UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Conservation Division
244 Federal Building
Tacoma 2, Washington

August 9, 1957

Territorial Department of Mines
Territorial Bldg.,
Juneau, Alaska

Gentlemen:

Under separate cover we are mailing to you a copy of our report "Water power possibilities of Sheep Creek, Carlson Creek, Lake Dorothy and Turner Lake near Juneau, Alaska."

Very truly yours,

F. A. Johnson
Regional Hydraulic Engineer

Encl. S/C

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Preliminary report

WATER POWER POSSIBILITIES OF SHEEP CREEK, CARLSON CREEK, LAKE DOROTHY AND TURNER LAKE NEAR JUNEAU, ALASKA

F. A. Johnson
February 1957

This preliminary report is distributed without editorial and technical review for conformity with official standards and nomenclature

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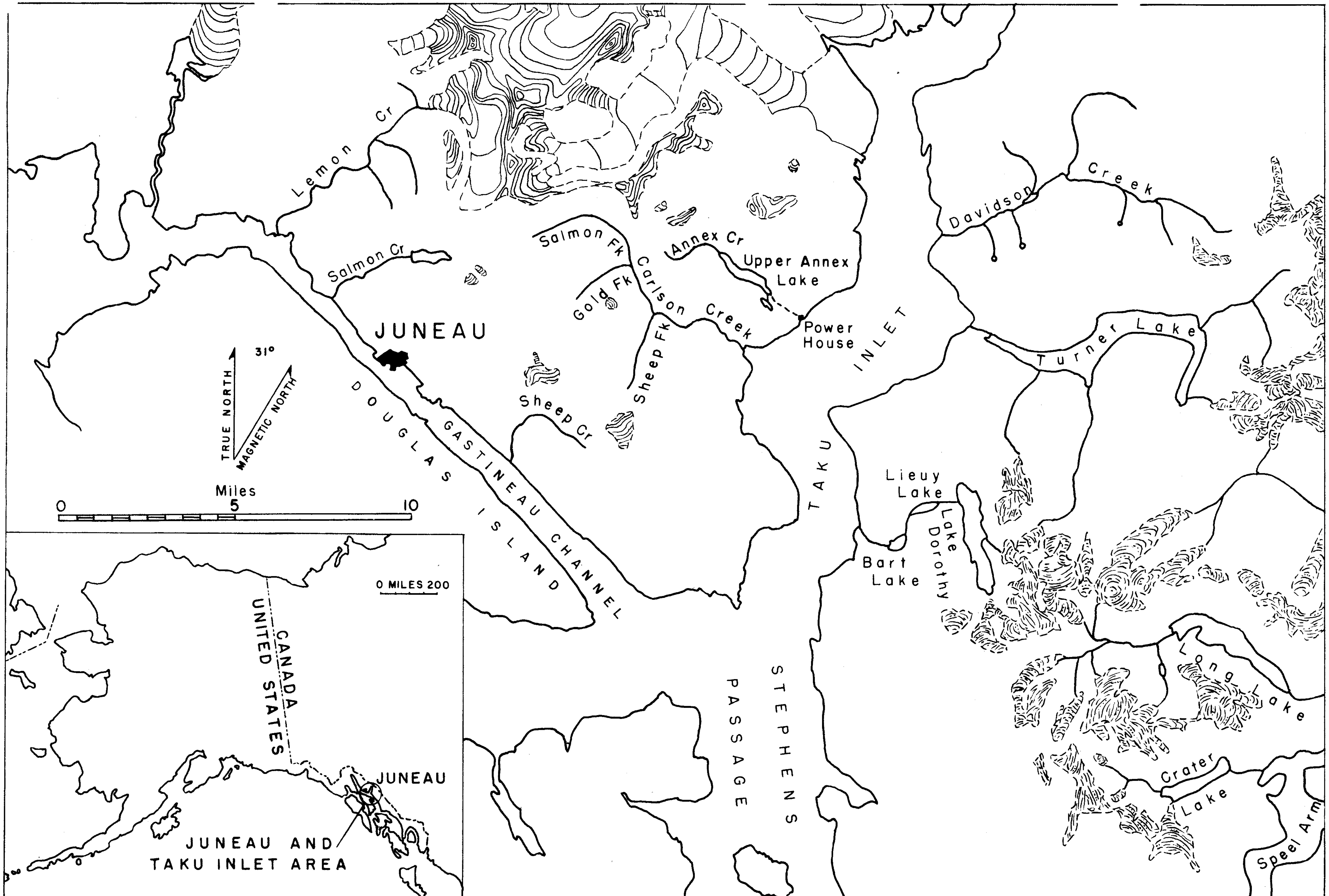

Figure 1. Location Map

WATER POWER POSSIBILITIES OF SHEEP CREEK, CARLSON CREEK, LAKE DOROTHY AND TURNER LAKE NEAR JUNEAU, ALASKA.

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Introduction

This report is one of a continuing series intended primarily to assist in the classification of lands within the public domain as to their value in the development of hydroelectric power. It describes the power possibilities of sites of Sheep Creek and Carlson Creek, and of Lake Dorothy and Turner Lake. The Carlson Creek and Sheep Creek basins are in mountainous terrain within about 10 miles of Juneau. The outlet of Lake Dorothy is 17 miles southeast of Juneau and that of Turner Lake is about 17 miles east. Both lakes are separated by Taku Inlet from Juneau and favorable industrial sites.

Information is presented concerning the climate, streamflow, topography and other features that are pertinent to the development of water-power in this area. Recent topographic maps, surveys of the power sites, geologic examinations, and climatic and water supply data were used in the preparation of the report.

Investigations were made as early as 1908 on Turner Lake, 1910 on Sheep Creek, 1913 on Carlson Creek, and 1929 on Lake Dorothy. Excepting Sheep Creek, these sites have not been developed. The power of Sheep Creek was partly developed without storage regulation from 1910 to 1944, but the project is now inactive. Applications for use of the Carlson Creek and Turner Lake sites have been made to the Forest Service; and an application for development of the Lake Dorothy project has been made to the Federal Power Commission. None of these applications are now pending.

The use of a substantial part of the potential power of these sites would depend on the creation of new industries in the Juneau area. One possibility that has been under recent consideration is the manufacture of wood pulp. Development of power at Turner Lake might be considered as a supplement to a project at Lake Dorothy, since the transmission facilities by underwater cable across Taku Inlet, and by power line to the vicinity of Juneau, then could be combined. Development of either the Carlson Creek or Sheep Creek sites might be considered as smaller, independent projects. They would be favored by their proximity to the industrial sites and domestic markets of Juneau.

In schemes for fairly complete utilization, the power available 100 percent of the time is 2,500 kw on Sheep Creek, 5,550 kw on Carlson Creek, 17,800 kw at Lake Dorothy and 3,610 kw at Turner Lake.

Previous investigations and reports

The results of a number of previous investigations have been summarized in a report entitled "Water Powers of

Southeast Alaska", published jointly by the Federal Power Commission and Forest Service in 1947. This report contains descriptions of the power sites, proposals for development, and estimates of the potential power. Information concerning Carlson Creek and TurnerLake is included in applications for permits on file in the Regional Office of the Forest Service, Juneau, and information concerning the Lake Dorothy proposal is in the files of the Federal Power Commission, Washington, D. C.

The Carlson Creek power site was investigated by the Alaska Juneau Mining Company in 1913. A copy of an unpublished report concerning the investigation is on file in the office of the Geological Survey, 244 Federal Building, Tacoma, Washington.

A discussion of the Carlson Creek and Turner Lake sites is contained in a publication entitled "Water-Powers of Southeastern Alaska", 1924, a report to the Federal Power Commission by J. C. Dort.

An investigation of the power possibilities of Lake Dorothy was made by the Bureau of Reclamation, and the results are given in "Status Report on the Lake Dorothy Project, Alaska" Juneau, Alaska, April 1955. The report includes a discussion of the power supply and markets of the Juneau area; a plan of development for the Lake Dorothy project, and a description of geologic conditions in the power site. The report was prepared by the District Office, Juneau, Alaska.

A number of reports entitled "Water-Power Investigations in Southeastern Alaska" have been published in Geological Survey Bulletins 662-B, 692-B, 712-B, 714-B and 722-B by G. H. Canfield. These reports consist mainly of compilations of the streamflow records and descriptions of the gaging stations. They include records of daily discharge of Carlson Creek and Sheep Creek for the periods of operation between 1916 and 1920. The operation of the gages and the measuring conditions are discussed. The records of monthly discharge for these stations are summarized in Bulletin 836-C, "Surface Water Supply of Southeastern Alaska, 1909-1930," by Fred F. Henshaw. This report was prepared in cooperation with the Federal Power Commission and Forest Service, and contains a discussion of factors having to do with runoff characteristics and power development.

A record of monthly discharge from Turner Lake for the period May 1908 to March 1909 is published in the report of 1947, "Water Powers of Southeastern Alaska".

Monthly discharge records for Dorothy Creek for the period from October 1929 to September 1945 are also published in "Water Powers of Southeast Alaska", 1947.

With some revisions, the monthly figures for Sheep Creek, Carlson Creek and Dorothy Creek to September 1950 will be published in a forthcoming water supply paper of the Geological Survey. Data taken from a preliminary manuscript of this compilation paper are given in Tables 16, 17 and 18 of this report.

Geological examinations of the Carlson Creek Sheep Creek and Turner Lake sites were made by George Plafker of the U. S. Geological Survey. A report on these examinations "Geologic investigations of proposed Sheep Creek, Carlson Creek and Turner Lake power sites, Alaska", 1956, has been released to the open-files. Copies of the report are available for inspection at the following offices of the Geological Survey: Library, Room 1033, General Services Administration Bldg., Washington, D. C.; Brooks Memorial Mines Bldg., College, Alaska; Room 117, Federal Bldg., Juneau, Alaska; Room 210 E. F. Glover Bldg., Anchorage, Alaska; Library, 4 Homewood Place, Menlo Park, Calif.; Room 468 New Customhouse, and Library, Federal Center, Denver, Colorado; 1031 Bartlett Bldg., Los Angeles, Calif.; Room 724 Appraisers Bldg., San Francisco, Calif.; 504 Federal Bldg., Salt Lake City, Utah; South 157 Howard St., Spokane, Wash. and also at the Territorial Department of Mines, Territorial Bldg., Juneau, Alaska. Copies from which reproductions of text and illustrations can be made at private expense are available at 4 Homewood Place, Menlo Park, California.

Maps

A map entitled "Plan and profile, Sheep Creek and Carlson Creek near Juneau, Alaska, Miscellaneous Dam Sites" was published by the Geological Survey in 1953. The scale of the plan map is 1:24,000 and the contour intervals are 20 and 40 feet. Maps of dam sites on Carlson Creek, Sheep Creek and Turner Creek are at larger scale and with a contour interval of 10 feet.

The power sites and their related drainage areas are shown on the topographic maps of the Juneau A-1, B-1 and B-2; Taku River A-6, and B-6 quadrangles, Taku River and Juneau, Alaska Reconnaissance Series. Except for the Reconnaissance Series, these maps were published by the Geological Survey from 1949 to 1952 on a scale of 1:63,360 and with contour interval of 100 feet. The reconnaissance maps were published by the Geological Survey in 1953 on a scale of 1:250,000 and with contour intervals of 200, 250 and 500 feet. They show the system of waterways and general topography of a large area in the region of Juneau. In addition to the maps of the regular topographic series there is a special topographic map entitled Juneau and Vicinity which includes the area at Juneau, the Sheep Creek basin and a portion of the Carlson Creek Basin. The scale is 1:24,000 and the contour interval is 40 feet.

A map of the Dorothy Creek basin prepared for the

Bureau of Reclamation has been printed on a scale of 1:7,200 and with contour interval of 20 feet. Copies are available for examination in the district office, Bureau of Reclamation, Juneau, Alaska, and in the office of the Geological Survey, 244 Federal Bldg., Tacoma, Washington.

A map of a dam site on Carlson Creek was prepared by the Alaska Gastineau Mining Company in 1920. The original scale was 1 inch equals 40 feet or 1:480, and the contour interval is 40 feet. A photostatic copy of this map at reduced scale is on file in the office of the Geological Survey, 244 Federal Building, Tacoma, Washington.

