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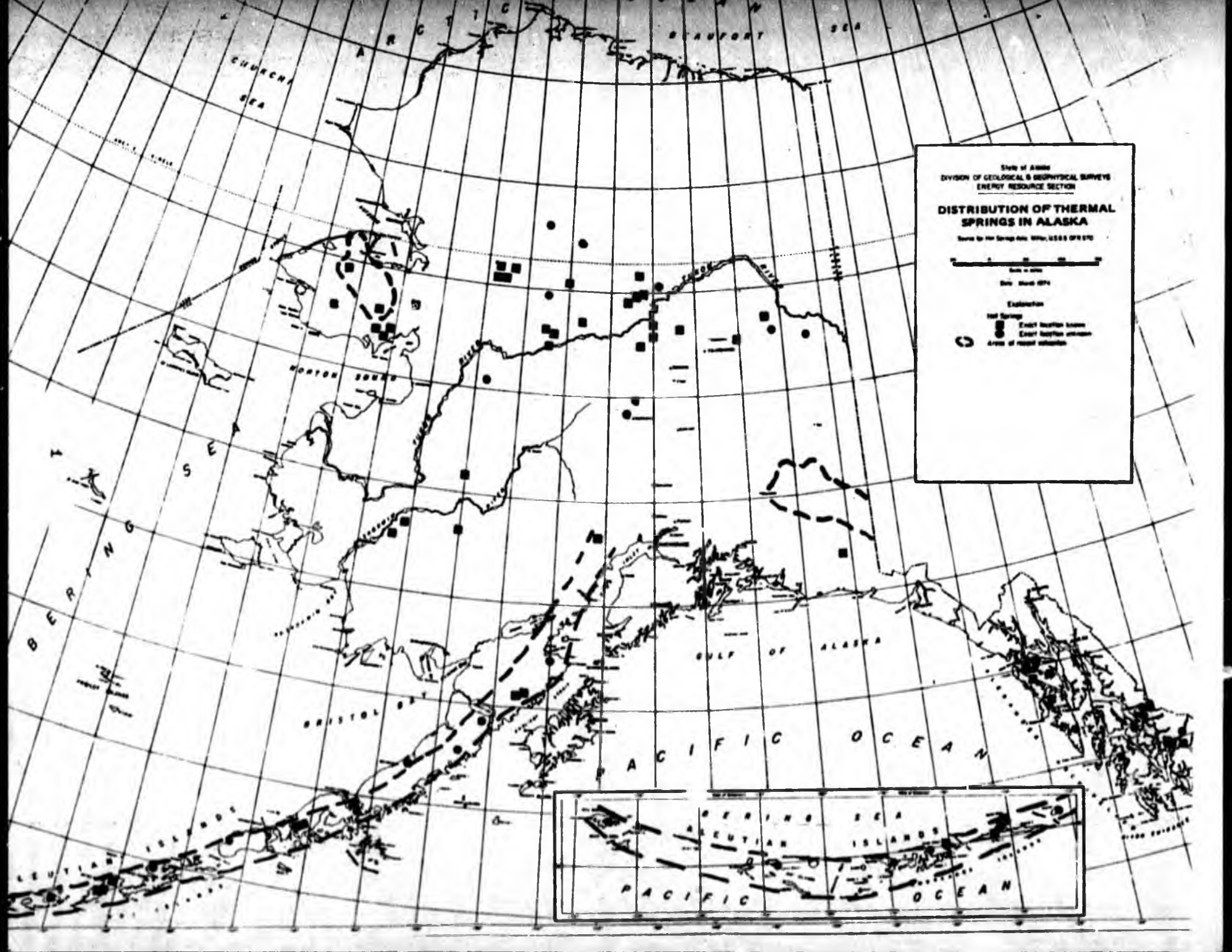
Bob Speed

**MANAGEMENT OF LAND, WATER AND HYDROTHERMAL RESOURCES
ASSOCIATED WITH HOT SPRINGS IN ALASKA**

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**STATE OF ALASKA
Department of Natural Resources
Division of Research and Development
Policy Research/Land Entitlement Section**

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State of Alaska
 DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS
 ENERGY RESOURCE SECTION

DISTRIBUTION OF THERMAL SPRINGS IN ALASKA

Source for Hot Springs Data: WPA, USGS OFR 870

Scale: 1:500,000
 Date: March 1974

Explanation

- Hot Springs
- Exact location known
- ▲ Exact location unknown
- - - - - Area of recent subsidence

TABLE OF CONTENTS

	Page
Distribution of Thermal Springs in Alaska (Map)	1
Introduction	1
Federal Land Withdrawals Affecting Hot Springs	2
Summary of Federal Laws Affecting Land Containing Hot Springs (Table)	4
Water Rights	5
Alaska Constitution	10
Hydrothermal Resources	12
Conclusions	14
References	16
Appendices	17

Introduction

The Department of Natural Resources has recently completed a review of legal and institutional issues relating to geothermal resources in Alaska in order to develop recommendations for amendments to state statutes affecting the management of those resources. During this review, a number of issues have been raised and ambiguities noted regarding the management of land, water and hydrothermal resources associated with hot springs.

Questions regarding land management which have been raised and will be addressed in this paper include:

- What federal laws apply to land surrounding hot springs, and what is their effect?
- What is the ownership status of land containing hot springs in Alaska?

Water management questions to be addressed include:

- What are the state and federal government's respective roles regarding the management of water associated with hot springs?
- What is the effect of federal reserved water rights?
- What is meant by the phrase "mineral and medicinal waters" in the Alaska Constitution and why does the Constitution exclude such waters from appropriation under state water law? What is the effect of this exclusion?

Finally, the following questions regarding hydrothermal resources management will be addressed:

- What is the potential for use of thermal resources associated with hot springs in Alaska?
- What is the effect of federal laws on such use?
- What state laws apply to the use of thermal resources and what is their effect?

Federal Land Withdrawals Affecting Hot Springs

A series of executive and public land orders issued as early as 1911 have had a significant effect on the lands surrounding hot springs in Alaska. These orders have reserved for federal use an area around hot springs outside national forests which were located on vacant, unreserved land in 1911.

The first federal law specifically addressing land containing hot springs in Alaska came in the form of Executive Order 1324½ signed by President Taft, March 28, 1911 (Appendix 1). It withdrew and reserved for public purposes 160 acres around every hot spring on public land in the Territory of Alaska. This order was later amended by Executive Order 1883 of January 24, 1914 (Appendix 2) so that it would not apply to land within national forests.

In 1947, Public Land Order 399 (Appendix 3) revoked Executive Orders 1324½ and 1883, and amended Executive Order 5389 of July 7, 1930 (Appendix 4) to take their place. Executive Order 5389 withdraws public land containing hot springs or springs "the waters of which possess curative properties" and reserves such land for lease for the construction of facilities or improvements to accommodate the public. Prior to the issuance of PLO 399, Executive Order 5389 did not apply to Alaska; however, as amended, it applies to land in Alaska except for land within national forests.^{1/}

Section 704(n) of the Federal Land Policy Management Act of 1976, 43 U.S.C. §1701, (FLPMA), repealed the authorizing statutes under which Executive

^{1/} A 1961 Department of the Interior Solicitor's Opinion (M-16625) indicates that any public land on which wells are drilled for the development of geothermal water would be subject to withdrawal and reservation under Executive Order 5389. The Solicitor's basis for this opinion is that "there is no language in [Executive Order 5389] or the regulations issued pursuant thereto which restricts the term 'hot spring' to a spring created solely by the forces of nature." This opinion, however, has been reversed by a more recent Solicitor's Opinion (M-36914, June 25, 1979). Although the 1979 Opinion discusses a 1926 Executive Order which withdraws land containing springs and water holes, it states that the general approach adopted also applies to Executive Order 5389. In his 1979 Opinion, the Solicitor states, "I cannot agree . . . with the inference in some of the opinions of my predecessors that the . . . Order causes a reservation of all artificially developed water sources . . . I am therefore overruling expressions in prior opinions . . . to the extent they apply the . . . Order to artificially developed water sources on the public lands." The Solicitor further defines the term "spring" to mean "a discrete natural flow of water emerging from the earth at a reasonably distinct location . . ." (emphasis added).

Order 5389 was issued.^{2/} Consequently, hot springs which come into existence after the effective date of FLPMA (October 21, 1976) are not withdrawn by Executive Order 5389, but could be withdrawn under other, still-existing legislative authority.^{3/}

FLPMA appears to have a potentially significant effect on land containing hot springs within national forests. Even though such land was not withdrawn by Executive Order 5389 as amended, the State has been prevented from receiving title to it. When land within a national forest is selected, it is removed from the forest system and placed in the public domain prior to transfer. At that point, the land was (before FLPMA) subject to Executive Order 5389 and could not be transferred if it were within the prescribed locality of a hot spring. FLPMA, however, has repealed the federal statutes which authorized Executive Order 5389. All previously withdrawn land remains unaffected by the repeal, but no new withdrawals can be made. Since Executive Order 5389 never withdrew lands containing hot springs in national forests in Alaska; and now, cannot withdraw them if they are removed from the forest system, it appears that the Order no longer prohibits the State from selecting and receiving title to such land through the forest selections process.

In a few cases in Alaska, lands containing hot springs were in private ownership prior to Executive Order 13244 of 1911; otherwise, all such lands outside national forests have been withdrawn and reserved by the federal government. Regulations pursuant to Executive Order 5389 require that applicants, in order to select land outside national forests, must show that no hot springs exist on the land or within the area prescribed by the order (43 C.F.R. 2311.2(a), Appendix 5B). Since Executive Order 5389 was in effect before Statehood and no title to land containing hot springs within national forests has been obtained, the State does not control any hot springs by virtue of its land ownership.

^{2/} Section 10 of the Act of December 29, 1916 (43 U.S.C. §300) and The Pickett Act of June 25, 1910 (43 U.S.C. §141).

^{3/} Solicitor's Opinion M-36914 of June 25, 1979 implies that Executive Order 5389 has withdrawn lands containing hot springs regardless of whether the water source is known to exist or has been specifically located. Thus, the fact that a hot spring in existence before October 21, 1976 was not identified until after that date would not affect the withdrawal of land around it.

Summary of Federal Laws Affecting Land Containing Hot Springs

<u>Date</u>	<u>Law</u>	<u>Effect</u>	<u>Appendix</u>
June 25, 1910	43 U.S.C. §141 (Pickett Act)	Authorizes the President to make withdrawals of public lands in certain cases.	-
March 28, 1911	E.O. 1324½	Withdraws land containing hot springs in Alaska.	1
January 24, 1914	E.O. 1883	Amends E.O. 1324½ to exclude land in national forests.	2
December 29, 1916	43 U.S.C. §291	Authorizes reservation of land containing public springs and water holes.	-
March 3, 1925	43 U.S.C. §971	Authorizes leasing of withdrawn land containing hot springs for resort purposes.	5A
July 7, 1930	E.O. 5389	Withdraws land containing hot springs in the U. S. except for Alaska.	4
August 20, 1947	PLO 399	Revokes E.O.'s 1324½ and 1883, and amends E.O. 5389 to include land in Alaska except for land in national forests.	3
October 21, 1976	43 U.S.C. §1701 (FLPMA)	Repeals Acts of 1910 and 1916; however, existing withdrawals remain in force unless changed in accordance with FLPMA.	-

Water Rights

The federal orders and subsequent regulations affecting hot spring locations are fairly clear as to their intent with respect to withdrawal and reservation of land. However, the issue of water rights remains somewhat clouded not only on this land, but on all federal withdrawals and reservations. Federal versus state water rights has been the subject of several landmark Supreme Court cases and a recent Department of the Interior Solicitor's Opinion. A review of federal legislation, Court decisions relating to water law and the recent Solicitor's Opinion can help clarify the issue of water management on federal land containing hot springs in Alaska.

Water Rights in the State of Alaska are based on the appropriation doctrine. Under this doctrine, the federal government generally recognizes the State's authority to manage and appropriate surface and subsurface waters.

The Act of Congress of 1866 as amended by the Act of 1870 established the appropriation doctrine of water rights in the western United States.^{4/} The Act of 1866 is primarily a mining law; however, Section 9 contains provisions which give formal sanction of the federal government to appropriations of water on public lands of the United States when such appropriations are obtained through, and are acknowledged by, local customs, laws and court decisions. The Act further provides that the rights of appropriators will be protected by state or territorial laws.

The appropriation doctrine received further support in western states with the enactment of the Desert Land Act of 1877.^{5/} This Act provides that water rights on desert land are subject to prior appropriation and that all unappropriated water should be held free for appropriation by the public subject to existing rights. In 1935, a Supreme Court decision held that the Desert Land Act applied not only to desert land but to all land of the public domain in the affected states and territories.^{6/} It further held that the Act severed all waters from the public land leaving waters subject to appropriation under the laws of the states and territories.

In Alaska, the United States District Court at Sitka recognized and applied the appropriation doctrine as early as 1890, holding that prior appropriations were entitled to protection under the Act of Congress of 1866.^{7/} It was 100 years after the enactment of the Act of 1866 that

^{4/} 14 Stat. 253, §9 (1866) and 16 Stat. 217 (1870).

^{5/} 19 Stat. 377 (1877), 43 U.S.C. §321 et seq. (1964).

^{6/} California Oregon Power Co. v. Beaver Portland Cement Co., 295 U. S. 142, 160-163 (1935).

^{7/} Noland v. Coon., 1 Alaska 36, 37-38 (1890).

the State of Alaska, in 1966, adopted the Water Use Act based on the appropriation doctrine.8/

Although the laws and court decisions thus far cited affirm state regulatory authority over water rights in the western United States, several Supreme Court decisions have placed limitations on this authority. These limitations have traditionally been referred to as "federal reserved water rights" or the "Winters Doctrine." This doctrine gives the federal government reserved rights to water on federally reserved lands. These water rights are protected against subsequent state appropriations.

The Winters Doctrine was foreshadowed by the 1899 Supreme Court case of *United States v. Rio Grande Dam and Irrigation Company*. This Court decision held that the United States, as owner of lands bordering a stream, cannot be deprived by a state of the right to the continued flow of the stream's waters as may be necessary for the beneficial use of the property.9/

The Winters Doctrine was later articulated in the 1908 case for which it was named, *Winters v. United States*.10/ In the "Winters" case, the Supreme Court held that the Indians of the Fort Belknap Indian Reservation in Montana were entitled to reserved water rights which were protected against rights acquired later under state law.

The next judicial influence on the Winters Doctrine came in the 1955 Supreme Court case of *Federal Power Commission v. Oregon* (also known as the "Pelton Dam" case).11/ The Court's decision essentially extended the Winters Doctrine to apply not only to Indian reservations, but to any lands "withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws."

The decisions of the "Winters" and "Pelton Dam" cases have subsequently been reaffirmed in two Supreme Court cases. In the 1963 case of *Arizona v. California*, the Court granted reserved water rights to the Indians of the Colorado Indian Reservation and went on to say that the United States has the power to reserve water rights for other federal reservations and property.12/ In discussing its *Arizona v. California* decision in a 1971 case, the Supreme Court said:

[T]he Federal Government had the authority both before and after a State is admitted into the Union "to reserve waters for the use and benefit of federally reserved lands." . . . The federally reserved lands include any federal enclave.13/

8/ A.S. 46.15.

9/ 174 U. S. 690 (1899).

10/ 207 U. S. 564 (1908).

11/ 349 U. S. 435 (1955).

12/ 373 U. S. 546 (1963).

13/ *United States v. District Court in and for the County of Eagle*, 401 U. S. 521 (1971).

A concise description of the effect of the Winters Doctrine as it had evolved to this point was written in 1971 by Frank Trelease, a noted authority on water law and primary author of the Alaska Water Use Act.

If the United States by treaty, act of Congress or executive order reserves a portion of the public domain for a federal purpose which will ultimately require water, and at the same time the government intends to reserve unappropriated water for that purpose,^{14/} then sufficient water to fulfill that purpose is reserved from appropriation by private users. The effect of the doctrine is twofold: 1) when water is eventually put to use the right of the United States will be superior to private rights in the source of water acquired after the date of the reservation, hence such private rights may be impaired or destroyed without compensation by the exercise of the reserved rights, and 2) the federal use is not subject to state laws regulating the appropriation and use of water.^{15/}

Mr. Trelease describes the doctrine as "wild cards that may be played at any time, blank checks that may be filled in for any amount or may never be cashed."^{16/}

In more recent years, however, two Supreme Court cases have resulted in a curtailment of the effects of the Winters Doctrine. A 1976 Court decision stated, "the implied-reservation-water-rights doctrine, however, reserves only that amount of water necessary to fulfill the purpose of the reservation, no more . . ."^{17/} The most recent modification of the Winters Doctrine came in July of 1978 in the case of *United States v. New Mexico*.^{18/} In its decision, the Supreme Court held that the Gila National Forest in New Mexico has reserved water rights only for the primary purposes for which it was established, but not for any secondary purposes. It also stated that "[w]here water is only valuable for a secondary use of the reservation . . . there arises the contrary inference that Congress intended . . . that the United States would acquire water in the same manner as any other public or private appropriator."

^{14/} The government's intent to reserve water need not be explicitly stated. A 1976 Supreme Court decision holds that this intent "is inferred if the previously unappropriated water is necessary to accomplish the purpose for which the land reservation is created," (*Cappaert v. United States*, 426 U. S. 128). Historically, federal reserved water rights have most often been created by implication rather than by express reservation.

^{15/} F. Trelease, *Federal-State Relations in Water Law*, 109 (1976).

