MR 195-31

GEOGRAPHICAL AREAS IN ALASKA RECOMMENDED FOR IMMEDIATE GEOLOGICAL INVESTIGATION

to

THE DEPARTMENT of INTERIOR

by

J. C. Roehm
Associate Mining Engineer
Territorial Department of Mines

August 25, 1947

TERRITORY OF ALASKA

DEPARTMENT OF MINES

JUNEAU, ALASKA

INTRODUCTION

Six (6) geographical areas within the Territory of Alaska are hereby recommended for immediate geological investigation. The basis for recommendations of applied geology and geological methods of exploration to these particular areas is hereby made to conform with the trends of industrial development of the Pacific Coast in the United States and the relations they will have upon Alaska's Industrial development, as well as Alaska's and National defense.

Recommendations for areas of potential mineral development has been requested by _____ Department of Interior from this department.

CLASSIFICATION OF AREAS ACCORDING TO PURPOSE

I. Areas that indicate potential minerals and mineral products that will aid in Alaskan defense and its contribution to National defense.

II. Areas that indicate potential industrial minerals and metals which would contribute to the industrial growth of the Pacific Coast. For example, the present limestone industry of Alaska is now well established and is contributing large tonnages of limerock to Pacific Coast industries.

III. Areas that indicate potential minerals and mineral products that may contribute to the industrial growth of Alaska for the support of its population and general welfare.

ECONOMIC FACTORS CONSIDERED

1. Areas are considered for the potential minerals and mineral products most in demand under the present economic and industrial trends.

II. Areas with the most favorable locations to the present modes of transportation.

III. Areas in regard to nearness to local, Pacific Coast, and foreign markets.

AREA I

Potential Mineral Product

The most indicative potential mineral product is petroleum.

Location

Area I is situated inland from the head of Bristol Bay in the Bering Sea. It is confined to longitudes 156° to 158° W. and latitudes 57° to 60° north. The area is geographically bounded by Becharof Lake and Egegik River on the south, the Nushagak River and the shores of Kvichak Bay on the west, Iliamna Lake and the westward drainage from the Alaska Peninsula including portions surrounding Brooks, Naknek, Nanwhyenuk, and Kukaklek lakes on the east, the lower drainage areas of the Kukhtul and Mulchatna rivers and the central lower drainage of the Nushagak River on the north.

Accessibility and Transportation.

The area is favorably accessible by salt water means of transportation both from the west and east, with interior fresh water transportation and an already-established road from fresh water across the peninsula to the Gulf of Alaska. The topography of the central portion of the area is very amenable to the building of both roads and airfields, due to the generally flat lowland and the abundance of unconsolidated materials. One large airfield has already been established along the Naknek River in the southern portion. Other favorable locations are along the Kvichak River. This river is navigable for flat-bottom river boats into Iliamna Lake, except during periods of low water. Iliamna Lake is the largest body of fresh water in Alaska, and is navigable into Piledriver Bay at the east end, at which point an already-established road leads across the peninsula

to Iliamna Bay on the Gulf of Alaska.

Geological Evidence

The area in question embraces a low, wide synclinorium, with steeply upturned sediments, dipping northwest, along the north slopes of the Alaska Range of the Alaska Peninsula. This structure holds true along the entire southern boundary. More gentle upturned edges of sediments of the same geologic ages occur along the northern edge of the area, with low southeast dips, within the Nushagak Hills and the mountains containing the Titchik and Wood River lakes. The central portion of the synclinorium which occupies an area nearly 50 miles across is a low flat mainly covered with unconsolidated deposits. Long low ridges, extending northeast-southwest, represent minor anticlinal structures, which represent the only topographical features of altitude. These rise above the gentle flatness of the central area. The unconsolidated materials and their present topographical expression represent discharged materials of former large rivers, glaciers and the edge of a minor ice sheet to the north. The northeastern portion of the synclinorium, embracing the area north of Lake Iliamna, contains low isolated hills, north and northwest striking sediments, with some flat lava beds, and on occasional minor intrusive plug. Copper deposits contained in limestone and along contact zones are known to exist within the bordering area to the east.

The low gentle plunge of the synclinorium is well expressed by the low shore lines and the shallowness of the waters of both Kvichak and Bristol Bays.

The economic importance of this synclinorium is that it contains the Triassic and Jurassic sediments, which along their outcrops on the Alaska Peninsula are known to be oil bearing. These ages of sediments outcrop along the shores of Iliamna lake near the east end, and extend along the Alaska Peninsula from Tuxedni Bay southwest to Chignik Bay. Undifferentiated Jurassic and Mesozoic sediments are to be found westward from Lake Clark through the Nushagak Hills to the Nushagak River.

