chewelah. Chewelah Mottled Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 128, 142; Eckel, 1912, p. 171, 173.) [Dolomite] marble, pink, fine-grained, crystalline, massive, flinty. Use: Probably none.

142. Whatcom County. Early Pennsylvanian part of Chilliwack Gronp. NE¼SW¼, NW¼SE¼, NE¼ sec. 14, T. 40 N., R. 5 E., Red Mountain. Permanente Cement Co., Kendall quarries. Analyst, E. J. Baldwin. (Danner, 1966, p. 82, 209, 210, 213, 215, 218, 219.) Limestone, fossiliferous. Index and geologic maps. Former use: Hydrated lime. Use: Cement.

143. Whatcom County. Probably Early Pennsylvanian part of Chilliwack Group. NE¼ sec. 4, T. 40 N., R. 6 E., north of town of Maple Falls. Black Mountain deposits. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 7-3. (Danner, 1966, p. 16, 19, 82, 209, 210, 249, 250, 252-254, 255, 452, 465.) Limestone, gray, massive, well-bedded, fossiliferous. Chip sample taken across 400 ft. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

144. County. locality, maps, and sections as as in sample 143. Early Pennsylvanian to Early Permian part of Chilliwack Group. Analyst, C. S. Homi; collector, W. R. Danner. Sample W 7-3. (Moen, 1962, p. 4, 8, 16, 18, 92, 96-98, 100, 119, pl. 1.) General: Limestone, gray, dense to crystalline, fossiliferous. Moderate to large tonnage. Possible use: Concrete aggregate, ballast, road metal, riprap.

145. Whatcom County. Devonian to Early Permian, Chilliwack Group. NW¼ sec. 5, T. 40 N., R. 6 E. Northwest Black Mountain deposit. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. Sample W 20-2. (Moen, 1962, p. 4, 8, 92, 97, 100, pl. 1; Danner, 1966, p. 16, 19, 82, 210, 244, 245, 453, 466.) Limestone, fossiliferous. Chip sample taken across 200 ft. Index and geologic maps, geologic sections. Possible use: None, rock impure.

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent clay (*Group D*), common- and mixed-rock categories

[Samples of mixed-rock category indicated by an asterisk (*). Chemical analyses arranged by State, quadrangle or county, and stratigraphic position]

Chemical analyses

	Alaska												
	1	*2	3	4	*5	6	*7	*8	9	10	*11	12	13
	50D23-6	50D23-7	50D23-2	50D23-5	50D36-18		50D36-31	50D36-30	50D42-4		50D57-1	50D155-158	50D156-110
SiO_2	52.31	42.86	52.23	51.89	44.3	48.4	51.3	50.3	63.28	66.88	54.88	61.85	61.0
Al_2O_3	16.71	23.09	15.98	17.15	18.0	17.2	18.8	18.3	19.14	20.23	15.75	18.15	19.5
Fe_2O_3	8.05	9:19	9.06	8.63	3.5	3.1	5.7	5.0	[1]5.93	[1]6.27	6.78	7.28	7.0
FeO	------	------	------	------	8.5	6.4	3.0	3.5	------	------	------	------	------
MgO	4.36	5.20	4.88	4.68	6.2	4.3	3.4	4.1	2.00	2.11	4.54	3.80	.8
CaO	4.76	6.41	4.20	4.11	8.7	10.5	7.6	8.3	2.44	2.58	4.44	.81	.92
Na_2O	4.77	5.15	4.42	4.89	1.4	1.8	5.2	4.5	.64	.68	6.80	1.42	------
K_2O					1.3	1.2	1.0	1.9	.81	.86		.65	------
H_2O	------	------	------	------	4.50	3.40	1.80	2.00	------	------	------	------	------
TiO_3	.88	.97	.81	.87	.85	.74	.74	.53	.55	.58	.93	------	------
P_2O_5	[2].18	[2].18	[2].20	[2].19	.37	.43	.28	.24	------	------	[2].21	------	.32
MnO	------	------	------	------	.17	.14	.16	.16	------	------	.17	------	------
SO_3	------	------	------	------	------	------	------	------	------	------	------	.15	.22
NaCl + KCl	------	------	------	------	------	------	------	------	------	------	------	------	[3].52
Ignition loss	[4]7.98	[4]6.95	[4]8.22	[4]7.59	[5]1.80	[5]2.20	[5].34	[5].48	[6]5.40	------	[4]5.57	5.27	4.84
Total	[100.00]	[100.00]	[100.00]	[100.00]	99.6	99.8	99.3	99.3	100.19	100.19	[100.07]	[99.38]	95.1
Class	14,70,4	0,77,0	14,70,4	12,72,2	9,62,4	------	12,66,1	12,63,1	23,71,0	------	19,64,0	22,71,0	19,74,0

[1] Total iron.

[2] P_2O_3.

[3] Gravimetric determination.

[4] Loss, CO_2, H_2O, organic.

[5] CO_2.

[6] Sample dried at 110°F. Ignition loss includes organic matter, small amount of CO_2, H_2O, and sulfur.

DESCRIPTIVE NOTES

[Underscored page nnmbers in reference indicate source of analysis]

Alaska

1-4. Blying Sound quadrangle. Holocene [implied]. Off southern Alaska coast. Analyst, Willard Woodstock. (Tyler, 1931, p. 12-15, 16-20.) Mud, bottom sample; fossiliferous. Mineralogy. Index maps.

1. Lat 59°36' N., long 148°32' W. Sample 7. Depth of water 612 ft.
*2. Lat 59°37' N., long 148°10' W. Sample 8. Depth of water 528 ft. *Analysis shows 5.2 percent alkalies; MgO and CaO not calculated as carbonate.
3. Lat 59°38' N., long 148°33' W. Sample 3. Depth of water 390 ft.
4. Lat 59°38.6' N., long 147°51' W. Sample 6. Depth of water 408 ft.

5, 6. Craig quadrangle. Middle Ordovician to Early Silurian. [Abont 19.0, 10.0], Prince of Wales Island, head of Karta Bay. Analysts, P. L. D. Elmore, K. E. White, S. D. Botts. (Sainsbury, 1961, p. 301, 312, 313, pl. 33.) Index and geologic maps.

*5. Lab. No. 147327. Matrix of conglomeratic volcanic graywacke. Bulk density 2.975. Analysis used in computations. *Analysis shows 8.5 percent FeO, 2.7 percent alkalies, 0.8 percent TiO_2; suggests 12.9 percent more MgO and CaO than required for carbonate.
6. Lab. No. 147326. Composite chip sample from numerous cobbles of pyroxene porphyry encased in matrix of volcanic graywacke. Bulk density 2.970.

7, 8. Craig quadrangle. Early Silurian. Analysts, P. L. D. Elmore, K. E. White, S. D. Botts. (Sainsbury, 1961, p. 301, 311, 313, pl. 33.) Albitized conglomeratic volcanic graywacke or conglomeratic tuffaceous graywacke. Chip sample of more than 100 ft. Index and geologic maps.

*7. [About 19.8, 11.7], Prince of Wales Island, south shore of entrance to Thorne Bay, near south arm of bay. Lab. No. 145071. Bulk density 2.900. *Analysis shows 6.2 percent alkalies, 3.0 percent FeO; suggests 10.6 percent more MgO and CaO than required for carbonate.

Alaska—Continued

*8. [About 19.8, 11.9], Prince of Wales Island, north shore of entrance of Thorne Bay. Lab. No. 145070. Bulk density 2.967. *Analysis shows 6.4 percent alkalies, 3.5 percent FeO; suggests 11.8 percent more MgO and CaO than required for carbonate.

9, 10. Fairbanks quadrangle. Pleistocene, Kowak Clay or Yukon Silts. [Probably sec. 7, T. 1 N., R. 1 E.], about 7 miles from town of Fairbanks, roadcut on Steese highway, near south fork of Engineer Creek. Analysts, T. A. Bell, T. C. Bruce, M. H. Clarke. Sample I. (Taber, 1943, p. 1438, 1454, 1467, 1472, 1474, 1475, 1478-1480, 1484.) Silt; light brown when dry, dark grayish brown when wet; shows thin lenticular bedding; fossiliferous. Mineralogy. Mechanical analysis. Index maps, generalized section.

9. [Calculated by compilers to include ignition loss.] Analysis used in computations.
10. Analysis as reported in text; average of two or more determinations. Dry basis.

*11. Icy Bay quadrangle. Holocene [implied]. Lat 59°42' N., long 143°49' W, off southern Alaska coast. Analyst, Willard Woodstock. Sample 1. (Tyler, 1931, p. 12-15, 16-20.) Mud, bottom sample; fossiliferous. Depth of water 468 ft. Mineralogy. Index maps. *Analysis shows 6.8 percent alkalies, 0.9 percent TiO_2; MgO and CaO not calculated as carbonate.

12. Healy quadrangle. Jurassic(?). [Sec. 20, T. 17 S., R. 7 W.], about 3.9 miles southwest of Windy, on Windy Creek. Collector, R. E. Fallows. Lab. No. 10377. (Moxham, Eckhart, and Cobb, 1959, p. 69, 92, 93, 94, pl. 11.) Claystone, dark-gray, platy, siliceous. Stratigraphic thickness 25 ft. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

13. Healy quadrangle. Jurassic. [Sec. 20, T. 17 S., R. 7 W., unsurveyed], lower part of Windy Creek. Sample 652. (Warfield, 1962, p. 3, 12, 13, 20, 22, 24.) Shale, black. Channel sample taken across 80 ft, from outcrop. Index and geologic maps. Possible use: Portland cement, mineral wool.

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent clay (Group D), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Alaska—Continued											Idaho	
	14	15	16	17	18	19	20	21	22	*23	*24	*25	*26
	50D 156-111	50D 156-112	50D 156-108	50D 156-121	50D 156-105	50D 156-106	50D 156-109	50D 155-174	50D 155-163	50D 107-1	50D 109-5	11D 4-4	11D 4-5
SiO_2	60.4	62.6	57.8	63.0	57.1	55.3	59.4	56.02	55.83	35.47	49.70	23.8	30.2
Al_2O_3	20.6	22.7	22.7	20.9	20.0	23.4	22.1	17.23	17.19	15.12	18.81	10.1	11.1
Fe_2O_3	7.0	7.5	7.0	6.9	6.8	7.6	7.2	[1]8.08	[1]8.79	7.61	3.12	2.2	3.0
FeO	------	------	------	------	------	------	------	------	------	2.98	6.61	------	------
MgO	1.2	.29	.6	.15	2.1	1.8	.09	2.27	2.30	11.67	5.63	------	------
CaO	.24	1.8	.80	1.2	1.54	.52	1.14	1.61	1.54	5.57	10.45	13.8	12.6
Na_2O	[3].58	[3].82	[3]1.0	[3]1.0	[2].43	[2].40	[3].72	1.29	1.07	.37	2.98	------	------
K_2O					[2].49	[2].36		2.53	2.63	1.27	.99	------	------
H_2O+	------	------	------	------	------	------	------	[4](3.71)	[4](4.39)	7.84	.09	------	------
H_2O-	------	------	------	------	------	------	------	[4](3.34)	[4](3.69)	8.71	.04	------	------
TiO_2	------	------	------	------	------	------	------	.80	.78	2.52	1.14	.3	.3
P_2O_5	.32	.30	.34	.28	.32	.32	.32	------	------	.78	.32	11.3	10.3
MnO	------	------	------	------	------	------	------	------	------	.21	.18	------	------
CO_2	------	------	------	------	------	------	------	------	------	.00	.01	3.2	.6
SO_3	.20	.17	.20	.19	.25	.19	.18	------	------	------	------	[5]3.2	[5]2.0
Cl	------	------	------	------	------	------	------	------	------	.00	------	------	------
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	.91	1.17
MoO_3	------	------	------	------	------	------	------	------	------	------	------	.02	.02
Organic C	------	------	------	------	------	------	------	------	------	------	------	[4](17.1)	[4](12.6)
Ignition loss	4.96	5.2	5.36	3.6	6.42	6.94	4.40	[6]9.79	[6]10.04	------	------	27.7	24.8
Total	95.5	101.4	95.8	97.2	95.4	96.8	95.6	99.62	100.17	100.12	100.07	[96.5]	[96.1]
Class	16,77,0	14,84,0	10,83,0	18,76,0	14,76,0	5,88,0	12,81,0	16,71,7	16,73,7	0,75,0	13,59,0	3,60,0	7,62,0

	Idaho—Continued												
	*27	*28	*29	*30	*31	*32	33	*33a	34	35	36	37	38
	11D4-10	11D4-11	11D4-12	11D4-13	11D4-7	11D4-17	11D5-1	11D15-5	11D28-1	11D28-7	11D29-3	11D29-28	11D29-7
SiO_2	24.9	25.4	16.6	23.4	15.0	23.4	59.9	29.8	64.5	58.4	64.9	54.4	55.6
Al_2O_3	12.2	11.2	9.3	12.3	4.7	6.8	24.6	7.6	21.2	29.6	25.15	28.5	29.1
Fe_2O_3	2.1	2.0	2.6	2.7	1.4	1.8	6.6	[7]1.87	2.86	1.9	1.9	8.2	3.9
MgO	------	------	------	------	------	------	.4	.40	------	.04	1.05	.2	.42
CaO	15.2	12.0	10.5	11.8	17.4	17.4	.8	21.5	------	1.55	1.2	1.7	Trace
TiO_2	------	------	------	------	.2	------	------	------	------	------	------	------	------
P_2O_5	11.8	10.7	10.4	9.8	12.8	13.1	------	13.8	------	------	------	------	------
CO_2	.6	1.7	.5	1.5	.6	.6	------	.39	------	------	------	------	------
S	1.6	4.2	5.8	3.9	4.6	2.8	------	.98	------	------	------	------	------
V_2O_5	1.16	.91	1.35	1.08	1.60	.94	------	[8].015	------	------	------	------	------
F	------	------	------	------	------	.3	------	------	------	------	------	------	------
MoO_3	<.01	.08	.08	.07	.07	.03	------	------	------	------	------	------	------
Organic C	[4](11.7)	[4](10.1)	[4](16.2)	[4](9.7)	[4](25.7)	[4](16.0)	------	7.98	------	------	------	------	------
Ignition loss	25.9	28.7	40.6	32.1	41.2	30.0	8.9	[9]17.6	6.7	9.1	6.8	8.3	11.9
Total	[95.5]	[96.9]	[97.7]	[98.6]	[99.6]	[10][97.1]	[101.2]	[101.9]	[95.3]	[100.6]	[101.0]	[101.3]	[100.9]
Class	1,64,0	3,64,0	0,67,0	0,70,0	5,57,1	9,68,0	9,90,2	13,52,1	24,71,0	4,94,3	18,80,0	0,96,0	0,99,1

	Idaho—Continued									
	39	40	41	42	43	44	45	46	47	48
	11D29-8	11D29-6	11D29-5	11D29-55	11D29-4	11D29-13	11D29-36	11D29-37	11D29-38	11D29-49
SiO_2	58.4	56.55	54.00	53.80	53.78	62.3	50.3	62.9	47.3	56.3
Al_2O_3	28.4	30.36	29.00	28.60	28.57	26.1	28.0	25.1	24.8	28.3
Fe_2O_3	2.6	[11]2.72	[11]4.00	[11]4.40	4.39	1.11	8.9	2.2	12.4	3.6
MgO	.28	.04	------	Trace	Trace	.21	------	------	------	------
CaO	Trace	.28	------	.56	.56	.27	------	------	------	------
Na_2O	------	.08	------	.88	.88	.11	------	------	------	------
K_2O	------	.15	------	.53	.53	.30	------	------	------	------
H_2O-	------	------	------	------	------	[12]1.07	------	------	------	------
TiO_2	------	------	------	------	------	------	1.4	.8	4.0	1.0
Ignition loss	11.3	9.97	11.00	11.70	[13]11.70	9.9	[9]10.7	[9]8.9	[9]9.2	[9]10.2
Total	[101.0]	100.15	98.00	100.47	100.41	101.4	[99.3]	[99.9]	[97.7]	[99.4]
Class	5,95,1	0,99,1	0,97,0	0,97,1	0,97,1	15,85,1	0,92,0	16,83,0	0,87,0	2,96,0

Spectrographic analyses

[ND = looked for but not detected]

	24	33a
Be	ND	< 0.001
B	ND	.01 - 0.1
Na	------	.1 - 1.0
Sc	0.003	------
Ti	------	.1 - 1.0
V	.03	------
Cr	.006	.1 - 1.0
Mn	------	.001- .01
Ni	.003	.01 - .1
Co	.004	------
Cu	.02	.001- .01
Zn	------	.01 - .1
Ga	.003	------
Sr	.04	.01 - .1
Y	ND	.01 - .1
Zr	.003	.01 - .1
Mo	------	.01 - .1
Ag	------	.001- .01
Ba	.05	.01 - .1
La	ND	------
Pb	ND	------

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[1] Total iron.

[2] Gravimetric determination.

[3] NaCl + KCl; by gravimetric determination.

[4] Not included in total.

[5] Reported as S.

[6] Moisture, both above and below 105°C; CO_2; and possible loss of oxygen from Fe_2O_3.

[7] Reported as Fe.

[8] Reported as V.

[9] At 1,000°C.

[10] Subtotal 97.2 percent, Less O = 0.1 percent; total = 97.1 percent.

[11] Includes FeO.

[12] Moisture below 100°C.

[13] Volatile.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

14, 15. Healy quadrangle. Jurassic. [Sec. 20, T. 17 S., R. 7 W., unsurveyed], lower part of Windy Creek. (Warfield, 1962, p. 3, 12, 13, 20, 21, 22-24.) Shale, black. Channel sample from outcrop. Index and geologic maps. Possible use: Portland cement, mineral wool.
14. Sample 653; taken across 100 ft.
15. Sample 654; taken across 80 ft.

16. Quadrangle, age, reference, maps, and use as in samples 14, 15. [Sec. 21, T. 17 S., R. 7 W., unsurveyed], along Little Windy Creek just above its confluence with Windy Creek. Sample 642. Shale, black, thin-bedded. Channel sample taken across 54 ft; from outcrop.

17. Quadrangle, age, reference, maps, and use as in samples 14, 15. [Sec. 22, T. 17 S., R. 7 W., unsurveyed], Cantwell to McKinley Park highway, near confluence of Jack River and Windy Creek. Shale, black. Channel sample taken across 50 ft; from outcrop.

18, 19. Quadrangle, age, reference, maps, and use as in samples 14, 15. [Sec. 28, T. 17 S., R. 7 W., unsurveyed], cut on Alaska railroad between mile 321-322. Shale, black, thin-bedded. Channel sample from outcrop.
18. Sample 635; taken across 100 ft.
19. Sample 636; taken across 43 ft.

20. Quadrangle, age, reference, maps, and use as in samples 14, 15. [Sec. 29, T. 17 S., R. 7 W.], along small gully 0.5 mile northeast of Alaska railroad crossing. Sample 648. Interbedded black shale and purple graywacke; some yellow limonite stain. Channel sample taken across 100 ft; from outcrop.

21, 22. Healy quadrangle. Tertiary. (Cobb, 1951, p. 139, 142, 165-167, pls. 18, 19.) Index and geologic maps, columnar sections. Use: Portland cement.
21. NW¼ sec. 16, T. 12 S., R. 6 W., near mouth of Cripple Creek. Lab. No. 45. Clay.
22. Sec. 22, T. 12 S., R. 7 W., Healy Creek. Lab. No. 39C. Claystone, 12 ft thick.

*23. Pribilof Islands quadrangle. Pleistocene or Holocene. [12.2, 3.8], St. George Island, 1 mile east of Suskaralogh Point. Analyst, B. Bruun. (Barth, 1956, p. 117, 139, 147, 153, pls. 20, 21.) General: Tuff, whitish or yellow; numerous brown dots. Norm and cation percentages given. Index maps. *Analysis shows 3.0 percent FeO, 1.6 percent alkalies, 2.5 percent TiO_2; MgO and CaO not calculated as carbonate.

*24. Rat Islands quadrangle. Tertiary(?) or Quaternary. [16.05, 12.9], Semisopochnoi Island, Tuman Head. Analyst, W. J. Blake; spectrographic analyst, E. L. Hufschmidt; collector, H. A. Powers. Lab. No. ID-20750. (Coats, 1959, p. 477, 479, 504, 514, 515, pl. 59.) Pyroclastics (olivine-hypersthene basalt), medium-gray, dense; 10-20 ft thick. Mineralogy. Norms and Niggli numbers. Index and geologic maps, geologic section. *Analysis shows 6.6 percent FeO, 4.0 percent alkalies, 1.1 percent TiO_2; MgO and CaO not calculated as carbonate.

Idaho

25 - 32. Bear Lake County. [Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. T. 14 S., R. 43 E.] (Ravitz and others, 1949, p. 306, 309, 320.) Shale. Use: Fertilizer, source of vanadium.
25, 26. [Near] town of Paris. Paris Canyon deposit.
*25. Lot 6-6. *Analysis shows 3.2 percent S, 0.9 percent V_2O_5; suggests 14.9 percent phosphate.
*26. Lot 6-10. *Analysis shows 2.0 percent S, 1.2 percent V_2O_5; suggests 13.6 percent phosphate.
27 - 32. [Near] towns of Paris and Bloomington, Paris and Bloomington Canyons.
*27. Lot 6-4. *Analysis shows 1.6 percent S, 1.2 percent V_2O_5; suggests 15.5 percent phosphate.
*28. Lot 6-7. *Analysis shows 4.2 percent S, 0.9 percent V_2O_5; suggests 14.1 percent phosphate.
*29. Lot 6-8. *Analysis shows 5.8 percent S, 1.4 percent V_2O_5; suggests 13.7 percent phosphate.
*30. Lot 6-9. *Analysis shows 3.9 percent S, 1.1 percent V_2O_5; suggests 12.9 percent phosphate.
*31. Lot 6-13. *Analysis shows 4.6 percent S, 1.6 percent V_2O_5; suggests 16.9 percent phosphate.
*32. *Analysis shows 2.8 percent S, 0.9 percent V_2O_5; suggests 17.3 percent phosphate.

33. Benewah County. Middle to late Miocene, Latah Formation. Sec. 20, T. 46 N., R. 2 W., 2 miles west of St. Maries, railroad cut. Analyst, J. H. Jonte. Sample 8. (Skeels, 1920, p. 27, 28; Hubbard, 1956a, p. 2, 23, pl. 1.) Clay, gray with brown streaks, medium-fine-grained; 19 ft exposed. Index map, geologic sections, columnar section. Physical properties, firing tests. Possible use: Brick, refractories, tile.

Idaho—Continued

*33a. Caribou County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. [Sec. 29], T. 10 S., R. 45 E., near Georgetown. Field No. CF-9. (Town, 1966, p. 2-6, 7, 10, 12.) Phosphatic shale, dark-brown, nonfriable. Trench sample. Mineralogy, thin-section description. Geologic section, compositional triangle. Beneficiation tests. *Analysis shows 1.0 percent S; suggests 32.7 percent phosphorite.

34. Kootenai County. [Latah Formation.] Secs. 8, 9, 16, 17, T. 50 N., R. 3 W., 3 miles northeast of town of Coeur d' Alene. Fernan Hill deposit. (Kelly and others, 1956, p. 50, 57.) Clay, as much as 30 ft thick. Tonnage estimated. Index map.

35. Kootenai County. Latah Formation. SE¼ sec. 9, T. 50 N., R. 4 W., about 2-3 miles northwest of Coeur d' Alene. Stockton deposit. Analyst, J. H. Jonte. Sample 19. (Skeels, 1920, p. 1, 31, 35, 36; Scheid, 1952, p. 5, 8, 14, 16, 18, 20, pls. 1, 2, fig. 1, table 2.) Clay, white, fine-grained, massive; 4 ft exposed, possibly as much as 46 ft thick, average thickness about 18 ft; overburden 1-5 ft. General mineralogy. Index and geologic maps, geologic section, columnar section. Physical properties, firing tests. Possible use: Source of alumina, face brick, terra cotta, sewer pipe, pottery, refractories, draintile.

36. Latah County. [Miocene] NW¼ sec. 18, T. 39 N., R. 4 W., 0.75 mile north of Joel Station. Moscow Fire Brick and Clay Products Co., abandoned pit. Analyst, J. H. Jonte. Sample 46. (Skeels, 1920, p. 1, 47, 51, 52; Wilson, 1934, p. 14, 63, 69, 70, 72.) Sample: Clay, gray, fine-grained; 30-50 ft thick, overburden 3-4 ft. Index and geologic maps, geologic section, columnar section. Physical properties, firing tests. Former use: Face brick, firebrick. Possible use: Refractories, whiteware.

37. Latah County. Miocene. [T. 39 N., R. 4 W.], 6 miles east of town of Moscow, 1 mile north of Joel Station. Analyst, J. H. Jonte. Sample 40. (Skeels, 1920, p. 1, 47-49.) Clay, red, medium-grained; 10 ft exposed; overburden 2 ft. Geologic section, columnar section. Physical properties, firing tests. Possible use: Face brick, draintile.

38, 39. Latah County. Latah Formation. [Probably] NE¼NW¼ sec. 16, T. 39 N., R. 5 W., near Moscow. Canfield deposit. Collector, V. E. Scheid. (Hubbard, 1956a, p. 4, 5-7, pls. 1-3, table 1.) Tonnage estimated. Index and geologic maps. Use: Firebrick.

36. Sample 4. Clay, yellow; 2 ft bed.
39. Sample 5. Clay, gray; 4 ft bed.

40 - 42. Latah County. Latah Formation. Sec. 16, T. 39 N., R. 5 W., about 1 mile southeast of Moscow. Moscow Fire Brick and Clay Products Co., Canfield pits. (Hodge, 1938e, p. 494-496, 503, 610, 613, 619, 620-622.) Kaolin. Mineralogy. Tonnage estimated. Index and geologic maps. Use: Firebrick. Possible use: Source of alumina, refractories.

43. Latah County. [Miocene. Sec. 16, T. 39 N., R. 5 W.], east of Moscow. Moscow Fire Brick and Clay Products Co., Canfield pit. (Landes, 1934, p. 1073, 1076.) Clay. Use: Face brick, firebrick, flux, pottery, hollow tile. Possible use: Chinaware.

44. Latah County. Miocene. [T. 39 N., R. 5 W.], 1 mile east of Moscow. Near Moscow Fire Brick and Clay Products Co. pit. Analyst, R. V. Lundquist. Sample 9. (Tullis and Laney, 1933, p. 481, 493-495.) Clay. Index map. Use: Face brick, firebrick, terra cotta, sewer pipe, stoneware, draintile, structural tile, roofing tile.

45 - 48. Latah County. T. 40 N., R. 2 W., about 3 miles southwest of town of Deary. (Hosterman and others, 1960, p. 1-4, 7, 12, 13, 15, 17, 19, 21, 29, 37, 89, 90, 112, 124, pls. 1, 2, 6.) Overburden averages 15.9 ft. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections. Log of drill hole. Composite sample, samples taken at about 5 ft intervals or where clay showed marked change. Possible use [except sample 47]: Source of alumina, refractories, draintile, ceramic structural wares.

45. Latah Formation. NW¼ sec. 18. Drill hole O1-109. Clay, varicolored; some beds plastic, some limonite bands; depth 19.3-96.6 ft.

46. Latah Formation. SW¼ sec. 18. Drill hole O1-106. Clay, varicolored, sandy; depth 12.8-80.9 ft.

47. Miocene. SW¼ sec. 19. Drill hole O1-210. Clay, varicolored; depth 13.5-17.6 ft. Possible use: Source of alumina, gallium, ilmenite.

48. Latah Formation. NW¼ sec. 20. Drill hole O1-305. Clay, varicolored; some beds sandy, some beds plastic; depth 8.0-47.7 ft.

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent clay (Group D), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Idaho—Continued												
	49	50	51	52	53	54	55	56	57	58	59	60	61
	11D29-51	11D29-53	11D29-54	11D29-52	11D29-27	11D29-16	11D29-45	11D29-42	11D29-44	11D29-47	11D29-40	11D29-35	11D29-17
SiO_2	58.4	62.0	58.5	48.3	52.7	51.02	55.1	64.4	49.5	57.3	58.4	59.73	61.8
Al_2O_3	26.5	23.2	23.8	16.5	21.2	25.29	29.1	20.3	26.5	25.7	24.3	29.40	26.2
Fe_2O_3	3.2	4.7	6.6	19.9	[1]14.6	5.85	3.0	5.6	10.8	4.4	6.0	.87	1.13
MgO	------	------	------	------	1.6	.19	------	------	------	------	------	.07	.22
CaO	------	------	------	------	1.4	.42	------	------	------	------	------	.50	.28
Na_2O	------	------	------	------	------	.23	------	------	------	------	------	------	.21
K_2O	------	------	------	------	------	.72	------	------	------	------	------	------	.60
H_2O-	------	------	------	------	------	------	------	------	------	------	------	.0	[2]1.19
TiO_2	1.0	.9	1.0	3.3	------	1.65	.8	.6	1.4	1.0	2.4	------	------
P_2O_5	------	------	------	------	------	.112	------	------	------	------	------	------	------
CO_2	------	------	------	------	------	.43	------	------	------	------	------	------	------
SO_3	------	------	------	------	------	.099	------	------	------	------	------	------	------
Organic matter	------	------	------	------	------	[3].61	------	------	------	------	------	------	------
Ignition loss	[4]9.2	[4]8.6	[4]9.5	[4]8.3	8.8	10.60	[4]10.5	[4]6.0	[4]9.6	[4]10.1	[4]8.5	9.41	9.9
Total	[98.3]	[99.4]	[99.4]	[96.3]	[100.3]	[97.22]	[98.5]	[96.9]	[97.8]	[98.5]	[99.6]	100.0	101.5
Class	8,89,0	16,83,0	9,89,0	0,91,0	15,65,6	0,93,1	0,97,0	22, 74,0	0,90,0	7,91,0	9,89,0	7,92,1	14,85,1

	Idaho—Continued					Oregon							
	62	63	64	65	66	67	68	69	70	71	72	73	74
	11D29-30	11D31-1	11D42-2	11D42-3	11D44-1	36D1-54	36D2-1	36D3-12	36D3-19	36D3-28	36D3-11	36D3-10	36D4-1
SiO_2	58.77	56.8	55.48	49.55	62.1	49.05	64.12	54.14	54.19	64.89	56.5	49.1	63.20
Al_2O_3	30.28	24.8	20.83	17.78	24.1	19.66	24.33	30.38	30.41	21.11	22.5	26.9	23.36
Fe_2O_3	1.60	5.58	7.76	6.61	.4	7.96	2.31	3.90	4.21	4.80	6.0	9.5	1.86
FeO	------	------	.15	------	------	.75	------	------			------	------	------
MgO	Trace	.14	3.23	3.24	.0	1.17	.36	.28	.25	1.13	4.0	------	1.07
CaO	.34	.87	1.45	None	1.8	2.34	.34	.52	.30	2.44	.9	------	.92
Na_2O	.08	------	.40	------	------	6.18	------	------	------	------	[5]1.5	[5]1.6	------
K_2O			2.19	------	------	.78	------	------	------	------			
H_2O+	------	------	[6](7.47)	6.88	------	11.79	------	------	------	------	------	------	------
H_2O-	[7].88	------	[6](7.15)	15.45	------								
TiO_2	------	------	.88	.58	------	------	[8].13	[8].27	------	------	1.0	2.5	[8].34
Ignition loss	[9]8.44	12.6	8.18	------	11.2	------	8.49	11.35	11.33	5.13	7.6	10.4	4.64
Total	100.39	[100.8]	100.55	100.09	99.6	99.68	100.08	100.84	100.69	99.50	100.0	100.0	95.39
Class	3,96,1	7,92,2	10,81,2	11,86,0	19,77,3	5,83,1	19,80,1	0,97,2	0,97,1	22,74,0	10,82,1	0,90,0	20,73,0

Oregon—Continued

	75	76	77	78	79	80
	36D4-2	36D5-72	36D5-71	36D5-24	36D5-1	36D5-57
SiO_2	60.90	60.2	53.9	63.58	58.22	44.01
Al_2O_3	21.71	19.7	22.0	25.58	17.51	24.19
Fe_2O_3	[10]6.43	[3]9.0	[3]10.3	2.55	5.44	[3]17.43
MgO	1.99	------	------	.29	1.20	.13
CaO	.56	------	------	.47	1.16	.12
Na_2O	------	------	------	------	1.80	------
K_2O	------	------	------	------	.87	------
H_2O+	------	------	------	------	[12]5.13	------
H_2O-	------	[6](28.3)	[6](22.4)	------	[13]7.59	------
TiO_2	------	1.80	1.80	[8].13	.88	------
P_2O_5	------	------	------	------	Trace	[3].30

	75	76	77	78	79	80
	36D4-2	36D5-72	36D5-71	36D5-24	36D5-1	36D5-57
MnO	------	------	------	------	Trace	[3]0.35
S	------	------	------	------	------	.016
Cl	------	------	------	------	0.20	------
Ignition loss	4.82	7.5	10.1	8.00	[11].25	13.81
Total	96.41	[98.2]	[98.1]	100.60	100.25	[100.36]
Class	15,79,0	15,81,0	4,93,0	15,84,1	21,73,1	0,87,0

[1] FeO.

[2] Moisture below 100°C.

[3] Calculated from reported Fe, P, Mn or C_2.

[4] At 1,000°C; for samples 52, 59, at 950°C.

[5] Mainly alkalies and alkaline earth, by difference.

[6] Not included in total.

[7] Sample air dried; moisture at 110°C.

[8] TiO.

[9] Combined water, ignition.

[10] Includes FeO.

[11] CO_2.

[12] Combined water (+105°C).

[13] Moisture (-105°C).

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

49-52. Latah County. T. 40 N., R. 2 W., about 3 miles southwest of town of Deary. (Hosterman and others, 1960, p. 1-4, 12, 13, 15, 17, 19, 21, 29, 37, 95, 97, 98, 122, pls. 1, 2, 6.) Overburden averages 15.9 ft. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections. Log of drill hole. Composite sample, samples taken at 5 ft intervals or where clay showed marked change. Possible use [except sample 52]: Source of alumina, refractories, draintile, ceramic structural wares.

- 49. Middle to late Miocene, Latah Formation. NW¼ sec. 29. Drill hole O1-290. Clay, pink-gray, white streaks; some beds plastic; depth 35.6-45.7 ft.
- 50. Latah Formation. SE¼ sec. 30. Drill hole O1-146. Clay, varicolored; some beds sandy; some limonite; includes 13 ft bed of sand; depth 5.4-55.0 ft.
- 51. Latah Formation. SE¼ sec. 30. Drill hole O1-144. Clay, varicolored; includes 5 ft bed of sand, 1.9 ft bed of limonite; depth 32.6-62.9 ft.
- 52. Miocene. SW¼ sec. 30. Drill hole O1-134. Clay, yellow and blue; depth 16.5-24.0 ft. Possible use: Source of alumina, gallium, ilmenite.

53. Latah County. Latah Formation. [T. 40 N., R. 2 W.], west of Deary, railroad cut. Sample 30. (Skeels, 1920, p. 42, 43.) Clay, white, brown, coarse-grained. Physical properties, firing tests. Possible use: Building brick, face brick, draintile.

54. Latah County. Latah Formation [implied]. Southwestern part of T. 40 N., R. 2 W., and southeastern part of T. 40 N., R. 3 W., about 7 miles northeast of town of Troy. Olson deposit. (Hubbard, 1956a, p. 2, 11-13, pls. 1, 2, 5, table 1.) Deposit: Clay; averages 26 ft thick; overburden averages 16 ft thick. Sample: Average composition of entire deposit calculated from a composite sample of area. Tonnage estimated. Index and geologic maps. Use: Brick. Possible use: Source of alumina.

55-59. Latah County. T. 40 N., R. 3 W., about 3 miles southwest of Deary. (Hosterman and others, 1960, p. 1-4, 15-17, 19, 21, 29, 37, 88, 90, 110, 120, 121, pls. 1, 2, 6.) Overburden averages 15.9 ft. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections. Log of drill hole. Composite sample, samples taken at about 5 ft intervals or where clay showed marked change. Possible use [except sample 59]: Source of alumina, refractories, draintile, ceramic structural wares.

- 55. Latah Formation. Near center sec. 24. Drill hole O1-275. Clay, gray, yellow-gray, plastic; depth 12.0-29.3 ft.
- 56. [Miocene.] NE¼ sec. 24. Drill hole O1-204. Clay, yellow, sandy; depth 70.0-135.0 ft.
- 57. Latah Formation. NE¼ sec. 24. Drill hole O1-281. Clay, varicolored; some beds plastic; depth 15.5-35.9 ft.
- 58. Latah Formation. SE¼ sec. 24. Drill hole O1-105. Clay, varicolored; contains 4.5 ft sandy bed; depth 7.4-43.0 ft.
- 59. Miocene. SE¼ sec. 24. Drill hole O1-111. Clay, varicolored; some plastic portions; depth 20.0-38.0 ft. Possible use: Source of alumina, gallium, ilmenite.

60. Latah County. Latah Formation. South center NW¼ sec. 34, T. 40 N., R. 3 W., 4 miles northeast of Troy. Idaho Fire Brick Co., Linderman pit. Collector, Suksdorf. Sample 4. (Wilson, 1934, p. 14, 63, 68, 73, 74, 76, 77, 83, 84, 111.) Clay, white; 4-22 ft thick; overburden 5-36 ft. Mineralogy. Index and geologic maps, detailed measured section. Physical properties, firing tests. Screen analysis. Former use: Firebrick. Possible use: Refractories, whiteware.

61. Latah County. Miocene. Near center sec. 31, T. 40 N., R. 5 W., north of town of Moscow. Aberdeen Clay and Color Co., Rogers deposit. Analyst R. V. Lundquist; collector, V. E. Scheid. Sample 10. (Tullis and Laney, 1933, p. 481, 493-495; Hubbard, 1956a, p. 5-7, pls. 1-3, table 1.) Clay, white; 12-15 ft thick; overburden 5-15 ft. Tonnage estimated. Index and geologic maps. Use: Face brick, firebrick, terra cotta, sewer pipe, stoneware, draintile, roofing tile, structural tile.

62. Latah County. Latah Formation. [Sec. 31, T. 42 N., R. 4 W.], near town of Potlatch. Analyst, W. R. Bloor. Sample 93. (Shedd, 1910, p. 222, 223, 224, 307, 320, 321; Wilson, 1934, p. 14, 63, 69, 94, 96.) Clay, white, plastic; 15 ft thick; overburden 8-10 ft. Microscopic description. Index and geologic maps. Physical properties, firing tests. Former use: Brick, stoneware.

63. Lewis County. Latah Formation. NE¼ sec. 6, T. 33 N., R. 2 E., town of Nez Perce. Analyst, R. V. Lundquist. Sample 53. (Scheid and others, 1951, p. 19; Hubbard, 1956a, p. 2, 30, 31, pl. 1.) Clay, gray; 8 ft thick; overburden 3 ft. Index map. Physical properties, firing tests. Former use: Brick.

Idaho—Continued

64. Twin Falls County. [T. 10 S., R. 17 E.], town of Twin Falls. Analyst, under supervision of O. W. Rees. Sample 8C. (Grim and Rowland, 1942, p. 801-803.) [Clay] so-called beidellite. Mineralogy. Differential thermal curve.

65. Twin Falls County. [T. 10 S., R. 17 E.], tunnel near Twin Falls. Analyst, J. J. Fahey. Lab. No. D-124. (Wells, 1937, p. 98; Ross and Hendricks, 1945, p. 31, 34, 39-46, 55, pl. 3.) Clay, tawny-olive with a little buff-pink; in masses 2-14 in. thick. Mineralogy. Ridgway color notation. Indices of refraction and birefringence; photomicrograph.

66. Washington County. [T. 11 N., R. 6 W.], 10 miles west of town of Weiser. Samples 83, 84. (Skeels, 1920, p. 67, 70, 71.) Shale, blue-gray, very fine grained; 6 ft exposed. Index map. Physical properties, firing tests. Possible use: Brick, sewer pipe, draintile.

Oregon

67. Baker County. [T. 14 S., R. 44 E.], town of Huntington. Analyst, E. P. Henderson. Record C-528. (Ross, 1926, p. 4, 7, 10, 11; Wells, 1937, p. 102.) Glauconite, earthy texture. Thin-section description, optical properties. Graphic presentation of analysis.

68. Benton County. Probably post-middle Miocene. SW¼ sec. 2, T. 14 S., R. 6 W., 8.4 miles by road northwest of town of Monroe. Bystrom ranch. Field No. 29. (Wilson and Treasher, 1938, p. 1, 19, 24, 64, 84, 91.) Clay, gray, sandy; some iron stain. Index map. Firing tests. Former use: Refractories. Possible use: Structrual ware.

69. Clackamas County. Probably post-middle Miocene. W½NE¼ sec. 1, T. 6 S., R. 2 E., more than 10 miles by road southeast of town of Molalla. Zahar property. Field No. 9B. (Wilson and Treasher, 1938, p. 1, 19, 24, 42, 47, 84.) Clay. Index maps.

70. Clackamas County. Pliocene or Pleistocene. Sec. 1, T. 6 S., R. 2 E., near Molalla. Zahar deposit. Sample 3. (Hodge, 1938f, p. 817, 851-853.) General: Fine blue plastic clay to coarse kaolinitic weathered gravel. Clay, 200 ft thick. Index map. Possible use: Refractories.

71. Clackamas County. NE¼ sec. 24, T. 2 S., R. 2 E., 1 mile south of town of Carver. Stewart deposit. Sample 1. (Hodge, 1938f, p. 817, 848, 849, 853.) Clay, gray, sandy; and clayey loose sand; about 15 ft thick; overburden 0.5 ft of white clay. Deposit possibly 200 ft thick. Index map. Use: Probably none.

72, 73. Clackamas County. [Sec. 1, T. 6 S., R. 2 E., near] Molalla. Analyst, Anthony Centenero; collector, R. L. Nichols. Samples M-1, M-4. (Pask and Davies, 1943, p. 3, 10, 20, 22, 23, 25; Pask and Davies, 1945, p. 57, 62, 73, 74, 76, 78.) Clay. Mineralogy. Thermal analysis curve.
73. Possible use: Source of alumina.

74. Clatsop County. Probably post-middle Miocene. [T. 6 N., R. 10 W.], about 2 miles south of town of Seaside. P. M. West property. Field No. 2. (Wilson and Treasher, 1938, p. 1, 19, 24, 33, 84, 88.) Clay, cream-colored, soft. Index map. Firing tests. Former use: Pottery. Possible use: Structural ware.

75. Clatsop County. NW¼NW¼ sec. 4, T. 5 N., R. 10 W., Seaside. P.H. West property. Sample 4. (Hodge, 1938f, p. 842, 843, 848.) Clay, yellowish- to grayish-white, plastic; uniform in texture. Overburden. Index map.

76, 77. Columbia County. Miocene or later. NW¼ sec. 16, T. 4 N., R. 2 W., about 0.5 mile north of town of Spitzenberg, Alder Creek area. Dietz property. (Kelly, 1947, p. 4, 6, 22, 23, figs. 1, 2.) Silt, dark-red, pisolitic. Index and geologic maps, geologic sections.

- 76. Drill hole 34. Silt, plastic; depth 26.0 ft. Bulk density 2.68.
- 77. Drill hole 36. Silt, mealy to plastic; depth 11.0 ft. Bulk density 2.62. [For another analysis from same drill hole, see sample 2, group Hai.]

78. Columbia County. Probably post-middle Miocene. NE¼ sec. 33, T. 8 N., R. 3 W., 6 miles west of town of Rainier. Fransen deposit. Field No. 1D. (Wilson and Treasher, 1938, p. 1, 19, 24, 27, 29-33, 84-86, 88.) Clay, blue-gray and white; inclusions of tan organic matter; channel sample of upper 15 ft. Mineralogy. Tonnage estimated. Index maps, detailed measured section. Physical properties, firing tests. Former use: Stoneware. Possible use: Refractories.

79. Columbia County. Tertiary. [T. 7 N., R. 5 W.], about 1.5 miles south of town of Clatskanie. Sample 2. (Schenck, 1927, p. 565-567.) Shale, gray, tuffaceous, sandy. Mineralogy. Photomicrograph.

80. Columbia County. [T. 4 N., R. 3 W.], Pearson location. (Hodge, 1935b, p. 18.) [Iron-bearing rock.]

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington,containing more than 75 percent clay (Group D),common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Oregon—Continued												
	81	82	83	*84	85	86	*87	*88	*89	*90	*91	*92	*93
	36D5-58	36D5-59	36D5-60	36D5-47	36D5-44	36D5-45	36D6-10	36D8-1	36D8-2	36D9-10	36D10-28	36D10-29	36D10-30
SiO_2	44.86	46.29	67.70	34.67	55.51	60.36	34.8	24.2	28.2	38.04	32.2	26.2	38.4
Al_2O_2	23.57	24.27	17.18	11.22	22.17	25.02	14.4	6.2	6.4	19.00	4.9	7.3	8.4
Fe_2O_2	[1]20.04	[1]17.26	[1]12.32	[1]42.04	7.23	2.90	[1]19.59	[1]42.6	[1]40.3	8.23	38.7	46.8	31.3
FeO	------	------	------	------	------		------	------	------	------	.45	.29	1.3
MgO	.15	.28	.30	.25	1.50	.67	3.5	8.6	4.6	3.77	7.0	2.1	6.8
CaO	.10	.18	.16	.10	------	1.12	8.1	3.3	3.2	7.35	1.0	.24	.58
Na_2O	------	------	------	------	.20	------	------	------	------	12.76	.07	.08	.26
K_2O	------	------	------	------	.15	------	------	------	------	8.50	.02	.09	.24
H_2O+	------	------	------	------	------	------	3.00	------	------	1.50	11.9	13.3	8.0
H_2O-	------	------	------	------	------	------				.14			
TiO_2	------	------	------	------	------	------	3.1	------	------	------	.08	.20	.32
P_2O_5	[1].32	[1].22	[1].31	[1].81	------	------	[2]Nil(?)	[1].41	------	------	.05	.12	.20
MnO	[1].15	[1].48	[1].17	[1].75	------	------	------	------	------	------	.48	.43	.49
S	.025	.019	.011	.012	------	------	Nil(?)	.03	------	------	------	------	------
Cr_2O_3	------	------	------	------	------	------	9.4	2.53	2.44	------	1.1	1.3	1.5
ZrO_2	------	------	------	------	------	------	.87	------	------	------	------	------	------
Ni	------	------	------	------	------	------	------	.70	.74	------	[3]2.3	[3]2.2	[3]1.5
Co	------	------	------	------	------	------	------	.06	.07	------	[4].06	[4].08	[4].06
Ag	------	------	------	------	------	------	Nil	------	------	------	------	------	------
Ignition loss	10.76	11.35	2.28	10.87	[5]13.10	9.67	2.00	11.4	10.2	------	[6].24	[6].28	[6].17
Total	[99.98]	[100.35]	[100.43]	[100.72]	[99.86]	99.74	[7][98.8]	[100.0]	[96.2]	[8]99.29	100.6	101.0	99.5
Class	0,86,0	0,88,1	23,76,0	0,73,1	8,88,3	13,83,3	0,63,0	0,49,13	0,57,9	0,64,2	0,71,0	0,61,1	0,77,0

	Oregon—Continued												
	*94	*95	*96	*97	*98	*99	*100	101	102	103	104	105	106
	36D10-38	36D15-19	36D17-37	36D17-31	36D17-32	36D17-33	36D17-35	36D17-17	36D17-18	36D17-21	36D17-22	36D17-23	36D17-24
SiO_3	44.0	46.96	32.5	31.5	35.1	21.4	21.4	65.02	66.97	58.58	62.90	63.08	63.96
Al_2O_3	3.7	18.66	3.8	3.9	3.5	4.7	9.1	21.30	22.37	31.52	27.42	27.94	27.28
Fe_2O_2	[1]28.3	10.05	29.6	34.5	38.6	49.1	47.3	6.06	3.57				
FeO	------		1.9	.93	.12	.20	.72			------	------	------	------
MgO	12.5	10.60	15.9	12.4	4.7	3.3	4.1	.25	.25	1.42	2.08	1.70	2.26
CaO	1.3	8.46	1.5	1.4	.72	.42	.32	.19	.10	1.04	1.28	.94	.82
Na_2O	------	------	.04	.07	.04	.04	.10	------	------	------	------	------	------
K_2O	------	------	.02	.02	.02	.04	.13	------	------	------	------	------	------
H_2O	------	------	11.3	12.1	13.6	15.9	13.4	------	------	------	------	------	------
TiO_2	------	------	.06	.06	.04	.10	.23	------	------	------	------	------	------
P_2O_5	[1].09	------	.02	.02	.04	.06	.11	------	------	------	------	------	------
MnO	------	------	.24	.30	.46	.44	.28	------	------	------	------	------	------
S	.44	------	------	------	------	------	------	------	------	------	------	------	------
Cr_2O_3	[9].57	------	1.1	1.1	1.2	2.4	2.0	------	------	------	------	------	------
Ni	1.7	------	[3]1.9	[3]2.2	[3]2.0	[3]2.0	[3]1.4	------	------	------	------	------	------
CoO	------	------	.04	.04	.07	.14	.07	------	------	------	------	------	------
Ignition loss	------	5.62	[6].14	[6].14	[6].18	[6].21	[6].21	6.61	6.70	7.21	6.42	6.02	5.85
Total	[92.6]	100.35	100.1	100.7	100.4	100.4	100.9	99.43	99.96	99.77	100.10	99.68	100.17
Class	6,78,0	3,79,0	0,71,0	0,70,0	0,78,0	0,55,0	0,52,0	21,78,0	23,76,0	6,91,0	17,80,0	16,81,0	18,79,0

	Oregon—Continued					
	107	*108	109	110	111	112
	36D17-25	36D17-29	36D20-14	36D24-1	36D24-3	36D24-80
SiO_2	64.1	43.29	58.10	65.10	57.16	54.86
Al_2O_2	27.0	12.41	29.68	22.53	29.06	30.38
Fe_2O_3		12.31	1.76	2.50	3.62	4.36
MgO	.2	14.13	.20	.46	.33	.56
CaO	1.2	6.34	.21	.65	.56	.44
Na_2O	------	1.18	------	------	------	------
K_2O	------	.11	------	------	------	------
TiO_2	------	1.33	[10].44	[10].25	[10].17	[10].15
P_2O_5	------	.07	------	------	------	------
MnO	------	.21	------	------	------	------
CO_2	------	None	------	------	------	------
SO_3	------	.07	------	------	------	------
Cr_2O_3	------	2.37	------	------	------	------
NiO	------	.051	------	------	------	------
N	------	.100	------	------	------	------
Ignition loss	7.6	5.96	9.61	8.08	9.23	9.73
Total	100.1	[99.93]	100.00	99.57	100.13	100.48
Class	19,79,2	7,67,0	4,95,1	22,75,2	2,97,2	0,96,2

[1] Calculated from reported Fe, Fe natural, Mn, or P.

[2] P.

[3] NiO.

[4] CoO.

[5] Moisture and loss on ignition.

[6] CO_2.

[7] Gold found; no platinum found by spectrograph.

[8] 100.09 percent in text.

[9] Cr.

[10] TiO.

Spectrographic analysis
[One determination for two samples]

	88- 89
Mn	0.1 -1
Ti	.01- .1
K	.1 -1
Na	.01- .1
V	.01-1

Spectrographic analysis
[Sample from same general area as sample used for chemical analysis]

	90		90
B	< 0.001	Ni	< 0.001
Ti	0.01- .001	Cu	< .001
V	.01- .001	Sr	0.1- .01
Cr	< .001	Ba	1 - .1
Mn	.01- .001		

Quantitative spectrographic analyses
[Elements looked for but not detected: Y, Rh, Cd, Re, Os, Ir, Pt. Results have an accuracy of ± 15 percent]

	96	97	98	99	100
Sc	0.0042	0.0054	0.0054	0.0076	0.0066
V	.011	.012	.010	.020	.023
Cu	.013	.0098	.0090	.011	.012
Sr	<.0002	<.0002	<.0002	<.0002	.0010
Ba	.002	.002	.003	.003	.006

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

81- 83. Columbia County. [T. 4 N., R. 3 W.] Pearson location. (Hodge, 1935b, p. 18.)
81, 82. [Iron-bearing rock.] 83. [Clay.]

*84. Columbia County. [T. 4 N., R. 3 W.] Finley location. (Hodge, 1935b, p. 18.) [Iron-bearing rock.] *Analysis suggests 5.4 percent excess Al_2O_3, 20.4 percent excess Fe_2O_3, 1.9 percent phosphate.

85. Columbia County. SW¼SW¼ sec. 19, T. 5 N., R. 1 W., near town of St. Helens. Analyst, L. L. Hoagland. (Jacobs, 1950, p. 2, 5.) Clay. Firing tests.

86. Columbia County. NE¼ sec. 33, T. 8 N., R. 3 W., 3 miles from town of Mayger. Franzen ranch. Sample 3. (Hodge, 1938f, p. 817, 839, 841, 842, 848.) Clay, sandy; weathers white. Index maps. Firing tests. Use: Stoneware. Possible use: Terra cotta.

*87. Coos County. [Pleistocene or Holocene.] W½ sec. 16, T. 26 S., R. 14 W., 8.5 miles north of town of Bandon, Coos Bay area. Shepard deposit. Analyst, under direction of A. C. Rice. (Hundhausen, 1947, p. 2-4, 7-12, 13, figs. 1-3; Zapffe, 1949, p. 47-49, 50, pl. 5.) General: Black sand with some layers of gravel; averages 7 ft thick; overburden averages 32.0 ft thick; mineralogy. Composite sample. Index and geologic maps, geologic sections. Beneficiation tests. Use: Source of chromite. Possible use: Source of garnet, magnetite, titanium, gem zircons. *Analysis shows 9.4 percent Cr_2O_3, 3.1 percent TiO_2; suggests 3.9 percent excess Al_2O_3, 5.2 percent excess Fe_2O_3; MgO and CaO not calculated as carbonate.

88, 89. Curry County. Secs. 19, 30, T. 37 S., R. 13 W., 17 miles by road east of town of Gold Beach. Red Flats nickel deposit. (Hundhausen and others, 1954, p. 1, 2, 4, 11, figs. 1, 2.) [Iron-bearing rock], nickeliferous laterite, brick-red. Mineralogy. Index maps. Possible use: Source of ferronickel. [For analyses of parent rock, see samples 69, 70, group M.]
*88. *Analysis shows 2.5 percent Cr_2O_3; suggests 3.7 percent excess Al_2O_3, 25.1 percent excess Fe_2O_3, 4.9 percent more MgO and CaO than required for carbonate.
*89. *Analysis shows 2.4 percent Cr_2O_3; suggests 3.2 percent excess Al_2O_3, 20.3 percent excess Fe_2O_3, 3.2 percent more MgO and CaO than required for carbonate.

*90. Deschutes County. N½ sec. 36, T. 16 S., R. 11 E., near town of Tumalo, Laidlaw Butte. Analyst, L.L. Hoagland. Sample P-9205. (Oregon Dept. Geology and Mineral Industries, 1950b, p. 41; Mason, 1951, p. 8, 9.) Volcanic cinders, red to black; cinders range from fine to more than 6 in. in diameter. Index map. Possible use: Concrete blocks, fertilizer, road metal. *Analysis shows 21.3 percent alkalies; suggests 2.1 percent excess Al_2O_3, 10.3 percent more MgO and CaO than required for carbonate.

91- 93. Douglas County. Possibly post-Miocene to Pleistocene. [T. 30 S., R. 6 W.], near town of Riddle, Nickel Mountain. Hanna Ore Co. pit. Analysts, P. L. D. Elmore, J. I. Dinnin, S. D. Botts, M. D. Mack. (Hotz, 1964, p. 356, 357, 368, 369, 371, 375-377, 393.) General mineralogy. Graphs of molecular proportions of constituents. Index map. Use: Source of nickel. [For analyses of parent rock, see samples 74, 75, group M.]
*91. Sample 3. Lateritic soil, yellowish-orange; depth 5-8 ft. *Analysis shows 2.3 percent NiO, 1.1 percent Cr_2O_3; suggests 1.9 percent excess Al_2O_3, 14.9 percent excess Fe_2O_3, 7.8 percent more MgO and CaO than required for carbonate.
*92. Sample 4. Lateritic soil, yellowish-orange; depth 3-5 ft. *Analysis shows 2.2 percent NiO, 1.3 percent Cr_2O_3; suggests 4.4 percent excess Al_2O_3, 28.1 percent excess Fe_2O_3, 2.1 percent more MgO and CaO than required for carbonate.
*93. Sample 5. Lateritic soil, red; contains iron oxide pellets; depth 1-3 ft. *Analysis shows 1.5 percent Cr_2O_3, 1.5 percent NiO, 1.3 percent FeO; suggests 2.0 percent excess Al_2O_3, 7.3 percent excess Fe_2O_3, 7.2 percent more MgO and CaO than required for carbonate.

*94. Douglas County. [T. 29 or 30 S., R. 6 W.], about 5 miles northwest of Riddle. Hanna Development Co. Lot F-4. (Cremer, 1954, p. 2, 5, 6.) Nickeliferous iron-bearing rock from surface trench. Mineralogy. Tonnage estimated. Possible use: Source of ferronickel. *Analysis shows 1.7 percent Ni; MgO and CaO not calculated as carbonate.

Oregon—Continued

*95. Jackson County. S½SW¼ sec. 28, T. 35 S., R. 4 W., north of town of Rogue River. Sparks property. Sample 1. (Hodge, 1938f, p. 817, 887-889, 891.) Clay. Index maps. *MgO and CaO not calculated as carbonate.

96 - 100. Josephine County. Possibly post-Miocene to Pleistocene. [T. 38 S., R. 8 W., southwest of town of Selma], Eight Dollar Mountain. Analysts, P. L. D. Elmore, J. I. Dinnin, S. D. Botts, M. D. Mack; spectrographic analyst, Sol Berman. (Hotz, 1964, p. 356, 357, 367-372, 373, 374, 388.) General mineralogy. Graph of molecular proportions of constituents, graph of trace element content. Index map. Use: Probably none. [For other analyses of parent rock and weathered product, see samples 78-80, group M.]
*96. Sample 2. Peridotite, weathered; depth 13.6-17.8 ft. X-ray diffractometer patterns of clay fractions. *Analysis shows 1.1 percent Cr_2O_3, 1.9 percent FeO, 1.9 percent NiO; suggests 5.6 percent excess Fe_2O_3, 17.3 percent more MgO and CaO than required for carbonate.
*97. Sample 3. Saprolite, yellowish-brown, granular; greenish and black mottling; depth 10.8-13.6 ft. *Analysis shows 2.2 percent NiO, 1.1 percent Cr_2O_3, 0.9 percent FeO; suggests 1.2 percent excess Al_2O_3, 10.8 percent excess Fe_2O_3; 13.8 percent more MgO and CaO than required for carbonate.
*98. Sample 4. Saprolite, yellowish-brown, granular; greenish and black mottling; depth 8.2-10.8 ft. X-ray diffractometer patterns of clay fractions. *Analysis shows 2.0 percent NiO, 1.2 percent Cr_2O_3; suggests 1.0 percent excess Al_2O_3, 11.4 percent excess Fe_2O_3, 5.2 percent more MgO and CaO than required for carbonate.
*99. Sample 5. Soil, mottled reddish-brown and yellowish-orange with some black mottling; depth 5.5-8.2 ft. *Analysis shows 2.4 percent Cr_2O_3, 2.0 percent NiO; suggests 3.1 percent excess Al_2O_3, 32.6 percent excess Fe_2O_3, 3.5 percent more MgO and CaO than required for carbonate.
*100. Sample 8. Soil, red-brown; contains iron oxide pellets and vegetal material; depth 0-1 ft. X-ray diffractometer patterns of clay fractions. *Analysis shows 2.0 percent Cr_2O_3, 1.4 percent NiO; suggests 6.3 percent excess Al_2O_3, 32.7 percent excess Fe_2O_3, 4.2 percent more MgO and CaO than required for carbonate.

101, 102. Josephine County. NW¼ sec. 24, T. 35 S., R. 7 W., near town of Merlin. Stiewig property. (Hodge, 1938f, p. 817, 889-891, 892.) Index maps. Log of auger hole.
101. Sample 3. Clay, light-brown; 3 ft thick. Use: Probably none.
102. Sample 2. Clay, gray; 2 ft thick. Possible use: Pottery.

103 - 107. Josephine County. Sec. 19, T. 37 S., R. 6 W., Cheney Creek. Rogue River Lime Co. Analyst, S.B. Gorbutt. (Winchell, 1914, p.14, 15, 234, fig. 1.) Shale and clay. Index maps. Possible use: Portland cement.

*10B. Josephine County. West corner sec. 26, T. 39 S., R. 8 W., at intersection of Sucker Creek and Oregon Cave roads. Sample 9929. (Robinson and others, 1935, p. 8, 12.) Soil, dark-colored, sandy, loamy; depth 0-4 in.; pH value. *Analysis shows 2.4 percent Cr_2O_3, 1.3 percent TiO_2, 1.3 percent alkalies; MgO and CaO not calculated as carbonate. [For analysis of parent rock, see sample 62, group M.]

109 - 112. Probably post-middle Miocene. (Wilson and Treasher, 1938, p. 19, 24, 50, 61, 62, 70, 75-78, 84, 91, 92.) Index maps. Firing tests.
109. Lane County. NW¼ sec. 16, T. 23 S., R. 3 W., about 18 miles south of town of Cottage Grove. Field No. 36 G. Clay, light-colored, iron-stained, flintlike, plastic. Possible use: None.
110. Marion County. NE¼ sec. 23, T. 6 S., R. 1 E., near town of Scotts Mills, Salem area. Field No. 28. Clay, surface exposure.
111. Marion County. SE¼ sec. 1, T. 8 S., R. 1 W., 8.5 miles south of town of Silverton, Salem area, roadcut. Field No. 24. Clay, gray, some iron stain, plastic.
112. Marion County. West line, NW¼SE¼ sec. 27, T. 8 S., R. 1 W., 0.8 mile north of town of Sublimity, Salem area, roadcut. Field No. 26. Clay, blue-gray.

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent clay (Group D), common- and mixed rock-categories—Continued

Chemical analyses—Continued

	Oregon—Continued										Washington		
	113	114	115	116	117	118	119	120	121	122	123	*124	*125
	36D33-1	36D34-25	36D34-46	36D35-4	36D35-7	36D35-2	36D35-5	36D35-6	36D36-1	36D36-6	46D3-2	46D4-19	46D4-24
SiO_2	58.16	57.94	55.21	50.77	49.86	52.11	52.83	50.19	59.41	58.12	54.92	19.68	25.35
Al_2O_3	15.03	22.76	17.87	12.29	16.09	15.07	13.52	18.41	24.77	28.74	18.56	4.64	2.64
Fe_2O_3	10.59	[1]8.72	14.75	8.71	6.53	5.43	9.05	5.67	.54	2.75	6.48	[1]50.64	[1]36.41
FeO	------	------	------	Nil	Nil	Trace	Nil	Nil			------	------	------
MgO	1.99	------	------	1.90	.83	2.52	1.57	1.20	.68	1.05	1.14	8.86	19.18
CaO	4.57	------	2.10	3.67	2.71	2.24	3.24	2.91	[2]5.98	.60	1.34	1.52	1.97
Na_2O	2.56	------	[3]4.98	1.82	1.34	.92	1.56	2.81	------	------	1.14	------	------
K_2O	1.68	------		1.48	3.26	.39	1.58	.48	------	------	1.76	------	------
H_2O+	1.77	------	------	5.29	6.14	5.24	4.37	5.33	------	------	------	------	------
H_2O-				12.31	11.48	15.18	10.50	11.92	------	------	[4]5.23	[5]1.81	[5]2.88
TiO_2	------	------	------	1.25	1.74	.40	1.10	1.12	------	------	1.50	------	.38
P_2O_5	.43	------	------	.69	.09	.11	.43	.05	------	------	------	[1].053	[1].041
MnO	------	------	------	.08	.08	.09	.07	.05	------	------	.10	[1].54	[1].57
SO_3	.07	------	------	------	[6].06	------	------	[6].04	------	------	------	[7].018	[7].027
Cr_2O_3	------	------	------	------	------	------	------	------	------	------	------	[8]2.41	1.36
NiO	------	------	------	------	------	------	------	------	------	------	------	1.31	.98
CoO	------	------	------	------	------	------	------	------	------	------	------	------	.08
Organic matter	3.52	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	------	[9]10.26	5.09	[10].04	[10]Nil	[10]Trace	[10]Trace	[10]Nil	8.53	8.55	[11]8.04	10.41	11.26
Total	100.37	[99.68]	100.00	100.30	100.21	99.70	99.82	100.18	99.91	99.81	100.21	[101.89]	[103.13]
Class	20,70,0	8,92,0	7,86,0	19,71,0	14,76,0	19,74,1	19,72,0	11,80,0	15,76,5	4,93,1	15,77,4	0,42,12	0,55,11

	Washington—Continued												
	126	*127	*128	*129	130	131	132	133	134	135	136	137	138
	46D4-6	46D4-35	46D4-40	46D4-38	46D8-15	46D8-16	46D8-17	46D8-26	46D10-9	46D10-3	46D17-12	46D17-24	46D17-54
SiO_2	55.64	49.19	34.21	54.62	45.2	52.6	46.1	50.0	50.96	60.13	63.90	56.60	52.5
Al_2O_3	27.41	18.44	12.41	18.47	18.5	20.9	18.4	26.3	22.36	29.10	19.42	20.46	27.0
Fe_2O_3	[12]3.37	11.93	7.41	7.63	21.4	11.7	19.1	6.07	6.52		5.75	6.42	4.8
MgO	.76	3.58	2.37	3.56	------	------	------	------	3.62	[1].65	1.80	1.03	------
CaO	.58	10.05	35.91	10.28	------	------	------	------	1.78	[1]5.03	.88	1.30	------
Na_2O	Trace	------	------	------	------	------	------	------	7.10	.29	1.81	.66	[13]2.4
K_2O												1.48	
H_2O-	------	------	------	------	------	------	------	------	[4]2.24	------	[4].76	[4]1.50	------
TiO_2	------	------	------	------	------	------	------	------	------	------	------	.47	1.3
S	------	------	------	------	------	------	------	------	------	.75	------	------	------
Ignition loss	11.29	2.87	7.04	2.98	[14]12.2	[14]11.2	[14]13.0	[14]12.8	[11]5.70	[15]4.66	[11]6.40	[11]9.90	12.0
Total	99.05	96.06	99.35	97.54	[97.3]	[96.4]	[96.6]	[95.2]	100.28	[100.61]	100.72	99.82	100.0
Class	3,93,3	3,79,0	4,55,5	13,70,0	0,90,0	2,94,0	0,91,0	0,93,0	4,84,0	11,78,10	23,73,0	13,80,4	0,96,0

	Washington—Continued						
	139	140	141	142	143	144	*145
	46D17-63	46D17-64	46D17-23	46D17-25	46D17-41	46D17-46	46D19-69
SiO_2	52.18	52.36	54.50	59.70	62.80	60.80	31.23
Al_2O_3	26.33	29.14	34.70	30.60	23.04	18.44	2.98
Fe_2O_3	3.92	3.66			1.14	6.00	[1]60.89
MgO	.52	.19	1.33	.97	.51	1.34	.45
CaO	1.24	1.34	1.10	1.00	.40	3.17	2.09
Na_2O	------	------	------	------	3.84	2.90	------
K_2O	------	------	------	------		1.32	------
H_2O-	[16]2.62	------	------	------	[4]1.65	[4]2.10	------
TiO_2	1.21	------	------	------	------	([17])	None
P_2O_5	------	------	------	------	------	------	[1].41
MnO	------	------	------	------	------	[17].40	1.85
CO_2	------	------	3.00	2.20	------	------	------
S	------	------	------	------	------	------	.07
Cr_2O_3	------	------	------	------	------	------	None
Ignition loss	12.15	14.56	[11]5.37	[11]5.33	[11]6.58	[11]3.29	------
Total	100.17	101.25	100.00	99.80	[18]99.96	99.76	[99.97]
Class	1,94,3	0,97,3	0,92,5	9,87,4	21,74,1	21,69,0	0,59,0

114

Spectrographic results of clay from drill hole 50

[Amounts in percent]

Mg	0.01 - 0.1
Ti	1 -10
V	.01 - .1
Cr	.001- .01
Mn	.01 - .1
Zr	.01 - .1
Mo	< .001
Ba	.01 - .1

[1] Calculated from reported Fe, Fe (dry), $MgCO_3$, $CaCO_3$, P or Mn.

[2] In form of concretions.

[3] Alkalies.

[4] Sample air dried, moisture at 110°C.

[5] Reported as H_2O (-105°C).

[6] SO_4^{-2}.

[7] S.

[8] Cr.

[9] At 1,000°-1,000°C, sample air dried.

[10] CO_2.

[11] Combined water, ignition.

[12] Includes FeO.

[13] Mainly alkalies and alkaline earth, by difference.

[14] At 800°C, sample dried at 130°C.

[15] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[16] At 110°C.

[17] TiO_2 = 0.40 percent. MnO___ (Shedd, 1910, p. 319).

[18] 99.76 percent in text.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

113. Wasco County. [T. 1 N., R. 13 E.], near town of The Dalles, Rockland Ridge. (Schneider, 1888, p. 236, 237, 238, 241.) Soil, reddish-brown. Mineralogy, physical properties. Chemical analyses of sized fractions also given. [For analysis of parent rock, see sample 64, group M.]

114. Washington County. Miocene and Pliocene. NW¼SW¼ sec. 1, T. 2 N., R. 3 W., 14 miles north of town of Hillsboro. Hutchison-Nixon properties. Analyst, L. L. Hoagland; spectrographic analyst, E. W. Miller; collectors, J. F. Cleaver, L. C. Swanson. Drill hole 50, sample 1. (Libbey and others, 1945, p. 1, 4, 5, 20, 24, 32-34, 35-38.) Clay, red, few oolites; depth 20-24 ft; overburden 20 ft. Tonnage estimated. Index maps, geologic sections, detailed measured section. [For other analyses from same drill hole, see sample 45, group Ha; samples 23-25, group Hb; samples 47-49, group Hbi.]

115. Washington County. [T. 1 N., Rs. 3, 4 W.], town of Forest Grove. Forest Grove Stone Co. quarries. Analyst, A. R. Sweetser. (Day, 1899, p. 434.) Sandstone. Bulk density 2.35.

116 - 120. Wheeler County. Late Oligocene and early Miocene, John Day Formation. North of town of Mitchell. (Hay, 1963, p. 200, 234, 235, figs. 2, 4, 5, 8.) Mineralogy. Index and geologic maps, geologic sections, correlated columnar sections.

116, 117. Sec. 36, T. 10 S., R. 20 E. Claystone, yellow.
  116. Analyst, H. Asari. Sample 20.
  117. Analyst, W. H. Herdsman. Sample 17. Thin-section description.

118, 119. T. 10 S., R. 21 E. Analyst, H. Asari. Claystone, yellow.
  118. Center N½SW¼ sec. 31. Sample 9.
  119. NW¼SW¼ sec. 31. Sample 19.

120. NE¼ sec. 1, T. 11 S., R. 20 E. Analyst, W. H. Herdsman. Sample 18. Claystone, pale yellowish-green.

121. Yamhill County. Oligocene. Sec. 36, T. 5 S., R. 7 W., sec. 1, T. 6 S., R. 7 W. Willamina Clay Products Co. Sample 1. (Hodge, 1938f, p. 817-820, 823, 825, 826, 848.) Clay. Tonnage estimated. Index maps. Physical properties, firing tests. Use: Face brick, refractories, tile. Possible use: Pottery, stoneware.

122. Yamhill County. [T. 4 S., R. 5 W.], about 9 miles southwest of town of McMinnville, Peavine Ridge. Willamina Clay Products Co. Sample 2. (Hodge, 1938f, p. 817, 838, 848.) Clay, white; part buff colored, plastic; overburden. Index map. Former use: Stoneware.

Washington

123. Benton County. [Holocene. T. 8 N., R. 24 E.], town of Prosser. Prosser Brick and Tile Co. Analyst, W. R. Bloor. Sample 1. (Shedd, 1910, p. 230, 231, 307, 318, 319; Glover, 1941, p. 336, 342, 343.) Clay, light-gray, plastic. Physical properties, firing tests. Former use: Brick. Possible use: Tile.

124, 125. Chelan County. [Late Cretaceous], underlies Swauk Formation. Secs. 11, 13, 14, T. 22 N., R. 17 E., 15 miles from town of Dryden. Washington Nickel Mining and Alloys Co. property. (Glover, 1942, p. 4, 5; Broughton, 1943, p. 4, 12, 14-17, pl. 1; Zapffe, 1949, p. 77, 79, 80, 81, pl. 4.) [Iron-bearing rock] brown, massive; 22 ft bed. Channel sample. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Alloy steels.
  *124. Analysis shows 2.4 percent Cr, 1.3 percent NiO; suggests 35.4 percent excess Fe_2O_3, 3.2 percent excess Al_2O_3, 4.4 percent more MgO and CaO than required for carbonate.
  *125. Analysis shows 1.4 percent Cr_2O_3; suggests 16.2 percent excess Fe_2O_3, 1.2 percent excess Al_2O_3; MgO and CaO not calculated as carbonate.

126. Chelan County. [Late Cretaceous and Paleocene], Swauk Formation. SW¼ sec. 23, T. 23 N., R. 20 E., near town of Wenatchee. Gladding, McBean, and Co., Wenatchee pit. (Hodge, 1938e, p. 495, 496, 503, 693-695, 697-699, 701.) Clay, gritty. Tonnage estimated. Index and geologic maps. Firing tests. Use: Refractories.

*127. Chelan County. N½ sec. 10, SE¼ sec. 3, T. 27 N., R. 15 E. Soda Springs deposit, Ideal Cement Co. Drill hole 53. (Danner, 1966, p. 82, 387-390, 392, 397.) Limestone, light-gray to white, medium to coarsely crystalline; interbeds of schist and quartzite; depth 93-128 ft. Index and geologic maps. Former use: Cement. *MgO and CaO not calculated as carbonate. [For other analyses from same drill hole, see samples 292, 293, group B; samples 59, 60, group E; sample 121, group F_1.]

128, 129. Chelan County. NW¼ sec. 14, T. 27 N., R. 15 E. Rainy Creek deposit. Drill hole 54. (Danner, 1966, p. 82, 387, 393-396, 397.) Limestone, white to gray, medium to coarsely crystalline. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Portland cement. [For other analyses from same drill hole, see samples 294, 295, group B; samples 61-63, group E; sample 122, group F_1.]

Washington—Continued

  *128. Depth 128-149 ft. *MgO and CaO not calculated as carbonate.
  *129. Depth 61-110 ft. *MgO and CaO not calculated as carbonate.

130 - 132. Cowlitz County. Tertiary. SE¼ sec. 17, T. 10 N., R. 1 W., about 6.5 miles northeast of town of Castle Rock. Cowlitz deposit. (Popoff, 1955, p. 1-5, 7, 11, 12, 15-18, 35.) Clay, yellow-gray; contains pebbles or concretions; thick overburden. Mineralogy. Tonnage estimated. Index and geologic maps. Log of drill hole 1. Use: Refractories.
  130. Depth 65.5-72.5 ft.
  131. Depth 60.0-65.5 ft.
  132. Depth 55.5-60.0 ft.

133. Cowlitz County. Tertiary. SE¼ sec. 18, T. 10 N., R. 1 W., about 6.5 miles northeast of Castle Rock. Cowlitz deposit. (Popoff, 1955, p. 1-5, 7, 11-16, 18, 19, 36.) Clay, gray-blue, gritty; contains pebbles; depth 29.7-37.2 ft. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections. Log of drill hole 4. Use: Refractories. Possible use: Source of alumina [implied]. [For other analyses from same drill hole, see samples 70, 71, group Hk; samples 53-61, group Ha.]

134. Ferry County. Pleistocene. [T. 40 N., R. 36 E.], near town of Laurier. Richardson property, terrace beds. Analyst, W. R. Bloor. Sample 8. (Shedd, 1910, p. 307, 318, 319; Glover, 1941, p. 88, 342, 343.) Clay. Possible use: Slip for glaze.

135. Ferry County. [T. 36 N., R. 32 E.], a few miles west of town of Republic. Analyst, A. H. Cederberg. (Landes, 1905 [1906], p. 381; Shedd, 1910, p. 318, 319; Glover, 1941, p. 336, 343.) Clay. Possible use: Brick, cement, structural ware.

136, 137. King County. Eocene and Oligocene, Puget Group. Gladding, McBean, and Co. mine. Analyst, W. R. Bloor. (Glover, 1941, p. 122, 128, 344, 345.) Measured section. Physical properties, firing tests. Use: Sewer pipe.
  136. NE¼ sec. 26, T. 21 N., R. 6 E., town of Kummer. Sample 12. (Shedd, 1910, p. 256, 257, 260, 261, 307, 319.) Clay, light-gray, plastic, fine-grained; contains very fine particles of grit. Mineralogy. Microscopic description.
  137. [Sec. 3, T. 22 N., R. 7 E.], town of Taylor. Sample 22. (Shedd, 1910, p. 263, 264, 267, 319; Wilson, 1934, p. 98-100.) Shale. Use: Brick, flue lining, roofing tile. Possible use: China, ceramic ware.

138. King County. Puget Group. S½SE¼ sec. 32, T. 24 N., R. 6 E., about 7 miles east of town of Renton. Gladding, McBean, and Co., Harris clay mine. Analyst, Anthony Centenero; collector, R. L. Nichols. Sample H-1. (Glover, 1941, p. 119, 120; Pask and Davies, 1943, p. 3, 10, 20, 22, 23, 25; Pask and Davies, 1945, p. 57, 62, 73, 74, 76, 78.) Clay. Mineralogy. Thermal analysis curve. Possible use: Source of alumina.

139. County, locality as in sample 138. [Puget Group.] Analyst, H. R. Shell. (Speil and others, 1945, p. 31, 32.) Kaolin. Mineralogy. Thermal analysis curve.

140. King County. Puget Group. S½ sec. 32, T. 24 N., R. 6 E., 3.3 miles from town of Issaquah. Gladding, McBean, and Co., Harris mine. (Hodge, 1938e, p. 761, 762-769.) Clay, dark, semiplastic, massive; some fine sandy layers. Tonnage estimated. Index map, geologic section, columnar section. Firing tests. Use: Refractories.

141, 142. King County. Puget Group. [T. 24 N., Rs. 10, 11 E.], Taylor. Gladding, McBean, and Co. mine. Samples 69, 70. (Glover, 1941, p. 122, 344, 345.) Shale. Use: Sewer pipe.

143. King County. Miocene, Hammer Bluff Formation. SE¼ sec. 28, T. 21 N., R. 6 E., 10 miles east of town of Auburn. Gladding, McBean, and Co. Analyst, W. R. Bloor. Sample 23. (Shedd, 1910, p. 269, 270, 307, 318, 319, 321; Glover, 1941, p. 137-139, 342, 343.) Clay, light-gray, plastic, very fine grained; 9 ft thick in pit; overburden. Generalized geologic section, measured section. Physical properties, firing tests. Use: Stoneware. Possible use: Terra cotta, pottery, structural ware.

144. King County. Pleistocene. [T. 24 N., Rs. 3, 4 E.], south part of town of Seattle. Seattle Brick and Tile Co. Analyst, W. R. Bloor. Sample 27. (Shedd, 1910, p. 239-241, 243, 307, 318, 319; Glover, 1941, p. 51, 338, 344, 345.) Clay; blue when wet; gray when dry; shaly, plastic; weathers yellow; 20 ft exposed. Physical properties, firing tests. Use: Brick, tile.

*145. Kittitas County. [Late Cretaceous], underlies Swauk Formation. Secs. 26, 34, 35, T. 23 N., R. 14 E., and secs. 1, 2, T. 22 N., R. 14 E., 16 miles from Lakeside railroad station. Iron Chancellor claim. Analyst, J. A. Dodge. Sample D_2. (Jenkins and Cooper, 1922, p. 73, 81, 82, pl. 1.) [Iron-bearing rock.] Tonnage estimated. Index map. *Analysis shows 1.8 percent MnO; suggests 35.2 percent excess Fe_2O_3, 1.7 percent excess Al_2O_3; MgO and CaO not calculated as carbonate.

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent clay (Group D), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued										
	146	*147	148	149	150	151	152	153	154	155	156
	46D19-1	46D19-70	46D19-5	46D21-2	46D21-3	46D21-7	46D21-6	46D22-1	46D23-1	46D40-159	46D40-158
SiO_2	58.20	35.65	52.95	55.82	59.86	60.10	54.83	60.52	60.58	59.48	58.48
Al_2O_3	23.83	------	15.69	19.43	19.43	16.61	21.25	19.37	18.42	18.24	[1]17.92
Fe_2O_3	4.61	[2]49.78	11.85	2.38	5.15	8.55	7.00	5.95	7.90	6.92	6.76
MgO	1.40	.19	2.04	.46	1.70	1.29	1.04	1.65	1.53	3.62	2.95
CaO	.67	2.96	4.40	1.13	1.40	1.43	.80	1.94	8.16	2.95	5.26
Na_2O	3.15	------	2.09	.95	.32	[3].80	[4].69	1.99	------	2.21	1.98
K_2O			1.11	.80	.38	[3]1.18	[4].36			1.95	1.10
H_2O+	------	------	[5]4.01	------	------	------	------	------	[6]1.83	------	------
H_2O-	[7]1.28	------	[8]2.19	[7]7.72	[7]2.78	[7]3.04	[7]5.30	[7]4.02	[8]1.81	------	------
TiO_2	.06	------	2.57	1.15	1.15	.98	1.06	------	------	------	------
P_2O_5	------	[2]1.95	.19	------	------	------	------	------	------	------	------
MnO	------	[2]8.66	------	2.04	.61	------	------	------	------	------	------
S	------	.02	------	------	------	------	------	------	------	------	------
Cu	------	Trace	------	------	------	------	------	------	------	------	------
C (organic)	------	------	.63	------	------	------	------	------	------	------	------
Ignition loss	[9]6.42	------	[10]None	[9]7.82	[9]6.48	[9]6.60	[9]7.62	[9]4.74	------	5.26	4.26
Total	99.62	[99.21]	99.72	[11]99.70	99.26	100.58	99.95	100.18	100.23	100.63	[1]98.71
Class	11,83,0	0,68,0	12,75,0	19,73,3	20,74,1	21,74,1	9,86,1	20,75,0	19,71,0	19,71,0	19,68,0

	Washington—Continued										
	157	158	159	160	161	162	163	164	165	166	167
	46D40-157	46D40-161	46D25-25	46D26-1	46D26-4	46D26-33	46D26-32	46D26-3	46D26-29	46D26-31	46D26-13
SiO_2	58.76	57.68	60.26	59.32	61.58	63.28	62.96	57.53	54.10	60.80	65.60
Al_2O_3	19.42	15.74	19.08	20.04	20.29	18.64	18.82	28.37	32.38	26.20	27.12
Fe_2O_3	8.82	8.14	8.48	5.76	5.95	7.52	7.35				
MgO	1.34	3.75	1.93	2.33	2.30	3.16	3.62	4.50	.86	3.15	------
CaO	6.48	5.77	.67	1.54	1.34	1.97	2.00	1.88	7.03	9.74	6.16
Na_2O	.66	1.41	.46	5.05	2.01	[12]1.07	------	------	------	------	------
K_2O	1.01	1.32	1.90			1.70	------	------	------	------	------
H_2O-	------	------	------	[7]1.64	[7]1.94	------	------	------	------	------	------
TiO_2	------	------	------	.06	------	------	------	------	------	------	------
SO_3	------	------	Trace	------	------	------	------	------	------	------	------
Ignition loss	3.10	6.17	7.40	[9]3.76	[9]4.14	2.26	3.00	------	------	------	------
Total	99.59	99.98	[100.18]	99.50	99.55	99.60	97.75	[92.28]	[94.37]	[99.89]	[98.88]
Class	14,76,0	21,67,0	17,77,1	17,73,0	19,75,0	22,70,0	21,71,0	10,83,1	0,92,0	17,70,0	20,74,0

	Washington—Continued										
	168	169	170	171	172	173	174	175	176	177	178
	46D26-30	46D26-66	46D26-54	46D27-1	46D28-8	46D28-6	46D28-5	46D28-9	46D29-56	46D29-64	46D29-61
SiO_2	54.68	44.16	54.88	58.40	59.40	55.81	56.35	59.92	57.06	54.18	58.75
Al_2O_3	22.15	[13]19.63	20.08	19.57	19.58	[14]26.28	[14]24.62	21.08	16.16	18.05	[14]25.94
Fe_2O_3	9.09	6.09	7.57	5.20	6.44			4.56	8.30	9.91	
MgO	2.52	2.15	3.08	1.83	4.13	[2]1.62	[2]1.23	2.90	3.20	4.51	[2]2.14
CaO	2.03	13.06	3.98	4.66	4.26	[2]2.43	[2]2.05	3.88	5.96	4.17	[2]2.61
Na_2O	1.42	------	------	[15]3.92	.41	3.98	3.94	.97	2.22	1.04	1.48
K_2O	1.75	------	------		.75			1.16		1.17	
H_2O-	------	------	------	[16]6.45	------	6.11	7.52	------	------	------	[16]4.60
S	------	------	------	------	------	Trace	.31	------	------	------	------
Ignition loss	4.78	14.36	8.61	------	4.38	[17]3.68	[17]2.96	4.74	[9]6.22	[18]6.98	[17]4.38
Total	98.42	99.45	[19]98.20	100.03	99.35	[99.91]	[98.98]	99.21	99.12	100.01	[99.90]
Class	5,85,0	3,74,18	11,79,4	18,72,0	18,72,0	12,76,8	15,74,6	18,73,0	19,69,0	11,79,0	15,74,9

[1] Al_2O_3=17.29 percent, total=98.69 percent (Shedd, 1913, p. 248).

[2] Calculated from reported Fe(iron), $MgCO_3$, $CaCO_3$, P or Mn.

[3] Na_2O=1.18 percent, K_2O=0.80 percent (Shedd, 1910, p. 319).

[4] Na_2O=0.36 percent, K_2O=0.69 percent (Shedd, 1910, p. 319).

[5] At redness.

[6] Above 110°C.

[7] Sample air dried; moisture at 110°C.

[8] At 110°C.

[9] Combined water; ignition.

[10] CO_2.

[11] 100.00 percent in text.

[12] Na_2O=0.70 percent (Shedd, 1913, p. 248).

[13] Al_2O_3=19.06 percent (Shedd, 1913, p. 250).

[14] Iron and aluminum oxides.

[15] Alkalies.

[16] Combined water.

[17] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[18] Combined water, ignition; sample air dried.

[19] Ignition loss=7.61 percent, total=97.21 percent (Shedd, 1913, p. 248).

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

146. Kittitas County. Eocene, Roslyn Formation. [T. 20 N., R. 15 E.],town of Roslyn. Analyst, W. R. Bloor. Sample 28. (Shedd, 1910, p. 318, 319; Glover, 1941, p. 164, 344, 345.) General: Shale varies from gray to almost black; fine grained, grading into coarser sandy phases.

*147. Kittitas County. [Ts. 19, 20 N., R. 13 E.],south of town of Easton, Big Creek district. Analyst, J. A. Dodge. Sample N_3. (Jenkins and Cooper, 1922, p. 86.) [Iron-bearing rock.] *Analysis shows 8.7 percent MnO; suggests 4.6 percent phosphate, 18.2 percent excess Fe_2O_3; CaO and MgO not calculated as carbonate.

148. Kittitas County. [Probably T. 26 N., R. 30 E.],Hanson Creek. Analyst, George Steiger. Record 2028. (Clarke, 1904, p. 370; Calkins, 1905, p. 47.) Soil, residual. [For analysis of similar parent material, see sample 87, group M.]

149, 150. Lewis County. Pleistocene, Willapa Clays. [Sec. 33, T. 11 N., R. 2 W.], a little east of town of Sopenah. Little Falls Fire Clay Co. Analyst, W. R. Bloor. Samples 30, 31. (Shedd, 1910, p. 294, 295, 296, 307, 318, 319; Glover, 1941, p. 184, 185, 338, 344, 345.) Physical properties, firing tests. Use: Brick, sewer pipe, draintile.

149. Clay, light-yellow, plastic. Possible use: Structural ware.
150. Clay, light-gray, fine-grained.

151, 152. Lewis County. [Holocene. NW¼ T. 14 N., R. 2 W.],town of Centralia. Wingard Brothers Brick Yard. Analyst, W. R. Bloor. Samples 32, 33. (Shedd, 1910, p. 298, 299, 307, 318, 319.) Clay, fine-grained, plastic. Physical properties, firing tests. Use: Brick, draintile.

151. Clay, light-yellow. 152. Clay, dark-yellow.

153. Lincoln County. [T. 25 N., R. 38 E.],Mondovi railroad station. H. T. Ahrens property. Analyst, W. R. Bloor. Sample 34. (Shedd, 1910, p. 219, 220, 307, 318, 319; Glover, 1941, p. 338, 346, 347.) Clay, light-brown, plastic, very little grit. Physical properties, firing tests. Use: Brick, tile.

154. Mason County. Sec. 31, T. 23 N., R. 3 W., Lilliwaup Falls. Lilliwaup Stone quarry, abandoned. Analyst, R. W. Thatcher. (Shedd, 1903, p. 49-51, 134, 136, 138, 141.) General: Andesitic tuff, dark-gray, fine- to coarse-grained; from a few inches to 4 ft thick. Bulk density 2.726. Mineralogy. Physical properties. Use: Dimension stone [implied].

155, 156. Okanogan County. Pleistocene. T. 35 N., R. 25 E., near town of Riverside, Scotch Creek basin. Analyst, A. A. Hammer. Samples 5, 6. (Shedd, 1913, p. 167, 168, 169, 248, pl. 21; Glover, 1941, p. 192, 193, 346, 347.) Clay, blue, plastic, some grit. Index maps. Possible use: Portland cement.

155. Sec. 25. Hess property.

157. County, age, analyst, references,and use as in samples 155, 156. [T. 35 N., R. 25 E.],near town of Conconully. Pendergass property. Sample 7. Clay, earthy, plastic, gritty. Index map.

158. County, age, analyst, references,and use as in samples 155, 156. [T. 39 N., R. 29 E.], 1 mile east of town of Havilla. Sample 3. Clay, light-yellow, fine-grained, free from grit, plastic. Index map.

159. Pacific County. Miocene, Astoria Formation. SE¼SE¼ sec. 20, T. 10 N., R. 10 W. Bear River deposit. (Danner, 1966, p. 82, 431, 433.) Shale, sample taken across 12 ft. Index and geologic maps.

160. Pend Oreille County. Pleistocene. [T. 31 N., R. 46 E.],southeast of town of Newport. Analyst, W. R. Bloor. Sample 81. (Shedd, 1910, p. 212, 213, 307, 320, 321; Glover, 1941, p. 201, 205, 346, 347.) Clay, yellow, plastic, stratified. Physical properties, firing tests.

161. Pend Oreille County. Pleistocene. T. 38 N., R. 43 E., near town of Portland. Pacific Portland Cement Co. Analyst, W. R. Bloor. Sample 80. (Shedd, 1910, p. 214, 215, 307, 320, 321; Shedd, 1913, p. 180, 182, 186, 187, pl. 21; Glover, 1941, p. 201, 346, 347.) Clay; yellow or buff at surface, blue at depth; fine grained; plastic; some grit; 50 ft thick. Mineralogy. Index maps. Physical properties, firing tests; microscopic description. Use: Brick. Possible use: Portland cement.

162 - 167. Pend Oreille County. Pleistocene. T. 38 N., R. 43 E., near town of Cement. Jordan property. (Shedd, 1913, p. 180, 187, 188, 248, pl. 21; Glover, 1941, p. 201, 346, 347.) Index maps.

162, 163. Analyst, A. A. Hammer. Possible use: Portland cement.

162. Railroad cut. Sample 10. Clay, yellowish, earthy, stratified.
163. Sample 11. Clay, yellowish-brown, massive, fine-grained, plastic; some grit.

164, 165. Clay, blue, fine-grained, plastic; some grit.

164. Analyst, C. M. Fassett. Sample 13.
165. Analyst, O. P. Moore. Sample 23.

166, 167. Analyst, O. P. Moore. Samples 24, 25. Clay, buff, fine-grained, plastic; some grit.

168. County, locality, and maps as in samples 162-167. Analyst, A. A. Hammer. Sample 7. (Shedd, 1913, p. 180, 186, 250, pl. 21.) Shale, very light gray, finely laminated. Possible use: Portland cement.

169, 170. Pend Oreille County. T. 39 N., R. 43 E., town of Metaline Falls. Analyst, A. A. Hammer. Samples 5, 8. Index maps.

169. Sullivan Creek. (Shedd, 1913, p. 180, 193, 250, pl. 21.) Shale, light-colored, fine-grained, stratified.
170. (Shedd, 1913, p. 180, 189, 190, 248, pl. 21.) Clay, buff, fine; some sand; 12-15 ft thick. Use: Portland cement.

171. Pierce County. Pleistocene. [T. 21 N., R. 2 E.],Gig Harbor. Sample 2. (Geijsbeek, 1911, p. 753, 755, 763, 764.) General: Clay, blue; intermixed with gravel. Index map. Use: Brick.

172. San Juan County. Pleistocene. [T. 35 N., R. 2 W.], Lopez Island, 3.5 miles north of town of Lopez. Analyst, A. A. Hammer. (Shedd, 1910, p. 290; Glover, 1941, p. 217, 339, 348, 349.) Clay; light gray when dry; light blue when wet; fairly plastic; few sandy layers; 30 ft thick. Possible use: Brick, draintile.

173, 174. San Juan County. Pleistocene. [T. 36 N., R. 4 W.],town of Roche Harbor. Samples 4, 5. (Landes, 1905 [1906], p. 378; Glover, 1941, p. 217, 339, 348, 349.) Clay, interstratified with sand; free from grit; some beds at least 40 ft thick. Firing tests. Possible use: Cement, brick and related ware.

174. Analyst, F. C. Newton.

175. San Juan County. Pleistocene. Sec. 21, T. 37 N., R. 1 W., Orcas Island, East Sound. Old brick yard pit. Analyst, A. A. Hammer. Sample 46. (Shedd, 1913, p. 206, 249, pl. 21; McLellan, 1927, p. 170; Glover, 1941, p. 217, 348, 349.) Clay, light-gray with a slightly yellowish tinge; fine grained; some grit; plastic; at least 20 ft thick. Index and geologic maps, geologic sections. Former use: Brick. Possible use: Portland cement.

176. Skagit County. Pleistocene. [T. 35 N., R. 8 E.],town of Concrete. Washington Portland Cement Co. pit. Analyst, R. M. White. Sample 48. (Shedd, 1910, p. 282, 283, 320, 321; Glover, 1941, p. 218, 220, 348, 349.) General: Clay; gray when dry; light blue when wet; some layers plastic, some sandy. Use: Brick, portland cement, tile.

177. Skagit County. Pleistocene. [T. 35 N., R. 8 E.],near Concrete. Analyst, A. A. Hammer. Sample 49. (Shedd, 1910, p. 283, 307, 320, 321; Shedd, 1913, p. 226, 227, 249, pl. 21; Glover, 1941, p. 220, 339, 348, 349.) Clay, light-gray, very fine grained. Index map. Possible use: Portland cement.

178. Skagit County. Pleistocene. [NE¼ T. 35 N., R. 8 E.],near Concrete. Washington Portland Cement Co. Analyst, C. W. Johnson. Sample 3. (Landes, 1905 [1906], p. 380; Shedd, 1910, p. 282, 283, 320, 321; Glover, 1941, p. 218, 220, 348, 349.) Clay; gray when dry; light blue when wet; stratified; some layers plastic, some sandy; average thickness 165 ft. Use: Brick, portland cement, tile.

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent clay (Group D), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued										
	179	180	181	182	183	184	185	186	187	188	*189
	46D29-60	46D29-57	46D29-59	46D29-55	46D29-58	46D29-54	46D29-62	46D29-66	46D29-63	46D31-3	46D31-60
SiO_2	55.90	57.24	57.42	56.78	57.36	56.64	56.18	56.04	49.65	53.56	46.86
Al_2O_3	[1]25.50	24.76	24.68	25.56	25.06	25.80	17.37	22.56	19.94	25.26	9.28
Fe_2O_3							8.89	8.70	9.27	8.86	[2]24.38
MgO	[2]1.35	4.86	4.58	4.30	4.56	4.26	4.14	3.87	6.32	2.05	2.44
CaO	[2]2.75	5.44	5.66	5.12	5.36	5.26	4.60	.45	2.58	2.66	.22
Na_2O	3.91	------	------	------	------	------	1.76	3.18	3.28	.27	------
K_2O							1.43			.43	------
H_2O	[3]6.45	------	------	------	------	------	------	[4].30	[4]2.15	------	(s)
TiO_2	------	------	------	------	------	------	------	.11	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	------	------	[2].055
CO_2	[2]3.63	------	------	------	------	------	[6]5.03	[6]4.96	[6]5.85	[7]6.02	------
S	.51	------	------	------	------	------	------	------	------	------	13.52
Total	[100.00]	[92.30]	[92.34]	[91.76]	[92.34]	[91.96]	99.40	100.17	99.04	99.11	[8][96.76]
Class	13,75,8	16,72,3	16,72,3	14,75,4	15,73,3	13,75,3	15,72,0	6,86,0	4,77,12	0,93,0	3,81,0

	Washington—Continued										
	190	191	192	193	194	195	196	*197	*198	199	200
	46D32-35	46D32-17	46D32-2	46D32-1	46D32-41	46D32-46	46D32-49	46D32-48	46D32-47	46D32-53	46D32-10
SiO_2	47.1	41.63	62.34	55.20	59.92	40.72	40.54	40.50	40.42	60.08	58.13
Al_2O_3	22.8	8.69	24.86	29.25	16.65	4.96	5.19	5.26	5.18	28.83	19.01
Fe_2O_3	12.7	25.99	2.13	2.58	8.25	29.57	31.24	31.40	31.32	3.79	6.84
FeO	------	------			------	.71	.39	.26	.16	------	------
MgO	------	.33	.04	.03	3.71	.74	.06	.04	.00	1.03	3.17
CaO	------	1.78	.22	.20	2.22	1.98	1.92	1.88	1.76	.76	2.06
Na_2O	------	.22	2.56	1.29	2.02	------	.14	.25	.17	------	1.51
K_2O	------	.32		.64	2.14	------	.24	.29	.19	------	2.03
H_2O+	------	9.91	------	------	------	6.66	6.00	[9](6.13)	------	[9](6.03)	------
H_2O-	------	10.67	------	------	------	15.46	14.75	------	------	------	------
TiO_2	5.8	------	.71	.80	------	.02	------	.0	.0	------	------
MnO	------	------	------	------	------	------	------	.0	.0	------	------
Li_2O	------	Trace	------	------	------	------	------	.0	.0	------	------
Ignition loss	[10]8.7	------	7.94	10.20	[11]5.19	------	------	20.90	20.80	[6]5.46	[11]7.14
Total	[97.1]	99.54	100.80	100.19	100.10	100.82	100.47	[100.8]	[100.0]	[99.95]	99.89
Class	0,86,0	0,95,1	16,81,0	1,96,0	21,69,0	0,96,0	0,95,0	0,80,3	0,80,3	5,93,0	17,74,1

	Washington—Continued										
	201	202	203	204	205	206	207	208	209	210	211
	46D32-11	46D32-12	46D32-44	46D32-45	46D41-218	46D41-196	46D41-180	46D41-179	46D41-183	46D41-181	46D41-185
SiO_2	59.04	60.55	49.48	46.06	58.15	57.56	64.57	65.18	58.06	61.64	61.18
Al_2O_3	25.74	26.37	16.30	12.22	16.90	22.48	24.95	24.44	29.04	24.20	24.96
Fe_2O_3	5.08	2.43	3.12	18.54	9.22	10.40	1.16	2.71	1.82	2.10	8.04
FeO	------	------	------	.28	------	------			------	------	------
MgO	.06	------	4.69	1.62	3.02	3.14	.73	.41	1.02	.78	.10
CaO	.22	1.20	2.15	1.66	[12]2.15	.45	.21	.36	------	.30	2.06
Na_2O	Trace	------	.03	------	[12]1.36	------	.73	.87	1.75	.16	------
K_2O	.12	------	.36	------	[12]1.71	------				2.38	------
H_2O+	------	------	9.44	17.26	------	------	------	------	------	------	------
H_2O-	[4].39	------	14.41						[4]1.18	[4].52	------
TiO_2	.52	------	.62	.84	------	------	------	.52	------	.50	------
P_2O_5	------	------	Trace	------	------	------	------	------	------	------	------
MnO	------	------	.05	------	------	------	------	------	------	------	------
Ignition loss	[6]8.81	[6]8.60	------	------	4.12	2.78	7.08	6.18	[6]7.56	[6]7.56	------
Total	99.98	[99.15]	100.65	98.48	[13]96.63	96.81	99.43	100.67	100.43	100.14	[96.34]
Class	8,91,1	11,86,2	17,76,0	4,91,3	18,71,0	6,87,0	19,78,1	19,80,0	5,93,0	16,79,2	8,90,0

See following page for footnotes.

Semiquantitative spectrographic analyses

[Analyst for sample P, G.V. Wheeler; analyst for sample S, W. Burkhardt. (a) Element detected; present in too small concentration for spectrochemical determination by procedures employed. (b) Presence not detected; limit of detectability by procedure employed is as yet uncertain]

	196			196			196	
	P	S		P	S		P	S
Li	------	[a]< 0.09	Co	------	< 0.001	Zr	------	0.009
Be	------	<.0005	Cu	0.002	.0004	Mo	0.005	<.003
B	------	<.006	Zn	------	<.03	Ag	------	<.0001
Sc	------	(b)	Ga	------	<.001	Cs	------	(b)
V	------	.005	Rb	------	<.01	Ba	.007	[a]<.04
Cr	------	<.0007	Sr	.007	[a]<.03	Tl	------	<.00003
Mn	0.002	.04	Y	------	<.005	Pb	.02	<.02
Ni	------	<.001						

DESCRIPTIVE NOTES

[*Underscored page numbers in reference indicate source of analysis*]

Washington—Continued

179. Skagit County. Pleistocene. [T. 35 N., R. 8 E.], near town of Concrete. Washington Portland Cement Co. Analyst, F. C. Newton. Sample 4. (Landes, 1905 [1906], p. 380; Shedd, 1910, p. 282, 283, 320, 321; Glover, 1941, p. 218, 220, 348, 349.) Clay; gray when dry; light blue when wet; stratified; some layers plastic, some sandy; average thickness 165 ft. Use: Brick, portland cement, tile.

180 - 184. County, age, and locality as in sample 179. Analyst, R.M. White. Samples 52-56. (Shedd, 1913, p. 222, 249, pl. 21; Glover, 1941, p. 339, 348, 349.) Deposit: Clay, light-gray, stratified; some sandy layers; about 30 ft thick. Index map. Use: Portland cement.

185. Skagit County. Pleistocene. [T. 35 N., R. 9 E.], 1 mile north of town of Sauk. Analyst, A. A. Hammer. Sample 50. (Shedd, 1910, p. 283, 320, 321; Shedd, 1913, p. 228, 229, 249, pl. 21; Glover, 1941, p. 348, 349.) Clay; light gray when dry; bluish when wet; very fine grained, no grit; stratified; uniform; more than 40 ft thick. Index map. Possible use: Portland cement.

186. Skagit County. [E¼ T. 36 N., R. 4 E.], town of Prairie. M. M. Clothier property. Analyst, W. R. Bloor. Sample 47. (Shedd, 1910, p. 307, 320, 321.) Clay.

187. Skagit County. Holocene. [Sec. 7, T. 36 N., R. 4 E.], town of Alger. Bellingham Brick and Tile Co. Analyst, W. H. Fuller. Sample 46. (Shedd, 1910, p. 280-282, 307, 320, 321; Glover, 1941, p. 222, 223, 348, 349.) Clay, blue-gray; deposit at least 100 ft thick. Physical properties, firing tests. Use: Brick, tile.

188. Snohomish County. Pleistocene. [T. 27 N., R. 10 E.], about 2 miles up river from town of Index. Analyst, A.A. Hammer. Sample 60. (Shedd, 1913, p. 233,234,250; Glover, 1941, p. 225,348,349.) Clay; blue when wet; light gray when dry; very fine grained, uniform; finely stratified; at least 15 ft thick. Possible use: Portland cement, structural ware.

*189. Snohomish County. NE¼ sec. 36, T. 29 N., R. 8 E., 15 miles northeast of town of Sultan. Lockwood Pyrite deposit. Sample 5. (Zapffe, 1949, p. 37, 39, 40.) [Iron-bearing rock], contains pyrrhotite and pyrite. Mineralogy. Tonnage estimated. Possible use: Source of iron, sulfuric acid. *Analysis shows 13.5 percent S; MgO and CaO not calculated as carbonate.

190. Spokane County. Miocene. NW¼ sec. 22, T. 24 N., R. 44 E., about 11 miles southeast of town of Spokane. Drill hole M-77. (Hosterman and others, 1960, p. 2-4, 12-15, 20, 25, 26, 37, 62, pl. 3.) Clay, blue, yellow; depth 5.0-18.0 ft; overburden averages 21.4 ft. Weighted composite sample; samples taken at about 5-foot intervals or where clay showed a marked change. Mineralogy. Bulk density averages 1.64. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Source of alumina, ilmenite, gallium.

191. Spokane County. Miocene. SE¼SE¼ sec. 16, T. 24 N., R. 44 E., about 12 miles southeast of Spokane. Excelsior clay deposit. Analyst, J. Husted; collectors, V. T. Allen, V. E. Scheid. (Scheid and others, 1945, p. 2, 16, 20, 21, pl. 1, fig. 1.) General: Nontronite; veins of yellow-green clay. Index and geologic maps. Optical properties; photomicrograph.

192, 193. Spokane County. Probably Miocene. Sec. 23, T. 24 N., R. 44 E., near town of Mica. Gladding, McBean, and Co. (Hodge, 1938e, p. 495, 496, 503, 510, 516, 517, 526-529, 531-533, 534, 535, 537.) Overburden. Channel sample. Mineralogy. Tonnage estimated. Index and geologic maps; detailed measured section.
  192. Clay, white and light-gray, plastic, some micaceous sand; average thickness 12 ft. Use: Refractory cement, sewer pipe, tile.
  193. Clay, gray; includes sandy layers; average thickness 35 ft. Use: Refractories.

194. Spokane County. Sec. 1, T. 23 N., R. 44 E., town of Freeman. Washington Brick, Lime, and Sewer Pipe Co. pit. Analyst, A. A. Hammer. Sample 66. (Shedd, 1910, p. 190, 191, 193, 320, 321; Glover, 1941, p. 231, 233, 241, 339, 350, 351.) Clay, deep-reddish-brown; 60 ft thick. Mineralogy. Index and geologic map, generalized geologic section. Physical properties, firing tests; microscopic description. Use: Brick.

195. Spokane County. SW¼ sec. 5, T. 23 N., R. 45 E., about 17 miles southeast of Spokane. Analyst, J. G. Fairchild. Sample 59. (Ross and Hendricks, 1945, p. 32, 35, 39-46.) Nontronite, yellowish-green. Mineralogy. Relation of ions to crystal structure.

Washington—Continued

196. Spokane County. NW¼ sec. 8, T. 23 N., R. 45 E., 1 mile east of town of Manito. Analyst, under direction of W. C. Bowden. (Kerr and Kulp, 1949, p. 69,70,73; Kerr and others, 1949, p. 35, fig. 17; Kerr and others, 1950a, p. 42; Kerr and others, 1950b, p. 40, 55; Wheeler and Burkhardt, 1950, p. 71, 80, 81; La Habra Laboratory, California Research Corporation, 1950, p. 132; Lewis, 1950, p. 93, 103.) Nontronite, green, waxy, massive. Mineralogy. Index map. Differential thermal analysis curve; base exchange capacity; size composition; spectrogram.

197, 198. Spokane County. [T. 23 N., R. 45 E.], Manito. (Whitehouse and others, 1960, p. 12, 48, table 2.) Nontronite. Physical properties; electron microscopic description. Nine samples analyzed.
  *197. Each value is upper limit of each constituent analyzed. *Analysis suggests 3.0 percent excess Fe_2O_3.
  *198. Each value is lower limit of each constituent analyzed. *Analysis suggests 2.9 percent excess Fe_2O_3.

199. Spokane County. SW¼ sec. 30, T. 25 N., R. 45 E. Barkuloo prospect. Analyst, C.M. Fassett. Sample 235. (Glover, 1941, p.231,233,350,351.) Clay, gray. Index and geologic map, generalized geologic section.

200 - 202. Spokane County. Middle to late Miocene, Latah Formation. SE¼ sec. 35, T. 25 N., R. 44 E., 2.5 miles east of town of Chester. Sommers pit. (Glover, 1941, p.231,233,253,254,350,351.) Maximum thickness 45 ft; overburden 1-6 ft. Index and geologic map, generalized geologic section.
  200, 201. (Shedd, 1910, p. 175, 177, 178, 180, 181, 307, 320, 321.)
    Use: Face brick, firebrick, sewer pipe.
    200. Analyst, A.A. Hammer. Sample 67. Clay, light-gray.
    201. Analyst, W. R. Bloor. Sample 63. Clay, light-yellow, streaked, coarse-grained, sandy, little plasticity. Mineralogy. Physical properties, firing tests; microscopic description.
  202. Sample 234. Clay, light-gray.

203, 204. Spokane County. [T. 25 N., Rs. 42, 43 E.], Spokane. Collector, Edward Sampson. (Ross and Hendricks, 1945, p. 31, 32, 34, 35, 39-46, 51, 55, 70.) Mineralogy. Relation of ions to crystal structure.
  203. Analyst, J. G. Fairchild. Sample 21. Montmorillonite-beidellite, salmon-buff; fillings of vesicular cavities in basalt. Ridgway color notation.
  204. Analyst, E. V. Shannon. (Ross and Shannon, 1925, p. 467, 468.) Iron-beidellite, pistachio-green; interbedded with basalt flows. Optical properties; base exchange capacity; dehydration curve; indices of refraction and birefringence.

205, 206. Stevens County. Tertiary [implied]. Analyst, A. A. Hammer. (Shedd, 1913, p. 144, 145, 151, 152, 251, pl. 21; Glover, 1941, p. 280, 352, 353.) Large deposit. Index map. Possible use: Portland cement.
  205. T. 35 N., R. 37 E., 6 miles south of town of Kettle Falls. Sample 28. Shale, brown, finely laminated, fine-grained.
  206. [T. 38 N., R. 39 E.], 4 miles east of town of Bossburg. Bonanza mine. Sample 34. Shale, bluish; in thin layers.

207, 208. Stevens County. Latah Formation. Secs. 29, 32, T. 30 N., R. 42 E., 6 miles northeast of town of Clayton. Washington Brick, Lime, and Sewer Pipe Co., A. B. pit. (Hodge, 1938e, p. 495, 496, 503, 590-592, 593.) Deposit: Clay, white, plastic, some iron stain; minable depth 16 ft; overburden 2 ft. Tonnage estimated. Index and geologic maps. Firing tests. Use: Firebrick, terra cotta.

209, 210. Stevens County. Probably correlative of Latah Formation. NE¼NW¼ sec. 32, T. 30 N., R. 42 E., about 7 miles by road north of Clayton. Washington Brick, Lime, and Sewer Pipe Co., A. B. pit. Analyst, W. R. Bloor. Samples 76, 77. (Shedd, 1910, p. 28, 207-209, 210, 307, 320, 321; Glover, 1941, p. 233, 287, 350, 351.) Clay, almost white, plastic, stratified; 20 ft exposed, overburden 10-12 ft. Index and geologic map. Physical properties, firing tests; microscopic description. Use: Pottery, stoneware. Possible use: Refractories.

211. Stevens County. Probably correlative of Latah Formation. SW¼ sec. 34, T. 30 N., R. 42 E., Clayton district. Deer Park Natural Pigment Co., old Neafus clay pit. Analyst, Richard Marsh. Sample 273. (Glover, 1941, p. 233, 290, 350, 351.) General: Clay, nearly white, fine-grained, plastic; 8-11 ft thick. Index and geologic map, generalized measured section. Use: Pottery, stoneware.

Footnotes of analyses on preceding page:

[1] Iron and aluminum oxides.

[2] Calculated from reported Fe, $MgCO_3$, $CaCO_3$, and (or) P.

[3] Combined water.

[4] Sample air dried; moisture at 110°C.

[5] Reported as H_2O(-110°C) = ?.

[6] Combined water, ignition.

[7] Ignition loss.

[8] With sample 107, group Fe, and other samples not recorded: As_2O_3 = 0.05 percent; Pb, Zn, Ni, Cr, Se, and Sb absent or nearly so.

[9] Not included in total.

[10] At 950°C.

[11] Moisture and combined water, ignition.

[12] CaO = 2.57 percent, Na_2O = 1.71 percent, K_2O = 1.36 percent(Shedd, 1913, p. 251).

[13] 99.63 percent in text.

Table 4.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing more than 75 percent clay (Group D), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	212	213	214	215	216	217	218	219	220	221	222	223	*224
	46D41-187	46D41-200	46D41-202	46D41-203	46D41-204	46D41-195	46D41-192	46D41-194	46D41-191	46D41-199	46D41-198	46D41-189	46D43-161
SiO_2	43.49	56.98	50.68	56.48	57.68	52.94	51.12	60.14	55.90	56.72	57.16	62.56	40.60
Al_2O_3	19.59	17.74	19.79	20.52	22.60	22.12	21.26	20.00	20.69	15.69	16.10	23.96	4.78
Fe_2O_3	27.56	7.22	9.45	7.16	8.26	6.72	9.12	5.68	7.55	9.34	8.26	4.70	[1]36.84
MgO	------	4.08	3.15	3.49	2.08	3.91	4.26	2.85	2.32	3.13	4.06	Trace	.55
CaO	.98	5.25	6.48	4.18	5.95	2.99	3.48	4.07	3.63	4.43	4.15	------	1.80
Na_2O	------	.86	2.31	------	------	4.62	3.29	------	------	1.09	1.13	1.12	------
K_2O	------	1.31								1.19	1.46		
H_2O-	------	------	------	------	------	[2]1.56	[2]1.34	------	------	------	------	[2].92	[3].96
TiO_2	------	------	------	------	------	.06	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	------	[1].082
MnO	------	------	------	------	------	------	------	------	------	------	------	------	[1].26
S	------	------	------	------	------	------	------	------	------	------	------	------	3.09
Cu	------	------	------	------	------	------	------	------	------	------	------	------	.075
Ignition loss	9.77	6.07	7.20	5.10	1.69	[4]4.98	[4]5.70	4.50	6.40	[4]6.64	7.13	[4]6.84	8.26
Total	[101.39]	99.51	[5]99.06	[6]96.93	98.26	99.90	99.57	97.24	96.49	98.23	[7]99.45	100.10	[97.30]
Class	0,84,2	17,71,0	5,82,0	12,77,0	8,82,0	6,82,0	3,85,0	18,72,0	11,80,0	18,70,1	20,68,2	15,84,0	0,84,0

	Washington—Continued											
	225	*226	*227	*228	*229	230	231	232	233	234	235	*236
	46D34-3	46D34-5	46D37-157	46D37-154	46D37-155	46D37-159	46D37-160	46D37-18	46D37-24	46D37-25	46D37-23	46D37-106
SiO_2	57.36	14.90	34.8	31.3	32.0	46.5	48.8	47.84	58.20	59.92	57.06	36.5
Al_2O_3	18.79	7.25	17.8	14.4	17.2	16.9	16.2	35.14	18.17	17.85	[8]26.80	9.3
Fe_2O_3	6.68	54.05	38.8	45.5	38.3	28.6	23.1		[9]6.95	7.31		[1]41.61
MgO	2.42	------	------	------	1.59	------	------	.20	3.28	3.15	[1].54	------
CaO	3.89	------	------	------	.04	------	------	1.29	3.47	6.08	[1]5.95	------
Na_2O	.10	------	------	------	------	------	------	------	------	------	2.56	------
K_2O	1.06	------	------	------	------	------	------	------	------	------		
H_2O	[2]3.56	[10]18.20	------	------	6.31	------	------	[11]15.90	------	------	------	------
TiO_2	.50	------	------	------	.22	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	[1].48	------	------	------	------	------	------	[1].167
MnO	------	------	------	------	[1].18	------	------	------	------	------	------	------
CO_2	------	------	------	------	[12]2.18	------	------	------	------	------	[1]5.26	------
S	------	------	------	------	.015	------	------	------	------	------	------	.01
NiO	------	------	------	------	.57	------	------	------	------	------	------	[13].82
Cr_2O_3	------	------	------	------	.91	------	------	------	------	------	------	[14]1.50
Organic matter	------	2.80	------	------	------	------	------	------	------	------	------	------
Ignition loss	[4]3.58	------	[15]5.48	[15]5.56	[16](8.49)	[15]7.02	[15]7.20	------	6.00	5.42	------	11.8
Total	[17]97.94	[97.20]	[96.9]	[96.8]	[100.0]	[99.0]	[95.3]	100.37	96.07	99.73	[98.17]	[101.7]
Class	17,73,0	0,51,0	0,66,0	0,61,0	0,62,4	0,88,0	0,91,0	0,92,0	19,71,0	20,70,0	12,73,12	0,78,0

	Washington—Continued				
	237	238	239	240	241
	46D38-7	46D38-8	46D38-9	46D38-6	46D39-2
SiO_2	39.92	40.24	42.60	44.00	55.63
Al_2O_3	5.37	4.94	5.86	6.41	18.25
Fe_2O_3	29.46	30.17	30.15	31.90	3.88
FeO	.28	None	------	------	------
MgO	.93	.39	.24	.13	1.03
CaO	2.46	2.36	.19	.14	1.13
Na_2O	Trace	None	3.51	2.80	.90
K_2O	Trace	None	.09	.07	1.38
H_2O+	7.00	6.79	16.75	------	------
H_2O-	14.38	15.29			[2]7.25
TiO_2	.08	.02	.24	.05	.75
P_2O_5	------	------	.07	.02	------
MnO	------	------	.03	------	------
SO_3	------	------	------	------	.42
V_2O_5	------	------	------	------	.10
Cr_2O_3	------	------	------	------	.11
SrO	------	------	------	------	.13
ZrO_2	------	------	------	------	.18
BaO	------	------	------	------	.03
Ignition loss	------	------	------	14.40	[4]8.57
Total	99.88	100.20	99.73	99.92	99.74
Class	0,94,0	0,95,0	0,94,1	0,94,1	19,73,4

Semiquantitative spectrographic analyses

[Analyst for sample P, G.V. Wheeler; analyst for sample S, W. Burkhardt. (a) Presence uncertain by reason of interference at the only characteristic spectral lines exhibited. (b) Presence not detected; limit of detectability by procedure employed is as yet uncertain. (c) Possible presence suspected; limit of detectability by procedure employed still uncertain. (d) Element detected; present in too small concentration for spectrochemical determination by procedures employed]

	237			237	
	P	S		P	S
Li	Faint trace	< 0.09	Ga	0.004	< 0.001
Be	------	<.0005	Rb	------	(a)
B	------	<.006	Sr	.05	.08
Sc	------	(b)	Y	------	<.005
V	------	.002	Zr	------	(c)
Cr	------	<.0007	Mo	------	<.003
Mn	------	<.002	Ag	------	<.0001
Ni	0.007	.006	Cs	------	(b)
Co	------	<.001	Ba	.003	d<.04
Cu	.001	.0006	Tl	------	<.00003
Zn	------	<.03	Pb	------	<.02

[1] Calculated from reported Fe (dry), $MgCO_3$, $CaCO_3$, P and (or) Mn.

[2] Sample air dried; moisture at 110°C.

[3] H_2O (-110°C).

[4] Combined water, ignition.

[5] Reported as 99.11 percent (Shedd, 1913, p. 146); 98.72 percent (Shedd, 1913, p. 249).

[6] Reported as 98.93 percent (Shedd, 1913, p. 249).

[7] Reported as 99.51 percent (Shedd, 1913, p. 249).

[8] Iron and aluminum oxides.

[9] Iron.

[10] Moisture.

[11] Moisture (H_2O).

[12] Ignition loss minus H_2O; calculated by compilers.

[13] Ni.

[14] Cr.

[15] Includes H_2O.

[16] Includes H_2O; not included in total.

[17] Reported as 99.91 percent (Shedd, 1910, p. 276).

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

212. Stevens County. Middle to late Miocene, Latah Formation. SW¼ sec. 34, T. 30 N., R. 42 E., about 7 miles north of town of Deer Park. Analyst, K. A. Johnson. (Wilson, 1929, p. 2, 22-24, 25-38; Glover, 1941, p. 290.) Ocher-sienna mixture; 3.5-5 ft thick; overburden. Beneficiation tests. Use: Pigments.

213. Stevens County. Pleistocene. [T. 36 N., R. 38 E.], town of Kettle Falls. Analyst, A. A. Hammer. (Shedd, 1910, p. 218, 219; Shedd, 1913, p. 143, 144, 249; Weaver, 1920, p. 338, 341, pl. 1.) Clay, light-gray, very fine grained, free from grit; more than 40 ft thick; overburden 10-15 ft. Index and geologic map, geologic sections. Use: Brick. Possible use: Portland cement.

214-216. Stevens County. Pleistocene. Analyst, A. A. Hammer. Samples 39, 41, 42. (Shedd, 1913, p. 146, 147, 148, 249, pl. 21; Glover, 1941, p. 294-296, 352, 353.) Index map. Possible use: Portland cement, slip for glaze, common red ware.
  214. [T. 37 N., R. 37 E.], 0.75 mile from town of Marcus, railroad cut. Clay, dark-gray, fine-grained, compact.
  215, 216. [T. 37 N., R. 38 E.], about 0.5 mile north and a little east of town of Evans, roadcut. Clay, light-gray, fine-grained, stratified.

217, 218. Stevens County. Pleistocene. [SW¼ T. 38 N., R. 38 E.], near town of Bossburg. Spokane Pottery Co. Analyst, W. R. Bloor. Samples 78, 79. (Shedd, 1910, p. 217, 218, 307, 321; Glover, 1941, p. 295, 296, 352, 353.) Clay; dark with bluish cast when wet; light gray when dry; plastic. Physical properties, firing tests. Use: Glaze for stoneware. Possible use: Brick, draintile.

219, 220. Stevens County. Pleistocene. Bossburg. Analyst, A. A. Hammer. (Shedd, 1913, p. 103, 151, 249, pl. 21; Glover, 1941, p. 294-296, 352, 353.) Clay, light-gray, fine-grained, finely stratified, free from grit. Possible use: Portland cement, slip for glaze, common red ware.
  219. [SW¼ T. 38 N., R. 38 E.] Sample 43.
  220. [T. 38 N., R. 38 E.] Rasmussens place. Sample 40. Clay, uniform, fairly plastic. Index map.

221. Stevens County. Pleistocene. Sec. 36, T. 40 N., R. 39 E., near town of Northport, railroad cut. Analyst, A. A. Hammer. Sample 84. (Shedd, 1910, p. 216, 321; Shedd, 1913, p. 156, 157, 158, 249; Weaver, 1920, p. 338, 343, pl. 1.) Clay, yellowish, compact, fine-grained, free from grit, plastic. Index and geologic map, geologic sections. Former use: Brick. Possible use: Portland cement.

222. Stevens County. Pleistocene. [T. 40 N., Rs. 40, 41 E.], about 2 miles northeast of Northport, railroad cut. Analyst, A. A. Hammer. Sample 36. (Shedd, 1913, p. 156, 157, 158, 249; Glover, 1941, p. 295, 296, 352, 353.) Clay, gray, earthy, compact, stratified, fine-grained; free from gritty material. Possible use: Cement material.

223. Stevens County. Sec. 19, T. 29 N., R. 42 E., town of Clayton. Washington Brick, Lime, and Manufacturing Co. Analyst, W. R. Bloor. Sample 70. (Shedd, 1910, p. 200-202, 205, 206, 307, 320, 321; Glover, 1941, p. 233, 282, 284, 350, 351.) Clay, light-yellow, sandy, plastic; about 6 ft thick. Mineralogy. Index and geologic map, generalized geologic section. Physical properties, firing tests, microscopic description. Use: Face brick, terra cotta.

*224. Stevens County. [NW¼ sec. 3, T. 37 N., R. 37 E.], Kelly Hill. Napoleon mine. (Zapffe, 1949, p. 20, 21.) Limonite, brown, soft; occurs as thick mantle. Tonnage estimated. Sample of oxidized material; not typical of deposit. Former use: Low heat cement, flux. *Analysis shows 3.1 percent S; suggests 6.9 percent excess Fe_2O_3; MgO and CaO not calculated as carbonate.

225. Thurston County. Pleistocene. [T. 18 N., R. 2 W.], town of Olympia. Analyst, W. R. Bloor. Sample 86. (Shedd, 1910, p. 275, 276, 307, 320, 321; Glover, 1941, p. 301, 340, 352, 353.) Clay; light gray when dry; slightly greenish when wet; fine grained; free from grit; fairly plastic. Physical properties, firing tests. Possible use: Brick, structural ware.

*226. Thurston County. Holocene. SE¼SW¼ sec. 6, T. 17 N., R. 1 E., 9 miles east of Olympia, shore of Lake St. Clair. (Patty and Glover, 1921, p. 109; Glover, 1942, p. 21; Huntting, 1956, p. 31.) Limonite, 2-6 ft thick. Tonnage estimated. Index map. Former use: Paint pigment. *Analysis suggests 5.8 percent excess Al_2O_3, 43.1 percent excess Fe_2O_3.

227-231. Whatcom County. Early Tertiary. N½ sec. 2, T. 39 N., R. 4 E., 4 miles east of town of Everson. Sumas Mountain Iron deposit. Analyst, W. H. Ott. (Moen, 1962, p. 105, 109, 110-112, pls. 1, 4.) Mineralogy. Average bulk density of five samples 3.0. Tonnage estimated. Index and geologic maps, geologic sections. Use: None.
  *227. Sample 1. Siltstone, medium-brown. Channel sample taken across 5.0 ft. *Analysis suggests 9.6 percent excess Al_2O_3, 20.9 percent excess Fe_2O_3.
  *228. Sample 2. Claystone, grayish-red. Channel samples taken across 4.5 ft. *Analysis suggests 8.5 percent excess Al_2O_3, 27.0 percent excess Fe_2O_3.
  *229. Sample 6. Claystone, grayish-brown. Channel sample taken across 3.0 ft. *Analysis shows 0.9 percent Cr_2O_3; suggests 9.7 percent excess Al_2O_3, 21.7 percent excess Fe_2O_3.
  230. Sample 7. Claystone, grayish-brown. Channel sample taken across 3.0 ft.
  231. Sample 5. Siltstone, medium yellowish-brown. Channel sample taken across 5.0 ft.

232. Whatcom County. Eocene, Chuckanut Formation. SE¼ sec. 12, T. 40 N., R. 4 E., 3 miles southeast of town of Sumas. Denny-Renton Clay and Coal Co., old clay mine. Analyst, A. G. Smith. Sample 91. (Shedd, 1910, p. 286-288, 320, 321; Glover, 1941, p. 306, 311-313, 352, 353.) Clay. Index map, detailed measured section. Former use: Terra cotta, fire clay.

233. Whatcom County. Pleistocene. [Sec. 33, T. 39 N., R. 2 E.], town of Brennan. Olympic Portland Cement Co. pit. (Shedd, 1913, p. 217; Glover, 1941, p. 319, 341, 352, 353.) Clay. Firing tests. Possible use: Brick, tile.

234. Whatcom County. Pleistocene. Sec. 9, T. 40 N., R. 5 E., about 5 miles northwest of town of Kendall. Jacobs farm. Analyst, A. A. Hammer. Sample 61. (Shedd, 1913, p. 209, 213, 214, pl. 21; Glover, 1941, p. 319, 352, 353; Moen, 1962, p. 85, 86, pl. 1.) Clay, gray to yellow, fine-grained, no grit. Index and geologic map, geologic sections. Possible use: Brick, portland cement [implied].

235. Whatcom County. Pleistocene. [Sec. 34, T. 40 N., R. 5 E.], near Kendall, along railroad. Analyst, A. H. Cederberg. Sample 4. (Landes, 1905 [1906], p. 379; Glover, 1941, p. 319, 352, 353.) Clay; at least 50 ft thick. Possible use: Cement.

*236. Whatcom County. Sec. 2, T. 39 N., R. 4 E., and sec. 35, T. 40 N., R. 4 E., 3 miles southeast of Nooksack station. Sumas Mountain deposits. (Zapffe, 1949, p. 53, 54, 55.) Deposit: [Iron-bearing rock] laterite, brown to red, mainly fine grained, massive, dense; maximum thickness 30 ft, usually 20 ft. Tonnage estimated. Possible use: Pigment, production of iron. *Analysis suggests 3.9 percent excess Al_2O_3, 17.6 percent excess Fe_2O_3.

237. Whitman County. S½NE¼ sec. 4, T. 17 N., R. 45 E., 1 mile south of town of Garfield, roadcut. Analyst, under direction of W. C. Bowden. Sample 33a. (Kerr and Kulp, 1949, p. 69, 70, 72; Kerr and others, 1949, p. 35, fig. 17; Kerr and others, 1950a, p. 42; Kerr and others, 1950b, p. 23, 40, 55; Wheeler and Burkhardt, 1950, p. 71, 80, 81; La Habra Laboratory, California Research Corporation, 1950, p. 132; Bray and Stevens, 1950, p. 93, 102; Hunt, 1950, p. 109, 117.) Nontronite, green, waxy, massive; in veins 1-3 ft thick. Mineralogy. Index map. Differential thermal analysis curve, base exchange capacity, size composition, X-ray data, spectrogram, infrared spectrum.

238. Whitman County. Sec. 4, T. 17 N., R. 45 E., 1 mile south of Garfield, roadcut. Analyst, N. Davidson. (Allen and Scheid, 1946, p. 297, 298.) Nontronite, yellow; in veins 1-6 in. wide. Optical properties.

239, 240. Whitman County. [T. 18 N., R. 45 E.], near Garfield. Nontronite. Physical properties.
  239. (Osthaus, 1953, p. 405, 406, 410.)
  240. (Osthaus, 1956, p. 302, 304, 318, 320.)

241. Yakima County. Holocene. [T. 13 N., R. 18 E.], North Yakima. C. A. Rhodes property. Analyst, W. R. Bloor. Sample 95. (Shedd, 1910, p. 320, 321; Glover, 1941, p. 332, 341, 352, 353.) Clay.

Table 5.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing clay and carbonate each less than 75 percent; clay and carbonate each greater than uncombined silica (Group E), common- and mixed-rock categories

[Samples of mixed-rock category indicated by an asterisk(*). Chemical analyses arranged by State, quadrangle or county, and stratigraphic position]

Chemical analyses

	Alaska												
	1	2	3	4	5	6	7	8	9	*10	11	12	13
	50E5-8	50E5-7	50E5-12	50E6-2	50E23-3	50E52-55	50E52-54	50E52-19	50E156-2	50E156-10	50E154-40	50E154-41	50E154-42
SiO_2	18.0	16.3	32.8	33.00	43.83	47.6	41.8	25.5	24.0	21.3	28.7	22.5	21.55
Al_2O_3	1.8	.95	3.2	13.1	12.59	12.6	11.2	5.6	7.1	14.6	6.55	4.75	4.35
Fe_2O_3	1.0	1.1	1.6	2.08	6.79	4.2	4.3	2.1	4.4	11.4	2.88	1.43	1.85
MgO	.97	.59	.62	3.89	3.82	2.6	2.1	2.0	2.0	1.3	3.1	1.5	3.0
CaO	37.0	37.8	21.9	18.2	13.85	14.5	19.9	33.5	31.0	21.6	29.2	37.0	35.7
Na_2O	.48	.48	.82	.83	4.10	1.2	1.7	1.3	------	------	------	------	------
K_2O	.28	.34	.39	.46		2.2	1.5	.70	------	------	------	------	------
H_2O	------	------	------	[1]5.29	------	------	------	------	------	------	------	------	------
TiO_2	------	------	------	.10	.92	------	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	[2].19	.12	.14	.06	.07	.25	------	------	------
SO_3	------	------	------	------	------	.19	------	.64	1.26	7.24	.01	.01	.01
NaCl + KCl	------	------	------	------	------	------	------	------	.80	.62	------	------	------
Ignition loss	[3]39.3	[3]40.0	[3]36.8	[4]18.55	[5]13.91	14.2	16.9	28.2	[6]25.4	[6]17.4	------	------	------
Total	[98.8]	[97.6]	[98.1]	[7][95.5]	[100.00]	[99.4]	[99.5]	99.6	96.0	95.7	[70.4]	[67.2]	[66.5]
Class	14,16,68	13,15,69	25,31,40	7,46,41	14,54,20	21,48,22	17,44,29	13,22,59	6,32,57	0,39,35	14,27,59	12,18,69	12,18,70
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	------	------	------	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued											Idaho	
	14	15	16	17	18	19	*20	*21	*22	*23	*24	*25	26
	50E154-121	50E155-1	50E155-135	50E155-136	50E155-139	50E124-20	50E124-15	50E124-18	50E124-16	50E124-17	50E124-14	11E4-8	11E9-5
SiO_2	18.0	21.4	26.0	19.0	22.8	28.6	17.8	21.4	19.2	19.8	15.8	18.4	27.5
Al_2O_3	4.82	5.90	8.90	5.15	5.25	[8]8.2	[8]5.4	[8]6.8	[8]6.4	[8]6.2	[8]4.2	3.7	6.6
Fe_2O_3	2.18	1.70	4.30	1.05	1.35							1.8	.9
FeO	------	------	------	------	------	------	------	------	------	------	------	------	1.4
MgO	4.9	1.1	.6	.1	.1	5.3	3.7	5.4	3.3	5.6	6.2	------	3.3
CaO	34.8	37.0	31.0	41.0	37.6	29.6	29.3	33.3	33.3	35.0	30.9	25.0	30.3
Na_2O	------	------	------	------	------	------	------	------	------	------	------	------	.68
K_2O	------	------	------	------	------	------	------	------	------	------	------	------	1.7
H_2O+	------	------	------	------	------	[9]1.1	[9]7.9	[9].9	[9]3.7	[9]1.6	[9]6.5	------	1.4
H_2O-	------	------	------	------	------	[10]1.16	[10].81	[10]1.08	[10].71	[10]1.05	[10].72	------	
TiO_2	------	------	------	------	------	------	------	------	------	------	------	.3	.23
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	10.2	.07
MnO	------	------	------	------	------	------	------	------	------	------	------	------	.12
CO_2	------	------	------	------	------	20.9	12.3	24.2	20.6	24.9	16.2	4.6	26.2
SO_3	2.15	.62	------	------	------	1.3	18.6	3.0	8.15	3.1	16.05	[11]3.4	[12].31
NaCl	------	------	------	------	------	.01	.01	.01	.01	.01	.01	------	------
Total	[66.8]	[67.7]	[70.8]	[66.3]	[67.1]	[96.2]	[95.8]	[96.1]	[95.4]	[97.3]	[96.6]	[13][97.0]	100.7
Class	7,20,69	9,22,68	5,37,57	9,18,73	12,19,67	15,24,46	9,15,27	10,20,53	8,18,46	9,18,55	9,12,35	10,43,10	15,22,58
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	------	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	------	Magnesian calcite

	Idaho—Continued												
	27	*28	29	30	31	32	33	34	35	36	37	38	39
	11E45-43	11E15-2	11E15-3	11E35-35	11E35-6	11E35-40	11E35-36	11E35-37	11E35-21	11E35-16	11E35-20	11E35-22	11E35-17
SiO_2	23.84	22.5	[14]7.52	[15]17.2	37.94	[15]44.8	[15]18.5	[15]19.0	37.28	18.42	37.20	41.34	23.96
Al_2O_3	4.68	4.5	1.77	12.0	9.22	13.4	9.2	3.9	12.88	8.29	11.44	15.63	9.16
Fe_2O_3	------	------			4.10			1.2					
MgO	8.57	1.4	38.28	1.4	3.74	4.6	1.6	.3	1.42	2.85	2.54	4.04	1.81
CaO	24.39	21.8	1.18	34.9	23.28	19.2	37.2	40.2	25.76	36.46	25.80	20.06	35.67
$Na_2O + K_2O$	------	------	------	------	[16].88	------	------	------	------	------	------	------	------
H_2O+	------	------	[17]15.41	------	2.63	------	------	------	------	------	------	------	------
H_2O-	------	------	[18]1.06	------									
P_2O_5	[19]6.02	8.9	------	------	------	------	------	------	------	------	------	------	------
CO_2	23.55	13.4	34.97	[20]35.8	18.21	[20]17.0	[20]33.6	[19]31.4	------	------	------	------	------
V	.02	.11	------	------	------	------	------	------	------	------	------	------	------
Cr	.03	------	------	------	------	------	------	------	------	------	------	------	------
Organic matter	[19]6.36	[19]23.3	------	------	------	------	------	------	------	------	------	------	------
Total	[97.46]	[95.9]	100.19	[101.3]	100.00	[99.0]	[100.1]	[96.0]	[77.34]	[66.02]	[76.98]	[81.07]	[70.60]
Class	16,20,49	15,37,25	5,21,67	0,34,65	17,37,40	22,39,30	3,27,70	11,15,71	16,38,44	5,24,71	18,33,45	15,46,33	9,27,61
CaO/MgO	Calcite	Calcite	Magnesite	Magnesian calcite	Magnesian calcite	------	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

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[1] Ignition loss at 600°C (C.L. Grant, oral comm., Jan. 29, 1965).

[2] P_2O_3.

[3] Includes ignition loss due to oxidation of FeO.

[4] CO_2 (C.L. Grant, oral commun. Jan. 29, 1965).

[5] Reported as loss, CO_2, H_2O, organic.

[6] CO_2, 400°-1,000°C, direct combustion. Sample 9, ignition loss = 26.6 percent, sample 10, ignition loss = 21.9 percent; not included in total.

[7] Ca, Na, K, determined by flame photometer; SiO_2 determined gravimetrically; other elements determined spectrochemically. Sample dried at 110°C.

[8] R_2O_3.

[9] Comb. H_2O.

[10] Free H_2O.

[11] S.

[12] Sulfur soluble in aqua regia, calculated as FeS_2.

[13] V_2O_5 = 0.69 percent, MoO_3 = 0.07 percent, F = 0.2 percent, ignition loss = 28.7 percent; subtotal = 97.1 percent, less O = 0.1 percent.

[14] Includes insoluble.

[15] Acid insoluble (chiefly SiO_2).

[16] Alkalies and undetermined.

[17] Above 105°C.

[18] Below 105°C.

[19] Calculated from reported MgO, $CaCO_3$, P and (or) C.

[20] Loss on ignition (chiefly CO_2).

Spectrochemical analysis of sample 4

[Values in ppm. ND = not detected (less than 1 ppm), e = extrapolated value]

V	^{e}160	Mn	75	Co	6.2	Zn	665	Mo	ND	Sn	1.8
Cr	281	Ni	^{e}261	Cu	155	Ga	.85	Sr	282	Ba	1120

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1, 2. Anchorage quadrangle. Holocene. [Sec. 11, T. 17 N., R. 1 W.], Knik Arm area, Wasilla Lake. Analysts, E. A. Nygaard, S. M. Berthold. (Moxham and Eckhart, 1956, p. 3, 6, 8, 12-14, 15, 16, 18, 19, pl. 1.) Marl, white to very light gray, plastic; contains mollusk fragments and plant remains. Composite sample. Tonnage estimated. Index and geologic maps, geologic section, columnar sections. Possible use: Portland cement.

1. Auger hole 2, sample 4. 2. Auger hole 3, sample 5.

3. Quadrangle, age, analysts, reference, maps, and use as in samples 1, 2. [Sec. 33, T. 18 N., R. 1 E.], Finger Lake. Auger hole 3, sample 6. Marl; light tan when wet; buff to grayish white when dry; at least 8-21 ft thick where drilled; overburden. Tonnage estimated. Columnar section.

4. Arctic quadrangle. Permian and Triassic, part of undifferentiated Sadlerochit and Shublik Formations. [About 3.1, 13.7], rolling foothills on north side of Porcupine Lake, Brooks Range. (Ugolini, Tedrow and Grant, 1963, p. 115-118, 119-122.) Shale, black, hard. Mineralogy, thin-section description, pH values. C/N ratios, differential thermal analyses, cation-exchange capacity.

5. Blying Sound quadrangle. Holocene [implied]. Lat 59°32' N., long 148°45' W., off southern Alaska coast. Analyst, Willard Woodstock. Sample 4. (Tyler, 1931, p. 12-15, 16-20.) Mud, bottom sample, fossiliferous. Depth of water 276 ft. Mineralogy. Index maps.

6, 7. Healy quadrangle. Pre-Devonian. [About 6.75-7.35, 7.5-7.7], ridge southwest of mouth of West Fork, Windy Creek area. Analysts, A. C. Vlisidis, Leonard Shapiro. Lab. Nos. 1915C, 1940C. (Moxham, Eckhart, and Cobb, 1959, p. 69, 88-91, 92, 93, pl. 11.) Argillite, red, green, and yellow, mottled; about 200 ft thick; little overburden. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

8. Quadrangle, reference, maps, sections, and use as in samples 6, 7. Devonian(?). [5.8-6.7, 7.8-8.0], headwaters of West Fork of Windy Creek. Analysts, Leonard Shapiro, L. E. Reichen, S. M. Berthold. Lab. No. 1927C. Limestone, dark- to bluish-gray, fine-grained, very dense, massive, locally banded; weathers light gray. Chip sample.

9, 10. Healy quadrangle. Middle Devonian. [5.8-6.7, 7.8-8.0], headwaters of West Fork of Windy Creek. Samples 502, 510. (Warfield, 1962, p. 3, 12, 13, 15-18.) Limestone, dark-gray to blue-gray, fine-grained, dense, recrystallized; contains calcite veinlets. Estimated thickness 3,100 ft. Representative sample from channel 50 ft in length. Index and geologic maps. Possible use: Portland cement, mineral wool.

*10. Analysis suggests 15.6 percent gypsum, 6.6 percent excess Al_2O_3, 5.1 percent excess Fe_2O_3.

11-13. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 E. unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 98-101, 109, 112, 114, 123, figs. 1, 3, 35-37, 39-41.) Limestone, black, fine-grained, contains calcite veinlets, shale partings. Total depth of diamond-drill hole 395 ft. Index and geologic maps, geologic section; log of drill hole 8. Possible use for deposit: Portland cement; magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 59-61, group F_1; samples 419-491, group F_2.]

11. Depth 390-395 ft.
12. Depth 385-390 ft.
13. Depth 380-385 ft.

14. Quadrangle, age, locality, analyst, reference, maps, and use as in samples 11-13. Limestone, black, silicified; depth 575-580 ft. Total depth of diamond-drill hole 620 ft. Geologic section, log of drill hole 9. [For other analyses from same drill hole, see samples 23-25, group B; samples 4, 5, group C; samples 62, 63 group F_1; samples 492-608, group F_2.]

15. Quadrangle, age, locality, analyst, reference, maps, and use as in samples 11-13. Limestone, black, fine-grained; depth 280-284 ft. Total depth of diamond-drill hole 284 ft. Geologic section, log of drill hole 11. [For other analyses from same drill hole, see sample 6, group C; sample 64, group F_1; samples 649-702, group F_2.]

16-18. Healy quadrangle. Triassic. [2.45-2.75, 2.85-3.3], West Fork of Chulitna River. Analyst, H. E. Peterson. Samples 192, 191, 188. (Rutledge and others, 1953, p. 4, 87, 118-120, 123, figs. 1, 3, 26, 43.) Outcrop description: Limestone, white to gray, fossiliferous; fractured and weathered; interbedded with siliceous material. Index and geologic maps. Possible use: Cement, rock wool.

Alaska—Continued

19-24. Sitka quadrangle. [19.0, 16.25], Chichagof Island, Iyoukeen Cove. Gypsum-Camel deposit. Analyst, H. E. Peterson. (Jermain and Rutledge, 1952, p. 1, 3, 4, 5, figs. 1-6.) General: Gypsum, mostly white, fine-grained, translucent. Overburden. Index and geologic maps, geologic sections, measured section.

19. Sample 1. Clay, blue and brown; with gypsum.

*20. Sample 6. Gypsum, some clay seams. *Analysis suggests 40.0 percent gypsum, 5.4 percent more MgO and CaO than required for carbonate.

*21. Sample 7. Gypsum with some gravel. *Analysis suggests 6.4 percent gypsum, 9.6 percent more MgO and CaO than required for carbonate.

*22. Sample 8. Gypsum with some gravel. *Analysis suggests 17.5 percent gypsum, 5.7 percent more MgO and CaO than required for carbonate.

*23. Sample 9. Gypsum with some gravel. *Analysis suggests 6.7 percent gypsum, 8.3 percent more MgO and CaO than required for carbonate.

*24. Sample 17. Gypsum with some clay seams. *Analysis suggests 34.5 percent gypsum, 7.3 percent more MgO and CaO than required for carbonate.

Idaho

*25. Bear Lake County. [Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. T. 14 S., R. 43 E.], Paris Canyon. Metals Reserve Co. Lot No. 6-15. (Ravitz and others, 1949, p. 308, 309, 314.) Shale. Use: None. *Analysis shows 3.4 percent S; 0.7 percent V_2O_5; suggests 24.2 percent phosphate, 5.7 percent more CaO than required for carbonate.

26. Bonner County. Precambrian, Wallace Formation. T. 56 N., R. 2 E., southeast end of Howe Mountain. Quarry. Analysts, P. L. D. Elmore, S. D. Botts, I. H. Barlow, Gillison Chloe. Lab. No. 155260. (Harrison and Jobin, 1963, p. K3, K15, K36, K37, pl. 1.) Limestone, blue-gray. Index and geologic maps, geologic sections. Possible use: Cement.

27. Caribou County. Phosphoria Formation [Meade Peak Phosphatic Shale Member. Secs. 2, 11, T. 8 S., R. 42 E.] Conda mine. Sample S5. (Emigh, 1958, p. 27, 28, 30, fig. 1.) General: When fresh, phosphatic dolomitic shale, black, fine-grained, dense; when weathered, shale, brown, fossiliferous; 17-24 ft thick. Mineralogy, thin-section description. Index map.

*28. Caribou County. Phosphoria Formation. [T. 8 S., R. 42 E.], town of Conda. (Stickney and Wells, 1955, p. 8, 10, 11.) [Limestone, phosphatic, argillaceous]; 18 ft thick. Composite of channel samples. Beneficiation tests. Possible use: None [implied]. *Analysis suggests 21.1 percent phosphate.

29. Caribou County. Possibly Tertiary or Quaternary. [T. 9 S., R. 42 E.], within 4 miles of town of Soda Springs. Analyst, E. V. Shannon. Sample 94140. (Yale and Stone, 1923, p. 12, 13; Mansfield, 1927, p. 2, 333, 334, pls. 1, 19.) General: Hydromagnesite, white, earthy-textured, friable, amorphous; 2-4 ft thick. Index and geologic maps, generalized columnar section. Possible use: General uses of magnesite including refractories.

30-34. Nez Perce County. Late Triassic. (Savage, 1965, p. 18a, 18b, 18c, 19, 20, pls. 1, 2, fig. 1.) Tonnage estimated. Index and geologic maps, geologic section. Possible use: Portland cement.

30, 31. Martin Bridge Formation. NW¼ sec. 34, T. 32 N., R. 5 W., Lime Point.

30. Analyst, Huey-rong Hsi. Sample 2Km. [Limestone.] Possible use: Aggregate, ballast, flux, lime.

31. Analyst, A. B. Lort; collector, H. S. Gale. Lab. No. 3747. (Eckel, 1913, p. 136-138, 139.) Shale, average from prospect pit. Use: Portland cement.

32, 33. Hurwal Formation. SE¼ sec. 36, T. 33 N., R. 5 W., near mouth of Madden Creek. Analyst, Huey-rong Hsi. Samples, 3Hh, 3Ch. Limey shale.

34. Sec. 34, T. 32 N., R. 5 W., east of Lime Point. Sample 41s. [Limestone.] Possible use: Aggregate, ballast, flux, lime.

35-39. Nez Perce County. [Late Triassic. Sec. 34, T. 32 N., R. 5 W.], Lime Point. Samples 1-5. (Shedd, 1913, p. 119.) Shale.

35, 36. Analyst, Elton Fulmer.

37-39. Analyst, H. C. Johansen.

Table 5.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing clay and carbonate each less than 75 percent; clay and carbonate each greater than uncombined silica (Group E), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Idaho—Continued				Oregon								
	40	41	42	43	44	45	46	47	48	49	50	51	52
	11E35-19	11E35-15	11E35-18	11E40-9	36E3-30	36E10-40	36E15-6	36E27-10	36E27-8	36E27-6	36E27-11	36E27-9	36E27-12
SiO_2	35.74	17.74	26.87	37.88	17.35	45.2	31.77	32.64	31.32	18.30	33.06	31.86	34.24
Al_2O_3	13.65	9.08	11.84	9.13	6.13	1.7	9.80	[1]19.24	[1]16.50	[1]10.30	[1]14.82	7.69	7.47
Fe_2O_3				------		[2]12.0	3.96					[3]4.75	[3]9.45
FeO	------	------	------	[2]4.33	------	------	------	------	------	------	------		
MgO	3.47	2.16	2.14	[2]8.96	[2].61	18.3	4.19	[2]4.58	[2]3.06	[2]1.98	[2]2.51	[2]1.59	[2]4.62
CaO	25.07	39.13	31.75	[2]13.50	[2]40.69	.18	27.56	[2]20.41	[2]24.93	[2]36.65	[2]25.23	[2]28.95	[2]21.65
$Na_2O + K_2O$	------	------	------	4.00	------	------	------	------	------	------	------	------	------
H_2O	------	------	------	------	[4]1.31	------	1.54	------	------	------	------	------	------
TiO_2	------	------	------	.41	------	------	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	------	[2].02	------	------	------	------	------	------	------
MnO	------	------	------	[2].20	------	------	------	------	------	------	------	------	------
CO_2	------	------	------	[2]20.88	[2]32.60	------	20.36	[2]21.03	[2]22.91	[2]30.94	[2]22.54	[2]24.47	[2]22.04
S	------	------	------	------	------	.003	.03	------	------	------	------	------	------
Cr	------	------	------	------	------	.64	------	------	------	------	------	------	------
Ni	------	------	------	------	------	1.7	------	------	------	------	------	------	------
Co	------	------	------	------	------	.013	------	------	------	------	------	------	------
Total	[77.93]	[68.11]	[72.60]	99.29	[98.69]	[79.8]	99.21	[97.90]	[98.72]	[98.17]	[98.16]	[99.31]	[99.47]
Class	13,40,41	3,27,67	7,35,55	22,26,43	7,18,74	29,34,32	10,37,45	0,54,46	4,45,51	1,29,70	8,41,50	13,32,55	10,41,48
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Dolomite	Calcite	------	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Oregon—Continued					Washington							
	53	54	55	56	57	58	59	60	*61	62	63	64	65
	36E27-5	36E27-7	36E27-3	36E28-2	36E28-3	46E2-7	46E4-34	46E4-32	46E4-41	46E4-39	46E4-36	46E4-53	46E4-51
SiO_2	15.38	18.82	24.08	17.74	52.84	26.28	24.49	30.40	24.70	32.01	30.37	40.43	19.24
Al_2O_3	6.58	4.77	15.66	7.01	19.98	15.32	4.21	6.54	9.69	20.70	8.78	8.61	4.19
Fe_2O_3	[3]5.70	[3]4.05				1.57	1.86	2.90	4.76	3.58	2.26	3.42	1.72
MgO	[2]2.05	[2]1.69	2.74	[2].42	[2]2.18	Trace	1.05	1.85	2.84	2.31	1.49	1.80	.95
CaO	[2]37.25	[2]37.87	31.58	[2]41.42	[2]10.53	28.72	38.85	34.56	35.97	21.22	32.42	27.82	45.27
H_2O-	------	------	[5]3.56	[4].42	------	------	------	------	------	------	------	------	------
CO_2	[2]31.47	[2]31.57	20.24	[2]32.96	[2]10.65	[6]27.17	[6]27.73	[6]21.82	[6]21.70	[6]19.24	[6]23.00	[6]17.63	[6]27.62
Total	[98.43]	[98.77]	[97.86]	[99.97]	[96.18]	99.06	98.19	98.07	99.66	99.06	98.32	99.71	98.99
Class	0,27,71	6,23,71	0,44,45	6,19,75	19,57,23	0,46,51	15,17,59	16,27,44	2,41,41	0,56,32	12,32,46	21,34,33	10,17,59
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	------	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite

	Washington—Continued											
	66	*67	68	*69	70	71	72	73	74	75	76	77
	46E4-50	46E4-47	46E4-45	46E4-59	46E4-54	46E5-2	46E10-2	46E16-6	46E16-5	46E16-4	46E23-5	46E23-6
SiO_2	35.15	39.91	20.92	40.10	43.79	41.96	18.9	31.06	16.46	13.86	25.17	26.84
Al_2O_3	9.26	12.02	5.44	12.27	13.04	11.06	[1]7.2	8.46	[7]8.87	5.74	[7]13.34	[7]13.84
Fe_2O_3	5.25	3.71	2.60	3.88	1.16	6.26		10.94		2.02		
MgO	2.24	2.05	2.00	1.98	1.92	2.20	[2]2.2	2.17	.84	.44	1.51	1.45
CaO	28.05	27.36	40.93	24.89	22.52	19.88	[2]37.0	25.11	40.66	41.66	34.26	33.42
$Na_2O + K_2O$	------	------	------	------	------	------	[8]2.1	------	------	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	.020	------	.049	.118
S	------	------	------	------	------	------	Trace	------	------	------	------	------
Ignition loss	17.83	15.15	28.84	13.83	14.77	15.06	[9]31.4	20.04	[10]32.74	32.67	[10]24.63	[10]23.89
Total	97.78	100.20	100.73	96.95	97.20	[96.42]	[98.8]	[97.78]	[99.59]	[96.39]	[98.96]	[99.56]
Class	13,40,32	14,45,25	8,23,60	14,46,22	19,42,25	15,48,24	7,20,71	4,52,34	2,26,69	1,22,70	3,39,48	4,40,46
CaO/MgO	------	------	Magnesian calcite	------	------	------	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, BaO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2]

	74	76	77		74	76	77		74	76	77
Na_2O	0.86	1.17	1.27	Cr_2O_3	0.0030	0.0023	0.0041	CuO	0.0026	0.035	0.037
K_2O	.71	.90	------	MnO	.35	6.84	3.00	SrO	.019	.022	.02
TiO_2	.11	.078	.22	NiO	.003	.066	.044	ZrO_2	.010	.012	.013
V_2O_5	.0084	.036	.032	CoO	------	.0053	.006	Ag_2O	------	.0023	.0010

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

40-42. Nez Perce County. [Late Triassic. Sec. 34, T. 32 N., R. 5 W.], Lime Point. Analyst, H. C. Johansen. Samples 6-8. (Shedd, 1913, p. 119.) Shale.

43. Shoshone County. Precambrian, Wallace Formation. [SE¼ T. 47 N., R. 4 E., NE¼ T. 46 N., R. 4 E.], 7 miles south of town of Wallace, Foolhen Ridge. Analyst, J. G. Fairchild. Specimen 106. (Hobbs and others, 1965, p. 5, 27, pl. 6.) Dolomite, argillaceous. Index and geologic maps.

Oregon

44. Clackamas County. [T. 6 S., R. 1 E.], about 1 mile from town of Marquam. Analyst, R. S. Edwards. (Eckel, 1913, p. 308, 309.) Limestone, 10-25 ft thick. Use: Cement.

45. Douglas County. [T. 29 or 30 S., R. 6 W.], about 5 miles northwest of town of Riddle. Owner, Hanna Development Co. Lot B. (Cremer, 1954, p. 2, 5, 6.) Nickeliferous iron-bearing rock. Mineralogy. Tonnage estimated. Possible use: Source of ferronickel.

46. Jackson County. Paleozoic. Secs. 22, 23, 24, T. 39 S., R. 2 W., north of Little Applegate River, Bear Gulch. USED sample 77. (Hodge, 1938d, p. 282, 299, 305, 306, 310.) Limestone, black. Index map. Use: None.

47-54. Polk County. Secs. 11, 12, T. 8 S., R. 6 W., about 4 miles southwest of town of Dallas. Portland Cement Co. Analyst and collector, R.K. Meade. (Williams, 1914, p. 61, 62.) Limestone beds about 10 ft thick. Tonnage estimated.

47. Core sample 1. Limestone, depth 50-60 ft.
48. Core sample 1. Limestone, depth 1-20 ft.
49. Core sample 6. Limestone, depth 0-10 ft. Possible use: Portland cement.
50. Core sample 8. Limestone, depth 30-40 ft.
51. Limestone, brown; from quarry.
52. Limestone, dark-blue; from quarry.
53. Limestone. Chip sample from quarry. Possible use: Portland cement.
54. Limestone. Chip sample. Possible use: Portland cement.

55. Polk County. Secs. 1, 2, 11, 12, T. 8 S., R. 6 W., 3 miles from Bridgeport. Oregon Portland Cement Co., Dallas quarry. (Stafford, 1904, p. 6, 7, 8, 110; Oregon Dept. Geology and Mineral Industries, 1943, p. 66.) Limestone, blue, fine texture. Tonnage estimated. Use: Building stone. Possible use: Cement.

56, 57. Sherman County. [T. 2 N., R. 16 E.], south of town of Rufus. (Eckel, 1913, p. 309.) Alternating layers of limestone and volcanic ash. Possible use: Cement.

56. Analyst, R. S. Edwards. Limestone, 1-2 ft thick.
57. Analyst, R. K. Meade. Volcanic ash.

Washington

58. Asotin County. Probably Late Triassic (Mills, 1962, p. 240). SE¼SW¼ sec. 19, T. 7 N., R. 47 E., near town of Anatone, Lime Hill. Analyst, A. A. Hammer. Sample 1. (Shedd, 1913, p. 114-116, 117, 250, pl. 21.) Calcareous shale, dark-to light-gray; about 50 ft thick. Index maps. Possible use: Portland cement.

59, 60. Chelan County. N½ sec. 10, SE¼ sec. 3, T. 27 N., R. 15 E. Soda Springs deposit, Ideal Cement Co. Drill hole 53. (Danner, 1966, p. 82, 387-390, 392, 397.) Limestone, light-gray to white, medium to coarsely crystalline. Mineralogy. Index and geologic maps. Former use: Cement. [For other analyses from same drill hole, see samples 292, 293, group B; sample 127, group D; sample 121, group F_1.]

Washington—Continued

59. Depth 78-93 ft.

60. Depth 44-68 ft.

61-70. Chelan County. NW¼ sec. 14, T. 27 N., R. 15 E. Rainy Creek deposit. (Danner, 1966, p. 82, 387, 393-396, 397.) Limestone, white to gray, medium to coarsely crystalline. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

61-63. Drill hole 54. [For other analyses from same drill hole, see samples 294, 295, group B; samples 128, 129, group D; sample 122, group F_1.]

*61. Depth 149-152 ft. *Analysis suggests 16.4 percent more CaO and MgO than required for carbonate.
62. Depth 110-128 ft.
63. Depth 42.5-50 ft.

64-68. Drill hole 55. [For other analyses from same drill hole, see sample 26, group C; samples 123-126, group F_1.]

64. Depth 199.7-205 ft.
65. Depth 177.5-198 ft.
66. Depth 174-177.5 ft.
*67. Depth 60.5-91.8 ft. *Analysis suggests 15.5 percent more MgO and CaO than required for carbonate.
68. Depth 44.5-51 ft.

69, 70. Drill hole 56. [For other analyses from same drill hole, see sample 296, group B; samples 127, 128, group F_1; samples 37, 38, group F_2.]

*69. Depth 138-151.3 ft. *Analysis suggests 14.8 percent more MgO and CaO than required for carbonate.
70. Depth 25-32 ft.

71. Clallam County. Cretaceous and Tertiary, Soleduck Formation. [T. 28 N., R. 4 W., T. 29 N., R. 3 W., unsurveyed], Greywolf Valley. (Danner, 1966, p. 82, 428, 429.) Limestone, red. Index and geologic map.

72. Ferry County. [T. 36 N., R. 32 E.], a few miles west of town of Republic. Analyst, A. H. Cederberg. (Landes, 1905 [1906], p. 381; Darton, 1909, p. 26.) Limestone, bluish, compact. Possible use: Cement.

73. Jefferson County. Soleduck Formation. Sec. 7, T. 27 N., R. 3 W. Tubal Cain mine. (Danner, 1966, p. 82, 428, 429.) Limestone, red. Index and geologic map.

74, 75. Jefferson County. Early(?) and middle Eocene, Crescent Formation. Center sec. 18, T. 26 N., R. 1 W. Pulali Point deposit. (Danner, 1966, p. 16, 19, 82, 426, 427, 447, 456.) Limestone, argillaceous, gray, fossiliferous. Index and geologic map.

74. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample J 1-1. Composite chip sample.

75. Composite sample.

76, 77. Mason County. Crescent Formation. Sec. 4, T. 23 N., R. 5 W. Staircase deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 421, 427, 428, 447, 456.) Limestone, gray, fossiliferous; weathers red; beds 2-6 in. thick. Thin-section description. Chip sample. Index and geologic map.

76. Sample M 1-1 taken across 100 ft.

77. Sample M 1-2 taken across 30 ft.

Footnotes of analyses on preceding page:

[1] Samples 47-50, iron oxide and alumina; sample 72, iron and aluminum oxides.

[2] Calculated from reported $FeCO_3$, $MgCO_3$, $CaCO_3$, Fe, P, and (or) $MnCO_3$.

[3] Oxide of iron.

[4] Ignition loss, used as total H_2O in computations.

[5] At 105°C.

[6] Ignition loss.

[7] R_2O_3.

[8] Alkalies.

[9] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[10] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

Table 5.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing clay and carbonate each less than 75 percent; clay and carbonate each greater than uncombined silica (Group E), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued											
	78	79	80	*81	82	83	84	85	86	87	88	89
	46E40-98	46E40-61	46E40-57	46E24-26	46E26-134	46E26-135	46E26-136	46E26-137	46E26-77	46E26-76	46E26-79	46E26-80
SiO_2	20.42	19.64	20.10	2.16	22.64	23.92	24.52	27.64	25.72	15.62	37.40	20.32
R_2O_3	[1]6.60	[1]4.83	[1]5.10	21.92	13.28	13.84	15.28	16.08	[2]15.72	[2]9.82	[2]25.14	[2]12.20
MgO	[3]15.34	[3]14.37	[3]14.64	1.02	[4]3.16	[4]3.64	[4]5.33	[4]3.31	[4]1.74	[4]2.30	[4]1.40	[4]1.74
CaO	23.04	25.12	24.74	30.22	[4]31.38	[4]29.63	[4]26.13	[4]26.39	[4]29.70	[4]38.46	[4]16.64	[4]34.80
Ignition loss	[5]34.60	[5]36.04	[5]35.42	44.62	[6]28.08	[6]27.25	[6]26.32	[6]24.33	25.64	32.82	16.20	29.66
Total	100.00	100.00	100.00	99.94	98.54	98.28	97.58	97.75	[98.52]	[99.02]	[96.78]	[98.72]
Class	9,19,69	12,14,74	12,15,72	0,23,56	0,37,63	1,39,60	0,42,58	1,45,54	0,45,49	0,27,68	0,66,24	0,36,60
CaO/MgO	Dolomite	Calcareous dolomite	Dolomite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	------	Magnesian calcite

	Washington—Continued											
	90	91	92	93	94	95	96	97	98	99	100	101
	46E26-78	46E26-62	46E26-63	46E26-65	46E26-67	46E26-68	46E26-69	46E26-28	46E26-26	46E28-14	46E29-42	46E29-10
SiO_2	32.22	23.54	41.61	48.22	32.48	31.96	40.5	26.04	17.04	39.80	19.9	24.83
Al_2O_3	[2]20.52	15.20	22.84	17.46	19.92	18.00	16.4	[7]14.54	7.48	21.62	3.1	[7]5.77
Fe_2O_3				4.38			5.2		2.60		1.6	
MgO	[4]1.84	2.38	2.83	2.24	3.42	2.97	2.7	3.32	3.91	[4]1.39	------	------
CaO	[4]21.91	30.22	15.07	12.10	20.41	22.61	15.4	29.34	40.47	[4]16.30	[8]41.0	36.79
$Na_2O + K_2O$	------	------	------	------	------	------	------	------	------	[9]2.15	------	------
S	------	------	------	------	------	------	------	------	------	.41	------	------
Ignition loss	20.34	------	------	11.29	19.77	21.01	15.2	------	29.02	[6]14.32	32.5	30.36
Total	[96.83]	[71.34]	[82.35]	95.69	[96.00]	[96.55]	[95.4]	[73.24]	100.52	[95.99]	[10][98.1]	97.75
Class	0,56,35	0,41,56	3,67,26	12,63,13	0,57,33	2,53,37	6,61,33	2,42,51	1,29,59	4,62,32	13,13,71	15,17,66
CaO/MgO	Magnesian calcite	Magnesian calcite	------	------	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	------	Calcite	Calcite

	Washington—Continued											
	102	*103	104	105	106	107	108	*109	110	111	112	113
	46E29-9	46E42-4	46E42-10	46E42-1	46E42-2	46E42-3	46E41-234	46E43-153	46E37-57	46E37-171	46E37-35	46E37-131
SiO_2	16.72	36.45	15.65	22.85	21.63	18.46	41.28	17.67	33.61	28.89	0.63	21.15
Al_2O_3	4.69	8.95	[7]6.33	[7]9.36	[7]6.21	[7]7.10	10.31	4.61	[7]7.45	[7]6.48	.55	[7]5.56
Fe_2O_3	3.11	7.94					2.33	.92				
FeO	------	------	------	------	------	------	------	.62	------	------	------	------
MgO	------	13.20	2.30	1.61	1.29	4.05	3.12	16.32	.15	.96	[4].20	.49
CaO	40.74	16.85	40.25	34.86	39.58	36.34	21.93	30.92	32.67	34.75	[4]40.85	36.38
H_2O+	------	------	------	------	------	------	------	[11]3.86	------	------	------	------
H_2O-	------	------	------	------	------	------	------	[12]Trace	------	------	25.50	------
P_2O_5	------	------	.033	.046	.055	.047	------	------	.072	.068	------	.017
Ignition loss	33.37	14.08	[13]34.49	[13]29.98	[13]31.99	[13]33.41	19.42	[14]25.08	[13]26.12	[13]27.90	[6]32.27	[13]35.70
Total	98.63	[97.47]	[99.05]	[98.71]	[100.76]	[99.41]	98.39	100.00	[100.07]	[99.05]	100.00	[99.30]
Class	5,22,71	12,46,21	0,27,72	7,27,62	11,18,69	7,21,70	20,37,36	8,19,53	21,22,55	18,19,59	0,27,73	12,21,66
CaO/MgO	Calcite	------	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 110, CoO = 0.001 percent]

	104	105	106	107	110	111	113
Na_2O	0.22	0.67	0.83	0.47	0.44	1.39	0.86
K_2O	3.07	5.25	3.67	3.23	------	.70	------
TiO_2	.17	.28	.39	.28	.24	.23	.18
V_2O_5	.003	.003	.010	.0076	.015	.011	.0092
Cr_2O_3	.0024	.0037	.0047	.0045	.0018	.0036	.0019
MnO	.27	.45	.80	.45	.10	.11	.065
NiO	.0038	.0028	.0044	.0028	.0026	.0032	.0026
CuO	.0018	.0049	.016	.0047	.0082	.0069	.0046
SrO	.032	.028	.036	.020	.0092	.017	.013
ZrO_2	.006	.0084	.013	.010	.0072	.0069	.0051
Ag_2O	------	------	------	------	.001	.0005	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

78-80. Okanogan County. Triassic. T. 35 N., R. 26 E., about 1.25 miles northwest of town of Riverside. (Bennett, 1944, p. 6-9, 11, 14-16, pl. 2; Bennett, 1945, p. 5, 6.) Deposit description: Dolomite, light-gray to gray to brownish-gray. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone.

78. NE¼NW¼ sec. 26. Owner, N. W. L. Brown. Sample 69.
79, 80. NW¼SW¼ sec. 23. Samples 118, 108.

*81. Okanogan County. T. 35 N., R. 26 E., 3 miles west of Riverside, Johnson Creek. Analyst, A. A. Hammer. Sample 20. (Shedd, 1913, p. 166, 167, 245, pl. 21.) Limestone, yellowish-white. Index maps. *Analysis suggests 20.6 percent excess R_2O_3.

82-85. Pend Oreille County. Cambrian, Metaline Limestone (Mills, 1962, p. 38). [T. 39 N., R. 43 E.], 1 mile east of town of Metaline Falls, Sullivan Creek. Lehigh Portland Cement Co. (Patty, 1921, p. 83, 84.) Shale, dark, thin-bedded. Use: Cement [implied].

86-90. Pend Oreille County. Paleozoic. [T. 39 N., R. 43-45 E.], near Metaline Falls, Sullivan Creek. Inland Portland Cement Co. (Bancroft, 1911, p. 188, 190, 192; Eckel, 1913, p. 366, 367.) Shale, dark-blue or black. Index map. Use: Cement.

91-93. Pend Oreille County. T. 39 N., R. 43 E., Metaline Falls, Sullivan Creek. (Shedd, 1913, p. 180, 193, 194, 250, pl. 21.) Shale. Index maps.

91. Sample 9. Possible use: Portland cement.
92. Sample 8.
93. Analyst, A. A. Hammer. Sample 6. Shale, almost black, fine-grained, stratified.

94-96. Pend Oreille County. [T. 39 N., R. 43 E.], Metaline Falls. Inland Portland Cement Co. (Krejci, 1914, p. 927, 936.) Shale, calcareous. Use: Portland cement.

97, 98. Pend Oreille County. T. 38 N., R. 43 E., near town of Cement. Jordan property. (Shedd, 1913, p. 180, 183, 184, 245, pl. 21.) Limestone. Index maps. Possible use: Cement.

97. Sample 35.
98. Analyst, A. A. Hammer. Sample 26. Limestone, almost black, very fine grained.

99. San Juan County. Probably Cretaceous. [T. 37 N., R. 2 W.], northwest shore of Orcas Island. Analyst, A. H. Cederberg. Sample 4. (Landes, 1905 [1906], p. 378; Glover, 1941, p. 217, 348, 349.) Shale. Possible use: Cement material.

100. Skagit County. Devonian(?) part of Chilliwack Group. NE¼NE¼ sec. 16, T. 35 N., R. 9 E., about 2 miles from town of Sauk. Portland deposit. Analysts, K. S. Johnson, Anthony Centenero. Sample 12. (Popoff, 1948, p. 2, 5, 8, 11, 12, figs. 1, 2; Danner, 1966, p. 82, 269, 271, 283, 284, 287, 288.) General: Limestone, white to dark-gray, medium- or coarse-grained, massive, uniform texture. Chip sample taken across 1.0 ft. Tonnage estimated. Index and geologic maps.

101, 102. Skagit County. Early Pennsylvanian part of Chilliwack Group. Center sec. 2, T. 35 N., R. 8 E., about 1 mile by road from town of Concrete. Lone Star Cement Co. (Hodge, 1938d, p. 13, 47, 48, 51, 52, 53; Danner, 1966, p. 82, 269, 271-274.) General: Limestone, light- to dark-gray, dense to organoclastic and oolitic, well-bedded; about 500-800 ft thick. Thin-section description. Tonnage estimated. Index maps. Use: Cement.

Washington—Continued

*103. Stevens County. Cambrian(?), Northport Limestone. NE¼NW¼ sec. 35, T. 39 N., R. 39 E., 6 miles southwest of town of Northport. Ideal Cement Co. Diamond-drill hole 1; 828 ft drilled at inclination of -45°. (Mills, 1962, p. 74, 96, 99, 100, 102, pls. 1, 4.) Unit description: Limestone, predominantly gray, fine-grained, bedded. Sample depth 800-828 ft. Tonnage estimated. Index and geologic maps, geologic section. Possible use: None, rock impure. *Analysis suggests 19.3 percent more MgO and CaO than required for carbonate. [For other analyses from same drill hole, see samples 438, 439, group F_1; samples 1665-1676, group F_2.]

104-107. Stevens County. Northport Limestone. NW¼ sec. 35, T. 36 N., R. 39 E., 3 miles north of town of Colville. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-115, S-117 to S-119. (Mills, 1962, p. 12, 13, 167, 168, 249, 261, 264, pls. 1, 6.) Limestone, dark-gray to black, fine-grained, medium-bedded, argillaceous; contains lenticles and layers of dolomitic limestone. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.

108. Stevens County. Tertiary. Sec. 21, T. 35 N., R. 39 E., 3 miles south of Colville. Analyst, A. A. Hammer. Sample 31. (Shedd, 1913, p. 136, 251, pl. 21; Glover, 1941, p. 280, 350, 351.) Shale, light-gray, finely laminated. Index map. Possible use: Portland cement.

*109. Stevens County. Sec. 9, T. 32 N., R. 41 E., about 5 miles east of town of Chewelah. The Royal Serpentine Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 124, 125, 137, 142; Eckel, 1912, p. 171, 173.) [Dolomite] marble, dark, crystalline, fine-grained, stratified. Bulk density 2.817. Physical properties. Use: Dimension stone [implied]. *Analysis suggests 19.1 percent more MgO and CaO than required for carbonate.

110. Whatcom County. Devonian part of Chilliwack Group. West central part of sec. 21, T. 40 N., R. 5 E., east slope of Sumas Mountain. Sumas Mountain deposit. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. Sample W 18-3. (Moen, 1962, p. 4, 8, 15, 95, 96, 99, 119, pl. 1; Danner, 1966, p. 16, 19, 209, 210, 233-235, 453, 466.) Limestone, light-gray to dark-gray, generally dense. Chip sample taken across 270 ft. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, ballast, road metal, riprap.

111. Whatcom County. Pennsylvanian part of Chilliwack Group. NW¼ sec. 5, T. 36 N., R. 8 E., about 17 miles north of Concrete, on northwest side of Dock Butte. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 28-4. (Danner, 1966, p. 16, 19, 82, 259, 260, 264, 454, 467.) Limestone, brown to buff, dense; interbedded with sandstone and argillite. Composite chip sample. Index maps. Possible use: None, deposit small, impure, and in remote area.

112. Whatcom County. Devonian to Early Permian, Chilliwack Group (Danner, 1966). [T. 40 N., R. 4 E., near] town of Sumas. International Lime Co. Analyst, R. S. Edwards. (Burchard, 1912, p. 695, pl. 1.) Limestone. Index map.

113. Whatcom County. Holocene. NW¼SW¼ sec. 7, T. 40 N., R. 6 E. Silver Lake deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 10-1. (Danner, 1966, p. 16, 19, 82, 438, 439, 453, 465.) Mud, soft, calcareous. (Tufa intermixed with soil and other impurities.) Composite chip sample. Index and geologic map. Possible use: None, deposit small and impure.

Footnotes of analyses on preceding page:

[1] Iron and alumina.

[2] Alumina and iron oxide.

[3] By difference.

[4] Calculated from reported $MgCO_3$ or $CaCO_3$.

[5] 950°-1,000°C; also called CO_2.

[6] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[7] R_2O_3.

[8] Reported as calculated.

[9] Alkalies, and so forth.

[10] Analysis on dry basis.

[11] Above 110°C.

[12] At 110°C.

[13] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[14] CO_2.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F$_1$), common- and mixed-rock categories

[Samples of mixed-rock category indicated by an asterisk (*). Chemical analyses arranged by State, quadrangle or county, and stratigraphic position]

Chemical analyses

	Alaska												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	50F$_1$5-5	50F$_1$5-10	50F$_1$29-2	50F$_1$30-1	50F$_1$36-4	50F$_1$36-19	50F$_1$36-29	50F$_1$52-21	50F$_1$52-24	50F$_1$52-40	50F$_1$52-6	50F$_1$52-7	50F$_1$52-8
SiO_2	10.2	8.4	[1]11.55	10.52	[2]13.18	[2]20.77	[2]22.84	7.1	8.6	7.9	16.2	12.5	16.4
Al_2O_3	1.3	.12	------	------	------	------	------	2.3	2.5	1.3	2.5	2.4	3.3
Fe_2O_3	1.2	[3].57	------	------	------	------	------	.19	.80	.85	1.2	1.3	2.0
MgO	.56	.54	1.37	18.46	[4]1.36	[4].89	[4]1.55	1.4	1.0	2.4	1.2	1.3	1.2
CaO	40.6	45.0	46.24	27.27	[4]47.32	[4]44.06	[4]41.80	48.5	47.7	46.9	43.6	45.9	42.3
Na_2O	.48	.34	------	------	------	------	------	.22	.83	.63	1.1	.60	.82
K_2O	.27	.20	------	------	------	------	------	.11	.28	.16	.31	.47	.62
P_2O_5	------	------	------	------	------	------	------	.03	.03	.03	.09	.04	.04
SO_3	------	------	------	------	------	------	------	.84	1.16	.30	.68	.43	.10
Ignition loss	43.6	[5]43.2	------	41.62	[6]38.63	[6]35.57	[6]34.50	38.8	38.2	39.4	34.6	35.0	32.2
Total	[98.2]	98.4	[59.16]	97.87	[100.49]	[101.29]	[100.69]	99.5	101.1	99.9	101.5	99.9	99.0
Class	7,17,74	8,9,81	(12,0)85	11,0,87	(13,0)87	(21,0)81	(23,0)78	3,7,86	3,9,85	5,6,87	10,10,76	7,10,77	8,15,70
CaO/MgO	Calcite	Calcite	Calcite	Dolomite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite

	Alaska—Continued												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	50F$_1$ 156-1	50F$_1$ 156-3	50F$_1$ 156-4	50F$_1$ 156-19	50F$_1$ 156-20	50F$_1$ 156-21	50F$_1$ 156-22	50F$_1$ 156-23	50F$_1$ 156-31	50F$_1$ 156-32	50F$_1$ 156-33	50F$_1$ 156-35	50F$_1$ 156-36
SiO_3	9.24	6.4	6.4	7.4	7.1	8.4	10.1	6.4	7.8	10.0	8.0	14.0	6.9
Al_2O_3	3.8	2.1	2.0	3.11	3.73	3.95	4.90	3.23	3.05	4.05	3.3	5.85	3.75
Fe_2O_3	1.9	1.1	1.1	1.09	1.17	1.45	1.60	.89	.96	1.45	1.0	1.45	.65.
MgO	1.1	1.45	1.5	1.55	1.4	1.45	2.25	2.1	1.8	1.8	1.4	2.4	1.7
CaO	43.8	47.8	47.6	47.0	47.4	46.4	42.7	46.8	47.0	44.2	47.1	40.1	46.6
Na_2O[7]	------	------	------	------	------	------	.30	.26	------	------	------	------	------
K_2O[7]	------	------	------	------	------	------	.32	.33	------	------	------	------	------
P_2O_5	.04	.018	.016	.04	.02	.013	.015	.023	.030	.032	.029	.046	.035
CO_2[8]	36.0	38.8	39.0	38.1	38.1	37.6	36.1	39.0	38.0	36.6	38.3	33.8	38.6
SO_3	1.02	.52	.54	.62	.66	.14	.22	.07	.08	.11	.06	.12	.06
Ignition loss[9]	(36.6)	(39.2)	(39.4)	(38.8)	(38.8)	(37.6)	(36.1)	(39.2)	(38.3)	(36.8)	(38.4)	(34.3)	(38.8)
NaCl + KCl[7]	.18	.10	.04	1.00	.86	.82	------	------	.01	.01	.16	.44	.92
Total	[97.1]	[98.3]	[98.2]	[99.9]	[100.4]	[100.2]	[98.5]	[99.1]	[98.7]	[98.2]	[99.3]	[98.2]	[99.2]
Class	0,16,80	1,9,88	2,9,88	1,11,86	0,11,86	0,14,85	0,18,81	0,11,88	1,11,86	1,16,83	1,12,87	2,21,76	0,12,87
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite

	Alaska—Continued												
	27	28	29	30	31	32	33	34	35	36	37	38	39
	50F$_1$ 156-38	50F$_1$ 156-44	50F$_1$ 156-47	50F$_1$ 156-49	50F$_1$ 156-50	50F$_1$ 156-51	50F$_1$ 156-52	50F$_1$ 156-55	50F$_1$ 156-58	50F$_1$ 156-81	50F$_1$ 156-82	50F$_1$ 156-83	50F$_1$ 156-84
SiO_3	6.1	6.1	6.8	8.8	7.0	7.4	6.2	5.8	5.4	7.1	9.3	9.9	10.5
Al_2O_3	3.7	4.25	3.7	3.85	3.55	3.05	2.95	3.85	4.0	3.32	4.2	4.4	5.1
Fe_2O_3	.90	.75	.90	1.15	1.15	.85	.85	1.15	1.4	.78	1.0	1.0	1.3
MgO	1.9	2.3	1.1	1.95	1.9	1.65	2.4	2.4	2.7	2.02	1.78	1.45	1.65
CaO	46.8	46.9	47.4	47.8	47.8	47.8	48.1	45.1	43.5	46.2	44.4	43.0	43.8
P_2O_5	.030	.018	.027	.039	.030	.030	.030	.023	.021	.023	.020	.025	.025
CO_3[8]	38.8	38.8	37.4	37.1	38.8	38.4	38.7	39.3	39.5	38.4	36.8	36.0	35.9
SO_3	.06	.62	.67	1.1	1.0	.95	.69	.67	1.0	.62	.37	.47	.24
Ignition loss[9]	(38.8)	(39.6)	(38.0)	(37.6)	(39.2)	(39.8)	(39.5)	(39.7)	(39.8)	(39.2)	(37.8)	(37.6)	(37.6)
NaCl + KCl[7]	.90	.01	.14	.50	.70	.24	.08	.70	.86	< .01	.70	.64	.10
Total	[99.2]	[99.7]	[98.1]	[102.3]	[101.9]	[100.4]	[100.0]	[99.0]	[98.4]	[98.5]	[98.6]	[96.9]	[98.6]
Class	0,11,87	0,10,87	0,12,85	1,13,84	0,11,88	1,10,87	0,10,87	0,10,87	0,10,86	0,12,87	1,15,83	1,16,80	0,18,81
CaO/MgO	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

	Alaska—Continued												
	40	41	42	43	44	45	46	47	48	49	50	51	52
	50F$_1$ 156-85	50F$_1$ 156-86	50F$_1$ 156-97	50F$_1$ 52-5	50F$_1$ 52-74	50F$_1$ 155-104	50F$_1$ 155-112	50F$_1$ 155-105	50F$_1$ 52-107	50F$_1$ 52-108	50F$_1$ 52-109	50F$_1$ 52-111	50F$_1$ 52-112
SiO_3	6.2	6.3	6.5	7.7	11.4	10.4	16.2	18.7	10.1	6.9	12.2	6.4	6.1
Al_2O_3	3.7	4.2	3.6	2.2	.85	1.7	1.8	2.0	2.35	2.30	3.15	2.65	2.65
Fe_2O_3	1.1	1.1	1.0	.68	.33	.37	.50	.44	1.16	.80	1.75	.86	1.43
MgO	1.9	1.6	1.3	.75	.05	.7	.65	.45	1.15	1.05	1.5	1.9	3.45
CaO	47.0	47.0	46.9	47.1	47.6	47.60	44.25	42.75	46.5	49.0	44.2	47.8	46.5

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Alaska—Continued												
	40	41	42	43	44	45	46	47	48	49	50	51	52
	50F_1 156-85	50F_1 156-86	50F_1 156-97	50F_1 52-5	50F_1 52-74	50F_1 155-104	50F_1 155-112	50F_1 155-105	50F_1 52-107	50F_1 52-108	50F_1 52-109	50F_1 52-111	50F_1 52-112
Na_2O	------	------	------	<0.01	------	------	------	------	------	------	------	------	------
K_2O	------	------	------	<.01	------	------	------	------	------	------	------	------	------
P_2O_5	0.028	0.035	0.016	------	------	------	------	------	------	------	------	------	------
CO_2 [8]	38.8	38.0	39.1	------	------	------	------	------	------	------	------	------	------
SO_3	.25	.33	.08	------	------	0.08	0.07	0.02	0.01	0.01	0.01	0.01	0.01
Ignition loss [9]	(39.4)	(39.0)	(39.4)	------	------	------	------	------	------	------	------	------	------
NaCl + KCl [7]	.70	.70	.08	------	------	------	------	------	------	------	------	------	------
Total	[99.7]	[99.3]	[98.6]	[58.4]	[60.2]	[60.8]	[63.5]	[64.4]	[61.3]	[60.1]	[62.8]	[59.6]	[60.1]
Class	0,10,87	0,11,86	0,11,87	3,8,87	10,3,85	7,6,86	12,7,80	15,7,77	5,10,85	2,9,89	5,14,81	1,10,89	0,11,87
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite

[1] Insoluble.

[2] Insoluble (HCl).

[3] (R.M. Moxham, written commun., Sept. 11, 1964.)

[4] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[5] Includes ignition loss due to oxidation of FeO.

[6] CO_2, calculated from reported $MgCO_2$ and (or) $CaCO_3$.

[7] Gravimetric determination.

[8] 400°-1,000°C, direct combustion.

[9] Not included in total.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1, 2. Anchorage quadrangle. Holocene. [T. 17 N., R. 1 W.], Knik Arm area. Analysts, E. A. Nygaard, S. M. Berthold. (Moxham and Eckhart, 1956, p. 3,6,8,13,14,15,17-19,pl.1.) Tonnage estimated. Index and geologic maps, columnar sections of marl deposits. Possible use: Portland cement.

1. [Sec. 8], west end of Lucile Lake. Sample 8, auger hole 1. Marl, white to light-gray, plastic to sticky; 7 ft thick; overlain by 1-6 ft of mud. [For another analysis from same drill hole, see sample 4, group B.]

2. [Sec. 12], Edlund deposit, adjacent to Wasilla Lake. Sample 1, auger hole 1-GS. Marl; mostly light gray to cream colored when wet; white when dried; fine grained; uniform in composition; 21 ft thick near center of deposit. Isopach map, geologic section. [For other analyses from same drill hole, see sample 1, group C; sample 14, group F_2.]

3. Chandler Lake quadrangle. [Early and Late Mississippian, Pennsylvanian(?) and Permian], Lisburne [Group]. [1.5-2.3, 3.4-4.6], Chandler Lake. Sample 45A Gr8. (Gryc, 1948, p. 1, 2.) Limestone.

4. Charley River quadrangle. [Precambrian], Tindir Group. [About 21.3-21.8, 2.3-2.9], divide west of Pleasant Creek. Analyst, J. G. Fairchild. Sample 30AMt151. (Mertie, 1933, p. 350, 369, 383, 384, pl. 7.) Dolomite, siliceous. Mineralogy. Index and geologic maps.

5-7. Craig quadrangle. Analyst, R. K. Bailey. Record 2952. (Wells, 1937, p. 47.) Index and geologic maps.

5. Late Silurian. [9.9-10.1, 10.1-13.85], north side of Heceta Island. Vermont Marble Co. claim. Deposit 36. (Burchard, 1920, p. 39, 76, 77, pls. 1, 3.) Limestone, mottled, fine-grained, dense; some limestone conglomeratic, some fossiliferous.

6. Paleozoic. [10.2, 17.5], Marble Island, 1.5 miles south of Tokeen. Vermont Marble Co. Deposit 34. (Burchard, 1920, p. 15, 37, 72, 73, pls. 1, 3.) [Limestone] marble, brown; contains cherty material. Mineralogy, thin-section description.

7. Paleozoic. [About 22.35, 0.7], Prince of Wales Island, Dickman Bay. Alaska-Shamrock Marble Co. Deposit 49. (Burchard, 1920, p. 15, 38, 86-88, 90, pls. 1, 5.) [Limestone] marble, mottled. Mineralogy, thin-section description. Possible use: Interior decoration.

8-13. Healy quadrangle. Devonian(?). [5.8-6.7, 7.8-8.0], headwaters of West Fork of Windy Creek. Analysts, Leonard Shapiro, L. E. Reichen, S. M. Berthold. (Moxham, Eckhart, and Cobb, 1959, p. 69, 88-91, pl.11.) Limestone, dark- to bluish-gray, fine-grained, very dense, massive, locally banded; weathers light gray. Chip samples. Index and geologic maps, geologic sections. Possible use: Portland cement.

	Lab.No.	Sample		Lab.No.	Sample
8.	501920 C	491	11.	1952 C	551
9.	1923 C	494	12.	1953 C	555
10.	1930 C	502	13.	1954 C	559

14-42. Healy quadrangle. Middle Devonian. [5.8-6.7, 7.8-8.0], near headwaters of West Fork of Windy Creek. (Warfield, 1962, p. 3, 12, 13, 15-17, 18, 19, 20.) Deposit description. Limestone, dark-gray to blue-gray, fine-grained, dense, recrystallized; contains abundant calcite veinlets. Estimated thickness 3,100 ft. Representative samples from channel 50 ft long. Index and geologic maps. Possible use: Portland cement, mineral wool.

	Sample		Sample		Sample		Sample
14.	501	22.	532	30.	551	37.	589
15.	503	23.	533	31.	552	38.	590
16.	504	24.	534	32.	553	39.	591
17.	519	25.	536	33.	554	40.	592
18.	520	26.	537	34.	558	41.	593
19.	521	27.	539	35.	561	42.	605
20.	522	28.	545	36.	588		
21.	523	29.	548				

43. Healy quadrangle. Middle Devonian. [5.8-6.7, 7.8-8.0], near headwaters of West Fork of Windy Creek. Analyst, H. E. Peterson. Sample 164. (Rutledge and others, 1953, p. 4, 117, 118, 132, figs. 1, 3, 41, 42.) Limestone, gray, recrystallized. Index and geologic maps. Possible use: Portland cement, rock wool.

44. Healy quadrangle. Paleozoic, possibly Devonian. [Sec. 7, T. 17 S., R. 7 W., unsurveyed], pinnacle between Bain and Little Windy Creeks. Analyst, H. E. Peterson. Sample 172. (Rutledge and others, 1953, p. 4, 93, 116, 117, figs. 1, 3, 41.) Limestone, medium- to dark-gray, fine-grained; contains calcite veinlets; fractured and weathered where exposed. Index and geologic maps.

45-47. Healy quadrangle. Paleozoic, possibly Devonian. [T. 17 S., R. 7 W., unsurveyed], along course of Bain Creek. Analyst, H. E. Peterson. Samples W-11, W-10, W-12. (Rutledge and others, 1953, p. 4, 93, 116, figs. 1, 3, 35, 41.) Limestone, cherty; outcrop samples. Index and geologic maps. Possible use: None.

48-52. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 96, 105, 123, figs. 1, 3, 35-37, 41.) Limestone, black, fine-grained. Total depth of diamond-drill hole 629 ft. Index and geologic maps, geologic sections, log of drill hole 4. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see sample 53, this group; sample 3, group C; samples 221-336, group F_2.]

48. Limestone; contains calcite veinlets; depth 620-629 ft.

49. Limestone; contains calcite veinlets; depth 615-620 ft.

50. Depth 610-615 ft.

51. Limestone; contains few calcite veinlets and some shale partings; depth 600-605 ft.

52. Limestone; contains few calcite veinlets and some shale partings; depth 595-600 ft.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington,containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Alaska—Continued												
	53	54	55	56	57	58	59	60	61	62	63	64	65
	$50F_1$ 52-176	$50F_1$ 52-231	$50F_1$ 52-234	$50F_1$ 52-235	$50F_1$ 52-256	$50F_1$ 52-275	$50F_1$ 154-43	$50F_1$ 154-44	$50F_1$ 154-50	$50F_1$ 154-124	$50F_1$ 154-127	$50F_1$ 155-3	$50F_1$ 52-59
SiO_2	6.9	9.4	10.4	13.8	7.2	9.95	7.5	6.3	5.9	7.4	9.5	13.9	[1]16.2
Al_2O_3	3.1	2.2	3.10	2.50	3.3	3.15	3.75	3.2	3.0	2.28	4.07	2.23	5.2
Fe_2O_3	1.13	------	1.5	.85	.80	.61	1.17	.92	.82	.72	1.73	.97	
MgO	5.85	1.8	4.5	1.3	2.85	1.1	2.3	2.7	2.5	3.3	5.3	.5	3.2
CaO	42.4	46.1	41.4	44.3	43.3	47.1	44.9	46.6	46.8	46.2	40.4	43.9	40.9
SO_3	.01	.01	.01	.01	.01	.005	.01	.01	.01	.40	1.76	.01	------
Ignition loss	------	------	------	------	------	------	------	------	------	------	------	------	34.4
Total	[59.4]	[59.5]	[60.9]	[62.8]	[57.5]	[61.9]	[59.6]	[59.7]	[59.0]	[60.3]	[62.8]	[61.5]	99.9
Class	0,12,88	6,7,86	3,13,83	8,10,82	0,12,83	4,11,84	0,13,85	0,11,88	0,10,89	3,9,87	0,16,79	9,9,79	(8,15)74
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite

	Alaska—Continued						Idaho						
	66	67	68	69	70	*71	72	73	74	75	76	77	78
	$50F_1$ 52-60	$50F_1$ 155-147	$50F_1$ 155-138	$50F_1$ 155-140	$50F_1$ 105-3	$50F_1$ 124-23	$11F_1$ 4-3	$11F_1$ 4-2	$11F_1$ 4-14	$11F_1$ 10-2	$11F_1$ 10-3	$11F_1$ 10-7	$11F_1$ 10-9
SiO_2	[1]10.6	10.0	10.4	10.8	[1]11.32	[2]9.71	10.41	15.06	17.70	14.5	10.1	[3]10.9	[3]12.6
Al_2O_3	1.0	3.40	2.43	1.52	------	------	3.57	2.03	3.96	1.6	.8	[4]3.1	[4]4.8
Fe_2O_3		1.40	.57	.28	------	------	1.41	.68	[5]1.61			[6].93	[6]1.1
MgO	.6	.9	.1	.1	[7].40	19.08	1.69	.55	16.76	[7]9.66	[7]6.60	.7	.5
CaO	49.2	46.4	47.0	48.2	[7]48.85	33.60	44.39	44.76	21.95	[7]35.85	[7]42.03	46.5	45.8
H_2O	------	------	------	------	------	------	[8]1.00	[8].60	------	------	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	.86	.91
CO_2	[9]38.1	------	------	------	[7]38.78	[9]33.82	[10]37.01	[10]35.89	[9]38.15	[7]38.69	[7]41.97	[11]35.1	[11]34.3
F	------	------	------	------	------	------	------	------	------	------	------	.15	.12
U	------	------	------	------	------	------	------	------	------	------	------	.024	.011
Subtotal	------	------	------	------	------	------	------	------	------	------	------	98.26	100.14
Less O	------	------	------	------	------	------	------	------	------	------	------	[7].063	[7].051
Total	99.5	[62.1]	[60.5]	[60.9]	[99.35]	[96.21]	99.48	99.57	100.13	[100.3]	[101.5]	[98.2]	[100.1]
Class	(9,3)86	2,14,83	5,9,84	8,5,86	(11,0)88	10,0,72	3,14,83	11,8,81	9,17,74	12,4,84	8,2,90	(4,12)80	(3,16)78
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcareous dolomite	Magnesian calcite	Calcite	Dolomite	Calcareous dolomite	Magnesian calcite	Calcite	Calcite

	Idaho—Continued									Oregon			
	79	*80	81	82	83	84	85	86	87	88	89	90	91
	$11F_1$10-8	$11F_1$45-41	$11F_1$19-5	$11F_1$19-12	$11F_1$19-10	$11F_1$19-11	$11F_1$19-16	$11F_1$35-34	$11F_1$35-31	$36F_1$1-8	$36F_1$1-16	$36F_1$1-18	
SiO_2	[3]11.0	4.30	------	------	11.02	14.77	13.84	[12]11.9	[12]4.0	16.84	11.21	8.99	9.84
Inorganic insoluble	------	------	11.44	20.19	------	------	------	------	------	------	------	------	------
Organic insoluble	------	------	.04	.30	------	------	------	------	------	------	------	------	------
Al_2O_3	[4]4.1	------	------	------	.90	3.68	1.50	3.4	15.7	1.24	.15	3.20	2.86
Fe_2O_3	[6].86	------	------	------	.24		[13]1.72				.17	1.12	1.02
FeO	------	------	------	------	.08	------	------	------	------		None	------	------
MgO	.6	8.46	[7]18.66	Trace	4.73	[7]4.23	10.59	1.3	.8	.43	.52	2.19	2.31
CaO	46.5	42.07	[7]27.39	[7]43.79	47.39	[7]40.62	33.44	45.0	37.2	44.86	49.82	45.98	45.45
Na_2O	------	------	------	------	------	------	------	------	------	------	.21	------	------
K_2O	------	------	------	------	------	------	------	------	------	------	Trace	------	------
H_2O	------	------	------	------	[14].97	------	------	------	------	------	Trace	------	------
TiO_2	------	------	------	------	------	------	.10	------	------	------	Trace	------	------
P_2O_5	1.35	[7]16.56	None	None	------	------	------	------	------	------	.05	------	------
MnO	------	------	------	------	------	------	------	------	------	------	.02	------	------
CO_2	[11]33.9	23.60	[7]41.87	[7]34.37	33.71	[7]36.58	[10]37.82	[15]38.0	[15]42.0	[9]36.58	38.39	[9]38.87	[9]38.31
S	------	------	None	None	------	------	------	------	------	------	[16]Trace	------	.02
Organic matter	------	[7]3.47	------	[17].042	------	------	------	------	------	------	Trace	------	------
F	.17	------	------	------	------	------	------	------	------	------	------	------	------
U	.012	------	------	------	------	------	------	------	------	------	------	------	------
Subtotal	98.49	------	------	------	------	------	------	------	------	------	------	------	------
Less O	[7].072	------	------	------	------	------	------	------	------	------	------	------	------
Total	[98.4]	[98.46]	99.40	98.69	[99.04]	99.88	99.01	[99.6]	[99.7]	99.95	[18]100.54	100.35	[19]99.81
Class	(3,14)77	4,3,51	(11,0)88	(20,0)78	9,4,75	9,10,81	9,9,82	6,10,83	0,18,68	15,4,81	11,1,87	2,12,85	------
CaO/MgO	Calcite	Calcareous dolomite	Dolomite	Calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	------

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[1] Insoluble.

[2] Insoluble, includes SiO_2 and R_2O_3.

[3] Acid insoluble.

[4] Reported as R_2O_3.

[5] Reported as oxide of iron.

[6] Fe as Fe_2O_3.

[7] Calculated from reported $MgCO_3$,$CaCO_3$,P,C, and(or) F.

[8] Reported as ignition.

[9] Ignition loss.

[10] Reported as calculated.

[11] Calculated from reported $CaCO_3$ and $MgCO_3$, approximate mineral composition.

[12] Acid insoluble (chiefly SiO_2).

[13] Reported as from total Fe.

[14] Ignition loss less CO_2.

[15] Loss on ignition (chiefly CO_2).

[16] SO_3.

[17] Carbon determined by combustion.

[18] SrO=none, mere traces not determined; Li_2O= trace, FeS_2= trace.

[19] 98.81 percent in text.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

53-64. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. Index and geologic maps, geologic sections, logs of diamond-drill holes. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required.

53. Drill hole 4. (Rutledge and others, 1953, p. 4, 91, 93, 96, 104, 123, figs. 1, 3, 35-37, 41.) Limestone, black, fine-grained; contains few calcite veinlets and brown shale partings; depth 270-275 ft. Total depth of diamond-drill hole 629 ft. [For other analyses from same drill hole, see samples 48-52, this group; sample 3, group C; samples 221-336, group F_2.]

54-58. Drill hole 6. (Rutledge and others, 1953, p. 4, 91, 93, 97, 105, 106, 123, figs. 1, 3, 35, 36, 38, 41.) Total depth of diamond-drill hole 265 ft. [For other analyses from same drill hole, see sample 22, group B; samples 337-379, group F_2.]

54. Limestone, black; shale partings; depth 264-265 ft. Shale, black, soft; depth 263-264 ft.
55. Limestone, black, fine-grained; depth 230-235 ft.
56. Limestone, black, fine-grained; depth 225-230 ft.
57. Limestone, black, fine-grained; contains calcite veinlets and brown claylike residue; depth 120-125 ft.
58. Limestone, black, fine-grained; contains calcite veinlets; depth 25-30 ft.

59-61. Drill hole 8. (Rutledge and others, 1953, p. 4, 91, 93, 98, 109, 123, figs. 1, 3, 35-37, 41.) Limestone, black, fine-grained; contains few calcite veinlets and shale partings. Total depth of diamond-drill hole 395 ft. [For other analyses from same drill hole, see samples 11-13, group E; samples 419-491, group F_2.]

59. Depth 375-380 ft.
61. Depth 340-345 ft.
60. Depth 370-375 ft.

62, 63. Drill hole 9. (Rutledge and others, 1953, p. 4, 91, 93, 98, 99, 111, 112, 123, figs. 1, 3, 35, 36, 39, 41.) Total depth of diamond-drill hole 620 ft. [For other analyses from same drill hole, see samples 23-25, group B; samples 4, 5, group C; sample 14, group E; samples 492-608, group F_2.]

62. Limestone, dark-gray; contains calcite veinlets; depth 560-565 ft.
63. Limestone, gray; contains some calcite veinlets and some brown claylike residue; depth 548-550 ft.

64. Drill hole 11. (Rutledge and others, 1953, p. 4, 91, 93, 100, 101, 114, 123, figs. 1, 3, 35, 36, 40, 41.) Limestone, black, fine-grained; very little calcite; some weathering; depth 270-275 ft. Total depth of diamond-drill hole 284 ft. [For other analyses from same drill hole, see sample 6, group C; sample 15, group E; samples 649-702, group F_2.]

65, 66. Healy quadrangle. [Devonian. Sec. 9, T. 17 S., R. 7 W., unsurveyed], about 2 miles southwest of Windy Station. Analyst, M. L. Sharp. Samples 6, 7. (Waring, 1947, p. 4, 6-8.) Limestone, dark-gray; calcite veins; about 100 ft thick. Index maps.

67-69. Healy quadrangle. Triassic. West Fork of Chulitna River, Broad Pass region. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 87, 118-120, 123, figs. 1, 3, 26, 43, 44.) Outcrop description: Limestone, white to gray, fossiliferous, fractured and weathered. Possible use: Cement material, rock wool.

67. [2.3-2.5, 3.3-3.75] Sample 173. Limestone, crystalline.
68, 69. [2.45-2.75, 2.85-3.3] Samples 189, 187. Limestone, interbedded with shales and siliceous material.

70. Port Alexander quadrangle. Triassic. [About 14.2, 15.9], Kuiu Island, Keku Straits, about 3 miles southwest of Point Cornwallis. Analyst, J. G. Fairchild. Sample 14. (Buddington, 1926, p. 61.) Limestone.

*71. Sitka quadrangle. Paleozoic. [Sec. 29, T. 48 S., R. 66 E.], Admiralty Island, beach south of Marble Cove. Analyst, R. K. Bailey. Record 2952. (Burchard, 1920, p. 15, 53, pls. 1, 2; Wells, 1937, p. 47.) [Dolomite] marble, blue and white speckled, medium-grained. Mineralogy, thin-section description. Index and geologic maps. *Analysis suggests 17.1 percent more CaO than required for carbonate.

Idaho

72, 73. Bear Lake County. Jurassic, Twin Creek Limestone. T. 11 S., R. 44 E., Georgetown Canyon. Analyst, W. C. Wheeler; collector, R. W. Richards. Record 2794. (Clarke, 1915, p. 239; Mansfield, 1927, p. 2, 263, 332, pls. 1, 9, 12, 19.) Limestone. Index and geologic maps, geologic section, generalized columnar section. Possible use: Portland cement.

Idaho—Continued

74. Bear Lake County. Pliocene, Salt Lake Formation. Sec. 35, T. 12 S., R. 43 E., about 0.5 mile southwest of town of Bern. (Mansfield, 1927, p. 2, 110, 111, pls. 1, 9, 12, 19.) Marl, white, dense, very fine; free of grit; 1.5-2 ft thick. Index and geologic maps, geologic section, generalized columnar section.

75, 76. Bonneville County. Early Cretaceous. (Savage, 1961, p. 26, 76, figs. 3, 9.) Limestone. Geologic map, correlated columnar sections.

75. Peterson Limestone. Sec. 1, T. 3 S., R. 45 E., northwest of mouth of McCoy Creek. General: Dolomitic limestone, fossiliferous, thin-bedded to massive; weathers grayish white; contains calcite veins.
76. Draney Limestone. [T. 2 S., R. 44 E.], Jensen Pass. General: Limestone, light-gray, fossiliferous, fine-grained or lithographic, almost a dolomite locally; weathers white.

77-79. Bonneville County. Early Cretaceous, Bear River Formation. Sec. 4, T. 1 S., R. 42 E., Fall River area. Collector, J. D. Vine. (Bell, 1963, p. A6, A28.) Limestone, gray, fine-grained; contains much organic matter. Mineralogy.

77. Lab. No. W66873.
78. Lab. No. W67247.
79. Lab. No. W90218.

*80. Caribou County. Permian, Phosphoria Formation, [Meade Peak Phosphatic Shale Member. T. 7 S., R. 43 E.], near Soda Springs. Ballard mine. No. S73. (Emigh, 1958, p. 21, 22, 24-26, figs. 1, 5.) [Phosphatic shale], top of bed. Mineralogy, thin-section description. Index map. *Analysis suggests 38.4 percent phosphate.

81, 82. Custer County. Analyst, R. C. Wells. (Ross, 1947, p. 1089, 1095, 1107, 1108, 1114-1116, 1118, pls. 1, 3, 12, 13.) Dolomite and limestone, dark-blnish-gray, fossiliferous. Photomicrographs. Index and geologic maps, geologic sections, detailed measured sections.

81. Late Devonian, Jefferson Dolomite. [T. 9 N., R. 22 E.], west side of Borah Peak. Analysis NC 22. Sample: Dolomite, light-colored.
82. Mississippian. [T. 9 N., R. 24 E., possibly] southeast of peak near Swauger Lakes. Analysis NC 39.

83, 84. Custer County. Mississippian. T. 6 N., R. 23 E., southwest of town of Mackay, Alder Creek district. (Umpleby, 1917, p. 12, 59, 70, 93, 95, pls. 1, 7.) General: Limestone, blue, massive and semimassive; chert in lower members. Index and geologic maps.

83. Analyst, W. C. Wheeler. Lab. No. 2851. (Umpleby, 1914, p. 308-310, 329; Clarke, 1915, p. 239.) Bulk density 2.786.

84. Empire mine. Analyst, J. F. Kemp. (Kemp, 1907, p. 6.) Geologic sections.

85. Custer County. T. 15 N., R. 13 E., [unsurveyed], about 1 mile southwest of town of Ivers. Analyst, J. G. Fairchild. Lab. No. C927. (Newhouse, 1934, p. 2, 69, 70, 72, pl. 1.) Dolomitic limestone from quarry. Mineralogy. Bulk density 2.884. Index map, geologic sections. Use: Flux.

86, 87. Nez Perce County. Late Triassic, Martin Bridge Formation. NW¼ sec. 34, T. 32 N., R. 5 W., Lime Point. Analyst, Huey-rong Hsi. Sample 2Hm1, average of six samples; sample 2Jm. (Savage, 1965, p. 18a, 18b, 19, 20, pls. 1, 2, fig. 1.) [Limestone.] Tonnage estimated. Index and geologic maps, geologic section. Possible use: Aggregate, ballast, portland cement, flux, lime.

Oregon

88. Baker County. Probably pre-Carboniferous, limestone in Burnt River Schist. Sec. 11, T. 12 S., R. 43 E., 3.75 miles south of town of Durkee. Nelson deposit. (Hodge, 1938d, p. 154, 199, 236-238, 240.) General: Limestone, interbedded with chert and argillite. Index and geologic maps.

89. Baker County. Triassic. Sec. 3, T. 12 S., R. 44 E., about 5 miles from town of Weatherby, Burnt River Canyon on Sisley Creek. Analyst, J. G. Fairchild. Record 63-D. (Moore, 1937, p. 133, 140, 141, pl. 1; Wells, 1937, p. 58, 59.) Limestone, light-gray to white, fine-grained to coarse-granular, recrystallized. Bulk density 2.70. Tonnage estimated. Index map. Possible use: Cement.

90, 91. Baker County. Probably Triassic. Secs. 27, 34, T. 13 S., R. 44 E., near town of Lime; West of Oregon Portland Cement Co. quarry. (Hodge, 1938d, p. 154, 199, 201, 206, 213, 215, 216.) General: Limestone, white, powdery; average thickness is probably less than 1 ft. Index and geologic maps. Possible use: Cement.

90. Analysts, G. C. Ware, Kenneth McCleod. USED sample 4. Analysis used in computations.
91. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Oregon—Continued												
	92	93	94	95	96	97	98	99	100	101	102	103	104
	36$F_1$1-43		36$F_1$1-14	36$F_1$1-51	36$F_1$3-29	36$F_1$6-1	36$F_1$6-2	36$F_1$7-1	36$F_1$15-11	36$F_1$15-8	36$F_1$27-4	36$F_1$28-1	36$F_1$29-3
SiO_2	13.55	14.60	10.92	16.54	14.88	10.57	[1]10.58	9.40	23.86	17.46	14.56	12.28	9.3
Al_2O_3	5.49	4.91	3.21	1.84	4.09	4.27	[2]5.28	.62	.32	.49	4.55	2.44	4.7
Fe_2O_3	1.17	.83	1.63	------	[3]1.63	2.96		.48		.55	[3]3.75		1.8
FeO	------	------	.25	------	------	------	------	None	------	------	------	------	------
MgO	3.14	3.53	.85	.88	[4].63	1.35	[4]1.79	.64	Trace	8.47	[4]1.07	[4]3.90	[5]1.3
CaO	40.22	40.06	45.36	44.95	[4]43.69	42.97	[4]44.40	49.12	41.83	37.02	[4]40.72	[4]43.60	[5]46.1
Na_2O	------	------	.22	------	------	------	------	.15	------	------	------	------	------
K_2O	------	------	.45	------	------	------	------	Trace	------	------	------	------	------
H_2O	------	------	.96	------	------	------	------	.61	.46	.47	------	------	------
TiO_2	------	------	.20	------	------	------	------	Trace	------	------	------	------	------
P_2O_5	------	------	.07	------	------	------	------	Trace	------	------	------	------	------
MnO	------	------	.03	------	------	------	------	Trace	------	------	------	------	------
CO_3	36.36	[6]35.69	36.24	[7]35.29	[4]34.98	33.47	[4]36.81	38.83	32.57	34.86	[4]33.14	[4]38.49	------
S	------	.03	[8]Trace	------	------	------	------	[8]None	------	.02	------	------	------
SrO	------	------	None	------	------	------	------	None	------	------	------	------	------
Li_2O	------	------	None	------	------	------	------	None	------	------	------	------	------
FeS_2	------	------	.14	------	------	------	------	None	------	------	------	------	------
Organic matter	------	------	.14	------	------	------	------	Trace	------	------	------	------	------
Total	99.93	99.65	100.67	[99.50]	99.90	95.59	[98.86]	99.85	99.04	99.34	[97.79]	[100.71]	[63.2]
Class	2,18,80	------	3,13,82	13,6,80	6,15,79	0,19,76	(2,15)83	8,3,88	23,1,74	16,3,76	2,23,75	8,7,86	0,17,80
CaO/MgO	Magnesian calcite	------	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite

	Oregon—Continued	Washington											
	105	106	107	108	109	110	111	112	113	114	115	116	117
	36$F_1$32-13	46$F_1$2-15	46$F_1$2-16	46$F_1$2-9	46$F_1$2-10	46$F_1$2-3	46$F_1$2-25	46$F_1$4-69	46$F_1$4-66	46$F_1$4-14	46$F_1$4-85	46$F_1$4-83	46$F_1$4-86
SiO_2	7.52	7.95	5.93	4.60	4.53	9.82	16.01	13.01	9.51	6.74	17.00	13.84	[9]15.21
Al_2O_3	2.77	[10]1.88	[10]1.00	[10]1.85	[10]1.70	2.24	1.98	[10]1.21	[10]1.51	2.55	[10]2.57	[10]3.69	------
Fe_2O_3	1.05						.85			1.38			
MgO	1.19	3.71	.51	1.10	1.00	.79	1.11	.83	.58	.64	.97	1.02	1.46
CaO	49.43	44.51	47.21	47.10	46.20	48.33	43.83	46.78	48.91	49.64	44.64	45.39	46.08
H_2O+	------	------	------	------	------	------	.23	------	------	------	------	------	------
P_2O_5	------	.050	.031	.017	.014	------	.117	.068	.035	------	.074	.073	------
MnO	------	------	------	------	------	------	.02	------	------	------	------	------	------
CO_2	37.64	[11]40.67	[11]41.82	[11]41.50	[11]41.52	[6]38.18	34.59	[11]37.29	[11]38.90	[6]38.67	[11]34.89	[11]35.32	[7]35.71
S	------	------	------	------	------	------	.102	------	------	------	------	------	------
Total	99.60	[98.77]	[96.50]	[96.17]	[94.96]	99.36	[98.84]	[99.19]	[99.44]	99.62	[100.14]	[99.33]	[98.46]
Class	1,10,85	5,7,87	4,7,85	2,8,86	2,9,85	6,7,85	12,8,78	11,4,84	7,4,87	1,11,85	13,8,78	8,11,78	(15,0)81
CaO/MgO	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	118	119	120	121	122	123		118	119	120	121	122	123
	46$F_1$4-88	46$F_1$4-87	46$F_1$4-72	46$F_1$4-33	46$F_1$4-42	46$F_1$4-52		46$F_1$4-88	46$F_1$4-87	46$F_1$4-72	46$F_1$4-33	46$F_1$4-42	46$F_1$4-52
SiO_3	[9]18.50	[9]13.40	15.61	11.71	9.06	16.89	Ignition loss	[7]32.02	[7]36.55	33.65	38.62	36.55	35.48
Al_2O_3	------	------	3.83	2.33	3.12	1.36							
Fe_2O_3	------	------	1.63	.47	1.74	.70	Total	[95.51]	[96.70]	[99.84]	99.10	98.71	100.39
MgO	1.68	1.96	2.00	.62	1.47	.69							
CaO	43.31	44.79	42.80	45.35	46.77	45.27	Class	(18,0)72	(13,0)82	7,15,73	7,10,82	2,14,80	14,6,79
Na_2O	------	------	.15	------	------	------							
K_2O	------	------	.17	------	------	------	CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_3, Sb_2O_3, BaO, TeO_3, Cs_2O, La_2O_3, CeO_2, Pr_2O_2, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_3, UO_3]

	106	107	108	109	112	113	115	116
Na_2O	0.15	0.05	0.11	0.13	0.61	0.58	1.23	1.10
K_2O	------	------	------	------	------	.25	.25	1.50
TiO_3	.038	.018	.053	.052	.03	.012	.27	.35
V_2O_5	------	------	.003	.003	------	------	------	------
Cr_2O_3	.0009	.0005	.0005	.0005	.00064	.0008	.0023	.0064
MnO	.07	.06	.22	.15	.048	.036	.15	.17
NiO	------	------	------	------	.001	.0017	.0022	.0044
CuO	.0026	.0015	.0016	.0020	.0014	.0022	.0020	.0032
SrO	.038	.048	.10	.13	.031	.014	.013	.014
ZrO_2	------	------	------	------	------	------	.0051	.0057
Ag_2O	------	------	------	------	------	------	.0002	.0002

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

92, 93. Baker County. Probably Triassic. [T. 13 S., R. 44 E.], railroad cut near Windy Point. (Hodge, 1938d, p. 154, 199, 201, 206, 210, 211, 213, 215.) General: Limestone, bluish-gray, dense, massive; weathers nearly white; beds 2-20 ft thick; overburden thin. Index and geologic maps.

92. Analysts, G. C. Ware, Kenneth McCleod. USED sample 3. Analysis used in computations.

93. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

94. Baker County. Sec. 8, T. 7 S., R. 43 E., about 2.8 miles above Martin Bridge. Analyst, J. G. Fairchild. Record 83-D. (Moore, 1937, p. 134; Wells, 1937, p. 58, 59; Hodge, 1938d, p. 154, 199, 250, 254.) Limestone. Bulk density 2.61. Tonnage estimated. Index and geologic maps.

95. Baker County. Secs. 22, 27, T. 9 S., R. 39 E., Washington Gulch. (Wagner, 1958, p. 44, 45.) Limestone. Index map.

96. Clackamas County. [T. 6 S., R. 1 W.], about 1 mile from town of Marquam. Portland Cement Co. (Williams, 1914, p. 63, 64.) Limestone, composed almost entirely of fossil shells; 15-25 ft thick. Tonnage estimated. Use: Lime. Possible use: Portland cement.

97, 98. Coos County. Eocene, Pulaski Formation. NE¼ sec. 35, T. 25 S., R. 12 W., Coos Bay area. Morgan property. (Oregon Department of Geology and Mineral Industries, 1940, p. 32, 33.) Limestone, dull-gray, amorphous. Overburden 5-20 ft. Tonnage estimated. Possible use: Agricultural.

97. USED sample 192C. (Hodge, 1938d, p. 279.) Outcrop sample. Former use: Mortar.

98. Grab sample.

99. Grant County. Permian. Sec. 19, T. 18 S., R. 25 E., Grindstone Creek. Analyst, J. G. Fairchild; collectors, R. W. Richards, B. N. Moore. Record 63-D. (Moore, 1937, p. 147, pl. 1; Wells, 1937, p. 58, 59.) Limestone. Bulk density 2.68. Index map. Possible use: Cement.

100. Jackson County. Probably Devonian. Sec. 20, T. 36 S., R. 3 W., ridge 1 mile southwest of town of Gold Hill. Analyst, R. C. Wells. Specimen 7021. (Diller and Kay, 1909, p. 50, 51, pl. 2.) Limestone. Index map. Possible use: None.

101. Jackson County. Paleozoic. Sec. 19, T. 40 S., R. 4 W., Carberry Creek. USED sample 80. (Hodge, 1938d, p. 282, 299, 309, 310.) General: Limestone, black, some light-colored areas. Index map. Possible use: [Probably none].

102. Polk County. Secs. 11, 12, T. 8 S., R. 6 W., about 4 miles southwest of town of Dallas. Portland Cement Co. Analyst and collector, R. K. Meade. (Williams, 1914, p. 61, 62.) General: Limestone; beds about 10 ft thick. Chip sample from outcrop. Tonnage estimated. Possible use: Portland cement.

103. Sherman County. [T. 2 N., R. 16 E.], south of town of Rufus. Analyst, R. K. Meade. (Eckel, 1913, p. 309.) Limestone, 1-2 ft thick; alternating with layers of volcanic ash. Possible use: Cement.

104. Tillamook County. NW¼NW¼ sec. 10, T. 2 S., R. 9 W., about 7.5 miles southeast of town of Tillamook. Owner, Charles Nelson. (Hodge, 1938d, p. 154, 268, 269.) Limestone. Tonnage estimated. Index map. Former use: Lime.

105. Wallowa County. Late Triassic. SW corner sec. 10, T. 3 S., R. 44 E., near mouth of Falls Creek. USED sample 35. (Hodge, 1938d, p. 154, 165, 169, 171, 178, 180.) Limestone. Index and geologic maps. Possible use: Cement.

Washington

106 - 109. Asotin County. Probably Late Triassic. Sec. 19, T. 7 N., R. 47 E., Lime Hill, about 25 miles south of town of Clarkston. Ideal Cement Co. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 239-243, 244, 252, 264, pl. 1.) General: Limestone, gray to light-gray, cryptocrystalline to fine-grained; beds 1/16 in.-4 ft thick; chip sample from outcrop. Most units siliceous and (or) slightly argillaceous. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

106. SE¼NE¼ sec. 19. Sample A-11, of 70 ft.

107. SE¼NE¼ sec. 19. Sample A-12, of 27 ft.

108. NE¼SE¼ sec. 19. Sample A-1, of 60 ft.

109. NE¼SE¼ sec. 19. Sample A-2, of 48 ft.

110, 111. County, age, locality [except section], remarks, maps, and use as in samples 106-109.

110. Analyst, A. A. Hammer. (Shedd, 1913, p. 114, 117, 118, 250, pl. 21; Mills, 1962, p. 239-241, 243.) Limestone, dark-gray, fine-grained.

111. (Mills, 1962, p. 239-242, 243.)

112, 113. Chelan County. Pre-Ordovician, limestone in Swakane Gneiss. Sec. 23, T. 26 N., R. 18 E. Dry Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 398-400, 403, 447, 455.) Limestone, thin-bedded; chip sample. Tonnage estimated. Index and geologic maps. Former use: Lime. Possible use: None, deposit small.

