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Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

Water-Supply Paper 575

SURFACE WATER SUPPLY OF HAWAII

JULY 1, 1922, TO JUNE 30, 1923

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TERRITORY OF HAWAII

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AUTHORITY FOR INVESTIGATIONS

This volume contains results of measurements of the flow of certain streams and ditches in the Territory of Hawaii made during the year ending June 30, 1923. The investigations leading to the report were made by the United States Geological Survey in cooperation with the Territory of Hawaii, under the general sanction of the organic law of the Survey (Stat. L., vol. 20, p. 394), which contains the following paragraph:

Provided, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

As water is the most abundant and most valuable of the minerals, the investigation of water resources is authorized under the provision for examining mineral resources. The work has been supported since the fiscal year ending June 30, 1895, by appropriations in successive sundry civil bills passed by Congress under the following item:

For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

The Legislature of the Territory of Hawaii approved on March 22, 1909, "An act to promote the conservation and development of the natural resources of the Territory," which provided in substance as follows: A special tax of 2 per cent shall be levied, assessed, and collected annually on all incomes in excess of $4,000; and all amounts so collected shall constitute a special fund to be expended only for the encouragement of immigration and the conservation of natural resources in the proportion of three-fourths for immigration and one-fourth for conservation. The conservation fund shall be used for the development, conservation, improvement, and utilization of the natural resources, and shall be available for expenditure at such times and in such manner as a board of three persons appointed in accordance with section 80 of the organic act shall, with the approval of the governor, determine.

An act of April 26, 1911, amended the original act so as to extend it until December 31, 1913.

On April 4, 1913, the governor of the Territory of Hawaii approved the following acts providing (act 56) for the creation and maintenance of a division of hydrography under the board of agriculture and forestry, and (act 57) appropriating the revenues from water licenses for the use of the board of commissioners of agriculture and forestry toward forest protection and hydrographic surveying.

Section 1 of act 56 reads:

The board of agriculture and forestry is hereby authorized to create and maintain a division of hydrography for the investigation and determination of the water resources of the Territory by the gaging of streams and rainfall and other means, in cooperation with the United States Geological Survey or otherwise, and in furtherance thereof to take over and exercise the functions of the Territory in the conduct of the present hydrographic survey of the Territory.

Section 2 provides that this act shall take effect July 1, 1913.

Section 1 of act 57 reads:

All revenues derived from water licenses issued by the Territory during the period beginning July 1, 1913, and ending June 30, 1915, whether by way of rentals or otherwise, shall constitute and be held as a special fund in the treasury of the Territory to be disbursed on warrants of the auditor issued on approved vouchers of the president of the board of commissioners of agriculture and forestry. Such moneys shall be apportioned and applied from time to time by the board of commissioners of agriculture and forestry, acting with the approval of the governor, equally between the division of forestry and the division of hydrography to the following general purposes, and not otherwise:

1. For the protection of forest reservations, established or set apart according to law, against damage by fire, animals, and otherwise by means of fences and any other means whatsoever, and for the expenditures of the division of forestry.

2. For the development and maintenance of the hydrographic survey throughout the Territory.

Each voucher against said fund shall designate the general purpose for which it is drawn.

Section 2 provides that this act also shall take effect July 1, 1913.

Since June 30, 1915, the funds for the use of the division of hydrography have been supplied by successive appropriations from the general revenues of the Territory.

On March 23, 1917, the following act by the legislature of the Territory of Hawaii was approved:

ACT 27.

SECTION 1. The division of hydrography, authorized by and created pursuant to section 483 of the Revised Laws of Hawaii, 1915, is hereby transferred, together with all the materials, equipment, and supplies now under the control of the division or of the board of commisioners of agriculture and forestry for the division, to the commissioner of public lands.

SEC. 2. The commissioner of public lands shall have and exercise the same powers, duties, and jurisdiction with respect to said division as are now exercised by the board of commissioners of agriculture and forestry.

SEC. 3. All unexpended balances of appropriations heretofore made for said division, the expenditure of which is now by law vested in the board of commis-

sioners of agriculture and forestry, are hereby transferred to the commissioner of public lands and the expenditure thereof vested in said commissioner.

SEC. 4. This act shall take effect upon its approval.

On April 27, 1917, Act 156 by the Legislature of the Territory of Hawaii, "relating to the use of water from artesian wells," was approved, defining and prohibiting waste therefrom. Sections 5, 7, and 10 of this act read as follows:

SEC. 5. Any person boring, or causing to be bored, an artesian well shall keep a complete and accurate record of the depth and thickness of the different strata penetrated and within 90 days after the last day of boring, shall file such record in the office of the superintendent of hydrography of the Territory of Hawaii.

SEC. 7. For the more effectual carrying out of this act, the high sheriff and deputy high sheriff of the Territory, and the sheriff and deputy sheriff of any county or city and county, all police officers, and any authorized representative of any city, or county, or city and county, or of the superintendent of hydrography of the Territory may at all times enter without warrant the premises where an artesian well is situated or whereon or wherein artesian water is used in order to procure such information or for such other purpose as may be necessary.

SEC. 10. This act shall take effect from and after July 1, 1917, A. D.

A special item in the appropriation for the division of hydrography provided $1,200 for "expenses, water investigation" to be used for obtaining information regarding artesian wells. Since that time no further appropriations for the purpose have been available.

COOPERATION

COOPERATION WITH THE TERRITORY OF HAWAII

Under the authority conferred by the Federal and Territorial legislation, the Director of the United States Geological Survey and the Governor of the Territory of Hawaii entered into a cooperative agreement, dating from July 1, 1910, for "the gaging of streams and the determination of the water supply of the Territory of Hawaii." [1]

The principal features of this agreement are:

1. The United States Geological Survey assumes the responsibility of gathering, analyzing, and publishing the data.

2. During the progress of the work all notes, maps, and data gathered as a result of field studies are at all times open to inspection by the representative of the Territory, and if they are not satisfactory the agreement can be terminated.

3. Accounts for payment of salaries, travel, and subsistence, supplies, or other expenses necessary to the completion of the work shall be rendered in the manner required by the laws and regulations of the contracting parties, and vouchers shall be preferred to either party for payment according as it may be convenient or according to the balance remaining in the respective allotments.

[1] The U. S. Geological Survey also cooperated with the Territory of Hawaii in mapping several islands. The whole of the islands of Kauai, Oahu, and Molokai, and parts of the islands of Hawaii and Maui have been mapped.

4. The cost of publication is borne entirely by the Geological Survey.

Unless otherwise stated, all data have been collected and are published under this cooperative agreement with the Territory of Hawaii, which has borne from 60 to 80 per cent of the cost thereof.

Until June 30, 1913, the Territory of Hawaii was represented in the cooperation by the Board of Conservation; from July 1, 1913, to March 23, 1917, by the Board of Commissioners of Agriculture and Forestry; and since this date by the Commissioner of Public Lands.

OTHER COOPERATION

Special investigations have been made in cooperation with the Hawaiian Department, United States Army, the city and county of Honolulu, and private persons and corporations, under one of the plans indicated in the following paragraphs:

1. Expense of work, equipment, or installation paid entirely or in part by the cooperating party or by direct reimbursement to the field men.

2. Records collected by employees of a cooperating party but under supervision of and by methods of the Survey.

3. Assistance given in the collection of records, such as furnishing transportation, subsistence, or equipment.

4. Records furnished by a cooperating party, collected by his methods and under his supervision.

Cooperation in the collection of records for whose accuracy responsibility has not rested with the Survey has been acknowledged in the descriptions of the stations. Special acknowledgment is due to the following individuals and companies cooperating under plans 1, 2, and 3: Island of Kauai—Kekaha Sugar Co., Waimea Sugar Co., Kilauea Sugar Plantation Co., and Princeville plantation; island of Oahu—Wahiawa Water Co.; island of Maui—Pioneer Mill Co. and East Maui Irrigation Co.

SCOPE OF WORK

The investigations of the surface waters of the Territory are not complete, nor do they include all the streams and ditches that might advantageously be studied. They include, however, as many of the streams and ditches on the larger islands as the available appropriations would allow. It is essential that records of stream flow should be kept during a period of years long enough to determine within reasonable limits the range of flow from the maximum to the minimum. The length of such a period manifestly varies for different streams. Experience has shown that the records should be kept from 20 to 30 years.

In the performance of this work an effort is made to reach the highest degree of precision possible with a rational expenditure of

time and money. In all engineering work there is a point beyond which refinement is needless and wasteful, and this statement applies with especial force to stream-measurement work in Hawaii. It has been found, however, that it is possible to obtain data which are sufficiently accurate, although many of those presented in this report are for periods too short to yield definite conclusions.

Special intensive investigations of the discharge of certain streams which are of major importance for domestic water supply, power, and irrigation have been made.

Investigations of ditch seepage and other losses, in many localities, were made in cooperation with private corporations.

Records were kept of the artesian heads on typical wells in the more important artesian areas on Oahu.

DEFINITION OF TERMS

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated more or less definitely with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as "second-feet," "gallons per minute," "gallons per day," "miner's inches," and "run-off in second-feet per square mile," and (2) those which represent the actual quantity of water, as "run-off in depth in inches," "million gallons," and "acre-feet." Those used in this report may be defined as follows:

"Second-foot" is an abbreviation for cubic foot per second, and is the unit for the rate of discharge of water flowing in a stream 1 square foot in cross section at a rate of 1 foot per second. It is generally adopted as the fundamental unit in the measurement of flowing water and is the "natural" unit, as the foot and the second are the units used in making the physical determinations.

An "acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

In the Territory of Hawaii the unit most commonly used in measuring water is the "million gallons." This is used with two meanings—(1) to indicate a rate of flow and (2) to express an actual quantity of water. In the former sense "million gallons per day" is inferred, 1,000,000 gallons of 231 cubic inches being taken as the unit of quantity and 24 hours as the unit of time. With this meaning the term is generally used in connection with pumping and irrigation. In the latter sense "million gallons" as an absolute quantity is used in the measurement of storage capacities of reservoirs.

The following convenient approximate relations exist between second-feet, million gallons per day, and acre-feet: 1 second-foot flowing 24 hours equals about 2 acre-feet; 1,000,000 gallons equals

about 3 acre-feet; and 1 second-foot equals approximately two-thirds million gallons per day.

"Man's water" is an irrigator's term also in common use in Hawaii. It signifies the amount of water that one irrigator can properly handle in the field. It varies greatly, being dependent upon the condition of the furrows, the age of the crop, and the skill and individuality of the irrigator.

The following terms not in common use are here defined:

"Stage-discharge relation," an abbreviation for the term "relation of gage height to discharge."

"Control," a term used to designate the section or sections of the stream channel below the gage which determine the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.

The "point of zero flow" for a gaging station is that point on the gage—the gage height—at which water ceases to flow over the control.

EXPLANATION OF TABLES

For each current-meter gaging station are given, in general, the following data: Description of station, list of discharge measurements, table of daily discharge, table of monthly and yearly discharge and run-off in acre-feet and million gallons.

All rates of flow are expressed as million gallons per day.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as shifting channels and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the utilization of the water, the maximum and minimum stage and discharge, and the accuracy of the data.

The discharge-measurement table gives the results of the discharge measurements made during the year, including the date, name of hydrographer, gage height, and discharge in second-feet and million gallons per day.

The table of daily discharge gives the discharge in million gallons per day corresponding to the observed gage height as determined from the rating table, the number of significant figures used varying with the size of the discharge.

In the table of monthly discharge the column headed "Maximum" gives the flow for the day when the total discharge was greatest. This does not correspond to the rate of flow at the crest of the flood which is given under the heading "Extremes of discharge." Likewise in the column of "Minimum" the quantity given is the flow for the day when the total discharge was least. The columns headed "Mean"

give the average flow in million gallons per day and in cubic feet per second during the month. The "Total in million gallons" is the sum of the daily flows and "Total in acre-feet" is computed from the mean monthly discharge in million gallons per day.

Owing to the volcanic formation of the Hawaiian Islands there is so wide a diversity in the character and porosity of the rocks of the drainage basins that a general relation between rainfall and run-off can not be determined. For this reason information concerning drainage areas has been omitted in the various station descriptions.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS

The accuracy of stream flow data depends (1) on permanence of the relation between discharge and stage, (2) number, accuracy, and distribution of discharge measurements, and (3) on the accuracy of observations of stage and interpretation of data.

The accuracy recorded in the station description is based on the accuracy of the rating curve, the reliability of the gage-height record, the range of the fluctuation in stage, and knowledge of local conditions. The use of "excellent," "good," "fair," or "poor," indicates that the probable errors are within 5, 10, 15, and 25 per cent, respectively.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published.

DIVISION OF WORK

The data were collected and prepared for publication under the direction of E. D. Burchard, district engineer, Honolulu, Hawaii, by Max H. Carson, office engineer, E. M. Pickop, S. B. Hall, John McCombs, Karl Jetter, Francis Kanahele, John Kaheaku, Keiji Suzuki, Mrs. Clara H. Stevens, and Miss Marie A. Davison. The manuscript has been prepared by B. L. Bigwood and reviewed by Max H. Carson.

PUBLICATIONS

The following table gives, by years, the number of the papers on the surface-water supply of Hawaii published from 1903 to 1923. The data for any particular station will be found in the reports covering the years during which the station was maintained. This table in conjunction with the list of stations following provides a convenient index for finding the data for any station. For example, to find the data for Koolau ditch near Keanae, Maui, refer to the list of stations which shows that this station was operated from 1910 to 1912 and 1917 to date. Then referring to the table below it is found that Water-Supply Papers 318, 336, 485, 515, 516, 535, 555, and 575 contain the data for the years during which the station was operated.

Numbers of papers on surface-water supply of Hawaii, 1903–1923

Year	No.	Year	No.	Year	No.
1903	[a] 77	1915–16	445	1919–20	516
1909–1911 [b]	318	1916–17	465	1920–21	535
1912 [b]	336	1917–18	485	1921–22	555
1913 [b]	373	1918–19	515	1922–23	575
1913–1915	430				

[a] Water resources of Molokai, by Waldemar Lindgren.
[b] Calendar years; reports subsequent to Water-Supply Paper 373 cover the year beginning July 1 and ending June 30.

GAGING STATIONS MAINTAINED IN HAWAII

The following list comprises the gaging stations maintained in Hawaii by the United States Geological Survey and cooperative parties. The stations are arranged by stream basins and appear in systematic order for the several islands, tributaries of main streams being indicated by indention. The dates show the years or parts of years for which records are available. A dash following the date indicates that the station was being maintained June 30, 1923.

KAUAI ISLAND

Waimea River near Waimea, 1910–1919.
Waimea River below Kekaha ditch intake, near Waimea, 1921–
  Poomau River:
    Kawaikoi Stream near Waimea, 1909–1917; 1919–
      Kauaikinana Stream near Waimea, 1919–
      Waiakoali Stream near Waimea, 1909–1912; 1919–
    Mohihi Stream at elevation 3,700 feet, near Waimea, 1919–
    Mohihi Stream near Waimea, 1909–1912.
  Waiahulu Stream near Waimea, 1916–18.
  Koaie Stream at elevation 3,700 feet, near Waimea, 1919–
  Koaie Stream near Waimea, 1916–18.
  Waialae River at elevation 3,700 feet, near Waimea, 1920–
  Waialae River near Waimea, 1910–1916.
  Waialae River at elevation 800 feet, near Waimea, 1916–1921.
  Kekaha ditch at camp No. 1, near Waimea, 1910–1915, 1917–
  Kekaha ditch at flume No. 3, near Waimea, 1910–1912.
  Kekaha ditch at flume No. 4, near Waimea, 1916–17.
  Kekaha ditch at siphon, near Waimea, 1910–1912.
  Kekaha ditch at tunnel No. 12, near Waimea, 1910–1914.
  Kekaha ditch below tunnel No. 12, near Waimea, 1916–
  Waimea ditch near Waimea, 1911–1913, 1916–1921.
  Kamenehune ditch near Waimea, 1911–1919.
  Makaweli River near Waimea, 1911–1917.
    Halekua Stream near Waimea, 1912–13.
    Olokele River near Waimea, 1915–1917.
      Olokele ditch at tunnel No. 12, near Makaweli, 1904–1917.
      Olokele ditch at weir, near Makaweli, 1912–1917.
    Poowaiomahaihai ditch near Waimea, 1911–1913.
Hanapepe River above Hanapepe Falls, near Eleele, 1911–12.

Hanapepe River at Koula, near Eleele, 1910–1916, 1917–1921.
Hiloa ditch near Eleele, 1911–1915.
East Branch Hanapepe River below Hanapepe Falls, near Eleele, 1911–12.
Hanapepe ditch at Hanapepe Falls, near Eleele, 1911–1915.
Hanapepe ditch at Koula, near Eleele, 1910–1921.
Hanapepe ditch at weir, near Hanapepe, 1910–1917.
Manuahi Stream near Eleele, 1917–1920.
Huleia River near Lihue, 1912–1915.
Hanamaulu River at Kapaia, near Lihue, 1911–1914.
Wailua River:
South Fork of Wailua River at siphon, near Lihue, 1910–1911.
South Fork of Wailua River near Lihue, 1911–
Hanamaulu ditch near Lihue, 1910–1919.
Lihue ditch near Lihue, 1910–1919.
North Fork of Wailua River near Lihue, 1910–1914.
North Fork of Wailua River at elevation 650 feet, near Lihue, 1914–
Kanaha ditch near Lihue, 1910–
East Branch of North Fork of Wailua River near Lihue, 1912–
Uhau Iole Stream at elevation 750 feet, near Lihue, 1912.
Keahua Stream at elevation 750 feet, near Lihue, 1912.
Kawi Stream at elevation 750 feet, near Lihue, 1912.
Konohiki Stream at Makakualele weir (mauka), near Kapaa, 1911–1913.
Kaehulua Stream at Kuhinoa (mule stable) weir, near Kapaa, 1911–1913.
South Fork of Kaehulua Stream at Wainamuamu weir, near Kapaa, 1911–12.
North Fork of Kaehulua Stream at Wainamuamu weir, near Kapaa, 1911–13.
Kapaa River near Kealia, 1910–1920.
Akulikuli Spring near Kealia, 1911–1913.
Kapahi ditch near Kealia, 1909–
Tunnel ditch at Kapahi, near Kapaa, 1909–1911.
Kapaa ditch at Kapahi, near Kapaa, 1909–1911.
Pipe ditch at Kapahi, near Kapaa, 1909–1911.
Kealia Stream:
Kaneha ditch near Kealia, 1909–1913.
Anahola River at elevation 1,140 feet, near Kealia, 1912.
Anahola River near Kealia, 1910, 1912–
Anahola River at Kiokala dam, near Kealia, 1910–1912.
Anahola ditch above Kaneha reservoir, near Kealia, 1914–
Anahola ditch at Kiokala, near Kealia, 1909–1914.
Anahola ditch at makai weir, near Kealia, 1909–1911.
Halaulani Stream near Kilauea, 1922–
Kalihiwai River near Hanalei, 1914–1923.
Kalihiwai River near Kilauea, 1912–1914.
Hanalei River at elevation 625 feet, near Hanalei, 1914–
Hanalei River near Hanalei, 1911–1919.
China ditch near Hanalei, 1911–1919.
Kuna ditch near Hanalei, 1912–13, 1916–1919.
Waioli Stream near Hanalei, 1914–
Lumahai River near Hanalei, 1914–1917; 1920–
Lumahai River near Wainiha, 1912.
Wainiha River near Hanalei, 1914–1917.
Wainiha River, East Channel, near Wainiha, 1912–1916.
Wainiha River, West Channel, near Wainiha, 1911–1916,
Wainiha canal at intake, near Wainiha, 1910–1916.
Wainiha canal at tunnel No. 18, near Wainiha, 1911.
Wainiha canal at tailrace, near Wainiha, 1911.

OAHU ISLAND

Kalihi Stream near Honolulu, 1913–
Nuuanu Stream at Laukaha weir, in upper Nuuanu Valley, near Honolulu, 1903, 1910–1913.
Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, 1913–
Nuuanu Stream at Kuakini Street, near Honolulu, 1911–12.
    Lulumaha ditch at upper Nuuanu reservoir, near Honolulu, 1911–1913.
    Maole ditch, mauka station, near Honolulu, 1917–1920.
    Maole ditch, makai station, near Honolulu, 1917–1923.
Pauoa Stream at upper Pauoa Valley, near Honolulu, 1911–1913.
    Kahuawai Spring near Honolulu, 1912–1914.
Manoa Stream at upper Manoa Valley, near Honolulu, 1910–1913.
Manoa Stream at College of Hawaii, near Honolulu, 1909–1918.
    West Branch of Manoa Stream near Honolulu, 1913–1921.
    East Branch of Manoa Stream near Honolulu, 1913–1921.
        East Manoa ditch near Honolulu, 1915–16, 1918–1921.
Palolo Stream:
    Pukele Stream at Mahoe springs, near Honolulu, 1912–13.
    Waiomao Stream at upper Palolo Valley, near Honolulu, 1911–1913.
    Waiomao Stream above Pukele, near Honolulu, 1911–12.
Waimanalo ditch below main reservoir, near Waimanalo, 1912–13.
Pump ditch near Waimanalo, 1912.
Makawao ditch near Kailua, 1912–16.
Kailua Stream above Wong Leong's ditch, near Kailua, 1922–23.
Kailua Stream near Kailua, 1912–1916.
    Wong Leong's ditch near Kailua, 1912–1916.
    Makawao Stream near Kailua, 1912–1916.
        Makawao Spring near Kailua, 1914–1916.
    Kaimi Stream near Kailua, 1912–1916.
        Main spring near Kailua, 1914–1916.
    Kamakalepo Stream near Kailua, 1912–1916.
    Pohakea Stream near Kailua, 1912–1914.
Kahanaiki Stream in Kailua Valley near Kailua, 1912.
Kahanaiki Stream near Kailua, 1914–1916.
    South Branch of Kahanaiki Stream near Kailua, 1913–14.
    North Branch of Kahanaiki Stream near Kailua, 1913–14.
    Kahanaiki ditch in Kailua Valley, near Kailua, 1912–13.
Kaneohe Stream near Kaneohe, 1914–1916.
    Young Mau ditch near Kaneohe, 1914–1916.
    Ahlo ditch near Kaneohe, 1914–1916.
    Hooleinaiwa Stream near Kaneohe, 1914–1916.
    Piho Stream near Kaneohe, 1914–1916.
    Kuou Stream near Kaneohe, 1914–1916.
        Kuou ditch near Kaneohe, 1914–1916.
    Luluku Stream near Kaneohe, 1914–1916.
        North Luluku ditch near Kaneohe, 1914–1916.
Kawa Stream near Kaneohe, 1914–1916.
Heeia Stream:
    Wing Wo Tai ditch near Heeia, 1914–1916.
  Hop Tuck ditch near Heeia, 1914–1916.
    Lee ditch near Heeia, 1914–1916.
    Haiku Stream near Heeia, 1914–1919.
        Reservoir ditch near Heeia, 1914–1916.
        Waipio ditch near Heeia, 1914–1916.
    Iolekaa Stream near Heeia, 1914–1916.

Waiahole Stream below power house, near Waiahole, 1915
Waiahole Stream near Waiahole, 1911–1916.
Waiahole Stream at Waikane, 1911–12.
Waihi Stream near Waikane, 1911.
Halona Stream near Waikane, 1911.
Waianu Stream near Waikane, 1911.
Waikane Stream near Waikane, 1911–12.
Kahana Stream near Kahana, 1914–1917.
East Branch of Kahana Stream near Kahana, 1914–1917.
Punaluu Stream at elevation 539 feet, near Punaluu, 1915–1918.
Punaluu Stream at elevation 250 feet, near Punaluu, 1914–1918.
Punaluu Stream near Hauula, 1906–7.
Waihoi Stream near Punaluu, 1915–1917.
Kaluanui Stream near Hauula, 1906–7, 1915–1917.
Kaipapau Stream near Hauula, 1906–7.
Koloa Stream near Laie, 1914–1918.
Wailele Stream near Laie, 1914–1918.
East Branch of Kahawainui Stream near Laie, 1914–1918.
East Branch of Malaekahana Stream near Kahuka, 1914–1918.
Middle Branch of Malaekahana Stream near Kahuka, 1914–1918.
Kaukonahua Stream:
North Fork of Kaukonahua Stream near Wahiawa, 1911.
Right Branch of North Fork of Kaukonahua Stream near Wahiawa 1913–
Left Branch of North Fork of Kaukonahua Stream near Wahiawa, 1913–
South Fork of Kaukonahua Stream above United States Army reservoir, near Wahiawa, 1911, 1913–1917.
United States Army ditch at reservoir, near Wahiawa, 1914–15.
South Fork of Kaukonahua Stream below United States Army reservoir, near Wahiawa, 1914–1917.
Wahiawa reservoir ditch near Wahiawa, 1910–11.