Soundings in Taku Inlet, Gastineau Channel and a portion of Stephens Passage are shown on Chart 8235 of the U. S. Coast and Geodetic Survey. The chart is on a scale of 1:40,000, and the soundings are in fathoms.

Geographic and topographic features

Sheep Creek basin

Sheep Creek flows into Gastineau Channel about 4 miles southeast of Juneau. It drains an area of about 6 square miles, ranging in altitude from sea level to above 4,000 feet. There is a growth of brush on the lower slopes, but above an altitude of about 1500 feet vegetation is very light. There are a few small cirque glaciers at the higher altitudes on north-facing slopes but these probably have a negligible effect on the seasonal or annual distribution of runoff.

The inactive power plant, as described in "Water Powers of Southeast Alaska", 1947, consists of three impulse wheels operated under a head of about 600 feet. These were connected to generators with aggregate capacity of 2,225 kw. Water formerly was conveyed to the powerhouse from a diversion dam at an altitude of 620 feet, through about half a mile of flume and half a mile of penstock. As it now exists, the conduit from the diversion dam to the forebay includes a 400-foot section of pipe and about 600 feet of tunnel. Both the pipe section and the flume upstream from the tunnel were in damaged condition in 1956.

A number of mines have been operated in the Sheep Creek basin, and much of the land is patented or in mining claims. These reportedly were not being worked in 1956. A transmission line from the Annex Creek power house to Juneau traverses the basin and follows the creek for about a mile and a half through the reservoir site. The Sheep Creek adit of the Alaska-Juneau gold mine has a portal in the reservoir site at the altitude of about 720 feet. Buildings of the Alaska-Juneau Gold Mining Co. (Portal Camp) are located here. There are a few buildings along Gastineau Channel near the mouth of the creek, and a small settlement called Thane.

A road extends from Juneau along Gastineau Channel to the mouth of Sheep Creek. From this point an aerial tram extends to within the reservoir site. A road about three quarters of a mile long extends from this tram through Portal Camp to the bottom of another aerial tram which extends up to the divide on the eastern side of the Sheep Creek basin. In addition there is a trail roughly paralleling the transmission line through the basin.

Carlson Creek basin

Carlson Creek drains an area of about 27 square miles. The course of the stream is generally from northwest to southeast, and it enters Taku Inlet 10 miles east of Juneau. Vegetation consists of deciduous and coniferous trees along the creek and on slopes below altitudes of from 1500 to 2500 feet. Above 2500 feet the hills are generally barren. The basin is bounded by ridges generally at an altitude of 3,000 feet, but with a few peaks extending above 4,000 feet. There are a few cirque glaciers, generally located above an altitude of 2,500 feet on north-facing slopes. These probably have only a minor effect on the distribution of runoff.

A transmission line is located along Carlson Creek and its tributary, the Sheep Fork. This conveys power from a plant on Annex Creek, two miles northeast of Carlson Creek, to Juneau. There are no settlements or inhabitants in the Carlson Creek basin.

The basin can be reached by boat, or on foot by trail along the transmission-line route.

Dorothy Creek basin

Dorothy Creek drains an area of about 15 square miles on the southeast side of Taku Inlet. The range of altitude is from sea level to about 5,000 feet. Ridges extending above 4,000 feet enclose much of the basin. The lower portion is timbered, but there are extensive exposures of bare, glaciated rock at the higher altitudes. There are no settlements or inhabitants in the basin.

As would be expected from the relatively high altitudes, a considerable portion of the basin is covered by glaciers. The glaciers, and transient accumulations of snow in wet years, have a substantial equalizing effect on the annual runoff.

Lake Dorothy, at an altitude of 2,421 feet constitutes a favorable storage site for a high-head power development. The surface area of the lake is approximately 950 acres, and considerable storage capacity could be developed by drawdown of the lake surface. The drainage area at the lake outlet is 11 square miles.

Access to the basin would be dependent on boats via Taku Inlet, or on use of float planes.

Turner Lake basin

Turner Lake has a drainage area of 53.1 square miles; a surface altitude of 73 feet, and a surface area of 3,050 acres. It discharges into Turner Creek, which flows half a mile northwestward to the tidal flats of Taku Inlet. The lake is about

8 miles in length, and is surrounded by very steep hillsides.

Ridges extending above an altitude of 4,000 feet enclose much of the drainage basin, and there are a few peaks above an altitude of 5,000 feet. There is some timber at the lower and upper ends of the lake, but much of the drainage basin is barren. There are many cirque glaciers at the higher altitudes, particularly along the eastern and southern boundary of the basin. It is doubtful, however, that these are of sufficient size to have much effect on the annual distribution of runoff.

There are no roads in or near the basin. Access would be dependent on boat travel via Taku Inlet, or on use of float planes. There is a trail from Taku Inlet to the lake outlet; a service cabin and boathouse of the Forest Service nearby, and a shelter cabin at the eastern end of the lake.

CLIMATE

The outstanding characteristics of the Juneau region are the heavy precipitation and the relatively mild climate at sea level resulting from its proximity to the ocean. The temperatures at Juneau for the months November through February are about the same as at Spokane, Washington, but the summer temperatures are substantially lower. The average temperature at Juneau for the period November to February is 31.5°F but at Annex Creek, 10 miles to the east, it is 26.9°F.

The mean annual precipitation is about 90 inches at Juneau and 115 inches at Annex Creek. As estimated from runoff records, the mean annual precipitation on the Sheep Creek basin is somewhat more than 150 inches; that on the Carlson Creek basin more than 180 inches; that on the Dorothy Creek basin more than 130 inches. The Turner Lake basin is roughly similar in range of altitude and in aspect to the Dorothy Creek basin, but since it is farther inland it may receive somewhat lesser precipitation. Records of discharge were obtained for Turner Lake during an 11-month period in 1908 and 1909. From these it is estimated that the runoff for a 12-month period was about 110 inches, which probably corresponds to precipitation of roughly 120 inches. Judging from the few records obtained elsewhere in Alaska during that period, precipitation may have been somewhat less than a long-term average.

The Juneau area has considerable cloudiness, although this, as well as the temperature characteristics, vary considerably within short distances, even at sea level. During a 20-year period the number of clear days recorded at Annex Creek averaged 94, as compared with only 54 at Juneau. The amount of cloudiness, like the temperatures and precipitation, is influenced greatly by local topography. The irregular configuration of the mountains, separated by the complex system of waterways, results in considerable variability.

Precipitation at the higher altitudes is largely in the form of snow, rather than rain as at Juneau. The magnitude of the precipitation, its occurrence as snow on the mountains in winter months, and the relatively cloudy, cool summers account for the numerous glaciers of the region.

Fairly complete climatic records are available for Juneau from 1905 to date and for Annex Creek from 1917 to date. The monthly records of precipitation for Juneau covering the water years ending September 30, 1915-56, are listed in Table 13; those for Annex Creek 1917-56, are listed in Table 14. The mean temperatures for Juneau are listed in Table 15. The records for Juneau prior to 1915 are not listed because the precipitation recorded during some years, notably 1910 and 1911, seemed to be abnormally light, and not representative of the areal precipitation of the region. The runoff of Sheep Creek in the water year 1911 was approximately the same as in 1951, whereas the precipitation recorded at Juneau was less than half of that recorded in 1951. The records listed in Table 13 cover several series of wet and dry years, and probably are a representative sample of the long-term pattern.

The bulk of the precipitation results from relatively warm, moist winds from the Pacific Ocean, rising over the mountain barrier along the coast. Exceptionally strong winds occur when there is a westward flow of cold air from the inland, notably through waterways such as the Taku Inlet during winter months. It is reported that winds of very high velocity also occur at the mountain passes.

FACTORS THAT WOULD AFFECT THE OPERATION OF POWER PLANTS

Strong winds, heavy snow packs at the higher elevations and the low winter temperatures are factors that would affect the design and operation of transmission lines. In the operation of the line from Annex Creek to Juneau periodic heating with overloads has been used to prevent icing. The steel towers of this line have been braced with stub poles in places because of wind and snow loads. The line crosses the divide between the Carlson Creek and Sheep Creek basins at an altitude of 3,400 feet.

Snow or rock slides may be a hazard in places such as the mountain side between Turner Creek and Dorothy Creek along Taku Inlet. Here very steep slopes extend up several thousand feet above tidewater. The possibility of slides should be considered in the design and location of structures such as surface penstocks, powerhouses and transmission lines. A mass of loose rock near the Turner Lake outlet and along Turner Creek was interpreted by Plafker (1956) to be a landslide from a slope to the north. A large scar on this slope identifies its origin. Plafker suggested that a diversion wall might be required at the north abutment to prevent slide rock from falling on the contemplated dam.

The location of transmission lines might be dependent in part on considerations of accessibility for maintenance. Since there are no roads in the region except near Juneau, construction and maintenance of lines distant from tidewater would be difficult.

There are reservoir sites on Sheep Creek and Carlson Creek that could be developed to maximum altitudes of about 850 feet and 550 feet respectively by construction of dams. Storage capacity might be developed at Turner Lake by construction of a dam to raise the surface to an altitude of roughly 130 feet. Lake Dorothy at an altitude of 2,421 feet could be used for storage capacity, largely by drawdown through a tunnel. Because of its high altitude and sheltered basin, ice forming on the reservoir surface probably would be much thicker on Lake Dorothy than at the other sites. The effect of ice on dams, spillways and intake structures would have to be considered in the design and maintenance of power plants, but probably would not present an unusual problem.

The creation of a reservoir at Turner Lake would conflict with use of the lake for salmon spawning. A considerable number of salmon were seen there in the course of the dam-site survey. Construction of a fish ladder should be considered since a dam approximately 60 feet high is necessary for adequate development of the site. Cascades in the lower reaches of Sheep Creek and Dorothy Creek probably prevent the migration of fish up those streams. On Carlson Creek there is a fall of about 60 feet just below the dam site which may be a barrier to fish migration.

WATER SUPPLY

Records and estimates of runoff

Records of runoff that were considered in the preparation of this report are as follows:

Station	Drainage area, Sq. mi.	Period of record[a]
Sheep Creek near Juneau	4.30	Jan. 1911-Sept. 1913 Oct. 1916-Sept. 1920 Oct. 1946-Sept. 1956
Carlson Creek near Juneau	22.3 24.3	Oct. 1916-Sept. 1920 Oct. 1951-Sept. 1956
Dorothy Creek near Juneau	15.2	Oct. 1929-Sept. 1941 Oct. 1942-Sept. 1943 Oct. 1944-Sept. 1956
Turner Creek at outlet of Turner Lake	53.1	May 1908 -March 1909

a/ The figures of monthly and annual runoff for the periods as listed are given in Tables 16, 17, 18, and 19, pgs. 46 through 49.

Excepting the record for Turner Creek, the data were obtained from compilations of the Geological Survey.

The Turner Lake record was published in "Water Powers of Southeast Alaska", 1947, as furnished by the Alaska Treadwell Mining Company. It was stated that the accuracy of the record is not known.

The bulk of the runoff at all stations occurs from about May to October, with the minimums generally between January and March. This distribution results from melting of snow and ice during the summer, and heavy rainfall in late summer and fall. During midwinter the precipitation occurs largely as snowfall at the higher altitudes, and there is relatively little melting. The seasonal distribution thus is modified by the altitude ranges of the basins. These are summarized as follows:

Basin outlet	Area in sq. mi. below: 500'	1000'	2000'	2500'	Area above 2500'
Carlson Crk. gage	0.8	3.1	10.2	14.3	10.0
Dorothy Crk. gage	0.0	0.6	1.7	4.3	10.9
Sheep Crk. gage	0.0	0.6	2.1	2.9	1.4
Turner Lake outlet	8.6	12.6	22.6	29.5	23.6

The annual distribution of runoff from the higher areas is modified appreciably by the varied carryover of water stored as ice or snow. For example, precipitation was substantially below normal in the water year 1936, and substantially above normal in 1949, both at Juneau and Annex Creek. The runoff of Dorothy Creek, however, was somewhat above normal in 1936 and was substantially below normal in 1949. Melting was increased by relatively high summer temperatures during the drier year, and was reduced by low summer temperatures during the wetter year. The equalizing effect of such natural storage probably is greatest in basins like that of Dorothy Creek where nearly a quarter of the area above the gage is occupied by glaciers. In basins similar to Sheep Creek and Carlson Creek, the annual variations of runoff are similar to those of precipitation. (See Figures 2 and 3).