The Jurassic is definitely known to be oil bearing as indicated by numerous reports of the United States Geological Survey on Wide Bay, Chinitna Bay, Cold Bay and the area southwest of Becharof Lake. The writer while carrying on investigations within the area for the Territorial Department of Mines, has, from personal observation, been led to believe that petroleum is associated with some of the minor anticlinal structures or possibly the in between synclinal structures that are contained within this synclinorium. Positive evidence that substantiates this belief is to be found by the occurrence of deteroriated asphaltic gravels that outcrop along the banks of the Naknek River, four miles upstream from its mouth in Bristol Bay. These gravels (samples of which are to be had in the storeroom of the Department of Mines, Juneau, along with colored slides showing the outcroppings) are best observed on the south bank of the Naknek River, one-third of a mile northwest of the Bureau of Fisheries Station. They have an exposed thickness of 12 feet and are exposed for a distance of 150 feet along the bank. This location is eight miles in a northeast direction and on line of strike from Johnson Hill which is an elongated ellipitcal dome. This marked monument of topography breaks the gentle levelness of the flat country for over 35 miles in all directions. This hill rises nearly 300 feet above the general terrane. It has a length of over a mile, one-half mile in width and dome-shaped in cross-section to its elongation. It structure indicates the top of a small anticline.

Another similar shaped dome with larger dimensions was observed from a plane by the writer at the head of what the Natives term Yellow River and locally called Yellow Hill. This river empties into the Kvichak River at a point 22 miles from its source at the west end of Iliamna Lake. The hill is located approximately 15 miles airline north from the mouth of Yellow River. The hill has a length of over one and a half miles, judged from the air, and one half mile in width. It extends eight or nine hundred feet above the general terrane, which in this area is probably less than 100 feet above sea level. Trappers in the area, and several pilots reported noting oil seepages and slicks along the shores and banks of Yellow River. A few small spots

of oil film were observed by the writer in close proximity to the dome during the several circling flights. This topographical feature is isolated from any other by 25 to 30 miles. A small shallow lake exists within a mile and one half of the dome on the northeast end, which looked to be favorable for landing light pontoon aircraft.

Another feature is the reported occurrence of bituminous limestones that were found outcropping along the north shore of Lake Iliamna. These outcroppings occur at a point five miles west and south of the mouth of the Newhalen River. This occurrence has not been verified, but the writer hopes to do so this season.

In an airline between the mouth of the Kvichak River on Bristol Bay and the southwest end of Six Mile Lake, the writer observed black sediments exposed in folds on the slopes of thelow hills. Six Mile lake forms the source of the Newhalen River and is located to the southwest of the extreme southwest end of Lake Clark. Vegetation is scant over this area, and structure along the hills can plainly be observed.

Economic and Political Considerations

The most advantageous reason for exploring this area with the intent for exploitation of oil is its nearness for consumption by Aleutian and Alaska Coastal Defense bases. An oil supply at this location would meet a large demand from the diesel-operated canneries of Bristol Bay, Cook Inlet, Kodiak and along the Alaska Peninsula. Another supply demand would be from the various mining operations inland from the Bering Sea and those supplied by means of the Yukon and Kuskokwim Rivers.

The amount of oil sold to the fishing and mining industries, coupled with a low sales or severence tax, would contribute financially to the Territorial Government.

Objections to the exploitation of oil within this area, providing it was found in commercial quantities, would arise from the large cannery interests situated in Bristol Bay, the transportation companies serving Alaska, and the large oil companies serving Alaska.

The cannery interests at Bristol Bay would object on the grounds that their rights would be invaded by the fear of oil poluting the waters occupied by their silver salmon horde. This fear is unfounded, as was partially true of the past, with the great improvement of oil drilling rigs and the present day methods used in capping and controlling oil wells.

The objections raised by the transportation companies serving Alaska would be a purely selfish loss of reduced tonnage. The experiences gained by the army and navy during the last war with regard to transportation difficulties to Alaska should overrule these objections for the national welfare. The writer is of the opinion that both the army and Navy would welcome detailed geological information concerning this area.

The larger oil companies should welcome information regarding the potential oil possibilities, if they are found to exist, rather than object to them. A cheaper oil in this section of Alaska would increase consumption and sales thereby stimulating greater industrial activity.

AREA II

Potential Mineral Product

The indicated mineral product is petroleum.

Location

Area II is situated in Southeastern Alaska including the southern portions of Admiralty Island and the northeast corner of Kuiu Island. The area is in part covered by the waters of Frederick Sound and inclosed in longitude 134° to 134° 40" west and latitude 56° 40" to 57° 30" north. Geographically the boundaries are Hood Bay, central interior portion of Admiralty Island and Gambier Bay on the north; Chatham Strait, the west shore of Saginaw Bay of Kuiu Island on the west; head of Saginaw Bay and the entrance to Port Camden on the south; Keku Strait, west coast of the northwest section of Kupreanof Island and waters of Frederick Sound on the east.