112. Sample Cn 5-1. Limestone, crystalline; composite.

113. Sample Cn 5-4. Limestone, black; single specimen.

114. Chelan County. NW¼ sec. 3, NE¼ sec. 4, T. 25 N., R. 20 E., on Entiat River. Snperior Lime and Mining Co. USED sample 231B. (Hodge, 1938d, p. 13, 80, 81, 83, 85, 86; Danner, 1966, p. 82, 398, 410-412, 414, 415.) General: Limestone, white to green, thin-bedded, brittle with flinty appearance. Tonnage estimated. Index and geologic maps. Geologic section, measured section. Possible use: Terrazzo chips, roofing granules, decorative stone.

115 - 119. Chelan County. NE¼ sec. 4, T. 25 N., R. 20 E., on Entiat River. (Danner, 1966, p. 18, 19, 82, 398, 410-412, 414, 415, 447, 455.) General: Limestone, white to greenish-gray, finely crystalline, thin-bedded. Tonnage estimated. Index and geologic maps, geologic section, measured section. Possible use: Terazzo chips, roofing granules, decorative stone.

115, 116. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples Cn 8-1, Cn 8-3.

115. Chip sample taken across 80 ft.

116. Chip sample, single specimen.

117. Log of drill hole 3. Limestone, white; includes 1 ft of gneiss; depth 22.5-39 ft.

118. Log of drill hole 3. Limestone, white; thin schist interbeds; depth 18.5-22.5 ft.

119. Log of drill hole 3. Limestone, banded; depth 0-9 ft.

120. Chelan County. South-central part sec. 15, and SE¼ sec. 9, T. 16 N., R. 19 E., 18 miles by road from town of Entiat. Gold Ridge deposit. (Danner, 1966, p. 82, 398, 406-406.) Limestone, white, fine- to medium-grained, crystalline; contains a few thin quartz and mica schist layers. Sample taken across 25 ft. Index and geologic maps, geologic sections. Possible use: Roofing granules, decorative stone.

121. Chelan County. N½ sec. 10, SE¼ sec. 3, T. 27 N., R. 15 E. Soda Springs deposit, Ideal Cement Co. Drill hole 53. (Danner, 1966, p. 82, 387-390, 392, 397.) Limestone, light-gray to white, medium to coarsely crystalline; interbeds of schist and quartzite; depth 68-78 ft. Index and geologic maps. Former nse: Cement. [For other analyses from same drill hole, see samples 292, 293, group B; sample 127, group D; samples 59, 60, group E.]

122. Chelan County. NW¼ sec. 14, T. 27 N., R. 15 E. Rainy Creek deposit. Drill hole 54. (Danner, 1966, p. 82, 387, 393-396, 397.) Limestone, white to gray, medium to coarsely crystalline; mineralogy; depth 152-163 ft. Tonnage estimated. Index and geologic maps. Possible use: Portland cement. [For other analyses from same drill hole, see samples 294, 295, group B; samples 128, 129, group D; samples 61-63, group E.]

123. County, locality, reference, remarks, maps, and use as in sample 122. Drill hole 55. Depth 198-199.7 ft. [For other analyses from same drill hole, see samples 124-126, this group; sample 26, group C; samples 64-68, group E.]

Footnotes of analyses on preceding page:

[1] Insoluble in boiling diluted HCl.

[2] Iron and aluminum oxide, R_2O_3.

[3] Reported as oxide of iron.

[4] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[5] Reported as calculated.

[6] Ignition loss.

[7] CO_2, calculated from reported MgO and $CaCO_3$.

[8] SO_3.

[9] Insoluble.

[10] R_2O_3.

[11] Sample dried at 110°-112°C; ignition loss, 1,000°-1,100°C.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	124	125	126	127	128	129	130	131	132	133	134	135	136
	$46F_1$4-49	$46F_1$4-46	$46F_1$4-44	$46F_1$4-60	$46F_1$4-56	$46F_1$4-77	$46F_1$4-78	$46F_1$4-79	$46F_1$10-17	$46F_1$10-18	$46F_1$10-19	$46F_1$10-20	$46F_1$10-21
SiO_2	17.18	11.90	15.86	13.11	15.61	8.31	7.49	15.37	13.52	12.51	18.09	9.51	10.15
Al_2O_3	3.34	2.33	2.54	2.60	2.43	2.66	1.68	4.42	[1]1.05	[1].99	[1].85	[1]1.17	[1].96
Fe_2O_3	1.85	.82	1.37	1.05	.16	1.46	1.96	1.06					
MgO	.94	1.29	.82	.90	.38	.66	1.30	1.17	1.12	.92	1.41	.24	.28
CaO	43.02	46.29	44.56	46.26	45.50	49.50	49.80	41.50	46.06	47.04	43.40	50.49	50.07
Na_2O	------	------	------	------	------	.32	.33	2.72	------	------	------	------	------
K_2O	------	------	------	------	------	.06	.05	.19	------	------	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	.056	.051	.040	.015	.017
Ignition loss	33.11	36.77	34.66	35.69	35.56	37.03	37.39	33.47	[2]38.11	[2]38.34	[2]36.23	[2]38.60	[2]38.56
Total	99.44	99.40	99.81	99.61	99.64	[100.00]	[100.00]	[99.90]	[99.92]	[99.85]	[100.02]	[3][100.02]	[100.04]
Class	9,14,72	7,9,81	10,11,76	7,10,79	11,8,79	2,12,81	2,10,82	6,16,73	12,4,85	11,3,86	17,3,80	8,3,87	9,3,87
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	137	138	139	140	141	142	143	144	145	146	147	148	149
	$46F_1$ 10-22	$46F_1$ 14-4	$46F_1$ 14-1	$46F_1$ 16-7	$46F_1$ 16-3	$46F_1$ 23-2	$46F_1$ 40-173	$46F_1$ 40-174	$46F_1$ 40-175	$46F_1$ 40-176	$46F_1$ 24-19	$46F_1$ 24-8	$46F_1$ 24-12
SiO_2	21.62	13.04	11.10	11.94	7.52	[4]11.64	14.30	11.98	9.96	9.74	10.00	8.00	19.14
Al_2O_3	.76	10.21	1.30	3.49	3.99	1.24	[1].34	[1].43	[1].88	[1].80	[5]2.79	[5]2.47	[5]3.40
Fe_2O_3			[6]1.80	2.21	2.01	[7]14.59							
MgO	1.90	1.23	------	1.47	------	------	.59	.30	.29	.32	[8]6.32	[8]19.12	[8]13.20
CaO	42.83	40.82	[7]46.33	44.57	49.20	[7]39.41	47.31	49.09	49.66	49.43	41.48	27.76	27.94
P_2O_5	.057	.116	------	------	------	[7].37	.005	.014	.005	.006	------	------	------
Mn_2O_3	------	------	------	------	------	[9]1.58	------	------	------	------	------	------	------
Ignition loss	[2]32.86	[2]32.61	[10]36.37	34.40	36.28	[10]30.93	[2]37.21	[2]38.46	[2]38.82	[2]38.93	[11]39.41	[11]42.65	[11]36.32
Total	[100.03]	[98.03]	[96.90]	[98.08]	[99.00]	[99.76]	[99.76]	[100.27]	[99.62]	[99.23]	100.00	100.00	100.00
Class	20,2,74	0,23,69	7,8,83	3,16,74	0,14,80	(0,22)70	14,1,84	11,1,87	8,3,88	8,2,88	5,8,86	4,7,88	13,10,76
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Dolomite	Calcareous dolomite

	Washington—Continued												
	150	151	152	153	154	155	156	157	158	159	160	161	162
	$46F_1$ 24-13	$46F_1$ 24-14	$46F_1$ 24-34	$46F_1$ 24-135	$46F_1$ 24-137	$46F_1$ 24-140	$46F_1$ 24-141	$46F_1$ 24-142	$46F_1$ 24-143	$46F_1$ 24-144	$46F_1$ 24-145	$46F_1$ 24-200	$46F_1$ 24-203
SiO_2	8.46	11.80	6.58	7.62	9.56	9.46	14.56	8.45	17.74	10.20	9.14	8.42	8.60
R_2O_3[5]	1.72	2.73	1.70	2.14	3.20	2.76	3.66	2.24	3.70	2.06	2.30	1.68	3.72
MgO[8]	14.12	12.58	17.83	18.24	18.12	18.22	17.31	18.30	16.08	17.92	18.00	17.88	17.72
CaO	33.78	33.16	29.34	29.14	27.62	27.80	25.50	28.56	25.16	28.08	28.54	29.41	28.32
Ignition loss[11]	41.92	39.73	44.55	42.86	41.50	41.76	38.97	42.45	37.32	41.74	42.02	42.61	41.64
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	6,5,89	7,8,84	4,7,89	4,6,89	4,9,86	5,8,86	8,11,80	5,7,88	12,11,77	7,6,87	5,7,87	6,5,89	2,11,86
CaO/MgO	Calcareous dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	163	164	165	166	167	168	169	170	171	172	173	174	175
	$46F_1$ 24-205	$46F_1$ 24-206	$46F_1$ 24-244	$46F_1$ 24-207	$46F_1$ 24-208	$46F_1$ 24-210	$46F_1$ 24-211	$46F_1$ 24-213	$46F_1$ 24-217	$46F_1$ 24-221	$46F_1$ 24-224	$46F_1$ 24-227	$46F_1$ 24-233
SiO_2	9.91	9.50	5.86	6.78	9.70	6.89	11.66	7.37	8.05	11.00	9.94	7.48	7.80
R_2O_3[5]	2.45	3.59	3.30	2.84	2.78	2.60	3.45	3.66	2.36	3.50	2.96	2.94	2.72
MgO[3]	17.70	17.35	17.98	17.86	17.58	18.20	16.88	17.91	18.33	16.87	17.22	17.33	17.98
CaO	28.18	28.18	29.85	29.69	28.42	29.36	27.78	28.80	28.68	28.12	28.60	29.85	29.03
Ignition loss[11]	41.76	41.38	43.01	42.83	41.52	42.95	40.23	42.26	42.58	40.51	41.28	42.40	42.47
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	6,7,87	3,10,85	0,10,89	2,8,89	5,8,86	3,8,89	6,10,83	1,11,87	4,7,88	5,10,84	5,9,86	3,9,88	3,8,88
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite

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[1] R_2O_3.

[2] Sample dried at 110°-112°C; ignition loss at 1,000°- 1,100°C.

[3] With samples 55-58, group F_2, Na_2O = 160 ppm, K_2O = 750 ppm, TiO_2 = < 30 ppm, and S = 26 ppm.

[4] Insoluble.

[5] Iron and alumina.

[6] Includes FeO.

[7] Calculated from reported Fe, $CaCO_3$, and (or) P.

[8] By difference.

[9] Reported as manganese (Mn_2O_3).

[10] CO_2, calculated from reported $CaCO_3$.

[11] 950°-1,000°C; also called CO_2.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, ZnO, Ga_2O_3, GeO_3, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_3, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, Bi_2O_3, ThO_2, UO_2]

	132	133	134	135	136	137	138	143	144	145	146
Na_2O	0.06	0.06	------	------	------	0.26	0.73	------	------	------	------
TiO_2	.054	.036	0.025	0.0064	0.0092	.043	.054	0.0044	0.0076	0.0034	0.0048
V_2O_5	.007	.004	.007	------	.0056	.003	.039	------	------	------	------
Cr_2O_3	.00077	.00058	.0005	.0015	.0014	.0025	.0017	.0016	.0017	.0019	.0011
MnO	.035	.036	.026	.094	.26	.076	3.7	.042	.078	.049	.035
NiO	.001	.002	.002	------	------	.001	.033	------	------	.0019	------
CoO	------	------	------	------	------	------	.0028	------	------	------	------
CuO	.0024	.0059	.003	.0068	.0049	.0022	.035	.0026	.0021	.011	.0061
SrO	.045	.049	.039	.015	.015	.034	.020	.024	.012	.021	.018
ZrO_2	.002	------	.0033	------	------	------	.0096	------	------	------	------
Ag_2O	------	------	------	------	------	------	.0013	------	------	------	------
PbO	------	------	------	------	------	------	------	------	.0035	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

124 - 126. Chelan County. NW¼ sec. 14, T. 27 N., R. 15 E. Rainy Creek deposit. Drill hole 55. (Danner, 1966, p. 82, 387, 393-396, 397.) Limestone, white to gray, medium to coarsely crystalline; mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Portland cement. [For other analyses from same drill hole, see sample 123, this group; sample 26, group C; samples 64-68, group E.]

124. Depth 142.5-174 ft.
126. Depth 0-44.5 ft.
125. Depth 51-60.5 ft.

127, 128. County, locality, reference, remarks, maps, and use as in samples 124-126. [For other analyses from drill hole 56, see sample 296, group B; samples 69, 70, group E; samples 37, 38, group F_2.]

127. Depth 151.3-166 ft.
128. Depth 79-116 ft.

129 - 131. Chelan County. Sec. 15, T. 28 N., R. 21 E., about 11 miles by road from town of Chelan. Manson or Wapato Lake deposit. (Danner, 1966, p. 82, 409, 410, 416.) Limestone, white to gray, finely to medium crystalline, laminated to massive; interbedded with mica schist and gneiss. Deposit small. Composite sample. Index and geologic maps, geologic section. Former use: Lime. Possible use: Terrazzo chips, roofing granules, decorative stone.

132 - 137. Ferry County. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 244, 252, 253, 264, pl. 1.) Limestone, some impurities. Mineralogy. Chip sample from outcrop. Index and geologic maps. Use: None, rock impure.

132 - 134. Pre-Permian, late Paleozoic. NE¼SW¼ sec. 9, T. 35 N., R. 32 E., Sheep Mountain area. (Mills, 1962, p. 207, 209, 210.) Samples F-27, F-28, F-30. Limestone, dark-gray to black, fine- to medium-grained, thin-bedded.

135, 136. Permian. SE¼ sec. 9, T. 36 N., R. 32 E., about 4 miles southwest of town of Republic. Union Lime Co., abandoned quarry. (Mills, 1962, p. 199-201, 202, 203.) Limestone, gray, very fine grained; deposit 50-70 ft thick; overburden. Tonnage estimated.

135. Sample F-34 represents 38 ft.
136. Sample F-37 represents 50 ft.

137. Triassic. SE¼NE¼ sec. 18, T. 40 N., R. 34 E., about 2.5 miles southwest of town of Danville. U.S. Public Domain. Sample F-5. (Mills, 1962, p. 186-188.) Limestone, white to light-gray, medium-grained.

138. Grays Harbor County. Early(?) and middle Eocene, Metchosin Volcanics. Sec. 12, T. 23 N., R. 7 W. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample GH 1. (Danner, 1966, p. 16, 19, 82, 420, 423, 447, 456.) Limestone, chip sample. Index and geologic maps.

139. Grays Harbor County. Early(?) and middle Eocene, Crescent Formation. NW¼ sec. 4, T. 20 N., R. 9 W., Humptulips River. East Fork deposit. (Hodge, 1938d, p. 18; Danner, 1966, p. 82, 422, 423.) Limestone. Index and geologic maps. Use: Probably none, rock impure.

140, 141. Jefferson County. Cretaceous and Tertiary, Soleduck Formation. (Danner, 1966, p. 82, 428, 429.) Index and geologic map.

140. [T. 26 N., R. 4 W., unsurveyed], Dosewallips, Miners Creek. Limestone, white.
141. [T. 27 N., R. 4 W., unsurveyed], Mount Deception. Limestone, green.

Washington—Continued

142. Mason County. [T. 24 N., R. 6 E.], about 11 miles northwest of town of Hoodsport. Hoodsport mine. Analyst, Elton Fulmer. (Shedd, 1902, p. 9, 18.) [Limestone, impure.] Possible use: None.

143 - 146. Okanogan County. Carboniferous. Sec. 27, T. 40 N., R. 30 E., 2.6 miles northeast of town of Chesaw, Buckhorn Mountain area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples O-13, O-20, O-47, O-48. (Mills, 1962, p. 12, 13, 211-213, 214, 245, 254, 264, pl. 1.) General: Limestone, light-gray to dark-gray, fine-grained, very thin bedded; contains chert. Chip sample. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

143. With other samples, represents 150 ft.
144. With other samples, represents 320 ft.

147 - 151. Okanogan County. Triassic. Sec. 8, T. 34 N., R. 26 E., about 4.5 miles southwest of town of Riverside. Owner, Beechenow, deposit 10. (Bennett, 1944, p. 6-9, 11, 22-24, pl. 1; Bennett, 1945, p. 12, 13.) Deposit: Dolomitic marble, white; chert veins and limy dolomite in upper part; stratigraphic thickness about 250 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite: refractories, crushed stone.

147. SW¼NE¼ sec. 8. Sample 460a.
148 - 151. NW¼SE¼ sec. 8.
148. Sample 449a.
150. Sample 454a.
149. Sample 453a.
151. Sample 455a.

152. County, age, reference, maps, and use as in samples 147-151. NE¼NW¼ sec. 10, T. 35 N., R. 26 E., about 4 miles northwest of Riverside. Owner, S.J. Booher, deposit 9. Sample 427. Deposit: Dolomite, dark-gray, dense; stratigraphic thickness about 400 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

153 - 175. Okanogan County. Triassic. Sec. 15, T. 35 N., R. 26 E. Deposit 7. (Bennett, 1944, p. 7, 9, 11, 17-19, pls. 5, 6; Bennett, 1945, p. 8.) Deposit: Dolomite, light- to dark-gray, dense, both massive and bedded. Beds where distinct usually more than a foot to several feet thick; stratigraphic thickness 164 ft to more than 1,000 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone.

153 - 160. NW¼NE¼ sec. 15. Owner, Tim Bernard.
153. Sample 255.
157. Sample 262.
154. Sample 257.
158. Sample 263.
155. Sample 260.
159. Sample 264.
156. Sample 261.
160. Sample 265.
161 - 164. SW¼NE¼ sec. 15. Owner, Tim Bernard.
161. Sample 239.
163. Sample 244.
162. Sample 242.
164. Sample 245.
165 - 170. SE¼NE¼ sec. 15. Owner, R. E. Smith.
165. Sample 234.
168. Sample 249.
166. Sample 246.
169. Sample 250.
167. Sample 247.
170. Sample 253.
171 - 175. NE¼SE¼ sec. 15. Owner, R. E. Smith.
171. Sample 206.
174. Sample 216.
172. Sample 210.
175. Sample 223.
173. Sample 213.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

Washington—Continued

	176	177	178	179	180	181	182	183	184	185	186	187	188
	$46F_1$ 24-238	$46F_1$ 24-239	$46F_1$ 24-241	$46F_1$ 24-243	$46F_1$ 24-248	$46F_1$ 24-249	$46F_1$ 24-250	$46F_1$ 24-253	$46F_1$ 24-254	$46F_1$ 24-255	$46F_1$ 24-257	$46F_1$ 24-258	$46F_1$ 24-282
SiO_2	10.30	6.72	6.44	8.58	5.90	7.14	7.36	7.33	6.45	7.38	10.70	6.60	8.00
R_2O_3[1]	3.61	2.78	2.94	3.26	4.16	2.27	2.58	3.98	3.62	3.35	3.48	3.25	3.16
MgO[2]	17.50	16.61	18.17	17.44	17.97	19.00	17.82	17.96	18.67	18.40	16.87	18.34	18.48
CaO	27.74	28.92	29.46	28.98	29.16	28.46	29.54	28.62	28.52	28.46	28.32	29.02	28.16
Ignition loss[3]	40.85	42.97	42.99	41.74	42.81	43.13	42.70	42.11	42.74	42.41	40.63	42.79	42.20
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	4,11,84	2,8,89	2,9,89	3,10,86	0,10,88	3,7,89	3,8,89	1,12,87	0,11,88	2,10,87	5,10,84	1,9,88	3,9,87
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	189	190	191	192	193	194	195	196	197	198	199	200	201
	$46F_1$ 24-259	$46F_1$ 40-7	$46F_1$ 24-264	$46F_1$ 24-266	$46F_1$ 24-267	$46F_1$ 24-268	$46F_1$ 24-271	$46F_1$ 24-272	$46F_1$ 24-273	$46F_1$ 24-276	$46F_1$ 24-278	$46F_1$ 24-280	$46F_1$ 24-287
SiO_2	11.29	7.38	7.81	11.70	11.64	19.74	19.46	10.09	7.22	10.14	10.43	9.00	8.90
R_2O_3[1]	3.12	2.58	2.25	3.96	2.83	3.84	3.48	3.10	3.08	3.74	3.54	4.44	1.44
MgO[2]	17.48	18.59	18.09	16.90	17.51	15.68	15.71	17.81	17.47	17.30	17.53	17.79	18.51
CaO	27.62	28.68	29.20	27.42	27.38	24.44	24.76	27.76	29.76	27.92	27.62	27.62	28.46
Ignition loss[3]	40.49	42.77	42.65	40.02	40.64	36.30	36.59	41.24	42.27	40.86	40.88	41.15	42.69
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.80	99.96	100.00	100.00	100.00
Class	6,9,84	3,8,89	4,7,89	5,12,82	7,8,84	13,11,74	14,10,75	5,9,85	2,9,88	4,11,84	5,10,84	2,13,84	6,4,89
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	202	203	204	205	206	207	208	209	210	211	212	213	214
	$46F_1$ 24-289	$46F_1$ 24-291	$46F_1$ 24-292	$46F_1$ 24-299	$46F_1$ 40-1	$46F_1$ 40-2	$46F_1$ 40-3	$46F_1$ 40-4	$46F_1$ 40-8	$46F_1$ 40-9	$46F_1$ 40-10	$46F_1$ 40-11	$46F_1$ 40-12
SiO_2	8.53	21.48	15.90	12.31	11.68	16.35	11.56	13.35	11.52	12.28	17.58	6.74	19.66
R_2O_3[1]	1.62	2.05	1.76	2.43	1.82	2.14	1.63	2.12	2.42	3.09	2.55	2.76	2.33
MgO[2]	18.39	16.21	16.69	17.54	17.08	16.13	17.09	15.91	17.46	17.10	16.37	18.06	16.35
CaO	28.76	23.82	26.54	27.22	28.44	26.72	28.60	28.70	27.76	27.37	25.56	29.55	24.54
Ignition loss[3]	42.70	36.44	39.11	40.50	40.98	38.66	41.12	39.92	40.84	40.16	37.94	42.89	37.12
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	6,5,89	18,6,75	13,5,81	8,7,84	9,5,86	13,6,80	9,5,86	10,6,83	7,7,85	7,9,83	13,7,79	2,8,89	16,7,77
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	215	216	217	218	219	220	221	222	223	224	225	226	227
	$46F_1$40-13	$46F_1$40-15	$46F_1$40-16	$46F_1$40-18	$46F_1$40-40	$46F_1$40-47	$46F_1$40-27	$46F_1$40-30	$46F_1$40-54	$46F_1$40-55	$46F_1$40-56	$40F_1$40-58	$46F_1$40-63
SiO_2	13.53	8.74	7.14	16.94	10.90	7.66	8.00	7.39	14.74	9.38	10.84	10.24	13.76
R_2O_3[1]	2.16	2.85	2.60	3.20	1.40	2.26	1.98	2.12	3.64	3.04	3.34	2.50	4.96
MgO[2]	17.29	17.91	18.71	16.48	15.62	17.23	17.06	18.88	16.28	17.48	17.66	18.02	15.23
CaO	26.98	28.56	28.66	25.42	30.80	30.30	30.40	28.56	26.64	28.56	27.38	27.78	27.68
Ignition loss[3]	40.04	41.94	42.89	37.96	41.28	42.55	42.56	43.05	38.70	41.54	40.78	41.36	39.37
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.90	101.00
Class	10,6,83	4,8,87	3,8,89	12,9,78	9,4,87	4,7,89	5,6,89	4,6,89	9,11,80	4,9,86	5,10,84	6,7,86	5,14,81
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite

Washington—Continued

	228	229	230	231	232	233	234	235	236	237	238	239	240
	$46F_1$40-64	$46F_1$40-65	$46F_1$40-66	$46F_1$40-67	$46F_1$40-77	$46F_1$40-82	$46F_1$40-83	$46F_1$40-85	$46F_1$40-87	$46F_1$40-89	$46F_1$40-51	$46F_1$40-52	$46F_1$40-53
SiO_2	12.64	8.20	15.44	15.48	6.38	10.84	20.30	8.95	9.00	18.70	9.48	15.80	7.74
R_2O_3[1]	3.42	2.24	4.50	3.34	2.58	3.14	3.18	2.54	2.90	3.92	3.76	4.10	2.98
MgO[2]	17.19	17.99	16.81	16.32	17.52	16.59	14.28	17.93	17.67	12.34	16.13	15.67	17.52
CaO	26.86	29.06	25.02	26.36	29.83	28.75	26.14	28.52	28.65	28.91	29.66	26.50	29.50

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington containing 75 to 90 percent carbonate (Group F_1) common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	228	229	230	231	232	233	234	235	236	237	238	239	240
	46F$_1$40-64	46F$_1$40-65	46F$_1$40-66	46F$_1$40-67	46F$_1$40-77	46F$_1$40-82	46F$_1$40-83	46F$_1$40-85	46F$_1$40-87	46F$_1$40-89	46F$_1$40-51	46F$_1$40-52	46F$_1$40-53
Ignition loss[3]	39.89	42.51	38.23	38.50	43.69	40.68	36.10	42.06	41.78	36.13	40.97	37.93	42.26
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	7,10,82	4,7,88	8,13,78	10,10,79	2,8,90	6,9,84	15,9,75	5,7,87	4,8,87	12,11,75	3,11,85	9,12,78	3,9,88
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Dolomite	Dolomite	Calcareous dolomite	Calcareous dolomite	Dolomite	Dolomite

[1] Iron and alumina.

[2] By difference.

[3] 950°-1,000°C; also called CO_2.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

176 - 182. Okanogan County. Triassic. Sec. 15, T. 35 N., R. 26 E. Deposit 7. (Bennett, 1944, p. 6-9, 11, 17-19, pls. 5, 6; Bennett, 1945, p. 8.) Deposit: Dolomite, light- to dark-gray, dense, both massive and bedded. Beds where distinct usually more than a foot to several feet thick; stratigraphic thickness 165 ft to more than 1,000 ft. Fresh samples from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone.

176 - 180. NE¼SE¼ sec. 15. Owner, R. E. Smith.

176. Sample 228.
177. Sample 229.
178. Sample 231.
179. Sample 233.
180. Sample 238.

181, 182. NW¼SE¼ sec. 15. Owner, Tim Bernard.

181. Sample 201.
182. Sample 202.

183 - 209. Okanogan County. Triassic. T. 35 N., R. 26 E., about 2.5 miles northwest of town of Riverside. Deposit 6. (Bennett, 1944, p. 6-9, 11, 17, pl. 4; Bennett, 1945, p. 7.) Deposit: Dolomite, gray, massive; some siliceous beds. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone.

183 - 187. SW¼SE¼ sec. 15. Owner, Mrs. W. V. West.

183. Sample 185.
184. Sample 186.
185. Sample 187.
186. Sample 189.
187. Sample 195.

188, 189. SE¼SE¼ sec. 15. Owner, R. E. Smith.

188. Sample 182.
189. Sample 196.

190 - 200. NE¼NE¼ sec. 22. Owner, R. E. Smith.

190. Sample 163.
191. Sample 164.
192. Sample 166.
193. Sample 167.
194. Sample 168.
195. Sample 171.
196. Sample 172.
197. Sample 173.
198. Sample 176.
199. Sample 178.
200. Sample 180.

201 - 209. NW¼NE¼ sec. 22. Owner, Mrs. W. V. West.

201. Sample 143.
202. Sample 145.
203. Sample 147.
204. Sample 148.
205. Sample 156.

Washington—Continued

206. Sample 157.
207. Sample 158.
208. Sample 159.
209. Sample 160.

210 - 218. County, age, maps, and use as in samples 183-209. SE¼NE¼ sec. 22, T. 35 N., R. 26 E., 2 miles northwest of Riverside. Deposit 5. (Bennett, 1944, p. 6-9, 11, 16, pl. 4; Bennett, 1945, p. 6.) Deposit: Dolomite, gray, thick-bedded to massive; contains many cherty quartz veinlets. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

210. Sample 127.
211. Sample 128.
212. Sample 129.
213. Sample 130.
214. Sample 131.
215. Sample 132.
216. Sample 134.
217. Sample 135.
218. Sample 136.

219 - 222. County, age, maps, and use as in samples 183-209. Sec. 23, T. 35 N., R. 26 E., about 1.5 miles northwest of Riverside. Owners, Emmett,Omar, and R. E. Smith. (Bennett, 1944, p. 6-9, 11, 20, 21, pl. 3; Bennett, 1945, p. 11.) Deposit: Dolomite, light-gray, fine-grained; stratigraphic thickness 200-300 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

219, 220. NE¼SW¼ sec. 23. Samples 362, 369.

221, 222. SE¼NW¼ sec. 23. Samples 370, 373.

223 - 240. County, age, maps, and use as in samples 183-209. T. 35 N., R. 26 E., about 1.25 miles northwest of Riverside. Deposit 4. (Bennett, 1944, p. 6-9, 11, 14-16, pl. 2; Bennett, 1945, p. 5, 6.) Deposit: Dolomite, light-gray to gray to brownish-gray; some impurities; stratigraphic thickness 450-500 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

223 - 231. NW¼SW¼ sec. 23.

223. Sample 105.
224. Sample 106.
225. Sample 107.
226. Sample 109.
227. Sample 118.
228. Sample 119.
229. Sample 120.
230. Sample 121.
231. Sample 122.

232 - 240. SW¼SW¼ sec. 23. Owners, Emmett and Omar Smith.

232. Sample 91.
233. Sample 96.
234. Sample 97.
235. Sample 99.
236. Sample 101
237. Sample 103.
238. Sample 112.
239. Sample 113.
240. Sample 114.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	241	242	243	244	245	246	247	248	249	250	251	252	*253
	$46F_1$ 40-101	$46F_1$ 24-23	$46F_1$ 40-177	$46F_1$ 40-178	$46F_1$ 40-179	$46F_1$ 40-180	$46F_1$ 40-181	$46F_1$ 40-182	$46F_1$ 40-183	$46F_1$ 40-184	$46F_1$ 40-185	$46F_1$ 24-22	$46F_1$ 24-25
SiO_2	15.54	12.86	17.35	8.75	16.78	19.83	14.17	19.12	22.30	14.92	18.55	12.00	10.44
R_2O_3	[1]5.06	1.32	.65	1.25	2.48	2.72	1.82	2.22	1.38	1.96	4.33	1.80	2.66
MgO	[2]16.46	10.60	2.11	.84	1.78	2.00	1.35	.89	.81	1.80	1.05	4.20	47.53
CaO	25.35	31.25	43.38	49.54	43.29	41.18	45.08	42.60	42.11	44.60	42.23	45.91	1.78
P_2O_5	------	------	.105	.154	.344	.098	.056	.056	.061	.246	.090	------	------
Ignition loss	[3]37.59	43.20	[4]36.46	[4]39.78	[4]35.56	[4]33.62	[4]36.90	[4]34.69	[4]33.66	[4]36.23	[4]33.63	36.44	37.02
Total	100.00	99.23	[100.06]	[5][100.31]	[100.23]	[99.45]	[99.38]	[99.58]	[100.32]	[99.76]	[99.88]	100.35	99.43
Class	7,15,76	11,11,78	16,2,82	7,4,89	13,7,79	15,8,74	11,5,82	15,6,77	20,4,75	12,6,81	11,13,74	9,5,80	6,8,70
CaO/MgO	Dolomite	Calcareous dolomite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesite

	Washington—Continued												
	254	255	256	257	258	259	260	261	262	263	264	265	266
	$46F_1$40-164	$46F_1$25-14	$46F_1$25-13	$46F_1$25-4	$46F_1$25-19	$46F_1$25-21	$46F_1$25-22	$46F_1$25-23	$46F_1$26-81	$46F_1$26-83	$46F_1$26-84	$46F_1$26-85	$46F_1$26-86
SiO_2	9.10	10.56	9.50	9.69	10.33	7.03	8.83	9.76	19.29	[6]8.50	[6]9.62	[6]11.55	[6]9.38
Al_2O_3	[7]4.10	[7]4.74	[7]4.54	5.07	3.36	2.34	2.85	4.69	[7].52	[7]1.56	[7]1.30	[7]1.98	[7].90
Fe_2O_3				[8]1.75	2.12	1.21	2.09	2.52					
MgO	3.16	.91	1.21	.94	.97	.76	1.01	.93	18.16	[9]1.27	[9]1.46	[9]2.03	[9]1.08
CaO	48.16	45.57	46.41	45.91	45.66	47.87	46.91	44.60	25.96	[9]48.59	[9]47.91	[9]46.17	[9]49.25
Na_2O	------	------	------	------	.25	.12	.50	.15	------	------	------	------	------
K_2O	------	------	------	------	.60	.67	.35	.50	------	------	------	------	------
P_2O_5	------	.062	.168	------	------	------	------	------	.060	------	------	------	------
SO_3	------	------	------	------	.36	.79	.50	.20	------	------	------	------	------
Ignition loss	36.12	[4]37.24	[4]37.69	36.52	36.65	38.76	37.17	37.08	[4]36.29	[10]39.54	[10]39.21	[10]38.46	[10]39.84
Total	100.64	[99.08]	[99.52]	99.88	[100.30]	[99.55]	[100.21]	[100.43]	[100.28]	[99.46]	[99.50]	[100.19]	[100.45]
Class	2,12,79	3,14,82	2,13,83	0,17,79	2,15,80	2,10,86	1,14,81	0,18,80	18,2,76	(6,5)89	(7,4)89	(8,5)87	(8,2)89
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Dolomite	Calcite	Calcite	Magnesian calcite	Calcite

	Washington—Continued												
	267	268	269	270	271	272	273	274	275	276	277	278	279
	$46F_1$26-87	$46F_1$26-88	$46F_1$26-82	$46F_1$26-91	$46F_1$26-216	$46F_1$26-215	$46F_1$26-217	$46F_1$26-214	$46F_1$26-72	$46F_1$26-24	$46F_1$26-11	$46F_1$26-12	$46F_1$26-22
SiO_2	[6]10.06	[6]11.23	7.60	6.39	[11]12.44	[11]12.02	[11]16.69	[11]10.46	11.08	11.40	15.60	10.60	11.30
Al_2O_3	[7]1.40	[7]1.64	[7]4.22	[7]3.50	------	------	------	------	5.45	1.06	2.30	2.10	1.70
Fe_2O_3									1.67				
FeO	------	------	------	------	[9].12	[9].55	[9].12	[9].44	------	------	------	------	------
MgO	[9]1.60	[9].93	2.15	1.95	[9].17	[9]13.59	[9].37	[9]18.36	3.73	None	Trace	Trace	Trace
CaO	[9]47.89	[9]47.87	46.84	47.81	[9]48.58	[9]31.18	[9]45.81	[9]28.40	40.76	48.75	45.60	47.62	45.97
P_2O_5	------	------	.019	.016	------	------	------	------	------	------	------	------	------
MnO	------	------	------	------	[12]Trace	[9].01	[9].01	[9].03	------	------	------	------	------
Ignition loss	[10]39.34	[10]38.59	[4]38.64	[4]39.95	[10]38.38	[12]39.84	[10]36.44	[10]42.63	37.30	------	------	------	------
Total	[100.29]	[100.26]	[99.47]	[99.62]	99.69	97.19	99.44	100.32	[99.99]	[61.21]	[63.50]	[60.32]	[58.97]
Class	(8,4)89	(8,4)87	1,12,85	1,10,88	(12,0)87	(12,0)85	(17,0)83	(10,0)89	0,19,75	10,3,87	12,7,81	7,6,85	8,5,82
CaO	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcareous dolomite	Calcite	Dolomite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_2, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 255, K_2O = 3.0 percent; sample 256, K_2O = 1.20 percent; sample 262, PbO = 0.002 percent]

	243	244	245	246	247	248	249	250	251	255	256	262	269	270
Na_2O	------	0.17	0.32	0.28	0.28	0.16	0.18	0.13	------	0.47	0.56	------	0.11	0.097
TiO_2	0.014	.07	.12	.088	.075	.086	.057	.064	0.12	.13	.092	0.002	.084	.076
V_2O_5	.011	------	.064	.028	.020	.028	.023	.018	.0076	.011	.0056	------	.003	.003
Cr_2O_3	.0014	.00083	.0042	.0036	.0024	.0013	.0037	.0045	.005	.0023	.0015	------	.00061	.00058
MnO	.043	.17	.033	.048	.044	.044	.068	.02	.22	.055	.21	.047	.10	.07
NiO	------	------	.0068	.0042	.003	.0042	.0044	.0046	.0044	.001	.001	.001	.001	.001
CuO	.004	.0025	.004	.0083	.0066	.0081	.012	.0025	.0019	.0041	.0025	.0040	.0015	.0019
SrO	.036	.0087	.15	.095	.11	.07	.10	.083	.015	.056	.024	.0058	.018	.021
ZrO_2	------	.0045	.0039	.0066	.0066	.0096	.0054	.0045	.014	.0087	.0048	------	------	------
Ag_2O	.0002	.0002	.0005	------	------	------	------	.0002	------	------	.0002	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

241. Okanogan County. Triassic. NE¼NW¼ sec. 26, T. 35 N., R. 26 E., about 1.25 miles northwest of town of Riverside. Owner, N. W. L. Brown, deposit 4. Sample 72. (Bennett, 1944, p. 6-9, 11, 14-16, pl. 2; Bennett, 1945, p. 5.) Deposit: Dolomite, light-gray to gray to brownish-gray; some impurities; stratigraphic thickness 450-500 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone.

242. Okanogan County. Triassic (Bennett, 1944). T. 35 N., R. 26 E., west of Riverside. Analyst, A. A. Hammer. Sample 23. (Shedd, 1913, p. 166, 167, 245, pl. 21.) Limestone, yellow, flinty. Index maps.

243. Okanogan County. NE¼ sec. 4, T. 34 N., R. 26 E., about 4 miles southwest of Riverside. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sarrple O-5. (Mills, 1962, p. 12, 13, 238, 245, 254, 264, pl. 1.) Limestone, gray to dark-gray, fine- to medium-grained, well-bedded; 34 of 57 ft sampled. Chip sample from outcrop. Index and geologic map. Possible use: None, rock impure.

244. Okanogan County. SE¼ sec. 1, T. 35 N., R. 25 E., southeast side of Dunn Mountain. Scholz property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample O-4. (Mills, 1962, p. 12, 13, 232-234, 245, 254, 264, pl. 1.) Limestone, white to light-gray, medium-grained. Chip sample from three outcrops, represents 52 ft. Tonnage estimated. Index and geologic map. Possible use: Portland cement.

245-249. Okanogan County. T. 35 N., R. 25 E., Dunn Mountain area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. (Mills, 1962, p. 12, 13, 233, 235, 236, 245, 246, 254, 255, 264, pl. 1.) Limestone, dark-gray, fine- to medium-grained, siliceous. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.

245. NE¼NE¼ sec. 12. W. G. Scholz property. Sample O-2 represents 18 ft.
246. SE¼SE¼ sec. 12. McCain property. Sample O-53 represents 43 ft.
247. SE¼SE¼ sec. 12. McCain property. Sample O-54 represents 43 ft.
248. SE¼SE¼ sec. 12. McCain property. Sample O-55 represents 43 ft.
249. SE¼SE¼ sec. 12. McCain property. Sample O-56 represents 43 ft.

250. Okanogan County. SW¼ sec. 7, T. 35 N., R. 26 E., Dunn Mountain area. McCain property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample O-1. (Mills, 1962, p. 12, 13, 233, 235, 236, 245, 254, 264, pl. 1.) Limestone, dark-gray, fine- to medium-grained, siliceous. Chip sample from outcrop, represents 38 ft. Index and geologic maps. Possible use: None, rock impure.

251. Okanogan County. NE¼NW¼ sec. 26, T. 35 N., R. 26 E., 1 mile northwest of Riverside. Brown property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample O-70. (Mills, 1962, p. 236-238, 246, 256, 264, pl. 1.) Limestone, gray, fine-grained, siliceous, argillaceous, bedded; weathers gray with brownish streaks. Chip sample from outcrop taken across 48 ft. Index and geologic maps. Possible use: None, rock impure.

252-254. Okanogan County. Analyst, A. A. Hammer. (Shedd, 1913, p. 165, 166, 167, 244, 245, pl. 21.) Index maps.

252. T. 35 N., R. 25 E., near Riverside, Scotch Creek basin. Sample 18. Limestone, black to blue.
*253. T. 35 N., R. 26 E., 3 miles west of Riverside. Sample 21. Magnesite, black. *Analysis suggests 16.3 percent more MgO and CaO than required for carbonate.
254. [T. 37 N., R. 31 E.], west of town of Republic, Granite Creek. Sample 11. Limestone, white to blue, schistose.

255, 256. Pacific County. Oligocene. SW¼NW¼ sec. 24, T. 13 N., R. 8 W., 1.9 miles southeast of town of Menlo. Lawson ranch deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples PF 1-2; PF 1-1. (Danner, 1966, p. 16, 19, 82, 434, 435, 447, 456.) Limestone, bluish-gray, dense,fossiliferous; weathers light tan to cream. Chip sample, composite. Index and geologic maps. Possible use: Agricultural.

257. Pacific County. Oligocene. SE¼NW¼ sec. 24, T. 13 N., R. 8 W., 1.9 miles southeast of Menlo. Lawson ranch deposit. USED sample 176 B. (Hodge, 1938d, p. 13, 18, 20, 24; Danner, 1966, p. 82, 434, 435.) Limestone, bluish-gray, dense, fossiliferous; weathers light tan to cream. From outcrop 10 ft thick. Index and geologic maps. Possible use: Agricultural.

258-261. Pacific County. Oligocene. SE¼SE¼ sec. 20, T. 10 N., R. 10 W. Bear River deposit. (Danner, 1966, p. 82, 431-433, 434.) Limestone, bluish-gray to gray; in part dense vuggy algal material and in part coquina; weathers light brown or buff. Sample taken across 10 ft. Tonnage estimated. Index and geologic maps; measured section. Former use: Agricultural, lime.

262. Pend Oreille County. Precambrian, Priest River Group. NE¼ sec. 28, T. 35 N., R. 43 E., 1.5 mile north of Parker Lake. Hauck property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample PO-26. (Mills, 1962, p. 12, 13, 60, 246, 257, 264, pl. 1.) Dolomite, light-gray, medinm- to coarse-grained, silicified, friable. Chip sample from outcrop. Index and geologic map.

263-270. Pend Oreille County. Middle Cambrian, lower unit of Metaline Limestone. SW¼NE¼ sec. 31, T. 38 N., R. 43 E., 1 mile north of town of Ione. Jordan or Allen quarry, abandoned. Index and geologic maps. Former use: Cement, flux. Possible use: None.

263-268. (Mills, 1962, p. 54-57, 58, pls. 1, 2.) Limestone, gray, argillaceous, dolomitic.
269, 270. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples PO-7; PO-6. (Mills, 1962, p. 12, 13, 54-58, 246, 256, 264.) Limestone, dark-gray, fine-grained, slightly dolomitic and argillaceous; contains numerous brown streaks and patches; weathered. Chip sample from outcrop.

271-273. Pend Oreille County. Metaline Limestone. Between sections 15 and 16, T. 39 N., R. 43 E., about 1 mile north of town of Metaline Falls. Pend Oreille Mines and Metals Co., Pend Oreille mine. Analyst, E. T. Erickson. Drill hole 234. (Park and Cannon, 1943, p. 2, 43, 72, 73, pls. 1, 21, 22.) Mineralogy. Graphic presentation of analysis. Index and geologic maps, geologic sections. [For other analyses from same drill hole, see samples 602-620, group F_2.]

271. [Limestone], depth 550 ft.
272. [Calcareous dolomite], depth 440 ft.
273. [Limestone], depth 250 ft.

274. Pend Oreille County. Metaline Limestone. SW¼ sec. 29, T. 39 N., R. 43 E. Metaline Mining and Leasing Co., Bella May mine. Analyst, J. G. Fairchild. Drill hole 42. (Park and Cannon, 1943, p. 2, 43, 66, 67, pls. 1, 21, 22.) [Limestone], depth 631 ft. Mineralogy. Graphic presentation of analysis. Index and geologic maps, geologic sections. [For other analyses from same drill hole, see samples 654-657, group F_2.]

275. Pend Oreille County. Paleozoic. NE¼ sec. 27, T. 39 N., R. 43 E., about 1 mile southeast of Metaline Falls. Lehigh Portland Cement Co. (Hodge, 1938d, p. 13, 95, 122-126.) Limestone, blue, bedded. Index and geologic maps. Use: Portland cement.

276-279. Pend Oreille County. T. 38 N., R. 43 E., town of Cement. Jordan property. (Shedd, 1913, p. 180, 184, 245, pl. 21.) Limestone. Index maps. Possible use: Cement.

Footnotes of analyses on preceding page:

[1] Iron and alumina.

[2] By difference.

[3] 950°-1,000°C; also called CO_2.

[4] Sample dried at 110°-112°C; ignition loss at 1,000°-1,100°C.

[5] Na_2O = 270 ppm, K_2O = 700 ppm, TiO_2 = 310 ppm, S = 390 ppm.

[6] Insoluble.

[7] R_2O_3.

[8] Includes FeO.

[9] Calculated from reported $FeCO_3$, $MgCO_3$, $CaCO_3$, and (or) $MnCO_3$.

[10] CO_2, calculated from reported $FeCO_3$, $MgCO_3$, $CaCO_3$, and (or) $MnCO_3$.

[11] Insoluble (acid) 110°C.

[12] $MnCO_3$.

487-187 O - 73 - 6

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	280	281	282	283	284	285	286	287	288	289	290	291	292
	$46F_1$26-21	$46F_1$26-25	$46F_1$26-19	$46F_1$26-52	$46F_1$26-70	$46F_1$26-61	$46F_1$28-50	$46F_1$28-101	$46F_1$28-64	$46F_1$28-65	$46F_1$28-66	$46F_1$28-76	$46F_1$28-134
SiO_2	8.80	16.60	6.92	14.76	7.00	10.54	15.95	9.36	15.80	7.41	9.14	19.05	15.57
R_2O_3	2.00	2.92	2.92	[1]2.80	[1]5.32	[1]6.42	.78	1.41	2.00	1.91	1.17	2.05	.79
MgO	Trace	4.40	1.24	2.26	1.52	2.99	.39	1.04	.23	.21	.27	.72	.17
CaO	47.77	38.28	48.65	42.63	47.50	43.01	46.30	48.38	45.25	50.12	49.63	43.13	46.60
P_2O_5	------	------	------	------	------	------	.023	.092	.032	.019	.015	.023	.096
Ignition loss	------	------	39.34	35.84	38.98	------	[2]36.68	[2]39.16	[2]36.32	[2]40.33	[2]39.68	[2]34.86	[2]36.48
Total	[58.57]	[62.20]	99.07	98.29	[100.32]	[62.96]	[100.12]	[99.44]	[3][99.63]	[3][100.00]	[99.90]	[99.83]	[99.71]
Class	5,6,84	12,9,78	2,9,87	10,8,79	0,12,86	0,18,80	15,2,83	7,4,88	12,6,81	4,6,90	7,4,89	16,6,78	14,2,82
CaO/MgO	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	293	294	295	296	297	298	299	300	301	302	303	304	305
	$46F_1$28-54	$46F_1$28-55	$46F_1$28-133	$46F_1$28-132	$46F_1$28-78	$46F_1$28-79	$46F_1$28-128	$46F_1$28-81	$46F_1$28-82	$46F_1$28-80	$46F_1$28-46	$46F_1$28-48	$46F_1$28-92
SiO_2	7.86	9.99	11.87	19.29	14.32	11.35	9.12	20.10	18.84	16.94	22.22	13.34	13.33
R_2O_3	2.37	1.16	1.13	2.85	1.97	2.02	.72	1.43	1.34	1.13	.60	1.05	.93
MgO	1.31	.21	.43	.30	.32	1.83	.15	.68	1.68	.35	.18	.17	.29
CaO	48.62	49.28	48.05	42.95	45.81	46.51	50.34	43.19	42.69	45.30	42.97	47.99	47.50
P_2O_5	.290	.054	.033	.052	.034	.032	.011	.021	.020	.039	.044	.012	.100
Ignition loss[2]	39.30	39.18	38.26	34.17	36.74	38.30	39.54	34.53	35.15	35.94	34.09	37.36	37.29
Total	[4][99.75]	[99.87]	[5][99.77]	[99.61]	[99.19]	[100.04]	[99.88]	[6][99.95]	[6][99.72]	[99.70]	[100.10]	[99.92]	[99.44]
Class	4,7,88	8,3,88	10,3,86	15,8,76	11,6,82	8,6,85	8,2,89	18,4,77	17,4,79	15,3,81	21,2,77	12,3,84	12,3,84
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued					
	306	307	308	309	310	311
	$46F_1$ 28-93	$46F_1$ 29-134	$46F_1$ 29-128	$46F_1$ 29-122	$46F_1$ 29-124	$46F_1$ 29-125
SiO_2	13.31	9.03	13.37	13.35	9.43	11.90
R_2O_3	.74	.92	1.90	1.85	.87	1.77
MgO	.28	.36	.42	.42	.27	.48
CaO	47.68	50.34	46.69	46.46	49.41	47.83
P_2O_5	.078	.007	.057	.073	.055	.065
Ignition loss[2]	37.62	38.99	37.23	37.47	39.51	37.94
Total	[99.71]	[99.65]	[99.67]	[99.62]	[99.54]	[99.98]
Class	12,2,85	7,3,88	10,6,83	10,5,84	8,3,89	9,5,85
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Al_2O_3 and Fe_2O_3.

[2] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[3] Na_2O = 300 ppm, K_2O =490 ppm, TiO_2 = 810 ppm, S = 256 ppm.

[4] With sample 766, group F_2: Na_2O = 270 ppm, K_2O = 610 ppm, TiO_2 =< 30 ppm, S = 70 ppm.

[5] With sample 785, group F_2: Na_2O = 100 ppm, K_2O = 560 ppm, TiO_2 = 250 ppm, S = 470 ppm.

[6] With sample 63, group C and sample SJ 76-4, not recorded: Na_2O = 160 ppm, K_2O = 420 ppm, TiO_2 = 260 ppm, S = 240 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_2, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 287, K_2O = 1.13 percent]

	286	287	288	289	290	291	292	293	294	295	296	297	298
Na_2O	------	0.55	0.068	0.075	0.05	0.067	0.05	0.44	0.05	------	0.53	0.14	0.49
TiO_2	0.01	.036	.11	.15	.031	.053	.010	.034	.02	0.10	.063	.11	.12
V_2O_5	------	------	.010	.012	.0062	.0053	------	------	.003	------	------	------	------
Cr_2O_3	.00067	.0074	.0016	.0017	.0010	.0017	.0007	.0030	.00074	.0021	.0022	.0027	.0018
MnO	.09	.10	.087	.085	.05	.05	.13	.08	.75	.04	.26	.11	.05
NiO	.001	.0026	.0018	.0012	.001	.0018	------	.001	.001	.0024	.002	.002	.0024
CuO	.0038	.0038	.0031	.0026	.0018	.005	.011	.0030	.0021	.0089	.015	.0047	.0094
SrO	.013	.050	.0056	.0098	.0098	.015	.011	.022	.018	.028	.011	.025	.025
ZrO_2	------	.0054	------	------	------	------	------	.002	------	------	.002	.002	.002
Ag_2O	------	------	.0015	.0016	.0012	.0023	------	------	------	------	------	------	------

	299	300	301	302	303	304	305	306	307	308	309	310	311
Na_2O	------	------	------	0.075	------	------	0.05	0.18	0.59	0.19	0.05	------	0.071
TiO_2	0.019	0.059	0.04	.021	0.011	0.023	.05	.039	.087	.052	.045	0.016	.056
V_2O_5	------	------	------	------	------	------	.003	.003	------	.007	.0067	.0051	.0064
Cr_2O_3	.0005	.0036	.0017	.00083	.0005	.00058	.0013	.00096	.0024	------	------	------	------
MnO	.057	.07	.08	.13	.16	.37	.23	.34	.05	.04	.095	.033	.057
NiO	------	.0016	.001	.0018	.0016	.0018	------	.001	------	.0012	.002	.001	.001

Spectrochemical analyses—Continued

	299	300	301	302	303	304	305	306	307	308	309	310	311
CuO	0.0029	0.0057	0.0081	0.007	0.0049	0.0050	0.0051	0.0049	0.0047	0.0030	0.0038	0.0012	0.0026
SrO	.014	.013	.014	.16	.017	.0077	.014	.034	.011	.035	.055	.024	.021
ZrO_2	------	.002	------	------	------	------	------	------	------	------	------	------	------
Ag_2O	------	------	------	------	------	------	------	------	------	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

280, 281. Pend Oreille County. T. 38 N., R. 43 E., town of Cement. Jordan property. (Shedd, 1913, p. 180, 184, 245, pl. 21.) Limestone. Index maps. Possible use: Cement.

282, 283. Pend Oreille County. Analyst, A. A. Hammer. Index maps. Possible use: Portland cement.

282. T. 38 N., R. 43 E., Cement. Jordan property. (Shedd, 1913, p. 180, 184, 185, 245, pl. 21.) Limestone, yellowish- to light-gray, crystalline, fine-grained.

283. T. 39 N., R. 43 E., near town of Metaline. (Shedd, 1913, p. 180, 189, 190, 250, pl. 21.) [Limestone] shale, dark-colored, almost black, very fine grained, finely laminated.

284. Pend Oreille County. [T. 39 N., R. 43 E.], Metaline Falls. Inland Portland Cement Co., quarry. (Krejci, 1914, p. 927, 930, 936.) Limestone. Use: Portland cement.

285. Pend Oreille County. T. 39 N., R. 43 E., Metaline Falls, Sullivan Creek. (Shedd, 1913, p. 180, 193, 195, 250, pl. 21.) [Limestone] shale. Index maps. Possible use: Portland cement.

286. San Juan County. Early Pennsylvanian or Late Mississippian. N½ SE¼ sec. 20, T. 37 N., R. 2 W., Orcas Island. Englehartson deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 161-163, 448, 456.) Limestone, light-gray, organoclastic to crystalline; contains jasperoid. Thin-section description. Chip sample taken across 350 ft. Tonnage estimated. Index and geologic maps.

287. County, analysts, and maps as in sample 286. Mississippian and Permian(?). SE¼ sec. 25, T. 37 N., R. 2 W., Orcas Island, about 2.5 miles by boat southeast of town of East Sound. Langdon deposit. (Danner, 1966, p. 16, 19, 141, 191, 193, 450, 460.) Limestone, light-gray to bluish-gray, crystalline. Thin-section description. Chip sample taken across 50 ft. Tonnage estimated. Former use: Flux.

288 - 290. San Juan County. Early Pennsylvanian. SE¼ SW¼ sec. 16, T. 37 N., R. 1 W., Orcas Island. Mount Constitution deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 198, 199, 450, 460.) Limestone, dark-gray, dense to fragmental, fossiliferous; weathers buff; contains interbedded argillaceous material. Chip sample. Tonnage estimated. Index and geologic maps. Possible use: None, rock impure.

288. Sample SJ 77-1 taken across 325 ft.
289. Sample SJ 77-2 taken across 100 ft.
290. Sample SJ 77-3 single specimen.

291. County, age, analysts, maps, and use as in samples 288-290. NE¼ NE¼ sec. 19, T. 37 N., R. 1 W., Orcas Island, about 4 miles from town of East Sound. Wright deposit. Sample SJ 80-2. (Danner, 1966, p. 16, 19, 82, 141, 203, 450, 461.) Limestone, argillaceous, dark-gray-buff, dense, fossiliferous; weathers brownish buff. Thin-section description. Chip sample.

292. San Juan County. Permian. NW¼ NE¼ sec. 22, T. 36 N., R. 4 W., Henry Island, west side of Nelson Bay. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 59-2. (Danner, 1966, p. 16, 19, 82, 84, 129, 130, 449, 459.) Limestone, light-gray; interbedded with ribbon chert. Thin-section description. Chip sample taken across 100 ft. Index and geologic maps. Possible use: None, deposit small.

293. County, age, analysts, and maps as in sample 292. NE¼ SW¼ sec. 22, T. 37 N., R. 2 W. Fowler deposit. Sample SJ 26-1. (Danner, 1966, p. 16, 19, 82, 141, 164-166, 448, 457.) Limestone, argillaceous, siliceous, mostly crystalline; weathers buff. Chip sample taken across 90 ft. Tonnage estimated.

294. County, age, analysts, and maps as in sample 292. NW¼ NW¼ sec. 23, T. 37 N., R. 2 W., Orcas Island, about 1 mile southwest by boat from town of East Sound. Judd Cove deposit. Sample SJ 27-1. (Danner, 1966, p. 16, 19, 82, 166, 167, 168, 448, 457.) Limestone, dark-gray to light-gray, dense to crystalline; carbonaceous and argillaceous; weathers light gray or buff; contains jasperoid. Chip sample taken across 30 ft. Possible use: None, deposit small and impure.

295. County, analysts, and maps as in sample 292. Permian(?). NW¼ NW¼ sec. 29, T. 36 N., R. 3 W., San Juan Island. Rocky Bay quarries. Sample SJ 63-2. (Danner, 1966, p.16,19,82,94,99,100,449,459.) Limestone, bluish-gray, crystalline; interbedded with argillite. Chip sample taken across 125 ft. Tonnage estimated. Former use: Pulp and paper industry.

296. County, analysts, and maps as in sample 292. Late Triassic, Haro Formation. NE¼ sec. 14 and NW¼ sec. 13, T. 36 N., R. 4 W., San Juan Island. Davison Head deposit, Roche Harbor Lime and Cement Co. Sample SJ 50-2. (Danner, 1966, p. 16,19,82,84,121,122,123,449,459.) Limestone, argillaceous, fossiliferous. Chip sample taken across 4.5 ft. Detailed measured section. Possible use: None, deposit small and impure.

297, 298. County, analysts, and maps as in sample 292. SW¼ sec. 5, T. 36 N., R. 1 W., Orcas Island. Rosario deposit. Samples SJ 72-2, SJ 72-3. (Danner, 1966, p. 16, 19, 82, 141, 195, 196, 450, 460.) Limestone, dark-gray, finely crystalline; argillaceous interbeds. Chip sample. Possible use: None, deposit impure.

297. Sample taken across 150 ft. 298. Sample taken across 200 ft.

299. County, analysts, and maps as in sample 292. South part of sec. 11, T. 36 N., R. 3 W., Jones Island. Sample SJ 33-2. (Danner, 1966, p.16, 19, 82, 94, 131, 132, 448, 458.) Limestone, gray, dense. Thin-section description. Chip sample taken across 20 ft. Possible use: None, deposit small and impure.

300, 301. County, analysts, and maps as in sample 292. NE¼ sec. 17, T. 37 N., R. 1 W., Orcas Island. Buck Mountain deposit. Samples SJ 76-1, SJ 76-2. (Danner, 1966, p. 16, 19, 82, 141, 197, 198, 450, 460.) Limestone, white to buff, finely crystalline. Chip sample. Tonnage estimated. Possible use: Cement.

300. Sample taken across 20 ft. 301. Sample taken across 85 ft.

302. County, analysts, maps, and use as in sample 292. NW¼ NW¼ sec. 17, T. 37 N., R. 1 W., Orcas Island. Buck Mountain deposit. Sample SJ 75-1. (Danner, 1966, p.16,19,82,141,197,450,460.) Limestone, argillaceous, gray, mostly crystalline; weathers buff. Chip sample, composite.

303. County, analysts, and maps as in sample 292. Near center SE¼ sec. 15, T. 37 N., R. 2 W., Orcas Island. Double Hill deposit. Sample SJ 16-1. (Danner, 1966, p. 16, 19, 82, 141, 152, 157, 158, 448, 457.) Limestone, light-gray to gray, mostly crystalline, fossiliferous; contains jasperoid. Thin-section description. Chip sample taken across 40 ft. Tonnage estimated. Possible use: None, deposit small and impure.

304. County, analysts, reference, and maps as in sample 286. SE¼ SE¼ sec. 15, T. 37 N., R. 2 W., Orcas Island, about 0.80 mile southwest of town of East Sound. Langell deposit. Sample SJ 13-1. Limestone, blue-gray to white, finely crystalline to deuse; contains argillaceous and cherty material. Thin-section description. Chip sample taken across 40 ft.

305, 306. County, analysts, and maps as in sample 292. SE¼ NE¼ sec. 22, T. 37 N., R. 2 W., Orcas Island. Fowler deposit. (Danner, 1966, p. 16, 19, 82, 141, 166, 168, 169, 448, 457.) Limestone, siliceous. Former use: Lime. Possible use: None, deposit largely depleted.

305. Sample SJ 28-1; chip sample taken across 10 ft.
306. Sample SJ 28-2; chip sample, composite.

307. Skagit County. Devonian to Early Permian, Chilliwack Group. NE¼ NE¼ sec. 8, T. 35 N., R. 9 E. Jackman Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St 14-2. (Danner, 1966, p. 16, 19, 82, 269, 271, 275, 280, 281, 451, 462.) Limestone, gray, finely crystalline, massive; about 50-75 ft thick. Chip sample taken across 100 ft. Index and geologic maps.

308 - 311. County, age, analysts, and maps as in sample 307. T. 35 N., R. 10 E. Sutter Creek deposit. (Danner, 1966, p. 16, 19, 82, 269, 290, 295-297, 451, 462.) Limestone, dark-gray to gray, massive to well-bedded to laminated, dense to finely crystalline; contains calcite veinlets and interbeds of black shale. Thin-section description. Chip sample. Possible use: Cement.

308. NE¼ sec. 19. Sample St 11-8 taken across 174 ft.
309. SW¼ sec. 20. Sample St 11-2 taken across 25 ft.
310. SW¼ sec. 20. Sample St 11-4 taken across 15 ft.
311. SW¼ sec. 20. Sample St 11-5 taken across 60 ft.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued												
	312	313	314	315	316	317	318	319	320	321	322	323	324
	46F$_1$ 29-126	46F$_1$ 29-127	46F$_1$ 29-45	46F$_1$ 29-46	46F$_1$ 29-89	46F$_1$ 29-108	46F$_1$ 29-107	46F$_1$ 29-106	46F$_1$ 29-102	46F$_1$ 29-6	46F$_1$ 29-7	46F$_1$ 29-8	46F$_1$ 29-5
SiO_2	10.04	8.91	9.8	9.4	9.04	12.64	21.74	18.31	10.64	12.68	13.54	13.65	11.70
Al_2O_3	[1]1.35	[1]2.01	3.4	.5	[1]1.27	[1]2.11	[1]1.62	[1]4.74	[1].73	2.74	3.90	3.88	[1]3.84
Fe_2O_3			1.5	.3									
MgO	.44	2.48	.6	.2	.43	3.46	.36	.91	.87	------	------	------	------
CaO	49.19	47.17	46.8	50.4	50.32	43.70	42.47	41.72	49.00	46.24	43.34	43.97	46.75
P_2O_5	.090	.106	[2]< .01	[2]<.01	.005	.045	.017	.038	.018	------	------	------	------
S	------	------	.005	.016	------	------	------	------	------	------	------	------	------
Ignition loss	[3]38.95	[3]39.48	37.1	39.3	[3]38.75	[3]37.86	[3]33.76	[3]34.30	[3]38.68	36.70	36.11	36.12	36.92
Total	[100.06]	[100.16]	[4][99.2]	[5][100.2]	[99.82]	[99.82]	[99.97]	[100.02]	[99.94]	[98.36]	[96.89]	[97.62]	99.21
Class	8,4,88	6,6,88	2,14,81	8,2,89	7,4,87	9,6,84	19,5,76	10,14,75	9,2,87	8,8,82	7,13,77	7,12,78	5,11,82
CaO/MgO	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	325	326	327	328	329	330	331	332	333	334	335	336	337
	46F$_1$ 29-148	46F$_1$ 29-147	46F$_1$ 29-145	46F$_1$ 29-146	46F$_1$ 29-23	46F$_1$ 29-80	46F$_1$ 31-73	46F$_1$ 31-72	46F$_1$ 31-103	46F$_1$ 31-104	46F$_1$ 31-105	46F$_1$ 31-88	46F$_1$ 31-92
SiO_2	12.72	12.42	12.43	11.69	13.00	17.65	19.08	20.99	9.98	15.04	13.24	19.21	13.11
Al_2O_3	1.31	1.14	1.19	1.08	3.00	[1]1.26	[1]1.57	[1]1.83	1.98	.64	1.67	1.18	[1]1.20
Fe_2O_3	1.15	.90	.63	.99					1.52	2.18	.51	.66	
MgO	1.07	1.06	1.04	1.10	------	.95	.30	.35	1.16	1.02	1.03	Trace	.45
CaO	46.76	47.27	47.36	47.38	44.00	43.97	43.89	42.63	48.66	45.97	48.26	44.55	50.27
Na_2O	------	------	------	------	------	------	------	------	------	------	------	.06	------
K_2O	------	------	------	------	------	------	------	------	------	------	------	.02	------
P_2O_5	------	------	------	------	------	.054	.030	.049	------	------	------	------	.025
Ignition loss	36.84	37.00	36.90	37.01	37.0	[3]35.86	[3]34.79	[3]33.75	37.82	36.25	35.93	34.83	[3]34.38
Total	[99.85]	[99.79]	[99.55]	[99.25]	[97.0]	[6][99.74]	[99.66]	[99.60]	[101.12]	[101.10]	[100.64]	[100.51]	[99.44]
Class	9,7,82	9,6,83	10,5,82	9,6,83	8,10,79	16,4,80	16,5,78	18,5,76	5,10,84	11,7,80	10,6,80	16,5,78	11,4,77
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	338	339	340	341	342	343	344	345	346	347	348	349	350
	46F$_1$31-18	46F$_1$31-59	46F$_1$31-23	46F$_1$31-22	46F$_1$31-21	46F$_1$31-87	46F$_1$33-6	46F$_1$43-155	46F$_1$41-37	46F$_1$33-29	46F$_1$33-55	46F$_1$33-45	46F$_1$33-44
SiO_2	7.5	7.33	18.9	22.3	13.0	20.53	[7]8.1	[8]19.67	[7]16.9	[9]7.65	[9]8.58	[9]11.02	[9]10.52
Al_2O_3	3.1	3.36	1.1	.5	2.6	[1]1.73	1.6	[1].20	3.3	[10]1.12	[10]1.02	[10]1.40	[10]1.18
Fe_2O_3	1.4		.6	.4	1.7								
FeO	------	------	------	------	------	------	------	1.38	------	------	------	------	------
MgO	1.6	1.85	43.9	42.4	.8	1.51	[11]33.5	[12]15.44	[11]25.0	[11]36.56	[11]46.47	[11]43.44	[11]33.55
CaO	47.5	46.83			46.8	42.07	17.5	25.56	17.1	13.85	1.21	4.50	13.63
P_2O_5	[2].05	------	------	------	[2].03	.027	------	------	------	------	------	------	------
S	.276	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	[13]38.1	------	[13]34.5	[13]33.3	[13]35.0	[3]34.52	[14]39.3	[10]37.75	[14]37.7	[13]40.82	[13]42.72	[13]39.64	[13]41.12
Total	[99.5]	[59.37]	[99.0]	[98.9]	[99.9]	[100.39]	100.0	[100.00]	100.0	100.00	100.00	100.00	100.00
Class	0,13,83	2,10,87	16,5,77	21,2,75	6,12,77	18,5,77	5,5,78	(19,1)79	11,10,75	(6,3)81	(7,3)82	(9,4)76	(9,3)82
CaO/MgO	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian dolomite	Dolomite	Magnesian dolomite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 319, K_2O = 0.82 percent]

	312	313	316	317	318	319	320	330	331	332	337	343
Na_2O	0.05	0.05	0.46	0.14	0.083	0.38	------	------	0.071	0.06	0.05	0.82
TiO_2	.030	.037	.041	.039	.035	.10	0.01	0.026	.025	.016	.058	.03
V_2O_5	.011	.0064	------	.003	.003	.010	------	.003	.003	.003	.003	------
Cr_2O_3	------	------	.0005	.0011	.0009	.0013	.0005	.00083	.00093	.0015	.00099	.0005
MnO	.053	.063	.024	.024	.012	.045	.018	.028	.067	.10	.20	.085
NiO	.0028	.0017	------	.001	.001	.001	------	.0018	.001	.001	.001	------
CuO	.0038	.0039	.0013	.0020	.0023	.0021	.0013	.0041	.0046	.0068	.0026	.037
SrO	.022	.052	.017	.016	.011	.018	.0084	.0098	.017	.012	.014	.034

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

312, 313. Skagit County. Devonian to Early Permian, Chilliwack Group. T. 35 N., R. 10 E., Sutter Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples St 11-6, St 11-7. (Danner, 1966, p. 16, 19, 82, 269, 290, 295-297, 451, 452.) Limestone, dark-gray to gray, massive to well-bedded to laminated, dense to finely crystalline; contains calcite veinlets; interbeds of black shale. Thin-section description. Index and geologic maps. Possible use: Cement.
312. Chip sample taken across 100 ft.
313. Chip sample taken across 94 ft.

314, 315. Skagit County. Silurian and Devonian part of Chilliwack Group. SE¼SE¼ sec. 23 or NE¼NE¼ sec. 26, T. 35 N., R. 9 E. North Rockport deposit. Analysts, K. S. Johnson and Anthony Centenero. (Popoff, 1948, p. 2, 6, 7, 9, 11, 13, figs. 1, 3, 4; Danner, 1966, p. 82, 269, 289-292, 293, 294.) General: Limestone, white to dark-gray, medium- to coarse-grained, massive, uniform texture; total thickness may exceed 100 ft. Tonnage estimated. Index and geologic maps. Possible use: Agricultural, cement.
314. Contains thin seams of shale. Channel sample taken across 9.0 ft.
315. Channel sample taken across 8.0 ft.

316. Skagit County. Devonian(?) part of Chilliwack Group. E½ sec. 16, T. 35 N., R. 10 E., Jackman Ridge. Meiklejohn and Brown Co., Broderick claim. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St 18-4. (Danner, 1966, p. 16, 19, 82, 269, 271, 283, 284, 288, 451, 463.) Limestone, dense to finely crystalline, well-bedded, fossiliferous. Chip sample taken across 300 ft. Tonnage estimated. Index and geologic maps.

317 - 320. Skagit County. Pennsylvanian part of Chilliwack Group. E½ sec. 32, T. 35 N., R. 9 E. Sutter Mountain deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 269, 301-303, 451, 463.) Limestone, medium-crystalline. Chip sample. Index and geologic maps.
317. Sample St 23-1 taken across 32 ft.
318. Sample St 23-2 taken across 30 ft.
319. Sample St 23-3 taken across 45 ft.
320. Sample St 24-4 taken across 250 ft.

321 - 323. Skagit County. Early Pennsylvanian part of Chilliwack Group. Secs. 1, 2, T. 35 N., R. 8 E., about 1 mile north of town of Concrete. Superior Portland Cement Co. quarry. (Hodge, 1935c, p. 71, 72; Danner, 1966, p. 82, 269, 271-274.) General: Limestone, light- to dark-gray, dense to organoclastic and oolitic, well-bedded; about 500-600 ft thick. Thin-section description. Tonnage estimated. Index maps. Use: Portland cement.
321. Average of quarry run for the year 1935.
322. Average of quarry run for the year 1934.
323. Average of quarry run for the year 1932.

324 - 328. County, age, group, general remarks, maps, and use as in samples 321-323. Center sec. 2, T. 35 N., R. 8 E., about 1 mile by road from Concrete. Lone Star Cement Co. (Danner, 1966, p. 82, 269, 271-273, 274.)
324. (Hodge, 1938d, p. 13, 47, 48, 51, 52, 53.)
325. Weighted average for the year 1951.
326. Weighted average for the year 1952.
327. Weighted average for the year 1954.
328. Weighted average for the year 1953.

329. Skagit County. Early Pennsylvanian part of Chilliwack Group (Danner, 1966). [T. 35 N., R. 8 E.], Concrete. (Hodge, 1935a, pl. 25.) Limestone. Tonnage estimated. Possible use: Flux.

330. Skagit County. Early Pennsylvanian part of Chilliwack Group. NW¼ sec. 7, T. 36 N., R. 8 E., about 17 miles from Concrete. Washington Monument deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St 22-1. (Danner, 1966, p. 16, 19, 82, 259, 260, 264, 265, 268, 451, 463.) Limestone, massive to thin-bedded, oolitic, organoclastic and crystalline textures. Chip sample taken across 290 ft. Index and geologic maps. Possible use: Portland cement.

331, 332. Age, analysts, and maps as in sample 330. Snohomish County. NW¼ sec. 36, T. 32 N., R. 10 E., southeast of town of Darrington. Conn Creek deposit. Samples Sh 11-2, Sh 11-3. (Danner, 1966, p. 16, 19, 82, 333, 335-337, 452, 464.) Limestone, gray, some brown, mostly crystalline or organoclastic; in beds 0.5-26 in. thick, alternating with gray-brown chert beds 0.75-8 in. thick. Chip sample taken across 100 ft. Possible use: None, deposit small and impure.

333 - 335. Snohomish County. Jurassic and Cretaceous. NE¼ sec. 21, T. 27 N., R. 9 E., near town of Gold Bar. Proctor Creek deposit. Drill holes 2 and 3. (Danner, 1966, p. 82, 353-356, 358.) Limestone, black to gray; weathers light gray; contains calcite veinlets. Deposit small, tonnage estimated. Index and geologic maps. Logs of drill holes. Possible use: Agricultural, decorative stone. [For other analyses from drill holes, see sample 76, group C; sample 982, group F_2.]
333. Sample length 23 ft 5 in.; includes 2 ft of volcanics.
334. Sample length 28 ft 9 in.; includes 2 ft 10 in. of chert.
335. Sample length 25.5 ft; includes 9 in. of chert.

336. Snohomish County. Possibly Jurassic or Early Cretaceous. SE¼SW¼ sec. 11, T. 27 N., R. 8 E., about 2 miles south of town of Startup. Sultan deposit. Analyst, T. Baldwin. (Danner, 1966, p. 82, 343-345, 346.) Limestone, bluish-gray, fossiliferous; thin beds 1-24 in. thick; interbedded with chert. Tonnage estimated. Index and geologic maps. Possible use: None, rock impure.

337. Snohomish County. Late Jurassic or Early Cretaceous. SE¼ sec. 16, SW¼ sec. 15, T. 27 N., R. 9 E., 2.5 mile east of Gold Bar. Marble quarry area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Sh 14-3. (Danner, 1966, p. 16, 19, 82, 333, 339, 340, 348, 350-352, 353, 452, 464.) Limestone, predominantly black; about 60 ft exposed. Chip sample taken across 40 ft. Index and geologic maps. Use: Agricultural, flux, calcium carbide manufacture, sugar refining, ornamental stone.

338, 339. Snohomish County. SE¼SE¼ sec. 14, T. 32 N., R. 8 E., south of town of Fortson. Galbraith deposit. (Popoff, 1949b, p. 2-6, 8, figs. 1-4; Danner, 1966, p. 82, 326, 327, 328-332, 333, 334.) General: Limestone, gray to black, massive. Mineralogy. Tonnage estimated. Index and geologic maps. Graphic representation of analyses. Possible use: None, rock impure.
338. Sample taken across 32.1 ft.
339. Sample taken across 303.0 ft; average of 98 samples.

340 - 342. County, references, maps, and use as in samples 338, 339. NW¼NE¼ sec. 25, T. 32 N., R. 8 E., south of Fortson. Hi Hi deposit. General: Limestone, gray to nearly black, finely crystalline, massive.

343. County, analysts, reference, and maps as in sample 337. N½ sec. 24, T. 32 N., R. 11 E., east of Darrington. Circle Peak deposit, roadcut. Sample Sh 2-1. Limestone, white to light-gray, medium to coarsely crystalline. Mineralogy. Chip sample taken across 75 ft. Possible use: None, deposit impure.

344. Stevens County. Precambrian, [Edna Dolomite]. Sec. 36, T. 30 N., R. 37 E., Turk area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 21, 23, 24, pl. 2.) [Magnesian dolomite.] General mineralogy. Index and geologic maps.

345. Stevens County. Edna Dolomite. SE¼ sec. 16, T. 30 N., R. 38 E., Springdale-Hunters Road. Analyst, V. North. Sample CM-13. (Campbell and Loofbourow, 1962, p. 3, 12, pls. 1, 2.) Dolomite. Index and geologic maps, correlated columnar sections, geologic sections.

346. Stevens County. [Edna Dolomite.] Sec. 21, T. 30 N., R. 38 E. One mile southwest of Firminhac quarry. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 20, 23, 24, pl. 2.) [Magnesian dolomite], dark-gray, fine-grained; 125 ft bed. General mineralogy. Index and geologic maps.

347 - 350. Stevens County. Precambrian , Stensgar Dolomite. SE¼SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. (Bennett, 1943, p. 3-7, 9, 19, 21, pl. 1.) General mineralogy. Tonnage estimated. Index map, geologic section. Possible use: Source of magnesia [implied].
347. Lab. No. 211. [Dolomitic magnesite], outcrop sample.
348 - 350. General: Magnesite, medium-crystalline; for the most part massive; occasional banding; channel sample.
348. Lab. No. 185. [Magnesite.]
349. Lab. No. 303. [Dolomitic magnesite.]
350. Lab. No. 304. [Dolomitic magnesite.]

Footnotes of analyses on preceding page:

[1] R_2O_3.
[2] Calculated from reported P.
[3] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.
[4] Analysis on dry basis.
[5] Free C = 0.07 percent, calculated organic matter = 0.12 percent; analysis on dry basis.
[6] With sample 68, group C and sample 905, group F_2; Na_2O = 185 ppm, K_2O = 490 ppm, TiO_2 = 250 ppm, S = 325 ppm.
[7] Insoluble, mainly SiO_2.
[8] Insoluble.
[9] Insoluble, includes silica and insoluble silicates.
[10] Iron and alumina.
[11] By difference.
[12] Reported as calculated.
[13] At 950°C.
[14] Mainly CO_2.
[15] CO_2, reported as calculated.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

Washington—Continued

	351	352	353	354	355	356	357	358	359	360	361	362	363
	46$F_1$33-37	46$F_1$33-69	46$F_1$33-70	46$F_1$33-86	46$F_1$33-97	46$F_1$33-98	46$F_1$43-54	46$F_1$33-103	46$F_1$43-61	46$F_1$43-62	46$F_1$33-120	46$F_1$43-69	46$F_1$33-133
Insoluble [1]	17.09	10.71	13.58	9.76	9.25	8.07	20.45	10.26	11.90	17.04	19.10	19.60	7.77
R_2O_3[2]	2.32	1.73	1.46	1.40	.90	.81	.30	.48	1.22	1.19	1.97	1.36	1.08
MgO[3]	28.35	22.09	19.98	20.75	22.75	26.91	19.70	21.73	19.52	18.05	30.81	19.61	47.46
CaO	16.15	30.10	27.10	25.22	30.90	31.31	24.87	30.50	26.52	25.30	8.58	27.32	.86
Ignition loss[4]	36.09	35.37	37.88	42.87	37.20	32.90	34.68	37.03	40.84	38.42	39.54	32.11	42.83
Total	100.00	100.00	100.00	100.00	[101.00]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	13,7,72	8,5,73	11,4,79	7,4,88	8,3,77	7,2,68	20,1,72	9,1,77	10,4,85	15,3,80	16,6,77	17,4,67	6,3,82
CaO/MgO	Magnesian dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomitic magnesite	Dolomite	Magnesite

Washington—Continued

	364	365	366	367	368	369	370	371	372	373	374	375
	46F_1 33-137	46F_1 33-149	46F_1 33-150	46F_1 33-152	46F_1 43-73	46F_1 33-153	46F_1 33-157	46F_1 33-160	46F_1 33-189	46F_1 33-191	46F_1 43-77	46F_1 33-201
Insoluble [1]	10.82	14.74	9.57	14.80	9.95	9.81	8.76	9.18	13.04	12.70	15.91	9.85
R_2O_3[2]	1.57	.83	.73	1.05	.74	.84	.71	.54	.55	1.09	.70	1.01
MgO[3]	45.32	44.53	45.93	36.01	20.34	43.48	45.46	29.74	18.58	39.57	34.22	18.51
CaO	2.00	8.00	3.56	15.00	29.13	3.70	1.93	17.89	31.63	10.31	13.24	32.85
Ignition loss[4]	40.29	31.90	40.21	33.14	39.84	42.17	43.14	42.65	36.20	36.33	35.93	37.78
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	8,5,77	13,2,62	8,2,77	13,3,66	9,2,83	8,2,81	8,2,83	8,2,86	12,2,76	11,3,71	15,2,71	8,3,79
CaO/MgO	Magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomite	Dolomitic magnesite	Magnesite	Magnesian dolomite	Calcareous dolomite	Dolomitic magnesite	Dolomitic magnesite	Calcareous dolomite

Washington—Continued

	376	377	378	379	380	381	382	383	384	385	386	387
	46F_1 43-84	46F_1 43-86	46F_1 33-203	46F_1 33-205	46F_1 33-211	46F_1 43-103	46F_1 33-224	46F_1 33-232	46F_1 33-237	46F_1 33-243	46F_1 33-254	46F_1 33-259
Insoluble [1]	15.03	12.79	9.03	19.00	20.92	7.75	8.89	7.18	9.50	15.31	15.45	8.90
R_2O_3[2]	1.32	1.16	.83	1.08	.64	1.79	1.30	1.78	1.71	1.19	2.18	1.04
MgO[3]	20.18	16.44	21.38	19.88	20.14	43.23	47.81	31.26	47.57	21.15	21.64	44.75
CaO	30.21	33.95	28.73	27.02	26.48	7.23	1.55	19.32	1.50	24.30	26.76	3.42
Ignition loss[4]	33.26	35.66	40.03	33.02	31.82	40.00	40.45	40.46	39.72	38.05	33.97	41.89
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	13,4,69	11,3,76	8,2,83	18,3,69	20,2,66	5,5,77	7,4,77	4,5,81	7,5,76	3,3,78	12,6,70	7,3,81
CaO/MgO	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomitic magnesite	Magnesite	Magnesian dolomite	Magnesite	Dolomite	Dolomite	Dolomitic magnesite

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[1] Includes silica and insoluble silicates.

[2] Iron and alumina.

[3] By difference.

[4] At 950°C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

351 - 387. Stevens County. Precambrian, Stensgar Dolomite. SE¼SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. (Bennett, 1943, p. 3-7, 9, 21, pl. 1.) General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. Possible use of magnesite: Source of magnesium for light-metal construction.

351. Lab. No. 314. Sample U-34-37. (Bennett, 1943, p. 19.) [Magnesian dolomite], channel sample from old mine adit.

352 - 354. Drill hole 1. (Bennett, 1943, p. 10.) [For other analyses from same drill hole, see samples 1025-1051, group F_2.]

352. Lab. No. 104. [Dolomite] magnesitic dolomite, gray; depth 108-126 ft.

353. Lab. No. 102. Dolomite, gray to light-gray; depth 101-108 ft.

354. Lab. No. 85. Dolomite, yellow, green, pink; depth 21-26 ft.

355 - 360. Drill hole 2. (Bennett, 1943, p. 10, 11.) [For other analyses from same drill hole, see samples 89-92, group C; samples 1052-1085, group F_2.]

355. Lab. No. 197. [Dolomite] magnesitic dolomite, light-gray to gray; depth 246.5-259 ft.

356. Lab. No. 195. [Dolomite] dolomitic magnesite, light-gray; depth 242-244.5 ft.

357. Lab. No. 161. Dolomite, light-gray; contains serpentine; depth 183.5-186.5 ft.

358. Lab. No. 159. [Dolomite] magnesitic dolomite, light-gray; depth 182-183 ft.

359. Lab. No. 148. Dolomite, white; contains chalcedony; depth 150-152 ft.

360. Lab. No. 147. Dolomite, pink; contains chalcedony; depth 147-150 ft.

361, 362. Drill hole 3. (Bennett, 1943, p. 11, 12.) [For other analyses from same drill hole, see samples 93-96, group C; samples 1086-1094, group F_2.]

361. Lab. No. 296. Dolomitic magnesite, white and multicolored; depth 270-278 ft.

362. Lab. No. 289. Dolomite, gray and brown; contains serpentine; depth 81.5-93 ft.

363, 364. Drill hole 4. (Bennett, 1943, p. 12.) [For other analyses from same drill hole, see samples 1095-1110, group F_2.]

363. Lab. No. 245. Magnesite, medium- to dark-gray, medium-coarse texture; depth 140-170 ft.

364. Lab. No. 241. Magnesite, gray, medium-coarse texture; depth 118-121 ft.

365 - 371. Drill hole 5. (Bennett, 1943, p. 12, 13.) Rock, medium-coarse texture. [For other analyses from same drill hole, see sample 97, group C; samples 1111-1117, group F_2.]

365. Lab. No. 281. [Dolomitic magnesite] magnesite, white; depth 258-259 ft.

366. Lab. No. 280. [Dolomitic magnesite] magnesite, white; depth 245-250 ft.

367. Lab. No. 278. [Dolomitic magnesite] magnesite, white; depth 209.5-210.5 ft.

Washington—Continued

368. Lab. No. 277. Dolomite, gray; contains serpentine; depth 128-134 ft.

369. Lab. No. 274. [Dolomitic magnesite] magnesite, white; depth 117-120 ft.

370. Lab. No. 251. Magnesite, white, light-brown; depth 59-66 ft.

371. Lab. No. 248. [Magnesitic dolomite] dolomitic magnesite, white, friable; depth 0-35 ft.

372 - 374. Drill hole 10. (Bennett, 1943, p. 14.) Rock, medium-coarse texture. [For other analyses from same drill hole, see samples 98-105, group C; samples 1148-1155, group F_2.]

372. Lab. No. 341. [Calcareous dolomite] dolomite, white and light-gray; depth 321-322.5 ft.

373. Lab. No. 339. [Dolomitic magnesite] magnesite, white with gray; depth 289.5-293 ft.

374. Lab. No. 338. Dolomitic magnesite, white and gray; contains serpentine; depth 270-280 ft.

375 - 377. Drill hole 11. (Bennett, 1943, p. 14.) Rock, medium-coarse texture. [For other analyses from same drill hole, see samples 106-108, group C; sample 1156, group F_2.]

375. Lab. No. 361. [Calcareous dolomite] dolomite, light-gray; depth 186-203 ft.

376. Lab. No. 359. Dolomite, gray; contains serpentine; depth 150-173 ft.

377. Lab. No. 352. [Calcareous dolomite] dolomite, gray; contains serpentine; depth 83-112 ft.

378 - 380. Drill hole 12. (Bennett, 1943, p. 14, 15.) [For other analyses from same drill hole, see samples 109-113, group C; samples 1157-1179, group F_2.]

378. Lab. No. 401. Dolomite, gray and white; depth 422-429 ft.

379. Lab. No. 394. Dolomite, white, banded; depth 327-334 ft.

380. Lab. No. 387. Dolomite, banded; depth 268-274 ft.

381 - 385. Drill hole 13. (Bennett, 1943, p. 15, 16.) General: Magnesite, light-gray to yellowish, medium-crystalline, mostly massive. [For other analyses from same drill hole, see samples 114, 115, group C; samples 1180-1206, group F_2.]

381. Lab. No. 436. [Dolomitic magnesite] magnesite, multicolored; contains serpentine; depth 214-222 ft.

382. Lab. No. 435. Magnesite, gray, white; depth 206-214 ft.

383. Lab. No. 427. [Magnesitic dolomite] dolomitic magnesite, dark-gray; depth 157-161 ft.

384. Lab. No. 421. Magnesite, white to light-gray; depth 143-144 ft.

385. Lab. No. 414. Dolomite, dark-gray; depth 93-100 ft.

386, 387. Drill hole 14. (Bennett, 1943, p. 16.) General: Magnesite, predominantly white; mostly massive. [For other analyses from same drill hole, see samples 116-121, group C; samples 1207-1217, group F_2.]

386. Lab. No. 460. [Dolomite] magnesitic dolomite, gray and white; depth 211-241 ft.

387. Lab. No. 446. [Dolomitic magnesite] magnesite, white and light-gray; depth 81-88 ft.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F_1), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued											
	*388	389	*390	391	392	393	394	395	396	*397	398	399
	$46F_1$ 43-113	$46F_1$ 33-267	$46F_1$ 33-268	$46F_1$ 33-269	$46F_1$ 43-115	$46F_1$ 33-270	$46F_1$ 33-289	$46F_1$ 33-290	$46F_1$ 33-292	$46F_1$ 41-1	$46F_1$ 41-21	$46F_1$ 43-128
Insoluble [1]	12.10	8.72	14.33	16.12	12.10	9.36	6.55	7.30	6.00	15.28	19.64	9.11
R_2O_3 [2]	.66	.87	.87	.52	.24	1.77	3.83	1.97	3.84	1.08	1.27	1.66
MgO [3]	22.95	23.73	23.60	22.38	42.34	30.19	26.89	37.24	24.65	30.38	17.99	46.75
CaO	31.13	30.58	30.23	27.00	8.67	21.44	22.45	11.02	24.43	21.60	26.36	2.97
Ignition loss [4]	33.16	36.10	30.97	33.98	36.65	37.24	40.28	42.47	41.08	31.66	34.74	39.51
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	11,2,69	7,3,75	13,3,64	15,2,70	12,1,72	6,5,75	0,11,81	4,6,83	0,10,83	13,3,64	18,4,72	6,5,76
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomitic magnesite	Magnesian dolomite	Magnesian dolomite	Dolomitic magnesite	Magnesian dolomite	Magnesian dolomite	Dolomite	Magnesite

	Washington—Continued											
	400	401	402	403	404	405	406	407	408	409	410	411
	$46F_1$33-12	$46F_1$41-281	$46F_1$41-282	$46F_1$41-58	$46F_1$43-138	$46F_1$41-73	$46F_1$41-40	$46F_1$43-142	$46F_1$41-42	$46F_1$41-92	$46F_1$41-43	$46F_1$41-96
SiO_2	[5]8.6	[5]14.0	[5]10.8	[5]17.2	[6]8.1	[5]8.1	[5]10.6	[6]9.4	[5]9.3	18.18	[5]1.7	6.48
Al_2O_2	2.5	3.2	2.6	2.2	[7]2.1	1.8	3.9	[7]1.9	2.7	.44	1.5	4.20
Fe_2O_2										.45		
FeO	------	------	------	------	------	------	------	------	------	1.17	------	
MgO	46.1	36.8	39.4	[3]25.1	19.5	[3]20.3	[3]26.8	19.3	[3]27.8	16.10	19.6	41.53
CaO	.4	4.3	2.8	18.8	28.3	27.5	18.7	27.0	19.2	24.74	27.0	2.52
H_2O+	------	------	------	------	------	------	------	------	------	[8].69	------	------
H_2O-	------	------	------	------	------	------	------	------	------	[9].05	------	------
Ignition loss	[10]42.2	[10]41.3	[10]43.9	[10]36.7	42.6	[10]42.3	[10]40.0	41.7	[10]41.0	[11]38.18	[10]50.8	43.60
Total	[99.8]	[99.6]	[99.5]	100.0	[100.6]	100.0	100.0	[99.3]	100.0	100.00	[100.6]	98.33
Class	4,7,80	9,9,79	6,8,84	14,6,74	(6,5)88	5,5,88	4,11,79	(6,6)86	5,8,82	17,3,79	0,11,89	0,11,82
CaO/MgO	Magnesite	Dolomitic magnesite	Magnesite	Magnesian dolomite	Dolomite	Dolomite	Magnesian dolomite	Dolomite	Magnesian dolomite	Dolomite	Dolomite	Magnesite

	Washington—Continued											
	412	413	414	415	416	417	418	419	420	421	422	423
	$46F_1$43-144	$46F_1$43-2	$46F_1$43-3	$46F_1$43-4	$46F_1$43-5	$46F_1$43-6	$46F_1$43-7	$46F_1$43-8	$46F_1$43-9	$46F_1$41-224	$46F_1$42-11	$46F_1$43-147
SiO_2	[6]10.3	[12]13.00	[12]9.28	15.50	14.56	[12]14.78	14.04	13.82	15.59	14.84	10.18	11.5
$Al_2O_3 + Fe_2O_3$	[7]1.8	[2]5.56	[2]3.32	[2]1.22	[2].73	[2]6.50	[2]1.38	[2]1.22	[2]1.02	3.40	[7]4.91	------
MgO	18.7	[3]17.36	[3]18.80	[3]15.28	[3]14.77	[3]16.77	[3]15.56	[3]15.83	[3]14.95	1.20	2.22	18.9
CaO	26.8	25.79	27.18	28.75	30.15	25.16	29.15	29.03	29.20	44.88	44.17	27.4
P_2O_5	------	------	------	------	------	------	------	------	------	------	.024	------
Ag	------	------	------	------	------	------	------	------	------	------	------	.10
Au	------	------	------	------	------	------	------	------	------	------	------	Trace
Zn	------	------	------	------	------	------	------	------	------	------	------	< .05
Pb	------	------	------	------	------	------	------	------	------	------	------	< .05
Ignition loss	41.3	[10]38.29	[13]41.42	[10]39.25	[10]39.79	[13]36.79	[13]39.87	[13]40.10	[13]39.24	34.90	[14]37.52	------
Total	[98.9]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.22	[99.02]	[58.0]
Class	(7,5)86	4,16,78	4,10,85	13,4,83	13,2,84	4,19,74	12,4,84	12,4,84	14,3,83	9,10,77	2,14,82	12,0,88
CaO/MgO	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Calcareous dolomite	Dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcite	Magnesian calcite	Dolomite

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[1] Includes silica and insoluble silicates.

[2] Iron and alumina.

[3] By difference.

[4] At 950°C.

[5] Insoluble, mainly SiO_2.

[6] Insoluble.

[7] R_2O_2.

[8] Above 110°C.

[9] At 110°C.

[10] Mainly CO_2.

[11] CO_2.

[12] Also reported as insoluble.

[13] 950°-1,000°C; also called CO_2.

[14] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

Spectrochemical analysis

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_5, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_2, Y_2O_3, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_2, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_2, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_2, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_2, Lu_2O_3, HfO_2, Ta_2O_5, WO_2, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2]

	422		422		422		422		422
Na_2O	0.29	TiO_2	0.15	Cr_2O_3	0.0019	NiO	0.0026	SrO	0.038
K_2O	2.40	V_2O_5	.003	MnO	.34	CuO	.002	ZrO_2	.0036

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

388-399. Stevens County. Precambrian, Stensgar Dolomite. SE¼SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. (Bennett, 1943, p. 3-7, 9, 21, pl. 1.) General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. Possible use of magnesite: Source of magnesium for light-metal construction.

388-393. Drill hole 15. (Bennett, 1943, p. 16, 17.) General: Magnesite, light-gray to yellowish, medium crystalline, mostly massive. [For other analyses from same drill hole, see samples 1218-1235, group F_2.]

*388. Lab. No. 484. [Dolomite] magnesitic dolomite, light-gray; contains green rock; depth 232-237 ft. *Analysis suggests 18.2 percent more MgO and CaO than required for carbonate.

389. Lab. No. 482. [Dolomite] magnesitic dolomite, gray with white; depth 209-217 ft.

*390. Lab. No. 481. [Dolomite] magnesitic dolomite, white and light-gray; depth 198-209 ft. *Analysis suggests 20.6 percent more MgO and CaO than required for carbonate.

391. Lab. No. 479. [Dolomite] magnesitic dolomite, white and light-gray; depth 186-194 ft.

392. Lab. No. 478. [Dolomitic magnesite] magnesite, gray and white; contains serpentine; depth 149-186 ft.

393. Lab. No. 477. [Magnesitic dolomite] dolomitic magnesite, light-gray; depth 147-149 ft.

394-396. Drill hole 16. (Bennett, 1943, p. 17.) General: Magnesite, light-gray to yellowish, medium crystalline; mostly massive. [For other analyses from same drill hole, see sample 122, group C; samples 1236-1247, group F_2.]

394. Lab. No. 496. [Magnesitic dolomite] dolomitic magnesite, gray, white, and brown; depth 167-172 ft.

395. Lab. No. 495. [Dolomitic magnesite] magnesite, gray; depth 155-167 ft.

396. Lab. No. 493. Magnesitic dolomite, gray to white; depth 122-146 ft.

*397. Drill hole 17. Lab. No. 516. (Bennett, 1943, p. 17.) [Magnesitic dolomite] dolomitic magnesite, white and gray; depth 219-222 ft. *Analysis suggests 19.7 percent more MgO and CaO than required for carbonate. [For other analyses from same drill hole, see samples 123-126, group C; samples 1248-1259, group F_2.]

398, 399. Drill hole 19. (Bennett, 1943, p. 18.) [For other analyses from same drill hole, see samples 1270-1284, group F_2.]

398. Lab. No. 549. Dolomite, dark-gray; contains pyrite; depth 321-330 ft.

399. Lab. No. 545. Magnesite, gray and white; contains serpentine; depth 233-248 ft.

400. Stevens County. Stensgar Dolomite. Sec. 36, T. 30 N., R. 37 E., Turk area. Analyst, F. G. Mehl. Sample 80. (Bennett, 1941, p. 3, 12, 21, 23, 25, pl. 2.) Magnesite, coarse-grained. General mineralogy. Channel sample. Index and geologic maps.

401, 402. Stevens County. Stensgar Dolomite. NW¼ sec. 10, T. 30 N., R. 38 E., west and north of town of Springdale. U.S. Magnesite quarry. Analyst, F. G. Mehl. Samples 30, 31. (Bennett, 1941, p. 3, 12, 19, 20, 23, 24, pl. 1.) General: Magnesite, intermixed with dolomite. Mineralogy. Index and geologic maps.

403. Stevens County. Stensgar Dolomite. NW¼ sec. 10, T. 30 N., R. 38 E. Southwest of U.S. Magnesite quarry, from old pits. Analyst, F. G. Mehl. Sample 14. (Bennett, 1941, p. 3, 12, 20, 23, 24, pl. 1.) Magnesitic dolomite. General mineralogy. Index and geologic maps.

404. Stevens County. Stensgar Dolomite. Sec. 24, T. 31 N., R. 38 E. Collector, C. F. Deiss. Sample 4. (Campbell and Loofbourow, 1962, p. F3, F8, F18, pls. 1, 2.) Dolomite. Index and geologic maps, geologic sections, correlated columnar sections.

405, 406. Stevens County. Stensgar Dolomite. T. 31 N., R. 38 E., Red Marble area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 18, 23, 24, pl. 1.) General mineralogy. Index and geologic maps.

Washington—Continued

405. NE corner sec. 35. Sample 4. [Dolomite], light-bluish-gray, fine-grained to dense; weathers light gray. Outcrop sample.

406. Sec. 36. Sample 10. [Magnesian dolomite.]

407. Stevens County. Stensgar Dolomite. Sec. 9, T. 31 N., R. 39 E. Northwest Magnesite Co., Keystone quarry. Collector, C. F. Deiss. Sample 3. (Campbell and Loofbourow, 1962, p. F3, F8, F18, pls. 1, 2.) Dolomite. Index and geologic maps, geologic sections, correlated columnar sections.

408. Stevens County. Stensgar Dolomite. Sec. 32, T. 31 N., R. 39 E. Analyst, F. G. Mehl. Sample 13. (Bennett, 1941, p. 3, 12, 23, 24, pl. 1.) [Magnesian dolomite.] General mineralogy. Index and geologic maps.

409. Stevens County. Associated with Stensgar Dolomite. Secs. 1, 12, T. 31 N., R. 39 E., secs. 6, 7, T. 31 N., R. 40 E., 5 miles northwest of town of Valley. Washington State Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 101, 102, 137, 142; Whitwell and Patty, 1921, p. 12, 18, 23, 27, 28, pl. 2.) [Dolomite], marble, pink. Bulk density 2.829. Thin-section description. Tonnage estimated. Index and geologic map, geologic sections. Physical properties. Possible use: Dimension stone.

410. Stevens County. Stensgar Dolomite. Sec. 31, T. 32 N., R. 40 E. Analyst, F. G. Mehl. Sample 24. (Bennett, 1941, p. 3, 12, 23, 24, pl. 1.) Dolomite. General mineralogy. Index and geologic maps.

411. Stevens Connty. Associated with Stensgar Dolomite. Secs. 30, 31, T. 32 N., R. 40 E., 5 miles from town of Chewelah. Finch, Allen or Moss deposit. Analyst, A. A. Hammer. Sample 63. (Shedd, 1913, p. 125, 126, 246, pl. 21; Whitwell and Patty, 1921, p. 12, 18, 23, 27, 28, 41, pl. 2.) [Magnesite] limestone, light-gray. Tonnage estimated. Index and geologic maps, geologic sections. Use: None.

412. Stevens County. Stensgar Dolomite. NE¼NE¼ sec. 32, T. 33 N., R. 40 E., 4.7 miles northwest of Chewelah. Abandoned quarry. Collector, C. F. Deiss. Sample 1. (Campbell and Loofbourow, 1962, p. F3, F8, F13-15, F18, pls. 1, 2.) Dolomite. Index and geologic map, geologic sections, detailed measured section, correlated columnar sections.

413-420. Stevens County. Cambrian, Old Dominion Limestone. Sec. 35, T. 34 N., R. 38 E., about 11 miles northwest of town of Addy. (Bennett, 1944, p. 7, 31-33, pl. 10; Bennett, 1945, p. 15.) Deposit: Dolomite, light-gray to white, some banding, medium to coarsely crystalline. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Former use: Building stone. Possible use: General uses of dolomite; refractories, crushed stone.

413. NW¼NE¼ sec. 35. Owner, W. G. Merryweather. Sample 508.

414-419. NE¼NW¼ sec. 35. Owner, W. G. Merryweather.

414. Sample 509.
415. Sample 510.
416. Sample 512.
417. Sample 515.
418. Sample 539.
419. Sample 542.

420. SE¼NW¼ sec. 35. Sample 538.

421. Stevens County. Cambrian(?), Northport Limestone. Probably sec. 21, T. 35 N., R. 39 E., 1.5 miles south of town of Colville. Hams ranch. Analyst, A. A. Hammer. Sample 70. (Shedd, 1913, p. 132, 133, 246, pl. 21; Mills, 1962, p. 173, 174-176.) Limestone, dark; contains calcite seams; depth 35 ft. Tonnage estimated. Index and geologic map. Possible use: Portland cement. [For other analyses from same drill hole, see samples 1463-1465, group F_2.]

422. Stevens County. Northport Limestone. NW¼ sec. 35, T. 36 N., R. 39 E., 3 miles north of Colville. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample S-116. (Mills, 1962, p. 12, 13, 165, 167, 168, 249, 261, 264, pls. 1, 6.) Limestone, dark-gray to black, fine-grained, medium-bedded, argillaceous; contains lenticles of dolomitic limestone. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.

423. Stevens County. Northport Limestone. Sec. 28, T. 38 N., R. 38 E., 0.25 mile northeast of town of Bossburg. Young America mine. Analyst, under supervision of M. Wright. Drill hole 9. (Hundhausen, 1949, p. 3, 7, 9, 10, figs. 1, 2, 6.) Silicified dolomite; depth 213.0-217.0 ft. Mineralogy. Index and geologic maps, geologic section. [For other analyses from same drill hole, see samples 1494-1503, group F_2.]

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate (Group F$_1$), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued											
	424	425	426	427	428	429	430	431	432	433	434	435
	46F$_1$43-146	46F$_1$43-149	46F$_1$43-154	46F$_1$43-148	46F$_1$42-12	46F$_1$42-13	46F$_1$42-147	46F$_1$42-17	46F$_1$42-18	46F$_1$42-19	46F$_1$42-20	46F$_1$42-21
SiO_2	10.9	12.6	18.2	11.6	11.40	9.11	8.61	16.08	9.23	12.06	14.30	9.73
Al_2O_3	------	------	------	------	[1].34	[1]2.07	.94	.90	.35	1.43	.74	.67
Fe_2O_3	------	------	------	------			.49	.30	.14	.38	.12	.10
MgO	17.8	17.7	15.9	16.3	.24	1.82	8.32	3.10	1.45	2.16	1.05	1.13
CaO	26.9	26.2	24.3	27.6	49.35	47.79	40.96	43.22	50.78	46.34	47.11	49.63
P_2O_5	------	------	------	------	.051	.030	------	------	------	------	------	------
Ag	Trace	.46	.11	Trace	------	------	------	------	------	------	------	------
Au	Trace	Trace	Trace	Trace	------	------	------	------	------	------	------	------
Zn	.60	.20	.10	< .05	------	------	------	------	------	------	------	------
Pb	<.05	.30	< .05	< .05	------	------	------	------	------	------	------	------
Ignition loss	------	------	------	------	[2]38.56	[2]39.27	40.30	36.29	38.19	37.74	37.29	39.29
Total	[56.2]	[57.5]	[58.7]	[55.6]	[99.94]	[100.09]	[99.62]	[99.89]	[100.14]	[100.11]	[100.61]	[100.55]
Class	11,0,85	13,0,84	18,0,77	12,0,83	11,1,87	6,6,87	6,4,88	14,3,81	8,1,86	9,5,84	13,3,84	8,2,88
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite

	Washington—Continued											
	436	437	438	439	440	441	442	443	444	445	446	447
	46F$_1$41-154	46F$_1$41-167	46F$_1$42-15	46F$_1$42-162	46F$_1$42-22	46F$_1$42-23	46F$_1$42-24	46F$_1$42-25	46F$_1$42-26	46F$_1$42-27	46F$_1$42-28	46F$_1$42-29
SiO_2	[3]19.6	9.93	12.61	8.85	9.99	11.37	14.21	11.10	14.15	21.52	11.71	10.84
Al_2O_3	[1].6	[1]1.08	1.00	.96	.26	[1].76	[1].72	[1]1.44	[1]1.06	[1].70	[1].94	[1].70
Fe_2O_3			2.16	.04	.18							
MgO	17.4	[4]19.02	1.91	.93	2.22	4.69	2.61	1.20	1.00	.49	.24	.27
CaO	24.1	[4]27.56	45.60	50.21	48.30	44.00	44.72	45.00	44.00	43.37	48.57	48.82
P_2O_5	------	------	------	------	------	.004	.004	.038	.033	.047	.026	.024
Ignition loss	37.0	[5]42.41	37.23	39.31	39.33	[2]39.44	[2]37.60	[2]38.84	[2]37.75	[2]34.11	[2]38.50	[2]39.10
Total	[98.7]	[100.00]	[100.51]	[100.30]	[100.28]	[100.26]	[99.86]	[97.62]	[97.99]	[100.24]	[99.99]	[99.75]
Class	19,2,77	8,3,89	8,8,82	7,3,88	9,1,88	10,2,87	13,2,84	9,6,83	12,5,81	20,2,77	10,3,87	10,2,88
CaO/MgO	Dolomite	Dolomite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued										
	448	449	450	451	452	453	454	455	456	457	458
	46F$_1$43-145	46F$_1$42-291	46F$_1$43-163	46F$_1$43-150	46F$_1$43-152	46F$_1$41-223	46F$_1$41-117	46F$_1$37-74	46F$_1$37-53	46F$_1$37-54	46F$_1$37-66
SiO_2	10.47	5.59	15.18	14.43	17.59	2.18	23.32	15.72	7.70	8.16	9.70
Al_2O_3	1.85	1.69	------	2.53	.48	[1].80	------	[1]2.65	[1]1.48	[1]1.66	[1].77
Fe_2O_3	.56	.79	------	1.86	.56		.19				
FeO	.57	------	Trace	------	1.06	------	------	------	------	------	------
MgO	15.03	42.25	17.02	17.50	15.46	36.13	.32	.69	.46	.55	.21
CaO	32.66	1.48	27.69	24.99	26.52	4.99	42.46	44.33	50.08	49.78	49.73
H_2O+	[6].57	[7]11.75	------	------	------	------	------	------	------	------	------
H_2O-	[8].10				[8]Trace	------	[8].05	------	------	------	------
P_2O_5	------	------	------	------	------	------	------	.066	.050	.049	.014
MnO	------	.13	------	------	------	------	------	------	------	------	------
Ignition loss	[9]38.19	[9]36.48	[9]40.55	38.58	[9]38.25	54.09	[9]33.44	[2]35.70	[2]40.70	[2]39.97	39.32
Total	100.00	[100.16]	100.44	99.89	99.92	[10]98.19	99.78	[99.16]	[11][100.47]	[11][100.17]	[99.74]
Class	7,7,82	2,18,70	15,0,85	8,12,79	16,3,80	1,13,84	23,1,76	11,8,79	5,5,90	5,5,89	8,2,89
CaO/MgO	Calcareous dolomite	Magnesite	Dolomite	Dolomite	Calcareous dolomite	Dolomitic magnesite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] R_2O_3.

[2] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[3] Includes insoluble.

[4] Calculated from reported $MgCO_2$ and (or) $CaCO_3$.

[5] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[6] Above 110°C.

[7] Calculated from reported ignition loss minus CO_3.

[8] At 110°C.

[9] CO_2.

[10] 98.37 percent in text.

[11] Na_2O= 225 ppm, K_2O = 560 ppm, TiO_2 = 315 ppm, S = 150 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_2, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_3, Cs_2O, La_2O_2, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_2, HfO_2, Ta_2O_5, WO_2, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, Bi_2O_3, ThO_3, UO_2]

	428	429	441	442	443	444	445	446	447	455	456	457
Na_2O	------	0.43	------	------	------	------	------	------	------	0.26	------	------
K_2O	------	1.28	------	------	------	------	------	------	------	------	------	------
TiO_2	0.015	.15	0.004	------	0.022	0.010	0.024	0.018	0.016	.056	0.029	0.035
V_2O_5	------	------	------	------	------	------	------	------	------	.0064	.0076	.0081
Cr_2O_3	------	.0017	.00096	------	.0016	.0014	.0008	.0014	.0012	.0021	.0007	.00083
MnO	.012	.29	.105	0.051	.33	.24	.066	.063	.075	.21	.14	.13
NiO	------	------	.0022	.001	------	------	------	------	------	.004	.0026	.0026
CuO	.0024	.0036	.018	.0042	.0022	.0014	.0015	.0052	.0031	.0030	.0030	.0048
SrO	.013	.029	.020	.021	.013	.014	.015	.025	.027	.014	.021	.028
ZrO_2	------	.019	------	------	------	------	------	------	------	.002	------	------
PbO	------	.005	------	------	------	------	------	------	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

424-427. Stevens County. Cambrian(?), Northport Limestone. Sec. 28, T. 38 N., R. 38 E., 0.25 mile northeast of town of Bossburg. Young America mine. Analyst, under supervision of M. Wright. Drill hole 15. (Hundhausen, 1949, p. 3, 7, 9, 10, 11, figs. 1, 2, 8.) Silicified dolomite. Mineralogy. Index and geologic maps, geologic section. [For other analyses from same drill hole, see samples 1504-1514, group F_2.]

	Depth (ft)		Depth (ft)
424.	191.9-197.0	426.	123.6-128.7
425.	186.5-189.8	427.	118.4-123.6

428. Stevens County. Northport Limestone. Sec. 33, T. 38 N., R. 38 E., 0.75 mile east of Bossburg. Carrol property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample S-103. (Mills, 1962, p. 12, 13, 107, 108, 110, 112, 113, 249, 260, 264, pl. 1.) Limestone, white through gray to dark-gray, medium-grained, thin-bedded. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Cement, mineral filler, builders' lime, ceramic whiting; sugar, pulp and paper industries.

429. County, formation, analysts, and maps as in sample 428. Sec. 13, T. 39 N., R. 39 E., about 3 miles southwest of town of Northport. South of Janni quarry. Sample S-184. (Mills, 1962, p. 12, 13, 74, 76-78, 250, 263, 264, pl. 1.) Limestone, gray, fine- to medium-grained, thin-bedded. Chip sample from outcrop.

430-435. Stevens County. Northport Limestone. SW¼SW¼ sec. 26, T. 39 N., R. 39 E., 6 miles southwest of Northport. Ideal Cement Co. Diamond-drill hole 4A, drilled at inclination of +15°. (Mills, 1962, p. 74, 96, 97, 100, 101, 102, pls. 1, 4.) Limestone, white to light-gray, medium- to coarse-grained, relatively massive. Estimated thickness 750 ft. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Cement. [For other analyses from same drill hole, see samples 133-135, group C; samples 1610-1622, group F_2.]

	Drill hole interval (ft)		Drill hole interval (ft)
430.	229-241	433.	580-603
431.	261-276	434.	603-626
432.	570-580	435.	626-655

436, 437. Stevens County. Northport Limestone. NE¼ sec. 27, T. 39 N., R. 39 E., 2 miles east of town of Marble. (Deiss, 1955, p. 119-121, 127, 132, 133-135, pls. 14, 15.) Index and geologic maps, geologic sections, detailed measured section.

436. Analyst, E. S. Leaver. Sample 26. Unit description: Dolomite, gray, finely crystalline, dense, slightly vitreous on fresh fracture; contains quartz; 18 ft thick.
437. Analyst, Esther Claffy. Sample 39. Dolomite.

438, 439. Stevens County. Northport Limestone. NE¼NW¼ sec. 35, T. 39 N., R. 39 E., 6 miles southwest of Northport. Ideal Cement Co. Diamond-drill hole 1, drilled at inclination of -45°. (Mills, 1962, p. 74, 96, 97, 99, 100, 102, pls. 1, 4.) Tonnage estimated. Index and geologic maps, geologic section. [For other analyses from same drill hole, see sample 103, group E; samples 1665-1676, group F_2.]

438. Unit description: Limestone, gray, fine-grained, bedded; total thickness at least 800 ft. Sample depth 792-800 ft. Possible use: None, rock impure.
439. Unit description: Limestone, white to light-gray, medium- to coarse-grained, relatively massive; estimated thickness 750 ft. Sample depth 490-561 ft. Possible use: Cement.

440. Stevens County. Northport Limestone. NW¼NW¼ sec. 35, T. 39 N., R. 39 E., 6 miles southwest of Northport. Ideal Cement Co. Diamond-drill hole 11, drilled at inclination of -45°. (Mills, 1962, p. 74, 96-99, 102, pls. 1, 4.) Unit description: Limestone, dark-gray to black, medium- to coarse-grained; about 200 ft thick. Sample depth 210-280 ft. Tonnage estimated. Index and geologic maps, geologic section. Use: None, rock impure. [For other analyses from same drill hole, see samples 1677-1681, group F_2.]

441, 442. Stevens County. Permian. Sec. 3, T. 34 N., R. 37 E. Heidegger Hill deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-127, S-128. (Mills, 1962, p. 12, 13, 147, 149, 150, 151, 249, 261, 264, pls. 1, 5.) Limestone, light-gray to gray, fine- to medium-grained, massive. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.

443, 444. County, age, analysts, maps, and use as in samples 441, 442. SE¼ sec. 17, T. 36 N., R. 38 E., 0.25 mile north of town of Kettle Falls. Hanson property. Samples S-2, S-4. (Mills, 1962, p. 12, 13, 135, 138, 142, 143, 247, 257, 264, pl. 1.) Limestone, gray, medium-grained, massive, fossiliferous. Chip sample from outcrop.

445-447. County, age, analysts, maps, and use as in samples 441, 442. Sec. 15, T. 37 N., R. 38 E., about 1 mile south of town of Evans. Ideal Cement Co. (Mills, 1962, p. 12, 13, 123, 125, 126, 248, 249, 259, 261, 264, pl. 1.) Chip sample from outcrop.

445. NE¼SW¼ sec. 15. Sample S-59. Limestone, thin-bedded.
446, 447. SE¼SE¼ sec. 15. Samples S-134, S-135. Limestone, massive.

448. Stevens County. [T. 31 N., R. 40 E.], 5 miles northwest of town of Valley. Washington State Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 101, 102, 142.) [Dolomite] marble, green. Thin-section description. Possible use: Dimension stone.

449. Stevens County. [T. 32 N., R. 40 E.], near town of Chewelah. (Bates and Rapp, 1923, p. 529, 530, 532, 535, 538, 539, 544, 545, 548, 549, 555.) Magnesite, crystalline; large deposit. Physical tests. Use: Refractories. Possible use: Caustic magnesia for oxychloride stucco or flooring [implied].

450. Stevens County. Sec. 18, T. 32 N., R. 41 E., near Chewelah. Northwestern Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 129, 142; Eckel, 1912, p. 171, 173.) [Dolomite] marble, almost black, crystalline; at least 200 ft thick. Former use: Lime.

451. Stevens County. S½ sec. 32, T. 33 N., R. 40 E., near Chewelah. Highway quarry. (Hodge, 1938c, p. 3, 15, 22, 31, 48, 53.) [Dolomite], argillaceous, thin-bedded. Index and geologic maps. Use: Road metal.

452. Stevens County. Probably sec. 32, T. 33 N., R. 40 E., about 4 miles northwest of Chewelah. The Great Western Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 122, 123, 124, 137, 142; Eckel, 1912, p. 171, 173.) [Dolomite] marble, dark-pink, crystalline, generally massive. Thin-section description, physical properties. Possible use: Dimension stone.

453. Stevens County. [T. 35 N., R. 39 E.], town of Colville, Mud Lake, Weisners farm. Analyst, A. A. Hammer. Sample 57. (Shedd, 1913, p. 246.) [Dolomitic magnesite] dolomitic marl, snow-white.

454. Stevens County. Secs. 22, 27, T. 39 N., R. 39 E., 1 mile from town of Marble. Columbia River Marble and Lime Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 131, 132, 142; Eckel, 1912, p. 171.) [Limestone] marble, black, crystalline, fine-grained. Possible use: None.

455. Whatcom County. Devonian to Early Permian, Chilliwack Group. NW¼ sec. 5, T. 40 N., R. 6 E. Northwest Black Mountain deposit. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. Sample W 20-1. (Moen, 1962, p. 4, 8, 92, 97, 100, pl. 1; Danner, 1966, p. 16, 19, 82, 210, 244, 245, 453, 466.) Limestone, fossiliferous. Chip sample. Index and geologic maps, geologic sections. Possible use: None, rock impure.

456, 457. County, age, group, analysts, and maps as in sample 455. NW¼SW¼ sec. 7, T. 40 N., R. 6 E., Red Mountain. Silver Lake deposit. (Moen, 1962, p. 4, 8, 88, 97, 99, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 210, 223, 224, 225, 453, 465.) Limestone, gray, dense; contains chert, argillite; fossiliferous. Thin-section description. Small tonnage. Chip sample. Geologic sections. Possible use: Concrete aggregate, ballast, cement, road metal, riprap.

456. Sample W 9-1 taken across 150 ft.
457. Sample W 9-2 taken across 60 ft.

458. Whatcom County. Devonian part of Chilliwack Group. NW¼NE¼ sec. 8, T. 40 N., R. 6 E., Black Mountain. Analyst, C. S. Homi; collector, W. R. Danner. Sample W 21-1. (Moen, 1962, p. 4, 8, 15, 92, 96, 100, 119, pl. 1.) Limestone, medium-gray, dense to finely crystalline; weathers bluish gray to buff. Outcrop sample. Moderate to large tonnage. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, ballast, road metal, riprap.

Table 6.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, containing 75 to 90 percent carbonate ($Group F_1$), common- and mixed-rock categories—Continued

Chemical analyses—Continued

	Washington—Continued										
	459	460	461	462	463	464	465	466	467	468	469
	$46F_1$ 37-79	$46F_1$ 37-82	$46F_1$ 37-83	$46F_1$ 37-29	$46F_1$ 37-162	$46F_1$ 37-135	$46F_1$ 37-136	$46F_1$ 37-137	$46F_1$ 37-50	$46F_1$ 37-51	$46F_1$ 37-149
SiO_2	11.25	11.87	9.43	8.96	9.61	17.72	13.59	14.78	7.45	18.66	18.65
Al_2O_3	[1].97	[1]2.00	[1]1.43	2.44	[1].79	1.30	.51	.66	[1]2.44	.73	[1].72
Fe_2O_3						.85	.37	.53			
MgO	.36	.46	.47	1.01	.19	.68	.35	.67	.52	.53	.55
CaO	48.43	47.55	49.19	48.46	49.80	43.93	47.24	45.85	49.78	44.52	44.42
Na_2O	------	------	------	------	------	.02	.00	.00	------	------	------
K_2O	------	------	------	------	------	.07	.01	.02	------	------	------
P_2O_5	.009	.023	.026	------	.014	------	------	------	.023	.035	.035
Ignition loss	[2]38.54	[2]37.80	[2]39.04	39.16	[2]39.34	35.14	37.63	37.05	[2]39.84	35.60	[2]35.61
Total	[99.56]	[99.70]	[99.59]	100.03	[99.74]	[99.71]	[99.70]	[99.56]	[3][100.05]	[100.08]	[3][99.98]
Class	10,3,87	9,6,85	7,4,88	5,7,87	8,2,89	14,6,78	12,2,85	13,3,83	3,7,89	17,2,80	17,2,80
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued									
	470	471	472	473	474	475	476	477	478	479
	$46F_1$ 37-111	$46F_1$ 37-114	$46F_1$ 37-115	$46F_1$ 37-116	$46F_1$ 37-118	$46F_1$ 37-119	$46F_1$ 37-2	$46F_1$ 37-11	$46F_1$ 37-42	$46F_1$ 37-43
SiO_2	11.40	9.47	13.57	10.83	12.75	9.87	17.32	9.06	8.74	20.96
Al_2O_3	2.47	[1]1.52	[1]2.32	[1]1.78	[1]2.00	[1]1.68	.94	1.90	[1].97	[1]2.91
Fe_2O_3	1.15									
MgO	1.04	1.03	1.80	1.29	1.14	1.36	.50	.50	.77	1.20
CaO	46.11	48.65	46.06	47.0	46.50	48.43	45.84	49.73	49.74	41.01
P_2O_5	------	------	------	------	------	------	------	------	.024	.034
Ignition loss	37.83	39.65	37.40	38.90	38.70	39.00	34.94	38.52	[2]39.65	[2]33.60
Total	[100.00]	[100.32]	[101.15]	[99.8]	[101.09]	[100.34]	99.54	99.71	[99.89]	[99.71]
Class	6,10,84	7,4,89	10,7,83	8,5,87	9,6,85	7,5,87	16,3,79	6,6,86	7,3,89	16,9,74
CaO/MgO	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued									
	480	481	482	483	484	485	486	487	488	489
	$46F_1$37-44	$46F_1$37-45	$46F_1$37-65	$46F_1$37-68	$46F_1$37-130	$46F_1$37-122	$46F_1$37-73	$46F_1$37-146	$46F_1$37-127	$46F_1$37-163
SiO_2	14.90	17.27	17.04	11.01	14.74	10.22	14.70	8.04	7.92	21.23
R_2O_3	.86	2.30	.99	1.63	.47	.89	[4].47	1.94	2.16	2.11
MgO	1.08	1.03	13.76	.40	.20	3.26	.20	.40	.79	.67
CaO	45.75	43.52	30.26	48.52	47.17	45.54	47.17	48.32	49.02	42.04
P_2O_5	.026	.049	.020	.018	.012	.024	.012	.018	.076	.076
Ignition loss	[2]36.90	[2]35.56	[2]38.47	[2]38.34	[2]37.25	[2]39.72	37.28	[2]41.04	[2]38.98	[2]33.47
Total	[99.52]	[99.73]	[100.54]	[99.92]	[99.84]	[5][99.65]	[99.83]	[99.76]	[98.95]	[99.60]
Class	13,3,83	13,7,79	15,3,82	8,5,86	14,1,84	9,3,88	14,1,84	5,8,87	4,6,87	18,6,75
CaO/MgO	Calcite	Calcite	Calcareous dolomite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_3, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_3, Sb_2O_3 BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_5, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_3, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_3]

	459	460	461	463	467	469	478	479	480	481	482	483
Na_2O	------	0.05	0.31	------	0.082	------	0.082	------	------	------	------	0.05
TiO_3	0.023	.032	.11	0.020	.11	0.017	.029	0.034	0.025	0.053	0.013	.04
V_2O_5	------	------	------	.003	.0098	------	.003	.003	.003	.003	------	.012
Cr_2O_3	.0005	.00099	.0005	.0005	.0015	.00074	.0005	.00096	.00074	.0008	.0011	.00096
MnO	.062	.062	.062	.057	.30	.076	.10	.08	.11	.066	.083	.072
NiO	------	.0024	------	.001	.001	.001	------	.0024	.001	.001	.0028	.001
CuO	.0045	.0075	.0025	.0043	.0025	.0042	.0021	.0075	.0064	.0035	.0059	.0054
SrO	.0093	.0091	.011	.013	.010	.0048	.012	.013	.0092	.0090	.0048	.020
ZrO_3	------	------	------	------	------	------	------	.002	------	------	------	------
Ag_2O	------	------	------	.0002	------	------	------	------	------	------	------	------

	484	485	487	488	489		484	485	487	488	489
Na_2O	------	------	0.30	0.19	0.20	NiO	0.001	0.001	0.001	0.001	0.0036
TiO_3	0.010	0.022	.066	.045	.084	CuO	.0035	.0032	.0018	.0057	.0096
V_2O_5	------	------	------	.0075	.003	SrO	.015	------	.007	.027	.046
Cr_2O_3	.00096	.0005	.00064	.0011	.0015	ZrO_2	------	------	.0039	------	.002
MnO	.043	.094	.05	.16	.30	Ag_2O	------	------	------	------	.0002

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

459 - 461. Whatcom County. Early Late Devonian part of Chilliwack Group. NE¼ sec. 28, T. 40 N., R. 5 E., 1.25 miles northwest of town of Kendall. Permanente Cement Co., Balfour quarries. Analyst, C. S. Homi. (Moen, 1962, p. 4, 8, 94-96, 98, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 225, 226, 229, 453, 466.) Limestone, medium- to dark-gray, finely to coarsely crystalline, massive to well-bedded, fossiliferous. Thick overburden. Chip sample. Index and geologic maps, geologic sections. Former use: Cement. Possible use: None, deposit small.
459. Sample W 16-2 taken across 80 ft.
460. Sample W 16-5 taken across 275 ft.
461. Sample W 16-6 taken across 225 ft.

462. Whatcom County. Early Late Devonian part of Chilliwack Group. North part sec. 28, T. 40 N., R. 5 E., east side of Sumas Monntain. Permanente Cement Co., Balfour deposits. Analyst, A. A. Hammer. Sample 121. (Shedd, 1913, p. 209, 212, 213, 247, pl. 21; Danner, 1966, p. 82, 209, 210, 225, 226, 229.) Limestone, medium-gray, coarse-grained. Composite sample taken across 50 ft. Index and geologic maps. Possible use: None, deposit small.

463. Whatcom County. Late Devonian part of Chilliwack Group. Center sec. 5, or NW¼NE¼ sec. 8, T. 40 N., R. 6 E. Northwest Black Mountain deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 21-1. (Danner, 1966, p. 16, 19, 82, 209, 210, 243, 244, 453, 466.) Limestone, light-gray, fossiliferous. Thin-section description. Chip sample taken across 40 ft. Index and geologic maps.

464 - 466. Whatcom County. Early Pennsylvanian part of Chilliwack Group. [T. 37 N., R. 7 E., unsurveyed.] Ridley Creek deposit. (Danner, 1966, p. 82, 209, 257-259.) Limestone, fossiliferous. Index and geologic maps. Possible use: Cement.
464. Eric claim.
465. Gussy claim.
466. Carla claim.

467, 468. Whatcom County. Early Pennsylvanian part of Chilliwack Group. NW¼NW¼ sec. 13, T. 40 N., R. 5 E., Red Mountain. Analyst, C. S. Homi. (Moen, 1962, p. 4, 8, 88, 96, 99, 119, pl. 1.) General: Limestone, light-gray, crystalline, well-bedded, fossiliferous. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, road metal, riprap.
467. Spectrochemical analyst, C. E. Harvey. Sample W 6-3. (Danner, 1966, p. 16, 19, 82, 210, 220, 221, 452, 465.) Thin-section description. Chip sample taken across 170 ft. Tonnage estimated. Possible use: Ballast, cement.
468. Collector, W. R. Danner. Sample W6-4. Moderate to large tonnage.

469. Whatcom County. Early Pennsylvanian part of Chilliwack Group. SW¼ sec. 12, T. 40 N., R. 5 E. Red Mountain deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 6-4. (Danner, 1966, p. 16, 19, 82, 210, 220, 221, 452, 465.) Limestone; varies from dense and argillaceous to cherty, silty and coarsely crinoidal. Thin-section description. Chip sample taken across 140 ft. Tonnage estimated. Index and geologic maps. Possible use: Cement.

470 - 477. Whatcom County. Early Pennsylvanian part of Chilliwack Group. NE¼SW¼, NW¼SE¼, NE¼ sec. 14, T. 40 N., R. 5 E., about 3 miles northeast of town of Kendall. Permanente Cement Co., upper quarry. (Danner, 1966, p. 82, 209, 210, 213, 215, 218, 219.) Limestone, fossiliferous. Index and geologic maps. Former use: Hydrated lime. Use: Cement.
470 - 475. Analyst, E. J. Baldwin.
476, 477. (Hodge, 1938d, p. 13, 26, 28-30, 33, 36, 38, 39.) Limestone, light-gray, finely crystalline. Possible use: Flux.

478 - 481. Whatcom County. Early Pennsylvanian part of Chilliwack Group. SW¼SW¼ sec. 14, NW¼NW$_4$ sec. 23, T. 40 N., R. 5 E., about 3 miles northeast of Kendall. Permanente Cement Co., lower quarry, abandoned. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. (Moen, 1962, p. 4, 8, 88-91, 99, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 213, 214, 216, 218, 219, 453, 467.) Limestone, gray, dense to crystalline, fossiliferous. Chip sample. Index and geologic maps, geologic sections. Former use: Hydrated lime. Possible use: Concrete aggregate, ballast, road metal, riprap.
478. Sample W 24-1 taken across 110 ft.
479. Sample W 24-2 taken across 320 ft.
480. Sample W 24-3 taken across 200 ft.
481. Sample W 24-4 taken across 300 ft.

482. County, age, formation, analysts, maps, and use as in samples 478-481. SE¼NE¼ sec. 21, T. 40 N., R. 5 E. Snmas Mountain deposit. Sample W 17-2. (Moen, 1962, p. 4, 8, 16, 95, 97, 100, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 231-233, 453, 466.) Limestone, mottled buff and white, mostly crystalline, fossiliferous. Chip sample taken across 30 ft. Geologic sections.

483, 484. Whatcom County. Probably Early Pennsylvanian part of Chilliwack Group. Sec. 4, T. 40 N., R. 6 E., north of town of Maple Falls. Black Mountain deposits. Spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 209, 210, 249-252, 254, 255, 453, 465.) Chip sample. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.
483. SW¼NE¼ sec. 4. Analyst, C. S. Homi. Sample W 7-2. (Moen, 1962, p. 4, 8, 16, 18, 92, 96-98, 100, 119, pl. 1.) Limestone, light-gray, dense, fossiliferous. Sample taken across 500 ft. Possible use: Concrete aggregate, ballast, road metal, riprap.
484. SE¼SW¼ sec. 4. Analyst, under supervision of Mark Adams. Sample W 7-7. Limestone, gray, dense. Sample taken across 200 ft.

485. Whatcom County. Early Pennsylvanian part of Chilliwack Group. SW¼ sec. 7, T. 40 N., R. 6 E., 2.5 miles north of Maple Falls. Silver Lake quarry. Analyst, C. S. Homi. Sample W 1-1. (Moen, 1962, p. 4, 8, 87-89, 98, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 221-223, 452, 465.) General: Limestone, gray to brownish-gray, medium to coarsely crystalline; weathers buff; maximum thickness about 400 ft. Thin-section description. Chip sample taken across 280 ft. Tonnage estimated. Index and geologic maps, geologic sections. Use: Pulp and paper industry. Possible use: Concrete aggregate, ballast, road metal, riprap.

486. Whatcom County. Early Pennsylvanian to Early Permian part of Chilliwack Group. SW¼ sec. 4, T. 40 N., R. 6 E., Black Mountain. Analyst, C. S. Homi; collector, W. R. Danner. Sample W 7-7. (Moen, 1962, p. 4, 8, 16, 18, 92, 96-98, 100, 119, pl. 1.) General: Limestone, gray, dense to crystalline, fossiliferons. Moderate to large tonnage. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, ballast, road metal, riprap.

487. Whatcom County. Holocene. NW¼SW¼ sec. 7, T. 40 N., R. 6 E., about 3.5 miles north of Maple Falls. Silver Lake deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 10-2. (Danner, 1966, p. 16, 19, 82, 438, 439, 453, 465.) Tufa, creamy-white; composite sample. Index and geologic map. Possible use: None, deposit small and impure.

488. County, locality, and analysts as in sample 487. Sample W 3-1. (Danner, 1966, p. 16, 19, 82, 210, 223, 224, 225, 452, 465.) Limestone, dense, fossiliferous; weathers dark gray to brownish gray. Thin-section description. Chip sample, composite. Index and geologic maps. Possible use: Cement.

489. Whatcom County. SW¼ sec. 34, T. 41 N., R. 5 E. Vedder Mountain deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 22-1. (Danner, 1966, p. 16, 19, 82, 210, 246, 453, 466.) Limestone, float, light-bluish-gray, finely crystalline. Index and geologic maps. Possible use: None, rock impure.

Footnotes of analyses on preceding page:

[1] R_2O_3.

[2] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[3] A composite of samples 467, 469, this group, and samples 1879-1881, group F_2 contained Na_2O = 235 ppm, K_2O = 540 ppm, TiO_2 = 250 ppm, S = 220 ppm.

[4] $Al_2O_3 + Fe_2O_3$.

[5] With sample 1905, group F_2; Na_2O = 290 ppm, K_2O = 530 ppm, TiO_2 = 130 ppm, S = 530 ppm.

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category

[Chemical analyses arranged by quadrangle and stratigraphic position]

Chemical analyses

	Alaska											
	1	2	3	4	5	6	7	8	9	10	11	12
	50F$_2$5-18		50F$_2$5-17		50F$_2$5-14		50F$_2$5-13		50F$_2$5-16		50F$_2$5-15	
SiO_2	1.47	2.16	0.65	1.89	0.38	0.64	0.39	0.57	0.40	1.17	0.40	0.81
Al_2O_3	.68	------	.33	------	.29	------	.38	------	.36	------	.42	------
Fe_2O_3	.16	.55	.15	.62	.17	1.01	.10	.53	.06	.62	.08	.47
MgO	-.1	.08	-.1	.11	-.1	.16	-.1	.17	-.1	.13	-.1	.25
CaO	54.7	52.9	55.5	54.6	55.7	54.9	55.5	55.5	55.9	55.1	55.7	55.1
Ignition loss	43.0	42.3	43.7	42.8	43.7	43.7	43.8	42.1	43.6	43.1	43.6	43.4
Total	[100.1]	[98.0]	[100.4]	[100.0]	[100.3]	[100.4]	[100.3]	[98.9]	[100.4]	[100.1]	[100.3]	[100.0]
Class	0,2,97	------	0,1,99	------	0,1,99	------	0,1,99	------	0,1,99	------	0,1,99	------
CaO/MgO	Calcite	------	Calcite	------	Calcite	------	Calcite	------	Calcite	------	Calcite	------

	Alaska—Continued											
	13	14	15	16	17	18	19	20	21	22	23	24
	50F$_2$5-2	50F$_2$5-9	50F$_2$29-1	50F$_2$30-12	50F$_2$36-13		50F$_2$36-24	50F$_2$36-25	50F$_2$36-2	50F$_2$36-3	50F$_2$36-1	50F$_2$36-21
SiO_2	0.40	3.4	[1]0.58	4.74	0.61	[1]1.84	Trace	0.3	0.66	[1]3.45	[1]0.37	[1]0.20
Al_2O_3	.40	.00	------	------	.30	------	Trace	------	.11	.35	None	------
Fe_2O_3		.26	------	------	[2].48	------	0.002	.02	.09	.16		
MgO	.14	.41	4.11	2.93	8.10	[3]7.47	Trace	------	2.57	.91	.30	[3]7.14
CaO	54.70	50.0	47.98	48.70	46.45	[3]46.36	[3]54.9	[3]55.7	51.5	52.3	55.52	[3]45.88
Na_2O	------	.22	------	------	Absent	------	------	------	------	------	------	------
K_2O	------	.13	------	------	Absent	------	------	------	------	------	------	------
H_2O+	------	------	------	------	.16	------	------	------	------	------	------	------
H_2O-	------	------	------	------	.06	------	------	------	------	------	------	------
TiO_2	------	------	------	------	Trace	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	Absent	------	.002	.008	.013	.012	------	------
MnO	------	------	------	------	.03	------	------	------	------	------	------	------
CO_2	------	------	------	------	44.07	[3]44.54	[3]43.1	[3]43.8	[3]43.33	[3]42.03	[4]43.93	[3]43.81
S	------	------	------	------	.06	------	------	------	.011	.094	------	------
Ignition loss	[5]44.36	[6]45.6	------	41.21	------	------	------	------	------	------	------	------
Total	100.00	[100.0]	[52.67]	97.58	[7]100.32	[100.21]	[98.0]	99.8	98.3	99.3	100.12	[97.03]
Class	0,2,98	3,6,90	(1,0)94	5,0,93	0,1,97	------	0,0,98	0,0,100	0,1,97	(3,1)95	(0,0)100	(0,0)97
CaO/MgO	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	------	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite

	Alaska—Continned											
	25	26	27	28	29	30	31	32	33	34	35	36
	50F$_2$36-20	50F$_2$36-5	50F$_2$36-22	50F$_2$36-23	50F$_2$36-11	50F$_2$36-6	50F$_2$36-10	50F$_2$36-8	50F$_2$36-9	50F$_2$36-7	50F$_2$36-16	50F$_2$36-12
SiO_2	------	0.12	------	------	------	------	------	------	------	------	------	1.22
Insoluble	0.01	------	[8]2.95	[8]3.50	0.62	1.90	0.99	1.23	2.20	0.83	1.09	------
Al_2O_3	------	None	------	------	.38	.26	.08	.19	.05	.07	[9].42	.97
Fe_2O_3	------				.12	.12	.13	.13	.09	.09		
MgO	[3].45	[3].48	[3].96	[3].67	.54	.9	.68	.66	.84	1.08	.69	[10].49
CaO	[3]55.79	[3]55.46	[3]53.42	[3]53.76	54.1	53.8	54.7	54.0	53.7	53.8	53.87	54.95
P_2O_5	------	------	------	------	.005	.033	.020	.028	.019	.005	------	------
CO_2	[3]44.21	[3]44.06	[3]43.01	[3]42.96	[3]43.09	[3]43.3	[3]43.6	[3]43.1	[3]43.06	[3]43.38	[3]43.04	------
S	------	------	------	------	.033	.037	.028	.010	.014	.009	------	------
Ignition loss	------	------	------	------	------	------	------	------	------	------	------	42.37
Total	100.46	100.12	[100.34]	[100.89]	[98.9]	[100.4]	[100.2]	[99.3]	[100.0]	[99.3]	[99.11]	[100.00]
Class	(0,0)100	0,0,100	(3,0)97	(3,0)97	(0,1)98	(1,1)98	(1,0)99	(1,1)98	(2,0)98	(1,0)98	(0,1)98	0,2,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Reported as insoluble.

[2] Toral iron.

[3] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[4] Reported as calculated.

[5] Reported as undetermined --carbon dioxide and water.

[6] Includes ignition loss due to oxidation of FeO.

[7] BaO and SrO reported as absent.

[8] Reported as insoluble (HCl).

[9] Combined iron and aluminum oxides.

[10] Reported as 0.40 percent (Hodge, 1935a, p. 108).

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1-12. Anchorage quadrangle. [Probably Early Jurassic. About 12.4-12.7, 16.7-17.0], on north side of East Fork. (Jasper and Mihelich, 1961, p. 40, 42, 47, 48.) Limestone, chip sample; extensive deposits. Index map. Possible use: Cement. Samples 1, 3, 5, 7, 9, 11, analyses made at U.S. Bureau of Mines, Seattle; samples 2, 4, 6, 8, 10, 12, analyses made at Anchorage Division of Mines and Minerals Assay Office by Mitchell.

1, 2. Probably Jurassic. Field sample 313. (Plafker and Berg, 1964, p. 136-138.) Limestone, light-blue-gray, mottled, fine-grained; also white coarsely crystalline limestone; as much as 200 ft thick.

	Field sample		Field sample
3, 4.	314	9, 10.	317
5, 6.	315	11, 12.	318
7, 8.	316		

13. Anchorage quadrangle. Cretaceous. [Probably sec. 10, T. 11 N., R. 3 W., unsurveyed], 0.5 mile northeast of railroad, near town of Potter. Analyst, M. L. Sharp. Sample 1. (Waring, 1947, p. 4, 5, 8; Moxham and Eckhart, 1952, p. 18.) Limestone, about 20 ft thick. Index map. Former use: Lime. Possible use: Cement.

14. Anchorage quadrangle. [Holocene. Sec. 12, T. 17 N., R. 1 W.], Knik Arm area, adjacent to Wasilla Lake. Edlund deposit. Analysts, E. A. Nygaard and S. M. Berthold. Sample 2, auger hole 1-GS. (Moxham and Eckhart, 1956, p. 3, 6, 8, 13, 14, 15, 18, 19, pl. 1.) Marl; mostly light gray to cream colored when wet; white when dried; fine grained; uniform in composition; 21 ft thick near center of deposit; sample at 15 ft depth. Tonnage estimated. Index and geologic maps, isopach map, geologic section, columnar sections. Possible use: Portland cement. [For analyses from same drill hole, see sample 1, group C; sample 2, group F_1.]

15. Probably Chandler Lake quadrangle. [Early and Late Mississippian, Pennsylvanian(?) and Permian], Lisburne [Group]. [2.7-6.9, 6.2-17.6], Chandler Lake. Sample 45A Gr3. (Gryc, 1948, p. 1, 2.) Limestone, buff to gray, coarsely crystalline, fossiliferous.

16. Charley River quadrangle. [Precambrian], Tindir Group. [About 20.8, 0.4], along Tatonduk River in bluff just above mouth of Thicket Creek. Record D-31. (Mertie, 1933, p. 350, 369, 371, pl. 7; Wells, 1937, p. 46.) Limestone, cream-colored, massive, porous; 2-18 in. thick. Index and geologic maps.

17. Craig quadrangle. [Pre-Ordovician to Devonian], Wales Group. [About 18.75, 4.6], west side of Prince of Wales Island, Hetta Inlet. Jumbo mine. Analyst, George Steiger. Record 2441. (Clarke, 1915, p. 247; Wright, 1915, p. 30, 55, 106, pls. 2, 5; Kennedy, 1953, p. 2, 3, 5, 6, pls. 1, 6, 7.) General: Limestone, blue to black, finely crystalline; possibly 1,000 ft thick. Index and geologic maps, geologic sections.

18. Craig quadrangle. Copper Mountain region, near Jumbo mine. Analyst, George Steiger. Sample 20. (Buddington, 1926, p. 61.) Magnesian limestone. [Probably same analysis as No. 17.]

19, 20. Craig quadrangle. Probably Silurian. [T. 68 S., R. 76 E.], Kosciusko Island, Edna Bay. (Libbey, 1957, p. 7, 17, 18.) Limestone, largely recrystallized. Representative analyses. Index map. Possible use: Calcium carbide manufacture. General use: [Agricultural, chemical, portland cement].

21, 22. Craig quadrangle. Silurian. Analyst, Nils Johansson. (Roehm, 1946, p. 11, 25, 29, 53, 56-58, 60, 61.) Chip samples from outcrop. Mineralogy, thin-section description. Bulk density 2.70. Tonnage estimated. Index maps. Possible use: Agricultural.

21. [8.8, 14.3], northwest end of Heceta Island, Port Alice. Sample and deposit 14. Limerock, light-gray to buff, dense, semicrystalline, fossiliferous; contains dark streaks. Thickness 600 ft; little overburden.

22. [About 9.8, 14-14.2], along central north shore of Heceta Island. Sample and deposit 15. Limerock, dark-bluish-gray, semicrystalline; weathers dark gray. Estimated thickness 300 ft; little overburden.

Alaska—Continued

23. Craig quadrangle. Silurian. [9.9-10.1, 10.1-13.85], north side of Heceta Island, Ketchikan district. Analyst, J. G. Fairchild. Record C-630. (Buddington, 1926, p. 61; Wells, 1937, p. 47.) Limestone.

24, 25. Craig quadrangle. Silurian. [About 10.2, 17.5], northwest part of Marble Island, east of town of Tokeen. Vermont Marble Co. Analyst, R. K. Bailey. Record 2952. (Burchard, 1920, p. 67-69, pls. 1-3, 6; Buddington, 1926, p. 61; Wells, 1937, p. 47.) Marble; general description and thin-section description of Tokeen marble. Index and geologic maps.

24. [Limestone], veined. Photomicrograph. Use: Interior decoration.
25. [Limestone], white.

26. Craig quadrangle. Silurian. [10.4-10.6, 15.9-16.4], southwest end of Orr Island, Ketchikan district. Analyst, J. G. Fairchild. Record C-630. (Buddington, 1926, p. 61; Wells, 1937, p. 47.) Limestone.

27, 28. Craig quadrangle. Silurian. [10.6-10.65, 16.85-16.9], Orr Island. Mission-Alaska Quarry Co. quarry. Analyst, R. K. Bailey. Record 2952. (Burchard, 1920, p. 33, 74, 75, pls. 1, 3, 15; Buddington, 1926, p. 61; Wells, 1937, p. 47.) Thin-section description. Index and geologic maps. Use: Interior decoration [implied].

27. [Limestone], marble, mottled.
28. [Limestone], marble, dark-veined. Photomicrograph.

29-34. Craig quadrangle. Silurian. Dall Island. Analyst, Nils Johannson. (Roehm, 1946, p. 11, 25, 28, 30, 40-51.) Mineralogy, thin-section description. Chip samples from outcrop. Little overburden. Tonnage estimated. Index maps.

29. [14.1-14.9, 1.6-1.85], north shore of View Cove. Superior Portland Cement Co. quarry. Sample and deposit 8. Limerock, dark shades and shades of light-bluish-gray, fine-grained; bedded in part. Deposit 2,000 ft thick. Average bulk density 2.68. Use: Portland cement. Possible use: Agricultural, water treatment.

30. Silurian (Plafker and Berg, 1964, p. 136, 137). [14.3, 1.0], Coco Harbor. Sample and deposit 7. Limestone, chalky-white to light-gray, extremely fine grained, dense, occasional fine brownish streaks; weathers buff. Deposit 200 ft thick; sample 150 ft thick. Bulk density 2.68. Possible use: Agricultural, cement, metallurgical.

31-33. [14.3, 1.2-1.3], month of Green Bay, View Cove. Limerock, more than 1,500 ft thick. Possible use: Agricultural, cement.

31. Sample and deposit 9. Limerock, nearly black, thinly laminated, fissile. Bulk density 2.66. Additional possible use: Water treatment.
32. Sample and deposit 11. Limerock, dark-bluish-gray, thinly laminated, fissile, slightly friable; weathers light gray. Bulk density 2.70.
33. Sample and deposit 10. Limerock, dark-gray to bluish-gray, fissile, slightly friable; weathers light gray. Bulk density 2.70.

34. [14.3, 2.6], South Bay of Breezy Bay. Sample and deposit 12. Limerock, light-bluish-buff-gray, very fine grained, slightly friable; weathers light buff. Deposit 900 ft thick. Bulk density 2.66. Possible use: Agricultural, cement, metallurgical, water treatment.

35. Craig quadrangle. Silurian. [About 14.9, 1.6], Dall Island, View Cove. Pacific Coast Cement Co. property. (S. E. Hntton, written communication, 1928, cited in Buddington and Chapin, 1929, p. 391.) Limestone; average of large number of samples in district. Use: Cement.

36. Craig quadrangle. Silurian. [About 14.9, 1.6], Dall Island, between Baldy Bay and Tlevak Strait. Superior Portland Cement, Inc. quarry. (Hodge, 1935a, p. 107, 108, pl. 25; Hodge, 1935c, app. L-1, p. 41.) Limestone, very uniform; typical analysis. Tonnage estimated. Use: Cement. Possible use: Flux.

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	37	38	39	40	41	42	43	44	45	46	47	48
	50F$_2$36-15	50F$_2$36-27	50F$_2$36-26	50F$_2$36-28	50F$_2$40-6	50F$_2$40-3	50F$_2$40-1	50F$_2$40-2	50F$_2$40-4	50F$_2$40-5	50F$_2$42-5	50F$_2$42-1
SiO_2	------	1.4	------	------	------	------	------	------	------	------	2.06	------
Insoluble	0.44	------	[1]0.26	[1]7.82	[1]0.32	0.41	0.27	0.44	0.94	0.20	------	[2]2.1
Al_2O_3	.14	3.9	.14	------	------	.33	.08	.13	.23	.08	.50	1.1
Fe_2O_3	.06	------	Trace	------	------	.15	.05	.12	.11	.06		
MgO	.58	.7	.47	[3].58	[3].49	2.95	1.24	4.6	1.17	.48	19.88	.7
CaO	54.6	[3]53	55.80	[3]51.37	[3]55.79	51.3	54.4	50.2	53.8	54.8	31.20	53.6
P_2O_5	-.001	------	------	------	------	.010	.004	.002	-.001	.002	------	------
CO_2	[3]43.47	[3]42	43.86	[3]40.96	[3]44.34	[3]43.6	[3]43.8	[3]39.5	[3]43.5	[3]43.5	------	------
SO_3	------	------	Trace	------	------	------	------	------	------	------	------	------
S	.052	------	------	------	------	.37	.017	.024	.031	.011	------	------
Ignition loss	------	------	------	------	------	------	------	------	------	------	------	42.4
Total	[99.3]	[101]	[4][100.53]	[100.73]	[100.94]	[99.1]	[99.9]	[95.0]	[99.8]	[99.1]	[5]53.64	99.9
Class	(0,1)99	0,2,95	(0,0)100	(8,0)93	(0,0)100	(0,1)98	(0,0)99	(0,1)88	(0,1)98	(0,0)99	1,1,97	0,3,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Dolomite	Calcite

Alaska—Continued

	49	50	51	52	53	54	55	56	57	58	59	60	61
	50F$_2$52-2	50F$_2$52-4	50F$_2$52-3	50F$_2$52-1	50F$_2$52-22	50F$_2$52-23	50F$_2$52-25	50F$_2$52-26	50F$_2$52-27	50F$_2$52-20	50F$_2$52-39	50F$_2$52-41	50F$_2$52-42
SiO_2	4.1	5.9	5.4	4.0	3.5	2.1	6.2	5.4	6.0	6.6	3.2	5.2	5.9
Al_2O_3	1.15	1.6	1.6	1.3	2.3	.80	.95	1.1	.64	1.1	.31	.80	1.0
Fe_2O_3	.43	.58	.51	.50	.78	.32	.40	.46	.45	.41	.34	.78	.64
MgO	.35	.25	.65	.4	2.9	1.4	1.0	1.8	1.3	1.9	.83	8.0	2.1
CaO	51.4	49.8	50.3	51.4	47.9	53.0	50.0	50.3	50.1	50.1	53.1	43.4	48.4
Na_2O	<.01	<.01	<.01	<.01	.30	.50	.38	.62	.37	.59	.21	.33	.18
K_2O	<.01	<.01	<.01	<.01	.12	.13	.13	.19	.19	.20	.07	.08	.09
P_2O_5	------	------	------	------	.01	.01	.02	.01	.02	.00	.01	.01	.02
SO_3	------	------	------	------	.32	.24	.41	.35	.51	.61	.19	.11	.16
Ignition loss	------	------	------	------	42.4	42.6	40.6	40.4	40.4	39.6	41.9	41.8	40.5
Total	[57.4]	[58.2]	[58.5]	[57.6]	100.5	101.1	100.1	100.6	100.0	101.1	100.2	100.5	99.0
Class	2,4,92	2,6,89	2,6,91	1,5,93	0,7,92	0,3,96	4,4,91	3,4,90	4,3,91	4,4,88	2,2,95	3,4,91	3,5,90
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	62	63	64	65	66	67	68	69	70	71	72	73	74
	50F$_2$52-28	50F$_2$52-29	50F$_2$52-30	50F$_2$52-31	50F$_2$52-32	50F$_2$52-33	50F$_2$52-34	50F$_2$52-35	50F$_2$52-36	50F$_2$52-37	50F$_2$52-38	50F$_2$52-9	50F$_2$52-10
SiO_2	3.9	2.7	2.2	2.2	3.0	5.9	4.3	4.2	4.0	3.8	4.9	6.5	7.7
Al_2O_3	.59	.29	.00	.21	.83	.69	1.9	1.4	1.6	.79	1.4	.4	.6
Fe_2O_3	.19	.19	.18	.30	.30	.40	.27	.19	.24	.16	.11	.4	.4
MgO	2.0	.77	.76	.51	.75	1.6	1.1	1.2	1.2	1.0	.60	1.6	1.3
CaO	50.7	53.1	53.7	53.6	52.8	50.3	50.7	51.0	51.0	51.8	51.4	49.6	48.8
Na_2O	.23	.20	.20	.20	.24	.37	.32	.28	.26	.30	.26	.3	.3
K_2O	.15	.11	.10	.08	.08	.11	.10	.09	.08	.11	.08	.1	.1
P_2O_5	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.1	.1
SO_3	.18	.08	.12	.08	.09	.33	.30	.12	.13	.10	.29	.00	.2
Ignition loss	42.1	42.6	42.8	42.5	42.4	40.7	42.6	42.0	42.1	41.8	41.3	41.0	39.6
Total	100.0	100.0	100.1	99.7	100.5	100.4	101.6	100.5	100.6	99.9	100.4	100.0	99.1
Class	3,2,95	2,1,96	2,0,97	1,1,96	1,3,95	4,3,91	1,7,92	1,5,94	1,6,93	2,3,94	2,4,93	5,2,92	6,3,89
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Insoluble in HCl.

[2] Reported as probably silica.

[3] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[4] H_2S reported as not detected.

[5] Total reported as 99.7 percent.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

37. Craig quadrangle. Devonian. [13.5, 9.9], Wadleigh Island. Analyst, Nils Johansson. Sample and deposit 13. (Roehm, 1946, p. 11, 25, 29, 52-55.) Limerock, brownish-gray, finely crystalline, massive, dense; weathers light gray. Deposit 600 ft thick; little overburden. Mineralogy, thin-section description. Bulk density 2.69. Chip sample from outcrop. Tonnage estimated. Index maps. Possible use: Chemical.

38. Craig quadrangle. Paleozoic. Either [23.3, 2.65], head of North Arm or [24.7, 2.85], north entrance to Johnson Inlet, Prince of Wales Island. American Coral Marble Co. (Wright, 1908, p. 120, 121, pls. 1, 2.) [Limestone], marble, white, fine-grained; small amount of pyrite. Index and geologic maps.

39, 40. Craig quadrangle. Paleozoic. [10.2, 17.5], Marble Island, near town of Tokeen. Vermont Marble Co. Thin-section description. Index and geologic maps.

39. East of Tokeen. Analysts, G. J. Hough, H. A. Bright. Reference No. 50, lab. No. 2632. (Kessler, 1919, p. 4, 36-51, 52-54; Burchard, 1920, p. 15, 67-70, pls. 1, 3.) [Limestone] marble, white. Physical tests.

40. Locality, 1.5 miles south of Tokeen. Analyst, R. K. Bailey. Record 2952, deposit 34. (Burchard, 1920, p. 15, 72, 73, pls. 1, 3; Wells, 1937, p. 47.) [Limestone] marble, green; mineralogy.

41-46. Dixon Entrance quadrangle. Silurian. (Roehm, 1946, p. 11, 25, 28, 30-39; Plafker and Berg, 1964, p. 136, 137, 139, figs. 8, 20.) Limestone. Thin-section description; little overburden; tonnage estimated. Index and geologic maps. Samples 42-46: Analyst, Nils Johansson; mineralogy; chip samples from outcrop.

41. [9.5-9.6, 16.4-16.7], Dall Island, near Waterfall Bay. Analyst, R. K. Bailey. Record 2952; sample and deposit 4. (Burchard, 1920, p. 78-80, pls. 1, 4, 18; Wells, 1937, p. 47.) Marble, white, finely crystalline. Estimated thickness 2,000 ft. Photomicrograph. Possible use: Chemical, pulp and paper industry.

42. [9.5-9.6, 16.4-16.7], Dall Island, northeast shore at head of Waterfall Bay. Sample and deposit 3. Limestone, bluish-white, mottled, semicrystalline; weathers dull bluish gray. Estimated thickness 2,000 ft. Bulk density 2.60. Possible use: Agricultural.

43. [9.5-9.6, 16.4-16.7], Dall Island, southeast shore at head of Waterfall Bay. Sample and deposit 1. Limerock, dark-bluish-gray, massive, dense, finely crystalline; weathers dull bluish gray; contains few white calcite spots. Estimated thickness 2,000 ft. Bulk density 2.70. Possible use: Agricultural, cement, metallurgical, structural products, water treatment.

44. [9.55, 16.5], Dall Island, east shore at head of Waterfall Bay. Sample and deposit 2. Limestone, light-gray to nearly white, mottled, very fine grained; weathers light buff. Estimated thickness 2,000 ft. Bulk density 2.68. Possible use: Agricultural, lime.

45. [12.4-12.6, 16.1-16.3], north end of Long Island, hill due west of Cleva Bay. Sample and deposit 5. Limestone, dark-bluish-gray, dense, massive, finely crystalline; weathers to light bluish dull gray. Bulk density 2.70. Possible use: Agricultural, metallurgical.

46. [12.4-12.6, 16.1-16.3], north end of Long Island, west shore of Cleva Bay. Sample and deposit 6. Limestone, light-bluish-gray to nearly white, mottled crystalline luster, bedded. Bulk density 2.70. Possible use: Agricultural, pulp and paper industry.

47, 48. Fairbanks quadrangle. [Precambrian or early Paleozoic], Birch Creek Schist. Analyst, M. L. Sharp. (Waring, 1947, p. 4, 6, 8, 9.) Index map.

47. [Sec. 31, T. 2 N., R. 1 E., about 8 miles north-northeast of town of Fairbanks.] Lab. No. 9. General description: [Dolomite], white, fine-grained. Maximum thickness 15 ft. Possible use: Building stone, monumental stone.

48. [Sec. 13 or 14, T. 4 S., R. 8 W.], Nenana depot, railroad cut. Lab. No. 8. Limestone, blue-gray; 1-4 ft thick.

49-52. Healy quadrangle. Middle Devonian. [5.8-6.7, 7.8-8.0], headwaters of West Fork of Windy Creek. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 2, 4, 117, 118, 123, figs. 1, 3, 41, 42.) Limestone, gray, recrystallized. Index and geologic maps. Possible use: Portland cement, rock wool.

49. Sample 163. Sample from talus slope, represents entire width of outcrop.

50. Sample 165.

51. Sample 166.

52. Sample 167.

53-74. Healy quadrangle. Devonian(?). [5.8-6.7, 7.8-8.0], headwaters of West Fork of Windy Creek. Analysts, Leonard Shapiro, L. E. Reichen, S. M. Berthold. (Moxham, Eckhart, and Cobb, 1959, p. 69, 88-91, pl. 11.) Limestone, dark- to bluish-gray, fine-grained, very dense, massive, locally banded; weathers light gray. Chip samples. Index and geologic maps, geologic sections. Possible use: Portland cement.

	Lab. No.	Sample		Lab. No.	Sample
53.	501921 C	492	64.	1935 C	543
54.	1922 C	493	65.	1936 C	544
55.	1924 C	495	66.	1937 C	545
56.	1925 C	496	67.	1938 C	546
57.	1926 C	497	68.	1939 C	547
58.	1928 C	499	69.	1940 C	548
59.	1929 C	501	70.	1941 C	549
60.	1931 C	503	71.	-----	5410
61.	1932 C	504	72.	-----	5411
62.	1933 C	541	73.	1942 C	561
63.	1934 C	542	74.	1943 C	562

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category —Continued

Chemical analyses—Continued

	Alaska—Continued												
	75	76	77	78	79	80	81	82	83	84	85	86	87
	$50F_2$52-11	$50F_2$52-12	$50F_2$52-13	$50F_2$52-14	$50F_2$52-15	$50F_2$52-16	$50F_2$52-17	$50F_2$52-18	$50F_2$156-5	$50F_2$156-6	$50F_2$156-7	$50F_2$156-8	$50F_2$156-9
SiO_2	6.1	5.5	4.2	7.3	2.4	4.3	2.6	3.4	1.86	1.14	1.74	1.24	3.26
Al_2O_3	1.3	.6	.6	.4	.3	.4	.1	.5	1.15	1.0	1.0	.72	1.0
Fe_2O_3	.6	.4	.3	.3	.2	.1	.1	.2	.58	.58	.58	.58	.58
MgO	1.9	2.5	1.1	1.0	.6	1.3	.4	1.8	1.8	1.45	1.3	1.4	1.65
CaO	49.0	49.5	51.4	49.4	53.2	52.0	54.2	51.0	51.4	52.2	52.2	52.6	52.4
Na_2O	.3	.3	.2	.4	.2	.2	.1	.3	------	------	------	------	------
K_2O	.2	.1	.1	.1	.1	.1	.1	.1	------	------	------	------	------
P_2O_5	.1	.1	.1	.1	.1	.1	.1	.1	.007	.014	.018	.019	.03
CO_2	------	------	------	------	------	------	------	------	[1]42.2	[1]42.4	[1]41.7	[1]42.1	[1]41.7
SO_3	.4	.2	.2	.3	.1	.00	.00	.2	.22	.20	.30	.32	.26
NaCl+KCl	------	------	------	------	------	------	------	------	[2].16	[2].10	[2].70	[2].80	[2].52
Ignition loss	40.0	41.3	41.6	40.0	42.6	42.2	43.1	42.1	[3](42.2)	[3](42.8)	[3](42.6)	[3](42.6)	[3](42.7)
Total	[99.9]	[100.5]	[99.8]	[99.3]	[99.8]	[100.7]	[100.8]	[99.7]	[99.4]	[99.1]	[99.5]	[99.8]	[101.4]
Class	3,5,89	4,3,92	3,3,94	6,2,90	2,1,96	3,1,95	2,1,97	2,2,95	0,3,95	0,2,96	0,3,94	0,2,95	1,4,94
CaO/MgO	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Alaska—Continued

	88	89	90	91	92	93	94	95	96	97	98	99	100
	$50F_2$ 156-11	$50F_2$ 156-12	$50F_2$ 156-13	$50F_2$ 156-14	$50F_2$ 156-15	$50F_2$ 156-16	$50F_2$ 156-17	$50F_2$ 156-18	$50F_2$ 156-24	$50F_2$ 156-25	$50F_2$ 156-26	$50F_2$ 156-27	$50F_2$ 156-28
SiO_2	2.72	2.20	2.40	4.00	3.50	4.8	5.3	5.5	5.0	4.7	3.4	3.6	4.6
Al_2O_3	1.38	1.47	1.57	2.07	2.33	2.55	2.78	2.98	3.05	2.93	2.57	2.45	3.03
Fe_2O_3	1.02	.73	.73	.73	.87	.95	1.02	1.02	.95	.87	.73	.95	.87
MgO	1.6	2.0	1.65	2.45	2.0	1.8	1.7	1.65	1.8	1.8	1.5	1.7	2.2
CaO	50.8	50.6	50.6	50.2	50.0	48.4	48.3	48.0	49.4	49.5	51.0	50.0	48.5
Na_2O	------	------	------	------	------	------	------	------	[2].32	[2].38	------	------	------
K_2O	------	------	------	------	------	------	------	------	[2].23	[2].38	------	------	------
P_2O_5	.03	.016	.018	.025	.023	.02	.025	.03	.03	.03	.019	.020	.020
CO_2[1]	40.8	41.8	41.4	40.5	40.8	40.0	39.4	39.5	41.8	40.3	40.9	40.4	40.6
SO_3	.74	.30	.28	.42	.48	.50	.54	.56	.06	.07	.05	.06	.07
NaCl+KCl[2]	.58	.41	.62	.18	.14	.40	.90	1.34	------	------	.24	.36	.62
Ignition loss[3]	(41.7)	(42.6)	(42.6)	(41.3)	(41.6)	(40.5)	(40.2)	(40.2)	(42.4)	(40.4)	(41.2)	(40.8)	(40.6)
Total	[99.7]	[99.5]	[99.3]	[100.6]	[100.1]	[99.4]	[100.0]	[100.6]	[102.6]	[101.0]	[100.4]	[99.5]	[100.5]
Class	0,5,92	0,4,94	0,4,93	0,6,91	0,6,92	0,8,90	0,9,89	0,9,89	0,8,93	0,8,91	0,5,92	0,6,91	0,7,91
CaO/MgO	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

Alaska—Continued

	101	102	103	104	105	106	107	108	109	110	111	112
	$50F_2$ 156-29	$50F_2$ 156-30	$50F_2$ 156-34	$50F_2$ 156-37	$50F_2$ 156-39	$50F_2$ 156-40	$50F_2$ 156-41	$50F_2$ 156-42	$50F_2$ 156-43	$50F_2$ 156-45	$50F_2$ 156-46	$50F_2$ 156-48
SiO_2	5.5	5.4	4.4	5.5	5.4	4.8	3.6	2.6	3.6	4.0	5.2	6.0
Al_2O_3	3.03	3.15	2.3	3.60	2.15	3.05	2.3	1.75	2.50	2.05	3.0	3.25
Fe_2O_3	.87	.75	.60	.50	.65	.95	.60	.65	.60	.95	.80	.95
MgO	2.3	2.5	1.9	1.5	1.4	1.8	1.7	2.9	2.0	2.4	2.9	1.6
CaO	48.0	48.6	49.6	49.0	50.4	49.0	49.4	49.6	49.5	48.7	48.1	47.6
P_2O_5	.020	.025	.016	.032	.023	.025	.020	.020	.019	.019	.026	.027
CO_2[1]	39.8	40.0	40.8	39.2	41.1	39.8	39.9	41.7	41.4	40.2	39.6	39.4
SO_3	.07	.06	.03	.06	.01	.51	.42	.31	.36	.75	.45	.73
NaCl+KCl[2]	.14	.01	.01	.88	1.2	.74	.92	1.2	.46	.56	.20	.76
Ignition loss[3]	(40.4)	(40.3)	(41.2)	(39.4)	(41.2)	(40.2)	(40.6)	(41.9)	(41.6)	(40.5)	(39.8)	(39.9)
Total	[99.7]	[100.5]	[99.7]	[100.3]	[102.3]	[100.7]	[98.9]	[100.7]	[100.4]	[99.6]	[100.3]	[100.3]
Class	0,9,90	0,9,90	0,7,92	0,9,89	1,7,93	0,8,90	0,6,90	0,4,94	0,6,93	0,7,90	0,8,89	0,10,89
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2) common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued											
	113	114	115	116	117	118	119	120	121	122	123	124
	$50F_2$ 156-53	$50F_2$ 156-54	$50F_2$ 156-56	$50F_2$ 156-57	$50F_2$ 156-59	$50F_2$ 156-60	$50F_2$ 156-61	$50F_2$ 156-62	$50F_2$ 156-63	$50F_2$ 156-64	$50F_2$ 156-65	$50F_2$ 156-66
SiO_2	3.5	3.6	3.9	5.2	4.4	4.6	5.0	4.9	5.0	5.0	2.8	2.8
Al_2O_2	2.55	2.35	2.95	2.8	4.3	4.2	3.7	2.65	2.45	3.05	1.77	1.55
Fe_2O_3	.85	.85	.85	1.0	1.1	1.0	.9	.65	.75	.85	.43	.35
MgO	1.25	.85	1.45	1.9	2.0	2.3	1.9	1.5	1.8	1.3	1.43	.73
CaO	48.6	48.9	48.6	49.1	46.3	47.1	47.4	50.0	49.7	48.3	51.6	51.4
P_2O_5	.023	.017	.025	.019	.022	.026	.032	.028	.016	.018	.014	.020
CO_2[1]	40.6	40.6	40.4	39.6	39.8	40.2	40.2	39.8	40.2	40.2	41.8	42.0
SO_3	.45	.42	.53	.68	.64	.65	.76	.72	.57	.35	.11	.06
NaCl + KCl[2]	.10	.44	<.01	1.0	.80	.50	.62	.42	.22	<.01	.62	.30
Ignition loss[3]	(40.8)	(40.7)	(40.7)	(39.8)	(39.9)	(40.6)	(40.5)	(40.1)	(40.6)	(40.6)	(42.2)	(42.1)
Total	[97.9]	[98.0]	[98.7]	[101.3]	[99.4]	[100.6]	[100.5]	[100.7]	[100.7]	[99.1]	[100.6]	[99.2]
Class	0,6,90	0,6,90	0,7,90	0,8,89	0,8,88	0,7,90	0,8,90	0,8,90	0,8,91	0,9,90	0,5,94	0,5,94
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] 400°-1,000°C, direct combustion.

[2] Gravimetric determination.

[3] Not included in total.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

75-82. Healy quadrangle. Devonian(?). [5.8-6.7, 7.8-8.0], headwaters of West Fork of Windy Creek. Analysts, Leonard Shapiro, L. E. Reichen, S. M. Berthold. (Moxham, Eckhart, and Cobb, 1959, p. 69, 88-91, pl. 11.) Limestone, dark- to bluish-gray, fine-grained, very dense, massive, locally banded; weathers light gray. Chip samples. Index and geologic maps, geologic sections. Possible use: Portland cement.

	Lab. No.	Sample
75.	1944 C	563
76.	1945 C	564
77.	1946 C	565
78.	1947 C	566
79.	1948 C	567
80.	1949 C	568
81.	1950 C	569
82.	1951 C	5610

83-124. Healy quadrangle. Middle Devonian. [5.8-6.7, 7.8-8.0], headwaters of West Fork of Windy Creek, Foggy Pass. Deposit description: Limestone, dark-gray to blue-gray, fine-grained, dense, recrystallized; contains abundant calcite veinlets. Estimated thickness 3,100 ft. Index and geologic maps. Possible use: Portland cement, mineral wool.

83-109. (Warfield, 1962, p. 3, 12, 13, 15-18.) Representative samples from channel 50 ft long.

	Sample
83.	505
84.	506
85.	507
86.	508
87.	509
88.	511
89.	512
90.	513
91.	514
92.	515
93.	516
94.	517
95.	518
96.	524
97.	526
98.	527
99.	528
100.	529
101.	530
102.	531
103.	535
104.	538
105.	540
106.	541
107.	542
108.	543
109.	544

110-122. (Warfield, 1962, p. 3, 12, 13, 15-17, 19.) Representative samples from channel 50 ft long.

	Sample
110.	546
111.	547
112.	550
113.	555
114.	556
115.	559
116.	560
117.	562
118.	563
119.	564
120.	565
121.	569
122.	570

123, 124. (Warfield, 1962, p. 3, 12, 13, 15-17, 19.) Representative samples from 100 ft of talus. Tonnage estimated.

	Sample
123.	571
124.	572

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	125	126	127	128	129	130	131	132	133	134	135	136	137
	$50F_2$ 156-67	$50F_2$ 156-68	$50F_2$ 156-69	$50F_2$ 156-70	$50F_2$ 156-71	$50F_2$ 156-72	$50F_2$ 156-73	$50F_2$ 156-74	$50F_2$ 156-75	$50F_2$ 156-76	$50F_2$ 156-77	$50F_2$ 156-78	$50F_2$ 156-79
SiO_2	2.4	3.3	2.4	3.3	2.8	3.5	2.4	2.4	4.8	5.1	4.7	3.8	3.2
Al_2O_3	1.6	1.92	1.85	2.2	2.77	2.5	1.62	1.77	3.03	2.69	2.9	2.77	2.02
Fe_2O_2	.50	.78	.35	.50	.43	.50	.28	.43	.57	.71	.50	.43	.28
MgO	1.48	2.75	1.05	1.23	1.23	1.60	1.23	1.43	1.77	1.81	1.45	1.41	1.35
CaO	50.8	49.7	51.0	50.0	49.5	49.8	51.4	51.4	48.8	48.5	48.4	49.6	50.6
P_2O_5	.015	.028	.023	.025	.025	.023	.020	.023	.028	.041	.039	.030	.037
CO_2[1]	41.8	41.6	42.0	41.8	41.4	41.6	42.6	42.1	39.9	40.3	37.6	40.6	41.1
SO_3	.15	.22	.13	.07	.15	.21	.12	.08	.21	.20	.22	.18	.15
NaCl+KCl[2]	.82	1.0	.40	.46	.56	.14	1.1	1.1	1.1	.40	.96	.48	.06
Ignition loss[3]	(42.0)	(41.8)	(42.2)	(42.1)	(41.8)	(40.8)	(42.8)	(42.4)	(40.1)	(40.4)	(39.1)	(40.8)	(41.4)
Total	[99.6]	[101.3]	[99.2]	[99.6]	[98.9]	[99.9]	[100.8]	[100.7]	[100.2]	[99.8]	[96.8]	[99.3]	[98.8]
Class	0,4,94	0,5,94	0,4,94	0,6,93	0,5,92	0,6,93	0,4,95	0,4,95	0,8,90	0,8,91	0,8,85	0,7,92	0,6,93
CaO/MgO	Calcite	Magnesian calcite	Calcite	Caleite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Alaska—Continued

	138	139	140	141	142	143	144	145	146	147	148	149	150
	$50F_2$ 156-80	$50F_2$ 156-87	$50F_2$ 156-88	$50F_2$ 156-89	$50F_2$ 156-90	$50F_2$ 156-91	$50F_2$ 156-92	$50F_2$ 156-93	$50F_2$ 156-94	$50F_2$ 156-95	$50F_2$ 156-96	$50F_2$ 52-46	$50F_2$ 52-45
SiO_2	4.5	4.7	4.7	4.7	4.2	2.8	3.5	3.7	3.4	3.9	3.0	0.7	0.7
Al_2O_3	2.45	3.55	2.97	2.97	3.47	2.27	2.37	2.47	2.67	3.2	2.47	.25	.2
Fe_2O_3	.35	.95	.73	.73	.73	.73	.73	.73	.73	.80	.73	.15	.18
MgO	1.20	1.5	1.35	1.9	1.5	1.65	1.9	1.9	1.9	1.5	1.65	.05	.15
CaO	49.2	47.4	45.8	46.8	48.6	49.2	48.0	46.2	48.1	48.1	46.9	54.9	54.4
P_2O_5	.028	.037	.028	.025	.023	.023	.020	.020	.018	.032	.030	------	------
CO_2[1]	40.2	39.2	40.0	39.8	40.8	41.4	40.8	41.1	40.7	40.2	41.3	------	------
SO_3	.38	.26	.16	.15	.12	.14	.17	.07	.09	.08	.06	------	------
NaCl+KCl[2]	1.1	.24	.44	.50	.54	.40	.68	.62	.62	.26	.64	------	------
Ignition loss[3]	(40.6)	(39.8)	(40.4)	(40.4)	(41.0)	(41.6)	(41.0)	(41.6)	(41.6)	(40.8)	(41.4)	------	------
Total	[99.4]	[97.8]	[96.2]	[97.6]	[100.0]	[98.6]	[98.2]	[96.8]	[98.2]	[98.1]	[96.8]	[56.0]	[55.6]
Class	0,8,91	0,8,88	0,8,87	0,8,89	0,7,91	0,5,92	0,6,91	0,7,89	0,6,91	0,7,90	0,5,90	0,1,98	0,1,97
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

Alaska—Continued

	151	152	153	154	155	156	157	158	159	160	161	162	163
	$50F_2$ 52-43	$50F_2$ 52-44	$50F_2$ 52-63	$50F_2$ 52-62	$50F_2$ 52-61	$50F_2$ 52-64	$50F_2$ 52-48	$50F_2$ 52-49	$50F_2$ 52-50	$50F_2$ 52-51	$50F_2$ 52-52	$50F_2$ 52-53	$50F_2$ 155-113
SiO_2	0.7	0.5	5.5	1.4	1.7	0.7	1.4	1.5	1.4	2.2	1.5	1.1	4.3
Al_2O_3	.3	.15	.7	.3	.4	.25	.00	.30	.30	2.4	.46	.00	.1
Fe_2O_3	.17	.14	1.38	.20	.28	.25	.2	.16	.30	.30	.32	.2	.5
MgO	.05	.05	.1	.05	1.85	.05	3.2	1.1	.07	1.5	.07	2.5	15.8
CaO	55.2	55.2	50.9	55.2	51.8	55.4	51.2	52.8	54.1	51.5	54.0	52.0	34.4
Na_2O	------	------	------	------	------	------	.1	.29	.16	.17	.11	.1	.1
K_2O	------	------	------	------	------	------	.1	.12	.11	.14	.13	.1	.1
P_2O_5	------	------	------	------	------	------	.1	.00	.02	.01	.02	.1	.2
SO_3	------	------	------	------	------	------	------	.08	.06	.08	.08	------	------
Ignition loss	------	------	------	------	------	------	43.3	43.3	43.5	42.8	43.1	43.4	44.4
Total	[56.4]	[56.0]	[58.6]	[57.2]	[56.0]	[56.6]	99.6	99.7	100.0	101.1	99.8	99.5	99.9
Class	0,1,99	0,1,99	3,5,91	1,1,97	1,2,96	0,1,98	1,0,97	1,2,97	1,2,97	0,4,95	0,3,97	1,0,98	4,1,94
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcareous dolomite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	164	165	166	167	168	169	170	171	172	173	174	175	176
	$50F_2$ 52-68	$50F_2$ 52-69	$50F_2$ 155-117	$50F_2$ 155-118	$50F_2$ 155-119	$50F_2$ 155-120	$50F_2$ 155-121	$50F_2$ 155-122	$50F_2$ 155-123	$50F_2$ 155-124	$50F_2$ 155-125	$50F_2$ 155-126	$50F_2$ 155-127
Insoluble	3.88	2.64	[4]0.76	[4]0.96	[4]1.38	[4]0.84	[4]0.84	[4]0.76	[4]1.94	[4]1.04	[4]0.80	[4]4.90	[4]4.86
$Al_2O_3 + Fe_2O_3$[5]	.39	.18	.26	.18	.25	.18	.24	.26	.24	.12	.24	.24	.30
MgO	1.66	3.98	9.66	7.52	7.66	3.29	4.94	9.04	7.64	5.30	7.92	.68	1.02
CaO	52.04	50.14	44.76	47.08	46.46	51.92	49.26	44.84	46.06	49.32	46.50	52.58	51.96
P_2O_5	.05	.01	.04	.02	.03	.02	[6].01	[6].01	[6].01	[6].01	[6].01	[6].01	[6].01
CO_3	42.56	43.86	[7](45.37)	[7](45.07)	[7](45.15)	[7](44.29)	[7](44.18)	[7](44.94)	[7](44.40)	[7](44.37)	[7](45.00)	[7](42.04)	[7](42.61)
Total	100.56	100.81	[55.48]	[55.76]	[55.78]	[56.25]	[55.29]	[54.91]	[55.89]	[55.79]	[55.47]	[58.41]	[58.15]
Class	(3,1)96	(2,0)98	(0,1)97	(1,1)98	(1,1)97	(1,1)98	(0,1)98	(0,1)99	(2,1)97	(1,0)98	(0,1)98	(4,1)94	(4,1)95
CaO/MgO	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

[1] 400°-1,000°C, direct combustion.

[2] Gravimetric determination.

[3] Not included in total.

[4] Reported as insoluble (HCl).

[5] Reported as R_2O_3.

[6] May be less than 0.01 percent.

[7] Reported as calculated from CaO and MgO, not included in total.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

125-148. Healy quadrangle. Middle Devonian. [5.8-6.7, 7.8-8.0], near headwaters of West Fork of Windy Creek. Deposit description: Limestone, dark-gray to blue-gray, fine-grained, dense, recrystallized; contains abundant calcite veinlets. Estimated thickness 3,100 ft. Index and geologic maps. Possible use: Portland cement, mineral wool.

125-138. (Warfield, 1962, p. 3, 12, 13, 15-17, 19.) Representative samples from 100 ft of talus. Tonnage estimated.

	Sample		Sample
125.	573	132.	580
126.	574	133.	581
127.	575	134.	582
128.	576	135.	583
129.	577	136.	584
130.	578	137.	585
131.	579	138.	586

139-147. (Warfield, 1962, p. 3, 12, 13, 15-17, 20.) Representative samples from 100 ft of talus. Tonnage estimated.

	Sample		Sample
139.	594	144.	600
140.	595	145.	601
141.	596	146.	602
142.	598	147.	603
143.	599		

148. Sample 604. (Warfield, 1962, p. 3, 12, 13, 15-17, 20.) Outcrop sample.

149-152. Healy quadrangle. Paleozoic, possibly Devonian. [About 6.75-7.35, 7.5-7.7], on ridge parallel to and on south side of West Fork of Windy Creek above its confluence with Windy Creek. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 93, 115, 116, 117, figs. 1, 3, 41.) Limestone, gray to dark-gray, fine-grained; contains calcite veinlets. Outcrop samples. Index and geologic maps.

	Sample		Sample
149.	157	151.	159
150.	158	152.	160

153-156. Quadrangle, age, analyst, reference, and maps as in samples 149-152. [7.4-7.8, 7.9-8.1], 6.5 miles by trail northwest of town of Cantwell. Limestone. Outcrop samples.

	Sample		Sample
153.	153	155.	155
154.	154	156.	162

Alaska—Continued

157-162. Healy quadrangle. Devonian. [About 6.75-7.35, 7.5-7.7], summit of west end of ridge southwest of junction of West Fork with Windy Creek. Analysts, Leonard Shapiro, L. E. Reichen, S. M. Berthold. (Moxham, Eckhart, and Cobb, 1959, p. 69, 87, 88, pl. 11.) Limestone, dark-gray to black; weathers light gray; average thickness 300 ft. Chip samples. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Portland cement.

	Lab. No.	Sample
157.	-----	30
158.	1911 C	32
159.	1912 C	34
160.	1913 C	36
161.	1914 C	38
162.	-----	39

163. Healy quadrangle. Devonian. [7.4-7.8, 7.9-8.1], along upper valley slopes on north side of Windy Creek. Analyst, Leonard Shapiro. Sample 5. (Moxham, Eckhart, and Cobb, 1959, p. 69, 92, pl. 11.) [Calcareous dolomite] limestone. Index and geologic maps, geologic sections.

164, 165. Healy quadrangle. Devonian. [Sec. 7, T. 17 S., R. 7 W., unsurveyed], valley of Little Windy Creek. Analyst, R. K. Bailey. (Moxham, Eckhart, and Cobb, 1959, p. 69, 91, pl. 11.) Limestone. Index and geologic maps, geologic sections. Possible use: Probably none; half of limestone contains excessive amounts of magnesia.

	Sample
164.	C55
165.	C56

166-176. Healy quadrangle. Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], along south side of ridge between Windy and Bain Creeks, 1 mile west of railroad. Northern Empire Development Co. Analyst, R. K. Bailey. (Moxham, Eckhart, and Cobb, 1959, p. 67, 69, 85, 86, 96, pl. 11.) Deposit: Limestone, dark-gray to black, dense, fine-grained; weathers light gray and buff. Maximum thickness 600 ft. Chip samples. Index and geologic maps, geologic sections. Possible use: Portland cement; but magnesia content often too high.

	Sample		Sample
166.	53	172.	61
167.	54	173.	62
168.	56	174.	63
169.	58	175.	64
170.	59	176.	65
171.	60		

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	177	178	179	180	181	182	183	184	185	186	187	188	189
	$50F_2$ 155-128	$50F_2$ 155-129	$50F_2$ 155-130	$50F_2$ 155-131	$50F_2$ 156-98	$50F_2$ 52-67	$50F_2$ 52-66	$50F_2$ 52-65	$50F_2$ 52-72	$50F_2$ 52-73	$50F_2$ 52-70	$50F_2$ 52-71	$50F_2$ 52-75
SiO_2	------	------	------	------	0.8	4.0	2.5	5.0	4.8	5.4	1.8	1.0	0.8
Insoluble	[1]2.84	[1]2.42	[1]1.78	[1]1.72	[2](2.8)	------	------	------	------	------	------	------	------
Al_2O_3	[3].30	[3].20	[3].22	[3].18	.7	.85	1.15	1.4	.4	.6	1.35	.85	.51
Fe_2O_3					1.2	.25	.44	.50	.18	.13	.43	.36	.25
MgO	1.05	2.33	1.58	2.42	3.4	.4	1.5	5.25	.5	.05	2.95	4.95	4.55
CaO	53.22	51.96	53.24	52.20	51.0	51.8	50.2	46.0	52.55	52.4	50.95	49.20	49.7
Na_2O	------	------	------	------	.4	------	------	------	------	------	------	------	------
K_2O	------	------	------	------	.7	------	------	------	------	------	------	------	------
P_2O_5	[4].01	[4].01	[4].01	[4].01	.002	------	------	------	------	------	------	------	------
CO_2	[5](42.84)	[5](44.04)	[5](43.52)	[5](43.43)	39.4	------	------	------	------	------	------	------	------
SO_3	------	------	------	------	.18	------	------	------	.01	------	.01	.01	.01
Ignition loss	------	------	------	------	[3](41.0)	------	------	------	------	------	------	------	------
Total	[57.42]	[56.92]	[56.83]	[56.53]	[97.8]	[57.3]	[55.8]	[58.2]	[58.4]	[58.6]	[57.5]	[56.4]	[55.8]
Class	(2,1)96	(2,1)97	(1,1)97	(1,1)98	0,2,88	2,3,93	0,4,93	2,5,92	4,2,94	4,2,94	0,3,95	0,2,97	0,1,98
CaO/MgO	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued												
	190	191	192	193	194	195	196	197	198	199	200	201	202
	$50F_2$52-76	$50F_2$52-77	$50F_2$52-78	$50F_2$52-79	$50F_2$52-80	$50F_2$52-81	$50F_2$52-82	$50F_2$52-83	$50F_2$52-84	$50F_2$52-85	$50F_2$52-86	$50F_2$52-87	$50F_2$52-88
SiO_2	1.0	1.8	1.0	0.9	1.5	1.9	0.6	1.1	1.1	1.6	1.3	1.1	1.1
Al_2O_3	.50	.79	.49	.36	.49	.58	1.01	.28	.96	.93	.57	.53	.78
Fe_2O_3	.24	.29	.11	.14	.21	.34	.19	.16	.20	.23	.29	.23	.30
MgO	2.35	2.50	.80	1.50	2.45	2.10	3.60	2.25	4.15	4.30	4.65	3.60	4.85
CaO	52.0	51.2	53.9	52.9	51.6	51.9	50.7	52.2	49.6	49.4	49.3	50.5	48.8
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.1]	[56.6]	[56.3]	[55.8]	[56.3]	[56.8]	[56.1]	[56.0]	[56.0]	[56.5]	[56.1]	[56.0]	[55.8]
Class	0,2,98	0,3,97	0,2,98	0,1,98	0,2,97	0,3,97	0,1,98	0,1,98	0,2,97	0,3,97	0,2,97	0,2,98	0,2,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued												
	203	204	205	206	207	208	209	210	211	212	213	214	215
	$50F_2$52-89	$50F_2$52-90	$50F_2$52-91	$50F_2$52-92	$50F_2$52-93	$50F_2$52-94	$50F_2$52-95	$50F_2$52-96	$50F_2$52-97	$50F_2$52-98	$50F_2$52-99	$50F_2$52-100	$50F_2$52-101
SiO_2	0.7	0.9	1.0	0.7	1.1	1.2	1.3	0.9	1.4	0.8	0.8	1.1	0.5
Al_2O_3	.56	.53	.55	.49	.67	.65	.63	.8	.9	.6	.65	.65	.45
Fe_2O_3	.20	.17	.17	.15	.29	.19	.21	.34	.36	.21	.21	.21	.14
MgO	3.10	1.25	2.40	1.30	3.95	3.00	1.80	4.5	7.5	3.85	3.9	.85	.45
CaO	51.3	53.3	52.0	53.4	50.0	51.3	52.5	50.2	46.15	51.35	51.15	54.5	55.3
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.05	.03	.01	.01
Total	[55.9]	[56.2]	[56.1]	[56.0]	[56.0]	[56.4]	[56.4]	[56.8]	[56.3]	[56.9]	[56.7]	[57.3]	[56.8]
Class	0,1,98	0,2,98	0,2,98	0,1,98	0,2,98	0,2,98	0,2,97	0,2,96	0,3,96	0,1,96	0,1,97	0,2,96	0,1,98
CaO/MgO	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

	Alaska—Continued												
	216	217	218	219	220	221	222	223	224	225	226	227	228
	$50F_2$ 52-102	$50F_2$ 52-103	$50F_2$ 52-104	$50F_2$ 52-105	$50F_2$ 52-106	$50F_2$ 52-113	$50F_2$ 52-114	$50F_2$ 52-115	$50F_2$ 52-116	$50F_2$ 52-117	$50F_2$ 52-118	$50F_2$ 52-119	$50F_2$ 52-120
SiO_2	1.1	0.9	1.0	1.8	2.2	3.3	3.1	5.2	3.3	3.2	2.6	2.9	3.6
Al_2O_3	.9	.51	.56	.47	.79	1.40	1.35	2.65	1.55	1.25	1.25	1.40	1.65
Fe_2O_3	.24	.21	.24	.17	.29	.49	.03	.77	.61	.41	.40	.44	.51
MgO	2.05	1.75	1.60	1.00	3.15	2.6	2.45	2.2	1.4	1.35	1.5	2.2	1.5
CaO	53.15	52.8	52.7	53.0	50.5	50.2	50.3	48.3	51.3	51.9	52.1	51.2	50.8
SO_3	.02	.01	.01	.01	.01	.01	.01	.01	.01	.02	.01	.01	.01
Total	[57.5]	[56.2]	[56.1]	[56.4]	[56.9]	[58.0]	[57.2]	[59.1]	[58.2]	[58.1]	[57.9]	[58.2]	[58.1]
Class	0,2,96	0,2,98	0,2,97	1,2,97	0,3,96	0,5,93	1,4,95	0,9,90	0,6,93	1,5,94	0,5,94	0,5,93	0,6,94
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian. calcite	Calcite

[1] Reported as insoluble (HCl).

[2] Not included in total.

[3] Reported as R_2O_3.

[4] May be less than 0.01 percent.

[5] Reported as calculated from CaO and MgO; not included in total.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

177-180. Healy quadrangle. Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], along south side of ridge between Windy and Bain Creeks, 1 mile west of railroad. Northern Empire Development Co. Analyst, R. K. Bailey. (Moxham, Eckhart, and Cobb, 1959, p. 67, 69, 85, 86, 96, pl. 11.) Deposit: Limestone, dark-gray to black, dense, fine-grained; weathers gray and buff. Maximum thickness 600 ft. Chip samples. Index and geologic maps, geologic sections. Possible use: Portland cement, but magnesia content often too high.

	Sample		Sample
177.	66	179.	68
178.	67	180.	69

181. Healy quadrangle. Middle Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], Windy-Cantwell area. Sample 622. (Kenworthy and Moreland, 1956, p. 9, 10; Warfield, 1962, p. 3, 11-13, 16, 17.) Limestone, dark-gray to blue-gray, fine-grained, dense. Estimated thickness 3,100 ft. Index and geologic maps. Results of blowing tests. Possible use: Portland cement, mineral wool.

182-184. Healy quadrangle. Paleozoic, possibly Devonian. [Sec. 7, T. 17 S., R. 7 W., unsurveyed], face of bluff on west side of Little Windy Creek. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 93, 115, 116, 117, figs. 1, 3, 41.) Limestone, gray to dark-gray, fine-grained; contains thin seams of calcite. Outcrop samples. Index and geologic maps. Possible use: Probably none, magnesia content often too high.

	Sample
182.	170
183.	169
184.	168

185-188. Healy quadrangle. Paleozoic, possibly Devonian. [Sec. 7, T. 17 S., R. 7 W., unsurveyed.] Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 93, 115, 116, 117, figs. 1, 3, 35, 41.) Outcrop samples. Index and geologic maps. Possible use: None, deposit small and in remote area.

185. Pinnacle between Bain and Little Windy Creeks. Sample W-6. Limestone.

186. Pinnacle between Bain and Little Windy Creeks. Sample 171. Limestone, medium- to dark-gray, fine-grained; contains calcite veinlets; fractured and weathered where exposed.

187. Near Little Windy Creek. Sample W-7. Limestone.

188. Near Little Windy Creek. Sample W-8. Limestone.

189-220. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 95, 102, 123; figs. 1, 3, 35, 41.) Index and geologic maps. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required.

189-195. Drill hole 1. General description: Limestone, gray, dense, massive; contains calcite veinlets; total depth of diamond-drill hole 35 ft.

Alaska—Continued

	Depth (ft)
189.	30-35
190.	25-30
191.	20-25
192.	15-20
193.	10-15
194.	5-10
195.	0- 5

196-209. Drill hole 2. General description: Limestone, gray, dense, massive; contains calcite veinlets; total depth of diamond-drill hole 75 ft.

	Depth (ft)
196.	65-70
197.	60-65
198.	55-60
199.	50-55
200.	45-50
201.	40-45
202.	35-40
203.	30-35
204.	25-30
205.	20-25
206.	15-20
207.	10-15
208.	5-10
209.	0- 5

210-220. Drill hole 3. General description: Limestone, black, fine-grained; contains few calcite veinlets; total depth of diamond-drill hole 63 ft.

	Depth (ft)
210.	55-60
211.	50-55
212.	40-50
213.	35-40
214.	30-35
215.	25-30
216.	20-25
217.	15-20
218.	10-15
219.	5-10
220.	0- 5

221-228. Quadrangle, age, location, analyst, and possible use as in samples 189-220. (Rutledge and others, 1953, p. 4, 91, 93, 96, 105, 123, figs. 1, 3, 35-37, 41.) Limestone, black, fine-grained; contains few calcite veinlets and some shale partings; total depth of diamond-drill hole 629 ft. Index and geologic maps, geologic section, log of drill hole 4. [For other analyses from same drill hole, see samples 229-336, this group; sample 3, group C; samples 48-53, group F_1.]

	Depth (ft)
221.	590-595
222.	585-590
223.	580-585
224.	575-580
225.	570-575
226.	565-570
227.	560-565
228.	555-560

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	229	230	231	232	233	234	235	236	237	238	239	240	241
	$50F_2$ 52-121	$50F_2$ 52-122	$50F_2$ 52-123	$50F_2$ 52-124	$50F_2$ 52-125	$50F_2$ 52-126	$50F_2$ 52-127	$50F_2$ 52-128	$50F_2$ 52-129	$50F_2$ 52-130	$50F_2$ 52-131	$50F_2$ 52-132	$50F_2$ 52-133
SiO_2	3.0	3.7	4.1	2.3	3.6	2.3	3.3	3.9	3.5	2.6	4.2	3.85	2.7
Al_2O_3	1.10	1.40	1.75	1.05	1.75	.85	2.20	1.55	1.50	1.35	1.30	1.45	.8
Fe_2O_3	.37	.43	.69	.33	.37	.36	.43	.57	.50	.47	.53	.53	.31
MgO	1.65	1.3	.9	1.0	1.1	.8	2.1	1.25	.15	.45	.4	5.05	2.4
CaO	51.6	51.4	51.2	52.8	51.7	53.1	50.9	51.5	51.5	48.6	49.0	46.6	50.4
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[57.7]	[58.2]	[58.6]	[57.5]	[58.5]	[57.4]	[58.9]	[58.8]	[57.2]	[53.5]	[55.4]	[57.5]	[56.6]
Class	1,4,95	1,5,93	0,7,92	0,4,95	0,6,93	0,3,96	0,6,91	1,6,92	0,6,92	0,5,88	1,5,88	1,6,93	1,3,95
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	242	243	244	245	246	247	248	249	250	251	252	253	254
	$50F_2$ 52-134	$50F_2$ 52-135	$50F_2$ 52-136	$50F_2$ 52-137	$50F_2$ 52-138	$50F_2$ 52-139	$50F_2$ 52-140	$50F_2$ 52-141	$50F_2$ 52-142	$50F_2$ 52-143	$50F_2$ 52-144	$50F_2$ 52-145	$50F_2$ 52-146
SiO_2	1.8	1.85	1.8	2.4	1.6	3.75	1.8	0.75	1.2	0.8	1.25	1.55	1.0
Al_2O_3	.8	1.05	.9	.9	.75	1.1	.75	.5	.7	.65	.65	.45	.65
Fe_2O_3	.37	.49	.34	.29	.27	.31	.24	.24	.33	.31	.33	.26	.33
MgO	3.55	4.25	4.0	2.4	2.65	2.55	2.6	3.1	3.05	.6	3.9	3.55	3.4
CaO	50.2	49.1	49.6	51.1	51.4	49.4	51.5	51.4	50.9	53.9	50.0	50.9	51.3
Na_2O	------	------	------	------	------	------	------	------	------	[1].01	------	------	------
K_2O	------	------	------	------	------	------	------	------	------	[1].01	------	------	------
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.7]	[56.8]	[56.6]	[57.1]	[56.7]	[57.1]	[56.9]	[56.0]	[56.2]	[56.3]	[56.1]	[56.7]	[56.7]
Class	0,3,96	0,3,96	0,3,96	0,3,96	0,3,97	1,4,94	0,3,96	0,1,98	0,2,97	0,1,97	0,2,97	0,2,97	0,2,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	255	256	257	258	259	260	261	262	263	264	265	266	267
	$50F_2$ 52-147	$50F_2$ 52-148	$50F_2$ 52-149	$50F_2$ 52-150	$50F_2$ 52-151	$50F_2$ 52-152	$50F_2$ 52-153	$50F_2$ 52-154	$50F_2$ 52-155	$50F_2$ 52-156	$50F_2$ 52-157	$50F_2$ 52-158	$50F_2$ 52-159
SiO_2	1.1	1.0	0.4	0.6	0.5	0.35	0.75	0.5	0.3	0.3	0.35	0.6	0.15
Al_2O_3	.9	1.35	.75	1.05	.85	.65	.95	.7	.65	.5	.6	.95	.65
Fe_2O_3	.39	.43	.44	.43	.40	.29	.49	.56	.36	.29	.34	.37	.31
MgO	6.35	5.35	7.1	5.7	6.1	6.25	6.8	8.6	7.4	8.1	8.2	8.05	5.85
CaO	47.5	48.5	47.3	48.6	48.2	49.1	47.1	43.3	44.7	44.4	48.4	45.7	47.9
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.2]	[56.6]	[56.0]	[56.4]	[56.1]	[56.6]	[56.1]	[53.7]	[53.4]	[53.6]	[57.9]	[55.7]	[54.9]
Class	0,2,97	0,2,96	0,1,97	0,1,97	0,1,97	0,1,96	0,1,97	0,1,95	0,1,95	0,1,96	0,1,93	0,1,97	0,0,98
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	268	269	270	271	272	273	274	275	276	277	278	279	280
	$50F_2$ 52-160	$50F_2$ 52-162	$50F_2$ 52-163	$50F_2$ 52-164	$50F_2$ 52-165	$50F_2$ 52-166	$50F_2$ 52-167	$50F_2$ 52-168	$50F_2$ 52-169	$50F_2$ 52-170	$50F_2$ 52-171	$50F_2$ 52-172	$50F_2$ 52-173
SiO_2	0.3	0.5	0.4	0.6	0.6	1.7	1.25	2.55	3.25	2.95	3.15	4.35	3.9
Al_2O_3	.5	.95	.65	.5	.55	.75	1.0	1.15	1.1	.9	.9	.95	1.05
Fe_2O_3	.37	.36	.40	.36	.20	.37	.29	.49	.17	.20	1.33	.31	.37
MgO	11.2	12.65	13.35	11.75	1.6	7.15	1.7	2.15	.3	.35	2.35	3.55	5.3
CaO	42.7	41.0	39.9	42.2	55.8	46.9	53.0	50.9	53.2	53.5	51.1	48.8	47.1
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[55.1]	[55.5]	[54.7]	[55.4]	[58.8]	[56.9]	[57.2]	[57.2]	[58.0]	[57.9]	[58.8]	[58.0]	[57.7]
Class	0,1,98	0,1,97	0,1,98	0,1,97	0,1,93	0,3,95	0,2,96	0,5,95	1,4,95	1,3,95	0,6,91	2,4,93	2,4,93
CaO/MgO	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	281	282	283	284	285	286	287	288	289	290	291	292	293
	$50F_2$ 52-174	$50F_2$ 52-175	$50F_2$ 52-177	$50F_2$ 52-178	$50F_2$ 52-179	$50F_2$ 52-180	$50F_2$ 52-181	$50F_2$ 52-182	$50F_2$ 52-183	$50F_2$ 52-184	$50F_2$ 52-185	$50F_2$ 52-186	$50F_2$ 52-187
SiO_2	0.9	3.7	1.95	1.45	1.75	2.25	2.2	2.7	2.3	2.00	4.95	3.85	1.7
Al_2O_3	.6	1.35	.8	.8	1.35	1.0	.6	1.15	1.45	1.2	.9	1.2	1.0
Fe_2O_3	.24	.36	.30	.34	.21	.31	.13	.36	.43	.37	.21	.27	.29
MgO	3.7	1.4	4.45	3.65	4.95	4.05	2.75	4.45	6.45	5.8	3.65	3.4	2.7
CaO	51.3	51.4	49.3	50.9	48.9	49.7	51.5	48.8	46.6	47.7	48.4	49.4	51.5
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.8]	[58.2]	[56.8]	[57.2]	[57.2]	[57.3]	[57.2]	[57.5]	[57.2]	[57.1]	[58.1]	[58.1]	[57.2]
Class	0,2,97	1,5,93	0,3,96	0,3,96	0,3,95	0,4,95	1,2,96	0,4,94	0,4,94	0,4,95	3,3,93	1,4,93	0,3,96
CaO/MgO	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

[1] Reported as composite.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

229-293. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 96, 103-105, 123, figs. 1, 3, 35-37, 41.) Total depth of diamond-drill hole 629 ft. Index and geologic maps, geologic section, log of drill hole 4. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 221-228, 294-336, this group; sample 3, group C; samples 48-53, group F_1.]

229. Limestone, black, fine-grained; contains few calcite veinlets and some shale partings; depth 550-555 ft.

230. Limestone, black, fine-grained; contains few calcite veinlets and some shale partings; also includes 1 ft of pure-white crystalline limestone; depth 545-550 ft.

231-237. Limestone, black, fine-grained.

	Depth (ft)		Depth (ft)
231.	540-545	235.	520-525
232.	535-540	236.	515-520
233.	530-535	237.	510-515
234.	525-530		

238-241. Limestone, blue-gray; contains calcite veinlets.

	Depth (ft)		Depth (ft)
238.	505-510	240.	495-500
239.	500-505	241.	490-495

242-257. Limestone, black, fine-grained; contains few calcite veinlets, some brown claylike residue, and few shale partings.

	Depth (ft)		Depth (ft)
242.	485-490	246.	465-470
243.	480-485	247.	460-465
244.	475-480	248.	455-460
245.	470-475	249.	450-455

Alaska—Continued

	Depth (ft)		Depth (ft)
250.	445-450	254.	425-430
251.	440-445	255.	420-425
252.	435-440	256.	415-420
253.	430-435	257.	410-415

258. Limestone; part black, fine grained; part gray; contains calcite veinlets and some brown claylike residue; depth 405-410 ft.

259-267. Limestone, gray; contains calcite veinlets and some brown claylike residue.

	Depth (ft)		Depth (ft)
259.	400-405	264.	370-375
260.	390-400	265.	365-370
261.	385-390	266.	360-365
262.	380-385	267.	355-360
263.	375-380		

268. Limestone, gray, massive; depth 350-355 ft.

269-273. Limestone.

	Depth (ft)		Depth (ft)
269.	340-345	272.	325-330
270.	335-340	273.	320-325
271.	330-335		

274-293. Limestone, black, fine-grained; contains few calcite veinlets. Brown shale partings, depth 270-277 ft.

	Depth (ft)		Depth (ft)
274.	315-320	284.	260-265
275.	310-315	285.	255-260
276.	305-310	286.	250-255
277.	300-305	287.	245-250
278.	295-300	288.	240-245
279.	290-295	289.	235-240
280.	285-290	290.	230-235
281.	280-285	291.	225-230
282.	275-280	292.	220-225
283.	265-270	293.	215-220

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	294	295	296	297	298	299	300	301	302	303	304	305	306
	50F_2 52-188	50F_2 52-189	50F_2 52-190	50F_2 52-191	50F_2 52-192	50F_2 52-193	50F_2 52-194	50F_2 52-195	50F_2 52-196	50F_2 52-197	50F_2 52-198	50F_2 52-199	50F_2 52-200
SiO_2	1.45	2.15	2.25	1.8	1.1	1.3	1.45	0.9	1.0	0.8	0.95	2.4	2.45
Al_2O_3	.7	.55	1.4	1.1	.65	1.1	1.05	.6	1.1	.9	.75	.65	.75
Fe_2O_3	.20	.19	.57	.39	.33	.39	.30	.20	.35	.25	.18	.15	.18
MgO	1.65	1.3	7.95	5.55	3.7	5.0	3.0	2.8	4.75	4.55	2.7	2.05	3.5
CaO	53.5	53.3	45.0	48.4	51.7	49.5	51.45	51.95	50.0	50.35	52.35	51.95	50.65
SO_3	.01	.01	.01	.01	.01	.01	.005	.005	.005	.005	.005	.005	.005
Total	[57.5]	[57.5]	[57.2]	[57.2]	[57.5]	[57.3]	[57.3]	[56.5]	[57.2]	[56.9]	[56.9]	[57.2]	[57.5]
Class	0,3,95	1,2,96	0,4,94	0,3,94	0,2,95	0,2,95	0,3,96	0,2,98	0,2,95	0,1,96	0,2,97	1,2,96	1,3,95
CaO/MgO	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	307	308	309	310	311	312	313	314	315	316	317	318	319
	50F_2 52-201	50F_2 52-202	50F_2 52-203	50F_2 52-204	50F_2 52-205	50F_2 52-206	50F_2 52-207	50F_2 52-208	50F_2 52-209	50F_2 52-210	50F_2 52-211	50F_2 52-212	50F_2 52-213
SiO_2	1.65	2.2	1.6	1.2	1.75	0.65	0.6	0.8	0.65	0.85	0.8	1.2	0.45
Al_2O_3	1.25	1.55	1.05	.95	1.05	.65	.85	.85	.75	.85	.7	.8	.75
Fe_2O_3	.35	.23	.41	.25	.30	.27	.28	.21	.23	.32	.11	.27	.16
MgO	3.15	4.05	3.25	2.95	4.35	2.2	3.6	1.75	2.0	3.65	.85	2.0	.55
CaO	50.95	49.2	50.55	51.85	49.4	53.25	51.15	53.45	53.35	51.35	54.6	53.45	54.6
SO_3	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.005	.01
Total	[57.36]	[57.2]	[56.9]	[57.2]	[56.9]	[57.0]	[56.5]	[57.1]	[57.0]	[57.02]	[57.1]	[57.7]	[56.5]
Class	0,3,95	0,4,95	0,3,96	0,2,96	0,3,96	0,1,97	0,1,97	0,1,97	0,1,97	0,2,96	0,1,97	0,2,95	0,1,98
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite

Alaska—Continued

	320	321	322	323	324	325	326	327	328	329	330	331	332
	50F_2 52-214	50F_2 52-215	50F_2 52-216	50F_2 52-217	50F_2 52-218	50F_2 52-219	50F_2 52-220	50F_2 52-221	50F_2 52-222	50F_2 52-223	50F_2 52-224	50F_2 52-225	50F_2 52-226
SiO_2	0.6	0.95	0.6	0.5	0.95	0.95	0.75	0.45	0.4	0.7	0.7	0.3	1.0
Al_2O_3	.9	1.2	.95	.65	.60	.75	.65	.55	.65	.65	.55	.6	.55
Fe_2O_3	.20	.56	.25	.16	.20	.36	.36	.21	.23	.16	.11	.11	.13
MgO	.45	5.55	3.3	.95	3.25	5.15	4.15	3.15	3.15	.6	.45	.35	.6
CaO	54.4	49.1	51.5	54.2	51.7	49.6	50.5	52.4	52.1	54.5	55.4	55.4	55.0
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.02	.01	.01	.01	.01
Total	[56.6]	[57.4]	[56.6]	[56.5]	[56.7]	[56.8]	[56.4]	[56.8]	[56.6]	[56.6]	[57.2]	[56.8]	[57.3]
Class	0,1,98	0,2,95	0,1,97	0,1,98	0,2,97	0,2,96	0,1,97	0,1,97	0,1,97	0,1,98	0,1,97	0,1,98	0,2,97
CaO/MgO	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

Alaska—Continued

	333	334	335	336	337	338	339	340	341	342	343	344	345
	50F_2 52-227	50F_2 52-228	50F_2 52-229	50F_2 52-230	50F_2 52-236	50F_2 52-237	50F_2 52-238	50F_2 52-239	50F_2 52-240	50F_2 52-241	50F_2 52-242	50F_2 52-243	50F_2 52-244
SiO_2	0.6	1.7	2.5	2.4	4.6	3.8	3.2	4.8	3.0	5.2	5.0	5.6	2.6
Al_2O_3	.55	.75	.9	1.35	2.10	1.75	1.25	1.80	1.55	2.25	1.25	1.8	1.0
Fe_2O_3	.20	.18	.18	.37	------	------	------	------	------	------	------	^{1}.20	------
MgO	1.15	.9	1.0	4.05	1.7	1.8	.9	1.45	1.5	3.5	.95	1.0	1.05
CaO	53.8	53.2	53.3	49.6	49.3	50.3	51.7	49.7	50.7	47.1	50.9	49.9	52.5
Na_2O	------	------	------	^{1}.01	------	------	------	------	------	------	------	^{1}.007	------
K_2O	------	------	------	^{1}.01	------	------	------	------	------	------	------	^{1}.01	------
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.3]	[56.7]	[57.9]	[57.8]	[57.7]	[57.7]	[57.1]	[57.8]	[56.8]	[58.1]	[58.1]	[58.5]	[57.2]
Class	0,1,98	0,3,97	1,3,95	0,4,94	1,6,92	1,5,94	1,4,94	2,5,92	0,5,94	1,7,91	3,4,93	2,6,91	1,3,96
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	346	347	348	349	350	351	352	353	354	355	356	357	358
	$50F_2$ 50-245	$50F_2$ 50-246	$50F_2$ 50-247	$50F_2$ 50-248	$50F_2$ 50-249	$50F_2$ 52-250	$50F_2$ 52-251	$50F_2$ 50-252	$50F_2$ 50-253	$50F_2$ 50-254	$50F_2$ 50-255	$50F_2$ 50-257	$50F_2$ 50-258
SiO_2	2.2	2.6	5.4	2.2	2.0	2.8	3.5	2.6	5.5	4.0	5.1	3.75	5.35
Al_2O_2	1.1	1.05	1.6	1.3	1.35	1.15	1.70	1.65	3.10	3.5	3.15	3.1	2.5
Fe_2O_3	------	------	------	------	.47	.46	.47	.63	.89	.82	.80	.72	.57
MgO	.45	1.1	.85	1.0	1.45	1.4	1.6	1.3	1.55	2.45	2.1	1.35	1.65
CaO	52.9	52.1	50.7	52.2	51.9	52.0	51.2	51.8	48.6	48.2	47.5	52.0	48.2
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.7]	[56.9]	[58.6]	[56.7]	[57.2]	[57.8]	[58.5]	[58.0]	[59.6]	[59.0]	[58.7]	[60.9]	[58.3]
Class	0,3,95	1,3,95	3,5,92	0,4,95	0,4,96	0,5,94	0,6,93	0,5,94	0,10,89	0,7,91	0,9,89	0,7,87	0,9,89
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

[1] Reported as composite.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

294-336. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 96, 103, 123, figs. 1, 3, 35-37, 41.) Total depth of diamond-drill hole 629 ft. Index and geologic maps, geologic section, log of drill hole 4. Possible use for deposit: Portland cement; magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 221-293, this group; sample 3, group C; samples 48-53, group F_1.]

294-325. Limestone, black, fine-grained; contains few calcite veinlets.

	Depth (ft)		Depth (ft)
294.	210-215	310.	130-135
295.	205-210	311.	125-130
296.	200-205	312.	120-125
297.	195-200	313.	115-120
298.	190-195	314.	110-115
299.	185-190	315.	105-110
300.	180-185	316.	100-105
301.	175-180	317.	95-100
302.	170-175	318.	90- 95
303.	165-170	319.	85- 90
304.	160-165	320.	80- 85
305.	155-160	321.	75- 80
306.	150-155	322.	70- 75
307.	145-150	323.	65- 70
308.	140-145	324.	60- 65
309.	135-140	325.	55- 60

326-336. Limestone, black, fine-grained, crystalline; contains calcite veinlets and some brown claylike residue.

	Depth (ft)		Depth (ft)
326.	50-55	332.	20-25
327.	45-50	333.	15-20
328.	40-45	334.	10-15
329.	35-40	335.	5-10
330.	30-35	336.	0- 5
331.	25-30		

Alaska—Continued

337-358. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 97, 106, 123, figs. 1, 3, 35, 36, 38, 41.) Total depth of diamond-drill hole 265 ft. Index and geologic maps, geologic section, log of drill hole 6. Possible use for deposit: Portland cement; magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 359-379, this group; sample 22, group B; samples 54-58, group F_1.]

337-347. Limestone, black, fine-grained.

	Depth (ft)		Depth (ft)
337.	220-225	343.	190-195
338.	215-220	344.	185-190
339.	210-215	345.	180-185
340.	205-210	346.	175-180
341.	200-205	347.	170-175
342.	195-200		

348.

Depth (ft)	
168-170	Limestone, black, fine-grained.
165-168	Limestone, gray, fine-grained.

349-353. Limestone, black, fine-grained.

	Depth (ft)		Depth (ft)
349.	160-165	352.	145-150
350.	155-160	353.	140-145
351.	150-155		

354.

Depth (ft)	
139-140	Limestone, black.
135-139	Limestone, black, fine-grained; contains calcite veinlets and brown claylike residue.

355-358. Limestone, black, fine-grained; contains calcite veinlets and brown claylike residue.

	Depth (ft)		Depth (ft)
355.	130-135	357.	115-120
356.	125-130	358.	110-115

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	359	360	361	362	363	364	365	366	367	368	369	370	371
	$50F_2$ 52-259	$50F_2$ 52-260	$50F_2$ 52-261	$50F_2$ 52-262	$50F_2$ 52-263	$50F_2$ 52-264	$50F_2$ 52-265	$50F_2$ 52-266	$50F_2$ 52-267	$50F_2$ 52-268	$50F_2$ 52-269	$50F_2$ 52-270	$50F_2$ 52-271
SiO_2	1.4	2.8	1.7	3.85	4.1	2.1	1.75	1.15	2.95	5.2	2.1	2.8	1.4
Al_2O_3	1.25	1.55	1.15	1.0	1.35	1.05	1.05	1.3	1.1	1.1	.95	1.25	1.1
Fe_2O_3	.33	.34	.24	.24	.29	.17	.20	.26	.26	.31	.36	.43	.28
MgO	2.0	2.75	3.45	2.9	4.45	3.1	1.95	3.2	2.0	3.4	.95	2.6	2.0
CaO	51.3	49.5	49.7	49.2	47.2	49.6	52.0	50.3	50.1	46.9	52.0	50.0	52.65
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.005
Total	[56.3]	[57.0]	[56.2]	[57.2]	[57.4]	[56.0]	[57.0]	[56.2]	[56.4]	[56.9]	[56.4]	[57.1]	[57.4]
Class	0,2,96	0,5,94	0,3,96	2,4,94	1,5,94	0,4,95	0,3,97	0,2,96	1,4,94	3,4,91	0,4,95	0,5,95	0,2,96
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite

Alaska—Continued

	372	373	374	375	376	377	378	379	380	381	382	383	384
	$50F_2$ 52-272	$50F_2$ 52-273	$50F_2$ 52-274	$50F_2$ 52-276	$50F_2$ 52-277	$50F_2$ 52-278	$50F_2$ 52-279	$50F_2$ 52-280	$50F_2$ 154-1	$50F_2$ 154-2	$50F_2$ 154-3	$50F_2$ 154-4	$50F_2$ 154-5
SiO_2	1.45	3.45	1.7	2.7	0.8	0.45	0.7	0.35	1.8	2.0	1.6	0.8	0.6
Al_2O_3	1.7	1.7	1.15	1.5	.9	.8	.85	.5	.55	1.0	.60	.55	.55
Fe_2O_3	.35	.44	.23	.61	.28	.25	.21	.15	------	------	------	------	------
MgO	1.25	2.15	3.4	7.15	3.0	3.5	3.05	1.2	4.0	3.0	7.3	4.4	8.45
CaO	53.15	50.85	51.25	45.05	51.95	51.55	52.35	54.8	50.2	50.7	46.3	50.7	46.0
Na_2O	------	------	------	------	------	------	------	[1].01	------	------	------	------	------
K_2O	------	------	------	------	------	------	------	[1].01	------	------	------	------	------
SO_3	.005	.005	.005	.005	.005	.005	.005	.005	.01	.01	.01	.01	.01
Total	[57.9]	[58.6]	[57.7]	[57.0]	[56.9]	[56.6]	[57.2]	[57.0]	[56.6]	[56.7]	[55.8]	[56.5]	[55.6]
Class	0,3,95	0,6,92	0,3,94	0,5,94	0,1,96	0,1,97	0,1,96	0,1,97	1,2,97	0,3,97	1,2,97	0,1,97	0,1,98
CaO/MgO	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	385	386	387	388	389	390	391	392	393	394	395	396	397
	$50F_2$ 154-6	$50F_2$ 154-7	$50F_2$ 154-8	$50F_2$ 154-9	$50F_2$ 154-10	$50F_2$ 154-11	$50F_2$ 154-12	$50F_2$ 154-13	$50F_2$ 154-14	$50F_2$ 154-15	$50F_2$ 154-16	$50F_2$ 154-17	$50F_2$ 154-18
SiO_2	0.6	0.6	0.8	0.6	0.8	0.8	1.0	1.0	0.9	0.8	1.3	0.5	1.5
Al_2O_3	.35	.40	.55	.40	.25	.45	.60	.6	.55	.45	.55	.5	.65
Fe_2O_3	------	[1].55	------	------	------	------	------	.19	.21	.21	.23	.16	.26
MgO	6.55	7.8	6.0	3.3	1.6	2.9	3.75	3.0	3.45	3.35	3.45	3.9	3.9
CaO	48.C	46.6	48.8	52.0	53.9	52.2	51.1	52.3	51.2	51.8	51.0	51.2	50.3
Na_2O	------	------	------	------	------	------	[1].013	------	------	------	------	------	------
K_2O	------	------	------	------	------	------	[1].01	------	------	------	------	------	------
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[55.5]	[56.0]	[56.2]	[56.3]	[56.6]	[56.4]	[56.5]	[57.1]	[56.3]	[56.6]	[56.5]	[56.3]	[56.6]
Class	0,1,98	0,1,97	0,1,97	0,1,98	0,1,98	0,1,98	0,2,97	0,2,96	0,2,98	0,1,97	0,2,97	0,1,98	0,3,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	398	399	400	401	402	403	404	405	406	407	408	409	410
	$50F_2$ 154-19	$50F_2$ 154-20	$50F_2$ 154-21	$50F_2$ 154-22	$50F_2$ 154-23	$50F_2$ 154-24	$50F_2$ 154-25	$50F_2$ 154-26	$50F_2$ 154-27	$50F_2$ 154-28	$50F_2$ 154-29	$50F_2$ 154-30	$50F_2$ 154-31
SiO_2	1.1	1.4	1.4	0.9	1.5	1.2	1.2	1.0	1.2	1.9	3.2	2.2	2.1
Al_2O_3	.7	.6	.6	.7	.85	.75	.55	.45	.45	.65	1.25	.05	1.05
Fe_2O_3	.34	.21	.24	.20	.26	.23	.17	.21	.26	.29	.39	.34	.77
MgO	5.55	3.1	6.25	3.95	5.3	2.45	1.75	1.7	1.95	1.1	.7	1.3	6.35
CaO	48.5	51.0	47.6	50.7	48.7	52.0	53.2	53.2	53.0	52.9	52.5	52.2	46.6
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.2]	[56.3]	[56.1]	[56.5]	[56.6]	[56.6]	[56.9]	[56.6]	[56.9]	[56.8]	[58.0]	[56.1]	[56.9].
Class	0,2,97	0,2,98	0,2,97	0,2,97	0,3,96	0,2,97	0,2,97	0,2,98	0,2,97	0,3,97	1,5,94	2,1,96	0,4,95
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

[1] Reported as composite.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

359-379. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93 97, 105, 106, 123, figs. 1, 3, 35, 36, 38, 41.) Total depth of diamond-drill hole 265 ft. Index and geologic maps, geologic section, log of drill hole 6. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 337-358, this group; sample 22, gronp B; samples 54-58, group F_1.]

359-378. Limestone, black, fine-grained; contains calcite veinlets; brown claylike residue, depth 20-25 ft.

