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DIVISION OF MINES AND GEOLOGY
MARSHALL T. HUNTING, Supervisor

Bulletin No. 37

INVENTORY OF WASHINGTON MINERALS

PART I

SECOND EDITION

NONMETALLIC MINERALS

By
GRANT M. VALENTINE

Revised by
MARSHALL T. HUNTING

Volume 1 - TEXT

Volume 2 - MAPS



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$$f(x) = \frac{1}{x^2} = x^{-2}$$

$$f'(x) = -2x^{-3} = -\frac{2}{x^3}$$

$$f''(x) = \frac{6}{x^4}$$

$$f'''(x) = -\frac{24}{x^5}$$

$$f^{(4)}(x) = \frac{240}{x^6}$$

$$f^{(5)}(x) = -\frac{2880}{x^7}$$

$$f^{(6)}(x) = \frac{20736}{x^8}$$

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$$f^{(16)}(x) = \frac{800733693350400}{x^{18}}$$

INVENTORY OF
WASHINGTON MINERALS

PART 1
NONMETALLIC MINERALS

Volume 1 — TEXT

FOREWORD

This inventory of nonmetallic minerals of Washington was first published as Part I of Bulletin 37 in 1949. It proved to be a very popular report and within a very few years it went out of print. Rather than simply reprint the original Part I, it was decided to revise that first edition by correcting some errors that had been found and by adding new data on nonmetallic mineral occurrences that were discovered after 1949. This revised edition has been made more useful also through the addition of many more references to earlier reports on the occurrences listed in the first edition.

Both parts of Bulletin 37, Inventory of Washington minerals, presented the data in two forms—maps and text. Part I, the original report, was published in a book 11¾ by 18 inches in size. Although that format had the advantage of allowing most of the text for any given commodity to be on a page facing the map for that commodity, this advantage was probably more than offset by the awkwardness in handling a book of that size.

The format was changed when Part II was published; in it maps and text were bound in two separate volumes. This arrangement has the advantage of allowing descriptive material and corresponding map to be studied together with the least possible inconvenience to the reader and at the same time allows the volumes to be published in a more convenient size.

As the two-volume arrangement with a smaller size page met with general approval, that form was retained in publishing the present revision of Part I.

Although this edition has been very extensively revised by the writer, it retains the same arrangement and much of the wording of the original bulletin by Grant M. Valentine. Heavy demand for the bulletin has proved its worth; this revision should prove to be equally useful.

MARSHALL T. HUNTTING, Supervisor
Division of Mines and Geology

August 1, 1959

FOREWORD TO THE FIRST EDITION

Knowledge of the occurrence of minerals in Washington has been accumulating steadily since 1853, when the first mine (a coal property) was developed. Actually it antedates this, for the discovery of a coal outcrop was recorded as early as 1833, though 20 years elapsed before any particular attention was paid to mineral resources, and it was not until about 1860 that State-wide prospecting, at first for gold, was well underway. The early published references to mineral discoveries are, in general, vague and chiefly of historical value, but some are useful in describing deposits that have been forgotten or lost during the passage of years.

In 1890 the office of State Geologist was created by the State Legislature, resulting in the first coordinated effort to catalogue our mineral resources and possibilities. This work was discontinued after two years, but was resumed in 1901 through the establishment of the Washington Geological Survey and has been continuous since then.

During the 90 years or more that prospecting and mining have been active, a vast amount of information has been obtained on the minerals of the state. The literature on the subject is voluminous. The U. S. Geological Survey, U. S. Bureau of Mines, and many other agencies, as well as institutions, organizations, and individuals, have contributed extensively to the fund of published data.

More than 100 bulletins and reports on geology and mineral resources have been published by the Division of Mines and Geology and its predecessor agencies. Additional material available to the Division has been unpublished, existing as personal observations of staff members and, particularly, as notes from many years

of field investigations. All these sources of information can be consulted—and commonly are—when given resources are considered, but searching the literature is a time-consuming task.

To make desired data on industrial minerals and operations more readily available for Divisional use, a card catalogue of all known mineral references was compiled many years ago by the writer. It gave only brief details of individual deposits, but these, with their citations to further information, became of inestimable value. An immediate use was in the preparation of Bulletin 33, "Nonmetallic Mineral Resources of Washington." Since then the catalogue has been steadily added to by staff members as new information has been obtained, and a similar file has been compiled for metallic minerals and their operations. This last was a laborious undertaking for which Everett P. Hougland, formerly of the Divisional staff, was chiefly responsible.

The present report is the result of a considered conviction that the data in these card catalogues would be as useful to the mining industry as they have proved to be to the Division of Mines and Geology and should, therefore, be made available to all who are, or may become, interested in the state's mineral resources. The listing is purposely made as concise as possible, yet giving certain essential facts. It may be used in obtaining brief general information about any mineral resource, or it may be used as a starting point for detailed investigations. Upon completion of the section dealing with nonmetallic minerals it was considered desirable to publish it without delay as Part I of the compilation. Part II, on metallic mineral occurrences, is still in preparation but will follow as soon as possible.

SHELDON L. GLOVER

March 22, 1949

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INVENTORY OF WASHINGTON MINERALS

PART I—NONMETALLIC MINERALS

By GRANT M. VALENTINE

Revised by MARSHALL T. HUNTING

INTRODUCTION

PURPOSE OF THE REPORT

The primary purpose of this report is to present a complete list of all nonmetallic mineral occurrences in Washington known to the Division of Mines and Geology. Secondary purposes are to show the general distribution of these and to indicate their status and possible value.

Although an exhaustive effort has been made to incorporate all the important occurrences, no pretense is made of having included all those which may be known to other organizations or individuals.

ACKNOWLEDGMENTS AND SOURCES OF INFORMATION

The chief source of data for the report is the voluminous file of information accumulated through the years by the Division of Mines and Geology and its three predecessor organizations, the Washington Geological Survey, the Division of Geology, and the Division of Mines and Mining. Published information has been freely drawn upon, but much of the material used has heretofore been unpublished. Much credit is due Mr. Ward Carithers for early work on the compilation of this report while on the staff of the Division. Information concerning many of the basalt quarries and sand and gravel pits was supplied by Mr. Arthur M. Ritchie, Geologist of the Washington State Department of Highways; additional information was furnished by Mr. Donald E. Trimble, Geologist of the United States Geological Survey, and by the Northern Pacific Railway Co., the Chicago, Milwaukee, St. Paul and Pacific Railroad Co., and the Washington State Department of Highways. All members of the staff of the Division supplied data on some of the resources and specific occurrences. Mr. Sheldon L. Glover, formerly Supervisor of the Division of Mines and Geology, gave helpful guidance in the organization and preparation of the original report and supplied specific information about many of the occurrences.

GENERAL PLAN OF THE REPORT

The report consists of two essential elements—text and maps, which are printed in separate volumes. In volume 1, the text, resources are listed alphabetically except in instances where related materials are treated as a unit. A brief description of each resource precedes mention of its occurrences.

The numbers of the occurrences described in the text correspond with the numbers indicating their locations on the maps, which compose volume 2 and are

arranged in the same order as the resources in volume 1.

A few occurrences listed in the text have no corresponding map number, and in some instances it may be found that there is lack of agreement between map and text data. This is due to the fact that new occurrences were found and the status of old ones changed in the interval between completion of the maps and printing of the text. In instances of lack of agreement between text and map data, text data are to be considered the more accurate.

To facilitate rapid location of an occurrence, two indexes have been prepared. One is an alphabetical listing by subject and the other is an alphabetical listing of minerals by counties.

MAPS

In order to avoid the usual confused array of symbols resulting when many varied resources are plotted on one map, each resource or small group of resources has been plotted on a separate outline map. The maps therefore serve a dual purpose. First, they show the general distribution of a given resource in the state, and second, they serve to locate the occurrences listed in the text. Geometric patterns have been used as symbols. Where only one resource has been shown on a map, circles have been used. Where more than one resource has been shown, other geometric patterns have been used in addition to circles. Regardless of pattern, the same general plan of shading has been used to indicate the status of an occurrence. A solid symbol indicates a deposit which is being worked or which has been worked in the past. A symbol which is half shaded indicates an occurrence which is known to exist and which, in most instances, has been visited by a member of the Division of Mines and Geology or its predecessor organizations. An open symbol indicates a reported occurrence which has not been verified by the Division.

In locating the symbols on the maps a township grid was prepared on a map of the same scale and the symbols located to the nearest section. The accuracy is therefore to the nearest section if the section location is known. Symbols have been arranged on the maps according to two general plans. Resources of which there are very few occurrences have been numbered and arranged progressively across the map from west to east. Resources of which there are a large number of occurrences have been listed and separately numbered under county headings, with the counties arranged alphabetically.

TEXT

Every effort has been made in this report to list all occurrences of nonmetallic resources, even if it is known that the resource has no commercial value. This has been done because a deposit not now commercially valuable may be so in the future. Also, an occurrence may be indicative of commercial deposits in the vicinity and thus serve as a guide to prospecting. It is realized that many occurrences may exist which have not become known to the Division; information concerning these will be welcomed.

In order to prevent the report from becoming bulky, each occurrence is described under five headings in abbreviated form. These headings are: Name, Location, Description, Value, and Reference. Each occurrence has been given a name to make it easily identifiable. In most instances names are used which are known locally or have become associated with the deposit through long usage; in other instances the name used is suggested by prominent topographic features or nearby towns.

Under Location (**Loc**) the site of the deposit is designated as accurately as possible, usually by legal land description. Though this method may not be as convenient as some other means, such as distance from a town, it has been adopted in the interest of conciseness and accuracy. The legal description is abbreviated; thus, sec. 6, (24-32E) indicates section 6, Township 24 North, Range 32 East, Willamette meridian.

Under Description (**Descr**) is a brief statement regarding the deposit. The material included is largely dependent on the amount of information available. If details are known, an effort has been made to describe the deposit as to its mode of occurrence, size, and purity.

Under Value (**Value**) an effort has been made to estimate the possible commercial importance of a given occurrence. In most instances the evaluations purposely have been made very conservative because of the lack of quantitative data.

The descriptive matter is, of course, insufficient for anyone interested in the details of a specific material, so references to each occurrence have been added in order that interested persons may secure more data. The references (**Ref**) have been indicated by numbers in bold-face type, the numbers referring to the numbered citations listed on pages 135 to 140, inclusive, arranged alphabetically according to author.

Anyone wishing further details about a given property should refer to the specific reports cited under this heading. Most of these reports are available at public and institutional libraries. The only cited publications that are available from the Division of Mines and Geology are those, still in print, that were published by the Division or its predecessor agencies, the Washington Geological Survey, the Division of Geology, and the Division of Mines and Mining.

An asterisk (*) preceding an occurrence indicates that the deposit has been worked in the period from 1948 to 1957.

[illegible]

ABBREVIATIONS

To keep the number of pages in the report to minimum, certain abbreviations have been used consistently throughout. Though most are common abbreviations found in any dictionary, they are listed alphabetically below for easy reference.

Add.—Addition	Ltd.—Limited
Ave.—Avenue	mi.—mile, miles
Blk.—Block	N.—north
Bros.—Brothers	NE.—northeast
Bur.—Bureau	N. P. Ry.—Northern Pacific Railway Co.
C.—carbon	no.—number
C.—centigrade	NW.—northwest
C.C.C.—Civilian Conservation Corps	N.W.I.—Northwestern Improvement Co.
C. M. St. P. & P. R.R.—Chicago, Milwaukee, St. Paul & Pacific Railroad Co.	O.-W. R. & N.—Oregon-Washington Railroad & Navigation Co.
Co.—Company	p.—page, pages
col.—column	pt., pts.—part, parts
Constr.—Construction	Pub.—Public, Publications
cor.—corner	R.—Range
Corp.—Corporation	Ref —reference, references
Cr.—Creek	Rs.—Ranges
cu.—cubic	S.—south
Dept.—Department	SE.—southeast
Descr —description	S. P. & S. Ry.—Spokane, Portland, & Seattle Railway Co.
Div.—Division	sec.—section
D.L.C.—Donation Land Claim	sec. 6, (24-32E)—sec. 6, T. 24 N., R. 32 E.
E.—east	sq.—square
Engr.—Engineer, engineering	St.—Street
f. o. b.—free on board	SW.—southwest
Fk.—Fork	T.—Township
ft.—foot, feet	Tct.—Tract
G. N. Ry.—Great Northern Railway Co.	Tps.—Townships
Govt.—Government	U. S.—United States
in.—inch, inches	v.—volume
Inc.—Incorporated	W.—west
Jct.—Junction	Wash.—Washington
Loc —location	yd.—yard, yards

ALUM, ALUNITE, ANDALUSITE, SILLIMANITE, AND KYANITE

Alum is a group name applied to hydrous sulfates of aluminum combined with an alkali metal and 12 molecules of water. Alum minerals identified so far in Washington are not true alums but belong to an allied group. Among them are alumian, $\text{Al}_2\text{O}_3 \cdot 2\text{SO}_3$; alunogen, $\text{Al}_2(\text{SO}_4)_3 \cdot 16\text{H}_2\text{O}$; alunite, $\text{Al}_2\text{O}_3 \cdot \text{SO}_3 \cdot 9\text{H}_2\text{O}$; and smaller amounts of mendozite, melanterite, copiapite, and blödite.

Alunite is a basic hydrous potassium-aluminum sulfate mineral, having the formula $\text{K}_2\text{Al}_6(\text{OH})_{12}(\text{SO}_4)_4$. It may be a source of potash or aluminum if found in sufficient quantity. A deposit in Utah was worked experimentally for potash and aluminum during World War II.

Andalusite, sillimanite, and kyanite are minerals with the composition Al_2SiO_5 . All have similar uses, as in the metallurgical industry for heavy-duty refractories, for electrical porcelains such as spark plug cores, and for other ceramic purposes.

Prices of domestic kyanite in 1956 were \$29.00 per short ton, 35-mesh, carload lots, in bulk, and \$32.00 per ton in sacks. The price was \$40.00 per ton for 200-mesh material in carload lots in sacks. Imported kyanite was quoted at \$76.00 to \$81.00 per short ton for 60-percent grade, in bags, f. o. b. Atlantic seaboard. A shipment of sillimanite from Australia in 1946 sold for about \$23.00 per ton. Recent prices on andalusite, alum, and alunite are unavailable.

OCCURRENCES

On page 7 in volume 2 is plate 1, the map showing the known occurrences of alum, andalusite, sillimanite, kyanite, and alunite. These are numbered to correspond with the numbers of the occurrences listed below.

ALUM

YAKIMA COUNTY

- Name:** Mount Adams. **Loc:** In crater of Mount Adams and approximately 100 feet below top of west crater rim. **Descr:** Various alum minerals, and sulfur, constitute the cementing material in volcanic breccia. **Value:** Commercial separation probably not feasible. **Ref:** 44; 48, p. 118-119.

ALUNITE

KING AND PIERCE COUNTIES

- Name:** Enumclaw. **Loc:** 10 mi. or so E. of Enumclaw in secs. 1 and 12, (19-7E); secs. 4, 5, 6, 7, 9, and 10, (19-8E); sec. 36, (20-7E); and secs. 31, 32, 33, and 36, (20-8E). **Descr:** Disseminations and fracture fillings in altered andesites. **Value:** Extensive drilling in 1940 by Kalunite, Inc. indicates 588,000 tons of alunite, which is probably an insufficient quantity to offset the initial expense of a plant capable of treating the ore. **Ref:** 64-A, p. 798-799, 802-804; 71-A, p. 30; 126, p. 35-36.

ANDALUSITE, SILLIMANITE, AND KYANITE

SAN JUAN COUNTY

- Name:** Blakely Island. **Loc:** Blakely Island; may occur also on Frost, Willow, Armitage, Pointer, Orcas, San Juan, Guemes, Huckleberry, and Fidalgo Islands. **Descr:** Andalusite in Wark gabbrodiorites where intruded and altered by lamprophyre dikes. **Value:** Reportedly abundant, but probably not commercial. **Ref:** 87, p. 150.

SKAGIT COUNTY

- Name:** Johnsburg. **Loc:** On Johnsburg claim in NE $\frac{1}{4}$ sec. 34, (35-13E). **Descr:** Kyanite crystals in quartz veinlet in schist. **Value:** Noncommercial quantity observed. **Ref:** 135.

CHELAN COUNTY

- Name:** Railroad Creek. **Loc:** NW $\frac{1}{4}$ sec. 33, (31-16E). **Descr:** Kyanite forms a $\frac{1}{2}$ - to $1\frac{1}{2}$ -in. veinlet in Swakane gneiss. **Value:** Noncommercial. **Ref:** 135.
- Name:** Royal Development. **Loc:** Halfway in Trinity tunnel of Royal Development Co. in secs. 21 and 22, (30-16E). **Descr:** Small amount of kyanite. **Value:** Noncommercial. **Ref:** 107; 135.
- Name:** Twentyfive Mile Creek. **Loc:** Near W. $\frac{1}{4}$ cor. sec. 1, (28-20E), elevation 3,300 ft. **Descr:** Kyanite crystals as much as 2 in. long irregularly distributed in mica schist in an area of undetermined size but at least several hundred feet square. **Value:** Warrants investigation. **Ref:** 135.
- Name:** Mad River. **Loc:** In Mad River canyon on E. side of Maverick Peak, in NW $\frac{1}{4}$ sec. 16, (27-18E). **Descr:** "Massive crystalline kyanite" reported. **Value:** Unknown. **Ref:** 135.

KITITAS COUNTY

- Name:** Mount Stuart. **Loc:** 5 mi. NW. of Mount Stuart, approximately in sec. 7, (23-15E). **Descr:** Scattered brownish-yellow phenocrysts of andalusite in contact phases of Peshastin slate near granodiorite. **Value:** Grade below that of ore now used. **Ref:** 123, p. 4, col. 2.

STEVENS COUNTY

- Name:** Onion Creek. **Loc:** On Galena farm road near head of Onion Creek in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (37-40E). **Descr:** Andalusite occurs with biotite in phyllite or schist. **Value:** Warrants investigation. **Ref:** 135.

8A. **Name:** Meadow Creek. **Loc:** SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (38-41E), near Meadow Creek. **Descr:** Andalusite crystals as much as 2 in. long comprise as much as 50 percent of the schist in an area 75 ft. wide and 300 ft. long, near a granite contact. **Value:** Warrants investigation. **Ref:** 135.

8B. **Name:** Mill Creek. **Loc:** Near center sec. 35, (37-40E), on a branch of Mill Creek. **Descr:** Andalusite crystals $\frac{1}{8}$ in. to $\frac{1}{4}$ in. long in schist at border of small granite stock. **Value:** Warrants investigation. **Ref:** 135.

8C. **Name:** Longshot. **Loc:** Secs. 7, 8, and 18, (36-41E), on ridge extending NE. from Longshot mine. **Descr:** Andalusite crystals $\frac{1}{4}$ in. to 1 in. long make up as much as 50 percent of the schist in a band as much as several hundred ft. wide and $1\frac{1}{2}$ mi. long. **Value:** Warrants investigation. **Ref:** 135.

8D. **Name:** Old Dominion. **Loc:** Sec. 4, (35-40E), on ridge above Old Dominion mine. **Descr:** Andalusite in schist near granite contact. **Value:** Warrants investigation. **Ref:** 135.

PEND OREILLE COUNTY

9. **Name:** Lost Lake. **Loc:** NE. cor. sec. 15, (38-44E) and area W. of Lost Lake. **Descr:** Andalusite and sillimanite occur in hornfels and schist near borders of the Kaniksu granite. **Value:** Accessory

minerals; present in less than commercial quantity. **Ref:** 102, p. 57.

9A. **Name:** Huckleberry Mountain. **Loc:** SE $\frac{1}{4}$ sec. 30, (38-42E), near top of Huckleberry Mountain. **Descr:** Andalusite crystals as much as $\frac{1}{2}$ in. long in schist. **Value:** Warrants investigation. **Ref:** 135.

9B. **Name:** Aladdin Mountain. **Loc:** On N. end of Aladdin Mountain extending from SE. cor. sec. 3, (37-41E) to SE $\frac{1}{4}$ sec. 33, (38-41E). **Descr:** Small andalusite crystals in schist. **Value:** Warrants investigation. **Ref:** 135.

SPOKANE COUNTY

10. **Name:** Silver Hill. **Loc:** On Silver Hill in secs. 23 and 24, (24-43E); elevation 2,500 to 2,800 ft. **Descr:** Large andalusite crystals and sillimanite in graphitic mica schist and in dikes and veins of pegmatite, aplite, and quartz. **Value:** Quantity and quality below present commercial grade. **Ref:** 25, p. 295; 97, p. 181.

SKAMANIA COUNTY

11. **Name:** Washougal River. **Loc:** At head of N. Fork Washougal River. **Descr:** Rock composed of 35 percent andalusite, 32 percent quartz, 27 percent muscovite, 2 percent dumortierite, 4 percent accessory minerals. **Value:** Unknown. **Ref:** 112, p. 102-106.

ASBESTIFORM MATERIALS

Asbestos minerals of commerce are fibrous members of the serpentine and amphibole groups. Chrysotile ($H_4Mg_3Si_2O_9$), a member of the serpentine group, is the important asbestos mineral of commerce. Fibrous varieties of tremolite ($CaMg_3Si_4O_{12}$), actinolite [$Ca(Mg,Fe)_3(SiO_3)_4$], crocidolite ($NaFeSi_2O_6 \cdot FeSiO_3$), anthophyllite [$(Mg,Fe)SiO_3$], and amosite, an iron-rich anthophyllite, are members of the amphibole group used commercially. Paligorskite or "mountain leather," an unusual variety of sepiolite (actinolite?) which occurs in thin flexible sheets made of interlaced fibers, has not been used commercially but recently has received consideration as a possible asbestos substitute (reference 160).

The use of asbestos depends upon the length, fineness, flexibility, tensile strength, and spinnability of fiber, and on its resistance to heat and acid. Chrysotile ranks high in all characteristics except acid resistance. Tremolite is resistant to acids but lacks strength and flexibility of fiber. Fibers of crocidolite have high tensile strength but low heat resistance. Anthophyllite occurs in long coarse and usually brittle fibers of low

tensile strength but high heat and acid resistance. Fibers of amosite are flexible but usually have less tensile strength than chrysotile. Acids have little effect on amosite and it is more heat resistant than crocidolite. Asbestos is used in brake linings, clutch facings, fire-resistant textiles, high temperature insulation, paper, millboard, pipe covering, cement, yarn, packing, roofing, gaskets, acid filters, and is ground for asbestos flour.

Commercial deposits of chrysotile asbestos are not known in Washington, but favorable rock types occur in several areas. Several amphibole asbestos deposits are of a size and purity to warrant investigation.

Prices of chrysotile asbestos in June 1956 ranged from \$28.00 per ton for refuse or shorts to \$1,725 per ton for no. 1 crude f. o. b. mines Quebec, Canada. Prices of amphibole asbestos in 1946 ranged from \$18.50 to \$35.00 per ton for shorts and \$75.00 to \$83.00 per ton for shingle stock fiber f. o. b. mines Vermont.

If known, the variety of asbestos is specified in the following descriptions of occurrences.

OCCURRENCES

WHATCOM COUNTY

1. **Name:** Skyline Ridge. **Loc:** Asbestos is reported on Skyline Ridge between Mount Shuksan and Twin Lakes. Details unknown. **Ref:** 135.

On page 9 in volume 2 is plate 2, the map showing the occurrences of asbestiform materials, numbered to correspond with the numbers of the occurrences listed below.

2. **Name:** Twin Sisters. **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, (37-6E). **Descr:** Veinlets of cross-fiber serpentine asbestos less than $\frac{1}{4}$ in. thick. **Value:** Commercial quantity not obvious. **Ref:** 135.

SKAGIT COUNTY

3. **Name:** Oyster Creek. **Loc:** Irregular zone extends from near mouth of Oyster Creek to vicinity of Samish Lake. **Descr:** Schists lying just S. of boundary of Chuckanut formation are reported to contain amphibole asbestos. **Value:** Not known. **Ref:** 48, p. 15; 143.
4. **Name:** Burlington. **Loc:** Hill just N. of Burlington in N $\frac{1}{2}$ sec. 32, (35-4E). **Descr:** Somewhat fibrous soapstone-actinolite mixture developed in shear zones cutting greenstone. **Value:** Asbestos-Talc Products Co. mined this material. It was ground, mixed with imported asbestos, and used in special cements. **Ref:** 10, p. 267; 11, p. 207; 149, p. 7.
5. **Name:** Scott. **Loc:** W $\frac{1}{2}$ E $\frac{1}{2}$ sec. 27, (36-5E). **Descr:** Amphibole asbestos having fine white silky fibers up to 3 in. long, which are particularly flexible and strong for this kind of asbestos. **Value:** Possibly commercial; occurrence small. **Ref:** 48, p. 15.
6. **Name:** Lyman. **Loc:** Near Hamilton, across Skagit River from Lyman. **Descr:** Said to be long fibered and of good quality. **Value:** A small amount has been shipped. **Ref:** 37, p. 362; 39, p. 135; 40, p. 383; 48, p. 15; 119, p. 117.

SNOHOMISH COUNTY

7. **Name:** Clear Creek. **Loc:** Near headwaters of Clear Creek in sec. 3, (30-9E). **Descr:** Serpentine dike, 30 to 150 ft. wide, exposed to depth of 75 ft., contains talcose asbestos. **Value:** Further investigations warranted. **Ref:** 12, p. 52; 65, p. 18, 21.
8. **Name:** Bedal Creek. **Loc:** On Bedal Creek in sec. 35, (30-11E). **Descr:** Slip-fiber asbestos of low grade reportedly occurs as stringers and lenses, 1 in. or less in thickness, cutting quartz diorite, gneiss, and schist. **Value:** Not known. **Ref:** 96, p. 11.
9. **Name:** Florence Rae prospect. **Loc:** On Florence Rae property in sec. 27, (29-10E). **Descr:** Veins of cross-fiber asbestos, $\frac{1}{4}$ in. or less thick, cutting through a body of peridotite. **Value:** Observed quantity below commercial grade. **Ref:** 135.
10. **Name:** Mackinaw prospect. **Loc:** At Mackinaw prospect in sec. 19, (29-11E). **Descr:** Small amount of slip-fiber asbestos in serpentine of nickel prospect. **Value:** Quantity small. **Ref:** 135.

CHELAN COUNTY

11. **Name:** Stehekin River. **Loc:** In bed of a tributary to the Stehekin River, 5 mi. upstream from Lake Chelan. **Descr:** Reportedly a "ledge" of blue-white, long-fiber asbestos 5 to 25 ft. wide. **Value:** Unknown. **Ref:** 135.
12. **Name:** Williams Creek. **Loc:** On Williams (Raging) Creek, 9 mi. by trail from Chiwawa River road, a showing of asbestos is reported high on the

mountain. Another report states that asbestos is exposed in two tunnels, one at an altitude of 3,400 ft. and the other at 4,200 ft. **Descr:** Said to occur along hanging walls of veins of siliceous asbestiform material. Probably amphibole asbestos. **Value:** Unknown. **Ref:** 48, p. 14; 66, p. 50.

13. **Name:** Goose Creek. **Loc:** NW $\frac{1}{4}$ sec. 18, (27-17E), at Goose Creek camp ground. **Descr:** Anthophyllite in felty masses and veins in a ledge 50 ft. square on N. bank of Goose Creek. **Value:** Unknown. **Ref:** 135.
- 13A. **Name:** Deep Creek. **Loc:** Sec. 19, (27-18E), between Deep Creek and Goose Creek. **Descr:** Chrysotile asbestos reported. **Value:** Unknown. **Ref:** 135.
- 13B. **Name:** Nason Ridge. **Loc:** In road cut in S $\frac{1}{2}$ N $\frac{1}{2}$ sec. 32, (27-17E), on SE. slope of Nason Ridge. **Descr:** Anthophyllite in boulders as large as 10 ft. by 20 ft., not in place but probably have not traveled far. **Value:** Unknown. **Ref:** 135.
- 13C. **Name:** Trout Creek. **Loc:** Near center sec. 6, (24-16E), at intersection of Trout Creek and Jack Creek trails. **Descr:** Chrysotile reported. **Value:** Unknown. **Ref:** 135.
- 13D. **Name:** Trout Lake. **Loc:** Sec. 19, (24-16E), near Trout Lake. **Descr:** Anthophyllite in serpentine. Chrysotile reported nearby. **Value:** Unknown. **Ref:** 135.
- 13E. **Name:** Mill Creek. **Loc:** SE $\frac{1}{4}$ sec. 30, (24-18E). **Descr:** Anthophyllite in serpentine. **Value:** Unknown. **Ref:** 135.
14. **Name:** Chumstick Mountain. **Loc:** On Chumstick Mountain in sec. 27, (15-19E). **Descr:** Anthophyllite occurs as a vein less than 1 ft. wide in biotite gneiss. **Value:** Exposed by shallow pit. Insufficient quantity for commercial development. **Ref:** 66, p. 49; 96, p. 11.
15. **Name:** Swakane Canyon (may be same as Chumstick Mountain occurrence). **Loc:** In Swakane Canyon on property of Rafter and Bousquet Logging Co. **Descr:** Short-fiber anthophyllite. **Value:** Quantity and quality not known. **Ref:** 66, p. 50.
16. **Name:** Burch Mountain. **Loc:** Reported on W. slope Burch Mountain. **Descr:** Said to be in three "ledges" from 1 to 11 in. wide and of good fiber. **Value:** Unknown. **Ref:** 66, p. 50.
17. **Name:** Icicle Creek. **Loc:** Said to occur on Icicle Creek near Leavenworth. **Descr:** Unknown. **Value:** No production reported, but some development work done. **Ref:** 48, p. 14; 66, p. 50.
18. **Name:** Ingalls Creek. **Loc:** Reported on high ridge N. of Ingalls Creek a few miles from its mouth. **Descr:** Said to be of long fiber. **Value:** Unknown. **Ref:** 66, p. 50.

19. **Name:** Peshastin Creek. **Loc:** Sec. 14, (22-17E). **Descr:** Networks of tiny veinlets of cross-fiber asbestos in serpentine. **Value:** Low grade and short fibered. **Ref:** 135.

OKANOGAN COUNTY

20. **Name:** Alta Lake. **Loc:** 6 mi. SW. of Pateros and 1 mi. from Alta Lake. **Descr:** Large lenses of short-fiber amphibole asbestos. **Value:** Was formerly mined and shipped to Asbestomine Co. in Wenatchee, where it was used in the manufacture of cold-water paint. **Ref:** 48, p. 14; 103, p. 107, 108; 119, p. 117.
21. **Name:** Twisp. **Loc:** Old report mentions asbestos 14 mi. SW. of Twisp. **Descr:** Said to be large deposit of silky white long-fiber asbestos 400 ft. wide and traceable for 2,500 ft. **Value:** Unknown. **Ref:** 48, p. 15; 93, p. 447.
22. **Name:** Ivanhoe prospect. **Loc:** Reported at Ivanhoe prospect in SW $\frac{1}{4}$ sec. 16, (39-26E). **Descr:** Said to be "20 ft. down on 60-ft. ledge." **Value:** Unknown. **Ref:** 135.

FERRY COUNTY

23. **Name:** Hardscrabble Mountain. **Loc:** Reported on Hardscrabble Mountain in NW $\frac{1}{4}$ T. 38 N., R. 32 E. **Descr:** Said to be a 4-ft. vein of radiating tremolite. **Value:** Unknown. **Ref:** 48, p. 14.
24. **Name:** California prospect. **Loc:** Reported at California prospect in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 20, (36-34E). **Descr:** Serpentine asbestos. **Value:** Unknown. **Ref:** 135.

STEVENS COUNTY

25. **Name:** Laurier. **Loc:** E. of Laurier in secs. 1 and 12, (40-36E) and secs. 6 and 7, (40-37E). **Descr:** Thin masses of white asbestos along fractures in serpentine. **Value:** Low grade and of short fiber. **Ref:** 139, p. 90.
26. **Name:** Stranger Creek. **Loc:** NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (34-38E). **Descr:** Fibrous radiating tremolite interbedded with dolomite throughout a thickness of 1,000 ft. **Value:** Warrants investigation. **Ref:** 135.
27. **Name:** Chewelah. **Loc:** 8 mi. E. of Chewelah. **Descr:** Said to be a 5-ft. vein. **Value:** Unknown. **Ref:** 92, p. 111; 119, p. 117.
28. **Name:** Boundary Butte. **Loc:** Prospect hole in SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, (29-37E). **Descr:** Fibrous radiating tremolite occurs in a bed of altered dolomite 4 ft. thick. **Value:** Warrants investigation. **Ref:** 135.

PEND OREILLE COUNTY

29. **Name:** Metaline area. **Loc:** Mines in Metaline district. **Descr:** Paligorskite occurs as sheets along joints associated with the lead and zinc ores. **Value:** Quantity small. **Ref:** 102, p. 38-39, 59.
30. **Name:** Coffin prospect. **Loc:** Sec. 16, (38-42E). **Descr:** Small veinlets of serpentine asbestos less than $\frac{1}{4}$ in. thick cut across diopside and serpentine. **Value:** Fibers too short to be of value. **Ref:** 102, p. 59.

BARITE

Barite is barium sulfate, having the composition BaSO₄. In crushed and ground form it is used most extensively as an additive to the mud used in well drilling; it is also used as a paint pigment and filler, in glass, and as a filler in rubber. Barite is treated to form barium chloride (BaCl₂ • 2H₂O), which is used in heat-treating steel, as coatings for photographic paper, for green signal flares, in beet sugar purification, in the manufacture of hydrogen peroxide, in case-hardening steel, and as a source of other barium chemicals.

One deposit in Stevens County is currently (1956) producing a small amount of barite, and there are several other deposits in the county which appear to con-

tain barite in sufficient quantity and purity to support commercial operations. The Washington deposits of barite that have been in production at any time during the period from 1948 to 1956 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

Prices of barite, f. o. b. mines, in June 1956 were \$18.00 to \$21.00 per net ton, in bulk, for Georgia crude. Missouri barite sold at \$11.50 per ton for 4.3 specific gravity, oil well grade, and at \$16.00 for crude ore containing at least 94 percent BaSO₄ and less than 1 percent iron.

OCCURRENCES

On page 11 in volume 2 is plate 3, the map showing the occurrences of barite, numbered to correspond with the numbers of the occurrences listed below.

MASON COUNTY

1. **Name:** Maple Creek prospect. **Loc:** Sec. 9, (24-4W), at Maple Creek prospect on Hamma Hamma River. **Descr:** Constitutes a large part of one lens of manganese silicate ore at this property and

occurs in small quantities at other manganese deposits throughout the Olympic Peninsula. **Value:** Warrants investigation. **Ref:** 101, p. 442.

OKANOGAN COUNTY

2. **Name:** Copper Glance prospect. **Loc:** At Copper Glance prospect in N $\frac{1}{2}$ sec. 35, (38-20E). **Descr:** Gangue in copper-gold ore in shear zone in altered volcanics. **Value:** Might be recovered as a by-product. **Ref:** 135.

3. **Name:** Lead Horse claim. **Loc:** At Lead Horse claim on Billy Goat Mountain approximately in sec. 10, (38-20E). **Descr:** Gangue mineral in small copper-lead veins. **Value:** Below commercial grade. **Ref:** 135.
4. **Name:** Peacock claim. **Loc:** At Peacock claim on SW. side Billy Goat Mountain approximately in sec. 10, (38-20E). **Descr:** Gangue mineral in copper vein. **Value:** Unknown. **Ref:** 135.

FERRY COUNTY

5. **Name:** Congress mine. **Loc:** At Congress mine in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (32-33E). **Descr:** Occurs with magnetite and epidote at contact of gabbro and metasediments. **Value:** Unknown. **Ref:** 2, p. 182-185.

STEVENS COUNTY

6. **Name:** Van Stone. **Loc:** Reported 8 mi. SW. of Northport on claim of George Van Stone. **Descr:** Said to be of good quality and in a wide vein. **Value:** Unknown. **Ref:** 135.
- 6A. **Name:** Martin. **Loc:** W. of Columbia River, 5 mi. from Northport. **Descr:** Barite reported exposed 20 to 30 ft. wide and 1,400 ft. long. **Value:** Analysis shows 72 percent BaSO₄. **Ref:** 135.
7. **Name:** Iron Cap prospect. **Loc:** At Iron Cap (Riverview) prospect in NW $\frac{1}{4}$ sec. 9, (38-39E), at elevation of 3,600 ft., near top of O'Toole Mountain. **Descr:** 200-ft. adit and several open cuts expose a barite vein 1,000 ft. in length in silicified calcareous argillite overlain by basalt. **Value:** One assay shows 49.9 percent BaSO₄ and 31.5 percent SiO₂. Many thousand tons probably available. **Ref:** 28, p. 85; 96, p. 11.
8. **Name:** Oman. **Loc:** On Oman place in S $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 5, (37-39E). **Descr:** Occurs as small lenses in a shear zone in argillite 10 to 100 ft. wide. Exposed for 300 to 400 ft. **Value:** A commercial product might be obtained by proper milling. **Ref:** 28, p. 84.
- 8A. **Name:** Bruce Creek. **Loc:** SW $\frac{1}{4}$ sec. 32, (38-39E). **Descr:** Vertical vein of barite 8 ft. wide appears to be 90 percent pure. **Value:** Warrants investigation. **Ref:** 135.
- 8B. **Name:** Uribe. **Loc:** N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 5, (37-39E). **Descr:** Barite band exposed in road cut runs 84 percent barite across an 8-ft. width and 75 percent barite across a 4-ft. width. This is an extension of the Oman deposit. **Value:** Warrants investigation. **Ref:** 135.
- 8C. **Name:** Williams Lake. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (38-38E). **Descr:** Good barite deposit reported. **Value:** Unknown. **Ref:** 135.
- *8D. **Name:** Madsen. **Loc:** W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 26 and E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 27, (34-38E), 9 mi. NW. of Addy by road. **Descr:** An open cut shows barite to a depth of 7 ft. under 2 to 3 ft. of overburden. **Value:** Currently quarried by Manufacturers Mineral Co., Seattle. **Ref:** 2-A, p. 27.
- *9. **Name:** Eagle Mountain. **Loc:** NW $\frac{1}{4}$ sec. 33, (33-41E). **Descr:** Open cuts expose an 8-ft. vein traceable for 1,200 ft. **Value:** Currently quarried by Chewelah Minerals Corp., Chewelah. **Ref:** 28, p. 41.
10. **Name:** Blue Star mine. **Loc:** In N. center sec. 5, (32-41E). **Descr:** Forms important part of gangue. **Value:** Might be recovered as a byproduct. **Ref:** 2, p. 97.
11. **Name:** Inklers Point (Valley). **Loc:** Near center of S. line SE $\frac{1}{4}$ sec. 11, (31-40E). **Descr:** 24-in. vein of rather pure, white barite stained along fractures by limonite. **Value:** Commercial. **Ref:** 135.
- 11A. **Name:** Bettfreund. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, (31-40E), about 1 mi. NE. of Valley. **Descr:** Two exposures of barite about 250 ft. apart, one of which is a 6-ft. bed that crops out for 60 ft. along its strike. **Value:** Warrants investigation. **Ref:** 135.
12. **Name:** Loon Lake Copper mine. **Loc:** About $\frac{1}{2}$ mi. W. of old Loon Lake Copper mine near road in sec. 33, (31-41E). **Descr:** 50-ft. vein exposed on low knoll for 500 ft. contains at least two 2-ft. lenses of impure barite. **Value:** Unknown. **Ref:** 135.
13. **Name:** Slate quarry. **Loc:** Sec. 19, (31-39E) on N. side of road between Valley and old slate quarry. **Descr:** 3-in. vein of barite. **Value:** Quantity exposed is below commercial grade. **Ref:** 48, p. 16.
14. **Name:** Red Marble. **Loc:** Secs. 29 and 30, (31-39E) and sec. 36, (31-38E). **Descr:** 1 $\frac{1}{2}$ - to 8-ft. vein having phyllite hanging wall and quartzite footwall. **Value:** 100 tons shipped from sec. 29 in 1942. **Ref:** 135.
- 14A. **Name:** Allen. **Loc:** Sec. 22, (31-37E). **Descr:** Ralph Allen, Springdale, reports that he has a barite deposit at this location. **Value:** Unknown. **Ref:** 135.
- 14B. **Name:** Wells Fargo. **Loc:** NW $\frac{1}{4}$ sec. 36, (31-36E), at 4,000-ft. elevation. **Descr:** Barite vein in upper adit of Wells Fargo mine. **Value:** One assay shows 60.6 percent BaO, 3.4 percent SiO₂, 0.05 percent Al₂O₃, and 0.16 percent Fe₂O₃. **Ref:** 135; 139, p. 212-213.
15. **Name:** Chamokane. **Loc:** At old Chamokane property in secs. 9 and 10, (30-38E). **Descr:** Open cuts expose a 4-ft. vein of barite. **Value:** Warrants investigation. **Ref:** 28, p. 73.
16. **Name:** Copper Butte mine. **Loc:** SW $\frac{1}{4}$ sec. 11, (30-38E) in crosscut in old Copper Butte mine. **Descr:** A vein of barite, averaging 4 ft. in width, is exposed on surface for 200 ft. and in crosscut 200 ft. below surface. **Value:** Mined and shipped to Sunshine Mining Co. at Kellogg, Idaho, in 1942. **Ref:** 28, p. 63.

17. **Name:** Shallenberger deposit. **Loc:** At Shallenberger mine in NW¼ sec. 14, (30-38E). **Descr:** 3- to 12-in. vein exposed by surface trenches and underground for distance of 300 ft. Vein carries a little copper and iron. **Value:** Barite shipped in 1938. **Ref:** 48, p. 16; 103, p. 94; 119, p. 119; 139, p. 125, 212.
18. **Name:** Kauffman claim. **Loc:** On Dan Kauffman claims in NW¼ sec. 15, (30-38E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 48, p. 16.
19. **Name:** C. F. Allen. **Loc:** On C. F. Allen place in NW¼ sec. 21, (30-38E). **Descr:** Two veins, one 6 ft. and the other 2 ft. wide, separated by 2 ft. of argillite. **Value:** Further investigation warranted. **Ref:** 135.
20. **Name:** High Grade mine. **Loc:** At High Grade mine in sec. 6, (29-38E). **Descr:** Gangue mineral

in copper veins from a few inches to 6 ft. wide. **Value:** Might form commercial byproduct. **Ref:** 103, p. 94-95; 104, p. 146-149.

PEND OREILLE COUNTY

21. **Name:** Lead Hill prospect. **Loc:** At Lead Hill prospect in sec. 14, (40-44E). **Descr:** Gangue mineral. **Value:** Probably not commercial. **Ref:** 102, p. 63.
22. **Name:** Hardrock Thomas. **Loc:** At Hardrock Thomas prospect in sec. 2, (33-44E). **Descr:** Gangue mineral. **Value:** Probably noncommercial. **Ref:** 27, p. 69.
- *23. **Name:** Bobcat. **Loc:** At Bobcat mine, on S. Fk. Skookum Cr. **Descr:** Two carloads of barite reported shipped by Big Bend Uranium Corp. in 1957. **Value:** Unknown. **Ref:** 135.

BASALT AND ALLIED VOLCANIC ROCKS

With few exceptions the rocks included under this heading are fine-grained extrusive igneous rocks, principally basalt but also less basic types such as andesite and the acid type, rhyolite. One or two occurrences are of volcanic tuff. As the exact rock name is unimportant to many operators from whom locations are obtained, it may be found that some listed occurrences include intrusive (abyssal and hypabyssal) or even sedimentary rocks.

Areas in which basalt and allied volcanic rocks occur are shown on the accompanying map (plate 4, on page 13 in volume 2). Also shown are quarries having a record of production. Within a county, quarries have been arranged by township, range, and section, beginning with the most southerly tier of townships and progressing northward. Within a tier, quarries are arranged according to range number, beginning with the lowest and progressing toward the highest. In counties divided by the Willamette meridian, the same tier principle is used but, within a tier, quarries lying west of the meridian have been listed above those to

the east. When several quarries occur in a township they have been arranged according to section number, progressively from lowest to highest.

Basalt and, to a lesser extent, its acidic equivalents are used primarily for road building (for surfacing, in macadam, as ballast, and as asphalt aggregate). They are also used for riprap and breakwaters and have been used in the construction of buildings.

Though of low unit value (\$0.97 per ton in 1952), these rocks accounted for approximately 7 percent of the mineral production in Washington during 1952. The average value of basalt quarried in the United States in 1953 was \$1.54 per ton. Washington rated second among the states in value of basalt produced in 1953. Washington occurrences of basalt and allied volcanic rocks that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

OCCURRENCES

On page 13 in volume 2 is plate 4, the map showing the occurrences of basalt and allied volcanic rocks. These are numbered to correspond with the numbers of the occurrences listed below.

Map no.	Operator or owner	Quarry name	Property location
ADAMS COUNTY			
*1.	Adams County		NE¼ sec. 10, (15-31E)
2.		Cunningham	NE¼ sec. 3, (15-32E)
3.	Thomas E. Goodenough	Hatton	At Hatton
*4.	Adams County		SW¼ sec. 21, (15-33E)
*5.	Do		SE¼ sec. 14, (15-35E)
6.	Dept. of Highways		SW¼NW¼ sec. 13, (16-33E)

Map no.	Operator or owner	Quarry name	Property location
ADAMS COUNTY—Continued			
7.	M. F. Elmore	Elmore	NE¼ sec. 14, (16-33E)
*8.	Adams County		NW¼ sec. 20, (17-32E)
*9.	Do	Lind	NE¼ sec. 13, (17-33E)
10.	Dept. of Highways	do	S½NE¼ sec. 13, (17-33E)
11.	Do		NE¼ sec. 8, (17-34E)
12.			SW¼ sec. 17, (17-34E)
13.	Morgan Hill	Hill	NW¼ sec. 17, (17-34E)
*14.			SE¼ sec. 24, (18-34E)
15.	Dept. of Highways		Near center sec. 4, (18-35E)
16.	Do		NW¼SW¼ and SW¼ NW¼ sec. 16, and NE¼SE¼ and SE¼ NE¼ sec. 17, (18-35E)

Map no.	Operator or owner	Quarry name	Property location
ADAMS COUNTY—Continued			
*17.	Adams County		NE¼ sec. 14, (19-34E)
18.	Do	Ritzville	At Ritzville
*19.	Do		SE¼ sec. 5, (19-36E)
20.	Dept. of Highways	Daughters	SW¼SE¼ sec. 5, (19-36E)
*21.	Adams County		SE¼ sec. 29, (20-36E)
22.	Dept. of Highways	Oestreich	E½SE¼ sec. 29, (20-36E)

ASOTIN COUNTY			
*1.			SW¼SE¼ sec. 10, (6-44E)
*2.			NW¼NE¼ sec. 15, (6-44E)
3.	Dept. of Highways	Farrish	SE¼NW¼ sec. 19, (7-45E)
*4.	Asotin County		NW¼ sec. 3, (7-46E)
*5.	Do		NW¼ sec. 12, (8-44E)
6.	Dept. of Highways	Benedict	S½SW¼ sec. 5, (8-46E)
*7.			SE¼SW¼ sec. 32, (9-46E)
8.	N. Hostettler	Hostettler	E½SW¼NW¼NE¼ sec. 28, (10-46E)

BENTON COUNTY			
1.	Dept. of Highways	Reils	N½SE¼ and SE¼NE¼ sec. 6, (4-24E)
*2.	Benton County		NW¼NE¼ sec. 8, (6-24E)
*2A.			NE¼SW¼ sec. 13, (6-28E)
*3.	Benton County		SW¼ sec. 5, (7-28E)
*4.	Do		SE¼ sec. 5, (8-24E)
*4A.		Marin	SW¼ sec. 12, (8-24E)
*5.	Benton County		NW¼ sec. 16, (8-26E)
*6.	Do		SE¼ sec. 32, (8-27E)
*6A.		Luth	SW¼ sec. 28, (8-29E)
*7.	Benton County		Sec. 20, (9-25E)
8.	Dept. of Public Lands		SW¼SE¼ sec. 24, (9-25E)
*9.	Benton County		NE¼ sec. 26, (9-25E)
10.	Dept. of Highways		E½SW¼NW¼ sec. 13, (9-27E)
*11.	Benton County		Sec. 17, (9-27E)
*12.	Do		Sec. 34, (10-24E)
13.	Dept. of Highways	Rothrock	W½SE¼ sec. 7, (12-24E)
14.	Dept. of Public Lands		S½SE¼ sec. 26, (13-25E)

CHELAN COUNTY			
1.	Dept. of Highways		SE¼SW¼ sec. 35, (22-17E)
2.	J. A. Sampson	Sampson	At Wenatchee
3.	F. G. Redmon	Redmon	At Leavenworth
*4.			SW¼SW¼ sec. 17, (27-22E)

CLALLAM COUNTY			
1.	Dept. of Highways		SW¼NW¼ sec. 28, (30-7W)
2.	Do	Shotwell	SE¼NE¼ sec. 29, (30-7W)

Map no.	Operator or owner	Quarry name	Property location
CLALLAM COUNTY—Continued			
3.	U. S. Forest Service		Lot 4, sec. 33, (30-9W)
4.	Do		Lot 3 and NW¼SE¼ sec. 28, (30-11W)
5.	Dept. of Highways	Slater	SE¼NW¼ sec. 35, (31-7W)
6.	U. S. Army Engineers		Cape Flattery

CLARK COUNTY			
1.	Columbia Contract Co.		At Fisher
*1A.	Smithrock Quarry, Inc.		Sec. 7, (1-3E)
*2.	Clark County		Secs. 6 and 7, (1-3E)
*3.	Do		Sec. 30, (2-3E)
*4.	Do		Sec. 9, (3-3E)
*5.	Do		Sec. 20, (4-2E)
*6.	Do		Sec. 12, (5-1E)
*7.	Do		Sec. 19, (5-3E)
8.	Do	Yacolt	At Yacolt

COLUMBIA COUNTY			
*1.	Sid Mays		NE¼SW¼ sec. 5, (9-38E)
*2.	Columbia County		SE¼ sec. 2, (9-40E)
*3.		Barnes	SW¼NE¼ sec. 14, (10-37E)
*4.	Columbia County		Sec. 10, (10-38E)
*5.	Do		Sec. 19, (10-39E)
*6.	City of Dayton		Sec. 30, (10-39E)
7.	Dept. of Highways	Hester	NE¼NW¼ sec. 28, (11-39E)
8.	Do	Barkley	SE¼NW¼ sec. 26, (11-40E)
*9.			NE¼NE¼ sec. 19, (12-38E)
*10.	Arden Archer		NW¼ sec. 11, (12-39E)
11.	Berton Delaney	Delaney	NE¼NE¼ sec. 30, (12-39E)

COWLITZ COUNTY			
1.			SE¼ sec. 5, (5-1E)
2.		Kalama	W½ sec. 8, (6-1W)
*3.	Cowlitz County		SE¼ sec. 22, (6-1W)
*4.	Do		NE¼ sec. 27, (6-1E)
*4A.			NW¼SE¼ sec. 21, (6-3E)
5.	Dept. of Highways		Lot 2, sec. 30, (6-4E)
*6.	Cowlitz County		SE¼ sec. 35, (7-1W)
*6A.			NE¼ sec. 34, (8-1W)
*7.	Cowlitz County		Lot 2, sec. 8, (8-3W)
*8.	Star Sand & Gravel Co.	Mount Coffin	Near SW. cor. sec. 31, (8-2W)
*9.	Dept. of Highways		Sec. 25, (9-2W)
*10.		Kiewit	NW¼SW¼ sec. 25, (9-2W)

DOUGLAS COUNTY			
*1.		Batterman	SE¼SE¼ sec. 20, (23-21E)
*2.	Douglas County		SW¼NE¼ sec. 4, (24-22E)

Map no.	Operator or owner	Quarry name	Property location
DOUGLAS COUNTY—Continued			
*3.	Douglas County		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (24-24E)
*4.	Do		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (24-26E)
5.	Dept. of Highways	Hollings-head	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, (25-21E)
6.	Do	Case	W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 36, (25-22E)
*7.		Sutor	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (26-22E)
*8.			NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, (26-23E)
9.	Dept. of Highways	Wagoner	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (29-29E)
FERRY COUNTY			
1.	Dept. of Highways	Republic	At Republic
*2.	Ferry County		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (37-32E)
FRANKLIN COUNTY			
1.	Franklin County	Mesa	At Mesa
2.	N. P. Ry.		NE $\frac{1}{4}$ sec. 16, (13-31E)
3.	Max J. Kuney	Kuney	NE $\frac{1}{4}$ sec. 16, (13-31E)
*4.	Connell Sand & Gravel		SE $\frac{1}{4}$ sec. 6, (13-33E)
*5.			NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, (14-30E)
*6.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (14-30E)
*7.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (14-30E)
*8.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ and NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (14-30E)
*9.	Dept. of Highways	Anderson	N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 30, (14-32E)
GARFIELD COUNTY			
*1.	Garfield County		Sec. 9, (10-42E)
2.	Dept. of Highways	Knettle	NE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ and NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (11-41E)
3.	Do	Cyrus	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (11-42E)
*4.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (11-42E)
*4A.		Keatts	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, (11-43E)
5.	Dept. of Highways	Alpowa Hill	E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 16, (11-43E)
6.	Do	Oliphant	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (12-40E)
7.	Do		S $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 15, (12-40E)
8.	Do	Bartlow	N $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 16, (12-40E)
*8A.		Keatts	SW $\frac{1}{4}$ sec. 10, (12-42E)
*9.	Garfield County	Pomeroy	Sec. 32, (12-42E)
10.	Do		Sec. 24, (13-41E)
11.			SE $\frac{1}{4}$ sec. 9, (13-43E)

Map no.	Operator or owner	Quarry name	Property location
GRANT COUNTY			
*1.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, (16-24E)
*2.			NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (17-23E)
*3.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 20, and NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, (17-27E)
*4.			N $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 12, (17-28E)
*5.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (17-28E)
*6.		Imbert	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (17-30E)
*6A.	J. E. Houplin	Cathedral	Sec. 29, (18-23E)
*7.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (18-30E)
*8.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, (19-29E)
*9.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 33, (19-30E)
*10.			NW $\frac{1}{4}$ sec. 12, (20-24E)
*11.			SE $\frac{1}{4}$ sec. 33, (20-29E)
*12.		Bepple	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, (21-23E)
13.	Grant County	Ephrata	At Ephrata
*14.			SE $\frac{1}{4}$ sec. 31, (21-26E)
15.	Dept. of Highways	Wilson Creek	At Wilson Creek
*16.		Nelson	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (25-30E)
17.	Dept. of Public Lands		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (28-30E)

GRAYS HARBOR COUNTY			
*1.	Grays Harbor County		NE $\frac{1}{4}$ sec. 25, (16-5W)
*2.	Dept. of Highways	Arctic	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (16-8W)
3.	Rainier Logging Co.?		600 ft. SE. of Arctic quarry
4.	Logging Co.	Newskah	Center W $\frac{1}{2}$ sec. 2, (16-9W)
*5.	Quigg Bros. Constr. Co.	Newskah	N $\frac{1}{2}$ sec. 9, (16-9W)
6.	Do		Center N. line sec. 14, (16-9W)
*7.	Dept. of Highways	Hoquiam	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, (17-10W)

JEFFERSON COUNTY			
*1.	General Constr. Co.	Mats Mats	Lots 5, 6, 7, and 8, sec. 33, (29-1E)

KING COUNTY			
1.	Dept. of Highways		Lot 1, sec. 8 and lot 2, sec. 9, (19-9E)
2.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ and NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (20-7E)
3.	Dept. of Highways		Lots 1 and 2, sec. 34, (20-8E)
*4.	Puget Sound Bridge & Dredging Co.	Riverton	Govt. lot 7, sec. 9, (23-4E)

Map no.	Operator or owner	Quarry name	Property location
KING COUNTY—Continued			
*5.	Black River Quarry, Inc.	Black River	Sec. 14, (23-4E)
6.	Dept. of Highways		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, (24-6E)
*7.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 33, (23-11E)

KITSAP COUNTY			
1.	Kitsap and Mason Counties		SW $\frac{1}{4}$ sec. 3, (24-1W)
2.	Dept. of Highways		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, (24-1E)
*3.	Independent Asphalt Paving Co.	Charleston	At Charleston
4.	Peter Wilson	Wilson	Blk. 2, Wheelers Add., Port Orchard
5.	Dept. of Highways	Olsen	Blk. 64, Port Orchard
6.		Waterman	NE. of Waterman

KITTITAS COUNTY			
1.	Dept. of Public Lands		Lot 1, sec. 6, (16-18E)
2.	Kittitas County		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (17-20E)
3.	Dept. of Highways	Regan	NW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 5, (17-20E)
4.	Dept. of Public Lands		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, (17-22E)
5.	Andrew Dubinsky	Dubinsky	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, (19-16E)
6.	B. O. Cooper	Cooper	Sec. 9, (19-17E)
7.	Dept. of Highways	Adams	SW $\frac{1}{4}$ NE $\frac{1}{4}$ and E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 20, (19-17E)
8.	Do		NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, (20-15E)
9.	W. T. Burcham	Burcham	Sec. 3, (20-17E)
10.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 23, (21-12E)
11.	Do		Lot 1, sec. 26, (22-11E)

Klickitat County			
1.	U. S. Indian Service		NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 19, (2-14E)
2.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (2-15E)
*3.	Klickitat County		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (3-10E)
*4.	Do		NE $\frac{1}{4}$ sec. 14, (3-10E)
5.	Dept. of Highways	Reither	Lots 3 and 4, sec. 33, (3-11E)
*6.	Klickitat County		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (3-12E)
7.	Dept. of Highways	Maryhill	W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 16, (3-16E)
8.	Klickitat County		SW $\frac{1}{4}$ sec. 22, (4-11E)
*9.	Do		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (4-15E)
10.	Dept. of Highways	Stultz	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (4-16E)
*11.	Klickitat County		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (4-16E)
*12.	Do		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (4-17E)

Map no.	Operator or owner	Quarry name	Property location
Klickitat County—Continued			
*12A.		Thompson	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (4-18E)
*13.	Klickitat County		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 24, (5-10E)
*14.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, (5-14E)
15.	Dept. of Highways	Mahone	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (5-17E)
16.	Dept. of Highways	Cuff	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, (5-17E)
*17.	Klickitat County		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, (5-23E)
18.	Dept. of Highways	Dean	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, (6-10E)
*18A.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (6-10E)
*19.	Klickitat County		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, (6-12E)
20.	U. S. Indian Service		Sec. 5, (6-18E)
*21.		Matsen	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (6-19E)
*22.	Klickitat County		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 30, (6-20E)
*23.		Cleveland	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 30, (6-20E)

LEWIS COUNTY			
*1.	James P. Dean	Dean	Sec. 15, (11-7E)
*2.	Lewis County		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (12-2W)
*3.	Do	Eveline	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (12-2W)
4.	Dept. of Highways	Sliwa	Lot 10, sec. 6, (12-5W)
5.	Austin C. Coleman	Coleman	E $\frac{1}{2}$ lot 5, sec. 16, (12-2E)
6.	W. H. Mullaney	Mullaney	Lot 1, sec. 23, (12-3E)
*6A.			S $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 12, (12-6E)
*7.	Lewis County	Bunker	SE $\frac{1}{4}$ sec. 7, (13-3W)
*8.	Carbon Bros.	Meskill	NE $\frac{1}{4}$ sec. 10, (13-4W)
*9.	Lewis County	Doty	W $\frac{1}{2}$ sec. 11, (13-5W)
10.	Dept. of Highways	Alpha	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 12, (13-1E)
11.		Weyerhaeuser	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (15-1E)
*12.			SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (15-5E)

LINCOLN COUNTY			
1.	Dept. of Highways	Bonthius	Lot 4, sec. 6, (21-32E)
2.	Do	McDade	N $\frac{1}{2}$ N $\frac{1}{2}$ sec. 10, (21-33E)
3.	Do	Miller	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, (21-39E)
4.	Do	Rothrock	S $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 19, (21-39E)
5.	Do	Brown	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 23, (22-39E)
*6.	Lincoln County		Sec. 36, (24-37E)
7.	Dept. of Highways	Rockstool	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (25-36E)
8.			Sec. 18, (25-39E)
9.	Jordan D. Wilson	Wilson	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (26-31E)
10.	Viggo E. Jurgenson	Jurgenson	SW $\frac{1}{4}$ SW $\frac{1}{4}$ and SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 12, (26-32E)

Map no.	Operator or owner	Quarry name	Property location
LINCOLN COUNTY—Continued			
11.	Dept. of Highways		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (26-32E)
12.	Do		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (26-32E)
13.	Victor A. Lauritzen	Lauritzen	SW $\frac{1}{4}$ sec. 10, (26-33E)
14.	Dept. of Highways	Alm	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (26-34E)
15.	Do	Mangis	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 30, (26-35E)
16.	Do	Gale	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 5, (26-37E)
17.	Do		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 17, (26-37E)
*17A.			NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, (26-39E)
18.			Sec. 9, (27-31E)
19.	Dept. of Highways	Geib	Lot 3, sec. 5, (27-32E)
*19A.		Llewellyn	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (27-32E)
20.	Do	Kramer	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 20 and NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (27-32E)
21.	Do	Pebles	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 19, (27-37E)
MASON COUNTY			
*1.			SW $\frac{1}{4}$ sec. 19, (23-3W)
2.	Lilliwaup stone quarry	Tuff	Sec. 31, (23-3W)
OKANOGAN COUNTY			
1.	Dept. of Highways		Lot 1, sec. 36, (29-23E)
*2.	Okanogan County		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (33-25E)
*3.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, (35-21E)
*4.	Okanogan County		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 25, (35-25E)
*5.		Wehmeyer	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (36-19E)
*6.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 19, (37-31E)
*7.	Dept. of Highways	Wauconda	Near Wauconda
*8.	Okanogan County		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (38-26E)
*9.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (40-27E)
*10.	Okanogan County		SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 33, (40-27E)
PACIFIC COUNTY			
*A.		Provo	Sec. 16, (9-10W)
B.			Sec. 21, (9-10W)
*1.	Naselle Rock Co.	Lane Creek	N $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 3, (10-9W)
2.			W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 5, (10-10W)
3.	Pacific County		E $\frac{1}{2}$ sec. 32, (10-11W)
*3A.		O'Meara	Sec. 32, (10-11W)
*4.	Dept. of Highways	O'Conner Creek	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (11-9W)
*5.	U. S. Army Engineers	Naselle River	NW $\frac{1}{4}$ sec. 10, (11-10W)
6.	Dept. of Highways	Pluvius	N $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 11, (12-6W)

Map no.	Operator or owner	Quarry name	Property location
PACIFIC COUNTY—Continued			
7.		Nallpee	S $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 6, (12-7W)
8.	Dept. of Highways	Falls Creek	Center S $\frac{1}{2}$ sec. 11, (12-7W)
9.	Joslin & McAllister		NW $\frac{1}{4}$ sec. 14, (12-7W)
10.		Half Moon Creek	SW $\frac{1}{4}$ sec. 20, (13-6W)
10A.		Johnson	SE $\frac{1}{4}$ sec. 22, (14-9W)
10B.	Pacific County	N. Willapa River	Sec. 23, (14-9W)
*10C.	A. H. Beaty		NE $\frac{1}{4}$ sec. 23, (14-9W)
*10D.	A. W. Hammond		Center sec. 23, (14-9W)
*11.	Willapa Harbor Quarries		Sec. 32, (14-9W)
*12.	Pacific County		Sec. 32, (14-9W)
13.	Dept. of Highways		W $\frac{1}{2}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (15-9W)
PIERCE COUNTY			
1.	U. S. Forest Service		On Highway No. 5, T. 18 N., R. 10 E.
*1A.	Strong & McDonald	Mashel River	Mashel River area, T. 16 N., R. 6 E.
2.	Pierce County	Orting	At Orting
*3.	Pierce County River Improvement		Sec. 6, (18-5E)
SKAGIT COUNTY			
*1.	Dunlap Towing Co.	McGlynn Island	SW $\frac{1}{4}$ sec. 1, (33-2E)
SNOHOMISH COUNTY			
*1.	Stoen Constr. Co.	Monroe	E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 10, (27-6E)
SKAMANIA COUNTY			
*1.	Skamania County		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (1-5E)
2.	Dept. of Highways		N $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, (1-5E)
3.	Beacon Lake Corp.		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (2-6E)
4.	Dept. of Highways	Stevenson	At Stevenson
*5.	Skamania County		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (3-9E)
6.	Elder W. Dietderich	Dietderich	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (3-9E)
7.	S. P. & S. Ry.	Cooks	At Cooks
8.	Skamania County	Underwood	At Underwood
SPOKANE COUNTY			
1.	Spokane County		SE $\frac{1}{4}$ sec. 4, (21-43E)
2.	John Weinandy	Weinandy	SE $\frac{1}{4}$ sec. 4, (21-43E)
3.	G. W. Dorsey	Dorsey	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (21-43E)
4.	Dept. of Highways	Fieser	W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 1, (21-44E)
5.	Spokane County		SW $\frac{1}{4}$ sec. 1, (21-44E)
6.	Do		NE $\frac{1}{4}$ sec. 25, (21-44E)

Map no.	Operator or owner	Quarry name	Property location
SPOKANE COUNTY—Continued			
7.	Spokane County		NE ¼ sec. 25, (21-45E)
8.	Do		SW ¼ sec. 8, (22-43E)
9.	Do		SW ¼ sec. 24, (22-43E)
10.	Do		NW ¼ sec. 27, (22-45E)
11.	Do		SW ¼ sec. 26, (23-40E)
12.	B. D. Harris	Harris	SW ¼ NW ¼ sec. 35, (23-40E)
13.	Spokane County		NW ¼ sec. 35, (23-40E)
14.	E. D. Roberts	Roberts	NW ¼ NW ¼ sec. 35, (23-40E)
15.	Dept. of Highways		NE ¼ NW ¼ sec. 35, (23-40E)
16.	Spokane County		SW ¼ sec. 18, (23-42E)
17.	Do		SW ¼ sec. 20, (23-42E)
18.	Do		SW ¼ sec. 6, (23-43E)
19.	Do		NE ¼ sec. 14, (23-43E)
20.	Do		SW ¼ sec. 20, (23-43E)
21.	Do		NE ¼ SW ¼ sec. 29, (23-45E)
22.	Do		NW ¼ sec. 33, (23-45E)
23.			SW ¼ NW ¼ sec. 35, (23-45E)
24.	Spokane County		NE ¼ sec. 17, (24-41E)
25.	R. V. Wallace	Wallace	NE ¼ sec. 26, (24-41E)
26.			SW ¼ sec. 9, (24-41E)
27.			NW ¼ SW ¼ sec. 4, (24-42E)
28.	Spokane County		SE ¼ sec. 15, (24-42E)
*29.	N. P. Ry.		NE ¼ sec. 28, (24-42E)
30.	Spokane County		NW ¼ sec. 24, (24-43E)
31.			SE ¼ NW ¼ sec. 26, (24-43E)
32.	Dept. of Highways	Conrad	E ½ SE ¼ sec. 16, (24-44E)
33.	Dept. of Highways	Mica	SW ¼ NW ¼ sec. 26, (24-44E)
34.	Spokane County	Mica	NE ¼ sec. 27, (24-44E)
35.	Do		NW ¼ sec. 26, (25-42E)
*35A.	Carbon Bros.		NE. corner of Geiger Field
*36.	Inland Asphalt Co.		10th and Havana, Spokane
37.	Spokane County		SW ¼ sec. 24, (25-44E)
38.	Do		SE ¼ sec. 14, (26-41E)
39.	Do		NW ¼ sec. 17, (26-42E)
39A.	H. F. Green & Co.	Green	Sec. 32, (26-42E)
40.	Spokane County		SW ¼ sec. 4, (26-43E)
41.	Do		NW ¼ sec. 29, (26-44E)
42.	Do		NW ¼ sec. 13, (27-44E)
43.	Do		NW ¼ sec. 10, (28-42E)
44.	Do		NE ¼ sec. 4, (28-43E)
45.	Dept. of Highways	Hansen	SW ¼ SW ¼ sec. 4, (28-43E)
46.	Do	Bartlett	SE ¼ SE ¼ sec. 5, (28-43E)
47.	Spokane County		SW ¼ sec. 7, (28-44E)
48.	Dept. of Highways	Mount Spokane	SE ¼ sec. 32, (28-44E)
49.	Spokane County	Elk	At Elk

STEVENS COUNTY

- | | | | |
|----|-------------------|------------|-----------------------------|
| 1. | Dept. of Highways | Springdale | SE ¼ NE ¼ sec. 34, (30-40E) |
| 2. | Do | Collins | Sec. 14, (31-40E) |

Map no.	Operator or owner	Quarry name	Property location
STEVENS COUNTY—Continued			
3.	Dept. of Highways	Jeanneret	SW ¼ SE ¼ sec. 13, (33-39E)
4.	George W. Rose	Rose	SE ¼ NW ¼ sec. 26, (36-38E)
5.		China Bend	Approx. sec. 17, (38-39E)
THURSTON COUNTY			
*1.		Columbia	Center S. line sec. 11, (15-1E)
*2.	Stoen Constr. Co.	Gate	SW ¼ NW ¼ sec. 26, (16-4W)
*3.	James Nelson	Army	SW ¼ NW ¼ sec. 31, (17-1W)
*4.		Mottman	Center sec. 27, (18-2W)
5.		Webber	S ½ S ½ SW ¼ sec. 28, (18-2W)

WAHIAKUM COUNTY

- | | | | |
|------|-------------------|---------|----------------------------|
| *1. | Wahkiakum County | | Lot 4, sec. 21, (8-5W) |
| 2. | Do | | At Brookfield |
| *2A. | | | NW ¼ SW ¼ sec. 3, (10-7W) |
| 3. | Dept. of Highways | Johnson | SW ¼ NW ¼ sec. 23, (10-8W) |

WALLA WALLA COUNTY

- | | | | |
|------|--------------------|----------|------------------------------------------|
| 1. | Dept. of Highways | Gummings | SE ¼ SW ¼ sec. 26, (7-31E) |
| 2. | George E. Lambdin | Lambdin | NW ¼ SE ¼ and SE ¼ NE ¼ sec. 23, (7-32E) |
| 3. | Dept. of Highways | Moore | SW ¼ NE ¼ sec. 36, (7-32E) |
| 4. | Do | | SW ¼ NW ¼ sec. 7, (7-33E) |
| *5. | Walla Walla County | | Sec. 16, (7-33E) |
| 6. | Felix Davin | Davin | W ½ NW ¼ sec. 34, (7-34E) |
| *7. | Walla Walla County | | Sec. 7, (7-38E) |
| *8. | Do | | SW ¼ sec. 18, (7-38E) |
| 9. | Dept. of Highways | Dodd | NW ¼ SW ¼ sec. 35, (8-33E) |
| *10. | Walla Walla County | | Sec. 24, (8-34E) |
| *11. | Do | | Sec. 17, (8-37E) |
| 12. | Dept. of Highways | Mills | SE ¼ NE ¼ sec. 10, (9-37E) |
| *13. | Walla Walla County | | NW ¼ sec. 23, (11-35E) |

WHATCOM COUNTY

- | | | | |
|-----|---------------------------------------|---------|----------------------|
| *1. | Wenatchee Stone Co. and J. E. Houplin | Shuksan | W ½ sec. 33, (40-8E) |
|-----|---------------------------------------|---------|----------------------|

WHITMAN COUNTY

- | | | | |
|-----|-------------------|---------|-------------------------------------------|
| *1. | Whitman County | | NE ¼ sec. 5, (12-46E) |
| *2. | Do | | Sec. 7, (12-46E) |
| 3. | Edward J. Dahm | Dahm | E ½ sec. 18, (12-46E) |
| 4. | Dept. of Highways | Collins | NE ¼ SW ¼ and NW ¼ SE ¼ sec. 33, (12-46E) |

Map no.	Operator or owner	Quarry name	Property location
WHITMAN COUNTY—Continued			
5.	Dept. of Highways	Jones	SE $\frac{1}{4}$ SE $\frac{1}{4}$ and SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 20, (13-45E)
6.	Do	Druffel	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (13-45E)
7.	Do	Henderson	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, (14-44E)
8.	Do	Sage	Lots 2 and 3, Blk. 8, Fairview Add. to Pullman
9.	Do		W $\frac{1}{2}$ of 2d. St. in Fairview Add. to Pullman
10.	Do		Tct. in Fairview Add. to Pullman and vacated St.
11.	Whitman County		Sec. 5, (14-45E)
12.	Dept. of Highways	Bishop	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, (14-45E)
13.	Emily J. Staley	Staley	NE $\frac{1}{4}$ sec. 21, (14-45E)
*14.	Whitman County		Sec. 2, (15-42E)
15.	Do		Sec. 15, (15-44E)
16.	Walter G. Glaspy	Glaspy	SW $\frac{1}{4}$ sec. 26, (15-44E)
*16A.			NW $\frac{1}{4}$ sec. 31, (15-45E)
17.	Dept. of Highways	Scholtz	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (16-41E)
18.	Dept. of Highways	Sanders	E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 34, (16-42E)
19.	Do	McNeilly	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, (16-42E)
20.	Do	Chestnut	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (16-43E)
21.	Do	Cocking	Lots 6 and 7, sec. 4, (16-44E)
*21A.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (17-43E)
*22.	Whitman County		Sec. 29, (16-44E)
23.	City of Palouse	Palouse	At Palouse
24.	Dept. of Highways	Thompson	SE $\frac{1}{4}$ NW $\frac{1}{4}$ and NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, (16-45E)
25.	Dept. of Highways	Greenwalt	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (16-45E)
*26.	Whitman County		Sec. 29, (17-42E)
*26A.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (17-43E)
27.		Duffield Creek	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, (17-45E)
28.	Dept. of Highways	Turnbow	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, (17-45E)

Map no.	Operator or owner	Quarry name	Property location
WHITMAN COUNTY—Continued			
*28A.			SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (17-45E)
29.	Sam H. Weitman	Weitman	N $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 10, (18-43E)
30.	Dept. of Highways	Garfield	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, (18-45E)
31.	Spokane County	Oakesdale	N $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 23, (19-44E)
32.	Nellie Fish	Fish	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 26, (19-44E)
33.			NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, (19-44E)
*34.	Whitman County		Sec. 32, (19-44E)
35.	Do		Sec. 6, (19-45E)
36.	Dept. of Highways	Murphy	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, (19-45E)
*37.	Whitman County		Sec. 16, (19-45E)
*38.			SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 24, (20-45E)
YAKIMA COUNTY			
*1.	Yakima County		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (7-22E)
*1A.			NW $\frac{1}{4}$ sec. 35, (8-22E)
2.	U. S. Indian Service		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 6, (9-20E)
3.	Do		Lots 2 and 3, sec. 32, (10-20E)
4.	Yakima County	Union Gap	At Union Gap
5.	Dept. of Highways	Ruddell	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (12-22E)
*6.	Yakima County		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (13-17E)
7.	P. L. Zirkle	Zirkle	At Yakima
8.	Dept. of Highways	Dog Lake	SE $\frac{1}{4}$ sec. 36, (14-11E)
*8A.	White Pass Mine	White Pass	At Dog Lake
9.	N. P. Ry.		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (14-19E)
10.	Dept. of Highways		Sec. 12, (16-10E)
11.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (17-11E)
12.	U. S. Forest Service		On Highway No. 5 between American River Resort and Hells Crossing
13.	Dept. of Highways		S $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 4, (17-14E)

FERRUGINOUS BAUXITE

Bauxite is a recent discovery in Washington; hence few deposits are known. Drilling by the Aluminum Co. of America on the known deposits, however, has proved a substantial tonnage to exist. The nature of the deposits, as to occurrence and origin, makes large areas of southwestern Washington potentially important as a source of bauxite.

The known bauxite is restricted to the uppermost flows of the Miocene basalt from which it has been derived, but other rocks at the same weathering horizon may also be bauxitic. In beds as much as 20 feet thick, it overlies and grades into 20 feet or more of weathered basalt and is in turn overlain by reddish-brown clayey

silt. Reworking of the bauxite during the time of silt deposition has resulted in the incorporation of bauxite in the silt, thus making the boundary between silt and bauxite gradational.

Work by the State of Oregon Department of Geology and Mineral Industries (Refs: 83 and 84) has shown that these deposits should more properly be designated ferruginous bauxite, or possibly laterite, because their iron content is high as compared to bauxite ore obtained at present in southeastern United States.

Though the alumina content of Washington ferruginous bauxite is only about 35 percent as compared to 50 percent in bauxite from southeastern United States,

the nearness of Washington ore to abundant electric power and to operating aluminum plants places it in a favorable position to compete with higher grade ores less favorably located.

Bauxite is used principally as an ore of aluminum. Other important uses are as a refractory, as an abrasive, and in making high-alumina cement.

In June 1956, domestic crude bauxite, 50 to 52 percent (not dried), sold for \$5.00 to \$5.50 per long ton, f. o. b. Arkansas mines; domestic chemical grade, 55 to 58 percent, for \$8.00 to \$8.50 per long ton, f. o. b. Alabama and Arkansas mines; and domestic abrasive grade, 80 to 84 percent, for \$17.00 per long ton, f. o. b. Arkansas mines.

OCCURRENCES

On page 15 in volume 2 is plate 5, the map showing the occurrences of ferruginous bauxite, numbered to correspond with the numbers of the occurrences listed below.

COWLITZ COUNTY

1. **Name:** Longview. **Loc:** Road cut at top of hill in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (8-2W). **Descr:** Thin erosional remnant overlain by reddish-brown silt. **Value:** Not commercial. **Ref:** 123-C; 135.
2. **Name:** Cameron Creek area. **Loc:** Low gently rounded hill between Cameron and Slide Creeks in SW $\frac{1}{4}$ sec. 27, E $\frac{1}{2}$ sec. 28, NE $\frac{1}{4}$ sec. 33, and W $\frac{1}{2}$ sec. 34, (9-4W). **Descr:** 20 ft. of ferruginous bauxite

overlain by equal thickness of silt. **Value:** Large commercial deposit. **Ref:** 123-C; 135.

3. **Name:** Mill Creek area. **Loc:** Hill between Cameron and Mill Creeks in the E $\frac{1}{2}$ sec. 32 and W $\frac{1}{2}$ sec. 33, (9-4W) and N $\frac{1}{2}$ sec. 4, (8-4W). **Descr:** Bed approximately 20 ft. thick overlain by equal amount of silt. **Value:** Large commercial deposit. **Ref:** 123-C; 135.
4. **Name:** Section 4. **Loc:** N $\frac{1}{2}$ sec. 4, (8-2W). **Descr:** High-iron bauxite and high-alumina clay reported. **Value:** Unknown. **Ref:** 71-A, p. 29.
5. **Name:** Ostrander Creek. **Loc:** SE $\frac{1}{4}$ sec. 21, (9-1W). **Descr:** High-iron bauxite and high-alumina clay reported. **Value:** Unknown. **Ref:** 71-A, p. 29.

BERYL

Beryl is a complex beryllium aluminum silicate mineral, usually green, and frequently in six-sided prismatic crystals. Massive opaque varieties of beryl constitute the main source of beryllium, which is alloyed with other metals, principally copper, to make a hard, fatigue-resisting product. In the oxide form, beryllium is used in electronics and in special crucibles and refractories. Transparent beryl, free from flaws and of the proper color, is the gem mineral of emerald.

Beryl is known in Washington but not in quality suitable for gems. The beryl in one deposit was mined briefly in 1952 and 1953 as an ore of beryllium. This deposit is indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the description.

In June 1956, prices of beryl were \$46 to \$48 per short ton unit BeO contained in 10- to 12-percent ore, f. o. b. mine, Colorado.

OCCURRENCES

On page 17 in volume 2 is plate 6, the map showing the occurrences of beryl, numbered to correspond with the numbers of the occurrences listed below.

SNOHOMISH COUNTY

1. **Name:** Del Campo Peak. **Loc:** Reported 4 mi. W. of Monte Cristo in vicinity of Del Campo Peak. An attempt to verify the occurrence was unsuccessful. **Descr:** Said to be a large deposit from which at least two crystals were sold. **Value:** Unknown. **Ref:** 12, p. 52; 48, p. 119.
2. **Name:** Jones prospect. **Loc:** Reported in shaft on N. side of stream near N. center sec. 11, (28-10E). **Descr:** Shaft said to be in solid beryl. **Value:** Unknown; substantiation of report needed. **Ref:** 18, p. 74; 135.

CHELAN COUNTY

- 2A. **Name:** Lake Creek. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (27-15E). **Descr:** Beryl in pegmatite dike in road cut. **Value:** Warrants investigation. **Ref:** 135.

OKANOGAN COUNTY

3. **Name:** Nespelem. **Loc:** Reported near Nespelem on property of R. F. Hudnutt. **Descr:** Unknown. **Value:** Report should be substantiated. **Ref:** 135.

FERRY COUNTY

4. **Name:** Kettle Falls area. **Loc:** Vicinity of Kettle Falls. **Descr:** Small crystals in pegmatite. **Value:** None of gem quality observed. Now under water. **Ref:** 135.
- 4A. **Name:** Gemini. **Loc:** 11.7 mi. NE. of Nespelem, at Cache Cr. summit. **Descr:** Gemini Mines, Inc., Wenatchee, Wash., reported chromite, uvarovite, and beryl. **Value:** Unknown. **Ref:** 61-A; 135.

STEVENS COUNTY

5. **Name:** Kettle Falls. **Loc:** SW $\frac{1}{4}$ sec. 11, (36-38E). **Descr:** Crystals as much as $\frac{1}{4}$ in. long occur scattered through a 5-in. pegmatite sill in quartzite. **Value:** Noncommercial. Now under water. **Ref:** 135.

6. **Name:** Lost Creek. **Loc:** On SE. side of Granite Peak, on Lost Creek, probably in sec. 20, (36-43E). **Descr:** One beryl crystal in pegmatite. **Value:** Area warrants prospecting. **Ref:** 135.
7. **Name:** Blueslide. **Loc:** Sec. 10, (35-43E), near Blueslide. **Descr:** Small beryl crystals reported in pegmatite. **Value:** Warrants investigation. **Ref:** 135.
- *8. **Name:** Railway Dike. **Loc:** On ridge about 1 mi. S. of Calispell Peak, in SW¼ sec. 33, (34-42E). **Descr:** Numerous small crystals and some as much as 6 in. long and 2 in. in diameter occur in a pegmatite at least 50 ft. wide. Associated with it are columbite and muscovite. Beryl may constitute as much as 1 percent of the pegmatite mass. **Value:** 8 trenches and a 353-ft. adit were opened

in 1952 by Merikay Mines, New York, N. Y. A few hundred pounds of low-grade beryl ore was shipped. **Ref:** 135.

9. **Name:** Calispell Peak. **Loc:** About 1 mi. S. of Calispell Peak, probably in NE¼ sec. 28, (34-42E). **Descr:** Small hill on ridge is made up of massive quartz containing beryl as abundant small crystals. One crystal is several feet in length and 4 or 5 in. in diameter. **Value:** Warrants investigation. **Ref:** 135.

SPOKANE COUNTY

10. **Name:** Fish Lake. **Loc:** Near Fish Lake in S. P. & S. Ry. cut in SW¼ sec. 33, (24-42E). **Descr:** Few small crystals in 5-ft. pegmatite dike. **Value:** None of gem quality observed. **Ref:** 96; 135.

COMMON CLAYS AND SHALES

Clay is a soft earthy aggregate consisting essentially of hydrous aluminum silicate minerals. It is usually plastic when wet, and hard and brittle when dry. Shale is indurated clay, mud, or silt having fissility parallel to the original laminae of bedding. For convenience, rocks lacking fissility, such as claystone and mudstone, have also been included.

Included here are clays which fuse below pyrometric cone 12 and fire red. They are used in making common brick, hollow tile, face brick, drain tile, flowerpots, sewer pipe, and as a filler in linoleum and certain kinds of roofing.

There are few places in Washington where clays of this kind do not occur. Nearly every town has had at

least one brick plant in the past. The value of common clays and shales depends not only on physical properties but also on nearness and size of market; consequently, only those brick plants having favorable market conditions have been able to survive competition from lumber and concrete products. The Washington occurrences of common clay and shale that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

Prices of common clays are extremely variable, usually less than \$1.00 but may be as much as \$10.00 per ton.

OCCURRENCES

On page 19 in volume 2 is plate 7, the map showing the occurrences of common clays and shales. These are numbered to correspond with the numbers of the occurrences listed below.

WHATCOM COUNTY

- *1. **Name:** Brennan. **Loc:** At Brennan, in sec. 33, (39-2E). **Descr:** Glacial clays. **Value:** Currently used by The Olympic Portland Cement Co., Ltd., in the manufacture of portland cement. **Ref:** 66-D, p. 28; 135.
- *1A. **Name:** Everson. **Loc:** SE¼ sec. 24, (40-3E). **Descr:** Glacial clay. **Value:** Currently operated by Hampton Brick and Tile Co., Everson. **Ref:** 66-C, p. 23; 93-A, p. 21.
2. **Name:** Bellingham. **Loc:** Two deposits, one on Ellis St. near Gladstone, the other at the corner of Monroe and Potter in Bellingham. **Descr:** Two beds of glacial clay, more than 44 ft. in total thickness. **Value:** Were operated by J. F. Miller & Bros. about 1910. **Ref:** 116, p. 285-286.

3. **Name:** Grandview. **Loc:** At Grandview Station on the G. N. Ry., in sec. 13, (37-2E). **Descr:** Shale of the Chuckanut formation. **Value:** Formerly used in a brick and tile plant at the site. **Ref:** 47, p. 307-308.

SAN JUAN COUNTY

4. **Name:** Orcas Island. **Loc:** On Orcas Island in sec. 21, (37-1W). **Descr:** Extensive blue glacial clay. **Value:** Formerly used in a brick yard. **Ref:** 47, p. 217; 116, p. 289.

SKAGIT COUNTY

5. **Name:** Alger. **Loc:** At Alger, in sec. 7, (36-4E). **Descr:** Lacustrine clay from the valley bottom. **Value:** Used for several years by the Bellingham Brick & Tile Co. **Ref:** 47, p. 223; 116, p. 280-282.
- *5A. **Name:** Friday Creek. **Loc:** NW¼ sec. 32, (36-4E). **Descr:** Glacial clay. **Value:** Currently used in the manufacture of common brick by Northwest Brick & Tile, Inc., Route 1, Burlington. **Ref:** 66-D, p. 26.

6. **Name:** Anacortes. **Loc:** At Anacortes. **Descr:** Glacial clay. **Value:** Brick yard operated several years ago using this material. **Ref:** 47, p. 223.
 7. **Name:** Bay View. **Loc:** At Bay View on Padilla Bay. **Descr:** Glacial clay. **Value:** Brick yard formerly used this material in the manufacture of drain tile, hollow brick, and common brick. **Ref:** 47, p. 223.
 - *8. **Name:** Concrete. **Loc:** Sec. 2, (35-8E). **Descr:** Glacial clay in terraces. **Value:** Currently used by Superior Portland Cement, Inc. in the manufacture of portland cement. **Ref:** 47, p. 219-220; 66-D, p. 32.
 9. **Name:** Tiloh. **Loc:** Sec. 23, (34-4E). **Descr:** Recent lacustrine clay. **Value:** Formerly used by Knapp Brick & Tile Co. **Ref:** 47, p. 222; 53, p. 21.
- CLALLAM COUNTY**
10. **Name:** Port Angeles. **Loc:** In the business district of Port Angeles. **Descr:** Glacial clay. **Value:** Used in a brick plant many years ago. **Ref:** 47, p. 68-69.
- SNOHOMISH COUNTY**
11. **Name:** NE. Everett. **Loc:** In NE. part of Everett. **Descr:** Large body of blue glacial clay. **Value:** Formerly used in the manufacture of common brick by the Schaffer Brick Yard. **Ref:** 116, p. 278-279.
 12. **Name:** N. Everett. **Loc:** In N. part of Everett. **Descr:** Yellow surface clay, probably glacial. **Value:** Formerly used in making flowerpots by Dregone Flower-Pot Co. **Ref:** 116, p. 279-280.
 - *13. **Name:** Everett Brick Yard. **Loc:** 29th and Rockefeller Ave., Everett. **Descr:** Blue glacial clay. **Value:** Recently used in the manufacture of common brick, hollow block, and tile. **Ref:** 47, p. 226-227; 55, p. 21.
 - *13A. **Name:** Lowell. **Loc:** NW $\frac{1}{4}$ sec. 32, (29-5E). **Descr:** Blue glacial clay. **Value:** Currently used in the manufacture of common brick by Lowell Brick & Tile Co. **Ref:** 2-A, p. 26.
 14. **Name:** Snohomish. **Loc:** NW. part of Snohomish. **Descr:** Recent alluvial clay. **Value:** Formerly used by a small yard in the manufacture of common brick and drain tile. **Ref:** 47, p. 227.
 15. **Name:** Meadowdale. **Loc:** At Meadowdale in sec. 32, (28-4E). **Descr:** Glacial clay. **Value:** Used in making flowerpots and novelty ware for many years by the Meadowdale Pottery. **Ref:** 47, p. 228.
 16. **Name:** Monroe. **Loc:** On site of the State Reformatory. **Descr:** Glacial clay. **Value:** Reformatory constructed of bricks made from clay on site. **Ref:** 47, p. 227.
- KING COUNTY**
- *17. **Name:** Northwest Haydite Co., Inc. **Loc:** Near Woodinville, in sec. 9, (26-5E). **Descr:** Blue glacial clay. **Value:** Recently used in the manufacture of haydite and formerly used by the Bothell Brick & Tile Co. in making tile and common brick. **Ref:** 47, p. 158; 52, p. 25.
 18. **Name:** Lake Washington. **Loc:** 2 mi. from N. part of Seattle on W. shore of Lake Washington. **Descr:** Glacial clay, complicated by landslide. **Value:** Formerly used in making common brick by the Pontiac Brick Co. **Ref:** 116, p. 248.
 - *19. **Name:** Grotto. **Loc:** At Grotto in sec. 17, (26-11E). **Descr:** Glacial clay. **Value:** Currently used in the manufacture of portland cement by the Ideal Cement Co. **Ref:** 66-D, p. 27; 93-A, p. 22.
 - *20. **Name:** Lone Star Cement Corp. **Loc:** SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, (24-4E), in Seattle. **Descr:** Glacial clay. **Value:** Currently used in the manufacture of portland cement by Lone Star Cement Corp. **Ref:** 66-D, p. 32; 93-A, p. 24.
 - *21. **Name:** Abrahamson Brick Co. **Loc:** Plant and pit at 5000 W. Marginal Way, Seattle. **Descr:** Blue glacial clay. **Value:** Currently used in making "burlaps" and common brick. **Ref:** 47, p. 153-154; 55, p. 16; 66-D, p. 17; 116, p. 246-247.
 22. **Name:** Duwamish River. **Loc:** On Duwamish River a short distance S. of Abrahamson Brick Co. **Descr:** Blue glacial clay. **Value:** Used about 1910 in the manufacture of common brick by Washington Brick & Tile Co. **Ref:** 116, p. 247-248.
 - *23. **Name:** Builders Brick Co. **Loc:** Plant and pit at 9th and Charleston St., Seattle. **Descr:** Blue glacial clay. **Value:** Currently used in making common structural wares. **Ref:** 47, p. 152-153; 55, p. 18; 66-D, p. 19; 116, p. 243-244.
 24. **Name:** Glacial clay. **Loc:** 7117 W. Marginal Way, Seattle. **Descr:** Blue glacial clay. **Value:** Formerly used in the manufacture of common brick by Builders Brick Co. and Puget Sound Brick & Tile Co. **Ref:** 47, p. 152-153; 116, p. 243-244.
 25. **Name:** Glacial clay. **Loc:** 4201 Marginal Way, Seattle. **Descr:** Sandy glacial clay. **Value:** Formerly used in the manufacture of common brick by Builders Brick Co. and Lohse Brick Co. **Ref:** 47, p. 154; 116, p. 245-246.
 - *26. **Name:** Northwest Pottery Co. **Loc:** Plant at 3320 Airport Way. Pit at 9th and Spokane St., Seattle. **Descr:** Glacial clay. **Value:** Recently used in making flowerpots. **Ref:** 47, p. 157; 55, p. 29.
 - *27. **Name:** Seattle Brick & Tile Co. **Loc:** Plant and pit at 9th Ave. S. and Andover St., Seattle. **Descr:** Blue glacial clay. **Value:** Currently used in the manufacture of common brick, hollow block, and drain tile. **Ref:** 47, p. 156-157; 55, p. 31; 66-D, p. 30; 116, p. 240-243.
 - *27A. **Name:** Stillwell. **Loc:** 919 Horton St., Seattle. **Descr:** Glacial clay. **Value:** Intermittently operated by J. B. Stillwell, Seattle. **Ref:** 66-D, p. 31.