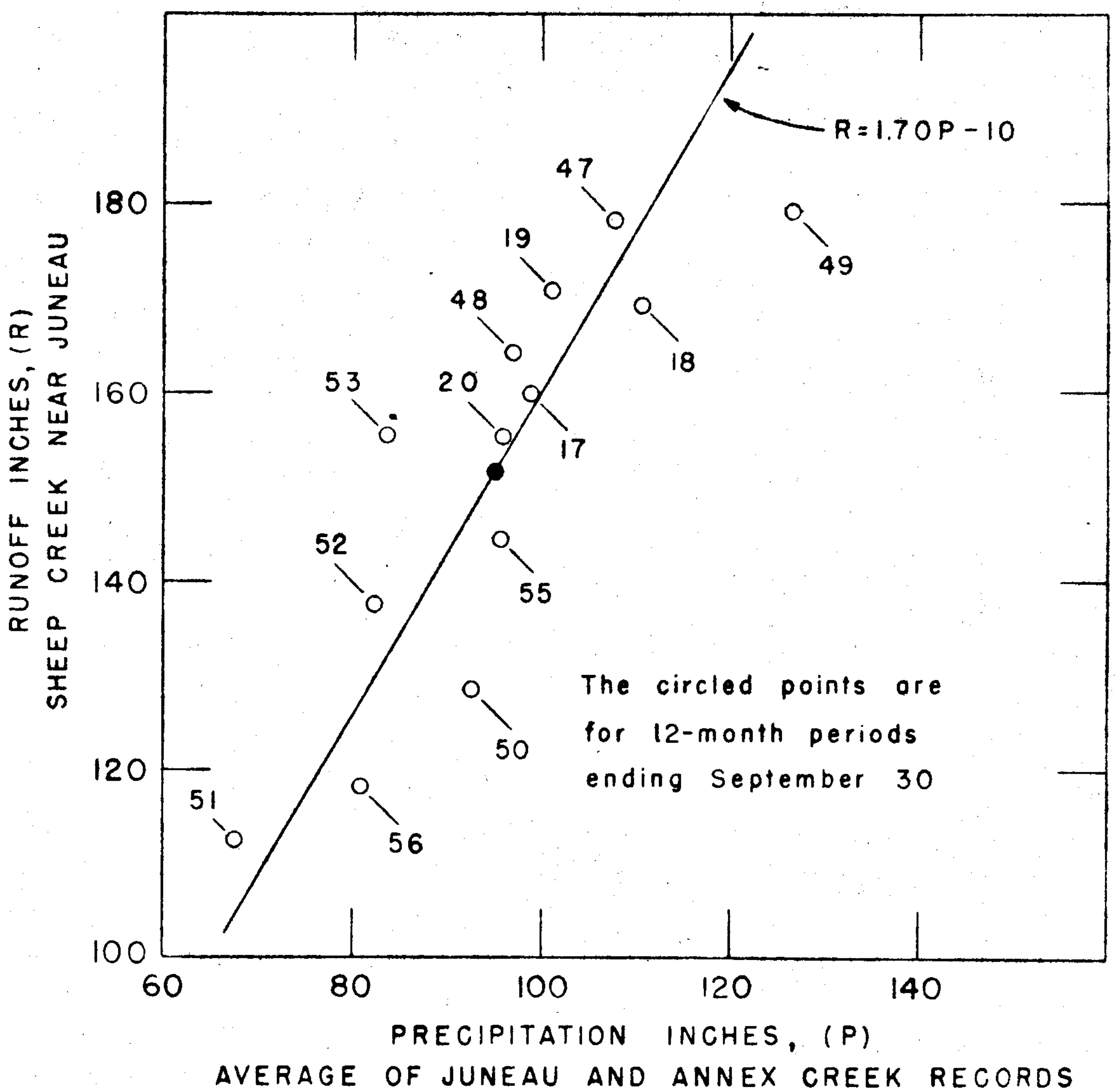


Figure 2 Relation of annual runoff of Sheep Creek to annual precipitation at Juneau and Annex Creek, Alaska

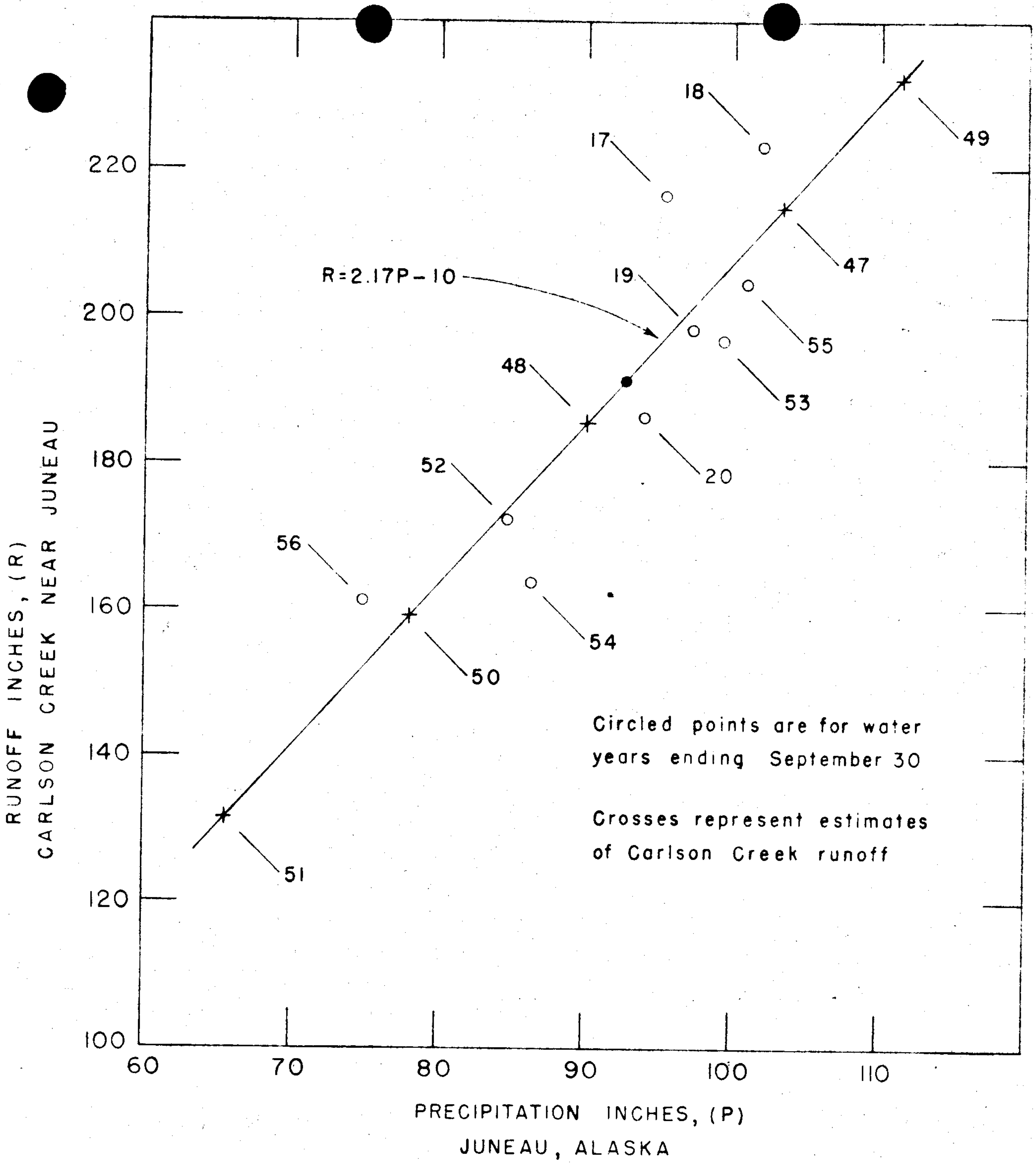


Figure 3. Relation of annual runoff of Carlson Creek to annual precipitation at Juneau, Alaska

STORAGE SITES

Sheep Creek reservoir site

There is a reservoir site on Sheep Creek extending from a mile to about three miles above the mouth of the stream. The site is in a broad, U-shaped valley. There is a narrow canyon at the lower end of this valley which constitutes a favorable dam site.

The sides of the canyon at the dam site extend up on a steep slope to an altitude of 1,000 feet, where the width is about 900 feet. A dam probably would not be considered to an altitude higher than 850 feet, where the canyon width is about 500 feet. The potential reservoir capacities and corresponding surface areas are shown in Table 1.

Plafker reported that the bedrock is well suited as a foundation for either a concrete or rock-fill dam, and that it is exposed at creek level on both sides. Because of the narrow section at the site, a concrete-arch structure might be favored. He described rock in the abutments as well-suited for a diversion tunnel, probably without lining except at the portals.

Water could be conveyed by penstock or conduit and penstock to a powerhouse at or near the site of the existing powerhouse near the mouth of Sheep Creek. The existing waterway consists of roughly 0.4 mile of conduit and tunnel and

Table 1 Sheep Creek Reservoir Site

Altitude (feet)	Area (acres)	Capacity (acre-feet)
617	0	0
640	5	50
680	50	1,170
720	118	4,530
760	178	10,450
800	249	18,990
840	283	29,630

0.5 mile of penstock. Plafker reported that rock for a powerhouse foundation in this vicinity is favorable. The shortest route from the dam site to tidewater is on a direct line to Thane, a distance of 0.7 mile. Thane is about a quarter of a mile northwest of the mouth of Sheep Creek. This route would involve location of the waterway on steeper slopes, and of the powerhouse on glacial deposits of unknown thickness.

Aggregate for concrete possibly is available in deposits along Sheep Creek in the reservoir site, or alternatively by crushing of the rock from outcrops on the valley sides just upstream from the dam sites. Because of the steep slopes, a tramway might be considered for access from the road near tidewater to the dam site.

There is a scattered growth of trees and brush in the reservoir site, but clearing probably would be a relatively minor operation. One of the main problems in the development of the site might be the acquisition of flowage rights, since there are numerous mining claims. For flowage above an altitude of 720 feet it would be necessary to seal the Sheep Creek adit of the Alaska-Juneau gold mine, now inactive. Relocation of the Annex Creek-Juneau transmission line would be necessary for a distance of roughly two miles.

The average annual discharge of Sheep Creek for the 16 years of complete record was 46.5 cfs, corresponding to 33,700 acre-feet per year. Complete regulation with uniform monthly releases could be obtained in a similar period with a usable storage capacity of 30,000 acre-feet. This would require construction of a dam to an altitude of 850 feet, with reservoir drawdown to an altitude of 695 feet. The maximum pool level would be 233 feet above stream level at the dam site; there would be 2,500 acre-feet of dead storage; and the mean surface altitude would be approximately 790 feet. Regulation for a uniform release of 40 cfs could be obtained with storage capacity of 19,000 acre-feet. This would require construction of a dam to an altitude of 810 feet, with reservoir drawdown to an altitude of 695 feet, and mean surface altitude of 770 feet.

The reservoirs would provide for uniform generation of power equal to that available from the average releases developed through the mean heads. With a pressure conduit, reaction turbines, and draft tubes, the mean gross heads would be 790 feet and 770 feet for the two suggested designs.

The maximum discharge recorded at the Sheep Creek gage was 850 cfs, September 8, 1948. This corresponds to 195 cfs per square mile; not an exceptionally high rate for such a small basin. If a dam is to be constructed at the Sheep Creek site, spillway capacity of at least 2,000 cfs probably would be considered.