MOLOKAI ISLAND

Halawa Stream near Halawa, 1917–
Papalaua Stream near Wailau, 1919–
Wailau Stream:
Waiakeakua Stream near Wailau, 1919–
Pulena Stream near Wailau, 1919–
Pelekunu Stream near Pelekunu, 1919–
Lanipuni Stream near Pelekunu, 1919–
Waikolu Stream at elevation 650 feet, near Kalaupapa, 1920–1923.
Waikolu Stream at pipe-line crossing, near Kalaupapa, 1919–

MAUI ISLAND

WEST MAUI

Iao Stream near Wailuku, 1910–1915.
Manianiа ditch near Wailuku, 1909–1913.
Waiehu Stream:
South Waiehu Stream near Wailuku, 1910–1917.
South Waiehu ditch near Wailuku, 1912–1915.
North Waiehu Stream near Wailuku, 1912–1917.
North Waiehu ditch near Wailuku, 1910–11, 1916–17.

Waihee Stream near Waihee, 1910–1912, 1913–1917.
Waihee canal near Waihee, 1910–1912.
Waihee canal at weir, near Wailuku, 1911–12.
Spreckels ditch near Waihee, 1910–1913.
Spreckels ditch at Waiale weir, near Wailuku, 1910–11.
Kahakuloa Stream at Kahakuloa, near Waihee, 1912–13.
Kahakuloa Stream near Honokahau, 1913–14.
Honokahau Stream near Honokahau, 1913–1920; 1922–
Honokahau ditch at intake, near Honokahau, 1907–1913.
Honokahau ditch above Honolua Stream, near Honokahau, 1910–11.
Honokahau ditch at Honokawai weir, near Lahaina, 1910–1912.
Honolua Stream at Honolua ranch, 1911.
Honolua Stream near Honokahau, 1913–1917.
Honolua ditch near Honokahau, 1911–12.
Honokawai Stream near Lahaina, 1911; 1912–1917.
Honokawai Stream at weir No. 1, near Lahaina, 1901.
Honokawai ditch near Lahaina, 1912–1917; 1918–
Kahoma Stream near Lahaina, 1911–12; 1913–1917.
Kahoma Stream at weir No. 1, near Lahaina, 1901.
Kahoma Stream at weir No. 2, near Lahaina, 1901.
Kahoma development tunnel near Lahaina, 1911–1917.
Kanaha Stream above pipe-line intake, near Lahaina, 1916–
Kanaha Stream near Lahaina, 1911–1916.
Lahainaluna weir No. 1 near Lahaina, 1901.
Lahainaluna weir No. 2 near Lahaina, 1901.
Lahainaluna ditch near Lahaina, 1913–14.
Kauaula Stream near Lahaina, 1912; 1913–1917.
Kauaula Stream at weir No. 3, near Lahaina, 1901.
Kauaula ditch near Lahaina, 1911–1917.
Kauaula Stream, North Fork, at weir No. 1, near Lahaina, 1901.
Kauaula Stream, South Fork, at weir No. 2, near Lahaina, 1901.
Launiupoko Stream near Lahaina, 1911–1917.
Olowalu Stream near Olowalu, 1913–1916.
Olowalu ditch near Olowalu, 1911–
Ukumehame Stream near Olowalu, 1911–12; 1913–1919.
Waikapu Stream near Waikapu, 1910–1917.
Paollo (Everett) ditch near Waikapu, 1910–1917.
South Side Waikapu ditch near Waikapu, 1910–1917.

EAST MAUI

Koolau ditch region:
Hanawi Stream near Nahiku, 1914–15; 1921–
Kapaula Stream near Nahiku, 1921–
Waiohue Stream near Nahiku, 1921–
West Kopiliula Stream near Keanae, 1914–1917; 1921–
East Wailuaiki Stream near Keanae, 1913–1917; 1922–
West Wailuaiki Stream near Keanae, 1914–1917; 1921–
East Wailuanui Stream near Keanae, 1914–1917; 1921–
West Wailuanui Stream near Keanae, 1913–1917.
Koolau ditch at Nahiku weir, near Nahiku, 1919–
Koolau ditch near Keanae, 1910–1912, 1917–
Koolau ditch at Wahinepe, near Huelo, 1922–
Koolau ditch at Alo division weir, near Huelo, 1908–1911.

Spreckles ditch region:
- Honomanu Stream at Haiku-uka boundary, near Kailiili, 1919–
- Honomanu Stream near Keanae, 1913–
- Haipuaena Stream at Haiku-uka boundary, near Kailiili, 1919–
- Haipuaena Stream near Huelo, 1910–
- Puohakamoa Stream near Huelo, 1910–
  - East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, 1919–
  - Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, 1919–
  - West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, 1919–
  - Puohakamoa intake of Koolau ditch near Huelo, 1922–
- Waikamoi Stream above Wailoa ditch, near Huelo, 1922–
- Waikamoi Stream near Huelo, 1910–1922.
  - East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, 1918–
  - West Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, 1918–
- Alo Stream near Huelo, 1910–
- Oopuola Stream near Huelo, 1910–1915.
- Spreckles ditch at station No. 1, near Huelo, 1910–1913.
- Spreckles ditch at station No. 2, near Huelo, 1911–1913.
- Spreckles ditch at station No. 3, near Huelo, 1910–1913.
- Spreckles ditch at Haipuaena weir, near Huelo, 1922–
- Spreckles ditch at station No. 4, near Huelo, 1910–1913.
- Spreckles ditch at station No. 5, near Huelo, 1911–1913.
- Spreckles ditch at station No. 6, near Huelo, 1911–1913.
- Spreckles ditch below Kaaiea Gulch, near Huelo, 1917–
- Spreckles ditch at station No. 7, near Huelo, 1911–1912.
- Spreckles ditch at station No. 8, near Huelo, 1911–1913.

Center ditch region:
- Manuel Luis ditch at Puohakamoa Gulch, near Huelo, 1917–
- Center ditch at Waikamoi, near Huelo, 1918–1922.
- Center ditch below Kolea reservoir, near Huelo, 1922–
- Center ditch near Huelo, 1910–1912.

Hamakua ditch region:
- Nailiilihaele Stream near Huelo, 1910–1912; 1913–1918; 1919–
- Kailua Stream at Haiku-uka boundary, near Kailiili, 1918–
- Kailua Stream near Huelo, 1910–1912; 1913–1918; 1919–
- Oanui Stream near Huelo, 1910–11; 1913–1916.
- Hoolawaliillii Stream near Huelo, 1911–
- Hoolawanui Stream near Huelo, 1911–
- Honopou Stream near Huelo, 1910–
- Halehaku Stream at dam, near Huelo, 1910–11.
- Halehaku Stream weir near Huelo, 1910–1912.
- Opana Stream near Huelo, 1910–1912.
- Wailoa ditch at Honopou, near Huelo, 1922–
- Opana ditch near Huelo, 1910–1912.
- New Hamakua ditch at Nailiilihaele weir, near Huelo, 1910–1912.
- New Hamakua ditch at Honopou, near Huelo, 1918–1922.
- New Hamakua ditch at Halehaku weir, near Huelo, 1910–
- New Hamakua ditch at station No. 1, near Huelo, 1912.
- New Hamakua ditch at station No. 2, near Huelo, 1912.

Hamakua ditch region—Continued.
New Hamakua ditch at station No. 3, near Huelo, 1912.
New Hamakua ditch at station No. 4, near Huelo, 1912.
New Hamakua ditch at station No. 5, near Huelo, 1912.
Old Hamakua ditch at Kailua, near Huelo, 1919–1922.
Old Hamakua ditch at Honopou, near Huelo, 1918–
Old Hamakua (Kauhikoa) ditch at Opana weir, near Huelo, 1910–
Kaluanui ditch at Puuomalei, near Hamakuapoko, 1910–1912.
Lowrie ditch at Opana weir, near Huelo, 1910–
Haiku ditch at Peahi weir, near Huelo, 1910–1914.
Haiku ditch at Manawai Gulch, near Peahi, 1914–

HAWAII ISLAND

Hilo group:
81 stations at elevation 2,700 feet, in forest back of Hilo, 1911–1913.
Olaa flume at Kaumana, near Hilo, 1917–1920.
Wailuku River near Hilo, 1911–1913, 1918–19.
Hilo Boarding School ditch near Hilo, 1918–19.
Honolii River at Kaiwiki, near Hilo, 1911–1913.
Honolii ditch at Kaiwiki, near Hilo, 1911.
Kawainui River at Kawainui, near Pepeekeo, 1911–12.
4 stations at Piihonua, near Hilo, 1912.

Hamakua group:
Waipio River below Koiawe, near Waipio, 1911–12.
Waipio River below Waima, near Waipio, 1911–12.
Waipio River at elevation 360 feet, near Waipio, 1901–2.
New Hamakua ditch at Waima Stream, near Waipio, 1912.
Lower Hamakua ditch at main weir, near Kukuihaele, 1910–1920.
Upper Hamakua ditch at Puualala and reservoir No. 3 weirs, near Kukuihaele, 1913–1920.
Kawainui Branch of Waipio River near Waipio, 1911–12.
Kawainui Stream at elevation 2,120 feet, near Waipio, 1901–2.
Kawainui Stream at elevation 1,435 feet, near Waipio, 1901–2.
Kawainui Stream at elevation 775 feet, near Waipio, 1901–2.
Branch No. 3 of Kawainui Stream at elevation 1,700 feet, near Waipio, 1901–2.
Branch No. 2 of Kawainui Stream at elevation 1,405 feet, near Waipio, 1901–2.
Branch No. 1 of Kawainui Stream at elevation 1,380 feet, near Waipio, 1901–2.
Alakahi Stream at elevation 1,200 feet, near Waipio, 1901–2.
Alakahi Stream at elevation 730 feet, near Waipio, 1901–2.
Koiawe Stream at elevation 610 feet, near Waipio, 1901–2.
Waima Stream at elevation 790 feet, near Waipio, 1901–2.
Waima Stream at elevation 385 feet, near Waipio, 1901–2.

Kohala group:
Honokane Stream—
East Branch of Honokane Stream at elevation 1,300 feet, near Honokane, 1901.
East Branch of Honokane Stream at elevation 770 feet, near Honokane, 1901.
West Branch of Honokane Stream at elevation 1,370 feet, near Honokane, 1901.
West Branch of Honokane Stream at elevation 775 feet, near Honokane, 1901.

Kohala group—Continued.
Honokane Stream—Continued.
Kohala ditch above Honokane Gulch, near Kohala, 1908–1918.
Kohala ditch at Awini weir, near Kohala, 1907–1917.
Kohala ditch at Niulii weir, near Kohala, 1907–1917.
Kehena ditch at Honokane mauka, near North Kohala, 1912–13.
Kehena ditch near Kohala, 1917–1919.
Kau group:
Waiohinu Springs, mauka station, near Naalehu, 1917–18.
Waiohinu Springs, makai station, near Naalehu, 1917–18.

GAGING-STATION RECORDS

ISLAND OF KAUAI

WAIMEA RIVER BELOW KEHAKA DITCH INTAKE, NEAR WAIMEA, KAUAI

LOCATION.—In Waimea Canyon, 8 miles by trail north of Waimea, at camp No. 1, 500 feet below Kekaha ditch intake.

RECORDS AVAILABLE.—July 24, 1921, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 40 feet below gage.

CHANNEL AND CONTROL.—Bed composed of boulders. Right bank vertical rock wall, 1,100 feet high. Left bank sloping and boulder-strewn; not subject to overflow. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum discharge during year probably greater than 2,500 million gallons per day or 3,870 second-feet on January 12 (gage height, at least 14.62 feet; at this stage the float wire disengaged from the wheel and the absolute maximum is therefore indeterminate). Minimum discharge uncertain owing to deposition of silt in recorder stilling well.

1921–1923: Maximum discharge recorded on January 12, 1923; minimum discharge uncertain but is probably less than 0.3 million gallons per day (0.5 second-foot).

DIVERSIONS.—Entire low-water flow, except leakage through dam is diverted into Kekaha ditch at intake 500 feet above station.

REGULATION.—By diversion only.

OBJECT OF STATION.—To determine amount of flow not diverted into Kekaha ditch.

UTILIZATION.—Low-water flow used for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation not permanent. Two rating curves used; well defined below 250 million gallons per day; indirect method for shifting control used April 1–25. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for extremely high stages.

Discharge measurements of Waimea River below Kekaha ditch intake, near Waimea Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 8	Karl Jetter	0.88	0.5	0.35	Jan. 19	M. H. Carson	3.47	297	192
Oct. 4	do	2.06	31.5	20.4	Mar. 4	Karl Jetter	2.32	63	41
Nov. 23	do	1.43	2.5	1.6	Apr. 19	do	2.58	80	52
23	do	1.42	2.5	1.6	June 6	do	1.07	1.15	.75

Discharge, in million gallons per day, of Waimea River below Kekaha ditch intake, near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	0.4	14.2	------	0.8	------	------	278	------	482	------	------
2	.4	.4	5.9	------	.8	------	------	189	------	295	------	------
3	.4	.4	77	------	2.9	------	------	------	------	197	------	------
4	.4	.4	19.2	------	30	------	------	------	------	158	------	------
5	.4	.4	7.8	5.4	44	------	------	------	34	129	------	------
6	.4	.4	.6	5.2	5.2	------	------	------	28	108	------	0.7
7	.4	.4	8.4	5.0	200	------	------	------	92	95	------	.8
8	.4	2.6	2.6	5.0	330	------	------	220	343	88	------	.8
9	.4	5.9	4.5	5.0	66	------	------	229	362	82	------	.8
10	1.6	1.1	1.4	4.8	15.4	------	------	------	213	77	------	.9
11	.6	13.8	------	4.8	61	------	------	------	213	------	------	.9
12	.4	1.4	------	4.8	33	------	------	------	115	------	------	.7
13	.4	.3	------	4.5	53	------	------	------	88	------	------	.7
14	.4	.3	------	4.5	39	------	------	------	65	------	------	.6
15	.4	.3	------	9.9	7.2	------	------	------	48	------	------	2.1
16	.4	.4	------	4.8	38	------	------	------	37	------	------	4.4
17	.4	.4	------	4.8	88	------	------	------	31	------	------	7.8
18	.4	.4	------	4.5	129	------	------	------	29	144	------	10.0
19	.4	.4	------	4.5	115	------	------	------	25	------	------	3.8
20	.5	.4	------	11.1	103	------	374	------	21	------	------	16.6
21	.5	.4	------	65	57	------	245	------	16.7	82	------	15.0
22	.4	.4	------	8.2	15.4	------	205	------	13.4	------	------	4.9
23	.4	.4	------	60	5.0	------	150	249	13.8	------	------	.3
24	.4	.4	------	199	1.4	------	140	213	61	------	------	.3
25	.4	.4	------	48	1.4	------	213	197	108	278	144	.3
26	2.0	2.2	------	5.5	1.5	------	250	------	71	136	------	.3
27	.4	10.1	------	1.0	799	------	500	------	246	------	197	.3
28	.4	.4	------	1.0	486	------	408	------	68	144	------	.3
29	.4	.4	------	.9	186	------	245	------	26	------	------	.3
30	.4	.4	------	.8	100	------	174	------	186	------	------	.3
31	.4	19.7	------	.8	------	------	513	------	936	------	------	------

NOTE.—No gage-height record Aug. 22; discharge interpolated. No record Sept. 11 to Oct. 4; discharge not determined. During other periods for which no discharge is given recorder did not operate properly, owing to the deposition of silt in stilling well.

Monthly discharge of Waimea River below Kekaha ditch intake, near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.0	0.4	0.50	0.77	15.6	48
August	19.7	.3	2.12	3.28	65.7	202
November	799	.8	100	155	3,010	9,210

KAUAIKINANA STREAM NEAR WAIMEA, KAUAI

LOCATION.—1 mile east of Kokee, 12 miles north of Waimea (20 miles from Waimea by road and trail), and 200 feet above Kokee-Mohihi trail.

RECORDS AVAILABLE.—July 1, 1919, to June 30, 1923. Miscellaneous measurements 1911–1916.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable at gage.

CHANNEL AND CONTROL.—Rocky boulder-strewn bed and high rocky banks. Control composed of large boulders; subject to shift during high floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 230 million gallons per day or 356 second-feet, at 7.15 p.m. November 27 (gage height, 6.60 feet); minimum discharge recorded, 0.3 million gallons per day or 0.45 second-foot, at 2 a. m. August 6, 1922 (gage height, 1.72 feet).

1919–1923: Maximum discharge recorded, 380 million gallons per day or 588 second-feet, December 24, 1920 (gage height, 8.30 feet); minimum discharge recorded, 0.17 million gallons per day or 0.26 second-foot, at 2 p.m. October 23, 1921 (gage height, 1.71 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high level (3,100 feet) diversion to serve semiarid Territorial lands now idle on account of lack of water.

UTILIZATION.—After it reaches Waimea River low-water flow is used for power and irrigation.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve fairly well defined below 30 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of Kauaikinana Stream near Waimea, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 6	Karl Jetter	1.87	0.9	0.6	Jan. 16	M. H. Carson	3.08	38	24.5
Oct. 2	do	1.84	.6	.4	Feb. 27	Karl Jetter	2.36	8.3	5.4
2	do	1.84	.85	.55	Apr. 13	do	2.23	4.5	2.9
Nov. 25	do	2.02	2.1	1.35	May 30	do	2.06	1.85	1.2

Discharge, in millions gallons per day, of Kauaikinana Stream near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.7	0.5	0.6	0.6	0.6	5.6	1.2	16.2	4.8	31	2.4	1.9
2	.8	.4	1.0	.7	.6	4.6	1.5	10.6	4.6	14.4	2.3	1.4
3	.8	.4	2.5	3.6	.6	3.9	2.1	8.5	4.3	10.1	2.2	1.2
4	.7	.4	2.3	1.5	.6	3.5	1.6	7.2	4.0	7.6	2.0	1.2
5	.7	.4	1.4	.8	.9	3.1	1.2	6.5	3.6	6.5	1.9	1.2
6	.7	.4	.9	.7	.7	2.9	1.2	5.8	3.5	5.6	1.9	1.4
7	.7	.4	.8	.6	1.6	2.7	1.2	5.4	5.6	5.0	1.9	1.2
8	.7	.4	1.0	.6	5.2	2.5	1.2	7.6	33	4.6	1.9	1.2
9	.7	.4	1.7	.6	1.5	2.4	1.8	18.5	40	4.3	1.8	1.2
10	.9	.5	1.1	.6	1.0	2.3	46	5.6	22	4.0	1.7	1.1
11	.8	1.0	20	.6	9.2	2.2	129	4.9	16.1	3.8	1.7	1.0
12	.8	.7	6.7	.5	3.3	2.1	91	18.4	8.3	3.5	1.7	1.0
13	.8	.6	1.4	.5	4.5	2.0	27	6.0	12.9	3.4	1.6	1.0
14	.9	.6	1.0	.5	2.5	1.9	84	4.9	7.4	3.4	1.6	1.0
15	1.0	.5	.8	.6	1.9	1.9	35	9.7	6.2	3.9	1.6	1.0
16	.9	.5	.7	.6	2.4	1.8	26	6.2	5.5	3.1	1.6	1.0
17	.8	.5	.9	.5	4.0	1.7	44	4.6	5.2	3.0	1.6	1.0
18	.8	1.0	1.1	.5	6.1	1.7	24	4.2	4.9	2.9	1.6	1.0
19	.7	.7	1.8	.5	4.4	1.6	25	3.8	4.4	2.8	1.5	1.0
20	.7	.7	1.0	1.2	6.6	1.6	22	3.5	4.2	2.7	1.5	1.0

Discharge, in millions gallons per day, of Kauaikinana Stream near Waimea, Kauai, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
21	0.7	0.6	0.7	1.9	3.4	1.5	12.7	3.4	3.9	2.6	1.4	1.0
22	.7	.6	.9	.9	2.3	1.5	9.8	19.2	3.6	2.5	1.4	1.0
23	.6	.5	1.9	1.4	1.9	1.4	7.8	11.5	3.5	2.4	1.4	1.0
24	.6	.5	1.3	4.5	1.6	1.4	6.9	11.3	3.8	2.4	1.4	.9
25	.6	.6	1.0	1.6	1.4	1.4	10.9	8.2	4.0	17.3	1.5	.9
26	.6	.9	.8	1.0	1.4	1.4	11.6	5.8	4.8	4.0	1.9	.8
27	.6	.7	.7	.8	87	1.3	27	5.4	15.2	2.9	5.1	.8
28	.5	.6	.6	.7	21	1.3	18.0	4.8	4.2	2.6	1.9	.8
29	.5	.5	.6	.6	13.8	1.3	10.1	-------	3.3	2.4	1.6	.8
30	.5	.5	.6	.6	7.6	1.2	7.8	-------	20	2.3	2.0	.8
31	.5	.6	-------	.6	-------	1.2	43	-------	68	-------	1.9	-------

Monthly discharge of Kauaikinana Stream near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.0	0.5	0.71	1.10	22.0	68
August	1.0	.4	.57	.88	17.6	54
September	20	.6	1.93	2.99	57.8	178
October	4.5	.5	1.00	1.55	30.9	95
November	87	.6	6.65	10.3	200	612
December	5.6	1.2	2.16	3.34	66.9	205
January	129	1.2	23.6	36.5	732	2,250
February	19.2	3.4	8.13	12.6	228	699
March	68	3.3	10.8	16.7	335	1,030
April	31	2.3	5.57	8.62	167	513
May	5.1	1.4	1.85	2.86	57.5	176
June	1.9	.8	1.06	1.64	31.8	98
The year	129	.4	5.33	8.25	1,950	5,980

KAWAIKOI STREAM NEAR WAIMEA, KAUAI

LOCATION.—3 miles northeast of Knudsen's mountain house and 21 miles by road and trail from Waimea.

RECORDS AVAILABLE.—April 13, 1909, to July 11, 1917, and July 1, 1919, to June 30, 1923. No record of value after December 17, 1916, until July 3, 1919.

GAGE.—Stevens continuous water-stage recorder installed August 4, 1919. Staff gage used April 13, 1909, to May 26, 1910; Friez water-stage recorder May 26, 1910, to October 11, 1911; and Barrett and Lawrence water-stage recorder October 11, 1911, to August 4, 1919.

DISCHARGE MEASUREMENTS.—Made by wading or from cable near trail crossing 300 feet downstream.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below station. Banks high and wooded. Control composed of rock ledge and boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, from extension of rating curve, 1,280 million gallons per day or 1,980 second-feet, at 10.10 p. m. January 10 (gage height, 10.59 feet); minimum discharge recorded, 1.9 million gallons per day or 2.9 second-feet, from 7 to 11 p. m. August 7 (gage height, 1.40 feet).

1909–1923: Maximum stage recorded, 15.2 feet December 18, 1916 (discharge not determined). Minimum discharge recorded, 1.3 million gallons per day or 2.0 second-feet, for several hours September 15, 1921 (gage height, 1.28 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diverting flood water into high level (3,100 feet) ditch to serve Territorial lands now idle on account of lack of irrigation.

UTILIZATION.—After it reaches Waimea River low water is used for power and irrigation.

ACCURACY.—Stage-discharge relation changed during flood of September 11. Rating curves fairly well defined between 2 and 200 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except for extremely high stages.