^{16/} *Id.* at 160.

^{17/} *Cappaert v. United States*, 426 U. S. 128 (1976).

^{18/} 98 S. Ct. 3012 (1978).

A recent Department of the Interior Solicitor's Opinion affirms the U.S. v. New Mexico Supreme Court decision.^{19/} In his 1979 Opinion, the Solicitor states:

The United States retains water rights by reserving federal lands and waters necessary to fulfill specified purposes [T]here is an important distinction between the purposes of a land reservation and secondary or subsidiary management apart from the reservation purpose(s); i.e., only the former obtain water rights by the act of reserving the land for particular purposes. [Emphasis added.]

The Solicitor later acknowledges that "land management agencies of the Department of the Interior have, throughout their history, appropriated water on the lands they administer . . . This appropriation of water . . . is necessary to carry out the secondary uses for which many federal reservations are administered." He advocates continuance of this policy saying, "application should be made pursuant to state procedural law for all uses of water interior land management agencies are making and plan to make on the federal lands they manage which are not covered by reserved rights . . ."

According to the Solicitor, the purposes of a federal withdrawal may require reservation of the "total yield" of a water source. Such is the case, in his opinion, on lands containing a spring or water hole withdrawn by a 1926 Executive Order.^{20/} The Solicitor broadly interprets the primary purposes of the 1926 Order to include, "(a) stockwatering, (b) human consumption, (c) agriculture and irrigation, including sustaining fish, wildlife and plants as food and forage sources, and (d) flood, soil, fire and erosion control."

Unfortunately, the Solicitor does not specifically address the amount of water reserved by Executive Order 5389, but says only that "[t]he general approach adopted . . . in relation to the 1926 Order is . . . applicable to these reservations." He does acknowledge, however, that "reserves [created by Executive Order 5389] are generally local in character or otherwise minor." Unlike the broad purposes of the 1926 Order which require reservation of the "total yield," Executive Order 5389 has a very specific purpose which could certainly be fulfilled with a much smaller water reservation in most cases. The lands withdrawn by Executive Order 5389 have only one primary purpose, which is clearly stated in the Code of Federal Regulations, 43 C.F.R. 2311.0-3(b)(2) (Appendix 5B):

Purpose of withdrawal. The Executive order [5389] . . . was designed to preserve for general public use and benefit the unreserved public lands, containing hot springs or springs the waters of which

^{19/} Solicitor's Opinion #M-36914, (June 25, 1979), Leo Krulitz, Solicitor.

^{20/} Executive Order of April 17, 1926 which creates Public Water Reserve No. 107, withdraws and reserves vacant, unappropriated, unreserved public land which contains a spring or water hole, or other body of water needed or used by the public for watering purposes. Alaska was excluded from the reserve created by this Order by Executive Order 5106 of May 4, 1929.

possess curative properties, in order that they might be leased under the provisions of the act of March 3, 1925 (43 Stat. 1133; 43 U.S.C. 971), and the regulations issued thereunder, contained in §2311.4.

Thus, the federal water reservation would, presumably, be limited to an amount needed for "bathhouses, hotels, or other improvements for the accommodation of the public," as stated in the provisions of 43 U.S.C. 971 (Appendix 5A) and 43 C.F.R. §2311.4 (Appendix 5B). Any water available over and above this reservation would be subject to appropriation under state law.

This state appropriation authority is acknowledged in the federal regulation pertaining to both Executive Order 5389 and the 1926 Order (43 C.F.R. §2311--Public Water Reserves, Appendix 5B). In granting a permit to conduct water from a public water reserve to a point outside the reserve, including unreserved public land, Section 2311.3(f) requires, "[t]hat the right to appropriate the waters of the State to the uses contemplated shall be obtained within 1 year from and after the issuance of the permit and the permittee shall file a certificate to that effect issued by the proper State Authority In the event that the State certificate as to the right to appropriate the water is not filed within 1 year, . . . then such permit shall become and be subject to cancellation." Since the 1926 Order reserves the total water yield at each source, this section is apparently applicable only to lands withdrawn by Executive Order 5389.

In the past, there has been a great deal of misunderstanding with respect to the appropriation and granting of rights to water associated with hot springs in Alaska. In some cases, the State of Alaska has denied issuance of water appropriation certificates based solely on the fact that the water in question was naturally hot. However, the federal regulations, Solicitor's Opinion and Supreme Court decisions cited above indicate that such denials are not justified unless the water is reserved and needed for use by a resort on a federal leasehold containing a hot spring. If this is not the case, the water is subject to appropriation under the state Water Use Act.

Alaska Constitution

Water rights are addressed in the Constitution of the State of Alaska in Article VIII, Section 13, which states:

Water Rights. All surface and subsurface waters reserved to the people for common use, except mineral and medicinal waters, are subject to appropriation. Priority of appropriation shall give prior right. Except for public water supply, an appropriation of water shall be limited to state purposes and subject to preferences among beneficial uses, concurrent or otherwise as prescribed by law, and to the general reservation of fish and wildlife.

Inherent in this statement are two often-asked questions: (1) What are "mineral and medicinal waters"? and (2) Why are they excluded from the appropriation doctrine? The answers to these questions can be found in the Alaska Constitutional Convention Proceedings (selected portions in Appendix 6). Transcripts of the proceedings indicate that by inserting the phrase "except mineral and medicinal waters" into Article VIII, Section 13, delegates intended to preclude appropriation by the State of "hot springs or springs with proven medicinal value." The following quotes from the proceedings show that this preclusion was made in deference to federal law which allegedly maintained the authority for such appropriations.

January 18, 1956
[morning]

TAYLOR: . . . the federal law provides that all hot springs or springs with proven medicinal value are reserved to the federal government, so people can have beneficial use of those springs-- those waters that do have a distinct medicinal value. And I thought, . . . in the section which is now 13, we could include some provisional clause along that line.

[afternoon]

RILEY: . . . this goes to the question raised by Mr. Taylor earlier today. He drew attention to the fact that the federal government reserves the disposition of hot springs. And some of us have talked with some of the federal land office people since that time, in an attempt to arrive at language as nearly like the federal reservation as possible, and this ["except mineral and medicinal waters"] is what we have offered. ■

It appears that the federal law to which the delegates were referring was Executive Order 5789 of July 7, 1930 and its subsequent amendment and regulations (Appendices 3-5). However, these orders and regulations effect a withdrawal and reservation of land and do not specifically give the federal government authority for the disposition of waters. As noted above, this issue was left for the courts to decide.

At the time of the Constitutional Convention in January of 1956, the Winters Doctrine was well established; and in the previous year, the Supreme Court had held, in the "Pelton Dam" case, that federal reserved water rights applied to any lands "withdrawn, reserved, or withheld from private appropriation and disposal under the public land laws."^{21/} Thus, the understanding of the delegates, that the law withdrawing lands containing hot springs included a reservation of the waters, was certainly well founded. However, the exemption of "mineral and medicinal waters" from the water appropriation clause in the Constitution is misleading in the following ways:

- 1) The phrase "mineral and medicinal waters" does not adequately describe what the delegates intended to exclude from the appropriation clause. Furthermore, this phrase is not defined either in the Constitution or in the Water Use Act where it is also used.
- 2) The exclusion of "mineral and medicinal waters" singles out one type of federal withdrawal (lands containing hot springs) for which the State acknowledges federal reserved water rights by Constitutional reference, whereas the Court has declared that the federal government maintains certain water rights on all withdrawals and reservations where they are needed.
- 3) The exclusion of "mineral and medicinal waters" could be interpreted to mean that the federal government reserves rights to all water associated with hot springs. However, the Supreme Court has held, in recent years, that federal reserved water rights apply only to the primary purposes for which the withdrawal was made.^{22/} Other water uses are subject to appropriation under state law, a fact acknowledged by the Court, federal regulations and a Department of the Interior Solicitor's Opinion.

These ambiguities could be clarified by amending the Water Use Act to define "mineral and medicinal waters" to mean waters of a hot spring or spring with curative properties, that is reserved by the federal government under PLO 399 and Executive Order 5389. This would not resolve the disparity caused by a Constitutional reference to one type of federal reserved water right and not to others; however, it would certainly help explain the intent of delegates to the Constitutional Convention and would clarify the State's role with respect to water management on land containing hot springs.

^{21/} 349 U. S. 435 (1955).

^{22/} United States v. New Mexico, 98 S. Ct. 3212 (1978).

Hydrothermal Resources

Due to their close proximity to the surface, the thermal resources associated with hot springs are easily utilized. In addition to traditional uses for baths and spas, these resources have potential for a wide variety of other applications such as space heating, district heating, agriculture and aquaculture uses, food processing and small-scale electric power generation. In Alaska, hot springs have historically been used for bathing purposes; first by Native Alaskans and later by immigrants to the state. Homesteaders developed most of the privately owned lands containing hot springs as spas or resorts in the early 1900's; and in a few cases, also used thermal energy from these hot spring waters for space heating and agricultural purposes. The State of Alaska is currently engaged in a geothermal demonstration project at Pilgrim Hot Springs located about 50 miles north of Nome where 90°C. (194°F.) water has been encountered at a depth of 90 feet. The thermal resources at Pilgrim have the potential for supporting a large agriculture or aquaculture facility and some geologists believe they may even be capable of supplying a district heating system for the City of Nome.

The Act of March 3, 1925 (43 U.S.C. 971, Appendix 5A) was rather narrow in its scope, providing for leasing of federal lands containing hot springs for "bathhouses, hotels or other improvements for the accommodation of the public." However, a growing awareness of geothermal resource potential and advancement of geothermal technology to pursue it led to the enactment of the Geothermal Steam Act of 1970 (84 Stat. 1566). This federal law provides for leasing and utilization of geothermal resources on both the public domain and withdrawn lands. Lands containing hot springs withdrawn by Executive Order 5389 fall under its authority and may be leased for hydrothermal uses other than hotels and bathhouses. However, these uses would not be considered a primary purpose of the withdrawal.

Currently, two State laws could apply to hydrothermal development on federal or private lands containing hot springs in Alaska. The Oil and Gas Conservation Act provides that the Alaska Oil and Gas Commission may regulate drilling, producing and plugging of wells drilled to a specified depth when it is likely that a hazardous substance may be encountered (AS 31.05.030(g)). Recently, the Commission established that hot groundwater under pressure is hazardous. Also, any withdrawal of water from a groundwater source is subject to the Water Use Act. Even in the case of land withdrawn under Executive Order 5389, it appears (based on past Supreme Court decisions), that development of hydrothermal resources for anything other than bathhouses, hotels or other resort improvements would be subject to prior appropriation under the state Water Use Act, since such development would not be a primary purpose of the withdrawal. Furthermore, this type of development on federal land would require a lease under the Geothermal Steam Act, which states, "[n]othing in this act shall constitute an express or implied claim or denial on the part of the Federal Government as to its exemption from State water laws." (84 Stat. 1573, Sec. 22.). It is anticipated that the State Legislature will consider amendments to statutes affecting geothermal resources

management during the 1980 legislative session. The application of state laws to hydrothermal development on federal and private lands containing hot springs could be affected by such legislation.

Conclusions

Based on the above discussion and citations pursuant to questions set forth in the Introduction, I have reached the following conclusions concerning the management of land, water and hydrothermal resources associated with hot springs in Alaska.

Land Management:

- Federal laws (summarized in the Table on page 4) have withdrawn and reserved vacant, unappropriated land in the state surrounding all hot springs which were in existence prior to October 21, 1976 and which were not within a national forest. This land is reserved for leasing for bathhouses, hotels or other improvements for the accommodation of the public. Land containing hot springs which is within a national forest is neither withdrawn nor reserved for such purpose and may be able to be selected under the forest selections process.
- Land containing hot springs which was occupied, appropriated or otherwise reserved prior to March 28, 1911 may be in private ownership. Otherwise, land in Alaska surrounding hot springs is in federal ownership.

Water Management:

- On federal withdrawals containing hot springs, the federal government maintains reserved rights to an amount of water needed for bathhouses, hotels or other improvements for the accommodation of the public. All other surface and subsurface water is subject to state jurisdiction under the Water Use Act.
- The effect of the reserved water right is that when water is eventually put to use for the purpose specified in the federal withdrawal, water rights for that purpose are superior to rights granted by the State after the date of the federal withdrawal. Water reserved for the federal purpose is not subject to the state Water Use Act.
- The phrase "mineral and medicinal waters" as used in the Alaska Constitution means waters of a hot spring or spring with curative properties, that are reserved by the federal government under PLO 399 and Executive Order 5389. The State Constitutional Convention excluded these waters from appropriation under state law in deference to the federal reserved rights which pertain to them. This exclusion affects only an amount of water needed to fulfill the primary purpose of the withdrawal. All other water is subject to the Water Use Act.

Hydrothermal Resources Management:

- There is great potential for the use of hydrothermal resources associated with hot springs in Alaska including applications to

space heating, district heating, agriculture and aquaculture uses, food processing and small-scale electric power generation.

- Federal withdrawals containing hot springs may be leased under provisions of the Act of March 3, 1925 for bathhouses, hotels or other improvements for the accommodation of the public. Withdrawn land and land in the public domain may be leased for geothermal development under provisions of the federal Geothermal Steam Act of 1970.
- State statutes which could affect hydrothermal development on federal or private lands containing hot springs include the Oil and Gas Conservation Act (AS 31.05) and the Water Use Act (AS 46.15). The Oil and Gas Conservation Act regulates development for safety and resource conservation purposes. The Water Use Act provides for determination and adjudication of rights in the waters of the state; and for water appropriation and distribution. The application of state statutes to hydrothermal development may be affected by a pending proposal for amendments to statutes affecting geothermal resources development in Alaska.

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APPENDICES

APPENDIX 1

(COPY)

DEPARTMENT OF THE INTERIOR

WASHINGTON

March 27, 1911.

Sir:

The Commissioner of the General Land Office has called to my attention the fact that there are a number of hot springs and other springs in the District of Alaska, the waters of which possess curative medicinal properties and suggest that the public interest, particularly that of the natives of Alaska, would be served by the withdrawal of the lands containing such springs from disposition pending the consideration by Congress of some measure providing for their use.

Under existing laws, lands containing mineral springs, not of a saline character, are subject to sale under the general land laws applicable to Alaska with the exception of the acts relating to the sale of mineral lands.

I concur in the opinion of the Commissioner with respect to public lands containing these springs and have the honor to submit with favorable recommendation an order of withdrawal.

Very respectfully,

(Sgd) Walter L. Fisher,

Secretary

E.C.F.

(1324½)
ORDER OF WITHDRAWAL.

It is hereby ordered that the following described lands be, and the same are, hereby withdrawn from settlement, location, sale, or entry and reserved for public purposes; to wit, to enable Congress to consider legislation providing for the use of medicinal springs in the public lands in the District of Alaska, subject to all the provisions, limitations, exceptions, and conditions contained in the Act of Congress entitled, "An Act to authorize the President of the United States to make withdrawals of public lands in certain cases," approved June 25, 1910.

All tracts of public lands in the District of Alaska upon which hot springs, or other springs, the waters of which possess curative medicinal properties, are located, to the extent of 160 acres surrounding each spring, in rectangular form with side and end lines equidistant, as near as may be, from such spring or group of springs.

(Signed) W.H.Taft

President.

Referred to the Commissioner
of the General Land Office for
appropriate action.

March 28, 1911.

(Signed) WALTER L. FISHER

Secretary of the Interior.

Executive Order

ALASKA

Under authority of the Act of Congress entitled "An Act To Authorize the President of the United States to make withdrawals of public lands in certain cases," approved June 25, 1910 (36 Stat., 817), as amended by the Act of August 24, 1912 (37 Stat., 497), it is hereby ordered that the Executive Order dated March 28, 1911, withdrawing "all tracts of public lands in the District of Alaska upon which hot springs, or other springs, the waters of which possess curative medicinal properties, are located, to the extent of 160 acres surrounding each spring, in rectangular form with side and end lines equidistant, as near as may be, from such spring or group of springs," be revoked so far as it applies to lands within National Forests.

WOODROW WILSON

THE WHITE HOUSE,

24 January, 1914.

[No. 1883.]

APPENDIX 3

[Public Land Order 300]
UNITED STATES AND ALASKA

REVOCATION OF EXECUTIVE ORDER 1224½,
WITHDRAWING PUBLIC LANDS CONTAINING
HOT OR MEDICINAL SPRINGS IN ALASKA AND
AMENDING EXECUTIVE ORDER 2389 WITH-
DRAWING SUCH LANDS IN UNITED STATES

By virtue of the authority contained in section 1 of the act of June 25, 1910, c. 421, 36 Stat. 847 (U. S. C., Title 43, sec.

141), and pursuant to Executive Order No. 9337 of April 24, 1943, it is ordered as follows:

Executive Order No. 1224½ of March 28, 1911, withdrawing certain public lands in the Territory of Alaska containing hot or medicinal springs, as amended by Executive Order No. 1883 of January 24, 1914, is hereby revoked; and Executive Order No. 2389 of July 7, 1930, withdrawing certain public lands containing hot or medicinal springs, exclusive of such lands in Alaska, is amended by deleting therefrom the words "exclusive of Alaska", so that the said order shall apply to lands containing hot or medicinal springs in both Alaska and the United States. Executive Order No. 5289, as herein amended, shall not apply to lands within National Forests.