- *28. **Name:** Washington Pottery Co. **Loc:** Plant at 807 Snoqualmie St.; pit at 9th and Lane St., Seattle. **Descr:** Glacial clay. **Value:** Currently used in making flowerpots. **Ref:** 47, p. 157; 55, p. 35; 66-D, p. 34.
29. **Name:** Glacial clay. **Loc:** 16th Ave. S. and Lane St., Seattle. **Descr:** Stratified glacial clay. **Value:** Formerly used in the manufacture of common brick by Hill Brick Co. **Ref:** 116, p. 244.
30. **Name:** Glacial clay. **Loc:** 4501 W. Marginal Way, Seattle. **Descr:** Glacial clay. **Value:** Formerly used in making flowerpots by Seattle Pottery & Tile Co. **Ref:** 47, p. 154-155.
- *30A. **Name:** Empire Way. **Loc:** At 9750 Empire Way, Seattle. **Descr:** Glacial clay. **Value:** Recently used in the manufacture of common brick by Empire Brick & Tile Co. **Ref:** 66-B, p. 22.
- *31. **Name:** Newcastle quarry. **Loc:** NE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (24-5E). **Descr:** Shale of the Puget group. **Value:** Currently mined by Gladding, McBean & Co. **Ref:** 47, p. 119-120; 55, p. 22; 66-D, p. 21; 71-A, p. 30.
- *32. **Name:** Renton. **Loc:** Plant and pit $\frac{1}{2}$ mi. E. of Renton on S. side of Cedar River. **Descr:** Shale of Puget group 150 ft. thick. **Value:** Currently mined by Gladding, McBean & Co. **Ref:** 47, p. 113-116; 55, p. 22; 66-D, p. 22; 71-A, p. 30.
- *32A. **Name:** Cavanaugh Molding Sand Co. **Loc:** NE $\frac{1}{4}$ sec. 30, (23-6E), Cedar Mountain area. **Descr:** Daubing clay. **Value:** Currently operated. **Ref:** 66-D, p. 20.
- *33. **Name:** Taylor. **Loc:** Plant and pit at Taylor. **Descr:** Shale of the Puget group. **Value:** Recently mined by Gladding, McBean & Co. **Ref:** 47, p. 122-125; 55, p. 22.
34. **Name:** Durham coal mine. **Loc:** NW $\frac{1}{4}$ sec. 2, (21-7E). **Descr:** Shales of Puget group accompanying coal. **Value:** Used commercially many years ago. **Ref:** 47, p. 134.
35. **Name:** Bayne. **Loc:** At Bayne. **Descr:** Shale of Puget group. **Value:** Used unsatisfactorily for paving brick but probably is suitable for other types of clay products. **Ref:** 47, p. 134.
- KITSAP COUNTY**
36. **Name:** Port Orchard. **Loc:** Sec. 34, (24-1E). **Descr:** Blue glacial clay more than 20 ft. thick. **Value:** Formerly used in the manufacture of common brick by Port Orchard Brick Yard. **Ref:** 47, p. 162; 116, p. 293.
37. **Name:** Harper. **Loc:** $\frac{1}{4}$ mi. SW. of Harper in SW $\frac{1}{4}$ sec. 35, (24-2E). **Descr:** 60-ft. bed of glacial clay. **Value:** Formerly used in making tile and common brick by Harper Brick & Tile Co. **Ref:** 47, p. 162; 116, p. 291-292.
- PIERCE COUNTY**
38. **Name:** Fox Island. **Loc:** On W. side of Fox Island near N. end. **Descr:** 40-ft. bed of glacial clay. **Value:** Formerly used in making common brick by Tacoma Trading Co. **Ref:** 116, p. 273-274.
39. **Name:** Ruston. **Loc:** Just S. of the Tacoma smelter. **Descr:** 75-ft. bed of blue glacial clay. **Value:** Formerly used in making common brick by the Goss plant. **Ref:** 47, p. 216.
40. **Name:** SE. Tacoma. **Loc:** SE. part of Tacoma. **Descr:** Light and dark sticky glacial clay. **Value:** Formerly used in making common brick by St. Paul & Tacoma Lumber Co. **Ref:** 116, p. 272-273.
- *41. **Name:** Gail Sigford (Paul Kirsten) pottery. **Loc:** at margin of a swamp in SE $\frac{1}{4}$ sec. 22, (17-2E). **Descr:** Recent soft, plastic bluish clay. **Value:** Formerly used in making garden and novelty ware by Paul Kirsten. Recently used for the same purpose by Miss Gail Sigford. **Ref:** 47, p. 216; 55, p. 25; 66-B, p. 33.
- *41A. **Name:** Beane. **Loc:** NE $\frac{1}{4}$ sec. 27, (17-4E). **Descr:** Glacial clay. **Value:** Recently used in the manufacture of common brick by Glen D. Beane Brick & Tile Co. **Ref:** 106-F, p. 43.
- *42. **Name:** Builders Brick Co. (formerly Far West Brick & Tile Co.). **Loc:** At Clay City in S $\frac{1}{2}$ sec. 25, (17-4E). **Descr:** Residual clay derived from andesite. **Value:** Currently used in making various clay structural products. **Ref:** 47, p. 208-213, 339, 348-349; 55, p. 18; 64-A, p. 796-797; 66-D, p. 19; 123-C; 144-A, p. 98, 102-104, 188-189.
- GRAYS HARBOR COUNTY**
- *42A. **Name:** Grays Harbor Pottery. **Loc:** Vicinity of Copalis Beach. **Descr:** Local clays. **Value:** Recently used in the manufacture of pottery by Grays Harbor Pottery Co. **Ref:** 106-F, p. 48.
- PACIFIC COUNTY**
43. **Name:** South Bend. **Loc:** In South Bend. **Descr:** Blue-gray Pleistocene clay. **Value:** Used many years ago in making common brick. **Ref:** 47, p. 199.
- LEWIS COUNTY**
44. **Name:** Centralia. **Loc:** In Centralia. **Descr:** Recent clay from bank of Chehalis River. **Value:** Formerly used in making common brick and drain tile by Wingard Bros. Brick Yard. **Ref:** 116, p. 298-299.
- *44A. **Name:** Brown. **Loc:** E $\frac{1}{2}$ sec. 34, (15-2W), near Centralia. **Descr:** Clay. **Value:** Currently operated by Gordon J. Brown, Chehalis. **Ref:** 66-D, p. 19.
- *45. **Name:** Chehalis Brick & Tile Co. **Loc:** In N. part of Chehalis. **Descr:** Willapa Pleistocene surface clays and underlying Eocene sediments. **Value:** Currently used in making various kinds of red face and special brick, hollow block, and drain tile. **Ref:** 47, p. 186-187; 55, p. 19; 66-D, p. 20; 116, p. 296-297.
46. **Name:** Vader. **Loc:** $\frac{1}{2}$ mi. E. of Vader in sec. 33, (11-2W). **Descr:** Large pit in Willapa Pleistocene clay. **Value:** Used years ago in making sewer pipe, paving brick, drain tile, and dry press brick by Little Falls Fire Clay Co. **Ref:** 47, p. 184; 116, p. 294-296.

CLARK COUNTY

- *47. **Name:** R. B. Muffet Brick & Tile Co. (Ridgefield Brick & Tile Co.). **Loc:** SE $\frac{1}{4}$ sec. 17, (4-1E). **Descr:** Surface alluvial clay. **Value:** Currently used in making face and common brick, hollow block, and drain tile. **Ref:** 47, p. 72-73; 55, p. 28; 66-D, p. 29.
- *47A. **Name:** Crawford. **Loc:** SE $\frac{1}{4}$ sec. 29, (4-3E). **Descr:** Residual clay. **Value:** Recently used in manufacture of common brick by Valley Lumber Co., Crawford. **Ref:** 66-B, p. 36.
- *48. **Name:** Hidden Brick Co. **Loc:** 2610 Kauffman St., Vancouver, Wash. **Descr:** Surface alluvial clay. **Value:** Currently used in making common brick. **Ref:** 47, p. 71-72; 55, p. 24; 66-D, p. 22.
- *48A. **Name:** Wilde. **Loc:** SE $\frac{1}{4}$ sec. 7, (2-2E), NE. of Vancouver. **Descr:** Pleistocene sandy clay. **Value:** Currently used by Geo. H. Wilde in the manufacture of common brick. **Ref:** 66-D, p. 35.
- *49. **Name:** Image. **Loc:** At Image in sec. 4, (1-2E). **Descr:** Pleistocene alluvial clays. **Value:** Formerly used in the manufacture of sewer pipe by Denny-Renton Clay & Coal Co. Now being sold for pottery by Harry R. Porter. **Ref:** 47, p. 69-70; 106-G, p. 51; 116, p. 299-300.

CHELAN COUNTY

50. **Name:** Union Valley. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 1, (27-22E). **Descr:** Stony surface soil and colluvial clay. **Value:** Middling-quality common brick produced intermittently up to 1937 by St. Luise Bros. **Ref:** 47, p. 64-65.
51. **Name:** Chelan. **Loc:** At Chelan. **Descr:** Silty clay 40 ft. thick covers considerable area. **Value:** Common and repress brick manufactured about 1910 by H. E. Dunham Brick Yard. **Ref:** 47, p. 64; 116, p. 235-236.
- 51A. **Name:** Leavenworth. **Loc:** At Leavenworth. **Descr:** Alluvial clay. **Value:** Formerly used in the manufacture of brick. **Ref:** 81, p. 31; 123-B, p. 8.
- *52. **Name:** Wenatchee Brick & Tile Co. **Loc:** Pit and plant at 9th and Columbia St., Wenatchee. **Descr:** Recent alluvial buff-colored clay. **Value:** Currently used for rough face brick, common brick, and hollow block. **Ref:** 47, p. 63-64; 55, p. 36; 66-B, p. 34.

KITITITAS COUNTY

53. **Name:** Cle Elum. **Loc:** On Yakima River at Cle Elum. **Descr:** Silty alluvial clay along Yakima River. **Value:** Fair quality bricks made from this material about 1910. **Ref:** 47, p. 166; 116, p. 233.
54. **Name:** Ellensburg. **Loc:** At E. edge of Ellensburg. **Descr:** Silty alluvial clay from valley floor. **Value:** Used in making common brick by Coble & Crawford about 1910. **Ref:** 47, p. 166; 116, p. 233.
- 54A. **Name:** Johnston Canyon. **Loc:** 4 mi. E. of Kittitas. Road to within $\frac{1}{2}$ mi. of property. **Descr:** Very extensive deposit of light-colored clay. **Value:** A plant operated briefly about 1924. Current owner is W. H. Long. **Ref:** 135.

YAKIMA COUNTY

55. **Name:** Yakima. **Loc:** On Yakima River in Yakima. **Descr:** Recent alluvial clay containing considerable organic matter. **Value:** Used in making common brick by Garrett Bros. & Co. about 1910. **Ref:** 116, p. 232.
- *55A. **Name:** Kaiser. **Loc:** Sec. 15, (13-19E). **Descr:** Clay. **Value:** Recently produced by Kaiser Bros. of Yakima. **Ref:** 106-F, p. 49.
- *55B. **Name:** Parker Heights. **Loc:** SE $\frac{1}{4}$ sec. 31, (12-20E). **Descr:** Clay. **Value:** Currently produced by Yakima Clay & Chemical Corp., Yakima. **Ref:** 2-A, p. 40.
- *55C. **Name:** Deaver. **Loc:** NW $\frac{1}{4}$ sec. 35, (12-23E). **Descr:** Clay of the Ringold formation. **Value:** Recently produced by A. L. Deaver and processed in the State Products Co. plant by Corliss-Kaiser Co., Inc. for use in asphalt flooring. **Ref:** 66-B, p. 22; 135.
56. **Name:** W. I. Wendt. **Loc:** Near center SE $\frac{1}{4}$ sec. 34, (11-21E). **Descr:** Light buff clay, probably Ringold. **Value:** Recently used by Research Laboratories as filler in asphalt flooring. **Ref:** 55, p. 36.
- *57. **Name:** Granger Clay Products Co. **Loc:** SW $\frac{1}{4}$ sec. 22, (10-21E). **Descr:** Shales of the Ellensburg formation. **Value:** Currently used in the manufacture of common brick, rough-textured face brick, hollow block, and drain tile. **Ref:** 47, p. 333-335; 55, p. 23; 66-B, p. 22.

BENTON COUNTY

58. **Name:** Hanford. **Loc:** Pit just N. of Hanford in sec. 25, (13-27E). **Descr:** Sandy alluvial clay from bank of Columbia River. **Value:** Formerly used in making common brick. **Ref:** 47, p. 61.
59. **Name:** Prosser. **Loc:** At Prosser. **Descr:** Silty alluvial clay. **Value:** Used in the manufacture of common brick about 1910 by Prosser Brick & Tile Co. **Ref:** 47, p. 60; 116, p. 230-231.
60. **Name:** Kennewick. **Loc:** At Kennewick. **Descr:** Silty alluvial clay. **Value:** Used in making common brick by Columbia Clay Co. about 1910. **Ref:** 47, p. 60; 116, p. 231.

KLICKITAT COUNTY

61. **Name:** Goldendale. **Loc:** At Goldendale. **Descr:** Recent soft alluvial clay in valley of Little Klickitat River. **Value:** Formerly used in making common brick. **Ref:** 47, p. 167.

OKANOGAN COUNTY

- *62. **Name:** Oroville (George J. Finnie) Brick Yard. **Loc:** Plant and one pit at Oroville, another pit $\frac{1}{2}$ mi. SE. of Oroville. **Descr:** Alluvial clay at plant, and silt from pit to the SE. **Value:** Recently used in making common brick. **Ref:** 47, p. 193-194; 55, p. 30.

FERRY COUNTY

63. **Name:** Republic. **Loc:** Pit 3 mi. W. of town. **Descr:** Yellowish-gray clay. **Value:** Formerly used in making a good grade of brick. **Ref:** 47, p. 87.

STEVENS COUNTY

64. **Name:** Orient. **Loc:** On property of Charles Rogers, probably in E½ sec. 23, (39-36E) on Orient hill road. **Descr:** Thick silt beds. **Value:** Mined years ago, shipped to a pottery near Spokane, and used as glaze on stoneware. **Ref:** 47, p. 299.
65. **Name:** Northport. **Loc:** Sec. 17, (39-40E). **Descr:** Silty glacial clay. **Value:** Used in making common brick about 1910. **Ref:** 47, p. 297-298; 116, p. 216.
- *66. **Name:** P. R. Fitzgerald. **Loc:** NE¼ sec. 15, (38-38E). **Descr:** Alluvial silty dark-blue clay. **Value:** Currently used for temporary seals in furnace openings. Formerly used as a slip clay. **Ref:** 47, p. 297; 55, p. 21; 64-A, p. 709; 106-G, p. 42; 116, p. 216-217.
- *67. **Name:** Spokane Portland Cement Co. **Loc:** Pit near Evans in sec. 15, (37-38E). **Descr:** Silty alluvial Pleistocene clay. **Value:** Recently used in the manufacture of portland cement. **Ref:** 47, p. 297; 53, p. 28.
- 67A. **Name:** Napoleon. **Loc:** Sec. 3, (37-37E). **Descr:** Shale. **Value:** Currently produced by Ideal Cement Co. for use in manufacture of portland cement. **Ref:** 2-A, p. 26.
68. **Name:** Kettle Falls. **Loc:** At old town of Kettle Falls. **Descr:** Silty glacial clay. **Value:** Used in making common brick about 1910. **Ref:** 47, p. 296; 116, p. 218-219.
69. **Name:** Colville. **Loc:** Formerly two brickyards at Colville, one a little E. and the other a little N. of town. **Descr:** Alluvial silty clay. **Value:** Used in making brick about 1910. **Ref:** 116, p. 210-211.
70. **Name:** Chewelah. **Loc:** At Chewelah. **Descr:** Pleistocene and recent silty alluvial clay. **Value:** Used in making common brick and drain tile about 1910. **Ref:** 47, p. 294; 116, p. 211.
71. **Name:** Clayton. **Loc:** Sec. 32, (30-42E). **Descr:** Horizontally stratified clays, possibly refractory. **Value:** Used in making flowerpots and other stoneware about 1910 by Spokane Pottery Co. **Ref:** 116, p. 207-210.

PEND OREILLE COUNTY

- *71A. **Name:** Metaline Falls. **Loc:** NE¼ sec. 27, (39-43E). **Descr:** Shale. **Value:** Currently used in the manufacture of portland cement by Lehigh Portland Cement Co. **Ref:** 106-G, p. 52.

SPOKANE COUNTY

- *72. **Name:** Building Supplies, Inc. **Loc:** Plant and pit at Mead in sec. 2, (26-43E). **Descr:** Stratified glacial clay. **Value:** Recently used in making common brick. Formerly used for same purpose by J. T. Davie Brick Co. **Ref:** 47, p. 279; 55, p. 18; 116, p. 174-175; 124-A, p. 44.
- *73. **Name:** Pioneer Brick Co. **Loc:** W. 2120 26th Ave., Spokane. **Descr:** Soft gray Latah shale. **Value:** Recently used in making common and rough-textured brick. Formerly used for same purpose by A. T. Dishman Brick Yard. **Ref:** 47, p. 270-271; 53, p. 26; 116, p. 169-172.

*73A. **Name:** Shelley Lake. **Loc:** Sec. 24, (25-44E). **Descr:** Clay. **Value:** Currently used in making portland cement by Ideal Cement Co., Spokane. **Ref:** 2-A, p. 26.

*74. **Name:** H. Seidel Clay Co., formerly Standard Stoneware Co., and prior to that Bergman Clay Manufacturing Co. **Loc:** SE¼ sec. 35, (25-44E). **Descr:** Latah clay from Sommer pit mixed with Palouse clay from Freeman. **Value:** Recently used in making flowerpots. **Ref:** 47, p. 253-256; 55, p. 31; 116, p. 175-181.

*75. **Name:** Gladding, McBean & Co. Formerly held by American Fire Brick Co. **Loc:** Plant and pits at Mica in sec. 23, (24-44E). **Descr:** In addition to the refractory-clay pits, there is a pit in Palouse clay. **Value:** The Palouse clay is used in making sewer pipe. **Ref:** 47, p. 249; 55, p. 22; 66-D, p. 22; 116, p. 182-188.

76. **Name:** Freeman. **Loc:** S. of railway at Freeman. **Descr:** Palouse clay. **Value:** Formerly used in making common brick by Washington Brick, Lime & Sewer Pipe Co. **Ref:** 47, p. 243; 116, p. 189-194.

77. **Name:** Cheney. **Loc:** Near Cheney. **Descr:** Palouse clay. **Value:** Formerly used in making common brick. **Ref:** 116, p. 194-196.

78. **Name:** Latah. **Loc:** W½ sec. 33, (21-45E). **Descr:** Alluvial clay underlying Palouse soil. **Value:** Formerly used in making common kinds of stoneware. **Ref:** 47, p. 236-237.

WHITMAN COUNTY

79. **Name:** Garfield. **Loc:** At Garfield. **Descr:** Palouse clay. **Value:** Formerly used in making common brick. **Ref:** 47, p. 329; 116, p. 226.
80. **Name:** Palouse. **Loc:** At Palouse. **Descr:** Palouse clay. **Value:** Formerly used in making common brick. **Ref:** 47, p. 329; 116, p. 222-225.
81. **Name:** Colfax. **Loc:** In Colfax. **Descr:** Local Palouse clay. **Value:** Formerly used in making common brick. **Ref:** 47, p. 329; 116, p. 225.
82. **Name:** Pullman. **Loc:** At Pullman. **Descr:** Palouse clay. **Value:** Used at various times in making common brick. **Ref:** 47, p. 329; 116, p. 225-226.
83. **Name:** Uniontown. **Loc:** At Uniontown. **Descr:** Palouse clay. **Value:** Recently used in the manufacture of common brick and drain tile by George Herboth Brick Co. **Ref:** 47, p. 329.

COLUMBIA COUNTY

84. **Name:** Dayton. **Loc:** At Dayton. **Descr:** Palouse clay. **Value:** Brickyard formerly used this material. **Ref:** 47, p. 73; 116, p. 227.

WALLA WALLA COUNTY

85. **Name:** Walla Walla. **Loc:** At Walla Walla. **Descr:** Recent alluvium in Walla Walla River valley. **Value:** A good grade of brick and tile formerly made from this material at brick plant near the site. **Ref:** 47, p. 306.

REFRACTORY AND SEMIREFRACTORY CLAYS AND SHALES, AND SPECIAL CLAYS

Refractory clays and shales are those which fuse above pyrometric cone 12. For low-heat duty, the softening point of a clay must be between cones 12 and 19 (about 1335° to 1520° C.); for intermediate-heat duty, between cones 19 and 26 (1520° to 1595° C.); for high-heat duty, between cones 26 and 31 (1595° to 1680° C.); and for superduty, above cone 33 (1745° C.). Factors other than fusion temperature which determine the adaptability of clay to refractory use are resistance to load, abrasion, slagging action, chemical attack, and thermal shock, all under conditions of high temperature.

Refractory clays and shales contain as much as 39 percent alumina, hence constitute potential sources of aluminum. Aluminum has been extracted from clay but not yet at a cost low enough to constitute strong competition with bauxite.

Deposits of refractory clays and shales occur near centers of industry in both eastern and western Washington. Several are being worked, and others will be as the demand increases.

In 1953 the average value of fire clay sold on the open market was \$3.68 per short ton. China clay, f. o. b. mines in South Carolina, Pennsylvania, and Georgia sold for \$5.00 to \$22.50 per ton in June 1956.

Bentonite is a clay largely composed of the mineral montmorillonite, the composition of which is approximately $5\text{Al}_2\text{O}_3 \cdot 2\text{MgO} \cdot 24\text{SiO}_2 \cdot 6\text{H}_2\text{O} (\text{Na}_2\text{O}, \text{CaO})$. It is generally considered to have formed by the alteration of volcanic ash or tuff.

Its uses depend principally on the peculiar property exhibited by most bentonite of swelling when immersed in water. Among its uses are: as a drilling mud in gas or oil wells; in bleaching and filtering fats, greases, and oils; in special waterproofing compounds; in oil refining; as a filler in paper and soap; as a deinking agent; as a binder in molding sand; as an ad-

hesive preventative in steel rolling; and as a suspending agent in ceramic glazes and enamels.

One deposit in Washington appears to have the requisite qualities of a commercial deposit and is currently under development.

Prices of bentonite in 1951 were: dried and crushed in bulk, \$9.00; pulverized, 200-mesh, bagged, \$12.50; and oil-well grade, \$14.00 per short ton.

Fuller's earth is a clay with the peculiar property of being able to decolorize or bleach fats and oils. Such clays are known also as active clays. Some clays which are not active in their natural condition may be treated with acid and rendered so. These clays are usually bentonitic, though not all bentonites are active. They consist principally of the mineral montmorillonite and are probably formed by the alteration of volcanic ash and tuff.

Only two Washington occurrences are included here. These are reported occurrences without verification but have been listed so that they might be considered in any future tests of Washington clays for absorption characteristics. In addition, it is quite possible that other deposits may be found, since volcanic ash and tuff beds are common in parts of the state.

Work done as a thesis problem at the Department of Geology, University of Washington, indicates that glacial clays of the Puget Sound region have fuller's earth possibilities.

In December 1953, fuller's earth sold for \$11.50 to \$21.75 per ton.

The Washington occurrences of refractory and semi-refractory clays and shales, and special clays that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

OCCURRENCES

On page 21 in volume 2 is plate 8, the map showing the occurrences of refractory and semifractory clays and shales, and special clays. These are numbered to correspond with the numbers of the occurrences listed below.

REFRACTORY CLAYS AND SHALES

WHATCOM COUNTY

1. **Name:** Denny-Renton clay mine. **Loc:** 3 mi. SE. of Sumas in SE $\frac{1}{4}$ sec. 12, (40-4E). **Descr:** Refractory shales. **Value:** Worked extensively in the past; now nearly worked out. **Ref:** 47, p. 311; 49-B; 116, p. 286-288; 123-C; 144-A, p. 65-67, 99-104, 119, 123-125.
- *2. **Name:** Sumas clay mine. **Loc:** S $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 7, (40-5E). **Descr:** Refractory shales. **Value:** Recently mined by Gladding, McBean & Co. **Ref:**

47, p. 312, 317; 49-B; 55, p. 22; 64-A, p. 769-777; 66-B, p. 23; 71-A, p. 48; 123-C.

3. **Name:** Smith. **Loc:** On Smith place in N. center sec. 7, (40-5E). **Descr:** Refractory shale. **Value:** Probably commercial. **Ref:** 47, p. 315, 316; 48, p. 22; 144-A, p. 134.
4. **Name:** Post. **Loc:** NW $\frac{1}{4}$ and SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (40-5E). **Descr:** Refractory shales of Sumas series. **Value:** Warrants investigation. **Ref:** 47, p. 311.
5. **Name:** Nicolay Spur. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ and SW $\frac{1}{4}$ sec. 18, (40-5E). **Descr:** Refractory shales of Sumas series. **Value:** Warrants investigation. **Ref:** 47, p. 312.

KING COUNTY

- *6. **Name:** Harris clay mine. **Loc:** S $\frac{1}{2}$ S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 32, (24-6E). **Descr:** Refractory shale. **Value:** Cur-

- rently mined by Gladding, McBean & Co. **Ref:** 47, p. 120; 48, p. 18; 55, p. 22; 64-A, p. 761-769; 66-D, p. 21; 71-A, p. 30; 95-A, p. 2, 15, 23; 123-C.
- 6A. **Name:** Issaquah clay pit. **Loc:** S½SE¼NW¼ sec. 33, (24-6E). **Descr:** Tough plastic light-firing clay. **Value:** Formerly mined by Gladding, McBean & Co. **Ref:** 47, p. 120; 123-B.
- 6B. **Name:** Squak Mountain. **Loc:** Sec. 33, (24-6E). **Descr:** High-alumina clay. **Value:** Unknown. **Ref:** 95-A, p. 15; 123-C.
- *7. **Name:** Taylor clay mine. **Loc:** NW¼ sec. 3, (22-7E). **Descr:** Refractory clay. **Value:** Recently mined by Gladding, McBean & Co. **Ref:** 47, p. 125; 55, p. 22; 64-A, p. 777-784; 77, p. 14; 116, p. 263-268; 123-C; 144-A, p. 118; 147, p. 98-100.
8. **Name:** Kangley. **Loc:** SW¼SE¼ sec. 26, (22-7E). **Descr:** Two beds of high-alumina claystone. The upper is more than 8 ft. thick, the lower, 5½ ft. thick. **Value:** Claystone of commercial quality and quantity could be obtained by underground mining. **Ref:** 71-A, p. 30; 95-A, p. 2, 11, 13, 27; 106; 123-C.
9. **Name:** Durham. **Loc:** E½SE¼ sec. 35 and sec. 36, (22-7E) and W½ sec. 1 and E½NE¼ sec. 2, (21-7E). **Descr:** High-alumina shale. **Value:** Commercial quantity and quality. **Ref:** 47, p. 134, 334; 71-A, p. 30; 95-A, p. 2, 12, 26; 106; 123-C; 144-A, p. 132.
- *10. **Name:** Alcorn. **Loc:** Sec. 20, (21-6E). **Descr:** Refractory clay, possibly an extension of Kummer bed. **Value:** Recently worked by Alcorn Bros. **Ref:** 55, p. 16; 66-B, p. 18.
- 10A. **Name:** Black Diamond. **Loc:** Sec. 13, (21-6E). **Descr:** Fire clay. **Value:** Unknown. **Ref:** 35-B, p. 10; 123-C.
11. **Name:** Diamond Mineral Spring. **Loc:** SW¼ sec. 21, (21-6E). **Descr:** Semirefractory clay of the Hammer Bluff formation. **Value:** Warrants investigation. **Ref:** 47, p. 141-142; 144-A, p. 196.
12. **Name:** Kummer. **Loc:** W½NE¼ sec. 26, (21-6E) on N. side Green River. **Descr:** Hard gray high-alumina claystone (flint clay). **Value:** Formerly mined. **Ref:** 47, p. 128-133, 344-345; 49-B; 64-A, p. 747-761; 77, p. 14-17; 95-A, p. 2, 4, 15; 106; 116, p. 255-263, 318-319; 123-B; 144-A, p. 16, 34, 62-65, 96-97, 102-104, 118-119, 123-125, 131.
- *13. **Name:** Johnson Coal Co. **Loc:** NE¼ sec. 26, (21-6E), near Johnson Coal Co. mine on S. side Green River. **Descr:** Extension of Kummer flint clay. **Value:** Currently mined by J. G. Adderson, Seattle, and used by Gladding, McBean & Co. **Ref:** 47, p. 130, 131; 66-D, p. 17; 71-A, p. 30.
14. **Name:** Kummer S. Tunnel. **Loc:** NE¼NE¼ sec. 26, (21-6E) near old No. 1 S. tunnel. **Descr:** Erosional remnant of Hammer Bluff formation. **Value:** Warrants investigation. **Ref:** 47, p. 132, 150; 144-A, p. 131.
- *15. **Name:** Green River (A). **Loc:** NE¼ sec. 27, (21-6E). **Descr:** Refractory shale, extension of Kummer bed. **Value:** Currently mined by J. G. Adderson. **Ref:** 2-A, p. 19; 47, p. 150.
16. **Name:** Green River (B). **Loc:** N½ sec. 27, (21-6E). **Descr:** Semirefractory clay of Hammer Bluff formation. **Value:** Formerly mined by Alcorn Bros. **Ref:** 47, p. 149.
17. **Name:** Shorey. **Loc:** SE¼ sec. 27, (21-6E). **Descr:** Semirefractory clay of Hammer Bluff formation. **Value:** Warrants investigation. **Ref:** 47, p. 148; 144-A, p. 118.
- *18. **Name:** Auburn clay pit. **Loc:** SE¼ sec. 28, (21-6E). **Descr:** Semirefractory clay of Hammer Bluff formation. **Value:** Recently mined by Gladding, McBean & Co. **Ref:** 47, p. 138-140; 55, p. 22; 71-A, p. 30; 144-A, p. 106-107.
- *19. **Name:** Smith Bros. (Hammer Bluff). **Loc:** NE¼ sec. 28, (21-6E). **Descr:** Sandy semirefractory clay of Hammer Bluff formation and underlying Puget series. Both sand and clay recovered. **Value:** Currently operated by Smith Bros. Silica Sand Co. **Ref:** 47, p. 144-147; 55, p. 32; 144-A, p. 96, 117.
20. **Name:** Brooks. **Loc:** NE¼ sec. 28, (21-6E). **Descr:** Sandy semirefractory clay of Hammer Bluff formation. **Value:** Formerly mined. **Ref:** 47, p. 142-144; 144-A, p. 118, 196.
21. **Name:** Kanasket. **Loc:** Sec. 12, (21-7E). **Descr:** High-alumina clay. **Value:** Warrants investigation. **Ref:** 71-A, p. 30; 95-A, p. 2, 12, 26; 106; 123-C.
- *22. **Name:** Green River (C) (Palmer). **Loc:** NW¼ sec. 14, (21-7E). **Descr:** Erosional remnant of Hammer Bluff formation. **Value:** Currently mined by Gladding, McBean & Co. **Ref:** 47, p. 150; 66-D, p. 21; 71-A, p. 30.
- *23. **Name:** Blum. **Loc:** NW¼ sec. 31, (21-7E) and SE¼NE¼ sec. 36, (21-6E). **Descr:** Hard gray claystone 7 to 14 ft. thick. **Value:** Currently operated by Gladding, McBean & Co. **Ref:** 71-A, p. 30; 95-A, p. 2, 13, 27; 106; 123-C.

PIERCE COUNTY

24. **Name:** La Grande. **Loc:** In cuts and pits along C. M. St. P. & P. R.R., ½ mi. N. of La Grande in sec. 28, (16-4E). **Descr:** Refractory clay exposed to depth of 12 ft. over an area 150 by 100 ft. **Value:** Mined years ago by Denny-Renton Clay & Coal Co. **Ref:** 47, p. 206-207, 339, 348-349; 116, p. 274-275; 123-C; 144-A, p. 84, 97-98, 102-104.

LEWIS COUNTY

25. **Name:** Ladd mine. **Loc:** At Ladd mine in sec. 12, (14-4E). **Descr:** Refractory shale reportedly underlies coal seam. **Value:** Unknown. **Ref:** 47, p. 179; 144-A, p. 101.
26. **Name:** Cowlitz River. **Loc:** On W. bank Cowlitz River in NW¼SW¼ sec. 24, (11-2W). **Descr:** Refractory clay with weak siliceous body. **Value:**

Might be usable if mixed with more plastic clays.
Ref: 47, p. 169-170; 144-A, p. 137.

27. **Name:** Buswell. **Loc:** On Buswell farm in NW $\frac{1}{4}$ sec. 25, (11-2W). **Descr:** Soft plastic clay usable for buff structural ware and possibly terra cotta. **Value:** Warrants investigation. **Ref:** 47, p. 170-172, 184-185, 338; 106-E, p. 23; 116, p. 294-296; 123-C; 144-A, p. 100-104, 120-121, 123-125, 137, 146-148.

- 27A. **Name:** Salmon Creek (Toledo). **Loc:** Sec. 15, (11-1E). **Descr:** Clays associated with lignite are similar to those at Cowlitz deposit near Castle Rock (see no. 28 below). **Value:** Unknown. **Ref:** 71-A, p. 35; 123-C.

COWLITZ COUNTY

- 27B. **Name:** Taylor Bros. **Loc:** Sec. 1, (10-1W). **Descr:** High-alumina clay. **Value:** Unknown. **Ref:** 123-C.

- 27C. **Name:** Spirit Lake Road clay. **Loc:** Sec. 14, (10-1E). **Descr:** Ferruginous clay. **Value:** Unknown. **Ref:** 123-C.

- 27D. **Name:** Washout Hill clay. **Loc:** Secs. 29 and 30, (10-1E). **Descr:** High-alumina clay. **Value:** Unknown. **Ref:** 123-C.

28. **Name:** Cowlitz. **Loc:** Several areas in secs. 7, 16, 17, 18, 19, and 20, (10-1W) and sec. 24, (10-2W). **Descr:** An estimated 11,000,000 tons of intermediate-heat-duty and some high-heat-duty clay. **Value:** Commercial. Gladding, McBean & Co. has removed more than 150,000 tons from two pits in secs. 17, 18, and 20, (10-1W). Columbia Metals Corp. shipped 14,000 tons from sec. 18 to an alumina-from-clay plant for experimental tests. **Ref:** A; 47, p. 81-83, 336, 342-343; 55, p. 22; 64-A, p. 784-794; 71; 71-A, p. 29; 95; 106-E; 123-A, p. 15-22; 123-C; 152.

CLARK COUNTY

29. **Name:** Boardman. **Loc:** S $\frac{1}{2}$ sec. 16, (5-4E). **Descr:** Red and gray high-alumina claystone. **Value:** Warrants investigation. Gray clay has cone fusion of 34-35; red clay, less than cone 30. **Ref:** 135.

- 29A. **Name:** Fly Creek. **Loc:** Sec. 16, (5-4E). **Descr:** Clay has Al_2O_3 content of 30 to 32 percent and Fe_2O_3 content of 12 to 14 percent. **Value:** Unknown. **Ref:** 71-A, p. 28.

SKAMANIA COUNTY

- 29B. **Name:** Kocher. **Loc:** NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (3-7E), 3 $\frac{1}{2}$ mi. NE. of Stevenson, on C. G. Kocher property. **Descr:** Light-colored clay containing 5 to 10 percent Fe_2O_3 . **Value:** Unknown. **Ref:** 71-A, p. 39.

Klickitat County

30. **Name:** F. B. Roberts. **Loc:** Sec. 5, (4-12E). **Descr:** High-alumina clay. **Value:** Should be investigated. **Ref:** 135.

CHELAN COUNTY

31. **Name:** Squaw Saddle. **Loc:** W. center sec. 16, (22-20E). **Descr:** High-alumina clay. **Value:** Doubtful refractory value. **Ref:** 66, p. 51.
32. **Name:** Dry Gulch. **Loc:** NE $\frac{1}{4}$ sec. 21, (22-20E). **Descr:** Two beds of high-alumina shale. **Value:** Warrants investigation. **Ref:** 64-A, p. 693; 66, p. 50; 71-A, p. 26; 123-C.
33. **Name:** N. W. L. Brown. **Loc:** Secs. 22 and 23, (22-20E). **Descr:** Refractory shales. Several tunnels. **Value:** Warrants investigation. **Ref:** 47, p. 62, 336, 342-343; 64-A, p. 706-708; 66, p. 50; 123-C.
34. **Name:** Stemilt Canyon. **Loc:** E $\frac{1}{2}$ E $\frac{1}{2}$ sec. 11, (21-20E). **Descr:** Claystone bed in Swauk formation. **Value:** Warrants investigation. Has cone fusion as high as 35. **Ref:** 66, p. 51; 123-C; 135.

DOUGLAS COUNTY

35. **Name:** Wenatchee clay mine. **Loc:** Secs. 23 and 26, (23-20E). **Descr:** Refractory shale. **Value:** Formerly operated by Gladding, McBean & Co. **Ref:** 47, p. 85-87, 336; 55, p. 22; 64-A, p. 693-706; 123-C.

STEVENS COUNTY

36. **Name:** Valley. **Loc:** Reported in NW $\frac{1}{4}$ sec. 20, (31-41E). **Descr:** Said to be high-grade clay. **Value:** Unknown. **Ref:** 47, p. 293-294; 71-A, p. 47; 116, p. 211-212, 320-321; 117, p. 126; 123-C.
37. **Name:** Kulzer. **Loc:** NW $\frac{1}{4}$ sec. 30, (31-41E). **Descr:** Semirefractory clay. **Value:** Usable for buff structural ware if high shrinkage is reduced. **Ref:** 47, p. 292, 293; 123-C; 144-A, p. 117, 123-125.
38. **Name:** Jumpoff Creek. **Loc:** Reported in N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 31, (31-41E). **Descr:** High-alumina clay. **Value:** Not known. **Ref:** 135.
- *39. **Name:** A. B. pit. **Loc:** NW $\frac{1}{4}$ sec. 32, (30-42E). **Descr:** Refractory clay. **Value:** Currently operated by Washington Brick & Lime Co. **Ref:** 47, p. 287-289; 53, p. 30; 66-D, p. 33; 71-A, p. 43; 144-A, p. 106, 194.
40. **Name:** Neafus pit. **Loc:** SW $\frac{1}{4}$ sec. 34, (30-42E). **Descr:** Refractory clay. **Value:** Has been mined. **Ref:** 47, p. 290-291, 340, 350-351; 64-A, p. 605-606; 144-A, p. 116, 123-125.
- *41. **Name:** Clayton. **Loc:** Sec. 19, (29-42E). **Descr:** Refractory and semirefractory clay. **Value:** Currently operated by Washington Brick & Lime Co. **Ref:** 47, p. 282-287, 340, 350-351; 49-B; 55, p. 35; 64-A, p. 590-594; 66-D, p. 33; 71-A, p. 43; 116, p. 199-207, 320-321; 123-C; 144-A, p. 65, 70-71, 96, 102-103.
- *41A. **Name:** Carpenter. **Loc:** NW $\frac{1}{4}$ sec. 35, (29-41E), W. of Clayton. **Descr:** Presumably refractory clay. **Value:** Recently operated by W. H. Carpenter, Clayton. **Ref:** 66-C, p. 19; 123-C.

SPOKANE COUNTY

42. **Name:** Conner pit. **Loc:** NE $\frac{1}{4}$ sec. 4, (29-42E). **Descr:** Refractory clay. **Value:** Formerly mined. **Ref:** 47, p. 264, 265; 144-A, p. 106.

- *42A. **Name:** Olson pit. **Loc:** NW $\frac{1}{4}$ sec. 4, (29-42E). **Descr:** Apparently large reserves of buff-firing, plastic refractory clays. **Value:** Recently operated by Washington Brick & Lime Co. **Ref:** 2-A, p. 37; 66-D, p. 33; 71-A, p. 43.
- 42B. **Name:** Deer Park. **Loc:** Near Deer Park. **Descr:** High-alumina clay. **Value:** Warrants investigation. **Ref:** 116, p. 196-197; 123-C.
43. **Name:** Milan. **Loc:** N. center sec. 2, (28-43E). **Descr:** Refractory clay exposed by small landslide. **Value:** Warrants investigation. **Ref:** 47, p. 262-264, 340; 123-C; 144-A, p. 95-96, 102-104, 116, 123-125.
44. **Name:** Fuher prospect. **Loc:** E $\frac{1}{2}$ sec. 28, (27-44E). **Descr:** Semirefractory clay. **Value:** Suitable for intermediate-heat-duty refractories. **Ref:** 47, p. 258, 259; 144-A, p. 114-115.
45. **Name:** Deadman Creek. **Loc:** $\frac{1}{4}$ mi. W. of Fuher prospect. **Descr:** Refractory clay exposed by pit. **Value:** Suitable for high-heat-duty refractories. **Ref:** 47, p. 258-260, 340, 350-351; 123-C; 144-A, p. 114-115, 123-125.
- *45A. **Name:** Noyd. **Loc:** Sec. 27, (27-44E). **Descr:** Presumably refractory clay. **Value:** Recently operated by Washington Brick & Lime Co. **Ref:** 106-F, p. 58.
46. **Name:** Bigelow Gulch. **Loc:** Head of Bigelow Gulch in sec. 25, (26-43E). **Descr:** Refractory clays more than 15 ft. thick and mantled by 5 to 6 ft. of soil. **Value:** Large deposit, covering an area of 50 to 100 acres. **Ref:** 47, p. 257; 123-C.
47. **Name:** Skattum. **Loc:** S $\frac{1}{2}$ sec. 11, (26-44E). **Descr:** Semirefractory clay. **Value:** Suitable for intermediate-heat-duty refractories. **Ref:** 47, p. 257, 340, 350-351; 123-C; 144-A, p. 114, 123-125.
48. **Name:** Fitzgerald. **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (26-44E). **Descr:** Semirefractory Latah clay. **Value:** well. **Value:** Warrants investigation. **Ref:** 47, p. 258; 144-A, p. 114.
- 48A. **Name:** Fivemile Prairie. **Loc:** Secs. 22, 25, and 26, (26-42E). **Descr:** Of 28 samples tested, only 2 were of refractory clay. **Value:** Doubtful. **Ref:** 71-A, p. 43; 120-A.
- *49. **Name:** Sommer pit. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (25-44E). **Descr:** Semirefractory Latah clay. **Value:** Currently mined by A. M. Sommer. **Ref:** 47, p. 253-255, 340, 350-351; 55, p. 32; 64-A, p. 594-601; 66-D, p. 31; 71-A, p. 42; 116, p. 175-181; 123-C; 144-A, p. 71-72, 91, 102-104, 106, 109-110.
- *50. **Name:** Pirello (Tiano) pit. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (25-44E). **Descr:** Semirefractory Latah clay. **Value:** Currently mined by Pirello Bros. **Ref:** 47, p. 255; 55, p. 30; 66-D, p. 29; 144-A, p. 193-194.
- 50A. **Name:** Connor pit. **Loc:** NW $\frac{1}{4}$ sec. 4, (24-42E). **Descr:** Refractory clay. **Value:** Has been used. **Ref:** 71-A, p. 42.
51. **Name:** Moran Prairie. **Loc:** SW $\frac{1}{4}$ sec. 10, (24-43E). **Descr:** Semirefractory clay. **Value:** Has been used. **Ref:** 47, p. 252.
52. **Name:** Barnhart. **Loc:** Reported in W $\frac{1}{2}$ sec. 13, (24-44E). **Descr:** Refractory clay. **Value:** Unknown, but warrants investigation. **Ref:** 64-A, p. 525; 147, p. 42.
53. **Name:** Conlan pit. **Loc:** NE $\frac{1}{4}$ sec. 15, (24-44E). **Descr:** Refractory clay. **Value:** Has been used. **Ref:** 64-A, p. 519; 147, p. 55.
- 53A. **Name:** Redlin Siding. **Loc:** NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (24-44E), in railroad cut. **Descr:** White clay, iron stained in part. **Value:** Possibly usable for production of aluminum. **Ref:** 64-A, p. 521.
54. **Name:** California Creek. **Loc:** W $\frac{1}{2}$ sec. 23, (24-44E). **Descr:** Refractory clay exposed in railway cut. **Value:** Warrants investigation. **Ref:** 64-A, p. 518-519; 147, p. 55.
- *55. **Name:** Mica (A). **Loc:** SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, (24-44E). **Descr:** Refractory clay. **Value:** Currently mined by Gladding, McBean & Co. for refractory use. **Ref:** 47, p. 251-252, 340, 348-349; 55, p. 35; 64-A, p. 566-570; 66-D, p. 33; 116, p. 181-188; 144-A, p. 18, 94-95, 102-103.
- *56. **Name:** Mica (B). **Loc:** Center N $\frac{1}{2}$ sec. 23, (24-44E). **Descr:** Refractory clay. **Value:** Currently mined by Gladding, McBean & Co. for refractory use. **Ref:** 47, p. 244-251, 340, 348-349; 55, p. 22; 64-A, p. 526-566; 66-D, p. 22; 116, p. 181-188; 144-A, p. 18, 94-95, 102-103.
- *56A. **Name:** Mason pit. **Loc:** SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, (24-44E), W. of Mica. **Descr:** Refractory clay. **Value:** Recently operated by Washington Brick & Lime Co. **Ref:** 66-D, p. 33.
- 56B. **Name:** Saltese Creek. **Loc:** S $\frac{1}{2}$ sec. 4, (24-45E). **Descr:** White clay. Probably refractory. **Value:** Warrants investigation. **Ref:** 47, p. 256; 123-C.
57. **Name:** Excelsior-Valley Ford area. **Loc:** Area around Excelsior and Valley Ford. **Descr:** 3,000-000 tons of intermediate-heat-duty clay ascertained by drilling. **Value:** Interbeds of nonrefractory clay make mining to grade difficult. **Ref:** 71; 71-A, p. 42; 114-A; 120-A, p. 37-39, 51, 53; 152.
58. **Name:** Wellsandt. **Loc:** E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 23, (23-41E). **Descr:** Clay, probably refractory, encountered in well. **Value:** Warrants investigation. **Ref:** 47, p. 253; 64-A, p. 607; 123-C.
- *59. **Name:** Freeman. **Loc:** Sec. 1, (23-44E). **Descr:** Clay used for refractories; some suitable for chinaware. **Value:** Recently operated by Washington Brick & Lime Co. **Ref:** 47, p. 241-244; 49-B; 55, p. 35; 64-A, p. 570-590; 66-D, p. 33; 71-A, p. 40; 116, p. 320-321; 123-C; 144-A, p. 61, 65, 67-69, 93-94, 102-108, 113-114, 123-125; 147, p. 42-46.
60. **Name:** Nessley. **Loc:** Reported just W. of post office in Freeman. **Descr:** Refractory clay. **Value:**

Warrants investigation. **Ref:** 64-A, p. 601-602; 147, p. 55.

- 60A. **Name:** Mica Creek. **Loc:** Sec. 3, (23-45E) or sec. 34, (24-45E). **Descr:** White clay. **Value:** Unknown. **Ref:** 64-A, p. 603; 123-C.
61. **Name:** Thompson. **Loc:** Reported in E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 5, (23-45E). **Descr:** Refractory clay. **Value:** Warrants investigation. **Ref:** 64-A, p. 602; 123-C; 147, p. 56.
62. **Name:** Lockwood. **Loc:** Sec. 8, (23-45E). **Descr:** Refractory clay exposed in railway cuts. **Value:** Warrants investigation. **Ref:** 64-A, p. 602; 123-C; 144-A, p. 113, 123-125; 147, p. 56.
63. **Name:** Manito Station. **Loc:** NW $\frac{1}{4}$ sec. 9, (23-45E). **Descr:** Refractory clay exposed in railway cuts. **Value:** Suitable for whiteware. **Ref:** 47, p. 239; 64-A, p. 525-526; 123-C; 147, p. 57-58.
64. **Name:** Murphy Creek. **Loc:** Near W. center sec. 18, (23-46E). **Descr:** Altered feldspathic dike of refractory clay. **Value:** Some suitable for refractory ware. **Ref:** 47, p. 237-239; 123-C; 144-A, p. 94, 102-104.
65. **Name:** Fairfield. **Loc:** NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (22-45E). **Descr:** Semirefractory clay exposed in road cut. **Value:** Warrants investigation. **Ref:** 47, p. 237; 144-A, p. 129.
66. **Name:** Latah. **Loc:** W $\frac{1}{2}$ sec. 33, (21-45E). **Descr:** Large body of semirefractory clay. **Value:** Formerly used for pottery. **Ref:** 47, p. 236; 144-A, p. 113.

WHITMAN COUNTY

67. **Name:** Cox pit. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, (16-46E). **Descr:** Refractory clay. **Value:** Formerly mined. **Ref:** 47, p. 321-325; 144-A, p. 112-113, 192-193.
- 67A. **Name:** Palouse. **Loc:** Near town of Palouse. **Descr:** White clay, probably refractory. **Value:** Unknown. **Ref:** 47, p. 325-326.
68. **Name:** Ringo. **Loc:** Reported in secs. 17 and 18, (16-46E). **Descr:** Clay, probably refractory, exposed in pit 100 by 200 ft. **Value:** Quantity and quality unknown. **Ref:** 96, p. 1.

SPECIAL CLAYS

Bentonite

WHATCOM COUNTY

- 68A. **Name:** Lookout Mountain. **Loc:** 1 mi. E. of U. S. 99. Said to be in W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 11, (37-3E). **Descr:** A bed of impure bentonite of the nonswelling variety is reported to average 7 ft. in thickness and to be traceable for 1 mi. **Value:** Warrants investigation. Owner is Wm. G. Bezona of Fern-dale. **Ref:** 135.

CHELAN COUNTY

- 68B. **Name:** Stemilt Creek. **Loc:** E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 31, (22-21E). **Descr:** Bentonitic clay is exposed in a bed

35 ft. thick for a length of at least 500 ft. in an area of landsliding. Clay has considerable amount of admixed basalt rubble and quartzite pebbles. **Value:** Warrants investigation. **Ref:** 135.

PIERCE COUNTY

- 68C. **Name:** Divide. **Loc:** Center sec. 14, (19-8E). **Descr:** Road cuts expose 4 beds of bentonite totaling 4 $\frac{1}{2}$ ft. in thickness but interstratified with perlite beds 7 ft. in total thickness. **Value:** Might be recovered as a byproduct in perlite recovery. **Ref:** 135.

KITTITAS COUNTY

69. **Name:** Yakima River. **Loc:** Reportedly from head of Yakima River. **Descr:** Size and extent of deposit unknown. Sample sent to the Division of Mines and Geology is good bentonite contaminated somewhat by silt. **Value:** Verification desirable. **Ref:** 135.

YAKIMA COUNTY

- *70. **Name:** Tieton. **Loc:** E $\frac{1}{2}$ sec. 7, (13-14E). **Descr:** Derived from alteration of volcanics. Determination of thickness and extent is complicated by landslides. **Value:** Currently under production by Calco Industrial Minerals, Seattle. **Ref:** 2-A, p. 21; 53, p. 23; 93-A, p. 18; 123-C, p. 17.
- 70A. **Name:** Hutchinson. **Loc:** Said to be above the Tieton occurrence. **Descr:** Samples examined by the Division of Mines and Geology are of high quality. Size of deposit not known. **Value:** Warrants investigation. **Ref:** 135.
- 70B. **Name:** Russell Ridge. **Loc:** On S. side of Russell Ridge in vicinity of Muddy and Andy Creeks, in or near sec. 6, (13-13E). **Descr:** High-grade bentonite reported. **Value:** Unknown. **Ref:** 135.
71. **Name:** Granger. **Loc:** At Granger Clay Products Co. pit in SW $\frac{1}{4}$ sec. 22, (10-21E). **Descr:** A 2-ft. bed of impure bentonite. **Value:** Noncommercial quantity. **Ref:** 47, p. 333; 144-A, p. 177.

Fuller's Earth

KITTITAS COUNTY

72. **Name:** East Roza. **Loc:** At East Roza in sec. 14, (15-19E). **Descr:** 4-ft. bed of clay underlying basalt and overlying diatomite. **Value:** Tests on the clay indicate that it has the properties of fuller's earth. Other clays associated with diatomite may have properties of fuller's earth. **Ref:** 48, p. 45.

OKANOGAN COUNTY

73. **Name:** Oroville. **Loc:** Vicinity of Oroville. **Descr:** Silts reported to have absorbent qualities of fuller's earth. **Value:** Warrants investigation. **Ref:** 48, p. 45.

Nontronite

SPOKANE COUNTY

74. **Name:** Excelsior. **Loc:** NE $\frac{1}{4}$ sec. 8, (23-45E) and SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (24-44E). **Descr:** Veins of non-

tronite associated with weathered pillow lava. **Value:** Unknown. **Ref:** B, p. 294-312.

75. **Name:** Spokane. **Loc:** About 17 mi. SE. of Spokane, in SW $\frac{1}{4}$ sec. 5, (23-45E). **Descr:** Clear yellowish-green nontronite. **Value:** Unknown. **Ref:** B, p. 294-312.

WHITMAN COUNTY

76. **Name:** Colfax. **Loc:** In road cut N. of Colfax, in SE $\frac{1}{4}$ sec. 35, (17-43E). **Descr:** Veins of nontronite associated with weathered basalt. **Value:** Unknown. **Ref:** B, p. 294-312.
77. **Name:** Garfield. **Loc:** In road cut 1 mi. S. of Garfield, in sec. 4, (17-45E). **Descr:** Veins of nontronite 1 to 6 in. wide associated with weathered basalt. **Value:** Unknown. **Ref:** B, p. 294-312.

Expanding Clays and Shales

KING COUNTY

- *78. **Name:** Northwest Haydite. **Loc:** Near Woodinville, in sec. 9, (26-5E). **Descr:** Blue glacial clay. **Value:** Recently used in the manufacture of haydite and formerly used by the Bothell Brick & Tile Co. in making tile and common brick. **Ref:** 47, p. 158; 52, p. 25.
79. **Name:** Cedar Mountain. **Loc:** SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, (23-6E). **Descr:** Clay reported to have satisfactory bloating characteristics. **Value:** Currently being explored by Hecla Mining Co. **Ref:** 135.

SPOKANE COUNTY

- *80. **Name:** Norlite. **Loc:** NE $\frac{1}{4}$ sec. 10, (28-43E). **Descr:** Latah shale. **Value:** Currently operated by Norlite Products Co., Spokane, for making expanded shale aggregate. **Ref:** 93-A, p. 26.

COAL AND COKE

Coal is carbonaceous sedimentary rock formed from the remains of vegetal matter by partial decomposition. The American Society for Testing Materials groups coal in four major classes. From highest to lowest they are: anthracitic, bituminous, subbituminous, and lignitic. Each class is subdivided into ranks—anthracitic into three, bituminous into five, subbituminous into three, and lignitic into two. Coals of higher rank than high-volatile bituminous are classified according to percentage of fixed carbon on the dry, mineral-matter-free basis. Coals of lower rank are classified by calorific value on the moist, mineral-matter-free basis. (**Ref:** 94, p. 31-135.) Commercial deposits of each of the four main classes of coal occur in Washington, though only coal of bituminous and subbituminous classes is being produced.

Some coals when heated under conditions of deficient oxygen yield a hard vesicular residue known as coke, and coal capable of yielding the residue is called coking coal. Coke is used primarily by the metallurgical industry for blast furnace and foundry use. Other uses are in raising steam and in the manufacture of water gas. The principle area of Washington coking coal is the Wilkeson-Carbonado field of Pierce County. Coals from

Skagit, King, and Lewis Counties have also been coked but have not produced as satisfactory a product as those from Pierce County. Coal from the Roslyn field of Kittitas County has been coked experimentally. No coke is being produced in Washington at the present time; though it was produced from 1884 to 1937 and for a short time in 1944.

The average price per ton in 1954 of coal from all Washington mines and for all ranks and grades was \$6.71 f. o. b. mine. The average price per ton of coke at the ovens in 1937 was \$6.00.

Mines listed under the known fields are those of which there is a record of production. Some properties have been known by several other names, but no attempt has been made to include all names by which a property has been known. Occurrences outside of the known fields are for the most part of no commercial importance; they have been included because of scientific or local interest and because they may serve as guides to discovery of usable deposits. Numbers 1 to 27 refer to coal fields, and the numbers in parentheses refer to mines within these fields. Numbers 28 to 61 refer to occurrences outside of the known fields.

OCCURRENCES

On page 23 in volume 2 is plate 9, the map showing the occurrences of coal, numbered to correspond with the numbers of the occurrences listed below.

WHATCOM COUNTY FIELDS

I. BELLINGHAM FIELD

A. Mines in operation as recently as 1948-1957:

- (1) Bellingham Coal Mines Co., Bellingham, Wash., operated the Bellingham mine in secs. 13 and 24, (38-2E).

B. Mines with a record of production prior to 1948:

- (1) Whatcom Creek mine in SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, (38-3E).
 (2) Bellingham Bay mine in sec. 31, (38-3E).
 (3) Geneva mine in NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (38-3E).

- (2) West Coast Coal Mines, Inc., Route 4, Box 420, Bellingham, Wash., operated the Glen Echo mine in sec. 5, (38-4E).

- (3) Goshen Coal Mines Co. operated the Goshen mine in SW $\frac{1}{4}$ sec. 19, (39-4E).

- (4) Rocky Ridge mine in SW $\frac{1}{4}$ sec. 31, (38-4E).
- (5) Van Zandt mine in sec. 17, (38-5E).
- (6) Manley's Camp mine in SE $\frac{1}{4}$ sec. 12, (37-3E).
- (7) Blue Canyon Coal Co. in sec. 15, (37-4E).
- (8) Blumont mine in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (34-5E).

2. GLACIER FIELD

The Glacier field includes several square miles of area in T. 39 N., R. 7 E. The field contains no operating mines, but numerous prospect tunnels have opened several seams of anthracite coal of probable commercial importance.

REFERENCES TO WHATCOM COUNTY FIELDS

1, p. 10-11, 24-27, 52-55, 96-100, 196-198; 32-A, p. 10-11, 43-45, 69, 78-79, 83, 85; 43-C, p. 66-70; 48, p. 28-30, 34, 37; 50, p. 8-9, 12, 25; 54, p. 9, 13, 27; 55, p. 17; 68; 119, p. 185-186; 121, p. 199; 153; 159, p. 173-176.

SKAGIT COUNTY FIELDS

3. COKEDALE FIELD

No mines have operated recently in this area, but the Cokedale mine, in SE $\frac{1}{4}$ sec. 4, and NE $\frac{1}{4}$ sec. 9, (35-5E), operated several years prior to 1921. Coal from this mine was used in the manufacture of coke by the Sedro Coal Co. from 1892 to 1905.

4. CUMBERLAND-DAY CREEK FIELD

There is no record of production from this field, but several seams of coal have been exposed by prospects in secs. 23 and 26, (35-6E) and sec. 13, (34-6E).

5. MOUNT VERNON-BIG LAKE-McMURRAY FIELD

This is a large field covering most of T. 33 N., R. 4 E. and T. 33 N., R. 5 E. and parts of T. 34 N., R. 4 E. and T. 34 N., R. 5 E. A production of 123 tons of coal was recorded in 1932 and 1933 from a mine near McMurray. In addition, considerable prospecting has been conducted.

6. RICK CREEK FIELD

This is a small field in the relatively inaccessible region covering secs. 10, 15, 22, and 23, (33-7E). It is probably a continuation of the Cumberland-Day Creek field.

REFERENCES TO SKAGIT COUNTY FIELDS

1, p. 10-11, 25; 48, p. 28, 34, 37; 50, p. 8-9; 54, p. 9-10; 70; 119, p. 186-187; 121, p. 193; 159, p. 178-179.

KING COUNTY FIELDS

7. NEWCASTLE-ISSAQUAH FIELD

A. Mines in operation as recently as 1948-1957:

- (1) B & R Coal Co., Box 389, Renton, Wash., operates the Issaquah mine in S $\frac{1}{2}$ N $\frac{1}{2}$ sec. 27, (24-5E).
- (2) Bianco Coal Mines, 3333 Cascadia Ave., Seattle, Wash., produced from secs. 31 and 32, (24-6E).
- (3) Black Nugget Coal Mine, 1401 7th Ave., Renton, Wash., produced from the SE $\frac{1}{4}$ sec. 14, (24-6E).

- (4) Lahey Coal Co., 8th and Pacific Ave., Seattle, Wash., produced from sec. 32, (24-6E).
- (5) Strain Coal Co., Old Times Building, Seattle, Wash., operated the Coal Creek mine in secs. 25 and 26, (24-5E).

B. Mines with a record of production prior to 1948:

- (1) Coal Creek mine, in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, (24-5E).
- (2) Primrose tunnel, in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, (24-5E).
- (3) Strain strip pit, in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, (24-5E).
- (4) Newcastle-King mine, in NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (24-5E).
- (5) Newcastle mine, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (24-5E).
- (6) Ford mine near center SE $\frac{1}{4}$ sec. 26, (24-5E).
- (7) Reynolds mine in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (24-6E).
- (8) Issaquah strip pit in SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (24-6E).
- (9) Finn mine in NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (24-6E).
- (10) United States Coal Co. in sec. 13, (24-6E).
- (11) Issaquah Coal Co. in secs. 13, 14, 23, and 24, (24-6E).
- (12) Grand Ridge mine in center sec. 14, (24-6E).
- (13) Superior mine in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 32, (24-6E).
- (14) Harris mine in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 32, (24-6E).
- (15) Old Issaquah mine in E $\frac{1}{2}$ sec. 33, (24-6E).
- (16) May Creek mine in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (23-5E).

8. RENTON FIELD

A. Mines in operation as recently as 1948-1957:

- (1) Renton Mining Co., Inc., Box 596, Renton, Wash., produced from sec. 29, (23-5E).
- (2) Springbrook Mining Co., Route 1, Renton, Wash., produced from SE $\frac{1}{4}$ sec. 30, (23-5E).
- (3) Spring Glen Coal Co., 532 Tobin Ave., Renton, Wash., produced from SE $\frac{1}{4}$ sec. 29, (23-5E).

B. Mines with a record of production prior to 1948:

- (1) Earlington mine in SE $\frac{1}{4}$ sec. 13, (23-4E).
- (2) Beacon Hill mine in NE $\frac{1}{4}$ sec. 14, (23-4E).
- (3) Tukwila mine in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, (23-4E).
- (4) Black River (Lisco) mine in N $\frac{1}{2}$ sec. 24, (23-4E).
- (5) Riverton mine in NW $\frac{1}{4}$ sec. 24, (23-4E).
- (6) Denny-Renton mine in S $\frac{1}{2}$ sec. 17, (23-5E).
- (7) Patton mine in SE $\frac{1}{4}$ sec. 19, (23-5E).
- (8) Sunbeam mine in SE $\frac{1}{4}$ sec. 19, (23-5E).
- (9) Talbot mine in SW $\frac{1}{4}$ sec. 20, (23-5E).
- (10) Old Renton mine in N $\frac{1}{2}$ sec. 20, (23-5E).
- (11) Old Springbrook mine in SE $\frac{1}{4}$ sec. 30, (23-5E).

9. CEDAR MOUNTAIN FIELD

A. Mines in operation as recently as 1948-1957:

- (1) Fireking Coal Mining Co., Renton, Wash., operated the Red Devil mine in sec. 26, (23-5E).
- (2) New Lake Young Coal Co., Renton, Wash., produced from sec. 36, (23-5E).

B. Mines with a record of production prior to 1948:

- (1) New Black Diamond mine in SW $\frac{1}{4}$ sec. 25, (23-5E).
- (2) Cedar Mountain mine in secs. 29 and 30, (23-6E).
- (3) Echo Lake mine on hill above Echo Lake.

10. SNOQUALMIE FIELD

This is a small field in secs. 1 and 12, (23-7E). No mines have operated for many years, but the Niblock mine in sec. 1, (23-7E) formerly operated. Coke was made from this coal by the Western Coke & Collieries Co. in 1908.

11. TIGER MOUNTAIN-RAGING RIVER FIELD

This field covers several square miles in T. 23 N., R. 7 E. Prospects are numerous, but only the Tiger Mountain mine in the NW $\frac{1}{4}$ sec. 13, (23-6E) is known to have had any production. Recent development work has been done on the property.

12. HOBART FIELD

The Hobart field covers parts of secs. 30 and 31, (23-7E). It has no mines, but prospects are numerous.

13. TAYLOR FIELD

The Taylor field covers parts of secs. 2, 3, 10, and 11, (22-7E). No mines have operated in this field during recent years, but the Taylor mine in the N $\frac{1}{2}$ sec. 3, (22-7E) operated at one time.

14. GREEN RIVER FIELD

A. Mines in operation as recently as 1948-1957:

- (1) Anderson Coal Mines, Inc., Ravensdale, Wash., produced from sec. 1, (21-6E).
- (2) Big Four Coal Co., Palmer, Wash., produced from the Elk mine in SE $\frac{1}{4}$ sec. 34, (22-7E).
- (3) Carbon Fuel Co., Cumberland, Wash., produced from sec. 21, (21-7E).
- (4) Franklin Gem Coal Co., Black Diamond, Wash., produced from secs. 7 and 18, (21-7E).
- (5) Green River Coal Co., Black Diamond, Wash., produced from SE $\frac{1}{4}$ sec. 36, (21-6E).
- (6) Hi-Heat Coal Co., Black Diamond, Wash., produced from secs. 8 and 9, (21-7E).
- (7) Johnson Coal Co., Box 71, Black Diamond, Wash., produced from the J & P mine in sec. 26, (21-6E).
- (8) Kummer Coal Co., Black Diamond, Wash., produced from secs. 25 and 26, (21-6E).
- (9) Northwestern Improvement Co., Smith Tower, Seattle, Wash., operated the McKay mine in sec. 1, (22-6E).
- (10) Palmer Coking Coal Co., Black Diamond, Wash., operated the Danville mine in sec. 24, (22-6E) and the Durham mine in sec. 2, (21-7E), and operates the Landsburg mine in sec. 25, (22-6E), the No. 10 Franklin mine in secs. 8 and 9, (21-7E), and the No. 12 Franklin mine and strip pit in sec. 18, (21-7E).

- (11) Olson Bros. Coal Co., Cumberland, Wash., produced from the New Hyde mine in secs. 8 and 9, (21-7E).
- (12) Louis Draghi, Black Diamond, Wash., produces from SE $\frac{1}{4}$ sec. 14, (21-6E).
- (13) Macks Coal Co., Black Diamond, Wash., produces from NW $\frac{1}{4}$ sec. 13, (21-6E).

B. Mines with a record of production prior to 1948:

- (1) Dale mine in SE $\frac{1}{4}$ sec. 36, (22-6E).
- (2) Raven mine in NE $\frac{1}{4}$ sec. 36, (22-6E).
- (3) Ravensdale mine in S $\frac{1}{2}$ sec. 36, (22-6E).
- (4) Parkin Slope mine in SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, (22-7E).
- (5) Kangley mine in SE $\frac{1}{4}$ sec. 26, (22-7E).
- (6) Wonder mine in SE $\frac{1}{4}$ sec. 28, (22-7E).
- (7) Alta mine in NE $\frac{1}{4}$ sec. 35, (22-7E).
- (8) Hiawatha mine in SE $\frac{1}{4}$ sec. 35, (22-7E).
- (9) Continental mine in NE $\frac{1}{4}$ sec. 1, (21-6E).
- (10) Old No. 12 mine in SE $\frac{1}{4}$ sec. 12, (21-6E).
- (11) Ginder Lake mine in NW $\frac{1}{4}$ sec. 12, (21-6E).
- (12) No. 12 mine in SW $\frac{1}{4}$ sec. 12, (21-6E).
- (13) Upper Diamond mine in SE $\frac{1}{4}$ sec. 13, (21-6E).
- (14) "B" mine in sec. 13, (21-6E).
- (15) Lawson mine in SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, (21-6E).
- (16) Morgan Slope No. 11 mine in secs. 13 and 14, (21-6E).
- (17) No. 2 mine in E $\frac{1}{2}$ sec. 14, (21-6E).
- (18) No. 14 mine in SE $\frac{1}{4}$ sec. 14, (21-6E).
- (19) Old Kummer mine in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, (21-6E).
- (20) Gem mine in SE $\frac{1}{4}$ sec. 28, (21-6E).
- (21) Blue Blaze mine in NE $\frac{1}{4}$ sec. 36, (21-6E).
- (22) Durham mine near N. line sec. 2, (21-7E) produced 665,396 tons from 1914 to 1944.
- (23) Pacific Coast Coal Co. mine in NW $\frac{1}{4}$ sec. 6, (21-7E).
- (24) Section 6 mine in center sec. 6, (21-7E).
- (25) New Franklin mine in SE $\frac{1}{4}$ sec. 7, (21-7E).
- (26) No. 7 mine in SE $\frac{1}{4}$ sec. 7, (21-7E).
- (27) Pacific Coast Coal Co. produced from secs. 7 and 18, (21-7E) in 1946.
- (28) O'Kay Coal Co. produced from the Black Beauty mine in SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, (21-7E) in 1946.
- (29) Hudson mine in center N $\frac{1}{2}$ sec. 14, (21-7E).
- (30) Davis mine in NW $\frac{1}{4}$ sec. 14, (21-7E).
- (31) Carbon mine in SE $\frac{1}{4}$ sec. 15, (21-7E).
- (32) Occidental (Gibbons) mine in SE $\frac{1}{4}$ sec. 16, (21-7E).
- (33) Franklin mine in E $\frac{1}{2}$ sec. 18, (21-7E).
- (34) Cannon mine in SW $\frac{1}{4}$ sec. 19, (21-7E).
- (35) Eureka mine in S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 21, (21-7E).
- (36) Old Carbon mine in NE $\frac{1}{4}$ sec. 21, (21-7E).
- (37) Daly mine in NW $\frac{1}{4}$ sec. 22, (21-7E).
- (38) Carbon No. 3 mine in SW $\frac{1}{4}$ sec. 22, (21-7E).
- (39) Bolde's No. 3 $\frac{1}{2}$ mine in center sec. 22, (21-7E).
- (40) Bolde's Carbon mine in sec. 22, (21-7E).
- (41) Pocahontas mine in NE $\frac{1}{4}$ sec. 23, (21-7E).
- (42) Navy mine in center sec. 28, (21-7E).
- (43) Ozark mine in W $\frac{1}{2}$ sec. 28, (21-7E).

- (44) Hyde mine (Rose Marshall) in NW¼ sec. 29, (21-7E).
- (45) Sunset mine in NE¼ sec. 33, (21-7E).
- (46) Independent mine in NW¼ sec. 33, (21-7E).
- (47) Krain (Gortz) mine near center sec. 1, (20-6E).
- (48) Green River Coal Co. in NE. cor. sec. 1, (20-6E).

REFERENCES TO KING COUNTY FIELDS

1, p. 4-5, 24-27, 40-45, 60-75, 103-137; **32-A**, p. 6, 10-11, 12, 29-35, 48-57, 72-74, 80-81, 85; **43**; **43-A**, p. 51, 55-56; **43-B**, p. 19-22, 58, 60, 62; **43-C**, p. 66-70, 72, 73, 76-80, 135; **48**, p. 28, 29, 34, 35; **50**, p. 9-10, 15, 19, 26-32; **54**, p. 10, 16, 20, 28-34; **55**; **102-A**, p. 29, 50-53, 59, 62, 79, 100; **119**, p. 187-191; **121**, p. 41-55, 80-129; **125-A**, p. 3, 57, 60-61, 64-66; **133**; **159**, p. 180-209.

PIERCE COUNTY FIELDS

15. WILKESON-CARBONADO FIELD

A. Mines in operation as recently as 1948-1957:

- (1) Apex Coal Co., Wilkeson, Wash., produced from the NW¼ sec. 27, (19-6E).
- (2) Carbonado Coal Co., Carbonado, Wash., produces from the SW¼NW¼ sec. 4, (18-6E).
- (3) Carbon-Wingate Coal Co., Wilkeson, Wash., produced from the center sec. 27, (19-6E).
- (4) Champion Coal Co. produced from a mine near Spiketon.
- (5) East Miller Coal Co., Wilkeson, Wash., produced from the SW¼ sec. 27, (19-6E).
- (6) Gale Creek Coal Co., Wilkeson, Wash., produced from the Queen mine in NE¼ sec. 28, (19-6E).
- (7) Sparton Coal Co., Wilkeson, Wash., produced from the NE¼ sec. 15, (19-6E).
- (8) Wilkeson-Wingate Coal Co., Wilkeson, Wash., produced from the SW¼ sec. 27, (19-6E).

B. Mines with a record of production prior to 1948:

- (1) Crocker mine in NW¼ sec. 36, (19-5E).
- (2) Driver mine in SE¼ sec. 15, (19-6E).
- (3) Peacock mine in NE¼ sec. 15, (19-6E).
- (4) Spiketon mine in sec. 15, (19-6E).
- (5) Acme (Acme Gem) mine in NE¼ sec. 15, (19-6E).
- (6) Burnett mine in sec. 16, (19-6E). Coke has been made from the coal of this mine.
- (7) South Willis mines in sec. 22, (19-6E). Coal from these mines was used in making coke by the Wilkeson Coal & Coke Co. in 1915.
- (8) Ouimette mine in SE¼ sec. 22, (19-6E).
- (9) Black Carbon mine in E½ sec. 22, (19-6E).
- (10) Pacific Coal & Oil Wells Co. in sec. 26, (19-6E).
- (11) Peacock mine in sec. 27, (19-6E).
- (12) Domestic Gem mine in sec. 27, (19-6E).
- (13) Dependable Coal Co. produced from NW¼ sec. 27, (19-6E) in 1946.
- (14) Briar Hill mines in sec. 28, (19-6E).
- (15) West Miller mine in sec. 28, (19-6E).

- (16) Wilkeson mine in secs. 27, 28, and 34, (19-6E). Coke was made from Wilkeson coal by the Tacoma Coal & Coke Co. from 1884 to 1898 and by the Wilkeson Coal & Coke Co. from 1891 to 1937. Wilkeson coal is one of the best Washington coking coals.
- (17) Wilkeson Products Co. in secs. 27, 28, and 34, (19-6E). Coke was made from this coal in 1944.
- (18) Carbonado mine in secs. 4, 5, 8, and 9, (18-6E). Coke was made from this coal by the Carbon Hill Coal Co. from 1902 to 1919.
- (19) Melmont mine in secs. 16 and 22, (18-6E).
- (20) Fairfax mine in secs. 26, 27, and 34, (18-6E). Coal from this mine was used in making coke by Fairfax Mines, Inc. from 1901 to 1919.
- (21) Olympic mine in sec. 36, (18-6E).
- (22) Olympic Mining Co. in sec. 36, (18-6E).
- (23) Montezuma (Marcy) mine in sec. 2, (17-6E). Coal from this mine was used in making coke by the Washington Manganese Coal & Copper Co. from 1901 to 1919.

16. ASHFORD FIELD

This field covers about 40 square miles in Tps. 15 and 16 N., Rs. 6 and 7 E. Prospects are numerous, but only the Mashell mine in sec. 22, (15-6E) is known to have produced.

REFERENCES TO PIERCE COUNTY FIELDS

1, p. 6-10, 24-25, 26, 27, 50-53, 86-95, 100-101, 173-191; **32**; **32-A**, p. 10-11, 41-42, 64-66, 77-78, 82, 85; **48**, p. 28-29, 34, 37; **50**, p. 10-11, 15, 19, 33-34; **54**, p. 10-11, 17-18, 20, 34-36; **55**; **114-AA**, p. 21, 42; **119**, p. 191-192; **121**, p. 167-193; **159**, p. 209-232.

SOUTHWESTERN WASHINGTON FIELDS

17. MORTON (MINERAL LAKE) FIELD

No mines in this field are producing at the present time, but the following mines have done so in the past:

- (1) East Creek mine in S½ sec. 12, (14-4E).
- (2) Sunburst mine in sec. 12, (14-4E).
- (3) The Associated Mining Co. operated the Mineral (Divide) mine in sec. 7, (14-5E).
- (4) Ladd mine in sec. 12, (14-5E).
- (5) Pennsylvania mine in secs. 20 and 21, (14-5E).
- (6) Crystal No. 1 mine in NW¼ sec. 21, (14-5E).
- (7) Watkins mine in W½ sec. 29, (14-5E).
- (8) Coal Canyon (Lindberg) mine in W½ sec. 29 or E½ sec. 30, (13-5E).
- (9) Majestic mine in NW¼ sec. 31, (14-5E).
- (10) Atlas Coal Co. produced from the Morton mine in SW¼ sec. 12, (12-4E) in 1946.

18. CINNABAR (ALPHA) FIELD

This field, an extension of the Tenino-Mendota field, covers about 10 square miles in T. 13 N., R. 1 E.; T. 13 N., R. 2 E.; T. 13 N., R. 3 E.; T. 14 N., R. 1 E.; and T. 14 N., R. 2 E. The field has had no production, though several prospects are known.

19. TENINO-MENDOTA FIELD**A. Mines in operation as recently as 1948-1957:**

- (1) Black Prince Coal Co., Box 554, Tenino, Wash., produces from the Victory mine in sec. 28, (15-1W).
- (2) Columbia Coal Co., Lewis & Clark Hotel, Centralia, Wash., produced from the Smith mine in NW¼ sec. 10, (14-1W).
- (3) Bucoda Coal Co., produced from the Belle mine in sec. 34, (15-1W).
- (4) Tono Coal Co., Rt. 1, Box 398, Centralia, Wash., produces from the Tono mine in secs. 16 and 21, (15-1W).

B. Mines with a record of production prior to 1948:

- (1) Great Western mine in sec. 35, (16-2W).
- (2) Pleasant Hill mine in NW¼ sec. 32, (16-1W).
- (3) Penn-Bucoda Coal Co., produced from secs. 7, 18, and 19, (15-1W) in 1947.
- (4) Skookumchuck mine in NW¼NW¼ sec. 8, (15-1W).
- (5) Boxer mine in sec. 6, (15-1W).
- (6) D. & F. Coal Mining Co. produced from sec. 18, (15-1W) in 1946.
- (7) Bucoda (Seatco) mine in NW¼ sec. 18, (15-1W).
- (8) Majestic mine in SW¼ sec. 18, (15-1W).
- (9) Royal (Hannaford No. 1 or Hannaford Valley) mine in sec. 30, (15-1W).
- (10) Hannaford Valley strip pit in center S½ sec. 30, (15-1W).
- (11) Black Bear mine in sec. 31, (15-1W).
- (12) Lincoln (Galvin) mine in NE¼ sec. 33, (15-1W).
- (13) Scatter Creek mine ½ mi. W. of Lincoln mine.
- (14) Non Pareil mine in SE¼ sec. 29, (15-2W).
- (15) Perth mine in NE¼ sec. 29, (15-2W).
- (16) Wabash mine in sec. 33, (15-2W).
- (17) Mendota mine in E½ sec. 3, (14-1W).
- (18) Empress mine in SW¼ sec. 8, (14-1W).
- (19) Kopiah mine in SE¼ sec. 9, (14-1W).
- (20) Old Monarch mine in NE¼ sec. 17, (14-1W).
- (21) Freeburn (Packwood) mine in SW¼ sec. 28, (14-1W).
- (22) Eureka mine in NE¼ sec. 2, (14-2W).
- (23) Florence mine in NW¼ sec. 2, (14-2W).
- (24) Potlatch mine in NE¼ sec. 3, (14-2W).
- (25) Salzer Valley mine in SE¼NE¼ sec. 22, (14-2W).

20. CHEHALIS FIELD**A. Mines in operation as recently as 1948-1957:**

- (1) Golden Glow Coal Co., Centralia, Wash., produced from secs. 22 and 23, (14-2W).
- (2) Monarch Coal Mining Co., Centralia, Wash., produced from the Fords Prairie mine in sec. 30, (15-2W).
- (3) Stoker Coal Mining Co., 311 South Gold St., Centralia, Wash., produced from sec. 29, (15-2W).

B. Mines with a record of production prior to 1948:

- (1) Gibson mine in sec. 23, (14-2W).
- (2) T & T Coal Co., Rt. 3, Box 328, Centralia, Wash., produced from SE¼SW¼ sec. 23, (14-2W) in 1947.
- (3) Howell mine in NE¼ sec. 27, (14-2W).
- (4) Reliance No. 1 mine in sec. 28, (14-2W).
- (5) Superior (Rosenthal) mine in NW¼ sec. 29, (14-2W).
- (6) Sheldon mine in sec. 33, (14-2W).
- (7) Richmond mine in SE¼ sec. 34, (14-2W).
- (8) Crescent (Littell) mine in NW¼ sec. 27, (14-3W).

21. VADER FIELD

The Vader field covers about 15 square miles in T. 11 N., R. 3 W. No mines are now operating, but the Winlock-Vader mine near Vader produced 88 tons of coal in 1932 and 1933.

22. SALMON CREEK FIELD

The Salmon Creek field covers about 8 square miles in T. 11 N., R. 1 E. Mr. A. C. Shives of Toledo, Wash., has recently produced from the SE¼SE¼ sec. 16, (11-1E), and drilling by the U. S. Bureau of Mines has proven considerable tonnage of lignite coal.

23. COAL BANK RAPIDS FIELD

No mines are operating in this field now, but two mines, the Walker in the SE¼ sec. 13, (10-1W) and the Coal Bank Rapids (Silver Lake) in sec. 30, (10-1E), have operated in the past. Several prospects are also known.

24. KELSO-CASTLE ROCK FIELD

A. Only one mine, the Hi-Way, in sec. 24, (9-2W), has operated in the period from 1948 to 1957.

B. Mines with a record of production prior to 1948:

- (1) Leavell mine in sec. 18, (9-1W).
- (2) Idleman mine in sec. 1, (9-2W).
- (3) Red Ash mine in SE¼ sec. 7, (9-2W).
- (4) Cherry Valley mine in the SE¼ sec. 7, (9-2W).
- (5) Carbondale mine in sec. 24, (9-2W).
- (6) Cowlitz No. 1 mine 4 mi. SW. of Castle Rock.
- (7) Coal Creek mine in sec. 27, (9-3W).
- (8) Anchor mine in sec. 13, (8-2W).
- (9) Dobson Creek mine in W½ sec. 24, (10-3W).

REFERENCES TO SOUTHWESTERN WASHINGTON FIELDS

1, p. 10, 24, 25, 26, 27, 48-51, 52, 53, 80-87, 96, 101, 103, 156-173, 192-196; **26**; **29**; **32-A**, p. 6, 10-11, 12, 26, 29, 39-43, 46, 47, 58, 60, 63, 66-71, 77, 78, 82, 85; **43-A**, p. 57; **43-C**, p. 72, 76-80; **48**, p. 28, 29, 34, 35, 36, 37; **50**, p. 11, 15, 19, 35-38; **54**, p. 11-12, 16, 20, 36-39; **55**; **114-AA**, p. 21, 42; **119**, p. 193-195; **121**, p. 41, 62-66, 74-75, 79, 152-167, 193-198; **123-A**; **126-A**; **155**; **159**, p. 238-257.

KITTITAS COUNTY FIELDS**25. ROSLYN-CLE ELUM FIELD**

A. Mines in operation as recently as 1948-1957:

- (1) Jonesville Coal Co., Roslyn, Wash., produced

from the Roslyn Coal & Coke Co. and Roslyn Fuel Co. property in sec. 12, (20-14E).

- (2) Northern Pacific Railway Co., Smith Tower, Seattle, Wash., produces from Mine No. 3 in sec. 7, (20-15E), and Mine No. 9 in secs. 20, 21, and 28, (20-15E).
- (3) Roslyn-Cascade Coal Co., Ronald, Wash., produces from sec. 6, (20-15E).

B. Mines with a record of production prior to 1948:

- (1) Rothlisberger mine in sec. 4, (19-15E).
- (2) Old No. 3 mine in sec. 1, (20-14E). Small quantity of coke made from this coal. Fair coking coal.
- (3) Lake Coal Co., Ronald, Wash., produced from the NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (20-14E) in 1946.
- (4) Blue Flame mine in the SE $\frac{1}{4}$ sec. 2, (20-14E).
- (5) Lakedale mine in sec. 11, (20-14E).
- (6) Beekman No. 1 mine in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (20-14E).
- (7) Beekman No. 2 mine in the SW $\frac{1}{4}$ sec. 12, (20-14E).
- (8) Roslyn-Cascade No. 3 mine in the SE $\frac{1}{4}$ sec. 12, (20-14E).
- (9) Roslyn-Cascade No. 4 mine in the NE $\frac{1}{4}$ sec. 12, (20-14E).
- (10) Patrick-McKay mine in sec. 6, (20-15E).
- (11) Busy Bee mine 2 $\frac{1}{2}$ miles northwest of Roslyn.
- (12) N. W. I. Roslyn No. 8 mine in sec. 8, (20-15E).
- (13) Roslyn No. 1 mine in secs. 8 and 9, (20-15E).
- (14) A & E mine in sec. 10, (20-15E).
- (15) Summit mine in sec. 14, (20-15E).
- (16) N. W. I. Roslyn No. 6 mine in sec. 16, (20-15E).
- (17) N. W. I. Roslyn No. 4 mine in sec. 20, (10-15E).
- (18) N. W. I. Roslyn No. 2 mine in sec. 20, (20-15E).
- (19) N. W. I. Roslyn No. 7 mine in secs. 22 and 27, (20-15E).
- (20) Cle Elum No. 2 Extension in sec. 23, (20-15E).
- (21) Cle Elum No. 3 Extension in sec. 23, (20-15E).
- (22) Cle Elum No. 1 (Queen) in sec. 26, (20-15E).
- (23) Cle Elum No. 2 in SE $\frac{1}{4}$ sec. 26, (20-15E).

26. TANEUM FIELD

The Taneum field covers several square miles in T. 19 N., R. 16 E. No mines have operated in recent years, but the Wilson mine in SW $\frac{1}{4}$ sec. 33, (19-16E) operated at one time.

27. MANASTASH FIELD

The Manastash field covers several square miles in the center of T. 18 N., R. 15 E. Prospects are numerous in this field, but only a small amount of production is recorded.

REFERENCES TO KITTITAS COUNTY FIELDS

1, p. 5-6, 24, 25, 26, 27, 44-47, 74-81, 137-156; 48, p. 28, 29, 34, 36; 50, p. 11-12, 15, 19, 38-40; 54, p. 12, 16, 20, 39-41; 55; 111, p. 184-185; 114-AA, p. 21, 42; 121, p. 55-62, 129-152; 159, p. 232-238.

OCCURRENCES OUTSIDE OF THE PRINCIPAL FIELDS

SAN JUAN COUNTY

28. **Name:** Orcas Island. **Loc:** NE. side Orcas Island. **Descr:** A number of small seams of semi-anthracite coal. **Value:** Has been used by local black-smiths. **Ref:** 87, p. 174.
29. **Name:** Waldron Island. **Loc:** On Waldron Island, exact location unknown. **Descr:** Small amounts of coal reportedly encountered in a drill hole. **Value:** Unknown. **Ref:** 87, p. 174, 175.

CLALLAM COUNTY

30. **Name:** Freshwater Bay. **Loc:** At Freshwater Bay. **Descr:** Reported occurrence, details unknown. **Value:** Unknown. **Ref:** 48, p. 30.
31. **Name:** Fuca mine. **Loc:** On seashore in NE $\frac{1}{4}$ sec. 26, (32-12W). **Descr:** Several beds of coal reported, but only one, a 22-in. bed, has been developed. **Value:** Minor production about 1910. **Ref:** 1, p. 103; 48, p. 30; 121, p. 77-78.

SNOHOMISH COUNTY

32. **Name:** Jordan. **Loc:** Near Jordan. **Descr:** Sub-bituminous coal. **Value:** Formerly mined for a brief time. **Ref:** 12, p. 53; 48, p. 30.
33. **Name:** Coal Creek. **Loc:** Headwaters of Coal Creek. **Descr:** Several coal claims staked in 1909. **Value:** Unknown. **Ref:** 21.

KING COUNTY

34. **Name:** Foss River. **Loc:** Skykomish area, Tps. 25 and 26 N., Rs. 11 and 12 E. **Descr:** Many claims staked on a poor grade of bony coal. **Value:** Some used locally. May be a source of graphite. **Ref:** 21.
- 34A. **Name:** Youngblood. **Loc:** On C. R. Youngblood farm in SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (21-5E) and in gully in W $\frac{1}{2}$ sec. 31, (21-6E). **Descr:** Mine in lignite bed 4 ft. 3 in. thick in Pleistocene deposits. **Value:** Reportedly usable in manufacture of activated carbon. **Ref:** 43-A, p. 57; 43-C, p. 72; 102-A, p. 29, 48, 49, 58, 69; 135; 155-A, p. 38, 48.

GRAYS HARBOR COUNTY

35. **Name:** Elma. **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, 18-6W). **Descr:** Said to be a 6-ft. "vein" 48 ft. beneath the surface. **Value:** Warrants investigation. **Ref:** 135.

PACIFIC COUNTY

36. **Name:** Firdale. **Loc:** Near center E. line NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, (13-7W). **Descr:** A 5-ft. bed of carbonaceous shale, in which are stringers of coal $\frac{1}{8}$ to 1 in. thick, is exposed at portal of an 800-ft. water-filled shaft. **Value:** Exposed coal too bony to be of value. **Ref:** 135.

LEWIS COUNTY

37. **Name:** Summit Creek (Carlton Pass) area. **Loc:** Around the headwaters of Cowlitz River. **Descr:** Anthracite and semi-anthracite intimately interstratified with thin shale seams. **Value:** Some shipped at one time, but high shale content made it unsatisfactory as fuel. Probably cannot be eco-

nomically separated from the associated shale. **Ref:** 50, p. 13-15; 54, p. 14-15; 48, p. 29; 121, p. 152-156.

CLARK COUNTY

38. **Name:** Lake Merwin. **Loc:** Secs. 29 and 30, (6-3E). **Descr:** Six coal claims staked here in 1934. **Value:** Unknown. **Ref:** 21.
39. **Name:** Yacolt. **Loc:** 5½ mi. W. of Yacolt. **Descr:** Two coal claims staked in 1905. **Value:** Unknown. **Ref:** 21.

SKAMANIA COUNTY

40. **Name:** Little Baldy Peak. **Loc:** N½NE¼ sec. 26, (4-9E). **Descr:** Coal claim staked in 1916. **Value:** Unknown. **Ref:** 21.

Klickitat County

41. **Name:** Lyle. **Loc:** SE¼NW¼ sec. 25, (3-12E). **Descr:** Two coal claims staked in 1905. **Value:** Unknown. **Ref:** 21.

YAKIMA COUNTY

42. **Name:** Bumping River. **Loc:** Near Bumping River trail to Cowlitz Pass in T. 15 N., R. 11 E. **Descr:** Coal claim staked in 1890. Possibly an extension of the Carlton Pass field. **Value:** Unknown. **Ref:** 21.
43. **Name:** Rattlesnake Creek. **Loc:** Sec. 29, (16-13E). **Descr:** Reported coal seam. **Value:** Unknown. **Ref:** 135.
44. **Name:** Rimrock. **Loc:** T. 13 N., Rs. 13 and 14 E. **Descr:** Four coal claims staked during 1889 and 1890. **Value:** Unknown. **Ref:** 21.

KITTITAS COUNTY

45. **Name:** Easton. **Loc:** SE¼ sec. 16, (20-13E). **Descr:** Coal claim staked in 1908. **Value:** Unknown. **Ref:** 21.
46. **Name:** Stampede Tunnel. **Loc:** Near N. P. Ry. tunnel No. 2 on Coal Creek. **Descr:** Two coal claims staked in 1886 and 1903. **Value:** Unknown. **Ref:** 21.
47. **Name:** Meaghersville. **Loc:** Sec. 1, (20-17E). **Descr:** Coal claims staked in 1932. **Value:** Unknown. **Ref:** 21.

CHELAN COUNTY

48. **Name:** Wenatchee Heights. **Loc:** NW¼NW¼ SW¼ sec. 26, (22-20E). **Descr:** Two 6-ft. beds of good subbituminous coal encountered in the Norco No. 1 oil well at depth of 2,000 ft. **Value:** Depth where discovered makes it noncommercial there. **Ref:** 48, p. 30; 66, p. 52.
49. **Name:** Dry Gulch. **Loc:** NE¼ sec. 21, (22-20E). **Descr:** A 4-ft. bed of bony coal, bone, and shale. **Value:** 1,275 tons mined prior to 1934. **Ref:** 1, p. 102; 48, p. 30; 66, p. 51.

50. **Name:** Camas Creek. **Loc:** Sec. 20, (23-18E). **Descr:** Several coal claims staked in 1897. **Value:** Unknown. **Ref:** 21.

51. **Name:** Johnson. **Loc:** NE¼ sec. 29, (23-20E). **Descr:** A 1-ft. bed of clean coal reported. **Value:** Probably noncommercial. **Ref:** 66, p. 51.

OKANOGAN COUNTY

52. **Name:** Twisp River. **Loc:** NE¼ sec. 7, (33-21E). **Descr:** A 6-ft. bed of shale in which are thin stringers of coal constituting 10 percent of the whole. **Value:** Several tons used locally by blacksmiths. **Ref:** 135.

STEVENS COUNTY

53. **Name:** Orazada Creek (Sand Creek). **Loc:** NW¼ sec. 8, (28-37E). **Descr:** Short slope driven on a zone of carbonaceous material in which are several small stringers of coal. **Value:** Noncommercial. **Ref:** 28, p. 75-76; 48, p. 30.
54. **Name:** Valley. **Loc:** Sec. 28, (31-40E). **Descr:** A 4-ft. bed of subbituminous coal occurs with shale between lava flows. **Value:** Production of 844 tons reported. **Ref:** 1, p. 191; 28, p. 47; 48, p. 30.

PEND OREILLE COUNTY

55. **Name:** Box Canyon prospect. **Loc:** Sec. 18, (38-43E). **Descr:** Open cuts and pits expose a 6-ft. zone in which are coal seams 2 to 14 in. thick constituting 40 percent of the zone. **Value:** Probably not commercial. **Ref:** 27, p. 61.
56. **Name:** Locke. **Loc:** On Risley ranch in sec. 36, (34-43E). **Descr:** A few thin seams of coal exposed by open cuts. **Value:** Noncommercial. **Ref:** 27, p. 72.

SPOKANE COUNTY

57. **Name:** Shelley Lake. **Loc:** Center sec. 19, (25-45E). **Descr:** Carbonaceous shale mined as coal at one time. **Value:** Noncommercial. **Ref:** 47, p. 271.

LINCOLN COUNTY

58. **Name:** Plum. **Loc:** NE. cor. sec. 15, (28-31E). **Descr:** Said to be a small bed of dirty coal. **Value:** Probably noncommercial. **Ref:** 48, p. 30.

COLUMBIA COUNTY

59. **Name:** Cahill Mountain. **Loc:** NE¼ sec. 17, (9-40E). **Descr:** Coal seam of fair quality, high in resin. **Value:** Uncertain. **Ref:** 135.