Discharge measurements of Kawaikoi Stream near Waimea, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 6	M. H. Carson	1.67	7.1	4.6	Apr. 14	Karl Jetter	1.84	14.2	9.2
Oct. 2	Karl Jetter	2.15	26	16.9	15	do	2.20	30.5	19.8
Jan. 18	Francis Kanehele	2.96	88	57	May 31	do	2.03	22.6	14.6
Mar. 1	Karl Jetter	1.88	17.0	11.0					

Discharge, in million gallons per day, of Kawaikoi Stream near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.1	2.0	8.6	8.1	4.9	18.3	3.9	33	10.6	89	18.3	19.0
2	3.3	2.0	23	22	4.6	15.8	9.7	22	10.2	31	13.7	8.9
3	2.9	2.0	40	69	6.6	14.0	24	18.0	9.5	21	11.8	7.3
4	2.6	2.0	31	17.2	17.7	12.9	16.4	16.1	8.9	19.3	8.7	6.6
5	3.3	2.2	17.2	9.5	18.5	12.1	8.3	14.6	8.3	19.6	7.8	6.7
6	4.8	2.1	7.5	7.6	9.5	11.3	5.9	13.4	8.2	14.9	7.6	6.9
7	3.4	2.0	22	6.6	48	10.6	5.0	12.4	53	17.0	7.3	6.3
8	2.8	8.0	21	8.2	48	10.0	5.6	18.0	178	12.9	7.1	5.9
9	3.0	25	28	7.6	14.6	9.3	26	44	168	11.3	6.9	6.3
10	13.0	9.8	10.3	8.9	9.3	8.7	335	19.3	84	10.4	6.7	6.9
11	5.0	34	230	6.4	52	8.3	746	13.1	78	11.6	6.6	5.9
12	3.6	6.8	60	5.5	22	7.8	464	25	25	12.9	6.4	5.6
13	3.1	3.6	15.2	4.9	36	7.4	130	13.7	25	10.4	6.3	5.5
14	4.1	2.8	15.9	14.0	19.0	7.1	378	11.3	18.3	23	6.3	5.5
15	5.6	2.5	12.9	18.5	24	6.7	96	14.5	14.6	26	6.1	5.5
16	3.6	2.4	22	8.0	31	6.6	95	13.1	12.9	11.1	6.3	8.3
17	2.8	15.0	16.8	6.1	50	6.3	210	10.4	12.6	9.8	5.9	9.1
18	2.5	8.1	33	7.8	89	5.9	68	9.5	11.6	19.6	5.8	8.5
19	2.4	7.1	25	6.9	38	5.8	140	9.1	10.8	12.6	5.8	6.6
20	2.4	7.5	11.6	25	39	5.6	77	8.7	10.4	12.1	5.6	7.4
21	3.2	4.0	8.5	21	21	5.3	50	12.1	9.8	12.4	6.4	7.8
22	2.9	2.8	15.7	11.4	14.3	5.2	36	76	9.1	8.9	6.4	7.1
23	2.5	2.5	21	28	11.8	4.9	25	33	12.2	8.0	6.1	6.6
24	2.4	2.6	13.1	61	10.6	4.8	22	30	42	7.8	6.8	5.9
25	2.3	3.6	9.3	15.2	18	4.6	34	21	29	69	23	5.5
26	2.4	19.2	7.3	9.8	16.4	4.5	57	13.1	71	18.0	45	5.2
27	2.2	10.8	6.3	8.0	325	4.4	130	11.6	154	11.1	64	5.2
28	2.2	4.5	5.9	6.9	131	4.3	70	12.6	19.6	10.0	15.5	5.2
29	2.3	5.4	7.4	6.3	34	4.3	29	-----	13.4	8.9	13.3	5.0
30	2.2	5.0	6.3	5.6	23	4.1	21	-------	87	10.5	23	6.4
31	2.0	4.0	-------	5.2	-------	4.0	111	-------	234	-------	23	-------

Monthly discharge of Kawaikoi Stream near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	13.0	2.0	3.35	5.18	104	319
August	34	2.0	6.82	10.6	211	649
September	230	5.9	25.1	38.8	752	2,310
October	69	4.9	14.4	22.3	446	1,370
November	325	4.6	39.6	61.3	1,190	3,650
December	18.3	4.0	7.77	12.0	241	739
January	746	3.9	111	172	3,430	10,600
February	76	8.7	19.6	30.3	549	1,680
March	234	8.2	46.4	71.8	1,440	4,410
April	89	7.8	18.7	28.9	560	1,720
May	64	5.6	12.6	19.5	390	1,200
June	19.0	5.0	6.95	10.8	209	640
The year	746	2.0	26.1	40.4	9,520	29,300

WAIAKOALI STREAM NEAR WAIMEA, KAUAI

LOCATION.—150 feet below Kokee-Mohihi trail a quarter of a mile below Waiakoali camp, and 12 miles northeast of Waimea (22 miles from Waimea by road and trail).

RECORDS AVAILABLE.—April 13, 1909, to December 4, 1912, and July 1, 1919, to June 30, 1923. Occasional measurements 1913 to 1917 reported as miscellaneous.

GAGE.—Stevens continuous water-stage recorder installed July 30, 1919. Staff gage April 13, 1909, to December 4, 1912.

DISCHARGE MEASUREMENTS.—Made by wading or from cable near trail.

CHANNEL AND CONTROL.—Channel a series of pools with mud and silt bottom divided by rapids of boulders and cobblestones. High sloping banks covered with ferns and underbrush. Control, large boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 577 millions gallons per day or 893 second-feet, at 8.45 a.m. January 12 (gage height, 7.75 feet); minimum discharge recorded, 0.45 million gallons per day or 0.7 second-foot, some time during period July 7 to August 21, probably on August 7 (gage height, 1.16 feet); clock was stopped but pencil recorded range in stage during period.

1909–1923: Maximum discharge recorded on January 12, 1923; minimum discharge recorded, 0.3 million gallons per day or 0.45 second-foot, November 29, 1909 (gage height, 1.45 feet on old staff gage).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diverting flood water into high level (3,100 feet) ditch to serve Territorial lands now idle on account of lack of irrigation.

UTILIZATION.—After it reaches Waimea River low water is used for power and irrigation.

ACCURACY.—Stage-discharge relation not permanent. Three fairly well defined rating curves used; indirect method for shifting control used September 16 to November 26. Operation of water-stage recorder satisfactory except during July and August. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except for high stages.

Discharge measurements of Waiakoali Stream near Waimea, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 6	Karl Jetter	1.30	1.1	0.7	Apr. 14	Karl Jetter	1.92	6.7	4.3
Oct. 2	do	1.71	5.0	3.2	15	do	2.02	8.8	5.7
Nov. 25	do	1.60	3.9	2.5	15	do	2.01	8.7	5.6
Jan. 18	Francis Kanahele	3.04	43	28	May 30	do	1.63	3.1	2.0
Mar. 1	Karl Jetter	1.98	7.7	5.0					

Discharge, in million gallons per day, of Waiakoali Stream near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar	Apr.	May	June
1	0.7		2.0	1.2	1.2	6.9	1.4	17.5	5.2	42	4.1	8.9
2	.8		2.8	3.0	1.2	5.7	1.6	12.1	5.4	17.0	3.9	3.0
3	.8		9.3	9.6	1.2	5.0	6.4	10.0	5.0	11.3	3.7	2.2
4	.7	0.4	4.8	4.8	2.1	4.5	5.8	8.9	4.4	9.4	3.2	1.9
5	.7		2.8	2.1	3.3	4.0	2.5	8.0	4.0	8.2	2.9	1.9
6	.7		1.6	1.6	1.8	3.7	1.7	7.4	3.9	7.2	2.8	1.9
7			2.5	1.3	8.6	3.2	1.5	7.0	8.4	6.8	2.8	1.8
8			2.4	1.3	20	3.0	1.5	9.8	40	6.2	2.6	1.7
9			2.6	1.4	5.7	2.8	3.8	13.3	34	5.8	2.5	1.6
10	1.2		2.2	1.3	3.0	2.7	83	7.9	17.7	5.5	2.5	1.6
11		2.0	64	1.2	8.1	2.5	197	6.5	18.5	5.2	2.4	1.5
12			20	1.1	5.5	2.4	203	6.8	10.2	4.9	2.3	1.5
13			4.6	1.0	8.6	2.2	36	6.1	8.3	4.6	2.3	1.5
14			4.3	1.0	5.3	2.1	173	5.4	7.1	4.5	2.2	1.5
15			4.3	1.7	3.4	2.0	48	5.2	6.2	5.0	2.2	1.4
16			2.5	1.5	5.8	2.0	38	5.0	5.7	4.4	2.1	1.5
17			3.4	1.2	10.9	1.9	62	4.7	5.5	4.0	2.1	1.6
18			3.1	1.1	17.0	1.8	28	4.4	5.1	5.6	2.0	1.6
19		1.6	5.6	1.2	10.9	1.8	50	4.1	4.8	4.9	2.0	1.5
20			2.5	4.3	10.2	1.8	36	3.9	4.6	4.6	1.9	1.5
21			1.8	6.7	6.9	1.8	18.9	3.9	4.3	4.6	1.9	1.5
22	.5	.7	1.8	2.3	4.1	1.7	17.5	19.7	4.1	3.8	2.0	1.6
23		.6	4.1	4.8	3.2	1.6	12.1	13.7	4.4	3.3	2.0	1.5
24		.5	3.4	14.5	2.7	1.6	11.3	12.6	8.2	3.2	2.1	1.5
25		.5	2.0	5.2	2.5	1.6	16.5	10.4	9.7	20	3.0	1.4
26		3.8	1.6	2.5	2.8	1.6	19.6	6.9	8.7	8.0	3.4	1.3
27		3.2	1.3	2.0	108	1.5	48	6.0	30	5.0	10.0	1.3
28		1.0	1.2	1.8	43	1.5	33	5.5	7.9	4.5	3.5	1.3
29		.7	1.2	1.6	13.9	1.5	15.2	-------	5.4	3.9	2.4	1.3
30		.7	1.2	1.4	8.9	1.5	11.3	-------	23	3.6	2.1	1.3
31		.6	-------	1.3	-------	1.4	44	-------	127	-------	7.0	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated by comparison with flow of Kawaikoi Stream because of lack of gage-height record.

Monthly discharge of Waiakoali Stream near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July			0.70	1.08	21.8	67
August			1.31	2.03	40.7	125
September	64	1.2	5.56	8.60	167	512
October	14.5	1.0	2.81	4.35	87.0	267
November	108	1.2	11.0	17.0	330	1,010
December	6.9	1.4	2.56	3.96	79.3	244
January	203	1.4	39.6	61.3	1,230	3,770
February	19.7	3.9	8.31	12.9	233	714
March	127	3.9	14.1	21.8	437	1,340
April	42	3.2	7.57	11.7	227	697
May	10.0	1.9	2.96	4.58	91.9	282
June	8.9	1.3	1.85	2.86	55.6	170
The year	203		8.21	12.7	3,000	9,002

MOHIHI STREAM AT ELEVATION 3,500 FEET, NEAR WAIMEA, KAUAI

LOCATION.—At upper trail crossing, at elevation 3,500 feet, 4 miles west of Kokee (6 miles by trail) and 24 miles by road and trail from Waimea.

RECORDS AVAILABLE.—August 12, 1919, to June 30, 1923. Fragmentary records at old station 2 miles downstream, from April 13, 1909, to December 31, 1912. Records valueless August 12, 1919, to June 12, 1920.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 260 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 300 feet above and 100 feet below station. Bed composed of mud and silt except at low-water measuring section where it is composed of boulders. Right bank sloping and covered with ferns and brush; subject to overflow for about 30 feet during extremely high stages. Left bank steep and fern-covered; not subject to overflow. Control at boulder rapids 60 feet below gage; subject to shift through collection of débris.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 450 million gallons per day or 696 second-feet, at 9.25 a.m. January 12 (gage height, 6.32 feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, from 8 p.m. August 7 to 2 a.m. August 8 (gage height, 0.79 foot).

1919–1923: Maximum discharge recorded, about 520 million gallons per day or 805 second-feet, at 1.35 p.m. January 16, 1921 (gage height, 6.91 feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, from 4 to 6 p. m. July 16, 1921, 2 to 5 p.m. September 14, noon to 3 p.m. September 15, 1921, and 8 p. m. August 7 to 2 a. m. and August 8, 1922.

DIVERSIONS.—None.

REGULATION.—No artificial regulation. Stream is a series of long pools and short rapids, and heads in the Alakai swamps.

OBJECT OF STATION.—To determine feasibility of diverting flood water into high level (3,100 feet) ditch to serve Territorial lands now idle on account of lack of irrigation.

UTILIZATION.—After it reaches Waimea River low-water flow is used for power and irrigation.

ACCURACY.—Stage-discharge relation changed during flood of November 27. Rating curve used prior to change fairly well defined between 0.5 and 10 million gallons per day; curve used subsequent to change well defined between 0.3 and 25 million gallons per day. Operation of water-stage recorder satisfactory except for one short period. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of Mohihi Stream at elevation 3,500 feet, near Waimea, Kauai, during the year ending June 30, 1923

[Made by Karl Jetter]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
July 6	0.98	0.9	0.6	Mar. 1	1.27	5.5	3.6
Oct. 2	1.52	7.4	4.8	Apr. 16	1.18	4.0	2.6
Nov. 28 [a]	2.70	88	57	16	1.18	3.9	2.5
Mar. 1	1.26	4.7	3.0	June 1	1.52	9.7	6.3

[a] Discredited; poor measuring section.

Discharge, in million gallons per day, of Mohihi Stream at elevation 3,500 feet, near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		0.2	5.3	1.0	0.6	7.4	0.6	13.8	3.1	47	3.1	7.9
2		.2	4.2	5.2	.6	4.7	.8	8.1	3.4	15.1	3.0	2.8
3		.2	10.2	9.0	.6	3.9	13.4	6.1	3.0	7.7	2.9	1.8
4	0.5	.2	5.6	4.4	1.9	3.5	12.6	5.0	2.5	6.0	2.2	1.3
5		.2	4.4	1.9	3.0	3.4	4.0	4.3	2.3	5.0	1.8	1.3
6		.2	2.3	1.2	1.6	3.0	2.0	3.9	2.1	4.1	1.7	1.1
7	.5	.2	3.3	.8	13.8	2.6	1.4	3.5	9.1	3.6	1.5	1.0
8	.4	.2	2.7	.9	22	2.4	1.3	7.4	40	3.3	1.4	.8
9	.4	1.1	2.8	1.0	4.8	2.1	5.9	12.5	27	3.0	1.3	.8
10	1.4	1.8	2.5	.9	2.6	1.9	89	5.8	14.3	2.8	1.2	.8
11	1.1	4.3	83	.6	8.0	1.7	207	3.9	17.0	2.6	1.1	.6
12	.6	1.9	24	.5	4.9	1.5	179	3.6	7.7	2.6	1.0	.6
13	.5	.7	4.0	.5	6.7	1.4	31	3.3	5.3	2.5	1.0	.6
14	.6	.5	4.9	.6	4.5	1.3	193	2.9	4.3	2.4	1.0	.6
15	1.0	.4	4.6	2.8	3.0	1.2	51	2.7	3.5	3.8	.9	.6
16	.7	.3	2.8	1.2	6.0	1.1	40	2.5	3.0	2.7	.8	.6
17	.5	.3	4.3	.8	10.0	1.0	66	2.4	3.0	2.4	.8	.8
18	.4	.8	3.4	1.1	14.6	1.0	27	2.1	2.8	8.7	.8	.8
19	.3	.6	6.1	1.0	9.2	1.0	52	2.0	2.6	4.7	.8	.6
20	.3	1.3	2.6	3.9	8.7	.9	32	1.9	2.4	4.6	.8	.7
21	.3	1.1	1.6	5.7	5.6	.9	16.1	1.9	2.2	4.7	.8	1.0
22	.3	.5	1.5	2.6	3.5	.8	13.1	26	2.0	2.5	.8	1.0
23	.3	.4	3.2	6.4	2.5	.8	9.4	15.7	2.4	2.0	1.0	.8
24	.3	.3	3.2	16.9	2.1	.8	8.5	10.6	7.0	1.7	1.5	.7
25	.2	.3	1.8	4.7	2.0	.8	13.1	9.4	8.2	21	4.1	.6
26	.3	2.8	1.1	2.4	2.2	.7	19.1	4.7	6.7	7.5	3.6	.5
27	.4	3.9	.8	1.7	103	.7	52	3.5	22	4.1	11.5	.5
28	.3	1.0	.7	1.3	53	.7	31	3.2	6.0	4.7	3.6	.5
29	.3	.6	.8	1.0	14.7	.7	13.8	-------	3.4	3.1	2.0	.5
30	.3	.4	.8	.8	8.3	.6	8.5	-------	17.6	3.1	2.0	.5
31	.3	1.9	-------	.7	-------	.6	37	-------	102	-------	13.8	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated by comparison with record of flow of Waiakoali and Kawaikoi Streams because of lack of gage-height record.

Monthly discharge of Mohihi Stream at elevation 3,500 feet, near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.4	0.2	0.48	0.74	15.0	46
August	4.3	.2	.93	1.44	28.8	88
September	83	.7	6.62	10.2	198	609
October	16.9	.5	2.69	4.16	83.5	256
November	103	.6	10.8	16.7	324	994
December	7.4	.6	1.78	2.75	55.1	169
January	207	.6	39.7	61.4	1,230	3,780
February	26	1.9	6.17	9.55	173	530
March	102	2.0	10.9	16.9	338	1,040
April	47	1.7	6.30	9.75	189	580
May	13.8	.8	2.38	3.68	73.8	226
June	7.9	.5	1.09	1.69	32.7	100
The year	207	.2	7.51	11.6	2,740	8,420

KOAIE STREAM AT ELEVATION 3,700 FEET, NEAR WAIMEA, KAUAI

LOCATION.—At elevation 3,700 feet, 4 miles east of Mohihi station, 1 mile below swamps, and 13 miles northeast of Waimea (27 miles by trail from Waimea by way of Kokee).

RECORDS AVAILABLE.—July 1, 1919, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder, installed September 5, 1919.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 200 feet above gage.

CHANNEL AND CONTROL.—Channel covered with boulders and cobblestones and flanked by high banks; straight for 100 feet above and 400 feet below gage. Control is bedrock across stream, forming low falls; right end is low and blocked by cobblestones and boulders which may shift. Control too wide to be very sensitive at low stages.

EXTREMES OF DISCHARGE.—Maximum recorded during year, about 3,340 million gallons per day or 5,170 second-feet at 6 p. m. September 11 (gage height, 5.35 feet); minimum recorded, 2.2 million gallons per day or 3.4 second-feet, at 4 p. m. July 1 and 5 p. m. December 28 (gage height, 0.41 foot).

1919–1923: Maximum recorded, about 3,750 million gallons per day or 5,800 second-feet, January 16, 1921 (gage height, 5.70 feet); minimum recorded, 1.3 million gallons per day or 2.0 second-feet, September 28, 1919 (gage height, 0.39 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of flood water available for storage for use in irrigating high-level lands above Waimea and Kekaha.

UTILIZATION.—After it reaches Waimea River low-water flow is used for power and irrigation.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined between 1 and 300 million gallons per day; fairly well defined between 300 and 500 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for extremely high stages.

Discharge measurements of Koaie Stream at elevation 3,700 feet, near Waimea, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 7	Karl Jetter	0.54	7.5	4.8	Mar. 2	Karl Jetter	0.75	26.5	17.2
Oct. 3	do	1.05	93	60	Apr. 17	do	.55	6.7	4.3
Jan. 17	M. H. Carson	1.56	346	224	June 2	do	.55	6.3	4.1

Discharge, in million gallons per day, of Koaie Stream at elevation 3,700 feet, near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.4	2.6	43	16.4	6.3	6.7	2.5	16.0	4.6	80	13.2	8.6
2	2.8	2.6	16.1	24	4.6	5.2	3.2	8.5	10.5	15.0	12.4	4.9
3	2.5	3.2	68	44	12.6	5.9	76	6.3	7.3	7.3	7.9	3.7
4	2.4	3.2	27	13.0	31	16.3	53	5.2	5.2	5.9	5.2	3.2
5	3.2	3.3	24	5.9	21	6.7	11.0	4.3	4.3	4.9	4.3	3.0
6	6.3	2.8	12.4	4.6	6.7	5.5	5.9	3.9	4.1	4.3	3.7	2.8
7	4.1	2.6	31	4.1	134	4.9	4.9	3.7	32	4.1	3.3	2.7
8	3.0	22	11.1	8.4	152	4.1	6.7	16.8	86	3.7	3.2	2.6
9	3.2	17.6	18.3	7.3	16.0	3.9	19.7	25	73	3.5	2.8	2.5
10	17.5	7.3	10.8	9.6	7.3	3.5	301	8.5	24	3.3	2.8	2.6
11	5.2	25	692	4.9	14.9	3.3	526	5.2	45	3.3	2.7	2.4
12	3.5	5.7	99	4.1	10.0	3.2	582	4.9	13.3	3.7	2.6	2.6
13	3.0	6.4	13.2	3.9	16.4	3.2	85	4.1	7.3	3.7	2.6	2.6
14	3.0	5.0	11.6	7.0	11.2	3.0	490	3.9	5.5	4.1	2.5	3.6
15	3.2	3.7	12.4	13.8	9.3	2.8	105	3.7	4.9	5.2	2.5	10.0
16	2.8	4.1	24	6.3	21	3.0	81	3.7	4.3	3.9	2.5	12.1
17	2.7	4.6	19.6	4.9	32	2.8	131	3.5	4.3	23	2.5	7.9
18	2.7	5.5	19.5	10.4	34	2.7	46	3.2	4.1	48	2.5	12.2
19	3.7	4.6	29	6.3	33	2.7	184	3.2	3.7	21	4.3	9.2
20	3.3	6.3	9.2	12.7	43	2.7	63	3.2	3.7	37	3.3	16.8
21	3.2	4.9	6.3	13.6	16.0	2.6	30	3.3	3.5	12.8	3.5	15.1
22	3.0	4.3	7.4	13.6	7.9	2.6	17.6	161	3.3	6.3	4.6	5.9
23	2.7	4.9	14.0	43	5.5	2.6	12.4	32	6.3	4.6	22	3.9
24	2.6	4.9	9.2	90	4.6	2.5	9.2	23	22	4.6	22	3.2
25	2.6	5.9	6.3	13.7	4.6	2.5	24	15.9	16.0	74	32	3.0
26	19.5	14.9	4.9	6.7	4.1	2.4	72	7.3	13.0	14.2	17.3	2.8
27	5.1	13.0	4.6	5.9	339	2.4	162	5.5	35	21	43	3.0
28	11.2	4.6	4.9	6.3	121	2.4	86	5.2	9.2	35	7.3	3.2
29	4.6	3.7	8.5	4.9	24	2.4	28	-------	5.2	19.4	5.2	3.5
30	3.0	3.5	6.3	5.2	11.6	2.5	14.9	-------	152	17.4	12.5	3.3
31	2.7	51	-------	8.0	-------	2.5	91	-------	197	-------	11.2	-------

Monthly discharge of Koaie Stream at elevation 3,700 feet, near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	19.5	2.4	4.54	7.02	141	432
August	51	2.6	8.18	12.7	254	778
September	692	4.6	42.1	65.1	1,260	3,880
October	90	3.9	13.6	21.0	422	1,290
November	339	4.1	38.5	59.6	1,150	3,540
December	16.3	2.4	3.85	5.96	120	366
January	582	2.5	107	166	3,320	10,200
February	161	3.2	13.9	21.5	390	1,190
March	197	3.3	26.1	40.4	810	2,480
April	80	3.3	16.5	25.5	494	1,520
May	43	2.5	8.62	13.4	267	821
June	16.8	2.4	5.43	8.40	163	500
The year	692	2.4	24.1	37.3	8,800	27 000

WAIALAE RIVER AT ELEVATION 3,700 FEET, NEAR WAIMEA, KAUAI

LOCATION.—At elevation 3,700 feet, 2 miles below swamps and 15 miles by trail northeast of Waimea, by way of Gay's mountain house.

RECORDS AVAILABLE.—January 26, 1920, to June 30, 1923, at present site; August 1, 1910, to January 25, 1916, at old site 2 miles downstream.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel rocky boulder-strewn bed with steep high banks; straight for 300 feet above and 100 feet below station. Control solid rock shoulder about 15 feet below well intake.

EXTREMES OF DISCHARGE.—Maximum recorded during year, about 3,660 million gallons per day or 5,660 second-feet, at 6.10 p. m. September 11 (gage height, 7.32 feet); minimum recorded, 1.3 million gallons per day or 2.0 second-feet from 3 to 4 p. m. July 1 and at 6 p. m. July 4 (gage height, 0.81 foot).

1920–1923: Maximum estimated, 4,500 million gallons per day or 6,960 second-feet, January 16, 1921 (gage height, 8.44 feet); minimum recorded on July 1 and 4, 1922.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of flood water available for storage for use in irrigating high-level lands above Waimea and Kekaha.

UTILIZATION.—After it reaches Waimea River low-water flow is used for irrigation.

ACCURACY.—Stage-discharge relation changed by flood of September 11. Two rating curves used; fairly well defined between 2 and 150 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except for high stages.