This order shall not otherwise become effective to change the status of the surveyed or unsurveyed public lands in Alaska released from withdrawal by this order until 10:00 a. m. on October 22, 1947. At that time, subject to valid existing rights and the provisions of existing withdrawals, the unsurveyed lands shall become subject to settlement and other forms of appropriation in accordance with applicable laws and regulations, but the surveyed lands shall become subject to application, petition, location, or selection as follows:

(a) *Ninety-day period for preference-right filings.* For a period of 90 days from October 22, 1947, to January 20, 1948, inclusive, the surveyed public lands in Alaska released from withdrawal by this order shall be subject to (1) application under the homestead laws, or the small tract act of June 1, 1928 (52 Stat. 669, 43 U. S. C. sec. 682a), as amended, by qualified veterans of World War II, for whose service recognition is granted by the act of September 27, 1944 (58 Stat. 734, 43 U. S. C. secs. 278-283), subject to the requirements of applicable law, and (2) application under any applicable public-land law, based on prior existing valid settlement rights and preference rights conferred by existing laws or equitable claims subject to allowances and confirmation. Applications by such veterans shall be subject to claims of the classes described in subdivision (2).

(b) *Twenty-day advance period for simultaneous preference-right filings.* For a period of 20 days from October 2, 1947 to October 21, 1947, inclusive, such veterans and persons claiming preference rights superior to those of such veterans, may present their applications, and all such applications, together with those presented at 10:00 a. m. on October 22, 1947, shall be treated as simultaneously filed.

(c) *Date for non-preference right filings authorized by the public-land laws.* Commencing at 10:00 a. m. on January 21, 1948, any of the lands remaining unappropriated shall become subject to such application, petition, location, or selection by the public generally as may be authorized by the public-land laws.

(d) *Twenty-day advance period for simultaneous non-preference right filings.* Applications by the general public may be presented during the 20-day period from January 1, 1948, to January 20, 1948, inclusive, and all such applications, together with those presented at 10:00 a. m. on January 21, 1948, shall be treated as simultaneously filed.

Veterans shall accompany their applications with certified copies of their certificates of discharge, or other satisfactory evidence of their military or naval service. Persons asserting preference rights, through settlement or otherwise, and those having equitable claims, shall accompany their applications by duly corroborated affidavits in support thereof, setting forth in detail all facts relevant to their claims.

Applications for these lands, which shall be filed in the proper district land office in Alaska shall be acted upon in accordance with the regulations contained in § 253.8 of Title 43 of the Code of Federal Regulations (Circular No. 324, May 22, 1916, 42 L. D. 234), to the extent that such regulations are applicable. Applications under the homestead laws shall be governed by the regulations contained in Part 65 of Title 43 of the Code of Federal Regulations and applications under the small tract act of June 1, 1928, shall be governed by the regulations contained in Part 257 of that title.

Inquiries concerning these lands shall be addressed to the proper district land office in Alaska.

The lands released from withdrawal by this order and for which applications may be filed as stated above are described as follows:

All surveyed public land in Alaska containing hot springs, or other springs the waters of which possess curative medicinal properties, to the extent of 160 acres surrounding each spring, in rectangular form with side and end lines equidistant, as near as may be, from such spring or group of springs, not including, however, any existent legal subdivision of the public land surveys which contains a hot spring, or a spring the waters of which possess curative properties.

C. GIRARD DANIELSON,
Assistant Secretary of the Interior.

August 20, 1947.

[P. S. Doc. 67-2007; Filed Aug. 27, 1947;

Executive Order

Withdrawal of Public Lands Containing Medicinal Springs

United States

Under authority of the act of Congress approved June 25, 1910 (36 Stat. 847), as amended by the act of August 24, 1912 (37 Stat. 497), it is hereby ordered that every smallest legal subdivision of the public land surveys which is vacant unappropriated unreserved public land and contains a hot spring, or a spring the waters of which possess curative properties; and all land within one-quarter of a mile of every such spring located on unsurveyed public land, exclusive of Alaska, be, and the same is hereby, withdrawn from settlement, location, sale, or entry, and reserved for lease under the provisions of the act of March 3, 1925 (43 Stat. 1133), subject to valid existing rights.

This order shall remain in full force and effect unless and until revoked by the President or by act of Congress.

HERBERT HOOVER

THE WHITE HOUSE,

July 7, 1930.

(No. 5389)

APPENDIX 5A

43 § 971

PUBLIC LANDS

Ch. 22

Title 15, the right of way granted in sections 966-970 of this title shall be forfeited without further action or declaration on the part of the Government or any proceedings or judgment of any court. Apr. 12, 1910, c. 155, § 5, 36 Stat. 296.

§ 971. Bathhouses, hotels, etc., adjacent to mineral, medicinal, etc., springs on public lands

The Secretary of the Interior, upon such terms and under such regulations as he may deem proper, may permit responsible persons or associations to use and occupy, for the erection of bathhouses, hotels, or other improvements for the accommodation of the public, suitable spaces or tracts of land near or adjacent to mineral, medicinal, or other springs which are located upon unreserved public lands or public lands which have been withdrawn for the protection of such springs: Provided, That permits or leases hereunder shall be for periods not exceeding twenty years. Mar. 3, 1925, c. 458, 43 Stat. 1135.

CHAPTER 23.—GRANTS OF SWAMP AND OVERFLOWED LANDS

Sec.

- 981. Indemnity to States on sale of lands.
- 982. Grant to States to aid in construction of levees and drains.
- 983. Lists and plats of lands, for governors of States.
- 984. Legal subdivisions mostly wet and unfit for cultivation.
- 985. Patents to prior purchasers and locators.
- 986. Selection of lands confirmed.
- 987. Lands to be certified to State of California within one year.
- 988. Act extended to Minnesota and Oregon.
- 989. Homestead entries by purchasers from Missouri of lands declared not to be swamp lands.
- 990. Grant to Missouri.
- 991. Title of purchasers of unconfirmed lands in Arkansas confirmed.
- 992. Sale of erroneously designated water-covered areas in Arkansas.
- 993. Sale of lands in Louisiana; preference rights; application for purchase; appraisal; payment for land.
- 994. Sale of lands in Wisconsin.

§ 981. Indemnity to States on sale of lands

Upon proof by the authorized agent of the State, before the Director of the Bureau of Land Management that any of the lands purchased by any person from the United States, prior to March 2, 1855, were "swamp lands," within the true intent and meaning of the Act

Chapter II—Bureau of Land Management

§ 2311.0-3

1902 (32 Stat. 388; 43 U.S.C. 372 et seq.), respectively.

(3) With respect to mineral lands, the said orders do not prevent prospecting, locating, developing, mining, entering, leasing, or patenting of the withdrawn lands, under the provisions of the applicable mineral or mineral leasing laws.

§ 2300.0-5 Definitions.

As used in §§ 2351.1 to 2351.6, and 2357.1, the term "withdrawal or reservation" means "withdrawal, reservation, or restriction" and "land" includes both land and water areas.

PART 2310—WITHDRAWALS—
BUREAU OF LAND MANAGEMENT

Subpart 2311—Public Water Reserves

Sec.

2311.0-3 Authority.

2311.0-8 Lands subject to withdrawal

2311.1 Selections, filings, or entries.

2311.2 Application to select or enter lands.

2311.3 Use of lands withdrawn as public water reserves.

2311.4 Leasing of public lands near or adjacent to springs, for bath houses, hotels or other improvements.

Subpart 2313—Stock Driveways

2313.0-3 Authority.

2313.1 Application for stock-driveway withdrawal.

Subpart 2317—Public Aviation Fields

2317.0-3 Authority.

2317.0-7 Cross references.

2317.1 Procedures.

Subpart 2311—Public Water Reserves

Authority: Sec. 11, 39 Stat. 868; 43 U.S.C. 361, unless otherwise noted.

Source: 35 FR 8552, June 13, 1970, unless otherwise noted.

§ 2311.0-3 Authority.

(a)(1) Withdrawal of lands from settlement, location, sale, or entry; reservation for public use. By executive order of April 17, 1926, it was ordered that every smallest legal subdivision of the public-land surveys which is vacant, unappropriated, unreserved, public land and contains a spring or

water hole, and all land within one quarter of a mile of every spring or water hole located on unsurveyed public land be, and the same is hereby, withdrawn from settlement, location, sale, or entry, and reserved for public use in accordance with the provisions of section 10 of the act of December 29, 1916 (39 Stat. 868; 43 U.S.C. 300), and in aid of pending legislation.

(2) Purpose of withdrawal. The Executive order of April 17, 1926, was designed to preserve for general public use and benefit unreserved public lands containing water holes or other bodies of water needed or used by the public for watering purposes. It is not therefore to be construed as applying to or reserving from homestead or other entry lands having small springs or water holes affording only enough water for the use of one family and its domestic animals. It withdraws those springs and water holes capable of providing enough water for general use for watering purposes.

(b) Withdrawal of land from settlement, location, sale, or entry; reservation for lease. (1) By E.O. 5389, July 7, 1930, as amended by P.L.O. 309 of August 20, 1947, it was ordered "that every smallest legal subdivision of the public land surveys which is vacant, unappropriated, unreserved public land and contains a hot spring or a spring the waters of which possess curative properties; and all land within one-quarter of a mile of every such spring located on unsurveyed public land be, and the same is hereby, withdrawn from settlement, location, sale, or entry, and reserved for lease under the provisions of the act of March 3, 1925 (43 Stat. 1133), subject to valid existing rights."

(2) Purpose of withdrawal. The Executive order mentioned in paragraph (b)(1) of this section was designed to preserve for general public use and benefit the unreserved public lands containing hot springs or springs the waters of which possess curative properties, in order that they might be leased under the provisions of the act of March 3, 1925 (43 Stat. 1133; 43 U.S.C. 711), and the regulations issued thereunder, contained in 42-11.4.

§ 2311.0-8

§ 2311.0-8 Lands subject to withdrawal.

(a) Lands not needed or used by the public for watering purposes. (1) The object of the Executive order of April 17, 1926, was to:

• • • preserve for general public use and benefit unreserved public lands containing water holes or other bodies of water needed or used by the public for watering purposes.

(2) In the States of Alabama, Arkansas, Florida, Louisiana, Michigan, Minnesota, Missouri, Mississippi, and Wisconsin the springs or water holes, if any, on the public lands are not needed or used by the public for watering purposes. The conditions in those States are entirely different from those in the other public-land States where grazing is carried on to a considerable extent and not only springs and water holes but other available sources of water supply are sometimes quite scarce. There are no lands in the States mentioned that come within the purview of the Executive order of April 17, 1926. Therefore, a nonwater hole and nonspring statement is not required in connection with applications for lands in such States. Neither will such statement be required in connection with applications for lands in Federal reclamation projects.

(3) By E.O. 5108 of May 4, 1929, Alaska was excluded from the public water reserve created by E.O. of Apr. 17, 1926.

§ 2311.1 Selections, filings, or entries.

(a) It must be shown by a duly corroborated statement in connection with every selection, filing, or entry made upon or subsequent to the date of Executive order of April 17, 1926, or theretofore filed but not allowed, that no spring or water hole exists, if it be a fact, upon any legal subdivision of the land sought to be appropriated, if surveyed, and if unsurveyed, within one-quarter of a mile from the exterior boundaries of said land. If there be any spring or water hole the showing should state the exact location and size thereof; together with an estimate of the quantity of water in gallons which it is capable of producing daily, and any other information necessary

Title 43—Public Lands: Interior

to determine whether or not it is valuable or necessary as a public water reserve.

(b) The showing mentioned will not be required in connection with proposed State exchanges or indemnity school and other State selections, involving public lands in grazing districts where agreements as to the exchanges or selections have been reached by representatives of the State, and the Bureau of Land Management.

(c) Where orders of designation under the said acts contain the quoted paragraph in paragraph § 2311.0-8(a) of this section, it will not be necessary for an entryman to make the showing required by §§ 2311.1(a) and (b) of this section.

(d) *Application of order of withdrawal to specified cases.* (1) In case the attempted appropriation of the land is one the allowance of which is within the discretion of the Secretary of the Interior or the Bureau of Land Management, the showing required by § 2311.1(a) of this subpart must be furnished, irrespective of the date of filing of the application, entry, or selection, before favorable action is taken thereon.

(2) This requirement shall not apply, however, to selections or filings made in pursuance of grants which have been determined to be "grants in present," and to have attached and become effective prior to April 17, 1926.

(3) Geological Survey designation lists, under the Enlarged Homestead Act will contain a paragraph that:

This area contains no springs or water holes of the type intended to be withdrawn by Executive order of April 17, 1926, creating public water reserve No. 107, and, therefore, is unaffected by it.

§ 2311.2 Application to select or enter lands.

(a) Showing as to hot or medicinal springs required with application to enter or select permission to use lands. (1) An applicant to enter or select lands situated outside of a national forest in any State must show that no hot spring or other spring having waters possessing curative

Chapter II—Bureau of Land Management

§ 2311.3

properties exists. If it be a fact, upon any legal subdivision of land sought to be appropriated, if surveyed, and if unsurveyed, that no portion of the land applied for is within an area of one-quarter of a mile from such spring.

(2) If there be any such spring upon or adjacent to the land as stated, the applicant must show the exact location and size thereof, together with an estimate of the quantity of water in gallons which it is capable of producing daily and any other information necessary to determine whether or not it is valuable or necessary within the meaning of said Executive order. The showing must be duly corroborated.

(3) Permission may be obtained to use or improve lands containing such springs under the said act of March 3, 1925.

(4) The showing mentioned will not be required in connection with proposed State exchanges or indemnity school and other State selections involving public lands in grazing districts, where agreements as to the exchanges or selections have been reached by representatives of the States and the Bureau of Land Management.

(b) Application of order of withdrawal to special cases. (1) In case the attempted appropriation of lands is one of the allowance of which is within the discretion of the Secretary of the Interior or the Bureau of Land Management, the showing referred to in paragraph (a) of this section must be furnished irrespective of the date of filing of the application, entry, or selection before favorable action is taken thereunder.

(2) Geological Survey designation lists, under the Enlarged Homestead Act, will contain a paragraph stating:

This area contains no spring of the type intended to be withdrawn by Executive order of July 7, 1930, No. 5389, and therefore is unaffected by it.

(3) Where orders of designation under the Enlarged Homestead Act contain the above-quoted paragraph, it will not be necessary for entrymen to make the showing required by paragraph (a) of this section.

(4) Also in cases of applications or entries for lands within Federal reclamation projects, where a report is made by the Bureau of Reclamation that the lands contain no spring of the type intended to be withdrawn by E.O. 5389, July 7, 1930, it will not be necessary for the claimant to make the showing required by paragraph (a) of this section.

(R.S. 2476; 43 U.S.C. 1201)

§ 2311.3 Use of lands withdrawn as public water reserves.

(a) Authority; governing regulations. Permission may be obtained to use or improve lands withdrawn as or in connection with public water reserves, under the act of June 25, 1910 (36 Stat. 847; 43 U.S.C. 141-143, 16 U.S.C. 471), or any other act, by filing application for such permission under the act of February 15, 1901 (31 Stat. 790; 43 U.S.C. 959), in accordance with the regulations governing said act, as found in Parts 2850, 2860, and 2870 of this chapter, as supplemented by this section.

(b) Who may make application; form and contents. (1) Any citizen, or association of citizens of the United States, or any corporation, duly created and existing under and by virtue of the laws of any State of the United States, who may desire to improve the productivity of any water hole or source of water supply within the boundaries of any public water reserve, or to conduct such waters from their source within such a reserve to a point of discharge more convenient for public use, may file in the proper office for the district, within which the reservation is situated, an application for permission so as to use the reserved land, or conduct the waters over or through the same.

(2) Such application should be in the form of a statement, duly corroborated by at least two persons, setting forth in detail the plan of the applicant for the improvement and care of the public water reserve, the public necessity for such improvement, the reasons why such plan will be more conducive to the public good and better conserve the waters for public use, and any other facts and circumstances pertinent thereto.

§ 2311.3

Title 43—Public Lands: Interior

(c) *Map and field notes required when water is to be conducted outside of the reserve.* If the waters are to be conducted from their source within the reserve to a point outside of the reserve, the application should be accompanied by a map and separate field notes in duplicate, the map being delineated upon tracing linen, and prepared in accordance with the regulations governing the submission of applications under the act of February 15, 1901, also evidence that applicant has applied to the proper State official for permission to appropriate the waters to the uses contemplated and has prosecuted such application in good faith to date of the filing of the application.

(d) *When reservoir declaratory statement may be required.* If the place of use of the water is upon unreserved public land the applicant may be called upon to file a reservoir declaratory statement under the act of January 13, 1897 (29 Stat. 484; 43 U.S.C. 952-955), as well as the application under the act of February 15, 1901, if deemed advisable.

(e) *Stipulations and agreements required.* As a condition precedent to the granting of any such permission, the applicant will be required to execute such stipulations and agreements as may be deemed proper and necessary by the authorizing officer of the proper office, to safeguard the public interests, after investigation of the facts, circumstances, and conditions in connection with each individual case.

(f) *Conditions of permit: failure to comply with the same.* (1) Each permit shall contain, besides those found necessary in individual cases, the following conditions:

(i) That the right to appropriate the waters of the State to the uses contemplated shall be obtained within 1 year from and after the issuance of the permit and the permittee shall file a certificate to that effect issued by the proper State authority.

(ii) That the proposed system shall be fully completed in substantial conformity with the plan upon which the permit is predicated, within 2 years from and after the issuance of such permit, unless a different period is

specifically provided for in such permit.