ASOTIN COUNTY

60. **Name:** Hanson Ferry. **Loc:** NW¼ sec. 33, (7-44E). **Descr:** A 3-ft. bed of woody lignite between two flows of basalt. **Value:** Probably noncommercial. **Ref:** 135.
61. **Name:** Grande Ronde. **Loc:** Near mouth of Grande Ronde River. **Descr:** A 125-ft. adit in lignite entire length. Winze at end of adit shows 25 ft. of lignite without exposing top or bottom. Probably not in place. **Value:** Uncertain. **Ref:** 110, p. 125-127.

DIATOMITE

Diatomite or diatomaceous earth is material composed primarily, or entirely, of the frustules of microscopic aquatic plants known as diatoms. These minute forms, which live in all bodies of water, secrete a frustule or casing of silica. When the diatoms die the frustules sink to the bottom and, in time, accumulate as thick beds of diatomite. The frustules are of many shapes and forms but most, if not all, are cellular, a feature which gives diatomite its light weight, heat insulating qualities, and effectiveness as a filtering agent. More than half of all diatomite produced is used in filtration; one-fifth is used as a filler in paper, rubber, and paint; and one-eighth in insulation. The remainder is used as an abrasive and in the manufacture of water glass, glazes, enamel, cement, lightweight brick, and paving materials.

Though many diatomite deposits occur west of the Cascade Mountains, those of greatest purity and largest extent occur in eastern Washington. The eastern ones also account for Washington's production, and it is to them that we can look for future expansion in production.

The Washington deposits of diatomite that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

Prices in 1956 are reported to range from about \$28 per short ton for certain filler uses up to about \$50 for filter-aid grades. The average price for the period 1951 to 1953, inclusive, was \$29.97.

OCCURRENCES

On page 25 in volume 2 is plate 10, the map showing the occurrences of diatomite, numbered to correspond with the numbers of the occurrences listed below.

WHATCOM COUNTY

1. **Name:** Vogel farm. **Loc:** Sec. 27, (40-4E). **Descr:** 4 ft. of bog material at the surface known to cover 2 acres. **Value:** Small size of deposit and high organic content make its value doubtful. **Ref:** 48, p. 41; 124, p. 15.
2. **Name:** Blaine. **Loc:** Sec. 9, (40-1E) and sec. 18, (40-2E). **Descr:** Five beds, with total thickness less than 3 ft., cover 1½ to 2 acres. **Value:** Too small to support commercial operation. **Ref:** 48, p. 41.
3. **Name:** Ferndale. **Loc:** Sec. 17, (9-2E). **Descr:** Well encountered 17-ft. bed at depth of 130 ft. **Value:** Too deep to be exploited. **Ref:** 142.
4. **Name:** Baker Lake. **Loc:** 2 mi. W. of Baker Lake. **Descr:** A 75-acre area. Depth unknown. **Value:** Unknown, but warrants investigation. **Ref:** 120, p. 31.

SKAGIT COUNTY

5. **Name:** Nookachamp Creek. **Loc:** SE¼ sec. 25, (34-4E). **Descr:** A 6- to 12-ft. bed underlies 6 in. to 1 ft. of soil over an area of 15 to 20 acres. **Value:** Size sufficient for commercial operation. **Ref:** 135.

ISLAND COUNTY

6. **Name:** Useless Bay. **Loc:** SE¼ sec. 29, (29-3E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 120, p. 27.

JEFFERSON COUNTY

7. **Name:** Irondale. **Loc:** NW¼NW¼ sec. 11, (29-1W). **Descr:** A peat bog about 12 acres in extent is reportedly underlain by 4 to 7 ft. of diatomite. **Value:** Unknown but warrants investigation. **Ref:** 135.

SNOHOMISH COUNTY

8. **Name:** Florence. **Loc:** Reported in sec. 32, (32-4E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 12, p. 53.
9. **Name:** Jim Creek. **Loc:** Reported near Jim Creek in T. 31 N., R. 6 E. **Descr:** Unknown. **Value:** Unknown. **Ref:** 12, p. 53.
10. **Name:** King's Lake. **Loc:** Reported at lake outlet in sec. 27, (31-6E). **Descr:** Said to be an acre in extent and of unknown depth. **Value:** Unknown. **Ref:** 135.
11. **Name:** McAleer Lake. **Loc:** Reported in sec. 32, (27-4E). **Descr:** A 4-ft. bed is said to cover several acres. **Value:** Unknown. **Ref:** 135.

KING COUNTY

12. **Name:** Sammamish River. **Loc:** Along Sammamish River between Woodinville and Redmond. **Descr:** Near surface in low, cultivated fields. Depth, extent, and purity unknown. **Value:** Unknown, but high surface damage costs might prohibit mining. **Ref:** 48, p. 40; 103, p. 97.
- 12A. **Name:** Lake Hancock. **Loc:** Around W. end of Lake Hancock in secs. 8 and 17, (24-9E). **Descr:** Said to cover 1,124 acres. **Value:** Warrants investigation. **Ref:** 135.
13. **Name:** Auburn. **Loc:** Reported near Auburn, details unknown. **Ref:** 135.

KITSAP COUNTY

14. **Name:** Harper. **Loc:** Near brick yard in sec. 2, (23-2E). **Descr:** Said to be 18 in. thick and probably 1 acre in extent. **Value:** Reported size too small for commercial development. **Ref:** 135.

PIERCE COUNTY

15. **Name:** Parkland. **Loc:** Center E½ sec. 8, (19-3E). **Descr:** Diatomite, 15 to 30 ft. thick, covers Pleis-

tocene gravels over an area of 30 acres. **Value:** Quantity sufficient for commercial operation. **Ref:** 48, p. 41; 124, p. 15-16.

- 15A. **Name:** Anderson Island. **Loc:** On NW. shore of Anderson Island, in W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 32, (20-1E). **Descr:** 12-ft. bed of very impure silty diatomite underlying about 12 ft. of glacial drift. **Value:** Too impure for most uses. **Ref:** 135.
16. **Name:** Roy. **Loc:** NE $\frac{1}{4}$ sec. 3, (18-2E). **Descr:** Deposit containing 2 percent foreign matter; of unknown depth and extent. **Value:** Size and extent should be determined. **Ref:** 135.
17. **Name:** Eatonville. **Loc:** N. of Eatonville on Route 1 near home of G. D. Beane. **Descr:** Impure; probably contains considerable pumicite. **Value:** Thickness and extent should be determined. **Ref:** 135.

THURSTON COUNTY

- 17A. **Name:** Spencer. **Loc:** On Spencer farm, NE $\frac{1}{4}$ sec. 18, (17-1E). **Descr:** Specimen of diatomite containing less than 5 percent silt impurity came from a Recent deposit at least 2 ft. thick and 500 ft. in diameter. **Value:** Unknown. **Ref:** 135.

LEWIS COUNTY

18. **Name:** Tilton River. **Loc:** Sec. 3, (12-2E). **Descr:** 15,000 tons with 20-ft.-maximum cover interbedded with sand and gravel. **Value:** Insufficient quantity for commercial operations. **Ref:** 96, p. 12.
- 18A. **Name:** Morton. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (12-4E). **Descr:** A drainage ditch exposes diatomite containing considerable organic matter and some volcanic ash. Bed said to be about 3 ft. thick. **Value:** Might have special use. **Ref:** 135.

SKAMANIA COUNTY

- 18B. **Name:** Stevenson. **Loc:** On property of Louis Larson, 4 mi. E. of Stevenson in Home Valley vicinity. **Descr:** Said to be at least 6 ft. of diatomite over an area of 5 or 6 acres. **Value:** Warrants investigation. **Ref:** 135.

GRANT COUNTY

19. **Name:** Sec. 10 deposit. **Loc:** W $\frac{1}{2}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, (19-23E). **Descr:** Pit exposes diatomite 10 to 11 ft. thick. **Value:** Probably commercial. **Ref:** 86, p. 37-38.
20. **Name:** Sec. 9 deposit. **Loc:** Center sec. 9, (18-23E). **Descr:** A 10-ft. bed underlies 2 to 10 ft. of overburden. **Value:** Some mined in 1940. **Ref:** 120, p. 23.
21. **Name:** S. sec. 9 deposit. **Loc:** S. center sec. 9, (18-23E). **Descr:** A 15-ft. bed underlies 1 to 8 ft. of soil and basalt over an area 200 by 400 ft. **Value:** Might be worked in connection with other deposits nearby. **Ref:** 120, p. 23.
22. **Name:** Sec. 16 deposit (A). **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (18-23E). **Descr:** 12 ft. of diatomite overlain by basalt and concealed at base. **Value:** Was worked intermittently for several years. **Ref:** 36, p. 104; 48, p. 40; 86, p. 37; 124, p. 16-17.

23. **Name:** Sec. 16 deposit (B). **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (18-23E). **Descr:** Pit exposes 6-ft. bed. **Value:** Extent should be determined. **Ref:** 86, p. 38-39.
24. **Name:** Sec. 16 deposit (C). **Loc:** NE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (18-23E). **Descr:** Two pits expose diatomite 6 ft. or more thick. **Value:** Probably could be worked in connection with nearby deposits. **Ref:** 86, p. 38-39.
- *25. **Name:** Sec. 17 deposit (A). **Loc:** S $\frac{1}{2}$ sec. 17, (18-23E). **Descr:** Exposed for distance of 150 ft. to depth of 12 ft. **Value:** Currently operated by Kenite Corp., Quincy, Wash. **Ref:** 2-A, p. 26; 120, p. 22.
- *26. **Name:** Dia-Cousti-Lite deposit. **Loc:** NW $\frac{1}{4}$ NE $\frac{1}{4}$ and NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, (18-23E). **Descr:** Deposit from a few feet to 18 ft. thick contains an estimated 100,000 tons. **Value:** Formerly operated by Dia-Cousti-Lite Co., Quincy; now operated by the Quincy Corporation of New York. **Ref:** 48, p. 40; 55, p. 20; 86, p. 39-40.
- *27. **Name:** State Products deposit. **Loc:** NW $\frac{1}{4}$ NE $\frac{1}{4}$ and SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (18-23E). **Descr:** Deposit 11 $\frac{1}{2}$ to 13 ft. thick. **Value:** Owned by State Products Co. and currently leased and operated by Corliss-Kaiser Co., Inc., Yakima. **Ref:** 48, p. 40; 55, p. 33; 86, p. 36-37.
- *28. **Name:** Sec. 21 deposit (A). **Loc:** NE $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (18-23E). **Descr:** Two tunnels 200 ft. apart expose 10 to 13 ft. of diatomite. Pillows and blocks of basalt cut effective thickness to 4 ft. in places. **Value:** A commercial product can be obtained by removal of basalt. Recently operated by Yakima Clay & Chemical Corp., Yakima. **Ref:** 2-A, p. 40; 86, p. 37.
- *29. **Name:** Sec. 21 deposit (B). **Loc:** N. central part SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (18-23E). **Descr:** Similar to loc. no. 28. **Value:** Usable material after separation of basalt. Recently operated by Yakima Clay & Chemical Corp., Yakima. **Ref:** 2-A, p. 40; 86, p. 36.
- *30. **Name:** Sec. 21 deposit (C). **Loc:** SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (18-23E). **Descr:** Deposit 13 to 14 ft. thick. Opal nodules and basalt fragments cut effective thickness to 4 ft. **Value:** Recently operated by Yakima Clay & Chemical Corp., Yakima. **Ref:** 2-A, p. 40; 86, p. 36.
31. **Name:** Webley deposit. **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, (18-23E). **Descr:** A 14-ft. bed, containing opal nodules, covered by 2 to 6 ft. of overburden. **Value:** Commercial quantity if separation of opal nodules is feasible. **Ref:** 86, p. 35.
- *32. **Name:** Sec. 22 deposit. **Loc:** NW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, (18-23E). **Descr:** A 13- to 14-ft. bed. Opal nodules and basalt fragments cut usable thickness to 4 ft. **Value:** Recently operated by Kenite Corp., Quincy, Wash. **Ref:** 2-A, p. 26; 86, p. 36.
33. **Name:** Sec. 26 deposit (A). **Loc:** Center sec. 26, (18-23E). **Descr:** A 10-ft. bed beneath 1 to 8 ft. of overburden. **Value:** Commercial quantity. **Ref:** 120, p. 24.

34. **Name:** Sec. 27 deposit. **Loc:** Sec. 27, (18-23E). **Descr:** A 30-ft. face exposed for 100 ft. Covered by 30 ft. of basalt. **Value:** Expensive underground mining necessary. **Ref:** 124, p. 17.
35. **Name:** Sec. 29 deposit (A). **Loc:** SE $\frac{1}{4}$ sec. 29, (18-23E). **Descr:** Bed 10 to 40 ft. thick exposed for 400 ft. and covered by 1 to 8 ft. of overburden. **Value:** Commercial. **Ref:** 120, p. 24.
36. **Name:** Grennell deposit. **Loc:** NE $\frac{1}{4}$ and SE $\frac{1}{4}$ sec. 32, (18-23E). **Descr:** Two exposures 2,000 ft. apart. One has been opened to a depth of 30 ft. and laterally for 500 ft. **Value:** Formerly worked by Grennell & Son. **Ref:** 86, p. 40; 120, p. 25-26; 124, p. 17.
37. **Name:** Sec. 33 deposit. **Loc:** W $\frac{1}{2}$ sec. 33, (18-23E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 120, p. 22.
38. **Name:** Sec. 34 deposit. **Loc:** SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (18-23E). **Descr:** Two small abandoned openings. **Value:** Mining difficulties make value doubtful. **Ref:** 86, p. 40.
39. **Name:** Sec. 29 deposit (B). **Loc:** Road cut in sec. 29, (17-24E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 120, p. 22.

KITITAS COUNTY

40. **Name:** Sec. 24 deposit. **Loc:** SW $\frac{1}{4}$ sec. 24, (16-19E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
41. **Name:** Sec. 25 deposit. **Loc:** W $\frac{1}{2}$ sec. 25, (16-19E). **Descr:** Appears to be large deposit. **Value:** Warrants investigation. **Ref:** 86, map.
42. **Name:** Sec. 26 deposit (B). **Loc:** SE $\frac{1}{4}$ sec. 26, (16-19E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
43. **Name:** Sec. 32 deposit. **Loc:** E $\frac{1}{2}$ sec. 32, (16-19E). **Descr:** A 3-ft. bed. **Value:** Extent should be determined. **Ref:** 86, p. 26.
44. **Name:** Sec. 36 deposit. **Loc:** NE $\frac{1}{4}$ and SW $\frac{1}{4}$ sec. 36, (16-19E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
45. **Name:** Sec. 31 deposit. **Loc:** S $\frac{1}{2}$ and NW $\frac{1}{4}$ sec. 31, (16-20E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
46. **Name:** Sec. 5 deposit. **Loc:** S $\frac{1}{2}$ sec. 5, (15-20E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
47. **Name:** Sec. 6 deposit. **Loc:** E $\frac{1}{2}$ sec. 6, (15-20E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
48. **Name:** Kittitas Diatomite Co. **Loc:** SE $\frac{1}{4}$ sec. 8, (15-20E). **Descr:** Two small pits expose 9 to 11 ft. of diatomite. **Value:** Recently operated by Kittitas Diatomite Co. **Ref:** 86, p. 18-19.
49. **Name:** Sec. 8 deposit. **Loc:** W $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 8, (15-20E). **Descr:** Small pit exposes diatomite covered by 20 ft. of overburden. **Value:** Stripping impractical. **Ref:** 86, p. 19.
50. **Name:** Sec. 9 deposit. **Loc:** S $\frac{1}{2}$ and NE $\frac{1}{4}$ sec. 9, (15-20E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
51. **Name:** Denny deposit. **Loc:** E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 10, (15-20E). **Descr:** Diatomite 10 ft. thick. **Value:** Worked about 1920. **Ref:** 48, p. 41; 86, p. 18; 120, p. 30; 124, p. 24.
52. **Name:** Secs. 11 and 14 deposit. **Loc:** Secs. 11 and 14, (15-20E). **Descr:** Average thickness in these bodies said to be 9 ft. **Value:** Considerable tonnage has been mined. **Ref:** 48, p. 41.
- *53. **Name:** Great Lakes Carbon Corp. **Loc:** S $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 15, (15-20E). **Descr:** Very large deposit 13 to 14 ft. thick. **Value:** Currently operated by Western Ventures, Inc., Spokane. Formerly operated by Great Lakes Carbon Corp. **Ref:** 2-A, p. 39; 48, p. 40; 55, p. 23; 86, p. 17; 120, p. 27; 124, p. 18.
- *54. **Name:** Sec. 15 deposit. **Loc:** $\frac{1}{2}$ mi. E. of deposit no. 53. **Descr:** Probably an extension of no. 53. **Value:** Currently operated by Western Ventures, Inc., Spokane. **Ref:** 2-A, p. 39; 48, p. 41; 124, p. 24.
55. **Name:** Sec. 16 deposit (A). **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (15-20E). **Descr:** Probably 10 ft. thick. **Value:** Probably could be worked in connection with nearby deposits. **Ref:** 86, p. 23.
56. **Name:** Sec. 16 deposit (B). **Loc:** SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (15-20E). **Descr:** Two pits, 300 ft. apart, expose 9 to 11 ft. of diatomite. **Value:** Warrants investigation. **Ref:** 86, p. 22-23.
57. **Name:** Sec. 16 deposit (C). **Loc:** SE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (15-20E). **Descr:** Diatomite, 10 to 11 ft. thick, occurs over a minable area 200 ft. by 1,500 ft. **Value:** Commercial quantity, deserves investigation. **Ref:** 86, p. 23.
58. **Name:** Secs. 20 and 17 deposit. **Loc:** N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 20 and SE $\frac{1}{4}$ sec. 17, (15-20E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, map.
59. **Name:** Sec. 19 deposit. **Loc:** Center sec. 19, (15-20E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, p. 13-14.
60. **Name:** Clerf deposit. **Loc:** NE $\frac{1}{4}$ sec. 25, (15-20E). **Descr:** Diatomite 18 ft. thick underlies less than 20 ft. of overburden. **Value:** Mined in 1942. **Ref:** 48, p. 41; 86, p. 13-14.
61. **Name:** Sec. 28 deposit. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (15-20E). **Descr:** Diatomite at least 8 ft. thick could be mined over fairly large area. **Value:** Warrants further investigation. **Ref:** 86, p. 23-24.
62. **Name:** Sec. 30 deposit. **Loc:** Center and NW $\frac{1}{4}$ sec. 30, (15-20E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, p. 13-14.
63. **Name:** Sec. 7 deposit. **Loc:** S $\frac{1}{2}$ sec. 7, (15-19E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 86, p. 27.
64. **Name:** East Roza. **Loc:** SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (15-19E). **Descr:** Diatomite, 10 ft. thick, extends 200 ft. along outcrop. It is covered by 8 in. of clay and rocky soil. **Value:** Formerly mined. **Ref:** 48, p. 41; 120, p. 30; 124, p. 20-21.

65. **Name:** West Roza. **Loc:** SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (15-19E). **Descr:** Exposed to depth of 4 ft. and laterally for 200 ft. May be 10 to 11 ft. thick. **Value:** Worked for several years by a Japanese company. **Ref:** 36, p. 103; 48, p. 41; 86, p. 27; 103, p. 96; 119, p. 125; 120, p. 30; 124, p. 21.

66. **Name:** Sec. 17 deposit (B). **Loc:** SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (15-19E). **Descr:** Diatomite, perhaps 10 to 11 ft. thick, covered by at least 20 ft. of overburden. **Value:** Thickness of overburden caused abandonment and makes mining cost prohibitive. **Ref:** 86, p. 27.

YAKIMA COUNTY

67. **Name:** Selah Tunnel. **Loc:** Highway cut just south of Selah tunnel in sec. 9, (14-19E). **Descr:** Small impure deposit. **Value:** Quality and quantity below commercial grade. **Ref:** 48, p. 42; 124, p. 21-22.

68. **Name:** Glead. **Loc:** E. side Naches Valley in sec. 33, (14-18E). **Descr:** Reportedly 30 ft. thick, opened to depth of 10 ft., and exposed laterally several hundred ft. **Value:** Should be investigated. **Ref:** 48, p. 41; 124, p. 22.

69. **Name:** Maple Grove. **Loc:** Approximately in sec. 35, (11-22E). **Descr:** Large extent and more than 16 ft. thick. **Value:** Warrants investigation. **Ref:** 48, p. 42; 124, p. 22-23.

70. **Name:** Sunnyside. **Loc:** NE $\frac{1}{4}$ sec. 2, (10-22E) (may be same as no. 69). **Descr:** Known thickness 4 ft., may be 15 ft. **Value:** Extent should be determined. **Ref:** 120, p. 31-32.

BENTON COUNTY

71. **Name:** Kiona. **Loc:** SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (9-26E). **Descr:** A thick cherty bed between basalt flows. **Value:** Warrants investigation. **Ref:** 72; 96; 124, p. 23.

Klickitat County

72. **Name:** Satus Pass. **Loc:** Secs. 11 and 14 (?), (6-17E). **Descr:** Reportedly a 50-ft. bed containing large tonnage. **Value:** Not known; should be investigated. **Ref:** 96, p. 12.

73. **Name:** Chapman Creek. **Loc:** Sec. 3, (3-19E). **Descr:** Said to be a large tonnage in two beds, an upper 4-ft. bed separated from a lower 22-ft. bed by 2 ft. of clay. **Value:** Further investigation desirable. **Ref:** 96, p. 12.

74. **Name:** Roosevelt. **Loc:** Reportedly 6 or 8 mi. NW. of Roosevelt. (May be same as no. 73). **Descr:** Unknown. **Value:** Said to have been operated by Miller Products Co., Portland, Oreg. **Ref:** 135.

ADAMS COUNTY

75. **Name:** Wenzelberger (Hatton). **Loc:** NE $\frac{1}{4}$ sec. 25, (16-30E). **Descr:** A 15-ft. bed crops out on N. side of an arroyo. **Value:** Considerable tonnage mined about 20 years ago. **Ref:** 48, p. 40; 86, p. 31; 119, p. 125; 120, p. 20; 124, p. 23-24.

SPOKANE COUNTY

76. **Name:** Milan. **Loc:** NW. cor NE $\frac{1}{4}$ sec. 13, (28-43E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.

DOLOMITE

Dolomite is a name applied to both a mineral and rock. The mineral dolomite is a double salt of calcium and magnesium with the theoretical formula $\text{CaMg}(\text{CO}_3)_2$. In the rock mass it frequently contains iron, alumina, manganese, silica, and other impurities. With decrease in its content of magnesia and increase in lime, it grades into limestone. With increase in magnesia and decrease in lime it grades into magnesite.

Physically, the rock is nearly indistinguishable from either limestone or magnesite. It has the same hardness (3), the same characteristic rhombic cleavage of individual crystals, and the same usual light color of white, gray, or blue gray. Other than by analysis, it may be distinguished by careful determination of specific gravity, reaction to hydrochloric acid, or determination of index of refraction.

Dolomite is calcined to make dolomitic lime, which is used as a refractory (dead-burned dolomite) and in paper mills. Raw dolomite is also used as a refractory,

particularly for patching furnace floors, as a source of magnesium metal, as a soil conditioner, and as a diluent in insecticides.

Virtually all of the dolomite in Washington occurs east of the Cascade Mountains and north of the Columbia and Spokane Rivers. The one important exception is a deposit in Lincoln County which lies south of the Spokane River. Reserves of dolomite in the state are huge. An estimate of nearly 600,000,000 tons by Bennett (**Ref:** 8) indicates a supply of several hundred years' duration, based on the current rate of consumption.

The Washington deposits of dolomite that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

In 1946 the average price of raw dolomite produced in the United States was \$1.67 per ton. The average price of dolomitic lime was \$13.51 per ton.

OCCURRENCES

On page 27 in volume 2 is plate 11, the map showing the occurrences of dolomite, numbered to correspond with the numbers of the occurrences listed below.

OKANOGAN COUNTY

1. **Name:** Deposit 9. **Loc:** Immediately N. of deposit 7 in sec. 10, (35-26E) overlooking Booher Lake.

- Descr:** 2,700 ft. long, and 1,000 ft. wide in the center. **Value:** Contains an estimated 33,600,000 tons. Undeveloped. **Ref:** 8, p. 22-23.
2. **Name:** Deposit 7. **Loc:** Mainly in secs. 10 and 15, (35-26E). **Descr:** Triangular in outline. E. and W. sides 6,800 ft. long and S. side 1,600 ft. long. **Value:** Contains an estimated 176,000,000 tons. Undeveloped. **Ref:** 8, p. 17-20.
 3. **Name:** Deposit 6. **Loc:** SE $\frac{1}{4}$ sec. 15 and NE $\frac{1}{4}$ sec. 22, (35-26E). **Descr:** Approximately 40 acres in extent. **Value:** Contains an estimated 18,400,800 tons. Undeveloped. **Ref:** 8, p. 17.
 4. **Name:** Deposit 8. **Loc:** E $\frac{1}{2}$ NW $\frac{1}{4}$ and NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (35-26E). **Descr:** Series of outcrops outline area 2,400 by 350 ft. **Value:** Contains an estimated 9,813,000 tons. Undeveloped. **Ref:** 8, p. 20-22.
 5. **Name:** Deposit 5. **Loc:** SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 22, (35-26E). **Descr:** 1,000 by 350 ft. in surface dimensions. **Value:** Contains an estimated 1,848,000 tons. Undeveloped. **Ref:** 8, p. 16.
 6. **Name:** Deposit 4. **Loc:** NW $\frac{1}{4}$ sec. 26 and SW $\frac{1}{4}$ sec. 23, (35-26E). **Descr:** Surface dimensions 4,200 by 600 ft. **Value:** Contains an estimated 31,917,000 tons. Undeveloped. **Ref:** 8, p. 14-16.
 7. **Name:** Deposit 3. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, (35-26E). **Descr:** Approximately 20 acres underlain by dolomite. **Value:** Contains an estimated 10,976,000 tons. Undeveloped. **Ref:** 8, p. 13-14.
 8. **Name:** Deposit 2. **Loc:** SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, (35-26E). **Descr:** Deposit 800 by 200 ft. in areal extent. **Value:** Contains an estimated 1,336,500 tons. Undeveloped. **Ref:** 8, p. 12-13.
 - *9. **Name:** N. W. L. Brown. **Loc:** Mostly in sec. 36, but partly in secs. 25, 26, and 35, (35-26E). **Descr:** Deposit 1,200 ft. long, 800 ft. wide at S. end, and 400 ft. wide at N. end. **Value:** Contains an estimated 5,300,000 tons. Currently worked by N. W. L. Brown, Riverside. **Ref:** 2-A, p. 21; 8, p. 11-12; 55, p. 18.
 10. **Name:** Johnson Creek. **Loc:** Sec. 4, 34-26E). **Descr:** Thick section of Riverside series. Dolomite interstratified with limestone, sandy dolomite, and chert. **Value:** Warrants investigation. **Ref:** 8, p. 24.
 11. **Name:** Deposit 10. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, (34-26E). **Descr:** Area of about 8 acres underlain by dolomite. **Value:** Contains an estimated 1,320,000 tons. Undeveloped. **Ref:** 8, p. 23-24.
 12. **Name:** Nespelem. **Loc:** On Park City road in sec. 18, (31-31E). **Descr:** Apparently a good grade of dolomite. **Value:** Further investigation desirable. **Ref:** 135.
- STEVENS COUNTY**
13. **Name:** Northport limestone formation. **Loc:** Extends northeastward from near Kettle Falls to region N. of Northport. **Descr:** Parts of this formation are dolomitic. **Value:** Parts contain dolomite in commercial quantity and quality. **Ref:** 139, p. 75-77.
 14. **Name:** Marble. **Loc:** NE $\frac{1}{4}$ sec. 27, (39-39E). **Descr:** Isolated hill of dolomite has large tonnage available. Samples of crushed rock shipped averaged about 3 percent silica and about 0.5 percent R₂O₃. **Value:** About 300,000 tons shipped in 1943 and 1944, and unknown amount shipped in 1952 to Spokane by Electro Metallurgical Co. for production of magnesium. Currently owned by Pacific Northwest Alloys, Inc., Spokane. **Ref:** 2-A, p. 31; 28, p. 114; 35-A.
 15. **Name:** Old Dominion limestone. **Loc:** Extends northeastward from S. of Colville to area N. of Aladdin in T. 38 N., R. 41 E. **Descr:** This formation contains scattered bodies of dolomite. **Value:** Portions have been used commercially. **Ref:** 48, p. 120; 139, p. 66.
 - *16. **Name:** U. S. Gypsum quarry. **Loc:** Secs. 15 and 16, (37-38E). **Descr:** Part of the Northport limestone formation. **Value:** Recently worked by U. S. Gypsum Co. **Ref:** 55, p. 34.
 17. **Name:** Old Dominion mine. **Loc:** Sec. 4, (35-40E). **Descr:** Two beds of dolomite, one 300 ft. and the other 100 ft. thick, are crosscut in main adit. **Value:** Warrants investigation. **Ref:** 135.
 18. **Name:** Tulare quarry. **Loc:** Sec. 13, (35-39E) and sec. 18, (35-40E). **Descr:** Part of Old Dominion limestone formation. **Value:** Quarried by Eric Carlson in 1947. **Ref:** 53, p. 14; 64, p. 100-101.
 19. **Name:** Dunn Mountain. **Loc:** Secs. 34 and 35, (34-38E). **Descr:** Deposit approximately 225 acres in extent. **Value:** Contains an estimated 200,000,000 tons. Marble quarries once operated in the N $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 35, (34-38E). **Ref:** 8, p. 30-35.
 20. **Name:** Addy. **Loc:** Secs. 11, 12, 13, and 14, (33-39E). **Descr:** Deposit 130 acres in extent. **Value:** contains an estimated 68,000,000 tons. Undeveloped. **Ref:** 8, p. 33-35.
 - *20A. **Name:** Chewelah Eagle. **Loc:** Sec. 5, (32-41E). **Descr:** Dolomite exposed in workings of Chewelah Eagle Mining Co. copper mine. **Value:** Recently produced by Chewelah Eagle Mining Co. of Chewelah. **Ref:** 66-B, p. 21.
 - 20B. **Name:** Irondale. **Loc:** Sec. 18, (32-38E). **Descr:** Hill of dolomite 750 ft. long, 350 ft. wide, and averaging 200 ft. in height. **Value:** Formerly quarried by the Irondale Corp. **Ref:** 64, p. 97.
 21. **Name:** Stensgar dolomite. **Loc:** Extends northeastward along Huckleberry Mountains from S. of Turk to a place 5 mi. N. of Chewelah. **Descr:** Portions of this formation are dolomitic. **Value:** Portions contain dolomite in commercial quantity. **Ref:** 6.
 - *22. **Name:** Valley. **Loc:** Secs. 15 and 22, (31-40E). **Descr:** White, crystalline dolomite exposed for

250 yds. **Value:** Currently quarried by Manufacturers Mineral Co., Seattle. **Ref:** 2-A, p. 27.

- 22A. **Name:** Hellhake. **Loc:** On Hellhake farm in W½ sec. 13, (31-40E), near Valley. **Descr:** Chalcadonic dolomite. **Value:** Appears to be suitable for use as honestone. **Ref:** 135.

LINCOLN COUNTY

23. **Name:** Old Fort Spokane. **Loc:** On S. side Spokane River in N½ sec. 21, NW¼ sec. 22, SW¼ sec. 15, and SE¼ sec. 16, (28-36E). **Descr:** Very large deposit of high-grade dolomite. **Value:** Commercial. **Ref:** 8, p. 25-30.

FELDSPAR AND NEPHELITE

Feldspar is a group name which includes a large number of mineral species. In general the species may be divided into two main sub-groups, orthoclase and plagioclase. Orthoclase includes the potassium aluminum silicates having the general formula $KAlSi_3O_8$, in which potassium may be replaced by other elements such as barium. Plagioclase includes the soda-lime feldspars, containing variable proportions of the two molecules $NaAlSi_3O_8$ and $CaAl_2Si_2O_8$. Feldspars of both sub-groups are characterized by two excellent cleavages near 90° to one another, a pearly to vitreous luster, a hardness of 6, and generally light colors such as white or pale shades of red, yellow, green, or gray.

Feldspar forms the most abundant mineral in the crust of the earth but occurs mainly as small crystals, as in granite, intimately intermixed and interlocked with other minerals. Occasionally, however, it occurs in large masses and then becomes commercially important, particularly the orthoclase variety. Feldspar is used in the manufacture of porcelain enamels, floor and wall tile, glass brick, hollow tile, glass, electrical and sanitary porcelains, whiteware, hotel china, glass

PEND OREILLE COUNTY

24. **Name:** Metaline limestone formation. **Loc:** Metaline district. **Descr:** Dolomite is irregularly distributed through this formation and often occurs as gangue of the lead-zinc ores. **Value:** Portions might be used. **Ref:** 102, p. 17-19.

ASOTIN COUNTY

25. **Name:** Asotin Creek. **Loc:** Sec. 34, (10-44E). **Descr:** Not known. **Value:** Reportedly quarried for marble at one time. **Ref:** 64, p. 131.

fiber and wool, soaps, cleansers, and sweeping compounds, and as an abrasive.

Though no deposits of feldspar in Washington are being worked at the present time, there are some which show promise. In addition, there is at least one body of rock, several miles in extent, from which feldspar might be extracted commercially by flotation or some allied method of recovery.

Nephelite, or nepheline, is a mineral allied to the feldspar group, with the formula $(Na,K)AlSiO_4$. It resembles feldspar in physical characteristics as well as in composition. It has the same hardness and colors but differs from feldspar in its greasy luster and lack of prominent cleavage, characteristics responsible for its frequent confusion with quartz. Its uses are the same as those listed for feldspar. In Washington the only deposits worthy of note are those in the Kruger-Ellemehem Mountain area. Though the percentage of nephelite in those rocks is small, the large volume of material available gives them potential importance.

In June 1956, potash feldspar, ground to 200 mesh, sold for \$18.50 per ton f. o. b. North Carolina. Prices on nephelite are comparable to those of feldspar.

OCCURRENCES

On page 29 in volume 2 is plate 12, the map showing the occurrences of feldspar and nephelite. These are numbered to correspond with the numbers of the occurrences listed below.

FELDSPAR

SAN JUAN COUNTY

1. **Name:** Orcas Island. **Loc:** On W. shore of Deer Harbor in sec. 7, (36-2W). **Descr:** Four bodies of pegmatite, three pure white and 25 to 45 ft. thick and the fourth 60 ft. thick but somewhat iron-stained. **Value:** Tests at the University of Washington indicate that this material would be an excellent component of high-grade porcelain. **Ref:** 48, p. 43; 71-A, p. 37; 87, p. 172-174; 145, p. 2-8.

SKAGIT COUNTY

2. **Name:** Nooksack River. **Loc:** In bed of tributary to the Nooksack River in NW¼ sec. 10, (36-7E).

Descr: Two or more 1-ft. dikes of plagioclase feldspar. **Value:** Exposed quantity too small to be of value. **Ref:** 135.

OKANOGAN COUNTY

3. **Name:** Tunk Creek. **Loc:** SW¼SE¼ sec. 8, (35-27E). **Descr:** Small clots of orthoclase occur in a pegmatite composed chiefly of quartz. **Value:** Quantity exposed is too small to support commercial operation. **Ref:** 135.

CHELAN COUNTY

4. **Name:** Wenatchee Lake. **Loc:** Sec. 20, (27-17E) on S. side of road along N. shore of lake. **Descr:** Pegmatite containing about 70 percent feldspar reportedly occurs in quantity. **Value:** Warrants investigation. **Ref:** 71-A, p. 26-28; 135.
5. **Name:** Chelan Tunnel. **Loc:** Near highway tunnel in sec. 20, (27-21E). **Descr:** Rather pure segrega-

tions and dikes of feldspar in Swakane gneiss. **Value:** Possibly workable concentrations in the area. **Ref:** 135.

6. **Name:** Winesap. **Loc:** Secs. 1, 2, and 11, (26-21E) and at Dick nickel prospect $\frac{1}{2}$ mi. to the W. **Descr:** Pegmatite dikes containing pink feldspar. **Value:** Size, extent, and purity should be determined. **Ref:** 135.

FERRY COUNTY

7. **Name:** Belcher mine. **Loc:** Sec. 6, (37-34E). **Descr:** Chunks of pure feldspar as much as 1 ft. in diameter on the dump. **Value:** Further investigation desirable. **Ref:** 135.

STEVENS COUNTY

8. **Name:** Waits Lake granite. **Loc:** Covers sec. 25 and parts of secs. 13, 14, 23, 24, 26, 35, and 36, (31-39E) and parts of secs. 19, 31, and 32, (31-40E). **Descr:** Porphyritic granite containing abundant feldspar phenocrysts up to 3 in. long and considerable feldspar in groundmass. **Value:** Feldspar might be recovered economically by flotation or some other method of concentration. **Ref:** 135.

PEND OREILLE COUNTY

9. **Name:** Cusick. **Loc:** Sec. 35, (35-45E). **Descr:** White microcline, somewhat iron-stained along seams and cracks, forms a lens in granite 30 ft. long and 1 to 3 ft. thick. **Value:** Exposed quantity too small for commercial use. **Ref:** 48, p. 44; 119, p. 127; 145, p. 10.
10. **Name:** Coffin prospect. **Loc:** Sec. 16, (38-42E). **Descr:** Pink feldspar makes up 70 percent of the country rock. **Value:** A commercial product might be obtained by flotation or some other means of separation. **Ref:** 135.

SPOKANE COUNTY

11. **Name:** Mica Peak. **Loc:** Near center of T. 24 N., R. 45 E. **Descr:** Pegmatite dikes containing considerable feldspar. **Value:** Warrants investigation. **Ref:** 48, p. 44.
12. **Name:** Fish Lake. **Loc:** Sec. 33, (24-42E). **Descr:** A 5-ft. pegmatite dike containing feldspar. **Value:** Size and purity should be determined. **Ref:** 96, p. 12.

WHITMAN COUNTY

13. **Name:** Bald Butte. **Loc:** Secs. 1, 2, 11, and 12, (13-45E). **Descr:** Feldspathic pegmatite dikes cutting quartz diorite. **Value:** Quantity and quality should be determined. **Ref:** 135.

NEPHELITE

SAN JUAN COUNTY

14. **Name:** Waldron Island. **Loc:** On Waldron Island. **Descr:** Boulders of nepheline syenite in a conglomerate. **Value:** Probably not commercial. **Ref:** 87.

OKANOGAN COUNTY

15. **Name:** Kruger Mountain. **Loc:** Sec. 3, (40-26E) and extending into Canada. **Descr:** Alkaline syenite, covering an area of approximately $1\frac{1}{2}$ square mi. in Washington, contains a small percentage of nephelite. **Value:** Usable product might be obtained by proper treatment. **Ref:** 17, p. 537-538.
16. **Name:** Ellemeham Mountain. **Loc:** SW $\frac{1}{4}$ sec. 9 and NW $\frac{1}{4}$ sec. 16, (40-26E). **Descr:** Nepheline syenite about $\frac{3}{4}$ sq. mi. in extent. Contains an estimated 10 percent of nephelite. **Value:** A usable product might be obtained by flotation or allied method of recovery. **Ref:** 17, p. 536-537, 538.

FLUORITE

Fluorite is a mineral having the composition CaF_2 . It has an octahedral cleavage, is generally brittle, is easily scratched with a knife, and has a vitreous luster. Its color is variable but most commonly bluish green, lavender, or white. Many a single sample shows all three colors.

More than half of all fluorite produced is used as a flux in the steel industry, one-third is used in the manufacture of hydrofluoric acid, and about one-tenth in the glass and enamel industries, and the remainder in other industries.

Only one deposit in Washington, the Mitchem mine

in Ferry County, has had any production. The other occurrences are not yet known to have commercial possibilities. Possibly by means of flotation or some other method fluorite might be recovered as a commercial byproduct from ore veins in which it occurs as a gangue mineral.

Fluorite prices in June 1956 for metallurgical grade, f. o. b. Illinois and Kentucky, were \$33 to \$35 per short ton of fluorite containing 72 $\frac{1}{2}$ percent effective CaF_2 and \$28 to \$30 for 60 percent material. Acid grade was quoted at \$47.50 per ton, bulk, carload lots, f. o. b. Illinois.

OCCURRENCES

On page 31 in volume 2 is plate 13, the map showing the occurrences of fluorite, numbered to correspond with the numbers of the occurrences listed below.

SNOHOMISH COUNTY

1. **Name:** Ethel Consolidated Mining Co. **Loc:** Secs. 34 and 35, (28-10E). **Descr:** Minor amounts occur as a gangue mineral in the copper ore veins.

Value: Might be recovered as a byproduct. **Ref:** 138, p. 65, 76.

CHELAN COUNTY

2. **Name:** Slide area. **Loc:** E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 17, (28-21E). **Descr:** Seven parallel veins of fluorite, from less than 1 in. to 6 in. wide, traceable for only a few feet. Distance between two outer veins is about

300 ft. Many other small occurrences of fluorite in the vicinity. **Value:** Probably noncommercial but warrants prospecting. **Ref:** 135.

OKANOGAN COUNTY

3. **Name:** Montgomery. **Loc:** Sec. 14, (?) (36-26E). **Descr:** Thin veinlets of fluorite in limy argillite. **Value:** Below present commercial grade. **Ref:** 135.
- 3A. **Name:** Lost River. **Loc:** In Three Pinnacles-Lost River area, sec. 25, (38-19E). **Descr:** 2 in. of quartz and fluorite in fault zone at 4,430-ft. elevation and up to 12 in. of fluorite and chalcedony in vein in granite at 7,200-ft. elevation. Also abundant fluorite float in area. **Value:** Is in inaccessible area but warrants investigation. **Ref:** 135.
4. **Name:** Riverside. **Loc:** Reported about 5 mi. E. of Riverside in T. 35 N., R. 27 E. **Descr:** Said to form small lenses in gneiss and schist. **Value:** Probably not commercial but should be investigated. **Ref:** 96, p. 4.
5. **Name:** Silver Bell claim. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, (38-31E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
6. **Name:** Ramore Mining Co. **Loc:** NE $\frac{1}{4}$ sec. 14, (33-31E). **Descr:** Gangue mineral associated with quartz and calcite in the lead-silver-copper veins. **Value:** Might be recovered as a byproduct. **Ref:** 98, p. 99.
7. **Name:** Apache claim. **Loc:** Sec. 27, (31-30E). **Descr:** Gangue mineral in silver ore. **Value:** Might be recovered as a byproduct. **Ref:** 98, p. 65.

FERRY COUNTY

8. **Name:** Zalla M. mine. **Loc:** Sec. 30, (38-32E). **Descr:** Gangue mineral in gold-silver-copper ore. **Value:** Possibly a commercial byproduct. **Ref:** 104, p. 199.
9. **Name:** American Flag mine. **Loc:** NE. cor. sec. 36,

(38-31E). **Descr:** Typical occurrence of Sheridan district—an accessory mineral in phonolite, of which it may constitute 30 percent in certain zones. **Value:** Might be concentrated by some means to make salable product. **Ref:** 48, p. 44.

10. **Name:** Mitchem mine. **Loc:** NE $\frac{1}{4}$ sec. 24, (30-32E). **Descr:** A 16-in. vein in granite. **Value:** About 60 tons produced in 1918 and 169 tons in 1945. **Ref:** 33, p. 69; 34, p. 20; 35, p. 1438; 48, p. 44; 98, p. 127; 103, p. 99-101; 119, p. 122.

STEVENS COUNTY

11. **Name:** Frisco Standard mine. **Loc:** Sample submitted to the Division of Mines and Geology reportedly came from this mine in SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (40-42E). **Descr:** Small sample of green fluorite. **Value:** Might be profitable byproduct. **Ref:** 135.
12. **Name:** Coyote prospect. **Loc:** Secs. 23 and 24, (40-39E). **Descr:** Gangue mineral in lead-silver-zinc ore. **Value:** Possibly a profitable byproduct. **Ref:** 135.
13. **Name:** Phalen Lake. **Loc:** Probably in NE $\frac{1}{4}$ T. 38 N., R. 39 E. **Descr:** Occurs in molybdenite-bearing quartz veins and as an accessory mineral of the granite cut by these veins, especially near schist and quartzite contacts. **Value:** Warrants investigation. **Ref:** 48, p. 45; 139, p. 128.
14. **Name:** Read iron prospect. **Loc:** N $\frac{1}{2}$ sec. 14, (30-37E). **Descr:** Occurs as a gangue mineral with wollastonite, tremolite, and quartz in the magnetite ore body. **Value:** Probably not commercial. **Ref:** 13, p. 14; 118, p. 45.
15. **Name:** Germania mine. **Loc:** Sec. 13, (29-37E). **Descr:** Gangue mineral associated with quartz in tungsten vein. **Value:** Possibly a profitable byproduct. **Ref:** 48, p. 44-45; 139, p. 128.

GARNET

Minerals of the garnet group have the general formula $R_3R_2(SiO_4)_3$, in which R_3 may be calcium, magnesium, iron, or manganese, and R_2 may be aluminum, iron, chromium, or titanium. All crystallize in the isometric system and are alike in habit, the common forms being the dodecahedron and trapezohedron. They are harder than quartz but, like it, lack cleavage and have a vitreous luster. Color varies through wide limits, but most common are shades of red and brown.

Garnet is used as a gem stone and as an abrasive. For gem stone use it must be clear, free from flaws and impurities, and of an attractive color. Abrasive require-

ments are less exacting, but well-crystallized, relatively pure material is preferred because of its greater strength and longer life. Almandite (iron-aluminum garnet), andradite (calcium-iron garnet) are the species most commonly used for abrasive purposes, but others would be equally usable if found in sufficient quantity. Ore used in the largest New York mine is garnet gneiss containing 7 to 8 percent garnet. Similar gneisses in Washington are potentially important.

In 1951, New York Adirondack garnet concentrates sold for about \$105 per short ton. Idaho garnet had a value of about \$60 per short ton, f. o. b. Idaho.

OCCURRENCES

On page 33 in volume 2 is plate 14, the map showing the occurrences of garnet, numbered to correspond with the numbers of the occurrences listed below.

SKAGIT COUNTY

1. **Name:** Cascade Pass. **Loc:** A short distance S. of Cascade Pass. **Descr:** Pyrope garnet crystals as

much as $\frac{3}{4}$ in. in diameter occur disseminated through dark-green schist. **Value:** Inaccessibility makes present commercial value doubtful. **Ref:** 135.

2. **Name:** Last Chance mine. **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (35-6E). **Descr:** Garnetiferous schist country rock. **Value:** Warrants investigation. **Ref:** 135.

SNOHOMISH COUNTY

3. **Name:** Vesper Peak. **Loc:** Center sec. 9, (29-10E). **Descr:** Lens 70 ft. long by 50 ft. wide is made up primarily of grossularite garnet together with minor amounts of calcite, augite, diopside, epidote, prehnite, and vesuvianite. **Value:** Semiprecious gem material. **Ref:** 12, p. 53; 18, p. 70.
4. **Name:** Barclay Creek. **Loc:** On N. side of Barclay Creek. **Descr:** Garnet crystals as much as 1 in. in diameter; associated with them are hornblende and epidote. **Value:** Should be investigated. **Ref:** 12, p. 53; 138, p. 64.

KING COUNTY

5. **Name:** Guye Peak. **Loc:** Secs. 29 and 31, (23-11E). **Descr:** Massive garnet in a band as much as 10 ft. wide occurs at contact between granodiorite and metamorphic rocks. **Value:** Might be usable as abrasive material. **Ref:** 123, p. 13.
6. **Name:** Denny Mountain. **Loc:** Sec. 6, (22-11E), 600 to 1,000 ft. above Denny Creek. **Descr:** Massive garnet as much as 10 ft. thick adjacent to the Denny limestone deposit. **Value:** Possible source of abrasive garnet. **Ref:** 123, p. 13.

CHELAN COUNTY

7. **Name:** Gaynor. **Loc:** Along Stevens Pass highway in vicinity of Gaynor, in secs. 2 and 3, (26-15E). **Descr:** Mica schists, some of which contain abundant small garnet crystals. **Value:** Large quantity of accessible schist; quality of garnet should be determined. **Ref:** 135.

OKANOGAN COUNTY

8. **Name:** Texas Creek. **Loc:** W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 2, (31-22E). **Descr:** Garnetiferous beds, some more than 10 ft. thick, occur along a contact zone. **Value:** Warrants investigation. **Ref:** 135.
9. **Name:** Four Metals mine. **Loc:** NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, (44-25E). **Descr:** Garnet occurs in a 2- to 7-ft.

quartz vein. **Value:** Less than commercial quantity. **Ref:** 104, p. 236.

10. **Name:** Buckhorn Mountain. **Loc:** Near N. line NW $\frac{1}{4}$ sec. 24, (40-30E) at main pit of Magnetic Mining Co. and at other places in the vicinity. **Descr:** Massive grossularite garnet constitutes a large part of the tactite associated with a magnetite ore body. **Value:** Might be crushed and used for abrasive purposes. **Ref:** 14, p. 10; 128, p. 48.
11. **Name:** Moore prospect. **Loc:** Sec. 25, (38-30E). **Descr:** Almandite garnet in muscovite schist. **Value:** Further investigation desirable. **Ref:** 96, p. 6.

FERRY COUNTY

12. **Name:** Midnight Mountain. **Loc:** NW. cor. sec. 12, (37-34E). **Descr:** Massive garnet exposed in test pits near contact between intrusive rock and limestone. Chunks 10 in. in diameter on dump. **Value:** Warrants investigation. **Ref:** 135.

STEVENS COUNTY

13. **Name:** Orient gneiss. **Loc:** Along Kettle River in Tps. 39 and 40 N., R. 36 E. **Descr:** Reddish-brown garnet crystals are common in this rock. **Value:** Some zones may contain abrasive garnet in commercial quantity. **Ref:** 139, p. 128.
14. **Name:** Magma mine. **Loc:** Sec. 28, (38-41E). **Descr:** Open cut exposes a 4-ft. band of massive grossularite garnet on a limestone-granite contact. **Value:** Extent should be determined. **Ref:** 135.
15. **Name:** Bon Air School. **Loc:** Sec. 2, (36-40E). **Descr:** Massive red garnet. **Value:** Should be investigated. **Ref:** 135.
16. **Name:** Deer Trail Monitor mine. **Loc:** Secs. 12, 13, and 24, (30-37E). **Descr:** Massive red-brown garnet along the limestone-granite contact. **Value:** Warrants investigation. **Ref:** 135.

GEM AND ORNAMENTAL STONES, DECORATIVE STONE, AND QUARTZ CRYSTAL

Included under this heading are precious and semiprecious stones which are suitable for cutting and polishing. Also included is decorative stone suited to uses such as stone walls and rockery rocks. Flagstones and platy rocks suitable for such uses as patio paving and fireplace facing are listed under the heading, "Slate and other platy rocks." It is realized that the occurrences listed probably constitute only a small percentage of those known to rock and mineral enthusiasts, but it is hoped that the enumeration will stimulate response from interested parties regarding other collecting localities of gem and decorative stones.

The Washington occurrences of gem and ornamental stones, decorative stone, and quartz crystal that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

Quartz crystal has the same composition as massive quartz (SiO_2) but has been placed under a separate heading because of its suitability to more exacting uses. It is used chiefly in optical and radio apparatus. For these uses crystals are needed which are 100 grams or more in weight and have a length parallel to the vertical crystallographic axis of at least 2 inches and a minimum diameter of 1 inch. In addition, crystals must be free from flaws, twinning, impurities, and discoloration and, in smaller sizes, must show at least one crystal face. Other uses are as telephone resonators, electrical parts for research work, and as a gem stone.

Although well-formed quartz crystals have been found in a number of places throughout the state, the known specimens are either too small or insufficiently free from flaws and impurities to be of particular value. The following locations are listed merely to serve as a guide in possible discovery of usable crystals.

OCCURRENCES

On page 35 in volume 2 is plate 15, the map showing the occurrences of gem and ornamental stones and quartz crystal. These are numbered to correspond with the numbers of the occurrences listed below.

GEM AND ORNAMENTAL STONES

CLALLAM COUNTY

1. **Name:** Olympic Peninsula. **Loc:** Olympic Peninsula, particularly along west coast near mouth of Quillayute River. **Descr:** Spherulitic jasper, originating in association with manganese deposits of the Olympic Peninsula, occurs in gravels at mouth of Quillayute River and up and down coast in that general vicinity. **Value:** Of value to collectors only. **Ref:** 49-A, p. 19.
- 1A. **Name:** Agate Bay. **Loc:** At Agate Bay on Strait of Juan de Fuca, just W. of Crescent Bay, in T. 31 N., R. 8 W. **Descr:** Agates in gravel beaches have weathered out of glacial drift and possibly out of basalt nearby. **Value:** Of value to collectors. **Ref:** 49-A, p. 18-19.
- 1B. **Name:** Ed. B. **Loc:** SE $\frac{1}{4}$ sec. 24, (30-11W), 6 $\frac{1}{2}$ mi. W. of Lake Crescent. **Descr:** Spherulitic jasper in masses as much as 6 in. across filling spaces between basalt pillows. **Value:** Of value to collectors only. **Ref:** 47-A, p. 19.
- 1C. **Name:** Lake Crescent. **Loc:** In gully at 2,000-ft. elevation, 1 mi. NW. of W. end of Lake Crescent. **Descr:** Boulder of spherulitic jasper weighing several tons. **Value:** Of value to collectors. **Ref:** 47-A, p. 19.

SKAGIT COUNTY

2. **Name:** James Stephens. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (34-5E). **Descr:** Ferrous anthophyllite somewhat serpentinized. Has also been called nephrite jade and jadeite. Mining operations of Northwest Talc & Magnesium Co. may have removed or covered the anthophyllite. **Value:** Of value to collectors only, although a few pounds were sold as jade by the original owner. **Ref:** 49-A, p. 29.
- 2A. **Name:** Scott. **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (36-5E), 6 mi. NE. of Sedro Woolley. **Descr:** Material similar to that at James Stephens property is said to occur here. **Value:** Of value to collectors only. **Ref:** 47-A, p. 29.

SNOHOMISH COUNTY

3. **Name:** Darrington. **Loc:** Vicinity of Darrington. **Descr:** A black rock (gabbro?) that contains chatoyant feldspar and presents a very beautiful appearance when polished. **Value:** Appears to have possibilities as an ornamental stone. **Ref:** 135.

PIERCE COUNTY

4. **Name:** Siegmund Ranch. **Loc:** 1 mi. E. of Clay City, near center W $\frac{1}{2}$ sec. 30, (17-5E). **Descr:** A 1-ft. exposure on the extension of a 25-ft. quartz vein contains crystals that project inward from both walls. Where they join in the center, their

tips are amethystine. **Value:** Of value to collectors only. **Ref:** 49-A, p. 28.

THURSTON-LEWIS COUNTY

5. **Name:** Tono. **Loc:** Tono coal mining district. **Descr:** Agate and chalcedony. **Value:** Of value to collectors only. **Ref:** 49-A, p. 30.
- 5A. **Name:** Skookumchuck. **Loc:** In canyon of Skookumchuck River, S. of Vail. **Descr:** Chalcedony containing minutely banded green chert. **Value:** Of value to collectors only. **Ref:** 47-A, p. 30.
6. **Name:** Newaukum River. **Loc:** Upper Newaukum River. **Descr:** Agate and chalcedony are common in stream gravels. **Value:** Of value to collectors only. **Ref:** 48, p. 46; 49-A, p. 25.
- 6A. **Name:** Chehalis Valley. **Loc:** Secs. 24 and 25, (13-4W) and in roadside ditches between Adna and Pe Ell. **Descr:** Agates in sandy clay. **Value:** Of value to collectors only. **Ref:** 47-A, p. 26.
- 6B. **Name:** Centralia. **Loc:** S $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 12, (14-2W), 4 $\frac{1}{2}$ mi. E. of Centralia. **Descr:** Agate fragments at surface of the ground. **Value:** Of value to collectors only. **Ref:** 47-A, p. 26.
- 6C. **Name:** Fall Creek. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (15-1E). **Descr:** Plasma and bloodstone as cavity fillings in basalt and as float near an abandoned quarry. **Value:** Of value to collectors only. **Ref:** 47-A, p. 26.
- 6D. **Name:** Doty. **Loc:** Near E. $\frac{1}{4}$ cor. sec. 15, (14-5W). **Descr:** Bed composed largely of pyroxene crystals, some of gem quality, occurs interbedded with Eocene tuff. **Value:** Of value to collectors only. **Ref:** 47-A, p. 27.

COWLITZ COUNTY

7. **Name:** Silver Lake. **Loc:** W $\frac{1}{2}$ sec. 5, (9-1E). **Descr:** Agate, jasper, and highly colored petrified wood occur abundantly in the soil above underlying hardpan at depths of 6 in. to 2 ft. **Value:** Of value to collectors only. **Ref:** 49-A, p. 20.

PACIFIC COUNTY

- 7A. **Name:** Bear River. **Loc:** NW $\frac{1}{4}$ sec. 5, (10-10E), 2 mi. N. of mouth of Bear River. **Descr:** Agates in gravel on bedrock at base of Pleistocene sands and clays. **Value:** Of value to collectors only. **Ref:** 47-A, p. 27.

CLARK COUNTY

- *7B. **Name:** Red Rock quarry. **Loc:** Secs. 8 and 9, (1-3E), near Camas. **Descr:** Red basalt suitable for wall rock and rockery rock. **Value:** Currently produced by Aksel Anderson, Portland, Ore. **Ref:** 2-A, p. 32.

SKAMANIA COUNTY

8. **Name:** Wind River. **Loc:** On Wind River, about 17 mi. N. of Carson. **Descr:** Opals said to occur as amygdulites in lava buttes. Not known whether the opal is of precious or common variety. **Value:** Unknown, but warrants investigation. **Ref:** 49-A, p. 29.

9. **Name:** Rainbow prospect. **Loc:** NW¼ sec. 5, (2-5E). **Descr:** Small quantity of amethystine quartz on dump of a shaft. **Value:** Of value to collectors only. **Ref:** 49-A, p. 29.

9A. **Name:** Stevenson. **Loc:** Near E. Fk. Spring Creek, about 4 mi. NW. of Stevenson. **Descr:** Buff-gray chalcedony as cavity fillings as much as 10 in. long in surface soil. **Value:** Of value to collectors only. **Ref:** 47-A, p. 29.

KITTITAS COUNTY

10. **Name:** Horse Canyon (Virden). **Loc:** W½ sec. 34, (20-17E). **Descr:** Attractive blue chalcedony. **Value:** Of value to collectors only. **Ref:** 49-A, p. 23.

*10A. **Name:** Cumby. **Loc:** SE¼ sec. 21, (21-15E) on Middle Fk. Teanaway River. **Descr:** Attractive jasp-agate in veinlets in basalt. **Value:** Several hundred pounds were mined and sold in 1955. **Ref:** 135.

*10B. **Name:** Lion Gulch. **Loc:** NE¼ sec. 24, (21-17E) in Lion Gulch. **Descr:** Green sandstone suitable for building stone. **Value:** Quarried in 1954 by Washington Green Sandstone, Inc., Moses Lake, Wash. **Ref:** 66-D, p. 33.

10C. **Name:** Redtop-Cle Elum Lake. **Loc:** A belt of Teanaway basalt 1 to 4 mi. wide extending about 50 mi. westward to Cle Elum Lake and beyond. **Descr:** Agates and chalcedonic nodules and geodes in Teanaway basalt. In sec. 16, (21-17E) are abundant agates, including blue varieties, and geodes in soil and basalt bedrock. **Value:** Of value to collectors only. **Ref:** 47-A, p. 23-24.

10D. **Name:** Liberty. **Loc:** At heads of Williams and Boulder Creeks. **Descr:** Abundant agate-filled geodes reported. Probably in Teanaway basalt. **Value:** Should be investigated. **Ref:** 47-A, p. 23.

10E. **Name:** Squaw Creek. **Loc:** In Squaw Creek area 10 mi. E. of Yakima River. **Descr:** Onyx agate reported as massive interbasalt-flow filling. **Value:** Some material is said to have been sold. **Ref:** 47-A, p. 24.

11. **Name:** Ginkgo Petrified Forest State Park. **Loc:** In E. central part of T. 17 N., R. 22 E. **Descr:** Opalized logs and log fragments abundant in the basalt and interbasalt sediments. **Value:** Currently a state park; hence removal of samples prohibited. **Ref:** 49-A, p. 24-25.

DOUGLAS COUNTY

12. **Name:** Moses Coulee. **Loc:** Along the Coulee. **Descr:** Fire opal reportedly found here as cavity fillings. **Value:** Unknown, but warrants investigation. **Ref:** 48, p. 46; 49-A, p. 20.

GRANT COUNTY

13. **Name:** Saddle Mountains. **Loc:** Along summit of Saddle Mountains. **Descr:** Opalized wood is abundant. **Value:** Suitable for ring stones, brooches, etc. **Ref:** 5, p. 395-401, 426-430; 49-A, p. 21.

YAKIMA COUNTY

*14. **Name:** Mount Adams
(See no. 7 under Slate and other platy rocks.)

*15. **Name:** Dog Lake
(See no. 6 under Slate and other platy rocks.)

16. **Name:** Yakima. **Loc:** NE¼ sec. 12, (13-18E). **Descr:** Red and maroon jasper with irregular yellow opal phases occurs in a 1-ft. bed associated with basalt. **Value:** Suitable for small ornaments. **Ref:** 49-A, p. 32.

17. **Name:** Barrel Springs. **Loc:** Sec. 18, (12-24E). **Descr:** Opalized wood. **Value:** Used by Indians for arrowheads. Suitable for cutting and polishing. **Ref:** 49-A, p. 32.

18. **Name:** Sunnyside-White Bluffs road. **Loc:** In small gullies crossed by the Sunnyside-White Bluffs road, sec. 26 or 35, (12-23E). **Descr:** Exposures of a bed composed of a tangle of petrified wood fragments. **Value:** Suitable for cutting and polishing. **Ref:** 49-A, p. 32.

19. **Name:** Sunnyside. **Loc:** Reported on N. side of Yakima River W. of Sunnyside. **Descr:** Agates in smooth washed gravel. **Value:** Unknown. **Ref:** 49-A, p. 31.

FRANKLIN COUNTY

20. **Name:** White Bluffs. **Loc:** Along E. bank of Columbia River NW. of Pasco, in T. 11 N., R. 28 E. **Descr:** Agates in iron-stained gravels forming bluffs. **Value:** Of value to collectors only. **Ref:** 49-A, p. 20-21.

Klickitat County

21. **Name:** Roosevelt. **Loc:** Secs. 16 and 17, (3-21E). **Descr:** Abundant opalized wood between basalt flows and exposed in soil. **Value:** Of value to collectors only. **Ref:** 49-A, p. 25.

*21A. **Name:** Laurel. **Loc:** NE¼ sec. 10, (5-11E). **Descr:** Red scoria. **Value:** Currently produced by William Tubbs, Glenwood, Wash. **Ref:** 2-A, p. 36.

OKANOGAN COUNTY

22. **Name:** Tunk Creek. **Loc:** N½ sec. 5, (35-27E). **Descr:** Thulite occurs as lenses as much as 3 ft. across in hornblende schist. **Value:** Has been used locally in brooches and fireplace facing. **Note:** Small crystals of sapphire and ruby have been found associated with the thulite. **Ref:** 49-A, p. 27; 113, p. 856; 114, p. 519-527.

23. **Name:** Roosevelt mine. **Loc:** Center sec. 24, (40-30E). **Descr:** Zoisite occurs with epidote, green garnet, and other contact metamorphic minerals. **Value:** Of value to collectors only. **Ref:** 127, p. 45.

24. **Name:** Nespelem. **Loc:** Reported in N. center sec. 4, (31-30E). **Descr:** Turquoise. **Value:** Unknown; warrants confirmation. **Ref:** 49-A, p. 27.

FERRY COUNTY

25. **Name:** Republic. **Loc:** Reported 15 mi. NE. of Republic. **Descr:** Amethyst, details unknown. **Value:** Unknown. **Ref:** 49-A, p. 20.

STEVENS COUNTY

26. **Name:** Smoky Bullion. **Loc:** NE¼ sec. 3, (37-39E). **Descr:** Thulite occurs as ½-in. veinlet. **Value:** Of interest to collectors only. **Ref:** 49-A, p. 30.

PEND OREILLE COUNTY

27. **Name:** Timber Mountain. **Loc:** W. center sec. 29 and S. center sec. 32, (36-43E). **Descr:** Thulite crystals ¼ in. or less in size occur in pegmatite. **Value:** Of value to collectors only. **Ref:** 49-A, p. 28; 102, p. 57.
28. **Name:** Ries. **Loc:** On W. bank of Pend Oreille River in sec. 12, (31-45E). **Descr:** Amethyst crystals in a quartz vein. **Value:** Of value to collectors only. **Ref:** 49-A, p. 28; 69, p. 46.

LINCOLN COUNTY

29. **Name:** Mondovi. **Loc:** Reported 1 mi. NW. of Mondovi; also a mile or so N. of Mondovi. **Descr:** Fire opals said to be large and of excellent quality. **Value:** Unknown; warrants investigation. **Ref:** 49-A, p. 27.

WHITMAN COUNTY

- *30. **Name:** Hole in the Ground (Bach)
(See no. 18 under Slate and other platy rocks.)
31. **Name:** Ringo. **Loc:** On hill W. of Ringo station in sec. 18, (16-46E). **Descr:** 75-ft. bands of quartz, some of which is amethystine. **Value:** Probably of value to collectors. **Ref:** 49-A, p. 31; 63, p. 75.
32. **Name:** Whelan. **Loc:** SW¼ sec. 20, (15-46E). **Descr:** Precious opal occurs as cavity fillings in basalt at depth of 22 ft. **Value:** Deposit operated commercially in 1891-1892. Sales amounted to \$5,762 in 1891. Now nonoperative but may still contain good opal. **Ref:** 48, p. 46; 49-A, p. 30-31; 73, p. 776; 125, p. 874.
33. **Name:** Moses. **Loc:** Sec. 17, (11-45E). **Descr:** Precious opal said to occur in a prospect pit and as float along railway below prospect. **Value:** Warrants confirmation. **Ref:** 49-A, p. 31; 89.

QUARTZ CRYSTAL

WHATCOM COUNTY

34. **Name:** Yellow Aster Butte. **Loc:** Near S. ¼ cor. sec. 18, (40-9E). **Descr:** Quartz crystals ⅛ to 4 in. long in vugs in quartz veins. **Value:** Probably of value to collectors only. **Ref:** 135.

JEFFERSON COUNTY

35. **Name:** Mount Anderson. **Loc:** NW¼SW¼ sec. 28, (26-5W). **Descr:** Clear quartz crystals as much as 2 in. long are said to be quite numerous. **Value:** Probably of value to collectors only. **Ref:** 49-A, p. 22.
36. **Name:** Rustler Creek. **Loc:** SW¼SW¼ sec. 31, (25-7W). **Descr:** Quartz crystals 2 in. long and 1 to 1½ in. in diameter occur in open portions of a quartz vein. **Value:** Of value to collectors only. **Ref:** 49-A, p. 22.

SNOHOMISH COUNTY

37. **Name:** Silvertip Peak. **Loc:** Reported near Weden Creek-Silver Creek divide SE. of Mackinaw prospect. **Descr:** A few clear quartz crystals said to have been found, one of which was 4 in. long and 2 in. in diameter. **Value:** Unknown; warrants investigation. **Ref:** 49-A, p. 30.

KING COUNTY

38. **Name:** Devil's Canyon. **Loc:** S½ sec. 27, (25-10E), 300 ft. above Devil's Canyon prospect. **Descr:** Vuggy zone about 400 ft. wide in which are many clusters of clear quartz crystals, most of the crystals being less than 2 in. long and ½ in. in diameter. **Value:** Probably of value to collectors only. **Ref:** 49-A, p. 23.
39. **Name:** Clipper. **Loc:** N. center sec. 1, (23-11E). **Descr:** Vuggy zone contains clear quartz crystals. **Value:** Might be useful in electronics; warrants investigation. **Ref:** 49-A, p. 23.
40. **Name:** Denny Iron. **Loc:** NE¼ sec. 6, (22-11E). **Descr:** Vugs and joint planes lined with quartz crystals. Excellent crystals have been found in float. **Value:** Deserves prospecting. **Ref:** 49-A, p. 22-23.

KITITAS COUNTY

41. **Name:** Lake Cle Elum. **Loc:** On W. shore of Lake Cle Elum near prominent beach where island exists at high water. Probably in sec. 29, (21-14E). **Descr:** Quartz crystals in geodes. **Value:** Of value to collectors only. **Ref:** 49-A, p. 24.

CHELAN COUNTY

42. **Name:** Crown Point mine. **Loc:** SE¼ sec. 8, (31-16E), at head of cirque basin W. of Lyman Lake in long adit 200 ft. below molybdenite vein. **Descr:** Vuggy zone in diorite contains clusters of quartz crystals as much as 2 in. long. **Value:** Probably of value to collectors only. **Ref:** 49-A, p. 18.

OKANOGAN COUNTY

43. **Name:** Early Winters Creek. **Loc:** On mountain just NW. of lower part of Early Winters Creek. **Descr:** Said to be deposit of large, slightly smoky quartz crystals. **Value:** Unknown; should be investigated. **Ref:** 49-A, p. 27.
44. **Name:** Sheridan district. **Loc:** Area at head of E. Fk. Toroda Creek. **Descr:** Workings in this vicinity said to expose quartz crystals of fairly large size. **Value:** Unknown; should be investigated. **Ref:** 49-A, p. 27.

WHITMAN COUNTY

45. **Name:** Colton. **Loc:** Near center sec. 7, (13-46E), on Bald Butte near Colton. **Descr:** Smoky quartz crystals said to be numerous in a sand pit. **Value:** Warrants investigation. **Ref:** 49-A, p. 31; 135.

GRANITE AND ALLIED PLUTONIC ROCKS

In a restricted sense, granite is a plutonic igneous rock composed chiefly of quartz and orthoclase feldspar and containing minor quantities of dark minerals, usually biotite or hornblende. Under this topic heading, however, is included not only true granite but various light-colored plutonic rocks. The red basalt being quarried near Camas has been included here because it is being used as architectural stone.

The occurrences listed include only those deposits having a record of production. Probably many more have been utilized for fill, riprap, or macadam, but it is believed that the cited occurrences include most of those which have been used for architectural or dimension stone.

The Washington occurrences of granite and allied plutonic rocks that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

The areas of granite occurrences are indicated on the map (plate 16) by crosshatching.

Average prices for granite in the United States during 1952 were as follows: rough construction, \$8.66 per short ton; rough architectural, \$2.44 per cu. ft.; dressed building stone, \$7.52 per cu. ft.; rubble, \$2.77 per short ton; rough monumental, \$3.59 per cu. ft.; and dressed monumental, \$11.56 per cu. ft.

OCCURRENCES

On page 37 in volume 2 is plate 16, the map showing the occurrences of granite and allied plutonic rocks. These are numbered to correspond with the numbers of the occurrences listed below.

PIERCE COUNTY

1. **Name:** Ashford (U. S. National Park) quarry. **Loc:** At Ashford. **Descr:** Granite. **Value:** Formerly quarried and used for road metal. **Ref:** 48, p. 105.
2. **Name:** Kapowsin quarry. **Loc:** At Kapowsin. **Descr:** Granite. **Value:** Formerly quarried and used for road metal. **Ref:** 48, p. 105; 115, p. 32.

KING COUNTY

3. **Name:** Mud Mountain quarry. **Loc:** Between Mud Mountain Dam and Chinook highway in sec. 5, (19-7E). **Descr:** Small plug-like intrusive of norite. **Value:** Quarried and used as backfill in the dam. **Ref:** 132.
4. **Name:** Landsburg quarry. **Loc:** At Landsburg. **Descr:** Granitic rock. **Value:** Formerly quarried by C. M. St. P. & P. R.R. **Ref:** 48, p. 105.
5. **Name:** Snoqualmie quarry. **Loc:** At Snoqualmie. **Descr:** Granodiorite. **Value:** Formerly quarried and used for road metal. **Ref:** 48, p. 105.

KITSAP COUNTY

- *5A. **Name:** Green Mountain quarry. **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (24-1W). **Descr:** Coarse-grained diabase. **Value:** Currently quarried by Bremerton Monument Co. and used for monumental stone and landscape rock. **Ref:** 66-D, p. 19.
- *5B. **Name:** Camp Union quarry. **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 8, (24-1W). **Descr:** Dioritic rock. **Value:** Currently quarried by Teel Bros. Contractors and used for riprap and landscape rock. **Ref:** 66-D, p. 32.

SNOHOMISH COUNTY

- *6. **Name:** Halford quarry. **Loc:** On W. side of Barclay Creek in NE $\frac{1}{4}$ sec. 34, (27-10E). **Descr:** Light-gray granodiorite. **Value:** Formerly Hemphill & McKillop and later Hemphill Bros., Seattle, pro-

duced crushed granite from this quarry. **Ref:** 48, p. 105; 55, p. 24; 119, p. 176.

- *6A. **Name:** Baring quarry. **Loc:** Sec. 2, (26-10E). **Descr:** Medium-grained granitic rock. **Value:** Crushed granite currently produced by Hemphill Bros., Seattle. **Ref:** 2-A, p. 24.
7. **Name:** Ellis quarry. **Loc:** About $\frac{1}{2}$ mi. E. of Index in sec. 20, (27-10E). **Descr:** Light-gray granodiorite. **Value:** Quarried about 1902 by T. S. Ellis and used as piers in the Arcade building in Seattle and as a monumental stone. **Ref:** 77, p. 4; 115, p. 41.
- *8. **Name:** Soderberg quarry. **Loc:** Sec. 19, (27-10E). **Descr:** Light-gray granodiorite. **Value:** Worked intermittently since about 1900. Currently quarried by Manufacturers Mineral Co. and crushed for poultry grit. **Ref:** 2-A, p. 27; 48, p. 105; 55, p. 27; 77, p. 4; 115, p. 38-41.
9. **Name:** Darrington quarry. **Loc:** Near Darrington. **Descr:** Granite. **Value:** Reportedly quarried and used as ornamental stone. **Ref:** 12, p. 54.

CLARK COUNTY

- *9A. **Name:** Camas. **Loc:** Secs. 8 and 9, (1-3E). **Descr:** Dense red basalt. **Value:** Currently being quarried and used for ornamental purposes. **Ref:** 2-A, p. 32; 135.

CHELAN COUNTY

10. **Name:** Entiat quarry. **Loc:** At Entiat. **Descr:** Granite. **Value:** Used by G. N. Ry. for rubble and riprap. **Ref:** 66, p. 52.
11. **Name:** Chelan quarry. **Loc:** At Chelan. **Descr:** Granite. **Value:** Reportedly quarried for road material. **Ref:** 66, p. 52.

- *11A. **Name:** Manson. **Loc:** Approximately NE. cor. sec. 15, (28-21E). **Descr:** Dark-red granite. **Value:** Recently worked by Columbia Granite Co. **Ref:** 135.

OKANOGAN COUNTY

- *12. **Name:** Pateros quarries. **Loc:** Two quarries on W. side U. S. highway 97 in sec. 20, (30-24E) and SE $\frac{1}{4}$ sec. 25, (30-23E). **Descr:** Light-gray granite. **Value:**

Columbia Granite Co. recently produced architectural and monumental stone. **Ref:** 55, p. 20.

*12A. **Name:** Brewster. **Loc:** N. center sec. 12, (30-24E). **Descr:** White granite. **Value:** Currently worked by Columbia Granite Co. **Ref:** 135.

*12B. **Name:** Methow River. **Loc:** SE¼ sec. 8, (31-22E). **Descr:** Light-gray gneissic granite. **Value:** Currently worked by Columbia Granite Co. **Ref:** 135.

FERRY COUNTY

13. **Name:** Devil's Elbow quarry. **Loc:** Granite point in Sanpoil Valley 18 mi. N. of Keller. **Descr:** Granite. **Value:** Formerly quarried for road metal. **Ref:** 48, p. 105; 119, p. 176.

PEND OREILLE COUNTY

14. **Name:** Scotia quarry. **Loc:** At Scotia. **Descr:** Granite. **Value:** Formerly quarried by G. N. Ry. **Ref:** 135.

SPOKANE COUNTY

15. **Name:** Little Spokane River quarry. **Loc:** Sec. 34, (27-42E). **Descr:** Light-gray granite. **Value:** Formerly quarried for building purposes. **Ref:** 15, p. 1399; 48, p. 105; 77, p. 5; 115, p. 41-44; 119, p. 173-176.

*16. **Name:** Empire Granite quarry. **Loc:** Secs. 19 and 20, (25-44E). **Descr:** Granite. **Value:** Empire Granite Co. currently produces monumental, architectural, and crushed granite. **Ref:** 2-A, p. 22; 48, p. 105; 55, p. 21; 85, p. 299.

17. **Name:** Moab quarry. **Loc:** Near Moab. **Descr:** Granite. **Value:** Formerly quarried. **Ref:** 48, p. 105.

18. **Name:** Giles & Peat quarry. **Loc:** Sec. 18, (24-41E). **Descr:** Light-gray granite. **Value:** Quarried and

used for building purposes about 1900. **Ref:** 115, p. 44-47.

19. **Name:** Washington Monumental & Cut Stone Co. **Loc:** NE¼ sec. 17, (24-41E). **Descr:** Light-gray granite. **Value:** Currently quarried for monumental and architectural purposes. **Ref:** 15, p. 1399; 48, p. 105; 55, p. 35; 119, p. 176.

*20. **Name:** Keene (Morris) quarry. **Loc:** SE¼ sec. 8, (24-41E). **Descr:** Light-gray granite. **Value:** Roy C. Keene & Son currently producing monumental and architectural granite. **Ref:** 2-A, p. 26; 48, p. 105; 55, p. 25; 119, p. 176.

21. **Name:** Medical Lake, County quarry. **Loc:** Near Medical Lake. **Descr:** Granite. **Value:** Formerly quarried. **Ref:** 48, p. 105.

22. **Name:** Fairfield quarry. **Loc:** Near Fairfield. **Descr:** Granite. **Value:** Formerly quarried for road metal. **Ref:** 48, p. 105.

WHITMAN COUNTY

23. **Name:** Granite Point quarry. **Loc:** Secs. 13 and 14, (13-43E). **Descr:** Light-gray granite. **Value:** Formerly quarried for general building and heavy masonry purposes. **Ref:** 15, p. 1400; 48, p. 105; 115, p. 34-36.

ASOTIN COUNTY

24. **Name:** Grande Ronde quarry. **Loc:** Near mouth of Grande Ronde River. **Descr:** Dark-gray granodiorite. **Value:** Takes fine polish. Formerly used for monumental purposes but abandoned because of inaccessibility. **Ref:** 15, p. 1400; 48, p. 105; 77, p. 5; 115, p. 36-38.

GRAPHITE

Graphite is one form of the element carbon (C); another is diamond. Unlike diamond, which is the hardest of known substances, graphite is one of the softest. Crystalline graphite is iron-black to dark steel-gray, is easily scratched by the thumbnail, is usually in thin flexible inelastic flakes, and has a greasy feeling. It can be distinguished from molybdenite by its black streak when rubbed on glazed porcelain; the streak of molybdenite is greenish-gray. So-called amorphous graphite is actually crystalline graphite in which individual crystals are of microscopic size.

Most large flake graphite is used in the manufacture of crucibles, though some is used in the manufacture of retorts and in lubricants. Not only must graphite of crucible grade be in large flakes (plus 50 mesh) but the

flakes themselves must be resistant to mechanical breakdown during the mixing process used in making crucibles. Graphite of other grades is used in commutator brushes, electrodes, bearings, lubricants, pencils, and batteries.

Washington deposits, like other domestic ones, cannot compete with foreign material of lower price and better grade, under normal conditions.

In September 1956, prices of graphite were as follows: Crystalline flake, natural, 85 to 88 percent C, crucible grade, 13 cents per pound; 96 percent C, special and dry usage, 22 cents; and 98 percent C, special for brushes, 26½ cents. Amorphous, natural graphite for foundry facings was quoted at 9 cents per pound for material containing up to 85 percent C.

OCCURRENCES

On page 39 in volume 2 is plate 17, the map showing the occurrences of graphite, numbered to correspond with the numbers of the occurrences listed below.

WHATCOM COUNTY

1. **Name:** Kulshan. **Loc:** NW¼ sec. 13, (38-5E). **Descr:** Road cut exposes black graphitic schist.

Value: Probably below commercial grade. **Ref:** 48, p. 49; 96, p. 4.

2. **Name:** Anderson Creek. **Loc:** Center sec. 16, (38-4E). **Descr:** Sericite-graphite schist containing considerable graphite. **Value:** Separation of graphite from sericite is difficult. **Ref:** 48, p. 49; 96, p. 4.

3. **Name:** Samish Lake. **Loc:** Sec. 27, (37-3E). **Descr:** A 10-ft. zone of low-grade graphite schist incorporated in chlorite schist. **Value:** Small size and low grade make economic recovery doubtful. **Ref:** 96, p. 4.

SKAGIT COUNTY

4. **Name:** Fairhaven Graphite Co. **Loc:** Reportedly near Samish Lake. **Descr:** Little known; said to be surface material. **Value:** Reportedly shipped graphite to a fireproof paint company in Tacoma in 1890. **Ref:** 48, p. 48.
5. **Name:** Pacific Graphite Co. **Loc:** Near Blanchard. **Descr:** Unknown. **Value:** This company organized in 1933, but the location was abandoned when found to be noncommercial. **Ref:** 48, p. 48.
6. **Name:** Jones Creek. **Loc:** Probably sec. 30, (36-6E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
7. **Name:** Big Lake. **Loc:** Reported 1½ mi. W. of Big Lake near E. line of sec. 27 or 34, (34-4E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 67.
8. **Name:** Cultus Mountain. **Loc:** On W. slope of Cultus Mountain. **Descr:** Considerable graphite schist; also massive graphite along small fault near S. line sec. 22, (34-5E). **Value:** Warrants investigation. **Ref:** 135.
9. **Name:** Skagit River. **Loc:** Sec. 2, (34-10E). **Descr:** Graphite schists. **Value:** Graphite content high enough to warrant investigation. **Ref:** 48, p. 48; 135.
10. **Name:** Suiattle River. **Loc:** Sec. 12, (33-10E). **Descr:** Small exposure of flake graphite in chlorite schist. **Value:** Separation of graphite from chlorite is difficult and expensive. **Ref:** 96, p. 4.

SNOHOMISH COUNTY

11. **Name:** Pugh Mountain. **Loc:** Reportedly between Bedal Falls and the top of Pugh Mountain. **Descr:** Said to be great quantity of graphitic rock exposed by landslide. **Value:** Unknown. **Ref:** 48, p. 48.

KING COUNTY

12. **Name:** Skykomish. **Loc:** On Maloney Creek, Anthracite Creek, Foss River, and in road cuts N. of Tye River opposite these streams. **Descr:** Lenses of carbonaceous material, some of which is graphitic. **Value:** Small size of lenses and intimate admixture of graphite and other minerals makes economic separation doubtful. **Ref:** 48, p. 47.

PIERCE COUNTY

13. **Name:** Prairie Creek. **Loc:** Sec. 29, (19-7E). **Descr:** Small seams of amorphous graphite of fair grade occur along an andesite-diorite contact. **Value:** Seams too small to support commercial operation. **Ref:** 48, p. 48; 96, p. 4.

LEWIS COUNTY

14. **Name:** Olympia Graphite Mining & Milling Co. **Loc:** Reportedly in Lewis County at base of main range of Cascades at an altitude of 1,500 ft. **Descr:**

Said to be a 15-ft. ledge of "trap" rock, traceable for 1,000 ft. and containing segregations of graphite as much as 30 pounds in weight. **Value:** In 1893 this company said to be developing a deposit. **Ref:** 38; 48, p. 48; 119, p. 130.

CHELAN COUNTY

15. **Name:** Wenatchee Lake. **Loc:** Road cuts in sec. 20, (27-18E). **Descr:** Graphite schist. **Value:** Investigation warranted. **Ref:** 48, p. 47; 66, p. 52.
- 15A. **Name:** Potato Creek. **Loc:** On a ridge W. of a tributary to Potato Creek about 4 mi. up Potato Creek. In a road cut in center of sec. 20, (27-20E). **Descr:** As much as 15 percent graphite in small flakes in hydrothermally altered rock. **Value:** Warrants investigation. **Ref:** 135.
- 15B. **Name:** North Fork Potato Creek. **Loc:** SW¼ sec. 17, (27-20E), on N. Fork Potato Creek. **Descr:** Quartz-feldspar gneiss containing flake graphite. One sample assayed 6.34 percent C. **Value:** Warrants investigation. **Ref:** 135.
16. **Name:** Nason Creek. **Loc:** Near confluence of Nason and White Pine Creeks. **Descr:** Lenses and "veins" in graphite schist. **Value:** Should be investigated. **Ref:** 3, p. 93; 48, p. 47; 66, p. 52; 119, p. 129.

KITITITAS COUNTY

17. **Name:** Taneum Creek. **Loc:** Secs. 26, 27, and 34, (19-15E). **Descr:** Low-grade graphitic schist. **Value:** At present noncommercial, although a mill was erected and some schist ground in an effort to produce. **Ref:** 96, p. 4.

YAKIMA COUNTY

- 17A. **Name:** Bumping Lake. **Loc:** At about 3,700-ft. elevation in sec. 25, (16-12E). **Descr:** 5- to 6-ft. bed of high-grade graphite reported. **Value:** Unknown. **Ref:** 135.
18. **Name:** Naches River. **Loc:** Reported somewhere on Naches River W. of Yakima. **Descr:** Sample of high-quality amorphous graphite sent to the Division of Mines and Geology said to have come from this locality. **Value:** Investigation warranted. **Ref:** 135.

OKANOGAN COUNTY

19. **Name:** Tonasket Creek. **Loc:** Road cuts along Tonasket Creek 4 mi. NE. of Oroville. **Descr:** Graphitic argillite. **Value:** Economic separation doubtful. **Ref:** 48, p. 48.
20. **Name:** Tonasket. **Loc:** Reported E. of Tonasket. **Descr:** Easily mined graphite schist. **Value:** Warrants investigation. **Ref:** 135.
21. **Name:** American Graphite & Metal Corp. **Loc:** Mine in NW¼NE¼NW¼ sec. 27, (34-29E). Mill in sec. 29, (34-27E). **Descr:** Graphite schist and gneiss at the mine, also a small body of limestone containing disseminated graphite, 2,000 ft. E. of the mine. **Value:** The ore is mined, hauled to mill and ground; graphite, 20 mesh and finer, is recovered.

To date none has been marketed. **Ref:** 55, p. 16; 135.

FERRY COUNTY

22. **Name:** Dulwich. **Loc:** Reported on W. side of Kettle River, 1 mi. N. of Dulwich. **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
- 22A. **Name:** Boulder Creek. **Loc:** NE $\frac{1}{4}$ sec. 2, (38-36E), on N. side of Boulder Creek. **Descr:** Large deposit of coarse-grained marble containing as much as 10 percent flake graphite. **Value:** Warrants investigation. **Ref:** 135.
23. **Name:** Renner Lake. **Loc:** NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (38-36E). **Descr:** Flake graphite disseminated through limestone and other rocks. Assay samples said to contain 7.57 percent graphite. **Value:** Warrants investigation. **Ref:** 135.
- 23A. **Name:** Hoodoo Mountain. **Loc:** Sec. 34, (37-36E). **Descr:** Quartz-muscovite schist containing small disseminated flakes of graphite. Graphite constitutes perhaps 2 or 3 percent of the schist. **Value:** Low percentage of graphite and small size of flakes make commercial recovery doubtful. **Ref:** 135.

STEVENS COUNTY

24. **Name:** Boundary. **Loc:** Near town of Boundary. **Descr:** Graphite schists. **Value:** Investigation desirable. **Ref:** 48, p. 49; 103, p. 108.
25. **Name:** Black Diamond prospect. **Loc:** Sec. 28, (38-39E). **Descr:** Lenses and masses of graphitic slate. **Value:** Separation cost probably prohibitive. **Ref:** 96, p. 4.
- 25A. **Name:** Bossburg. **Loc:** 5 mi. N. of Bossburg. **Descr:** Graphitic argillite beds 8 and 15 ft. thick exposed in road cuts about 1,000 ft. apart. **Value:** Unknown. **Ref:** 135.

SPOKANE COUNTY

26. **Name:** Sheep Mountain. **Loc:** Reported E. of Spokane on Sheep Mountain. **Descr:** Said to be a 40-ft. "vein" of high-quality graphitic rock. **Value:** Should be investigated. **Ref:** 48, p. 48; 91.
27. **Name:** Silver Hill. **Loc:** NE $\frac{1}{4}$ sec. 23 and NW $\frac{1}{4}$ sec. 24, (24-43E). **Descr:** Graphite-andalusite schist. **Value:** Does not appear to have commercial possibilities. **Ref:** 25, p. 295; 97, p. 181.

GRINDING PEBBLES AND COBBLES

Rounded flint pebbles are used in tube and pebble mills for grinding ores, ceramic minerals, and other substances. For many uses steel balls have supplanted stone, but for purposes where the addition of steel cuttings is detrimental, pebbles are still used. Flint pebbles are supplied principally by France, Belgium, and Greenland; but when these sources are cut off in time of war, domestic users turn to local materials such as chal-

cedonized rhyolite and quartzite. Two sizes of material are marketable—pebbles from $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter and cobbles 2 to 3 inches in diameter.

Flint pebbles are not known to occur in Washington, but quartzite pebbles of proper size, hardness, and sphericity are known to occur in several places.

In 1956 grinding pebbles sold for approximately \$23.00 per ton.

OCCURRENCES

On page 41 in volume 2 is plate 18, the map showing the occurrences of grinding pebbles and cobbles. These are numbered to correspond with the numbers of the occurrences listed below.

YAKIMA COUNTY

1. **Name:** Rimrock. **Loc:** Reported in road cuts near Rimrock. **Descr:** Said to be quartz pebbles suitable for pebble mills. **Value:** Should be investigated. **Ref:** 135.
2. **Name:** Selah. **Loc:** Sec. 35, (14-18E). **Descr:** Gravels, interstratified with silt, and composed of quartzite, basalt, andesite, and rhyolite pebbles. Rounded quartzite pebbles $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter constitute 0.09 percent of the whole. **Value:** Might be an emergency source. **Ref:** 135.
3. **Name:** Snipes Mountain. **Loc:** Sec. 26, (10-21E). **Descr:** Gravel made up of quartzite, basalt, and andesite pebbles and cobbles. About 7 percent of the gravels made up of rounded quartzite cobbles 3 to 4 in. in diameter, and .07 percent of pebbles $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. **Value:** Possible source of cobbles. **Ref:** 63, p. 162.

4. **Name:** Top Snipes Mountain. **Loc:** Secs. 30, 32, (10-22E). **Descr:** Two old pits expose gravels, 5 percent of which are made up of usable quartzite cobbles. **Value:** Possible source of cobbles. **Ref:** 63, p. 162.
5. **Name:** Toppenish Ridge. **Loc:** Sec. 1, (9-19E). **Descr:** Gravels similar to those on Snipes Mountain. **Value:** Should be investigated. **Ref:** 63, p. 162.
6. **Name:** Mabton Hill. **Loc:** Sec. 26, (8-22E). **Descr:** Gravels reported to be similar to those on Snipes Mountain. **Value:** Unknown. **Ref:** 63, p. 162.
7. **Name:** Benton City. **Loc:** Sec. 12, (9-26E). **Descr:** Gravel, in which is considerable fine material, contains 0.08 percent of rounded quartzite pebbles $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. **Value:** Possible emergency source of pebbles. **Ref:** 135.
8. **Name:** South Kiona. **Loc:** Sec. 20, (9-27E). **Descr:** Gravel, consisting mostly of small pebbles, contains 0.25 percent rounded quartzite pebbles $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. **Value:** Possible war-time source of pebbles. **Ref:** 135.

9. **Name:** Kiona. **Loc:** Sec. 16, (9-27E). **Descr:** Gravels, possibly of large extent, contain 0.06 percent of rounded quartzite pebbles $\frac{1}{4}$ to $\frac{1}{2}$ in. in diameter. **Value:** Unknown. **Ref:** 135.

BENTON COUNTY

10. **Name:** Fallon River bar. **Loc:** Sec. 5, (9-28E). **Descr:** Limited tonnage of gravel containing high sand content. Gravel made up of basalt, andesite, quartzite, and granite. Gravel contains 0.08 percent of rounded quartzite pebbles $\frac{1}{4}$ to $\frac{1}{2}$ in. in

diameter. **Value:** Might be used in emergency. **Ref:** 135.

FRANKLIN COUNTY

11. **Name:** Ringold gravel. **Loc:** On E. side of Columbia River between Pasco and Ringold. **Descr:** Tough, resistant quartzite cobbles 2 to 4 in. in diameter constitute about 3 percent of a gravel member. **Value:** Possible wartime source of cobbles. **Ref:** 63, p. 162.

GYPSUM

Gypsum is a hydrous calcium sulfate mineral having the composition $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. Clear, transparent crystals of gypsum are known as selenite; the fine-grained massive variety is called alabaster; fine-fibrous material having pearly opalescence is called satin spar; and earthy varieties, frequently intermixed with clay or silt, are known as gypsite. All varieties of gypsum can be readily scratched by the thumb nail. Selenite is characterized by one excellent cleavage which yields thin inelastic laminae.

Anhydrite is the anhydrous calcium sulfate mineral CaSO_4 .

The Washington deposits of gypsum that have been

in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

In 1952 about 93½ percent of the gypsum consumed in the United States was used by the building industry in the form of plasters, Keene's cement, and prefabricated building materials; 2.2 percent was consumed in industrial uses; and 4.3 percent, in uncalcined form, as a soil conditioner and as a retardant in portland cement.