Discharge measurements of Waialae River at elevation 3,700 feet, near Waimea, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 7	Karl Jetter	0.95	3.8	2.5	Jan. 13	M. H. Carson	1.72	82	53
Oct. 3	do	1.64	66	42.5	Mar. 3	Karl Jetter	1.12	11.8	7.6
4	E. D. Burchard	1.16	15.1	9.8	Apr. 18	do	1.62	65	42
Nov. 26	Karl Jetter	.98	6.1	3.9	June 3	do	.94	3.7	2.4

Discharge, in million gallons per day, of Waialae River at elevation 3,700 feet, near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.4	1.6	27	12.2	5.8	7.0	1.5	15.6	3.9	81	12.2	7.0
2	1.6	1.7	8.4	19.2	3.7	5.1	1.9	9.1	13.3	16.9	12.7	3.9
3	1.4	1.9	58	33	13.1	5.1	68	6.7	7.0	8.3	8.3	3.2
4	1.4	1.8	21	9.3	27	11.2	44	5.1	4.5	6.4	4.8	2.5
5	1.8	1.8	15.0	4.8	14.9	5.1	8.0	3.9	3.5	5.1	3.7	2.5
6	3.1	1.7	6.6	3.4	6.4	4.5	3.9	3.5	3.5	4.2	3.4	2.3
7	2.6	1.6	13.6	3.0	160	3.5	3.5	3.4	15.0	3.7	2.8	1.9
8	1.9	16.4	6.3	6.4	174	3.0	3.9	30	69	3.2	2.6	1.8
9	1.8	7.4	9.3	6.1	14.0	2.6	11.1	18.0	66	2.8	2.5	1.8
10	7.5	4.3	5.6	7.0	7.8	2.5	156	6.7	19.2	2.6	2.3	1.8

Discharge, in million gallons per day, of Waialae River at elevation 3,700 feet, near Waimea, Kauai, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
11	3.4	13.5	689	3.5	9.1	2.1	479	4.8	37	2.5	2.1	1.6
12	2.3	4.3	62	3.2	7.0	2.0	573	3.7	10.8	2.5	1.9	1.8
13	1.8	3.6	11.7	3.0	10.8	1.9	56	3.4	7.4	2.3	1.9	1.9
14	1.8	3.4	25	3.4	6.7	1.8	450	2.8	5.4	2.3	1.8	4.0
15	1.9	2.4	10.4	7.4	5.1	1.8	74	2.8	4.5	2.6	1.7	8.3
16	1.9	2.4	17.3	4.5	10.4	1.7	47	2.6	3.7	2.3	1.7	8.7
17	1.8	2.7	12.7	3.4	15.9	1.6	73	2.3	3.5	20	1.7	7.0
18	1.7	4.1	13.9	7.9	21	1.6	29	2.3	3.4	40	1.9	10 4
19	2.4	2.8	17.7	4.8	21	1.6	159	2.1	3.2	15.7	3.7	9.1
20	2.0	2.6	6.4	7.1	34	1.6	46	2.1	3.0	21	2.5	15.5
21	1.9	2.7	4.2	9.7	12.0	1.5	21	2.1	2.6	10.8	4.5	11.9
22	1.8	2.6	6.1	7.2	6.7	1.5	16.9	149	2.5	4.8	6.4	4.8
23	1.7	2.8	7.8	24	5.1	1.5	11.2	33	3.9	3.4	22	3.2
24	1.6	3.1	4.5	79	4.2	1.5	8.7	26	12.7	3.4	32	2.5
25	1.7	3.1	3.7	10.8	3.7	1.5	31	15.2	13.1	73	38	2.0
26	11.3	6.6	3.2	5.8	3.5	1.5	78	7.0	7.9	13.4	15.7	1.9
27	3.4	7.2	2.6	6.1	452	1.4	157	5.1	17.6	21	48	1.9
28	7.5	3.1	3.2	6.4	123	1.4	81	4.8	6.4	30	8.7	2.0
29	3.1	2.3	4.8	5.1	25	1.4	24	-------	3.9	16.9	6.1	2.6
30	2.0	2.3	4.8	5.4	12.2	1.4	13.8	-------	161	16.3	10.5	2.8
31	1.8	31	-------	8.3	-------	1.4	147	-------	321	-------	7.8	-------

Monthly discharge of Waialae River at elevation 3,700 feet, near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	11.3	1.4	2.69	4.16	83.3	256
August	31	1.6	4.80	7.43	149	457
September	689	2.6	36.1	55.9	1,080	3,320
October	79	3.0	10.3	15.9	320	980
November	452	3.5	40.5	62.7	1,220	3,730
December	11.2	1.4	2.69	4.16	83.3	256
January	573	1.5	92.8	144	2,880	8,830
February	149	2.1	13.3	20.6	373	1,140
March	321	2.5	27.1	41.9	839	2,580
April	81	2.3	14.6	22.6	438	1,340
May	48	1.7	8.90	13.8	276	847
June	15.5	1.6	4.42	6.84	133	407
The year	689	1.4	21.6	33.4	7,870	24,100

KEKAHA DITCH AT CAMP NO. 1, NEAR WAIMEA, KAUAI

LOCATION.—Half a mile below intake, 1,000 feet below Kekaha Sugar Co.'s weir, and 8 miles by trail north of Waimea.

RECORDS AVAILABLE.—October 26, 1917, to June 30, 1923. Staff at flume No. 4, 1 mile below intake, March 18, 1916, to August 2, 1917; weir, 1,000 feet above present site, November 8, 1907, to June 30, 1915.

GAGE.—Gurley printing water-stage recorder installed July 12, 1921, replacing vertical staff 900 feet upstream.

DISCHARGE MEASUREMENTS.—Made from upper end of covered section of ditch.

CHANNEL AND CONTROL.—Ditch about 9 feet wide cut in soft lava rock and lined with concrete slab; straight for 1,000 feet above and 300 feet below gage. Control in concrete-lined section of ditch and probably permanent.

EXTREMES OF DISCHARGE.—Maximum recorded during year, 65 million gallons per day or 101 second-feet, at midnight September 8 and midnight September 16 (gage height, 4.09 feet); minimum recorded, 1.0 million gallons per day or 1.6 second-feet, from 9 a. m. to 1 p. m. January 31, and from 7 p. m. February 9 to 1 a. m. February 10 (gage height, 0.60 foot).

1907–1923: Maximum recorded, 67 million gallons per day or 104 second-feet, on January 4, 1921, and March 6, 1922. Water occasionally shut off.

DIVERSIONS.—None above station. Numerous diversions near Waimea and Kekaha.

REGULATION.—By head gates.

OBJECT OF STATION.—To measure water diverted from river by ditch. Land and water owned by Territory and leased to Kekaha Sugar Co.

UTILIZATION.—Water used for irrigation of sugar cane and for domestic supply along the coastal plain east of Waimea and Kekaha.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined. Operation of water-stage recorder satisfactory except for a few short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from printed record by averaging hourly gage heights or, for days of considerable fluctuation in stage, by average hourly discharge. Records excellent.

Kekaha ditch diverts water from Waimea River at a point 8 miles by trail north of Waimea, 500 feet above gaging station on river and camp No. 1, and at an elevation of about 550 feet. The course of the ditch is roughly parallel to the river for a distance downstream of about 4½ miles where it crosses and then continues roughly parallel to river for a distance of about 2½ miles to a point about half a mile north of and at an elevation of about 400 feet above Waimea. Here, at the lower end of the river valley, it swings eastward and continues roughly parallel to the coast line for a distance of about 10 miles.

Discharge measurements of Kekaha ditch at camp No. 1, near Waimea, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 8	Karl Jetter	2.52	45.5	29.5	Mar. 3	Karl Jetter	2.95	61	39.5
Oct. 4	do	3.53	81	52	Apr. 19	do	3.22	68	44
Nov. 23	do	3.45	79	51	June 5	do	3.01	61	39.5
Jan. 19	Francis Kanahele	1.71	19.2	12.4					

Discharge, in million gallons per day, of Kekaha ditch at camp No. 1, near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	25	24	51	39	39	18.0	29	41		19.0	46	
2	28	24	53	55	32	23	31	43	40	18.0	46	
3	27	24	53	53	38	25	41	33		18.0	46	45
4	26	25	55	53	51	38	46	29	41	21	46	
5	25	25	55	46	51	38	46	31	41	25	46	39
6	31	25	51	36	46	39	41	41	41	30	46	41
7	31	24	53	32	41	39	37	39	43	34	48	38
8	28	30	55	34	43	43	38	43	43	33	48	37
9	26	46	58	39	48	43	43	34	39	36	46	36
10	39	41	53	41	48	43	48	35	41	43	43	36

Discharge, in million gallons per day, of Kekaha ditch at camp No. 1, near Waimea, Kauai, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
11	41	43	41	33	43	43	43	37	41	46	43	34
12	31	43	27	30	48	41	37	38	41	48	43	34
13	28	32	24	29	46	39	21	33	43	48	41	36
14	29	32	30	30	46	39	37	33	43	48	41	36
15	32	28	41	51	51	37	28	31	43	48	39	43
16	29	27	46	39	48	37	19.0	37	43	48	39	43
17	27	29	55	31	51	36	26	41	46	46	38	46
18	26	38	48	36	51	34	} 25	41	43	46	39	48
19	26	33	55	38	48	33		43	43	46	41	46
20	27	36	51	36	48	33	25	41	46	43	41	46
21	26	32	39	46	48	32	26	33	46	46	41	46
22	27	28	37	43	48	32	28	38	46	46	46	43
23	26	27	53	46	48	31	32		46	46	48	39
24	25	27	48	43	43	31	33		48	46		37
25	24	29	39	48	46	30	36		46	28		34
26	32	30	33	48	55	30	30	40	46	43		33
27	37	46	31	41	29	30	26		43	38	50	33
28	32	36	30	41	19.0	29	33		46	41		33
29	33	30	34	37	15.1	30	33		48	43		33
30	27	29	32	36	17.0	29	27		34	43		36
31	25	36		37		28	16.8		13.3			

NOTE.—Braced figures show mean discharge for periods indicated, estimated because of lack of gage-height record by comparison with flow at lower station below tunnel No. 12.

Monthly discharge of Kekaha ditch at camp No. 1, near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	41	24	28.9	44.7	896	2,750
August	46	24	31.6	48.9	979	3,010
September	58	24	44.4	68.7	1,330	4,090
October	55	29	40.2	62.2	1,250	3,830
November	55	15.1	42.8	66.2	1,290	3,940
December	43	18.0	34.0	52.6	1,050	3,230
January	48	16.8	32.5	50.3	1,010	3,090
February		29	37.7	58.3	1,060	3,240
March	48	13.3	42.0	65.0	1,300	4,000
April	48	18.0	38.8	60.0	1,160	3,570
May		38	45.2	69.9	1,400	4,300
June		33	39.5	61.1	1,190	3,640
The year	58	13.3	38.1	58.9	13,900	42,700

KEKAHA DITCH BELOW TUNNEL NO. 12, NEAR WAIMEA, KAUAI

LOCATION.—7 miles below intake, 2½ miles by trail from Waimea, and just above diversion for Waimea domestic supply.

RECORDS AVAILABLE.—July 15, 1921, to June 30, 1923. April 7, 1908, to November 30, 1914, and July 20, 1916, to July 15, 1921, at site half a mile downstream.

GAGE.—Gurley printing water-stage recorder installed July 15, 1921, replacing vertical staff half a mile downstream.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Channel cut in lava rock; fairly straight near gage. Control is section of ditch; not well defined; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 58 million gallons per day or 90 second-feet, at 11 p. m. March 30 (gage height, 4.37 feet); stage may have been higher during period of no record in September. Minimum recorded, 3.5 million gallons per day or 5.4 second-feet, at 1 a. m. February 19 (gage height, 1.08 feet).

1916–1923: Maximum recorded, 64 million gallons per day or 99 second-feet, at 8.30 a. m. December 22, 1921 (gage height, 4.40 feet). Water occasionally shut off.

DIVERSIONS.—Small amount of water is diverted above station for domestic supply and occasionally for irrigation of rice and taro.

REGULATION.—By head gates.

OBJECT OF STATION.—To determine discharge above first important lateral; also determine ditch losses between intake and station. Territorial land and water.

UTILIZATION.—Water used for irrigation of sugar cane, rice, and taro and for domestic supply

ACCURACY.—Stage-discharge relation changed September 12. Two well defined rating curves used. Operation of water-stage recorder satisfactory except during September and October. Daily discharge ascertained by applying to rating table mean daily gage height obtained from printed record by averaging hourly gage heights or, for days of considerable fluctuation in stage, by averaging hourly discharge. Records good.

For description of Kekaha ditch see under "Kekaha ditch at camp No. 1, near Waimea, Kauai."

Discharge measurements of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 5	Karl Jetter	2.13	32	20.7	Jan. 20	Francis Kanahele	2.01	24.9	16.1
Oct. 5	do	3.35	61	40.5	Mar. 5	Karl Jetter	3.07	52	34
Dec. 1	do	1.79	21.3	13.8	Apr. 20	do	3.32	60	38.5
Jan. 9	Francis Kanahele	3.08	55	36	June 7	do	2.95	50	32.5

Discharge, in million gallons per day, of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	21	20	38		30	13.4	25	26	37	22	37	41
2	23	19.2	40		25	18.3	27	24	32	17.5	37	39
3	24	20	42	40	24	21	36	22	32	15.0	39	37
4	22	21	44		36	34	39	10.7	34	15.0	37	36
5	22	21	42		37	36	39	24	36	18.3	37	34
6	25	20	40	30	36	34	37	32	36	25	37	34
7	28	19.2		27	34	34	34	34	37	30	39	32
8	24	22	45	27	37	36	32	30	39	30	39	32
9	23	40		32	39	37	36	23	37	30	39	30
10	30	38		34	39	37	39	18.3	37	34	37	30
11	35	38		29	37	37	41	29	37	37	37	30
12	28	38		24	37	37	39	30	36	37	37	29
13	24	29	25	22	37	36	18.7	29	36	39	37	30
14	24	28		22	36	34	31	34	36	39	36	30
15	28	25		34	37	34	27	34	37	39	36	34
16	25	24		32	37	34	14.2	34	37	39	36	37
17	23	21		26	39	32	17.5	36	37	39	34	39
18	22	26		26	39	32	18.3	16.4	37	41	34	39
19	22	24		30	39	30	10.8	31	37	39	36	39
20	23	24		27	37	30	20	32	39	39	37	39
21	22	24	40	41	37	30	18.3	34	39	39	36	39
22	22	21		37	37	29	21	34	39	39	39	39
23	21	20		39	37	29	23	30	39	39	41	36
24	20	20		37	36	29	27	30	41	39	43	32
25	19.2	22		39	34	29	29	34	41	24	41	30

Discharge, in million gallons per day, of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
26	24	21		39	37	29	30	36	41	37	41	29
27	31	35		34	34	29	34	37	41	36	41	29
28	26	32	25	34	21	26	21	36	41	37	39	29
29	29	26		30	11.7	25	15.0	-------	41	37	41	29
30	24	25		27	12.6	26	23	-------	37	37	41	29
31	21	28	-------	27	-------	26	26	-------	28	-------	39	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated because of lack of gage-height record by comparison with records of flow at upper station at camp No. 1.

Monthly discharge of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	35	19.2	24.4	37.8	755	2,320
August	40	19.2	25.5	39.5	791	2,430
September	----------	----------	35.9	55.5	1,080	3,310
October	----------	22	32.5	50.3	1,010	3,090
November	39	11.7	33.6	52.0	1,010	3,090
December	37	13.4	30.4	47.0	944	2,890
January	41	10.8	27.4	42.4	849	2,610
February	37	10.7	29.3	45.3	820	2,520
March	41	28	37.2	57.6	1,150	3,540
April	41	15.0	33 0	51.1	989	3,040
May	43	34	38.1	58.9	1,180	3,620
June	41	29	33.7	52.1	1,010	3,100
The year	----------	10.7	31.7	49.0	11,600	35,600

SOUTH FORK OF WAILUA RIVER NEAR LIHUE, KAUAI

LOCATION.—One-third of a mile above Waiehu Falls and 7 miles northeast of Lihue. Prior to November 18, 1918, station was one-third of a mile farther upstream.

RECORDS AVAILABLE.—December 10, 1911, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder installed November 19, 1918; Friez water-stage recorder used December 19, 1911, to November 8, 1918, and staff gage December 10–16, 1911.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 600 feet above and 300 feet below station. Right bank steep and high, left bank slopes gently. Control composed of solid rock ledge; somewhat shifting due to boulders lodging in water-worn grooves at left end of control.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 18,800 million gallons per day or 29,100 second-feet, at 5 a. m. March 31 (gage height, 9.64 feet); minimum discharge recorded, 4.6 million gallons per day or 7.1 second-feet, from midnight to 5 a. m. June 25 (gage height, 0.96 foot).

1911–1923: Maximum discharge recorded, 29,000 million gallons per day or 44,900 second-feet, at 7.25 a. m. January 16, 1920 (gage height, 11.25 feet); minimum discharge recorded, 2.8 million gallons per day or 4.3 second-feet, at 6 p. m. October 7, 1918 (gage height, 2.06 feet on old gage).

DIVERSIONS.—Several diversions above station for irrigation and power development.

REGULATION.—By diversions above station only.

OBJECT OF STATION.—To determine feasibility of diversion for homesteads after stream enters Territorial lands.

UTILIZATION.—Water going to waste except a small amount used for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined below 200 million gallons per day; fairly well defined between 200 and 15,000 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good.

Discharge measurements of South Fork of Wailua River near Lihue, Kauai, during the year ending June 30, 1923

[Made by Karl Jetter]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
July 14	1.15	12.0	7.8
June 15	1.00	7.4	4.8

Discharge, in million gallons per day, of South Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	5.7	7.5	193	45	51	98	6.0	224	88	310	46	10.9
2	5.6	11.0	50	62	44	115	85	169	115	182	60	7.9
3	5.6	9.1	198	71	79	95	73	145	71	145	47	6.8
4	5.7	59	67	44	93	136	38	134	53	124	30	5.7
5	9.4	18.2	48	27	64	110	15.1	115	49	115	25	5.4
6	20	8.1	46	19.6	45	86	14.2	98	55	98	23	5.3
7	8.6	7.0	86	16.8	354	71	16.4	78	68	78	18.5	5.1
8	6.4	48	33	34	630	65	12.6	119	118	57	14.6	5.0
9	6.3	36	31	151	176	57	15.1	120	124	49	12.9	5.0
10	12.9	14.2	26	60	106	54	46	93	72	42	9.1	5.0
11	8.8	16.4	2,020	25	90	37	524	86	179	37	7.9	5.0
12	11.7	10.9	686	21	65	28	1,100	71	90	33	7.4	4.9
13	8.6	24	314	16.8	54	28	530	60	62	17.2	7.0	4.8
14	7.2	18.9	414	104	44	23	748	54	59	15.1	7.0	4.8
15	10.1	9.1	224	72	42	22	280	45	49	18.5	6.6	6.8
16	11.8	9.3	225	28	54	21	169	40	35	14.2	6.4	8.0
17	18.5	7.7	148	28	79	19.0	250	43	21	47	6.4	7.4
18	10.9	7.0	93	31	84	19.0	157	37	16.4	202	6.1	6.0
19	9.3	7.2	78	61	96	15.5	556	33	13.5	191	12.6	5.1
20	7.4	26	55	56	59	13.5	589	29	10.1	370	6.3	6.1
21	7.4	14.4	51	37	42	12.6	347	29	9.9	214	7.4	6.6
22	7.7	7.7	584	128	33	7.9	195	272	9.3	59	8.6	5.8
23	7.5	7.7	292	249	29	7.2	182	170	75	34	33	5.3
24	7.5	8.3	166	300	23	7.0	157	115	57	37	14.6	4.9
25	7.5	7.6	90	124	22	6.8	224	106	45	196	40	4.7
26	47	6.9	68	78	213	6.6	292	69	34	103	38	8.3
27	15.6	42	53	75	911	6.4	619	105	45	104	140	5.8
28	86	7.7	48	68	577	6.3	496	118	31	124	35	6.6
29	23	7.4	48	60	182	6.1	291	-------	28	147	18.5	15.7
30	9.3	11.0	42	57	115	6.1	224	-------	478	83	36	18.8
31	7.4	238	-------	61	-------	6.1	548	-------	3,640	-------	23	-------

Monthly discharge of South Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	86	5.6	13.4	20.7	416	1,270
August	238	6.9	23.0	35.6	713	2,190
September	2,020	26	216	334	6,480	19,900
October	300	16.8	71.3	110	2,210	6,780
November	911	22	149	231	4,460	13,700
December	136	6.1	38.5	59.6	1,190	3,660
January	1,100	6.0	284	439	8,800	27,000
February	272	29	99.2	153	2,780	8,520
March	3,640	9.3	187	289	5,800	17,800
April	370	14.2	108	167	3,250	9,940
May	140	6.1	24.3	37.6	754	2,310
June	188	4.7	6.78	10.5	204	624
The year	3,640	4.7	101	156	37,100	114,000

NORTH FORK OF WAILUA RIVER AT ELEVATION 650 FEET, NEAR LIHUE, KAUAI

LOCATION.—1½ miles above intake of Kanaha ditch and 10 miles northwest of Lihue.

RECORDS AVAILABLE.—September 21, 1914, to June 30, 1923. Records available for old station at elevation 500 feet, August 1 to October 28, 1910, and December 28, 1910, to September 25, 1914.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 80 feet above and 50 feet below gage. Right bank steep and high; left bank slopes gently. Control composed of boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 1,800 million gallons per day or 2,790 second-feet, at 10 a. m. September 11 (gage height, 8.25 feet); minimum discharge recorded, 17.8 million gallons per day or 28 second-feet, at 9 p. m. June 13 (gage height, 0.76 foot).

1914–1923: Maximum discharge recorded, from extension of rating curve 2,200 million gallons per day or 3,400 second-feet, at 6.30 p. m. September 26, 1914 (gage height, 9.5 feet); minimum discharge, 12.9 million gallons per day or 20 second-feet, May 7, 1919.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diversion above or near this elevation. Territorial land and water. Important in relation to water supply for homesteads.

UTILIZATION.—Part of flow diverted for irrigation of sugar cane, but most of it is wasted.

ACCURACY.—Stage-discharge relation changed during flood of September 11. Rating curve used prior to change fairly well defined below 300 million gallons per day; curve used subsequent to change well defined below 80 million gallons per day and fairly well defined between 80 and 300 million gallons per day. Operation of water-stage recorder satisfactory except during January and June. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, during the year ending June 30, 1923

[Made by Karl Jetter]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Aug. 29	1.09	39	25.5	Apr. 27	1.60	105	68
Oct. 5	1.00	43.5	28	June 17	.93	36.5	23.6
Nov. 14	1.02	49.5	32	21	.90	34.5	22.2
Mar. 12	1.02	47	30.5				

Discharge, in million gallons per day, of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	22	24	141	38	34	60	22	60	36	126	41	24
2	22	30	55	48	31	57	39	44	42	64	44	21
3	21	27	134	60	53	59	42	38	31	48	36	21
4	21	52	51	36	38	63	28	36	28	44	31	19.8
5	30	28	61	30	33	41	23	32	28	38	33	20
6	24	26	61	27	33	33	24	30	30	33	28	19.0
7	22	24	57	27	168	32	24	28	40	32	26	19.0
8	21	62	38	40	241	29	24	43	48	30	25	18.7
9	24	41	51	101	68	27		32	40	29	24	19.0
10	30	32	38	36	48	26		28	30	28	22	18.7
11	28	38	508	28	55	24		24	54	30	21	18.4
12	30	31	225	26	36	23		23	31	33	21	19.0
13	24	47	106	25	36	22		22	28	26	21	18.7
14	26	32	165	89	30	22		22	26	26	20	23
15	22	32	82	39	36	22	240	22	24	26	19.8	24
16	37	28	91	30	36	22		22	23	24	19.4	29
17	28	26	56	31	41	22		22	23	72	19.8	24
18	32	26	52	45	44	22		22	21	115	29	24
19	24	26	44	115	41	22		22	21	97	21	23
20	24	42	36	56	33	22		21	21	171	19.0	23
21	22	30	49	38	28	22		24	19.8	70	23	24
22	21	30	176	59	26	22		174	21	44	26	19.8
23	26	28	100	112	24	22		60	52	36	42	22
24	22	28	68	171	22	22	85	41	38	48	39	
25	28	28	52	60	40	22		32	32	105	41	
26	66	57	41	44	147	22	130	27	43	48	44	
27	30	37	36	44	367	22	222	35	66	66	52	30
28	113	29	41	36	191	22	133	65	33	68	30	
29	30	28	36	33	70	22	87	-------	28	68	26	
30	26	50	36	32	44	22	64	-------	245	55	33	
31	30	106	-------	36	-------	22	156	-------	415	-------	28	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated because of lack of gage-height record by comparison with records of flow for East Branch of North Fork of Wailua River and Kalihiwai River.

Monthly discharge of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	113	21	29.9	46.3	926	2,840
August	106	24	36.3	56.2	1,120	3,450
September	508	36	89.6	139	2,690	8,250
October	171	25	51.4	79.5	1,590	4,890
November	367	22	69.8	108	2,090	6,430
December	63	22	28.8	44.6	892	2,740
January	----------	22	144	223	4,480	13,700
February	174	21	37.5	58.0	1,050	3,220
March	415	19.8	52.2	80.8	1,620	4,970
April	171	24	56.7	87.7	1,700	5,220
May	52	19.0	29.2	45.2	905	2,780
June	----------	18.4	23.4	36.2	702	2,150
The year	----------	18.4	54.2	83.9	19,800	60,600

KANAHA DITCH NEAR LIHUE, KAUAI

LOCATION.—300 feet below point where Kauai Electric Co.'s power line crosses ditch and 9 miles north of Lihue.

RECORDS AVAILABLE.—July 26, 1921, to June 30, 1923. August 6, 1910, to July 25, 1921, at site 800 feet upstream.

GAGE.—Stevens continuous water-stage recorder installed January 26, 1923. Gurley printing water-stage recorder at same location used July 25, 1921, to January 25, 1923. Vertical staff gage, 800 feet upstream, used prior to July 25, 1921.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage.

CHANNEL AND CONTROL.—Channel cut in conglomerate and clay; straight for 300 feet above and 10 feet below gage, where a sharp turn is made into a ¾-mile tunnel. Control composed of soft lava rock; shifting probably due to caving in of tunnel roof.

EXTREMES OF DISCHARGE.—Maximum recorded during year, 22 million gallons per day or 34 second-feet, at 4.30 a. m. March 31 (gage height, 3.71 feet); minimum recorded, 1.3 million gallons per day or 2.6 second-feet, for several hours April 20–24 (gage height, 0.29 foot).