Carlson Creek reservoir site

There is a reservoir site extending along Carlson

Creek and its tributary, Sheep Fork, from about Mile 2.3 to Mile 4.7. (The distances are from tidewater along Carlson Creek and Sheep Fork). There is a possible dam site at the lower end of the valley where the stream altitude is 340 feet. A much narrower site is located in a gorge half a mile downstream, where the stream elevation is 230 feet. A map of the lower site is shown together with the plan and profile of Sheep Creek and Carlson Creek, printed in 1953. The upper site was surveyed by the Alaska Gastineau Mining Company and a copy of the map dated November 1940 is available for examination at the office of the Geological Survey, 244 Federal Building, Tacoma, Washington.

It seems very unlikely that a reservoir with a pool level higher than an altitude of 560 feet would be considered. This would require a dam to a height of 330 feet above stream level at Mile 1.8, or one to a height of 220 feet at Mile 2.3. The distance between the 560-foot contours at the lower site is about 800 feet, and it is about 1600 feet at the upper site. The potential reservoir capacities and surface areas are shown on Tables 2 and 3.

George Plafker (1956) examined only the lower dam site. He reported that bedrock in the dam site area is suitable as a foundation for either a concrete or rock-fill dam as much as 350 feet in height. Preparation of the foundation would require the removal of (1) talus debris, which he judged

Table 2 Carlson Creek Reservoir site (with dam at lower site)

Altitude (feet)	Area (acres)	Capacity (acre-feet)
230	0	0
260	1	10
280	8	100
300	23	410
320	33	970
340	41	1,710
360	160	3,740
380	220	7,600
400	286	12,700
420	327	18,800
440	365	25,800
360	398	33,400
480	428	41,600
500	463	50,600
520	502	60,200
540	546	70,700
560	595	82,100

Table 3 Carlson Creek Reservoir site (with dam at upper site)

Altitude (feet)	Area (acres)	Capacity (acre-feet)
322	0	0
340	1	10
360	114	1,160
380	168	3,980
400	224	7,900
420	259	12,700
440	292	18,200
460	323	24,400
480	349	31,100
500	379	38,400
520	413	46,300
540	452	55,000
560	497	64,400

to be less than 15 feet in maximum thickness, and (2) a thin layer of soil that overlies bedrock.

The unpublished report of the Alaska-Gastineau Mining Company gives some information concerning the upper dam site. It states that the depth to bedrock in the channel is uncertain, and that the sides are covered with soil and trees with only rare exposures of bedrock. Borings, possibly of considerable depth, were considered essential for determining subsurface conditions, particularly in the valley bottom.

Water could be conveyed from either site by means of a tunnel and penstock to a point on Carlson Creek about half a mile from the mouth, where the altitude is 20 feet. Two major sets of joints would be crossed on a tunnel route from the lower site, and three or more on a route from the upper site. Except at these closely jointed zones and at the portals, Plafker judged that the rock would stand unsupported. Conveyance from the lower dam into the suggested powerhouse site would require about 0.9 mile of tunnel and 0.2 mile of penstock. Conveyance from the upper site would require about 1.4 miles of tunnel and 0.2 mile of penstock. Rock at the powerhouse site was considered by Plafker to be favorable for a foundation.

The character of the vegetation in the reservoir site may be judged from the photographs of Fig. 4. There is

Fig. 4

Carlson Creek reservoir site - Looking upstream from point above dam site.

Carlson Creek reservoir site - Looking up Sheep Fork valley a very dense growth of alder trees over much of the valley floor. About 2.5 miles of the Annex Creek-Juneau transmission line would have to be relocated around the reservoir area if a dam were constructed at the lower site to an altitude of 560 feet.

Aggregate for concrete may be available from alluvial deposits along the creek upstream from the dam site. It was reported by Plafker that the rock in the dam site area is suitable as a source for crushed aggregate or dimension stone. At present the only access to the site is by trail from the mouth of the creek. Construction of roads or tramways would be necessary for conveyance of aggregate from upstream borrow pits, and for conveyance of materials from tidewater.

The average discharge of Carlson Creek for 14 years of recorded and estimated runoff was approximately 308 cfs, corresponding to a runoff of 224,000 acre-feet per year. These figures are for the former location of the gaging station where the drainage area is 22.3 square miles. This is assumed to be the same as that tributary to the reservoir site, since the location is between the two dam sites. The runoff from 1952 to 1956 as listed in Table 17 is that recorded at the present station where the drainage area is 24.3 square miles. The figures for this period were reduced in accordance with the drainage-area ratio for computation of the average and monthly runoff available at the reservoir site.

The records do not include some of the driest periods of the past 40 years, notably the water years 1950 and 1951. For appraisal of the power possibilities, figures of monthly runoff were estimated for the water years 1947 to 1951, and are shown in Table 17. Figures of annual runoff first were estimated from the precipitation relationship of Figure 3. During the 9 years of record Carlson Creek runoff did not deviate more than 10% from figures indicated by the relationship, so these estimates probably are fairly accurate. Monthly estimates for the 5 water years then were made by using the same percentage distribution as for the recorded monthly records of nearby Sheep Creek.

An operation schedule for the period October 1946 to September 1955 shows that roughly 240,000 acre-feet of usable capacity would have been required for complete control. This could only be obtained by construction of very high dams at either site. In view of the limited head available for power generation, and the consequent, limited power potential, this possibility seems clearly out of question.

The storage possibilities are shown for two assumed capacities; 50,000 acre-feet and 25,000 acre-feet. Operation schedules for yearly use of the storage show that the following uniform releases could have been maintained:

Table 4 Operation schedules, Carlson Creek reservoir

Water year	50,000 A.F. capacity Releases, cfs.	25,000 A.F. capacity Releases, cfs.
1917	205	136
18	205	122
19	246	164
20	208	141
47	293	180
48	226	144
49	231	149
50	192	109
51	184	114
52	185	116
53	220	137
54	216	119
55	251	147
56	183	114

Judging from precipitation records, the 14 years of the study constitute a fairly representative sample of the long-term pattern. With a storage capacity of 50,000 acre-feet it is estimated accordingly that uniform releases of 183 cfs could be made 100 percent of the time; 185 cfs, 90 percent of the time; and 216 cfs, 50 percent of the time. With storage capacity of 25,000 acre-feet, the estimates are 109 cfs, 114 cfs and 137 cfs for 100, 90 and 50 percent of the time respectively.

A reservoir with usable capacity of 50,000 acre-feet and dead storage of about 10,000 acre-feet could be created by construction of a dam at the lower site for a pool level at an altitude of 520 feet. The width of the canyon at this level is 750 feet.

A reservoir with the same amounts of usable capacity and dead storage could be created at the upper site by construction of a dam for a pool level at an altitude of 550 feet. This is 230 feet above the stream level. The width of the canyon at this height is about 1600 feet, and the width at an altitude of 400 feet is more than 800 feet.

A reservoir with usable capacity of 25,000 acre-feet and dead storage of 8,00C acre-feet could be created at the lower site by a dam for maximum flowage line at an altitude of 460 feet, or 230 feet above the stream level. The width of the canyon at that altitude is 670 feet. The same usable capacity, and 7,000 acre-feet of dead storage could be obtained at the upper site with a flowage line 160 feet above stream level. The width of the canyon at that level is about 1,200 feet.

At the time of the stream surveys in 1952 Carlson Creek appeared fairly clear, with only a slight amount of sediment in suspension. It seems likely however, that some sediment and gravels would be carried into the reservoir from upstream. Since some of this material would remain in the upper part of the reservoir above dead storage level there would be a gradual reduction of active storage capacity from the outset. However, it seems that this probably would not seriously reduce power values within a period of many years.

The maximum recorded discharge of Carlson Creek was 6,200 cfs, Sept. 26, 1918. This corresponds to the fairly high unit rate of 278 cfs per square mile. If a dam should be contemplated, spillway capacity adequate for even greater discharges probably would be considered.

Lake Dorothy reservoir site and related possibilities

Lake Dorothy is approximately 2.4 miles from tidewater by the shortest route. The lake is more than 3 miles in length, in a north-south direction. It is at an altitude of 2,421 feet and has a surface area of 968 acres. The lake is bounded by steep mountain sides except for an area of glacial debris extending about a quarter of a mile south of the upstream end. In a part of this area the terminus of a glacier is only a few hundred feet from the lake.

Lake Dorothy is drained by Dorothy Creek, which flows 2.5 miles southwestward through Lieuy Lake to Bart Lake; thence about 1.5 miles northwestward to Taku Inlet. Lieuy Lake and Bart Lake are at altitudes of 1,706 feet and 996 feet respectively. Both lakes are relatively small, and the intervening drainage areas below Lake Dorothy are small.

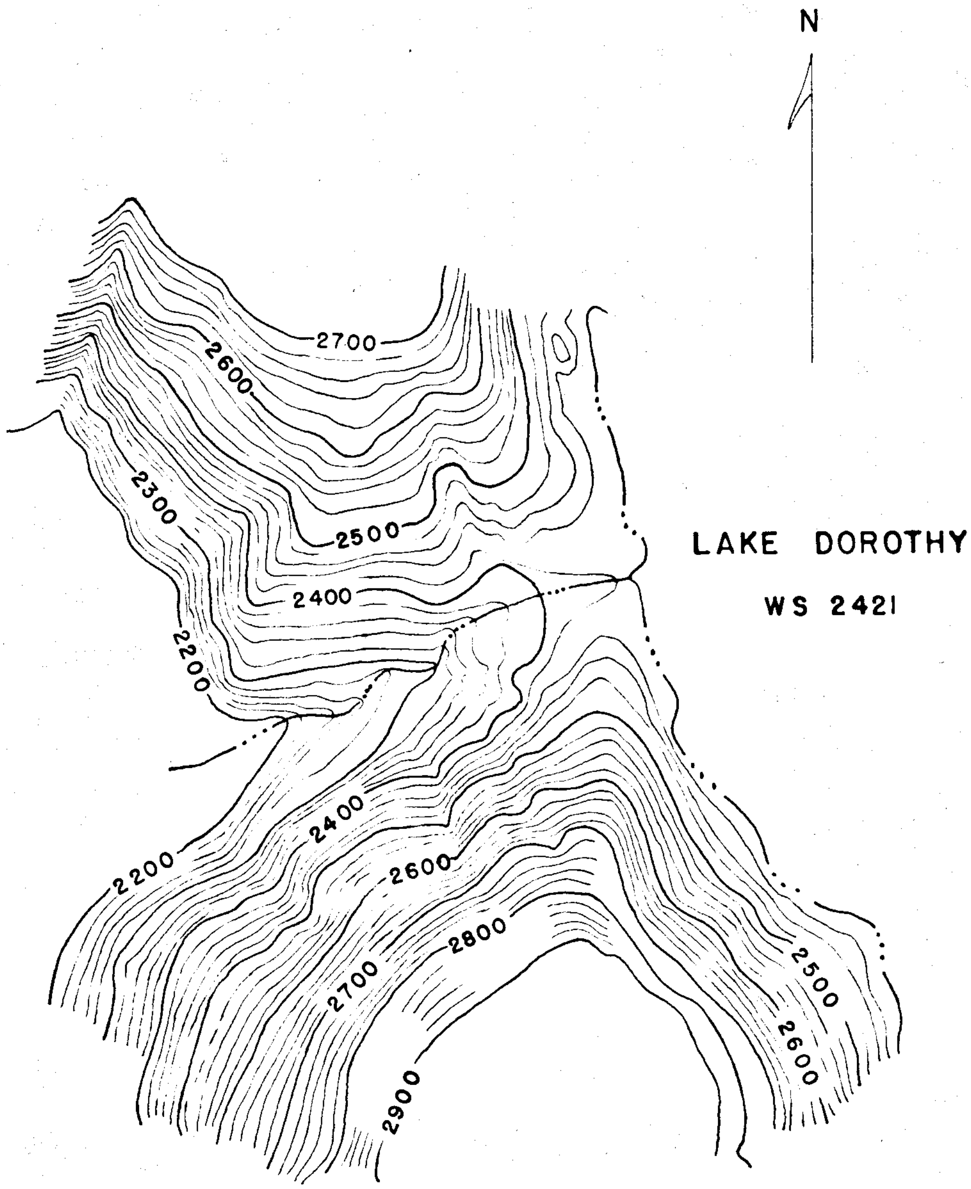
Lieuy Lake and Bart Lake formerly were called Lake Veronica and Lake Mary. The altitudes of these lakes and of Lake Dorothy are based on determinations made after publication of the quadrangle maps.