	Depth (ft)		Depth (ft)
359.	105-110	369.	55-60
360.	100-105	370.	50-55
361.	95-100	371.	45-50
362.	90- 95	372.	40-45
363.	85- 90	373.	35-40
364.	80- 85	374.	30-35
365.	75- 80	375.	20-25
366.	70- 75	376.	15-20
367.	65- 70	377.	10-15
368.	60- 65	378.	5-10

379. Depth (ft)

3-5 ------ Limestone, black, fine-grained; contains calcite veinlets.
0-3 ------ Limestone, blue-gray, fine-grained.

380-410. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 97, 107, 123, figs. 1, 3, 35, 36, 38, 41.) Total depth of drill hole 200 ft. Index and geologic maps, geologic section, log of drill hole 7. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 411-418, this group.]

380-389. Limestone, black, fine-grained; contains calcite veinlets.

	Depth (ft)		Depth (ft)
380.	195-200	383.	180-185
381.	190-195	384.	175-180
382.	185-190	385.	170-175

Alaska—Continued

	Depth (ft)		Depth (ft)
386.	165-170	388.	155-160
387.	160-165	389.	150-155

390, 391. Limestone, blue-gray, fine-grained; contains calcite veinlets.

390. Depth 145-150 ft.
391. Depth 140-145 ft.

392-396. Limestone, black, fine-grained.

	Depth (ft)		Depth (ft)
392.	135-140	395.	120-125
393.	130-135	396.	115-120
394.	125-130		

397. Limestone, blue-gray, fine-grained; contains a few bands of white limestone; depth 110-115 ft.

398, 399. Limestone, black, fine-grained; contains few calcite veinlets.

398. Depth 105-110 ft.
399. Depth 100-105 ft.

400-402. Limestone, blue-gray, fine-grained.

400. Depth 95-100 ft.
401. Depth 90-95 ft.
402. Depth 85-90 ft.

403-408. Limestone, blue-gray, fine-grained; contains calcite veinlets.

	Depth (ft)		Depth (ft)
403.	80-85	406.	65-70
404.	75-80	407.	60-65
405.	70-75	408.	55-60

409. Depth (ft)

52.5-55 ----- Limestone, white, crystalline.
50 -52.5 ----- Limestone, black, fine-grained; contains calcite veinlets.

410. Limestone, black, fine-grained; contains calcite veinlets; depth 45-50 ft.

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	411	412	413	414	415	416	417	418	419	420	421	422	423
	$50F_2$ 154-32	$50F_2$ 154-33	$50F_2$ 154-34	$50F_2$ 154-35	$50F_2$ 154-36	$50F_2$ 154-37	$50F_2$ 154-38	$50F_2$ 154-39	$50F_2$ 154-45	$50F_2$ 154-46	$50F_2$ 154-47	$50F_2$ 154-48	$50F_2$ 154-49
SiO_2	1.4	0.4	1.1	1.1	1.3	0.3	1.6	2.0	5.2	3.9	3.35	4.5	4.25
Al_2O_3	.7	.4	.5	.5	.65	.55	.65	.75	2.6	2.15	1.85	2.15	1.8
Fe_2O_3	.49	.14	.23	.16	.21	.26	.20	.44	.76	.65	.55	.61	.57
MgO	6.05	4.5	7.85	2.9	5.05	3.9	3.05	4.75	3.3	3.8	2.0	2.8	2.8
CaO	47.6	50.4	46.2	52.0	49.2	51.0	51.7	49.1	46.8	47.4	49.1	48.1	48.8
Na_2O	------	------	------	------	------	------	------	[1].01	------	------	------	------	------
K_2O	------	------	------	------	------	------	------	[1].01	------	------	------	------	------
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.2]	[55.8]	[55.9]	[56.7]	[56.4]	[56.0]	[57.2]	[57.1]	[58.7]	[57.9]	[56.9]	[58.2]	[58.2]
Class	0,3,97	0,1,99	0,2,97	0,2,97	0,2,97	0,1,98	0,2,96	0,3,95	0,9,90	0,7,93	0,6,92	0,8,92	0,7,93
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued												
	424	425	426	427	428	429	430	431	432	433	434	435	436
	$50F_2$ 154-51	$50F_2$ 154-52	$50F_2$ 154-53	$50F_2$ 154-54	$50F_2$ 154-55	$50F_2$ 154-56	$50F_2$ 154-57	$50F_2$ 154-58	$50F_2$ 154-59	$50F_2$ 154-60	$50F_2$ 154-61	$50F_2$ 154-62	$50F_2$ 154-63
SiO_2	5.5	3.7	3.7	3.0	3.6	2.5	2.7	2.6	2.15	3.1	2.65	2.9	3.25
Al_2O_3	2.95	2.0	1.8	1.65	1.6	.95	1.25	1.25	1.35	1.45	.75	.85	1.05
Fe_2O_3	.79	.64	.67	.37	.58	.40	.43	.43	.47	.43	.23	.21	.36
MgO	2.9	1.8	1.7	1.7	1.1	.9	.9	.7	1.5	2.1	1.7	2.6	3.9
CaO	46.6	49.8	49.8	50.5	52.5	50.4	52.1	52.4	51.5	50.5	52.3	51.0	49.0
Na_2O	------	------	------	------	------	------	------	------	------	------	------	[1].01	------
K_2O	------	------	------	------	------	------	------	------	------	------	------	[1].01	------
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[58.8]	[58.0]	[57.7]	[57.2]	[59.4]	[55.2]	[57.4]	[57.4]	[57.0]	[57.6]	[57.6]	[57.6]	[57.6]
Class	0,10,89	0,7,93	0,7,92	0,5,94	0,6,91	0,4,92	0,5,95	0,5,95	0,4,95	0,5,95	1,3,95	1,3,95	1,4,94
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued												
	437	438	439	440	441	442	443	444	445	446	447	448	449
	$50F_2$ 154-64	$50F_2$ 154-65	$50F_2$ 154-66	$50F_2$ 154-67	$50F_2$ 154-68	$50F_2$ 154-69	$50F_2$ 154-70	$50F_2$ 154-71	$50F_2$ 154-72	$50F_2$ 154-73	$50F_2$ 154-74	$50F_2$ 154-75	$50F_2$ 154-76
SiO_2	2.15	1.15	1.2	0.8	0.6	1.9	0.6	0.45	0.3	1.1	0.15	0.40	0.75
Al_2O_3	1.00	.95	.85	.7	.75	.45	.45	.45	.4	.5	.4	.5	.7
Fe_2O_3	.24	.37	.38	.27	.23	.19	.21	.20	.24	.23	.20	.26	.34
MgO	2.8	4.7	3.9	4.5	3.4	3.6	6.6	4.0	3.7	4.1	3.8	5.3	3.2
CaO	51.1	49.4	50.5	50.0	51.4	50.4	47.8	51.0	51.6	50.2	51.6	50.0	51.2
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[57.3]	[56.6]	[56.8]	[56.3]	[56.4]	[56.6]	[55.7]	[56.1]	[56.2]	[56.1]	[56.2]	[56.5]	[56.2]
Class	0,4,95	0,2,97	0,2,96	0,1,97	0,1,98	1,2,97	0,1,98	0,1,98	0,1,98	0,2,98	0,0,98	0,1,97	0,1,98
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued												
	450	451	452	453	454	455	456	457	458	459	460	461	462
	$50F_2$ 154-77	$50F_2$ 154-78	$50F_2$ 154-79	$50F_2$ 154-80	$50F_2$ 154-81	$50F_2$ 154-82	$50F_2$ 154-83	$50F_2$ 154-84	$50F_2$ 154-85	$50F_2$ 154-86	$50F_2$ 154-87	$50F_2$ 154-88	$50F_2$ 154-89
SiO_2	0.8	1.05	0.85	2.1	1.0	1.4	0.40	0.40	0.70	0.65	0.40	0.45	0.85
Al_2O_3	.7	.6	.65	.85	.6	1.05	.4	.45	.75	.5	.45	.45	.75
Fe_2O_3	.33	.40	.26	.31	.30	.41	.27	.31	.31	.28	.34	.33	.54
MgO	2.4	5.3	5.7	3.8	3.7	4.7	7.3	7.8	7.4	5.6	11.3	6.8	6.1
CaO	51.2	48.6	48.4	49.8	50.4	48.6	46.8	46.5	46.3	48.7	42.4	47.5	47.6
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[55.4]	[56.0]	[55.9]	[56.9]	[56.0]	[56.2]	[55.2]	[55.5]	[55.5]	[55.7]	[54.9]	[55.5]	[55.8]
Class	0,1,96	0,2,98	0,2,98	0,3,96	0,2,98	0,3,97	0,1,99	0,1,98	0,1,98	0,1,98	0,1,98	0,1,98	0,2,98
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Magnesian calcite	Magnesian calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	463	464	465	466	467	468	469	470	471	472	473	474	475
	$50F_2$ 154-90	$50F_2$ 154-91	$50F_2$ 154-92	$50F_2$ 154-93	$50F_2$ 154-94	$50F_2$ 154-95	$50F_2$ 154-96	$50F_2$ 154-97	$50F_2$ 154-98	$50F_2$ 154-99	$50F_2$ 154-100	$50F_2$ 154-101	$50F_2$ 154-102
SiO_2	0.60	0.65	0.45	0.25	0.65	0.2	0.3	0.3	0.3	0.4	0.2	0.1	0.4
Al_2O_3	.6	.6	.5	.65	.55	.40	.53	.50	.45	.45	.40	.50	.65
Fe_2O_3	.42	.43	.45	.34	.48	.34	.35	.31	.40	.30	.28	.28	.28
MgO	8.9	8.6	8.1	9.8	12.5	9.6	6.5	10.6	12.8	12.6	14.0	13.5	10.7
CaO	45.0	44.9	45.9	43.4	40.4	44.2	48.0	43.6	41.0	41.1	39.3	40.2	43.2
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[55.5]	[55.2]	[55.4]	[54.4]	[54.6]	[54.8]	[55.7]	[55.3]	[55.0]	[54.9]	[54.2]	[54.6]	[55.2]
Class	0,1,97	0,1,98	0,1,98	0,0,98	0,1,98	0,0,99	0,1,98	0,1,97	0,1,97	0,1,98	0,0,99	0,0,98	0,1,98
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite

[1] Reported as composite.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

411-418. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 E., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 97, 106, 107, 123, figs. 1, 3, 35, 36, 38, 41.) Limestone, black, fine-grained; contains calcite veinlets. Total depth of diamond-drill hole 200 ft. Index and geologic maps, geologic sections; log of drill hole 7. Possible use for deposit: Portland cement; magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 380-410, this group.]

	Depth (ft)		Depth (ft)
411.	40-45	415.	15-20
412.	35-40	416.	10-15
413.	30-35	417.	5-10
414.	20-30	418.	0- 5

419-475. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 E., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 98, 108, 109, 123, figs. 1, 3, 35-37, 41.) Total depth of diamond-drill hole 395 ft. Index and geologic maps, geologic section; log of drill hole 8. Possible use for deposit: Portland cement; magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 476-491, this group; samples 11-13, group E; samples 59-61, group F_1.]

419-458. Limestone, black, fine-grained; contains few calcite veinlets and shale partings.

	Depth (ft)		Depth (ft)
419.	365-370	425.	330-335
420.	360-365	426.	325-330
421.	355-360	427.	320-325
422.	350-355	428.	315-320
423.	345-350	429.	310-315
424.	335-340	430.	305-310

Alaska—Continued

	Depth (ft)		Depth (ft)
431.	300-305	445.	230-235
432.	295-300	446.	225-230
433.	290-295	447.	220-225
434.	285-290	448.	215-220
435.	280-285	449.	210-215
436.	275-280	450.	205-210
437.	270-275	451.	200-205
438.	265-270	452.	195-200
439.	260-265	453.	190-195
440.	255-260	454.	185-190
441.	250-255	455.	180-185
442.	245-250	456.	175-180
443.	240-245	457.	170-175
444.	235-240	458.	165-170

459-475. Limestone [except where noted], blue-gray, fine-grained; contains calcite veinlets and brown claylike residue.

	Depth (ft)	
459.	160-165	Limestone.
460.	155-160	[Dolomite.]
461.	150-155	Limestone.
462.	145-150	Do.
463.	140-145	Do.
464.	135-140	Do.
465.	130-135	Do.
466.	125-130	Do.
467.	120-125	[Dolomite.]
468.	115-120	Limestone.
469.	110-115	Do.
470.	105-110	[Dolomite.]
471.	100-105	Do.
472.	95-100	Do.
473.	90- 95	Do.
474.	85- 90	Do.
475.	80- 85	Do.

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	476	477	478	479	480	481	482	483	484	485	486	487	488
	$50F_2$ 154-103	$50F_2$ 154-104	$50F_2$ 154-105	$50F_2$ 154-106	$50F_2$ 154-107	$50F_2$ 154-108	$50F_2$ 154-109	$50F_2$ 154-110	$50F_2$ 154-111	$50F_2$ 154-112	$50F_2$ 154-113	$50F_2$ 154-114	$50F_2$ 154-115
SiO_2	0.1	0.5	0.5	0.6	0.6	0.3	0.5	0.6	0.5	1.3	2.3	3.4	1.7
Al_2O_3	.45	.60	.50	.70	.70	.60	.60	.95	1.30	1.30	1.70	2.35	.55
Fe_2O_3	.23	.31	.26	.34	.46	.34	.34	.37	.28	.37	.60	.83	.23
MgO	11.6	10.5	11.1	9.2	17.1	13.3	10.8	6.45	3.6	.4	1.1	3.3	1.4
CaO	42.2	43.2	42.6	44.8	35.6	40.1	43.2	47.3	51.0	53.6	52.4	48.4	53.0
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[54.6]	[55.1]	[55.0]	[55.6]	[54.5]	[54.6]	[55.4]	[55.7]	[56.7]	[57.0]	[58.1]	[58.3]	[56.9]
Class	0,0,99	0,1,98	0,1,98	0,1,97	0,1,97	0,1,98	0,1,97	0,1,98	0,1,97	0,2,97	0,4,94	0,6,92	0,2,97
CaO/MgO	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Magnesian calcite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Calcite

Alaska—Continued

	489	490	491	492	493	494	495	496	497	498	499	500	501
	$50F_2$ 154-116	$50F_2$ 154-117	$50F_2$ 154-118	$50F_2$ 154-125	$50F_2$ 154-128	$50F_2$ 154-129	$50F_2$ 154-130	$50F_2$ 154-131	$50F_2$ 154-132	$50F_2$ 154-133	$50F_2$ 154-134	$50F_2$ 154-135	$50F_2$ 154-136
SiO_2	1.3	0.7	0.5	6.2	5.0	6.1	4.4	3.2	3.6	3.3	3.9	4.3	4.3
Al_2O_3	.55	.75	.45	2.21	1.62	1.08	1.82	.93	1.34	1.28	1.33	1.87	1.03
Fe_2O_3	.20	.15	.23	.59	.58	.32	.78	.47	.26	.42	.37	.53	.37
MgO	1.15	.6	.45	2.8	1.3	.9	.7	1.2	3.7	2.8	4.8	4.9	5.4
CaO	53.6	54.6	55.1	47.2	50.1	50.3	50.7	51.9	49.1	49.3	46.8	46.0	46.6
Na_2O	------	------	[1].01	------	------	------	------	------	------	------	------	------	------
K_2O	------	------	[1].01	------	------	------	------	------	------	------	------	------	------
SO_3	.01	.01	.01	.32	.34	.05	.50	.16	.21	.32	.22	.49	.20
Total	[56.8]	[56.8]	[56.8]	[59.3]	[2][58.9]	[58.8]	[58.9]	[57.9]	[58.2]	[57.4]	[57.4]	[58.1]	[57.9]
Class	0,2,97	0,1,98	0,1,98	2,8,90	1,6,92	4,4,92	0,7,92	1,4,95	1,5,93	1,5,94	1,5,94	0,7,92	2,4,93
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	502	503	504	505	506	507	508	509	510	511	512	513	514
	$50F_2$ 154-137	$50F_2$ 154-138	$50F_2$ 154-139	$50F_2$ 154-140	$50F_2$ 154-141	$50F_2$ 154-142	$50F_2$ 154-143	$50F_2$ 154-144	$50F_2$ 154-145	$50F_2$ 154-146	$50F_2$ 154-147	$50F_2$ 154-148	$50F_2$ 154-149
SiO_2	3.6	3.1	0.8	0.8	0.6	1.0	1.1	1.4	1.6	2.4	1.1	1.4	1.0
Al_2O_3	1.06	1.13	.57	.60	.50	.81	.72	.76	.61	.54	.54	.47	.47
Fe_2O_3	.34	.37	.23	.30	.20	.19	.25	.34	.29	.26	.26	.23	.23
MgO	3.3	3.8	2.5	4.6	3.1	1.6	2.6	2.9	2.5	5.1	4.1	2.3	1.4
CaO	49.2	49.0	52.2	50.0	51.6	52.8	52.0	51.2	51.6	48.4	50.2	52.4	53.6
SO_3	.16	.34	.19	.23	.12	.09	.07	.10	.10	.12	.10	.11	.10
Total	[57.7]	[57.7]	[56.5]	[56.5]	[56.1]	[56.5]	[56.7]	[56.7]	[56.7]	[56.8]	[56.3]	[56.9]	[56.8]
Class	1,4,94	1,4,94	0,1,98	0,1,97	0,1,98	0,2,98	0,2,97	0,3,97	0,3,97	1,2,96	0,2,97	0,2,97	0,2,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite

Alaska—Continued

	515	516	517	518	519	520	521	522	523	524	525	526	527
	$50F_2$ 154-150	$50F_2$ 154-151	$50F_2$ 154-152	$50F_2$ 154-153	$50F_2$ 154-154	$50F_2$ 154-155	$50F_2$ 154-156	$50F_2$ 154-157	$50F_2$ 154-158	$50F_2$ 154-159	$50F_2$ 154-160	$50F_2$ 154-161	$50F_2$ 154-162
SiO_2	0.6	0.7	0.7	0.8	0.8	0.9	0.9	0.9	1.5	0.7	1.1	0.9	0.5
Al_2O_3	.36	.39	.47	.39	.49	.34	.51	.34	.49	.49	.69	.63	.34
Fe_2O_3	.34	.31	.23	.31	.31	.26	.29	.26	.31	.31	.31	.37	.26
MgO	2.3	3.3	1.5	2.7	4.8	6.2	5.6	2.5	3.8	3.7	4.8	7.7	8.7
CaO	52.8	51.8	53.6	52.2	49.8	48.4	49.4	52.2	51.0	51.4	50.0	45.4	46.0
SO_3	.10	.10	.09	.10	.09	.09	.09	.08	.08	.08	.07	.08	.09
Total	[56.5]	[56.6]	[56.6]	[56.5]	[56.3]	[56.2]	[56.8]	[56.3]	[57.2]	[56.7]	[57.0]	[55.1]	[55.9]
Class	0,1,98	0,1,97	0,1,98	0,1,98	0,1,97	0,2,97	0,2,96	0,2,98	0,2,95	0,1,97	0,2,96	0,2,97	0,1,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	528	529	530	531	532	533	534	535	536	537	538	539	540
	50F_2 154-163	50F_2 154-164	50F_2 154-165	50F_2 154-166	50F_2 154-167	50F_2 154-168	50F_2 154-169	50F_2 154-170	50F_2 154-171	50F_2 154-172	50F_2 154-173	50F_2 154-174	50F_2 154-175
SiO_2	0.6	1.0	1.1	1.0	1.3	0.6	0.8	0.7	0.8	0.8	1.1	2.8	3.0
Al_2O_3	.69	.64	.44	.87	.81	.39	.41	.26	.51	.40	.74	.81	2.20
Fe_2O_3	.31	.46	.46	.43	.49	.31	.49	.34	.29	.40	.46	.49	.40
MgO	6.3	9.4	9.0	4.8	6.2	7.7	7.2	4.9	5.3	9.8	6.4	1.2	2.3
CaO	48.5	44.7	45.2	49.7	47.5	47.0	47.2	49.4	49.4	44.6	48.0	54.0	51.6
SO_3	.08	.08	.09	.08	.09	.09	.09	.09	.07	.08	.08	.08	.07
Total	[56.5]	[56.3]	[56.3]	[56.9]	[56.4]	[56.1]	[56.2]	[55.7]	[56.4]	[56.1]	[56.8]	[59.4]	[59.6]
Class	0,1,96	0,2,96	0,2,96	0,2,96	0,2,96	0,1,97	0,2,97	0,1,98	0,1,97	0,1,96	0,2,95	1,4,91	0,5,90
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite

[1] Reported as composite.

[2] Na_2O, 0.30 percent; K_2O, 0.18 percent; composite of 0-548 ft.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

476-491. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 98, 107, 108, 123, figs. 1, 3, 35-37, 42.) Total depth of diamond-drill hole 395 ft. Index and geologic maps, geologic section, log of drill hole 8. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 419-475, this group; samples 11-13, group E; samples 59-61, group F_1.]

476.

Depth (ft)	
77-80	[Dolomite] limestone, blue-gray, fine-grained; contains few calcite veinlets and brown claylike residue.
75-77	[Dolomite] limestone, black, fine-grained; contains few calcite veinlets.

477-483. Limestone [except where noted], black, fine-grained; contains very few calcite veinlets.

	Depth (ft)	
477.	70-75	[Dolomite.]
478.	65-70	Limestone.
479.	60-65	Do.
480.	55-60	[Dolomite.]
481.	50-55	Do.
482.	45-50	Do.
483.	40-45	Limestone.

484.

Depth (ft)	
38-40	Limestone, black, fine-grained; contains few calcite veinlets.
35-38	Limestone, blue-gray, fine-grained; contains few calcite veinlets and some claylike residue.

485-491. Limestone, blue-gray, fine-grained; contains calcite veinlets and some claylike residue.

	Depth (ft)		Depth (ft)
485.	30-35	489.	10-15
486.	25-30	490.	5-10
487.	20-25	491.	0- 5
488.	15-20		

492-540. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 98, 99, 110-112, 123, figs. 1, 3, 35, 36, 39, 41.) Total depth of diamond-drill hole 620 ft. Index and geologic maps, geologic section, log of drill hole 9. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 541-608, this group; samples 23-25, group B; samples 4, 5, group C; sample 14, group E; samples 62, 63, group F_1.]

Alaska—Continued

492. Limestone, dark-gray; contains calcite veinlets. Depth 555-560 ft.

493-496. Limestone, gray; contains some calcite veinlets and some brown claylike residue.

	Depth (ft)		Depth (ft)
493.	543-548	495.	535-540
494.	540-543	496.	530-535

497-503. Limestone, dark-gray; contains calcite veinlets and some shale partings.

	Depth (ft)		Depth (ft)
497.	525-530	501.	505-510
498.	520-525	502.	500-505
499.	515-520	503.	495-500
500.	510-515		

504.

Depth (ft)	
492-495	Limestone, white, coarsely granular; contains calcite veinlets.
490-492	Limestone, dark-gray to black; contains calcite veinlets.

505-508. Limestone, dark-gray to black; contains calcite veinlets.

	Depth (ft)		Depth (ft)
505.	485-490	507.	475-480
506.	480-485	508.	470-475

509-540. Limestone, medium- to dark-gray; contains calcite veinlets; some stain.

	Depth (ft)		Depth (ft)
509.	465-470	525.	385-390
510.	460-465	526.	380-385
511.	455-460	527.	375-380
512.	450-455	528.	368-375
513.	445-450	529.	365-368
514.	440-445	530.	360-365
515.	435-440	531.	355-360
516.	430-435	532.	350-355
517.	425-430	533.	345-350
518.	420-425	534.	340-345
519.	413-420	535.	335-340
520.	408-413	536.	330-335
521.	405-408	537.	325-330
522.	400-405	538.	320-325
523.	395-400	539.	315-320
524.	390-395	540.	310-315

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	541	542	543	544	545	546	547	548	549	550	551	552	553
	$50F_2$ 154-176	$50F_2$ 154-177	$50F_2$ 154-178	$50F_2$ 154-179	$50F_2$ 154-180	$50F_2$ 154-181	$50F_2$ 154-182	$50F_2$ 154-183	$50F_2$ 154-184	$50F_2$ 154-185	$50F_2$ 154-186	$50F_2$ 154-187	$50F_2$ 154-188
SiO_2	2.8	1.3	1.3	0.9	0.6	0.6	0.4	0.4	0.5	0.6	0.6	0.8	1.0
Al_2O_3	.46	.51	.64	.48	.31	.37	.33	.50	.41	.41	.44	.54	.48
Fe_2O_3	.34	.29	.66	.26	.29	.43	.37	.40	.49	.49	.46	.46	.52
MgO	1.4	.4	6.2	2.1	5.1	10.4	6.8	8.3	8.8	7.4	10.5	10.7	8.7
CaO	52.6	54.7	47.9	53.1	50.1	43.8	47.8	46.4	45.6	46.9	43.6	42.8	43.4
SO_3	.07	.07	.07	.07	.06	.06	.04	.06	.08	.10	.13	.14	.14
Total	[57.7]	[57.3]	[56.8]	[56.9]	[56.5]	[55.7]	[55.7]	[56.1]	[55.9]	[55.9]	[55.7]	[55.4]	[54.2]
Class	2,2,95	0,2,97	0,2,95	0,2,97	0,1,97	0,1,97	0,1,98	0,1,97	0,1,97	0,1,97	0,1,96	0,1,97	0,2,96
CaO/MgO	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Calcareous dolomite	Magnesian calcite

	Alaska—Continued												
	554	555	556	557	558	559	560	561	562	563	564	565	566
	$50F_2$ 154-189	$50F_2$ 154-190	$50F_2$ 154-191	$50F_2$ 154-192	$50F_2$ 154-193	$50F_2$ 154-194	$50F_2$ 154-195	$50F_2$ 154-196	$50F_2$ 154-197	$50F_2$ 154-198	$50F_2$ 154-199	$50F_2$ 154-200	$50F_2$ 154-201
SiO_2	1.1	0.8	0.9	0.4	0.4	0.9	1.2	2.2	1.4	1.3	1.1	2.0	1.9
Al_2O_3	.53	.51	.53	.36	.57	.67	.77	1.04	.56	.69	.73	.91	.86
Fe_2O_3	.57	.49	.37	.34	.23	.43	.43	.46	.34	.31	.37	.49	.54
MgO	13.9	8.3	7.9	10.6	9.8	8.5	8.7	5.9	3.0	6.3	8.9	5.9	6.5
CaO	38.8	45.8	46.0	43.8	44.6	45.4	44.6	47.2	51.0	47.4	45.0	47.0	46.6
SO_3	.12	.02	.02	.04	.02	.01	.03	.05	.02	.05	.04	.02	.02
Total	[55.0]	[55.9]	[55.7]	[55.5]	[55.6]	[55.9]	[55.7]	[56.8]	[56.3]	[56.0]	[56.1]	[56.3]	[56.4]
Class	0,2,97	0,1,97	0,2,97	0,1,97	0,1,97	0,2,97	0,2,97	0,4,95	0,2,97	0,2,97	0,2,96	0,4,96	0,3,96
CaO/MgO	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued												
	567	568	569	570	571	572	573	574	575	576	577	578	579
	$50F_2$ 154-202	$50F_2$ 154-203	$50F_2$ 154-204	$50F_2$ 154-205	$50F_2$ 154-206	$50F_2$ 154-207	$50F_2$ 154-208	$50F_2$ 154-209	$50F_2$ 154-210	$50F_2$ 154-211	$50F_2$ 154-212	$50F_2$ 154-213	$50F_2$ 154-214
SiO_2	2.1	1.1	1.2	0.8	1.4	3.1	2.5	5.5	2.4	1.8	2.0	2.7	3.1
Al_2O_3	.74	.44	.67	.54	.63	.94	.91	1.16	.73	.79	.67	.31	.53
Fe_2O_3	.46	.26	.43	.26	.17	.26	.29	.54	.37	.31	.23	.09	.17
MgO	7.0	2.8	6.7	6.2	4.2	3.5	2.9	4.1	3.9	4.4	3.8	1.2	1.6
CaO	46.4	51.6	47.0	48.2	50.2	50.0	50.6	48.8	49.6	49.5	50.0	53.0	51.9
SO_3	.02	.02	.01	.01	.01	.02	.02	.05	.11	.09	.08	.07	.06
Total	[56.7]	[56.2]	[56.0]	[56.0]	[56.6]	[57.8]	[57.2]	[60.2]	[57.1]	[56.9]	[56.8]	[57.4]	[57.4]
Class	0,3,95	0,2,98	0,2,97	0,1,97	0,2,97	1,3,94	1,3,95	3,5,88	1,3,95	0,3,96	1,3,96	2,1,96	2,2,96
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

	Alaska—Continued												
	580	581	582	583	584	585	586	587	588	589	590	591	592
	$50F_2$ 154-215	$50F_2$ 154-216	$50F_2$ 154-217	$50F_2$ 154-218	$50F_2$ 154-219	$50F_2$ 154-220	$50F_2$ 154-221	$50F_2$ 154-222	$50F_2$ 154-223	$50F_2$ 154-224	$50F_2$ 154-225	$50F_2$ 154-226	$50F_2$ 154-227
SiO_2	2.8	2.7	2.0	2.2	2.7	3.9	2.2	1.2	1.0	0.6	0.5	0.5	1.1
Al_2O_3	.89	.86	.61	.50	.23	.29	.26	.33	.33	.21	.21	.21	.39
Fe_2O_3	.31	.34	.29	.20	.17	.11	.14	.17	.17	.09	.09	.09	.21
MgO	5.1	3.6	3.2	2.3	1.2	1.1	3.9	4.7	6.7	1.3	.5	1.4	3.9
CaO	47.9	49.6	51.2	51.7	53.2	52.4	50.4	50.0	48.0	54.8	55.7	54.8	51.4
SO_3	.07	.07	.08	.08	.07	.06	.05	.04	.03	.03	.03	.04	.05
Total	[57.1]	[57.2]	[57.4]	[57.0]	[57.6]	[57.9]	[57.0]	[56.4]	[56.2]	[57.0]	[57.0]	[57.0]	[57.0]
Class	1,3,95	1,3,95	1,3,95	1,2,97	2,1,96	3,1,95	2,1,96	0,1,97	0,1,97	0,1,97	0,1,97	0,1,97	0,2,96
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	593	594	595	596	597	598	599	600	601	602	603	604	605
	$50F_2$ 154-228	$50F_2$ 154-229	$50F_2$ 154-230	$50F_2$ 154-231	$50F_2$ 154-232	$50F_2$ 154-233	$50F_2$ 154-234	$50F_2$ 154-235	$50F_2$ 154-236	$50F_2$ 154-237	$50F_2$ 154-238	$50F_2$ 154-239	$50F_2$ 154-240
SiO_2	1.2	1.1	1.2	1.1	1.1	1.0	0.7	1.9	3.7	1.0	0.6	0.7	1.0
Al_2O_3	.38	.27	.38	.58	.46	.42	.40	.44	.63	.43	.46	.39	.37
Fe_2O_3	.32	.13	.22	.22	.34	.18	.20	.16	.27	.17	.14	.11	.13
MgO	5.1	2.2	4.2	4.1	5.5	2.4	2.3	3.0	2.0	.9	.3	.4	.7
CaO	49.8	53.0	50.6	50.8	49.0	52.4	53.0	51.6	51.2	54.4	54.8	55.0	54.8
SO_3	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	.03	.02
Total	[56.8]	[56.8]	[56.6]	[56.8]	[56.4]	[56.4]	[56.6]	[57.2]	[57.8]	[57.0]	[56.4]	[56.6]	[57.0]
Class	0,2,96	0,1,97	0,2,97	0,2,96	0,2,97	0,2,98	0,1,97	1,2,96	2,3,95	0,2,97	0,1,98	0,1,98	0,1,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

541-605. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 98, 99, 109, 110, 123, figs. 1, 3, 35, 36, 39, 41.) Total depth of diamond-drill hole 620 ft. Index and geologic maps, geologic section, log of drill hole 9. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 492-540, 606-608, this group; samples 23-25, group B; samples 4, 5, group C; sample 14, group E; samples 62, 63, group F_1.]

541-559. Limestone [except where noted], medium- to dark-gray; contains calcite veinlets; some stain.

	Depth (ft)	
541.	305 -310	Limestone.
542.	300 -305	Do.
543.	295 -300	Do.
544.	290 -295	Do.
545.	285 -290	Do.
546.	280 -285	Do.
547.	273 -280	Do.
548.	270 -273	Do.
549.	266.5-270	Do.
550.	265 -266.5	Do.
551.	260 -265	[Calcareous dolomite.]
552.	254.5-260	Do.
553.	251.6-254.5	Limestone.
554.	250 -251.6	[Calcareous dolomite.]
555.	245 -250	Limestone.
556.	240 -245	Do.
557.	235 -240	[Calcareous dolomite.]
558.	230 -235	Limestone.
559.	228 -230	Do.

560-562. Limestone, gray; contains few calcite veinlets and small amount of gray brown shale.

560. Depth 224-228 ft.
561. Depth 215-224 ft.
562. Depth 211-215 ft.

Alaska—Continued

563, 564. Limestone, dark-gray, fine-grained; contains calcite veinlets and some brown claylike residue.

563. Depth 206-211 ft.
564. Depth 204-206 ft.

565-568. Limestone, dark-gray, fine-grained; contains calcite veinlets and some yellowish brown claylike residne.

	Depth (ft)		Depth (ft)
565.	200 -204	567.	194-197.6
566.	197.6-200	568.	188-194

569-584. Limestone, black, fine-grained; contains calcite veinlets and grayish brown claylike residue.

	Depth (ft)		Depth (ft)
569.	183-188	577.	144-150
570.	180-183	578.	140-144
571.	174-180	579.	134-140
572.	169-174	580.	130-134
573.	164-169	581.	124-130
574.	159-164	582.	120-124
575.	154-159	583.	115-120
576.	150-154	584.	114-115

585-605. Limestone, dark-gray, fine-grained; contains calcite veinlets and brown claylike residue.

	Depth (ft)		Depth (ft)
585.	109-114	596.	59-61
586.	104-109	597.	54-59
587.	100-104	598.	47-54
588.	95-100	599.	44-47
589.	90- 95	600.	39-44
590.	84- 90	601.	34-39
591.	79- 84	602.	29-34
592.	74- 79	603.	26-29
593.	69- 74	604.	20-26
594.	64- 69	605.	16-20
595.	61- 64		

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	606	607	608	609	610	611	612	613	614	615	616	617	618
	$50F_2$ 154-241	$50F_2$ 154-242	$50F_2$ 154-243	$50F_2$ 154-244	$50F_2$ 154-245	$50F_2$ 154-246	$50F_2$ 154-247	$50F_2$ 154-248	$50F_2$ 154-249	$50F_2$ 154-250	$50F_2$ 154-251	$50F_2$ 154-252	$50F_2$ 154-253
SiO_2	1.1	0.8	2.2	0.3	4.6	2.3	3.0	2.1	5.6	4.6	4.6	4.3	5.2
Al_2O_3	.36	.52	.9	.13	1.59	1.16	5.81	1.43	2.20	1.11	.81	.81	1.03
Fe_2O_3	.24	.18	.40	.37	.51	.34	.69	.37	.60	.29	.29	.29	.37
MgO	1.7	.5	3.2	1.4	1.7	1.1	.7	.9	2.3	2.5	2.7	3.0	1.1
CaO	53.6	55.1	50.6	51.6	49.6	51.6	51.0	51.6	48.4	49.6	49.8	49.8	51.0
SO_3	.02	.02	.02	.01	.01	.01	.05	.04	.03	.03	.03	.02	.03
Total	[57.0]	[57.1]	[57.3]	[53.8]	[58.0]	[56.5]	[61.2]	[56.4]	[59.1]	[58.1]	[58.2]	[58.2]	[58.7]
Class	0,2,97	0,1,97	0,4,95	0,1,95	1,6,92	0,4,94	0,5,87	0,4,94	1,8,90	2,4,93	3,3,93	3,3,93	3,4,93
CaO/MgO	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite

Alaska—Continued

	619	620	621	622	623	624	625	626	627	628	629	630	631
	$50F_2$ 154-254	$50F_2$ 154-255	$50F_2$ 154-256	$50F_2$ 154-257	$50F_2$ 154-258	$50F_2$ 154-259	$50F_2$ 154-260	$50F_2$ 154-261	$50F_2$ 154-262	$50F_2$ 154-263	$50F_2$ 154-264	$50F_2$ 154-265	$50F_2$ 154-266
SiO_2	6.3	2.1	5.8	2.7	0.6	1.7	0.8	1.5	0.6	0.4	0.9	2.0	2.0
Al_2O_3	.98	.86	.91	.70	.46	.90	.61	.53	.41	.50	.68	.71	.47
Fe_2O_3	.32	.34	.29	.40	.34	.40	.29	.37	.29	.20	.32	.29	.23
MgO	.9	2.7	2.5	3.8	4.3	2.8	5.1	3.7	3.4	3.3	5.2	5.3	3.9
CaO	50.0	51.0	49.2	50.0	50.4	51.4	49.2	50.8	51.8	52.0	49.4	48.8	49.8
SO_3	.03	.02	.02	.03	.03	.03	.02	.03	.03	.02	.02	.03	.02
Total	[58.5]	[57.0]	[58.7]	[57.6]	[56.1]	[57.2]	[56.0]	[56.9]	[56.5]	[56.4]	[56.5]	[57.1]	[56.4]
Class	4,4,91	0,3,96	4,3,92	1,3,94	0,1,98	0,3,96	0,1,98	0,2,96	0,1,97	0,1,98	0,2,97	0,3,95	1,2,97
CaO/MgO	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	632	633	634	635	636	637	638	639	640	641	642	643	644
	$50F_2$ 154-267	$50F_2$ 154-268	$50F_2$ 154-269	$50F_2$ 154-270	$50F_2$ 154-271	$50F_2$ 154-272	$50F_2$ 154-273	$50F_2$ 154-274	$50F_2$ 154-275	$50F_2$ 154-276	$50F_2$ 154-277	$50F_2$ 154-278	$50F_2$ 154-279
SiO_2	4.0	4.0	4.6	6.2	3.9	2.2	1.1	1.5	2.3	1.1	1.4	0.7	0.6
Al_2O_3	.87	.84	.78	.80	2.00	.67	.61	.41	.56	.46	.58	.48	.40
Fe_2O_3	.43	.46	.32	.40	1.10	.63	.49	.29	.34	.34	.32	.32	.40
MgO	5.1	4.8	5.9	5.7	3.6	8.6	8.9	6.6	7.8	8.3	8.5	9.4	7.6
CaO	47.8	47.6	46.4	45.4	47.6	44.0	44.8	47.4	45.4	45.4	45.2	44.4	47.0
SO_3	.04	.07	.03	.03	.02	.02	.03	.02	.02	.03	.03	.02	.01
Total	[58.2]	[57.8]	[58.0]	[58.5]	[58.2]	[56.1]	[55.9]	[56.2]	[56.4]	[55.6]	[56.0]	[55.3]	[56.0]
Class	2,4,92	2,4,93	3,3,93	4,3,91	0,7,92	0,4,96	0,2,96	0,2,97	1,2,96	0,2,97	0,3,96	0,1,98	0,1,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	645	646	647	648	649	650	651	652	653	654	655	656	657
	$50F_2$ 154-280	$50F_2$ 154-281	$50F_2$ 154-282	$50F_2$ 154-283	$50F_2$ 155-4	$50F_2$ 155-5	$50F_2$ 155-6	$50F_2$ 155-7	$50F_2$ 155-8	$50F_2$ 155-9	$50F_2$ 155-10	$50F_2$ 155-11	$50F_2$ 155-12
SiO_2	0.8	1.0	0.6	0.7	2.5	1.8	5.2	1.7	0.6	3.6	5.3	5.2	2.4
Al_2O_3	.54	.87	.54	.51	.24	.24	1.33	.19	5.47	.66	1.90	1.44	.81
Fe_2O_3	.43	.43	.46	.49	.26	.26	.57	.31	.43	.34	.80	.66	.29
MgO	8.5	6.2	9.7	9.3	.4	1.4	4.4	.4	.4	.4	.3	.9	1.4
CaO	45.4	47.8	44.2	44.8	53.4	53.2	47.8	53.6	52.4	52.8	50.2	50.4	52.4
SO_3	.01	.02	.03	.02	.01	.03	.04	.03	.02	.02	.02	.04	.03
Total	[55.7]	[56.3]	[55.5]	[55.8]	[1][56.8]	[56.9]	[59.3]	[56.2]	[59.3]	[57.8]	[58.5]	[58.6]	[57.3]
Class	0,1,97	0,2,97	0,1,97	0,1,97	2,1,96	1,1,97	2,5,90	1,1,97	0,1,92	2,3,95	1,8,90	2,6,92	1,3,96
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	658	659	660	661	662	663	664	665	666	667	668	669	670[1]
	$50F_2$ 155-13	$50F_2$ 155-14	$50F_2$ 155-15	$50F_2$ 155-16	$50F_2$ 155-17	$50F_2$ 155-18	$50F_2$ 155-19	$50F_2$ 155-20	$50F_2$ 155-21	$50F_2$ 155-22	$50F_2$ 155-23	$50F_2$ 155-24	$50F_2$ 155-25
SiO_2	2.5	5.1	2.9	2.5	2.7	2.0	1.1	2.0	1.1	2.8	0.5	0.5	0.5
Al_2O_2	.67	.81	.67	.61	.60	.79	.50	.57	.61	.56	.46	.51	.43
Fe_2O_3	.23	.29	.23	.29	.20	.31	.20	.23	.29	.34	.34	.29	.17
MgO	3.7	4.6	4.4	4.2	3.3	5.2	3.4	1.8	5.9	3.8	8.6	6.0	3.2
CaO	50.4	47.4	49.0	49.2	50.8	48.6	51.6	52.4	48.6	49.8	46.0	49.0	52.6
SO_3	.02	.02	.02	.02	.02	.02	.02	.01	.03	.01	.02	.01	.01
Total	[57.5]	[58.2]	[57.2]	[56.8]	[57.6]	[56.9]	[56.8]	[57.0]	[56.5]	[57.3]	[55.9]	[56.3]	[56.9]
Class	1,3,95	3,3,93	1,3,95	1,3,96	1,2,95	0,3,95	0,2,96	1,2,97	0,2,96	1,2,95	0,1,97	0,1,97	0,1,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

[1] Na_2O, 0.050 percent, K_2O, 0.15 percent; composite of 0-270 ft.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

606-608. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 98, 99, 109, 123, figs. 1, 3, 35, 36, 39, 41.) Limestone, dark-gray, fine-grained; contains calcite veinlets and brown claylike residue. Total depth of diamond-drill hole 620 ft. Index and geologic maps, geologic section, log of drill hole 9. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 492-605, this group; samples 23-25, group B; samples 4, 5, group C; sample 13, group E; samples 62, 63, group F_1.]

606. Depth 13.9-16 ft.
607. Depth 12-13.9 ft.
608. Depth 0-12 ft.

609-648. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 100, 112, 113, 123, figs. 1, 3, 35, 36, 39, 41.) Total depth of diamond-drill hole 196 ft. Index and geologic maps, geologic section, log of drill hole 10. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required.

609-624. Limestone, black; contains calcite veinlets and yellow brown earthy residue.

	Depth (ft)		Depth (ft)
609.	194-196	617.	154-159
610.	189-194	618.	149-154
611.	184-189	619.	144-149
612.	179-184	620.	139-144
613.	174-179	621.	134-139
614.	169-174	622.	129-134
615.	164-169	623.	124-129
616.	159-164	624.	119-124

625-628. Limestone, dark-gray; contains calcite veinlets.

	Depth (ft)		Depth (ft)
625.	114-119	627.	104-109
626.	109-114	628.	99-104

629. Depth (ft)

97-99 ------- Limestone, dark-gray; contains calcite veinlets.
94-97 ------- Limestone, black.

630-635. Limestone, black.

	Depth (ft)		Depth (ft)
630.	89-94	633.	74-79
631.	84-89	634.	69-74
632.	79-84	635.	64-69

Alaska—Continued

636. Depth (ft)

61-64 ------- Limestone, black.
60-61 ------- Earthy gouge, yellow-brown, plastic.
59-60 ------- Limestone, black, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

637. Limestone, black, fine-grained; some earthy residue; part contains calcite veinlets, part contains siliceous veinlets. Depth 54-59 ft.

638-648. Limestone, black, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

	Depth (ft)		Depth (ft)
638.	49-54	644.	19-24
639.	44-49	645.	14-19
640.	39-44	646.	9-14
641.	34-39	647.	4- 9
642.	29-34	648.	0- 4
643.	24-29		

649-670. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 100, 101, 113, 114, 123, figs. 1, 3, 35, 36, 40, 41.) Total depth of diamond-drill hole 284 ft. Index and geologic maps, geologic section, log of drill hole 11. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 671-702, this group; sample 6, group C; sample 15, group E; sample 64, group F_1.]

649-654. Limestone, black, fine-grained; contains very little calcite.

	Depth (ft)		Depth (ft)
649.	265-270	652.	250-255
650.	260-265	653.	245-250
651.	255-260	654.	240-245

655, 656. Limestone, black; some weathering; contains yellow brown earthy residue.

655. Depth 234-240 ft.
656. Depth 228-234 ft.

657-670. Limestone, black, fine-grained; contains calcite veinlets and some yellowish brown earthy residue.

	Depth (ft)		Depth (ft)
657.	223-228	664.	190-195
658.	220-223	665.	185-190
659.	215-220	666.	180-185
660.	210-215	667.	175-180
661.	205-210	668.	170-175
662.	200-205	669.	165-170
663.	195-200	670.	160-165

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Alaska—Continued

	671	672	673	674	675	676	677	678	679	680	681	682	683
	$50F_2$ 155-26	$50F_2$ 155-27	$50F_2$ 155-28	$50F_2$ 155-29	$50F_2$ 155-30	$50F_2$ 155-31	$50F_2$ 155-32	$50F_2$ 155-33	$50F_2$ 155-34	$50F_2$ 155-35	$50F_2$ 155-36	$50F_2$ 155-37	$50F_2$ 155-38
SiO_2	0.5	0.4	0.6	0.9	0.9	1.1	1.6	0.9	0.9	0.9	1.2	1.0	1.5
Al_2O_3	.64	.47	.30	.33	.53	.67	.64	.64	.61	.67	.74	.37	.43
Fe_2O_3	.26	.23	.20	.17	.17	.23	.26	.26	.23	.23	.26	.23	.17
MgO	6.7	6.5	5.0	2.5	3.3	3.6	5.7	5.9	5.7	5.4	3.9	6.2	2.6
CaO	47.8	48.8	50.0	52.6	52.0	51.0	48.4	48.8	49.0	49.2	50.6	48.6	52.2
SO_3	.03	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[55.9]	[56.4]	[56.1]	[56.5]	[56.9]	[56.6]	[56.6]	[56.5]	[56.4]	[56.4]	[56.7]	[56.4]	[56.9]
Class	0,1,97	0,1,97	0,1,98	0,1,98	0,2,96	0,2,97	0,3,96	0,2,96	0,2,97	0,2,97	0,2,97	0,2,96	1,2,97
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	684	685	686	687	688	689	690	691	692	693	694	695	696
	$50F_2$ 155-39	$50F_2$ 155-40	$50F_2$ 155-41	$50F_2$ 155-42	$50F_2$ 155-43	$50F_2$ 155-44	$50F_2$ 155-45	$50F_2$ 155-46	$50F_2$ 155-47	$50F_2$ 155-48	$50F_2$ 155-49	$50F_2$ 155-50	$50F_2$ 155-51
SiO_2	1.0	1.1	1.2	1.7	1.8	2.3	1.7	1.7	1.2	2.4	1.0	2.6	1.4
Al_2O_3	.54	.74	.47	.64	.51	.64	.40	.43	.41	.53	.47	.64	.54
Fe_2O_3	.26	.26	.23	.46	.49	.46	.40	.37	.49	.37	.63	.46	.46
MgO	5.1	5.4	5.7	4.4	7.4	7.8	9.3	9.6	8.9	10.3	11.2	7.9	4.1
CaO	49.6	49.0	49.0	49.8	46.2	45.0	44.0	44.0	45.0	42.4	42.0	44.8	50.4
SO_3	.01	.01	.01	.01	.01	.01	.03	.01	.01	.03	.01	.01	.01
Total	[56.5]	[56.5]	[56.6]	[57.0]	[56.4]	[56.2]	[55.8]	[56.1]	[56.0]	[56.0]	[55.3]	[56.4]	[56.9]
Class	0,2,97	0,2,96	0,2,96	0,3,95	0,3,96	1,3,96	1,2,96	1,2,96	0,2,96	1,2,96	0,2,97	1,3,95	0,3,96
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Calcareous dolomite	Magnesian calcite	Magnesian calcite

Alaska—Continued

	697	698	699	700	701	702	703	704	705	706	707	708	709
	$50F_2$ 155-52	$50F_2$ 155-53	$50F_2$ 155-54	$50F_2$ 155-55	$50F_2$ 155-56	$50F_2$ 155-57	$50F_2$ 155-58	$50F_2$ 155-59	$50F_2$ 155-60	$50F_2$ 155-61	$50F_2$ 155-62	$50F_2$ 155-63	$50F_2$ 155-64
SiO_2	1.0	0.4	0.8	0.5	3.9	0.4	5.4	2.9	3.9	3.7	4.5	5.4	5.3
Al_2O_3	.54	.23	.57	.50	1.00	.46	2.39	1.53	1.38	1.36	1.78	2.08	2.10
Fe_2O_3	.46	.37	.23	.20	.20	.34	.71	.37	.52	.34	.52	.92	.60
MgO	5.1	8.6	5.7	7.9	7.8	9.6	1.4	1.7	.8	1.2	1.1	.7	1.0
CaO	49.0	45.8	48.8	46.6	47.0	44.4	49.0	51.0	51.4	51.6	50.6	50.2	50.0
SO_3	.01	.02	.01	.01	.01	.02	.05	.02	.04	.01	.01	.01	.02
Total	[56.1]	[55.4]	[56.1]	[55.7]	[59.9]	[55.2]	[1][59.0]	[57.5]	[58.0]	[58.2]	[58.5]	[59.3]	[59.0]
Class	0,2,97	0,1,98	0,1,97	0,1,98	2,3,88	0,1,98	0,9,90	0,5,95	1,5,93	1,5,94	1,7,92	1,8,91	1,8,91
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Alaska—Continued

	710	711	712	713	714	715	716	717	718	719	720	721	722
	$50F_2$ 155-65	$50F_2$ 155-66	$50F_2$ 155-67	$50F_2$ 155-68	$50F_2$ 155-69	$50F_2$ 155-70	$50F_2$ 155-71	$50F_2$ 155-72	$50F_2$ 155-73	$50F_2$ 155-74	$50F_2$ 155-75	$50F_2$ 155-76	$50F_2$ 155-77
SiO_2	3.9	4.4	2.9	4.9	2.5	1.0	4.0	0.6	0.9	2.1	2.3	1.6	1.5
Al_2O_3	1.29	.64	.73	.61	.43	.44	2.20	.37	.37	.56	1.01	.41	.47
Fe_2O_3	.31	.26	.37	.29	.17	.26	1.00	.23	.23	.34	.49	.29	.23
MgO	2.5	2.0	1.8	1.3	1.6	1.2	3.4	1.5	.7	1.9	1.3	5.5	1.7
CaO	49.8	50.2	51.2	51.0	52.2	53.6	47.6	53.2	53.2	50.2	50.4	45.8	51.0
SO_3	.01	.01	.01	.01	.01	.01	.04	.01	.01	.01	.02	.02	.01
Total	[57.8]	[57.5]	[57.0]	[58.1]	[56.9]	[56.5]	[58.2]	[55.9]	[55.4]	[55.1]	[55.5]	[53.6]	[54.9]
Class	1,5,94	3,3,94	1,3,95	3,3,94	2,2,96	0,2,98	0,7,92	0,1,98	0,2,96	1,2,94	0,4,93	1,2,93	0,2,95
CaO/MgO	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	723	724	725	726	727	728	729	730	731	732	733	734	735
	$50F_2$ 155-78	$50F_2$ 155-79	$50F_2$ 155-80	$50F_2$ 155-81	$50F_2$ 155-82	$50F_2$ 155-83	$50F_2$ 155-84	$50F_2$ 155-85	$50F_2$ 155-86	$50F_2$ 155-87	$50F_2$ 155-88	$50F_2$ 155-89	$50F_2$ 155-90
SiO_2	3.0	2.0	2.8	1.5	1.1	0.6	1.7	0.9	1.0	1.7	3.1	0.7	0.6
Al_2O_2	.67	.57	.74	.34	.59	.30	.66	.40	.40	.54	.61	.51	.41
Fe_2O_3	.23	.23	.26	.26	.31	.20	.54	.40	.20	.26	.29	.29	.29
MgO	2.7	1.3	.8	1.6	.9	.3	1.6	6.7	7.6	9.6	6.7	8.0	10.2
CaO	50.0	51.8	51.6	51.0	52.2	54.6	49.6	47.2	46.8	43.7	46.3	46.2	43.8
SO_3	.01	.01	.01	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[56.6]	[55.9]	[56.2]	[54.7]	[55.1]	[56.0]	[54.1]	[55.6]	[56.0]	[55.8]	[57.0]	[55.7]	[55.3]
Class	2,3,95	1,2,95	1,3,94	1,2,94	0,2,95	0,1,98	0,3,92	0,2,98	0,2,97	0,2,96	2,3,95	0,1,97	0,1,97
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

[1] Na_2O, 0.025 percent; K_2O, 0.16 percent, composite for drill hole 12.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

671-702. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 100, 101, 113, 123, figs. 1, 3, 35, 36, 40, 41.) Limestone [except where noted], black, fine-grained; contains calcite veinlets and some yellowish-brown earthy residue. Total depth of diamond-drill hole 284 ft. Index and geologic maps, geologic section, log of drill hole 11. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 649-670, this group; sample 6, group C; sample 15, group E; and sample 64, group F_1.]

	Depth (ft)		Depth (ft)	
671.	155-160	687.	75-80	
672.	150-155	688.	70-75	
673.	143-150	689.	65-70	
674.	138-143	690.	60-65	
675.	133-138	691.	55-60	
676.	130-133	692.	50-55	
677.	125-130	693.	44-50	[Dolomite.]
678.	120-125	694.	39-44	[Dolomite.]
679.	114-120	695.	35-39	
680.	110-114	696.	30-35	
681.	105-110	697.	24-30	
682.	100-105	698.	20-24	
683.	95-100	699.	15-20	
684.	90- 95	700.	10-15	
685.	85- 90	701.	5-10	
686.	80- 85	702.	0- 5	

703-735. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 101, 114, 115, 123, figs. 1, 3, 35, 36, 40, 41.) Total depth of diamond-drill hole 240 ft. Index and geologic maps, geologic section, log of drill hole 12. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 736-748, this group.]

703-711. Limestone, black, fine-grained; contains little calcite. Weathered appearance in lower part.

	Depth (ft)		Depth (ft)
703.	230-240	706.	215-220
704.	225-230	707.	210-215
705.	220-225		

Alaska—Continued

	Depth (ft)		Depth (ft)
708.	206-210	710.	200-205
709.	205-206	711.	195-200

712-715. Limestone, dark-gray, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

	Depth (ft)		Depth (ft)
712.	190-195	714.	180-185
713.	185-190	715.	175-180

716. Depth (ft)

173.5-175 ------ Limestone, dark-gray, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

173 -173.5 ------ Claylike material, brownish-yellow, plastic.

170 -173 ------ Limestone, black, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

717-721. Limestone, black, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

	Depth (ft)		Depth (ft)
717.	165-170	720.	150-155
718.	160-165	721.	145-150
719.	155-160		

722. Depth (ft)

141.5-145 ------ Limestone, black, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

140 -141.5 ------ Limestone, dark-gray, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

723-735. Limestone, dark-gray, fine-grained; contains calcite veinlets and some yellow brown earthy residue.

	Depth (ft)		Depth (ft)
723.	135-140	730.	100-105
724.	130-135	731.	95-100
725.	125-130	732.	90- 95
726.	120-125	733.	85- 90
727.	115-120	734.	80- 85
728.	110-115	735.	75- 80
729.	105-110		

Table 7.—Analyses of samples from Alaska containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Alaska—Continued												
	736	737	738	739	740	741	742	743	744	745	746	747	748
	$50F_2$ 155-91	$50F_2$ 155-92	$50F_2$ 155-93	$50F_2$ 155-94	$50F_2$ 155-95	$50F_2$ 155-96	$50F_2$ 155-97	$50F_2$ 155-98	$50F_2$ 155-99	$50F_2$ 155-100	$50F_2$ 155-101	$50F_2$ 155-102	$50F_2$ 155-103
SiO_2	0.6	0.4	1.1	0.4	0.4	0.5	0.4	0.4	0.4	0.3	0.3	0.6	0.6
Al_2O_3	.44	.34	.41	.30	.34	.37	.37	.40	.37	.37	.47	.61	.51
Fe_2O_3	.36	.26	.29	.20	.26	.23	.23	.20	.23	.23	.23	.29	.29
MgO	10.4	9.5	9.6	9.9	9.4	8.8	9.2	8.5	9.1	9.7	8.5	10.4	8.5
CaO	43.6	44.6	43.8	44.2	44.6	45.8	45.2	46.4	45.0	44.4	45.6	43.4	45.4
SO_3	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01	.01
Total	[55.4]	[55.1]	[55.2]	[55.0]	[55.0]	[55.7]	[55.4]	[55.9]	[55.1]	[55.0]	[55.1]	[55.3]	[55.3]
Class	0,1,97	0,1,98	0,2,98	0,1,98	0,1,99	0,1,97	0,1,98	0,1,97	0,1,98	0,1,98	0,1,99	0,1,97	0,1,98
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

	Alaska—Continued												
	749	750	751	752	753	754	755	756	757	758	759	760	761
	$50F_2$ 155-106	$50F_2$ 155-108	$50F_2$ 155-107	$50F_2$ 155-109	$50F_2$ 155-110	$50F_2$ 155-111	$50F_2$ 52-56	$50F_2$ 52-57	$50F_2$ 52-58	$50F_2$ 155-148	$50F_2$ 155-149	$50F_2$ 155-143	$50F_2$ 155-144
SiO_2	0.7	1.8	0.9	1.5	1.7	5.0	0.49	[1]0.9	[1]0.5	1.1	2.7	1.5	1.7
Al_2O_3	.8	1.0	.6	.65	.6	.8	.42	.9	.7	.53	.83	.76	.69
Fe_2O_3	.30	.36	.26	.14	.28	.17				.37	.37	.34	.31
MgO	3.7	.8	.5	.7	.55	.4	4.72	Trace	Trace	1.1	.6	.6	.3
CaO	50.95	53.45	54.70	54.20	54.00	52.25	49.63	54.4	54.7	54.0	53.8	54.5	54.4
SO_3	.06	.04	.01	.01	.01	.01	------	------	------	------	------	------	------
Ignition loss	------	------	------	------	------	------	------	43.8	43.9	------	------	------	------
Total	[56.5]	[57.4]	[57.0]	[57.2]	[57.1]	[58.6]	[2][55.26]	100.0	99.8	[57.1]	[58.3]	[57.7]	[57.4]
Class	0,1,97	0,3,96	0,2,97	0,2,97	0,2,97	3,3,93	0,1,98	(0,3)97	(0,2)98	0,2,97	1,3,94	0,3,95	0,3,96
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Alaska—Continued												
	762	763	764	765	766	767	768	769	770	771	772	773	774
	$50F_2$ 155-146	$50F_2$ 155-145	$50F_2$ 155-132	$50F_2$ 155-133	$50F_2$ 155-134	$50F_2$ 155-137	$50F_2$ 155-141	$50F_2$ 155-142	$50F_2$ 61-1	$50F_2$ 90-1	$50F_2$ 90-2	$50F_2$ 101-3	$50F_2$ 101-10
SiO_2	2.6	2.6	2.4	3.2	3.5	7.2	3.7	5.9	[1]2.56	[1]9.26	[1]1.82	[1]0.33	[1]0.06
Al_2O_3	1.36	1.10	1.05	1.64	1.87	1.52	.97	1.79	------	------	------	.11	.02
Fe_2O_3	.54	.40	.45	.66	.63	.48	.23	.51	------	------	------	.09	.04
MgO	.7	.6	.5	.7	.8	.1	.1	.01	[3].43	16.39	.14	4.39	.61
CaO	52.4	53.4	53.5	52.6	51.6	50.6	53.0	50.8	[3]53.87	29.22	53.93	49.4	54.7
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	.013	.008
CO_2	------	------	------	------	------	------	------	------	[3]42.75	------	------	[3]43.55	[3]43.61
S	------	------	------	------	------	------	------	------	------	------	------	.008	.017
Total	[57.6]	[58.1]	[57.9]	[58.8]	[58.4]	[59.9]	[58.0]	[59.0]	[99.61]	[54.87]	[55.89]	[97.9]	[99.1]
Class	0,5,95	0,4,94	0,4,95	0,6,92	0,6,93	4,6,90	2,3.95	2,7,91	(3,0)97	(9,0)86	(2,0)97	(0,1)97	(0,0)99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcareous dolomite	Calcite	Magnesian calcite	Calcite

	Alaska—Continued												
	775	776	777	778	779	780	781	782	783	784	785	786	787
	$50F_2$101-5	$50F_2$101-6	$50F_2$101-7	$50F_2$101-8	$50F_2$101-9	$50F_2$101-4	$50F_2$105-1	$50F_2$105-2	$50F_2$115-1	$50F_2$124-21	$50F_2$124-22	$50F_2$125-1	$50F_2$125-2
SiO_2	[1]0.47	[1]1.48	[1]0.54	[1]0.32	[1]None	[4]1.70	[1]1.03	[1]2.79	[1]1.52	[1]0.91	[4]3.61	0.12	0.13
Al_2O_3	.12	.18	.10	1.07	------	------	.12	None	------	------	------	.14	.03
Fe_2O_3	.14	.44	.40		[5]Trace	------	.21		------	------	------	.00	.07
FeO	------	------	------	------	------	------	------	------	------	------	------	.08	.03
MgO	.81	.50	1.70	2.24	0.30	[3]1.24	.30	[3].30	.46	[3]18.69	[3].69	2.02	2.54
CaO	53.5	53.5	53.0	52.2	55.59	[3]54.29	54.2	[3]54.24	54.30	[3]34.24	[3]53.47	53.75	53.09
Na_2O	------	------	------	------	------	------	------	------	------	------	------	.00	.00
K_2O	------	------	------	------	------	------	------	------	------	------	------	.02	.02
H_2O+	------	------	------	------	------	------	------	------	------	------	------	.06	.08
H_2O-	------	------	------	------	------	------	------	------	------	------	------	.02	.02
TiO_2	------	------	------	------	------	------	------	------	------	------	------	.00	.00
P_2O_5	.011	.016	.015	.287	------	------	.011	------	------	------	------	.01	.01
MnO	------	------	------	------	------	------	------	------	------	------	------	.01	.01
CO_2	[3]42.89	[3]42.5	[3]43.47	[3]43.49	43.67	[3]43.96	[3]42.8	[3]42.91	------	[3]47.28	[3]42.73	44.07	44.16
S	.013	.040	.028	.050	[6]Trace	------	.010	------	------	------	------	------	------
Total	[98.0]	[98.7]	[99.3]	[99.7]	[99.56]	[101.19]	[98.7]	[100.24]	[56.28]	[101.12]	[100.50]	100.30	100.19
Class	(0,1)97	(1,2)97	(0,1)98	(0,1)98	(0,0)99	(2,0)99	(1,1)97	(3,0)97	(2,0)98	(1,0)100	(3,0)97	0,0,99	0,0,99
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcareous dolomite	Calcite	Calcite	Magnesian calcite

[1] Reported as insoluble.

[2] Reported as calculated; CO_2, 44.17 percent.

[3] Calculated from reported $MgCO_3$ and(or) $CaCO_3$.

[4] Reported as insoluble in HCl.

[5] Reported as slight trace.

[6] Reported as SO_3.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska—Continued

736 - 748. Healy quadrangle. Paleozoic, possibly Devonian. [Secs. 8, 17, T. 17 S., R. 7 W., unsurveyed], southern slope of Alaska Range in southeastern corner of Mount McKinley National Park. Northern Empire Development Co. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 91, 93, 101, 114, 123, figs. 1, 3, 35, 36, 40, 41.) Limestone, dark-gray, fine-grained; contains calcite veinlets and some yellow-brown earthy residue. Total depth of diamond-drill hole 240 ft. Index and geologic maps, geologic section, log of drill hole 12. Possible use for deposit: Portland cement, magnesia content often high so that complex mining and thorough blending may be required. [For other analyses from same drill hole, see samples 703-735, this group.]

	Depth (ft)		Depth (ft)		Depth (ft)
736.	70-75	741.	40-48	745.	20-25
737.	65-70	742.	35-40	746.	15-20
738.	61-65	743.	30-35	747.	10-15
739.	55-61	744.	25-30	748.	0-10
740.	48-55				

749 - 754. Healy quadrangle. Paleozoic, possibly Devonian. [Sec. 9, T. 17 S., R. 7 W., unsurveyed], between Little Windy and Bain Creeks, Windy Creek area. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 93, 115, 116, figs. 1, 3, 35, 41.) Limestone. Index and geologic maps. Possible use: None.

749. Sample W-1.
750. Sample W-2.
751. Sample W-3.
752. Sample W-4.
753. Sample W-5.
754. Locality: Narrow outcrop along course of Bain Creek. Sample W-9.

755 - 757. Healy quadrangle. [Devonian. Sec. 9, T. 17 S., R. 7 W., unsurveyed], about 2 miles southwest of Windy station. Analyst, M. L. Sharp. (Waring, 1947, p. 4, 6-8.) Limestone. Index maps.

755. Sample 3. Limestone, dark-gray; massive or thick bedded.
756. Sample 4. Limestone, dark-gray.
757. Sample 5. Limestone, gray; contains calcite veins.

758 - 769. Healy quadrangle. Triassic. West Fork of Chulitna River, Broad Pass region. Analyst, H. E. Peterson. (Rutledge and others, 1953, p. 4, 87, 118-120, 123, figs. 1, 3, 26, 44.) Limestone. Index and geologic maps. Possible use: Cement, rock wool.

758 - 766. Locality: [2.3-2.5, 3.3-3.75]. Outcrop description: Limestone, white to gray, crystalline, fossiliferous; fractured and weathered.

	Sample		Sample		Sample
758.	173	761.	176	764.	180
759.	174	762.	178	765.	181
760.	175	763.	179	766.	182

767 - 769. Locality: [2.45-2.75, 2.85-3.3]. Outcrop description: Limestone, white to gray, fossiliferous; fractured and weathered. Interbedded with siliceous material.

767. Sample 190. 768. Sample 186. 769. Sample 185.

770. Juneau quadrangle. Silurian. [0.3, 12.35], south of Sandy Cove, east shore of Glacier Bay. Analyst, R. K. Bailey. Record 2952. (Burchard, 1920, p. 38, 42, 43, pl. 1; Buddington, 1926, p. 61.) Limestone, mottled. Index and geologic maps. Thin-section description. Possible use: Probably none.

771, 772. [Mount Michelson quadrangle. Early and Late Mississippian, Pennsylvanian(?) and Permian], Lisburne [Group]. [3.4-8.5, 0.0-17.6], Canning River. (Gryc, 1948, p. 1, 2, 5, 7.)

771. Sample 47A Gr 160. Dolomitic limestone, porous; sugary texture. Thin-section description.

772. Sample 47A Gr 184. Limestone.

773 - 778. Petersburg quadrangle. Analyst, Nils Johansson. (Roehm, 1946, p. 11, 25, 29, 60, 63-65, 67, 69-76, 81-83.) Chip samples, a portion contained weathered surfaces. Mineralogy, thin-section description. Little overburden; tonnage estimated. Index maps. Possible use: Agricultural.

773. Silurian. [4.8, 3.5], west coast of Prince of Wales Island, north shore of Shakan Bay. Sample and deposit 17. Limerock, dolomitic, bluish-gray, semicrystalline, massive, dense; weathers dull whitish gray; contains calcite veinlets and fossil outlines. Chip samples from base of bluff, taken across 1,500 ft; estimated thickness 2,000 ft.

Alaska—Continued

774. Silurian. [5.3, 3.1], west coast of Prince of Wales Island, Shakan Bay. Calder marble quarry. Sample and deposit 16. Marble, light-bluish-gray, crystalline, dense; weathers light gray. Bulk density 2.71. Chip samples taken across 300 ft; thickness 500 ft above sea level. Possible use: Chemical, pulp and paper industry.

775. Silurian. [9.0, 3.8], Prince of Wales Island, west shore of Exchange Cove. Sample and deposit 18. Limerock, light-bluish-gray, some mottled areas, semicrystalline. Bulk density 2.70. Chip samples taken across 2,000 ft; estimated thickness more than 1,000 ft. Possible use: Metallurgical.

776. Silurian. [9.8, 4.3], Shrubby Island of Kashevarof Islands, Mud Bay. Sample and deposit 19. Limerock, light-bluish-buff, finely crystalline, brittle; weathers gray. Bulk density 2.68. Chip samples taken across outcrop. Possible use: Metallurgical, water treatment.

777. Silurian. [10.4, 4.0], east side Shrubby Island of Kashevarof Islands, Piledriver Bay. Sample and deposit 20. Limerock, brownish-gray, mottled with blackish streaks, semicrystalline, some calcite veinlets; weathers reddish brown. Bulk density 2.67. Chip samples of beach outcrop taken across 1,500 ft. Possible use: Metallurgical, water treatment.

778. Middle Devonian. [6.3, 14.3], Kupreanof Island, Towers Arm. Sample and deposit 23. Limerock, dark, mottled-gray, semicrystalline, calcite-veined; weathers light gray. Bulk density 2.73. Chip samples taken across 2,000 ft in bluff. Beach outcrop; estimated thickness 2,000 ft.

779, 780. Petersburg quadrangle. Silurian. Prince of Wales Island. Thin-section description. Index and geologic maps.

779. [5.3, 3.1], a few miles north of town of Shakan, Marble Creek, Alaska Marble Co. Analyst, E. F. Ladd. (Wright, 1907, p. 75; Wright, 1908, p. 117, 118, pls. 1, 2; Burchard, 1920, p. 60, 61, 62, pls. 1, 3.) Marble, white, finely crystalline; quarried to an average depth of 60 ft. Use: Dimension stone [implied], interior decoration.

780. [6.35-6.8, 4.2-5.7], near head of Red Bay. Vermont Marble Co., claims. Analyst, R. K. Bailey. Record 2952, deposit 24. (Burchard, 1920, p. 59, pls. 1, 3; Buddington, 1926, p. 61; Wells, 1937, p. 47.) Limestone, light-gray and cream, mottled; banded gray and blue phases; fine grained, subcrystalline.

781. Port Alexander quadrangle. Silurian. [16.9-17.6, 15.6-15.8], Kuiu Island, west side of Saginaw Bay. Analyst, Nils Johansson. Sample and deposit 21. (Roehm, 1946, p. 11, 25, 29, 77-79.) Limerock, light-buff to bluish-gray, slightly friable, fossiliferous; weathers light gray. Bulk density 2.69. Chip sample from beach outcrop, a portion contained weathered surfaces. Mineralogy, thin-section description. 1,000 ft thick; little overburden. Tonnage estimated. Index maps. Possible use: Glass industry, metallurgical, structural products.

782. Port Alexander quadrangle. Permian. [16.9-17.6, 15.6-15.8], Kuiu Island, west side of Saginaw Bay. Analyst, J. G. Fairchild. Lab. No. C630, sample 13. (Buddington, 1926, p. 60, 61; Wells, 1937, p. 47.) Limestone in bluff; typical specimen.

783. [Sagavanirktok quadrangle.] Lisburne [Group]. [7.3-9.5, 0.0-17.6], Sagavanirktok River. Sample 46A Gr77. (Gryc, 1948, p. 1, 2, 4.) Limestone, partially recrystallized.

784, 785. Sitka quadrangle. Paleozoic. [Sec. 29, T. 48 S., R. 66 E.], Admiralty Island. Analyst, R. K. Bailey. Deposit 17. (Wells, 1937, p. 47.) Thin-section description. Index and geologic maps.

784. North of Marble Cove. Record 2952. (Burchard, 1920, p. 15, 52, pls. 1, 2.) [Calcareous dolomite], marble, white, fine-grained.

785. South of Marble Cove. (Burchard, 1920, p. 15, 52, 53, pls. 1, 2.) [Limestone], marble, white.

786, 787. Skagway quadrangle. Paleozoic. [Possibly secs. 27, 34, T. 30 S., R. 59 E.], upper Lynn Canal area, Haines cut-off. Analyst, H. M. Hyman; collector, E. C. Robertson. (Twenhofel, 1953, p.2,12.) Index map.

786. Lab. No. 50ARn-162. Limestone, white, massive.

787. Lab. No. 50ARn-163. Limestone, white, thick beds.

Table 8.—Analyses of samples from Idaho containing more than 90 percent carbonate (Group F_2), common-rock category

[Samples of mixed-rock category indicated by an asterisk (*). Chemical analyses arranged by county and stratigraphic position]

Chemical analyses

	Idaho												
	1	*2	3	4	5	6	7	8	9	10	11	12	13
	11F$_2$4-1	11F$_2$4-98	11F$_2$8-1	11F$_2$9-4	11F$_2$9-2	11F$_2$10-5	11F$_2$10-6	11F$_2$10-4	11F$_2$12-1	11F$_2$12-2	11F$_2$12-3	11F$_2$15-1	11F$_2$16-11
SiO_2	2.55	3.04	------	2.78	3.20	1.7	0.0	1.7	[1]0.02	0.06	0.09	[2]5.98	[3]5.25
Insoluble	------	------	------	------	------	------	.2	------	2.04	[4]1.90	[4]1.34	------	------
Al_2O_3	.43	.66	------	1.00	.80	1.5	.0	.4	.38	.28	.34	------	.66
Fe_2O_3	.44	.28	------		.80		.0			------		[5]1.05	[5].79
MgO	1.35	.84	------	1.13	[6]2.01	[6].72	.0	[6].57	.13	.07	.34	[6].20	[6]2.32
CaO	51.96	51.72	54.44	52.84	[6]49.86	[6]53.22	[6]54.9	[6]54.51	54.78	55.10	54.52	[6]51.84	[6]49.1
Na_2O	------	.12	------	------	------	------	------	------	------	------	------	------	------
K_2O	------	.09	------	------	------	------	------	------	------	------	------	------	------
P_2O_5	------	[6]13.49	------	------	------	------	------	------	------	------	------	------	------
MnO	------	.07	------	------	------	------	------	------	------	------	------	------	------
CO_2	[7]41.08	27.39	------	------	[6]41.33	[6]42.56	[6]44.9	[6]43.42	------	------	------	[6]40.93	[6]41.1
SO_3	------	.46	------	------	------	------	------	------	.03	.10	.10	------	------
Ignition loss	1.80	------	------	42.24	------	------	------	------	42.94	43.14	43.34	------	------
F	------	1.31	------	------	------	------	------	------	------	------	------	------	------
Organic matter	------	[6]2.80	------	------	------	------	------	------	------	------	------	------	------
V	------	.06	------	------	------	------	------	------	------	------	------	------	------
Cr	------	.02	------	------	------	------	------	------	------	------	------	------	------
Subtotal	------	102.35	------	------	------	------	------	------	------	------	------	------	------
Less O	------	[5].55	------	------	------	------	------	------	------	------	------	------	------
Total	99.61	[101.80]	[54.44]	99.99	98.00	[99.7]	100.0	[100.6]	100.32	100.65	100.07	100.00	[99.2]
Class	1,4,93	2,5,63	0,0,97	1,3,95	1,4,93	0,3,96	0,0,100	1,1,98	1,1,97	1,1,98	1,1,98	5,2,93	3,4,93
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

Idaho—Continued

	14	15	16	17	18	19	20	21	22	23	24	25	26
	11F$_2$16-1	11F$_2$16-2	11F$_2$16-3	11F$_2$16-5	11F$_2$16-6	11F$_2$16-4	11F$_2$18-9	11F$_2$18-8	11F$_2$18-1	11F$_2$18-2	11F$_2$18-3	11F$_2$18-4	11F$_2$18-6
SiO_2	[3]1.06	[3]0.50	[3]0.77	[3]1.35	[3]1.63	1.00	1.30	[8].64	1.02	3.8	3.6	0.6	1.2
Al_2O_3	.19	.09	.09	.17	.18	Trace	[9].15	[10].12	------	------	------	------	------
Fe_2O_3	[5].21	[5].14	[5].14	[5].21	[5].14	Trace							
FeO	------	------	------	------	------	------	------	------	------	[6].2	------	------	------
MgO	[6]2.18	[6].66	[6].50	[6]1.75	[6].62	------	.90	3.05	[6].3	[6].4	[6].2	[6].7	[6]3.4
CaO	[6]52.7	[6]54.6	[6]54.6	[6]53.1	[6]53.6	[6]54.45	54.32	51.96	[6]55.4	[6]52.0	[6]53.7	[6]54.0	[6]50.2
CO_2	[6]43.7	[6]43.6	[6]43.4	[6]43.6	[6]42.8	[6]42.75	------	[7]44.08	[6]43.7	[6]41.4	[6]42.3	[6]43.2	[6]43.1
$FeCO_3$	------	------	------	------	------	------	------	------	------	[11](.4)	------	Trace	Trace
Organic matter	------	------	------	------	------	------	------	Trace	------	------	------	------	------
Total	[100.0]	[99.6]	[99.5]	[100.2]	[99.0]	[98.20]	[56.67]	99.85	[100.4]	[97.8]	[99.8]	[98.5]	[97.9]
Class	0,1,99	0,1,99	0,1,98	1,1,98	1,1,97	1,0,97	1,0,98	(0,0)99	1,0,99	4,0,94	4,0,96	1,0,98	1,0,95
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

[1] Soluble silica.

[2] Silica, alumina, water, and loss.

[3] Reported as insoluble (silica).

[4] Insoluble in acid.

[5] Iron oxide.

[6] Calculated from reported $MgCO_3$, $CaCO_3$, $FeCO_3$, P, C, and(or) F.

[7] Reported as calculated.

[8] Insoluble portion contained a trace of titanium oxide. Silica, 0.37 percent (Russell, 1901b, p. 121).

[9] R_2O_3.

[10] Iron, manganese, and aluminum oxides.

[11] Not included in total.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho

1. Bear Lake County. Mississippian, Brazer Limestone. T. 13 S., R. 44 E., town of Montpelier. Analyst, W. C. Wheeler; collector, R. W. Richards. Lab. No. 2794. (Clarke, 1915, p. 239; Mansfield, 1927, p. 2, 331, pls. 1, 9, 12, 19.) Limestone, average sample; represents 20 ft of thick-bedded, broken, and calcite-seamed rock exposed in quarry wall. Index and geologic maps, geologic section, generalized columnar section.

*2. Bear Lake County. Permian, Phosphoria Formation, [Meade Peak Phosphatic Shale Member. T. 9 S., R. 45 E.], near Georgetown. Central Farmers Fertilizer Co. No. S107. (Emigh, 1958, p. 31, 32-34, fig. 1.) General: Phosphorite, 20 ft thick. Mineralogy, thin-section description. Sample: [Phosphatic shale], near top of bed. Index map. *Analysis suggests 32.0 percent phosphate.

3. Boise County. Sec. 31, T. 9 N., R. 3 E., town of Banks. (Hodge, 1944, p. 15, 64, pl. 9.) Limestone, white. Index map.

4. Bonner County. [T. 53 N., R. 1 W.], about 6 miles from town of Bayview, Pend Oreille Lake. International Portland Cement Co. (Shedd, 1913, p. 175, 176.) Limestone. Use: Cement.

5. Bonner County. [T. 57 N., R. 2 W.], near town of Ponderay. Idaho Smelting and Refining Co. Analyst, C. W. Lauer. (Burchard, 1912, p. 663, pl. 1.) Limestone. Index map. Use: Quarried [use not stated].

6. Bonneville County. Mississippian, Madison Limestone. Sec. 12, T. 2 N., R. 43 E., near Pine Creek bridge. (Savage, 1961, p. 19, 76, figs. 3, 9.) General: Limestone, dark-bluish-gray to brown and red, thin-bedded to massive, medium- to coarse-grained, fossiliferous. Geologic map. Correlated columnar sections.

7. Bonneville County. Quaternary. Sec. 9, T. 1 N., R. 43 E., near mouth of Fall Creek, west of Swan Valley. (Savage, 1961, p. 32, 33, 77, figs. 3, 9.) General: Travertine, gray to white, somewhat massive, porous, tabular. Geologic map, correlated columnar sections. Use: Lime.

8. Bonneville County. T. 1 N., R. 45 E., about 4 miles up Palisades Creek. (Savage, 1961, p. 75, figs. 3, 9.) Limestone. Geologic map, correlated columnar sections. Former use: Sugar industry.

9. Butte County. Paleozoic(?). [T. 4 N., R. 26 E.], town of Arco. Utah-Idaho Sugar Co. (Loughlin, 1914, p. 1383, 1384, pl. 7.) Limestone. Index map. Use: Sugar industry, road metal.

10. Butte County. Paleozoic(?). [T. 4 N., R. 26 E., near] Arco. Utah-Idaho Sugar Co. quarry. Analyst, Walter Stimmel. (Burchard, 1912, p. 662, pl. 1; Loughlin, 1914, p. 1383, 1384.) Limestone. Index map. Use: Sugar industry.

11. County, age, locality, and use as in sample 10. (Burchard, 1912, p. 663, pl. 1; Loughlin, 1914, p. 1383, 1384.) Limestone. Index map.

12. Caribou County. (Quaternary) Pleistocene. T. 9 S., R. 41 E., 4.5 miles west of town of Soda Springs, on bank of Bear River. (Fremont, 1845, p. 136; Mansfield, 1927, p. 2, 318, pls. 1, 19; Mansfield, 1929, p. 37, 97.) Travertine. Index and geologic maps, generalized columnar section.

13. Cassia County. Precambrian, [Albion Range Group.] Sec. 31, T. 10 S., R. 25 E., about 3 miles east of town of Declo. Quarry at north end of Albion Range. Analyst, R. V. Lundquist. (Anderson, 1931, p. 6, 154, 155, pls. 18, 19.) Marble, grayish, mottled, coarsely crystalline, thin-bedded; contains some disseminated pyrite and lime silicates; 15 ft exposed in quarry, overburden. Index and geologic maps, geologic sections. Former use: Sugar industry. Possible use: Lime.

14. Cassia County. [Albion Range Group.] Sec. 24, T. 11 S., R. 24 E. Quarry near highway between Albion and Declo. Analyst, R. V. Lundquist. (Anderson, 1931, p. 6, 154, 155, 156, pls. 18, 19.) Marble, grayish, mottled, banded, moderately coarsely crystalline, massive; free of pyrite or other minerals. Large reserves. Index and geologic maps, geologic sections. Former use: Lime. Possible use: Sugar industry, high-calcium lime, monumental and building stone.

Idaho—Continued

15, 16. Cassia County. [Albion Range Group.] Sec. 24, T. 12 S., R. 23 E., about 3.5 miles southeast of town of Hazel. Quarry near mouth of Smith Creek. Analyst, R. V. Lundquist. (Anderson, 1931, p. 6, 154, 155, 156, pls. 18, 19.) General: Marble, grayish, mottled, moderately coarsely crystalline; some layers of pure white marble. Bed about 100 ft thick. Index and geologic maps, geologic sections. Possible use: Sugar industry, lime, monumental stone.

15. Sample: Marble, grayish mottled bands.

16. Sample: Marble, white bands.

17, 18. Cassia County. Analyst, R. V. Lundquist. (Anderson, 1931, p. 6, 30, 33, 153, 154, pls. 18, 19.) Index and geologic maps, geologic sections. Possible use: Cement, high-calcium lime, building stone.

17. Mississippian. Sec. 9, T. 16 S., R. 29 E., southern end of Black Pine Range. Limestone, light-gray, massive; fractured and seamed with calcite.

18. Pennsylvanian, lower part of Wells Formation. [T. 14 S., Rs. 23-24 E.], east of town of Oakley, west slope of Albion Range. Limestone, dark-gray.

19. Cassia County. Paleozoic(?). [T. 10 S., R. 23 E., near] town of Burley. Barrett Lime Co. Analyst, W. H. Tremaine. (Burchard, 1912, p. 663, pl. 1; Loughlin, 1914, p. 1383, 1384, 1387, pl. 7.) Limestone. Index map. Use: Lime.

20. Clearwater County. [Precambrian, Orofino Series. T. 36 N., R. 2 E.], town of Orofino. (Hodge, 1944, p. 15, 72, pl. 10.) Limestone, white, crystalline. Index map.

21. Clearwater County. Orofino Series (Anderson, 1930). [T. 36 N., R. 2 E.], near Orofino. Analyst, W. F. Hillebrand. Lab. No. 1905. (Russell, 1901b, p. 120, 121; Eckel, 1913, p. 135, 136.) Limestone (also called marble), white, coarse-grained, crystalline. Possible use: Portland cement, lime, dimension stone.

22 - 24. Clearwater County. Orofino Series. Analyst, R. V. Lundquist. (Anderson, 1930, p. 9, 55, 56, 57, pls. 5, 7, fig. 1.) General: Limestone (also called marble), white, crystalline, in lenticular beds; ranges from a few feet to as much as 800 ft in thickness. Mineralogy. Index and geologic maps. Use of some Orofino area deposits: Agriculture (poultry grits), chemical agent in explosive manufacture, lime. Possible use: Cement.

22. T. 36 N., R. 2 E., south of Orofino. Clearwater Lime Products Co. quarry. Selected sample.

23. Sec. 16, T. 36 N., R. 2 E., about 2.5 miles south of Orofino, Clearwater Lime Products Co. quarry. Sample: Limestone (also called marble), white, massive, coarsely crystalline; probably 800 ft thick. Possible use: Dimension stone.

24. Sec. 17, T. 36 N., R. 2 E., about 1.5 miles south of Orofino. Clearwater Lime Products Co. quarry. Deposit: Limestone (also called marble), white, crystalline, both fine- and coarse-grained; contains much granitic material as dikes and veins; bed about 200 ft thick. Former use: Agriculture, lime.

25, 26. Clearwater County. Orofino Series. Sec. 3, T. 36 N., R. 3 E., Orofino Creek Canyon. Sewell Lime Co. Analyst, R. V. Lundquist. (Anderson, 1930, p. 9, 55, 58, pls. 5, 7, fig. 1.) General: Limestone (also called marble), mainly white, gray in some places, coarsely crystalline; about 600 ft thick; mineralogy. Index and geologic maps. Possible use: Dimension stone.

25. Sample: Marble, white. Possible use: Cement, chemical industry, lime.

26. Sample: Marble, gray.

Table 8.—Analyses of samples from Idaho containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued											
	27	28	29	30	31	32	33	34	35	36	37	38
	11F$_2$18-5	11F$_2$18-10	11F$_2$19-1	11F$_2$19-2	11F$_2$19-3	11F$_2$19-4	11F$_2$19-6	11F$_2$19-19	11F$_2$19-13	11F$_2$19-7	11F$_2$19-8	11F$_2$19-9
SiO$_2$	0.53	------	------	------	------	------	------	------	------	1.67	2.84	3.92
Inorganic insoluble	------	------	2.93	0.85	1.50	1.73	3.96	------	2.89	------	------	------
Organic insoluble	------	------	.03	.03	.10	.16	.04	------	.19	------	------	------
Al$_2$O$_3$	------	------	------	------	------	------	------	------	------	.30	.18	.72
Fe$_2$O$_3$	------	------	------	------	------	------	------	------	------	.16	.13	.04
FeO	[1].11	------	------	------	------	------	------	------	------	.08	.09	.26
MgO	[1]2.23	------	[1]20.22	[1]21.49	[1]21.06	[1]20.92	[1]20.43	[2]Trace	[1].51	.48	1.03	12.72
CaO	[1]52.86	[1]54.9	[1]30.72	[1]30.52	[1]30.54	[1]30.52	[1]29.82	[1]53.5	[1]53.85	53.71	54.14	42.14
H$_2$O[3]	------	------	------	------	------	------	------	------	------	.49	.41	.47
P$_2$O$_5$	------	------	.02	.03	None	None	None	------	None	------	------	------
CO$_2$	[1]43.92	[1]43.1	[1]46.20	[1]47.42	[1]46.96	[1]46.80	[1]45.71	[1]42.0	[1]42.83	41.89	41.28	38.98
S	------	------	.01	.02	None	None	None	------	None	------	------	------
FeCO$_3$	[4](.17)	------	------	------	------	------	------	------	------	------	------	------
Organic C	------	------	------	[4](.023)	------	------	------	------	------	------	------	------
Total	[99.65]	[98.0]	100.13	100.36	100.16	100.13	99.96	[95.5]	100.27	98.78	100.10	99.25
Class	1,0,99	0,0,98	(3,0)97	(1,0)99	(2,0)98	(2,0)98	(4,0)96	0,0,96	(3,0)97	1,2,95	2,1,93	3,3,85
CaO/MgO	Magnesian calcite	Calcite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcite	Calcite	Calcite	Calcite	Calcareous dolomite

	Idaho—Continued												
	39	40	41	42	43	44	45	46	47	48	49	50	51
	11F$_2$19-15	11F$_2$19-14	11F$_2$19-20	11F$_2$25-1	11F$_2$25-3	11F$_2$25-2	11F$_2$28-3	11F$_2$28-5	11F$_2$28-6	11F$_2$28-2	11F$_2$28-4	11F$_2$30-1	11F$_2$31-2
SiO$_2$	[5]0.05	------	1.38	1.0	0.8	2.8	[6]0.8	[6]2.3	[6]2.2	[6]5.1	[6]2.4	------	2.25
Insoluble	[7]2.18	[7]2.47	------	------	------	------	------	------	------	------	------	0.99	------
Al$_2$O$_3$ Fe$_2$O$_3$	.00	------	1.01	------	------	------	[3]None	[8].2	[8]Trace	[8]Trace	[3]None	------	.70
FeO	------	------	------	------	------	[1].2	------	------	------	------	------	------	.38
MgO	1.43	1.63	[1].65	[1].3	[1].4	[1].4	[1]2.8	[1]18.0	[1]20.8	[1]16.5	[1]2.7	.79	1.71
CaO	52.90	51.78	[1]53.79	[1]54.4	[1]54.4	[1]53.1	[1]52.2	[1]33.6	[1]31.4	[1]33.9	[1]51.7	53.40	53.45
CO$_2$	43.31	43.24	[1]42.93	[1]43.0	[1]43.1	[1]42.1	[1]44.0	[1]46.1	[1]47.3	[1]44.7	[1]43.5	43.35	[9]41.56
SO$_3$	.12	------	------	------	------	------	------	------	------	------	------	------	------
FeCO$_3$	------	------	------	Trace	Trace	[4](.4)	------	------	------	------	------	------	------
Total	99.99	99.12	99.76	[98.7]	[98.7]	[98.6]	99.8	100.2	101.7	100.2	100.3	[10]98.53	[11]100.05
Class	2,0,98	(2,0)97	0,2,97	1,0,98	1,0,98	3,0,96	(1,0)99	(2,1)97	(2,0)99	(5,0)95	(2,0)98	(1,0)98	1,3,93
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcareous dolomite	Dolomite	Calcareous dolomite	Magnesian calcite	Calcite	Calcite

[1] Calculated from reported MgCO$_3$, CaCO$_3$ and(or) FeCO$_3$.

[2] Reported as Mg.

[3] Loss on ignition less CO$_2$ (Umpleby, 1914, p. 344).

[4] Not included in total.

[5] Soluble silica.

[6] Reported as silica, mica, clay, and so forth.

[7] Dried at 118°C.

[8] Reported as iron oxides and alumina.

[9] Reported as ignition loss.

[10] 99.47 percent in text.

[11] H$_2$O- = 0.06 percent; not included in total.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

27. Clearwater County. Precambrian, Orofino Series. Sec. 3, T. 36 N., R. 3 E., Orofino Creek Canyon. Sewell Lime Co. Analyst, R. V. Lundquist. (Anderson, 1930, p. 9, 55, 58, pls. 5, 7, fig. 1.) General: Limestone (also called marble), mainly white, gray in some places, coarsely crystalline; about 600 ft thick; mineralogy. Index and geologic maps. Possible use: Dimension stone.

28. Clearwater County. Orofino Series (Anderson, 1930). Sec. 3, T. 36 N., R. 3 E., about 11 miles east of town of Orofino. Sewell Lime Co. (Hodge, 1944, p. 75.) Limestone, 100 ft bed.

29. Custer County. Ordovician, Kinnikinic Quartzite. [T. 9 N., R. 23 E.], Upper West Fork of Pahsimeroi River. Analyst, R. C. Wells. Analysis NC 61. (Ross, 1947, p. 1089, 1103, 1118, pl. 1.) Dolomite, dark. Index and geologic maps, geologic sections.

30. Custer County. Ordovician, Saturday Mountain Formation. Sec. 36, T. 13 N., R. 22 E., small butte 1.5 miles east northeast of Mahogany Hill. Analyst, R. C. Wells. Analysis NC 71. (Ross, 1947, p. 1089, 1104, 1105, 1118, pls. 1, 12.) General: Dolomite, dull, dark-bluish-gray, almost black; 700 ft exposed. Sample: Typical. Index and geologic maps, geologic sections. Photomicrograph.

31. Custer County. Silurian, Laketown Dolomite. [T. 10 N., R. 23 E.], Rock Creek, tributary to West Fork of Pahsimeroi River. Analyst, R. C. Wells. Analysis NC 58. (Ross, 1947, p. 1089, 1105, 1106, 1118, pls. 1, 12.) General: Dolomite, light-bluish-gray, bedded; more than 600 ft thick. Index and geologic maps, geologic sections. Photomicrograph of Laketown Dolomite.

32. Custer County. Late Devonian, Jefferson Dolomite. [T. 9 N., R. 22 E.], west side of Borah Peak. Analyst, R. C. Wells. Analysis NC 21. (Ross, 1947, p. 1089, 1107, 1108, 1118, pls. 1, 12.) General: Dolomite, dark-bluish-gray, fossiliferous. Sample: Dolomite, dark. Index and geologic maps, geologic sections, detailed measured sections. Photomicrographs.

33. Custer County. Late Devonian, Grand View Dolomite. [Possibly T. 14 N., R. 24 E.], Station 545, Mill Creek, near confluence with Grouse Creek. Analyst, R. C. Wells. Analysis NC 70. (Ross, 1947, p. 1089, 1109, 1110, 1118, pls. 1, 13.) General: Dolomite, moderately dark, bedded; weathers rusty. Index and geologic maps, geologic sections, detailed measured section. Photomicrograph.

34. Custer County. Mississippian, Brazer Limestone. T. 6 N., R. 22 E., 12 miles west of town of Mackay, near Cabin Creek. Analyst, J. A. Thomas. Sample and Lab. No. Se-7. (Skipp, 1961, p. 377-381, 386, 387.) Unit description: Limestone, dark-gray to medium-gray, fine- to medium-grained, thin- to thick-bedded, fossiliferous; weathers medium gray to light gray; contains sandstone lens; 495 ft thick. Sample description: Limestone, calcarenitic; fossil and lithic fragments cemented by fine-grained calcareous mud matrix which comprises about 50 percent of rock. Thin-section diagram. Index and geologic map, columnar section, detailed measured section.

35. Custer County. Brazer Limestone. [T. 12 N., R. 22 E.], Station 549, mouth of Rock Springs Canyon. Analyst, R. C. Wells. Analysis NC 74. (Ross, 1947, p. 1089, 1095, 1114-1116, 1118, pls. 1, 3, 13, figs. 2, 5.) General: Limestone, dark-bluish-gray, bedded, fossiliferous; contains chert. Index and geologic maps, geologic sections, detailed measured section. Photomicrograph of Brazer Limestone.

36 - 38. Custer County. Mississippian. [T. 6 N., R. 23 E.], near Mackay. Alder Creek Mining district. Empire mine. Analyst, W. C. Wheeler. Lab. No. 2851. (Umpleby, 1914, p. 308-310, 313, 314, 326, 329, 344-346; Umpleby, 1917, p. 12, 59, 70, 71, 93, 95, pls. 1, 7.) General: Limestone, blue, massive and semimassive; chert in lower members. Porosity. Index and geologic maps, geologic sections.

36. Sample: Limestone, blue-gray. Bulk density 2.728.

37. Sample: Limestone, blue-gray. Bulk density 2.749.

Idaho—Continued

38. Sample: Limestone, blue-gray. Bulk density 2.810.

39, 40. Custer County. Possibly Oligocene part of Challis Volcanics. Sec. 27, T. 13 N., R. 19 E. Analyst, J. G. Fairchild. Analysts of insoluble constituents, J. G. Fairchild and L. T. Richardson. Lab. No. D-93. (Ross, 1937, p. 3, 63, 64, 68, pl. 1.) General: Travertine, commonly yellowish-white, much brown stain; beds several inches to over a foot thick; total thickness more than 100 ft. Index and geologic maps, geologic sections. Possible use: Cement, lime, sugar refining, ornamental stone.

39. Analysis of travertine. The approximate analysis of insoluble constituents; amounts in percent: SiO_2 = 67, Al_2O_3 = 9, Fe_2O_3 = 6, MgO+CaO = 3, Na_2O+K_2O = 5, water and organic matter = 10, total = 100. Insoluble matter is in part clay containing less than 5 percent organic matter.

40. Analysis of travertine. The approximate analysis of insoluble constituents; amounts in percent: SiO_2 = 60, Al_2O_3 = 11, Fe_2O_3 = 3, MgO+CaO = 0, Na_2O+K_2O = 1, water and organic matter = 23, total = 98 [100 in text]. Insoluble matter is in part clay containing less than 5 percent organic matter.

41. Custer County. [T. 7 N., R. 24 E.], about 3 miles south of Mackay. Near mouth of Albert Tunnel. Analyst, J. F. Kemp. Sample 96. (Kemp, 1907, p. 6; Kemp and Gunther, 1908, p. 269-271, 273, 275, 276, 277.) [Limestone] marble, white, crystalline. Index and geologic maps, geologic sections.

42. Idaho County. Triassic. [T. 25 N., R. 1 E.], near town of Lucile, Salmon River Canyon. Analyst, R. V. Lundquist. (Anderson, 1930, p. 55, 59, fig. 1.) General: Limestone (marble), dark-bluish-gray, mottled, streaked or banded; some white layers; coarsely crystalline; 60-200 ft thick. Index map. Possible use: Portland cement, chemical industry, lime. Former use: Lime.

43, 44. Idaho County. Triassic. T. 30 N., R. 4 E., about 4 miles southeast of town of Harpster. McComas ranch. Analyst, R. V. Lundquist. (Anderson, 1930, p. 55, 59, pl. 7, fig. 1.) General: Limestone (marble), dark-bluish-gray, mottled, streaked or banded; some white layers; coarsely crystalline; 60-200 ft thick. Index and geologic maps. Possible use: Portland cement, chemical industry. Former use: Lime.

45-49. Kootenai County. Cambrian. [Sec. 34, T. 54 N., R. 2 W.], town of Bayview, southwest shore of Pend Oreille Lake. Washington Brick, Lime, and Sewer Pipe Co. Analyst, T. R. Ernst. (Loughlin, 1914, p. 1381, 1382, pl. 7; Hodge, 1938d, p. 133, 142, 143.) Deposit: Limestone, white, coarse-grained, crystalline; contains evenly disseminated specks of pyrite. Mineralogy. Index maps.

45. Use: Lime.

46. [Dolomite.]

47. [Dolomite.]

48. [Dolomite], blue.

49. Old quarry. Limestone. Use: Lime.

50. Lemhi County. Precambrian, Yellowjacket Formation(Ross, 1934, p. 16). [T. 19 N., R. 16 E.], near town of Yellowjacket. Yellowjacket mine. Analyst, J. J. Fahey; collector: C. P. Ross. Lab. No. D-259. (Wells, 1937, p. 52, 53.) Carbonate rock.

51. Lewis County. Jurassic. Secs. 15, 22, T. 34 N., R. 3 W., near town of Sweetwater, Mission Creek deposit. (Hodge, 1938d, p. 133, 145, 146; Hodge, 1944, p. 71, 72.) Deposit: Limestone, slate-colored, crystalline; contains few quartz seams, some iron stain, traces of coral; at least 300 ft thick. Sample: Limestone taken across 65-ft bed. Tonnage estimated. Index map. Former use: Flux, lime.

Table 8.—Analyses of samples from Idaho containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	52	53	54	55	56	57	58	59	60	61	62	63	64
	11$F_2$31-4	11$F_2$31-3	11$F_2$35-10	11$F_2$35-1	11$F_2$35-28	11$F_2$35-33	11$F_2$35-29	11$F_2$35-32	11$F_2$35-30	11$F_2$35-27	11$F_2$35-25	11$F_2$35-24	11$F_2$35-23
SiO_2	1.50	1.08	6.68	------	[1]1.1	[1]5.0	[1]2.5	[1]4.8	[1]2.6	[1]0.9	[1]0.7	[1]0.7	[1]0.5
Insoluble	------	[2].11	------	------									
Al_2O_3	[3].75	[4].19	.12	------	------	1.8	.7	.8	.6	Trace	.1	.1	Trace
Fe_2O_3			[5].60	------	.7				.4	.4	.3	.3	.5
MgO	.75	.51	.02	21.65	.1	.4	1.0	2.3	.7	.5	.2	.1	.6
CaO	53.45	54.75	52.29	30.88	54.5	52.0	53.4	50.3	53.3	55.1	55.5	55.0	55.0
P_2O_5	------	------	------	------	.04	------	------	------	------	------	------	------	------
Ignition loss	------	[6]43.50	39.48	46.10	[7]43.0	[7]39.7	[7]41.6	[7]41.2	[8]41.8	[8]40.2	[8]43.5	[8]43.1	[8]43.2
Organic matter	------	Trace	------	------	------	------	------	------	------	------	------	------	------
Total	[56.45]	100.14	[9]99.19	[98.63]	[99.4]	[98.9]	[99.2]	[99.4]	[99.4]	[97.1]	[100.3]	[99.3]	[99.8]
Class	0,2,97	1,1,98	6,2,89	0,0,97	0,2,97	2,5,89	0,3,94	3,2,92	1,3,95	0,1,91	0,1,99	0,1,98	0,1,98
CaO/MgO	Calcite	Calcite	Calcite	Dolomite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Idaho—Continued											
	65	66	67	68	69	70	71	72	73	74	75	76
	11$F_2$35-26	11$F_2$35-2	11$F_2$35-4	11$F_2$35-11	11$F_2$35-5	11$F_2$35-3	11$F_2$35-12	11$F_2$35-13	11$F_2$35-14	11$F_2$35-9	11$F_2$36-1	11$F_2$36-2
SiO_2	[1]0.8	0.48	0.34	0.39	0.12	0.66	------	Nil	0.24	0.35	1.78	1.74
Insoluble		------	------		------	------	------	0.58	------	------	------	------
Al_2O_3	Trace	.48	.18	[4].10	.20	.54	1.43	[3].21	[3].22	.27	.30	.70
Fe_2O_3	.5	Trace	Trace				------			Trace		
MgO	.2	.17	.43	.10	.25	.23	[10].10	Nil	------	[10]3.88	[10]1.85	[10].28
CaO	54.5	55.52	55.72	55.34	55.71	54.91	[10]55.38	55.75	53.30	[10]50.81	[10]52.41	[10]54.54
Na_2O+K_2O	------	[11].28	[11].13	------	------	------	------	------	------	------	------	------
H_2O	------	Trace	Trace	------	------	------	------	------	------	------	.08	------
CO_2	[8]42.7	43.07	43.20	[6]43.59	[10]44.04	[10]43.39	[10]43.57	[12]43.40	[12]43.10	[10]44.13	[10]43.18	[10]43.12
Total	[98.7]	100.00	100.00	99.52	[100.32]	99.73	100.48	99.94	96.86	99.44	[99.60]	100.38
Class	0,1,97	0,1,98	0,1,98	0,0,99	0,0,100	0,1,99	0,0,99	(0,1)99	0,2,95	0,1,99	1,1,97	1,2,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite

[1] Acid insoluble, chiefly SiO_2.

[2] Includes TiO_2, trace.

[3] R_2O_3.

[4] Iron, manganese, and aluminum oxides.

[5] Includes FeO.

[6] CO_2, reported as calculated.

[7] Ignition loss, chiefly CO_2.

[8] CO_2, calculated from reported $CaCO_3$ and MgO.

[9] H_2O-, 0.04 percent, not included in total.

[10] Calculated from reported $MgCO_3$ and $CaCO_3$.

[11] Alkalies and undetermined.

[12] Ignition loss.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

52. Lewis County. Jurassic. Secs. 15, 22, T. 34 N., R. 3 W., Mission Creek. (Hodge, 1944, p. 15, 71, pl. 10.) Limestone, blue-gray. Tonnage estimated. Index maps. Use: Flux, lime.

53. Lewis County. Probably Jurassic. [T. 34 N., R. 3 W.], right bank of Mission Creek, in canyon in Craig Mountain uplift. Analyst, W. F. Hillebrand. Lab. No. 1905. (Russell, 1901b, p. 120, 121; Hodge, 1938d, p. 133, 144.) General: Limestone, grayish-blue, hard, few fossils. Index map. Former use: Lime. Possible use: Sugar industry, cement rock.

54. Nez Perce County. Precambrian, Belt [Supergroup]. Sec. 21, T. 34 N., R. 3 W., 2.5 miles south of St. Joseph Mission at Slickpoo. Mill Creek deposit. (Hodge, 1938d, p. 133, 148, 149; Hubbard, 1956b, p. 10, 11, figs. 1, 2.) Deposit: Limestone, gray to white or brown; for most part coarsely crystalline. Average exposed thickness 200 ft. Tonnage estimated. Index and geologic maps. Possible use: Lime.

55. Nez Perce County. Belt [Supergroup]. NE¼ sec. 22, T. 37 N., R. 2 W. Bedrock Creek deposit quarry, Idaho Lime and Marble Co. (Hubbard, 1956b, p. 11, 12, fig. 2.) [Dolomite] dolomitic limestone, fractured, recrystallized; in two beds, one bed 85 ft thick. Tonnage estimated. Geologic map. Possible use: Cement, lime.

56. Nez Perce County. Late Triassic, Martin Bridge Formation. T. 32 N., R. 5 W., Lime Point area. Sample 5Bm or T-140. (Savage, 1965, p. 18a, 18b, 18c, 19, 20, pls. 1, 2, fig. 1.) Limestone, composite sample. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Aggregate, ballast, portland cement, flux, lime.

57-64. Nez Perce County. Martin Bridge Formation. NW¼ sec. 34, T. 32 N., R. 5 W., Lime Point. (Savage, 1965, p. 18a, 18b, 19, 20, pls. 1, 2, fig. 1.) Tonnage estimated. Index and geologic maps, geologic section. Possible use: Aggregate, ballast, portland cement, flux, lime.

57. Analyst, George Hsu. Sample 1Cm2 or S. L. 164. Sample: Limestone, composite sample.

58. Analyst, Huey-rong Hsi. Sample 2Gm2. Limestone, average of eight samples.

59. Analyst, Huey-rong Hsi. Sample 2Im. Limestone.

60. Sample 2Em; Lot No. 6. Limestone.

61. Sample 2Dm; Lot No. 5. Limestone.

62. Sample 2Cm; Lot No. 4. Limestone.

63. Sample 2Am2; Lot No. 2. Limestone, surface sample.

64. Sample 1Am2; Lot No. 1. Limestone, composite sample.

65. Nez Perce County. Martin Bridge Formation. [Probably] NW¼ sec. 34, T. 32 N., R. 5 W., general vicinity of Lime Point ridge. Sample 2Bm; Lot No. 3. (Savage, 1965, p. 18a, 18b, 19, 20, pls. 1, 2, fig. 1.) Limestone. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Aggregate, ballast, portland cement, flux, lime.

66, 67. Nez Perce County. Martin Bridge Formation. NW¼ sec. 34, T. 32 N., R. 5 W., Snake River Canyon, 1 to 3 miles above mouth of Grande Ronde River. Lime Point deposit, Idaho Portland Cement Co. Analyst, A. B. Lort. Collector, H. S. Gale. Test No. 11359. (Eckel, 1913, p. 137, 138; Loughlin, 1914, p. 1382, 1383, pl. 7; Hubbard, 1956b, p. 12, 13, fig. 2; Savage, 1965, p. 18a, 18b, 19, 20, pls. 1, 2, fig. 1.) Limestone, gray to white, massive. Tonnage estimated. Index and geologic maps, geologic section. Use: Portland cement. Possible use: Aggregate, ballast, flux, sugar industry, lime.

66. Lab. No. 3743. Sample: Represents large body of massive limestone; average of 121 samples chipped at approximately uniform intervals throughout tunnel of 100 ft.

67. Lab. No. 3744. Sample No. 2Fm. Average of about 30 samples from outcrop; represents about 50 ft in thickness.

68. Nez Perce County. Late Triassic (Savage, 1965, p. 8a). [Ts. 31, 32, N., R. 5 W.], 1 to 3 miles above mouth of Grande Ronde River and about 8 miles farther upstream, Snake River Canyon. Analyst, George Steiger. (Russell, 1901a, p. 28, pls. 1, 2; Russell, 1901b, p. 120, 121.) Limestone. Index and geologic maps. Possible use: Portland cement, sugar industry, building stone.

69. Nez Perce County. Late Triassic (Savage, 1965, p. 8a). [T. 31 N., R. 5 W.], Lime Point. Analyst, H. C. Johansen. (Shedd, 1913, p. 117, 119.) Limestone, dark-gray, fine-grained, carbonaceous. Use: Cement material [implied].

70. Nez Perce County. Probably Triassic. [T. 31 N., R. 5 W.], Lime Point. Analyst, Elton Fulmer. (Shedd, 1913, p. 117, 119; Mills, 1962, p. 239-241, 243.) General: Limestone, dark-gray to gray, cryptocrystalline to fine-grained; beds 1/16 in. - 4 ft; most units siliceous and (or) argillaceous; carbonaceous, some calcite. Tonnage estimated. Index and geologic map. Possible use: Cement material.

71. Nez Perce County. [Near] Taplin. West Coast Portland Cement Co. Analysts, W. F. Hillebrand, George Steiger. (Burchard, 1912, p. 663.) Limestone. Use: Quarried [use not given].

72, 73. Nez Perce County. T. 35 N., R. 3 W., 6.7 miles south of Jacques Spur on the Camas Prairie Railroad in Lapwai Indian Reservation. Lewiston Lime Co. quarry. (Hodge, 1944, p. 15, 71, pl. 10; Libbey, 1957, p. 30, 34, 35.) Limestone. Tonnage estimated. Index maps. Use: Pulp and paper industry, sugar industry, flux.

72. Analyst, C. F. Zeuch.

73. Analyst, C. R. Cramer.

74. Nez Perce County. [T. 36 N., R. 2 E., near] town of Orofino. Clearwater Lime Co. (Burchard, 1912, p. 663, pl. 1.) Limestone. Index map. Use: Quarried [use not given].

75. Oneida County. Paleozoic(?). [T. 16 S., R. 37 E., near] town of Franklin. Amalgamated Sugar Co. (Burchard, 1912, p. 663, pl. 1; Loughlin, 1914, p. 1383, 1384.) Limestone. Index map. Use: Sugar industry [implied].

76. Oneida County. [T. 16 S., R. 37 E., near] Franklin. Le Roy Quarry Co. (Burchard, 1912, p. 663, pl. 1.) Limestone. Index map. Use: Quarried [use not given].

Table 9.—Analyses of samples from Oregon containing more than 90 percent carbonate (Group F_2), common-rock category

[Chemical analyses arranged by county and stratigraphic position]

Chemical analyses

	Oregon											
	1	2	3	4	5	6	7	8	9	10	11	12
	$36F_21$-10		$36F_21$-11	$36F_21$-7	$36F_21$-45	$36F_21$-13	$36F_21$-1	$36F_21$-2	$36F_21$-3	$36F_21$-15	$36F_21$-17	$36F_21$-35
SiO_2	3.72	4.20	0.53	1.60	0.384	0.96	0.04	0.06	0.12	[1]None	1.13	1.99
Al_2O_3	.40	.21	.39	.24	[2].106	.19	.18	.18	.10	None	.43	[3].47
Fe_2O_3	.41	.29	.97			.45	.32	.31	.28	[1]None		
FeO	------	------			------		------	------	------	None	------	------
MgO	.04	.23	.09	.36	.178	.23	.84	1.24	3.04	0.52	.75	1.03
CaO	53.94	53.38	55.39	54.67	55.0	55.24	54.72	54.57	52.64	55.65	54.79	54.07
Na_2O	------	------	------	------	------	------	.30	------	------	Trace	------	------
K_2O	------	------	------	------	------	------				Trace	------	------
P_2O_5	.04	------	------	------	[4].02	------	.032	.006	.009	None	------	------
CO_2	41.24	41.78	------	------	------	------	43.80	43.61	43.95	43.93	------	------
SO_3	------	.02	------	------	------	------	------	------	------	------	------	------
S	.01	------	------	------	------	------	.017	.011	.018	------	------	------
SrO	------	------	------	------	------	------	------	------	------	[5]None	------	------
Ignition loss	------	------	42.31	------	------	42.20	------	------	------	------	43.04	42.88
Total	99.80	100.11	[99.68]	[56.87]	[55.7]	99.27	[100.25]	[99.99]	[100.16][6]	[100.10]	[100.14]	100.44
Class	3,2,94	------	0,1,96	1,1,98	0,0,99	0,2,96	0,0,99	0,0,99	0,0,99	0,0,100	0,1,97	1,1,97
CaO/MgO	Calcite	------	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite

Oregon—Continued

	13	14	15	16	17	18	19	20	21	22	23	24
	$36F_21$-22		$36F_21$-41		$36F_21$-42		$36F_21$-59		$36F_21$-19		$36F_21$-39	
SiO_2	1.27	2.64	3.75	4.34	5.85	6.56	4.82	5.16	1.09	2.46	0.41	0.66
Al_2O_3	2.58	.76	1.79	1.55	2.35	2.40	1.00	.78	2.44	.23	.29	.10
Fe_2O_3	.52	.24	.37	.39	.73	.58	.72	.44	.37	.39	.57	.68
MgO	6.10	6.09	6.44	6.58	13.18	13.33	2.40	2.43	.26	.34	1.31	1.37
CaO	46.73	47.32	44.50	45.20	35.58	35.50	49.91	49.88	53.36	53.88	54.04	53.96
P_2O_5	.01	------	------	------	------	------	.01	------	------	------	------	------
CO_2	43.05	------	41.80	------	41.91	------	40.59	------	42.08	------	43.16	------
S	.01	.02	------	.03	------	.02	.02	.01	------	.02	------	.02
Ignition loss	------	43.37	------	42.18	------	42.13	------	41.51	------	42.77	------	43.61
Total	100.27	100.44	98.65	100.27	99.60	100.52	99.47	100.21	99.60	100.09	[99.78]	[100.40]
Class	0,2,96	------	0,6,93	------	1,8,90	------	2,5,91	------	0,2,96	------	0,1,98	------
CaO/MgO	Magnesian calcite	------	Magnesian calcite	------	Calcareous dolomite	------	Magnesian calcite	------	Calcite	------	Calcite	------

Oregon—Continued

	25	26	27	28	29	30	31	32	33	34	35	36
	$36F_21$-23	$36F_21$-33	$36F_21$-36	$36F_21$-26	$36F_21$-31	$36F_21$-25	$36F_21$-27	$36F_21$-28	$36F_21$-24		$36F_21$-30	
SiO_2	0.94	1.76	2.53	1.07	1.55	1.05	1.22	1.33	1.04	1.56	1.45	2.30
Al_2O_3	[2].42	[2]1.03	[2]1.05	[2].46	[2].50	[2].54	[2].47	[2].71	.68	.45	1.18	.77
Fe_2O_3									.45	.29	.52	.39
MgO	.55	.75	.44	.72	.66	.72	1.28	.64	.35	.63	.60	.67
CaO	55.03	54.25	53.33	54.70	54.74	54.73	54.18	54.94	54.50	54.16	53.36	53.56
P_2O_5	------	------	------	------	------	------	------	------	.016	------	.028	------
CO_2	------	------	------	------	------	------	------	------	42.15	------	42.39	------
S	------	------	------	------	------	------	------	------	.008	.01	.013	None
Ignition loss	43.12	42.78	42.07	43.91	42.67	43.10	42.89	43.08	------	43.01	------	42.46
Total	100.06	100.57	99.42	[7]100.86	100.12	100.14	100.04	100.70	99.19	100.11	99.54	100.15
Class	0,1,98	0,3,96	1,3,95	0,1,99	1,1,96	0,2,97	0,1,97	0,2,97	0,2,96	------	0,3,96	------
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	------	Calcite	------

[1] Reported as trace (Wells, 1937, p. 59).

[2] R_2O_3.

[3] Reported as R_2O_3 (Al_2O_3, Fe_2O_3, and so forth).

[4] Calculated from reported P.

[5] Mere traces not determined (Wells, 1937, p. 59).

[6] TiO_2, Li_2O, FeS_2, H_2O, organic, none; MnO, trace.

[7] Reported in text as 99.96 percent.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon

1, 2. Baker County. Probably pre-Carboniferous, limestone in Burnt River Schist. T. 12 S., R. 41 E., southwest of town of Durkee, on Burnt River. (Hodge, 1938d, p. 154, 199, 236, 237, 243, 244, 245.) Limestone, less than 200 ft thick. Tonnage estimated. Index and geologic maps.

1. USED sample 20; sample 1. Analysis used in computations.

2. Sample 2. [Apparently aliquot analysis.]

3. Baker County. Probably pre-Carboniferous, limestone in Burnt River Schist. NW¼ sec. 12, T. 12 S., R. 42 E., southwest of Durkee. USED sample 260B. (Hodge, 1938d, p. 154, 199, 236, 237, 244, 245.) Limestone, chip sample. Tonnage estimated. Index and geologic maps.

4. Baker County. Probably pre-Carboniferous, limestone in Burnt River Schist. Sec. 11, T. 12 S., R. 43 E., 3.75 miles south of Durkee. Nelson deposit. (Hodge, 1938d, p. 154, 199, 236-238, 240.) General for deposit: Limestone, interbedded with chert and argillite; beds 600-700 ft thick. Index and geologic maps.

5. Baker County. Early Permian to Late Triassic, Elkhorn Ridge Argillite. Sec. 14, T. 9 S., R. 38 E., about 8 miles west of Wingville. (Libbey, 1957, p. 37, 41, 42.) Limestone, average analysis of 180 drill samples; at least 325 ft thick. Tonnage estimated. Index map. Possible use: Chemical grade lime.

6. Baker County. Permian to Late Triassic, limestone in Clover Creek Greenstone. NW¼ sec. 18, T. 7 S., R. 42 E., Table Mountain deposit. (Hodge, 1938d, p. 154, 199, 250, 255, 256, 257.) General: Limestone, blue-gray, fine-grained, massive. Tonnage estimated. Index and geologic maps.

7-9. Baker County. Triassic. Parts of secs. 27-29, 32-34, T. 11 S., R. 45 E., about 20 miles north of town of Huntington, at head of Connor and Fox Creeks. (Hodge, 1938d, p. 154, 221, 222, 227, 229, 231; Libbey, 1957, p. 37, 38, 42-44.) General: Limestone (marble), gray to white, massive, fine-grained, crystalline. Tonnage estimated. Index and geologic maps. Former use: Building stone. Possible use: Agricultural [implied], portland cement.

7. USED sample 28. Sample from interior of boulder.

8. USED sample 26.

9. USED sample 27.

10. Baker County. Triassic. Sec. 28, T. 11 S., R. 45 E., on Fox Creek. Analyst, J. G. Fairchild; collectors, R. W. Richards, B. N. Moore. Lab. No. D-63. (Moore, 1937, p. 136, 139, pls. 1, 14; Wells, 1937, p. 58, 59.) Limestone. Bulk density 2.68. Tonnage estimated. Index and geologic maps. Use: Dimension stone.

11. Baker County. [Probably Triassic. T. 13 S., R. 44 W.], town of Lime, 5 miles northwest of Huntington. Oregon Portland Cement Co. (Hodge, 1935a, p.114, 115, pl.25.) Limestone, average analysis. Tonnage estimated. Use: Portland cement, lime. Possible use: Flux.

12. Baker County. Triassic. T. 13 S., R. 44 E., Lime, on Burnt River about 5 miles above Huntington. Oregon Portland Cement Co. quarry. Analyst, Lugnet. (Moore, 1937, p. 142-144, pls. 1, 15.) General: Limestone; bluish gray or white when fresh; light gray when weathered; recrystallized; possibly contains some fossils. Index and geologic maps. Use: Cement material.

13, 14. Baker County. Probably Triassic. [T. 13 S., R. 44 E.], 0.5 mile south of Windy Point. (Hodge, 1938d, p. 154, 199, 201, 206, 210, 211, 213, 215.) General for Lime area: Limestone, bluish-gray, dense, massive; weathers nearly white; beds range from 2 to 20 ft in thickness; limestone 1,000-1,500 ft thick; overburden thin. Index and geologic maps.

13. Analysts, G. C. Ware, Kenneth McCleod. USED sample 12. Analysis used in computations.

14. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

15-18. Baker County. Probably Triassic. [T. 13 S., R. 44 E.], highway cut at Windy Point. (Hodge, 1938d, p. 154, 199, 201, 206, 209-211, 213, 215.) General: Magnesian limestone, bluish-gray, dense, massive; weathers nearly white; beds range from 2 to 20 ft in thickness; limestone 1,000-1,500 ft thick; overburden thin. Index and geologic maps.

15. Analysts, G. C. Ware, Kenneth McCleod. USED sample 1. Analysis used in computations.

16. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

17. Analysts, G. C. Ware, Kenneth McCleod. USED sample 2. Calcareous dolomite. Analysis used in computations.

18. Analyst, M. J. O'Dell. Calcareous dolomite. [Apparently aliquot analysis.]

19, 20. Baker County. Probably Triassic. SW¼ sec. 26, T. 13 S., R. 44 E., north of Marble Canyon. (Hodge, 1938d, p. 154, 199, 201, 206, 209, 213, 215.) General: Limestone, bluish-gray, dense, massive; weathers nearly white. Some limestone recrystallized to sugary, nearly white marble. Index and geologic maps.

19. Analysts, G. C. Ware, Kenneth McCleod. USED sample 17. Analysis used in computations.

20. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

21, 22. Baker County. Probably Triassic. [Possibly secs. 26, 35, T. 13 S., R. 44 E.], near Lime. East of quarry of Oregon Portland Cement Co. (Hodge, 1938d, p. 154, 199, 201, 206, 210, 211, 213, 215, 219.) General: Limestone, bluish-gray, dense, massive; weathers nearly white; beds range from 2 to 20 ft in thickness; thickness of limestone 1,000-1,500 ft; overburden thin. Tonnage estimated. Index and geologic maps.

21. Analysts, G. C. Ware, Kenneth McCleod. USED sample 11. Analysis used in computations.

22. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

23, 24. Baker County. Probably Triassic. Sec. 27, T. 13 S., R. 44 E., near Lime. Oregon Portland Cement Co. (Hodge, 1938d, p. 154, 199, 201, 206, 210, 213, 215, 219.) General: Limestone, bluish-gray, dense, massive; weathers nearly white; beds range from 2 to 20 ft in thickness; thickness of limestone 1,000-1,500 ft; overburden thin. Sample: Druse of nearly pure calcite, lining cavity. Tonnage estimated. Index and geologic maps.

23. Analysts, G. C. Ware, Kenneth McCleod. USED sample 6. Analysis used in computations.

24. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

25-36. Baker County. Probably Triassic. S½SE¼ sec. 27 and N½NE¼ sec. 34, T. 13 S., R. 44 E., Lime. Oregon Portland Cement Co. quarry. (Hodge, 1938d, p. 154, 199, 201, 206, 209-212, 214, 219.) General: Limestone and magnesian limestone, bluish-gray, dense, massive; weathers nearly white; beds range from 2 to 20 ft in thickness; thickness of limestone 1,000-1,500 ft; overburden thin. Tonnage estimated. Index and geologic maps. Use: Portland cement [implied].

28. Sample: Average of seven analyses for 1928.

29. Sample: Average of eleven analyses for 1930.

30. Sample: Average of eight analyses for 1931.

31. Sample: Average of four analyses for 1932.

32. Sample: Average of six analyses for 1935.

33. Analysts, G. C. Ware, Kenneth McCleod. USED sample 16. Analysis used in computations.

34. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

35. Analysts, G. C. Ware, Kenneth McCleod. USED sample 29. Analysis used in computations.

36. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

Table 9.—Analyses of samples from Oregon containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Oregon—Continued

	37	38	39	40	41	42	43	44	45	46	47	48	49
	36$F_2$1-32		36$F_2$1-34		36$F_2$1-37		36$F_2$1-38		36$F_2$1-55		36$F_2$1-40		36$F_2$1-20
SiO_2	1.64	2.66	1.86	2.18	2.87	3.04	4.74	5.02	0.83	1.28	1.95	2.58	2.04
Al_2O_3	1.39	.91	.94	.34	1.22	1.09	2.22	.63	1.08	.54	3.50	1.40	1.11
Fe_2O_3	.65	.19	.45	.36	.66	.39	.74	1.23	.46	.20	.38	.44	.64
MgO	.61	.70	.28	.45	.45	.68	.79	1.12	1.26	1.44	13.17	13.18	2.59
CaO	53.38	53.34	54.11	53.98	53.07	52.80	50.89	50.82	54.40	53.66	38.35	38.54	51.23
P_2O_5	.01	------	.02	------	.086	------	.03	------	.017	------	------	------	------
CO_2	41.64	------	41.70	------	41.26	------	40.60	------	41.85	------	44.15	------	42.05
S	.01	.01	.06	.04	.014	.01	.06	Trace	.06	.02	------	.03	------
Ignition loss	------	42.23	------	42.70	------	42.13	------	41.17	------	43.29	------	44.23	------
Total	99.33	100.04	99.42	100.05	99.63	100.14	100.07	99.99	[99.96]	100.43	101.50	100.40	99.66
Class	0,3,94	------	0,3,95	------	0,5,94	------	0,8,92	------	0,1,95	------	0,3,95	------	0,4,95
CaO/MgO	Calcite	------	Calcite	------	Calcite	------	Calcite	------	Calcite	------	Calcareous dolomite	------	Magnesian calcite

Oregon—Continued

	50	51	52	53	54	55	56	57	58	59	60	61	62
	36$F_2$1-20	36$F_2$1-21		36$F_2$1-44	36$F_2$1-47		36$F_2$1-48	36$F_2$1-49	36$F_2$1-50	36$F_2$1-52	36$F_2$1-4	36$F_2$1-5	36$F_2$1-61
SiO_2	2.62	2.23	2.70	2.77	0.64	0.26	0.20	0.71	0.07	0.40	[1]0.85	[1]6.19	8.00
Al_2O_3	.57	.76	.23	.64	.21	.45	.02	.05	.03	1.58	[2].25	[2]1.20	.80
Fe_2O_3	.39	.70	.73	.53	.19	.34	.42	[3].12	[3].08				[4].57
FeO	------	------	------		------	------		------	------	------	------	------	------
MgO	2.77	1.84	2.00	4.42	.71	.58	.14	1.55	.22	[4].13	[4].33	[4].44	4.5
CaO	51.06	52.18	51.88	49.90	54.88	55.17	56.04	53.76	55.76	[4]54.41	[4]55.01	[4]50.16	49.4
H_2O	------	------	------	------	------	------	------	------	------	Trace	------	------	------
CO_2	[5]42.75	41.68	[5]42.62	[5]41.46	43.97	42.51	[5]42.62	43.87	43.99	[4]42.87	[4]43.56	[4]39.85	------
S	.01	------	.07	------	[6].22	.05	------	------	------	------	------	------	------
Organic matter	------	------	------	------	------	------	------	------	------	.03	------	------	------
Total	100.17	99.39	100.23	99.72	[100.82]	[99.36]	[99.44]	[100.06]	[100.15]	[7]99.42	[100.00]	[97.84]	[63.3]
Class	------	0,4,94	------	1,3,92	0,1,99	------	0,0,97	0,0,99	0,0,100	0,1,97	(0,1)99	(4,4)90	6,3,87
CaO/MgO	------	Calcite	------	Magnesian calcite	Calcite	------	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

Oregon—Continued

	63	64	65	66	67	68	69	70	71	72	73	74	75
	36$F_2$1-60	36$F_2$1-56	36$F_2$10-1	36$F_2$10-2	36$F_2$10-4	36$F_2$10-3	36$F_2$10-25	36$F_2$10-21	36$F_2$10-22	36$F_2$10-23	36F_2 12-1	36$F_2$15-22	36$F_2$15-25
SiO_2	------	1.41	3.92	4.11	0.78	------	[1]2.4	1.20	1.84	2.67	2.08	0.92	3.1
Al_2O_3	------	.50	1.64	1.91	.75	------	------	[2].90	[2]1.44	.55	.50	------	------
Fe_2O_3	------		.61	.72	.78					.70	.34	------	2.2
FeO	------	------	------	------		------	------	------	------	------	Trace	------	------
MgO	------	1.00	.60	.64	.33	------	------	[4].38	[4].54	.33	.16	[4].40	[4]2.5
CaO	53.60	54.00	51.92	51.68	56.46	[4]54.61	[4]54.7	[4]54.63	[4]53.93	53.84	54.05	[4]55.03	[4]50.1
Na_2O	------	------	------	------	------	------	------	------	------	------	.17	------	------
H_2O	------	------	------	------	------	------	------	------	------	------	.31	------	------
MnO	------	------	------	------	------	------	------	------	------	------	.10	------	------
CO_2	------	------	[5]41.11	[5]40.91	[5]41.18	[4]42.9	[4]42.9	[4]43.29	[4]42.94	41.41	42.50	[4]43.63	[4]42.1
SrO	------	------	------	------	------	------	------	------	------	------	[8]None	------	------
Total	[53.60]	[56.91]	99.80	99.97	[100.28]	[97.5]	[100.0]	[100.40]	[100.69]	99.50	[9]100.21	[99.98]	[100.0]
Class	0,0,96	1,1,97	0,6,92	0,7,91	0,1,93	0,0,97	(2,0)98	0,2,98	0,3,97	1,3,94	1,2,97	1,0,99	1,4,95
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

[1] Insoluble.

[2] Iron and aluminum oxides; samples 70, 71, iron oxide and alumina.

[3] Reported as Fe_2O_3 (total Fe).

[4] Calculated from reported Fe, $CaCO_3$ and(or) $MgCO_3$.

[5] Ignition loss.

[6] SO_3.

[7] 100.00 percent in text.

[8] Mere trace not determined (Wells, 1937, p. 59).

[9] K_2O, TiO_2, P_2O_5, and organic matter reported as trace; SO_3, Li_2O, FeS_2, reported as none.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

37-52. Baker County. Probably Triassic. S½SE¼ sec. 27 and N½NE¼ sec. 34, T. 13 S., R. 44 E., near town of Lime. Oregon Portland Cement Co. quarry. (Hodge, 1938d, p. 154, 199, 201, 206, 209-211, 213, 214, 215, 219.) General: Limestone and magnesian limestone, bluish-gray, dense, massive; weathers nearly white; beds range from 2 to 20 ft in thickness; thickness of limestone 1,000-1,500 ft; overburden thin. Tonnage estimated. Index and geologic maps. Use: Portland cement [implied].

37. Analysts, G. C. Ware, Kenneth McCleod. USED sample 10. Analysis used in computations.

38. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

39. Analysts, G. C. Ware, Kenneth McCleod. USED sample 9. Analysis used in computations.

40. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

41. Analysts, G. C. Ware, Kenneth McCleod. USED sample 13. Analysis used in computations.

42. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

43. Analysts, G. C. Ware, Kenneth McCleod. USED sample 8. Analysis used in computations.

44. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

45. Analysts, G. C. Ware, Kenneth McCleod. USED sample 7. Analysis used in computations.

46. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

47. Analysts, G. C. Ware, Kenneth McCleod. USED sample 5. [Calcareous dolomite.] Analysis used in computations.

48. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

49. Analysts, G. C. Ware, Kenneth McCleod. USED sample 15. Analysis used in computations.

50. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

51. Analysts, G. C. Ware, Kenneth McCleod. USED sample 14. Analysis used in computations.

52. Analyst, M. J. O'Dell. [Apparently aliquot analysis.]

53. Baker County. Pre-Tertiary. Sec. 4, T. 6 S., R. 44 E., Granite Cliff, Eagle Creek Valley. USED sample 261B. (Hodge, 1938d, p. 154, 199, 250, 252, 254.) General: Limestone, mainly gray, massive, coarsely crystalline; part white and thin bedded; contains pyritic masses. Tonnage estimated. Index and geologic maps.

54, 55. Baker County. Tertiary or younger [implied]. [Either] E½ sec. 36, T. 11 S., R. 42 E., [or] SW¼ sec. 11, T. 12 S., R. 43 E. J. H. Prescott claim. (Hodge, 1938d, p. 154, 199, 236, 245, 246.) Travertine, 20-30 ft thick. Index and geologic maps.

54. Analysis used in computations.

55. USED sample 19. [Apparently aliquot analysis.]

56. Baker County. NE¼ sec. 14, T. 9 S., R. 38 E., 12.9 miles from town of Baker, on Marble Creek. USED sample 258B. (Hodge, 1938d, p. 154, 199, 250, 257, 258.) Limestone, medium-gray, fine-grained, structureless. Chip sample across quarry face. Tonnage estimated. Index and geologic maps. Former use: Lime.

57. Baker County. [SW¼ T. 9 S., R. 37 E.],Marble Creek. Analyst, W. C. Wheeler; collector, J. T. Pardee. Record 3055. (Wells, 1937, p. 59.) Limestone.

58. Baker County. [SW¼ T. 9 S., R. 37 E.], Marble Point. Analyst, W. C. Wheeler; collector, J. T. Pardee. Record 3055. (Wells, 1937, p. 59.) Limestone.

Oregon—Continued

59. Baker County. [T. 10 S., R. 41 E., near] town of Pleasant Valley. Portland Lime and Lumber Co. Analyst, E. A. Akerly. (Burchard, 1912, p. 683, pl. 1.) Limestone. Index map. Use: Quarried [use not given].

60, 61. Baker County. Parts of Tps. 11, 12 S., Rs. 41-43 E., Durkee-Burnt River area. National Industrial Products Corp. quarry. (Wagner, 1958, p. 44, 46.) Limestone, massive, crystalline. Index map.

60. Composite analysis of 1040 carloads of limestone. Use: Cement, paper industry, sugar industry.

61. Quarry waste.

62. Baker County. [T. 12 S., Rs. 37-43 W.], Burnt River Canyon. (Walsted, 1954, p. 34.) Limestone. Use: Portland cement. Possible use: Flux.

63. Baker County. Parts of Tps. 12, 13 S., R. 44 E., and Tps. 11, 12 S., R. 45 E., with minor lap into T. 11 S., R. 46 E., Connor Creek occurrence. (Wagner, 1958, p. 44, 46.) Limestone, channel sample. Index map.

64. Baker County. [T. 14 S., R. 44 E.], 3 miles west of town of Huntington. The Oregon Portland Cement Co. (Hodge, 1944, p. 15, 81-83, pl. 11.) Limestone. Tonnage estimated. Index map. Use: Cement.

65, 66. Douglas County. [Late Jurassic and Early Cretaceous, Myrtle Group.] SE corner sec. 20, T. 28 S., R. 5 W. Oregon Portland Cement Co. quarry. (Hodge, 1938d, p. 272-276.) Limestone. Index map. Former use: Portland cement.

65. Average analysis of limestone for the year 1929.

67, 68. Douglas County. SW¼ sec. 30, T. 28 S., R. 5 W., 2 miles southeast of town of Carnes. Fisher property. Limestone, chip sample. Index map.

67. [Late Jurassic and Early Cretaceous, Myrtle Group.] USED sample 99B. (Hodge, 1938b, p. 272-274.)

68. (Peterson, 1958, p. 34, 35.)

69. Douglas County. Sec. 21, T. 28 S., R. 5 W., 11 miles from town of Roseburg. Harrington deposit. (The Ore.-Bin, 1943, p. 66.) Limestone; tonnage estimated.

70, 71. Douglas County. [T. 28 S., R. 6 W.], south of Roseburg, along railroad, 3.5 miles from Greens station. (Williams, 1914, p. 59, 60.) Limestone, massive; outcrops 50-75 ft thick. Tonnage estimated. Possible use: Portland cement.

70. Sample from outcrop and old quarry.

71. Sample from outcrop.

72. Douglas County. [T. 27 S., R. 6 W.], near Roseburg. Analyst, W. Michaelis. (Eckel, 1913, p. 308.) Limestone, dark-gray, fine-grained, dense; physical tests. Possible use: Cement.

73. Grant County. Jurassic. Sec. 18, T. 17 S., R. 26 E., on Jackass Creek. Analyst, J. G. Fairchild. Record D-63. (Moore, 1937, p. 147, 148, pl. 1; Wells, 1937, p. 58, 59.) Limestone, light-gray; composed of shells; finely crystalline except for larger shells; 15 ft exposed. Bulk density 2.73. Index map. Possible use: Quicklime and lime products.

74. Jackson County. Devonian. Sec. 16, T. 36 S., R. 3 W., 1 mile northwest of town of Gold Hill. Analyst, P. H. Bates. (Darton, 1909, p. 28, 29; Diller, 1914, p. 11, 15, 16, 17, pls. 4, 10.) Limestone. Index and geologic maps. Use: Flux, lime. Possible use: Cement.

75. Jackson County. Devonian. Sec. 13, T. 36 S., R. 4 W., 3 miles west of Gold Hill, near Rock Point. Analyst, J. S. Phillips. (Eckel, 1905, p. 278, 324; Diller, 1914, p. 10, 11, 15, 16, pl. 4.) Limestone, crystalline. Index and geologic maps. Use for limestone in area: Flux, lime, building stone.

Table 9.—Analyses of samples from Oregon containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Oregon—Continued												
	76	77	78	79	80	81	82	83	84	85	86	87	88
	$36F_215$-12	$36F_215$-13	$36F_215$-15	$36F_215$-2	$36F_215$-3	$36F_215$-5	$36F_215$-4	$36F_215$-9	$36F_215$-10	$36F_215$-24	$36F_215$-29	$36F_217$-3	$36F_217$-5
SiO_2	0.31	0.37	0.53	6.27	0.61	2.63	3.84	0.94	1.63	------	0.93	[1]0.20	[2]0.40
Al_2O_3	.44	.20	.52	.59	.21	1.18	.85	.50	.45	------	.31	------	------
Fe_2O_3				[2].36	.23	.68	.68	.37	.30	------	.41	------	------
MgO	.03	.01	Trace	.23	.34	.60	.59	.78	.28	------	.34	[3].10	[3].38
CaO	55.34	55.71	55.05	52.00	55.44	53.13	52.78	55.15	54.73	[3]53.96	[4]54.20	[3]55.63	[3]55.24
H_2O	.56	.37	.50	------	------	------	------	------	------	------	------	------	------
CO_2	43.23	43.54	43.25	[5]40.67	[5]42.05	41.23	40.77	42.44	42.32	[3]42.35	[5]42.31	[3]43.77	[3]43.78
S	------	------	------	------	------	.03	.02	.02	.03	------	------	------	------
Total	[99.91]	[100.20]	[99.85]	100.12	[98.88]	99.48	99.53	100.20	99.74	[96.31]	98.50	[99.70]	[99.80]
Class	0,1,98	0,1,99	0,1,98	5,3,92	0,1,95	0,5,94	2,4,92	0,2,96	1,2,96	0,0,96	0,2,96	(0,0)99	0,0,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Oregon—Continued												
	89	90	91	92	93	94	95	96	97	98	99	100	101
	$36F_217$-4	$36F_217$-19	$36F_217$-2	$36F_217$-1	$36F_217$-13	$36F_217$-36	$36F_217$-9	$36F_217$-7	$36F_217$-11	$36F_217$-8	$36F_217$-10	$36F_217$-12	$36F_217$-68
SiO_2	0.23	1.00	0.06	0.05	0.13	0.71	0.87	0.06	2.31	0.34	1.73	3.20	2.1
Al_2O_3	.28	[6].80	.62	.21	.38	.24	.35	.01	1.72	.06	1.69	.93	1.2
Fe_2O_3				.28		.08	.31	.31	.33	.32	.30	.30	
MgO	.03	.40	Trace	.34	None	[3].53	.80	.33	.41	.25	.40	.36	Trace
CaO	55.28	54.60	55.38	55.61	55.55	[3]55.20	54.60	55.85	54.06	55.44	54.16	54.05	54.3
H_2O	.50	------	.40	------	.26	------	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	------	[3].05	------	------	------	------	------	------	------
CO_2	43.57	------	43.51	[5]42.88	43.63	[3]43.92	[5]43.41	[5]42.09	[5]41.33	[5]42.07	[5]41.57	[5]40.74	42.6
Total	[7]99.89	[56.80]	[99.97]	[99.37]	[99.95]	[100.73]	100.34	[98.65]	100.16	[98.48]	99.85	99.58	100.2
Class	0,1,99	0,2,98	0,0,99	0,0,97	0,0,99	0,1,99	0,2,98	0,0,96	0,4,93	0,1,95	0,3,94	1,4,92	0,3,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Oregon—Continued												
	102	103	104	105	106	107	108	109	110	111	112	113	114
	$36F_217$-20	$36F_217$-27	$36F_232$-1	$36F_232$-11	$36F_232$-2	$36F_232$-8	$36F_232$-7	$36F_232$-10	$36F_232$-21	$36F_232$-9	$36F_232$-6	$36F_232$-5	$36F_232$-4
SiO_2	[8]0.06	------	0.83	0.15	0.92	0.14	0.01	1.17	1.0	1.10	1.12	1.84	1.00
Al_2O_3	------	------	.62	2.08	.34	1.13	1.63	.17	[6].5	.23	.20	1.46	1.20
Fe_2O_3	.90	------	.58	.36	Trace	.31	.31	.12			.10	.58	.48
MgO	Trace	------	1.36	.47	.52	1.08	.71	1.23	1.0	1.06	.36	1.11	.72
CaO	55.10	[3]53.37	53.76	54.51	54.50	54.04	53.73	53.15	[3]53.92	53.37	54.44	53.18	54.09
Na_2O	------	------	------	.30	Trace	------	------	.08	------	------	.19	------	.31
K_2O	------	------	------		Trace	------	------	.08	------	------	Trace	------	
H_2O	------	------	------	------	.10	.01	.01	.10	------	------	.20	------	------
P_2O_5	------	------	.02	.02	Trace	.007	.006	Trace	[3].02	[3].01	.05	.48	.02
CO_2	[5]43.88	[3]41.89	42.73	42.48	43.18	42.26	43.12	42.05	[3]42.33	------	43.19	41.51	42.22
S	------	------	.09	.02	[9]None	.14	.18	[9]None	------	------	------	.02	.08
Organic matter	------	------	------	------	Trace	.82	.26	1.75	[3]2.12	[3]2.12	.07	------	------
Total	[99.94]	[95.26]	[99.99]	[100.39]	[10]99.80	99.94	[99.97]	[11]100.30	[100.9]	[57.89]	[12]99.92	100.18	100.12
Class	0,1,98	0,0,95	0,1,97	0,0,96	0,1,98	0,1,96	0,0,98	1,3,95	0,3,96	1,3,95	1,1,98	0,3,94	0,2,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Oregon—Continued					
	115	116	117	118	119	120
	$36F_232$-12	$36F_232$-3	$36F_232$-20	$36F_232$-14	$36F_232$-15	$36F_232$-16
SiO_2	2.76	0.12	0.38	1.22	3.10	------
Al_2O_3	1.33	Trace	[6].50	[6]1.04	[6]1.70	------
Fe_2O_3	1.04	Trace				
MgO	4.79	.28	1.00	.64	.68	20.52
CaO	48.99	55.62	54.32	53.69	52.28	32.84
P_2O_5	------	None	.006	------	------	------
CO_2	40.73	43.67	------	[5]42.62	[5]42.10	46.60
Total	99.64	[13]99.90	[14][56.22]	[99.21]	[99.86]	[99.96]
Class	0,5,91	0,0,99	0,1,99	0,2,96	0,5,94	0,0,98
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Dolomite

[1] Insoluble in acid.

[2] Includes FeO.

[3] Calculated from reported $MgCO_3$, $CaCO_3$, P or C.

[4] 54.40 percent (Hodge, 1944, p. 15).

[5] Ignition loss.

[6] R_2O_3.

[7] 98.89 percent in text.

[8] Includes insoluble.

[9] SO_3.

[10] TiO_2, MnO, reported as trace; SrO, Li_2O, reported as none; FeS_2 = 0.24 percent.

[11] Total reported as 100.54 percent in text. TiO_2, MnO, Li_2O, reported as trace; FeO, FeS_2, reported as none; SrO = 0.40 percent.

[12] TiO_2, MnO, reported as trace; FeO, SrO, FeS_2, Li_2O, reported as none.

[13] K_2O, MnO, reported as trace; FeO, TiO_2, SO_3, Li_2O, FeS_2, organic matter reported as none; SrO, mere traces not determined; Na_2O = 0.11 percent; H_2O = 0.10 percent.

[14] SO_2 = 0.01 percent.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

76, 77. Jackson County. Devonian. Sec. 2, T. 37 S., R. 3 W., 4 miles south of town of Gold Hill. Householders quarry, Carters quarry. Analyst, R.C. Wells. Record 2381, lab. Nos. 7017B, 7017A. (Diller and Kay, 1909, p.51,pl.2; Diller, 1914, p.10,11,15,16,17,pl.4.) Limestone. Index and geologic maps. Former use: Flux, lime. Possible use: Cement.

78. Jackson County. Carboniferous. Sec. 7, T. 41 S., R. 4 W., south of town of Watkins, on Applegate River. Analyst, R. C. Wells. Record 2381; lab. No. 7045. (Diller and Kay, 1909, p. 51, pl. 2; Diller, 1914, p. 10, 11, 15, 16, 17, pl. 4.) Limestone. Index and geologic maps. Former use: Flux,lime. Possible use: Cement.

79. Jackson County. Paleozoic. Sec. 11, T. 37 S., R. 3 W., 5 miles southeast of Gold Hill, on South Fork Kane Creek. Oregon Portland Cement Co. USED sample 89. (Hodge, 1938d, p. 282, 299, 311, 312.) Limestone, chip sample; overburden less than 3 ft. Large reserves. Index map. Former use: Agricultural, paper manufacture.

80. Jackson County. Paleozoic. NW¼ sec. 28, NE¼ sec. 29, T. 38 S., R. 1 W., 3.8 miles southwest of town of Phoenix. Briner quarry. (Hodge, 1938d, p. 299, 301, 302.) Limestone, about 20 ft thick. Tonnage estimated. Index map, geologic section. Former use: Lime.

81, 82. Jackson County. Paleozoic. T. 39 S., R. 2 W., north of Little Applegate River. USED samples 75, 76. (Hodge, 1938d, p. 282, 299, 305-307, 310.) Limestone, black. Index map.
  81. Secs. 22-24, Bear Gulch.
  82. Sec. 23, Muddy Gulch. Use: None, deposit small.

83, 84. Jackson County. Paleozoic. Secs. 2, 10, 11, T. 41 S., R. 4 W., in Upper Applegate region. Seattle Bar deposit. USED samples 78, 79. (Hodge, 1938d, p. 282, 299, 307-310.) General: Limestone, white, cream, gray; some banding; part well crystallized; average thickness 75 ft. Index map.
  83. (Oregon Dept. Geology and Mineral Industries, 1943, p. 184, 185.) Mineralogy. Index and geologic maps.

85. Jackson County. Sec. 21, T. 36 S., R. 3 W., south of Gold Hill. Galls Creek deposit. (Peterson, 1958, p. 34, 35.) Limestone, light-gray, to white,crystalline; in two narrow lenses. Index map.

86. Jackson County. Secs. 1, 2, T. 37 S., R. 3 W., 5 miles from Gold Hill. Baxter quarry. (Hodge, 1944, p. 15, 88, 89, pl. 13.) Limestone, composite sample. Tonnage estimated. Index map.

87, 88. Josephine County. [Devonian.] Sec. 19, T. 37 S., R. 6 W. Range River Lime Co. Analyst, H. N. Laurie. (Burchard, 1912, p. 683, pl. 1; Winchell, 1914, p. 14, 15, 58, 233, 234, fig. 1.) Limestone. Index maps. Possible use: Portland cement.

89. Josephine County. Devonian. Sec. 19, T. 37 S., R. 6 W., about 10.5 miles southwest of town of Grants Pass. Quarry. Analyst, R. C. Wells. Record 2381; lab. No. 7015A. (Diller and Kay, 1909, p. 50,51,pl.2; Diller, 1914, p.10,11,15,16,17,pl.4.) Limestone, fossiliferous. Index and geologic maps. Former use: Flux, lime. Possible use: Cement.

90. Josephine County. [Devonian.] Sec. 19, T. 37 S., near range line 6 and 7 W., south of town of Wilderville, Marble Mountain. Pacific Portland Cement Co. (Hodge, 1944, p. 15, 89, pl. 13.) Limestone, crystalline. Tonnage estimated. Index map. Possible use: Calcium carbide manufacture, glass production.

91. Josephine County. [Devonian.] Sec. 13, T. 39 S., R. 8 W., 3 miles southeast of town of Kerby. Analyst, R. C. Wells. Record 2381; lab. No. 7074. (Diller and Kay, 1909, p. 51, pl. 2; Diller, 1914, p. 10, 11, 15, 16, 17, pl. 4.) Limestone. Index and geologic maps. Former use: Flux, lime. Use: Cement.

92. Josephine County. [Late(?) Triassic, Applegate Group.] SW¼ sec. 15, T. 38 S., R. 5 W. Oregon Lime Products Co. quarry. USED sample 90. (Hodge, 1938d, p. 298; Oregon Dept. Geology and Mineral Industries, 1942, p. 174.) Limestone. Index and geologic maps. Use: Agricultural, chemical lime.

93. Josephine County. [Probably Applegate Group.] E½ sec. 31, T. 38 S., R. 5 W., about 4 miles west of Williams, P.O. Jones quarry. Analyst, R. C. Wells. Lab. No. 7025. (Diller and Kay, 1909, p. 51, pl. 2; Diller, 1914, p. 10, 11, 15, 16, 17, pl. 4; Oregon Dept. Geology and Mineral Industries, 1942, p. 158, 159, 160.) Limestone, variegated black and white to pure white, crystalline; contains shale. Little overburden. Tonnage estimated. Index and geologic maps. Former use: Flux, lime,monumental stone. Possible use: Cement.

94. Josephine County. Applegate Group. NE¼ sec. 31, T. 38 S., R. 5 W., 4 miles west of Williams. Jones marble deposit. (Ramp, 1962, p. 153-158.) Limestone(marble),white, gray streaks, crystalline; mineralogy. Average of three samples from quarries. Tonnage estimated. Index and geologic maps, geologic section. Former use: Agricultural, monumental stone. Possible use: Filler, pulp and paper industry.

95 - 100. Josephine County. Paleozoic or Jurassic. Sec. 30, T. 37 S., R. 6 W., Marble Mountain quarry. Pacific Portland Cement Co. (Hodge, 1938d, p. 288; Oregon Dept. Geology and Mineral Industries, 1942, p. 161, 162, 163.) General: Limestone, dark-gray, uniformly fine grained; some mottling; some aragonite. Tonnage estimated. Index and geologic maps.
  95. Average of numerous shipments. Use: Cement, pulp and paper industry.
  96. USED sample 190A. Chip sample. Possible use: Cement.
  97. USED sample 184A. Chip sample. Little overburden. Possible use: Calcium carbide manufacture, cement, glass production.
  98. USED sample 188A. Chip sample. Possible use: Cement.
  99. USED sample 182A. Chip sample. Little overburden. Possible use: Cement.
  100. USED sample 186A. Chip sample. Little overburden. Possible use: Calcium carbide manufacture, cement, glass production.

101. Josephine County. Sec. 19, T. 37 S., R. 6 W., Cheney Creek. Analysis VIII, D. (Winchell, 1914, p. 14, 15, 58, 233, 234, fig. 1.) Limestone. Index maps. Possible use: Portland cement.

102. Josephine County. [T. 37 S., R. 6 W.], about 3 miles from Wilderville, Grants Pass area. Beaver Portland Cement Co. (Miller, 1938, p. 41, 42.) Limestone. Use: Pulp and paper industry. Possible use: Flux.

103. Josephine County. Sec. 29, T. 38 S., R. 5 W., about 4 miles west of Williams. Turvey deposit. (Peterson, 1958, p. 34, 37.) Limestone. Index map.

104, 105. Wallowa County. Late Triassic. T. 2 S., R. 43 E., about 6 miles from town of Lostine, Lostine River Canyon. (Hodge, 1938d, p. 154, 165, 171, 176, 186-188, 190, 192.) Limestone. Index and geologic maps.
  104. SW¼ sec. 3, west quarry. USED sample 36. Deposit: Limestone, gray to white, fine to coarsely crystalline. Possible use: Cement.
  105. Sec. 10, south of Silver Creek quarry. USED sample 37. Deposit: Limestone, medium-gray, crystalline; 20-80 ft thick in bluff. Former use: Lime. Possible use: Flux.

106. Wallowa County. Triassic. SW¼ sec. 3(or 4) T. 2 S., R. 43 E., about 6 miles from Lostine. Quarry. Analyst, J. G. Fairchild. Record D-63. (Moore, 1937, p. 123, 129, pls. 1, 13; Wagner, 1958, p. 44, 45.) Limestone, light-gray, massive, thick-bedded; interbedded with quartzites; contains some pyrite grains. Bulk density 2.72. Index and geologic maps. Former use: Quicklime. Possible use: Cement.

107 - 111. Wallowa County. Triassic. Secs. 19, 20, T. 2 S., R. 44 E., 5.5 miles southwest of town of Enterprise. Pacific Carbide and Alloys Co. quarry. Index maps. Former use: Lime.
  107, 108. USED samples 30, 31. (Hodge, 1938d, p. 154, 165, 171-176.) Limestone, black, fine-grained, fossiliferous, massive. Tonnage estimated. Geologic map.
  109, 110. (Libbey, 1957, p. 37, 50-52, 53.) Limestone, sooty-black with white splotches, bedded, fossiliferous; strata 1-6 ft thick. Tonnage estimated. Use: Agricultural, calcium carbide manufacture. Possible use: Ornamental stone.
    109. Analyst, J. G. Fairchild. Record D-63. (Moore, 1937, p. 123, 130, 131, pls. 1, 13.) Bulk density 2.70. Geologic map.
  111. (Wagner, 1958, p. 44, 45.) Limestone, black, well-bedded, dense. Use: Calcium carbide manufacture.

112. Wallowa County. Late Triassic. NE¼ sec. 15, T. 2 S., R. 48 E., on Imnaha River. Analyst, J. G. Fairchild. Record 63-D. (Moore, 1937, p. 120, pl. 1.) Limestone, bluish-gray, thick-bedded, fossiliferous. Bulk density 2.68. Tonnage estimated. Index map. Possible use: Local use only, rock impure.

113, 114. Wallowa County. Late Triassic. SW¼ sec. 15, T. 3 S., R. 44 E., about 0.5 mile north of Deadman Creek. Hurricane Creek deposits. USED samples 32, 33. (Hodge, 1938d, p. 154, 165, 168, 171, 176, 180, 182.) Limestone. Tonnage estimated. Index and geologic maps.

115. Wallowa County. Late Triassic. [T. 3 S., R. 44 E.], from creek south of Falls Creek. USED sample 34. (Hodge, 1938d, p. 154, 165, 171, 176.) Limestone. Index and geologic maps.

116. Wallowa County. Triassic. Sec. 10, T. 4 S., R. 44 E., Hurricane Creek. Analyst, J. G. Fairchild; collectors, R. W. Richards, B. N. Moore. (Moore, 1937, p. 123, 132, 133, pls. 1, 13; Wells, 1937, p. 58, 59.) Marble, white. Bulk density 2.71. Tonnage estimated. Index and geologic maps. Possible use: Lime, building and ornamental stone.

117. Wallowa County. [T. 5 S., R. 45 E.], Marble Mountain. (Hodge, 1944, p. 15.) Limestone. Tonnage estimated.

118, 119. Wallowa County. Parts of secs. 8, 17-19, T. 5 S., R. 49 E. and parts of secs. 24-26, T. 5 S., R. 48 E., about 10 miles north of town of Homestead. Big Bar deposit. (Wagner, 1958, p. 43, 44.) Limestone, recrystallized, massive; thick beds; chip sample. Index map.

120. Wallowa County. [T. 6 S., R. 26 E.], Wallowa Mountains, on line between Wallowa and Baker Counties. Analyst, J. G. Fairchild; collector, C. P. Ross. Record C-332. (Wells, 1937, p. 59; Weitz, 1942, 2, 76, 79.) Dolomite. Index map. Possible use: Refractories, source of magnesia.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F$_2$), common-rock category

[Chemical analyses arranged by county and stratigraphic position]

Chemical analyses

	Washington												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	46F$_2$2-1	46F$_2$2-4	46F$_2$2-2	46F$_2$2-14	46F$_2$2-11	46F$_2$2-12	46F$_2$2-13	46F$_2$2-17	46F$_2$2-18	46F$_2$2-19	46F$_2$2-22	46F$_2$2-20	46F$_2$2-24
SiO_2	5.98	5.48	6.10	2.31	2.68	2.10	2.63	5.53	4.51	2.73	0.65	0.51	6.23
Insoluble	------	------	------	------	------	------	------	------	------	------	[1](1.71)	[1](1.16)	[1](.62)
Al_2O_3	2.04	3.50	2.16	[2]1.00	[2].91	[2].81	[2].84	[2]1.51	[2]1.64	[2]1.12	.31	.07	1.09
Fe_2O_3											.26	.25	1.46
MgO	.78	.65	.68	2.07	.31	.68	.68	.71	.61	.93	.54	2.88	.20
CaO	51.07	49.99	50.06	48.95	49.61	51.11	50.30	48.83	49.42	48.10	54.52	52.05	49.95
H_2O+	------	------	------	------	------	------	------	------	------	------	.07	.07	.03
P_2O_5	------	------	------	.017	.025	.025	.018	.030	.014	.043	.020	.005	.025
MnO	------	------	------	------	------	------	------	------	------	------	[3].03	[2].04	[3].04
CO_3	------	------	------	------	------	------	------	------	------	------	43.22	43.87	39.44
S	------	------	------	------	------	------	------	------	------	------	.047	.045	.029
Ignition loss	39.93	40.20	39.60	[4]42.81	[4]42.43	[4]42.68	[4]42.81	[4]41.12	[4]41.34	[4]43.10	[1](42.99)	[1](43.78)	[1](39.74)
Total	99.80	99.82	98.60	[97.16]	[95.96]	[97.40]	[97.28]	[97.73]	[97.53]	[96.02]	[99.67]	[99.79]	[98.49]
Class	3,6,89	0,10,89	2,6,89	1,5,92	1,6,89	1,4,93	1,5,91	3,6,89	2,6,89	1,7,88	0,1,98	0,1,99	3,6,90
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite

	Washington—Continued												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	46F$_2$2-23	46F$_2$2-21	46F$_2$4-89	46F$_2$4-68	46F$_2$4-65	46F$_2$4-67	46F$_2$4-82	46F$_2$4-7	46F$_2$4-11	46F$_2$4-13	46F$_2$4-9	46F$_2$4-10	46F$_2$4-8
SiO_2	3.35	0.55	0.38	1.13	0.80	4.70	0.43	0.27	2.20	6.14	1.14	1.42	0.60
Insoluble	[1](.45)	[1](.08)	------	------	------	------	------	------	------	------	------	------	------
Al_2O_3	.22	.05	.21	[2].23	[2].24	[2].86	[2].33	.03	------	------	------	------	------
Fe_2O_3	.86	.59						.15	1.48	1.30	.41	.88	.21
MgO	.08	.08	None	1.18	1.13	2.74	.45	[3].50	.77	.83	.69	.89	1.11
CaO	52.40	54.56	55.26	53.78	53.71	49.36	54.09	[3]55.13	53.25	51.33	55.18	54.70	55.16
H_2O+	.12	.07	------	------	------	------	------	[5].10	------	------	------	------	------
P_2O_5	.014	.027	------	.021	.010	.037	.020	------	.185	.265	.247	.279	.155
MnO	[3].01	[3].05	------	------	------	------	------	------	------	------	------	------	------
CO_2	41.76	43.33	------	------	------	------	------	[3]43.82	[6]43.46	[6]41.18	[6]44.05	[6]43.89	[6]44.49
S	.071	.030	------	------	------	------	------	Trace	------	------	------	------	------
Ignition loss	[1](41.86)	[1](43.32)	43.98	[4]43.14	[4]43.20	[4]41.61	[4]44.47	------	------	------	------	------	------
Total	[98.88]	[99.34]	99.83	[99.48]	[99.09]	[99.31]	[99.79]	100.00	[101.34]	[101.04]	[101.72]	[102.06]	[101.72]
Class	2,3,94	0,1,98	0,1,99	1,1,98	0,1,98	3,3,93	0,2,97	0,1,99	1,3,97	5,3,93	1,1,100	0,2,99	0,0,101
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	27	28	29	30	31	32	33	34	35	36	37	38	39
	46F$_2$4-12	46F$_2$4-84	46F$_2$4-22	46F$_2$4-73	46F$_2$4-71	46F$_2$4-76	46F$_2$4-25	46F$_2$4-26	46F$_2$4-27	46F$_2$4-28	46F$_2$4-58	46F$_2$4-55	46F$_2$4-29
SiO_2	2.37	0.56	2.00	0.09	1.66	0.52	7.09	2.92	4.62	0.68	3.69	1.54	2.16
Al_2O_3	------	[2].44	[2]1.00	4.96	.81	[2].28	[2]1.43	[2].73	[2]1.12	[2].36	1.19	.62	[2].61
Fe_2O_3	.21			.16	.24						.29	.10	
MgO	.36	.72	1.00	1.20	1.06	.40	.59	.69	.85	.47	.75	.50	.67
CaO	54.98	54.60	54.00	50.30	54.49	54.90	50.73	54.09	51.62	54.81	52.72	53.96	53.89
Na_2O	------	------	------	.22	[8].99	------	------	[7]195	[7]195	------	------	------	------
K_2O	------	------	------	.05				[7]620	[7]620	------	------	------	------
TiO_2	------	------	------	------	------	------	------	[7]100	[7]100	------	------	------	------
P_2O_5	.298	.094	.15	------	------	.084	.055	.039	.025	.064	------	------	.007
S	------	------	------	------	------	------	------	[7]816	[7]816	------	------	------	------
Ignition loss	[6]43.53	[4]42.95	------	42.92	40.83	[4]43.16	[4]39.98	[4]42.78	[4]41.69	[4]43.75	41.55	42.92	[4]42.65
Total	[101.75]	[99.36]	[58.15]	[99.90]	[100.08]	[99.34]	[99.88]	[101.25]	[99.92]	[100.13]	100.19	99.64	[99.99]
Class	2,0,99	0,1,97	0,3,94	0,2,92	0,3,92	0,1,98	5,4,90	2,2,97	3,3,94	0,1,99	1,4,93	0,2,97	1,2,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Not included in total.

[2] R_2O_2.

[3] Calculated from reported Mn, $MgCO_3$ and(or) $CaCO_3$.

[4] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[5] Reported as H_2O and undetermined.

[6] CO_2, calculated from reported $CaCO_3$ and MgO.

[7] In ppm. Determinations for samples 34 and 35.

[8] Reported as alkali.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analyses: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_2, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_2, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 5, PbO = 0.0054; sample 20, BaO = 0.29]

	4	5	6	7	8		4	5	6	7	8
Na_2O	------	------	------	0.05	0.083	MnO	0.13	0.13	0.13	0.059	0.094
TiO_3	0.015	0.016	0.011	.019	.029	NiO	------	------	------	------	------
V_2O_5	------	.0098	.0081	------	------	CuO	.0017	.0020	.0025	.0026	.0020
Cr_2O_3	.0005	.0005	.0005	.0007	.00086	SrO	.052	.032	.025	.013	.071

Spectrochemical analyses—Continued

	9	10	17	18	19	20	28	32	33	34	35	36	39
Na_2O	0.05	0.05	------	------	0.22	0.17	------	------	0.18	------	0.09	------	------
TiO_2	.035	.021	0.004	0.004	.013	.0044	0.006	------	.031	0.0072	.0092	0.002	------
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	------	------
Cr_2O_3	.0013	.00064	.0005	.0005	.0005	------	.0005	0.0005	------	------	------	.00099	------
MnO	.085	.078	.022	.01	.050	.07	.10	.06	.042	.05	.045	.02	0.019
NiO	------	------	------	------	.001	.0017	------	------	.001	------	.001	.0026	.001
CuO	.0026	.0019	.0005	.00088	.00066	.00082	.0058	.00082	.0022	.0019	.0025	.00082	.0015
SrO	.049	.056	.017	.018	.017	.059	.0098	.0081	.021	.029	.041	.021	.11

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington

1-3. Asotin County. Probably Late Triassic. Sec. 19, T. 7 N., R. 47 E., south of town of Asotin, Lime Hill. Analyst, A. A. Hammer. (Shedd, 1913, p. 114, 118, 244, pl. 21; Mills, 1962, p. 239-241, 243.) Deposit: Limestone, dark-gray, fine-grained, slaty. Surface sample, weathered. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

4-10. Asotin County. Probably Late Triassic. T. 7 N., R. 47 E., about 25 miles south of town of Clarkston, Lime Hill. Ideal Cement Co. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 239-243, 244, 252, 264, pl. 1.) General: Limestone, gray to light-gray, cryptocrystalline to fine-grained; most units siliceous and (or) argillaceous; beds 1/16 in.-4 ft thick; total thickness of limestone in area 3,143 ft. Chip sample of outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

4. SE¼NE¼ sec. 19. Sample A-3, represents 34 ft.
5. SW¼ sec. 19. Sample A-4, represents 54 ft.
6. SW¼ sec. 19. Sample A-5, represents 57 ft.
7. SW¼ sec. 19. Sample A-7, represents 66 ft.
8. NE¼NW¼ sec. 30. Sample A-8, represents 70 ft.
9. NE¼NW¼ sec. 30. Sample A-9, represents 74 ft.
10. NE¼NW¼ sec. 30. Sample A-10, represents 60 ft.

11-15. Asotin County. Probably Late Triassic. T. 7 N., R. 47 E., Lime Hill. Ideal Cement Co. (Mills, 1962, p. 239-242, 243.) General: Limestone, gray to light-gray, cryptocrystalline to fine-grained; contains some calcite; most units siliceous and (or) argillaceous; beds 1/16 in.-4 ft thick; total thickness of limestone in area 3,143 ft. Tonnage estimated. Index and geologic map. Possible use: Portland cement.

16. Chelan County. Pre-Ordovician, limestone in Swakane Gneiss. NE¼SW¼ sec. 10, T. 23 N., R. 20 E., about 5 miles north of town of Wenatchee. Storme deposit. Analyst, A. A. Hammer. (Shedd, 1913, p. 171, 244; Waters, 1932, p. 604, 606, 609-611; Danner, 1966, p. 82, 415.) Deposit: Limestone, white to gray, finely crystalline, massive; at least 12 ft thick. Index and geologic maps. Use: Lime. Possible use: Portland cement.

17-19. Chelan County. Limestone in Swakane Gneiss. Sec. 23, T. 26 N., R. 18 E. Dry Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 398-403, 447, 455.) Mineralogy. Tonnage estimated. Index and geologic maps. Former use: Lime. Possible use: None, deposit small.

17. Sample Cn 5-2. Limestone, white to blue-gray, crystalline; chip sample taken across 100 ft.
18. Sample Cn 5-5. Limestone, white, crystalline; chip sample, single specimen.
19. Sample Cn 5-3. Limestone, float.

20. Chelan County. Holocene. NW¼ sec. 10, T. 27 N., R. 15 E., north side of Little Wenatchee River. Soda Springs campground deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Cn 1-1. (Danner, 1966, p. 16, 19, 82, 387, 397, 444, 445, 447, 455.) Tufa, dark-gray-brown, hard; interbedded with soft porous layers; at least 2 ft thick; composite chip sample. Index and geologic maps. Possible use: None, deposit small.

21. Chelan County. [NW¼ T. 24 N., R. 18 E., near] town of Leavenworth. Alaska Marble Mountain Co. Analyst, C. R. Corey. (Burchard, 1912, p. 694, pl. 1.) Limestone. Index map. Use: Quarried [use not given].

22-27. Chelan County. NW¼ sec. 3 and NE¼ sec. 4, T. 25 N., R. 20 E. Superior Lime and Mining Co., Entiat River limestone deposit. (Hodge, 1938d, p. 13, 80, 81, 83, 85, 86; Danner, 1966, p. 82, 410-412, 414, 415.) General: Limestone, white to green, brittle with flinty appearance, thin-bedded. Tonnage estimated. Index and geologic maps, geologic section; measured section. Possible use: Terrazzo chips, roof granules, decorative stone.

Washington—Continued

28. Chelan County. NE¼ sec. 4, T. 25 N., R. 20 E. Entiat deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Cn 8-2. (Danner, 1966, p. 16, 19, 82, 398, 410-412, 414, 447, 455.) General: Limestone, white to greenish-gray, finely crystalline, thin-bedded. Sample: Chip sample, white, single specimen. Tonnage estimated. Index and geologic maps, geologic section; measured section. Possible use: Terrazzo chips, roofing granules, decorative stone.

29. Chelan County. [T. 25 N., R. 21 E., town of] Entiat. (Hodge, 1944, p. 15, 54, pl. 5.) Limestone. Tonnage estimated. Index map.

30, 31. Chelan County. South-central part sec. 15 and SE¼ sec. 9, T. 26 N., R. 19 E., 18 miles by road from Entiat. Gold Ridge deposit. (Danner, 1966, p. 82, 398, 406-408.) Limestone, white, fine- to medium-grained, crystalline; contains a few thin quartz and mica schist layers. Index and geologic maps, geologic sections. Possible use: Roofing granules, decorative stone.

30. Sample taken across 50 ft.
31. Composite sample.

32. Chelan County. W½ sec. 22, T. 26 N., R. 19 E., about 16 miles by road from Entiat. Indian Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Cn 6-1. (Danner, 1966, p. 16, 19, 82, 398, 406, 407, 447, 455.) Limestone, white, crystalline; chip sample taken across 2 ft. Index and geologic maps, geologic sections; measured sections of outcrops in area. Possible use: Rock garden.

33. Chelan County. NE¼ sec. 10, T. 27 N., R. 15 E. Lucky Line claims. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Cn 2-1. (Danner, 1966, p. 16, 19, 82, 387, 388, 392, 393, 397, 447.) Limestone, gray to white, medium to coarsely crystalline. Mineralogy. Chip sample taken across 100 ft. Index and geologic maps.

34-36. Chelan County. SW¼ sec. 10, T. 27 N., R. 15 E. Rainy Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. (Danner, 1966, p.16,19,82,387,393-396,397,447.) Limestone, white to gray, medium to coarsely crystalline. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

34. Sample Cn 3-1. Chip sample taken across 150 ft.
35. Sample Cn 3-2. Chip sample taken across 150 ft.
36. Sample Cn 3-3. Chip sample taken across 100 ft.

37, 38. Chelan County. NW¼ sec. 14, T. 27 N., R. 15 E. Rainy Creek deposit. Drill hole 56. (Danner, 1966, p. 82, 387, 393-396, 397.) Limestone, white to gray, medium to coarsely crystalline. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Portland cement. [For other analyses from same drill hole, see sample 296, group B; samples 69, 70, group E; samples 127, 128, group F_1.]

37. Depth 131.2-138 ft.
38. Depth 32-79 ft.

39. Chelan County. NE¼ sec. 15, T. 27 N., R. 15 E. Rainy Creek deposit, Calcium claim. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Cn 3-4. (Danner, 1966, p.16,19,82,387, 393-396,397,447.) Limestone, white to gray, medinm to coarsely crystalline. Mineralogy. Chip sample taken across 10 ft. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	40	41	42	43	44	45	46	47	48	49	50	51	52
	$46F_2$4-64	$46F_2$4-63	$46F_2$4-62	$46F_2$4-61	$46F_2$4-16	$46F_2$4-80	$46F_2$4-81	$46F_2$10-8	$46F_2$10-23	$46F_2$10-24	$46F_2$10-25	$46F_2$10-26	$46F_2$10-27
SiO_2	1.52	1.43	0.35	1.97	2.40	2.75	3.40	4.65	5.22	1.11	1.19	2.65	5.88
R_2O_3	.53	.24	.37	.21	Trace	.53	.59	.99	1.02	.39	.47	.56	.48
MgO	.82	.70	.85	.78	.65	1.72	.89	19.31	2.66	1.39	.14	1.12	.26
CaO	54.45	54.08	55.24	53.43	53.28	52.28	52.88	31.96	51.10	53.74	55.19	52.95	52.24
P_2O_5	.125	.048	.080	.074	------	.030	.011	------	.027	.005	.060	.007	.012
Ignition loss	[1]42.76	[1]42.92	[1]43.26	[1]43.16	43.26	[1]42.22	[1]41.91	43.54	[1]40.63	[1]43.40	[1]42.98	[1]42.60	[1]41.12
Total	[2][100.20]	[2][99.42]	[2][100.15]	[2][99.62]	99.59	[99.53]	[99.68]	100.45	[100.66]	[100.04]	[100.03]	[99.89]	[99.99]
Class	1,2,97	1,1,97	0,1,98	2,1,97	2,1,96	2,2,95	2,2,95	3,3,91	4,3,91	0,1,98	0,1,97	2,2,96	5,1,93
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Dolomite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	53	54	55	56	57	58	59	60	61	62	63	64	65
	$46F_2$10-28	$46F_2$10-35	$46F_2$10-29	$46F_2$10-30	$46F_2$10-31	$46F_2$10-32	$46F_2$10-33	$46F_2$10-1	$46F_2$10-34	$46F_2$10-36	$46F_2$10-37	$46F_2$10-38	$46F_2$10-39
SiO_2	5.63	2.46	1.41	1.15	0.72	0.57	1.86	1.1	1.46	4.00	7.08	0.59	0.50
R_2O_3	.25	.96	.42	.42	.40	.23	.27	[3]Trace	.39	.52	.75	.45	.29
MgO	.22	1.78	.34	.26	.30	.29	.25	Trace	.19	.24	.29	.30	.28
CaO	52.55	52.50	55.02	55.33	55.67	55.53	55.31	[4]55.2	54.77	53.40	51.53	54.92	55.25
P_2O_5	.032	.021	.006	.008	.004	.008	.013	------	.012	.016	.012	.019	.015
Ignition loss	[1]41.27	[1]42.25	[1]42.58	[1]42.41	[1]42.76	[1]42.61	[1]41.98	[5]43.4	[1]42.84	[1]41.52	[1]39.98	[1]43.42	[1]43.42
Total	[99.95]	[99.97]	[6][99.78]	[6][99.58]	[6][99.85]	[6][99.24]	[99.68]	99.7	[99.66]	[7][99.70]	[7][99.64]	[7][99.70]	[7][99.76]
Class	5,1,94	1,3,95	1,1,96	0,1,96	0,1,97	0,1,97	1,1,95	1,0,99	1,1,97	3,2,94	6,2,90	0,1,98	0,1,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	66	67	68	69	70	71	72	73	74	75	76	77	78
	$46F_2$10-40	$46F_2$10-6	$46F_2$10-7	$46F_2$10-44	$46F_2$10-41	$46F_2$10-42	$46F_2$10-43	$46F_2$10-49	$46F_2$10-45	$46F_2$10-46	$46F_2$10-47	$46F_2$10-48	$46F_2$10-4
SiO_2	2.34	------	------	3.75	8.09	3.87	2.73	------	4.62	3.67	9.22	5.35	0.66
Al_2O_2	[8].30	------	------	[8].62	[8]1.32	[8].50	[8].37	------	[8].46	[8].59	[8].38	[8].54	------
Fe_2O_2													.62
MgO	.34	20.00	11.15	4.15	4.04	1.40	2.37	1.21	7.25	8.41	3.33	10.59	[4].20
CaO	54.19	31.41	41.22	49.28	46.70	52.71	51.88	[4]53.9	46.52	45.57	47.60	41.13	[4]54.51
P_2O_5	.016	------	------	.103	.061	.035	.048	------	.046	.032	.042	.043	------
Ignition loss	[1]42.26	------	------	[1]42.17	[1]39.75	[1]41.59	[1]42.75	[9]43.7	[1]41.33	[1]42.25	[1]39.78	[1]42.12	[5]43.00
Total	[7][99.45]	[51.41]	[52.37]	[100.07]	[99.96]	[100.10]	[100.15]	[98.8]	[100.23]	[100.52]	[100.35]	[99.77]	[10][100]
Class	2,1,96	0,0,98	0,0,97	3,2,94	6,4,88	3,1,94	2,1,96	0,0,99	4,1,91	3,2,93	9,1,89	4,2,92	0,2,98
CaO/MgO	Calcite	Dolomite	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcareous dolomite	Calcite

[1] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[2] A composite of samples 40-43 contained Na_2O = 175 ppm, K_2O = 610 ppm, TiO_2 = 60 ppm, S = 55 ppm.

[3] Iron and aluminum oxides.

[4] Calculated from reported $MgCO_3$ and(or) $CaCO_3$.

[5] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[6] A composite of samples 55-58, this group, and sample 135 group F_1, contained Na_2O = 160 ppm, K_2O = 750 ppm, TiO_2 = < 30 ppm, S = 26 ppm.

[7] A composite of samples 62-66 contained Na_2O = 165 ppm, K_2O = 590 ppm, TiO_2 = < 30 ppm, S = 27 ppm.

[8] R_2O_3.

[9] CO_2, calculated from reported MgO and $CaCO_3$.

[10] Organic matter = 1 percent.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_2, SnO_2, Sb_2O_2, TeO_2, Cs_2O, BaO, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_2, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_2, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, Bi_2O_3, ThO_2, UO_2; sample 48, ZrO_2 = 0.0028; sample 52, Ag_2O = 0.00055]

	40	41	42	43	45	46	48	49	50	51	52	53	54
Na_2O	------	0.11	------	------	0.064	0.15	------	------	------	------	------	------	------
TiO_2	0.0048	.012	0.006	0.004	.013	.016	0.039	0.0092	0.0068	0.01	0.0092	0.0076	0.016
Cr_2O_3	.0005	.0005	.00058	.00064	.0005	.00085	.00077	.0005	.0005	.0005	.0016	.00093	.00058
MnO	.10	.029	.037	.055	.10	.11	.048	.02	.027	.016	.044	.085	.062
NiO	------	------	------	------	------	------	------	------	------	------	------	------	------
CuO	.0011	.00082	.0022	.00093	.0023	.0013	.0049	.0021	.0014	.0015	.0026	.00077	.0013
SrO	.02	.015	.01	.011	.038	.039	.013	.019	.017	.016	.018	.014	.013
PbO	------	------	------	------	------	------	------	------	------	------	------	------	------

	55	56	57	58	59	61	62	63	64	65	66	69	70
Na_2O	------	------	------	------	------	------	------	------	------	------	------	------	------
TiO_2	0.008	0.012	0.008	0.0032	0.008	0.0064	0.0084	0.0096	0.02	0.002	0.0044	0.014	0.02
Cr_2O_3	.0014	.00083	.0012	.0016	.0015	.0014	.0014	.0023	.0015	.0018	.0014	.00058	.0052
MnO	.09	.09	.17	.086	.043	.10	.05	.068	.033	.064	.044	.023	.05
NiO	------	------	------	------	------	------	------	.001	------	------	------	.001	.002
CuO	.0017	.0019	.0005	.00077	.00093	.0015	.0027	.0082	.0024	.0014	.0014	.0029	.0085
SrO	.017	.02	.029	.017	.017	.014	.013	.012	.011	.019	.016	.027	.032
PbO	------	------	------	------	------	------	------	------	.045	------	------	.30	------

Spectrochemical analyses—Continued

	71	72	74	75	76	77		71	72	74	75	76	77
Na_2O	------	------	0.06	0.05	0.65	0.05	NiO	------	------	------	------	------	0.001
TiO_2	0.014	0.026	.014	.023	.0084	.022	CuO	0.0010	0.0014	0.0017	0.0014	0.0016	.0019
Cr_2O_2	.0014	.0008	.0009	.0018	.00096	.0006	SrO	.043	.032	.032	.031	.032	.027
MnO	.016	.013	.078	.09	.062	.078	PbO	.011	.002	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

40-43. Chelan County. Mostly in SE¼ sec. 10, T. 28 N., R. 17 E., unsurveyed. Marble Creek deposit, Paradise claims. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p.16, 19, 82, 387, 403-405, 447, 455.) Tonnage estimated. Index and geologic maps. Possible use: Terrazzo chips, roofing granules, decorative stone.
40. Sample Cn 4-1. Limestone, crystalline, thin-bedded; bed averages 8 ft thick. Chip sample taken across 280 ft.
41. Sample Cn 4-2. Limestone, white, finely crystalline; bed less than 50 ft thick. Chip sample taken across 450 ft.
42. Sample Cn 4-3. Limestone, crystalline; bed 40-50 ft thick. Chip sample taken across 40 ft.
43. Sample Cn 4-4. Limestone, crystalline; bed 40-50 ft thick. Chip sample taken across 50 ft.

44. Chelan County. Sec. 13, T. 29 N., R. 20 E., town of Lakeside, north side of Lake Chelan. Analyst, A. A. Hammer. (Shedd, 1913, p.173,174,244, pl. 21; Danner, 1966, p.82,416-418.) Deposit: Limestone, white to light-bluish-gray, crystalline, stratified, uniform throughout; 30 ft exposed. Index and geologic maps. Use: Lime. Possible use: Portland cement.

45, 46. Chelan County. NE¼, SW¼, and SE¼ sec. 29, T. 29 N., R. 21 E., about 19.5 miles by road west of town of Chelan. Lake Chelan deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 416, 417, 447, 455.) Limestone, white, crystalline; interbedded with schist. Tonnage estimated. Index and geologic maps, measured section. Former use: Lime. Possible use: None, deposit small.
45. Sample Cn 7-1. Chip sample taken across 31 ft.
46. Sample Cn 7-2. Composite chip sample.

47. Ferry County. (Probably Precambrian, Boulder Creek Formation.) [T. 39 N., R. 36 E.], in hills west of town of Orient, Kettle River Range. Analyst, A. A. Hammer. (Shedd, 1913, p. 160, 162, 244, pl. 21; Mills, 1962, p. 178.) Dolomite, white, coarse texture. Deposit: Gray or white, fine- to coarse-grained; mineralogy. Index map. Possible use: Probably none.

48-51. Ferry County. Pre-Permian, late Paleozoic. SE¼NE¼ sec. 4, T. 35 N., R. 32 E., Swan Lake area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 207-209, 244, 253, 264, pl. 1.) Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, dimension stone.
48, 49. Limestone, white; few thin light-gray layers; coarse grained. Samples F-22 and F-23.
50, 51. Limestone, white; some gray and pale-yellow layers; coarse grained. Samples F-20 and F-21.

52, 53. Ferry County. Permian. NE¼NE¼ sec. 4, T. 36 N., R. 32 E., 3 miles west of town of Republic. Doblasue property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples F-1, F-2. (Mills, 1962, p.12,13,199,200,244,252,264,pl.1.) Limestone, gray, very fine grained, massive. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: None, rock impure, small tonnage.

54. Ferry County. Permian. NW¼NW¼ sec. 5, T. 36 N., R. 34 E., 9 miles southeast of Republic. Iron Mountain district. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample F-38. (Mills, 1962, p. 12, 13, 204, 244, 253, 264, pl. 1.) Limestone, cream-white to light-gray, fine-grained, slightly argillaceous, bedded; deposit 35 ft thick. Chip sample from outcrop. Tonnage estimated. Index and geologic map. Possible use: Portland cement.

55-59. Ferry County. Permian. SE¼ sec. 9, T. 36 N., R. 32 E., about 4 miles southwest of Republic. Union Lime Co., quarry abandoned. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12,13,199-201,202,203,244,253,264,pl.1.) Limestone, gray, very fine grained; some calcite, deposit ranges from 50 to 70 ft in thickness; overburden. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: None, small tonnage, contains silica.
55. Sample F-31 represents 3 ft.
56. Sample F-32 represents 28 ft.
57. Sample F-33 represents 20 ft.
58. Sample F-35 represents 42 ft.
59. Sample F-36 represents 40 ft.

Washington—Continued

60. Ferry County. Permian. SE¼ sec. 9, T. 36 N., R. 32 E., few miles west of Republic. Union Lime quarry. (Landes,1905 [1906], p. 381; Mills, 1962, p. 190, 200, 202, 203.) Limestone, bluish, compact; some calcite; 50-70 ft thick. Tonnage estimated. Index and geologic maps. Former use: Lime. Possible use: None, small tonnage; contains silica.

61. Ferry County. Permian. NW¼NW¼ sec. 15, T. 36 N., R. 32 E., east side of Copper Lakes. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample F-19. (Mills, 1962, p. 12, 13, 89, 199-201, 203, 244, 253, 264, pl. 1.) Limestone, gray, very fine grained, siliceous; 80 ft thick in area. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Chemical, metallurgical, calcium carbide manufacture; sugar industry, pulp and paper industry.

62-66. Ferry County. Permian. SE¼NW¼ sec. 5, T. 37 N., R. 34 E., Lambert Creek area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 192-195, 244, 252, 264, pl. 1.) Limestone, light-gray to light-brownish-gray, very fine grained; contains some chert. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, filler.
62. Sample F-10.
63. Sample F-11.
64. Sample F-12.
65. Sample F-13.
66. Sample F-14.

67, 68. Ferry County. Permian. Probably sec. 18, T. 37 N., R. 34 E., near top of Cooke Mountain, Belcher district. Analyst, J. G. Fairchild. (Bancroft, 1914, p. 1, 13, 15, 39, 42, 168, 169; Mills, 1962, p. 192-194.) Tonnage estimated. Index and geologic maps. Possible use: Portland cement, filler.
67. Dolomite.
68. Limestone, dolomitic.

69. Ferry County. Permian. SW¼SW¼ sec. 31, T. 40 N., R. 34 E. Vandiver property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample F-15. (Mills, 1962, p. 12, 13, 187, 189, 244, 252, 264, pl. 1.) Limestone, light-gray, fine-grained, massive; 50 ft sampled. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.

70-72. Ferry County. Permian or Triassic. NE¼NW¼ sec. 31, T. 40 N., R. 34 E., Little Goosmus Creek area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 187-189, 244, 252, 264, pl. 1.) General: Limestone, gray, fine-grained; contains blebs of white silica and black chert. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.
70. Sample F-16.
71. Sample F-17.
72. Sample F-18.

73. Ferry County. Permian and Triassic. NW¼SW¼ sec. 6, T. 39 N., R. 34 E., 2 miles northeast of town of Curlew. Owner: W. B. Helphrey. (Mills, 1962, p. 187, 190, pl. 1.) Limestone, white, fine- to coarse-grained; massive. Tonnage estimated. Index and geologic maps. Use: Probably none, deposit small.

74-77. Ferry County. Triassic. SW¼NW¼ sec. 17, T. 40 N., R. 34 E., about 2.5 miles southwest of town of Danville. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 186-188, 244, 252, 264, pl. 1.) Limestone, white to light-gray, medium-grained. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.
74. Sample F-3.
75. Sample F-7.
76. Sample F-8.
78. Sample F-9.

78. Ferry County. [NW¼NW¼ T. 36 N., R. 33 E., near] Republic. Republic Gold Mines and Lime Works. Analyst, S. G. Dewsnap. (Burchard, 1912, p. 694, pl. 1.) Limestone. Index map. Use: Quarried [use not given].

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	79	80	81	82	83	84	85	86	87	88	89	90	91
	$46F_210-10$	$46F_210-5$	$46F_215-1$	$46F_216-8$	$46F_217-59$	$46F_217-57$	$46F_217-60$	$46F_217-61$	$46F_217-62$	$46F_217-58$	$46F_217-1$	$46F_217-2$	$46F_217-5$
SiO_2	1.10	0.6	1.50	3.74	Trace	1.48	0.90	0.96	1.00	1.18	0.02	0.18	3.00
Al_2O_3	[1]1.00	------	------	1.14	[1]Trace	[1].54	[1].40	.35	.21	[1].36	.05	.24	.50
Fe_2O_3				.30				.13	.07		.37	.20	
MgO	1.50	Trace	------	.25	Trace	2.76	.04	.22	.32	3.64	1.73	1.63	1.60
CaO	55.00	[2]55.0	[2]54.17	49.73	55.50	52.97	54.45	54.64	54.80	52.14	54.32	55.00	52.00
H_2O	------	[3]1.2	.40	------	------	------	------	------	------	------	[4](.02)	------	------
MnO	------	------	[5]1.40	------	------	------	------	------	------	------	------	------	------
P	------	Trace	------	------	------	------	------	------	------	------	------	------	------
SO_3	[6]Trace	[7]Trace	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	------	[8]43.2	[8]42.53	43.91	44.00	42.00	43.15	43.41	43.42	42.40	43.07	42.15	42.40
Total	[58.60]	100.0	100.00	[99.07]	[99.50]	[99.75]	[98.94]	[99.71]	[99.82]	[99.72]	99.56	99.40	99.50
Class	0,2,93	1,1,98	2,0,97	1,8,89	0,0,99	1,2,94	0,1,97	0,2,98	1,1,98	1,1,95	0,0,97	0,0,95	2,1,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	92	93	94	95	96	97	98	99	100	101	102	103	104
	$46F_217-4$	$46F_217-3$	$46F_217-55$	$46F_217-48$	$46F_217-47$	$46F_219-4$	$46F_219-6$	$46F_222-2$	$46F_222-3$	$46F_222-4$	$46F_222-5$	$46F_222-6$	$46F_222-7$
SiO_2	2.64	0.40	1.20	0.70	1.08	1.05	2.27	[9]0.39	[9]0.64	[9]0.54	0.34	0.30	0.36
Al_2O_3	1.52	.16	[1]1.50	1.15	------	------	------	[10].40	[10].66	[10].44	[10].48	[10].54	[10].47
Fe_2O_3													
FeO	------	------	------	------	------	[2].78	------	------	------	------	------	------	------
MgO	1.30	1.98	1.50	------	------	------	------	[11]21.66	[11]21.42	[11]21.50	[11]20.59	[11]20.43	[11]20.35
CaO	53.38	53.30	54.32	[2]52.94	[2]55.09	[2]54.62	[2]53.44	30.80	30.95	30.81	31.40	31.60	31.65
H_2O	------	------	------	[3]3.20	.58	.84	------	------	------	------	------	------	------
P	------	------	------	------	------	------	Trace	------	------	------	------	------	------
Ignition loss	40.92	43.86	------	[8]41.56	[8]43.25	[8]42.88	[8]41.96	[12]46.75	[12]46.33	[12]46.71	[12]47.19	[12]47.13	[12]47.17
Total	99.76	99.70	[58.52]	99.55	100.00	100.17	[97.67]	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,4,92	0,0,99	0,2,93	0,4,94	1,1,98	1,1,98	2,0,95	0,1,98	0,1,97	0,1,98	0,1,99	0,1,99	0,1,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	105	106	107	108	109	110	111	112	113	114	115	116	117
	$46F_222-8$	$46F_222-9$	$46F_222-10$	$46F_222-11$	$46F_222-12$	$46F_222-13$	$46F_222-14$	$46F_222-15$	$46F_222-16$	$46F_222-17$	$46F_222-18$	$46F_222-19$	$46F_222-20$
SiO_2	0.48	0.96	0.30	0.56	0.68	0.50	0.34	0.30	0.46	0.60	0.38	0.58	0.56
R_2O_3 [10]	.88	.99	.48	.65	.62	.56	.52	.77	.92	.64	.82	.78	.86
MgO [11]	20.19	19.79	20.49	20.41	20.65	20.50	20.33	20.31	20.42	20.19	20.18	20.27	20.23
CaO	31.60	31.74	31.59	31.40	31.11	31.45	31.69	31.61	31.30	31.62	31.72	31.50	31.50
Ignition loss [12]	46.85	46.52	47.14	46.98	46.94	46.99	47.12	47.01	46.90	46.95	46.90	46.87	46.85
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,2,98	0,1,99	0,1,99	0,1,98	0,1,99	0,1,99	0,1,99	0,1,99	0,1,99	0,1,99	0,1,98	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	118	119	120	121	122	123	124	125	126	127	128	129	130
	$46F_222-21$	$46F_222-22$	$46F_222-23$	$46F_222-24$	$46F_222-25$	$46F_222-26$	$46F_222-27$	$46F_222-28$	$46F_222-29$	$46F_222-30$	$46F_222-31$	$46F_222-32$	$46F_222-33$
SiO_2	0.30	0.20	0.22	0.41	0.55	0.88	0.44	0.62	0.06	0.40	0.30	1.18	1.46
R_2O_3 [10]	.50	.44	.43	.32	.44	.51	.78	.86	.52	.83	.74	1.22	1.06
MgO [11]	20.40	20.61	20.68	20.59	20.47	20.11	20.20	20.07	20.56	20.28	20.43	19.46	19.64
CaO	31.65	31.50	31.40	31.50	31.45	31.65	31.61	31.65	31.60	31.55	31.50	31.84	31.56
Ignition loss [12]	47.15	47.25	47.27	47.18	47.09	46.85	46.97	46.80	47.26	46.94	47.03	46.30	46.28
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,99	0,0,99	0,0,99	0,1,99	0,1,99	0,1,98	0,1,99	0,1,98	0,0,99	0,1,99	0,1,99	0,2,98	0,3,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

See following page for footnotes.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

79. Ferry County. [T. 36 N., R. 33 E.], town of Republic. (Hodge, 1944, p. 15, pl. 5.) Limestone. Index map.

80. Ferry County. [T. 37 N., R. 32 E.], between towns of Republic and Wauconda. Analyst, S. G. Dewsnap. (Landes, 1902, p. 28, 29.) Limestone, bluish, compact; checked with light-blue granular marble. Use: Lime.

81. Island County. Pacific Lime Co. (Bethune, 1891, p. 100-102.) Limestone. Possible use: Lime.

82. Jefferson County. Holocene. Sec. 24, T. 27 N., R. 5 W., about 3 miles up West Creek from its junction with Dosewallips River. (Danner, 1966, p. 82, 444.) Tufa, white, chalky; maximum thickness about 5 in.; composite sample. Index and geologic maps. Possible use: None, deposit small.

83. King County. Permian. Sec. 12, T. 26 N., R. 10 E., about 2 miles northwest of town of Grotto. Baring deposits. (Danner, 1966, p. 82, 360, 372-374, 375.) *Limestone, crystalline; composite sample. Tonnage estimated.* Index and geologic maps, geologic sections. Possible use: None, deposit small.

84 - 87. King County. Permian. NW¼ sec. 13, T. 26 N., R. 10 E., Palmer Mountain. (Danner, 1966, p. 82, 360, 363, 369, 370, 371, 372.) Limestone, black to dark-bluish-gray to white, finely crystalline. Tonnage estimated. Index and geologic maps, geologic section.

  84. Roche Harbor deposit, Calcite Placer claims. Sample taken across 100 ft. Former use: Cement. Possible use: Decorative stone.

  85. Carbonate Placer claim. Sample taken across 35 ft. Use: None, deposit small.

  86, 87. Carbonate Placer claim. Use: None, deposit small.

88. King County. Permian. NW¼ sec. 13, T. 26 N., R. 10 E., Palmer Mountain. Marble Cliff claim. (Danner, 1966, p. 82, 360, 363, 370, 371.) Limestone; sample taken across 50 ft. Index and geologic maps. Possible use: None, deposit small.

89 - 91. King County. Permian. Secs. 13, 24, 25, T. 26 N., R. 10 E., about 2 miles southwest of Grotto. Northwestern Portland Cement Co. (Hodge, 1938d, p. 13, 69, 73, 74, 76; Danner, 1966, p. 82, 359, 360, 362, 363, 367, 368.) General: Limestone, ranges from pure white to dark-gray-blue; fine grained for most part but recrystallized in places; mineralogy. Tonnage estimated. Index and geologic maps. Former use: Cement, deposit now depleted.

  89. USED sample 205B.

92, 93. King County. Permian. Secs. 13, 24, 25, T. 26 N., R. 10 E., 2 miles from town of 8aring. Grotto deposits. Analyst, A. A. Hammer. (Shedd, 1913, p. 235, 244, pl. 21; Danner, 1966, p. 82, 359, 360, 362, 363, 367, 368.) Limestone, finely crystalline; stratified in some places; 100 ft exposed. Mineralogy. Tonnage estimated. Index and geologic maps. Former use: Cement, deposit now depleted.

  92. Limestone, dark-gray.

  93. Limestone, white.

94. King County. Permian, (Danner, 1966). [T. 26 N., R. 11 E.], near Grotto. (Hodge, 1944, p. 15, pl. 6.) Limestone. Tonnage estimated. Index map.

Washington—Continued

95. King County. [T. 23 N., R. 4 E., town of Tukwila], Tuckawila. Pacific Coast Portland Cement Co. Analyst, R. A. Heath. (Burchard, 1912, p. 695, pl. 1.) Limestone. Index map. Use: Quarried [use not given].

96. King County. [Possibly T. 24 N., R. 8 E., near town of Snoqualmie.] Snoqualmie Co. Analyst, G. A. Bethune. (Bethune, 1891, p. 100-102; 8ethune, 1892, p. 53.) Limestone. Use: Lime.

97. Kittitas County. [SE¼ T. 19 N., R. 15 E.], Cle-Elum. Analyst, G. A. Bethune. (Bethune, 1891, p. 100-102; Bethune, 1892, p. 53.) Limestone. Use: Lime.

98. Kittitas County. [T. 22 N., R. 15 E.], about 20 miles northwest of town of Roslyn. (Hodge, 1935c, p. 75.) Limestone. Possible use: Flux.

99 - 130. Lincoln County. Cambrian, Old Dominion Limestone. T. 28 N., R. 36 E., Old Fort Spokane area. (Bennett, 1944, p. 7, 26-28, pl. 8 or 9; Bennett, 1945, p. 14.) Deposit description: Dolomitic marble, white, medium- to coarse-grained. Stratigraphic thickness possibly 5,000-6,000 ft. Overburden. *Fresh sample from outcrop, fragments taken every 5 ft,* usually for a length of 50 ft. Tounage estimated. Index and geologic maps. Possible use: General uses of dolomite; source of magnesia, refractories, crushed stone.

  99 - 102. NW¼SW¼ sec. 15. Pacific Coast Marble Co.

    99. Sample 467.
    100. Sample 468.
    101. Sample 469.
    102. Sample 470.

  103 - 105. SW¼SW¼ sec. 15. Pacific Coast Marble Co.

    103. Sample 498.
    104. Sample 499.
    105. Sample 500.

  106 - 113. NE¼SE¼ sec. 16. Pacific Coast Marble Co.

	Sample		Sample
106.	480	110.	484
107.	481	111.	485
106.	482	112.	486
109.	483	113.	487

  114, 115. SW¼SE¼ sec. 16. Pacific Coast Marble Co.

    114. Sample 471.
    115. Sample 472.

  116 - 128. SE¼SE¼ sec. 16. Pacific Coast Marble Co.

	Sample		Sample
116.	473	123.	491
117.	474	124.	492
118.	475	125.	493
119.	476	126.	494
120.	488	127.	495
121.	489	128.	496
122.	490.		

  129, 130. NW¼NE¼ sec. 21. Owner: C. A. Olsen.

    129. Sample 454.
    130. Sample 455.

Footnotes of analyses on preceding page:

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[1] R_2O_3.
[2] Calculated from reported $CaCO_3$ or Fe.
[3] Organic matter and water.
[4] Moisture, not included in total.
[5] Reported as manganese.
[6] Reported as SO_2.
[7] Reported as sulfur.
[8] CO_2, calculated from reported $MgCO_3$ and (or) $CaCO_3$.
[9] Also reported as insoluble.
[10] Iron and alumina.
[11] By difference.
[12] 950°-1,000°C; also called CO_2.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	131	132	133	134	135	136	137	138	139	140	141	142	143
	$46F_222$-34	$46F_222$-35	$46F_222$-36	$46F_222$-37	$46F_222$-38	$46F_222$-39	$46F_222$-40	$46F_222$-41	$46F_222$-42	$46F_222$-43	$46F_222$-44	$46F_222$-45	$46F_222$-46
SiO_2	1.06	0.64	[1]0.31	[1]0.80	[1]0.72	0,14	0.18	0.28	0.32	0.44	0.72	0.82	1.30
R_2O_3[2]	.98	1.02	.46	.80	.52	.40	.47	.42	.76	.38	.66	.86	.80
MgO[3]	19.98	19.96	21.21	21.05	21.55	20.41	20.52	20.44	20.19	20.34	20.39	20.03	19.80
CaO	31.44	31.72	31.33	31.05	30.67	31.78	31.60	31.65	31.70	31.70	31.35	31.56	31.60
Ignition loss[4]	46.54	46.66	46.69	46.30	46.54	47.27	47.23	47.21	47.03	47.14	46.88	46.73	46.50
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,2,98	0,1,98	0,1,98	0,1,97	0,1,97	0,0,99	0,0,99	0,0,99	0,1,99	0,1,99	0,1,98	0,1,98	0,2,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	144	145	146	147	148	149	150	151	152	153	154	155	156
	$46F_222$-47	$46F_222$-48	$46F_222$-49	$46F_222$-50	$46F_222$-51	$46F_222$-52	$46F_222$-53	$46F_224$-24	$46F_240$-188	$46F_240$-189	$46F_240$-190	$46F_240$-191	$46F_240$-192
SiO_2	[1]1.28	[1]1.84	[1]0.68	0.82	0.53	0.35	0.20	2.24	1.29	1.20	0.34	3.98	3.45
R_2O_3	[2].56	[2].84	[2].47	[2].70	[2].44	[2].47	[2].64	4.00	.49	.34	.38	.79	.86
MgO	[3]21.09	[3]20.75	[3]21.19	[3]20.35	[3]20.54	[3]20.72	[3]20.50	2.28	10.90	3.22	3.23	.74	.60
CaO	30.87	30.92	31.03	31.32	31.40	31.26	31.50	49.05	43.73	51.96	52.24	52.69	53.14
P_3O_5	------	------	------	------	------	------	------	------	.014	.017	.021	.055	.075
Ignition loss	[4]46.20	[4]45.65	[4]46.63	[4]46.81	[4]47.09	[4]47.20	[4]47.16	41.32	[5]44.57	[5]43.45	[5]43.91	[5]41.80	[5]41.94
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	98.89	[100.99]	[100.19]	[100.12]	[100.06]	[100.06]
Class	0,2,97	0,2,95	0,1,98	0,1,98	0,1,99	0,1,99	0,0,99	0,4,92	0,1,97	1,1,97	0,1,98	3,2,94	2,3,95
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Magnesian calcite	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

	Washington—Continued												
	157	158	159	160	161	162	163	164	165	166	167	168	169
	$46F_2$ 40-193	$46F_2$ 40-194	$46F_2$ 40-195	$46F_2$ 40-196	$46F_2$ 40-197	$46F_2$ 40-198	$46F_2$ 40-199	$46F_2$ 40-200	$46F_2$ 40-201	$46F_2$ 40-202	$46F_2$ 40-203	$46F_2$ 40-187	$46F_2$ 40-253
SiO_2	2.34	2.94	1.57	1.43	0.50	1.36	3.73	1.28	0.29	0.44	0.50	2.64	[6]1.60
Al_2O_2 Fe_2O_2	[7].92	[7].73	[7].42	[7].34	[7].14	[7].29	[7].87	[7].13	[7].34	[7].37	[7].25	[7].50	.14 [8].42
MgO	.54	.72	.24	.14	.16	.31	.78	.24	.23	.28	.25	5.56	[9].91
CaO	53.51	53.33	54.62	55.52	55.51	54.93	52.75	54.95	55.67	55.41	55.46	48.70	[9]53.38
H_2O-	------	------	------	------	------	------	------	------	------	------	------	------	.35
P_2O_5	.075	.058	.006	.017	.028	.005	.010	.029	.019	.019	.018	.041	.08
Ignition loss	[5]42.45	[5]42.28	[5]42.98	[5]42.26	[5]43.54	[5]43.17	[5]41.98	[5]43.25	[5]43.42	[5]43.32	[5]43.49	[5]42.15	[10]42.89
Total	[99.84]	[100.06]	[11][99.84]	[11][99.71]	[99.88]	[100.06]	[100.12]	[11][99.88]	[11][99.97]	[11][99.84]	[99.97]	[99.59]	[99.77]
Class	1,3,96	2,2,95	1,1,97	1,1,96	0,0,99	1,1,98	2,3,95	1,0,98	0,1,99	0,1,98	0,1,99	2,1,93	(1,2)97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite

	Washington—Continued												
	170	171	172	173	174	175	176	177	178	179	180	181	182
	$46F_2$ 40-260	$46F_2$ 40-246	$46F_2$ 40-247	$46F_2$ 40-244	$46F_2$ 40-245	$46F_2$ 40-204	$46F_2$ 40-207	$46F_2$ 40-205	$46F_2$ 40-206	$46F_2$ 40-166	$46F_2$ 24-6	$46F_2$ 40-208	$46F_2$ 40-209
SiO_2	6.2	------	------	------	------	1.34	4.90	0.42	1.40	1.80	3.56	1.51	0.96
R_2O_3	------	------	------	------	------	.31	.31	.16	.28	.60	2.04	.33	.20
MgO	[9].5	[9]------	[9]------	[9]------	[9]------	.28	.40	.26	.70	Trace	Trace	.63	.53
CaO	[9]51.4	[9]55.2	[9]55.3	[9]54.9	[9]54.7	54.92	52.83	55.59	54.43	54.62	52.56	54.37	54.80
P_2O_5	------	------	------	------	------	.008	.014	.005	.011	------	------	.006	.004
Ignition loss	[10]40.9	[10]43.4	[10]43.4	[10]43.0	[10]43.0	[5]43.15	[5]41.45	[5]43.43	[5]43.13	41.88	40.88	[5]43.07	[5]43.34
Total	[99.0]	[98.6]	[98.7]	[97.9]	[97.7]	[100.01]	[99.90]	[99.86]	[99.95]	98.90	99.04	[99.92]	[99.83]
Class	6,0,93	0,0,99	0,0,99	0,0,98	0,0,98	1,1,98	4,1,94	0,0,99	1,1,98	1,2,95	0,6,92	1,1,98	1,1,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Also reported as insoluble.

[2] Iron and alumina.

[3] By difference.

[4] 950°-1,000°C; also called CO_2.

[5] Sample dried at 110°-112°C; ignition loss at 1,000°-1,100°C.

[6] Insoluble.

[7] R_2O_2.

[8] Reported as iron oxide.

[9] Calculated from reported $MgCO_3$ and(or) $CaCO_2$.

[10] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[11] A composite of samples 159, 160, 164-166 contained Na_2O = 170 ppm, K_2O = 720 ppm, TiO_2 = < 30 ppm; S=16 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_2, K_2O, Sc_2O_2, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_2, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, TeO_2, Cs_2O, BaO, La_2O_2, CeO_2, Pr_2O_2, Nd_2O_3, Sm_2O_2, Eu_2O_2, Gd_2O_2, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_2, Tm_2O_3, Yb_2O_2, Lu_2O_2, HfO_2, Ta_2O_5, WO_2, Re_5O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; for sample 160, PbO = 0.009 percent]

	152	153	154	155	156	157	158	159	160	161	162
Na_2O	------	------	------	0.15	0.09	0.09	0.05	------	------	------	------
TiO_2	0.0044	0.0044	0.0064	.022	.029	.018	.019	0.016	0.0088	0.0034	0.0076
V_2O_5	------	------	.003	------	------	------	------	.003	.003	------	------
Cr_2O_2	.00035	.00048	.00042	.00064	.0005	.0005	.0005	.0017	.00086	.00086	.0023
MnO	.0094	.01	.0079	.036	.028	.034	.039	.036	.061	.04	.027
CuO	.0027	.0020	.0012	.0014	.0012	.0012	.0011	.0016	.0014	.00088	.00077
SrO	.15	.12	.14	.14	.13	.15	.14	.0096	.0088	.014	.017

Spectrochemical analyses—Continued

	163	164	165	166	167	168	175	176	177	178	181	182
Na_2O	------	------	------	------	------	------	------	------	------	------	0.14	------
TiO_2	0.018	0.0036	0.0088	0.012	0.0096	0.03	0.014	0.0048	0.0036	0.0096	.12	0.006
V_2O_5	.003	------	.003	------	------	------	------	------	------	------	.0073	------
Cr_2O_3	.0012	.00051	.0014	.00096	.0016	.0008	.0022	.0014	.0015	.0023	.0019	.0018
MnO	.12	.032	.047	.043	.12	.078	.048	.035	.031	.056	.079	.024
CuO	.0021	.0015	.00077	.0020	.0016	.001	.0018	.0013	.00093	.0019	.0016	.00099
SrO	.014	.11	.012	.013	.016	.027	.02	.011	.013	.012	.017	.02

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

131-150. Lincoln County. Cambrian, Old Dominion Limestone. T. 28 N., R. 36 E., Old Fort Spokane area. (Bennett, 1944, p. 7, 26-28, pl. 8.) Deposit description: Dolomitic marble, white, medium- to coarse-grained; stratigraphic thickness possibly 5,000-6,000 ft; overburden. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; source of magnesia, refractories, crushed stone.

131-135. NW¼NE¼ sec. 21. Owner, C. A. Olsen. (Bennett, 1945, p. 14.)

131. Sample 456.
132. Sample 457.
133. Sample 458.
134. Sample 459.
135. Sample 460.

136-141. NE¼SW¼ sec. 21. Owner, C. A. Olsen. (Bennett, 1945, p. 13.)

	Sample		Sample
136.	461	139.	464
137.	462	140.	465
138.	463	141.	466

142-150. NW¼SW¼ sec. 21. Owner, W. F. Pierce. (Bennett, 1945, p. 13.)

	Sample		Sample
142.	445	147.	450
143.	446	148.	451
144.	447	149.	452
145.	448	150.	453
146.	449		

151. Okanogan County. Paleozoic. T. 35 N., R. 26 E., 1.5 miles west of town of Riverside. Analyst, A. A. Hammer. (Shedd, 1913, p. 166, 167, 245, pl. 21; Landes, 1934, p. 1077, 1078, 1080.) Limestone, brownish-blue; thin overburden. Index maps. Possible use: Portland cement [implied].

152-154. Okanogan County. Late(?) Permian, middle part of Anarchist [Group]. NE¼ sec. 25, T. 38 N., R. 26 E., about 5 miles northwest of town of Tonasket, Cayuse Mountain area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 224-226, 227, 245, 255, 264, pl. 1.) Limestone, white to light-gray; alternating with beds of dolomite. Chip samples from outcrop, together represent 150 ft. Index and geologic maps. Possible use: Probably none, rock impure.

152. Sample O-37.
153. Sample O-38.
154. Sample O-39.

155-158. Okanogan County. Middle part of Anarchist [Group]. SW¼ sec. 25, T. 38 N., R. 26 E., about 5 miles northwest of Tonasket. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 224-226, 227, 245, 255, 264, pl. 1.) Limestone, medium to dark in color, fine-grained, thin-bedded; calcite stringers. Chip samples from outcrop, together represent 200 ft. Index and geologic maps. Possible use: Portland cement.

155. Sample O-40.
156. Sample O-41.
157. Sample O-42.
158. Sample O-43.

159-167. Okanogan County. Middle part of Anarchist [Group]. T. 39 N., R. 26 E., about 6 miles southwest of town of Oroville, Sinlahekin district. Reed property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 221-223, 224, 245, 254, 264, pls. 1, 7.) Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, mineral filler, pulp and paper, builders' lime, ceramic whiting.

159, 160. Center sec. 4. Lesamiz property. Limestone, light-gray to dark-gray and black, fine-grained, well-bedded; weathers gray.

159. Sample O-27 represents 25 ft.

Washington—Continued

160. Sample O-28 represents 25 ft.

161-163. N½ sec. 10. Limestone, light- to medium-gray, very fine grained, massive; weathers gray; contains small amount of silica.

161. Sample O-24 represents 55 ft.
162. Sample O-25 represents 43 ft.
163. Sample O-26 represents 43 ft.

164-167. Center sec. 35. Limestone, light-gray to gray, medium- to thin-bedded.

164. Sample O-29.
165. Sample O-30.
166. Sample O-31.
167. Sample O-32.

168. Okanogan County. Probably Devonian, Carboniferous, or Mesozoic, Covada Group. SW¼SE¼ sec. 16, T. 33 N., R. 26 E., about 0.75 mile southeast of town of Okanogan, Jackass Butte. Colville Indian Reservation, abandoned quarry. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample O-75. (Mills, 1962, p. 12, 13, 228, 229, 246, 256, 264, pl. 1.) Limestone, white to light-gray, coarse-grained, slightly micaceous. Chip grab sample. Index and geologic map. Possible use: None, deposit small, rock impure.

169. Okanogan County. Covada Group. SW¼SE¼ sec. 16, T. 33 N., R. 26 E., about 0.75 mile southeast of Okanogan, Jackass Butte. (Hodge, 1938d, p. 13, 79; Mills, 1962, p. 228, 229.) Limestone. General: Marble, green, white; mineralogy. Total thickness about 200 ft. Index map. Former use: Lime. Possible use: None.

170-174. Okanogan County. Carboniferous. Center sec. 20, T. 39 N., R. 29 E., 2.5 miles north of town of Havillah. Bunch-Wildermuth property. (Mills, 1962, p. 211, 215-217.) General: Limestone, gray to light-gray, fine-grained, thin-bedded; contains calcite and quartz. Tonnage estimated. Index and geologic map. Possible use: None, deposit small.

170. Limestone, composite sample.

171-174. Analyst, W. H. Ott; collector, Walter Wildermuth.

175-178. Okanogan County. Carboniferous. Sec. 20, T. 39 N., R. 29 E., 2.5 miles north of Havillah. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 215, 216, 217, 245, 255, 264, pl. 1.) Limestone, gray to light-gray, fine-grained, thin-bedded; contains calcite and quartz; deposit ranges from 50 to 75 ft in thickness. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, mineral filler, pulp and paper industry, builders' lime, ceramic whiting; deposit small.

175, 176. NE¼SW¼ sec. 20. Samples O-33, O-36 represent 75 ft.

177. NE¼SW¼ sec. 20. Sample O-34 represents 40 ft.

178. SE¼ sec. 20. Sample O-35 represents total thickness in area; 50 ft.

179. Okanogan County. Carboniferous. Probably NE¼SE¼ sec. 34, T. 39 N., R. 29 E., east of Havillah. Analyst, A. A. Hammer. (Shedd, 1913, p. 169, 244, pl. 21; Mills, 1962, p. 211, 215, 216.) Limestone, blue, finely crystalline. Tonnage estimated. Index map. Possible use: Portland cement.

180. Okanogan County. Carboniferous(Mills, 1962). T. 39 N., R. 29 E., 5 miles southwest of town of Chesaw. Analyst, A. A. Hammer. (Shedd, 1913, p. 164, 165, 244.) Limestone, light-gray, finely crystalline. Possible use: Portland cement.

181, 182. Okanogan County. Carboniferous. Sec. 27, T. 40 N., R. 30 E., 2.6 miles northeast of Chesaw, Buckhorn Mountain area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 211-213, 214, 245, 254, 264, pl. 1.) General: Limestone, light-gray to dark-gray, fine-grained, very thin bedded; contains chert; about 3,000 ft thick. Chip sample from outcrop. This sample with other samples represents 150 ft. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, chemical, mineral filler, pulp and paper industry, builders' lime, metallurgical, ceramic whiting.

181. Sample O-14.
182. Sample O-15.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	183	184	185	186	187	188	189	190	191	192	193	194	195
	$46F_2$ 40-210	$46F_2$ 40-211	$46F_2$ 40-212	$46F_2$ 40-213	$46F_2$ 40-214	$46F_2$ 40-215	$46F_2$ 40-216	$46F_2$ 40-217	$46F_2$ 40-218	$46F_2$ 40-219	$46F_2$ 24-4	$46F_2$ 24-5	$46F_2$ 24-1
SiO_2	0.71	1.52	1.97	3.32	0.90	0.51	1.46	4.14	3.55	3.61	6.58	2.36	0.86
$Al_2O_3+Fe_2O_3$	[1].23	[1].38	[1].22	[1].31	[1].17	[1].38	[1].27	[1].78	[1].63	[1].72	.26	.88	.72
MgO	.32	.41	.40	.39	.45	.37	.33	.34	.60	.43	1.26	.96	.35
CaO	55.44	54.66	54.53	53.63	54.46	55.01	54.60	52.95	52.80	53.10	49.90	51.89	54.10
P_2O_5	.004	.005	.007	.028	.012	.008	.005	.009	.006	.009	------	------	------
Ignition loss	[2]43.32	[2]42.95	[2]42.80	[2]42.23	[2]43.13	[2]43.58	[2]42.78	[2]41.47	[2]42.30	[2]41.86	41.50	43.21	42.50
Total	[3][100.02]	[3][99.92]	[3][99.93]	[3][99.91]	[99.12]	[99.86]	[99.44]	[99.69]	[99.89]	[99.73]	99.50	99.30	98.53
Class	0,1,98	1,1,97	2,1,97	3,1,96	1,0,98	0,1,99	1,1,97	3,2,94	2,2,96	2,2,95	6,2,92	1,4,95	0,2,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	196	197	198	199	200	201	202	203	204	205	206	207	208
	$46F_2$40-254	$46F_2$24-2	$46F_2$24-17	$46F_2$24-18	$46F_2$24-9	$46F_2$24-10	$46F_2$24-11	$46F_2$24-15	$46F_2$24-16	$46F_2$24-93	$46F_2$24-92	$46F_2$24-91	$46F_2$24-94
SiO_2	3.09	4.54	6.46	4.20	3.86	3.38	2.76	1.44	4.17	0.84	1.65	1.91	6.57
R_2O_3	.19	.61	[4]1.28	[4]1.86	[4]1.76	[4]1.44	[4]1.68	[4]1.01	[4]1.24	[4]1.26	[4]2.12	[4]1.80	[4]2.38
MgO	.24	1.21	[5]12.40	[5]12.89	[5]14.86	[5]16.51	[5]14.70	[5]17.51	[5]12.18	[5]20.61	[5]19.80	[5]19.76	[5]18.34
CaO	[6]54.0	50.69	37.16	37.50	35.46	33.98	36.30	34.14	38.76	30.70	30.70	30.80	29.54
P_2O_5	.007	------	------	------	------	------	------	------	------	------	------	------	------
8	Nil	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	[7]42.3	42.85	[8]42.70	[8]43.55	[8]44.06	[8]44.69	[8]44.56	[8]45.90	[8]43.65	[8]46.59	[8]45.73	[8]45.73	[8]43.17
Total	[99.8]	99.90	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	3,1,96	4,3,93	4,4,92	1,5,93	1,5,93	1,4,94	0,5,95	0,3,97	2,4,94	0,1,98	0,3,96	0,3,96	3,7,90
CaO/MgO	Calcite	Calcite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	209	210	211	212	213	214	215	216	217	218	219	220	221
	$46F_2$ 24-95	$46F_2$ 24-96	$46F_2$ 24-97	$46F_2$ 24-98	$46F_2$ 24-99	$46F_2$ 24-100	$46F_2$ 24-101	$46F_2$ 24-102	$46F_2$ 24-103	$46F_2$ 24-104	$46F_2$ 24-105	$46F_2$ 24-106	$46F_2$ 24-107
SiO_2	2.08	1.86	1.69	1.30	1.26	0.56	0.30	0.98	0.42	0.28	0.46	0.24	0.38
$Al_2O_3+Fe_2O_3$[4]	1.46	1.60	2.09	1.37	1.07	.85	.90	1.24	1.40	1.35	1.34	.96	1.20
MgO[5]	19.42	19.43	19.72	20.07	19.81	20.06	20.26	19.57	19.61	20.00	20.00	20.25	20.29
CaO	31.28	31.28	30.80	31.00	31.48	31.68	31.58	31.86	32.02	31.64	31.54	31.58	31.36
Ignition loss[8]	45.76	45.83	45.70	46.26	46.38	46.85	46.96	46.35	46.55	46.73	46.66	46.97	46.77
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,4,96	0,3,96	0,3,96	0,2,97	0,2,97	0,1,98	0,1,99	0,2,97	0,1,98	0,1,98	0,1,98	0,0,99	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	222	223	224	225	226	227	228	229	230	231	232	233	234
	$46F_2$ 24-108	$46F_2$ 24-109	$46F_2$ 24-110	$46F_2$ 24-111	$46F_2$ 24-112	$46F_2$ 24-113	$46F_2$ 24-114	$46F_2$ 24-27	$46F_2$ 24-28	$46F_2$ 24-29	$46F_2$ 24-30	$46F_2$ 24-31	$46F_2$ 24-32
SiO_2	0.50	2.10	0.64	0.73	0.68	0.32	0.96	[9]0.66	[9]1.28	[9]0.92	[9]0.71	[9]0.92	[9]0.82
$Al_2O_3+Fe_2O_3$[4]	1.15	1.76	1.54	1.34	1.32	1.48	1.50	.56	.66	.69	.56	.60	.53
MgO[5]	20.21	19.09	19.98	19.94	20.16	20.66	19.84	20.92	20.82	20.98	21.43	21.30	21.40
CaO	31.40	30.94	31.40	31.48	31.30	30.80	31.40	31.31	31.26	31.01	31.03	30.81	30.82
Ignition loss[8]	46.74	46.11	46.44	46.51	46.54	46.74	46.30	46.55	45.98	46.40	46.27	46.37	46.43
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,4,95	0,1,98	0,1,98	0,1,98	0,1,98	0,2,97	0,1,98	0,2,96	0,2,97	0,1,97	0,2,97	0,1,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	235	236	237	238	239	240	241	242	243	244	245	246	247
	$46F_2$24-33	$46F_2$24-35	$46F_2$24-36	$46F_2$24-37	$46F_2$24-38	$46F_2$24-39	$46F_2$24-40	$46F_2$24-41	$46F_2$24-43	$46F_2$24-44	$46F_2$24-42	$46F_2$24-45	$46F_2$24-46
SiO_2	0.78	0.48	0.34	0.31	1.96	1.48	0.49	0.84	0.52	2.96	0.56	0.78	1.02
$Al_2O_3+Fe_2O_3$[4]	1.16	.79	.98	1.06	1.74	1.21	.78	1.26	.90	1.22	1.44	1.56	1.20
MgO[5]	19.89	20.43	20.41	20.36	19.69	20.41	20.34	20.10	20.07	19.60	19.88	20.20	20.15

	Washington—Continued												
	235	236	237	238	239	240	241	242	243	244	245	246	247
	$46F_224$-33	$46F_224$-35	$46F_224$-36	$46F_224$-37	$46F_224$-38	$46F_224$-39	$46F_224$-40	$46F_224$-41	$46F_224$-43	$46F_224$-44	$46F_224$-42	$46F_224$-45	$46F_224$-46
CaO	31.60	31.40	31.36	31.40	30.86	30.60	31.44	31.30	31.68	30.72	31.60	30.98	31.16
Ignition loss[8]	46.57	46.90	46.91	46.87	45.75	46.30	46.95	46.50	46.83	45.50	46.52	46.48	46.47
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,1,99	0,1,99	0,1,99	0,3,96	0,3,97	0,1,99	0,1,98	0,1,98	1,4,95	0,1,98	0,1,98	0,2,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

[1] R_2O_3.