1910–1923: Maximum recorded, 24 million gallons per day or 37 second-feet, at 2.30 a. m. October 1, 1921 (gage height, 4.01 feet). Ditch occasionally dry.

DIVERSIONS.—All diversions below station.

REGULATION.—By head gates.

OBJECT OF STATION.—To determine discharge of ditch which diverts water from river and delivers it to fee simple and Territorial lands leased to Lihue plantation. Territorial water. Important station relative to North Wailua homesteads.

UTILIZATION.—Water used for irrigation of sugar-cane and for domestic supply.

ACCURACY.—Stage-discharge relation not permanent. Three rating curves used; fairly well defined above 10 million gallons per day. Operation of water-stage recorders satisfactory except during November and December. Daily discharge for period July 1 to January 26 ascertained by applying to rating table mean daily gage height obtained from printed record by averaging hourly gage heights; for period January 27 to June 30 it was ascertained by applying to rating table mean daily gage height obtained from continuous graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair.

Kanaha ditch diverts from North Fork of Wailua River at a point about 8½ miles above mouth of river, 9 miles north of Lihue, and at an elevation of about 600 feet. The course of the ditch is due east, about parallel to the river, for a distance of about a third of a mile, and then turns sharply to the south. About 3 miles farther on it crosses South Fork of Wailua River and within a short distance joins Lihue ditch at an elevation of about 550 feet. Through Lihue ditch the water is carried around the base of Kilohana Crater, south for a distance of about 5 miles to the vicinity of Lihue.

Discharge measurements of Kanaha ditch near Lihue, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 14	Karl Jetter	3.04	27.5	17.7	Jan. 26	Francis Kanahele	2.36	15.2	9.8
Aug. 29	do	3.34	31	20.0	Apr. 26	Karl Jetter	2.36	20.9	13.5
Oct. 6	do	3.20	30	19.3	June 19	do	3.24	31.5	20.2
Dec. 8	do	2.87	22.4	14.5	20[a]	do	3.28	33	21.2
11	do	3.19	26	16.8					

[a] Rejected; measurement of June 19 considered correct.

Discharge, in million gallons per day, of Kanaha ditch near Lihue, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	17.6	18.4	19.2	19.2	17.6	-------	15.7	8.2	1.7	3.6	15.2	19.0
2	17.6	19.2	18.4	20	17.6	-------	15.7	7.6	1.7	3.6	16.0	18.3
3	17.6	18.4	20	20	18.4	-------	14.1	7.6	1.7	3.6	16.8	18.3
4	16.8	19.2	20	18.4	17.6	-------	14.9	7.6	1.7	3.6	16.8	17.5
5	19.2	19.2	20	19.2	17.6	-------	14.9	7.2	1.7	3.4	16.8	18.3
6	17.6	19.2	19.2	19.2	17.6	-------	14.9	7.2	1.7	1.5	16.0	17.5
7	17.6	19.2	18.4	19.2	20	-------	14.9	9.3	1.7	1.4	15.2	17.5
8	16.8	20	18.4	21	16.0	-------	14.9	10.3	1.7	1.4	15.2	17.5
9	18.4	18.4	19.2	20	13.8	-------	15.7	9.6	1.7	1.4	14.5	17.5
10	20	21	18.4	19.2	13.1	-------	16.5	9.6	1.7	1.4	16.4	16.8
11	19.2	20	13.1	20	13.1	-------	14.9	9.6	1.7	1.4	18.3	16.8
12	19.2	20	11.7	20	12.4	17.3	11.0	9.6	1.7	1.4	18.3	19.0
13	18.4	22	12.4	19.2	17.6	16.5	10.3	9.6	1.6	1.4	18.3	18.3
14	19.2	20	13.1	20	-------	16.5	10.3	9.6	1.7	1.4	18.3	21
15	18.4	20	11.7	17.6	-------	15.7	9.6	9.6	1.7	1.3	17.5	19.8
16	19.2	20	12.4	20	-------	16.5	8.9	11.9	1.7	1.3	17.5	21
17	19.2	20	10.3	20	-------	15.7	11.0	17.2	1.7	1.3	17.5	21
18	18.4	19.2	14.6	21	-------	16.5	10.3	18.2	1.7	1.3	19.5	21
19	18.4	20	17.6	21	-------	15.7	9.6	18.2	1.7	1.3	18.3	19.9
20	19.2	20	17.6	18.4	-------	15.7	7.9	19.0	1.7	1.3	17.5	19.8
21	18.4	19.2	20	18.4	-------	16.5	7.9	18.3	1.7	1.3	19.0	19.8
22	17.6	20	20	19.2	-------	16.5	7.6	16.1	1.7	1.3	19.8	18.3
23	19.2	20	18.4	19.2	-------	15.7	9.6	17.3	1.8	1.3	21	19.8
24	18.4	20	17.6	16.9	-------	15.7	10.3	17.3	1.7	11.5	19.8	18.3
25	19.2	20	16.8	15.3	-------	15.7	10.3	15.7	1.6	15.6	19.8	19.0
26	21	21	19.2	17.6	-------	15.7	10.3	17.4	1.6	14.9	19.0	19.0
27	18.4	21	20	18.4	-------	15.7	10.3	8.1	1.6	13.8	19.0	21
28	17.6	20	19.2	18.4	-------	15.7	9.6	2.3	1.5	13.8	18.3	21
29	17.6	20	17.6	18.4	-------	15.7	9.6	-------	1.5	13.8	18.3	21
30	18.4	19.2	18.4	17.6	-------	15.7	8.9	-------	1.6	14.5	19.0	21
31	18.4	19.2	-------	17.6	-------	15.7	8.9	-------	4.9	-------	19.8	-------

NOTE.—Water-stage recorder did not operate Nov. 14 to Dec. 11; discharge not determined. Gage-height record estimated for part of day June 15–17 and 19–21.

Monthly discharge of Kanaha ditch near Lihue, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	21	16.8	18.5	28.6	572	1,760
August	22	18.4	19.8	30.6	613	1,880
September	20	10.3	17.1	26.5	513	1,570
October	21	15.3	19.0	29.4	589	1,810
January	16.5	7.6	11.6	17.9	359	1,100
February	19.0	2.3	11.8	18.3	329	1,010
March	4.9	1.5	1.78	2.75	55.1	169
April	15.6	1.3	4.67	7.23	140	430
May	21	14.5	17.8	27.5	553	1,690
June	21	16.8	19.1	29.6	574	1,760

EAST BRANCH OF NORTH FORK OF WAILUA RIVER NEAR LIHUE, KAUAI

LOCATION.—1,200 feet above confluence with North Fork and 8 miles north of Lihue.

RECORDS AVAILABLE.—July 31, 1912, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder installed December 31, 1914. Staff gage 800 feet below, July 31, 1912, to September 30, 1914.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 60 feet above and 400 feet below gage. Banks low and wooded. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum discharge during year estimated 2,800 million gallons per day or 4,330 second-feet, at 5 a. m. March 31 (gage height, 9.51 feet); minimum discharge recorded, 10.2 million gallons per day or 15.8 second-feet, from 1 p. m. to midnight August 7 (gage height, 1.75 feet).

1912–1923: Maximum discharge recorded, about 3,000 million gallons per day or 4,640 second-feet, at 8 a. m. March 3, 1916 (gage height, 8.9 feet); minimum discharge recorded, 7 million gallons per day or 11 second-feet, February and March, 1915 (gage height, 1.60 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of diversion above this point. Territorial land and water. Valuable for prospective homesteads of North Wailua.

UTILIZATION.—After joining North Fork of Wailua River, part of water is diverted for irrigation of sugar cane, but most of it is wasted.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 10 and 60 million gallons per day; fairly well defined between 60 and 500 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except for extremely high stages.

Discharge measurements of East Branch of North Fork of Wailua River near Lihue, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 14	Karl Jetter	1.80	17.8	11.5	Mar. 12	Karl Jetter	2.03	38	24.4
Aug. 29	do	1.80	19.0	12.3	Apr. 26	do	2.07	38	24.6
Oct. 5	do	1.92	32	20.7	June 16	do	1.85	19.6	12.7
Nov. 15	do	1.95	34	22	22	do	1.80	17.4	11.2
Jan. 25	Francis Kanahele	2.36	79	51					

Discharge, in million gallons per day, of East Branch of North Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	12.5	11.3	65	26	20	42	10.9	44	31	112	25	18.9
2	12.0	12.5	28	26	20	40	43	36	33	66	27	16.3
3	12.0	11.3	73	31	29	42	24	31	25	50	28	14.9
4	11.6	16.8	37	21	30	44	14.4	28	21	47	21	13.9
5	15.4	12.0	34	18.9	25	33	13.0	26	21	39	20	13.4
6	14.9	10.9	30	17.8	21	28	12.0	24	20	33	19.4	13.4
7	13.0	10.6	34	16.3	81	27	12.5	21	36	30	18.9	12.5
8	12.0	26	23	19.4	76	23	13.0	23	43	28	18.4	12.5
9	12.5	18.9	31	22	40	21	22	23	29	26	17.8	12.5
10	16.8	15.8	24	17.8	31	20	92	20	23	24	16.3	12.5
11	15.8	23	351	15.8	41	18.9	560	18.9	39	26	15.8	12.5
12	15.4	14.9	196	15.8	28	18.4	408	18.4	27	26	15.4	12.5
13	14.9	22	96	14.4	26	17.8	194	17.3	23	23	14.9	12.0
14	13.0	18.9	134	45	21	16.8	482	16.8	21	21	14.9	12.0
15	13.0	16.8	74	25	23	16.3	146	16.3	20	21	14.4	13.0

Discharge, in million gallons per day, of East Branch of North Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
16	13.0	14.9	75	18.9	29	15.4	96	15.8	19.4	19.4	14.4	13.9
17	12.0	13.9	52	18.9	33	14.9	156	14.9	18.9	30	13.9	13.4
18	13.4	12.5	46	24	38	14.9	84	14.4	18.4	35	14.9	13.0
19	13.0	12.5	48	52	37	13.9	166	13.9	17.8	44	14.9	13.0
20	12.5	19.4	33	35	27	13.4	210	13.4	18.9	46	13.9	13.9
21	12.0	14.4	32	26	22	13.4	158	16.0	17.8	39	14.4	13.9
22	11.6	13.4	205	34	20	13.0	81	94	17.3	26	14.4	12.5
23	13.4	12.5	88	71	18.9	12.5	60	78	34	23	18.9	14.4
24	12.0	12.5	56	118	17.8	12.0	51	35	39	33	17.8	12.5
25	12.0	12.0	44	46	22	11.6	57	28	31	48	19.9	13.0
26	18.8	12.0	35	34	98	11.6	49	22	41	31	21	13.4
27	14.9	13.4	31	31	287	11.3	82	41	53	39	34	14.9
28	50	11.6	30	33	214	11.3	127	51	28	28	19.9	14.4
29	17.3	12.5	26	28	77	11.3	61	-------	23	29	16.8	17.3
30	13.4	19.5	26	25	52	11.6	53	-------	150	30	25	20
31	12.5	25	-------	23	-------	11.3	68	-------	619	-------	21	-------

Monthly discharge of East Branch of North Fork of Wailua River near Lihue Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	50	11.6	14.7	22.7	457	1,400
August	26	10.6	15.3	23.7	474	1,460
September	351	23	68.6	106	2,060	6,320
October	118	14.4	30.6	47.3	950	2,910
November	287	17.8	50.2	77.7	1,500	4,620
December	44	11.3	19.7	30.5	612	1,870
January	560	10.9	116	179	3,610	11,000
February	94	13.4	28.6	44.3	801	2,460
March	619	17.3	50.3	77.8	1,560	4,790
April	112	19.4	35.7	55.2	1,070	3,290
May	34	13.9	18.6	28.8	577	1,770
June	20	12.0	13.9	21.5	416	1,280
The year	619	10.6	38.6	59.7	14,100	43,200

KAPAHI DITCH NEAR KEALIA, KAUAI

LOCATION.—500 feet below intake and 5 miles west of Kealia.

RECORDS AVAILABLE.—April 15, 1909, to May 2, 1914; May 10, 1915, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder; installed March 4, 1920. Stevens 8-day water-stage recorder used May 10, 1915, to March 3, 1920. Watson recorder used prior to May 10, 1915.

DISCHARGE MEASUREMENTS.—Made by 20-foot sharp-crested weir immediately below gage and from foot plank across box flume 100 feet below gage.

CHANNEL AND CONTROL.—Channel straight for 50 feet above weir.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 233 million gallons per day or 361 second-feet, at 3 and 4 a. m. March 31 (gage height, about 3.15 feet). Water turned out of ditch a few times during year.

1915–1923: Maximum discharge recorded on March 31, 1923. Water turned out of ditch occasionally.

DIVERSIONS.—All diversions below station.

REGULATION.—Flow regulated by head gates.

OBJECT OF STATION.—To determine amount of water diverted by ditch. Water owned by Territory and part is leased to Makee Sugar Co. Homesteads entitled to part of water.

UTILIZATION.—Water used for irrigation of sugar cane and for domestic supply.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except for a few short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

Kapahi ditch diverts from Kapaa River at a point about 4 miles east of Kealia and mouth of the river and at an elevation of about 400 feet. The general course of the ditch is eastward toward Kealia. It comprises about 6 miles of main ditch.

Discharge measurements of Kapahi ditch near Kealia, Kauai, during the year ending June 30, 1923

[Made by Karl Jetter]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Aug. 30	0.52	26	16.9
Mar. 14	.22	6.3	4.0

Discharge, in million gallons per day, of Kapahi ditch near Kealia, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	9.3	10.0	34	8.0	6.4	8.1	8.5	5.2	4.8	8.5	12.5	11.2
2	8.9	11.6	20	8.8	6.4	6.7	16.8	5.5	6.6	9.2	14.2	9.7
3	8.9	9.7	23	9.3	6.7	3.8	10.8	4.0	4.6	7.8	12.5	9.3
4	9.3	23	16.5	12.1	7.0	4.1	9.3	3.1	6.0	3.6	11.2	8.5
5	12.1	11.7	22	11.2	6.7	6.0	9.3	3.3	6.0	4.4	11.7	8.5
6	11.2	5.3	18.5	10.4	12.3	6.0	8.9	4.1	6.0	4.8	11.7	8.5
7	9.7	9.3	20	10.0	16.4	4.1	8.9	7.4	5.7	4.8	11.2	8.5
8	9.3	19.2	13.8	14.0	12.4	4.1	8.9	5.9	5.7	4.8	10.4	8.1
9	9.3	16.6	20	15.8	15.0	4.4	12.1	5.9	5.4	6.0	10.4	7.8
10	16.6	14.7	14.2	12.1	11.5	4.1	12.1	5.7	5.1	6.4	10.4	7.8
11	12.1	18.4	16.6	16.5	4.8	4.4	8.8	5.7	5.4	6.4	10.0	7.4
12	12.5	12.5	11.6	11.7	4.4	7.4	5.1	7.4	5.1	7.8	10.0	7.4
13	12.1	15.1	11.2	10.0	12.6	7.8	5.7	7.4	5.4	9.3	10.0	7.4
14	10.4	16.6	10.3	34	11.2	8.1	6.7	7.4	4.8	8.8	10.0	7.4
15	10.0	14.7	6.4	19.7	9.5	8.9	4.4	7.4	9.3	8.5	10.0	8.9
16	10.8	12.1	4.8	14.2	11.5	8.5	3.6	7.8	10.4	8.1	10.0	10.8
17	10.4	11.2	3.3	15.7	11.0	6.7	4.8	8.9	10.4	7.4	10.0	8.5
18	12.1	10.0	3.6	16.5	9.1	8.9	5.7	8.1	10.8	6.4	10.8	9.3
19	11.7		3.3	12.3	5.7	9.7	4.8	11.6	11.2	8.5	11.2	8.1
20	11.2		3.3	10.0	10.7	9.3	4.8	12.1	11.2	10.8	10.0	9.7
21	9.7		3.3	9.3	8.9	8.9	4.4	14.2	11.2	10.4	10.0	10.0
22	8.5	14	4.4	5.2	8.9	8.9	3.8	12.3	11.2	10.0	8.9	7.8
23			3.6	7.3	8.9		2.8	4.8	12.5	11.2	9.7	8.5
24			3.8	4.8	8.9		2.8	4.4	10.8	11.7	10.8	7.8
25	13		3.8	4.1	6.8		2.4	5.8	5.7	8.8	12.5	8.5
26			5.8	3.8	9.1	8.9	3.8	6.4	12.3	6.4	12.5	9.3
27	12.5	10.4	10.0	6.0	9.1		4.1	6.4	9.7	7.8	13.8	10.0
28	33	9.7	12.1	6.4	6.7		5.1	4.2	9.3	10.0	13.0	9.7
29	13.0	12.5	12.1	6.0	8.9		5.1	-------	9.7	8.1	10.4	15.2
30	10.8	14.7	12.1	6.0	8.5		4.8	-------	7.8	11.2	13.8	17.3
31	10.4	17.0	-------	6.4	-------	8.5	5.1	-------	9.0	-------	11.7	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated because of lack of gage-height record by comparison with flow of Anahola River, Kalihiwai River, and Anahola ditch. Gage-height record estimated for part of day Mar. 31.

Monthly discharge of Kapahi ditch near Kealia, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	33	8.5	11.9	18.4	368	1,130
August	23	5.3	13.5	20.9	418	1,280
September	34	3.3	11.6	17.9	347	1,070
October	34	3.8	10.9	16.9	338	1,040
November	16.4	4.4	9.20	14.2	276	847
December	9.7	3.8	7.37	11.4	229	701
January	16.8	2.4	6.59	10.2	204	627
February	14.2	3.1	6.87	10.6	192	590
March	12.5	4.6	8.04	12.4	249	765
April	11.7	3.6	7.93	12.3	238	730
May	14.2	8.9	11.1	17.2	345	1,060
June	17.3	7.4	9.23	14.3	277	850
The year	34	2.4	9.54	14.8	3,480	10,700

ANAHOLA RIVER NEAR KEALIA, KAUAI

LOCATION.—A quarter of a mile above dam at Kiokala and 6 miles northwest of Kealia.

RECORDS AVAILABLE.—August 22 to November 2, 1910; December 30, 1912, to June 30, 1923. Fragmentary record December 15, 1910, to December 28, 1912, at dam a quarter of a mile below present site.

GAGE.—Stevens continuous water-stage recorder installed March 14, 1920. Friez water-stage recorder used August 22 to November 2, 1910, and December 28, 1912, to March 7, 1920.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 75 feet above and below gage. Right bank steep and high and covered with underbrush; left bank low for about 40 feet out from low-water channel, then rises abruptly. Control composed of boulders; permanent for low and medium stages; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 1,350 million gallons per day or 2,090 second-feet, at 5 a. m. March 31 (gage height, 9.03 feet); minimum discharge recorded, 2.7 million gallons per day or 4.2 second-feet, for several hours August 1–4 and 7 (gage height, 1.65 feet).

1910; 1912–1923: Maximum discharge recorded, from extension of rating curve, 1,450 million gallons per day or 2,240 second-feet, at 7.30 p. m. September 26, 1915 (gage height, 12.9 feet); minimum discharge recorded, 2.0 million gallons per day or 3.1 second-feet February 27 and 28, 1915 (gage height, 1.3 feet).

DIVERSIONS.—Part of flow diverted 3 miles above station.

REGULATION.—None except by diversions.

OBJECT OF STATION.—To determine feasibility of additional diversions for sugar-cane irrigation. Water owned by Territory and leased to Makee Sugar Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation shifting during period January 22 to March 30. Standard rating curve well defined between 2 and 40 million gallons per day; extended above 40 million gallons per day. Indirect method of shifting control used January 22 to March 30. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for period for which shifting-control method was used. Records good below 40 million gallons per day except those for period for which shifting control method was used, which are fair; high-stage records subject to error.

Discharge measurements of Anahola River near Kealia, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 15	M. H. Carson	1.71	5.6	3.6	Jan. 25	Francis Kanahele	2.63	39	25
Aug. 30	Karl Jetter	1.70	4.5	2.9	Mar. 11	Karl Jetter	2.60	39.5	25.5
Oct. 6	do	1.77	6.9	4.4	Apr. 25	do	2.40	41	26.5
Dec. 3	do	2.10	18.7	12.1	June 14	do	1.67	4.0	2.6

Discharge, in million gallons per day, of Anahola River near Kealia, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	5.0	2.7	30	[illegible]	5.5	21	4.4	19.1	29	60	7.0	4.4
2	4.4	3.1	6.4	[illegible]	5.3	14.1	9.4	15.8	47	29	6.8	4.0
3	3.8	3.1	13.4	[illegible]	6.1	13.0	5.9	14.1	22	19.6	6.6	3.8
4	3.6	7.4	10.9	[illegible]	5.9	17.6	4.7	13.0	18.1	87	6.4	3.6
5	4.5	3.6	6.4	[illegible]	5.5	10.1	4.4	12.4	15.8	32	6.4	3.6
6	4.2	3.0	6.4	[illegible]	4.9	9.1	4.2	11.8	14.4	18.6	5.9	3.4
7	3.4	2.7	10.2	[illegible]	21	9.1	4.0	11.0	20	15.5	5.7	3.4
8	3.3	9.9	5.1	[illegible]	53	8.1	4.0	11.0	19.1	13.4	5.5	3.6
9	4.0	7.7	6.4	[illegible]	10.6	7.4	8.8	26	13.4	12.1	5.3	3.4
10	8.2	5.1	4.9	[illegible]	6.8	7.0	23	14.8	12.1	11.2	5.3	3.3
11	4.2	7.7	100	[illegible]	19.4	6.8	86	11.0	24	12.7	5.1	3.1
12	3.6	4.4	74	[illegible]	7.0	6.4	118	22	13.4	12.7	4.9	3.1
13	4.2	4.4	40	[illegible]	5.9	6.1	110	11.8	26	14.4	4.9	3.0
14	3.8	3.4	16.6	[illegible]	5.3	6.1	130	9.8	13.8	11.2	4.7	3.0
15	3.4	3.3	12.1	[illegible]	9.0	5.9	47	9.6	11.8	11.0	4.7	3.1
16	3.4	3.3	24	[illegible]	20	5.7	32	9.1	11.0	9.3	4.5	3.4
17	3.1	3.3	11.8	[illegible]	13.2	5.5	35	8.4	10.4	12.7	4.5	3.3
18	3.3	2.8	9.8	[illegible]	11.6	5.3	19.6	8.1	9.3	13.8	4.7	3.3
19	3.1	4.4	17.9	[illegible]	23	5.3	68	7.9	8.8	21	4.5	3.1
20	3.1	10.0	7.6	[illegible]	8.4	5.1	150	7.9	8.6	11.0	4.4	3.0
21	3.3	4.9	7.4	[illegible]	6.6	5.1	350	22	8.4	9.1	5.7	3.3
22	3.1	4.0	92	[illegible]	6.1	5.1	54	60	8.8	7.6	4.7	3.1
23	3.1	3.6	25	[illegible]	5.7	4.9	33	68	20	7.2	4.9	4.0
24	3.1	3.6	11.0	[illegible]	5.3	4.5	24	21	26	7.4	4.7	3.3
25	3.0	4.4	8.6	[illegible]	14.3	4.5	29	15.8	24	25	4.9	3.0
26	2.8	3.3	7.9	[illegible]	45	4.5	27	12.7	84	10.4	6.8	3.0
27	3.3	3.0	6.8	[illegible]	158	4.5	60	116	38	14.4	12.0	3.0
28	15.0	3.0	6.6	[illegible]	207	4.4	54	54	15.8	8.4	7.2	3.0
29	4.0	3.1	5.9	[illegible]	62	4.4	31	-------	11.8	7.6	4.7	3.1
30	3.1	3.6	5.5	[illegible]	33	4.5	26	-------	76	7.2	5.7	3.4
31	2.8	8.6	-------	[illegible]	-------	4.4	27	-------	292	-------	4.9	-------

Monthly discharge of Anahola River near Kealia, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	15.0	2.8	4.07	6.30	126	387
August	10.0	2.7	4.53	7.01	140	431
September	100	4.9	19.7	30.5	591	1,810
October	55	4.0	11.6	17.9	361	1,100
November	207	4.9	26.3	40.7	790	2,420
December	21	4.4	7.27	11.3	226	692
January	350	4.0	5.11	79.1	1,580	4,860
February	116	7.9	22.3	34.5	624	1,920
March	292	8.4	30.7	47.5	953	2,920
April	87	7.2	17.8	27.5	532	1,640
May	12.0	4.4	5.61	8.68	174	534
June	4.4	3.0	3.34	5.17	100	308
The year	350	2.7	17.0	26.3	6,200	19,000

ANAHOLA DITCH ABOVE KANEHA RESERVOIR, NEAR KEALIA, KAUAI

LOCATION.—At upper end of second tunnel above Kaneha reservoir, 7 miles from Kealia.

RECORDS AVAILABLE.—December 9, 1921, to June 30, 1923. At station 100 feet upstream at lower end of third tunnel above reservoir, May 29, 1915, to December 9, 1921. Flow at two stations not exactly comparable owing to occasional operation of check gate and spillway between.

