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GULF OF ALASKA PETROLEUM SEEPS

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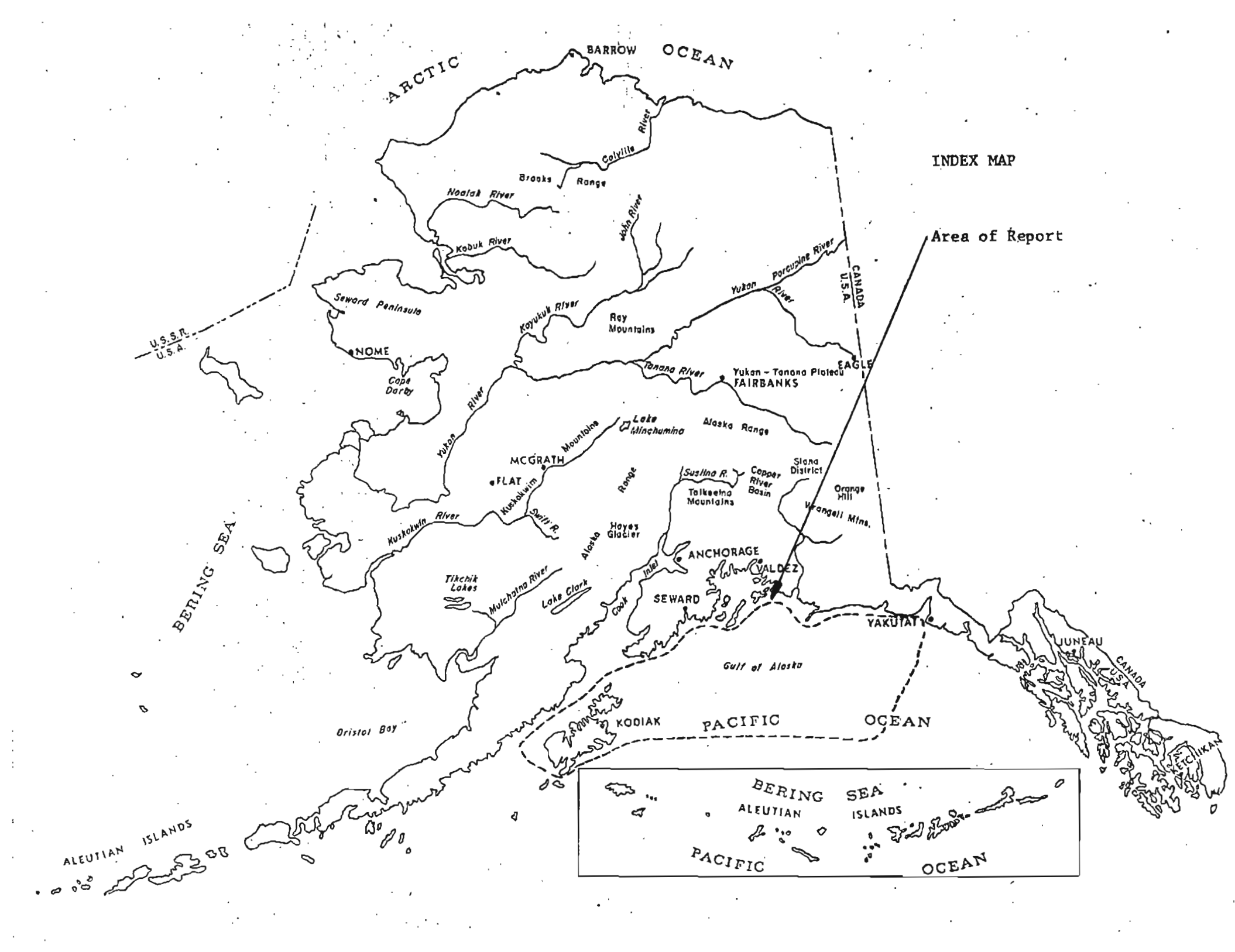
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INTRODUCTION

This report lists all the known petroleum seeps that are in proximity to the Gulf of Alaska. Known seeps extend from the Kanatak area, west of Kodiak Island on the Alaskan Peninsula, to the Samovar Hills, northeast of Icy Bay. The five areas that contribute nearly all the seep oil are the Samovar Hills, Yakataga, Katalla, Iniskin and Kanatak. These are described and estimates of the quantity of oil from each area are listed. These estimates are the averaged values from the literature and from oral communications with geologists in the petroleum industry and from personal observations by the writer. Many approximate seep areas are listed based on unconfirmed reports. These are not considered valid seeps unless confirmed by the U. S. G. S. or by competent geologists in the field.