Storage capacity at Lake Dorothy could be developed by tapping the lake with a tunnel outlet; by damming the lake outlet; or by a combination of the two methods. It is probable that most or all of the capacity would be developed by tunnel diversion, since the rock is reportedly favorable for tunneling, and relatively little head would be lost by drawdown of this high lake. A further consideration is that access for construction of a dam at the lake outlet would be very difficult.

The topography at the lake outlet is shown in Figure 5, traced from the map of Dorothy Creek basin, scale 1:7,200. The width of the outlet section at an altitude of 2,460 feet is about 500 feet, and at an altitude of 2,520 feet it is 960 feet. Both sides of the outlet section and the creek bed have been glaciated; consequently, very little if any, soil or gravel mantles the outlet area.

The potential capacities and surface areas above and below the lake surface are shown in Table 5.

According to the status report on the Lake Dorothy project by the U. S. Bureau of Reclamation, (1955) rock conditions are favorable for tunneling along several routes from Lake Dorothy to the Taku Inlet. The shortest route is along a line about due west from the lake outlet. It was found that several fault traces intersect this route. However, it was considered by the Bureau of Reclamation that



LAKE DOROTHY DAM SITE

Scale 1:7200 or 1 inch = 600 feet

0 600 1200 1800 2400 feet

Contour interval 20 feet

Table 5

Lake Dorothy Reservoir Site

Altitude (feet)	Area (acres)	Capacity (acre-feet)
2,240	642	142,500
2,260	670	129,500
2,280	697	116,000
2,300	727	101,500
2,320	760	87,000
2,340	793	71,000
2,360	828	55,000
2,380	864	38,500
2,400	901	20,500
2,421 a/	968	0
2,440	1,049	19,200
2,460	1,114	40,800
2,480	1,180	63,700
2,500	1,239	87,900
2,520	1,282	113,100
2,540	1,319	139,100

a/ Lake surface
Areas and capacities below the lake surface were taken from curves determined by the Bureau of Reclamation; those at and above lake surface from map of Dorothy Creek basin, scale 1:7200, contour interval 20 feet.

Fig. 6

1. View of Lake Dorothy looking south.

2. View of Lake Dorothy outlet area looking east.

the fault zones are relatively narrow, and except at these narrow fault zones supports would not be required for tunnels.

Access to the Lake Dorothy power site would depend largely on boat travel. Because of the steep mountainside at the site, access from tidewater to tunnel adits probably would be provided by aerial tramways. The difficulty of access to the lake outlet might make construction of a dam less practicable than development of storage capacity entirely by drawdown, as proposed in the Bureau of Reclamation report.

Sources of concrete aggregate suggested by the Bureau include several places along Taku Inlet such as the mouths of creeks where sand and gravel have been deposited. Another possible source is the delta at the head of Lake Dorothy.

The mean discharge of Dorothy Creek for 24 years of complete record, 1930 to 1956, was 143 cfs, corresponding to a mean annual runoff of 104,000 acre-feet. This was from a drainage area of 15.2 square miles.

The drainage area at Lake Dorothy is only about 72 percent of that at the gage but because of the relatively high altitudes above the lake it is probable that there is proportionately greater runoff. For estimates of this report this was assumed to be about 78.5 percent of the total, with relatively greater amounts during melt periods, and relatively smaller amounts in winter months. A distribution estimated for the Bureau of Reclamation study (1955) seems reasonable, and was used for purposes of this report:

Month	Runoff at lake outlet in percent of runoff at gage
October	85
November	75
December	50
January	35
February	35
March	35
April	35
May	60
June	80
July	85
August	85
September	85
Annual average	78.5

According to this estimate the mean discharge from Lake Dorothy for 25 water years of complete record, 1930 to 1956, was about 112 cfs, corresponding to a mean annual runoff of about 81,000 acre-feet. This period was taken as representative of a runoff distribution that might occur in successive years of the future. The period includes two relatively dry cycles; 1932 to 1935 and 1949 to 1956. (The years of missing record, 1942 and 1944, probably were a little wetter than average).

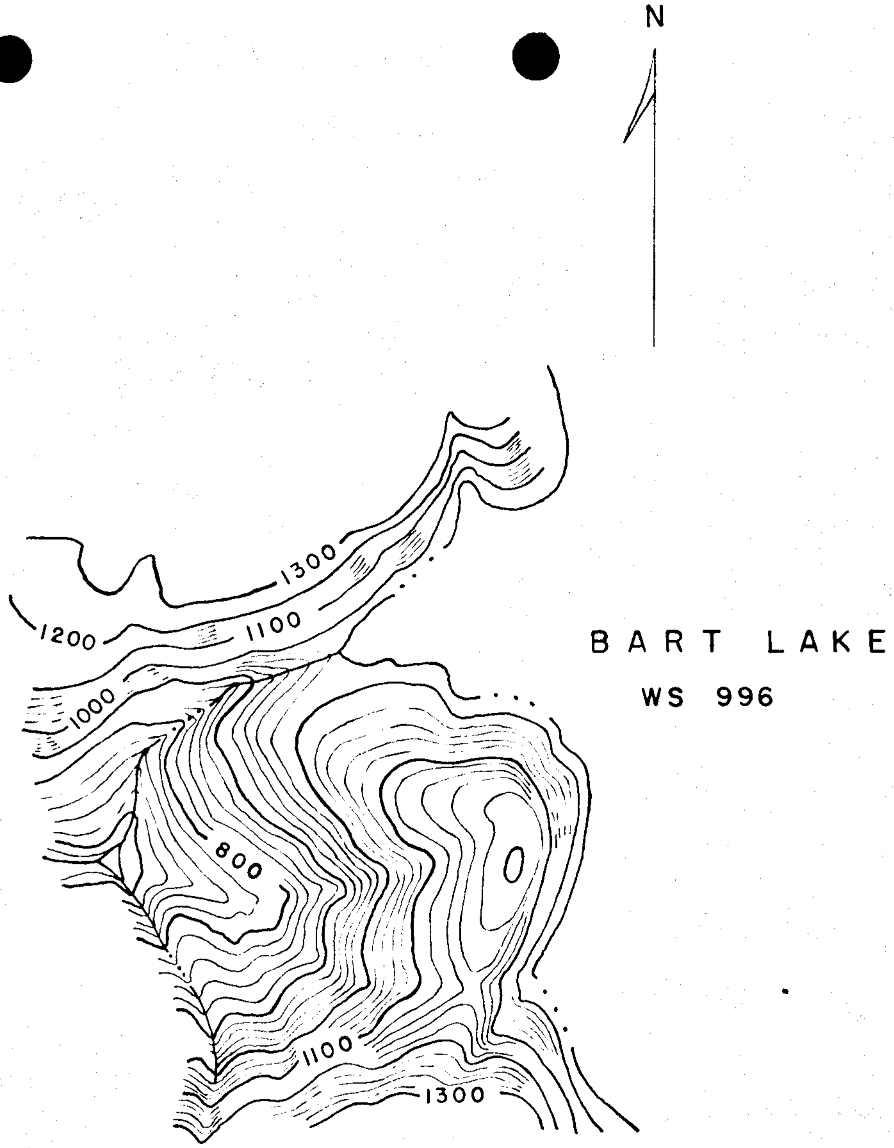
With a storage capacity of 125,000 acre-feet it would have been possible to make full use of this runoff on a schedule of uniform releases. This would have required that the reservoir be about 60 percent full, October 1932. It would have been empty, May 1936, full November 1949, and about 60 percent full, September 1956. Judging from precipitation records, it is likely that a similar schedule of releases could have been maintained from 1916 to 1956. The storage margin of September 1956 probably would have been adequate unless the dry period should happen to be extended several more years.

The much lesser capacity of about 50,000 acre-feet would have provided for a uniform release of 102 cfs, or roughly 90 percent of the 25-year average. The reservoir would have been full October 1932, nearly empty May 1934 and full October 1935. There would have been spill in most other years to 1948, and drawdown from November 1948 to May 1952, when the reservoir again would have been nearly empty.

A storage capacity of 125,000 acre-feet could be obtained between the lake surface and an altitude of 2,530 feet, 109 feet above the surface. The same capacity is available by drawdown of the lake surface 143 feet to an altitude of 2,266 feet. As an example of combined damming and drawdown, 125,000 acre-feet of capacity could be developed by raising the lake surface 58 feet and drawing it down 71 feet. A storage capacity of 50,000 acre-feet could be obtained by raising the lake surface 47 feet or by drawing it down 55 feet.

Consideration was given to a diversion from Bart Lake in the report; "Water Powers of Southeast Alaska", 1947. Diversion of natural flows from the drainage area between Lake Dorothy and Bart Lake could be used for generation of power coordinately with that from the Lake Dorothy diversion. The intervening drainage area is 3.7 square miles, or about a third of that tributary to Lake Dorothy. Runoff from this area is estimated to be roughly a quarter of that at Lake Dorothy. For regulation in the coordinated system, storage capacity additional to that required for a Lake Dorothy plant alone could be developed at Lake Dorothy. The head available below Bart Lake is only about 37 percent of that below Lake Dorothy. The increase in dependable power thus would be in the order of 10 percent.

With a powerhouse located near the mouth of Dorothy Creek, the diversion from Bart Lake would require 6,000 feet of tunnel and 1,000 feet of penstock. This is about half the length of a waterway from Lake Dorothy to the same powerhouse. For substantial diversion of all natural flows, the capacity of the waterway probably would be of the same order as that required for regulated flows from Lake Dorothy alone. In addition the waterway and powerhouse capacity of the Lake Dorothy unit would be greater for coordinated operation with the Bart Lake unit than if operated as an individual plant.



BART LAKE DAM SITE

Scale 1:7200 or 1 inch = 600 feet

0 600 1200 1800 2400 feet

Contour interval 20 feet

Bart Lake - Showing outlet and Dorothy Creek below the lake.

Fig. 8

It seems possible that Bart Lake might be considered for individual power development if the powerhouse and transmission facilities of the Lake Dorothy unit could be used jointly. Substantial regulation of the inflow between Lake Dorothy and Bart Lake could be had with storage capacity of about 10,000 acre-feet. This could be obtained with a dam at the outlet, raising the lake surface 40 feet to an altitude of 1,036 feet. The valley at the lake outlet is 360 feet wide at an altitude of 1,036 feet. Since the creek channel drops very sharply just below the outlet, the site may be more favorable for an arch dam than a gravity dam. The outlet area is shown in Figure 7, as traced from the special map of the Dorothy Creek basin. The reservoir areas and capacities are given in Table 6.

A capacity of 10,000 acre-feet would provide for uniform release of 25 cfs in a period like 1932 to 1955. The waterway requirements thus would be considerably less than for diversion of natural flows in a scheme of coordinated development.

The maximum discharge recorded at the Dorothy Creek gage, 1929 to 1956, was 1,780 cfs, November 3, 1949. This corresponds to a rate of 117 cfs per square mile. In September 1918 there was a maximum discharge of 278 cfs per square mile from an area of 22.3 square miles in the nearby Carlson Creek basin. It seems possible that discharge at this

Table 6 Bart Lake Reservoir Site

Altitude (feet)	Area (acres)	Capacity (acre-feet)
996	229	0
1,000	245	950
1,020	252	5,920
1,040	257	11,000
1,060	261	16,200
1,080	266	21,500
1,100	273	26,800

unit rate or more might occur in the smaller Dorothy Creek basin. Spillway capacity should be considered accordingly if storage is to be developed partially or entirely by damming.

Turner Lake reservoir site

Turner Lake is only half a mile from tidewater, and is at an altitude of 73 feet. The lake extends about 6 miles to the east and there is an arm at the eastern end extending a mile and a half to the south. Except at the valley between the lake and Taku Inlet, and at small areas of glacial deposits from the larger tributaries, steep mountain sides extend down to the lake on all sides. The surface area of the lake is approximately 3,050 acres. The reservoir areas and capacities are given in Table 7.