GAGE.—Stevens continuous water-stage recorder. At old station 100 feet upstream a Friez recorder was used from May 29 to June 26, 1915, a Stevens eight-day recorder from June 26, 1915, to April 10, 1920, and a Stevens continuous recorder from April 10, 1920, to December 9, 1921.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel at gage is short straight stretch of open ditch cut in firm earth between two tunnels. Control is rock section of ditch in tunnel; probably permanent. Possible backwater effect from reservoir below.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 62 million gallons per day or 96 second-feet, at 3.40 p. m. February 27 (gage height, 4.15 feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, at 2 p. m. February 28 (gage height, 0.85 foot).

1915–1923: Maximum discharge recorded, 130 million gallons per day or 201 second-feet, at 7.10 a. m. January 16, 1921 (gage height, 6.25 feet at old station). Water occasionally turned out of ditch so it does not flow into reservoir.

DIVERSIONS.—None except that occasionally excess water is diverted through spillway 100 feet above station.

REGULATION.—By operation of head gates and spillway gates.

OBJECT OF STATION.—To determine amount of water diverted from Anahola River into Kaneha reservoir. Water owned by Territory and leased to Makee Sugar Co.

UTILIZATION.—Water is stored in Kaneha reservoir for irrigation of sugar cane and for domestic supply near Anahola and Kealia.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined between 1 and 15 million gallons per day; extended beyond these limits. Operation of water-stage recorder not satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Medium-stage records good except for periods during which recorder did not operate properly; records for extremely low and high stages subject to error.

Anahola ditch diverts water from Anahola River at a point about 3½ miles above gaging station and dam on the river at Kiokala and carries it southeastward for about 1½ miles to Kaneha reservoir, where it is stored.

Discharge measurements of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, during the year ending June 30, 1923

[Made by Karl Jetter]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
July 15	1.24	2.3	1.45	Mar. 14	1.28	2.7	1.75
Oct. 6	1.38	4.4	2.8	June 14	1.21	2.1	1.35
Dec. 3	1.73	11.0	7.1				

Discharge, in million gallons per day, of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.8		9.8	3.4	3.4		5.7	2.1	1.2	1.9	3.9	3.3
2	2.0		5.2	4.3	3.7	3.2	3.4	2.1	1.0	5.9	3.8	2.5
3	1.9		7.9	6.4	4.4		4.4	2.1	1.6	6.7	3.4	2.1
4	1.9		7.4	3.5	4.7	4.3	5.4	2.1	1.5	4.3	3.0	2.0
5	2.4	2.2	6.2	2.9	4.4	2.3	3.7	2.0	1.7	.4	3.0	2.0
6	3.3		6.8	2.9	3.3	1.9	2.1	2.0	2.2	4.8	3.1	1.8
7	2.1		7.0	2.8	6.2	2.3	1.9	1.9	.9	5.9	2.8	1.8
8			4.5	3.4	7.3	1.7	1.8	1.9	1.6	5.0	2.6	1.8
9			6.7	3.7	6.4	1.6	1.9	2.1	2.0	4.6	2.4	1.8
10			4.7	3.2	5.3	1.5	2.1	2.0	1.9	4.6	2.3	1.7
11	2.9	4.7	6.2	2.7	5.7	1.4	2.4	1.9	2.1	5.2	2.2	1.7
12			2.3	2.6	5.3	1.4	3.8	2.0	2.0	5.0	2.1	1.6
13			8.3	2.5	4.8	2.3	8.1	1.9	1.7	5.6	2.1	1.7
14			7.3	10.3	3.8	2.8	8.3	1.8	2.1	5.3	2.1	1.6
15			6.9	6.2	4.2	2.7	10.5	1.9	2.1	4.8	2.0	1.8
16		2.0	5.6	4.0	6.7	2.7	6.0	1.9	2.1	3.7	2.1	2.0
17			5.2	5.2	6.2	2.6	6.2	2.0	2.1	5.2	2.0	1.9
18			7.2	5.7	6.2	2.5	5.7	2.0	2.1	5.9	2.2	2.0
19			8.4	8.0	6.7	2.5	4.3	1.9	2.1	3.4	2.4	1.7
20	1.9		5.1	6.0	5.8	2.4	1.4	1.9	2.1	5.0	2.0	2.1
21			5.1	4.9	4.7	2.1	.3	2.3	2.1	5.1	2.5	2.2
22			10.8	6.2	4.0	2.2	.3	3.6	2.1	4.6	2.3	1.6
23		3.0	7.2	7.3	3.6	2.1	.3	4.9	2.5	3.9	4.2	2.1
24			6.5	9.0	3.3	2.1	.3	1.7	2.8	4.2	2.8	1.7
25			5.1	6.8	3.9	2.1	.3	.9	2.8	2.3	3.5	1.7
26			4.8	5.6	6.9	2.0	.3	2.0	2.1	3.4	6.7	1.7
27		2.3	4.2	4.8	4.5	2.1	.3	2.8	2.2	5.2	8.7	1.7
28		2.1	3.4	4.6		2.0	.3	.6	4.4	4.5	5.9	1.8
29	3.1	2.8	3.4	4.6	.4	1.9	.3	-------	4.9	4.8	2.8	2.6
30		3.2	3.9	4.7		1.7	1.7	-------	3.0	3.9	6.0	3.8
31		6.1	-------	3.6	-------	4.6	2.5	-------	1.2	-------	3.8	-------

NOTE.—Water-stage recorder did not operate July 8 to Aug. 26; discharge estimated by comparison with flow at stations on Anahola River, Kapahi ditch, and Kalihiwai River. Discharge Nov. 28 to Dec. 3 based on poor gage-height record and comparison with flow of above-mentioned streams. Discharge Dec. 30 to Jan. 26 computed from poor gage-height record. Braced figures show mean discharge for periods indicated.

Monthly discharge of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July			2.35	3.64	73.0	224
August			3.04	4.70	94.1	289
September	10.8	2.3	6.10	9.44	183	562
October	10.3	2.5	4.90	7.58	152	466
November	7.3		4.55	7.04	137	419
December		1.4	2.37	3.67	73.4	225
January	10.5	.3	3.10	4.80	96.0	295
February	4.9	.6	2.08	3.22	58.3	179
March	4.9	.9	2.14	3.31	66.2	204
April	6.7	.4	4.50	6.96	135	414
May	8.7	2.0	3.25	5.03	101	309
June	3.8	1.6	1.99	3.08	59.8	183
The year	10.8	.3.	3.36	5.20	1,230	3,770

HALAULANI STREAM NEAR KILAUEA, KAUAI

LOCATION.—3½ miles south of Kilauea and 1½ miles above confluence with Pohakuhanu Stream.

RECORDS AVAILABLE.—April 29, 1922, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Recorder located on pool at foot of low falls. Stream bed composed of small gravel and boulders. Right bank vertical; left bank sloping and covered with dense vegetation. Control composed of boulders dividing the stream into two channels at ordinary stages; shifts, especially in left channel.

EXTREMES OF DISCHARGE.—Maximum recorded during period of record, 405 million gallons per day, or 627 second-feet, at 5.10 a. m. March 31, 1923 (gage height, 4.75 feet); minimum recorded, 1.2 million gallons per day, or 1.9 second-feet for several hours June 24–25, 1923 (gage height, 0.56 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of using water for domestic supply and power development. This stream is typical of a number of small streams along this mountain side.

ACCURACY.—Stage-discharge relation changed slightly during flood of March 31, 1923. Two rating curves used, both well defined below 40 million gallons per day; extended above that quantity. Operation of water-stage recorder satisfactory except as noted in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those for high stages and those estimated.

Discharge measurements of Halaulani Stream near Kilauea, Kauai, during the years ending June 30, 1922–23

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
1922					1923				
May 30[a]	E. M. Pickop	1.02	8.9	5.7	Jan. 24	Francis Kanahele	0.91	5.1	3.3
July 13	Karl Jetter	.70	2.6	1.65	Mar. 10	Karl Jetter	.75	2.9	1.9
Aug. 18	do	.66	1.8	1.15	Apr. 24	do	.70	2.8	1.85
Oct. 6	do	.70	2.2	1.4	June 15	do	.59	2.1	1.35
Nov. 17	do	.98	5.7	3.7					

[a] Discredited.

Discharge, in million gallons per day, of Halaulani Stream near Kilauea, Kauai, for the years ending June 30, 1922 and 1923

Day	Apr.	May	June	Day	Apr.	May	June	Day	Apr.	May	June
1922				1922				1922			
1		2.0	2.1	11		2.6	2.0	21		1.8	2.4
2		2.0	2.0	12		3.1	1.8	22		1.9	2.1
3		1.9	1.9	13		2.7	1.6	23		1.8	1.7
4		2.0	1.8	14		2.2	1.7	24		10.6	1.6
5		1.9	1.8	15		2.1	1.7	25		7.8	1.5
6		2.6	1.7	16		1.9	1.6	26		7.4	1.4
7		4.6	1.7	17		2.1	1.6	27		5.3	1.4
8		2.4	1.6	18		2.4	1.6	28		2.6	1.4
9		2.6	1.9	19		2.0	1.6	29	2.1	2.1	1.4
10		3.2	1.6	20		1.9	1.6	30	2.1	5.0	1.4
								31		2.4	

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1922–23												
1	1.4	1.4	5.7	1.6		3.6	1.5	2.9	3.8	10.4	2.0	
2	1.4	1.6	2.5	1.8		3.2	2.8	2.6	5.9	3.5	1.9	
3	1.4	1.4	3.7	2.1		3.3	1.8	2.3	3.0	2.8	1.8	
4	1.4	2.3	2.6	1.7		3.4	1.6	2.2	2.6	17.6	1.7	
5	1.6	1.6	2.5	1.6	2.2	2.7	1.6	2.1	2.3	4.9	1.8	
6	1.4	1.4	2.7	1.6		2.4	1.4	2.1	2.2	2.9	1.6	
7	1.4	1.4	3.6	1.5		2.6	1.5	2.0	3.0	2.5	1.6	
8	1.3	3.4	2.2	1.5	9.7	2.2	1.5	2.1	2.5	2.2	1.6	1.4
9	1.5	2.9	2.5	2.4	3.3	2.1	2.1	3.5	2.1	2.1	1.6	
10	2.2	2.0	2.1	1.7	2.3	2.0	4.4	2.5	2.0	2.0	1.6	
11	1.6	2.1	11.7	1.5	2.7	1.9	10.4	2.1	3.9	2.3	1.6	
12	1.5	1.8	14.9	1.5	2.2	1.8	16.5	3.8	2.4	2.2	1.6	
13	1.5	1.8	4.7	1.4	2.1	1.8	38	2.2	4.2	3.2	1.6	
14	1.4	1.6	3.2	4.7	1.8	1.8	17.7	2.0	2.4	3.1	1.5	
15	1.4	1.5	2.7	2.3	2.0	1.8	4.6	1.9	2.0	2.3	1.6	
16	1.4	1.4	4.1	1.8	3.2	1.7	3.2	1.8	1.8	2.0	1.5	1.5
17	1.3	1.4	2.8	1.6	3.1	1.7	2.9	1.8	1.8	2.9	1.4	1.4
18	1.4	1.4	2.7	2.2	3.0	1.7	2.5	1.7	1.7	3.2	1.4	1.4
19	1.4	2.5	2.9	2.9	3.5	1.6	16.5	1.7	1.6	4.1	1.4	1.4
20	1.4	2.8	2.2	2.2	2.4	1.6	24	1.9	1.6	2.8	1.4	1.4
21	1.3	1.8	2.2	2.1	2.1	1.6	42	8.0	1.5	2.3	1.6	1.4
22	1.3	1.6	12.1	3.4	1.9	1.6	5.5	11.6	1.4	2.1	1.5	1.3
23	1.4	1.4	4.5	5.7	1.8	1.6	3.9	16.7	2.8	1.9	1.6	1.3
24	1.3	1.5	2.6		1.7	1.5	3.2	4.3	3.4	2.0	1.6	1.3
25	1.3	1.5	2.3		3.8	1.4	4.8	3.0	3.5	3.8	1.8	1.3
26	1.4	1.4	2.1		16.2	1.4	5.6	2.6	21	2.2		1.3
27	1.4	1.4	1.9	3.3	51	1.4	15.6	17.3	5.3	2.8		1.3
28	3.6	1.4	1.8		30	1.4	10.8	6.8	2.6	2.0	2.0	1.3
29	1.7	1.4	1.7		6.8	1.4	5.2		2.1	2.0		1.3
30	1.4	1.4	1.7		4.0	1.4	4.0		36	2.0		1.9
31	1.4	1.7				1.4	3.5		63			

NOTE.—Braced figures show mean discharge for periods indicated, estimated because of lack of gage-height record by comparison with flow of Anahola River. Gage-height graph estimated for part of day Sept. 11–12, 22, Oct. 22, 23, and Nov. 8.

Monthly discharge of Halaulani Stream near Kilauea, Kauai, for the years ending June 30, 1922 and 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1922						
May	10.6	1.8	3.13	4.84	96.9	298
June	2.4	1.4	1.71	2.65	51.2	157
The year					148	455
1922-23						
July	3.6	1.3	1.51	2.34	46.8	144
August	3.4	1.4	1.75	2.71	54.2	166
September	14.9	1.7	3.83	5.93	115	353
October		1.4	2.49	3.85	77.2	237
November	51		5.87	9.08	176	540
December	3.6	1.4	1.97	3.05	61.0	187
January	42	1.4	8.41	13.0	261	800
February	17.3	1.7	4.12	6.37	116	354
March	63	1.4	6.30	9.75	195	599
April	17.6	1.9	3.40	5.26	102	313
May		1.4	1.69	2.61	52.3	161
June		1.3	1.39	2.15	41.8	128
The year	63	1.3	3.56	5.51	1,300	3,980

KALIHIWAI RIVER NEAR HANALEI, KAUAI

LOCATION.—At elevation 700 feet, 1 mile east of Kauai Electric Co.'s power line and 9 miles southeast of Hanalei.

RECORDS AVAILABLE.—March 13, 1914, to July 31, 1923, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and 50 feet below gage; current sluggish at low stages. Right bank low and wooded; left bank a high and nearly vertical cliff. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during period July 1, 1922, to July 31, 1923, from extension of rating curve, 1,680 million gallons per day or 2,600 second-feet, at 3.45 a. m. March 31 (gage height, 7.77 feet); minimum discharge recorded, 8.8 million gallons per day or 13.6 second-feet for several hours June 12–14 and 22 (gage height, 0.11 foot).

1914–1923: Maximum discharge recorded, from extension of rating curve 4,000 million gallons per day or 6,200 second-feet, at 6.30 a. m. September 25, 1914 (gage height, 14.4 feet); minimum discharge recorded, 5.8 million gallons per day or 9.0 second-feet, at 8 a. m. February 22, 1920 (gage height, 0.53 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high-level diversions, in connection with Territorial project relative to Hanalei River.

UTILIZATION.—Part of flow is diverted below station for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 7 and 100 million gallons per day. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good below 100 million gallons per day; above that quantity they are subject to error; estimated records fair.

Discharge measurements of Kalihiwai River near Hanalei, Kauai, during the period July 1, 1922, to July 31, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
1922					1923				
July 11	Karl Jetter	0.57	30.5	19.8	Jan. 22	Francis Kanahele	1.12	78.	50
Sept. 28	do	.62	30	19.5	Mar. 8	Karl Jetter	.78	47.5	30.5
Nov. 22	do	.53	27.5	17.8	Apr. 22	do	.56	30	19.5
Dec. 6	do	.67	35	22.7	June 12	do	.12	12.6	8.1
					July 31	F.K. Walker	.33	22.2	14.3

Discharge, in million gallons per day, of Kalihiwai River near Hanalei, Kauai, for the period July 1, 1922, to July 31, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1922-23												
1	11.4		64	17.4	21			27	29	52	16.6	15.1
2	11.2		32	21	21			23	38	32	16.9	12.4
3	11.0			34	35			21	23	27	15.3	11.4
4	10.8	12		17.4	32	30	20	19.2	19.6	39	14.3	11.0
5	13.4			15.3	27			18.1	18.8	28	14.1	10.8
6	12.0		30	14.1	27			17.4	19.2	22	13.8	10.4
7	11.6			13.6	89	23		16.4	35	20	12.9	9.9
8	11.0			15.8	115	18.1	21	19.2	32	17.4	12.2	9.5
9	12.4			17.8	40	17.1	18.9	25	22	16.6	11.8	9.5
10	17.4			13.4	32	16.1	160	16.9	19.6	15.8	11.6	9.3
11	15.1			12.2	48	15.3	307	15.6	34	18.8	11.2	9.1
12	14.6	18		11.8	28	14.6	262	17.4	21	18.8	11.0	8.8
13	13.6			11.0	24	14.1	241	14.6	21	18.1	10.8	8.8
14	12.4		110	45	20	13.8	172	14.3	18.5	23	10.6	9.0
15	13.1			17.1	26	13.6	52	14.1	17.1	18.8	10.4	10.8
16	12.2			14.1	34	12.9	49	13.4	16.4	15.3	10.2	12.0
17	12.0	14.8		14.6	32	12.6	56	13.1	16.1	30	10.0	9.7
18	12.9	13.8		21	40	12.2	32	12.6	15.1	40	11.2	10.2
19	12.2	14.3	35	25	37	12.0	115	12.4	14.6	42	10.4	9.7
20	12.4	21		21	25	11.6	138	14.3	14.3	47	9.9	10.8
21	12.2	15.6		16.9	21	11.4	117	38	14.1	26	11.0	10.4
22	11.0	14.3		23	18.1		46	111	13.8	21	11.0	9.3
23	12.2	13.6	80	40	17.1		34	132	40	17.4	17.4	9.9
24		14.1		87	16.1		36	34	35	21	14.6	9.3
25	14	14.1		26	29		32	25	29	30	15.8	12.1
26		12.9	30	21	97	11.5	58	23	84	19.2	19.0	12.0
27		12.9		21			134	100	56	20	30	11.0
28		12.4	23	26	100		64	55	27	18.5	16.6	12.0
29		14.3	18.5	22			46	-------	21	25	12.4	17.1
30	19	19.8	17.4	25			37	-------	176	19.9	26	19.6
31		68	-------	22	-------		40	-------	290	-------	16.6	-------

Day	July	Day	July	Day	July
1923		1923		1923	
1	23	11	10.8	21	22
2	12.4	12	10.4	22	15.1
3	11.2	13	9.7	23	59
4	12.9	14	9.5	24	26
5	14.3	15	9.5	25	18.1
6	12.4	16	9.3	26	15.6
7	15.3	17	13.9	27	13.8
8	12.4	18	19.5	28	12.9
9	12.4	19	39	29	12.6
10	11.0	20	18.8	30	13.8
				31	12.9

NOTE.—Braced figures show mean discharge for periods indicated; estimated because of lack of gage-height record by comparison with flow of adjacent streams and ditches.

Monthly discharge of Kalihiwai River near Hanalei, Kauai, for the period July 1, 1922, to July 31, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1922–23						
July		10.8	13.6	21.0	420	1,290
August	68		16.8	26.0	522	1,600
September		17.4	52.0	80.5	1,560	4,790
October	87	11.0	22.7	35.1	702	2,160
November		16.1	45.0	69.6	1,350	4,140
December			16.6	25.7	513	1,580
January	307		77.7	120	2,410	7,390
February	132	12.4	30.8	47.7	863	2,650
March	290	13.8	39.7	61.4	1,230	3,780
April	52	15.3	25.3	39.1	760	2,330
May	30	9.9	14.1	21.8	436	1,340
June	19.6	8.8	11.0	17.0	331	1,010
The year	307	8.8	30.4	47.0	11,100	34,100
1923						
July	59	9.3	16.4	25.4	510	1,560

HANALEI RIVER AT ELEVATION 625 FEET, NEAR HANALEI, KAUAI

LOCATION.—2 miles west of Kauai Electric Co.'s power line and 10 miles south of Hanalei. Trail to station leaves power line at Pole No. 334.

RECORDS AVAILABLE.—January 26, 1914, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder; moved 300 feet upstream on July 20, 1921. Datum of recorder in use prior to July 20, 1921, raised 6.0 feet January 15, 1915.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages. Bed composed of boulders; rough. Right bank steep and high; left bank slopes gently. Control composed of boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 5,160 million gallons per day or 7,980 second-feet, at 9 a. m. September 11 (gage height, 8.04 feet); minimum discharge recorded, 29 million gallons per day or 45 second-feet, at 5 p. m. June 24 (gage height, 1.04 feet).

1914–1923: Maximum discharge recorded, from extension of rating curve, 6,500 million gallons per day or 10,100 second-feet, at 11.20 a. m. January 16, 1921 (gage height, 7.50 feet at old location); minimum discharge recorded, 14 million gallons per day or 22 second-feet, January 6 and 10, 1918 (gage height, 0.35 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high-level diversion to Territorial agricultural lands. Territorial water.

UTILIZATION.—Small part of flow diverted for irrigation of rice and taro and for domestic supply.

ACCURACY.—Stage-discharge relation changed during floods of November 7 and March 30. Rating curve used July 1 to November 7 and curve used November 8 to March 30, well defined between 30 and 200 million gallons per day; extended beyond these limits. Rating curve used March 31 to June 30 well defined between 28 and 60 million gallons per day; extended beyond these limits. Operation of water-stage recorder satisfactory, except during July and August. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except those for high stages and those estimated, which are fair.

Discharge measurements of Hanalei River at elevation 625 feet, near Hanalei, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 12	Karl Jetter	1.15	53	34.5	Mar. 9	Karl Jetter	1.67	123	80
Sept. 27	do	1.32	76	49	Apr. 22	do	1.42	78	51
Nov. 21	do	1.30	79	51	June 13	do	1.07	46.5	30
Jan. 22	Francis Kanahele	1.75	140	90					

Discharge, in million gallons per day, of Hanalei River at elevation 625 feet, near Hanalei, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	31		170	54	46	93	33	80	58	193	57	43
2	31		75	58	45	84	75	66	68	88	57	37
3	34		141	76	63	73	78	58	51	65	46	37
4	31	34	79	50	58	83	51	54	48	65	43	34
5	49		75	42	50	62	41	51	48	57	43	34
6	34		70	42	66	54	38	51	48	50	40	32
7	31		71	38	228	51	38	48	81	46	37	32
8	31		56	50	215	48	38	55	101	43	37	32
9	34		72	68	84	48	50	62	85	43	34	32
10	48		58	42	68	44	232	51	62	40	34	32
11	34	51	771	38	94	44	747	44	92	43	34	30
12	38		213	34	62	41	910	44	58	47	34	32
13	31		104	34	54	41	322	41	54	40	32	30
14	37		113	96	48	41	499	41	48	40	32	32
15	31		89	46	58	38	167	41	44	43	32	34
16	45	42	109	38	62	38	138	38	44	37	32	37
17	34	42	66	44	66	38	174	38	44	87	32	34
18	38	34	77	93	102	38	105	38	41	88	42	34
19	31	38	66	82	70	36	248	38	41	116	34	32
20	34	50	56	59	58	36	194	38	41	165	32	34
21		38	58	50	51	36	143	47	41	70	34	34
22		38	162	64	48	36	90	242	41	52	34	30
23	33	34	89	106	44	36	70	109	74	46	65	32
24		42	63	181	44	33	62	70	85	70	53	30
25		38	56	63	59	33	84	54	66	119	61	32
26		53	54	54	193	33	123	48	120	57	62	32
27		46	46	54	542	33	283	67	182	110	83	32
28	42	34	54	46	237	33	189	87	75	98	46	32
29		34	46	46	111	33	132	-------	58	80	40	37
30		53	50	42	80	33	100	-------	318	76	71	45
31		113	-------	46	-------	33	128	-------	632	-------	54	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated because of lack of gage-height record by comparison with flow at stations on Lumahai River and Waioli Stream.

Monthly discharge of Hanalei River at elevation 625 feet, near Hanalei, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July			36.3	56.2	1,120	3,450
August			44.4	68.7	1,380	4,220
September	771	46	107	166	3,210	9,850
October	181	34	59.2	91.6	1,840	5,630
November	542	44	100	155	3,010	9,210
December	93	33	45.3	70.1	1,400	4,310
January	910	33	180	279	5,580	17,100
February	242	38	60.8	94.1	1,700	5,220
March	632	41	91.9	142	2,850	8,740
April	193	37	72.5	112	2,170	6,670
May	83	32	44.1	68.2	1,370	4,200
June	45	30	33.7	52.1	1,010	3,100
The year	910	30	73.0	113	26,600	81,700

WAIOLI STREAM NEAR HANALEI, KAUAI

LOCATION.—3 miles above mouth of stream and 4 miles from Hanalei.

RECORDS AVAILABLE.—July 1, 1914, to June 30, 1923. Data from December 19, 1916, to June 30, 1918, have been revised in Water-Supply Paper 515.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable at gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 30 feet above and 20 feet below gage. Right bank steep; left bank slopes gently. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year 854 million gallons per day or 1,320 second-feet, at 3.45 p. m. September 11 (gage height, 5.88 feet); minimum discharge recorded, 7.1 million gallons per day or 11.0 second-feet, at 1 p. m. August 26 (gage height, 1.38 feet).