The average price of crude gypsum in 1956 was \$2.72 per short ton.

OCCURRENCES

On page 43 in volume 2 is plate 19, the map showing the occurrences of gypsum, numbered to correspond with the numbers of the occurrences listed below.

PIERCE COUNTY

1. **Name:** Orting. **Loc:** Near Orting. **Descr:** Andesite porphyry exposed in quarry contains 10 percent or more of gypsum. **Value:** Grade too low for commercial use. **Ref:** 135.
2. **Name:** Tacoma. **Loc:** Reportedly a short distance from Tacoma, presumably near Orting. **Descr:** Unknown. **Value:** Probably the McMillan travertine deposit. **Ref:** 135.

YAKIMA COUNTY

3. **Name:** Mount Adams. **Loc:** In crater of Mount Adams. **Descr:** Gypsum occurs as cavity filling and as cementing material of volcanic breccia associated with native sulfur. **Value:** Inaccessibility and small quantity make commercial exploitation questionable. **Ref:** 48, p. 49.
4. **Name:** Ahtanum Creek. **Loc:** Reportedly near head of Ahtanum Creek. **Descr:** Sample from this location said to be unusually fine specimen; quantity unknown. **Value:** Unknown. **Ref:** 135.

CHELAN COUNTY

5. **Name:** Squaw Saddle No. 1. **Loc:** At top of Squaw Saddle near SW. cor. SE¼NW¼ sec. 16, (22-20E). **Descr:** Very small and sparsely disseminated crystals of selenite in altered andesite. **Value:** Percentage of gypsum below commercial grade. **Ref:** 135.

6. **Name:** Squaw Saddle No. 2. **Loc:** A few hundred feet S. of Squaw Saddle near center sec. 16, (22-20E). **Descr:** Small crystals of selenite in clay. **Value:** Percentage of gypsum below commercial grade. **Ref:** 20, p. 141-142.

- 6A. **Name:** Holden. **Loc:** Lower levels of Holden mine of Howe Sound Co., secs. 12 and 13, (31-16E) and secs. 18 and 19, (31-17E). **Descr:** Bed of anhydrite 20 ft. thick next to limestone exposed in drift and in drill holes. **Value:** Unknown. **Ref:** 135.

OKANOGAN COUNTY

7. **Name:** Minnie prospect. **Loc:** E½ sec. 23, (32-22E). **Descr:** Gypsum occurs as coatings on limestone at contact with leached quartz vein. **Value:** Non-commercial quantity. **Ref:** 135.
- *8. **Name:** Poison Lake. **Loc:** NE. cor. SE¼ sec. 5, (38-27E). **Descr:** Area, 20 acres. The lake bed, the average thickness of which was 20 ft. or slightly less, was mainly gypsite and represented more than 800,000 tons, part of which has been mined out. **Value:** Worked and sold for agricultural purposes by Agro Minerals, Inc., Tonasket, Wash. **Ref:** 9; 66-D, p. 17.
9. **Name:** Lenton Flat. **Loc:** Sec. 3, (40-25E). **Descr:** Dry bed 80 acres in extent is underlain by layer of mud more than 18 ft. thick containing a considerable quantity of gypsite. Top 6 ft. contains an average of 60 percent CaSO_4 . Lower 12 ft. averages about 40 percent CaSO_4 . Associated with the gypsite are hydromagnesite and marl. **Value:**

Sufficient quantity and quality to warrant market investigation. **Ref:** 9.

10. **Name:** Bitter Lake. **Loc:** SE. cor. sec. 7 and NE. cor. sec. 18, (40-27E). **Descr:** Lake (area about 3 acres) underlain by a mud layer about 20 ft. thick in which the average CaSO_4 content is 60 percent. **Value:** Small amount mined at one time. **Ref:** 9; 48, p. 49.

LIMESTONE AND MARBLE, MARL, TRAVERTINE, AND CALICHE

Limestone is a sedimentary rock composed principally of calcium carbonate (calcite) in which individual crystals of calcite are not visible to the unaided eye. Marble is a limestone that is recrystallized, with the result that individual calcite crystals are readily visible. In commerce the term limestone includes any rock composed principally of calcium carbonate, regardless of its crystallinity. Similarly, the term marble is used to include any crystalline carbonate rock or mixture of carbonate rock and serpentine that will take a polish.

Uncalcined limestone is used as a flux, as a soil conditioner, as an ingredient of portland cement, in sugar refining, and in the manufacture of paper. Calcined limestone or lime (CaO) is used as mortar and finishing lime in the building trade, as a flux in the steel industry, in paper manufacture, in water purification, in glass manufacture, in calcium carbide manufacture, and as a soil conditioner. Marble is used as a building and decorative stone and, when of proper composition, for the same uses as limestone.

Washington limestones are nearly all of pre-Tertiary age, and through folding and faulting subsequent to deposition they have almost all become marble. They vary in composition from pure calcium carbonate to high-magnesia varieties and dolomite. The largest deposits occur in eastern Washington, but those of western Washington have been worked more extensively because of their nearness to industry and market along Puget Sound.

In 1952 the average United States price of limestone for flux was \$1.18 per short ton; for agricultural stone, \$1.63 per short ton; and for other uses, \$2.01 per short ton. The average net mill realization (excluding container cost) per ton of lime sold on the open market in 1952 was \$11.80. Dimension stone (marble) in 1952 ranged from \$2.89 per ton for rough construction to \$2.59 per cu. ft. for finished (sawed and cut) stone. The 1953 average price for agricultural limestone in Washington was \$4.54 per ton.

Marl is loose, earthy calcareous material deposited from lakes. It has no fixed composition but is composed predominantly of calcium carbonate (CaCO_3) in the form of chemically precipitated particles and as shells and shell fragments. Sand, silt, and clay are present in variable amounts, and considerable organic material may also be present. Certain calcareous soils are also

FERRY COUNTY

11. **Name:** Jenny prospect. **Loc:** Sec. 34, (40-36E). **Descr:** Gypsum accompanies quartz and gouge in gold-silver-copper-lead vein. **Value:** Complex occurrence and small quantity make commercial extraction impractical. **Ref:** 2, p. 203.
12. **Name:** New Republic mine. **Loc:** $\text{W}\frac{1}{2}\text{NE}\frac{1}{4}$ sec. 12, (36-32E). **Descr:** Gypsum accompanies quartz as gangue in gold vein. **Value:** Quantity and quality below commercial grade. **Ref:** 127, p. 47.

known as marl, but only lake deposits are considered here.

Marl is used principally as a soil conditioner either alone or mixed with other materials beneficial for plants. Some of it, however, is sufficiently free from silt, sand, and clay to be used as a substitute for limestone in the manufacture of lime or portland cement.

A number of undrained lakes and dry lake beds in eastern Washington contain appreciable quantities of marl. Five of the deposits have been used commercially, and others probably will be in the future.

The average price per ton for marl in the United States in 1952 was 72 cents.

Travertine is calcium carbonate (CaCO_3) deposited from ground or surface waters. Cellular deposits are known as tufa, calcareous sinter, spring deposits, or cave deposits. Solid banded material capable of taking a good polish is known as Mexican onyx or onyx marble and is used for decorative purposes. Travertine forms the stalactites and stalagmites of caves, the fillings of some veins and spring conduits, and is deposited in the drainage area surrounding some springs.

In addition to its use as an ornamental stone, travertine, when in sufficiently large bodies, may be used in place of limestone for some purposes. A deposit of travertine in Pierce County has been used as agricultural lime, fluxing stone, and some was even burned for lime, but the deposit is now virtually exhausted. Other, similar deposits probably occur in the state.

The price of travertine suitable for ornamental use was approximately \$1.60 per cu. ft. in 1946. Travertine adaptable to the same uses as limestone must compete with it in price.

Caliche is material consisting of silt, sand, or gravel cemented with calcium carbonate and other salts deposited from ground water. The calcium carbonate content of the material ranges from almost nothing to almost 100 percent. Two samples taken from the top of the Saddle Mountains in sec. 3, T. 15 N., R. 24 E., showed 61.1 and 47.9 percent CaCO_3 , 5.1 and 4.7 percent MgCO_3 , 7.5 and 9.4 percent R_2O_3 , and 26.0 and 35.8 percent SiO_2 .

Caliche underlies a large part of the Columbia Basin area. Of 340 wells drilled by the U. S. Bureau of Reclamation, caliche was found in 102 wells in the areas outlined on the accompanying map (plate 20, on page 45 in volume 2). Within these areas only 32 wells failed

to show caliche. Caliche is known to occur in other places in the Columbia Basin, but specific data are lacking. The caliche ranges in thickness from less than 1 foot to at least 76 feet; in 31 wells it was more than 20 feet thick. Overburden ranges from 2 or 3 feet to as much as 70 feet of alluvium.

Although caliche is not known to have any current commercial use, it is a mineral resource of potential value that has been investigated by several concerns

that undoubtedly were attracted by its proximity to railroads and relatively low cost of extraction.

The Washington deposits of limestone and marble, marl, and travertine that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

OCCURRENCES

On page 45 in volume 2 is plate 20, the map showing the occurrences of limestone, marl, travertine, and caliche. These are numbered to correspond with the numbers of the occurrences listed below.

LIMESTONE AND MARBLE

WHATCOM COUNTY

- *1. **Name:** Kendall quarry. **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec 14, (40-5E). **Descr:** Limestone deposit in which reserves are reportedly sufficient for 50 years. **Value:** Currently operated by Permanente Cement Co. **Ref:** 2-A, p. 31; 48, p. 59; 55, p. 29; 64, p. 29-41; 80, p. 379; 82-A, p. 83-84; 87-A, p. 47; 96, p. 14; 117, p. 208-213.
2. **Name:** Hilltop. **Loc:** NW. cor. SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, (40-5E). **Descr:** Reportedly a 120-ft. bluff of limestone. **Value:** Warrants investigation. **Ref:** 64, p. 45.
3. **Name:** Sumas Mountain. **Loc:** On E. slope of Sumas Mountain N. of Coal Creek in T. 40 N., R. 5 E. **Descr:** Several deposits of various sizes are reported to occur. **Value:** Should be investigated. **Ref:** 64, p. 44.
4. **Name:** Black Mountain. **Loc:** Secs. 3, 4, 9, and 10, (40-6E). **Descr:** Large exposures of limestone. About 15 million tons estimated to be available in SE $\frac{1}{4}$ sec. 4. **Value:** Investigation warranted. **Ref:** 64, p. 43; 135.
5. **Name:** Balfour quarry. **Loc:** NE $\frac{1}{4}$ sec. 28, (40-5E). **Descr:** Substantial tonnage left. **Value:** Formerly operated by The Olympic Portland Cement Co., Ltd. **Ref:** 48, p. 59; 64, p. 41-42; 96, p. 14.
6. **Name:** Red Mountain. **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (40-5E). **Descr:** Several small isolated bodies of limestone. **Value:** High quarrying costs make present value doubtful. **Ref:** 48, p. 59; 64, p. 42.
7. **Name:** Olympic quarry. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, (40-5E). **Descr:** Limestone lens in schist. **Value:** Formerly quarried by The Olympic Portland Cement Co., Ltd. for cement but abandoned because of high quarrying cost. **Ref:** 64, p. 33; 96, p. 14.
- *7A. **Name:** Maple Falls quarry. **Loc:** SW $\frac{1}{4}$ sec. 7, (40-6E). **Descr:** Limestone. **Value:** Currently operated by Mitchell Bay Lime Co., Seattle. **Ref:** 2-A, p. 28; 82-A, p. 11; 87-A, p. 46-47.

- *8. **Name:** Maple Falls quarry. **Loc:** NW $\frac{1}{4}$ sec. 22, (40-6E). **Descr:** Limestone lens in conglomerate and graywacke. **Value:** Recently operated by Mitchell Bay Lime Co. Reserve tonnage is small. **Ref:** 48, p. 59; 55, p. 27; 96, p. 14; 117, p. 215-216.
9. **Name:** Boulder Creek. (May be same as no. 8.) **Loc:** On Boulder Creek in sec. 22, (40-6E). **Descr:** Jumble of limestone blocks which have probably slid from Black Mountain. **Value:** Should be investigated. **Ref:** 64, p. 44.
10. **Name:** Baker Lake. **Loc:** On mountain SE. of Baker Lake approximately in sec. 35, (38-9E). **Descr:** Road cuts expose high-quality limestone in blocks as much as 15 ft. thick. **Value:** Warrants investigation. **Ref:** 135.
11. **Name:** Ruby. **Loc:** 2 mi. below Ruby in a small tributary to the Skagit River. **Descr:** Float indicates a body of limestone above. **Value:** Unknown; should be investigated. **Ref:** 48, p. 59.

SAN JUAN COUNTY

12. **Name:** Buck Mountain. **Loc:** On NE. shore of Orcas Island between Point Lawrence and foot of Buck Mountain. **Descr:** Many small lenses. **Value:** One lens in sec. 22, (37-1W) has been worked. **Ref:** 48, p. 57.
13. **Name:** Payton (Flaherty). **Loc:** On Orcas Island in NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, (37-1W). **Descr:** Two main, and several smaller lenses. **Value:** Worked out years ago. **Ref:** 48, p. 56; 117, p. 204-205.
14. **Name:** Langdon. **Loc:** Orcas Island in SE $\frac{1}{4}$ sec. 25, (37-2W). **Descr:** Rises from water's edge in a 75-ft. bluff and is exposed laterally for 200 ft. **Value:** Formerly quarried and shipped to Tacoma smelter. Considerable stone remains. **Ref:** 48, p. 56; 117, p. 204.
15. **Name:** Red Cross. **Loc:** Orcas Island in sec. 20, (37-2W). **Descr:** Large lens. **Value:** Worked by Roche Harbor Lime & Cement Co. in 1943; now held as a reserve. **Ref:** 80, p. 378; 87-A, p. 53; 96, p. 14.
16. **Name:** Soderberg. **Loc:** Orcas Island in N. center sec. 31, (37-2W). **Descr:** Crystalline limestone lenses in metamorphic rocks. **Value:** Formerly quarried. **Ref:** 48, p. 57; 80, p. 378; 87, p. 168; 87-A, p. 54; 117, p. 204-205.

- 16A. **Name:** East Sound. **Loc:** Secs. 19, 25, and 31, (37-3W). **Descr:** Limestone. **Value:** Unknown. **Ref:** 64-B, p. 59.
17. **Name:** Imperial Lime Co. **Loc:** Orcas Island in SE $\frac{1}{4}$ sec. 36, (37-3W). **Descr:** Crystalline limestone lenses. **Value:** Formerly quarried. **Ref:** 48, p. 57; 80, p. 378; 117, p. 204.
18. **Name:** Newhall. **Loc:** On Orcas Island in sec. 8, (36-1W). **Descr:** Small deposit of high-quality limestone. **Value:** Warrants investigation. **Ref:** 135.
- *19. **Name:** McGraw-Kittinger. **Loc:** Orcas Island, NW $\frac{1}{4}$ sec. 2, (36-2W). **Descr:** Large deposit containing many thousand tons of good limestone. **Value:** Currently operated by Everett Lime Co. **Ref:** 2-A, p. 22; 48, p. 56; 55, p. 36; 82-A, p. 74; 87, p. 167; 87-A, p. 53; 96, p. 13; 117, p. 204.
20. **Name:** Pineo. **Loc:** Orcas Island in SE $\frac{1}{4}$ sec. 3, (36-2W). **Descr:** Rounded knob of limestone. **Value:** Formerly quarried; now nearly exhausted. **Ref:** 48, p. 57.
- *21. **Name:** West Sound. **Loc:** Orcas Island in sec. 9, (36-2W). **Descr:** Large lens in argillite. **Value:** Recently leased from Roche Harbor Lime & Cement Co. and operated by Ray Van Moorhem. **Ref:** 48, p. 56; 55, p. 31; 87, p. 52-53; 96, p. 13.
22. **Name:** Crane Island. **Loc:** Sec. 19, (36-2W). **Descr:** Limestone body 12 by 70 by 200 ft. **Value:** Probably commercial, though undeveloped. **Ref:** 96, p. 14.
23. **Name:** Shaw Island. **Loc:** Secs. 29 and 32, (36-2W). Along SW. shore and W. central part of the island. **Descr:** Several small bodies. **Value:** May be of sufficient size for commercial use. **Ref:** 48, p. 57.
24. **Name:** Jones Island. **Loc:** On N. end and W. shore of Jones Island. **Descr:** A 15-ft. bed which would require underground mining. **Value:** Expensive mining makes value doubtful. **Ref:** 48, p. 57.
- *25. **Name:** Cliff Island. **Loc:** Sec. 24, (36-3W). **Descr:** Small body of good-quality limestone. **Value:** Recently worked by Manufacturers Mineral Co. **Ref:** 48, p. 57; 55, p. 27.
26. **Name:** Wilson. **Loc:** San Juan Island in sec. 29, (36-3W). **Descr:** Two small lenses in slate contain about 4,500 tons. **Value:** Abandoned by Mitchell Bay Lime Co. after quarrying 500 tons. **Ref:** 96, p. 13.
27. **Name:** Krumdick. **Loc:** San Juan Island in sec. 29, (36-3W). **Descr:** One small lens in slate contains about 1,000 tons. **Value:** Some production in the past. **Ref:** 96, p. 13.
28. **Name:** Johnson. **Loc:** San Juan Island in sec. 29, (36-3W). **Descr:** Several small lenses in cherty argillite contain a few thousand tons. **Value:** Abandoned by Mitchell Bay Lime Co. after removing 2,000 tons. **Ref:** 96, p. 13.
29. **Name:** Rulo. **Loc:** San Juan Island in sec. 30, (36-3W). **Descr:** Lens in argillite contains a few thousand tons. **Value:** Could supply small tonnage. **Ref:** 96, p. 13.
30. **Name:** Eureka. **Loc:** San Juan Island in sec. 34, (36-3W). **Descr:** Small lenses in slate contain about 6,000 tons. **Value:** Worked in past. Could still supply small tonnage. **Ref:** 48, p. 56; 96, p. 13.
31. **Name:** Limestone Point. **Loc:** San Juan Island in NE $\frac{1}{4}$ sec. 18, (36-3W). **Descr:** Massive lens. **Value:** Good material removed, remainder noncommercial. **Ref:** 48, p. 56; 96, p. 13.
- *32. **Name:** Roche Harbor. **Loc:** San Juan Island in sec. 23, (36-4W). **Descr:** Lenses in argillite contain 1,000,000 tons. **Value:** Roche Harbor Lime & Cement Co. recently produced 300 tons daily. **Ref:** 2-A, p. 33; 48, p. 56; 55, p. 31; 64, p. 15; 64-B, p. 59; 82-A, p. 84; 87, p. 164-165; 87-A, p. 51-52; 96, p. 13; 106-J, p. 4-7; 117, p. 203.
33. **Name:** Henry Island. **Loc:** On shore of Henry Island. **Descr:** Several lenses of limestone; the largest has been worked, but considerable tonnage remains. **Value:** Could support small operation. **Ref:** 48, p. 57.
34. **Name:** Mitchell Bay. **Loc:** San Juan Island in sec. 34, (36-4W). **Descr:** Three lenses in argillite containing only a few hundred tons. **Value:** Formerly quarried by Puget Sound Pulp & Timber Co. but now worked out. **Ref:** 48, p. 56; 96, p. 13.
- *35. **Name:** Cowell. **Loc:** San Juan Island in sec. 23, (35-4W). **Descr:** Large lenses of crystalline limestone. **Value:** Recently worked by The Olympic Portland Cement Co., Ltd. **Ref:** 48, p. 56; 55, p. 29; 64, p. 11; 87, p. 166; 87-A, p. 52; 96, p. 13.

OLYMPIC PENINSULA

36. **Name:** Olympic Peninsula limestone. **Loc:** On northern, eastern, and southern flanks of the Olympic Mountains. **Descr:** Bluish-gray to reddish-brown siliceous limestone, interbedded with volcanic flows and argillite, is associated with the manganese deposits. **Value:** Known to be usable for rock wool; may have other uses. **Ref:** 48, p. 54; 51, p. 11-15, 31; 87-A, p. 107-108; 99, p. 6-7; 101, p. 439-440; 101-A.

SKAGIT COUNTY

37. **Name:** Goat Mountain. **Loc:** Reported at SW. cor. sec. 24, (36-7E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
- *38. **Name:** Concrete. **Loc:** Sec. 2, (35-8E). **Descr:** Large deposits of limestone interbedded with slate and quartzite. **Value:** Currently worked by Lone Star Cement Corp. **Ref:** 2-A, p. 35; 48, p. 57; 55, p. 34; 64, p. 47-53; 80, p. 379-380; 82-A, p. 86-88; 87-A, p. 45-46; 96, p. 14; 117, p. 220-222.
39. **Name:** Jackman Creek. **Loc:** Secs. 3, 4, 5, 8, and 9, (35-9E) and secs. 35 and 36, (36-9E). **Descr:** Large beds of good limestone as much as 75 ft. thick. **Value:** Undeveloped but considered to be com-

mercial. **Ref:** 48, p. 58; 64, p. 54-55; 96, p. 14; 117, p. 225-226.

40. **Name:** Sauk. **Loc:** Secs. 9, 15, and 16, (35-9E). **Descr:** Large deposits of good limestone. **Value:** Undeveloped but potentially important. **Ref:** 48, p. 58; 64, p. 56; 82-A, p. 85; 96, p. 14; 106-A; 117, p. 227-228.
41. **Name:** Rockport. **Loc:** Sec. 26, (35-9E). **Descr:** Large deposit of good grade. **Value:** Held by Roche Harbor Lime & Cement Co. but undeveloped. **Ref:** 48, p. 58; 64, p. 56-58; 96, p. 14; 106-A.
42. **Name:** Damnation Creek. **Loc:** Near main road in sec. 10, (36-11E). **Descr:** Strata of limestone 1 to 3 ft. thick interbedded with schist. **Value:** Beds too thin for economic removal. **Ref:** 135.
43. **Name:** Marble Creek. **Loc:** NE $\frac{1}{4}$ sec. 3, (35-12E). **Descr:** Four limestone beds 30 to 60 ft. thick enclosed in schist. **Value:** Commercial if more accessible. **Ref:** 48, p. 58; 96, p. 14.

SNOHOMISH COUNTY

- *44. **Name:** Jack. **Loc:** N $\frac{1}{2}$ sec. 16 and S $\frac{1}{2}$ sec. 9, (32-6E). **Descr:** Lenses containing 50,000 to 100,000 tons. **Value:** Recently worked by J. A. Jack; may be exhausted. **Ref:** 12, p. 55; 55, p. 24; 87-A, p. 44-45; 106-AA.
- 44A. **Name:** Rock Creek (Bald Mountain). **Loc:** SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 6, (32-6E). **Descr:** Good-grade limestone bed at least 30 ft. thick. **Value:** Warrants investigation. **Ref:** 106-AA.
- 44B. **Name:** Bryant. **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, (32-6E). **Descr:** A bed of rather pure limestone averaging 30 ft. thick can be traced for 650 ft. on the surface. **Value:** Warrants investigation. **Ref:** 64-B, p. 58; 106-AA.
- *45. **Name:** Paddock. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ and center sec. 2, (31-6E). **Descr:** Limestone bed averaging 60 ft. in thickness can be traced for 2,800 ft. **Value:** Currently operated by Morcrop Lime Co. **Ref:** 2-A, p. 28; 55, p. 28; 82-A, p. 81; 106-AA.
46. **Name:** Twin Lakes. **Loc:** SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, center NW $\frac{1}{4}$ sec. 8, and NE $\frac{1}{4}$ sec. 18, (31-7E). **Descr:** Quantity not known, but grade reported to be good. **Value:** Warrants investigation. **Ref:** 135.
- *47. **Name:** Canyon Creek Lodge. **Loc:** E $\frac{1}{2}$ sec. 5, (30-7E). **Descr:** Large lens of limestone in metamorphic rocks. **Value:** Formerly worked by Everett Lime Co. Recent limited production by Mineral Processors, Inc. **Ref:** 2-A, p. 27; 12, p. 55; 48, p. 58; 55, p. 21; 64, p. 59-63; 64-B, p. 57-58; 87-A, p. 44; 96, p. 14; 117, p. 230-233.
- *48. **Name:** Shumway. **Loc:** Near center sec. 9, (30-7E). **Descr:** Large lens in metamorphic rock. **Value:** Worked for years but now nearly exhausted. **Ref:** 12, p. 54; 48, p. 58; 64, p. 64; 66-B, p. 24; 80, p. 380; 96, p. 14.
49. **Name:** Granite Falls. **Loc:** NW $\frac{1}{4}$ sec. 14, (30-7E). **Descr:** Body of limestone associated with meta-

morphic rock. **Value:** Now exhausted. **Ref:** 12, p. 55; 48, p. 58; 96, p. 14.

50. **Name:** Galbraith. **Loc:** Secs. 14, 23, 24, and 25, (32-8E). **Descr:** Approximately 3,000,000 tons of limestone of good grade. **Value:** Operated in 1939 by Everett Lime Co. **Ref:** 12, p. 55; 48, p. 58; 64, p. 58-59; 82-A, p. 88-89; 96, p. 14; 106-C.
51. **Name:** White Horse Mountain. **Loc:** Secs. 13, 25, and 30, (32-8E). **Descr:** Lenses in metamorphic rocks contain more than 1,000,000 tons of limestone of good grade. **Value:** Warrants investigation. **Ref:** 96, p. 14. **Note:** This is probably the same as the Galbraith property (no. 50), above.
52. **Name:** Whitechuck River. **Loc:** Sec. 18, (31-11E). **Descr:** Impure shaly carbonaceous limestone. **Value:** Might have restricted use. **Ref:** 48, p. 59; 96, p. 14.
53. **Name:** Marble Peak. **Loc:** Reported in sec. 31, (30-10E). **Descr:** Said to be two 20-ft. beds separated by 6 ft. of sandstone. **Value:** Warrants investigation. **Ref:** 135.
54. **Name:** Sultan River. **Loc:** Sec. 8, (28-8E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
55. **Name:** Sultan. **Loc:** Sec. 19, (28-8E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
56. **Name:** Wallace Falls. **Loc:** Sec. 15, (27-9E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
- *57. **Name:** Gold Bar. **Loc:** Secs. 16 and 21, (27-9E). **Descr:** Several lenses interbedded with argillite and sandstone. **Value:** Currently worked by Miller Lime Co. **Ref:** 12, p. 54; 64, p. 64-67; 66-C, p. 24; 82-A, p. 80; 87-A, p. 43-44; 96, p. 14.

KING COUNTY

58. **Name:** Grotto Mountain. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (26-10E). **Descr:** Small body of limestone exposed in railway cut. **Value:** Should be investigated. **Ref:** 64, p. 75; 80, p. 380.
- *59. **Name:** Crosby-Palmer Mountain. **Loc:** Secs. 13, 24, and 25, (26-10E). **Descr:** Several large deposits of limestone in metamorphic rocks. **Value:** Recently operated by Ideal Cement Co. **Ref:** 48, p. 55; 64, p. 69-70, 73-75; 80, p. 380; 87-A, p. 43; 96, p. 13; 107-C, p. 48; 117, p. 234-235.
60. **Name:** Guye Peak. **Loc:** Sec. 28, (23-11E). **Descr:** Fair grade of limestone 100 ft. thick. **Value:** Warrants investigation. **Ref:** 80, p. 380; 96, p. 13; 123, p. 13.
61. **Name:** Denny Mountain. **Loc:** W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 5, and E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 6, (22-11E). **Descr:** 6,000,000 tons of high-grade limestone lying between granite and metamorphic rocks. **Value:** Tonnage and quality indicate it to be a commercial deposit. **Ref:** 48, p. 55; 80, p. 380.

GRAYS HARBOR COUNTY

62. **Name:** Humptulips. **Loc:** N. center sec. 4, (20-9W). **Descr:** On NW. side of Humptulips River is a rounded hill of noncrystalline limestone 50 ft. high, 100 ft. wide, and 150 ft. long;

also a bed 110 ft. thick across the river to the SE. **Value:** Probably similar in quality and quantity to the Bear River deposit (no. 64). **Ref:** 48, p. 55; 64, p. 18-21; 96, p. 13.

PACIFIC COUNTY

63. **Name:** Menlo (Lawson Ranch). **Loc:** SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (13-8W). **Descr:** Noncrystalline limestone interbedded with Oligocene shale. Size of body unknown; poorly exposed. **Value:** Uncertain. **Ref:** 48, p. 55; 64, p. 18, 24-25; 96, p. 13.
- *64. **Name:** Bear River. **Loc:** NW $\frac{1}{4}$ sec. 27 and SW $\frac{1}{4}$ sec. 22, (10-10W). **Descr:** Lenticular deposit of noncrystalline limestone of agricultural grade. **Value:** Currently worked by Columbia River Lime Co., Vancouver, Wash. **Ref:** 48, p. 55; 64, p. 18-24; 66-D, p. 20; 82-A, p. 73; 96, p. 13.
- 64A. **Name:** Knappton. **Loc:** Near Knappton. **Descr:** Cement rock body reported to be 15 to 30 ft. thick and 1,200 ft. long. **Value:** Reported to have been quarried at one time. **Ref:** 135.

LEWIS COUNTY

65. **Name:** Newaukum. **Loc:** Reported in sec. 27, (14-2E). **Descr:** Member of Newaukum series. **Value:** Unknown. **Ref:** 29, p. 103.
- 65A. **Name:** Mineral Creek. **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ and NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (14-5E), on Mineral Creek. **Descr:** Limestone or travertine, one sample of which shows 5.10 percent insoluble, 0.50 percent R₂O₃, 90.00 percent calcium carbonate, and 1.00 percent magnesium carbonate. **Value:** Unknown. **Ref:** 135.

CHELAN COUNTY

66. **Name:** Martin Peak. **Loc:** On S. slope of Martin Peak, 2 mi. NE. of Holden. **Descr:** A 10- to 40-ft. bed extends several thousand feet. **Value:** Should be investigated. **Ref:** 135.
67. **Name:** Buckskin Mountain. **Loc:** S. of Holden on N. and E. slopes of Buckskin Mountain. **Descr:** Similar to that on Martin Peak. **Value:** Should be investigated. **Ref:** 135.
68. **Name:** Deer Point. **Loc:** Secs. 13 and 14, (29-20E). **Descr:** A good grade of limestone of unknown extent. **Value:** Burned for lime at one time. **Ref:** 66, p. 53; 117, p. 172-174.
69. **Name:** South Shore. **Loc:** Sec. 29, (29-21E). **Descr:** A good grade of material of unknown extent. **Value:** Burned for lime at one time. **Ref:** 66, p. 53; 117, p. 172-174.
70. **Name:** Wapato Lake. **Loc:** Secs. 14 and 15, (28-21E). **Descr:** Limestone rather poorly exposed but which may be as much as 100 ft. thick. Higher grade portions contain 93.5 percent calcium carbonate and 6.5 percent impurity, mostly silica. **Value:** Probably usable if it were more favorably located with respect to market. **Ref:** 96, p. 13.
71. **Name:** Rainy Creek. **Loc:** $\frac{1}{2}$ mi. up Rainy Creek from its confluence with Little Wenatchee River.

Descr: Large deposit of crystalline limestone. **Value:** Inaccessible, but warrants investigation. **Ref:** 66, p. 53; 96, p. 13.

- *71A. **Name:** Soda Springs. **Loc:** N $\frac{1}{2}$ sec. 10, (27-15E) at Soda Springs. **Descr:** White marble in ridge extending $\frac{1}{2}$ mi. E. from Soda Springs. At least 50,000,000 tons available. **Value:** Currently worked by Ideal Cement Co., Grotto, Wash. **Ref:** 66-D, p. 27; 82-A, p. 81-83; 135.
72. **Name:** Marble Creek. **Loc:** Sec. 10, (28-17E). **Descr:** Approximately 100,000 tons of good-grade limestone. **Value:** Could support small operation. **Ref:** 66, p. 53.
- 72A. **Name:** Gold Ridge. **Loc:** NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (26-19E) on Gold Ridge. **Descr:** Limestone bed 40 to 100 ft. thick exposed for 2,000-ft. length. Contains some impurities. **Value:** Warrants investigation. **Ref:** 135.
73. **Name:** Entiat. **Loc:** NW $\frac{1}{4}$ sec. 3 and NE $\frac{1}{4}$ sec. 4, (25-20E). **Descr:** Limestone body containing an estimated 1,000,000 tons. **Value:** Some production from the deposit. **Ref:** 64, p. 80-87; 66, p. 52.
74. **Name:** Starnose (Staples). **Loc:** N $\frac{1}{2}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 10, (23-20E). **Descr:** Small deposit of low grade. **Value:** Worked at one time, but of little value. **Ref:** 64, p. 88; 66, p. 53; 96, p. 13; 117, p. 171.

OKANOGAN COUNTY

75. **Name:** Kruger Mountain. **Loc:** Secs. 18 and 19, (40-27E). **Descr:** Irregular lenses interstratified with slates and siliceous beds. **Value:** Should be investigated. **Ref:** 129, p. 65-66.
76. **Name:** Golden. **Loc:** Secs. 3, 4, 9, 10, 15, and 21, (39-26E). **Descr:** Irregular lenses interstratified with slates and siliceous rocks. **Value:** Should be investigated. **Ref:** 129, p. 65-66.
77. **Name:** Wehesville. **Loc:** Sec. 35, (39-26E). **Descr:** Similar to Golden deposits. **Value:** Should be investigated. **Ref:** 129, p. 65-66.
- 77A. **Name:** Tonasket. **Loc:** N $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 25, (38-26E), 7 mi. from railroad. **Descr:** Rather pure limestone reported to be 1,000 ft. wide and 1 mi. long. **Value:** Warrants investigation. Owned by E. E. Leigh, Mount Vernon. **Ref:** 135.
78. **Name:** Havilla. **Loc:** $\frac{1}{2}$ mi. E. of Havilla. **Descr:** Crystalline limestone of good grade, quantity unknown. **Value:** Warrants investigation. **Ref:** 64-B, p. 55; 117, p. 168-169.
- *79. **Name:** Riverside area. **Loc:** Tps. 34, 35, and 36 N., Rs. 25 and 26 E. **Descr:** A limestone-dolomite series several thousand feet thick, containing various grades of limestone and dolomite in large quantities. **Value:** Portions are commercial. Quarries are currently operated in secs. 4 and 31, (34-26E) and secs. 24 and 25, (35-25E) by R. C. Mulligan, Okanogan. **Ref:** 8; 64, p. 78-79; 82-A, p. 81; 93-A, p. 25.
80. **Name:** Okanogan. **Loc:** On E. side of Okanogan River in sec. 16, (33-26E). **Descr:** Crystalline

limestone exposed 300 to 400 ft. laterally, and 100 to 200 ft. vertically. **Value:** Burned for lime at one time. **Ref:** 64, p. 79; 98, p. 178.

81. **Name:** Buckhorn Mountain. **Loc:** Secs. 2, 9, 10, 11, and 15, (40-30E). **Descr:** Fairly large bodies of coarsely crystalline limestone. **Value:** Inaccessible but of commercial tonnage and grade. **Ref:** 14, p. 8-9; 117, p. 163; 128, p. 19-20.
82. **Name:** Wauconda. **Loc:** Deposits 1 mi. N. and 3 mi. S. of Wauconda. **Descr:** Small bodies. **Value:** Probably too small for economical operation. **Ref:** 117, p. 169-170.

FERRY COUNTY

- 82A. **Name:** Curlew. **Loc:** Secs. 5 and 6, (39-34E). **Descr:** An old mine adit, the portal of which is 500 ft. from railroad, is reported to cut limestone at from 300 to 500 ft. from portal. Analysis shows 0.95 percent SiO_2 , 0.03 percent Fe_2O_3 , 0.30 percent Al_2O_3 , 0.28 percent P, 1.70 percent MgCO_3 , and 96.5 percent CaCO_3 . **Value:** Warrants investigation. **Ref:** 135.
83. **Name:** Curlew Lake. **Loc:** Reported in sec. 9, (37-33E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
84. **Name:** Doblasue. **Loc:** SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 4, (36-32E). **Descr:** Unknown. **Value:** Burned for lime by Doblasue Lime and Mining Co. at one time. **Ref:** 135.
85. **Name:** Union Lime. **Loc:** NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (36-32E). **Descr:** Hard blue-gray limestone, said to be a large body. **Value:** Formerly burned for lime. **Ref:** 80, p. 381.
86. **Name:** Lime Creek. **Loc:** Near N. line sec. 31, (31-33E). **Descr:** Small mass. **Value:** Quarried for use in construction of the old Keller smelter. **Ref:** 98, p. 178.
87. **Name:** Orient. **Loc:** W. of Orient. **Descr:** Several bodies of dolomitic limestone. **Value:** Investigation desirable. **Ref:** 117, p. 160.

STEVENS COUNTY

88. **Name:** Northport limestone. **Loc:** On both sides of the Columbia River from near Kettle Falls to Northport. **Descr:** This formation is predominantly dolomitic but contains several large bodies of high-grade limestone. **Value:** Several deposits within the area are being worked, and one, in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, (38-38E), recently was under development by John Thomson of Colville. **Ref:** 2, p. 53; 139, p. 75-77.
89. **Name:** Northport. **Loc:** S. center sec. 33, (40-40E). **Descr:** Part of Northport limestone. **Value:** Furnished flux for the old smelter at Northport. **Ref:** 28, p. 106; 64-B, p. 53; 139, p. 75-77.
90. **Name:** South Northport. **Loc:** N. center sec. 8, (39-40E). **Descr:** Part of Northport limestone. **Value:** Quarry formerly operated here. **Ref:** 135.
91. **Name:** Red Top limestone. **Loc:** Extends from Deep Creek, in SE. cor. T. 40 N., R. 41 E., to Fish

Creek. **Descr:** A mile-wide belt of argillaceous blue-gray limestone. **Value:** Portions may be commercial. **Ref:** 139, p. 80.

92. **Name:** Republican Creek limestone. **Loc:** Extends from head of Republican Creek northeastward into Pend Oreille County. **Descr:** Light-colored fine-grained limestone forming a belt about 1 mi. wide. **Value:** Portions may be commercial. **Ref:** 139, p. 78-79.
- *93. **Name:** Janni. **Loc:** SE $\frac{1}{4}$ sec. 7, (39-40E). **Descr:** A crystalline limestone body containing large tonnage. **Value:** Currently operated by Peter Janni & Sons. **Ref:** 2-A, p. 32; 28, p. 111; 55, p. 25; 64, p. 114-118; 82-A, p. 77; 96, p. 14.
- 93A. **Name:** Marble Mountain. **Loc:** Secs. 22, 23, 26, 27, 28, 33, and 34, (39-39E). **Descr:** Many drill holes indicate 2,867,000 tons of high-grade limestone. **Value:** Warrants investigation. **Ref:** 64-B, p. 51-52.
- 93B. **Name:** Norton and Ornduff. **Loc:** SW $\frac{1}{4}$ sec. 13, (39-39E), $\frac{3}{4}$ mi. S. of Northport. **Descr:** Two sheared and faulted beds of limestone. **Value:** At least 500 tons have been shipped for use in pulp manufacture. Owner estimates 6,000,000 tons available. **Ref:** 64, p. 119-122; 64-B, p. 52.
- *94. **Name:** Marble. **Loc:** Sec. 25, (39-39E). **Descr:** Large tonnage of limestone of good grade. **Value:** Currently operated by Ideal Cement Co. **Ref:** 2-A, p. 25; 28, p. 114-115; 53, p. 28; 82-A, p. 74-76.
- 94A. **Name:** Bossburg. **Loc:** On E. and W. sides of Columbia River, in T. 39 N., R. 38 E. **Descr:** Pure limestone interbedded with quartzite in outcrop 2 mi. long and 1 mi. wide. **Value:** Warrants investigation. **Ref:** 64-B, p. 50-51.
95. **Name:** China Bend. **Loc:** Sec. 12, (38-38E). **Descr:** Small deposits of high-grade limestone. **Value:** Formerly used by Florentine Marble Co. **Ref:** 115, p. 130-131.
96. **Name:** Gold Bar Mining Co. **Loc:** Secs. 15 and 22, (37-38E). **Descr:** Two deposits of unknown size and purity. **Value:** Should be investigated. **Ref:** 135.
- *97. **Name:** U. S. Gypsum Co. **Loc:** SW $\frac{1}{4}$ sec. 10, (37-38E). **Descr:** Large reserve of high-grade limestone. **Value:** Recently quarried by U. S. Gypsum Co. **Ref:** 28, p. 86-87; 55, p. 34; 64, p. 107-112; 64-A, p. 49; 106-J, p. 4.
- *98. **Name:** Powell. **Loc:** Sec. 15, (37-38E). **Descr:** Siliceous limestone, formerly a large body but now said to be nearly depleted. **Value:** Recently operated by Spokane Portland Cement Co. **Ref:** 28, p. 114-115; 55, p. 33; 64, p. 103-107.
99. **Name:** Clugston limestone. **Loc:** Extends from Deep Creek, 4 mi. N. of Aladdin, southwestward to headwaters of Clugston and Onion Creeks, thence south to sec. 10, (36-39E). **Descr:** Dense massive stone, in places argillaceous. **Value:** Por-

tions of it have been used in the past. **Ref:** 115, p. 116-117; 139, p. 71-72.

100. **Name:** Keystone Marble Co. **Loc:** Secs. 1 and 12, (37-39E). **Descr:** Coarse white, gray, and pink limestone of high grade. **Value:** Quarried for marble about 1903. **Ref:** 64-A, p. 50; 115, p. 116-119.
101. **Name:** Jefferson Marble Mining & Milling Co. **Loc:** Sec. 13, (37-39E). **Descr:** Varicolored limestone of good grade. **Value:** Quarried for building stone about 1903. **Ref:** 115, p. 109-113.
102. **Name:** Old Dominion limestone. **Loc:** Extends northeastward from Addy to the Aladdin area. **Descr:** Large body which varies in composition from limestone to dolomite. **Value:** Parts have been used. **Ref:** 139, p. 66-68.
103. **Name:** Peaceful Valley limestone. **Loc:** Secs. 27, 34, and 35, (35-37E) and secs. 2 and 3, (34-37E). **Descr:** Fine-grained limestone body about 2 mi. long has an average width of 800 ft. **Value:** Portions have been used. **Ref:** 64-A, p. 48; 115, p. 143.
104. **Name:** Kettle Falls. **Loc:** 2 mi. S. of Kettle Falls. **Descr:** High-grade limestone occurred in low rounded knolls only a few feet above the river but is now covered by water. **Value:** Inaccessible. **Ref:** 64, p. 102-103; 117, p. 142.
105. **Name:** Colville Marble Co. **Loc:** 16 mi. NE. of Colville on N. fork of Mill Creek. **Descr:** Several thousand acres of siliceous limestone staked about 1903. **Value:** Not usable for building purposes but may have other commercial uses. **Ref:** 64, p. 102; 115, p. 120-121.
- 105A. **Name:** Jacobs Farm. **Loc:** Sec. 27, (34-39E). **Descr:** Limestone. **Value:** 10,000,000 tons of limestone reported available. **Ref:** 64-B, p. 48.
- *106. **Name:** Chewelah. **Loc:** Sec. 5, (32-41E). **Descr:** Dolomitic limestone. **Value:** Recently worked by Chewelah Eagle Mining Co. **Ref:** 55, p. 19.
107. **Name:** Jumpoff Joe Lake. **Loc:** Sec. 1, (30-40E) and sec. 36, (31-40E). **Descr:** Said to be thick deposits covering considerable area. **Value:** Burned for lime at one time. **Ref:** 64, p. 97; 117, p. 123-125.

PEND OREILLE COUNTY

108. **Name:** Metaline limestone. **Loc:** Covers a wide area in the northern part of the county. **Descr:** Varies from pure limestone to dolomite. Parts of it are siliceous. **Value:** Portions of it support commercial operations. **Ref:** 102, p. 17-19, 77.
- *109. **Name:** Leigh. **Loc:** NE¼ sec. 27, (39-43E). **Descr:** Large deposit which varies from high-grade limestone to siliceous and dolomitic types. **Value:** Currently quarried by Lehigh Portland Cement Co. **Ref:** 2-A, p. 26; 27, p. 41; 55, p. 26; 64, p. 122-128; 82-A, p. 77-79; 102, p. 77; 117, p. 190-199.
110. **Name:** Box Canyon. **Loc:** Secs. 19 and 20, (38-43E). **Descr:** Large beds of high-grade limestone. **Value:** Pacific Portland Cement Co. was preparing to operate the deposit in 1905. **Ref:** 64, p. 129; 80, p. 382; 102, p. 77.
- *111. **Name:** Ione (Jordan). **Loc:** Sec. 31, (38-43E). **Descr:** Limestone. **Value:** Formerly used as flux by Bunker Hill & Sullivan Mining and Concentrating Co. Currently produced by The Green Co., Spokane. **Ref:** 2-A, p. 24; 27, p. 62; 64, p. 128-129; 117, p. 181-186.

ASOTIN COUNTY

112. **Name:** Rogersburg. **Loc:** Secs. 19 and 20, (7-47E). **Descr:** Large deposit of high-grade limestone occurs on both sides of the Snake River. **Value:** Commercial quality and quantity. **Ref:** 64, p. 130; 64-B, p. 70; 96, p. 13; 117, p. 113-117.

MARL

OKANOGAN COUNTY

113. **Name:** Blue Lake. **Loc:** Sec. 12, (39-26E). **Descr:** Marl exposed to depth of 3 ft. **Value:** Worked at one time. **Ref:** 135.
114. **Name:** Weber (Mud Lake). **Loc:** Sec. 24, (36-25E). **Descr:** A 5- to 7-ft. bed covers 40 acres. **Value:** Sufficient tonnage for commercial operation. **Ref:** 96, p. 15.
115. **Name:** Crumbacher Lake. **Loc:** NE¼ sec. 26, (36-26E). **Descr:** Marl deposit 10 to 15 ft. thick and covered by 1 to 3 ft. of overburden. **Value:** Worked at one time by Dan Graham. **Ref:** 48, p. 65; 96, p. 15.
- *116. **Name:** Booher Lake. **Loc:** SE¼ sec. 3, (35-26E). **Descr:** A 25-ft. bed of marl covers 50 acres. **Value:** Currently worked by Washington Natural Products Co., Seattle. **Ref:** 2-A, p. 37; 48, p. 65; 55, p. 18; 96, p. 15.
117. **Name:** Green Lake. **Loc:** Sec. 13, (34-25E). **Descr:** Unknown. **Value:** Reportedly mined. **Ref:** 135.
118. **Name:** Salmon Creek. **Loc:** On Salmon Creek Road 8 mi. NNW. of Okanogan. Approximately in NE¼ sec. 23, (34-25E). **Descr:** Said to be a deposit 8 to 9 ft. deep covering an area of 80 acres. **Value:** Warrants investigation. **Ref:** 135.
- 118A. **Name:** Ward Lake (Bonner Lake). **Loc:** SE¼ sec. 32, (34-22E). **Descr:** Marl occurs around the lake to a reported depth of at least 35 ft. Covered by 2 ft. of overburden. **Value:** Unknown. **Ref:** 135.
- 118B. **Name:** Scott. **Loc:** Sec. 18, (33-22E). **Descr:** Marl underlies several acres to a depth of several feet. **Value:** Unknown. **Ref:** 135.
- 118C. **Name:** Minnie. **Loc:** E½ sec. 23, (32-22E), just NE. of the Minnie prospect. **Descr:** Marl in a small depression. **Value:** Probably not commercial. **Ref:** 135.
- 118D. **Name:** Coulee. **Loc:** Near center sec. 22, (29-23E), 1.3 mi. S. of Alta Lake. **Descr:** Thin-bedded marl

at least 8 ft. deep in a flat 3 to 5 acres in extent at the south end of a small pond. **Value:** Warrants investigation. **Ref:** 135.

119. **Name:** Alta Lake. **Loc:** Sec. 10, (29-23E). **Descr:** Reportedly occurs in lake beds. **Value:** Unknown. **Ref:** 135.

FERRY COUNTY

120. **Name:** Renner Lake. **Loc:** SE. cor. sec. 13, (38-36E). **Descr:** Occurs in a more-or-less dry lake bed to depth of 46 in. **Value:** Operated briefly. **Ref:** 135.

STEVENS COUNTY

121. **Name:** Ranahan. **Loc:** 2 mi. from Bossburg, probably in sec. 23, (38-37E). **Descr:** 12 acres of marl at least 20 ft. thick. **Value:** Warrants investigation. **Ref:** 135.
122. **Name:** Clark (Charles Lake). **Loc:** S $\frac{1}{2}$ sec. 34, (32-37E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 48, p. 65.
123. **Name:** Hall Lake. **Loc:** Sec. 1, (29-36E). **Descr:** Deposit covers 20 acres and is said to be 20 ft. thick in places. **Value:** Worked intermittently. **Ref:** 28, p. 75.
124. **Name:** Kulzer. **Loc:** Sec. 17, (32-41E). **Descr:** Occurs in small lake. **Value:** Regarded as commercial by owner. **Ref:** 135.
125. **Name:** Blue Creek. **Loc:** 2 $\frac{1}{4}$ mi. up Blue Creek from the railroad. Probably near center sec. 35, (33-39E). **Descr:** 3 to 4 ft. of snow-white, very pure marl, covered by 6 to 18 in. of soil, is reported to occur in a large flat. **Value:** Was once mined. **Ref:** 135.

PEND OREILLE COUNTY

- 125A. **Name:** Usk. **Loc:** SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 24, (35-43E). **Descr:** At least 30 acres reported to be underlain by marl to unknown depth. Rather pure. **Value:** Unknown. **Ref:** 135.
- 125B. **Name:** Charmicheal. **Loc:** W $\frac{1}{2}$ sec. 22, (40-43E). **Descr:** Exposed in road cuts to depth of 2 or 3 ft. **Value:** May be large deposit; warrants investigation. **Ref:** 135.

TRAVERTINE

WHATCOM COUNTY

126. **Name:** Silver Lake. **Loc:** Sec. 5, (40-6E). **Descr:** Small spring deposit. **Value:** Too small for commercial operation. **Ref:** 96, p. 15.

SKAGIT COUNTY

127. **Name:** Alverson. **Loc:** 350 ft. W. of strontium mine in sec. 2, (33-2E). **Descr:** Small spring deposit at tide level. **Value:** Too small for economic operation. **Ref:** 135.

- 127A. **Name:** Concrete. **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, (35-8E), just W. of Concrete. **Descr:** Small deposit reported. **Value:** Limited production in 1959 by J. E. George, Issaquah. **Ref:** 135.

SNOHOMISH COUNTY

128. **Name:** Paddock. **Loc:** NE $\frac{1}{4}$ sec. 16, (32-10E). **Descr:** Less than $\frac{1}{2}$ ton of travertine. **Value:** Noncommercial. **Ref:** 135.
129. **Name:** Dan Creek (Whitechuck). **Loc:** At head of Dan Creek, in NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (31-10E) and SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (32-10E). **Descr:** An estimated 150,000 tons. **Value:** About 1,200 tons shipped for agricultural purposes in 1940-41. Currently worked by J. E. George, Issaquah. **Ref:** 12, p. 54; 64, p. 67; 106-D.

JEFFERSON COUNTY

130. **Name:** Dosewallips. **Loc:** SE $\frac{1}{4}$ sec. 7, (26-4W). **Descr:** Exposed for 85 ft. along trail and 70 ft. up the hillside. **Value:** Warrants investigation. **Ref:** 135.

PIERCE COUNTY

131. **Name:** McMillan. **Loc:** NW $\frac{1}{4}$ sec. 18, (19-5E). **Descr:** Relatively small deposit of travertine on glacial gravel. **Value:** Worked intermittently for years, now exhausted. **Ref:** 48, p. 55; 64, p. 76-78; 87-A, p. 108; 96, p. 15; 103, p. 140.

STEVENS COUNTY

132. **Name:** Burnt Valley. **Loc:** 7 mi. NE. of Chewelah and 3 mi. from Snook's ranch, which is in secs. 21, 22, 27, and 28, (33-41E). **Descr:** Not known. **Value:** Warrants investigation. **Ref:** 135.
- 132A. **Name:** Last Chance. **Loc:** On property of Last Chance Consolidated Mining Co. in center S $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 24, (39-40E). **Descr:** Travertine occurs in a gully 50 to 150 ft. wide and 600 ft. long. Only 1 ft. thick in most exposures but exposed to depth of at least 6 ft. in one place. **Value:** Commercial quality, but quantity may be too small. **Ref:** 135.

- 132B. **Name:** Black Canyon. **Loc:** Center NW $\frac{1}{4}$ sec. 18, (39-41E) at elevation of 2,580 ft. **Descr:** Exposed in stream to depth of 4 ft. in an area 15 ft. square. Probably covers an area 50 by several hundred feet. **Value:** Good quality, but quantity may be less than commercial. **Ref:** 135.

SPOKANE COUNTY

133. **Name:** Silver Lake. **Loc:** Sec. 20, (24-41E). **Descr:** Coatings 1 to 2 ft. thick on granite in Silver Lake. **Value:** Probably cannot be recovered economically. **Ref:** 135.

MAGNESITE

Magnesite is a magnesium carbonate having the formula $MgCO_3$. As with other members of the calcite group, identification of magnesite cannot be established with certainty by visual examination. It can be distinguished, however, by its reaction to cold dilute acid, by its specific gravity, by its indices of refraction, or by chemical analysis.

Washington magnesite is the coarsely crystalline variety; in fact, a considerable amount of it was quarried and cut for marble before it was recognized as magnesite. Known commercial deposits in Washington are restricted to Stevens County. They occur as irregular bodies in the Stensgar dolomite, a formation which is exposed discontinuously throughout a distance of some 30 miles in the area southwest of Chewelah.

The Washington deposits of magnesite that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the head-

ing "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

A rock from which magnesium carbonate might be recovered as a byproduct is the "nickel ledge" or "silica-carbonate" rock found in Snohomish, Skagit, Chelan, and Kittitas Counties. It consists principally of a mixture of chalcedony, quartz, and magnesium carbonate in which are small amounts of nickel, gold, and chromium. Anyone planning to treat the rock for its metal content might well consider the possibility of recovering magnesium carbonate for additional profit.

The largest use of magnesite is in the manufacture of "dead-burned magnesite" for refractories. It is also used in magnesium oxychloride cement, fertilizers, rubber, epsom salts manufacture, and can be an ore of magnesium metal.

Dead-burned magnesite sold for \$40 per ton, in bulk, f. o. b. Washington in June 1956.

OCCURRENCES

On page 47 in volume 2 is plate 21, the map showing the occurrences of magnesite, numbered to correspond with the numbers of the occurrences listed below.

SKAGIT COUNTY

1. **Name:** Swinomish Bay. **Loc:** SE $\frac{1}{4}$ sec. 35, (34-2E). **Descr:** Occurs in "nickel ledge" rock. **Value:** Possible source of magnesite. **Ref:** 135.
2. **Name:** Mount Vernon. **Loc:** Secs. 9 and 10, (33-4E). **Descr:** Occurs in nickel-gold-bearing ("nickel ledge") rock associated with several other minerals. **Value:** Possible source of magnesite. **Ref:** 62, p. 67.

SNOHOMISH COUNTY

3. **Name:** Granite Falls. **Loc:** W $\frac{1}{2}$ sec. 33, (30-7E). **Descr:** A tabular body of "nickel ledge" rock 25 to 50 ft. wide and exposed for 2,000 ft. Contains siderite, pyrite, quartz, cinnabar, and nickeliferous minerals in addition to magnesite. **Value:** Possible source of magnesite. **Ref:** 135.

KITITAS COUNTY

4. **Name:** Boulder Creek. **Loc:** Sec. 36, (23-14E). **Descr:** Several exposures of "nickel ledge" rock that contain variable amounts of magnesium carbonate. **Value:** Possible source of magnesite. **Ref:** 122, p. 3-4.

CHELAN COUNTY

5. **Name:** Blewett. **Loc:** At the old town of Blewett on both sides of Peshastin Creek and at other places in the Blewett area. **Descr:** Magnesium-carbonate-bearing "nickel ledge" rock. **Value:** Possible source of magnesite. **Ref:** 122, p. 3-4; 137, p. 41-42.
6. **Name:** Ingalls Creek. **Loc:** SW $\frac{1}{4}$ sec. 19, (23-18E). **Descr:** Magnesium-carbonate-bearing "nickel ledge" rock. **Value:** Uncertain. **Ref:** 122, p. 3-4; 137, p. 41-42.

OKANOGAN COUNTY

7. **Name:** Wagonroad Coulee. **Loc:** NE $\frac{1}{4}$ sec. 4, (35-26E). **Descr:** A 10-in. vein of amorphous magnesite in serpentine. **Value:** Exposed quantity insufficient to support commercial operation but indicative of possibilities in the area. **Ref:** 135.

FERRY COUNTY

8. **Name:** Danville. **Loc:** SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (40-34E). **Descr:** Hydromagnesite in $\frac{1}{4}$ -in. veinlets. **Value:** Exposed quantity below commercial grade. **Ref:** 135.
- 8A. **Name:** Indian. **Loc:** SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, (32-40E). **Descr:** Magnesite deposit. **Value:** Unknown. **Ref:** 135.

STEVENS COUNTY

- *9. **Name:** Finch quarry. **Loc:** NE $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ NW $\frac{1}{4}$, and SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, (32-40E). **Descr:** Principal quarry of Northwest Magnesite Co. **Value:** Recently operated for use in refractories. **Ref:** 6, p. 15; 48, p. 63; 55, p. 29; 139, p. 326; 141, p. 16, 18, 19, 22, 41.
- *10. **Name:** Allen quarry. **Loc:** SW $\frac{1}{4}$ sec. 30, (32-40E). **Descr:** Large quarry owned by Northwest Magnesite Co. **Value:** Recently operated for use in refractories. **Ref:** 6, p. 15-16; 48, p. 63; 55, p. 29; 139, p. 330-331; 141, p. 16, 18, 19, 20, 22, 49.
- *11. **Name:** Moss quarry. **Loc:** SE. cor. sec. 25, (32-39E). **Descr:** A continuation of the Allen deposit. **Value:** Recently operated by Northwest Magnesite Co. **Ref:** 6, p. 15-16; 48, p. 63; 55, p. 29; 139, p. 330; 141, p. 16, 18, 19, 20, 22, 49.
12. **Name:** Woodbury. **Loc:** NW $\frac{1}{4}$ sec. 1, (31-39E). **Descr:** Irregular bodies of magnesite in dolomite. **Value:** Operated for a short time during World War I. **Ref:** 6, p. 16; 48, p. 63; 139, p. 330; 141, p. 18, 19, 53.

13. **Name:** Mountainview School. **Loc:** Near center E $\frac{1}{2}$ sec. 3, (31-39E). **Descr:** Coarse crystalline magnesite in dense blue dolomite. **Value:** Warrants investigation. **Ref:** 6, p. 16.
14. **Name:** Phoenix. **Loc:** SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (31-39E). **Descr:** Irregular patches of coarse, crystalline magnesite in dolomite. **Value:** Warrants investigation. **Ref:** 6, p. 16.
15. **Name:** Nogues. **Loc:** SE $\frac{1}{4}$ sec. 4, (31-39E). **Descr:** Irregular patches of magnesite in dolomite. **Value:** Warrants investigation. **Ref:** 6, p. 16.
16. **Name:** Midnight. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (31-39E). **Descr:** Four small outcrops of magnesite developed by small quarry and 50-ft. shaft. **Value:** No production, but examination warranted. **Ref:** 6, p. 17; 48, p. 64; 139, p. 328; 141, p. 48.
- *17. **Name:** Keystone quarry. **Loc:** Near W. line SW $\frac{1}{4}$ sec. 9, (31-39E). **Descr:** Dolomite replaced by magnesite. **Value:** First magnesite shipped was from this deposit. Recently operated by Northwest Magnesite Co. **Ref:** 6, p. 17; 48, p. 63; 55, p. 29; 139, p. 326; 141, p. 17, 23, 46.
18. **Name:** Crosby. **Loc:** E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 18, (31-39E). **Descr:** Mass 125 ft. thick and traceable for 400 ft. **Value:** Commercial quantity and quality. **Ref:** 6, p. 18; 48, p. 64; 141, p. 57.
19. **Name:** Double Eagle quarries. **Loc:** Larger quarry lies in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 18, (31-39E), the smaller 1,500 ft. W. **Descr:** Magnesite in dolomite. **Value:** Probably the two exposures opened by quarries are connected; if so, commercial. **Ref:** 6, p. 17; 48, p. 64; 139, p. 179, 180; 141, p. 54.
- 19A. **Name:** Davis. **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (31-39E). **Descr:** Magnesite deposit. **Value:** Unknown. **Ref:** 135.
- 19B. **Name:** Black Bear. **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (31-38E), $\frac{1}{2}$ mi. W. of Red Marble quarry. **Descr:** Magnesite deposit. **Value:** Unknown. **Ref:** 135.
- *20. **Name:** Red Marble quarry. **Loc:** SE $\frac{1}{4}$ sec. 24 and NE $\frac{1}{4}$ sec. 25, (31-38E). **Descr:** Large body of very high grade magnesite. **Value:** Currently operated by Northwest Magnesite Co. **Ref:** 6, p. 18-19; 48, p. 64; 139, p. 330, 331; 141, p. 17, 19, 52.
21. **Name:** U. S. Magnesite quarry. **Loc:** NW $\frac{1}{4}$ sec. 10, (30-38E). **Descr:** Magnesite intermixed with dolomite and, in places, silica. **Value:** The most southerly of the deposits from which ore has been shipped. **Ref:** 6, p. 19-20; 48, p. 64; 139, p. 331; 141, p. 56.
22. **Name:** C. F. Allen. **Loc:** On property of C. F. Allen on W. edge of sec. 16, (30-38E). **Descr:** Dolomite, portions of which are magnesian. **Value:** Warrants investigation. **Ref:** 6, p. 21; 48, p. 63; 139, p. 330, 331; 141, p. 16, 18, 19, 20, 22, 49.
- 22A. **Name:** Section 20. **Loc:** NW $\frac{1}{4}$ sec. 20, (30-38E). **Descr:** Magnesite deposit. **Value:** Unknown. **Ref:** 135.
23. **Name:** Turk. **Loc:** Sec. 1, (29-37E) and sec. 36, (30-37E). **Descr:** 2,200,000 tons of magnesite partially "blocked out" by diamond drilling in sec. 36. **Value:** Commercial. **Ref:** 6, p. 21-23; 7.

MICA

Mica is the name applied to a group of minerals, characterized by perfect basal cleavage, which easily yields thin, elastic laminae or sheets. The micas are silicates, and in most instances orthosilicates, of aluminum with potassium and hydrogen. Commonly, they also contain magnesium, ferrous iron, and, in certain instances, ferric iron, sodium, and lithium. Rarely, they may also contain barium, manganese, chromium, rubidium, or caesium. One of the commonest and most useful of the group is muscovite $[(H,K)AlSi_3O_{10}]$. Other micas of importance to commerce are phlogopite $[H,K,Mg_3Al_2(SiO_4)_7]$, biotite $[H_2K(MgFe)_3Al(SiO_4)_3]$, and vermiculite, a hydrated mica.

Phlogopite is used principally in the electrical industry for those uses requiring a material resistant to high temperature. In sheet form, muscovite is used in capacitors, communication instruments, and for many electrical insulation purposes. In ground form, it is used in roofing, asphalt landing mats, cable and telephone wire insulation, paints for waterproofing textile fabrics, wall paper, rubber, plastics, heat insulation, artificial snow, axle grease and oil, pipe-line enamel, textiles, and in oil well drilling, annealing, and welding. Built-up mica (small irregular sheets glued together) is used in mold-

ing plate for commutator rings, channels and mica tube, heater plate, segment plate, and flexible tape. Biotite is not used in sheet form, but in ground form is used in coating asphalt roofing to prevent it from sticking when rolled.

Vermiculite has the property of expanding to several times its volume when heated. In expanded form it is used for insulation and as an aggregate in lightweight concrete. It is also used to some extent by plant nurseries and as packing for fragile articles. Two other micas, lepidolite, a lithium mica, and mariposite, a chromium mica, are minor sources of lithium and chromium respectively.

No known deposits in Washington are capable of producing commercial sheet mica, but one deposit of biotite schist has recently produced flake mica for a roofing concern. Similar schists, which occur in many of the belts of metamorphic rocks in Washington, also may be of commercial importance. That deposit which has recently produced is marked with an asterisk (*).

Prices of mica in June 1956, f. o. b. mines, were as follows: Punch, 7 to 12 cents per pound according to size and quality. Sheet, clear, 1 $\frac{1}{2}$ - by 2-inch, \$0.70 to \$1.10; 2- by 2-inch, \$1.10 to \$1.60; 2- by 3-inch, \$1.60 to \$2.00;

3- by 3-inch, \$1.80 to \$2.30; 3- by 4-inch, \$2.00 to \$2.60; 3- by 5-inch, \$2.60 to \$3.00; 4- by 6-inch, \$2.75 to \$4.00; and 6- by 8-inch, \$4.00 to \$8.00 per pound. Wet ground,

very fine mica sold for \$140 to \$155 per ton, and dry ground, \$32.50 to \$70.00 per ton. Scrap sold for \$25.00 to \$28.00 per ton, depending on quality.

OCCURRENCES

On page 49 in volume 2 is plate 22, the map showing the occurrences of mica, numbered to correspond with the numbers of the occurrences listed below.

SKAGIT COUNTY

1. **Name:** Alvard. **Loc:** SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (36-11E). **Descr:** Biotite schist, nearly free of minerals other than mica, forms the footwall of the Alvard talc body. **Value:** Possibly commercial; warrants investigation. **Ref:** 135.
- *2. **Name:** Skagit Talc Products. **Loc:** Secs. 11 and 14, (36-11E). **Descr:** Large bodies of biotite schist associated with talc, also a 12- to 15-in. vein of vermiculite reported. **Value:** Schist shipped to roofing concern in 1947 and 1948. **Ref:** 53, p. 27; 55, p. 32.

SNOHOMISH COUNTY

3. **Name:** Barclay Creek. **Loc:** On ridge between Barclay and Lewis Creeks at an elevation of about 3,000 ft. **Descr:** Said to contain specimens of muscovite and biotite more than 8 in. across. **Value:** Might be a source of sheet mica; warrants investigation. **Ref:** 138, p. 42.

KING COUNTY

4. **Name:** Tunnel Creek. **Loc:** About 2 mi. up Hope Lake trail from old highway at Scenic. **Descr:** Trail has cut through pegmatite dike in which are numerous "books" of mica an inch or more across. **Value:** Exposed material below commercial quality and quantity. **Ref:** 135.

OKANOGAN COUNTY

5. **Name:** Mazama. **Loc:** Reportedly on property of Sidney Walter near Mazama. **Descr:** Large sheets of muscovite said to occur. **Value:** Unknown. **Ref:** 135.
- 5A. **Name:** Oroville. **Loc:** Sec. 4, (40-26E). **Descr:** Vermiculite books up to $\frac{3}{4}$ in. thick sent to Division of Mines and Geology for identification. Expands well. Large mass reported. **Value:** Unknown. **Ref:** 135.
- 5B. **Name:** Loomis. **Loc:** Near Loomis. **Descr:** Sample of mica schist sent to Division of Mines and Geology for identification is reported to come from large deposit. **Value:** Unknown. **Ref:** 135.
6. **Name:** Dorian claim. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (35-25E). **Descr:** Small flakes of mariposite along bedding planes in quartzite. **Value:** Of interest to collectors only. **Ref:** 70, p. 36.
7. **Name:** Tunk Creek. **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8 and E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 17, (35-27E). **Descr:** Muscovite, in "books" up to 2 in. across, forms small percentage of pegmatite. **Value:** Quantity too small for commercial operation. **Ref:** 135.

7A. **Name:** Riverside. **Loc:** A few mi. W. of Riverside. **Descr:** A dike containing lepidolite has been reported. **Value:** Unknown. **Ref:** 135.

8. **Name:** Brewster. **Loc:** Reportedly near Brewster. **Descr:** Two samples of vermiculite sent to the Division of Mines and Geology for identification. **Value:** Unknown. **Ref:** 135.

CHELAN COUNTY

9. **Name:** Royal Development Co. mine. **Loc:** SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (30-16E). **Descr:** Reportedly a 3-ft. dike of lepidolite in main tunnel, about 5,000 ft. from the portal. **Value:** Should be investigated. **Note:** This reported occurrence may be erroneous. **Ref:** 41.
10. **Name:** Mad River. **Loc:** Reported on Mad River N. of Leavenworth. **Descr:** Said to be deposit of mica. **Value:** Unknown. **Ref:** 48, p. 66; 66, p. 53.
11. **Name:** Goman. **Loc:** SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5, (26-21E). **Descr:** Muscovite in sheets as large as 3 in. but averaging 2 in. in diameter. **Value:** Quantity and quality determinations desirable. **Ref:** 66, p. 53.
12. **Name:** Chelan Falls. **Loc:** 1 $\frac{1}{2}$ mi. from Chelan Falls. **Descr:** "Gold" mica, possibly phlogopite, occurs as small kidneys in a large ledge. **Value:** 700 pounds extracted prior to 1897. **Ref:** 48, p. 66; 66, p. 53.
- 12A. **Name:** Indian Creek. **Loc:** NW $\frac{1}{4}$ sec. 22, (26-19E), in the Indian Creek area. **Descr:** A sample of fine-flake mica schist submitted by Thomas Raspet of Entiat was practically pure mica. **Value:** Warrants investigation. **Ref:** 135.
13. **Name:** Tumwater Canyon. **Loc:** Sec. 21, (25-17E). **Descr:** Large mass of friable schist, about 90 percent muscovite. **Value:** Appears to have best commercial possibilities of any known deposit of flake mica in Washington. **Ref:** 66, p. 54.

FERRY COUNTY

14. **Name:** Sherman Creek. **Loc:** Approximately in sec. 17, (36-36E). **Descr:** Muscovite in sheets several inches across but marred by "A" structure. **Value:** Warrants investigation. **Ref:** 135.
- 14A. **Name:** Keller. **Loc:** Keller district. **Descr:** Vermiculite schist with flakes up to 1/16 inch in diameter. Exfoliates briskly. **Value:** Possibly valuable for flake mica if not for vermiculite. **Ref:** 135.

STEVENS COUNTY

15. **Name:** Marcus. **Loc:** Near Marcus, 5 mi. from Colville River. **Descr:** Reportedly a mica deposit. **Value:** Unknown. **Ref:** 135.

PEND OREILLE COUNTY

16. **Name:** Blueslide. **Loc:** 5 to 10 mi. from Blueslide. **Descr:** Said to be occurrence of large sheet muscovite. **Value:** Unknown. **Ref:** 135.

SPOKANE COUNTY

17. **Name:** Denison. **Loc:** NE $\frac{1}{4}$ sec. 14, (27-42E). **Descr:** Segregations of biotite associated with quartz. **Value:** Investigation warranted. **Ref:** 135.

MINERAL PIGMENTS

Mineral pigments are used to give color, body, or opacity to paints, stucco, plaster, cement, mortar, linoleum, rubber, plastics, or other materials. Pigments may be divided into three classes, (1) natural pigments, (2) pigments made by burning or subliming natural minerals, and (3) chemically manufactured pigments. Included here are members of only the first class. A number of standard colors are sold on the market, but nearly all consist of limonite ($2\text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$), hematite (Fe_2O_3), or mixtures of these minerals with manganese oxide and/or clay. Ocher is a mixture of iron oxides (usually hydrated) and clay. Sienna consists of hydrated iron oxide and clay but in addition contains manganese oxide, which gives it a brown color. With

an increase in manganese oxide content, sienna grades into umber.

In Washington several deposits of pigments have been worked commercially in the past, and several others show promise of being commercial. Failure of operation in most cases was due to lack of experience on the part of the operators, inadequate equipment, weak market, or a combination of the three, rather than to poor quality of source material.

In December 1953 the price for raw sienna was 4 $\frac{1}{2}$ to 13 cents; raw American type umber, 6 $\frac{1}{4}$ to 6 $\frac{1}{2}$ cents, natural red iron oxide, 5 $\frac{3}{4}$ to 9 $\frac{1}{4}$ cents; and natural yellow iron oxide, 1.4 to 2.5 cents per pound.

OCCURRENCES

On page 51 in volume 2 is plate 23, the map showing the occurrences of mineral pigments, numbered to correspond with the numbers of the occurrences listed below.

CLALLAM COUNTY

- Name:** Mount Baldy. **Loc:** Sec. 31, (30-7W). **Descr:** Short tunnel driven on body of red ocher. **Value:** Used by local Indians as ceremonial body paint; may have other uses. **Ref:** 135.
- Name:** Swamp Creek. **Loc:** Reported in E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 10, (30-5W). **Descr:** Sample submitted to the Division of Mines and Geology is said to have come from this location. **Value:** Appears to have possibilities as dark-brown paint pigment. **Ref:** 135.

WHATCOM COUNTY

- Name:** Sumas Mountain. **Loc:** N $\frac{1}{2}$ sec. 7, (40-5E). **Descr:** Red, ferruginous shales. **Value:** Might be ground and used as pigment. **Ref:** 48, p. 68.

GRAYS HARBOR COUNTY

- Name:** Aberdeen. **Loc:** Plant at Aberdeen, materials obtained locally and from Stevens County. **Descr:** Unknown. **Value:** Formerly operated by Aberdeen Clay & Color Co. **Ref:** 48, p. 67.

PIERCE COUNTY

- Name:** Clay City. **Loc:** Clay City and vicinity. **Descr:** Highly colored clays suitable for the production of sienna. **Value:** Far West Clay Co. formerly used the pigment at Clay City. Other clays in the vicinity also usable. **Ref:** 48, p. 67; 146, p. 41.

- Name:** Mount Spokane. **Loc:** Reportedly on E. slope of Mount Spokane. **Descr:** Mica deposits reported. **Value:** Unknown. **Ref:** 135.

- Name:** Freeman-Mica area. **Loc:** In Freeman-Mica area. **Descr:** Small flake muscovite in residual high-kaolin clays. **Value:** Might form commercial byproduct of clay-beneficiation plant. **Ref:** 48, p. 66.

- Name:** Mashel River. **Loc:** Sec. 22, (16-4E). **Descr:** Large bed of ferruginous shale. **Value:** Mashell Paint Co. formerly produced a pigment similar to Italian burnt sienna; considerable amount sold. **Ref:** 48, p. 67; 96, p. 15; 146, p. 41.

THURSTON COUNTY

- Name:** Lake St. Clair. **Loc:** Secs. 4 and 6, (17-1E). **Descr:** UMBER bed having an average thickness of 4 ft. covers an area 450 ft. long and 300 ft. wide. Deposit contains 7,600 tons of umber on the dry basis. **Value:** Operators failed to market the pigment because they burned it to low-priced iron oxide instead of selling it in natural form as higher-priced umber. **Ref:** 48, p. 68; 96, p. 15.

COWLITZ COUNTY

- Name:** Kalama. **Loc:** Road cuts on Pacific Highway in sec. 8, (6-1W). **Descr:** Red-brown clay, 5 ft. or more thick. **Value:** Tests indicate the clay may have value as a pigment. **Ref:** 48, p. 67; 96, p. 15; 146, p. 40-41.

CLARK COUNTY

- Name:** Boardman. **Loc:** S $\frac{1}{2}$ sec. 16, (5-4E). **Descr:** Thick bed of red mudstone covers a large area. **Value:** Should be tested to determine its value for pigment. **Ref:** 135.

SKAMANIA COUNTY

- Name:** Badger Mountain (A). **Loc:** Reported at foot of Badger Mountain on Niggerhead Creek. **Descr:** Sample of brown residual clay reportedly from this location gave good umber color when

ground with oil. **Value:** Warrants investigation. **Ref:** 135.

YAKIMA COUNTY

11. **Name:** Chinook Pass. **Loc:** Sec. 32, (17-11E). **Descr:** A spring deposit of spongy iron oxide contains an estimated 10,000 cu. yd. **Value:** Appears to have possibilities as a pigment. **Ref:** 96, p. 15.
12. **Name:** Rose. **Loc:** Presumably near Yakima. **Descr:** Sample submitted to the Division of Mines and Geology by F. A. Rose of Yakima had good texture but "off" color. **Value:** Might be used for special colors. **Ref:** 135.
- 12A. **Name:** Pacific Clay. **Loc:** Secs. 26 and 35, (12-23E). **Descr:** Red clay 40 ft. thick with no overburden. Fe_2O_3 content is 2.6 percent. **Value:** Tinting strength too low to have commercial value except for local use in cheap mortars. **Ref:** 146-A, p. 187.

KITITAS COUNTY

13. **Name:** Horse Canyon. **Loc:** Reported in Horse Canyon. **Descr:** Described only as pigment. **Value:** Unknown. **Ref:** 90, p. 133.

DOUGLAS COUNTY

14. **Name:** Badger Mountain (B). **Loc:** On Badger Mountain. **Descr:** Mr. Murdock of Waterville has knowledge of a "paint mine" at this location. **Value:** Red pigment reputedly taken from here; warrants investigation. **Ref:** 135.

STEVENS COUNTY

15. **Name:** Gladstone Mountain. **Loc:** Secs. 17 and 18, (39-42E). **Descr:** Earthy to dense hard limonite surrounds galena nodules in ore chimneys. **Value:** Might constitute commercial byproduct. **Ref:** 135.

- 15A. **Name:** Chewelah. **Loc:** Near Chewelah. **Descr:** Samples of ocher and red pigment from a 70-ft. deposit. Fe_2O_3 content is 2.5 to 26.4 percent. **Value:** Tinting strength too weak for general use but may have local value. **Ref:** 146-A, p. 187-188.
16. **Name:** Firminhac. **Loc:** $\frac{1}{2}$ mi. E. of summit on Springdale-Hunters road. **Descr:** Red ocher exposed in open cuts and pits. **Value:** Should be investigated. **Ref:** 135.
17. **Name:** Kulzer. **Loc:** Sec. 20, (31-41E). **Descr:** Spongy limonite. **Value:** Developed by M. Kulzer for iron, but might, after grinding, make a suitable pigment. **Ref:** 135; 146-A, p. 188.
18. **Name:** Deer Park. **Loc:** SW $\frac{1}{4}$ sec. 34, (30-42E). **Descr:** Large, partially developed beds of ocher and sienna. Ocher $3\frac{1}{2}$ to 5 ft. thick in which are 2- to 6-in. layers of sienna. **Value:** Pigment has been produced from this deposit. **Ref:** 48, p. 68; 146, p. 21-39.

SPOKANE COUNTY

19. **Name:** Vera. **Loc:** 2 mi. E. of Chester. **Descr:** Bright red and yellow claystone overlain by 15 ft. of gray clay. **Value:** Possibly commercial, but thickness and extent should be determined. **Ref:** 48, p. 67; 146, p. 39-40.
20. **Name:** Saxby. **Loc:** Near Idaho line SE. of Saxby station in cut on C. M. St. P. & P. R.R. **Descr:** Bright red and yellow clays. **Value:** Appear to have characteristics suitable for pigments; probably small deposit. **Ref:** 48, p. 67.
21. **Name:** Tekoa. **Loc:** Near N. center sec. 25, (21-45E). **Descr:** Road cuts expose bright red even-textured clay. **Value:** Material should be tested and quantity determined. **Ref:** 48, p. 67.

MINERAL WATERS

Nearly all water occurring on the earth's crust as lakes, streams, springs, and in wells contains dissolved mineral matter. Included here, however, are only those waters which contain sufficient mineral matter to give them a noticeable flavor, odor, or medicinal effect.

Mineral springs and lakes are abundant in Washington, particularly in its mountainous regions. Many are popular for bathing, others for their reported curative effect on certain ailments, and some for their palatability, either alone or mixed with other beverages. A number have been developed as resorts where cabins, hotels, camping facilities, and natatoriums are available. At various times, waters of certain springs and lakes have

been bottled and sold. One group of carbon dioxide-charged springs furnishes the raw material used in the manufacture of solid carbon dioxide or "dry ice." The mineral springs and lakes that are currently exploited commercially are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the commercialized springs and lakes.

It is not possible to place a value on a given spring or lake; rather, its value depends on the extent to which accommodations have been developed and on its appeal to tourists.

OCCURRENCES

On page 53 in volume 2 is plate 24, the map showing the occurrences of mineral waters, numbered to correspond with the numbers of the occurrences listed below.

WHATCOM COUNTY

1. **Name:** Baker (Morovitz) Hot Spring. **Loc:** SE $\frac{1}{4}$ sec. 19, (38-9E). **Descr:** Small spring of warm sulfur water. **Value:** U. S. Forest Service camp at the site. **Ref:** 48, p. 74.

CLALLAM COUNTY

- *2. **Name:** Sol Duc Hot Springs. **Loc:** NW¼ sec. 32, (29-9W). **Descr:** Several springs with moderate flow of hot sulfur water. **Value:** Well developed with hotel, large cottage camp, and natatorium. Accessible by road. **Ref:** 2-A, p. 34; 48, p. 70; 103, p. 110; 119, p. 141.
- *3. **Name:** Olympic Hot Springs. **Loc:** NW¼ sec. 28, (29-8W). **Descr:** Twenty-one springs with large combined flow of hot sulfur water. **Value:** Natatorium and baths are operated in connection with modern hotel and cottage camp. **Ref:** 2-A, p. 30; 48, p. 70.

SNOHOMISH COUNTY

4. **Name:** Sulphur Creek Hot Springs. **Loc:** SE¼ sec. 18, (32-13E). **Descr:** Sulfur springs. **Value:** Undeveloped; accessible by Forest Service trail. **Ref:** 48, p. 73.
5. **Name:** Kennedy (Byrne) Hot Springs. **Loc:** NE¼ sec. 1, (30-12E). **Descr:** Two groups of springs with a small combined flow of fairly hot water, containing carbon dioxide, iron, and sulfur. **Value:** Forest Service camp on the site. **Ref:** 48, p. 73.
- *6. **Name:** Garland (Star) Mineral Springs. **Loc:** N. center sec. 25, (28-11E). **Descr:** Four spring groups have a moderate flow of water ranging in temperature from 50° to 84° F. Mineral content varies, but in general is low in sulfur and iron; hence not unpleasant to taste. **Value:** Modern hotel, cottage camp, baths, and natatorium on the site. **Ref:** 2-A, p. 23; 48, p. 73.

KING COUNTY

7. **Name:** Money Creek Soda Springs. **Loc:** SE¼ sec. 30, (26-11E). **Descr:** Small springs. **Value:** Undeveloped. **Ref:** 48, p. 71; 65, map opposite p. 36.
8. **Name:** Skykomish Soda Springs. **Loc:** On Skykomish River bank ½ mi. E. of Miller River. **Descr:** Two springs with small flow of cold water saturated with carbon dioxide. **Value:** Undeveloped. **Ref:** 48, p. 71.
9. **Name:** Scenic (Madison) Hot Spring. **Loc:** Center W½ sec. 33, (26-13E). **Descr:** Single spring supplies hot sulfur water in quantity sufficient to fill 2-in. pipe. **Value:** At one time was piped into hotel at Scenic for baths. Hotel burned and has not been rebuilt. **Ref:** 16, p. 7-8; 48, p. 71; 103, p. 110; 119, p. 140.
10. **Name:** Goldmeyer Hot Springs. **Loc:** W½NW¼ sec. 14, (23-11E). **Descr:** Mineral springs. **Value:** Formerly developed in connection with the operation of a hotel. **Ref:** 135.
11. **Name:** Diamond Mineral Spring. **Loc:** SW¼ sec. 21, (21-6E). **Descr:** Small spring of cold water, containing small amount of inflammable gas, issues from concreted basin. **Value:** Undeveloped. **Ref:** 48, p. 71; 103, p. 110.

12. **Name:** Flaming Geyser. **Loc:** S. center sec. 27, (21-6E). **Descr:** A drilled well from which cold salt water and inflammable gas issues. Gas also issues naturally from creek bed nearby. **Value:** Auto camp and park on the site. **Ref:** 48, p. 70.
13. **Name:** Green River Hot Springs. **Loc:** At station of Hot Springs on N. P. Ry. **Descr:** Mineral springs. **Value:** Once supported a prominent resort, but now in area reserved for Tacoma's water supply; hence visitors banned. **Ref:** 48, p. 71.

KITSAP COUNTY

14. **Name:** Mineral spring. **Loc:** Said to be near Bremerton, probably the spring at Port Orchard. **Descr:** Sulfur water. **Value:** Used as drinking water at one time and said to have been popular with early Indians. **Ref:** 16, p. 9; 48, p. 71.

PIERCE COUNTY

15. **Name:** Longmire Springs. **Loc:** Near SE. cor. sec. 29, (15-8E) in Rainier National Park. **Descr:** Group of springs which range in temperature and mineral content from cold carbon dioxide-charged water to hot sulfur-iron water. **Value:** Known since early days, now the site of a hotel. **Ref:** 48, p. 72.

THURSTON COUNTY

16. **Name:** Olympia Hygeian Spring. **Loc:** On Olympia Brewery property in Tumwater. **Descr:** Cold pure water. **Value:** Springs improved by drilled well; water formerly bottled and sold for table use; now in disuse. **Ref:** 48, p. 73; 103, p. 110; 119, p. 141.

LEWIS COUNTY

17. **Name:** Alpha Mineral Springs. **Loc:** At Alpha. **Descr:** Water has high chlorine content. **Value:** Formerly bottled and sold for medicinal purposes. **Ref:** 48, p. 72.

17A. **Name:** Packwood spring. **Loc:** Sec. 32, (13-9E). 10 ft. from Cowlitz River. **Descr:** Sulfur-iron water issues from rock fissures at a temperature of 100° F. **Value:** Undeveloped. **Ref:** 105, p. 95.

- *18. **Name:** Ohanapecosh Hot Springs. **Loc:** SW¼ sec. 4, (14-10E). **Descr:** One large and several small springs flowing water with moderate soda and sulfur content. Temperature ranges from slightly warm to very warm. **Value:** Support a hotel, natatorium, and cottage camp. **Ref:** 48, p. 72.

19. **Name:** Summit Creek Soda Spring. **Loc:** Near center sec. 18, (14-11E). **Descr:** Single small flow of palatable cold water charged with carbon dioxide. **Value:** A small nonoperating plant on the site. **Ref:** 48, p. 72; 105, p. 95.

COWLITZ COUNTY

20. **Name:** Soda springs. **Loc:** NE¼ sec. 2, (10-4E). **Descr:** Two warm-water springs charged with carbon dioxide and containing some iron. **Value:** No development; reached by Forest Service trail. **Ref:** 48, p. 70.

SKAMANIA COUNTY

21. **Name:** Government Springs. **Loc:** Sec. 31, (5-7E). **Descr:** Fairly large flow of cold water containing carbon dioxide and some iron. **Value:** Developed; hotel located nearby. **Ref:** 48, p. 72.
22. **Name:** Little Soda Spring. **Loc:** SE¼ sec. 5, (4-7E). **Descr:** Very small flow of cold water carrying carbon dioxide and some iron. **Value:** Undeveloped. **Ref:** 48, p. 73.
23. **Name:** Rock Creek Hot Spring. **Loc:** NE¼ sec. 27, (3-7E). **Descr:** Mineral spring. **Value:** Apparently undeveloped. **Ref:** 48, p. 72; 143, maps.
- *24. **Name:** Moffett's Hot Springs. **Loc:** SW¼ sec. 16, (2-7E). **Descr:** Mineral springs with a daily flow of 30,000 gallons. **Value:** 7,000 gallons sold for medicinal use in 1901 and 120,000 gallons used for bathing purposes. Hotel now operated there. **Ref:** 2-A, p. 28; 16, p. 8; 48, p. 73.
- *25. **Name:** St. Martin Hot Springs. **Loc:** SE. cor. sec. 21, (3-8E). **Descr:** Group of springs has a fairly large flow of very warm palatable water. **Value:** Supply baths of a hotel nearby. **Ref:** 2-A, p. 33; 48, p. 73.
26. **Name:** Collins Hot Springs. **Loc:** At Collins. **Descr:** Said to have been covered and ruined by railway-grading operations. **Ref:** 48, p. 72.

Klickitat County

- *27. **Name:** Klickitat Mineral Springs. **Loc:** NW. cor. sec. 23, NE¼ sec. 24, (4-13E), and N½NW¼ sec. 19, (4-14E). **Descr:** Many springs of cold palatable water charged with carbon dioxide. **Value:** Water formerly bottled and sold. Gas from drilled wells is piped to plant of Gas-Ice Corp., where it is converted to "dry ice." **Ref:** 2-A, p. 23; 48, p. 71; 55, p. 21.
28. **Name:** Blockhouse Mineral Springs. **Loc:** At Blockhouse, 7 mi. W. of Goldendale. **Descr:** Mineral springs. **Value:** Water used for baths in hotel. **Ref:** 48, p. 72.

YAKIMA COUNTY

29. **Name:** Soda springs. **Loc:** NE¼ sec. 35, (9-12E). **Descr:** Probably cold carbon dioxide-charged water. **Value:** Undeveloped; accessible by trail. **Ref:** 88; 105, p. 95.
30. **Name:** Klickitat Soda Spring. **Loc:** SW¼ sec. 26, (11-13E). **Descr:** Large cold-water spring, well charged with carbon dioxide. **Value:** Undeveloped; accessible by trail. **Ref:** 48, p. 74; 105, p. 95.
- 30A. **Name:** Upper Soda Springs. **Loc:** In Klickitat River, near McCormick Meadow, in center W½ sec. 24, (11-12E). **Descr:** Line of springs flowing carbonated water. The gas was reported to be 96.5 percent CO₂. **Value:** Undeveloped. **Ref:** 135.
31. **Name:** Simcoe Soda Springs. **Loc:** SW¼ sec. 9, (11-15E). **Descr:** Reportedly several warm and cold springs. **Value:** Undeveloped. Accessible by road. **Ref:** 16, p. 9.

32. **Name:** Ahtanum Soda Springs. **Loc:** NW¼ sec. 17, (12-15E). **Descr:** Several groups of springs with moderate flow of cold carbon dioxide-charged water. **Value:** A camp ground constitutes only development. **Ref:** 48, p. 74; 103, p. 110; 119, p. 141.
33. **Name:** Goose Egg Soda Springs. **Loc:** NW¼ sec. 4, (13-14E). **Descr:** Large combined flow of cold water containing carbon dioxide and some iron. **Value:** Undeveloped, reached by trail only. **Ref:** 48, p. 74; 105, p. 95.
34. **Name:** Artesian mineral well. **Loc:** In Yakima. **Descr:** Large flow of hot water (92° F.). **Value:** Supplied water for natatorium. **Ref:** 48, p. 74; 103, p. 110; 119, p. 141.
- 34A. **Name:** Bumping Lake mineral spring. **Loc:** In the valley of Deep Creek, near the mouth of Copper Creek, 3 mi. S. of Bumping Lake on road to Copper City. **Descr:** A spring with very small flow of water having total solids content of 4,800 parts per million. Water contains sodium, calcium, magnesium, potassium, lithium, manganese, boron, aluminum, iron, silicon, and copper combined as chlorides, carbonates, and sulfates. Water also has small uranium content. **Value:** Staked as a uranium claim by Tom Hendrix, Yakima. **Ref:** 135.
35. **Name:** Bumping River Soda Spring. **Loc:** NW¼ sec. 34, (17-13E). **Descr:** Spring with moderate flow of cold carbon dioxide-charged water. **Value:** Undeveloped. Accessible by trail. **Ref:** 48, p. 74; 105, p. 95.
36. **Name:** Quartz Creek Soda Spring. **Loc:** Near center SW¼ sec. 3, (17-13E). **Descr:** Small spring of cold carbon dioxide-charged water. **Value:** Undeveloped; accessible by trail. **Ref:** 48, p. 74.

KITITAS COUNTY

37. **Name:** Jungle Spring. **Loc:** Approximately in center of S½ sec. 2, (18-13E). **Descr:** Unknown. **Value:** Undeveloped; accessible by trail. **Ref:** 135.

CHELAN COUNTY

38. **Name:** Soda Spring. **Loc:** NW¼ sec. 10, (27-15E). **Descr:** Small flow of cold water, well charged with carbon dioxide and some iron. **Value:** Forest Service camp and guard station near the site. Accessible by good road. **Ref:** 48, p. 70.
39. **Name:** Ford Camp Soda Spring. **Loc:** At edge of Little Wenatchee River in W½ sec. 13, (28-13E). **Descr:** A moderate flow of clear cold water with a rusty flavor. **Value:** Undeveloped; accessible by trail. **Ref:** 48, p. 70.

GRANT COUNTY

- *40. **Name:** Soap Lake. **Loc:** Covers parts of secs. 12, 13, and 24, (22-26E) and secs. 18 and 19, (22-27E). **Descr:** One of the larger of many salt and alkaline lakes in eastern Washington. Of minerals in the water, sodium carbonate, sodium sulfate, and sodium chloride predominate. **Value:** Resorts with

cabins and hotels are available to visitors. Salts derived from the water have been marketed in package form. **Ref:** 9; 22, p. 113; 24, p. 180; 48, p. 69; 79, p. 19, 20; 81, p. 50; 103, p. 111; 109, p. 93; 119, p. 141; 140, p. 28.

41. **Name:** Moses Lake. **Loc:** Near town of Moses Lake on U. S. Highway No. 10. **Descr:** A weakly alkaline lake, about 13 miles long. Predominant salts in this water are carbonates of sodium, magnesium, and calcium; sodium chloride; and sodium sulfate. **Value:** Hotel and cottages available to visitors. **Ref:** 16, p. 10; 24, p. 180.