The distance across the lake outlet between the steeper slopes is roughly 1,200 feet, but rock outcrops within this area constitute favorable abutments for a dam of moderate height. The potential storage capacity between the present lake surface and an altitude of 127 feet is approximately 175,000 acre-feet. The width of this section at an altitude of 127 feet is 360 feet. A saddle just to the southwest is 300 feet wide at the 127-foot altitude and its low point is at an altitude of 98 feet. An auxiliary dam would be required in this section for a pool level above an altitude of about 95 feet. Another saddle about 500 feet

Table 7 Turner Lake Reservoir Site

Altitude (feet)	Area (acres)	Capacity (acre-feet)
73	3,050	0
100	3,550	89,000
200	4,010	467,000
300	4,480	892,000

farther to the southwest could be excavated for a natural spillway. The ground surface at the low point is at an altitude of 136 feet. The saddle has a covering of talus rock estimated to be less than 15 feet thick.

Plafker (1956) described the foundation at the main dam site as bedrock, concealed by large blocks of rock from a landslide. The foundation at the saddle dam site is bedrock with a covering of soil estimated to be less than 3 feet thick. The foundation rock is grandiorite, which Plafker considers excellently suited for either a concrete or rock-fill dam.

Removal of landslide debris from the outlet section would be relatively difficult because of the large size of the rock fragments.

Water could be conveyed from the reservoir to a powerhouse either at a creek altitude of approximately 16 feet, 500 feet downstream from the outlet, or farther downstream near tidewater. Because of the low relief at the site and short distance for conveyance, the waterway probably would consist of a surface conduit and penstock.

The rock in the dam-site area was considered by Plafker to be well-suited for a rock-fill dam or for crushed aggregate. It was reported that there is no natural aggregate in the vicinity of the dam site.

The drainage area at Turner Lake is about 4.8 times that at Lake Dorothy. Judging from the discharge records obtained in 1908 and 1909 the average annual runoff is at least 110 inches. It was estimated that the average annual runoff at Lake Dorothy for 25 years of complete record, 1930 to 1956, was 81,000 acre-feet, or 138 inches on the drainage area. Complete regulation during that period would have required 125,000 acre-feet of storage capacity, but regulation for uniform release of 90 percent of the average would have required only 50,000 acre-feet of capacity.

An average annual runoff of 110 inches from the Turner Lake basin corresponds to about 310,000 acre-feet per year; or a discharge of 428 cfs. On the assumption that the storage requirements per unit of runoff are similar to those at Lake Dorothy, more than 450,000 acre-feet of capacity would be needed for substantially complete control, but only 175,000 acre-feet would be needed for 90 percent utilization, or a regulated flow of 385 cfs.

A dam to an altitude of nearly 200 feet would be required for a capacity of 450,000 acre-feet, and it would extend at least 1,650 feet across the outlet section. The much lesser capacity of 175,000 acre-feet could be created by raising the lake surface to an altitude of 127 feet. A dam to this height on a curved axis across the main section and saddle section would have a crest length of about 660 feet. The height of the dam above bedrock for nearly half of this distance probably would not be more than 35 feet.

The period of runoff records for Turner Creek is too short to provide a reliable indication of the maximum discharge to be expected. The drainage area is somewhat more than twice that of Carlson Creek. It would be conservative to assume that the maximum flows are in roughly the same proportion, since intensities tend to vary in an inverse relation to the sizes of drainage areas. On such an assumption the requirement for spillway capacity would be in excess of 12,400 cfs.

WATER POWER DEVELOPMENT

The power possibilities discussed in the following sections were based on several illustrative plans. Optimum plans evidently can be determined only after additional field investigations, and after comparative studies.

The potential power was computed on the assumption that the regulated flow could be utilized through the mean gross head for generation of electric power at an over-all efficiency of 80 percent. In kilowatts this is given by the equation $P = 0.068\ Q\ H$, where Q is the flow in cubic feet per second, and H is the mean head in feet. An allowance for friction losses in the conduits was not made.

Sheep Creek power site

Water could be conveyed from the Sheep Creek reservoir through a conduit and penstock to a powerhouse at Gastineau Channel. The total length of the waterway would be approximately 0.9 mile with a powerhouse located at the mouth of Sheep Creek. It would be approximately 0.7 mile by the shortest route to a site near Thane. The powerhouse of the existing, inactive plant is near the mouth of Sheep Creek. This site may be preferable from the standpoint of foundation conditions and terrain for location of the penstock.

Although the existing plant has impulse wheels, it is assumed that the ultimate development may be designed with reaction turbines for maximum utilization of the head. With draft tubes this would make it possible to use the head down to the average tailwater altitude at mean sea level. The power possibilities are summarized accordingly in the following Table 8 for two capacities:

Table 8. Sheep Creek power site, potential power and related data

Usable capacity, acre-feet	Reservoir altitude, operating range-feet	Mean flow, cfs.	Mean head, feet	Continuous power, kilowatts
30,000	695-850	46.5	790	2,500
19,000	695-810	40.0	770	2,090

Carlson Creek power site

Two possible dam sites on Carlson Creek were discussed in the description of the reservoir site. Water would be conveyed from either site by means of a tunnel and penstock to a powerhouse on the creek, half a mile upstream from the mouth. The total length of waterway from the upper site would be about 1.6 miles, and from the lower site about 1.1 miles. The length of penstock would be about 0.2 mile in either plan. Alternatively, it would be possible to extend the tunnel about half a mile and convey the water through a somewhat longer penstock to a powerhouse located at the tidewater of Sunny Cove on Taku Inlet. The altitude of Carlson Creek at the upper powerhouse site is 20 feet.

It is assumed that the power plant would be designed with reaction turbines and draft tubes so that the head could be developed down to the average tailwater level. The power possibilities are summarized in the following Tables 9 and 10 on assumption that the powerhouse would be at the upper site, with tailwater altitude of 20 feet.

Table 9. Carlson Creek power site, potential power and related data; usable capacity, 50,000 A.F.

Percent of time	Operating range, altitude ft.		Mean head, ft.		Mean flow, cfs.	Power, kilowatts	
	Upper site	Lower site	Upper site	Lower site		Upper site	Lower site
100	410-550	390-520	470	445	183	5,850	5,550
90	"	"	"	"	185	5,910	5,590
50	"	"	"	"	216	6,900	6,550

Table 10. Carlson Creek power site, potential power and related data; usable capacity, 25,000 A.F.

Percent of time	Operating range, altitude ft.		Mean head, ft.		Mean flow, cfs.	Power, kilowatts	
	Upper site	Lower site	Upper site	Lower site		Upper site	Lower site
A 100	395-480	380-460	440	405	109	3,260	3,000
90	"	"	"	"	114	3,410	3,140
50	"	"	"	"	137	4,100	3,780

Lake Dorothy power site and related possibilities

Water could be conveyed from Lake Dorothy to a powerhouse on Taku Inlet by means of a tunnel and penstock. Of several possible routes, the Bureau of Reclamation (1955) proposed one leading almost due west from near the northern end of Lake Dorothy. The length of waterway would be about 2.8 miles, including 1.2 miles of penstock. It would be possible to locate the powerhouse about 0.7 mile to the south near the mouth of Dorothy Creek with about the same length of waterway.

The development would entail use of impulse wheels, and for purposes of this report it is assumed that the nozzles would be at an altitude of 17 feet, a few feet above the high water level. The power possibilities are summarized in the following Table 11 for two assumed degrees of regulation, on assumption that the capacity would be developed entirely by drawdown of the lake surface.

Table 11. Lake Dorothy power site, potential power and related data.

Capacity, acre-feet	Operating range altitude, feet	Mean flow, cfs.	Mean head[a/] feet	Continuous power, kilowatts
125,000	2,266 - 2,421	112	2,330	17,800
50,000	2,366 - 2,421	102	2,378	16,510

a/The head corresponding to the mean contents in the year of maximum drawdown. In most years the mean head would be greater.

Creation of a reservoir by damming the lake outlet instead of drawdown might be considered. For a capacity of 125,000 acre-feet this would result in a mean gross head of 2,463 feet; an increase of about 6 percent above that available by drawdown for the same capacity. For a capacity of 50,000 acre-feet, the mean gross head would be 2,429 feet; an increase of about 2 percent above that available by drawdown.

Development of power by storage at Bart Lake for use of the inflow below Lake Dorothy might be considered if diversion could be made to a common powerhouse. For an illustration of this possibility it is assumed that a storage capacity of 10,000 acre-feet would be provided by a dam at the lake outlet. The mean regulated flow on a schedule of uniform release is estimated as 25 cfs in a period like 1932 to 1955. The mean reservoir level would be at an altitude of 1,018 feet, corresponding to a mean gross head of 1,001 feet. The dependable power that could be generated thus would be 1,700 kilowatts.

Turner Lake power site

Water probably would be conveyed from the Turner Lake reservoir to a powerhouse by means of a surface pipe or conduit, and a penstock. Much of the potential head could be utilized by conveyance to a powerhouse on Turner Creek about 500 feet downstream from the dam. The water surface altitude there is at an altitude of approximately 16 feet. It is assumed that the head could be developed down to this average level by use of reaction turbines and draft tubes. The power possibilities are summarized accordingly in the following Table 12.

Table 12. Turner Lake power site, potential power and related data.

Capacity, acre-feet	Operating range, altitude, feet	Mean flow cfs	Mean head feet	Continuous power kilowatts
450,000	73 - 200	428	124	3,610
175,000	73 - 127	385	80	2,090

If the head could be used down to mean sea level the power possibilities would be increased 13 percent in the larger development and 20 percent in the smaller. The length of waterway required to reach the edge of Taku Inlet would be approximately half a mile.

Table 13

Monthly and annual precipitation, Juneau, Alaska

Water Year [a]	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1916	9.1	8.6	8.9	0.9	6.7	3.3	4.8	4.2	6.0	5.0	6.5	12.2	76.2
17	14.6	8.0	7.9	10.3	5.9	4.2	1.7	3.5	5.3	10.5	11.1	12.3	95.3
18	18.6	16.8	6.4	8.6	5.8	4.3	5.9	5.6	3.8	2.3	11.5	12.4	102.0
19	14.0	15.0	10.3	11.4	3.1	4.4	6.5	5.0	3.7	6.4	5.9	11.4	97.1
1920	12.5	9.9	7.7	14.3	10.1	4.6	4.6	6.1	4.9	1.4	9.7	8.2	94.0
21	10.9	5.6	6.0	4.1	8.9	6.5	4.0	6.1	1.9	7.1	7.9	8.6	77.6
22	11.6	6.0	12.7	11.6	3.8	5.1	10.9	5.1	2.7	3.2	9.2	10.3	92.2
23	6.5	11.4	2.2	5.2	13.4	8.0	5.4	3.2	1.4	4.1	6.9	16.5	84.2
24	8.7	11.7	13.1	6.8	7.2	7.5	8.9	7.4	1.0	8.2	8.0	18.8	107.3
1925	12.7	9.5	4.3	5.8	3.7	6.5	6.2	4.3	4.9	7.6	7.7	8.7	81.9
26	8.9	11.7	10.1	11.6	5.8	8.7	7.6	3.7	2.6	4.0	2.9	3.3	80.9
27	13.5	3.2	14.4	3.8	4.3	8.6	4.0	3.9	1.9	1.4	5.5	10.4	74.9
28	13.6	3.6	7.5	13.5	5.3	6.7	4.7	8.2	0.9	4.6	6.1	8.4	83.1
29	11.4	9.0	10.4	9.1	7.2	6.2	3.3	4.7	4.2	4.8	5.1	5.5	80.9
1930	17.3	17.6	4.6	0.9	8.6	10.1	4.0	3.9	3.8	6.3	9.5	9.8	96.4
31	14.5	13.2	12.9	9.1	8.3	3.4	7.4	8.6	5.1	5.7	11.3	9.4	108.9
32	15.9	7.8	5.6	11.8	9.3	2.8	2.8	4.9	10.6	5.8	2.5	11.8	91.6
33	9.7	7.0	5.4	6.0	6.7	3.9	7.1	4.6	6.9	3.7	11.7	4.6	77.3
34	14.1	13.2	0.9	14.9	7.6	4.6	6.6	2.8	3.9	3.4	7.8	5.2	85.0
1935	12.3	5.6	4.4	5.9	7.5	3.2	5.0	7.6	4.7	7.2	10.4	11.9	85.7
36	5.9	11.2	9.3	4.9	2.4	7.7	7.2	5.6	0.5	6.5	2.8	12.3	76.3
37	18.7	25.9	9.1	5.6	3.8	6.1	5.8	5.8	4.8	8.2	11.6	9.9	115.3
38	14.8	6.4	7.0	10.3	6.1	5.7	5.7	8.2	8.9	7.3	4.9	13.2	98.5
39	9.9	12.1	11.7	10.2	8.4	9.1	4.8	5.6	4.6	8.4	12.2	14.1	111.1
1940	19.1	13.1	9.7	4.0	2.2	5.2	3.3	6.4	6.1	4.5	10.8	9.3	93.7
41	9.7	6.8	6.2	6.4	1.6	6.2	5.0	3.8	5.2	7.3	1.3	5.6	65.1
42	16.2	11.5	5.0	10.6	7.5	7.9	4.6	1.7	6.0	6.2	7.6	8.4	93.2

Table 13 con't.