(iii) That of the permittee shall, during the month of January, in each year after the completion of such system, file with the authorizing officer of the proper office within which the system is located, a statement of maintenance, in substantially the following form: _____, (Name) of _____ (Address), states that he is the President of the _____ company (or person) to whom permit (give land district and serial number), was issued by _____, (give date), in connection with public water reserve No. _____ that the system (as set forth) and described in said permit has been kept in repair and water sufficient for the public needs has been kept therein during the whole of the calendar year of 19____, that the same has been kept open to the public at all times during the year, and that the said permittee has in all things, complied with the provisions of said permit, and the stipulations therein contained and the acts under which said permit was issued.

(Signature) _____

(Date) _____

(2) In the event that the State certificate as to the right to appropriate the water is not filed within 1 year, or proof of the construction of the system, consisting of the statement of the permittee duly corroborated by two witnesses within 2 years or such other period as may be mentioned in the permit, or statement of maintenance is not filed as hereinbefore provided or in case any of the terms, conditions, provisions, or stipulations of the permit shall not be well and in good faith performed, observed, and carried out, then such permit shall become and be subject to cancellation. Nothing hereinbefore contained, however, is to be construed as limiting the power or authority of the authorizing officer to cancel and terminate the permit at any time when in his judgment such action is desirable.

Chapter II—Bureau of Land Management

§ 2311.4

(3) Permits issued hereunder are transferable only upon the written authority and consent of the authorizing officer.

(g) *Changes in system or new structures may be authorized.* If, at any time, it becomes necessary for the permittee to change his system or to erect structures other than those authorized by his permit, application for permission so to do, in the form of a statement setting forth in detail the reason and necessity for the change must be filed, and no such change shall be made until authorized in writing by the authorizing officer.

(R.S. 2478; 43 U.S.C. 1201)

§ 2311.1 Leasing of public lands near or adjacent to springs, for bath houses, hotels, or other improvements.

(a) *Statutory authority.* The act of March 3, 1925 (43 Stat. 1133; 43 U.S.C. 971) authorizes the issuance of leases for periods not exceeding 20 years of tracts of land near or adjacent to mineral, medicinal, or other springs located upon unreserved public lands or public lands withdrawn for the protection of such springs, for the erection of bath houses, hotels, or other improvements for the accommodation of the public. Leases may issue under the act to any responsible persons or associations, which words are construed to include private corporations and municipalities.

(b) *Lands which may be leased.* Leases may be issued for surveyed or unsurveyed unreserved public lands in the several States, situated near or adjacent to mineral, medicinal, or other springs, which are located upon unreserved public lands, and for public lands which have been withdrawn for the protection of such springs.

(c) *Form and contents of application.* An application for lease should be filed in duplicate in the proper office and should include the following:

- (1) Applicant's name and address.
- (2) If applicant is a private corporation, a certified copy of the articles of incorporation.
- (3) If applicant is a municipality, the law or charter and procedure taken by which the municipality has become a

legal body corporate. An application by a private corporation or municipality should show that it is legally qualified to take the lease requested and that the taking of such lease has been duly authorized by its governing body.

(4) An accurate description of the land desired. If the land is surveyed it should be described with reference to the public-land surveys. A lease may be granted for part of a legal subdivision or for more than one legal subdivision, in the discretion of the manager.

(5) The names and addresses of three persons to whom reference may be made as to applicant's reputation and business standing and as to his ability, both from a financial standpoint and otherwise, to carry out the contemplated project.

(6) The period of time for which the lease is desired, not to exceed 20 years, and the purpose for which the lease is sought, whether for the erection of a bathhouse, hotel, or other improvement for the accommodation of the public. It is important that the application should specify all purposes for which it is intended or desired to use the land, as a lease, if issued, will authorize the use of the land only for the purposes specified in the application, and its use for any other purpose will not be permitted. Thus, if an applicant for a hotel in addition to using the land for ordinary hotel purposes, wishes to operate a billiard hall or moving-picture theater, etc., on the land, that fact should be disclosed in the application.

(7) Details as to the proposed improvements, including the estimated cost of construction and of subsequent maintenance; also the time when construction work will begin and when it will be completed, if the proposed lease is granted.

(d) *Granting of lease is discretionary.* The granting of an application for lease is discretionary, and any application may be granted or denied in part or in its entirety as may appear to be warranted in the particular case.

(e) *Authority of the authorizing officer to regulate prices.* All leases issued under the act of March 3, 1925, will contain stipulations authorizing the

§ 2313.0-3

authorizing officer to fix the rates and prices for accommodations and services whenever this is deemed necessary. The charges which may be made may or may not be regulated by the authorizing officer as may be deemed proper in the particular case.

(43 Stat. 1133; 49 U.S.C. 971)

Subpart 2313—Stock Driveways

Source: 35 FR 9554, June 13, 1970, unless otherwise noted.

§ 2313.0-3 Authority.

The reservation of driveways for stock provided for in section 10 of the act of December 29, 1916 (39 Stat. 865; 43 U.S.C. 300) will be considered on application of parties interested on recommendation of other departments of the Government, or on the reports of agents of this Department. Lands withdrawn for driveways for stock or in connection with water holes can not thereafter be entered.

§ 2313.1 Application for stock-driveway withdrawal.

(a) Upon the receipt in the proper office of a duly executed application, in duplicate, for the withdrawal of public lands for a stock driveway by responsible parties in interest, the lands described therein shall be segregated from disposition temporarily, pending final action thereon by the Bureau of Land Management.

(b) Pending and during such temporary segregation, applications to enter or select any affected lands may be received and suspended.

(c) Lands withdrawn for driveways for stock or in connection with water holes are not subject to entry or disposition, and applications for the acquisition of lands so withdrawn will be rejected by the authorizing officer. Applications for the exchange of such lands, which show that they are filed pursuant to a program for the improvement of stock driveways, and applications to lease or use such lands under any appropriate public land law, until such time as they may be needed for the purposes of the withdrawal, and where the proposed use will not

Title 43—Public Lands: Interior

interfere with such purpose, will receive consideration.

Subpart 2317—Public Aviation Fields

Source: 35 FR 9554, June 13, 1970, unless otherwise noted.

§ 2317.0-3 Authority.

(a) The act of May 24, 1928 (45 Stat. 728; 49 U.S.C. 211), as amended, authorizes the Secretary of the Interior to withdraw lands for beacon lights and other air-navigation facilities, under such rules as he may prescribe.

(b) Under the authority given to the President by the act of June 25, 1910 (36 Stat. 847; 43 U.S.C. 141, 16 U.S.C. 471) to withdraw lands for public purposes, withdrawals may be made for beacon lights, emergency or intermediate landing fields, except terminal airports.

§ 2317.0-7 Cross references.

To the extent applicable, the procedures in Part 2350 of this chapter shall apply.

§ 2317.1 Procedures.

(a) Withdrawals under the act of May 24, 1928 (45 Stat. 728; 49 U.S.C. 211) may be made on motion of the Bureau of Land Management, or upon application of the Federal Aviation Agency or any other Federal agency, or the lessee of a terminal airport or the applicant for such a lease.

(b) In addition to the requirements of Part 2350 of this chapter, all applications for withdrawal shall contain a statement by the authorized officer of the Federal Aviation Administration as to the need and feasibility of the facility for which the withdrawal is requested.

PART 2320—WITHDRAWALS FOR OTHER INTERIOR AGENCIES**Subpart 2322—Bureau of Reclamation**

Arr.
 2322.0-3 Authority.
 2322.0-5 Definitions.
 2322.0-7 Cross references.
 2322.1 Effect of withdrawals.
 2322.1-1 Under final form.

APPENDIX 6
ALASKA CONSTITUTIONAL CONVENTION PROCEEDINGS

JAN. 18, 1956

PRESIDENT EGAN: What is your pleasure, Mr. Riley?

RILEY: Mr. President, I move its adoption.

PRESIDENT EGAN: Mr. Riley moves the adoption of the proposed amendment.

ROBERTSON: May we have it read again, please.

PRESIDENT EGAN: Will the Chief Clerk please read it again.

(The Chief Clerk read the proposed amendment again.)

PRESIDENT EGAN: Mr. Riley so moves. Do you ask unanimous consent, Mr. Riley?

RILEY: I do, Mr. President.

PRESIDENT EGAN: Mr. Riley asks unanimous consent for the adoption of the proposed amendment. Mr. Ralph Rivers.

R. RIVERS: I object, just for the moment, Mr. President. Would we not say "subordinate property rights" instead of "inferior"?

RILEY: Either would do, I would think. This is one proposed by a delegate and the Committee accepted it.

R. RIVERS: That could be referred to Style and Drafting. I will support that.

PRESIDENT EGAN: Is there objection to unanimous consent request for the adoption of the amendment? If there is no objection, the proposed amendment is ordered adopted. Are there other amendments to Section 17? Section 18? Mr. Taylor.



TAYLOR: Seventeen, Mr. President. I have a question regarding that particular section. It says the person should not be divested of his right to use of waters, except for a superior beneficial or public use. I was thinking about matters which have not been brought up by the Committee, and I brought it up today: the federal law provides that all hot springs or springs with proven medicinal value are reserved to the federal government, so people can have the beneficial use of those springs -- those waters that do have a distinct medicinal value. And I thought, possibly, in 17, or in the section which is now 13, we could include some provisional clause along that line.

PRESIDENT EGAN: Do you have an amendment, Mr. Taylor?

★ TAYLOR: I have no amendment right now. I just brought it up, that we might prepare an amendment after the dinner recess.

PRESIDENT EGAN: Mr. Ralph Rivers.

R. RIVERS: Mr. President, I have an amendment to Section 16, if I may have the privilege of backing up a bit. The new Section 16.

PRESIDENT EGAN: The Chief Clerk will please read the proposed amendment to the new Section 16.

CHIEF CLERK: "Line 13, page 6, delete the period after the word 'law' and add 'with just compensation'."

PRESIDENT EGAN: Mr. Ralph Rivers.

R. RIVERS: Mr. President, I move the adoption of the amendment. I might state that I talked to Mr. Riley and a couple of others on the Committee; I don't know whether I referred it to the Committee as a whole, but I talked to members of the Committee about it.

PRESIDENT EGAN: Mr. Ralph Rivers moves the adoption of the proposed amendment. Is there a second?

TAYLOR: Would you read it again?

KNIGHT: I'll second it.

PRESIDENT EGAN: Mr. Knight seconds the motion. Would the Chief Clerk please read the proposed amendment.

(The Chief Clerk read the amendment again.)

TAYLOR: I'd like to raise a point of inquiry. Do you think it would not be better if that were done only by operation of law "and with just compensation".

PRESIDENT EGAN: Mr. Ralph Rivers.

TAYLOR: Do you want a conjunction in there?

R. RIVERS: I don't care whether the "and" is in there or not. That would be for Style and Drafting. I'm not sure if "operation of law with just compensation". I think it's adequate with the "and". Mr. President and delegates, the reason I bring this up is that the very next section says "Proceedings in eminent domain may be undertaken for private ways of necessity to permit essential access for extraction or utilization of resources."

JAN. 18, 1956

PRESIDENT EGAN: That would be at the end of the line. Mr. Riley asks unanimous consent that the proposed amendment be adopted. Is there objection? Hearing no objection, it is so ordered. Are there other amendments from the Resources Committee?

CHIEF CLERK: "Page 5, line 14, strike 'nonmetallic'."

PRESIDENT EGAN: Mr. Riley.

RILEY: I ask unanimous consent, Mr. President, for the adoption of the amendment.

PRESIDENT EGAN: Mr. Riley asks unanimous consent for the adoption of the amendment. Is there objection? Hearing no objection, the proposed amendment is ordered adopted.

CHIEF CLERK: "Page 3, Section 8, line 13, strike lines 13 and 14, and insert in lieu thereof: 'selection of lands granted to the State by the United States and for the administration of the State public domain.'"

RILEY: Mr. President, I ask unanimous consent for the adoption of the amendment.

PRESIDENT EGAN: Mr. Riley asks unanimous consent for the adoption of the amendment. Would the Chief Clerk please read the amendment once more.

(The Chief Clerk read the proposed amendment again.)

PRESIDENT EGAN: Is there objection to the unanimous consent request for adoption of the amendment? If not, the proposed amendment is ordered adopted.

★ CHIEF CLERK: "Page 5, Section 13, line 20, after the word 'use' insert a comma, and add 'except mineral and medicinal waters'."

PRESIDENT EGAN: Mr. Riley.

RILEY: Mr. President, I ask unanimous consent for adoption of the amendment.

PRESIDENT EGAN: Mr. Riley asks unanimous consent for the adoption of the amendment. Is there objection?

COOPER: I object.

PRESIDENT EGAN: Objection is heard by Mr. Cooper.

COOPER: Just for a point of clarification -- "except mineral waters" -- what is that?

PRESIDENT EGAN: Mr. Riley.

RILEY: Mr. Cooper, this goes to the question raised by Mr. Taylor earlier today. He drew attention to the fact that the federal government reserves the disposition of hot springs. And some of us have talked with some of the federal land office people since that time, in an effort to arrive at language as nearly like the federal reservation as possible, and this is what we have offered.

PRESIDENT EGAN: Mr. Cooper.

COOPER: Mr. President, I'll have to ask further. The term "mineral waters" -- anyone living in this area certainly is well aware of the fact that there is plenty of mineral in this water; and, therefore, there could be a question at a future date.

PRESIDENT EGAN: Mr. Riley, do you have an explanation? Do you so move, Mr. Riley, for the adoption of the amendment?

RILEY: I have, yes.

PRESIDENT EGAN: Mr. Riley moves. Is there a second to the motion?

KNIGHT: I'll second it.

PRESIDENT EGAN: Mr. Knight seconds the motion. The question is open for discussion. The question is, "Shall the proposed amendment, as offered by the Committee on Resources, be adopted by the Convention?" All those in favor of adopting the proposed amendment will signify by saying "aye", all opposed, by saying "no". The "ayes" have it and the proposed amendment is ordered adopted. Are there other amendments?

CHIEF CLERK: No more committee amendments.

PRESIDENT EGAN: If not, then we will start with the second time around on the amending process.

KILCHER: Mr. President.

PRESIDENT EGAN: Mr. Kilcher.

KILCHER: Will this be the second reading?

PRESIDENT EGAN: Does the Committee desire a recess at this time, for the purpose of hearing any proposed amendments? Mr. Smith.

SMITH: I would like to ask if there are amendments to be offered?

JAN. 25, 1956

proposed amendment will signify by saying "aye"; all opposed, by saying "no". The "ayes" have it, and the proposed amendment is ordered adopted. Are there other proposed committee amendments?

CHIEF CLERK: "Page 4, lines 1 and 2, strike 'or interests therein'."

RILEY: Mr. President, I move the adoption of the amendment as read.

STEWART: I second the motion.

PRESIDENT EGAN: Mr. Riley moves the adoption of the amendment, seconded by Mr. Stewart. Mr. Riley.

RILEY: That is simply a redundancy. It appears in a subsection and it appears earlier on page 3 in the language qualifying the subsection.

PRESIDENT EGAN: Mr. Riley has moved, it has been seconded that the proposed amendment be adopted by the Convention. Mr. Hurley.

HURLEY: May I ask Mr. Riley again where it appears before that?

RILEY: On page 3, Mr. Hurley, on line 24.

PRESIDENT EGAN: Is there further discussion? If not, the question is, "Shall the proposed committee amendment be adopted by the Convention?" All those in favor of adopting the amendment will signify by saying "aye"; all opposed, by saying "no". The "ayes" have it and the proposed amendment is ordered adopted. Are there other committee amendments?

★ CHIEF CLERK: "Page 5, line 20 --"

RILEY: I would like to suggest to the Clerk that the word, "the" might help the sense of that amendment. Shall I read the amendment?

CHIEF CLERK: Yes, please.

PRESIDENT EGAN: Mr. Riley.

RILEY: On line 20, we had, by action of the Convention, inserted, "except mineral and medicinal waters". That particular insert should, under this amendment, follow the word "shall" instead of the word "use". It was adopted following the word "use", but in the judgment of the Committee it would better follow the word "shall" for clarity of meaning -- "except mineral and medicinal waters" inserted after the word "shall"

and set off by commas. I move its adoption.

PRESIDENT EGAN: Mr. Riley moves the adoption of the proposed amendment. Is there a second to the motion?

KNIGHT: I second it.

PRESIDENT EGAN: Mr. Knight seconds the motion. Mr. Taylor.

TAYLOR: I am not objecting; this is just for information. Mr. Riley, did your Committee, in considering this amendment as to mineral springs or mineral and medicinal waters--is that the definition as given in the Bureau of Land Management regulations?

RILEY: I would say that it is not full, but representatives of BLM in town, in Fairbanks that is, suggested to us that it would satisfy the point raised by you and others the other evening.

TAYLOR: That is right. I think that was my amendment and I wasn't sure whether that was as it was set forth.

RILEY: Yes, that is right. I am sorry I didn't check with you before.

PRESIDENT EGAN: Mr. Hellenenthal.

HELLENENTHAL: Mr. Riley, I take it this is a matter of substance or we wouldn't be asked to pass on it.

RILEY: I would say it is a matter of substance.

HELLENENTHAL: How is it a matter of substance?

RILEY: As I read it now, Mr. Hellenenthal, it states, "All waters reserved to the people for common use except mineral and medicinal waters..." which would suggest that mineral and medicinal waters may not be reserved to the people for common use; but, if it is read following the word "shall": "All waters reserved to the people for common use shall, except mineral and medicinal waters, be subject to appropriation." There is a prospect there of misunderstanding, we feel, of a substantive nature. The point of the whole sentence is that these waters with that exception shall be subject to appropriation. We don't want to suggest that all other waters except mineral and medicinal waters are subject to reservation. The reservation applies across the field.