OIL AND NATURAL GAS

A small amount of oil has been produced from the Ocean City field in Grays Harbor County, Washington, and two small gas fields have been discovered. One, in Whatcom County 6 miles northwest of Bellingham, has produced gas for local domestic use; the other, in the Rattlesnake Hills of north central Benton County, has produced gas commercially. Neither field is producing now (1957). Of approximately 310 wells drilled prior to July 1956, there were 154 which had showings or reported showings of oil, gas, or both. In addition, 30 wells produced gas, and 4 wells produced between 30 and 100

SPOKANE COUNTY

42. **Name:** Schafer's Medical Springs. **Loc:** Near Dishman. **Descr:** Mineral water. **Value:** Formerly developed for medicinal purposes. **Ref:** 48, p. 73.
43. **Name:** Medical Lake. **Loc:** At the town of Medical Lake in sec. 18, (24-41E). **Descr:** Large lake, the waters of which contain sodium chloride, potassium chloride, and sodium carbonate. **Value:** Facilities available for visitors. **Ref:** 16, p. 48; 48, p. 69.

barrels of oil. One well had produced about 9,300 barrels of oil from August 1957 through December 1958. Four other wells had considerably more oil than would be classed as showings. The 39 wells last mentioned are shown on plate 25, on page 55 in volume 2. On this map the wells are numbered to correspond with the numbers assigned to them in the following list, which includes their names, locations, depths, and company by which they were drilled. For further information regarding these and the other wells drilled, see references 49 and 84-A.

WELLS HAVING SOME OIL, OR MORE THAN USUAL SHOWING

Map no.	Company or owner	Well name	Depth in feet	Location
CLALLAM COUNTY				
1.	Washington Oil Co.	Washington (Old)	2,125	SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (28-13W)
JEFFERSON COUNTY				
2.	Leslie Petroleum Co.; Hoh River Oil & Gas Development Co. with the General Petroleum Co.	Sims No. 1; Gilkey No. 1	2,069 2,155	Center SE $\frac{1}{4}$ NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (26-14W)
3.	Hoh River Oil & Gas Development Co.	Gilkey No. 2	866	2 ft. from Sims No. 1
4.	Washington Oil Co. Ltd.; Consolidated Oil Co. of Washington, Inc.	Kipling No. 1; Gilkey No. 3	316 808	About 140 ft. E. of Sims No. 1
GRAYS HARBOR COUNTY				
5.	Union Oil Co. of California	State No. 1 (Ocean City)	6,278	330 ft. S. and 690 ft. W. of center sec. 15, (18-12W)
6.	Union Oil Co. of California	State No. 3	9,344	53 ft. S. of State No. 1
7.	T. T. Hawksworth; Gas and Oil Development Co.	State No. 4	3,711	500 ft. W. and 250 ft. S. of State No. 3
8.	Ocean City Oil Fields, Inc.	Hogan No. 22-1	4,918	SW cor NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 22, (18-12W)

Map no.	Operator or owner	Quarry name	Property location	
GRAYS HARBOR COUNTY—Continued				
9.	Sunshine Mining Co.	Medina No. 1	4,140	330 ft. N. and 1,320 ft. W. of center sec. 15, (18-12W)

NATURAL GAS WELLS WITH A RECORD OF PRODUCTION

Map no.	Company or owner	Well name	Depth in feet	Location
WHATCOM COUNTY				
1.	?	Anderson	250	Near center W $\frac{1}{2}$ sec. 32, (40-1E), on Anderson farm
2.	Whatcom Natural Gas Corp.	Lingbloom No. 1 (Chamber of Commerce No. 1)	171	NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (39-2E), on J. E. Lingbloom farm
3.	Do	Lingbloom No. 2 (Chamber of Commerce No. 2)	172	SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (39-2E), on O. H. Lingbloom farm
4.	Peoples Gas & Oil Development Co.	Peoples No. 1 (P.G.O. Lingbloom No. 1)	1,085	NW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (39-2E), on Lingbloom farm, 200 ft. NW. of Lingbloom No. 2
5.	Whatcom Natural Gas Corp.	Lingbloom No. 4 (Chamber of Commerce No. 4)	166	SE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (39-2E), on O. H. Lingbloom farm

Map no.	Company or owner	Well name	Depth in feet	Location
WHATCOM COUNTY—Continued				
6.	A. W. Hunter	Harden No. 1 (Hunter No. 1)	193	SW. cor. NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (39-2E), on L. W. Harden farm
7.	M. & M. Oil & Gas Co.	Lange No. 2	2,008	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, (39-2E)
8.	Whatcom Natural Gas Corp.	Whatcom No. 1 (Lange No. 3)	175	E. $\frac{1}{4}$ cor. sec. 28, (39-2E) on Lange farm
9.	Peoples Gas & Oil Development Co.	Peoples No. 3	560	Near N. $\frac{1}{4}$ cor. sec. 34, (39-2E)
10.	Do	Peoples No. 2 (originally Peoples No. 1)	1,785	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, (39-2E) S. of County farm
11.	Do	Peoples No. 4	880	NE. cor. SW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, (39-2E)
12.	Mr. Erickson	Erickson water well	61	Near N. line of NW $\frac{1}{4}$ sec. 33, (39-4E) ?
13.	N. H. Jepson	Jepson water well	270	SW. cor. sec. 10, (38-3E), on Jepson farm

SKAGIT COUNTY

1.	H. S. Winters	Winters water well	30	SW $\frac{1}{4}$ sec. 30, (35-6E)
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BENTON COUNTY

1.	Walla Walla Oil, Gas & Pipe Line Co.	Walla Walla No. 3	1,507	NE. cor. NE $\frac{1}{4}$ sec. 19, (11-26E)
2.	Yellowhawk Gas & Oil Co.	Yellowhawk No. 1	715	NE. cor. NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 20, (11-26E)
3.	Conservative Land Investment Co. of Spokane	Water well (Walla Walla No. 1)	1,234 ?	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 20, (11-26E)

Map no.	Company or owner	Well name	Depth in feet	Location
BENTON COUNTY—Continued				
4.	Walla Walla Oil, Gas & Pipe Line Co.	Walla Walla No. 5	780	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 20, (11-26E)
5.	Do	Walla Walla No. 2	1,507	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, (11-26E)
6.	Do	Walla Walla No. 9	700	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, (11-26E)
7.	Big Bend Land Co.	Big Bend No. 1	670+	Center SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (11-26E)
8.	Seattle-Inland Empire Co.	Goodwin No. 1 (Big Bend No. 2)	2,212	Center NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (11-26E)
9.	Northwestern Oil & Gas Co.	Northwestern No. 1	712	Center NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (11-26E)
10.	Do	Northwestern No. 3	757	Center SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (11-26E)
11.	Do	Northwestern No. 2	1,281	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, (11-26E)
12.	Walla Walla Oil, Gas & Pipe Line Co.	Walla Walla No. 6	803	Center N $\frac{1}{2}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (11-26E)
13.	Do	Walla Walla No. 7	763+	Center N $\frac{1}{2}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (11-26E)
14.	Do	Walla Walla No. 8	790	Center N $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (11-26E)
15.	West Coast Gas & Oil Co.	West Coast No. 2	850	Center NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, (11-26E)
16.	Northwestern Natural Gas Co.	Northwestern No. 4	980+	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (11-26E)

OLIVINE AND SERPENTINE

Olivine is a group name applied to magnesium-iron silicate minerals containing variable proportions of the two molecules Mg_2SiO_4 and Fe_2SiO_4 . Pure magnesium silicate is known by the mineral name of forsterite; pure iron silicate, by the mineral name of fayalite; and those silicates in between are known as olivine. Members containing both molecules are most common, but the end members are also known to occur naturally. Physically, olivine is characterized by rather poor cleavage, a hardness greater than quartz, a vitreous luster, and a yellow-green color. Rocks made up entirely of olivine are called dunite.

Olivine had little commercial value in the United States before 1933; its first and still most important use is for refractory purposes. Recently, however, processes have been developed whereby magnesia and magne-

sium may be commercially extracted from olivine. Another recent development is the use of olivine in fused phosphate fertilizer, and olivine is now being crushed and used to a limited extent as molding sand and as blast sand. When found in sufficiently clear, flawless crystals of proper color, olivine is marketable as the gem stone peridot.

Among the states of the United States, only North Carolina has a reserve of olivine comparable to that in Washington. Though only two companies have recently utilized Washington olivine, it is certain that the mineral will be used increasingly as time goes on.

The Washington deposits of olivine that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the head-

ing "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

Washington olivine is well suited to refractory usage, as it is high in magnesia and low in iron. No olivine of gem quality is known in the state.

The average value for all olivine produced in the United States in 1950 was \$14.46 per short ton.

Serpentine is an acid magnesium silicate mineral having the composition $H_4Mg_3Si_2O_{10}$. It may be massive, fibrous, platy, lamellar, or in pseudomorphic crystals. Only the massive varieties are considered here; the fibrous ones are listed under "Asbestiform materials." Physically, serpentine is a waxy to greasy feeling mineral, easily knife-scratched, usually without cleavage, and variable in color. When pure, serpentine is green to yellow green in color, but when containing impurities,

may be red, black, blue gray, or other colors. When veined with calcite, serpentine is known as verde antique.

Formerly serpentine was used exclusively as a decorative stone, but recently it has found use in refractories, as a base in special paints, and as a diluent in insecticides. It has also been used experimentally as source material for epsom salts and magnesium metal.

Large deposits of serpentine occur in Washington and, though none are being worked at the present time, a number in Stevens County produced decorative stone about 1900.

No recent figures are available on the price of serpentine, but in 1935 building and ornamental serpentine (verde antique) sold for approximately \$10.00 per cu. ft.

OCCURRENCES

On page 57 in volume 2 is plate 26, the map showing the occurrences of olivine and serpentine. These are numbered to correspond with the numbers of the occurrences listed below.

OLIVINE

WHATCOM COUNTY

1. **Name:** Sumas Mountain. **Loc:** $W\frac{1}{2}NW\frac{1}{4}$ sec. 1, (39-4E). **Descr:** Reportedly a large deposit of fresh olivine. **Value:** Unknown. **Ref:** 154.
2. **Name:** Twin Sisters Mountains. **Loc:** Covers the $SE\frac{1}{4}$ T. 38 N., R. 6 E.; $E\frac{1}{2}$ T. 37 N., R. 6 E.; $W\frac{1}{2}$ T. 37 N., R. 7 E.; $NE\frac{1}{4}$ T. 36 N., R. 6 E.; and $NW\frac{1}{4}$ T. 36 N., R. 7 E. The southern part of the Twin Sisters is in Skagit County. **Descr:** Large mountain range consisting of dunite and pyroxenite in approximately equal amounts. **Value:** Huge potential supply of refractory material. **Ref:** 66-E; 106-I, p. 12; 135; 151, p. 20.

SKAGIT COUNTY

- *3. **Name:** Scheel quarry. **Loc:** $NW\frac{1}{4}NE\frac{1}{4}$ sec. 16, (36-7E). **Descr:** Glacial till or landslide debris composed entirely of dunite boulders, pebbles, and sand. **Value:** Currently quarried by Northwest Olivine Co., Mount Vernon, and crushed for foundry sand. Formerly shipped east for use in refractories. **Ref:** 2-A, p. 33; 55, p. 31; 66-D, p. 30; 93-A, p. 26; 106-I, p. 12.
4. **Name:** Beacon Point. **Loc:** On Cypress Island in center $N\frac{1}{2}$ sec. 34, (36-1E). **Descr:** Small deposit of fresh olivine. **Value:** Might be worked in connection with other deposits on the island. **Ref:** 106-I, p. 12; 135.
- *5. **Name:** Olivine Hill. **Loc:** On Cypress Island in $E\frac{1}{2}$ sec. 4, (35-1E). **Descr:** Large deposit of fresh olivine. **Value:** Quarry recently operated by Manganese Products Co. Olivine was fused with phosphate rock to make fertilizer. **Ref:** 56, p. 4; 87, p. 142-145; 106-I, p. 12.
6. **Name:** Reef Point. **Loc:** On Cypress Island near

NW. cor. sec. 8, (35-1E). **Descr:** Small deposit of fresh dunite. **Value:** Might be operated in connection with Olivine Hill deposit. **Ref:** 106-I, p. 12; 135.

7. **Name:** Strawberry Bay. **Loc:** On shore of Cypress Island NW. of Strawberry Bay near center $NW\frac{1}{4}$ sec. 31, (36-1E). **Descr:** Small deposit of fresh olivine. **Value:** Might be worked in connection with other Cypress Island deposits. **Ref:** 106-I, p. 12; 135.

KITTITAS COUNTY

8. **Name:** Boulder Creek. **Loc:** On N. side of Boulder Creek about 1 mi. above its mouth, approximately in $NE\frac{1}{4}$ sec. 35, (23-14E). **Descr:** Small mass of fairly fresh olivine in serpentine. **Value:** Exposed quantity not commercial. **Ref:** 135.

OKANOGAN COUNTY

9. **Name:** Mount Chopaka. **Loc:** Above the 7,500-ft. elevation on the 7,829-ft. peak of Mount Chopaka. **Descr:** Olivine constitutes about 75 percent of an amphibole peridotite. **Value:** Inaccessibility makes commercial value doubtful. **Ref:** 135.

Klickitat County

- 9A. **Name:** Twin Buttes. **Loc:** Sec. 27, (4-16E), on Twin Buttes a mile SE. of Goldendale. **Descr:** Olivine cores in volcanic bombs. **Value:** Of scientific interest only. **Ref:** 135.

SERPENTINE

WHATCOM COUNTY

10. **Name:** Sumas Mountain. **Loc:** Sec. 1, (39-4E) and adjacent areas of Sumas Mountain. **Descr:** Serpentine, associated with metamorphic rocks, underlies the sediments of the Chuckanut formation. **Value:** Warrants investigation. **Ref:** 154.
11. **Name:** Twin Sisters Mountains. **Loc:** On W. and S. border of the range. **Descr:** Serpentine forms a belt about $\frac{1}{2}$ mi. wide and 10 to 12 mi. long around the central mass of olivine. **Value:** Large potential supply. **Ref:** 135.

SAN JUAN COUNTY

12. **Name:** Mount Pickett. **Loc:** Orcas Island, Mount Pickett Range. **Descr:** Scattered remnants of serpentinized dunite. **Value:** Warrant investigation. **Ref:** 87, p. 149.
13. **Name:** Blakely Island. **Loc:** On Blakely Island. **Descr:** Scattered remnants of serpentinized dunite of the Fidalgo formation. **Value:** Warrant investigation. **Ref:** 87, p. 149.

SKAGIT COUNTY

14. **Name:** Cypress Island. **Loc:** Cypress Island. **Descr:** Entire central portion of the island consists of serpentinized dunite of Fidalgo formation. **Value:** Large potential supply. **Ref:** 87, p. 142-145, 149.
15. **Name:** Fidalgo Head. **Loc:** Sec. 21, (35-1E). **Descr:** About 200 acres of Fidalgo Head is underlain by serpentinized dunite of the Fidalgo formation. **Value:** Large potential supply. **Ref:** 87, p. 142.
16. **Name:** Burrows Island. **Loc:** Secs. 32 and 33, (35-1E). **Descr:** Entire island made up of serpentinized dunite of Fidalgo formation. **Value:** Large potential supply. **Ref:** 87, p. 142.
17. **Name:** Allan Island. **Loc:** Secs. 4 and 5, (34-1E). **Descr:** Entire island made up of serpentinized dunite of Fidalgo formation. **Value:** Large potential supply. **Ref:** 87, p. 142.
18. **Name:** Hat Island. **Loc:** Padilla Bay, E½ sec. 16, and W½ sec. 15, (35-2E). **Descr:** Island composed of serpentinized dunite of the Fidalgo formation. **Value:** Large potential supply. **Ref:** 87, p. 142.
19. **Name:** Dot Island. **Loc:** Padilla Bay, N½SE¼ sec. 9, (35-2E). **Descr:** Island composed of serpentinized dunite of the Fidalgo formation. **Value:** Warrants investigation. **Ref:** 87, p. 142.
20. **Name:** Saddlebag Island. **Loc:** Padilla Bay, near center sec. 9, (35-2E). **Descr:** Serpentinized dunite of the Fidalgo formation. **Value:** Warrants investigation. **Ref:** 87, p. 142.
21. **Name:** Burlington. **Loc:** Sec. 32, (35-4E). **Descr:** Hill made up of serpentinized greenstone. **Value:** Should be investigated. **Ref:** 135.
22. **Name:** Cultus Mountain. **Loc:** Cultus Mountain area. **Descr:** Many exposures of crushed and sheared serpentine lenses in schist. **Value:** Probably too much contamination by associated schist to be of value. **Ref:** 135.
23. **Name:** Oso. **Loc:** Sec. 20, (33-7E). **Descr:** Reportedly extensive exposures of easily mined serpentine accessible to transportation. **Value:** Should be investigated. **Ref:** 135.
24. **Name:** Marblemount area. **Loc:** E. of Skagit River at Marblemount. **Descr:** Lens-like bodies in metamorphic rocks. **Value:** Some lenses may be large enough to support commercial operation. **Ref:** 135.

SNOHOMISH COUNTY

25. **Name:** Darrington area. **Loc:** E. of Darrington. **Descr:** Serpentine reportedly occurs over a large area. **Value:** Should be investigated. **Ref:** 135.

26. **Name:** Granite Falls. **Loc:** E½SE¼ sec. 18, (30-7E). **Descr:** Dark-green to black serpentine, having talc along shear planes, exposed over a distance of 200 ft. **Value:** Quarry opened for road metal, but material was unsatisfactory for that purpose. **Ref:** 135.
27. **Name:** Sultan Basin. **Loc:** NW. across Sultan Basin and into the valley of the S. Fk. of the Stillaguamish River. **Descr:** Serpentinized peridotites intrusive into metamorphic rocks. **Value:** Commercial possibilities should be determined. **Ref:** 18, p. 18.
28. **Name:** Weden Creek. **Loc:** SE¼SW¼ sec. 19, (29-11E). **Descr:** Serpentinized peridotite. **Value:** Probably not commercial. **Ref:** 135.

CHELAN COUNTY

29. **Name:** Wenatchee Mountains. **Loc:** Two belts border Mount Stuart Range on S., E., and W. **Descr:** Two belts of serpentinized peridotite, roughly parallel, cover 50 square miles of area. Serpentine ranges from yellow, through green, to black. **Value:** Large potential supply. **Ref:** 30, p. 50-51; 122, p. 4; 137, p. 34-41.
30. **Name:** Tumwater Canyon. **Loc:** Sec. 9, (25-17E). **Descr:** Great quantity of massive serpentine. **Value:** Commercial qualities should be ascertained. **Ref:** 135.
31. **Name:** Mills Canyon. **Loc:** Sec. 34, (25-20E). **Descr:** Serpentine, details not known. **Value:** Unknown. **Ref:** 136.
32. **Name:** Entiat Mountains (A). **Loc:** Secs. 21, 28, and 33, (25-19E). **Descr:** Serpentine, details unknown. **Value:** Unknown. **Ref:** 136.
33. **Name:** Entiat Mountains (B). **Loc:** SE¼ sec. 8, (25-19E). **Descr:** Serpentine, details unknown. **Value:** Unknown. **Ref:** 136.
34. **Name:** Roaring Creek. **Loc:** W½ sec. 8, (25-20E). **Descr:** Serpentine, details unknown. **Value:** Unknown. **Ref:** 136.

OKANOGAN COUNTY

35. **Name:** Johnson Creek. **Loc:** NE¼ sec. 5, (34-26E). **Descr:** Dark-green to black nickel-bearing serpentine. Extent unknown. **Value:** Might constitute commercial byproduct in nickel-recovery program. **Ref:** 135.
36. **Name:** Wagonroad Coulee. **Loc:** NE¼ sec. 4, (35-26E). **Descr:** Serpentine band 500 ft. wide in dolomite. **Value:** Warrants investigation. **Ref:** 135.
37. **Name:** Mount Chopaka. **Loc:** Secs. 13 and 14, (40-24E). **Descr:** Brecciated serpentinized dunite. **Value:** Noncommercial at present because of inaccessibility. **Ref:** 135.
38. **Name:** Similkameen River. **Loc:** SE¼ sec. 16, (40-25E). **Descr:** Serpentinized dunite exposed over an area ½ by ½ mi. **Value:** Large quantity; quality should be determined. **Ref:** 135.

FERRY COUNTY

39. **Name:** Danville. **Loc:** Secs. 10 and 16, (40-34E). **Descr:** Serpentine covers at least 1 sq. mi. of area, some within $\frac{1}{4}$ mi. of railroad. **Value:** Possibly commercial; quality should be determined. **Ref:** 135.
40. **Name:** Republic. **Loc:** Approximately in NE $\frac{1}{4}$ sec. 24, (36-34E). **Descr:** Varicolored serpentine exposed in low road cuts for 300 ft. **Value:** Appears to be a large body of good quality. **Ref:** 135.

STEVENS COUNTY

41. **Name:** Laurier. **Loc:** 4 mi. E. of Laurier. **Descr:** Serpentine, derived from peridotite, covers an area 1 mi. square. **Value:** Possibly commercial; quality determinations desirable. **Ref:** 139, p. 90, 131.
- *41A. **Name:** Regal. **Loc:** Sec. 7, (32-41E). **Descr:** Serpentine. **Value:** Currently produced by Washington Non-Metallics, Inc. for use as terrazzo chips. **Ref:** 135.
42. **Name:** Royal. **Loc:** Sec. 9, (32-41E). **Descr:** Mixture of green serpentine and marble. **Value:** A small amount of decorative stone produced about 1900 by Royal Serpentine Marble Co. **Ref:** 48, p. 111; 115, p. 124-125.
43. **Name:** North American. **Loc:** Secs. 12 and 19, (31-39E) and secs. 24 and 25, (31-38E). **Descr:** Serpentine associated with magnesite. **Value:** Developed about 1900 by North American Marble & Onyx Co. **Ref:** 48, p. 11; 115, p. 95-100.
- *44. **Name:** McGrath. **Loc:** NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, (31-39E). **Descr:** Serpentine. **Value:** Formerly produced for

stucco and terrazzo. Currently produced by Washington Non-Metallics, Inc. for use as terrazzo chips. **Ref:** 2-A, p. 38; 28, p. 49; 48, p. 111.

- *45. **Name:** U. S. Marble Co. **Loc:** Secs. 8 and 9, (31-39E). **Descr:** All variations from marble, through verde antique, to serpentine. **Value:** Large production for decorative stone at one time. Currently produced by Washington Non-Metallics, Inc. for use as terrazzo chips. **Ref:** 2-A, p. 38; 48, p. 111; 115, p. 87-95.
- *46. **Name:** Green Mountain Marble Co. **Loc:** Sec. 13, (31-40E). **Descr:** Green fine-textured marble-serpentine mixture. **Value:** Formerly produced a small amount of decorative stone. Currently produced by Washington Non-Metallics, Inc. for use as terrazzo chips. **Ref:** 2-A, p. 38; 48, p. 111; 115, p. 105.
- *47. **Name:** Pacific Coast Marble, Tiling & Manufacturing Co. **Loc:** Sec. 18, (31-41E). **Descr:** Mottled and variegated green, white, and brown serpentine-marble mixture. **Value:** Formerly produced for decorative stone. Currently produced by Washington Non-Metallics, Inc. for use as terrazzo chips. **Ref:** 2-A, p. 38; 48, p. 111; 115, p. 103-105.

PEND OREILLE COUNTY

48. **Name:** Spokane Marble Co. **Loc:** Sec. 32, (30-43E). **Descr:** Variegated black, yellow-gray, white, and green marble-serpentine mixture. **Value:** Considerable decorative stone produced about 1900. **Ref:** 48, p. 111; 115, p. 106-109.

PEAT

Peat may be defined as vegetal matter in partly decomposed and more or less disintegrated condition. It is formed by accumulation under conditions of excess water and limited access to air. It is made up of different kinds of plants, the kinds depending on local climatic and topographic conditions. Appearance and characteristics depend on the type of plants composing it and the conditions of decay to which they have been subjected.

In 1953, approximately 87 percent of all peat sold in the United States was used for soil improvement and for the manufacture of mixed fertilizers. It is also used as litter for barns and poultry yards, for improvement of lawns and golf courses, in nurseries and greenhouses, and as packing material for plants, fruits, vegetables, eggs, and other fragile articles. No peat was sold as fuel in the United States during 1953, largely because of the availability of better grades of fuel.

In Washington, peat deposits are essentially restricted to areas affected by continental glaciation, particularly in Puget Sound Basin. These are principally small deposits formed in undrained depressions left when the ice receded. Many are made up of sphagnum moss; hence are ideally suited for use as poultry litter and packing for fragile articles. In addition they are used by nurseries.

The Divisions of Mines and Geology has conducted an investigation of the peat deposits in the state (**Ref:** 108-A), and the known and reported occurrences are listed below.

The Washington deposits of peat that have been in production at any time during the period from 1948 to 1957 are indicated in the table under the heading "Occurrences" by an asterisk (*) preceding the listing of the producing deposits.

OCCURRENCES

On page 59 in volume 2 is plate 27, the map showing the numbers of the occurrences listed below.
the occurrences of peat, numbered to correspond with

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
CHELAN COUNTY						
1.	Merritt	NE¼ sec. 6, (26-16E)	1		6	108-A, p. 40
2.	Fish Lake	Secs. 16, 21, (27-17E)	180	½	15	108-A, p. 38-39
3.	Goose Creek	Secs. 17, 18, (27-18E)			3	108-A, p. 40
4.	Winton	Sec. 17, (26-17E)	3		19	108-A, p. 39
5.	Beehive Mountain	Sec. 12, (21-19E)	1½			108-A, p. 40
CLALLAM COUNTY						
1.	Waatch	Secs. 15, 16, 21, 22, (33-15W)	400		?	108-A, p. 44
2.	Neah Bay	Sec. 15, (33-15W)	250		3	108-A, p. 44
3.	Crown Zellerbach	W½ sec. 33, (33-15W)	41	1	4	108-A, p. 43-44
4.	Sooes River	Sec. 5, (32-15W)	102	3½	2½	108-A, p. 42-43
5.	Ahlstrom	SW¼ sec. 25, (31-16W)	10	1	5	108-A, p. 42
6.	Wessler	Secs. 25, 26, 35, 36, (31-15W)	23	2½	19	108-A, p. 40-41
7.	Ozette Lake	Sec. 8, (30-15W)	30	?	?	108-A, p. 42
8.	Tyee	SE¼ sec. 34, (30-13W)	5	2	1½	108-A, p. 41
9.	Fletcher	Near Forks	10	?	?	108-A, p. 41-42
10.	Dungeness	Secs. 5, 6, (30-3W)	?		?	108-A, p. 45
11.	Sequim Game Reserve	Secs. 4, 9, 16, 17, (30-3W)	150		7	108-A, p. 45
CLARK COUNTY						
1.	Fargher Lake	Secs. 23, 24, 25, 26, (5-2E)	423		4	108-A, p. 45-46
2.	Dollar Corner	Sec. 31, (4-2E), sec. 6, (3-2E)	196		3	108-A, p. 46-47
3.	Manor	Secs. 17, 18, (3-2E)	5		9	108-A, p. 47-48
4.	Orchards	Secs. 13, 14, 15, (2-2E), secs. 18, 19, (2-3E)	440		9	108-A, p. 46
COWLITZ COUNTY						
*1.	Rockett	NE¼ sec. 10, (10-1W)	10	4		66-C, p. 28; 108-A, p. 48-49
2.	Stankey Farm	SW¼ sec. 28, (10-1W)	2	2		108-A, p. 51
3.	Silver Lake	Secs. 4, 5, 8, 9, (9-1W), secs. 25, 26, (10-1W)	724	?	?	108-A, p. 49-51
FERRY COUNTY						
1.	Copper Lakes	Secs. 9, 10, 15, 16, (36-32E)	5		2	108-A, p. 51
2.	Sanpoil River	NW¼ sec. 4, (36-33E)	20			108-A, p. 51
3.	Curlew Lake	Sec. 17, (37-33E)	6		4	108-A, p. 51
GRANT COUNTY						
1.	Rocky Ford Creek	Secs. 20, 21, 28, 32, 33, (21-27E), secs. 4, 5, 8, (20-27E)	440		3	108-A, p. 52-53
2.	Crab Lake	Secs. 7, 8, 9, 10, 11, 17, 18, (22-30E), secs. 12, 13, (22-29E)	1,415		13	108-A, p. 51-52

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
GRAYS HARBOR COUNTY						
1.	MacAfee	Secs. 19, 20, 30, (21-10W)	200	1	9	108-A, p. 55
2.	Carlisle Lakes	Secs. 4, 8, 9, 17, 18, (19-11W)	415	3	5	108-A, p. 54-55
3.	Ocean City	SE¼ sec. 34, (19-12W)	10		3	108-A, p. 54
4.	Ocean Dune	Secs. 22, 23, (18-12W)	115		5	108-A, p. 54
5.	North Bay	Sec. 13, (18-12W), secs. 17, 18, (18-11W)	601	1	5	108-A, p. 53-54
ISLAND COUNTY						
1.	Cranberry Lake	Secs. 34, 35, (34-1E), secs. 3, 10, (33-1E)	180	45	34	108-A, p. 56-58
2.	Taylor	Sec. 20, (33-2E)	9	?	?	108-A, p. 65
3.	Oak Harbor	Secs. 26, 35, (33-1E)	99		13	108-A, p. 63-64
4.	Swantown	Sec. 32, (33-1E)	83		9	108-A, p. 58-59
5.	Crockett Lake	Secs. 13, 14, 15, 22, 23, 24, (31-1E)	792		16	108-A, p. 59-60
6.	Hancock Lake	Secs. 5, 6, 7, 8, (30-2E)	202	3	16	108-A, p. 60-62
7.	Mutiny Bay	W½ sec. 9, (29-2E)	60		1	108-A, p. 64
8.	Roadside	Sec. 17, (29-3E)	11	1	12	108-A, p. 65
9.	Hillberg	Secs. 28, 29, (29-3E)	17	2	16	108-A, p. 65
10.	Glendale	Sec. 35, (29-3E)	34	1	8	108-A, p. 64
11.	Maxwelton	Sec. 33, (29-3E), secs. 3, 4, (28-3E)	118		5	108-A, p. 64
12.	Miller Lake	Secs. 15, 16, 21, 22, 28, (29-3E)	337	1	38	108-A, p. 62-63
13.	Clinton	Secs. 23, 24, (29-3E)	6		5½	48, p. 79; 108-A, p. 65
JEFFERSON COUNTY						
1.	Forks	Secs. 17, 18, (27-12W)	18	1	2½	108-A, p. 68-69
2.	Braden Creek	SW¼ sec. 25, (26-13W)	5		4	108-A, p. 69
3.	Chimacum	(29-1W), (28-1W), (29-1E), (28-1E)	2,605		31	108-A, p. 67
4.	Shine	Sec. 32, (28-1E), sec. 5, (27-1E)	102	2	20	108-A, p. 68
KING COUNTY						
1.	Echo Lake	Sec. 6, (26-4E)	5	2	7	108-A, p. 94
2.	Ronald	Sec. 8, (26-4E)	25	4	13	108-A, p. 86
*3.	Meridian	Meridan Ave. and N. 165th St., Seattle	3½	6	5½	66-B, p. 38; 108-A, p. 94-95
4.	Ravenna	Ravenna Ave. and 80th St., Seattle	45		19	108-A, p. 80
5.	Malmo	E. 45th St. and 25th Ave. N.E., Seattle	24		6	108-A, p. 87
*6.	Mercer Slough	Secs. 4, 5, 8, 9, 16, 17, (24-5E)	535		50	106-G, p. 52; 108-A, p. 69-70
*7.	Seola	28th Ave. S.W. and 104th St. S.W., Seattle	12	2	6	66-C, p. 29; 108-A, p. 91
8.	Sunnydale	Secs. 16, 17, (23-4E)	26	13	17	108-A, p. 84-86
*9.	Miller Creek	Secs. 20, 21, (23-4E)	56		10	66-C, p. 22; 108-A, p. 78

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
KING COUNTY—continued						
10.	Renton	Secs. 19, 30, (23-5E)	180		1	108-A, p. 74
*11.	Arrow Lake	Sec. 6, (22-4E)	8		14	66-C, p. 16; 108-A, p. 92-93
12.	Panther Lake	Secs. 4, 5, (22-5E)	32		8	108-A, p. 84
*13.	Bow Lake	NE ¼ sec. 33, (23-4E)	36		19	66-B, p. 20; 108-A, p. 81-82
14.	Bingaman Lake	Sec. 34, (22-4E)	7	1	6	108-A, p. 93
15.	Lakota	Sec. 12, (21-3E), sec. 7, (21-4E)	27		?	108-A, p. 84
*16.	Dolloff Lake	Secs. 3, 9, 10, (21-4E)	52		9	106-F, p. 48; 108-A, p. 79
17.	Steel Lake	Sec. 4, (21-4E)	44		16	108-A, p. 80-81
*18.	Federal Way	NE ¼ sec. 8, (21-4E)	14		10	106-F, p. 46; 108-A, p. 90
19.	North Lake	Sec. 15, (21-4E)	13		13	108-A, p. 90-91
20.	Misner Farm	Sec. 15, (21-4E)	3½		5	108-A, p. 94
21.	Auburn Junction No. 1	Sec. 16, (21-4E)	7		3	108-A, p. 88
22.	Auburn Junction No. 2	Sec. 16, (21-4E)	8	4		108-A, p. 88-89
23.	Algona No. 2	Secs. 23, 26, (21-4E)	45		4	108-A, p. 70
24.	Algona No. 1	Secs. 25, 26, 35, 36, (21-4E)	417		7	108-A, p. 70
25.	Lake Twelve	Secs. 7, 8, (21-7E)	35	5	13	108-A, p. 82-83
26.	Black Diamond	Sec. 2, (21-6E)	18	2	16	108-A, p. 88
27.	Covington	Sec. 32, (22-6E)	58	6	20	108-A, p. 77
28.	Shadow Lake	Secs. 7, 18, (22-6E)	57	5	12	108-A, p. 77-78
29.	Otter Lake	Sec. 31, (23-6E), sec. 6, (22-6E)	69	7	13	108-A, p. 76-77
30.	Webster Lake	Sec. 34, (23-6E)	8	?	?	108-A, p. 93
31.	Cedar Mountain	Sec. 30, (23-6E)	33	1	7	108-A, p. 83-84
32.	Beaver Lake	Secs. 3, 10, (24-6E)	48	6	6	108-A, p. 79-80
33.	Phantom Lake	Secs. 1, 2, (24-5E), secs. 34, 35, (25-5E)	260		17	108-A, p. 72-73
34.	Redmond	Sec. 7, (25-6E)	21		20	108-A, p. 88
35.	Sammamish Lake	Secs. 7, 18, (25-6E), secs. 12, 13, (25-5E)	282		10	108-A, p. 71-72
36.	Happy Valley- Evans Creek	Secs. 16, 17, 21, 22, (25-6E)	230	1	16	108-A, p. 73-74
*37.	Carlson	NE ¼ sec. 16, (25-6E)	7	1	8	66-B, p. 21; 108-A, p. 93
38.	Ames Lake	Secs. 13, 24, (25-6E), secs. 18, 19, (25-7E)	10	14	1	108-A, p. 91-92
39.	Ames Lake Creek	Secs. 35, 36, (26-6E), secs. 1, 12, (25-6E), secs. 6, 7, (25-7E)	357		45	108-A, p. 70-71
40.	Aries Farm	Sec. 34, (26-5E)	54		3	108-A, p. 78-79
41.	Cottage Lake No. 2	Secs. 17, 18, (26-6E)	34	5	3	108-A, p. 75-76
42.	Lake Leota	Secs. 11, 12, (26-5E)	2½	3	6	108-A, p. 95
43.	Cottage Lake No. 1	Sec. 12, (26-5E), secs. 7, 18, (26-6E)	85	5	15	108-A, p. 74-75
44.	Paradise Lake No.1	Sec. 5, (26-6E)	23	7	14	108-A, p. 87
45.	Lake Joy	Secs. 26, 35, (26-7E)	6	1	16	108-A, p. 93-94
46.	Moss Lake	Sec. 36, (26-7E)	42	8	3	108-A, p. 81
	*Argus	15045—1st Ave. N.E., Seattle				66-B, p. 18
	*Black Gold	15024—1st Ave. N.E., Seattle				66-B, p. 19

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
KING COUNTY—continued						
	*Plant Food	2303 N. 175th St., Seattle				66-B, p. 32
	*Fuller Soils	1702 Meridian Ave., Seattle				66-C, p. 20
	Patterson Creek	Sec. 25, (25-6E)		?		135
	*Mount View	28th Ave. and 104th St. S.W., Seattle	12	2	6	66-C, p. 24
	*Arbor Lake	240 S. 124th St., Seattle				66-C, p. 16
	*Coalfield	NW¼ sec. 7, (23-6E)				106-F, p. 55
	Lake Wilderness	Secs. 20, 21, 28, 29, (22-6E)		?		135
	Ravensdale	Sec. 35, (22-6E)			20	59, p. 133-134
KITSAP COUNTY						
1.	Lofall	Sec. 25, (27-1E)	19	2	16	108-A, p. 104
2.	Miller Lake	Secs. 21, 28, (27-2E)	9	1	19½	108-A, p. 105-106
3.	Carpenter Lake	Secs. 26, 27, (27-2E)	102	19	15	108-A, p. 96-97
4.	Port Madison Indian Reservation	Secs. 18, 19, (26-2E)	60		13	108-A, p. 100
5.	Seabeck	Sec. 20, (25-1W)	5	2	6	108-A, p. 105
6.	Nettleton	Secs. 23, 24, 26, (24-2W)	137	2	22½	108-A, p. 95-96
*7.	Tahuya Lake	Secs. 17, 20, (24-1W)	73	6	11	66-C, p. 22, 31; 108-A, p. 97-100
8.	Kitsap Lake	Sec. 17, (24-1E)	19	1½	19	108-A, p. 103-104
9.	Lost Lake	Sec. 15, (23-1W)	30	1	8½	108-A, p. 100
10.	Glenwood	Sec. 6, (22-1E)	13		8	108-A, p. 105
11.	Mathews Lake	Sec. 28, (23-1E)	7		3	108-A, p. 106-107
12.	Roberts Lane No. 2	Sec. 28, (23-1E)	4	1½	10½	108-A, p. 106
13.	Roberts Lane No. 1	Sec. 28, (23-1E)	8		7	108-A, p. 106
14.	Square Lake	Sec. 16, (23-1E)	21	1	17	108-A, p. 102-103
15.	Nels Johnson Lake	Sec. 17, (23-1E)	2	1	9	108-A, p. 107
16.	Sunnyslope	Sec. 7, (23-1E), sec. 12, (23-1W)	16		10	108-A, p. 104-105
*17.	Teel Brothers	SE¼ sec. 7, (23-1E)	7	1	6	66-D, p. 32; 108-A, p. 107
18.	Gurley Creek	Sec. 8, (23-2E)	23	2	23	108-A, p. 101-102
19.	Mace Lake	Sec. 5, (22-2E)	29		6	108-A, p. 100-101
	Paulsbo	Near Paulsbo			28	61, p. 266-267
	*Organic Plant Foods	NW¼ sec. 7, (23-1E)				93-A, p. 27
KITTITAS COUNTY						
1.	Kachess Lake	Sec. 13, (21-12E)	25		1	108-A, p. 107
Klickitat County						
1.	Conboy Lake	Sec. 33, (6-12E)	50		4	108-A, p. 108
LEWIS COUNTY						
1.	Forest	Sec. 28, (13-1W)	1	1	2	108-A, p. 109
2.	Davis Lake	Secs. 1, 2, 11, 12, 13, (12-4E), secs. 7, 18, (12-5E)	542		20	108-A, p. 108-109
3.	Mineral	Secs. 7, 8, (14-5E)	148		7	108-A, p. 109
LINCOLN COUNTY						
1.	Creston	Sec. 13, (26-34E)	10		3½	108-A, p. 109-110

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
MASON COUNTY						
1.	West of Price Lake	Sec. 21, (23-4W)	4	1	3	108-A, p. 120
2.	Tenas Lake	Secs. 2, 10, 11, 14, 15, (23-4W)	226			108-A, p. 112
3.	Price Lake	Secs. 21, 22, 23, (23-4W)	124		13½	108-A, p. 112-113
4.	Skokomish River	Secs. 2, 10, 11, (21-4W)	308		8	108-A, p. 111-112
5.	Cranberry Lake	Sec. 29, (21-3W)	225	1+	?	108-A, p. 120
6.	Johns Creek	Secs. 1, 2, (20-4W), secs. 25, 26, 36, (21-4W), secs. 30, 31, 32, (21-3W, secs. 5, 6, (20-3W)	500	3	9	108-A, p. 110-111
7.	Oakland Bay	Secs. 2, 3, 10, (20-3W)			2	108-A, p. 120
8.	C.C.C. Project No. 5	Secs. 29, 30, 31, 32, (20-5W)	19	3	9	108-A, p. 116-118
9.	C.C.C. Project No. 13	Sec. 28, (20-5W)	5		4½	108-A, p. 118-119
10.	Wivell Farm	Sec. 10, (19-4W)	13		6	108-A, p. 118
11.	Shelton Valley	Secs. 25, 26, 35, (20-4W)	320		3	108-A, p. 110
12.	Isabella Lake	Sec. 31, (20-3W)	69		9	108-A, p. 113
13.	Drainage Ditch	Sec. 5, (19-3W)	23	1	15	108-A, p. 116
14.	Lake Spencer	Sec. 32, (21-2W)	23	20	17	108-A, p. 115-116
15.	J. M. Hoar	Sec. 28, (21-2W)	26	3	14	108-A, p. 113-114
16.	Grapeview Road	Sec. 21, (21-2W)	24	1	13	108-A, p. 114-115
17.	Deer Creek	Secs. 9, 10, 16, 17, 19, 20, 21, 29, 30, (21-2W)	500		17	108-A, p. 110
*18.	Peninsula	Secs. 2, 11, (22-3W)	40	12	4	66-C, p. 27; 108-A, p. 113
19.	Tee Lake	Sec. 36, (23-3W)	3		2	108-A, p. 120
20.	Shoe Lake	Secs. 25, 36, (23-3W)	4	6	7	108-A, p. 119-120
21.	Belfair No. 3	Secs. 10, 15, (23-2W)	5		2	108-A, p. 119
22.	Belfair No. 2	Secs. 12, 13, (23-2W)	5	2	1	108-A, p. 119
23.	Belfair No. 4	Sec. 1, (23-2W)	4	3	3	108-A, p. 119
24.	Tiger Lake	Secs. 5, 8, (23-1W)	17		25	108-A, p. 118
25.	Belfair No. 1	Sec. 28, (23-1W)	5		5	108-A, p. 119
OKANOGAN COUNTY						
1.	Smaller	Sec. 17, (29-28E)	½		9	108-A, p. 122
2.	Bear Paw	NW¼ sec. 20, (39-28E)	1		1½+	108-A, p. 122
3.	Big Mac "Lake"	SE¼ sec. 10, (39-28E)	9		30	108-A, p. 122
4.	Bonaparte Lake	Sec. 9, (38-30E)	10		5	58, p. 60-68; 108-A, p. 121
5.	Bonaparte Meadows	Secs. 16, 17, 20, 21, 29, (38-30E)	282		20	108-A, p. 120-121
6.	Aeneas Valley	Sec. 8, (35-31E)			5	108-A, p. 121-122
	Circle Lake	SW¼ sec. 17, (39-28E)	1		2½	135
	Summit Lake	Secs. 8, 17, (39-28E)	1½			135
	*Buzzard Lake	NW¼ sec. 35, (34-25E)			?	66-D, p. 26
	St. John Lake	SW¼ sec. 4, (39-28E)	1			135
	Carlton	SW¼ sec. 17, (32-22E)	1		1½	135

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
PACIFIC COUNTY						
1.	Grayland	Sec. 31, (16-11W), secs. 6, 7, 8, 17, 18, 20, 29, 32, (15- 11W), secs. 4, 5, (14-11W)	1,946	4	5	108-A, p. 128
2.	Bay Center	Bay Center area	25		15	108-A, p. 126-128
3.	Peninsula	Long Beach area	4,000	5	10	48, p. 79; 108-A, p. 122-126
4.	Chinook	Secs. 30, 31, (10-10W)	45	2	2	108-A, p. 126
PEND OREILLE COUNTY						
1.	Fence Creek	Sec. 22, (40-43E)	18		1	108-A, p. 136-137
2.	Everett Creek	Sec. 27, (40-43E)	5—		4½	108-A, p. 137
3.	Big Meadow	Secs. 6, 7, (37-42E)	170		17	108-A, p. 133
4.	Lost Creek	Secs. 28, 29, (37-42E)	5	2	10	108-A, p. 135-136
5.	Nile Lake	Sec. 35, (37-42E)	16		16	108-A, p. 136
6.	Granite Mountain	Sec. 14, (36-42E)	4		1	108-A, p. 136
7.	Rufus Meadow	Secs. 26, 27, (36-42E)	30	1	11	108-A, p. 134-135
8.	Ruby Creek Meadow	Sec. 3, (35-42E)	1			108-A, p. 136
9.	Bunchgrass Meadow	Sec. 24, (37-44E)	69		13	108-A, p. 133-134
10.	Northeast Shore Davis Lake	Secs. 29, 31, 32, (32-44E)	97		3	108-A, p. 130
11.	South End Davis Lake	Secs. 6, 7, (31-44E)	67		24	108-A, p. 130-131
12.	Rocky Gorge Meadow	Sec. 10, (31-43E)	20			108-A, p. 133
13.	Deer Creek No. 2	Secs. 10, 11, 13, 14, (31-43E)	195		9	108-A, p. 132-133
14.	Deer Creek No. 1	Secs. 7, 18, 19, (31-44E)	200		1	108-A, p. 132
15.	Kent Meadows	Secs. 10, 15, (31-44E)	175		6	108-A, p. 131-132
16.	Northeast End Diamond Lake	Secs. 30, 31, (31-45E), secs. 25, 36, (31-44E)	341		5	108-A, p. 129
17.	Southwest End Diamond Lake	Secs. 3, 8, 9, 10, 16, 17, (30-44E)	528		10	108-A, p. 129
18.	Sedge Meadow near Diamond Lake	Sec. 15, (30-44E)	20			108-A, p. 129-130
PIERCE COUNTY						
1.	Crescent Lake No. 1	Secs. 17, 20, (22-2E)	10	2	18	108-A, p. 149
2.	Crescent Lake No. 2	Sec. 20, (22-2E)	1		4	108-A, p. 149-150
*3.	Fircrest	SE¼ sec. 2, (20-2E)	29		11	106-F, p. 46; 108-A, p. 148-149
4.	Tidal muck	Secs. 32, 33, (19-1E), secs. 4, 5, (18-1E)	80			108-A, p. 151
5.	McChord Airfield	Sec. 1, (19-2E), sec. 6, (19-3E)	22		8	108-A, p. 149
*6.	Parkland	Secs. 5, 6, 7, 8, (19-3E)	38		21	66-B, p. 31; 108-A, p. 147-148
7.	Clover Creek	Secs. 7, 8, 17, 18, (19-3E)	120		19	108-A, p. 142
8.	Spanaway Lake No. 1	Sec. 29, (19-3E)	54		15	108-A, p. 144
9.	Spanaway Lake No. 2	Secs. 29, 30, (19-3E)	46		16	108-A, p. 145
10.	Lacamas Creek	Secs. 6, 7, 18, (17-3E)	262		13	108-A, p. 137
11.	Kirsten	SW¼ sec. 23, (17-2E)	9		13	108-A, p. 150-151
12.	McKenna Road No. 1	Secs. 20, 21, 29, (17-3E)	117	1	7	108-A, p. 143-144
13.	McKenna Road No. 2	Secs. 20, 29, (17-3E)	106		7	108-A, p. 144

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
PIERCE COUNTY—continued						
14.	Harts Lake	Secs. 7, 8, (16-3E)	43		23	108-A, p. 147
15.	Silver Lake No. 1	Secs. 11, 12, 13, (16-3E)	165	1	12	108-A, p. 139-140
16.	Silver Lake No. 2	Sec. 13, (16-3E)	48		14	108-A, p. 140
17.	Halverson	Sec. 13, (16-3E)	31		14	108-A, p. 148
18.	Kreger Lake No. 2	NW¼NW¼ sec. 14, (16-3E)	34		8	108-A, p. 139
19.	Kreger Lake No. 1	Secs. 14, 22, 23, (16-3E)	180		17	108-A, p. 139
20.	Cranberry Lake	Sec. 1, (16-3E)	115	8	17	108-A, p. 142-143
21.	Mud Lake	Secs. 28, 32, 33, (17-4E)	135		7	108-A, p. 140-141
22.	South Creek	Secs. 32, 33, (18-4E)	132		12	108-A, p. 141
23.	Milton Nos. 1 and 2	Sec. 5, (20-4E)	58	13	7	48, p. 79; 108-A, p. 146
24.	Stevens Road	Secs. 3, 10, (20-4E)	4		4½	108-A, p. 151
25.	Stuck River No. 1	Secs. 11, 12, 13, 14, (20-4E)	250		8	108-A, p. 137-138
26.	Stuck River No. 2	Secs. 1, 12, (20-4E), secs. 6, 7, (20-5E)	120		9½	108-A, p. 138
27.	Thomas	Sec. 5, (20-5E)	5		9	108-A, p. 151
28.	Lake Tapps	Sec. 8, (20-5E)	9		3	108-A, p. 151
29.	Bonney Lake	Sec. 29, (20-5E)	9	2	7	108-A, p. 150
	Fennel Creek	On Fennel Cr., 4 miles SE. of Sumner		?		48, p. 79
	*McKay	SW¼ sec. 3, (19-4E)	10		?	66-D, p. 24
SAN JUAN COUNTY						
1.	Beaverton Valley	Secs. 2, 3, 9, 10, 11, (35-3W)	240		23	108-A, p. 152-155
2.	Section 4	Sec. 4, (35-3W)	40		8	108-A, p. 155
3.	Sportsmans Lake No. 1	Sec. 4, (35-3W)	35		6	108-A, p. 155-156
4.	Sportsmans Lake No. 2	NW. shore Sportmans Lake			2	108-A, p. 156
5.	San Juan	Sec. 5, (35-3W)	15	9	10	108-A, p. 156-157
6.	Orcas No. 2	Sec. 11, (36-2W)	18	10	12	108-A, p. 159
7.	Orcas No. 1	Sec. 14, (36-2W)	9	12	11	108-A, p. 159
8.	Killebrew Lake	Sec. 14, (36-2W)	30	12	8	60, p. 237; 108-A, p. 159
9.	Cold Spring	E½ sec. 29, (37-1W)	7	1	15	108-A, p. 159
10.	Constitution No. 1	NE¼ sec. 29, NW¼ sec. 28, (37-1W)	9	9	8	60, p. 236-237; 108-A, p. 159
11.	Constitution No. 2	SE¼ sec. 20, SW¼ sec. 21, (37-1W)	5	15	23	60, p. 236-237; 108-A, p. 159
12.	Spencer	Secs. 13, 14, (35-2W)	90		5	108-A, p. 157-159
13.	Blakely	Sec. 3, (35-1W)		8	2	108-A, p. 159
SKAGIT COUNTY						
1.	Heart Lake	Sec. 36, (35-1E)	5		2	108-A, p. 168
2.	Lake Campbell	Sec. 13, (34-1E)	27		8	108-A, p. 166
3.	Similk Bay	SW. cor. sec. 10, (34-2E)	4		3	108-A, p. 169
4.	Burlington	Secs. 26, 27, 35, 36, (35-3E)	616		12	108-A, p. 162-163
5.	Belleville	Sec. 17, (35-4E)	10		3	108-A, p. 168-169
6.	Sedro Woolley	Sec. 31, (36-5E), sec. 6, (35-5E), sec. 36, (36-4E)	62	2	18	59, p. 134-135; 108-A, p. 164-165
7.	Carpenter Creek	Sec. 4, (33-4E)	5			108-A, p. 167
8.	Devils Mountain	Secs. 3, 4, (33-4E)	14			108-A, p. 167

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
SKAGIT COUNTY—continued						
9.	Milltown	Secs. 27, 34, (33-4E)	269	3	12	108-A, p. 163-164
10.	Walker Valley	Sec. 5, (33-5E)	25	?	20	108-A, p. 166
11.	Big Lake	Secs. 16, 17, (33-5E)	12	12	12	108-A, p. 167
12.	Pilchuck Creek	Secs. 21, 22, (33-5E)	12	2	14	108-A, p. 167-168
13.	Hamilton	Secs. 5, 8, (35-7E)	33	2	15	108-A, p. 165-166
14.	Sawmill	Secs. 27, 28, (36-8E)	48		13	108-A, p. 165
15.	Concrete	Sec. 34, (36-8E)	5		8	108-A, p. 168
SKAMANIA COUNTY						
1.	Cayuse Meadow	Sec. 9, (7-8E)	5			108-A, p. 169
SNOHOMISH COUNTY						
1.	Lake Ketchum	Secs. 6, 7, (32-4E)	19	13	3	108-A, p. 188-189
2.	Old Homestead	Sec. 17, (31-4E)	3	$\frac{1}{3}$	1	108-A, p. 193
*3.	Tulalip	Secs. 5, 6, (30-4E)	2½	1	16	66-C, p. 18; 108-A, p. 194
4.	Lake Goodwin	Sec. 22, (31-4E)	12	1	20	108-A, p. 189-190
5.	Silvana	Secs. 10, 11, 14, 15, (31-4E)	127		4	108-A, p. 177
6.	Portage Creek	Secs. 16, 17, (31-5E)	97		23	108-A, p. 182
7.	Cranberry Lake	Sec. 35, (31-4E)	2½	1	4	108-A, p. 193-194
8.	Mary Shelton Lake	Sec. 1, (30-4E)	2½		3	108-A, p. 194
9.	Arcadia	W½ sec. 22, (30-4E)				108-A, p. 195
10.	Ebey Island	Secs. 15, 16, 21, 22, 26, 27, 28, 33, 34, 35, (29-5E)	932		27	108-A, p. 172-173
11.	Beverly Park	Secs. 7, 8, (28-5E)	8	17	2	108-A, p. 192
12.	Snohomish Valley	Secs. 5, 8, 9, 15, 16, 21, 22, 23, (28-5E)	920		23	108-A, p. 171-173
13.	Blackman Lake	Sec. 7, (28-6E)	13		6	108-A, p. 189
*14.	Thomas Lake	Secs. 28, 29, 32, 33, (28-5E), sec. 4, (27-5E)	280	5	20	66-C, p. 20, 29; 108-A, p. 174-176
15.	Chase Lake	Sec. 30, (27-4E)	10	14		108-A, p. 190-191
16.	Lake Ballinger	Sec. 32, (27-4E)	41		10	108-A, p. 184-185
*17.	Scriber Lake	Secs. 16, 21, (27-4E)	20	15		106-G, p. 61; 108-A, p. 187
*18.	Lake Forest Park	SW¼ sec. 34, (27-4E)	10	12	12	66-D, p. 18; 108-A, p. 190
*19.	Fuller	NW¼ sec. 21, (27-5E)			7	66-C, p. 20; 108-A, p. 190
20.	Crystal Lake-Little Lake	Secs. 25, 36, (27-5E)	133	10	11	108-A, p. 177
21.	Hooven	Secs. 35, 36, (27-5E)	20	12	10	108-A, p. 186-187
22.	Paradise Lake No. 2	Sec. 32, (27-6E), sec. 5, (26-6E)	99	3	11	108-A, p. 180-182
*23.	Frye	Secs. 2, 3, (27-6E), secs. 26, 27, 28, 33, 34, 35, (28-6E)	1,975		13	66-C, p. 24; 108-A, p. 169-171
24.	Woods Creek	Sec. 33, (28-7E)	7	8	8	108-A, p. 192-193
25.	Winters Lake	Sec. 21, (28-8E)	9	1	14	108-A, p. 191-192
26.	Lake Stevens No. 2	Secs. 20, 21, (29-6E)	65		14	108-A, p. 183
27.	Lake Stevens No. 1	Secs. 8, 17, (29-6E)	82		1	108-A, p. 182-183
28.	Lake Cassidy-Lake Martha	Secs. 13, 24, 25, (30-5E), secs. 19, 30, 31, (30-6E), sec. 6, (29-6E)	623	7	14	108-A, p. 173-174

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
SNOHOMISH COUNTY—continued						
29.	Granite Falls	SE¼ sec. 18, (30-7E)	42	11		61, p. 266; 108-A, p. 183
30.	Verlot	Sec. 25 or 36, (30-8E)	15	2	4	108-A, p. 188
31.	Robe No. 1	Sec. 8, (30-8E)	222	½	8	108-A, p. 176-177
32.	Robe No. 2	Secs. 6, 7, (30-8E)	121	1½	2	108-A, p. 177
33.	Riley Lake	Secs. 19, 20, (32-7E)	38	3	9	108-A, p. 185-186
*34.	Kirk Lake	Sec. 23, (32-9E)	100	2	13	66-C, p. 17; 108-A, p. 178-180
SPOKANE COUNTY						
1.	Eloika Lake No. 1	Secs. 15, 16, (29-43E)	37		14	108-A, p. 202-203
2.	Eloika Lake No. 2	Secs. 15, 16, (29-43E)	24		3½	108-A, p. 203
3.	Bailey Lake	Sec. 28, (29-43E)	28		5	108-A, p. 203-205
4.	Little Trout Lake	Sec. 28, (29-43E)	14		50+	108-A, p. 205
5.	Meadow Lake	Sec. 23, (24-41E)	31		8	108-A, p. 203
6.	Lakeside Marsh	Secs. 25, 26, 36, (24-41E)	77		12	108-A, p. 201
7.	Fish Lake	Sec. 32, (24-42E), sec. 5, (23-42E)	3		26	108-A, p. 205-206
8.	Newman Lake No. 2	Secs. 27, 28, 33, 34, (27-45E)	332		31	108-A, p. 199-200
9.	Newman Lake No. 3	Sec. 4, (26-45E), sec. 33, (27-45E)	150		7	108-A, p. 200
10.	Newman Lake No. 1	Secs. 10, 11, 12, 13, 14, (26-45E)	730		16	108-A, p. 197-199
*11.	Saltese Marsh	Secs. 20, 28, 29, 32, 33, (25- 45E), sec. 4, (24-45E)	1,200		10	55, p. 28; 108-A, p. 196-197
12.	Liberty Lake Hurd	Secs. 25, 26, (25-45E) SE¼ sec. 23, (29-43E)	87		12	108-A, p. 200-201 135
STEVENS COUNTY						
1.	Cedar Creek	Secs. 14, 23, 26, (40-41E)	303		7	108-A, p. 206-208
2.	Deep Creek	Sec. 35, (40-41E), secs. 2, 11, 14, (39-41E)	666		18	108-A, p. 208-209
3.	Colville	Secs. 7, 17, 18, (35-39E)	178		6	108-A, p. 211
4.	Narcisse Creek	Secs. 26, 27, 34, (35-40E)	240		2	108-A, p. 210
5.	Lake Thomas	Secs. 4, 9, (36-42E)	41		17	108-A, p. 216
6.	Coffin Lake	Secs. 30, 31, (36-42E)	196		2	108-A, p. 210-211
7.	Bliesner Farm	Sec. 2, (31-40E)			15	108-A, p. 211-213
8.	Waits Lake	Secs. 17, 20, (31-40E)	98		2	108-A, p. 214-215
9.	Haviland Meadows	Secs. 1, 12, (30-39E), secs. 6, 7, (30-40E)	740		3	108-A, p. 209-210
10.	Deer Lake No. 1	Sec. 1, (30-41E), sec. 6, (30-42E, sec. 31, (31-42E)	122		1	108-A, p. 213
*11.	Deer Lake No. 2	Secs. 2, 3, 10, 11, (30-41E)	38		16	124-A, p. 46; 108-A, p. 213-214
12.	Loon Lake *Green Soil	Sec. 33, (30-41E) SE¼ sec. 15, (30-41E)	74		8	108-A, p. 215-216 93-A, p. 21
THURSTON COUNTY						
1.	Eberhardt	Secs. 25, 36, (19-3W)	26	20		108-A, p. 227
2.	Snyder Cove	Sec. 2, (19-2W), sec. 5, (18-2W)	14	1	14	108-A, p. 227-228
3.	Gull Harbor	Secs. 25, 36, (19-2W)	56		1½	108-A, p. 224
4.	Kaiser Road	Secs. 5, 8, (18-2W)	75	½	14	108-A, p. 223-224
5.	Grass Lake	Secs. 8, 17, (18-2W)	5		4	108-A, p. 229-230
*6.	Percival Creek	Secs. 20, 21, 28, 29, 32, (18-2W)	258		30	66-C, p. 27; 106-G, p. 58; 108-A, p. 218-219

Map no.	Deposit	Location	Area (acres)	Maximum thickness (feet)		References
				Sphagnum	Fibrous	
THURSTON COUNTY—continued						
7.	Belmore	Sec. 4, (17-2W)	42	9	18	108-A, p. 224-225
8.	Bush Prairie	Sec. 2, (17-2W)	11	1	13	108-A, p. 228-229
9.	Lake Susan	Sec. 1, (17-2W)	10		19	108-A, p. 229
10.	Maple Bowl	Sec. 12, (17-2W)	31	1	18	108-A, p. 226
11.	Black River	Secs. 7, 18, (17-2W), secs. 11, 12, 13, 14, 24, 25, 26, 35, 36, (17-3W), sec. 2, (16-3W)	1,465	2	30	108-A, p. 216-218
12.	Bucoda	Secs. 3, 10, 15, (15-2W)	147		14	108-A, p. 220
*13.	Chain Hill	Sec. 18, (16-1W)	4	30		53, p. 24; 61, p. 268; 108-A, p. 230
14.	Boston Harbor	Sec. 13, (19-2W)	43		5	108-A, p. 224
15.	Ames Huntley Road No. 1, No. 2	S½ sec. 36, (19-2W)	103	2	18	108-A, p. 225-226
16.	Bigelow Lake	Secs. 12, 13, (18-2W), secs. 7, 18, (18-1W)	96	3	8	108-A, p. 222-223
*17.	Woodward Creek	Secs. 7, 18, 19, (18-1W)	170	3	12	2-A, p. 30; 108-A, p. 219-220
18.	Hicks Lake No. 2	Secs. 27, 28, (18-1W)	27		23	108-A, p. 221-222
19.	Hicks Lake No. 1	Secs. 27, 28, 34, (18-1W)	142	2	30	108-A, p. 220-221
20.	Long Lake- Patterson Lake	Sec. 35, (18-1W), sec. 2, (17-1W)	107		10	108-A, p. 222
21.	Johnson Road	Secs. 17, 18, 19, 20, (17-1E)	135		7	108-A, p. 222
22.	Kingslea Ranch	Sec. 35, (17-1E)	9		8	108-A, p. 229
23.	Eureka	Secs. 13, 23, 24, (16-1E)	12		5½	108-A, p. 228
	*South Bay	NW¼ sec. 32, (19-1W)				106-H, p. 42
WHATCOM COUNTY						
1.	Monument 9	Sec. 34, (41-1E)	38		8	108-A, p. 243
2.	Blaine	Sec. 35, (41-1E)	20		1½	108-A, p. 243
3.	Lake Terrell	Sec. 22, (39-1E)	98		11	108-A, p. 242
4.	Mountain View	Secs. 22, 27, (39-1E)	48		10	108-A, p. 242
5.	Custer	Secs. 25, 26, 36, (40-1E), secs. 27, 28, 29, 30, 31, 32, 33, 34, (40-2E)	1,636	1	11	108-A, p. 235-237
6.	Sweet Road	NW¼ sec. 9, (40-2E)	6		4	108-A, p. 245
7.	Barnhart Road	Sec. 3, (40-2E)	19		11½	108-A, p. 243-244
8.	Boundary-Meridian	Secs. 35, 36, (41-2E), sec. 31, (41-3E)	420	2	20	108-A, p. 240-241
9.	Northwood	Secs. 32, 33, 34, (41-3E), secs. 3, 4, 5, 7, 8, 9, (40-3E)	1,230		12	108-A, p. 237-238
10.	Pangborn Lake	Secs. 1, 2, (40-3E), sec. 6, (40-4E)	430	1	18	108-A, p. 238-240
11.	Wiser Lake	Sec. 36, (40-2E), secs. 1, 2, (39-2E), secs. 29, 31, 32, 33, 34, 35, 36, (40-3E), secs. 2, 3, 4, 5, 6, 8, 9, 10, 11, 17, 18, (39-3E)	2,450	3	29	108-A, p. 230-235
12.	Fazon Lake	Sec. 13, (39-3E)	186		25	108-A, p. 241-242
13.	Lake Louise	Sec. 8, (37-4E)	1	?		108-A, p. 245
*14.	Mosquito Lake	SW¼ sec. 13 and SW¼ sec. 14, (38-5E)	16	11	1	48, p. 78-79; 55, p. 35; 61, p. 266; 108-A, p. 244-245
15.	Carlson	Sec. 26, (38-5E)	18		8	108-A, p. 244

PERLITE

Perlite is volcanic glass, usually rhyolitic in composition, which is traversed by numerous curved fractures. Many of the fractures are spherical and enclose small spheroids made up of concentric shells of glass similar to the structure of an onion. Perlite usually contains 2 to 5 percent combined water. Value of perlite depends on its property of expanding when heated, to form a light vesicular material several times its original volume. In commerce, the term perlite is used more generally to include any volcanic glass which will expand when heated, the sense in which it is used here.

Perlite, in its expanded form, is sold primarily for plaster aggregate but is also used as loose-fill thermal insulation and in acoustic tile board. Doubtless other uses for it will develop.

As the use of perlite is relatively an innovation, few deposits in Washington are known. The Division of Mines and Geology has conducted an investigation of the perlite deposits in the state (**Ref: 66-A**), and the known and reported occurrences are listed below. It is known that some of these are too small to be commercial or that they contain nonexpandable material, but they are included because other occurrences in the area may possess the requisite qualities.

In 1953 the price of crude perlite rock, ground to customers' specifications, ranged between \$6.00 and \$12.00 per ton, f. o. b. mill. Processed material for plaster and concrete aggregate, in 3- and 4-cubic-foot paper bags, sold for 15 to 35 cents per cubic foot.

OCCURRENCES

On page 61 in volume 2 is plate 28, the map showing the occurrences of perlite, numbered to correspond with the numbers of the occurrences listed below.

KING COUNTY

1. **Name:** Cyclone Creek. **Loc:** SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (20-8E). **Descr:** Gray perlite is exposed over an area 20 by 75 ft. with a 15-ft. difference in elevation between highest and lowest parts of outcrop. Shows fair expansion when heated. **Value:** Exposed quantity insufficient to support commercial operation. **Ref: 66-A**, p. 26-27, 47-50; **67-A**.

PIERCE COUNTY

2. **Name:** White River "G." **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, (19-8E). **Descr:** Black perlite body 4 ft. thick, overlying soft tuff, is exposed for about 50 ft. along both banks of a small stream. Probably part of a huge landslide block. **Value:** Exposed quantity insufficient to support commercial operation. **Ref: 66-A**, p. 48, 54-55; **67-A**.
3. **Name:** Divide. **Loc:** Center sec. 14, (19-8E). **Descr:** Greenish-black perlite is poorly exposed to a height of 9 ft. for a distance of 100 ft. in an old railroad cut. **Value:** Exposed quantity insufficient to support commercial operation. **Ref: 66-A**, p. 26-27, 48, 51-52; **67-A**.
4. **Name:** Milky Creek. **Loc:** Reported in SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26 and NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (19-8E). **Descr:** Said to be one exposure 200 ft. long and 50 ft. wide, and another 100 ft. long and 50 ft. wide. Thickness unknown. **Value:** Unknown. **Ref: 66-A**, p. 26-27, 48, 52-53; **67-A**.
- 4A. **Name:** Mashel River. **Loc:** NW $\frac{1}{4}$ sec. 30, (16-6E). **Descr:** Perlite in cliff 15 ft. high and 350 ft. long. **Value:** Rock is porphyritic, hence probably not usable. **Ref: 66-A**, p. 26-27, 55-57.

CLARK COUNTY

5. **Name:** Crawford. **Loc:** Reported in vicinity of Crawford, possibly in T. 4 N., R. 2 or 3 E. **Descr:** Unknown. **Value:** Unknown. **Ref: 66-A**, p. 60.

SKAMANIA COUNTY

- 5A. **Name:** Gillott. **Loc:** E $\frac{1}{2}$ sec. 19 or W $\frac{1}{2}$ sec. 20, (8-7E). **Descr:** Perlite reported to be in a 40-ft. adit. Float was found in a stream nearby. **Value:** Unknown. **Ref: 66-A**, p. 26-27, 58-59.
6. **Name:** Stevenson. **Loc:** Said to be near Stevenson. **Descr:** A dense basic igneous rock, probably glassy and perlitic in part and porphyritic in part. **Value:** Unknown. **Ref: 135**.

YAKIMA COUNTY

7. **Name:** Mount Adams. **Loc:** Said to be on the headwaters of Klickitat River in T. 11 N., R. 11 or 12 E. **Descr:** Black perlite. **Value:** Unknown. **Ref: 66-A**, p. 26-27, 59.

KLICKITAT COUNTY

8. **Name:** Satus Creek. **Loc:** Center W $\frac{1}{2}$ sec. 10, (6-16E). **Descr:** Gray perlite exposed for 25 ft. along east bank of Satus Creek to a height of 30 ft. **Value:** Exposed quantity insufficient to support commercial operation. **Ref: 66-A**, p. 26-27, 40-42; **67-A**.

BENTON COUNTY

9. **Name:** Prosser. **Loc:** SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (8-24E). **Descr:** Black perlitic basaltic glass in a 2- to 10-in. layer at base of basalt flow. **Value:** Too small to support commercial operation. **Ref: 66-A**, p. 26-27, 57-58.
10. **Name:** Kennewick. **Loc:** Said to be near Kennewick. **Descr:** Perlitic obsidian. Size of deposit unknown. **Value:** Unknown. **Ref: 135**.

CHELAN COUNTY

11. **Name:** Rooster Comb. **Loc:** Center NW $\frac{1}{4}$ sec. 22, (22-20E). **Descr:** Gray perlite, as a border phase of a glassy dacite porphyry mass, is exposed in an area several hundred feet square. **Value:** Warrants further investigation. **Ref: 20**, p. 123-129; **66-A**, p. 38-39; **67-A**; **156**, p. 57.
12. **Name:** Dry Gulch. **Loc:** SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (22-20E). **Descr:** Gray perlite is exposed intermittently

over an area 75 ft. wide by 400 ft. long. Lowest exposure is 50 ft. below the highest. **Value:** Warrants further investigation. **Ref:** 20, p. 123-129; 66-A, p. 26-27, 29-38; 67-A; 156, p. 57.

13. **Name:** Norco well. **Loc:** NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (22-20E). **Descr:** A well drilled as an oil test penetrated 3 ft. of soil, 336 ft. of basalt, 339 ft. of Swauk shale and sandstone, 256 ft. of rhyolite (177 ft. of which is perlite), and then 3,969 ft. of Swauk sedimentary rocks. **Value:** Unknown. **Ref:** 66-A, p. 26-27, 39-40.

14. **Name:** Crum Canyon. **Loc:** Said to be in Crum Canyon, probably in T. 26 N., R. 20 E. **Descr:** Greenish perlite with banded structure said to come from a band 3 ft. thick. There are in the area much larger masses of glassy rock which may be perlite in part. **Value:** Probably does not expand well enough to be used for perlite but may be suitable for white rock wool. **Ref:** 66-A, p. 26-27, 63-67.

PUMICE AND PUMICITE

Pumice is a fragmental, highly cellular volcanic rock consisting largely of glass that is commonly rhyolitic in composition. It represents rock froth formed in the craters of active volcanoes during expansion of abundant water vapors and other gases and ejected during eruptions.

Because of its hardness and the sharp particles produced when crushed, pumice is an excellent abrasive and, until recently, 80 percent of the pumice used in the United States was used for this purpose. Its light weight and heat insulating value have recently stimulated its use in the building industry for loose-fill insulation, as concrete aggregate, and as plaster sand.

Washington pumice occurs in two regions. The first is a fan-shaped area extending from Glacier Peak, its source, eastward as far as Soap Lake in Grant County. The second extends northward from Mount St. Helens, its source, to Mount Rainier. Since deposition, the blankets of pumice have been dissected by stream erosion, leaving commercial deposits only in protected areas.

Prices on pumice are extremely variable; they depend on quality of material, its use, and its reputation. In Washington, prices vary from as low as \$1.00 per yd. at the pit, for concrete aggregate, to \$5.00 per yd. at the pit for pumice plaster sand.

Pumicite, sometimes termed volcanic ash, represents

the very fine dustlike material thrown into the air by explosive volcanic activity. Like pumice, it is composed largely of rhyolitic glass but may contain appreciable quantities of crystalline material.

Pumicite is used primarily as an abrasive in such products as scouring powder, mechanics' soap, metal polish, and rubber erasers. It has also been used in plaster and certain types of cement. As an insulant, it has been used in packing steam and water pipes, for lagging boilers, and for lining cold storage rooms.

Pumicite is found principally east of the Cascade Mountains, having been carried there from the volcanic cones by prevailing westerly winds. Some of the pumicite is related to the same period of explosive activity which produced the pumice, but some is much earlier in age, as it underlies at least one flow of basalt which is probably Miocene in age.

No data are available on prices of Washington pumicite because none is being produced commercially at the present time. In California, pumicite sold at \$10.32 per ton in 1945, but it is not known whether this price is f. o. b. pit or delivered.

The Washington deposits of pumice and pumicite that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

OCCURRENCES

On page 63 in volume 2 is plate 29, the map showing the occurrences of pumice and pumicite. These are numbered to correspond with the numbers of the occurrences listed below.

PUMICE

CHELAN COUNTY

- Name:** Mud Creek. **Loc:** NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, (26-20E). **Descr:** 42 to 48 in. thick at lower edge but thins to 6 in. within 20 ft. up the hill. **Value:** Mined to small extent. **Ref:** 19, p. 52.
- Name:** Entiat River (A). **Loc:** N $\frac{1}{2}$ sec. 7, (26-20E). **Descr:** 4 ft. of pea-size pumice overlain by 6 ft. of silt and rock fragments. **Value:** Small amount used locally. **Ref:** 19, p. 52.

- Name:** Goman pit. **Loc:** SW $\frac{1}{4}$ sec. 5 and NE $\frac{1}{4}$ sec. 8, (26-21E). **Descr:** 4 to 6 ft. thick along lower edge but thins to a few inches within 100 ft. up the hill. **Value:** Recently operated by George Goman, Winesap, Wash. **Ref:** 19, p. 52.
- Name:** Clearwater pit. **Loc:** NE $\frac{1}{4}$ sec. 8, (26-21E). **Descr:** Deposit 200 to 300 ft. long, 75 ft. wide, 1 to 2 ft. thick along upper edge, and 10 ft. thick at center and lower edge. Overburden 2 to 5 ft. thick. **Value:** Operated in 1945. **Ref:** 19, p. 52.
- Name:** P & B mine (C & B pit). **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 8, (26-21E). Adjoins E. end of Clearwater pit. **Descr:** Pumice 5 ft. thick, covered by 1 to 5 ft. of silty soil, is exposed in a pit 500 ft. square. **Value:** Recently worked by Clarence Bunney, Everett, Wash. **Ref:** 55, p. 18.

5. **Name:** Dick nickel property. **Loc:** N. center sec. 9, (26-21E). **Descr:** About 20 pits opened show small, discontinuous deposits. **Value:** Exposed quantities too small for other than local use. **Ref:** 19, p. 52.
6. **Name:** Oklahoma Gulch. **Loc:** SW $\frac{1}{4}$ sec. 9, (26-21E). **Descr:** 32 in. of pea-size pumice and sand overlain by 39 in. of silt and loose rock. **Value:** Warrants investigation. **Ref:** 19, p. 52.
- *6A. **Name:** Heller pit (C). **Loc:** E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 10, (26-21E). **Descr:** Pumice 4 to 6 ft. thick is exposed in a 2-acre pit. **Value:** Recently operated by George Heller, Chelan, Wash. **Ref:** 55, p. 24.
7. **Name:** Staymen. **Loc:** Near center sec. 3, (26-22E). **Descr:** 6 ft. of well-sorted water-worn pea-size pumice overlain by 50 ft. of sand and gravel, 25 percent of which is pumice. **Value:** Overburden excessive. **Ref:** 19, p. 51.
8. **Name:** Chiwawa River (A). **Loc:** N. center sec. 11, (27-17E). **Descr:** 14 in. of pumice overlain by 16 in. of silt, sand, and a little altered pumice. **Value:** Bed too thin for commercial use. **Ref:** 19, p. 37.
9. **Name:** Goose Creek. **Loc:** Near NE. cor. sec. 13, (27-17E). **Descr:** 8 in. of pumice overlain by 30 in. of silt, sand, and a little altered pumice. **Value:** Noncommercial. **Ref:** 19, p. 37.
- *9A. **Name:** Conklin. **Loc:** NW $\frac{1}{4}$ sec. 24, (27-19E). **Descr:** Pumice. **Value:** Currently operated by Entiat Pumice Co., Ephrata, Wash. **Ref:** 2-A, p. 22.
- *10. **Name:** Harris pit. **Loc:** NW $\frac{1}{4}$ sec. 29, (27-19E). **Descr:** 6 ft. of pumice overlain by 49 in. of silt, sand, and some pumice. **Value:** Recently operated by C. A. Harris, Ardenvoir, Wash. **Ref:** 19, p. 52-53; 55, p. 23.
11. **Name:** Staymen-Knapp Coulee Road. **Loc:** SE $\frac{1}{4}$ sec. 32, (27-22E). **Descr:** Gopher holes show pumice for at least 500 ft. along road from Staymen to Knapp Coulee. Two drill holes 200 ft. apart encountered 3 ft. of pea-size pumice covered by 3 ft. of overburden. **Value:** Warrants further investigation. **Ref:** 19, p. 51.
12. **Name:** Chiwawa River (B). **Loc:** River bank near NE. cor. sec. 1, (28-16E). **Descr:** 8 ft. of silt, sand, gravel, and pumice covered by 40 ft. of overburden. **Value:** Noncommercial because of excessive overburden and contamination. **Ref:** 19, p. 36.
13. **Name:** Chiwawa River (C). **Loc:** SE $\frac{1}{4}$ sec. 6, (28-17E). **Descr:** Drill hole encountered 35 in. of pumice overlain by 24 in. of silt and pumice. **Value:** Warrants investigation. **Ref:** 19, p. 37.
14. **Name:** Chiwawa River (D). **Loc:** Near center sec. 6, (28-17E). **Descr:** 12 to 18 in. of pumice overlain by 12 to 18 in. of pumice and silt. **Value:** Bed too thin to support commercial operation. **Ref:** 19, p. 36.
15. **Name:** Chiwawa River (E). **Loc:** NW $\frac{1}{4}$ sec. 8, (28-17E). **Descr:** 25 in. of pumice overlain by 14 in. of silt and altered pumice. **Value:** Might support small operation. **Ref:** 19, p. 37.
16. **Name:** Chiwawa River (F). **Loc:** SW $\frac{1}{4}$ sec. 8, (28-17E). **Descr:** An upper 49-in. bed of pumice and a lower 9-in. bed separated by 2 in. of sand and overlain by 20 in. of silt, sand, and altered pumice. **Value:** Probably commercial. **Ref:** 19, p. 37.
17. **Name:** Chiwawa River (G). **Loc:** Near SW. cor. sec. 16, (28-17E). **Descr:** Road cut and drill hole show 44 in. of pumice overlain by 43 in. of silt and altered pumice. **Value:** Warrants investigation. **Ref:** 19, p. 37.
18. **Name:** Chiwawa River (H). **Loc:** N. center sec. 17, (28-17E). **Descr:** 59 in. of pumice overlain by 24 in. of silt in which is a little altered pumice. **Value:** Workable thickness. **Ref:** 19, p. 37.
19. **Name:** Chiwawa River (I). **Loc:** NW $\frac{1}{4}$ sec. 21, (28-17E). **Descr:** Road cut and drill hole show 36 in. of pumice overlain by 34 in. of silt and altered pumice. **Value:** Should be investigated. **Ref:** 19, p. 37.
20. **Name:** Gate Creek. **Loc:** E. center sec. 27, (28-17E). **Descr:** Road cut and drill hole show 20 in. of pumice overlain by 30 in. of silt and altered pumice. **Value:** Might support small local operation. **Ref:** 19, p. 37.
21. **Name:** Chiwawa River (J). **Loc:** Near E. $\frac{1}{4}$ cor. sec. 34, (28-17E). **Descr:** Road cut exposes 18 in. of pumice overlain by 20 in. of silt and a little altered pumice. **Value:** Might be usable locally. **Ref:** 19, p. 37.
22. **Name:** Lake Creek (A). **Loc:** 1,000 ft. W. of NE. cor. sec. 1, (28-18E). **Descr:** An upper 24-in. bed in pumice and a lower 22-in. bed separated by 4 in. of sand and overlain by 14 in. of silty soil. **Value:** Sufficient thickness to support commercial operation. **Ref:** 19, p. 46.
23. **Name:** Lake Creek (B). **Loc:** Near S. $\frac{1}{4}$ cor. sec. 1, (28-18E). **Descr:** An upper 40-in. bed of pumice and a lower 14-in. bed separated by 7 in. of sand and overlain by 15 in. of silty soil. **Value:** Warrants development. **Ref:** 19, p. 46.
24. **Name:** Lake Creek (C). **Loc:** E. center sec. 1, (28-18E). **Descr:** An upper 16-in. bed of pumice and a lower 20-in. bed separated by 5 in. of sand and overlain by 28 in. of silty soil and altered pumice. **Value:** Pumice and sand might be worked as a unit. **Ref:** 19, p. 46.
25. **Name:** Lake Creek (D). **Loc:** 330 ft. S. of NE. cor. sec. 1, (28-18E). **Descr:** Road cut shows an upper 22-in. bed of pumice and a lower 8-in. bed separated by 5 in. of sand and overlain by 3 to 12 in. of silty soil. **Value:** Might be used locally. **Ref:** 19, p. 46.
26. **Name:** Entiat River (B). **Loc:** NE $\frac{1}{4}$ sec. 2, (28-18E). **Descr:** Drill hole shows an upper 43-in. bed of pumice and a lower 34-in. bed separated by 6 in. of sand and overlain by 24 in. of silty soil and altered pumice. **Value:** Warrants development. **Ref:** 19, p. 45.

- *27. **Name:** Smart pit. **Loc:** SE $\frac{1}{4}$ sec. 2, (28-18E). **Descr:** 3 ft. of pumice covered by 2 to 4 ft. of overburden. **Value:** Recently worked by Jack J. Smart, Brief, Wash. **Ref:** 19, p. 40; 53, p. 27.
28. **Name:** Lake Creek (E). **Loc:** N. center sec. 12, (28-18E). **Descr:** Road cut exposes 30 in. of pumice overlain by 24 in. of silt, sand, and altered pumice. **Value:** Warrants investigation. **Ref:** 19, p. 46.
29. **Name:** Lake Creek (F). **Loc:** Near W. $\frac{1}{4}$ cor. sec. 12, (28-18E). **Descr:** Road cut exposes an upper 30-in. bed of pumice and a lower 12-in. bed separated by 6 in. of sand and covered by 36 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 45.
30. **Name:** Heller pit. **Loc:** SE $\frac{1}{4}$ sec. 12, (28-18E). **Descr:** Pit exposes 64 in. of pumice overlain by 26 in. of silt and pumice. **Value:** Formerly operated by George Heller, Chelan, Wash. **Ref:** 19, p. 40; 72-A, p. 2, 6.
31. **Name:** Lake Creek (G). **Loc:** 1,000 ft. SE. of no. 30. **Descr:** An upper 15-in. bed of pumice and a lower 9-in. bed separated by 3 in. of sand and overlain by 30 in. of silty soil and altered pumice. **Value:** Overburden rather heavy compared to pumice thickness. **Ref:** 19, p. 45.
32. **Name:** Lake Creek (H). **Loc:** About 1,000 ft. SE. of no. 31. **Descr:** An upper 45-in. bed of pumice and a lower 9-in. bed separated by 2 in. of sand and mantled by 10 to 20 in. of overburden. **Value:** Sufficient thickness for commercial operation. **Ref:** 19, p. 45.
33. **Name:** Entiat River (C). **Loc:** Near center sec. 13, (28-18E). **Descr:** Road cut and drill hole show an upper 28-in. bed of pumice and a lower 9-in. bed separated by 4 in. of sand and covered by 10 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 45.
34. **Name:** Entiat River (D). **Loc:** 100 ft. SE. of no. 33. **Descr:** An upper 69-in. bed of pumice and a lower 10-in. bed separated by 6 in. of sand and covered by 30 in. of overburden. **Value:** Warrants development. **Ref:** 19, p. 45.
35. **Name:** Entiat River (E). **Loc:** 650 ft. W. of SE. cor. sec. 13, (28-18E). **Descr:** Road cut exposes 30 in. of pumice mantled by 24 to 30 in. of overburden. **Value:** Ratio of overburden to pumice rather high. **Ref:** 19, p. 45.
36. **Name:** Entiat River (F). **Loc:** N. center sec. 19, (28-19E). **Descr:** Road cut and drill hole show an upper 46-in. bed of pumice and a lower 9-in. bed separated by 12 in. of sand and mantled by 28 in. of overburden. **Value:** Sufficient thickness to support commercial operation. **Ref:** 19, p. 46.
- *37. **Name:** Nichol pit. **Loc:** NW $\frac{1}{4}$ sec. 19, (28-19E). **Descr:** Pit exposes 37 in. of pumice mantled by 16 in. of overburden. **Value:** Recently operated by William Nichol, Entiat, Wash. **Ref:** 19, p. 41; 55, p. 28; 72-A, p. 2, 6.
- *38. **Name:** Patty Bros. pit. **Loc:** NW $\frac{1}{4}$ sec. 19, (28-19E). **Descr:** Pit exposes 56 in. of pumice covered by 30 in. of overburden. **Value:** Recently operated by Patty Bros., Okanogan, Wash. **Ref:** 19, p. 41; 55, p. 30.
39. **Name:** McCrea Branch. **Loc:** SE $\frac{1}{4}$ sec. 28, (28-19E). **Descr:** Road cuts for distance of 200 ft. expose 20 to 24 in. of pumice mantled by 30 to 36 in. of overburden. **Value:** Ratio of overburden to pumice rather high. **Ref:** 19, p. 46.
- *40. **Name:** Asher and Fouts pit. **Loc:** NE $\frac{1}{4}$ sec. 33 and NW $\frac{1}{4}$ sec. 34, (28-19E). **Descr:** Average depth of pumice 4 to 5 ft.; overburden about 2 ft. **Value:** Recently operated by Asher and Fouts, Entiat, Wash. **Ref:** 19, p. 41-42; 55, p. 16.
41. **Name:** Joe Creek. **Loc:** SE $\frac{1}{4}$ sec. 11, (28-21E). **Descr:** Road cuts and small pit expose 64 in. of pumice and sand for distance of 300 ft. **Value:** Warrants investigation. **Ref:** 19, p. 49.
42. **Name:** Little Giant Creek. **Loc:** SW $\frac{1}{4}$ sec. 2, (29-16E). **Descr:** An upper 71-in. bed of pumice and a lower 17-in. bed separated by 12 in. of sandy altered pumice and covered by 21 inches of overburden. **Value:** Commercial quantity. **Ref:** 19, p. 36; 72-A, p. 2, 6.
43. **Name:** Chiwawa River (K). **Loc:** NW $\frac{1}{4}$ sec. 2, (29-16E). **Descr:** Road cut and drill hole show 13 ft. of pumice covered by 57 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 36.
44. **Name:** Cottonwood Camp. **Loc:** SE $\frac{1}{4}$ sec. 7, (29-18E). **Descr:** Road cut exposes 60 in. of pumice overlain by 13 in. of silty soil. **Value:** Warrants development. **Ref:** 19, p. 43.
- *45. **Name:** Heller pit (A). **Loc:** SE $\frac{1}{4}$ sec. 7, (29-18E). **Descr:** 9 $\frac{1}{2}$ ft. of pumice exposed. **Value:** Recently operated by George W. Heller, Chelan, Wash. **Ref:** 19, p. 39; 55, p. 24.
- *46. **Name:** Heller pit (B). **Loc:** SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, (29-18E). **Descr:** An upper 38-in. bed of pumice and a lower 56-in. bed separated by 8 in. of sand and overlain by 12 to 30 in. of silty soil. **Value:** Recently operated by George W. Heller, Chelan, Wash. **Ref:** 19, p. 44; 72-A, p. 2, 6.
47. **Name:** Entiat River (G). **Loc:** Near SW. cor. sec. 8, (29-18E). **Descr:** Road cut exposes 6 ft. of pumice overlain by 2 ft. of silty soil and some altered pumicite. **Value:** Commercial quantity. **Ref:** 19, p. 44.
48. **Name:** Entiat River (H). **Loc:** NW $\frac{1}{4}$ sec. 16, (29-18E). **Descr:** Pit exposes two 40-in. beds of pumice separated by 2 to 8 in. of sand and overlain by 6 to 22 in. of silty soil. **Value:** Warrants development. **Ref:** 19, p. 44.
49. **Name:** Entiat River (I). **Loc:** Near S. $\frac{1}{4}$ cor. sec. 16, (29-18E). **Descr:** Road cut exposes two 40-in. beds of pumice separated by 3 in. of sand and overlain by 24 in. of silty soil. **Value:** Warrants development. **Ref:** 19, p. 44.

50. **Name:** Entiat River (J). **Loc:** NW $\frac{1}{4}$ sec. 16, (29-18E). **Descr:** 5 to 7 ft. of pumice covered by 6 to 24 in. of overburden. **Value:** Operated by Oroville Independent Growers, Inc. during 1945. **Ref:** 19, p. 38.
51. **Name:** Entiat River (K). **Loc:** Near N. $\frac{1}{4}$ cor. sec. 17, (29-18E). **Descr:** Road cut exposes an upper 48-in. bed of pumice and a lower 30-in. bed separated by 8 in. of sand and covered by 12 in. of overburden. **Value:** Commercial quantity. **Ref:** 19, p. 44.
52. **Name:** Entiat River (L). **Loc:** NE $\frac{1}{4}$ sec. 21, (29-18E). **Descr:** Road cut exposes an upper 42-in. bed of pumice and a lower 24-in. bed separated by 6 in. of sand and overlain by 24 in. of silty soil. **Value:** Commercial quantity. **Ref:** 19, p. 44.
- *53. **Name:** Big Six pit. **Loc:** SW $\frac{1}{4}$ sec. 22, (29-18E). **Descr:** About 5 ft. of pumice mantled by 2 ft. of overburden. **Value:** Recently operated by Big Six Pumice Mining Corp., Brief, Wash. **Ref:** 19, p. 39; 55, p. 17.
- *54. **Name:** Butler Bros. pit. **Loc:** NW $\frac{1}{4}$ sec. 22, (29-18E). **Descr:** Conditions similar to those at Big Six pit. **Value:** Recently operated by Butler Bros., Brief, Wash. **Ref:** 19, p. 39; 55, p. 18.
55. **Name:** Pope Creek. **Loc:** Near S. $\frac{1}{4}$ cor. sec. 26, (29-18E). **Descr:** Road cut and drill hole show an upper 40-in. bed of pumice and a lower 24-in. bed separated by 2 in. of sand and covered by 18 to 24 in. of overburden. **Value:** Warrants development. **Ref:** 19, p. 44; 72-A, p. 2, 6.
56. **Name:** Entiat River (M). **Loc:** SE $\frac{1}{4}$ sec. 26, (29-18E). **Descr:** 5 ft. of pumice mantled by 1 ft. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 44.
57. **Name:** Pope Ridge. **Loc:** NE $\frac{1}{4}$ sec. 27, (29-18E). **Descr:** 6 ft. of pumice covered by 1 $\frac{1}{2}$ to 2 ft. of overburden. **Value:** Commercial quantity. **Ref:** 19, p. 44.
58. **Name:** Silver Ridge (A). **Loc:** NE $\frac{1}{4}$ sec. 35, (29-18E). **Descr:** Drill hole shows a 35-in. upper bed of pumice and a 24-in. lower bed separated by 12 in. of sand and covered by 12 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 44.
59. **Name:** Silver Ridge (B). **Loc:** 300 ft. NE. of no. 58. **Descr:** An upper 45-in. bed of pumice and a lower 26-in. bed separated by 6 in. of sand and covered by 40 in. of overburden. **Value:** Heavy overburden, but warrants investigation. **Ref:** 19, p. 45.
60. **Name:** Silver Ridge (C). **Loc:** 100 ft. NE. of no. 59. **Descr:** Same as no. 59. **Value:** Heavy overburden, but warrants investigation. **Ref:** 19, p. 45.
61. **Name:** Silver Falls Camp. **Loc:** Near W. $\frac{1}{4}$ cor. sec. 36, (29-18E). **Descr:** Road cut exposes 4 ft. of pumice beneath 1 ft. of overburden. **Value:** Warrants development. **Ref:** 19, p. 45.
62. **Name:** Chelan Mountains (A). **Loc:** Near center sec. 21, (29-19E). **Descr:** Road cut exposes 24 in. of pumice beneath 26 in. of overburden. **Value:** Ratio of overburden to pumice too high for economic recovery. **Ref:** 19, p. 47.
63. **Name:** Chelan Mountains (B). **Loc:** Near center sec. 27, (29-19E). **Descr:** Road cut and pit expose upper 18-in. bed of pumice and a lower 26-in. bed separated by 4 in. of sand. **Value:** Warrants investigation. **Ref:** 19, p. 47.
64. **Name:** Lake Creek Road (A). **Loc:** Near W. $\frac{1}{4}$ cor. sec. 29, (29-19E). **Descr:** Road cut exposes an upper 28-in. bed of pumice and a lower 18-in. bed separated by 6 in. of sand and covered by 17 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 47.
65. **Name:** Lake Creek Road (B). **Loc:** NE $\frac{1}{4}$ sec. 30, (29-19E). **Descr:** Road cut exposes 31 in. of pumice, 10 in. of overburden. **Value:** Could support small operation. **Ref:** 19, p. 47.
66. **Name:** Lake Creek Road (C). **Loc:** SE $\frac{1}{4}$ sec. 30, (29-19E). **Descr:** Road cut and pit expose 47 in. of pumice in which is a 3-in. sand layer. Overburden 22 in. **Value:** Commercial quantity. **Ref:** 19, p. 47.
67. **Name:** Lake Creek Road (D). **Loc:** Near center sec. 31, (29-19E). **Descr:** Road cut and pit expose, from surface down: 35 in. of overburden, 42 in. of pumice, 7 in. of sand, and 14 in. of pumice. **Value:** Warrants investigation. **Ref:** 19, p. 46.
68. **Name:** Lake Creek Road (E). **Loc:** NE $\frac{1}{4}$ sec. 31, (29-19E). **Descr:** Road cut and pit expose, from surface down: 18 in. of overburden, 33 in. of pumice, 3 in. of sand, and 23 in. of pumice. **Value:** Warrants development. **Ref:** 19, p. 46.
- *69. **Name:** Bortz pit. **Loc:** NE $\frac{1}{4}$ sec. 31, (29-19E). **Descr:** 61 in. of pumice beneath 24 in. of overburden. **Value:** Recently operated by L. A. Bortz, Entiat, Wash. **Ref:** 19, p. 43; 55, p. 18.
- *70. **Name:** Griffith pit. **Loc:** NE $\frac{1}{4}$ sec. 31, (29-19E). **Descr:** 58 in. of pumice beneath 18 in. of overburden. **Value:** Recently operated by Clifford Griffith, Entiat, Wash. **Ref:** 19, p. 43; 55, p. 23.
71. **Name:** Twentyfive Mile Creek. **Loc:** N. center sec. 27, (29-20E). **Descr:** An open cut exposes 5 ft. of pumice beneath 16 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 48.
72. **Name:** Davis. **Loc:** N. center sec. 30, (29-21E). **Descr:** Basin area about 7 acres in extent. Drill hole in center encountered 46 in. of pumice under 44 in. of overburden. **Value:** Overburden too thick for economic mining. **Ref:** 19, p. 49.
- *72A. **Name:** Sorlie. **Loc:** Sec. 9, (28-21E), near Twentyfive Mile Creek. **Descr:** Alluvial fan made up of pumice. **Value:** Currently operated by Arne Sorlie, Lakeside, Wash. **Ref:** 66-B, p. 34.
73. **Name:** Antilon Creek. **Loc:** SW $\frac{1}{4}$ sec. 35, (29-21E). **Descr:** Small pocket of pumice 43 in. thick beneath 40 in. of overburden. **Value:** Appears to be too small for commercial operation. **Ref:** 19, p. 49.