[2] Sample dried at 110°-112°C; ignition loss, 1,000°-1,100°C.

[3] A composite of samples 183-186 contained Na_2O = 200 ppm, K_2O = 720 ppm, TiO_2 = < 30 ppm, S = 70 ppm.

[4] Iron and alumina.

[5] By difference.

[6] Calculated from reported $CaCO_3$.

[7] CO_2, calculated from reported MgO and $CaCO_3$.

[8] 950°-1,000°C; also called CO_2.

[9] Also reported as insoluble.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_5, NiO, CoO, ZnO, Ga_2O_3, GeO_3, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_3, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_2, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_3, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_3, UO_3]

	183	184	185	186	187	188	189	190	191	192
Na_2O	0.05	------	------	------	------	------	0.05	------	0.05	------
TiO_3	.004	0.015	0.0068	0.012	0.0064	0.0076	.0056	0.0064	.022	0.0076
Cr_2O_3	.0019	.0018	.0019	.00054	.0013	.0013	.0013	.0017	.0012	.0023
MnO	.013	.024	.042	.016	.058	.072	.02	.028	.07	.028
CuO	.00072	.00077	.00099	.00077	.00044	.00071	.0012	.0039	.0014	.0037
SrO	.021	.024	.029	.013	.015	.013	.024	.014	.021	.020

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

183 - 192. Okanogan County. Carboniferous. Sec. 27, T. 40 N., R. 80 E., 2.6 miles northeast of town of Chesaw, Buckhorn Mountain area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 211-213, 214, 245, 254, 264, pl. 1.) General: Limestone, light-gray to dark-gray, fine-grained, very thin bedded; contains chert; about 3,000 ft thick. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, chemical, mineral filler, pulp and paper industry, builders' lime, metallurgical, ceramic whiting.

183 - 185. With other samples, represents 150 ft.
183. Sample O-16.
184. Sample O-17.
185. Sample O-18.
186 - 188. With other samples, represents 320 ft.
186. Sample O-19.
187. Sample O-21.
188. Sample O-23.
189. Sample O-44.
190. Sample O-45.
191. Sample O-46.
192. Sample O-49.

193, 194. Okanogan County. Carboniferous (Mills, 1962). T. 40 N., R. 30 E., southwest of Chesaw. Analyst, A. A. Hammer. (Shedd, 1913, p. 163, 164, 165, 245, pl. 21.) Index maps. Possible use: Portland cement.
193. Limestone, light-gray, very finely crystalline.
194. Limestone, dark-gray, very fine grained, laminated.

195. Okanogan County. Carboniferous. T. 40 N., R. 30 E., east of Chesaw, Buckhorn Mountain. Analyst, A. A. Hammer. (Shedd, 1913, p. 163, 164, 165, 244; Mills, 1962, p. 211-213, 214.) General: Limestone, bluish-gray or blue and white banded, bedded; weathers gray; contains chert. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

196, 197. Okanogan County. Carboniferous. Probably T. 40 N., R. 30 E., 1-3 miles east of Chesaw, Buckhorn Mountain. (Mills, 1962, p. 211-213, 214.) Tonnage estimated. Possible use: Portland cement.
196. Hallauer claims. General: Limestone, bluish-gray or blue and white banded, bedded; weathers gray; contains chert. Index and geologic map.
197. Analyst, A. A. Hammer. (Shedd, 1913, p. 163, 164, 165, 244, pl. 21.) Limestone, dark-gray, occasional thin white seams, crystalline, fine-grained. Index and geologic maps.

198 - 204. Okanogan County. Triassic. Sec. 8, T. 34 N., R. 26 E., about 4.5 miles southwest of town of Riverside. Owner: Beechenow. Deposit 10. (Bennett, 1944, p. 6-9, 11, 23, 24, pl. 1; Bennett, 1945, p. 13.) Deposit: Dolomitic marble, white; chert veins and limy dolomite in upper part; stratigraphic thickness about 250 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone.
198. SW¼NE¼ sec. 8. Sample 458a.
199. SW¼NE¼ sec. 8. Sample 459a.
200. NW¼SE¼ sec. 8. Sample 450a.
201. NW¼SE¼ sec. 8. Sample 451a.
202. NW¼SE¼ sec. 8. Sample 452a.
203. NW¼SE¼ sec. 8. Sample 456a. Possible use: Source of magnesia.
204. NW¼SE¼ sec. 8. Sample 457a.

205 - 228. Okanogan County. Triassic. SW¼SE¼ sec. 10, T. 35 N., R. 26 E. Owner: Tim Bernard. Deposit 7. (Bennett, 1944, p. 6, 7, 9, 11, 17-19, pls. 5, 6; Bennett, 1945, p. 8.) Deposit: Dolomite, light- to dark-gray, dense, both massive and bedded. Beds where distinct usually more than a foot to several feet thick; stratigraphic thickness 165 to more than 1,000 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

	Sample		Sample		Sample
205.	313	213.	323	221.	331
206.	314	214.	324	222.	332
207.	315	215.	325	223.	333
208.	318	216.	326	224.	334
209.	319	217.	327	225.	335
210.	320	218.	328	226.	336
211.	321	219.	329	227.	337
212.	322	220.	330	228.	338

229 - 247. Okanogan County. Triassic. T. 35 N., R. 26 E., about 4 miles northwest of Riverside. Owner: S. J. Booher. Deposit 9. (Bennett, 1944, p. 6-9, 11, 22, 23, pl. 7; Bennett, 1945, p. 12.) Deposit: Dolomite, dark-gray, dense; probable stratigraphic thickness 400 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

229 - 244. NE¼NW¼ sec. 10.

	Sample		Sample		Sample
229.	420	234.	425	239.	436
230.	421	235.	426	240.	437
231.	422	236.	433	241.	438
232.	423	237.	434	242.	439
233.	424	238.	435	243.	441
				244.	442

245. NW¼NW¼ sec. 10. Sample 440.
246, 247. SE¼NW¼ sec. 10.
246. Sample 390. 247. Sample 391.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	248	249	250	251	252	253	254	255	256	257	258	259	260
	46F$_2$24-48	46F$_2$24-49	46F$_2$24-50	46F$_2$24-51	46F$_2$24-52	46F$_2$24-53	46F$_2$24-54	46F$_2$24-55	46F$_2$24-56	46F$_2$24-57	46F$_2$24-58	46F$_2$24-59	46F$_2$24-60
SiO_2	0.58	0.37	2.33	1.00	0.74	0.66	0.38	1.78	1.68	1.34	1.02	0.79	1.44
$Al_2O_3+Fe_2O_3$[1]	1.28	1.20	1.94	1.56	1.76	1.31	1.58	1.92	1.68	1.84	1.45	.79	1.42
MgO[2]	20.02	20.23	19.62	19.94	20.10	20.07	19.81	19.89	20.12	19.41	19.57	19.89	19.02
CaO	31.50	31.36	30.62	31.22	31.06	31.40	31.70	30.64	30.56	31.48	31.76	31.82	32.10
Ignition loss[3]	46.62	46.84	45.49	46.28	46.34	46.56	46.53	45.77	45.96	45.93	46.20	46.71	46.02
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,1,98	0,4,95	0,2,97	0,1,97	0,1,98	0,1,98	0,3,96	0,3,96	0,2,96	0,2,97	0,1,98	0,3,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	261	262	263	264	265	266	267	268	269	270	271	272	273
	46F$_2$24-61	46F$_2$24-62	46F$_2$24-63	46F$_2$24-64	46F$_2$24-65	46F$_2$24-66	46F$_2$24-67	46F$_2$24-68	46F$_2$24-69	46F$_2$24-70	46F$_2$24-71	46F$_2$24-72	46F$_2$24-73
SiO_2	1.30	1.48	1.42	0.73	3.20	1.84	2.00	0.31	0.35	1.65	0.47	1.82	1.74
$Al_2O_3+Fe_2O_3$[1]	1.32	1.40	1.13	1.12	1.86	.94	.99	.66	.80	1.23	1.31	1.60	1.28
MgO[2]	19.72	20.80	20.01	19.97	19.09	19.96	19.81	20.62	20.19	21.76	20.10	20.08	19.80
CaO	31.44	30.04	31.10	31.56	30.82	31.06	31.12	31.32	31.70	28.92	31.46	31.16	31.00
Ignition loss[3]	46.22	46.28	46.34	46.62	45.03	46.20	46.08	47.09	46.96	46.44	46.66	45.34	46.18
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,2,97	0,3,97	0,2,97	0,1,98	0,5,94	0,3,97	0,3,97	0,1,99	0,1,99	0,3,97	0,1,98	0,3,95	0,3,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	274	275	276	277	278	279	280	281	282	283	284	285	286
	46F$_2$24-74	46F$_2$24-75	46F$_2$24-76	46F$_2$24-77	46F$_2$24-78	46F$_2$24-79	46F$_2$24-80	46F$_2$24-115	46F$_2$24-116	46F$_2$24-81	46F$_2$24-82	46F$_2$24-83	46F$_2$24-84
SiO_2	2.32	1.52	1.65	1.95	1.22	0.66	1.10	0.40	0.48	0.35	0.50	0.36	0.40
$Al_2O_3+Fe_2O_3$[1]	1.44	1.74	1.04	1.64	.86	2.22	1.25	1.00	1.68	1.93	.98	.72	1.10
MgO[2]	19.72	19.81	20.04	19.25	20.29	19.60	21.54	20.09	22.33	19.15	19.81	20.18	19.94
CaO	30.66	30.94	31.00	31.42	31.06	31.40	29.42	31.70	28.64	32.28	31.94	31.76	31.80
Ignition loss[3]	45.86	45.99	46.27	45.74	46.57	46.12	46.69	46.91	46.87	46.29	46.77	46.98	46.76
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.10	100.00	100.00	100.00	100.00	100.00
Class	0,4,96	0,3,96	0,3,97	0,3,96	0,2,98	0,1,97	0,2,97	0,1,99	0,1,98	0,1,98	0,1,98	0,1,99	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	287	288	289	290	291	292	293	294	295	296	297	298	299
	46F$_2$ 24-85	46F$_2$ 24-86	46F$_2$ 24-87	46F$_2$ 24-88	46F$_2$ 24-89	46F$_2$ 24-90	46F$_2$ 24-117	46F$_2$ 24-118	46F$_2$ 24-119	46F$_2$ 24-120	46F$_2$ 24-121	46F$_2$ 24-122	46F$_2$ 24-123
SiO_2	0.58	0.42	0.30	0.55	1.27	1.80	0.72	0.58	[4]0.80	[4]0.96	[4]0.58	[4]0.76	[4]0.86
$Al_2O_3+Fe_2O_3$[1]	.97	1.20	1.45	1.23	.84	1.56	1.72	1.08	.69	.84	.68	.62	.61
MgO[2]	19.90	20.20	19.98	20.39	20.47	19.59	20.10	20.21	21.27	20.91	20.82	20.60	20.73
CaO	31.58	31.32	31.58	31.16	30.84	31.20	31.08	31.38	30.72	30.92	31.31	31.12	30.92
Ignition loss[3]	46.97	46.86	46.69	46.67	46.58	45.85	46.38	46.75	46.52	46.37	46.61	46.90	46.88
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,1,98	0,1,98	0,1,98	0,2,98	0,3,96	0,1,97	0,1,98	0,1,97	0,2,97	0,1,98	0,1,98	0,2,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	300	301	302	303	304	305	306	307	308	309	310	311	312
	46F$_2$ 24-124	46F$_2$ 24-125	46F$_2$ 24-126	46F$_2$ 24-127	46F$_2$ 24-128	46F$_2$ 24-129	46F$_2$ 24-130	46F$_2$ 24-131	46F$_2$ 24-132	46F$_2$ 24-133	46F$_2$ 24-134	46F$_2$ 24-154	46F$_2$ 24-155
SiO_2	[4]0.58	[4]1.22	[4]0.74	[4]1.08	[4]1.16	[4]0.96	[4]1.61	[4]1.02	[4]2.82	[4]1.76	[4]1.22	1.64	1.50
$Al_2O_3+Fe_2O_3$[1]	.68	.72	.78	.66	1.10	.68	1.18	1.06	1.36	1.30	.92	1.38	1.56
MgO[2]	20.79	20.63	20.53	20.51	20.44	20.73	20.48	20.73	20.25	20.46	20.58	20.03	19.81
CaO	30.97	30.77	31.12	31.02	30.82	30.82	30.47	30.57	29.97	30.34	30.72	30.82	31.05
Ignition loss[3]	46.98	46.66	46.83	46.73	46.48	46.81	46.26	46.62	45.50	46.14	46.56	46.13	46.08
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.90	100.00	100.00	100.00	100.00
Class	0,1,99	0,2,98	0,1,98	0,2,98	0,2,97	0,2,98	0,3,97	0,2,98	1,4,95	0,3,96	0,2,97	0,3,97	0,3,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	313	314	315	316	317	318	319	320	321	322	323	324	325
	$46F_2$ 24-156	$46F_2$ 24-157	$46F_2$ 24-158	$46F_2$ 24-159	$46F_2$ 24-160	$46F_2$ 24-161	$46F_2$ 24-162	$46F_2$ 24-163	$46F_2$ 24-164	$46F_2$ 24-165	$46F_2$ 24-166	$46F_2$ 24-167	$46F_2$ 24-168
SiO_2	0.63	2.45	2.26	1.42	0.95	2.00	0.55	2.02	0.90	0.76	0.66	0.30	0.28
$Al_2O_3 + Fe_2O_3$[1]	1.00	1.46	1.36	1.16	1.42	.94	1.11	1.08	1.19	1.35	.78	1.08	.80
MgO[2]	20.42	19.96	19.62	20.19	20.21	19.76	20.06	19.51	20.10	20.28	21.15	20.49	20.54
CaO	31.19	30.42	30.98	30.94	31.00	31.20	31.55	31.42	31.26	31.05	30.42	31.22	31.36
Ignition loss[3]	46.76	45.71	45.78	46.29	46.42	46.10	46.73	45.97	46.55	46.56	46.99	46.91	47.02
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,4,95	0,4,96	0,2,97	0,2,97	0,3,97	0,1,98	0,3,96	0,2,98	0,1,98	0,1,98	0,1,99	0,0,99
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	326	327	328	329	330	331	332	333	334	335	336	337	338
	$46F_2$24-169	$46F_2$24-170	$46F_2$24-171	$46F_2$24-172	$46F_2$24-173	$46F_2$24-174	$46F_2$24-175	$46F_2$24-136	$46F_2$24-138	$46F_2$24-139	$46F_2$24-146	$46F_2$24-147	$46F_2$24-148
SiO_2	0.26	0.29	0.30	0.33	0.31	0.58	0.26	5.30	7.15	5.21	[4]6.62	[4]5.34	[4]2.96
$Al_2O_3 + Fe_2O_3$[1]	.66	.78	.82	1.12	.84	2.23	1.60	1.98	2.21	2.25	1.50	1.36	.84
MgO[2]	20.22	20.58	20.20	20.40	20.47	20.08	20.08	19.08	18.35	19.23	20.01	19.90	20.30
CaO	31.80	31.35	31.14	31.32	31.40	30.92	31.46	29.58	29.25	29.28	28.95	29.10	30.28
Ignition loss[3]	47.06	47.00	47.54	46.83	46.98	46.19	46.60	44.06	43.04	44.03	42.92	44.30	45.62
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,0,99	0,1,99	0,2,98	0,1,98	0,1,99	0,1,97	0,0,98	2,6,92	3,6,90	1,7,91	4,4,89	3,4,92	2,2,95
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	339	340	341	342	343	344	345	346	347	348	349	350	351
	$46F_2$ 24-149	$46F_2$ 24-150	$46F_2$ 24-151	$46F_2$ 24-152	$46F_2$ 24-176	$46F_2$ 24-177	$46F_2$ 24-178	$46F_2$ 24-179	$46F_2$ 24-180	$46F_2$ 24-181	$46F_2$ 24-182	$46F_2$ 24-153	$46F_2$ 24-183
SiO_2	[4]1.56	[4]0.76	[4]0.24	[4]5.02	1.82	2.60	2.35	0.76	0.72	0.22	1.00	1.35	0.32
$Al_2O_3 + Fe_2O_3$[1]	.94	.75	.52	.70	1.06	1.25	1.10	1.30	1.01	1.02	.92	1.44	.95
MgO[2]	20.84	20.98	21.79	18.97	20.06	19.72	19.59	20.12	20.21	20.26	20.23	19.95	20.15
CaO	30.72	30.97	30.97	30.47	30.90	30.74	31.15	31.28	31.35	31.52	31.20	31.04	31.70
Ignition loss[2]	45.94	46.54	46.48	44.85	46.16	45.69	45.81	46.54	46.71	46.98	46.65	46.22	46.88
Total	100.00	100.00	100.00	100.01	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,3,96	0,1,98	0,0,97	4,2,94	1,3,97	1,4,96	1,3,96	0,1,98	0,1,98	0,0,99	0,2,98	0,2,97	0,1,99
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

[1] Iron and alumina.

[2] By difference.

[3] 950°-1,000°C; also called CO_2.

[4] Also reported as insoluble.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

248 - 269. Okanogan County. Triassic. SE¼ NW¼ sec. 10, T. 35 N., R. 26 E., about 4 miles northwest of town of Riverside. Owner, S. J. Booher. Deposit 9. (Bennett, 1944, p. 6-9, 11, 22, 23, pl. 7; Bennett, 1945, p. 12.) Deposit: Dolomite, dark-gray, dense; probable stratigraphic thickness 400 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

	Sample		Sample		Sample
248.	398	256.	406	263.	413
249.	399	257.	407	264.	414
250.	400	258.	408	265.	415
251.	401	259.	409	266.	416
252.	402	260.	410	267.	417
253.	403	261.	411	268.	418
254.	404	262.	412	269.	419
255.	405				

270 - 351. Okanogan County. Triassic. T. 35 N., R. 26 E. Deposit 7. (Bennett, 1944, p. 6, 7, 9, 11, 17-19, pls. 5, 6; Bennett, 1945, p. 8.) Deposit: Dolomite, light- to dark-gray, dense, both massive and bedded. Beds where distinct usually more than a foot to several feet thick; stratigraphic thickness 165 to more than 1,000 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

270 - 275. NE¼ SW¼ sec. 10. Owner, S. J. Booher.

	Sample		Sample		Sample
270.	339	272.	341	274.	343
271.	340	273.	342	275.	344

276 - 292. NW¼ SE¼ sec. 10. Owner, R. E. Smith.

Washington—Continued

	Sample		Sample		Sample
276.	345	282.	351	288.	357
277.	346	283.	352	289.	358
278.	347	284.	353	290.	359
279.	348	285.	354	291.	360
280.	349	286.	355	292.	361
281.	350	287.	356		

293, 294. SE¼ SE¼ sec. 10. Owner, R. E. Smith. Samples 316, 317.

295 - 332. NE¼ NE¼ sec. 15. Owner, Tim Bernard.

	Sample		Sample		Sample
295.	273	308.	286	321.	284a
296.	274	309.	287	322.	285a
297.	275	310.	288	323.	286a
298.	276	311.	274a	324.	287a
299.	277	312.	275a	325.	288a
300.	278	313.	276a	326.	289a
301.	279	314.	277a	327.	290a
302.	280	315.	278a	328.	291a
303.	281	316.	279a	329.	292a
304.	282	317.	280a	330.	293a
305.	283	318.	281a	331.	294a
306.	284	319.	282a	332.	295a
307.	285	320.	283a		

333 - 351. NW¼ NE¼ sec. 15. Owner, Tim Bernard.

	Sample		Sample		Sample
333.	256	340.	270	346.	292
334.	258	341.	271	347.	293
335.	259	342.	272	348.	294
336.	266	343.	289	349.	295
337.	267	344.	290	350.	273a
338.	268	345.	291	351.	296
339.	269				

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	352	353	354	355	356	357	358	359	360	361	362	363	364
	$46F_2$ 24-184	$46F_2$ 24-185	$46F_2$ 24-186	$46F_2$ 24-187	$46F_2$ 24-188	$46F_2$ 24-189	$46F_2$ 24-190	$46F_2$ 24-191	$46F_2$ 24-192	$46F_2$ 24-193	$46F_2$ 24-194	$46F_2$ 24-195	$46F_2$ 24-196
SiO_2	0.25	0.88	0.90	0.78	1.23	1.10	3.38	1.52	1.10	3.01	2.05	1.20	0.48
$Al_2O_3+Fe_2O_3$[1]	1.26	1.00	.85	1.06	1.56	1.60	2.45	2.02	1.96	1.94	1.34	1.25	1.43
MgO[2]	20.20	20.18	20.19	20.33	19.95	19.96	19.18	19.57	19.81	18.92	19.71	20.06	20.28
CaO	31.46	31.29	31.36	31.20	31.03	31.12	30.42	31.10	30.96	31.04	30.96	31.16	31.20
Ignition loss[3]	46.83	46.65	46.70	46.63	46.23	46.22	44.57	45.79	46.17	45.09	45.94	46.33	46.61
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,0,98	0,2,98	0,2,98	0,1,98	0,2,97	0,2,97	0,6,93	0,3,96	0,2,97	0,5,94	0,4,96	0,2,97	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	365	366	367	368	369	370	371	372	373	374	375	376	377
	$46F_2$ 24-197	$46F_2$ 24-198	$46F_2$ 24-199	$46F_2$ 24-201	$46F_2$ 24-202	$46F_2$ 24-204	$46F_2$ 24-251	$46F_2$ 24-245	$46F_2$ 24-209	$46F_2$ 24-212	$46F_2$ 24-214	$46F_2$ 24-215	$46F_2$ 24-216
SiO_2	6.57	4.24	2.36	3.12	6.10	4.90	7.36	6.25	6.85	6.14	4.12	4.70	6.81
$Al_2O_3+Fe_2O_3$[1]	2.36	2.40	1.85	1.98	2.55	1.94	1.86	2.66	2.22	2.68	2.38	2.12	2.14
MgO[2]	18.68	19.26	20.08	19.38	18.62	19.24	18.75	17.87	17.99	18.22	18.81	19.66	18.79
CaO	29.14	29.72	30.14	30.44	29.35	29.64	28.90	30.20	29.85	29.72	30.34	29.80	29.00
Ignition loss[3]	43.25	44.38	45.57	45.08	43.38	44.26	43.13	43.02	43.09	43.24	44.35	43.72	43.26
Total	100.00	100.00	100.00	100.00	100.00	99.98	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	3,7,90	0,7,92	0,4,95	0,5,94	2,7,90	2,6,92	4,5,90	2,8,89	3,6,90	2,8,90	0,7,92	1,6,91	3,6,90
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	378	379	380	381	382	383	384	385	386	387	388	389	390
	$46F_2$ 24-218	$46F_2$ 24-219	$46F_2$ 24-220	$46F_2$ 24-222	$46F_2$ 24-223	$46F_2$ 24-225	$46F_2$ 24-226	$46F_2$ 24-228	$46F_2$ 24-229	$46F_2$ 24-230	$46F_2$ 24-231	$46F_2$ 24-232	$46F_2$ 24-234
SiO_2	4.86	5.35	3.78	6.20	6.08	5.53	5.24	4.48	4.38	3.88	3.49	2.92	5.50
$Al_2O_3+Fe_2O_3$[1]	1.90	1.62	1.77	2.95	2.55	2.82	2.70	2.45	2.82	1.90	1.55	1.85	2.84
MgO[2]	19.24	18.72	19.13	18.09	18.17	18.38	17.76	18.37	18.66	18.69	19.12	19.53	17.94
CaO	29.70	30.18	30.46	29.70	29.88	29.82	30.20	30.64	30.68	30.89	30.78	30.42	30.30
Ignition loss[3]	44.30	44.13	44.86	43.06	43.32	43.45	44.10	44.06	43.46	44.64	45.06	45.28	43.42
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,6,92	3,5,92	1,5,94	1,9,89	2,7,90	1,8,90	1,8,91	0,7,92	0,8,90	1,6,93	1,5,94	0,5,94	1,8,90
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	391	392	393	394	395	396	397	398	399	400	401	402	403
	$46F_2$ 24-235	$46F_2$ 24-236	$46F_2$ 24-237	$46F_2$ 24-240	$46F_2$ 24-242	$46F_2$ 24-246	$46F_2$ 24-247	$46F_2$ 24-252	$46F_2$ 24-256	$46F_2$ 24-281	$46F_2$ 24-283	$46F_2$ 24-260	$46F_2$ 24-261
SiO_2	4.12	5.01	3.14	4.75	4.94	3.54	4.14	5.50	5.18	4.90	4.15	6.44	4.52
$Al_2O_3+Fe_2O_3$[1]	1.91	2.56	2.60	2.62	3.49	2.94	2.68	3.14	2.84	3.00	2.78	1.86	1.80
MgO[2]	18.31	18.50	18.69	18.82	18.59	18.81	18.93	18.77	18.42	19.09	18.98	18.41	18.32
CaO	31.20	30.11	30.90	29.84	29.55	30.36	30.00	29.20	29.96	29.20	29.90	29.80	30.90
Ignition loss[3]	44.46	43.82	44.67	43.07	43.43	44.35	44.25	43.39	43.60	43.81	44.19	43.49	44.46
Total	100.00	100.00	100.00	99.10	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	1,6,93	1,7,91	0,5,93	0,8,89	0,9,90	0,6,92	0,7,92	0,9,90	0,8,90	0,9,91	0,7,92	3,5,91	2,5,93
CaO/MgO	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	404	405	406	407	408	409	410	411	412	413	414	415	416
	$46F_2$ 24-262	$46F_2$ 24-263	$46F_2$ 24-274	$46F_2$ 24-275	$46F_2$ 24-277	$46F_2$ 24-284	$46F_2$ 24-285	$46F_2$ 24-286	$46F_2$ 24-288	$46F_2$ 24-290	$46F_2$ 24-293	$46F_2$ 24-294	$46F_2$ 24-295
SiO_2	3.38	5.35	5.70	5.50	6.04	0.30	0.18	1.12	6.56	7.81	1.56	2.14	1.03
$Al_2O_3+Fe_2O_3$[1]	2.34	1.92	3,16	2.68	2.71	1.04	1.72	1.84	1.82	1.58	1.20	1.12	1.24
MgO[2]	18.85	18.22	17.79	18.52	18.20	19.14	18.57	19.73	18.74	18.36	19.77	19.71	19.86
CaO	30.74	30.60	30.20	29.22	29.80	32.88	33.20	31.22	29.36	29.24	31.30	31.10	31.48
Ignition loss[3]	44.69	43.91	43.15	43.58	43.25	46.64	46.33	46.09	43.52	43.01	46.17	45.93	46.39
Total	100.00	100.00	100.00	99.50	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,6,93	2,6,92	0,9,89	1,8,90	2,8,90	0,1,98	0,0,98	0,2,97	4,5,91	5,5,90	0,3,97	0,3,96	0,2,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	417	418	419	420	421	422	423	424	425	426	427	428	429
	$46F_224$-296	$46F_224$-297	$46F_224$-298	$46F_240$-5	$46F_240$-17	$46F_240$-19	$46F_240$-20	$46F_240$-21	$46F_240$-22	$46F_240$-23	$46F_240$-24	$46F_240$-25	$46F_240$-26
SiO_2	1.28	2.52	4.70	5.70	2.45	4.64	4.80	[4]2.28	[4]1.14	[4]0.54	[4]0.36	[4]0.42	[4]0.60
$Al_2O_3 + Fe_2O_2$[1]	1.45	1.79	2.81	1.68	2.00	2.04	2.10	.80	.90	.84	.62	.56	.56
MgO[2]	19.92	19.03	18.87	17.36	19.38	18.97	18.90	20.72	21.56	21.67	21.65	21.48	21.73
CaO	31.10	31.30	29.70	31.58	30.84	30.06	30.00	30.02	29.62	29.87	30.11	30.31	29.92
Ignition loss[3]	46.25	45.36	43.92	43.68	45.33	44.79	44.20	46.18	46.78	47.08	47.26	47.23	47.19
Total	100.00	100.00	100.00	100.00	100.00	100.50	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,2,97	0,4,95	0,8,91	3,5,92	0,4,95	1,6,93	1,6,92	1,2,96	0,2,98	0,1,98	0,1,99	0,1,99	0,1,99
CaO/MgO	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	430	431	432	433	434	435	436	437	438	439	440	441	442
	$46F_240$-28	$46F_240$-29	$46F_240$-31	$46F_240$-32	$46F_240$-33	$46F_240$-34	$46F_240$-35	$46F_240$-36	$46F_240$-37	$46F_240$-38	$46F_240$-39	$46F_240$-41	$46F_240$-42
SiO_2	4.20	2.48	1.70	0.75	0.68	2.48	3.12	0.72	0.86	1.22	2.91	5.92	5.35
$Al_2O_2 + Fe_2O_3$[1]	1.78	1.50	1.02	1.22	1.08	1.32	2.24	1.88	1.84	2.24	3.02	1.82	2.21
MgO[2]	19.04	20.13	19.70	19.68	19.81	19.27	18.76	19.67	19.41	19.48	19.08	18.39	18.69
CaO	30.35	30.20	31.38	31.84	31.78	31.08	31.04	31.52	31.18	31.24	30.34	30.16	29.86
Ignition loss[3]	44.63	45.69	46.20	46.51	46.65	45.85	44.84	46.21	46.71	45.82	44.65	43.71	43.89
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	1,5,93	0,4,95	0,3,97	0,1,98	0,1,98	0,4,96	0,5,94	0,1,97	0,2,96	0,2,96	0,5,93	3,5,91	2,6,91
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

[1] Iron and alumina.

[2] By difference.

[3] 950°-1,000°C; also called CO_2.

[4] Also reported as insoluble.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

352-397. Okanogan County. Triassic. Sec. 15, T. 35 N., R. 26 E. Deposit 7. (Bennett, 1944, p. 6, 7, 9, 11, 17-19, pls. 5, 6; Bennett, 1945, p. 8.) Deposit: Dolomite, light- to dark-gray, dense, both massive and bedded. Beds where distinct usually more than a foot to several feet thick; stratigraphic thickness 165 to more than 1,000 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

352-367. NW¼NE¼ sec. 15. Owner, Tim Bernard.

	Sample		Sample		Sample
352.	297	358.	303	363.	308
353.	298	359.	304	364.	309
354.	299	360.	305	365.	310
355.	300	361.	306	366.	311
356.	301	362.	307	367.	312
357.	302				

368-370. SW¼NE¼ sec. 15. Owner, Tim Bernard.

368. Sample 240. 369. Sample 241. 370. Sample 243.

371. NW¼SE¼ sec. 15. Owner, Tim Bernard. Sample 203.

372-375. SE¼NE¼ sec. 15. Owner, R. E. Smith.

	Sample		Sample
372.	235	374.	251
373.	248	375.	254

376-397. NE¼SE¼ sec. 15. Owner, R. E. Smith.

	Sample		Sample		Sample
376.	204	384.	215	391.	225
377.	205	385.	218	392.	226
378.	207	386.	219	393.	227
379.	208	387.	220	394.	230
380.	209	388.	221	395.	232
381.	211	389.	222	396.	236
382.	212	390.	224	397.	237
383.	214				

398-420. County, age, maps, and use as in samples 352-397. T. 35 N., R. 26 E., about 2.5 miles northwest of town of Riverside. Deposit 6. (Bennett, 1944, p. 6-9, 11, 17, pl. 4; Bennett, 1945, p. 7.) Deposit: Dolomite, gray, massive; some siliceous beds. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

398, 399. SW¼SE¼ sec. 15. Owner, Mrs. W. V. West. Samples 184, 188.

Washington—Continued

400-405. SE¼SE¼ sec. 15. Owner, R. E. Smith.

	Sample		Sample		Sample
400.	181	402.	197	404.	199
401.	183	403.	198	405.	200

406-408. NE¼NE¼ sec. 22. Owner, R. E. Smith.

406. Sample 174. 407. Sample 175. 408. Sample 177.

409-420. NW¼NE¼ sec. 22. Owner, Mrs. W. V. West.

	Sample		Sample		Sample
409.	140	413.	146	417.	152
410.	141	414.	149	418.	153
411.	142	415.	150	419.	154
412.	144	416.	151	420.	161

421-423. County, age, maps, and use as in samples 352-397. SE¼NE¼ sec. 22, T. 35 N., R. 26 E., 2 miles northwest of Riverside. Deposit 5. (Bennett, 1944, p. 6-9, 11, 16, pl. 4; Bennett, 1945, p. 6.) Deposit: Dolomite, gray, thick-bedded to massive; contains many cherty quartz veinlets. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

421. Sample 137. 422. Sample 138. 423. Sample 139.

424-442. County, age, maps, and use as in samples 352-397. Sec. 23, T. 35 N., R. 26 E., about 1.5 miles northwest of Riverside. Owners, Emmett, Omar, and R. E. Smith. Deposit 8. (Bennett, 1944, p. 6-9, 11, 20, 21, pl. 3; Bennett, 1945, p. 11.) Deposit: Dolomite, light-gray, fine-grained; stratigraphic thickness 200-300 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Samples representative of deposit. Tonnage estimated.

424-429. NE¼NW¼ sec. 23.

	Sample		Sample		Sample
424.	383	426.	385	428.	387
425.	384	427.	386	429.	388

430-440. SE¼NW¼ sec. 23.

	Sample		Sample		Sample
430.	371	434.	376	438.	380
431.	372	435.	377	439.	381
432.	374	436.	378	440.	382
433.	375	437.	379		

441, 442. NE¼SW¼ sec. 23. Samples 363, 364.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued											
	443	444	445	446	447	448	449	450	451	452	453	454
	$46F_2$40-43	$46F_2$40-44	$46F_2$40-45	$46F_2$40-46	$46F_2$40-70	$46F_2$40-71	$46F_2$40-72	$46F_2$40-73	$46F_2$40-74	$46F_2$40-75	$46F_2$40-76	$40F_2$40-78
SiO_2	3.38	2.72	5.41	2.18	4.35	3.50	4.00	3.88	5.12	3.21	2.88	1.86
$Al_2O_3+Fe_2O_3$ [1]	1.35	1.56	1.52	2.09	2.00	1.75	2.54	2.08	2.35	2.42	2.07	2.10
MgO [2]	19.41	19.66	18.24	19.84	18.98	19.50	19.16	19.42	19.54	20.27	20.24	20.31
CaO	30.62	30.50	30.20	30.40	30.23	30.43	29.93	29.93	28.95	29.34	29.54	30.08
Ignition loss [3]	45.24	45.56	44.63	45.49	44.44	44.82	44.37	44.69	43.04	44.76	45.27	45.77
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.00	100.00	100.00	100.12
Class	1,4,95	0,5,95	3,5,92	0,4,95	1,6,93	1,5,93	0,7,92	0,6,93	1,7,89	0,6,93	0,5,94	0,3,96
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued											
	455	456	457	458	459	460	461	462	463	464	465	466
	$46F_2$ 40-79	$46F_2$ 40-80	$46F_2$ 40-81	$46F_2$ 40-84	$46F_2$ 40-86	$46F_2$ 40-88	$46F_2$ 40-50	$46F_2$ 40-139	$46F_2$ 40-140	$46F_2$ 40-141	$46F_2$ 40-142	$46F_2$ 40-143
SiO_2	4.11	4.30	5.05	5.00	4.60	4.41	6.18	1.70	1.22	1.03	2.21	1.60
$Al_2O_3+Fe_2O_3$ [1]	2.30	2.54	2.00	2.35	2.20	2.01	1.94	1.88	1.70	2.00	2.25	2.70
MgO [2]	19.38	18.46	19.36	18.67	18.52	18.34	18.21	19.56	19.85	19.60	19.16	19.49
CaO	29.74	30.58	29.49	30.08	30.52	30.80	30.16	31.14	31.18	31.36	31.07	30.78
Ignition loss [3]	44.47	44.12	44.10	43.90	44.16	44.44	43.51	45.72	46.05	46.01	45.31	45.43
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,7,92	0,7,92	2,6,92	1,7,91	1,6,92	1,6,93	3,6,91	0,3,96	0,2,97	0,2,97	0,4,95	0,3,95
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued											
	467	468	469	470	471	472	473	474	475	476	477	478
	$46F_2$ 40-144	$46F_2$ 40-105	$46F_2$ 40-106	$46F_2$ 40-107	$46F_2$ 40-108	$46F_2$ 40-109	$46F_2$ 40-110	$46F_2$ 40-111	$46F_2$ 40-112	$46F_2$ 40-113	$46F_2$ 40-114	$46F_2$ 40-115
SiO_2	2.08	1.37	1.78	0.95	2.06	1.48	0.30	1.24	0.64	0.74	[4]1.44	[4]1.92
$Al_2O_3+Fe_2O_3$ [1]	3.16	.80	1.05	1.66	1.38	2.00	.92	1.02	1.28	1.00	------	------
MgO [2]	19.28	19.91	20.15	19.63	19.58	19.59	20.05	19.43	19.76	20.05	21.7	21.6
CaO	30.50	31.61	30.87	31.56	31.17	31.21	31.85	32.00	31.74	31.61	30.8	30.6
Ignition loss [3]	44.98	46.31	46.15	46.20	45.81	45.72	46.88	46.31	46.58	46.60	------	------
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	[53.9]	[54.1]
Class	0,4,94	0,2,97	0,3,97	0,2,97	0,4,96	0,3,96	0,1,99	0,2,97	0,1,98	0,1,98	1,0,97	2,0,96
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued											
	479	480	481	482	483	484	485	486	487	488	489	490
	$46F_2$ 40-116	$46F_2$ 40-96	$46F_2$ 40-97	$46F_2$ 40-99	$46F_2$ 40-100	$46F_2$ 40-102	$46F_2$ 40-103	$46F_2$ 40-104	$46F_2$ 40-117	$46F_2$ 40-118	$46F_2$ 40-119	$46F_2$ 40-120
SiO_2	[4]1.80	2.10	2.64	3.88	2.86	2.40	4.74	2.76	[4]3.42	[4]4.74	[4]4.42	[4]3.48
$Al_2O_3+Fe_2O_3$ [1]	------	1.32	1.76	2.74	1.72	1.68	1.93	1.52	1.52	1.54	1.38	1.16
MgO [2]	21.2	19.96	19.71	19.33	18.91	19.40	18.06	19.17	21.11	19.80	21.47	21.03
CaO	30.5	30.82	30.47	29.69	31.26	31.07	31.11	31.16	29.59	29.88	29.00	29.71
Ignition loss [3]	------	45.80	45.42	44.36	45.25	45.45	44.16	45.39	44.36	44.04	43.73	44.62
Total	[53.5]	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,0,98	0,4,96	0,5,95	0,7,92	0,5,95	0,4,95	2,6,92	0,4,95	1,4,92	2,5,92	2,4,91	2,3,93
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued											
	491	492	493	494	495	496	497	498	499	500	501	502
	$46F_2$ 40-121	$46F_2$ 40-122	$46F_2$ 40-91	$46F_2$ 40-92	$46F_2$ 40-93	$46F_2$ 40-94	$46F_2$ 40-95	$46F_2$ .40-123	$46F_2$ 40-124	$46F_2$ 40-125	$46F_2$ 40-126	$46F_2$ 40-127
SiO_2	[4]2.36	[4]1.90	2.10	1.94	0.76	0.84	0.93	0.68	0.76	0.63	0.25	0.46
$Al_2O_3+Fe_2O_3$ [1]	1.22	.98	1.14	1.65	1.04	1.19	.85	2.23	1.85	1.54	1.66	.92
MgO [2]	21.10	22.20	19.59	19.32	20.07	19.92	19.87	19.69	19.56	19.80	19.44	20.30
CaO	30.23	30.64	31.27	31.42	31.51	31.56	31.76	31.31	31.78	31.61	32.20	31.51
Ignition loss [3]	45.09	44.28	45.90	45.67	46.62	46.49	46.59	46.06	46.05	46.42	46.45	46.81
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.97	100.00	100.00	100.00	100.00
Class	0,4,94	0,3,92	0,3,96	0,3,96	0,1,98	0,1,98	0,2,98	0,1,97	0,1,97	0,1,98	0,1,98	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued										
	503	504	505	506	507	508	509	510	511	512	513
	$46F_2$ 40-128	$46F_2$ 40-129	$46F_2$ 40-130	$46F_2$ 40-131	$46F_2$ 40-132	$46F_2$ 40-133	$46F_2$ 40-134	$46F_2$ 40-135	$46F_2$ 40-136	$46F_2$ 40-137	$46F_2$ 40-138
SiO_2	1.00	1.02	0.80	0.82	1.38	1.56	1.48	0.92	1.78	4.72	1.52
$Al_2O_3 + Fe_2O_3$[1]	1.36	1.08	1.00	1.21	.83	1.42	1.10	1.44	.88	2.28	1.10
MgO[2]	20.42	20.00	20.09	19.99	20.28	19.66	19.90	19.86	19.60	16.38	19.69
CaO	30.87	31.56	31.66	31.46	31.22	31.32	31.12	31.46	31.56	32.44	31.51
Ignition loss[3]	46.35	46.34	46.45	46.52	46.29	46.04	46.40	46.32	46.18	43.73	46.18
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.55	100.00
Class	0,2,97	0,2,97	0,1,98	0,1,98	0,2,97	0,3,97	0,3,97	0,2,97	0,3,97	1,7,92	0,3,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite

	Washington—Continued										
	514	515	516	517	518	519	520	521	522	523	524
	$46F_2$ 40-146	$46F_2$ 40-147	$46F_2$ 40-148	$46F_2$ 40-149	$46F_2$ 40-150	$46F_2$ 40-151	$46F_2$ 40-152	$46F_2$ 40-153	$46F_2$ 40-154	$46F_2$ 40-155	$46F_2$ 40-145
SiO_2	0.56	0.65	3.06	0.76	2.00	2.41	2.74	2.70	4.74	4.14	1.77
$Al_2O_3 + Fe_2O_3$[1]	1.16	1.40	2.22	1.68	1.34	1.30	1.42	1.70	1.96	1.72	2.10
MgO[2]	21.93	21.55	20.70	21.52	21.01	21.25	19.53	20.06	19.84	19.68	19.72
CaO	29.96	29.63	28.81	29.44	29.54	29.05	30.82	30.18	29.25	30.04	30.75
Ignition loss[3]	46.39	46.77	45.21	46.60	46.11	45.99	45.49	45.36	44.21	44.42	45.66
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,97	0,1,98	0,5,94	0,1,97	0,3,96	0,4,96	0,4,95	0,5,94	1,6,92	1,5,93	0,3,96
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

[1] Iron and alumina.

[2] By difference, except for samples 477,478,479.

[3] 950°-1,000°C; also called CO_2.

[4] Also reported as insoluble.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

443 - 446. Okanogan County. Triassic. NE¼SW¼ sec. 23, T. 35 N., R. 26 E., about 1.5 miles northwest of town of Riverside. Owners, Emmett, Omar, and R. E. Smith. Deposit 8. (Bennett, 1944, p. 6-9, 11, 20, 21, pl. 3; Bennett, 1945, p. 11.) Deposit: Dolomite, light-gray, fine-grained, stratigraphic thickness 200-300 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

443. Sample 365.
444. Sample 366.
445. Sample 367.
446. Sample 368.

447 - 461. County, age, maps, and use as in samples 443-446. SW¼SW¼ sec. 23, T. 35 N., R. 26 E., about 1.25 miles northwest of Riverside. Owners, Emmett and Omar Smith. Deposit 4. (Bennett, 1944, p. 6-9, 11, 14-16, pl. 2; Bennett, 1945, p. 5, 6.) Deposit: Dolomite, light-gray to gray to brownish-gray; some impurities; stratigraphic thickness 450-500 ft. Fresh sample from outcrop, fragments taken every 5 ft usually for a length of 50 ft. Tonnage estimated.

	Sample		Sample		Sample
447.	85	452.	90	457.	95
448.	86	453.	90a	458.	98
449.	87	454.	92	459.	100
450.	88	455.	93	460.	102
451.	89	456.	94	461.	111

462 - 467. County, age, maps, and use as in samples 443-446. SW¼SW¼ sec. 25, T. 35 N., R. 26 E., about 0.5 mile southwest of Riverside. Owner, H. F. Hubbard. Deposit 1. (Bennett, 1944, p. 6-9, 11, 12, pl. 1; Bennett, 1945, p. 4.) Deposit: Dolomite, light-gray, dense; beds range up to 6 ft or more in thickness; maximum stratigraphic thickness exposed about 550 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

	Sample		Sample		Sample
462.	39	464.	41	466.	43
463.	40	465.	42	467.	44

468 - 501. County, age, maps, and use as in samples 443-446. Sec. 26, T. 35 N., R. 26 E., about 1.25 miles northwest of Riverside. Deposit 4. (Bennett, 1944, p. 6-9, 11, 14-16, pl. 2; Bennett, 1945, p. 5.) Deposit: Dolomite, light-gray to gray to brownish-gray; some impurities; stratigraphic thickness 450-500 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

Washington—Continued

468 - 483. NE¼NW¼ sec. 26. Owner, N. W. L. Brown.

	Sample		Sample		Sample
468.	51	474.	61	479.	66
469.	52	475.	62	480.	67
470.	53	476.	63	481.	68
471.	54	477.	64	482.	70
472.	55	478.	65	483.	71
473.	60				

484 - 492. NW¼NW¼ sec. 26. Owner, R. E. Smith.

	Sample		Sample		Sample
484.	73	487.	79	490.	82
485.	74	488.	80	491.	83
486.	75	489.	81	492.	84

493 - 501. SE¼NW¼ sec. 26. Owners, Emmett and Omar Smith.

	Sample		Sample		Sample
493.	46	496.	49	499.	57
494.	47	497.	50	500.	58
495.	48	498.	56	501.	59

502 - 513. County, age, maps, and use as in samples 443-446. NW¼SE¼ sec. 26, T. 35 N., R. 26 E., about 1.5 miles northwest of Riverside. Owner, N.W.L. Brown. Deposit 3. (Bennett, 1944, p.6-9,11,13,pl.1; Bennett, 1945, p.4.) Deposit: Stratigraphic thickness about 700 ft. Upper 300 ft, dolomite, gray, fine-grained, beds up to 4 ft in thickness; underlying 400 ft, dolomite, light-gray to white, dominantly fine grained, bedding not as distinct as upper part; some impurities. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

	Sample		Sample		Sample
502.	27	506.	31	510.	35
503.	28	507.	32	511.	36
504.	29	508.	33	512.	37
505.	30	509.	34	513.	38

514 - 524. County, age, maps, and use as in samples 443-446. NW¼NW¼ sec. 36, T. 35 N., R. 26 E., about 0.5 mile southwest of Riverside, State land. Deposit 1. (Bennett, 1944, p. 6-9, 11, 12, pl. 1; Bennett, 1945, p. 4.) Deposit: Dolomite, light-gray, dense; beds range up to 6 ft or more in thickness; maximum stratigraphic thickness exposed about 550 ft. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated.

	Sample		Sample		Sample
514.	17	518.	21	522.	25
515.	18	519.	22	523.	26
516.	19	520.	23	524.	45
517.	20	521.	24		

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2),common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	525	526	527	528	529	530	531	532	533	534	535	536	537
	46$F_2$40-160	46$F_2$40-220	46$F_2$40-221	46$F_2$40-222	46$F_2$40-223	46$F_2$40-224	46$F_2$40-225	46$F_2$40-226	46$F_2$40-227	46$F_2$40-228	46$F_2$24-20	46$F_2$24-21	46$F_2$40-229
SiO_2	1.3	4.43	2.09	2,64	5.45	5.66	3.97	4.26	2.27	3.59	5.02	1.76	5.10
Al_2O_3	<.05	[1]1.06	[1].70	[1].84	[1].61	[1].99	[1].68	[1].79	[1].73	[1].55	3.13	1.36	[1]1.43
Fe_2O_3	.12												
MgO	1.0	.77	.71	.85	.60	1.07	1.13	1.04	.78	1.13	14.93	1.94	1.22
CaO	52.8	52.06	53.55	52.95	51.76	50.56	52.05	51.98	53.03	52.69	32.07	52.42	50.55
P_2O_5	------	.105	.076	.064	.094	.118	.082	.094	.086	.052	------	------	.114
Ignition loss	43.8	[2]41.77	[2]42.60	[2]42.33	[2]41.11	[2]41.10	[2]41.54	[2]41.59	[2]42.60	[2]41.98	43.06	41.86	[2]40.97
Total	99.1	[3][100.20]	[99.73]	[99.67]	[99.62]	[99.50]	[99.45]	[99.75]	[99.50]	[99.99]	98.21	99.34	[99.38]
Class	1,2,96	3,3,94	1,2,96	1,2,95	4,2,93	4,3,92	3,2,94	3,2,94	1,2,96	3,2,95	0,10,88	0,3,94	3,4,92
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcareous dolomite	Calcite	Calcite

	Washington—Continued												
	538	539	540	541	542	543	544	545	546	547	548	549	550
	46$F_2$40-230	46$F_2$40-231	46$F_2$40-232	46$F_2$40-233	46$F_2$40-234	46$F_2$40-235	46$F_2$40-236	46$F_2$40-237	46$F_2$40-238	46$F_2$40-239	46$F_2$40-240	46$F_2$40-241	46$F_2$40-165
SiO_2	2.98	2.83	3.89	3.40	3.76	1.56	1.33	7.38	0.71	1.35	4.45	0.30	3.64
R_2O_3	.79	.68	1.56	.74	.72	.23	.29	.09	.19	.28	.18	.18	2.18
MgO	1.28	.73	.92	.82	1.25	.14	.19	.42	.24	.40	.18	.35	2.83
CaO	52.50	53.10	51.53	52.43	51.83	55.49	55.39	51.54	55.56	54.68	53.40	55.35	49.36
P_2O_5	.075	.070	.116	.064	.085	.006	.006	.016	.009	.012	.018	.014	------
Ignition loss	[2]42.33	[2]42.31	[2]41.25	[2]41.98	[2]41.67	[2]42.34	[2]42.45	[2]40.46	[2]43.34	[2]43.15	[2]41.66	[2]43.46	39.28
Total	[99.96]	[99.72]	[99.27]	[99.43]	[99.32]	[99.77]	[99.66]	[4][99.91]	[4][100.05]	[4][99.87]	[4][99.89]	[4][99.65]	97.29
Class	2,2,95	2,2,96	1,5,93	2,2,95	3,2,94	1,1,96	1,1,96	7,0,92	0,1,98	1,1,98	4,1,95	0,1,99	0,6,87
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

	Washington—Continued												
	551	552	553	554	555	556	557	558	559	560	561	562	563
	46$F_2$25-1	46$F_2$25-24	46$F_2$25-18	46$F_2$25-20	46$F_2$25-15	46$F_2$25-16	46$F_2$25-17	46$F_2$25-2	46$F_2$25-3	46$F_2$25-11	46$F_2$26-89	46$F_2$26-90	46$F_2$26-92
SiO_2	4.20	2.30	6.36	5.53	5.70	5.11	2.89	1.67	2.24	Very low	0.26	3.45	3.72
Al_2O_3	1.80	[1].94	[1]1.38	2.19	[1]2.84	[1]2.50	[1]1.51	[6].47	.76	------	[1].26	[1]2.93	[1]2.27
Fe_2O_3	[6].76			.99					[6].68	------			
MgO	[7].71	Trace	.73	.80	.84	1.27	.87	[7].16	.30	Very low	21.30	19.41	.87
CaO	[7]51.54	53.62	50.06	49.08	49.98	50.06	52.46	[7]54.55	53.52	[7]54	31.41	29.63	51.19
Na_2O	------	------	------	.12	------	------	------	------	------	------	------	------	------
K_2O	------	------	------	.51	------	------	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	.053	.049	.038	------	------	------	.003	.008	.011
SO_2	------	------	------	.23	------	------	------	------	------	------	------	------	------
Organic matter	------	------	------	------	------	------	------	.41	------	------	------	------	------
Ignition loss	[8]41.23	43.17	41.54	40.09	[2]40.42	[2]40.86	[2]42.05	[8]43.00	42.21	[8]43	[2]46.37	[2]44.41	[2]41.51
Total	[100.24]	[100.03]	[100.07]	[99.54]	[99.83]	[99.85]	[99.82]	100.26	99.71	[97]	[99.60]	[99.84]	[99.57]
Class	0,7,93	1,4,96	4,5,91	1,9,89	1,8,90	1,7,91	0,4,94	1,2,98	0,4,95	0,0,97	0,0,97	0,6,92	0,6,93
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Dolomite	Dolomite	Calcite

[1] R_2O_3.

[2] Sample dried at 110°-112°C, ignition loss 1,000°-1,100°C.

[3] Na_2O = 270 ppm, K_2O = 700 ppm, TiO_2 = 310 ppm, S = 390 ppm.

[4] A composite of samples 545-549 contained Na_2O = 210 ppm, K_2O = 750 ppm, TiO_2 = < 30 ppm, S = 22 ppm.

[5] Iron oxides.

[6] Includes FeO.

[7] Calculated from reported $MgCO_3$ and(or) $CaCO_3$.

[8] CO_2, calculated from reported $MgCO_2$ and(or) $CaCO_3$.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_2, CoO, ZnO, Ga_2O_3, GeO_3, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_3, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_3; sample 561, PbO = 0.0035 percent]

	526	527	528	529	530	531	532	533	534	537	538	539	540	541
Na_2O	0.05	------	0.05	------	------	0.05	0.05	------	------	0.05	0.05	0.05	0.05	------
K_2O	------	------	------	------	------	------	------	------	------	------	------	------	------	------
TiO_2	.038	0.014	.018	0.017	0.021	.014	.023	0.043	0.015	.046	.017	.018	.035	0.023
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Cr_2O_3	.0007	.00054	.0005	.0005	.0008	.00067	.00064	.00058	.00067	.0013	.00058	.00074	.0013	.00067
MnO	.15	.017	.034	.019	.024	.019	.015	.016	.029	.047	.016	.018	.05	.019
NiO	------	------	------	------	------	------	------	------	------	------	------	------	------	------
CuO	.0043	.0012	.0012	.0015	.0035	.0014	.00088	.00077	.002	.002	.0015	.0012	.0013	.0011
SrO	.0098	.10	.11	.11	.10	.17	.14	.12	.14	.16	.13	.12	.13	.11
ZrO_2	.0042	------	------	------	------	------	------	------	------	------	------	------	------	------
Ag_2O	.00099	------	------	------	------	------	------	------	------	------	------	------	------	------

	542	543	544	545	546	547	548	549	555	556	557	561	562	563
Na_2O	0.053	0.05	0.05	------	------	------	------	------	0.32	0.32	0.14	------	0.05	0.052
K_2O	------	------	------	------	------	------	------	------	.90	1.05	------	------	.56	------
TiO_2	.027	.0052	.0064	0.002	0.0056	0.01	0.002	0.002	.063	.072	.048	0.0036	.044	.044
V_2O_5	------	------	------	------	------	------	------	------	.0092	.0064	.0059	------	------	.003
Cr_2O_3	.00077	.0012	.0013	.00064	.0011	.0012	.0007	.0009	.0014	.0015	.0009	------	.0014	.0005
MnO	.02	.043	.053	.028	.036	.048	.037	.042	.026	.021	.01	.038	.06	.06

Spectrochemical analyses—Continued

	542	543	544	545	546	547	548	549	555	556	557	561	562	563
NiO	------	------	------	------	------	------	------	------	0.001	0.001	0.001	0.0015	0.001	0.001
CuO	0.0014	0.0014	0.0028	0.0019	0.0019	0.00099	0.00066	0.0014	.0045	.0057	.0052	.0031	.0016	.0014
SrO	.14	.012	.013	.0063	.0091	.0084	.0048	.007	.081	.096	.14	.0054	.0046	.018
ZrO_2	------	------	------	------	------	------	------	------	.002	.002	.002	------	.002	------
Ag_2O	------	------	.0002	.0004	------	------	------	------	------	------	------	------	.0002	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

525. Okanogan County. Pleistocene. Sec. 3, T. 35 N., R. 26 E., about 4 miles northwest of town of Riverside, from shore of Booher Lake. (Wilson and Skinner, 1937, p. 6, 34, 76, 152.) Marl, gray, unconsolidated. Index map. Physical tests; general data for whiting and putties. Possible use: Putty, whiting.

526 - 530. Okanogan County. SE¼ sec. 1, T. 35 N., R. 25 E., southeast side of Dunn Mountain. Scholz property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 232-234, 245, 254, 264, pl. 1.) Limestone, white to light-gray, medium-grained. Chip sample from three outcrops. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

526. Sample O-3 represents 38 ft.
527. Sample O-51 represents 48 ft.
528. Sample O-52 represents 43 ft.
529. Sample O-62 represents 32 ft.
530. Sample O-63 represents 35 ft.

531 - 534. Okanogan County. Sec. 12, T. 35 N., R. 25 E., Dunn Mountain area. McCain property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 233, 235, 246, 255, 256, 264, pl. 1.) Limestone, white, coarse-grained, bedded. Chip sample from outcrop. Index and geologic maps. Possible use: Portland cement.

531. SW¼ NE¼ sec. 12. Sample O-65 represents 37 ft.
532. SE¼ NE¼ sec. 12. Sample O-59 represents 34 ft.
533. SE¼ NE¼ sec. 12. Sample O-60 represents 32 ft.
534. SE¼ NE¼ sec. 12. Sample O-61 represents 42 ft.

535. Okanogan County. Sec. 25, T. 35 N., R. 25 E., west of Riverside. Analyst, A. A. Hammer. (Shedd, 1913, p. 166, 245, pl. 21.) [Dolomite] limestone, white, flinty, crystalline. Index map.

536. Okanogan County. [T. 35 N., R. 25 E.], near Riverside, Scotch Creek basin. Analyst, A. A. Hammer. (Shedd, 1913, p. 166, 245, pl. 21.) Limestone, white, crystalline. Index map. Possible use: Portland cement [implied].

537. Okanogan County. SW¼ SW¼ sec. 6, T. 35 N., R. 26 E., Dunn Mountain area. Scholz property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample O-64. (Mills, 1962, p. 12, 13, 233, 234, 246, 255, 264, pl. 1.) Limestone, white, medium-grained, bedded. Chip sample from outcrop represents 72 ft. Index and geologic maps. Possible use: Portland cement.

538 - 542. Okanogan County. Sec. 7, T. 35 N., R. 26 E., Dunn Mountain area. McCain property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 233-235, 236, 246, 256, 264, pl. 1.) Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

538 - 541. NW¼ SW¼ sec. 7. Limestone, white, coarse-grained, bedded.

538. Sample O-66.	540. Sample O-68.
539. Sample O-67.	541. Sample O-69.

542. SW¼ SW¼ sec. 7. Sample O-58. Limestone, dark-gray, fine- to medium-grained, siliceous; represents 43 ft.

543, 544. Okanogan County. T. 38 N., R. 30 E., about 4.5 miles north of town of Wauconda. Jones property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 220, 221, 245, 254, 264, pl. 1.) Limestone, white, coarse-grained. Chip sample from outcrop. Index and geologic maps.

543. SW¼ NW¼ sec. 13. Sample O-6. Limestone, sample represents 10 ft, entire thickness of bed. Possible use: None, deposit small.
544. NE¼ sec. 14. Sample O-7. Limestone, poorly bedded; represents about 57 ft.

Washington—Continued

545 - 549. Okanogan County. NE¼ NW¼ sec. 25, T. 38 N., R. 30 E., about 4 miles north of Wauconda. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 218-220, 245, 254, 264, pl. 1.) General: Limestone, white, medium-grained, well-bedded; weathers gray; contains little quartz; deposit about 150 ft thick. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, mineral filler, builders' lime.

545. Sample O-8 represents 38 ft.
546. Sample O-9 represents 28 ft.
547. Sample O-10 represents 70 ft.
548. Sample O-11 represents 40 ft.
549. Sample O-12, 40 ft in length.

550. Okanogan County. T. 38 N., R. 30 E., north of Wauconda. Analyst, A. A. Hammer. (Shedd, 1913, p. 169, 170, 244; Mills, 1962, p. 218.) Limestone, white, crystalline. Possible use: Portland cement.

551. Pacific County. Eocene. [T. 9 N., R. 11 W.], 6 miles east of town of Ilwaco, on Bear River. Lindsey claim. Analyst, S. V. Peppel. (Darton, 1909, p. 27.) Limestone, fossiliferous.

552 - 557. Pacific County. Oligocene. SE¼ SE¼ sec. 20, T. 10 N., R. 10 W. Bear River deposit. Limestone, bluish-gray to gray; weathers light brown or buff; part dense vuggy algal material and part coquina. Tonnage estimated. Index and geologic maps, measured section. Former use: Agricultural, lime.

552, 553. Analyst, E. W. Layell. (Danner, 1966, p. 82, 431-433, 434.)
554. (Danner, 1966, p. 82, 431-433, 434.) Sample taken across 10 ft.
555 - 557. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 431-434, 447, 456.)
555. Sample Pf 2-1. Chip sample taken across 90 ft.
556. Sample Pf 2-2. Chip sample taken across 90 ft.
557. Sample Pf 2-3. Chip sample taken across 160 ft.

558, 559. Pacific County. Oligocene. SW¼ SW¼ sec. 21, T. 10 N., R. 10 W., northeast of Ilwaco. Willapa Pulp and Paper Mills quarry. SE¼ SE¼ sec. 20, T. 10 N., R. 10 W., Bear River deposit (Danner, 1966). (Hodge, 1938d, p. 13, 18, 20, 22-24; Danner, 1966, p. 82, 431-433, 434.) Limestone, light-tan, part crystalline, part massive; weathers bluish. Overburden averages 5 ft. Tonnage estimated. Index and geologic maps, columnar section, geologic section, measured section. Former use: Fertilizer, lime. Possible use: Flux.

559. USED sample 221A.

560. Pacific County. Oligocene. Probably NW corner sec. 27, SW corner sec. 22, T. 10 N., R. 10 W. Bear River deposit. (Glover, 1936, p. 55.) Deposit: Limestone, interbedded with shales. Former use: Fertilizer, lime.

561. Pend Oreille County. Precambrian, Priest River Group. NE¼ sec. 28, T. 35 N., R. 43 E., 1.5 miles north of Parker Lake. Hauck property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample PO-27. (Mills, 1962, p. 12, 13, 60, 246, 257, 264, pl. 1.) Dolomite, light-gray, medium- to coarse-grained, friable. Chip sample from outcrop. Index and geologic map.

562, 563. Pend Oreille County. Middle Cambrian, lower unit of Metaline Limestone. SW¼ NE¼ sec. 31, T. 38 N., R. 43 E., 1 mile north of town of Ione. Ione quarry, abandoned. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples PO-5, PO-8. (Mills, 1962, p. 12, 13, 54-58, 246, 256, 264, pls. 1, 2.) Limestone, dark-gray, fine-grained, slightly dolomitic and argillaceous; contains brown streaks and patches; weathered. Chip sample from outcrop. Index and geologic maps. Former use: Natural hydraulic cement, flux. Possible use: None, rock impure.

Table 10.--Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	564	565	566	567	568	569	570	571	572	573	574	575	576
	$46F_2$ 26-93	$46F_2$ 26-94	$46F_2$ 26-95	$46F_2$ 26-96	$46F_2$ 26-97	$46F_2$ 26-98	$46F_2$ 26-99	$46F_2$ 26-100	$46F_2$ 26-101	$46F_2$ 26-102	$46F_2$ 26-103	$46F_2$ 26-104	$46F_2$ 26-105
SiO_2	[1]7.38	[1]6.20	[1]6.92	[1]4.67	[1]5.79	[1]7.55	5.34	0.57	2.24	------	------	------	------
R_2O_3	1.42	.92	1.04	.85	.94	1.16	2.86	.95	Trace	------	------	------	------
MgO	[2]1.32	[2]1.08	[2]1.33	[2].94	[2].69	[2].93	3.03	.42	.21	[2]0.38	[2]0.19	[2]0.33	[2]0.43
CaO	[2]49.85	[2]51.31	[2]50.27	[2]51.83	[2]51.31	[2]49.87	47.53	54.62	54.33	[2]53.89	[2]53.61	[2]54.17	[2]52.77
P_2O_5	------	------	------	------	------	------	.009	.032	------	------	------	------	------
Ignition loss	[3]40.60	[3]41.46	[3]40.91	[3]41.70	[3]41:03	[3]40.16	[4]40.68	[4]42.90	42.76	[3]42.73	[3]42.30	[3]42.90	[3]41.80
Total	[100.57]	[100.97]	[100.47]	[99.99]	[99.76]	[99.67]	[99.45]	[99.49]	[99.54]	[97.00]	[96.10]	[97.40]	[95.00]
Class	(5,4)91	(5,2)94	(5,3)92	(3,2)94	(4,3)93	(6,3)91	1,8,90	0,1,97	2,0,97	0,0,97	0,0,96	0,0,97	0,0,95
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	577	578	579	580	581	582	583	584	585	586	587	588	589
	$46F_2$ 26-106	$46F_2$ 26-107	$46F_2$ 26-108	$46F_2$ 26-109	$46F_2$ 26-110	$46F_2$ 26-111	$46F_2$ 26-112	$46F_2$ 26-113	$46F_2$ 26-114	$46F_2$ 26-115	$46F_2$ 26-116	$46F_2$ 26-117	$46F_2$ 26-118
SiO_3	1.42	0.76	0.89	1.44	0.65	0.43	1.10	1.15	0.91	0.76	0.51	0.54	0.77
R_2O_3	.76	.39	.80	.89	.32	.39	.62	.41	.56	[5].08	[5]Trace	.54	.35
MgO	.46	.48	.48	.72	.36	.57	.48	.43	.47	.50	.77	.96	.91
CaO	54.58	54.62	54.58	53.75	54.99	54.76	54.30	54.58	54.37	54.48	54.63	54.00	54.33
P_2O_5	.005	.003	.005	.004	.003	.003	.004	.004	.004	------	------	.012	.004
Ignition loss	[4]42.88	[4]43.28	[4]42.99	[4]42.82	[4]43.29	[4]43.53	[4]43.06	[4]43.25	[4]43.36	43.29	43.64	[4]43.54	[4]43.29
Total	[100.10]	[99.53]	[99.74]	[99.62]	[99.61]	[99.68]	[99.56]	[99.82]	[99.67]	[99.11]	[99.55]	[99.59]	[99.65]
Class	0,2,97	0,1,98	0,2,97	0,3,97	0,1,98	0,1,99	0,2,97	0,1,98	0,2,98	1,0,98	1,0,99	0,1,98	0,1,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	590	591	592	593	594	595	596	597	598	599	600	601	602
	$46F_2$ 26-119	$46F_2$ 26-120	$46F_2$ 26-121	$46F_2$ 26-122	$46F_2$ 26-123	$46F_2$ 26-124	$46F_2$ 26-125	$46F_2$ 26-126	$46F_2$ 26-127	$46F_2$ 26-128	$46F_2$ 26-129	$46F_2$ 26-27	$46F_2$ 26-159
SiO_2	1.28	3.48	0.16	0.07	0.23	0.86	0.11	0.16	0.72	0.41	0.44	------	[6]0.18
R_2O_3	[5]Trace	[5].19	.15	.18	.16	.14	.32	.18	.25	.12	[5].46	------	[7].29
MgO	1.58	4.38	.29	.35	.36	.26	.36	.26	.56	.46	3.36	------	[2]20.05
CaO	53.84	48.07	55.34	55.49	54.85	55.06	55.20	55.27	54.73	55.13	50.18	[2]55.00	[2]31.42
P_2O_5	------	------	.004	.002	.004	.003	.011	.004	.014	.005	------	------	------
Ignition loss	43.12	42.98	[4]43.72	[4]43.75	[4]43.76	[4]43.32	[4]43.70	[4]43.73	[4]43.53	[4]43.66	43.65	[3]43.18	[3]46.74
Total	[99.82]	[99.10]	[99.66]	[99.84]	[99.36]	[99.64]	[99.70]	[99.60]	[99.80]	[99.78]	[98.09]	[98.18]	[8]98.68
Class	1,0,97	3,1,95	0,0,99	0,0,99	0,1,99	1,0,98	0,0,99	0,0,99	0,1,99	0,0,99	0,1,97	0,0,98	(0,0)98
CaO/MgO	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Dolomite

	Washington—Continued												
	603	604	605	606	607	608	609	610	611	612	613	614	615
	$46F_2$ 26-203	$46F_2$ 26-202	$46F_2$ 26-174	$46F_2$ 26-191	$46F_2$ 26-205	$46F_2$ 26-152	$46F_2$ 26-166	$46F_2$ 26-145	$46F_2$ 26-161	$46F_2$ 26-153	$46F_2$ 26-163	$46F_2$ 26-155	$46F_2$ 26-206
Insoluble[6]	2.67	2.58	0.51	1.20	3.95	0.11	0.27	0.06	0.21	0.12	0.22	0.14	4.46
FeO[2]	.22	.75	.10	.13	.13	.10	.10	.07	.05	.12	.10	.08	.10
MgO[2]	11.72	19.59	.16	.19	1.52	.33	.11	.23	.22	.21	.40	.70	3.60
CaO[2]	40.24	30.73	55.22	44.98	52.00	55.43	55.51	55.75	55.61	45.73	55.44	55.22	49.31
MnO[2]	.01	.01	------	------	------	------	------	------	------	------	.01	------	.01
CO_2[2]	44.52	46.00	43.57	53.44	42.56	43.92	43.75	44.06	43.92	54.03	44.02	44.15	42.72
Total	99.38	99.66	[8]99.56	[8]99.94	[8]100.16	[9]99.89	[8]99.74	[8]100.17	[8]100.01	[8]100.21	100.19	[8]100.29	100.20
Class	(3,0)96	(3,0)96	(1,0)99	(1,0)99	(4,0)96	(0,0)100	(0,0)99	(0,0)100	(0,0)100	(0,0)100	(0,0)100	(0,0)100	(4,0)96
CaO/MgO	Calcareous dolomite	Dolomite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Na_2O, K_2O, Sc_2O_3, V_2O_5, Cr_2O_3, NiO, CoO, ZnO, Ga_2O_3, GeO_3, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_3, UO_2; sample 570, Na_2O = 0.05 percent, K_2O = 0.90 percent, Cr_2O_3 = 0.0021 percent, NiO = 0.001 percent; sample 579, Ag_2O=0.00072 percent]

	570	571	577	578	579	580	581	582	583	584	585
TiO_3	0.072	0.027	0.018	0.0056	0.014	0.02	0.0044	0.0034	0.0076	0.0064	0.011
MnO	.11	.043	.01	.01	.019	.013	.036	.019	.01	.01	.019
CuO	.0015	.00071	.0006	.0005	.0084	.00099	.0010	.00088	.00082	.00066	.00088
SrO	.014	.014	.013	.0084	.011	.012	.011	.011	.011	.009	.018

Spectrochemical analyses—Continued

	588	589	592	593	594	595	596	597	598	599
TiO_2	0.013	0.0088	0.002	0.002	------	------	0.0056	------	0.0056	0.0072
MnO	.019	.016	.014	.019	0.019	0.015	.017	0.015	.017	.017
CuO	.00052	.00082	.0005	.0005	.00072	.0006	.00071	.00088	.0005	.0005
SrO	.007	.010	.009	.0086	.0082	.008	.0068	.0082	.0084	.009

Footnotes of analyses on preceding page:

[1] Insoluble.

[2] Calculated from reported $FeCO_3$, $MgCO_3$, $CaCO_2$, and (or) $MnCO_3$.

[3] CO_2, calculated from reported $FeCO_3$, $MgCO_3$, $CaCO_3$, and (or) $MnCO_2$.

[4] Sample dried at 110°-112°C, ignition loss, 1,000°-1,100°C.

[5] Al_2O_3.

[6] Insoluble (acid) 110°C.

[7] FeO, calculated from reported $FeCO_3$.

[8] $MnCO_3$, trace.

[9] $MnCO_3$, none.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

564 - 569. Pend Oreille County. Middle Cambrian, lower unit of Metaline Limestone. SW¼ NE¼ sec. 31, T. 38 N., R. 43 E., 1 mile north of town of Ione. Ione quarry. Analyst [possibly] J. E. Hayes. (Mills, 1962, p. 54-57, 58, pls. 1, 2.) Limestone, gray, argillaceous, dolomitic; finely disseminated talc in upper part of quarry. Index and geologic maps. Former use: Natural hydraulic cement, flux. Possible use: None, rock impure.

570. Pend Oreille County. Probably lower unit of Metaline Limestone. SE¼ NW¼ sec. 31, T. 38 N., R. 43 E., 1.5 miles from Ione. Green quarry. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample PO-4. (Mills, 1962, p. 12, 13, 55, 58, 59, 246, 256, 264, pls. 1, 2.) Limestone, gray, argillaceous. Grab sample. Index and geologic maps. Possible use: None, rock impure.

571. Pend Oreille County. Lower unit of Metaline Limestone. SE¼ sec. 11, T. 39 N., R. 43 E., 3.7 miles north of town of Metaline Falls. Three Mile Creek area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample PO-25. (Mills, 1962, p. 12, 13, 41, 42, 246, 257, 264, pls. 1, 2.) Limestone, gray, fine-grained, slightly argillaceous. Chip sample from outcrop represents 52 ft. Tonnage estimated. Index and geologic maps. Possible use: Chemical, metallurgical, calcium carbide manufacture, sugar industry, pulp and paper industry, finishing lime, filler, ceramic whiting.

572. Pend Oreille County. Lower unit of Metaline Limestone. SW¼ SW¼ T. 39 N., R. 43 E., about 2 miles northeast of Metaline Falls. Collector, W. A. G. Bennett. Sample WGB-8. (Mills, 1962, p. 41, pls. 1, 2.) Limestone, gray. Sample represents 75 ft. Tonnage estimated. Index and geologic maps.

573 - 580. Pend Oreille County. Lower unit of Metaline Limestone. Sec. 6, T. 40 N., R. 44 E., 15 miles north of Metaline Falls. Getchell-Dehuff property. Tonnage estimated. Index and geologic maps. Possible use: Chemical, metallurgical, finishing lime, mineral filler, pulp and paper industry.

573 - 576. SW¼ sec. 6. (Mills, 1962, p. 44-46, pls. 1, 2.) Limestone, light-greenish-gray to dark-gray and black; dense to medium grained or finely crystalline. Weighted core analysis.

573. Diamond-drill hole 1. Core sample 58.1 ft.
574. Diamond-drill hole 2. Core sample 49.1 ft.
575. Diamond-drill hole 3. Core sample 118.2 ft.
576. Diamond-drill hole 4. Core sample 103.3 ft.

577 - 580. W½ sec. 6. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 44-47, 246, 256, 264, pls. 1,2 .) General: Limestone, light-gray to gray, fine- to medium-grained, massive. Chip samples from outcrop represent width of 650 ft.

577. Sample PO-13.
578. Sample PO-14.
579. Sample PO-15.
580. Sample PO-16.

581 - 584. Pend Oreille County. Lower unit of Metaline Limestone. SE¼ NE¼ sec. 20, T. 40 N., R. 44 E., Slate Creek area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 42-44, 246, 256, 264, pls. 1, 2.) Index and geologic maps.

581, 582. Samples PO-9, PO-10. Limestone, light-gray, fine-grained, thin-bedded; contains up to 0.5 percent fine-grained muscovite. Chip samples from outcrop represent 150 ft. Possible use: None, small tonnage.

583, 584. Samples PO-11, PO-12. Limestone, light-gray to gray, fine- to medium-grained, massive. Chip samples from outcrop represent 230 ft. Possible use: Calcium carbide manufacture, chemical, metallurgical, finishing lime, filler, ceramic whiting, pulp and paper industry.

585. Pend Oreille County. Probably upper unit of Metaline Limestone. NE¼ NE¼ sec. 1, T. 37 N., R. 42 E., west of Ione. Thackston property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample PO-3. (Mills, 1962, p. 12, 13, 54, 55, 59, 246, 256, 264, pls. 1, 2.) Limestone, gray, fine-grained, bedded; weathers gray. Overburden less than 2 ft thick. Chip sample from outcrop represents 20 ft. Index and geologic maps. Possible use: Mineral filler, cement industries, finishing lime, pulp and paper industry, ceramic whiting.

586, 587. Pend Oreille County. Upper unit of Metaline Limestone. E½ sec. 4, T. 40 N., R. 43 E., 12 miles north of town of Metaline. Collector, W. A. G. Bennett. Samples WGB-5, WGB-6. (Mills, 1962, p. 51-53, pls. 1, 2.) General: Limestone, white to light-gray, medium- to coarse-grained, massive; contains very few thin muscovite schist layers. Sample: Limestone (marble),white with shades of gray, crystalline. Tonnage estimated. Index and geologic maps. Possible use: Chemical, metallurgical, finishing lime, calcium carbide manufacture, mineral filler, sugar industry, pulp and paper industry.

588, 589. Pend Oreille County. Upper unit of Metaline Limestone. SW¼ sec. 13, T. 40 N., R. 43 E., 12 miles north of Metaline Falls. Black Heart claims. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples PO-1, PO-2. (Mills, 1962, p. 12, 13, 45, 47, 48, 246, 256, 264, pls. 1, 2.) Limestone, white to light-gray, fine to very fine grained. Chip samples from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Cement, finishing lime, mineral filler, pulp and paper industry.

590, 591. Pend Oreille County. Upper unit of Metaline Limestone. NE¼ NE¼ sec. 15 and NW¼ NW¼ sec. 14, T. 40 N., R. 43 E., about 8 miles north of Metaline Falls. Collector, W. A. G. Bennett. (Mills, 1962, p. 53, 54, pls. 1, 2.) Limestone. Index and geologic maps.

590. Sample WGB-10. Possible use: Cement.
591. Sample WGB-13. Possible use: None, rock impure.

592 - 599. Pend Oreille County. Upper unit of Metaline Limestone. SW¼ NE¼ sec. 22, T. 40 N., R. 43 E., 9.5 miles north of Metaline Falls. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 32, 49-51, 246, 257, 264, pls. 1, 2.) Limestone, light-gray to gray, fine-grained, well-bedded. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Glass, chemical, metallurgical, calcium carbide manufacture, sugar industry, pulp and paper industry.

	Sample		Sample
592.	PO-17	596.	PO-21
593.	PO-18	597.	PO-22
594.	PO-19	598.	PO-23
595.	PO-20	599.	PO-24

600. Pend Oreille County. Upper unit of Metaline Limestone. NE¼ sec. 27, T. 40 N., R. 43 E., about 8.5 miles north of Metaline Falls. Collector, W. A. G. Bennett. Sample WGB-12. (Mills, 1962, p. 48, 49, pls. 1, 2.) Limestone, gray, very fine grained; some dolomitic masses. Sample represents stratigraphic thickness of about 300 ft. Index and geologic maps. Possible use: None, rock impure.

601. Pend Oreille County. Metaline Limestone (Mills, 1962). T. 38 N., R. 43 E., Ione. (Hodge, 1944, p. 15, pl. 4.) Limestone. Tonnage estimated. Index map.

602 - 615. Pend Oreille County. Metaline Limestone. Between secs. 15 and 16, T. 39 N., R. 43 E., about 1 mile north of Metaline Falls. Pend Oreille Mines and Metals Co., Pend Oreille mine. Analyst, E. T. Erickson. Drill hole 234. (Park and Cannon, 1943, p. 2, 43, 72, 73, pls. 1, 21, 22.) Mineralogy. Graphic presentation of analysis. Index and geologic maps, geologic sections. [For other analyses from same drill hole, see samples 616-620, this group; samples 271-273, group F_1.]

	Depth (ft)			Depth (ft)	
602.	710 --	[Dolomite.]	609.	410 --	[Limestone.]
603.	685 --	[Calcareous dolomite.]	610.	338 --	Do.
604.	645 --	[Dolomite.]	611.	300 --	Do.
605.	588 --	[Limestone.]	612.	275 --	Do.
606.	525 --	Do.	613.	225 --	Do.
607.	500 --	Do.	614.	198 --	Do.
608.	480 --	Do.	615.	175 --	Do.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	616	617	618	619	620	621	622	623	624	625	626	627	628
	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$
	26-177	26-146	26-168	26-192	26-196	26-149	26-195	26-154	26-169	26-139	26-197	26-210	26-158
Insoluble[1]	0.65	0.08	0.29	1.24	1.62	0.10	1.59	0.14	0.35	0.02	1.80	5.76	0.17
FeO[2]	.10	.17	.52	.52	.50	.04	.22	.06	.10	.07	.09	.04	.05
MgO[2]	1.01	.33	20.20	18.05	19.98	.12	18.64	1.68	.21	.18	.23	.14	.19
CaO[2]	53.40	54.91	31.46	33.54	31.25	55.85	32.91	54.00	55.46	55.57	54.68	52.38	55.57
MnO[2]	------	------	.03	.02	.03	------	.04	.04	.02	.01	.01	.01	.01
CO_2[2]	43.07	43.57	47.10	46.37	46.69	44.00	46.37	44.28	44.04	43.89	43.23	41.31	43.87
Total	[3]98.23	[4]99.06	99.60	99.74	100.07	[3]100.11	99.77	100.20	100.18	99.74	100.04	99.64	99.86
Class	(1,0)97	(0,0)99	(0,0)99	(1,0)98	(2,0)98	(0,0)100	(2,0)98	(0,0)100	(0,0)100	(0,0)100	(2,0)98	(6,0)94	(0,0)100
CaO/MgO	Calcite	Calcite	Dolomite	Calcareous dolomite	Dolomite	Calcite	Calcareous dolomite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Washington—Continued

	629	630	631	632	633	634	635	636	637	638	639	640	641
	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$
	26-194	26-150	26-181	26-204	26-186	26-209	26-193	26-189	26-199	26-198	26-188	26-180	26-170
Insoluble	[1]1.36	[1]0.10	[1]0.70	[1]3.82	[1]0.99	[1]5.22	[5]1.28	1.09	2.11	2.11	1.09	0.69	0.35
Al_2O_3	------	------	------	------	------	------	.62	------	------	------	------	------	------
Fe_2O_3	------	------	------	------	------	------	.34	------	------	------	------	------	------
FeO[2]	.05	.05	.06	.65	.27	.35	------	------	------	------	------	------	------
MgO[2]	1.34	.11	.15	19.99	20.40	19.81	20.86	20.74	20.17	20.16	20.73	21.05	21.28
CaO[2]	53.59	55.70	55.25	29.97	31.47	29.73	20.32	29.93	29.78	29.76	29.91	30.76	30.85
MnO[2]	.01	------	------	.07	.03	.04	------	------	------	------	------	------	------
CO_2[2]	43.56	43.87	43.61	45.80	47.18	45.15	56.58	46.14	45.40	45.39	46.13	47.14	47.45
Total	99.91	[3]99.83	[3]99.77	100.30	100.34	100.30	100.00	97.90	97.46	97.42	97.86	99.64	99.93
Class	(1,0)98	(0,0)100	(1,0)99	(4,0)96	(1,0)99	(5,0)95	0,2,98	(1,0)97	(2,0)95	(2,0)95	(1,0)97	(1,0)99	(0,0)100
CaO/MgO	Calcite	Calcite	Calcite	Dolomite	Dolomite	Dolomite	Magnesian dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	642	643	644	645	646	647	648	649	650	651	652	653	654
	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$
	26-173	26-178	26-183	26-175	26-182	26-187	26-201	26-208	26-207	26-212	26-179	26-200	26-185
SiO_2	0.49	0.65	0.75	0.54	[1]0.72	[1]1.04	[1]2.54	[1]5.04	[1]4.69	[1]6.15	[1]0.69	[1]2.27	[1]0.97
Al_2O_3	1.00	1.12	.42	.31	------	------	------	------	------	------	------	------	------
Fe_2O_3	.09	.09	.39	.36	------	------	------	------	------	------	------	------	------
FeO[2]	------	------	------	------	------	.06	.17	.24	.24	.24	.67	.38	.43
MgO[2]	.74	.66	19.96	19.95	.12	.40	.81	19.05	19.18	19.41	20.17	19.51	20.89
CaO[2]	54.27	54.21	31.76	31.35	55.59	55.00	53.57	30.66	30.66	29.89	31.70	31.68	30.66
MnO[2]	------	------	------	------	------	------	.01	.02	.02	.02	.12	.05	.05
CO_2[2]	43.41	43.28	46.73	46.40	43.76	43.64	43.05	45.20	45.34	44.82	47.39	46.61	47.34
Total	100.00	100.01	100.01	98.91	[6]100.19	[4]100.14	100.15	100.21	100.13	100.53	100.74	100.50	100.34
Class	0,1,98	0,1,98	0,1,98	0,1,98	(1,0)99	(1,0)99	(3,0)97	(5,0)95	(5,0)95	(6,0)94	(1,0)99	(2,0)98	(1,0)99
CaO/MgO	Calcite	Calcite	Dolomite	Dolomite	Calcite	Calcite	Calcite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	655	656	657	658	659	660	661	662	663	664	665	666	667
	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$
	26-151	26-147	26-219	26-130	26-131	26-132	26-133	26-162	26-218	26-172	26-164	26-141	26-143
Insoluble	[1]0.10	[1]0.10	[1]0.10	[5]1.32	[5]4.40	[5]5.80	[5]6.52	[5]0.21	[5]0.47	0.42	0.23	0.05	0.06
Al_2O_3	------	------	------	[7]1.04	[7]3.44	[7]3.96	[7]3.52	.11	.15	------	------	------	------
Fe_2O_3	------	------	------					.36	.32	------	------	------	------
FeO[2]	.33	------	------	------	------	------	------	------	------	------	------	------	------
MgO[2]	20.39	.10	.10	.90	1.97	2.87	3.70	20.72	20.66	21.44	21.05	.50	.43
CaO[2]	31.57	55.91	55.87	54.10	49.27	47.33	46.47	31.35	31.28	30.58	31.15	55.51	55.51
MnO[2]	.03	------	------	------	------	------	------	------	------	------	------	------	------
CO_2[2]	47.26	43.99	44.13	43.43	40.83	40.28	40.51	47.24	47.12	47.42	47.44	44.13	44.06
Total	99.68	[6]100.10	[6]100.20	100.79	99.91	100.26	100.72	99.99	100.00	99.86	99.87	100.19	100.06
Class	(0,0)99	(0,0)100	(0,0)100	0,2,98	0,7,92	0,9,90	1,9,91	0,0,99	0,1,99	(0,0)99	(0,0)100	(0,0)100	(0,0)100
CaO/MgO	Dolomite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Dolomite	Dolomite	Dolomite	Dolomite	Calcite	Calcite

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	668	669	670	671
	46F_2 26-176	46F_2 26-142	46F_2 26-140	46F_2 26-190
Insoluble	0.55	0.05	0.04	1.10
MgO^2	.43	.66	.30	21.21
CaO^2	55.12	55.42	55.63	29.92
CO_2^2	43.74	44.23	44.00	46.65
Total	99.84	100.36	99.97	98.88
Class	(1,0)99	(0,0)100	(0,0)100	(1,0)98
CaO/MgO	Calcite	Calcite	Calcite	Dolomite

[1] Insoluble (acid) 110°C.

[2] Calculated from reported $FeCO_3$, $MgCO_3$.$CaCO_3$ and (or) $MnCO_3$.

[3] $MnCO_3$, trace.

[4] $MnCO_3$, none.

[5] SiO_2.

[6] $FeCO_3$, none; $MnCO_3$, none.

[7] R_2O_3.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

616 - 620. Pend Oreille County. Middle Cambrian, Metaline Limestone. Between secs. 15 and 16, T. 39 N., R. 43 E., about 1 mile north of town of Metaline Falls. Pend Oreille Mines and Metals Co., Pend Oreille mine. Analyst, E. T. Erickson. Drill hole 234. (Park and Cannon, 1943, p. 2, 43, 72, 73, pls. 1, 21, 22.) Mineralogy. Graphic presentation of analyses. Index and geologic maps, geologic sections. [For other analyses from same drill hole, see samples 602-615, this group; samples 271-273, group F_1.]

	Depth (ft)	
616.	150	[Limestone.]
617.	125	Do.
618.	101	[Dolomite.]
619.	75	[Calcareous dolomite.]
620.	50	[Dolomite.]

621 - 634. County, age, formation, locality, and reference as in samples 616-620. Analyst, R. E. Stevens. Drill hole 235. Mineralogy. Graphic presentation of analysis. Index and geologic maps, geologic section.

	Depth (ft)			Depth (ft)	
621.	589	[Limestone.]	628.	325	[Limestone.]
622.	550	[Calcareous dolomite.]	629.	300	Do.
623.	535	[Limestone.]	630.	275	Do.
624.	497	Do.	631.	249	Do.
625.	400	Do.	632.	175	[Dolomite.]
626.	375	Do.	633.	125	Do.
627.	350	Do.	634.	100	Do.

635. Pend Oreille County. Metaline Limestone. [S½ sec. 16, T. 39 N., R. 43 E.] North of Josephine shaft. Analyst, C. M. Collins. Lab. No. A-15. (Dings and Whitebread, 1965, p. 2, 16, pl. 1.) Dolomite, medium-gray, sublithographic. Index and geologic maps, geologic sections.

636 - 640. Pend Oreille County. Metaline Limestone. [Sec. 16, T. 39 N., R. 43 E.], about 1.5 miles north of Metaline Falls. Yellowhead mine. (Dings and Whitebread, 1965, p. 2, 16, 100, 101, pls. 1, 2.) Index and geologic maps, geologic sections.

636, 637. Analyst, J. C. Crampton. Lab. Nos. A-13, A-14. Dolomite, light-gray, very fine grained.

638 - 640. Dolomite, light- to medium-gray, fine-grained, bedded.
- 638. Analyst, J. C. Crampton. Sample 42 D 78.
- 639. Analyst, J. C. Crampton. Sample 42 D 101.
- 640. Analyst, C. M. Collins. Sample 54 D 27.

641. Pend Oreille County. Metaline Limestone. [Sec. 21, T. 39 N., R. 43 E.], west of Metaline Falls. Analyst, C. M. Collins. Lab. No. A-16. (Dings and Whitebread, 1965, p. 2, 16, pl. 1.) Dolomite, light-gray, fine to very fine grained. Index and geologic maps, geologic sections.

642 - 645. Pend Oreille County. Metaline Limestone. [Sec. 27 or 34, T. 39 N., R. 43 E.], east of Metaline Falls, south slope of Quarry Hill. Analyst, C. M. Collins. (Dings and Whitebread, 1965, p. 2, 9-12, pl. 1.) Index and geologic maps, geologic sections, detailed measured section from area.

642. Lab. No. A-18. Limestone, bedded.
643. Lab. No. A-19. Limestone, bedded.
644. Lab. No. A-20. Dolomite, bedded.
645. Lab. No. A-21. Dolomite, bedded.

Washington—Continued

646 - 657. Pend Oreille County. Metaline Limestone. SW¼ sec. 29, T. 39 N., R. 43 E. Metaline Mining and Leasing Co., Bella May mine. Analyst, J. G. Fairchild. (Park and Cannon, 1943, p. 2, 43, 44, 66, 67, pls. 1, 21, 22.) Mineralogy. Graphic presentation of analyses. Index and geologic maps, geologic sections. Samples 646-653, drill hole 40. Samples 654-657, drill hole 42. [For another analysis from drill hole 42, see sample 274, group F_1.]

	Depth (ft)			Depth (ft)	
646.	472	[Limestone.]	652.	202	[Dolomite.]
647.	450	Do.	653.	168	Do.
648.	425	Do.	654.	662	Do.
649.	400	[Dolomite.]	655.	646	Do.
650.	375	Do.	656.	550	[Limestone.]
651.	351	Do.	657.	525	Do.

658 - 661. Pend Oreille County. Metaline Limestone. [T. 39 N., R. 43 E.], about 2 miles southeast of Metaline Falls. Lehigh Portland Cement Co. quarry. (Patty, 1921, p. 83, 84.) Limestone, dark-bluish. Use: Cement [implied].

662. Pend Oreille County. Metaline Limestone. [Secs. 12, 13, T. 40 N., R. 43 E.], northeast of Crescent Lake. Analyst, C. M. Collins. Lab. No. A-6. (Dings and Whitebread, 1965, p. 2, 16, pl. 1.) Dolomite, light-gray, fine-grained. Index and geologic maps, geologic sections.

663. County, formation, analyst, reference, maps, and sections as in sample 662. [Sec. 13, T. 40 N., R. 43 E.], southwest of Crescent Lake. Lab. No. A-7. Dolomite, cream-gray, fine- to medium-grained.

664, 665. Pend Oreille County. Metaline Limestone. Analyst, C. M. Collins. (Dings and Whitebread, 1965, p. 2, 16, pl. 1.) Index and geologic maps, geologic sections.
- 664. [Sec. 13 or 14, T. 40 N., R. 43 E.], northeast slope of Timber Hill. Lab. No. A-11. Dolomite, black and white streaked, fine-grained.
- 665. [Sec. 14, T. 40 N., R. 43 E.], western slope of Timber Hill. Lab. No. A-10. Dolomite, grayish-white, fine-grained.

666 - 670. Pend Oreille County. Metaline Limestone. [Sec. 22 or 27, T. 40 N., R. 43 E.], from hill east of Lead King mine. (Dings and Whitebread, 1965, p. 2, 18, 19, 21, pl. 1.) Limestone, gray. Index and geologic maps, geologic sections, detailed measured section. Photomicrographs.

666. Lab. No. A-5. Sample from bed about 1,525 ft below top of formation.
667. Lab. No. A-4. Sample from bed about 1,300 ft below top of formation.
668. Lab. No. A-3. Sample from bed about 915 ft below top of formation.
669. Lab. No. A-2 Sample from bed about 685 ft below top of formation.
670. Lab. No. A-1. Sample from bed about 425 ft below top of formation.

671. Pend Oreille County. Metaline Limestone. [Sec. 24, T. 40 N., R. 43 E.], north of Lime Creek. Analyst, C. M. Collins. Lab. No. A-12. (Dings and Whitebread, 1965, p.2,16,pl.1.) Dolomite, light-gray, sublithographic. Index and geologic maps, geologic sections.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	672	673	674	675	676	677	678	679	680	681	682	683	684
	$46F_2$ 26-171	$46F_2$ 26-138	$46F_2$ 26-184	$46F_2$ 26-211	$46F_2$ 26-213	$46F_2$ 26-157	$46F_2$ 26-144	$46F_2$ 26-148	$46F_2$ 26-156	$46F_2$ 26-165	$46F_2$ 26-167	$46F_2$ 26-160	$46F_2$ 26-71
SiO_2	------	------	------	------	------	------	------	------	0.16	0.24	------	------	1.88
Insoluble	[1]0.36	[1]0.01	[1]0.78	[1]5.83	[1]8.76	[1]0.17	[1]0.06	[1]0.10			0.29	0.21	------
Al_2O_3	------	------	------	------	------	------	------	------	.22	.29	------	------	.80
Fe_2O_3	------	------	------	------	------	------	------	------					.44
FeO	[2].07	[3]None	[3]None	[3]None	[3]None	[3]None	[3]None	[3]None	------	------	------	------	------
MgO	[2].91	[3]None	[2].02	[2]2.05	[2].31	[2]19.79	[2]1.01	[2].41	21.68	21.69	[2]21.04	[2]21.10	.82
CaO	[2]54.62	[2]55.78	[2]45.04	[2]40.06	[2]50.44	[2]32.39	[2]54.23	[2]55.66	30.45	30.35	[2]31.21	[2]31.03	53.70
MnO	[2].01	[3]None	[3]None	[3]None	[3]None	[2].02	[3]None	[3]None	------	------	------	------	------
CO_2	[2]43.93	[2]43.79	[2]53.23	[2]51.71	[2]39.94	[2]47.06	[2]43.85	[2]44.14	[4]47.55	[4]47.48	[2]47.48	[2]47.40	[5]42.60
Organic matter	------	------	------	------	------	------	------	------	A little	Trace	------	------	------
Total	99.90	99.58	99.07	99.65	99.45	99.43	99.15	100.31	100.06	100.05	100.02	99.74	[100.24]
Class	(0,0)99	(0,0)99	(1,0)98	(6,0)94	(9,0)91	(0,0)99	(0,0)99	(0,0)100	0,0,100	0,0,99	(0,0)100	(0,0)100	0,3,96
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Dolomite	Calcite	Calcite	Dolomite	Dolomite	Dolomite	Dolomite	Calcite

	Washington—Continued												
	685	686	687	688	689	690	691	692	693	694	695	696	697
	$46F_2$26-60	$46F_2$26-58	$46F_2$26-57	$46F_2$26-59	$46F_2$26-53	$46F_2$26-17	$46F_2$26-18	$46F_2$26-20	$46F_2$26-35	$46F_2$26-34	$46F_2$26-36	$46F_2$27-8	$46F_2$28-165
SiO_2	1.32	0.92	2.48	2.32	1.60	3.10	3.60	8.00	5.00	5.00	4.60	2.40	0.71
$Al_2O_3 + Fe_2O_3$	.72	.76	3.02	1.52	[6]Trace	1.68	4.12	1.10	3.80	4.90	1.30	[7].50	[8].45
MgO	.70	[3]Trace	[2]1.40	1.89	[3]Trace	.96	Trace	Trace	16.54	15.67	18.10	[2].45	.43
CaO	54.86	[2]54.62	[2]51.20	51.74	[2]55.18	51.12	49.28	49.71	31.05	30.97	30.52	[2]52.63	54.79
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	------	.037
CO_2	[5]42.84	[2]42.88	[2]41.72	[6]42.40	[2]43.32	[5]42.90	[5]41.94	------	------	------	------	[2]41.81	[9]43.46
Total	[100.44]	99.18	99.82	99.87	[100.10]	99.76	98.94	[58.81]	[56.39]	[56.54]	[54.52]	[97.79]	[99.88]
Class	0,2,97	0,2,98	0,4,94	0,4,95	2,0,98	0,6,93	0,9,88	6,3,89	0,9,90	0,9,88	2,4,92	2,1,95	0,1,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcareous dolomite	Calcareous dolomite	Dolomite	Calcite	Calcite

	Washington—Continued												
	698	699	700	701	702	703	704	705	706	707	708	709	710
	$46F_2$28-187	$46F_2$28-45	$46F_2$28-31	$46F_2$28-27	$46F_2$28-28	$46F_2$28-29	$46F_2$28-30	$46F_2$28-84	$46F_2$28-85	$46F_2$28-90	$46F_2$28-91	$46F_2$28-112	$46F_2$28-113
SiO_2	3.63	3.03	1.91	5.89	1.84	2.36	4.31	1.51	0.48	1.22	2.74	0.70	0.63
Al_2O_3	[8].10	[8].56	.29	[8].82	[8].31	[8].28	[8]1.05	[8].77	[8].27	[8].14	[8].69	[8].38	[8].32
Fe_2O_3			.13										
MgO	.55	.33	.11	.25	.14	.22	.16	.20	.10	.22	.09	.11	.16
CaO	52.45	53.42	54.62	51.64	54.53	54.20	54.29	54.36	55.28	54.90	53.73	55.42	55.06
P_2O_5	.018	.003	------	.011	.001	.006	.018	.009	.006	.030	.012	.009	.009
Ignition loss	[9]41.83	[9]42.23	42.83	[9]40.60	[9]42.64	[9]41.90	[9]41.36	[9]42.52	[9]43.01	[9]43.10	[9]42.02	[9]42.80	[9]43.45
Total	[98.58]	[99.57]	[99.89]	[99.21]	[99.46]	[98.97]	[101.19]	[99.37]	[99.15]	[99.61]	[99.28]	[99.42]	[99.63]
Class	3,0,95	2,2,96	1,1,97	6,2,92	1,1,97	2,1,95	3,3,93	0,2,96	0,1,98	1,0,98	2,2,95	0,1,97	0,1,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_5, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_2, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_2, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_2, PbO, Bi_2O_3, ThO_2, UO_2]

	697	698	699	701	702	703	704	705	706	707	708	709	710
Na_2O	------	0.24	------	------	------	0.075	0.13	------	------	------	------	------	------
TiO_2	0.008	.033	0.014	0.0092	0.004	.0028	.024	0.014	0.0044	0.0024	0.016	0.0076	0.0068
Cr_2O_3	.0005	.0005	------	------	------	------	------	------	------	------	------	------	------
MnO	.20	.14	.21	.34	.15	.19	.26	.40	.061	.027	.081	.058	.015
NiO	------	.001	.0016	------	------	------	------	------	------	------	------	------	------
CuO	.0016	.0026	.0027	.0015	.0016	.0024	.0019	.0047	.0025	.0022	.0019	.0018	.0037
SrO	.010	.014	.013	.0086	.042	.0052	.010	.011	.015	.0056	.0098	.0098	.011

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

672-679. Pend Oreille County. Middle Cambrian, Metaline Limestone. SE¼ sec. 27, T. 40 N., R. 43 E. Pend Oreille Mines and Metals Co., Lead King mine. Analyst, J. J. Fahey. Drill hole 15. (Park and Cannon, 1943, p. 2, 44, 70, pls. 1, 21, 22.) Mineralogy. Graphic presentation of analysis. Index and geologic maps, geologic sections.

	Depth (ft)	
672.	1000	[Limestone.]
673.	900	Do.
674.	800	Do.
675.	692	Do.
676.	600	Do.
677.	500	[Dolomite.]
678.	400	[Limestone.]
679.	300	Do.

680, 681. Pend Oreille County. Metaline Limestone. Sec. 12, T. 40 N., R. 44 E., north side of Crescent Lake. Analyst, R. C. Wells. (Park and Cannon, 1943, p. 2, 42, pl. 1.) Index and geologic maps, geologic sections.

680. Dolomite, black; contains small amount of organic material.
681. Dolomite, white or light-colored.

682, 683. Pend Oreille County. Metaline Limestone. [NW¼ T. 40 N., R. 44 E.], south end of Confusion Ridge. Analyst, C. M. Collins. (Dings and Whitebread, 1965, p. 2, 16, pl. 1.) Index and geologic maps, geologic sections.

682. Lab. No. A-9. Dolomite, light-gray, fine- to medium-grained.
683. Lab. No. A-8. Dolomite, light-gray with faint streaks and dark-gray patches, fine-grained.

684. Pend Oreille County. Paleozoic. NE¼ sec. 27, T. 39 N., R. 43 E., about 1 mile southeast of town of Metaline Falls. Lehigh Portland Cement Co. (Hodge, 1938d, p. 13, 95, 122-124, 126.) Limestone, bedded. Index and geologic maps. Use: Portland cement.

685. Pend Oreille County. Paleozoic. [T. 39 N., R. 43 E.], Metaline Falls. Inland Portland Cement Co. quarry. (Landes, 1934, p. 1077, 1080.) General for county: Limestone, white to gray, crystalline. Use: Cement [implied].

686, 687. Pend Oreille County. Paleozoic (Landes, 1934). [T. 39 N., R. 43 E., near] Metaline Falls. Inland Portland Cement Co. Analyst, C. R. Ranch. (Burchard, 1912, p. 695, pl. 1.) Limestone. Index map. Use: Cement [implied].

688. Pend Oreille County. Paleozoic (Landes, 1934). T. 39 N., R. 43 E., Metaline Falls. Inland Portland Cement Co. Analyst, A. A. Hammer. (Shedd, 1913, p. 180, 190, 191, 192.) Limestone, dark-colored, compact, fine-grained; at least 300 ft thick. Index map. Possible use: Portland cement.

689. Pend Oreille County. Secs. 19, 20, T. 38 N., R. 43 E., 3 miles north of town of Ione, Box Canyon. (Landes, 1905 [1906], p. 381, 382; Hodge, 1938d, p. 13, 95, 129.) Limestone. Index and geologic maps. Possible use: Cement.

690-695. Pend Oreille County. T. 38 N., R. 43 E., town of Cement. Jordan property. (Shedd, 1913, p. 180, 184, 185, 245, pl. 21.) Index maps.

690. Analyst, A. A. Hammer. No. 25. Limestone, unweathered, fine-grained. Possible use: Portland cement.
691. Analyst, A. A. Hammer. No. 27. Limestone, dark-blue, compact, brittle. Composite of small samples taken at intervals along face of bluff. Possible use: Portland cement.
692. No. 29. Limestone. Possible use: Cement.
693. No. 38. [Calcareous dolomite] magnesian limestone.
694. No. 40. [Calcareous dolomite] magnesian limestone.
695. No. 41. [Dolomite] magnesian limestone.

696. Pierce County. Holocene. SW¼ sec. 12, T. 19 N., R. 4 E., 0.75 mile from town of McMillin. Valley Lime Co. (S½ sec. 7, T. 19 N., R. 5 E., about 3 miles north of town of Orting, McMillan deposit, Danner, 1966.) (Hodge, 1938d, p. 76, 77, 78; Danner, 1966, p. 82, 436, 442, 443.) Travertine (tufa), few inches to 40 ft thick. Approximate analysis of shipped product. Index and geologic maps. Former use: Lime, flux. Use: Agricultural lime, chicken grit, stock feed. Possible use: Ornamental stone.

Washington—Continued

697. San Juan County. Devonian(?). SE¼ sec. 11, T. 36 N., R. 3 W., Jones Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 33-1. (Danner, 1966, p. 16, 19, 82, 94, 131-133, 448, 458.) Limestone, light-gray, crystalline, fossiliferous; chip sample taken across 14 ft. Tonnage estimated. Index and geologic maps. Possible use: None, deposit small.

698. San Juan County. Devonian. N½ sec. 20, T. 36 N., R. 3 W., about 6 miles northwest of Friday Harbor, O'Neal Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 18-1. (Danner, 1966, p. 16, 19, 82, 123, 124, 448, 457.) Limestone, dark-gray, fossiliferous, partly recrystallized and silicified; weathers light gray. Chip sample taken across 100 ft. Index and geologic maps.

699. San Juan County. Devonian. Cen. sec. 15, T. 37 N., R. 2 W., Orcas Island. Double Hill deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 15-1. (Danner, 1966, p. 16, 19, 82, 141, 152, 156, 157, 448, 457.) Limestone, light-bluish-gray, dense to finely crystalline; contains calcite veinlets, chert or jasperoid. Chip sample taken across 75 ft. Tonnage estimated. Index and geologic maps.

700-704. San Juan County. Late Middle Devonian. SE¼ sec. 20, T. 37 N., R. 2 W., Orcas Island. Red Cross deposit. Limestone, gray, fossiliferous, partially recrystallized; contains chert or jasperoid. Tonnage estimated. Index and geologic maps. Former use: Pulp and paper industry.

700. (Danner, 1966, p. 82, 141-144.)
701-704. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141-144, 448, 457.)
    701. Sample SJ 19-1. Chip sample taken across 120 ft.
    702. Sample SJ 21-1. Chip sample taken across 40 ft.
    703. Sample SJ 22-1. Chip sample taken across 22 ft.
    704. Sample SJ 23-1, weathers white. Chip sample taken across 235 ft.

705, 706. San Juan County. Late Middle Devonian. T. 37 N., R. 2 W., Orcas Island. Owner, Ruth Brown. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 176, 177, 179, 449, 458.) Limestone, light-gray to buff, oolitic and clastic to dense and crystalline, fossiliferous. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Lime. Possible use: None.

705. SW¼SE¼ sec. 30. North quarry. Sample SJ 40-1 taken across 55 ft.
706. NE¼NW¼ sec. 31. South quarry. Sample SJ 40-2 taken across 150 ft.

707, 708. San Juan County. Devonian. SE¼ sec. 30, T. 37 N., R. 2 W., Orcas Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 183-185, 449, 458.) Chip sample. Tonnage estimated. Index and geologic maps.

707. Big Soderberg quarry. Sample SJ 38-1. Limestone, dark-blue-gray, dark-gray, white, crystalline. Composite sample. Use: Pulp and paper industry, decorative stone.
708. Little Soderberg quarry. Sample SJ 38-2. Limestone, gray to dark-gray, fossiliferous, mostly crystalline; taken across 60 ft.

709, 710. San Juan County. Devonian or Pennsylvanian. SW¼ and NW¼ sec. 31, T. 37 N., R. 2 W., Orcas Island. Imperial deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 185-187, 188, 449, 458.) Limestone, bluish-gray, crystalline, chip sample. Tonnage estimated. Index and geologic maps. Former use: Lime.

709. Sample SJ 37-1 taken across 80 ft.
710. Sample SJ 37-2 taken across 100 ft.

Footnotes of analyses on preceding page:

[1] Insoluble (acid) 110°C.

[2] Calculated from reported $FeCO_3$, $MgCO_3$, $CaCO_3$, and (or) $MnCO_3$.

[3] Reported as $FeCO_3$, $MgCO_3$, or $MnCO_3$.

[4] Reported as calculated.

[5] Ignition loss.

[6] Aluminum and iron oxides.

[7] Iron oxide.

[8] R_2O_3.

[9] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	711	712	713	714	715	716	717	718	719	720	721	722	723
	$46F_2$ 28-19	$46F_2$ 28-114	$46F_2$ 28-115	$46F_2$ 28-116	$46F_2$ 28-32	$46F_2$ 28-33	$46F_2$ 28-34	$46F_2$ 28-35	$46F_2$ 28-36	$46F_2$ 28-43	$46F_2$ 28-174	$46F_2$ 28-171	$46F_2$ 28-154
SiO_2	1.14	0.90	0.69	0.80	2.44	0.61	0.93	0.85	0.48	3.60	0.28	0.22	1.11
R_2O_3	Trace	.72	.45	.33	.60	.49	.17	.25	.21	.56	.17	.19	.33
MgO	.31	.27	.22	.15	.27	.25	.09	.30	.16	.32	.17	.24	.29
CaO	54.44	54.71	54.88	54.81	54.03	54.81	55.07	55.05	55.36	53.35	55.31	55.16	54.92
P_2O_5	------	.158	.108	.068	.172	.218	.175	.092	.105	.044	.039	.036	.032
Ignition loss	43.11	[1]42.65	[1]43.61	[1]42.97	[1]42.05	[1]42.69	[1]42.62	[1]43.02	[1]43.10	[1]42.48	[1]43.56	[1]43.20	[1]43.28
Total	99.00	[99.41]	[99.96]	[99.13]	[99.56]	[99.07]	[99.06]	[99.56]	[99.42]	[100.35]	[99.53]	[99.05]	[99.96]
Class	1,0,98	0,2,97	0,1,98	0,1,97	1,2,95	0,1,97	1,0,97	0,1,98	0,1,98	3,2,96	0,0,99	0,0,98	1,1,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	724	725	726	727	728	729	730	731	732	733	734	735	736
	$46F_2$ 28-157	$46F_2$ 28-170	$46F_2$ 28-169	$46F_2$ 28-156	$46F_2$ 28-162	$46F_2$ 28-122	$46F_2$ 28-4	$46F_2$ 28-123	$46F_2$ 28-12	$46F_2$ 28-121	$46F_2$ 28-163	$46F_2$ 28-120	$46F_2$ 28-188
SiO_2	0.50	0.32	0.31	0.13	0.65	0.20	0.20	0.27	0.25	0.44	0.62	0.44	0.21
Al_2O_3	[2].22	[2].17	[2].14	[2].35	[2].27	[3].30	------	[3].21	[4].80	[4]1.13	.20	[3]1.13	[4].44
Fe_2O_3											.11		
MgO	.20	.10	.22	.31	.26	[5].49	.17	[5].22	------	------	.13	------	[5].19
CaO	55.48	55.59	55.42	55.37	55.08	[5]55.22	[5]55.82	[5]55.50	[5]55.38	[5]55.08	55.32	[5]55.02	[5]55.17
P_2O_5	.023	.024	.018	.032	.021	------	------	------	[5].23	[5].25	------	------	------
Ignition loss	[1]43.53	[1]43.58	[1]43.67	[1]43.68	[1]43.52	[6]43.88	[7]44.00	[6]43.80	[6]43.47	[6]43.24	43.64	[6]43.19	[6]43.53
Total	[99.95]	[99.78]	[99.78]	[99.87]	[99.80]	[100.09]	[100.19]	[100.00]	[100.13]	[100.14]	[100.02]	[99.78]	99.54
Class	0,1,99	0,0,99	0,0,99	0,0,99	0,1,99	0,0,100	0,0,100	0,0,100	0,0,99	0,1,98	0,1,99	0,1,98	0,0,100
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued											
	737	738	739	740	741	742	743	744	745	746	747	748
	$46F_2$ 28-3	$46F_2$ 28-160	$46F_2$ 28-147	$46F_2$ 28-141	$46F_2$ 28-144	$46F_2$ 28-143	$46F_2$ 28-137	$46F_2$ 28-152	$46F_2$ 28-164	$46F_2$ 28-172	$46F_2$ 28-155	$46F_2$ 28-148
SiO_2	0.14	0.84	1.31	2.65	1.80	1.69	3.74	1.97	0.72	0.22	1.13	1.51
R_2O_3	[4].10	.17	.46	.39	.51	.43	.41	.93	.33	.20	.79	.90
MgO	[5].20	.21	.12	.17	.22	.31	.22	.44	.24	.16	.39	.34
CaO	[5]55.32	55.32	54.60	53.85	54.37	54.36	53.23	53.81	54.91	55.21	54.42	54.19
P_2O_5	------	.010	.018	.100	.096	.041	.163	.127	.138	.144	.015	.030
Ignition loss	[6]43.65	[1]43.46	[1]42.98	[1]42.49	[1]42.68	[1]42.77	[1]41.81	[1]42.57	[1]43.25	[1]43.53	[1]42.96	[1]42.94
Total	99.41	[100.01]	[99.49]	[99.65]	[99.68]	[99.60]	[99.57]	[99.85]	[99.59]	[99.46]	[99.70]	[99.91]
Class	0,0,99	1,0,99	1,1,97	2,1,96	1,1,97	1,1,97	3,1,95	0,3,96	0,1,98	0,0,98	0,2,97	0,3,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Sample dried at 110°-112° C; ignition loss 1,000°-1,100° C.

[2] R_2O_3.

[3] Iron and aluminum oxides.

[4] Iron and alumina; sample 737 iron oxide and alumina.

[5] Calculated from reported $MgCO_3$, $CaCO_3$, and(or) P.

[6] CO_2, calculated from reported $MgCO_3$ and(or) $CaCO_3$.

[7] CO_3, calculated from reported MgO and $CaCO_3$.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_2, SnO_2, Sb_2O_2, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_3, UO_2]

	712	713	714	715	716	717	718	719	720	721	722	723	724	725
Na_2O	------	------	------	------	------	------	------	------	------	------	------	------	------	------
TiO_2	0.006	0.0088	0.0028	0.015	0.0088	------	0.004	0.0028	0.025	0.002	0.002	0.012	0.002	0.0028
V_2O_5	------	------	------	.003	.003	0.003	.003	.003	------	------	------	------	------	------
Cr_2O_3	.00061	.0012	.00051	.0005	.0005	------	------	------	.0007	------	------	.0005	------	.0005
MnO	.37	.058	.016	.021	.037	.032	.061	.032	.10	.12	.054	.027	.055	.14
NiO	------	------	------	------	------	------	------	------	.001	------	------	------	------	------
CuO	.0033	.0019	.0024	.0012	.0010	.0014	.00072	.0010	.0022	.0018	.0011	.0019	.0016	.0014
SrO	.020	.035	.035	.022	.042	.038	.028	.031	.012	.0098	.013	.015	.011	.014

	726	727	728	738	739	740	741	742	743	744	745	746	747	748
Na_2O	------	------	------	------	0.05	0.05	0.05	------	------	------	0.05	------	------	------
TiO_2	0.006	0.0064	0.006	0.0024	.0068	.012	.010	0.012	0.0028	0.029	.006	0.0044	0.079	0.093
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Cr_2O_2	------	------	.0005	------	------	.0005	.0005	.0005	.0005	.0005	------	------	.00077	.0010
MnO	.046	.022	.04	.05	.074	.17	.038	.12	.18	.50	.045	.028	.077	.065
NiO	------	------	------	------	------	------	------	.001	.001	------	------	------	.001	.001
CuO	.0014	.0025	.0012	.00088	.0012	.0026	.0012	.0038	.0011	.0020	.0010	.00088	.0014	.0016
SrO	.015	.013	.015	.018	.015	.024	.014	.014	.015	.018	.017	.011	.017	.021

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

711. San Juan County. Devonian or Pennsylvanian. Sec. 31, T. 37 N., R. 2 W., Orcas Island, town of East Sound. Cowles Lime Co. Analyst, A. A. Hammer. (Shedd, 1913, p. 204, 205, 206, 247, pl. 21; Danner, 1966, p. 82, 141, 185-187, 188.) Limestone, crystalline, massive. Tonnage estimated. Index and geologic maps. Use: Quicklime. Possible use: Portland cement.

712-714. San Juan County. Devonian(?) and Permian. NW¼ sec. 29, NE¼ sec. 30, T. 37 N., R. 2 W., Orcas Island. Soderberg Beach deposits. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 188-190, 449, 458.) Limestone, light-gray, mostly dense to clastic; partially recrystallized. Chip sample. Index and geologic maps. Possible use: None, deposit small.

712. Sample SJ 39-1 taken across 50 ft; about 4 ft thick.
713. Sample SJ 39-2 taken across 23 ft; maximum thickness 23 ft.
714. Sample SJ 39-3 taken across 30 ft.

715-719. San Juan County. Mississippian(?). NE¼NW¼ sec. 2, T. 36 N., R. 2 W., Orcas Island. McGraw-Kittinger deposits. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 145-147, 148, 448, 457.) Limestone, gray, crystalline. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Agricultural. Use: Pulp and paper industry.

715. Sample SJ 29-1 taken across 70 ft.
716. Sample SJ 29-2 taken across 70 ft.
717. Sample SJ 29-3 taken across 40 ft.
718. Sample SJ 29-4 composite.
719. Sample SJ 29-5 taken across 60 ft.

720. San Juan County. Early Pennsylvanian. Center SE¼ sec. 15, T. 37 N., R. 2 W., Orcas Island, about 0.75 mile west of town of East Sound. Double Hill deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 8-1. (Danner, 1966, p. 16, 19, 82, 141, 151, 152, 154, 155, 448, 456.) Limestone, light-gray, dense to finely crystalline, fossiliferous; contains jasperoid. Thin-section description. Chip sample taken across 30 ft. Tonnage estimated. Index and geologic maps. Possible use: None, deposit impure.

721-723. San Juan County. Pennsylvanian or Permian. NE¼ sec. 23, T. 36 N., R. 4 W., San Juan Island. Roche Harbor Lime and Cement Co. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 84-87, 88, 449, 459.) General: Limestone, mostly bluish gray, fossiliferous; from few feet to more than 50 ft thick. Chip sample. Tonnage estimated. Index and geologic maps. Possible use: None, deposits largely depleted.

721. Sample SJ 51-1 taken across 25 ft.
722. Sample SJ 51-2 taken across 25 ft.
723. Sample SJ 62-1 taken across 320 ft.

724, 725. County, age, analysts, and maps as in samples 721-723. NW¼SE¼ sec. 23, T. 36 N., R. 4 W., San Juan Island, about 1 mile southeast of town of Roche Harbor. Mosquito Pass quarries. (Danner, 1966, p. 16, 19, 82, 84, 86, 90, 449, 459.) Limestone, coarsely crystalline; occurs in lenses. Chip sample. Tonnage estimated. Former use: Lime.

724. Sample SJ 52-1 taken across 10 ft.
725. Sample SJ 52-2,composite.

726-728. County, age, analysts, remarks, maps, and use as in samples 721-723. SE¼ sec. 23, T. 36 N., R. 4 W., San Juan Island. Roche Harbor Lime and Cement Co. (Danner, 1966, p. 16, 19, 82, 84-87, 88, 449, 459.) Chip sample. Tonnage estimated.

726. Wescott Bay quarry. Sample SJ 51-3 taken across 30 ft.
727. Wescott Bay quarry. Sample SJ 51-4 taken across 20 ft.
728. Wescott Bay, outcrop. Sample SJ 53-1 taken across 50 ft.

729-735. County, age, remarks, maps, and use as in samples 721-723. Sec. 23, T. 36 N., R. 4 W., San Juan Island, Roche Harbor area. (Danner, 1966, p. 82, 84-88.) Tonnage estimated.

729. Tacoma and Roche Harbor Lime Co. Analyst, C. F. McKenna. (Landes, 1905 [1906], p. 377, 378; McLellan, 1927, p. 91, 164-166.) Limestone, bluish-gray, coarse- to medium-grained, recrystallized; 200 ft exposed above tidewater. Use: Cement, lime [implied].
730. (Hodge, 1935c, p. 59-61; Hodge, 1938b, p. 15.) Comprehensive sample of seven different quarries. Use: Agricultural, chemical, flux, glass, insecticide, pulp and paper industry.
731. (Landes, 1905 [1906], p. 377, 378.) Limestone, entirely crystalline, uniform in character; 200 ft exposed above tidewater. Use: Lime.
732. (Landes, 1902, p. 24-26.) Limestone, crystalline; 250 ft exposed above tidewater. Use: Flux, lime.
733. (Brown, 1901, p. 196.)
735. (Landes, 1905 [1906], p. 377, 378.) Use: Lime.

736. San Juan County. Pennsylvanian or Permian (Danner, 1966, p. 84). [T. 36 N., R. 4 W.], north end of San Juan Island, Roche Harbor. Roche Harbor Lime and Cement Co. (Hodge, 1935c, p. 59-61, 64.) Limestone, uniform in character and composition; 200 ft exposed above tidewater. Sample is average of all analyses made by various chemists of limestone in the Roche Harbor area. Tonnage estimated. Use: Agricultural, chemical, glass, metallurgical, pulp and paper industry.

737. San Juan County. Pennsylvanian or Permian (Danner, 1966, p. 84). [T. 36 N., R. 4 W.], San Juan Island, Roche Harbor. (Darton, 1909, p. 21, 22.) Limestone (marble). Use: Lime. Possible use: Cement.

738-740. San Juan County. Permian(?). S½NE¼ sec. 15, T. 36 N., R. 4 W., Henry Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 68, 82, 84, 125, 126, 127, 128, 449, 459.) Limestone, light- to dark-gray, mostly crystalline; contains chert or jasperoid. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Lime.

738. Quarry. Sample SJ 56-1 taken across 35 ft.
739. Quarry. Sample SJ 56-2 taken across 80 ft.
740. Outcrop southeast of quarry. Sample 56-3, composite.

741-744. County, analysts, reference, and use as in samples 738-740. Permian. N½SE¼ sec. 15, T. 36 N., R. 4 W., Henry Island. Abandoned quarries. Limestone, gray, dense to crystalline. Thin-section description. Chip sample. Tonnage estimated. Index and geologic maps.

741. Sample SJ 55-1 taken across 20 ft.
742. Sample SJ 60-1 taken across 90 ft.
743. Sample SJ 60-2 taken across 40 ft.
744. Sample SJ 60-3, composite.

745, 746. County, age, and analysts as in samples 741-744. T. 36 N., R. 4 W., Henry Island. (Danner, 1966, p. 16, 19, 82, 84, 128, 129, 130, 449, 459.) Thin-section description. Chip sample taken across 100 ft. Tonnage estimated. Index and geologic maps. Possible use: None, deposit small.

745. SW¼SE¼ sec. 21. Kellett Bluff deposit. Sample SJ 57-1. Limestone, light-gray, crystalline.
746. NW¼NE¼ sec. 22, west side of Nelson Bay. Sample SJ 59-1. Limestone, light-gray; weathers almost white; interbedded with ribbon chert.

747, 748. San Juan County. Permian(?). SE¼NW¼ sec. 25, T. 36 N., R. 4 W., San Juan Island. English Camp deposit; owner J. Crook. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 84, 91, 92, 449, 460.) Limestone, light-gray, dense to finely crystalline; about 10 ft thick. Thin-section description. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Lime.

747. Sample SJ 64-1 taken across 35 ft.
748. Sample SJ 64-2 taken across 63 ft.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	749	750	751	752	753	754	755	756	757	758	759	760	761
	$46F_2$ 28-140	$46F_2$ 28-153	$46F_2$ 28-135	$46F_2$ 28-182	$46F_2$ 28-175	$46F_2$ 28-176	$46F_2$ 28-177	$46F_2$ 28-178	$46F_2$ 28-179	$46F_2$ 28-180	$46F_2$ 28-11	$46F_2$ 28-181	$46F_2$ 28-150
SiO_2	2.65	1.91	3.03	1.16	1.59	5.17	0.93	1.20	3.63	1.15	1.60	------	1.71
Al_2O_3	^{1}1.00	^{1}1.04	^{1}.95	^{1}.61	^{1}.90	^{1}1.11	^{1}.50	^{1}.70	^{1}.61	^{1}.91	.30	------	^{1}.95
Fe_2O_3											.12	------	
MgO	.27	.26	.25	.51	3.38	3.49	2.08	6.03	5.79	1.42	2.30	^{2}.92	.48
CaO	54.19	53.93	53.57	54.00	50.71	48.04	52.51	47.29	47.58	53.08	52.35	^{2}52.64	54.06
H_2O-	------	------	------	------	------	------	------	------	------	------	.07	------	------
P_2O_5	.160	.071	.070	.014	.100	.030	.030	.170	.088	.045	------	------	.113
SO_3	------	------	------	------	------	------	------	------	------	------	.01	------	------
Ignition loss	^{3}41.53	^{3}42.45	^{3}42.01	^{3}43.12	^{3}43.41	^{3}41.68	^{3}43.56	^{3}43.98	^{3}42.63	^{3}43.19	43.20	^{4}42.32	^{3}42.85
Total	[99.80]	[99.66]	[99.88]	[99.41]	^{5}[100.09]	^{5}[99.52]	[99.61]	^{6}[99.37]	^{6}[100.33]	[99.80]	99.95	[95.88]	[100.16]
Class	1,3,94	0,3,96	1,3,95	0,2,97	0,3,97	3,3,93	0,1,98	0,2,97	3,2,94	0,2,97	1,1,97	0,0,96	0,3,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite

	Washington—Continued												
	762	763	764	765	766	767	768	769	770	771	772	773	774
	$46F_2$28-139	$46F_2$28-145	$46F_2$28-151	$46F_2$28-44	$46F_2$28-53	$46F_2$28-56	$46F_2$28-57	$46F_2$28-58	$46F_2$28-95	$46F_2$28-96	$46F_2$28-97	$46F_2$28-59	$46F_2$28-37
SiO_2	2.35	1.44	1.76	1.99	0.69	3.33	4.81	1.40	2.69	1.61	1.20	3.41	4.20
R_2O_3	1.13	1.01	.29	2.53	.35	.90	1.33	.36	.80	.73	.65	.93	.42
MgO	.59	.55	6.97	6.50	.35	1.35	.35	.29	.47	1.63	.31	.12	.17
CaO	53.63	54.00	47.01	46.39	55.03	51.79	52.12	54.53	53.48	52.70	54.28	53.20	55.33
P_2O_5	.200	.205	.132	.455	.150	.010	.062	.028	.120	.055	.024	.009	.046
Ignition loss ^{3}	42.63	42.92	43.98	42.59	43.23	42.12	40.65	42.94	42.27	43.12	43.10	42.05	41.92
Total	[100.53]	[100.12]	[100.14]	[100.46]	^{7}[99.80]	[99.50]	[99.32]	[99.55]	[99.83]	[99.84]	[99.56]	[99.72]	[102.09]
Class	0,3,96	0,3,97	1,1,97	0,3,94	0,1,98	2,3,95	3,4,92	1,1,97	1,2,95	0,2,97	0,2,98	2,3,95	3,1,95
CaO/MgO	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued											
	775	776	777	778	779	780	781	782	783	784	785	786
	$46F_2$28-38	$46F_2$28-39	$46F_2$28-41	$46F_2$28-40	$46F_2$28-110	$46F_2$28-111	$46F_2$28-52	$46F_2$28-124	$46F_2$28-168	$46F_2$28-173	$46F_2$28-146	$46F_2$28-166
SiO_2	0.40	0.41	0.38	0.15	1.62	1.18	1.38	0.23	0.38	0.22	1.35	0.72
R_2O_3	.32	.56	.14	.15	.49	.75	.82	.14	.19	.09	.43	.19
MgO	.16	.17	.11	.13	.27	.20	.41	.10	.19	.26	.23	.12
CaO	55.36	55.40	55.62	55.66	54.71	54.83	54.39	55.86	55.62	55.60	54.65	55.53
P_2O_5	.044	.205	.032	.051	.192	.130	.112	.029	.001	.037	.048	.080
Ignition loss ^{3}	43.03	43.42	43.68	43.59	42.75	43.01	43.17	43.79	43.19	43.80	42.86	43.43
Total	[99.31]	[100.16]	[99.96]	[99.73]	[100.03]	[100.10]	[100.28]	[100.15]	[99.57]	[100.01]	^{8}[99.57]	[100.07]
Class	0,1,98	0,1,99	0,0,99	0,0,99	1,1,97	0,2,97	0,2,98	0,0,99	0,1,98	0,0,99	1,1,97	0,1,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] R_2O_2.

[2] Calculated from reported $MgCO_3$ and(or) $CaCO_3$.

[3] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[4] CO_2, calculated from reported $MgCO_2$ and $CaCO_2$.

[5] Na_2O = 260 ppm, K_2O = 560 ppm, TiO_2 = 325 ppm, S = 180 ppm.

[6] Na_2O = 270 ppm, K_2O = 530 ppm, TiO_2 = < 30 ppm, S = 60 ppm.

[7] With sample 293, group F_1, Na_2O = 270 ppm, K_2O = 610 ppm, TiO_2 = < 30 ppm, S = 70 ppm.

[8] With sample 295, group F_1, Na_2O = 100 ppm, K_2O = 560 ppm, TiO_2 = 250 ppm, S = 470 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_2, K_2O, Sc_2O_2, CoO, ZnO, Ga_2O_3, GeO_3, As_2O_2, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_2, Nd_2O_3, Sm_2O_2, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_2, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_2, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2]

	749	750	751	752	753	754	755	756	757	758	761	762
Na_2O	------	------	0.10	------	------	------	------	------	------	------	------	------
TiO_2	0.021	0.020	.04	0.037	0.062	0.031	0.012	0.0048	0.002	0.094	0.024	0.030
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	------
Cr_2O_2	.00055	.0005	.0005	.0028	.0041	.0050	.0025	.0020	.0020	.0044	.0005	.00064
MnO	.13	.14	.11	.019	.16	.40	.064	.09	.032	.13	.25	.11
NiO	.0024	.003	.0022	.001	.0014	.002	.0018	.001	.001	.0018	------	------
CuO	.0029	.0033	.0022	.0018	.0026	.0031	.0024	.0025	.0024	.0016	.0029	.0040
SrO	.018	.022	.021	.055	.025	.026	.026	.022	.015	.031	.021	.018

	763	764	765	766	767	768	769	770	771	772	773	774
Na_2O	------	------	------	------	0.11	0.40	0.05	------	------	------	------	------
TiO_2	0.022	0.0044	0.044	0.048	.049	.16	.011	0.036	0.013	0.041	0.025	0.0044
V_2O_5	------	------	------	------	.003	.003	.003	.003	.003	.003	------	------
Cr_2O_3	.0007	.00064	.0065	.0008	.0022	.0012	.00089	.00083	.002	.0014	------	.0005
MnO	.097	.17	.16	.17	.17	.43	.07	.80	.29	.023	.078	.11
NiO	------	------	.0018	------	.001	.001	------	------	------	------	.001	------
CuO	.0024	.0024	.0047	.0019	.0016	.0019	.0012	.0019	.0022	.0020	.0031	.0023
SrO	.017	.017	.017	.02	.055	.015	.036	.028	.034	.040	------	.02

	775	776	777	778	779	780	781	782	783	784	785	786
Na_2O	------	------	------	------	------	------	------	------	------	------	------	------
TiO_2	0.0076	0.018	0.0076	0.0056	0.011	0.019	0.042	0.002	------	0.0032	0.0092	------

Spectrochemical analyses—Continued

	775	776	777	778	779	780	781	782	783	784	785	786
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	------
Cr_2O_3	0.0005	0.0005	------	------	0.0005	0.0005	0.0007	0.0005	0.0005	0.0005	0.0005	0.00077
MnO	.04	.22	0.076	0.016	.45	.14	.049	.09	.13	.032	.037	.025
NiO	------	------	------	------	------	------	------	------	------	------	------	------
CuO	.0011	.0017	.0023	.0017	.0048	.0025	.0017	.00094	.00066	.0013	.0025	.0017
SrO	.02	.021	.035	.020	.013	.034	.024	.018	.015	.014	.035	.027

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

749 - 751. San Juan County Permian(?). NW¼ SW¼ sec. 25, T. 36 N., R. 4 W., San Juan Island. Young Hill East deposit, Roche Harbor Lime and Cement Co. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 84, 93, 95, 449, 460.) Limestone, light-gray, finely crystalline. Chip sample. Tonnage estimated. Index and geologic maps. Possible use: None, deposit small.

749. Sample SJ 65-1 taken across 75 ft.
750. Sample SJ 65-2 taken across 90 ft.
751. Sample SJ 65-3 taken across 100 ft.

752. County, analysts, maps, and use as in samples 749-751. Permian. NW¼ SW¼ sec. 24, T. 35 N., R. 4 W., San Juan Island. Deadman Bay deposit. Sample SJ 66-1. (Danner, 1966, p. 16, 19, 82, 108, 114, 115, 449, 460.) Limestone. Chip sample, composite.

753 - 758. San Juan County. Permian. NE¼ sec. 23, NW¼ sec. 24, T. 35 N., R. 4 W., San Juan Island. Cowell quarries; owner, R. Brown. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 108-110, 112, 113, 448, 456.) Chip sample. Tonnage estimated. Index and geologic maps. Former use: Cement, lime, road metal, pulp and paper industry.

753 - 755. Limestone, blne-gray, dense to crystalline; contains chert or jasperoid stringers.
753. Sample SJ 7-1 taken across 160 ft.
754. Sample SJ 7-2 taken across 160 ft.
755. Sample SJ 7-3 taken across 120 ft.

756 - 758. Limestone, light-gray, finely crystalline; contains chert or jasperoid.
756. Sample SJ 7-4 taken across 160 ft.
757. Sample SJ 7-5 taken across 280 ft.
758. Sample SJ 7-6 taken across 200 ft.

759, 760. County, age, locality, and use as in samples 753-758. (Danner, 1966, p. 108-110, 112, 113.) Tonnage estimated. Index and geologic maps.

759. (Hodge, 1935a, p. 113; Hodge, 1938b, p. 12, 13, 15, 16.) Limestone.
760. Limestone, light-gray, finely crystalline; contains chert or jasperoid. Composite chip sample.

761 - 763. County, age, analysts, and maps as in samples 753-758. NE¼ sec. 18, T. 36 N., R. 3 W., San Juan Island. Limestone Point quarry, abandoned. (Danner, 1966, p. 16, 19, 82, 94, 119, 120, 121, 449, 458, 459.) Limestone, gray, fossiliferous; beds range from 1 in. to several feet in thickness. Thin-section description. Chip sample. Former use: Lime.

761. Sample SJ 43-1 taken across 55 ft.
762. Sample SJ 43-2 taken across 130 ft.
763. Sample SJ 61-3 taken across 50 ft.

764. San Juan County. Middle Permian. NE¼ SE¼ sec. 34, T. 36 N., R. 4 W., San Juan Island. Mitchell Bay quarry, abandoned. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 45-1. (Danner, 1966, p. 16, 19, 82, 108, 118, 119, 449, 459.) Limestone, light-gray to buff, finely crystalline. Chip sample taken across 150 ft. Index and geologic maps. Possible use: None, deposit depleted.

765. County, age, analysts, and maps as in sample 764. SW¼ sec. 14, T. 37 N., R. 2 W., Orcas Island, Double Hill deposit. Sample SJ 10-1. (Danner, 1966, p. 16, 19, 82, 141, 152, 155, 156, 448, 457.) Magnesian limestone, light-gray to blue-gray and buff, crystalline; contains calcite veinlets, jasperoid. Thin-section description. Chip sample taken across 35 ft. Possible use: None, deposit small and impure.

766. County, analysts, and maps as in sample 764. Permian. SE¼ NW¼ sec. 22, T. 37 N., R. 2 W., Orcas Island. Fowler deposit. Sample SJ 25-1. (Danner, 1966, p. 16, 19, 82, 141, 164, 166, 448, 457.) Limestone, light-gray-blue, dense to crystalline, fossiliferous; weathers gray. Chip sample taken across 21 ft.

767 - 769. County, analysts, and maps as in sample 764. Permian. NW¼ NW¼ sec. 23, T. 37 N., R. 2 W., Orcas Island, about 1 mile southwest of town of East Sound. Judd Cove deposit. (Danner, 1966, p. 16, 19, 82, 141, 166, 167, 168, 448, 457.) Limestone, dark-gray to light-gray, dense to crystalline, carbonaceous, argillaceous; weathers light gray or buff; contains jasperoid. Chip sample. Possible use: None, deposit small and impure.

767. Sample SJ 27-2 taken across 10 ft.
768. Sample SJ 27-3 taken across 40 ft.
769. Sample SJ 27-4 taken across 15 ft.

770 - 772. County, analysts, and maps as in sample 764. Late Permian. NW¼ sec. 23, T. 37 N., R. 2 W., Orcas Island, about 1 mile south of town of East Sound. Camp Indralaya deposit. (Danner, 1966, p. 16, 19, 82, 169-171, 448, 457.) Limestone, gray, dense to crystalline, fossiliferous; weathers light buff. Chip sample. Possible use: None, deposit small.

770. Sample SJ 30-1 taken across 30 ft.
771. Sample SJ 30-2 taken across 35 ft.
772. Sample SJ 30-3 taken across 17 ft.

773. County, analysts, and maps as in sample 764. Early Permian(?). SW¼ sec. 23, T. 37 N., R. 1 W., Orcas Island. Chuckanut Lime Co. quarry, abandoned. Sample SJ 87-1. (Danner, 1966, p. 16, 19, 82, 141, 207, 208, 450, 461.) Limestone, light-brownish-gray, dense to clastic; partly recrystallized. Thin-section description. Chip sample taken across 25 ft. Former use: Lime. Possible use: None, deposit largely depleted.

774 - 778. San Juan County. Paleozoic, probably Permian. NE¼ sec. 9, T. 36 N., R. 2 W., Orcas Island. West Sound deposit, Everett Lime Co. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 148-150, 151, 448, 449, 458.) Limestone, gray, finely crystalline. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Pulp and paper industry. Possible use: None, deposit depleted.

774. Sample SJ 36-1 taken across 60 ft.
775. Sample SJ 36-2 taken across 130 ft.
776. Sample SJ 36-3 taken across 50 ft.
777. Sample SJ 36-4 taken across 60 ft.
778. Sample SJ 36-5 taken across 80 ft.

779, 780. County, age, analysts, and maps as in samples 774-778. NW¼ SE¼ sec. 3, T. 36 N., R. 2 W., Orcas Island. Pineo deposit. (Danner, 1966, p. 16, 19, 82, 141, 172, 175, 177, 448, 458.) Possible use: None, deposit small.

779. Sample SJ 32-6. Limestone, blue-gray, dense to crystalline; taken across 38 ft. Thin-section description. Chip sample.
780. Sample SJ 32-7. Limestone, bluish-gray, mostly crystalline; taken across 20 ft. Chip sample.

781. County, age, analysts, and maps as in samples 774-778. SW¼ NE¼ sec. 22, T. 37 N., R. 2 W., Orcas Island, about 1.5 miles south of town of East Sound. Fowler deposit. Sample SJ 24-1. (Danner, 1966, p. 16, 19, 82, 141, 164, 165, 448, 457.) Limestone, white to dark-gray-blue, crystalline, massive. Chip sample taken across 70 ft. Tonnage estimated. Possible use: None, deposit small.

782. San Juan County. Permian(?). Either NW¼ sec. 30 or SW¼ sec. 19, T. 36 N., R. 2 W., Crane Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 35-1. (Danner, 1966, p. 16, 19, 82, 135-137, 141, 448, 458.) Limestone, light-gray to brownish-gray, mostly crystalline; well bedded in layers 1-3 in. thick. Thin-section description. Chip sample taken across 75 ft. Tonnage estimated. Index and geologic maps. Possible use: None, deposit small.

783, 784. County, age, analysts, maps, and use as in sample 782. N½ sec. 25, T. 36 N., R. 3 W., Cliff Island. (Danner, 1966, p. 16, 19, 82, 134, 135, 141, 448, 458.) Limestone, light-gray, mostly crystalline; thin-section description. Chip sample. Former use: Pulp and paper industry.

783. Sample SJ 34-1 taken across 400 ft.
784. Sample SJ 34-2 taken across 500 ft.

785, 786. County, age, analysts, and maps as in sample 782. Sec. 29, T. 36 N., R. 3 W., San Juan Island. (Danner, 1966, p. 16, 19, 82, 94, 449.) Tonnage estimated. Former use: Pulp and paper industry.

785. NW¼ NW¼ sec. 29. Rocky Bay quarries. Sample SJ 63-1. (Danner, 1966, p. 99, 100, 459.) Limestone, bluish-gray, crystalline; interbedded with argillite. Chip sample taken across 225 ft.
786. Wilson quarry; owner, B. Haffner. Sample SJ 41-1. (Danner, 1966, p. 96, 97, 458.) Limestone, light-gray, crystalline. Chip sample taken across 50 ft.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	787	788	789	790	791	792	793	794	795	796	797	798	799
	$46F_2$ 28-136	$46F_2$ 28-149	$46F_2$ 28-167	$46F_2$ 28-102	$46F_2$ 28-2	$46F_2$ 28-1	$46F_2$ 28-161	$46F_2$ 28-158	$46F_2$ 28-183	$46F_2$ 28-184	$46F_2$ 28-185	$46F_2$ 28-77	$46F_2$ 28-103
SiO_2	3.02	1.52	0.40	1.77	1.61	1.14	0.61	0.80	1.75	0.27	0.77	5.99	4.72
R_2O_3	.49	.15	.43	.58	[1].04	------	.96	.71	1.87	.40	1.27	1.53	.96
MgO	.29	.11	4.39	.20	------	[2].15	.34	.66	6.30	.27	.95	.36	.18
CaO	53.87	54.75	50.48	54.50	[2]54.59	[2]54.47	54.87	53.94	46.71	54.95	53.84	51.10	52.49
$Na_2O + K_2O$	------	------	------	------	[3].51	[3]1.21	------	------	------	------	------	------	------
P_2O_5	.036	.048	.010	.130	------	------	.100	.080	.220	.070	.150	.033	.236
Ignition loss	[4]42.47	[4]42.61	[4]44.16	[4]42.50	[5]42.86	[5]42.92	[4]43.00	[4]43.32	[4]43.11	[4]43.61	[4]42.92	[4]40.63	[4]40.97
Total	[100.18]	[99.19]	[99.87]	[99.68]	[6][99.61]	[99.89]	[99.88]	[99.51]	[99.96]	[99.57]	[99.90]	[99.64]	[99.56]
Class	2,1,96	1,0,97	0,1,99	1,2,96	2,0,97	1,0,98	0,1,97	0,2,98	0,3,95	0,1,99	0,1,97	3,4,91	3,3,93
CaO/MgO	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	800	801	802	803	804	805	806	807	808	809	810	811	812
	$46F_2$ 28-105	$46F_2$ 28-106	$46F_2$ 28-189	$46F_2$ 28-107	$46F_2$ 28-104	$46F_2$ 28-20	$46F_2$ 28-109	$46F_2$ 28-108	$46F_2$ 28-98	$46F_2$ 28-99	$46F_2$ 28-100	$46F_2$ 28-86	$46F_2$ 28-88
SiO_2	0.86	0.41	1.19	0.87	4.14	1.32	0.50	0.27	0.84	0.86	1.34	0.90	1.28
R_2O_3	.32	.30	.50	.26	1.21	[7].40	.65	.16	.42	.33	.70	.74	.39
MgO	.31	.33	.20	.38	8.06	[2].56	2.24	.33	.40	.35	.44	.16	.14
CaO	54.73	55.06	55.13	54.77	44.29	[2]53.97	53.02	55.44	55.10	55.12	54.43	52.53	54.79
P_2O_5	.012	.018	.039	.015	.027	------	.170	.107	.240	.100	.160	.027	.008
Ignition loss	[4]43.30	[4]43.41	[4]42.90	[4]43.24	[4]42.58	[5]42.99	[4]43.41	[4]43.73	[4]42.86	[4]43.34	[4]42.89	[4]41.38	[4]42.93
Total	[99.53]	[99.53]	[99.96]	[99.54]	[100.31]	99.24	[99.99]	[100.04]	[99.86]	[100.10]	[99.96]	[95.74]	[99.54]
Class	0,1,98	0,1,98	0,1,97	0,1,98	2,4,93	1,0,98	0,1,98	0,0,99	0,1,97	0,1,98	0,2,97	0,2,94	1,1,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued											
	813	814	815	816	817	818	819	820	821	822	823	824
	$46F_2$ 28-89	$46F_2$ 28-7	$46F_2$ 28-17	$46F_2$ 28-22	$46F_2$ 28-23	$46F_2$ 28-24	$46F_2$ 28-25	$46F_2$ 28-26	$46F_2$ 28-10	$46F_2$ 28-159	$46F_2$ 28-142	$46F_2$ 28-127
SiO_2	4.30	0.43	0.18	1.99	3.37	1.22	0.34	3.77	[8]0.56	0.86	1.27	5.38
R_2O_3	.67	.13	.61	.46	.52	.30	.61	.97	[9].27	.25	.58	.41
MgO	2.36	.20	.25	.10	.28	.21	.02	.22	[10]Trace	.12	.15	.19
CaO	50.60	55.16	55.31	54.53	53.47	54.80	55.31	54.18	[2]55.52	55.50	54.57	52.67
P_2O_5	.013	.008	.063	.064	.032	.068	.193	.013	.02	.128	.051	.045
Ignition loss	[4]42.02	[4]43.45	[4]43.24	[4]42.55	[4]41.83	[4]42.82	[4]43.33	[4]41.42	[5]43.63	[4]42.96	[4]42.86	[4]40.95
Total	[99.96]	[99.38]	[99.65]	[99.69]	[99.50]	[99.42]	[99.80]	[100.57]	100.00	[99.82]	[99.48]	[99.64]
Class	3,2,94	0,0,99	0,0,98	1,1,96	2,2,95	1,1,97	0,1,98	2,3,94	(0,1)99	0,1,97	0,2,97	5,1,93
CaO/MgO	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_2, K_2O, Sc_2O_3, V_2O_5, CoO, ZnO, Ga_2O_2, GeO_2, As_2O_2, Y_2O_2, ZrO_2, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_2, CeO_2, Pr_2O_2, Nd_2O_2, Sm_2O_3, Eu_2O_2, Gd_2O_3, Tb_2O_2, Dy_2O_2, Ho_2O_2, Er_2O_3, Tm_2O_3, Yb_2O_2, Lu_2O_3, HfO_2, Ta_2O_5, WO_2, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_2, PbO, Bi_2O_2, ThO_2, UO_2; sample 789, V_2O_5 = 0.003 percent; sample 798, ZrO_2 = 0.002 percent]

	787	788	789	790	793	794	795	796	797	798	799	800	801	802
Na_2O	------	------	------	0.06	0.05	------	------	------	------	0.05	------	------	------	------
TiO_2	0.021	0.0056	0.006	.018	.013	0.015	0.071	0.0036	0.012	.14	0.026	0.006	0.006	0.024
Cr_2O_3	.00058	.0005	.00055	.00077	.00099	.00099	.0025	.00093	.0050	.00086	.00064	.0005	.0005	.0019
MnO	.098	.045	.009	.045	.052	.052	.80	.25	1.00	.052	.074	.03	.024	.075
NiO	------	------	------	.002	------	------	.0032	------	.0026	.0028	.0016	------	------	.0014
CuO	.002	.0013	.0010	.0031	.0016	.0021	.0028	.0017	.0026	.0054	.0029	.0014	.0021	.0014
SrO	.23	.025	.015	.036	.022	.014	.021	.067	.056	.036	.052	.027	.024	.025
Ag_2O	------	------	------	------	------	------	------	------	------	------	------	------	------	------

	803	804	806	807	808	809	810	811	812	813	814	815	816	817
Na_2O	0.05	0.06	------	------	------	------	------	------	------	------	------	------	------	------
TiO_2	.0092	.039	0.0088	0.0036	0.018	0.0088	0.026	0.008	0.026	0.0088	0.0048	0.008	0.0072	0.0096
Cr_2O_2	.0049	.0012	.0005	.0005	.0005	.0005	.0005	.00093	.0005	.0005	.0005	.0005	.0005	.0005
MnO	.028	.23	.14	.027	.086	.04	.06	.095	.038	.19	.024	.017	.027	.10
NiO	.0014	.0026	------	------	------	------	------	------	.0018	------	------	------	.001	.001
CuO	.0023	.0055	.0030	.0054	.0029	.0033	.0034	.0035	.0037	.0025	.0025	.0012	.0020	.0031
SrO	.018	.048	.022	.015	.014	.024	.027	.038	.024	.015	.025	.024	.029	.028
Ag_2O	------	------	------	.00033	.00055	.00071	.00033	------	------	------	------	------	------	------

	818	819	820	822	823	824
Na_2O	------	------	0.075	------	------	0.15
TiO_2	0.0064	0.002	.020	0.0056	0.039	.024
Cr_2O_3	.0005	.0005	.00099	.0010	.0007	.00058
MnO	.028	.024	.028	.008	.16	.02
NiO	0.001	0.001	0.001	------	------	------
CuO	.0023	.0031	.0025	0.0021	0.0024	0.0024
SrO	.052	.018	.038	.021	.021	.035
Ag_2O	------	------	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

787 - 789. San Juan County. Permian(?). Sec. 34, T. 36 N., R. 3 W., San Juan Island, 3.7 miles by road from town of Friday Harbor. Eureka deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 94, 102-106, 449, 458.) Limestone, light-blue-gray, mostly crystalline. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Lime. Possible use: None, deposit small.
787. SE¼ sec. 34, abandoned quarry. Sample SJ 44-1 taken across 40 ft.
788. SE¼ sec. 34. Sample SJ 44-2 taken across 20 ft.
789. S½ sec. 34. Sample SJ 1-1 taken across 50 ft.

790. San Juan County. Mississippian and Permian(?). SE¼ sec. 25, T. 37 N., R. 2 W., Orcas Island, about 2.5 miles southeast of town of East Sound. Langdon deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 68-2. (Danner, 1966, p. 16, 19, 82, 141, 191, 193, 450, 460.) Limestone, light-gray to bluish-gray, crystalline. Thin-section description. Chip sample, composite. Tonnage estimated. Index and geologic maps. Former use: Flux.

791. San Juan County. Probably Carboniferous. [T. 37 N., R. 2 W.], west shore of Orcas Island. Roche Harbor Lime and Cement Co., Red Cross deposit. Analyst, A. H. Cederberg. (Landes, 1905 [1906], p. 377, 378; Hodge, 1935c, p. 66, 67; Hodge, 1938b, p. 12, 13, 15, 16.) General: Limestone, mostly white to bluish-gray, recrystallized; streaked with irregular black veinlets. Tonnage estimated. General use: Cement, flux, pulp and paper industry, lime.

792. San Juan County. Pre-Cretaceous. [T. 37 N., R. 2 W.], northwest shore of Orcas Island. Analyst, A. H. Cederberg. (Landes, 1905 [1906], p. 377, 378.) Limestone, entirely crystalline. Use: Lime. Possible use: Cement.

793, 794. San Juan County. T. 35 N., R. 3 W., San Juan Island, Hannah area. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 107-109, 447, 456.) Chip sample. Index and geologic maps.
793. SE¼SW¼ sec. 19. Sample SJ 4-1. Limestone, gray, crystalline; contains interbedded carbonaceous material; taken across 6 ft.
794. N½NE¼ sec. 30. Sample SJ 4-2. Limestone, taken across 65 ft.

795 San Juan County. SE¼SW¼ sec. 11, T. 35 N., R. 4 W., San Juan Island, Smallpox Bay. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 6-1. (Danner, 1966, p. 16, 19, 82, 108, 115, 116, 448, 456.) Limestone, light-gray, finely crystalline Chip sample taken across 40 ft. Index and geologic maps. Possible use: None, deposit small.

796, 797. San Juan County. T. 35 N., R. 4 W., San Juan Island. Lawson Cave deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 108, 116, 117, 447, 448, 456.) Limestone, finely crystalline. Chip sample. Index and geologic maps. Tonnage estimated. Possible use: Probably none.
796. NW¼SW¼ sec. 13. Sample SJ 5-1. Limestone, gray to white; composite.
797. NE¼SE¼ sec. 14. Sample SJ 5-2. Limestone, light-gray; taken across 30 ft.

798 - 799. San Juan County. T. 36 N., R. 1 W., Orcas Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples SJ 72-1, SJ 70-1. (Danner, 1966, p. 16, 19, 82, 141, 193-196, 450, 460.) Index and geologic maps. Possible use: None, deposit small and impure.
798. SW¼ sec. 5, Rosario deposit. Limestone, dark-gray, finely crystalline; argillaceous interbeds. Chip sample taken across 90 ft.
799. NE¼NE¼ sec. 6, Entrance Mountain deposit. Limestone, white to light-gray, crystalline; contains black carbonaceous stringers. Chip sample taken across 100 ft.

800 - 803. San Juan County. NW¼ sec. 8, T. 36 N, R. 1 W., Orcas Island, near town of Olga. Newhall deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 194, 195, 450, 460.) Limestone, gray, coarsely crystalline, contains calcite veinlets. Chip sample. Index and geologic maps. Former use: Lime. Possible use: None, deposit small.
800. Sample SJ 71-1 taken across 180 ft.
801. Sample SJ 71-2 taken across 110 ft.
802. Sample SJ 71-3 taken across 15 ft; part may be talus material.
803. Sample SJ 71-4, composite.

804. County and analysts as in samples 800-803. SW¼ sec. 8, T. 36 N., R. 1 W., Orcas Island. Olga deposit. Sample SJ 69-1. (Danner, 1966, p. 16, 19, 82, 141, 194, 450, 460.) Limestone, gray, crystalline. Chip sample, composite. Index and geologic maps. Possible use: None, deposit small.

805. San Juan County. Olga, Queen Brick and Lime Co. (Burchard, 1912, p. 694, pl. 1.) Limestone. Index map.

806. San Juan County. NE¼SE¼ sec. 3, T. 36 N., R. 2 W., Orcas Island. Pineo deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 32-5. (Danner, 1966, p. 16, 19, 82, 141, 172, 174, 448, 458.) Limestone, blue-gray, crystalline. Chip sample, composite. Index and geologic maps. Possible use: None, deposit small.

807. County, locality, analysts, reference, maps, and use as in sample 806. Sample SJ 32-4. Limestone, white to light-gray, crystalline; occurs as float. Chip sample, composite.

808 - 810. County, locality [except quarter section], analysts, and maps as in sample 806. E½ sec. 3, near abandoned quarries. (Danner, 1966, p. 16, 19, 82, 141, 172, 173, 448, 457.) Limestone, gray, mostly crystalline. Thin-section description. Chip sample. Tonnage estimated. Former use: Pulp and paper industry.
808. Sample SJ 32-1 taken across 50 ft.
809. Sample SJ 32-2 taken across 55 ft.
810. Sample SJ 32-3 taken across 90 ft.

811 - 816. San Juan County. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141.) Index and geologic maps. Possible use: None, deposit small.
811. West part SE¼ sec. 13, T. 36 N., R. 2 W., Orcas Island, 2.75 miles by road east of Orcas Landing. Killebrew Lake deposit. Sample SJ 48-1. (Danner, 1966, p. 179, 180, 449, 459.) Limestone, bluish-gray, finely crystalline; contains calcite veinlets. Chip sample, composite.
812. SE¼ sec. 17, T. 36 N., R. 2 W., Orcas Island, about 2 miles southwest of town of West Sound. Caldwell Point deposit. Sample SJ 73-1. (Danner, 1966, p. 181, 182, 450, 460.) Limestone, gray, crystalline. Chip sample taken across 30 ft.
813. SW¼NE¼ sec. 18, T. 36 N., R. 2 W., Orcas Island, about 0.5 mile south of town of Deer Harbor. Deer Harbor deposit. Sample SJ 74-1. (Danner, 1966, p. 182, 183, 450, 460.) Limestone, dense to crystalline; weathers light gray; contains calcite veinlets, carbonaceous and cherty layers. Chip sample taken across 50 ft.
814, 815. SE¼NW¼ sec. 29, T. 36 N., R. 2 W., Shaw Island. Yansen deposit. Samples SJ 82-1, SJ 82-2. (Danner, 1966, p. 137, 138, 450, 461.) Limestone, light-gray to bluish-gray, crystalline. Chip sample, composite. Tonnage estimated.
816. NW¼SW¼ sec. 29, T. 36 N., R. 2 W., Shaw Island. Biendle deposit. Sample SJ 83-1. (Danner, 1966, p. 138, 139, 450, 461.) Limestone, gray, crystalline. Chip sample, composite.

817. County, analysts, reference, and maps as in samples 811-816. NE¼ sec. 30, T. 36 N., R. 2 W., Shaw Island. Lutz quarry, abandoned. Sample SJ 84-1. (Danner, 1966, p. 139, 140, 450, 461.) Limestone, gray, crystalline. Chip sample taken across 100 ft. Former use: Pulp and paper industry. Possible use: None, deposit depleted.

818 - 820. San Juan County. SE¼SE¼ sec. 30 and NW¼ sec. 32, T. 36 N., R. 2 W., west coast of Shaw Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 140, 141, 450, 461.) Limestone, light-gray, crystalline. Chip sample. Index and geologic maps. Possible use: None, deposit small.
818. Sample SJ 85-1 taken across 30 ft.
819. Sample SJ 85-2, composite.
820. Sample SJ 91-1, composite.

821. San Juan County. [NW¼ T. 36 N., R. 2 W.], Deer Harbor. Henry Cowell Lime and Cement Co. Analyst, H. Byers. (Burchard, 1912, p. 694, pl. 1.) Limestone. Index map.

822 - 824. San Juan County. SW¼SW¼ sec. 29, T. 36 N., R. 3 W., San Juan Island. Johnson quarries. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 94, 98, 99, 449, 458.) Limestone, light-blue-gray, mostly crystalline. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Lime [implied].
822. Sample SJ 42-1 taken across 10 ft.
823. Sample SJ 42-2 taken across 5 ft.
824. Sample SJ 42-3, composite.

Footnotes of analyses on preceding page:

[1] Iron and aluminum oxides.

[2] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[3] Alkalies, and so forth.

[4] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[5] CO_2, calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[6] S, trace.

[7] FeO.

[8] Insoluble in acid.

[9] $Al_2O_3 + Fe_2O_3$.

[10] $MgCO_3$.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	825	826	827	828	829	830	831	832	833	834	835	836	837
	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$
	28-126	28-138	28-68	28-69	28-70	28-71	28-72	28-73	28-74	28-13	28-60	28-62	28-61
SiO_2	4.25	2.03	3.29	2.85	1.59	4.39	1.37	3.23	1.79	4.28	0.81	2.06	6.30
R_2O_3	.48	.38	1.02	1.38	.28	1.53	.45	.91	1.07	.96	.50	.74	.64
MgO	.21	.23	.16	.94	.17	.65	.36	.43	.91	.64	.19	.29	.15
CaO	52.87	54.14	53.03	52.69	54.85	52.10	54.58	53.06	53.55	52.36	54.90	53.88	51.80
P_2O_5	.058	.072	.014	.020	.011	.180	.006	.007	.011	------	.130	.043	.066
Ignition loss	[1]41.65	[1]42.79	[1]41.91	[1]41.70	[1]42.71	[1]41.15	[1]43.02	[1]41.87	[1]42.61	42.00	[1]43.15	[1]42.19	[1]40.47
Total	[99.52]	[99.64]	[99.42]	[99.58]	[99.61]	[100.00]	[99.79]	[99.51]	[99.94]	100.24	[99.68]	[99.20]	[99.43]
Class	3,1,94	1,1,97	2,3,95	1,4,94	1,1,97	2,4,92	1,1,97	2,3,95	0,3,96	3,3,94	0,1,98	1,2,95	5,2,92
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Washington—Continued

	838	839	840	841	842	843	844	845	846	847	848	849	850
	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$
	28-63	28-15	28-186	28-49	28-47	28-94	28-117	28-118	28-18	28-21	29-43	29-98	29-99
SiO_2	1.19	0.80	6.78	6.84	1.10	1.48	0.84	2.54	1.64	0.04	1.0	2.74	2.80
Al_2O_3	[2].37	[2].60	[2]1.78	[2].60	[2].50	[2].92	[2].41	[2].50	------	------	.0	[2].73	[2].39
Fe_2O_3									.06	------	.1		
MgO	.08	.40	.57	.24	.13	.30	.10	.52	.39	------	.1	.27	.18
CaO	55.17	54.32	50.35	51.27	54.85	54.40	54.94	53.47	54.43	[3]55.02	55.5	53.66	53.96
H_2O	------	------	------	------	------	------	------	------	------	.73	------	------	------
P_2O_5	.004	------	.004	.013	.041	.210	.180	.120	------	[3].02	[3]< .01	.003	.005
MnO	------	------	------	------	------	------	------	------	------	[4]1.01	------	------	------
S	------	------	------	------	------	------	------	------	------	------	.011	------	------
Ignition loss	[1]43.05	------	[1]40.19	[1]40.97	[1]43.30	[1]42.22	[1]42.93	[1]42.45	43.30	[5]43.19	43.1	[1]42.48	[1]42.31
Total	[99.86]	[56.12]	[99.67]	[99.93]	[99.92]	[99.53]	[6][99.40]	[6][99.60]	99.82	100.01	[7][99.8]	[99.88]	[99.64]
Class	1,1,98	0,1,98	4,5,90	6,2,92	0,1,98	0,3,95	0,1,97	2,1,96	2,0,98	0,1,98	1,0,98	2,2,96	2,1,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Washington—Continued

	851	852	853	854	855	856	857	858	859	860	861	862	863
	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$	$46F_2$
	29-116	29-117	29-118	29-100	29-47	29-48	29-49	29-50	29-51	29-44	29-120	29-119	29-52
SiO_2	4.40	4.97	1.59	4.22	0.78	1.1	1.4	0.6	0.6	0.7	3.18	1.59	1.8
Al_2O_3	------	------	------	[2].65	.72	.1	.1	.0	.0	.0	[2].82	[2].39	.1
Fe_2O_3	------	------	------			.1	.1	.1	.1	.1			.2
MgO	------	------	------	.14	Trace	.0	.1	.1	.1	.1	.18	.14	.1
CaO	[3]53.33	[3]52.83	[3]55.1	54.18	54.95	55.1	55.1	55.3	55.1	55.5	53.36	54.86	54.7
P_2O_5	------	------	------	.005	------	[3]<.01	[3]<.01	[3]<.01	[3]<.01	[3]<.01	.008	.001	[3]<.01
S	------	------	------	------	------	.010	.004	.003	.013	.005	------	------	.003
Ignition loss	[5]41.86	[5]41.47	[5]43.2	[1]41.69	43.50	43.1	43.0	43.4	43.4	43.3	[1]41.85	[1]42.76	42.7
Free C	------	------	------	------	------	------	.03	.03	.03	.03	------	------	------
Total	[99.59]	[99.27]	[99.9]	[100.88]	99.95	[7][99.5]	[7][99.8]	[7][99.5]	[7][99.3]	[7][99.7]	[99.40]	[99.74]	[99.6]
Class	4,0,95	5,0,94	2,0,98	3,2,94	0,1,98	1,1,98	1,1,98	0,0,99	0,0,99	1,0,98	2,2,95	1,1,97	1,1,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_2, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 830, PbO = 0.023 percent]

	825	826	827	828	829	830	831	832	833	835	836	837
Na_2O	0.05	0.05	------	------	------	0.13	------	0.05	------	------	------	------
TiO_2	.010	.0084	0.027	0.029	0.012	.051	0.0088	.052	0.026	0.018	0.014	0.0048
V_2O_5	------	------	.0053	.0053	.0053	.0053	.0048	.0059	.005	------	------	------
Cr_2O_3	.0005	.0005	.0016	.0005	.0005	.0005	.0005	.00083	.0005	.0005	.00077	.00054
MnO	.22	.085	.032	.08	.045	.48	.072	.062	.067	.072	.11	.078
NiO	------	------	.0012	.0012	.0012	.001	.001	.001	.001	.001	.001	.001
CuO	.0019	.0016	.0043	.0029	.0016	.0027	.0028	.0033	.0023	.0028	.0024	.0033
SrO	.014	.014	.064	.013	.014	.011	.011	.011	.028	.034	.027	.028
Ag_2O	------	------	.0015	.00088	.0010	.00038	.00044	.0018	------	------	------	------
BaO	.15	------	------	------	------	------	------	------	------	------	.36	.43

	838	840	841	842	843	844	845	849	850	854	861	862
Na_2O	------	------	------	------	------	------	------	0.075	------	0.20	0.15	------
TiO_2	0.0056	0.031	0.016	0.0096	0.031	0.0068	0.032	.0092	0.008	.030	.016	0.0052
V_2O_5	------	------	------	------	.003	------	------	------	------	------	------	------
Cr_2O_3	------	------	.0005	------	.0029	.0005	.00096	------	------	------	------	------
MnO	.031	.09	.20	.80	.24	.062	.06	.09	.03	.027	.042	.09
NiO	.001	------	.0014	------	------	.001	.001	.001	------	------	------	------
CuO	.0036	.0024	.0025	.0025	.0019	.0024	.0025	.00082	.00082	.00099	.00066	.0006
SrO	------	.013	.011	.0089	.024	.031	.033	.0083	.0098	.0098	.013	.009
Ag_2O	------	------	------	------	------	------	------	------	------	------	------	------
BaO	------	------	------	------	------	------	------	------	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

825, 826. San Juan County. Southwest corner sec. 15, T. 36 N., R. 4 W., Henry Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 84, 127, 128, 449, 459.) Limestone, dark-gray, finely crystalline; weathers light gray. Chip sample. Tonnage estimated. Index and geologic maps.

825. Sample SJ 58-1 taken across 100 ft.
826. Sample SJ 58-2 taken across 75 ft. Average of two determinations.

827. San Juan County. NE¼ sec. 17, T. 37 N., R. 1 W., Orcas Island. Racoon Point deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 78-1. (Danner, 1966, p. 16, 19, 82, 141, 199, 200, 450, 461.) Limestone, brownish-gray, sugary-crystalline, bed 10-20 ft thick; contains small lenses of argillaceous rock. Chip sample taken across 20 ft. Index and geologic maps. Possible use: None, deposit small.

828-833. San Juan County. North-central part of sec. 19, T. 37 N., R. 1 W., Orcas Island, about 3 miles by road from town of East Sound. Payton deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 200-202, 450, 461.) Limestone, gray, crystalline; contains calcite veinlets. Chip sample. Index and geologic maps. Use: Quarried, use not stated. Possible use: Probably none [implied].

828. Sample SJ 79-1 taken across 225 ft.
829. Sample SJ 79-2 taken across 225 ft.
830. Sample SJ 79-3 taken across 200 ft.
831. Sample SJ 79-4 taken across 90 ft.
832. Sample SJ 79-5, composite.
833. Sample SJ 79-6 taken across 35 ft.

834. San Juan County. Sec. 19, T. 37 N., R. 1 W., Orcas Island, East Sound. Mount Constitution Lime Co. Analyst, A. A. Hammer. Sample 101. (Shedd, 1913, p. 204, 205, 206, 247, pl. 21.) Limestone, massive, crystalline; 25-40 ft thick. Index map. Use: Lime. Possible use: Portland cement.

835-837. San Juan County. Sec. 30, T. 37 N., R. 1 W., Orcas Island, about 3.5 miles by road from East Sound. Flaherty deposit or quarry. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 204-206, 450, 461.) Index and geologic maps. Possible use: None, deposit small or depleted.

835. SW¼NW¼ sec. 30. Sample SJ 81-1. Limestone, gray to white, crystalline. Chip sample, composite.
836. About SE¼NW¼ sec. 30. Sample SJ 89-1. Limestone, light-gray, crystalline to dense. Chip sample taken across 70 ft.
837. SW¼ sec. 30. Sample SJ 88-1. Limestone, blue-gray, crystalline. Chip sample taken across 120 ft.

838. San Juan County. NW¼NW¼ sec. 31, T. 37 N., R. 1 E., Orcas Island. Lawrence Point deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample SJ 86-1. (Danner, 1966, p. 16, 19, 141, 206, 207, 450, 461.) Limestone, light-gray, crystalline; contains stringers of black carbonaceous material and calcite veinlets. Chip sample, composite. Tonnage estimated. Index and geologic maps. Possible use: None, deposit small.

839. San Juan County. [About T. 37 N., R. 1 W., unsurveyed], Orcas Island. (Hodge, 1944, p. 15, pl. 6.) Limestone, selected sample. Tonnage estimated. Index map.

840-843. San Juan County. T. 37 N., R. 2 W., Orcas Island. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 448, 457.) Index and geologic maps.

840. Sec. 14, near head of East Sound. Sample SJ 20-1. Limestone. Chip sample.
841. SE¼SE¼ sec. 15, about 0.80 mile southwest of East Sound. Langell deposit. Sample SJ 14-1. (Danner, 1966, p. 152, 159, 160, 161.) Limestone, blue-gray to white, finely crystalline to dense; weathers white; contains argillaceous and cherty material. Chip sample taken across 70 ft. Thin-section description. Possible use: None, deposit small.
842. SW¼SE¼ sec. 15. Rusch deposit. Sample SJ 11-1. (Danner, 1966, p. 152, 158, 159.) Limestone, light-gray, crystalline. Chip sample taken across 70 ft. Tonnage estimated. Possible use: None, deposit small.
843. NW¼SE¼ sec. 22. Fowler deposit. Sample SJ 31-1. (Danner, 1966, p. 164, 169.) Limestone, white to light-gray, crystalline. Chip sample, composite. Possible use: None, deposit small.

844, 845. San Juan County. NE¼ sec. 25, T. 37 N., R. 2 W., Orcas Island. Langdon deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 141, 190, 191, 450, 460.) Limestone, gray, crystalline. Chip sample. Index and geologic maps. Former use: Lime. Possible use: None, deposit small.

844. Sample SJ 67-1 taken across 185 ft.
845. Sample SJ 67-2 taken across 200 ft.

846. San Juan County. Sec. 25, T. 37 N., R. 2 W., Orcas Island, about 2.5 miles from East Sound. Analyst, A. A. Hammer. Sample 100. (Shedd, 1913, p. 204, 205, 206, 247, pl. 21.) Limestone, massive, crystalline; 75 ft thick. Index map. Use: Flux. Possible use: Portland cement.

847. San Juan County. [Tps. 34-38 N., Rs. 1-4 W.] Tacoma and Roche Harbor Lime Co. Analyst, G. A. Bethune. (Bethune, 1891, p. 101.) Limestone. Possible use: Lime.

848. Skagit County. Silurian and Devonian part of Chilliwack Group. SE¼SE¼ sec. 23, T. 35 N., R. 9 E., about 1 mile from town of Rockport. North Rockport deposit. Analysts, K. S. Johnson, Anthony Centenero. (Popoff, 1948, p. 2, 6, 7, 9, 11, 13, figs. 1, 3, 4; Danner, 1966, p. 82, 269, 289-292, 293, 294.) General: Limestone, white to dark-gray, medium- or coarse-grained, massive, uniform texture. Channel sample taken across 40.0 ft. Tonnage estimated. Index and geologic maps. Possible use: Agricultural, cement.

849-854. County, age, formation, maps, and use as in sample 848. T. 35 N., R. 9 E., North Rockport deposit. (Danner, 1966, p. 16, 19, 82, 269, 289-292, 293, 294, 451, 462.) Limestone, light- to dark-gray, finely crystalline, massive to poorly bedded. Tonnage estimated.

849. SE¼ sec. 23. Analyst, Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St10-1. Chip sample taken across 350 ft.
850. SE¼ sec. 23, NE¼ sec. 26. Analyst, Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St 8-2. Chip sample taken across 750 ft.
851. SE¼ sec. 23, NE¼ sec. 26. Sample taken across 40 ft.
852. SE¼ sec. 23, NE¼ sec. 26. Sample taken across 50 ft.
853. SE¼ sec. 23, NE¼ sec. 26. Sample taken across 40 ft.
854. NE¼ sec. 26. Analyst, Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St 8-1. Chip sample taken across 350 ft.

855. County, age, formation, maps, and use as in sample 848. SE¼ sec. 23, NE¼ sec. 26, T. 35 N., R. 9 E., about 0.75 mile north of Rockport, Sauk Mountain. Roche Harbor Lime Co. Analyst, A. A. Hammer. Sample 117. (Shedd, 1913, p. 229, 230, 247, pl. 21; Hodge, 1938b, p. 13, 47, 56, 57, 58; Danner, 1966, p. 82, 269, 289-292, 293, 294.) Limestone, light-gray, massive, finely crystalline; more than 120 ft exposed. Tonnage estimated.

856-860. County, age, formation, analysts, references, maps, and use as in sample 848. NE¼NE¼ sec. 26, T. 35 N., R. 9 E. North Rockport deposit, Roche Harbor Lime and Cement Co. General: Limestone, white to dark-gray, medium- to coarse-grained, massive, uniform texture. Tonnage estimated.

856. Channel sample taken across 14.0 ft.
857. Channel sample taken across 13.2 ft.
858. Channel sample taken across 11.8 ft.
859. Channel sample taken across 9.0 ft.
860. Channel sample taken across 10.0 ft.

861-863. Skagit County. Silurian(?) and Devonian(?) part of Chilliwack Group. SE¼NE¼ sec. 26, T. 35 N., R. 9 E., about 0.5 mile from Rockport. South Rockport deposit. (Danner, 1966, p. 16, 19, 82, 269, 290, 292-294, 451, 462.) Index and geologic maps.

861, 862. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples St 9-2, St 9-1. Limestone, gray, finely crystalline. Chip sample.
861. Composite. 862. Taken across 100 ft.
863. Roche Harbor Lime and Cement Co. Analysts, K.S. Johnson, Anthony Centenero. (Popoff, 1948, p. 2, 6, 7, 11, 13, figs. 1, 3.) Limestone, white to dark-gray, medium- or coarse-grained, massive, uniform texture. Channel sample taken across 10 ft.

Footnotes of analyses on preceding page:

[1] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[2] R_2O_3.

[3] Calculated from reported $CaCO_3$ or P.

[4] Reported as manganese.

[5] CO_2, calculated from reported $CaCO_3$.

[6] With sample 64 group C, $Na_2O = 330$ ppm, $K_2O = 565$ ppm, $TiO_2 = 1,250$ ppm, $S = 143$ ppm.

[7] Analysis on dry basis.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	864	865	866	867	868	869	870	871	872	873	874	875	876
	$46F_2$ 29-139	$46F_2$ 29-142	$46F_2$ 29-137	$46F_2$ 29-136	$46F_2$ 29-135	$46F_2$ 29-40	$46F_2$ 29-31	$46F_2$ 29-32	$46F_2$ 29-33	$46F_2$ 29-34	$46F_2$ 29-36	$46F_2$ 29-35	$46F_2$ 29-37
SiO_2	4.66	1.30	2.63	1.96	0.89	1.1	0.6	0.5	0.9	0.7	2.1	1.0	2.3
Al_2O_3	[1].88	[1].40	[1].19	[1].33	[1].20	.1	.1	.1	.2	.3	.3	.2	.8
Fe_2O_3						.1	.1	.1	.1	.1	.2	.1	.4
MgO	.21	.19	.31	.14	.16	.2	.1	.0	.0	.0	.0	.0	.3
CaO	52.87	54.70	54.48	55.02	55.47	54.9	55.7	55.8	55.6	55.7	54.9	55.6	53.5
P_2O_5	.007	.005	.003	.008	.008	[2].01	[2].01	[2].01	[2]<.01	[2].01	[2].02	[2].01	[2].03
S	------	------	------	------	------	.000	.001	.001	.000	.000	.001	.000	.008
Ignition loss	[3]41.50	[3]42.98	[3]42.23	[3]42.53	[3]42.75	43.0	43.2	43.1	43.2	43.4	42.5	43.2	42.2
Total	[100.13]	[99.58]	[4][99.84]	[4][99.99]	[4][99.48]	[5][99.4]	[5][99.8]	[5][99.6]	[5][100.0]	[5][100.2]	[5][100.0]	[5][100.1]	[5][99.5]
Class	3,3,94	1,1,97	2,1,96	1,1,96	1,1,97	1,1,98	0,1,98	0,1,98	0,1,98	0,1,98	1,1,96	1,1,98	0,3,95
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued											
	877	878	879	880	881	882	883	884	885	886	887	888
	$46F_2$29-38	$46F_2$29-39	$46F_2$29-41	$46F_2$29-93	$46F_2$29-92	$46F_2$29-97	$46F_2$29-96	$46F_2$29-95	$46F_2$29-94	$46F_2$29-88	$46F_2$29-2	$46F_2$29-1
SiO_2	2.8	1.4	5.3	1.59	6.86	2.28	2.04	2.27	7.56	6.29	3.41	0.80
Al_2O_3	.4	.3	.9	[1].22	[1].62	[1].79	[1].48	[1].30	[1]1.16	[1].99	[6]1.78	[6].70
Fe_2O_3	.3	.2	.6									
MgO	.3	.3	.4	.06	.67	.09	.09	.13	.48	.25	[2]1.10	[2].31
CaO	53.5	54.5	51.5	55.20	51.40	54.48	54.79	54.83	51.02	52.15	[2]51.82	[2]54.98
P_2O_5	[2].02	[2].01	[2].03	.004	.008	.018	.006	.003	.008	.005	------	------
S	.010	.001	.035	------	------	------	------	------	------	------	------	------
Ignition loss	42.2	42.7	40.6	[3]42.53	[3]40.22	[3]42.10	[3]42.08	[3]42.15	[3]39.74	[3]40.16	[7]41.88	[7]43.50
Total	[5][99.5]	[5][99.4]	[5][99.4]	[99.60]	[99.78]	[99.76]	[99.49]	[99.68]	[99.97]	[99.84]	[99.99]	[100.29]
Class	2,2,95	1,1,97	3,4,91	1,1,97	6,2,91	1,2,95	1,1,95	2,1,96	6,3,90	5,3,91	0,5,95	0,1,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued											
	889	890	891	892	893	894	895	896	897	898	899	900
	$46F_2$29-20	$46F_2$29-18	$46F_2$29-14	$46F_2$29-21	$46F_2$29-19	$46F_2$29-15	$46F_2$29-17	$46F_2$29-16	$46F_2$29-22	$46F_2$29-13	$46F_2$29-26	$46F_2$29-3
SiO_2	5.36	4.26	5.56	2.06	4.68	6.76	3.72	8.36	2.92	8.40	1.94	3.36
$Al_2O_3 + Fe_2O_3$	1.12	1.22	.98	1.12	1.20	.92	1.24	.96	1.06	.88	.22	1.78
MgO	1.08	.91	1.10	Trace	.92	1.16	.62	1.04	Trace	1.22	Trace	.30
CaO	52.08	52.70	51.98	54.25	52.30	51.20	53.22	50.70	53.60	50.30	54.92	51.85
Ignition loss	------	------	------	------	------	------	------	------	------	------	42.67	42.61
Total	[59.64]	[59.09]	[59.62]	[57.43]	[59.10]	[60.04]	[58.80]	[61.06]	[57.58]	[60.80]	99.75	99.90
Class	3,3,91	2,4,92	4,3,91	0,3,96	3,4,92	5,3,90	2,4,93	7,3,88	1,3,96	7,3,88	2,1,97	0,6,93
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued											
	901	902	903	904	905	906	907	908	909	910	911	912
	$46F_2$29-4	$46F_2$29-25	$46F_2$29-24	$46F_2$29-87	$46F_2$29-79	$46F_2$29-86	$46F_2$29-85	$46F_2$29-84	$46F_2$29-83	$46F_2$29-82	$46F_2$29-81	$46F_2$29-72
SiO_3	7.34	0.70	0.64	1.47	2.72	6.34	4.30	4.48	2.94	1.20	0.00	2.00
Al_2O_3	.41	.40	.36	[1].43	[1].37	[1]1.00	[1].94	[1].76	[1]1.50	[1].84	[1].50	------
Fe_2O_3	.83	[8].10	[8].11									
MgO	------	[2].17	[2].14	.26	.19	[2]2.31	[2].81	[2]2.72	[2]10.74	[2]2.04	[9]Trace	------
CaO	50.74	[2]55.01	[2]55.14	54.00	53.70	[2]49.20	[2]52.13	[2]49.37	[2]46.54	[2]52.47	[2]55.46	54.30
H_2O	------	.18	.16	------	------	------	------	------	------	------	------	------
P_2O_5	------	------	------	.013	.010	------	------	------	------	------	------	------
Ignition loss	40.15	[7]43.38	[7]43.44	[3]43.21	[3]42.20	[7]41.15	[7]41.82	[7]41.73	[7]38.30	[7]43.45	[7]43.54	------
Total	99.47	99.94	99.99	[99.38]	[10][99.19]	[100.00]	[100.00]	[99.06]	[100.02]	[100.00]	[99.50]	[56.30]
Class	6,3,91	0,1,99	0,1,99	1,2,97	2,1,96	5,3,93	3,3,94	3,2,94	0,4,84	0,2,98	0,0,99	2,0,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

---

[1] R_2O_3.

[2] Calculated from reported $MgCO_3$, $CaCO_3$ and (or) P.

[3] Sample dried at 110°-112° C; ignition loss 1,000°-1,100°C.

[4] A composite of samples 866-868 contained Na_2O = 150 ppm, K_2O = 490 ppm, TiO_2 = 100 ppm, S = 350 ppm.

[5] Analysis on dry basis.

[6] Iron and aluminum oxides.

[7] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[8] Iron oxide.

[9] $MgCO_3$.

[10] With sample 68, group C, sample 330 group F_1. Na_2O= 185 ppm, K_2O = 490 ppm, TiO_2 = 250 ppm, S = 325 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_5, Cr_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_3, Sb_2O_3, BaO, TeO_3, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_3, UO_2; sample 886, ZrO_2 = 0.0048 percent]

	864	865	866	867	868	880	881	882	883	884	885	886	904	905
Na_2O ----	0.083	------	------	------	------	------	------	------	------	0.05	0.05	0.05	------	------
TiO_3 ----	.021	0.0044	0.002	0.0044	0.0048	0.0038	0.016	0.01	0.012	.015	.032	.032	0.0072	0.0044
Cr_2O_3 ---	------	------	------	------	------	------	------	------	------	------	------	.0005	.0005	.0007
MnO ----	.043	.03	.021	.027	.024	.038	.021	.025	.016	.027	.015	.019	.20	.034
NiO ----	.0014	------	------	------	.001	------	------	------	------	------	..001	------	------	------
CuO ----	.0020	.00072	.0012	.0010	.0006	.0006	.0014	.0014	.0012	.00083	.0011	.0012	.0014	.00066
SrO -----	.010	.011	.0096	.008	.010	.007	.013	.01	.017	.0084	.015	.020	.013	.015

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

864, 865. Skagit County. Devonian part of Chilliwack Group. T. 35 N., R. 9 E., about 6 miles by road from town of Concrete. Jackman Creek deposit. Analyst, under snpervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 269, 271, 451, 462.) Chip sample. Index and geologic maps. Possible use: None, deposit small.

864. NW¼ sec. 4. Sample St 4-1. (Danner, 1966, p. 275-277, 278.) Limestone, bluish-gray to dark-gray, finely crystalline, fossiliferous. Composite sample of chips taken from all outcrops and numerous pieces of float.

865. NE¼ sec. 5. Sample St 5-1. (Danner, 1966, p. 275, 279.) Limestone, dark-gray, thin-bedded to massive, finely crystalline; weathers light gray; taken across 150 ft.

866 - 868. Skagit County. Devonian(?) part of Chilliwack Group. N½SE¼ sec. 4, T. 35 N., R. 9 E., about 6 miles from Concrete. Webber Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 269, 271, 275, 281, 282, 451, 462, 463.) Limestone, bluish-gray to dark-gray, mostly crystalline, fossiliferous, thin-bedded; contains secondary chert and pyrite. Chip sample. Index and geologic maps.

866. Sample St 15-1 taken across 60 ft.
867. Sample St 15-2 taken across 300 ft.
868. Sample St 15-3 taken across 400 ft.

869 - 879. Skagit County. Devonian(?) part of Chilliwack Group. T. 35 N., R. 9 E., about 2 miles from town of Sauk. Owner, Browns Logging Co. Analysts, K. S. Johnson, Anthony Centenero. (Popoff, 1948, p. 2, 5-8, 11, 12, figs. 1, 2; Danner, 1966, p. 82, 269, 271, 283-286, 287, 288.) General: Limestone, white to dark-gray, medium- or coarse-grained, massive, uniform texture. Tonnage estimated. Index and geologic maps.

869. NW¼NW¼ sec. 15. Paystreak deposit. Chip sample taken across 24.0 ft.

870 - 878. SE¼NW¼ sec. 15. Paystreak deposit.

870. Chip sample taken across 10 ft.
871. Chip sample taken across 10.0 ft.
872. Chip sample taken across 17.0 ft.
873. Chip sample taken across 12.0 ft.
874. Chip sample taken across 17.5 ft.
875. Chip sample taken across 16.0 ft.
876. Chip sample taken across 16.0 ft.
877. Chip sample taken across 14.0 ft.
878. Chip sample taken across 21.0 ft.

879. NE¼NE¼ sec. 16. Portland deposit. Chip sample taken across 12.5 ft; contains two thin seams of shale.

880, 881. Skagit County. Devonian(?) part of Chilliwack Group. T. 35 N., R. 10 E. Meiklejohn and Brown Co., Portland claim. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 269, 271, 283, 284, 287, 288, 451, 463.) General: Limestone, thin-bedded, fossiliferous; interbedded shales. Chip sample. Tonnage estimated. Index and geologic maps.

880. NE¼ sec. 16. Sample St 17-3 taken across 100 ft.
881. SE¼ sec. 9. Sample St 17-4 taken across 60 ft.

882 - 885. County, age, formation, analysts, and maps as in samples 880, 881. T. 35 N., R. 10 E. Meiklejohn and Brown Co., Paystreak claim. (Danner, 1966, p. 16, 19, 82, 269, 271, 283-286, 288, 451, 463.) Limestone, light-gray, dark-gray, brownish-gray, medium crystalline, mostly massive, fossiliferous. Chip sample. Tonnage estimated.

882. NW¼ sec. 15. Sample St 17-1 taken across 50 ft.
883. NW¼ sec. 15. Sample St 17-2 taken across 50 ft.
884. NE¼ sec. 16. Sample St 18-1 taken across 50 ft.
885. NE¼ sec. 16. Sample St 18-2 taken across 250 ft.

886. County, age, formation, analysts, and maps as in samples 880, 881. E½ sec. 16, T. 35 N., R. 10 E. Meiklejohn and Brown Co., Broderick claim. Sample St 18-5. (Danner, 1966, p. 16, 19, 82, 269, 271, 283, 284, 288, 451, 463.) Limestone, dense to crystalline, well-bedded, fossiliferous. Chip sample taken across 25 ft. Tonnage estimated.

887, 888. Skagit County. Early Pennsylvanian part of Chilliwack Group. NW¼ and S½ sec. 1, NE¼ sec. 2, T. 35 N., R. 8 E., 1.5-2.5 miles by road from Concrete. Lone Star Cement Co. Analyst, C. W. Johnson. (Landes, 1905 [1906], p. 379, 380; Danner, 1966, p. 82, 269, 271-274.) Limestone, massive, fossiliferous; contains secondary chert. Tonnage estimated. Index maps. Use: Portland cement.

889 - 901. Skagit County. Early Pennsylvanian part of Chilliwack Group. Center sec. 2, T. 35 N., R. 8 E., about 1 mile by road from Concrete. Lone Star Cement Co. (Danner, 1966, p. 82, 269, 271-274.) Limestone, light- to dark-gray, dense to organoclastic and oolitic, well-bedded; about 500-600 ft thick. Thin-section description. Index maps. Use: Portland cement.

889 - 900. (Shedd, 1913, p. 220, 221, 225, 226, 247, pl. 21.)

889. Sample 104.	893. Sample 108.	897. Sample 112.
890. Sample 105.	894. Sample 109.	898. Sample 113.
891. Sample 106.	895. Sample 110.	899. Sample 114.
892. Sample 107.	896. Sample 111.	900. Sample 115.

901. (Hodge, 1938c, p. 13, 47, 48, 51, 52, 53.) Tonnage estimated.

902, 903. Skagit County. Early Pennsylvanian part of Chilliwack Group (Danner, 1966). Sec. 2, T. 35 N., R. 8 E., near Concrete. (Hodge, 1938c, p. 13, 47, 48, 53, 54.) General: Limestone, almost pure white, crystalline; at least 150 ft thick. Tonnage estimated. Index map. Possible use: Flux.

904. Skagit County. Early Pennsylvanian part of Chilliwack Group. North center and NW¼ sec. 5, T. 36 N., R. 8 E., about 16 miles north of Concrete. Dock Butte Trail deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St 19-1. (Danner, 1966, p. 16, 19, 82, 259, 260, 262, 263, 451, 463.) Limestone, gray to light-gray, mostly finely crystalline. Chip sample taken across 250 ft. Index and geologic maps. Possible use: None, deposit small.

905 - 911. Skagit County. Early Pennsylvanian part of Chilliwack Group. About 17 miles from Concrete. Washington Monument deposit. (Danner, 1966, p. 16, 19, 82, 259, 260, 264, 265, 268, 451.) Limestone, massive to thin-bedded, oolitic, organoclastic and crystalline textures. Index and geologic maps. Possible use: Portland cement.

905. NW¼ sec. 7, T. 36 N., R. 8 E. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample St 22-3. Chip sample, composite.

906 - 911. W½ sec. 7, T. 36 N., R. 8 E., and SE¼NE¼ and SE¼ sec. 12, T. 36 N., R. 7 E.

912. Skagit County. Early Pennsylvanian part of Chilliwack Group (Danner, 1966). [Probably T. 36 N., Rs. 8, 9 E.], Concrete. (Hodge, 1944, p. 15, pl. 6.) Limestone, selected sample. Tonnage estimated. Index map.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses— Continued

	Washington—Continued												
	913	914	915	916	917	918	919	920	921	922	923	924	925
	$46F_2$ 29-105	$46F_2$ 29-104	$46F_2$ 29-103	$46F_2$ 29-101	$46F_2$ 29-140	$46F_2$ 29-141	$46F_2$ 29-138	$46F_2$ 29-130	$46F_2$ 29-132	$46F_2$ 29-131	$46F_2$ 29-133	$46F_2$ 29-27	$46F_2$ 29-28
SiO_2	3.69	1.08	2.36	8.03	3.35	2.01	6.55	2.99	1.93	3.82	2.83	1.58	1.60
Al_2O_3	[1].74	[1].36	[1].29	[1].60	[1].98	[1].31	[1].42	[1].72	[1].30	[1].29	[1].32	.46	.16
Fe_2O_3													.56
MgO	.35	.39	.23	.67	.19	.23	.15	.24	.17	.01	.06	[2]Trace	------
CaO	52.88	55.57	54.89	51.11	53.97	55.07	52.00	54.14	55.00	53.65	54.60	[3]54.71	53.89
P_2O_5	.007	.017	.021	.010	.013	.005	.007	.010	.006	.007	.008	------	------
Ignition loss	[4]41.87	[4]42.83	[4]42.24	[4]39.78	[4]40.97	[4]41.93	[4]40.97	[4]41.60	[4]42.30	[4]42.11	[4]41.91	[5]42.94	42.91
Total	[6][99.54]	[6][100.25]	[6][100.03]	[100.20]	[99.47]	[99.56]	[100.10]	[99.70]	[99.71]	[99.89]	[99.73]	99.69	99.12
Class	2,2,95	0,1,97	2,1,96	7,2,90	2,3,93	1,1,95	6,1,93	2,2,94	1,1,96	3,1,96	2,1,95	1,1,98	1,2,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	926	927	928	929	930	931	932	933	934	935	936	937	938
	$46F_2$ 29-29	$46F_2$ 29-30	$46F_2$ 29-129	$46F_2$ 29-123	$46F_2$ 29-112	$46F_2$ 29-78	$46F_2$ 29-77	$46F_2$ 29-144	$46F_2$ 29-143	$46F_2$ 29-110	$46F_2$ 29-109	$46F_2$ 31-70	$46F_2$ 31-69
SiO_2	2.80	1.36	0.55	8.39	8.78	2.61	2.63	1.15	2.97	1.06	1.25	4.03	5.20
Al_2O_3	.28	.82	[1].42	[1].86	[1].90	[1].94	[1].95	[1].32	[1].73	[1].31	[1].96	[1]1.46	[1]1.39
Fe_2O_3	.98												
MgO	------	Trace	.09	.45	.48	1.84	1.85	.73	.30	4.72	4.84	.48	.35
CaO	[3]52.89	54.77	55.13	50.17	50.14	52.20	52.32	54.09	52.57	50.16	49.90	52.16	51.87
P_2O_5	------	------	.003	.056	.090	.019	.018	.035	.044	.064	.200	.024	.022
Ignition loss	[5]41.51	42.05	[4]43.41	[4]39.91	[4]39.60	[4]42.57	[4]42.49	[4]43.98	[4]43.07	[4]43.91	[4]43.41	[4]41.44	[4]40.90
Total	98.46	99.00	[99.60]	[99.84]	[99.99]	[7][100.18]	[7][100.26]	[100.30]	[99.68]	[8][100.22]	[100.56]	[99.59]	[99.73]
Class	1,3,94	0,2,95	0,1,98	7,3,90	7,3,89	1,3,96	1,3,95	1,2,98	2,3,94	1,1,98	0,2,96	2,4,93	3,4,92
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite

	Washington—Continued												
	939	940	941	942	943	944	945	946	947	948	949	950	951
	$46F_2$31-74	$46F_2$31-33	$46F_2$31-34	$46F_2$31-35	$46F_2$31-36	$46F_2$31-37	$46F_2$31-38	$46F_2$31-39	$46F_2$31-40	$46F_2$31-41	$46F_2$31-42	$46F_2$31-43	$46F_2$31-44
SiO_2	6.50	0.3	1.2	0.9	0.6	0.3	0.6	0.7	0.7	0.5	0.5	0.6	0.7
Al_2O_3	[1].76	.0	.2	.3	.2	.0	.0	.1	.0	.0	.0	.0	.1
Fe_2O_3		.06	.4	.4	.2	.1	.2	.2	.1	.1	.2	.2	.1
MgO	.57	.5	.0	.3	.7	.4	.5	.6	.8	.6	.5	1.4	.6
CaO	50.83	55.5	52.9	54.7	54.8	55.5	55.4	54.8	54.9	55.0	55.3	54.1	54.3
P_2O_5	.025	[3].11	[3].208	[3].02	[3].01	[3].02	[3].01	[3].03	[3].14	[3].02	[3].01	[3].15	[3].02
S	------	.009	.014	.015	.014	.014	.007	.016	.012	.007	.004	.005	.003
Organic matter	------	[9](.03)	[9](.05)	------	------	------	------	[9](.07)	[9](.05)	------	------	------	------
Ignition loss	[4]40.51	[10]43.6	[10]43.2	[10]43.4	[10]43.6	[10]43.7	[10]43.5	[10]43.4	[10]43.3	[10]43.4	[10]43.5	[10]43.5	[10]43.4
Total	[99.20]	[11][100.1]	[11][98.1]	[11][100.0]	[11][100.1]	[11][100.0]	[11][100.2]	[11][99.8]	[11][100.0]	[11][99.6]	[11][100.0]	[11][100.0]	[11][99.2]
Class	5,2,91	0,0,99	0,3,94	0,2,98	0,1,99	0,0,99	0,0,99	0,1,98	1,0,98	0,0,98	0,0,99	0,0,98	0,1,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_5, K_2O, Sc_2O_5, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_3]

	913	914	915	916	917	918	919	920	921	922	923	928
Na_2O	0.05	------	------	------	------	0.083	------	------	------	------	------	------
TiO_2	.011	0.012	0.002	0.008	0.017	.0092	0.0032	0.014	0.008	0.004	0.012	0.0076
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	.003
Cr_2O_3	.0007	.0007	.0005	.0005	------	------	------	------	------	------	------	------
MnO	.012	.011	.007	.019	.03	.024	.062	.027	.032	.053	.063	.02
NiO	.001	------	------	------	------	------	.001	------	------	------	------	.001
CuO	.0013	.0013	.00094	.0013	.00099	.0005	.0012	.00088	.0012	.00077	.0016	.0005
SrO	.010	.011	.0094	.0092	.011	.009	.009	.0082	.0088	.010	.0082	.010

	929	930	931	932	933	934	935	936	937	938	939
Na_2O	------	------	------	------	0.11	0.21	------	------	0.18	0.20	0.06
TiO_2	0.018	0.027	0.046	0.014	.011	.026	0.0048	0.0088	.021	.033	.013
V_2O_5	.0067	.003	------	------	------	------	.003	.003	------	------	.003
Cr_2O_3	------	------	.0010	.00074	.0005	.00074	------	------	.00074	.0011	.0005
MnO	.053	.053	.053	.025	.01	.019	.022	.051	.14	.15	.043
NiO	.001	.001	.001	.001	------	.001	------	------	------	------	.001
CuO	.0016	.0014	.00088	.00077	.00088	.0017	.00099	.0012	.0014	.0019	.0022
SrO	.025	.040	.015	.015	.024	.012	.0091	.011	.034	.015	.017

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

913 - 916. Skagit County. Pennsylvanian part of Chilliwack Group. E½ sec. 32, T. 35 N., R. 9 E. Sutter Mountain deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 269, 301-303, 451, 463.) Limestone, medium crystalline. Chip sample. Index and geologic maps.

913. Sample St 24-1 taken across 52 ft.
914. Sample St 24-2 taken across 500 ft.
915. Sample St 24-3 taken across 400 ft.
916. Sample St 24-5 taken across 300 ft.

917 - 923. Skagit County. Devonian to Early Permian, Chilliwack Group. T. 35 N., R. 9 E., about 6 miles by road from town of Concrete. Jackman Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 269, 271, 275, 276, 278-281, 450, 451, 463.) Chip sample. Index and geologic maps. Possible use: None, deposit small.

917, 918. NW¼ sec. 4. Limestone, fine to medium crystalline. Mineralogy.

917. Sample St 16-1 taken across 460 ft.
918. Sample St 16-2 taken across 170 ft.

919. SW¼ NE¼ sec. 5. Sample St 3-1. Limestone, gray, massive, finely crystalline; taken across 90 ft.

920. N½ SE¼ sec. 5. Sample St 16-3. Limestone, finely crystalline; taken across 105 ft.

921, 922. SE¼ sec. 5. Limestone, dense, well-bedded; 40-100 ft thick.

921. Sample St 16-4, composite.
922. Sample St 6-1 taken across 120 ft.

923. NE¼ NE¼ sec. 8. Sample St 14-1. Limestone, gray, finely crystalline, massive; about 50-75 ft thick. Composite sample of talus.

924 - 926. Skagit County. Devonian to Early Permian, Chilliwack Group. NW¼ NW¼ sec. 9 and NE¼ NE¼ sec. 8, T. 35 N., R. 9 E., about 2.5 miles northeast of town of Van Horn. Bear Creek deposit. (Hodge, 1938c, p. 13, 48, 54, 55; Danner, 1966, p. 82, 269, 271, 275, 280, 281.) Limestone, gray, finely crystalline, massive; about 50-75 ft thick. Tonnage estimated. Index and geologic maps.

924. (Hodge, 1935c, p. 72, 73.) Possible use: Flux.

927. Skagit County. Devonian to Early Permian, Chilliwack Group (Danner, 1966). Secs. 9, 15, 16, T. 35 N., R. 9 E., near town of Sauk. Analyst, A. A. Hammer. Sample 116. (Shedd, 1913, p. 228, 229, 247, pl. 21; Hodge, 1938c, p. 13, 56.) Limestone, light-colored, crystalline, coarse-texture; 100 ft exposed. Index maps. Possible use: Portland cement.

928, 929. Skagit County. Devonian to Early Permian, Chilliwack Group. T. 35 N., R. 10 E., Sutter Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 269, 290, 295-297, 451, 462.) Limestone, dark-gray to gray, massive to well-bedded to laminated, dense to finely crystalline; contains calcite veinlets; interbeds of black shale. Thin-section description. Chip sample. Index and geologic maps. Possible use: Cement.

928. NE¼ sec. 19. Sample St 11-9, single specimen.
929. SW¼ sec. 20. Sample St 11-3 taken across 25 ft.

930. County, age, formation, analysts, and maps as in samples 928, 929. S½ sec. 21, T. 35 N., R. 10 E., 4 miles east of Rockport. Rocky Creek deposit, roadcut. Sample St 12-1. (Danner, 1966, p. 16, 19, 82, 269, 290, 297, 298, 451, 462.) Limestone, dark-blue-gray, dense to crystalline, thin-bedded. Chip sample taken across 30 ft. Possible use: None, deposit impure.

931, 932. County, age, formation, analysts, and maps as in samples 928, 929. NE¼ sec. 30, T. 36 N., R. 9 E., about 9 miles northeast of Concrete. Three Mile Creek quarry, abandoned. (Danner, 1966, p. 16, 19, 82, 269-271, 450, 462.) Limestone, light-gray, mostly finely crystalline; contains calcite veinlets and stylolites; poorly bedded. Mineralogy. Chip sample. Former use: Road metal. Possible use: None, deposit in remote area.

931. Sample St 2-1 taken across 20 ft.
932. Sample St 2-2 taken across 120 ft.

933, 934. Skagit County. Holocene. NE¼ NE¼ sec. 9, T. 35 N., R. 8 E., northwest of Concrete. Strong deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 436, 439, 450, 462.) Tufa, deposit consists of layers of soft porous crumbly tufa and hard porous tufa; at least 6 ft thick. Chip sample. Index and geologic maps. Former use: Agricultural.

933. Sample St 1-1 taken across 55 ft.
934. Sample St 1-3, single specimen.

935, 936. Skagit County. SW¼ sec. 2, SE¼ sec. 3, T. 35 N., R. 12 E. Crescent Marble Co., Marble Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples St 13-1, St 13-2. (Danner, 1966, p. 16, 19, 82, 269, 299-301, 451, 462.) Limestone, alternating blue and white layers, medium to coarsely crystalline. Chip sample taken across 50 ft. Tonnage estimated. Index and geologic maps. Possible use: Decorative stone.

937, 938. Snohomish County. Probably Early Pennsylvanian. NW¼ and SW¼ sec. 18, T. 31 N., R. 11 E., southeast of town of Darrington. Whitechuck River deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 333, 335, 337, 338, 339, 452, 464.) Limestone, dark-blue-gray, oolitic and finely crystalline; weathers light blue gray; interbedded with shale. Chip sample. Index and geologic maps, measured section. Possible use: None, deposit small.

937. Sample Sh 3-2 taken across 20 ft.
938. Sample Sh 3-3 taken across 60 ft.

939. County, analysts, reference, maps, and use as in samples 937, 938. Early Pennsylvanian. NW¼ sec. 36, T. 32 N., R. 10 E., southeast of Darrington. Conn Creek deposit. Sample Sh 11-1. Limestone, gray, some brown, mostly crystalline or organoclastic, cherty; in beds 0.5-26 in. thick; alternating with gray-brown chert, in beds 0.75-8 in. thick. Chip sample taken across 75 ft.

940 - 951. Snohomish County. Permian. SW¼ sec. 1 and SE¼ sec. 2, T. 31 N., R. 6 E., about 10 miles east of town of Arlington. Twin Lakes deposit. Analysts, K. A. Johnson, Anthony Centenero. (Popoff, 1949a, p. 2, 4-6, figs. 1, 2 sheets A, B; Danner, 1966, p. 82, 311-315.) General: Marble, light-gray to dark-gray, fine-grained; contains calcite veinlets; about 60 ft thick. Tonnage estimated. Index and geologic maps. Use: Agricultural.

940. Sample S 1 taken across 15.5 ft.

941. Sample S 2 taken across 18.0 ft.

942. Sample S 3 taken across 10.0 ft.

943. Sample S 4 taken across 10.5 ft.

944. Sample S 5 taken across 3.0 ft.

945. Sample S 6 taken across 5.0 ft.

946. Sample S 7 taken across 10.0 ft.

947. Sample S 8 taken across 7.0 ft.

948. Sample S 9 taken across 6.0 ft.

949. Sample S 10 taken across 10.0 ft.

950. Sample S 11 taken across 13.0 ft.

951. Sample S 12 taken across 9.0 ft.

Footnotes of analyses on preceding page:

[1] R_2O_3.

[2] $MgCO_3$.

[3] Calculated from reported $CaCO_3$ or P.

[4] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[5] CO_2, calculated from reported $CaCO_3$.

[6] A composite of samples 913-915 contained Na_2O = 175 ppm, K_2O = 490 ppm, TiO_3 = 180 ppm, S = 195 ppm.

[7] Na_2O = 165 ppm, K_2O = 450 ppm, Ti_2O = 250 ppm, S = 375 ppm.

[8] Na_2O = 125 ppm, K_2O = 380 ppm, TiO_2 = 150 ppm, S = 125 ppm.

[9] Calculated from reported free carbon; not included in total.

[10] At 950°C.

[11] Analysis on dry basis.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	952	953	954	955	956	957	958	959	960	961	962	963	964
	46F₂31-1	46F₂31-7	46F₂31-66	46F₂31-67	46F₂31-63	46F₂31-64	46F₂31-65	46F₂31-2	46F₂31-68	46F₂31-45	46F₂31-46	46F₂31-55	46F₂31-57
SiO_2	0.22	0.2	1.11	1.51	1.21	0.67	0.78	0.61	0.60	0.7	0.6	0.39	0.26
Al_2O_3	[1]Trace	[2]1.4	[1].29	[1].68	[1].27	[1].27	[1].97	.13	------	.0	.0	[1].26	[1].16
Fe_2O_3									[3]1.15	.2	.1		
MgO	Trace	Trace	.44	.99	2.29	.49	9.70	.42	.80	.7	.6	1.13	.97
CaO	55.12	[4]55.0	54.23	53.35	52.13	54.75	43.44	54.44	[4]55.14	55.1	55.2	54.87	55.18
P_2O_5	------	------	.017	.006	.022	.005	.009	------	------	[5].14	[5].09	[5].13	[5].13
S	------	------	------	------	------	------	------	------	------	.004	.004	------	------
Ignition loss	43.86	[6]43.1	[7]43.19	[7]42.88	[7]43.13	[7]43.41	[7]44.82	44.00	[6]43.29	[8]43.2	[8]43.4	43.57	43.53
Total	99.20	[99.7]	[99.28]	[99.42]	[99.05]	[99.60]	[99.72]	99.60	[100.98]	[9][100.0]	[9][100.0]	100.35	100.23
Class	0,1,98	0,0,98	1,1,98	0,2,97	1,1,97	0,1,98	0,1,98	0,1,98	0,1,98	0,0,98	0,0,98	0,1,99	0,0,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	965	966	967	968	969	970	971	972	973	974	975	976	977
	46F₂31-56	46F₂31-47	46F₂31-48	46F₂31-49	46F₂31-50	46F₂31-51	46F₂31-52	46F₂31-53	46F₂31-54	46F₂31-90	46F₂31-91	46F₂31-93	46F₂31-94
SiO_2	1.23	0.2	2.0	0.4	0.2	0.2	0.5	0.4	2.50	6.76	3.02	5.09	5.04
Al_2O_3	[1].29	.2	.3	.1	.1	.1	.4	.1	[1].60	[1].83	[1].84	[1].60	[1]1.22
Fe_2O_3		.1	.1	.1	.1	.2	.2	.1					
MgO	.15	.4	.4	.4	.4	.4	.3	.4	.40	.51	.59	.32	.78
CaO	54.66	55.1	54.0	55.1	55.4	55.6	55.5	55.3	54.04	50.93	53.03	52.68	51.41
P_2O_5	------	[5].04	[5].05	[5].06	[5].12	[5].03	[5].09	[5].10	------	.025	.031	.030	.035
S	------	.004	.002	.002	.000	.004	.001	.003	------	------	------	------	------
Ignition loss	[6]43.27	[8]43.6	[8]43.0	[8]43.6	[8]43.6	[8]43.8	[8]43.5	------	42.0	[7]40.21	[7]41.75	[7]40.88	[7]41.04
Total	[99.60]	[9][99.6]	[9][99.9]	[9][99.8]	[9][99.9]	[9][100.3]	[9][100.5]	[9][56.4]	[99.5]	[99.26]	[99.26]	[99.60]	[99.52]
Class	1,1,98	0,0,99	1,1,97	0,1,99	0,0,99	0,0,99	0,1,99	0,1,99	1,2,95	5,2,91	2,2,94	4,2,92	3,4,92
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued											
	978	979	980	981	982	983	984	985	986	987	988	989
	46F₂ 31-95	46F₂ 31-96	46F₂ 31-102	46F₂ 31-101	46F₂ 31-106	46F₂ 31-108	46F₂ 31-6	46F₂ 31-5	46F₂ 31-78	46F₂ 31-77	46F₂ 31-76	46F₂ 31-75
SiO_2	4.74	3.49	------	------	3.22	0.29	0.1	0.1	2.60	3.96	2.50	2.80
Al_2O_3	[1].75	[1].44	------	------	.35	[1].24	.2	.0	[1].81	[1]1.12	[1].88	[1]6.51
Fe_2O_3					.73		.2	.04				
MgO	.56	.20	------	------	.95	1.15	.9	1.0	.26	.33	.26	18.04
CaO	52.21	53.63	53.56	53.73	55.10	53.96	54.4	54.1	53.07	52.40	53.30	30.26
H_2O-	------	------	------	------	------	([10])	([10])	[11](6.9)	------	------	------	------
P_2O_5	.027	.018	------	------	------	.008	[5].04	[5].01	.026	.034	.009	.003
S	------	------	------	------	------	------	.119	.099	------	------	------	------
Ignition loss	[7]41.14	[7]41.78	[6]42.04	[6]42.17	40.05	[7]44.12	[8]44.4	[8]44.5	[7]42.32	[7]41.76	[7]42.62	[7]42.17
Total	[99.43]	[99.56]	[95.60]	[95.90]	[100.40]	[99.77]	[100.4]	[99.8]	[99.09]	[99.60]	[99.57]	[99.78]
Class	3,2,93	3,1,95	0,0,96	0,0,96	2,3,90	0,1,99	0,1,99	0,1,99	1,3,95	2,3,94	1,3,96	0,5,88
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Dolomite

[1] R_2O_3.

[2] Iron and aluminum oxides.

[3] Iron oxide.

[4] Calculated from reported $CaCO_3$.

[5] Calculated from reported P.

[6] CO_2, calculated from reported MgO and(or) $CaCO_3$.

[7] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[8] At 950°C.

[9] Analysis on dry basis.

[10] Moisture content about 7 percent; not included in total.

[11] Not included in total.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 989, CoO = 0.0017 percent, Ag_2O = 0.0012 percent]

	954	955	956	957	958	974	975	976	977	978
Na_2O	------	------	------	------	------	------	0.05	0.05	0.05	------
TiO_2	0.0064	0.017	0.0036	0.0052	0.002	0.053	.050	.04	.092	0.064
V_2O_5	.003	.003	------	------	------	------	.003	.003	.003	.003
Cr_2O_3	.0025	.0048	.0005	.0012	.0015	.0016	.0012	.0010	.0013	.0010
MnO	.08	.11	.027	.032	.16	.12	.095	.07	.073	.073
NiO	------	------	------	------	------	------	------	.001	.001	.001
CuO	.0010	.0017	.0012	.00093	.0028	.0019	.0012	.00082	.0021	.0014
SrO	.024	.034	.021	.021	.014	.014	.015	.017	.011	.015

Spectrochemical analyses—Continued

	979	983	986	987	989		979	983	986	987	989
Na_2O	------	0.05	------	0.067	0.12	MnO	0.083	0.039	0.043	0.043	0.18
TiO_2	0.052	.005	0.020	.022	.03	NiO	------	------	.001	.001	.015
V_2O_5	------	------	.003	.003	.0056	CuO	.0013	.0019	.0010	.0021	.0040
Cr_2O_3	.0010	.0005	------	.0005	.0005	SrO	.015	.014	.014	.013	.034

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

952. Snohomish County. Permian. S½NE¼ sec. 5, T. 30 N., R. 7 E., about 3.5 miles northeast of town of Granite Falls. Everett Lime Co. Analyst, A. A. Hammer. Sample 118. (Shedd, 1913, p. 231, 232, 247, pl. 21; Hodge, 1938c, p. 13, 59-62; Danner, 1966, p. 82, 305, 318-321, 322.) Limestone, dark-gray, coarsely crystalline; maximum thickness about 50 ft. Thin-section description. Tonnage estimated. Index and geologic maps. Former use: Pulp and paper industry, lime. Use: Agricultural, flux, calcium carbide manufacture, sugar refining, building stone, rock wool.

953 - 958. Snohomish County. Permian. E½ sec. 5, T. 30 N., R. 7 E., about 3 miles northeast of Granite Falls. Canyon Creek Lodge deposit. (Danner, 1966, p. 16, 19, 82, 305, 318-321, 322, 452, 464.) Limestone, gray to dark-gray, dense, fossiliferous; contains calcite veinlets; maximum thickness about 50 ft. Tonnage estimated. Former use: Pulp and paper industry, lime. Use: Agricultural, flux, calcium carbide manufacture, sugar refining, building stone, rock wool.

953. Analyst, A. H. Cederberg. (Landes, 1905 [1906], p. 380.) Possible use: Cement.

954 - 958. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Chip sample.
954. Sample Sh 12-1 taken across 40 ft.
955. Sample Sh 12-2 taken across 40 ft.
956. Sample Sh 12-3 taken across 60 ft.
957. Sample Sh 12-4, single specimen.
958. Sample Sh 12-5, single specimen.

959. Snohomish County. Permian. Secs. 7, 8, T. 30 N., R. 7 E., Granite Falls. Analyst, A. A. Hammer. Sample 119. (Shedd, 1913, p. 231, 232, 247, pl. 21; Danner, 1966, p. 82, 305, 318, 321.) Limestone, dark-gray, coarsely crystalline. Index maps. Possible use: Portland cement, lime [implied].

960. Snohomish County. Permian. SW¼NE¼ sec. 9, T. 30 N., R. 7 E., about 3 miles northeast of Granite Falls. Shumway deposit. (Landes, 1902, p. 27; Danner, 1966, p. 82, 318, 322.) Limestone, gray, crystalline to organoclastic, fossiliferous; contains stringers of argillaceous material. Tonnage estimated. Index and geologic maps. Use: Flux, lime.

961, 962. Snohomish County. Permian. NE¼NE¼ sec. 7, T. 32 N., R. 6 E., about 10 miles northeast of town of Arlington. Bryant deposit. Analysts, K. A. Johnson, Anthony Centenero. (Popoff, 1949a, p. 2-6, figs. 1, 3; Danner, 1966, p. 82, 306-308.) General: Marble, light-gray to dark-gray, fine-grained; contains calcite veins. Thin overburden. Index and geologic maps. Possible use: Agricultural.
961. Sample S 1 taken across 13 ft.
962. Sample S 2 taken across 10 ft.

963 - 965. County, age, locality, maps, and use as in samples 961, 962. (Hodge, 1944, p. 15, 58, pl. 6; Danner, 1966, p. 82, 306-308.) Limestone, crystalline; maximum thickness 25-35 ft. Tonnage estimated.

966 - 972. County, age, locality [except section and deposit], analysts, general remarks, and maps as in samples 961, 962. Limited reserves.

966 - 971. SE¼NE¼ sec. 16. Jack deposit. (Popoff, 1949a, p. 2-6, figs. 1, 4; Danner, 1966, p. 82, 306, 308-310, 311.) Geologic section. Possible use: Agricultural, glass, pulp and paper indnstry.
966. Sample S 1 taken across 18.0 ft.
967. Sample S 2 taken across 7.5 ft.
968. Sample S 3 taken across 26.6 ft.
969. Sample S 4 taken across 26.5 ft.
970. Sample S 5.
971. Sample S 6.

972. SW¼NW¼ sec. 6. Rock Creek deposit. (Popoff, 1949a, p. 2, 4, 5, 7, fig. 1; Danner, 1966, p. 82, 305, 306, 307.) Bed not less than 30 ft thick. Former use: Agricultural.

Washington—Continued

973. Snohomish County. Late Jurassic or Early Cretaceous. NE¼ sec. 16, T. 27 N., R. 9 E., about 3 miles east of town of Gold Bar. Marble quarry area. (Hodge, 1938c, p. 64, 65, pl. 10; Hodge, 1944, p. 15, pl. 6; Danner, 1966, p. 82, 348, 350-352, 353.) Limestone, white, coarsely crystalline; occurs in two or three bands 10-40 ft thick interbedded with siliceous sediments. Index and geologic maps, geologic section. Use: Agricultural, flux, calcium carbide manufacture, sugar refining, ornamental stone.

974 - 979. Snohomish County. Late Jurassic or Early Cretaceous. T. 27 N., R. 9 E., 2.5 miles east of Gold Bar. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 348-352, 353, 452, 464.) General: Limestone, black to gray, mostly oolitic, well-bedded; weathers light bluish gray. Chip sample. Index and geologic maps. Use [except sample 979]: Agricultural, flux, calcium carbide manufacture, sugar refining, ornamental stone.

974 - 976. SE¼ sec. 16, SW¼ sec. 15. Marble quarry area. Limestone, predominantly black, about 60 ft exposed.
974. Sample Sh 14-1 taken across 40 ft.
975. Sample Sh 14-2 taken across 30 ft.
976. Sample Sh 14-4 taken across 10 ft.

977, 978. SE¼ sec. 16. Haystack quarry. Samples Sh 14-5, Sh 14-6 taken across 40 ft.

979. SE¼ sec. 16. Crystal Creek outcrop. Sample Sh 14-7. Limestone, crystalline; most beds 10 ft or less thick. Sample taken across 70 ft.

980 - 982. Snohomish County. Jurassic and Cretaceous. T. 27 N., R. 9 E., near Gold Bar. Proctor Creek deposit. (Danner, 1966, p. 82, 353-356, 357, 358.) Limestone, black to gray; contains calcite veinlets; weathers light gray. Tonnage estimated. Index and geologic maps. Possible use: Agricultural, decorative stone.

980. NE¼NE¼ sec. 21. Sample length 30 ft.
981. NE¼NE¼ sec. 21. Sample length 135 ft.
982. NE¼ sec. 21. Sample length 36 ft. Log of drill hole 2. [For other analyses from same drill hole, see samples 333-335, group F_1.]

983 - 985. Snohomish County. Holocene. SW¼SW¼ sec. 1, SE¼SE¼ sec. 2, T. 31 N., R. 10 E. Blackoak Creek deposit. Tufa, cream to light-brown, crumbly, porous; layers from a few inches to 15 ft thick, average 6 ft. Bulk density <2.25. Index and geologic maps. Former use: Agricultural.

983. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample Sh 1-1. (Danner, 1966, p. 16, 19, 82, 333, 436, 440, 441, 442, 452, 464.) Chip sample taken across 6 ft.

984, 985. (Popoff, 1949c, p. 2-4, fig. 1; Danner, 1966, p. 82, 333, 436, 440, 441, 442.)
984. Sample S 1, 5.0 ft thick.
985. Sample S 2 taken across 22 ft.

986 - 988. Snohomish County. NE¼ sec. 1, T. 31 N., R. 10 E., southeast of town of Darrington. Conn Creek deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C.E. Harvey. (Danner, 1966, p.16, 19, 82, 333-335, 452, 464.) Limestone, dark-gray-blue, dense to organoclastic, oolitic and crystalline, massive to bedded. Chip sample. Index and geologic maps. Possible use: None, deposit small.

986. Sample Sh 10-1 taken across 75 ft.
987. Sample Sh 10-2 taken across 100 ft.
988. Sample Sh 10-3 taken across 160 ft.

989. County, locality [except quarter section], analysts, reference, maps, and use as in samples 986-988. NE¼NW¼ sec. 1. Sample Sh 9-1. [Dolomite] limestone, dark-gray; weathers dark golden brown; contains calcite veinlets. Chip sample taken across 220 ft.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	990	991	992	993	994	995	996	997	998	999	1000	1001	1002
	46F$_2$31-19	46F$_2$31-15	46F$_2$31-17	46F$_2$31-16	46F$_2$31-14	46F$_2$31-13	46F$_2$31-12	46F$_2$31-11	46F$_2$31-10	46F$_2$31-9	46F$_2$31-83	46F$_2$31-82	46F$_2$31-80
SiO_2	1.6	3.3	2.9	2.2	5.3	2.0	2.9	0.9	1.9	1.2	1.40	2.70	1.36
Al_2O_3	.3	.6	.8	.5	1.2	.5	1.1	.1	.7	.5	[1].48	[1].36	[1].40
Fe_2O_3	.3	.4	.5	.4	.9	.5	.5	.1	.4	.3			
MgO	1.9	1.0	1.1	.9	2.7	11.5	2.8	9.1	4.6	4.2	1.51	.34	.36
CaO	52.7	52.8	52.6	53.7	49.2	41.3	50.8	45.0	49.6	50.4	53.44	53.92	55.01
P_2O_5	[2].02	[2].03	[2].03	[2].02	[2].04	[2].03	[2].03	[2].02	[2].02	[2].02	.004	.005	.005
S	.050	.179	.252	.157	.214	.111	.052	.018	.190	.077	------	------	------
Ignition loss	[3]43.0	[3]41.7	[3]41.6	[3]42.2	[3]40.4	[3]43.8	[3]41.9	[3]44.4	[3]42.5	[3]43.1	[4]42.87	[4]42.29	[4]42.58
Total	[99.9]	[100.0]	[99.8]	[100.1]	[100.0]	[99.7]	[100.1]	[99.6]	[99.9]	[99.8]	[99.70]	[99.62]	[99.72]
Class	1,2,97	2,3,94	1,4,93	1,2,95	2,6,90	1,3,95	0,5,93	1,1,97	0,3,94	0,2,96	1,1,97	2,1,96	1,1,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcareous dolomite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015
	46F$_2$31-79	46F$_2$31-86	46F$_2$31-81	46F$_2$31-25	46F$_2$31-24	46F$_2$31-26	46F$_2$31-27	46F$_2$31-28	46F$_2$31-31	46F$_2$31-30	46F$_2$31-29	46F$_2$31-32	46F$_2$31-84
SiO_2	1.43	1.36	1.71	0.5	4.9	0.6	0.6	0.7	1.2	0.6	2.3	1.1	1.75
Al_2O_3	[1].52	[1]1.20	[1].39	.0	1.1	.0	.0	.0	.2	.0	.7	.0	[1].50
Fe_2O_3				.1	.7	.1	.1	.1	.2	.2	.4	.2	
MgO	.39	<.001	2.60	.6	5.3	4.4	1.8	3.0	1.4	5.0	4.3	.5	5.72
CaO	55.03	54.10	52.08	55.0	46.0	50.4	53.6	51.9	53.3	49.5	49.1	54.9	48.85
P_2O_5	.006	<.001	.004	[2].01	[2].02	[2].01	[2].01	[2].01	[2].01	[2].01	[2].01	[2].01	.004
S	------	------	------	.031	.048	.008	.009	.005	.030	.043	.039	.012	------
Ignition loss	[4]42.51	43.29	[4]42.78	43.6	41.5	44.1	43.8	44.0	43.4	44.4	42.8	43.1	[4]43.29
Total	[99.89]	[99.95]	[99.56]	[99.8]	[99.6]	[99.6]	[99.9]	[99.7]	[99.7]	[99.8]	[99.6]	[99.8]	[100.11]
Class	1,2,96	0,3,97	1,1,96	0,0,99	2,5,91	0,0,99	0,0,99	1,0,99	1,1,98	0,1,99	1,3,95	1,0,98	1,1,96
CaO/MgO	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite

	Washington—Continued												
	1016	1017	1018	1019	1020	1021	1022	1023	1024	1025	1026	1027	1028
	46F$_2$31-85	46F$_2$33-7	46F$_2$41-289	46F$_2$41-290	46F$_2$42-276	46F$_2$33-4	46F$_2$33-5	46F$_2$41-35	46F$_2$41-34	46F$_2$33-60	46F$_2$33-61	46F$_2$33-62	46F$_2$33-63
Insoluble	[5]1.11	[6]6.3	[6]1.5	[6]1.5	3.4	[6]4.7	[6]5.0	[6]3.2	[6]1.5	[7]3.95	[7]5.00	[7]2.44	[7]2.90
$Al_2O_3 + Fe_2O_3$	[1].49	2.2	2.2	1.2	[1].9	.9	.9	1.6	1.8	[8].82	[8]1.00	[8].75	[8].64
MgO	5.14	45.1	22.1	29.4	46.9	45.7	46.0	24.1	22.9	[9]21.69	[9]21.81	[9]20.73	[9]21.68
CaO	49.97	1.4	27.5	18.8	.7	.8	.6	29.2	28.6	30.66	30.72	30.44	30.57
Ignition loss	[4]43.17	[10]43.5	[10]45.8	[10]47.7	45.2	[10]46.5	[10]46.4	[10]40.9	[10]43.7	[3]42.88	[3]41.47	[3]45.64	[3]44.03
Total	[11][99.89]	[98.5]	[99.1]	[98.6]	[97.1]	[98.6]	[98.9]	[99.0]	[98.5]	100.00	100.00	100.00	99.82
Class	0,1,96	3,6,83	0,3,95	0,3,95	(2,3)86	3,3,89	3,3,89	1,5,84	0,3,91	3,2,89	3,3,86	1,2,95	2,2,92
CaO/MgO	Magnesian calcite	Magnesite	Dolomite	Magnesian dolomite	Magnesite	Magnesite	Magnesite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1029	1030	1031	1032	1033	1034	1035	1036	1037	1038	1039	1040	1041
	46F$_2$33-64	46F$_2$33-65	46F$_2$33-66	46F$_2$43-52	46F$_2$33-67	46F$_2$33-68	46F$_2$33-71	46F$_2$33-72	46F$_2$33-73	46F$_2$33-74	46F$_2$33-75	46F$_2$33-76	46F$_2$33-77
Insoluble [7]	2.64	3.49	3.38	4.51	4.45	5.94	5.35	4.08	4.60	3.17	2.80	2.96	2.28
R_2O_3 [8]	.71	1.01	.97	1.07	1.34	1.47	.88	.77	.76	1.03	.43	.50	.58
MgO [9]	21.70	21.87	21.08	21.77	23.19	22.60	21.43	21.09	20.67	20.75	21.74	23.64	21.59
CaO	30.16	30.45	30.65	30.10	29.98	29.73	30.02	29.44	30.37	29.67	30.20	28.51	30.50
Ignition loss [3]	44.79	43.18	43.92	42.55	42.04	40.26	42.32	44.62	43.60	45.38	44.83	44.39	45.05
Total	100.00	100.00	100.00	100.00	101.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	1,2,93	2,3,90	2,3,92	3,3,89	2,4,87	3,4,83	4,3,88	3,2,93	3,2,91	1,3,95	2,1,94	2,1,92	1,2,94
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1042	1043	1044	1045	1046	1047	1048	1049	1050	1051	1052	1053	1054
	46F$_2$33-78	46F$_2$33-79	46F$_2$33-80	46F$_2$33-81	46F$_2$33-82	46F$_2$33-83	46F$_2$33-84	46F$_2$33-85	46F$_2$33-87	46F$_2$33-88	46F$_2$33-89	46F$_2$33-90	46F$_2$33-91
Insoluble [7]	2.36	3.06	1.52	0.53	5.71	3.55	4.52	3.36	4.05	3.31	4.17	3.55	4.10
R_2O_3 [8]	.51	.46	.41	.46	.57	1.04	.86	.77	.81	1.12	.86	.66	.62
MgO [9]	21.24	22.25	22.02	21.55	21.92	27.35	25.63	24.01	37.34	42.71	22.62	22.78	23.76
CaO	30.93	29.42	30.17	30.42	25.76	23.72	23.58	27.33	9.95	3.67	30.38	30.09	28.95
Ignition loss [3]	44.96	44.81	45.88	47.04	46.04	44.34	45.41	44.53	47.85	49.19	41.97	42.92	42.57
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,1,94	2,1,93	1,1,96	0,1,98	5,3,92	2,3,91	3,3,93	2,2,92	3,2,94	1,3,95	3,3,87	2,2,89	3,2,88
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Magnesian dolomite	Magnesian dolomite	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Dolomite	Dolomite	Dolomite

[1] R_2O_3.

[2] Calculated from reported P.

[3] At 950°C.

[4] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[5] SiO_2.

[6] Mainly SiO_2.

[7] Includes silica and insoluble silicates.

[8] Iron and alumina.

[9] By difference.

[10] Mainly CO_2.

[11] $P_2O_5 = 0.006$ percent.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Na_2O, K_2O, Sc_2O_3, V_2O_5, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 1003, Na_2O = 0.05 percent]

	1000	1001	1002	1003	1005	1015	1016
TiO_2	0.016	0.008	0.0072	0.0092	0.0034	0.01	0.006
Cr_2O_3	.0005	------	------	------	.0005	------	------
MnO	.068	.063	.10	.034	.068	.055	.029
CuO	.0016	.0013	.0012	.0016	.0015	.0020	.0011
SrO	.015	.018	.020	.013	.017	.012	.015

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

990 - 999. Snohomish County. SE¼ SE¼ sec. 14, T. 32 N., R. 8 E., south of town of Fortson. Galbraith deposit. (Popoff, 1949b, p. 2, 5, 6, figs. 1, 2, 4; Danner, 1966, p. 82, 326, 329-332, 333, 334.) General: Limestone, gray to black, massive. Mineralogy. Tonnage estimated. Index and geologic maps. Graphic representation of analysis. Possible use: Magnesia content too high for cement or chemical uses.

990. Sample BM 1 taken across 20.0 ft.
991. Sample BM 3 taken across 30.2 ft.
992. Sample BM 4 taken across 33.0 ft.
993. Sample BM 5 taken across 19.5 ft.
994. Sample BM 6 taken across 32.0 ft.
995. Sample BM 7 and 7a taken across 39.0 ft.
996. Sample BM 8 taken across 28.1 ft.
997. Sample BM 9 taken across 21.2 ft.
998. Sample BM 10 taken across 25.5 ft.
999. Sample BM 11 taken across 16.0 ft.

1000 - 1003. County, locality, maps, and use as in samples 990-999. About 5 miles west of town of Darrington. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 326, 329-332, 333, 334, 452, 464.) Limestone, light-gray to black, massive, finely crystalline; weathers gray or dark blue gray; contains calcite veinlets and black stylolites. Mineralogy. Chip sample. Tonnage estimated.

1000. Sample Sh 4-1 taken across 100 ft.
1001. Sample Sh 4-2, composite.
1002. Sample Sh 4-4, single specimen.
1003. Sample Sh 4-5, single specimen.

1004. Snohomish County. SE¼ sec. 21, SW¼ sec. 22, T. 32 N., R. 12 E., east of Darrington. Lime Mountain deposit. (Thorsen, 1966, p. 341-343; Danner, 1966, p. 82, 333.) Limestone, light-gray, coarse-grained; taken across 100 ft. Index and geologic maps.

1005. County, analysts, reference, remarks, and maps as in samples 1000-1003. NE¼ NE¼ sec. 23, T. 32 N., R. 8 E., about 5 miles west of Darrington. Galbraith deposit. Sample Sh 4-3. Chip sample taken across 40 ft.

1006 - 1014. Snohomish County. NE¼ NE¼ sec. 25, T. 32 N., R. 8 E., south of town of Fortson. Climax deposit. (Popoff, 1949b, p. 2-5, 7, figs. 1, 3; Danner, 1966, p. 82, 326-328, 329.) General: Limestone, gray to nearly black, finely crystalline, massive; more than 100 ft thick. Channel sample. Index and geologic maps. Possible use: None, deposit small and impure.

1006. Sample BM 6 taken across 7.0 ft.
1007. Sample BM 7 taken across 24.0 ft.
1008. Sample BM 8 taken across 12.2 ft.
1009. Sample BM 9 taken across 13.0 ft.
1010. Sample BM 10 taken across 23.0 ft.
1011. Sample BM 12 taken across 19.8 ft.
1012. Sample BM 13 taken across 9.0 ft.
1013. Sample BM 14 taken across 20.0 ft.
1014. Sample BM 15 taken across 14.0 ft.

1015, 1016. Snohomish County. NE¼ sec. 25, T. 32 N., R. 8 E., about 5 miles west of Darrington. Climax claim. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples Sh 5-1, Sh 5-2. (Danner, 1966, p. 16, 19, 82, 326-328, 329, 452, 464.) Limestone, bluish-gray, finely crystalline; contains calcite veinlets. Chip sample taken across 35 ft. Index and geologic maps. Possible use: None, deposit small and impure.

1017. Stevens County. Precambrian, Edna Dolomite. Sec. 36, T. 30 N., R. 37 E., Turk area. Analyst, F. G. Mehl. Sample 23. (Bennett, 1941, p. 3, 12, 20, 23, 24, pl. 2.) Magnesite. General mineralogy. Index and geologic maps.

1018, 1019. County, age, formation, analyst, reference, and maps as in sample 1017. SW¼ sec. 15, T. 30 N., R. 38 E. Near Firminhac quarry. Samples 36, 46. Dolomite, about 100 ft thick. General mineralogy.

1020. Stevens County. Precambrian, Stensgar Dolomite. Sec. 1, T. 29 N., R. 37 E. Turk deposit. Collector, Eugene Callaghan. (Campbell and Loofbourow, 1962, p. 3F, 8F, 18F, 40F, 45F, pls. 1, 2.) Magnesite, white. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections of area. Possible use: Refractories.

1021 - 1024. County, age, formation, and locality as in sample 1020. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 21, 23, 25, pls. 1, 2.) General mineralogy. Index and geologic maps.

1021, 1022. Samples 73, 74. Magnesite, coarse-grained; channel samples.
1023, 1024. Samples 75, 76. Dolomite.

1025 - 1051. Stevens County. Stensgar Dolomite. SE¼ SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. (Bennett, 1943, p. 3-6, 9, 10, 21, pl. 1.) General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole 1. Possible use of magnesite: Source of magnesium for light metal construction [implied]. [For other analyses from same drill hole, see samples 352-354, group F_1.]

	Lab. No.	Depth (ft)	
1025.	125	191 -204	[Dolomite] magnesitic dolomite, gray.
1026.	124	181 -191	Do.
1027.	123	170 -180	Dolomite, gray and white.
1028.	122	156.5-170	[Dolomite] magnesitic dolomite, gray.
1029.	121	155 -156.5	[Dolomite] magnesitic dolomite, white.
1030.	120	152 -155	[Dolomite] magnesitic dolomite, gray.
1031.	119	150 -152	Dolomite, white.
1032.	118	140 -150	[Dolomite] magnesitic dolomite, light-gray.
1033.	117	129 -140	[Dolomite] magnesitic dolomite, gray.
1034.	116	126 -129	[Dolomite] magnesitic dolomite, gray and light-gray.
1035.	101	94 -101	Dolomite, gray.
1036.	100	92 - 94	Dolomite, light-gray to gray.
1037.	99	87 - 92	Dolomite, gray to light-gray.
1038.	98	85 - 87	Dolomite, light-gray.
1039.	96	72 - 78	[Dolomite] magnesitic dolomite, white and gray.
1040.	95	71 - 72	[Dolomite] magnesitic dolomite, gray.
1041.	94	69 - 71	[Dolomite] magnesitic dolomite, white to light-gray.
1042.	93	65 - 69	Dolomite, yellowish and light-gray.
1043.	92	58 - 65	[Dolomite] magnesitic dolomite, white to gray.
1044.	91	53 - 58	[Dolomite] magnesitic dolomite, gray.
1045.	90	49 - 53	[Dolomite] magnesitic dolomite, white, gray, and brown.
1046.	89	47 - 49	[Dolomite] magnesitic dolomite, white and gray.
1047.	88	44 - 47	[Magnesian dolomite] dolomitic magnesite, gray.
1048.	87	41 - 44	[Magnesian dolomite] dolomitic magnesite, gray and white.
1049.	86	26 - 41	[Dolomite] magnesitic dolomite, brown and gray.
1050.	84	10 - 16.5	[Dolomitic magnesite] magnesite, white.
1051.	105	4 - 10	[Dolomitic magnesite] magnesite, white and light-gray.

1052 - 1054. County, age, formation, locality, analyst, remarks, and use as in samples 1025-1051. Drill hole 2. (Bennett, 1943, p. 3-6, 9-11, 21, pl. 1.) [Dolomite] magnesitic dolomite, light-gray. [For other analyses from same drill hole, see samples 1055-1085, this group; samples 89-92, group C; samples 355-360, group F_1.]

1052. Lab. No. 219. Depth 396-403 ft.
1053. Lab. No. 218. Depth 341-396 ft.
1054. Lab. No. 204. Depth 337-341 ft.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1055	1056	1057	1058	1059	1060	1061	1062	1063	1064	1065	1066	1067
	46F_2 33-92	46F_2 33-93	46F_2 33-94	46F_2 33-95	46F_2 33-96	46F_2 33-99	46F_2 33-100	46F_2 33-101	46F_2 33-102	46F_2 33-104	46F_2 33-105	46F_2 43-56	46F_2 43-57
Insoluble[1]	4.67	2.43	2.13	4.09	4.49	4.84	0.51	1.47	1.29	5.92	3.64	4.10	3.50
R_2O_3[2]	.75	.49	.55	.62	.72	.85	.65	.65	.58	.40	.54	.63	.78
MgO[3]	23.41	25.33	22.80	23.06	23.28	19.92	21.85	22.52	22.25	22.14	23.10	23.40	21.64
CaO	29.41	26.65	29.90	29.93	29.52	27.59	30.23	29.40	29.66	30.00	29.05	27.90	29.97
Ignition loss[4]	41.76	45.10	44.62	42.30	41.99	46.80	46.76	45.96	46.22	41.54	43.67	43.97	44.11
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	3,2,87	2,1,93	1,2,93	3,2,88	3,2,87	3,6,91	0,1,98	0,2,96	0,2,96	5,1,87	3,2,91	3,2,91	2,2,92
CaO/MgO	Dolomite	Magnesian dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1068	1069	1070	1071	1072	1073	1074	1075	1076	1077	1078	1079	1080
	46F_2 33-106	46F_2 33-107	46F_2 43-63	46F_2 33-108	46F_2 33-109	46F_2 33-110	46F_2 33-111	46F_2 33-112	46F_2 43-64	46F_2 33-113	46F_2 43-65	46F_2 33-114	46F_2 33-115
Insoluble[1]	4.63	8.80	3.72	1.38	3.90	0.74	1.49	0.83	1.41	0.53	4.98	0.33	0.32
R_2O_3[2]	.46	.65	.29	.30	.42	.31	.32	.30	.66	.53	.78	.45	.85
MgO[3]	20.59	19.30	21.56	25.18	20.24	22.15	21.93	21.95	23.64	21.86	20.44	22.22	44.43
CaO	29.39	28.08	29.51	26.88	30.12	30.23	30.05	30.24	28.14	30.29	30.99	30.07	3.63
Ignition loss[4]	44.73	42.57	44.92	46.26	45.32	46.57	46.21	46.68	46.15	46.79	42.81	46.93	50.77
Total	99.80	99.40	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	4,1,94	8,2,89	3,1,94	1,1,96	3,1,95	0,1,97	1,1,97	0,1,98	0,2,96	0,1,98	4,2,90	0,1,98	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Magnesian dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomitic magnesite

	Washington—Continued												
	1081	1082	1083	1084	1085	1086	1087	1088	1089	1090	1091	1092	1093
	46F_2 43-66	46F_2 33-116	46F_2 33-117	46F_2 33-118	46F_2 33-119	46F_2 33-121	46F_2 43-71	46F_2 33-124	46F_2 33-125	46F_2 33-126	46F_2 33-127	46F_2 33-128	46F_2 33-129
Insoluble[1]	0.77	0.36	0.33	0.63	0.78	8.13	7.08	5.86	2.57	2.92	1.40	1.39	2.40
R_2O_3[2]	.42	.48	.77	.67	.81	.74	1.33	1.41	.99	.97	.67	.40	.54
MgO[3]	22.30	21.64	38.41	23.18	25.66	21.59	43.09	27.90	22.71	22.21	21.86	22.00	23.62
CaO	29.59	30.56	10.72	28.30	25.31	29.24	5.22	22.51	28.08	28.88	29.85	30.18	27.78
Ignition loss[4]	46.92	46.96	49.77	47.22	47.44	40.30	43.28	42.32	45.65	45.02	46.22	46.03	45.66
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,1,98	0,1,98	0,1,98	0,1,98	7,2,84	5,4,84	4,4,86	1,3,95	1,3,94	0,2,96	1,1,96	1,2,95
CaO/MgO	Dolomite	Dolomite	Dolomitic magnesite	Dolomite	Magnesian dolomite	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106
	46F_2 33-130	46F_2 33-131	46F_2 33-132	46F_2 33-134	46F_2 33-135	46F_2 33-136	46F_2 33-138	46F_2 33-139	46F_2 33-140	46F_2 33-141	46F_2 43-72	46F_2 33-142	46F_2 33-143
Insoluble[1]	6.28	5.92	5.21	2.08	3.49	4.29	1.99	7.83	5.73	4.91	3.96	3.60	3.24
R_2O_3[2]	.83	1.04	.97	.94	1.07	1.27	1.82	.75	.75	.89	1.11	1.00	.89
MgO[3]	33.30	44.25	45.80	46.36	46.52	46.67	34.54	45.99	46.51	47.83	47.34	47.63	45.54
CaO	14.06	4.22	2.33	1.06	1.19	1.05	14.22	1.82	.65	.14	.11	.02	1.68
Ignition loss[4]	45.53	44.57	45.69	49.56	47.73	46.72	47.43	43.61	46.36	46.23	47.48	47.75	48.65
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	5,2,91	4,3,86	4,3,88	1,3,95	2,3,91	2,4,89	0,3,94	6,2,84	4,2,89	3,3,88	2,3,90	2,3,91	2,3,93
CaO/MgO	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite

	Washington—Continued												
	1107	1108	1109	1110	1111	1112	1113	1114	1115	1116	1117	1118	1119
	46F_2 33-144	46F_2 33-145	46F_2 33-146	46F_2 33-147	46F_2 33-148	46F_2 33-151	46F_2 33-154	46F_2 33-155	46F_2 33-156	46F_2 33-158	46F_2 33-159	46F_2 33-161	46F_2 33-162
Insoluble[1]	3.75	3.47	4.42	3.94	3.80	2.85	5.40	4.24	5.24	0.54	1.45	3.62	4.32
R_2O_3[2]	.95	1.17	1.07	.89	.89	.40	1.05	.99	.93	.68	.43	.70	.69
MgO[3]	46.61	47.45	47.09	44.32	43.48	22.04	42.64	46.75	42.01	45.00	31.32	40.47	22.43
CaO	1.06	.26	.55	3.90	4.70	29.58	5.47	.78	5.01	2.78	18.79	7.47	30.06
Ignition loss[4]	47.63	47.65	46.87	46.95	47.13	45.13	45.44	47.24	46.81	51.00	48.01	47.74	42.50
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,3,91	2,3,91	3,3,89	2,3,91	2,3,91	2,1,94	4,3,88	3,3,90	4,3,91	0,1,98	1,1,97	2,2,93	3,2,89
CaO/MgO	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesian dolomite	Dolomitic magnesite	Dolomite

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[1] Includes silica and insoluble silicates.

[2] Iron and alumina.

[3] By difference.

[4] At 950°C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1055 - 1085. Stevens County. Precambrian, Stensgar Dolomite. SE¼ SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. Drill hole 2. (Bennett, 1943, p. 3-6, 9, 10, 11, 21, pl. 1.) General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. Possible use of magnesite: Source of magnesium for light-metal construction [implied]. [For other analyses from same drill hole, see samples 1052-1054, this group; samples 89-92, group C; samples 355-360, group F_1.]

	Lab. No.	Depth (ft)	
1055.	203	306 -337	[Dolomite] magnesitic dolomite, light-gray to gray.
1056.	202	303 -306	[Magnesitic dolomite] dolomitic magnesite, dark-gray.
1057.	201	293 -303	[Dolomite] magnesitic dolomite, light-gray to gray.
1058.	200	275 -293	[Dolomite] magnesitic dolomite, gray.
1059.	199	259 -275	Do.
1060.	194	228 -242	Dolomite, gray.
1061.	193	226 -228	[Dolomite] magnesitic dolomite, white to gray.
1062.	173	215 -226	[Dolomite] magnesitic dolomite, white to dark-gray.
1063.	171	208.5-214	[Dolomite] magnesitic dolomite, gray.
1064.	157	176 -181.5	[Dolomite] magnesitic dolomite, light-gray.
1065.	156	171 -176	[Dolomite] magnesitic dolomite, gray.
1066.	155	170 -171	[Dolomite] magnesitic dolomite, dark-gray; contains serpentine.
1067.	154	159.5-170	[Dolomite] magnesitic dolomite, white; contains chalcedony and olivine.
1068.	146	142 -147	Dolomite, white, light-green and pink.
1069.	145	134 -142	Dolomite, salmon-colored.
1070.	144	124 -134	[Dolomite] magnesitic dolomite, white; contains chalcedony.
1071.	143	114 -124	[Magnesitic dolomite] dolomitic magnesite, white.
1072.	142	112 -114	Dolomite, white.
1073.	141	108 -112	[Dolomite] magnesitic dolomite, white.
1074.	140	106 -108	Do.
1075.	139	88 -106	Do.
1076.	138	84 - 88	[Dolomite] magnesitic dolomite, white; contains green silicate.
1077.	136	73.5- 75	[Dolomite] magnesitic dolomite, white.
1078.	135	72.5- 73.5	Dolomite, white; contains serpentine.
1079.	134	68 - 72.5	[Dolomite] magnesitic dolomite, white.
1080.	133	67 - 68	[Dolomitic magnesite] magnesite, brown and white.
1081.	132	59 - 67	[Dolomite] magnesitic dolomite, white; contains chalcedony.
1082.	131	58 - 59	[Dolomite] magnesitic dolomite, white.
1083.	130	54 - 58	[Dolomitic magnesite] magnesite, white.
1084.	129	50 - 54	[Dolomite] magnesitic dolomite, white.
1085.	127	0 - 26	[Magnesitic dolomite] dolomitic magnesite, white.

1086 - 1094. County, age, formation, locality, analyst, remarks, and use as in samples 1055-1085. Drill hole 3. (Bennett, 1943, p. 3-6, 9, 11, 12, 21, pl. 1.) [For other analyses from same drill hole, see samples 93-96, group C; samples 361, 362, group F_1.]

	Lab. No.	Depth (ft)	
1086.	293	205 -229	[Dolomite] magnesitic dolomite, gray and white.
1087.	227	70.5- 73	[Dolomitic magnesite] magnesite, tan; contains serpentine.
1088.	226	65 - 70.5	Dolomitic magnesite, dark-gray and brown.
1089.	225	61 - 65	[Dolomite] magnesitic dolomite, white and light-gray.
1090.	224	43 - 61	[Dolomite] magnesitic dolomite, white and gray.
1091.	223	29 - 43	[Dolomite] magnesitic dolomite, light-gray.
1092.	222	23 - 29	[Dolomite] magnesitic dolomite, white, light-tan.
1093.	221	18 - 23	[Dolomite] magnesitic dolomite, light-tan.
1094.	220	0 - 18	Dolomitic magnesite, white.

1095 - 1110. County, age, formation, locality, analyst, remarks, and use as in samples 1055-1085. Drill hole 4. (Bennett, 1943, p. 3-7, 9, 12, 21, pl. 1.) Magnesite, medium-coarse texture. [For other analyses from same drill hole, see samples 363, 364, group F_1.]

	Lab. No.	Depth (ft)	
1095.	247	200 -219.5	[Dolomitic magnesite] magnesite, medium-gray.
1096.	246	170 -200	Magnesite, medium- to dark-gray.
1097.	244	137 -140	Magnesite, light-brown.
1098.	243	123 -137	Magnesite, white and gray.
1099.	242	121 -123	Magnesite, light-brown.
1100.	240	111 -113	Dolomitic magnesite, light-gray.
1101.	238	70 -103	Magnesite, pale-gray.
1102.	237	57 - 70	Magnesite, light-gray.
1103.	236	32 - 57	Magnesite, light- to medium-gray.
1104.	235	29.5- 32	Magnesite, light-brown.
1105.	234	22 - 29.5	Magnesite, dark-gray.
1106.	233	20 - 22	Magnesite, brown.
1107.	232	18 - 20	Magnesite, dark-gray.
1108.	231	15 - 16	Magnesite, brown.
1109.	230	12 - 15	Magnesite, brown and gray.
1110.	229	0 - 12	[Dolomitic magnesite] magnesite, white, brown, and gray.

1111 - 1117. County, age, formation, locality, analyst, remarks, and use as in samples 1055-1085. Drill hole 5. (Bennett, 1943, p. 3-7,9,12,13, 21,pl.1.) Rock, medium-coarse texture. [For other analyses from same drill hole, see sample 97, group C; samples 365-371, group F_1.]

	Lab. No.	Depth (ft)	
1111.	282	266 -267	[Dolomitic magnesite] magnesite, white.
1112.	279	222 -231	[Dolomite] magnesitic dolomite, white.
1113.	273	113.5-117	[Dolomitic magnesite] magnesite, brown.
1114.	272	111 -113.5	Magnesite, dark-gray.
1115.	271	71 -111	[Dolomitic magnesite] magnesite, white, friable.
1116.	250	46 - 59	Magnesite, white, friable.
1117.	249	35 - 46	[Magnesitic dolomite] dolomitic magnesite, white, friable.

1118. County, age, formation, locality, analyst, remarks, and use as in samples 1055-1085. Drill hole 6. (Bennett, 1943, p. 3-6, 9, 13, 21, pl. 1.) [Dolomitic magnesite] magnesite, light-gray; depth 24-55 ft.

1119. County, age, formation, locality, analyst, remarks, and use as in samples 1055-1085. Drill hole 7. Lab. No. 270. (Bennett, 1943, p. 3-7, 9, 13, 21, pl. 1.) [Dolomite] magnesitic dolomite, light- to dark-gray, medium-coarse texture; depth 122-136 ft. [For other analyses from same drill hole, see samples 1120-1125, this group.]

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1120	1121	1122	1123	1124	1125	1126	1127	1128	1129	1130	1131	1132
	$46F_2$ 33-163	$46F_2$ 33-164	$46F_2$ 33-165	$46F_2$ 33-166	$46F_2$ 33-167	$46F_2$ 33-168	$46F_2$ 33-169	$46F_2$ 33-170	$46F_2$ 33-171	$46F_2$ 33-172	$46F_2$ 33-173	$46F_2$ 33-174	$46F_2$ 33-175
Insoluble[1]	3.03	2.96	4.62	4.82	5.80	3.98	2.02	0.75	4.75	4.39	5.65	4.65	3.76
R_2O_3[2]	.60	.86	.90	.70	.82	.91	.89	.71	.88	.80	.79	.79	.66
MgO[3]	21.52	34.76	45.23	44.89	40.99	45.20	45.61	45.76	45.22	46.25	42.45	46.24	45.58
CaO	30.70	14.38	2.84	3.62	6.17	2.58	2.09	2.03	3.04	1.53	3.67	1.56	1.12
Ignition loss[4]	44.15	47.04	46.41	45.97	46.22	47.33	49.39	50.75	46.11	47.03	47.44	46.76	48.88
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,2,92	2,3,94	3,3,89	4,2,89	4,2,90	2,3,91	0,3,95	0,1,98	3,3,89	3,2,90	4,2,91	3,2,90	3,2,94
CaO/MgO	Dolomite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesite

	Washington—Continued												
	1133	1134	1135	1136	1137	1138	1139	1140	1141	1142	1143	1144	1145
	$46F_2$ 33-176	$46F_2$ 33-177	$46F_2$ 33-178	$46F_2$ 43-75	$46F_2$ 33-179	$46F_2$ 33-180	$46F_2$ 33-181	$46F_2$ 33-182	$46F_2$ 43-76	$46F_2$ 33-183	$46F_2$ 33-184	$46F_2$ 33-185	$46F_2$ 33-186
Insoluble[1]	3.67	3.67	3.63	3.55	6.95	4.50	5.77	3.34	4.58	4.32	4.92	4.21	4.10
R_2O_3[2]	.90	.75	.85	.83	1.38	.79	.93	.87	1.74	1.02	.64	.76	.78
MgO[3]	46.82	46.52	46.65	46.01	40.99	45.76	46.36	43.96	39.91	36.67	30.59	43.68	46.93
CaO	.80	.74	.80	1.53	7.65	2.37	1.86	4.26	7.78	12.66	17.98	4.02	.62
Ignition loss[4]	47.81	48.32	48.07	48.08	43.03	46.58	45.08	47.57	45.99	45.33	45.87	47.33	47.57
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,3,91	2,2,92	2,2,92	2,2,92	5,4,84	3,2,89	4,3,86	2,3,92	2,5,89	3,3,90	4,2,92	3,2,91	3,2,91
CaO/MgO	Magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesian dolomite	Dolomitic magnesite	Magnesite

	Washington—Continued												
	1146	1147	1148	1149	1150	1151	1152	1153	1154	1155	1156	1157	1158
	$46F_2$ 33-187	$46F_2$ 33-188	$46F_2$ 33-192	$46F_2$ 43-78	$46F_2$ 33-194	$46F_2$ 33-195	$46F_2$ 33-196	$46F_2$ 33-198	$46F_2$ 33-199	$46F_2$ 33-200	$46F_2$ 33-202	$46F_2$ 33-206	$46F_2$ 33-207
Insoluble[1]	3.48	4.07	6.79	1.98	6.23	3.56	8.05	1.26	1.80	4.54	6.50	6.28	4.29
R_2O_3[2]	.97	1.00	.59	.54	.86	1.00	1.00	.87	.78	.96	.87	.82	.94
MgO[3]	46.84	45.61	21.74	22.19	44.06	46.54	43.27	46.68	45.73	44.50	20.59	22.67	22.13
CaO	1.03	2.27	30.02	30.42	2.87	.82	2.94	.74	2.11	3.33	31.58	29.97	30.37
Ignition loss[4]	47.68	47.05	40.86	44.87	45.98	48.08	44.64	50.45	49.58	46.67	40.46	40.26	42.27
Total	100.00	100.00	100.00	100.00	100.00	100.00	99.90	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,3,91	2,3,90	6,2,85	1,2,94	5,3,88	2,3,92	6,3,88	0,2,96	0,2,95	3,3,90	5,3,85	5,2,84	3,3,88
CaO/MgO	Magnesite	Magnesite	Dolomite	Dolomite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1159	1160	1161	1162	1163	1164	1165	1166	1167	1168	1169	1170	1171
	$46F_2$ 33-208	$46F_2$ 33-209	$46F_2$ 33-210	$46F_2$ 33-212	$46F_2$ 43-95	$46F_2$ 43-96	$46F_2$ 33-213	$46F_2$ 33-214	$46F_2$ 33-215	$46F_2$ 33-216	$46F_2$ 33-217	$46F_2$ 33-218	$46F_2$ 33-219
Insoluble[1]	2.60	5.56	2.48	6.32	0.55	0.20	3.42	5.05	3.72	3.55	4.05	5.53	3.75
R_2O_3[2]	.74	1.20	.48	.35	.19	.25	.28	.47	.57	.74	.85	.72	.78
MgO[3]	21.81	21.97	22.28	21.77	22.13	22.14	22.16	22.15	22.04	22.22	22.13	21.01	21.95
CaO	30.37	30.57	30.76	30.28	30.55	30.70	30.76	30.50	30.26	30.25	30.32	28.97	30.36
Ignition loss[4]	44.48	40.70	44.00	41.28	46.58	46.71	43.38	41.83	43.41	43.24	42.65	43.77	43.16
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	1,2,93	4,4,85	2,1,92	6,1,86	0,1,97	0,0,98	3,1,91	4,1,87	3,2,91	2,2,90	3,2,89	4,2,91	2,2,90
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1172	1173	1174	1175	1176	1177	1178	1179	1180	1181	1182	1183	1184
	$46F_2$ 33-220	$46F_2$ 33-221	$46F_2$ 43-98	$46F_2$ 33-222	$46F_2$ 33-223	$46F_2$ 43-99	$46F_2$ 43-100	$46F_2$ 43-101	$46F_2$ 33-225	$46F_2$ 33-226	$46F_2$ 33-227	$46F_2$ 33-228	$46F_2$ 33-229
Insoluble[1]	4.20	4.45	5.80	1.98	2.26	2.00	2.73	2.95	6.56	5.14	4.15	3.82	3.56
R_2O_3[2]	1.02	1.15	1.48	.73	.90	.64	.77	.86	1.17	1.03	1.28	1.12	1.27
MgO[3]	22.54	22.02	22.62	21.78	21.42	20.96	20.20	20.13	40.76	46.58	38.98	46.78	45.66
CaO	29.98	30.47	30.00	30.46	30.18	30.93	32.00	31.34	8.61	1.67	10.44	1.00	2.15
Ignition loss[4]	42.26	41.91	40.10	45.00	45.24	45.47	44.30	44.72	42.90	45.58	45.15	47.28	47.36
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,3,88	3,3,87	3,4,83	1,2,94	1,3,94	1,2,95	1,2,93	2,3,94	3,3,84	3,3,87	2,4,88	2,3,90	1,4,91
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesite

[1] Includes silica and insoluble silicates.

[2] Iron and alumina.

[3] By difference.

[4] At 950°C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1120-1125. Stevens County. Precambrian, Stensgar Dolomite. SE¼SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. Drill hole 7. (Bennett, 1943, p. 3-7, 9, 13, pl. 1.) Rock, medium-coarse texture. General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. Possible use of magnesite: Source of magnesium for light-metal construction [implied]. [For another analysis from same drill hole, see sample 1119, this group.]

	Lab. No.	Depth (ft)	
1120.	269	104 -122	[Dolomite] magnesitic dolomite, light-tan.
1121.	268	86 -104	Dolomitic magnesite, light-gray, friable.
1122.	256	82 - 86	Magnesite, bluish-gray to brown.
1123.	255	64 - 82	[Dolomitic magnesite] magnesite, bluish-gray, friable.
1124.	254	48 - 64	[Dolomitic magnesite] magnesite, light-gray, friable.
1125.	253	0 - 48	Magnesite, white, friable.

1126-1136. County, age, formation, locality, analyst, reference, remarks, and use as in samples 1120-1125. Drill hole 8.

	Lab. No.	Depth (ft)	
1126.	267	240 -284	Magnesite, gray to white.
1127.	266	219.5-240	Do.
1128.	265	147 -182	Magnesite, gray and tan.
1129.	264	123 -147	Magnesite, gray and tan, sugary.
1130.	263	115 -123	[Dolomitic magnesite] magnesite, white.
1131.	262	100 -115	Magnesite, gray and brown.
1132.	261	94 -100	Magnesite, dirty white.
1133.	260	67 - 94	Magnesite, gray and brown, banded.
1134.	259	39 - 67	Magnesite, tan to nearly white.
1135.	258	19 - 39	Magnesite, gray, partly friable.
1136.	257	0 - 19	Magnesite, white, sandy.

1137-1147. County, age, formation, locality, analyst, reference, remarks, and use as in samples 1120-1125. Drill hole 9.

	Lab. No.	Depth (ft)	
1137.	320	233 -250	[Dolomitic magnesite] magnesite, dark-gray and light-gray.
1138.	319	213 -233	Magnesite, dark-gray with tan.
1139.	318	184 -213	Magnesite, gray.
1140.	317	174 -184	[Dolomitic magnesite] magnesite, gray.
1141.	316	144 -156	[Dolomitic magnesite] magnesite, gray and tan; contains serpentine.
1142.	288	132 -144	[Dolomitic magnesite] magnesite, light-gray with tan.
1143.	287	122 -132	[Magnesitic dolomite] dolomitic magnesite, light-gray.
1144.	286	98 -122	[Dolomitic magnesite] magnesite, dark-gray, tan, white.
1145.	285	64 - 98	Magnesite, dark-gray, tan, and white.
1146.	284	32 - 64	Magnesite, dark-gray and tan.
1147.	283	0 - 32	Do.

1148-1155. County, age, formation, locality, analyst, remarks, and use as in samples 1120-1125. Drill hole 10. (Bennett, 1943, p. 3-7, 9, 14, pl. 1.) [For other analyses from same drill hole, see samples 98-105, group C; samples 372-374, group F_1.]

	Lab. No.	Depth (ft)	
1148.	337	259 -263	[Dolomite] magnesitic dolomite, gray.
1149.	336	244 -259	[Dolomite] magnesitic dolomite, grayish; contains serpentine.
1150.	329	115 -134	Magnesite, gray, brown, and white.
1151.	328	100 -115	Do.
1152.	327	74 -100	Magnesite, white, gray, and brown.
1153.	325	48 - 67	Magnesite, white with gray.
1154.	324	25 - 48	Magnesite, light-gray and white.
1155.	322	0 - 3	[Dolomitic magnesite] magnesite, white and brown.

1156. County, age, formation, locality, analysts, remarks, and use as in samples 1120-1125. Drill hole 11. (Bennett, 1943, p. 3-7, 9, 14, pl 1.) Dolomite, gray; depth, 173-182 ft. [For other analyses from same drill hole, see samples 106-108, group C; samples 375-377, group F_1.]

1157-1179. County, age, formation, locality, analyst, remarks [except texture], and use as in samples 1120-1125. Drill hole 12. (Bennett, 1943, p. 3-6, 9, 14, 15, pl. 1.) [For other analyses from same drill hole, see samples 109-113, group C; samples 378-380, group F_1.]

	Lab. No.	Depth (ft)	
1157.	392	318 -322	[Dolomite] magnesitic dolomite, white.
1158.	391	305 -318	[Dolomite] magnesitic dolomite, gray with white.
1159.	390	303 -305	[Dolomite] magnesitic dolomite, dark-gray and white.
1160.	389	284 -303	[Dolomite] magnesitic dolomite, dark-gray.
1161.	388	274 -284	[Dolomite] magnesitic dolomite, gray and white.
1162.	386	262 -268	[Dolomite] magnesitic dolomite, gray.
1163.	385	239 -262	[Dolomite] magnesitic dolomite, white; contains asbestos.
1164.	384	237 -239	[Dolomite] magnesitic dolomite, white; contains asbestos.
1165.	383	229 -237	[Dolomite] magnesitic dolomite, white.
1166.	381	205 -216	[Dolomite] magnesitic dolomite, dark-gray.
1167.	380	184 -205	Do.
1168.	379	177 -184	Do.
1169.	378	157 -177	[Dolomite] magnesitic dolomite, dark-gray; contains calcite.
1170.	377	154 -157	Dolomite, light-gray; contains calcite.
1171.	376	137 -154	[Dolomite] magnesitic dolomite, dark-gray; contains calcite.
1172.	375	123 -137	[Dolomite] magnesitic dolomite, dark-gray.
1173.	374	107 -123	Do.
1174.	373	100 -107	[Dolomite] magnesitic dolomite, gray; contains serpentine.
1175.	372	95 -100	[Dolomite] magnesitic dolomite, white to light-gray.
1176.	371	77 - 95	Dolomite, gray.
1177.	370	55 - 77	Dolomite, white.
1178.	369	48 - 55	Dolomite, tan.
1179.	368	12 - 48	Dolomite, white.

1180-1184. County, age, formation, locality, analyst, remarks [except texture], and use as in samples 1120-1125. Drill hole 13. (Bennett, 1943, p. 3-7, 9, 15, 16, 21, pl. 1.) General: Magnesite, light-gray to yellowish, medium crystalline; for the most part massive; occasional banding. [For other analyses from same drill hole, see samples 1185-1206, this group; samples 114, 115, group C; samples 381-385, group F_1.]

	Lab. No.	Depth (ft)	
1180.	434	196 -206	[Dolomitic magnesite] magnesite, gray.
1181.	433	184 -196	Magnesite, gray with white.
1182.	432	180 -184	[Dolomitic magnesite] magnesite, gray; contains calcite.
1183.	431	172 -180	Magnesite, gray.
1184.	430	168 -172	Magnesite, dark-gray.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continned

Washington—Continued

	1185	1186	1187	1188	1189	1190	1191	1192	1193	1194	1195	1196	1197
	$46F_2$ 33-230	$46F_2$ 33-231	$46F_2$ 33-233	$46F_2$ 33-234	$46F_2$ 33-235	$46F_2$ 33-236	$46F_2$ 33-238	$46F_2$ 33-239	$46F_2$ 33-240	$46F_2$ 33-241	$46F_2$ 33-242	$46F_2$ 43-105	$46F_2$ 33-244
Insoluble[1]	3.93	3.04	2.84	1.65	0.95	1.90	4.70	1.96	5.00	1.97	1.43	1.95	5.65
R_2O_3[2]	1.46	1.35	1.66	1.79	1.24	1.10	1.40	1.36	1.33	1.82	2.17	4.17	2.23
MgO[3]	36.23	46.33	23.80	45.41	45.42	45.87	46.93	43.72	45.68	23.21	23.04	25.26	23.98
CaO	13.28	1.38	28.10	1.95	1.95	1.95	1.10	4.02	2.55	29.30	29.91	29.00	27.25
Ignition loss[4]	45.10	47.90	43.60	49.20	50.44	49.18	45.87	48.94	45.44	43.70	43.45	39.62	40.89
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	1,4,89	1,4,91	0,5,90	0,3,94	0,2,97	0,3,94	2,4,87	0,3,94	3,4,87	0,3,91	0,2,90	0,3,82	2,7,84
CaO/MgO	Dolomitic magnesite	Magnesite	Dolomite	Magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Magnesite	Dolomite	Dolomite	Dolomite	Magnesian dolomite

Washington — Continued

	1198	1199	1200	1201	1202	1203	1204	1205	1206	1207	1208	1209	1210
	$46F_2$ 33-245	$46F_2$ 33-246	$46F_2$ 33-247	$46F_2$ 33-248	$46F_2$ 33-249	$46F_2$ 33-250	$46F_2$ 33-251	$46F_2$ 33-252	$46F_2$ 33-253	$46F_2$ 33-255	$46F_2$ 33-256	$46F_2$ 33-257	$46F_2$ 33-258
Insoluble[1]	2.19	3.78	5.70	2.73	1.15	2.28	4.42	3.25	3.42	5.37	3.73	3.79	6.06
R_2O_3[2]	2.04	1.16	1.10	1.37	1.31	.94	1.17	.77	.88	1.17	1.02	.99	1.30
MgO[3]	35.55	35.38	46.60	28.64	21.80	26.57	46.40	46.52	46.69	39.09	43.82	46.82	40.81
CaO	14.08	14.48	1.65	22.48	29.70	24.45	1.31	1.46	1.26	10.01	4.50	1.00	8.13
Ignition loss[4]	46.14	45.20	44.95	44.78	46.04	45.76	46.70	48.00	47.75	44.36	46.93	47.40	43.70
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,4,91	2,3,90	4,3,86	0,4,91	0,2,96	1,3,94	2,3,89	2,2,92	2,3,91	3,3,87	2,3,91	2,3,91	4,4,85
CaO/MgO	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Dolomite	Magnesian dolomite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Dolomitic magnesite

Washington—Continued

	1211	1212	1213	1214	1215	1216	1217	1218	1219	1220	1221	1222	1223
	$46F_2$ 33-260	$46F_2$ 33-261	$46F_2$ 33-262	$46F_2$ 33-263	$46F_2$ 33-264	$46F_2$ 33-265	$46F_2$ 33-266	$46F_2$ 43-112	$46F_2$ 43-114	$46F_2$ 43-116	$46F_2$ 33-271	$46F_2$ 33-272	$46F_2$ 33-273
Insoluble[1]	7.25	0.36	0.24	0.40	1.75	0.47	3.00	8.38	6.90	5.92	5.77	4.54	4.80
R_2O_3[2]	1.04	.70	.80	.87	.80	.88	.76	.54	.68	1.54	1.38	.98	1.36
MgO[3]	34.62	46.29	43.46	46.28	47.08	45.54	37.27	20.72	22.79	43.99	41.89	44.76	34.09
CaO	13.83	1.33	4.67	1.19	.47	2.08	12.14	28.85	30.68	4.57	7.46	3.62	16.00
Ignition loss[4]	43.26	51.32	50.83	51.26	49.90	51.03	46.83	41.51	38.95	43.98	43.50	46.10	43.75
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	6,3,86	0,1,99	0,0,99	0,1,98	0,2,95	0,1,98	2,2,93	7,2,87	6,2,81	3,5,85	3,4,84	3,3,89	3,4,87
CaO/MgO	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Dolomite	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesian dolomite

Washington—Continued

	1224	1225	1226	1227	1228	1229	1230	1231	1232	1233	1234	1235	1236
	$46F_2$ 33-274	$46F_2$ 33-275	$46F_2$ 33-276	$46F_2$ 33-277	$46F_2$ 33-278	$46F_2$ 33-279	$46F_2$ 33-280	$46F_2$ 33-281	$46F_2$ 33-282	$46F_2$ 33-283	$46F_2$ 33-284	$46F_2$ 33-285	$46F_2$ 33-286
Insoluble[1]	4.08	5.29	6.56	6.34	5.73	6.38	4.83	6.44	7.43	3.05	1.00	1.60	5.16
R_2O_3[2]	1.07	.88	1.04	.84	.87	1.00	.83	.92	1.04	.96	.87	.78	1.40
MgO[3]	38.01	45.07	41.93	45.60	37.71	46.52	37.82	45.92	41.08	45.78	41.45	25.95	22.08
CaO	11.52	3.44	7.17	2.68	10.95	1.25	11.52	1.60	8.07	1.70	7.15	25.50	29.14
Ignition loss[4]	45.32	45.32	43.30	44.54	44.74	44.85	45.00	45.12	42.38	48.51	49.53	46.17	42.22
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	2,3,89	4,3,87	5,3,84	5,2,86	4,3,88	5,3,86	3,2,89	5,3,86	6,3,83	1,3,93	0,2,97	0,2,95	3,4,88
CaO/MgO	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesian dolomite	Dolomite

Washington—Continued

	1237	1238	1239	1240	1241	1242	1243	1244	1245	1246	1247	1248	1249
	$46F_2$ 43-118	$46F_2$ 33-287	$46F_2$ 33-288	$46F_2$ 33-291	$46F_2$ 33-293	$46F_2$ 33-294	$46F_2$ 33-295	$46F_2$ 33-296	$46F_2$ 33-297	$46F_2$ 33-298	$46F_2$ 33-299	$46F_2$ 43-119	$46F_2$ 43-120
Insoluble[1]	5.07	3.04	3.39	5.63	5.58	6.07	4.71	4.34	6.04	6.57	4.20	3.59	4.97
R_2O_3[2]	1.05	1.13	1.09	1.18	1.33	1.54	1.08	1.00	1.08	1.14	1.05	1.31	1.06
MgO[3]	22.91	41.32	41.07	42.84	34.91	43.20	41.77	33.90	40.45	33.81	45.97	30.54	15.97
CaO	28.44	6.95	7.37	5.72	13.87	5.76	6.88	15.99	8.40	16.65	1.77	20.76	35.58
Ignition loss[4]	42.53	47.56	47.08	44.63	44.31	43.43	45.56	44.77	43.93	41.83	47.01	43.80	42.42
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	99.90	100.00	100.00	100.00	100.00
Class	3,3,88	1,3,92	2,3,92	4,3,86	3,4,88	3,5,84	3,3,88	3,3,89	4,3,86	5,3,84	2,3,90	1,4,88	3,3,90
CaO/MgO	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesian dolomite	Dolomitic magnesite	Magnesian dolomite	Magnesite	Magnesian dolomite	Calcareous dolomite

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[1] Includes silica and insoluble silicates.

[2] Iron and alumina.

[3] By difference.

[4] At 950°C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1185 - 1206. Stevens County. Precambrian, Stensgar Dolomite. SE¼SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. Drill hole 13. (Bennett, 1943, p. 3-7, 9, 15, 16, 21, pl. 1.) General: Magnesite, light-gray to yellowish, medium crystalline; for the most part massive; occasional banding; mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. Possible use of magnesite: Source of magnesium for light-metal construction [implied]. [For other analyses from same drill hole, see samples 1180-1184, this group; samples 114, 115, group C; samples 381-385, group F_1.]

	Lab. No.	Depth (ft)	
1185.	429	165 -168	[Dolomitic magnesite] magnesite, dark-gray.
1186.	428	161 -165	Magnesite, dark-gray.
1187.	425	152 -155	[Dolomite] magnesitic dolomite, white and gray.
1188.	424	150 -152	Magnesite, white and gray.
1189.	423	147 -150	Magnesite, brown.
1190.	422	144 -147	Magnesite, white and gray.
1191.	420	140 -143	Magnesite, gray.
1192.	419	139 -140	[Dolomitic magnesite] magnesite, light-brown.
1193.	418	135 -139	Magnesite, gray.
1194.	417	119 -135	[Dolomite] magnesitic dolomite, gray.
1195.	416	109 -119	Do.
1196.	415	100 -109	[Dolomite] dolomitic magnesite, dark-gray; contains pyrite.
1197.	412	82 - 87	Magnesitic dolomite, white, gray, and brown.
1198.	411	78 - 82	[Dolomitic magnesite] magnesite, dark-gray; contains calcite.
1199.	410	71 - 78	[Dolomitic magnesite] magnesite, dark-gray and tan.
1200.	409	61 - 71	Magnesite, white to light-gray.
1201.	408	53 - 61	Dolomitic magnesite, gray and brown.
1202.	407	34 - 53	[Dolomite] magnesitic dolomite, white, gray, and brown.
1203.	406	20 - 34	[Magnesitic dolomite] dolomitic magnesite, light-brown with light-gray.
1204.	405	15 - 20	Magnesite, light-brown.
1205.	404	9 - 15	Magnesite, white and light-gray.
1206.	403	0 - 9	Do.

1207 - 1217. County, age, formation, locality, analyst, reference, and use as in samples 1185-1206. Drill hole 14. General: Magnesite, predominantly white; for the most part massive; occasional banding; mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see samples 116-121, group C; samples 386, 387, group F_1.]

	Lab. No.	Depth (ft)	
1207.	450	108 -120	[Dolomitic magnesite] magnesite, gray with brown and white.
1208.	449	102 -108	[Dolomitic magnesite] magnesite, gray.
1209.	448	97 -102	Magnesite, gray.
1210.	447	88 - 97	[Dolomitic magnesite] magnesite, gray, brown and white.
1211.	445	66 - 81	Dolomitic magnesite, white, gray, and multicolored.
1212.	444	62 - 66	Magnesite, white.
1213.	443	58 - 62	[Dolomitic magnesite] magnesite, white.
1214.	442	50 - 58	Magnesite, white.
1215.	441	33 - 50	Do.
1216.	439	19 - 23	Do.
1217.	438	0 - 19	[Dolomitic magnesite] magnesite, white, iron stains.

1218 - 1235. County, age, formation, locality, analyst, remarks, and use as in samples 1185-1206. Drill hole 15. (Bennett, 1943, p. 3-7, 9, 16, 17, 21, pl. 1.) [For other analyses from same drill hole, see samples 388-393, group F_1.]

Washington—Continued

	Lab. No.	Depth (ft)	
1218.	485	237 -257	Dolomite, dark-gray; contains serpentine.
1219.	483	217 -232	[Dolomite] magnesitic dolomite, gray; contains serpentine.
1220.	476	137 -147	[Dolomitic magnesite] magnesite, gray; contains serpentine.
1221.	475	133 -137	[Dolomitic magnesite] magnesite, dark-gray.
1222.	472	90 -133	[Dolomitic magnesite] magnesite, dark-gray with white.
1223.	471	84 - 90	[Magnesitic dolomite] dolomitic magnesite, gray.
1224.	470	82 - 84	[Dolomitic magnesite] magnesite, gray.
1225.	469	78 - 82	[Dolomitic magnesite] magnesite, light-gray.
1226.	468	68 - 78	Do.
1227.	467	66 - 68	Magnesite, light-gray.
1228.	466	59 - 61	[Dolomitic magnesite] magnesite, gray with white.
1229.	465	53 - 59	Magnesite, dark-gray.
1230.	464	46 - 53	[Dolomitic magnesite] magnesite, gray, white, and brown.
1231.	463	32 - 46	Magnesite, light-gray and white.
1232.	462	22 - 32	[Dolomitic magnesite] magnesite, light-gray.
1233.	461	16 - 22	Magnesite, light-gray; contains calcite.
1234.	474	7 - 16	[Dolomitic magnesite] magnesite, white, brown, and gray.
1235.	473	0 - 7	[Magnesitic dolomite] dolomitic magnesite, brown and white.

1236 - 1247. County, age, formation, locality, analyst, remarks, and use as in samples 1185-1206. Drill hole 16. (Bennett, 1943, p. 3-7, 9, 17, 21, pl. 1.) [For other analyses from same drill hole, see sample 122, group C; samples 394-396, group F_1.]

	Lab. No.	Depth (ft)	
1236.	501	285 -295	[Dolomite] magnesitic dolomite, banded.
1237.	499	225 -278	[Dolomite] magnesitic dolomite, gray; contains calcite and serpentine.
1238.	498	207 -225	[Dolomitic magnesite] magnesite, white with light-gray.
1239.	497	172 -207	[Dolomitic magnesite] magnesite, gray with white.
1240.	494	146 -155	[Dolomitic magnesite] magnesite, gray.
1241.	492	120 -122	Dolomitic magnesite, gray and white.
1242.	491	113 -120	[Dolomitic magnesite] magnesite, gray and white.
1243.	490	85 -113	[Dolomitic magnesite] magnesite, gray, white, and brown.
1244.	489	55 - 85	[Magnesitic dolomite] dolomitic magnesite, light-gray and white.
1245.	488	52 - 55	[Dolomitic magnesite] magnesite, light-gray.
1246.	487	48 - 52	[Magnesitic dolomite] dolomitic magnesite, light gray.
1247.	486	0 - 48	Magnesite, light-gray to white.

1248, 1249. County, age, formation, locality, analyst, and use as in samples 1185-1206. Drill hole 17. (Bennett, 1943, p. 3-7, 9, 17, 21, pl. 1.) General: Magnesite, predominantly white; for the most part massive; occasional banding; mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. [For other analyses from same drill hole, see samples 1250-1259, this group; samples 123-126, group C; sample 397, group F_1.]

1248. Lab. No. 519. [Magnesitic dolomite] dolomitic magnesite, light-gray; contains serpentine; depth 269-271.25 ft.

1249. Lab. No. 518. [Calcareous dolomite] dolomite, white and gray; contains serpentine; depth 246.5-252 ft.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	1250	1251	1252	1253	1254	1255	1256	1257	1258	1259	1260	1261	1262
	$46F_2$41-3	$46F_2$41-4	$46F_2$41-5	$46F_2$41-6	$46F_2$41-8	$46F_2$41-9	$46F_2$41-10	$46F_2$41-11	$46F_2$41-12	$46F_2$41-13	$46F_2$43-123	$46F_2$41-14	$46F_2$41-15
Insoluble[1]	5.48	5.38	7.10	7.46	7.56	3.13	0.67	1.07	3.97	4.75	4.31	2.75	0.47
R_2O_3[2]	1.22	1.34	1.28	1.10	.96	1.00	.90	1.08	1.30	1.11	2.29	1.67	1.31
MgO[3]	39.13	45.30	43.60	43.62	47.01	43.81	44.61	42.81	38.75	37.56	29.92	34.09	22.89
CaO	9.90	2.58	4.75	4.87	.58	4.41	3.16	5.04	9.50	10.58	20.11	15.72	28.74
Ignition loss[4]	44.27	45.40	43.27	42.95	43.94	47.65	50.66	50.00	46.48	46.00	43.37	45.77	46.59
Total	100.00	100.00	100.00	100.00	100.05	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	3,4,87	3,4,87	5,4,83	6,3,83	6,3,84	1,3,92	0,1,98	0,2,97	2,4,91	3,3,90	0,7,87	0,5,91	0,1,97
CaO/MgO	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesian dolomite	Dolomitic magnesite	Dolomite

Washington—Continued

	1263	1264	1265	1266	1267	1268	1269	1270	1271	1272	1273	1274	1275
	$46F_2$ 43-124	$46F_2$ 41-16	$46F_2$ 41-17	$46F_2$ 43-125	$46F_2$ 41-18	$46F_2$ 41-19	$46F_2$ 41-20	$46F_2$ 43-126	$46F_2$ 43-127	$46F_2$ 41-22	$46F_2$ 41-23	$46F_2$ 43-129	$46F_2$ 41-24
Insoluble[1]	1.54	2.25	5.25	2.15	3.92	3.52	4.04	2.73	3.50	1.13	7.86	6.04	4.39
R_2O_3[2]	1.32	1.53	3.07	1.72	1.81	1.39	1.60	.60	.74	.75	.89	.98	1.35
MgO[3]	27.53	34.09	26.12	20.78	32.29	31.55	39.10	23.17	44.68	43.29	47.47	45.08	46.47
CaO	23.07	15.47	24.84	30.08	17.10	18.32	8.38	29.17	4.19	5.04	1.48	3.64	1.07
Ignition loss[4]	46.54	46.66	40.72	45.27	44.88	45.22	46.88	44.33	46.89	49.79	42.30	44.26	46.72
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,3,95	0,4,93	0,9,82	0,4,94	1,5,89	1,4,91	1,5,91	2,2,92	2,2,91	0,2,96	6,3,81	4,3,85	2,4,89
CaO/MgO	Magnesian dolomite	Dolomitic magnesite	Magnesian dolomite	Dolomite	Magnesian dolomite	Magnesian dolomite	Dolomitic magnesite	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Magnesite

Washington—Continued

	1276	1277	1278	1279	1280	1281	1282	1283	1284	1285	1286	1287	1288
	$46F_2$41-25	$46F_2$41-26	$46F_2$41-27	$46F_2$41-28	$46F_2$41-29	$46F_2$41-30	$46F_2$41-31	$46F_2$41-32	$46F_2$41-33	$46F_2$33-59	$46F_2$33-58	$46F_2$33-57	$46F_2$33-56
Insoluble[1]	4.73	4.11	4.32	5.41	3.97	4.75	2.90	4.42	3.95	6.28	5.16	4.80	6.28
R_2O_3[2]	1.21	.75	.55	1.28	1.16	1.08	1.32	1.00	1.48	1.12	1.25	1.14	1.14
MgO[3]	41.17	25.01	25.71	43.14	34.79	39.16	39.25	42.89	46.37	45.11	45.39	46.47	46.15
CaO	7.95	27.56	26.88	5.59	15.36	10.27	9.42	5.69	.82	2.96	1.82	.61	1.32
Ignition loss[4]	44.94	42.57	42.54	44.58	44.72	44.74	47.11	46.00	47.38	44.53	46.38	46.98	45.11
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	3,4,87	3,2,88	3,2,88	3,4,86	2,3,89	3,3,88	1,4,92	3,3,89	1,4,90	4,3,85	3,4,89	3,3,90	4,3,86
CaO/MgO	Dolomitic magnesite	Magnesian dolomite	Magnesian dolomite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite

Washington—Continued

	1289	1290	1291	1292	1293	1294	1295	1296	1297	1298	1299	1300	1301
	$46F_2$33-54	$46F_2$33-53	$46F_2$33-52	$46F_2$33-51	$46F_2$33-50	$46F_2$33-49	$46F_2$33-48	$46F_2$33-47	$46F_2$33-46	$46F_2$33-43	$46F_2$33-42	$46F_2$33-41	$46F_2$33-40
Insoluble[1]	4.77	4.32	4.47	4.13	3.72	4.37	5.47	4.45	4.74	2.91	2.16	2.75	6.62
R_2O_3[2]	1.02	1.05	1.02	1.07	1.14	1.13	1.21	1.28	1.25	1.13	1.06	1.00	.87
MgO[3]	44.55	44.22	45.99	46.26	43.94	47.41	46.50	45.85	46.24	27.13	29.96	32.29	31.95
CaO	2.25	3.79	1.60	1.11	3.33	.16	.82	1.17	1.28	22.65	19.52	16.89	17.29
Ignition loss[4]	47.41	46.62	46.92	47.43	47.87	46.93	46.00	47.25	46.49	46.18	47.30	47.07	43.27
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	3,3,91	3,3,90	3,3,90	2,3,91	2,3,92	2,3,89	3,4,88	2,4,90	3,4,89	1,3,94	0,3,95	1,3,94	5,3,87
CaO/MgO	Magnesite	Dolomitic magnesite	Magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesian dolomite	Magnesian dolomite	Magnesian dolomite	Magnesian dolomite

Washington—Continued

	1302	1303	1304	1305	1306	1307	1308	1309	1310	1311	1312	1313	1314
	$46F_2$33-39	$46F_2$33-38	$46F_2$33-21	$46F_2$33-22	$46F_2$33-23	$46F_2$33-24	$46F_2$33-25	$46F_2$33-26	$46F_2$33-27	$46F_2$33-28	$46F_2$33-30	$46F_2$33-31	$46F_2$33-32
Insoluble[1]	7.02	4.30	6.00	0.45	4.82	6.08	5.67	4.52	3.80	0.64	5.08	4.28	1.32
R_2O_3[2]	.83	1.31	.82	1.09	1.15	1.09	1.07	1.23	.96	.89	.92	.99	.27
MgO[3]	21.65	25.76	46.51	20.65	47.17	46.80	47.76	45.73	35.21	46.68	47.50	25.32	21.64
CaO	27.11	23.07	1.36	31.15	.18	.92	.11	.86	14.24	.68	.42	24.47	30.84
Ignition loss[4]	43.39	45.56	45.31	46.66	46.68	45.11	45.39	47.66	45.79	51.11	46.08	44.94	45.93
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	6,2,90	2,4,93	5,2,87	0,1,98	3,3,89	4,3,86	4,3,86	2,4,91	2,3,91	0,1,98	4,3,88	3,3,92	1,1,96
CaO/MgO	Dolomite	Magnesian dolomite	Magnesite	Dolomite	Magnesite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesian dolomite	Dolomite

[1] Includes silica and insoluble silicates.

[2] Iron and alumina.

[3] By difference.

[4] At 950° C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1250 - 1259. Stevens County. Precambrian, Stensgar Dolomite. SE¼ SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. Drill hole 17. (Bennett, 1943, p. 3-7, 9, 17, 21, pl. 1.) General: Magnesite, predominantly white, massive; occasional banding; mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole. Possible use of magnesite: Source of magnesium for light-metal construction [implied]. [For other analyses from same drill hole, see samples 1248, 1249, this group; samples 123-126, group C; sample 397, group F_1.]

	Lab. No.	Depth (ft)	
1250.	513	116 -127	[Dolomitic magnesite] magnesite, gray with a little brown.
1251.	512	113 -116	Magnesite, gray.
1252.	511	104 -113	[Dolomitic magnesite] magnesite, gray; contains veinlets.
1253.	510	86 -104	[Dolomitic magnesite] magnesite, gray, white, and brown.
1254.	508	81 - 83	Magnesite, light-gray.
1255.	507	58 - 81	Magnesite, white with gray.
1256.	506	51 - 58	Magnesite, white.
1257.	505	39 - 51	[Dolomitic magnesite] magnesite, white; contains veinlets.
1258.	504	29 - 39	[Dolomitic magnesite] magnesite, light-gray with white.
1259.	503	0 - 29	[Dolomitic magnesite] magnesite, brown, white, and light-gray.

1260 - 1269. County, age, formation, locality, analyst, and use as in samples 1250-1259. Drill hole 18. (Bennett, 1943, p. 3-6, 9, 18, 21, pl. 1.) General mineralogy. Tonnage estimated. Index map, geologic section. Log of drill hole.

	Lab. No.	Depth (ft)	
1260.	532	169 -187	[Magnesitic dolomite] dolomitic magnesite, mottled; contains serpentine.
1261.	531	156 -169	Dolomitic magnesite, white, black, and gray.
1262.	530	143 -156	[Dolomite] magnesitic dolomite, white, gray, and brown.
1263.	529	127 -143	[Magnesitic dolomite] dolomitic magnesite, gray and brown.
1264.	528	108 -127	Dolomitic magnesite, gray and white.
1265.	524	67 - 90	[Magnesitic dolomite] dolomitic magnesite, brown and gray.
1266.	523	53 - 63	Dolomite, brown.
1267.	522	35 - 53	[Magnesitic dolomite] dolomitic magnesite, gray and brown, friable.
1268.	521	21 - 31	[Magnesitic dolomite] dolomitic magnesite, white, gray, and brown.
1269.	520	0 - 21	[Dolomitic magnesite] magnesite, white, gray, and brown.

1270 - 1284. County, age, formation, locality, analyst, reference, remarks, and use as in samples 1260-1269. Drill hole 19. [For other analyses from same drill hole, see samples 398, 399, group F_1.]

	Lab. No.	Depth (ft)	
1270.	548	281.5-310	[Dolomite] magnesitic dolomite, white and gray; contains serpentine.
1271.	547	272 -281.5	[Dolomitic magnesite] magnesite, light-gray and white; contains serpentine.
1272.	546	248 -272	[Dolomitic magnesite] magnesite, light-gray and white.
1273.	544	213 -233	Magnesite, gray and white.
1274.	543	190 -213	[Dolomitic magnesite] magnesite, medium-gray; contains serpentine.
1275.	542	180 -190	Magnesite, medium-gray.
1276.	541	166 -180	[Dolomitic magnesite] magnesite, medium-gray.
1277.	540	150 -166	[Magnesitic dolomite] dolomitic magnesite, dark-gray.
1278.	539	128 -150	[Magnesitic dolomite] dolomitic magnesite, light- and dark-gray; contains pyrite.
1279.	538	106 -128	[Dolomitic magnesite] magnesite, light- and dark-gray.
1280.	537	82 -106	Dolomitic magnesite, light- and dark-gray.
1281.	536	64 - 82	[Dolomitic magnesite] magnesite, gray and brown.
1282.	535	39 - 64	[Dolomitic magnesite]. magnesite, gray and brown.
1283.	534	25 - 39	[Dolomitic magnesite] magnesite, white and gray.
1284.	533	0 - 25	Magnesite, brown and gray.

1285 - 1297. County, age, formation, locality, analyst, and use as in samples 1250-1259. (Bennett, 1943, p. 3-7, 9, 19, 21, pl. 1.) General: Magnesite, light-gray to yellowish, medium-crystalline; for the most part massive, occasional banding; mineralogy. Channel sample from old mine adit. Tonnage estimated. Index map, geologic section.

	Lab. No.	
1285.	181	Magnesite.
1286.	182	Do.
1287.	183	Do.
1288.	184	Do.
1289.	186	Do.
1290.	187	[Dolomitic magnesite.]
1291.	188	Magnesite.
1292.	189	Do.
1293.	190	[Dolomitic magnesite.]
1294.	191	Magnesite.
1295.	192	Do.
1296.	301	Do.
1297.	302	Do.

1298 - 1303. County, age, formation, locality, analyst, and use as in samples 1250-1259. (Bennett, 1943, p. 3-6, 9, 19, 21, pl. 1.) General mineralogy. Channel sample from old mine adit. Tonnage estimated. Index map, geologic section.

	Lab. No.	
1298.	308	[Magnesian dolomite.]
1299.	309	Do.
1300.	310	Do.
1301.	311	Do.
1302.	312	[Dolomite.]
1303.	313	[Magnesian dolomite.]

1304 - 1314. County, age, formation, locality, analyst, and use as in samples 1250-1259. (Bennett, 1943, p. 3-6, 9, 19, 21, pl. 1.) General mineralogy. Outcrop sample. Tonnage estimated. Index map, geologic section.

	Lab. No.	
1304.	126	[Magnesite.]
1305.	297	[Dolomite.]
1306.	205	[Magnesite.]
1307.	298	Do.
1308.	206	Do.
1309.	208	Do.
1310.	209	[Dolomitic magnesite.]
1311.	210	[Magnesite.]
1312.	212	Do.
1313.	213	[Magnesian dolomite.]
1314.	214	[Dolomite.]

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1315	1316	1317	1318	1319	1320	1321	1322	1323	1324	1325	1326	1327
	46F$_2$33-33	46F$_2$33-34	46F$_2$33-35	46F$_2$33-36	46F$_2$42-283	46F$_2$42-287	46F$_2$33-9	46F$_2$33-10	46F$_2$33-11	46F$_2$41-36	46F$_2$41-44	46F$_2$41-45	46F$_2$41-46
Insoluble	[1]5.50	[1]7.13	[1]5.30	[1]3.11	[2]4.4	[2]4.9	[3]5.8	[3]5.2	[3]6.3	[3]1.9	[3]3.6	[3]2.3	[3]3.6
Al_2O_3+Fe_2O_3	[4].56	[4]1.10	[4].83	[4].74	[5]1.2	[5]1.4	2.4	1.5	2.1	1.0	1.8	1.3	1.1
MgO	[6]20.28	[6]39.57	[6]22.19	[6]22.22	43.5	43.8	45.8	43.5	45.0	20.8	35.4	44.9	43.0
CaO	29.34	9.70	29.38	29.53	4.9	4.1	.6	3.1	1.6	29.4	11.9	1.0	1.6
H_2O	------	------	------	------	1.0	1.0	------	------	------	------	------	------	------
Ignition loss	[7]44.32	[7]42.50	[7]42.30	[7]44.40	[8]45.0	[8]44.8	[9]45.3	[9]45.4	[9]44.5	[9]44.5	[9]48.2	[9]50.3	[9]50.0
Total	100.00	100.00	100.00	100.00	[100.0]	[100.0]	[99.9]	[98.7]	[99.5]	[97.6]	[100.9]	[99.8]	[99.3]
Class	5,2,93	5,3,83	4,2,88	2,2,92	2,4,87	3,5,87	2,7,86	3,4,87	3,6,85	0,3,93	1,5,95	0,4,96	2,5,93
CaO/MgO	Dolomite	Dolomitic magnesite	Dolomite	Dolomite	Dolomitic magnesite	Dolomitic magnesite	Magnesite	Magnesite	Magnesite	Dolomite	Dolomitic magnesite	Magnesite	Magnesite

	Washington—Continued												
	1328	1329	1330	1331	1332	1333	1334	1335	1336	1337	1338	1339	1340
	46F$_2$41-47	46F$_2$41-48	46F$_2$41-49	46F$_2$41-50	46F$_2$41-51	46F$_2$41-52	46F$_2$41-53	46F$_2$41-55	46F$_2$41-54	46F$_2$41-56	46F$_2$41-57	46F$_2$41-87	46F$_2$41-86
Insoluble	[3]3.8	[3]3.3	[3]5.6	[3]1.8	[3]4.9	[3]6.2	[3]2.5	[3]2.3	[3]2.0	[3]5.4	[3]5.6	[2]4.83	[2]5.60
Al_2O_3+Fe_2O_3	1.2	2.2	1.1	1.3	2.1	1.1	2.3	1.1	1.6	1.6	1.0	------	------
FeO	------	------	------	------	------	------	------	------	------	------	------	.85	.88
MgO	42.8	24.9	42.9	28.3	38.6	22.1	[6]22.3	44.4	22.0	38.8	42.8	38.41	40.90
CaO	2.2	23.2	1.0	20.2	6.7	24.8	27.9	.8	27.8	6.0	.7	7.39	6.88
Ignition loss	[9]49.3	[9]45.9	[9]48.5	[9]47.0	[9]47.0	[9]43.9	[9]45.0	[9]50.3	[9]46.0	[9]47.2	[9]48.2	[8]47.81	[8]46.03
Total	[99.3]	[99.5]	[99.1]	[98.6]	[99.3]	[98.1]	100.0	[98.9]	[99.4]	[99.0]	[98.3]	99.29	100.29
Class	2,4,93	0,6,94	4,4,92	0,3,95	1,6,91	4,3,91	0,4,93	0,4,94	0,3,95	3,5,91	4,4,91	5,0,94	6,0,90
CaO/MgO	Magnesite	Magnesian dolomite	Magnesite	Magnesian dolomite	Dolomitic magnesite	Magnesian dolomite	Dolomite	Magnesite	Dolomite	Dolomitic magnesite	Magnesite	Dolomitic magnesite	Dolomitic magnesite

	Washington—Continued												
	1341	1342	1343	1344	1345	1346	1347	1348	1349	1350	1351	1352	1353
	46F$_2$33-1	46F$_2$33-2	46F$_2$33-3	46F$_2$33-13	46F$_2$33-14	46F$_2$33-15	46F$_2$33-16	46F$_2$33-17	46F$_2$33-18	46F$_2$33-19	46F$_2$33-20	46F$_2$41-88	46F$_2$41-79
Insoluble	[3]2.5	[3]0.9	[3]6.3	[3]2.9	[3]7.3	[3]0.5	[3]2.0	[3]4.5	[3]1.4	[3]3.6	[3]5.8	[2]1.47	[3]2.6
Al_2O_3+Fe_2O_3	1.0	.8	2.6	1.0	1.5	1.2	1.1	.7	1.4	.4	1.8	.65	1.9
MgO	23.8	20.9	19.6	21.1	16.8	24.7	33.2	21.6	25.3	20.2	21.9	None	41.4
CaO	26.2	29.3	26.8	29.9	31.5	25.7	14.9	30.0	21.9	29.1	29.8	54.12	3.6
Ignition loss	[9]45.9	[9]46.8	[9]43.2	[9]43.6	[9]42.6	[9]47.5	[9]47.6	[9]43.0	[9]46.5	[9]45.2	[9]41.0	43.50	[9]47.9
Total	[99.4]	[98.7]	[98.5]	[98.5]	[99.7]	[99.6]	[98.8]	[99.8]	[96.5]	[98.5]	[100.3]	99.74	[97.4]
Class	1,3,95	0,2,96	2,8,89	1,3,91	5,4,90	0,1,98	0,3,95	3,2,90	0,4,92	3,1,94	3,5,85	0,3,97	0,5,92
CaO/MgO	Magnesian dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Magnesian dolomite	Dolomitic magnesite	Dolomite	Magnesian dolomite	Dolomite	Dolomite	Calcite	Dolomitic magnesite

	Washington—Continued												
	1354	1355	1356	1357	1358	1359	1360	1361	1362	1363	1364	1365	1366
	46F$_2$41-80	46F$_2$41-81	46F$_2$41-82	46F$_2$41-83	46F$_2$41-84	46F$_2$41-85	46F$_2$41-297	46F$_2$41-90	46F$_2$42-275	46F$_2$42-274	46F$_2$41-91	46F$_2$42-278	46F$_2$41-41
Insoluble	[3]1.2	[3]3.5	[3]1.3	[3]1.9	[3]4.8	[3]4.8	1.5	[2]5.79	3.3	2.9	[3]4.2	3.5	[2]0.89
Al_2O_3	1.5	1.6	1.4	2.4	1.9	1.2	[5].5	.43	[5].8	[5].7	2.3	[5]2.1	None
Fe_2O_3								.85					.00
FeO	------	------	------	------	------	------	------	None	------	------	------	------	.58
MgO	25.5	30.0	21.4	22.4	20.4	42.5	46.2	42.07	44.8	45.0	43.6	43.3	45.76
CaO	24.9	16.9	28.8	26.5	28.4	1.7	.6	1.69	.6	1.6	.4	2.1	None
H_2O+	------	------	------	------	------	------	------	[10]1.94	------	------	------	------	[10]3.53
Ignition loss	[9]46.8	[9]47.0	[9]46.5	[9]46.1	[9]44.0	[9]49.1	49.9	[8]47.23	49.1	48.6	[9]48.9	47.5	[8]49.24
Total	[99.9]	[99.0]	[99.4]	[99.3]	[99.5]	[99.3]	[98.7]	100.00	[98.6]	[98.8]	[99.4]	[98.5]	100.00
Class	0,2,96	1,5,93	0,3,96	0,4,94	2,6,91	3,5,92	1,1,96	4,5,91	2,2,94	2,2,93	0,7,92	0,6,91	1,4,94
CaO/MgO	Magnesian dolomite	Magnesian dolomite	Dolomite	Dolomite	Dolomite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite

[1] Includes silica and insoluble silicates.

[2] SiO_2.

[3] Mainly SiO_2.

[4] Iron and alumina.

[5] R_2O_3.

[6] By difference.

[7] At 950°C.

[8] CO_2.

[9] Mainly CO_2.

[10] Water above 110°C and undetermined, by difference.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1315 - 1318. Stevens County. Precambrian, Stensgar Dolomite. SE¼ SW¼ sec. 36, T. 30 N., R. 37 E., near town of Turk. Analyst, under direction of W. W. Holbrook. (Bennett, 1943, p. 3-6, 9, 19, 21, pl. 1.) General mineralogy. Outcrop sample. Tonnage estimated. Index map, geologic section. Possible use of magnesite: Source of magnesium for light-metal construction [implied].

1315. Lab. No. 215. [Dolomite.]
1316. Lab. No. 216. [Dolomitic magnesite.]
1317. Lab. No. 217. [Dolomite.]
1318. Lab. No. 299. [Dolomite.]

1319, 1320. Stevens County. Stensgar Dolomite. SW¼ sec. 36, T. 30 N., R. 37 E. Probably Turk deposit. (Doerner and others, 1946, p. 13, 48; Campbell and Loofbourow, 1957.) Magnesite. Mineralogy. Possible use: Production of magnesia.

1321 - 1323. Stevens County. Stensgar Dolomite. Sec. 36, T. 30 N., R. 37 E., Turk area. Analyst, F. G. Mehl. Samples 77-79. (Bennett, 1941, p. 3, 12, 21, 23, 25, pl. 2.) Magnesite, coarse-grained. General mineralogy. Channel sample. Index and geologic maps.

1324. County, formation, locality, analyst, reference, and maps as in samples 1321-1323. Sample 81. Dolomite.

1325 - 1338. Stevens County. Stensgar Dolomite. NW¼ sec. 10, T. 30 N., R. 38 E., west and north of town of Springdale. U.S. Magnesite Co. area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 19, 20, 23, 24, 25, pl. 1.) General: Magnesite intermixed with dolomite; from quarry; mineralogy. Index and geologic maps. Sample 1336: (Campbell and Loofbourow, 1962, p. F-3, F-8, F-18, F-45, pls. 1, 2.); tonnage estimated; geologic sections, correlated columnar sections.

	Sample	
1325.	19	[Magnesite.]
1326.	27	Do.
1327.	35	Do.
1328.	37	Do.
1329.	40	[Magnesian dolomite.]
1330.	41	[Magnesite.]
1331.	43	[Magnesian dolomite.]
1332.	49	[Dolomitic magnesite.]
1333.	50	[Magnesian dolomite.]
1334.	51	[Dolomite.]
1335.	67	[Magnesite.]
1336.	64	Dolomite.
1337.	70	[Dolomitic magnesite.]
1338.	71	[Magnesite.]

1339, 1340. Stevens County. Stensgar Dolomite. 18 miles west of Springdale. U.S. Magnesite Co. quarry. Analyst, Chase Palmer; collector, R. W. Stone. Record 3220. (Yale and Stone, 1921, p. 150, 151; Wells, 1937, p. 62; Bennett and others, 1966, p. 227, 229.) Magnesite, crystalline. Use: Refractories [implied].

1339. N¼ corner sec. 10, T. 30 N., R. 38 E.(?). From upper 40 ft of quarry.
1340. [Possibly T. 30 N., R. 37 E.] Magnesite, 18 ft in middle of quarry. Use: Steel plants [implied].

1341 - 1343. Stevens County. Stensgar Dolomite or Edna Dolomite. Sec. 17, T. 30 N., R. 38 E., C. F. Allen area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 21, 23, 24, 25, pl. 2.) Dolomite, gray, fine-grained; contains veins of carbonate; magnesitic in places. General mineralogy. Index and geologic maps.

1341. Sample 42.
1342. Sample 57.
1343. Sample 68.

1344 - 1351. Stevens County. Stensgar Dolomite. Sec. 19, T. 30 N., R. 38 E., Turk area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 22-24, 25, pl. 2.) General mineralogy. Index and geologic maps.

Washington—Continued

	Sample	
1344.	26	Dolomite.
1345.	28	Do.
1346.	33	Do.
1347.	34	[Dolomitic magnesite.]
1348.	38	Dolomite.
1349.	48	Do.
1350.	52	Do.
1351.	59	Do.

1352. Stevens County. [Stensgar Dolomite.] SW¼ sec. 1, T. 30 N., R. 40 E., 3 miles south and 1.5 miles east of town of Valley, Jump Off Joe Lake. Analyst, A. A. Hammer. Lab. No. 62. (Shedd, 1913, p. 123, 124, 246, pl. 21.) Limestone, dark-gray, fine-grained; flinty appearance. Index map. Use: Lime. Possible use: Portland cement.

1353 - 1357. Stevens County. Stensgar Dolomite. NW¼ sec. 1, T. 31 N., R. 39 E., Woodbury area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 16, 23, 24, 25, pl. 1.) General: Dolomite with some magnesite, from 30 ft face of old quarry; mineralogy. Index and geologic maps.

	Sample
1353.	20
1354.	22
1355.	60
1356.	62
1357.	65

1358, 1359. County, formation, analyst, reference, and maps as in samples 1353-1357. SW corner, sec. 3, T. 31 N., R. 39 E., Phoenix area. General mineralogy.

1358. Sample 20-A. Dolomite.
1359. Sample 29. Magnesite, coarsely crystalline.

1360. Stevens County. Stensgar Dolomite. Sec. 7, T. 31 N., R. 39 E. Midnight deposit. Collector, Eugene Callaghan. Sample 8. (Campbell and Loofbourow, 1962, p. F-3, F-8, F-18, F-43, pls. 1, 2.) Magnesite, dark, coarse-grained. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections.

1361. Stevens County. Magnesite, associated with Stensgar Dolomite. Secs. 8, 9, T. 31 N., R. 39 E., 12 miles northwest of Valley. U.S. Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 87, 91, 93-95, 135, 137, 139, 142; Whitwell and Patty, 1921, p. 12, 18, 23, 27, 28, 46, 47, pl. 2.) [Magnesite] limestone, black, coarsely crystalline; 200 ft thick. Bulk density 2.908. Tonnage estimated. Index and geologic map, geologic sections. Physical properties.

1362, 1363. Stevens County. Stensgar Dolomite. T. 31 N., R. 39 E. Collector, Eugene Callaghan. (Campbell and Loofbourow, 1962, p. F-3, F-4, F-8, F-18, F-40, F-43, pls. 1, 2.) Index and geologic maps, geologic sections, correlated columnar sections.

1362. Sec. 9. Northwest Magnesite Co., Keystone quarry. Sample 6. Magnesite, dark-gray to almost black. Use: Refractories.

1363. Secs. 17, 18. Double Eagle deposit. Sample 7. Magnesite, dark-gray to black, coarse-grained. Former use: Plastic magnesia.

1364, 1365. Stevens County. Stensgar Dolomite. Sec. 18, T. 31 N., R. 39 E. Crosby deposit. Index and geologic maps.

1364. NE¼ SW¼ sec. 18. Analyst, F. G. Mehl. Sample 32. (Bennett, 1941, p. 3, 12, 18, 23, 24, pl. 1.) Magnesite, pink to red, finely crystalline. General mineralogy.

1365. Collector, Eugene Callaghan. Sample 10. (Campbell and Loofbourow, 1962, p. F-3, F-8, F-18, F-43, pls. 1, 2.) Magnesite, red, fine-grained. Tonnage estimated. Geologic sections, correlated columnar sections.

1366. Stevens County. Magnesite, associated with Stensgar Dolomite. Sec. 19, T. 31 N., R. 39 E., west of Valley, near Red Marble quarry. Analyst, R. W. Thatcher. Sample 4. (Shedd, 1903, p. 97, 98-100, 137, 142; Whitwell and Patty, 1921, p. 12, 18, 23, 27, 28, pl. 2.) Magnesite, pink, coarse-grained. Bulk density 2.858. Tonnage estimated. Index and geologic map, geologic sections. Physical tests. Use for area: Refractories. Possible use: Dimension stone.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	1367	1368	1369	1370	1371	1372	1373	1374	1375	1376	1377	1378	1379
	46F$_2$41-78	46F$_2$42-277	46F$_2$41-60	46F$_2$41-61	46F$_2$41-62	46F$_2$41-63	46F$_2$41-64	46F$_2$41-65	46F$_2$41-66	46F$_2$41-67	46F$_2$41-68	46F$_2$41-288	46F$_2$41-38
Insoluble	[1]4.27	3.5	[2]2.3	[2]2.3	[2]1.5	[2]5.4	[2]2.2	[2]4.5	[2]3.1	[2]1.6	[2]2.3	[2]0.9	[2]3.9
$Al_2O_3+Fe_2O_3$	[3].78	[4].7	1.4	.8	.6	1.0	.6	1.1	.9	.7	.9	.8	.9
MgO	45.02	45.1	44.1	45.0	44.9	43.3	45.0	44.0	44.3	45.2	44.7	[5]24.7	22.0
CaO	1.07	.2	.5	.1	1.4	1.1	.1	.1	.6	.5	.3	20.9	29.3
Ignition loss	[6]49.51	49.8	[7]50.1	[7]50.5	[7]51.0	[7]48.1	[7]50.7	[7]49.3	[7]49.9	[7]50.8	[7]50.4	[7]45.3	[7]45.1
Total	100.65	[99.3]	[98.4]	[98.7]	[99.4]	[98.9]	[98.6]	[99.0]	[98.8]	[98.8]	[98.6]	[92.6]	[101.2]
Class	4,0,95	(2,2)95	0,5,93	1,3,94	0,2,96	4,3,92	1,3,94	3,4,92	2,3,94	0,3,95	1,4,94	0,3,89	2,3,94
CaO/MgO	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesian dolomite	Dolomite

Washington—Continued

	1380	1381	1382	1383	1384	1385	1386	1387	1388	1389	1390	1391	1392
	46F$_2$41-69	46F$_2$41-70	46F$_2$41-71	46F$_2$41-72	46F$_2$41-74	46F$_2$41-75	46F$_2$41-76	46F$_2$41-39	46F$_2$41-89	46F$_2$42-272	46F$_2$41-99	46F$_2$41-97	46F$_2$41-98
Insoluble	[2]3.8	[2]6.9	[2]1.5	[2]3.1	[2]3.3	[2]2.2	[2]4.6	[2]0.9	[1]1.58	[1]2.25	5.33	2.07	[1]0.46
$Al_2O_3+Fe_2O_3$	2.8	1.0	1.4	1.6	1.4	1.4	2.1	1.6	[4]1.78	1.16	[3]1.01	[3]1.03	[3]1.01
MgO	20.0	[5]21.8	[5]22.3	[5]21.2	[5]24.4	[5]21.6	[5]20.7	[5]31.0	1.23	45.98	43.52	44.50	46.23
CaO	28.2	27.3	29.4	29.0	25.5	29.5	28.9	20.6	54.02	1.31	.35	1.02	.31
Ignition loss	[7]43.8	[7]43.1	[7]45.3	[7]44.7	[7]45.4	[7]45.3	[7]43.7	[7]45.9	41.38	[8]49.30	[6]47.91	[6]47.91	[6]50.32
Total	[98.6]	[100.1]	[99.9]	[99.6]	100.0	100.0	100.0	100.0	99.99	[100.00]	[98.12]	[96.53]	98.33
Class	0,7,91	5,3,89	0,3,94	0,5,93	1,4,93	0,4,94	1,6,90	0,2,93	0,3,93	0,3,94	(5,0)92	(2,0)92	0,0,96
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Magnesian dolomite	Magnesite	Dolomite	Magnesian dolomite	Calcite	Magnesite	Magnesite	Magnesite	Magnesite

Washington—Continued

	1393	1394	1395	1396	1397	1398	1399	1400	1401	1402	1403	1404	1405
	46F$_2$ 41-298	46F$_2$ 41-101	46F$_2$ 42-293	46F$_2$ 41-214	46F$_2$ 41-121	46F$_2$ 41-122	46F$_2$ 41-123	46F$_2$ 41-124	46F$_2$ 41-125	46F$_2$ 41-126	46F$_2$ 41-127	46F$_2$ 41-128	46F$_2$ 43-39
SiO_2	1.56	1.85	[9]6.1	2.84	[10]1.52	[10]2.80	[10]0.36	[10]0.76	[10]0.68	[10]0.72	[10]0.50	[10]0.40	0.94
$Al_2O_3+Fe_2O_3$	[4]1.28	[3].88	[4]2.8	[4]1.31	[11].56	[11].52	[11].44	[11].56	[11].76	[11].64	[11].60	[11].56	[11].96
MgO	45.24	45.20	19.1	19.12	[5]21.21	[5]20.91	[5]21.44	[5]21.27	[5]21.29	[5]21.31	[5]21.53	[5]21.42	[5]20.15
CaO	.31	1.74	27.9	31.25	30.03	29.68	30.50	30.41	30.32	30.33	30.21	30.52	31.35
Ignition loss	------	[6]49.70	43.2	43.89	[12]46.68	[12]46.09	[12]47.26	[12]47.00	[12]46.95	[12]47.00	[12]47.16	[12]47.10	[12]46.60
Total	[48.39]	[99.37]	[99.1]	98.41	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,3,95	2,0,96	(1,8)89	1,4,92	1,2,98	2,2,96	0,1,99	0,1,98	0,1,98	0,1,98	0,1,99	0,1,99	0,2,98
CaO/MgO	Magnesite	Magnesite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	1406	1407	1408	1409	1410	1411	1412	1413	1414	1415	1416	1417	1418
	46F$_2$43-40	46F$_2$43-41	46F$_2$43-42	46F$_2$43-43	46F$_2$43-10	46F$_2$43-11	46F$_2$43-12	46F$_2$43-13	46F$_2$43-14	46F$_2$43-15	46F$_2$43-16	46F$_2$43-17	46F$_2$43-18
SiO_2	0.80	[10]0.44	1.90	[10]0.44	[10]2.50	0.72	6.10	2.90	1.42	5.28	2.46	3.20	8.18
$Al_2O_3+Fe_2O_3$ [11]	.69	.60	1.14	.48	.42	.82	.93	.86	.64	.99	.92	.58	.84
MgO [5]	20.18	21.39	19.74	21.29	20.91	20.17	18.41	19.40	19.94	18.61	19.43	19.65	17.48
CaO	31.55	30.42	31.20	30.62	30.22	31.50	30.45	31.20	31.45	30.70	31.35	30.85	30.45
Ignition loss [12]	46.78	47.15	46.02	47.17	45.95	46.79	44.11	45.64	46.55	44.42	45.84	45.72	43.05
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,98	0,1,99	0,3,96	0,1,99	2,1,96	0,1,98	5,3,93	1,3,96	0,2,98	4,3,93	1,3,96	2,2,96	7,2,91
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite

[1] SiO_2.

[2] Mainly SiO_2.

[3] FeO.

[4] R_2O_3.

[5] By difference.

[6] CO_2.

[7] Mainly CO_2.

[8] Loss (H_2O and CO_2).

[9] Insoluble.

[10] Also reported as insoluble.

[11] Iron and alumina.

[12] 950°-1,000°C; also called CO_2.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1367. Stevens County. Precambrian, magnesite, associated with Stensgar Dolomite. Secs. 24, 25, T. 31 N., R. 38 E., about 15 miles west of town of Valley. American Mineral Production Co., Red Marble quarry. Analyst, Chase Palmer; collector, R. W. Stone. Record 3220. (Whitwell and Patty, 1921, p. 12, 15, 23, 27, 28, 52, 53, pl. 2; Landes, 1934, p. 1085, 1087, 1088; Wells, 1937, p. 62.) Deposit: Magnesite, reddish-brown to rose-red, from coarsely crystalline to a fine groundmass; probably more than 300 ft thick. Tonnage estimated. Index and geologic map, geologic sections. General use: Insulating and accoustical board, chemical; caustic magnesite for use in plastics.

1368. Steveus County. Steusgar Dolomite. Sec. 25, T. 31 N., R. 38 E. Northwest Magnesite Co., Red Marble quarry. Collector, Eugene Callaghan. Sample 11. (Campbell and Loofbourow, 1962, p. F-3, F-8, F-16, F-18, F-44, F-45, pls. 1, 2.) Magnesite, red or pink. Tonnage estimated. Index and geologic maps, geologic sections, detailed measured section, correlated columnar sections. Use: Refractories.

1369-1377. Stevens County. Stensgar Dolomite. SE corner sec. 24, T. 31 N., R. 38 E., Red Marble area. Analyst, F. G. Mehl. (Bennett, 1941, p. 3, 12, 18, 19, 23, 25, pl. 1.) Magnesite, various colors, coarse and finely crystalline. General mineralogy. Outcrop sample. Index and geologic maps.

	Sample		Sample
1369.	53	1374.	63
1370.	54	1375.	66
1371.	55	1376.	69
1372.	58	1377.	72
1373.	61		

1378, 1379. County, formation, analyst, and maps as in samples 1369-1377. T. 31 N., R. 38 E., Red Marble area. (Bennett, 1941, p. 3, 12, 23, 24, pl. 1.) General mineralogy.

1378. Sec. 24. Sample 8. [Magnesian dolomite.]
1379. Sec. 25. Sample 39. [Dolomite.]

1380-1386. County, formation, locality, analyst, reference, and maps as in samples 1378, 1379. [Dolomite except where noted] light-bluish-gray, fine-grained to dense; weathers light gray. General mineralogy. Outcrop samples.

1380. SW¼ sec. 25. Sample 18.
1381-1386. NE corner sec. 35. Samples 1-3, 5-7.
    1384. [Magnesian dolomite.]
    1385. [Magnesite.]

1387. County, formation, locality, analyst, reference, and maps as in samples 1378, 1379. Sec. 36. Sample 9. [Magnesian dolomite.]

1388. Stevens County. [Stensgar Dolomite.] SE¼ sec. 36, T. 31 N., R. 40 E., 3 miles south and 1.5 miles east of Valley, Jump Off Joe Lake. Analyst, A. A. Hammer. Sample 52. (Shedd, 1913, p. 123, 124, 245, pl. 21; Mills, 1962, p. 158, 160-162.) Limestone, dark-blue, compact. Tonnage estimated. Index and geologic maps. Use: Lime. Possible use: Portland cement, mineral filler, pulp and paper industry.

1389. Stevens County. Stensgar Dolomite. [SW¼SW¼ sec. 30, T. 32 N., R. 40 E., Allen and Moss quarries; NW¼NW¼ sec. 1, T. 31 N., R. 39 E., Woodbury quarry; and (or) NE¼NE¼ sec. 25, T. 31 N., R. 38 E., Red Marble quarry.] American Mineral Production Co. (Weaver, 1920, p. 321, 322, 324, 330, 331, pl. 1.) Magnesite. Tonnage estimated. Index and geologic map, geologic sections. General use: Cement, paper industry, plaster, refractories, tiling.

1390-1392. Stevens County. Stensgar Dolomite. Sec. 30, T. 32 N., R. 40 E., 5 miles from town of Chewelah. American Mineral Production Co., Allen quarry. General: Magnesite, crystalline, massive; averages 200 ft thick. Tonnage estimated. Index and geologic maps, geologic sections. Use: Insulating and accoustical board, chemical, caustic magnesite for use in plastics, refractories. Possible use: Production of light-weight metal alloys, Sorel cement.

1390. [SW¼ sec. 30.] Analyst, Chase Palmer; collector, R. W. Stone. Record 3228. (Dolman, 1920, p. 176-179, 182-184; Wells, 1937, p. 62; Hodge, 1938b, p. 13, 34-36, 43, 44, 51.)
1391. (Whitwell and Patty, 1921, p. 12, 15, 23, 27, 28, 41, 49, 50, pl. 2; Landes, 1934, p. 1084-1088.)
1392. Analyst, Chase Palmer; collector, R. W. Stone. Record 3220. (Wells, 1937, p. 62; Hodge, 1938b, p. 36, 41, 43, 51, pl. 2.)

1393, 1394. Stevens County. Sec. 30, T. 32 N., R. 40 E., 5 miles from Chewelah. Northwest Magnesite Co., Finch quarry. (Dolman, 1920, p. 176-179, 182-184.) Tonnage estimated. Index and geologic maps, geologic sections. Use: Refractories. Possible use: Production of light-weight metal alloys, Sorel cement, chemical, insulation material.

1393. [Probably Stensgar Dolomite.] NW¼ sec. 30. Sample 15. (Hodge, 1938b, p. 13, 15, 34-36, 43, 45, 51.) Magnesite, white, gray, pink, or nearly black; part laminated, part massive; crystalline, from very fine to very coarse grained; at least 300 ft thick.

1394. Magnesite, associated with Steusgar Dolomite. SW¼NW¼ sec. 30. Analyst, Chase Palmer; collector, R. W. Stone. Record 3228. (Whitwell and Patty, 1921, p. 12, 15, 23, 27, 28, 41, 42, pl. 2.) General: Magnesite, crystalline, massive, bedded; more than 250 ft thick.

1395. Steveus County. Stensgar Dolomite. NE¼NE¼ sec. 32, T. 33 N., R. 40 E., 4.7 miles northwest of Chewelah. Abandoned quarry. Collector, C. F. Deiss. Sample 2. (Campbell and Loofbourow, 1962, p. F-3, F-13-15, F-18, pls. 1, 2.) Dolomite. Index and geologic maps, geologic sections, detailed measured section, correlated columnar sections.

1396. Stevens County. Cambrian, Old Dominion Limestone. SW¼SW¼ sec. 3, T. 33 N., R. 39 E., northwest of town of Addy, headwaters of Stranger Creek. Analyst, A. A. Hammer. Sample 61. (Shedd, 1913, p. 130, 131, 246, pl. 21; Mills, 1962, p. 164.) [Dolomite] limestone, white or light-gray, coarse; deposit at least 50 ft thick. Index map. Use: None.

1397-1404. Stevens County. Lower part of Old Dominion Limestone. T. 33 N., R. 39 E., northwest of Addy. Owner, A. B. Lind. (Bennett, 1944, p. 6-8, 31, 33-35, pl. 12; Bennett, 1945, p. 16.) Deposit: Dolomite, light-gray or gray, fine- to medium-grained; 2,000 ft exposed. Fresh sample from outcrop, fragments taken every 5 ft usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Possible use: General uses of dolomite; source of magnesia, refractories, crushed stone.

1397-1402. NW¼NW¼ sec. 13. Samples 544-549.
1403, 1404. NE¼NE¼ sec. 14. Samples 550, 551.

1405-1418. Stevens County. Old Dominion Limestone. T. 34 N., R. 38 E., about 11 miles northwest of Addy. (Bennett, 1944, p. 6-8, 31-33, pl. 10; Bennett, 1945, p. 15.) Deposit: Dolomite, light-gray to white, some banding, medium to coarsely crystalline. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Former use: Building stone. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

1405-1409. SE¼SW¼ sec. 26. Samples 526-533.
1410-1416. NW¼NE¼ sec. 35. Owner, W. G. Merryweather. Samples 501-507.
1417, 1418. NE¼NW¼ sec. 35. Owner, W. G. Merryweather. Samples 513, 514.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1419	1420	1421	1422	1423	1424	1425	1426	1427	1428	1429	1430	1431
	46F$_2$43-19	46F$_2$43-20	46F$_2$43-21	46F$_2$43-22	46F$_2$43-23	46F$_2$43-24	46F$_2$43-25	46F$_2$43-26	46F$_2$43-27	46F$_2$43-28	46F$_2$43-29	46F$_2$43-30	46F$_2$43-31
SiO_2	0.70	1.02	0.58	0.31	0.48	0.40	[1]0.60	0.90	[1]0.68	0.52	0.22	0.34	0.36
$Al_2O_3+Fe_2O_3$ [2]	.59	.54	.26	.72	.75	.62	.38	.66	.42	.36	.94	.70	.34
MgO [3]	20.19	20.16	20.58	20.73	20.27	20.43	21.28	20.26	21.40	20.55	20.39	20.42	21.58
CaO	31.60	31.50	31.45	31.15	31.55	31.50	31.01	31.40	30.82	31.45	31.50	31.50	30.88
Ignition loss [4]	46.92	46.78	47.13	47.09	46.95	47.05	46.73	46.78	46.68	47.12	46.95	47.04	46.84
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Class	0,1,99	0,2,98	0,1,99	0,1,99	0,1,99	0,1,99	0,1,98	0,2,98	0,1,98	0,1,99	0,0,99	0,1,99	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1432	1433	1434	1435	1436	1437	1438	1439	1440	1441	1442	1443	1444
	46F$_2$ 43-32	46F$_2$ 43-33	46F$_2$ 43-34	46F$_2$ 43-35	46F$_2$ 43-36	46F$_2$ 43-37	46F$_2$ 43-38	46F$_2$ 41-210	46F$_2$ 41-211	46F$_2$ 41-237	46F$_2$ 41-238	46F$_2$ 42-30	46F$_2$ 42-31
SiO_2	3.58	5.28	4.37	0.35	0.44	1.18	8.38	0.91	0.98	2.61	3.12	0.37	0.43
Al_2O_2	[2].72	[2]1.16	[2]1.34	[2].96	[2].64	[2].98	[2].91	------	------	------	------	[5].36	[5].43
Fe_2O_3											.12		
FeO	------	------	------	------	------	------	------	------	------	------	.81	------	------
MgO	[3]19.18	[3]18.20	[3]18.49	[3]20.47	[3]20.20	[3]20.18	[3]17.31	20.68	22.21	.76	.67	.81	1.82
CaO	31.15	31.00	31.20	31.30	31.70	31.14	30.52	31.80	30.08	53.68	52.04	54.45	53.39
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	.007	.004
Ignition loss	[4]45.37	[4]44.36	[4]44.60	[4]46.92	[4]47.02	[4]46.52	[4]42.88	[6]46.64	[6]46.70	[6]42.89	[6]43.22	[7]43.48	[7]43.71
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.03	99.97	99.94	99.98	[8][99.48]	[8][99.78]
Class	2,2,95	3,3,93	2,4,93	0,1,99	0,1,99	0,2,98	7,3,90	1,0,98	1,0,98	3,0,97	3,0,96	0,1,98	0,1,99
CaO/MgO	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcareous dolomite	Dolomite	Dolomite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1445	1446	1447	1448	1449	1450	1451	1452	1453	1454	1455	1456	1457
	46F$_2$ 42-32	46F$_2$ 42-33	46F$_2$ 42-34	46F$_2$ 41-292	46F$_2$ 41-236	46F$_2$ 41-241	46F$_2$ 41-242	46F$_2$ 41-243	46F$_2$ 41-232	46F$_2$ 42-40	46F$_2$ 42-39	46F$_2$ 42-35	46F$_2$ 42-36
SiO_2	0.34	0.53	0.46	0.38	1.56	0.98	1.89	0.82	0.82	1.99	2.21	2.80	1.93
Al_2O_3	[5].37	[5].50	[5].40	.28	.64	------	------	------	------	[5]1.14	[5]1.00	[5]1.60	[5]1.17
Fe_2O_3						Trace	------	Trace	.63				
FeO	------	------	------	------	------	------	Trace	------	Trace	------	------	------	------
MgO	1.38	1.82	.87	2.03	1.12	1.25	10.05	.70	19.02	1.18	.59	.69	.56
CaO	53.84	52.97	54.51	54.06	54.62	53.96	43.60	54.81	32.77	52.76	53.23	52.42	53.42
P_2O_5	.004	.005	.004	------	------	------	------	------	------	.012	.010	.006	.008
Ignition loss	[7]43.74	[7]43.84	[7]43.67	43.15	42.34	[6]43.76	[6]44.63	[6]43.56	[6]46.73	[7]42.64	[7]42.63	[7]41.96	[7]42.65
Total	[8][99.67]	[8][99.66]	[8][99.91]	[9]99.90	100.28	99.95	[10]100.17	99.89	99.97	[99.72]	[11][99.67]	[11][99.48]	[11][99.74]
Class	0,1,99	0,1,98	0,1,99	0,1,97	0,2,95	1,0,99	2,0,98	1,0,99	0,1,99	0,3,96	1,3,96	0,5,94	0,3,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcareous dolomite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1458	1459	1460	1461	1462	1463	1464	1465	1466	1467	1468	1469	1470
	46F$_2$ 42-37	46F$_2$ 42-41	46F$_2$ 42-38	46F$_2$ 41-227	46F$_2$ 41-229	46F$_2$ 41-226	46F$_2$ 41-228	46F$_2$ 41-225	46F$_2$ 42-42	46F$_2$ 42-43	46F$_2$ 42-44	46F$_2$ 42-45	46F$_2$ 42-46
SiO_2	3.06	4.16	1.81	2.20	2.00	5.44	1.96	3.16	1.86	5.68	1.58	1.84	0.69
$Al_2O_3+Fe_2O_3$	[5]1.67	[5]1.22	[5].95	1.60	1.08	1.36	2.68	.92	[5]1.38	[5]2.97	[5].95	[5].50	[5].49
MgO	.76	2.37	.56	1.78	.76	3.96	3.26	2.15	2.89	8.06	1.13	21.36	21.56
CaO	51.99	50.08	53.58	53.06	53.55	47.87	48.73	51.22	50.51	41.78	53.39	30.47	30.95
P_2O_5	.008	.009	.010	------	------	------	------	------	.004	.015	.006	.005	.037
Ignition loss	[7]42.11	[7]42.14	[7]42.76	42.76	42.64	40.37	42.00	41.95	[7]43.08	[7]41.64	[7]42.70	[7]46.63	[7]46.97
Total	[11][99.60]	[99.98]	[99.67]	101.40	100.03	99.00	98.63	99.40	[99.72]	[100.14]	[99.76]	[100.80]	[100.70]
Class	0,5,94	2,4,94	0,3,96	0,4,96	0,3,96	3,4,90	0,3,94	2,3,94	0,3,96	1,9,90	0,3,96	1,1,98	0,1,98
CaO/MgO	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Dolomite	Dolomite

See following page for footnotes.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_2, V_2O_5, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_3, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 1467, K_2O = 1.50 percent, V_2O_5 = 0.003 percent, NiO = 0.001 percent, ZrO_2 = 0.006 percent]

	1443	1444	1445	1446	1447	1454	1455	1456	1457	1458	1459
Na_2O	------	------	------	------	------	------	0.05	0.05	0.05	------	------
TiO_2	0.014	0.013	0.0084	0.011	0.016	0.037	.035	.048	.028	0.06	0.031
Cr_2O_3	------	------	------	------	------	.0008	.00093	.0013	.00067	.0013	.008
MnO	.02	.02	.014	.024	.020	.14	.032	.042	.025	.037	.060
CuO	.0014	.0018	.00099	.0010	.0010	.0013	.0015	.0019	.0014	.0014	.0097
SrO	.0096	.012	.013	.0096	.012	.022	.021	.020	.015	.024	.11
Ag_2O	------	------	------	------	------	------	.0002	.0002	------	------	------

Spectrochemical analyses—Continued

	1460	1466	1467	1468	1469		1460	1466	1467	1468	1469
Na_2O	------	------	0.11	------	------	CuO	0.0053	0.0095	0.0024	0.0052	0.0021
TiO_2	0.021	0.024	.11	0.022	------	SrO	.048	.061	.018	.011	.0047
Cr_2O_2	.0085	.0067	.0011	------	------	Ag_2O	------	------	------	------	------
MnO	.031	.055	.45	.012	0.050						

Footnotes of analyses on preceding page:

[1] Also reported as insoluble.

[2] Iron and alumina.

[3] By difference.

[4] 950°-1,000°C; also called CO_2.

[5] R_2O_3.

[6] CO_2.

[7] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[8] A composite of samples 1443-1447 contained Na_2O = 135 ppm, K_2O = 490 ppm, TiO_2 = <30 ppm, S = 63 ppm.

[9] 99.86 percent in text.

[10] H_2O- at 110°C, trace.

[11] A composite of samples 1455-1458 contained Na_2O = 225 ppm, K_2O = 660 ppm, TiO_2 = 270 ppm, S = 25 ppm.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1419 - 1438. Stevens County. Cambrian, Old Dominion Limestone. Sec. 35, T. 34 N., R. 38 E., about 11 miles northwest of town of Addy. (Bennett, 1944, p. 6-8, 31-33, pl. 10; Bennett, 1945, p. 15.) Deposit: Dolomite, light-gray to white, some banding, medium to coarsely crystalline. Fresh sample from outcrop, fragments taken every 5 ft, usually for a length of 50 ft. Tonnage estimated. Index and geologic maps. Former use: Building stone. Possible use: General uses of dolomite; refractories, crushed stone; for those analyses with more than 20 percent MgO, source of magnesia.

1419 - 1434. NE¼ NW¼ sec. 35. Owner, W. G. Merryweather.

	Sample		Sample
1419.	516	1427.	524
1420.	517	1428.	525
1421.	518	1429.	528
1422.	519	1430.	529
1423.	520	1431.	530
1424.	521	1432.	540
1425.	522	1433.	541
1426.	523	1434.	543

1435 - 1438. SE¼ NW¼ sec. 35. Samples 534-537.

1439, 1440. Stevens County. Old Dominion Limestone. Secs. 26, 27, 34, 35, T. 34 N., R. 38 E., about 7 miles southwest of town of Colville. Crystal Marble Co. Analyst, R. W. Thatcher. Lab. Nos. 67, 68. (Shedd, 1903, p. 113, 114-116, 137, 139, 140, 142; Weitz, 1942, p. 2, 75, 79, 82; Mills, 1962, p. 164.) Dolomite, coarsely crystalline. Index maps. Possible use: Source of magnesium, refractories.

1441, 1442. Stevens County. Old Dominion Limestone. [Ts. 36, 37, N., R. 40 E.], about 16 miles northeast of Colville. Colville Marble Co. Analyst, R.W. Thatcher. (Shedd, 1903, p.120, 121, 142; Mills, 1962, p.170.)

1441. (Eckel, 1905, p. 324, 325.) Limestone, white, crystalline. Use: [Dimension stone]. Possible use: Portland cement.

1442. (Shedd, 1913, p. 137, 246, pl. 21.) Marble, very dark gray, coarse- to fine-grained. Index map. Use: Portland cement [implied].

1443 - 1447. Stevens County. Cambrian, Maitlen Phyllite, Reeves Limestone Member. Sec. 35, T. 40 N., R. 41 E. Cedar Lake deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 62, 68-70, 250, 262, 264, pl. 1.) Limestone, white to cream-white, medium- to coarse-grained, well-bedded; 1,000 ft exposed. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, mineral filler, pulp and paper industry.

1443 - 1446. N½ SE¼ sec. 35. Samples S-163 to S-166.

1447. W½ SE¼ sec. 35. Sample S-167.

1448, 1449. Stevens County. Cambrian, Metaline Limestone. [T. 36 N., R. 37 E.], about 2 miles south of town of Kettle Falls. Fishs ranch. Analyst, A. A. Hammer. Samples 42, 43. (Shedd, 1913, p. 142, 143, 245, pl. 21; Mills, 1962, p. 143-145.) Limestone. Index map. Former use: Lime.

1448. Limestone, gray, crystalline, stratified.

1450 - 1452. Stevens County. Cambrian, Clugston Creek Limestone. Secs. 1, 12, T. 37 N., R. 39 E., 8.5 miles from town of Bossburg. Keystone Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 116, 117, 137, 139, 140, 142; Mills, 1962, p. 171.) Possible use: Dimension stone [implied].

1450. [Limestone] marble, white, massive, coarse-grained. Bulk density 2.724. Thin-section description, physical properties.

1451. Marble, dark-gray to black, massive. Thin-section description.

1452. Limestone, marble, gray, massive. Thin-section description, physical tests.

Washington—Continued

1453. Stevens County. Cambrian(?), Northport Limestone (Mills, 1962, p.107). Secs. 13, 18, T. 35 N., Rs. 39, 40 E., about 4 miles east of Colville. Standard Marble-Onyx Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 119, 120, 137, 142; Shedd, 1913, p. 134, 135, 246, pl. 21.) [Calcareous dolomite] magnesian limestone, light-gray, massive; uniform in texture; 100 ft exposed. Bulk density 2.873. Index map. Thin-section description, physical properties.

1454 - 1460. Stevens County. Northport Limestone. NW¼ NE¼ sec. 21, T. 35 N., R. 39 E., 1 mile south of Colville. Hoeft property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 173, 175, 176, 248, 259, 264, pls. 1, 6.) Limestone, gray, fine- to medium-grained. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

	Sample		Sample
1454.	S-70	1458.	S-75
1455.	S-72	1459.	S-112
1456.	S-73	1460.	S-113
1457.	S-74		

1461 - 1465. Stevens County. Northport Limestone. Probably sec. 21, T. 35 N., R. 39 E., 1.5 miles south of Colville. Hams ranch. Analyst, A. A. Hammer. (Shedd, 1913, p. 132, 133, 245, 246, pl. 21; Mills, 1962, p. 173, 174-176.) Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

1461, 1462. Samples 53, 54. Limestone, dark-gray to black, fine-grained, crystalline. Surface sample.

1463 - 1465. Limestone, dark; contains calcite. [For another analysis from same drill hole, see sample 421, group F_1.]

1463. Sample 72; depth 80 ft.

1464. Sample 71; depth 60 ft.

1465. Sample 69; depth 20 ft.

1466. Stevens County. Northport Limestone. SE¼ NE¼ sec. 26, T. 36 N., R. 39 E., about 5 miles northeast of Colville. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample S-114. (Mills, 1962, p. 12, 13, 165, 167, 168, 249, 261, 264, pls. 1, 6.) Limestone, light-gray, fine-grained, well-bedded; 23 ft sampled. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.

1467. County, formation, analysts, reference, maps, and use as in sample 1466. NW¼ sec. 35, T. 36 N., R. 39 E., 3 miles north of Colville. Sample S-120. Limestone, dark-gray to black, fine-grained, medium-bedded, argillaceous; contains layers of dolomitic limestone. Chip sample from outcrop.

1468. County, formation, analysts, and maps as in sample 1466. NW¼ NE¼ sec. 13, T. 37 N., R. 39 E., about 14 miles from Colville. Jefferson Marble, Mining, and Milling Co., abandoned quarry. Sample S-23. (Mills, 1962, p. 12, 13, 171, 172, 247, 258, 264, pls. 1, 6.) Limestone, white to pinkish-white, medium-grained; weathers white to pale yellow; contains mica and dolomite. Chip sample from outcrop. Possible use: Portland cement; deposit too remote for development.

1469, 1470. Stevens County. Northport Limestone. Sec. 17, T. 38 N., R. 37 E., near town of Barstow. Analyst, under supervision of Mark Adams. (Mills, 1962, p. 12, 13, 133, 134, 249, 262, 264, pl. 1.) Dolomite, white to brownish-white, fine-grained, massive to moderately well bedded; weathers gray; contains quartz and tremolite. Chip sample from outcrop. Index and geologic map. Possible use: None, rock impure.

1469. NE¼ NW¼ sec. 17. Spectrochemical analyst, C. E. Harvey. Sample S-147.

1470. SW¼ NW¼ sec. 17. Sample S-146.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	1471	1472	1473	1474	1475	1476	1477	1478	1479	1480	1481	1482	1483
	46F$_2$42-47	46F$_2$42-48	46F$_2$42-49	46F$_2$42-50	46F$_2$42-51	46F$_2$42-52	46F$_2$42-53	46F$_2$42-59	46F$_2$42-60	46F$_2$42-61	46F$_2$42-62	46F$_2$42-63	46F$_2$42-54
SiO_2	1.09	0.70	5.11	3.84	2.47	2.62	2.63	0.70	1.23	0.43	0.96	1.61	1.01
R_2O_2	.38	.74	2.04	1.66	.85	.75	.88	.41	.39	.23	.13	.16	.20
MgO	16.33	19.72	1.10	4.29	.98	2.98	4.00	1.59	3.65	3.70	6.40	6.70	2.20
CaO	36.41	31.85	50.81	47.88	52.87	50.63	49.50	54.53	51.24	51.24	47.79	46.95	52.97
P_2O_5	.010	.018	.133	.150	.083	.050	.061	.010	.016	.044	.029	.004	.009
Ignition loss[1]	45.93	45.72	40.94	41.90	42.47	42.69	42.73	43.44	43.70	43.64	43.78	43.64	43.62
Total	[100.15]	[98.75]	[100.13]	[99.72]	[99.72]	[99.72]	[99.80]	[100.68]	[100.23]	[99.28]	[99.09]	[99.06]	[100.01]
Class	0,1,98	0,1,96	2,6,92	1,5,93	1,2,96	1,2,95	1,3,95	0,1,98	1,1,98	0,1,98	1,0,97	1,0,97	1,1,98
CaO/MgO	Calcareous dolomite	Dolomite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite

Washington—Continued

	1484	1485	1486	1487	1488	1489	1490	1491	1492	1493	1494	1495	1496
	46F$_2$ 42-55	46F$_2$ 42-56	46F$_2$ 42-57	46F$_2$ 42-58	46F$_2$ 41-246	46F$_2$ 42-65	46F$_2$ 42-66	46F$_2$ 42-64	46F$_2$ 42-67	46F$_2$ 42-68	46F$_2$ 42-298	46F$_2$ 43-136	46F$_2$ 43-140
SiO_2	0.64	1.62	0.75	1.42	1.00	0.72	0.65	0.45	0.38	0.38	6.8	7.8	9.0
R_2O_3	.30	.28	.21	.15	------	.60	.23	.27	.15	.22	------	------	------
MgO	4.98	7.03	4.16	2.41	1.60	3.00	1.20	.38	.56	.76	13.9	18.6	18.1
CaO	49.98	46.73	51.16	52.40	53.96	51.23	54.18	54.97	55.34	55.21	35.2	29.0	26.5
H_2O-	------	------	------	------	[2]Trace	------	------	------	------	------	------	------	------
P_2O_5	.014	.004	.007	.005	------	.008	.011	.006	.018	.008	------	------	------
Ag	------	------	------	------	------	------	------	------	------	------	.42	Trace	1.22
Au	------	------	------	------	------	------	------	------	------	------	Trace	Trace	Trace
Zn	------	------	------	------	------	------	------	------	------	------	.20	<.05	2.40
Pb	------	------	------	------	------	------	------	------	------	------	<.05	<.05	.80
Ignition loss	[1]44.06	[1]43.98	[1]44.18	[1]43.31	[3]43.27	[1]43.06	[1]42.64	[1]43.54	[1]43.44	[1]43.26	------	------	------
Total	[99.97]	[99.64]	[100.47]	[99.70]	99.83	[4][98.62]	[4][98.91]	[99.62]	[99.89]	[99.84]	[56.6]	[55.5]	[58.0]
Class	0,1,98	1,1,97	0,1,99	1,0,97	1,0,98	0,1,97	0,1,96	0,1,99	0,0,98	0,1,98	7,0,92	8,0,91	9,0,85
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcareous dolomite	Dolomite	Dolomite

Washington—Continued

	1497	1498	1499	1500	1501	1502	1503	1504	1505	1506	1507	1508	1509
	46F$_2$ 43-162	46F$_2$ 42-294	46F$_2$ 43-143	46F$_2$ 42-296	46F$_2$ 42-282	46F$_2$ 43-141	46F$_2$ 42-288	46F$_2$ 43-135	46F$_2$ 42-297	46F$_2$ 42-299	46F$_2$ 42-273	46F$_2$ 42-290	46F$_2$ 42-281
SiO_2	6.7	6.2	9.7	6.5	4.4	9.4	5.2	7.8	6.7	7.4	2.9	5.3	4.0
MgO	20.5	20.5	19.5	20.2	20.5	18.2	19.9	17.8	17.7	18.2	20.0	19.1	19.5
CaO	31.6	31.2	28.2	28.8	29.5	27.6	28.7	29.3	28.6	28.6	29.4	29.0	29.0
Ag	Trace	Trace	Trace	Trace	Trace	1.07	.21	Trace	Trace	Trace	.12	Trace	Trace
Au	.005	.005	Trace	Trace	Trace	.01	.01	Trace	Trace	Trace	Trace	Trace	Trace
Zn	<.05	<.05	<.05	<.05	<.05	.30	.80	.60	.40	<.05	<.05	<.05	<.05
Pb	<.05	<.05	<.05	<.05	<.05	1.80	<.05	<.05	<.05	<.05	<.05	<.05	<.05
Total	[58.9]	[58.0]	[57.5]	[55.6]	[54.5]	[58.4]	[54.9]	[55.6]	[53.4]	[54.3]	[52.5]	[53.5]	[52.6]
Class	7,0,86	6,0,88	10,0,89	6,0,93	4,0,95	9,0,87	5,0,93	8,0,90	7,0,88	7,0,89	3,0,94	5,0,92	4,0,93
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	1510	1511	1512	1513	1514	1515	1516	1517	1518	1519	1520	1521	1522
	46F$_2$ 42-292	46F$_2$ 42-280	46F$_2$ 43-139	46F$_2$ 43-137	46F$_2$ 42-295	46F$_2$ 42-69	46F$_2$ 42-70	46F$_2$ 42-71	46F$_2$ 42-72	46F$_2$ 42-73	46F$_2$ 42-74	46F$_2$ 42-75	46F$_2$ 42-76
SiO_2	5.9	3.9	8.3	8.1	6.5	0.83	0.72	0.42	0.64	0.70	1.41	0.87	1.83
R_2O_3	------	------	------	------	------	.20	.20	.17	.17	.10	.12	.12	.18
MgO	19.0	19.8	18.4	18.1	19.0	.27	.21	.30	.31	.39	.87	1.12	.72
CaO	28.2	29.3	27.4	28.1	27.9	54.99	55.50	55.39	55.36	55.02	54.10	53.81	53.89
P_2O_5	------	------	------	------	------	.017	.010	.013	.009	.010	.017	.020	.020
Ag	.10	Trace	.74	Trace	1.08	------	------	------	------	------	------	------	------
Au	Trace	Trace	Trace	Trace	Trace	------	------	------	------	------	------	------	------
Zn	<.05	.60	<.05	<.05	<.05	------	------	------	------	------	------	------	------
Pb	<.05	<.05	<.05	<.05	.40	------	------	------	------	------	------	------	------
Ignition loss[1]	------	------	------	------	------	43.62	43.14	43.57	43.41	43.64	43.16	43.46	43.03
Total	[53.3]	[53.6]	[54.9]	[54.4]	[54.9]	[99.93]	[99.78]	[99.86]	[99.90]	[99.86]	[99.68]	[99.40]	[99.67]
Class	6,0,90	4,0,94	8,0,87	8,0,88	6,0,90	0,1,99	0,1,98	0,0,99	0,0,98	1,0,99	1,0,98	1,0,98	2,1,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Sample dried at 110°-112° C; ignition loss 1,000°-1,100° C.

[2] At 110° C.

[3] CO_2.

[4] Na_2O=235 ppm, K_2O=620 ppm, TiO_2= <30 ppm, S=30 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_3, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, Bi_2O_3, ThO_2, UO_2; sample 1479, Ag_2O = 0.0012 percent]

	1471	1472	1473	1474	1475	1476	1477	1478	1479	1480	1481	1482	1483
Na_2O	------	------	0.054	0.135	0.14	0.17	0.29	------	------	------	------	------	------
TiO_3	0.0076	------	.043	.053	.026	.022	.042	0.002	0.002	0.002	0.002	0.002	0.010
Cr_2O_3	------	------	.00067	.00096	.0005	.0005	.00096	------	------	------	------	------	------
MnO	.03	0.075	.34	.24	.21	.10	.048	.015	.035	.029	.034	.025	.029
CuO	.0014	.0048	.0011	.0012	.0018	.0017	.0022	.0010	.0037	.00093	.0017	.00093	.0014
SrO	.012	.006	.018	.018	.016	.014	.018	.012	.011	.011	.012	.0098	.014
PbO	------	------	------	------	.0045	.0064	------	------	.018	------	------	------	------

	1484	1485	1486	1487	1489	1490	1491	1492	1493	1515	1516	1517	1518
Na_2O	------	------	------	------	------	------	------	------	------	------	------	------	------
TiO_3	0.0052	0.0084	0.004	------	0.002	0.002	------	0.01	0.0084	0.0048	0.0056	0.002	0.002
Cr_2O_3	------	------	------	------	------	------	------	------	------	------	------	------	------
MnO	.038	.043	.032	0.021	.014	.02	0.023	.022	.025	.011	.012	.013	.013
CuO	.0013	.0019	.0017	.0014	.00077	.0010	.0015	.00088	.00083	.00077	.0012	.0012	.00088
SrO	.014	.013	.012	.014	.0098	.010	.012	.012	.011	.011	.011	.011	.011
PbO	------	------	------	------	.023	.0041	------	------	------	------	------	------	------

	1519	1520	1521	1522
Na_2O	------	------	------	------
TiO_3	------	------	------	0.0048
Cr_2O_3	------	------	------	------
MnO	0.017	0.021	0.037	.016
CuO	0.0022	0.0014	0.0025	0.00094
SrO	.011	.011	.015	.010
PbO	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page nnmbers in reference indicate source of analysis]

Washington—Continued

1471, 1472. Stevens County. Cambrian(?), Northport Limestone. T. 38 N., R. 37 E., near town of Barstow. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 133, 134, 249, 262, 264, pl. 1.) Dolomite, white to brownish-white, fine-grained, massive to moderately well bedded; weathers gray; contains quartz and tremolite. Chip sample from outcrop. Index and geologic map. Possible use: None, rock impure.

1471. NE¼ SW¼ sec. 17. Sample S-149.
1472. W½ sec. 17. Sample S-148.

1473 - 1477. Stevens County. Northport Limestone. NE¼ sec. 25, T. 38 N., R. 37 E., 0.75 mile north of town of Bossburg. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-68, S-69, S-143 to S-145. (Mills, 1962, p. 12, 13, 107, 113-116, 248, 249, 259, 262, 264, pl. 1.) Limestone, white to light-gray, medium-grained, thin-bedded. Chip samples from outcrop; together represent about 120 ft. Index and geologic maps. Possible use: None, rock impure.

1478 - 1487. County, formation, analysts, maps, and use as in samples 1473-1477. NW¼ sec. 12, T. 38 N., R. 38 E., 5 miles northeast of Bossburg, China Bend area. Samples S-5 to S-9, S-138 to S-142. (Mills, 1962, p. 12, 13, 102-104, 105, 247, 249, 257, 261, 262, 264, pl. 1.) Limestone, white to light-gray, medium-grained, thick-bedded. Chip sample from outcrop.

1488. Stevens County. Northport Limestone. Sec. 12, T. 38 N., R. 38 E., Ryan station. Florentine Marble Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 130, 131, 142; Mills, 1962, p. 102, 104.) Limestone, light-gray, fine-grained, bedded. Use: Dimension stone [implied].

1489 - 1493. Stevens County. Northport Limestone. T. 38 N., R. 38 E., about 4 miles northeast of Bossburg. Columbia Rock Co. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-10, S-11, S-52 to S-54. (Mills, 1962, p. 12, 13, 105-107, 247, 248, 257, 259, 264, pl. 1.) Limestone, interbedded light- and dark-gray, medium-grained, thin-bedded. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use (except sample 1489): Cement, mineral filler, chemical, metallurgical, builders' lime, sugar industry, pulp and paper industry.

1489 - 1491. NW¼ NW¼ sec. 14.
1492, 1493. SE¼ NE¼ sec. 15.

Washington—Continued

1494 - 1514. Stevens County. Northport Limestone. Sec. 28, T. 38 N., R. 38 E., 0.25 mile northeast of Bossburg. Young America mine. Analyst, under supervision of M. Wright. (Hundhausen, 1949, p. 3, 7, 9, 10, 11, figs. 1, 2, 6, 8.) Silicified dolomite. Mineralogy. Index and geologic maps, geologic section.

1494 - 1503. Drill hole 9. [For another analysis from same drill hole, see sample 423, group F_1.]

	Depth (ft)
1494.	240.2-250.8
1495.	224.5-231.6
1496.	217.0-221.5
1497.	175.8-185.9
1498.	165.2-175.8
1499.	154.6-165.2
1500.	144.0-154.6
1501.	137.7-144.0
1502.	135.7-137.7
1503.	130.5-135.7

1504 - 1514. Drill hole 15. [For other analyses from same drill hole, see samples 424-427, group F_1.]

	Depth (ft)
1504.	232.0-236.7
1505.	224.5-232.0
1506.	197.0-201.4
1507.	179.4-186.5
1508.	163.7-169.2
1509.	145.8-154.5
1510.	136.9-145.8
1511.	128.7-136.9
1512.	92.1-101.2
1513.	85.3- 92.1
1514.	80.7- 85.3

1515 - 1522. Stevens County. Northport Limestone. Sec. 33, T. 38 N., R. 38 E., 0.75 mile east of Bossburg. Carrol property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-48 to S-51, S-98 to S-101. (Mills, 1962, p. 12, 13, 107, 108, 110, 112, 113, 247-249, 259, 260, 264, pl. 1.) Limestone, white through gray to dark-gray, medium-grained, thin-bedded. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Cement, mineral filler, builders' lime, ceramic whiting, sugar industry, pulp and paper industry

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1523	1524	1525	1526	1527	1528	1529	1530	1531	1532	1533	1534	1535
	$46F_2$42-77	$46F_2$42-78	$46F_2$42-79	$46F_2$42-80	$46F_2$42-81	$46F_2$42-82	$46F_2$42-83	$46F_2$42-84	$46F_2$42-85	$46F_2$42-86	$46F_2$42-87	$46F_2$42-88	$46F_2$42-89
SiO_2	0.96	1.60	1.14	1.14	2.12	0.97	1.02	3.05	0.58	0.72	0.42	0.81	1.54
R_2O_3	.16	.15	.26	.20	.19	.25	.15	.13	.14	.19	.12	.18	.19
MgO	.33	.73	.74	1.33	.68	1.30	1.44	.90	.30	.34	.34	.31	.18
CaO	54.83	54.47	54.56	53.52	54.06	53.93	53.59	53.04	55.08	55.16	55.02	54.98	54.66
P_2O_5	.017	.011	.035	.047	.030	.050	.015	.026	.017	.031	.041	.011	.014
Ignition loss[1]	43.21	43.35	43.52	43.73	43.15	43.71	43.79	42.62	43.49	43.57	43.52	43.35	43.08
Total	[99.51]	[2][100.31]	[2][100.26]	[2][99.97]	[2][100.23]	[2][100.21]	[100.01]	[99.77]	[99.61]	[100.01]	[99.46]	[3][99.64]	[3][99.66]
Class	1,0,98	1,0,98	1,1,99	1,1,98	1,1,98	1,1,99	1,1,99	3,0,96	0,0,99	0,1,99	0,0,99	1,1,98	1,1,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1536	1537	1538	1539	1540	1541	1542	1543	1544	1545	1546	1547	1548
	$46F_2$ 42-90	$46F_2$ 42-91	$46F_2$ 42-92	$46F_2$ 42-93	$46F_2$ 42-94	$46F_2$ 42-95	$46F_2$ 42-96	$46F_2$ 42-97	$46F_2$ 42-98	$46F_2$ 42-99	$46F_2$ 42-100	$46F_2$ 42-101	$46F_2$ 42-102
SiO_2	0.26	1.31	0.58	3.61	3.05	1.53	2.37	0.50	1.87	2.06	1.01	0.72	0.75
R_2O_3	.13	.14	.13	.32	.29	.16	.03	.12	.35	.29	.00	.14	.39
MgO	.17	.27	.24	1.89	1.54	1.61	3.21	1.10	7.27	4.17	2.18	1.35	2.38
CaO	55.45	54.74	55.32	51.76	51.91	53.03	51.23	54.38	46.30	50.18	53.10	54.00	52.39
P_2O_5	.007	.016	.016	.022	.028	.020	.027	.021	.033	.038	.021	.025	.021
Ignition loss[1]	43.60	43.20	43.54	41.43	42.20	42.75	42.76	43.16	43.61	42.94	43.49	43.12	42.99
Total	[3][99.62]	[3][99.68]	[3][99.83]	[99.03]	[99.02]	[99.10]	[99.63]	[99.28]	[99.43]	[99.68]	[99.80]	[99.35]	[98.92]
Class	0,0,99	1,0,98	0,0,99	3,1,93	3,1,95	1,0,96	2,0,96	0,0,98	1,1,96	2,1,96	1,0,98	0,0,97	0,1,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite

	Washington—Continued												
	1549	1550	1551	1552	1553	1554	1555	1556	1557	1558	1559	1560	1561
	$46F_2$ 42-103	$46F_2$ 42-104	$46F_2$ 42-105	$46F_2$ 41-251	$46F_2$ 41-253	$46F_2$ 41-252	$46F_2$ 41-250	$46F_2$ 41-255	$46F_2$ 41-258	$46F_2$ 41-256	$46F_2$ 41-254	$46F_2$ 41-257	$46F_2$ 42-109
SiO_2	0.67	2.31	2.21	0.86	0.51	0.65	0.78	0.65	0.51	1.13	0.96	1.41	1.67
$Al_2O_2 + Fe_2O_3$	[4].03	[4].03	[4].11	.26	.34	.19	.51	.31	.45	.26	.20	.41	[4].70
MgO	.88	.62	1.46	.96	1.15	.96	1.08	.81	Trace	1.46	1.06	.96	.75
CaO	54.68	54.00	52.80	54.86	54.26	54.32	53.90	54.64	54.85	53.65	54.16	53.16	53.45
P_2O_5	.014	.013	.010	------	------	------	------	------	------	------	------	------	.006
Ignition loss	[1]43.38	[1]42.35	[1]42.50	42.50	42.30	42.54	42.00	42.92	43.10	42.68	43.00	43.16	[1]42.72
Total	[99.65]	[99.32]	[99.09]	99.44	98.56	98.66	98.27	99.33	98.91	99.18	99.38	99.10	[5][99.30]
Class	1,0,98	2,0,96	2,0,96	0,1,96	0,1,96	0,1,96	0,1,95	0,1,97	0,1,98	1,1,96	1,1,97	1,1,97	0,2,96
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1562	1563	1564	1565	1566	1567	1568	1569	1570	1571	1572	1573	1574
	$46F_2$ 42-110	$46F_2$ 42-111	$46F_2$ 42-112	$46F_2$ 42-113	$46F_2$ 42-106	$46F_2$ 42-107	$46F_2$ 42-108	$46F_2$ 41-110	$46F_2$ 41-112	$46F_2$ 41-111	$46F_2$ 41-113	$46F_2$ 41-116	$46F_2$ 41-115
SiO_2	0.53	0.63	1.59	0.81	2.69	2.62	0.55	0.86	0.82	------	------	------	------
Al_2O_2	[4].32	[4].29	[4].52	[4].35	[4]1.28	[4]1.02	[4].34	.40	.59	------	------	------	------
Fe_2O_3									.53	------	------	------	------
MgO	.90	.82	.97	.52	1.43	.92	1.57	.28	.06	------	------	------	------
CaO	54.16	54.55	53.66	55.32	51.84	52.81	53.73	54.62	55.05	55.32	55.40	55.38	55.34
P_2O_5	.005	.005	.005	.004	.014	.004	.003	------	------	------	------	------	------
Ignition loss	[1]43.18	[1]43.18	[1]42.89	[1]42.79	[1]42.24	[1]42.16	[1]43.78	43.74	42.30	------	------	------	------
Total	[5][99.09]	[5][99.47]	[5][99.63]	[5][99.79]	[99.49]	[99.53]	[99.97]	99.90	99.35	[55.32]	[55.40]	[55.38]	[55.34]
Class	0,1,98	0,1,98	1,2,97	0,1,97	1,4,95	1,3,95	0,1,99	0,2,98	0,2,96	0,0,99	0,0,99	0,0,99	0,0,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[2] A composite of samples 1524-1528 contains Na_2O = 135 ppm, K_2O = 490 ppm, TiO_2 = < 30 ppm, S = 14 ppm.

[3] A composite of samples 1534-1538 contains Na_2O = 125 ppm, K_2O = 300 ppm, TiO_2 =< 30 ppm, S= 14 ppm.

[4] R_2O_2.

[5] A composite of samples 1561-1565 contains Na_2O = 235 ppm, K_2O = 660 ppm, TiO_2=< 30 ppm, S = 30 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Na_2O, K_2O, Sc_2O_3, V_2O_5, NiO, CoO, ZnO, Ga_2O_3, GeO_3, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ru, Rh, Pd, CdO, In_2O_3, SnO_3, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_3]

	1523	1524	1525	1526	1527	1528	1529	1530		1531	1532	1533	1534	1535
TiO_3	0.0076	0.002	0.002	0.002	0.0068	0.0068	------	------	------	0.0052	0.009	0.002	0.0038	0.002
Cr_2O_3	------	------	------	------	------	------	------	------	------	------	------	------	------	------
MnO	.017	.017	.022	.032	.016	.017	0.022	0.020	0.027	.016	.012	.039	.007	.008
CuO	.0012	.00066	.0016	.0016	.0019	.0015	.0019	.0012	.0014	.0022	.0060	.010	.0027	.0038
SrO	.013	.021	.021	.021	.019	.014	.015	.011	.010	.014	.018	.020	.022	.023
Ag_2O	------	------	------	------	------	------	------	------	------	------	------	------	------	------

	1536	1537	1538	1539	1540	1541	1542	1543	1544	1545	1546	1547	1548
TiO_3	0.002	0.002	0.0047	0.002	0.008	0.002	0.006	0.002	0.002	0.0036	0.0044	0.002	0.012
Cr_2O_3	------	------	------	.0005	.0005	------	------	------	.0005	------	------	------	.0025
MnO	.010	.016	.009	.058	.050	.032	.036	.037	.078	.048	.029	.028	.038
CuO	.0018	.0095	.0031	.0044	.0026	.0016	.0021	.0015	.0037	.0023	.0023	.0024	.0024
SrO	.019	.026	.023	.016	.015	.017	.015	.015	.012	.012	.015	.015	.0098
Ag_2O	------	.0002	------	------	------	------	------	------	------	------	------	------	.00055

	1549	1550	1551	1561		1562		1563		1564		1565	
TiO_2	0.0036	0.0032	0.011	0.003	0.029	0.002	0.002	0.002	0.006	0.019	0.01	0.0092	0.008
Cr_2O_3	------	------	------	------	.0008	------	------	------	------	.0006	------	------	------
MnO	.028	.019	.018	.017	.049	.030	.028	.014	.024	.04	.045	.021	.019
CuO	.0027	.0017	.0020	.0047	.00093	.00052	.00047	.0013	.0006	.00077	.00066	.00071	.00077
SrO	.013	.010	.011	.012	.0094	.011	.013	.0098	.012	.016	.011	.014	.013
Ag_2O	.00088	.00041	.0005	------	------	------	------	------	------	------	------	------	------

	1566	1567	1568		1566	1567	1568		1566	1567	1568
TiO_2	0.051	0.035	0.0048	MnO	0.062	0.068	0.043	SrO	0.016	0.014	0.0098
Cr_2O_3	.0013	.00083	------	CuO	.0017	.0026	.0017	Ag_2O	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1523 - 1551. Stevens County. Cambrian(?), Northport Limestone. Sec. 33, T. 38 N., R. 38 E., 0.75 mile east of town of Bossburg. Carrol property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 107, 108, 110, 112, 113, 248-251, 260, 261, 263, 264, pl. 1.) Limestone, white through gray to dark-gray, medium-grained, thin-bedded. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Cement, mineral filler, builders' lime, sugar industry, pulp and paper industry, ceramic whiting.

1523. Sample S-102.

1524 - 1530 Samples S-91 to S-97.

1531 - 1538. Samples S-104 to S-111.

1539 - 1551. Samples S-199 to S-211.

1552 - 1555. Stevens County. Northport Limestone. Secs. 27, 28, 33, 34, T. 38 N., R. 38 E., Bossburg, Silver Queen Mountain. Analyst, A. A. Hammer. (Shedd, 1913, p. 150, 151, 245, pl. 21.) Limestone, white or gray, crystalline, stratified. Thin-section description. Index map. Possible use: Portland cement.

1552 - 1554. Samples 46-48. (Mills, 1962, p. 107, 111.)

1555. Sample 49.

1556 - 1560 Stevens County. Northport Limestone. T. 38 N., R. 38 E., near Bossburg. Analyst, A. A. Hammer. Samples 90-94. (Shedd, 1913, p. 150, 151, 246, pl. 21; Mills, 1962, p. 107, 111.) Limestone, gray, coarsely crystalline, stratified. Thin-section description. Index map. Possible use: Portland cement.

Washington—Continued

1561 - 1568. Stevens County. Northport Limestone. SE¼ SW¼ sec. 29, T. 38 N., R. 41 E., 2 miles north of town of Aladdin. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 70-73, 247, 258, 264, pls. 1, 3.) Limestone, light-gray, medium- to coarse-grained, massive; 160 ft thick. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, mineral filler, pulp and paper industry, builders' lime.

1561 - 1565. Samples S-24 to S-28 represent 30 ft.

1566, 1567. Samples S-160, S-161 represent 160 ft. May be some contamination by soil particles.

1568. Sample S-162 represents 45 ft.

1569 - 1574. Stevens County. Northport Limestone. SW¼ sec. 13, T. 39 N., R. 39 E., about 4 miles south of town of Northport. Norton and Ornduff property. (Hodge, 1938d, p. 13, 95, 116, 119-121; Mills, 1962, p. 74, 93-95.) Tonnage estimated. Index and geologic maps. Use: Pulp and paper industry.

1569. Analyst, E. W. Lazell. Limestone, gray to dark-gray, fine-grained, moderately well bedded; 50-75 ft thick. Possible use: Portland cement.

1570 - 1574. Limestone, white to cream, crystalline, laminated.

1570. Possible use: Portland cement.

1571 - 1574. Analyst, E. W. Lazell.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1575	1576	1577	1578	1579	1580	1581	1582	1583	1584	1585	1586	1587
	46F_2 41-114	46F_2 42-114	46F_2 42-115	46F_2 42-116	46F_2 42-117	46F_2 42-118	46F_2 42-119	46F_2 42-120	46F_2 42-121	46F_2 42-122	46F_2 42-123	46F_2 41-109	46F_2 41-280
SiO_2	------	2.16	1.40	1.50	1.33	2.02	6.00	2.31	4.17	2.54	1.16	1.98	------
R_2O_3	------	1.39	.74	.79	.65	.94	2.30	.90	1.56	1.13	.31	.40	------
MgO	------	1.29	1.42	1.43	.56	1.26	.80	.75	1.20	.93	.46	2.92	10.5
CaO	55.44	51.34	52.44	52.30	54.38	52.80	49.96	52.99	51.23	52.50	54.49	52.25	[1]47.4
P_2O_5	------	.010	.004	.006	.011	.004	.014	.006	.009	.007	.017	------	------
Ignition loss	------	[2]42.72	[2]43.65	[2]43.38	[2]42.91	[2]42.61	[2]40.02	[2]42.35	[2]41.62	[2]41.98	[2]43.26	42.87	------
Total	[55.44]	[3][98.91]	[3][99.65]	[3][99.41]	[99.84]	[99.63]	[99.09]	[99.31]	[99.79]	[99.09]	[99.70]	100.42	[57.9]
Class	0,0,99	0,4,94	0,3,97	0,3,96	1,2,97	0,3,96	2,8,89	1,3,95	2,5,93	1,3,94	1,1,98	1,1,96	0,0,92
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite

	Washington—Continued												
	1588	1589	1590	1591	1592	1593	1594	1595	1596	1597	1598	1599	1600
	46F_2 41-279	46F_2 41-278	46F_2 41-271	46F_2 42-124	46F_2 42-125	46F_2 42-126	46F_2 42-127	46F_2 .42-128	46F_2 42-129	46F_2 42-130	46F_2 42-131	46F_2 42-132	46F_2 42-133
SiO_2	------	------	------	4.59	3.13	3.12	5.11	4.08	0.59	0.53	0.54	0.70	2.56
R_2O_3	------	------	------	1.33	1.18	1.42	1.52	1.40	.31	.35	.29	.37	.36
MgO	6.04	5.6	2.49	1.96	1.21	1.95	2.60	2.90	.64	.52	.62	.60	.69
CaO	[1]50.4	[1]51.0	[1]52.7	50.48	52.06	51.23	48.98	49.58	54.70	54.66	54.77	54.66	53.59
P_2O_5	------	------	------	.014	.014	.018	.009	. .018	.005	.005	.003	.058	.039
Ignition loss[2]	------	------	------	41.56	42.22	42.32	41.46	41.61	43.54	43.51	43.30	42.73	42.03
Total	[56.4]	[56.6]	[55.2]	[99.93]	[99.81]	[100.06]	[99.68]	[99.59]	[99.78]	[99.58]	[99.52]	[99.12]	[99.27]
Class	0,0,97	0,0,97	0,0,99	2,4,93	1,3,95	1,4,95	3,4,92	2,4,93	0,1,99	0,1,99	0,1,98	0,1,97	2,1,95
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1601	1602	1603	1604	1605	1606	1607	1608	1609	1610	1611	1612	1613
	46F_2 42-134	46F_2 42-135	46F_2 42-136	46F_2 42-137	46F_2 42-138	46F_2 42-139	46F_3 42-140	46F_2 42-141	46F_2 42-142	46F_2 42-143	46F_2 42-144	46F_2 42-145	46F_2 42-146
SiO_2	3.76	4.68	1.57	1.88	1.61	0.75	3.00	0.29	1.08	0.66	0.93	1.65	2.35
Al_2O_3	2.31	1.43	.61	.99	1.09	.72	.97	.47	.93	.46	.33	1.31	.77
Fe_2O_3	.16	.36	.16	.22	.24	.08	.22	.16	.28	.10	.06	4.27	.24
MgO	.98	6.63	.53	3.42	1.21	4.07	.91	.35	8.35	.34	.33	.61	.71
CaO	51.83	44.99	54.68	50.72	53.85	50.55	52.68	55.36	45.21	55.62	55.35	51.48	53.86
Ignition loss	40.57	41.68	42.59	42.93	42.52	43.55	42.01	43.11	43.98	43.18	43.09	40.55	42.15
Total	[99.61]	[99.77]	[100.14]	[100.16]	[100.52]	[99.72]	[99.79]	[99.74]	[99.83]	[100.36]	[100.09]	[99.87]	[100.08]
Class	0,6,91	2,5,91	0,2,96	0,3,96	0,3,96	0,1,97	1,3,94	0,1,98	0,2,96	0,1,98	0,1,98	0,3,91	1,3,95
CaO/MgO	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1614	1615	1616	1617	1618	1619	1620	1621	1622	1623	1624	1625	1626
	46F_2 42-148	46F_2 42-149	46F_2 42-150	46F_2 42-151	46F_2 42-152	46F_2 42-153	46F_2 42-154	46F_2 42-155	46F_2 42-156	46F_2 41-164	46F_2 41-165	46F_2 41-166	46F_2 41-168
SiO_3	3.96	2.33	8.43	5.58	0.33	3.27	0.69	1.59	3.00	1.59	1.35	1.70	7.33
Al_2O_3	1.31	1.79	.94	.65	.21	1.10	.81	.82	.46	[5].36	[5].38	[5].41	[5].43
Fe_2O_3	.20	.22	.14	.26	.08	.24	.14	.14	.04				
MgO	1.45	1.17	1.35	.57	.49	1.42	.33	.61	.88	[1]21.20	[1]21.35	[1]21.37	[1]19.99
CaO	52.41	53.07	50.02	52.21	55.92	53.02	55.28	54.37	53.80	[1]30.03	[1]30.03	[1]29.80	[1]28.24
Ignition loss	41.24	41.93	39.49	40.83	43.32	41.30	43.03	42.02	42.30	[6]46.73	[6]46.89	[6]46.72	[6]44.01
Total	[100.57]	[100.51]	[100.37]	[100.10]	[100.35]	[100.35]	[100.28]	[99.55]	[100.48]	[99.91]	[100.00]	[100.00]	[100.00]
Class	1,4,92	0,4,94	7,3,89	4,3,92	0,1,98	1,4,93	0,1,97	0,3,95	2,1,96	1,1,98	1,1,98	1,1,98	7,1,92
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1627	1628	1629	1630	1631	1632	1633	1634	1635	1636	1637	1638	1639
	46F_2 41-169	46F_2 41-170	46F_2 41-171	46F_2 41-129	46F_2 41-130	46F_2 41-131	46F_2 41-132	46F_2 41-133	46F_2 41-134	46F_2 41-135	46F_2 41-136	46F_2 41-137	46F_2 41-138
SiO_2	0.84	1.56	1.58	1.0	[7]1.7	0.6	[7]1.4	[7]2.0	0.7	[7]2.6	[7]1.5	[7]4.4	[7]1.9
R_2O_3	.31	.40	.26	1.1	.8	.7	1.0	1.2	.7	1.1	.5	1.3	1.2
MgO	[1]21.44	[1]21.25	[1]21.30	21.6	21.3	21.7	21.1	20.8	21.3	21.1	21.4	20.4	20.9
CaO	[1]30.25	[1]30.02	[1]30.03	30.0	29.6	29.9	30.2	29.8	30.4	29.7	29.9	28.8	29.6
Ignition loss	[6]47.16	[6]46.77	[6]46.83	46.1	45.8	46.2	46.3	46.0	47.0	45.8	46.4	44.5	45.8
Total	[100.00]	[100.00]	[100.00]	[99.8]	[99.2]	[99.1]	[100.0]	[99.8]	[100.1]	[100.3]	[99.7]	[99.4]	[99.4]
Class	0,1,99	1,1,98	1,1,98	0,2,96	0,2,96	0,1,97	0,2,97	0,3,96	0,1,98	1,3,95	1,1,97	2,4,93	0,3,95
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

[1] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[2] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[3] A composite of samples 1576-1578 contained $Na_2O = 250$ ppm, $K_2O = 620$ ppm, $TiO_2 = < 30$ ppm, S= 180 ppm.

[4] A composite of samples 1596-1600 contained $Na_2O = 220$ ppm, $K_2O= 570$ ppm, $TiO_2= 40$ ppm, S = 45 ppm.

[5] R_2O_3.

[6] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[7] Includes insoluble.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_5, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_2, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_2, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_2, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 1578, Ag_2O = 0.00045 percent]

	1576	1577	1578	1579	1580	1581	1582	1583	1584	1585	1591	1592	1593	1594
Na_2O	------	------	------	0.071	0.05	0.05	0.05	0.05	0.05	------	0.20	0.13	0.075	0.14
TiO_2	0.014	0.0084	0.011	.014	.029	.061	.032	.054	.022	0.026	.032	.026	.027	.042
Cr_2O_2	.00077	.0005	.0005	.0005	.0007	.0014	.00067	.0012	.00064	.0005	.0005	.0005	.0005	.0005
MnO	.027	.021	.025	.045	.033	.050	.020	.035	.017	.028	.11	.072	.066	.070
NiO	------	.0038	.001	------	------	------	------	------	------	------	------	------	------	------
CuO	.0024	.0126	.0010	.0011	.0016	.0021	.0012	.0020	.0016	.00077	.0020	.0028	.0018	.0019
SrO	.013	.014	.012	.012	.015	.013	.018	.022	.016	.020	.021	.025	.027	.020
ZrO_2	------	------	------	.002	------	------	------	------	------	------	.002	------	------	.0051

	1595	1596	1597	1598	1599	1600
Na_2O	0.16	------	------	------	------	------
TiO_2	.041	0.01	0.0084	0.012	0.011	0.008
Cr_2O_2	.0005	------	------	------	------	------
MnO	.052	.021	.012	.017	.014	.02
NiO	------	------	------	------	------	------
CuO	0.0019	0.00088	0.00051	0.0006	0.00088	0.00071
SrO	.020	.014	.017	.014	.014	.013
ZrO_2	------	------	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1575. Stevens County. Cambrian(?), Northport Limestone. SW¼ sec. 13, T. 39 N., R. 39 E., about 4 miles south of town of Northport. Norton and Ornduff property. Analyst, E. W. Lazell. (Hodge, 1938d, p. 13, 95, 116, 119-121; Mills, 1962, p. 74, 93.) Limestone, white to cream, crystalline, laminated. Tonnage estimated. Index and geologic maps. Use: Pulp and paper industry.

1576 - 1585. Stevens County. Northport Limestone. SE¼ sec. 13, T. 39 N., R. 39 E., about 3 miles southwest of Northport. Makynen property, formerly Norton Ornduff property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 93-95, 247, 250, 257, 264, pl. 1.) Tonnage estimated. Index and geologic maps. Possible use: Portland cement.

1576. Sample S-12. Limestone, yellow-white, coarse-grained, micaceous. Chip sample from outcrop, represents 11 ft. Former use: Pulp and paper industry.

1577. Sample S-13. Limestone, gray, fine-grained. Chip sample from outcrop, represents 54 ft. Former use: Pulp and paper industry.

1578. Sample S-14. Limestone, yellow-white, coarse-grained. Chip sample from outcrop, represents 45 ft. Former use: Pulp and paper industry.

1579 - 1584. Samples S-190 to S-195. Limestone, samples represent 400 ft.

1585. Sample S-196. Limestone. Grab sample from abandoned quarry.

1586 - 1595. Stevens County. Northport Limestone. Sec. 13, T. 39 N., R. 39 E., about 3 miles southwest of Northport. Index and geologic maps.

1586 - 1590. Janni quarry. (Mills, 1962, p. 74, 76, 77.) Limestone, white to pale-yellow-white, fine- to medium-grained, massive. Use: Food additive, agricultural, terrazzo flooring, pulp and paper industry, plaster, roofing, stucco.

1586. Analyst, A. A. Hammer. Sample 51. (Shedd, 1913, p. 154, 155, 245, pl. 21.) Possible use: Portland cement [implied].

1591 - 1595. South of Janni quarry. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-185 to S-189. (Mills, 1962, p. 12, 13, 74, 76-78, 250, 263, 264, pl. 1.) Limestone, gray, fine- to medium-grained, thin-bedded. Chip sample from outcrop.

1596 - 1600. Stevens County. Northport Limestone. SW¼SW¼ sec. 25, T. 39 N., R. 39 E., 5 miles southwest of Northport. Onion Creek deposit, Menegas property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-29 to S-33. (Mills, 1962, p. 12, 13, 81-83, 247, 258, 264, pl. 1.) Limestone, white, medium-grained, moderately well bedded; weathers white to light gray; minimum thickness 210 ft. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Portland cement, mineral filler, chemical, metallurgical, builders' lime, sugar industry, pulp and paper industry.

1601 - 1622. Stevens County. Northport Limestone. SW¼SW¼ sec. 26, T. 39 N., R. 39 E., 6 miles southwest of Northport. Ideal Cement Co. (Mills, 1962, p. 74, 96, 100, 101, 102, pls. 1, 4.) Tonnage estimated. Index and geologic maps, geologic section. Possible use: Cement.

Washington—Continued

1601 - 1609. Diamond-drill hole 4, drilled at inclination of -70°. Limestone, predominantly gray, fine-grained, bedded; total thickness at least 800 ft. [For another analysis from same drill hole, see sample 132, group C.]

	Depth (ft)		Depth (ft)
1601.	351-413	1606.	134-191
1602.	309-351	1607.	108-134
1603.	264-309	1608.	64- 96
1604.	220-264	1609.	1- 64
1605.	191-212		

1610 - 1612. Diamond-drill hole 4A, drilled at inclination of +15°. Limestone, predominantly gray, fine-grained, bedded; total thickness at least 800 ft. [For other analyses from same drill hole, see samples 133-135, group C; samples 430-435, group F_1.]

	Drill hole interval
1610.	0- 64
1611.	64-151
1612.	151-156

1613. Diamond-drill hole 4A. Limestone, predominantly gray, fine-grained, bedded; total thickness at least 800 ft; and limestone, white to light-gray, medium- to coarse-grained, relatively massive; estimated 750 ft thick. Drill hole interval 156-214 ft.

1614 - 1622. Diamond-drill hole 4A. Limestone, white to light-gray, medium- to coarse-grained; estimated 750 ft thick.

	Drill hole interval		Drill hole interval
1614.	241-261	1619.	710-761
1615.	276-300	1620.	761-783
1616.	655-687	1621.	786-860
1617.	688-692	1622.	860-901
1618.	693-708		

1623 - 1639. Stevens County. Northport Limestone. NE¼ sec. 27, T. 39 N., R. 39 E., 2 miles east of town of Marble. (Deiss, 1955, p. 119-121, 127, 132, 133-135, pls. 14, 15.) Index and geologic maps, geologic sections, detailed measured section. Use: Source of magnesium [implied].

1623 - 1629. Analyst, Esther Claffy. Samples 36-38, 40-43. Dolomite.

1630, 1631. Analyst, E. S. Leaver. Samples 1, 2. Unit description: Dolomite, pale-gray, finely to medium crystalline, dense, thick-bedded; some irregular beds of black-gray dolomite mottled light-gray in spots or stringers; 47 ft thick.

1632. Analyst, E. S. Leaver. Sample 3. Dolomite.

1633 - 1635. Analyst, E. S. Leaver. Samples 4-6. Unit description: Dolomite, gray, finely to medium crystalline; 59 ft thick.

1636 - 1638. Analyst, E. S. Leaver. Samples 7-9. Unit description: Dolomite, gray; 50 ft thick.

1639. Analyst, E. S. Leaver. Sample 10. Unit description: Dolomite, dull-gray, gray, and blue-gray banded, finely to medium crystalline, thick-bedded or unbedded; 88 ft thick.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1640	1641	1642	1643	1644	1645	1646	1647	1648	1649	1650	1651	1652
	$46F_2$ 41-139	$46F_2$ 41-140	$46F_2$ 41-141	$46F_2$ 41-142	$46F_2$ 41-143	$46F_2$ 41-144	$46F_2$ 41-145	$46F_2$ 41-146	$46F_2$ 41-147	$46F_2$ 41-148	$46F_2$ 41-149	$46F_2$ 41-150	$46F_2$ 41-151
SiO_3	0.5	[1]1.3	[1]1.4	0.6	[1]2.7	0.5	0.5	1.0	[1]1.4	0.6	[1]3.0	[1]4.5	1.0
R_2O_3	.7	.7	.5	.8	.4	1.0	.4	.4	.4	.3	.6	.6	.5
MgO	20.8	20.8	21.2	21.4	21.1	21.5	21.7	21.6	21.5	21.8	21.1	20.9	21.6
CaO	30.3	30.4	30.0	30.2	29.7	30.3	30.4	30.1	30.1	30.1	29.5	28.8	30.0
Ignition loss	46.6	46.4	46.3	46.7	45.7	47.0	47.1	46.8	46.7	46.9	45.5	44.8	46.6
Total	[98.9]	[99.6]	[99.4]	[99.7]	[99.6]	[100.3]	[100.1]	[99.9]	[100.1]	[99.7]	[99.7]	[99.6]	[99.7]
Class	0,1,98	0,2,97	1,1,97	0,1,98	2,1,96	0,1,98	0,1,99	0,1,98	1,1,98	0,1,98	2,2,95	3,2,93	0,1,97
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

	Washington—Continued												
	1653	1654	1655	1656	1657	1658	1659	1660	1661	1662	1663	1664	1665
	$46F_2$ 41-152	$46F_2$ 41-153	$46F_2$ 41-155	$46F_2$ 41-156	$46F_2$ 41-157	$46F_2$ 41-158	$46F_2$ 41-159	$46F_2$ 41-160	$46F_2$ 41-161	$46F_2$ 41-162	$46F_2$ 41-163	$46F_2$ 41-268	$46F_2$ 42-157
SiO_2	[1]1.7	0.7	0.6	[1]1.2	[1]2.6	0.8	0.6	0.7	0.9	1.0	[1]1.6	0.30	0.65
Al_2O_3	[2].7	[2].4	[2].5	[2].6	[2].6	[2].3	[2].5	[2].3	[2].3	[2].4	[2].5	[2].10	.55
Fe_2O_3													.06
MgO	21.5	21.6	21.6	21.5	20.9	21.3	21.4	21.5	21.5	21.5	21.3	------	.40
CaO	29.9	30.0	30.3	29.7	29.6	30.3	30.3	30.3	30.4	30.2	29.8	[3]55.60	55.36
Ignition loss	46.4	46.0	46.2	45.7	45.8	46.9	46.9	46.6	46.5	46.0	46.0	[4]43.64	43.14
Total	[100.2]	[98.7]	[99.2]	[98.7]	[99.5]	[99.6]	[99.7]	[99.4]	[99.6]	[99.1]	[99.2]	[99.64]	[100.16]
Class	1,2,97	0,1,96	0,1,97	0,2,95	2,2,96	0,1,98	0,1,98	0,1,98	0,1,97	0,1,96	1,1,96	0,0,99	0,1,98
CaO/MgO	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Calcite	Calcite

	Washington—Continued												
	1666	1667	1668	1669	1670	1671	1672	1673	1674	1675	1676	1677	1678
	$46F_2$ 42-158	$46F_2$ 42-159	$46F_2$ 42-160	$46F_2$ 42-161	$46F_2$ 42-163	$46F_2$ 42-164	$46F_2$ 42-165	$46F_2$ 42-166	$46F_2$ 42-167	$46F_2$ 42-188	$46F_2$ 42-169	$46F_2$ 42-170	$46F_2$ 42-171
SiO_3	0.84	1.35	1.64	1.32	2.32	2.40	2.16	2.28	2.55	0.28	0.28	1.64	6.60
Al_2O_3	.72	.54	1.44	.57	.71	1.03	.58	.69	.54	.63	.19	.39	.16
Fe_2O_3	.45	.16	.49	.12	.10	.04	.08	.16	.10	.08	.08	.14	.12
MgO	11.20	.76	11.43	.29	1.40	2.09	.57	.67	.57	.56	.85	.79	6.59
CaO	42.11	54.29	42.00	55.19	52.62	51.35	54.31	53.18	53.39	55.27	54.84	54.82	45.41
Ignition loss	44.73	42.95	43.90	42.80	42.48	42.39	42.59	42.57	42.34	43.43	43.52	42.73	41.49
Total	[100.05]	[100.05]	[100.90]	[100.29]	[99.63]	[99.30]	[100.29]	[99.55]	[99.49]	[100.25]	[99.76]	[100.51]	[100.37]
Class	0,2,97	0,2,97	0,3,95	0,2,97	1,2,96	1,3,95	1,2,96	1,2,96	1,2,96	0,0,98	0,1,99	1,2,97	6,1,92
CaO/MgO	Calcareous dolomite	Calcite	Calcareous dolomite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite

	Washington—Continned												
	1679	1680	1681	1682	1683	1684	1685	1686	1687	1688	1689	1690	1691
	$46F_2$ 42-172	$46F_2$ 42-173	$46F_2$ 42-174	$46F_2$ 41-93	$46F_2$ 41-264	$46F_2$ 42-175	$46F_2$ 42-176	$46F_2$ 42-177	$46F_2$ 42-178	$46F_2$ 42-263	$46F_2$ 42-264	$46F_2$ 42-265	$46F_2$ 42-266
SiO_3	3.33	2.64	8.12	------	------	1.37	2.27	2.68	6.89	[5]0.90	------	------	------
Al_2O_3	.28	.22	.77	------	------	[2].68	[2]1.04	[2]1.17	[2]2.25	[5].19	------	------	------
Fe_2O_3	.08	.06	.24	------	------					[5].18	------	------	------
MgO	2.34	1.52	3.34	1.47	1.50	.94	.42	.59	1.32	.54	0.54	1.40	0.77
CaO	51.86	53.34	47.83	[3]53.1	[3]52.9	53.48	53.48	53.18	49.13	55.18	54.84	54.12	54.90
P_2O_5	------	------	------	------	------	.034	.025	.032	.057	[5].016	------	------	------
Ignition loss	42.17	42.39	39.72	[4]43.3	[4]43.2	[6]43.00	[6]42.49	[6]42.21	[6]40.11	------	------	------	------
Total	[100.06]	[100.17]	[100.02]	[97.9]	[97.6]	[99.50]	[99.72]	[99.86]	[99.76]	[57.01]	[55.38]	[55.52]	[55.67]
Class	3,1,95	2,1,96	6,3,88	0,0,98	0,0,98	0,2,97	1,3,96	1,3,95	3,7,89	0,1,97	0,1,98	0,1,97	0,1,97
CaO/MgO	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Includes insoluble.

[2] R_2O_2.

[3] Calculated from reported $CaCO_3$.

[4] CO_2, calculated from reported MgO and (or) $CaCO_3$.

[5] Equal weighted composite of samples 1688-1693.

[6] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_5, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_5, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 1687, $PbO = 0.002$ percent]

	1684	1685	1686	1687		1684	1685	1686	1687
Na_2O	0.05	0.05	0.05	0.35	MnO	0.10	0.075	0.088	0.16
TiO_2	.014	.02	.041	.052	CuO	.0013	.0019	.0021	.0030
Cr_2O_5	------	.0005	.0005	.001	SrO	.015	.014	.027	.025

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1640 - 1663. Stevens County. Cambrian(?), Northport Limestone. NE¼ sec. 27, T. 39 N., R. 39 E., 2 miles east of town of Marble. Analyst, E. S. Leaver. (Deiss, 1955, p. 119-121, 127, 133-135, pls. 14, 15.) Index and geologic maps, geologic sections, detailed measured section. Use: Source of magnesium.

1640, 1641. Samples 11, 12. Unit description: Dolomite, dull-gray, gray, and blue-gray banded, finely to medium crystalline, thick-bedded or unbedded; 88 ft thick.

1642 - 1644. Samples 13-15. Unit description: Dolomite, dull-gray, medium-crystalline to sugary, thick-bedded; alternating bands of black-gray dolomite mottled with small light-gray spots and streaks; 64 ft thick.

1645 - 1647. Samples 16-18. Unit description: Same as samples 1642-1644; 70 ft thick.

1648, 1649. Samples 19, 20. Unit description: Same as samples 1640, 1641; contains black beds; 28 ft thick.

1650 - 1652. Samples 21-23. Unit description: Same as samples 1642-1644; 62 ft thick.

1653. Sample 24. Unit description: Dolomite, light-gray, fine to microcrystalline, thick-bedded; some irregular masses of black dolomite; 31 ft thick.

1654, 1655. Samples 25, 27. Unit description: Dolomite, pale- and light-gray, some beds dark-gray; finely crystalline, slightly vitreous on fresh fracture; 18 ft thick.

1656 - 1658. Samples 28-30. Unit description: Dolomite, faint-blue to dull-light-gray, finely to medium crystalline, unbedded or thick-bedded; 49 ft thick.

1659. Sample 31. Unit description: Same as samples 1656-1658; 15 ft thick.

1660, 1661. Samples 32, 33. Unit description: Dolomite, light-gray; contains irregular black-gray masses; 16 ft thick.

1662, 1663. Samples 34, 35. Unit description: Dolomite, light- and dark-gray; contains black irregular masses mottled with light gray; 32 ft thick.

1662. Dolomite, black, mottled.
1663. Dolomite, light-gray.

1664. Stevens County. Northport Limestone (Mills, 1962, p. 74). Secs. 28, 33, T. 39 N., R. 39 E., Marble Mountain. Lazy S Ranch. Analyst, H. M. Brewer. (Hodge, 1944, p. 51, 52, pl. 4.) Limestone. Tonnage estimated. Index map.

1665 - 1676. Stevens County. Northport Limestone. NE¼ NW¼ sec. 35, T. 39 N., R. 39 E., 6 miles southwest of town of Northport. Ideal Cement Co. (Mills, 1962, p. 74, 96, 97, 99, 100, 102, pls. 1, 4.) Diamond-drill hole 1; 828 ft drilled at an inclination of -45°. Tonnage estimated. Index and geologic maps, geologic section. [For other analyses from same drill hole, see sample 103, group E; samples 438, 439, group F_1.]

1665, 1666. Unit description: Limestone, predominantly gray, fine-grained, bedded; interbeds of dark-gray to black dolomite; depth 760-820 ft. Possible use: None, rock impure.

1665. Limestone, depth 774-787 ft.
1666. Dolomite, depth 760-764 ft.

Washington—Continued

1667 - 1671. Unit description: Limestone, white to light-gray, medium- to coarse-grained, relatively massive; interbeds of dolomitic limestone; depth 292-760 ft. Possible use: Cement.

1667. Limestone, depth 655-760 ft.
1668. Dolomitic limestone, depth 642-655 ft.
1669. Limestone, depth 561-642 ft.
1670. Limestone, depth 391-490 ft.
1671. Limestone, depth 292-391 ft.

1672 - 1676. Unit description: Same as samples 1667-1671; depth 0-292 ft. Possible use: Mineral filler, pulp and paper industry, builders' lime.

	Depth (ft)
1672.	249-292
1673.	117-249
1674.	69- 93.5
1675.	10- 61
1676.	0- 6.5

1677 - 1681. County, formation, locality [except quarter section], reference, maps, and section as in samples 1665-1676. NW¼ NW¼ sec. 35. Diamond-drill hole 11; 346 ft drilled at an inclination of -45°. Tonnage estimated. [For another analysis from same drill hole, see sample 440, group F_1.]

1677. Unit description: Limestone, white to light-gray, medium- to coarse-grained, relatively massive; estimated 750 ft thick. Limestone, depth 280-346 ft. Possible use: Cement.

1678 - 1671. Unit description: Limestone, dark-gray to black, some gray beds, medium- to coarse-grained, bedded; 0-280 ft thick. Use: None, rock impure.

	Depth (ft)
1678.	100-210
1679.	50-100
1680.	10- 50
1681.	0- 10

1682 - 1687. Stevens County. Northport Limestone. Sec. 7, T. 39 N., R. 40 E., about 2 miles southwest of Northport. Limestone, white to cream-white to light-gray, medium-grained, bedded; about 40 ft thick. Index and geologic maps. Possible use [except sample 1687]: Portland cement, mineral filler, builders' lime.

1682, 1683. (Mills, 1962, p. 78, 79-81.)
1684 - 1687. Janni property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-180 to S-183. (Mills, 1962, p. 12, 13, 78-81, 250, 263, 264, pl. 1.) Tonnage estimated.
1687. Use: Probably none, rock impure.

1688 - 1691. Stevens County. Northport Limestone. W½ sec. 8, T. 39 N., R. 40 E., about 1 mile south of Northport. John Sherve property. Samples 1-4. (Mills, 1962, p. 85-87, 88, 89, pl. 1.) Limestone, light-gray to gray, medium-grained, moderately well bedded; about 300 ft exposed. Tonnage estimated. Index and geologic maps. Possible use: Chemical, metallurgical, calcium carbide manufacture, sugar industry, pulp and paper industry.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1692	1693	1694	1695	1696	1697	1698	1699	1700	1701	1702	1703	1704
	$46F_2$ 42-267	$46F_2$ 42-268	$46F_2$ 42-179	$46F_2$ 42-180	$46F_2$ 42-181	$46F_2$ 42-182	$46F_2$ 42-183	$46F_2$ 42-184	$46F_2$ 42-185	$46F_2$ 42-186	$46F_2$ 42-187	$46F_2$ 42-188	$46F_2$ 42-189
SiO_2	------	------	0.39	0.13	0.35	0.69	1.29	0.21	0.37	0.25	1.54	0.14	0.19
R_2O_3	------	------	.12	.16	.17	.14	.00	.10	.14	.19	.21	.20	.10
MgO	0.54	0.64	.27	.26	.20	.34	.28	.42	.32	.56	.49	.35	.17
CaO	55.08	54.24	55.35	55.35	55.28	54.83	54.90	55.32	55.13	55.08	54.53	55.35	55.47
P_2O_5	------	------	.003	.003	.006	.006	.012	.006	.007	.003	.004	.004	.007
Ignition loss [1]	------	------	43.15	43.18	43.29	43.34	42.96	43.71	43.68	43.82	43.21	43.93	43.73
Total	[55.62]	[54.88]	[99.28]	[99.08]	[99.30]	[99.35]	[99.44]	[2][99.77]	[2][99.65]	[2][99.90]	[2][99.98]	[99.97]	[99.67]
Class	0,1,98	0,1,98	0,0,98	0,0,98	0,0,98	0,0,98	1,0,98	0,0,99	0,0,99	0,0,99	1,1,98	0,0,100	0,0,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1705	1706	1707	1708	1709	1710	1711	1712	1713	1714	1715	1716	1717
	$46F_2$ 42-190	$46F_2$ 42-191	$46F_2$ 42-192	$46F_2$ 42-193	$46F_2$ 42-194	$46F_2$ 42-195	$46F_2$ 42-200	$46F_2$ 42-199	$46F_2$ 42-198	$46F_2$ 42-197	$46F_2$ 42-196	$46F_2$ 42-201	$46F_2$ 42-202
SiO_2	0.66	0.25	1.28	0.71	1.17	0.22	2.51	3.87	2.82	3.26	1.96	0.38	0.24
R_2O_3	.19	.19	.15	.31	.00	.20	1.29	1.85	1.27	1.42	.72	.20	.22
MgO	.51	.31	.35	1.05	.26	.68	.79	.95	.88	1.02	1.17	.50	.45
CaO	55.35	55.43	54.90	54.23	54.90	54.90	52.85	51.55	52.80	51.67	52.92	55.13	55.08
P_2O_5	.009	.005	.010	.010	.003	.003	.007	.008	.011	.014	.009	.007	.005
Ignition loss [1]	43.07	43.30	42.65	42.76	43.12	43.03	42.72	41.87	42.43	41.72	42.94	43.80	43.85
Total	[99.79]	[99.48]	[99.34]	[99.07]	[99.45]	[99.03]	[3][100.17]	[3][100.10]	[3][100.21]	[3][99.10]	[3][99.72]	[100.02]	[99.84]
Class	0,1,98	0,0,98	1,0,97	0,1,97	1,0,98	0,0,98	0,4,96	1,5,94	1,4,95	1,4,94	1,2,97	0,1,99	0,1,99
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1718	1719	1720	1721	1722	1723	1724	1725	1726	1727	1728	1729	1730
	$46F_2$ 42-203	$46F_2$ 42-204	$46F_2$ 42-205	$46F_2$ 42-206	$46F_2$ 42-207	$46F_2$ 41-270	$46F_2$ 42-208	$46F_2$ 42-209	$46F_2$ 42-210	$46F_2$ 42-211	$46F_2$ 41-208	$46F_2$ 41-209	$46F_2$ 42-212
SiO_2	1.15	1.67	0.90	1.44	0.69	0.3	0.80	0.60	1.24	1.50	5.26	3.15	2.52
Al_2O_3	[4].76	[4].98	[4].32	[4].31	[4].42	Trace	[4].41	[4].45	[4].30	[4].64	1.46	.41	[4].28
Fe_2O_3						Trace							
MgO	2.05	2.00	2.48	6.22	2.47	[5].70	.53	1.02	3.98	.75	14.90	20.11	.63
CaO	52.60	52.32	52.31	47.67	52.42	[5]54.85	55.20	54.84	50.12	53.81	32.56	31.55	53.08
P_2O_5	.008	.007	.035	.043	.056	------	.060	.040	.040	.010	------	------	.001
Ignition loss	[1]43.25	[1]42.99	[1]43.18	[1]43.63	[1]43.40	[6]43.82	[1]43.66	[1]43.25	[1]43.78	[1]43.16	43.96	43.91	[1]43.16
Total	[99.82]	[99.97]	[99.22]	[99.31]	[99.46]	[99.7]	[7][100.66]	[7][100.20]	[7][99.46]	[7][99.87]	98.14	99.13	[99.67]
Class	0,2,97	0,3,96	0,1,97	1,1,97	0,1,97	0,0,99	0,1,99	0,1,98	1,1,98	0,2,97	3,6,89	2,1,92	2,2,96
CaO/MgO	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcareous dolomite	Dolomite	Calcite

	Washington—Continued											
	1731	1732	1733	1734	1735	1736	1737	1738	1739	1740	1741	1742
	$46F_2$ 42-213	$46F_2$ 42-214	$46F_2$ 42-215	$46F_2$ 42-216	$46F_2$ 42-217	$46F_2$ 42-218	$46F_2$ 42-219	$46F_2$ 42-220	$46F_2$ 42-221	$46F_2$ 42-222	$46F_2$ 42-223	$46F_2$ 42-224
SiO_2	1.63	6.04	6.44	2.92	2.40	2.77	4.55	3.19	3.27	2.61	4.60	4.40
R_2O_3	.23	.69	.21	1.15	1.17	.94	1.66	1.38	1.27	1.08	1.46	1.09
MgO	.72	4.82	2.38	2.83	.79	1.42	.98	.64	1.67	1.68	1.20	1.40
CaO	54.13	46.80	49.47	50.25	53.02	52.14	51.44	52.59	51.39	51.88	49.00	48.50
P_2O_5	.003	.002	.003	.020	.016	.027	.022	.011	.009	.019	.032	.043
Ignition loss [1]	43.01	41.68	41.35	42.63	42.68	42.33	41.31	41.97	42.17	42.55	41.83	42.06
Total	[99.72]	[100.03]	[99.85]	[8][99.80]	[8][100.08]	[8][99.63]	[99.96]	[99.78]	[99.78]	[99.82]	[98.12]	[97.49]
Class	1,1,97	5,2,93	6,1,93	1,3,95	0,3,96	1,3,95	2,5,93	1,4,94	1,4,95	1,3,95	2,6,90	3,5,90
CaO/MgO	Calcite	Magnesian calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[2] A composite of samples 1699-1702 contained Na_2O = 175 ppm, K_2O = 360 ppm, TiO_2 = < 30 ppm, S = 43 ppm.

[3] A composite of samples 1711-1715 contained Na_2O = 220 ppm, K_2O = 630 ppm, TiO_2 = 170 ppm, S = 30 ppm.

[4] R_2O_3.

[5] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[6] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[7] A composite of samples 1724-1727 contained Na_2O = 250 ppm, K_2O = 570 ppm, TiO_2 = 70 ppm, S = 40 ppm.

[8] A composite of samples 1734-1736 contained Na_2O = 220 ppm, K_2O = 610 ppm, TiO_2 = 315 ppm, S = 30 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Na_2O, K_2O, Sc_2O_3, V_2O_5, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_3, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2; sample 1712, $Ag_2O = 0.0029$ percent; sample 1730, $Ag_2O = 0.00094$ percent; sample 1733, $NiO = 0.001$ percent; sample 1737, $Na_2O = 0.05$ percent, $V_2O_5 = 0.003$ percent, $NiO = 0.001$ percent; sample 1738, $V_2O_5 = 0.003$ percent; sample 1739, $NiO = 0.001$ percent, $V_2O_5 = 0.003$ percent; sample 1740, $Na_2O = 0.05$ percent, $Ag_2O = 0.0002$ percent]

	1694	1695	1696	1697	1698	1699	1700	1701	1702	1703	1704	1705	1706	1707
TiO_3 ----	0.004	0.002	0.010	0.0056	0.0048	------	------	------	------	------	------	0.002	------	0.006
Cr_2O_3 ---	------	------	------	------	------	------	------	------	------	------	------	------	------	------
MnO----	.035	.021	.015	.015	.011	0.013	0.016	0.027	0.026	0.02	0.014	.013	0.019	.013
CuO ----	.0012	.00088	.0010	.0010	.00088	.0011	.0011	.0017	.0014	.0019	.0027	.0014	.0018	.0016
SrO ----	.011	.0092	.010	.011	.012	.014	.013	.015	.015	.015	.015	.011	.013	.0096

	1708	1709	1710	1711	1712	1713	1714	1715	1716	1717	1718	1719	1720	1721
TiO_3 ----	0.011	0.0048	0.006	0.010	0.032	0.017	0.048	0.010	0.004	0.002	0.024	0.027	0.002	0.006
Cr_2O_3 ---	------	------	------	.00067	.0014	.0008	.0009	.0005	------	------	------	.0005	------	------
MnO----	.044	.040	.032	.025	.04	.025	.033	.015	.016	.019	.05	.054	.030	.055
CuO ----	.0012	.0014	.0021	.0024	.0016	.0016	.0014	.0010	.00066	.0012	.00077	.0016	.0005	.0007
SrO ----	.010	.011	.010	.014	.013	.012	.011	.02	.013	.012	.013	.016	.009	.0097

	1722	1724	1725	1726	1727	1730	1731	1732	1733	1734	1735	1736	1737	1738
TiO_3----	0.006	0.002	0.002	0.002	0.018	------	------	0.0048	------	0.079	0.09	0.13	0.14	0.094
Cr_2O_3 ---	------	------	.00093	.0015	.0011	------	------	------	------	.0020	.0026	.0028	.0018	.0014
MnO----	.052	.0094	.014	.025	.009	0.053	0.056	.079	0.04	.16	.21	.20	.23	.13
CuO----	.0006	.00082	.00082	.0013	.0011	.00088	.00083	.0029	.0015	.0019	.0017	.00088	.0012	.0015
SrO ----	.013	.015	.011	.012	.019	.017	.015	.021	.021	.029	.032	.020	.034	.029

	1739	1740	1741	1742		1739	1740	1741	1742		1739	1740	1741	1742
TiO_3 ---	0.11	0.072	0.022	0.014	MnO-----	0.40	0.13	0.22	0.35	SrO------	0.038	0.043	0.012	0.017
Cr_2O_3 ---	.0017	.0028	.0018	.00074	CuO-----	.0015	.0015	.0014	.0017					

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1692 - 1698. Stevens County. Cambrian(?), Northport Limestone. W½ sec. 8, T. 39 N., R. 40 E., about 1 mile south of town of Northport. John Sherve property. (Mills, 1962, p. 12, 13, 85-87, 88, 89, 250, 263, 264, pl. 1.) Limestone, light-gray, medium-grained, moderately well bedded; about 300 ft exposed. Tonnage estimated. Index and geologic maps. Possible use: Chemical, metallurgical, calcium carbide manufacture, sugar industry, pulp and paper industry.
  1694 - 1698. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-175 to S-179. Chip sample from outcrop.

1699 - 1710. Stevens County. Northport Limestone. S½ sec. 8, T. 39 N., R. 40 E., 1 mile south of Northport. Ester Sherve property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-150 to S-155, S-169 to S-174. (Mills, 1962, p. 12, 13, 86, 88, 89, 249, 250, 262-264, pl. 1.) Limestone, light-gray to gray, fine- to medium-grained, very thin bedded. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Chemical, metallurgical, calcium carbide manufacture, sugar industry, pulp and paper industry.

1711 - 1715. County, formation, analysts, and maps as in samples 1699-1710. SE¼ NW¼ sec. 18, T. 39 N., R. 40 E., southwest of Northport. Boderius property. Samples S-15 to S-19. (Mills, 1962, p. 12, 13, 90, 92, 247, 257, 258, 264, pl. 1.) Chip sample from outcrop. Index and geologic maps. Possible use: Cement.
  1711 - 1714. Limestone, pale-yellow-white, medium-grained, slightly micaceous; 225 ft thick; samples represent 47 ft.
  1715. Limestone, light-blue-gray, medium-grained; represents 60 ft.

1716 - 1719. County, formation, analysts, maps, and use as in samples 1699-1710. Sec. 18, T. 39 N., R. 40 E., 2 miles southwest of Northport. Rainey property. Samples S-156 to S-159. (Mills, 1962, p. 12, 13, 89-91, 250, 262, 264, pl. 1.) Chip sample from outcrop. Tonnage estimated.
  1716, 1717. Limestone, white to very light gray, medium-grained; moderately well bedded; 80 ft thick.
  1718, 1719. Limestone, white, fine-grained; weathers cream white; moderately well bedded.
    1718. 50 ft thick.
    1719. 80 ft thick.

1720 - 1722. Stevens County. Northport Limestone. Sec. 33, T. 40 N., R. 40 E., 0.9 mile east of Northport. Evans property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-20 to S-22. (Mills, 1962, p. 12, 13, 83-85, 247, 258, 264, pl. 1.) Limestone, light-gray, medium-grained, thin-bedded; weathers gray; few interbeds of dolomite; about 125 ft thick; overburden. Chip sample from outcrop. Index and geologic maps. Former use: Flux. Possible use: Probably none.

Washington—Continued

1723. County, formation, locality, and use as in samples 1720-1722. (Hodge, 1944, p. 53, pl. 4.) Limestone, 400 ft face. Tonnage estimated. Index map.

1724 - 1726. Stevens County. Mississippian and(or) Pennsylvanian. SW¼ sec. 1, T. 30 N., R. 40 E., about 1 mile southwest of Jumpoff Joe Lake. Brassfield property. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-35 to S-37. (Mills, 1962, p. 12, 13, 157-160, 247, 258, 264, pl. 1.) Limestone, gray, medium-grained, massive. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use [except sample 1726]: Portland cement, mineral filler, builders' lime, sugar industry, pulp and paper industry.

1727. County, age, analysts, and maps as in samples 1724-1726. SW¼ sec. 36, T. 31 N., R. 40 E., 1/3 mile west of Jumpoff Joe Lake. Abandoned quarry. Sample S-34. (Mills, 1962, p. 12, 13, 158, 160-162, 247, 258, 264, pl. 1.) Limestone, light-gray, very fine grained, massive. Chip sample from outcrop. Possible use: Portland cement, mineral filler, pulp and paper industry.

1728, 1729. Stevens County. Mississippian and(or) Pennsylvanian. T. 32 N., R. 41 E., east of town of Chewelah. Analyst, A. A. Hammer. Samples 67, 68. (Shedd, 1913, p. 128, 129, 246, pl. 21; Mills, 1962, p. 163, 164.) Limestone, fine-grained. Mineralogy, thin-section description. Index map. Use: None.
  1728. Sec. 5. [Dolomite] white.
  1729. Sec. 32. Limestone, dark; at least 200 ft thick.

1730 - 1733. Stevens County. Permian. Sec. 3, T. 34 N., R. 37 E. Heidegger Hill deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Samples S-124 to S-126, S-129. (Mills, 1962, p. 12, 13, 147, 149, 150, 151, 249, 261, 264, pls. 1, 5.) Limestone, light-gray to gray, fine- to medium-grained, massive; contains streaks of siliceous and dolomitic limestone. Chip sample from outcrop. Index and geologic maps. Possible use: None, rock impure.

1734 - 1740. County, age, analysts, maps, and use as in samples 1730-1733. Sec. 33, T. 35 N., R. 37 E., 10.5 miles south of town of Kettle Falls. Splitoff deposit. (Mills, 1962, p. 12, 13, 147-149, 248, 249, 259-261, 264, pls. 1, 5.) Limestone, gray to dark-gray, fine-grained, rather massive, slightly silicified. Chip sample from outcrop. Tonnage estimated.
  1734 - 1739. SW¼ NE¼ sec. 33. Samples S-76 to S-78, S-121 to S-123.
  1740. Sec. 33. Sample S-71.

1741, 1742. County, age, analysts, maps, and use as in samples 1730-1733. SE¼ sec. 17, T. 36 N., R. 38 E., 0.25 mile north of Kettle Falls. Hanson property. Samples S-1, S-3. (Mills, 1962, p. 12, 13, 135, 138, 142, 143, 247, 257, 264, pl. 1.) Limestone, gray, medium-grained, massive, fossiliferous; contains stringers and blebs of silicified and dolomitic limestone. Chip sample from outcrop.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	1743	1744	1745	1746	1747	1748	1749	1750	1751	1752	1753	1754	1755
	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$
	41-105	41-108	41-107	41-106	42-225	42-226	42-227	42-228	42-229	42-230	42-231	42-232	42-233
SiO_2	[1]3.4	[1]5.3	[1]4.8	[1]4.2	2.97	2.76	0.60	0.42	0.36	1.71	1.34	0.35	1.16
R_2O_3	[2].4	[2].3	[2].5	[2].5	.30	.25	.27	.27	.29	.24	.29	.25	.15
MgO	------	------	------	------	.26	.27	.22	.38	.28	.36	.49	.35	.33
CaO	52.5	50.9	51.8	51.3	53.72	53.86	55.35	55.26	55.35	54.30	54.42	55.44	54.80
P_2O_5	------	------	------	------	.010	.016	.036	.021	.013	.012	.043	.026	.013
Ignition loss[3]	------	------	------	------	42.36	42.64	43.53	43.46	43.69	43.02	43.08	43.57	43.24
Total	[56.3]	[56.5]	[57.1]	[56.0]	[99.62]	[99.80]	[4][100.01]	[4][99.81]	[4][99.98]	[4][99.64]	[4][99.66]	[99.99]	[99.69]
Class	3,1,94	5,1,91	4,1,92	4,1,92	2,1,96	2,1,97	0,1,99	0,1,99	0,1,99	1,1,98	1,1,98	0,1,99	1,0,98
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Washington—Continued

	1756	1757	1758	1759	1760	1761	1762	1763	1764	1765	1766	1767	1768
	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$
	42-234	42-235	42-236	42-237	42-238	42-239	42-240	42-241	42-242	42-243	42-244	42-245	42-246
SiO_2	1.17	2.79	1.10	0.32	0.63	1.12	1.47	1.40	1.50	1.73	1.80	1.18	1.59
R_2O_3	.15	.29	.42	.16	.22	.56	.54	.49	.55	.56	.60	.34	.47
MgO	.31	.21	.27	.23	.29	.38	.39	.35	.38	.29	.30	.24	.28
CaO	54.90	54.98	54.98	55.37	55.27	54.50	54.53	54.70	54.34	54.63	54.61	54.41	53.93
P_2O_5	.015	.019	.029	.028	.028	.030	.050	.020	.020	.040	.030	.023	.034
Ignition loss[3]	43.20	42.12	43.08	43.39	43.15	43.00	43.19	42.78	42.63	42.74	42.56	43.51	43.26
Total	[99.74]	[100.41]	[99.88]	[99.50]	[99.59]	[5][99.59]	[5][100.17]	[5][99.74]	[5][99.42]	[5][99.99]	[5][99.90]	[6][99.70]	[6][99.56]
Class	1,0,98	2,1,96	0,1,98	0,0,98	0,1,98	0,2,97	1,2,98	1,1,97	1,2,96	1,2,97	1,2,96	1,1,98	1,2,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Washington—Continued

	1769	1770	1771	1772	1773	1774	1775	1776	1777	1778	1779	1780	1781
	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$
	42-247	42-248	42-249	42-250	42-251	42-252	42-253	42-254	42-255	42-256	41-230	41-240	41-247
SiO_2	2.31	2.09	0.76	1.22	0.49	0.79	1.05	1.58	1.37	0.80	0.67	3.49	0.13
Al_2O_3	[7].49	[7].37	[7].19	[7].30	[7].27	[7].18	[7].22	[7].15	[7].28	[7].21	None	None	------
Fe_2O_3											None	.24	------
MgO	.24	.23	.25	.39	.25	.23	.26	.31	.24	.19	.21	1.11	.54
CaO	54.00	54.24	55.12	54.90	55.34	55.16	55.05	54.77	54.86	55.21	55.16	51.54	54.95
H_2O	------	------	------	------	------	------	------	------	------	------	None	[8].16	[9]Trace
P_2O_5	.027	.028	.012	.012	.019	.017	.017	.022	.025	.020	------	------	------
Ignition loss	[3]43.02	[3]43.18	[3]43.64	[3]43.06	[3]43.28	[3]43.16	[3]42.98	[3]42.75	[3]43.28	[3]43.66	[10]43.77	[10]42.46	[10]44.22
Total	[6][100.09]	[6][100.14]	[99.97]	[99.88]	[99.65]	[99.54]	[99.58]	[99.58]	[100.06]	[100.09]	100.01	[11]99.00	99.84
Class	1,2,97	1,1,97	0,1,99	1,1,98	0,1,98	0,1,98	1,1,98	1,0,97	1,1,98	0,1,99	1,0,99	3,1,95	0,0,100
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Washington—Continued

	1782	1783	1784	1785	1786	1787	1788	1789	1790	1791	1792	1793	1794
	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$	46F$_2$
	41-103	41-95	41-94	41-299	42-279	42-285	42-284	42-286	41-296	41-294	41-293	43-134	43-133
SiO_2	0.96	6.00	6.20	[12]2.06	[12]3.84	[12]4.63	[12]4.44	[12]4.63	1.47	1.21	[12]0.80	7.65	[12]7.6
Al_2O_3	.20	1.70	1.90	.15	.34	.41	.79	1.23	.70	.38	.3	.30	[7]1.4
Fe_2O_3				.68	.36	.94	.92	.93	.82	.83	Trace	.70	
MgO	.36	[13]19.12	[13]18.98	[14]45.63	[14]45.92	[14]44.21	[14]49.49	[14]41.92	24.5	[14]45.53	[14]46.9	43.5	[10]35.6
CaO	55.10	[13]29.30	[13]29.24	.59	.19	2.09	1.77	2.78	25.2	.10	.9	.03	[10]9.3
H_2O	------	------	------	------	------	------	------	------	.1	.08	------	.08	------
Ignition loss	43.28	[15]43.88	[13]43.68	50.88	49.34	47.72	42.50	48.48	[10]47.2	50.15	51.1	[10]48.0	[15]46.1
Total	99.90	[100.00]	[100.00]	[99.99]	[99.99]	100.00	[99.91]	[99.97]	[100.0]	[98.28]	100.0	[100.3]	[100.0]
Class	1,1,98	3,5,92	3,5,92	(1,2)97	(3,2)94	(3,3)91	(2,5)81	(1,6)93	0,3,97	0,2,95	(0,1)98	6,2,92	(5,4) 91
CaO/MgO	Calcite	Dolomite	Dolomite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesite	Magnesian dolomite	Magnesite	Magnesite	Magnesite	Dolomitic magnesite

[1] Reported as insoluble (silica).

[2] Iron.

[3] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[4] A composite of samples 1749-1753 contained Na_2O = 225 ppm, K_2O = 600 ppm, TiO_2 = <30 ppm, S = 15 ppm.

[5] A composite of samples 1761-1766 contained Na_2O = 225 ppm, K_2O = 560 ppm, TiO_2 = 40 ppm, S = 40 ppm.

[6] A composite of samples 1767-1770 contained Na_2O = 220 ppm, K_2O = 560 ppm, TiO_2 = <30 ppm, S = 470 ppm.

[7] R_2O_3.

[8] Water at 110°C and undetermined matter; by difference.

[9] At 110°C.

[10] CO_2.

[11] 100.00 percent in text.

[12] Insoluble.

[13] Calculated from reported $MgCO_3$ and(or) $CaCO_3$.

[14] By difference.

[15] CO_2, calculated from reported $MgCO_3$, and $CaCO_3$.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_2, Na_2O, K_2O, Sc_2O_2, V_2O_2, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_2, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_2, Tm_2O_3, Yb_2O_3, Lu_2O_2, HfO_2, Ta_2O_2, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, Bi_2O_3, ThO_2, UO_2]

	1747	1748	1749		1750	1751	1752	1753	1755	1756	1757	1758	1759
TiO_2	0.004	0.0068	0.0092	0.0064	0.0048	0.006	0.0064	0.011	0.0052	0.0076	0.0044	0.013	0.0076
Cr_2O_3	.00083	.0010	.00064	.00093	.0012	.0008	.0018	.0018	.00077	.00058	.0012	.0010	.00086
MnO	.12	.038	.16	.15	.24	.17	.13	.15	.05	.05	.13	.10	.092
CuO	.0018	.0010	.00094	.00063	.00063	.00069	.00043	.00066	.0012	.0014	.0013	.0029	.0017
SrO	.018	.024	.015	.013	.011	.013	.015	.018	.014	.018	.021	.020	.018
PbO	------	------	------	------	------	------	------	------	------	------	------	------	------

	1760	1761	1762	1763	1764	1765	1766	1767	1768	1769	1770	1771	1772
TiO_2	0.01	0.013	0.012	0.0068	0.0088	0.006	0.01	0.002	0.0076	0.0076	0.0044	0.005	0.006
Cr_2O_2	.0008	.0007	.0012	.0021	.0013	.0015	.0012	.00054	.0016	.00093	------	.0020	.0027
MnO	.06	.06	.086	.15	.11	.10	.14	.055	.038	.084	.086	.033	.051
CuO	.0021	.0011	.0011	.0021	.0012	.00093	.0034	.00099	.00099	.0011	.0017	.00094	.0018
SrO	.014	.02	.027	.016	.018	.02	.022	.018	.017	.013	.018	.024	.028
PbO	------	------	------	------	------	------	------	------	.002	.012	.005	------	------

	1773	1774	1775	1776	1777	1778		1773	1774	1775	1776	1777	1778
TiO_2	0.0048	0.0032	0.0068	0.0056	0.015	0.002	CuO	0.0033	0.0013	0.0015	0.0011	0.0021	0.0020
Cr_2O_2	.0007	.0005	.0012	------	.0024	------	SrO	.018	.019	.038	.02	.032	.017
MnO	.076	.045	.075	.085	.084	.068	PbO	------	------	------	------	------	------

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1743-1746. Stevens County. Permian. Sec. 15, T. 37 N., R. 38 E., about 1 mile south of town of Evans. Ideal Cement Co., abandoned quarries. (Hodge, 1938d, p. 13, 95, 103-106, 107; Mills, 1962, p. 123, 125, 126.) Limestone, white to dark-gray. Index and geologic maps. Use: Flux, chicken grit, pulp and paper industry.

1743-1745. S½ sec. 15.

1747-1756. Stevens County. Permian. Sec. 22, T. 37 N., R. 38 E., about 1.5 miles southeast of Evans. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 126-129, 248, 249, 259, 261, 264, pl. 1.) Limestone, light-gray to gray, very fine grained, massive; weathers light gray or white. Chip sample from outcrop. Tonnage estimated. Index and geologic maps. Possible use: Mineral filler, pulp and paper industry, builders' lime, ceramic whiting.

1747, 1748. NE¼ NE¼ sec. 22, Brooks property. Samples S-132, S-133.

1749-1756. NW¼ NE¼ sec. 22, U.S. Government land. Samples S-62 to S-67, S-130, S-131.

1757-1778. County, age, analysts, maps, and use as in samples 1747-1756. T. 37 N., R. 38 E. (Mills, 1962, p. 12, 13, 135, 138, 139-142, 247, 248, 258-260, 264, pl. 1.) Limestone, white to light-gray, fine- to medium-grained, massive, fossiliferous. Little overburden. Chip sample from outcrop. Tonnage estimated. Possible use: Portland cement.

1757-1760. NE¼ SE¼ sec. 34, McDonald property. Samples S-81 to S-84.

1761-1766. SE¼ SE¼ sec. 34, Fuhrman property. Samples S-38 to S-43.

1767-1778. NW¼ NW¼ sec. 35, State land. Samples S-44 to S-47, S-79, S-80, S-85 to S-90.

1779, 1780. Stevens County. Probably Carboniferous. NW¼ NE¼ sec. 13, T. 37 N., R. 39 E., about 14 miles from town of Colville. Jefferson Marble, Mining, and Milling Co. (Shedd, 1903, p. 109-111, 112, 137, 142; Eckel, 1905, p. 324, 325; Mills, 1962, p. 171, 172.) Marble, fine-grained, crystalline; both massive and stratified. Possible use: Portland cement, dimension stone, ornamental stone.

1779. [Limestone], white; bulk density 2.719. Physical properties.

1780. Analyst, R. W. Thatcher. [Limestone], pinkish. Thin-section description.

Washington—Continued

1781. Stevens County. Probably Carboniferous. Sec. 13, T. 38 N., R. 37 E., 2.5 miles northwest of town of Bossburg. Analyst, R. W. Thatcher. Sample 88. (Shedd, 1903, p. 129, 130, 142; Eckel, 1905, p. 324, 325.) Limestone, light-gray, coarse-grained. Bulk density 2.73. Physical properties. Possible use: Portland cement, dimension stone, ornamental stone.

1782. Stevens County. Paleozoic. SW¼ sec. 10, T. 37 N., R. 38 E., about 0.5 mile northeast of Evans. U.S. Gypsum Co. quarry. Analyst, A. A. Hammer. Sample 86. (Shedd, 1913, p. 147, 246, pl. 21; Landes, 1934, p. 1077, 1079, 1080; Mills, 1962, p. 117-119, 120.) Limestone, light-gray to gray, fine- to medium-grained, beds from several inches to 3 or 4 ft thick. Tonnage estimated. Index and geologic maps. Use: Cement, mineral filler, builders' lime, ceramic whiting, sugar industry, pulp and paper industry. Possible use: Portland cement.

1783, 1784. Stevens County. Sec. 18, T. 32 N., R. 38 E. (Hodge, 1935c, p. 6.) [Dolomite.] Tonnage estimated. Use: Furnace lining.

1785-1793. Stevens County. [T. 32 N., R. 40 E.], town of Chewelah. (Ralston and others, 1925, p. 1, 9, 10, 15-17, 22-24, 59, 78, 80, 91-93.) Magnesite [except where noted], crystalline. Physical tests. Possible use: Production of plastic magnesia for use in composition flooring, plasters, stucco; magnesian mortars.

1785. Northwest Magnesite Co. Analyst, E. H. Delius. Sample M-25.

1786. Northwest Magnesite Co. Analysts, E. H. Delius, F. C. Henriques. Sample M-29.

1787. Northwest Magnesite Co. Analyst, E. H. Delius. Sample M-33.

1788. Northwest Magnesite Co. Analyst, F. C. Henriques. Sample M-45.

1789. Analysts, W. C. Riddell, W. S. Morley, R. L. Sebastian. Sample M-1.

1790. Analyst, W. S. Morley. Sample M-15. Dolomite. Possible use: Magnesian mortars, stucco.

1791. Analyst, W. S. Morley. Sample M-16.

1792. Analyst, F. C. Henriques. Sample M-19.

1793. Sample M-29.

1794. County and locality as in samples 1785-1793. (Dean and others, 1938, p. 32, 34.) Magnesite, beneficiation tests.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

Washington—Continued

	1795	1796	1797	1798	1799	1800	1801	1802	1803	1804	1805	1806	1807
	$46F_2$ 41-205	$46F_2$ 41-291	$46F_2$ 41-207	$46F_2$ 42-289	$46F_2$ 41-213	$46F_2$ 41-212	$46F_2$ 41-217	$46F_2$ 41-231	$46F_2$ 41-233	$46F_2$ 41-219	$46F_2$ 41-222	$46F_2$ 41-220	$46F_2$ 41-221
SiO_2	0.64	0.17	------	5.28	1.12	0.56	1.70	2.90	3.91	3.54	0.80	1.72	2.72
Al_2O_3	------	------	------	2.58	.96	.40	.56	1.37	1.23	.76	.90	.40	.98
Fe_2O_3	------	------	------	.64									
FeO	.85	Trace	------	1.01	------	------	------	------	------	------	------	------	------
MgO	47.27	10.78	23.0	17.28	23.62	.79	.56	^{1}19.41	20.28	^{1}20.93	^{1}21.26	^{1}21.18	^{1}20.38
CaO	.81	43.24	27.5	28.83	29.56	55.15	54.57	^{1}28.91	30.99	^{1}29.41	^{1}30.30	^{1}30.10	^{1}29.60
CO_2	50.31	45.75	------	44.27	^{2}43.61	^{2}43.12	^{2}42.18	^{1}43.88	^{2}43.72	^{1}45.95	^{1}47.00	^{1}46.74	^{1}45.49
Total	99.88	99.94	[50.5]	99.89	98.87	100.02	99.57	[96.47]	100.13	[100.59]	[100.26]	[100.14]	[99.17]
Class	1,0,97	0,0,100	0,0,97	0,9,90	0,2,91	0,1,98	1,2,95	1,4,92	2,4,91	2,2,96	0,1,99	1,1,98	1,3,95
CaO/MgO	Magnesite	Calcareous dolomite	Dolomite	Dolomite	Dolomite	Calcite	Calcite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite	Dolomite

Washington—Continued

	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820
	$46F_2$ 41-216	$46F_2$ 41-235	$46F_2$ 41-261	$46F_2$ 42-257	$46F_2$ 42-258	$46F_2$ 42-259	$46F_2$ 42-260	$46F_2$ 41-104	$46F_2$ 42-261	$46F_2$ 42-262	$46F_2$ 41-102	$46F_2$ 41-262	$46F_2$ 41-263
SiO_2	0.90	3.98	1.00	0.91	1.29	0.53	1.44	0.42	0.73	1.56	1.15	0.92	0.90
Insoluble	------	------	------	------	------	------	------	.38	------	------	------	------	------
Al_2O_3	.58	.41	^{3}.50	^{3}.11	^{3}.27	^{3}.20	^{3}.51	.14	^{3}.24	^{3}.12	Trace	^{3}.52	^{3}.30
Fe_2O_3								.03					
MgO	^{1}20.62	21.15	1.00	.37	.28	.35	.47	.56	.27	.27	Trace	.15	1.00
CaO	^{1}31.09	33.07	54.25	55.46	55.50	55.64	54.60	55.54	54.99	54.83	54.21	55.00	54.30
P_2O_5	------	------	------	.008	.022	.017	.011	------	.003	.022	------	------	------
CO_2	^{1}46.93	^{2}41.19	------	^{4}43.29	^{4}42.82	^{4}43.19	^{4}42.90	^{2}42.40	^{4}43.49	^{4}43.17	^{2}43.64	------	------
Total	[100.12]	99.80	[56.75]	^{5}[100.15]	^{5}[100.18]	^{5}[99.93]	^{5}[99.93]	[99.47]	[99.72]	[99.97]	[99.00]	[56.59]	[56.50]
Class	0,1,99	3,1,87	0,1,98	1,0,98	1,1,97	0,1,98	1,1,97	0,0,96	0,1,99	1,0,98	1,1,97	0,2,98	0,1,98
CaO/MgO	Dolomite	Dolomite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

Washington—Continued

	1821	1822	1823	1824	1825	1826	1827	1828	1829	1830	1831	1832	1833
	$46F_2$ 41-248	$46F_2$ 41-266	$46F_2$ 41-265	$46F_2$ 41-249	$46F_2$ 41-245	$46F_2$ 41-267	$46F_2$ 41-259	$46F_2$ 41-269	$46F_2$ 41-118	$46F_2$ 41-275	$46F_2$ 41-276	$46F_2$ 41-120	$46F_2$ 37-77
SiO_2	2.94	0.90	0.90	0.98	4.68	1.00	1.76	1.18	6.41	2.86	4.40	2.3	3.04
Al_2O_3	.49	^{3}.75	^{3}1.00	.36	^{3}1.56	^{3}.20	Trace	^{3}.18	2.09	2.18	3.04	.4	.52
Fe_2O_3	.49			------								.23	
FeO	Trace	------	------	------	------	------	------	------	------	------	------	------	------
MgO	18.56	.90	1.00	.79	Trace	.20	Trace	------	Trace	^{1}1.70	^{1}1.66	.5	.30
CaO	31.56	54.50	54.50	54.48	51.05	54.88	55.37	^{1}55.36	51.51	^{1}50.59	^{1}49.19	53.4	53.69
H_2O+	^{6}Trace	------	------	------	------	------	------	------	------	------	------	------	------
H_2O-	^{7}Trace	------	------	------	------	------	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	------	.005	------	------	------	------	------	------	.010
CO_2	45.91	------	------	^{2}43.26	^{2}42.53	------	^{2}42.50	^{1}43.45	^{2}40.13	^{1}41.57	^{1}40.43	^{2}42.5	^{2}42.39
SO_3	------	------	------	------	------	.015	------	------	------	------	------	------	------
Total	99.95	[57.05]	[57.40]	99.87	99.82	[56.30]	99.63	100.17	100.14	98.90	98.72	99.3	[99.95]
Class	2,2,96	0,2,97	0,2,96	0,1,98	2,7,91	1,1,98	2,0,97	1,0,99	3,6,90	0,5,94	0,8,91	1,2,96	2,2,96
CaO/MgO	Calcareous dolomite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[2] Ignition loss.

[3] R_2O_3.

[4] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[5] A composite of samples 1811-1814 contained Na_2O = 190 ppm, K_2O = 840 ppm, TiO_2 = < 30 ppm, S = 45 ppm.

[6] Above 110°C.

[7] At 110°C.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, Na_2O, K_2O, Sc_2O_3, V_2O_5, Cr_2O_2, NiO, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_2, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_2, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_2, Yb_2O_2, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_2, ThO_2, UO_2]

	1811	1812	1813	1814	1816	1817		1811	1812	1813	1814	1816	1817
TiO_2	0.0044	0.013	0.0037	0.021	0.011	0.0052	CuO	0.00055	0.0012	0.0015	0.00096	0.0013	0.0011
MnO	.012	.012	.015	.016	.018	.01	SrO	.010	.0076	.010	.013	.017	.015

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1795. Stevens County. [Secs. 11-14, T. 32 N., R. 40 E.], town of Chewelah. Analyst, Chase Palmer; collector, R. W. Stone. Record 3220. (Wells, 1937, p. 62; Hodge, 1938b, p. 36, 41, 43, 51, pl. 2.) Magnesite. Tonnage estimated. Index and geologic maps, geologic sections.

1796. Stevens County. Secs. 7, 8, T. 32 N., R. 41 E., 3 miles east of Chewelah. Columbia Marble and Onyx Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 125, 126, 127, 137, 142.) Dolomitic marble, white, medium-grained, uniform. Bulk density 2.754. Physical properties. Possible use: Dimension stone [implied].

1797. Stevens County. [Probably T. 32 N., R. 41 E.], southwest slope of Eagle Mountain, Chewelah district. Analyst, J. G. Fairchild. (Bancroft, 1914, p. 1, 13, 15, 39, 42, 94, 95.) Dolomite, white, coarsely crystalline. Index and geologic maps.

1798. Stevens County. Probably sec. 32, T. 33 N., R. 40 E., about 4 miles northwest of Chewelah. The Great Western Marble and Onyx Co. Analyst, R. W. Thatcher. (Shedd, 1903, p. 122, 123, 124, 137, 142.) [Dolomite] marble, pinkish-white, generally massive. Thin-section description. Physical properties. Possible use: Dimension stone.

1799. Stevens County. Ts. 33, 34 N., R. 38 E., near town of Addy. Near Crystal quarry. Analyst, A. A. Hammer. Sample 56. (Shedd, 1913, p. 139, 140, 246, pl. 21.) [Dolomite] magnesian limestone. Index map. Use: Dimension stone.

1800. Stevens County. Sec. 27, T. 34 N., R. 39 E., Addy. Jacobs farm. Analyst, A. A. Hammer. Sample 85. (Shedd, 1913, p. 140, 246, pl. 21; Hodge, 1944, p. 15, 48, pl. 4.) Limestone, light. Tonnage estimated. Index maps.

1801. Stevens County. Secs. 27, 34, 35, T. 35 N., R. 37 E., and secs. 2, 3, T. 34 N., R. 37 E., 6 miles south of town of Kettle Falls, Peaceful Valley. Analyst, A. A. Hammer. Sample 44. (Shedd, 1913, p. 143, 245, pl. 21.) Limestone, gray, crystalline, fine-grained, uniform texture, flinty appearance. Index map. Possible use: Portland cement.

1802. Stevens County. [Secs 8, 9, T. 35 N., R. 39 E.], town of Colville. Old quarry. (Hodge, 1935a, p. 117, 118.) Dolomite. Tonnage estimated. Possible use: Refractories.

1803 Stevens County. Sec. 13, T. 35 N., R. 39 E., 4 miles east of Colville. Analyst, A. A. Hammer. Sample 75. (Shedd, 1913, p. 134, 135, 246, pl. 21.) [Dolomite] limestone, dark-gray, crystalline. Thin-section description. Index map. Possible use: None.

1804 - 1808. Stevens County. [T. 35 N., R. 39 E], near Colville, on Colorado River. Lab. Nos. 57-61. (Weitz, 1942, p. 2, 79, 82.) Dolomite. Index map. Possible use: Source of magnesium, refractories.

1809. Stevens County. [Sec. 9, T. 35 N., R. 40 E.], about 4 miles east of Colville. Old Dominion mine. Analyst, A. A. Hammer. Sample 73. (Shedd, 1913, p. 134, 135, 246, pl. 21.) [Dolomite] limestone, white, coarsely crystalline. Thin-section description. Index map. Possible use: None.

1810. Stevens County. [T. 36 N., R. 38 E.], Kettle Falls. (Hodge, 1944, p. 15, 48, 49, pls. 4, 5.) Limestone, gray, crystalline. Tonnage estimated. Index maps.

1811 - 1814. Stevens County. SW¼ sec. 10, T. 37 N., R. 38 E., about 0.5 mile northeast of town of Evans. Boise Cascade Corporation, abandoned quarry. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Mills, 1962, p. 12, 13, 117-120, 248, 259, 264, pl. 1.) Limestone, light-gray, fine- to medium-grained; beds range from several inches to 3 or 4 ft in thickness. Chip samples from outcrop represent 200 ft of 250 ft exposure. Tonnage estimated. Index and geologic maps Possible use: Cement, mineral filler, builders' lime, ceramic whiting, sugar industry, pulp and paper industry.
1811. Sample S-55, 57 ft thick.
1812. Sample S-56, 43 ft thick.
1813. Sample S-57, 43 ft thick.
1814. Sample S-58, 57 ft thick.

1815. Stevens County. SW¼ sec. 10, T. 37 N., R. 38 E., near town of Marcus. U.S. Gypsum Co. quarry. (Hodge, 1938d, p. 13, 95, 107-109, 111, 112.) Limestone, white, light-gray. Index and geologic maps. Use: Lime.

Washington—Continued

1816 - 1818. Stevens County. NE¼ NE¼ sec. 16, T. 37 N., R. 38 E., 0.25 mile south of Evans. Rasmusson property. (Mills, 1962, p. 12, 13, 121-123, 249, 261, 264, pl. 1.) Limestone, white to light-gray, fine-grained, thin- to medium-bedded; about 350 ft thick. Tonnage estimated. Index and geologic maps. Possible use: Mineral filler, pulp and paper industry, builders' lime, ceramic whiting.

1816, 1817. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Chip sample from outcrop.
1816. Sample S-136 represents 33 ft.
1817. Sample S-137 represents 29 ft.

1818. Analyst, A. A. Hammer. Sample 58. (Shedd, 1913, p. 147, 246, pl. 21.) Use: Lime. Possible use: Portland cement.

1819. Stevens County. T. 37 N., R. 38 E., town of Marcus. Northwest Gypsum Co. (Hodge, 1944, p. 15, 49, pl. 4.) Limestone, selected sample. Tonnage estimated. Index map. Use: Lime.

1820. Stevens County. [T. 37 N., R. 39 E.], Clugston Creek. (Hodge, 1944, p. 15, pl. 4.) Limestone, selected sample. Tonnage estimated. Index map.

1821. Stevens County. Sec. 13, T. 38 N., R. 37 E., 2.5 miles northwest of town of Bossburg. Bryant property. Analyst, R. W. Thatcher. (Shedd, 1903, p. 129, 130, 142.) Dolomitic marble, white, coarse-grained, stratified. Bulk density 2.73. Physical properties. Possible use: Dimension stone, ornamental stone.

1822, 1823. Stevens County. [Sec. 18, T. 38 N., R. 38 E.], Bossburg. (Hodge, 1944, p. 15, 50, pl. 4.) Limestone, selected sample. Index map.
1822. Tonnage estimated.

1824. Stevens County. Sec. 18, T. 38 N., R. 38 E., 2 miles north of Bossburg. Analyst, A. A. Hammer. Sample 89. (Shedd, 1913, p. 148, 149, 246, pl. 21.) Limestone, white, medium-grained. Index map. Possible use: Portland cement.

1825. Stevens County. [T. 38 N., R. 38 E.], 1.5 miles northeast of Bossburg. Analyst, A. A. Hammer. Sample 45. (Shedd, 1913, p. 245, pl. 21.) Limestone, gray, coarsely crystalline. Index map.

1826. Stevens County. [T. 38 N., R. 38 E.], 7 miles north of Evans. (Hodge, 1944, p. 15, 51, pl. 4.) Limestone. Index map.

1827. Stevens County. Sec. 29, T. 38 N., R. 41 E., town of Northport, Deep Creek. Analyst, A. A. Hammer. Sample 59. (Shedd, 1913, p. 159, 160, 246.) Limestone, white, coarse-grained, crystalline. Possible use: Portland cement.

1828. Stevens County. Secs. 28, 33, T. 39 N., R. 39 E., Marble Mountain. Lazy S Ranch. Analyst, H. M. Brewer. (Hodge, 1944, p. 51, 52, pl. 4.) Limestone. Tonnage estimated. Index map.