HELLENENTHAL: Style and Drafting can still work on it after this amendment?

RILEY: I am sure, but with this to clarify our meaning.



PRESIDENT EGAN: The question is, "Shall the proposed amendment be adopted by the Convention?" All those in favor of adopting the proposed amendment will signify by saying "aye"; all opposed, by saying "no". The "ayes" have it, and the proposed amendment is ordered adopted. Are there other committee amendments?

CHIEF CLERK: "Page 5, line 24, strike 'of' and substitute 'among'."

RILEY: Mr. President, I move the adoption of the amendment.

PRESIDENT EGAN: Mr. Riley moves the adoption of the amendment. Is there a second?

MARSTON: I second the motion.

PRESIDENT EGAN: Mr. Marston seconds the motion. Mr. Riley.

RILEY: The Committee feels that the substitution of the word "among" in that instance ties in more clearly with the concept of concurrent use. That, too, might have been a Style and Drafting change but we feel that it does touch on substantive matter.

PRESIDENT EGAN: The question is, "Shall the proposed amendment be adopted by the Convention? All those in favor of adopting the proposed amendment will signify by saying "aye"; all opposed, by saying "no". The "ayes" have it and the proposed amendment is ordered adopted. Are there other amendments?"

CHIEF CLERK: "Transpose Sections 7 and 8, page 3."

PRESIDENT EGAN: Transpose Sections 7 and 8. Mr. Riley.

RILEY: Here, Mr. President, I would waive the motion to adopt, thinking it would serve the purpose to call the matter to the attention of Style and Drafting.

PRESIDENT EGAN: Are there other amendments for Committee Proposal No. 8/a?

R. RIVERS: May I address a question to Mr. Riley?

PRESIDENT EGAN: If there is no objection, Mr. Rivers.

R. RIVERS: Mr. Riley, I refer to page 3, first to line 7, which I have marked down as a new Section 8, and it speaks of "lands and interests therein". The same question applies to new Section 10 on line 24, "or interests therein", and I would like to know what that means: "or interests therein"?

RILEY: I should like to ask for a five-minute recess and

STATE OF ALASKA

OFFICE OF THE GOVERNOR

ALASKA ENERGY OFFICE

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JAY S. HAMMOND, GOVERNOR

April 23, 1976

The Honorable Kathryn Ostrosky
State House of Representatives
Pouch V
Juneau, Alaska 99811

Dear Representative Ostrosky:

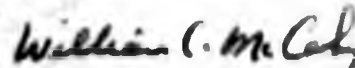
In July, 1975, the Energy Office and the Geophysical Institute of the University of Alaska co-sponsored a conference on the potential use of wind and geothermal power in Alaska. Over 250 people attended and participated. The National Science Foundation funded the convention and the report.

After the two day conference several working groups continued to work on analyzing these two alternative energy sources. Enclosed is a copy of the report of that conference and its working groups.

Alaska is blessed with alternative energy sources. Careful and planned use may well allow us to improve the standard of living for all Alaskans, protect our environment and provide for many of our energy requirements while still being the major domestic source for our nation's oil and gas needs.

I will be pleased and honored to answer any questions you might have concerning this document and energy research and development within Alaska.

Sincerest best wishes,



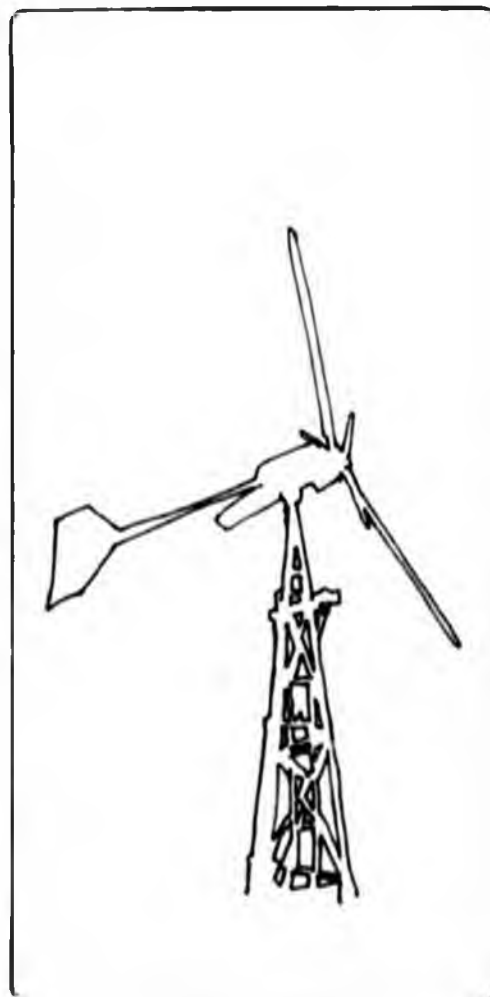
William C. McConkey
Director
Alaska State Energy Office
WMcC/mgf
Encl:

GEOHERMAL ENERGY AND WIND POWER . . .

ALTERNATE ENERGY SOURCES FOR ALASKA

Resource assessments and recommended plans and programs developed from the proceedings of the Alaskan Geothermal and Wind Power Resources Planning Conference, July 8-9, 1975; Anchorage, Alaska

EDITED BY
ROBERT B. FORBES



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The Alaska Energy Office
Office of the Governor
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and
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University of Alaska
College, Alaska

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April, 1976

GEOHERMAL AND WIND POWER...
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Recommended plans, policies and programs developed
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William McConkey, Director

Edited by Robert B. Forbes

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The 1973 oil embargo by the OPEC (Oil Producing Export Countries) shocked the United States and its leaders and accentuated the seriousness of the nation's declining energy reserves. Project Independence, as initiated by Richard Nixon and reaffirmed by President Ford, was designed to achieve American "energy self-sufficiency" by 1980. However, our dependence on foreign oil imports has actually increased since the embargo was lifted. Crude oil imports during the first six months of 1975 were 24.5% above the same period in 1973. At the same time, domestic production of crude oil and lease condensate during the first half of 1975 decreased 5.2% from the same period in 1974.

Diminishing oil and gas reserves in the "Lower 43" states will result in the accelerated consumption of Alaskan oil and gas when these resources are developed and available for delivery. It is clear that Alaska and the nation must find and develop alternate energy sources as rapidly as possible.

Rising transportation and petroleum product costs, particularly in rural Alaska, accentuate the need for alternate energy sources. Preliminary surveys have indicated that the State of Alaska has many areas which have high wind power potential, as well as known geothermal resource areas.

On July 8 and 9, 1975, over 150 people, including scientists, state and federal government officials, and representatives from the private sector, attended the Alaska Geothermal and Wind Resources Planning Conference in Anchorage, Alaska (see Appendix B).

Objectives of the Conference were:

- (1) To review and evaluate the potential of geothermal and wind resources as alternative Alaskan energy sources,
- (2) To assemble a small and highly competent group of conferees, from Alaska and other states, to conduct an assessment as outlined in (1) above,
- (3) To encourage dialogue between potential Alaskan consumers, scientists and planners, with special attention to rural and native populations,
- (4) To develop short- and long-range plans and programs for the utilization of Alaskan geothermal and wind resources in harmony with national and international needs and priorities, and
- (5) To produce, publish and distribute a comprehensive report which summarizes the findings of the conferees on (1), (3) and (4) above.

Working groups were formed to define plans and programs in several areas including:

1. agriculture
2. electrical power
3. fisheries and aquaculture
4. geothermal resource research and development
5. space heating and industrial application
6. wind power development and applications

Conference data including the technical program, the list of attendees and working group assignments are contained in Appendices A, B and C.

This report attempts to define Alaskan energy problems which can be alleviated through the efficient use of wind power and geothermal resources, and to present recommended short- and long-range plans for the initiation of state and federal programs in the more promising areas.

The content of this report is based on input from Conference working groups and many published (acknowledged) and unpublished sources, including data from various state and federal agencies.

We are particularly grateful to the Geothermal Program Office, National Science Foundation, for a grant (NSF #AER75-20207), which helped defray Conference expenses and the publication costs of this report.

We hope that future accomplishments show that the Alaskan Geothermal and Wind Resources Planning Conference was a very important first step in the efficient and timely development of alternate energy resources in Alaska.

The Organizing Committee
Alaska Geothermal and Wind
Resources Planning Conference

ACKNOWLEDGMENTS

So many people have contributed so much to this report, that it is neither possible nor practical to personally acknowledge all of the contributors. However, I do wish to offer my special thanks to the following persons who played key roles in the organization of the Planning Conference and the completion of this report.

Mr. William Ogle, energy consultant to the Alaska Energy Office, contributed his expertise to many sections of this report; he was also one of the principal architects of the Planning Conference.

Mr. Tom Miller, of the U. S. Geological Survey, Anchorage, was a major contributor to the section on Alaska's Geothermal Potential; and much of the recent material on Alaskan geothermal and resource assessment has been derived from the work of Tom and his co-workers.

Ms. Clarissa Quinlan, of the Alaska Energy Office, helped prepare the section on Energy Economics and devoted weeks of her time to the organization and planning of the Conference.

My special gratitude to Mrs. Fran Pedersen, my secretary, who typed, assembled and indexed the manuscript and supervised the final compilation and publication of the report.

We are deeply grateful to the National Science Foundation for a grant which defrayed many of the costs associated with the Planning Conference and the preparation and publication of this report.

RBF

TABLE OF CONTENTS

FOREWORD -----	i
ACKNOWLEDGMENTS -----	iv
ALASKA AND THE ENERGY CRUNCH -----	1
(R. B. Forbes and W. McConkey)	
Socio-Economic Framework -----	1
Alaskan Economic Setting -----	1
Consumer Price Versus Income and Earnings -----	3
Rural Alaskan Economics -----	8
Energy Problems in Villages and Remote Areas -----	8
The Alaskan Native Claims Settlement Act -----	9
Petroleum Impact -----	10
ENERGY ECONOMICS -----	12
(Electric and Wind Power Working Group; R. Cross and T. Wentink, Co-Chairmen)	
Statewide Requirements -----	12
Urban Electric Power -----	12
Energy Consumption in the Rural Communities -----	16
Larger Communities -----	16
The Villages -----	15
Rural Electric Power -----	17
Forecast of Alaska Power Requirements -----	18
ALASKA'S GEOTHERMAL POTENTIAL -----	23
(R. B. Forbes, with contributions from the Research and Development Working Group)	
Geothermal Energy in the National Interest -----	23
The Alaska Geothermal Resources Act of 1971 -----	23
Classification of Geothermal Resources -----	25
Previous Work and Publications -----	25
Heat Flow and Thermal Gradients -----	27
Volcanism and Geothermal Resources -----	29
Silicic Volcanism -----	29
Basaltic Volcanic Fields -----	32
Volcanism in Southeastern Alaska -----	33
Estimated Magnitudes and Heat Contents of Alaskan Volcanic Systems -----	34
Direct Extraction of Energy From Volcanoes -----	34
Thermal Springs as Geothermal Resources -----	38
Origin of Thermal Spring Water -----	38
Vapor-Dominated Versus Hot Water Systems -----	38
Geothermometry -----	42
Geologic Setting of Alaskan Thermal Springs -----	45
Quaternary Volcanic Belts -----	46
Southeastern Alaska -----	46
Central Alaska -----	46

Maximum Surface Water Temperatures -----	48
Estimated Reservoir Temperatures -----	48
Reservoir and Conduit Systems -----	48
Flow Rates -----	49
Saline Springs -----	49
 GEOHERMAL RESOURCE APPLICATIONS -----	 52
(L. Leonard and R. B. Forbes)	
Utilization of Alaskan Thermal Springs -----	52
Electricity -----	53
Space Heating -----	57
Refrigeration -----	59
Transmission of Geothermal Energy -----	59
(L. Leonard)	
High Temperature Pipelines -----	59
Low Temperature Pipelines -----	60
 SPACE HEATING AND INDUSTRIAL APPLICATIONS -----	 61
(Space Heating and Industrial Applications Working Group; J. Kunze and W. Ogle, Co-Chairmen)	
Space Heating -----	61
The Industrial Belt -----	61
The New Capital Site -----	61
Industrial Applications -----	62
Recommended Projects -----	62
 ENVIRONMENTAL HAZARDS AND PROTECTION -----	 63
(R. B. Forbes)	
Environmental Hazards -----	63
Chemical Pollution -----	63
Noise Pollution -----	63
Thermal Pollution -----	63
Anti-Pollution Measures -----	64
Environmental Vulnerability of Alaskan Thermal Springs -----	64
 WIND POWER POTENTIAL OF ALASKA -----	 67
(T. Wentink)	
Wind Power Potential Defined -----	67
Wind Power Calculations -----	70
Meaningful Variables -----	71
Alaskan Wind Data -----	72
Ranking of Wind Power Sites -----	76

POWER AND ENERGY PRODUCTIVITY OF SMALL WINDMILLS IN ALASKA -----83
 (T. Wentink)

Present State of Technology -----83
 The Use of Mean Wind Speeds -----85
 Evaluation of Available WECS Units -----85
 Grumman WS25 Prototype (15 KW) -----86
 Electro WG50 (6 KW) -----86
 Aerowatt 4.1 KW -----87
 Jacobs-like 3 KW WECS -----93
 Energy Productivity and the Height Effect -----94
 Engineering Design Factors -----96
 Power Coefficient and Efficiency -----96
 Cut-in-Speeds and Calms -----96
 Productivity Curves -----96
 Icing Problems and Blade Coating -----98
 D.C. Versus A.C. Rural Systems and Inverters -----99
 WECS Foundation Requirements -----100
 Environmental Impact -----100
 Possible Bird Kills -----101
 Communications Interference -----101
 Weather Modification -----101
 Mechanical Risk and Liability -----102

WIND POWER APPLICATIONS -----103
 (T. Wentink)

Wind Versus Fossil Fuel-Generated Power -----103
 Industrial Applications -----105
 Ammonia Production -----105
 Urea and Methanol Production -----107
 Mining -----108
 Agriculture -----108
 Refrigeration -----109

ALASKAN AGRICULTURE AND THE ENERGY PROBLEM -----110
 (Agriculture Working Group; D. H. Dinkel, Chairman)

Logistics -----110
 Controlled Environment Systems -----112
 Open Plot and Controlled Environment Gardening
 on Geothermally-Heated Ground -----113

FISHERIES AND AQUACULTURE -----116
 (Fisheries and Aquaculture Working Group; W. McNeil, Chairman)

Opportunities for Aquaculture -----116
 Salt in Ocean Ranching -----116
 Uses of Warm Water in Ocean Ranching -----120
 Proposed Program -----121
 Inventory of Geothermal Waters -----121
 Feasibility of Using Thermal Waters -----121

CONCLUSIONS AND RECOMMENDATIONS -----125

Geothermal Potential and Applications -----125
 Classification of Geothermal Resources -----125
 Geothermal Resources Applied to Alaskan Needs -----125
 Convective Systems -----126
 Volcano-Related Systems -----126
 Heat Flow and Thermal Gradient Measurements -----127
 Total Energy Utilization of Thermal Springs -----127
 Rural Geothermal Priorities and the Total
 Energy Concept -----128
 Electric Versus Non-Electric Applications -----128
 Sources of State Funding -----129
Present State of Geothermal Research and Development -----130
 Development -----130
 Research -----130
A Proposed Geothermal Research and Development Program -----131
Wind Power Potential and Applications -----133
 Potential -----133
 State of Technology -----133
 Applications -----134
 Electricity -----137
Wind Power Demonstration Projects -----139
Institutional Considerations -----139
 The Alaska State Energy Office and
 Statewide Coordination of Geothermal
 Activities -----139
 State of Alaska Geological and Geophysical Survey -----139
 State Versus Federal Funding -----139
 Possible ERDA-State of Alaska Memorandum of
 Understanding -----140

REFERENCES -----141*

APPENDICES

- A. Program for the Alaska Geothermal and Wind Resources Planning Conference
- B. Attendance List for the Alaska Geothermal and Wind Resources Planning Conference
- C. Working Groups for the Alaska Geothermal and Wind Resources Planning Conference
- D. Chevak's Current Energy Picture (Fall, 1975):
 A Study of a Southwestern Alaskan Eskimo Village
- E. Proposed Projects
 - E-1. Proposed Use of Geothermal Water for Salmon Aquaculture on Umanak Island, Alaska
 - E-2. A Proposal for Alaska Municipal Geothermal Heating

- E-3.
- E-4. Proposed Total Energy Studies of
- E-5. Selected Alaskan Thermal Springs

- F. Preliminary Proposal for Wind Power
Demonstrations at Selected Alaskan Sites
(Umnak Island, Cold Bay and Kotzebue)
- G. The Alaska Geothermal Resources Act of 1971

ALASKA AND THE "ENERGY CRUNCH"

(R. B. Forbes and W. McConkey)

Socio-Economic Framework

Alaskan Economic Setting: When considering Alaskan energy problems, it is important to remember that Alaska may have more in common with the developing countries of Africa and Latin America than it does with the other forty-nine states. At first hearing, this sounds like an overstatement, but hard facts reinforce this comparison.

Alaska, the largest of the fifty states, has a land area which is equal to about one-fifth the total area of the continental United States. The Alaskan population is around 300,000. Alaska has only three communities (Anchorage, Fairbanks and Juneau) which could be classified as cities when compared to other states.