74. **Name:** Buck Creek. **Loc:** SW $\frac{1}{4}$ sec. 16, (30-16E). **Descr:** River bank exposes 4 ft. of pumice mantled by 18 to 24 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 35.
75. **Name:** Royal Development (A). **Loc:** SW $\frac{1}{4}$ sec. 22, (30-16E). 1,000 ft. N. of Royal Development Co. mill buildings. **Descr:** Road cut and drill hole show 4 ft. of pumice under 2 ft. of overburden. **Value:** Further investigation desirable. **Ref:** 19, p. 35; 72-A, p. 2, 6.
76. **Name:** Royal Development (B). **Loc:** Near center sec. 22, (30-16E). **Descr:** Drill hole encountered 55 in. of pumice beneath 24 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 35.
77. **Name:** Phelps Creek. **Loc:** Near SW. cor. sec. 22, (30-16E). **Descr:** Excavations expose a 40-in. bed of pumice and a 64-in. bed separated by 2 to 12 in. of sand and mantled by 25 in. of silt. **Value:** Warrants development. **Ref:** 19, p. 36.
- *78. **Name:** Scholze pit. **Loc:** NW $\frac{1}{4}$ sec. 27, (30-16E). **Descr:** 56 to 60 in. of pumice; 18 to 24 in. of overburden. **Value:** Recently operated by Joe Scholze, Leavenworth, Wash. **Ref:** 19, p. 34; 55, p. 31; 72-A, p. 2, 6; 96, p. 16.
79. **Name:** James Creek. **Loc:** Near NE. cor. sec. 28, (30-16E). **Descr:** Road cuts expose 30 in. of pumice beneath 24 in. of overburden. **Value:** Might support small operation. **Ref:** 19, p. 36.
80. **Name:** Willow Creek. **Loc:** E. center sec. 34, (30-16E). **Descr:** Road cut and drill hole expose 81 in. of pumice overlain by 27 in. of silt. **Value:** Warrants development. **Ref:** 19, p. 36.

DOUGLAS COUNTY

- *1. **Name:** Hicks (Bridgeport) pit. **Loc:** Sec. 28, (29-25E). **Descr:** Pit shows, from surface down: 18 in. of silt and pumice, 24 in. of pumice, and 4 in. of pumicite. **Value:** Recently operated by Cleo Hicks, Bridgeport, Wash. **Ref:** 19, p. 48; 55, p. 24.
2. **Name:** Farmer. **Loc:** 1.7 mi. S. of Sunset Highway in NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (24-25E). **Descr:** Clean sand-size pumice appears to cover an area 175 by 75 ft. to a depth of 4 ft. (?) **Value:** Commercial deposit especially suited for use in plaster. **Ref:** 135.
3. **Name:** Moses Coulee. **Loc:** SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (24-25E). **Descr:** Sand-size pumice, covered by 1 to 3 ft. of silt and rocks, appears to cover an area 100 by 200 ft. to a depth of 5 ft. **Value:** Excellent plaster sand. 700 to 800 yd. shipped in 1946-47. **Ref:** 135.

GRANT COUNTY

- *1. **Name:** Adrian. **Loc:** NW $\frac{1}{4}$ sec. 24, (22-27E). **Descr:** Sand-size pumice in bed from 1 to 3 $\frac{1}{2}$ ft. thick occurs along cliffs for at least $\frac{1}{2}$ mi.; 12 to 36 in. of silt overburden. **Value:** Recently operated by Hy-Dry Insulation & Supply Co., Seattle, Wash. **Ref:** 19, p. 54; 55, p. 24.
- *2. **Name:** Soap Lake. **Loc:** E $\frac{1}{2}$ SW $\frac{1}{4}$ and W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 36, (23-26E). **Descr:** Clean sand-size pumice,

exposed to a depth of 12 ft., appears to cover an area 200 by 150 ft. **Value:** Commercial deposit of plaster sand. Currently operated by L. C. Swartz Concrete Products, Ephrata, Wash. **Ref:** 2-A, p. 35; 135.

LEWIS COUNTY

1. **Name:** Cispus River (A). **Loc:** SW $\frac{1}{4}$ sec. 3, (11-6E). **Descr:** Railway cuts for $\frac{1}{4}$ mi. expose 54 to 60 in. of pumice overlain by 6 to 12 in. of silty soil. **Value:** Workable thickness and extent. **Ref:** 19, p. 23.
2. **Name:** Cispus River (B). **Loc:** E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 4, (11-6E). **Descr:** Open cut exposes 51 in. of pumice beneath 13 in. of overburden. **Value:** Warrants investigation. **Ref:** 19, p. 21.
3. **Name:** Cispus River (C). **Loc:** Near center W $\frac{1}{2}$ sec. 4, (11-6E). **Descr:** Railway cut exposes 4 ft. of pumice mantled by 8 in. of pumiceous soil. **Value:** Workable thickness; extent should be determined. **Ref:** 19, p. 21.
4. **Name:** Cispus River (D). **Loc:** 300 ft. W. of center sec. 5, (11-6E). **Descr:** Railway cut exposes 3 ft. of pumice overlain by 1 ft. of silty soil. **Value:** Might support small operation. **Ref:** 19, p. 21.
5. **Name:** Cispus River (E). **Loc:** Near W. $\frac{1}{4}$ cor. sec. 5, (11-6E). **Descr:** Railway cut exposes 4 ft. of pumice overlain by 1 ft. of silty soil. **Value:** Warrants investigation. **Ref:** 19, p. 21.
- *6. **Name:** "Popcorn" pit. **Loc:** Center sec. 5, (11-6E). **Descr:** Reworked pumice 13 ft. thick. **Value:** Recently operated by Insulrock Products (Layrite Concrete Products), Seattle, Wash. **Ref:** 19, p. 19-20; 53, p. 31.
7. **Name:** Cowlitz River. **Loc:** Near W. $\frac{1}{4}$ cor. sec. 6, (11-6E). **Descr:** Open cut exposes 30 in. of pumice beneath 36 in. of overburden. **Value:** Ratio of overburden to pumice high for economic development. **Ref:** 19, p. 21.
8. **Name:** Cispus River (F). **Loc:** NE $\frac{1}{4}$ sec. 10, (11-6E). **Descr:** Railway cut exposes 54 in. of pumice beneath 24 in. of overburden. **Value:** Commercial thickness; extent should be determined. **Ref:** 19, p. 23.
9. **Name:** Cispus River (G). **Loc:** Near E. $\frac{1}{4}$ cor. sec. 11, (11-6E). **Descr:** Railway cuts expose 26 to 35 in. of pumice beneath 1 to 2 in. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 23.
10. **Name:** Cispus River (H). **Loc:** Near SE. cor. sec. 13, (11-6E). **Descr:** Road cut exposes, from surface down: 2 in. of soil, 22 in. of pumice, 8 in. of silt, and 24 in. of pumice. **Value:** Workable if silt is pumiceous. **Ref:** 19, p. 23; 96, p. 16.
11. **Name:** Glenoma. **Loc:** Near center sec. 14, (12-5E). **Descr:** Road cut exposes 14 in. of impure pumice. **Value:** Noncommercial. **Ref:** 19, p. 20.
12. **Name:** Rainy Valley. **Loc:** Near S. $\frac{1}{4}$ cor. sec. 24, (12-5E). **Descr:** Open cut exposes 6 ft. of pumice

- beneath 6 to 12 in. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 20.
13. **Name:** Cowlitz Valley (A). **Loc:** Near S. $\frac{1}{4}$ cor. sec. 35, (12-5E). **Descr:** Open cuts expose 4 ft. of pumice overlain by 6 to 12 in. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 21.
 14. **Name:** Cowlitz Valley (B). **Loc:** Near S. $\frac{1}{4}$ cor. sec. 36, (12-5E). **Descr:** Pit exposes 5 ft. of pumice overlain by 1 ft. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 21.
 15. **Name:** Tom Dalton (A). **Loc:** NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, (12-6E). **Descr:** Two auger holes 60 ft. apart encountered 11 and 13+ ft. of pumice beneath 2 ft. of overburden. Probably covers 2 $\frac{1}{2}$ acres. **Value:** Commercial quantity. **Ref:** 135.
 16. **Name:** Tom Dalton (B). **Loc:** Road cut at toe of slope in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, (12-6E). **Descr:** Pumice, mantled by 2 $\frac{1}{2}$ ft. of overburden, covers 1 $\frac{1}{2}$ acres to an average depth of 6 ft. **Value:** Could support small operation. **Ref:** 135.
 17. **Name:** Rainy Creek (A). **Loc:** Near W. $\frac{1}{4}$ cor. sec. 8, (12-6E). **Descr:** Drill hole encountered 6 ft. of pumice beneath 4 ft. of soil and silt. **Value:** Commercial thickness; extent should be determined. **Ref:** 19, p. 20.
 18. **Name:** Rainy Creek (B). **Loc:** 600 ft. S. of no. 15. **Descr:** Road cut exposes 26 in. of pumice overlain by 14 in. of soil. **Value:** Might be worked in conjunction with nearby deposits. **Ref:** 19, p. 20.
 19. **Name:** Rainy Creek (C). **Loc:** NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, (12-6E). **Descr:** Road cuts expose 3 ft. of pumice beneath 2 to 6 in. of soil. **Value:** Could support small operation. **Ref:** 19, p. 20.
 20. **Name:** Kiona Creek (A). **Loc:** Near E. center SW $\frac{1}{4}$ sec. 11, (12-6E). **Descr:** Road cut exposes 32 in. of pumice overlain by 6 to 12 in. of soil. **Value:** Might support small operation. **Ref:** 19, p. 20.
 21. **Name:** Kiona Creek (B). **Loc:** Near SE. cor. sec. 11, (12-6E). **Descr:** Road cut exposes 30 in. of pumice overlain by 6 to 12 in. of soil. **Value:** Might support small operation. **Ref:** 19, p. 20.
 22. **Name:** Kiona Creek (C). **Loc:** S $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 12, (12-6E). **Descr:** Deposit extends 800 by 300 ft. Two drill holes, 200 ft. apart, encountered 6 and 8+ ft. of pumice beneath 1 $\frac{1}{2}$ ft. of overburden. **Value:** Warrants development. **Ref:** 135.
 23. **Name:** Kiona Creek (D). **Loc:** Near E. $\frac{1}{4}$ cor. sec. 12, (12-6E). **Descr:** Ditch exposes 41 in. of pumice overlain by 24 to 30 in. of soil. **Value:** Ratio of overburden to pumice too high for cheap mining. **Ref:** 19, p. 20.
 24. **Name:** Kiona Valley. **Loc:** SW. cor. sec. 14, (12-6E). **Descr:** Drill hole encountered 3 ft. of pumice beneath 1 ft. of soil and roots. **Value:** Might support small operation. **Ref:** 19, p. 21.
 25. **Name:** Cispus (A). **Loc:** Near center sec. 19, (12-6E). **Descr:** Road cuts expose 4 ft. of pumice overlain by 6 to 8 in. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 20.
 26. **Name:** Cispus (B). **Loc:** Near W. $\frac{1}{4}$ cor. sec. 20, (12-6E). **Descr:** Open cuts expose 4 ft. of pumice overlain by 6 to 8 in. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 21.
 27. **Name:** Cowlitz Valley (C). **Loc:** SW. cor. sec. 23, (12-6E). **Descr:** Pit exposes 3 to 4 ft. of pumice overlain by 1 ft. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 21.
 28. **Name:** Cowlitz Valley (D). **Loc:** Near SE. cor. sec. 23, (12-6E). **Descr:** Road cut exposes 32 in. of pumice. **Value:** Thickness of overburden and extent of pumice should be determined. **Ref:** 19, p. 21.
 - *29. **Name:** Hunt & Gaines pit. **Loc:** E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 26, (12-6E). **Descr:** Pumice 3 ft. thick over an area of 40 to 60 acres. Less than 1 ft. of overburden. **Value:** Recently operated by P. F. Hunt and John Gaines, Winlock, Wash. **Ref:** 135.
 30. **Name:** Cowlitz Valley (E). **Loc:** Near SW. cor. sec. 29, (12-6E). **Descr:** Road cuts expose 42 to 72 in. of pumice overlain by 12 in. of soil. **Value:** Warrants development. **Ref:** 19, p. 21.
- #### OKANOGAN COUNTY
1. **Name:** Cooper Mountain. **Loc:** Center sec. 16, (29-22E). **Descr:** Test pit exposes 5 ft. of fine, very sandy pumice. **Value:** Probably too sandy to give it much advantage over ordinary concrete aggregate. **Ref:** 19, p. 50.
 2. **Name:** Firman pit. **Loc:** SE $\frac{1}{4}$ sec. 5, (30-21E). **Descr:** Deposit 400 ft. long, 12 in. thick, and covered by 18 in. of overburden. **Value:** Operated briefly by George Firman, Okanogan, Wash., in 1946. **Ref:** 19, p. 49; 55, p. 21.
 3. **Name:** Peterson pit. **Loc:** Center sec. 17, (30-21E). **Descr:** Pit exposes 84 in. of sand and pea-size pumice beneath 18 in. of overburden. **Value:** Has been operated by Don Peterson and partners, Tonasket, Wash. **Ref:** 19, p. 50.
 4. **Name:** Brewster. **Loc:** Near E. $\frac{1}{4}$ cor. sec. 20, (31-25E). **Descr:** Road cut and pit show 75 in. of alternating sand and sand-size pumice overlain by 42 in. of silty soil. **Value:** Might be suitable for plaster sand. **Ref:** 19, p. 53-54.
- #### SKAMANIA COUNTY
1. **Name:** East St. Helens. **Loc:** NW $\frac{1}{4}$ sec. 1, (8-5E). **Descr:** Stream bank exposes pumice intermixed with gravel to depth of 4 ft. **Value:** Usable only if separation of gravel from pumice is economical. **Ref:** 19, p. 23.
 2. **Name:** St. Helens Lake. **Loc:** SW $\frac{1}{4}$ sec. 3, (9-5E). **Descr:** Trail cut exposes 2 ft. of pumice overlain by 3 in. of soil. **Value:** Pumice bed too thin to support commercial operation. **Ref:** 19, p. 24.
 3. **Name:** Cedarbrook. **Loc:** E $\frac{1}{2}$ sec. 12, (9-5E). **Descr:** Pit shows 2 ft. of pumice overlain by 3 in.

- of soil. **Value:** Deposit too thin for commercial operation. **Ref:** 19, p. 24.
4. **Name:** S. Spirit Lake. **Loc:** NW $\frac{1}{4}$ sec. 13, (9-5E). **Descr:** Trail cut shows 27 in. of pumice beneath 3 in. of soil. **Value:** Deposit too thin for commercial operation. **Ref:** 19, p. 24.
 5. **Name:** Ranger Station. **Loc:** Near center sec. 14, (9-5E). **Descr:** Drill hole showed 10 in. of pumice beneath 2 in. of soil. **Value:** Noncommercial. **Ref:** 19, p. 24; 72-A, p. 2, 5.
 - *6. **Name:** Draughon pit. **Loc:** SW $\frac{1}{4}$ sec. 23, (9-5E). **Descr:** Apparently a large deposit. **Value:** Recently operated by Mutual Industries, Ltd., Tacoma, Wash. **Ref:** 135.
 7. **Name:** Swift Creek (A). **Loc:** Near NE. cor. sec. 27, (9-5E). **Descr:** Road cut exposes 5 ft. of pumice overlain by 3 to 4 in. of soil. **Value:** Warrants investigation. **Ref:** 19, p. 24; 96, p. 16.
 8. **Name:** Swift Creek (B). **Loc:** SE $\frac{1}{4}$ sec. 27, (9-5E). **Descr:** Road cut exposes 4 ft. of pumice. **Value:** Thickness of overburden and extent of pumice should be determined. **Ref:** 19, p. 23.
 9. **Name:** Swift Creek (C). **Loc:** N $\frac{1}{2}$ sec. 34, (9-5E). **Descr:** Gulch exposes 12 ft. of pumice overlain by 2 in. of soil. **Value:** Warrants development. **Ref:** 19, p. 23.
 10. **Name:** Swift Creek (D). **Loc:** NW $\frac{1}{4}$ sec. 34, (9-5E). **Descr:** Gulch exposes 13 to 20 ft. of pumice overlain by 1 ft. of soil. **Value:** Warrants development. **Ref:** 19, p. 24.
 11. **Name:** St. Charles Lake. **Loc:** SW $\frac{1}{4}$ sec. 5, (9-6E). **Descr:** Pit exposes, from surface down: 1 in. of soil, 12 in. of pumice, 6 in. of silt, and 56 in. of pumice. **Value:** Warrants investigation. **Ref:** 19, p. 24.
 12. **Name:** Deadman Lake. **Loc:** NE $\frac{1}{4}$ sec. 2, (10-5E). **Descr:** Pit exposes 30 in. of pumiceous silt overlain by 6 in. of soil. **Value:** Probably too impure for most uses. **Ref:** 19, p. 25.
 13. **Name:** Green River (A). **Loc:** SW $\frac{1}{4}$ sec. 12, (10-5E). **Descr:** Pit exposes 22 in. of stream-worn pumice and silt overlain by 2 in. of soil. **Value:** Pumice too thin for commercial development. **Ref:** 19, p. 25.
 14. **Name:** Green River (B). **Loc:** N $\frac{1}{2}$ sec. 13, (10-5E). **Descr:** Pit exposes 7 in. of pumice overlain by 6 in. of soil. **Value:** Noncommercial. **Ref:** 19, p. 25.
 15. **Name:** Goat Mountain. **Loc:** W $\frac{1}{2}$ sec. 8, (10-6E). **Descr:** Pit exposes 22 in. of pumice overlain by 6 in. of soil. **Value:** Deposit too thin for commercial development. **Ref:** 19, p. 25.
 16. **Name:** Golconda prospect. **Loc:** At portal of Golconda prospect tunnel near W. $\frac{1}{4}$ cor. sec. 16, (10-6E). **Descr:** Exposed from surface down are: 3 in. of soil, 8 to 14 in. of pumice, 14 in. of silt, and 45 in. of pumice. **Value:** Warrants investigation. **Ref:** 19, p. 25.
 17. **Name:** Ryan Lake. **Loc:** N. center sec. 16, (10-6E). **Descr:** Pit exposes 2 ft. of pumice overlain by 6 in. of silt and pumicite. **Value:** Pumice bed too thin for commercial development. **Ref:** 19, p. 25.
 18. **Name:** Polar Star prospect. **Loc:** At portal of Polar Star tunnel in N $\frac{1}{2}$ sec. 18, (10-6E). **Descr:** 10 to 14 in. of pumice mantled by 3 in. of soil. **Value:** Noncommercial. **Ref:** 19, p. 25.
 19. **Name:** Strawberry Lookout. **Loc:** N $\frac{1}{2}$ sec. 22, (10-6E). **Descr:** Pit exposes 2 in. of pumice overlain by 6 in. of soil. **Value:** Noncommercial. **Ref:** 19, p. 25.
 20. **Name:** Lookout trail (A). **Loc:** Near S. line sec. 22, (10-6E). **Descr:** Stream cut exposes 10 ft. of pumice mixed with a little clay, sand, and a few rock fragments. **Value:** Warrants investigation. **Ref:** 19, p. 25.
 21. **Name:** Lookout trail (B). **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (10-6E). **Descr:** Pit exposes, from surface down: 1 in. of soil, 8 in. of pumice, 5 in. of silt, and 44 in. of pumice. **Value:** Warrants investigation. **Ref:** 19, p. 25.
 22. **Name:** Green River (C). **Loc:** Near N. $\frac{1}{4}$ cor. sec. 29, (10-6E). **Descr:** Trail cuts expose 6 to 12 in. of pumice overlain by 2 to 3 in. of soil. **Value:** Pumice bed too thin for commercial use. **Ref:** 19, p. 24.
 23. **Name:** Clearwater Creek. **Loc:** NW $\frac{1}{4}$ sec. 34, (10-6E). **Descr:** Trail cuts expose 1 to 3 ft. of pumice contaminated by rotten logs and stumps. **Value:** Quantity and quality below commercial grade. **Ref:** 19, p. 25.
- SNOHOMISH COUNTY**
1. **Name:** Oso. **Loc:** Sec. 8, (32-7E). **Descr:** 20 to 25 acres reported to be underlain by alluvial deposit of pumice. **Value:** Warrants investigation. **Ref:** 135.
 - *2. **Name:** Darrington. **Loc:** Secs. 13 and 24, (31-10E). **Descr:** Alluvial deposit of pumice. **Value:** Recently operated by Unit Company, Inc., Seattle, Wash. **Ref:** 66-B, p. 36; 135.
- YAKIMA COUNTY**
- *1. **Name:** Zillah pit. **Loc:** Near center sec. 11, (11-20E). **Descr:** Stream-worn cobbles and pebbles of pumice said to cover an area of 10 acres to a depth of more than 20 ft. **Value:** Recently operated by White Diamond Pumice Mining Co., Sunnyside, Wash. **Ref:** 135.
 2. **Name:** Mount Tumac. **Loc:** NW. part of T. 14 N., R. 12 E. **Descr:** Volcanic scoria scattered around the cone of Mount Tumac. **Value:** Large quantity of material which might have some future use. **Ref:** 96, p. 16.
- PUMICITE**
- SKAGIT COUNTY**
1. **Name:** Skagit River. **Loc:** Sec. 11, (36-11E). **Descr:** Three deposits of pumicite within an area of about 40 acres. An estimated 15,000 to 18,000 tons avail-

able and covered by less than 15 ft. of overburden. **Value:** A few carloads of material has been mined. **Ref:** 19, p. 60-61; 96, p. 16.

LEWIS COUNTY

2. **Name:** Mill Creek. **Loc:** Near center SE $\frac{1}{4}$ sec. 13, (12-1E). **Descr:** Water-laid partially decomposed and consolidated pumicite 12 ft. thick is exposed for 250 ft. Topographic expression of the deposits extend upstream $\frac{1}{2}$ mi. **Value:** Warrants investigation. **Ref:** 19, p. 61.

CHELAN COUNTY

3. **Name:** Lakeside. **Loc:** SW $\frac{1}{4}$ sec. 17, (27-22E). **Descr:** Road cuts expose 8 to 10 ft. of pumicite interstratified with thin beds of clay and sand. **Value:** Warrants investigation. **Ref:** 19, p. 62.
4. **Name:** Mud Creek. **Loc:** Near SE. cor. sec. 4, (26-20E). **Descr:** Road cut exposes pumicite for 75 ft. to depth of 8 ft. **Value:** Included foreign matter makes its value doubtful. **Ref:** 19, p. 62.
5. **Name:** Entiat. **Loc:** NW $\frac{1}{4}$ sec. 29, (25-21E). **Descr:** Highway and railway cuts expose pumicite intermittently for $\frac{1}{2}$ mi. It is impure and covered by 3 to 10 ft. of silt. **Value:** Heavy mantle and impure condition of the pumicite make its value doubtful. **Ref:** 19, p. 62.
6. **Name:** MacDougal Canyon. **Loc:** Sec. 2, (23-19E). **Descr:** Several small wedge-shaped deposits along the sides of the canyon. Pumicite contains 20 percent impurity. **Value:** 100 yd. sold for use in pumice blocks in 1946. **Ref:** 19, p. 63.

KITTITAS COUNTY

7. **Name:** Roza pit. **Loc:** NW $\frac{1}{4}$ sec. 22, (15-19E). **Descr:** Bed of light-gray pumicite at least 3 ft. thick. **Value:** 2 or 3 tons mined for use in mechanics' soap at one time. **Ref:** 19, p. 65-66.
8. **Name:** Sentinel Bluff. **Loc:** Sec. 4, (15-23E), and sec. 32, (16-23E). **Descr:** Thin bed of pumicite can be seen near top of cliffs on W. side of the Columbia River. **Value:** Inaccessible. **Ref:** 19, p. 65.

YAKIMA COUNTY

9. **Name:** Wenas. **Loc:** NW $\frac{1}{4}$ sec. 6, (13-19E). **Descr:** This deposit typical of many scattered through northern Yakima and southern Kittitas Counties. Bed having maximum thickness of 2 ft. exposed for 100 ft. under 2 to 5 ft. of overburden. **Value:** Bed rather thin for commercial development. **Ref:** 19, p. 66; 72-A, p. 2, 6.
- 9A. **Name:** Selah No. 1. **Loc:** SW $\frac{1}{4}$ sec. 35, (14-18E). **Descr:** Pumicite tested for pozzolanic activity. **Value:** Warrants investigation. **Ref:** 72-A, p. 2, 6.
- 9B. **Name:** Selah No. 2. **Loc:** Center sec. 36, (14-18E). **Descr:** Pumicite tested for pozzolanic activity. **Value:** Warrants investigation. **Ref:** 72-A, p. 2, 6.
- *9C. **Name:** Army. **Loc:** Sec. 20, (14-23E). **Descr:** Pumicite bed several feet thick. **Value:** Large quantity was mined and used as pozzolan in Priest Rapids Dam in 1957. **Ref:** 72-A, p. 18-22; 93-A, p. 18.

10. **Name:** Moxee City. **Loc:** Sec. 25, (12-20E). **Descr:** A 15-ft. bed of pumicite, associated with tuff and clay, is capped by basalt. **Value:** Warrants investigation. **Ref:** 19, p. 67; 96, p. 16.
11. **Name:** Snipes Mountain. **Loc:** Secs. 32 and 33, (10-22E). **Descr:** Series of sediments which includes at least 4 pumicite members totaling 41 ft. in thickness. **Value:** Warrants investigation. **Ref:** 19, p. 66-67; 72-A, p. 2, 6; 81-B; 96, p. 16.
- 11A. **Name:** Toppenish Ridge. **Loc:** NE $\frac{1}{4}$ sec. 6, (9-20E). **Descr:** Pumicite bed 28 ft. thick in sediments overlain by basalt. **Value:** Unknown. **Ref:** 81-B.
- 11B. **Name:** Horse Heaven Hills. **Loc:** Secs. 34, 35, and 36, (8-22E). **Descr:** 50 ft. of pumicite in sediments overlain by basalt. **Value:** Unknown. **Ref:** 81-B.

GRANT COUNTY

- *12. **Name:** Beverly. **Loc:** W $\frac{1}{2}$ sec. 23, (15-23E). **Descr:** Consolidated pumicite 28 to 35 ft. thick. 30,000 to 40,000 tons could be removed before underground mining became necessary. **Value:** Commercial quantity and quality. Operated for short time by Superior Portland Cement, Inc., Seattle, under lease from N. W. L. Brown. **Ref:** 19, p. 65; 66-D, p. 32; 72-A, p. 2, 5; 81-B; 96, p. 16.
13. **Name:** Sentinel Mountain. **Loc:** Extends from center sec. 4, (15-24E) into sec. 2, (15-24E). **Descr:** 10- to 20-ft. bed of consolidated pumicite with relationships similar to Beverly deposit. **Value:** Warrants investigation. **Ref:** 19, p. 65.

BENTON COUNTY

14. **Name:** Rider pit. **Loc:** Near N. line NE $\frac{1}{4}$ sec. 4, (10-26E). **Descr:** Exposed for length of 90 ft. and to depth of 15 ft. **Value:** Small quantity sold for use in scouring powder at one time. **Ref:** 19, p. 68.
- 14A. **Name:** Prosser. **Loc:** 3 mi. E. of Prosser, in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (9-25E). **Descr:** 6-ft. interbasalt bed of pumicite. **Value:** Unknown. **Ref:** 81-B.
- 14B. **Name:** South Prosser. **Loc:** Sec. 4, (8-25E), S. of Prosser. **Descr:** 20 ft. of impure pumicite in sediments overlain by basalt. **Value:** Unknown. **Ref:** 81-B.
- 14C. **Name:** Nine Canyon. **Loc:** SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (7-30E). **Descr:** 9 to 10 ft. of pumicite overlain by basalt. **Value:** Unknown. **Ref:** 81-B.

FRANKLIN COUNTY

15. **Name:** Richland. **Loc:** Sec. 36, (11-28E). **Descr:** A 2- to 4-ft. bed of pumicite interbedded with thin sand and clay layers. **Value:** May be too impure for most uses. **Ref:** 96, p. 16.

WALLA WALLA COUNTY

16. **Name:** Wallula. **Loc:** SW $\frac{1}{4}$ sec. 21, (7-32E). **Descr:** Patches of pumicite at least 4 ft. thick. **Value:** Warrants investigation. **Ref:** 19, p. 70.
17. **Name:** Touchet. **Loc:** N. center sec. 21, (7-33E). **Descr:** Several pumicite beds as much as 4 ft. thick. **Value:** Warrants investigation. **Ref:** 19, p. 70-71.
18. **Name:** Dry Creek. **Loc:** Near W. $\frac{1}{4}$ cor. sec. 16, (7-33E). **Descr:** Bed 4 ft. thick, possibly 200 to 300

ft. long and 75 ft. wide. **Value:** Might support small operation. **Ref:** 19, p. 71.

19. **Name:** Pleasant Ridge Road. **Loc:** SE $\frac{1}{4}$ sec. 5, (7-33E). **Descr:** Drill hole encountered 8 ft. of pumicite which is believed to cover an area 500 to 600 ft. long and at least 100 ft. wide. **Value:** Warrants investigation. **Ref:** 19, p. 71.
20. **Name:** Strohmaier. **Loc:** On Strohmaier place in SW $\frac{1}{4}$ sec. 24, (8-33E). **Descr:** Lens of pumicite about 700 ft. long, 100 ft. wide, and 6 to 7 ft. thick at its center. **Value:** Warrants investigation. **Ref:** 19, p. 71; 72-A, p. 2, 5.
21. **Name:** Dodds Road. **Loc:** SW $\frac{1}{4}$ sec. 23, (8-33E). **Descr:** Deposit 13 ft. thick exposed for 550 ft. **Value:** Warrants investigation. **Ref:** 19, p. 72; 72-A, p. 2, 5.
22. **Name:** Touchet River. **Loc:** SE $\frac{1}{4}$ sec. 35, (9-33E). **Descr:** Road cut exposes 11 ft. of pumicite overlain by 3 ft. of silt. **Value:** Warrants investigation. **Ref:** 19, p. 72; 72-A, p. 2, 5.
23. **Name:** Eureka. **Loc:** Near N. $\frac{1}{4}$ cor. sec. 5, (9-34E). **Descr:** Pumicite 3 to 3 $\frac{1}{2}$ ft. thick and 50 ft. wide exposed about 300 ft. along road. **Value:** Might support small operation. **Ref:** 19, p. 72; 72-A, p. 2, 5.
24. **Name:** Prescott-Pleasantville Road. **Loc:** In gully followed by Prescott-Pleasantville road. **Descr:** Pumicite exposed for distance of 800 ft. to a depth of 4 ft. Probably less than 25 ft. wide. **Value:** Might be worked on small scale. **Ref:** 19, p. 72.

COLUMBIA COUNTY

25. **Name:** Lyons Ferry. **Loc:** Near S. $\frac{1}{4}$ cor. sec. 30, (13-37E). **Descr:** Pumicite has accumulated on the N. sides of small ridges. Each deposit is about 200 ft. long, 30 to 50 ft. wide, and 1 to 10 ft. thick. **Value:** Warrant investigation. **Ref:** 19, p. 73.
- 25A. **Name:** Starbuck. **Loc:** Center sec. 13, (12-37E). **Descr:** Pumicite tested for pozzolanic activity. **Value:** Warrants investigation. **Ref:** 72-A, p. 2, 5.
26. **Name:** Snake River. **Loc:** Sec. 13, (13-39E). **Descr:** Pumicite 2 to 9 ft. thick interbedded with fine

sand has been reported. **Value:** Unknown. **Ref:** 19, p. 73; 96, p. 16.

GARFIELD COUNTY

27. **Name:** Garfield. **Loc:** Center sec. 18, (11-44E). **Descr:** Deposit about 50 ft. long, 20 ft. wide, and 8 ft. thick. **Value:** Too small for other than local use. **Ref:** 19, p. 73; 72-A, p. 2, 5.

ASOTIN COUNTY

28. **Name:** Dry Gulch. **Loc:** SE $\frac{1}{4}$ sec. 34, (10-44E). **Descr:** Pits and quarry expose well-stratified and consolidated pumicite as much as 15 ft. thick. **Value:** Used occasionally as building materials in Lewiston-Asotin area. **Ref:** 19, p. 74-75; 72-A, p. 2, 5; 96, p. 16.
29. **Name:** Asotin Creek. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 3, (9-44E). **Descr:** Gully exposes 10 ft. of unconsolidated pumicite for length of 100 ft. and width of 30 ft. **Value:** Too small for other than local use. **Ref:** 19, p. 75.

WHITMAN COUNTY

30. **Name:** Wawawai. **Loc:** Along road on N. side of Snake River between Wawawai and Lewiston, Idaho. **Descr:** Several small alluvial fan deposits. **Value:** Noncommercial. **Ref:** 19, p. 75.
31. **Name:** Wawawai Canyon. **Loc:** NE $\frac{1}{4}$ sec. 18, (13-44E). **Descr:** Deposit 150 ft. long, 10 to 25 ft. wide, and 14 ft. thick at its center. **Value:** Might support small operation. **Ref:** 19, p. 75-76.
32. **Name:** Willow Creek. **Loc:** E. center sec. 19, (15-39E). **Descr:** Creek bank exposes pumicite for length of 100 ft., width of less than 30 ft., and maximum thickness of 8 $\frac{1}{2}$ ft. **Value:** Too small for commercial use. **Ref:** 19, p. 76.

SPOKANE COUNTY

- *33. **Name:** Mead. **Loc:** SW $\frac{1}{4}$ sec. 2, (26-43E). **Descr:** A 10-ft. bed of pumicite opened by a pit 150 ft. long and 25 ft. wide. **Value:** Formerly used by Building Supplies, Inc. for dusting brick molds. **Ref:** 19, p. 77-78; 66-C, p. 30.

QUARTZ, MASSIVE

Massive quartz is silicon dioxide (SiO₂). It is white, clear, or less often rose or smoky colored, and occurs as veins, dike-like masses, or lenses. It may be of high purity or may be mixed with other minerals.

It is used as a flux in copper smelting, in the manufacture of silicon, ferrosilicon, and silicon carbide, in chemical ware, as a filter for acid towers, for tube-mill linings, as an abrasive, and for poultry grit.

A number of bodies of massive quartz have recently been worked in Washington, and others of commercial

size and quality are known. The Washington occurrences of massive quartz that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences. For other occurrences of quartz see "Quartzite," "Sandstone," and "Silica sand."

The average value of quartz sold in the United States in 1952 was \$4.11 per ton.

OCCURRENCES

On page 65 in volume 2 is plate 30, the map showing the occurrences of massive quartz, numbered to correspond with the numbers of the occurrences listed below.

WHATCOM COUNTY

- *1. **Name:** Olympic. **Loc:** SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (40-5E). **Descr:** Massive quartz body in greenstone, containing 99.3 percent silica and 0.3 percent ferric oxide. White fusion at cone 32. **Value:** Recently used by The Olympic Portland Cement Co., Ltd., as a retarding agent in portland cement. **Ref:** 63, p. 155-158; 96, p. 17; 150, p. 52-53.

SKAGIT COUNTY

2. **Name:** Doris. **Loc:** Said to be in sec. 4, (36-11E), but is probably the Doris claim of the Scheel deposit in sec. 16, (36-11E). **Descr:** Cliff exposes a body of massive quartz, 50 by 100 ft., in quartz diorite and schist. **Value:** A few thousand tons available without underground mining. **Ref:** 96, p. 17.
- *3. **Name:** Stoner. **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, (36-11E). **Descr:** Lens of quartz, 90 ft. thick, is exposed vertically for 85 ft. and laterally for 300 ft. Two smaller masses flank it on either side. Composite sample from the three bodies contained 99.6 percent silica and 0.13 percent ferric oxide. Glassy fusion at cone 32 $\frac{1}{2}$. **Value:** Worked by Skagit Mineral Products Co., Inc. in 1943. Recently developed by Northwest Crushing Co. **Ref:** 63, p. 152-155; 96, p. 17; 106-B; 150, p. 48.
4. **Name:** Silica Camp. **Loc:** Sec. 15, (36-11E). **Descr:** Large quartz lens in schist. **Value:** Worked by Skagit Mineral Products Co., Inc. in 1943. **Ref:** 55, p. 32; 96, p. 17.
- 4A. **Name:** Pressentin. **Loc:** Near center W $\frac{1}{2}$ sec. 15, (36-11E). **Descr:** Several lenses of quartz in schist, two of which are 14 and 22.7 ft. thick. **Value:** Doubtful. **Ref:** 96, p. 17; 106-B.
5. **Name:** Scheel (part of the Bacon Creek deposit). **Loc:** Sec. 16, (36-11E), 450 ft. above Bacon Creek. **Descr:** Quartz vein. A composite sample, from a 300-ton block, contained 99.0 percent silica, 0.47 percent ferric oxide, and 0.4 percent alumina. Clear fusion at cone 32. **Value:** Was sold in 1942, after crushing, as pulpstone and, after grinding, for molding sand and glass sand. **Ref:** 106-B; 150, p. 48.
6. **Name:** Bacon Creek. **Loc:** Secs. 16 and 17, (36-11E). **Descr:** Several large quartz lenses in schist. **Value:** Recently worked by Skagit Mineral Products Co., Inc. **Ref:** 55, p. 32; 75-A, p. 37; 96, p. 17; 106-B.
- 6A. **Name:** Mineral Park. **Loc:** A few hundred feet NW. of Cascade River near Mineral Park. **Descr:** Quartz body 50 ft. thick estimated to contain 1,000,000 tons of quartz. **Value:** Warrants investigation. **Ref:** 135.

7. **Name:** Rockport. **Loc:** Said to be at Rockport but is actually the Scheel deposit on Bacon Creek. **Value:** Opened and worked on a small scale by the H. P. Scheel Eversharp Pulp-Burr Co., Tacoma. **Ref:** 48, p. 94.

- 7A. **Name:** Good Luck. **Loc:** SW $\frac{1}{4}$ sec. 21, (28-11E). **Descr:** Quartz pegmatite is 500 ft. long and 50 to 100 ft. wide. **Value:** Warrants investigation. **Ref:** 135.

KING COUNTY

- *7B. **Name:** White River. **Loc:** NW $\frac{1}{4}$ sec. 1, (19-7E). **Descr:** Completely silicified andesite. **Value:** Formerly quarried by Denny-Renton Clay & Coal Co. and used in manufacture of silica brick. Currently quarried by Manufacturers Mineral Co. **Ref:** 48, p. 95; 63, p. 145-147; 64-A, p. 799.
- *7C. **Name:** Superior. **Loc:** NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, (19-7E), just N. of highway. **Descr:** Completely silicified andesite. Apparently large tonnage available. Contains 97.48 percent silica, 0.28 percent ferric oxide, 0.84 percent alumina, 0.04 percent lime, 0.12 percent magnesia, and less than 0.10 percent total alkalis. **Value:** Quarry was operated by Superior Portland Cement, Inc. in 1948. **Ref:** 135.

PIERCE COUNTY

8. **Name:** Siegmund Ranch. **Loc:** NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, (17-5E). **Descr:** Vein of massive quartz as much as 25 ft. wide and traceable for several hundred yards. Contains 95.1 percent silica, 0.6 percent ferric oxide, and gave glassy fusion at cone 31 to 32. **Value:** Warrants investigation. **Ref:** 48, p. 94; 63, p. 147-148; 96, p. 17; 103, p. 112-113.

SKAMANIA COUNTY

9. **Name:** Yacolt. **Loc:** Sec. 13, (4-5E). **Descr:** A 4 $\frac{1}{2}$ -ft. quartz vein of good quality cutting andesite. **Value:** Vein probably too narrow to support commercial operation. **Ref:** 96, p. 17.

KITTITAS COUNTY

10. **Name:** Boose. **Loc:** Reported 6 mi. S. of Cle Elum. **Descr:** Said to be a 6-ft. vein of quartz which assays 97 percent silica. **Value:** Unknown. **Ref:** 135.
11. **Name:** Silver Creek mine. **Loc:** Sec. 12, (23-14E). **Descr:** Veins or lenses of massive quartz which carry disseminated sulfides. **Value:** Mining difficulties make its value doubtful. **Ref:** 96, p. 17.

CHELAN COUNTY

12. **Name:** Burch Mountain. **Loc:** W $\frac{1}{2}$ sec. 4 and NE. cor. sec. 5, (23-20E) and E $\frac{1}{2}$ sec. 32, (24-20E). **Descr:** Several quartz veins which average 96 percent silica. The largest is 25 ft. wide and traceable for 800 ft. **Value:** Warrants investigation. **Ref:** 48, p. 94; 63, p. 126-127; 66, p. 56.
13. **Name:** Boyles. **Loc:** NE $\frac{1}{4}$ sec. 9, (23-20E). **Descr:** Several small quartz lenses. **Value:** Several small pits failed to show silica in commercial quantity. **Ref:** 66, p. 55; 96, p. 17.

14. **Name:** Leavenworth. **Loc:** Center sec. 10, (24-17E). **Descr:** Body of pegmatitic quartz in diorite exposed in a sloping area 40 by 50 ft. to a height of 35 ft. **Value:** Might support small operation. **Ref:** 66, p. 56.

15. **Name:** Merritt. **Loc:** SE $\frac{1}{4}$ sec. 6, (26-16E). **Descr:** Lens of white pegmatitic quartz in schist. **Value:** Mined by Ohio Ferro-Alloys Corp. for use in ferrosilicon, but mining costs prohibitive. Currently sold to mineral collectors. **Ref:** 48, p. 94; 63, p. 122-126; 66, p. 56.

15A. **Name:** Harris Creek. **Loc:** NE $\frac{1}{4}$ sec. 33, (27-20E), on Harris Creek. **Descr:** Quartz assaying 99.56 percent silica, 0.08 percent ferric oxide, 0.16 percent alumina, no lime, 0.02 percent magnesia, and 0.08 percent ignition loss is reported in an outcrop 40 ft. wide and 150 ft. long. **Value:** Warrants investigation. **Ref:** 135.

OKANOGAN COUNTY

16. **Name:** Malott. **Loc:** SE $\frac{1}{4}$ sec. 22, (32-25E). **Descr:** Three pegmatite dikes contain more than 100,000 tons of impure silica. **Value:** Warrants investigation. **Ref:** 135.

16A. **Name:** Loup Loup. **Loc:** W $\frac{1}{2}$ sec. 29, (34-25E), on top of hill. **Descr:** Large uniform deposit of quartz, free of impurities, crops out on hilltop. **Value:** Warrants investigation. **Ref:** 135.

16B. **Name:** Howell. **Loc:** S $\frac{1}{2}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 6, (33-25E). **Descr:** Massive quartz. **Value:** Unknown. **Ref:** 135.

16C. **Name:** Snow White. **Loc:** S $\frac{1}{2}$ sec. 36, (36-23E), $\frac{1}{4}$ mi. NW. of Wagon Camp. **Descr:** 50,000 tons of pegmatitic quartz exposed assayed 99.78 percent SiO₂. **Value:** Owned by H. M. Taylor and W. W. Cheetham, Okanogan. **Ref:** 135.

17. **Name:** Chloride Queen mine. **Loc:** Dump, Chloride Queen mine in SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, (39-21E). **Descr:** Quartz gave glassy fusion at cone 32. **Value:** Quantity not known. **Ref:** 150, p. 43.

FERRY COUNTY

17A. **Name:** Independent Mountain. **Loc:** Sec. 22, (40-35E), on Independent Mountain. **Descr:** Good grade of quartz reported on 4 claims. **Value:** Silica was produced in 1957 by Prichard Silica, Inc. **Ref:** 124-B, p. 9; 135.

17B. **Name:** Cedar Ridge. **Loc:** On Cedar Ridge, N. of Barnaby Creek road, 7 mi. W. of Columbia River. **Descr:** Pegmatitic quartz segregations reported

by Frank W. Blasher, 217 - 8th Ave. So., Seattle. **Value:** Unknown. **Ref:** 135.

STEVENS COUNTY

18. **Name:** Steinmetz. **Loc:** Sec. 24, (30-42E). **Descr:** Large quartz vein reported to contain 3,000,000 tons of material which assays 97.2 percent silica. **Value:** Warrants investigation. **Ref:** 135.

18A. **Name:** Blue Grouse Mountain. **Loc:** On E. flank of Blue Grouse Mountain, probably in S $\frac{1}{2}$ sec. 15, (30-42E). **Descr:** Large quartz body of unknown purity. **Value:** Warrants investigation. **Ref:** 135.

18B. **Name:** Big Smoke. **Loc:** SW $\frac{1}{4}$ sec. 31, (28-38E), on Spokane Indian Reservation. **Descr:** More than 100,000 tons of pegmatitic quartz outcropping said to assay 99.39 to 99.83 percent SiO₂. **Value:** Leased by Big Smoke Uranium, Inc., Spokane. **Ref:** 135.

PEND OREILLE COUNTY

19. **Name:** Sauvola. **Loc:** E $\frac{1}{2}$ sec. 15, (39-42E). **Descr:** Said to be a vein or pegmatite dike of quartz "2,000 ft. thick, 600 ft. deep, and traceable for 2,000 ft." **Value:** Unknown but warrants investigation. **Ref:** 27, p. 51.

SPOKANE COUNTY

*20. **Name:** Denison (Latshaw). **Loc:** NE $\frac{1}{4}$ sec. 14, (27-42E). **Descr:** Segregation of pegmatitic quartz in granite forms a hill 200 ft. high and 500 ft. in diameter. The quartz is clear and contains from 97.8 to 99.4 percent silica. **Value:** Pacific Silica Co., Seattle, currently produces silica from the deposit. **Ref:** 2-A, p. 31; 48, p. 94; 55, p. 30; 63, p. 14-32; 75-A, p. 28-29.

21. **Name:** Dishman. **Loc:** SW $\frac{1}{4}$ sec. 20, (25-44E). **Descr:** Lens of quartz, somewhat granular and seemingly very pure, occurs in granite. **Value:** Probably too small to be of commercial value. **Ref:** 135.

21A. **Name:** Glander. **Loc:** NW $\frac{1}{4}$ sec. 24, (29-45E). **Descr:** Reported to be large body of massive quartz. **Value:** Unknown. **Ref:** 135.

21B. **Name:** Quartz Mountain. **Loc:** NW $\frac{1}{4}$ sec. 35, (28-45E). **Descr:** 50,000,000 tons of massive quartz reported. **Value:** Warrants investigation. **Ref:** 124-B, p. 13; 135.

LINCOLN COUNTY

22. **Name:** Egypt. **Loc:** SE $\frac{1}{4}$ sec. 6, (27-37E), 17 mi. N. of Davenport. **Descr:** Apparently large deposit of very pure massive quartz reported by James K. and Eugene Frederick, Davenport. **Value:** Undeveloped but warrants investigation. **Ref:** 135.

QUARTZITE

Quartzite is metamorphosed sandstone consisting largely of quartz (silica) grains so thoroughly cemented or recrystallized that it breaks as easily through the grains as around them.

It has been used chiefly in the manufacture of silica brick but also as an abrasive, as a flux, in chemical ware, in the manufacture of ferrosilicon, as a filter for acid towers, for tube mill liners, and for poultry grit.

The quartzite areas of Washington are shown on the accompanying map. As the geology is better known for some counties and areas within counties than for others, the information shown is not of equal accuracy over the entire map. In Stevens, Pend Oreille, Lincoln, and Whitman Counties, actual areas of quartzite are outlined. In

Ferry, Okanogan, Spokane, Snohomish, and Whatcom Counties, rock series containing quartzite are outlined.

Only a few deposits of quartzite have been worked in recent years, but many others of equal size and purity are known. The Washington deposits of quartzite that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits. For other occurrences of silica see "Quartz, massive," "Sandstone," and "Silica sand."

Quartzite used in the manufacture of silica brick sold for an average value of \$2.85 per ton in 1946. The average value of all quartz (including quartzite) sold in the United States in 1952 was \$4.11 per ton.

OCCURRENCES

On page 67 in volume 2 is plate 31, the map showing the occurrences of quartzite, numbered to correspond with the numbers of the occurrences listed below.

KING COUNTY

- *1. **Name:** White River. **Loc:** NW¼ sec. 1, (19-7E) and surrounding area. **Descr:** Rock resembling quartzite or chert but probably a silicified igneous rock. **Value:** Quarried at one time and used in the manufacture of silica brick by the Denny-Renton Clay & Coal Co. Currently operated by Manufacturers Mineral Co. **Ref:** 48, p. 95; 63, p. 145-147; 64-A, p. 799.

PEND OREILLE COUNTY

- *1A. **Name:** Metaline Falls. **Loc:** NE¼ sec. 27, (39-43E). **Descr:** Quartzite. **Value:** Currently used in the manufacture of portland cement by Lehigh Portland Cement Co. **Ref:** 2-A, p. 26; 124-B, p. 12.
- 1B. **Name:** Eagle. **Loc:** Sec. 2, (36-43E). **Descr:** Massive white quartzite in outcrop 3,500 ft. long, 1,000 ft. wide, and 700 ft. thick. Contains 97 to 98 percent silica, 0.7 percent alumina, and 0.2 percent ferric oxide. **Value:** Warrants investigation. **Ref:** 135.

STEVENS COUNTY

2. **Name:** Steep Cliff. **Loc:** W½ sec. 9 and sec. 16, (32-40E). **Descr:** Large tonnage of readily accessible quartzite which averages 96.3 percent silica. **Value:** Commercial quantity and quality. **Ref:** 63, p. 45-49.
- 2A. **Name:** Chewelah Creek. **Loc:** NE¼NW¼ sec. 35, (33-40E). **Descr:** Quartzite reported to contain 98 to 99 percent silica. **Value:** Unknown. **Ref:** 135.
3. **Name:** Chewelah. **Loc:** SW¼NE¼ sec. 4, (32-40E). **Descr:** Quartzite body 1,000 ft. long and 150 ft. wide contains 97.7 to 98.7 percent silica. **Value:** Worked by Ohio Ferro-Alloys Corp., Tacoma, in 1947. **Ref:** 53, p. 25; 63, p. 41-44.
4. **Name:** Inklers Point. **Loc:** Sec. 14, (31-40E). **Descr:** More than 1,000,000 tons of accessible quartzite containing from 96.8 to 98.1 percent silica. **Value:**

Some used as road metal. Probably suitable for other uses. **Ref:** 63, p. 32-40; 96, p. 17; 124-B, p. 10.

- *4A. **Name:** Cottonwood Creek. **Loc:** SE¼ sec. 6, (31-41E). **Descr:** Quartzite containing 99.35 percent silica, 0.14 percent ferric oxide, and 0.30 percent alumina. **Value:** Quarried by Pacific Silica Co. in 1957. **Ref:** 93-A, p. 27; 124-B, p. 7.
5. **Name:** Lane Mountain. **Loc:** E½SE¼ sec. 34, (31-39E). **Descr:** Massive low-iron quartzite. Also some friable sandstone resembling that at the Springdale property. **Value:** Potential source of glass sand or molding sand. **Ref:** 135.
6. **Name:** Empey Mountain. **Loc:** SE¼NE¼ sec. 4, (30-39E). **Descr:** Hard varicolored quartzite. **Value:** Developed to some extent but probably of small commercial value. **Ref:** 53, p. 21.
- *7. **Name:** Springdale (Lyons Hill, Marshall). **Loc:** NW¼SW¼ and SW¼NW¼ sec. 13, (29-39E). **Descr:** Easily disintegrated white to yellow quartzite of remarkable purity. **Value:** Suitable for glass sand, molding sand, white plaster sand, and chemical uses. Quarried by Exploration & Development Associates, Los Altos, Calif., in 1958. **Ref:** 75-A, p. 33-36; 93-A, p. 19; 114-B; 124-B, p. 11; 135.

SPOKANE COUNTY

8. **Name:** Moran Prairie. **Loc:** Sec. 15, (24-43E). **Descr:** Quartzite, containing some iron and muscovite, is partially capped by basalt. **Value:** Nearness to Spokane gives it potential usefulness. **Ref:** 96, p. 17.

WHITMAN COUNTY

9. **Name:** Stratton Butte. **Loc:** Sec. 18, (18-46E). **Descr:** Quartzite, considered to be a commercial source of silica. **Value:** Warrants investigation. **Ref:** 63, p. 88; 96, p. 17.
10. **Name:** Steptoe Butte. **Loc:** Covers secs. 19, 20, 29, and 30, (18-44E). **Descr:** Quartzite, containing a little mica and iron oxide. **Value:** Possible source of silica. **Ref:** 63, p. 82-85; 96, p. 17.

11. **Name:** Ladow Butte. **Loc:** Secs. 6 and 7, (17-46E). **Descr:** Weathered quartzite. **Value:** Thought to be a possible source of silica. **Ref:** 63, p. 87-88; 96, p. 17.
12. **Name:** Ringo Hills. **Loc:** Secs. 17 and 18, (16-46E).

Descr: Quartzite of fair quality. **Value:** Possibly a source of silica. **Ref:** 63, p. 74-82; 96, p. 17.

13. **Name:** Kamiak Butte. **Loc:** Secs. 15 and 16, (16-45E). **Descr:** Quartzite having a silica content between 96 and 98.5 percent. **Value:** Possible source of silica. **Ref:** 63, p. 69-74; 96, p. 17.

SALINE COMPOUNDS

Saline compounds are naturally occurring soluble salts commonly formed by evaporation of water from closed basins. Those important in Washington are: magnesium sulfate, sodium sulfate, and sodium carbonate. Washington saline compounds are found in lakes which occupy undrained depressions in the eastern part of the state. The saline compounds occur as dissolved components of the lake brines and as crystalline solids. In solid form they occur as efflorescences around the edges of the lakes, disseminated crystals in mud layers at the bottom of the lakes, or as crystalline beds and lenses between the mud layers. The lakes vary in saline content and concentration; a lake rich in sodium carbonate may be separated by less than a mile from one rich in sodium sulfate. Saline compounds have been successfully recovered from several of the lakes, and other lakes are currently under development.

Epsomite or hydrous magnesium sulfate ($\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$) is known commercially under the name of epsom salts. The technical grade (more than 90 percent pure) is used principally in tanning leather. Other uses are in the textile industry, in enameling industries, in fire-proofing compounds, and in the manufacture of paints and soaps. The chemically pure grade is used for medicinal purposes.

Sodium carbonate or natural soda is usually a mixture of sodium carbonate and bicarbonate in varying

proportions. In commerce, where it is known as soda ash, it is used chiefly in the manufacture of glass. This use plus the manufacture of caustic soda and other chemicals consumes nearly 75 percent of the total domestic output. Other uses are in the manufacture of pulp and paper, soaps, cleansers, water softeners, textiles, and in the recovery of alumina.

Sodium sulfate minerals important to commerce are mirabilite or Glauber's salt ($\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$) and thenardite (Na_2SO_4). In commerce, sodium sulfate is known as salt cake. Its chief use is in the manufacture of kraft pulp and paper, a use which consumes more than 75 percent of the total domestic production. Other important uses are in the manufacture of glass, stock feeds, sodium chemicals, and as a flux in metallurgy.

In 1956 soda ash was quoted at \$1.65 to \$1.75 per 100 pounds in paper bags, carlots. Salt cake, bulk, was quoted at \$24 per ton; Glauber's salt at \$45 per ton, in bags; and anhydrous sodium sulfate at \$2.50 per 100 pounds, in bags. Magnesium sulfate, 100-percent basis, sold for approximately \$50 per ton in 1945.

The Washington occurrences of saline compounds that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

OCCURRENCES

On page 69 in volume 2 is plate 32, the map showing the occurrences of saline compounds, numbered to correspond with the numbers of the occurrences listed below.

MAGNESIUM SULFATE

OKANOGAN COUNTY

- Name:** Bitter Lake. **Loc:** SE. cor. sec. 7 and NE. cor. sec. 18, (40-27E). **Descr:** Area of about 3 acres. Formerly, rather pure epsomite occurred between mud segregations to depths of from 4 to 20 ft. Now, approximately 9,000 tons of epsomite occur intermixed with mud and other salts. **Value:** Produced epsom salts commercially during World War I. **Ref:** 9; 48, p. 42; 67-B; 96, p. 16; 119, p. 137.
- Name:** Wannacut Lake. **Loc:** Secs. 1, 2, 11, 12, and 13, (39-26E). **Descr:** Area of 334 acres. Brine contains 225,500 tons of various salts, of which 155,000 tons are epsomite. **Value:** Brine rather weak for economical recovery of salts. **Ref:** 9.

- Name:** Poison Lake. **Loc:** NE. cor. SE $\frac{1}{4}$ sec. 5, (38-27E). **Descr:** Mixed salts occur as solid bed 20 ft. thick over area of 20 acres. Total of 820,000 tons of various crystalline salts. Little, if any, crystalline epsomite remains of the original mass, said to have measured 300 by 200 by 25 ft. Analysis of lake-bed material, however, shows about 4 percent of magnesium sulfate (33,800 tons) that could be recovered by leaching. Brine contains 15,000 tons of mixed salts, of which 6,200 tons are epsomite. **Value:** Intermittent production by Agro Minerals, Inc., Tonasket, Wash. **Ref:** 2-A, p. 19; 9; 48, p. 42-43; 96, p. 16; 119, p. 137.

SODIUM CARBONATE

OKANOGAN COUNTY

- Name:** Rimrock Lake. **Loc:** SW $\frac{1}{4}$ sec. 14, (32-26E). **Descr:** Area of 10 acres. Brine contains total of 1,400 tons of dissolved salts, of which 900 tons are sodium carbonate. **Value:** Tonnage alone insufficient for commercial operation. **Ref:** 9.

5. **Name:** Omak Lake. **Loc:** NE $\frac{1}{4}$ T. 32 N., R. 27 E., and SW $\frac{1}{4}$ T. 32 N., R. 28 E. **Descr:** Area of 3,821 acres. Weak brine contains 1,522,000 tons of mixed salts, of which 888,000 tons are sodium carbonate. **Value:** Sufficient tonnage of sodium carbonate to support commercial operation if economical means of treating the weak brine could be devised. **Ref:** 9.

GRANT COUNTY

6. **Name:** Soap Lake. **Loc:** Secs. 12, 13, and 24, (22-26E) and secs. 18 and 19, (22-27E). **Descr:** Large lake with weak brine. Assuming average depth of 25 ft., brine contains 1,172,000 tons of salts, of which 628,000 tons are sodium carbonate. **Value:** Salts probably could not be recovered without making heavy payments to resort owners who depend on salt content of water for reputed medicinal benefit to guests. **Ref:** 9.
7. **Name:** Mitchell Lake. **Loc:** SW $\frac{1}{4}$ sec. 13, (22-29E). **Descr:** Area of 8 acres. Contains 21,000 tons of crystalline salts, of which 11,000 tons are anhydrous sodium carbonate. **Value:** Formerly the source of sal soda and soda ash marketed by Alki, Inc. **Ref:** 9; 48, p. 98; 96, p. 16.
8. **Name:** Carbonate Lake. **Loc:** SW $\frac{1}{4}$ sec. 18, (17-29E). **Descr:** Area of 15 acres. Contained 28,600 tons of mixed crystalline salts, of which 24,500 tons were sodium carbonate. Brine contained 42,600 tons of mixed salts, of which 22,100 tons were sodium carbonate. **Value:** Now destroyed as a saline lake by the U. S. Bureau of Reclamation in connection with canal construction for the Columbia Basin irrigation project. **Ref:** 9; 48, p. 98; 96, p. 16.

SODIUM SULFATE

(Tonnages given are on anhydrous basis.)

OKANOGAN COUNTY

9. **Name:** Cameron Lake. **Loc:** SE $\frac{1}{4}$ sec. 3, (32-26E). **Descr:** Area of 9 acres. Brine contains 8,600 tons of mixed salts, of which 8,000 tons are sodium sulfate. Contains 27,000 tons of mixed salts in crystalline form in addition to the salts in the brine. **Value:** Warrants investigation. **Ref:** 9; 48, p. 99.
10. **Name:** Patterson Lake. **Loc:** E $\frac{1}{2}$ sec. 1, (32-26E). **Descr:** Small lake containing 340 tons of sodium sulfate and 330 tons of sodium carbonate. **Value:** Tonnage alone too small to warrant installation of recovery equipment. **Ref:** 9.
11. **Name:** Murray Lake. **Loc:** S $\frac{1}{2}$ sec. 20, (32-27E). **Descr:** Area of 13 acres. Brine contains 7,880 tons of mixed salts, of which 7,100 tons are sodium sulfate. **Value:** Tonnage alone too small for commercial operation. **Ref:** 9; 48, p. 99.
12. **Name:** Cook Lake. **Loc:** NW $\frac{1}{4}$ sec. 11, (32-26E). **Descr:** Small lake. Brine contains 5,240 tons of mixed salts, of which 3,700 tons are sodium sulfate. **Value:** Tonnage alone below commercial quantity. **Ref:** 9.
13. **Name:** Penley Lake. **Loc:** E $\frac{1}{2}$ sec. 10, (32-26E). **Descr:** Area of 11 acres. Contains 24,350 tons of mixed crystalline salts, of which 23,700 tons are sodium sulfate. Brine contains 8,000 tons of mixed salts, of which 7,000 tons are sodium sulfate. **Value:** Warrants investigation. **Ref:** 9; 48, p. 99.
14. **Name:** Virginia Lake. **Loc:** NE $\frac{1}{4}$ sec. 23 and NW $\frac{1}{4}$ sec. 24, (32-25E). **Descr:** Area of 3 $\frac{1}{2}$ acres. Contains 4,000 tons of sodium sulfate in solid crystal and 4,600 tons in brine. **Value:** Tonnage alone insufficient for commercial operation. **Ref:** 9; 48, p. 99; 96, p. 16.
15. **Name:** Salt Lake (Soap Lake). **Loc:** Secs. 25, 26, 35, and 36, (32-25E). **Descr:** Area of 157 acres. Contains 270,000 tons of mixed salts in brine, of which 194,000 tons are sodium sulfate. **Value:** Warrants investigation. **Ref:** 9; 48, p. 99.
16. **Name:** B. J. Lake. **Loc:** SW $\frac{1}{4}$ sec. 26, (32-25E). **Descr:** Area of 19 acres. Contains about 23,000 tons of total salts, most of which is sodium sulfate, in crystalline form and in the brine. **Value:** Warrants investigation. **Ref:** 9; 48, p. 99.
17. **Name:** Lake "32." **Loc:** SW $\frac{1}{4}$ sec. 32, (32-26E). **Descr:** Area of 7 $\frac{1}{2}$ acres. Contains 1,900 tons of sodium sulfate in brine. **Value:** Tonnage alone insufficient for commercial operation. **Ref:** 9; 48, p. 99.
18. **Name:** Stevens Lake. **Loc:** N $\frac{1}{2}$ sec. 33 and S $\frac{1}{2}$ sec. 29, (32-26E). **Descr:** Area of 8 acres. Contains 1,700 tons of sodium sulfate in brine. **Value:** Tonnage alone below commercial quantity. **Ref:** 9; 48, p. 99.
19. **Name:** Lake "36." **Loc:** NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, (32-26E). **Descr:** Area of 10 $\frac{1}{2}$ acres. Contains 17,270 tons of mixed crystalline salts, of which 16,700 tons are sodium sulfate. Brine contains 9,070 tons of mixed salts, of which 3,000 tons are sodium sulfate. **Value:** Tonnage too small unless worked in conjunction with nearby lakes. **Ref:** 9.
20. **Name:** Hauan Lake. **Loc:** NW $\frac{1}{4}$ sec. 35, (32-26E). **Descr:** Area of 21 acres. Contains 55,890 tons of mixed solid salts, of which 53,900 tons are sodium sulfate. Brine contains 23,300 tons of mixed salts, of which 19,800 tons are sodium sulfate. **Value:** Warrants investigation. **Ref:** 9; 48, p. 99.
21. **Name:** Morris Lake. **Loc:** NW $\frac{1}{4}$ sec. 2 and NE $\frac{1}{4}$ sec. 3, (31-26E) and SW $\frac{1}{4}$ sec. 35, (32-26E). **Descr:** Area of 19 acres. Contains 1,700 tons of sodium sulfate in brine. Also, crystalline salts about 2 $\frac{1}{2}$ ft. thick contain 9,000 tons of sodium sulfate per foot of depth of crystal. **Value:** Warrants investigation. **Ref:** 9; 48, p. 99.
22. **Name:** Lawson Lake. **Loc:** NE $\frac{1}{4}$ sec. 10, (31-26E). **Descr:** Area of 20 acres. Brine contains 3,000 tons of sodium sulfate. Also, crystalline salts, averaging 5 ft. in thickness, contain 8,000 tons of sodium

sulfate per foot of depth of crystal. **Value:** Tonnage alone too small for commercial operation. **Ref:** 9; 48, p. 99.

23. **Name:** Lake "31." **Loc:** SW $\frac{1}{4}$ sec. 31, (32-28E) and NW $\frac{1}{4}$ sec. 6, (31-28E). **Descr:** Small lake, the brine of which contains 620 tons of sodium sulfate. **Value:** Noncommercial quantity. **Ref:** 9.

SAND AND GRAVEL

Sand and gravel are widespread in the state and constitute one of its very important resources. They are used largely by the building and heavy construction industries for concrete aggregate, plaster sand, mortar sand, building sand, macadam, and fill. Listed below, under county headings which are arranged alphabetically, are all the sand and gravel pits known to the Division of Mines and Geology. It is realized that the following list does not include all existent pits, for there are many small local pits which operate intermittently and of which no record exists. To facilitate location of a pit within a county, pits have been arranged by township, range, and section, beginning with the most southerly row of townships and working progressively northward. Within a given row, pits are arranged according to range number, beginning with the lowest and progressing toward the highest. In counties divided by the Willamette meridian, the same principle is applied, but within a row, pits lying west of the meridian have been listed before those to the east. In those instances where more than one pit occurs in a township they are ar-

GRANT COUNTY

24. **Name:** Sulfate Lake. **Loc:** W $\frac{1}{2}$ sec. 15, (17-28E). **Descr:** Area of 9 acres. Contained 24,000 tons of sodium sulfate in solid crystal. **Value:** Mined and sold during World War I for use in the manufacture of kraft paper. Now destroyed as a saline lake by the U. S. Bureau of Reclamation in connection with canal construction for the Columbia Basin irrigation project. **Ref:** 9; 48, p. 97-98; 96, p. 16.

ranged by section, progressively from the lowest to the highest number. (See plate 33, on page 71 in volume 2.)

It was found after plotting known pits on the map that many large areas of sand and gravel were not represented. The reason for this is that many of the large deposits are isolated from present market or transportation facilities. As new roads are continually being built, old ones straightened, and centers of demand growing and shifting, it was thought desirable to show all known areas of sand and gravel whether they have been developed or not; hence a second map, showing occurrence areas, is included to supplement that showing pit locations. This map is plate 34, on page 73 in volume 2.

Sand and gravel for all uses sold for an average price of \$0.84 per ton in Washington during 1955. Washington occurrences of sand and gravel that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

Ref: 48, p. 90-93; 80-A; 82.

OCCURRENCES

On page 71 in volume 2 is plate 33, the map showing the known sand and gravel pits. These are numbered to correspond with the numbers of the pits listed below.

Map no.	Operator or owner	Pit name	Property location
ADAMS COUNTY			
*1.	Adams County	Taunton	SE $\frac{1}{4}$ sec. 4, (15-28E)
*1A.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (15-28E)
*1B.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (15-28E)
*1C.		Hartman	NW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (15-29E)
*1D.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (15-29E)
*1E.		Yorgerson	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (15-29E)
*2.	Adams County	Othello	NW $\frac{1}{4}$ sec. 22, (15-29E)
*3.	Do	Charrie	SW $\frac{1}{4}$ sec. 10, (15-36E)
*4.	Dept. of Highways		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (15-36E)
*5.	Adams County	Washtucna	SW $\frac{1}{4}$ sec. 28, (15-36E)
*6.	Do		NW $\frac{1}{4}$ sec. 31, (15-37E)
*6A.	Pre-Mix Concrete, Inc.		NW $\frac{1}{4}$ sec. 7, (16-29E)

Map no.	Operator or owner	Pit name	Property location
ADAMS COUNTY—Continued			
*7.	Adams County		SW $\frac{1}{4}$ sec. 36, (16-34E)
*7A.			NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (17-31E)
*8.	Adams County	Roxboro	NW $\frac{1}{4}$ sec. 20, (17-32E)
*8A.	Kron Phillips Sand & Gravel Co.		11 mi. W. of Lind
*9.	City of Lind	Lind	W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 12, (17-33E)
*10.	Adams County		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, (17-33E)
*11.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, (17-33E)
*12.	Adams County	Stolzer	SE $\frac{1}{4}$ sec. 10, (17-34E)
*12A.		Kaspar Farms	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, (17-34E)
*13.	Adams County	Schneider	NW $\frac{1}{4}$ sec. 12, (17-35E)
*14.	Do		SE $\frac{1}{4}$ sec. 12, (17-37E)
*15.	Do	School land	SE $\frac{1}{4}$ sec. 36, (17-37E)
*16.	Do	Bauer	NE $\frac{1}{4}$ sec. 4, (18-33E)
*17.			Sec. 6, (18-36E)
*18.	Adams County		SW $\frac{1}{4}$ sec. 14, (18-37E)
*19.	Do	H. Harder	NW $\frac{1}{4}$ sec. 1, (18-38E)
*20.	Do	Krause	NE $\frac{1}{4}$ sec. 2, (19-36E)

Map no.	Operator or owner	Pit name	Property location	Map no.	Operator or owner	Pit name	Property location
ADAMS COUNTY—Continued				BENTON COUNTY—Continued			
*21.	Adams County	Schott	NW ¼ sec. 13, (19-36E)	16.	Richland Concrete Co.		NW ¼ sec. 15, (9-28E)
*22.	Do	Finnel Lake	NE ¼ sec. 35, (19-36E)	*17.			SW ¼SW ¼ sec. 24 and NW ¼NW ¼ sec. 25, (9-28E)
*23.	Do	Hille	NW ¼ sec. 14, (20-32E)	*18.			SE ¼NW ¼ and SW ¼NW ¼ sec. 29, (9-28E)
*24.	Do	Robbins	NE ¼ sec. 20, (20-35E)	*19.			SE ¼SE ¼ sec. 30, (9-29E)
25.	Iver Sorenson	Sorenson	SW ¼SW ¼ sec. 15, (20-36E)	*20.			NE ¼SE ¼SE ¼ sec. 35, (9-29E)
26.	Adams County	Tokio	½ mi. E. of Tokio	*21.			N ½SE ¼ sec. 35, (9-29E)
27.	N. P. Ry.	Keystone Jct.	Sec. 17, (20-37E)	*22.		Hibbs	Lot 3, NW ¼ sec. 18, (12-24E)
28.	C. M. St. P. & P. R.R.		Sec. 12, (20-37E)				
ASOTIN COUNTY				CHELAN COUNTY			
1.	Dept. of Highways		NW ¼NW ¼ sec. 11, (6-44E)	*1.	Chelan County	Colockum	SE ¼NW ¼ sec. 20, (21-22E)
*1A.		Fleser	Lot 7, E ½NE ¼ sec. 35, (7-44E)	2.	Dept. of Highways		SW ¼NE ¼ sec. 13, (22-17E)
2.	Clarence C. Taplin	Taplin	NW ¼SW ¼ sec. 11, (7-45E)	*3.	George Batterman		Sec. 13, (22-20E)
*3.	Asotin County	Asotin	NW ¼NW ¼ sec. 21, (10-46E)	*3A.			SW ¼NW ¼ sec. 14, (22-20E)
*3A.			Lot 6, SW ¼SE ¼ sec. 15, (11-45E)	*4.	Chelan County	Malaga	NW ¼SW ¼ sec. 27, (22-21E)
4.	P. P. Puyears	Puyears	Sec. 19, (11-45E)	*4A.	Aluminum Co. of America	Alcoa	N ½NW ¼NE ¼SW ¼ sec. 27, (22-21E)
*5.	American Transit Mix	Silcott	Sec. 20, (11-45E)	5.	Dept. of Highways	Allen	SE ¼SE ¼ sec. 24, (23-17E)
6.			Sec. 29, (11-45E)	6.	Do	Latimer	NW ¼NE ¼ sec. 18, (23-18E)
7.		Conner's Gulch	NE ¼ sec. 30, (11-45E)	7.		Carey	NW ¼SE ¼ sec. 3, (23-19E)
*8.	Asotin County	Clarkston	SW ¼SW ¼ and NW ¼SW ¼ sec. 20, (11-46E)	*7A.			NE ¼SW ¼ sec. 3, (23-19E)
*8A.	Lewiston Pre-Mix Concrete Co.	Clarkston	SE ¼ sec. 28, (11-46E)	*8.	Chelan County	Cashmere	SE ¼ sec. 5, (23-19E)
*8B.	Poe Bros.		NW ¼ sec. 29, (11-46E)	9.	Do		Sec. 6, (23-19E)
9.	Dept. of Highways	Vineland	Lot 5, Blk. UU, Vine-land W. city limits Clarkston	*9A.	Kane Bros. Con-crete Products, Inc.		SE ¼NE ¼ sec. 6, (23-19E)
BENTON COUNTY				10.		James	SE ¼SW ¼ sec. 13, (23-19E)
*1.			SE ¼NE ¼ and NE ¼SE ¼ sec. 2, (5-27E)	11.	W. E. Taylor	Monitor	½ mi. E. of Monitor, on Wenatchee River flood plain
*1A.	U. S. Bur. of Reclamation	Plymouth	N ½ sec. 13, (5-27E)	12.	Dept. of Highways		SE ¼NW ¼ sec. 15, (23-20E)
2.	City of Prosser	Prosser	E ½NE ¼ sec. 11, (8-24E)	13.	Do	Bolyard	SE ¼NW ¼ sec. 15, (23-20E)
3.	Dept. of Highways		NE ¼SE ¼SE ¼ sec. 5, (8-25E)	*13A.	G. N. Ry.	Olds	Sec. 15, (23-20E)
*3A.			NW ¼SW ¼ sec. 11, (8-28E)	*14.	Chelan County	Weister	N ½NW ¼SE ¼ sec. 21, (23-20E)
*4.	Benton County	Kennewick	Sec. 2, (8-29E)	*14A.			S ½SW ¼ sec. 21, (23-20E)
5.			Sec. 7, (8-30E)	15.	City of Wenatchee		NW ¼SE ¼ sec. 21, (23-20E)
*5A.	Matheson Sand & Gravel Co.	Matheson	2 mi. E. and S. of Kennewick	*15A.	O. H. Sampson		SE ¼NW ¼ sec. 33, (23-20E)
*5B.	Layrite Concrete Products of Kennewick		NW ¼ sec. 8, (8-30E)	*16.	Columbia Con-crete Pipe Co.		SW ¼ sec. 34, (23-20E)
*5C.	Pre-Mix Concrete, Inc.		Sec. 18, (8-30E)	17.	Dept. of Highways	Barkee	Lot 1, sec. 1, (24-17E)
*6.	Benton County	Finley	NE ¼ sec. 27, (8-30E)	*17A.	Pumice Stone Products, Inc.		SE ¼ sec. 11, (24-17E)
*6A.			NW ¼SW ¼ sec. 25, (9-24E)	*18.	Chelan County	Peshastin	SE ¼SW ¼ sec. 16, (24-18E)
7.			Sec. 31, (9-24E)	19.	Dept. of Highways		NE ¼SE ¼ sec. 21, (24-18E)
8.			SE ¼ sec. 10, (9-25E)	20.	Chelan County		Sec. 22, (24-18E)
9.			NE ¼ sec. 15, (9-25E)	21.	Do		NW ¼NW ¼ sec. 27, (24-18E)
10.			SW ¼ sec. 12, (9-26E)	*22.	Chelan County	Peshastin	NW ¼SE ¼ sec. 35, (24-18E)
11.			4 mi. NE. of Kiona	23.	Dept. of Highways		N ½NW ¼SE ¼ sec. 35, (24-18E)
12.		Kiona	S. side of river at Kiona				
13.			1 ¼ mi. NE. of Kiona				
14.	Dept. of Highways	Richland	Tet. 38, Richland Gardens				
15.		Fallon Bridge	Just E. of Fallon Bridge, 4 mi. NW. of Richland				

CHELAN COUNTY—Continued

Map no.	Operator or owner	Pit name	Property location
24.	Dept. of Highways	Smith	NW ¼ SE ¼ sec. 35, (24-18E)
25.	E. R. Carter	Carter	SW ¼ NE ¼ sec. 36, (24-18E)
*26.	J. M. Hughes	Hughes	Sec. 33, (24-19E)
27.	Dept. of Highways	Wagner	SW ¼ SW ¼ sec. 24, (24-20E)
28.			SW ¼ SE ¼ sec. 26, (24-20E)
29.	Earl Barnhill	Barnhill	Near Swakane Canyon road in sec. 35, (24-20E)
30.	Dept. of Highways		Fronting lots 1 and 2, sec. 16, (25-17E)
31.	Do		Fronting lot 3, sec. 16, (25-17E)
32.	Do		Lots 2 and 3, sec. 21, (25-17E)
33.	Do	Bowyer	NW ¼ SW ¼ sec. 9, (25-21E)
34.		Worby	Sec. 16, (25-21E)
35.		Entiat	Sec. 17, (25-21E)
36.	W. Bowyer	W. Bowyer	Lot 2, Blk. 3, 1st add. Entiat Fruitlands E ½ NE ¼ sec. 1, (26-13E)
*36A.			SW ¼ SW ¼ and SE ¼ SW ¼ sec. 5, (26-15E)
37.	Dept. of Highways		Sec. 3, (26-16E)
38.	Fred G. Redmon	Merritt	NW ¼ SE ¼ sec. 3, (26-16E)
39.	Dept. of Highways	Hutchinson	SW ¼ NE ¼ sec. 4, (26-16E)
40.	Do	Smith	NE ¼ SE ¼ sec. 12, (26-16E)
41.	Do		S ½ NW ¼ sec. 12, (26-16E)
42.	Do		Near Merritt; lots 1-3, 7, and 9, Blk. "B", and lots 2-6, 9-10, and 12-14, Blk. "C", Cascade Gardens
43.	Do	Securities	Lot 8, Blk. "B", Cascade Gardens, sec. 8, (26-17E)
44.	Do	Cadman	Lot 8, Blk. "C", Cascade Gardens
45.	Do	Christenson	Lot 49, Blk. "C", Cascade Gardens
46.	Do	O'Conner	Lots 4 and 6, Blk. "B", and lots 1, 7, and 11, Blk. "C", Cascade Gardens
47.	Do		NE ¼ SE ¼ sec. 12, (26-16E)
48.	Do		SE ¼ SE ¼ sec. 8, ((26-17E)
49.	Do	Hastings	Lots 2 and 3, sec. 13, (26-17E)
50.	Do	Taylor	SE ¼ SE ¼ sec. 17, (26-17E)
51.	Dept. of Highways	Dillon 1	NE ¼ NE ¼ sec. 17, (26-17E)
52.	Do	Dillon 2	Sec. 20, (26-17E)
53.	Fred G. Redmon	Winton	NW ¼ SE ¼ sec. 10, (26-21E)
54.	Chelan County		Lot 7, sec. 28, (27-17E)
55.	Dept. of Highways		NE ¼ SE ¼ sec. 28, (27-17E)
56.	Do		NE ¼ SW ¼ and NW ¼ SE ¼ sec. 31, (27-18E)
*56A.	Chalmer D. Corle		SW ¼ sec. 12, (27-22E)
*56B.	Chelan Concrete Co.		W ½ SW ¼ sec. 14, (27-22E)
57.	Leonda Varney	Varney	

CHELAN COUNTY—Continued

Map no.	Operator or owner	Pit name	Property location
*57A.			NE ¼ NE ¼ sec. 4, (27-23E)
58.	Dept. of Highways		SE ¼ NW ¼ sec. 18, (27-23E)
59.	Chelan County		Sec. 25, (28-21E)
60.	Do		Sec. 32, (28-22E)
61.	Dept. of Highways		NE ¼ SE ¼ sec. 15, (28-23E)

CLALLAM COUNTY

1.	Clallam County	Beaver camp	Sec. 5, (28-13W)
2.	Dept. of Highways		Govt. lot 5, sec. 6, (28-13W)
3.	Do		SW ¼ SE ¼ sec. 28, (28-13W)
4.	Dept. of Pub. Lands		SE ¼ NE ¼ SE ¼ sec. 34, (28-13W)
5.	Dept. of Highways		SW ¼ SE ¼ sec. 20, (28-14W)
6.	Do		Govt. lots 2 and 3, sec. 19, (29-2W)
7.	Clallam County	Peterson	Sec. 10, (29-3W)
8.	Clallam County	Almaden	Sec. 10, (29-3W)
*9.	Do	Blynn	NE ¼ sec. 12, (29-3W)
10.	Margaret Sylvia	Sylvia	Tct. 12, lot 2, sec. 12, (29-3W)
11.	Clallam County	Louella	Sec. 21, (29-3W)
12.	Do	Round Mountain	Sec. 4, (29-5W)
13.	Do	Nelson	Sec. 2, (29-6W)
14.	Dept. of Highways		Govt. lot 1 and NW ¼ NE ¼ sec. 9, (29-13W)
15.	Clallam County		Sec. 32, (29-13W)
*15A.	Blake Sand & Gravel		SW ¼ sec. 5, (39-3W)
16.	Clallam County	McInnes	Sec. 6, (30-3W)
*17.	Do	Evans	NW ¼ sec. 6, (30-3W)
*17A.	Sequim Gravel Co.		SW ¼ sec. 8, (30-3W)
18.	Dept. of Highways	Vincent	SE ¼ NE ¼ sec. 20, (30-3W)
19.	L. B. Hastings	Hastings	Lot 3, sec. 27, (30-3W)
20.	Clallam County	Hansen	Sec. 1, (30-4W)
21.	Do	Eberle	Sec. 1, (30-4W)
*22.	Do	Lotz gazelle	NE ¼ sec. 3, (30-4W)
23.	Dept. of Highways	Christie	S ½ SE ¼ NE ¼ sec. 10, (30-4W)
24.	Do		NE ¼ SW ¼ sec. 13, (30-4W)
25.	Clallam County	Sherborn road	Sec. 20, (30-4W)
*26.	Do		Sec. 6, (30-5W)
*26A.	K. Goodman		NE ¼ SE ¼ sec. 7, (30-5W)
27.	Clallam County	Round Mountain	Sec. 8, (30-5W)
*27A.	Kermit Goodman		NW ¼ sec. 8, (30-5W)
28.	Dept. of Highways	Lindsay	NE ¼ SW ¼ sec. 12, (30-5W)
*29.	Clallam County	Blue Mountain	Sec. 14, (30-5W)
*30.	Do	Morse Creek	NE ¼ SE ¼ sec. 18, (30-5W)
31.	Do	Danz	Sec. 32, (30-5W)
32.	Do	Round Mountain Road	Sec. 33, (30-5W)
33.			Sec. 5, (30-6W)
34.			Sec. 6, (30-6W)
*35.	Clallam County	Aldwell	Sec. 8, (30-6W)
36.	Do		Sec. 18, (30-6W)
*37.	Do	Black Diamond	Sec. 20, (30-6W)
38.	Do	Mount Pleasant	Sec. 24, (30-6W)

Map no.	Operator or owner	Pit name	Property location	Map no.	Operator or owner	Pit name	Property location
CLALLAM COUNTY—Continued				CLARK COUNTY			
*39.	Angeles Sand & Gravel Co.		Lot 4 and SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 30, (30-6W)	*1.	Rock Products, Inc.		NE $\frac{1}{4}$ SW $\frac{1}{4}$ and SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (1-3E)
40.	Clallam County	Ranger	Sec. 3, (30-7W)	*2.	Clark County	Washougal	Sec. 7, (1-4E)
41.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (30-7W)	*2A.	Camas Sand & Gravel Co.		NW $\frac{1}{4}$ sec. 24, (1-4E)
42.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, (30-7W)	*2B.	Smith Bros.		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, (2-1E)
*43.	Clallam County	Eden	Sec. 16, (30-7W)	*2C.	Levanen & Karvonen		NW $\frac{1}{4}$ sec. 11, (2-1E)
44.			Sec. 19, (30-7W)	3.			Sec. 16, (2-1E)
*45.	Angeles Sand & Gravel Co.		Lot 2, sec. 26, (30-7W)	*3A.	Kampe Sand & Gravel Co.	Sand	NE $\frac{1}{4}$ sec. 19, (2-1E)
*46.	Clallam County	Little River	NE $\frac{1}{4}$ NE $\frac{1}{4}$ and NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (30-7W)	4.	Minsinger Sand & Gravel Co.		At Vancouver
47.			Sec. 29, (30-7W)	*4A.	B-D Sand & Gravel Co.	Sand	SE $\frac{1}{4}$ sec. 20, (2-1E)
48.	Dept. of Highways	Elwha River	NE $\frac{1}{4}$ sec. 32, (30-7W)	*5.	Portland Sand & Gravel Co.		Sec. 27, (2-1E)
49.			Sec. 2, (30-8W)	*5A.	Pacific Building Materials Co.	Sand	Sec. 27, (2-1E)
50.	Clallam County	Ramapo	Sec. 3, (30-8W)	*5B.	Geo. H. Wilde Co.		NE $\frac{1}{4}$ sec. 7, (2-2E)
51.			Sec. 5, (30-8W)	*5C.		Whatley	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, (2-2E)
52.			Sec. 11, (30-8W)	*5D.	Smith Bros.		SW $\frac{1}{4}$ sec. 10, (2-2E)
53.			Sec. 1, (30-9W)	*5E.		Marrion	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (2-2E)
*54.	Clallam County	Christopher Hillstead	Sec. 11, (30-9W)	6.			Sec. 17, (2-2E)
55.	Do		Sec. 11, (30-9W)	7.			Sec. 30, (2-3E)
56.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (30-9W)	8.			Sec. 15, (3-1E)
57.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, (30-10W)	*9.	Clark County	Salmon Creek	Sec. 26, (3-1E)
58.	Do		NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (30-10W)	*10.	H. B. Kline		SW $\frac{1}{4}$ sec. 26, (3-1E)
59.	Do		Lots 1 and 2 and N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 26, (30-11W)	11.		Homan (Glenwood)	Sec. 33, (3-2E)
60.	Do		Lot 7, sec. 27, (30-11W)	12.			Sec. 9, (3-3E)
61.	Do		Lot 3, sec. 28, (30-11W)	13.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 19, (4-1E)
62.	Do		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (30-11W)	*13A.	Spencer & Son Sand & Gravel		La Center area
63.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (30-11W)	*13B.	W. N. Dixon		NW $\frac{1}{4}$ sec. 19, (4-2E)
64.	Do		Lot 1, sec. 36, (30-12W)	14.			Sec. 20, (4-2E)
65.			Sec. 31, (31-3W)	15.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (4-2E)
*66.	Clallam County	Elwha	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (31-7W)	16.			Sec. 10, (4-3E)
*66A.			Suburban lot 47, west of Port Angeles	17.	Dept. of Highways		Govt. lots 4 and 10, sec. 9, (5-1E)
*67.	Clallam County	Joyce-Piedmont	Sec. 36, (31-7W)	*17A.		Haapa	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (5-1E)
68.	Do	Fielding Creek	Sec. 25, (31-9W)	18.			Sec. 35, (5-1E)
*69.	Do	Lyre	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (31-9W)	19.			Sec. 19, (5-3E)
70.			Sec. 35, (31-9W)	20.			Sec. 22, (5-3E)
*71.	Clallam County	Piedmont	SE $\frac{1}{4}$ sec. 36, (31-9W)	21.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (5-3E)
72.	Dept. of Highways		Lot 1, sec. 19, (31-10W)	22.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (5-3E)
73.	Do		Lot 1 and NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, (31-10W)	23.	Do		Govt. lot 8, sec. 36, (6-3E)
*73A.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, (31-10W)	COLUMBIA COUNTY			
74.	Clallam County	Pysht	Sec. 10, (31-11W)	1.	Lee Mays	Mays	N $\frac{1}{2}$ SW $\frac{1}{4}$ and SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5, (9-38E)
75.	Dept. of Highways	Merrill	Lot 6, sec. 18, (31-11W)	2.		Hale	Sec. 6, (9-38E)
*76.	Clallam County	Smith	SE $\frac{1}{4}$ sec. 9, (31-12W)	*2A.	Dayton Sand & Gravel Co.		Sec. 25, (10-38E)
77.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (31-12W)	3.	Dept. of Highways		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (11-40E)
78.	Clallam County	Harding Creek	Sec. 27, (31-12W)	*4.	Columbia County	Starbuck	Sec. 3, (12-37E)
*78A.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, (32-12W)	*5.	Do	do	Sec. 13, (12-37E)
79.	Do	Weel Road	Sec. 28, (32-12W)	6.	Berton Delaney	Delaney	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 19 and NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (12-39E)
80.	Do	Talbot Bar	Sec. 14, (32-13W)	7.	Robert E. Lee	Lee	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (12-39E)
				8.		Grange City	Sec. 32, (13-37E)

Map no.	Operator or owner	Pit name	Property location
COWLITZ COUNTY			
1.	Dept. of Highways	Martin	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12 and NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 13, (5-1W)
2.	Cowlitz County	Lewis River	SE $\frac{1}{4}$ sec. 2, (5-1E)
3.	Dept. of Highways		Lot 1, sec. 3, and lot 1, sec. 10, (5-1E)
*3A.	Woodland Sand & Gravel		Sec. 10, (5-1E)
4.	Leslie Waters	Waters	At Woodland
5.	Dept. of Highways		D.L.C. no. 41, (6-1W) and D.L.C. no. 38, (7-1W)
6.	Do		NW $\frac{1}{4}$ sec. 5, (6-1W) and SW $\frac{1}{4}$ sec. 32, (7-1W)
*6A.			W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 32, (7-1W)
7.	Cowlitz County		SE $\frac{1}{4}$ sec. 34, (6-1W)
8.			Near mouth of Kalama River
9.	Dept. of Highways		NW $\frac{1}{4}$ sec. 21, (6-3E)
10.	Do		Govt. lot 7, sec. 36, (6-3E)
*11.	Cowlitz County	Lewis River	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (7-1W)
*11A.	Weyerhaeuser Timber Co.	Sand	Secs. 5, 6, (7-2W)
*11B.	Coweman Gravel Co.		Sec. 32, (8-1W)
12.			2 $\frac{1}{2}$ mi. SE. of Kelso
13.			5 mi. NW. of Kelso, approximately in sec. 17, (8-2W)
*13A.			NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, (8-2W)
*13B.	Rex R. Losey		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (8-2W)
*14.	Crystal Pool Sand & Gravel Co.		Sec. 25, (8-2W)
*15.	Longview Concrete Pipe Co.		Sec. 27, (8-2W)
*15A.			NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (8-2W)
*16.	Do		Sec. 34, (8-2W)
17.		Sand pit	SE $\frac{1}{4}$ sec. 4, (8-4W)
18.		do	SE $\frac{1}{4}$ sec. 13, (8-4W)
*18A.		Williamson	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (8-4W)
*18B.	Orval Howard		Sec. 2, (9-2W)
19.	Dept. of Highways		Govt. lots 5 and 8, sec. 3, (9-2W)
20.			Gravel bar at Castle Rock
*20A.	William E. Davis		In Cowlitz River, Castle Rock area
*20B.		McKone	S $\frac{1}{2}$ sec. 14, (9-2W)
21.	D. S. Huntington	Huntington	Sec. 14, (9-2W)
22.	Dept. of Highways	Cowlitz River bar	N. center sec. 26, (9-2W)
23.	Do		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (9-4E)
24.	Do		E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 4, (10-2W)
*25.	Cowlitz County	Cowlitz	SW $\frac{1}{4}$ sec. 16, (10-2W)
26.	Dept. of Highways	Peabody	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (10-2W)
27.	Do		NE $\frac{1}{4}$ SE $\frac{1}{4}$ and SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (10-2W)
28.	Do		SE $\frac{1}{4}$ sec. 19 and NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (10-1E)
*29.	Cowlitz County	Cowlitz	NE $\frac{1}{4}$ sec. 30, (10-1E)