Juneau, Alaska - con't.

Water Year a/	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1943	17.2	5.1	4.6	10.3	5.4	2.9	8.2	3.6	3.5	8.7	11.9	16.8	98.2
44	15.0	13.4	18.5	9.2	3.6	8.4	4.1	6.1	3.7	3.1	6.6	5.0	96.7
1945	15.8	10.5	6.1	5.4	8.8	9.3	5.2	2.5	5.6	11.5	4.5	12.1	97.3
46	15.2	4.0	4.8	6.8	4.4	6.5	7.8	3.6	1.4	6.8	8.3	8.1	77.7
47	13.3	12.5	6.1	8.7	3.4	11.2	7.3	5.7	4.2	3.3	9.9	17.8	103.4
48	10.6	11.9	8.6	11.1	2.4	5.8	0.5	5.1	4.0	7.2	5.2	17.6	90.0
49	13.6	20.2	7.1	15.4	2.6	5.6	10.0	5.1	7.4	5.3	5.7	10.3	111.3
1950	14.8	12.0	5.1	1.2	3.1	3.3	4.5	6.2	1.6	9.9	5.4	10.9	78.0
51	7.0	4.2	4.8	4.0	4.8	7.0	10.1	3.8	6.1	4.1	3.8	5.5	65.2
52	5.4	6.8	5.3	6.5	5.9	6.8	7.8	10.5	3.6	4.0	8.0	14.1	84.7
53	17.3	12.4	5.7	3.6	11.6	9.0	7.2	4.2	4.3	3.6	9.4	10.8	99.1
54	20.9	5.4	13.8	5.2	11.7	4.3	3.6	4.2	2.0	4.7	1.7	8.8	86.3
1955	10.6	11.0	14.0	9.0	6.8	9.7	5.3	10.0	3.3	2.7	10.3	8.3	101.0
56	12.4	4.0	3.4	2.7	6.0	4.9	4.5	9.0	2.9	3.6	14.2	7.3	74.9
Mean	13.1	10.1	7.8	7.7	6.1	6.2	5.7	5.4	4.1	5.6	7.6	10.4	90.0

The figures were taken from climatological records of the Weather Bureau, U. S. Department of Commerce. The published figures were rounded to the nearest tenths and added to obtain the annual totals.

a/ Oct. 1 - Sept. 30

Monthly and annual precipitation, Annex Creek, Alaska

Water Year [a]	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1917	-	-	-	9.3	6.7	3.7	0.7	3.4	5.1	12.2	15.8	12.8	-
18	19.6	20.9	9.3	8.5	8.1	6.5	6.1	5.4	2.9	2.9	16.1	12.7	119.0
19	15.9	16.7	10.0	14.0	4.7	5.6	5.5	2.7	2.0	5.5	7.9	14.8	105.3
1920	15.3	8.4	7.9	11.6	8.4	6.2	5.1	4.3	5.0	0.7	15.7	8.9	97.5
21	12.4	7.2	7.3	3.1	9.7	4.3	3.4	5.6	1.9	6.5	7.4	11.3	80.1
22	19.5	6.5	14.1	9.8	3.0	4.2	9.2	5.0	2.2	5.7	-	12.2	-
23	11.0	17.2	3.6	6.2	15.2	7.4	6.1	3.9	1.9	3.1	9.4	18.1	103.1
24	15.5	16.7	13.1	9.0	7.4	8.0	8.5	7.3	1.8	12.8	14.5	28.5	143.1
1925	16.3	11.9	4.1	2.7	6.0	9.3	8.7	3.8	6.0	8.2	9.9	9.7	96.6
26	9.8	12.3	14.2	16.3	8.2	8.9	10.0	3.9	2.4	3.5	4.3	4.1	97.9
27	19.9	5.6	16.0	5.2	5.2	6.1	4.5	3.9	1.6	0.9	6.5	15.6	91.0
28	16.3	5.7	9.8	11.9	7.0	10.0	5.9	9.6	0.7	8.0	8.7	13.8	107.4
29	13.3	10.2	9.8	8.3	7.1	6.7	4.1	4.8	5.5	6.8	6.1	8.3	91.0
1930	23.7	21.0	5.4	1.7	14.5	12.0	3.0	3.5	4.4	6.7	11.8	15.7	123.4
31	16.1	22.4	17.1	13.1	9.6	4.2	7.2	13.0	6.9	6.9	14.7	12.5	143.7
32	20.2	9.6	7.9	11.7	8.6	4.6	2.1	2.8	14.5	7.6	3.7	16.6	109.9
33	13.1	9.6	6.7	6.5	8.5	3.8	7.1	2.6	5.5	2.3	16.3	5.3	87.3
34	15.1	18.0	0.3	17.8	7.9	2.7	6.3	1.8	4.2	1.3	9.9	8.1	93.4
1935	13.2	5.4	6.4	6.8	6.5	4.3	4.5	5.9	4.5	9.8	11.5	12.5	91.3
36	8.2	16.0	10.2	8.0	3.7	6.6	6.0	5.3	0.1	5.8	4.8	16.7	91.4
37	31.1	30.8	10.1	3.9	5.0	7.9	5.0	7.2	6.8	11.5	14.8	16.9	151.0
38	27.3	8.4	10.2	13.3	11.8	3.3	5.4	7.7	9.3	8.1	4.7	20.3	129.8
39	12.8	14.7	12.3	12.7	7.3	7.3	5.9	7.2	4.7	10.0	20.7	18.9	134.5
1940	29.1	15.1	10.1	5.6	3.5	8.2	4.8	9.0	6.0	5.3	15.2	16.0	127.9

Table 14

Table 14 con't.

Annex Creek, Alaska - con't.

Water Year a/	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1941	14.8	9.2	10.2	8.6	2.0	6.9	6.0	5.0	6.0	8.9	1.6	9.4	88.6
42	24.1	14.2	8.3	14.4	8.4	7.7	4.7	1.6	6.0	8.8	11.8	12.0	122.0
43	18.5	7.8	9.7	11.3	12.0	3.1	10.3	5.8	2.6	11.1	17.0	22.9	132.1
44	20.9	20.1	25.1	12.8	5.0	7.5	4.9	8.7	4.4	3.7	9.3	6.6	129.0
1945	22.7	13.9	7.3	9.3	7.4	8.3	6.2	0.6	6.8	13.8	5.4	20.7	122.4
46	23.3	7.3	8.1	13.9	8.5	6.1	5.5	4.8	1.0	7.0	12.1	10.4	108.0
47	21.0	17.8	9.1	11.1	6.7	7.3	8.1	3.6	4.9	5.9	7.6	9.1	112.2
48	20.1	7.5	14.3	2.2	2.8	4.9	2.2	8.3	3.2	9.7	6.5	22.0	103.7
49	20.3	21.9	6.8	2.4	3.4	4.9	9.3	15.5	15.0	4.5	16.0	21.9	141.9
1950	14.5	22.4	4.5	0.4	7.3	3.6	2.0	10.7	1.4	8.1	11.5	21.0	107.4
51	4.2	1.2	8.4	5.2	5.8	8.3	8.3	3.6	10.1	3.2	4.7	6.7	69.7
52	9.7	4.2	3.6	3.4	6.4	6.7	-	-	-	-	-	-	-
53	8.0	6.0	7.7	5.2	9.4	9.4	4.7	3.0	3.0	2.0	4.2	5.0	67.6
54	7.5	3.0	-	-	-	-	2.0	4.7	-	5.1	1.8	11.4	-
1955	9.8	9.9	10.9	6.1	2.6	-	2.4	7.4	4.4	10.2	7.7	10.6	-
56	10.6	3.7	4.1	-	7.3	5.8	4.9	11.8	2.8	3.9	18.8	9.6	-
Mean	16.5	12.3	9.3	8.5	7.1	6.4	5.6	5.8	4.7	6.6	10.2	13.6	106.6

The figures were taken from climatological records of the Weather Bureau, U. S. Department of Commerce. The published figures were rounded to the nearest tenths and added to obtain the annual totals.

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Table 15

Average monthly and annual temperatures, Juneau, Alaska

Water Year [a]	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1916	41.3	35.0	32.0	15.8	32.1	29.3	43.8	48.7	55 4	57.5	55.8	50.8	41.5
17	44.8	37.0	29.0	23.0	27.2	33.4	41.9	47.1	51.9	52.7	54.6	50.5	41.1
18	42.2	37.4	14.6	30.1	27.4	27.6	37.8	45.8	54.0	59.7	54.4	52.2	40.3
19	42.4	37.5	31.6	32.0	30.1	28.2	42.4	46.2	51.5	54.9	55.6	51.8	42.0
1920	40.4	30.4	29.6	22.4	34.8	31.6	36.8	45.2	53.2	58.8	53.4	48.6	40.4
21	41.0	37.0	31.1	24.5	31.4	30.8	41.0	47.2	56.6	54.0	54.3	50.4	41.6
22	44.4	33.2	34.6	31.5	23.8	31.4	39.6	46.4	53.2	54.0	55.0	49.0	41.3
23	43.8	38.2	29.0	26.5	32.4	32.8	41.7	48.2	54.6	59.4	58.9	50.6	42.9
24	46.0	40.8	32.0	30.4	32.8	36.8	38.0	47.8	55.8	54.6	55.3	48.8	43.3
1925	42.2	36.6	27.6	19.9	27.2	33.0	38.8	48.0	52.9	55.7	55.0	50.8	40.6
26	45.5	40.4	38.2	39.6	35.0	40.8	43.8	49.0	57.4	57.6	57.6	50.6	46.3
27	45.8	37.6	32.4	29.2	32.0	35.9	34.0	46.6	55.0	58.8	58.4	50.6	43.0
28	41.9	27.9	25.0	33.0	35.0	32.2	39.0	45.6	55.7	56.3	53.2	49.4	41.2
29	43.6	38.8	34.4	30.7	31.1	35.1	38.0	47.2	54.2	55.3	56.1	52.2	43.1
1930	45.8	39.0	30.3	23.4	29.2	32.0	39.8	46.4	52.6	54.8	55.6	50.2	41.6
31	40.3	37.0	39.0	37.6	36.2	32.8	43.2	46.0	54.7	55.1	55.6	50.8	44.0
32	43.4	33.6	32.8	27.9	24.3	33.7	43.1	46.4	49.4	53.4	56.8	48.8	41.1
33	44.2	31.8	27.1	24.0	28.6	32.6	39.2	48.2	51.4	53.9	55.2	49.4	40.5
34	38.5	39.4	13.0	29.0	37.0	36.2	42.4	49.2	52.6	57.6	55.9	50.9	41.8
1935	44.0	36.8	29.4	23.2	37.0	28.0	39.6	45.4	53.2	55.2	53.7	50.8	41.4
36	39.4	34.2	34.0	26.6	15.0	32.3	42.0	48.0	60.4	57.4	57.8	50.0	41.4
37	46.9	42.2	27.8	27.8	29.4	38.0	40.6	47.0	55.7	55.1	54.6	52.7	43.2
38	47.4	37.2	26.0	31.9	24.2	36.2	42.0	47.0	51.0	54.7	56.8	54.1	42.4
39	48.3	37.6	32.3	33.6	26.5	31.8	38.2	46.4	54.6	56.4	53.6	49.6	42.4
1940	41.2	38.3	39.9	32.8	32.2	35.6	45.4	49.0	53.1	58.8	54.8	52.2	44.4
41	45.8	33.8	34.8	31.2	33.6	39.6	45.2	49.2	56.1	56.7	59.8	51.0	44.7
42	43.5	35.0	29.5	38.0	35.8	34.8	42.5	53.3	55.4	57.7	56.9	53.1	44.6

Table 15 con't.