1829. Stevens County. [T. 39 N., R. 40 E.], about 3 miles south of Northport. Analyst, A. A. Hammer. Sample 60. (Shedd, 1913, p. 154, 155, 246, pl. 21.) Limestone, light-gray, fine-grained. Index map. Possible use: Portland cement, flux [implied].

1830, 1831. Stevens County. [T. 39 N., R. 43 E., near town of] Metaline Falls. Inland Portland Cement Co. Analyst, C. R. Ranch. (Burchard, 1912, p. 695, pl. 1.) Limestone, quarried. Index map.

1832. Stevens County. [T. 40 N., R. 40 E.], near Northport. Limestone quarry. (Wilson and Skinner, 1937, p. 6, 34, 57, 76, 152.) Limestone, white. Index map. Physical tests. Use: Whiting [implied]. Possible use: Putty.

1833. Whatcom County. Devonian to Early Permian, Chilliwack Group. SW¼ NW¼ sec. 17, T. 40 N., R. 6 E., Black Mountain. Old quarry. Analyst, C. S. Homi; collector, W. R. Danner. Sample W2-1. (Moen, 1962, p. 4, 8, 92, 97, 100, 119, pl. 1.) Limestone, gray, dense. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, ballast, road metal, riprap.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1834	1835	1836	1837	1838	1839	1840	1841	1842	1843	1844	1845	1846
	$46F_2$37-13	$46F_2$37-28	$46F_2$37-55	$46F_2$37-56	$46F_2$37-58	$46F_2$37-59	$46F_2$37-60	$46F_2$37-61	$46F_2$37-62	$46F_2$37-63	$46F_2$37-47	$46F_2$37-85	$46F_2$37-30
SiO_2	6.95	5.05	7.16	6.91	2.61	2.41	2.27	1.48	0.26	3.15	8.52	2.72	3.04
R_2O_3	1.09	.82	.90	1.72	1.46	.71	.94	.52	.16	1.03	1.08	[1].72	[1].76
MgO	.44	.55	.46	.62	.23	.21	1.31	.18	20	.14	.31	.15	.30
CaO	50.79	51.95	50.73	50.22	53.53	53.89	52.19	54.47	55.27	53.33	50.16	53.68	52.48
P_2O_5	.031	.021	.008	.009	.008	.005	.007	.090	.004	.007	.011	.012	------
Ignition loss	[2]40.43	[2]41.32	[2]40.44	[2]40.20	[2]41.92	[2]42.69	[2]43.60	[2]43.10	[2]43.45	[2]42.21	[2]39.84	42.60	42.14
Total	[99.73]	[99.71]	[3][99.70]	[99.68]	[99.76]	[99.92]	[100.32]	[99.84]	[99.34]	[99.87]	[99.92]	[99.88]	98.72
Class	5,3,91	4,2,93	6,3,91	4,5,90	0,4,94	1,2,97	1,4,96	1,2,98	0,0,99	1,3,95	7,3,90	2,2,96	2,3,94
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1847	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859
	$46F_2$37-150	$46F_2$37-78	$46F_2$37-80	$46F_2$37-81	$46F_2$37-84	$46F_2$37-86	$46F_2$37-87	$46F_2$37-88	$46F_2$37-89	$46F_2$37-90	$46F_2$37-91	$46F_2$37-166	$46F_2$37-76
SiO_2	2.70	3.81	2.16	5.50	2.43	2.76	2.06	7.33	6.25	8.84	2.28	3.02	6.49
R_2O_3	.76	.96	.64	.93	.47	.84	.62	1.05	1.22	.71	.71	.51	.82
MgO	.18	.28	.18	.31	.26	.46	.23	.10	.18	.14	.45	.32	.12
CaO	53.65	52.75	54.19	51.88	53.96	53.15	54.05	50.98	51.43	50.38	53.75	53.64	51.36
P_2O_5	.012	.004	.010	.004	.010	.008	.007	.010	.006	.008	.004	.010	.016
Ignition loss[2]	42.59	41.90	42.70	41.13	42.67	42.32	42.73	40.25	40.68	39.84	42.32	42.43	40.83
Total	[99.89]	[99.70]	[99.88]	[99.75]	[99.80]	[99.54]	[99.70]	[99.72]	[4][99.77]	[99.92]	[99.51]	[99.93]	[99.64]
Class	1,2,96	2,3,95	1,2,97	4,3,93	2,1,97	1,2,96	1,2,97	6,3,91	4,4,92	8,2,90	1,2,96	2,1,96	5,3,92
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

	Washington—Continued												
	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872
	$46F_2$ 37-164	$46F_2$ 37-41	$46F_2$ 37-92	$46F_2$ 37-93	$46F_2$ 37-94	$46F_2$ 37-95	$46F_2$ 37-33	$46F_2$ 37-180	$46F_2$ 37-179	$46F_2$ 37-178	$46F_2$ 37-177	$46F_2$ 37-176	$46F_2$ 37-175
SiO_2	5.16	2.43	0.67	0.37	0.09	0.40	0.48	7.34	4.10	3.30	2.72	5.27	0.61
Al_2O_3	.82	[5].55	[5].32	[5].26	[5].09	[5].37	1.00	[5].97	[5].75	[5].67	[5].43	[5]1.35	[5].25
Fe_2O_2	.95												
MgO	.70	.31	.16	.10	.19	.19	2.05	.30	.18	.22	.18	1.05	.24
CaO	58.87	53.89	55.63	55.71	55.33	55.36	52.88	50.41	52.43	53.33	53.18	50.93	55.79
P_2O_5	------	.010	.200	.248	.150	.209	------	.026	.022	.022	.014	.021	.013
Ignition loss	------	[2]42.57	[2]42.97	[2]43.12	[2]43.37	[2]43.10	43.14	[2]40.26	[2]41.71	[2]42.09	[2]42.40	[2]41.01	[2]42.91
Total	[66.50]	[6][99.76]	[99.95]	[99.81]	[99.22]	[99.63]	99.55	[7][99.31]	[7][99.19]	[7][99.63]	[7][98.92]	[7][99.63]	[99.81]
Class	3,5,75	2,2,96	0,1,97	0,1,98	0,0,99	0,1,98	0,1,97	6,3,91	3,2,94	2,2,95	2,2,95	3,4,92	0,1,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] $Al_2O_3+Fe_2O_3$.

[2] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[3] Na_2O = 175 ppm, K_2O = 560 ppm, TiO_2 = 250 ppm, S = 740 ppm.

[4] Na_2O = 210 ppm, K_2O = 565 ppm, TiO_2 = 200 ppm, S = 73 ppm.

[5] R_2O_3.

[6] Na_2O = 250 ppm, K_2O = 550 ppm, TiO_2 = 65 ppm, S = 840 ppm.

[7] A composite of samples 1867-1871 contained Na_2O = 155 ppm, K_2O = 490 ppm, TiO_2 = 170 ppm, S = 460 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_2, K_2O, Sc_2O_3, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_2, SnO_2, Sb_2O_2, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_3, Sm_2O_3, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_2, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_3, PbO, Bi_2O_3, ThO_2, UO_2]

	1834	1835	1836	1837	1838	1839	1840	1841	1842	1843	1844	1847
Na_2O	------	------	------	------	------	------	------	------	------	------	------	------
TiO_2	0.012	0.023	0.052	0.045	0.039	0.015	0.067	0.016	0.0044	0.059	0.019	0.014
V_2O_5	------	------	.003	.003	.003	.003	.003	------	------	.0048	------	------
Cr_2O_3	.0005	------	.0005	.0005	.0005	.0005	.0005	.0005	------	.0005	.00055	------
MnO	.12	.12	.15	.068	.048	.038	.035	.24	.035	.04	.055	.10
NiO	------	------	.001	.001	.001	.001	------	------	------	------	.001	------
CuO	.0020	.0019	.0035	.0043	.0016	.0016	.0017	.0018	.0014	.0012	.0046	.0015
SrO	.013	.012	.015	.018	.012	.011	.011	.012	.0084	.0094	.013	.010

	1848	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859
Na_2O	0.11	------	------	------	------	------	------	0.28	------	------	------	------
TiO_2	.029	0.0088	0.024	0.012	0.018	0.016	0.015	.024	0.024	0.017	0.011	0.028
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	.003
Cr_2O_2	.0005	------	.0005	------	.0005	------	.0005	------	------	------	------	.0005
MnO	.042	.060	.042	.045	.10	.09	.21	.12	.09	.09	.058	.063
NiO	.001	.0026	.001	------	------	------	------	------	------	------	------	.0017
CuO	.0015	.0042	.0029	.0023	.0019	.0025	.0042	.003	.0037	.0035	.0049	.0026
SrO	.0065	.0079	.0083	.0094	.010	.0084	.015	.0098	.011	.011	.0063	.012

	1861	1862	1863	1864	1865	1867	1868	1869	1870	1871	1872
Na_2O	------	------	------	------	0.05	0.068	------	0.05	0.05	------	------
TiO_2	0.013	0.024	------	------	.0096	.026	0.010	.0092	.0068	0.039	0.0064
V_2O_5	------	------	------	------	------	------	------	------	------	.003	------
Cr_2O_3	------	------	------	------	------	.0018	.0009	.00099	.0008	.0012	------

Spectrochemical analyses—Continued

	1861	1862	1863	1864	1865	1867	1868	1869	1870	1871	1872
MnO	0.092	0.014	0.008	0.01	0.021	0.045	0.05	0.073	0.043	0.04	0.15
NiO	.001	------	------	------	------	------	------	------	------	------	------
CuO	.0024	.0025	.0017	.0015	.0018	.0021	.0013	.0018	.00094	.0019	.0012
SrO	.0089	.027	.011	.011	.011	.010	.013	.013	.014	.021	.011

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1834, 1835. Whatcom County. Devonian part of Chilliwack Group. NW¼ sec. 9, T. 40 N., R. 5 E., about 6 miles from town of Sumas. Hilltop deposit. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. (Moen, 1962, p. 4, 8, 15, 97, 100, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 230, 231, 453, 466.) Limestone, light-gray, dense, fossiliferous; chip sample. Thin-section description. Limited tonnage. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, ballast, road metal, riprap.
1834. Sample W 19-1 taken across 150 ft.
1835. Sample W 19-2 taken across 70 ft.

1836 - 1843. Whatcom County. Devonian part of Chilliwack Group. West central part of sec. 21, T. 40 N., R. 5 E., east slope of Sumas Mountain. Sumas Mountain deposit. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. (Moen, 1962, p. 4, 8, 15, 95, 96, 99, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 233-235, 236, 453, 466.) Limestone, light-gray to dark-gray, generally dense; about 200 ft thick. Chip sample. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, ballast, road metal, riprap.
1836. Sample W 18-1, composite.
1837. Sample W 18-2 taken across 60 ft.
1838. Sample W 18-4 taken across 140 ft.
1839. Sample W 18-5, composite.
1840. Sample W 18-6, composite.
1841. Sample W 18-7, composite.
1842. Sample W 18-8, composite.
1843. Sample W 18-9, composite.

1844. County, analysts, references, maps, and use as in samples 1836-1843. Early Late Devonian part of Chilliwack Group. NE¼ sec. 23, T. 40 N., R. 5 E., west side of Red Mountain. Northwestern Lime Co. Sample W 8-1. Limestone, light-blue-gray, dense, fossiliferous; chip sample taken across 120 ft. Moderate to large tonnage.

1845. Whatcom County. [Early Late Devonian] part of Chilliwack Group. NE¼ sec. 28, T. 40 N., R. 5 E., 1.25 miles northwest of town of Kendall. Balfour quarries. Analyst, C. S. Homi; collector, W. R. Danner. Sample W 16-8. (Moen, 1962, p. 4, 8, 94-98, pl. 1.) General: Limestone, medium- to dark-gray, finely to coarsely crystalline, massive to well-bedded, fossiliferous. Maximum thickness about 150 ft; thick overburden. Index and geologic maps, geologic sections. Former use: Cement.

1846. County, age, group, and locality as in sample 1845. Analyst, A. A. Hammer. Sample 122. (Shedd, 1913, p. 209, 212, 213, 247, pl. 21; Danner, 1966, p. 82, 209, 210, 225, 226, 229.) General: Limestone, white to dark-gray, coarsely crystalline. Surface sample. Index and geologic maps. Possible use: Portland cement.

1847. County, age, group, and locality as in sample 1845. Analyst, Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 16-8. (Danner, 1966, p. 16, 19, 82, 209, 210, 225, 226, 229, 453, 466.) Limestone, dark-gray to black, dense, crystalline or organoclastic texture; weathers light gray. Chip sample taken across 240 ft. Index and geologic maps. Possible use: None, deposit small.

1848 - 1857. County, age, group, locality, remarks, and use as in sample 1845. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. (Moen, 1962, p. 4, 8, 94-98, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 225, 226, 229, 453, 466.) Chip sample.
1848. Sample W 16-1 taken across 130 ft.
1849. Sample W 16-3 taken across 140 ft.
1850. Sample W 16-4 taken across 170 ft.
1851. Sample W 16-7, composite.
1852. Sample W 16-9 taken across 250 ft.
1853. Sample W 16-10 taken across 130 ft.
1854. Sample W 16-11 taken across 110 ft.
1855. Sample W 16-12 taken across 100 ft.
1856. Sample W 16-13, composite.
1857. Sample W 16-14, composite.

Washington—Continued

1858, 1859. Whatcom County. Early Late Devonian part of Chilliwack Group. NW¼ sec. 17, T. 40 N., R. 6 E., north of town of Maple Falls. German deposit. Analyst, C. S. Homi or Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 209, 210, 241, 242, 243, 452, 453, 465.) Limestone, gray, dense to crystalline, fossiliferous. Possible use: None, deposit small.
1858. SW¼NW¼ sec. 17. Sample W 2-1. Chip sample taken across 60 ft.
1859. Sample W 23-1. Thin-section description. Chip sample taken across 150 ft. Possible use: Concrete aggregate, ballast, road metal, riprap.

1860, 1861. Whatcom County. Early Late Devonian part of Chilliwack Group. Center W½ sec. 19, T. 40 N., R. 6 E. Doaks Creek deposit, Mitchell Bay Lime Co. quarry. Alternating layers of dense gray limestone and coralline limestone; deposit at least 200 ft thick. Tonnage estimated. Index and geologic maps, geologic section. Use: Pulp and paper industry [implied].
1860. Analyst, T. H. Williams. (Danner, 1966, p. 82, 209, 210, 239, 240.) Sample taken across 160 ft.
1861. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. Sample W 4-1. (Moen, 1962, p. 4, 8, 88, 93, 94, 99, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 239, 240, 452, 465.) Chip sample taken across 120 ft. Possible use: Concrete aggregate, ballast, road metal, riprap.

1862 - 1865. Whatcom County. Probably Pennsylvanian part of Chilliwack Group. Sec. 22, T. 40 N., R. 6 E., 3 miles northeast of town of Maple Falls. Mitchell Bay Lime Co. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. (Moen, 1962, p. 48, 91-93, 98, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209-213, 452, 465.) Limestone, white to gray, crystalline, fossiliferous. Chip sample. Tonnage estimated. Index and geologic maps. Former use: Pulp and paper industry. Possible use: Concrete aggregate, ballast, road metal, riprap.
1862. NW¼ sec. 22. Sample W 5-1 taken across 180 ft.
1863. NW¼ sec. 22. Sample W 5-2 taken across 120 ft.
1864, 1865. Center sec. 22. Samples W 5-3 and W 5-4 taken across 100 ft.

1866. Whatcom County. Devonian to Early Permian part of Chilliwack Group (Danner, 1966). E½NW¼ sec. 22, T. 40 N., R. 6 E., about 4 miles northeast of Maple Falls, Boulder Creek. Analyst, A. A. Hammer. Sample 125. (Shedd, 1913, p. 215, 216, 247, pl. 21.) Limestone, light-colored, coarsely crystalline, massive. Index map. Possible use: Portland cement [implied].

1867 - 1871. Whatcom County. Pennsylvanian part of Chilliwack Group. NE¼ NE¼ sec. 33, NW¼NW¼ sec. 34, T. 37 N., R. 8 E., unsurveyed, about 14 miles by road north of town of Concrete. Dock Butte Trail deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 259-261, 454, 467.) Limestone, dark-bluish-gray, crystalline; weathers light gray. Chip sample. Index and geologic maps. Possible use: None, deposit in remote area.
1867. Sample W 29-1, composite.
1868. Sample W 29-2, composite.
1869. Sample W 29-3 taken across 110 ft.
1870. Sample W 29-4, composite.
1871. Sample W 29-5 taken across 50 ft.

1872. County, age, group, analysts, and maps as in samples 1867-1871. South center and SW¼ sec. 32, T. 37 N., R. 8 E., about 16 miles north of Concrete. Dock Butte Trail deposit. Sample W 27-1. (Danner, 1966, p. 16, 19, 82, 259, 260, 263, 453, 467.) Limestone, gray to light-gray, finely crystalline. Chip sample taken across 40 ft. Possible use: None, deposit small.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1873	1874	1875	1876	1877	1878	1879	1880	1881	1882	1883	1884	1885
	46F$_2$ 37-174	46F$_2$ 37-173	46F$_2$ 37-172	46F$_2$ 37-133	46F$_2$ 37-134	46F$_2$ 37-138	46F$_2$ 37-49	46F$_2$ 37-52	46F$_2$ 37-48	46F$_2$ 37-64	46F$_2$ 37-117	46F$_2$ 37-113	46F$_2$ 37-112
SiO_2	0.35	0.88	0.41	2.65	4.48	2.46	8.75	2.57	3.68	6.67	7.19	3.13	3.46
Al_2O_3	[1].30	[1].60	[1].34	.94	1.15	.54	[1].85	[1].83	[1].68	[1].54	1.26	.97	1.20
Fe_2O_2				.65	.83	.25					0.56	.46	.46
MgO	.19	.19	.15	3.23	2.69	1.15	.32	.81	1.15	20.85	1.51	.50	1.10
CaO	54.83	54.68	54.90	49.67	49.07	52.62	50.10	53.21	52.24	28.18	48.94	52.62	51.61
Na_2O	------	------	------	.00	.00	.00	------	------	------	------	------	------	------
K_2O	------	------	------	.00	.01	.02	------	------	------	------	------	------	------
P_2O_5	.020	.019	.025	------	------	------	.024	.030	.022	.018	------	------	------
Ignition loss	[2]43.53	[2]43.06	[2]43.48	42.41	40.94	42.37	[2]39.74	[2]42.72	[2]42.26	[2]43.89	40.56	42.32	42.18
Total	[99.22]	[99.43]	[99.30]	[99.55]	[99.17]	[99.41]	[3][99.78]	[3][100.17]	[3][100.03]	[100.15]	[100.02]	[100.00]	[100.01]
Class	0,1,98	0,2,98	0,1,98	0,4,94	2,5,91	1,2,95	7,2,90	1,2,96	3,2,95	6,2,92	4,5,91	1,4,95	1,5,94
CaO/MgO	Calcite	Calcite	Calcite	Magnesian calcite	Magnesian calcite	Calcite	Calcite	Calcite	Calcite	Dolomite	Calcite	Calcite	Calcite

	Washington—Continued												
	1886	1887	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898
	46F$_2$ 37-109	46F$_2$ 37-27	46F$_2$ 37-107	46F$_2$ 37-108	46F$_2$ 37-1	46F$_2$ 37-3	46F$_2$ 37-8	46F$_2$ 37-6	46F$_2$ 37-7	46F$_2$ 37-5	46F$_2$ 37-168	46F$_2$ 37-10	46F$_2$ 37-4
SiO_2	1.77	1.32	1.37	1.52	0.62	1.14	1.80	0.60	0.60	0.46	7.58	3.94	0.36
Al_2O_3	1.03	.29	[4].42	[4].35	.21	.41	.58	.30	.56	.40	[1]1.42	1.18	.42
Fe_2O_3	.31	------			.42	.38							
FeO	------	.21	------	------			------	------	------	------	------	------	------
MgO	1.00	.36	[5].12	[5].60	.64	.008	Trace	Trace	Trace	------	7.06	.50	1.02
CaO	52.31	54.60	[5]54.12	[5]54.61	54.30	54.84	55.22	55.86	55.96	55.25	43.27	53.07	55.17
$Na_2O + K_2O$	------	[6].24	------	------	------	------	------	------	------	------	------	------	------
H_2O-	------	------	------	------	[7](.02)	[7](.01)	------	------	------	------	------	------	------
P_2O_5	------	------	------	------	.025	.023	------	------	------	------	------	------	------
Ignition loss	43.13	42.98	[8]44.74	[8]43.53	[9]43.27	[9]43.02	42.14	42.66	42.60	43.36	41.14	40.84	42.86
Total	[99.55]	100.00	[100.77]	[100.61]	99.48	99.82	99.74	99.42	99.72	99.47	[10]100.47	99.53	99.83
Class	0,4,95	1,1,97	1,1,99	1,1,99	0,1,98	0,2,98	1,2,95	0,1,97	0,1,97	0,1,98	5,4,90	2,3,92	0,1,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcite	Calcite

	Washington—Continued												
	1899	1900	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1911
	46F$_2$ 37-9	46F$_2$ 37-46	46F$_2$ 37-12	46F$_2$ 37-70	46F$_2$ 37-71	46F$_2$ 37-72	46F$_2$ 37-96	46F$_2$ 37-67	46F$_2$ 37-169	46F$_2$ 37-145	46F$_2$ 37-144	46F$_2$ 37-143	46F$_2$ 37-142
SiO_2	2.22	2.56	7.50	2.72	4.51	1.90	0.50	2.05	2.52	------	------	------	------
Al_2O_2	2.30	[1].38	1.17	[1].57	[1].91	[1].60	[1].18	[1]1.02	1.36	------	------	------	------
Fe_2O_2			.71						.67	------	------	------	------
FeO	------	------		------	------	------	------	------	------	------	------	------	------
MgO	17.05	2.92	.54	5.70	.34	.28	.80	7.76	12.90	------	------	------	------
CaO	34.33	50.79	49.99	47.57	52.59	54.29	54.79	45.02	44.56	53.38	54.89	53.22	54.22
H_2O-	------	------	[7](.06)	------	------	------	------	------	------	------	------	------	------
P_2O_5	------	.020	.037	.019	.010	.018	.030	.026	------	------	------	------	------
Ignition loss	43.56	[2]43.22	39.36	[2]43.74	[2]41.66	[2]42.84	[2]43.62	[2]44.33	------	------	------	------	------
Total	99.46	[99.89]	99.31	[11][100.32]	[100.02]	[99.93]	[12][99.92]	[13][100.21]	[62.01]	[53.38]	[54.89]	[53.22]	[54.22]
Class	0,4,92	2,1,97	5,5,89	2,2,97	3,3,94	1,2,97	0,1,99	0,3,97	0,5,82	0,0,95	0,0,98	0,0,95	0,0,97
CaO/MgO	Calcareous dolomite	Magnesian calcite	Calcite	Magnesian calcite	Calcite	Calcite	Calcite	Magnesian calcite	Calcareous dolomite	Calcite	Calcite	Calcite	Calcite

[1] R_2O_3.

[2] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[3] A composite of samples 1879-1881 and samples 467-469 group F_1 contained Na_2O = 235 ppm, K_2O = 540 ppm, TiO_3 = 250 ppm, S = 220 ppm.

[4] Iron and aluminum oxides.

[5] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[6] Alkalies.

[7] Not included in total.

[8] CO_3, calculated from reported $MgCO_3$ and $CaCO_3$.

[9] CO_3.

[10] 110.47 percent in text.

[11] Na_2O = 225 ppm, K_2O = 500 ppm, TiO_2 = 95 ppm, S = 110 ppm.

[12] With sample 485 group F_1, Na_2O= 290 ppm, K_2O= 530 ppm, TiO_3 = 130 ppm, S = 530 ppm.

[13] Na_2O = 250 ppm, K_2O = 500 ppm, TiO_3 = 70 ppm, S = 245 ppm.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_2O, Sc_2O_3, V_2O_5, CoO, ZnO, Ga_2O_3, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_3, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_2, Nd_2O_3, Sm_2O_2, Eu_2O_3, Gd_2O_3, Tb_2O_3, Dy_2O_3, Ho_2O_3, Er_2O_3, Tm_2O_3, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_2O_2, PbO, Bi_2O_3, ThO_2, UO_2]

	1873	1874	1875	1879	1880	1881	1882	1900	1902	1903	1904	1905	1906
Na_2O	------	0.05	------	------	------	0.05	------	------	------	------	------	0.05	------
TiO_2	0.0036	.02	0.0056	0.013	0.014	.02	0.0052	0.0076	0.021	0.017	0.0092	.0032	0.028
Cr_2O_2	------	------	------	------	.005	------	.0005	------	.00067	.00055	.0005	------	.00096
MnO	.25	.22	.16	.060	.13	.065	.048	.11	.16	.046	.044	.03	.12
NiO	------	------	------	.001	------	------	.0026	.003	.0018	.001	------	.001	.001
CuO	.0012	.0018	.0095	.002	.0015	.0014	.0036	.0015	.0020	.0027	.0015	.0012	.0031
SrO	.007	.011	.0077	.0087	.0074	.008	.0025	.014	.014	.015	.013	.0072	.0091

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1873 - 1875. Whatcom County. Pennsylvanian part of Chilliwack Group. South center and SW¼ sec. 32, T. 37 N., R. 8 E., about 16 miles north of town of Concrete. Dock Butte Trail deposit. (Danner, 1966, p. 16, 19, 82, 259, 260, 262, 263, 453, 467.) Limestone, gray to light-gray, finely crystalline. Chip sample. Index and geologic maps. Possible use: None, deposit small.

1873. Sample W 28-1 taken across 100 ft.
1874. Sample W 28-2 taken across 230 ft.
1875. Sample W 28-3 taken across 200 ft.

1876 - 1878. Whatcom County. Early Pennsylvanian part of Chilliwack Group. [T. 37 N., R. 7 E., unsurveyed.] Ridley Creek deposit. (Danner, 1966, p. 82, 209, 257-259.) Limestone, fossiliferous. Index and geologic maps. Possible use: Cement, deposit in remote area.

1876. Goodnews claim.
1877. Irene claim.
1878. Mazama No. 2 claim.

1879 - 1881. Whatcom County. Early Pennsylvanian part of Chilliwack Group. NW¼ NW¼ sec. 13, T. 40 N., R. 5 E., Red Mountain. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. (Moen, 1962, p. 4, 8, 88, 96, 99, 119; pl. 1; Danner, 1966, p. 16, 19, 82, 210, 220, 221, 452, 465.) General: Limestone, light-gray, crystalline, well-bedded, fossiliferous. Thin-section description. Chip sample. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Concrete aggregate, ballast, cement, road metal, riprap.

1879. Sample W 6-2 taken across 120 ft.
1880. Sample W 6-5 taken across 120 ft.
1881. Sample W 6-1 taken across 130 ft.

1882. County, age, group, analysts, maps, and use as in samples 1879-1881. SE¼ NE¼ sec. 21, T. 40 N., R. 5 E. Sumas Mountain deposit. Sample W 17-1. (Moen, 1962, p. 4, 8, 16, 95, 97, 100, 119, pl. 1; Danner, 1966, p. 16, 19, 82, 209, 210, 231-233, 453, 466.) [Calcareous dolomite] limestone, buff and white mottled, mostly crystalline, fossiliferous. Chip sample taken across 80 ft.

1883 - 1899. Whatcom County. Early Pennsylvanian part of Chilliwack Group. NE¼ SW¼, NW¼ SE¼, NE¼ sec. 14, T. 40 N., R. 5 E., about 3 miles northeast of town of Kendall, Red Mountain. Permanente Cement Co., upper quarry. (Danner, 1966, p. 82, 209, 210, 213, 215, 218, 219.) Limestone, fossiliferous. Index and geologic maps. Former use: Hydrated lime. Use: Cement.

1883 - 1886. Analyst, E. J. Baldwin.
1887. (Burchard, 1912, p. 695, pl. 1; Shedd, 1913, p. 209-211, 212.) Limestone, light-gray; exposed thickness 275 ft.
1888. Analyst, A. H. Cederberg. (Landes, 1905 [1906], p. 379; Burchard, 1912, p. 695, pl. 1.) Limestone, crystalline.
1889. Analyst, D. W. Riedle. (Landes, 1905 [1906], p. 379; Hodge, 1935c, p. 69.) Limestone, crystalline.

Washington—Continued

1890 - 1899. (Hodge, 1938d, p. 13, 26, 28-30, 33, 36, 38, 39, 40.) Limestone, light-gray, finely crystalline. Possible use: Flux.
1890. USED sample 187A.
1891. USED sample 185A.

1900, 1901. Whatcom County. Early Pennsylvanian part of Chilliwack Group. SW¼ SW¼ sec. 14, NW¼ NW¼ sec. 23, T. 40 N., R. 5 E., about 3 miles northeast of Kendall, Red Mountain. Permanente Cement Co., lower quarry, abandoned. (Danner, 1966, p. 16, 19, 82, 209, 210, 213, 214, 216, 218, 219, 453, 467.) Limestone, gray, dense to crystalline, fossiliferous. Index and geologic maps, geologic sections. Former use: Hydrated lime.

1900. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. Sample W 24-5. (Moen, 1962, p. 4, 8, 88-91, 99, 119, pl. 1.) Chip sample, composite. Possible use: Concrete aggregate, ballast, road metal, riprap.
1901. USED sample 189B. (Hodge, 1938d, p. 13, 26, 28-30, 33, 34, 39.)

1902 - 1911. Whatcom County. Sec. 4, T. 40 N., R. 6 E., north of town of Maple Falls. Black Mountain deposits. (Danner, 1966, p. 16, 19, 82, 209, 210, 249-254, 255, 452, 465.) Limestone, fossiliferous. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

1902 - 1906. Analyst, C. S. Homi; spectrochemical analyst, C. E. Harvey. (Moen, 1962, p. 4, 8, 16, 87-89, 92, 96-98, 100, 119, pl. 1.) Chip sample. Possible use: Concrete aggregate, ballast, road metal, riprap.
1902. Probably Early Pennsylvanian part of Chilliwack Group. NE¼ sec. 4. Sample W 7-4. Limestone, gray, massive, bedded; taken across 300 ft.
1903. Probably Early Pennsylvanian part of Chilliwack Group. NE¼ SW¼ sec. 4. Sample W 7-5. Limestone, brown or gray, sugary; bed at least 200 ft thick. Thin-section description. Sample taken across 200 ft.
1904. Probably Early Pennsylvanian part of Chilliwack Group. NE¼ SW¼ sec. 4. Sample W 7-6. Limestone, brown or gray, sugary; bed at least 200 ft thick. Thin-section description. Composite sample.
1905. Early Pennsylvanian part of Chilliwack Group. SW¼ sec. 7. Sample W 1-2. Limestone, gray to brownish-gray, medium to coarsely crystalline, maximum thickness about 400 ft. Thin-section description. Sample taken across 320 ft.
1906. Early to middle Permian part of Chilliwack Group. SE¼ sec. 4. Sample W 7-1. Limestone, crystalline, at least 50 ft thick; taken across 1,000 ft.

1907 - 1911. Early to middle Permian part of Chilliwack Group. SE¼ sec. 4. Analysts, sample 1907: T. H. Williams; samples 1908-1911: E. J. Baldwin. Limestone, brown to gray, dense to sugary.

Table 10.—Analyses of samples from Washington containing more than 90 percent carbonate (Group F_2), common-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924
	$46F_2$ 37-141	$46F_2$ 37-139	$46F_2$ 37-140	$46F_2$ 37-126	$46F_2$ 37-147	$46F_2$ 37-148	$46F_2$ 37-34	$46F_2$ 37-123	$46F_2$ 37-31	$46F_2$ 37-128	$46F_2$ 37-129	$46F_2$ 37-124	$46F_2$ 37-125
SiO_2	------	------	------	1.72	1.97	0.29	2.00	1.42	1.44	7.81	5.82	2.43	2.25
R_2O_3	------	------	------	.94	1.17	.21	[1].66	1.12	[2].92	1.30	2.23	.71	.75
MgO	------	------	------	.25	.33	.10	[3].22	.44	Trace	1.03	.58	.22	.25
CaO	53.76	54.96	53.65	54.12	52.95	54.61	[3]53.80	54.11	54.36	49.53	50.61	53.71	54.02
P_2O_5	------	------	------	.009	.010	.006	------	.244	------	.045	.029	.056	.009
Ignition loss	------	------	------	[4]42.85	[4]43.33	[4]44.25	[5]42.47	[4]42.33	43.17	[4]40.12	[4]40.12	[4]42.69	[4]42.77
Total	[53.76]	[54.96]	[53.65]	[99.89]	[99.76]	[99.47]	[99.15]	[99.66]	99.89	[99.84]	[99.39]	[99.82]	[100.05]
Class	0,0,96	0,0,98	0,0,96	0,3,97	0,5,95	0,2,98	1,2,96	0,2,96	0,3,97	6,4,90	2,7,90	1,2,96	1,2,97
CaO/MgO	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite	Calcite

[1] Alumina and iron.

[2] $Al_2O_3 + Fe_2O_2$.

[3] Calculated from reported $MgCO_3$ and (or) $CaCO_3$.

[4] Sample dried at 110°-112°C; ignition loss 1,000°-1,100°C.

[5] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

Spectrochemical analyses

[The metallic elements not detected in the spectrochemical analysis: Li_2O, BeO, B_2O_3, K_3O, Sc_2O_3, CoO, ZnO, Ga_2O_2, GeO_2, As_2O_3, Y_2O_3, ZrO_2, Nb_2O_5, MoO_3, Ag_2O, Ru, Rh, Pd, CdO, In_2O_2, SnO_2, Sb_2O_3, BaO, TeO_2, Cs_2O, La_2O_3, CeO_2, Pr_2O_3, Nd_2O_2, Sm_2O_2, Eu_2O_3, Gd_2O_3, Tb_2O_2, Dy_2O_2, Ho_2O_3, Er_2O_3, Tm_2O_2, Yb_2O_3, Lu_2O_3, HfO_2, Ta_2O_5, WO_3, Re_2O_7, Os, Ir, Pt, Au, Tl_3O_3, PbO, Bi_2O_3, ThO_2, UO_2]

	1915	1916	1917	1919	1921	1922	1923	1924
Na_2O	0.05	0.14	0.05	0.05	0.05	0.05	0.05	0.05
TiO_	.022	.029	.012	.0056	.035	.029	.018	.020
V_2O_5	------	------	------	------	.0084	------	------	------
Cr_2O_3	.0005	.0005	------	------	.0012	.00099	.0005	.0005
MnO	.072	.027	.007	.019	.095	.067	.18	.13
NiO	------	------	------	------	.0018	.001	.001	------
CuO	.0015	.002	.0014	.0005	.0036	.0036	.002	.0018
SrO	.0098	.022	.022	.031	.035	.036	.013	.011

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

1912-1914. Whatcom County. Early to middle Permian part of Chilliwack Group. SE¼ sec. 4, T. 40 N., R. 6 E., north of town of Maple Falls. Black Mountain deposits. Analyst, E. J. Baldwin. (Danner, 1966, p. 82, 209, 210, 250, 252-254, 255.) Limestone, brown to gray, dense to sugary, fossiliferous. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Cement.

1915. Whatcom County. Devonian. N½SE¼ sec. 32, T. 40 N., R. 7 E. Church Mountain deposits, roadcut. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 13-1. (Danner, 1966, p. 16, 19, 82, 247, 255, 256, 453, 465.) Limestone, gray, crystalline, thin-bedded, fossiliferous. Chip sample taken across 12 ft. Index maps. Possible use: None, deposit small.

1916, 1917. Whatcom County. Holocene. Center sec. 33, T. 40 N., R. 7 E., about 2.6 miles east of town of Glacier. Church Mountain deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 437, 438, 453, 465.) Tufa, brownish-yellow to buff, porous; maximum thickness about 2 ft. Chip sample. Index and geologic maps. Possible use: Agricultural, ornamental stone.

1916. Sample W 11-1 taken across 220 ft.
1917. Sample W 25-1 taken across 70 ft.

1918. Whatcom County. [T. 38 N., R. 3 E.], Balfour Station on Bellingham and Northern railroad. (Shedd, 1913, p. 217.) Limestone. Use: Portland cement.

1919. Whatcom County. S½ sec. 34, T. 38 N., R. 9 E. Baker Lake deposit, roadcut. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. Sample W 26-1. (Danner, 1966, p. 16, 19, 82, 256, 257, 453, 467.) Limestone, gray, finely crystalline. Chip sample, composite. Index map. Possible use: None, deposit small.

1920. Whatcom County. NE¼SW¼ sec. 23, T. 40 N., R. 5 E., near town of Kendall. Northwestern Portland Cement Co. Analyst, A. A. Hammer. Sample 120. (Shedd, 1913, p. 209, 211, 212, 247, pl. 21; Danner, 1966, p. 82, 210, 237, 238.) Limestone, gray, coarsely crystalline, some chert. Small tonnage. Index and geologic maps. Possible use: Portland cement.

1921, 1922. Whatcom County. NW¼SW¼ sec. 7, T. 40 N., R. 6 E., about 3.5 miles north of town of Maple Falls. Silver Lake deposit. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 223, 224, 225, 453, 465.) Limestone, dense, fossiliferous; weathers dark gray to brownish gray. Thin-section description. Chip sample. Index and geologic maps. Possible use: Cement.

1921. Sample W 15-1 taken across 230 ft.
1922. Sample W 15-2 taken across 150 ft.

1923, 1924. Whatcom County. N½SE¼ sec. 32, T. 40 N., R. 7 E. Church Mountain deposits, roadcut. Analyst, under supervision of Mark Adams; spectrochemical analyst, C. E. Harvey. (Danner, 1966, p. 16, 19, 82, 247, 255, 256, 453, 465.) Limestone, gray, crystalline, thin-bedded; about 20 ft thick. Chip sample. Index maps. Possible use: None, deposit small.

1923. Sample W 12-1 taken across 20 ft.
1924. Sample W 12-2 taken across 385 ft.

Table 11.—Analyses of samples from Idaho, Oregon, and Washington, of clays in which (2.178 x Al_2O_3) + H_2O (however determined) is 50 percent or more of the sample (Group Hk), special-rock category

[Kaolin-like clays (kaolinite only, no "bauxite"). SiO_2/Al_2O_3 weight ratio from 1.178 to 1.768; total iron < 30 percent. Chemical analyses arranged by State, county, and stratigraphic position]

Chemical analyses

	Idaho												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	11Hk29-32	11Hk29-2	11Hk29-19	11Hk29-11	11Hk29-10	11Hk29-14	11Hk29-15	11Hk29-48	11Hk29-39	11Hk29-50	11Hk29-31	11Hk29-29	11Hk29-26
SiO_2	57.5	41.7	46.2	44.93	44.58	45.0	52.2	48.5	42.1	47.4	46.13	53.2	53.9
Al_2O_2	40.9	24.0	35.7	38.10	37.42	32.1	30.3	29.6	30.4	33.9	37.36	35.2	34.4
Fe_2O_3	.5	17.3	.1	.67	.95	7.9	4.0	5.5	10.1	3.7	2.20	1.16	.9
FeO	------	------	------	.02	.06	------	------	------	------	------	------	------	------
MgO	.5	.20	.21	.45	.71	.51	.36	------	------	------	.64	1.5	.4
CaO	.4	1.74	.37	.23	.24	Trace	Trace	------	------	------	.65	1.5	.2
Na_2O	------	------	.67	.13	.12	------	------	------	------	------	Trace	------	------
K_2O	------	3.80	.03	.06	.18	.05	------	------	------	------			
H_2O-	------	------	[1]2.30	[2]2.18	[2]2.25	------	------	------	------	------	[3]1.34	------	------
TiO_2	------	------	------	1.09	1.16	1.0	------	4.1	5.6	2.0	------	------	------
P_2O_5	------	------	------	.02	.02	------	------	------	------	------	------	------	------
SO_3	------	------	------	.02	.03	------	------	------	------	------	------	------	------
MnO_2	------	------	------	.01	.005	------	------	------	------	------	------	------	------
Ignition loss	2	9.50	14.5	12.03	12.20	15.1	14.3	[4]10.2	[4]11.0	[4]11.9	[5]12.20	------	10.2
Total	[102]	[98.2]	100.1	[99.94]	[99.92]	[101.7]	[101.2]	[97.9]	[99.2]	[98.9]	100.52	[92.6]	[100.0]
Class	0,92,0	0,77,4	0,89,1	0,84,1	0,84,2	0,87,1	0,97,1	0,88,0	0,79,0	0,87,0	0,85,2	0,91,0	0,94,1

[1] Below 100°C.

[2] At 105°C.

[3] Sample air dried, moisture at 110°C.

[4] At 950°C.

[5] Combined water, ignition.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho

1. Latah County. Miocene. [T. 39 N., R. 2 W.], 6 miles east of town of Troy. Sample 33. (Skeels, 1920, p. 44, 45.) Clay, white, fine-grained; 24 ft thick, overburden 1 ft. Physical properties, firing tests. Possible use: Refractories.

2. Latah County. Miocene. T. 39 N., R. 3 W., near Troy, old Kendrick road. (Hubbard, 1956a, p. 19, pls. 1, 2.) Clay. Index and geologic maps.

3. Latah County. Miocene. [T. 39 N., R. 3 W.], near Troy. Analyst, R. V. Lundquist. Sample 1. (Tullis and Laney, 1933, p. 485-493, 495.) Clay. Index map. Microscopic examination. Use: Face brick, firebrick, terra cotta, sewer pipe, stoneware, draintile, roofing tile, structural tile.

4, 5. Latah County. Middle and late Miocene, Latah Formation. NE¼ NW¼ sec. 16, T. 40 N., R. 1 W., 0.5 mile north of town of Helmer. A. P. Green Co. (Ponder and Keller, 1960, p. 44, 45, 47, 48, 50, 51, 53-57, 58.) Mineralogy. Index and geologic map. Microscopic description, size distribution analyses, chemical analyses recalculated to relative number of cations, allophane content of clay samples. Possible use: Fire clay.

4. Sample AD-1. Clay, white, speckled; contains brown silt-size particles.

5. Sample SC-1. Clay, gray to very light brown, extremely fine grained, plastic; contains very little silt; from bed 8-12 ft thick.

6. Latah County. Miocene. Sec. 6, T. 40 N., R. 2 W., 1 mile northwest of town of Vassar, railroad cut. (Hubbard, 1956a, p. 21, pls. 1, 2, 5.) Clay, maximum thickness 12 ft, overburden 8 ft. Index and geologic maps.

7. Latah County. [Latah Formation.] Sec. 23, T. 40 N., R. 2 W., 0.5 mile east of town of Deary, railroad cut. (Hubbard, 1956a, p. 20, 21, pls. 1, 2, 5.) Composite sample. Lower bed: Clay, creamy-gray, 6 ft thick; upper bed: Clay, yellow, sandy, 4 ft thick. Index and geologic maps.

Idaho—Continued

8-10. Latah County. Miocene. About 3 miles southwest of Deary. (Hosterman and others, 1960, p. 1-4, 12, 13, 15, 20, 29, 37, 101, 111, pls. 1, 2, 6.) Overburden averages 15.9 ft. Mineralogy. Bulk density averages 1.64. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections. Log of drill hole. Weighted composite sample; samples taken at about 5-ft intervals or where clay showed a marked change. Possible use: Source of alumina, gallium, ilmenite.

8. SW¼ sec. 19, T. 40 N., R. 2 W. Drill hole O1-163. Clay, varicolored; depth 18.7-27.0 ft.

9. NE¼ sec. 24, T. 40 N., R. 3 W. Drill hole O1-207. Clay, blue and yellow; depth 10.5-37.8 ft.

10. SE¼ sec. 25, T. 40 N., R. 3 W. Drill hole O1-173. Clay, varicolored; depth 7.5-20.1 ft.

11. Latah County. Latah Formation. [Sec. 31, T. 42 N., R. 4 W.], near town of Potlatch. Analyst, W. R. Bloor. Sample 92. (Shedd, 1910, p. 222, 223, 224, 307, 320, 321.) Clay, white, plastic; 15 ft thick; overburden 8-10 ft. Microscopic description. Use: Stoneware.

12. Latah County. [Latah Formation. T. 42 N., R. 4 W.], 0.5 mile north of town of Onaway. Sample 55. (Skeels, 1920, p. 55, 56.) Clay, white, fine-grained; at least 20 ft thick. Physical properties, firing tests. Use: Terra cotta, crude pottery, refractories. Possible use: Face brick, building tile.

13. Latah County. [Sec. 6, T. 40 N., R. 2 W.], near Stanford station, railroad cut. Sample 23. (Skeels, 1920, p. 38, 40.) Clay, white, brown, fine-grained; contains mica. Geologic section, columnar section. Physical properties, firing tests. Possible use: Structural ware.

Table 11.—Analyses of samples from Idaho, Oregon, and Washington, of clays in which $(2.178 \times Al_2O_3) + H_2O$ (however determined) is 50 percent or more of the sample (Group Hk), special-rock category—Continued

Chemical analyses—Continued

	Oregon												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	36Hk3-1	36Hk3-5	36Hk3-35	36Hk3-7	36Hk3-13	36Hk3-14	36Hk3-17	36Hk3-18	36Hk3-16	36Hk3-9	36Hk5-8	36Hk5-56	36Hk20-3
SiO_2	43.52	43.74	44.98	45.86	43.6	45.5	46.09	54.17	44.40	46.1	51.22	42.11	50.80
Al_2O_3	36.72	31.72	33.09	38.78	30.2	27.8	37.55	31.13	36.60	30.1	31.34	24.77	33.45
Fe_2O_3	5.10	7.85	3.03	2.79	10.3	11.5	[1]2.51	[1]4.42	[1]1.96	9.6	2.92	[2]19.43	.81
MgO	.21	.42	.5	.24	.3	.4	.07	.13	.11	------	.4	.13	None
CaO	.65	3.60	.44	.70	.3	.3	.44	.50	.36	------	.00	.10	None
Na_2O	------	------	------	------	.1	.4	------	------	.41	[3].8	------	------	None
K_2O	------	------	------	------	<.05	<.05	------	------					None
H_2O+	------	------	------	------	------	------	------	------	------	------	------	------	[4]12.11
H_2O-	------	------	[5]3.26	------	------	------	------	------	------	------	[5]1.20	------	[5].61
TiO_2	[6].66	[6].27	1.92	[6].21	1.8	1.8	------	------	------	1.6	1.82	------	1.92
P_2O_5	------	------	------	------	.19	.13	------	------	------	------	------	[2].25	------
MnO	------	------	------	------	------	------	------	------	------	------	------	[2].66	------
CO_2	------	------	------	------	[7](1.32)	[7](1.43)	------	------	------	------	------	------	------
SO_3	------	------	------	------	<.05	<.05	------	------	[8].09	------	------	[8].020	------
V_2O_5	------	------	------	------	<.05	<.05	------	------	------	------	------	------	------
ZrO_2	------	------	------	------	<.05	<.05	------	------	------	------	------	------	------
Organic matter	------	------	------	------	[9](.33)	[9](.43)	------	------	------	------	------	------	.31
Ignition loss	13.10	12.61	12.73	12.40	[10]12.6	[10]11.8	13.61	10.39	16.20	11.8	12.02	12.85	------
Total	99.96	100.21	[100.0]	100.98	99.6	99.8	100.27	100.74	100.13	100.0	100.9	[100.32]	100.01
Class	0,82,2	0,80,7	0,86,2	0,84,2	0,82,2	0,84,2	0,86,1	0,96,1	0,86,1	0,86,0	0,94,1	0,83,0	0,93,0

	Oregon—Continued													
	27	28	29	30	31	32	33	34	35	35a	36	37	38	39
	36Hk20-5	36Hk20-16	36Hk20-8	36Hk20-11	36Hk20-12	36Hk20-10	36Hk20-7	36Hk20-24	36Hk20-13	36Hk20-15	36Hk20-22	36Hk20-4	36Hk24-50	36Hk24-4
SiO_2	50.91	51.2	46.98	48.40	49.68	47.20	46.3	49.58	50.12	62.06	38.22	53.15	35.03	51.72
Al_2O_3	33.67	30.4	39.86	39.20	38.42	39.82	35.7	34.53	35.43	27.44	31.78	31.34	29.60	31.08
Fe_2O_3	.50	3.6	.46	.74	.56	.47	.3	.29	2.23	1.48	[1]17.36	[1]1.08	[2]18.23	2.87
MgO	None	.0	.19	.22	.15	.16	.3	.7	.15	.17	.40	------	------	.66
CaO	None	.2	.47	.50	.44	.43	.3	.00	.37	.40	.77	.23	------	.47
Na_2O	None	.2	------	------	------	------	1.4	------	------	------	------	------	------	------
K_2O	None	.1	------	------	------	------	None	------	------	------	------	------	------	------
H_2O+	[4]11.97	------	------	------	------	------	------	------	------	------	------	------	------	------
H_2O-	[5].61	------	------	------	------	------	------	[5].41	------	------	------	------	------	------
TiO_2	1.99	2.4	[6].17	[6].19	[6].13	[6].25	------	2.80	[6].22	[6].22	------	2.25	4.07	[6].14
P_2O_5	-----	.25	------	------	------	------	------	------	------	------	------	------	------	------
CO_2	-----	.7	------	------	------	------	------	------	------	------	------	------	------	------
V_2O_5	-----	<.05	------	------	------	------	------	------	------	------	------	------	------	------
As_2O_3	-----	.27	------	------	------	------	------	------	------	------	------	.19	------	------
ZrO_2	-----	.0	------	------	------	------	------	------	------	------	------	------	------	------
Sb_2S_3	-----	.08	------	------	------	------	------	------	------	------	------	------	------	------
WO_3	-----	.0	------	------	------	------	------	------	------	------	------	------	------	------
Hg	-----	.0	------	------	------	------	------	------	------	------	------	------	------	------
Organic matter	.16	[11].1	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	-----	[12]11.8	12.46	10.92	11.18	12.40	13.4	12.57	11.52	8.83	11.19	11.53	[13]15.23	12.46
Total	99.81	[14][101.3]	100.59	100.17	100.56	100.73	[97.7]	100.9	100.04	100.60	99.72	99.77	[102.16]	99.40
Class	0,93,0	0,93,1	0,86,1	0,86,1	0,89,1	0,86,1	0,85,1	0,90,1	0,90,1	12,87,1	0,73,2	0,95,0	0,73,0	0,93,2

	Oregon—Continued								Washington			
	40	41	42	43	44	45	46	47	48	49	50	51	52
	36Hk24-9	36Hk24-11	36Hk24-83	36Hk24-84	36Hk24-5	36Hk24-10	36Hk24-6	36Hk24-76	36Hk24-8	46Hk4-3	46Hk4-4	46Hk4-2	46Hk4-1
SiO_2	43.20	44.88	46.2	45.20	46.58	44.80	46.04	47.46	45.11	51.26	44.80	48.20	44.13
Al_2O_3	36.12	34.71	32.3	36.96	35.87	37.95	33.89	33.70	32.71	32.65	37.35	34.79	32.46
Fe_2O_3	4.46	7.71	3.8	3.43	5.06	3.62	7.34	[1]4.52	[1]7.72	.61	.41	.61	[1]4.45
MgO	.37	.28	([15])	.31	.28	.18	.27	.11	.18	.21	.09	.12	.31
CaO	.41	.23	([15])	.79	.76	.42	.64	1.07	.33	.50	.58	.56	.71
Na_2O	------	------	[15]1.9	------	------	------	------	------	------	.55	1.29	1.07	------
K_2O	------	------	------	------	------	------	------	------	------				
TiO	.43	.28	------	.16	.10	.29	.33	------	------	------	------	------	------
Ignition loss	15.02	12.74	12.4	13.13	11.78	13.10	11.95	12.87	13.80	[17]14.22	[17]15.48	[17]14.65	18.08
Total	100.01	100.83	96.6	99.98	100.43	100.36	100.46	99.73	99.85	100.00	100.00	100.00	100.14
Class	0,83,2	0,84,1	0,86,0	0,84,2	0,85,2	0,84,1	0,85,2	0,88,2	0,86,1	0,94,1	0,85,1	0,90,1	0,88,2

[1] Includes FeO.

[2] Calculated from reported Fe, P, or Mn.

[3] Mainly alkalies and alkaline earth, by difference.

[4] Above 110°C.

[5] At 110°C.

[6] TiO.

[7] Not included in total.

[8] S.

[9] Organic C, not included in total.

[10] At 950°C

[11] Organic C.

[12] At 950°C; ignition loss at 700° C = 11.5 percent.

[13] At 1,000°-1,100°C; sample air dried.

[14] Sample dried at 130°C.

[15] Minor amounts of lime and magnesia.

[16] Reported as soda.

[17] Combined water, ignition.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon

14, 15. Clackamas County. Probably post-middle Miocene. (Wilson and Treasher, 1938, p. 19, 24, 31, 41-46, 84-86, 88, 89.) Index maps. Firing tests.
  14. SE¼ SE¼ sec. 15, T. 5 S., R. 2 E., 2.4 miles southeast of town of Molalla. Robbins property. Field No. 7. Clay, gray, compact; weathers brown; some iron stain, conchoidal fracture; estimated thickness 25 ft; overburden. Possible use: Probably none.
  15. NE¼ NE¼ sec. 27, T. 5 S., R. 2 E., 4.3 miles by road southeast of Molalla. Ellis property. Auger hole A. Field No. 6 D 28. Fire clay, bluish-gray to purplish-green; weathers brown; 23.5 ft from top of clay; overburden more than 70 ft. Mineralogy. Tonnage estimated. Detailed measured sections. Physical properties. Possible use: Refractories.

16. Clackamas County. [Probably post-middle Miocene. T. 5 S., R. 2 E., near] Molalla. Analyst, H. R. Shell. (Speil and others, 1945, p. 31, 32.) Kaolin. Mineralogy, thermal analysis curve.

17. Clackamas County. Probably post-middle Miocene. SE¼ SE¼ sec. 1, T. 6 S., R. 2 E., more than 10 miles by road southeast of Molalla. Dibble property. Field No. 8 A. (Wilson and Treasher, 1938, p. 19, 24, 42, 46, 47, 84-86, 89.) Clay, light-bluish-gray, smooth, not gritty, compact, conchoidal fracture; overburden. Index maps, physical properties, firing tests. Possible use: Refractories.

18, 19. Clackamas County. Pliocene, Molalla Formation. Secs. 15, 16, 21, 22, 27, 28, T. 5 S., R. 2 E., southeast of Molalla. (Oregon Dept. Geology and Mineral Industries, 1951, p. 18, 19, 20, fig. 1.) Clay, analysis of composite sample. Mineralogy. Tonnage estimated. Index map.
  18. From lower clay series which averages about 55 ft thick.
  19. From upper clay series which ranges from 20 to 133 ft in thickness.

20. Clackamas County. Pliocene or Pleistocene. SE¼ SE¼ sec. 1, T. 6 S., R. 2 E., near Molalla. Dibble pit. Sample 4. (Hodge, 1938f, p. 817, 851, 853.) Clay. Index map, detailed measured section. Former use: Pottery.

21, 22. Clackamas County. Pliocene or Pleistocene. Sec. 1, T. 6 S., R. 2 E., near Molalla. Samples 5, 6. (Hodge, 1938f, p. 817, 851-853.) General: Material varies from fine, blue, plastic clay to coarse, kaolinitic, weathered gravels. Clay depth 200 ft. Index map. Possible use: Refractories.
  22. Analyst, Lazell.

23. Clackamas County. [Sec. 1, T. 6 S., R. 2 E., near] Molalla. Analyst, Anthony Centenero; collector, R. L. Nichols. Sample M-3. (Pask and Davies, 1943, p. 3, 10, 20, 22, 23, 25; Pask and Davies, 1945, p. 57, 62, 73, 74, 76, 78.) Clay. Mineralogy. Thermal analysis curve. Possible use: Source of alumina.

24. Columbia County. [Post-middle Miocene. NE¼ sec. 33, T. 8 N., T. 3 W., 6 miles west of town of Rainier.] Fransen. Analyst, H. R. Shell. (Speil and others, 1945, p. 31, 32.) Kaolin. Mineralogy, thermal analysis curve.

25. Columbia County. [T. 4 N., R. 3 W.] Pearson location. (Hodge, 1935b, p. 18.) [Iron-bearing rock.]

26 - 28. Lane County. Late Eocene and Oligocene, Calapooya Formation. Sec. 31, T. 22 S., R. 3 W., about 16 miles south of town of Cottage Grove, Hobart Butte. Willamina Clay Products Co. quarry. (Allen, 1946, p. 129, 131, 132, 133; Allen and others, 1951, p. 1-5, 7, 9, pls. 1, 2, fig. 1.) Clay. Deposit up to 204 ft thick; overburden up to 130 ft thick. Mineralogy. Index and geologic maps, geologic sections, generalized columnar section. Photomicrograph. Use: Refractories. Possible use: Source of alumina.
  26. Analyst, W. W. Brannock. Sample 16G.
  27. Analyst, W. W. Brannock. Sample 16W.
  28. Sec. 31, T. 22 S., R. 3 W. and sec. 36, T. 22 S., R. 4 W. Composite sample.

29 - 33. Lane County. Probably post-middle Miocene. SW¼ sec. 31, T. 22 S., R. 4 W., about 16 miles south of Cottage Grove, Hobart Butte. Willamina Clay Products Co. quarry. (Wilson and Treasher, 1938, p. 19, 24, 37, 69, 70, 73, 74, 84-86, 92.) Clay. Average bulk density 2.4. Tonnage estimated. Index maps, measured section. Physical properties, firing tests. Possible use: Paint and paper filler, refractories, whiteware.
  29. Field No. 35 C 1.
  30. Field No. 35 C 2.
  31. Field No. 35 G.
  32. Field No. 35 I 1.

34. Lane County. [Probably post-middle Miocene. SW¼ sec. 31, T. 22 S., R. 4 W., about 16 miles south of Cottage Grove.] Hobart Butte. Analyst, H. R. Shell. (Speil and others, 1945, p. 30-32.) Kaolin, siliceous. Mineralogy, thermal analysis curve.

35, 35a. Lane County. Probably post-middle Miocene. NW¼ sec. 16, T. 23 S., R. 3 W., about 18 miles south of Cottage Grove. (Wilson and Treasher, 1938, p. 19, 24, 70, 75-78, 84, 92.) Index maps. Firing tests. Possible use: Probably none.
  35. Field No. 36 A. Clay, tan, plastic.
  35a. Field No. 36 H 3. Clay, bluish-gray matrix mottled with white inclusions.

36. Lane County. SW¼ SE¼ sec. 1, T. 18 S., R. 4 W., about 2.6 miles south of town of Eugene. Stevens property. Sample 2. (Hodge, 1938f, p. 817, 871, 872, 887.) Red ocher clay, uniformly dense. Index map. Firing tests. Use: Mineral paint, black porcelain.

37. Lane County. SW¼ sec. 31, T. 22 S., R. 3 W., about 14 miles south of Cottage Grove. Hobart Butte Mining Association. Sample 3. (Hodge, 1938f, p. 817, 876, 877, 881-883, 887.) Clay, white to light-gray. Channel sample. Tonnage estimated. Index maps. Firing tests. Use: Refractories.

38. Marion County. Miocene and Pliocene. NW¼ sec. 28, T. 8 S., R. 3 W., about 5 miles south of town of Salem, roadcut. Analyst, L. L. Hoagland. Sample P-3567. (Libbey, Lowry, and Mason, 1945, p. 4, 5, 72, 74, 76, 77, 85, 87, 88.) [Ferruginous bauxite] laterized basalt, red and gray, soft; 1.5-ft channel sample. Overburden. Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories.

39. Marion County. Probably post-middle Miocene. SE¼ SW¼ sec. 25, T. 7 S., R. 1 W., 6 miles south of town of Silverton, roadcut. Field No. 20. (Wilson and Treasher, 1938, p. 19, 24, 50, 60, 84, 91.) Clay, iron-stained, fine-grained, somewhat plastic; overburden. Index maps. Firing tests.

40 - 46. Marion County. Probably post-middle Miocene. T. 8 S., R. 1 E., King area. Tonnage estimated. Index maps. Firing tests. Possible use: Non-plastic refractories.
  40. SW¼ SW¼ sec. 3, west of Silver Creek Falls, roadcut. Field No. 18. (Wilson and Treasher, 1938, p. 19, 24, 50, 59, 84, 90.) Clay, tan-gray, oolitic.
  41. South line of SW¼ SE¼ sec. 13. Field No. 15. (Wilson and Treasher, 1938, p. 19, 24, 50, 56, 57, 84, 90.) Clay, gray-brown; 4.5 ft thick, overburden 3.5 ft. Auger-drill hole. Detailed measured section.
  42, 43. SW¼ SE¼ sec. 18, few miles northeast of town of Sublimity. King property. General: Clay, white, fine-grained; tuff overburden. Detailed measured sections. Physical properties.
    42. Channel sample 11. (Wilson and Treasher, 1938, p. 19, 24, 49-51, 52, 53, 85, 86, 90.) Clay, white, soft, compact.
    43. Field No. 11. (Wilson and Treasher, 1938, p. 19, 24, 49-53, 84-86, 89.)
  44. NW¼ sec. 19. Field No. 14. (Wilson and Treasher, 1938, p. 19, 24, 50, 55-57, 84, 90.) Clay, white; overburden. Auger-drill hole. Detailed measured section.
  45. NE¼ NE¼ sec. 21. Field No. 16. (Wilson and Treasher, 1938, p. 19, 24, 50, 56, 84, 90.) Clay, white, soft, compact; contains dark inclusions; overburden.
  46. NW¼ SE¼ sec. 21. Field No. 17. (Wilson and Treasher, 1938, p. 19, 24, 50, 56, 57, 59, 84, 90.) Clay, overburden 25 ft of tuff. Detailed measured section.

47. Marion County. [T. 8 S., R. 1 E.], near town of Silverton, above lower falls on Silver Creek. Sample 1. (Hodge, 1938f, p. 817, 864, 867.) Fire clay, white, upper part stained pink and yellow; about 16 ft thick. Index map.

48. Marion County. [T. 8 S., R. 1 W.], 4 miles northeast of Sublimity. Sample 4. (Hodge, 1938f, p. 817, 862, 867.) Fire clay, white; at least 8 ft thick; overburden few inches to 2 ft thick. Index map. Firing tests.

Washington

49 - 51. Chelan County. Late Cretaceous and Paleocene, Swauk Formation. NW¼ sec. 27, T. 22 N., R. 20 E., 3-4 miles south of town of Wenatchee. N. W. L. Brown prospect. Analyses 8-10. (Glover, 1941, p. 62, 336, 342, 343.) Shale, dark-gray-brown, nonplastic; thick beds interstratified with sandstone. Firing tests. Possible use: Refractories.

52. Chelan County. SW corner sec. 22, T. 22 N., R. 20 E., southwest of Wenatchee. Brown pit. (Hodge, 1938e, p. 706, 707.) Fire clay, 6 ft thick. Detailed measured section. Firing tests.

Table 11.—Analyses of samples from Idaho, Oregon, and Washington, of clays in which (2.178 x Al_2O_3) + H_2O (however determined) is 50 percent or more of the sample (Group Hk), special-rock category—Continued

Chemical analyses— Continued

	Washington—Continued												
	53	54	55	56	57	58	59	60	61	62	63	64	65
	46Hk8-56	46Hk8-9	46Hk8-8	46Hk8-10	46Hk8-11	46Hk8-7	46Hk8-39	46Hk8-41	46Hk8-51	46Hk8-52	46Hk8-53	46Hk8-50	46Hk8-55
SiO_2	36.9	43.9	42.8	44.1	44.1	47.2	36.6	41.3	46.3	41.7	41.7	42.8	38.1
Al_2O_3	31.2	31.8	32.3	28.9	28.2	27.0	29.3	30.7	28.6	30.3	31.1	31.0	31.3
Fe_2O_3	8.3	5.7	7.9	4.1	9.6	8.0	8.4	9.8	10.7	11.3	11.7	10.6	6.5
MgO	------	------	------	------	------	------	------	------	------	------	------	.2	------
CaO	------	------	------	------	------	------	------	------	------	------	------	.3	------
Na_2O	------	------	------	------	------	------	------	------	------	------	------	.1	------
K_2O	------	------	------	------	------	------	------	------	------	------	------	< .05	------
TiO_3	2.3	2.1	2.0	2.3	2.1	2.0	2.1	2.2	2.0	2.5	2.0	2.2	2.3
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	.29	------
CO_2	------	------	------	------	------	------	------	------	------	------	------	[1](.74)	------
SO_3	------	------	------	------	------	------	------	------	------	------	------	.28	------
Zr_2O_3	------	------	------	------	------	------	------	------	------	------	------	< .05	------
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	< .05	------
Organic C	------	------	------	------	------	------	------	------	------	------	------	[1](.39)	------
Ignition loss[2]	20.8	15.3	14.1	19.0	17.2	12.8	21.7	14.0	11.0	12.9	12.3	12.2	20.6
Ignition loss[3]	(20.1)	(14.8)	(13.6)	(18.3)	(16.3)	(12.1)	(21.1)	(13.5)	(10.2)	(12.5)	(12.2)	(11.7)	(19.8)
Total	[99.5]	[98.8]	[99.1]	[98.4]	[101.2]	[97.0]	[98.1]	[98.0]	[98.6]	[98.7]	[98.8]	100.1	[98.8]
Class	0,80,0	0,85,0	0,83,0	0,99,0	0,89,0	0,89,0	0,81,0	0,81,0	0,86,0	0,81,0	0,80,0	0,81,1	0,82,0

	Washington—Continued												
	66	67	68	69	70	71	72	73	74	75	76	77	78
	46Hk8-58	46Hk8-60	46Hk8-61	46Hk8-62	46Hk8-20	46Hk8-27	46Hk8-33	46Hk8-34	46Hk8-35	46Hk8-38	46Hk8-54	46Hk8-14	46Hk8-13
SiO_2	37.9	40.6	48.3	40.6	41.0	37.4	39.7	39.8	40.3	37.4	39.6	41.09	38.80
Al_2O_3	31.2	29.2	30.5	31.1	28.6	22.6	32.0	32.5	31.9	30.4	30.4	31.07	32.03
Fe_2O_3	7.0	6.2	4.9	8.0	9.8	21.6	7.5	10.4	6.2	9.8	7.0	5.71	6.12
MgO	------	------	------	------	------	------	------	------	------	------	< .05	------	------
CaO	------	------	------	------	------	------	------	------	------	------	.6	------	------
Na_2O	------	------	------	------	------	------	------	------	------	------	.1	------	------
K_2O	------	------	------	------	------	------	------	------	------	------	.2	------	------
TiO_2	2.1	2.0	2.3	2.1	2.4	------	2.0	2.0	2.4	2.1	2.0	2.10	2.13
P_2O_5	------	------	------	------	------	------	------	------	------	------	.28	.20	------
CO_2	------	------	------	------	------	------	------	------	------	------	[1](2.23)	------	------
SO_3	------	------	------	------	------	------	------	------	------	------	.26	------	------
Zr_2O_3	------	------	------	------	------	------	------	------	------	------	<.05	------	------
V_2O_5	------	------	------	------	------	------	------	------	------	------	<.05	------	------
BeO	------	------	------	------	------	------	------	------	------	------	<.05	------	------
Organic C	------	------	------	------	------	------	------	------	------	------	[1](4.23)	------	------
Ignition loss	[2]20.5	[2]20.5	[2]12.1	[2]17.1	[2]16.4	[4]14.2	[2]17.4	[2]14.2	[2]18.2	[2]18.0	[2]19.0	[5]17.86	[5]20.41
Ignition loss[3]	(19.8)	(19.8)	(11.6)	(16.2)	(16.3)	------	(16.8)	(14.0)	(17.9)	(17.6)	(18.0)	------	------
Total	[98.7]	[98.5]	[98.1]	[98.9]	[98.2]	[95.8]	[98.6]	[98.9]	[99.0]	[97.7]	99.6	[98.03]	[99.49]
Class	0,81,0	0,86,0	0,89,0	0,83,0	0,83,0	0,77,0	0,81,0	0,79,0	0,83,0	0,79,0	0,79,3	0,84,0	0,83,0

	Washington—Continued												
	79	80	81	82	83	84	85	86	87	88	89	90	91
	46Hk9-1	46Hk9-5	46Hk17-40	46Hk29-70	46Hk32-18	46Hk32-21	46Hk32-32	46Hk32-33	46Hk32-34	46Hk32-36	46Hk32-37	46Hk32-38	46Hk32-57
SiO_2	51.97	46.67	57.50	49.73	39.7	49.5	43.5	40.5	39.2	40.0	43.1	39.9	41.2
Al_2O_3	30.96	35.84	34.37	32.57	28.2	28.4	30.9	32.4	29.6	32.2	30.2	29.2	31.1
Fe_2O_3	[6]4.44	3.61	[7]1.24	[7]1.52	13.4	5.4	5.3	7.1	10.4	9.1	9.0	11.5	8.2
MgO	.72	Trace	1.00	1.28	------	------	------	------	------	------	------	------	.0
CaO	.30	.62	.50	.42	------	------	------	------	------	------	------	------	1.0
Na_2O	------	------	[8].68	1.10	------	------	------	------	------	------	------	------	.4
K_2O	------	------		.00	------	------	------	------	------	------	------	------	.3
H_2O	------	------	4.71	12.38	------	------	------	------	------	------	------	------	------
TiO_2	------	------	------	------	6.9	4.8	7.5	7.8	8.3	6.3	5.0	6.3	7.3
S	------	------	------	.47	------	------	------	------	------	------	------	------	------
$CaSO_4$	------	------	------	[9].10	------	------	------	------	------	------	------	------	------
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	------	< .05
Ignition loss	11.74	[10]13.25	------	------	[11]10.6	[11]9.3	[11]11.3	[11]11.4	[11]11.0	[11]11.3	[11]11.6	[11]10.4	11.1
Total	100.13	99.99	100.00	[12]100.00	[98.8]	[97.4]	[98.5]	[99.2]	[98.5]	[98.9]	[98.9]	[97.3]	100.6
Class	0,93,2	0,87,1	0,95,0	0,91,0	0,76,0	0,89,0	0,81,0	0,76,0	0,75,0	0,76,0	0,81,0	0,75,0	0,77,2

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[1] Not included in total.
[2] At 950°C. Sample dried at 130°C.
[3] At 700°C. Not included in total.
[4] At 800°C. Sample dried at 130°C.
[5] At 1,000°C.
[6] Includes FeO.
[7] Iron oxide.
[8] Alkalies.
[9] Reported as sulph. lime.
[10] Volatile.
[11] At 950°C.
[12] Carb. lime = 0.43 percent.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

53-78. Cowlitz County. Tertiary. T. 10 N., R. 1 W., about 6.5 miles northeast of town of Castle Rock. Cowlitz deposit. (Popoff, 1955, p. 1-5, 7, 9, 10-16, 18, 19, 21-25, 31, 37-40, 44, 46-57.) Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections. Log of drill hole. Use: Refractories. Possible use: Source of alumina.

53. SE¼ sec. 7. Drill hole 48. Clay, red-brown and green-blue, semiplastic; more than 40 ft thick; overburden; depth 9.7-46.4 ft.

54-57. Clay, blue-gray, lignitic; ranges up to 70 ft in thickness.

54. SE¼ sec. 9. Drill hole 45, depth 14.2-41.5 ft.

55. NE¼ sec. 16. Drill hole 27, depth 12.9-45.3 ft.

56. NE¼ sec. 16. Drill hole 47, depth 49.0-66.7 ft.

57. NE¼ sec. 16. Drill hole 49, depth 39.7-77.9 ft.

58. NE¼ sec. 16. Drill hole 14. Clay, gray; contains lignite. Depth 2.5-41.8 ft.

59, 60. SW¼ sec. 17. Lower portion: Clay, blue-gray and gray, semiflint, fine, dense; contains clay pellets, siderite oolites and concretions; 12-20 ft thick. Upper portion: Clay, gray or nearly black; contains lignite seams, overburden.

59. Drill hole 36, depth 44.3-92.4 ft.

60. Drill hole 39, depth 3.6-31.2 ft.

61-69. Clay, red-brown and green-blue, semiplastic; more than 40 ft thick, overburden.

61. NW¼ sec. 17. Drill hole 13, depth 23.0-53.0 ft.

62. NW¼ sec. 17. Drill hole 42, depth 28.9-70.9 ft.

63. NW¼ sec. 17. Drill hole 44, depth 14.0-39.3 ft.

64. NW¼ sec. 17. Drill holes 13, 42, 44, composite sample.

65. NE¼ sec. 18. Drill hole 46, depth 48.4-103.4 ft.

66. NE¼ sec. 18. Drill hole 52, depth 24.5-53.5 ft.

67. NE¼ sec. 18. Drill hole 54, depth 72.0-119.2 ft.

68. NE¼ sec. 18. Drill hole 58, depth 6.3-28.9 ft.

69. NE¼ sec. 18. Drill hole 59, depth 1.5-68.7 ft.

70-75. SE¼ sec. 18. Lower portion: Clay, blue-gray and gray, semiflint, dense, fine; contains clay pellets, siderite oolites and concretions; 12-20 ft thick. Upper portion: Clay, gray or nearly black; contains lignite seams; overburden.

70. Drill hole 4, depth 15.7-82.0 ft. Composite sample. [For other analyses from same drill hole, see sample 133, group D; samples 53-61, group Ha.]

71. Drill hole 4. Clay, limonitic with concretions; depth 26.0-29.7 ft.

72. Drill hole 6, depth 3.0-65.8 ft.

Washington—Continued

73. Drill hole 7, depth 3.0-29.4 ft.

74. Drill hole 11, depth 24.6-62.0 ft.

75. Drill hole 35, depth 2.5-55.9 ft.

76. SE¼ sec. 7, NE¼ sec. 18. Drill holes 46, 48, 50, 52-54, 58, 59. Clay, red-brown and green-blue, semiplastic; more than 40 ft thick, overburden. Composite sample.

77, 78. On boundary SW¼ sec. 17, NW¼ sec. 20. Clay, gray, lignitic.

79. Douglas County. Late Cretaceous and Paleocene, Swauk Formation. Sec. 23, T. 23 N., R. 20 E., about 4 miles north of town of Wenatchee. Keegan pit. (Hodge, 1938e, p. 694, 698, 699, 704, 705.) Clay, channel sample. Index maps. Use: Probably none.

80. Douglas County. Eocene. [T. 22 N., R. 20 E.], near town of East Wenatchee. Gladding, McBean, and Co. mine. (Landes, 1934, p. 1069, 1074, 1076.) Clay, dark; 24 ft thick; overburden 10-20 ft. Firing test. Use: Firebrick.

81. King County. [T. 21 N., R. 6 E.], town of Kummer. Black Diamond clay mine. Analyst, G. A. Bethune. (Bethune, 1891, p. 106; Glover, 1941, p. 344, 345.) Clay. Firing tests. Possible use: Refractories.

82. Skagit County. Tertiary. [T. 35 N., R. 6 E.] Cumberland Co., Conner mines. Analyst, G. A. Bethune. (Bethune, 1891, p. 106, 107; Wheeler, 1896, p. 595; Glover, 1941, p. 348, 349.) Clay. Firing test. Possible use: Refractories.

83-91. Spokane County. Miocene. T. 24 N., R. 44 E., about 11 miles southeast of town of Spokane. (Hosterman and others, 1960, p. 1-4, 12, 13-15, 20, 25, 26, 37, 40, 42, 55-57, 60, 61, pl. 3.) Mineralogy. Average bulk density 1.64. Overburden averages 21.4 ft. Tonnage estimated. Index and geologic maps, geologic sections. Log of drill hole. Weighted composite sample; samples taken at about 5-ft intervals or where clay showed marked change. Possible use: Source of alumina, gallium, ilmenite.

83. On line SE¼ sec. 20, SW¼ sec. 21. Drill hole E-2. Clay, varicolored; some iron stain; depth 58.0-80.0 ft.

84. SW¼ sec. 21. Drill hole E-10. Upper part: Clay, blue and blue-gray. Lower part: Semidecomposed basalt, gray; iron stain. Depth 48.0-63.0 ft.

85. NE¼ sec. 22. Drill hole M-42. Clay, mostly blue and blue-gray, some brown; some yellow tuffaceous clay; depth 3.0-49.0 ft.

86. NE¼ sec. 22. Drill hole M-44. Clay, mostly blue and white, some gray, some iron stain; depth 12.0-44.0 ft.

87. NE¼ sec. 22. Drill hole M-75. Clay, varicolored; some iron stain; depth 17.0-49.0 ft.

88. SE¼ sec. 22. Drill hole M-39. Clay, blue-gray and gray; some iron stain; depth 5.0-36.0 ft.

89. SE¼ sec. 22. Drill hole M-50. Clay, gray; iron stain; depth 2.0-9.0 ft.

90. SE¼ sec. 22. Drill hole M-65. Clay, blue; some tan tuffaceous clay; some iron stain; depth 17.0-41.0 ft.

91. Sec. 22. Weighted composite sample of area.

Table 11.—Analyses of samples from Idaho, Oregon, and Washington, of clays in which (2.178 x Al_2O_3) + H_2O (however determined) is 50 percent or more of the sample (Group Hk), special-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	92	93	94	95	96	97	98	99	100	101	102	103	104
	46Hk32-39	46Hk32-23	46Hk32-26	46Hk32-27	46Hk32-30	46Hk32-28	46Hk32-29	46Hk32-56	46Hk32-31	46Hk32-5	46Hk32-14	46Hk32-60	46Hk32-20
SiO_2	40.8	41.3	43.2	43.5	43.7	38.3	39.0	40.3	52.8	54.80	52.32	40.1	44.3
Al_2O_3	32.8	29.2	29.0	24.8	25.0	31.0	27.9	30.8	31.0	31.10	30.68	30.2	28.5
Fe_2O_3	6.7	12.3	9.6	13.0	12.5	11.4	14.7	9.1	1.9	1.68	1.70	10.6	10.2
MgO	------	------	------	------	------	------	------	.0	------	Trace	.46	------	------
CaO	------	------	------	------	------	------	------	1.0	------	------	.80	------	------
Na_2O	------	------	------	------	------	------	------	.5	------	.21	Trace	------	------
K_2O	------	------	------	------	------	------	------	.4	------		1.50	------	------
H_2O-	------	------	------	------	------	------	------	------	------	^{1}2.70	^{1}1.76	------	------
TiO_2	7.0	6.0	6.5	6.2	6.5	7.0	6.0	7.5	1.3	.23	.52	6.9	4.2
V_2O_5	------	------	------	------	------	------	------	.05	------	------	------	------	------
Ignition loss	^{2}10.5	^{2}10.8	^{2}10.3	^{2}11.5	^{2}8.7	^{2}11.3	^{2}10.2	10.9	^{2}10.4	^{3}9.40	^{3}10.08	^{2}10.7	^{2}10.0
Total	[97.8]	[99.6]	[98.6]	[99.0]	[96.4]	[99.0]	[97.8]	100.6	[97.4]	100.12	99.82	[98.5]	[97.2]
Class	0,76,0	0,78,0	0,80,0	0,83,0	0,81,0	0,74,0	0,74,0	0,75,2	0,94,0	0,98,0	0,93,2	0,76,0	0,82,0

	Washington—Continued												
	105	106	107	108	109	110	111	112	113	114	115	116	117
	46Hk 32-24	46Hk 32-59	46Hk 32-61	46Hk 41-175	46Hk 41-176	46Hk 41-177	46Hk 41-178	46Hk 41-260	46Hk 37-22	46Hk 37-19	46Hk 37-158	46Hk 37-15	46Hk 38-2
SiO_2	39.1	38.3	40.7	53.20	49.67	51.36	53.64	51.22	43.30	48.7	45.56	47.96	53.16
Al_2O_3	32.0	30.2	30.9	30.72	32.38	33.09	31.96	33.52	35.21	32.1	30.60	33.61	30.08
Fe_2O_3	11.8	9.1	8.7	2.40	1.50	2.39	1.82	1.72	^{4}1.07	4.9	4.28	3.95	1.83
MgO	------	------	.0	.52	.58	.78	Trace	Trace	.14	.3	.54	------	.24
CaO	------	------	1.0	.83	.25	------	------	------	.08	.9	1.39	1.94	.43
Na_2O	------	------	.4	3.00	1.35	.08	1.17	.62	1.30	Trace	------	------	.09
K_2O	------	------	.3					------	.52				1.50
H_2O	------	------	------	------	^{1}2.30	^{1}2.12	^{1}1.66	^{1}1.38	15.90	^{5}14.0	------	------	^{1}1.70
TiO_3	5.5	6.9	7.3	------	.51	------	------	------	^{6}1.11	------	------	------	1.50
Mn	------	------	------	------	------	------	------	------	.00	------	------	------	------
Sand	------	------	------	------	------	------	------	------	1.20	------	------	------	------
Ignition loss	^{2}11.4	^{2}10.8	11.0	^{7}9.00	10.92	^{3}10.54	^{3}10.06	^{3}11.16	------	------	^{8}15.72	^{8}12.88	^{3}9.76
Total	[99.8]	[95.3]	100.3	99.67	99.46	100.36	100.31	99.62	[99.83]	100.9	98.09	100.34	100.29
Class	0,75,0	0,73,0	0,76,2	0,92,3	0,91,2	0,93,2	0,96,0	0,93,0	0,84,0	0,92,0	0,87,4	0,88,3	0,95,1

[1] Sample air dried; moisture at 110°C.
[2] At 950°C.
[3] Combined water, ignition.
[4] Iron oxide.
[5] Moisture (H_2O) (Shedd, 1910, p. 321).
[6] Titanic acid.
[7] Volatile.
[8] Loss on ignition plus moisture at 212°F.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

92-99. Spokane County. Miocene. T. 24 N., R. 44 E., about 11 miles southeast of town of Spokane. (Hosterman and others, 1960, p. 1-4,12,13-15, 20,21,25,26,37,45-48,52-54,57,pl. 3.) Mineralogy. Average bulk density 1.64. Overburden averages 21.4 ft. Tonnage estimated. Index and geologic maps, geologic sections Log of drill hole Weighted composite sample, samples taken at about 5-ft intervals or where clay showed marked change. Possible use: Source of alumina, ilmenite, gallium.

92. NW¼ sec. 23. Drill hole M-47. Clay, blue, lower part gray, includes semidecomposed basalt, depth 11.0-30.0 ft.
93. NW¼ sec. 28. Drill hole M-14. Clay, blue-gray; depth 7.5-24.5 ft.
94. NW¼ sec. 28. Drill hole E-23. Clay, mostly blue, plastic; limonite streaks; depth 49.0-77.0 ft.
95. On line NW¼SW¼ sec. 28. Drill hole M-26B. Clay, blue-gray and brown; depth 9.0-18.0 ft.
96. NE¼ sec. 29. Drill hole M-30. Clay, blue-gray, some yellow, depth 13.0-28.0 ft.
97. On line NE¼SE¼ sec. 29. Drill hole E-34. Clay, mostly blue and gray; some iron stain, depth 13.0-41.0 ft.
98. On line NW¼ sec. 28 and NE¼ sec. 29. Drill hole E-29. Clay, blue-gray; depth 13.5-20.0 ft.
99. Secs. 20, 21, 28, 29. Weighted composite sample of area.

100. Spokane County. Middle and late Miocene, Latah Formation. SE¼ sec. 20, NE¼ sec. 29, T. 24 N., R. 44 E., about 11 miles southeast of Spokane. Drill hole Ex-13, sample RHS 849. (Scheid, Hosterman, and Sohn, 1945, p. 1,2,16,38, pls. 1,2, fig. 1, table 2.) Clay, gray and white, plastic; depth 34.0-41.0 ft. Index and geologic maps, geologic sections. Log of drill hole. Possible use: Source of alumina, titanium.

Washington—Continued

101. Spokane County. Latah Formation [implied]. T. 24 N., R. 44 E., near town of Mica. Gladding, McBean,and Co. pit. Analyst, W.R. Bloor. Sample 53. (Shedd, 1910, p. 182,184-186,307,321; Glover, 1941, p. 231,233,348,349; Hosterman and Livingston, 1966, p. 179,180,184, table 15.) Clay, almost white, fine-grained, little grit, very plastic, about 50 ft thick. Mineralogy. Tonnage estimated. Index and geologic map, generalized geologic section. Physical properties, firing tests, microscopic descriptions. Use: Face brick, firebrick, electric conduits, terra cotta, sewer pipe, refractories, vitrified structural ware.

102. Spokane County. Latah Formation. SE¼ sec. 35, T. 25 N., R. 44 E., 2.5 miles east of town of Chester. Sommer's pit. Analyst, W.R. Bloor. Sample 62. (Shedd, 1910, p. 175,179,180,181,307,321; Glover, 1941, p. 231,233,253,254,350,351.) Clay, grayish, fine-grained, no grit, plastic; maximum thickness 45 ft; overburden 1-6 ft. Mineralogy. Index and geologic map, generalized geologic section. Physical properties, firing tests, microscopic description. Use: Face brick, firebrick, sewer pipe.

103-106. Spokane County. Miocene and Pliocene [implied]. T. 24 N., R. 44 E., about 11 miles southeast of Spokane. (Scheid, Hosterman, and Sohn, 1945, p. 1,2,15,16,54, pls. 1,3, fig. 1, table 2.) Index and geologic maps, geologic sections. Possible use: Source of alumina, titanium.

103. Secs. 20, 21, 28, 29, 32, 33. Clay. Weighted average of assays of weighted composite samples of 23 drill holes.
104. SW¼ sec. 21. Drill hole Mi-10, sample RHS 293. Clay, yellow, depth 3.0-8.0 ft; clay, blue-gray, depth 8.0-13.0 ft. Log of drill hole.

DESCRIPTIVE NOTES—Continued

Washington—Continued

105. SW¼ sec. 21, NW¼ sec. 28. Drill hole Mi-12, sample RHS 294. Clay, yellow, depth 6.0-9.0 ft; clay, blue-gray, depth 9.0-32.0 ft. Log of drill hole.

106. Secs. 22, 23, 27, 34. Clay. Weighted average of assays of weighted composite samples of 17 drill holes.

107. Spokane County. [T. 24 N., R. 44 E.], near town of Excelsior. (Allen and Nichols, 1946, p. 59-61; Pettijohn, 1957, p. 356.) Clay. Mineralogy.

108. Stevens County. Miocene, correlative of Latah Formation. [NW¼ SW¼ T. 29 N., R. 42 E.], town of Clayton. Washington Brick, Lime, and Sewer Pipe Co. pit. (Wilson, 1923, p. 65, 70; Glover, 1941, p. 233, 282, 283, 350, 351.) Clay, fine-grained, plastic. Index and geologic map, generalized geologic section, generalized measured section. Physical properties, firing tests. Use: Firebrick.

109-111. Stevens County. Miocene, correlative of Latah Formation. Sec. 19, T. 29 N., R. 42 E., Clayton. Washington Brick, Lime, and Manufacturing Co. Analyst, W. R. Bloor. (Shedd, 1910, p. 200-205, 206, 307, 321; Glover, 1941, p. 233, 282-284, 350, 351.) Index and geologic map, generalized geologic section. Physical properties, firing tests, microscopic description. Use: Face brick, bonding clays, terra cotta.

109. Sample 3. Clay, light-gray, very plastic, no grit, laminated; 3 ft thick. Mineralogy.

110, 111. Samples 72, 71. Clay, white, fine-grained, plastic, little grit; 12 ft thick.

112. Stevens County. Miocene, correlative of Latah Formation. SE¼ sec. 34, T. 30 N., R. 42 E., north of town of Deer Park. Neafus property. Analyst, W. R. Bloor. Sample 56. (Shedd, 1910, p. 196, 197, 307, 320, 321; Wilson, 1934, p. 16, 64, 146; Glover, 1941, p. 231, 233, 264, 350, 351.) Clay, white, plastic, no grit. Index and geologic map, geologic section. Physical properties, firing tests, microscopic description. Use: Filler, pottery, refractories.

113. Whatcom County. Tertiary. [Tps. 37, 38 N., R. 2 E.], Bellingham Bay. (Bethune, 1892, p. 66; Wheeler, 1896, p. 296, 595.) Clay. Use: Brick, terra cotta, earthenware, pottery, stoneware.

114. Whatcom County. Eocene, Chuckanut Formation. SE¼ sec. 12, T. 40 N., R. 4 E., 3 miles southeast of town of Sumas. Denny-Renton Clay and Coal Co., old clay mine. Analyst, H. K. Benson. Sample 89. (Shedd, 1910, p. 286-288, 320, 321; Glover, 1941, p. 306, 311-313, 352, 353.) Clay. Index map, detailed measured section. Former use: Terra cotta, fire clay.

115, 116. Whatcom County. Eocene, Sumas Shale. NE¼ sec. 7, T. 40 N., R. 5 E., about 5 miles southwest of Sumas. Gladding, McBean, and Co., abandoned mine. (Hodge, 1938e, p. 769, 770-773, 775; Moen, 1962, p. 68, 70, 81, 82, pls. 1, 3.) Index and geologic maps, geologic sections, measured section. Firing tests. Use: Refractories.

115. Clay, light-gray; 5-8 ft thick.

116. Clay.

117. Whitman County. Miocene, correlative of Latah Formation. [NE corner, T. 16 N., R. 45 E.], town of Palouse. Palouse Pottery Manufacturing Co. Analyst, W. R. Bloor. Sample 94. (Shedd, 1910, p. 224, 225, 307, 320, 321; Glover, 1941, p. 320, 352, 353.) Clay, light in color, plastic. Use: Stoneware.

Table 12.—Analyses of samples from Washington of clays in which (2.178 x Al_2O_3) + H_2O (however determined) is 50 percent or more of the sample (Group Hki), special-rock category

[Kaolin-like clays (kaolinite only, no "bauxite"). SiO_2/Al_2O_3 weight ratio from 1.178 to 1.768. Total iron > 30 percent. Chemical analyses arranged by county and stratigraphic position]

Chemical analyses

	Washington		
	1	2	3
	46Hki 41-186	46Hki 37-156	46Hki 37-153
SiO_2	27.02	33.4	27.9
Al_2O_3	20.29	21.8	20.1
Fe_2O_3	48.51	36.4	40.9
MgO	1.08	------	------
CaO	2.55	------	------
Ignition loss	------	[1]8.20	[1]8.49
Total	[99.45]	[99.8]	[97.4]
Class	0,48,0	0,66,0	0,57,0

[1] Includes H_2O.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington

1. Stevens County. [Miocene.] SW¼ sec. 34, T. 30 N., R. 42 E. Deer Park Natural Pigment Co., old Neafus clay pit. Analyst, Richard Marsh. Sample 275. (Glover, 1941, p. 233, 290, 350, 351.) General: Clay, sienna, brown, hard, in layers as much as 5 ft thick. Index and geologic map, generalized measured section.

2, 3. Whatcom County. Early Tertiary. N½ sec. 2, T. 39 N., R. 4 E., 4 miles east of town of Everson. Sumas Mountain Iron deposit. Analyst, W. H. Ott. (Moen, 1962, p. 105, 109, 110-112, pls. 1, 4.) Mineralogy. Channel sample. Average bulk density of five samples 3.0. Tonnage estimated. Index and geologic maps, geologic sections. Use: None.

2. Sample 3. Claystone, grayish-brown; occasional pisolites of magnetite.

3. Sample 8. Claystone, grayish-brown; silty in part.

Table 13.—Analyses of samples from Alaska, Oregon, and Washington, of clays in which $Al_2O_3+SiO_2+H_2O$(however determined) is 50 percent or more of the sample (Group Ha), special-rock category

[High-alumina clays (kaolinite predominant, "bauxite" subordinate). SiO_2/Al_2O_3 weight ratio from 0.371 to 1.178; total iron <30 percent. Chemical analyses arranged by State, county, and stratigraphic position]

Chemical analyses

	Alaska	Oregon											
	1	2	3	4	5	6	7	8	9	10	11	12	13
	50Ha151-1	36Ha3-3	36Ha3-4	36Ha3-36	36Ha3-37	36Ha3-8	36Ha3-6	36Ha3-33	36Ha3-34	36Ha3-15	36Ha3-21	36Ha3-22	36Ha3-23
SiO_2	43.64	36.38	38.96	36.20	39.74	36.6	35.84	17.34	28.71	21.5	[1]83.44	[1]32.82	[1]19.54
Al_2O_2	38.33	39.22	39.04	35.96	36.20	38.2	32.50	37.94	39.54	43	[3]35.81	[2]36.81	[2]43.34
Fe_2O_2	1.43	5.85	4.54	3.35	1.96	5.6	14.10	9.39	8.25	[3]14.3	[3]14.59	[3]14.43	[3]16.17
FeO	------	------	------	------	------	------	------	7.49	.18	------	------	------	------
MgO	1.02	.31	.34	.4	.5	.1	.26	.27	.13	------	------	------	------
CaO	1.48	.67	.84	.56	.62	.4	.61	.52	.14	------	------	------	------
Na_2O	------	------	------	------	------	[4].4	------	.10	.04	------	------	------	------
K_2O	------	------	------	------	------			.06	.05	------	------	------	------
H_2O+	13.64	------	------	------	------	------	------	18.02	17.63	------	------	------	------
H_2O-	.60	------	------	[5]5.91	[5]4.99	------	------	2.58	3.01	[6](24)	[6](13.70)	------	[6](32.6)
TiO_2	------	[7].28	[7].17	1.87	1.78	2.2	[7].20	2.40	1.77	1	------	------	------
P_2O_5	------	------	------	------	------	------	------	.40	.24	------	------	------	------
MnO	------	------	------	------	------	------	------	.10	.04	------	------	------	------
S	------	------	------	------	------	------	------	.05	.02	------	------	------	------
Ignition loss	------	17.36	16.28	16.05	15.28	16.5	17.46	[8]2.90	[8].03	20	13.85	14.06	19.32
Subtotal	------	------	------	------	------	------	------	99.56	99.78	------	------	------	------
Less O	------	------	------	------	------	------	------	.03	.01	------	------	------	------
Total	100.14	100.07	100.17	100.3	101.1	100.0	100.97	99.53	99.77	[9][100]	[97.69]	[98.12]	[98.37]
Class	0,83,0	0,74,2	0,77,2	0,78,2	0,82,2	0,74,1	0,75,2	0,49,4	0,67,0	0,55,0	0,68,0	0,68,0	0,51,0

	Oregon—Continued												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	36Ha3-25	36Ha3-2	36Ha3-27	36Ha5-36	36Ha5-64	36Ha5-2		36Ha5-43	36Ha5-42	36Ha5-41	36Ha5-40	36Ha5-68	36Ha5-69
SiO_2	[1]16.78	39.47	40.67	14.34	23.36	26.65	22.04	34.92	31.70	21.66	15.00	13.9	30.5
Al_2O_2	[2]45.42	39.52	39.70	38.48	39.22	34.49	37.30	37.32	32.12	36.12	39.32	36.0	28.5
Fe_2O_2	[3]13.87	[10]4.12	[10]5.12	[3]27.27	[3]17.86	[3]20.75	[3]21.45	[3]8.17	[3]18.59	[3]23.61	[3]26.87	[3]26.7	[3]22.5
MgO	------	.03	------	------	------	------	------	------	------	------	------	Nil	------
CaO	------	.72	.40	------	------	------	------	------	------	------	------	------	------
H_2O-	[6](25.6)	------	------	------	------	------	------	------	------	------	------	[11](22.3)	[11](27.2)
TiO_2	------	------	------	------	3.32	4.73	4.94	3.02	2.96	3.37	3.69	4.40	------
P_2O_5	------	------	------	------	[3].433	[3].49	------	------	------	------	------	------	------
Ignition loss	22.46	15.98	13.84	[12]18.46	[12]18.10	15.93	17.62	[12]15.06	[12]13.80	[12]17.50	[12]17.26	18.4	13.4
Total	[98.53]	99.84	99.73	[98.55]	[102.31]	[103.04]	[103.35]	[98.49]	[99.17]	[102.26]	[102.14]	[99.4]	[94.9]
Class	0,50,0	0,78,1	0,78,1	0,42,0	0,56,0	0,60,0	------	0,71,0	0,66,0	0,53,0	0,42,0	0,42,0	0,64,0

	Oregon—Continued												
	27	28	29	30	31	32	33	34	35	36	37	38	39
	36Ha5-65	36Ha5-25	36Ha5-26	36Ha5-27	36Ha20-9	36Ha20-6	36Ha20-2	36Ha20-1	36Ha24-30	36Ha24-31	36Ha24-32	36Ha24-38	36Ha24-45
SiO_2	16.0	43.62	39.40	38.10	46.98	45.60	45.3	42.0	28.04	27.96	21.92	16.96	28.70
Al_2O_3	34.8	37.56	39.82	40.10	40.20	38.75	39.1	42.7	28.16	34.60	33.44	30.52	28.35
Fe_2O_3	[3]26.9	5.31	6.68	8.82	.37	.57	.9	1.4	25.4	23.8	28.3	26.9	[3]21.04
MgO	------	.22	.14	.15	.17	.19	------	------	------	------	------	------	------
CaO	------	.39	.21	.35	.47	.37	------	------	------	------	------	------	------
H_2O-	[11](19.9)	------	------	------	------	------	------	------	------	------	------	------	------
TiO_2	3.9	[7]1.07	[7].32	[7].47	[7].50	[7].34	2.4	2.3	5.33	5.00	5.82	5.64	4.32
Ignition loss	18.5	12.63	13.28	12.20	11.38	14.90	13.3	12.5	13.07	8.64	10.52	19.98	[12]16.97
Total	[100.1]	100.80	99.85	100.19	100.07	100.72	101.0	100.9	[100.0]	[100.0]	[100.0]	[100.0]	[99.38]
Class	0,45,0	0,82,1	0,76,1	0,73,1	0,84,1	0,86,1	0,84,0	0,79,0	0,60,0	0,55,0	0,47,0	0,48,0	0,65,0

[1] SiO_2 may be high because of mixture from other parts of drill hole.

[2] Includes about 1 percent TiO_2.

[3] Calculated from reported iron, Fe, or P.

[4] Mainly alkalies and alkaline earth, by difference.

[5] Moisture loss H_2O- at 110°C.

[6] At 110° C, not included in total.

[7] TiO.

[8] CO_2.

[9] Analysis on dry basis.

[10] Includes FeO.

[11] Not included in total.

[12] At 1,000°-1,100°C, sample air dried.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1. Wainwright quadrangle. Late Cretaceous. T. 9 N., Rs. 29-31 W., near town of Wainwright, Avalik River (James Keogh, oral commun., Dec. 9, 1964) reported as Abatik River. Analyst, F. A. Gonyer; collector, P. S. Smith. Sample 10. (Ross and Kerr, 1930, p. 162, 163.) Kaolinite, light-gray; optical properties.

Oregon

2, 3. Clackamas County. Probably post-middle Miocene. NE¼ NE¼ sec. 27, T. 5 S., R. 2 E., 4.3 miles by road southeast of town of Molalla. Ellis property. (Wilson and Treasher, 1938, p. 1, 24, 31, 41-45, 84-86, 88.) General: Fire clay, bluish-gray to purplish-green; weathers brown. Overburden more than 70 ft. Mineralogy. Tonnage estimated. Index maps, detailed measured sections. Physical properties, firing tests. Possible use: Refractories.
  2. Field No. 6 D 30. Auger hole sample, 20 ft.
  3. Field No. 6 X 1. Channel sample represents upper 11 ft of clay.

4, 5. County, age, and locality as in samples 2, 3. Analyst, H. R. Shell. Samples 6-x-1, 103. (Speil and others, 1945, p. 30, 32.) Kaolin. Mineralogy. Thermal analysis curve.

6. Clackamas County. [Probably post-middle Miocene. Sec. 27, T. 5 S., R. 2 E., southeast of town of] Molalla. Analyst, Anthony Centenero; collector, R. L. Nichols. Sample M-2. (Pask and Davies, 1943, p. 3, 10, 20, 22, 23, 25; Pask and Davies, 1945, p. 57, 62, 73, 74, 76, 78.) Clay. Mineralogy. Thermal analysis curve. Possible use: Source of alumina.

7. Clackamas County. Probably post-middle Miocene. SE¼ SE¼ sec. 1, T. 6 S., R. 2 E., more than 10 miles by road southeast of Molalla. Dibble property. Field No. 8B. (Wilson and Treasher, 1938, p. 1, 24, 42, 46, 47, 84-86, 89.) Clay, deep-blue when wet, sandy; weathers brown; 150 ft thick; overburden. Index maps. Physical properties, firing tests. Possible use: None.

8, 9. Clackamas County. Late Miocene and early Pliocene. Analyst, F. H. Neuerburg. (Trimble, 1963, p. 3, 89, 90, 93, 103, pl. 1.) Index and geologic maps, geologic section. Possible use: Quick-setting aluminous cement; source of aluminum.
  8. NW¼ NE¼ sec. 19, T. 3 S., R. 4 E., near River Mill Dam. Sample C-945. Laterite, brown.
  9. SE¼ NW¼ sec. 33, T. 3 S., R. 4 E., above forebay at Faraday. Sample C-946. Laterite, light-orange, earthy.

10-14. Clackamas County. Pliocene. T. 4 S., R. 4 E., 6 miles southeast of town of Estacada. (The Ore.-Bin, 1948, p. 63-65; Oregon Dept. Geology and Mineral Industries, 1951, p. 15.) [Bauxitic clay] bauxite, brown, oolitic. Mineralogy. Index map. Possible use: SiO_2 too high for production of alumina but may be used for other purposes.
  10. NW¼ sec. 3 or NE¼ sec. 4. Kiggins farm. Average analysis from two auger holes, about 7 ft of section.
  11-14. NW¼ sec. 3 and NE¼ sec. 4. Kiggins and Shearer farms. Auger hole 6. [For another analysis from same drill hole, see sample 1, group Hb.]
    11. Depth 19-20 ft.
    12. Depth 17-18 ft.
    13. Depth 15-16 ft.
    14. Depth 11-12 ft.

15. Clackamas County. Pliocene or Pleistocene. E½ NE¼ sec. 27, T. 5 S., R. 2 E., about 4 miles south of Molalla. Ellis deposit. Sample 2. (Hodge, 1938f, p. 817, 849-853.) Clay, gray, plastic; 8 ft thick. Index map. Firing tests. Possible use: Ceramics.

16. Clackamas County. [T. 2 S., R. 1 E.], town of Oswego. Ladd property. Sample 6. (Hodge, 1938f, p. 817, 842, 847, 848.) Clay, plastic, sandy; overburden. Index maps. Use: Patching furnace linings, pottery.

17-20. Columbia County. Miocene and Pliocene. SW¼ sec. 1, T. 4 N., R. 2 W., about 0.5 mile south-southeast of town of Yankton, railroad cut. (Libbey, Lowry, and Mason, 1945, p. 1, 4, 5, 26, 47-49, 50, 87, 88.) Index maps, geologic section.
  17. Analyst, L. L. Hoagland. Sample P-3320. [Ferruginous bauxite] laterized basalt, brown, earthy, lower 1.5 ft sampled; overburden about 6 ft. Channel sample.
  18. Sample P-3395. Bauxitic clay, reddish-brown, soft, slightly pisolitic; 6.2 ft thick, top of section; overburden about 6 ft. Channel sample.

Oregon—Continued

19, 20. Sample P-3274. Bauxitic clay, light-brown, soft; 3-ft channel sample.
  20. Analyst, L. L. Hoagland.

21-24. Columbia County. Miocene and Pliocene. Sec. 18, T. 7 N., R. 2 W., west of town of Rainier, roadcut. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 1, 4, 5, 27, 54, 55, 87, 88.) Silt overburden. Mineralogy. Index maps, measured section.
  21. Sample P-3396. Bauxitic clay, buff, oolitic; some hard spots; 3 ft thick.
  22. Sample P-3397. [Ferruginous bauxite] bauxitic clay, red, oolitic; some yellowish fragments of fossil wood; upper 1.5 ft of lower layer.
  23. Sample P-3398. [Ferruginous bauxite] red, oolitic, hard with a few soft streaks; some fossil wood; sample of entire middle section, 8.7 ft thick.
  24. Sample P-3361. [Ferruginous bauxite] boulder, hard, oolitic; from upper section.

25-27. Columbia County. Miocene or later. NW¼ sec. 16, T. 4 N., R. 2 W., about 0.5 mile north of town of Spitzenberg, Alder Creek area. Dietz property. (Kelly, 1947, p. 4, 6, 17, 18, figs. 1, 2.) Laterite, dark-red, oolitic or pisolitic; averages about 14 ft thick; silt overburden averages about 13 ft. Auger-drill hole samples. Index and geologic maps, geologic sections.
  25. Drill hole 20. Depth 34.0 ft. Bulk density 2.81.
  26. Drill hole 20. Depth 21.0 ft. Bulk density 2.78.
  27. Drill hole 23. Depth 14.0 ft. Bulk density 2.75.

28-30. Columbia County. Probably post-middle Miocene. NE¼ sec. 33, T. 8 N., R. 3 W., 6 miles west of Rainier. Fransen deposit. (Wilson and Treasher, 1938, p. 1, 19, 24, 27-33, 84, 86, 88.) Mineralogy. Tonnage estimated. Index maps. Firing tests. Former use: Stoneware. Possible use: Refractories.
  28. Field No. 1C. Clay, greenish-gray; about 5 ft thick.
  29. Field No. 1 F. Clay, pale-gray-green, fine-grained, compact; depth 17.5-31.5 ft. Auger-drill hole sample.
  30. Field No. 1 G. Clay. Detailed measured section.

31, 32. Lane County. Probably post-middle Miocene. SW¼ sec. 31, T. 22 S., R. 4 W., about 16 miles south of town of Cottage Grove. Willamina Clay Products Co., Hobart Butte quarry. Field Nos. 35 F 2, 35 H 2. (Wilson and Treasher, 1938, p. 19, 24, 69-74, 84-86, 92.) Clay, gray. Average bulk density 2.4. Tonnage estimated. Index maps, measured section. Physical properties, firing tests. Possible use: Paint and paper filler, refractories, whiteware.

33, 34. Lane County. [Sec. 31, T. 22 S., R. 3 W.], Hobart Butte deposit. Analyst, Anthony Centenero. (Pask and Davies, 1943, p. 3, 10, 20, 22-25; Pask and Davies, 1945, p. 57, 72, 73, 74, 76, 78.) Clay. Mineralogy, thermal analysis curve. Possible use: Source of alumina.
  33. Collector, R. L. Nichols. Sample HB-1.

35-38. Marion County. Miocene and Pliocene. NW¼ sec. 19, T. 8 S., R. 3 W., 7-10 miles south of town of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. Drill hole 17. (Corcoran and Libbey, 1956, p. 1, 2, 6, 16, 19, 26, 27, 29, pl. 1.) General: Ferruginous bauxite, average thickness 14.4 ft. Tonnage estimated. Index and geologic maps. Graph showing variation in chemical composition for each 2 ft interval of depth. [For other analyses from same drill hole, see samples 3, 4, group Hai; samples 10-13, group Hbi.]
  35, 36. Bauxitic clay [implied] brown to blue-black; yellow, black, blue spots, slightly gritty.
    35. Sample 9. Depth 18-20 ft.
    36. Sample 8. Depth 16-18 ft.
  37. Sample 7. Bauxitic clay [implied] tan to blue-black; yellow, black, blue spots, slightly gritty; depth 14-16 ft.
  38. Sample 1. Bauxite, yellow-brown, earthy, gritty; numerous fragments of gibbsite; depth 2-4 ft. Possible use: Source of alumina, ferrotitanium, pig iron.

39. Marion County. Miocene and Pliocene. Near center sec. 26, T. 8 S., R. 3 W., about 5 miles south of Salem, roadcut. Analyst, L.L. Hoagland. Sample P-3536. (Libbey, Lowry, and Mason, 1945, p. 4, 5, 72, 74, 78, 85-88.) [Ferruginous bauxite], red, nodular; 3.5 ft channel sample. Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories.

Table 13.—Analyses of samples from Alaska, Oregon, and Washington, of clays in which $Al_2O_3 + SiO_2 + H_2O$ (however determined) is 50 percent or more of the sample (Group Ha), special-rock category—Continued

Chemical analyses—Continued

	Oregon—Continued						Washington						
	40	41	42	43	44	45	46	47	48	49	50	51	52
	36Ha 24-48	36Ha 24-49	36Ha 24-68	36Ha 24-2	36Ha 27-2	36Ha 34-23	46Ha 8-57	46Ha 8-12	46Ha 8-59	46Ha 8-47	46Ha 8-48	46Ha 8-49	46Ha 8-19
SiO_2	17.71	31.49	17.2	42.16	19.10	15.94	36.3	38.86	37.5	35.7	37.8	34.7	37.3
Al_2O_3	35.08	29.69	33.4	41.30	34.01	36.20	32.8	33.06	32.6	35.7	35.0	34.3	32.7
Fe_2O_3	[1]26.56	[1]21.59	26.6	2.87	[1]23.77	[1]25.80	7.1	7.58	5.7	11.0	10.4	11.9	6.8
MgO	------	------	------	.30	------	------	------	------	------	.1	------	------	------
CaO	------	------	------	.26	------	------	------	------	------	.3	------	------	------
Na_2O	------	------	------	------	------	------	------	------	------	< .05	------	------	------
K_2O	------	------	------	------	------	------	------	------	------	< .05	------	------	------
TiO_3	3.57	3.77	2.67	[2].55	3.18	------	2.3	2.45	2.3	1.1	2.2	2.3	2.4
P_2O_5	------	------	------	------	------	------	------	------	------	.25	------	------	------
CO_3	------	------	------	------	------	------	------	------	------	[3](1.30)	------	------	------
SO_3	------	------	------	------	------	------	------	------	------	< .05	------	------	------
Zr_2O_3	------	------	------	------	------	------	------	------	------	< .05	------	------	------
V_2O_5	------	------	------	------	------	------	------	------	------	< .05	------	------	------
Organic C	------	------	------	------	------	------	------	------	------	[3](.35)	------	------	------
Ignition loss	20.43	[4]15.73	18.03	13.37	[4]19.28	[4]20.91	[5]20.5	[6]17.78	[5]20.6	[7]15.8	[5]13.7	[5]15.7	[5]19.4
Ignition loss	------	------	------	------	------	------	[8](19.7)	------	[8](19.3)	------	[8](13.4)	[8](15.0)	[8](19.0)
Total	103.35	[102.27]	[97.9]	100.81	[99.34]	[98.85]	[99.0]	[99.73]	[98.7]	100.2	[99.1]	[98.9]	[98.6]
Class	0,50,0	0,68,0	0,47,0	0,79,1	0,51,0	0,47,0	0,79,0	0,80,0	0,81,0	0,72,2	0,75,0	0,72,0	0,79,0

	Washington—Continued												
	53	54	55	56	57	58	59	60	61	62	63	64	65
	46Ha8-21	46Ha8-22	46Ha8-23	46Ha8-24	46Ha8-25	46Ha8-28	46Ha8-29	46Ha8-30	46Ha8-31	46Ha8-32	46Ha8-36	46Ha8-37	46Ha8-40
SiO_2	37.0	38.4	30.4	33.4	35.2	35.0	35.6	32.6	37.6	35.1	36.8	36.4	35.7
Al_2O_3	34.9	37.7	41.6	35.3	37.0	37.4	38.5	37.3	42.5	30.9	32.4	32.5	33.0
Fe_2O_3	5.7	2.9	4.15	5.9	4.0	9.4	8.3	11.7	2.7	11.0	6.9	6.7	9.3
TiO_3	------	------	------	------	------	------	------	------	------	2.0	2.3	2.1	2.3
Ignition loss	[9]17.8	[9]17.4	[9]23.0	[9]24.6	[9]22.3	[9]17.8	[9]19.2	[9]18.4	[9]18.0	[5]19.6	[5]20.1	[5]20.4	[5]18.6
Ignition loss	------	------	------	------	------	------	------	------	------	[8](19.2)	[8](19.2)	[8](19.9)	[8](18.4)
Total	[95.4]	[96.4]	[99.2]	[99.2]	[98.5]	[99.6]	[101.6]	[100.0]	[100.8]	[98.6]	[98.5]	[98.1]	[98.9]
Class	0,77,0	0,78,0	0,71,0	0,78,0	0,78,0	0,74,0	0,76,0	0,71,0	0,77,0	0,77,0	0,79,0	0,79,0	0,76,0

	Washington—Continued												
	66	67	68	69	70	71	72	73	74	75	76	77	78
	46Ha8-42	46Ha8-43	46Ha8-44	46Ha8-45	46Ha8-46	46Ha8-18	46Ha8-6	46Ha8-4	46Ha8-3	46Ha8-2	46Ha8-1	46Ha8-63	46Ha8-5
SiO_2	34.4	38.7	39.7	39.3	37.9	37.7	38.28	42.7	42.8	32.5	36.6	40.20	41.22
Al_2O_3	34.7	33.0	34.8	34.0	33.5	32.7	34.91	38.9	37.3	39.4	42.3	34.79	37.35
Fe_2O_3	10.9	5.9	5.7	9.0	7.2	7.2	5.85	3.3	3.2	4.1	.9	1.78	4.13
MgO	------	------	------	------	------	.2	------	------	------	------	------	.4	------
CaO	------	------	------	------	------	.6	.31	------	------	------	------	.40	------
Na_2O	------	------	------	------	------	.2	------	------	[10].3	[10]1.1	[10].7	------	------
K_2O	------	------	------	------	------	.1	------	------					
H_2O-	------	------	------	------	------	------	------	------	------	------	------	[11]3.34	------
TiO_2	2.2	2.3	2.3	2.3	2.3	2.3	2.30	2.0	2.9	2.1	2.5	2.47	------
P_2O_5	------	------	------	------	------	.34	.55	------	------	------	------	------	------
CO_2	------	------	------	------	------	[3](2.76)	------	------	------	------	------	------	------
SO_3	------	------	------	------	------	.43	------	------	------	------	------	------	------
Zr_2O_3	------	------	------	------	------	< .05	------	------	------	------	------	------	------
V_2O_5	------	------	------	------	------	< .05	------	------	------	------	------	------	------
Organic C	------	------	------	------	------	[3](3.23)	------	------	------	------	------	------	------
Ignition loss	[5]16.6	[5]19.5	[5]16.6	[5]14.7	[5]18.4	[7]18.5	16.60	15.2	13.5	20.8	17.0	16.49	17.30
Ignition loss	[8](16.0)	[8](19.1)	[8](15.9)	[8](14.1)	[8](17.8)	[8](17.7)	------	------	------	------	------	------	------
Total	[98.8]	[99.4]	[99.1]	[99.3]	[99.3]	100.4	[98.80]	102.1	100.0	100.0	100.0	99.9	[100.00]
Class	0,72,0	0,81,0	0,80,0	0,78,0	0,79,0	0,76,4	0,78,0	0,83,0	0,81,0	0,72,0	0,74,0	0,82,2	0,83,0

[1] Calculated from reported Fe.

[2] TiO.

[3] Not included in total.

[4] At 1,000°-1,100°C, sample air dried.

[5] At 950°C. Sample dried at 130°C.

[6] At 1,000°C.

[7] At 950°C.

[8] At 700°C. Not included in total.

[9] At 800°C. Sample dried at 130°C.

[10] Mainly alkalies and alkaline earth, by difference.

[11] At 110°C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

40, 41. Marion County. Miocene and Pliocene. NW¼ sec. 28, T. 8 S., R. 3 W., about 5 miles south of town of Salem, roadcut. Analyst, L.L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 4, 5, 67, 72, 74, 76, 77, 85, 87, 88.) Index maps.

40. Sample P-3569. [Ferruginous bauxite] laterite; represents upper 3 ft containing brownish-gray material with whitish gibbsitic pieces.

41. Sample P-3568. [Ferruginous bauxite] laterized basalt, claylike, soft, few oolites in upper part; 3 ft thick; overburden. Channel sample. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories.

42. Marion County. Miocene and Pliocene. Near center sec. 35, T. 8 S., R. 3 W., 7-10 miles south of Salem, Salem Hills area. (Corcoran and Libbey, 1956, p. 1, 2, 19, pl. 1.) General: Ferruginous bauxite, predominantly yellowish to reddish brown, earthy; contains veinlets of limonite and light-colored clayey material; average thickness 14.4 ft. Tonnage estimated. Index and geologic maps.

43. Marion County. Probably post-middle Miocene. SE¼NE¼ sec. 3, T. 8 S., R. 2 W., 1.1 miles west of town of Macleay. Salem area, roadcut. Field No. 27. (Wilson and Treasher, 1938, p. 19, 24, 50, 62, 84, 91.) Clay, mixture of white, yellow-brown and gray; soft, fine grained. Index maps. Firing tests. Possible use: None.

44. Polk County. Miocene and Pliocene. Southwest corner sec. 16, T. 7 S., R. 3 W., about 1 mile northwest of Salem. Analyst, L.L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 1, 4, 5, 74, 75, 85-88.) [Ferruginous bauxite], 2 ft channel sample. Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories.

45. Washington County. Miocene and Pliocene. NW¼SW¼ sec. 1, T. 2 N., R. 3 W., 14 miles north of town of Hillsboro. Hutchison-Nixon properties. Analyst, L.L. Hoagland; collectors, J.F. Cleaver, L.C. Swanson. Drill hole 50, sample 3. (Libbey, Lowry, and Mason, 1945, p. 1, 4, 5, 24, 34, 35-38, 87, 88.) [Ferruginous bauxite] clay, brick-red, hard, magnetic, oolitic, pisolitic; depth 27-32 ft. Overburden 20 ft. Tonnage estimated. Index maps, geologic sections, detailed measured section. [For other analyses from same drill hole, see sample 114, group D; samples 23-25, group Hb; samples 47-49, group Hbi.]

Washington

46 - 51. Cowlitz County. Tertiary. T. 10 N., R. 1 W., about 6.5 miles northeast of town of Castle Rock. Cowlitz deposit. (Popoff, 1955, p. 1-5, 7, 9, 11-18, 21, 22, 25, 38, 52-54.) Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections. Log of drill hole. Use: Refractories. Possible use: Source of alumina.

46. SE¼ sec. 7. Drill hole 50. Clay, red-brown and green-blue, semiplastic; more than 40 ft thick, overburden; depth 16.0-54.0 ft.

47. On boundary SW¼ sec. 17, NW¼ sec. 20. Clay, gray, lignitic.

48. NE¼ sec. 18. Drill hole 53. Clay, red-brown and green-blue, semiplastic; more than 40 ft thick, overburden; depth 34.0-65.6 ft.

49-51. NW¼ sec. 18. Clay, less than 25 ft thick; overburden.

49. Drill holes 8, 9. Composite sample.

50. Drill hole 8. Depth 4.0-27.3 ft.

51. Drill hole 9. Depth 3.7-28.2 ft.

52 - 71. Cowlitz County. Tertiary. SE¼ sec. 18, T. 10 N., R. 1 W., about 6.5 miles northeast of Castle Rock. Cowlitz deposit. (Popoff, 1955, p. 1-5, 7, 9, 10-19, 25, 37, 45, 46, 48, 57, 58.) Lower portion: Clay, blue-gray and gray, semiflint, fine, dense; contains clay pellets, siderite oolites, and concretions; 12-20 ft thick. Upper portion: Clay, gray or nearly black; contains lignite seams; overburden. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections. Log of drill hole. Use: Refractories. Possible use: Source of alumina.

52. Drill hole 3. Depth, 48.5-97.3 ft.

53-61. Drill hole 4. [For other analyses from same drill hole, see sample 133, group D, and samples 70, 71, group Hk.]

53. Clay, gray-blue with white clay pellets; depth 76.2-82.0 ft.

54. Clay, gray-blue with white clay pellets and tuffaceous material; depth 72.0-76.2 ft.

55. Clay, gray with small amount of lignite; depth 59.1-69.4 ft.

56. Clay and lignite; depth 49.5-59.1 ft. Measured section.

57. Clay, with small amount of lignite; depth 43.1-49.5 ft.

58. Clay, cream-gray and yellow-brown; depth 23.0-26.0 ft.

59. Clay, cream and yellow-brown; depth 20.5-23.0 ft.

60. Clay, cream and yellow-brown; depth 17.8-20.5 ft.

61. Clay, cream; contains basalt pebbles; depth 15.7-17.8 ft.

62. Drill hole 5. Depth 50.8-98.0 ft.

63. Drill hole 32. Depth 13.0-59.0 ft.

64. Drill hole 34. Depth 26.8-79.1 ft.

65. Drill hole 38. Depth 17.5-60.5 ft.

66. Drill hole 40. Depth 2.0-23.8 ft.

67. Drill hole 56. Depth 2.1-33.4 ft.

68. Drill hole 57. Depth 4.6-45.0 ft.

69. Drill hole 60. Depth 3.2-21.7 ft.

70. Drill hole 61. Depth 2.5-48.1 ft.

71. Remarks [except section] as in samples 52-71. SW¼ sec. 17, SE¼ sec. 18. Composite samples of drill holes 3-7, 11, 32, 34-36, 38-40.

72. Cowlitz County. Tertiary. T. 10 N., Rs. 1, 2 W., about 6.5 miles northeast of Castle Rock, Cowlitz deposit. (Popoff, 1955, p. 2-5, 11-15, 25, 31.) Clay. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections.

73 - 76. County, age, locality, maps, and use as in samples 52-71. Analyst, Anthony Centenero; collector, R.L. Nichols. Samples CR-1 to CR-4. (Pask and Davies, 1943, p. 3, 10, 20-22, 23, 24; Popoff, 1955, p. 1-5, 7, 8, 11, 12, 15, 16, 25.) Clay. Mineralogy. Tonnage estimated. Thermal analysis curve.

77. Cowlitz County. [T. 9 N., R. 2 W.], Castle Rock. Analyst, H. R. Shell. (Speil and others, 1945, p. 30, 32.) Kaolin. Mineralogy. Thermal analysis curve.

78. Cowlitz County. [T. 9 N., R. 2 W., Castle Rock.] (Every and Hagan, 1949, p. 27, 29.) Clay. Mineralogy. Physical tests. Use: Cement if beneficiated.

Table 13.—Analyses of samples from Alaska, Oregon, and Washington, of clays in which $Al_2O_3+SiO_2+H_2O$ (however determined) is 50 percent or more of the sample (Group Ha), special-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	79	80	81	82	83	84	85	86	87	88	89	90	91
	46Ha 8-64	46Ha 17-10	46Ha 17-9	46Ha 17-14	46Ha 17-15	46Ha 17-16	46Ha 17-33	46Ha 17-22	46Ha 32-19	46Ha 32-22	46Ha 32-25	46Ha 32-52	46Ha 37-17
SiO_2	41.88	40.37	40.26	39.90	40.80	40.10	24.50	41.36	39.4	36.9	39.4	45.2	46.57
Al_2O_3	36.04	38.57	35.84	39.40	39.30	40.30	55.00	40.49	34.4	32.4	33.7	38.5	32.73
Fe_2O_3	1.98	3.43	3.20	2.83	1.47	1.37	[1]3.40	.71	5.8	10.9	7.8	3.1	4.10
MgO	.5	.45	.26	.56	.54	.10	------	Trace	------	------	------	.4	.61
CaO	.40	.67	.40	.96	.87	.52	------	.62	------	------	------	Trace	1.74
Na_2O	------	.22	Trace	------	1.30	------	------	1.47	------	------	------	------	.96
K_2O	------	.08	[2].00	------	------	.72	------						
H_2O-	[3]2.59	[4]1.56	[4]1.75	------	1.28	------	------	[5]15.29	------	------	------	------	2.37
TiO_3	2.42	------	2.38	------	.30	------	2.80	------	8.4	7.5	7.0	------	------
Ignition loss	14.88	[6]15.30	[6]15.21	16.40	[7]14.90	17.33	[8]15.5	------	[9]11.9	[9]11.4	[9]11.3	[6]12.7	[7]11.07
Total	100.7	100.65	[10]99.30	100.05	100.76	100.44	[101.2]	[99.94]	[99.9]	[99.1]	[99.2]	99.9	100.15
Class	0,83,2	0,80,2	0,80,1	0,78,3	0,79,3	0,80,1	0,54,0	0,80,0	0,75,0	0,71,0	0,75,0	0,84,1	0,86,4

[1] Total iron.

[2] Reported only in Shedd (1910, p. 319).

[3] At 110°C.

[4] Sample air dried, moisture at 110°C.

[5] Common water.

[6] Combined water, ignition.

[7] Volatile.

[8] Includes CO_3.

[9] At 950°C.

[10] CO_3 = 0.70 percent, total = 100.00 (Shedd, 1910, p. 319).

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

79. Cowlitz County. [Probably T. 10 N., R. 1 W., near town of Castle Rock. Cowlitz deposit.] Analyst, H.R. Shell. (Speil and others, 1945, p. 30, 32.) Kaolin. Mineralogy. Thermal analysis curve.

80,81. King County. Eocene and Oligocene, Puget Group. NE¼ sec. 26, T. 21 N., R. 6 E., town of Kummer. Gladding, McBean,and Co., clay mine. Analyst, W.R. Bloor. Samples 9, 10. (Shedd, 1910, p. 256-258, 259,307,319; Glover, 1941, p. 128,129,344,345.) Flint fire clay, almost black, nonplastic, conchoidal fracture; 5-10 ft thick; overburden. Measured section. Physical properties, firing tests. Use: Firebrick.

82-84. King County. Puget Group. NE¼ sec. 26, T. 21 N., R. 6 E., 2.2 miles south of town of Black Diamond. Kummer mine. (Hodge, 1938e, p. 750, 751, 753,754,758-760.) Tonnage estimated. Index map, geologic section, detailed measured section. Use: Refractories.

82. Flint clay, nonplastic.

83. (Wilson, 1923, p. 21,62-65.) Clay, dark, highly carbonaceous. Physical properties, firing tests.

84. Flint clay, nonplastic. Firing test.

85. King County. Puget Group. [Tps. 21, 22 N., R. 7 E.],town of Durham. Sample 4. (Allen, 1952, p. 652,670,671,685, pl. 4.) Clay. Mineralogy. Index map. Photomicrograph. Refractive index.

86. King County. [T. 24 N., Rs. 10,11 E.],town of Taylor. Denny Clay Co. Analyst, W.J. Rattle. Sample 2. (Roberts, 1902b, p. 14,15; Wilson, 1934, p. 98-100; Glover, 1941, p. 122,344,345.) Clay, light-yellow. Use: Brick, flue lining, sewer pipe, roofing tile. Possible use: Ceramics, china.

Washington—Continued

87-89. Spokane County. Miocene. T. 24 N., R. 44 E., about 11 miles southeast of town of Spokane. (Hosterman and others, 1960, p. 2-4,12-15,20,25,26, 37,43,46,48,pl. 3.) Overburden averages 21.4 ft. Mineralogy. Average bulk density 1.64. Weighted composite sample, samples taken at about 5-ft intervals or where clay showed a marked change. Tonnage estimated. Index and geologic maps, geologic sections. Log of drill hole. Possible use: Source of alumina, ilmenite, gallium.

87. On line SE¼ sec. 20, NE¼ sec. 29. Drill hole E-14. Clay, blue; in lower part very fine and even grained; some kaolin amygdules and streaks; depth 43.5-53.5 ft.

88. On line SW¼ sec. 21, NW¼ sec. 28. Drill hole E-40. Clay, blue-gray and light-tan; some kaolin amygdules, iron stain; depth 1.0-17.0 ft.

89. NW¼ sec. 28, Drill hole E-25. Clay, varicolored; some kaolin amygdules; depth 35.0-50.5 ft.

90. Spokane County. T. 24 N., R. 44 E., near town of Mica. Washington Brick, Lime,and Sewer Pipe Co. pit. Sample 215. (Glover, 1941, p. 231,233, 348,349.) Clay, blue, plastic. Index and geologic map, generalized geologic section, measured section. Use: Terra cotta, pottery, refractories, structural ware.

91. Whatcom County. Eocene, Chuckanut Formation. SE¼ sec. 12, T. 40 N., R. 4 E., 3 miles southeast of town of Sumas. Denny-Renton Clay and Coal Co., old clay mine. (Wilson, 1923, p. 21,62,65-67; Glover, 1941, p. 306,311-313,352,353.) Clay. Physical properties, firing tests. Former use: Fire clay, terra cotta. Use: Refractories.

Table 14.—Analyses of samples from Oregon and Washington of clays in which $Al_2O_3+SiO_2+H_2O$ (however determined) is 50 percent or more of the sample (Group Hai), special-rock category

[High-alumina clays (kaolinite predominant, "bauxite" subordinate). SiO_2/Al_2O_3 weight ratio from 0.371 to 1.178; total iron > 30 percent or > Al_2O_3. Chemical analyses arranged by State, county, and stratigraphic position]

Chemical analyses

	Oregon									Washington	
	1	2	3	4	5	6	7	8	9	10	11
	36Hai 5-63	36Hai 5-70	36Hai 24-33	36Hai 24-34	36Hai 24-52	36Hai 24-58	36Hai 24-66	36Hai 24-72	36Hai 26-2	46Hai 37-152	46Hai 37-151
SiO_2	14.04	28.1	15.02	13.44	17.33	24.13	11.04	17.77	26.02	20.3	[1]17.76
Al_2O_3	33.70	25.8	29.11	34.64	29.22	24.05	29.62	30.75	24.03	24.1	22.46
Fe_2O_3	[2]35.54	[2]26.5	32.9	32.4	[2]35.26	26.18	32.2	[2]31.30	27.80	48.1	[3]31.30
FeO	------	------	------	------	------	2.73	------	------	1.76	------	------
MgO	------	------	------	------	------	.15	------	------	.11	------	Trace
CaO	------	------	------	------	------	.13	------	------	.02	------	Trace
Na_2O	------	------	------	------	------	.05	------	------	.03	------	------
K_2O	------	------	------	------	------	.04	------	------	.04	------	------
H_2O+	------	------	------	------	------	12.43	------	------	11.14	------	------
H_2O-	------	[4](28.3)	------	------	------	2.56	------	------	2.62	------	------
TiO_3	4.86	4.70	6.39	6.80	3.27	6.13	6.63	5.25	5.72	------	------
P_2O_5	[2].53	------	------	------	------	.79	------	------	.44	------	[5]Trace
MnO	------	------	------	------	------	.31	------	------	.05	------	------
S	------	------	------	------	------	------	------	------	.18	------	------
Ignition loss	14.58	14.0	16.58	12.72	[6]16.88	------	20.08	[6]16.91	[7].07	[8]6.56	23.40
Subtotal	------	------	------	------	------	------	------	------	100.03	------	------
Less O	------	------	------	------	------	------	------	------	.09	------	------
Total	[103.25]	[99.1]	[100.0]	[100.0]	[101.96]	99.68	[99.6]	[101.98]	99.94	[99.1]	[94.92]
Class	0,38,0	0,62,0	0,42,0	0,35,0	0,46,0	0,56,0	0,39,0	0,47,0	0,58,0	0,42,0	(0,54)0

[1] Insoluble.
[2] Calculated from reported Fe or P.
[3] Iron oxide.
[4] Not included in total.
[5] P.
[6] At 1,000°-1,100°C, sample air dried.
[7] CO_2.
[8] Includes H_2O.

Spectrographic analysis of sample 6

Zr	0.01-0.001	V	0.01-0.001	Ba	<0.001
Cr	.01- .001	Cu	<.001	Ni	< .001

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon

1. Columbia County. Miocene and Pliocene. SW¼ sec. 1, T. 4 N., R. 2 W., about 0.5 mile south-southeast of town of Yankton, railroad cut. Sample P-3394. (Libbey, Lowry, and Mason, 1945, p. 1, 5, 26, 48, <u>49</u>.) Bauxitic clay, mottled brown and gray, pisolitic; 2.4 ft thick. Mineralogy. Index maps, geologic section.

2. Columbia County. Miocene or younger. NW¼ sec. 16, T. 4 N., R. 2 W., about 0.5 mile north of Spitzenberg, Alder Creek area. Dietz property. Drill hole 36. (Kelly, 1947, p. 4, 6, <u>23</u>, figs. 1, 2.) Laterite, light-brown with scattered black specks; averages about 14 ft thick; silt overburden averages about 13 ft. Depth 22.0 ft. Bulk density 2.79. Index and geologic maps, geologic sections. [For another analysis from same drill hole, see sample 77, group D.]

3, 4. Marion County. Miocene and Pliocene. NW¼ sec. 19, T. 8 S., R. 3 W., 7-10 miles south of town of Salem. Analysts, L. L. Hoagland and assistants. Drill hole 17. (Corcoran and Libbey, 1956, p. 1, 2, 6, 16, <u>26</u>, 29, pl. 1.) Average thickness 14.4 ft. Tonnage estimated. Index and geologic maps. Graph showing variation in chemical composition of each 2-ft interval of depth. [For other analyses from same drill hole, see samples 35-38, group Ha; samples 10-13, group Hbi.]

3. Bauxitic clay [implied], tan to light-red, white, yellow, red, black spots, earthy, gritty; depth 12-14 ft.

4. Bauxitic clay [implied], tan to light-red, earthy, gritty; depth 10-12 ft.

5. Marion County. Miocene and Pliocene. NE¼ SW¼ sec. 28, T. 8 S., R. 3 W., about 5 miles south of Salem, Salem Hills area. Analyst, L. L. Hoagland. Sample P-3570. (Libbey, Lowry, and Mason, 1945, p. 4, 5, 72, 74, <u>77</u>, 85-88; Corcoran and Libbey, 1956, p. 1, 2, <u>19</u>, pls. 1, 2.) [Ferruginous bauxite] laterized basalt, light-brown, soft, earthy; 4 ft thick. Channel sample. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories.

6. Marion County. Miocene and Pliocene. On line secs. 29, 30, T. 8 S., R. 3 W., 7-10 miles south of Salem, Salem Hills area. Analyst, under direction of S. S. Goldich; spectrographic analyst, T. C. Matthews. Drill hole 14. Lab. No. R2151. (Corcoran and Libbey, 1956, p. 1-3, 6, <u>13</u>, 14, pl. 1.) Clay, depth 16-20 ft. Index and geologic maps. [For other analyses from same drill hole, see samples 35, 36, group Hbi.]

Oregon—Continued

7. Marion County. Miocene and Pliocene. SE¼ sec. 35, T. 8 S., R. 3 W., 7-10 miles south of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. Drill hole 24. (Corcoran and Libbey, 1956, p. 1, 2, 6, 19, <u>35</u>, pl. 1.) Ferruginous bauxite, depth 12.5-25 ft; overburden 12.5 ft. Tonnage estimated. Index and geologic maps. Possible use: Source of alumina [implied], pig iron, ferrotitanium.

8. Marion County. Miocene and Pliocene. NE¼ SE¼ sec. 35, T. 8 S., R. 3 W., about 6 miles south of Salem, roadcut. Analyst, L. L. Hoagland. Sample P-3573. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 70, 72, 74, <u>79</u>, 85-88.) [Ferruginous bauxite] laterized basalt, red, earthy; 3 ft thick. Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories.

9. Multnomah County. Late Miocene and early Pliocene. SW¼ SE¼ sec. 25, T. 1 N., R. 4 E. Analyst, F. H. Neuerberg. Sample C-947. (Trimble, 1963, p. 3, <u>89</u>, 93, 103, 104, pl. 1.) Ferruginous bauxite, pisolitic. Index and geologic maps, geologic section. Possible use: Source of aluminum, quick-setting aluminous cement.

Washington

10. Whatcom County. Early Tertiary. N½ sec. 2, T. 39 N., R. 4 E., 4 miles east of town of Everson. Sumas Mountain Iron deposit. Analyst, W. H. Ott. Sample 4. (Moen, 1962, p. 105, 109, <u>110</u>-112, pls. 1, 4.) Claystone, grayish-brown; 4.5-ft channel sample. Average bulk density of five samples 3.0. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections. Use: None.

11. Whatcom County. Early Tertiary. NE¼ sec. 2, T. 39 N., R. 4 E., about 4 miles southeast of town of Nooksack, west slope of Sumas Mountain. Sample 3. (Hodge, 1938a, p. 15-<u>17</u>; Moen, 1962, p. 105, <u>109</u>, 112, pl. 4.) Ferruginous shale. Tonnage estimated. Index and geologic maps, geologic section. Possible use: Pigment.

Table 15.—Analyses of samples from Oregon of clays in which $Al_2O_3+SiO_2+H_2O$ (however determined) is 50 percent or more of the sample (Group Hb), special-rock category

[Bauxite and bauxitic clays ("bauxite" predominant, kaolinite subordinate). SiO_2/Al_2O_3 weight ratio <0.371; total iron <30 percent. Chemical analyses arranged by county and stratigraphic position]

Chemical analyses

	Oregon										
	1	2	3	4	5	6	7	8	9	10	11
	36Hb3-24	36Hb5-29	36Hb5-33	36Hb5-37	36Hb5-39	36Hb24-29	36Hb24-39	36Hb24-21	36Hb24-23	36Hb24-24	36Hb24-44
SiO_2	[1]14.60	11.21	10.99	5.09	14.46	9.37	1.55	3.42	8.32	13.39	3.24
Al_2O_3	[2]45.49	35.32	52.73	44.47	43.96	35.74	53.35	45.72	52.32	36.24	59.55
Fe_2O_3	[3]15.14	[3]25.65	[3]9.12	[3]26.25	[3]18.60	29.2	[3]14.17	26.8	13.0	16.3	[3]3.70
TiO_2	------	2.68	2.06	2.08	3.21	6.21	2.68	7.83	3.06	3.38	1.00
Ignition loss	21.43	[4]21.01	[4]26.61	[4]22.69	[4]21.70	19.48	[4]28.83	16.23	23.30	30.69	[4]32.85
Total	[96.66]	[95.87]	[101.51]	[100.58]	[101.93]	[100.0]	[100.58]	[100.0]	[100.0]	[100.0]	[100.34]
Class	0,45,0	0,40,0	0,44,0	0,31,0	0,45,0	0,35,0	0,31,0	0,22,0	0,37,0	0,53,0	0,38,0

	Oregon—Continued										
	12	13	14	15	16	17	18	19	20	21	22
	36Hb24-47	36Hb24-51	36Hb24-57	36Hb24-60	36Hb24-71	36Hb24-70	36Hb24-69	36Hb24-82	36Hb24-73	36Hb27-1	36Hb34-11
SiO_2	2.55	4.82	6.92	2.23	10.65	4.87	11.60	4	6.23	3.50	4.70
Al_2O_3	52.80	50.23	38.83	50.64	35.27	56.50	38.02	60	35.87	50.90	47.36
Fe_2O_3	[3]14.27	[3]15.76	29.1	[3]19.41	[3]29.46	[3]1.73	22.3	[5]5	29.3	[3]17.13	[3]17.43
TiO_2	2.98	3.57	3.17	2.11	4.62	1.30	5.34	------	6.99	1.82	3.69
Ignition loss	[4]28.77	[4]26.11	19.50	[4]27.07	[4]19.84	[4]32.86	22.74	31	21.61	[4]28.87	[4]26.81
Total	[101.37]	[100.49]	[97.5]	[101.46]	[99.84]	[97.26]	[100.0]	[100]	[100.0]	[102.22]	[99.99]
Class	0,33,0	0,34,0	0,31,0	0,31,0	0,38,0	0,41,0	0,42,0	0,37,0	0,32,0	0,35,0	0,34,0

	Oregon—Continued				
	23	24	25	26	27
	36Hb34-13	36Hb34-19	36Hb34-20	36Hb34-30	36Hb36-10
SiO_2	5.76	11.48	6.14	7.99	12.34
Al_2O_3	39.76	38.40	41.00	36.47	35.05
Fe_2O_3	[3]27.18	[3]25.83	[3]29.84	[3]27.93	29.33
TiO_2	------	5.31	------	3.23	2.20
Ignition loss	[4]24.60	[4]21.52	[4]23.44	[4]23.05	21.12
Total	[97.30]	[102.54]	[100.42]	[98.67]	[100.04]
Class	0,34,0	0,41,0	0,34,0	0,36,0	0,42,0

[1] SiO_2 may be high because of mixture from other parts of drill hole.

[2] Includes about 1 percent TiO_2.

[3] Calculated from reported iron or Fe.

[4] At 1,000°-1,100° C, sample air dried.

[5] Iron oxide.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon

1. Clackamas County. Pliocene. NW¼ sec. 3, NE¼ sec. 4, T. 4 S., R. 4 E., 6 miles southeast of town of Estacada. Kiggins and Shearer farms. Auger hole 6. (The Ore.-Bin, 1948, p. 63-65; Oregon Department of Geology and Mineral Industries, 1951, p. 15.) [Bauxite clay] bauxite, brown, oolitic; depth 13-14 ft. Mineralogy. Index map. Possible use: SiO_2 too high for production of alumina but may be used for other purposes. [For other analyses from same drill hole, see samples 11-14, group Ha.]
2. Columbia County. Miocene and Pliocene. [T. 4 N., R. 2 W.], about 1 mile southeast of town of Spitzenberg. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 26, 57, 58, 86-88.) Ferruginous bauxite, red, oolitic. Index maps. Possible use: Source of iron, alumina, titanium oxide, and ferrotitanium.
3. County, age, analyst, maps, and use as in sample 2. [T. 4 N., R. 2 W.], 1 mile west of town of Yankton. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 26, 63, 86-88.) Ferruginous bauxite.
4. County, age, analyst, maps, and use as in sample 2. [T. 5 N., R. 1 W.], about 1.5 miles south of Deer Island Post Office. McBride property. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 26, 57, 86-88.) Ferruginous bauxite, red, porous, granular; float sample.
5. County, age, analyst, and maps as in sample 2. Sec. 18, T. 7 N., R. 2 W., west of town of Rainier, roadcut. Sample P-3400. (Libbey, Lowry, and Mason, 1945, p. 1, 4, 5, 27, 54, 55, 56, 87, 88.) Grab sample of hard gibbsitic pieces of ferruginous bauxite. Silt overburden. Measured section.
6. Marion County. Miocene and Pliocene. NW¼ sec. 18, T. 8 S., R. 3 W., 7-10 miles south of town of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. Drill hole 5. (Corcoran and Libbey, 1955, p. 23-27; Corcoran and Libbey, 1956, p. 1, 2, 6, 19, 35, pl. 1.) Ferruginous bauxite, depth 2-10 ft; overburden 2 ft. Tonnage estimated. Index and geologic maps. Possible use: Source of alumina, ferrotitanium, pig iron.
7. Marion County. Miocene and Pliocene. SW¼ sec. 19, T. 8 S., R. 3 W., about 5 miles southwest of Salem. Analyst, L. L. Hoagland. Sample P-3551. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 72, 74-76, 85-88.) Gibbsitic float, brown, porous, granular, residual grains of magnetite. Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories; source of alumina, iron, titanium oxide, ferrotitanium.

Oregon—Continued

8-10. Marion County. Miocene and Pliocene. SW¼ sec. 22, T. 8 S., R. 3 W., 7-10 miles south of Salem, Rosedale Church area. Analysts, L. L. Hoagland and assistants. Drill hole 22. (Corcoran and Libbey, 1956, p. 1, 2, 6, 20, 27, 29, pls. 1, 2.) Average thickness 14.4 ft. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections. Graph showing variation in chemical composition for each 2-ft interval of depth. Possible use: Source of alumina, ferrotitanium, pig iron. [For other analyses from same drill hole, see samples 17-25, group Hbi.]

8. Sample 4. Ferruginous bauxite, tan, granular, gritty, depth 8-10 ft.
9. Sample 2. [Bauxite] ferruginous bauxite, brownish-red, earthy, gritty, porcelaneous; numerous fragments of gibbsite; depth 4-6 ft.
10. Sample 1. Ferruginous bauxite, brownish-red; numerous fragments of porcelaneous gibbsite; depth 2-4 ft.

11-13. Marion County. Miocene and Pliocene. T. 8 S., R. 3 W., about 5 miles south of Salem, roadcut. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 72, 74, 77, 78, 85-88.) Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories; source of alumina, ferrotitanium, iron, titanium oxide.

11. Near center sec. 26. Sample P-3546. Bauxite nodule, light-colored.
12. Near center W½ sec. 27. Gibbsitic material, light-colored, porous; 1 ft thick.
13. NE¼SW¼ sec. 28. Sample P-3549. Gibbsitic nodule, brown, porous, granular. Thin-section description.

14. Marion County. Miocene and Pliocene. NW¼ sec. 29, T. 8 S., R. 3 W., 7-10 miles south of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. Drill hole 2. (Corcoran and Libbey, 1955, p. 23-27; Corcoran and Libbey, 1956, p. 1, 2, 6, 21, 35, pl. 1.) Ferruginous bauxite; depth 2-14.5 ft; overburden 2 ft. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: Source of alumina, ferrotitanium, pig iron.
15. Marion County. Miocene and Pliocene. Near center sec. 30, T. 8 S., R. 3 W., about 6 miles southwest of Salem. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 71, 72, 74-76, 79, 85-88.) Bauxite, gibbsitic, brownish-white, porous, granular; contains residual

DESCRIPTIVE NOTES—Continued

Oregon—Continued

magnetite. Float sample. Mineralogy. Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories; source of alumina, iron, titanium oxide, and ferrotitanium.

16, 17. County, age, analyst, reference, maps, and use as in sample 15. NE¼ SE¼ sec. 35, T. 8 S., R. 3 W., about 6 miles south of Salem, roadcut.

16. Sample P-3537. [Ferruginous bauxite] laterized basalt; upper 5.5 ft.

17. Sample P-3532. Bauxite nodule, light-colored, slightly porous. Mineralogy.

18. Marion County. Miocene and Pliocene. NW¼ sec. 35, T. 8 S., R. 3 W., 7-10 miles south of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. Drill hole 21. (Corcoran and Libbey, 1955, p. 23-27, 28; Corcoran and Libbey, 1956, p. 1, 2, 6, 29, 35, pl. 1.) Ferruginous bauxite; depth 4-18 ft; overburden 4 ft. Tonnage estimated. Index and geologic maps. Graph showing variation in chemical composition for each 2-ft interval of depth. Possible use: Source of alumina, pig iron, ferrotitanium.

19. Marion County. Miocene and Pliocene. [T. 8 S., R. 3 W.], south of Salem, Salem Hills deposit. (Corcoran, 1962, p. 25, 26-28.) Bauxite nodule, dense, porcelaneous, representative sample. Mineralogy. Index map. Possible use: Source of alumina, iron.

20. County, age, analysts, area, reference, maps, graph, and use as in sample 18. S½ sec. 1, T. 9 S., R. 3 W., 7-10 miles south of Salem. Drill hole 13. Ferruginous bauxite; depth 8-10 ft; overburden 8 ft. Tonnage estimated.

21. Polk County. Miocene and Pliocene. SE¼ sec. 8, T. 7 S., R. 3 W., about 2 miles northwest of Salem, Wallace Hill. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 72, 74, 75, 85-88.) Bauxitic float, porous, granular. Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories; source of alumina, iron, titanium oxide, ferrotitanium.

22. Washington County. Miocene and Pliocene. NW¼ sec. 27, T. 2 N., R. 2 W. Anderson property. Analyst, L. L. Hoagland; collectors, J. F. Cleaver, L. C. Swanson. Sample P-3366. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 25, 45, 86-88.) [Limonitic material] ferruginous bauxite, pisolitic, earthy. Mineralogy. Index maps. Possible use: Source of iron, alumina, titanium oxide, ferrotitanium.

23-26. Washington County. Miocene and Pliocene. T. 2 N., R. 3 W., 14 miles north of town of Hillsboro. Hutchison-Nixon properties. Analyst, L. L. Hoagland; collectors, J. F. Cleaver, L. C. Swanson. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 18, 20, 24, 32-34, 35-38, 41, 86-88.) Tonnage estimated. Index maps. Possible use: Source of iron, alumina, titanium oxide, ferrotitanium.

23-25. NW¼ SW¼ sec. 1. Drill hole 50. Overburden 20 ft. Geologic sections, detailed measured section. [For other analyses from same drill hole, see sample 114, group D; sample 45, group Ha; samples 47-49, group Hbi.]

23. Sample 13. [Ferruginous bauxite], varicolored, spotted, gritty, lumpy, firm; depth 45-49 ft.

24. Ferruginous bauxite, brown, gritty, slightly oolitic; depth 36.5-39 ft.

25. Sample 6. [Ferruginous bauxite], red-brown, slightly oolitic, firm; depth 36-36.5 ft.

26. SE¼ SW¼ sec. 1. Drill hole 44. [Ferruginous bauxite], oolitic, 9 ft thick. [For another analysis from same drill hole, see sample 46, group Hbi.]

27. Yamhill County. [Miocene or younger.] SE¼ NW¼ sec. 3, T. 3 S., R. 2 W., near town of Newberg. Sample 26825. (Oregon Department Geology and Mineral Industries, 1961, p. 122.) Ferruginous bauxite; depth 5-7 ft; overburden. [For other analyses from same drill hole, see samples 62, 63, group Hbi and sample 48, group Fe.]

Table 16.—Analyses of samples from Oregon and Washington of clays in which $Al_2O_3+SiO_2+H_2O$ (however determined) is 50 percent or more of the sample (Group Hbi), special-rock category

[Bauxite and bauxitic clays ("bauxite" predominant, kaolinite subordinate). SiO_2/Al_2O_3 weight ratio < 0.371; total iron > 30 percent. Chemical analyses arranged by State, county and stratigraphic position]

	Oregon												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	36Hbi 5-62	36Hbi 5-78	36Hbi 5-31	36Hbi 5-32	36Hbi 5-38	36Hbi 5-30	36Hbi 5-61	36Hbi 5-4	36Hbi 5-6	36Hbi 24-35	36Hbi 24-36	36Hbi 24-37	36Hbi 24-85
SiO_2	11.5	6.7	2.32	6.29	6.60	9.3	10.7	7.2	1.77	5.40	4.42	8.44	7.92
Al_2O_2	31	35.5	33.50	38.80	35.56	30.9	33.9	37.2	30.79	36.45	33.72	32.64	34.36
Fe_2O_2	[1]30	[1]37.8	[1]45.27	[1]33.55	[1]34.63	[1]36.8	[1]31.2	[1]31.5	42.32	31.8	35.2	33.0	33.1
H_2O-	[2]20	------	------	------	------	[3](15.9)	[3](16.1)	[3](17.0)	1.66	------	------	------	------
TiO_2	5	5.7	2.58	1.49	4.50	6.40	4.70	5.2	5.16	7.44	7.39	6.93	7.00
Ignition loss	------	16.8	[4]17.73	[4]20.65	[4]18.71	16.5	18.5	18.5	[5].13	18.91	19.27	18.99	17.62
Total	[98]	[102.5]	[101.40]	[100.78]	[100.00]	[99.9]	[99.0]	[99.6]	[6]99.23	[100.0]	[100.0]	[100.0]	[100.0]
Class	0,41,0	0,28,0	0,22,0	0,31,0	0,30,0	0,32,0	0,37,0	0,31,0	0,21,0	0,28,0	0,27,0	0,33,0	0,31,0

[1] Calculated from reported Fe.

[2] Reported as circa 20 percent.

[3] Not included in total.

[4] At 1,000°-1,100°C, sample air dried.

[5] CO_2.

[6] Amounts in percent: FeO = 0.80, MgO = 0.03, CaO = 0.01, Na_2O = 0.02, K_2O = 0.01, H_2O+ = 16.27, P_2O_5 = 0.22, MnO = 0.02, S = 0.04, subtotal = 99.25, less O = 0.02.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon

1. Columbia County. [Miocene and Pliocene. T. 4 N., R. 1 W.], near town of St. Helens. (Libbey, Lowry, and Mason, 1946, p. 246, 249, 253, 258, 259.) Ferruginous bauxite, light-brown through red to dark-brown, upper part oolitic or pisolitic, lower part earthy to nodular; 6-20+ ft thick, overburden 1-50+ ft thick. Tonnage estimated. Index map. Possible use: Source of alumina, iron, titanium.

2. Columbia County. Miocene and Pliocene [implied]. Sec. 1, T. 4 N., R. 2 W., about 3 miles west of St. Helens. Yankton cut. (Bell, 1945, p. 1, 4, 5, 9, fig. 1, pl. 2.) Laterite, reddish-brown mottled with gray, pisolitic, indurated; average thickness 10 ft, overburden averages 30 ft. Channel sample. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: None.

3-5. Columbia County. Miocene and Pliocene. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 26, 53, 57, 58, 86-88.) Index maps. Possible use: Source of alumina, ferrotitanium, iron, titanium oxide.

3. [T. 4 N., R. 2 W.], about 2 miles east of town of Spitzenberg. Ferruginous bauxite, oolitic.

4. [T. 4 N., R. 2 W.], about 3.5 miles north-northwest of town of Scappoose. Oester property. Ferruginous bauxite, oolitic; 2 ft channel sample. Former use: Paint pigment.

5. [T. 5 N., R. 1 W.], 2.5 miles west of Columbia City, roadcut. Ferruginous bauxite; 4.5-ft vertical channel sample; upper 3 ft red, oolitic; lower 1.5 ft nodular.

6-8. Columbia County. Miocene or younger. NW¼ sec. 16, T. 4 N., R. 2 W., about 0.5 mile north of Spitzenberg, Alder Creek area. Dietz property. (Kelly, 1947, p. 4, 6, 15, 19, 20, figs. 1, 2.) Laterite, dark-red, oolitic or pisolitic; averages about 14 ft thick; silt overburden averages about 13 ft thick. Index and geologic maps, geologic sections.

6. Drill hole 14. Depth 14.0 ft. Bulk density 2.98.

7. Drill hole 25. Depth 6.0 ft. Bulk density 2.87.

8. Drill hole 29. Depth 11.0 ft. Bulk density 2.94.

9. Columbia County. Late Miocene and early Pleistocene. NW¼ SW¼ sec. 5, T. 3 N., R. 2 W. Alcoa Mining Co., test pit. Analyst, F. H. Neuerburg. Sample C-948. (Trimble, 1963, p. 3, 87, 89, 94, 103, 104.) Laterite crust, pisolitic. Index map. Possible use: Source of aluminum, iron; quick-setting aluminous cement.

10-13. Marion County. Miocene and Pliocene. NW¼ sec. 19, T. 8 S., R. 3 W., 7-10 miles south of town of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. Drill hole 17. (Corcoran and Libbey, 1956, p. 1, 2, 6, 26, 29, 35, pl. 1.) Average thickness 14.4 ft. Tonnage estimated. Index and geologic maps. Graph showing variation in chemical composition for each 2 ft interval of depth. Possible use: Source of alumina, pig iron, ferrotitanium. [For other analyses from same drill hole, see samples 35-38, group Ha and samples 3, 4, group Hai.]

10. Sample 4. Bauxite, yellow-brown to light-red, earthy, gritty; depth 8-10 ft.

11. Sample 3. Bauxite, yellow-brown to light-red, earthy, gritty, firm, dry; depth 6-8 ft.

12. Sample 2. Bauxite, yellow-brown, earthy, gritty, firm; depth 4-6 ft.

13. Ferruginous bauxite, depth 2-12 ft.

Table 16.—Analyses of samples from Oregon and Washington of clays in which $Al_2O_3 + SiO_2 + H_2O$ (however determined) is 50 percent or more of the sample (Group Hbi), special-rock category—Continued

Chemical analyses—Continued

	Oregon—Continued												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	36Hbi 24-40	36Hbi 24-42	36Hbi 24-43	36Hbi 24-13	36Hbi 24-14	36Hbi 24-15	36Hbi 24-16	36Hbi 24-17	36Hbi 24-18	36Hbi 24-19	36Hbi 24-20	36Hbi 24-22	36Hbi 24-27
SiO_2	8.13	8.14	4.14	2.40	2.72	2.98	4.96	4.70	7.00	5.38	2.18	10.96	6.03
Al_2O_3	34.09	32.10	34.96	32.16	33.32	35.16	35.60	28.94	33.92	35.80	36.80	29.68	35.90
Fe_2O_3	31.2	30.0	30.8	41.4	35.5	37.8	36.7	37.1	37.2	36.3	31.0	35.9	33.8
TiO_3	6.76	6.65	6.85	7.20	6.56	7.84	5.95	7.70	6.85	6.80	7.40	9.90	7.20
Ignition loss	19.82	22.94	25.60	16.84	21.90	16.22	16.79	22.80	15.03	15.72	22.62	13.56	16.80
Total	[100.0]	[99.8]	[102.4]	[100.0]	[100.0]	[100.0]	[100.0]	[101.2]	[100.0]	[100.0]	[100.0]	[100.0]	[99.7]
Class	0,34,0	0,37,0	0,33,0	0,21,0	0,26,0	0,21,0	0,25,0	0,31,0	0,27,0	0,25,0	0,26,0	0,32,0	0,27,0

	Oregon—Continued												
	27	28	29	30	31	32	33	34	35	36	37	38	39
	36Hbi 24-26	36Hbi 24-25	36Hbi 24-46	36Hbi 24-53	36Hbi 24-55	36Hbi 24-54	36Hbi 24-67	36Hbi 24-56	36Hbi 24-59	36Hbi 24-63	36Hbi 24-62	36Hbi 24-61	36Hbi 24-64
SiO_3	5.79	5.46	7.46	10.55	8.75	5.85	4.4	5.28	4.81	6.48	4.28	4.14	10.63
Al_2O_3	33.80	31.25	31.20	37.46	35.51	32.84	38.6	36.47	30.02	32.31	37.85	37.37	31.01
Fe_2O_3	32.7	33.3	33.2	[1]30.35	30.9	32.7	32.6	32.3	33.14	36.9	30.9	32.4	32.7
FeO	------	------	------	------	------	------	------	------	2.79	------	------	------	------
MgO	------	------	------	------	------	------	------	------	.23	------	------	------	------
CaO	------	------	------	------	------	------	------	------	.13	------	------	------	------
Na_2O	------	------	------	------	------	------	------	------	.03	------	------	------	------
K_2O	------	------	------	------	------	------	------	------	.07	------	------	------	------
H_2O+	------	------	------	------	------	------	------	------	17.15	------	------	------	------
H_2O-	------	------	------	------	------	------	------	------	2.59	------	------	------	------
TiO_2	7.19	6.69	6.80	2.78	6.20	6.58	5.16	6.13	6.76	6.00	6.94	7.14	6.91
P_2O_5	------	------	------	------	------	------	------	------	1.51	------	------	------	------
MnO	------	------	------	------	------	------	------	------	.36	------	------	------	------
Ignition loss	20.52	23.28	21.34	[2]19.80	18.64	22.03	20.6	19.82	------	18.31	20.02	18.95	18.75
Total	[100.0]	[100.0]	[100.0]	[100.94]	[100.0]	[100.0]	[101.4]	[100.0]	99.59	[100.0]	[100.0]	[100.0]	[100.0]
Class	0,30,0	0,33,0	0,34,0	0,37,0	0,33,0	0,32,0	0,28,0	0,29,0	0,28,0	0,29,0	0,27,0	0,26,0	0,37,0

	Oregon—Continued												
	40	41	42	43	44	45	46	47	48	49	50	51	52
	36Hbi 24-65	36Hbi 24-81	36Hbi 24-27	36Hbi 34-47	36Hbi 34-6	36Hbi 34-9	36Hbi 34-28	36Hbi 34-12	36Hbi 34-16	36Hbi 34-17	36Hbi 34-29	36Hbi 34-35	36Hbi 34-36
SiO_2	7.51	6	6.7	5.12	5.70	8.95	8.89	8.56	3.64	8.70	9.97	4.00	5.34
Al_2O_3	33.85	35	35.0	34.08	36.48	31.85	35.58	34.96	36.92	34.68	35.81	42.00	42.12
Fe_2O_3	32.0	[3]32	31.5	[1]43.49	[1]33.25	[1]37.11	[1]31.27	[1]32.15	[1]32.95	[1]32.16	[1]33.12	[1]31.98	[1]32.60
H_2O-	------	------	------	------	[4](17.5)	[4](19.0)	[4](19.15)	------	------	------	[4](19.83)	20.8	20.8
TiO_2	6.00	6	6.5	4.12	------	4.5	3.46	------	------	4.18	------	------	------
P_2O_5	------	------	------	------	------	[1].321	------	------	------	------	------	------	------
Ignition loss	20.64	21	20.2	[2]16.57	[2]19.8	[2]18.0	[2]22.34	[2]21.96	[2]23.65	[2]19.04	[2]21.14	------	------
Total	[100.0]	[100]	[99.9]	[103.38]	[95.2]	[100.7]	[101.54]	[97.63]	[97.16]	[98.76]	[100.04]	[98.8]	[100.9]
Class	0,33,0	0,31,0	0,31,0	0,25,0	0,29,0	0,33,0	0,37,0	0,36,0	0,30,0	0,34,0	0,38,0	0,28,0	0,30,0

[1] Calculated from reported Fe or P.
[2] At 1,000°-1,100°C, sample air dried.
[3] Iron oxide.
[4] At 100°-105°C, not included in total.

Spectrographic analysis of sample 35

V	0.01 -0.001	Sr	<0.001
Cr	<.001	Zr	.01 -0.001
Ni	.01 - .001	Ba	.01 - .001
Cu	.01 - .001		

General spectrographic analysis for locality 5, samples 44, 45

Mg	0.1 -1	Sr	0.001-0.01
Ti	1.0 -10	Zr	.01 - .1
V	.01 - .1	Mo	<.001
Cr	.001- .01	Ba	.001- .01
Mn	.01 - .1		

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

14-26. Marion County. Miocene and Pliocene. T. 8 S., R. 3 W., 7-10 miles south of town of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. (Corcoran and Libbey, 1956, p. 1, 2, 6, 20, 22, 24, 27, 28, 29, 35, pls. 1, 2.) Average thickness 14.4 ft. Tonnage estimated. Index and geologic maps. Possible use: Source of alumina, ferrotitanium, pig iron.

- 14. SW¼ sec. 19. Drill hole 7. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 2-18 ft, overburden 2 ft.
- 15. On line secs. 20, 21. Drill hole 25. Ferruginous bauxite, depth 12.5-25 ft, overburden 12.5 ft.
- 16. NE¼ sec. 21. Drill hole 26. Ferruginous bauxite, depth 6-20 ft, overburden 6 ft. Geologic sections.
- 17-25. SW¼ sec. 22. Drill hole 22. Mineralogy. Geologic sections. Graph showing variation in chemical composition for each 2 ft interval of depth. [For other analyses from same drill hole, see samples 8-10, group Hb.]
  - 17. Sample 12. Ferruginous bauxite, tan, gritty; depth 24-25 ft.
  - 18. Sample 11. Ferruginous bauxite, reddish-brown, gritty, earthy; depth 22-24 ft.
  - 19. Sample 10. Ferruginous bauxite, reddish-brown, gritty, earthy; depth 20-22 ft.
  - 20. Sample 9. Ferruginous bauxite, reddish-brown, gritty, earthy, slightly clayey; depth 18-20 ft.
  - 21. Sample 8. Ferruginous bauxite, reddish-brown, gritty, earthy, slightly clayey; depth 16-18 ft.
  - 22. Sample 7. Ferruginous bauxite, reddish-brown, gritty, earthy, damp; depth 14-16 ft.
  - 23. Sample 6. Ferruginous bauxite, reddish-brown, gritty, earthy; depth 12-14 ft.
  - 24. Sample 5. Ferruginous bauxite, tan, granular; depth 10-12 ft.
  - 25. Sample 3. Ferruginous bauxite, grayish-brown to reddish-brown; contains fragments of gibbsite; depth 6-8 ft.
- 26. SE¼ sec. 22. Drill hole 23. Ferruginous bauxite, depth 4-32 ft, overburden 4 ft. Geologic sections, measured section.

27. Marion County. [Miocene and Pliocene. T. 8 S., R. 3 W.], about 7 miles south of Salem, Salem Hills area. Drill hole 23. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 4-32 ft. Index and geologic maps.

28, 29. County, age, locality, analysts, reference, maps, and use as in samples 14-26. Average thickness 14.4 ft. Tonnage estimated.

- 28. SE¼ sec. 22. Drill hole 27. Ferruginous bauxite, depth 2-20 ft, overburden 2 ft. Geologic sections.
- 29. NW¼ sec. 27. Drill hole 20. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 8-21 ft, overburden 8 ft. Geologic sections.

30. Marion County. Miocene and Pliocene. NE¼ SW¼ sec. 28, T. 8 S., R. 3 W., about 5 miles south of Salem, roadcut. Analyst, L. L. Hoagland. Sample P-3571. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 72, 74, 77, 85-88; Corcoran and Libbey, 1956, p. 1, 2, 19, pls. 1, 2.) [Ferruginous bauxite], laterized basalt, brown with limonitic and gibbsitic streaks; contains residual magnetite grains. Channel sample of upper 5 ft. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories; source of alumina, iron, titanium oxide, ferrotitanium.

31-40. Marion County. Miocene and Pliocene. T. 8 S., R. 3 W., 7-10 miles south of Salem, Salem Hills area. Analysts [except samples 33, 35], L. L. Hoagland and assistants. (Corcoran and Libbey, 1956, p. 1, 2, 6, 12, 13, 15, 18, 19, 29, 35, 40, pls. 1, 2.) Average thickness 14.4 ft. Tonnage estimated. Index and geologic maps. Possible use: Source of alumina, ferrotitanium, pig iron.

- 31. SE¼ sec. 28. Drill hole 1. (Corcoran and Libbey, 1955, p. 23-27, 28.) Ferruginous bauxite, depth 2-20 ft, overburden 2 ft. Geologic sections. Graph showing variation in chemical composition for each 2-ft interval of depth.
- 32. SE¼ sec. 28. Drill hole 18. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 4-18 ft, overburden 4 ft. Geologic sections.
- 33. N½ sec. 29. Ferruginous bauxite.
- 34. NE¼ sec. 29. Drill hole 11. (Corcoran and Libbey, 1955, p. 23-27, 28.) Ferruginous bauxite, depth 2-21 ft, overburden 2 ft. Graph showing variation in chemical composition for each 2-ft interval of depth.
- 35, 36. On line secs. 29, 30. Drill hole 14. Ferruginous bauxite. [For another analysis from same drill hole, see sample 6, group Hai.]
  - 35. Analyst, under direction of S. S. Goldich; spectrographic analyst, T. C. Matthews. Depth 2-6 ft.
  - 36. (Corcoran and Libbey, 1955, p. 23-27.) Depth 2-8 ft.
- 37. SW¼ sec. 30. Drill hole 15. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 2-24 ft. Log of drill hole. Differential thermal analysis curve for depth 22-24 ft. Graph showing variation in chemical composition for each 2-ft interval of depth.
- 38. NW¼ sec. 33. Drill hole 16. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 2-22 ft, overburden 2 ft.
- 39. NW¼ sec. 33. Drill hole 8. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 2-8 ft, overburden 2 ft.
- 40. NW¼ sec. 34. Drill hole 19. (Corcoran and Libbey, 1955, p. 23-27.) Ferruginous bauxite, depth 8-14 ft, overburden 8 ft.

41. Marion County. Miocene and Pliocene. [T. 8 S., R. 3 W.], south of Salem. Salem Hills deposit. (Corcoran, 1962, p. 25, 26-28.) [Ferruginous bauxite], earthy; average thickness 14.4 ft. Mineralogy. Index map. Possible use: Source of alumina, iron.

42. Marion County. Miocene and Pliocene. [T. 8 S., R. 3 W.], 7-10 miles south of Salem, Salem Hills area. Analysts, L. L. Hoagland and assistants. (Corcoran and Libbey, 1956, p. 1, 2, 6, 35, pls. 1, 2.) Ferruginous bauxite. Weighted average of drill hole samples. Average thickness 14.4 ft, average overburden 4.4 ft. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Source of alumina, ferrotitanium, pig iron.

43. Washington County. Miocene and Pliocene. NW¼ sec. 2, T. 1 N., R. 2 W. Berger deposit. Analyst, L. L. Hoagland; collectors, J. F. Cleaver, L. C. Swanson. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 25, 45.) Ferruginous bauxite, oolitic. Float sample. Index maps. Possible use: Source of alumina and iron.

44, 45. Washington County. Miocene and Pliocene. N½ sec. 6, T. 2 N., R. 2 W. Hendrickson farm. Analyst, L. L. Hoagland; spectrographic analyst, E. W. Miller; collectors, J. F. Cleaver, L. C. Swanson. Locality 5. (Libbey, Lowry, and Mason, 1944, p. 1-3, 7, 10, 11, 13; Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 20, 25, 29-31, 86-88.) Mineralogy. Tonnage estimated. Index maps. Possible use: Source of alumina, ferrotitanium, iron, titanium oxide.

- 44. Old railroad cut. Sample P-2473. Ferruginous bauxite, reddish-brown, hard; 6 ft thick. Measured section.
- 45. Ferruginous bauxite. Arithmetical average analysis of samples from 29 drill holes.

46-50. Washington County. Miocene and Pliocene. T. 2 N., R. 3 W., 14 miles north of town of Hillsboro. Hutchison-Nixon properties. Analyst, L. L. Hoagland; collectors, J. F. Cleaver, L. C. Swanson. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 24, 32-36, 40, 86-88.) [Ferruginous bauxite], oolitic and pisolitic. Tonnage estimated. Index maps. Possible use: Source of alumina, ferrotitanium, iron, titanium oxide.

- 46. SE¼ SW¼ sec. 1. Drill hole 44. Depth 22-34 ft. [For another analysis from same drill hole, see sample 26, group Hb.]
- 47-49. NW¼ SW¼ sec. 1. Drill hole 50. Geologic sections, detailed measured section. [For other analyses from same drill hole, see sample 114, group D; sample 45, group Ha, and samples 23-25, group Hb.]
  - 47. [Ferruginous bauxite], varicolored; depth 49-50 ft.
  - 48. [Ferruginous bauxite], brick-red, sandy, nonoolitic, firm; depth 42-43 ft.
  - 49. [Ferruginous bauxite], brick-red, sandy, slightly oolitic, firm; depth 41-42 ft.
- 50. NW¼ SW¼ sec. 1. Drill hole 53.

51, 52. Washington County. Miocene and Pliocene [implied]. SE¼ sec. 1, T. 2 N., R. 3 W. Hutchinson farm. (Libbey, Lowry, and Mason, 1944, p. 1-3, 9, 16, 17.) Drill hole samples. Index maps, detailed measured section. Possible use: Source of iron and alumina. [For another analysis from same drill hole, see sample 53, this group.]

- 51. Sample P-2541. Ferruginous bauxite, brown and yellow-brown, pebbly, 2 ft thick; depth 17.5 ft.
- 52. Sample P-2540. Ferruginous bauxite, 1 ft thick; depth 16.5 ft.

Table 16.—Analyses of samples from Oregon and Washington of clays in which $Al_2O_3 + SiO_2 + H_2O$ (however determined) is 50 percent or more of the sample (Group Hbi), special-rock category—Continued

Chemical analyses—Continued

	Oregon—Continued											Washington
	53	54	55	56	57	58	59	60	61	62	63	64
	36Hbi 34-37	36Hbi 34-42	36Hbi 34-43	36Hbi 34-44	36Hbi 34-27	36Hbi 34-1	36Hbi 34-2	36Hbi 34-3	36Hbi 34-4	36Hbi 36-9	36Hbi 36-8	46Hbi 19-36
SiO_2	5.00	3.39	4.25	6.42	8.88	7.0	7.83	8.47	8.58	4.64	4.40	9.7
Al_2O_3	37.24	30.48	31.44	40.28	31.40	27.0	36.21	32.96	34.30	34.10	30.70	38.2
Fe_2O_3	[1]34.55	[1]41.57	[1]41.91	[1]31.55	[1]35.02	25.0	[1]37.82	[1]34.99	[1]35.52	37.70	43.10	[1]46.86
FeO	------	------	------	------	------	5.4	------	------	------	------	------	------
H_2O-	21.22	------	------	------	------	[2]18.0	[2]19.74	[2]23.43	[3](21.11)	------	------	------
TiO_2	------	4.65	4.81	4.49	------	3.2	------	------	4.46	3.80	.63	------
P_2O_5	------	------	------	------	------	.3	[1].311	[1].389	[1].332	------	------	[1].15
S	------	------	------	------	------	------	------	------	------	------	------	.040
Ni	------	------	------	------	------	------	------	------	------	------	------	.27
Cr_2O_3	------	------	------	------	------	------	------	------	------	------	------	1.39
Misc.	------	------	------	------	------	[4]2.1	------	------	------	------	------	------
Ignition loss	------	[5]18.51	[5]18.17	[5]18.22	[5]20.41	12.0	------	------	18.00	19.60	21.16	------
Total	[98.01]	[98.60]	[100.58]	[100.96]	[95.71]	[100.0]	[101.91]	[100.24]	[101.19]	[99.84]	[99.99]	[96.6]
Class	0,31,0	0,24,0	0,25,0	0,29,0	0,35,0	------	------	------	------	0,27,0	0,29,0	0,18,0

[1] Calculated from reported Fe or P.

[2] H_2O(-110°C).

[3] H_2O(-110°C), not included in total.

[4] Includes CaO, MgO, MnO, SO_2 and rare elements. H_2O = 16.00 percent, Mn = 2.00 percent, P = 0.130 percent, S = Trace (Zapffe, 1949, pl. 3.).

[5] At 1,000°-1,100°C, sample air dried.

Spectrographic analysis of sample 58

B	<0.001	Mn	0.10-0.01	Zr	0.10 -0.01
V	.10 -.01	As	.10- .01	Mo	<.001
Cr	.10 -.01	Sr	.01- .001	Ba	.10 - .01

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

53. Washington County. Miocene and Pliocene [implied]. SE¼ sec. 1, T. 2 N., R. 3 W. Hutchinson farm. Sample P-2539. (Libbey, Lowry, and Mason, 1944, p. 1-3, 9, 16, 17.) Ferruginous bauxite, yellow-brown with white fragments, some oolites; 2 ft thick; depth 14.5 ft. Index maps, detailed measured section. Possible use: Source of iron and alumina. [For other analyses from same drill hole, see samples 51, 52, this group.]

54, 55. Washington County. Miocene and Pliocene. T. 2 N., R. 3 W., about 3 miles north of town of Wilkesboro. Davies property. Analyst, L.L. Hoagland; collectors, J.F. Cleaver, L.C. Swanson. (Libbey, Lowry, and Mason, 1945, p. 1,2,4,5,24,46,47,86-88.) [Ferruginous bauxite.] Composite float sample of oolitic and nodular bauxite. Index maps. Possible use: Source of alumina, iron, titanium oxide, ferrotitanium.

54. NE¼ sec. 19. 55. SE¼ sec. 19.

56. County, age, analyst, collectors, reference, maps, and use as in samples 54, 55. [T. 2 N., R. 3 W.], about 1.5 miles north northeast of Davies. [Ferruginous bauxite], float sample.

57. County, age, analyst, collectors, maps, and use as in samples 54, 55. NW¼SW¼ sec. 35, T. 3 N., R. 3 W., 14 miles north of Hillsboro. Hutchison-Nixon properties. Drill hole 61. (Libbey, Lowry, and Mason, 1945, p. 1,2,4,5,24,32,33,35,36,39,43,86-88.) [Ferruginous bauxite], oolitic and pisolitic. Tonnage estimated. Geologic section.

58-61. Washington County. [T. 2 N., R. 3 W.], about 12 miles north of Hillsboro. Hillsboro deposit. (Zapffe, 1949, p. 61-63, 64, 65, pl. 3.) General: Laterite, oolitic to nodular; thickness 1-20 ft, overburden 1-40 ft. Mineralogy. Tonnage estimated. Possible use: Source of alumina, iron.

62, 63. Yamhill County. SE¼NW¼ sec. 3, T. 3 S., R. 2 W., near town of Newberg. (Oregon Department of Geology and Mineral Industries, 1961, p. 122.) Ferruginous bauxite, overburden 6 ft. [For other analyses from same drill hole, see sample 27, group Hb and sample 48, group Fe.]

62. Sample 26828. Depth 17-19 ft.
63. Sample 26826. Depth 9-11 ft.

Washington

64. Kittitas County. [Late Cretaceous, underlies Swauk Formation.] Tps. 22, 23 N., R. 14 E., about 26 miles north of town of Cle Elum. Analyst, under direction of O.C. Ralston. Drill hole 37. (Zoldok, 1948, p. 1,2,4-6, figs. 1-3.) [Iron-bearing rock], depth 267.0-275.5 ft. Index and geologic maps, geologic sections. Possible use: Nickel-iron alloy, low chromium steel.

Table 17.—Analyses of samples from Alaska, Oregon, and Washington, of iron-rich rocks, most of which contain 50 percent or more of ferrous oxide or ferric oxide (Group Fe), special-rock category

[Minor discrepancies occur in naming of constituents and in their amounts when more than one version of the analysis is found in the literature. Chemical analyses arranged by State, quadrangle or county, and stratigraphic position]

	Alaska		Oregon									
	1	2	3	4	5	6	7	8	9	10	11	12
	50Fe95-2	50Fe95-1	36Fe3-32	36Fe5-12	36Fe5-11	36Fe5-10	36Fe5-13	36Fe5-14	36Fe5-7		36Fe5-15	
SiO_2	4.12	5.53	8.14	4.60	3.18	1.18	7.28	15.62	4.07	5.05	4.61	5.77
Al_2O_3	------	1.34	6.05	4.90	2.12	.81	5.86	10.68	3.65	4.53	6.25	7.81
Fe_2O_3	[1]76.01	78.30	73.34	[1]75.06	[1]78.65	[1]85.46	[1]71.76	[1]58.52	[1]55.7	[1]69.2	[1]56.9	[1]71.2
MgO	------	.10	------	.13	.22	.10	.11	.13	------	------	------	------
CaO	------	1.97	.31	.06	.05	.06	.04	.07	------	------	------	------
H_2O+	------	10.40	12.40	------	------	------	------	------	------	------	------	------
H_2O-	------		.38	------	------	------	------	------	19.5	------	20.0	------
TiO_2	------	None	------	1.30	.19	.08	------	------	------	------	.32	------

Table 17.— Analyses of samples from Alaska, Oregon, and Washington, of iron-rich rocks, most of which contain 50 percent or more of ferrous oxide or ferric oxide (Group Fe), special-rock category—Continued

Chemical analyses—Continued

	Alaska		Oregon									
	1	2	3	4	5	6	7	8	9	10	11	12
	50Fe95-2	50Fe 95-1	36Fe3-32	36Fe5-12	36Fe5-11	36Fe5-10	36Fe5-13	36Fe5-14	36Fe 5-7		36Fe5-15	
P_2O_5	[1]0.002	.13	.44	[1]2.26	[1]2.24	[1].55	[1]1.53	[1]0.96	[1]1.42	[1]1.76	[1]1.62	[1]2.04
MnO	[1].35	1.37	------	[1].35	[1].45	[1].12	[1].31	[1].28	[1].65	[1].80	[1].67	[1].84
S	<.004	Trace	.01	.04	.03	.02	.03	.03	.02	.03	.03	.03
V	<.005	------	------	------	------	------	------	------	------	------	------	------
Cu	<.2	------	------	------	------	------	------	------	------	------	------	------
BaO	------	Trace	------	------	------	------	------	------	------	------	------	------
Ignition loss	------	[2]1.10	------	12.37	11.60	10.37	13.25	13.78	10.5	13.04	8.80	11.09
Total	[80.7]	100.24	101.07	[101.07]	[98.73]	[98.75]	[100.17]	[100.07]	[3][95.5]	[4][94.4]	[3][99.2]	[4][98.8]

	Oregon—Continued												
	13	14	15	16	17	18	19	20	21	22	23	24	25
	36Fe 5-19		36Fe5-18	36Fe5-23		36Fe5-28	36Fe5-34	36Fe5-35	36Fe5-79	36Fe5-9	36Fe5-21	36Fe5-73	36Fe5-76
SiO_2	5.46	6.89	5.40	4.58	5.69	1.77	4.28	8.38	8.4	3.58	10.35	5.29	4.00
Al_2O_2	1.80	2.27	[5]6.86	3.18	3.95	22.35	21.60	20.00	20.0	7.47	9.41	3.11	4.00
Fe_2O_2	[1]56.28	[1]71.1	[1]75.22	[1]57.02	[1]70.8	[1]62.42	[1]51.51	[1]49.59	[1]49.6	[6]51.00	[6]46.20	[1]76.13	[1]49.05
MgO	------	------	------	------	------	------	------	------	------	------	------	------	.35
CaO	------	------	------	------	------	------	------	------	------	Trace	.56	------	.90
H_2O-	20.8	------	[7](10.24)	19.5	------	------	------	------	------	------	------	[7](19.50)	[8]21.50
TiO_2	------	------	------	.32	.40	2.98	3.68	3.20	3.2	------	------	None	------
P_2O_5	[1].82	[1]1.05	[1].94	[1]1.28	[1]1.58	------	------	------	------	[1]1.94	[1].87	[1].95	[1]1.37
MnO	[1].34	[1].43	[1].34	------	------	------	------	------	------	[1]1.60	[1].32	[1].54	[1].58
S	.07	.08	.06	.10	.13	------	------	------	------	.025	.026	.041	.25
ZnO	------	------	------	------	------	------	------	------	------	------	------	------	.42
Ignition loss	10.28	12.98	11.0	10.04	12.47	[8]11.85	[8]17.92	[8]15.62	15.6	14.34	12.18	12.96	11.50
Total	[3][95.8]	[4][94.8]	[99.8]	[3][96.0]	[4][95.0]	[101.37]	[98.99]	[96.79]	[96.8]	[79.96]	[79.92]	[99.02]	[93.92]

[1] Calculated from reported Fe, P, or Mn.

[2] CO_2.

[3] Analysis on natural basis.

[4] Analysis on dry basis.

[5] Aluminum.

[6] Fe (dry).

[7] Not included in total.

[8] H_2O (-110°C).

[9] At 1,000°-1,100°C; sample air dried.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1. Nome quadrangle. [Sec. 28, T. 8 S., R. 35 W., unsurveyed], 19 miles northwest of Nome. Monarch prospect. Sample Sinuk 22. (Herreid, 1966, p. 1, 5, 6, figs. 1, 2.) Limonite rubble, dense. Index and geologic maps. Possible use: None.

2. Nome quadrangle. [16.7, 13.75], about 25 miles northwest of Nome. Monarch group of claims. Analyst, R. C. Wells. (Eakin, 1915, p. 361-363, 364; Herreid, 1966, p. 1, 5, figs. 1, 2.) Limonite rubble, dense. Composite sample from open cuts. Mineralogy. Tonnage estimated. Index and geologic maps. Possible use: None.

Oregon

3. Clackamas County. SW¼ NE¼ sec. 9, T. 3 S., R. 1 E., about 2.5 miles southwest of town of Williamette. USED sample 222A. (Hodge, 1938a, p. 70-72.) Limonite, 2 ft thick. Measured section.

4-8. Columbia County. Miocene. Tps. 3-5 N., Rs. 2, 3 W., near town of Scappoose. (Hotz, 1953, p. 75, 77, 82, 84, 85, 91, 92.) Average thickness of beds, 5 ft, overburden 5-160 ft. Tonnage estimated. Index maps. Possible use: Pig iron for steel.

4. Sample 1. [Iron-bearing rock], dark-brown to yellow-brown, granular; composed chiefly of granules of hard black limonite in yellow clay. Composite of nine samples.

5. Sample 2. [Iron-bearing rock], claylike or sandy material; contains layers of hard black limonite.

6. Sample 3. Limonite, black, hard, brittle.

7. Sample 4. [Iron-bearing rock], dark-brown to yellow-brown, granular; composed chiefly of granules of hard black limonite in yellow clay. Composite of five samples.

8. Sample 5. [Iron-bearing rock], claylike or sandy material; contains layers of hard black limonite. Composite of five samples.

9-14. Columbia County. Miocene [implied]. (Oregon Department Geology and Mineral Industries, 1951, p. 6, 31, 32, 33, fig. 1; Hotz, 1953, p. 75, 80, 82, 84, 86-92, pls. 8-11.) Weighted average analyses. Tonnage estimated. Index and geologic maps, geologic sections.

9, 10. Secs. 3, 10, T. 3 N., R. 2 W., sec. 34, T. 4 N., R. 2 W., about 2 miles northwest of Scappoose. Colport Charcoal Iron deposits. Limonite, predominantly yellow, soft; contains bands of hard dark-brown to nearly black limonite; 2-14 ft thick, average thickness more than 5 ft, average thickness of overburden 60-90 ft. Correlated columnar sections. Use: Sulfur absorbent in purifying manufactured gas; pigment.

11, 12. SW¼ sec. 27, T. 4 N., R. 2 W., 3.5 miles northwest of Scappoose. Limonite, about 3 ft thick, average overburden 30 ft. Possible use: Pig iron for steel.

Oregon—Continued

13, 14. Sec. 35, T. 4 N., R. 3 W., 7 miles west of Scappoose. Ironcrest deposit. Limonite, 2-20 ft thick. Former use: Paint pigment. Possible use: Source of iron.

15. Columbia County. Miocene. S½ sec. 35, T. 4 N., R. 3 W., near Scappoose. Ironcrest mine. (Hodge, 1935b, p. 12, 14, 15, 19.) [Iron-bearing rock.] Trench sample. Tonnage estimated. Possible use: Probably none, deposit small.

16, 17. Information as in samples 9-14. SW¼ sec. 24, NW¼ sec. 25, T. 5 N., R. 3 W., about 14 miles west of town of St. Helens. Ladysmith deposit. Limonite, 2-17 ft thick, averages about 10 ft thick; overburden averages about 15 ft. Possible use: Pig iron for steel.

18-20. Columbia County. Miocene and Pliocene. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 26, 48, 49-51, 56, 86-88.) Index maps. Possible use: Source of alumina, iron, titanium oxide, ferrotitanium.

18. [T. 3 N., R. 1 W.], 2 miles northwest of Scappoose. [Limonitic clay] ferruginous bauxite, pisolitic.

19. S½ NW¼ sec. 1, T. 4 N., R. 2 W., about 2.5 miles west of St. Helens. Gaman property. Sample P-3266. Ferruginous bauxite, compact.

20. SW¼ sec. 1, T. 4 N., R. 2 W., south of town of Yankton. Railroad cut. Sample P-3272. [Limonite.] Concretion, porous; overburden about 6 ft. Mineralogy. Geologic section.

21. Columbia County. Miocene and Pliocene. Sec. 1, T. 4 N., R. 2 W., about 3 miles west of St. Helens. Yankton cut. (Bell, 1945, p. 1, 4, 5, 9, fig. 1, pl. 2.) Limonite concretion. Index and geologic maps, geologic sections. Possible use: None.

22. Columbia County. North part sec. 3, T. 3 N., R. 2 W. and SW¼ sec. 34, T. 4 N., R. 2 W., about 2 miles northwest of Scappoose. Colport Development Co. (Williams and Parks, 1923, p. 8, 18, 20, 21.) Bog iron ore, average thickness 4.95 ft, composite sample. Tonnage estimated. Index and geologic maps.

23, 24. Columbia County. S½ sec. 35, T. 4 N., R. 3 W., 8 miles west of Scappoose. Ironcrest mine or field. (Miller, 1938, p. 29, 30, 31.) Limonite, occurs as bog and residual deposits, 2.5-16 ft thick. Tonnage estimated.

23. Analyst, Dwight Woodbridge. Composite of seven samples.

24. Composite of 13 samples.

25. Columbia County. Tps. 3-5 N., Rs. 2, 3 W., south of Scappoose. (Zapffe, 1949, p. 56, 57-60, 64.) Laterite, yellowish to rusty; average thickness about 5 ft, overburden 5-100 ft. Mineralogy. Tonnage estimated. Possible use: Cast iron, foundry iron, steel.

Table 17.—Analyses of samples from Alaska, Oregon, and Washington, of iron-rich rocks, most of which contain 50 percent or more of ferrous oxide or ferric oxide (Group Fe), special-rock category—Continued

Chemical analyses—Continued

	Oregon—Continued												
	26	27	28	29	30	31	32	33	34	35	36	37	38
	36Fe5-5	36Fe5-74	36Fe5-77	36Fe5-75	36Fe5-3	36Fe5-80	36Fe5-16	36Fe5-17	36Fe5-46	36Fe5-50	36Fe5-51	36Fe5-52	36Fe5-53
SiO_2	3.61	2.80	4.03	3.05	6.20	1.25	2.50	3.50	2.78	3.92	4.27	4.95	12.07
Al_2O_3	3.69	3.30	3.47	3.97	5.60	5.27	[1]8.72	[1]4.36	1.21	3.47	5.52	3.10	15.64
Fe_2O_3	[2]58.37	[2]61.70	[2]47.12	[2]53.61	[2]83.08	74.46	[2]76.36	[2]77.22	[2]81.28	[2]77.13	[2]76.56	[2]76.86	[2]55.98
MgO	.156	.01	.306	.05	.66	------	------	------	.10	.10	.08	.10	.12
CaO	.264	.10	1.10	.68	1.00	------	------	------	.08	.09	.10	.12	.15
H_2O+	------	------	21.50	15.20	------	15.54	------	------	------	------	------	------	------
H_2O-	[3]20.00	[3]19.50					[4](8.78)	[4](22.86)	------	------	------	------	------
TiO_3	.30	------	------	------	------	------	------	------	------	------	------	------	------
P_2O_5	[2]1.365	[2]1.35	[2]1.475	[2]1.756	[2]1.83	[5].34	[2].98	[2]1.05	[2]1.03	[2]1.22	[2]1.22	[2]1.55	[2]1.15
MnO	[2].557	[2].52	------	------	[2].23	------	[2].31	[2].28	[2].67	[2].74	[2].61	[2].70	[2].66
S	.100	.02	.053	.025	------	[6]3.22	Trace	.07	.009	.018	.023	.017	.028
Cr_2O_3	.003	------	------	------	------	------	------	------	------	------	------	------	------
ZnO	.415	.41	.41	.42	------	------	------	------	------	------	------	------	------
Ignition loss	12.40	13.50	[7]10.33	[7]12.57	------	------	12.0	14.1	13.30	13.96	12.49	13.67	15.06
Total	[101.23]	[103.21]	[89.79]	[91.33]	[8][98.60]	100.08	[100.9]	[100.6]	[100.46]	[100.65]	[100.87]	[101.07]	[100.86]

	Oregon—Continued										Washington		
	39	40	41	42	43	44	45	46	47	48	49	50	51
	36Fe5-54	36Fe5-55	36Fe5-48	36Fe5-49	36Fe5-22	36Fe24-77	36Fe24-28	36Fe24-41	36Fe34-10	36Fe36-7	46Fe4-23	46Fe6-1	46Fe6-2
SiO_2	18.20	18.78	7.95	7.98	3.20	3.44	2.78	10.18	4.56	3.64	15.89	14.3	23.6
Al_2O_3	18.48	13.71	4.22	4.77	[1]4.72	4.90	29.15	14.35	10.48	16.25	8.04	------	------
Fe_2O_3	[2]48.50	[2]50.36	[2]74.74	[2]73.96	[2]78.36	[2]73.39	[2]50.11	[2]60.73	[2]72.30	58.63	[2]58.33	[2]43.47	[2]60.9
MgO	.13	.11	.09	.08	------	------	------	------	------	------	5.60	------	------
CaO	.11	.09	.13	.14	------	------	------	------	------	------	1.50	------	------
H_2O+	------	------	------	------	------	------	------	------	------	------	[9]5.03	------	------
H_2O-	------	------	[4](20.70)	[4](26.00)	[4](14.64)	------	------	------	------	------	[9]2.48	------	------
TiO_2	------	------	------	------	------	.39	1.39	1.39	1.76	2.20	.17	.4	.2
P_2O_5	[2]1.08	[2]1.06	[2].93	[2].89	[2]1.24	------	------	------	------	------	[2].046	1.81	2.52
MnO	[2].57	[2]1.03	[2].45	[2].48	[2].64	------	------	------	------	------	[2].54	[10]5.5	[10]9.2
S	.026	.020	.020	.024	.25	------	------	------	------	------	.02	------	------
Cr_2O_3	------	------	------	------	------	------	------	------	------	------	3.17	------	------
NiO	------	------	------	------	------	------	------	------	------	------	1.37	------	------
Ignition loss	13.69	15.73	12.08	12.38	12.2	[11]16.43	[11]17.17	[11]13.96	[11]12.14	19.32	[4](5.37)	10.7	[4](10.9)
Total	[100.79]	[100.89]	[100.61]	[100.70]	[100.6]	[98.55]	[100.60]	[100.61]	[101.24]	[100.04]	[12][102.56]	[76.2]	[96.4]

	Washington—Continued												
	52	53	54	55	56	57	58	59	60	61	62	63	64
	46Fe14-3	46Fe14-6	46Fe14-2	46Fe16-10	46Fe16-1	46Fe19-58	46Fe19-57	46Fe19-52	46Fe19-50	46Fe19-49	46Fe19-47	46Fe19-45	46Fe19-43
SiO_3	0.80	1.38	[13]13.04	------	[13]9.67	7.65	7.55	6.10	5.90	5.85	5.41	3.10	10.28
Al_2O_3	------	3.00	1.06	1.00	None	9.16	3.66	5.40	11.90	8.30	5.31	4.08	.60
Fe_2O_3	[2]71.53	------	[2]74.80	[2]59.17	[2]76.75	[2]70.86	[2]79.15	[2]74.73	[2]72.59	[2]73.87	57.44	82.56	[2]78.76
FeO	------	65.54	------	------	------	------	------	------	------	------	15.58	1.24	------
MgO	------	1.13	------	------	------	3.87	2.16	2.75	1.00	3.26	.80	1.01	1.48
CaO	------	.06	------	2.00	[2].52	Trace	1.17	1.25	1.15	None	Trace	.28	.53
$Na_2O + K_2O$	------	------	------	------	------	------	------	------	------	------	2.49	------	------
H_2O	------	------	------	------	------	------	------	------	------	------	[14]3.13	1.53	------
TiO_3	22.23	24.12	------	------	------	------	------	None	------	------	------	------	None
P_2O_5	.18	.01	Trace	.751	[2]2.50	Trace	[2].18	[2].03	[2].30	[2].04	[2].06	------	[2].032
H_3PO_4	------	------	------	------	------	------	------	------	------	------	1.61	------	------
MnO	------	[2].10	[10].14	2.00	[10].20	1.00	2.20	1.15	.69	.65	1.65	[15].30	.173
CO_3	------	------	------	------	[2].43	------	------	------	------	------	[16]1.90	------	[16]None
S	.062	.077	------	------	------	Trace	.07	.04	.04	.05	Trace	------	None
NiO	------	------	------	------	------	1.20	.92	1.10	.70	.90	2.98	.68	------
CoO	------	------	------	------	------						Trace	------	------
Cr	------	------	------	------	------	2.04	1.99	3.18	2.65	2.06	[17]2.12	[17]5.20	------
Ignition loss	------	------	------	------	------	------	------	------	------	------	------	------	5.30
Total	[94.80]	[95.42]	[89.04]	[64.92]	[90.07]	[95.78]	[99.05]	[95.73]	[96.92]	[94.98]	[18]100.48	99.98	[97.16]

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[1] Reported as aluminum.

[2] Calculated from reported Fe, $CaCO_3$, P or Mn.

[3] H_2O(-110°C).

[4] Not included in total.

[5] Phosphoric acid.

[6] Sulfuric acid.

[7] At 500°C.

[8] Analysis on dry basis; moisture content, as mined, about 30 percent divided about equally between combined and free water.

[9] H_2O+ reported as H_2O(+105°C); H_2O- reported as H_2O(-105°C).

[10] Mn_2O_3.

[11] At 1,000°-1,100°C, sample air dried.

[12] CoO = 0.11 percent, Pb = 0.05 percent, Cu = 0.08 percent, As = 0.02 percent.

[13] Insoluble.

[14] Combined water.

[15] Manganous oxide.

[16] Carbonic acid.

[17] Cr_2O_3.

[18] Reported as 98.87 percent.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Oregon—Continued

26-29. Columbia County. (Zapffe, 1949, p. 56, 57-59, 60, 64, pls. 3, 5.) Laterite, yellowish to rusty, finely granular; average thickness about 5 ft, overburden 5-100 ft. Mineralogy. Tonnage estimated. Possible use: Cast iron, foundry iron, steel.

26, 27. Tps. 3-5 N., Rs. 2, 3 W., south of town of Scappoose.

28, 29. Sec. 3, T. 3 N., R. 2 W. Oregon Iron Ore Development Co.

30. Columbia County. [T. 3 N., R. 2 W.], near Scappoose. (Walsted, 1955, p. 4, 6.) Limonite, earthy texture. Tonnage estimated. Possible use: Foundry pig iron.

31. Columbia County. [T. 4 N., R. 2 W.], about 25 miles northwest of Portland, North Fork of Scappoose River. Raffety and Payne mine. (Diller, 1896, p. 511.) Limonite. Use: Source of iron [implied].

32, 33. Columbia County. S½ sec. 35, T. 4 N., R. 3 W., near Scappoose. Ironcrest mine. (Hodge, 1935b, p. 12-15, 19, 27.) [Iron-bearing rock.] Thickness few inches to 12 ft; overburden 2-15 ft. Tonnage estimated. Use: Probably none.

34. Columbia County. [T. 4 N., R. 3 W.] Finley location. (Hodge, 1935b, p. 18.) [Iron-bearing rock.]

35-40. Columbia County. [T. 4 N., R. 3 W.] Pearson location. (Hodge, 1935b, p. 18.) [Iron-bearing rock.]

38, 39. Trench sample.

41, 42. Columbia County. [T. 4 N., R. 3 W.], Pisgah Heights. Heppner location. (Hodge, 1935b, p. 18.) [Iron-bearing rock.]

43. Columbia County. Sec. 24, T. 5 N., R. 3 W. Scappoose deposits, Ladysmith mine. (Hodge, 1935b, p. 19, 24, 25, 27.) [Iron-bearing rock], generally soft; 8-20 ft thick, overburden a few feet to 46 ft. Tonnage estimated. Use: Probably none.

44. Marion County. Miocene and Pliocene. Sec. 24, T. 8 S., R. 2 W. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 72, 81, 85-88.) Limonite. Index map. Possible use: Source of iron, titanium oxide, ferrotitanium.

45, 46. Marion County. Miocene and Pliocene. T. 8 S., R. 3 W. Analyst, L. L. Hoagland. (Libbey, Lowry, and Mason, 1945, p. 2, 4, 5, 71, 72, 74, 80, 85-88.) Index maps. Possible use: Abrasives, cement, aluminum chemicals, oil refining, refractories; source of alumina, iron, titanium oxide, ferrotitanium.

45. SW¼ sec. 15, about 4 miles south of town of Salem. Summers property. Sample P-3987. Ferruginous bauxite, pisolitic; float sample. Mineralogy.

46. SW¼ sec. 19, about 5 miles southwest of Salem. Sample P-3552. Limonitic float.

47. Washington County. Miocene and Pliocene. NW¼ sec. 27, T. 2 N., R. 2 W. Anderson property. Analyst, L. L. Hoagland; collectors, J. F. Cleaver, L. C. Swanson. Sample P-3363. (Libbey, Lowry, and Mason, 1945, p. 1, 2, 4, 5, 25, 45, 86-88.) [Limonitic material] ferruginous bauxite, float sample. Mineralogy. Index maps. Possible use: Source of alumina, iron, titanium oxide, ferrotitanium.

Oregon—Continued

48. Yamhill County. SE¼ NW¼ sec. 3, T. 3 S., R. 2 W., near town of Newberg. Sample 26827. (Oregon Department Geology and Mineral Industries, 1961, p. 122.) Ferruginous bauxite, depth 13-15 ft; overburden 6 ft. [For other analyses from same drill hole, see sample 27, group Hb, and samples 62, 63, group Hbi.]

Washington

49. Chelan County. [Late Cretaceous, underlies Swauk Formation.] W½ sec. 13, E½ sec. 14, T. 22 N., R. 17 E. Blewett Pass deposits, Apollo claim; Washington Nickel Mining and Alloys, Inc. (Zapffe, 1949, p. 77-79, 80, 81, pl. 4.) Laterite, brownish-red, fine-grained, metallic luster, magnetic, massive, slightly oolitic; contains serpentine pebbles. Tonnage estimated. Possible use: Nickeliferous alloy.

50, 51. Clark County. E½ SE¼ sec. 5, T. 2 N., R. 2 E., 0.5 mile south and 0.25 mile east of Barberton. Howland acres. (Huntting, 1956, p. 31, 195.) Limonite, maximum thickness 20 ft, overburden 6-18 in. Sample 2 ft thick. Mineralogy. Index map.

52, 53. Grays Harbor County. SE¼ sec. 28, T. 18 N., R. 5 W., 3.5 miles east of town of Elma. Dennis property. (Jenkins and Cooper, 1922, p. 107-109, pl. 1.) Deposit 1-4 ft thick, overburden 3-8 ft. Mineralogy. Tonnage estimated. Index maps.

52. Analyst, R. P. Cope. (Huntting, 1956, p. 196.) Black sand, stratified. Possible use: Source of iron and titanium.

53. General: Magnetite, hard, granular; intermixed with sand and gravel. Sample: Consolidated black sand.

54. Grays Harbor County. [T. 18 N., R. 5 W.], northeast of Elma, Black Hills. Analyst, Elton Fulmer. (Shedd, 1902, p. 225, 235; Jenkins and Cooper, 1922, p. 109.) Nodules of black sand.

55. Jefferson County. [Tps. 29, 30 N., R. 1 W.], near Port Townsend, Chimacum Valley. (Hodge, 1935a, pl. 6; Hodge, 1935b, p. 6.) Limonite, bog ore, brown, earthy; 10-20 in. thick. Tonnage estimated. Use: Probably none.

56. Jefferson County. [Tps. 29, 30 N., R. 1 W.], Chimacum Valley, Irondale district. Analyst, Elton Fulmer. Sample 31. (Shedd, 1902, p. 10.) Limonite, bog ore.

57-64. Kittitas County. [Late Cretaceous], underlies Swauk Formation. Secs. 26, 34, 35, T. 23 N., R. 14 E., secs. 1, 2, T. 22 N., R. 14 E., 16 miles from Lakeside railroad station. Balfour Guthrie group of claims. (Shedd, 1902, p. 27, 28, 30, 33; Jenkins and Cooper, 1922, p. 73, 75, 78, 81, 82, pl. 1.) [Iron-bearing rock.] Tonnage estimated. Index map.

57-61. Analyst, Edward Riley. Samples from exposure.

62. Average analysis of iron ore from Cle Elum.

63. Analyst, Cabell Whitehead; collector, J. P. Kimball. (Kimball, 1898, p. 157, 158, 161.) [Sample not reported in Shedd, 1902.] Ferruginous beds 6-18 ft thick. Mineralogy.

64. Analysts, C. F. Chandler, C. E. Pellen. (Courtis, 1900, p. 1116.) Surface sample.

Table 17.—Analyses of samples from Alaska, Oregon, and Washington, of iron-rich rocks, most of which contain 50 percent or more of ferrous oxide or ferric oxide (Group Fe), special-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	65	66	67	68	69	70	71	72	73	74	75	76	77
	46Fe19-22	46Fe19-63	46Fe19-55	46Fe19-64	46Fe19-61	46Fe19-65	46Fe19-62	46Fe19-48	46Fe19-59	46Fe19-38	46Fe19-56	46Fe19-51	46Fe19-46
SiO_2	1.85	12.87	7.50	12.95	11.07	12.99	12.71	5.68	9.55	10.09	7.53	6.07	4.31
Al_2O_3	None	1.27	[1]25.95	.89	2.39	1.53	1.01	[1]4.80	1.21	21.52	13.36	.84	19.82
Fe_2O_3	[2]98.44	[2]87.07	[2]66.05	[2]83.08	[2]82.24	[2]86.59	[2]85.80	[3]86.40	[2]84.70	[2]60.98	[2]72.11	[2]87.15	[2]69.83
MgO	.09	.12	------	1.75	------	.21	.19	------	1.90	------	------	------	------
CaO	.05	.09	------	1.13	------	.11	.93	------	1.69	------	------	------	------
TiO_3	None	None	------	None	------	None	None	------	None	Nil	------	------	------
P_2O_5	[2].09	[2].05	Trace	[2].11	[2].14	[2].07	[2].05	None	[2].07	------	------	[2].02	------
MnO	None	Trace	------	Trace	------	Trace	Trace	------	Trace	[2].26	------	Trace	------
S	None	None	Trace	None	------	None	None	Trace	Trace	.08	------	None	------
Cr_2O_3	None	.63	------	2.39	------	.72	1.26	------	1.53	2.90	------	1.33	------
ChO(sic), Mn	------	------	------	------	Present	------	------	------	------	------	------	------	------
Ignition loss	------	------	------	------	------	------	------	------	------	2.84	2.06	------	1.71
Total	[100.52]	[102.10]	[99.50]	[102.30]	[95.84]	[102.22]	[101.95]	[96.88]	[100.65]	[98.67]	[95.06]	[95.41]	[95.67]

	Washington—Continued												
	78	79	80	81	82	83	84	85	86	87	88	89	90
	46Fe19-32	46Fe19-71	46Fe19-30	46Fe19-3	46Fe19-31	46Fe19-34	46Fe19-27	46Fe19-72	46Fe19-66	46Fe19-54	46Fe19-28	46Fe19-29	46Fe19-37
SiO_2	7.63	8.31	7.5	7.6	7.6	8.4	6.9	7.68	14.25	7.5	6.5	7.2	9.9
Al_2O_3	12.88	13.39	11.9	18.9	11.8	14.1	23.1	16.25	20.23	21.9	16.3	9.7	19.7
Fe_2O_3	[2]70.94	[2]68.67	[3]70.7	[3]61.9	[3]68.6	[3]66.5	[3]56.6	[2]64.45	[4]42.22	37.1	[2]61.95	[2]69.63	[2]52.47
FeO	------	------	------	------	------	------	------	------	------	21.3	------	------	------
MgO	2.22	2.90	2.0	2.2	3.3	2.2	1.9	2.43	2.46	2.3	------	------	------
CaO	.23	.33	------	------	------	------	------	.31	.33	------	------	------	------
H_2O	.64	.59	------	------	------	------	------	[5].53	------	6.8	------	------	------
TiO_2	.35	.31	------	------	------	------	------	.53	.53	.7	------	------	------
P_2O_5	[2].06	[2].08	------	------	------	------	------	[2].073	[2].092	.09	[2].08	[2].03	[2].06
MnO	[2].67	[2].77	------	------	------	------	------	[2].76	[2].46	Trace	------	------	------
S	.055	.062	------	------	------	------	------	.045	.063	.03	.038	.106	.048
Cr_2O_3	3.13	3.33	[7]3.9	[7]3.6	[7]4.6	[7]4.2	[7]3.6	[6]2.02	[6]1.77	2.2	2.48	2.59	2.08
NiO	.97	1.07						[8].74	[8].77	.2	[8].78	[8].87	[8].55
Co	------	------	------	------	------	------	------	.084	------	------	------	------	------
Ignition loss	2.00	2.55	2.0	3.4	1.9	2.4	5.0	2.83	------	[9].15	------	------	------
Total	[101.78]	[102.36]	98.0	97.6	[97.8]	97.8	97.1	[98.73]	[83.18]	100.3	[88.1]	[90.1]	[84.8]

	Washington—Continued												
	91	92	93	94	95	96	97	98	99	100	101	102	103
	46Fe19-23	46Fe19-40	46Fe19-35	46Fe19-24	46Fe19-41	46Fe19-42	46Fe19-33	46Fe19-25	46Fe19-26	46Fe19-39	46Fe19-53	46Fe19-68	46Fe19-60
SiO_2	5.0	11.5	9.3	5.4	12.9	15.4	8.4	5.6	5.8	10.8	7.410	18.38	9.90
Al_2O_3	28.5	22.9	29.9	15.9	22.2	15.4	9.6	7.0	9.9	13.9	7.51	------	7.90
Fe_2O_3	[2]54.34	[2]51.77	[2]47.90	[2]66.90	[2]50.08	[2]52.17	[2]47.3	[2]62.9	[2]49.9	[2]65.6	[2]73.09	[2]74.96	[2]74.66
FeO	------	------	------	------	------	------	[2]21.6	[2]11.4	[2]18.4	------	------	------	------
MgO	------	------	------	------	------	------	2.9	4.1	3.9	4.69	2.720	.27	------
CaO	------	------	------	------	------	------	.6	.3	2.2	.2	.740	3.15	------
P_2O_5	[2].07	[2].13	[2].38	[2].08	[2].23	[2].20	[2].032	[2].05	[2].07	[2].04	.080	[2]2.91	[2].06
MnO	------	------	------	------	------	------	------	[2]1.4	[2].41	[2].32	1.050	[2]1.70	[2]1.48
S	.020	1.58	.019	.076	.159	.035	.05	.01	.02	.007	.041	.01	None
Cr_2O_3	1.61	2.30	2.02	2.46	2.25	2.29	[6]1.7	[6]2.23	[6]2.1	[6]2.27	3.352	------	[6]1.70
Ni	.44	.69	.39	.89	.66	.75	.92	1.43	1.25	1.19	.93	------	1.07
Co	------	------	------	------	------	------	------	.02	.11	.01			------
Cu	------	------	------	------	------	------	------	.02	.03	------	------	------	------
As	------	------	------	------	------	------	------	.03	------	------	------	------	------
Ba	------	------	------	------	------	------	------	Nil	------	------	------	------	------
Pt	------	------	------	------	------	------	------	Nil	------	------	------	------	------
Ignition loss	------	------	------	------	------	------	[10]2.2	[10]3.0	[10]3.5	------	------	------	------
Total	[90.0]	[90.9]	[89.9]	[91.7]	[88.5]	[86.2]	[95.3]	[99.5]	[97.6]	[99.0]	[96.92]	[101.38]	[96.77]

[1] Alumina and chromium oxide.

[2] Calculated from reported Fe, Fe +++, Fe ++, P or Mn.

[3] Iron oxide or iron oxides.

[4] Fe dry.

[5] H_2O (-110° C).

[6] Cr.

[7] Nickel and chromic oxides.

[8] Ni.

[9] CO_2.

[10] At 1,000° C.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

65-73. Kittitas County. [Late Cretaceous], underlies Swauk Formation. Secs. 26, 34, 35, T. 23 N., R. 14 E., secs. 1, 2, T. 22 N., R. 14 E., 16 miles from Lakeside railroad station. Balfour Guthrie group of claims. (Jenkins and Cooper, 1922, p. 73-75, 78, 81, 82-84, pl. 1.) [Iron-bearing rock.] Tonnage estimated. Index maps.

65. Iron Boss claim. Analyst, J. A. Dodge. Sample D_3.

66. Iron Duke claim. Analyst, J. A. Dodge. Sample D_7.

67. Iron Monarch mine. Analyst, Solon Shedd. Sample 24. (Shedd, 1902, p. 10, 27, 28, 30-32; Ingalls, 1909, p. 117, 118.) Sample: Greenish-black, pebbly or oolitic with amorphic or finely crystalline groundmass. Possible use: Probably none, deposit small.

68. Iron Monarch claim. Analyst, J. A. Dodge. Sample D_5.

69. Summit of Magnetic Mountain. Analyst, J. A. Dodge. Sample I_1. (Kimball, 1898, p. 157, 158, 160, 161.) Ferruginous beds, 6-18 ft thick. Mineralogy. Possible use: None.

70. Magnetic Point claim. Analyst, J. A. Dodge. Sample D_1.

71. Roslyn claim. Analyst, J. A. Dodge. Sample D_6.

72. Roslyn mine. Analyst, Solon Shedd. (Shedd, 1902, p. 10, 27, 30, 32; Whittier, 1917, p. 21-23, 25, 95.) Possible use: Pig iron.

73. Yankee claim. Analyst, J. A. Dodge. Sample D_4.

74, 75. Kittitas County. Underlies Swauk Formation. T. 23 N., R. 14 E., Cle Elum district. Balfour Guthrie and Co., Ltd. (Zapffe, 1944, p. 5-7, 10, 11, 21, 22, 27, pls. 1, 2.) [Iron-bearing rock.] Mineralogy. Tonnage estimated. Index and geologic map, geologic sections. Possible use: Sponge iron, pig iron, steel; source of aluminum, nickel.

74. SW¼ sec. 26. Iron Boss Fraction claim. Laterite, black; 5.6 ft thick.

75. NW¼ sec. 35. Iron Monarch claim. Collectors: J. T. Mullen and C. L. Holmberg. Sample C-11. Laterite, 4.0 ft thick.

76. Kittitas County. Underlies Swauk Formation. [Secs. 26, 34, 35, T. 23N., R. 14 E., secs. 1, 2, T. 22 N., R. 14 E.], Cle Elum district. Monarch mine. Analyst, J. A. Dodge. (Kimball, 1898, p. 157, 158, 160, 161; Courtis, 1900, p. 1116, 1117.) Hematite, 6-18 ft thick. Mineralogy. Possible use: None.

77-79. Kittitas County. Underlies Swauk Formation. NW¼ sec. 35, T. 23 N., R. 14 E., Cle Elum district. Balfour Guthrie and Co., Ltd. Collectors, J. T. Mullen, C. L. Holmberg. (Zapffe, 1944, p. 5-7, 10, 11, 21, 22, 27, pl. 1.) [Iron-bearing rock.] Mineralogy. Tonnage estimated. Index and geologic map, geologic sections. Possible use: Sponge iron, pig iron, steel; source of aluminum, nickel.

77. Bessemer Iron No. 2 claim. Sample C-6. Laterite, 5.5 ft thick.

78. Bessemer Iron No. 2 claim. Samples C-4, C-5, C-6. Laterite, weighted analysis.

79. Iron Monarch and Bessemer Iron No. 2 claim. Samples C-1, C-6, C-10, C-11. Laterite, weighted analysis.

80-84. Kittitas County. Underlies Swauk Formation. SW¼ sec. 26, NW¼ sec. 35, T. 23 N., R. 14 E. Balfour Guthrie and Co., Ltd.; Iron Monarch, Bessemer Iron No. 2, Iron Boss claims. (Zapffe, 1944, p. 5, 7-10, 12, 18, 21, 22, 25, 27, figs. 1, 2, 5, pls. 1, 2.) [Iron-bearing rock.] Mineralogy. Tonnage estimated. Computed analysis of weighted average. Index and geologic maps, geologic sections. Possible use: Sponge iron, pig iron, steel; source of aluminum, nickel.

80. Laterite, nonoolitic, massive, dense.

81. (Bethune, 1891, p. 102.) Laterite, oolitic

82. Laterite, massive, dense. Average thickness, 6.67 ft.

83. Average thickness, 6.75 ft.

84. Laterite, oolitic. Average thickness, 5.4 ft.

85, 86. Kittitas County. Underlies Swauk Formation. Secs. 23, 26, 35, T. 23 N., R. 14 E., secs. 1-3, T. 22 N., R. 14 E., 25 miles north of town of Cle Elum, Cle Elum mining district. (Zapffe, 1949, p. 67, 68, 71, 72-76, pl. 4.) Laterite. Mineralogy. Tonnage estimated.

85. (Zapffe, 1944, p. 5-12, 21, 25, 27, pls. 1, 2.) Average analysis of weighted samples. Index and geologic maps, geologic sections. Possible use: Sponge iron, pig iron, steel; source of aluminum, nickel.

86. Surface sample. Possible use: Stainless steels.

87. Kittitas County. Underlies Swauk Formation. T. 23 N., R. 14 E., low hills along Clealum [Cle Elum] River, between Camp and Boulder Creeks. Analyst, W. F. Hillebrand; collector, Bailey Willis. (Smith and Willis, 1900, p. 356-358, 361, 364; Smith and Calkins, 1906, p. 13, 14; Whittier, 1917, p. 21-23, 25, 95.) [Iron-bearing rock], greenish-black, oolitic, amorphous. Mineralogy. Index and geologic maps, geologic sections, columnar sections. Possible use: Pig iron.

88-96. Kittitas County. Underlies Swauk Formation. Tps. 22, 23 N., R. 14 E., about 26 miles north of Cle Elum. Analyst, under direction of O.C. Ralston. (Zoldok, 1948, p. 1-6, 7, figs. 1-3.) [Iron-bearing rock], massive or oolitic. Average thickness 14.6 ft. Index and geologic maps, geologic sections. Possible use: Nickel-iron alloy, low chromium steel.

88. Iron King claim. Drill hole 6. Depth 54.0-82.5 ft.

89. Iron King claim. Drill hole 7. Depth 119.0-124.0 ft.

90. Iron King claim. Drill hole 8. Depth 30.0-35.0 ft.

91. Iron Boss claim. Drill hole 23. Depth 142.2-177.0 ft.

92. Iron Monarch claim. Drill hole 26. Depth 53.3-61.0 ft.

93. Iron Monarch claim. Drill hole 29. Depth 190.0-199.0 ft.

94. Bessemer No. 2 claim. Drill hole 31. Depth 27.0-46.5 ft.

95. Iron Prince claim. Drill hole 49. Depth 70.0-83.0 ft.

96. Bessemer No. 1 claim. Drill hole 54. Depth 259.3-264.9 ft.

97-99. Kittitas County. Underlies Swauk Formation. [Tps. 22, 23 N., R. 14 E.], about 26 miles north of Cle Elum. Analyst, H. E. Peterson. (Ravitz, 1947, p. 3-5, 6, 7, 10, 37, 39.) [Iron-bearing rock], 4-50 ft thick, averages about 17 ft. Mineralogy. Tonnage estimated. Beneficiation tests. Possible use: Source of ferronickel, chromium cast iron.

99. (Cremer, 1954, p. 2, 4, 5.)

100. County, formation, and location as in samples 97-99. (Cremer, 1954, p. 2, 4, 5.) Nickeliferous iron-bearing rock. Mineralogy. Tonnage estimated. Possible use: Source of ferronickel.

101. Kittitas County. Underlies Swauk Formation. [Tps. 22, 23 N., R. 14 E.], Clealum [Cle Elum] district. Analyst, Edward Riley. (Courtis, 1900, p. 1116, 1117.) [Iron-bearing rock.] Surface sample, average of 6 samples.

102. Kittitas County. [Tps. 19, 20 N., R. 13 E.], south of town of Easton, Big Creek district. Analyst, J. A. Dodge. Sample N_2. (Jenkins and Cooper, 1922, p. 86.) [Iron-bearing rock.]

103. Kittitas County. [T. 22 N., R. 16 E.], about 3 miles south of Mount Stuart, Teanaway mining district. Analyst, J. C. Beneker. Sample L_3. (Jenkins and Cooper, 1922, p. 84, 85.) [Iron-bearing rock.]

Table 17.—Analyses of samples from Alaska, Oregon, and Washington, of iron-rich rocks, most of which contain 50 percent or more of ferrous oxide or ferric oxide (Group Fe), special-rock category—Continued

Chemical analyses— Continued

	Washington—Continued										
	104	105	106	107	108	109	110	111	112	113	114
	46Fe 19-67	46Fe 25-26	46Fe 29-75	46Fe 31-61	46Fe 43-164	46Fe 43-165	46Fe 42-270	46Fe 43-166	46Fe 37-104	46Fe 37-103	46Fe 37-102
SiO_2	16.56	17.00	22.00	13.97	5.80	4.49	2.23	7.35	23.5	19.43	10.96
Al_2O_3	12.60	6.00	------	3.68	[1]1.85	[1]2.00	------	1.23	10.1	------	3.14
Fe_2O_3	[2]66.11	[3]45.50	[2]57.92	[2]48.93	[4]84.55	[4]80.08	[2]85.79	[2]70.84	[2]54.1	[2]56.73	[5]29.42
MgO	------	1.00	------	.24	------	------	------	1.00	------	------	------
CaO	------	5.00	------	.19	------	------	------	4.10	.4	------	16.56
H_2O	------	8.00	------	[6]7.58	------	------	------	[7].51	6.25	------	------
TiO_2	------	9.50	[8]3.00	------	------	------	------	------	------	------	------
P_2O_5	------	([9])	------	[2].016	.36	.72	[2].11	[2].062	[2].133	[2].350	[10].698
MnO	[2].70	2.00	[11]12.51	------	------	------	------	[2].50	Trace	------	Trace
S	------	Negligible	------	22.41	.33	.32	.023	14.53	.004	.013	Nil
Cr	1.7	------	------	------	------	------	------	------	------	------	------
Ni	1.11	------	------	------	------	------	------	------	------	------	------
As	------	------	------	------	------	------	------	------	.001	------	------
ZrO_2	------	2.00	------	------	------	------	------	------	------	------	------
Ignition loss	------	4.00	------	[12](21.50)	------	------	------	------	4.7	------	------
Total	[98.8]	100.00	[95.43]	[13][98.00]	[92.89]	[87.61]	[88.15]	[100.12]	[99.2]	[76.52]	[60.78]

[1] Aluminum and chromium oxides.

[2] Calculated from reported Fe, P, or Mn.

[3] Fe_3O_4.

[4] Iron oxide.

[5] Fe dry.

[6] H_2O (+110°C).

[7] H_2O (-110°C).

[8] Titanium.

[9] Fraction of 1.0 percent, not determined.

[10] Calculated from reported P (Zapffe, 1949, pl. 5).

[11] Mn_3O_4.

[12] Includes ignition loss, H_2O(-110°C), CO_2, and C; not included in total.

[13] Na = 0.28 percent, K = 0.70 percent. With sample 189 group D and other samples not recorded; As_2O_3 = 0.05 percent; Cr, Ni, Zn, Se, Sb, Pb absent or nearly so.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington— Continued

104. Kittitas County. T. 22 N., R. 16 E., about 3 miles south of Mount Stuart. Devine deposit. Analyst, J.C. Beneker. Sample M_4. (Jenkins and Cooper, 1922, p. 84,85; Huntting, 1956, p. 197.) [Iron-bearing rock.] Possible use: Source of iron [implied].