Accessibility and Transportation

The area is very favorably situated for salt water transportation. The Bays of both island masses within the area offer excellent harbors and dock sites for the larger ocean going vessels. Inland transportation is difficult but not considered inaccessible.

Geological Evidence

Excellent structure and abundant host rocks for the preservation of petroleum have been observed within the area. The Keku synclinorium (a cross-section is shown in U.S.G.S. Bulletin 800, "Geology and Mineral Deposits of Southeastern Alaska", by A. F. Buddington and T. Chapin, 1929, opposite page 294), extends for 40 miles in a northwest-southeast direction. The structure has a width of 20 miles on the south and widens to over 30 miles to the north.

The known geological formations in the synclinorium range from Silurian at the base, through Devonian, Carboniferous into Triassic. The greater portion of the area containing the southern portion of Admiralty Island is capped by tertiary lavas, under which lower Cretaceous (?) sediments outcrop at about sea level elevation. The carboniferous limestones and interbedded sandstones, that outcrop along the east shores of Saginaw Bay, in Keku Straits and on some of the Keku Islets have been found to contain bituminous matter formed from dried petroleum. These limestones in part have been classified as members of the Permian (U.S.G.S.Bull. 800, pages 118-130). Black carboniferous shales, saturated to such a degree that crude oil seeps from factures on a fresh break, have been presented in the Department of Mines office. Investigation has revealed that these shales came from the south end of Admiralty Island. Actual oil seepage to the extent of an accumulation of residue, has been reported from this area, by an individual well known to be reliable by this office.

Carboniferous formations are known to exist in several localities along the shores of south Admiralty Island east of Point Gardner, the southern-most tip of the island, Chapin, Pybus, Herring and Gambier bays.

The formations, as they outcrop on the north end of Kuiu Island and among the Keku Islets, consist of interbedded conglomerate, chert, limestone, sandstone, shale and interbedded lava. The limestones, with a small amount of interbedded sandstone and shale, have a reported thickness of 1200 feet.

Commercial bodies of petroleum are not likely to be found in the sediments on Kuiu Island and the Keku Islets, since they appear to be the reservoir or host formations, and the petroleum products have dried and escaped because of proximity to the surface.

The Keku synclinorium plunges to the northwest under the waters of Frederick Sound, and thence under younger sediments and lavas of lower Admiralty Island. As a result these oil-saturated carboniferous rocks become deeply buried to the northwest under the southern portion of Admiralty Island, and from which oil seepage is known. The structural trend shows that the synclinorium becomes wider to the northwest, hence the individual structures such as the anticlines and synclines become larger with greater widths between their apexes. The fact that crude oil evidence finds its way to the surface outcroppings at the present time in this locality discredits the former belief that there exists no possibilities for oil in southeastern Alaska because of nearness to the coast batholith and the abundance of extrusive rocks.

Geological investigations with sufficient exploration to prove or disprove the existence of commercial petroleum bodies within this area are warrented. The need for natural fuels in the development of other mineral products and metals and for industry in general in Southeastern Alaska is very apparent.

AREA III

Potential Mineral Product

The mineral in evidence with apparent abundance is scrap Mica.

Location

The area embraces a wide bank of gneiss extending

from Sitklan Island in the extreme southeastern portion of Alaska northwestward across Boca de Quadra to Smeaton Bay and Behm Canal on the north. Sitklan Island is located in the mouth of Portland Canal. This band of gneiss has a width of four miles across Sitklan Island and gradually widens to six miles at Boca de Quadra and ten miles on the north along the south shore of Behm Canal and Smeaton Bay. The longitude of the area is 130° 40" to 131° West and latitude 54° 40" to 55° 20" North.

Accessibility and Transportation

The area is readily accessible to ocean going vessels with good harbors and dock sites. Port Tongass cuts the area between Sitklan Island and the mainland. Nakat Bay extends into the central portion of the area for fifteen miles. Boca de Quadra cuts across the belt in the northern portion and has bays extending both north and south into the central portion of the gneiss band. The northern boundary is accessible via Revillagigedo Channel and Behm Canal.