Over one-half of the Alaskan population lives in or immediately adjacent to these three cities. The residual population is scattered throughout the rest of the state in hundreds of towns, villages, and settlements. Very few of these outlying communities can be conveniently reached by any form of transportation other than air. Modern communications are often limited to a single radio facility located in a Bureau of Indian Affairs or state-operated school, or some other federal or state administrative facility. Traditionally, long transportation routes and high maintenance costs have made the Alaskan cost of living higher than that in other states. Rural communities are at the end of the "logistics pipeline" as emphasized by the cost of fuel oil, for example, which exceeds \$1 per gallon in many villages (Table 1).

The Alaskan economy tends to be resource oriented, and most of the revenue is derived from the export of raw materials to other states or

TABLE 1

Representative Fuel Prices in Rural Alaska

<u>VILLAGE</u>	<u>OIL/per GALLON</u>	<u>GAS/per GALLON</u>
ALAKANUK	\$1.00	\$1.00
AMBLER	.95	1.19
ARCTIC VILLAGE	2.10	2.20
BARROW	2.40	2.37
BEAVER	2.00	1.85
BETTLES	1.60	1.60
CHEVAK	.85	1.05
EMMONAK	.97	.82
FOOPER BAY	.93	1.27
KIANA	1.74	1.25
KIPNUK	.82	.91
KOTLICK	.80	1.00
NULATO	1.00	1.25
PILOT STATION	1.00	1.00
SHUNGNAK	.95	1.30

ALASKA STATE ENERGY OFFICE
November, 1975

countries where they are processed, marketed and consumed. Fish, timber, metals and petroleum comprise the major exports. Alaska's small population base, high operating costs and lack of local markets have discouraged resident processing and manufacturing.

Alaska shares the problems of underdeveloped countries which have become the economic domains of more highly industrialized nations. In common with such countries, a significant portion of Alaska's population (about 20%) lives in poverty. This segment of the population is dominated by Natives who exist, for the most part, in socio-economic limbo between traditional hunting and fishing economies and the complexities of 20th century civilization. The Native peoples account for a little over one-half of the state's rural population; and it is these Alaskans who suffer the most from the nation's economic problems and continuing inflation. Cross-cultural blocks and the lack of investment capital have left many villages with little cash income other than welfare checks. Few villagers are regularly employed, and if so, the jobs are usually government related. Generally speaking, the economic base of rural Alaska is that provided by federal and state support.

Consumer Prices Versus Income and Earnings: High Alaskan consumer prices have received worldwide attention, dating back to the days of the Klondike and Nome gold stampedes. It does indeed cost more to live in Alaska than elsewhere in the United States. A quotation from a recent report, "Consumer Prices, Personal Income and Earnings in Alaska," by the University of Alaska's Institute of Social, Economic and Government Research (Tussing and Thomas, 1974), summarizes the current economic differential:

"Almost everything costs more in Alaska than it does in the 'lower forty-eight.' How much more varies widely among places in the state, with the lowest differential occurring in the Anchorage area. The highest differentials occur in the northern and western regions, with costs there sometimes two or three times the national average. Alaska price differentials also vary by commodity. For instance, the costs of housing and all construction in Alaska exceed the U.S. average far more than the costs of such factory-manufactured or processed goods as automobiles, food, or clothing.

"Table 2 summarizes autumn 1973 family budget costs for three levels of living in Anchorage, relative to the U.S. urban average. Housing accounted for the largest part of the absolute difference between the Anchorage budget and the U.S. urban average: 39 percent of the difference between the budgets of the lower income families and 42 percent in the budgets of intermediate and higher income families.

"Living cost differentials between Alaska and other states are *steeply biased against low income families*. The total cost of a budget for higher income families in Anchorage in 1973 was 26 percent higher than its U.S. average urban counterpart, but the 'lower level' budget was 47 percent higher. Differentials are greatest in the lower income budget level in almost every expenditure category, but as previously stated, the most extreme contrasts are in housing costs. The Anchorage cost of housing for lower level income families was 92 percent higher than the national urban average, but only 45 percent higher for the higher income families."

Although Alaskans enjoy a 14% nominal income advantage over "average" United States residents, this advantage does not offset even the Anchorage cost of living differential (+31%) which is probably the lowest of any locality in the state of Alaska, based on the U.S.D.C. Consumer Price Index for 1974. If one compares the per capita income data in Table 2 with the market basket food costs and average annual food expenditures in Tables 3 and 4, respectively, it is painfully apparent that many seasonally-employed residents in rural Alaska communities are living at poverty levels.

TABLE 2

Per Capita Personal Income and Comparative Ratios for
Alaska and the United States, 1969 and 1972

	1969 Census	1972 BEA ^a	Ratio to State Total (Alaska=100)		Ratio to U.S. Total (U.S.=100)	
			1969 Census	1972 BEA	1969 Census	1972 BEA
Alutian Islands	\$3,317	\$8,354	88	162	106	186
Anchorage	4,747	5,582	113	109	135	124
Anchorage City	4,741		126		151	
Spenard	4,639		123		148	
Barrow	1,833	10,831	49	211	59	241
Bethel	1,326	2,456	35	48	43	55
Bristol Bay Division	1,637	3,753 ^b	97	73	116	84
Bristol Bay Borough	3,641		43		52	
Cordova-McCarthy	4,072	7,189	108	140	130	160
Fairbanks	3,932	5,606	106	109	127	125
Fairbanks City	5,049		134		161	
Haines	3,662	3,906	97	76	117	87
Juneau and Angoon		8,020 ^b		150		179
Angoon	516		14		16	
Juneau	5,053		134		161	
Kenai-Cook Inlet	3,806	4,197	101	82	121	93
Ketchikan	3,720	5,606	99	109	119	125
Kobuk	1,527	2,658	41	62	49	59
Kodiak	3,356	5,245	89	102	107	117
Kuskokwim	1,670	3,578	44	73	53	80
Metanuska-Sustina	2,894	4,051	77	79	92	90
Nome	1,927	3,300	53	64	63	73
Outer Ketchikan	2,634	3,091	70	72	84	82
Prince of Wales	4,036	7,470	108	145	129	165
Seward	3,908	4,067	93	79	112	90
Sitka	3,899	5,673	104	110	124	126
Sligo-Valdez	3,339	4,641	80	90	106	103
Southeast Fairbanks	3,250	3,913	86	76	108	87
Upper Yukon	3,963	4,648	105	90	128	103
Valdez-Chitina-Whittier	4,353	4,279	116	83	139	95
Wade Hampton	1,069	1,877	28	37	34	42
Wrangell-Petersburg	3,376	4,051	90	96	108	110
Yukon-Koyukuk	3,369	3,219	89	63	107	72
State Total	3,765	5,142	100	100	120	117
U.S. Total	3,169	4,492	83	87	100	100

^aBureau of Economic Analyst^bBecause of symmetrical errors in source tables, BEA figures for "Bristol Bay" and "Juneau and Angoon" were estimated by interpolation between per capita income figures for adjacent census divisions, SAISA's or counties.

Source: U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population, General Social and Economic Characteristics, Alaska and United States Summary, and Survey of Current Business, May 1974.

(Taken from Tussing and Thomas, 1974)

TABLE 3

Market Basket Food Costs^a in Selected Alaska Cities and Seattle, Washington, 1963-1974

	1963	1964	1965 ^b	1966	1967	1968	1969	1970	1971	1972	1973	1974 (March)	1974 (June)
Anchorage	\$22.67	\$22.68	\$20.80	\$22.26	\$22.03	\$22.00	\$23.05	\$22.97	\$24.32	\$25.03	\$23.43	\$34.32	\$34.04
Bethel	N/A	N/A	N/A	N/A	N/A	32.19	33.79	35.69	37.24	38.40	41.19	45.02	45.84
Fairbanks	25.26	25.13	23.34	24.45	23.99	24.44	25.82	26.35	26.71	27.01	30.83	35.55	35.57
Juneau	21.11	21.54	20.67	21.40	21.19	21.90	22.76	22.63	23.78	24.99	29.01	32.99	33.17
Kenai-Soldotna	N/A	N/A	N/A	N/A	N/A	23.42	24.36	24.32	25.01	26.47	30.53	33.90	37.09
Ketchikan	20.40	20.85	19.89	10.75	20.85	21.62	22.73	23.24	23.54	24.62	27.92	30.96	31.78
Kodiak	22.91	22.82	21.43	22.33	22.38	23.25	24.47	25.96	26.79	27.96	31.67	34.77	36.12
Nome	28.91	29.55	28.70	28.96	29.45	30.28	31.66	33.20	35.03	36.59	39.97	45.40	49.17
Palmer	21.85	21.85	21.14	21.91	21.23	21.65	23.13	23.65	24.21	24.89	28.60	33.03	34.53
Petersburg	21.12	21.46	21.24	22.02	22.17	23.01	24.03	24.29	25.43	27.11	29.92	33.79	35.83
Seward	22.50	22.25	21.77	22.36	21.94	23.05	24.08	24.73	25.44	26.80	31.57	36.41	37.75
Sitka	21.01	22.20	21.82	22.70	22.44	23.23	24.02	24.90	25.42	26.32	29.62	33.17	32.54
Valdez	N/A	N/A	N/A	24.60	24.50	25.31	26.67	28.42	28.52	29.03	34.02	33.49	39.17
Seattle	17.70	17.90	N/A	N/A	16.69	17.36	18.45	19.08	19.63	20.71	23.69	26.81	27.45

^aAt home food costs.^bChange in combination of forty-five food items used in market basket.

Source: "Retail Prices of 45 Food Items in Thirteen Alaska Cities," Palmer: Alaska Agricultural Experiment Station.

(Taken from Tussing and Thomas, 1974)

TABLE 4

Average Annual Food Expenditures for Twenty-four
Alaska Communities (October 1972 Survey)
and Comparisons with Anchorage Data

Alaska Community	Expenditures Per Household	% of Anchorage Food Expenditures Per Household	Expenditures Per Person	% of Anchorage Food Expenditures Per Person
Anchorage	\$2,907	100	\$ 971	100
Barrow	3,878	131	954	98
Bethel	4,156	140	950	98
Cold Bay	3,033	104	1,178	121
Cordova	3,175	107	1,006	104
Dillingham	4,420	149	1,319	136
Emmonak	3,103	105	601	62
Fairbanks	3,206	103	1,035	107
Fort Yukon	4,426	150	1,070	110
Haines	3,858	130	1,024	105
Juneau	2,879	97	920	95
Kenai	3,436	116	987	102
Ketchikan	3,625	122	731	75
Kodiak	3,862	130	1,163	120
Kotzebue	4,484	151	1,030	106
Nenana	4,129	139	1,214	125
Nome	3,406	115	902	93
Palmer	3,388	114	942	97
Seward	3,244	110	894	91
Sitka	4,150	140	1,145	118
Tanana	5,340	180	951	98
Valdez	3,369	114	1,193	123
Wrangell	2,653	90	884	91
Yakutat	4,255	144	1,324	136
Summary - All locations	3,185	103	978	101

Source: State of Alaska, Division of Personnel, *Survey of Salaries and Benefits, Housing and Food Costs and Salary Recommendations, Part III Housing and Food Costs*, December 1972

(Taken from Tussing and Thomas, 1974)

Rural Alaskan Economics: Although some villages owe their locations to aboriginal subsistence patterns involving fishing sites, caribou migration routes and various animal populations, others are situated according to more recent developments including gold camps, river transportation routes and airstrips. In some cases, the present location of settlements and villages reflects old patterns or activities which no longer exist; and in others, natural and/or man-made changes have created a hostile environment for village life.

Poverty is said to be a state of mind. Although both native and white rural Alaskans do not think of themselves in those terms, living conditions in most rural areas would be equated with poverty based on inadequate lighting, the lack of central heating or plumbing, and fresh fruits and vegetables. According to Tussing and Thomas (1974), the lowest per capita incomes were found in rural divisions with predominantly native populations (e.g., Angoon, Wade Hampton, Bethel, Kobuk).

Poverty in rural Alaska is related to high import costs and little or no local cash income. A dollar expended for a gallon of fuel oil or a head of lettuce leaves the village...never to return. Under current conditions, there is very little cash flow within the village communities.

Energy Problems in Villages and Remote Areas: To most Americans, the energy crisis is something new. To rural Alaskans, it is a way of life. Isolation, high transportation costs and unforgiving winters have equated energy conservation with survival. Inflation and the recent "energy crisis" have brought an added increment of economic hardship.

Heat is a precious commodity in the Alaskan arctic. All communities in the more isolated areas are forced to import expensive fossil fuels to maintain adequate communications and living standards. Most of the

fresh produce consumed by such villages is also imported. Electricity, where present, is generated by gasoline- or diesel-powered generators, resulting in an additional fossil fuel demand -- and a dependence on exterior supply.

The high cost of imported fossil fuels in the outlying communities restricts improvements and depresses the standard of living. The high cost of fresh and canned vegetables creates an additional economic stress on these communities and is a source of dietary problems in the more isolated populations during the winter.

Before any discussion of Alaska's geothermal and wind potential can be undertaken, it is necessary to address two important issues affecting the State's future. These are the Native Land Claims Settlement Act and the further development of Alaska's onshore and offshore oil and natural gas reserves.

The Alaska Native Claims Settlement Act: Stewart French (1972) has conducted an excellent analysis of the Native Claims Settlement Act. French's introductory statement introduces the reader to the social and economic impact of the Act on the peoples of Alaska:

"No event since the 1968 Prudhoe Bay oil discovery, and perhaps even Statehood in 1958, has had as great a potential social and economic impact on the people of Alaska--both Native and non-Native--as has the enactment of the Alaska Native Claims Settlement Act (Public Law 92-203, 85 Stat. 688). The Act is a complex legislative resolution of a 104-year old question and a source of conflict that have been bars to full achievement of the social and economic aspirations of Natives, non-Natives, and the State."

The Native Claims Settlement Act provides that the Native peoples of Alaska will receive:

- (1) legal title to 40 million acres of land together with mineral estate, plus nearly a billion dollars from federal appropriations and shared revenue from state and federal mineral leases;
- (2) membership in regional (profit) and village (profit or non-profit) stockholder corporations;
- (3) an Alaskan Native Fund, totaling \$462,5 million in federal monies, to be paid over 11 years; and \$500 million derived from 2% of the revenues acquired from mineral leases on state and federal lands.

Among many other benefits, new mechanisms and sources of support for village improvement will become available, including help from the respective regional corporations. The potential now exists for cooperative village development programs and economic experiments, as joint enterprises between native and federal and/or state agencies.

The Alaskan Native, represented through 12 regional native corporations and a multitude of village corporations, will become one of the largest landowners in the State along with the federal and state governments. The growth and development policies of these corporations will play key roles in shaping the State's future economic, environmental and social systems.

Petroleum Impact: Completion of the trans-Alaska oil pipeline, with an estimated total cost of over \$6.5 billion, is scheduled for July, 1977. Employing over 20,000 workers during peak construction periods, the pipeline is the largest privately-financed project in history.

The impact of this construction on Alaska's social, economic and governmental institutions has been considerable and may not be totally understood for several years to come. The very foundations of the State's economic structure are being altered by this first large-scale development of an Alaskan energy source. Routing of the natural gas

pipeline from the North Slope is another major issue which must be decided within the next year or so. If the trans-Canadian pipeline the next year or so. If the trans-Canadian pipeline is selected rather than the trans-Alaskan route, it is possible that the State will experience a significant slowdown in economic activity.

What lies ahead? By 1978 only two major oil fields (Cook Inlet and North Slope) containing an estimated 20 billion barrels of oil will be in a production mode; however, the recoverable petroleum reserves in Alaska total 76.1 billion barrels. Continuation of the "energy crisis" in the "lower forty-eight" and the depletion of other domestic petroleum resources over the next few years will most certainly mean additional exploration and development of Alaska's onshore and offshore oil and gas reserves. Needless to say, the impact of these activities on the State will be extensive.

ENERGY ECONOMICS

Statewide Requirements

The electric utilities operations in the State of Alaska bear little resemblance to the complex systems of the lower 48 states. Although Alaskan generation and transmission equipment is modern and efficient, the great distances between population centers prohibit grid system interties, and there is no long-range service to outlying rural communities. The Alaskan power scene is much like that which existed in the United States before the rural electrification drive which took place in the early 1930's.