1914–1923: Maximum discharge recorded, from extension of rating curve, 955 million gallons per day or 1,480 second-feet, at 6.30 a. m. December 19, 1916 (gage height, 6.15 feet); minimum discharge recorded, 2.0 million gallons per day or 3.1 second-feet, July 22, 1914 (gage height, 0.6 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high-level diversions, in connection with Territorial Hanalei River project. Territorial land and water.

UTILIZATION.—Small part of flow is diverted for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation changed during floods of September 11, January 10, and March 30. Two rating curves used, both well defined between 6 and 60 million gallons per day; extended beyond these limits. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of Waioli Stream near Hanalei, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 11	Karl Jetter	1.50	14.8	9.6	Jan. 23	M. H. Carson	1.80	28.5	18.4
Sept. 30	do	1.72	21.3	13.8	Mar. 6	Karl Jetter	1.67	20.9	13.5
Nov. 18	do	2.35	78	50	Apr. 24	do	1.74	21.2	13.7
Dec. 4	do	1.74	22	14.2	June 11	do	1.57	14.4	9.3
12	do	1.57	13.1	8.5					

Discharge, in million gallons per day, of Waioli Stream near Hanalei, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	8.2	8.8	44	14.6	11.8	13.3	8.5	16.6	17.5	37	22	14.0
2	8.0	10.1	20	17.6	10.4	15.3	23	14.1	18.0	20	18.8	11.5
3	7.8	9.2	24	26	14.9	15.3	39	12.8	14.4	16.0	14.0	10.4
4	8.0	16.0	18.4	13.6	19.6	16.6	25	12.2	13.3	50	12.9	9.6
5	15.2	9.4	16.3	10.4	14.0	12.3	13.6	12.0	13.9	27	12.9	16.8
6	9.2	8.2	16.9	9.4	18.5	11.2	11.2	12.0	15.3	16.4	12.6	12.0
7	8.0	7.8	23	10.0	71	12.9	11.2	11.5	40	15.0	11.2	10.1
8	8.0	32	14.7	13.8	113	10.6	14.5	12.2	39	12.3	10.1	9.8
9	12.2	29	17.5	12.3	21	10.4	23	37	35	11.2	10.1	9.6
10	13.9	15.9	11.5	9.2	14.0	9.8	94	19.8	24	10.6	9.8	9.8
11	11.2	11.3	242	8.3	45	9.8	287	14.1	56	16.1	9.6	9.2
12	10.1	11.5	79	7.9	16.0	9.6	200	23	21	14.5	9.6	9.8
13	11.5	11.0	27	7.9	14.3	9.4	163	14.7	16.6	19.2	9.6	9.8
14	27	9.0	19.2	43	11.8	9.4	133	13.3	14.4	28	9.6	11.2
15	12.2	11.2	16.8	15.9	18.0	9.2	33	13.3	13.3	19.3	10.1	12.3
16	9.9	11.5	35	11.8	22	9.2	32	12.5	12.5	12.6	9.8	14.8
17	9.0	12.0	19.2	10.6	26	9.2	46	12.0	12.5	29	9.8	12.0
18	9.9	9.2	31	15.7	30	9.2	26	11.7	12.2	38	14.4	12.0
19	9.9	23	22	13.4	28	9.2	114	11.5	11.7	29	11.2	11.8
20	9.9	22	14.3	28	16.0	9.2	77	20	11.7	18.4	10.1	12.0
21	9.4	11.2	13.3	16.4	12.6	9.2	88	38	11.7	13.6	15.0	11.5
22	9.4	9.6	29	23	10.9	9.2	26	102	11.7	12.6	12.0	9.2
23	9.6	8.4	18.5	37	10.1	9.0	18.0	43	31	11.2	18.3	9.2
24	9.2	9.2	12.0	59	10.1	9.0	15.3	23	30	19.2	22	9.2
25	9.6	8.6	11.2	18.4	37	9.0	14.4	17.2	26	33	22	10.1
26	20	7.6	10.6	12.9	28	8.8	32	14.4	119	18.8	39	9.6
27	11.0	7.6	9.8	12.9	138	8.5	11.2	29	83	31	40	9.8
28	20	7.2	11.5	11.5	67	8.5	64	26	21	26	20	10.1
29	9.9	8.4	10.1	11.8	23	8.5	34	-------	16.0	33	16.0	12.3
30	9.0	8.2	11.5	10.1	15.0	8.5	22	-------	112	29	26.0	21
31	9.0	21	-------	11.5	-------	8.5	19.3	-------	93	-------	18.8	-------

Monthly discharge of Waioli Stream near Hanalei, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	27	7.8	11.1	17.2	345	1,060
August	32	7.2	12.4	19.2	385	1,180
September	242	9.8	28.3	43.8	849	2,610
October	59	7.9	16.9	26.1	524	1,610
November	138	10.1	29.6	45.8	887	2,730
December	16.6	8.5	10.3	15.9	318	980
January	287	8.5	55.4	85.7	1,720	5,270
February	102	11.5	21.4	33.1	599	1,840
March	119	11.7	31.2	48.3	967	2,970
April	50	10.6	22.2	34.3	666	2,040
May	40	9.6	15.7	24.3	486	1,490
June	21	9.2	11.4	17.6	340	1,050
The year	287	7.2	22.2	34.3	8,090	24,800

LUMAHAI RIVER NEAR HANALEI, KAUAI

LOCATION.—6 miles above mouth and 10 miles by road and trail from Hanalei.

RECORDS AVAILABLE.—May 23, 1914, to October 11, 1917, and July 1, 1920, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 350 feet above and 150 feet below station. Bed composed of large boulders and cobblestones. Right bank high and vertical; left bank low, wooded, and sloping. Control composed of large boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum discharge during year, estimated 5,000 million gallons per day or 7,740 second-feet, at 4.30 p. m. September 11 (gage height, 9.41 feet); minimum discharge recorded, 23 million gallons per day or 36 second-feet, at noon July 4 (gage height, 0.63 foot).

1914–1917; 1920–1923: Maximum discharge recorded on September 11, 1922; minimum discharge recorded, 23 million gallons per day or 36 second-feet, at 7 p. m. June 29, 1922 (gage height, 0.64 foot), and at noon July 4, 1922 (gage height, 0.63 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of high-level diversions in cooperation with Territorial Hanalei River project.

UTILIZATION.—Small part of flow used for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation not permanent. Standard rating curve used July 1 to September 11 well defined between 30 and 100 million gallons per day; standard curve used September 12 to June 30 well defined between 20 and 200 million gallons per day. Indirect method for shifting control used July 1 to September 11 and March 31 to June 30. Operation of water-stage recorder satisfactory except as noted in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for periods for which shifting-control method was used. Records fair.

Discharge measurements of Lumahai River near Hanalei, Kauai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 10	Karl Jetter	0.84	49.5	32	Jan. 21	M. H. Carson	2.12	221	143
Sept. 29	do	1.22	54	35	Mar. 8	Karl Jetter	2.15	226	146
Nov. 19	do	1.80	140	90	Apr. 23	do	1.27	54	35
Dec. 5	do	1.32	64	41.5	June 9	do	1.16	47	30.5
13	do	1.12	44	28.5					

Discharge, in million gallons per day, of Lumahai River near Hanalei, Kauai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	24	25	162	58	39	52	24	55	39	107	53	53
2	24	26	60	71	35	52	40	47	41	62	50	48
3	24	24	126	103	48	45	63	43	38	44	42	38
4	24	36	66	55	62	53	50	40	36	49	37	35
5	33	25	58	41	47	41	34	39	37	43	35	37
6	25	24	50	37	46	37	28	38	40	36	36	35
7	24	24	80	36	215	37	27	38	122	36	33	33
8	24	85	48	43	290	34	30	38	201	33	32	32
9	30	59	64	48	71	33	61	53	155	31	31	32
10	34	46	43	37	49	31	540	43	79	30	30	32
11	26	74	1,100	33	136	30	}	38	158	37	30	32
12	26	33	361	31	57	29		40	76	37	29	32
13	27	40	76	30	55	28		37	52	35	29	31
14	49	30	60	97	45	28		35	46	60	29	32
15	28	30	54	50	69	28		35	41	53	29	33
16	25	30	86	38	84	27	} 410	35	39	36	29	41
17	25	31	58	37	95	27		35	39	68	28	36
18	26	27	80	59	170	26		34	37	80	34	37
19	25	31	70	55	102	26		34	36	94	32	37
20	25	37	47	73	66	26		37	35	71	29	40
21	26	28	42	50	51	26	}	49	35	50	36	38
22	25	26	62	94	43	26	76	323	34	40	31	32
23	26	25	50	110	39	25	62	105	73	35	58	31
24	25	25	39	214	38	25	52	62	100	47	69	30
25	25	25	35	64	76	24	48	51	73	90	80	31
26	43	26	33	47	76	24	116	43	181	47	104	30
27	28	26	32	43	609	24	464	45	333	60	146	30
28	86	24	38	38	271	24	198	40	68	69	57	31
29	30	24	35	38	84	24	111	-------	51	64	47	34
30	26	24	37	34	54	24	66	-------	327	70	90	53
31	25	61	-------	36	-------	24	66	-------	407	-------	67	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated because of lack of gage-height record by comparison with flow of Hanalei River and Waioli Stream. Gage-height record partly estimated Nov. 7 and 17–19.

Monthly discharge of Lumahai River near Hanalei, Kauai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	86	24	29.5	45.6	913	2,810
August	85	24	33.9	52.5	1,050	3,230
September	1,100	32	105	162	3,150	9,670
October	214	30	58.1	89.9	1,800	5,530
November	609	35	104	161	3,120	9,570
December	53	24	31.0	48.0	960	2,950
January	----------	24	215	333	6,670	20,500
February	323	34	54.0	83.6	1,510	4,640
March	407	34	97.7	151	3,030	9,290
April	107	30	53.8	83.2	1,610	4,950
May	146	28	47.2	73.0	1,460	4,490
June	53	30	35.4	54.8	1,060	3,260
The year	----------	24	72.2	112	26,300	80,900

MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the island of Kauai at points other than regular gaging stations are listed below:

Miscellaneous measurements on Kauai during the year ending June 30, 1923

Date	Stream	Tributary to—	Locality	Gage height	Discharge	Million gallons per day
				Feet	*Sec.-ft.*	
Oct. 7	Irrigation ditch	Cane field No. 21	At 3-foot rectangular weir on Kilauea plantation, Kilauea.	0.60	4.4	2.8
7	do	do	do	.95	8.7	5.6
Nov. 16	do	do	do	.44	3.3	2.2
16	do	Cane field No. 27	At 2-foot rectangular weir on Kilauea plantation, Kilauea.	.28	1.0	.65
16	do	do	do	.45	2.0	1.3
16	do	do	do	.63	3.3	2.2
16	do	Cane field No. 1	At 3-foot rectangular weir on Kilauea plantation, Kilauea.	.50	3.7	2.4
16	do	do	do	.34	2.2	1.4
16	do	do	At 4-foot rectangular weir on Kilauea plantation, Kilauea.	.45	3.9	2.5
16	do	do	do	.25	1.65	1.1
Apr. 26	do	do	do	.29	2.3	1.45
Nov. 16	do	Cane field No. 3	At 2-foot rectangular weir on Kilauea plantation, Kilauea.	.64	3.7	2.4
16	do	do	do	.49	2.8	1.8
16	do	do	do	.22	.6	.4

ISLAND OF OAHU

KALIHI STREAM NEAR HONOLULU, OAHU

LOCATION.—At Kioi Pool, three-eighths of a mile above Catholic orphanage, 3 miles up Kalihi Road from King Street car line, and 5 miles north of Honolulu post office.

RECORDS AVAILABLE.—September 6, 1913, to June 30, 1923.

GAGE.—Gurley seven-day water-stage recorder used June 25, 1918, to March 17, 1923, and June 3–30, 1923. Au continuous water-stage recorder used March 18 to June 2, 1923. Friez recorder used September 8 to November 22, 1918, and Gurley printing recorder December 4, 1913, to June 25, 1918.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Water drops over a 10-foot fall into pool at gage. Channel is solid rock with steep, high banks; two channels above gage height of 6.0 feet. High-water control, solid rock; low-water control, concrete dam completed January 11, 1919; shifts owing to deposition of gravel in pool above.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 1,200 million gallons per day or 1,860 second-feet, at 4 p. m. January 19 (gage height, 13.9 feet); minimum discharge recorded, 0.85 million gallons per day or 1.3 second-feet, at 6 p. m. July 24 (gage height, 2.86 feet).

1913–1923: Maximum discharge estimated 1,250 million gallons per day or 1,930 second-feet, January 16, 1921 (gage height, 14.0 feet, determined from floodmarks); minimum discharge recorded, 0.5 million gallons per day or 0.8 second-foot, several times between February 27 and March 5, 1920 (gage height, 2.80 feet).

DIVERSIONS.—Catholic orphanage diverts water for domestic use into 4-inch pipe (which is reduced by several stages to 1-inch outlet) at a dam about 300 feet above station. Dam was installed May, 1920. Prior to this there were no diversions above station.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of using stream to augment water supply of city of Honolulu. Part of water rises on Territorial lands.

UTILIZATION.—Part of water diverted 400 feet below station for power development; remaining low-water flow is diverted further downstream for irrigation of taro.

ACCURACY.—Stage-discharge relation changed several times during January, February, and April owing to backwater from deposition of gravel in pool above artificial control. Standard rating curve well defined below 150 million gallons per day; extended above that quantity. Operation of water-stage recorder satisfactory except for one short period. During periods of no backwater daily discharge was ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. For periods during which backwater occurred, as noted in footnote to daily-discharge table, discharge was ascertained by applying to gage-height graph, before entering rating table, a correction derived from the plotting of individual discharge measurements with reference to the standard rating curve or from the observed fall in water surface caused by cleaning gravel from pool. Records good below 150 million gallons per day except those for periods of backwater effect, which are fair; high-water records uncertain.

Discharge measurements of Kalihi Stream near Honolulu, Oahu, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 19	John McCombs	3.03	3.3	2.2	Feb. 13	M. H. Carson	* 3.20	5.3	3.5
Dec. 2	M. H. Carson	3.09	3.9	2.5	13	do	3.10	5.3	3.4
27	E. D. Burchard	2.97	2.7	1.75	Mar. 31	do	5.84	128	83
Feb. 3	John McCombs	* 3.47	10.5	6.8	Apr. 7	Karl Jetter	* 3.38	7.3	4.7
10	M. H. Carson	* 3.48	6.1	3.9	28	M. H. Carson	* 3.36	6.8	4.4

* Stage-discharge relation affected by backwater from gravel deposited in pool just above control.

Discharge, in million gallons per day, of Kalihi Stream near Honolulu, Oahu, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.4	1.1	1.8	2.3	3.2	3.8	1.6	8.6	7.4	71	4.3	1.7
2	1.2	1.1	1.9	2.6	2.7	2.9	2.6	5.6	7.8	17.0	4.2	1.6
3	1.2	1.6	1.8	3.6	2.5	2.9	1.9	4.4	6.9	9.1	4.0	1.5
4	1.1	1.5	1.7	17.4	2.7	3.2	1.6	4.2	5.8	6.7	3.6	1.4
5	1.3	1.1	2.2	5.2	14.7	53	1.5	4.0	5.4	6.3	3.5	1.9
6	1.0	1.0	2.0	4.7	8.3	11.0	1.5	3.9	5.5	5.0	3.5	1.5
7	1.0	1.0	2.2	5.4	10.0	4.8	1.4	3.6	5.0	5.0	3.5	1.4
8	1.2	1.3	1.8	3.0	13.1	3.9	1.4	3.8	6.0	4.4	3.4	1.3
9	1.3	11.6	2.0	2.7	10.3	3.3	1.3	3.8	5.0	4.2	3.6	1.3
10	1.3	3.4	3.0	2.5	5.5	3.4	8.0	3.5	5.0	4.3	3.0	1.2
11	1.2	2.2	74	2.4	3.5	3.1	35	3.3	8.0	20	3.0	1.2
12	1.1	2.8	52	2.3	3.6	3.0	30	3.1	4.8	10.2	2.8	1.2
13	1.1	2.4	12.3	2.2	4.3	2.9	43	2.9	4.2	5.2	2.7	1.2
14	3.1	1.9	8.2	2.2	2.9	2.7	167	2.9	3.8	4.6	2.6	1.4
15	1.4	1.7	8.0	9.0	3.5	2.6	21	2.8	3.5	8.1	2.6	1.3

Discharge, in million gallons per day, of Kalihi Stream near Honolulu, Oahu, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
16	1.3	1.6		3.0	11.5	2.3	11.5	2.7	3.3	5.4	2.6	1.5
17	1.1	1.6		2.6	3.8	2.3	15.1	2.5	3.1	6.3	2.4	1.3
18	1.0	1.5		2.3	3.5	2.2	29	2.4	3.3	23	2.3	1.0
19	1.1	1.8		2.2	3.3	2.1	297	2.3	3.4	14.4	2.2	1.0
20	1.0	1.9	6.0	2.1	2.9	2.2	142	38	3.4	62	2.1	1.0
21	1.0	1.4		2.1	2.8	2.0	33	50	3.3	12.1	2.2	1.0
22	1.0	1.3		34	2.7	1.9	35	37	3.3	8.6	2.1	1.0
23	.9	1.2		74	2.6	1.9	19.6	126	3.4	7.9	2.0	1.1
24	.9	1.2	3.1	6.3	2.6	1.8	13.5	14.6	3.1	14.1	2.0	1.2
25	1.0	1.4	3.0	3.9	9.5	1.7	10.9	30	2.9	14.6	2.2	1.1
26	1.0	1.2	2.7	3.1	10.5	1.7	9.9	14.6	8.7	7.8	2.3	1.1
27	1.0	1.2	3.9	2.8	7.7	1.7	11.1	11.3	9.6	6.2	2.2	1.1
28	3.8	1.1	2.7	2.8	11.5	1.7	6.9	8.6	3.9	5.2	1.8	1.2
29	1.6	1.0	2.6	2.7	4.0	1.6	6.7	-------	3.3	5.0	2.4	1.5
30	1.1	1.1	2.4	2.6	3.3	1.7	6.3	-------	2.9	4.6	1.8	1.3
31	1.8	7.0	-------	3.5	-------	1.6	19.9	-------	66	-------	1.8	-------

NOTE.—Braced figure shows mean discharge for period indicated, estimated, because of lack of gage-height record, by comparison with flow of Nuuanu Stream. Stage-discharge relation affected by backwater from gravel deposited above control Jan. 20 to Feb. 13, Apr. 2–7 and 21–28; see under "Accuracy" in station description.

Monthly discharge of Kalihi Stream near Honolulu, Oahu, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	3.8	0.9	1.31	2.03	40.5	125
August	11.6	1.0	2.04	3.16	63.2	194
September	74	1.7	8.11	12.5	243	747
October	74	2.1	7.02	10.9	218	668
November	14.7	2.5	5.77	8.93	173	531
December	53	1.6	4.42	6.84	137	420
January	297	1.3	31.8	49.2	986	3,030
February	126	2.3	14.3	22.1	400	1,230
March	66	2.9	6.81	10.5	211	648
April	71	4.2	12.6	19.5	378	1,160
May	4.3	1.8	2.73	4.22	84.7	260
June	1.9	1.0	1.28	1.98	38.5	118
The year	297	.9	8.15	12.6	2,970	9,130

NUUANU STREAM BELOW RESERVOIR NO. 2 WASTEWAY, NEAR HONOLULU, OAHU

LOCATION.—On Pali road in upper Nuuanu Valley, 1 mile above end of car line and 5 miles from Honolulu post office.

RECORDS AVAILABLE.—October 21, 1913, to January 16, 1921, and September 12, 1921, to June 30, 1923. Station rebuilt September, 1921, after destruction by flood of January 16, 1921.

GAGE.—Gurley weekly water-stage recorder; installed September 12, 1921. Friez weekly water-stage recorder August 7, 1920, to January 16, 1921. Gurley weekly water-stage recorder April 12, 1918, to August 7, 1920, at same location as old inclined staff. Datum practically unchanged.

DISCHARGE MEASUREMENTS.—Low-water discharge measured by 2-foot sharp-crested weir with end contractions; flood discharge measured by 12-foot sharp-crested weir with end contractions, which, with flow over small weir, gives total flood discharge. Both weirs set in concrete. Crest of small weir is 1 foot lower than that of large weir. The weirs were reconstructed April 10–27, 1914, and September 12, 1921, but original dimensions were maintained.

CHANNEL AND CONTROL.—Channel originally in solid rock; has filled in considerably with gravel and silt; straight for about 75 feet above and below weir. Banks high and covered with vegetation.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 1,050 million gallons per day or 1,620 second-feet, at 2 p. m. January 19 (gage height, 6.95 feet); minimum discharge recorded, 0.07 million gallons per day, or 0.11 second-foot, at 6 a. m. July 7 (gage height, 0.10 foot).

1913–1923: Maximum discharge recorded, 1,600 million gallons per day, or 2,480 second-feet, January 16, 1921 (gage height, by leveling to flood-marks, 8.74 feet); minimum discharge recorded July 7, 1922.

DIVERSIONS.—Most of low and medium stage flow is diverted above station for domestic supply and for development of power.

REGULATION.—Amount diverted above station varies.

OBJECT OF STATION.—To determine amount of water in the stream at this point in connection with investigations of water supply for city of Honolulu. Territorial land and water.

UTILIZATION.—Station measures waste water and seepage from reservoirs Nos. 2, 3, and 4 and the Luakaha weir. This waste water is used for irrigation of rice and taro.

ACCURACY.—Stage-discharge relation permanent. Weir rating curve well defined; overflow rating, above 200 million gallons per day, uncertain. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records excellent below 200 million gallons per day; uncertain above that quantity.

Discharge measurements of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Nov. 19	E. D. Burchard	1.06	6.5	4.2	Feb. 24	M. H. Carson	1.60	31.5	20.4
Dec. 2	M. H. Carson	.92	5.3	3.5	Mar. 8	Francis Kanahele	1.47	23.4	15.1
Jan. 20	E. D. Burchard	[a] 3.40	253	164	31	M. H. Carson	[b] 2.69	124	80
Feb. 13	M. H. Carson	1.44	24.3	15.7	Apr. 21	do	1.36	16.6	10.7

[a] Stage rose 0.64 foot during measurement.
[b] Stage fell 0.26 foot during measurement.

Discharge, in million gallons per day, of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.15	0.2	0.85	1.6	2.2	4.2	2.8	17.6	16.8	50	8.1	3.2
2	.15	.15	.55	2.0	2.0	3.7	5.3	18.0	17.2	20	7.9	3.2
3	.15	.15	.5	1.8	1.6	3.6	4.2	17.6	16.0	15.2	7.6	3.0
4	.15	.15	.45	5.7	1.7	3.7	3.0	15.6	15.2	13.7	7.4	2.9
5	.15	.1	.55	2.6	8.3	27	3.2	15.6	14.5	13.3	7.1	3.0
6	.15	.1	.5	2.4	4.8	10.8	3.1	15.2	14.1	13.0	6.9	2.8
7	.09	.1	.65	2.2	3.5	6.1	2.8	14.9	13.3	12.2	6.9	2.2
8	.1	.15	.45	2.0	7.7	5.5	2.7	14.9	14.9	10.5	6.7	2.0
9	.15	.6	.55	2.0	6.1	5.3	2.6	14.1	13.3	10.2	6.5	1.8
10	.1	.35	.55	1.8	3.8	5.1	3.0	13.7	12.6	9.1	6.1	1.8
11	.1	.25	42	1.8	3.3	4.5	14.4	13.7	13.0	9.3	5.9	1.3
12	.1	.25	21	1.7	3.4	4.5	29	13.3	12.2	8.6	4.9	1.5
13	.1	.3	4.1	1.6	3.7	4.5	20	13.0	11.9	7.9	5.3	1.7
14	.1	.2	2.5	1.6	3.0	4.1	130	12.2	11.9	7.6	5.5	2.4
15	.15	.2	3.3	2.0	3.1	4.1	19.2	11.9	11.3	6.9	5.5	1.5
16	.15	.15	2.8	1.8	5.9	4.5	12.6	11.6	10.8	7.1	5.3	1.4
17	.1	.15	2.8	1.8	3.7	4.0	14.4	11.6	11.0	8.1	5.1	1.2
18	.1	.15	3.1	1.5	3.7	4.0	24	11.3	10.8	14.8	5.1	1.0
19	.1	.15	2.7	1.5	3.3	4.0	222	10.8	10.5	15.6	4.6	1.1
20	.09	.1	2.4	1.5	3.3	3.7	94	29	10.2	51	4.3	1.1
21	.09	.1	2.2	1.5	2.9	3.4	45	34	10.2	11.6	4.2	1.0
22	.09	.2	2.3	1.7	2.9	3.4	70	21	9.9	10.5	3.7	1.0
23	.09	.15	2.0	68	2.4	3.3	40	114	9.9	15.1	3.4	.8
24	.09	.15	1.9	5.6	2.1	3.2	28	19.6	9.9	13.9	3.4	.7
25	.1	.15	1.8	3.0	3.4	3.2	24	40	9.6	12.8	3.6	.8
26	.1	.15	1.7	2.8	3.9	3.0	23	22	10.8	9.9	3.6	.65
27	.15	.1	1.8	2.8	4.5	3.2	23	19.2	11.3	9.9	3.7	.65
28	.55	.09	1.7	2.4	5.9	3.1	18.8	17.6	9.3	9.1	3.3	.65
29	.25	.09	1.6	2.4	3.5	3.0	17.6	-------	9.1	8.6	3.5	.7
30	.2	.09	1.5	2.2	3.4	3.1	16.8	-------	8.8	8.3	3.6	.65
31	.25	9.0	-------	2.3	-------	2.8	24	-------	56	-------	3.6	-------

Monthly discharge of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	0.55	0.09	0.142	0.220	4.39	14
August	9.0	.09	.459	.710	14.2	44
September	42	.45	3.69	5.71	111	340
October	68	1.5	4.37	6.76	136	416
November	8.3	1.6	3.77	5.83	113	347
December	27	2.8	4.89	7.57	152	465
January	222	2.6	30.4	47.0	942	2,890
February	114	10.8	20.8	32.2	583	1,790
March	56	8.8	13.4	20.7	416	1,270
April	51	6.9	13.8	21.4	414	1,270
May	8.1	3.3	5.24	8.11	162	499
June	3.2	.65	1.59	2.46	47.7	146
The year	222	.09	8.48	13.1	3,100	9,490

MAOLE DITCH, MAKAI STATION, NEAR HONOLULU, OAHU

LOCATION.—In Nuuanu Valley, 150 feet from Pali road, opposite reservoir No. 4 into which ditch empties, and 6½ miles from Honolulu post office.