Geological Evidence

A portion of the area consisting of Sitklan Island and the mainland along Port Tongass Narrows and short distances inland was examined by the writer in July 1945. The band of gneiss consists of metamorphosed sediments with wide intrusions of large crystal quartz-feldspar porphyries and large inclusions of hornblendite. Abundant mica occurs throughout the metamorphosed sediments and is contained between the large quartz and feldspar crystals of the porphyry. The greatest concentration of mica, and that considered as of possible economic importance, is to be found in minable zones along the contacts of the hornblendite and the quartz-feldspar porphyries. Zones of lessor mica content are the porphyry and metamorphosed sediment contacts. The porphyries, being of the large crystal type, approach the character and composition of pegmatites. Sheet mica books measuring up to ten inches in length and nearly as wide are found scattered both in the porphyry near the contacts and along the contacts. The hornblendite-porphyry contacts contain minable tonnages with a mica content estimated between 15 to 20 percent of the volume of the rock mass. Two

zones were examined on the north shore of Sitklan Island, 400 feet west of the most northerly point of the island. Stripping and rock cuts into the zones revealed good unaltered quantities of mica. The zones are 100 feet apart and average nearly 10 feet in width. The length was not determined due to cover mainly of moss and timber. These deposits are well situated for loading direct to barge or ship, since they are at an elevation of 100 feet and less than 300 feet from the shore, which breaks abruptly into deep water. (Samples of this mica, both as books and in the matrix, are on file at the Department headquarters at Juneau.) These zones are found along the east contact of a large hornblendite inclusion mass. Similar contacts and masses were noted inland on the mainland to the north. An investigation of the entire gneissic belt may reveal considerable more of the mica zones and possibly areas favorable for sheet book mica.

Economic Factors and Potential Markets.

The particular advantages of having a source of mica on or near tidewater, amenable to open-cut and machine methods of mining, makes possible an industry which can compete for markets along the Pacific Coast with imported mica. Cheap available hydroelectric power for grinding, together with machine mining and modern methods of concentrating and grinding, might even extend the markets. At least a small amount of powdered mica could be utilized in a potentially rapid development of the pulp and paper industry in Alaska and the Pacific Coast.

A detailed study of the associated minerals such as feldspar, beryllium and other rare non-metallic minerals and metals which may be encountered in mining, is recommended. A geological investigation of the area is warranted, together with an economic study of the by-products and future marketing conditions.

AREA IV.

Potential Mineral

The mineral product known to exist in vast amounts and of commercial grades is dolomite.

Potential Market and Demand

The present offering of large timber tracts for sale in Southeastern Alaska by the Department of Agriculture is expected to result in the establishment of large pulp mills within its boundaries. The location of the pulp mill sites is expected to be along the mainland of Southeastern Alaska, near rivers and lakes that will offer hydro-electric power. Water power surveys have been carried on for several years by large paper companies, the Department of Agriculture and the U. S. Geological Survey to such an extent that the available power is known.

Should the establishment of pulp mills become a reality, reports are that the sulphite process may be used in the treatment of the timber in reduction to pulp. This process utilizes high grade dolomite.

Location

The area of high grade dolomite occurrences extends along the western margin of the Coast Batholith from Boca de Quadra in the Ketchikan District to Limestone Inlet, 25 miles south of Juneau. Specific locations mentioned are based on information received from prospectors, U.S.G.S. publications dealing with Southeastern Alaska, and personal observation.

Dolomite outcroppings were reported on both the north and south shores of Boca de Quadra near the entrance.

Other reported outcroppings apparently of the same band or formations, were reported to occur along the west shore of Behm Canal, opposite Smeaton Island in the southern portion of the canal.

This same belt of dolomite-bearing formations traverses across Revillagigedo Island. Exposures of dolomite occur along the shores of Thorne Arm, Carrol Inlet, and George Inlet in the central southern portion of this island.

In the Wrangell District to the north of the Ketchikan District dolomitic marbles occur on the north and south shores of Bradfield Canal near the

entrance, on Blake Island near the mouth of Blake Channel, inland from the east shore of Eastern Passage and the south shores of Virginia Lake.

In the Petersburg District, north of the Wrangell District, dolomite was reported along the south shores of Thomas Bay, and the mainland coast opposite Petersburg. Marbelized dolomite of reported high purity is known to exist inland from the east central shore of Thomas Basin.

In the Juneau District dolomitic limestone, dolomite and dolomitic marble are known to exist in several localities. The best formations and those most favorable to transportation are known to exist inland from the head of Fords Terror in Endicott Arm, the south shore of the east arm of Tracy Arm, North arm of Port Snettisham, upstream from the mouth of the Whiting River and Limestone Inlet off Stephens Passage below Grand Island.