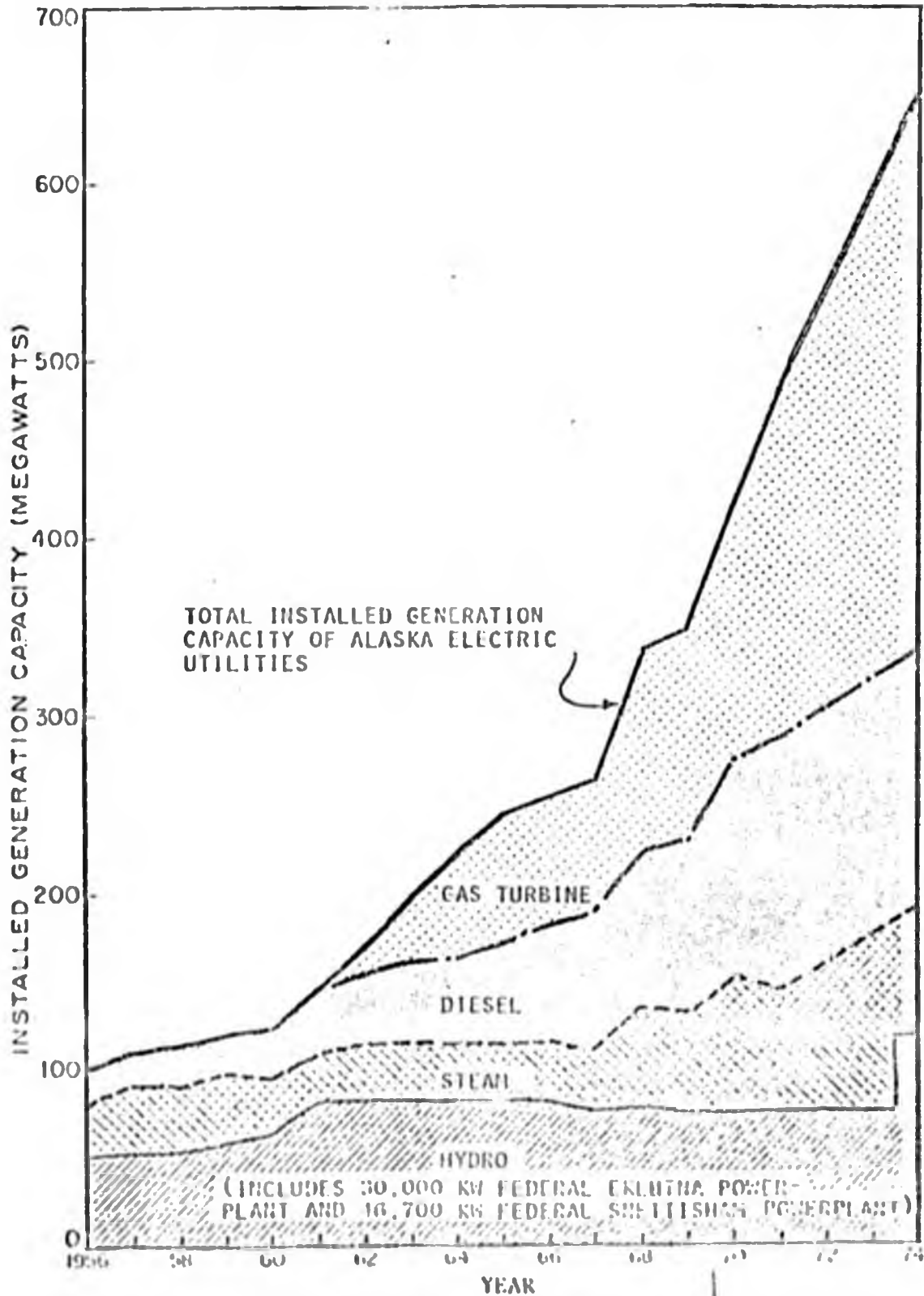
Alaskan electricity is derived from several sources including hydro-electric, oil-fired and coal-fired steam, gas turbine and diesel-generating systems (Figure 1). Figure 1 shows the relatively large contribution of diesel-electric power plants. The increasing use of diesel-electric power is creating a problem in Alaska which geothermal energy sources could help to alleviate. Although the portability and relatively low capital cost of diesel-electric plants has brought electricity to many communities in rural Alaska, the high cost of fuel and accompanying maintenance problems are escalating the cost of electricity in remote areas.

Urban Electric Power

Anchorage, Fairbanks, Juneau and Ketchikan have electric utility systems comparable to those in small cities in the other states (without the interties with larger systems). In 1970 these systems were providing electricity to homes in Alaska at an average rate of 3.0¢ per kWh

ALASKA ELECTRIC UTILITIES

INSTALLED GENERATION - YEARLY GROWTH BY TYPE



(Taken from Alaska Electric Power Statistics, 1960-1970)

Figure 1: Diagram showing cumulative and individual growth curves for electric generating plants (by type) in Alaska.

as compared to 2.10¢ per kWh for the rest of the nation. This is a small differential considering the higher cost of living in Alaska, and the absence of power-sharing with larger systems. As of 1970, the electric power consumed by the urban communities (which include unusually large peripheral suburban areas) accounted for 75% of the yearly electricity consumed in the State of Alaska. Some idea of the present variation between power costs in Alaska and those in another state can be seen in Table 16.

The success of urban power systems and the related abundance of accessible fossil fuels indicate that the bulk of the State's electrical power requirements can be met by such facilities. The large natural gas reserves and relatively untouched hydroelectric potential of the south-central region should insure an adequate supply of low-cost electricity to the Anchorage area for many years to come. The coal resources of interior Alaska, coupled with access to crude from the trans-Alaska pipeline, should more than meet power requirements of the Fairbanks area, the second largest urban area in the State. The Juneau area is presently supplied with hydroelectric power, and the hydroelectric potential of the area is more than adequate to meet projected needs over the next 50 years. It is unlikely that geothermally-produced electricity could be economically competitive in the foreseeable future with the present systems in these cities.

Alaskan urban energy use patterns are similar to those of the 48 states, in that consumption approaches available supply until limits are established by economic constraints. The usual diurnal and seasonal load cycles are amplified by Alaskan winters. Figure 2 shows monthly cycles and peak loads for Anchorage, Fairbanks and Ketchikan from 1963 to 1971.

MONTHLY PEAK LOADS

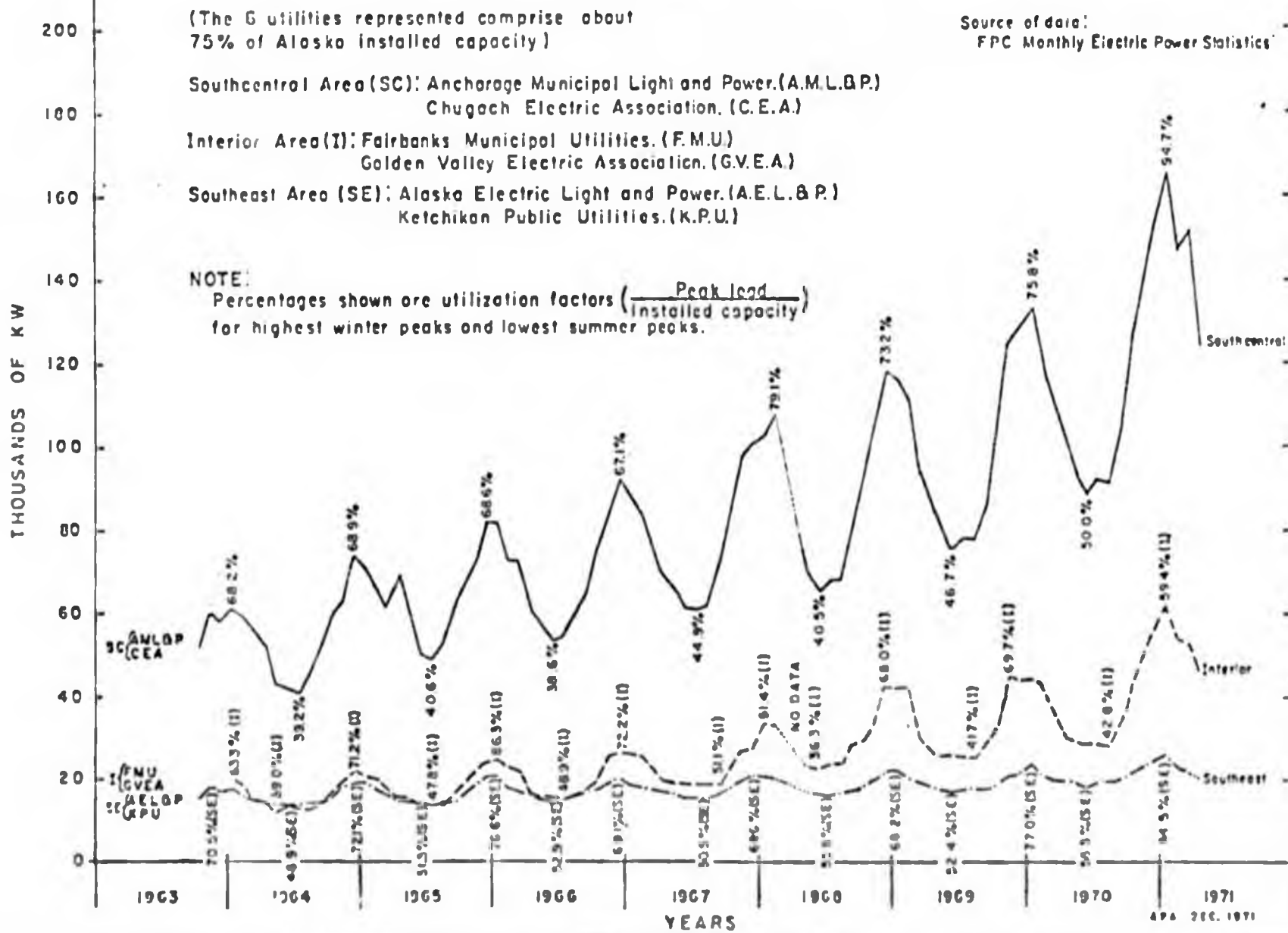


Figure 2: Monthly peak loads in three Alaskan geographical areas (on major utilities; most rural suppliers not included)

Energy Consumption in the Rural Communities

Larger Communities: Small communities, such as Barrow, Bethel, Cold Bay and Kotzebue, are either too remote to use the large power plants and grids which supply Anchorage and Fairbanks, or are unable to use local energy resources (if they exist). For instance, Cold Bay and Bethel have no local energy resources, but Kotzebue is in potential range of rich but undeveloped coal fields. Barrow is powered largely by local subsurface gas fields, but cost rate increases and pressure depletion may make this usage unattractive in the near future. The above cities are powered by small, privately-owned utility companies (about 0.7 to 3.0 MW).

The important point here is that these communities (except Barrow) derive most electricity and heat from expensive fuel oil which is transported over large distances. The utilities currently pay about 40¢/gal. Costs to individuals now range from 50¢ to above \$2/gal. in the bush communities. The requirement for more highly refined grade number one versus grade number two fuel oil, due to the cold, increases the oil costs.

The Villages: Of the nearly 200 small villages in Alaska with 50 to 300 inhabitants, about 50 communities are powered by the Alaska Village Electric Cooperative (AVEC). Many other villages have no central source of electricity. Energy use patterns vary considerably, but electricity is chiefly used for lighting, communications and household appliances. Heat is mostly derived from oil stoves. The accelerated use of over-snow and all-terrain vehicles has caused a recent increase in gasoline consumption in the bush communities.

A vivid example of the energy situation in a typical Alaskan native village is presented in a paper entitled "Chevak's Current Energy Picture: A Study of a Southwestern Alaskan Eskimo Village" (see Appendix D).

Rural Electric Power

As mentioned previously, the lack of interties between urban electric utility systems prevents power distribution from larger systems to remote areas. There are many communities throughout the State which have less than 1,000 people and which must produce their own power.

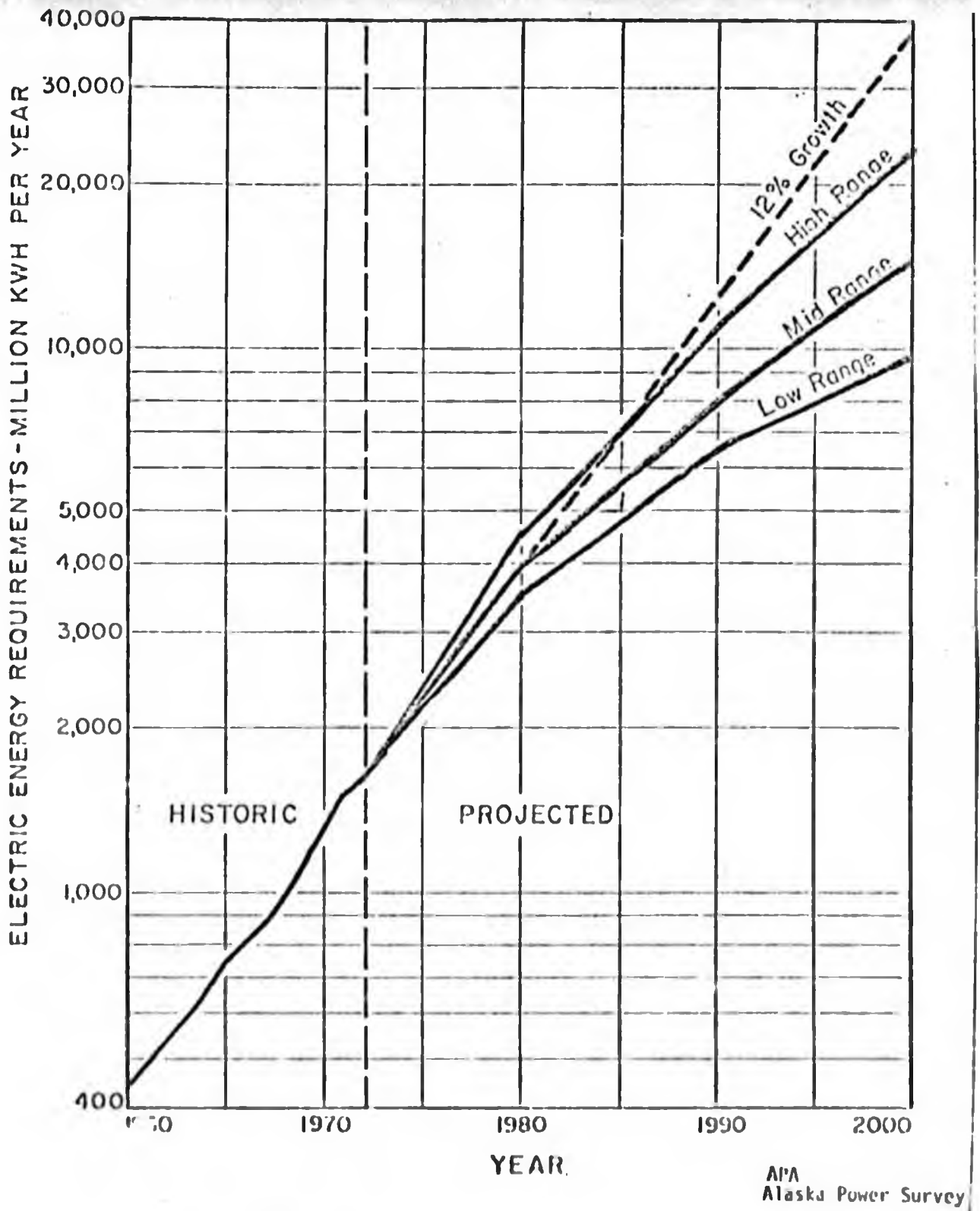
The agency which has had the most experience in such systems is the Alaska Village Electric Cooperative, Inc. (AVEC). This non-profit power co-op was formed in 1967, and received its initial operating capital from the Rural Electrification Administration of the U. S. Department of Agriculture. Since its formation, AVEC has installed power systems in 48 Alaskan villages which previously had little or no electricity. These systems range in size from 100 KW at Shaktolik, a small Eskimo village on Norton Sound, to the 450 KW plant at Savoonga on St. Lawrence Island in the Bering Sea.

Due to the small power needs of these villages, diesel-electric generators have been installed. But the high diesel fuel and maintenance costs in these remote areas have resulted in power costs up to 20¢ per kWh. This rate is highly damaging to the village consumer as it is roughly six times the cost of electricity in other parts of Alaska; the average annual cash income of rural residents is far below that of the urban population, and this imposes the highest cost on those least able to pay.

Forecast of Alaska Power Requirements

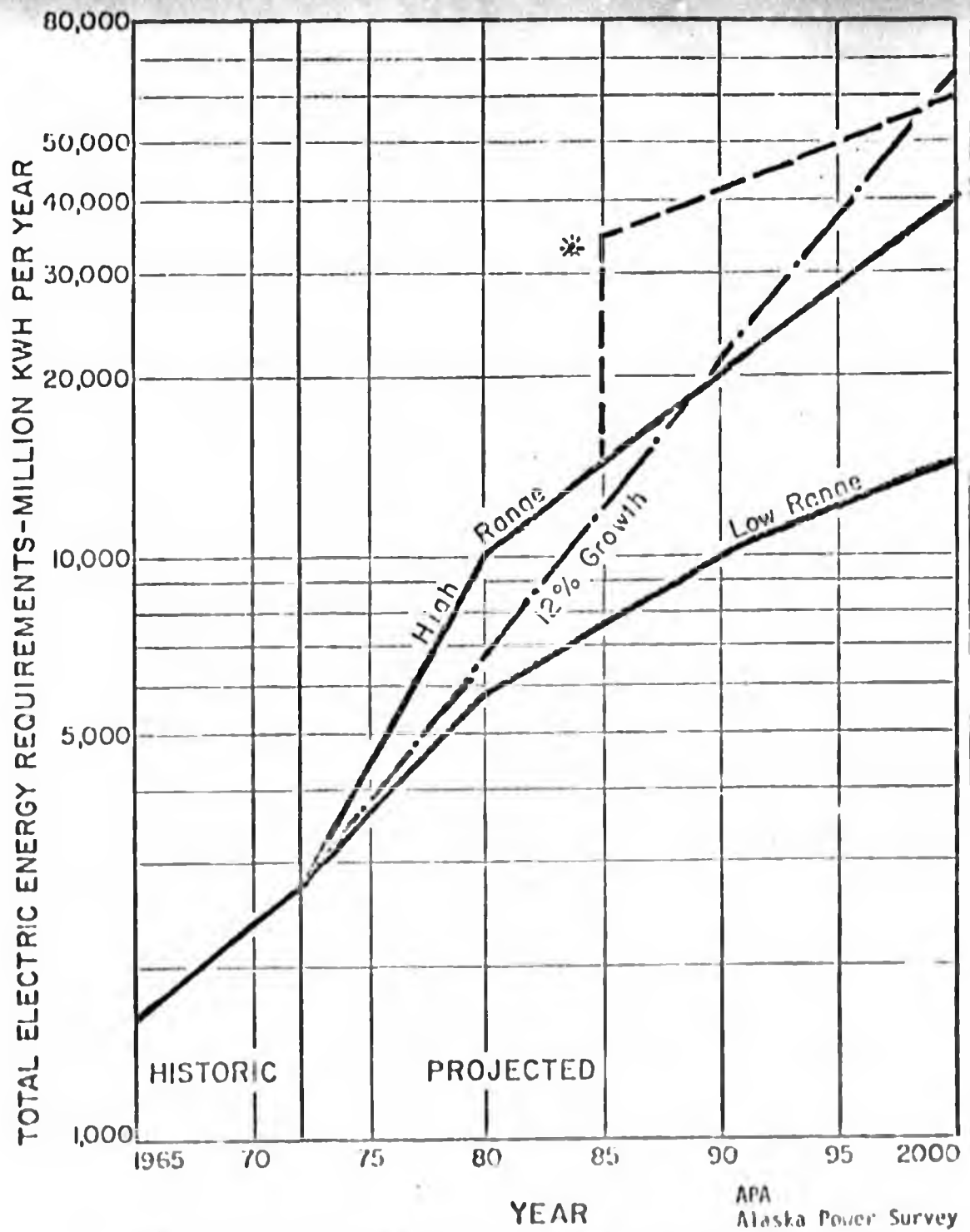
A current overview of statewide power system needs and alternatives is contained in the 1974 Reports of the Advisory Committee for the Federal Power Commission's Alaska Power Survey. The more important points are summarized below (see Figures 3, 4 and 5).