KNOWN OIL SEEP AREAS

1. Samovar Hills Area

There are several known oil seeps in the Samovar Hills area about 40 miles northeast of Icy Cape. Oil seeps from the Kulthieth Formation (Eocene), which at this location consist of interbedded marine and nonmarine beds and from interbedded argillites and graywacke of the Yakutat group (Late Cretaceous) near the contact with the Kulthieth Formation. The total quantity of oil from the seeps has been estimated at 2 1/2 barrels per day (105 gallons, estimated by the writer in 1962). The writer has also examined most of the streams originating from the west side of the Malaspina Glacier and drainage along the upper west side of the glacier and found no evidence of petroleum in the stream waters. The Samovar Hills are entirely surrounded by glacial ice, and oil from the seeps is degraded by evaporation and the residue escapes into the glacier and is widely dispersed.

2. Yakataga Area (Sullivan Anticline)

This area is about 80 miles east of the Katalla area: Nearly all the seeps are on or near the faulted crest of the Sullivan Anticline which lies along the coast between Cape Yakataga and Icy Bay. The known seeps are in areas of outcrops of the Poul Creek Formation (Miocene) and lower part of the Yakataga Formation (Miocene - Lower Pliocene). The largest of the seeps is known as the Johnson Creek Seep and the estimated quantity of oil discharged is one barrel per day (42 gallons). Oil from this seep reaches marine waters with petroleum residues on the sands along the creek banks.

About a dozen other seeps have been noted in the Yakataga area. Most of this oil discharges from joint cracks in sandstone and the quantity is very low.

3. Katalla Area

This area is located on the south coast of Alaska about 530 miles southeast of Anchorage and 250 miles west of Yakataga. There are a series of petroleum seeps distributed through an eastward-trending belt about 25 miles long and from four to eight miles wide. This zone skirts the north shore of Controller Bay. To the east it extends into the alluvial flats of the Bering River and to the west into the flats of the Copper River.

The surface rocks are a series of intensely folded and faulted shales, sandstones and conglomerates. The structural trend is about N. 20 degrees E. and the line of petroleum seeps lies diagonally to this trend. Nearly all the seeps are in the outcrop area of the middle part of the Katalla Formation of Middle Oligocene to Middle Miocene age (Miller, Payne, Gryc, 1956).

Many of the seeps are from soft shale and may be related to faulting. Martin (1921) describes one of the seep areas as a brecciated iron-stained shale. The amount of oil seeping from the shales is very small and most of it is absorbed by the soil. The larger seeps are associated with sandstones or

conglomerates and usually with depositional or structural features -- joints and bedding planes. Many of the seeps flow into streams or sloughs and have access to marine waters. One seep on the north shore of Strawberry Harbor has been described as exposed at low tide and appears associated with bedrock under beach sands.

A relatively large seep was noted between Burls Creek and the mouth of Bering River. Here oil accumulates along the edge of the tidal flats. Shale float indicates the probable bedrock.

As far as could be determined the abandoned oil wells in the Katalla area are not contributing oil even though many have casings that are rusted through.

Oral correspondence with Don Hartman, State of Alaska, and oil company personnel who have visited the area, indicate the total quantity of oil issuing from seeps in the Katalla area is between 1/2 and one barrel per day (21 to 42 gallons/day). Much of the light fraction end of the relatively high gravity (40 degrees to 45 degrees A.P.I.) oil evaporates from the surfaces of the sloughs and ponds and nearly all the remainder is absorbed into the soil. Probably less than 10% of the total quantity of seep oil from this area reaches the Gulf of Alaska marine waters.

4. Iniskin Peninsula Area (Chinitna District)

Iniskin Bay is an indentation about 12 miles deep which with Chinitna Bay on the north blocks out an irregular-shaped peninsula on the west shore of Cook Inlet (about 150 miles southwest of Anchorage). The shoreline of this peninsula is broken in the southwest by two small indentations -- Oil Bay and Dry Bay.

Oil seeps have been reported near Chinitna and confirmed seeps are present along Oil and Dry Bays. The seeps are located on the eastern limb of a faulted anticline and are from fine-grained sandstones and claystones of Middle Jurassic Age (Tuxedni Formation). The amount of oil issuing from all seeps in the area is very low, not exceeding one or two gallons per day (writer's estimate, 1967).