Juneau, Alaska - con't.

Water Year a/	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1943	45.2	31.4	23.8	23.6	29.2	33.4	42.4	48.1	55.2	55.4	55.4	51.0	41.2
44	45.6	42.6	38.6	36.4	34.0	34.6	41.8	47.9	56.4	56.8	56.4	53.2	45.4
1945	47.1	37.8	35.0	34.6	32.8	36.2	37.8	50.0	51.8	53.3	55.2	49.4	43.4
46	44.0	28.8	31.6	33.8	33.4	34.4	38.2	49.4	57.9	55.2	53.7	51.3	42.6
47	41.8	32.8	24.0	23.9	28.0	37.3	39.6	48.6	54.0	57.2	55.4	50.3	41.1
48	45.0	39.3	36.8	34.6	24.0	30.4	37.0	49.0	56.1	57.9	55.6	49.6	42.9
49	42.8	34.0	23.2	28.4	21.6	37.6	39.6	46.7	50.0	54.8	54.4	52.7	40.5
1950	43.1	42.0	25.2	18.0	25.3	35.2	38.0	44.9	57.9	55.6	57.4	51.0	41.1
51	41.5	26.1	32.5	22.6	25.6	27.2	40.2	47.3	52.9	61.8	57.3	53.5	40.7
52	41.3	36.1	28.1	19.0	33.2	34.7	38.6	45.6	53.8	57.7	56.4	50.9	41.3
53	47.0	40.4	36.2	20.6	36.2	33.8	42.0	50.9	59.7	59.7	57.5	51.4	44.6
54	45.5	37.2	35.9	23.0	26.8	34.6	36.2	50.2	56.4	57.1	60.0	53.0	43.0
1955	44.5	41.4	30.7	34.3	33.1	32.0	39.5	43.8	52.9	59.3	53.4	50.9	43.0
56	45.5	27.8	23.3	25.1	24.7	32.0	42.0	48.1	52.6	59.9	55.6	50.9	40.6
Mean	43.8	36.1	30.3	28.1	30.0	33.6	40.3	47.6	54.4	56.5	55.8	51.0	42.3

The figures were taken from climatological records of the Weather Bureau, U. S. Department of Commerce.

a/ Oct. 1 - Sept. 30

Table 16

Monthly and annual runoff in thousands of acre-feet
Sheep Creek near Juneau, Alaska

Water Year a/	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1911	-	-	-	0.60	0.48	0.42	0.30	2.70	5.50	5.70	4.60	2.40	-
12	3.80	1.20	2.10	0.59	1.15	0.73	1.20	5.73	4.30	2.95	2.87	2.87	29.49
13	2.70	1.21	1.80	0.73	1.01	0.95	1.93	4.05	4.05	5.20	4.05	3.60	31.28
17	5.16	1.92	0.91	0.35	1.09	0.57	0.55	3.69	5.37	6.11	5.93	5.02	36.67
18	5.52	6.37	1.13	0.63	0.38	0.26	0.35	3.91	6.13	4.26	5.31	4.55	38.80
19	4.01	3.74	2.32	1.82	0.44	0.30	1.51	3.78	5.16	5.92	4.69	5.46	39.15
1920	5.34	1.68	1.08	2.06	0.89	0.60	0.46	2.93	6.90	5.26	5.16	3.31	35.67
1947	4.24	4.45	0.52	0.50	0.20	2.45	2.53	5.43	5.18	3.86	3.43	8.06	40.85
48	4.71	4.55	1.41	1.05	0.49	0.15	0.01	5.54	4.91	5.76	3.01	6.05	37.64
49	4.53	5.44	0.58	0.51	0.17	0.61	1.32	5.25	7.57	5.78	5.57	3.75	41.08
1950	5.16	4.99	0.86	0.19	0.01	0.00	0.12	3.10	4.00	4.28	2.97	3.82	29.50
51	2.21	1.09	0.33	0.34	0.02	0.03	0.92	5.38	6.86	4.15	2.46	2.03	25.82
52	1.85	1.44	0.76	0.18	0.07	0.10	0.70	4.78	6.39	5.60	3.74	5.96	31.57
53	5.63	3.72	1.16	0.46	0.31	0.09	1.15	5.56	5.14	4.27	3.99	4.20	35.6[illegible]
54	5.93	1.42	1.36	0.65	0.89	0.26	0.16	2.77	4.52	3.81	1.74	2.40	25.91
1955	3.26	3.16	2.83	0.80	0.38	0.29	0.29	2.45	5.22	4.79	5.90	3.69	33.06
56	2.88	1.42	0.28	0.05	0.00	0.00	0.22	5.82	4.11	3.71	5.57	3.05	27.11
Mean	4.18	2.99	1.21	0.68	0.47	0.46	0.81	4.29	5.37	4.79	4.17	4.13	33.71

The monthly figures were taken from records compiled by the Geological Survey and were rounded to the nearest one hundredth. The records from 1950 to 1955 are provisional, subject to revision.

a/ Oct. 1 - Sept. 30

Monthly and annual runoff in thousands of acre-feet
Carlson Creek near Juneau, Alaska

Water Year a/	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1917	28.0	7.3	3.6	3.1	4.4	2.5	3.6	23.0	41.9	52.1	51.5	35.8	256.8
18	29.9	28.9	3.9	4.1	1.0	0.7	2.7	17.3	46.4	46.9	45.4	37.7	264.9
19	22.1	16.1	7.7	8.4	1.6	1.2	5.7	20.1	34.6	42.3	38.1	36.7	234.6
1920	25.3	7.7	6.5	6.8	2.4	1.1	1.5	14.8	43.1	42.2	45.1	24.6	221.1
1947	26.5*	27.8*	3.3*	3.1*	1.3*	15.3*	15.8*	34.0*	32.4*	24.1*	21.4*	50.0*	255. *
48	27.8*	26.8*	8.2*	6.2*	2.9*	0.9*	0.5*	32.6*	28.8*	34.0*	17.8*	35.5*	222. *
49	29.2*	35.0*	3.7*	3.2*	1.0*	4.0*	8.5*	34.0*	49.0*	37.3*	35.9*	24.2*	265. *
1950	32.3*	32.2*	5.5*	1.1*	0.5*	0.5*	0.8*	20.5*	26.0*	27.7*	19.3*	24.6*	191. *
51	13.5*	6.3*	2.0*	2.0*	0.5*	0.5*	5.6*	32.4*	41.6*	25.3*	14.9*	12.4*	157. *
52	16.3	7.0	3.0	1.0	0.9	1.6	5.5	22.7	41.4	45.0	34.8	43.1	222.3
53	47.0	20.8	7.4	2.3	1.7	0.8	6.1	31.1	43.4	32.4	30.5	30.5	254.0
54	42.5	6.9	7.5	2.6	10.5	2.0	1.8	19.8	39.2	34.6	17.4	26.6	211.4
1955	22.1	22.2	18.2	4.6	2.6	2.0	2.7	16.8	38.8	50.5	51.7	32.2	264.4
56	16.9	9.5	1.8	1.3	1.3	1.1	3.3	33.2	33.4	37.2	47.1	22.7	208.8

a/ Oct. 1 - Sept. 30

Drainage area 1917-20, 22.3 sq. miles; 1952-56, 24.3 sq. miles

* Estimated (for 22.3 sq. miles).

Table 17

Table 18

Monthly and annual runoff in thousands of acre-feet,
Dorothy Creek near Juneau, Alaska

Water Year a/	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1930	21.0	9.0	4.0	0.7	0.7	1.3	2.9	4.6	11.7	20.3	22.9	16.8	115.9
31	12.0	11.5	6.2	2.9	3.9	1.4	2.0	7.2	19.6	19.1	22.2	17.9	125.9
32	12.9	3.8	1.0	1.1	0.8	0.8	1.6	4.3	14.9	17.8	17.3	16.3	92.6
33	13.2	2.5	1.4	1.2	0.9	0.6	1.3	5.3	8.9	15.4	16.5	10.9	78.1
34	10.4	9.4	2.0	0.6	0.7	0.9	1.2	3.7	14.9	17.0	25.0	14.9	100.7
1935	13.2	4.9	3.3	1.0	0.6	1.1	1.1	3.3	9.8	24.3	18.8	12.1	93.5
36	12.4	3.4	5.1	1.1	0.7	1.2	2.1	6.7	18.9	18.4	16.7	21.2	107.9
37	28.0	16.9	7.0	1.5	0.8	1.4	1.6	4.1	17.7	15.4	18.4	20.2	133.0
38	23.6	5.1	3.0	2.6	2.1	4.2	1.3	7.7	12.2	17.2	15.1	23.3	117.4
39	14.3	4.4	3.4	2.0	1.3	1.1	1.4	4.5	13.4	21.0	26.8	15.3	108.9
1940	15.9	8.4	4.6	1.6	1.9	1.0	2.2	7.1	12.9	19.7	24.8	18.8	118.9
41	13.7	4.2	2.0	1.1	1.3	1.4	3.2	5.8	15.0	19.9	13.3	8.8	89.7
43	15.5	3.2	1.9	2.3	1.1	2.5	3.7	5.8	13.5	23.6	20.8	22.8	116.7
1945	19.7	8.3	5.2	1.2	0.8	1.5	1.6	7.2	14.5	20.3	16.1	18.4	114.8
46	24.5	2.8	1.2	0.9	0.8	1.1	1.1	8.6	16.8	16.3	20.4	13.7	108.2
47	11.9	7.7	1.6	1.4	1.0	5.3	2.8	7.3	16.6	16.3	14.9	22.8	109.6
48	13.0	5.3	3.9	2.2	1.1	1.0	0.8	8.2	19.1	18.7	16.8	23.0	113.1
49	10.0	7.3	2.3	1.9	0.8	1.1	1.7	7.1	12.3	16.7	18.9	16.5	96.6
1950	10.6	21.1	2.2	0.8	0.6	0.7	0.8	4.5	12.9	17.7	15.4	18.0	105.3
51	6.0	1.9	0.9	1.1	0.8	1.0	1.4	5.6	16.7	19.8	13.3	13.5	82.0
52	8.9	2.7	1.4	1.1	1.0	0.9	1.3	5.0	10.7	18.8	17.8	19.9	89.5
53	20.1	9.4	2.0	1.2	1.1	1.3	1.4	7.2	14.8	19.5	20.5	16.9	115.4
54	14.5	5.5	1.9	1.6	5.8	1.5	1.0	4.2	12.2	15.2	12.7	14.2	90.3
1955	8.3	6.8	4.4	1.7	1.0	1.2	1.2	3.8	9.9	20.0	20.9	15.0	94.2
56	7.2	3.2	1.3	0.7	0.6	0.9	1.2	6.8	10.2	18.6	27.1	14.3	92.1
Mean	14.4	6.7	2.9	1.4	1.3	1.5	1.7	5.8	14.0	18.7	18.9	17.0	104.4

The figures for the period 1930 to 1950 were taken from compilations of the Geological Survey; those from 1951 to 1955 are from unpublished records of the Geological Survey. The monthly figures were rounded to the nearest tenth and added to obtain the annual totals.

a/ Oct. 1 - Sept. 30

Table 19

Monthly runoff in thousands of acre-feet
Turner Creek at Turner Lake Outlet near Juneau b/

Water Year a/	O	N	D	J	F	M	A	M	J	J	A	S	Annual
1908								15.6	43.7	49.5	43.7	50.6	
09	40.0	17.6	15.1	8.9	5.0	6.5							

a/ Oct. 1 - Sept. 30.

b/ Called Turner Creek at Taku Inlet in "Water Powers of Southeast Alaska".