105. Pacific County. [T. 9 N., R. 10 W.] Columbia River. McGowan deposit. (Zapffe, 1949, p. 44-47, pl. 5.) Titaniferous beach sands, black and dark gray. Mineralogy. Possible use: Abrasives, source of iron, titanium.

106. Skagit County. Secs. 23,24, T. 35 N., R. 6 E.. Snowstorm claim. Analyst, E.H. Rothert. Sample L_4. (Jenkins and Cooper, 1922, p. 96,101,102,pl.1.) [Iron-bearing rock.] Mineralogy. Tonnage estimated. Index map. Possible use: Source of iron.

107. Snohomish County. NE¼ sec. 36, T. 29 N., R. 8 E., 15 miles northeast of town of Sultan. Lockwood Pyrite deposit. (Zapffe, 1949, p. 37,39,40.) [Iron-bearing rock.] Mineralogy. Tonnage estimated. Possible use: Source of sulfuric acid, iron.

108. Stevens County. Sec. 20, T. 31 N., R. 41 E., about 3 miles east of town of Valley, Vigilant mine; owner Mike Kulzer. Analyst, Solon Shedd. Sample 41. (Shedd, 1902, p. 10,36,38; Jenkins and Cooper, 1922, p. 37, 40,56,57,pl. 1.) [Iron-bearing rock] varies from soft reddish to hard, compact. Tonnage estimated. Index map, geologic section. Pormer nse: Flux; possible use: Steel.

109. Stevens County. Sec. 11, T. 39 N., R. 37 E., about 20 miles north and a little west of town of Colville, Clugston Creek district. I.X.L. mine. Analyst, Solon Shedd. Sample 39. (Shedd, 1902, p. 10,36,37.) Limonite or bog ore, porous, soft to flinty. Possible use: None, deposit small.

110. Stevens Connty. Sec. 23, T. 39 N., R. 41 E., 12 miles from town of Boundary. Thompson property. Analyst, R.P. Cope. (Glover, 1942, p. 20.) Limonite. Tonnage estimated.

111. Stevens County. [SW¼ sec. 24, T. 40 N., R. 37 E.], east slope of Sulphide Mountain, Big Iron mine. (Zapffe, 1949, p. 18,19,20,pl. 2.) Limonite, brown. Tonnage estimated. Former use: Calcining of magnesite; possible use: Probably none.

112. Whatcom County. Early Tertiary. Sec. 2, T. 39 N., R. 4 E., sec. 35, T. 40 N., R. 4 E., 3 miles sontheast of Nooksack station. Sumas Mountain deposits. (Zapffe, 1949, p. 53,54,55,pl. 3; Moen, 1962, p. 109,111,112, pls. 1,4.) Laterite, brown to red, fine-grained, massive, dense; maximum thickness 30 ft. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Pigment, production of iron.

113. Whatcom County. Secs. 8,17, T. 40 N., R. 3 W., about 1 mile north of town of Lynden. Sturman or Herringa farm. Analyst, R.P. Cope. Sample C. (Jenkins and Cooper, 1922, p. 103-105, pl. 1; Zapffe, 1949, p. 42,43, pl. 5; Huntting, 1956, p. 205.) Bog iron deposit, 2-3 ft thick. Tonnage estimated. Index maps. Use: Source of iron.

114. Whatcom County. Sec. 35, T. 40 N., R. 7 E., sec. 2, T. 39 N., R. 7 E., 4 miles southeast of Church Mountain. (Zapffe, 1949, p. 51,52, pl. 5.) [Iron-bearing rock.] Analysis of 5 bulk samples. Tonnage estimated.

Table 18.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, of manganese-bearing rocks (Group Mn), special-rock category

[These analyses are included here because they do not meet the criteria for inclusion in the common- or mixed-rock categories. Chemical analyses arranged by State, county and stratigraphic position]

Chemical analyses

	Alaska							
	1	2	3	4	5	6	7	8
	50Mn160-3		50Mn160-6		50Mn160-4		50Mn160-5	
SiO_2	8.4	------	------	------	------	------	------	------
Insoluble	11.4	------	------	------	------	------	------	------
Al_2O_3	3.0	------	------	------	------	------	------	------
Fe	9.6	15.07	14.78	14.54	13.4	13.03	12.86	13.29
MgO	1.9	------	------	------	------	------	------	------
CaO	3.1	------	------	------	------	------	------	------
TiO_2	.90	------	------	------	------	------	------	------
P_2O_5	.50	------	------	------	------	------	------	------
Mn	23.2	18.52	19.95	19.96	20.9	19.38	22.53	18.69
S	.55	------	------	------	------	------	------	------
V_2O_5	.13	------	------	------	------	------	------	------
Ni	.63	.30	.31	.31	.37	.58	.42	.53
Co	.50	.25	.31	.37	.40	.23	.19	.35
Cu	.06	------	------	------	------	------	------	------

Table 18.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, of manganese-bearing rocks (Group Mn), special-rock category —Continued

Chemical analyses

	Alaska—Continued							
	1	2	3	4	5	6	7	8
	50Mn160-3		50Mn160-6		50Mn160-4		50Mn160-5	
Mo	0.20	------	------	------	------	------	------	------
Ignition loss	25.4	------	------	------	------	------	------	------
Total	[89.5]	[34.14]	[35.35]	[35.18]	[35.1]	[33.22]	[36.00]	[32.86]

	Idaho						Oregon		Washington				
	9	10	11	12	13	14	15	16	17	18	19	20	21
	11Mn3-9	11Mn7-1	11Mn21-2	11Mn21-1	11Mn21-3	11Mn30-2	36Mn1-62	36Mn1-53	46Mn5-9	46Mn5-4	46Mn5-3	46Mn5-5	46Mn5-10
SiO_2	10.4	[1]5.80	12.4	3.04	20.2	2.20	5.42	49.0	------	15.80	3.04	15.86	14.70
Insoluble	13.9		16.5	------	28.0		------	------	6.4	------	------	------	------
Al_2O_3	4.2	------	3.8	------	10.3	2.50	2.11	3.8	------	------	------	------	------
Fe_2O_3	[2]6.29	3.04	[2]2.43	[2].20	[2]10.4		.87	[2]2.29	------	[2]3.00	.76	[2]2.12	[2]4.36
MgO	------	------	------	------	------	1.00	.64	.10	------	[2].17	------	[2].29	[2].15
CaO	1.7	8.86	19.8	------	.20	6.10	2.48	1.2	5.2	[2]4.28	1.20	[2]7.32	[2]5.94
Na_2O	------	------	------	------	------	------	.52	------	------	------	------	------	------
K_2O	------	------	------	------	------	------	.61	------	------	------	------	------	------
H_2O+	------	[3]11.60	------	------	------	[3]8.24	7.35	------	------	------	1.16	------	------
H_2O-	------	[3]4.10	------	------	------	[3]10.88							
TiO_2	------	------	------	------	------	------	.09	------	------	------	------	------	------
P_2O_5	[2].140	------	[2].078	------	[2].236	------	------	[2].096	------	------	------	------	------
MnO	[2]49.92	[4]55.90	[2]26.19	[2]73.68	[2]33.5	([4])	[4]65.40	[2]29.67	[2]56.9	[2]56.18	86.38	[2]56.68	[2]56.14
S	------	------	------	------	------	------	------	Nil	------	------	------	------	------
Ni	------	------	------	------	------	------	------	------	------	< .01	------	------	< .01
CoO	------	------	------	------	------	[5]13.08	.36	[6].01	------	------	------	------	------
Cu	------	------	------	.026	------	[7]1.56	------	------	------	.73	------	------	.05
Zn	Nil	------	Nil	------	Nil	------	------	Trace	------	< .01	------	Nil	.07
As	------	------	------	.04	------	------	------	------	------	< .0005	------	------	< .0005
Ba	.82	------	.47	------	2.2	------	------	Nil	------	.09	------	------	.02
WO_3	------	------	------	------	------	------	------	Nil	------	------	------	------	------
Pb	------	------	------	.05	------	------	------	------	------	< .01	------	Nil	< .01
Ignition loss	------	------	------	------	------	------	------	------	[8]16	[9]3.55	------	[9]7.06	[9]4.83
Total	[87.4]	101.04	[81.7]	[77.04]	[105.0]	100.32	100.21	[86.2]	[84]	[83.83]	[10]92.54	[89.33]	[86.28]

[1] Insoluble portion and separated silica.

[2] Calculated from reported Fe, $MgCO_3$, $CaCO_3$, P, or Mn.

[3] H_2O+ above 110°C; H_2O- below 110°C.

[4] Sample 10, O = 11.74 percent in excess of MnO; sample 14, MnO_2 = 49.64 percent; sample 15, MnO_2 = 14.36 percent.

[5] CoO_2 = 5.12 percent.

[6] Co.

[7] CuO.

[8] At 1500°C.

[9] CO_2, calculated from reported $MgCO_3$ and $CaCO_3$.

[10] Mn = 66.66 percent, Mn_3O_4 = 92.87 percent; CO_2, present; total reported as 99.11 percent.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Alaska

1-8. (Dietz, 1955, p. 209, 210, 211, 218.) General: Sea floor manganese, dull dirty brown to earthy black. Mineralogy. Index map.

1-4. Lat 52°47' N. long 150°05' W., Gilbert Seamount.

1. Analyst, H. E. Peterson. Sample NH-D-1. Manganese crust.

2-4. Analyst, E. Goldberg. Analyses of three separate pieces of same nodule.

5-8. Lat 56°10' N. long 145°15' W., Seamount GA-3.

5. Analyst, H. E. Peterson. Sample NH-D-7. Manganese crust.

6-8. Analyst, E. Goldberg. Analyses of three separate pieces of same nodule.

Idaho

9. Bannock County. Pleistocene. [T. 12 S., R. 40 E.], about 1 mile northeast of town of Cleveland. Manganese Mining Co. Analyst, under direction of H. E. Peterson. (Vincent and Holmes, 1952, p. 1, 3, 6; Hewett and Fleischer, 1960, p. 23, 35, 37.) Manganese and clay, porous, iron-stained, beds 1-5 ft thick. Mineralogy, thin-section description. Index map. Beneficiation tests. Possible use: Source of ferromanganese.

10. Blaine County. [T. 2 N., R. 24 E.], 10 miles west of town of Arco, Lava Creek mining district. B. A. Smith property. Analyst, E. V. Shannon. (Shannon, 1926, p. 212.) Wad, variety of psilomelane, dark-brown, amorphous, rather soft, sectile, compact, tough.

11, 12. Franklin County. Pleistocene. (Hewett and Fleischer, 1960, p. 23, 35, 37.) Manganese and clay, bed 1-4 ft thick. Mineralogy. Index map. Possible use: Source of manganese.

11. [T. 12 S., R. 40 E.], 1 mile southeast of town of Cleveland. McGregor property. (Vincent and Holmes, 1952, p. 1, 11-14.) Beneficiation tests. Possible use: Source of ferromanganese.

12. [T. 12 S., R. 40 E.] Cleveland district.

13. Franklin County. [T. 12 S., R. 40 E.], 1 mile south of Cleveland. Hot Spot property. Analyst, H. E. Peterson. (Vincent and Holmes, 1952, p. 1, 2, 6-10.) [Manganese-bearing rock], porous to fairly compact. Mineralogy. Beneficiation tests. Possible use: Source of ferromanganese.

14. Lemhi County. [T. 21 N., R. 18 E., unsurveyed], Blackbird district. Togo claim. Analyst, E. V. Shannon. (Shannon, 1926, p. 212, 213.) Asbolite, variety of psilomelane, friable, earthy.

Oregon

15. Baker County. [T. 10 S., R. 41 E.], town of Pleasant Valley. Analyst, F. A. Gonyer. Sample 7. (Kerr, 1940, p. 1380, 1382.) Psilomelane. X-ray diffraction pattern.

16. Baker County. [T. 11 S., R. 42 E.], 8 miles west of town of Durkee. Sheep Mountain property. Analyst, under direction of H. E. Peterson. (Wells and Agey, 1947, p. 1, 2, 3-7.) [Manganese-bearing rock.] Mineralogy. Screen analysis. Beneficiation tests. Possible use: Source of manganese.

Washington

17, 18. Clallam County. Jurassic. Near line between secs. 23, 24, T. 30 N., R. 10 W. (Huntting, 1956, p. 254).

17. Thirty miles west of town of Port Angeles. Crescent mine, Sunshine Mining Co. Analyst, Church Holmes. (King, 1942, p. 52, 53.) [Manganese-bearing rock], primarily hausmannite.

18. Crescent mine. (Dean and others, 1938, p. 19.) Manganese, hard, dense. Mineralogy.

19. Clallam County. [Jurassic.] T. 30 N., R. 10 W. Crescent mine. Analyst, E. P. Henderson; collector, M. N. Short. Record C-771. (Pardee, 1928, p. 10, 16-18, pl. 1; Wells, 1937, p. 91.) Hausmannite. Selected sample. Mineralogy. Index map, geologic section.

20. Clallam County. [Jurassic. T. 30 N., R. 10 W.], Crescent. (Koster and Shelton, 1936, p. 512.) [Manganese-bearing rock.]

21. Clallam County. NW¼SE¼ sec. 16, T. 30 N., R. 12 W., about 2 miles northeast of town of Sappho(Huntting, 1956, p. 257). State Lease claim. (Dean and others, 1938, p. 19.) Manganese, hard, dense. Mineralogy.

Table 18.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, of manganese-bearing rocks (Group Mn), special-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	22	23	24	25	26	27	28	29	30	31	32	33	34
	46Mn 5-11	46Mn 5-6	46Mn 5-8	46Mn 14-7	46Mn 16-9	46Mn 16-2	46Mn 23-3		46Mn 23-4		46Mn 23-7	46Mn 40-256	46Mn 40-276
SiO_2	12.8	26.27	7.75	13.30	35.5	23.4	25	23.68	37.15	39.92	30	4.8	47.43
Al_2O_3	------	------	------	------	------	------	------	3.48	[1]2.58	1.32	------	------	------
Fe_2O_3	[2]2.0	[2]4.72	[2]1.50	[2]27.24	[2]7.9	[2]25.7	[2]24	3.52	------	[2]4.15	[2]15.0	[2]6.9	[2]6.89
MgO	------	[2].12	[2].02	[2].16	------	------	------	1.31	2.82	4.46	------	------	------
CaO	------	[2].15	[2]1.97	[2].36	------	6.9	------	1.56	2.86	.40	------	.82	------
H_2O+	------	------	------	------	------	------	------	------	14.07	[4]7.90	------	------	------
H_2O-	------	------	------	------	------	------	------	------		[4].49	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	[2].14	[2].11
MnO	[2]58.8	[2]55.79	[2]71.18	[2]38.30	[2]48	[2]34.1	[2]36	46.57	[5]37.0	41.58	[2]31	[6]78.21	[2]32.4
CO_2	------	[2].25	[2]1.57	[2].45	------	------	------	[7]18.32	2.10	------	------	------	------
S	------	------	------	------	------	------	------	------	------	------	------	Trace	.05
Ni	------	<.01	.07	<.01	------	------	------	------	------	------	------	------	------
Cu	------	.05	.14	.02	------	------	------	------	------	------	------	------	------
Zn	------	<.01	<.01	.03	------	------	------	------	------	------	------	------	------
As	------	<.0005	<.0005	<.0005	------	------	------	------	------	------	------	Trace	------
Ba	------	.19	.01	.04	------	------	------	------	------	------	------	------	------
Pb	------	<.01	<.01	<.01	------	------	------	------	------	------	------	------	------
Total	[73.6]	[<87.57]	[<84.23]	[<79.92]	[91]	[90.1]	[85]	98.44	100.6	100.22	[76]	[90.9]	[86.9]

[1] Al_2O_3 + FeO.

[2] Calculated from reported Fe, $MgCO_3$, P, or Mn.

[3] FeO.

[4] H_2O + above 100°C; H_2O- below 100°C.

[5] MnO_2 = 2.03 percent.

[6] MnO_3.

[7] Ignition loss.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

22. Clallam County. SW¼NE¼ sec. 21, T. 30 N., R. 12 W., about 2 miles northeast of Sappho, Soleduck-Crescent district. State Lease or Beaver Creek Falls property; owners C. S. Greenlee, Charles Anderson. Collector, S. H. Green. (Hodge, 1938g, p. 29, 34, 35, 57, 60.) [Manganese-bearing rock], oxidized, about 3 ft thick. Mineralogy. Channel sample. Index map.

23. Clallam County. NW¼SW¼ sec. 24, T. 30 N., R. 12 W. (Huntting, 1956, p. 257). Victor claim. (Dean and others, 1938, p. 19.) Manganese, hard, dense. Mineralogy.

24. Clallam County. NW¼NW¼ sec. 28, T. 30 N., R. 11 W., 1 mile northwest of Snider Ranger station (Huntting, 1956, p. 254). Clallam claim. (Dean and others, 1938, p. 19.) Manganese, hard, dense. Mineralogy.

25. Grays Harbor. S½ sec. 8, T. 22 N., R. 9 W., about 36 miles by road north of town of Hoquiam (Huntting, 1956, p. 258). E. E. Fishel claim. (Dean and others, 1938, p. 19.) Manganese, hard, dense. Mineralogy.

26. Jefferson County. Early(?) and middle Eocene, bementite rock associated with Metchosin Volcanics. Sec. 7, T. 27 N., R. 3 W., northwest side of Iron Mountain. Tubal Cain mine. (Washington Department Conservation and Development, 1940, p. 2, 3, 7-11, 21.) Bementite rock, contains native copper, massive, vitreous to dull metallic luster; about 6 ft thick. Mineralogy. Tonnage estimated.

27. Jefferson County. Secs. 13, 24, T. 26 N., R. 4 W., on south slope of Mount Constance. Elkhorn group of claims, Northwestern Manganese Producers Assoc. Analyst, W. H. Ott. (Hodge, 1938g, p. 29, 34, 35, 53-55.) Manganiferous rock, oxidized. Mineralogy. Index maps. Possible use: Probably none.

28. Mason County. Possibly Mesozoic. N½N½ sec. 33, T. 24 N., R. 5 W. (Huntting, 1956, p. 260), 1 mile north of Devils Staircase. Black Hump claim. (Pardee, 1922, p. 229, 232, 234, 239, 240.) Bementite rock, light-grayish or yellowish-brown to medium-dark-brown, dull to vitreous. Hardness about 6; bulk density about 3.1. Mineralogy. Index map. Possible use: Source of manganese.

29-31. Mason County. Probably Mesozoic. T. 24 N., R. 5 W., along the north or south fork of Skokomish River. Black and White mine. Analyst, George Steiger. Record 3225. (Pardee, Larsen and Steiger, 1921, p. 25-29, 30; Pardee, 1922, p. 229, 232, 234, 235, 239, 240; Pardee, 1928, p. 10, 13, 18.) [Manganese-bearing rock], partly weathered. Mineralogy. Possible use: Source of manganese.

29. Partly weathered bementite rock, dull-black, soft, amorphous.

30. Neotocite, dark-brown to black, resinous-lustered. Separated from partly weathered bementite rock by heavy solutions.

31. Bementite. Separated from partly weathered bementite rock by heavy solutions. Molecular ratios. Physical properties.

32. Mason County. Bementite rock associated with Metchosin Volcanics. T. 23 N., R. 6 W., Steel Creek area. (Washington Department Conservation and Development, 1940, p. 2, 3, 7-11, 23.) [Manganese-bearing rock] bementite rock. Average of several analyses. Mineralogy. Tonnage estimated.

33, 34. Okanogan County. [T. 34 N., R. 26 E.], about 4 miles northeast of town of Omak, Pogue Flat. Manganese.

33. Probably Jurassic. (Patty and Glover, 1921, p. 75, 78, 79.) Manganese, weathered.

34. (Jenkins, 1918, p. 1082.) Manganese, black, intermixed with quartz. Selected sample.

Table 19.—Analyses of samples from Idaho and Washington, most of which contain 50 percent or more gypsum, gypsite, or anhydrite (Group G), special rock category

[Chemical analyses arranged by State, county, and stratigraphic position]

Chemical analyses

	Idaho		Washington										
	1	2	3	4	5	6	7	8	9	10	11	12	13
	11G4-15	11G44-4	46G40-274	46G40-264	46G40-268	46G40-275		46G40-272		46G40-267		46G40-258	
SiO_2	4.14	[1]6.0	32.6	8.5	15.4	[2]78.4	32.7	[2]77.8	28.9	[2]77.4	14.6	[2]78.5	5.6
Al_2O_3	.89	[3]1.0	8.0	3.2	4.4	[3]None	8.0	[3]None	6.7	[3]None	4.3	[3]None	1.7
Fe_2O_3	.10		2.3	.7	.4		1.5		1.5		.4		.4
MgO	.99	------	[4]1.4	[4]1.5	[4]2.6	------	------	------	[4].3	------	[4]1.8	------	[4]6.3
CaO	31.40	30.4	------	------	------	------	[5]6.9	------	[5]9.1	------	[5]3.7	------	[5]4.6
Na_2O	------	------	1.1	------	------	------	------	------	1.0	------	------	------	------
H_2O	18.39	[6](17.5)	4.6	2.4	3.0	------	1.5	------	2.0	------	1.9	------	1.3
CO_2	2.33	[7]19.9	------	------	------	------	------	------	------	------	------	------	------
SO_3	41.13	41.8	------	------	------	------	------	------	------	------	------	------	------
NaCl	------	------	------	------	------	None	.6	None	------	None	------	None	------
Na_2CO_3	------	------	------	------	------	None	------	None	------	None	------	None	------
$NaHCO_3$	------	------	------	------	------	None	------	None	------	None	------	None	------
Na_2SO_4	------	------	1.1	------	------	1.1	2.7	.8	.9	.8	1.8	.6	.4
$MgCl_2$	------	------	------	------	.1	------	------	------	------	------	------	------	------
$3MgCO_3 \cdot Mg(OH)_2$	------	------	9.6	10.6	5.8	------	4.9	------	.4	------	7.4	------	3.8
$Mg(OH)_2$	------	------	------	------	------	------	1.5	------	3.5	------	------	------	------
$MgSO_4$	------	------	2.1	2.2	.4	4.3	4.4	4.7	4.7	4.9	4.7	3.8	3.9
$CaSO_4$	------	------	37.1	70.4	68.2	15.2	33.2	15.7	38.4	17.3	60.0	17.5	72.7
Total	99.37	[8][99.1]	99.9	99.5	100.3	[9]99.0	[10]97.9	[9]99.0	[10][11]97.4	[9]100.4	[10]100.6	[9]100.4	[10]100.7

	Washington—Continued					
	14	15	16	17	18	19
	46G40-273	46G40-261	46G40-271	46G40-262	46G40-257	
SiO_2	29.0	6.4	25.4	7.7	5.2	4.44
Al_2O_3	8.4	1.0	7.4	1.9	1.2	1.02
Fe_2O_3	1.7	.5	1.2	.6	.5	.42
$MgCO_3$	------	1.5	3.6	12.0	9.9	8.45
$CaCO_3$	11.0	6.6	------	------	------	------
H_2O	1.5	5.1	6.1	4.7	5.2	------
S	[12]Trace	[12]Trace	------	------	------	------
NaCl	2.1	------	------	------	------	------
Na_2SO_4	1.4	------	------	------	------	------
$MgCl_2$	------	.2	1.7	1.3	1.2	1.02
$3MgCO_3 \cdot Mg(OH)_2$	4.2	15.4	8.5	9.0	12.5	12.46
$Mg(OH)_2$	2.4	------	------	------	------	------
$MgSO_4$	------	------	1.6	2.1	3.9	6.83
$CaSO_4$	37.4	63.5	45.1	62.1	60.9	65.75
Total	99.1	100.2	[13]100.6	101.4	100.5	100.39

[1] Acid insoluble.

[2] Insoluble.

[3] R_2O_3.

[4] $MgCO_3$.

[5] $CaCO_3$.

[6] Combined water; not included in total.

[7] Total ignition loss.

[8] Analysis of crushed size fraction; ¼ inch.

[9] Represents material leached by 150 milliliters ot water applied in several portions.

[10] Complete analysis of sample including items soluble in hot water leaches.

[11] 97.1 percent in text.

[12] Sulfide.

[13] 100.9 percent in text.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho

1. Bear Lake County. SW¼ SW¼ sec. 32, T. 12 S., R. 45 E., Montpelier Canyon. Analyst, W. C. Wheeler. (Clarke, 1915, p. 359; Mansfield, 1927, p. 2, 348, 349, pls. 1, 9, 12, 19; Stone and others, 1920, p. 99.) Gypsum, white, fine-grained, massive; at least 4 ft thick. Index and geologic maps, geologic section, generalized columnar sections. Use: Probably none.

2. Washington County. Secs. 7, 8, 17, 18, 20, T. 13 N., R. 7 W., North of town of Weiser. (Prater, 1947, p. 1, 2-6.) Gypsum rock, white to light-gray; contains some pyrite. Bulk density 2.32. Screen analysis, grinding tests, flotation tests.

Washington

3-13. Okanogan County. Holocene [implied]. NW¼ SW¼ sec. 4, T. 38 N., R. 27 E., 12 miles by road north of town of Tonasket, Poison Lake. Analysts, H. D. Benson, R. W. Moulton, and(or) P. G. Hebner. (Bennett, 1962, p. 6, 102-105, 110, 111, 112-114.) Mineralogy. Tonnage estimated. Index and geologic maps. Log of drill hole. Use: Source of gypsite and epsomite.

3. Auger-drill hole 1, sample 72. Gypsite, gray; depth 11.7-25 ft.
4. Auger-drill hole 1, sample 71. Gypsite, gray; depth 6-11.7 ft.
5. Auger-drill hole 1, sample 70. Gypsite, gray to brown; depth 0-6 ft.

Washington--Continued

6, 7. Auger-drill hole 5, samples 60, 60A. Gypsite gravel; depth 17-18 ft.

8, 9. Auger-drill hole 5, samples 59, 59A. Gypsite, gray, muddy; depth 10-17 ft.

10, 11. Auger-drill hole 5, samples 58, 58A. Gypsite, gray, some mud; depth 3-10 ft.

12, 13. Auger-drill hole 5, samples 57, 57A. Gypsite, light-gray; depth 0-3 ft.

14, 15. County, age, and analysts as in samples 3-13. Sec. 3, T. 40 N., R. 25 E., about 2.5 miles northwest of Nighthawk Station, Lenton Flat. (Bennett, 1962, p. 6, 115, 124, 125.) Drill hole sample. Mineralogy. Tonnage estimated. Index maps.

14. Sample 78. Mud, black to gray; contains gypsum; depth 6-16 ft.
15. Sample 77. Gypsum, contains some mud and clay; depth 0-6 ft.

16-19. County, age, and analysts as in samples 3-13. T. 40 N., R. 27 E., about 4 miles north-northwest of town of Oroville, Poison Lake. (Bennett, 1962, p. 6, 115, 117, 118, 121-123.) Mineralogy. Tonnage estimated. Index maps.

16, 17. SE¼ SE¼ sec. 7. Auger-drill hole 3.

16. Sample 80. Mud, black to gray; contains gypsum; depth 13-30 ft. Measured section.
17. Sample 79. Gypsite, depth 0-13 ft.

18, 19. NE corner sec. 18. Auger-drill hole 2. Mud and gypsite; depth 0-20 ft. Measured section.

Table 20.—Analyses of samples from Idaho, Oregon, and Washington, containing 50 percent or more miscellaneous chloride-, sulfate-, carbonate-, and nitrate-bearing material (Group 5), special-rock category

[Chemical analyses recorded here as given in the original publications; no calculations or recalculations have been made by the compilers. Analyses arranged by State and county]

Chemical analyses

	Idaho			Oregon									
	1	2	3	4	5	6	7	8	9	10	11	12	13
	11S45-46			36S13-6	36S19-7	36S19-8	36S19-9	36S19-10	36S19-11	36S19-12	36S19-13	36S19-14	36S19-5
SiO_2	[1]6.42	4.36	------	[2]1.25	------	------	------	------	------	------	------	------	------
Al_2O_2	------	.88	------	------	------	------	------	------	------	------	------	------	------
Fe_2O_3	------	.27	------	------	------	------	------	------	------	------	------	------	------
MgO	------	.13	------	------	------	------	------	------	------	------	------	------	------
CaO	------	.67	------	------	------	------	------	------	------	------	------	------	------
Na_2O	------	------	------	47.49	------	------	------	------	------	------	------	------	------
H_2O-	.85	------	------	[3]10.08	------	------	------	------	------	------	------	------	[4]54.00
MnO	------	Trace	------	------	------	------	------	------	------	------	------	------	------
Cl	------	------	------	2.90	1.67	2.25	------	.38	5.15	6.23	15.35	.71	------
SO_2	------	.11	------	11.76	[5]Heavy	[5]Very heavy	------	[5]Heavy	[5]Heavy	[5]Heavy	[5]Heavy	[5]Heavy	------
CO_2	------	------	------	26.33	[6].18	[6].60	------	[6]6.02	[6]8.07	[5]6.74	[5]14.64	[6]3.74	------
HCO_2	------	------	------	------	.30	.13	------	4.65	6.43	4.66	9.07	8.77	------
NaCl	[7]91.79	------	98.900	------	[8]2.75	[8]3.71	------	[8].63	[4]8.50	[8]10.28	[6]25.31	[8]1.17	3.67
Na_2SO_4	------	------	------	------	------	------	99+	------	------	------	------	------	2.49
$NaHCO_2$	------	------	------	------	[8].41	[8].18	------	[8]6.32	[8]8.74	[8]6.34	[8]12.33	[8]11.92	3.92
Na_2CO_2	------	------	------	------	[8].32	[8]1.06	------	[8]10.65	[8]14.28	[8]11.93	[8]25.90	[8]6.62	34.91
KCl	------	------	.261	------	------	------	------	------	------	------	------	------	------
K_2SO_4	------	------	------	------	------	------	------	------	------	------	------	------	1.01
$MgCL_2$	------	------	.022	------	------	------	------	------	------	------	------	------	------
$CaSO_4$	------	------	.817	------	------	------	------	------	------	------	------	------	------
B_2O_3	------	------	------	.28	------	------	------	------	------	------	------	------	------
Total	99.06	[9][6.42]	[9]100.000	100.09	------	------	------	------	------	------	------	------	100.00

	Oregon—Continued												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	36S19-4	36S19-3	36S19-15	36S19-16	36S19-17	36S19-6	36S19-18	36S19-19	36S19-20	36S19-1	36S23-8	36S23-11	36S23-10
SiO_2	0.16	0.18	0.21	0.08	0.08	0.20	------	------	------	------	------	------	------
Insoluble	------	------	------	------	.02	------	------	------	------	------	------	------	------
Mg	------	------	------	------	------	------	------	------	------	------	Much	0.14	0.03
Ca	------	------	------	------	------	------	------	------	------	------	Some	1.61	1.77
Na	------	------	------	------	------	------	------	------	------	------	Much	31.13	13.74
K	------	------	------	------	------	------	------	------	------	------	Small amount	.39	19.75
H_2O	[4]62.65	[4]60.16	[4]54.97	[4]42.55	[4]53.33	------	[10](46.00)	------	------	[10](61.00)	------	------	------
Cl	------	------	------	------	------	------	------	.51	1.54	------	Small amount	.09	.18
SO_4	------	------	------	------	------	------	------	Heavy	Heavy	------	Some	19.39	4.62
CO_3	------	------	------	------	------	------	------	14.28	22.40	------	None	None	None
HCO_3	------	------	------	------	------	------	------	9.93	10.24	------	------	None	None
NO_3	------	------	------	------	------	------	------	------	------	------	73.75	47.25	59.91
NaCl	1.72	1.22	1.49	1.93	1.07	3.27	12.12	[8].84	[8]2.54	15.55	------	------	------
Na_2SO_4	.77	.91	1.33	1.92	1.54	1.72	7.83	------	------	1.11	------	------	------
$NaHCO_2$	.67	1.00	2.01	Nil	Nil	1.44	9.45	[8]13.50	[8]13.92	.60	------	------	------
Na_2CO_3	33.49	35.83	38.90	53.00	43.35	18.44	70.80	[8]25.28	[8]39.65	78.95	------	------	------
Na_3PO_4	.10	.11	.12	.09	.11	.18	------	------	------	------	------	------	------
$Na_2B_4O_7$	.07	.14	.23	.10	.14	.24	------	------	------	------	------	------	------
KCl	.37	.45	.74	.33	.36	.89	------	------	------	------	------	------	------
K_2SO_4	------	------	------	------	------	------	1.64	------	------	1.40	------	------	------
BO_2	------	------	------	------	------	------	------	------	------	------	------	None	None
LiCl	Nil	Nil	Nil	Nil	Nil	Nil	------	------	------	------	------	------	------
Br_2	.00052	.00078	.0016	.0010	.0018	.00052	------	------	------	------	------	------	------
I_2	.0001	.0001	.0001	.0004	.0002	.0001	------	------	------	------	------	------	------
Total	100.00	100.00	100.00	100.00	100.00	26.38	101.84	------	------	97.61	------	100.00	100.00

	Washington											
	27	28	29	30	31	32	33	34	35	36	37	38
	46S13-25	46S13-23	46S13-26	46S13-18	46S13-19	46S13-8	46S13-9	46S13-10	46S13-24	46S13-27	46S13-21	46S13-14
SiO_2	------	------	------	------	------	------	------	------	------	------	------	0.7
Insoluble	18.3	10.5	22.4	1.2	1.3	------	------	------	16.3	24.6	3.9	5.3
R_2O_3	None	None	.1	None	None	------	------	------	None	None	None	None
H_2O	------	------	------	------	------	3.00	4.51	64.04	------	------	------	------
NaCl	.5	.2	1.6	1.3	4.0	.86	1.82	2.77	1.3	1.1	2.3	1.9
Na_2SO_4	80.2	88.4	75.2	96.5	88.4	62.37	79.24	1.85	2.4	3.1	5.0	15.4
$NaHCO_3$	None	.7	.5	None	None	------	------	------	None	None	None	None
Na_2CO_3	.7	.9	.9	1.2	6.3	33.77	14.43	31.34	78.6	70.1	86.1	74.0
K_2SO_4	------	------	------	------	------	------	------	------	------	------	.86	------
$MgSO_4$	.2	.3	.1	None	------	------	------	------	None	None	None	None
$CaSO_4$	None	None	None	None	------	------	------	------	None	None	None	None
Total	99.9	101.0	[11]100.8	100.2	100.0	100.00	100.00	100.00	98.6	98.9	98.2	97.3

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[1] Insoluble.

[2] Insoluble in hot water.

[3] Water of crystallization.

[4] Essentially water of crystallization and a little insoluble matter; by difference.

[5] SO_4.

[6] CO_3.

[7] Soluble salt.

[8] Reported as calculated.

[9] Sample 2, analysis of insoluble portion of sample 1; sample 3, analysis of soluble portion of sample 1.

[10] Water of crystallization; not included in total.

[11] 100.6 percent in text.

Spectrographic analyses

	32	33		32	33		32	33
Si	Trace	None	Fe	------	Trace	Ca	Trace	None
Al	Trace	------	Mg	Trace	Trace	K	Faint trace	Some

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho

1-3. Bannock County. Between Oligocene and late Pliocene or Pleistocene. NE¼ NE¼ sec. 28, T. 9 S., R. 46 E., on Crow Creek near Lowe's ranch. Analyst, Chase Palmer. (Breger, 1910, p. 555, 556, 558, 564, 568; Mansfield, 1927, p. 2, 338, 339, pls. 1, 7, 8, 12, 19.) Rock salt, reddish-brown; 20 ft thick, overburden 6 ft. Tonnage estimated. Index and geologic maps, geologic sections, generalized columnar section. Use: Domestic and stock.

Oregon

4. Harney County. Holocene [implied]. [T. 26 S., R. 30 W.], about 6 miles west of town of Narrows, near Dog Mountain. Analyst, George Steiger. (Russell, 1903, p. 35, 36, pl. 1.) [Sodium carbonate-sodium sulfate] efflorescence, white. Index map. Use: Source of sodium carbonate and sodium bicarbonate.

5-12. Lake County. Holocene [implied]. Analyst, W. H. Heileman. (Waring, 1908, p. 59, 60, 74, 75, pls. 6, 10.) Efflorescent saline crust, glaubers salt. Index and geologic maps.

5. [Tps. 25, 26 S., R. 19 E.], region north of Fossil Lake, Sucker Flat. Sample 8. Geologic section.

6, 7. [T. 26 S., R. 16 E.], about 10 miles northwest of Christmas Lake. Samples 6, 7. Geologic section.

8. T. 26 S., R. 18 E., south end of Christmas Lake. Sample 2. Geologic section.

9. [T. 29 S., Rs. 22, 23 E., unsurveyed], playa in North Alkali Valley. Sample 9.

10. [T. 30 S., R. 22 E.], west side of Alkali Flat. Sample 3.

11. [T. 30 S., R. 23 E.], edge of pool in Alkali Flat. Sample 4.

12. [T. 30 S., R. 23 E.], center of Alkali Flat. Sample 5.

13-18. Lake County. Holocene. [T. 30 S., R. 23 E.], Alkali Lake. American Soda Products Co. (Allison and Mason, 1947, p. 1, 9, 11, pl. 1.) Tonnage estimated. Index map. Former use: Washing soda.

13. Analyst, L. L. Hoagland. Sample 2. Crystalline salts, composite of three samples representing top 2 ft of solid salts.

14. Sample 3e. Crystalline salts, depth 22-28 in.

15. Sample 3d. Crystalline salts, depth 18-22 in.

16. Sample 3c. Crystalline salts, depth 6-18 in.

17. Sample 3b. Crystalline salts, depth 3-6 in.

18. Sample 3a. Crystalline salts, depth 0-3 in.

19. County, age, reference, and map as in samples 13-18. [T. 30 S., R. 23 E.], Alkali Lake. Sample 5. Crystalline salt, depth 42 in. Tonnage estimated. Possible use: Source of high-grade soda.

20. Lake County. Holocene. [Tps. 30-32 S., Rs. 16, 17 E.], Summer Lake. Analyst, L. L. Hoagland. (Allison and Mason, 1947, p. 1, 3, 4, pl. 1.) Efflorescent salts. Theoretical mineralogy. Composite of three samples. Tonnage estimated. Index map. Possible use: None.

21, 22. Lake County. Holocene [implied]. Analyst, W. H. Heileman. (Waring, 1908, p. 20, 74, 75, pls. 1, 2, 6, 10.) Efflorescent saline crust, glaubers salt. Index and geologic maps.

Oregon—Continued

21. Tps. 30-32 S., Rs. 17, 18 E., east side of Summer Lake. Sample 1.

22. [T. 33 S., R. 21 E.], north end of Lake Abert. Sample 10. Geologic section.

23. Lake County. Holocene. [Tps. 33, 34 S., R. 21 E.], north end of Abert Lake. Analyst, L. L. Hoagland. (Allison and Mason, 1947, p. 1, 7, pl. 1.) Efflorescent salts, 1/16 in. thick. Index map. Possible use: None.

24-26. Malheur County. T. 24 S., R. 46 E., Sucker Creek. Homedale deposit. Analyst, R. K. Bailey. (Mansfield, 1916, p. 21, 23, 26, 27, 32.) Index map. Possible use: None.

24. Sec. 20. Roosevelt claim. Sample S.C. 6. Potassium nitrate with admixture of magnesium and sodium sulfates. Selected sample.

25. Sec. 29, Discovery Cave. Dorothy claim. Sample 2983. Sodium sulfate and sodium nitrate. Representative sample.

26. Sec. 29. Abbie claim. Sample 2983. Potassium nitrate and sodium nitrate, white, finely crystalline, incrustation.

Washington

27-30. Grant County. Holocene [implied]. SW¼ SW¼ NW¼ sec. 15, T. 17 N., R. 28 E., about 13 miles west of Warden railroad station, formerly Sulphate Lake, now flooded. Analysts, H. K. Benson, R. W. Moulton, and(or) P. G. Hebner. (Bennett, 1962, p. 6, 49-52, 53, 54.) Log of drill hole. Tonnage estimated. Index and geologic maps.

27. Auger-drill hole 1, sample 21. Mirabilite crystals from pan; depth 1.7-4.7 ft.

28. Auger-drill hole 1, sample 20. Mirabilite crystals disseminated in mud; depth 0.5-1.7 ft.

29. Auger-drill hole 6, sample 23. Mirabilite crystals disseminated in mud; depth 0.5-6.5 ft.

30. Sample 24. Thenardite, crust on old workings; up to 6 in. thick.

31. County, age, and analysts as in samples 27-30. S½ SE¼ sec. 15, T. 17 N., R. 28 E., Tucker Lake. Sample 25. (Bennett, 1962, p. 42.) Salt crust, less than 0.5 in. thick.

32-38. Grant County. Holocene [implied]. W½ SW¼ sec. 18, T. 17 N., R. 29 E., 9-10 miles west of Warden railroad point, formerly Carbonate Lake, now flooded. Analysts, H. K. Benson, R. W. Moulton, and(or) P. G. Hebner. (Bennett, 1962, p. 6, 9, 18, 19, 24, 25-28, 30.) Tonnage estimated. Index and geologic maps, geologic section.

32-34. Spectrographic analyst, G. M. Valentine. Mineralogy. Microscopic description.

32. Sample A. Salt crust, finely banded; 1-2 mm thick.
33. Sample B. Salt, white, porous, fragile.
34. Sample C. Salt, white, porous, fragile.

35. Auger-drill hole 3, sample 2. Salt, depth 8-10 ft. Log of drill hole.

36. Auger-drill hole 5, sample 4. Salt, disseminated crystals in mud; depth 6-9.2 ft.

37. Sample 3. Salt crust, pinkish.

38. Sample 5. Salt crust, white; 6 in. thick. Mineralogy.

Table 20.—Analyses of samples from Idaho, Oregon, and Washington, containing 50 percent or more miscellaneous chloride-, sulfate-, carbonate-, and nitrate-bearing material (Group S), special-rock category—Continued

Chemical analyses—Continued

	Washington—Continued												
	39	40	41	42	43	44	45	46	47	48	49	50	51
	46S13-11	46S13-22	46S13-12	46S13-13	46S13-15	46S13-20	46S13-28	46S13-16	46S13-17	46S19-44	46S40-263	46S40-250	46S40-249
SiO_2	------	------	------	------	0.8	2.0	37.6	0.9	1.0	0.82	------	------	0.1
Insoluble	0.1	5.0	0.3	0.4	1.5	18.0	------	65.8	15.1	------	8.1	0.6	4.1
Al_2O_3	[1]None	[1]None	[1]None	[1]None	None	None	4.3	None	None	.04	[1]None	[1]None	[1]None
Fe_2O_3					None	None	1.3	None	None				
MgO	------	------	------	------	------	------	1.2	------	------	.07	------	------	------
CaO	------	------	------	------	------	------	------	------	------	.03	------	------	------
Na_2O	------	------	------	------	------	------	------	------	------	45.59	------	------	------
K_2O	------	------	------	------	------	------	------	------	------	9.58	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	------	1.05	------	------	------
SO_3	------	------	------	------	------	------	------	------	------	.09	------	------	------
Cl	------	------	------	------	------	------	------	------	------	.99	------	------	------
NaCl	1.4	5.6	1.4	3.8	.9	1.3	3.8	3.9	1.6	------	.6	None	.4
Na_2SO_4	10.7	27.4	10.7	30.1	1.2	1.6	2.3	.7	1.3	------	88.7	99.1	34.3
$NaHCO_3$	None	None	None	None	None	None	------	None	None	------	None	.4	None
Na_2CO_3	86.8	61.1	86.7	64.3	92.5	76.3	19.2	22.9	80.2	------	.6	None	1.2
$CaCO_3 \cdot Na_2CO_3$	------	------	------	------	------	------	[2]20.1	------	------	------	------	------	------
K_2SO_4	------	------	.3	.62	------	------	------	2.8	------	------	1.1	------	------
$MgSO_4$	.2	None	.3	None	.2	None	------	.2	None	------	.2	Trace	47.2
$3MgCO_3 \cdot Mg(OH)_2$	------	------	------	------	------	------	[2]6.6	------	------	------	------	------	------
$CaSO_4$	None	None	None	None	None	None	------	None	None	------	None	None	1.8
Organic matter	------	------	------	------	------	------	------	------	------	[3]7.03	------	------	------
Ignition loss	------	------	------	------	2.2	------	[4]3.4	------	------	[5]34.93	------	------	10.1
Subtotal	------	------	------	------	------	------	------	------	------	100.22	------	------	------
Less O	------	------	------	------	------	------	------	------	------	[6].22	------	------	------
Total	99.2	99.1	99.7	99.2	99.3	99.2	[7]99.8	97.2	99.2	100.00	99.3	100.1	99.2

	Washington—Continued												
	52	53	54	55	56	57	58	59	60	61	62	63	64
	46S40-265	46S40-248	46S40-255	46S40-269	46S40-266	46S40-259	46S40-270	46S40-252	46S40-242	46S40-243	46S40-251	46S32-58	46S39-3
Insoluble	11.3	0.08	3.1	18.7	11.4	5.8	23.7	1.5	0.03	0.03	0.9	[8]0.96	[8]3.03
R_2O_3	.5	------	None	None	None	None	None	None	.02	.10	None	------	------
MgO	------	------	------	------	------	------	------	------	17.44	17.88	18.1	.06	.14
CaO	------	------	------	------	------	------	------	------	------	------	------	------	.05
Na_2O	------	------	------	------	------	------	------	------	------	------	------	51.29	41.64
K_2O	------	------	------	------	------	------	------	------	------	------	------	3.07	13.45
H_2O	------	50.90	------	------	------	------	------	------	48.17	47.32	------	------	------
P_2O_5	------	------	------	------	------	------	------	------	------	------	------	1.01	.63
CO_3	------	------	------	------	------	------	------	------	------	------	None	------	------
HCO_3	------	------	------	------	------	------	------	------	------	------	None	------	------
SO_3	------	------	------	------	------	------	------	------	34.30	34.64	34.3	4.78	1.65
Cl	------	------	------	------	------	------	------	------	------	------	None	2.22	.34
NaCl	.4	.23	.5	.8	.4	.3	None	None	------	------	------	------	------
Na_2SO_4	86.2	48.28	94.9	76.9	85.9	90.3	75.1	96.8	------	------	------	------	------
$NaHCO_3$	None	.33	.5	.7	.7	Trace	Trace	None	------	------	------	------	------
Na_2CO_3	None	------	Trace	Trace	Trace	None	None	None	------	------	------	------	------
K_2SO_4	------	------	.6	1.0	.6	------	------	------	------	------	------	------	------
$MgSO_4$	.8	.18	.5	.5	.4	1.8	1.0	.7	------	------	------	------	------
$CaSO_4$	1.3	------	None	.5	.5	1.2	None	.8	------	------	------	------	------
Organic matter	------	------	------	------	------	------	------	------	------	------	------	[3]3.86	[3]4.41
Ignition loss	------	------	------	------	------	------	------	------	------	------	[9]47.0	[5]32.83	[5]34.14
Subtotal	------	------	------	------	------	------	------	------	------	------	------	100.08	99.48
Less O	------	------	------	------	------	------	------	------	------	------	------	.49	.07
Total	100.5	[10]100.00	100.1	99.1	99.9	99.4	99.8	99.8	99.96	99.97	100.3	99.59	99.41

[1] R_2O_3.

[2] Does not include combined water. Sample oven-dried.

[3] Organic matter and water of crystallization.

[4] Includes water and carbon dioxide.

[5] CO_2.

[6] Less excess O due to chlorine.

[7] Presumably potassium included in soda (Bennett, 1962, p. 39).

[8] SiO_2.

[9] At 1,000°C.

[10] Fe, Ca, B = None.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Washington—Continued

39-47. Grant County. Holocene [implied]. Analysts, H. K. Benson, R. W. Moulton, and(or) P. G. Hebner. Tonnage estimated. Index and geologic maps.

39-42. W½SW¼ sec. 18, T. 17 N., R. 29 E., 9-10 miles west of Warden railroad point, formerly Carbonate Lake, now flooded. (Bennett, 1962, p. 6, 9, 18, 19, 24, 28, 30.) Geologic section.

39. Auger-drill hole 13, sample 11. Salt, hard; depth 4-6 in. Log of drill hole.

40. Anger-drill hole 13, sample 10. Salt, includes crust and salt crystals disseminated in mud; depth 0-4 in. Log of drill hole.

41. Auger-drill hole 14, sample 14. Salt, white; depth 0-2 ft. Log of drill hole.

42. Sample 19. Salt crust.

43-47. N½SW¼ sec. 18, T. 22 N., R. 29 E., about 1 mile southwest of Wilson Creek railroad station, Mitchell Lake. (Bennett, 1962, p. 6, 35-39, 40.)

43. Sample 26. Natron, thin layer.

44. Auger-drill hole 1, sample 27. Salt, 2 ft thick.

45. Auger-drill hole 5, sample 30A. Salt, depth 5-7 ft.

46. Auger-drill hole 5, sample 30. Salt, depth 5-7 ft.

47. Auger-drill hole 5, sample 29. Salt from crust 1 in. thick and from 1-5 ft of salt pan. Log of drill hole.

48. Kittitas County. [Holocene. T. 18 N., R. 20 E.], Kittitas Valley on Cherry Creek. (Hilgard, 1892, p. 48, 49.) [Sodium carbonate.]

49-59. Okanogan County. Holocene [implied]. Analysts [except sample 54] H. K. Benson, R. W. Moulton, and(or) P. G. Hebner. Tonnage estimated. Index and geologic maps.

49, 50. S½SW¼ sec. 26, T. 32 N., R. 25 E., B-J Lake. Owner, C. A. Kearney. (Bennett, 1962, p. 6, 57-60.)

49. Auger-drill hole 1, sample 61. Composite salt sample; depth 0-3 ft. Log of drill hole.

50. Sample 37. Mirabilite crystals, white, massive or fine-grained; about 1.5 in. thick.

51. NE¼ sec. 1, T. 32 N., R. 26 E., Patterson Lake. Sample 75. (Bennett, 1962, p. 6, 91-93.) Salt crust on mud, about 1 in. thick.

Washington—Continued

52. NE¼ sec. 10, T. 32 N., R. 26 E., about 8 miles from town of Okanogan, Penley Lake. Owner, C. A. Kearney. Auger-drill hole 1. (Bennett, 1962, p. 6, 95-97, 98.) [Sodium sulfate] salts; depth 0-7 ft. Log of drill hole. Tonnage estimated.

53. Sec. 32, T. 32 N., R. 26 E., 9 miles south of Okanogan, Lake 32. Analyst, R. C. Wells. Record C-912. (Wells, 1937, p. 123, 124; Bennett, 1962, p. 6, 64-66, 68.) Mirabilite. Former use: Source of sodium sulfate.

54-56. SW¼NW¼ sec. 35, T. 32 N., R. 26 E., Hauan Lake. Owner, C. A. Kearney. Auger-drill hole 4. (Bennett, 1962, p. 6, 76-80.) Salt.

54. Sample 64. Depth 6-9 ft.

55. Sample 63. Depth 3-6 ft.

56. Sample 62. Depth 0-3 ft.

57-59. NW¼SW¼ sec. 36, T. 32 N., R. 26 E., deposit 13. (Bennett, 1962, p. 6, 81, 82, 84, 85.)

57. Auger-drill hole 7, sample 65. Salt, depth 0-7 ft.

58. Auger-drill hole 15, sample 66. Mirabilite crystals, coarsely granular aggregate; contains mud and sand inclusions.

59. Sample 67. Thenardite, white, powdery; surface layer.

60-62. Okanogan County. Holocene [implied]. T. 38 N., R. 27 E., 12 miles by road north of town of Tonasket, Poison Lake. (Bennett, 1962, p. 6, 102-105, 108, 109, 113, 114.) Mineralogy. Tonnage estimated. Index and geologic maps. Use: Source of epsomite and gypsite.

60. NW¼SW¼ sec. 4. Analyst, H. C. Rickaby. Sample B. (Walker and Parsons, 1927, p. 21-23.) Hexahydrite mixed with epsomite.

61. NE¼SE¼ sec. 5 or NW¼SW¼ sec. 4. Analyst, H. C. Rickaby. Sample A. (Walker and Parsons, 1927, p. 21-23.) Hexahydrite, white, efflorescent crust. Bulk density 1.71.

62. NE¼SE¼ sec. 5 or NW¼SW¼ sec. 4. Analysts, H. K. Benson, R. W. Moulton, and(or) P. G. Hebner. Sample 81. Epsomite, some included mud.

63. Spokane County. [Holocene. T. 28 N., R. 44 E.], 3 miles southwest of Cottonwood Springs. (Hilgard, 1892, p. 49.) Sodium carbonate.

64. Yakima County. [Holocene. T. 13 N., R. 18 E.], 2 miles west of town of Yakima City, on Atahnam Creek. (Hilgard, 1892, p. 49.) [Sodium carbonate.]

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category

[Most of these analyses report 21.1 percent P_2O_5 or more, corresponding to 50 percent fluorapatite ($9CaO \cdot 3P_2O_5 \cdot CaF_2$). Chemical analyses arranged by county and stratigraphic position]

Chemical analyses

	Idaho												
	1	2	3	4	5	6	7	8	9	10	11	12	13
	11P3-3		11P3- 4	11P3-5	11P3-6		11P3-7	11P4-93	11P4-97	11P4-96	11P4-95	11P4-94	11P4-21
SiO_2	2.6	[1]1.5	[1]17.5	[1]17.7	23.8	[1]27.3	15.6	6.30	5.57	19.10	24.24	19.78	[1]21.4
Al_2O_3	.39	.35	2.7	2.0	4.1	------	2.3	.65	------	3.82	4.10	3.75	3.7
Fe_2O_3	[2].26	.28	1.08	.83	[2]1.9	------	1.46	.32	------	------	------	------	1.3
MgO	.12	------	------	------	.40	------	------	.11	.24	1.02	1.21	.75	------
CaO	50.9	------	------	------	35.4	------	39.5	50.13	52.00	35.00	31.88	34.06	------
Na_2O	.76	------	------	------	.57	------	------	.22	------	------	------	------	------
K_2O	.14	------	------	------	1.1	------	------	.10	------	------	------	------	------
H_2O+	[3]1.3	------	------	------	[3]2.1	------	------	------	------	------	------	------	------
H_2O-	.4	------	------	------	.7	------	------	------	------	------	------	------	------
TiO_2	.07	------	------	------	.32	------	------	------	------	------	------	------	------
P_2O_5	34.8	35.7	26.8	28.1	25.7	25.4	26.9	[4]36.27	[4]35.85	[4]23.98	[4]21.41	[4]22.83	26.5
MnO	------	------	------	------	------	------	------	.02	------	------	------	------	------
SO_3	1.92	------	------	------	------	------	------	.18	------	------	------	------	------
V	------	------	------	------	------	------	.12	.03	------	.04	.17	.33	------
Cr	------	------	------	------	------	------	------	.02	------	.09	.09	.08	------
F	3.45	------	------	------	2.20	------	2.6	4.40	------	------	------	------	------
eU	[5].009	------	------	------	[5].004	------	------	------	------	------	------	------	------
Oil	[6].05	------	------	------	[6].10	------	------	------	------	------	------	------	------
Organic matter	[7]1.9	------	------	------	[7]1.5	------	[4]4.1	[4]1.75	[4]1.60	[4]11.32	[4]11.98	[4]15.49	------
Ignition loss	[8]3.52	6.20	10.46	7.80	[8].76	------	------	[8]1.45	[8]2.02	[8]3.42	[8]3.38	[8]3.06	7.74
Subtotal	102.59	------	------	------	100.65	------	92.58	101.95	------	------	------	------	------
Less O	[4]1.45	------	------	------	[4].93	------	[4]1.1	[4]1.85	------	------	------	------	------
Total	[101.1]	[44.0]	[58.5]	[56.4]	[99.7]	[52.7]	[91.5]	[100.10]	[97.28]	[97.79]	[98.46]	[100.13]	[60.6]

	Idaho—Continued												
	14	15	16	17	18	19	20	21	22	23	24	25	26
	11P4-22	11P4-23	11P4-24	11P4-25	11P4-26	11P4-27	11P4-28	11P4-29	11P4-30	11P4-31	11P4-32	11P4-33	11P4-34
Acid insoluble	23.7	23.9	22.3	17.7	18.8	16.3	12.9	3.0	8.5	4.2	12.5	21.6	17.3
Al_2O_3	3.3	3.6	2.5	3.0	3.4	2.6	2.5	.86	1.7	.40	2.0	2.8	2.8
Fe_2O_3	1.2	2.5	.89	1.2	1.5	1.2	1.2	.52	.93	.40	1.0	1.16	1.10
P_2O_5	25.7	24.4	26.4	27.4	23.7	26.0	27.2	35.6	33.6	37.3	32.5	27.1	27.9
Ignition loss	8.18	9.62	7.96	9.16	15.18	14.24	14.12	6.90	5.08	2.36	2.92	8.84	9.08
Total	[62.1]	[64.0]	[60.0]	[58.5]	[62.6]	[60.3]	[57.9]	[46.9]	[49.8]	[44.7]	[50.9]	[61.5]	[58.2]

	Idaho—Continued												
	27	28	29	30	31	32	33	34	35	36	37	38	39
	11P4-35	11P4-36	11P4-37	11P4-38	11P4-39	11P4-40	11P4-41	11P4-42	11P4-44	11P4-45	11P4-46	11P4-47	11P4-48
Acid insoluble	18.2	23.3	15.8	22.9	21.3	12.7	15.5	22.3	24.9	22.6	9.7	14.7	22.7
Al_2O_3	3.0	3.5	2.6	3.4	3.7	2.6	3.7	5.0	3.5	5.4	1.7	2.3	5.4
Fe_2O_3	1.32	1.34	.54	1.16	1.60	1.48	1.58	1.46	1.20	1.8	.68	.78	1.9
P_2O_5	26.9	24.0	27.2	25.4	24.1	28.6	26.7	23.0	24.2	23.7	31.6	27.4	21.1
Ignition loss	9.66	10.80	12.24	8.76	11.40	10.60	11.70	12.12	8.68	10.56	8.80	13.62	15.00
Total	[59.1]	[62.9]	[58.4]	[61.6]	[62.1]	[56.0]	[59.2]	[63.9]	[62.5]	[64.1]	[52.5]	[58.8]	[66.1]

[1] Acid insoluble.

[2] Total iron.

[3] Total water.

[4] Calculated from reported P, C or F.

[5] Radiometric determination by B.A. McCall.

[6] Oil by distillation at about 500°C; distillate weighed.

[7] 230°-500°C.

[8] CO_2.

Spectrographic analyses

[Elements looked for but not detected: Li,Ge,Rb,Ru,Rh,Pd,In,Te,Cs,Ce,Pr,Eu,Tb,Er,Lu,Hf,Ta,W,Re,Os,Ir,Pt,Au,Hg,Tl,Bi,Th. For samples 1,5: Analysts, Charles Annell, Joseph Haffty; geochemical determinations of As,Sb, and Se by H.E. Crowe, J.E. Swick, R.R. Beins. B = 1-10 percent, D = 0.1-1 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent, G = <0.001 percent, ND = not detected]

	1	2	3	4	5	6
Be	<0.00005	ND	G	ND	<0.00005	G
B	<.005	F	E	F	<.005	E
Na	------	B	D	B	------	D
Mg	------	D	D	D	------	D
K	------	B	D	B	------	B
Sc	<.0005	F	F	ND	.003	F
Ti	------	D	E	D	------	E
V	.1	0.05	0.2	0.20	.01	0.008
Cr	.1	E	E	E	.1	E
Mn	.001	F	F	E	.003	F
Ni	.03	E	E	E	.01	E
Co	<.001	------	------	------	<.001	------
Cu	.003	E	E	E	.01	E
Zn	.03	E	E	E	<.008	ND
Ga	<.001	F	F	F	.001	F
As	.002	ND	ND	ND	.004	ND
Se	.0001	------	------	------	.0005	------
Sr	.1	F	E	F	.1	D
Y	0.03	E	E	E	0.03	D
Zr	.001	E	F	E	.01	E
Nb	ND	F	ND	F	ND	ND
Mo	.003	F	E	F	.003	F
Ag	.0003	G	G	G	.0003	ND
Cd	.01	F	E	F	< .005	ND
Sn	ND	F	F	F	ND	ND
Sb	.0003	ND	ND	ND	.0002	ND
Ba	.01	E	E	E	.01	E
La	.01	E	E	E	.03	E
Nd	<.006	ND	ND	ND	.03	ND
Sm	ND	ND	ND	ND	ND	F
Gd	ND	ND	ND	ND	ND	E
Dy	ND	ND	ND	E	ND	E
Ho	ND	F	ND	F	ND	F
Tm	ND	ND	ND	E	ND	E
Yb	.0003	F	G	F	.001	E
Pb	<.001	F	F	F	<.001	F

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho

1-6. Bannock County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. NE¼ sec. 1, T. 6 S., R. 38 E., Rocky Canyon. (Davidson and others, 1953, p. 2-4, 9, 10-12, 14, 15.) Trench sample. Index map, detailed measured section.
  1, 2. Sample 4403-RAS. Phosphate rock, 133.3-135.3 ft from top of member. General mineralogy.
    1. (Gulbrandsen, 1966, p. 770-773, table 1.)
  3. Sample 4334-HWP. Phosphate rock, argillaceous, 124.3-126.0 ft from top of member.
  4. Sample 4387-HWP. Phosphate rock, argillaceous, 111.8-112.5 ft from top of member.
  5, 6. Sample 4330-RSJ. Phosphate rock, argillaceous, 56.8-57.2 ft from top of member. General mineralogy.
    5. (Gulbrandsen, 1966, p. 770-773, table 1.)

7. County, formation, and member as in samples 1-6. [T. 6 S., R. 34 E., near] town of Pocatello. Simplot Fertilizer Co. (Hall and Banning, 1958, p. 13.) Phosphatic shale.

8-12. Bear Lake County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. [T. 9 S., R. 45 E.], near Georgetown. (Emigh, 1958, p. 29, 31, 32-34, fig. 1.) Mineralogy, thin-section description. Index map.
  8, 9. Central Farmers Fertilizer Co. Samples S61, S69. Phosphate pellets.
  10-12. Central Farmers Fertilizer Co. mine. General: When fresh, phosphatic dolomitic shale, black, fine-grained, dense, hard; when weathered, shale, brown, soft, fossiliferous; 17-24 ft thick.
    10. Phosphate pellets, 4 ft above bottom of bed.
    11. Phosphate pellets, 8 ft above bottom of bed.
    12. Phosphate pellets, 16 ft above bottom of bed.

13-17. County, formation, and member as in samples 8-12. SE¼ sec. 1, T. 10 S., R. 44 E., Georgetown Canyon. (O'Malley and others, 1953, p. 2, 3, 27-29.) Phosphate rock, argillaceous. Trench sample. Index map, detailed measured section.
  13. Sample 2918-DFD, 96.35-98.55 ft from top of member.
  14. Sample 2901-DFD, 93.75-94.75 ft from top of member.
  15. Sample 2902-DFD, 92.45-93.75 ft from top of member.
  16. Sample 2903-DFD, 90.85-92.45 ft from top of member.
  17. Sample 2904-DFD, 89.05-90.85 ft from top of member.

18-34. County, formation, and member as in samples 8-12. NE¼NW¼ sec. 30, T. 10 S., R. 45 E., Georgetown Canyon. Trench sample. Index map, detailed measured section.
  18-24. (O'Malley and others, 1953, p. 2, 3, 30, 31-33.)
    18. Sample 3291-WOM. Phosphate rock, 46.7-48.7 ft from top of member.

Idaho—Continued

    19. Sample 3292-WOM. Mudstone and phosphate rock, 46.4-46.7 ft from top of member.
    20. Sample 3293-WOM. Phosphate rock, 43.4-46.4 ft from top of member.
    21. Sample 3295-WOM. Phosphate rock, 39.5-41.0 ft from top of member.
    22. Sample 3299-WOM. Phosphate rock, 35.3-36.3 ft from top of member.
    23. Sample 3300-WOM. Phosphate rock, 34.1-35.3 ft from top of member.
    24. Sample 3231-WOM. Phosphate rock and phosphatic mudstone, 33.1-34.1 ft from top of member.

  25-34. (Swanson and others, 1956, p. 2, 5, 25.)
    25. Sample 7462-LDC. Phosphate rock, argillaceous, 34.2-34.9 ft from top of member.
    26. Sample 7463-LDC. Phosphate rock, 30.4-34.2 ft from top of member.
    27. Sample 7464-LDC. Phosphate rock, 27.6-30.4 ft from top of member.
    28. Sample 7284-LDC. Phosphate rock, argillaceous, 24.0-25.6 ft from top of member.
    29. Sample 7286-LDC. Phosphate rock, 21.5-22.0 ft from top of member.
    30. Sample 7287-LDC. Phosphate rock, argillaceous, 20.5-21.5 ft from top of member.
    31. Sample 7292-LDC. Phosphate rock, argillaceous, 9.5-11.8 ft from top of member.
    32. Sample 7294-LDC. Phosphate rock, 7.4-8.3 ft from top of member.
    33. Sample 7296-LDC. Phosphate rock, 6.0-6.8 ft from top of member.
    34. Sample 7297-LDC. Phosphate rock, 0-6.0 ft from top of member.

35-39. County, formation, and member as in samples 8-12. Sec. 31, T. 12 S., R. 45 E., Montpelier Canyon. (McKelvey and others, 1953a, p. 2, 50, 52, 53, 56.) Trench sample. Index map, detailed measured section.
  35. Sample 2855-RPS. Phosphate rock, argillaceous, 154.76-156.86 ft from top of member.
  36. Sample RAG-47-47. Phosphate rock, argillaceous, 63.83-64.38 ft from top of member.
  37. Sample RAG-45-47. Phosphate rock and phosphatic mudstone, 62.39-63.35 ft from top of member.
  38. Sample FCA-151-47. Phosphate rock, 41.13-41.93 ft from top of member.
  39. Sample FCA-150-47. Phosphate rock, calcareous, argillaceous, 40.78-41.13 ft from top of member.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

	Chemical analyses—Continued												
	Idaho—Continued												
	40	41	42	43	44	45	46	47	48	49	50	51	52
	11P4-49	11P4-50	11P4-51	11P4-52	11P4-53		11P4-54		11P4-55	11P4-56	11P4-57	11P4-58	11P4-59
Acid insoluble	22.3	13.7	14.9	5.7	[1]13.2	11.7	[1]6.8	5.2	7.4	5.6	24.8	20.5	19.1
Al_2O_3	3.9	2.3	3.3	.8	2.0	------	1.6	1.1	2.1	.92	2.2	3.7	3.3
Fe_2O_3	1.3	1.2	1.2	.34	[2].86	------	[2].76	.60	1.1	.74	.55	1.1	.64
MgO	------	------	------	------	.48	------	.27	------	------	------	------	------	------
CaO	------	------	------	------	37.1	------	45.0	------	------	------	------	------	------
Na_2O	------	------	------	------	.73	------	.40	------	------	------	------	------	------
K_2O	------	------	------	------	.58	------	.26	------	------	------	------	------	------
H_2O+	------	------	------	------	[3]5.9	------	[3]3.8	------	------	------	------	------	------
H_2O-	------	------	------	------	2.1	------	1.3	------	------	------	------	------	------
TiO_3	------	------	------	------	.21	------	.16	------	------	------	------	------	------
P_2O_5	24.1	28.0	25.9	33.1	25.4	25.8	32.4	31.8	30.5	35.6	27.4	23.9	25.3
SO_3	------	------	------	------	3.69	------	------	------	------	------	------	------	------
F	------	------	2.67	3.54	2.50	------	2.75	------	------	------	------	------	------
Organic matter	------	------	------	------	[4]9.3	------	[4]5.2	------	------	------	------	------	------
Oil	------	------	------	------	[5].16	------	[5].13	------	------	------	------	------	------
eU	------	------	------	------	[6].008	------	[6].009	------	------	------	------	------	------
Ignition loss	11.60	12.34	15.64	6.48	[7]1.73	------	[7]1.31	13.10	12.56	5.54	3.98	13.84	12.40
Subtotal	------	------	63.61	49.96	105.95	------	102.15	------	------	------	------	------	------
Less O	------	------	[8]1.12	[8]1.49	[8]1.05	------	[8]1.16	------	------	------	------	------	------
Total	[63.2]	[57.5]	[62.5]	[48.5]	[104.9]	[37.5]	[101.0]	[51.8]	[53.7]	[48.4]	[58.9]	[63.0]	[60.7]

	Idaho—Continued												
	53	54	55	56	57	58	59	60	61	62	63	64	65
	11P4-60	11P4-61	11P4-62	11P4-63	11P4-64	11P4-69	11P4-70	11P4-71	11P4-72	11P4-73	11P4-74	11P4-75	11P4-76
Acid insoluble	19.1	7.7	22.7	22.0	5.5	2.7	25.0	3.4	1.7	20.5	4.3	22.7	11.1
Al_2O_3	2.9	1.3	2.4	4.2	.83	1.4	5.8	1.2	.73	4.1	1.1	4.8	2.8
Fe_2O_3	.68	.32	.71	1.2	.33	.61	2.43	.84	.38	1.88	.64	1.74	.67
P_2O_5	27.4	34.2	26.5	26.5	35.9	36.9	23.8	35.3	36.9	26.6	35.5	25.8	33.3
Ignition loss	7.72	5.00	7.12	5.38	3.34	3.14	7.88	6.08	5.66	6.62	5.28	6.40	2.76
Total	[57.8]	[48.5]	[59.4]	[59.3]	[45.9]	[44.8]	[64.9]	[46.8]	[45.4]	[59.7]	[46.8]	[61.4]	[50.6]

	Idaho—Continued												
	66	67	68	69	70	71	72	73	74	75	76	77	78
	11P4-77	11P4-78	11P4-79	11P4-80	11P4-81	11P4-82	11P4-83	11P4-84	11P4-85	11P4-86	11P4-87	11P4-88	11P4-89
Acid insoluble	6.4	23.0	17.8	6.2	2.8	16.3	4.3	3.0	1.8	6.1	8.0	9.5	17.9
Al_2O_3	1.5	4.3	3.2	1.4	.86	3.5	.94	1.1	.56	.74	.92	.98	3.16
Fe_2O_3	.43	1.34	.60	.57	.33	1.19	.34	.34	.27	.30	.21	.31	1.36
P_2O_5	35.6	27.4	28.9	35.6	37.8	29.4	36.8	36.9	38.1	36.2	35.6	34.7	28.1
Ignition loss	2.32	3.12	6.66	2.94	2.62	4.58	2.40	3.34	3.32	2.86	2.64	2.56	14.16
Total	[46.2]	[59.2]	[57.2]	[46.7]	[44.4]	[55.0]	[44.8]	[44.7]	[44.0]	[46.2]	[47.4]	[48.0]	[64.7]

	Idaho—Continned												
	79	80	81	82	83	84	85	86	87	88	89	90	91
	11P4-90	11P4-43	11P4-91	11P4-92	11P4-65	11P4-66	11P4-67	11P4-68	11P6-4	11P6-5	11P6-6	11P6-7	11P6-11
SiO_3	------	0.46	6.3	6.6	23.0	16.8	6.8	[9]10.36	------	------	3.5	18.1	------
Insoluble	[10]10.6	2.62	------	------	------	------	------	------	[10]12.9	[10]24.3	------	------	[10]15.7
Al_2O_3	2.19	.97	1.5	2.4	11.5	4.3	1.1	1.90	2.29	4.35	.3	3.1	1.2
Fe_2O_3	1.06	.40	------	------	2.2	2.3	.9	[2].97	.73	1.52	[11].5	[11].9	.49
MgO	------	.35	------	------	------	------	------	.17	------	------	.2	.3	------
CaO	------	48.91	46.5	46.0	15.8	30.2	49.2	45.27	------	------	50.2	39.0	------
Na_2O	------	.97	------	------	------	------	------	.64	------	------	------	------	------
K_2O	------	.34	------	------	------	------	------	.46	------	------	------	------	------
H_2O+	------	1.34	------	------	------	------	------	------	------	------	------	------	------
H_2O-	------	1.02	------	------	------	------	------	------	------	------	------	------	------
TiO_3	------	None	------	------	------	.2	<.01	.09	------	------	------	------	------
P_2O_5	32.0	33.61	30.8	31.1	21.9	22.8	32.7	32.21	29.6	23.1	35.4	27.4	28.4
MnO	------	------	------	------	------	------	------	.005	------	------	------	------	------
CO_2	------	2.42	------	------	.6	.7	1.7	1.77	------	------	------	------	------
SO_3	------	2.16	------	------	[12].2	[13]1.2	[12].6	[12]1.43	------	------	------	------	------
F	------	.40	3.1	3.2	------	------	2.6	3.43	------	------	------	------	2.77
Cl	------	Trace	------	------	------	------	------	.03	------	------	------	------	------
V	------	------	.17	.19	[14].50	[14].49	[14].14	[15].15	------	------	------	------	------
Cr_2O_3	------	------	------	------	------	------	------	.13	------	------	------	------	------
MoO_3	------	------	------	------	<.01	<.01	<.01	[16]None	------	------	------	------	------
Organic C	------	([17])	------	------	3.1	8.5	.5	------	------	------	.1	1.3	------
Ignition loss	15.73	------	------	------	8.6	16.2	7.0	[18]1.88	9.16	10.72	[19]4.5	[19]5.0	8.92
Subtotal	------	95.97	88.37	89.49	------	------	103.26	100.90	------	------	------	------	57.48
Less O	------	.16	[8]1.31	[8]1.35	------	------	[8]1.09	[8]1.44	------	------	------	------	[8]1.17
Total	[61.6]	95.81	[87.1]	[20][88.1]	[87.4]	[103.7]	[102.2]	99.46	[54.7]	[64.0]	[94.7]	[95.1]	[56.3]

[1] SiO_3.

[2] Total iron or total Fe.

[3] Total water.

[4] 230°-500°C.

[5] Oil by distillation at about 500°C, distillate weighed.

[6] Radiometric determination by B.A. McCall.

[7] CO_2.

[8] Calculated from reported F.

[9] Total Si.

[10] Acid insoluble.

[11] Fe.

[12] S.

[13] Total sulfates; acid insoluble sulfide = 0.00 percent.

[14] V_2O_5.

[15] V_2O_3.

[16] Mo.

[17] Organic matter present, undetermined.

[18] Ignition loss, constant weight at 1,000° C, corrected for total CO_2 and for oxidation of pyritic sulfur, when present.

[19] At 1,000°C.

[20] Minor constitnents and CO_3 known to be present.

Spectrographic analyses

[C = 1-5 percent, D = 0.1-1 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent. For samples 44,46, elements looked for but not detected: Li,Ge,Rb,Nb,Ru,Rh,Pd,In,Sn,Te, Cs,Ce,Pr,Sm,Eu,Gd,Tb,Dy,Ho,Er,Tm,Lu,Hf,Ta,W,Re,Os,Ir,Pt,Au,Hg,Tl,Bi,Th; analysts, Charles Annell, Joseph Haffty; geochemical determinations of As,Sb,Se, by H.E. Crowe, J.E. Swick, R.R. Beins]

	44	46	89	90		44	46	89	90
Be	< 0.00005	< 0.00005	------	------	Se	0.001	0.0005	------	------
B	<.005	<.005	F	E	Sr	.1	.1	E	E
Na	------	------	D	C	Y	.1	.03	------	------
Sc	.003	.001	------	------	Zr	.003	.003	F	E
Ti	------	------	E	D	Mo	.01	.03	F	E
V	.03	.1	D	D	Ag	.003	.001	------	F
Cr	.1	.3	D	D	Cd	.01	.03	------	------
Mn	< .001	.003	E	E	Sb	.001	.001	------	------
Ni	.1	.03	E	E	Ba	.01	.01	E	E
Co	< .001	<.001	F	F	La	.03	.01	------	------
Cu	.01	.01	F	F	Nd	.03	< .006	------	------
Zn	.03	.03	------	E	Yb	.001	.0003	------	------
Ga	< .001	<.001	------	------	Pb	<.001	< .001	E	E
As	< .001	<.001	D	D					

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continned

40-43. Bear Lake County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. Sec. 31, T. 12 S., R. 45 E., Montpelier Canyon. (McKelvey and others, 1953a, p. 2, 50, 51, 52-57.) Phosphate rock. Trench sample. Index map, detailed measured section.

40. Sample FCA-149-47; 40.38-40.78 ft from top of member.
41. Sample FCA-148-47; 39.58-40.38 ft from top of member.
42. Sample FCA-66-47; 37.78-38.18 ft from top of member.
43. Sample FCA-197-47; 20.15-20.90 ft from top of member.

44-49. County, formation, and member as in samples 40-43. Sec. 8, T. 14 S., R. 43 E., Paris Canyon. (O'Malley and others, 1953, p. 2, 34-37.) Phosphate rock. Trench sample. Index map, detailed measured section.

44, 45. Sample 1846-DFD. Microphanite phosphorite, 149.8-150.9 ft from top of member. General mineralogy.

44. (Gulbrandsen, 1966, p. 770-773, table 1.)

46, 47. Sample 3160-WOM. Pellet phosphorite, 22.8-23.9 ft from top of member. General mineralogy.

46. (Gulbrandsen, 1966, p. 770-773, table 1.)

48. Sample 3162-WOM; 21.4-22.4 ft from top of member.
49. Sample 3171-WOM; 14.1-15.8 ft from top of member.

50-57. County, formation, and member as in samples 40-43. Sec. 21, T. 14 S., R. 43 E., Bloomington Canyon. (O'Malley and others, 1953, p. 2, 38-43.) Drill hole samples. Index map, detailed measured section.

50. Sample 947-RHT. Phosphate rock, argillaceous, 168.70-169.90 ft from top of member.
51. Sample 823-RMC. Phosphate rock, argillaceous, 21.7-22.7 ft from top of member.
52. Sample 821-RMC. Phosphate rock, 20.1-21.1 ft from top of member.
53. Sample 817-RMC. Phosphate rock, 16.3-17.2 ft from top of member.
54. Sample 816-RMC. Phosphate rock, 15.3-16.2 ft from top of member.
55. Sample 815-RMC. Phosphate rock, 14.4-15.2 ft from top of member.
56. Sample 812-RMC. Phosphate rock, 12.8-13.2 ft from top of member.
57. Sample 811-RMC. Phosphate rock, 11.8-12.8 ft from top of member.

58-77. County, formation, and member as in samples 40-43. SE¼ sec. 36, T. 14 S., R. 44 E., Dingle [railroad station]. (Sheldon and others, 1953, p. 2, 25-28.) Phosphate rock. Index map, detailed measured section. Samples 58-66, from tunnel; samples 67-77, trench samples. Samples 59, 64, 67, 68, 71, phosphate rock, argillaceous; sample 62, phosphatic mudstone and phosphate rock.

	Sample	Ft from top of member
58.	4097-RAS	32.2- 34.1
59.	4096-RAS	30.7- 32.2
60.	4095-RAS	28.6- 30.7
61.	4094-RAS	26.7- 28.6
62.	4093-RAS	25.9- 26.7
63.	4092-RAS	25.0- 25.9
64.	4091-RAS	24.0- 25.0
65.	4090-RAS	23.3- 24.0
66.	4087-RAS	20.8- 21.2
67.	4009-RAS	111.5-113.3
68.	4016-RAS	99.5-101.0
69.	4028-RAS	31.6- 33.2
70.	4029-RAS	30.5- 31.6
71.	4032-RAS	28.3- 29.0
72.	4034-RAS	26.0- 26.9
73.	4050-MAW	25.2- 26.0
74.	4051-MAW	24.0- 25.2
75.	4053-MAW	22.8-23.4
76.	4055-MAW	21.5-21.9
77.	4057-MAW	20.0-21.2

78, 79. County, formation, and member as in samples 40-43. Sec. 13, T. 15 S., R. 44 E., Hot Springs. (Sheldon and others, 1953, p. 2, 29, 30.) Trench sample. Index map, detailed measured section.

78. Sample 4593-HWP. Phosphate rock, argillaceous, 30.35-32.25 ft from top of member.
79. Sample 4595-HWP. Phosphate rock, 27.85-29.45 ft from top of member.

80. County, formation, and member as in samples 40-43. Tps. 10, 11 S., Rs. 44, 45 E., 8 miles east of Georgetown. Utah Fertilizer and Chemical Manufacture claim. Analyst, George Steiger. (Gale and Richards, 1910, p. 459, 465, 484, 487, 488, pl. 5; Clarke, 1915, p. 352; Kirkham, 1925, p. 317-319, 321, 324, 333.) Phosphate rock, dark-grayish-brown, oolitic; averages 6 ft thick. Bulk density about 2.90-2.95. Tonnage estimated. Index and geologic maps, geologic sections. Use: Fertilizer.

81, 82. County, formation, and member as in samples 40-43. [T. 13 S., R. 44 E.], near town of Montpelier. San Francisco Chemical Co. Phosphate rock. General mineralogy. Beneficiation tests. Possible use: Fertilizer, source of elemental phosphorus.

81. (Stickney and Wells, 1955, p. 1-3, 4.)

82. (Hall and Banning, 1958, p. 1-4, 9-13, 44.) Possible use: Source of vanadium, chrome, artificial fluorspar or synthetic cryolite.

83-85. County, formation, and member as in samples 40-43. [T. 14 S., R. 43 E.] (Ravitz and others, 1949, p. 308, 309, 320.) Use: Source of vanadium, fertilizer.

83, 84. Paris and Bloomington Canyons.

83. Phosphatic shale.

84. Oolite rock.

85. Bloomington Canyon. Phosphate rock.

86. County, formation, and member as in samples 40-43. [T. 14 S., R. 43 E.], near Paris. Sample 550. (Jacob and others, 1933, p. 16, 22, 28.) Phosphate rock. Tonnage estimated.

87, 88. Bingham County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. SE¼NW¼ sec. 31, T. 1 S., R. 39 E., Wolverine Canyon. (Smart and others, 1954, p. 2, 4, 8, 9, 10.) Trench sample. Index map, detailed measured section.

87. Sample 4800-ERC. Phosphate rock, 51.0-52.0 ft from top of member.
88. Sample 4818-RAG. Phosphate rock, argillaceous, 31.4-33.2 ft from top of member.

89, 90. County, formation, and member as in samples 87,88. Secs. 2,11,14,15,22, T. 4 S., R. 37 E., east of Fort Hall. Gay mine. Collector, A.L. Service. (Mabie and Hess, 1964, p. 2, 3, 5, 7, 8, 9, 12, 13, 48, 58, 78-80; Service and Popoff, 1964, p. 6, 11, 12, 28, 31-33, 63.) Phosphorite, light-brown, nonfriable. Mineralogy. Tonnage estimated. Index map; compositional classification triangle, cumulative curves of pellet and gangue size. Physical properties. Possible use: Agricultural, chemical, metallurgical. [For another analysis from same measured section see sample 109 group B.]

89. Field No. ALS-14, medium-grained; 3.2 ft thick.
90. Field No. ALS-12, fine-grained, argillaceous, siliceous; 12.0 ft thick.

91. County, formation, and member as in samples 87, 88. Sec. 22, T. 4 S., R. 37 E. Fort Hall Indian Reservation, Simplot mine. Sample 2139-WOM. (O'Malley and others, 1953, p. 2, 5, 6-8.) Phosphate rock, 69.4-69.9 ft from top of member. Index map, detailed measured section.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	92	93	94	95	96	97	98	99	100	101	102	103	104
	11P6-13		11P6-14		11P6-12	11P6-15	11P6-16	11P6-18	11P6-19	11P6-21	11P6-20	11P6-25	11P6-24
SiO_2	9.0	[1]7.7	10.9	[1]9.9	[1]13.4	[1]24.9	[1]18.6	3.75	4.18	5.37	2.29	13.57	20.25
Al_2O_2	1.4	1.3	1.2	------	2.2	3.0	3.3	.87	1.11	1.26	.54	------	------
Fe_2O_2	[2].66	.67	[2]1.4	------	.77	1.1	1.2	.39	------	------	------	------	------
MgO	.47	------	.68	------	------	------	------	.27	.49	.29	.26	.62	1.02
CaO	46.0	------	45.4	------	------	------	------	49.79	47.13	46.76	49.40	43.24	37.79
Na_2O	.50	------	.46	------	------	------	------	.66	------	------	------	------	------
K_2O	.44	------	.36	------	------	------	------	.15	------	------	------	------	------
H_2O+	[3]2.1	------	[3]1.6	------	------	------	------	------	------	------	------	------	------
H_2O-	.6	------	.3	------	------	------	------	------	------	------	------	------	------
TiO_2	.14	------	.12	------	------	------	------	------	------	------	------	------	------
P_2O_5	32.0	32.4	31.8	32.0	31.6	26.3	28.1	[4]32.22	[4]32.40	[4]33.20	[4]34.21	[4]30.02	[4]25.12
MnO	------	------	------	------	------	------	------	Trace	------	------	------	------	------
CO_2	1.92	[5]5.76	2.83	------	[5]4.36	[5]5.46	[5]5.78	5.93	3.77	2.28	3.13	2.16	3.05
SO_3	1.52	------	1.10	------	------	------	------	1.64	------	------	------	------	------
Cl	.04	------	------	------	------	------	------	------	------	------	------	------	------
F	2.95	------	2.98	------	------	------	------	3.03	------	------	------	------	------
V	------	------	------	------	------	------	------	.03	.04	.04	.15	------	------
Cr	------	------	------	------	------	------	------	.04	.07	.09	.05	------	------
Organic matter	[6]2.8	------	[6]1.9	------	------	------	------	[4]1.90	[4]4.35	[4]3.62	[4]3.18	[4]3.03	[4]4.39
Oil	[7].13	------	[7].10	------	------	------	------	------	------	------	------	------	------
eU	[8].008	------	[8].005	------	------	------	------	------	------	------	------	------	------
Subtotal	102.68	------	103.14	------	------	------	------	100.67	------	------	------	------	------
Less O	[4]1.24		[4]1.25	------	------	------	------	[4]1.28	------	------	------	------	------
Total	[101.4]	[47.8]	[101.9]	[41.9]	[52.3]	[60.8]	[57.0]	[99.39]	[93.54]	[92.91]	[93.21]	[92.64]	[91.62]

	Idaho—Continued												
	105	106	107	108	109	110	111	112	113	114	115	116	117
	11P6-23	11P6-10	11P6-9	11P6-8	11P6-17	11P6-22	11P10-15		11P10-20		11P10-10		11P10-11
SiO_2	14.66	6.42	5.62	5.57	5.8	4.03	7.6	[1]6.7	11.0	[1]20.7	6.5	[1]4.6	[1]11.9
Al_2O_3	------	2.48	1.05	1.91	1.2	------	1.2	5.72	1.1	------	1.1	1.14	1.80
Fe_2O_3	------	------	------	------	.96	------	[2].67	.75	[2].96	------	[2].72	.84	1.28
MgO	.59	------	------	------	------	.19	.62	------	.25	------	.17	------	------
CaO	41.70	49.17	49.88	49.64	46.9	51.36	45.8	------	46.0	------	47.8	------	------
Na_2O	------	------	------	------	------	------	1.0	------	.80	------	1.0	------	------
K_2O	------	------	------	------	------	------	.32	------	.29	------	.25	------	------
H_2O+	------	------	------	------	------	------	[3]2.1	------	[3]1.3	------	[3]1.8	------	------
H_2O-	------	------	------	------	------	------	.7	------	.3	------	.3	------	------
TiO_2	------	------	------	------	------	------	.15	------	.10	------	.10	------	------
P_2O_5	[4]29.11	35.33	35.24	35.65	32.9	[4]28.67	29.2	28.9	31.2	30.8	33.0	32.8	31.5
CO_2	2.02	[5]4.95	[5]6.13	[5]5.80	------	10.30	4.34	[5]9.02	2.90	------	1.10	[5]4.61	[5]11.52
F	------	3.15	3.00	3.04	3.3	------	3.53	------	3.28	------	4.15	------	------
V	------	------	------	------	.12	------	------	------	------	------	------	------	------
Cr	------	------	------	------	------	.15	------	------	------	------	------	------	------
Organic matter	[4]4.15	------	------	------	[4]3.4	------	[6]1.3	------	[6].9	------	[8]2.2	------	------
Oil	------	------	------	------	------	------	[7].15	------	[7].05	------	[7].10	------	------
eU	------	------	------	------	------	------	[8].011	.012	[8].009	.008	[8].012	.013	.007
Subtotal	------	101.50	100.92	101.61	94.58	------	98.69	------	100.44	------	100.30	------	------
Less O	------	[4]1.33	[4]1.26	[4]1.28	[4]1.4	------	[4]1.49	------	[4]1.38	------	[4]1.75	------	------
Total	[92.23]	100.17	99.66	100.33	[93.2]	[94.70]	[97.2]	[51.1]	[99.1]	[51.5]	[98.6]	[44.0]	[58.0]

	Idaho—Continued												
	118	119	120	121	122	123	124	125	126	127	128	129	130
	11P10-12	11P10-13		11P10-14	11P10-16	11P10-17	11P10-18	11P10-19	11P10-21	11P10-22	11P10-23	11P10-24	11P45-34
SiO_2	[1]4.3	2.5	[1]2.4	[1]3.5	[1]5.8	[1]6.9	[1]13.5	[1]15.4	[9]21.6	[9]19.3	[9]8.5	[9]24.5	13.82
Al_2O_3	.56	.32	.30	.72	.88	.57	1.94	.82	6.3	4.4	5.4	7.2	.68
Fe_2O_3	.30	[2].27	.25	.51	.46	.68	.90	.70	1.1	2.1	2.0	2.4	------
MgO	------	.08	------	------	------	------	------	------	------	------	------	------	.11
CaO	------	52.5	------	------	------	------	------	------	------	------	------	------	43.75
Na_2O	------	.86	------	------	------	------	------	------	------	------	------	------	------
K_2O	------	.09	------	------	------	------	------	------	------	------	------	------	------
H_2O+	------	[3]1.9	------	------	------	------	------	------	------	------	------	------	------
H_2O-	------	.4	------	------	------	------	------	------	------	------	------	------	------
TiO_2	------	.02	------	------	------	------	------	------	------	------	------	------	------
P_2O_5	34.8	35.2	35.6	34.2	35.8	35.4	29.5	31.1	24.1	18.0	32.3	18.6	[4]31.56
CO_2	[5]11.04	2.76	[5]7.89	[5]8.65	[5]9.07	[5]7.72	[5]9.41	[5]10.33	------	------	------	------	2.09
F	------	4.00	------	------	------	------	------	------	------	------	------	------	------
V_2O_3	------	------	------	------	------	------	------	------	.04	.41	.03	.10	[10].06
Cr	------	------	------	------	------	------	------	------	------	------	------	------	.03

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	118	119	120	121	122	123	124	125	126	127	128	129	130
	11P10-12	11P10-13		11P10-14	11P10-16	11P10-17	11P10-18	11P10-19	11P10-21	11P10-22	11P10-23	11P10-24	11P45-34
Organic matter	------	[6]1.2	------	------	------	------	------	------	7.6	24.9	2.5	15.0	[4]3.94
Oil	------	[7].05	------	------	------	------	------	------	------	------	------	------	------
eU	.004	[8].003	.004	.004	.002	.009	.009	.008	------	------	------	------	------
Subtotal	------	102.15	------	------	------	------	------	------	------	------	------	------	------
Less O	------	[4]1.68	------	------	------	------	------	------	------	------	------	------	------
Total	[51.0]	[11][100.5]	[46.4]	[47.6]	[52.0]	[51.3]	[55.3]	[58.4]	[60.7]	[69.1]	[50.7]	[67.8]	[96.04]

[1] Acid insoluble.
[2] Total iron.
[3] Total water.
[4] Calculated from reported P, C, or F.
[5] Ignition loss.
[6] 230°-500°C.
[7] Oil by distillation at about 500°C, distillate weighed.
[8] Radiometric determination by B.A. McCall.
[9] Calculated; insoluble less organic matter.
[10] V.
[11] Th = 8 ppm.

Spectrographic analyses

[Elements looked for but not detected: Li, Ge, Rb, Nb, Ru, Rh, Pd, In, Sn, Te, Cs, Ce, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Bi]

	92	94	111	113	115	119		92	94	111	113	115	119
Be	< .00005	< 0.0001	< 0.00005	< 0.00005	< 0.00005	0.0001	Sr	0.1	0.1	0.1	0.03	0.1	0.1
B	< .005	<.005	<.005	<.005	<.005	<.005	Y	.01	.03	.1	.1	.1	.1
Sc	< .0005	<.0005	.001	.001	.001	.003	Zr	.003	.003	.003	.003	.003	.001
V	.03	.03	.03	.01	.03	.001	Mo	.01	.003	.01	.003	.01	<.0005
Cr	.1	.1	.1	.1	.1	.1	Ag	.001	.001	.001	.0003	.001	.0003
Mn	.001	.01	.003	.003	.003	.001	Cd	.01	.01	.01	<.005	.01	<.005
Ni	.01	.01	.03	.003	.01	.003	Sb	.0005	.0005	.0007	.0005	.001	.0003
Co	<.001	<.001	<.001	<.001	<.001	<.001	Ba	.01	.01	.01	.01	.03	.01
Cu	.003	.01	.01	.003	.01	.0003	La	.01	.01	.03	.03	.03	.1
Zn	.03	.03	.03	.01	.01	< .008	Nd	< .006	.03	.03	.03	.03	.03
Ga	< .001	<.001	<.001	<.001	<.001	< .001	Yb	.0003	.001	.003	.003	.001	.003
As	.002	.002	.002	.003	.02	.004	Pb	< .001	<.001	<.001	<.001	<.001	<.001
Se	.0003	.0003	.005	.0007	.003	.001							

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

92-98. Bingham County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. Sec. 22, T. 4 S., R. 37 E., Fort Hall Indian Reservation. Simplot mine. (O'Malley and others, 1953, p. 2, 6, 7, 8; samples 92, 94, Gulbrandsen, 1966, p. 770-773, table 1.) Phosphate rock. Index map, detailed measured section.

92-95. Pellet phosphorite; general mineralogy.

92, 93. Sample 2144-WOM, 63.1-63.8 ft from top of member.

94, 95. Sample 2157-WOM, 48.6-49.6 ft from top of member.

96. Sample 2659-WOM, 35.9-36.6 ft from top of member.

97. Sample 2663-WOM, 31.5-32.8 ft from top of member.

98. Sample 2679-WOM, 18.2-18.9 ft from top of member.

99-105. County, formation, and member as in samples 92-98. [T. 4 S., R. 37 E., east of Fort Hall.] Gay mine. (Emigh, 1958, p. 21, 22, 23, 24-27, 29, 30, figs. 1, 8.) General: Phosphate pellets in groundmass of calcite, dolomite, and detrital minerals; fresh rock, black, dense; weathered rock, brown, porous; fossiliferous. Mineralogy, thin-section description. Index map. Surface sample.

99. Sample S128, 1 ft above bottom of bed. Photomicrograph.

100. Sample S131, 3 ft above bottom of bed.

101. Sample S133, 5 ft above bottom of bed.

102. Sample S132, 5 ft above bottom of bed.

103. Sample S129a. Weathered sample, light-brown; 14 ft above bottom of bed.

104. Sample S129b. Unweathered sample, dark-brown; 14 ft above bottom of bed.

105. Sample S130, 20 ft above bottom of bed.

106-108. County, formation, member, and locality as in samples 99-105. (Martin, 1958, p. 1047, 1048.) Phosphate oolite. Mineralogy.

109. County, formation, member, and locality as in samples 92-98. Simplot Fertilizer Co. (Hall and Banning, 1958, p. 1-9, 13-19, 44.) Phosphate rock. General mineralogy. Beneficiation tests. Possible use: Fertilizer, source of phosphorus, vanadium, chrome, artificial fluorspar or synthetic cryolite.

110. County, formation, and member as in samples 92-98. [T. 4 S., R. 40 E.] Blackfoot property. Sample S56. (Emigh, 1958, p. 15-20.) General: Phosphate rock, black or brown, dense, fossiliferous; 3-8 in. thick. Surface sample, phosphate pellets. Mineralogy, thin-section description.

Idaho—Continued

111-125. Bonneville County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. (Smart and others, 1954, p. 2, 5, 6, 7, 11-13; Sheldon, 1963, p. 52, 57, 65-73, 75-81, 92-98, 154, 165-173, 174, 179, pls. 4, 6-9, 12; samples 111, 113, 115, 119, Gulbrandsen, 1966, p. 770-773, table 1.) Mineralogy. Channel sample. Tonnage estimated. Index and geologic maps, detailed measured section, correlated columnar sections.

111-114. NW¼ sec. 17, T. 1 N., R. 43 E., north side of Fall Creek.

111, 112. Sample 5310-FDF. Phosphorite, brownish-black, calcareous, coarsely pelletal to finely nodular, fossiliferous; 38.6-41.0 ft from top of member.

113, 114. Sample 5337-RGW. Phosphorite, dark-gray, sandy, oolitic, fossiliferous; 1.0-2.0 ft from top of member.

115-125. NE¼ sec. 31, T. 1 S., R. 45 E., near Bear Creek. Phosphorite. Fence diagram.

	Sample	Ft from top of member
115, 116.	6514-RPS	52.5-53.5
117.	6558-MAW	12.4-12.7
118.	6559-MAW	11.0-12.4
119, 120.	6561-MAW	8.5- 9.8
121.	6563-MAW	5.8- 6.9
122.	6564-MAW	3.9- 5.8
123.	6565-MAW	2.9- 3.9
124.	6566-MAW	.6- 2.9
125.	6567-MAW	.0- .6

126-128. County, formation, and member as in samples 111-125. NE¼ sec. 19, T. 1 N., R. 46 E., on ridge between Austin Creek and Dry Canyon. Analyst, F. L. Schmehl. (Gardner, 1944, p. 3, 13, 20, 21, 22, pls. 1, 4.) Channel sample. Index and geologic maps, geologic section, detailed measured section, correlated columnar sections. Possible use: Fertilizer, source of vanadium.

126. Sample H-2. Phosphate rock, dark-gray to black; 2.2 ft thick.

127. Sample H-11. Phosphate rock, black, thin-bedded; contains 6 in.-bed of pellets; 2.3 ft thick.

128. Sample H-16. Phosphate rock, light- to dark-gray; 1.5 ft thick.

129. Information [except locality] as in samples 126-128. W½ sec. 27, T. 2 N., R. 45 E., Thompson Peak. Sample G-2. Phosphate rock, black; contains pellets; 2.0 ft thick.

130. Information [except locality] as in samples 99-105. Caribou County. [T. 5 S., R. 39 E.] Chesterfield property. Sample S126.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	131	132	133	134	135	136	137	138	139	140	141	142	143
	11P45-35	11P15-11	11P15-12	11P15-13	11P15-14	11P15-15	11P15-16	11P15-17	11P15-18	11P15-19	11P15-20	11P15-21	11P15-22
Acid insoluble	[1]2.01	23.4	7.5	18.5	18.2	15.8	2.6	18.9	16.7	9.0	2.3	10.3	4.3
Al_2O_3	.46	3.06	4.36	1.44	2.2	2.3	.59	2.2	2.6	2.0	.76	1.2	.75
Fe_2O_3	------	1.10	.90	1.00	1.32	1.03	.51	1.01	1.52	.80	.34	.59	.50
MgO	.12	------	------	------	------	------	------	------	------	------	------	------	------
CaO	50.79	------	------	------	------	------	------	------	------	------	------	------	------
P_2O_5	[2]36.11	26.6	34.5	29.9	27.7	27.6	34.9	26.1	28.2	32.0	37.2	34.0	36.6
V	.12	------	------	------	------	------	------	------	------	------	------	------	------
Cr	.04	------	------	------	------	------	------	------	------	------	------	------	------
Organic matter	[2]2.80	------	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	[3]2.16	3.75	2.65	2.35	6.93	9.72	7.81	10.05	8.27	7.48	3.26	2.20	3.20
Total	[94.61]	[57.9]	[49.9]	[53.2]	[56.4]	[56.4]	[46.4]	[58.3]	[57.3]	[51.3]	[43.9]	[48.3]	[45.4]

	Idaho—Continued												
	144	145	146	147	148	149	150	151	152	153	154	155	156
	11P15-23	11P15-24	11P15-25		11P15-26	11P15-27	11P15-28	11P15-29	11P15-30	11P15-31	11P15-32		11P15-33
Acid insoluble	8.7	4.5	[1]4.6	3.5	15.8	20.9	18.3	20.6	19.2	5.5	[1]11.1	10.7	5.0
Al_2O_3	.82	.54	.81	.78	2.2	3.0	2.3	2.6	2.8	1.0	1.7	------	.76
Fe_2O_3	.70	.59	[4].38	.47	1.13	.93	1.19	.96	.67	.37	[4]2.6	------	.50
MgO	------	------	.17	------	------	------	------	------	------	------	.11	------	------
CaO	------	------	49.1	------	------	------	------	------	------	------	44.0	------	------
Na_2O	------	------	.68	------	------	------	------	------	------	------	.56	------	------
K_2O	------	------	.22	------	------	------	------	------	------	------	.37	------	------
H_2O+	------	------	[5]2.1	------	------	------	------	------	------	------	[5]2.1	------	------
H_2O-	------	------	.5	------	------	------	------	------	------	------	.6	------	------
TiO_2	------	------	.11	------	------	------	------	------	------	------	.16	------	------
P_2O_5	35.2	36.8	34.3	34.0	29.2	26.1	27.5	26.8	27.2	33.6	31.4	32.0	34.80
F	------	------	3.45	------	------	------	------	------	------	------	3.50	------	------
Organic matter	------	------	[6]3.0	------	------	------	------	------	------	------	[6]2.1	------	------
Oil	------	------	[7].13	------	------	------	------	------	------	------	[7].10	------	------
eU	------	------	[8].011	------	------	------	------	------	------	------	[8].006	------	------
Ignition loss	2.33	2.69	[3].86	6.15	6.50	7.85	7.72	7.65	7.53	7.57	[3].87	------	5.88
Subtotal	------	------	100.42	------	------	------	------	------	------	------	101.28	------	------
Less O	------	------	[2]1.45	------	------	------	------	------	------	------	[2]1.47	------	------
Total	[47.8]	[45.1]	[99.0]	[44.9]	[54.8]	[58.8]	[57.0]	[58.6]	[57.4]	[48.0]	[99.8]	[42.7]	[46.9]

	Idaho—Continued												
	157	158	159	160	161	162	163	164	165	166	167	168	169
	11P15-34	11P15-35	11P15-36	11P15-37	11P15-38	11P15-39		11P15-40	11P15-41		11P15-42	11P15-43	11P15-44
Acid insoluble	3.4	2.7	12.3	20.6	21.3	[1]8.1	5.7	20.4	[1]14.2	15.5	24.0	21.0	9.7
Al_2O_3	.66	.76	.65	1.2	4.5	1.6	1.8	3.7	3.8	3.6	4.1	3.9	2.7
Fe_2O_3	.35	.57	.31	1.56	1.66	[4].68	.68	1.47	[4]2.0	1.97	1.3	1.2	.60
MgO	------	------	------	------	------	.15	------	------	.20	------	------	------	------
CaO	------	------	------	------	------	47.3	------	------	40.7	------	------	------	------
Na_2O	------	------	------	------	------	.33	------	------	.58	------	------	------	------
K_2O	------	------	------	------	------	.54	------	------	.80	------	------	------	------
H_2O+	------	------	------	------	------	[5]1.8	------	------	[5]2.9	------	------	------	------
H_2O-	------	------	------	------	------	.4	------	------	.8	------	------	------	------
TiO_2	------	------	------	------	------	.14	------	------	.20	------	------	------	------
P_2O_5	36.00	36.00	34.00	28.40	27.0	34.7	33.7	26.3	29.0	28.5	26.5	25.2	31.5
SO_3	------	------	------	------	------	.75	------	------	------	------	------	------	------
Cl	------	------	------	------	------	.03	------	------	------	------	------	------	------
F	------	------	------	------	------	3.30	------	------	2.88	------	------	------	------
Organic matter	------	------	------	------	------	[6]1.7	------	------	[6]1.9	------	------	------	------
Oil	------	------	------	------	------	[7].15	------	------	[7].10	------	------	------	------
eU	------	------	------	------	------	[8].012	------	------	[8].009	------	------	------	------
Ignition loss	7.30	5.14	2.15	3.92	5.36	[3]1.49	3.84	7.32	[3].72	5.12	9.02	9.60	7.86
Subtotal	------	------	------	------	------	103.17	------	------	100.79	------	------	------	------
Less O	------	------	------	------	------	[2]1.39	------	------	[2]1.21	------	------	------	------
Total	[47.7]	[45.2]	[49.4]	[55.7]	[59.8]	[101.8]	[45.7]	[59.2]	[99.6]	[54.7]	[64.9]	[60.9]	[52.4]

[1] SiO_2.

[2] Calculated from reported P, C or F.

[3] CO_2.

[4] Total iron.

[5] Total water.

[6] 230°-500°C.

[7] Oil by distillation at about 500°C, distillate weighed.

[8] Radiometric determination, B.A. McCall.

Spectrographic analyses

[Elements looked for but not detected, samples 146,154,162,165: Li,Ge,Rb,Nb,Ru,Rh,Pd,Sn,Te,Cs,Ce,Pr,Sm,Eu,Gd,Tb,Dy,Ho,Er,Tm,Lu,Hf,Ta,W,Re,Os,Ir,Pt,Au,Hg,Tl, Bi,Th; analysts, Charles Annell, Joseph Haffty; geochemical determinations of As,Sb,Se, by H.E. Crowe, J.E. Swick, R.R. Beins. Elements looked for but not detected, samples 161,163,164,166-169: Li,K,Rb,Nb,Sn,Te,Cs,Pr,Sm,Eu,Gd,Tb,Dy,Ho,Er,Tm,Lu,Hf,Ta,W,Pt,Au,Tl,Bi,Th; D = 0.1-1 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent, G = < 0.001 percent, ND = not detected]

	146	154	161	162	163	164	165	166	167	168	169
Be	< 0.00005	< 0.00005	ND	0.0003	ND	ND	< 0.00005	ND	ND	ND	ND
B	<.005	<.005	ND	<.005	ND	ND	<.005	ND	ND	ND	ND
Na	------	------	D	------	D	D	------	D	D	D	D
Mg	------	------	E	------	E	E	------	E	E	E	E
Sc	<.0005	<.001	ND	<.0005	ND	ND	.001	ND	ND	ND	ND
Ti	------	------	E	------	E	E	------	E	E	E	F
V	.1	.01	D	.1	D	D	.01	E	D	D	D
Cr	.1	.1	D	.1	D	D	.1	D	D	D	D
Mn	.001	.01	D	.003	E	D	.03	D	E	E	E
Ni	.01	.03	E	.01	E	E	.03	E	E	E	E
Co	<.001	<.001	ND	<.001	ND	ND	<.001	ND	ND	ND	ND
Cu	.01	.01	F	.01	F	E	.01	F	E	E	F
Zn	.01	.01	E	.03	E	E	.03	E	E	E	ND
Ga	<.001	<.001	ND	<.001	F	F	.001	F	F	F	ND
As	.001	.005	ND	.002	ND	ND	.005	ND	ND	ND	ND
Se	.007	.002	------	.001	------	------	.004	------	------	------	------
Sr	.1	.1	D	.1	D	D	.1	D	D	D	D
Y	.03	.03	E	.03	E	E	.03	E	E	E	E
Zr	.003	.003	F	.003	F	E	.003	F	F	F	F
Mo	.003	.01	F	<.0005	F	F	.003	F	F	F	F
Ag	.0003	.0003	G	.001	G	G	.003	G	G	G	G
Cd	.03	<.005	F	.01	E	E	<.005	ND	E	E	F
In	ND	ND	G	ND	ND	G	ND	G	G	G	ND
Sb	.0005	.0007	ND	.0005	ND	ND	.001	ND	ND	ND	ND
Ba	.01	.01	F	.01	F	F	.01	ND	F	F	F
La	.01	.03	E	.01	F	E	.03	E	ND	ND	E
Nd	<.006	.03	ND	<.006	ND	ND	.01	ND	ND	ND	ND
Yb	.0003	.0003	G	.0003	G	F	.001	G	G	G	G
Pb	<.001	<.001	F	<.001	F	E	<.001	F	E	E	ND

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

131. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. [T. 5 S., R. 39 E.] Chesterfield property. Sample S127. (Emigh, 1958, p. 21, 22, 24-26.) General: Phosphate pellets in groundmass of calcite, dolomite, and detrital minerals; fresh rock, black, dense; weathered rock, brown, porous, soft; fossiliferous. Mineralogy, thin-section description. Index map. Sample 2 ft below top of bed.

132-134. County, formation, and member as in sample 131. Sec. 20, T. 5 S., R. 41 E., Reservoir Mountain. (Davidson and others, 1953, p. 2, 4, 5-7, 8.) Phosphate rock. Trench sample. Index map, detailed measured section.
132. Sample 4732-MET, 167.7-169.3 ft from top of member.
133. Sample 4736-MET, 160.8-161.8 ft from top of member.
134. Sample 4720-JDW, 10.1-10.6 ft from top of member.

135-145. County, formation, and member as in sample 131. Sec. 34, T. 5 S., R. 43 E., Gravel Creek Divide. (Davidson and others, 1953, p. 2, 4, 16-18.) Phosphate rock. Trench sample. Index map, detailed measured section.
135. Sample 5881-MAW, 100.5-101.2 ft from top of member.
136. Sample 5827-RGW, 85.8-87.4 ft from top of member.
137. Sample 5828-RGW, 85.0-85.8 ft from top of member.
138. Sample 5804-HWP, 65.4-66.4 ft from top of member.
139. Sample 5812-HWP, 26.1-27.6 ft from top of member.
140. Sample 5813-HWP, 24.1-26.1 ft from top of member.
141. Sample 5814-HWP, 23.1-24.1 ft from top of member.
142. Sample 5815-HWP, 21.8-23.1 ft from top of member.
143. Sample 5816-HWP, 20.8-21.8 ft from top of member.
144. Sample 5817-HWP, 20.0-20.8 ft from top of member.
145. Sample 5818-HWP, 18.9-20.0 ft from top of member.

146-160. County, formation, and member as in sample 131. SE¼ sec. 10, T. 6 S., R. 42 E., town of Henry. (Davidson and others, 1953, p. 2, 4, 20-23; samples 146, 154, Gulbrandsen, 1966, p. 770-773, table 1.) Phosphate rock. Trench sample. Index map, detailed measured section.

Idaho—Continned

146, 147. Sample 4252-RAS, 193.2-195.0 ft from top of member. General mineralogy.
148. Sample 4109-MET, 187.2-188.5 ft from top of member.
149. Sample 4113-MET, 179.4-180.9 ft from top of member.
150. Sample 4114-MET, 177.2-179.4 ft from top of member.
151. Sample 4652-JDW, 171.1-173.1 ft from top of member.
152. Sample 4654-JDW, 165.3-168.9 ft from top of member.
153. Sample 4655-JDW, 164.4-165.3 ft from top of member.
154, 155. Sample 4263-RAS, 100.3-101.0 ft from top of member. General mineralogy.
156. Sample 4265-RAS, 38.6-40.5 ft from top of member.
157. Sample 4267-RAS, 37.3-37.9 ft from top of member.
158. Sample 4268-RAS. Phosphate rock, contains carbonate rock lenses; 36.1-37.3 ft from top of member.
159. Sample 4269-RAS, 35.3-36.1 ft from top of member.
160. Sample 4272-RAS, 30.9-31.6 ft from top of member.

161-169. County, formation, and member as in sample 131. Sec. 24, T. 6 S., R. 42 E., North Wooley Range. (McKelvey and others, 1953a, p. 2, 5-7, 8, 9; samples 162, 165, Gulbrandsen, 1966, p. 770-773, table 1.) Phosphate rock. Trench sample. Index map, detailed measured section.
161. Sample 1299-WOM. Phosphate rock, argillaceous, 153.45-153.75 ft from top of member.
162, 163. Sample 1312-RAH, 147.25-149.05 ft from top of member. General mineralogy.
164. Sample 1242-CEW, 124.95-126.45 ft from top of member.
165, 166. Sample 1243-CEW, 122.75-124.95 ft from top of member. General mineralogy.
167. Sample 1211-CEW. Phosphate rock and phosphatic mudstone, 37.05-38.55 ft from top of member.
168. Sample 1212-CEW. Phosphate rock, argillaceous, fossiliferous; 33.5-37.05 ft from top of member.
169. Sample 1304-WOM. Phosphate rock, fossiliferous, 28.8-33.5 ft from top of member.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses— Continued

	Idaho—Continued												
	170	171	172	173	174	175	176	177	178	179	180	181	182
	11P15-45	11P15-46	11P15-47	11P15-48	11P15-49	11P15-50	11P15-51	11P15-52	11P15-53	11P15-54	11P15-55	11P15-56	11P15-57
Acid insoluble	4.4	16.8	11.6	16.2	7.6	5.7	5.6	16.8	5.9	21.5	18.2	24.9	10.9
Al_2O_3	.76	3.3	2.2	2.12	1.27	1.01	1.06	2.74	.96	5.4	3.8	4.4	2.8
Fe_2O_3	.37	.96	.85	1.14	.76	.49	.68	1.28	.46	2.2	1.5	1.5	1.0
P_2O_5	36.3	29.4	32.2	29.9	34.4	35.4	34.5	29.3	35.7	25.6	28.3	23.1	31.7
Ignition loss	4.80	5.22	4.64	5.50	4.10	3.85	5.45	4.70	3.57	5.88	4.80	11.08	6.10
Total	[46.6]	[55.7]	[51.5]	[54.9]	[48.1]	[46.4]	[47.3]	[54.8]	[46.6]	[60.6]	[56.6]	[65.0]	[52.5]

	Idaho—Continued												
	183	184	185	186	187	188	189	190	191	192	193	194	195
	11P15-58	11P15-59	11P15-60	11P15-61	11P45-33	11P15-62	11P15-63	11P15-64	11P15-65	11P15-66	11P15-67	11P15-68	11P15-69
Acid insoluble	2.1	9.5	3.3	2.0	[1]3.49	18.5	8.0	5.0	16.3	3.7	19.7	22.7	19.9
Al_2O_3	.78	1.8	.74	.37	.71	4.7	2.1	1.7	4.4	1.5	3.1	3.7	3.1
Fe_2O_3	.54	.85	.49	.49	------	1.02	.84	.64	1.72	.64	1.1	.56	1.6
MgO	------	------	------	------	.33	------	------	------	------	------	------	------	------
CaO	------	------	------	------	48.33	------	------	------	------	------	------	------	------
P_2O_5	35.6	32.1	35.4	36.4	[2]33.89	26.8	33.3	34.6	28.8	36.2	28.5	26.8	28.5
V	------	------	------	------	.20	------	------	------	------	------	------	------	------
Cr	------	------	------	------	.05	------	------	------	------	------	------	------	------
Organic matter	------	------	------	------	[2] 4.42	------	------	------	------	------	------	------	------
Ignition loss	6.31	5.81	5.68	5.22	[3] 2.13	7.72	5.76	5.94	6.64	5.66	4.70	6.28	4.38
Total	[45.3]	[50.1]	[45.6]	[44.5]	[93.55]	[58.7]	[50.0]	[47.9]	[57.9]	[47.7]	[57.1]	[60.0]	[57.5]

	Idaho—Continued												
	196	197	198	199	200	201	202	203	204	205	206	207	208
	11P15-70	11P15-71	11P15-72	11P15-73	11P15-74	11P15-75	11P15-76	11P15-77	11P15-78	11P15-79	11P15-80	11P15-81	11P15-82
Acid insoluble	14.7	16.1	10.1	5.1	5.9	13.0	20.7	12.1	12.7	18.1	17.4	11.3	3.7
Al_2O_3	1.4	2.5	1.2	.98	1.4	2.0	3.5	2.7	2.4	3.1	3.2	2.8	1.1
Fe_2O_3	.85	1.1	.44	.82	.56	.92	1.25	.98	1.15	1.77	1.14	1.05	.36
P_2O_5	31.7	30.2	34.5	32.4	34.5	31.3	27.4	31.3	31.4	27.3	27.4	29.9	36.2
Ignition loss	3.18	4.42	2.16	19.80	8.88	6.62	6.60	9.36	5.82	8.94	9.80	11.32	6.50
Total	[51.8]	[54.3]	[48.4]	[59.1]	[51.2]	[53.8]	[59.4]	[56.4]	[53.5]	[59.2]	[58.9]	[56.4]	[47.9]

	Idaho—Continued												
	209	210	211	212	213	214	215	216	217	218	219	220	221
	11P15-83	11P15-84	11P15-85	11P15-86	11P15-87	11P15-88	11P15-89	11P15-90	11P15-92	11P15-93	11P15-94	11P15-95	11P15-96
Acid insoluble	14.7	24.6	5.1	13.0	15.4	20.5	20.1	21.1	12.0	20.5	2.0	2.8	16.6
Al_2O_3	2.6	1.9	1.1	2.2	3.6	3.1	3.4	3.8	2.6	2.6	.51	1.9	2.6
Fe_2O_3	.48	.48	.38	.63	1.94	.85	1.15	1.24	.80	1.33	.51	.85	1.15
P_2O_5	32.2	32.0	36.3	32.2	28.5	27.2	27.1	25.8	30.1	27.0	37.1	35.8	30.6
Ignition loss	5.74	5.24	3.34	10.02	8.10	8.38	8.84	9.88	9.28	6.74	4.96	7.92	4.60
Total	[55.7]	[64.2]	[46.2]	[58.0]	[57.5]	[60.0]	[60.6]	[61.8]	[54.8]	[58.2]	[45.1]	[49.3]	[55.6]

[1] SiO_2.

[2] Calculated from reported P, or C.

[3] CO_3.

Spectrographic analyses

[B = 1-10 percent, D = 0.1-1 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent, G = < 0.001 percent, ND = not detected. Elements looked for but not detected: Li, Be, Sc, As, Rb, Nb, Sb, Te, Cs, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Lu, Ta, W, Pt, Au, Tl, Bi; additional elements looked for but not detected; samples 170-172, 199-208: K, Hf, Th; samples 209-217: Ce]

	170	171	172	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
B	ND	ND	ND	ND	ND	ND	ND	F	ND	ND	ND	ND	ND	ND	G	ND	G	G	G	G	G	G
Na	D	D	D	D	D	D	B	D	D	D	D	D	D	B	D	D	D	D	D	D	D	D
Mg	E	E	E	D	D	D	D	D	D	D	D	D	E	D	D	D	D	D	D	D	D	D
Ti	E	E	E	E	E	E	E	E	E	E	E	E	F	E	E	E	E	E	E	E	E	E
V	D	D	E	E	E	E	E	D	E	E	E	E	E	D	D	D	D	D	D	D	D	D
Cr	D	D	D	E	E	E	E	E	D	D	D	D	E	E	E	E	E	E	E	E	E	E
Mn	E	E	E	E	F	E	ND	F	F	E	F	F	E	F	F	F	F	E	F	F	F	F
Ni	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Co	ND	ND	ND	ND	ND	ND	E	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cu	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	E	E
Zn	E	E	ND	E	E	E	E	E	E	E	ND	ND	ND	E	E	E	E	E	E	E	E	E
Ga	ND	F	ND	ND	ND	ND	ND	ND	ND	F	ND	ND	ND	F	ND	ND	F	F	F	F	F	F
Sr	D	D	D	D	D	D	D	E	D	D	E	E	E	E	E	E	E	E	E	E	E	E
Y	E	E	E	F	F	F	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Zr	F	F	F	F	F	F	F	F	F	F	F	F	F	F	E	E	E	E	F	F	F	F
Mo	F	F	F	ND	ND	F	F	G	F	F	ND	ND	F	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ag	G	G	G	G	G	G	ND	G	G	G	G	G	ND	G	G	G	G	G	G	G	G	G
Cd	E	ND	ND	E	E	E	E	E	E	E	ND	ND	E	E	E	E	E	F	E	E	E	E
Sn	ND	ND	ND	ND	ND	ND	ND	F	ND	ND	ND	ND	ND	F	F	F	F	ND	F	F	ND	ND
Ba	F	E	F	F	F	F	F	E	F	F	F	G	F	E	E	E	E	E	E	E	E	E

Spectrographic analyses—Continued

	170	171	172	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217
La	E	E	E	E	E	E	E	F	E	E	E	E	E	F	F	F	E	E	E	E	E	E
Yb	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Pb	ND	ND	ND	ND	ND	ND	E	F	F	ND	ND	ND	ND	F	F	F	F	F	F	F	F	F

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

170 - 172. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. Sec. 24, T. 6 S., R. 42 E., North Wooley Range. (McKelvey and others, 1953a, p. 2, 5-8.) Phosphate rock. Trench sample. Index map, detailed measured section.

170. Sample 1305-WOM, 28.2-28.8 ft from top of member.
171. Sample 1200-RLP, 27.0-28.2 ft from top of member.
172. Sample 1202-RLP, 25.2-26.0 ft from top of member.

173 - 178. County, formation, and member as in samples 170-172. Sec. 16, T. 6 S., R. 43 E., Rasmussen Ridge, Enoch Valley. (Davidson and others, 1953, p. 2, 4, 24-26, 27.) Phosphate rock. Trench sample. Index map, detailed measured section.

173. Sample 4286-KBK, 151.7-153.7 ft from top of member.
174. Sample 4287-KBK, 150.2-151.7 ft from top of member.
175. Sample 4288-KBK, 147.6-150.2 ft from top of member.
176. Sample 4289-KBK, 146.4-147.6 ft from top of member.
177. Sample 6071-RAS, Phosphate rock and argillaceous phosphate rock, 3.8-4.8 ft from top of member.
178. Sample 6072-RAS. Phosphate rock, 2.2-3.8 ft from top of member.

179 - 182. County, formation, and member as in samples 170-172. NW¼ sec. 26, T. 7 S., R. 42 E., Woodall Creek. (O'Malley and others, 1953, p. 2, 9-11, 12.) Trench sample. Index map, detailed measured section.

179. Sample 1173-RAG. Mudstone and phosphate rock, 102.0-103.0 ft from top of member.
180. Sample 1184-VEM. Phosphate rock, 97.7-98.4 ft from top of member.
181. Sample 1997-WOM. Phosphate rock, argillaceous, 12.0-13.2 ft from top of member.
182. Sample 1998-WOM. Phosphate rock, 11.4-12.0 ft from top of member.

183 - 186. County, formation, and member as in samples 170-172. Sec. 7, T. 7 S., R. 43 E., Ballard Trench. (Davidson and others, 1953, p. 2, 4, 28.) Phosphate rock. Trench sample. Index map, detailed measured section.

183. Sample 4574-HWP, 4.3-5.1 ft from top of member.
184. Sample 4576-HWP, 2.8-4.3 ft from top of member.
185. Sample 4577-HWP, 1.8-2.8 ft from top of member.
186. Sample 4578-HWP, 1.1-1.8 ft from top of member.

187. County, formation, and member as in samples 170-172. [T. 7 S., R. 43 E.], near Soda Springs, Ballard mine. Sample S70. (Emigh, 1958, p. 21, 22, 24-26, figs. 1, 5.) General: Phosphate pellets in groundmass of calcite, dolomite, and detrital minerals; fresh rock, black, dense, hard; weathered rock, brown, porous, soft; fossiliferous. Sample 2 ft below surface. Mineralogy, thin-section description. Index map.

188 - 192. County, formation, and member as in samples 170-172. NE¼ sec. 10, T. 7 S., R. 43 E., Little Long Valley. (Swanson and others, 1956, p. 2, 5, 23, 24.) Phosphate rock. Trench sample. Index map, detailed measured section.

188. Sample 7354-RPS, 174.5-179.0 ft from top of member.
189. Sample 7356-RPS, 168.2-174.2 ft from top of member.
190. Sample 7358-RPS, 162.4-167.7 ft from top of member.
191. Sample 7361-RPS, 149.4-153.4 ft from top of member.
192. Sample 7398-RPS, 26.9-29.1 ft from top of member.

Idaho—Continued

193 - 198. County, formation, and member as in samples 170-172. Sec. 24, T. 7 S., R. 43 E., Blackfoot Narrows. (O'Malley and others, 1953, p. 2, 13-16.) Trench sample. Index map, detailed measured section.

193. Sample 1859-WOM. Phosphate rock, 149.3-150.2 ft from top of member.
194. Sample 1959-WOM. Phosphate rock, argillaceous, fossiliferous; 16.6-19.5 ft from top of member.
195. Sample 1960-WOM. Phosphate rock, 16.1-16.6 ft from top of member.
196. Sample 1929-WOM. Phosphate rock, 15.5-16.1 ft from top of member.
197. Sample 1930-WOM. Phosphate rock, 14.6-15.5 ft from top of member.
198. Sample 1945-WOM. Phosphate rock, 12.1-12.7 ft from top of member.

199 - 208. County, formation, and member as in samples 170-172. Sec. 6, T. 7 S., R. 44 E., North Rasmussen Valley. (McKelvey and others, 1953a, p. 2, 10, 11-13, 14, 15.) Phosphate rock. Sample 202, phosphate rock and mudstone; sample 205, phosphate rock, fossiliferous. Trench sample. Index map, detailed measured section.

	Sample	Ft from top of member
199.	1316-RAH	131.65-132.15
200.	1353-CEW	115.60-119.60
201.	1355-CEW	112.30-114.60
202.	1357-CEW	110.60-111.50
203.	1358-CEW	109.20-110.60
204.	1386-WOM	106.65-108.15
205.	1392-WOM	92.75- 95.75
206.	1522-WOM	21.2 - 25.3
207.	1523-WOM	19.9 - 21.2
208.	1335-RLP	11.2 - 12.5

209 - 217. County, formation, and member as in samples 170-172. Sec. 9, T. 7 S., R. 44 E., Rasmussen Valley. (McKelvey and others, 1953a, p. 2, 16-18, 19, 20.) Phosphate rock. Sample 213, phosphate rock, fossiliferous. Trench sample. Index map, detailed measured section.

	Sample	Ft from top of member
209.	1449-WOM	103.9-105.0
210.	1467-WOM	91.9- 94.2
211.	1489-WOM	87.2- 91.9
212.	1469-WOM	82.7- 86.7
213.	1485-WOM	73.9- 77.1
214.	1452-DFD	17.1- 17.6
215.	1453-DFD	14.5- 17.1
216.	1454-DFD	13.5- 14.5
217.	1456-DFD	11.1- 12.1

218 - 221. County, formation, and member as in samples 170-172. Sec. 28, T. 7 S., R. 44 E., Kendall Canyon. (O'Malley and others, 1953, p. 2, 20, 21, 22, 23.) Trench sample. Index map, detailed measured section.

218. Sample 1538-WOM. Phosphate rock, argillaceous, fossiliferous; 144.9-145.4 ft from top of member.
219. Sample 1604-WOM. Phosphate rock, 14.5-15.1 ft from top of member.
220. Sample 1608-WOM. Phosphate rock, 10.5-11.0 ft from top of member.
221. Sample 1612-DFD. Phosphate rock, 8.9-9.7 ft from top of member.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses— Continued

	Idaho—Continued												
	222	223	224	225	226	227	228	229	230	231	232	233	234
	11P15-97	11P15-98	11P15-99	11P15-100	11P15-101	11P15-102	11P15-103	11P15-104	11P45-39	11P45-38	11P45-40	11P45-37	11P45-36
Acid insoluble	7.5	3.3	15.0	17.3	9.4	6.6	[1]6.0	[1]18.0	[1]20.67	[1]20.66	[1]7.10	[1]4.46	[1]23;43
Al_2O_3	3.2	.61	3.3	3.3	1.5	1.6	1.3	2.5	3.97	4.23	.96	.83	4.44
Fe_2O_3	1.71	.32	1.36	1.12	.69	.56	[2]1.6	[2].7	------	------	------	------	------
MgO	------	------	------	------	------	------	<.1	2.5	.38	.89	.31	.19	.19
CaO	------	------	------	------	------	------	48.9	36.4	29.29	31.66	45.23	47.04	33.21
P_2O_5	34.6	36.3	29.4	29.5	33.2	35.3	34.1	23.1	[3]22.12	[3]22.83	[3]29.36	[3]32.36	[3]23.66
V	------	------	------	------	------	------	------	------	.05	.20	.07	.12	.12
Cr	------	------	------	------	------	------	------	------	.04	.12	.03	.04	.04
Organic matter	------	------	------	------	------	------	[4].2	[4]2.0	[3]10.88	[3]13.67	[3]10.20	[3]9.45	[3]9.45
Ignition loss	3.46	10.22	5.98	3.52	8.70	2.74	[5]3.8	[5]11.2	[6]5.39	[6]2.85	[6]4.73	[6]2.60	[6]2.60
Total	[50.5]	[50.8]	[55.0]	[54.7]	[53.5]	[46.8]	[96.0]	[96.4]	[92.79]	[97.11]	[97.99]	[97.09]	[97.14]

	Idaho—Continued												
	235	236	237	238	239	240	241	242	243	244	245	246	247
	11P45-30	11P45-31	11P45-32	11P45-29	11P15-105	11P15-106	11P15-107	11P15-111	11P15-112	11P15-113	11P15-114	11P15-115	11P15-116
Acid insoluble	[1]3.81	[1]6.00	[1]1.59	[1]13.00	14.2	11.1	12.2	20.5	20.1	24.8	15.5	11.5	5.6
Al_2O_3	.85	.54	.56	2.09	2.4	1.8	2.0	3.3	4.1	5.5	4.1	1.7	.63
Fe_2O_3	.49	------	------	1.37	1.2	1.0	1.2	1.32	1.48	1.53	1.59	1.22	.46
MgO	1.02	.21	.25	------	------	------	------	------	------	------	------	------	------
CaO	46.75	49.85	49.30	------	------	------	------	------	------	------	------	------	------
Na_2O	.72	------	------	------	------	------	------	------	------	------	------	------	------
K_2O	.16	------	------	------	------	------	------	------	------	------	------	------	------
H_2O	------	------	------	1.40	------	------	------	------	------	------	------	------	------
P_2O_5	[3]27.09	[3]31.92	[3]32.86	30.50	27.7	29.6	29.3	26.7	23.9	20.4	28.9	33.0	36.9
MnO	.02	------	------	------	------	------	------	------	------	------	------	------	------
SO_3	2.33	------	------	------	------	------	------	------	------	------	------	------	------
F	2.70	------	------	------	------	------	------	------	------	------	------	------	------
V	.08	.01	.19	[7].11	[7].25	[7].19	[7].26	------	------	------	------	------	------
Cr	.06	.02	.03	------	------	------	------	------	------	------	------	------	------
Organic matter	[3]7.17	[3].76	[3]7.46	------	------	------	------	------	------	------	------	------	------
Ignition loss	[6]9.74	[6]5.16	[6]4.03	------	12.6	10.7	10.4	6.66	16.74	15.76	7.00	3.24	1.84
Subtotal	102.99	------	------	------	------	------	------	------	------	------	------	------	------
Less O	[3]1.14	------	------	------	------	------	------	------	------	------	------	------	------
Total	[101.85]	[94.47]	[96.27]	[48.47]	[58.4]	[54.4]	[55.4]	[58.5]	[66.3]	[68.0]	[57.1]	[50.7]	[45.4]

	Idaho—Continued												
	248	249	250	251	252	253	254	255	256	257	258	259	260
	11P15-117	11P15-118	11P15-119	11P15-120	11P15-121	11P15-122	11P15-123	11P15-124	11P15-125	11P15-126	11P15-127	11P15-128	11P15-129
Acid insoluble	16.6	6.9	10.4	18.9	8.6	16.5	14.4	5.7	14.6	6.7	11.7	3.2	16.7
Al_2O_3	2.2	3.5	1.7	2.8	1.3	2.2	2.3	.8	1.5	1.1	1.9	.7	3.2
Fe_2O_3	.95	1.7	.91	1.1	.58	1.1	1.2	.61	.97	.80	1.3	.58	.7
P_2O_5	28.3	33.0	31.8	27.8	33.1	29.4	29.6	34.0	30.6	33.9	31.6	36.7	26.9
F	2.39	2.55	2.84	2.56	2.49	2.67	2.82	3.27	2.97	3.23	3.04	3.65	2.55
Ignition loss	6.46	5.24	5.96	6.76	6.16	6.18	7.38	6.18	5.02	5.22	5.22	4.18	9.9
Subtotal	56.90	52.89	53.61	59.92	52.23	58.05	57.70	50.56	55.66	50.95	54.76	49.01	59.95
Less O[3]	1.01	1.07	1.20	1.08	1.05	1.12	1.19	1.38	1.25	1.36	1.28	1.54	1.07
Total	[55.9]	[51.8]	[52.4]	[58.8]	[51.2]	[56.9]	[56.5]	[49.2]	[54.4]	[49.6]	[53.5]	[47.5]	[58.9]

[1] SiO_2.

[2] Fe.

[3] Calculated from reported P, C, or F.

[4] Organic carbon.

[5] At 1,000°C.

[6] CO_2.

[7] V_2O_5.

Spectrographic analyses

[D = 0.1-1 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent, G = < 0.001 percent, ND = not detected. Elements looked for but not detected: Co, Ga, As, Nb, Sb, Ta, W, Bi. Additional elements looked for but not detected; samples 239-241: Li, Pt, Au; samples 243-247: Sc, Te, Cs, Sm, Tb, Dy, Tm, Yb, Tl; samples 248-252, 255-259: Li, Sc, Rb, In, Te, Cs, Pr, Nd, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Lu, Yb, Pt, Au, Tl; sample 260: Li, Ge, In, Pt, Au, Hg]

	228	229	239	240	241	243	244	245	246	247	248	249	250	251	252	255	256	257	258	259	260
Be	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	G	G	ND	ND	G	ND	ND	ND	ND
B	E	E	F	F	F	F	F	F	F	ND	F	F	F	F	ND	F	F	F	ND	F	F
Na	C	C	E	D	E	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Mg	---	---	D	D	D	D	D	E	E	E	D	D	D	D	D	D	D	D	D	D	D
Ti	D	D	E	E	E	E	E	E	E	E	E	D	E	E	E	E	E	E	E	E	E
V	D	D	D	E	D	D	D	E	D	D	E	E	E	E	E	E	E	E	E	E	D

Spectrographic analyses—Continued

	228	229	239	240	241	243	244	245	246	247	248	249	250	251	252	255	256	257	258	259	260
Cr	D	D	E	E	E	D	D	D	D	D	D	E	D	D	D	D	D	D	D	D	E
Mn	F	C	F	F	F	F	F	E	F	F	F	E	F	F	F	E	E	F	E	F	F
Ni	E	E	E	E	E	E	E	F	F	E	E	E	E	E	F	F	F	E	E	E	E
Cu	F	F	G	G	G	E	E	F	F	F	E	E	E	E	E	E	E	F	F	F	G
Zn	E	E	E	E	E	E	E	E	F	E	E	E	F	F	F	F	F	F	F	F	E
Sr	E	E	F	E	E	E	E	D	D	E	D	D	D	D	D	D	D	D	D	D	E
Y	---	---	---	---	---	E	E	F	E	E	E	E	F	F	F	F	F	E	E	E	---
Zr	F	F	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	E	E	E	E
Mo	F	F	F	F	F	ND	F	ND	ND	ND	F	F	F	F	F	F	F	F	F	F	F
Ag	---	---	G	G	G	F	F	G	G	G	G	G	G	G	G	G	G	G	G	G	F
Cd	E	E	ND	ND	ND	E	E	E	F	F	E	F	E	E	E	E	F	F	F	F	ND
Sn	---	---	ND	ND	ND	ND	ND	ND	ND	ND	ND	F	F	F	F	F	F	F	F	F	ND
Ba	E	E	E	E	E	F	F	F	G	F	E	E	E	E	E	E	E	F	F	F	ND
La	---	---	---	---	---	F	E	F	E	E	F	E	F	F	F	F	F	E	E	E	---
Pb	E	E	ND	ND	ND	E	E	ND	ND	ND	E	F	E	E	F	F	F	E	E	F	ND

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

222-227. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. T. 7 S., R. 44 E. (O'Malley and others, 1953, p. 2, 17-19, 20-23.) Phosphate rock. Trench sample. Index map, detailed measured section.

222, 223. Sec. 28, Kendall Canyon.

222. Sample 1613-DFD, 8.3-8.9 ft from top of member.

223. Sample 1617-DFD, 4.9-6.1 ft from top of member.

224-227. Sec. 31, North Dry Valley.

224. Sample 1657-WOM. Phosphate rock, fossiliferous, 25.1-29.5 ft from top of member.

225. Sample 1682-WOM, 19.0-20.2 ft from top of member.

226. Sample 1685-WOM, 17.1-17.8 ft from top of member.

227. Sample 1689-WOM, 15.1-15.6 ft from top of member.

228, 229. County, formation, and member as in samples 222-227. Secs. 2(?), 11(?), T. 8 S., R. 42 E. Aspen Range deposits, Conda mine. Collector, A. L. Service. Field Nos. WSA-5, WSA-4. (Mabie and Hess, 1964, p. 2, 3, 5, 7, 8, 9, 12, 13, 58, 82, 83; Service and Popoff, 1964, p. 6, 11, 12, 28, 31-33, 63.) Index map, compositional classification triangle. Physical properties, beneficiation tests. Possible use: Agricultural, chemical, metallurgical.

230-237. County, formation, and member as in samples 222-227. [Secs. 2, 11, T. 8 S., R. 42 E.] Conda mine. (Emigh, 1958, p. 21, 22, 24-28, 29, 30, fig. 1.) Mineralogy, thin-section description. Index map.

230-234. General: When fresh, phosphatic dolomitic shale, black, fine-grained, dense, hard; when weathered, shale, brown, soft; fossiliferous; 17-24 ft thick.

230. Sample S13. Phosphate pellets, 4 ft above bottom of bed.

231. Sample S14. Phosphate pellets, 8 ft above bottom of bed.

232. Sample S3. Phosphate pellets, 8.5 ft above bottom of bed.

233. Sample S16. Phosphate pellets, 16 ft above bottom of bed.

234. Sample S17. Phosphate pellets, 20 ft above bottom of bed.

235-237. General: Phosphate pellets in groundmass of calcite, dolomite, and detrital minerals; fresh rock, black, dense, hard; weathered rock, brown, porous, soft; fossiliferous.

235. Sample S7.

236. Sample S10.

237. Sample S11.

238. County, formation, and member as in samples 222-227. [Secs. 2, 11, T. 8 S., R. 42 E.], 8 miles north of town of Soda Springs. Conda mine. (Caro, 1949, p. 282, 283; Russell, 1949, p. 279-281.) Phosphate rock, averages 7.2 ft thick. Detailed columnar sections. Beneficiation tests. Possible use: Fertilizer.

239-241. County, formation, and member as in samples 222-227. Sec. 13, T. 8 S., R. 42 E. Conda mine. (McKelvey and others, 1935b, p. 1, 2, 4, 25-28, 29, pl. 1.) Mineralogy. Index maps, detailed measured section.

239. Sample FCA-73-47. Phosphate rock, fossiliferous, 178.60-180.20 ft from top of member.

Idaho—Continued

240. Sample FCA-75-47. Phosphate rock, 175.75-177.15 ft from top of member.

241. Sample FCA-77-47. Phosphate rock, 171.45-173.25 ft from top of member.

242. County, formation, member, maps, and sections as in samples 222-227. Sec. 1, T. 8 S., R. 43 E., Caldwell Canyon. (McKelvey and others, 1953b, p. 2, 4, 11-13, pl. 1.) Phosphate rock, argillaceous, 93.80-95.70 ft from top of member. Trench sample. Mineralogy.

243-247. County, formation, and member as in samples 222-227. SE¼ sec. 23, T. 8 S., R. 43 E., Johnson Creek. (McKelvey and others, 1953a, p. 2, 32, 33-36.) Trench sample. Index map, detailed measured section.

243. Sample VEM-477-47. Phosphate rock, argillaceous, 28.3-29.0 ft from top of member.

244. Sample VEM-479-47. Phosphate rock, argillaceous, fossiliferous, 26.7-27.3 ft from top of member.

245. Sample VEM-486-47. Phosphate rock, 22.3-22.9 ft from top of member.

246. Sample VEM-490-47. Phosphate rock, 18.9-19.4 ft from top of member.

247. Sample RAW-56-47. Phosphate rock, 14.2-14.8 ft from top of member.

248-259. County, formation, and member as in samples 222-227. NW¼ NW¼ sec. 30, T. 8 S., R. 43 E., Trail Canyon. (McKelvey and others, 1953a, p. 2, 21-23, 24-28, 29, 31.) Trench sample. Index map, detailed measured section.

248. Sample RAH-183-47. Phosphate rock, 205.01-205.56 ft from top of member.

249. Sample WOM-3181. Phosphate rock, 198.91-201.01 ft from top of member.

250. Sample VEM-178-47. Phosphate rock, 191.06-191.96 ft from top of member.

251. Sample VEM-179-47. Phosphate rock, 189.66-191.06 ft from top of member.

252. Sample VEM-180-47. Phosphate rock, 188.66-189.66 ft from top of member.

253. Sample LES-247-47. Phosphate rock and phosphatic calcareous mudstone, 186.11-186.61 ft from top of member.

254. Sample LES-248-47. Phosphate rock, calcareous, and calcareous phosphatic mudstone, 184.66-186.11 ft from top of member.

255. Sample VEM-256-47. Phosphate rock, 19.76-20.36 ft from top of member.

256. Sample VEM-259-47. Phosphate rock, 17.36-18.36 ft from top of member.

257. Sample VEM-263-47. Phosphate rock, contains phosphatic limestone concretions, 16.46-17.06 ft from top of member.

258. Sample VEM-264-47. Phosphate rock, 15.66-16.46 ft from top of member.

259. Sample VEM-265-47. Phosphate rock, 15.06-15.66 ft from top of member.

260. County, formation, and member as in samples 222-227. NW¼ NE¼ sec. 10, T. 8 S., R. 44 E., Mabie Canyon. Spectrographic analyst, D. M. Mortimer. Sample RAW-40-47. (McKelvey and others, 1953b, p. 1, 2, 4, 14-19, 24, pl. 1.) Phosphate rock, 184.6-186.1 ft from top of member. Trench sample. Mineralogy. Index maps, detailed measured section. [For other analyses from same measured section see sample 114, group B and samples 261-284, this group.]

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	261	262	263	264	265	266	267	268	269	270	271	272	273
	11P15-130	11P15-131	11P15-132	11P15-133	11P15-134	11P15-135	11P15-136	11P15-138	11P15-139	11P15-140	11P15-141	11P15-142	11P15-143
Acid insoluble	23.4	19.8	14.1	6.8	15.2	14.7	17.8	24.4	14.9	12.0	24.2	18.5	14.0
Al_2O_3	4.1	2.5	2.5	1.3	2.4	2.2	2.8	5.1	3.3	2.4	4.2	3.8	2.7
Fe_2O_3	1.3	1.3	.9	.8	1.1	1.0	1.5	1.8	1.4	2.4	1.6	1.2	1.1
P_2O_5	23.1	26.2	28.7	32.5	27.7	28.6	26.1	21.7	24.3	32.2	21.2	23.9	26.8
F	2.16	2.50	2.47	3.30	2.48	2.86	------	------	------	------	------	------	------
Ignition loss	11.0	10.0	9.4	8.8	10.8	10.3	11.1	14.3	17.9	3.3	16.5	15.5	14.8
Subtotal	65.06	62.30	58.07	53.50	59.68	59.66	------	------	------	------	------	------	------
Less O[1]	.91	1.05	1.04	1.40	1.04	1.20	------	------	------	------	------	------	------
Total	[64.2]	[61.2]	[57.0]	[52.1]	[58.6]	[58.5]	[59.3]	[67.3]	[61.8]	[52.3]	[67.7]	[62.9]	[59.4]

	Idaho—Continued												
	274	275	276	277	278	279	280	281	282	283	284	285	286
	11P15-144	11P15-145	11P15-146	11P15-147	11P15-148	11P15-149	11P15-150	11P15-151	11P15-152	11P15-153	11P15-154	11P15-155	11P15-156
Acid insoluble	22.6	9.8	11.2	17.8	14.4	4.5	11.9	9.8	5.0	3.5	1.8	[2]5.0	[2]6.9
Al_2O_3	4.8	2.4	2.3	3.8	3.1	1.6	2.1	1.8	.8	.8	.7	1.1	1.5
Fe_2O_3	1.7	.8	.9	1.1	1.2	.5	.9	.7	.5	.4	.5	.6	.8
CaO	------	------	------	------	------	------	------	------	------	------	------	48.1	46.2
H_2O-	------	------	------	------	------	------	------	------	------	------	------	[3].7	[3].8
P_2O_5	20.9	28.4	25.9	23.8	26.5	34.0	31.5	32.7	37.1	36.7	37.7	30.9	30.0
F	------	------	------	------	2.83	3.54	3.17	3.27	3.72	3.90	------	3.37	3.33
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	.15	.16
Ignition loss	18.5	14.9	18.7	15.8	11.8	8.0	6.6	5.8	3.5	4.4	3.2	8.5	7.5
Subtotal	------	------	------	------	59.83	52.14	56.17	54.07	50.62	49.70	------	98.42	97.19
Less O	------	------	------	------	[1]1.19	[1]1.49	[1]1.33	[1]1.38	[1]1.57	[1]1.64	------	[1]1.42	[1]1.40
Total	[68.5]	[56.3]	[59.0]	[62.3]	[58.6]	[50.6]	[54.8]	[52.7]	[49.0]	[48.1]	[43.9]	[97.0]	[95.8]

	Idaho—Continued												
	287	288	289	290	291	292	293	294	295	296	297	298	299
	11P15-157	11P15-158		11P15-159	11P15-160	11P15-161	11P15-162	11P15-163	11P15-164	11P15-165		11P15-166	11P15-167
Acid insoluble	[2]6.0	[4]6.0	3.5	22.3	18.7	17.6	3.6	12.7	17.5	[4]4.3	3.2	18.2	2.3
Al_2O_3	1.2	1.6	1.47	4.10	3.60	3.35	1.34	1.84	2.98	.70	.85	3.5	.85
Fe_2O_3	.6	[5]2.8	2.88	1.35	1.23	1.78	.33	.80	1.05	[5].36	.33	1.66	.45
MgO	------	.33	------	------	------	------	------	------	------	.11	------	------	------
CaO	47.4	45.1	------	------	------	------	------	------	------	49.5	------	------	------
Na_2O	------	1.0	------	------	------	------	------	------	------	.22	------	------	------
K_2O	------	.36	------	------	------	------	------	------	------	.18	------	------	------
H_2O+	------	[6]2.7	------	------	------	------	------	------	------	[6]2.1	------	------	------
H_2O-	[3].8	.7	------	------	------	------	------	------	------	.8	------	------	------
TiO_2	------	.15	------	------	------	------	------	------	------	.11	------	------	------
P_2O_5	31.8	31.6	32.1	23.7	24.5	24.9	37.1	32.5	29.6	35.6	36.0	24.1	36.6
F	3.22	3.23	------	------	------	------	------	------	------	3.53	------	------	------
V_2O_5	.27	------	------	------	------	------	------	------	------	------	------	------	------
Organic matter	------	[7]2.7	------	------	------	------	------	------	------	[7]2.7	------	------	------
Oil	------	[8].10	------	------	------	------	------	------	------	[8].10	------	------	------
eU	------	[9].010	[10].008	[10].010	[10].012	[10].012	[10].019	[10].016	[10].010	[9].010	[10].014	------	------
Ignition loss	7.1	[11]2.21	6.40	13.50	15.70	15.00	3.15	2.80	4.50	[11]1.26	5.55	14.66	5.13
Subtotal	98.39	100.59	------	------	------	------	------	------	------	101.58	------	------	------
Less O	[1]1.36	[1]1.36	------	------	------	------	------	------	------	[1]1.49	------	------	------
Total	[97.0]	[99.2]	[46.4]	[65.0]	[63.7]	[62.6]	[45.5]	[50.7]	[55.6]	[100.1]	[45.9]	[62.1]	[45.3]

[1] Calculated from reported F.
[2] Insoluble.
[3] At 105°C.
[4] SiO_3.
[5] Total iron.
[6] Total water.
[7] 230°-500°C.
[8] Oil by distillation at about 500° C; distillate weighed.
[9] Radiometric determination, B.A. McCall.
[10] Uranium (Montgomery and Cheney, 1967, p, 48, 49, 51).
[11] CO_3.

Spectrographic analyses

[D = 0.1-1 percent; E = 0.01-0.1 percent; F = 0.001-0.01 percent; G = < 0.001 percent; ND = not detected. Elements looked for but not detected: Li, Be, Co, Ga, Ge, As, Nb, Cd, In, Sn, Sb, Ba, Ta, W, Pt, Au, Hg, Pb, Bi]

	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284
B	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Na	D	D	D	D	E	D	E	D	E	D	D	E	E	E	E	E	E	E	E	E	E	E	E	D
Mg	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D
Ti	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
V	D	D	D	D	D	D	D	E	E	E	D	D	D	D	D	D	D	D	D	D	D	E	E	E
Cr	E	E	E	E	E	E	E	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mn	F	F	F	F	F	F	F	F	F	E	E	E	E	E	E	E	E	F	F	E	E	F	F	E

Spectrographic analyses—Continued

	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284
Ni	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Cu	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G
Zn	E	E	E	E	E	E	E	E	E	ND	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Sr	E	E	E	E	E	E	E	E	E	D	E	D	D	D	D	D	D	E	E	E	E	E	E	F
Zr	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E
Mo	F	F	F	F	F	F	E	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Ag	F	F	F	G	G	F	G	G	G	G	F	F	F	F	F	F	F	F	G	G	G	G	G	G

Spectrographic analyses of samples 288, 296

[Elements looked for but not detected: Li, Ge, Rb, Nb, Ru, Rh, Pd, In, Sn, Te, Cs, Ce, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Bi, Th]

	288	296		288	296		288	296		288	296		288	296
Be	0.0001	< 0.00005	Mn	0.003	0.001	Ga	0.001	< 0.001	Zr	0.003	0.001	Ba	0.01	0.01
B	<.005	<.005	Ni	.03	.01	As	.006	.002	Mo	.003	<.0005	La	.01	.01
Sc	<.0005	<.0005	Co	<.001	<.001	Se	.0005	.0005	Ag	.0003	.001	Nd	<.006	<.006
V	.03	.1	Cu	.003	.01	Sr	.1	.1	Cd	.01	.03	Yb	.0003	.0003
Cr	.1	.3	Zn	.03	.03	Y	.03	.01	Sb	.0005	.0004	Pb	<.001	<.001

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

261 - 284. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. NW¼NE¼ sec. 10, T. 8 S., R. 44 E., Mabie Canyon. Spectrographic analyst, D. M. Mortimer. (McKelvey and others, 1953b, p. 1, 2, 4, 14, 15, 16, 17-19, 24, pl. 1.) Phosphate rock; sample 274, phosphate rock and mudstone. Mineralogy. Trench sample. Index maps, detailed measured section. [For other analyses from same measured section see sample 114, group B and sample 260, this group.]

Sample	Ft from top of member
261. RAW-43-47	181.2-182.9
262. RAW-44-47	179.2-181.2
263. RAW-46-47	177.1-179.2
264. RAW-47-47	176.2-177.1
265. RAW-58-47	172.3-173.7
266. RAW-60-47	170.7-171.5
267. VEM-317-47	161.7-162.9
268. RMC-99-47	149.4-150.0
269. VEM-362-47	116.2-116.9
270. VEM-372-47	107.3-108.3
271. VEM-421-47	47.4- 48.4
272. VEM-423-47	45.8- 46.5
273. VEM-424-47	45.1- 45.8
274. VEM-426-47	43.5- 43.9
275. VEM-427-47	42.2- 43.5
276. VEM-428-47	41.2- 42.2
277. VEM-429-47	39.4- 41.2
278. VEM-431-47	38.5- 39.4
279. VEM-432-47	37.1- 38.5
280. VEM-438-47	33.7- 34.3
281. VEM-440-47	31.9- 32.7
282. VEM-444-47	27.8- 28.5
283. VEM-445-47	27.3- 27.8
284. VEM-446-47	26.8- 27.3

285 - 287. County, formation, and member as in samples 261-284. [T. 8 S., R. 44 E.], north of Georgetown, near Slug Creek, Deer Creek-Wells Canyon area. (Deiss, 1949, p. 62, 64, 83, 85, 92, 94, pl. 5.)

Idaho—Continued

General: Phosphate rock, black, blackish-brown, dark-brown-gray. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections. Possible use: Fertilizer.

285. Trench K, sample 4. Phosphate rock, 1 ft 5 in. thick.

286. Trench K, sample 2. Phosphate rock, 1 ft 6 in. thick.

287. Trench J, sample 2. Phosphate rock, 2 ft 2 in. thick.

288 - 297. County, formation, and member as in samples 261-284. S½ sec. 21, T. 8 S., R. 45 E., Timber Creek. (Sheldon and others, 1953, p. 2, 5, 6-8; Montgomery and Cheney, 1967, p. 2, 39, 40, 48, 49, 51, pls. 2, 3.) Trench sample. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections, detailed measured section.

288, 289. Sample 5704-MAW. Phosphate rock, 189.1-191.0 ft from top of member. General mineralogy.

288. (Gulbrandsen, 1966, p. 770-773, table 1.)

290. Sample 4437-RAS. Phosphate rock, argillaceous, 50.1-52.4 ft from top of member.

291. Sample 4438-RAS. Phosphate rock, argillaceous, 48.9-50.1 ft from top of member.

292. Sample 4439-RAS. Phosphate rock, argillaceous, 47.0-48.9 ft from top of member.

293. Sample 4443-RAS. Phosphate rock, 39.7-40.6 ft from top of member.

294. Sample 5208-RGW. Phosphate rock, 33.5-35.4 ft from top of member.

295. Sample 4452-RGW. Phosphate rock, 28.7-29.9 ft from top of member.

296, 297. Sample 4453-RGW. Phosphate rock, 27.4-28.7 ft from top of member. General mineralogy.

296. (Gulbrandsen, 1966, p. 770-773, table 1.)

298, 299. County, formation, and member as in samples 261-284. SE¼SE¼ sec. 31, T. 8 S., R. 45 E., South Stewart Canyon. (Sheldon and others, 1953, p. 2, 9, 10-13.) Trench sample. Index map, detailed measured section.

298. Sample 4125-JDW. Phosphate rock, argillaceous, 46.20-51.20 ft from top of member.

299. Sample 4127-JDW. Phosphate rock, 40.10-42.20 ft from top of member.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	300	301	302	303	304	305	306	307	308	309	310	311	312
	11P15-168	11P15-169	11P15-170	11P15-171	11P15-234		11P15-235	11P15-236	11P15-237	11P15-238	11P15-239	11P15-240	11P15-241
Acid insoluble	20.7	9.1	8.6	4.0	[1]4.6	1.5	23.4	13.0	22.0	22.5	22.2	16.1	8.7
Al_2O_3	4.3	1.5	1.3	.76	1.0	.94	4.8	2.3	3.9	5.6	4.0	3.4	2.3
Fe_2O_3	1.80	.67	.72	.47	[2].42	.40	2.26	1.11	1.63	2.16	1.34	1.24	1.11
MgO	------	------	------	------	.16	------	------	------	------	------	------	------	------
CaO	------	------	------	------	48.5	------	------	------	------	------	------	------	------
Na_2O	------	------	------	------	1.0	------	------	------	------	------	------	------	------
K_2O	------	------	------	------	.24	------	------	------	------	------	------	------	------
H_2O+	------	------	------	------	[3]2.0	------	------	------	------	------	------	------	------
H_2O-	------	------	------	------	.6	------	------	------	------	------	------	------	------
TiO_3	------	------	------	------	.12	------	------	------	------	------	------	------	------
P_2O_5	26.9	33.2	34.4	36.9	34.0	35.6	24.6	31.6	26.3	24.3	22.6	25.8	33.5
SO_2	------	------	------	------	2.77	------	------	------	------	------	------	------	------
F	------	------	------	------	3.38	------	------	------	------	------	------	------	------
Th	------	------	------	------	7 ppm	------	------	------	------	------	------	------	------
Organic matter	------	------	------	------	[4]2.7	------	------	------	------	------	------	------	------
Oil	------	------	------	------	[5].10	------	------	------	------	------	------	------	------
eU	------	------	------	------	[6].009	[7].006	[6].004	[7].014	[7].014	[7].003	[7].008	[7].009	[7].014
Ignition loss	5.75	5.12	2.88	2.55	[8]2.03	6.20	6.80	5.76	6.30	8.74	14.36	13.56	3.92
Subtotal	------	------	------	------	103.63	------	------	------	------	------	------	------	------
Less O	------	------	------	------	[9]1.42	------	------	------	------	------	------	------	------
Total	[59.4]	[49.6]	[47.9]	[44.7]	[102.2]	[44.6]	[61.9]	[53.8]	[60.1]	[63.3]	[64.5]	[60.1]	[49.5]

	Idaho—Continued												
	313	314	315	316	317	318	319	320	321	322	323	324	325
	11P15-242	11P15-243	11P15-244	11P15-245	11P15-246	11P15-247	11P15-248	11P15-249		11P15-250	11P15-251	11P15-252	11P15-172
Acid insoluble	1.2	6.0	8.0	6.4	9.6	13.4	18.0	[1]7.7	4.9	2.8	2.8	21.1	21.0
Al_2O_3	.77	1.1	1.4	.78	1.5	2.5	3.2	1.2	1.2	1.5	1.2	2.8	3.4
Fe_2O_3	.44	.72	.38	.23	.59	1.07	1.32	[2].52	.50	.67	.82	1.24	1.61
MgO	------	------	------	------	------	------	------	.10	------	------	------	------	------
CaO	------	------	------	------	------	------	------	49.5	------	------	------	------	------
Na_2O	------	------	------	------	------	------	------	.23	------	------	------	------	------
K_2O	------	------	------	------	------	------	------	.21	------	------	------	------	------
H_2O+	------	------	------	------	------	------	------	[3]1.3	------	------	------	------	------
H_2O-	------	------	------	------	------	------	------	.1	------	------	------	------	------
TiO_3	------	------	------	------	------	------	------	.09	------	------	------	------	------
P_2O_5	38.5	35.8	34.6	36.2	34.1	31.7	29.6	35.3	36.5	35.7	36.9	27.8	24.0
SO_3	------	------	------	------	------	------	------	.38	------	------	------	------	------
F	------	------	------	------	------	------	------	3.55	------	------	------	------	------
V	------	------	------	------	------	------	------	------	------	------	------	------	.08
Organic matter	------	------	------	------	------	------	------	[4]1.0	------	------	------	------	------
Oil	------	------	------	------	------	------	------	[5].10	------	------	------	------	------
eU	[7].016	[7].017	[7].013	[7].018	[7].012	[7].012	[7].010	[6].011	[7].011	[7].011	[7].010	[6].010	[7].008
Ignition loss	2.70	2.76	4.26	3.08	3.22	3.36	3.56	[8]1.15	2.56	5.96	4.08	4.08	13.62
Subtotal	------	------	------	------	------	------	------	102.44	------	------	------	------	------
Less O	------	------	------	------	------	------	------	[9]1.49	------	------	------	------	------
Total	[43.6]	[46.4]	[48.6]	[46.7]	[49.0]	[52.0]	[55.7]	[101.0]	[45.7]	[46.6]	[45.8]	[57.0]	[63.7]

	Idaho—Continued												
	326	327	328	329	330	331	332	333	334	335	336	337	338
	11P15-173	11P15-174	11P15-175	11P15-176	11P15-177	11P15-178	11P15-179	11P15-180	11P15-181	11P15-182		11P15-183	11P15-184
Acid insoluble	16.5	15.8	4.5	5.8	4.7	9.0	13.5	4.4	2.3	[1]17.9	18.1	23.2	19.7
Al_2O_3	3.3	3.4	1.3	1.4	1.1	1.3	1.2	1.4	.44	2.6	3.1	2.8	2.7
Fe_2O_3	1.34	1.43	.45	.54	.50	.56	.63	.67	.16	[2].86	1.2	1.7	1.1
MgO	------	------	------	------	------	------	------	------	------	.16	------	------	------
CaO	------	------	------	------	------	------	------	------	------	45.1	------	------	------
Na_2O	------	------	------	------	------	------	------	------	------	.72	------	------	------
K_2O	------	------	------	------	------	------	------	------	------	.53	------	------	------
H_2O+	------	------	------	------	------	------	------	------	------	[3]3.4	------	------	------
H_2O-	------	------	------	------	------	------	------	------	------	.9	------	------	------
TiO_2	------	------	------	------	------	------	------	------	------	.10	------	------	------
P_2O_5	27.0	26.5	35.4	35.3	35.9	34.6	33.2	34.6	37.8	31.4	26.5	25.1	27.6
F	------	------	------	------	------	------	------	------	------	2.40	------	------	------
V	.1	.10	.08	.09	.07	.04	.04	.08	.06	------	------	------	------
Organic matter	------	------	------	------	------	------	------	------	------	[4]3.2	------	------	------
Oil	------	------	------	------	------	------	------	------	------	[5].20	------	------	------
eU	[7].011	[7].017	[7].018	[7].017	[7].022	[7].013	[7].011	[7].011	[7].010	[6].006	------	------	------
Ignition loss	9.94	13.86	5.42	7.22	3.80	2.44	2.12	7.04	3.60	[8]1.48	8.10	7.90	6.76
Subtotal	------	------	------	------	------	------	------	------	------	110.96	------	------	------
Less O	------	------	------	------	------	------	------	------	------	[9]1.01	------	------	------
Total	[58.2]	[61.1]	[47.2]	[50.4]	[46.1]	[48.0]	[50.7]	[48.2]	[44.4]	[110.0]	[57.0]	[60.7]	[57.9]

See following page for footnotes.

Spectrographic analyses

[Elements looked for but not detected: Li,Ge,Rb,Nb,Ru,Rh,Pb,In,Sn,Te,Cs,Ce,Pr,Sm,Eu,Gd,Tb,Dy,Ho,Er,Tm,Lu,Hf,Ta,W,Re,Os,Ir,Pt,Au,Hg,Tl,Bi,Th. Th determined chemically in sample 304]

	304	320	335		304	320	335		304	320	335
Be	<0.00005	< 0.00005	< 0.00005	Zn	0.03	0.03	0.03	Ag	0.0003	0.0003	0.0003
B	<.005	<.005	.01	Ga	<.001	<.001	<.001	Cd	.01	.01	.01
Sc	<.0005	<.0005	.001	As	.002	.001	.002	Sb	.0003	.0003	.0004
V	.03	.03	.1	Se	.001	.002	.001	Ba	.01	.01	.01
Cr	.1	.1	.1	Sr	.03	.1	.1	La	.01	.01	.01
Mn	<.001	.03	.003	Y	.01	.03	.03	Nd	<.006	<.006	<.006
Ni	.01	.01	.03	Zr	.003	.003	.01	Yb	.0003	.001	.001
Co	< .001	< .001	< .001	Mo	<.0005	<.0005	.01	Pb	< .001	<.001	<.001
Cu	.01	.003	.01								

[B = 1-10 percent; D = 0.1-1 percent; E = 0.01-0.1 percent; F = 0.001-0.01 percent; G = < 0.001 percent; ND = not detected. Elements looked for but not detected: Li,Co,Ge,As, Rb,Ru,Rh,Pd,Cd,In,Sb,Te,Cs,Ce,Pr,Nd,Sm,Eu,Gd,Tb,Dy,Er,Lu,Hf,Ta,W,Re,Os,Ir,Pt,Au,Hg,Tl,Bi,Th]

	325	326	327	328	329	330	331	332	333	334		325	326	327	328	329	330	331	332	333	334
Be	ND	ND	ND	G	ND	ND	ND	ND	ND	ND	Sr	F	F	F	F	F	F	F	F	F	F
B	F	F	F	F	F	F	F	F	F	F	Y	E	E	E	E	E	E	E	E	E	E
Na	B	B	B	B	B	B	B	B	B	B	Zr	E	E	E	E	E	E	E	E	E	F
Mg	D	D	D	D	D	E	E	E	D	E	Nb	E	E	E	ND	ND	E	E	E	E	E
K	B	B	B	D	D	B	B	D	B	D	Mo	F	F	F	F	F	F	F	F	F	F
Sc	F	F	F	F	F	F	F	F	F	F	Ag	G	G	G	G	G	G	G	G	G	G
Ti	E	E	E	E	E	E	E	E	E	E	Sn	F	F	F	F	F	F	F	F	F	F
Cr	D	D	D	D	E	E	E	E	D	E	Ba	E	E	E	E	E	E	E	E	E	E
Mn	F	F	E	F	F	F	F	F	E	F	La	F	F	E	F	F	E	E	E	E	E
Ni	D	D	D	E	E	E	E	E	E	E	Ho	F	F	F	F	F	F	F	F	F	F
Cu	E	E	E	E	E	E	E	E	E	E	Tm	E	D	D	E	E	E	E	E	E	E
Zn	E	E	E	E	E	E	E	E	E	E	Yb	G	G	G	G	G	G	G	G	G	G
Ga	F	F	F	F	F	F	F	F	F	F	Pb	F	F	F	F	F	F	E	F	F	F

Footnotes of analyses on preceding page:

[1] SiO_2.
[2] Total iron.
[3] Total water.
[4] 230°-500°C.
[5] Oil by distillation at about 500°C, distillate weighed.
[6] Radiometric determination by B.A. McCall.
[7] Uranium (Montgomery and Cheney, 1967, p. 52-56).
[8] CO_2.
[9] Calculated from reported F.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

300 - 303. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. SE¼SE¼ sec. 31, T. 8 S., R. 45 E., South Stewart Canyon. (Sheldon and others, 1953, p. 2, 9, 10-13.) Phosphate rock. Trench sample. Index map, detailed measured section.

300. Sample 4128-JDW, 39.45-40.10 ft from top of member.
301. Sample 4129-JDW, 38.55-39.45 ft from top of member.
302. Sample 4137-JDW, 31.3-32.1 ft from top of member.
303. Sample 4173-MET, 27.3-28.3 ft from top of member.

304 - 324. County, formation, and member as in samples 300-303. SE¼ sec. 33, T. 8 S., R. 45 E., Lone Pine Spring. (Sheldon and others, 1953, p. 2, 20-23; Montgomery and Cheney, 1967, p. 2, 39, 40, 52-55, pls. 2, 3.) Phosphate rock. Sample 309, phosphatic mudstone and phosphate rock. Trench sample. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections.

304, 305. Sample 4520-RGW, 167.8-169.8 ft from top of member. General mineralogy.
304. (Gulbrandsen, 1966, p. 770, 771, table 1.)
306. Sample 4519-RGW, 166.9-167.8 ft from top of member.
307. Sample 5105-RAS, 155.7-157.7 ft from top of member.
308. Sample 5078-RPS, 143.0-144.0 ft from top of member.
309. Sample 5075-RPS, 137.0-140.5 ft from top of member.
310. Sample 5026-RAS, 40.2-42.4 ft from top of member.
311. Sample 5025-RAS, 38.2-40.2 ft from top of member.
312. Sample 5022-RAS, 34.0-35.5 ft from top of member.
313. Sample 5021-RAS, 33.1-34.0 ft from top of member.
314. Sample 5090-MAW, 29.6-30.8 ft from top of member.
315. Sample 5088-MAW, 28.5-29.1 ft from top of member.
316. Sample 5086-MAW, 26.6-27.8 ft from top of member.
317. Sample 5084-MAW, 25.0-26.0 ft from top of member.
318. Sample 5083-MAW, 24.1-25.0 ft from top of member.
319. Sample 5081-MAW, 23.0-23.7 ft from top of member.

Idaho—Continued

320, 321. Sample 5018-MAW, 20.5-21.5 ft from top of member. General mineralogy.
320. (Gulbrandsen, 1966, p. 770, 771, table 1.)
322. Sample 5017-MAW, 19.6-20.5 ft from top of member.
323. Sample 5016-MAW, 18.1-19.6 ft from top of member.
324. Sample 5014-MAW, 14.9-15.9 ft from top of member.

325 - 334. County, formation, member, maps, and sections as in samples 304-324. SW¼ sec. 31, T. 8 S., R. 46 E., Pole Canyon. (Sheldon and others, 1953, p. 2, 14-17; Montgomery and Cheney, 1967, p. 2, 39, 40, 56, 59, pls. 2, 3.) Phosphate rock. Trench sample. Tonnage estimated.

325. Sample 4416-RAS, 29.3-31.9 ft from top of member.
326. Sample 4417-RAS, 27.9-29.3 ft from top of member.
327. Sample 4419-RAS, 24.7-25.9 ft from top of member.
328. Sample 4420-RAS, 22.8-24.7 ft from top of member.
329. Sample 4421-RAS, 21.1-22.8 ft from top of member.
330. Sample 4423-RAS, 18.8-19.8 ft from top of member.
331. Sample 4424-RAS, 16.8-18.8 ft from top of member.
332. Sample 4427-RAS, 13.3-14.6 ft from top of member.
333. Sample 4428-RAS, 12.4-13.3 ft from top of member.
334. Sample 4429-RAS, 11.9-12.4 ft from top of member.

335 - 338. County, formation, and member as in samples 300-303. NE¼SW¼ sec. 29, T. 9 S., R. 43 E., Swan Lake Gulch. (McKelvey and others, 1953b, p. 2, 4, 42-44, 45, pl. 1.) Phosphate rock. Mineralogy. Trench sample. Index maps, detailed measured section.

335, 336. Sample WOM-2890, 157.6-159.0 ft from top of member.
335. (Gulbrandsen, 1966, p. 770, 771, table 1.)
337. Sample WOM-2933. Phosphate rock, argillaceous, fossiliferous; 151.1-152.1 ft from top of member.
338. Sample WOM-2937. Phosphate rock, 147.2-148.5 ft from top of member.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses— Continued

	Idaho—Continued												
	339	340	341	342	343	344	345	346	347	348	349	350	351
	11P15-185	11P15-186		11P15-187	11P15-188	11P15-189	11P15-190	11P15-191	11P15-192	11P15-193	11P15-194	11P15-195	11P15-196
Acid insoluble	21.7	[1]14.2	13.2	22.9	6.4	22.2	19.2	18.8	16.1	24.5	24.7	11.5	11.2
Al_2O_3	2.1	2.1	------	4.5	1.0	4.1	2.9	2.5	3.4	5.0	5.3	2.3	2.2
Fe_2O_3	.80	[2].84	------	1.27	.54	1.25	1.07	1.02	1.48	1.89	2.28	.84	.88
MgO	------	.82	------	------	------	------	------	------	------	------	------	------	------
CaO	------	41.2	------	------	------	------	------	------	------	------	------	------	------
Na_2O	------	.32	------	------	------	------	------	------	------	------	------	------	------
K_2O	------	.34	------	------	------	------	------	------	------	------	------	------	------
H_2O+	------	[3]3.0	------	------	------	------	------	------	------	------	------	------	------
H_2O-	------	1.2	------	------	------	------	------	------	------	------	------	------	------
TiO_3	------	.24	------	------	------	------	------	------	------	------	------	------	------
P_2O_5	25.6	24.8	25.2	25.4	33.2	26.9	29.1	28.6	25.8	22.2	23.4	31.6	31.1
SO_3	------	1.12	------	------	------	------	------	------	------	------	------	------	------
F	------	1.95	------	------	2.84	------	------	------	------	------	------	------	------
Organic matter	------	[4]4.6	------	------	------	------	------	------	------	------	------	------	------
Oil	------	[5].15	------	------	------	------	------	------	------	------	------	------	------
eU	------	[6].006	------	------	------	------	------	------	------	------	------	------	------
Ignition loss	8.74	[7]7.25	------	6.46	6.02	5.70	6.54	6.12	13.88	12.86	9.34	5.72	12.48
Subtotal	------	104.14	------	------	50.00	------	------	------	------	------	------	------	------
Less O	------	[8].82	------	------	[8]1.07	------	------	------	------	------	------	------	------
Total	[58.9]	[103.3]	[38.4]	[60.5]	[48.9]	[60.2]	[58.8]	[57.0]	[60.7]	[66.4]	[65.0]	[52.0]	[57.9]

	Idaho—Continued												
	352	353	354	355	356	357	358	359	360	361	362	363	364
	11P15-197	11P15-198	11P15-199	11P15-200	11P15-201	11P15-202	11P15-203	11P15-204	11P15-205	11P15-206	11P15-207	11P15-208	11P15-209
Acid insoluble	8.0	20.5	20.0	15.7	14.6	22.6	13.1	12.9	5.0	7.9	9.4	14.5	24.8
Al_2O_3	1.4	3.8	3.7	2.6	2.7	4.5	2.3	2.2	1.4	.87	2.8	2.5	5.5
Fe_2O_3	.58	1.32	1.27	1.02	.98	1.48	1.05	1.10	.51	.39	.91	1.13	1.28
P_2O_5	33.9	27.1	27.6	30.4	30.9	26.4	32.0	32.5	35.9	34.9	32.1	30.1	25.1
F	------	------	------	------	------	------	------	------	------	3.37	------	------	------
Ignition loss	5.14	5.92	5.52	4.06	4.16	5.56	2.90	2.84	3.14	2.04	6.50	5.84	7.14
Subtotal	------	------	------	------	------	------	------	------	------	49.47	------	------	------
Less O	------	------	------	------	------	------	------	------	------	[8]1.42	------	------	------
Total	[49.0]	[58.6]	[58.1]	[53.8]	[53.3]	[60.5]	[51.4]	[51.5]	[46.0]	[48.0]	[51.7]	[54.1]	[63.8]

	Idaho—Continued												
	365	366	367	368	369	370	371	372	373	374	375	376	377
	11P15-210	11P15-211	11P15-212	11P15-213	11P15-214	11P15-215	11P15-216	11P15-217	11P15-218	11P15-219	11P15-220	11P15-221	11P15-222
Acid insoluble	17.6	24.4	17.0	23.7	17.6	16.2	10.6	12.1	20.9	6.7	19.4	21.5	25.0
Al_2O_3	6.7	3.6	2.7	5.6	2.8	1.6	2.7	2.4	4.4	2.0	5.2	4.4	5.2
Fe_2O_2	.70	1.26	1.12	1.42	.83	1.28	1.2	1.66	2.60	1.13	1.75	1.58	1.68
P_2O_5	28.5	26.7	29.2	27.2	29.5	30.8	33.5	31.6	27.6	35.3	28.1	23.1	21.4
Ignition loss	7.26	6.34	6.34	4.78	4.64	3.94	3.02	5.02	4.18	2.20	3.94	13.1	13.8
Total	[60.8]	[62.3]	[56.4]	[60.7]	[55.4]	[53.8]	[51.0]	[52.8]	[59.7]	[47.3]	[58.4]	[63.7]	[67.1]

	Idaho—Continued												
	378	379	380	381	382	383	384	385	386	387	388	389	390
	11P15-223	11P15-224	11P15-225	11P15-226	11P15-227	11P15-228	11P15-229	11P15-230	11P15-231	11P15-232	11P15-233	11P15-258	11P15-253
Acid insoluble	10.4	10.0	10.6	9.0	8.7	11.4	13.6	10.2	10.3	22.8	7.1	------	[9]3.40
Al_2O_3	1.9	1.5	1.3	1.5	2.2	1.8	1.4	1.6	.93	3.4	1.60	0.9	.7
Fe_2O_3	.68	.52	.59	.70	.33	.40	.68	.70	.46	1.61	.94	.4	.3
CaO	------	------	------	------	------	------	------	------	------	------	------	47.6	50.2
P_2O_5	32.3	33.1	32.8	33.8	33.3	32.3	31.4	31.3	32.3	27.2	34.2	33.1	35.6
F	------	------	------	------	------	------	------	------	------	------	------	3.59	2.88
V_2O_5	------	------	------	------	------	------	------	------	------	------	------	.33	.06
Ignition loss	5.88	4.70	4.98	4.24	5.30	4.98	9.34	8.04	6.02	5.98	4.26	[16]6.8	[10]4.8
Subtotal	------	------	------	------	------	------	------	------	------	------	------	92.72	97.94
Less O	------	------	------	------	------	------	------	------	------	------	------	[8]1.51	[8]1.21
Total	[51.2]	[49.8]	[50.3]	[49.2]	[49.8]	[50.9]	[56.4]	[51.8]	[50.0]	[61.0]	[48.1]	[91.2]	[96.7]

[1] SiO_2.

[2] Total iron.

[3] Total water.

[4] 230°-500°C.

[5] Oil by distillation at about 500°C, distillate weighed.

[6] Radiometric determination, by B.A. McCall.

[7] CO_2.

[8] Calculated from reported F.

[9] Insoluble.

[10] Ignition loss an approximate measure of organic matter content if rock does not contain carbonates (Lowell, 1952, p. 45).

Spectrographic analysis

[Elements looked for but not detected: Li, Ge, Rb, Nb, Ru, Rh, Pd, In, Sn, Te, Cs, Ce, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf, Ta, W, Re, Os, Ir, Pt, Au, Hg, Tl, Bi, Th]

	340		340		340		340		340
Be	<0.00005	Mn	0.003	Ga	<0.001	Zr	0.003	Ba	0.01
B	<.005	Ni	.03	As	<.001	Mo	.01	La	<.003
Sc	<.0005	Co	<.001	Se	.0007	Ag	.001	Nd	<.006
V	.03	Cu	.01	Sr	.03	Cd	.03	Yb	.0003
Cr	.1	Zn	.03	Y	.01	Sb	.0007	Pb	<.001

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

339 - 341. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. NE¼SW¼ sec. 29, T. 9 S., R. 43 E., Swan Lake Gulch. (McKelvey and others, 1953b, p. 2, 4, 42, 43, 44, 45, pl. 1.) Mineralogy. Trench sample. Index maps, detailed measured section.

339. Sample WOM-2940. Phosphate rock, argillaceous, 142.6-145.5 ft from top of member.

340, 341. Sample WOM-2998. Phosphate rock, calcareous, 24.4-25.2 ft from top of member.

340. (Gulbrandsen, 1966, p. 770-773, table 1.)

342 - 361. County, formation, and member as in samples 339-341. NW¼SE¼ sec. 14, T. 9 S., R. 44 E., Dry Valley. (McKelvey and others, 1953a, p. 2, 38, 39, 43.) Phosphate rock. Samples 353, 354, 357, phosphate rock and phosphatic mudstone. Trench sample. Index map, detailed measured section.

Sample	Ft from top of member
342. VEM-523-47	192.67-193.67
343. VEM-528-47	186.37-187.97
344. VEM-532-47	181.97-182.67
345. VEM-534-47	179.57-181.47
346. VEM-535-47	177.87-179.57
347. RMC-127-47	43.27- 44.07
348. RMC-128-47	42.47- 43.27
349. RMC-131-47	40.27- 40.97
350. RMC-132-47	39.77- 40.27
351. VEM-603-47	37.27- 38.07
352. VEM-604-47	36.67- 37.27
353. VEM-605-47	36.07- 36.67
354. VEM-608-47	32.87- 33.57
355. RMC-94-47	30.67- 31.17
356. RMC-95-47	29.97- 30.67
357. RMC-96-47	29.47- 29.97
358. RAG-112-47	27.08- 27.88
359. RAG-114-47	25.35- 25.95
360. RAG-119-47	21.71- 22.13
361. RAG-121-47	20.94- 21.46

362 - 383. County, formation, and member as in samples 339-341. NE¼SE¼ sec. 19, T. 9 S., R. 44 E., West Dairy. (McKelvey and others, 1953a, p. 2, 44, 45, 48, 49.) Phosphate rock. Trench sample. Index map, detailed measured section.

Sample	Ft from top of member
362. RAG-83-47	174.64-175.84
363. RAG-84-47	173.98-174.64
364. RAG-87-47	171.36-172.86
365. RAG-90-47	167.53-169.28
366. FCA-246-47	166.48-167.53
367. FCA-247-47	165.23-166.48
368. FCA-249-47	163.03-163.93
369. RMC-61-47	161.88-162.63
370. LES-421-47	151.08-152.23
371. LES-423-47	149.28-150.08
372. LES-424-47	148.78-149.28
373. VEM-275-47	147.73-148.03
374. VEM-276-47	147.23-147.73
375. VEM-278-47	145.73-146.53
376. RAG-129-47	37.10- 38.60
377. RAG-130-47	36.00- 37.10
378. VEM-294-47	33.20- 34.20
379. VEM-295-47	32.60- 33.20
380. VEM-296-47	32.20- 32.60
381. VEM-304-47	26.20- 26.50
382. RAW-11-47	20.70- 21.20
383. RAW-9-47	19.30- 19.80

384 - 388. County, formation, and member as in samples 339-341. NE¼NE¼ sec. 20, T. 9 S., R. 44 E., north Dairy area. (McKelvey and others, 1953b, p. 2, 4, 39, 40, 41, pl. 1.) Mineralogy. Tonnage estimated. Index maps.

384. Sample RMC-25-47. Phosphate rock and argillaceous phosphate rock, 0.8 ft thick.

385. Sample RMC-27-47. Phosphate rock and argillaceous phosphate rock, 0.43 ft thick.

386. Sample RMC-29-47. Phosphate rock, 0.4 ft thick.

387. Sample RMC-48-47. Phosphate rock and mudstone, 0.9 ft thick.

388. Sample RMC-50-47. Phosphate rock, 1.3 ft thick.

389, 390. County, formation, and member as in samples 339-341. S½NE¼ sec. 32, T. 9 S., R. 45 E., 15 miles by road northeast of Georgetown, Deer Creek-Wells Canyon area. (Deiss, 1949, p. 61, 62, 64, 83, 85, 87, 88, 94, pls. 5, 6; Lowell, 1952, p. 2, 12, 13, 15, 16, 19, 21-27, 36, 46, 47, pls. 1-3.) Phosphate rock, black, blackish-brown, dark-brown-gray. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections. Photomicrographs. Use: Source of elemental phosphorus. Possible use: Fertilizer, source of fluorine and vanadium.

389. Trench C, sample 1.

390. Trench A, sample 7.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	391	392	393	394	395	396	397	398	399	400	401	402	403
	11P15-254	11P15-255	11P15-256	11P15-257	11P15-259	11P15-260	11P15-261	11P15-262	11P15-263	11P15-264	11P15-265	11P15-266	11P15-267
Insoluble	------	------	------	------	3.9	4.1	8.1	24.6	17.6	18.4	17.6	17.0	14.5
Al_2O_3	0.8	1.3	0.9	0.6	.7	1.1	1.9	3.3	2.4	2.2	3.1	3.1	3.8
Fe_2O_3	.7	.4	.4	.5	.6	.5	.5	1.0	1.0	.9	1.5	1.4	1.2
CaO	48.8	46.3	47.1	50.1	47.4	46.4	44.2	33.9	37.5	36.3	34.6	35.8	34.8
H_2O-	------	------	------	------	[1]1.1	[1]1.3	[1]1.3	[1]1.9	[1]2.0	[1]2.2	[1]2.9	[1]2.9	[1]3.3
P_2O_5	33.9	32.6	33.1	34.0	33.0	32.1	28.0	21.9	25.4	25.2	23.9	23.9	23.3
F	3.55	3.53	3.55	3.71	3.28	3.18	3.24	2.39	2.51	2.43	2.57	2.84	2.33
V_2O_5	.08	.08	.07	.05	.22	.23	.14	.07	.24	.41	.13	.03	.03
Ignition loss[2]	7.0	9.3	8.6	4.5	8.9	11.3	10.9	11.7	12.4	14.5	16.0	16.7	19.4
Subtotal	94.83	93.51	93.72	93.46	99.10	100.21	98.28	100.76	101.05	102.54	102.30	103.67	102.66
Less O[3]	1.49	1.49	1.49	1.56	1.38	1.34	1.36	1.01	1.06	1.02	1.08	1.20	.98
Total	[93.3]	[92.0]	[92.2]	[91.9]	[97.7]	[98.9]	[96.9]	[99.8]	[100.0]	[101.5]	[101.2]	[102.5]	[101.7]

	Idaho—Continued												
	404	405	406	407	408	409	410	411	412	413	414	415	416
	11P15-269	11P15-270	11P15-271	11P15-272	11P15-273	11P15-274	11P15-275	11P15-276	11P15-277	11P15-278	11P15-279	11P15-294	11P15-295
Insoluble	22.8	18.7	12.5	11.1	4.6	4.7	6.4	6.8	4.4	14.9	------	19.4	3.4
Al_2O_3	2.5	1.9	2.4	2.5	1.2	1.0	1.2	1.3	.5	1.8	1.3	2.7	.9
Fe_2O_3	1.2	1.7	1.0	.9	.5	.6	.6	.6	.4	.7	.8	1.1	.4
CaO	34.2	39.6	37.0	38.3	47.2	48.7	47.5	47.6	50.8	41.4	45.4	39.1	49.5
H_2O-[1]	1.8	.7	3.1	3.1	1.3	1.0	1.1	1.0	.6	1.0	------	1.0	.7
P_2O_5	24.2	28.0	25.4	20.1	34.3	34.4	32.0	33.8	35.5	24.1	33.0	27.2	34.4
F	2.61	3.10	2.53	1.90	3.51	3.63	3.53	3.57	3.84	2.51	3.30	2.71	3.53
V_2O_5	.03	.01	.36	.44	.25	1.16	.13	.13	.05	.01	.09	.23	.18
Ignition loss[2]	11.4	5.9	16.8	21.1	8.6	5.9	7.3	6.5	4.6	12.3	8.5	6.3	6.6
Subtotal	100.74	99.61	101.09	99.44	101.46	101.09	99.76	101.30	100.69	98.72	92.39	99.74	99.61
Less O[3]	1.10	1.30	1.06	.80	1.48	1.53	1.49	1.50	1.62	1.06	1.39	1.14	1.49
Total	[99.6]	[98.3]	[100.0]	[98.6]	[100.0]	[99.6]	[98.3]	[99.8]	[99.1]	[97.7]	[91.0]	[98.6]	[98.1]

	Idaho—Continued												
	417	418	419	420	421	422	423	424	425	426	427	428	429
	11P15-296	11P15-297	11P15-298	11P15-299	11P45-4	11P45-5	11P45-1	11P45-2	11P45-3	11P15-280	11P15-281	11P15-282	11P15-283
Insoluble	6.2	7.6	------	------	------	------	3.5	12.3	23.3	[4]15.7	[4]15.2	[4]18.7	[4]19.2
Al_2O_3	1.3	1.1	1.3	0.9	1.7	0.9	.9	2.5	3.6	3.10	2.14	4.48	4.30
Fe_2O_3	.7	.7	.5	.4	.7	.3	.6	.8	1.4	.93	.78	1.73	1.65
CaO	46.2	47.6	47.8	49.2	44.5	49.5	48.0	36.4	30.6	------	------	------	------
H_2O-[1]	1.0	.9	------	------	------	------	.9	2.6	3.1	------	------	------	------
P_2O_5	32.2	28.3	34.3	32.2	29.4	34.9	35.5	25.3	22.3	30.6	29.6	23.4	23.6
F	3.35	2.86	3.59	3.79	3.30	3.71	3.37	2.92	2.10	------	------	------	------
V_2O_5	.32	.12	.12	.07	.43	.09	.17	.04	.03	------	------	------	------
Ignition loss	[2]7.7	[2]10.6	[2]6.7	[2]4.5	[2]11.6	[2]5.4	[2]8.2	[2]14.4	[2]15.8	6.37	6.89	14.82	14.39
Subtotal	98.97	99.78	94.31	91.06	91.63	94.80	101.14	97.26	102.23	------	------	------	------
Less O[3]	1.41	1.20	1.51	1.60	1.39	1.56	1.42	1.23	.88	------	------	------	------
Total	[97.6]	[98.6]	[92.8]	[89.5]	[90.2]	[93.2]	[99.7]	[96.0]	[101.4]	[56.7]	[54.6]	[63.1]	[63.1]

	Idaho—Continued												
	430	431	432	433	434	435	436	437	438	439	440	441	442
	11P15-284	11P15-285	11P15-286	11P15-287	11P15-288	11P15-289	11P15-290	11P15-291	11P15-292	11P15-293	11P45-6	11P45-7	11P45-8
Acid insoluble	16.8	15.4	12.9	8.2	16.6	7.7	2.3	14.6	13.3	20.6	23.5	18.5	15.7
Al_2O_3	4.72	3.88	3.10	2.27	4.44	1.74	1.18	3.66	2.74	3.63	2.7	2.7	3.4
Fe_2O_3	1.39	1.20	1.40	1.04	1.38	.75	.53	1.18	1.24	1.24	1.12	2.56	1.12
P_2O_5	25.8	26.5	28.5	31.6	26.9	34.5	36.6	29.9	30.3	27.4	25.7	29.5	25.8
Ignition loss	12.76	11.88	10.72	14.79	10.98	5.75	5.49	5.37	6.22	5.68	7.70	4.66	16.00
Total	[61.5]	[58.9]	[56.6]	[57.9]	[60.3]	[50.4]	[46.1]	[54.7]	[53.8]	[58.6]	[60.7]	[57.9]	[62.0]

	Idaho—Continued												
	443	444	445	446	447	448	449	450	451	452	453	454	455
	11P45-9	11P45-10	11P45-11	11P45-12	11P45-13	11P45-14	11P45-15	11P45-16	11P45-17	11P45-18	11P45-19	11P45-20	11P45-21
Acid insoluble	12.6	3.1	5.0	18.7	9.4	13.7	5.9	23.5	[5]4.4	[5]23.5	[5]30.4	[5]3.7	[5]26.6
Al_2O_3	2.8	.9	1.2	3.3	1.7	2.1	.4	5.0	1.1	3.4	4.1	.8	4.0
Fe_2O_3	1.04	.36	.48	1.22	.76	1.02	.24	1.84	[6].3	[6].7	[6]1.0	[6].71	[6]1.03
MgO	------	------	------	------	------	------	------	------	< .1	< .1	< .1	.14	1.13
CaO	------	------	------	------	------	------	------	------	49.0	37.5	33.2	49.4	32.0
P_2O_5	27.9	36.0	35.5	27.8	32.9	31.6	36.4	24.6	34.4	26.6	23.5	34.2	21.6
S	------	------	------	------	------	------	------	------	------	------	------	.85	.42
V	------	------	------	------	------	------	------	------	------	------	------	.055	.018
Organic carbon	------	------	------	------	------	------	------	------	1.9	2.3	3.6	[7]1.30	[7]1.80
Ignition loss	13.42	6.48	5.26	7.90	5.90	4.98	2.76	6.94	[8]5.7	[8]7.9	[8]10.1	[8]5.4	[8]7.6
Total	[57.8]	[46.8]	[47.4]	[58.9]	[50.7]	[53.4]	[45.7]	[61.9]	[< 96.9]	[< 102.0]	[< 106.0]	[96.6]	[96.2]

[1] Moisture at 105°C.

[2] Ignition loss an approximate measure of organic matter content if rock does not contain carbonates (Lowell, 1952, p. 45).

[3] Calculated from reported F.

[4] Acid insoluble.

[5] SiO_3.

[6] Fe.

[7] Noncarbonate carbon.

[8] At 1,000°C.

Spectrographic analyses

[C = 1-5 percent, D = 0.1-1.0 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent, G = < 0.001 percent]

	451	452	453	454	455
Be	------	------	------	G	G
B	F	E	E	F	E
Na	D	D	D	C	D
Sc	------	------	------	------	F
Ti	D	D	D	E	D
V	D	D	D	------	------
Cr	D	D	D	D	E
Mn	E	E	F	E	E
Ni	D	D	------	E	D
Co	F	E	F	------	F
Cu	F	F	F	F	F
Zn	E	E	E	------	E
Sr	E	E	E	E	E
Y	------	------	------	E	E
Zr	F	F	F	F	E
Nb	E	E	E	------	E
Mo	F	E	E	------	F
Ag	------	------	------	F	G
Cd	------	------	------	------	E
Sn	------	------	------	------	E
Ba	E	E	E	------	E
Pb	E	E	E	E	E

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

391-425. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. Fifteen miles by road northeast of Georgetown, Deer Creek-Wells Canyon area. (Deiss, 1949, p. 62, 64, 83, 85, 87-91, 94, pls. 5-7; Lowell, 1952, p. 2, 6, 7, 9, 10, 12, 15, 16, 21-27, 45-47, pls. 1-3.) Phosphate rock, black, blackish-brown, dark-brown-gray. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections, correlated columnar sections. Photomicrographs. Use: Source of elemental phosphorus. Possible use: Fertilizer, source of vanadium and fluorine.

391-394. S½NE¼ sec. 32, T. 9 S., R. 45 E. Trenches A and B.
391. Sample 4, 1 ft 4 in. thick.
392. Sample 2, 1 ft thick.
393. Sample 11, 2 ft thick.
394. Sample 15, 1 ft 6 in. thick.

395-413. S½SW¼ sec. 34, T. 9 S., R. 45 E. Trench I.
395. Sample 2, 1 ft 6 in. thick.
396. Sample 3, 3 ft 3 in. thick.
397. Sample 4, 10 in. thick.
398. Sample 5, 3 ft thick.
399. Sample 6, 7 ft 7 in. thick.
400. Sample 8, 2 ft 8 in. thick.
401. Sample 11, 1 ft 11 in. thick.
402. Sample 12, 2 ft 10 in. thick.
403. Sample 13, 1 ft 6 in. thick.
404. Sample 40, 6 in. thick.
405. Sample 42, 11 in. thick.
406. Sample 47, 3 ft 6 in. thick.
407. Sample 48, 2 ft 6 in. thick.
406. Sample 49, 2 ft thick.
409. Sample 50, 1 ft 1 in. thick.
410. Sample 52, 1 ft 8 in. thick.
411. Sample 55, 4 in. thick.
412. Sample 56, 10 in. thick.
413. Sample 57, 4 in. thick.

414. W½NE¼ sec. 5, T. 10 S., R. 45 E. Trench D, sample 1. Phosphate rock, 5 ft thick.

415-417. NW¼NE¼ sec. 9, T. 10 S., R. 45 E. Trench E.
415. Sample 1A, 4 in. thick.
416. Sample 2A, 2 ft 4 in. thick.
417. Sample 3A, 6 in. thick.

418-420. NW¼ sec. 9, T. 10 S., R. 45 E. Trench H.
418. Sample 12, 1 ft 4 in. thick.
419. Sample 15, 1 ft 8 in. thick.
420. Sample 22, 2 ft 1 in. thick.

421-425. SW¼SW¼ sec. 9, T. 10 S., R. 45 E. Trenches G and F.
421. Sample 11, 3 ft 1 in. thick.
422. Sample 17, 1 ft 4 in. thick.
423. Sample 1, 4 ft 2 in. thick.
424. Sample 9, 11 in. thick.
425. Sample 10, 4 ft 3 in. thick.

426-439. County, formation, and member as in samples 391-425. NW¼NW¼ sec. 8, T. 10 S., R. 45 E., Snowdrift Mountain. (Smart and others, 1954, p. 2, 4, 15-19.) Phosphate rock. Sample 428, phosphate rock, calcareous. Index map, detailed measured section.

Sample	Ft from top of member
426. 6635-JAP	176.5-177.1
427. 6644-JAP	159.7-160.7
428. 6659-TMC	143.1-143.7
429. 6740-RGW	47.0- 47.8
430. 6741-RGW	45.5- 47.0
431. 6742-RGW	44.3- 45.5
432. 6743-RGW	42.9- 44.3
433. 6744-RGW	41.5- 42.9
434. 6745-RGW	40.4- 41.5
435. 6746-RGW	39.7- 40.4
436. 6747-RGW	38.9- 39.7
437. 6749-RGW	37.3- 38.1
438. 6753-ERC	34.4- 35.3
439. 6756-ERC	30.0- 31.9

440-450. County, formation, and member as in samples 391-425. SW¼SE¼ sec. 16, T. 10 S., R. 45 E., Clear Creek. (Swanson and others, 1956, p. 2, 26, 27.) Phosphate rock. Samples 446 and 450, phosphate rock and mudstone. Trench sample. Index map, detailed measured section.

Sample	Ft from top of member
440. 7302-RPS	136.9-144.0
441. 7325-RPS	51.0- 52.0
442. 7329-LDC	39.7- 42.2
443. 7330-LDC	35.2- 39.7
444. 7331-LDC	32.6- 35.2
445. 7332-LDC	31.7- 32.6
446. 7333-LDC	30.3- 31.7
447. 7335-LDC	27.2- 29.5
448. 7336-LDC	24.8- 27.2
449. 7340-LDC	20.7- 21.6
450. 7343-RPS	15.7- 16.4

451-453. County, formation, and member as in samples 391-425. Sec. 29, T. 10 S., R. 45 E., south of Georgetown. Collector, A. L. Service. (Mabie and Hess, 1964, p. 2, 3, 5, 7, 8, 9, 12, 13, 58, 81, 82; Service and Popoff, 1964, p. 6, 11, 12, 28, 31-33, 63.) Mineralogy. Tonnage estimated. Index map, compositional classification triangle. Physical properties, beneficiation tests. Possible use: Agricultural, chemical, metallurgical.

451. Field No. ALS-1. Phosphorite, light-brown, medium-grained; 5.5 ft thick.
452. Field No. ALS-3. Phosphorite, brown, fine-grained, argillaceous, siliceous; 12.4 ft thick.
453. Field No. ALS-2. Phosphorite, brown, fine-grained, argillaceous, siliceous; two beds 15.6 and 4.5 ft thick.

454, 455. County, formation, and member as in samples 391-425. [Sec. 29], T. 10 S., R. 45 E., near Georgetown. (Town, 1966, p. 2-6, 7-9, 12.) Trench sample. Mineralogy, thin-section description. Geologic section; compositional triangle. Beneficiation tests.

454. Field No. CF-16. Phosphorite, dark-brown; 2.8 ft thick.
455. Field No. CF-15. Phosphatic shale, medium-brown; 3.0 ft thick.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

Idaho—Continued

	456	457	458	459	460	461	462	463	464	465	466	467	468
	11P45-22	11P45-23	11P45-24	11P45-25	11P45-26	11P45-27	11P45-28	11P15-108	11P15-109		11P15-110	11P16-12	
SiO_2	23.9	24.3	20.7	17.0	20.2	18.0	9.1	[1]7.50	[1]8.15	[2]6.02	[1]3.93	18.2	------
Acid insoluble	------	------	------	------	------	------	------	------	------	[3]6.86	------	------	18.9
Al_2O_2	3.9	3.5	3.3	3.9	4.1	3.5	.9	.96	1.16	1.16	[4].74	2.8	------
Fe_2O_3	[5]1.36	[5]2.99	[5]1.15	[5]1.87	[5]1.26	[5]2.83	[5].47	[6].80	[6].87	[6].87	[6].60	[6]1.1	------
MgO	.36	.31	.37	.30	.35	.30	.09	.22	.31	.31	------	.63	------
CaO	33.7	33.7	35.1	32.8	33.9	38.9	47.9	45.96	45.99	45.99	47.94	40.3	------
Na_2O	------	------	------	------	------	------	------	.78	.65	------	------	.67	------
K_2O	------	------	------	------	------	------	------	.40	.45	------	------	.86	------
H_2O+	------	------	------	------	------	------	------	[8]1.96	[8]1.90	------	------	[7]1.6	------
H_2O-	------	------	------	------	------	------	------	------	------	------	------	.4	------
TiO_2	------	------	------	------	------	------	------	.07	.06	.06	------	.22	------
P_2O_5	23.4	23.6	24.4	21.6	22.0	27.1	34.9	32.24	32.53	32.53	33.56	27.6	28.2
MnO	------	------	------	------	------	------	------	.002	.002	------	------	------	------
CO_2	------	.91	1.00	.72	1.70	3.14	------	1.80	1.72	1.34	2.06	1.54	------
SO_3	------	------	------	------	------	------	------	[9]1.66	[9]1.74	------	------	------	------
S	.31	.48	.63	1.09	.70	.25	.12	[10].00	[10].00	------	------	------	------
N	------	------	------	------	------	------	------	.091	.10	------	------	------	------
F	------	------	------	------	------	------	------	3.40	3.33	3.33	3.37	2.93	------
Cl	------	------	------	------	------	------	------	.03	.03	------	------	------	------
V	.057	.060	.062	.044	.060	.057	.022	[11].35	[11].40	------	------	------	------
Cr_2O_3	------	------	------	------	------	------	------	.13	.13	------	------	------	------
Mo	------	------	------	------	------	------	------	None	None	------	------	------	------
I in ppm	------	------	------	------	------	------	------	2.6	1.9	------	------	------	------
BaO	------	------	------	------	------	------	------	[12].07	[12].07	------	------	------	------
Organic matter	[13]2.41	[13]2.87	[13]3.83	[13]7.81	[13]4.96	[13]1.42	[13].43	[14]2.29	[14]2.35	------	------	[15].8	------
Oil	------	------	------	------	------	------	------	------	------	------	------	[16].10	------
eU	------	------	------	------	------	------	------	------	------	------	------	[17].007	------
Ignition loss	[18]7.8	[18]8.4	[18]10.2	[18]17.5	[18]12.8	[18]6.0	[18]2.7	------	------	[19]5.89	------	------	------
Subtotal	------	------	------	------	------	------	------	------	------	104.36	92.20	99.76	------
Less O	------	------	------	------	------	------	------	------	------	[20]1.40	[20]1.42	[20]1.23	------
Total	[97.2]	[101.1]	[100.7]	[104.6]	[102.0]	[101.5]	[96.6]	[21]99.21	[21]100.47	[102.96]	[22][90.78]	[98.5]	[47.1]

Idaho—Continued

	469	470	471	472	473	474	475	476	477	478	479	480	481
	11P16-13		11P16-14		11P16-15		11P17-1		11P17-2		11P17-3	11P17-4	11P17-5
SiO_2	16.9	[23]15.7	17.4	[23]15.9	19.0	[23]17.6	5.4	[23]4.3	10.8	[23]10.0	21.0	12.5	8.43
Al_2O_3	2.2	------	1.1	------	3.0	------	1.0	------	1.5	------	1.0	1.4	------
Fe_2O_2	[6]1.0	------	[6]1.6	------	[6]1.2	------	[6].79	------	[6]1.2	------	[5].3	[5]1.0	------
MgO	.30	------	.13	------	.53	------	.04	------	.38	------	1.6	.2	.11
CaO	43.0	------	42.8	------	39.0	------	48.6	------	38.9	------	39.8	45.4	49.84
Na_2O	.53	------	.40	------	.58	------	.64	------	.60	------	------	------	1.18
K_2O	.55	------	.25	------	.78	------	.37	------	.80	------	------	------	.22
H_2O+	[7]3.2	------	[7]1.2	------	[7]2.6	------	[7]1.6	------	[7]2.2	------	------	------	------
H_2O-	.4	------	.3	------	.4	------	.5	------	.5	------	------	------	------
TiO_3	.15	------	.05	------	.18	------	.09	------	.28	------	------	------	.008
P_2O_5	30.0	30.1	31.0	32.3	28.1	28.4	34.5	34.5	27.3	31.4	25.6	31.2	33.93
CO_2	1.02	------	.69	------	1.15	------	1.86	------	1.90	------	[24]6.5	[24]3.2	Present
SO_3	------	------	------	------	------	------	------	------	1.56	------	------	------	------
F	2.95	------	2.93	------	2.70	------	3.43	------	3.15	------	------	------	3.63
Organic matter	[15]1.0	------	[15].8	------	[13]1.3	------	[13]1.8	------	[13]2.1	------	[14]<.1	------	.24
Oil	[16].10	------	[16].12	------	[16].15	------	[16].05	------	[16].10	------	------	------	------
eU	[17].006	------	[17].004	------	[17].007	------	[17].006	------	[17].009	------	------	------	------
Subtotal	103.31	------	100.77	------	100.68	------	100.68	------	93.28	------	------	------	97.726
Less O	[20]1.24	------	[20]1.23	------	[20]1.14	------	[20]1.44	------	1.33	------	------	------	[20]1.53
Total	[102.1]	[45.8]	[99.5]	[48.2]	[99.5]	[46.0]	[99.2]	[38.8]	[92.0]	[41.4]	[95.9]	[94.9]	[96.20]

Idaho—Continued

	482	483	484	485	486	487	488	489	490
	11P17-6	11P41-1	11P41-2	11P41-3	11P41-4	11P41-5	11P41-6	11P41-7	11P41-8
Insoluble	[23]12.6	3.5	5.2	2.9	5.3	4.5	6.7	22.3	14.3
Al_2O_3	.73	.8	1.7	.6	.7	.3	1.4	3.1	2.3
Fe_2O_2	[6].83	.9	1.3	.4	.5	.3	1.3	1.6	1.3
CaO	------	50.9	48.2	52.2	49.0	48.8	43.8	29.9	35.6
P_2O_5	31.3	36.8	34.3	35.7	34.3	33.2	29.8	19.5	23.4
Chem U	.011	------	------	------	------	------	------	------	------
V_2O_3	------	------	------	------	.89	------	------	.12	------
Ignition loss	[18]3.31	2.1	2.6	2.9	3.6	5.8	8.7	15.0	13.4
Total	[48.8]	[95.0]	[93.3]	[94.7]	[94.3]	[92.9]	[91.7]	[91.5]	[90.3]

Minor elements and oxides of sample 481			
S	Present	Co	0.000
Cl	0.008	Cu	.001
V_2O_5	.03	Zn	.012
Cr_2O_3	.07	MoO_3	.002
MnO	.008	Ag	.00004
Ni	.005	Pb	.002

---

[1] Total Si.

[2] Without regard for F.

[3] Insoluble in 1:1 HCl.

[4] Total Al, not corrected for Ti.

[5] Fe.

[6] Total Fe or total iron.

[7] Total water.

[8] Total water at 800°C, does not include water at 105°C.

[9] Total sulfates.

[10] Acid insoluble sulfide.

[11] V_2O_3.

[12] For Conda area; not necessarily in sample.

[13] Noncarbonate carbon.

[14] Organic C.

[15] 230°-500°C.

[16] Oil by distillation at about 500° C, distillate weighed.

[17] Radiometric determination by B.A. McCall.

[18] At 1,000°C.

[19] Constant weight at 1,000°C after drying at 105°C.

[20] Calculated from reported F.

[21] Corrected for O equivalent of F, Cl, and pyritic S; sample 464, CuO = 0.011 percent, ZnO = 0.001 percent, As_2O_3 = 0.0026 percent.

[22] Sample air-dried.

[23] Acid insoluble.

[24] Ignition loss, at 1,000°C.

Spectrographic analyses

[C = 1-5 percent, D = 0.1-1.0 percent, E = 0.01-0.1 percent, F = 0.001-0.01 percent, G = <0.001 percent, ND = not detected. For samples 467,469,471,473,475,477: Elements looked for but not detected; Ge,Rb,Nb,Ru,Rh,Pd,In,Sn,Te,Cs,Ce,Pr,Sm,Eu,Gd,Tb,Dy,Ho,Er,Tm,Lu,Hf,Ta,W,Re,Os,Ir,Pt,Au,Hg,Tl,Bi, and Th; analysts, Charles Annell, Joseph Haffty; geochemical determinations of As,Sb,Se, by H.E. Crowe, J.E. Swick, R.R. Beins]

	456	457	458	459	460	461	462	467	469	471	473	475	477	479	480
Li	E	E	------	------	------	------	------	ND	ND	ND	ND	ND	ND	---	---
Be	G	G	------	F	G	G	------	0.0001	<0.00005	<0.00005	0.0001	<0.00005	0.0001	---	---
B	E	E	E	E	E	E	F	<.005	<.005	<.005	<.005	<.005	<.005	F	F
Na	D	D	D	D	D	D	E	------	------	------	------	------	------	C	C
Sc	------	------	------	------	------	------	------	.001	.001	<.0005	.003	.003	.001	---	---
Ti	D	D	D	D	D	D	E	------	------	------	------	------	------	D	D
V	------	------	------	------	------	------	------	.1	.03	.003	.03	.003	.01	D	D
Cr	D	D	D	C	E	D	D	.3	.1	.1	.3	.1	.1	D	D
Mn	D	E	C	F	E	E	D	.003	.01	.003	.01	.01	.01	E	E
Ni	D	D	D	D	D	------	D	.03	.01	.03	.03	.01	.01	E	E
Co	------	------	------	------	------	------	------	<.001	<.001	<.001	<.001	<.001	<.001	---	---
Cu	F	F	F	F	F	E	F	.03	.01	.01	.03	.003	.01	F	F
Zn	E	E	------	------	------	------	------	.01	.01	.03	.01	.01	.01	---	E
Ga	E	E	------	E	------	F	------	.001	<.001	<.001	.001	<.001	<.001	---	---
As	------	------	------	------	------	------	------	.002	.003	<.001	.004	.002	<.001	---	---
Se	------	------	------	------	------	------	------	.001	.0007	.001	.001	.001	.003	---	---
Sr	E	E	------	D	------	------	------	.1	.1	.1	.1	.03	.1	E	E
Y	E	E	F	D	E	E	E	.1	.1	.03	.1	.1	.1	---	---
Zr	E	E	------	E	E	E	------	.01	.003	.001	.003	.003	.003	F	F
Mo	F	F	E	E	E	------	------	.003	.003	.01	<.0005	.001	.003	F	E
Ag	F	G	F	F	F	F	F	.001	.001	.0003	.001	.0001	.0003	F	F
Cd	------	------	------	E	------	------	------	<.005	<.005	<.005	<.005	<.005	.01	---	---
Sb	------	------	------	------	------	------	------	.0005	.0005	.0003	.0004	.0005	.0004	---	---
Ba	------	------	------	E	------	------	------	.03	.03	.01	.03	.01	.01	---	---
La	------	------	------	------	------	------	------	.03	.03	.01	.03	.1	.03	---	---
Nd	------	------	------	------	------	------	------	.03	.03	<.006	.03	.03	.03	---	---
Yb	------	------	------	------	------	------	------	.001	.001	.0003	.001	.003	.003	---	---
Pb	E	E	------	E	------	------	------	.001	<.001	<.001	<.001	<.001	<.001	E	E

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

456-462. Caribou County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. [Sec. 29], T. 10 S., R. 45 E., near Georgetown. (Town, 1966, p. 2-6, 7, 9, 12.) Trench sample. Mineralogy, thin-section description. Geologic section, compositional triangle. Beneficiation tests.

456. Field No. CF-14. Phosphatic shale, light-brown; 3.8 ft thick.

457. Field No. CF-13. Phosphatic shale, medium-brown; 6.9 ft thick.

458. Field No. CF-12. Phosphatic shale, dark-brown; 6.0 ft thick.

459. Field No. CF-10. Phosphatic shale, medium- to dark-brown; 10.4 ft thick.

460. Field No. CF-3. Phosphatic shale and mudstone, dark-brown; 14.0 ft thick.

461. Field No. CF-2. Phosphorite, light-brown; 5.1 ft thick.

462. Field No. CF-1. Phosphorite, light-gray; 17 ft thick.

463-466. Caribou County. [Phosphoria Formation. T. 8 S., R. 42 E.], near town of Conda. Phosphate rock.

463, 464. Samples 454, 973. (Jacob and others, 1933, p. 11, 22, 28, 31, 46, 51.) Tonnage estimated. General use: Manufacture of phosphoric acid, fertilizer; source of vanadium.

465. Analyst, L. F. Rader, Jr. Sample 973. (Hill, Marshall, and Jacob, 1931, p. 1120, 1123, 1124.) Physical properties.

466. (Marshall and others, 1935, p. 205, 206, 209.) Beneficiation tests. Possible use: Fertilizer, livestock feed [implied].

467-474. Cassia County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. Sec. 7, T. 12 S., R. 29 E., near Mud Spring. (Smart and others, 1954, p. 2, 20, 21; samples 467, 469, 471, 473, Gulbrandsen, 1966, p. 770, table 1.) General mineralogy. Index maps, detailed measured section.

467, 468. Sample 6414-RAS. Phosphate rock, 77.4-78.3 ft from top of member.

469, 470. Sample 6416-RAS. Phosphate rock, argillaceous, 75.9-76.8 ft from top of member.

471, 472. Sample 6420-MAW. Phosphate rock, 67.1-68.1 ft from top of member.

473, 474. Sample 6438-TMC. Phosphate rock, 29.2-31.2 ft from top of member.

475-478. Clark County. Phosphoria Formation, Retort Phosphatic Shale Member. NW¼ sec. 12, T. 14 N., R. 40 E., Centennial Range. (Klepper and others, 1953, p. 2, 3, 36; samples 475, 477, Gulbrandsen, 1966, p. 770, table 1.) Trench sample. General mineralogy. Index maps, detailed measured section.

475, 476. Sample OAP-518. Oolite-pellet phosphorite, 19.5-20.2 ft from top of member.

477, 478. Sample OAP-521. Pellet phosphorite, 15.9-17.4 ft from top of member.

Idaho—Continued

479, 480. Clark County. Phosphoria Formation, Meade Peak Phosphatic Shale Member. Secs. 11-14, T. 14 N., R. 40 E., Centennial Range. Centennial mines. Collector, A. L. Service. (Mabie and Hess, 1964, p. 2-4, 7, 8, 9, 12, 13, 25, 58, 72; Service and Popoff, 1964, p. 6, 11, 12, 28, 30, 32, 33, 63.) Mineralogy, tonnage estimated. Index map, compositional classification triangle. Physical properties, beneficiation tests. Photomicrographs. Possible use: Agricultural, chemical, metallurgical.

479. Field No. CCP-3. Phosphorite, light-gray, coarse-grained, cherty, arenaceous, nonfriable.

480. Field No. CCP-4. Phosphorite, gray, coarse-grained, partially cherty, arenaceous, nonfriable; 4.6 ft thick.

481. County, formation, and member as in samples 479, 480. NE¼ sec. 7, T. 14 N., R. 41 E., Centennial Range. Sample OAP-505. (Klepper and others, 1953, p. 2, 36-38.) Phosphate rock, 1.7-6.3 ft from top of member. Trench sample. Index map, detailed measured section.

482. County, formation, and member as in samples 479, 480. NE¼ sec. 19, T. 14 N., R. 41 E., Taylor Creek Ridge. Sample RFG-5564. (Cressman and Swanson, 1964, p. 280, 311, 523-526, pls. 14, 15.) Phosphorite, coarsely oolitic, thin- to thick-bedded; 1.5 ft thick. Channel sample. Index maps, detailed measured section. Photomicrographs.

483, 484. Teton County. Formation and member as in samples 479, 480. Sec. 6, T. 3 N., R. 46 E., about 3 miles northeast of town of Victor, Teton Range. Analyst, F. J. Gray. Trench C. (Gardner, 1944, p. 3, 20, 30, pl. 3.) Index and geologic maps, detailed measured section. Possible use: Fertilizer, source of vanadium.

483. Sample C-4. Phosphate rock, light-gray, hard; contains oolites and pellets; 1.7 ft thick.

484. Sample C-3. Phosphate rock, light-greenish-gray, weathered; contains oolites; 1.9 ft thick.

485-490. County, formation, member, analyst, maps, and use as in samples 483, 484. NE¼ sec. 18, T. 4 N., R. 44 E., 1 mile north of Elk Flat, Bighole Mountains. Trench E. (Gardner, 1944, p. 3, 20, 27, 28, pls. 2, 4.) Detailed measured section, correlated columnar sections.

485. Sample E-1. Phosphate rock, dark-gray; contains a few pisolites; 1.5 ft thick.

486. Sample E-4. Phosphate rock, dark-gray; contains oolites, pellets, and angular fragments of phosphate; 0.7 ft thick.

487. Sample E-5. Phosphate rock, dull-gray; contains scattered oolites, pellets, and angular fragments of phosphate; 0.8 ft thick.

488. Sample E-7. Phosphate rock, gray to black, shaly; contains pellets 0.5 ft thick.

489. Sample E-12. Phosphate rock, black; contains pellets; 0.8 ft thick.

490. Sample E-14. Phosphate rock, black; contains pellets; 1.0 ft thick.

Table 21.—Analyses of samples from Idaho of phosphate rock or nodules containing 21.1 percent or more P_2O_5 (Group P), special-rock category—Continued

Chemical analyses—Continued

	Idaho—Continued												
	491	492	493	494	495	496	497	498	499	500	501	502	503
	11P41-9	11P41-10	11P41-11	11P41-12	11P41-13	11P41-14	11P41-15	11P41-16	11P41-17	11P41-18	11P41-19	11P41-20	11P41-21
Insoluble	16.3	19.3	12.3	2.5	21.0	13.3	21.9	3.5	7.2	20.7	1.8	21.7	20.6
Al_2O_3	2.8	4.5	.5	.3	3.2	2.2	3.1	1.1	2.0	.8	.5	4.2	3.7
Fe_2O_3	1.5	2.3	.9	.5	1.9	1.1	1.8	1.0	1.1	1.0	.8	1.9	1.9
CaO	33.5	36.8	45.8	49.2	30.3	37.4	29.4	48.3	45.6	41.8	52.0	35.1	34.4
P_2O_5	20.9	24.6	31.2	33.2	19.2	25.0	18.9	32.0	30.8	28.9	36.3	24.0	23.5
Ignition loss	15.2	6.3	3.5	5.4	14.8	12.9	15.7	5.3	5.3	2.4	3.3	6.3	8.5
Total	[90.2]	[93.8]	[94.2]	[91.1]	[90.4]	[91.9]	[90.8]	[91.2]	[92.0]	[95.6]	[94.7]	[93.2]	[92.6]

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Idaho—Continued

491 - 503. Teton County. Permian, Phosphoria Formation, Meade Peak Phosphatic Shale Member. T. 4 N., R. 44 E., Bighole Mountains. Analyst, F. J. Gray. (Gardner, 1944, p. 3, 13, 20, 25, 26, 28, 29, pls. 2, 4.) Index and geologic maps, detailed measured section, correlated columnar sections. Possible use: Fertilizer, source of vanadium.

491, 492. NE¼ sec. 18, 1 mile north of Elk Flat. Trench E.

491. Sample E-20. Phosphate rock, black; contains pellets; 0.1 ft thick.

492. Sample E-30. Phosphate rock, dull-gray to black, fine-grained; 0.8 ft thick.

493 - 499. NW¼ sec. 22, Mahogany Ridge. Trench D.

493. Sample D-1. Phosphate rock, dark-gray, hard; weathers bluish gray; 1.9 ft thick.

494. Sample D-5. Phosphate rock, black; contains pellets; 0.8 ft thick.

495. Sample D-7. Phosphate rock, black, shaly; contains pellets; 0.8 ft thick.

Idaho—Continued

496. Sample D-14. Phosphate rock, sooty-black; contains pellets; 1.1 ft thick.

497. Sample D-19. Phosphate rock, black, shaly; contains pellets; 1.9 ft thick.

498. Sample D-21. Phosphate rock, dull-gray to brown; contains pellets; 0.3 ft thick.

499. Sample D-29. Phosphate rock, black and gray; contains pellets; 1.2 ft thick.

500 - 503. NW¼ sec. 34, ridge southwest of Patterson Creek. Trench F.