Known Geological Data

One dolomite deposit was examined by the writer inland, one and one-half miles up Marble Creek in Carrol Inlet. This stream enters Carrol Inlet on the east shore ten miles from the head. The formations were marbelized dolomite consisting of two nearly horizontal strata separated conformably by schistose greenstone 50 feet thick. The lower bed rests upon a steeply inclined metamorphic crystalline schist. The texture of this marble is medium to fine grained, with the lower bed more marbelized than the upper and inclined to be more stressed. The color of both formations ranges from pure white to a light cream. The lower stratum has a thickness of 70 feet, and the upper stratum which forms the outcropping formation, a variable thickness up to 400 feet. Chemical analysis of a pure white variety gave the following results:

$CaCO_3$	$MgCO_3$	Al_2O_3	Fe_2O_3	SiO	
56.9	41.96	0.44	0.40	0.40	Percentages

This shows a total calcium-magnesium carbonate content of 98.96%. The light cream varieties of the upper stratum are believed from observation to be within a percent or two of this purity, which is over the minimum requirements for dolomite used in

the sulphite process of pulp manufacture. These formations were observed for a mile in width along the banks of Marble Creek which cuts slightly diagonally across the strike. The length of the strata was not determined, but is known to extend for several claim lengths. It was reported to extend north to Swan River below Swan Lake, which is one of the proposed hydroelectric power sites for a pulp mill.

A wide zone was reported containing marbelized dolomite in beds 20 feet in thickness located at the head of George Inlet. These beds outcrop along the beach as low bluffs. Analysis of the dolomite beds have not been obtained.

Outcrops along the beach near the head of Thorne Arm have been reported. These have neither been observed nor are any analysis known.

The dolomitic marbles on Ham Island and the outcroppings at the mouth of Bradfield Canal were only casually examined by the writer a few years ago. An attempt was made in 1912 to 1914 to quarry marble on Ham Island and the old workings are still in evidence. The marbles range in color from white to light gray and bluish gray. The white appears to be of high purity.

These deposits of dolomite along the coastal mainland are believed to have been originally limestone beds, which have become more or less marbelized and to have gone through the processes of dolmitization by the effects of heat and pressure and possibly hot thermal solutions of the coast intrusive batholith.

Long belts of dolomite outcroppings were observed along the east and north shores of Blake Channel. These were not investigated, since deep water is lacking in this channel. Shallow-draft scows and power scows could possibly operate successfully.

A road extends from the mainland opposite Wrangell to Virginia Lake, where on the south shore dolomite is reported. This occurrence has not been investigated

and analysis are lacking.

Dolomite outcroppings were reported along the mainland opposite Petersburg and along the south shores of Thomas Bay. This is one of the first in which several million feet of pulp timber is soon to be auctioned by the U. S. Forest Service.

A belt of dolomite of reported high purity extends south, inland from the head of Scenery Cove in Thomas Basin.

The deposits in the vicinity of Thomas Basin are of special importance providing a pulp mill is erected in the vicinity.

The dolomite that has been reported inland from the north arm of Fords Terror, and the outcroppings along the south shore of Tracy Arm, are white to light gray in color and of the large crystalline type. The stratum along the south shore of the east arm of Tracy Arm is reported to be 75 feet in width.

An outcropping of crystalling dolomite is reported in Port Snettisham at Bride Point.

The dolomitic marble that occurs up the Whiting River, seven and one half miles east of Whiting Point, is reported to be of excellent purity. It has a medium to large crystalline structure.

A detailed geological investigation of these dolomite occurrences in order to establish the highest grade deposits and those most amenable to transportation and cheap mining is warranted in view of present Alaskan developments.

AREA V.

Potential Mineral Product

The mineral known to be present in the area is flourite.

Location

The area includes Zarembo Island and the south

half of Kupreanof Island in Southeastern Alaska. The longitudional location is 132° 40" to 133° 40" West and the latitude is 56° 15" to 56° 50" North. Zarembo Island is geographically bounded by Stikine Strait and Etolin Island to the south and southeast, Woronkofski and Vank Island on the east, Mitkof Island on the north, Sumner Strait and Kupreanof Island on the northwest and west, and Prince of Wales Island on the southwest. The south half of Kupreanof Island is bounded on the south by Sumner Straig, Woewodski Island, Duncan Canal, and Lindenberg Peninsula on the east, Rocky Pass and Kuiu Island on the west.

Accessibility and Transportation

Zarembo Island and south Kupreanof Island are both very accessible to salt water transportation alongside the present steamship routes of the inside passage. There are no established roads on either island, and only a few trails. Inland roadways could be built, since the relief is generally low.

Geological Evidence

Tertiary lava flows occupy the greater portion of the west half of Zarembo Island and the western half of the south half of Kupreanof Island. These lavas are believed by the writer to have been derived from one parent magma which, during its fluid state, contained a certain volume of the element flourine. The existence of this element is found in the mineral flourite, which has been observed by the writer in seams, fractures, faults and veins of these lavas. The outcropping veinlets, veins and bunches of flourite appear to be the result of hot spring waters and gases whih have escaped along shears, faults and fractures made by later lava dikes and sills into the older extrusives. The flourite is associated with agate, chalcedony, jasper, pyrite and quartz, all of which are believed to be derived from solutions and gases of the deeper parent magma. Extensive hydrothermal action is to be noted along the eastern contact of these lavas, extending southeast from St. John Harbor on the Northwest end of Zarembo Island. Minor occurrences of flourite may be observed in the outcropping rocks along the shore line from Point Nesbitt, the southern-most point of the island along the west shore and around the northwest end to St. John Harbor, with the exception of a small area covered with Tertiary sediments along

the west side opposite Snow Pass. Three miles northeast of Pt. MacNamara on the northwest shore of Zarembo Island, the largest concentration of these flourite veinlets is to be found. No economic deposits were noted, however, pieces for collections, carving and sale as semi-precious rocks can easily be obtained here.