5. Kanatak District (Wide Bay)

This area is located on the east side of the Alaska Peninsula approximately opposite the middle of Kodiak Island. Active oil seeps and oil residues are found principally in two areas: Vicinity of Oil Creek and on the Bear Creek - Salmon Creek Anticline, and south of Becharof Lake on the Ugashik Anticline.

These seeps are issuing from the upper part of the Shelikof Formation for the Oil Creek and Bear Creek Anticlines and from the lower part of the Naknek Formation for the Ugashik Anticline. The flow of oil from the largest seep has been estimated (1921) to be about 1/2 barrel (21 gallons) per day (Capps, 1922, p. 107-109; Smith, 1926, p. 86-87). The total quantity of oil from all the seeps in the area probably does not exceed 3/4 barrel per day (31 1/2 gallons per day).

There are several paraffin residual areas, at least one of which exceeds two acres in extent (Capps, 1921, p. 107-109; Smith, 1926, p. 86-87). This amount of residual paraffin represents several thousand barrels of oil degraded by evaporation and oxidation.

At Wide Bay a small oil seep was found in 1924 in sandstone exposed at low tide in the northwest flank of the Wide Bay Anticline (Smith, 1926, p. 84-85).

REPORTED BUT UNVERIFIED OIL SEEPS
(Including two known areas of petroliferous rocks)

1. Andronica Island (Shumagin Group)

A U. S. Coast & Geodetic Survey party reported seeing an oil seep on the east shore of Andronica Island in 1913 (Martin, 1931, p. 73). The island is composed of Cenozoic Volcanics. The seep has not been confirmed.

2. Chignik Bay

A. S. Keller and J. T. Cass (1956) found petroliferous sandstone in exposures of the Chignik Formation on the northwest shore of Chignik Bay.

3. Aniakchak Area

Oil seeps were reported in the Aniakchak area (Smith & Baker, 1924, p. 209-210). These have not been verified.

4. Puale Bay

Some limestone beds of Late Triassic age exposed on the northeast side of Puale Bay are petroliferous according to G. D. Hanna (1955, oral communication to Miller, et al, 1959, p. 34).

5. Kejulik River Valley

Small oil seeps reportedly seen in the Kejulik River Valley were not found by a Geological Survey party (Smith, 1925, p. 206).

6. West Shore of Shelikof Strait (20 miles southwest of Cape Douglas)

Reported oil seep associated with fossiliferous sandstone. Fossiliferous marine sandstone of Jurassic and Cretaceous age is exposed in sea cliffs near Kaguyak, but no seeps have been reported by geological parties that have visited the area.

7. Kamishak Bay (West Side)

There have been reports of oil seeps at the entrance to Bruin Bay and at the mouth of the Douglas River (Mather, 1925, p. 176-177). Later attempts to locate these seeps were not successful.

8. Oil seeps were reported near Tyonek and at the mouth of the Little Susitna River (Martin, 1921, p. 72). None of these seeps has been observed by later geological field parties.

9. Crooked Creek (Eastern part of the Nelchina area)

Unverified oil seeps reported.

10. Katalla Area (East)

Seeps east of the Katalla have been reported, but not verified.

11. East Shore of Icy Bay

Oil seeps near the east shore of Icy Bay (Maddren, 1914, p. 114), M. M. Miller through written communication with D. J. Miller) have not been verified. The writer in the course of drilling at Riou Bay spent some time looking for these seeps and was not able to find them.

12. Yakutat Bay

Oil films on water were reported (Tarr & Butler, 1909, p. 169-170). These have not been confirmed.

13. Lituya Bay

An oily film and petroliferous odor in Tertiary sandstone exposed at the crest of an anticline on Topsy Creek was observed by Miller, et al. (1959, p. 44).

14. Cape Spencer

Oil films have been reported near Cape Spencer with no confirmations (Martin, 1921, p. 72).

15. Keku Island Area

Reported oil saturated black shales and an oil seep near the southwest end of Admiralty Island (J. C. Roehm, unpublished report of the Territory of Alaska, Department of Mines, 1947).

SUMMARY AND CONCLUSION

There are only four known active seep areas in proximity to Gulf of Alaska marine waters. The total amount of oil emitted by these areas is estimated to be 296 $\pm$ gallons per day, most of which is evaporated or degraded by oxidation with the formation of hydrocarbon soils. The total amount of oil reaching the Gulf of Alaska marine waters is estimated at 10% of the total amount, or about 30 gallons a day. There are no known seeps within the Gulf of Alaska marine waters and there have been no reports of visual observations of oil films or tarry material that would indicate underwater oil seeps.

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