500. Sample F-7. Phosphate rock, dark-gray; contains oolites; 1.1 ft thick.

501. Sample F-8. Phosphate rock, black, thin-bedded; contains oolites and pellets; 1.2 ft thick.

502. Sample F-9. Phosphate rock, dull-brown; contains pellets; 1.0 ft thick.

503. Sample F-11. Phosphate rock, dull-brownish-gray; contains pellets; 2.6 ft thick.

Table 22.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, of coal and coal ash, oil shale and oil shale ash, diatomaceous sediment, minerals, and parent rock and weathered products,miscellaneous group (Group M), special-rock category

[Analysis of the ash is indicated by an "a" following sample number. Chemical analyses arranged by rock type, State, quadrangle or county, and stratigraphic position]

	Alaska												
	1	2	3	4	5	6	7	8	9	10	11	12	13
		50M5-1		50M 155-180	50M 155-182	50M 155-185	50M 155-179	50M 155-181	50M 155-188	50M 155-184	50M 155-183	50M 155-187	50M 155-186
Fixed carbon	56.3	57.2	65.4	33.9	30.2	30.6	33.6	33.3	31.0	32.5	34.7	30.4	31.5
Sulfur	.5	.4	.4	.2	.1	.2	.2	.2	.3	.2	.2	.2	.4
Moisture	1.1	.9	.9	18.0	18.6	26.0	24.6	24.0	21.1	21.7	23.1	20.0	21.9
Volatile matter	20.2	19.9	20.5	42.2	43.7	34.8	37.7	37.0	34.9	36.4	37.0	36.9	35.8
Ash	22.4	22.0	13.2	5.9	7.5	8.6	4.1	5.7	13.0	9.4	5.2	12.7	10.8
Total	[100.5]	[100.4]	[100.4]	[100.2]	[100.1]	[100.2]	[100.2]	[100.2]	[100.3]	[100.2]	[100.2]	[100.2]	[100.4]

	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a	11a	12a	13a
SiO_2	49.9	51.3	49.1	28.5	29.7	44.4	16.7	29.5	49.9	39.0	31.2	48.1	46.2
Al_2O_3	[1]29.1	[1]25.9	[1]28.7	[2]22.5	17.9	16.8	[2]4.1	[2]19.8	25.4	23.0	20.4	26.4	20.0
Fe_2O_3	10.0	8.3	7.9	8.4	13.5	6.4	16.2	9.4	3.1	5.8	7.2	2.7	7.9
MgO	1.4	3.0	1.8	4.5	5.2	3.6	7.6	3.1	4.0	4.4	8.0	4.1	2.8
CaO	3.7	5.1	5.9	29.0	28.4	22.2	45.1	28.9	10.1	15.4	23.5	12.2	12.5
Na_2O	.9	1.1	.6	------	------	------	------	------	------	------	------	------	------
K_2O	.7	1.1	.8	------	------	------	------	------	------	------	------	------	------
TiO_2	1.1	2.3	1.4	------	.6	.7	------	------	1.0	.9	.9	1.6	.9
P_2O_5	------	------	------	------	.1	.5	------	------	.2	3.1	.02	.1	1.0
SO_3	2.5	2.4	3.3	5.8	3.6	4.0	8.7	7.8	3.8	4.8	7.8	2.9	6.7
BaO	------	------	------	.7	------	------	.9	.5	------	------	------	------	------
Total	[99.3]	[100.5]	[99.5]	[99.4]	[99.0]	[98.6]	[99.3]	[99.0]	[97.5]	[96.4]	[99.0]	[98.1]	[98.0]

	Oregon		Washington									
	14	15	16	17	18	19	20	21	22	23	24	25
	36M6-13	36M6-4	46M17-66	46M17-67	46M17-68	46M17-56	46M17-69	46M17-70	46M19-15		46M19-14	
Fixed carbon	[3]35.04	32.6	[3]47.42	[3]49.99	[3]34.76	39.0	[3]45.49	[3]43.25	46.6	41.5	46.1	42.3
Nitrogen	1.03	------	1.58	.87	.60	------	.98	1.05	------	------	------	------
Sulfur	------	.7	.49	.70	------	.4	1.08	.32	.4	.4	.5	.4
Moisture	16.91	21.3	6.29	4.76	2.35	11.6	10.10	11.51	------	------	------	------
Volatile matter	39.85	29.0	36.53	41.09	28.05	39.5	38.25	40.58	34.8	32.5	32.2	30.2
Ash	8.19	17.1	9.74	4.15	34.84	9.9	6.15	4.65	18.6	26.0	21.7	27.5
Total	[101.02]	[100.7]	[102.05]	[101.56]	[100.60]	[100.4]	[102.05]	[101.36]	[100.4]	[100.4]	[100.5]	[100.4]

Table 22.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, of coal and coal ash, oil shale and oil shale ash, diatomaceous sediment, minerals, and parent rock and weathered products, miscellaneous group (Group M), special-rock category—Continued

Chemical analyses—Continued

	Oregon—Continued		Washington—Continued									
	14a	15a	16a	17a	18a	19a	20a	21a	22a	23a	24a	25a
SiO_2	3.52	55.9	9.00	2.02	25.70	43.1	4.18	2.54	48.0	50.0	54.4	55.6
Al_2O_3	------	[1]24.9	------	------	------	[1]36.5	------	------	30.7	29.2	31.3	31.6
Fe_2O_3	[4]1.39	6.5	[4].40	[4].66	[4]1.53	[5]11.2	[4].73	[4].80	5.6	5.4	4.4	.43
FeO	------	------	------	------	------	------	------	------	------	------	.12	.08
MgO	.13	.5	.02	.06	.09	2.3	.07	.07	2.2	2.2	1.7	1.6
CaO	1.16	3.5	.05	.53	3.62	5.2	.50	.47	4.3	3.8	2.6	2.3
Na_2O	------	1.8	------	------	------	------	------	------	.61	.88	.41	.43
K_2O	------	1.0	------	------	------	------	------	------	1.0	1.0	.98	.88
TiO_2	------	3.5	------	------	------	------	------	------	3.5	2.6	2.2	2.0
P_2O_5	------	------	------	------	------	[6].65	------	------	2.3	1.8	.90	.74
MnO	------	------	------	------	------	------	------	------	.33	.23	.04	.04
SO_3	------	2.1	------	------	------	------	------	------	------	------	------	------
Total	[6.20]	[99.7]	[9.47]	[3.27]	[30.94]	[99.0]	[5.48]	[3.88]	[98.5]	[97.1]	[99.0]	[95.7]

Washington—Continued

	26	27	28	29	30	31	32	33	34	35	36	37	38
	46M19-16		46M19-19		46M19-18		46M19-20		46M19-17		46M19-21		46M19-73
Fixed carbon	49.3	48.9	41.4	38.3	47.2	44.4	42.9	40.7	43.3	41.0	45.7	45.0	[3]50.48
Nitrogen	------	------	------	------	------	------	------	------	------	------	------	------	1.04
Sulfur	.4	.4	.4	.3	.5	.5	.4	.3	.4	.4	.4	.4	.55
Moisture	------	------	------	------	------	------	------	------	------	------	------	------	2.06
Volatile matter	32.5	32.5	34.1	32.9	34.9	33.8	34.3	33.9	35.6	34.6	39.1	37.7	36.10
Ash	18.2	18.6	24.5	28.8	17.9	21.8	22.8	25.4	21.1	24.4	15.2	17.3	11.36
Total	[100.4]	[100.4]	[100.4]	[100.3]	[100.5]	[100.5]	[100.4]	[100.3]	[100.4]	[100.4]	[100.4]	[100.4]	[101.59]

	26a	27a	28a	29a	30a	31a	32a	33a	34a	35a	36a	37a	38a
SiO_2	42.8	43.7	52.4	51.7	50.4	49.0	52.5	51.8	52.3	52.2	43.4	44.0	6.96
Al_2O_3	27.6	29.4	34.5	33.2	34.1	34.5	32.8	32.6	32.6	32.4	24.6	23.9	------
Fe_2O_3	4.6	4.9	3.9	4.4	4.2	4.8	3.5	3.9	4.2	3.9	6.9	6.8	[4]1.20
FeO	.16	.08	.00	.04	.40	.04	.20	.04	.04	.08	.04	.04	------
MgO	1.8	2.1	1.4	1.4	1.6	1.3	.96	1.0	1.1	1.0	4.7	3.3	.05
CaO	8.8	8.4	2.3	3.5	1.4	1.6	2.7	3.3	3.0	3.8	7.6	8.3	1.06
Na_2O	.51	.72	.23	.19	.31	.30	.37	.41	.41	.42	1.3	1.4	------
K_2O	.81	.89	.91	.93	1.3	1.2	1.1	1.1	.93	.98	.49	.59	------
TiO_2	2.0	2.0	1.9	1.7	3.2	3.6	1.6	1.6	1.8	1.6	2.5	2.3	------
P_2O_5	6.2	5.9	.52	.55	1.3	1.5	.59	.59	.59	.60	3.3	3.4	------
MnO	.05	.05	.03	.04	.02	.01	.02	.02	.03	.03	.04	.04	------
Total	[95.3]	[98.1]	[98.1]	[97.6]	[98.2]	[97.8]	[96.3]	[96.4]	[97.1]	[97.0]	[94.9]	[94.1]	[9.27]

[1] Includes P_2O_5.

[2] Includes P_2O_5 and TiO_2.

[3] Reported as coke.

[4] Reported as iron.

[5] Not corrected for TiO_2.

[6] P.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Coal and coal ash

1-3. Alaska. Anchorage quadrangle. Paleocene, Chickaloon Formation. T. 19 N., R. 3 E. Matanuska field. (Fieldner and others, 1918, p. 26, 28; Barnes and others, 1951, p. 139, 193, pls. 27-29; Selvig and Gibson, 1956, p. 4, 10, 11, 24.) Coal, bituminous. Size range of coal: Over ¼ in. to over 1 in. screen. Mineralogy. Index and geologic maps, geologic sections, correlated columnar sections.

4-13. Alaska. Healy quadrangle. Tertiary. Nenana field, Usibelli and Suntrana mines. (Selvig and Gibson, 1956, p. 4, 10, 11, 24; Barnes and others, 1951, p. 139, 142, 146, 156, 162, 163, pls. 18, 19, 23.) General: Coal, subbituminous, black with dark brown streak, dull luster. Mineralogy. Tonnage estimated. Index and geologic maps, geologic sections, correlated colnmnar sections.

4. NE¼ sec. 19, T. 12 S., R. 6 W. Lab. No. 47156.
5, 6. SE¼ sec. 23, T. 12 S., R. 7 W. Lab. Nos. 46754, 46755.
7, 8. SE¼ sec. 23, T. 12 S., R. 7 W. Lab. Nos. 47157, 47158.
9-13. SW¼ sec. 24, T. 12 S., R. 7 W. Lab. Nos. 46753, 46756, 46757, 46758, 46759.

14. Oregon. Coos County. [T. 25 S., R. 13 W.], Coos Bay. Newport. Analyst, I. C. Allen. (Mining and Scientific Press, 1900, p. 569.) Coal.

15. Oregon. Coos County. [Sec. 28, T. 32 S., R. 11 W.], near town of West Fork Station. Anderson coal bed. Lab. No. 20153. (Fieldner and others, 1918, p. 26-28; Selvig and Gibson, 1956, p. 16, 17.) Coal. Mineralogy.

16-18. Washington. King County. Analyst, I. C. Allen. (Mining and Scientific Press, 1900, p. 569.) Coal and coal ash.

16. [Sec. 1, T. 21 N., R. 6 E., sec. 36, T. 22 N., R. 6 E., Ravensdale mine.] Leary.
17, 18. [T. 21 N., Rs. 6, 7 E.] Franklin.

Coal and coal ash—Continued

19. Washington. King County. Eocene and Oligocene, Puget Group. Sec. 25, T. 23 N., R. 5 E., 5 miles east of town of Renton. New Black Diamond mine. Lab. No. A34981. (Fieldner, Cooper, and Osgood, 1931, p. 4, 72, 73, 100, 133; Osgood, 1931, p. 133.) Subbituminous coal and coal ash. Measured section.

20, 21. Information as in samples 16-18. [T. 24 N., Rs. 5, 6 E.], Newcastle.
21. Seattle.

22-37. Washington. Kittitas County. Roslyn-Cle Elum coal field, Roslyn Cascade and Roslyn mines. (Geer, 1965, p. 1-4, 7-11, 13-16.) Coal and coal ash. Bulk density by size. Channel sample. Tonnage estimated. Measured section. Physical properties. Bulk density 1.80. Samples 22, 24, 26, 28, 30, 32, 34, 36: From 2 in. to 200-mesh size range; samples 23, 25, 27, 29, 31, 33, 35, 37: From 2 in. to 3/8 in. and raw 3/8 in. to 0 coal.

22, 23. Sec. 1, T. 20 N., R. 14 E., sec. 6, T. 20 N., R. 15 E. Samples 6, 7, 4.5 ft thick.
24, 25. Sec. 2, T. 20 N., R. 14 E. Prospect. Sample 9, 4.5 ft thick.
26, 27. Sec. 2, T. 20 N., R. 14 E. Sample 8, 2 ft 4 in. thick.
28, 29. Sec. 7, T. 20 N., R. 15 E. Sample 3, 9 ft 5.75 in. thick.
30, 31. Sec. 8, T. 20 N., R. 15 E. Sample 4, 2 ft 4.5 in. thick.
32, 33. Sec. 20, T. 20 N., R. 15 E. Sample 2, 7 ft 9 in. thick.
34, 35. Sec. 29, T. 20 N., R. 15 E. Sample 1, 5 ft 10 in. thick.
36, 37. Sec. 29, T. 20 N., R. 15 E. Sample 5, 5 ft 2.75 in. thick.

38. Washington. Kittitas County. [T. 20 N., Rs. 14, 15 E.] Roslyn. Analyst, I. C. Allen. (Mining and Scientific Press, 1900, p. 569.) Coal.

Table 22.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, of coal and coal ash, oil shale and oil shale ash, diatomaceous sediment, minerals, and parent rock and weathered products, miscellaneous group (Group M), special-rock category—Continued

Chemical analyses—Continued

	Washington—Continued							Alaska					
	39	40	41	42	43	44	45	46	47	48	49	50	51
	46M27-7	46M31-109	46M31-110	46M34-7	46M34-6	46M34-8	46M37-101	50M29-4	50M29-5	50M55-4	50M55-5	50M55-6	50M55-7
Fixed carbon	63.6	[1]37,09	[1]42.24	59.0	62.7	63.2	40.7	[2]12.3	[2]41.2	[2]26.7	[2]26.1	[2]61.1	[2]28.2
Nitrogen	------	1.08	.96	------	------	------	------	------	------	------	------	------	------
Sulfur	.5	.39	.59	.5	.5	.5	.3	------	------	------	------	------	------
Moisture	------	13.85	13.06	.8	.7	.7	7.2	[3]3.8	[3]4.0	[3]4.0	[3]5.6	[3]9.8	[3]5.0
Volatile matter	19.8	42.21	36.95	27.6	26.0	26.2	35.3	[4]5.3	[4]7.5	[4]14.2	[4]10.1	[4]14.8	[4]9.7
Ash	16.6	6.87	7.74	12.6	10.6	9.9	16.8	[5]78.6	[5]47.3	[5]55.1	[5]58.2	[5]14.3	[5]57.1
Total	[100.5]	[101.49]	[101.54]	[100.5]	[100.5]	[100.5]	[100.3]	100.0	100.0	100.0	100.0	100.0	100.0

	39a	40a	41a	42a	43a	44a	45a	46a	47a	48a	49a	50a	51a
SiO_2	44.6	5.09	5.56	50.9	48.2	44.6	47.0	44.0	41.3	15.7	30.4	9.22	39.1
Al_2O_3	[6]34.6	------	------	33.0	33.9	34.7	[6]39.5	11.6	2.31	2.47	7.04	1.25	5.70
Fe_2O_3	[7]13.1	[8].85	[8]1.01	4.6	4.8	4.9	[7]4.7	[9]2.30	[9]2,55	[9]3.01	[9]2.28	[9]1.42	[9]8.60
MgO	1.2	.07	.05	1.2	1.4	1.5	1.8	1.20	.10	.68	1.58	.17	.88
CaO	4.7	.53	.63	2.1	2.6	3.1	6.0	2,10	.14	23.1	4.84	.11	2.45
Na_2O	------	------	------	------	------	------	------	1.14	.97	.17	.75	.16	.62
K_2O	------	------	------	------	------	------	------	2.23	.48	.45	.98	.43	1.18
TiO_2	------	------	------	3.5	3.5	3.6	------	.53	.23	.19	.47	.18	.42
P_2O_5	[10].61	------	------	.8	1.1	1.4	[10].57	.40	.05	.55	2.10	.17	.55
MnO	------	------	------	------	------	------	------	.067	.009	.68	.45	.003	.13
SO_3	------	------	------	1.3	1.7	2.6	------	[11]6.27	[11]2.72	[11]7.89	[11]7.97	[11]9.21	[11]13.6
BaO	------	------	------	------	------	------	------	7.56	.26	1.81	3.52	.03	.03
Ignition loss	------	------	------	------	------	------	------	[12]20.2	[12]49.2	[12]43.6	[12]40.2	[12]86.4	[12]37.2
Total	[13][98.8]	[6.54]	[7.25]	[97.4]	[97.2]	[96.4]	[99.6]	[14]99.6	[14]100.3	[14]100.3	[14]102.6	[14]108.8	[14]110.5

	Alaska—Continued				
	52	53	54	55	56
	50M55-8	50M55-1	50M55-2	50M55-3	50M68-1
Total carbon	51.3	38.0	63.3	36.0	17.6
Water	4.5	3.0	6.5	3.0	2.8
Volatile matter[4]	20.0	8.0	12.8	6.9	5.3
Ash at 900°C (calc.)	24.2	51.0	17.4	54.1	74.3
Total	100.0	100.0	100.0	100.0	100.0

	52a	53a	54a	55a	56a	Alaska		Idaho			Oregon		
						57	58	59	60	61	62	63	64
						50M160-2	50M160-1	11M19-22	11M19-18	11M40-13	36M8-3	36M8-9	36M8-5
SiO_2	13.1	42.9	15.4	50.7	58.0	33.3	31.2	0.6	------	[15]2.28	------	------	------
Al_2O_3	3.03	1.44	1.19	1.34	8.34	4.9	6.0	Trace	34.48	------	------	------	------
Fe_2O_3	[9]3.96	[9].77	[9].31	[9]1.77	[9]1.29	2.4	4.0	Trace	5.49	3.84	------	------	------
FeO	------	------	------	------	------	------	------	2.9	None	------	------	------	------
MgO	.28	.07	.07	.17	.60	1.7	2.3	------	Trace	------	------	------	------
CaO	.75	.06	.06	.18	.12	3.0	2.9	2.9	4.32	------	29.80	29.96	32.15
Na_2O	.28	.71	.50	.20	.63	2.3	2.6	------	------	------	Trace	.25	------
K_2O	.61	.22	.28	.28	1.70	1.2	1.1	------	------	------			
H_2O+	------	------	------	------	------	------	------	2.0	[17]36.96	[16]3.27	25.00	22.75	19.42
H_2O-	------	------	------	------	------	------	------			[16].30			
TiO_2	.22	.14	.12	.10	.36	.25	.33	39.0	------	------	------	------	------
P_2O_5	.15	<.03	.03	.04	.20	------	------	Trace	19.14	------	------	------	------
MnO	.009	.002	.001	.01	.005	.11	.14	------	------	------	------	------	------
SO_3[11]	13.0	2.87	2.72	3.25	2.62	------	------	------	------	------	------	------	------
Sb_2O_5	------	------	------	------	------	------	------	------	------	36.54	------	------	------
BaO	.07	1.91	.36	.07	.89	.10	.10	.3	------	------	------	------	------
PbO	------	------	------	------	------	.012	.012	.2	------	53.48	------	------	------
UO_2	------	------	------	------	------	------	------	10.3	------	------	------	------	------
UO_3	------	------	------	------	------	------	------	33.5	------	------	------	------	------
Boracic acid	------	------	------	------	------	------	------	------	------	------	45.20	47.04	48.44
Chlorides	------	------	------	------	------	------	------	------	------	------	------	Trace	------
Ignition loss	[12]76.1	[12]49.0	[12]80.4	[12]48.4	[12]24.7	------	------	[16].2	------	[18].60	------	------	------
Total	[14]111.6	[14]100.1	[14]101.4	[14]106.5	[14]99.5	[19][49.4]	[18][50.8]	[20][100.2]	100.39	100.31	100.00	100.00	100.01

Minor elements

[Samples 46a-56a reported in ppm except where otherwise indicated]

	46a	47a	48a	49a	50a	51a	52a	53a	54a	55a	56a	57	58
B	250	60	52	110	53	80	52	35	32	37	180	0.017	0.014
Sc	------	------	------	------	------	------	------	------	------	------	------	.0018	.0020
V	3100	210	90	1700	240	660	450	70	200	140	1200	.012	.014
Cr	280	48	19	250	24	110	40	14	18	16	260	.004	.006
Ni	95	28	81	400	22	450	72	17	22	72	120	.002	.003
Co	3	12	41	27	2	150	9	8	8	14	2	.001	.001
Cu	65	34	75	480	38	320	40	9	8	25	32	.009	.010
Zn	140	34	420	7000	38	810	52	13	48	38	76	------	------
Ga	------	------	------	------	------	------	------	------	------	------	------	.0016	.0017
As	24	110	37	110	37	200	49	67	63	110	27	------	------
Se	50	20	3	200	5	10	< 1	< 1	8	5	100	------	------
Sr	860	110	580	600	70	100	70	490	80	42	200	.028	.036

See following page for footnotes.

Minor elements—Continued

	46a	47a	48a	49a	50a	51a	52a	53a	54a	55a	56a	57	58
Y	------	------	------	------	------	------	------	------	------	------	------	.002	.002
Zr	------	------	------	------	------	------	------	------	------	------	------	.010	.010
Mo	23	440	11	100	110	220	370	170	110	450	36	------	------
Ag	300 ppb	300 ppb	330 ppb	4000 ppb	200 ppb	300 ppb	150 ppb	100 ppb	200 ppb	200 ppb	400 ppb	------	------
Te	100 ppb	< 50 ppb	< 50 ppb	< 50 ppb	< 50 ppb	< 50 ppb	< 50 ppb	< 50 ppb	< 50 ppb	< 50 ppb	< 50 ppb	------	------
Au	30 ppb	70 ppb	70 ppb	50 ppb	< 30 ppb	150 ppb	150 ppb	70 ppb	50 ppb	100 ppb	70 ppb	------	------
Hg	750 ppb	650 ppb	900 ppb	1500 ppb	1400 ppb	1400 ppb	3000 ppb	3000 ppb	1200 ppb	1600 ppb	1000 ppb	------	------
Pb	< 10	< 10	20	10	10	80	30	< 10	< 10	< 10	10	------	------
eU	30	20	30	70	20	30	50	< 10	20	< 10	20	------	------

Footnotes of analyses on preceding page:

[1] Reported as coke.

[2] Total carbon.

[3] Water.

[4] Gas, by difference (H.A. Tourtelot, oral commun., Jan. 14, 1969).

[5] At 900°C (calc.).

[6] Includes P_2O_5.

[7] Not corrected for TiO_2.

[8] Iron.

[9] Total iron as Fe_2O_3.

[10] P.

[11] Total sulfur as SO_3.

[12] At 1,000° C.

[13] Dried at 105° C.

[14] Mathematical total. No adjustments, such as oxygen included as Fe_2O_3 if iron is pyrite, or inclusion of sulfur twice, due to measuring as SO_3 and also as LOI, have been made.

[15] Insoluble.

[16] H_2O+, +110 C; H_2O-, -110° C.

[17] Loss of water at 107° = 20.00 percent, at 175° = 7.36 percent, at 255° = 3.13 percent at 290° = 0.94 percent, to low redness = 3.90 percent, at blasting = 1.61 percent.

[18] CO_2.

[19] All constituents reported as elements, not oxides.

[20] ThO_2 = 4.1 percent, Ce_2O_2 = None, ZrO_2 = 0.2 percent, Yt_2O_3 = 3.9 percent, SrO = 0.1 percent.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Coal and coal ash—Continued

39. Washington. Pierce County. Eocene and Oligocene, Puget Group. Secs. 27, 34, T. 19 N., R. 6 E., sec. 3, T. 18 N., R. 6 E., town of Wilkeson. Wilkeson mine. Lab. No. 9903. (Fieldner, Cooper, and Osgood, 1931, p. 2, 4, 60, 92, 93, 100; Osgood, 1931, p. 189, 190.) Bituminous coal and ash. Index map, measured section.

40, 41. Washington. Snohomish County. [T. 32 N., R. 5 E.], Bryant. Analyst, I. C. Allen. (Mining and Scientific Press, 1900, p. 569.) Coal and coal ash.

42-44. Washington. Thurston County. [NW¼NW¼ sec. 8, T. 15 N., R. 1 W. Skookumchuck mine], Skookum mine. Lab. Nos. 47728-47730. (Selvig and Gibson, 1956, p. 20, 21, 28, tables 3, 4.) Coal and ash. Mineralogy.

45. Washington. Whatcom County. Puget Group. Sec. 13, T. 38 N., R. 2 E., 1 mile from town of Bellingham. Bellingham mine. Collectors, D. J. Parker, J. G. Schoning. Lab. No. A39449. (Fieldner, Cooper, and Osgood, 1931, p. 4, 97, 100; Osgood, 1931, p. 196.) Subbituminous coal and coal ash. Measured section.

Oil shale and oil shale ash

46-56. Alaska. (Tourtelot and Tailleur, 1965, tables 1, 2, 3, fig. 1.) Mineralogy. Index map, detailed measured section. X-ray analysis, Fischer assay.

46. Chandler Lake quadrangle. Early(?) Jurassic, unnamed unit overlying Triassic, Shublik Formation. [16.8, 9.4], Cobblestone Creek, about 2 miles below junction of Peregrine Creek. Lab. No. D115223. Shale, black, from 1-ft bed. Bulk density 2.1.

47. Chandler Lake quadrangle. Presumably Late Jurassic or Early Cretaceous. [13.35, 8.2], Welcome Creek, 1 mile below junction of Erratic Creek. Lab. No. D115225. Shale or impure nonbanded coal, black, bedded; from 1-ft oil shale zone. Bulk density 1.7. Thin-section description.

48. Howard Pass quadrangle. Unnamed unit overlying Shublik Formation. [14.7, 11.2], south side of Lisburne Ridge, 2.8 miles east of Hardway Creek. Lab. No. D115221. Shale, dark-gray, weathers brown, laminated, fossiliferous; from 3-ft bed. Bulk density 1.9. Thin-section description.

49. Howard Pass quadrangle. Unnamed unit overlying Shublik Formation. [14.7, 11.2], south side of Lisburne Ridge, 2.S miles east of Hardway Creek. Lab. No. D115222. Shale, black, fossiliferous; contains concretions; from 3-ft oil shale zone. Bulk density 1.8. Thin-section description.

50-52. Howard Pass qnadrangle. Presumably Late Jurassic or Early Cretaceous. Kiligwa River. Shale, black, bedded. Thin-section description.

50. [3.4, 11.4], about 2 miles above junction of Rolling Pin Creek. Lab. No. D115217. Sample from 5-ft oil shale zone. Bulk density 1.2.

51. [3.45, 12.4], 1.3 miles below junction of Rolling Pin Creek. Lab. No. D115216. Shale, fossiliferous; from 1-ft layer in lower 5 ft oil shale zone. Bulk density 1.8.

Oil shale and oil shale ash—Continued

52. Lab. No. D115215. Shale, fossiliferous; from 1-ft layer at top of 5-ft oil shale zone. Bulk density 1.3.

53, 54. Howard Pass quadrangle. Unnamed cherty unit between Early to Late Mississippian, Lisburne Group and Early Cretaceous, Okpikruak Formation. [9.5, 11.8], south of Monument Ridge, 1.5 miles east of Cntaway Creek. Thin-section description.

53. Lab. No. D115219. Tasmanite, dark-gray with bluish cast; from lower half of 1-ft bed. Bulk density 1.5.

54. Lab. No. D115218. Tasmanite, brownish-gray; from upper half of 1-ft bed. Bulk density 1.1.

55. Quadrangle, age, and unit as in samples 53, 54. [10.9, 12.3], Cula Creek. Lab. No. D115220. Tasmanite, bluish-gray; weathers tawny gray. Float sample. Bulk density 1.2. Thin-section description.

56. Killik River quadrangle. [Late Jurassic or Early Cretaceous. 16.2, 9.45], Middle Fork of Okpikruak River, about 0.2 mile below junction of Okanugun Creek. Lab. No. D115226. Claystone, black, iron-stained. Bulk density 1.9.

Diatomaceous sediment

57, 58. Alaska, Unnamed quadrangle north of Adak quadrangle. Bering Sea. (Goldberg and Arrhenius, 1958, p. 156, 158, 170, 171, 172, 183.) Diatomaceous sediment with volcanic ash layers. Graphic representation of chemical analysis. Index map.

57. Lat 52°25' N., long 176°24' W. Sample Ck9. Depth 3,440 m.

58. Lat 53°01' N., long 176°15' W. Sample Ck8. Depth 3,660 m. Diatomaceous ooze containing considerable amount of glacial marine detritus and layers of volcanic ash.

Minerals

59. Idaho. Custer County. Tertiary. [T. 10 N., R. 13 E.], Stanley basin. Analyst, R. C. Wells. (Hess and Wells, 1920, p. 230; Wells, 1937, p. 113.) Brannerite. Bulk density 5.42.

60. Idaho. Custer County. [T. 13 N., R. 24 E.], town of Goldburg. (Schaller, 1907, p. 155, 156.) Evansite, brown, amorphous, conchoidal-fracture, massive, very brittle; hardness about 3. Average density 1.98. Index of refraction.

61. Idaho. Shoshone County. [Ts. 48, 49 N., Rs. 3-6 E. Coeur d'Alene district.] Hypotheek mine. (Shannon, 1920, p. 88-90.) Bindhiemite, yellow, earthy, compact. Mineralogy.

62, 63. Oregon. Curry County. [T. 40 S., R. 14 W.], 5 miles north of Chetko River, on seacoast. Analyst, Thomas Price. (Chase, 1873, p. 287-289.) Borate, milk-white, greasy, unctious.

64. Oregon. Curry County. [T. 40 S., R. 14 W.] Analyst, J. E. Whitfield. (Whitfield, 1887, p. 283.) Priceite, white, chalky.

Table 22.—Analyses of samples from Alaska, Idaho, Oregon, and Washington, of coal and coal ash, oil shale and oil shale ash, diatomaceous sediment, minerals, and parent rock and weathered products, miscellaneous group (Group M), special-rock category—Continued

Chemical analyses—Continued

	Oregon—Continued			Idaho	Oregon							
	65	66	67	68	69	70	71	72	73	74	75	76
	36M8-4	36M8-10	36M8-11	11M29-18	36M8-7	36M8-8	36M10-26	36M10-52	36M10-9	36M10-55	36M10-56	36M10-54
SiO_2	------	------	------	72.15	37.2	37.5	42.81	41.43	40.55	42.8	71.7	45.8
Al_2O_3	[1]0.97	[1]1.00	[1]0.93	17.11	2.0	2.0	------	.04	[2]1.33	1.1	1.4	3.4
Fe_2O_3	------	------	------	.69	[3]12.7	[3]10.2	2.61	2.52		.8	14.4	[3]9.7
FeO	------	------	------	.50	------	------	7.20	6.25	------	6.8	.14	------
MgO	------	------	------	.39	26.9	17.2	45.12	43.74	21.70	45.7	3.9	19.9
CaO	31.73	31.37	32.38	1.75	3.2	1.1	None	.55	------	.90	.12	1.0
Na_2O	------	------	------	4.02	------	------	------	------	------	.03	.02	------
K_2O	------	------	------	2.11	------	------	------	------	------	.01	.02	------
H_2O	18.29	18.29	18.29	[4].01	------	------	------	------	7.00	1.6	5.5	------
TiO_2	------	------	------	.24	------	------	------	------	------	.02	.03	------
P_2O_5	------	------	------	.02	[5].08	------	------	------	------	.02	.01	------
MnO	------	------	------	[6].005	------	------	None	None	------	.12	.20	------
SO_2	------	------	------	.01	[7].01	------	------	------	------	------	------	------
Boric acid	50.01	49.34	48.50	------	------	------	------	------	------	------	------	------
Cr_2O_3	------	------	------	------	.90	[8].77	[9].79	.76	------	.45	.59	[8].74
NiO	------	------	------	------	[10].77	[10]1.29	.26	.10	29.66	.36	1.5	[10]1.50
CoO	------	------	------	------	[11].06	[11].17	------	------	------	.02	.03	------
Ignition loss	[12]Trace	[12]Trace	[12]Trace	.91	10.6	------	.57	4.41	------	[12].12	[12].17	------
Total	[13][101.00]	[13][100.00]	[13][100.10]	99.92	[94.4]	[70.2]	99.36	99.80	100.24	100.8	99.7	[82.0]

	Oregon—Continued										Washington	
	77	78	79	80	81	82	83	84	85	86	87	88
	36M10-50	36M17-39	36M17-14	36M17-34	36M17-38	36M17-40		36M17-29	36M24-86	36M33-2	46M19-13	46M36-1
SiO_2	54.0	43.0	15.6	18.5	[14]12.26	45.63	38.23	43.50	54.95	50.85	54.50	47.35
Al_2O_3	.7	1.6	6.4	6.9	------	6.58	2.34	7.62	13.47	12.54	14.43	34.38
Fe_2O_3	[3]10.7	1.4	56.1	52.2	[3]23.22	8.77	15.88	7.62	2.26	10.03	2.17	
FeO	------	6.7	.14	.68	------	------	------	------	10.00	7.11	8.80	------
Fe_7S_8	------	------	------	------	.55	------	------	------	------	------	------	------
MgO	------	43.1	2.1	1.7	------	28.01	19.85	23.21	3.47	5.57	4.24	4.43
CaO	.5	1.4	.30	.05	------	11.03	12.14	8.92	7.13	9.33	8.01	8.27
Na_2O	------	.02	.06	.07	------	------	.35	.11	3.00	2.37	3.05	2.55
K_2O	------	.02	.06	.05	------	------	------	.18	1.69	1.13	1.29	1.33
H_2O+	------	2.4	15.9	15.6	[15]1.12	------	[18]8.72	------	.82	.34	[15]1.09	------
H_2O-					[15].81	------	------	------	.32		[16].29	------
TiO_2	------	.03	.12	.12	------	------	------	.19	2.12	.76	1.69	------
P_2O_5	------	.01	.07	.06	------	------	------	.02	.35	------	.21	------
MnO	------	.14	.25	.25	------	------	------	.20	.20	------	.10	------
CO_2	------	.26	.27	.24	Trace	------	------	[17]5.43	------	------	None	[18].95
SO_3	[7].01	------	------	------	------	------	------	.12	------	.05	.11	------
Cl	------	------	------	------	.04	------	------	------	------	------	------	------
Cr_2O_3	------	.36	1.8	2.1	[19].12	------	------	.38	------	------	------	------
NiO	[10]1.2	.37	1.8	2.0	[10]60.45	------	2.49	.070	------	------	None	------
CoO	------	.02	.14	.13	[11].55	------		------	------	------	------	------
Cu	------	------	------	------	.50	------	------	------	------	------	------	------
As	------	------	------	------	.23	------	------	------	------	------	------	------
SrO	------	------	------	------	------	------	------	------	------	------	.09	------
ZrO_2	------	------	------	------	------	------	------	------	------	------	None	------
BaO	------	------	------	------	------	------	------	------	------	------	.06	------
Volatile matter	------	------	------	------	.70	------	------	------	------	------	------	------
Total	[67.1]	100.8	101.1	100.6	100.55	100.02	100.00	[97.57]	99.78	100.08	100.13	99.26

Quantitative spectrographic analyses
[Elements looked for but not detected: Y, Rh, Cd, Re, Os, Ir, Pt. Results have an average accuracy of ± 15 percent]

	78	79	80		78	79	80
Sc	0.0017	0.0076	0.0067	Sr	<0.0002	<0.0002	<0.0002
V	.0051	.016	.020	Ba	<.002	.003	.003
Cu	.0007	.015	.010				

Spectrographic analysis

	85		85
V	0.01 -0.001	Sr	0.1 -0.01
Cr	.01 - .001	Zr	.01- .001
Ni	.01 - .001	Ba	.1 - .01
Cu	<.001		

---

[1] Reported as Na Cl, $\overset{\cdots}{Fe}$, $\overset{\cdots}{Al}$.
[2] Iron and aluminum oxide.
[3] Fe.
[4] H_2O- at 105°C.
[5] P.
[6] MnO_2.
[7] S.
[8] Cr.
[9] Chromic oxide.
[10] Ni or Ni free.
[11] Co.
[12] CO_2.
[13] Sample dried at 212°F.
[14] Silicate (anhydrous).
[15] H_2O+ above 100°C; H_2O- below 100°C.
[16] H_2O+ above 105°C; H_2O- below 105°C.
[17] Ignition loss.
[18] Loss on ignition, principally organic matter.
[19] Chromite and magnetite; $FeO \cdot CrO_3$, $FeO \cdot Fe_2O_3$.

DESCRIPTIVE NOTES

[Underscored page numbers in reference indicate source of analysis]

Minerals—Continued

65-67. Oregon. Curry County. [T. 40 S., R. 14 W.] Chetko deposit. (Silliman, 1873, p. 129.) Priceite, soft, chalky. Bulk density 2.262-2.298.

Parent rock and weathered products

68. Idaho. Latah County. Miocene. NW¼ NW¼ sec. 33, T. 40 N., R. 3 W., about 4 miles northeast of town of Troy. (Ponder and Keller, 1960, p. 44, 45, 47-50, 54, 55, 57, 58.) Granodiorite gneiss. Mineralogy, microscopic description. Index and geologic map. Chemical analysis recalculated to relative number of cations. [For analysis of residual clay, see sample 140, group B.]

69, 70. Oregon. Curry County. Secs. 19, 30, T. 37 S., R. 13 W., 17 miles, by road, east of town of Gold Beach. Red Flats nickel deposit. (Hundhausen, McWilliams, and Banning, 1954, p. 1, 2, 4, 6, 11, 14, figs. 1, 2.) Serpentine, nickeliferous, weathered. Mineralogy. Index maps. Possible use: Source of ferronickel. [For analyses of weathered products see samples 8B, 89, group D.]

71-73. Oregon. Douglas County. Sec. 17, T. 30 S., R. 6 W., about 5 miles northwest of town of Riddle, Nickel Mountain. Owner, E. F. Adams. (Pecora and Hobbs, 1942, p. 205, 206, 211-213, 215, 222, 223, 225, 226, pls. 37, 38.) Index and geologic maps.

71. Analyst, F. W. Clarke. Record 814. (Clarke, 1888, p. 485; Austin, 1894, 1895, 1896, p. 176, 177.) Olivine.

72. Analyst, F. W. Clarke. Record 811. (Clarke, 1888, p. 483, 485.) Peridotite.

73. Late Tertiary. Analyst, Dr. Hood. (Blake, 1883, p. 403, 404; Austin, 1894, 1895, 1896, p. 174, 175, 178, 180, 190-193.) Hydrated nickel magnesian silicate. Bulk density 2.20-2.58. Mineralogy, thin-section description.

74, 75. Oregon. Douglas County. [T. 30 S., R. 6 W.], near Riddle, Nickel Mountain. Hanna Ore Co. pit. Analysts, P. L. D. Elmore, J. I. Dinnin, S. D. 8otts, M. D. Mack; rapid rock analysis. (Hotz, 1964, p. 356, 357, 362-364, 368, 369, 371, 375-377.) General mineralogy. Index map. Graphs of molecular proportions of constituents. [For other analyses of weathered products, see samples 91-93, group D.]

74. Peridotite, fresh. Composite sample. Bulk density 3.35. Niggli values and modes.

75. Possibly post-Miocene to Pleistocene. Peridotite, weathered; contains veins of quartz and garnierite; depth 8-10 ft.

76. Oregon. Douglas County. [T. 30 S., R. 6 W.], near Riddle. Nickel Mountain deposit. (Hundhausen, McWilliams, and Banning, 1954, p. 6, 14, pl. 1, fig. 1.) Serpentine, nickeliferous. Index map. Possible use: Source of ferronickel.

77. Oregon. Douglas County. [T. 30 S., R. 6 W.], Riddle, Nickel Mountain. (Fursman, 1962, p. 6, 7.) Nickel-bearing rock.

Parent rock and weathered products—Continued

78-80. Oregon. Josephine County. [T. 38 S., R. 8 W., southwest of town of Selma], Eight Dollar Mountain. Analysts, P. L. D. Elmore, J. I. Dinnin, S. D. Botts, M. D. Mack; rapid rock analysis. Spectrographic analyst, Sol Berman. (Hotz, 1964, p. 356, 357, 362-364, 367-369, 371, 372-374, 388.) General mineralogy. Index map. Graph of molecular proportions of constituents; graph of trace element content. Possible use: Probably none. [For other analyses of weathered products, see samples 96-100, group D.]

78. Peridotite, fresh. Bulk density 3.20. Niggli values and modes.

79. Possibly post-Miocene to Pleistocene. Soil, yellowish-orange; contains weathered peridotite fragments; depth 2.8-5.5 ft. X-ray diffractometer patterns of clay fractions.

80. Possibly post-Miocene to Pleistocene. Soil, reddish-yellow with streaks of red; depth 1-2.8 ft.

81-83. Oregon. Josephine County. [T. 38, 39 S., R. 9 W.] (Melville, 1892, p. 509-511.) Josephinite, greenish-black; occurring as pebbles in placer gravel.

81. (Clarke, 1903, p. 10.) Mineralogy. Bulk denisty 6.204.

82. Insoluble portion of sample 81.

83. Soluble portion of sample 81.

84. Oregon. Josephine County. West corner sec. 26, T. 39 S., R. 8 W., at intersection of Sucker Creek and Oregon Cave roads. Sample 9930. (Robinson, Edgington, and Byers, 1935, p. 8, 19.) Serpentinelike rock. [For analysis of weathered product, see sample 108, group D.]

85. Oregon. Marion County. Miocene, Salem Hills Basalt or Stayton Lavas. NW¼ sec. 2, T. 9 S., R. 3 W., 7-10 miles south of town of Salem, Salem Hills area. State Highway Dept. rock quarry. Analyst, under direction of S. S. Goldich; spectrographic analyst, T. C. Matthews. Lab. No. R2150; (Corcoran and Libbey, 1956, p. 1, 2, 3, 6, 13, 14, pl. 1.) Presh basalt. Index and geologic maps.

86. Oregon. Wasco County. [T. 1 N., R. 13 E.], near The Dalles, Rockland Ridge. (Schneider, 1888, p. 236, 237.) Augite andesite. Mineralogy. [For analysis of weathered product, see sample 113, group D.]

87. Washington. Kittitas County. Late Miocene and early Pliocene, Yakima Basalt. [Probably] T. 19 N., R. 15 E., about 4 miles southwest of Clealum, [Cle Elum], Clealum Ridge. Analyst, George Steiger. (Smith, 1904, p. 7.) Basalt, dark-gray, aphanitic; about 1,000-2,000 ft thick. Mineralogy, thin-section description. Index and geologic maps, geologic sections, columnar section. [For analysis of residual soil from similar parent rock, see sample 148, group D.]

88. Washington. Walla Walla County. Middle Miocene through early Pliocene, Columbia River Group. [T. 7 N., R. 36 E.], town of Walla Walla. Analyst, G. P. Merrill. (Russell, 1901a, p.44.) Basalt, representative sample.

GRAPHICAL SUMMARIES

The analyses assembled in this report may be considered primarily as individual pieces of information about the composition of particular sedimentary rocks in particular places. Also, they may be thought of collectively as groups of data that tend to cluster around various modal points of composition corresponding to rocks of different lithologic types, geologic ages, economic uses, and so forth. Collectively, then, the data of the analyses need to be summarized if any clustering of points or systematic relations that may exist are to be recognized.

Many of the samples had been collected for analysis because the rock was, or was thought possibly to be, of economic value. For this reason, the resulting analyses do not represent random sampling of all sedimentary rocks of the report region. Yet, despite this systematic bias in the choice of samples, the compilers hope that the wide range in composition of the samples may tend to offset the purely local peculiarities in the data and provide information of more regional interest and utility.

AREAL DISTRIBUTION

Figures 3 and 4 are maps showing the location of analyzed samples according to the rock-classification groups. The map of Alaska and the map of Idaho, Oregon, and Washington show the general distribution of the rocks. The plotting of the data is crowded in some areas, and, accordingly, the symbols may indicate more than one sample; in addition, where symbols are closely spaced on the map, some of them are plotted in the county adjacent to their true location. The maps, thus, are the most useful in showing only the general location of the area in which samples were taken. More detailed locations are given in the descriptive notes accompanying the tables of analyses.

The data on the geographic distribution of samples that contain more than 75 percent silica show the kinds of consideration that the maps suggest. Also, inference can be made either that the report region probably contains relatively little highly siliceous material or that the economic demand for such a resource has been low. The maps do not provide a basis for determining which alternative is pertinent, but the reader can be aware that the question exists.

DISTRIBUTION BY COMPOSITION

Figures 5–24 show how the analyses plot within the fields of the triangular diagram that is the basis for the classification system. The points are plotted by computer method. In some of the more crowded areas of the diagrams, samples tend to overlap.

These summaries emphasize again that many more data are available for some kinds of rocks, notably mixtures of siliceous and clayey materials (group B) and carbonate rocks (group F), than for others. Whether these larger amounts of data are a reflection of the economic value of such rocks or of the relative abundance of the rocks is not certain.

The summaries also emphasize the difficulties of designing a classification system that consistently groups sedimentary rocks according to the names commonly applied to them. Rocks called clay, for example, fall into several of the classification groups when classified according to their chemical composition. The inverse is also true and is perhaps more important. Common names for sedimentary rocks are not always closely related to the actual rock composition, nor are they always consistently applied.

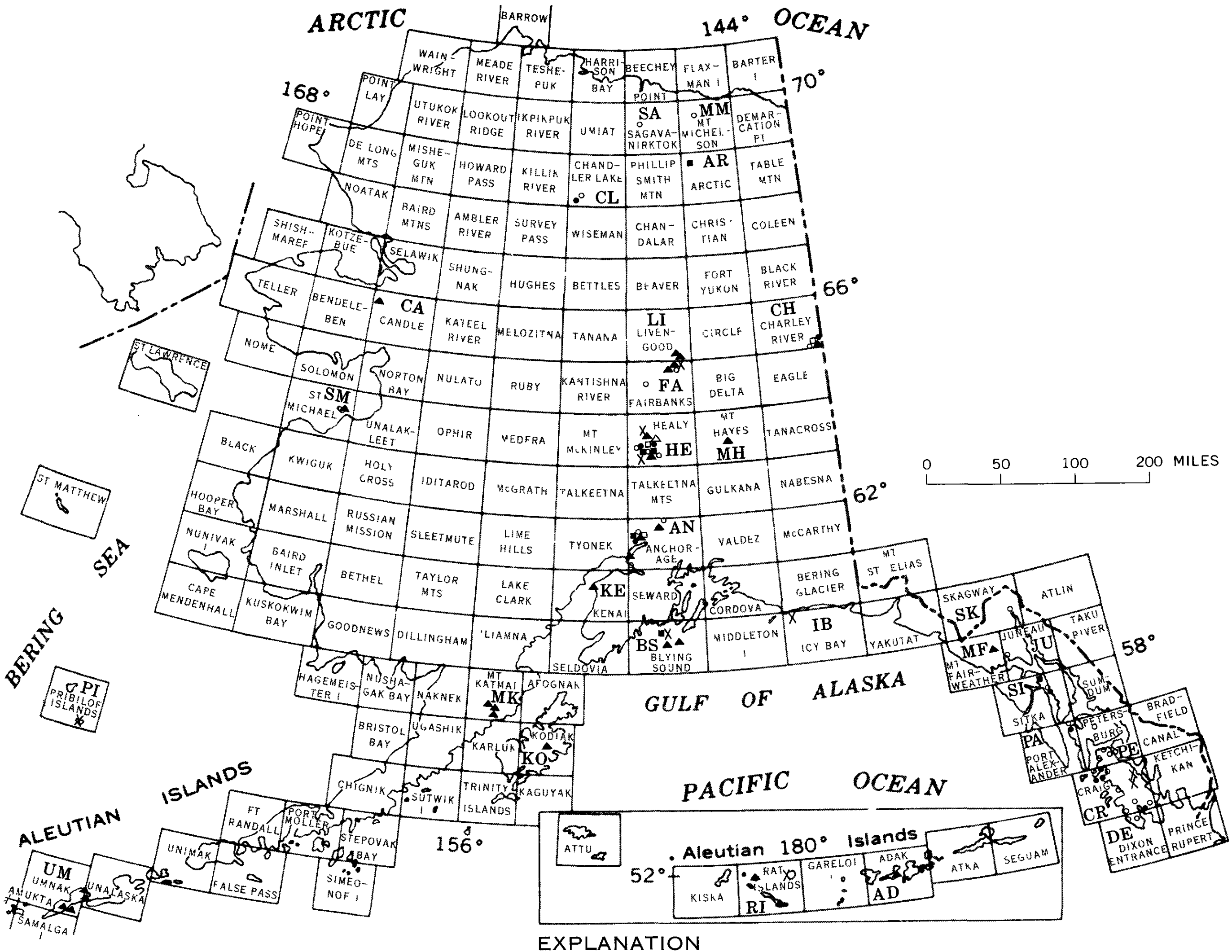
Tables 25 and 26 categorize the numbers of analyses by classification group and States as an aid in understanding the distribution of data.

Table 27 lists, by State, the number of analyses in each classification group, stratigraphic unit, and county. The stratigraphic units are those of the original author and do not necessarily conform to the usage of the U.S. Geological Survey. The tables are useful for finding the available data on rocks of a particular composition within a reasonably restricted geographic area.

Figures 18–24 show the distribution of analyses according to the name applied to the rock by the original author and its position within the compositional diagram. The relations between the names applied to the rocks by the original authors and the classification groups are also shown, subdivided by States, in tables 23 and 24.

Figures 7–17 show the position on the composition diagram of the analyzed samples, according to geologic age. The diagrams show all the samples of a given age, such as Cambrian (fig. 15).

The diagrams differ considerably in their significance for generalizations regarding the bulk composition of rocks of a system. Nearly all the samples of Cambrian age (fig. 15), for example, are from Washington, whereas other States are scarcely represented. The Cambrian System in Washington probably consists chiefly of carbonate rocks, but the degree to which the available data are representative of this system must be judged by the user. Analyzed samples of Devonian age (fig. 13) are chiefly from Alaska. The many analyses and the fairly wide range in rock composition suggest that the available data are meaningful in reference to the bulk composition of rocks of the various systems.



EXPLANATION

Symbol may indicate more than one sample

△
Group A
Rocks containing uncombined silica more than 75 percent

▲
Group B
Rocks containing uncombined silica and clay, each less than 75 percent; uncombined silica and clay, each more than carbonate

□
Group C
Rocks containing uncombined silica and carbonate, each less than 75 percent; uncombined silica and carbonate, each more than clay

X
Group D
Rocks containing clay more than 75 percent

■
Group E
Rocks containing clay and carbonate, each less than 75 percent; clay and carbonate, each more than uncombined silica

●
Group F_1
Rocks containing carbonate from 75 to 90 percent

○
Group F_2
Rocks containing carbonate more than 90 percent

Abbreviation	Quadrangle name	Abbreviation	Quadrangle name	Abbreviation	Quadrangle name	Abbreviation	Quadrangle name
AD	Adak	DE	Dixon Entrance	LI	Livengood	PI	Pribilof Islands
AN	Anchorage	FA	Fairbanks	MF	Mount Fairweather	RI	Rat Islands
AR	Arctic	HE	Healy	MH	Mount Hayes	SA	Sagavanirktok
BS	Blying Sound	IB	Icy Bay	MK	Mount Katmai	SM	St. Michael
CA	Candle	JU	Juneau	MM	Mount Michelson	SI	Sitka
CL	Chandler Lake	KE	Kenai	PE	Petersburg	SK	Skagway
CH	Charley River	KO	Kodiak	PA	Port Alexander	UM	Umnak
CR	Craig						

FIGURE 3. — Sample localities for common- and mixed-rock categories, Alaska.

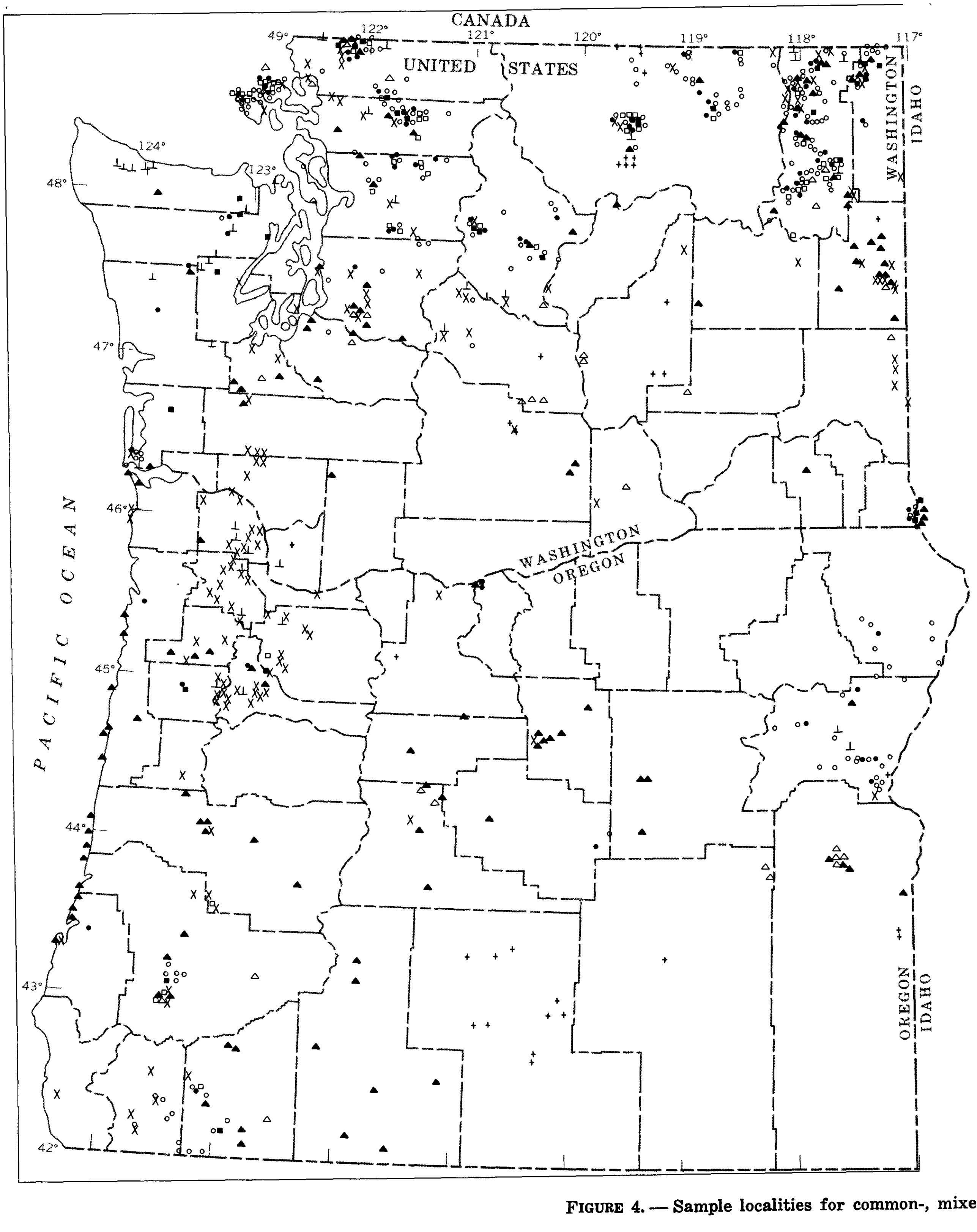
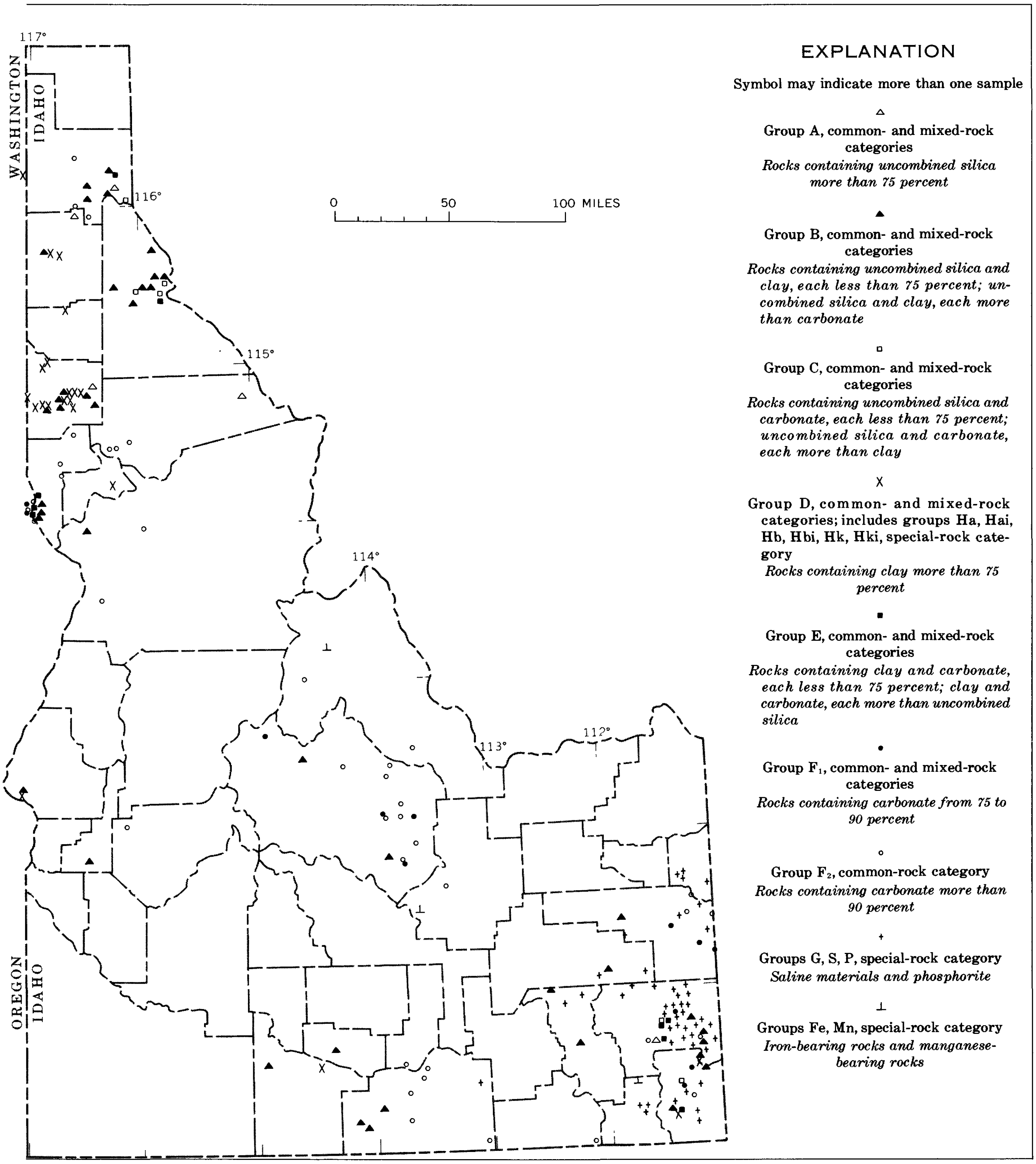


FIGURE 4. — Sample localities for common-, mixed-, and



special-rock categories, Idaho, Oregon, and Washington.

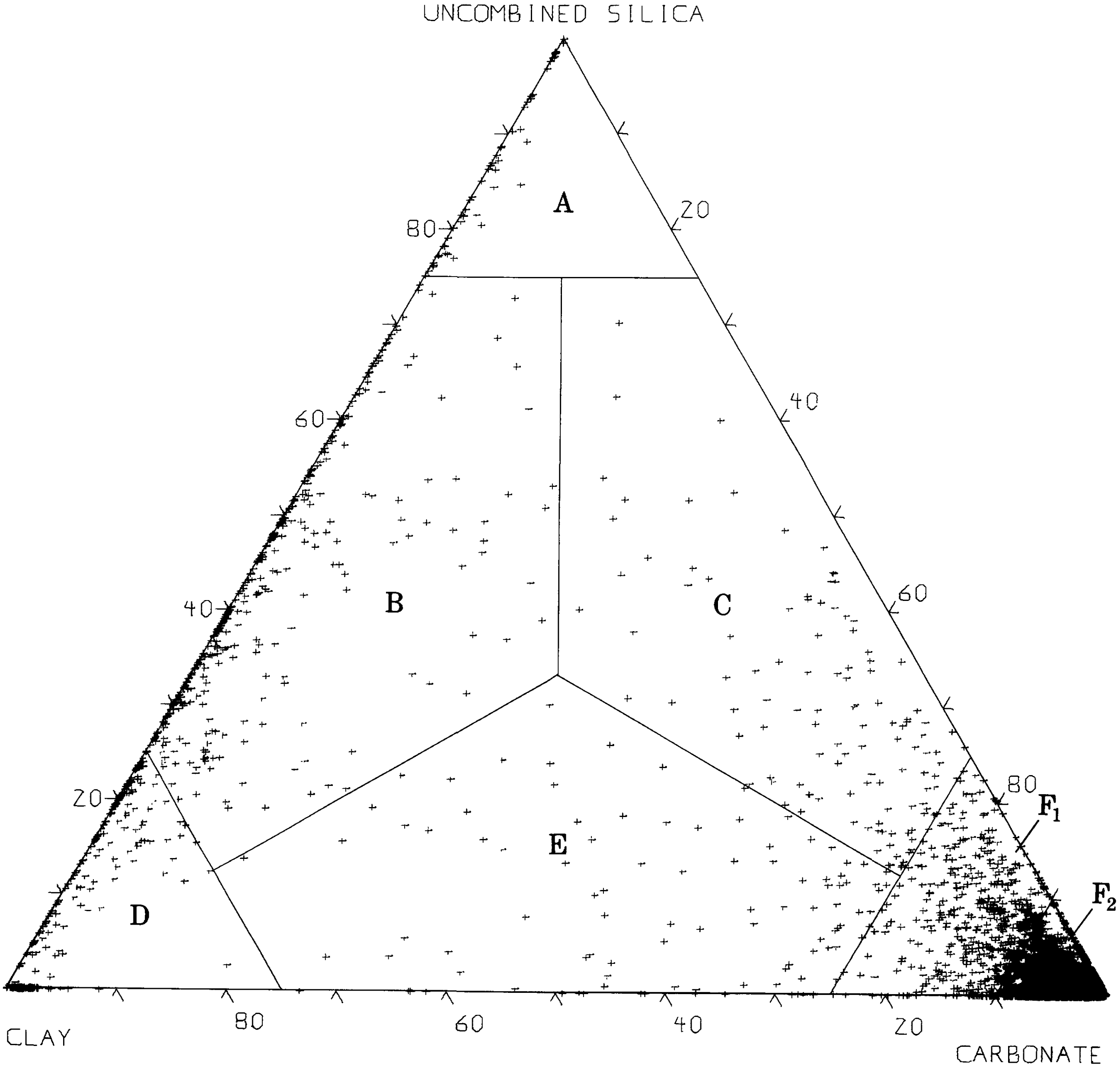


Figure 5. — Distribution among compositional groups of analyses of samples from the Northwestern States and Alaska; common-rock category.

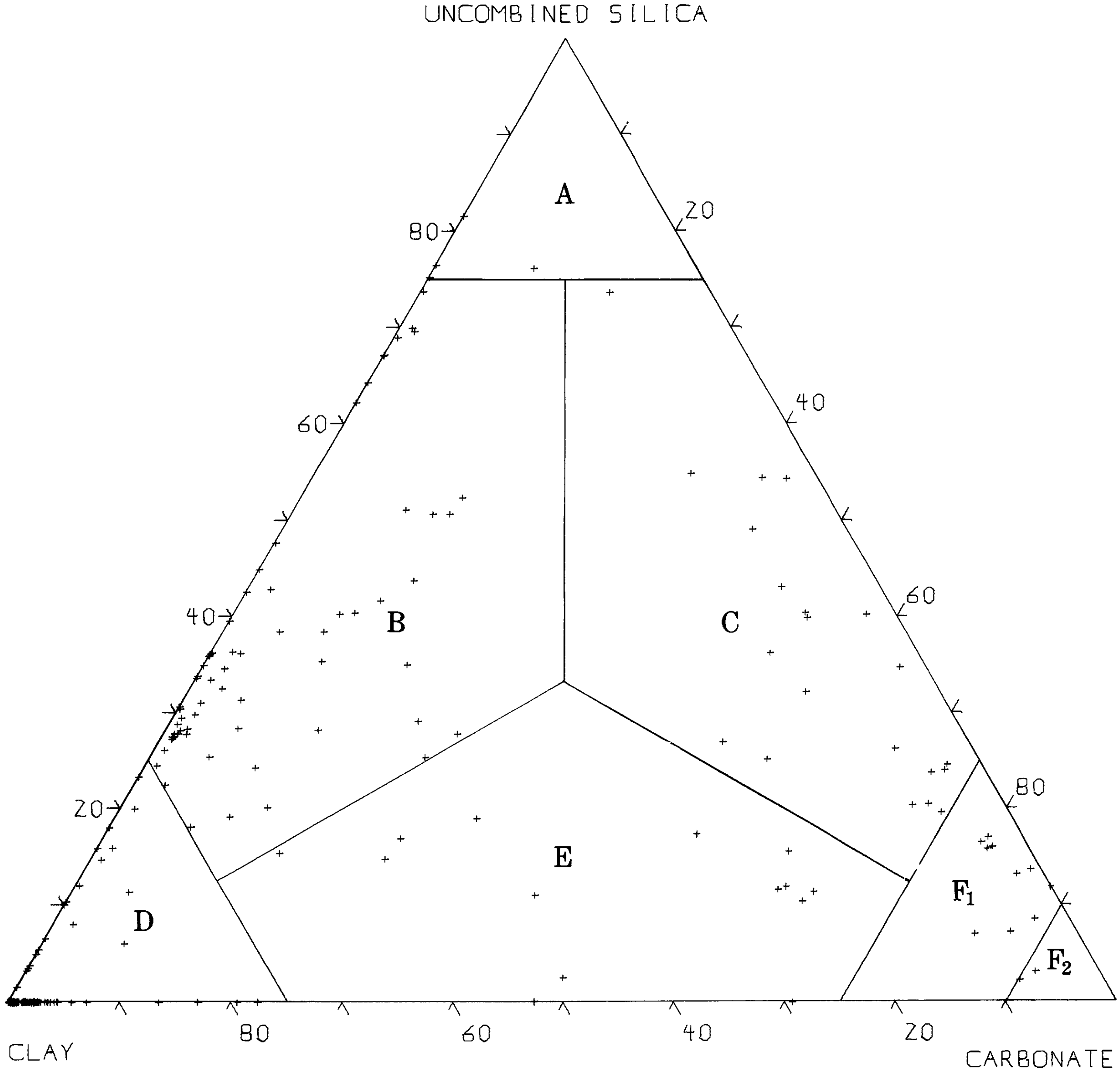


Figure 6. — Distribution among compositional groups of analyses of samples from the Northwestern States and Alaska; mixed-rock category.

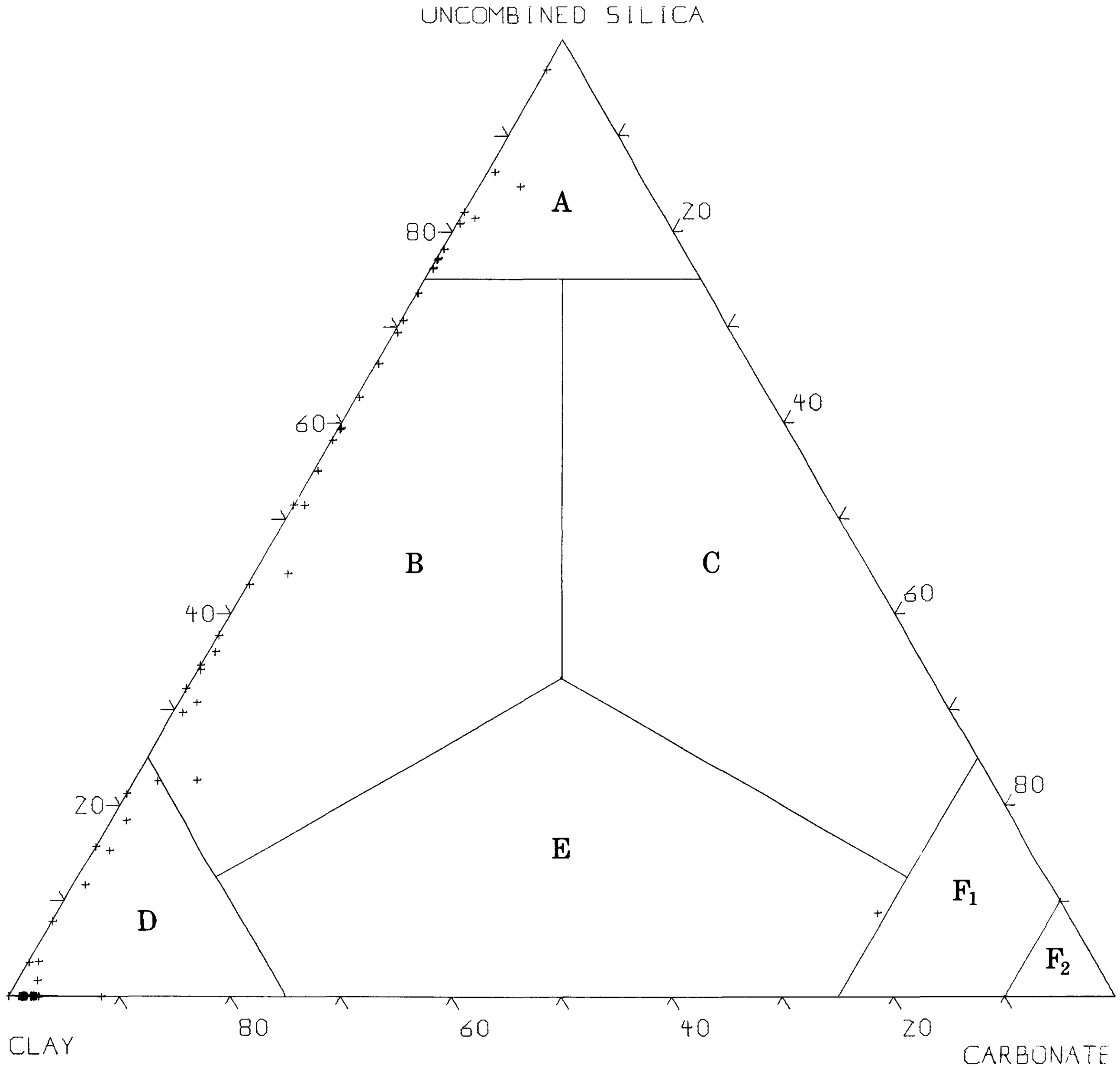


FIGURE 7.—Distribution among compositional groups of analyses of samples of Miocene, Miocene and Pliocene, and Miocene or later ages, from the Northwestern States and Alaska; common-rock category.

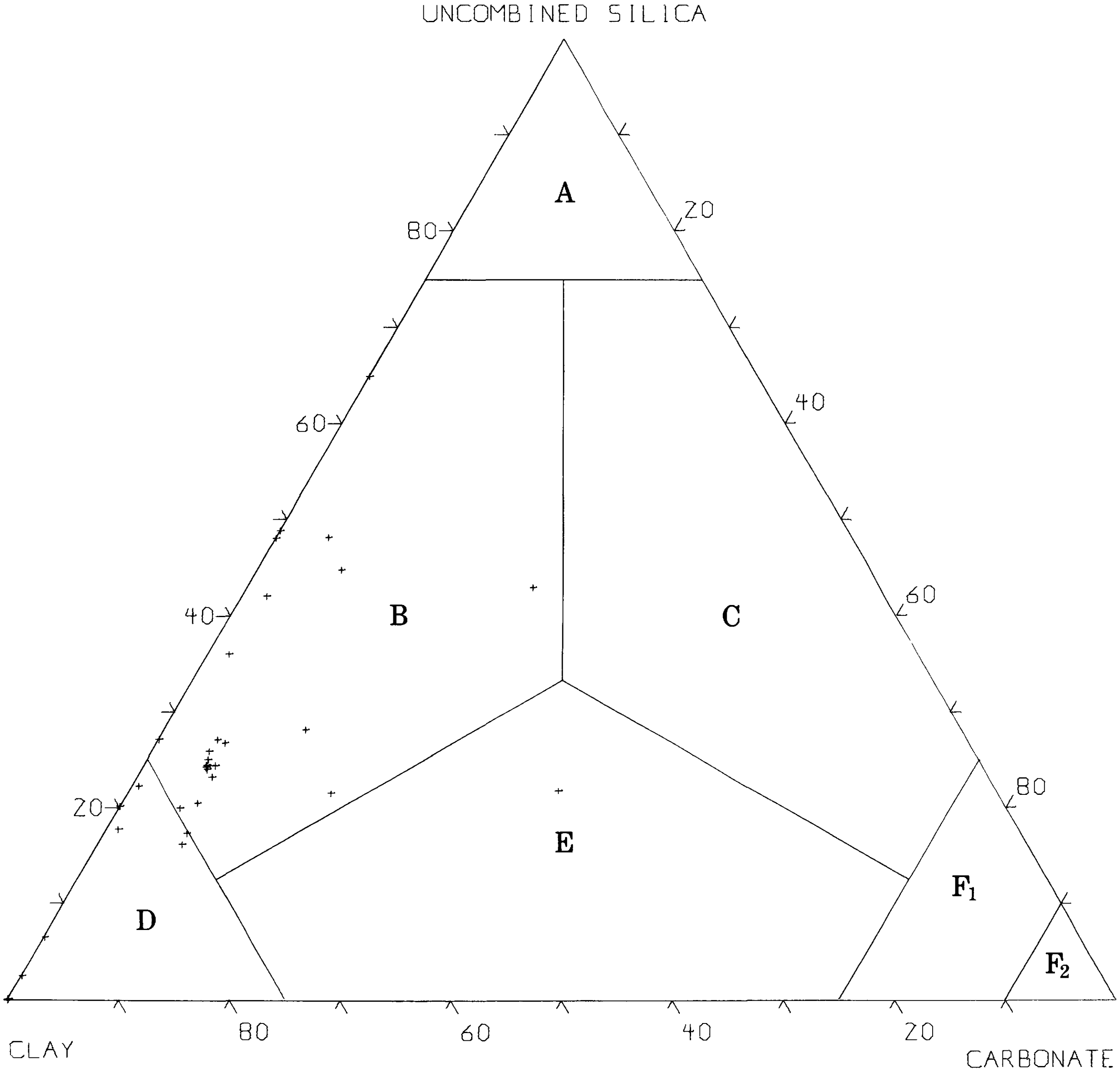


FIGURE 8. — Distribution among compositional groups of analyses of samples of Tertiary age from the Northwestern States and Alaska; common-rock category.

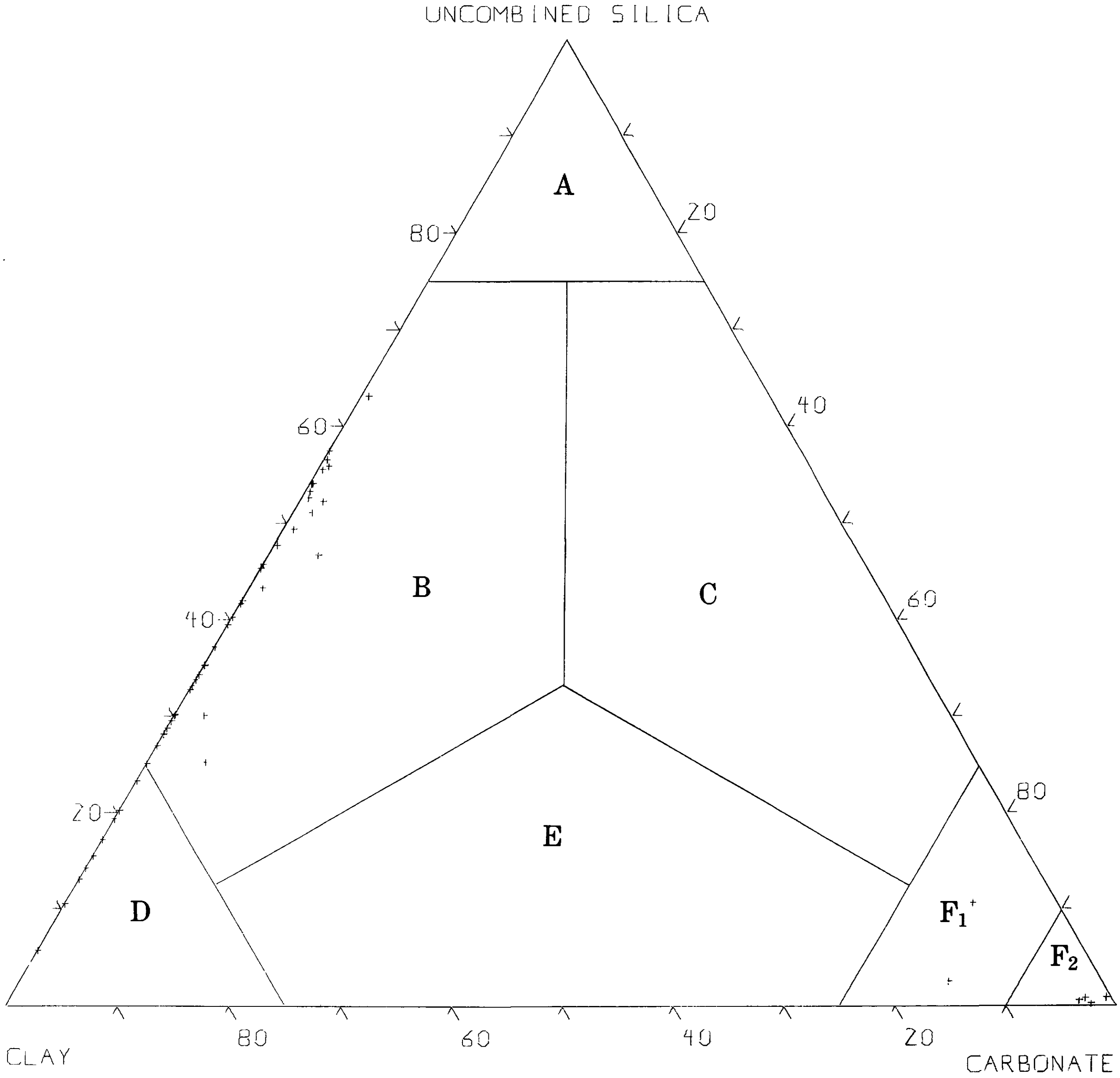


FIGURE 9. — Distribution among compositional groups of analyses of samples of Jurassic age from the Northwestern States and Alaska; common-rock category.

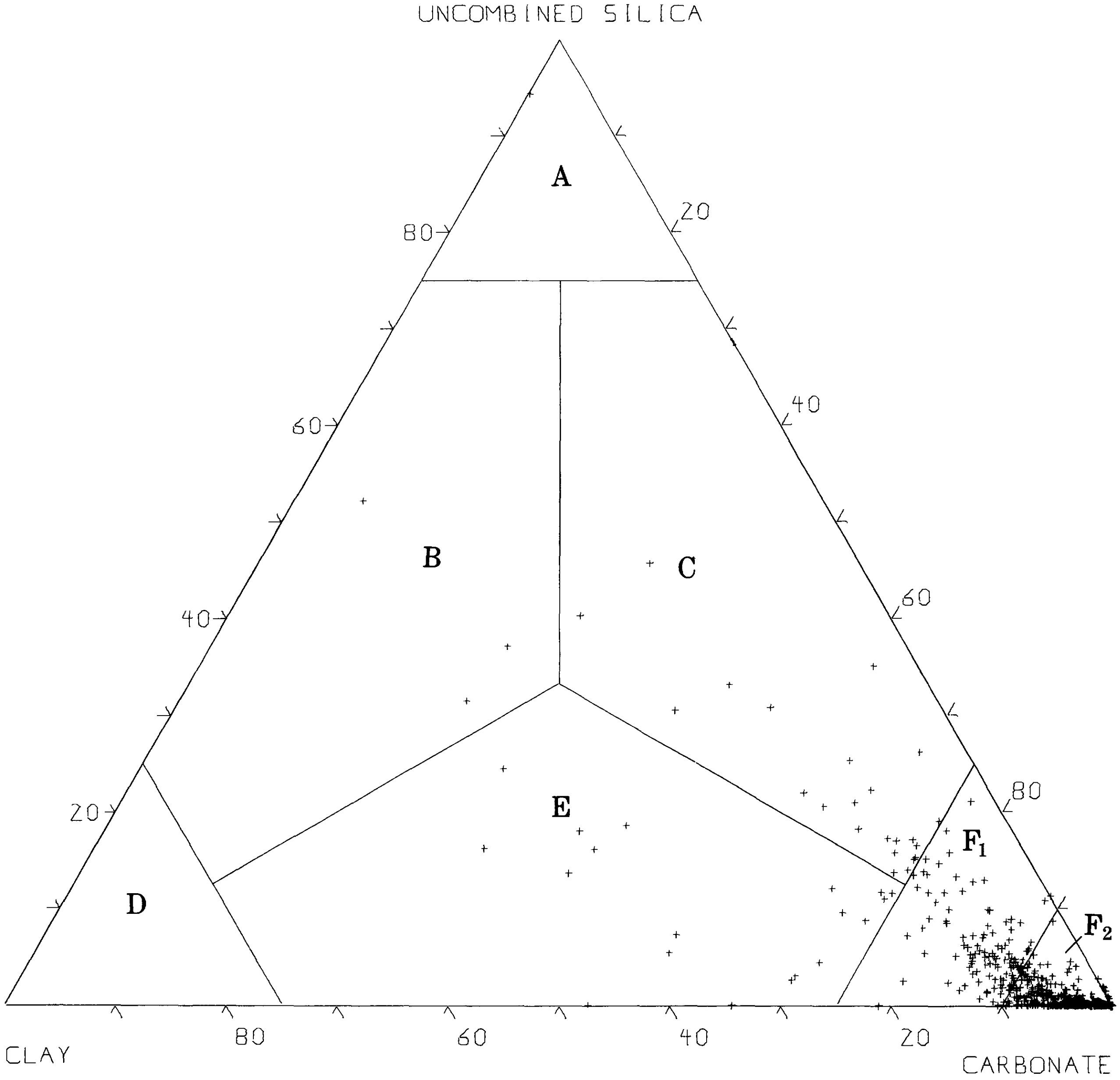


FIGURE 10.— Distribution among compositional groups of analyses of samples of Triassic age from the Northwestern States and Alaska; common-rock category.

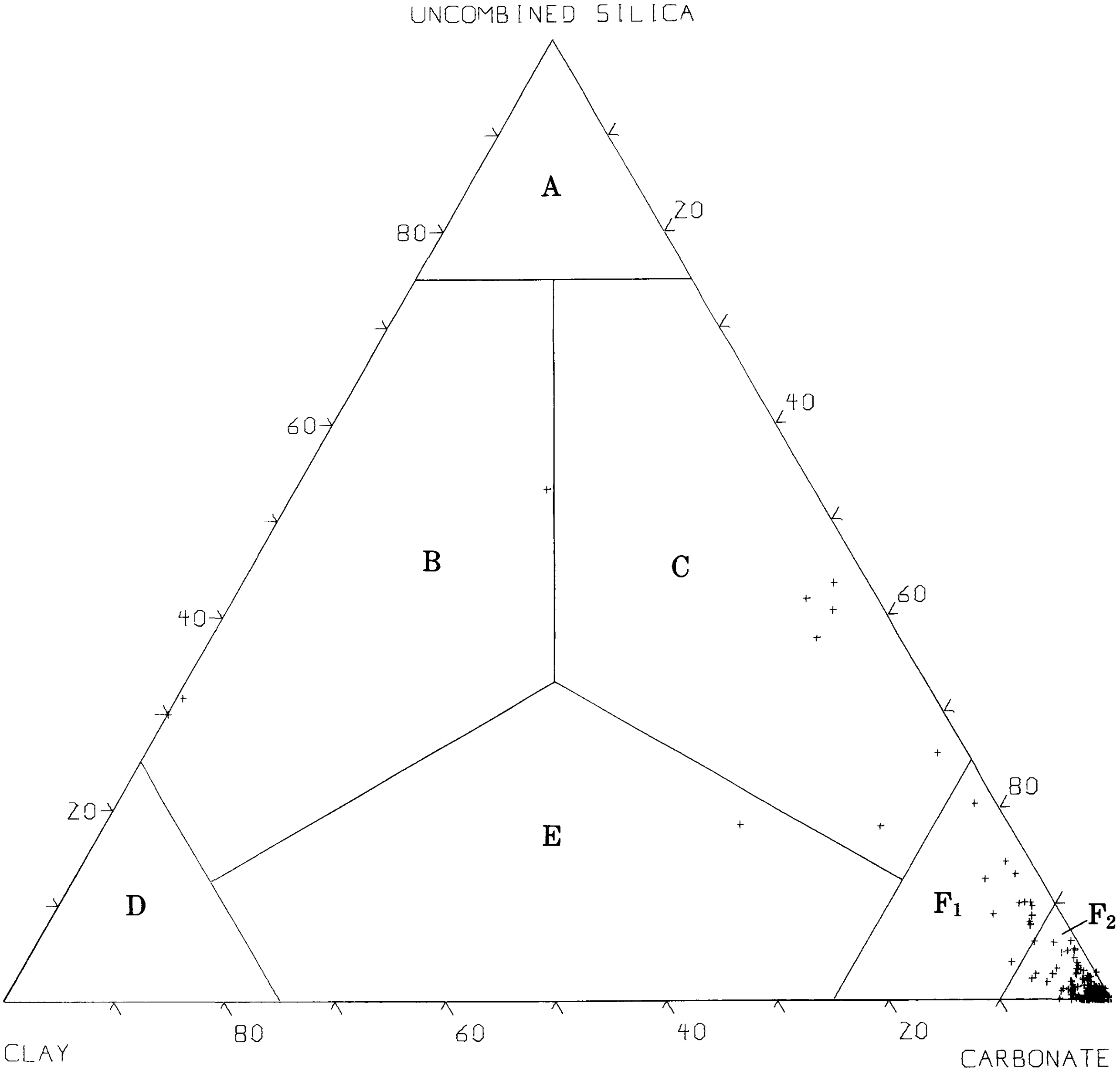


FIGURE 11.—Distribution among compositional groups of analyses of samples of Permian age from the Northwestern States and Alaska; common-rock category.

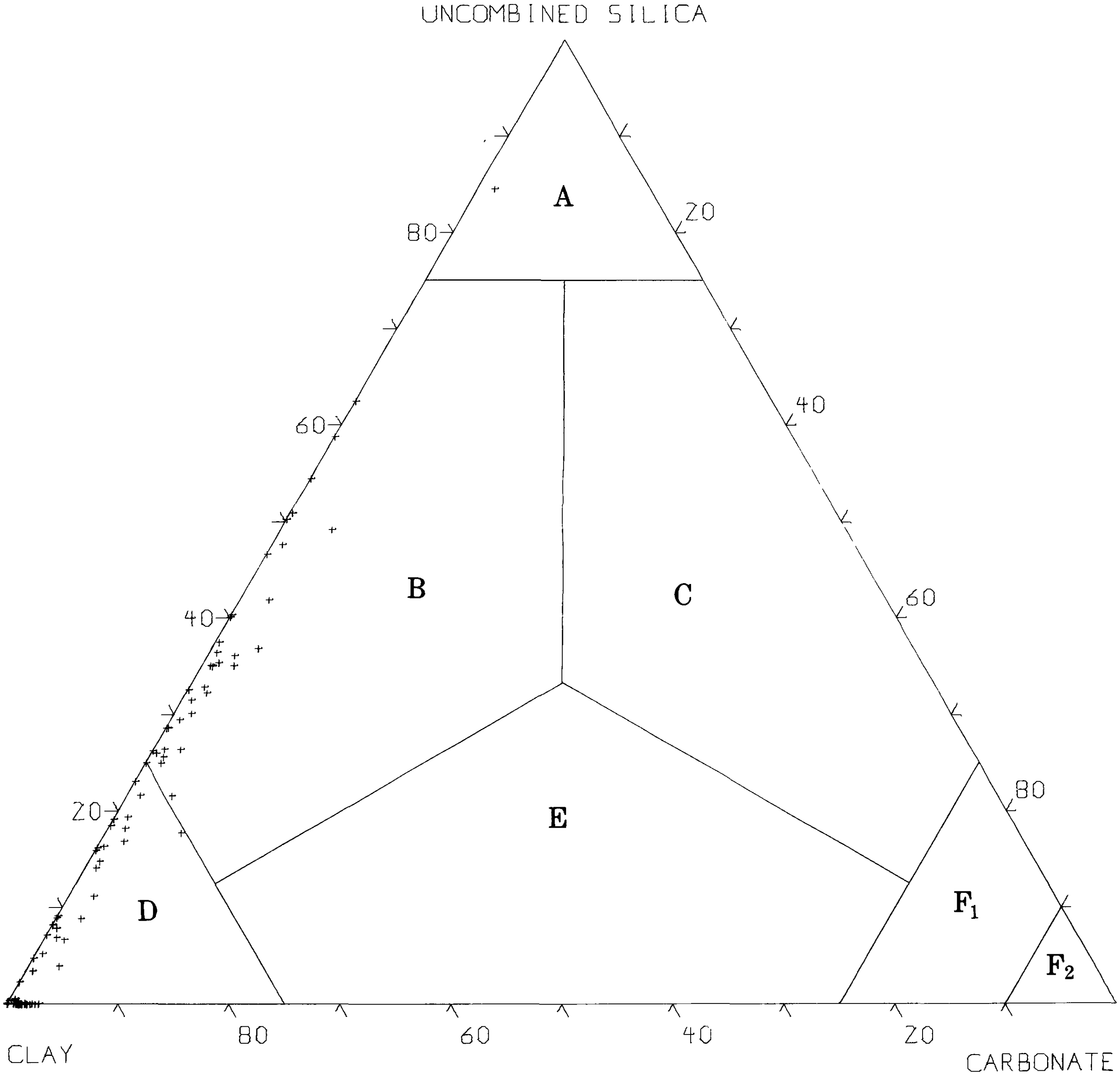


FIGURE 12. — Distribution among compositional groups of analyses of samples of Mississippian age from the Northwestern States and Alaska; common-rock category.

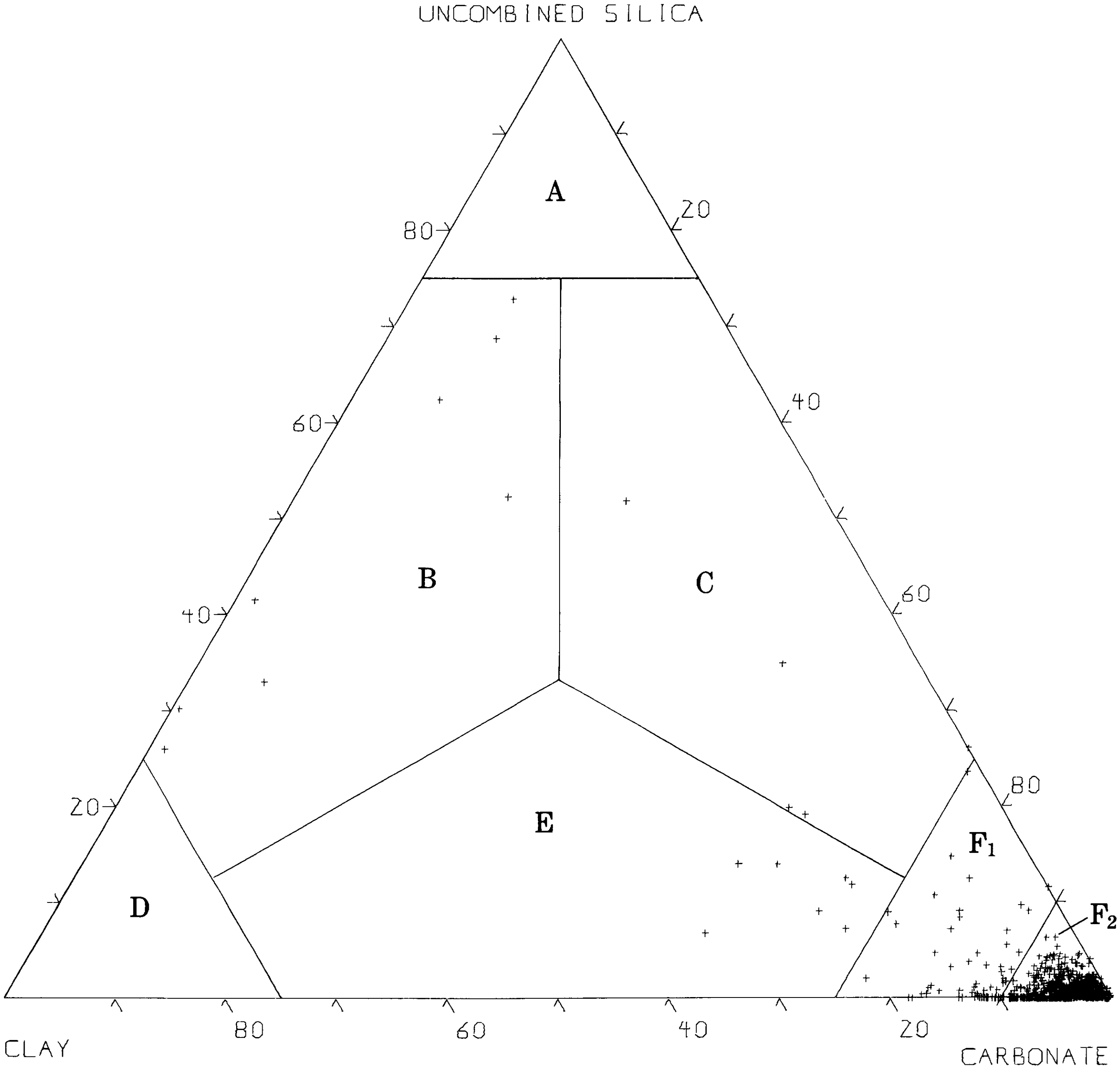


Figure 13. — Distribution among compositional groups of analyses of samples of Devonian age from the Northwestern States and Alaska; common-rock category.

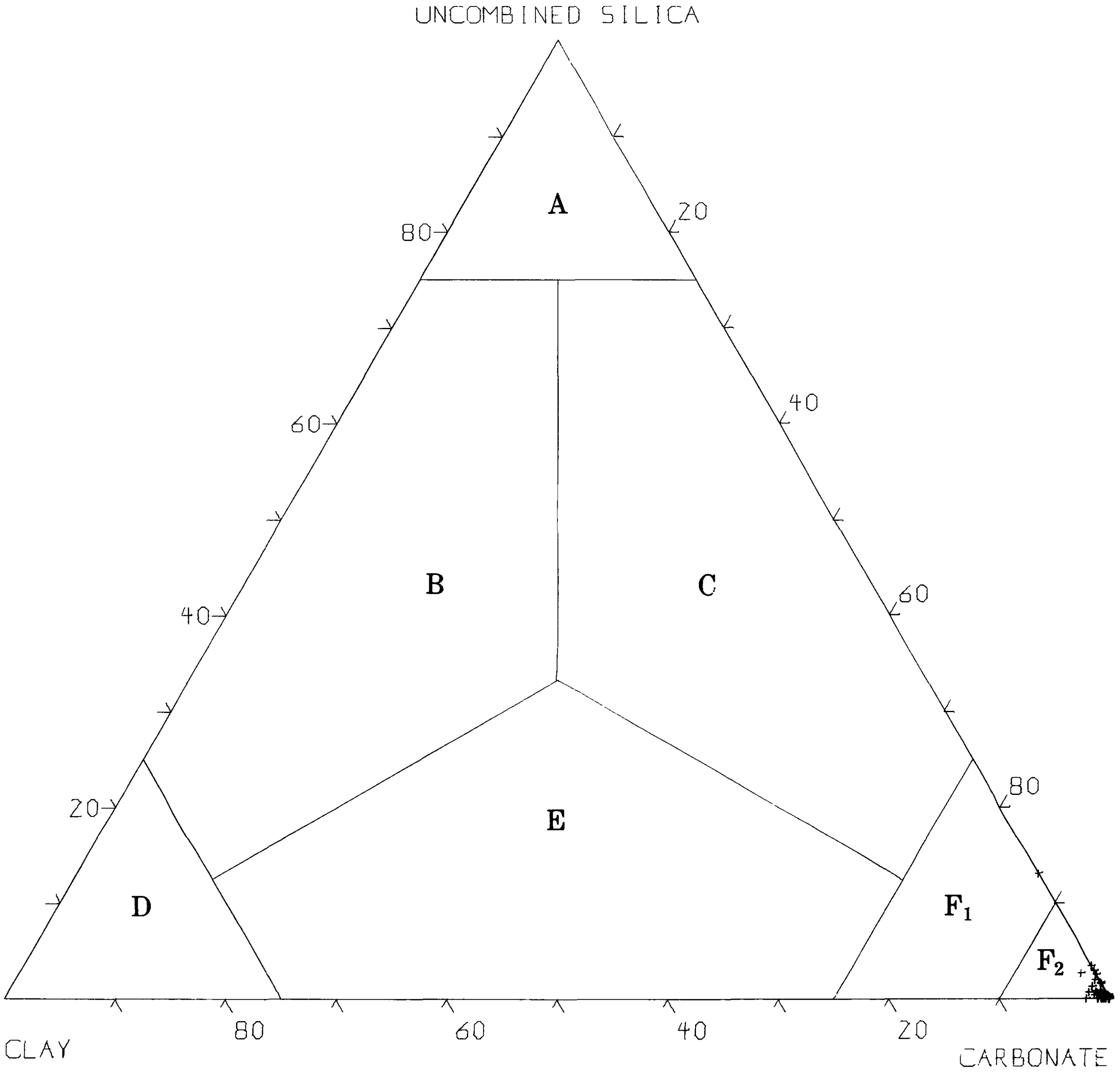


FIGURE 14. — Distribution among compositional groups of analyses of samples of Silurian age from the Northwestern States and Alaska; common-rock category.

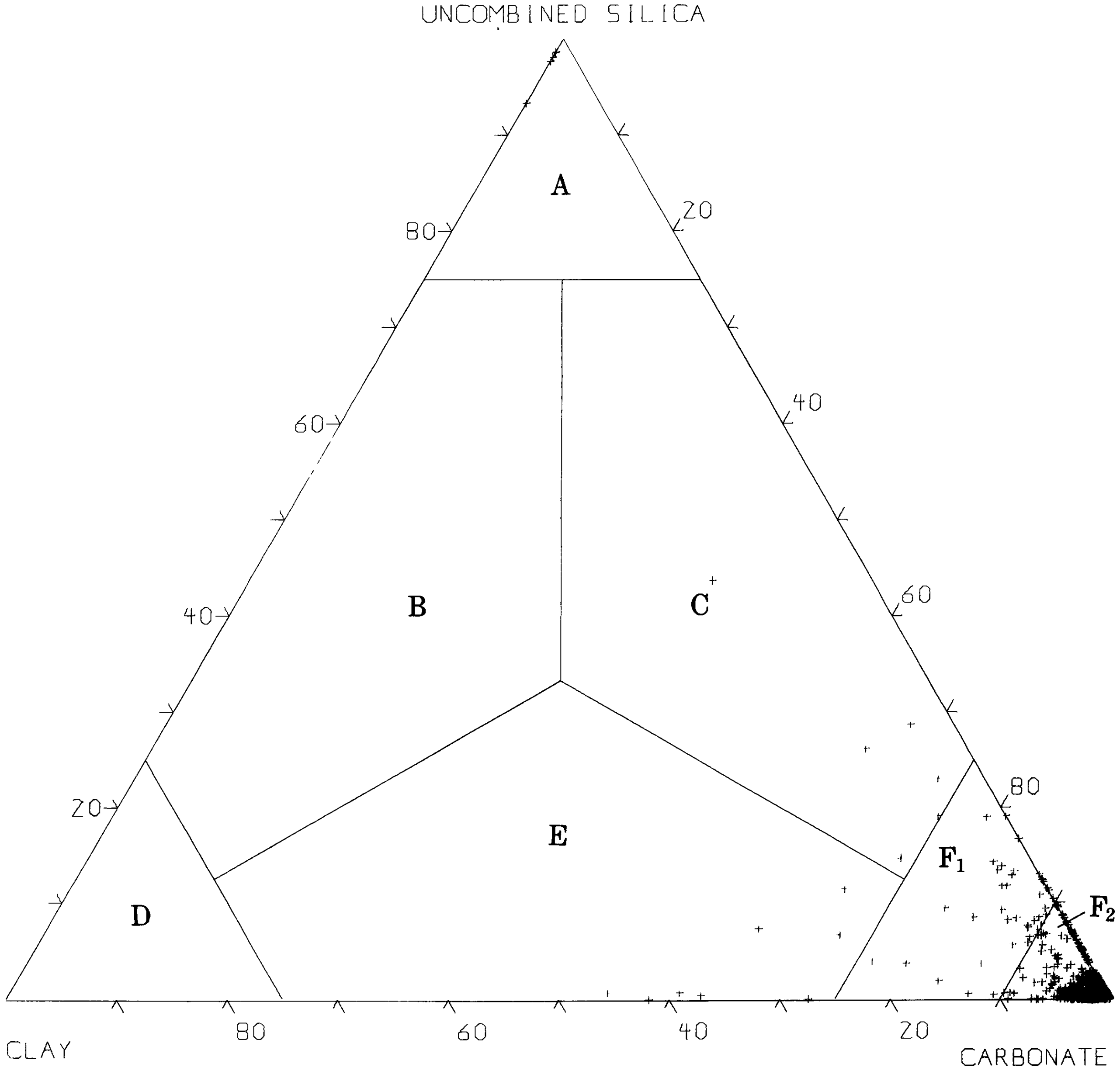


Figure 15. — Distribution among compositional groups of analyses of samples of Cambrian age from the Northwestern States; common-rock category.

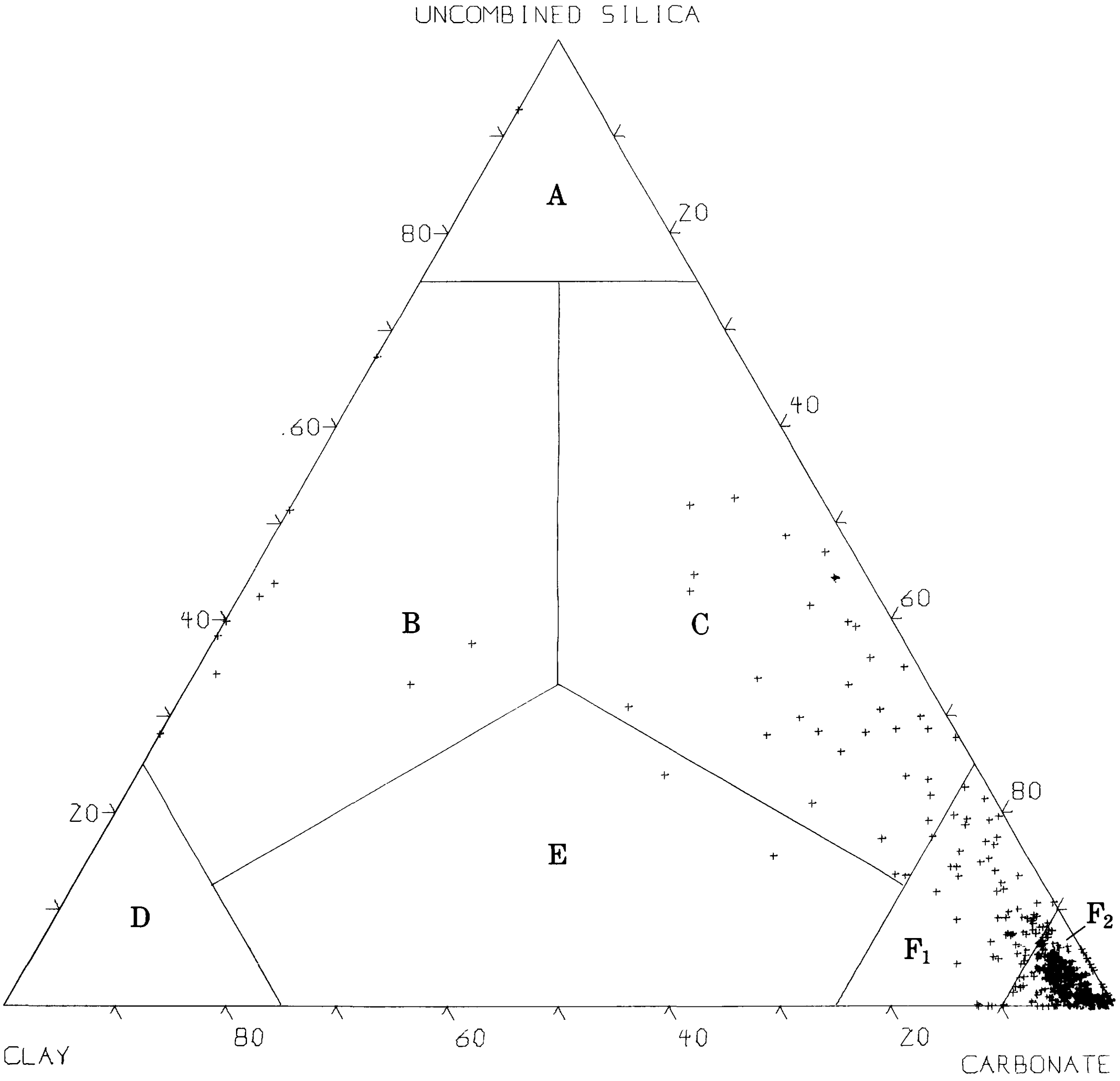


FIGURE 16. — Distribution among compositional groups of analyses of samples of Precambrian age from the Northwestern States and Alaska; common-rock category.

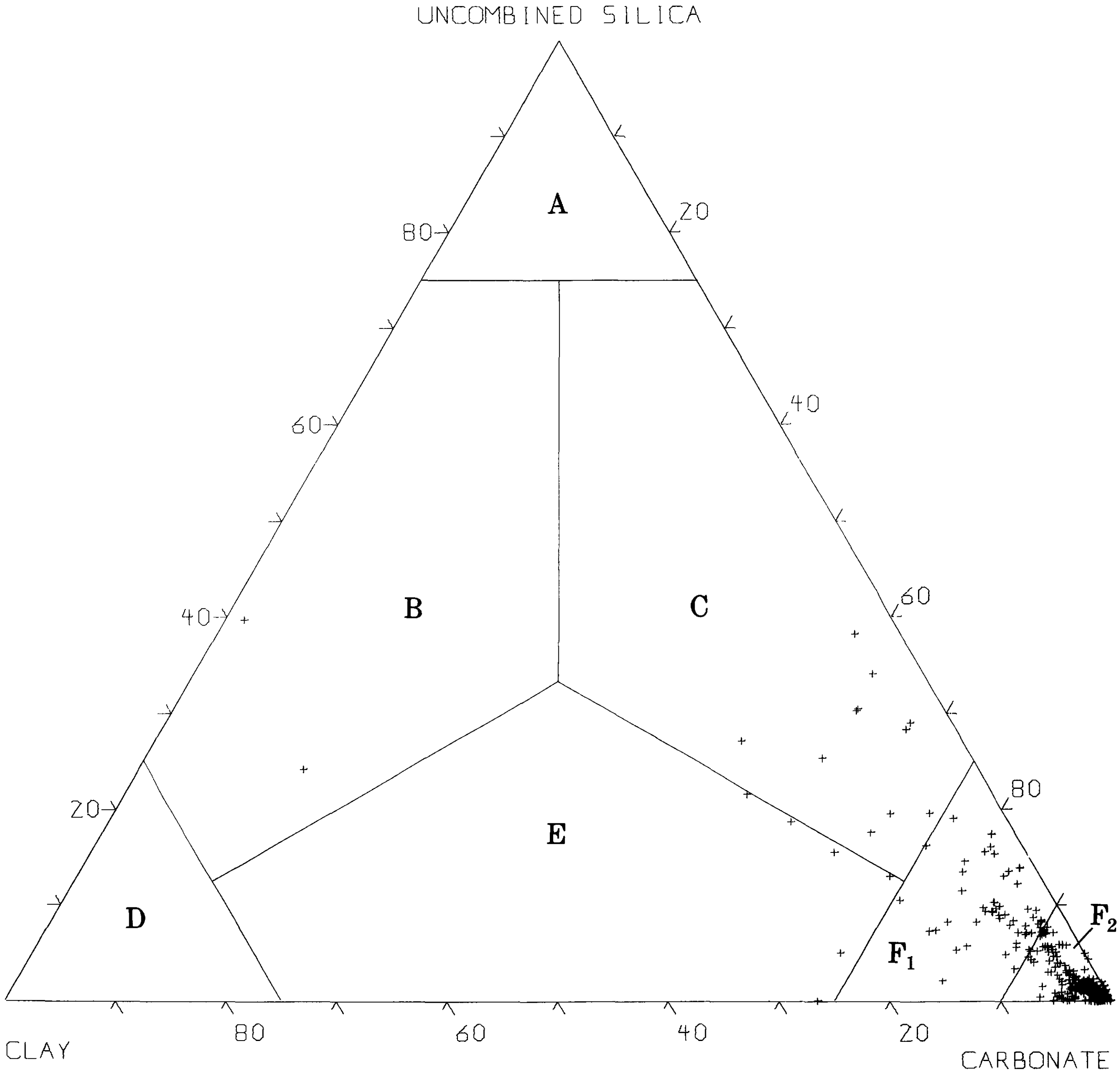


FIGURE 17. — Distribution among compositional groups of analyses of samples of Silurian to Permian ages, Chilliwack Group, from the Northwestern States; common-rock category.

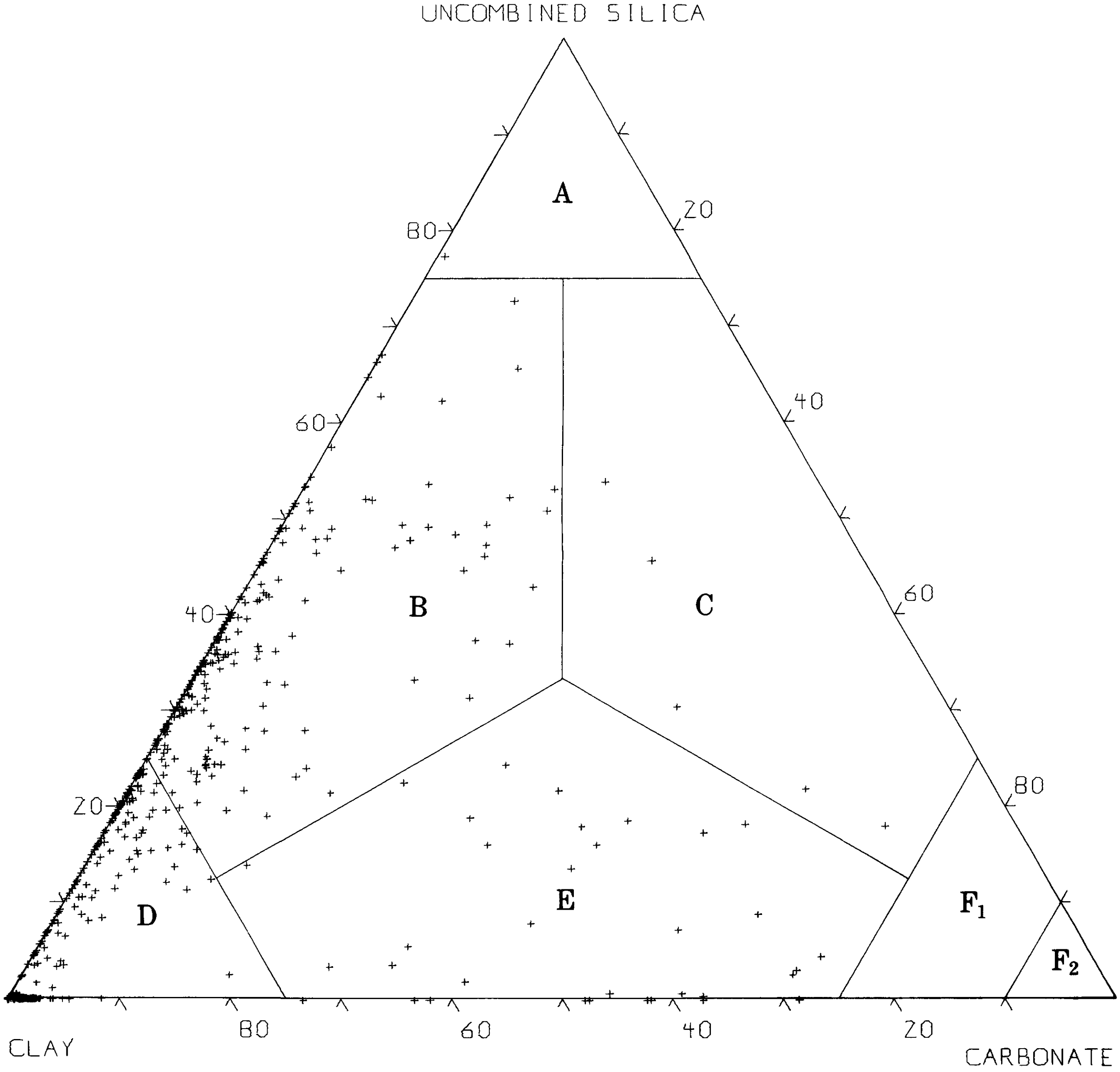


FIGURE 18. — Distribution among compositional groups of analyses of samples of clay from the Northwestern States and Alaska; common-rock category.

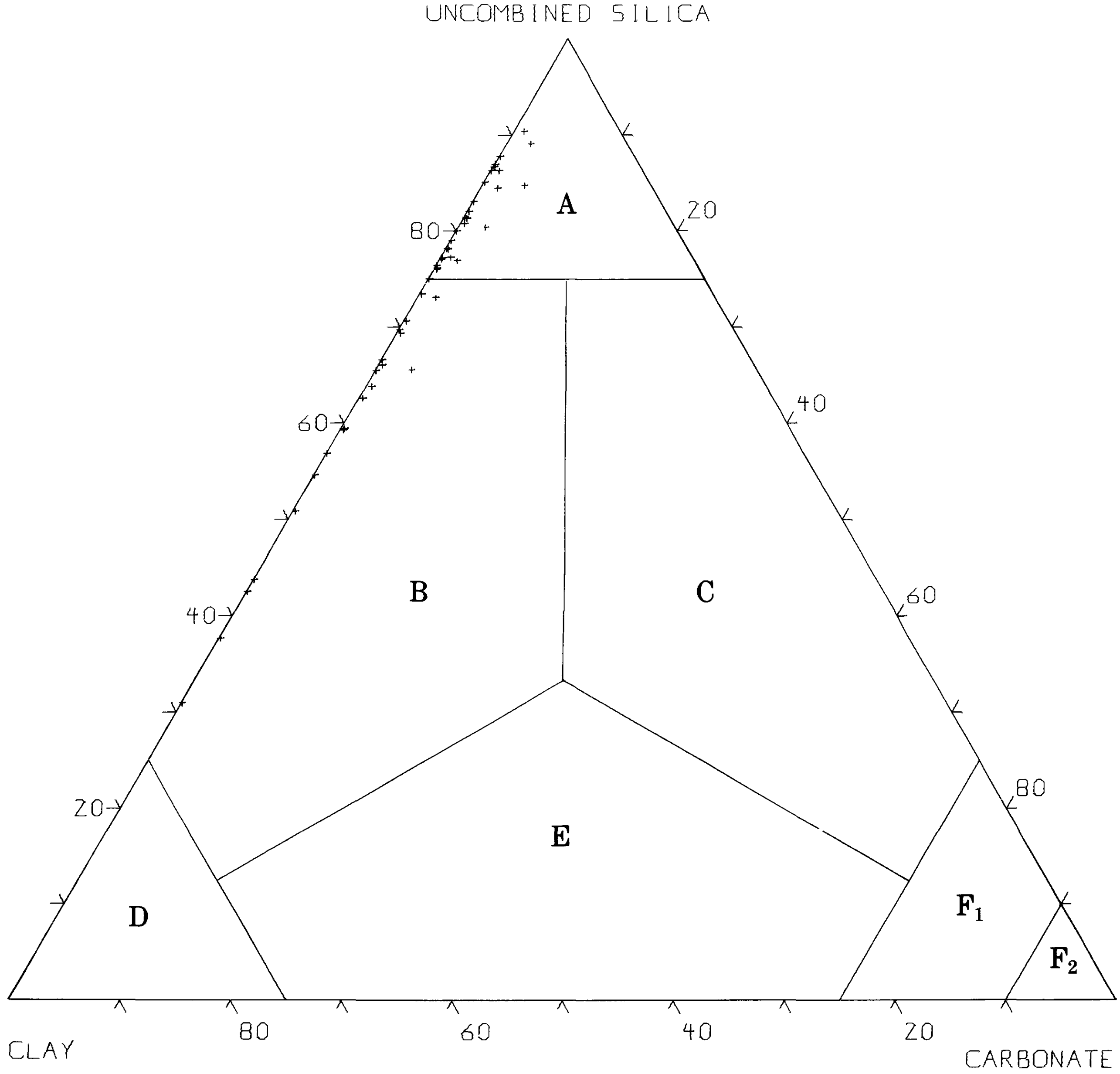


FIGURE 19. — Distribution among compositional groups of analyses of samples of diatomite from the Northwestern States and Alaska; common-rock category.

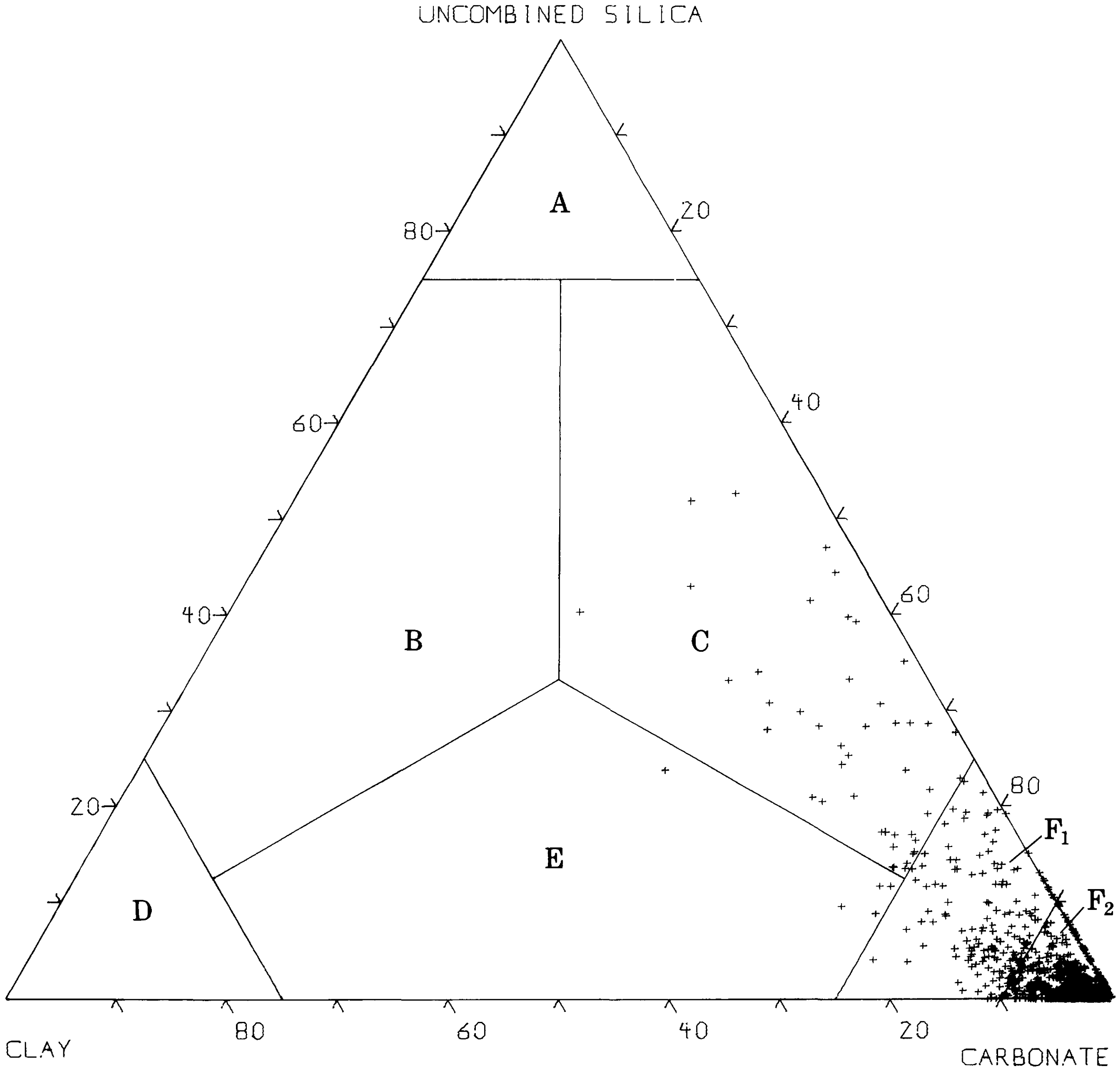


FIGURE 20. — Distribution among compositional groups of analyses of samples of dolomite from the Northwestern States and Alaska; common-rock category.

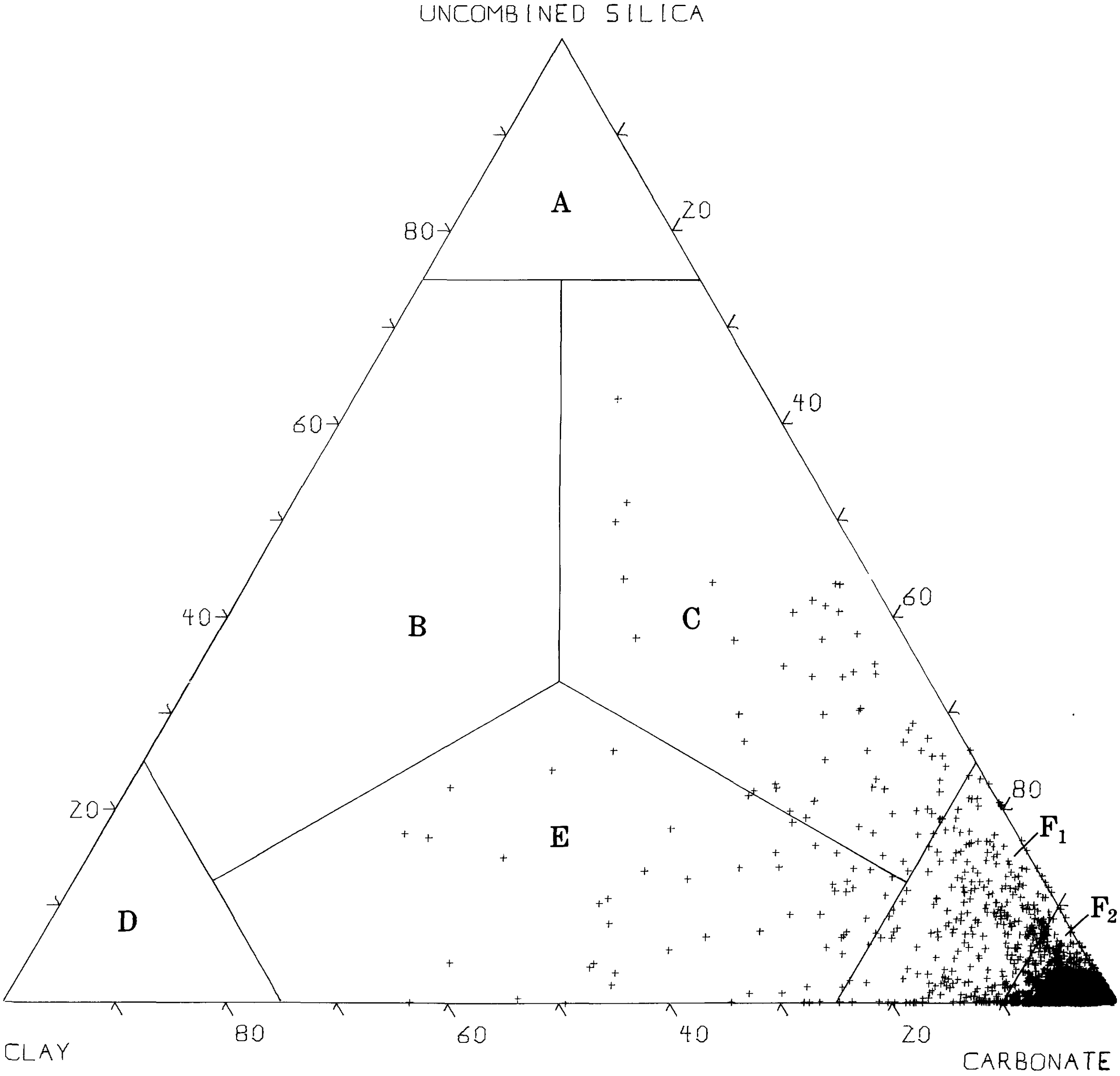


FIGURE 21. — Distribution among compositional groups of analyses of samples of limestone from the Northwestern States and Alaska; common-rock category.

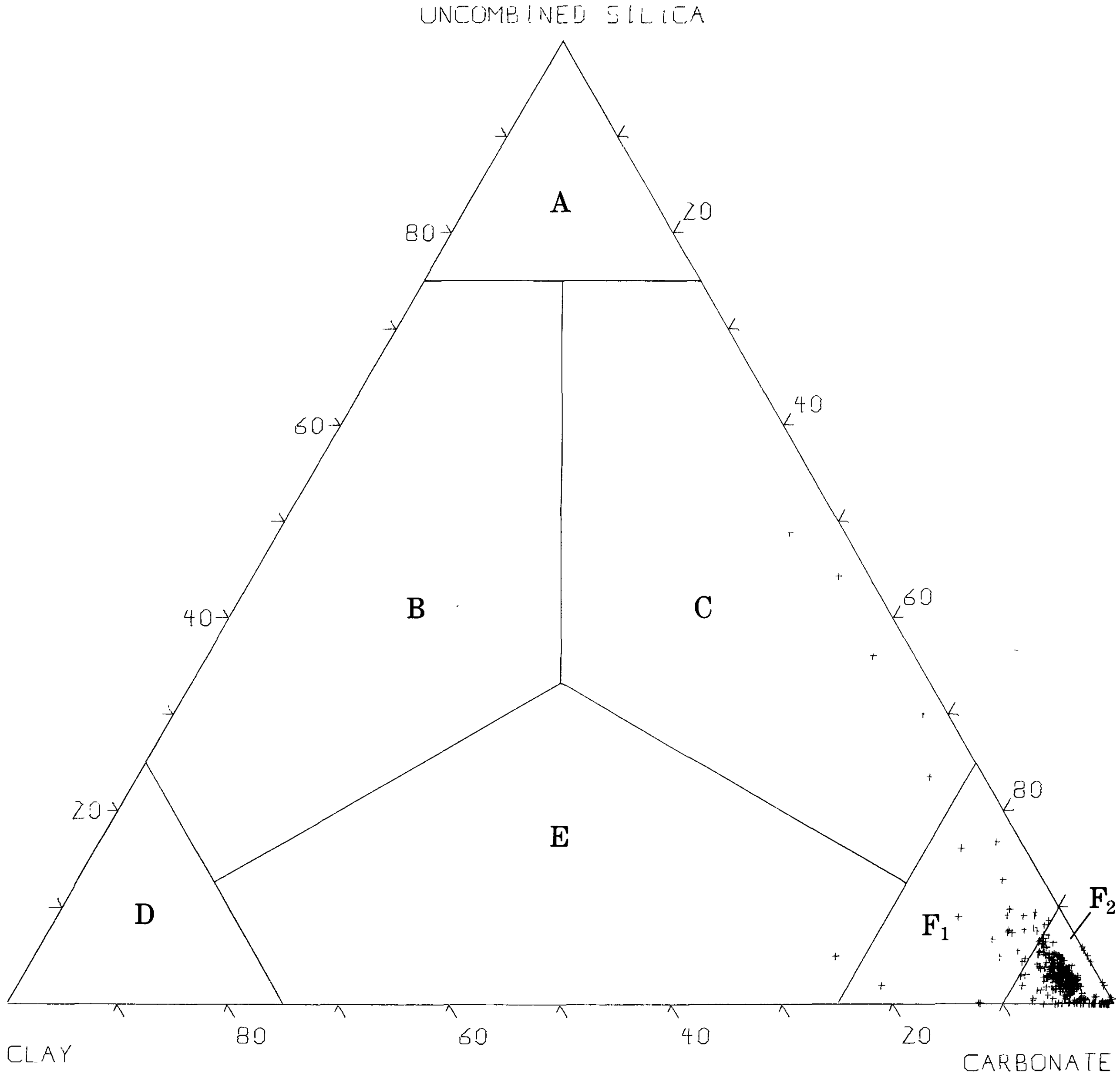


FIGURE 22. — Distribution among compositional groups of analyses of samples of magnesite from the Northwestern States; common-rock category.

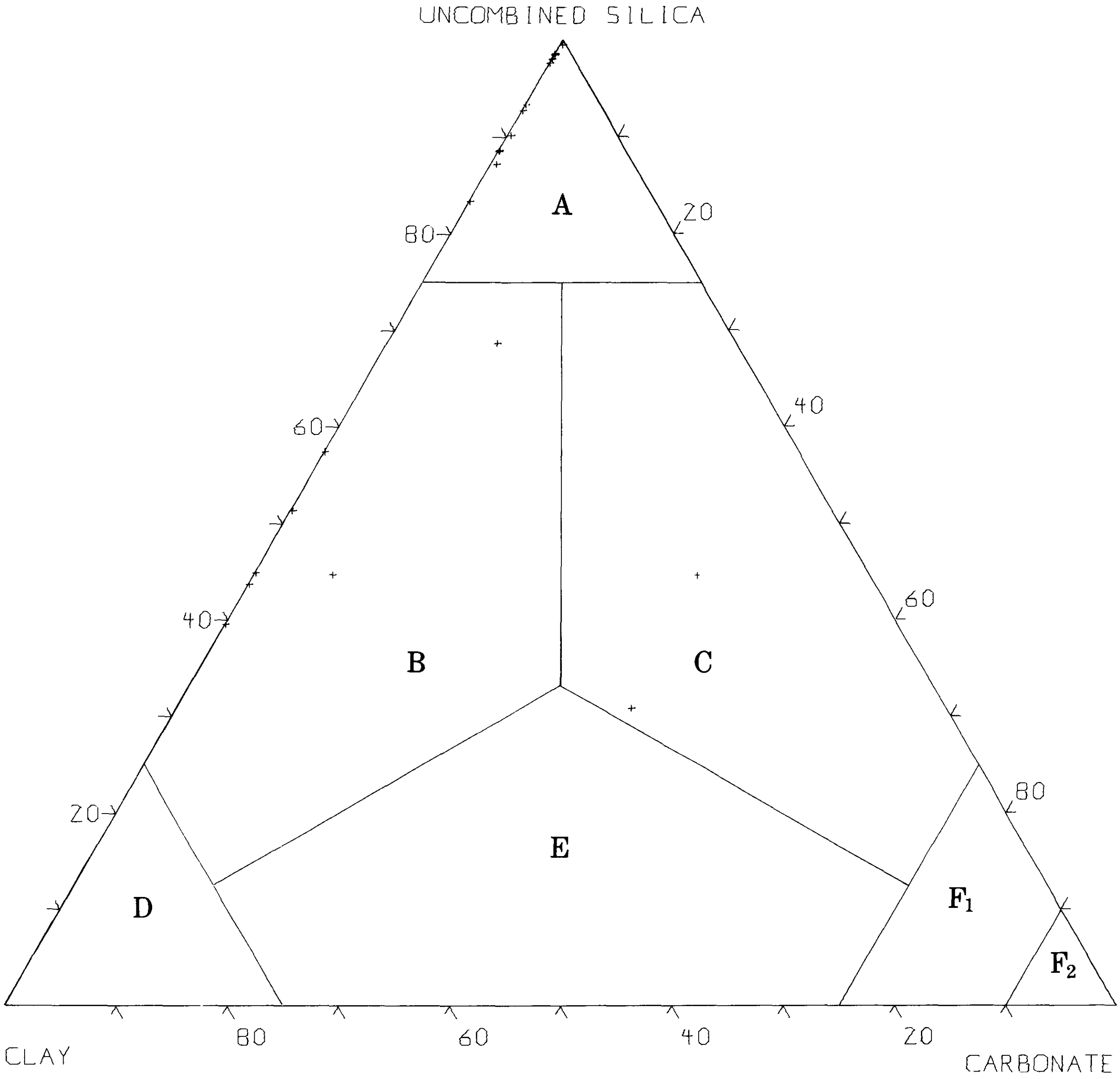


FIGURE 23. — Distribution among compositional groups of analyses of samples of sand and sandstone from the Northwestern States and Alaska; common-rock category.

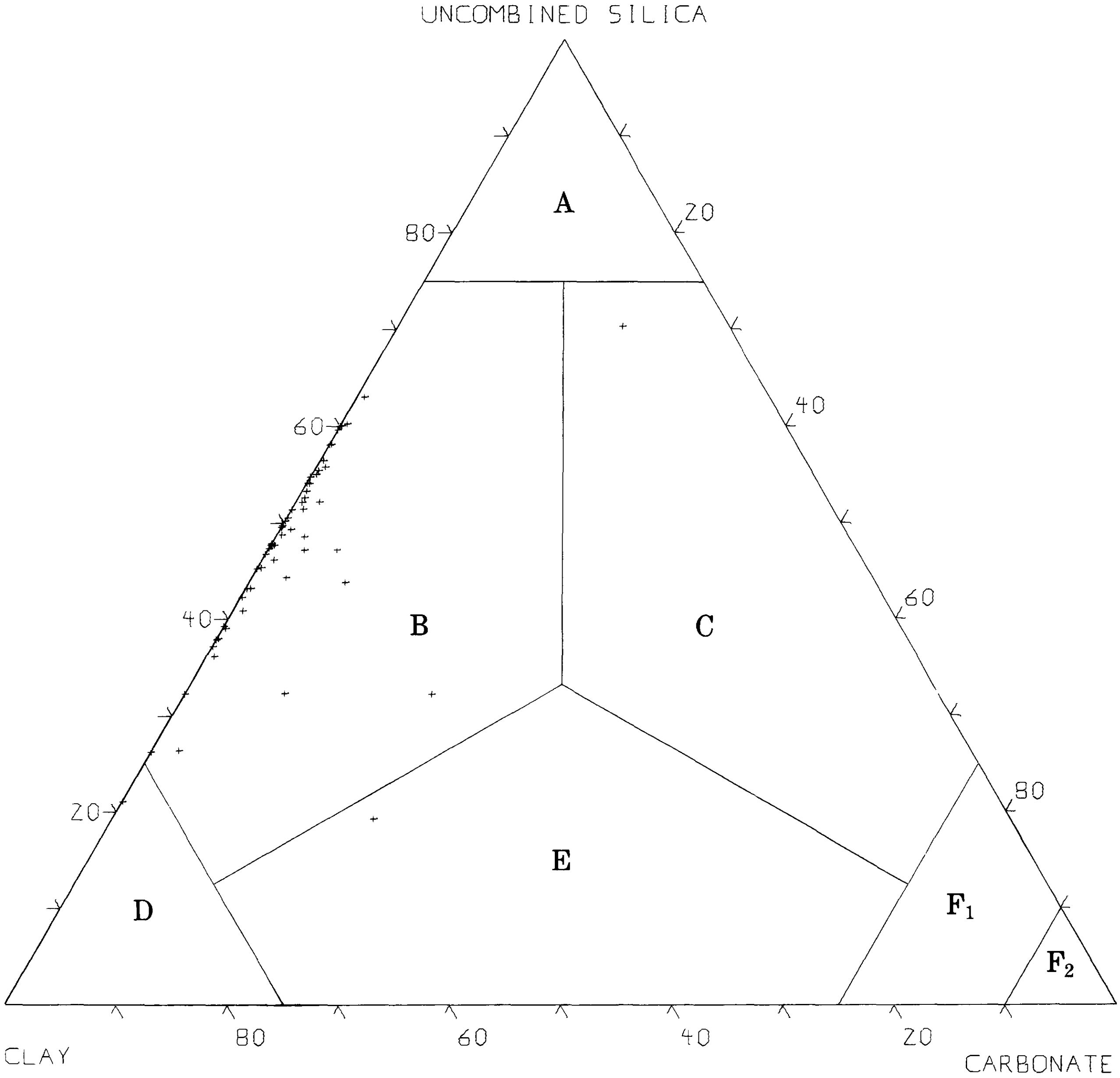


FIGURE 24. — Distribution among compositional groups of analyses of samples of tuff from the Northwestern States and Alaska; common-rock category.

TABLE 23.—*Number of samples of various rock types in the classification groups A–F_2, common- and mixed-rock categories*

Rock type	Classification group						
	A	B	C	D	E	F_1	F_2
Alaska							
Argillite	......	6	......	......	2	......	....
Chert	1	......	......	......	......	......	....
Clay, claystone	......	20	......	3	1	......	1
Diatomaceous earth, diatomaceous ooze	......	1	......	......	......	......	....
Dolomite	......	......	1	......	......	2	15
Glacial flour	......	1	......	......	......	......	....
Graywacke	......	......	......	4	......	......	....
Gypsum	......	......	......	......	5	......	....
Iron-bearing rock	......	1	......	......	......	......	....
Limestone	......	1	3	......	11	67	768
Marble	......	......	......	......	......	......	2
Marl	......	......	1	......	3	2	1
Mud	......	2	......	5	1	......	....
Pumice, pumice lapilli	......	18	......	......	......	......	....
Pyroclastic	......	......	......	1	......	......	....
Quartzite	......	1	......	......	......	......	....
Sand, sandstone	......	2	1	......	......	......	....
Shale	......	25	......	7	1	......	....
Silt, siltstone	......	9	......	1	......	......	....
Tuff, tuff-breccia	......	5	......	1	......	......	....
Volcanic ash	......	2	......	......	......	......	....
Total	1	94	6	22	24	71	787
Idaho							
Alluvium	......	1	......	......	......	......	....
Argillite	......	6	......	......	......	......	....
Clay	......	16	......	30	......	......	....
Dolomite	......	......	3	......	1	2	9
Hydromagnesite	......	......	......	......	1	......	....
Kaolin	......	......	......	3	......	......	....
Limestone	......	......	......	......	4	12	57
Marble	......	......	......	......	......	......	5
Marl	......	......	......	......	......	1	....
Phosphorite	......	3	......	......	......	......	1
Pumice	......	3	......	......	......	......	....
Quartzite	4	1	2	......	......	......	....
Sand, sandstone	2	2	......	......	......	......	....
Shale	......	12	4	10	13	1	....
Silt, siltstone	......	3	......	......	......	......	....
Tuff	......	4	......	......	......	......	....
Travertine	......	......	......	......	......	......	4
Volcanic ash	......	4	......	......	......	......	....
Total	6	55	9	43	19	16	76
Oregon							
Argillite	......	2	......	......	......	......	....
Chert	1	......	......	......	......	......	....
Clay	......	14	......	27	......	......	....
Diatomite	14	13	......	......	......	......	....
Dolomite	......	......	......	......	......	......	1
Garnierite	3	6	......	......	......	......	....
Genthite	......	1	1	......	......	......	....
Glauconite	......	......	......	1	......	......	....
Iron-bearing rock	......	9	......	7	1	......	....
Kaolin	......	2	......	......	......	......	....
Laterite	......	4	......	......	......	......	....
Oregon—Continued							
Limestone	......	......	4	......	12	16	99
Marble	......	......	......	......	......	......	1
Mudstone	......	1	......	......	......	......	....
Nickel silicate, nickel-bearing rock	1	......	......	......	......	......	....
Pumice	......	4	......	......	......	......	....
Sand, sandstone	......	17	......	2	......	......	....
Saprolite	......	......	......	2	......	......	....
Shale	......	2	......	6	......	......	....
Silica rock	1	......	......	......	......	......	....
Silt, siltstone	......	1	......	2	......	......	....
Soil	......	......	......	7	......	......	....
Travertine	......	......	......	......	......	......	1
Tuff	......	37	......	......	......	......	....
Volcanic ash	......	5	......	......	1	......	....
Volcanic cinder	......	......	......	1	......	......	....
Weathered igneous rock, weathered products	......	4	......	1	......	......	....
Total	20	122	5	56	14	16	102
Washington							
Argillite	......	1	......	......	......	......	....
Arkose	......	1	......	......	......	......	....
Beidellite	......	......	......	2	......	......	....
Chert	......	......	1	......	......	......	....
Clay	......	70	......	83	......	......	....
Conglomerate	1	......	......	......	......	......	....
Diatomite	14	5	......	......	......	......	....
Dolomite	......	......	55	......	4	152	685
Graywacke	......	1	......	......	......	......	....
Iron-bearing rock	......	......	......	6	......	......	....
Kaolin	2	2	......	1	......	......	....
Limestone	......	7	51	3	33	194	928
Limonite	......	......	......	2	......	......	....
Loess	......	1	......	......	......	......	....
Magnesite	......	......	15	......	......	31	217
Marble	......	......	......	......	......	6	83
Marl	......	......	......	......	......	......	1
Montmorillonite	......	......	......	1	......	......	....
Mud	......	......	......	......	1	......	....
Nontronite	......	......	......	8	......	......	....
Ocher-sienna	......	......	......	1	......	......	....
Sand, sandstone	12	7	......	......	......	......	....
Shale	......	29	1	8	18	......	....
Silt, siltstone	......	2	......	2	......	......	....
Soil	......	2	......	1	......	......	....
Tufa	......	......	......	......	......	1	10
Tuff	......	3	......	1	......	......	....
Total	29	131	123	119	56	384	1,924

Total for four States

	A	B	C	D	E	F_1	F_2	Total
Alaska	1	94	6	22	24	71	787	1,005
Idaho	6	55	9	43	19	16	76	224
Oregon	20	122	5	56	14	16	102	335
Washington	29	131	123	119	56	384	1,924	2,766
Total	56	402	143	240	113	487	2,889	4,330

TABLE 24. — *Number of samples of various rock types in the classification groups of the special-rock category*

Rock type	Classification group											
	Hk	Hki	Ha	Hai	Hb	Hbi	Fe	Mn	G	S	P	M
Alaska												
Clay, claystone	......	......	......	......	......	......	......	......	......	......	......	1
Coal, coal ash	......	......	......	......	......	......	......	......	......	......	......	11
Diatomaceous earth, diatomaceous ooze	......	......	......	......	......	......	......	......	......	......	......	2
Kaolinite	......	......	1	......	......	......	......	......	......	......	......	......
Limonite	......	......	......	......	......	......	2	......	......	......	......	......
Manganese (sea floor)	......	......	......	......	......	......	......	4	......	......	......	......
Shale	......	......	......	......	......	......	......	......	......	......	......	7
Tasmanite	......	......	......	......	......	......	......	......	......	......	......	3
Total	......	......	1	......	......	......	2	4	......	......	......	24
Idaho												
Bindhiemite	......	......	......	......	......	......	......	......	......	......	......	1
Brannerite	......	......	......	......	......	......	......	......	......	......	......	1
Clay	13	......	......	......	......	......	......	......	......	......	......	......
Evansite	......	......	......	......	......	......	......	......	......	......	......	1
Gneiss	......	......	......	......	......	......	......	......	......	......	......	1
Gypsum	......	......	......	......	......	......	......	......	2	......	......	......
Manganese	......	......	......	......	......	......	......	4	......	......	......	......
Phosphorite	......	......	......	......	......	......	......	......	......	......	480	......
Psilomelane	......	......	......	......	......	......	......	2	......	......	......	......
Rock salt	......	......	......	......	......	......	......	......	......	1	......	......
Total	13	......	......	......	......	......	......	6	2	1	480	4
Oregon												
Bauxite, bauxitic clay, float nodule	......	......	......	......	6	3	......	......	......	......	......	......
Bog iron ore	......	......	......	......	......	......	1	......	......	......	......	......
Borate	......	......	......	......	......	......	......	......	......	......	......	2
Clay	30	......	27	4	2	......	......	......	......	......	......	......
Coal, coal ash	......	......	......	......	......	......	......	......	......	......	......	2
Ferruginous bauxite	1	......	10	4	16	51	3	......	......	......	......	......
Gibbsitic float, nodule	......	......	......	......	2	......	......	......	......	......	......	......
Iron-bearing rock	1	......	......	......	......	......	16	......	......	......	......	......
Kaolin	3	......	1	......	......	......	......	......	......	......	......	......
Laterite	......	......	5	1	......	9	5	......	......	......	......	......
Limonite	......	......	......	......	1	......	15	......	......	......	......	......
Limonitic concretions, float	......	......	......	......	......	......	3	......	......	......	......	......
Manganese-bearing rock	......	......	......	......	......	......	......	1	......	......	......	......
Psilomelane	......	......	......	......	......	......	......	1	......	......	......	......
Priceite	......	......	......	......	......	......	......	......	......	......	......	4
Saline materials:												
Glaubers salt (sodium sulfate)	......	......	......	......	......	......	......	......	......	10	......	......
Potassium nitrate	......	......	......	......	......	......	......	......	......	1	......	......
Potassium nitrate-sodium nitrate	......	......	......	......	......	......	......	......	......	1	......	......
Sodium carbonate	......	......	......	......	......	......	......	......	......	9	......	......
Sodium carbonate-sodium sulfate	......	......	......	......	......	......	......	......	......	1	......	......
Sodium sulfate-sodium nitrate	......	......	......	......	......	......	......	......	......	1	......	......
Soil	......	......	......	......	......	......	......	......	......	......	......	2
Weathered igneous rocks, weathered products	......	......	......	......	......	......	......	......	......	......	......	15
Total	35	......	43	9	27	63	43	2	......	23	......	25
Washington												
Basalt	......	......	......	......	......	......	......	......	......	......	......	2
Bementite	......	......	......	......	......	......	......	4	......	......	......	......
Bog iron	......	......	......	......	......	......	1	......	......	......	......	......
Clay	66	3	44	1	......	......	......	......	......	......	......	......
Coal, coal ash	......	......	......	......	......	......	......	......	......	......	......	22
Gypsite, gypsum	......	......	......	......	......	......	......	......	9	......	......	......
Hausmannite	......	......	......	......	......	......	......	2	......	......	......	......
Hematite	......	......	......	......	......	......	1	......	......	......	......	......
Iron-bearing rock	......	......	......	......	......	1	46	......	......	......	......	......
Kaolin	......	......	2	......	......	......	......	......	......	......	......	......
Laterite	......	......	......	......	......	......	8	......	......	......	......	......
Limonite	......	......	......	......	......	......	6	......	......	......	......	......
Magnetite	......	......	......	......	......	......	1	......	......	......	......	......
Manganese	......	......	......	......	......	......	......	9	......	......	......	......
Mud	......	......	......	......	......	......	......	......	3	......	......	......
Neotocite	......	......	......	......	......	......	......	1	......	......	......	......
Saline materials:												
Epsomite	......	......	......	......	......	......	......	......	......	1	......	......
Gaylussite	......	......	......	......	......	......	......	......	......	1	......	......
Hexahydrite	......	......	......	......	......	......	......	......	......	2	......	......
Mirabilite	......	......	......	......	......	......	......	......	......	5	......	......
Natron	......	......	......	......	......	......	......	......	......	1	......	......
Sodium carbonate	......	......	......	......	......	......	......	......	......	13	......	......
Sodium magnesium carbonate	......	......	......	......	......	......	......	......	......	1	......	......
Sodium sulfate	......	......	......	......	......	......	......	......	......	7	......	......
Sodium sulfate-sodium carbonate	......	......	......	......	......	......	......	......	......	4	......	......
Sand, sandstone	......	......	......	......	......	......	3	......	......	......	......	......
Shale	3	......	......	1	......	......	......	......	......	......	......	......
Total	69	3	46	2	......	1	66	16	12	35	......	24

Total for four States

	Hk	Hki	Ha	Hai	Hb	Hbi	Fe	Mn	G	S	P	M	Total
Alaska	......	......	1	......	......	......	2	4	......	......	......	24	31
Idaho	13	......	......	......	......	......	......	6	2	1	480	4	506
Oregon	35	......	43	9	27	63	43	2	......	23	......	25	270
Washington	69	3	46	2	......	1	66	16	12	35	......	24	274
Total	117	3	90	11	27	64	111	28	14	59	480	77	1,081

TABLE 25. — *Distribution of samples by State, category, and group*

Group		Alaska	Idaho	Oregon	Washington	Total
	Common-rock category					
A	Silica	1	6	16	29	52
B	Mixed silica and clay	83	45	84	129	341
C	Mixed silica and carbonate	6	9	4	103	122
D	Clay	15	34	40	103	192
E	Mixed clay and carbonate	18	17	14	50	99
F_1	Lower carbonate	70	15	16	380	481
F_2	Higher carbonate	787	75	102	1,924	2,888
	Total	980	201	276	2,718	4,175
	Mixed-rock category					
A	Silica	......	......	4	......	4
B	Mixed silica and clay	11	10	38	2	61
C	Mixed silica and carbonate	......	......	1	20	21
D	Clay	7	9	16	16	48
E	Mixed clay and carbonate	6	2	......	6	14
F_1	Lower carbonate	1	1	......	4	6
F_2	Higher carbonate	......	1	......	......	1
	Total	25	23	59	48	155
	Special-rock category					
Hk	Kaolinlike clays	......	13	35	69	117
Hki	Kaolinlike clays with iron	......	......	......	3	3
Ha	High-alumina clays	1	......	43	46	90
Hai	High-alumina clays with iron	......	......	9	2	11
Hb	Bauxite	......	......	27	......	27
Hbi	Bauxite with iron	......	......	63	1	64
Fe	Iron-bearing rocks	2	......	43	66	111
Mn	Manganese-bearing rocks	4	6	2	16	28
G	Gypsum	......	2	......	12	14
S	Sulfates and related rocks	......	1	23	35	59
P	Phosphorites	......	480	......	......	480
M	Miscellaneous:					
	Coal and coal ash	11	......	2	22	35
	Oil shale and oil-shale ash	11	......	......	......	11
	Diatomaceous sediment	2	......	......	......	2
	Minerals	......	3	6	......	9
	Igneous rock and weathered products	......	1	17	2	20
	Total	31	506	270	274	1,081

TABLE 26. — *Distribution of 5,411 samples by State, category, and group*

State

Alaska	1,036	Oregon	605
Idaho	730	Washington	3,040

Category

Common-rock	4,175
Mixed-rock	155
Special-rock	1,081

Group

A	56	F_1	487	Hai	11	G	14
B	402	F_2	2,889	Hb	27	S	59
C	143	Hk	117	Hbi	64	P	480
D	240	Hki	3	Fe	111	M	77
E	113	Ha	90	Mn	28		

The geologist or geochemist interested in estimating the average composition of the earth's materials probably cannot find the gross averages of thousands of published analyses of unusually pure limestones particularly useful for his purpose. Careful observance, however, of the areal distribution and thickness of different rock types and of different geologic formations represented by the published analyses should enable the geologist or geochemist to make closer estimates of average compositions than most of those now available, or at least enable him to discover which rock types and formations are most in need of new analytical data.

Several noteworthy questions and facts about sedimentary rocks resulted from the compilation. One possibly significant relation became apparent when the analyses of this report were plotted on triangular diagrams (figs. 5–24). A very large proportion of all the analyses fall not within the central region of the diagram, as might reasonably be expected, but within about 10 percent of the exterior boundaries of the triangle. This means that many samples of uncombined silica and clay mixtures contain very little carbonate, and that many samples of clay and carbonate mixtures contain very little uncombined silica, and so forth. Such relationships are probably not an artifact resulting from systematic bias in the choice of analyzed samples or in the classification system used; rather, they are largely results of natural sedimentation processes. Thus, environments favorable for deposition of sand are unfavorable for the deposition of clay and carbonates, and vice versa. It follows that the physicochemical factors of sand, clay, and carbonate depositional environments would appear to be unrelated. If so, the data of this compilation stand as a tribute to the good judgment of geologists who, years ago, adopted the familiar sand-clay-carbonate diagram. The validity of these relations will be substantiated or weakened as the compilation of rock analyses from other regions progresses.

CUMULATIVE FREQUENCY CURVES

Figures 25–32 are cumulative frequency curves of the constituents determined in all samples of each classification group. These curves are drawn on semilog coordinates in order to show on one diagram the wide range in abundance of some of the constituents. Note that the less abundant constituents generally vary proportionally much more widely than do the more abundant major constituents.

Many of the constituents, particularly those determined in only a few samples, are distributed very irregularly, and several of them do not fit very well into either normal or log-normal distribution. Nevertheless, when comparisons of the kind just mentioned are made for many of the constituents, most of the more abundant major ones are found to have approximately normal distribution, and many of the minor constituents of intermediate and lesser abundance show a tendency toward log-normal distribution.

487-187 O - 73 - 20

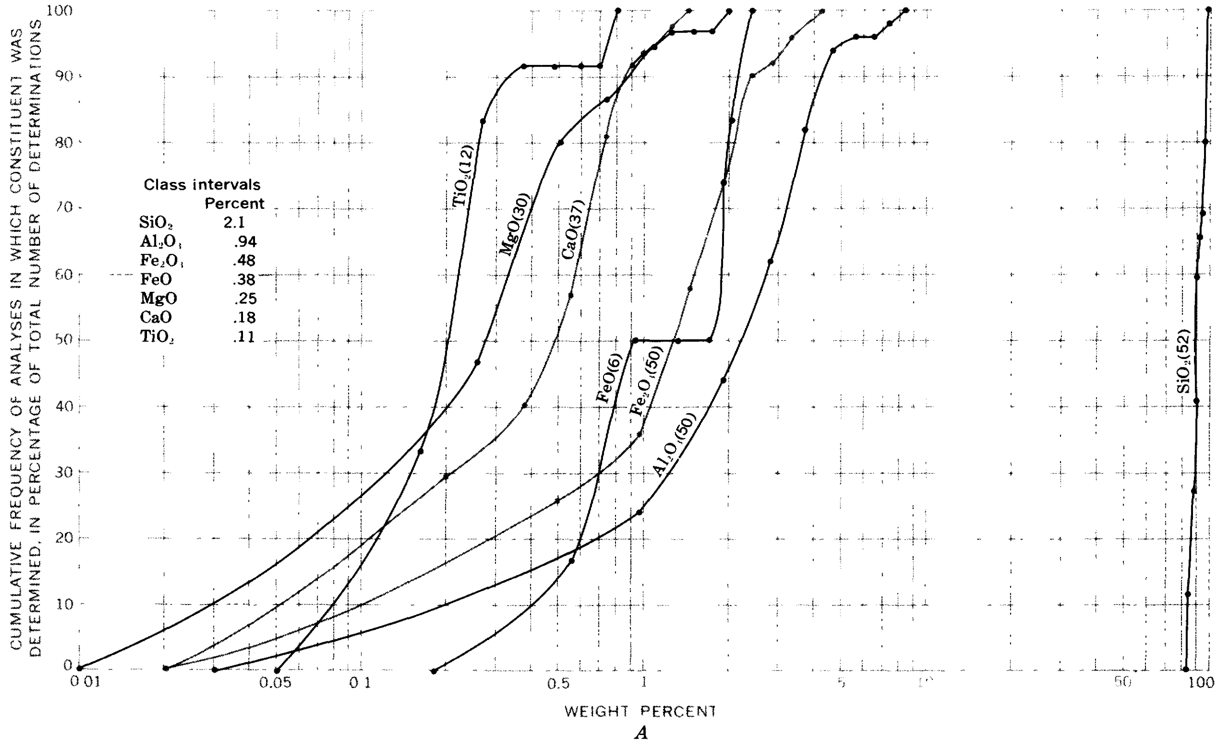


FIGURE 25 (above and facing page). — Group A. Cumulative frequency curves showing the proportion of all analyses in the common-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked "Al_2O_3" in part *A*, above, indicates that all group A analyses in which Al_2O_3 was determined (50 analyses) contain 8.5 percent or less of this constituent and that half of these analyses contain 2.2 percent

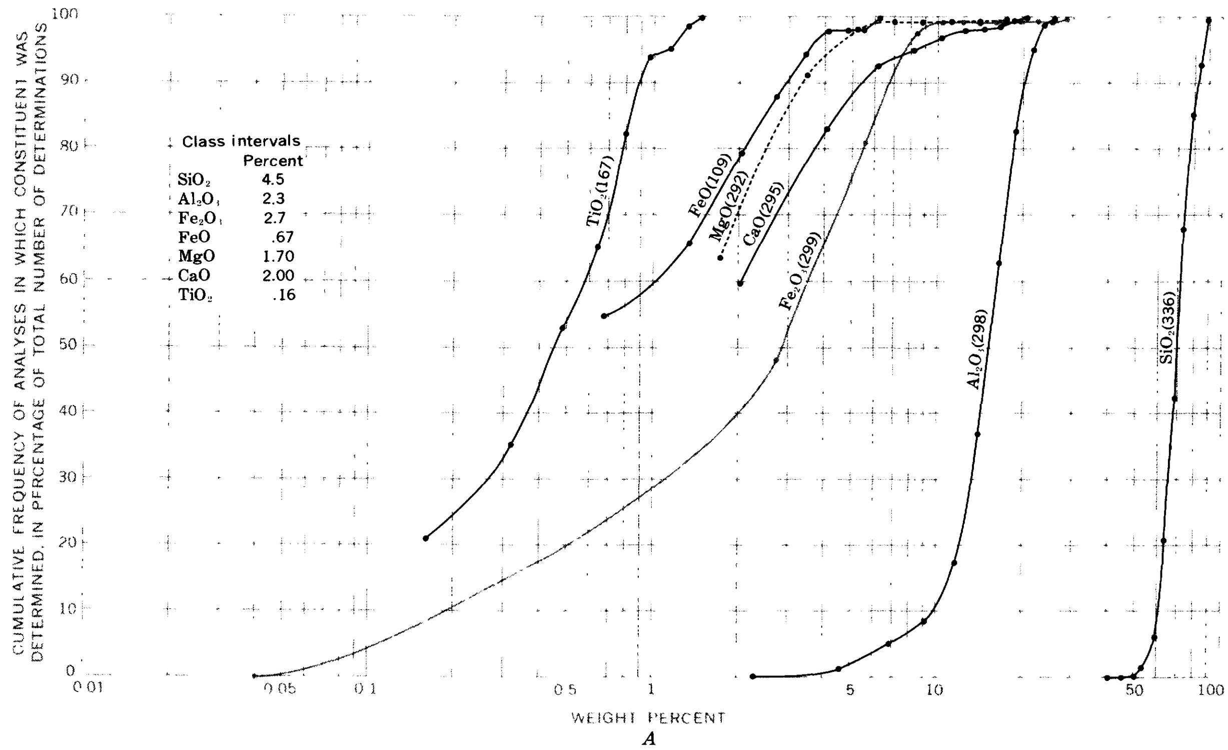
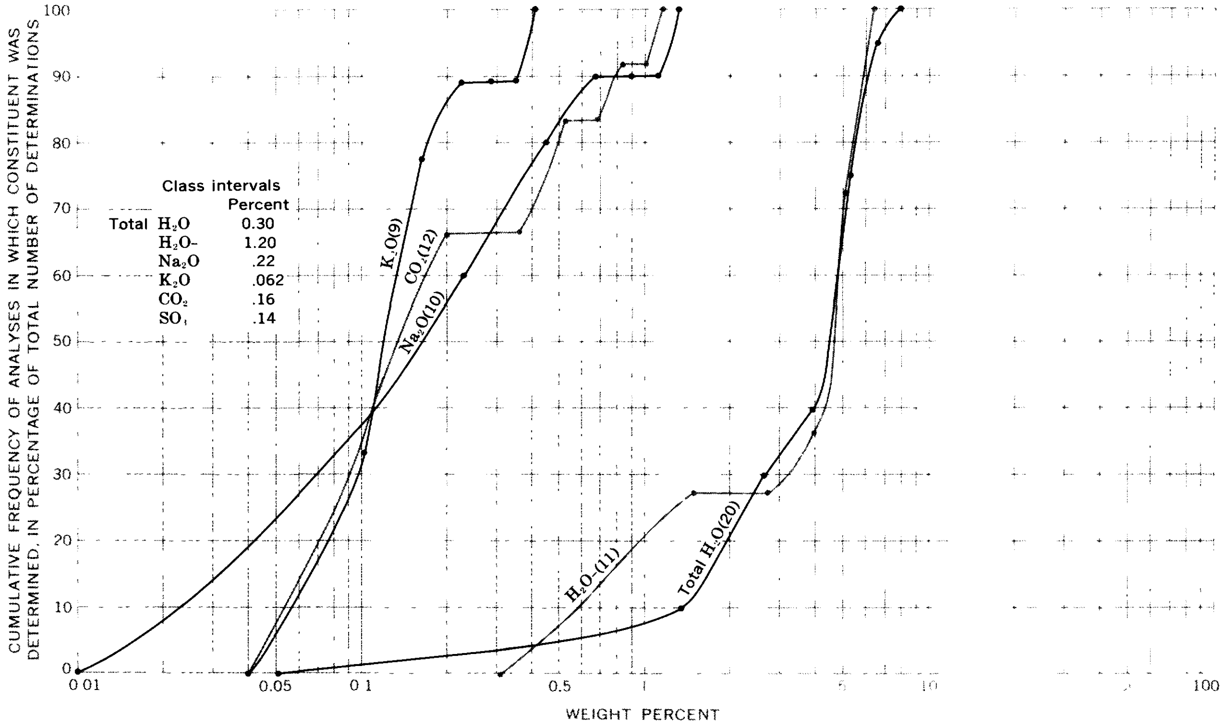
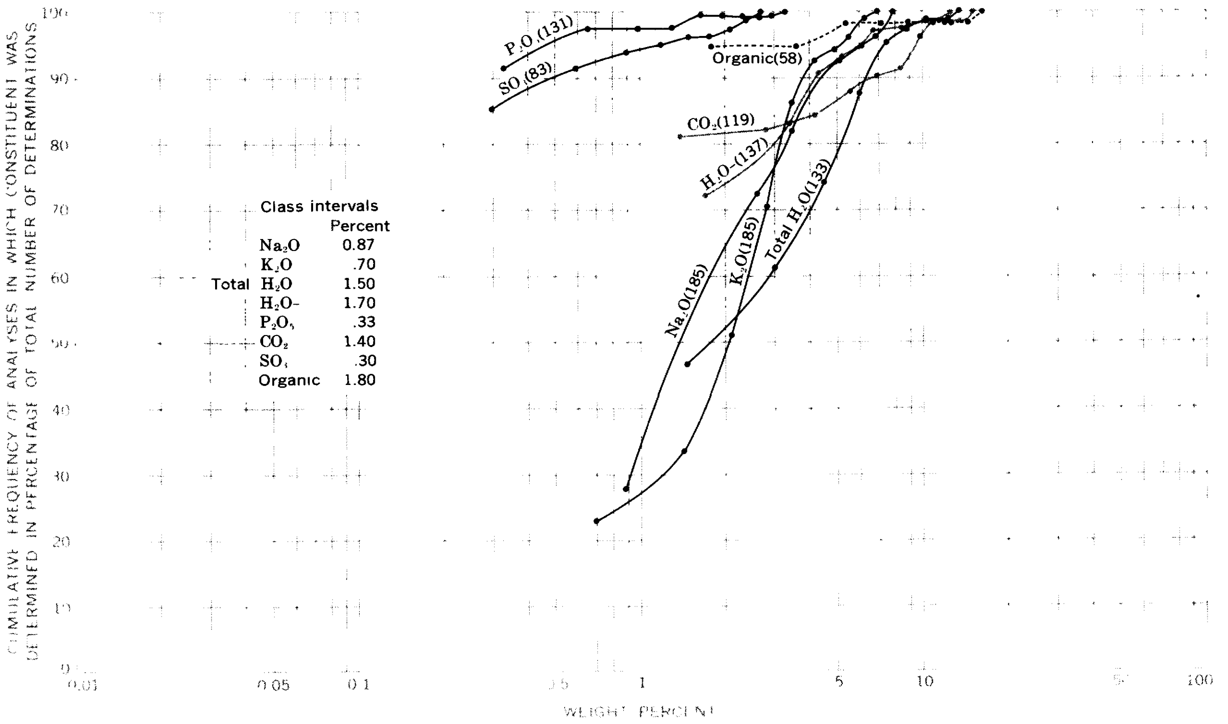


FIGURE 26 (above and facing page). — Group B. Cumulative frequency curves showing the proportion of all analyses in the common-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked Fe_2O_3 in part *A*, above, indicates that all group B analyses in which Fe_2O_3 was determined (299 analyses) contain 27 percent or less of this constituent and that half of these analyses contain 2.8 percent



B

or less Al_2O_3. Constituents determined in fewer than 10 percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line. Determinations of SO_3 in group A samples were not plotted because 87 percent of the values fall between 0 and 0.7 percent.



B

or less Fe_2O_3. The lower limit of the lowest class interval for all constituents is zero. Constituents determined in fewer than 10 percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line.

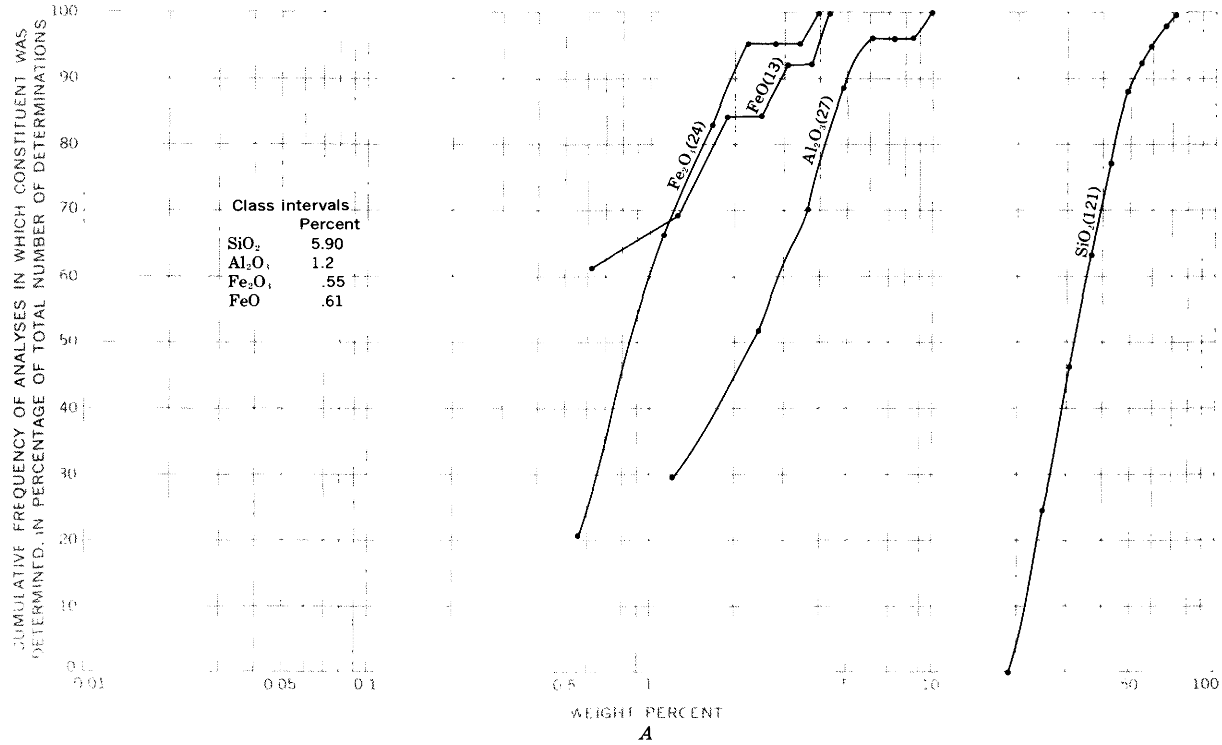


Figure 27 (above and facing page).—Group C. Cumulative frequency curves showing the proportion of all analyses in the common-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked MgO in part *B*, above, indicates that all group C analyses in which MgO was determined (118 analyses) contain 39 percent or less of this constituent and that half of these analyses contain 3.1 percent or less MgO.

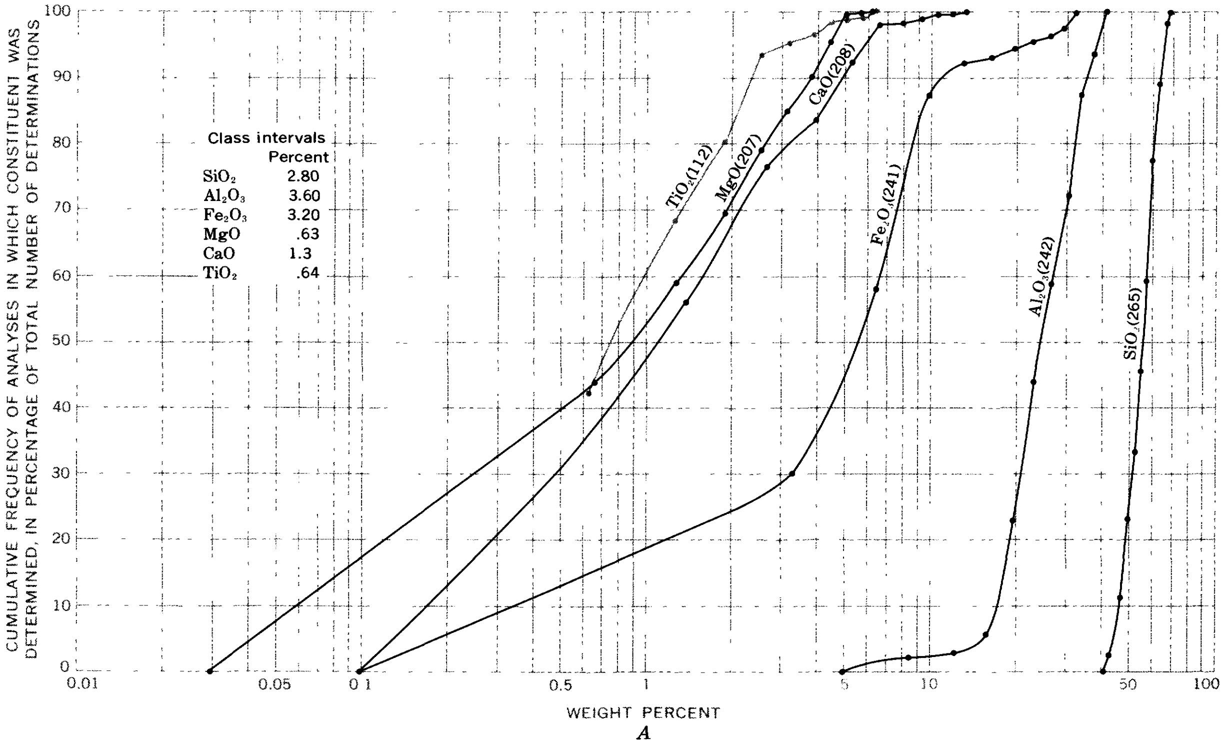
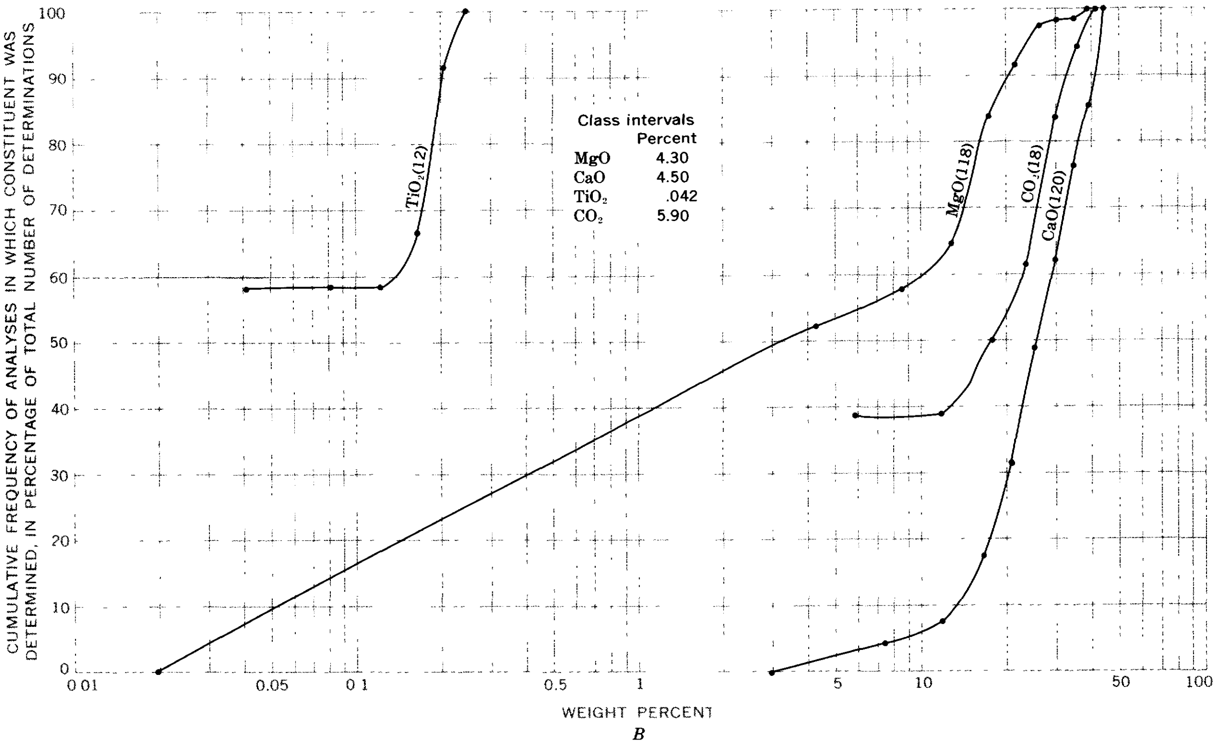
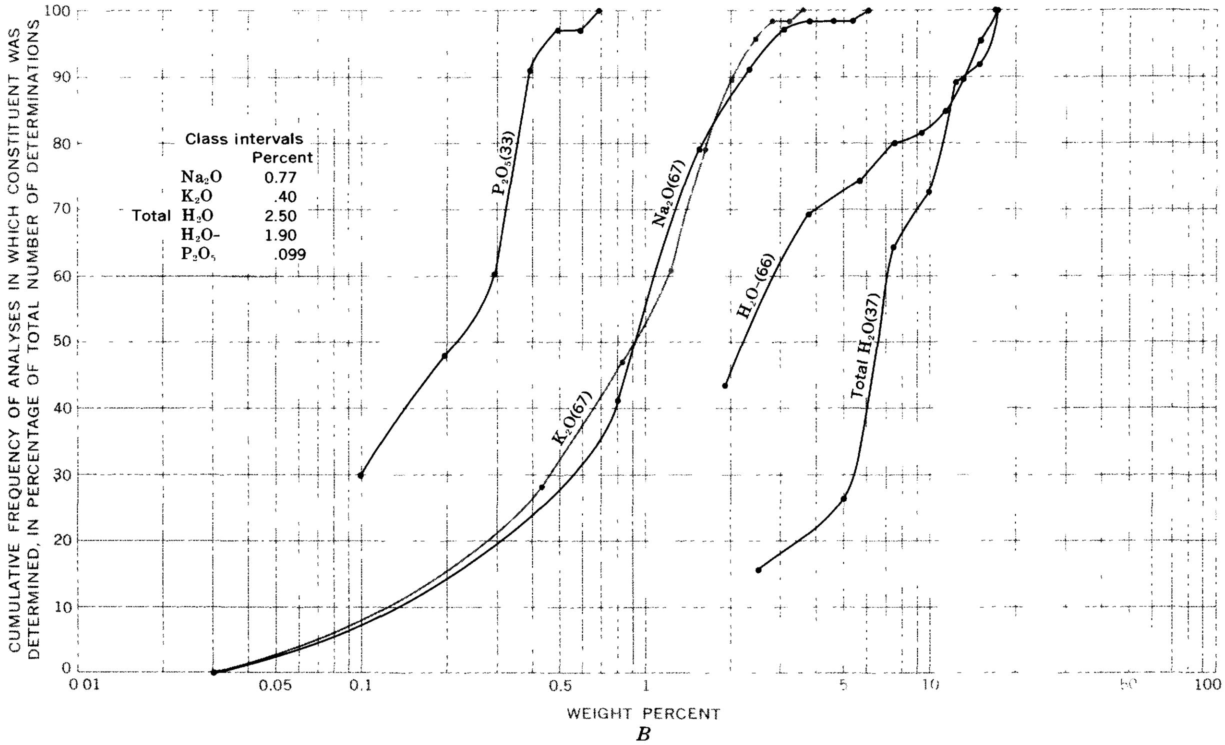


Figure 28 (above and facing page).—Groups D, Hk, Ha. Cumulative frequency curves showing the proportion of analyses in the common-rock category and some analyses in the special-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked CaO in part *A*, above, indicates that groups D, Hk, Ha analyses in which CaO was determined (208 analyses) contain 13 percent or less of this constituent



The lower limit of the lowest class interval for all constituents is zero. Constituents determined in fewer than 10 percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line. Determinations of P_2O_5 in group C samples were not plotted because 98 percent of the values fall between zero and 0.7 percent.



and that half of these analyses contain 1.1 percent or less CaO. The lower limit of the lowest class interval for all constituents is zero. Constituents determined in fewer than 10 percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line.

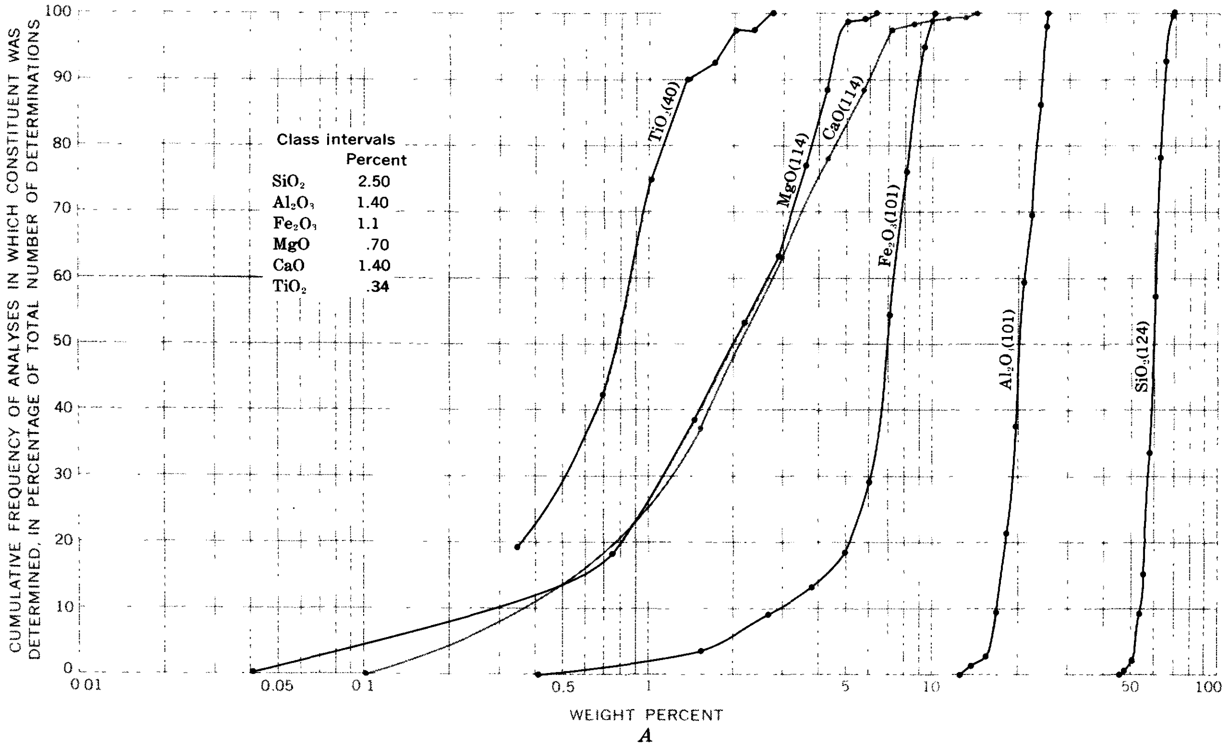


FIGURE 29 (above and facing page). — Group D (here restricted to clay samples containing less than 25 percent alumina and (or) less than 10 percent iron). Cumulative frequency curves showing the proportion of analyses in the common-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked Na_2O in part *B*, above, indicates that the group D analyses of clay samples containing less

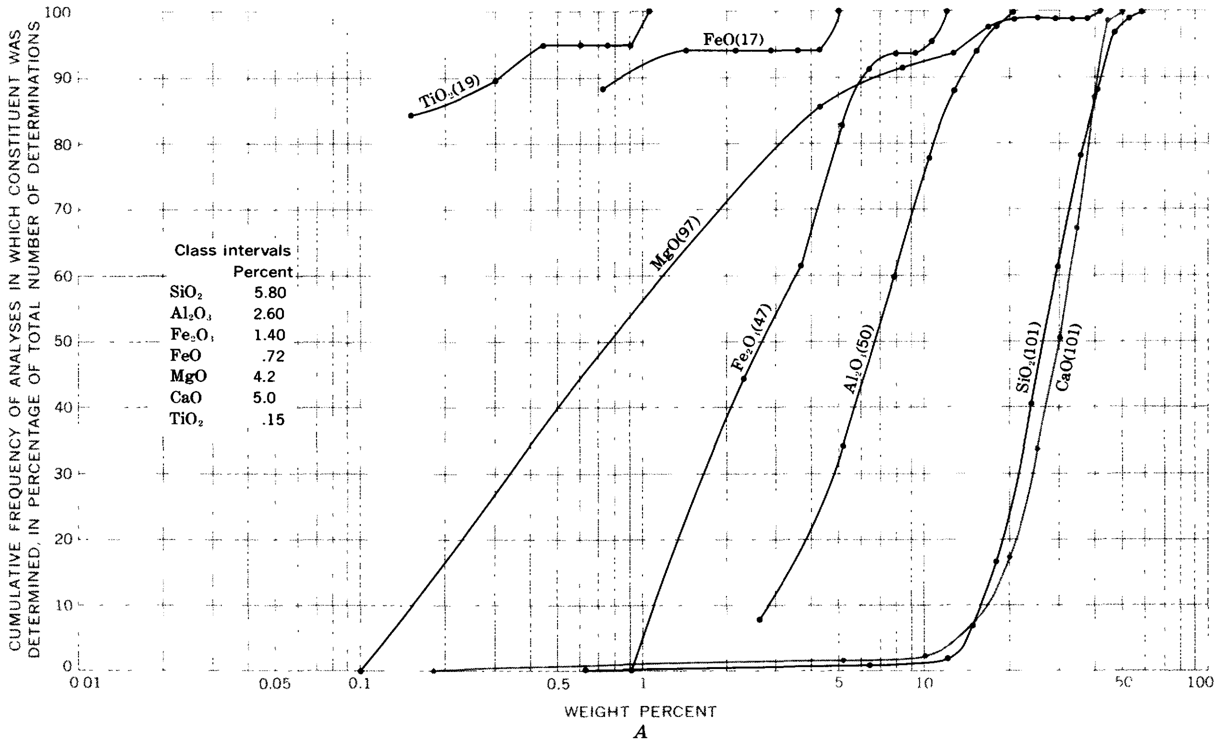
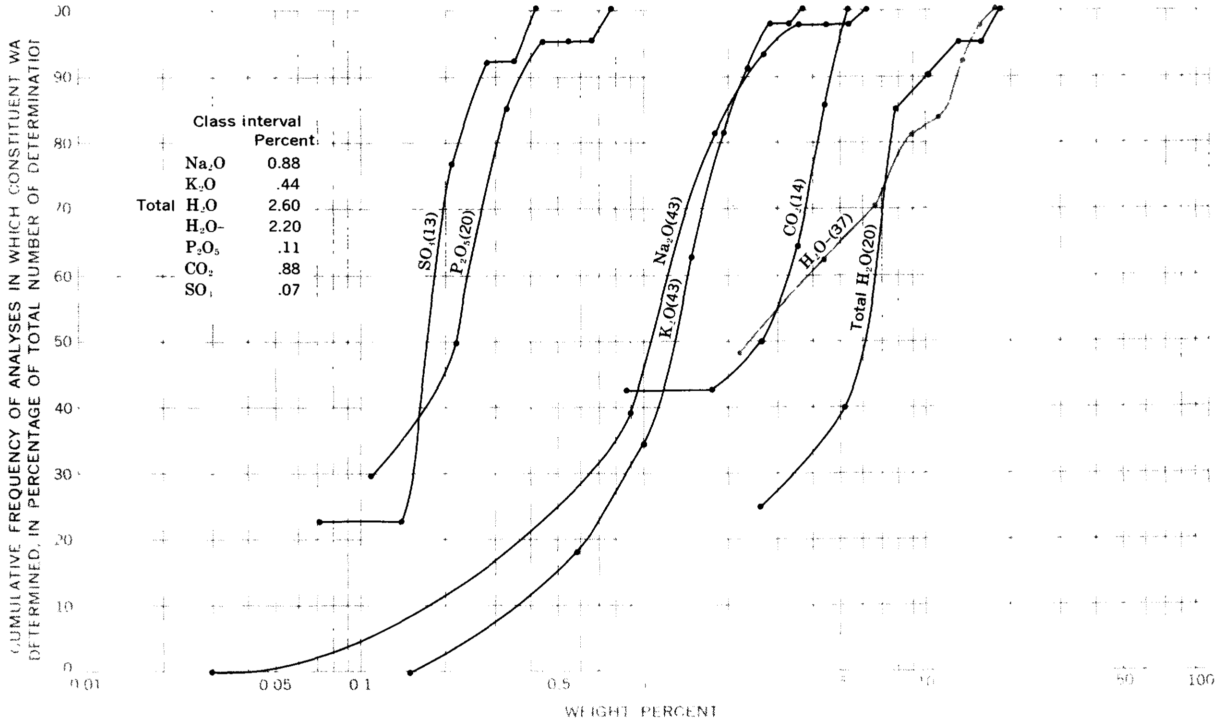
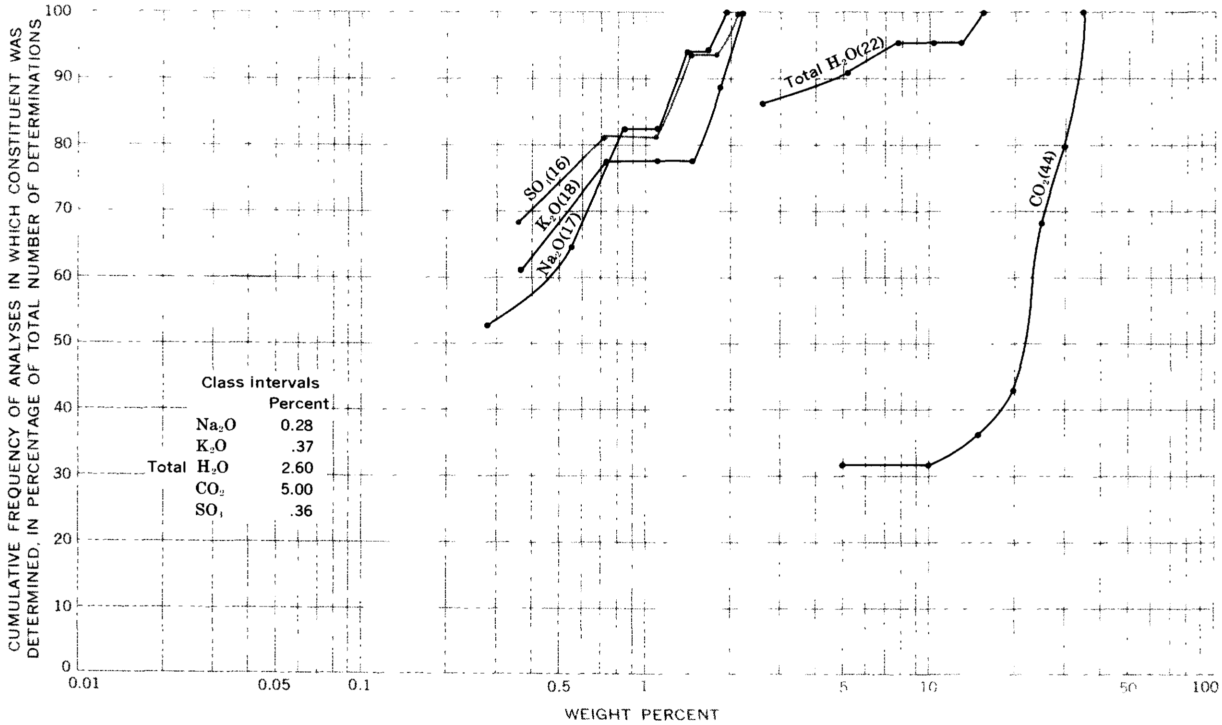


FIGURE 30 (above and facing page). — Group E. Cumulative frequency curves showing the proportion of all analyses in the common-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked CO_2 in part *B*, above, indicates that all group E analyses in which CO_2 was determined (44 analyses) contain 35 percent or less of this constituent and that half of these analyses contain 22 percent or less CO_2. The lower limit of the lowest class interval for all constituents is zero. Constituents determined in fewer than 10



B

than 25 percent alumina and (or) less than 10 percent iron in which Na$_2$O was determined (43 analyses) contain 5.1 percent or less of this constituent and that half of these analyses contain 1.1 percent or less Na$_2$O. The lower limit of the lowest class interval for all constituents is zero. Constituents determined in fewer than 10 percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line.



B

percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line. Determinations of H$_2$O—, P$_2$O$_5$, and organic content in group E samples were not plotted: H$_2$O— because 94 percent of the vâlues fall between zero and 4.2 percent; P$_2$O$_5$ because 96 percent of the values fall between zero and 0.86 percent; and organic content because 94 percent of the values fall between zero and 1.1 percent.

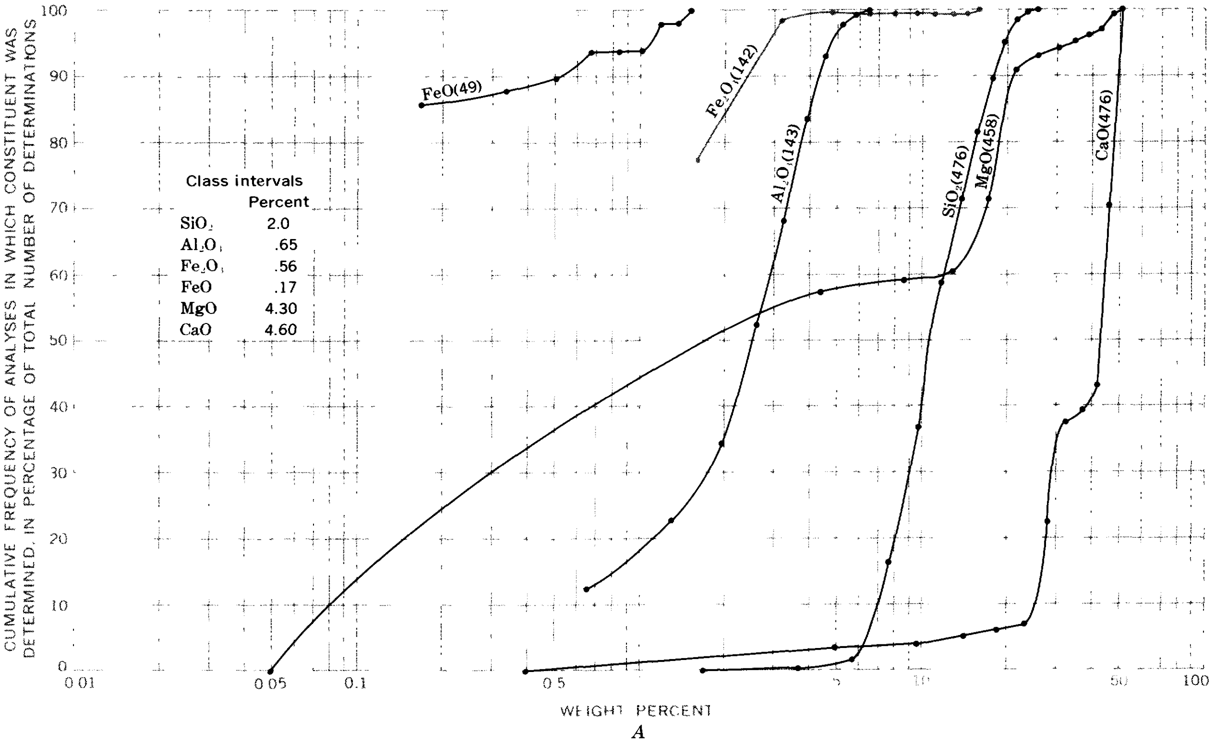


Figure 31 (above and facing page). — Group F_1. Cumulative frequency curves showing the proportion of all analyses in the common-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked MgO in part *A*, above, indicates that all group F_1 analyses in which MgO was determined (458 analyses) contain 51 percent or less of this constituent and that half of these analyses contain 43 percent

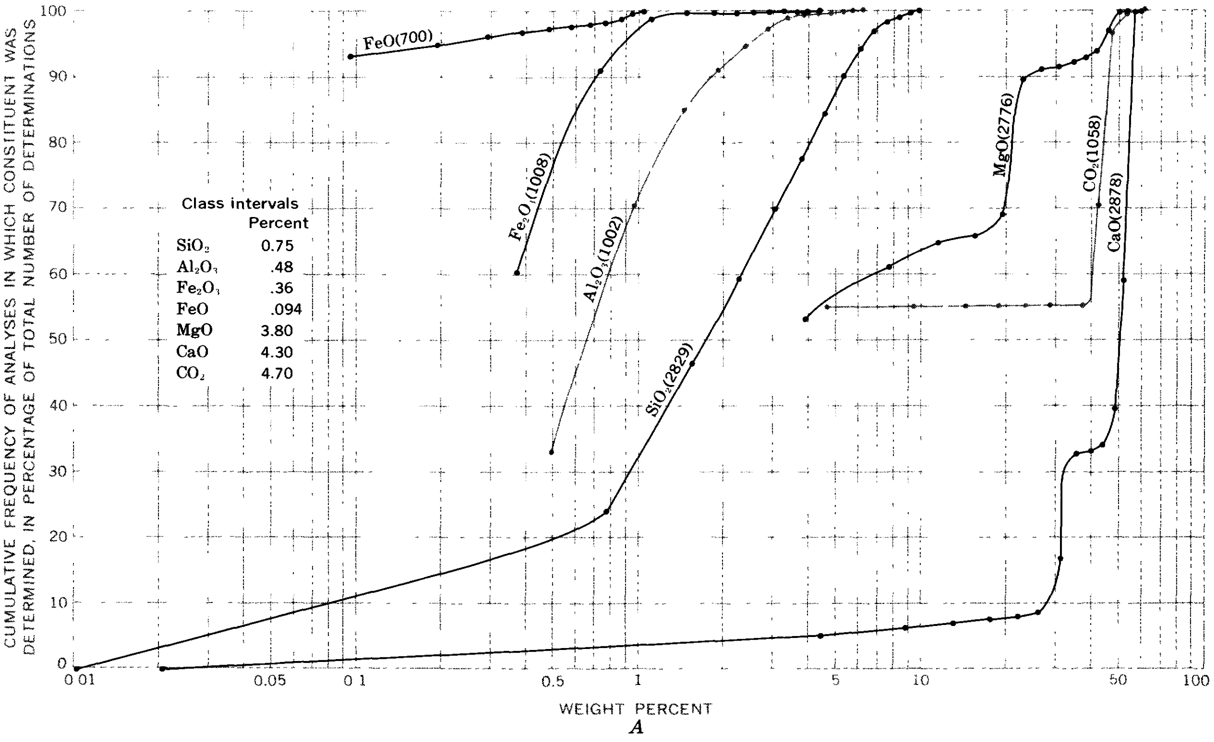
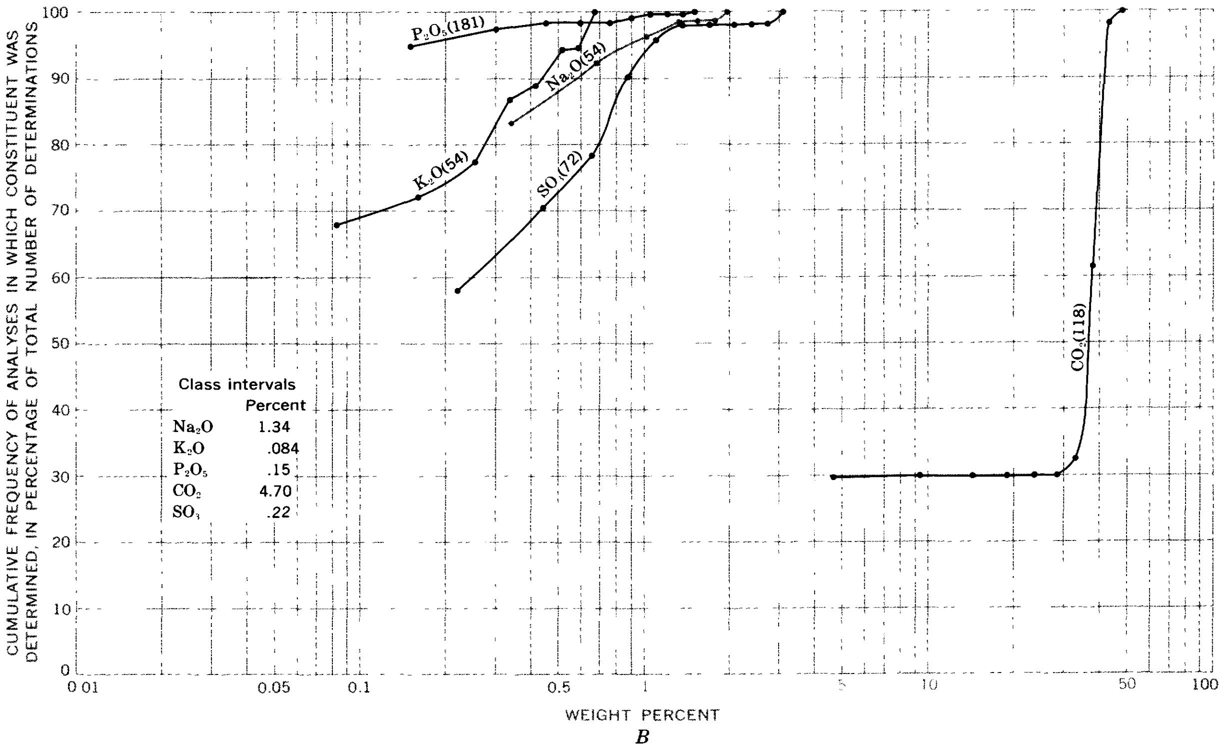
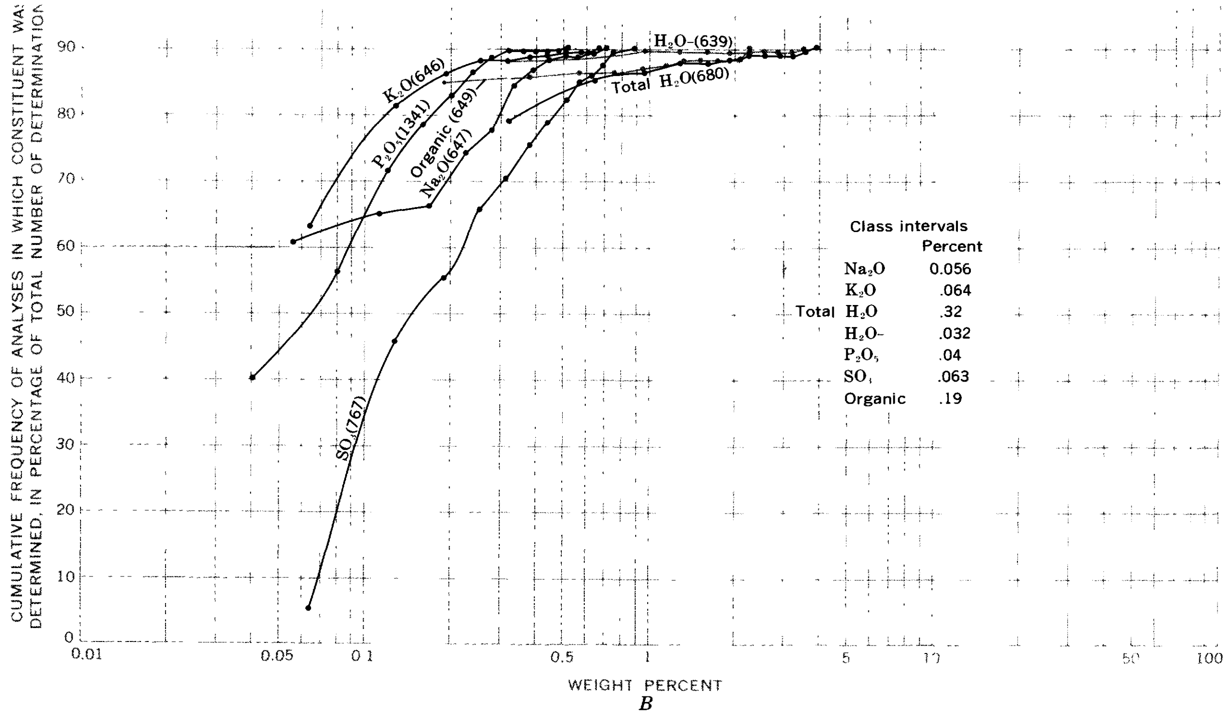


Figure 32 (above and facing page). — Group F_2. Cumulative frequency curves showing the proportion of all analyses in the common-rock category that contain as much as, but not more than, the indicated percentage of various constituents. For example, the line marked SiO_2 in part *A*, above, indicates that all group F_2 analyses in which SiO_2 was determined (2,829 analyses) contain 9.8 percent or less of this constituent and that half of these analyses contain 1.7 per-



or less MgO. The lower limit of the lowest class interval for all constituents is zero. Constituents determined in fewer than 10 percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line. Determinations of total H_2O in group F_1 samples were not plotted because 98 percent of the values fall between zero and 1.5 percent.



cent or less SiO_2. The lower limit of the lowest class interval for all constituents is zero. Constituents determined in fewer than 10 percent of the analyses were not plotted. Total number of determinations made of each constituent is given in parentheses on each line.

TABLE 27.—*Distribution of samples by State, age, stratigraphic unit, quadrangle or county, and classification group*

[See p. 2 and p. 3 for explanation of classification groups. Only samples with stratigraphic information are listed]

Age	Stratigraphic unit	Quadrangle (Alaska) or county (Idaho, Oreg., Wash.)	Classification group																			Totals	
			A	B	C	D	E	F_1	F_2	Hk	Hki	Ha	Hai	Hb	Hbi	Fe	Mn	G	S	P	M	Quadrangle or county	Formation
Alaska																							
Holocene	Not given	Anchorage		2	1		3	2	1													9	39
		Blying Sound		2		4	1															7	
		Candle		1																		1	
		Kenai		1																		1	
		Kodiak		1																		1	
		Icy Bay				1																1	
		Mount Katmai		16																		16	
		Mount Hayes		1																		1	
		St. Michael		1																		1	
		Umnak		1																		1	
Holocene-Pleistocene.	do	Adak		1																		1	2
		Pribilof Islands				1																1	
Pleistocene	do	Healy		1																		1	3
		Rat Islands		2																		2	
	Kowak Clay or Yukon Silts	Fairbanks		2		1																3	5
		Livengood		2																		2	
Quaternary	Not given	Fairbanks		2																		2	3
		Umnak		1																		1	
	Okmok Volcanics	do		1																		1	1
	Patterson Point Formation	Rat Islands		1																		1	1
Quaternary-Tertiary.	Not given	do				1																1	1
Paleocene	Chickaloon Formation	Anchorage																			3	3	3
Tertiary	Not given	Healy		13		2															10	25	26
		Umnak		1																		1	
Tertiary or earlier.	Amchitka Formation	Rat Islands		1																		1	1
Cretaceous	Not given	Anchorage							1													1	2
		Wainwright										1										1	
	Matanuska Formation	Anchorage		1					1													2	2
Cretaceous-Jurassic.	Not given	Chandler Lake																			1	1	4
		Howard Pass																			2	2	
		Killik River																			1	1	
Jurassic	do	Anchorage							12													12	48
		Healy		27		9																36	
	Unnamed unit overlying Shublik Formation.	Chandler Lake																			1	1	3
		Howard Pass																			2	2	
Triassic	Not given	Healy	1				3	3	12													19	20
		Port Alexander						1														1	
Triassic-Permian.	Part of undifferentiated Sadlerochit and Shublik Formations.	Arctic		4			1															5	5
Permian	Not given	Port Alexander							1													1	1
Cretaceous-Mississippian.	Unnamed cherty unit between Lisburne Group and Okpikruak Formation.	Howard Pass																			3	3	3
Permian-Pennsylvanian-Mississippian.	Lisburne Group	Chandler Lake						1	1													2	5
		Mount Michaelson							2													2	
		Sagavanirktok							1													1	
Devonian	Not given	Craig							1													1	174
		Healy		4			2	38	128													172	
		Petersburg							1													1	
Devonian-Ordovician.	Wales Group	Craig							1													1	1
Devonian-Paleozoic.	Not given	Healy		4	4		5	21	581													615	615
Silurian	do	Craig				2		1	18													21	36
		Dixon Entrance							6													6	
		Juneau							1													1	
		Petersburg							7													7	
		Port Alexander							1													1	
Silurian-Ordovician.	do	Craig				2																2	2
Pre-Devonian	do	Healy					2															2	2
Paleozoic	do	Craig						2	3													5	10
		Sitka						1	2													3	
		Skagway							2													2	
Paleozoic-Precambrian.	Birch Creek Schist	Fairbanks							2													2	2
Precambrian	Tindir Group	Charley River		1	1			1	1													4	4

Idaho

Holocene	Not given	Bannock		1																		1	2
		Nez Perce		1																		1	
Pleistocene	do	Bannock															1					1	4
		Caribou							1													1	
		Franklin															2					2	
Quaternary	do	Bannock																	3			3	4
		Bonneville							1													1	
Quaternary-Tertiary.	do	Caribou					1															1	1
Pliocene	do	Bannock		1																		1	1
	Salt Lake Formation	Bear Lake						1														1	4
		Bonneville		1																		1	
		Cassia		2																		2	
Pliocene-Miocene.	Payette Formation	do		1																		1	1
Miocene	Not given	Kootenai		1																		1	30
		Latah		12		9				7											1	29	
	Latah Formation	Benewah		1		1																2	28
		Kootenai				2																2	
		Latah		2		16				5												23	
		Lewis				1																1	
Miocene-Oligocene-Eocene.	Challis Volcanics	Custer		2					2													4	4
Tertiary	Not given	do																			1	1	1
Cretaceous	Bear River Formation	Bonneville						3														3	3
	Draney Limestone	do						1														1	1
	Peterson Limestone	do						1														1	1
Jurassic	Not given	Lewis							3													3	3
	Twin Creek Limestone	Bear Lake		1				1														2	2
Triassic	Not given	Idaho							2													2	14
		Nez Perce					9		3													12	
	Hurwal Formation	do		1	3		2															6	6
	Martin Bridge Formation	do		1			2	1	12													16	16
Permian	Phosphoria Formation	Caribou					1													4		5	513
	Retort Phosphatic Shale Member.	Clark																		2		2	
	Meade Peak Phosphatic Shale Member.	Bannock																		7		7	
		Bear Lake		3		8	1		1											79		92	
		Bingham		1																22		23	
		Bonneville																		15		15	
		Caribou		8	1	1	1	1												328		340	
		Cassia																		4		4	
		Clark																		4		4	
		Teton																		21		21	
Permian-Pennsylvanian.	Wells Formation	Cassia							1													1	1
Mississippian	Not given	do							1													1	7
		Custer						3	3													6	
	Madison Limestone	Bonneville							1													1	1
	Brazer Limestone	Bear Lake							1													1	3
		Custer							2													2	
Devonian	Grand View Dolomite	do							1													1	1
	Jefferson Dolomite	do						1	1													2	2
Silurian	Laketown Dolomite	do							1													1	1
Ordovician	Saturday Mountain Formation	do							1													1	1
	Kinnikinic Quartzite	do							1													1	1
	Swan Peak Quartzite	Caribou	1																			1	1
Cambrian	Gold Creek Quartzite	Bonner	1																			1	6
		Kootenai							5													5	
Paleozoic	Not given	Butte							3													3	5
		Cassia							1													1	
		Oneida							1													1	
Precambrian	Striped Peak Formation	Bonner			1																	1	2
		Shoshone			1																	1	
	Wallace Formation	Bonner		1			1															2	7
		Shoshone		2	2		1															5	
	St. Regis Formation	do		2																		2	2
	Revett Formation	Bonner	1																			1	2
		Shoshone			1																	1	
	Burke Formation	do		1																		1	1
	Prichard Formation	Bonner		1																		1	3
		Shoshone		2																		2	
	Orofino Series	Clearwater							9													9	9
	Yellowjacket Formation	Lemhi							1													1	1
	Belt Supergroup	Nez Perce							2													2	2
	Albion Range Group	Cassia							4													4	4

TABLE 27. — *Distribution of samples by State, age, stratigraphic unit, quadrangle or county, and classification group*—Continued

Age	Stratigraphic unit	Quadrangle (Alaska) or county (Idaho, Oreg., Wash.)	Classification group																			Totals	
			A	B	C	D	E	F_1	F_2	Hk	Hki	Ha	Hai	Hb	Hbi	Fe	Mn	G	S	P	M	Quadrangle or county	Formation
							Oregon																
Holocene	Not given	Grant		1																		1	23
		Harney																	1			1	
		Klamath		3																		3	
		Lake																	18			18	
Holocene-Pleistocene.	do	Coos		2		1																3	3
Pleistocene-Pliocene.	do	Clackamas				1				3		1										5	5
Pleistocene-Miocene.	do	Columbia											1									1	9
		Douglas				3																3	
		Josephine				5																5	
Quaternary-Tertiary.	do	Baker							2													2	6
		Deschutes		1																		1	
		Klamath		2																		2	
		Malheur		1																		1	
Pliocene	do	Clackamas										5		1								6	9
		Klamath		3																		3	
	Molalla Formation	Clackamas								2												2	2
	Deschutes Formation	Deschutes	5																			5	5
Pliocene-Miocene.	Not given	Clackamas										2										2	114
		Columbia										8	1	4	5	4						22	
		Marion								1		6	7	15	33	3						65	
		Multnomah											1									1	
		Polk										1		1								2	
		Washington										1		5	15	1						22	
	Payette Formation	Harney	2	4																		6	17
		Malheur	8	3																		11	
Miocene	Not given	Columbia														10						10	19
		Douglas	1	7																		8	
		Marion																			1	1	
	Mascall Formation	Baker		2																		2	4
		Grant		2																		2	
	Nye Mudstone	Lincoln		1																		1	1
	Unnamed unit overlying Astoria Formation.	do		1																		1	1
	Astoria Formation	do		1																		1	1
Miocene or later	Not given	Benton				1																1	60
		Clackamas				1				4		6										11	
		Clatsop				1																1	
		Columbia				3				1		6	1		3							14	
		Douglas	1			3																4	
		Jackson	1	2																		3	
		Lane		1		1				7		2										11	
		Marion				3				8		1										12	
		Yamhill		3																		3	
Miocene-Oligocene.	John Day Formation	Wheeler		5		5																10	10
Oligocene	Not given	Lane		2																		2	3
		Yamhill				1																1	
Oligocene-Eocene.	Keasey Shale	Columbia		1																		1	1
	Calapooya Formation	Lane								3												3	3
Eocene	Wilbur Tuff Lentils	Douglas		1																		1	1
	Pulaski Formation	Coos						2														2	2
Tertiary	Not given	Columbia				1																1	5
		Douglas	2	1																		3	
		Yamhill		1																		1	
Cretaceous-Jurassic.	Myrtle Group	Douglas							3													3	3
Jurassic	Not given	Grant							1													1	1
	Trowbridge Formation	do		10																		10	10
	Snowshoe Formation	do		6																		6	6
	Hyde Formation	do		9																		9	9
Jurassic-Paleozoic.	Not given	Josephine							6													6	6
Triassic	do	Baker						3	27													30	43
		Wallowa						1	12													13	
	Applegate Group	Baker							1													1	4
		Josephine							3													3	
Triassic-Permian.	Limestone in Clover Creek Greenstone.	Baker							1													1	1
	Elkhorn Ridge Argillite	do							1													1	1

Permian	Not given	Grant						1														1	1
Carboniferous	do	Baker			2																	2	3
		Jackson							1													1	
Pre-Carboniferous	Limestone in Burnt River Schist	Baker						1	3													4	4
Devonian	Not given	Jackson			1			1	3													5	10
		Josephine							5													5	
Paleozoic	do	Jackson		1			1	1	6													9	9
Washington																							
Holocene	Not given	Benton				1																1	72
		Chelan							1													1	
		Grant																	21			21	
		Jefferson							1													1	
		Kittitas																	1			1	
		Lewis				2																2	
		Okanogan																17	14			31	
		Pierce							1													1	
		Skagit				1			1													2	
		Spokane																	1			1	
		Snohomish							3													3	
		Thurston				1																1	
		Whatcom					1	1	2													4	
		Yakima				1													1			2	
Pleistocene	do	Columbia		3																		3	62
		Ferry				1																1	
		King		1		1																2	
		Lewis		2																		2	
		Okanogan		2		4			1													7	
		Pend Oreille		2		8																10	
		Pierce				1																1	
		San Juan				4																4	
		Skagit		1		10																11	
		Skamania		1																		1	
		Snohomish		1		1																2	
		Spokane		1																		1	
		Stevens		2		10																12	
		Thurston				1																1	
		Whatcom		1		3																4	
	Willapa Clays	Lewis				2																2	2
Pleistocene-Miocene.	Yakima Basalt	Kittitas																			1	1	1
Quaternary	Not given	Yakima		1																		1	1
Quaternary-Tertiary.	do	King		2																		2	2
Pliocene-Miocene.	Columbia River Group	Spokane								4												4	5
		Washington																			1	1	
Miocene	Not given	Benton	1																			1	27
		Spokane		1		4				17		3										25	
		Stevens									1											1	
	Astoria Formation	Pacific				1																1	1
	Hammer Bluff Formation	King		9		1																10	10
	Latah Formation	Spokane		3		3				3												9	23
		Stevens		2		6				5												13	
		Whitman								1												1	
Miocene or later	Not given	Pierce		1																		1	1
Miocene-Oligocene-Eocene.	do	Pacific		1																		1	1
Miocene-Eocene.	Lincoln Creek Formation	Lewis		1																		1	2
		Thurston		1																		1	
Oligocene	Not given	Pacific						7	9													16	16
	Gerome Volcanics	Stevens		1																		1	1
Oligocene-Eocene.	Puget Group	King		5		5						6									3	19	22
		Pierce	1																		1	2	
		Whatcom																			1	1	
Eocene	Not given	Clallam		1																		1	5
		Douglas								1												1	
		Pacific							1													1	
		Thurston	1	1																		2	
	Crescent Formation	Grays Harbor		1				1														2	6
		Jefferson					2															2	
		Mason					2															2	
	Metchosin Volcanics	Grays Harbor						1														1	3
		Jefferson															1					1	
		Mason															1					1	
	Kummer Series	King	1																			1	1
	Sumas Shale	Whatcom								2												2	2
	Roslyn Formation	Kittitas				1																1	1
	Chuckanut Formation	Whatcom	2	1		1																4	4
Paleocene-Cretaceous.	Swauk Formation	Chelan	1	1		1				3												6	7
		Douglas								1												1	

TABLE 27. — *Distribution of samples by State, age, stratigraphic unit, quadrangle or county, and classification group*—Continued

Age	Stratigraphic unit	Quadrangle (Alaska) or county (Idaho, Oreg., Wash.)	Classification group																			Totals	
			A	B	C	D	E	F_1	F_2	Hk	Hki	Ha	Hai	Hb	Hbi	Fe	Mn	G	S	P	M	Quad-rangle or county	Forma-tion
								Washington—Continued															
Tertiary	Not given	Cowlitz		4						26		31										61	81
		Skagit								1												1	
		Stevens		7		2	1															10	
		Whatcom				5				1			2			1						9	
Tertiary-Cretaceous.	Soleduck Formation	Clallam					1															1	4
		Jefferson					1	2														3	
Cretaceous	Not given	King		2																		2	5
		San Juan	1				1		1													3	
	Underlies Swauk Formation	Chelan				2										1						3	50
		Kittitas				1									1	45						47	
Cretaceous-Jurassic.	Not given	Snohomish			2			5	10													17	17
Jurassic	do	Clallam															4					4	5
		Okanogan															1					1	
Triassic	do	Asotin		1	1		1	6	15													24	472
		Ferry			2				4													6	
		Okanogan			16		3	96	327													442	
	Haro Formation	San Juan			1			1														2	2
Mesozoic	Not given	Mason															4					4	4
Mesozoic-Carboniferous-Devonian.	Covada Group	Okanogan							2													2	2
Triassic-Permian.	Not given	Ferry							4													4	4
Permian	do	do						2	18													20	180
		King							12													12	
		San Juan			2			3	52													57	
		Snohomish		1					33													34	
		Stevens			1			7	49													57	
	Anarchist [Group]	Okanogan							16													16	16
	Chilliwack Group	Whatcom							9													9	9
Permian-Pennsylvanian.	Not given	San Juan							17													17	17
	Chilliwack Group	Whatcom			1				1													2	2
Permian-Mississippian.	Not given	San Juan							1													1	1
Permian-Devonian.	do	do							3													3	3
	Chilliwack Group	Skagit			4			7	16													27	34
		Whatcom			1		1	3	2													7	
Pennsylvanian	Not given	San Juan			2			4	1													7	11
		Snohomish			1				3													4	
	Chilliwack Group	Skagit			1		2	19	30													52	125
		Snohomish						2														2	
		Whatcom		2	2		1	23	43													71	
Pennsylvanian-Devonian.	Not given	San Juan							3													3	3
Mississippian	do	do							5													5	5
Carboniferous	do	Okanogan						4	20													24	38
		San Juan			1			2	1													4	
		Stevens			1				9													10	
Devonian	do	San Juan							12													12	13
		Whatcom							1													1	
	Chilliwack Group	Skagit			2		1	1	23													27	64
		Whatcom					1	6	30													37	
Devonian-Silurian.	do	Skagit						2	16													18	18
Pre-Ordovician	Limestone in Swakane Gneiss	Chelan						2	4													6	6
Cambrian	Not given	Stevens			1																	1	1
	Northport Limestone	do			4		5	19	271													299	299
	Clugston Creek Limestone	do							3													3	3
	Metaline Limestone	Pend Oreille					4	12	122													138	140
		Stevens							2													2	
	Maitlin Phyllite, Reeves Limestone Member.	do							5													5	5
	Old Dominion Limestone	Lincoln							52													52	108
		Stevens			1			8	47													56	
	Addy Quartzite	do	1																			1	1
Paleozoic	Not given	Ferry						3	4													7	25
		Okanogan							1													1	
		Pend Oreille		1			5	1	5													12	
		Stevens	4						1													5	
Precambrian	Boulder Creek Formation	Ferry							1													1	1
	Stensgar Dolomite	Stevens			45			66	376													487	487
	Edna Dolomite	do			4			3	3													10	10
	Priest River Group	Pend Oreille						1	1													2	2

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INDEXES

The indexes are provided to make the data as readily available as possible for a variety of purposes without any single index being so large as to be cumbersome. They consist of indexes to stratigraphic names, geologic ages, rock name, actual and possible uses, and minor constituents.

The stratigraphic names indexed here are the names used in the references from which the analyses were taken. Many of the names do not represent the most recent usage, although some were reviewed for conformity to nomenclature adopted for use by the U.S. Geological Survey. Each page listed in the index refers to the page on which the descriptive notes appear.

The index "Analyses by Geologic Age" provides information as given in the original publication. No attempt was made to resolve uncertain age assignments or supply an age when none was stated. Pages listed refer to those on which the descriptive notes occur.

The index "Actual and Possible Uses" lists those uses given in the references from which the analyses were taken. For a large number of samples, no use was suggested in the reference. No interpretation was made of the original author's statement.

The index to minor constituents was complex to prepare, and perhaps not all problems were satisfactorily solved from the user's point of view. However, to be able to conveniently find those analyses that report arsenic or bismuth, by means of an index, is very useful. Similarly, the compounds or radicals not commonly reported in analyses of sedimentary rocks, such as potassium sulfate or bicarbonate, would be difficult to find without indexing. Also, an element, such as aluminum or calcium, is a major constituent in many rocks and is of interest as a minor constituent in only a few rocks. The indexing of all analyses in which aluminum is reported is not helpful, but the selection of analyses in which aluminum is of interest as a minor constituent, thus, depended upon the judgment of the compilers. This selection by the compilers necessarily applies to other elements as well.

As a preliminary guide to the indexing of analyses in which the elements are either major or minor constituents (depending on the material), considerable significance was given to analyses in which the element was determined spectrographically, for when an element is present in a sample in amounts amenable to spectrographic analysis, it generally is a minor constituent. The major and (or) minor constituents were divided into two indexes; the first index applies to analyses of rocks in the common- and mixed-rock categories, and the second, to analyses of rocks in the special-rock category.

Elements are indexed without regard to the form of the element as reported in the analyses. Boron, gallium, and other elements are commonly reported as the element in spectrographic analyses, but reported as the oxide if they were determined chemically. Spectrographic analyses and chemical analyses are separately grouped in the index, however. Such compounds as sodium sulfate are indexed only if they were reported as the compound in the original analyses. Many samples, the analyses of which report sodium oxide and sulfur trioxide, are just as likely to contain sodium sulfate as those in which the compound was reported.

The pages listed in the indexes refer to those on which the analyses occur; however, for a few samples, the data on one or two minor constituents are found in the descriptive notes or in the footnotes.

STRATIGRAPHIC NAMES

ANALYSES BY GEOLOGIC AGE

ROCK NAME

ACTUAL AND POSSIBLE USE

CHEMICAL AND SPECTROGRAPHIC ANALYSES FOR MINOR CONSTITUENTS, COMPOUNDS, AND RADICALS (OXIDES REPORTED AS ELEMENTS) IN ROCKS OF THE COMMON- AND MIXED-ROCK CATEGORIES

[Constituents looked for and not detected or if below limiting values are given in italics; constituents may appear more than once on a page and may appear in more than one form]

CHEMICAL AND SPECTROGRAPHIC ANALYSES FOR MINOR CONSTITUENTS, COMPOUNDS, AND RADICALS (OXIDES REPORTED AS ELEMENTS) IN ROCKS OF THE SPECIAL-ROCK CATEGORY

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