Map no.	Operator or owner	Pit name	Property location
DOUGLAS COUNTY			
1.	Dept. of Highways	Rank	W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 10, (20-22E)
*2.	Douglas County		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 13, (20-22E)
*3.	Grant County	Trinidad	NE $\frac{1}{4}$ sec. 13, (20-22E)
*3A.	Lineville & Case		SW $\frac{1}{4}$ NE $\frac{1}{4}$ and SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 22, (21-22E)
4.		Batterman	NW $\frac{1}{4}$ sec. 2, (22-20E)
*4A.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, (22-20E) and SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (23-20E)
5.			S $\frac{1}{2}$ sec. 11, (22-20E)
*6.			Sec. 13, (22-20E)
7.			Approximately sec. 17, (22-21E)
8.			4 mi. NW. of Rock Island
*8A.	Rich Sand & Gravel		Sec. 20, (22-21E)
*8B.		Palmer	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 20, (22-21E)
*9.	Columbia Concrete Pipe Co.		NW $\frac{1}{4}$ sec. 24, (22-21E)
*9A.		Wilson	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, (22-21E)
*9B.	Rich Sand & Gravel		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 25, (22-21E)
*10.	Rock Island Sand & Gravel Co.		Sec. 24, (22-21E)
11.		Palisades	1 $\frac{3}{4}$ mi. N. of Palisades
12.		Orondo	3 mi. S. of Orondo
13.	Dept. of Highways	Bachelor	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, (24-25E)
14.	Do		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (25-21E)
15.	M. E. Nelson	Nelson	At Waterville
16.	Dept. of Highways	Campbell	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, (25-23E)
*17.	Douglas County		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (25-26E)
18.	Dept. of Highways	Paul	W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 25, (25-26E)
19.	Do		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (25-27E)
20.	Dept. of Highways		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, (25-28E)
*20A.			N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 29, (25-28E)
21.	Dept. of Highways		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, (25-28E)
22.		Coulee Dam	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (25-28E)
*23.	Douglas County		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (26-23E)
24.			1 mi. E. of Withrow
*24A.			E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 14, (26-27E)
*24B.		Holcomb	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (27-24E)
*24C.		Holcomb	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, (27-24E)
*24D.		Wall pit	NW $\frac{1}{4}$ NE $\frac{1}{4}$ and NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 26, (27-24E)
25.	Dept. of Highways	Leslie	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 22, (27-25E)
*26.	Douglas County		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, (27-25E)
27.	Dept. of Highways		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, (27-26E)
28.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (27-26E)
*28A.	Douglas County		NW $\frac{1}{4}$ NE $\frac{1}{4}$ and NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 1, (27-27E)

Map no.	Operator or owner	Pit name	Property location
DOUGLAS COUNTY—Continued			
29.	Dept. of Highways	Glessing	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, (27-27E)
30.		Sims	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, (27-28E)
31.		Foster Creek	On Foster Creek $6\frac{1}{2}$ mi. S. of Bridgeport
32.	Dept. of Highways	Sharyer	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (28-25E)
33.	Do	Weakly	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (28-25E)
34.	Do	Schmidt	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, (28-25E)
*34A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ and NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (28-27E)
35.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (28-28E)
36.			Near mouth of Foster Creek
*36A.	Charles Thornton		E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 35, (29-25E)
*36B.	Bridgeport Sand & Gravel Co.		E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 35, (29-25E)
37.	Dept. of Highways	Holland	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (29-25E)
*38.		Sanford	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (29-30E)
39.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, (30-25E)
40.	Do	McCormack	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, (30-25E)

FERRY COUNTY

1.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (30-33E)
2.	Do		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (30-33E)
3.	U. S. Indian Service		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 13, (32-32E)
*3A.			Lot 1, NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, (32-36E)
4.	U. S. Indian Service		NW $\frac{1}{4}$ NE $\frac{1}{4}$ and NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, (33-32E)
*4A.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (33-32E)
*4B.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (33-36E)
*4C.			NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (34-32E)
*5.	Ferry County		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (34-36E)
*6.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, (34-36E)
*6A.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (34-36E)
*6B.		Demski	SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12 and SE $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 13, (35-32E)
*6C.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (35-32E)
7.	Dept. of Highways	Rittel	Govt. lot 3, sec. 18, (35-33E)
8.	Do		Govt. lot 2, sec. 18, (35-33E)
9.			$3\frac{1}{2}$ mi. W. of Republic
10.	Dept. of Highways		Lot 12, sec. 36, (36-32E)
*11.	Ferry County		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (36-33E)
*11A.		O'Brien	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, (36-33E)
*12.	Ferry County		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, (36-34E)
*12A.			S $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, (36-37E)

Map no.	Operator or owner	Pit name	Property location
FERRY COUNTY—Continued			
*13.	Ferry County		NE $\frac{1}{4}$ sec. 2, (37-32E)
14.	Dept. of Highways		Govt. lot 1, sec. 5, (37-33E)
*15.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (37-33E)
*16.		Carson	S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 17, (37-37E)
*17.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (39-32E)
18.	Dept. of Highways	Hathaway	Govt. lots 2 and 3, sec. 1, (39-33E)
*19.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, (39-33E)
*20.		Croswell	Lot 7, SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, (40-32E)
*21.		Massey	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (40-34E)

FRANKLIN COUNTY

1.	Franklin County		Sec. 12, (9-28E)
*1A.	Pre-Mix Concrete, Inc.		SE $\frac{1}{4}$ SW $\frac{1}{4}$ and SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (9-28E)
*1B.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 20, (9-29E)
2.			Sec. 27, (9-29E)
3.			SE $\frac{1}{4}$ sec. 2, (9-30E)
4.			On N. P. Ry. 4 mi. N. of Pasco
5.		2 pits	Sec. 13, (9-30E)
6.			Sec. 20, (9-30E)
*7.	Central Sand & Gravel Co.	Pasco	4th and Ainsworth, Pasco
*8.	Franklin County		NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (9-30E)
9.			$\frac{1}{4}$ mi. SE. of Pasco
10.	Franklin County	Levey	Sec. 6, (9-32E)
*10A.	Do		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, (10-28E)
11.			Sec. 36, (10-29E)
*11A.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, (10-30E)
12.		Glade	Sec. 19, (10-30E)
13.	Franklin County		Sec. 12, (10-32E)
14.			Sec. 32, (10-32E)
15.	Franklin County	Eltopia	Sec. 1, (11-30E)
*15A.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, (11-30E)
16.	Dept. of Highways		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (11-30E)
*16A.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (11-30E)
17.			Sec. 33, (11-33E)
18.			Sec. 12, (12-28E)
19.	Franklin County	Rickerts Ringold	Sec. 25, (12-28E)
*19A.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 25, (12-28E)
20.		Vale	Sec. 1, (12-30E)
*20A.			S $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 16, (12-30E)
*20B.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (12-30E)
21.			Sec. 29, (12-33E)
22.	Franklin County	Hanford	Sec. 25, (13-27E)
23.	Dept. of Highways	Muir	Lot 2, sec. 30, (13-28E)
24.	Do	Ambacher	Govt. lot 3, sec. 32, (13-28E)
25.			Sec. 22, (13-29E)
*26.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (13-29E)
27.	Dept. of Highways		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, (13-30E)
28.			Sec. 24, (13-30E)
29.	Franklin County	Mesa	Sec. 26, (13-30E)
*30.	N. P. Ry.		S $\frac{1}{2}$ N $\frac{1}{2}$ and S $\frac{1}{2}$ sec. 19, (13-31E)

Map no.	Operator or owner	Pit name	Property location
FRANKLIN COUNTY—Continued			
31.	Franklin County		Sec. 7, (13-33E)
32.	Do		Sec. 11, (13-33E)
33.	Do	Connell	At Connell
34.			½ mi. SE. of Connell
35.	Dept. of Highways		SE¼SE¼ sec. 36, (14-31E)
36.	Franklin County		Sec. 31, (14-32E)
*37.	Do	Sulphur	NE¼NE¼ sec. 36, (14-32E)
*37A.	Connell Sand & Gravel		9 mi. E. of Connell
38.	Franklin County		Sec. 32, (14-34E)
39.	Do	Kahlotus	Sec. 33, (14-34E)

GARFIELD COUNTY			
1.	Norman Cyrus	Cyrus	NE¼NW¼ sec. 2, (11-42E)
2.	Amos H. Bartlow	Bartlow	SW¼SW¼ sec. 11, (11-43E)
3.	Dept. of Pub. Lands		SE¼NW¼ sec. 16, (11-43E)
4.	W. S. Oliphant	Oliphant	NW¼NE¼ sec. 15, (12-40E)

GRANT COUNTY			
1.	C. M. St. P. & P. R.R.	Corfu	Sec. 9, (15-27E)
*1A.		Nehls	SW¼ sec. 17, (16-26E)
*1B.			N½NW¼ sec. 19, (16-27E)
*1C.			SE¼NE¼ sec. 19, (16-27E)
*1D.			S½NW¼ sec. 20, (16-27E)
*1E.		Sims	SE¼SE¼ sec. 27, (16-27E)
*1F.			NW¼NW¼ sec. 8, (17-23E)
2.	W. D. Sinclair	Sinclair	Lot 3, sec. 17, (17-23E)
*2A.			W½NE¼NW¼ sec. 33, (17-23E)
*2B.			NW¼NW¼ sec. 2, (17-28E)
*2C.			SW¼SW¼ sec. 33, (17-28E)
*2D.		Sand	SW¼ sec. 5, (17-29E)
3.	Dept. of Highways	Morton	SE¼NW¼NW¼ sec. 27, (18-23E)
4.	C. M. St. P. & P. R.R.		S½ sec. 2, (18-28E)
*4A.	Sampson Sand & Gravel		Sec. 31, (18-29E)
5.			E½ sec. 7, (19-24E)
*6.			N½SE¼ sec. 31, (19-24E)
6A.	Dept. of Highways		SE¼NE¼ sec. 32, (19-24E)
*6B.			W½NE¼ sec. 32, (19-24E)
7.	Dept. of Highways		N½SE¼ sec. 32, (19-24E)
8.	Do		E½SW¼NE¼ sec. 32, (19-24E)
9.	Do	Freeman	W½SW¼ sec. 29, (19-27E)
*9A.	Columbia Sand & Gravel, Inc.		NW¼SE¼ sec. 5, (19-28E)
*9B.		Laudenback	NW¼NW¼ sec. 9, (19-28E)
*9C.	Holmes Bros.		SW¼NW¼ sec. 11, (19-28E)
*9D.	Crab Creek Sand & Gravel, Inc.		NE¼ sec. 11, (19-28E)

Map no.	Operator or owner	Pit name	Property location
GRANT COUNTY—Continued			
*10.	John Nelson	Nelson	Sec. 15, (19-28E)
*10A.	Holmes Bros.		SE¼SE¼ sec. 25, (19-28E)
11.	Dept. of Highways		W½NE¼ sec. 35, (19-28E)
*12.	Grant County		NW¼ sec. 19, (19-29E)
*12A.			N½NW¼NW¼ sec. 19, (19-29E)
*12B.			NE¼SE¼ sec. 14, (20-23E)
13.			Sec. 32, (20-24E)
14.			SW¼ sec. 8, (20-25E)
*14A.			SW¼NW¼ sec. 10, (20-25E)
15.	Dept. of Highways	Hurlbut	NE¼NW¼ sec. 12, (20-25E)
*15A.			SE¼SE¼ sec. 12, (20-25E)
*15B.			SW¼SE¼ sec. 15, (20-25E)
*15C.			SW¼SW¼ sec. 16, (20-25E)
*15D.	Spurgeon & Sons		Sec. 16, (20-25E)
*15E.			W½NW¼ sec. 15, (20-26E)
*15F.			N½NE¼ sec. 10, (20-28E)
*15G.			SW¼SW¼ sec. 14, (20-28E)
*15H.			SE¼SW¼ sec. 26, (20-28E)
*15I.			SE¼NW¼ sec. 35, (20-28E)
*15J.			NW¼SE¼ sec. 17, (20-29E)
*15K.		Sutherland	NE¼NW¼ sec. 17, (20-29E)
*15L.			SW¼SW¼ sec. 28, (20-29E)
*15M.			NW¼SW¼ and SW¼SW¼ sec. 30, (20-29E)
16.	C. F. Stepon	Stepon	SE¼SW¼ sec. 32, (21-24E)
17.			Sec. 9, (21-26E)
*17A.	L. C. Swartz Concrete Products		SW¼ sec. 15, (21-26E)
*18.	Curtis Bros.	Curtis	Sec. 22, (21-26E)
*19.	M. E. Nelson	Nelson	Sec. 22, (21-26E)
*19A.	Olson Sand & Gravel	Gravel	NE¼SE¼ sec. 22, (21-26E)
*19B.			SW¼SW¼ sec. 23, (21-26E)
20.			Sec. 29, (21-26E)
*20A.		Ephrata	SE¼NW¼ sec. 18, (21-27E)
*20B.			NE¼ sec. 10, (21-28E)
*20C.	Olson Sand & Gravel	Sand	SW¼SW¼ sec. 24, (22-26E)
21.	Dept. of Highways		SE¼SW¼SW¼ sec. 26, (22-26E)
*22.	Grant County	Soap Lake	SW¼ sec. 26, (22-26E)
*22A.	Dee Nichols & Sons		SW¼ sec. 26, (22-26E)
23.	Dept. of Highways		NW¼NE¼NW¼ sec. 36, (22-26E)
24.	Dept. of Pub. Lands		W½SW¼ sec. 36, (22-26E)
25.	Dept. of Highways		NE¼ sec. 13, (22-27E)
26.			Sec. 17, (22-27E)
*27.	Curtis Bros.		Sec. 20, (22-27E)
28.	Dept. of Highways	Ness	E½NW¼ sec. 24, (22-27E)
29.			Sec. 9, (22-29E)
30.			NW¼ sec. 11, (22-29E)
31.	N. P. Ry. ?	Nagel	Sec. 30, (20-29E)
32.	Dept. of Highways	Bank	SW¼SW¼ sec. 10, (22-30E)

Map no.	Operator or owner	Pit name	Property location	Map no.	Operator or owner	Pit name	Property location
GRANT COUNTY—Continued				GRAYS HARBOR COUNTY—Continued			
33.	Dept. of Highways	Egbert	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, (22-30E)	*18.	Grays Harbor County		SE $\frac{1}{4}$ sec. 2, (18-5W)
34.			W $\frac{1}{2}$ sec. 16, (22-30E)	*18A.		Stueck	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (18-5W)
35.			Sec. 24, (22-30E)	*19.	Cloquallum Sand & Gravel		NW $\frac{1}{4}$ sec. 30, (18-5W)
36.			Sec. 27, (23-27E)	19A.		Cloquallum Creek	Sec. 13, (18-6W)
37.			Sec. 25, (23-30E)	20.		Brady	2 $\frac{1}{2}$ mi. W. of Elma
38.	Dept. of Highways		W $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 26, (25-28E)	21.	N. P. Ry.	Elma	Sec. 25, (18-6W)
39.	Do		NE $\frac{1}{4}$ sec. 17, (25-29E)	*21A.	Dale Winters		SW $\frac{1}{4}$ sec. 28, (18-6W)
*40.	Grant County	Hartline	N $\frac{1}{2}$ sec. 19, (25-29E)	22.	Dept. of Highways	Maris	Lot 4, sec. 31, (18-6W)
41.	H. W. Carolus	Carolus	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (25-30E)	23.			1 mi. SE. of Elma
42.		Hartline	Sec. 31, (26-30E)	24.		Wynoochee River	Sec. 35, (18-8W)
*42A.			NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (27-29E)	*25.	Grays Harbor County		SE $\frac{1}{4}$ sec. 4, (18-11W)
*43.	W. S. Pryor		Sec. 11, (28-30E)	*25A.		Strand	Sec. 21, (18-11W)
*44.	Do		Sec. 15, (28-30E)	26.			Sec. 32, (19-8W)
45.	Dept. of Highways		N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 16, (28-30E)	27.			Sec. 1, (19-9W)
*45A.			SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (28-30E)	28.		Diamond Lake	Sec. 15, (19-11W)
*45B.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (28-30E)	*28A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, (19-11W)
46.	Dept. of Highways		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (28-30E)	29.			N $\frac{1}{2}$ sec. 28, (19-11W)
GRAYS HARBOR COUNTY				*29A.		Carter	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, (18-9W)
*1.	Grays Harbor County		NW $\frac{1}{4}$ sec. 31, (16-4W)	30.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (19-11W)
*1A.			S $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 31, (16-4W)	31.	Do	Humtulpis	SE $\frac{1}{4}$ sec. 7, (20-10W)
2.	Dept. of Highways	Ames	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (16-4W)	32.	Do		Lots 3 and 4, 2d add. to Humtulpis Gardens
3.			Sec. 10, (16-5W)	33.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7 and SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, (20-10W)
4.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (16-5W)	34.	Do		W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 9, (20-10W)
5.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (16-5W)	35.	Do		S $\frac{1}{2}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, and N $\frac{1}{2}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (20-10W)
*6.	Grays Harbor County		SW $\frac{1}{4}$ sec. 23, (16-5W)	*35A.		Hathaway	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (20-10W)
7.		Oakville	N $\frac{1}{2}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (16-5W)	*36.	Grays Harbor County		SE $\frac{1}{4}$ sec. 23, (20-11W)
*7A.		Sand	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (16-12W)	37.			SE $\frac{1}{4}$ sec. 34, (20-11W)
8.	Dept. of Highways	Johnson	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7 and NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, (17-5W)	38.	Dept. of Highways		W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 21, (20-12W)
*9.			NE $\frac{1}{4}$ sec. 29, (17-5W)	39.			NE $\frac{1}{4}$ sec. 14, (21-10W)
10.			Sec. 32, (17-5W)	40.			SE $\frac{1}{4}$ sec. 26, (21-10W)
*10A.	Dale Winters		NW $\frac{1}{4}$ sec. 4, (17-6W)	41.	Dept. of Highways	Fishel	Secs. 6 and 7, (22-9W)
*10B.	El Monte Ready-Mix, Inc.		SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, (17-6W)	42.	U. S. Forest Service		SE $\frac{1}{4}$ sec. 35, (22-10W)
*10C.	Bocek Bros.		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, (17-7W)	43.	Dept. of Highways		Lot 1, sec. 35, (22-10W)
*11.	Grays Harbor Construction Co.		Sec. 18, (17-7W)	44.	Do		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (23-10W)
*12.	Grays Harbor County		SW $\frac{1}{4}$ sec. 2, (17-8W)	45.	Do		Lot 7, sec. 17, (23-10W)
*12A.	M. Hagara and A. Snell		NW $\frac{1}{4}$ sec. 2, (17-8W)	46.		Quinault Lake	Sec. 22, (23-10W)
*13.	Grays Harbor Construction Co.		Sec. 13, (17-8W)	*46A.	Simpson Logging Co.		E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 22, (23-10W)
14.		Chehalis River	Sec. 23, (17-8W)	47.	Dept. of Highways		Lot 6, sec. 23, (23-10W)
*15.	Swano Excavating Co.	Swano	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (17-9W)	48.	Do		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 22, (23-11W)
15A.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ and SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (17-9W)	49.	Do		Lot 10, sec. 2, (23-12W)
*15B.	M. Hagara and A. Snell		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (17-9W)	50.	Do		Lot 3, sec. 2, (23-12W)
16.			Sec. 24, (17-9W)	51.	Do		Lots 7 and 8, sec. 2, (23-12W)
*16A.			SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (17-10W)	52.	Taholah Indian Agency		NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, (23-12W)
*17.	Dept. of Highways	Stafford Creek	Sec. 27, (17-10W)	ISLAND COUNTY			
				1.		Coupeville	Near NE. cor. sec. 3, (31-1E)
				*2.		Keystone	NE $\frac{1}{4}$ sec. 23, (31-1E)
				3.		Penn Cove	S $\frac{1}{2}$ sec. 33, 32-1E)
				4.	Island County		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (32-3E)

Map no.	Operator or owner	Pit name	Property location
ISLAND COUNTY—Continued			
*5.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (32-3E)
*5A.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, (33-1E) and NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (33-2E)
*5B.	Mount Vernon Sand & Gravel Co., Inc.	Whidbey	NW $\frac{1}{4}$ sec. 26, (33-1E)
*5C.		Oak Harbor	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, (33-1E)
6.	Dept. of Highways	Airport	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, (33-1E)
*6A.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, (33-2E)
7.			W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 17, (33-2E)

JEFFERSON COUNTY			
*1.	Jefferson County	Queets	Lot 8, sec. 27, (24-12W)
*2.	Do	do	Lot 16, sec. 29, (24-12W)
3.	Catherine M. R. Kofoed	Kofoed	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, (24-12W)
4.	Dept. of Highways		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (24-12W)
5.	Do	Roberts	Lot 4, sec. 22, (24-13W)
*5A.	Major Estate		W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 27, (24-13W)
*6.	Dept. of Highways	Queets River	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, (24-13W)
7.	Dept. of Highways	Pierce	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (25-2W)
8.	Dept. of Pub. Lands		Lot 4, sec. 8, (25-13W)
9.			Sec. 3, (26-2W)
10.			Sec. 14, (26-2W)
11.	Dept. of Highways	Davies	Lot 4, sec. 35, (26-2W)
12.	Do		Lot 16, sec. 4, (26-12W)
13.	Do		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (26-12W)
14.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (26-13W)
*15.	Jefferson County	Hoh	Lot 7, sec. 22, (26-13W)
16.	Dept. of Highways		Lot 4, sec. 32, (26-13W)
17.			Sec. 6, (27-1W)
*18.	Jefferson County	E. Quilcene	Lot 4, sec. 19, (27-1W)
19.	Dept. of Highways	Calkins	Lot 3, sec. 1, (27-2W)
20.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (27-2W)
*21.	Jefferson County	Quilcene	Lot 1, sec. 25, (27-2W)
*22.	Do	Hoh	Lot 3, sec. 25, (27-11W)
23.	A. F. Thomas	Thomas	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (28-2W)
24.	Dept. of Highways	Currier	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (28-2W)
25.	Do	Newsted	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, (28-2W)
26.			Sec. 6, (28-1E)
27.	Dept. of Highways		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 18, (28-1E)
*28.	Jefferson County	Shine	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (28-1E)
*28A.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 32, (28-1E)
*28B.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, (28-1E)
29.	Crosby Lithorage Co.	Hadlock	At Hadlock
*29A.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, (29-1W)
*30.	Jefferson County	Chimacum	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (29-1W)
*31.	Kitsap County		NE $\frac{1}{4}$ sec. 11, (29-1W)
32.	Dept. of Highways	Hastings	Sec. 17, (29-1W)
33.			SE $\frac{1}{4}$ sec. 25, (29-1W)

Map no.	Operator or owner	Pit name	Property location
JEFFERSON COUNTY—Continued			
34.		Uncas	Sec. 26, (29-2W)
35.	Dept. of Highways		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (29-2W)
36.		Port Townsend	In Port Townsend
37.			Sec. 21, (30-1W)
*37A.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (30-1W)
*37B.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (30-1W)
38.		Irondale	Sec. 34, (30-1W)
39.	Dept. of Highways		Lot 3, sec. 36, (30-2W)

KING COUNTY			
*1.	King County	Krain	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, (20-6E)
2.	Dept. of Highways		N $\frac{1}{2}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, (20-6E)
3.			Sec. 14, (20-6E)
4.	Edlund, White & Edlund	Enumclaw	At Enumclaw
5.	Dept. of Highways		SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5, (20-7E)
*5A.	Tougaw & Olson, Inc.	Tougaw	Sec. 29, (20-7E)
6.	Do	Slack	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, (20-7E)
7.			Sec. 4, (21-4E)
8.	Dept. of Highways	Redondo	Center E $\frac{1}{2}$ sec. 5, (21-4E)
9.			Sec. 17, (21-4E)
10.	Dept. of Highways	Panther Lake	Center sec. 19, (21-4E)
*11.	N. P. Ry.		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 18, (21-5E)
*12.	N. P. Ry.		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 19, (21-5E)
*12A.	Miles Co.		NE $\frac{1}{4}$ sec. 19, (21-5E)
13.	Dept. of Highways		E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 20, (21-5E)
*13A.	Meade Sand and Gravel Co.	Auburn	NW $\frac{1}{4}$ sec. 29, (21-5E)
*13B.	Valley Sand and Gravel, Inc.		NW $\frac{1}{4}$ sec. 29, (21-5E)
14.	Stoneway Dock Co.	Black Diamond	At Black Diamond
15.	N. P. Ry.	Kanasket	Sec. 11, (21-7E)
16.	Crosby Lithorage Co.	Maury	On Maury Island
17.			Sec. 5, (22-4E)
18.	Dept. of Highways		E $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, (22-4E)
19.			Sec. 21, (22-4E)
*19A.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (22-4E)
*20.	Meade Sand and Gravel Co.	Midway	Sec. 28, (22-4E)
21.			Sec. 33, (22-4E)
*22.	King County	Calhoun	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (22-5E)
*22A.			NE $\frac{1}{4}$ sec. 6, (22-5E)
*23.	King County	Titus	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (22-5E)
*24.	Western Sand & Gravel Co.		NE $\frac{1}{4}$ sec. 16, (22-6E)
25.			Sec. 27, (22-6E)
*25A.		Creighton	W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 6, (22-10E)
*25B.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, (22-10E)
*25C.			SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (22-10E)
26.	Dept. of Pub. Lands		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (22-10E)
27.	Do		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (22-10E)

Map no.	Operator or owner	Pit name	Property location	Map no.	Operator or owner	Pit name	Property location
KING COUNTY—Continued				KING COUNTY—Continued			
28.			Sec. 25, (23-3E)	64.	Dept. of Highways		Shoreland adjoining lots 10 and 11, sec. 10, and lots 1 and 2, sec. 15, (24-7E)
29.			Sec. 31, (23-3E)	65.	Dept. of Highways	Hjort	SW ¼SW ¼ sec. 29, (24-7E)
30.	Raymond D. Ogden	Ogden	SW ¼SW ¼ sec. 3, (23-4E)	66.			Sec. 31, (24-7E)
31.			Sec. 20, (23-4E)	67.	L. I. Schlock	Schlock	NE ¼SW ¼ and SE ¼SW ¼ sec. 34, (24-8E)
*32.	King County	Bow Lake	NE ¼SE ¼ sec. 34, (23-4E)	*68.	Washington Sand & Gravel Co.		N. 88th and Stone St., Seattle
*32A.	Northwest Construction Co.		NE ¼SE ¼ sec. 34, (23-4E)	69.			Sec. 32, (25-4E)
33.	Dept. of Highways		W ½ Tct. 24, Highland, sec. 34, (23-4E)	*70.	King County	Issaquah	SE ¼ sec. 1, (25-5E)
*34.	Klinker Sand & Gravel Co.		Lot 3, Blk. 1, Melville Barth Add., Seattle	71.			Sec. 28, (25-5E)
*35.	King County	Renton	SW ¼SW ¼ sec. 9, (23-5E)	72.			Sec. 29, (25-5E)
36.	Dept. of Highways	Sartori	NW ¼NW ¼ sec. 16, (23-5E)	73.			Sec. 30, (25-5E)
*37.	Stoneway Dock Co.		Sec. 17, (23-5E)	*73A.	Cadman Gravel Co.		SW ¼ sec. 6, (25-6E)
38.	Dept. of Highways	Tobins	Henry H. Tobins D.L.C. no. 37, sec. 18, (23-5E)	*73B.	Acme Construction Co.		NE ¼NE ¼ sec. 6, (25-6E)
39.	Do		Lots 24-37, Blk. 4, 1st add. to Renton	74.	Dept. of Pub. Lands		SE ¼SE ¼ sec. 16, (25-6E)
40.	Do		Lots 3, 4, 5, and 8, sec. 18, (23-5E)	75.			Sec. 28, (25-6E)
41.			Sec. 20, (23-5E)	76.	Dept. of Highways	Gain	NW ¼SW ¼ sec. 15, (25-7E)
42.			Sec. 11, (23-6E)	77.			Sec. 30, (25-7E)
43.	Dept. of Highways		Lot 1, sec. 4, (23-7E)	78.		Richmond Beach	Sec. 1, (26-3E)
44.	A. W. Pratt	Pratt	NW ¼SW ¼ and NE ¼SW ¼ sec. 4, (23-8E)	79.	K. E. Jellum	Haller Lake	At Haller Lake
45.	Marion M. Miller	Miller	SW ¼SE ¼ sec. 4, (23-8E)	*79A.	Suburban Sand & Gravel, Inc.		Sec. 1, (26-4E)
*46.	Lester W. David	David	NE ¼SE ¼ sec. 14, (23-8E)	*79B.	Kenmore Construction Co.		Sec. 1, (26-4E)
*46A.		Brister	NE ¼SE ¼ sec. 24, (23-8E)	80.			S ½ sec. 32, (26-4E)
*46B.			SE ¼SW ¼ sec. 18, (23-9E)	*80A.	Kenmore Sand & Gravel Co.		SW ¼SW ¼ sec. 1, (26-5E)
*46C.		Scott	E ½SE ¼ sec. 29, (23-9E)	81.			Sec. 5, (26-5E)
47.	Dept. of Highways		SE ¼NE ¼ sec. 30, (23-9E)	82.	Dept. of Highways		S ½NW ¼SW ¼ sec. 11, (26-5E)
*48.	C. M. St. P. & P. R.R.	Ragner	SW ¼ sec. 30 and NW ¼ sec. 31, (23-9E)	*83.	King County	Woodinville	SW ¼NE ¼SW ¼ sec. 11, (26-5E)
*48A.			NW ¼SE ¼ sec. 34, (23-9E)	*84.	Kirkland Sand & Gravel Co.		NW ¼SW ¼ sec. 33, (26-5E)
*49.	City of Seattle		14th SW. and Juneau St., Seattle	85.	Dept. of Highways		Lots 7, 8, and 9, Blk. 2, and lots 3 and 4, Blk. 10, and vacated street, Bothell
50.			Sec. 20, (24-4E)	86.			Sec. 6, (26-6E)
*51.	Mutual Materials Co.		SE ¼ sec. 31, (24-4E)	87.			Sec. 10, (26-6E)
52.			Sec. 33, (24-4E)	*87A.			SE ¼SW ¼ sec. 31, (26-6E)
53.	Eastside Sand & Gravel Co.	Factoria	At Factoria	88.	Dept. of Highways		NW ¼SE ¼ sec. 31, (26-7E)
*54.	Lakeside Gravel Co.		NW ¼SE ¼ sec. 10, (24-5E)	89.	Dept. of Pub. Lands		In S. fork Skykomish River in secs. 21 and 28, (26-11E)
*54A.			SE ¼SW ¼NW ¼ sec. 11, (24-5E)	90.	Dept. of Highways		Shorelands of Skykomish River in lots 3 and 6, sec. 26, (26-11E)
*55.	Haines		W ½NE ¼NW ¼ sec. 15, (24-5E)	91.	Do		W ½SW ¼ sec. 27, (26-12E)
56.			Sec. 22, (24-5E)	92.	Do		E ½SE ¼ sec. 28, (26-12E)
57.			Sec. 15, (24-6E)	93.	Do	Proffitt	NW ¼SE ¼ sec. 28, (26-12E)
*58.	King County	Issaquah	S ½NE ¼ sec. 21, (24-6E)				
*59.	Issaquah Sand & Gravel	Tibbetts	SE ¼ sec. 21, (24-6E)				
*59A.	Lewis Sutter		SE ¼ sec. 21, (24-6E)				
60.			Sec. 33, (24-6E)				
61.	H. E. Foster	Foster	N ½NW ¼ sec. 8, (24-7E)				
62.	A. W. Chisholm	Chisholm	SW ¼NW ¼ sec. 9, (24-7E)				
63.	Lawrence Smart	Smart	Lots 10 and 11, sec. 10, (24-7E)				

KITSAP COUNTY			
*A.	South Kitsap Gravel Co.		NE ¼NE ¼ sec. 9, (22-1E)
*1.	Kitsap County	Olalla	SW ¼NE ¼ sec. 4, (22-2E)
*1A.			NE ¼NW ¼ sec. 11, (23-1W)

Map no.	Operator or owner	Pit name	Property location
KITSAP COUNTY—Continued			
*2.	Kitsap County	Navy Yard	Tct. 12, sec. 13, (23-1E)
*2A.	Teel Bros. Contractors		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (23-1E)
3.	Dept. of Highways	Holmberg	Lots 1-5, Blk. 30, Navy Yard Park, Div. 2 sec. 13, (23-1E)
4.	Do		Blk. 11, Navy Yard Park, Div. 2, sec. 13, (23-1E)
*4A.	Morrison Gravel Co.		E $\frac{1}{2}$ sec. 23, (23-1E)
*4B.			NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (23-1E)
*5.	Kitsap County	Bethel	Lots 11, 12, and 14, Port Orchard
*6.	Do		N $\frac{1}{2}$ W $\frac{1}{2}$ and S $\frac{1}{2}$ sec. 32, (23-1E)
*7.	Do		NW $\frac{1}{4}$ SW $\frac{1}{4}$ and SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (23-1E)
*8.	Do		E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 34, (23-1E)
9.	Dept. of Highways		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, (23-1E)
*10.	Kitsap County	Camp Union	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, (24-1W)
*11.	Do	Holly	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (24-2W)
*12.	Do	Chico Hill	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, (24-1E)
13.	Dept. of Highways	Paddock	NE $\frac{1}{4}$ sec. 7, (24-1E)
*14.	Bremerton Sand & Gravel Co.		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, (24-1E)
*15.	Kitsap County	Sheridan	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, (24-1E)
16.	Mamie F. Allen	Allen	S $\frac{1}{2}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (24-1E)
17.	Dept. of Highways		Govt. lot 1 and SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (24-1E)
*17A.	Ace Paving Co.		SE $\frac{1}{4}$ sec. 16, (24-1E)
*18.	Kitsap County	Kitsap Lake	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (24-1E)
*18A.	Bremerton Gravel & Asphalt Co.		NW $\frac{1}{4}$ sec. 28, (24-1E)
*19.	Kitsap County	Seabeck	Govt. lot 7, sec. 20, (25-1W)
*20.	Do	Seabeck Hill	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (25-1W)
*20A.		Collins	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, (25-1W)
*21.	Kitsap County	Albright	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (25-1E)
*21A.		Riley	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (25-1E)
*22.	Kitsap County		N $\frac{1}{2}$ N $\frac{1}{2}$ and SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, (25-1E)
*23.	Do		SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (25-1E)
*24.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, (25-1E)
25.	Dept. of Highways		E $\frac{1}{2}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, (25-1E)
26.	Do		W $\frac{1}{2}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, (25-1E)
27.	Do		E $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, (25-1E)
*28.	Kitsap County	Barker Creek	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, (25-1E)
29.	Dept. of Highways	Bowling	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, (25-1E)
30.	Do		Govt. lot 2, sec. 32, (25-1E)
31.	Do		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (25-2E)
*31A.	Bainbridge Sand & Gravel Co.		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (25-2E)

Map no.	Operator or owner	Pit name	Property location
KITSAP COUNTY—Continued			
*32.	Kitsap County		Part of S $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (25-2E)
*33.	Do		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 1, (26-1E)
*34.	Do		N $\frac{1}{2}$ NE $\frac{1}{4}$ and E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 6, (26-1E)
35.	Dept. of Highways	Danielson	SE $\frac{1}{4}$ NE $\frac{1}{4}$ and NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, (26-1E)
*36.	Kitsap County		W $\frac{1}{2}$ NW $\frac{1}{4}$ and SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, (26-1E)
*36A.	Oliver Lanning		Sec. 9, (26-1E)
*36B.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, (26-1E)
*36C.	Fred Hill Materials, Inc.		SW $\frac{1}{4}$ sec. 30, (26-1E)
*36D.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, (26-2E)
*36E.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 31, (26-2E)
37.	Dept. of Highways		SW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (27-1E)
*38.	Kitsap County		NW. cor. SE $\frac{1}{4}$ sec. 27, (27-1E)
*39.	Do	Breidablick	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (27-1E)
40.	Kitsap County		Sec. 35, (27-1E)
*41.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (27-2E)
42.	W. S. Jameson	Jameson	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (27-2E)

KITTITAS COUNTY

1.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, (15-19E)
2.	Dept. of Highways	Roberts	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (15-19E)
*3.	C. M. St. P. & P. R.R.	Cohasset	NE $\frac{1}{4}$ sec. 19, (16-23E)
*4.	Dept. of Pub. Lands		Blk. "B" and lot 52, State Add. to Ellensburg
5.	Dept. of Highways	Goebel	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (17-18E)
6.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, (17-18E)
7.			Sec. 1, (17-19E)
8.	Dept. of Highways	Loter	Govt. lot 4 and SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (17-19E)
9.		Wheeler	1 $\frac{1}{2}$ mi. S. of Kittitas Sec. 30, (17-19E)
*9A.	Ellensburg Cement Products, Inc.		
10.	W. A. Tozer	Tozer	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 31, (17-19E)
11.	Dept. of Highways		E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 16, (17-21E)
12.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (17-23E)
*13.	Hutchinson Sand & Gravel Co.		Sec. 11, (18-17E)
14.			Sec. 24, (18-17E)
*14A.		Thayer	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, (18-18E)
15.	Wm. Donahue		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (18-18E)
*15A.		O'Neal	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (18-18E)
16.	Wm. Donahue	Donahue	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (18-18E)
*16A.			W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 20, (18-18E)
17.	Dept. of Highways	Desmond	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (18-18E)

Map no.	Operator or owner	Pit name	Property location
KITTITAS COUNTY—Continued			
18.	Dept. of Highways	Rego	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 32, (18-18E)
*18A.		Lym	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, (18-18E)
19.	Dept. of Highways	Boyd	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (18-18E)
20.	City of Ellensburg		W $\frac{1}{2}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 33, (18-18E)
21.	Charles Lester	Lester	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 33, (18-18E)
*22.	Kittitas County		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (18-18E)
*22A.		Stokes	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (18-19E)
23.			Sec. 30, (18-19E)
24.	Dept. of Highways	Smith	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, (18-19E)
25.	Do	Ballard	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (19-16E)
26.	Dept. of Highways		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (19-16E)
27.	Smithson Co.	Smithson	NW $\frac{1}{4}$ sec. 25, (19-17E)
28.	Dept. of Highways		SE $\frac{1}{4}$ sec. 3, (20-13E)
*28A.	Cresto & Finch		W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 12, (20-13E)
29.			Sec. 15, (20-14E)
30.	Dept. of Highways		NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 19, (20-14E)
31.	Do	Venera	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (20-14E)
*32.	Do		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (20-14E)
33.			2 mi. W. of Roslyn
34.	N. P. Ry.	Cle Elum	Secs. 27 and 28, (20-15E)
35.			Sec. 30, (20-15E)
36.	N. P. Ry.		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (20-15E)
37.	Dept. of Highways		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, (20-15E)
*38.	C. M. St. P. & P. R.R.	Cle Elum	SE $\frac{1}{4}$ sec. 33, (20-15E)
39.	Bruce Cooper	Cooper	N $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 25, (20-16E)
40.			Sec. 29, (20-16E)
41.	W. M. Emerson	Teanaway	In Blks. 1 and 2, town of Teanaway
42.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (20-16E)
43.	C. M. St. P. & P. R.R.		Sec. 15, (20-17E)
*43A.			E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 10, (21-12E)
44.	U. S. Forest Service		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14 and NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, (21-12E)
*44A.	Cascade Logging Co.		E $\frac{1}{2}$ sec. 36, (21-12E)
45.	Dept. of Highways		E $\frac{1}{2}$ SE $\frac{1}{4}$ and SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (22-11E)

Klickitat County			
*A.		Lyle	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (2-12E)
1.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (2-13E)
*2.	Charles Dubrowski		Sec. 4, (2-16E)
*3.	Bingen Sand & Gravel Co.		Sec. 29, (3-11E)
4.	Dept. of Highways		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (3-11E)
5.		Lyle	$\frac{3}{4}$ mi. NW. of Lyle
6.			Sec. 35, (3-12E)
7.	Dept. of Pub. Lands		W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 16, (3-16E)
8.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (3-16E)

Map no.	Operator or owner	Pit name	Property location
Klickitat County—Continued			
9.	H. H. Hartley		At Maryhill
10.	Dept. of Highways		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (3-19E)
11.	Do		E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 5, (3-20E)
*11A.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (3-21E)
12.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, (4-10E)
*12A.	Stanley Thompson		SE $\frac{1}{4}$ sec. 16, (4-16E)
13.	Dept. of Pub. Lands		Lot 2, sec. 36, (4-21E)
14.	Dept. of Highways		Lots 1 and 2, sec. 28, (4-22E)
15.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (5-10E)
16.	Do		W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 17, (5-17E)
17.	Do		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5, (6-18E)

LEWIS COUNTY			
*1.	Eddie Berlin		SE $\frac{1}{4}$ sec. 8, (11-1W)
*1A.	Sorenson Gravel Co.		Sec. 16, (11-1W)
*1B.		Rush	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (11-1W)
*1C.	Lewis County	Toledo	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 17, (11-1W)
*1D.		Keating	N $\frac{1}{2}$ N $\frac{1}{2}$ sec. 19, (11-1W)
*2.	Lewis County	Olequah	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, (11-2W)
*2A.		Miller Bar	S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 13, (11-2W)
*2B.		Mulford	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, (11-2W)
*2C.		Wilder	NW $\frac{1}{4}$ sec. 26, (11-2W)
*2D.		Wallace	W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 27, (11-2W)
*2E.	Austin & Warnoch		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (11-2W)
3.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (12-2W)
*4.	Lewis County	Roundtree	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, (12-4W)
5.	Dept. of Highways		Lot 15, sec. 5, (12-5W)
6.	Do		Lot 10, sec. 5, (12-5W)
*7.	Lewis County	Salkum	Sec. 23, (12-1E)
*7A.			NW $\frac{1}{4}$ sec. 24, (12-1E)
*8.	Lewis County	Kelly	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (12-1E)
*8A.		McQuiggs	N $\frac{1}{2}$ N $\frac{1}{2}$ sec. 32, (12-1E)
*9.	Lewis County	Harmony	Lot 5, sec. 1, (12-2E)
10.	Dept. of Highways	Moore-Davis	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16 and SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (12-2E)
11.	Do		Govt. lots 7 and 8, sec. 13, (12-3E)
12.	Do		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (12-3E)
*13.	Lewis County	Mossyrock	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (12-3E)
14.	Edlund, White & Edlund	do	At Mossyrock
*15.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, (12-4E)
16.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (12-4E)
17.	Do		E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 22, (12-5E)
18.	Do		W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 31, (12-5E)
19.	N. P. Ry.		E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 31, (12-5E)

Map no.	Operator or owner	Pit name	Property location
LEWIS COUNTY—Continued			
20.	Dept. of Highways	Fairhurst	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (12-6E)
*21.	Lewis County	Kiona	W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 10, (12-6E)
*21A.		Smathers	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, (12-6E)
22.	I. N. DeRossett	Randle	In Randle
*22A.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (12-7E)
23.	Dept. of Highways		Govt. lots 4-9, sec. 15, (12-8E)
24.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (13-1W) and Govt. lot 2, sec. 31, (13-1E)
*24A.		Shorey	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, (13-2W)
*24B.	S. C. Breen		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (13-2W)
*25.	Lewis County	Union	Sec. 23, (13-2W)
26.	W. A. Fate	Fate	Island in Newaukum River in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, (13-2W)
27.	Dept. of Highways		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (13-2W)
28.	Do		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (13-3W)
29.	Lewis County	Onalaska	At Onalaska
30.	Dept. of Highways		NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (13-1E)
*31.	M. T. and R. L. Huntting	Huntting	N $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 33, (13-2E)
32.			Sec. 26, (13-3E)
33.	Dept. of Highways		W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 27, (13-3E)
34.	Do		E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 28, (13-3E)
35.	Chesser Lumber Co.	Chesser	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (13-4E)
36.	Dept. of Highways		S $\frac{1}{2}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (13-4E)
37.	Do	Lindberg	Lots 3 and 4, sec. 19, (13-5E)
38.	Hayes & Powell	Packwood	At Packwood
*38A.	Matchett and Panco		NE $\frac{1}{4}$ sec. 1, (13-9E)
*38B.		Warnke	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (13-9E)
39.	Dept. of Highways		Lots 4 and 5, sec. 32, (13-9E)
*39A.		Bernobich	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 6, (14-2W)
*40.	Twin City Sand & Gravel Co.		NE $\frac{1}{4}$ sec. 7, (14-2W)
*40A.	Poe Sand & Gravel Co.		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, (14-3W)
*40B.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (14-3W)
*41.	Lewis County	Mineral	E $\frac{1}{2}$ sec. 10, (14-5W)
42.	Dept. of Highways	Smith	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, (14-5W)
43.	U. S. Forest Service		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (14-10E)
*44.	Lewis County	Waunch Prairie	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (15-2W)
*44A.	Pacific Sand & Gravel Co.		Sec. 31, (15-2W)
*44B.	Martin Sand & Gravel Co.		Sec. 32, (15-2W)
*44C.	Pacific Sand & Gravel Co.		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (15-3W)
*45.	Lewis County	Independence	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (15-4W)

Map no.	Operator or owner	Pit name	Property location
LEWIS COUNTY—Continued			
46.	Dept. of Highways		W $\frac{1}{2}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ and S $\frac{1}{2}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (15-5E)
47.	Do		N $\frac{1}{2}$ SW $\frac{1}{4}$ and NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (15-5E)
48.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (15-5E)
LINCOLN COUNTY			
1.	Dept. of Highways		Govt. lot 3 and S $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 3, (21-31E)
2.			Sec. 12, (21-31E)
3.	Lincoln County		SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18, (21-31E)
*4.	Do		Sec. 15, (21-32E)
*5.	Joslin & McAllister		NW $\frac{1}{4}$ SE $\frac{1}{4}$ and SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 5, (21-33E)
*5A.	J. E. Scrupps	Gravel	NE $\frac{1}{4}$ sec. 5, (21-33E)
*5B.		Ramm	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, (21-33E)
6.			$\frac{1}{2}$ mi. SE. of Odessa
7.	B. Minard	Minard	NE $\frac{1}{4}$ sec. 13, (21-33E)
*7A.	J. E. Scrupps	Sand	NW $\frac{1}{4}$ sec. 14, (21-33E)
8.			Sec. 1, (21-34E)
9.	Dept. of Highways	Anderson	Lot 3, sec. 5, (21-34E)
*9A.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, (21-36E)
10.			Sec. 24, (21-36E)
11.			N $\frac{1}{2}$ sec. 10, (21-37E)
12.	Lincoln County		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (21-37E)
*12A.		Smith	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (21-37E)
*12B.		do	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (21-37E)
13.			Sec. 2, (21-38E)
*13A.		Underwood	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, (21-38E)
14.	Dept. of Highways		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, (21-38E)
15.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 14, (21-38E)
16.			Sec. 27, (21-38E)
17.	Dept. of Highways	Rothrock	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, (21-39E)
18.	N. P. Ry.	Sprague	Sec. 25, (21-39E)
19.			SE $\frac{1}{4}$ sec. 8, (22-31E)
20.	Dept. of Highways	Hammer-smith	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (22-35E)
21.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (22-36E)
*21A.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (22-37E)
22.	Dept. of Highways		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26 and NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (22-37E)
23.			Sec. 31, (22-38E)
24.	Dept. of Highways		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, (22-39E)
25.	Dept. of Highways	Lawton	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 24, (22-39E)
26.	Lincoln County		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, (23-31E)
27.			Sec. 18, (23-31E)
28.	J. C. & C. G. Hallapeter	Hallapeter	SW $\frac{1}{4}$ sec. 27, (23-33E)
29.	Lincoln County		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 25, (23-34E)
30.	J. M. Phillips	Phillips	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (23-36E)
31.	California Land & Stock Co.		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (23-36E)

Map no.	Operator or owner	Pit name	Property location
LINCOLN COUNTY—Continued			
32.	Dept. of Highways		SW $\frac{1}{4}$ NE $\frac{1}{4}$ and SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (23-36E)
33.	Do		NE $\frac{1}{4}$ sec. 21, (23-36E)
*33A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (23-36E)
34.			Sec. 11, (23-38E)
35.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (23-39E)
36.	Do		SW $\frac{1}{4}$ NW $\frac{1}{4}$ and NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (24-32E)
37.	G. G. Doggett	Doggett	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (24-37E)
38.			Sec. 12, (24-38E)
39.			Sec. 34, (24-38E)
40.	Lincoln County		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, (24-39E)
*40A.			SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 24, (25-35E)
41.	Dept. of Highways		Govt. lot 4, sec. 18, (25-36E)
42.	Do		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 23, (25-36E)
43.		Rocklyn	N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 26, (25-36E)
44.			Sec. 12, (25-37E)
45.	John H. Nichols	Nichols	SW $\frac{1}{4}$ sec. 15, (25-37E)
46.	Lincoln County		Sec. 22, (25-37E)
47.	Dept. of Highways		S $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 14, (25-39E)
48.	Do		E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 18, (25-39E)
49.	Lincoln County		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (25-39E)
50.		Almira	1 $\frac{1}{4}$ mi. NE. of Almira
*50A.			SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (26-31E)
*51.	Lincoln County		Sec. 33, (26-31E)
52.	Dept. of Highways	Burke	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (26-31E)
53.	Do	Scheiber	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, (26-32E)
*53A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 12, (26-32E)
54.		Govan	$\frac{1}{2}$ mi. SW. of Govan
55.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ and SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, (26-32E)
56.	Do	Hansen	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (26-33E)
57.	Do	Roby	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 7, (26-33E)
58.		Wilbur	$\frac{1}{4}$ mi. N. of Wilbur
59.	Dept. of Highways	Miller	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (26-33E)
60.	Do	Hall	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, (26-34E)
*60A.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (26-35E)
61.	Lincoln County		Sec. 17, (26-37E)
*62.	Do		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (27-36E)
*62A.		Riddle	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (27-36E)
63.	Dept. of Highways	Loughbon	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (27-37E)
64.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (28-31E)
*64A.			NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (28-31E)
65.	Dept. of Highways		E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 25, (28-31E)
66.	Do	L. Campbell	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 20, (28-33E)
67.	Do	Campbell	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (28-33E)

Map no.	Operator or owner	Pit name	Property location
MASON COUNTY			
1.			Sec. 8, (19-3W)
2.	N. P. Ry.		Sec. 17, (19-3W)
*3.	Mason County	Lake Isabella	Sec. 1, (19-4W)
4.			Sec. 4, (19-4W)
5.	N. P. Ry.		Sec. 27, (19-4W)
6.	Dept. of Highways	Miller	W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 31, (19-4W)
7.			SE $\frac{1}{4}$ sec. 10, (19-5W)
8.			Sec. 7, (19-6W)
*8A.	John's Creek Sand & Gravel Co.		Sec. 3, (20-3W)
*9.	Mason County	Bay Shore	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (20-3W)
10.			Sec. 18, (20-3W)
11.			NE $\frac{1}{4}$ sec. 32, (20-3W)
*12.	Shelton Sand & Gravel Co.		Sec. 13, (20-4W)
*12A.	Mason Materials Co.	Mason	Sec. 24, (20-4W)
13.			S $\frac{1}{2}$ sec. 35, (20-4W)
*14.	Mason County		NE $\frac{1}{4}$ sec. 11, (20-5W)
15.			Sec. 29, (20-6W)
16.			Sec. 8, (21-1W)
17.			Sec. 33, (21-3W)
18.			W $\frac{1}{2}$ sec. 35, (21-3W)
19.	Dept. of Highways		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (21-4W)
20.	Do		Govt. lots 11 and 12, sec. 15, (21-4W)
21.	Do		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (21-4W)
22.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 22, (21-4W)
*22A.			S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 26, (21-4W)
23.			NW $\frac{1}{4}$ sec. 26, (21-4W)
24.	Dept. of Highways		E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 6, (22-1W)
*24A.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, (22-1W)
*25.	Mason County	Cascade Tracts	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (22-2W)
*26.	Do		NE $\frac{1}{4}$ sec. 17, (22-2W)
27.	Dept. of Highways	Beekman	Govt. lot 4, sec. 33, (22-3W)
*28.	Kitsap County	Pope & Talbot	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (23-1W)
29.	Dept. of Highways	Overton	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (23-1W)
*29A.	Belfair Sand & Gravel		S $\frac{1}{2}$ sec. 30, (23-1W)
*29B.	North Shore Sand & Gravel		Sec. 31, (23-1W)
*30.	Mason County	Bear Creek	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 9, (23-2W)
*30A.		Graves	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (23-3W)
*30B.			SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (23-3W)
*30C.		Will	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (23-3W)
*30D.		Stewart	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, (23-3W)
31.	Hamma Hamma Logging Co.		Lot 4 and NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (24-3W)

OKANOGAN COUNTY			
1.	Consolidated Builders, Inc.		E. side of Columbia River at Grand Coulee Dam
*1A.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (29-23E)
*1B.	J. D. Shotwell Co.		NW $\frac{1}{4}$ sec. 10, (29-25E)
*1C.	Bridgeport Sand & Gravel		E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 35, (29-25E)

OKANOGAN COUNTY—Continued

Map no.	Operator or owner	Pit name	Property location
*1D.	Thornton Sand & Gravel		Bridgeport area
2.	Dept. of Highways	Socula	Lot 6, sec. 17, (29-31E)
*2A.		Seaten	NW $\frac{1}{4}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 20, (29-31E)
*2B.			S $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 30, (29-31E)
3.	John Larrabee	Larrabee	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (30-23E)
4.	Dept. of Highways		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (30-24E)
5.	Do		E $\frac{1}{2}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (30-24E)
6.	Do		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 22, (30-24E)
*6A.	Brewster Red-E-Mix Concrete Co.		NW $\frac{1}{4}$ sec. 23, (30-24E)
*6B.		Freer	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, (30-25E)
*6C.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (30-25E)
*6D.		Wapato	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (31-25E)
7.			5 $\frac{1}{2}$ mi. NE. of Brewster
8.	Dept. of Highways	Bell	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 31, (30-31E)
9.	Do	Averill	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (31-22E)
10.	Do	Countryman	Lot 4, sec. 27, (31-22E)
11.	Do	Ohms	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, (32-22E)
12.			SW $\frac{1}{4}$ sec. 10, (32-22E)
*12A.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, (32-22E)
13.			3 $\frac{1}{2}$ mi. SW. of Carlton
14.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10 and SW $\frac{1}{4}$ sec. 11, (32-29E)
*14A.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (32-29E)
15.	Colville Indian Agency		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, (32-30E)
*15A.	R. D. Schrier		NE $\frac{1}{4}$ sec. 7, (33-22E)
16.	Dept. of Highways	Smith	SE $\frac{1}{4}$ NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (33-22E)
17.	Dept. of Highways	Burton	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (33-22E)
18.	Elgin Land Co.		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (33-26E)
19.	Dept. of Highways		E $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 1, (33-27E)
20.	Do	Garrett	NW $\frac{1}{4}$ SW $\frac{1}{4}$ and NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (34-21E)
*20A.		Dibble	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (34-21E)
*21.	Columbia Concrete Pipe Co.		SE $\frac{1}{4}$ sec. 4, (34-26E)
22.	Dept. of Highways	Swimpkin	NW $\frac{1}{4}$ NW $\frac{1}{4}$ and SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (34-26E)
*22A.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (34-27E)
*22B.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (35-21E)
23.	Dept. of Highways		W $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 7, (36-27E)
24.			NE $\frac{1}{4}$ sec. 27, (36-27E)
*24A.		Figlenski	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (36-27E)
*24B.	Verbeck Bros.		Sec. 15, (37-27E)
25.	Dept. of Highways		Lot 1 and NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 16, (37-27E)
*25A.	Verbeck Bros.		Sec. 17, (37-27E)
26.	Dept. of Highways		Tax lot 4 in lot 2, sec. 30, (37-27E)

OKANOGAN COUNTY—Continued

Map no.	Operator or owner	Pit name	Property location
27.	Dept. of Highways	Rounds	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, (37-28E)
28.	Do	Lesamiz	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, (37-28E)
29.	Do	Averill	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (37-29E)
30.	Do	Davis	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (37-29E)
*30A.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, (37-29E)
31.	Dept. of Highways	Davis	E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 26, (37-29E)
32.	U. S. Indian Service		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (37-29E)
*32A.		Rounds	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (37-29E)
33.	Dept. of Highways	Van Slyke	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (37-30E)
34.	Do	Smith	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (37-30E)
35.	Do	Schertenleib	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 9, (37-30E)
36.	Do	Spencer	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, (37-30E)
37.	Do	See	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (37-30E)
38.	Do	Bradley	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, (37-30E)
39.	Do	Garris	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (37-31E)
40.	Do		S $\frac{1}{2}$ SW $\frac{1}{4}$ and NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (37-31E)
41.	Do		SW $\frac{1}{4}$ NE $\frac{1}{4}$ and SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, (38-27E)
*41A.		Helm	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, (38-28E)
*41B.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (38-28E)
*41C.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, (39-27E)
42.	Dept. of Highways		E $\frac{1}{2}$ lot 3, sec. 14, (39-27E)
43.	Do	Robinson	Lot 2, sec. 28, and SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (39-27E)
44.	Do	Lesamiz	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (39-27E)
*44A.	Verbeck Bros.		Sec. 5, (40-27E)
*44B.			NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (40-27E)
*44C.	Fowler Construction Co.		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (40-27E)
*44D.	Beitz Bros.		W $\frac{1}{2}$ sec. 16, (40-27E)
45.	Dell Hart		Sec. 21, (40-27E)
46.			NW $\frac{1}{4}$ sec. 26, (40-27E)
*47.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (40-29E)

PACIFIC COUNTY

	Operator or owner	Pit name	Property location
1.	Dept. of Highways		NE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ and SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 4, (10-9W)
2.	Do		S $\frac{1}{2}$ N $\frac{1}{2}$ and N $\frac{1}{2}$ S $\frac{1}{2}$ sec. 5, (10-10W)
3.	A. H. Cuples		At Long Beach
4.	Dept. of Highways		Tideland fronting lot 2, sec. 29, (10-11W)
*4A.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (10-11W)
5.	Dept. of Highways		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (11-9W)
6.	Nahcotta Sand & Gravel Co.	Nahcotta	W. side of Long Island

Map no.	Operator or owner	Pit name	Property location	Map no.	Operator or owner	Pit name	Property location
PACIFIC COUNTY—Continued				PEND OREILLE COUNTY—Continued			
7.	Dept. of Pub. Lands		Lot 3, sec. 12, (11-11W)	25.	Dept. of Highways	Davis Lake	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, (32-44E)
8.	Dept. of Highways		W $\frac{1}{2}$ NE $\frac{1}{4}$ and E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 14, (12-10W)	26.	Do	Clark	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (32-44E)
9.	W. M. Newart	Newart	S $\frac{1}{2}$ N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 14, (12-10W)	27.	Do		Govt. lots 4 and 5, sec. 36, (32-44E)
10.	Dept. of Pub. Lands		Lots 1 and 2, sec. 23, (12-10W)	28.	Dept. of Pub. Lands		N $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 36, (32-44E)
11.	Dept. of Highways	Londalen	E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 27, (12-10W)	*29.	Pend Oreille County		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, (32-45E)
12.			Sec. 2, (13-8W)	30.			Sec. 30, (32-45E)
13.			On S. Fk. Willapa River 6 mi. S. of Raymond	*31.	Pend Oreille County		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (32-45E)
14.		Holcomb	1 mi. N. of Holcomb	32.	Dept. of Highways	Perry	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (32-45E)
15.		Palix River	A few mi. up Palix River	*33.	Pend Oreille County		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (32-45E)
*15A.			NE $\frac{1}{4}$ sec. 31, (14-9W)	34.	A. Crown	Crown	NE $\frac{1}{4}$ sec. 2, (33-43E)
16.	Pacific Contracting Co.		At Raymond	*35.	Pend Oreille County		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (33-44E)
17.	W. R. Osborne		Do	36.	Dept. of Highways		W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 12, (34-43E)
18.	Harbor Sand & Gravel Co.		Do	*37.	Pend Oreille County		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18, (34-44E)
*19.	Pacific County		Sec. 26, (15-7W)	38.	Dept. of Highways		Lot 3, sec. 18, (35-44E)
PEND OREILLE COUNTY				39.	Do		Sec. 19, (35-44E)
1.	R. F. Washburn	Washburn	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (30-43E)	*40.	Pend Oreille County		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, (36-43E)
2.	George W. Neville	Neville	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (30-43E)	*41.	Do		SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (36-43E)
*3.	Pend Oreille County		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (30-43E)	42.	Dept. of Highways		Lot 1, sec. 34, (36-43E)
*4.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (30-43E)	*42A.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (37-42E)
*5.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, (30-44E)	*42B.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, (37-43E)
6.	Dept. of Highways		Sec. 1, (30-44E)	43.	Dept. of Highways	Ferguson	Govt. lots 4 and 5, sec. 5, (37-43E)
*7.	Pend Oreille County		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (30-44E)	*43A.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, (37-43E)
*8.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, (30-44E)	44.			Sec. 18, (37-43E)
*9.	Do		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (30-45E)	*44A.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 30, (37-43E)
*10.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (30-45E)	*45.	Pend Oreille County		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 33, (37-43E)
*11.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, (30-45E)	*46.	Joslin & McAllister		Lot 1, sec. 18, (38-43E)
12.	Dept. of Highways		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (31-43E)	*47.	Pend Oreille County		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 19, (38-43E)
13.	Do	Kinney	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (31-44E)	48.	Dept. of Highways	Hiatt	SW $\frac{1}{4}$ SE $\frac{1}{4}$ and Govt. lot 8, sec. 31, (38-43E)
14.	Do		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 6, (31-44E)	49.	Interstate Engr. & Construction Co.		At Metaline Falls
15.	Do		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, (31-44E)	50.	Dept. of Highways		Govt. lots 8 and 9, sec. 28, (39-43E)
*16.	Pend Oreille County		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (31-44E)	*51.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (39-44E)
17.			Sec. 2, (31-45E)	*52.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (40-43E)
*17A.	Albert E. Rathbun		Sec. 3, (31-45E)	PIERCE COUNTY			
*17B.	Romero Bros.		SE $\frac{1}{4}$ sec. 13, (31-45E)	*1.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (15-5E)
*17C.			SE $\frac{1}{4}$ sec. 19, (31-45E)	1A.	Elizabeth M. Messler	Messler	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (15-7E)
18.			SE $\frac{1}{4}$ sec. 23, (31-45E)	*1B.	Shafer Bros.		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 31, (15-7E)
19.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (31-45E)	2.	Dept. of Highways	Hall	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, (15-7E)
20.		Penrith	1 mi. W. of Penrith	3.	Wheeler & Reese		Sec. 11, (16-4E)
*21.	Pend Oreille County		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 12, (32-42E)	*4.	C. M. St. P. & P. R.R.	Eatonville	SW $\frac{1}{4}$ sec. 13, (16-4E)
*22.	Do		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (32-43E)	5.			Sec. 17, (16-4E)
*23.	Do		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (32-43E)	6.	Dept. of Highways	Peterson	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 18, (16-4E)
24.	Dept. of Highways	Usk	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (32-44E)	7.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (16-4E)

Map no.	Operator or owner	Pit name	Property location
PIERCE COUNTY—Continued			
*7A. *7B.		Pack Forest Reichein	NW ¼ sec. 28, (16-4E) NE ¼ NW ¼ sec. 25, (17-2E)
8.	Dept. of Highways		NE ¼ NE ¼ sec. 27, (17-2E)
*9.	Pierce County		E ½ SW ¼ and NE ¼ SE ¼ sec. 3, (17-4E)
*9A.			NE ¼ SE ¼ sec. 3, (17-4E)
10.	Dept. of Highways		Govt. lot 2, sec. 31, (17-4E)
*11.	Pierce County		SE ¼ NE ¼ sec. 8, (17-5E)
12.	U. S. Forest Service		NW ¼ NE ¼ SE ¼ sec. 28, (17-7E)
*12A.		Ockfen	SW ¼ SE ¼ sec. 11, (18-3E)
13.			Sec. 11, (18-4E)
*13A.		Jones	S ½ NW ¼ NE ¼ sec. 30, (18-4E)
*13B.		Christoph	NE ¼ NE ¼ sec. 36, (18-4E)
14.	Dept. of Highways		NW ¼ SW ¼ sec. 20, (18-5E)
*14A.			SW ¼ NE ¼ sec. 20, (18-5E)
*14B.			N ½ S ½ NW ¼ sec. 31, (18-7E)
15.	N. P. Ry.	Nisqually	Sec. 27, (19-1E)
*16.	Harrison Bros. Co.		NE ¼ sec. 1, (19-2E)
*17.	C. S. Barlow & Sons, Inc.		E ½ SE ¼ sec. 2, (19-2E)
*18.	Pierce County		SE ¼ NW ¼ sec. 12, (19-2E)
19.	Dept. of Highways		SW ¼ NW ¼ sec. 12, (19-2E)
*19A.			S ½ NW ¼ sec. 21, (19-2E)
*19B.			SE ¼ SW ¼ sec. 29, (19-2E)
*19C.	Woodworth & Co., Inc.		NE ¼ SW ¼ sec. 6, (19-3E)
*19D.			SW ¼ SE ¼ sec. 24, (19-3E)
*20.	C. M. St. P. & P. R.R.	Fredrick- son	SE ¼ sec. 25, (19-3E)
*21.	Pierce County		Lot 1, sec. 30, (19-4E)
22.			Sec. 36, (19-4E)
23.	Wm. T. Gregg	Gregg	SW ¼ SE ¼ sec. 32, (19-6E)
24.	Dept. of Highways	Ogle	S ½ SW ¼ sec. 33, (19-6E)
*24A.			NW ¼ SW ¼ sec. 24, (19-9E)
25.			SW. cor. sec. 12, (20-2E)
*26.	Pioneer Sand & Gravel Co.	Steilacoom	Secs. 20 and 29, (20-2E)
*27.	Glacier Sand & Gravel Co.		Secs. 20 and 29, (20-2E)
*28.	Holroyd Co.	Holroyd	74th and Orchard Grove, S. Tacoma
*29.	Tacoma Sand & Gravel Co.		48th and Waller Road, Tacoma
*29A.		McKinney	NE ¼ NW ¼ sec. 14, (20-3E)
30.			Sec. 19, (20-3E)
*30A.		Lidford	NE ¼ SW ¼ sec. 24, (20-3E)
*30B.		Sawyer	NE ¼ NE ¼ sec. 25, (20-3E)
*30C.			SE ¼ NW ¼ sec. 1, (20-4E)
*30D.			NE ¼ SW ¼ sec. 3, (20-4E)

Map no.	Operator or owner	Pit name	Property location
PIERCE COUNTY—Continued			
31.	Alice Wise	Wise	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 6, (20-4E)
32.	Carl Leiendecker	Leiendecker	Do
33.	J. A. Milcane	Milcane	SE $\frac{1}{4}$ NW $\frac{1}{4}$ and NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (20-4E)
34.	Frank P. Spinning	Spinning	Blks. 38 and 40 in lot 16, Puyallup, sec. 27, (20-4E)
*35.	Pierce County		Lot 5, sec. 30, (20-4E)
*35A.	Hill Top Gravel Co.		SW $\frac{1}{4}$ sec. 35, (20-4E)
36.	L. H. Heidinger	Heidinger	Lot 4, sec. 6, (20-5E)
*36A.	Tim Corliss & Son		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 20, (20-5E)
37.			W $\frac{1}{2}$ sec. 32, (20-5E)
*38.	Pierce County		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (21-1W)
*38A.	Mackie & Lewis		E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 2, (21-1E)
*39.	Pierce County		W $\frac{1}{2}$ SE $\frac{1}{4}$ and SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, (21-1E)
40.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 20, (21-2E)
*40A.		Weathers	NW $\frac{1}{4}$ sec. 33, (21-2E)
*40B.	Woodworth & Co., Inc.	Hylebus	Sec. 25, (21-3E)
41.		County line	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, (21-4E)
*42.	Pierce County		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (22-1W)
*42A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (22-1E)
43.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (22-1E)
SAN JUAN COUNTY			
*1.	San Juan County		Lot 2, sec. 18, (34-1W)
*1A.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18, (34-1W)
2.			Sec. 7, (34-2W)
*2A.		Erismann	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 23, (35-2W)
*3.	San Juan County		Lot 5, sec. 13, (35-3W)
4.	C. B. Morrow		At Friday Harbor
*5.	San Juan County		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, (37-2W)
SKAGIT COUNTY			
*1.			Center N. line sec. 4, (33-4E)
*2.	Skagit County	Conway	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, (33-4E)
*3.	Dept. of Highways	do	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 21, (33-4E)
*3A.			NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 22, (33-4E)
*3B.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (34-1E)
4.	Dept. of Highways		Sec. 26, (34-2E)
*4A.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (34-2E)
*4B.		Gorton	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 9, (34-3E)
5.			On Skagit River, 1 mi. SW. of Mount Vernon
6.	Blackmore Transfer Co.	Clear Lake	At Clear Lake
*7.	Private		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (34-4E)
8.		Riverside	Sec. 8, (34-4E)
*9.	Skagit County		Sec. 14, (34-4E)
*9A.	E. L. Miller		N $\frac{1}{2}$ sec. 34, (34-4E)

Map no.	Operator or owner	Pit name	Property location
SKAGIT COUNTY—Continued			
*10.		Davis	N $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 34, (34-4E)
*10A.	Mount Vernon Sand & Gravel Co., Inc.		NW $\frac{1}{4}$ sec. 34, (34-4E)
*11.	Dept. of Highways	Big Lake	NE $\frac{1}{4}$ sec. 35, (34-4E)
12.	Do		E $\frac{1}{2}$ SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (34-5E)
*13.	Skagit County		Sec. 25, (35-1E)
14.		Whitmarsh	Sec. 3, (35-3E)
*15.	C. C. Carney		Sec. 17, (35-3E)
*16.	Skagit County		Sec. 21, (35-3E)
*16A.	Robert Nordlund		Sec. 4, (35-4E)
*16B.	Mount Vernon Sand & Gravel Co., Inc.	Samish	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 6, (35-4E)
*17.	Skagit County		Sec. 13, (35-4E)
*18.	Do		Sec. 18, (35-4E)
*18A.	G. N. Ry.	Belleville	Sec. 18, (35-4E)
*18B.		Rogers	NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 18, (35-4E)
19.	Dept. of Highways	Callahan	N $\frac{1}{2}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 18, (35-4E)
*20.	Morris Bros.	Sand	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (35-4E)
21.		La Plant	Sec. 35, (35-4E)
*22.	Dept. of Highways	Utopia	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 23, (35-5E)
*22A.	Bingham Investment Co.		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (35-5E)
*22B.	Bradsberry Log Co.		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, (35-5E)
23.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 30, (35-5E)
*23A.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (35-5E)
24.	Lyman Timber Co.		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (35-6E)
25.	Dept. of Highways	Burns	Lot 6, sec. 9, (35-8E)
26.	Do		Govt. lot 3, sec. 19, (35-9E)
*26A.		Hornbeck	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, (35-9E)
27.	Dept. of Highways		NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 30, (35-10E)
28.	Do		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, (35-11E)
*28A.		White	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (36-4E)
29.	Dept. of Highways		N $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 8, (36-4E)
30.	Do	Sluss	W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 8, (36-4E)
31.	Do		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (36-4E)
32.		Prairie	Sec. 24, (36-4E)
33.		Thornwood	Sec. 25, (36-4E)
34.		Prairie	Sec. 19, (36-5E)
*35.	Harrington & Martin		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 1, (36-11E)
*36.			SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 21, (36-11E)

SKAMANIA COUNTY

*1.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 2, (1-5E)
2.	Dept. of Highways	Gensman	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 5 and NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, (1-5E)
*3.			NE $\frac{1}{4}$ sec. 30, (2-7E)
4.			Sec. 22, (3-8E)
5.			Sec. 23, (3-8E)
6.	John F. Sweeney	Sweeney	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, (3-8E)
7.	Dept. of Highways		Lot 4, sec. 35, (3-8E)
*8.	Skamania County	Wind Mountain	NW $\frac{1}{4}$ sec. 35, (3-8E)

Map no.	Operator or owner	Pit name	Property location
SKAMANIA COUNTY—Continued			
*9.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (3-8E)
*10.			NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (3-8E)
*11.	Skamania County	Underwood	SW $\frac{1}{4}$ sec. 14, (3-10E)
*12.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (3-10E)
*13.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, (4-7E)
*14.			N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 36, (4-7E)

SNOHOMISH COUNTY

*1.	Builders Sand and Gravel		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (27-4E)
2.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, (27-4E)
*2A.	Lake City Gravel & Materials Co.		Sec. 26, (27-4E)
*3.	Snohomish County		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 29, (27-4E)
*3A.	Northlake Sand & Gravel Co.		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (27-4E)
*3B.	S. H. Edinger Gravel Co.		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (27-4E)
4.	Wesco Powder Co.		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 6, (27-5E)
5.			SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, (27-5E)
6.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, (27-6E)
7.			SE $\frac{1}{4}$ sec. 3, (27-6E)
*7A.	Monroe Sand & Gravel Co.		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (27-6E)
*8.	Do	Skykomish River	Sec. 14, (27-6E)
*8A.	Clearview Sand & Gravel Co.		Sec. 18, (27-6E)
9.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 26, (27-6E)
10.			2 mi. E. of Monroe in a sidehill pit
11.			2 mi. E. of Monroe on Skykomish River
12.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 19, (27-7E)
13.			On Skykomish River 2 mi. S. of Startup
14.	Dept. of Highways	Startup	In Skykomish River in sec. 2, (27-8E)
15.		Sultan	On Skykomish River at Sultan
16.	Dept. of Highways	S. Sultan	Lot 1, sec. 6, (27-8E)
*16A.	G. N. Ry.	Reiter	Sec. 10, (27-9E)
17.	Wallace Falls Timber Co.	do	SW $\frac{1}{4}$ NE $\frac{1}{4}$ and NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14 and SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (27-9E)
18.		Index	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, (27-10E)
19.	Dept. of Highways	Eagle Falls	In Skykomish River between lots 1 and 2, sec. 27, (27-10E)
20.	Do	Halford	In Skykomish River between lots 11 and 12, sec. 34, (27-10E)
*21.	Snohomish County		Sec. 1, (28-4E)
*22.	Associated Sand & Gravel Co.		E $\frac{1}{2}$ sec. 1, (28-4E)
23.			NE $\frac{1}{4}$ sec. 12, (28-4E)
*24.			Just N. of Snohomish city limits
25.	S. Snohomish		SW $\frac{1}{4}$ sec. 19, (28-5E)
26.	Roosevelt		SW $\frac{1}{4}$ sec. 26, (28-5E)

Map no.	Operator or owner	Pit name	Property location
SNOHOMISH COUNTY—Continued			
*27. 28.	Snohomish County		Sec. 30, (28-5E) SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 4, (28-6E)
29.	Dept. of Highways	Pilchuck River	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (28-6E)
*30. 31.	Snohomish County Do	Snohomish	Sec. 7, (28-6E) NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, (28-6E)
32.			SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (28-6E)
33.			NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (28-6E)
*33A. 34.	Snohomish Sand & Gravel		4th and Cypress Sts., Snohomish NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, (28-6E)
35.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, (28-6E)
*35A. 36. 37.	C. H. Beavers	Monroe	Sec. 36, (28-6E) SE $\frac{1}{4}$ sec. 22, (28-7E) NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (28-7E)
38.			NE. cor. sec. 30, (28-7E)
39.			NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 32, (28-7E)
40.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 34, (28-7E)
*40A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, (28-8E)
*41. 42.	Snohomish County		Sec. 29, (28-8E) NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 31, (28-8E)
43.	Hat Island Sand & Gravel Co.	Gedney (Hat) Island	On Gedney (Hat) Island
*43A. 43B.	L. D. Fairfield Construction Co.	Amanda	Everett area SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (29-4E)
*43C.	E. H. Stiles		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (29-5E)
*44. 44A.	Snohomish County		Sec. 11, (29-5E) SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, (29-5E)
45. 46. 47.		Hartford do Valalta	NW. cor. sec. 4, (29-6E) SW $\frac{1}{4}$ sec. 9, (29-6E) NW $\frac{1}{4}$ sec. 15, (29-6E)
*48.	Snohomish County	Pilchuck River	Sec. 16, (29-6E)
49. 50. 51.			SE $\frac{1}{4}$ sec. 20, (29-6E) At Machias NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 25, (29-6E)
52. 53. 53A.	Snohomish County	Machias	SE $\frac{1}{4}$ sec. 22, (29-7E) Sec. 31, (29-7E) SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (30-4E)
54. 55.			SW $\frac{1}{4}$ sec. 5, (30-5E) NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (30-5E)
*55A.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 20, (30-5E)
56.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, (30-6E)
57.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, (30-6E)
*58. 59.	Snohomish County	Granite Falls	Sec. 10, (30-6E) SW $\frac{1}{4}$ sec. 13, (30-6E)
60.			NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, (30-6E)
*60A.			SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 22, (30-6E)

Map no.	Operator or owner	Pit name	Property location
SNOHOMISH COUNTY—Continued			
61. 62. 63.		Johnson	NW $\frac{1}{4}$ sec. 32, (30-6E) Sec. 34, (30-6E) SE $\frac{1}{4}$ sec. 2, (30-7E)
*64.	Snohomish County	Canyon Creek	Sec. 3, (30-7E)
65. 66. 67.			SW $\frac{1}{4}$ sec. 20, (30-7E) Sec. 22, (30-7E) Sec. 27, (30-7E)
*68.	Do	Worthy Creek	Sec. 1, (31-4E)
69.		Pilchuck Creek	Sec. 2, (31-4E)
70.		Stillaguamish	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, (31-4E)
*71.	Snohomish County	Lake Howard	Sec. 20, (31-4E)
72. 73.			Sec. 30, (31-4E) SW $\frac{1}{4}$ sec. 2, (31-5E)
*73A.	Arlington Sand & Gravel Co.	Arlington	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, (31-5E)
*73B.	Do		E $\frac{1}{2}$ sec. 2, (31-5E)
*73C.	Vernon Bjerkaker		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (31-5E)
*73D. 74.	Roy Robb		S $\frac{1}{2}$ sec. 11, (31-5E) On Stillaguamish River 1 $\frac{1}{2}$ mi. E. of Sylva Sec. 14, (31-5E)
*74A.	Lyons Sand & Gravel		Sec. 15, (31-5E)
*75. 76. 77.	Snohomish County		SE $\frac{1}{4}$ sec. 17, (31-5E) NE $\frac{1}{4}$ sec. 34, (31-6E)
78.	Dept. of Highways	Lake Ketchum	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 7, (32-4E)
*78A.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, (32-4E)
79.	Dept. of Highways		NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 8, (32-4E)
*80.	Snohomish County	East Stanwood	Center sec. 19, (32-4E)
*80A. 81.	Allie J. Haglund		Sec. 19, (32-4E) SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, (32-4E)
*82.	Snohomish County	Sunday Lake	Center sec. 26, (32-4E)
83. 84.			SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (32-4E)
*85. 85A.	Snohomish County		SE. cor. sec. 23, (32-5E) Sec. 30, (32-5E) NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, (32-5E)
86.	N. P. Ry.	Arlington	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 35, (32-5E)
*87. 88.	Snohomish County		Sec. 36, (32-5E) NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 8, (32-6E)
89.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (32-6E)
90. 91.	Snohomish County Do	Halterman Darrington	Sec. 10, (32-7E) Sec. 23, (32-9E)
SPOKANE COUNTY			
1. 2.			NW $\frac{1}{4}$ sec. 25, (21-40E) NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (21-42E)
3. 4.	Spokane County		SW $\frac{1}{4}$ sec. 27, (21-42E) NW $\frac{1}{4}$ sec. 2, (21-43E)
5. 6.		North Pine	SE $\frac{1}{4}$ sec. 21, (21-43E) SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (21-43E)
7.		Spring Valley	SE $\frac{1}{4}$ sec. 27, (21-43E)

Map no.	Operator or owner	Pit name	Property location	Map no.	Operator or owner	Pit name	Property location
SPOKANE COUNTY—Continued				SPOKANE COUNTY—Continued			
8.	Frank Peterschick	Peterschick	NW ¼ NW ¼ and SE ¼ SW ¼ sec. 34, (21-43E)	51.			Sec. 26, (25-40E)
9.			NW ¼ sec. 25, (21-45E)	52.			NE ¼ sec. 27, (25-40E)
10.			SE ¼ sec. 9, (22-40E)	*53.	Spokane County	Galena	NE ¼ sec. 30, (25-41E)
11.			SW ¼ sec. 21, (22-40E)	54.			NE ¼ sec. 32, (25-41E)
*12.	Spokane County		SW ¼ sec. 29, (22-41E)	*55.	Acme Sand & Gravel Co.	Acme	Washington and Cora Sts., Spokane
*13.	Do		SW ¼ SE ¼ sec. 10, (22-42E)	56.			Sec. 4, (25-42E)
*14.	Do		NW ¼ NW ¼ sec. 28, (22-42E)	57.			NW ¼ sec. 9, (25-42E)
15.			SE ¼ sec. 31, (22-42E)	*58.	Union Sand & Gravel Co.	Fort George Wright	Sec. 14, (25-42E)
*15A.			NE ¼ SW ¼ sec. 24, (22-43E)	*59.	Do	Yardley	NW ¼ sec. 14, (25-42E)
*16.	Spokane County		SW ¼ sec. 35, (22-43E)	60.	N. P. Ry.	Hangman	Sec. 25, (25-42E)
17.			NW ¼ NW ¼ sec. 28, (22-44E)	*60A.			S ½ SE ¼ sec. 28, (25-42E)
18.		Saline	NW ¼ NE ¼ sec. 28, (22-44E)	*61.	Carbon Bros.	Carbon	N. 3430 Cook St., Spokane
*19.	Spokane County	Tyler Road	NW ¼ sec. 9, (23-40E)	*62.	Ajax Sand & Gravel Co.	Ajax	Carnahan and Hartson Ave., Spokane
20.	Fred G. Redmon	Redmon	At Cheney	63.			Sec. 4, (25-43E)
21.		Cheney	SE ¼ sec. 14, (23-41E)	64.			Sec. 7, (25-43E)
22.	Dept. of Highways	Cramer	SW ¼ SE ¼ sec. 20, (23-41E)	*65.	City of Spokane		W ½ NE ¼ SW ¼ sec. 23, (25-43E)
*22A.			SW ¼ NW ¼ sec. 24, (23-41E)	66.			SE ¼ sec. 23, (25-43E)
*22B.			NW ¼ NE ¼ sec. 14, (23-42E)	67.			Sec. 31, (25-43E)
*23.	Spokane County		SW ¼ sec. 6, (23-43E)	68.			NE ¼ NW ¼ sec. 35, (25-43E)
*23A.			N ½ SE ¼ sec. 34, (23-45E)	69.		Trent Road	E ½ sec. 1, (25-44E)
24.			Sec. 10, (24-40E)	*70.	Spokane Sand & Gravel Co.	Irwin	At Irwin, sec. 3, (25-44E)
25.	Dept. of Highways	Davies	Lots 22-24, Blk. 2, Carpenter Davies Add., Spokane	71.	Hawkeye Fuel Co.	do	Do
*25A.			NW ¼ NW ¼ sec. 11, (24-41E)	72.	N. P. Ry.	do	Do
*26.	Spokane County	Walters	NE ¼ NE ¼ sec. 15, (24-41E)	73.		Millwood	NE ¼ SW ¼ sec. 4, (25-44E)
27.			NW ¼ SE ¼ sec. 15, (24-41E)	74.			NE ¼ sec. 4, (25-44E)
28.			SW ¼ SW ¼ sec. 15, (24-41E)	*74A.			SW ¼ SW ¼ sec. 8, (25-44E)
29.		Four Lakes	SW ¼ sec. 23, (24-41E)	75.			SW ¼ sec. 9, (25-44E)
30.		Midway	NE ¼ sec. 26, (24-41E)	*76.	Spokane Sand & Gravel Co.	Riblett	At Riblett, near Dishman
31.			NE ¼ sec. 33, (24-41E)	*77.	Dishman Ready Mix	Edgecliff	8709 E. Sprague Ave., Spokane
32.			NW ¼ sec. 5, (24-42E)	78.			Sec. 19, (25-44E)
33.	W. H. Burgett	Burgett	Hayford Add., sec. 6, (24-42E)	79.	Amos Lewis	Chester	At Chester, sec. 33, (25-44E)
34.		Hayford	NW ¼ sec. 6, (24-42E)	*79A.	Ace Sand & Gravel Co.	Ace	N. 302 Park Road, Spokane
*34A.			NE ¼ NE ¼ sec. 6, (24-42E)	*80.	Max J. Kuney	Velox	Naval Supply Depot, Velox
35.	Dept. of Highways	Cochrane	Govt. lots 2-6, sec. 7, (24-42E)	81.			NW ¼ sec. 9, (25-45E)
36.			Sec. 16, (24-42E)	82.			Center sec. 15, (25-45E)
37.			NE ¼ sec. 18, (24-42E)	83.		Sprague	SE ¼ sec. 19, (25-45E)
38.			SW ¼ sec. 33, (24-42E)	84.		Liberty Lake	NE ¼ sec. 23, (25-45E)
39.			SW ¼ sec. 4, (24-43E)	85.			NE ¼ sec. 30, (25-45E)
39A.		Freise	SW ¼ sec. 6, (24-43E)	86.			NW ¼ sec. 9, (26-40E)
40.			NE ¼ sec. 9, (24-43E)	*87.	Spokane County		SE ¼ sec. 10, (26-40E)
41.	Dept. of Highways	Henningsen	NE ¼ SW ¼ sec. 17, (24-43E)	88.			NE ¼ sec. 34, (26-40E)
42.			SW ¼ sec. 32, (24-43E)	*89.	Spokane County		SW ¼ SW ¼ sec. 23, (26-41E)
43.	Dept. of Highways	Paradise	SE ¼ NW ¼ sec. 32, (24-43E)	90.		Indian Prairie	SE ¼ sec. 30, (26-41E)
*44.	Do		SW ¼ SE ¼ sec. 10, (24-44E)	91.		Nine Mile	SE ¼ sec. 6, (26-42E)
*45.	Spokane County		SW ¼ NE ¼ sec. 10, (24-44E)	92.			SW ¼ NW ¼ sec. 25, (26-42E)
46.			SW ¼ sec. 14, (24-44E)	*93.	Acme Sand & Gravel Co.		1500 E. Francis and Maple Sts., Spokane
47.			NE ¼ SW ¼ sec. 32, (24-44E)	94.	John P. Cunningham, Jr.	Cunningham	N. 6315 Cedar St., Spokane
48.		Hite	SE ¼ sec. 17, (25-40E)	95.			Sec. 3, (26-43E)
49.			SE ¼ sec. 22, (25-40E)	*95A.	Materne Sand Co.	Materne	Cedar and Francis Sts., Spokane
50.	Dept. of Highways	Deep Creek	SE ¼ SW ¼ sec. 24, (25-40E)	*95B.	S & F Construction Co.		SW ¼ sec. 4, (26-43E)
				*96.	Spokane County		S ½ SW ¼ SW ¼ sec. 5, (26-43E)
				97.			NE ¼ sec. 7, (26-43E)

Map no.	Operator or owner	Pit name	Property location
SPOKANE COUNTY—Continued			
*98.	Spokane Sand & Gravel Co.	Mead	At Mead, sec. 10, (26-43E)
99.	Hawkeye Fuel Co.	do	Do
*99A.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 11, (26-43E)
*99B.			SE $\frac{1}{4}$ sec. 10, (26-43E)
100.			Sec. 25, (26-43E)
101.			SW $\frac{1}{4}$ sec. 26, (26-43E)
102.		Big Gulch	Sec. 29, (26-43E)
*103.	Spokane County		NE $\frac{1}{4}$ sec. 26, (26-44E)
*104.	Do	Starr road	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (26-45E)
105.			NW $\frac{1}{4}$ sec. 24, (26-45E)
106.		Moab	SW $\frac{1}{4}$ sec. 24, (26-45E)
107.			N $\frac{1}{2}$ sec. 14, (27-42E)
108.			S $\frac{1}{2}$ sec. 14, (27-42E)
109.			NW $\frac{1}{4}$ sec. 17, (27-42E)
110.	Wm. R. Curkeet	Curkeet	NW $\frac{1}{4}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 10, (27-43E)
*111.	Spokane County		NW $\frac{1}{4}$ sec. 10, (27-43E)
112.			Sec. 15, (27-43E)
113.			NE $\frac{1}{4}$ sec. 18, (27-43E)
114.			NW $\frac{1}{4}$ sec. 22, (27-43E)
115.			SE $\frac{1}{4}$ sec. 32, (27-43E)
*115A.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 32, (27-43E)
116.			SE $\frac{1}{4}$ sec. 33, (27-43E)
117.			NW $\frac{1}{4}$ sec. 35, (27-43E)
*118.	Spokane County		SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (27-44E)
*118A.			SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 24, (28-42E)
119.		Hazard	SE $\frac{1}{4}$ sec. 29, (28-42E)
120.			SE. cor. sec. 3, (28-43E)
121.	Dept. of Highways		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (28-43E)
122.		Keuster Lake	Sec. 15, (28-43E)
*123.	Spokane County		SW $\frac{1}{4}$ sec. 26, (28-43E)
*124.	Do		N $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 28, (28-43E)
125.			SW $\frac{1}{4}$ sec. 9, (29-42E)
126.			SW $\frac{1}{4}$ sec. 3, (29-43E)
127.			NE $\frac{1}{4}$ sec. 8, (29-43E)
*128.	Spokane County		SE $\frac{1}{4}$ sec. 11, (29-43E)
129.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 14, (29-43E)
130.	Do	Vican	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 23, (29-43E)
131.			Sec. 27, (29-43E)
*132.	Spokane County		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, (29-43E)
133.			NE $\frac{1}{4}$ sec. 34, (29-43E)
134.			NE $\frac{1}{4}$ sec. 20, (29-44E)
135.			NW $\frac{1}{4}$ sec. 23, (29-44E)
136.			SE $\frac{1}{4}$ sec. 34, (29-44E)

STEVENS COUNTY

1.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (28-40E)
2.	A. H. Timm	Ford	At Ford
*2A.			NW $\frac{1}{4}$ sec. 2, (30-40E)
3.	Dept. of Highways		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 34, (30-40E)
4.	G. B. Lanham	Lanham	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, (30-40E)
5.	Dept. of Pub. Lands		SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, (30-40E)
6.	John Byra Ager	Ager	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (30-41E)
7.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (30-41E)
8.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 5, (31-37E)

Map no.	Operator or owner	Pit name	Property location
STEVENS COUNTY—Continued			
9.	Dept. of Highways	Tiffany	W $\frac{1}{2}$ sec. 9, (31-37E)
10.	Do		SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (31-37E)
11.	Do	Oemigan	Lots 3 and 4, sec. 33, (32-37E)
12.			Sec. 1, (32-38E)
*13.	Dept. of Highways		SW $\frac{1}{4}$ NW $\frac{1}{4}$ and NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (32-40E)
*14.	City of Chewelah		NW $\frac{1}{4}$ sec. 4, (32-40E)
15.	F. R. Hewett	Hewett	At Chewelah
*15A.			SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 7, (32-41E)
16.	Joslin & McAllister		SE $\frac{1}{4}$ SE $\frac{1}{4}$ and NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 28, (33-37E)
17.	Dept. of Highways		E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 28, (33-37E)
*17A.			SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 34, (33-37E)
18.			SW $\frac{1}{4}$ sec. 34, (33-38E)
19.			NW $\frac{1}{4}$ sec. 35, (33-38E)
20.	Dept. of Highways		Govt. lots 3 and 4, sec. 1, (33-39E)
21.			NW $\frac{1}{4}$ sec. 12, (33-39E)
22.			On N. side of hill W. of Addy
23.			NW $\frac{1}{4}$ sec. 23, (33-39E)
24.			SW $\frac{1}{4}$ sec. 27, (33-39E)
*24A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (33-39E)
*25.	City of Chewelah		SW $\frac{1}{4}$ sec. 33, (33-40E)
26.	Dept. of Highways		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (34-39E)
27.			N $\frac{1}{2}$ sec. 5, (35-39E)
*27A.	Colville Valley Concrete Co.		SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, (35-39E)
28.	Dept. of Highways	Krueger	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, (35-39E)
29.	Do		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, (35-39E)
30.			SW $\frac{1}{4}$ sec. 15, (35-39E)
31.		Church Flat	$\frac{1}{2}$ mi. E. of Colville at W. edge of Church Flat
32.			N. center sec. 21, (35-39E)
33.			SE $\frac{1}{4}$ sec. 31, (35-39E)
34.	Fred W. Hair	Hair	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 1, (36-37E)
*35.	Stevens County		SW $\frac{1}{4}$ sec. 17, (36-38E)
36.	J. J. Lansberry	Lansberry	W $\frac{1}{2}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (36-38E)
37.	Dept. of Highways		S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 36, (36-38E)
38.	Do		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (36-38E)
*39.	Joslin & McAllister		S $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 36, (36-38E)
*40.	Stevens County		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 35, (36-39E)
41.	Dept. of Highways		Govt. lot 5 and NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (36-42E)
42.	George L. Denman	Denman	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 22, (37-38E)
43.	W. G. Minter	Minter	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, (37-38E)
44.	U. S. Indian Service		SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 32, (37-38E)
45.	Dept. of Highways	Morrison	Lot 3, sec. 12, (38-38E)
46.	Do		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, (39-39E)