The interior of Zarembo Island is covered with a dense growth of spruce and hemlock together with considerable huckleberry brush and moss. It has not been prospected or mapped. Detail mapping together with extensive exploration for possible commercial fluorite deposits is warranted, in view of the present demand for flourite by the Pacific Coast Aluminum Industry. Flourite is used to make synthetic cryolite, which is used in the reduction of bauxite to alumina. Particular attention should be paid to the structural features of the island and the eastern contact of the lavas with the older rocks for flourite deposits.

Extrusive rocks of the same age that occur on Zarembo Island are to be found in the southern portion of Kupreanof Island. Observation by the writer in noting generally their composition, color, texture and accessory minerals indicate that they are of the same parent magma as those of Zarembo Island. Evidence of fluorite has been noted by the writer in the lava outcrops along the south shores of the island, also an abundance of Zeolites. High grade bentonite, made up of the clay mineral, Montmorrillite (identified by U. S. Bureau of Mines Station, Seattle by Thermal Method) has been observed by the writer in the vicinity of Column Point on the south shore of the island. The central portion of this island, like Zarembo, has not been mapped or prospected. The already-known occurrences of base metals, together with gold and silver on the northern portion of the island, and the existence of commercial-type non-metallic minerals associated with the lavas, warrant consideration from the standpoint of geological investigation.

AREA VI

Potential Mineral Product

The abundant mineral products are pumice and pumicite.

Location

Area VI comprises a strip of land 15 miles wide and 30 miles in length extending in a northwest direction from the shores of Katmai Bay on the Alaska Peninsula and is confined within the boundaries of Katmai National Monument. The longitude of the area is 154° 50" to 155° 25" West and latitude 58° to 58° 25" North. Important geographical features are contained in the area; namely, Mt. Katmai, The Valley of Ten Thousand (Extinct) Smokes and recently active volcanoes.

Accessibility and Transportation

Roads, trails and airfields are not to be found within the boundaries of Katmai National Monument. A road of an approximate length of 40 miles would traverse the area, and could easily be constructed from the unconsolidated materials at hand. The location of this road would be from Katmai Bay on the Gulf of Alaska up the right limit of Katmai River and along the east slopes of Observation Mountain, up the right limit of Mageik Creek, and across Katmai Pass (elevation 2500') down into the Valley of Ten Thousand Smokes. By an additional 15 miles of construction from the north end of the Valley of Ten Thousand Smokes, across comparatively level country, in which gravels are abundant, this road would connect with the east end of Naknek Lake. Thence shallow-draft vessels could ply the waters of Naknek Lake and Naknek River, making another accessible route to Bristol Bay.

A large airfield could easily be constructed at a moderate expense by consolidating the loose pumicite overlying the pumice deposits on the floor of the Valley of Ten Thousand Smokes.

Potential and Practical Uses of Pumice and Pumicite

The utilization of high-quality pumice and pumicite is rapidly becoming an important feature in the construction and building trades of America and Europe. Pumice and pumicite offer natural advantages that are superior to other similar natural materials used in these trades. Loose pumice and pumicite has a thermal conductivity factor that ranges from 0.5 to 1.0 depending upon the apparent density.* Blocks from natural pumice of low density have a thermal conductivity (K) factor ranging from about 1.0 to 2.0. Carithers* compares this with ordinary concrete, which he states has a thermal conductivity factor of 6.0 to 9.0, and common brick of 3.0 to 6.0. Substances of lower conductivity have greater insulating properties, hence the value of pumice in the building trades is very obvious. Nowhere within the continental United States and its possessions is there a greater need for low thermal building materials than in the Territory of Alaska.

Pumice of high quality is made up of silica and contains innumerable, infinitesimal small open chambers of cellular structure. This fact accounts for its low thermal conductivity. For the same reason the material maintains a low density. Good quality pumice has a density ranging from 20 to 30 pounds per cubic foot, much lower than water. As a lightweight aggregate in precast masonry blocks and in concrete it replaces completely sand and gravel. This reduces the weight of common concrete, 140 to 150 pounds per cubic foot to as little as 50 pounds per cubic foot. Building blocks of high tensile strength, made from pumice, are far superior in cheapness of the material itself, cheapness of construction and with regard to insulation qualities from both heat and cold and acoustics, than any other known building material. Pumice blocks are now being cut into more than 15 sizes and shapes and by machines that have capacities of 600 blocks per hour.