1. The power survey indicated statewide electric energy requirements of 2.6 billion kilowatt-hours in 1972 and installed generating capacity of one million kilowatts in mid-1973. The largest portion of the requirements is for the electric utility system (1.6 billion kilowatt-hours in 1972) and utility loads have been increasing about 12 percent per year (doubling every 5 to 6 years). Self-supplied industrial power systems and national defense installations account for the remainder of the power requirements.
2. Requirements of 3 to 10 million kilowatts of new generating capacity will be needed by the year 2000 under alternative assumptions for future development in the State.
3. In recent years, most new generator additions have been oil and natural gas-fired units, and in 1972 about 60 percent of the State's total electric energy came from these premium fuels. Based on current trends, this percentage may increase to about 90 by 1980; hence the very real concern for considering alternative power sources.
4. Unlike the rest of the U.S., Alaska does not have extensive power grid systems. The load centers in the various regions of the State are served by isolated power systems. Anchorage and nearby areas in the Matanuska-Susitna and Kenai Peninsula Boroughs



(Taken from Alaska Electric Power Statistics 1960-1970)

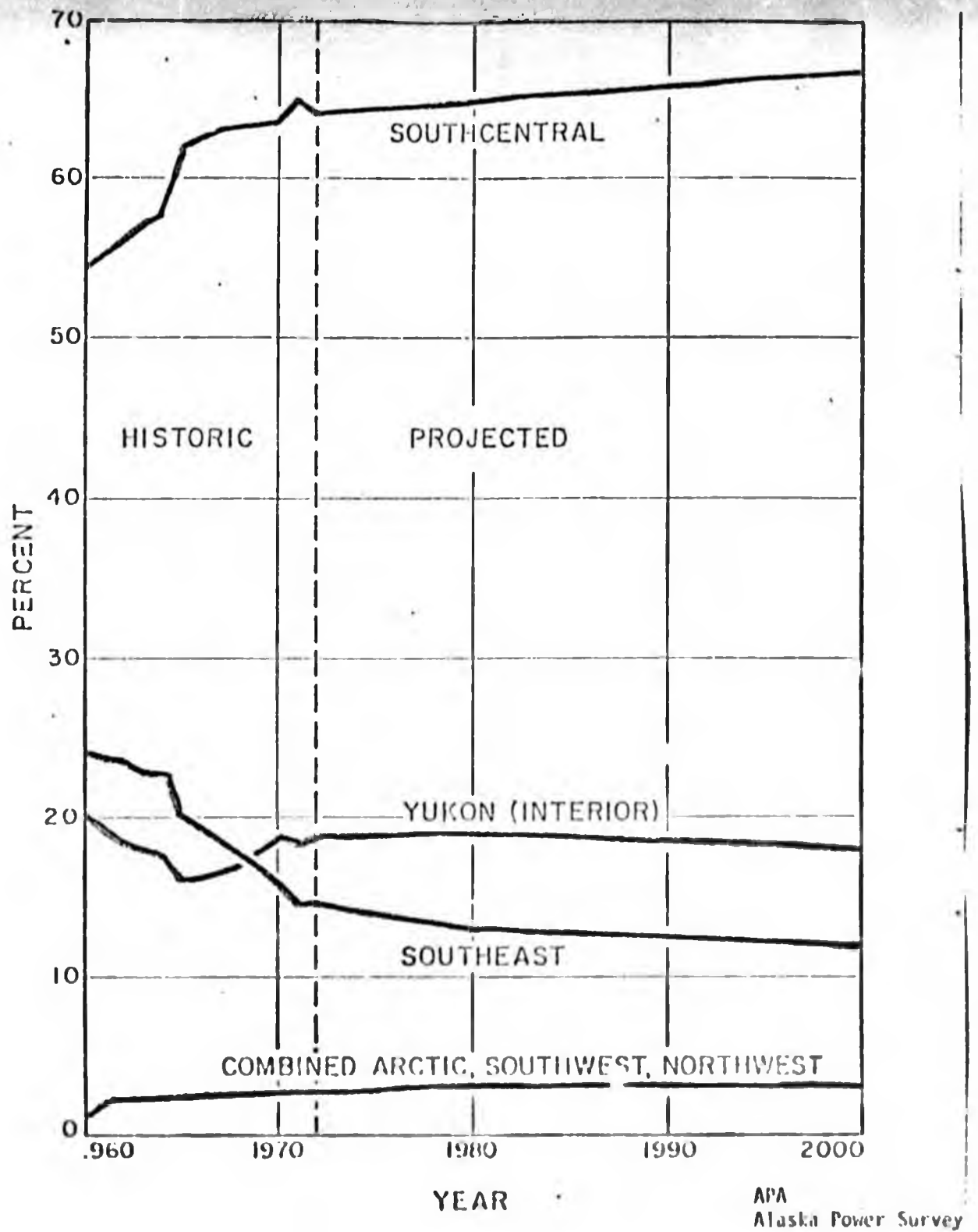
Figure 3: Utility system power requirements 1960-2000.



* SHOWS EFFECT OF LARGE INDUSTRIAL LOAD, SUCH AS A NUCLEAR FUEL ENRICHMENT PLANT OR OTHER VERY LARGE ENERGY INTENSIVE FACILITY.

(Taken from Alaska Electric Power Statistics 1960-1970)

Figure 4: Total Alaska Power Requirements 1965-2000.



(Taken from Alaska Electric Power Statistics 1960-1970)

Figure 5: Regional Utility Power Requirements, Percent Statewide Total

account for roughly one-half of the total statewide power requirements. The Fairbanks area and a handful of coastal cities from Ketchikan to Kodiak account for most of the rest.

5. There is a unique set of power concerns for Alaska's remote cities and villages. These number around 175 and account for around 2 to 3 percent of total State power needs. Included are a few fairly large regional centers (Bethel, Nome, Kotzebue, and Barrow with populations of 2,000 to 3,000). Most of the rest have populations of 100 to 500. Barrow now has access to natural gas; most of the rest are totally dependent on costly, imported petroleum products for their energy needs. Many of the smaller villages don't even have power systems.

6. There is likelihood the major railbelt load centers will be fully interconnected in about 10 years, and the railbelt area power requirements will be about 70 to 80 percent of total State needs for the foreseeable future. There are possibilities that regional power systems will develop in other portions of the State, but many of the remote cities and villages will likely remain isolated from larger power systems for the foreseeable future.

ALASKA'S GEOTHERMAL POTENTIAL

Geothermal Energy in the National Interest

Until the last few years, the United States has not shown much concern or interest in the assessment or development of its geothermal resources. More recently, however, possible worldwide energy shortages, growing pollution problems and the awakening of a national environmental conscience have developed an accelerated interest in geothermal energy. This new cognizance has been reinforced by the Congress with the passage of the "Geothermal Steam Act of 1970" (84 Stat 1566), which authorizes and delineates geothermal resource "provinces" and "areas," and defines leasing and regulative policies for federal lands.

U. S. Geological Survey Circular 647, "Classification of Public Lands Valuable for Geothermal Steam and Associated Geothermal Resources" (Godwin, et al., 1971), presents the criteria for determining which federal lands are classifiable as geothermal steam and associated geothermal resources lands under the Geothermal Steam Act of 1970 (84 Stat 1566). This publication includes a map of Alaska showing lands classified for geothermal resources as of December 24, 1970 (Figure 6).

The Alaska Geothermal Resources Act of 1971

The State of Alaska enacted a Geothermal Resources Act in 1971, which establishes procedural, regulatory and administrative policies governing future exploration, development and production of geothermal resources on state lands (see Appendix C).



Figure 6: Map of Alaska showing lands classified for geothermal resources effective December 24, 1970. Numbers correspond to localities shown in inset. From U. S. Geological Survey Circular 647, Codwin, et al., 1971.

1. Pilgrim Springs
2. Geyser Spring Basin and Okmok Caldera
3. Wrangell Mountains

Classification of Geothermal Resources

A comprehensive assessment of potential Alaskan geothermal resources or targets must consider the following:

1. Surface Resources
 - a. Thermal springs
2. Subsurface Resources
 - a. Two phase reservoir systems (steam and water)
 - b. One phase reservoir systems (hot water)
 - c. Geopressured hot water reservoirs
 - d. Hot water reservoirs in sections with normal geothermal gradients
 - e. Hot dry rock
 - (1) Potential reservoir rocks; water injected from surface
 - (2) Impermeable rocks; reservoir space must be artificially created by hydrofracture or explosives
 - f. Hot dry rock in volcanic piles adjacent to subsurface magma bodies, or recently extruded plugs or domes
 - g. Subsurface magma tap

Previous Work and Publications

The earliest contribution to our knowledge of the geothermal framework of Alaska was G. A. Waring's "Mineral Springs of Alaska" (1917), a pioneering work which included data on the geologic setting, chemistry, and thermometry of Alaskan hot springs which were known to the author in 1917. This work, and the accompanying spring location map, was the authoritative reference for over 50 years.

In 1971, Ms. Norma Biggar, Geophysical Institute, University of Alaska, compiled a revision of Waring's map (Figure 7), which showed the location and temperature range of known Alaskan thermal springs.

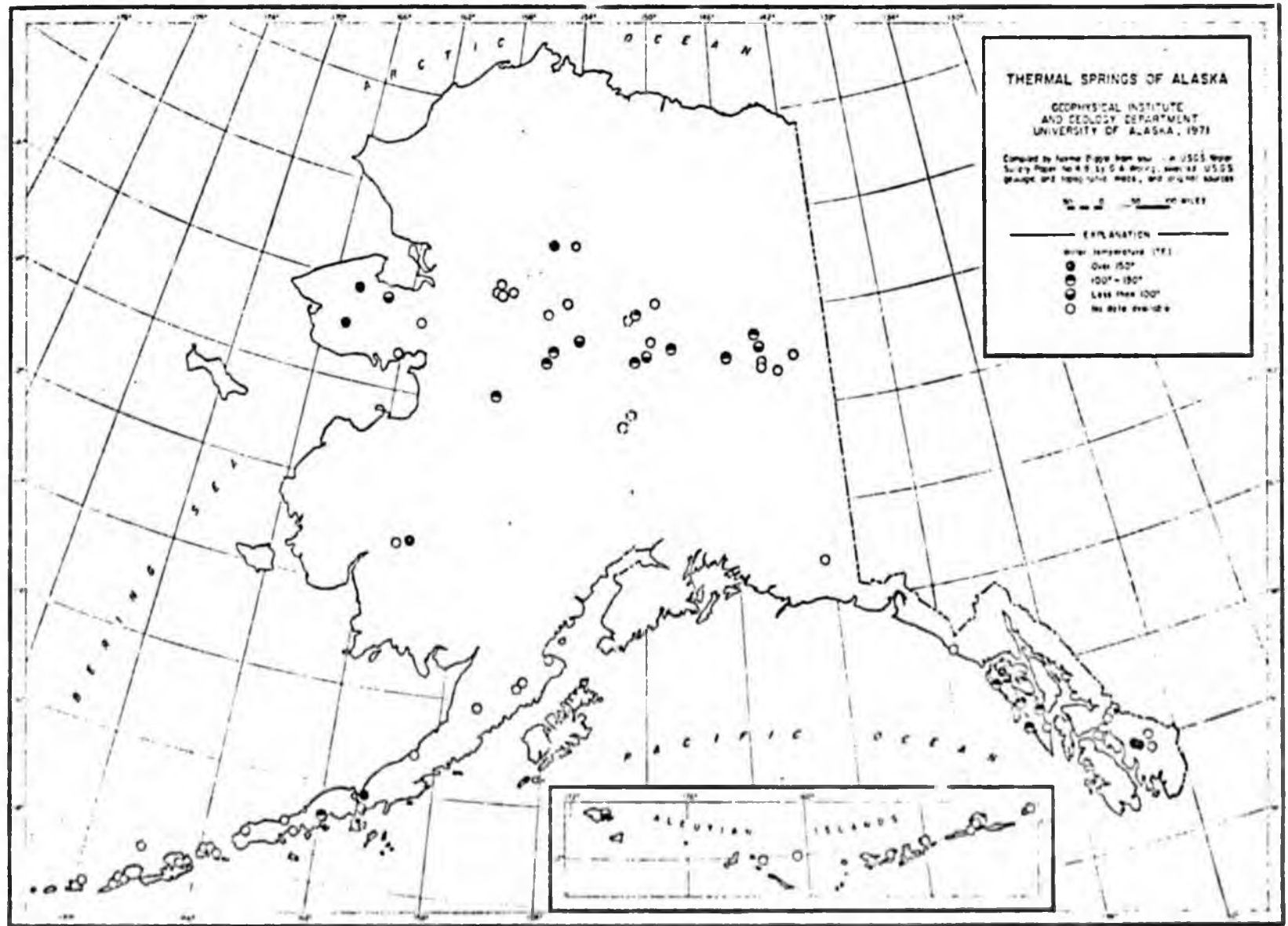


Figure 7: Location map of Alaskan thermal springs as compiled by Ms. Norma Biggar in 1971.

Biggar's map was accompanied by relevant tables of data on spring water temperature and chemistry. Subsequently, T. P. Miller, Alaskan Branch, U.S.G.S., produced a similar location map which included more recently-discovered thermal springs and new chemical and temperature data from the collaborative work of Ivan Barnes, of the U.S.G.S. (1973). A more recent report entitled "Geologic setting and chemical characteristics of hot springs in West-Central Alaska" (Miller, et al., 1975), provides additional data on the geothermal potential of thermal springs in that region.

Ms. Biggar completed a University of Alaska M.S. dissertation on "A geological and geophysical study of Chena Hot Springs, Alaska" in May 1973. The thesis investigation included geomagnetic, microseismic and soil temperature surveys, in addition to site geology and geochemistry (Biggar, 1973).

Forbes, et al. (1975), conducted geophysical studies of Pilgrim Springs in summer 1974. The data and findings of this study are contained in "A Geophysical Reconnaissance of Pilgrim Springs, Alaska," a report published by the Geophysical Institute, University of Alaska.

U.S. Geological Survey Circular #726, "Assessment of Geothermal Resources of the United States - 1975," contains new and relevant material on Alaska's geothermal resource potential, with particular attention given to hot-water and high-temperature hydrothermal convection and volcanic systems.

Heat Flow and Thermal Gradients

High heat flow and/or geothermal gradients are the characteristic signatures of economically significant geothermal anomalies. Although

high heat flow values can be obtained on many active Alaskan volcanoes, published heat flow determinations in drill holes have not exceeded 2.6 hfu (one heat flow unit = 1 microcalorie/cm²/sec.).

We know very little about the thermal gradient at Alaskan localities other than those located in the petroleum provinces, and there are only a few reliable heat flow measurements reported for Alaska (Lachenbruch and Marshall, 1969; Lachenbruch, personal communication).

According to Lachenbruch (personal communication), no more than 20 reliable heat flow measurements have been recorded from Alaskan localities although temperature data are available for many holes which have been drilled in Alaskan petroleum provinces. Heat flow values calculated from data taken from drill holes near Cape Thompson, Barrow and Umiat (Lachenbruch and Marshall, 1969) were not far from the world average, and low to average values (1.3 microcalories/cm²/sec.) have been reported by Sass and Munroe (1970) for the Amchitka deep drill holes.

Heat flow data have been taken from other drill holes in the Cook Inlet and Prudhoe Bay areas, but analyses of these data are still in process (Lachenbruch, personal communication). Preliminary data from a deep test hole near Eielson Air Force Base (Fairbanks district), however, indicates that the heat flow is anomalously high at this locality (Lachenbruch, personal communication). Although it is not known at this time whether the anomaly is more than 1.5 times that of the worldwide average of 1.5 microcalories/cm²/sec., the presence of Chena and Circle Springs, and other thermal springs in the Salcha River drainage, indicates that the Yukon-Tanana Uplands deserve additional study.