Map no.	Operator or owner	Pit name	Property location
STEVENS COUNTY—Continued			
*47.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 3, (39-40E)
*48.	Dept. of Highways		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (39-40E)
THURSTON COUNTY			
*1.	Thurston County	Stevens	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 6, (15-1W)
2.	Dept. of Highways	Johnson	Lot 5, Stevens Garden Tct., sec. 6, (15-1W) and Rueben Crowder D.L.C. 38 and 41, sec. 31, (16-1W)
*3.	Thurston County	Crowder	NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 6, (15-1W)
*4.	Do	McConnell	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, (15-1W)
5.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, (15-3W)
*5A.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (15-3W)
*5B.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 13, (15-3W)
*5C.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, (15-4W)
*6.	Thurston County	Bardeaux	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (15-4W)
7.			Sec. 7, (16-1W)
8.		Scatter Creek	Sec. 10, (16-1W)
*9.	Thurston County	Sandymere	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (16-1W)
10.		Crescent Well	Sec. 3, (16-2W)
*10A.			SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, (16-2W)
*10B.			NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (16-2W)
11.			Center N $\frac{1}{2}$ sec. 30, (16-2W)
12.	Dept. of Pub. Lands		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 32, (16-2W)
*13.	Thurston County	Little Rock	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, (16-3W)
14.	N. P. Ry.	Mima	Sec. 15, (16-3W)
15.	Do	Tallheimer	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 19, (16-3W)
16.			Sec. 23, (16-4W)
17.	J. Edward Peterson	Peterson	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 35, (16-4W)
18.	Maud Peterson		Tct. 9, "F" Add. to Gate City, sec. 35, (16-4W)
19.	Thurston County	Gehrke	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 4, (16-1E)
20.	C. M. St. P. & P. R.R.	Rainier	W. $\frac{1}{4}$ cor. sec. 7, (16-1E)
21.	Dept. of Highways		W $\frac{1}{2}$ W $\frac{1}{2}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, (16-1E)
*22.	Thurston County	Vail	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, (16-1E)
*23.	Do	Longmire	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 24, (16-2E)
*24.	Do	Squires	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 1, (17-1W)
*25.	Do	Spurgeon	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 14, (17-1W)
26.			Sec. 19, (17-1W)
*27.	Thurston County	Grove	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (17-1W)
*27A.			NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 1, (17-2W)
*27B.			E $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 28, (17-2W)

Map no.	Operator or owner	Pit name	Property location
THURSTON COUNTY—Continued			
28.			Sec. 32, (17-2W)
*29.	Thurston County	Vincent	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, (17-3W)
30.	Dept. of Highways	Olsen	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 11, (17-1E)
*31.	Thurston County	Yelm	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 13, (17-1E)
*32.	Do	Price	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (17-2E)
*32A.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 10, (18-1W)
*32B.	Thurston County		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (18-1W)
33.	Dept. of Highways	Fleetwood	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (18-1W)
*34.	Thurston County	Gleason Kearney	NW $\frac{1}{4}$ sec. 15, 18-1W)
*34A.	Holroyd Co.	Nisqually	SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (18-1E)
35.			Sec. 18, (18-1W)
36.			Sec. 7, (18-2W)
*37.			NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (18-2W)
*38.	Thurston County	Mottman	NE $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 21, (18-2W)
*39.	Do	Page	NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, (18-2W)
40.	Dept. of Highways	Duval	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (18-3W)
41.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 17, (18-1E)
42.	Dept. of Highways		NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (18-1E)
WAHKIAKUM COUNTY			
1.		Sand pit	SE $\frac{1}{4}$ sec. 18, (8-4W)
*1A.			SE $\frac{1}{4}$ sec. 4, (8-6W)
2.	Brookfield Quarry & Towage Co.	Cathlamet	At Cathlamet
*3.		Elokomin River	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 29, (9-5W)
*4.		do	NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 31, (9-5W)
5.		do	Sec. 32, (9-5W)
*5A.			NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, (10-7W)
6.	Dept. of Highways	Olsen	Lot 1, sec. 8, and lot 3, sec. 9, (10-7W)
7.		Grays River	Sec. 17, (10-7W)
8.		do	Sec. 18, (10-7W)
WALLA WALLA COUNTY			
1.		Touchet	Sec. 3, (6-33E)
2.			Sec. 5, (6-33E)
3.			Sec. 2, (6-35E)
4.	Dept. of Highways		NE $\frac{1}{4}$ sec. 11, 6-35E)
5.	Do	Attalia	W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 3, (7-31E)
*6.	J. H. Collins & Co.		E $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 10, (7-31E)
*7.	Do		E $\frac{1}{2}$ NE $\frac{1}{4}$ sec. 10, (7-31E)
8.			Sec. 15, (7-31E)
9.			Sec. 22, (7-32E)
10.			Sec. 25, (7-32E)
11.	Felix M. Davin	Davin	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (7-34E)
12.	Earnest A. Loos	Loos	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (7-34E)
13.		Lowden	1 mi. SW. of Lowden
14.	F. B. Welch	Welch	Sec. 33, (7-34E)
15.			Sec. 9, (7-36E)

Map no.	Operator or owner	Pit name	Property location
WALLA WALLA COUNTY—Continued			
*16.	J. H. Collins & Co.		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 19, (7-36E)
*17.	Jones Scott Co.		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 19, (7-36E)
18.	Dept. of Highways	Wilson	Blks. 2 and 3, Cass's 2d Add., Walla Walla
*19.	Walla Walla County		NW $\frac{1}{4}$ sec. 22, (7-36E)
20.		Mill Creek	NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 18, (7-37E)
21.		Two Rivers	$\frac{1}{4}$ mi. N. of Two Rivers
22.	Dept. of Highways	Thanney	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26 and SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 27, (8-37E)
*23.	Walla Walla County		Sec. 5, (9-33E)
24.	Dept. of Highways		Govt. lot 1, sec. 5, (9-33E)
25.	Do		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, (9-35E)
26.		Waitsburg	Just E. of bridge at Waitsburg
*26A.	Stanley Seaton Sand & Gravel		Sec. 12, (9-37E)

WHATCOM COUNTY

1.		Village Point	On Lummi Island at Village Point
*2.	City of Bellingham		SW $\frac{1}{4}$ sec. 15, (37-3E)
3.		Acme	On Nooksack River at Acme
*4.	Whatcom County		SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (37-5E)
*5.	Lind Gravel Co.		Sec. 24, (38-2E)
*5A.		Griffin	SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, (38-3E)
6.	Lind Gravel Co.		Sec. 17, (38-3E)
*6A.	Mulka Gravel Co.		Bellingham area
7.	Dept. of Highways	Meuer	NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, (38-5E)
8.		Clarkson	1 mi. SW. of Ferndale
*8A.			NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 27, (39-2E)
9.	Dept. of Highways	Wiser Lake	NW $\frac{1}{4}$ NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 11, (39-3E)
*9A.			NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 12, (39-3E)
*10.	Whatcom County	Laurel	NW $\frac{1}{4}$ sec. 19, (39-3E)
*10A.	C. V. Wilder Co.	Bellingham	SE $\frac{1}{4}$ sec. 19, SW $\frac{1}{4}$ sec. 20, (39-3E)
11.			Center sec. 20, (39-3E)
12.		Nugent's Bridge	On Nooksack River at Nugent's Bridge
13.	Dept. of Highways	Wallace	Lot 3, sec. 28, (39-4E)
14.	Dept. of Highways		Sec. 28, (39-4E)
*14A.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 2, (39-6E)
*14B.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 2, (40-1E)
*15.	Whatcom County		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, (40-1E)
16.	Jan Bordstrom	Bordstrom	SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, (40-1E)
17.	W. R. Loop	Loop	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, (40-1E)
18.	Dept. of Highways		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, (40-1E)
*18A.	Whatcom Builders Supply Co.		SE $\frac{1}{4}$ sec. 22, (40-2E)
19.	Dept. of Highways	Loomis	SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 27, (40-2E)
20.	Do	Erickson	NW $\frac{1}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (40-3E)
21.	Whatcom County	Lynden	At Lynden

Map no.	Operator or owner	Pit name	Property location
WHATCOM COUNTY—Continued			
22.	Franklin Swope	Swope	At Lynden
*23.	Whatcom County	Everson	NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 36, (40-3E)
*23A.	Sumas Fuel Co.		NW $\frac{1}{4}$ sec. 21, (40-4E)
24.	Dept. of Highways	Whelan	SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, (40-5E)
25.	Do	N. Fk. Nooksack River	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 31, (40-9E)
*26.			SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 32, (41-1E)

WHITMAN COUNTY

1.			SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, (13-40E)
2.	M. Barnhill	Barnhill	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 28, (14-40E)
3.			On S. fk. of Palouse River, 5 mi. SE. of Pullman
4.	Dept. of Highways		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, (15-39E)
5.	Do	Snow	SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, (15-39E)
6.	Do	Camp	NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 15, (15-39E)
7.	Do		NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 17, (15-39E)
*8.	Whitman County	Camp	Sec. 17, (15-39E)
9.			At bridge across Union Flat Cr., 3 mi. N. of La Crosse
10.	Dept. of Highways		NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, (16-42E)
*10A.	Foley Ready-Mix Co.		Center sec. 10, (16-43E)
11.	Dept. of Highways		NE $\frac{1}{4}$ NW $\frac{1}{4}$ and NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 15, (16-45E)
*12.	Whitman County	Winona	Sec. 5, (17-40E)
13.	Dept. of Highways		NE $\frac{1}{4}$ sec. 30, (18-44E)
14.		Ewan	On N. side of railroad at Ewan
15.	Dept. of Highways	Schell	SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 15, (19-40E)
16.	Do		NE $\frac{1}{4}$ NW $\frac{1}{4}$ and NW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 26, (19-40E)
17.			NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 29, (19-41E)
18.	O.-W. R. & N. Co.		SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28, (19-43E)
*19.	Joslin & McAllister		NW $\frac{1}{4}$ sec. 16, (20-39E)
20.			Sec. 12, (20-42E)
21.			Sec. 14, (20-42E)
22.			Sec. 22, (20-42E)
23.			Sec. 28, (20-42E)
24.	Jesse E. Durham	Durham	SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 14, (20-43E)
25.	L. D. Johnson	Johnson	SE $\frac{1}{4}$ sec. 31, (20-44E)
*26.	Whitman County	Schindler	Sec. 17, (20-45E)

YAKIMA COUNTY

1.	U. S. Indian Service		W $\frac{1}{2}$ SE $\frac{1}{4}$ sec. 10, (7-18E)
2.	Do		NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec 13, (8-18E)
3.			Sec. 24, (8-22E)
*4.	Dept. of Highways	Mabton	NE $\frac{1}{4}$ sec. 35, (8-22E)
5.	Dept. of Highways		SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 6, (8-23E)
6.	Yakima Indian Agency		NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 26, (9-19E)

Map no.	Operator or owner	Pit name	Property location
YAKIMA COUNTY—Continued			
7.		Emerald	Sec. 6, (9-22E)
*7A.	Emerald Sand & Gravel Co.	do	NE¼ sec. 8, (9-22E)
*7B.	Vivien Sears	Sand	SE¼SE¼ sec. 13, (9-22E)
8.		Levold	7 mi. SW. of Sunnyside on Yakima River
*8A.			NE¼NE¼ sec. 19, (9-23E)
*8B.	F. H. Berney	Sand	SE¼SW¼ sec. 20, (9-23E)
*8C.	George E. Smith	do	Sec. 27, (9-23E)
*9.	Yakima Cement Products Co.		NW¼ sec. 34, (9-23E)
*10.	C. E. Keller	Keller	Old highway, NE¼ sec. 35, (9-23E)
11.	Dept. of Highways		SE¼SW¼ sec. 9, (10-20E)
12.	Do		SW¼SW¼ sec. 15, (10-20E)
*13.	Do		SE¼NE¼ sec. 28, (10-20E)
*13A.	John Thompson		Sec. 17, (10-21E)
14.		Granger	Sec. 21, (10-21E)
*15.	W. S. Tolley	Tolley	Sec. 22, (10-21E)
*15A.			NW¼NW¼ sec. 33, (10-21E)
*15B.			SW¼ sec. 34, (10-21E)
*16.	Yakima County	Medin	Lot 2, sec. 36, (10-21E)
17.		Patch	3½ mi. SW. of Sunnyside
*18.	Yakima County	Miller	SE¼ sec. 18, (10-23E)
*19.	Do	Sheller	SE¼ sec. 22, (10-23E)
20.	U. S. Indian Service		SW¼SW¼ sec. 3, (11-19E)
21.	Mathieson Construction Co.	Wapato	At Wapato
*22.	Yakima County	Ashue	SE¼SE¼ sec. 17, (11-19E)
*23.	Do	Harrah	SW¼SW¼ sec. 31, (11-19E)
24.		Dunn's Ranch	Sec. 7, (11-20E)
*25.	W. S. Tolley		Sec. 28, (11-20E)
*25A.			SE¼SW¼ sec. 32, (11-20E)
*25B.	F. B. Kerby & Sons		Sec. 35, (11-20E)
26.		Zillah	NW¼SE¼ sec. 36, (11-20E)
*27.	Yakima County	Outlook	SW¼SW¼ sec. 31, (11-22E)
28.	Thos. A. Wheeler	Wheeler	Lot 5, sec. 17, and SE¼SW¼ sec. 8, (12-19E)
*29.	Francis J. Tobin		E½ sec. 20, (12-19E)

Map no.	Operator or owner	Pit name	Property location
YAKIMA COUNTY—Continued			
*30.	Yakima County	Union Gap	NE¼NW¼ sec. 20, (12-19E)
31.	Dept. of Highways		Lots 1 and 2, sec. 20, (12-19E)
32.			NE¼SW¼ and lot 1, sec. 21, (12-19E)
33.	Dept. of Highways	Calvert	Lot 4, sec. 31, (12-19E)
34.	Do	Hypothek	NW¼NE¼ sec. 15, (12-20E)
35.	Do	Beal	S½SE¼ sec. 17, (12-21E)
*36.	Riverside Sand & Gravel Co.		SE¼NE¼ sec. 1, (13-18E)
*36A.	Lone Pine Crushing, Inc.		SE¼ sec. 11, (13-18E)
*36B.	Westside Gravel Co.		Sec. 13, (13-18E)
*36C.	S & F Sand & Gravel Co.		2000 E. Beech St., Yakima
37.			Sec. 2, (13-19E)
38.	J. Breunig	Breunig	NW¼NE¼ sec. 6, (13-19E)
*38A.	Valley Cement Co.		SW¼NW¼ sec. 6, (13-19E)
39.			NW¼ sec. 17, (13-19E)
*39A.	Superior Concrete Products		Sec. 20, (13-19E)
*39B.			E½SW¼SW¼ sec. 27, (13-19E)
*40.	Yakima County	Meyers	SE¼ sec. 28, (13-19E)
41.	Dept. of Highways		NE¼SW¼ and NW¼SE¼ sec. 28, (13-19E)
*42.	Yakima Cement Products Co.		Sec. 31, (13-19E)
*42A.			SE¼NW¼ sec. 2, (14-16E)
43.	Dept. of Highways	Clarke	S½NW¼ sec. 4, (14-17E)
44.	Do		N½SW¼ sec. 4, (14-17E)
*44A.	Parten & Robbins		NW¼ sec. 4, (14-17E)
*45.	Yakima County	S. Naches	SE¼NE¼ sec. 9, (14-17E)
*45A.	Joe Brandt	Selah	SE¼ sec. 26, (14-18E)
46.	E. S. Hill	Hill	NE¼SW¼ sec. 29, (14-19E)
47.	Dept. of Pub. Lands		SW¼NW¼ and NW¼SW¼ sec. 12, (15-15E)
48.	W. L. Stevens	Stevens	SE¼SW¼ sec. 12, (15-15E)
49.	Dept. of Highways		NW¼SE¼ sec. 20, (15-16E)
50.	Robt. C. Bond	Bond	SE¼NW¼ sec. 17, (16-15E)

SANDSTONE

Sandstone is a sedimentary rock composed of cemented mineral grains and rock fragments from 1/16 to 2 mm. in size.

Included under this heading are all sandstones, regardless of use to which they are suited. After crushing, some are suitable for glass sand, molding sand, blast sand, furnace sand, or abrasives. Others are suitable for building stone or grindstones. This classification has been made because uses change; hence a classification by use now might not be applicable a few years hence.

Areas on the accompanying map (plate 35) which are bounded by a solid line include rock series or formations which contain sandstone members, as it is impossible on a map of this scale to show the members them-

selves. Areas outlined with a dotted boundary are those in which the actual areal extent is uncertain or unknown. For other silica deposits see "Quartz, massive," "Quartzite," and "Silica sand."

The Washington occurrences of sandstone that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

The average prices on sandstone in the United States for 1952 were as follows: rough construction, \$6.14 per short ton; cut stone, slabs, and mill blocks, \$2.16 per cu. ft.; rubble, \$3.37 per short ton; curbing, \$2.58 per cu. ft.; and flagging, \$1.84 per cu. ft.

OCCURRENCES

On page 75 in volume 2 is plate 35, the map showing the occurrences of sandstone, numbered to correspond with the numbers of the occurrences listed below.

SAN JUAN COUNTY

1. **Name:** Sucia Island quarries. **Loc:** Sucia Island. **Descr:** Dark medium-grained quartz sandstone cemented by silica. **Value:** Considerable stone was formerly produced from two quarries, some of which was used in construction of a drydock in Bremerton and as paving blocks in Seattle. **Ref:** 48, p. 109; 87, p. 175-176; 115, p. 72-73.
2. **Name:** Alaska Barge Co. quarry. **Loc:** Waldron Island on E. side of Point Disney. **Descr:** Sandstone of the Nanaimo series. **Value:** Considerable amount formerly used for Belgian blocks and riprap. **Ref:** 48, p. 109; 87, p. 176.
3. **Name:** Reid Harbor quarries. **Loc:** Stuart Island at Reid Harbor. **Descr:** Quartz sandstone cemented by silica and iron. **Value:** Formerly quarried from three places and used for building stone. **Ref:** 48, p. 109; 87, p. 176; 115, p. 71-72.
4. **Name:** North Beach quarry. **Loc:** At North Beach, Orcas Island. **Descr:** Green-gray sandstone of Nanaimo series gave speckled gray fusion at cone 8. **Value:** Not known. **Ref:** 87, p. 118; 150, p. 46.
5. **Name:** Deer Harbor. **Loc:** Point on SW. side of Deer Harbor opposite Fisherman Island. **Descr:** Speckled gray fusion at cone 12. **Value:** Not known. **Ref:** 150, p. 46.
6. **Name:** Humphrey Head quarry. **Loc:** Lopez Island at Humphrey Head. **Descr:** Sandstone of the Leech River group. **Value:** Formerly quarried. **Ref:** 48, p. 109; 87, p. 176.

CLALLAM COUNTY

7. **Name:** Port Angeles quarry. **Loc:** About 2 mi. S. of Port Angeles. **Descr:** Sandstone. **Value:** Formerly used as building stone in Port Angeles. **Ref:** 135.

KITSAP COUNTY

8. **Name:** Seal Rock. **Loc:** Seal Rock at South Beach, Bainbridge Island. **Descr:** Impure Oligocene sandstone, containing 64.2 percent silica and 4.7 percent ferric oxide, fused to light brown below cone 10. **Value:** Silica content too low for commercial use. **Ref:** 150, p. 38.
9. **Name:** Reynolds quarry. **Loc:** NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 3, (24-1E). **Descr:** Massive moderately cemented Oligocene sandstone. **Value:** Formerly used as riprap on the Tacoma waterfront from S. 15th St. to Sperry Flour Mills. **Ref:** 48, p. 109.

GRAYS HARBOR COUNTY

10. **Name:** Aberdeen-Hoquiam. **Loc:** Two samples, one from a cliff back of Whitman School in Aberdeen, the other from a road cut in North Hoquiam hill. **Descr:** Soft brown sandstone of Montesano formation. Dark brown fusions at cone 4. **Value:** Cone fusions too low for furnace or molding sand. **Ref:** 150, p. 28.

PACIFIC COUNTY

11. **Name:** Willapa Harbor. **Loc:** On shore of Willapa Harbor along the Naselle River-Long Beach highway. **Descr:** Massive soft dark-brown sandstone. Brown fusion at cone 6. **Value:** Cone fusion too low for furnace or molding sand. **Ref:** 150, p. 44.
12. **Name:** McGowan quarry. **Loc:** N. of Fort Columbia on Columbia River. **Descr:** Tuffaceous sandstone (?). **Value:** Formerly quarried as building stone by H. S. McGowan. **Ref:** 135.
13. **Name:** Megler. **Loc:** Road cut at Megler ferry landing. **Descr:** Massive sandstone. Washed sample, from which 27 percent clay was removed, gave a brown vesicular fusion at cone 4. **Value:** Probably not commercial. **Ref:** 150, p. 44.

WHATCOM COUNTY

14. **Name:** Saar Creek. **Loc:** On Saar Creek SE. of Sumas. **Descr:** Basal conglomerate of the Chuckanut formation containing a high percentage of

- quartz fragments. **Value:** Possible source of silica. **Ref:** 48, p. 96; 63, p. 158.
15. **Name:** Nooksack River. **Loc:** In road cut near the line between secs. 27 and 28, (39-5E). **Descr:** Chuckanut sandstone with dark-gray fusion below cone 10. **Value:** Possibly suited to building use. **Ref:** 150, p. 52.
 16. **Name:** Deming. **Loc:** Road cut on Mount Baker highway 0.5 mi. E. of Deming. **Descr:** Dark-gray fusion below cone 10. **Value:** Uncertain. **Ref:** 150, p. 52.
 17. **Name:** Glacier coal mine. **Loc:** Coal mine dump 1 mi. S. of Glacier on the Mount Baker highway. **Descr:** Dark-colored hard sandstone gave dark fusion below cone 10. **Value:** Uncertain. **Ref:** 150, p. 52.
 18. **Name:** Glacier. **Loc:** 2 mi. N. of summit of the C.C.C. road up the mountain S. of Glacier. **Descr:** Dark-gray fusion below cone 10. **Value:** Uncertain. **Ref:** 150, p. 52.
 19. **Name:** Bellingham Coal Mines Co. **Loc:** Dump, Bellingham Coal Mines Co. mine, secs. 13 and 24, (38-2E). **Descr:** Light-colored sandstone gave speckled brown fusion at cone 6. **Value:** Uncertain. **Ref:** 150, p. 52.
 20. **Name:** Chuckanut Bay quarry. **Loc:** Secs. 13 and 14, (37-2E). **Descr:** Dark fine-grained quartz sandstone of the Chuckanut formation, well cemented with iron oxide. **Value:** Considerable quantities formerly quarried for building stone. **Ref:** 48, p. 109; 115, p. 62-65.
 21. **Name:** Samish Lake. **Loc:** NE $\frac{1}{4}$ sec. 26, (37-3E). **Descr:** Basal conglomerate of the Chuckanut formation, 12 ft. thick, contains considerable amount of quartz fragments. Washed sample gave speckled gray fusion at cone 29. **Value:** Possible source of silica. **Ref:** 48, p. 96; 150, p. 52.
 22. **Name:** Lake Whatcom. **Loc:** SW $\frac{1}{4}$ sec. 16, (37-4E). **Descr:** Gray fusion below cone 10. **Value:** Uncertain. **Ref:** 150, p. 52.
 23. **Name:** Blue Canyon. **Loc:** Just below bunkers of the Blue Canyon coal mines on SE. side of Lake Whatcom. **Descr:** Pyrometric cone test of washed sand, from which 23 percent clay had been removed, gave brown fusion at cone 7. **Value:** Uncertain. **Ref:** 150, p. 52.
- SKAGIT COUNTY**
24. **Name:** Mount Vernon. **Loc:** SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 28, (34-4E). **Descr:** Medium-grained green-brown sandstone containing 64.8 percent silica and 3.5 percent ferric oxide gave light-brown fusion below cone 10. **Value:** Silica content too low to be considered a source of silica. **Ref:** 150, p. 47.
 25. **Name:** Hilltop Park. **Loc:** Road cuts in Mount Vernon's Hilltop Park. **Descr:** Composite sample from several road cuts contained 70.8 percent silica and 2.7 percent ferric oxide and gave a speckled gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 47.
 26. **Name:** Glen Allen Park. **Loc:** Just N. of Glen Allen Park on W. side of Big Lake. **Descr:** Medium-grained brown sandstone, containing 73.1 percent silica and 2.2 percent ferric oxide, gave a dark-gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 47.
 27. **Name:** Lake McMurray. **Loc:** Road cut in the first hill N. of Lake McMurray on the Big Lake-Lake McMurray road. **Descr:** Green-brown medium-grained sandstone containing 63.0 percent silica and 6.7 percent ferric oxide gave speckled cream fusion at cone 5 plus. **Value:** Silica content and cone fusion too low for most uses. **Ref:** 150, p. 47.
- SNOHOMISH COUNTY**
28. **Name:** Lake Chaplain. **Loc:** E. end of Lake Chaplain. **Descr:** Mesozoic marine sandstone. Dark-gray fusion below cone 8. **Value:** Low fusion temperature indicates low silica content. **Ref:** 150, p. 48.
 29. **Name:** Sultan River. **Loc:** On W. bank of Sultan River Gorge at the N. end of Horseshoe Curve. **Descr:** Sandstone gave a dark-gray fusion below cone 8. **Value:** Probably unsuited to most uses. **Ref:** 150, p. 48.
- KING COUNTY**
30. **Name:** Skykomish (A). **Loc:** Road cut on Stevens Pass highway in E. end of Skykomish. **Descr:** Hard coarse sandy conglomerate, containing 66.0 percent silica and 3.4 percent ferric oxide, gave a speckled light-brown fusion at cone 5 plus. **Value:** Silica content too low for most uses. **Ref:** 150, p. 37.
 31. **Name:** Skykomish (B). **Loc:** Same as no. 30. **Descr:** May be weathered phase of no. 30. Light-brown fusion at cone 5 plus. **Value:** Low fusion temperature indicates low silica content. **Ref:** 150, p. 37.
 32. **Name:** Olympic Foundry. **Loc:** In South Seattle back of the Olympic Foundry at 5200 Airport Way. **Descr:** A 12-ft. bank of light Oligocene sandstone, containing 61.3 percent silica and 4.7 percent ferric oxide, gave a speckled light-gray fusion below cone 10. **Value:** Uncertain. **Ref:** 150, p. 37-38.
 33. **Name:** B & R Coal Co. **Loc:** Dumps of B & R Coal Co. mine in sec. 27, (24-5E) and sec. 32, (24-6E). **Descr:** Light-gray sandstone, containing 74.1 percent silica and 1.4 percent ferric oxide, fused at cone 8 minus. **Value:** Uncertain. **Ref:** 150, p. 34.
 34. **Name:** Bianco Coal Co. **Loc:** Secs. 31 and 32, (24-6E). **Descr:** Soft light-gray sandstone containing 68.3 percent silica and 2.1 percent ferric oxide gave a spotted brown fusion at cone 16. **Value:** Possibly usable as molding sand. **Ref:** 150, p. 34.
 35. **Name:** Bianco Coal Co. **Loc:** Same as no. 34. **Descr:** Darker and more shaly than no. 34. Silica

- content 58.3 percent and ferric oxide content 5.3 percent. Dark-gray fusion at cone 5 plus. **Value:** Probably not commercial. **Ref:** 150, p. 34.
- *35A. **Name:** Preston. **Loc:** NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 21, (24-7E). **Descr:** Rust-colored sandstone suitable for building stone. **Value:** Currently produced by Snoqualmie Stone, Inc., Seattle, Wash. **Ref:** 2-A, p. 39; 93-A, p. 29.
36. **Name:** Renton. **Loc:** 1 mi. E. of Renton and just W. of the golf courses. **Descr:** A 3-ft. sandstone member containing 70.0 percent silica, 4.1 percent ferric oxide, and 15.1 percent alumina. Washed sample gave dark-gray fusion at cone 12. **Value:** Probably not commercial. **Ref:** 150, p. 29.
37. **Name:** Renton mine. **Loc:** SW $\frac{1}{4}$ sec. 17, (23-5E). **Descr:** Sandstone of Puget group. **Value:** Formerly used in making beer bottles by a glass factory at Renton. **Ref:** 48, p. 96.
38. **Name:** Renton Junction (A). **Loc:** NE $\frac{1}{4}$ sec. 19, (23-5E). **Descr:** Soft gray iron-stained sandstone. Washed sand contains 88.8 percent silica and 0.11 percent ferric oxide. Washed sand, from which 16 percent clay had been removed, fused at cone 23. **Value:** Was sold to a glass plant in 1942. **Ref:** 150, p. 35.
39. **Name:** Renton Junction (B). **Loc:** 450 ft. S. of no. 38. **Descr:** An iron-stained 8-ft. exposure of sandstone. Lightly speckled gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 36.
40. **Name:** Renton Junction (C). **Loc:** S. of nos. 38 and 39 and N. of an old mine dump just off the Renton - Kent highway. **Descr:** Hard sandstone gave gray fusion at cone 7. **Value:** Uncertain. **Ref:** 150, p. 36.
41. **Name:** Cavanaugh. **Loc:** On the Otter Lake road SE. of its junction with the Maple Valley highway. Probably in sec. 29, (29-6E). **Descr:** Soft gray sandstone containing 76.8 percent silica and 2.2 percent ferric oxide. Washed sand, from which 13 percent clay had been removed, gave medium-gray fusion at cone 18. **Value:** Probably suitable for molding use. **Ref:** 150, p. 29.
42. **Name:** Cedar Mountain. **Loc:** Dump of the Cedar Mountain Coal Co. in sec. 29, (23-6E). **Descr:** Lumps of gray-white sandstone, containing 74.1 percent silica and 1.8 percent ferric oxide. Light-gray fusion at cone 15. **Value:** Possibly suited to molding use. **Ref:** 150, p. 30.
43. **Name:** Guye. **Loc:** Road cut 1.5 mi. W. of Snoqualmie Pass summit. **Descr:** Light and dark conglomerate of Guye formation. Light conglomerate contained 79.2 percent silica and 1.8 percent ferric oxide and gave buff-gray fusion at cone 10; the dark conglomerate contained 79.6 percent silica and 4.2 percent ferric oxide and gave light-brown fusion at cone 10. **Value:** Uncertain. **Ref:** 150, p. 37.
44. **Name:** Jones Lake (A). **Loc:** Road cut north of Jones Lake toward Black Diamond, probably in sec. 14, (21-6E). **Descr:** A 6-ft. bed of buff to gray sandstone gave a light-gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 33.
45. **Name:** Jones Lake (B). **Loc:** Road cut N. of no. 44. **Descr:** Sample gave speckled gray fusion at cone 8. **Value:** Uncertain. **Ref:** 150, p. 33.
46. **Name:** Alcorn. **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, (21-6E). **Descr:** Sandstone containing 2 percent ferric oxide. Washed sample, from which had been removed 19 percent clay with fusion of cone 15, gave fusion at cone 18. **Value:** Probably suitable for bottle glass, molding sand, or blast sand. **Ref:** 48, p. 95; 63, p. 141; 150, p. 33.
47. **Name:** Green River bridge (A). **Loc:** Under the bridge across Green River which leads to Flaming Geyser Park. **Descr:** Thick bed of Kummer sandstone. Speckled gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 32.
48. **Name:** Green River bridge (B). **Loc:** Same as no. 47 but stratigraphically higher, next to overlying shale. **Descr:** Contained 65.8 percent silica and 8.9 percent ferric oxide. Washed sand, from which 36 percent clay had been removed, fused at cone 6. **Value:** Probably not commercial. **Ref:** 150, p. 32.
49. **Name:** New Black Diamond mine. **Loc:** New Black Diamond mine in secs. 7 and 18, (21-7E). **Descr:** Light-gray sandstone. Washed sample, from which 17 percent clay had been removed, fused at cone 18 $\frac{1}{2}$. **Value:** Possibly commercial. **Ref:** 150, p. 30.
50. **Name:** Black Beauty mine. **Loc:** Drill hole near the Black Beauty coal mine in sec. 8, (21-7E). **Descr:** Fine and coarse sandstone. Both samples fused at cone 8 minus. **Value:** Probably not commercial. **Ref:** 150, p. 34.
51. **Name:** Green River Gorge (A). **Loc:** First road cut W. of Green River Gorge bridge on the Franklin-Black Diamond road. **Descr:** Gray weathered sandstone gave speckled gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 33.
52. **Name:** Green River Gorge (B). **Loc:** Same as no. 51. **Descr:** A more massive sandstone overlying no. 53 gave speckled gray fusion at cone 14. **Value:** Uncertain. **Ref:** 150, p. 33-34.
53. **Name:** Franklin. **Loc:** Near the bottom of Green River Gorge near Franklin. **Descr:** Gray iron-stained sandstone gave speckled gray fusion at cone 7. **Value:** Probably not commercial. **Ref:** 150, p. 34.
54. **Name:** Eureka (Cumberland) quarry. **Loc:** Sec. 28, (21-7E). **Descr:** Light-colored medium-grained sandstone containing 86.3 percent silica and 0.7 percent ferric oxide. Speckled gray fusion at cone

12. **Value:** Formerly quarried for building stone.
Ref: 48, p. 109; 115, p. 65-67; 150, p. 34.

*54A. **Name:** Hammer Bluff (Smith Bros.) (See no. 18 under Silica sand.)

PIERCE COUNTY

*55. **Name:** Walker (Wilkeson) quarry. **Loc:** Sec. 27, (19-6E). **Descr:** Arkosic sandstone. Contains 0.5 to 2.0 percent ferric oxide and fuses to green glass at cone 9 to 15½. **Value:** Used in Capitol buildings at Olympia. Has also been used for grindstones and pulpstones. Currently operated by Walker Cut Stone Co., Inc., Wilkeson, Wash. **Ref:** 2-A, p. 36; 48, p. 109; 55, p. 35; 115, p. 68-70; 150, p. 45.

56. **Name:** Fairfax quarry. **Loc:** Sec. 22, (18-6E). **Descr:** Light-colored fine-grained sandstone well cemented by silica. **Value:** Formerly quarried for use in construction of coke ovens. **Ref:** 48, p. 109; 115, p. 70-71.

57. **Name:** Mowich River. **Loc:** 2 mi. W. of the Mowich River entrance to Mount Rainier National Park. **Descr:** Puget sandstone. Unwashed sample gave speckled gray fusion at cone 4. **Value:** Probably not commercial. **Ref:** 150, p. 46.

THURSTON COUNTY

58. **Name:** Hercules quarry. **Loc:** NW¼NE¼ sec. 20, (16-1W). **Descr:** Sandstone, consisting primarily of fine angular grains of quartz cemented by iron oxide. **Value:** Used intermittently as building stone. **Ref:** 48, p. 109; 115, p. 61-62; 150, p. 51.

59. **Name:** Western quarry. **Loc:** W½SW¼ sec. 19, (16-1W). **Descr:** Like sandstone at Hercules quarry. **Value:** Formerly used extensively as building stone. **Ref:** 48, p. 109; 115, p. 57-61.

LEWIS COUNTY

60. **Name:** Centralia. **Loc:** Railway cut in NW¼NE¼ sec. 33, (15-2W). **Descr:** Arkosic phase of Puget series. **Value:** Said to be suitable for molding sand. **Ref:** 63, p. 131-135; 96, p. 18.

61. **Name:** Chehalis Brick & Tile Co. west pit. **Loc:** N. part of Chehalis. **Descr:** Eocene sandstone. Washed sample, from which 40 percent clay had been removed, gave white unspotted fusion at cone 20. **Value:** Probably suited to molding use. **Ref:** 150, p. 41.

62. **Name:** Chehalis Brick & Tile Co. pit. **Loc:** Upper west side of shale and sand pit across the road from the plant. **Descr:** Gray fine-grained Eocene sandstone. Washed sand gave a spotted light-gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 42.

63. **Name:** Morton. **Loc:** Road cut on Morton-Kosmos highway 0.8 mi. SE of Morton. **Descr:** Fine-grained dirty sandstone. Dark-brown fusion at cone 6. **Value:** Probably not commercial. **Ref:** 150, p. 43.

64. **Name:** Morton (A). **Loc:** Cut on Morton-Kosmos highway 3.8 mi. SE. of Morton. **Descr:** Coarse-

grained gray iron-stained sandstone. Washed sample gave lightly spotted near-white fusion at cone 16 minus. **Value:** Possibly commercial. **Ref:** 150, p. 43.

65. **Name:** Morton (B). **Loc:** Cut on Morton-Kosmos highway, 4 mi. SE. of Morton. **Descr:** Sandstone containing 84.2 percent silica and 1.8 percent ferric oxide. Washed sample gave spotted gray fusion at cone 14. **Value:** Possibly commercial. **Ref:** 150, p. 43.

COWLITZ COUNTY

66. **Name:** Kelso. **Loc:** Cut on Pacific highway, 1.8 mi. S. of Kelso city limits. **Descr:** Weathered soft sandstone. Washed sample, from which 29 percent clay had been removed, gave a light-gray fusion at cone 10. **Value:** Uncertain. **Ref:** 150, p. 27.

SKAMANIA COUNTY

67. **Name:** Wood Bros. quarry. **Loc:** NW¼ sec. 26, (4-9E). **Descr:** Interbasalt sandstone. **Value:** Formerly quarried and sold for hones and whetstones by Wood Bros. **Ref:** 135.

YAKIMA COUNTY

68. **Name:** Yakima quarry. **Loc:** Near Yakima. **Descr:** Sandstone of Ellensburg formation. **Value:** Formerly used in local building. **Ref:** 48, p. 109.

69. **Name:** Howard quarry. **Loc:** Near Selah. **Descr:** Sandstone. **Value:** Reportedly used in local buildings. **Ref:** 48, p. 109.

KITTITAS COUNTY

70. **Name:** Easton Tunnel. **Loc:** Cut on the C. M. St. P. & P. R.R. 1 mi. W. of Easton and 200 ft. E. of first tunnel. **Descr:** Naches sandstone, more than 25 ft. thick, occurs between Kachess rhyolite flows. Contains 74.5 percent silica and 2.4 percent ferric oxide. Light-brown fusion at cone 23-26. **Value:** Uncertain. **Ref:** 150, p. 39.

71. **Name:** Cle Elum area. **Loc:** NE. of Cle Elum. **Descr:** Soft sandstone. **Value:** Quarried in the past for use in local buildings. **Ref:** 135.

72. **Name:** Jonesville No. 2 mine. **Loc:** Dump of Jonesville No. 2 mine at Ronald. **Descr:** Roslyn sandstone, containing 67.6 percent silica, 3.8 percent ferric oxide, and 3.7 percent ignition loss. Brown fusion below cone 10. **Value:** Uncertain. **Ref:** 150, p. 39.

73. **Name:** Roslyn-Cascade mine. **Loc:** Excavation at Roslyn-Cascade Coal Co. wash house in Roslyn. **Descr:** Washed sample of sandstone gave spotted gray fusion at cone 5. **Value:** Uncertain. **Ref:** 150, p. 39.

74. **Name:** Teanaway River (A). **Loc:** On NE. side of Teanaway River valley, 4.5 mi. N. of Blewett Pass highway. **Descr:** Brownish-gray weathered sandstone. Washed sample gave speckled gray fusion at cone 9. **Value:** Uncertain. **Ref:** 150, p. 40.

75. **Name:** Teanaway River (B). **Loc:** On E. side of Teanaway River road, 1 mi. S. of bridge at junction of N. and S. forks of river. **Descr:** A 40-ft. cliff of massive coarse-grained sandstone containing 65.8 percent silica, 2.1 percent ferric oxide, and 17.7 percent alumina. Light-gray fusion at cone 9. **Value:** Uncertain. **Ref:** 150, p. 41.
- *75A. **Name:** Lion Gulch. **Loc:** NE $\frac{1}{4}$ sec. 24, (21-17E), in Lion Gulch. **Descr:** Green sandstone suitable for building stone. **Value:** Quarried in 1954 by Washington Green Sandstone, Inc., Moses Lake, Wash. **Ref:** 66-D, p. 33.
76. **Name:** Cle Elum River. **Loc:** Along Lake Cle Elum road for 2.5 mi. N. of Salmon La Sac Ranger Station. **Descr:** Composite sample showed 71.0 percent silica and 2.4 percent ferric oxide. Light-brown fusion at cone 11. **Value:** Uncertain. **Ref:** 150, p. 39.
77. **Name:** Standup Creek. **Loc:** On W. side of Standup Creek valley. Approximately in center of sec. 28, (22-16E). **Descr:** Swauk sandstone. A washed sample, from which 36 percent clay had been removed, fused at cone 5. **Value:** Probably not commercial. **Ref:** 150, p. 40-41.
- CHELAN COUNTY**
78. **Name:** Mission Creek (A). **Loc:** 0.9 mi. S. of the intersection of the main Mission Creek highway with the west branch road. Intersection in sec. 6, (22-19E). **Descr:** Sandstone. Washed sample, from which 25 percent clay had been removed, gave a dark-gray fusion at cone 5. **Value:** Probably not commercial. **Ref:** 150, p. 26.
79. **Name:** Mission Creek (B). **Loc:** Road cut 4.4 mi. S. of the intersection in sec. 6 and 0.7 mi. N. of the intersection with Canyon 2 road to Wenatchee. **Descr:** Washed sample of sandstone gave a dark-gray fusion at cone 4. **Value:** Probably not commercial. **Ref:** 150, p. 26.
80. **Name:** Mission Creek (C). **Loc:** At road intersection in sec. 6, (22-19E). **Descr:** Hard impure sandstone. Washed sample, from which 25 percent clay had been removed, gave a dark-gray fusion at cone 4. **Value:** Probably not commercial. **Ref:** 150, p. 26.
81. **Name:** Stemilt Canyon. **Loc:** NW $\frac{1}{4}$ sec. 36, (22-20E). **Descr:** High cliffs of soft Swauk sandstone. Washed sample, from which 16 percent clay with fusion of cone 29 had been removed, fused at cone 30 $\frac{1}{2}$. **Value:** Suitable for amber glass and molding or blast sand. **Ref:** 48, p. 95; 63, p. 115-117; 150, p. 25.
- *82. **Name:** Brown quarry. **Loc:** SW $\frac{1}{4}$ sec. 22, (22-20E). **Descr:** An estimated 350,000 tons of marketable sand after crushing. Test sample contained 99.4 percent silica and 0.1 percent ferric oxide. Washed sample of fines gave glassy fusion at cone 32. **Value:** Quarried by N. W. L. Brown, P. O. Box 333, Wenatchee, Wash., and sold for use in foundries and portland cement plants. **Ref:** 48, p. 95; 55, p. 18; 66, p. 56.
83. **Name:** Cain. **Loc:** SE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 22, (20-22E). **Descr:** Sandstone, containing 87.5 percent silica, 1.6 percent ferric oxide, and 6.5 percent alumina. **Value:** Warrants investigation. **Ref:** 150, p. 22.
84. **Name:** Squillchuck Canyon. **Loc:** Dikeline projection N. of Brown property in sec. 22, (22-20E). **Descr:** Rock which is believed to be silicified sandstone contains 73.2 percent silica and 2.3 percent ferric oxide. Light-brown fusion at cone 8 minus. **Value:** Uncertain. **Ref:** 150, p. 23-24.
85. **Name:** Keegan (Dry Gulch). **Loc:** NW $\frac{1}{4}$ sec. 21, (21-20E). **Descr:** Coarse iron-stained sandstone, with an average clay content of 9 percent, fused at cone 30 on both washed and unwashed samples. **Value:** Suitable for amber glass and furnace sand. **Ref:** 63, p. 114-115; 66, p. 55-56; 150, p. 25.
- *85A. **Name:** Wenatchee. **Loc:** Sec. 21, (22-20E). **Descr:** Sandstone suitable for building stone. **Value:** Currently produced by Wenatchee Stone Co. **Ref:** 2-A, p. 39.
86. **Name:** Stemilt School road (A). **Loc:** Irrigation cut probably in NE. cor. sec. 31, (22-21E). **Descr:** Softened coarse sandstone, containing 91.2 percent silica, 0.6 percent ferric oxide, and 3.8 percent alumina. Washed sample gave spotted light-brown fusion at cone 30 minus. **Value:** Possibly suited to furnace or molding use. **Ref:** 150, p. 24.
87. **Name:** Stemilt School road (B). **Loc:** Up hill from no. 86. **Descr:** Softened white sandstone, containing 92.3 percent silica, 0.2 percent ferric oxide, and 4.0 percent alumina, gave a clear fusion at cone 32 plus. **Value:** Possibly suitable for some grades of glass. **Ref:** 150, p. 24.
88. **Name:** Mission Creek area. **Loc:** Along the Mission Creek road for 1.5 mi. N. of road intersection leading to Canyon 2. **Descr:** Composite sample of miscellaneous sandstone. Washed sand, from which 20 percent clay had been removed, gave dark-gray fusion at cone 3. **Value:** Probably not commercial. **Ref:** 150, p. 26.
89. **Name:** Shotwell road. **Loc:** N. part of sec. 30, (23-20E). **Descr:** Soft light-colored sandstone containing 92.9 percent silica, 0.6 percent ferric oxide, and 4.1 percent alumina. Washed sand gave speckled but otherwise clear glass fusion at cone 32 plus. **Value:** Suitable for furnace sand and probably some grades of glass. **Ref:** 150, p. 24.
- DOUGLAS COUNTY**
90. **Name:** Gladding McBean. **Loc:** Near clay bunker of Gladding, McBean & Co. in sec. 23, (23-20E). **Descr:** Stained fine-grained sandstone. Washed sample gave gray fusion at cone 20-23. **Value:** Uncertain. **Ref:** 150, p. 27.
91. **Name:** Pinnacle. **Loc:** Pinnacle near center sec. 23, (23-20E). **Descr:** Lower portion of 20-ft. outcrop

is coarse, fairly clean sandstone. Washed sample contained 74.6 percent silica and 1.1 percent ferric oxide. Spotted gray fusion at cone 23 minus. **Value:** Possibly a source of molding or furnace sand. **Ref:** 150, p. 27-28.

92. **Name:** Spring. **Loc:** NW. cor. sec. 13, (23-20E). **Descr:** Coarse hard sandstone. Washed sample contained 63.8 percent silica and 1.4 percent ferric oxide and gave a gray spotted fusion at cone 8. **Value:** Probably not commercial. **Ref:** 150, p. 28.

BENTON COUNTY

93. **Name:** Prosser quarry. **Loc:** 2 mi. E. of Prosser.

Descr: Sandstone. **Value:** Formerly quarried for local building use. **Ref:** 48, p. 109.

FERRY COUNTY

94. **Name:** Wiseman-McGillis quarries. **Loc:** N. of Republic 1½ mi. **Descr:** Sandstone. **Value:** Formerly quarried for local building use. **Ref:** 48, p. 109.

ASOTIN COUNTY

95. **Name:** Clarkston quarry. **Loc:** NE¼ sec. 8, (10-46E). **Descr:** Sandstone composed of basaltic glass grains. **Value:** Formerly quarried for local building use. **Ref:** 48, p. 109.

SILICA SAND

Silica sand, as described under this heading, is sand composed predominantly of quartz and includes sands commonly classified by use, such as glass sand, blast sand, molding sand, engine sand, furnace sand, and grinding sand. Sands used for mortar and masonry purposes are included under "Sand and gravel." Many occurrences having no particular economic value are included because they have been thought to have value, have been investigated, and have had their physical and chemical data determined. For other occurrences of

silica see "Quartz, massive," "Quartzite," and "Sandstone."

The Washington deposits of silica sand that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

In 1952 the average price per short ton of glass sand was \$2.66; of foundry sand, \$1.97; and of grinding sand, \$2.37.

OCCURRENCES

On page 77 in volume 2 is plate 36, the map showing the occurrences of silica sand, numbered to correspond with the numbers of the occurrences listed below.

MASON COUNTY

1. **Name:** Matlock area. **Loc:** Two tested samples, one 7.7 mi. E. of Matlock on Matlock-Shelton road, the other 5.5 mi. W. of Matlock on Tornow branch of Satsop River road. **Descr:** Recent (?) sand from road cuts. Both samples gave dark-brown fusion at cone 6. **Value:** Probably nonusable for other than mortar sand. **Ref:** 150, p. 43.

GRAYS HARBOR COUNTY

2. **Name:** Montesano. **Loc:** Sec. 12, (17-8W). **Descr:** Clayey sand exposed in a pit to a depth of 50 ft. **Value:** Several carloads of material was reportedly used for molding sand. **Ref:** 48, p. 75; 63, p. 137-138; 96, p. 17.
3. **Name:** C. W. Miller. **Loc:** Adjoins Montesano deposit on north. **Descr:** Extensive deposits. **Value:** Satisfactory for molding purposes. **Ref:** 48, p. 75.
4. **Name:** East Aberdeen. **Loc:** N. part sec. 10, (17-9W). **Descr:** Bed of clayey sand more than 50 ft. thick. **Value:** Has been used extensively in foundries. **Ref:** 48, p. 75; 63, p. 136-137; 96, p. 18.
5. **Name:** West Aberdeen. **Loc:** Sec. 5, (17-9W). **Descr:** Clayey sand reportedly 50 ft. or more thick. **Value:** Worked in 1934 and said to be satisfactory for molding use. **Ref:** 48, p. 75.

6. **Name:** Markham. **Loc:** Near Markham on the Aberdeen - Westport road. **Descr:** Dark - brown fusion at cone 4. **Value:** Cone fusion too low for molding or furnace use. **Ref:** 150, p. 28.

7. **Name:** Grayland Beach. **Loc:** E. of Grayland Beach. **Descr:** Dark-brown fusion at cone 4. **Value:** Cone fusion indicates material to be below commercial grade. **Ref:** 150, p. 28.

PACIFIC COUNTY

8. **Name:** Naselle River. **Loc:** Sec. 31, (11-9W). **Descr:** Iron-stained fine-grained laminated sandy clay. A washed sample gave a vesicular, brown fusion at cone 4. **Value:** Low cone fusion indicates poor material. **Ref:** 150, p. 44.
9. **Name:** Nemah River. **Loc:** Road cut 3 mi. S. of Little Nemah River bridge. **Descr:** Similar to no. 8. Tested sample contained 81.1 percent silica and 0.6 percent ferric oxide. Light-gray fusion at cone 16 after removal of 36 percent clay by washing. **Value:** Possibly usable for molding sand. **Ref:** 150, p. 44.
10. **Name:** Fender. **Loc:** Road cut in NW. cor. NE¼ sec. 27, (10-11W). **Descr:** Sand, seemingly with the characteristics of molding sand. **Value:** Warrants investigation. **Ref:** 135.
11. **Name:** Long Beach. **Loc:** Dunes at Long Beach. **Descr:** Fine - grained spherical sand containing 68.0 percent silica and 4.3 percent ferric oxide.

Washed sand gave a black fusion below cone 4. **Value:** Cone fusion and silica content too low for most uses. **Ref:** 150, p. 44.

KING COUNTY

12. **Name:** Issaquah. **Loc:** Gladding, McBean & Co. clay pit SW. of Issaquah city park. **Descr:** Washed sand, from which 72 percent clay had been removed, contained 83.0 percent silica and 0.7 percent ferric oxide. Light-colored fusion at cone 16. **Value:** Possibly usable as molding sand. **Ref:** 150, p. 34-35.
- *13. **Name:** Cavanaugh (Cedar Mountain). **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 30, (23-6E). **Descr:** Washed sand, from which 63 percent clay with fusion of cone 9 to 10 was removed, gave a very dark brown fusion at cone 16 minus. **Value:** Currently sold for molding use by M. B. Cavanaugh, Kenwood, Wash. **Ref:** 2-A, p. 22; 48, p. 75; 55, p. 19; 150, p. 30.
- *14. **Name:** Wilde. **Loc:** E $\frac{1}{2}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, (23-6E). **Descr:** Molding sand. **Value:** Recently produced by George H. Wilde, Vancouver, Wash. **Ref:** 55, p. 36.
15. **Name:** Otter Lake. **Loc:** Along the Otter Lake road SE. of highway intersection, at entrance to old mine. **Descr:** Washed sand, from which 13 percent clay was removed, contained 77.1 percent silica, 10.8 percent alumina, and 2.1 percent ferric oxide. Spotted light-gray fusion at cone 16. **Value:** Possibly usable for molding purposes. **Ref:** 150, p. 30.
16. **Name:** Alcorn. **Loc:** NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 27, (21-6E). **Descr:** Completely decomposed Eocene sandstone. Washed sample contained 81.2 percent silica, 0.17 percent ferric oxide, and 10.1 percent alumina. Fusion at cone 19 on washed, and cone 20 on unwashed sand. **Value:** Formerly sold by Alcorn Bros. for molding sand. **Ref:** 47, p. 149; 150, p. 33.
17. **Name:** Brooke. **Loc:** N $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 28, (21-6E). **Descr:** 11 feet of light-gray sand overlain by 3 to 15 ft. of stained sand and clay. Upper 4 ft. of gray sand contained 93.3 percent silica, 0.1 percent ferric oxide, and 4.5 percent alumina. After washing, fused at cone 18. Lower 7 ft. of gray sand contained 90.7 percent silica. After removal of 29 percent clay by washing, gave clear, glassy fusion at cone 18. **Value:** Formerly used as white aggregate for stuccos and mortars. **Ref:** 47, p. 143; 150, p. 31-32.
- *18. **Name:** Smith Bros. (Hammer Bluff). **Loc:** NE $\frac{1}{4}$ sec. 28, (21-6E). **Descr:** Sediments of Hammer Bluff formation and underlying Puget series. After removal of 54 percent clay by washing, sample contained 97.2 percent silica and 0.1 percent ferric oxide. Brown spotted fusion at cone 30 on washed sample. **Value:** Currently worked by Smith Bros. Silica Sand Co. and sold for use in the manufacture of brown bottles. **Ref:** 2-A, p. 34; 47, p. 144-147; 55, p. 32; 75-A, p. 30; 124-B, p. 8; 150, p. 32.

19. **Name:** Hammer Bluff school. **Loc:** Road cut near the school E. of Hammer Bluff. **Descr:** Washed sand, from which 49 percent clay was removed, contained 87.6 percent silica and 0.9 percent ferric oxide and gave a spotted gray fusion at cone 23. **Value:** Probably suitable for molding purposes. **Ref:** 150, p. 32.
20. **Name:** Gladding, McBean & Co. **Loc:** SE $\frac{1}{4}$ sec. 28, (21-6E). **Descr:** Sandy clay containing 38 percent clay. After washing, contained 79.1 percent silica, 0.8 percent ferric oxide and gave a slightly spotted light-gray fusion at cone 20-23. **Value:** Possibly suitable for molding purposes. **Ref:** 150, p. 32.
21. **Name:** Denny-Renton Clay & Coal Co. **Loc:** Sec. 1, (19-7E). **Descr:** Sand contained 90.1 percent silica and 0.5 percent ferric oxide. A light-colored fusion at cone 32-33. **Value:** Probably suitable for molding and furnace use. **Ref:** 150, p. 36.

PIERCE COUNTY

- *22. **Name:** Steilacoom. **Loc:** Secs. 20 and 29, (20-2E). **Descr:** Large deltaic deposit of Pleistocene sand and gravel. **Value:** Pioneer Sand & Gravel Co. is currently producing engine and blast sand in connection with their sand and gravel operation. **Ref:** 48, p. 75.

THURSTON COUNTY

23. **Name:** Tono (A). **Loc:** Cut in a side road 1 mi. S. of Tono near N. line sec. 28, (15-1W). **Descr:** Fine-grained iron-stained sand. After removal of 36 percent clay by washing, gave a speckled light-gray fusion at cone 12. **Value:** Uncertain. **Ref:** 150, p. 51.
24. **Name:** Tono (B). **Loc:** Mine drainage ditch below occurrence no. 23. **Descr:** Sample contained 88.5 percent silica and 0.5 percent ferric oxide. After removal of 32 percent clay by washing, gave speckled gray-white fusion at cone 19. **Value:** Possibly usable for molding sand. **Ref:** 150, p. 51.

LEWIS COUNTY

25. **Name:** Mendota. **Loc:** Road cut in central part sec. 3, (14-1W). **Descr:** Gray-brown fine-grained sand containing 79.5 percent silica and 0.8 percent ferric oxide. Washed sand, from which 15 percent clay was removed, gave speckled gray fusion at cone 5. **Value:** Uncertain. **Ref:** 150, p. 42.
26. **Name:** Lund. **Loc:** On Lund ranch in sec. 2, (13-3W). **Descr:** Sand deposits, consisting of 90 percent quartz, underlie 4 ft. of clay. **Value:** Possible source of silica. **Ref:** 96, p. 18.
27. **Name:** Stillwater Creek. **Loc:** NW. cor. sec. 32, (11-2W). **Descr:** Iron-stained fine-grained sand containing 79.7 percent silica and 1.6 percent ferric oxide. Washed sand yielded a buff speckled fusion at cone 8. **Value:** Probably not commercial. **Ref:** 150, p. 42.
28. **Name:** Campbell Road. **Loc:** Approximately in center N $\frac{1}{2}$ sec. 33, (11-3W). **Descr:** Iron-stained

sand containing 74.7 percent silica and 2.3 percent ferric oxide. Washed sand gave a brown vesicular fusion at cone 4. **Value:** Probably not commercial. **Ref:** 150, p. 42.

CLARK COUNTY

- *29. **Name:** Wilde. **Loc:** SE $\frac{1}{4}$ sec. 7, (2-2E) in Salmon Creek area NE. of Vancouver. **Descr:** Molding sand. **Value:** Currently worked by George H. Wilde, Vancouver, Wash. **Ref:** 66-D, p. 35.

Klickitat County

30. **Name:** Sundale. **Loc:** On Dewey Beeks' property in sec. 3, (3-19E). **Descr:** Sand, reportedly usable for molding purposes. **Value:** Should be investigated. **Ref:** 96, p. 18.
31. **Name:** Goodnoe Hills. **Loc:** On Gus Beeks' property in sec. 17, (3-19E). **Descr:** Quartz-bearing sand that might be useful as molding sand. **Value:** Should be investigated. **Ref:** 96, p. 18.

Kittitas County

32. **Name:** Vantage Ferry. **Loc:** At Vantage Ferry. **Descr:** Dune sand gave a brown fusion at cone 7 minus. **Value:** Possibly usable. **Ref:** 150, p. 41.
33. **Name:** Ellensburg (Craig Hill). **Loc:** SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 36, (18-18E) and near center N. line sec. 1, (17-18E). **Descr:** Clayey sand containing 63.6 percent silica and 6.7 percent ferric oxide. Dark-gray fusion below cone 10. **Value:** Several hundred tons shipped. Deposit now nearly exhausted, but it is likely that other deposits can be found in the vicinity. **Ref:** 48, p. 75; 63, p. 119-122; 150, p. 41.

Chelan County

34. **Name:** Cashmere. **Loc:** Near the intersection of secs. 4, 5, 8, and 9, (23-19E). **Descr:** Loose carbonaceous sand gave a fusion at cone 6. **Value:** Probably unsuitable for most uses. **Ref:** 150, p. 26.
35. **Name:** Leavenworth. **Loc:** Railway cut 2.9 mi. S. of the Clark Canyon road. **Descr:** Crossbedded gravel, sand, and clay containing 78.5 percent silica, 1.7 percent ferric oxide, and 11.5 percent alumina. **Value:** Uncertain. **Ref:** 150, p. 27.

Okanogan County

36. **Name:** Omak. **Loc:** Sec. 11, (33-27E). **Descr:** Loose silt-size quartz sand. **Value:** Possibly usable for molding purposes. **Ref:** 96, p. 18.

Douglas County

37. **Name:** Gladding, McBean & Co. **Loc:** NW. cor. sec. 13, (23-20E). **Descr:** Fine-grained crossbedded sand. Washed sample, from which 40 percent clay was removed, contained 77.4 percent silica and 1.6 percent ferric oxide. Gray fusion at cone 16. **Value:** Possibly suited to molding use. **Ref:** 150, p. 28.

GRANT COUNTY

38. **Name:** Corfu. **Loc:** Sec. 8, (15-27E). **Descr:** Sands, said to contain 85 percent silica. **Value:** Doubtful. **Ref:** 96, p. 17.

Stevens County

39. **Name:** Kettle Falls. **Loc:** Road cut in sec. 19, (36-38E). **Descr:** This exposure considered typical of clayey sand which occurs over a wide area W. of Kettle Falls. **Value:** Though not tested, may be suitable for molding use. **Ref:** 63, p. 63.
- *40. **Name:** Chewelah (Waterman). **Loc:** E $\frac{3}{4}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 28 and SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 21, (32-40E). **Descr:** Loose sand, quartzite pebbles and cobbles as much as 6 in. in diameter. Analyses run 98 percent silica and 0.35 percent ferric oxide. Fusion at cones 32 to 33. Abrasion resistance equal to or better than that of best California blast sands. **Value:** Currently operated by Manufacturers Mineral Co., Seattle, and sold as molding and filter sand. **Ref:** 2-A, p. 27; 55, p. 27; 63, p. 58-63; 75-A, p. 31-32; 124-B, p. 6; 150, p. 50.
41. **Name:** Conner. **Loc:** NE $\frac{1}{4}$ sec. 4, (29-42E). **Descr:** Sandy clay. Washed sample, from which 50 percent clay had been removed, contained 89.3 percent silica and 0.6 percent ferric oxide, and gave a gray-cream fusion at cone 26. **Value:** Possibly commercial. **Ref:** 150, p. 50.
- 41A. **Name:** Springdale (Lyons Hill, Marshall). (See no. 7 under Quartzite.)

Spokane County

42. **Name:** McKinley. **Loc:** Sec. 26, (26-42E). **Descr:** Arkosic sand prospected over an area 400 by 100 ft. Washed sand contained 0.75 percent ferric oxide and fused at cone 29. Unwashed sand fused at cone 31. **Value:** Probably suitable as molding or furnace sand. **Ref:** 48, p. 76; 63, p. 65-66; 96, p. 18; 150, p. 49.
- *42A. **Name:** Mead (Berk). **Loc:** Center sec. 13, (26-43E). **Descr:** Silica sand. **Value:** Currently produced by Crystal Line Products, Spokane. **Ref:** 135.
43. **Name:** Spokane. **Loc:** At Spokane waterworks plant. **Descr:** Dark fusion at cone 7 minus. **Value:** Probably not commercial. **Ref:** 150, p. 49.
44. **Name:** Mica area. **Loc:** Mica and vicinity. **Descr:** Residual clays in which are abundant angular grains of quartz. **Value:** Silica, suitable for potters' flint and some grades of glass, can be recovered by washing. **Ref:** 47, p. 244-252; 48, p. 96; 148.
45. **Name:** Freeman area. **Loc:** Freeman and vicinity. **Descr:** Residual clay which contains an appreciable percentage of angular quartz grains. White fusion at cone 30. **Value:** Silica, suitable for potters' flint and some grades of glass, can be recovered by washing. **Ref:** 47, p. 241-244; 48, p. 96; 148; 150, p. 49.

SLATE AND OTHER PLATY ROCKS

Slate is a metamorphic rock in which preexisting and newly formed platy minerals have been oriented in such a fashion that the rock has acquired a distinct cleavage.

Slate is used for roofing, flagstones, electrical panels and switchboards, school slates, pencils, toys, blackboards, and billiard tables, and is ground to granules and flour for roofing and other building materials.

In 1952 roofing slate sold for \$21.06 per square (100 sq. ft.), and millstock for approximately 75 cents per

sq. ft. In 1945 crushed slate granules sold for approximately \$9.00 per short ton, and slate flour for approximately \$3.50 per short ton.

The Washington occurrences of slate and other platy rocks that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing occurrences.

OCCURRENCES

On page 79 in volume 2 is plate 37, the map showing the occurrences of slate and other platy rocks. These are numbered to correspond with the numbers of the occurrences listed below.

WHATCOM COUNTY

1. **Name:** Whatcom-Skagit area. **Loc:** Many places in Skagit and Whatcom Counties. A good example is an exposure at the SE. cor. sec. 30, (37-4E). **Descr:** Slate, mostly too jointed or crumpled to have commercial possibilities, occurs in the metamorphic rocks. **Value:** Possibly good-quality slate somewhere in the series. **Ref:** 135.

SKAGIT COUNTY

2. **Name:** Sedro Woolley. **Loc:** Near center sec. 36, (35-4E). **Descr:** Slate, less jointed than some and having moderately flat, smooth cleavage. **Value:** Quarried at various times for riprap, but some parts of the bed might be suitable for roofing and other uses. **Ref:** 48, p. 112.

SNOHOMISH COUNTY

3. **Name:** Pilchuck River. **Loc:** Sec. 17, (29-8E). **Descr:** Road cuts expose slate of good quality. **Value:** Warrants investigation. **Ref:** 96, p. 18.

CLALLAM COUNTY

- *4. **Name:** Lake Sutherland. **Loc:** Near Lake Sutherland. **Descr:** Flagstone. **Value:** Recently produced. **Ref:** 93-A, p. 23.

PIERCE COUNTY

- *5. **Name:** Hicks. **Loc:** NW $\frac{1}{4}$ sec. 20, (18-5E), near Orting. **Descr:** Flaggy sandstone. **Value:** Limited production from small quarry. **Ref:** 66-D, p. 22.

YAKIMA COUNTY

- *6. **Name:** Dog Lake. **Loc:** On both sides of Clear Creek from Dog Lake to Tieton River. **Descr:** Light-gray andesite which breaks into long flat tablets of various sizes. **Value:** Suitable for flagstones and patio blocks. Currently operated in a small way. **Ref:** 135.
- *7. **Name:** Mount Adams. **Loc:** SW. cor. sec. 27, (8-11E). **Descr:** Light pinkish-gray andesite that breaks into sheets from $\frac{1}{2}$ to 3 or 4 in. thick and 6

to 8 ft. across. **Value:** Has been used for flagstones, stone benches, and other decorative purposes. Recently operated by Joe Marsten, Portland, Oreg. **Ref:** 66-D, p. 25; 135.

8. **Name:** Gold Ridge. **Loc:** NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 15, (26-19E) on Gold Ridge. **Descr:** Part of a white limestone bed 40 to 100 ft. thick and 2,000 ft. long is thoroughly jointed, producing slabs $\frac{1}{2}$ in. thick and more than 1 ft. in diameter. **Value:** Suitable for patio paving stones and similar uses. **Ref:** 135.

KITITITAS COUNTY

- *9. **Name:** Kirsch. **Loc:** Sec. 24, (21-17E) and sec. 6, (20-18E). **Descr:** Flaggy sandstone. **Value:** Quarried in 1957 by J. J. Kirsch, Cle Elum, Wash. **Ref:** 93-A, p. 23.
- *10. **Name:** Black Diamond. **Loc:** Sec. 27, (21-17E). **Descr:** Flaggy sandstone. **Value:** Quarried in 1957 by Ollie Jordin, Cle Elum, Wash. **Ref:** 93-A, p. 30.
- *11. **Name:** Cougar Gulch. **Loc:** Sec. 36, (21-17E). **Descr:** Flaggy sandstone. **Value:** Quarried in 1957 by Ollie Jordin, Cle Elum, Wash. **Ref:** 93-A, p. 31.

FERRY COUNTY

12. **Name:** Stahley Mountain. **Loc:** SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 26, (35-36E). **Descr:** Slate. **Value:** Undeveloped but may have commercial value. **Ref:** 135.

STEVENS COUNTY

- *13. **Name:** Slate quarry. **Loc:** S $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 19, (31-39E) **Descr:** Slate of fairly good quality, purple to silvery green in color, which can be split into thin, medium-smooth plates. **Value:** Intermittently quarried by David Symington, Seattle. **Ref:** 2-A, p. 38; 48, p. 112; 103, p. 146-147; 106-G, p. 62; 119, p. 181.

14. **Name:** Waits Lake. **Loc:** Near Waits Lake. **Descr:** C. A. Sargent reports a deposit of slate of roofing quality. **Value:** Warrants investigation. **Ref:** 135.

PEND OREILLE COUNTY

- *15. **Name:** No Name Lake (Bennion). **Loc:** SE $\frac{1}{4}$ sec. 5, (32-45E). **Descr:** Sheeted metamorphic rock, variously colored, breaks into thin slabs. **Value:** Formerly quarried and sold for flagstones and

patio paving by D. S. Bennion, 1310 W. Ide, Spokane. **Ref:** 66-C, p. 17.

- *16. **Name:** Bead Lake. **Loc:** On highway about 2 mi. from Bead Lake. **Descr:** Siliceous slate. **Value:** Currently operated by George B. Deeble. **Ref:** 135.

SPOKANE COUNTY

- *17. **Name:** Fish Lake. **Loc:** Sec. 32, (24-42E). **Descr:** Flaggy metamorphic rocks suitable for use in patios and for similar uses. **Value:** Has been intermittently quarried. **Ref:** 66-C, p. 22.

WHITMAN COUNTY

- *18. **Name:** Hole in the Ground (Bach). **Loc:** On farm of H. C. Bach, probably in NW¼NE¼ sec. 22, (20-41E). **Descr:** Sheeted metamorphic rock, in various shades of red, purple, and brown, breaks into slabs 1 to 2 in. thick and several feet across. **Value:** Quarried occasionally and used for flagstones, patio paving, table tops, and benches. **Ref:** 66-D, p. 22; 135.

TALC AND SOAPSTONE

Talc is an acid magnesium silicate mineral with the composition $H_2Mg_3(SiO_3)_4$. Its color is usually some shade of green, and it is one of the softest of known minerals. Because of its softness it is used in cosmetics and for ornamental carvings. Its resistance to acids makes it valuable for use in laboratory sinks. High-temperature resistance accounts for its use in furnace linings. It is also used as a filler in textiles and papers, in soaps, for greaseless pancake griddles, for switchboard panels, for table tops, for steel-marking pencils, for tailor's chalk, and as a diluent in insecticides.

Soapstone is a massive impure talc; it formerly was known as steatite, but that term is beginning to be reserved for a variety of talc or soapstone that hardens under the application of heat and that was formerly

termed "lava talc." Soapstone is applicable to the same uses as talc except those in which gritty or non-acid-resistant particles might be harmful.

Washington deposits of pure talc are small. Those spoken of as "talc" are largely soapstone containing small lenses of talc. Several deposits of soapstone are currently worked, and others are of sufficient size and purity to warrant investigation.

The Washington deposits of talc and soapstone that have been in production at any time during the period from 1948 to 1957 are indicated in the descriptions under the heading "Occurrences" by an asterisk (*) preceding the descriptions of the producing deposits.

In August 1956, air-floated 325-mesh talc sold for \$18.50 to \$20.00 per ton f. o. b. New York.

OCCURRENCES

On page 81 in volume 2 is plate 38, the map showing the occurrences of talc and soapstone. These are numbered to correspond with the numbers of the occurrences listed below.

SKAGIT COUNTY

- *1. **Name:** Skagit Talc Products. **Loc:** NW¼NW¼ sec. 14, (36-11E). **Descr:** Large tonnage of excellent soapstone containing some high-grade talc. **Value:** Formerly used extensively for furnace blocks. Currently ground for insecticide base and cut into dimension blocks for carving, etc. Steel-marking pencils are made on demand. Certain portions of the deposit have been found to be usable as steatite or lava talc. **Ref:** 2-A, p. 34; 48, p. 116; 55, p. 32; 96, p. 19; 149, p. 5.
2. **Name:** Alvard. **Loc:** Near SW. cor. sec. 15, (36-11E). **Descr:** Large quantity of soapstone and reportedly a large quantity of talc. Quality lowered somewhat by ankerite inclusions. **Value:** Recently operated by Skagit Mineral Products Co., Inc. Later leased by William Soren, owner of Skagit Talc Products. **Ref:** 48, p. 116; 55, p. 32; 96, p. 19; 149, p. 3.
- *2A. **Name:** Rainbow. **Loc:** Sec. 15, (36-11E). **Descr:** Soapstone. **Value:** Current limited production by Scheel Olivine, Inc., Mount Vernon. **Ref:** 2-A, p. 33.

- *3. **Name:** McMyrl-Wilson. **Loc:** NE¼ sec. 21, (36-11E). **Descr:** Pale green soapstone and talc in bodies as much as 10 ft. wide. **Value:** Dimension soapstone cut for refractory use at one time. Recently quarried by Northwest Talc & Magnesium Co., Clearlake, Wash. **Ref:** 2-A, p. 34; 48, p. 117; 96, p. 19; 149, p. 3-4.
- *3A. **Name:** Dad's Girl claim. **Loc:** N½ sec. 21, (36-11E), on hill above McMyrl-Wilson adit. **Descr:** Soapstone body 20 ft. wide exposed for 75 ft. Talc itself is good grade but contains ankerite inclusions. **Value:** Currently operated by Skagit Talc Products, Sedro Woolley, Wash. **Ref:** 149, p. 3.
4. **Name:** Scott. **Loc:** SW¼SE¼ sec. 27, (36-5E). **Descr:** Largely serpentized schists, but some are talcose. One lens of soapstone 3 to 4 in. thick. **Value:** Exposed quantity too small for commercial use. **Ref:** 135.
5. **Name:** Alger. **Loc:** Reported in SE¼NE¼ sec. 15, (36-4E). **Descr:** Unknown. **Value:** Unknown. **Ref:** 135.
6. **Name:** Lyman. **Loc:** S½ sec. 30, (35-6E). **Descr:** Rubbery bluish-white talcose clay. **Value:** Talc content and peculiar physical properties might prove to be of value. **Ref:** 48, p. 116.

- *7. **Name:** Londonderry. **Loc:** SW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 16, (35-11E). **Descr:** Soapstone deposit, in part nearly pure talc, exposed in body 70 to 100 ft. wide for a length of 200 ft. Enclosed in schist. **Value:** Recently operated by National Talc Co., Seattle, and currently operated by Herman Smith, Marblemount, Wash. **Ref:** 55, p. 26; 93-A, p. 29; 96, p. 19.
- *8. **Name:** Sadie Cudworth. **Loc:** Near SE. cor. sec. 21, (35-12E). **Descr:** Soapstone crops out for 1,000 ft. along the road, thickness unknown. **Value:** Quarried in 1953-1954 by J. L. Pape, Rockport, Wash. **Ref:** 48, p. 117; 96, p. 19; 106-G, p. 57; 135.
- *9. **Name:** Clear Lake. **Loc:** Secs. 16 and 17, (34-5E). **Descr:** Serpentine and schist in which are lenses of high-quality talc. **Value:** Currently quarried by Northwest Talc & Magnesium Co., ground in its plant at Clearlake, and sold for agricultural use and as a diluent in insecticides. **Ref:** 2-A, p. 29; 55, p. 29.

YAKIMA COUNTY

10. **Name:** Miller. **Loc:** Unknown. **Descr:** Sample of good talc sent to the Division of Mines and Geology by George Miller, Granger, Wash. **Value:** Unknown. **Ref:** 135.

CHELAN COUNTY

11. **Name:** White River. **Loc:** Soapstone reported on White River NW. of Wenatchee Lake. **Descr:** Sample from there of fair quality. **Value:** Unknown. **Ref:** 48, p. 115; 66, p. 57.
12. **Name:** Williams Creek. **Loc:** On Williams (Raging) Creek, 9 mi. by trail from the Chiwawa River road. **Descr:** Soapstone associated with asbestos. **Value:** Warrants investigation. **Ref:** 66, p. 57.
13. **Name:** Ruth. **Loc:** Sec. 2, (25-15E). **Descr:** A 5- to 8-ft. ledge of soapstone in biotite gneiss. **Value:** Not promising. **Ref:** 96, p. 19.
14. **Name:** Entiat. **Loc:** Sec. 32, (26-20E). **Descr:** Talc zone in gneiss 20 to 30 ft. wide, 2,000 ft. long, and 500 ft. high. **Value:** Warrants investigation. **Ref:** 96, p. 19.
15. **Name:** Tumwater Canyon. **Loc:** On a hillside close to the highway about 5 mi. NW. of Leavenworth, probably in sec. 21, (25-17E). **Descr:** Steeply dipping thick tabular body of soapstone in contact with biotite schist. **Value:** Warrants investigation. **Ref:** 66, p. 57.
16. **Name:** Roaring Creek. **Loc:** Sec. 8, (25-20E). **Descr:** Soapstone 50 ft. wide, 500 ft. long, and 500

ft. high. **Value:** Warrants investigation. **Ref:** 96, p. 19.

17. **Name:** Lockwood & Cole. **Loc:** Sec. 24, (25-20E) and sec. 18, (25-21E). **Descr:** Soapstone 30 to 50 ft. wide, 1,000 ft. long, and 500 ft. high. **Value:** Warrants investigation. **Ref:** 96, p. 19.

OKANOGAN COUNTY

18. **Name:** Kaaba-Texas mine. **Loc:** Secs. 15 and 23, (40-25E). **Descr:** Reportedly crystalline talc as much as 18 in. thick on the hanging wall of the vein. **Value:** Unknown, but should be investigated. **Ref:** 48, p. 115-116; 57, p. 25.
19. **Name:** Johnson Creek. **Loc:** S. center sec. 32, (35-26E). **Descr:** Basic igneous rock has altered to serpentine, talc, and associate minerals. A 1-in. vein of high-grade talc exposed in an old open cut. **Value:** Exposed quantity not commercial. **Ref:** 48, p. 116; 96, p. 19.

FERRY COUNTY

20. **Name:** Republic. **Loc:** Road cut in sec. 20, (36-34E). **Descr:** Shear zone in schist carries considerable talc. In the same cut talc is 3 to 4 ft. thick along a felsite-serpentine contact. **Value:** Warrants investigation. **Ref:** 48, p. 115; 135.

STEVENS COUNTY

21. **Name:** Firmenhac. **Loc:** W $\frac{1}{2}$ SW $\frac{1}{4}$ sec. 15, (30-38E). **Descr:** Slate, quartzite, and dolomite cut by basic dikes. Dolomite has altered to good-quality talc, which forms a 3-ft. vein exposed for 50 ft. **Value:** Several tons mined, but none known to have been shipped. **Ref:** 48, p. 117-118; 135; 149, p. 9.
22. **Name:** C. F. Allen. **Loc:** NW $\frac{1}{4}$ sec. 21, (30-38E). **Descr:** Talcose serpentinized schist. **Value:** Warrants investigation. **Ref:** 48, p. 118; 149, p. 8-9.

LINCOLN COUNTY

23. **Name:** C. W. Capps (Mondovi). **Loc:** W $\frac{1}{2}$ NW $\frac{1}{4}$ sec. 34, (27-38E). **Descr:** Talc of fair grade occurs in calcareous schist. It averages 5 ft. in width over a distance of several hundred feet. **Value:** Talc formerly ground and shipped to paper mills. **Ref:** 48, p. 115; 96, p. 19; 149, p. 9.
24. **Name:** Travis farm. **Loc:** NE $\frac{1}{4}$ sec. 6, (24-39E). **Descr:** Argillaceous quartzite and talc schist near granite intrusives. **Value:** Warrants investigation. **Ref:** 48, p. 115; 96, p. 19; 119, p. 139.

PEND OREILLE COUNTY

25. **Name:** Totem Gulch. **Loc:** Sec. 23 or 26, (39-44E), in Totem Gulch on Sullivan Mountain. **Descr:** Deposit of exceptionally pure talc reported in road cut. **Value:** Unknown. **Ref:** 135.

MISCELLANEOUS NONMETALLIC MINERALS

On page 83 in volume 2 is plate 39, the map showing the occurrences of miscellaneous nonmetallic minerals. The ones that are numbered correspond with the numbered occurrences listed below.

BORATES

Borates are minerals consisting of the borate radical (B_4O_7) in combination with another element or elements. Borates important to commerce are borax, sodium borate ($Na_2B_4O_7 \cdot 10H_2O$); kernite, sodium borate ($Na_2B_4O_7 \cdot 4H_2O$); ulexite, sodium-calcium borate ($NaCaB_5O_9 \cdot 8H_2O$); and colemanite, calcium borate ($Ca_2B_6O_{11} \cdot 5H_2O$).

They are used in cleaning compounds, for metal soldering, in enamels and glazes, for tanning, for wood preservation, for water softening, in glass manufacture, in flame-resistant paints, and in medicinals.

Though borates have been reported in some of the saline lakes of eastern Washington, no authentic occurrences are known.

Ref: 48, p. 119.

BRUCITE

Brucite is hydroxide of magnesium having the composition $Mg(OH)_2$. Physically, it resembles talc but is slightly harder and lacks talc's greasy feeling. It is usually white in color, inclining to green, gray, or blue.

Only one occurrence of brucite is known in Washington, but others may occur in the Stevens County magnesite belt. In the Keystone quarry, located in the SW $\frac{1}{4}$ sec. 9, (31-39E), brucite formed a lenticular mass about 40 feet thick and 20 feet long. It was first mined with accompanying magnesite as marble and used for structural purposes. Because of its delicate translucent green color and the ease with which it could be worked, it was also carved into vases and other ornaments. Later, it was quarried with magnesite for refractory purposes and eventually exhausted.

Ref: 23; 48, p. 120; 141, p. 17.

CORUNDUM

The mineral corundum (Al_2O_3), next to diamond, is the hardest mineral known, for which reason it has long been used as an abrasive, though it has now been replaced to a large extent by artificial abrasives. It occurs in several forms. When clear, flawless, and of proper color, it is the gem mineral of ruby and sapphire. When intermixed with magnetite or hematite it is known as emery. When massive, opaque, and in common colors of brown, gray, or black, it is known simply as corundum.

OCCURRENCES

OKANOGAN COUNTY

1. **Name:** Tunk Creek. **Loc:** Center sec. 4, (35-27E). **Descr:** Corundum, some of gem sapphire quality, associated with thulite. **Value:** Warrants investigation. **Ref:** 135.

WHITMAN COUNTY

2. **Name:** Bald Butte. **Loc:** NW. cor. sec. 18, (13-46E), on Bald Butte. **Descr:** Corundum crystals, up to 1 inch in diameter, some of gem quality, found in soil. **Value:** Warrants investigation. **Ref:** 135.

DUMORTIERITE

Dumortierite is a basic boro-silicate of aluminum, bright blue to purple in color, of the same hardness as quartz, and showing one direction of distinct cleavage. It is used in the metallurgical industry for heavy-duty refractories and in electrical porcelains such as spark plug cores.

Material identified as dumortierite by Schaller in 1905 reportedly came from the head of the N. Fork of Wapshougal River in Skamania County. In this occurrence dumortierite constitutes about 2 percent of a quartz-muscovite-andalusite rock, in which it occurs as tiny spherulites about 1 millimeter in size. Possibly it could be developed in connection with the andalusite.

Ref: 112, p. 102-106.

MONAZITE

Monazite is a phosphate of the cerium metals. Its composition is essentially $(Ce,La,Di)PO_4$ but it also contains thorium. It is usually clove-brown but may be reddish or yellowish brown. It has the hardness of an ordinary knife blade, a conchoidal fracture, and resinous luster. It is used in making impregnating liquids for incandescent mantles and in fission bombs.

In Washington, monazite occurs as an accessory mineral in some granites, gneisses, pegmatites, and aplites, and in river sands derived from these rocks. Commercial deposits are not known in either type of occurrence, though monazite in considerable amount has been reported in black sands along the Pend Oreille and Columbia Rivers and in beach sands near Moclips in Grays Harbor County, and has been found in granite and gneiss in the Sherman Creek Pass area in Ferry County.

Ref: 100, p. 14-15.

NITRATES

There are several natural nitrate minerals, but only three occur in sufficient abundance to be important in commerce. They are sodium nitrate (soda niter), potassium nitrate (niter or saltpeter), and calcium nitrate (nitrocalcite). They are used in the manufacture of nitric acid, in meat pickling, in preparation of smoking tobacco, in fertilizers, matches, pottery, glass, and as a catalyst in the manufacture of sulfuric acid.

Although occurrences of nitrates in Washington have been reported, attempts to verify the reports have been unsuccessful; hence, so far as is known, there are no nitrate deposits in the state.

Ref: 48, p. 122.

OIL SHALES

Realization that our petroleum reserves are not without limit has led to intensive investigation of potential source materials of petroleum products other than liquid petroleum and petroleum gases. Two of the most promising sources are coal, and oil shales. In 1920, one hundred samples of the most promising Washington shales were collected from scattered localities in King, Pierce, Grays Harbor, Lewis, Thurston, Cowlitz, Clallam, Whatcom, and Spokane Counties and tested to determine if any could be classed as oil shales. The content of most samples tested was less than one gallon per ton. The highest petroleum content, 7 gallons per ton, was found in a "freak" sample from Spokane County, but even this amount is below that now considered sufficient for economical exploitation.

Ref: 103, p. 40-41; 130.

PHOSPHATES

Two phosphate minerals, vivianite, a hydrous ferrous phosphate, and apatite, calcium fluophosphate, are known to occur as isolated crystals in scattered areas throughout Washington, but "phosphate rock," the massive impure form of apatite which forms the chief source of commercial phosphate, is not known in the state.

Ref: 48, p. 122.

POTASH

Potash is one of the ten most abundant substances of the earth's crust and forms an essential constituent of some of its most common minerals. The common minerals of potash are silicates, however, and when combined in this manner potash is not readily extracted. Potash minerals of commerce are chlorides and sulfates of potassium—minerals which occur only in favored areas throughout the world, either in saline lakes or in beds representing saline lakes of an earlier geologic period.

Saline lakes of Washington contain small quantities of potash salts, but not enough to arouse even faint hope of commercial development. Alunite deposits near Enumclaw (see p. 5) contain potash in extractable form but would require considerable treatment before potash of commercial grade could be produced.

Ref: 48, p. 122; 64-A, p. 798-799, 802-804.

PYROPHYLLITE

Pyrophyllite is an acid aluminum silicate mineral, $H_2Al_2(SiO_3)_4$, with properties and uses similar to those of talc. Like talc it is very soft (1-2), greasy, and occurs in masses of flexible inelastic laminae. In color it may be white, grayish or brownish green, apple green, yellowish, or grayish white.

Like talc, 77 percent of all pyrophyllite consumed is used in five industries—paint, rubber, roofing, ceramic, and insecticide. It is also used in foundry facings and nonreflecting paints.

Pyrophyllite is not known to occur in Washington, but certain areas are favorable to its occurrence.

Ref: 135.

STRONTIUM

Of the ten or more known strontium minerals, only two occur in sufficient quantity to have commercial application. These are strontianite, strontium carbonate ($SrCO_3$), and celestite, strontium sulfate ($SrSO_4$). Strontianite is usually white in color, can be scratched easily with a knife, and effervesces in hydrochloric acid. Celestite is usually pale blue in color (hence its name) and is noticeably heavy (specific gravity 3.95 to 3.97). Both minerals may be recognized by the red flame which they yield when held in a blow pipe flame or one equally hot.

The largest use of strontium is in pyrotechnics for such things as fusees, signal flares, and fireworks. Other uses are in sugar refining, medicinals, as a "getter" in removing gases from radionic tubes, and in high-temperature greases.

OCCURRENCES

WHATCOM COUNTY

1. **Name:** Ruby Creek. **Loc:** H. B. Brown, Edmonds, Wash., reports strontium ore just above the gorge of Skagit River near the mouth of Ruby Creek. **Descr:** Said to be extensive and of good grade. **Value:** Not known; warrants investigation. **Ref:** 48, p. 113.

SKAGIT COUNTY

2. **Name:** Alverson deposit. **Loc:** SE $\frac{1}{4}$ sec. 2, (33-2E). **Descr:** Celestite and strontianite occur in a shattered zone 3 to 4 ft. wide in serpentinized dunite. Several thousand tons said to be available above sea level. **Value:** Several hundred tons shipped during World War I. Now worked intermittently by Manufacturers Mineral Co., Seattle. **Ref:** 2-A, p. 27; 16-A; 48, p. 113; 81-A.

SNOHOMISH COUNTY

3. **Name:** Ethel Creek. **Loc:** On the N. side of Ethel Creek. **Descr:** Said to be a 4-inch vein of strontianite. **Value:** Unknown. **Ref:** 48, p. 113.

SULFUR

Sulfur, combined with other elements, occurs abundantly in nature. In lesser amounts it also occurs in free, uncombined form. In this form it resembles the sulfur of commerce though it is usually less pure. It is soft, brittle, usually yellow in color, and ignites readily when held in a match flame.

The largest use of sulfur in the Northwest is in the pulp and paper industry. Other important uses are in the manufacture of sulfuric acid, in rubber, plastics, dyes, food products, insecticides, vulcanizing, paints and varnishes, medicinals, and other chemicals.

In July 1956 sulfur sold for \$25.50 to \$26.50 per long ton, f. o. b. mines, Texas.

OCCURRENCES

SNOHOMISH COUNTY

1. **Name:** Sulphur Creek. **Loc:** At Sulphur Creek in sec. 18, (32-14E). **Descr:** Reported as sulfur deposits, but investigation by geologists of the Northern Pacific Railway Co. revealed only warm sulfur water. **Value:** Not known. **Ref:** 48, p. 114.

KING COUNTY

2. **Name:** White River (A). **Loc:** By the logging railroad bridge over White River in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 33, (20-8E). **Descr:** Sulfur said to occur in landslide boulders and as veinlets and cavity fillings in brecciated "granites." **Value:** Probably insufficient quantity to be commercial. **Ref:** 48, p. 114; 64-A, p. 801-802; 157, p. 801-802.
3. **Name:** 110-Line. **Loc:** Near center NW $\frac{1}{4}$ sec. 33, (20-8E). **Descr:** A core hole, drilled in 1937 by Kalunite, Inc. just W. of a trestle in the 110-line of White River Lumber Co. logging railroad, penetrated 50 ft. of andesite, then 140 ft. of rock containing 20 to 30 percent sulfur. **Value:** Warrants investigation. **Ref:** 135.

PIERCE COUNTY

- 3A. **Name:** White River (B). **Loc:** Secs. 3 and 4, (19-8E), in railroad cuts S. of the river. **Descr:** Native sulfur. **Value:** Unknown. **Ref:** 64-A, p. 802.

YAKIMA COUNTY

4. **Name:** Mount Adams. **Loc:** At and near the summit of Mount Adams. **Descr:** Sulfur and alum occur as cavity fillings, veinlets, and cementing material in breccia and tuff. 840,000 tons of 46 percent sulfur said to have been indicated by drilling. **Value:** Commercial quantity, but inaccessibility and altitude make commercial exploitation difficult. **Ref:** 48, p. 114; 96, p. 10.

OKANOGAN COUNTY

5. **Name:** Minnie prospect. **Loc:** E $\frac{1}{2}$ sec. 23, (32-22E). **Descr:** A small amount of native sulfur occurs in zone of leached quartz. **Value:** Quantity below commercial requirements. **Ref:** 135.

TOPAZ

Topaz is a fluosilicate of aluminum having the composition $(\text{AlF})_2\text{SiO}_4$; usually it also contains the hydroxyl radical. Physically, topaz is characterized by a hardness intermediate between that of quartz and corundum, a vitreous luster, perfect cleavage in one direction, and a variety of colors, though usually yellow or white.

Topaz is used as a substitute for fluor spar in steel metallurgy, as a leadless glaze, in refractories, and, when free of flaws and of proper color, as a gem stone.

No topaz of gem quality or in sufficient quantity to be of commercial importance is known in Washington, though it is known to occur as an accessory mineral in some rocks.

Ref: 135.

TOURMALINE

Tourmaline is a complex silicate of boron and aluminum with either iron, magnesium, or the alkali metals prominent. Physically, tourmaline is characterized by a hardness equal to quartz or slightly above, a vitreous luster, and a variety of colors. Commonest colors are black, brownish black, or bluish black, but colors also may be blue, green, or red, sometimes of rich shades. Some specimens are red internally and green externally, or red at one end and green, blue, or black at the other.

Tourmaline has long been prized as a gem stone when found in crystals of sufficient clarity and proper color. More recent uses, those in frequency control devices and pressure gauges, take advantage of tourmaline's property of piezoelectricity. Color is unimportant in these uses, but crystals must be free from physical or crystallographic flaws and 1 inch or more in minimum diameter.

Tourmaline occurs in Washington, but no deposit of crystals suited to either of the above two uses is known.

Ref: 48, p. 9.

WOLLASTONITE

Wollastonite is calcium metasilicate having the composition CaSiO_3 . It usually occurs in grayish-white masses which are brittle and tend to splinter into bundles of fibres. It is slightly softer than a knife blade and has a pearly luster on cleavage surfaces. At the present time experiments are being conducted to determine the value of wollastonite in the manufacture of thermal insulation, in glaze for pottery, and as a filler in paint, rubber, and linoleum.

Only one authentic occurrence of wollastonite is known in Washington, though samples submitted to the Division of Mines and Geology from various places in the state indicate that it may be widespread. It occurs in a contact metamorphic zone at the Read iron property in Stevens County in the N $\frac{1}{2}$ sec. 14, (30-37E). The quantity of wollastonite in this occurrence is not known.

Ref: 13, p. 14.

ZIRCON

Zircon, zirconium silicate, with the composition ZrSiO_4 , is commonly yellowish brown in color but may be colorless, yellow, grayish green, or reddish brown. It is slightly harder than quartz, has an adamantine luster, and breaks with a conchoidal fracture.

The largest use of zircon is in electrical and chemical porcelains. Other uses are as a pigment, in refractories, glazes, glass, flashlight powder, and as an abrasive. When clear and free from flaws, zircon is used as a gem stone.

Zircon is a common accessory mineral in acidic plutonic rocks throughout Washington and in detrital deposits derived from these rocks, but it is not known to occur in sufficient concentration in any one deposit to be of commercial importance.

The price of zirconium ore, 55 percent ZrO_2 , f. o. b. Atlantic seaboard, in 1945 was \$65 to \$75 per short ton.

Ref: 48, p. 9.

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