*Carithers Ward, "Pumice and Pumicite Occurrences of Washington" Report of Investigations No. 15, Dept. of Conservation and Development. State of Washington.

Concrete made from pumice has many economical advantages and possesses tensile strength, when the density is 60 to 70 pounds per cubic foot, of approximately 600 to 1000 pounds per square inch. There are many other uses for pumice and pumicite, which are adaptable to Alaskan uses.

The immediate availability of large tonnages of a high grade pumice to the army and navy in their consbuction in Alaska would make for a much stronger and permanent condition. In view of the large tonnages of construction materials shipped to Alaska from the States at high costs, the availability of pumice products would contribute considerably to the public welfare.

Geological Evidence

The writer with one guide, familar with the Monument Area, spent three days investigating the pumice and pumice sand deposits within the Valley of Ten Thousand Smokes in July 1941. This valley was formerly U-shaped and contained a central river and was mantled with small timber. During the eruption of Mt. Katmai in 1913 the valley became partially filled with volcanic magma filled with hot gases and hot thermal solution for a distance of nearly 20 miles. The partial filling of the valley took place by one flow of magma upon another during and following the eruption of Mt. Katmai. The magma was highly acid or extremely high in silica content. The hot gases and liquids contained in the magma, as the internal pressure was greatly reduced when it flowed out on the surface, expended forming the pumice and the geysers, formerly termed Smokes.

Following are three paragraphs taken from the writer's "Report of Investigations in the Kvichak Precinct" 1941 to the Territorial Department of Mines, which describes these pumice deposits:

> "The pumice deposits consist of various flows conformable on each other and varying in thickness from a few feet up to 100 feet. These strata vary somewhat in the amount of ferric iron content which accounts for the various shades of

pink. This pumice is extremely light in weight, filled with infinitesimal gas bubble holes, and its composition appears to be nearly pure silica. The impurities noted by eye consist of ash and cinders, black carbon matter, and iron oxides. Several samples of this pumice were collected for specimens. As the pumice disintegrates by the action of weathering agencies, mainly water and wind action, silica sands are formed. These are found along the stream banks deposited by stream action, and by wind as sand dunes and in sedimentary bands in some of the canyons and along the edges of the flows. The purest sands are the wind blown deposits, since the wind deposits only small and light weight particles. The largest and best deposits noted were found on the north side of the valley near the edge of the flows in the canyons formed by the side mountain streams.

The guide with the writer reported a great abundance of these sands along the wide flat valley of Katmai River and along the shores of Katmai Bay. Again wind blown deposits are found along the beach of the bay and have been reported as of great purity, between 98 and 99 percent silica.

The sands are very well located with respect to salt water transportation, the only difficulty being the shallowness of Katmai Bay for docking and loading facilities. With regard to the pumice, the most and purest lies with certain strata of the various lava flows within the Valley of Ten Thousand Smokes. Some, however, was reported to occur on the Katmai River drainage. Via Katmai Pass, elevation 2500 feet, there exists a suitable caterpillar route over which this pumice could be hauled to the beach in Katmai Bay."

The pumice has attractive natural colors ranging deep red to various shades of pink to light gray. Samples are on display in the Department of Mines Office, Juneau, Alaska.

The extent of the deposits is the limits of the valley, nearly 20 miles in length and from five to ten miles in width. The thickness at the north or far end is over 200 feet, and the deposit apparently thickens in the central and upper portions of the valley. A drainage system of a small nature is rapidly superimposing itself upon the valley, and cutting deep ravines and gorges into the pumice.

Future Scenic and Scientific Value of the Monument

Herewith is a paragraph taken from the above mentioned report in which the writer states his impressions following his visit to the Valley of Ten Thousand Smokes:

> "The valley, with the loss of its numerous smokes, has lost its great picturesque attraction. The eight remaining smokes are not confined to a small area nor do they have great attraction. How long these smokes will remain active is unknown, but they apparently will cease as did the others of the valley. Therefore, with the rapidly advancing vegetation over the valley floor, nature will, within a very short time, have healed its own wound, and have covered from view a wonderful and spectacular sight."

The writer here wishes to call attention to the fact that the opportunity for a scientific study valuable to geology and the related mining industry has become nearly lost. The data that could have been gained by frequent investigations to the area in regard to acid magmas, the formation of gold bearing veins and placers, together with the origin of other minerals and metals and the actual observation of hydrothermal solutions may have been of importance. Very rarely in the life of man are opportunities offered by nature to study conditions on the surface, that normally take place deep within the earth's crust. As here, at the head of the Valley of Ten Thousand Smokes, exposed on the surface and within a few feet of the surface, one can witness the actual formation of an auriferous quartz vein. The actual formation of sulphides containing low gold values and the precipitation of other metals by present flowing hydrothermal waters is in actual existence. The combined chemical processes of the waters in the zone of combined

temperature and pressure, and the inbetween effects to those within the zone of free oxygen are observable.

Since the early scientific investigations by the National Geographical Society, the valley has not been visited by more than a handful of persons, the most of whom were satisfying a personal ambition only. There appears to be not one scientific publication with regard to this natural phenomenon since those of the Geographical Society were published nearly thirty years ago.

The writer hereby submits these areas for future investigation, on the basis formerly mentioned, merely to bring them up for consideration by the Department of Interior.

Respectively submitted,

J. C. Roehm
Associate Mining Engineer

August 27, 1947

EXCERPT from report entitled "Geographical Areas in Alaska Recommended for Investigation" by J. C. Roehm - 1952. File MR-195-31

AREA II

Potential Mineral Product

The indicated mineral product is petroleum.

Location

Area II is situated in Southeastern Alaska including the southern portions of Admiralty Island and the northeast corner of Kuiu Island. The area is in part covered by the waters of Frederick Sound and inclosed in longitude 134° to 134° 40" west and latitude 56° 40" to 57° 30" north. Geographically the boundaries are Hood Bay, central interior portion of Admiralty Island and Gambier Bay on the north; Chatham Strait, the west shore of Saginaw Bay of Kuiu Island on the west; head of Saginaw Bay and the entrance to Port Camden on the south; Keku Strait, west coast of the northwest section of Kupreanof Island and waters of Frederick Sound on the east.

Accessibility and Transportation

The area is very favorably situated for salt water transportation. The Bays of both island masses within the area offer excellent harbors and dock sites for the larger ocean going vessels. Inland transportation is difficult but not considered inaccessible.

Geological Evidence

Excellent structure and abundant host rocks for the preservation of petroleum have been observed within the area. The Keku synclinorium (a cross-section is shown in U.S G.S. Bulletin 800, "Geology and Mineral Deposits of Southeastern Alaska", by A. F. Buddington and T. Chapin, 1929, opposite page 294), extends for 40 miles in a northwest-southeast direction. The structure has a width of 20 miles on the south and widens to over 30 miles to the north.

The known geological formations in the synclinorium range from Silurian at the base, through Devonian, Carboniferous into Triassic. The greater portion of the area containing the southern portion of Admiralty Island is capped by tertiary lavas, under which lower Cretaceous (?) sediments outcrop at about sea level elevation. The carboniferous limestones and inter-bedded sandstones, that outcrop along the east shores of Saginaw Bay, in Keku Straits and on some of the Keku Islets have been found to contain bituminous matter formed from dried petroleum. (These limestones in part have been classified as members of the Permian U.S.G.S. Bull. 800, pages 118-130). Black carboniferous shales, saturated

to such a degree that crude oil seeps from factures on a fresh break, have been presented in the Department of Mines office. Investigation has revealed that these shales came from the south end of Admiralty Island. Actual oil seepage to the extent of an accumulation of residue, has been reported from this area, by an individual well known to be reliable by this office.

Carboniferous formations are known to exist in several localities along the shores of south Admiralty Island east of Point Gardner, the southernmost tip of the island, Chapin, Pybus, Herring and Gambier bays. The formations, as they outcrop on the north end of Kuiu Island and among the Keku Islets, consist of interbedded conglomerate, chert, limestone, sandstone, shale and interbedded lava. The limestones, with a small amount of interbedded sandstone and shale, have a reported thickness of 1200 feet.

Commercial bodies of petroleum are not likely to be found in the sediments on Kuiu Island and the Keku Islets, since they appear to be the reservoir or host formations, and the petroleum products have dried and escaped because of proximity to the surface.

The Keku synclinorium plunges to the northwest under the waters of Frederick Sound, and thence under younger sediments and lavas of lower Admiralty Island. As a result these oil-saturated carboniferous rocks become deeply buried to the northwest under the southern portion of Admiralty Island, and from which oil seepage is known. The structural trend shows that the synclinorium becomes wider to the northwest, hence the individual structures such as the anticlines and synclines become larger with greater widths between their apexes. The fact that crude oil evidence finds its way to the surface outcroppings at the present time in this locality discredits the former belief that there exists no possibilities for oil in southeastern Alaska because of nearness to the coast batholith and the abundance of extrusive rocks.

Geological investigations with sufficient exploration to prove or disprove the existence of commercial petroleum bodies within this area are warranted. The need for natural fuels in the development of other mineral products and metals and for industry in general in Southeastern Alaska is very apparent.