RECORDS AVAILABLE.—October 5, 1917, to January 16, 1921, and September 12, 1921, to March 2, 1923, when station was discontinued.

GAGE.—Gurley weekly water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Ditch is earth cut with bottom lining of concrete. At the gage a section 50 feet long, 5½ feet wide and 3 feet deep is constructed of concrete, with concrete control at lower end.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during period, 94 million gallons per day or 145 second-feet, at 10 p. m. September 11 (gage height, 3.24 feet); minimum discharge recorded, ditch frequently dry.

1919–1923: Maximum discharge recorded, 168 million gallons per day or 260 second-feet, at 3.30 a. m. January 16, 1921 (gage height, 4.17 feet); minimum discharge recorded, ditch frequently dry.

DIVERSIONS.—Ditch diverts water from Maole Stream and a few intermittent streams into Nuuanu reservoir No. 4.

REGULATION.—By head gates.

OBJECT OF STATION.—To determine amount of water diverted from Maole Stream in Hillebrand Glen to reservoir No. 4 of city.

UTILIZATION.—City water supply and development of power.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 10 million gallons per day. Operation of water-stage recorder satisfactory except for one week in January. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except for high stages.

No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Maole ditch, makai station, near Honolulu, Oahu, for the period July 1, 1922, to March 2, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1			0.04	0.01	0.02	0.06			
2			.05	.05		.01	0.2		0.26
3		0.07	.02	.2			.02		
4		.01		.85		.03			
5			.3	.4	.55	4.6			
6			.06	.15	.07	.25			
7			.06	.08	.06	.04			
8		.02		.02	.35	.01			
9		4.5	.02	.01	.06				
10		.15	.6		.03	.01			
11		.02	20.0		.03				
12		.15	4.4		.01				
13		.05	.35		.04				
14			.15						
15			.15	.4	.02				
16			.1	.04	4.2				
17			.25	.05	.04				
18			.4						
19			.1						
20			.07					0.02	
21			.08				.01	.06	
22			.09	.2			.02	.3	
23			.02	5.4			.01	.55	
24			.01	.04				.02	
25		.01	.01	.01	.35			.5	
26					.3			.08	
27			.15		.3			.02	
28	0.45		.01		.45			.01	
29			.01		.02				
30									
31	.02	1.5		.04			.01		

NOTE.—No flow on days for which no discharge is given except January 14–20, during which period no record was obtained and discharge was not determined.

Monthly discharge of Maole ditch, makai station, near Honolulu, Oahu, for the period July 1, 1922, to March 2, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	0.45	0.00	0.015	0.023	0.47	1
August	4.5	.00	.209	.323	6.48	20
September	20.0	.00	.917	1.42	27.5	84
October	5.4	.00	.256	.396	7.95	24
November	4.2	.00	.230	.356	6.90	21
December	4.6	.00	.162	.251	5.01	15
February	.55	.00	.056	.087	1.56	5

KAILUA STREAM ABOVE WONG LEONG'S DITCH, NEAR KAILUA, OAHU

LOCATION.—On left bank of stream a quarter of a mile east of junction of old Honolulu-Waimanalo road and road to Kailua, a quarter of a mile below confluence of two main tributaries, half a mile above old gaging station, and three-quarters of a mile south of Kailua.

RECORDS AVAILABLE.—April 1, 1922, to March 31, 1923, when station was discontinued. Fragmentary record for old station below Wong Leong's ditch, November 12, 1913, to June 30, 1916.

GAGE.—Gurley seven-day water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Bed of stream composed of gravel. Channel straight near gage. Banks wooded; subject to overflow during flood stages. Control formed by graval bar; shifts during high water.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during period of record, about 1,800 million gallons per day, or 2, 800 second-feet, at 8 a. m. October 23 (gage height, 8.63 feet); minimum discharge recorded, 1.8 million gallons per day, or 2. 8 second-feet, at 6 p. m. July 24 and during period when recorder clock was stopped August 6–9 (gage height, 0.54 foot).

Recorder clock stopped about midnight March 31, 1923, and the station was discontinued March 31, but the recorder was not removed until a few days later. During this time the pencil recorded a stage of 9.32 feet, which, by comparison with Nuuanu Stream, probably occurred about 8 p. m. April 1 (discharge, about 2,200 million gallons per day, or 3,400 second-feet).

DIVERSIONS.—Makawao flume diverts water from upper tributaries to the Waimanalo plantation. A small rice ditch diverts most of low-water flow of Pohakea Stream past gage on left bank. Wong Leong's ditch below station usually diverts all of low-water flow of main stream.

REGULATION.—By diversion only.

UTILIZATION.—Water used for irrigation of sugar cane and rice.

ACCURACY.—Stage-discharge relation not permanent. Four poorly defined rating curves used. Operation of water-stage recorder satisfactory. Records should be used with caution owing to lack of sufficient measurements to define changes in rating. High-stage extension of rating curves particularly uncertain.

Discharge measurements of Kailua Stream above Wong Leong's ditch, near Kailua, Oahu, during the period April 1, 1922, to August 25, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Apr. 17	M. H. Carson	0.71	5.5	3.6	Feb. 4	M. H. Carson	1.05	24.4	15.8
May 16	do	.67	4.8	3.1	Mar. 21	do	1.11	17.0	11.0
July 21	E. D. Burchard	.55	2.8	1.85	June 19	E. D. Burchard	.67	5.9	3.8
Aug. 18	do	.55	2.9	1.9	28	Karl Jetter	.63	5.4	3.5
Oct. 30	John McCombs	.82	5.7	3.7	Aug. 13	E. D. Burchard	.61	4.5	2.9
Dec. 12		.75	8.0	5.1	25	do	.59	3.5	2.2

Discharge, in million gallons per day, of Kailua Stream above Wong Leong's ditch, near Kailua, Oahu, for the period April 1, 1922, to March 31, 1923

Day	Apr.	May	June	Day	Apr.	May	June	Day	Apr.	May	June
1922				1922				1922			
1	3.8	3.7	2.6	11	3.5	5.9	2.8	21	4.7	3.1	3.4
2	4.2	3.7	2.6	12	3.5	4.0	3.0	22	4.2	2.8	3.2
3	3.8	3.5	3.5	13	3.4	3.4	3.1	23	4.2	2.8	2.7
4	3.8	3.8	3.5	14	3.5	3.3	3.0	24	4.1	3.7	2.5
5	4.2	4.0	3.2	15	3.5	3.2	2.7	25	4.0	3.0	2.6
6	4.1	3.7	2.5	16	3.4	3.1	2.8	26	4.0	3.4	2.6
7	4.7	3.5	2.5	17	3.5	3.2	2.8	27	4.0	3.1	2.7
8	4.4	3.7	2.5	18	24	2.8	3.0	28	4.0	3.0	2.8
9	4.0	3.7	2.6	19	7.5	2.8	2.5	29	4.0	3.1	2.8
10	3.7	3.7	2.8	20	5.0	3.1	2.7	30	4.5	2.8	2.8
								31		2.6	

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1922-23									
1	2.8	2.1	2.2	3.2	3.2	5.4	4.3	19.7	17.2
2	2.8	2.2	2.1	3.1	2.8	4.9	8.3	17.8	17.4
3	2.8	2.2	2.4	3.2	2.7	4.8	6.1	17.3	15.6
4	3.2	2.2	2.2	7.5	2.6	4.3	5.9	16.4	14.8
5	2.7	2.1	2.3	4.5	5.4	22	5.6	15.8	13.6
6	2.5	1.9	2.2	4.1	3.4	10.0	4.3	15.8	13.3
7	2.3	1.8	2.0	3.4	3.2	7.2	3.4	15.6	12.8
8	2.3	2.0	2.1	3.3	3.7	6.3	3.3	18.1	12.8
9	2.3	3.4	2.2	3.2	4.5	5.9	3.3	17.5	12.5
10	2.3	2.4	2.2	3.1	3.7	6.1	3.3	16.7	12.8
11	2.3	2.1	4.3	3.1	4.5	5.3	8.1	15.8	14.8
12	2.4	2.3	40	3.0	3.7	5.1	13.1	17.3	13.9
13	2.3	2.2	21	2.7	4.9	5.1	30	14.7	13.6
14	3.7	2.1	8.5	2.7	3.6	5.1	146	14.4	14.5
15	3.4	2.1	5.0	3.4	3.4	4.9	26	14.4	13.6
16	2.4	2.0	4.0	2.8	5.4	5.1	18.8	14.4	12.8
17	2.3	2.0	3.8	2.6	3.4	5.1	23	14.7	12.0
18	2.3	1.9	3.7	2.5	3.2	5.1	33	15.0	11.7
19	2.8	2.2	3.4	2.6	3.2	5.1	154	15.3	11.7
20	2.6	2.2	3.4	2.7	3.2	5.7	214	92	11.5
21	2.3	2.1	3.4	2.7	3.0	5.3		23	11.0
22	2.3	2.1	3.8	3.1	2.8	5.1		22	11.0
23	2.3	2.2	3.5	75	2.8	4.9		31	10.7
24	2.1	2.3	3.4	8.3	3.2	4.8	40	19.5	10.7
25	2.2	2.6	3.3	4.9	6.4	4.8		113	10.0
26	2.3	3.3	3.2	3.7	5.8	5.3		30	17.1
27	2.3	2.4	3.4	3.4	8.3	4.8		24	17.2
28	2.6	2.2	3.4	3.4	11.4	4.6	20	19.4	11.0
29	2.1	2.1	3.2	3.2	6.3	4.5	18.1	-------	9.6
30	2.1	2.1	3.1	2.7	5.6	4.3	17.3	-------	10.0
31	2.2	2.4	-------	3.6	-------	4.3	41	-------	215

NOTE.—Gage-height record estimated by comparison with Nuuanu Stream, June 18–20, 25–27, July, 19–21, Aug. 6–9, Aug. 30 to Sept. 1, and Mar. 2. Braced figure shows mean discharge for period indicated, estimated, because of lack of gage-height record, by comparison with flow of Nuuanu Stream.

Monthly discharge of Kailua Stream above Wong Leong's ditch, near Kailua, Oahu, for the period April 1, 1922, to March 31, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1922						
April	24	3.4	4.77	7.38	143	439
May	5.9	2.6	3.39	5.25	105	323
June	3.5		2.83	4.38	84.8	261
The period					333	1,020
1922–23						
July	3.7	2.1	2.49	3.85	77.3	237
August			2.23	3.45	69.2	212
September	40	2.0	5.09	7.88	153	469
October	75	2.5	5.83	9.02	181	555
November	11.4	2.6	4.31	6.67	129	397
December	22	4.3	5.85	9.05	181	557
January	214	3.3	35.2	54.5	1,090	3,350
February	113	14.4	24.3	37.6	681	2,090
March	215	9.6	19.6	30.3	606	1,860
The period					3,170	9,730

RIGHT BRANCH OF NORTH FORK OF KAUKONAHUA STREAM NEAR WAHIAWA, OAHU

LOCATION.—200 feet upstream from intake of Wahiawa Water Co.'s tunnel, which is at confluence of right and left branches, or two main branches, of North Fork of Kaukonahua Stream, 8 miles northeast of Wahiawa.

RECORDS AVAILABLE.—May 29, 1913, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 20 feet upstream from gage.

CHANNEL AND CONTROL.—Channel is a straight stretch 200 feet long that has been cleared of boulders. Banks steep and flow well distributed and confined. Natural control of large boulders has been improved somewhat for low-water stages.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 518 million gallons per day or 801 second-feet, at midnight September 10 (gage height, 6.29 feet); a higher discharge probably occurred in January when recorder did not operate. Minimum discharge, 0.7 million gallons per day or 1.1 second-feet, at 7 a. m. July 22 and 9 a. m. July 25 (gage height, 1.43 feet).

1913–1923: Maximum discharge from extension of rating curve, 985 million gallons per day or 1,520 second-feet (revised determination), at 3 a. m. March 26, 1920 (gage height, 9.0 feet, determined from floodmarks and comparison with record for Left Branch); minimum mean daily discharge, 0.2 million gallons per day or 0.3 second-foot, March 24 and 28, 1914.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water taken from Territorial lands by Wahiawa Water Co. Water rises on Territorial lands.

UTILIZATION.—Wahiawa Water Co.'s ditch diverts entire low-water flow of both Right and Left Branches of North Fork of Kaukonahua Stream for domestic water supply and irrigation near Wahiawa. All water, except low flow, from North Fork is impounded in Wahiawa reservoir for irrigation of sugar cane on Waialua plantation.

ACCURACY.—Stage-discharge relation changed by floods of April 1 and 20, and by cleaning débris from control June 8. Rating curve used July 1 to April 1 well defined between 1 and 200 million gallons per day; curve used April 2–20 well defined below 100 million gallons per day; curve used April 21 to June 8 well defined below 5 million gallons per day and fairly well defined between 5 and 200 million gallons per day; curve used June 9–30 well defined below 30 million gallons per day and fairly well defined between 30 and 200 million gallons per day. Operation of water-stage recorder satisfactory except during January. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good for ordinary stages.

Discharge measurements of Right Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 25	E. D. Burchard	1.48	1.35	0.9	Apr. 19	E. D. Burchard	3.37	94	61
Sept. 6	John McCombs	1.94	7.0	4.6	June 4	do	1.42	1.75	1.15
Oct. 25	M. H. Carson	1.70	3.2	2.1	5	do	1.48	2.6	1.65
Dec. 14	Francis Kanahele	1.72	3.4	2.2	5	do	1.84	6.3	4.0
Jan. 22	E. D. Burchard	2.82	52	34	5	do	1.72	4.2	2.7
Mar. 9	Francis Kanahele	1.88	6.5	4.2	8	do	1.39	1.55	1.0

Discharge, in million gallons per day, of Right Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.2	1.8	17.2	3.6	13.7	20		11.5	3.8	43	5.3	1.3
2	1.2	1.8	10.6	3.0	6.3	5.4		8.6	3.2	12.5	4.4	1.2
3	1.1	8.1	10.1	4.7	4.0	7.1		7.5	2.8	5.8	3.8	1.2
4	1.0	4.8	7.2	14.3	2.5	7.1		6.6	2.5	4.3	3.3	1.1
5	1.8	1.8	13.9	4.6	14.8	45		5.9	2.4	3.4	3.1	1.8
6	1.2	1.5	6.0	4.6	6.1	15.1	3.3	5.4	3.4	2.9	2.7	1.3
7	1.0	1.4	11.0	6.9	50	5.9		4.8	2.5	3.7	2.4	1.1
8	.9	2.1	4.2	3.4	96	4.6		4.8	6.9	2.6	2.2	1.2
9	1.0	22	8.0	3.0	17.0	4.0		4.6	4.6	2.1	4.2	1.2
10	1.4	5.1	30	2.7	11.0	4.0		4.2	2.2	1.9	2.1	1.2
11	1.0	4.3	119	2.4	6.8	3.2		3.6	11.6	9.0	1.8	1.2
12	1.4	6.2	33	2.2	5.0	2.8		3.4	2.8	13.9	1.6	1.5
13	1.0	5.8	35	2.1	5.1	2.7		3.0	2.1	2.5	1.5	1.4
14	5.6	2.7	11.2	2.0	3.7	2.5		2.8	1.7	1.4	1.4	23
15	1.7	2.3	19.0	8.2	4.0	2.4		2.6	1.4	7.9	1.3	5.4
16	5.1	2.0	9.3	4.7	6.5	2.4	55	2.4	1.2	4.0	3.4	2.9
17	2.0	1.8	6.6	3.3	3.2	2.2		2.2	1.0	21	1.5	4.6
18	1.3	1.6	6.6	2.3	3.1	2.1		2.1	1.0	43	6.8	2.5
19	1.0	5.1	5.6	4.1	6.9	2.0		1.9	1.0	38	2.0	1.9
20	.8	4.1	4.8	2.1	3.2	1.9		46	.9	63	1.3	1.7
21	.8	2.0	13.8	1.8	2.6	1.8		38	.8	15.9	4.5	2.0
22	.8	4.8	35	1.9	2.4	1.6		27	.8	12.6	4.1	1.6
23	1.4	1.9	6.4	18.7	2.4	1.5	14.2	71	.9	17.0	8.7	2.5
24	.9	1.7	5.0	4.1	2.2	1.4	10.9	10.8	2.3	9.4	2.4	2.0
25	11.4	1.6	4.8	2.4	9.9	1.4	8.6	27	2.0	9.5	2.6	4.6
26	6.3	2.7	3.8	2.1	22	1.4	16.4	8.4	8.0	6.2	2.0	2.5
27	6.7	5.2	3.6	2.1	10.8	1.5	36	5.9	4.6	21	2.8	2.0
28	28	1.6	3.5	2.1	31	1.8	21	4.6	1.4	8.1	1.5	7.1
29	3.0	1.5	3.0	5.6	4.5	1.3	17.1	-------	1.0	27	1.4	20
30	1.8	13.2	2.8	2.1	7.4	2.2	15.2	-------	1.8	7.2	2.7	5.1
31	9.9	61	-------	5.9	-------	1.4	27	-------	43	-------	1.6	-------

NOTE.—No gage-height record Dec. 31 to Jan. 22; discharge estimated by comparison with flow at station on Left Branch of this stream. Braced figures show mean discharge for periods indicated.

Monthly discharge of Right Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	28	0.8	3.35	5.18	104	319
August	61	1.4	5.92	9.16	184	563
September	119	2.8	15.0	23.2	450	1,380
October	18.7	1.8	4.29	6.64	133	408
November	96	2.2	12.1	18.7	364	1,110
December	45	1.3	5.15	7.97	160	490
January			27.7	42.9	859	2,640
February	71	1.9	11.7	18.1	327	1,010
March	43	.8	4.05	6.27	126	385
April	63	1.4	14.0	21.7	420	1,290
May	8.7	1.3	2.92	4.52	90.4	278
June	23	1.1	3.60	5.57	108	331
The year		.8	9.11	14.1	3,320	10,200

LEFT BRANCH OF NORTH FORK OF KAUKONAHUA STREAM NEAR WAHIAWA, OAHU

LOCATION.—100 feet above intake of Wahiawa Water Co's tunnel which is at confluence of right and left branches, or two main branches, of North Fork of Kaukonahua Stream 8 miles northeast of Wahiawa.

RECORDS AVAILABLE.—May 25, 1913, to June 30, 1923.

GAGE.—Au continuous water-stage recorder installed June 7, 1923. Prior to that date Stevens continuous recorder was used.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel straight for 100 feet above and below gage; fairly uniform in cross section with high, wooded banks; one channel at all stages. Stream bed composed of boulders and gravel. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum during year, from extension of rating curve, 4,080 million gallons per day or 6,310 second-feet, at 5 a. m. January 14 (gage height, 10.3 feet); minimum recorded, 1.0 million gallons per day, or 1.6 second-feet, at 9 a. m. January 1 (gage height, 1.16 feet).

1913–1923: Maximum recorded on January 14, 1923; minimum recorded, 0.1 million gallons per day or 0.16 second-foot, at 4 a. m. February 18 and 11.30 p. m. March 5, 1920.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted from Territorial land by Wahiawa Water Co. Water all rises on Territorial lands.

UTILIZATION.—Wahiawa Water Co.'s tunnel diverts entire low-water flow of both Right and Left Branches of North Fork, for domestic water supply and irrigation near Wahiawa. All water, except low flow, from North Fork of Kaukonahua Stream is impounded in Wahiawa reservoir for irrigation of sugar cane on Waialua plantation.

ACCURACY.—Stage-discharge relation changed during flood of January 13–14. Rating curve used July 1 to January 13, well defined below 75 million gallons per day; fairly well defined above 75 million gallons per day on basis of logarithmic extension and one slope determination at a stage of 8.82 feet. Curve used January 14 to June 30, well defined below 100 million gallons per day; extended above that quantity on basis of form of previous curve.

Operation of water-stage recorder satisfactory from June to January; after January intake of well became plugged and record below about 1.8 feet was practically useless. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day; most of gage-height record estimated for period May 6 to June 7. Records good prior to February 1; thereafter they are subject to uncertainties.

Discharge measurements of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 25	E. D. Burchard	1.25	2.1	1.4	Apr. 19	E. D. Burchard	1.98	22.7	14.7
Sept. 6	John McCombs	1.71	12.6	8.1	June 4	do	1.44	2.6	1.65
Oct. 25	M. H. Carson	1.38	5.5	3.6	5	do	1.54	4.7	3.0
Dec. 14	Francis Kanahele	1.34	4.0	2.6	5	do	1.78	11.7	7.6
Jan. 22	E. D. Burchard	2.45	49.5	32	5	do	1.65	7.8	5.0
22	do	3.16	124	80	8	do	1.37	2.2	1.45
Mar. 9	M. H. Carson	1.79	10.7	6.9					

Discharge, in million gallons per day, of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.4	3.0	16.4	5.2	10.3	16.4	1.2	14.6	8.0	48	6.9	2.3
2	2.3	3.7	17.2	5.4	4.0	5.8	5.0	12.0		126		2.2
3	2.2	28	13.9	8.1	3.7	8.1	7.5	10.7	6.5	5.4	6.2	2.2
4	2.2	8.9	16.3	20	2.4	6.4	2.5			4.9		2.0
5	7.2	4.2	37	8.4	25	54	1.7			4.5		3.7
6	2.8	3.6	11.7	6.4	10.7	21	8.8		11.3	4.7	5.6	2.9
7	2.2	2.8	17.0	7.4	40	6.4	5.5		7.1	4.7	5.3	1.7
8	2.1	14.0	7.6	5.1	107	5.2	6.4		11.7		4.9	1.4
9	3.2	38	9.8	4.9	26	4.7	10.7		9.1	3.6	8.0	1.3
10	4.7	11.0	48	4.2	11.3	4.2	2.7		6.5		4.4	1.2
11	4.0	9.1	131	3.7	7.4	3.7	66	5.5	22	16.6	3.7	1.1
12	4.7	11.3	33	8.4	5.4	3.4	98		7.8	33	3.3	1.7
13	2.3	6.0	47	3.3	6.8	3.2	82			5.6	2.9	21
14	7.6	5.4	14.6	3.2	4.6	2.9	303			4.0	2.6	17.5
15	3.4	5.1	39	10.1	4.6	2.9	24			14.8	2.5	6.7
16	8.3	4.0	14.6	91	9.8	2.7	13.3			12.1	7.6	3.4
17	2.9	3.7	9.6	5.1	4.6	2.4	29			24	2.9	8.0
18	3.0	3.7	10.1	3.3	4.6	2.4	33			46	8.0	3.3
19	2.7	11.8	8.1	11.5	9.2	2.3	269		2.4	55	3.7	2.4
20	2.3	7.4	7.6	3.3	4.4	2.2	73	69		50	2.2	2.0
21	1.7	4.7	22	2.8	3.6	2.1	32	42		21	8.3	3.4
22	1.6	5.8	54	8.8	3.2	1.8	43	29		10.7	8.0	1.7
23	1.8	3.7	9.8	20	2.9	1.7	17.7	66		11.6	13.9	2.7
24	1.8	4.9	7.6	6.0	2.7	1.5	13.9	13.6		8.3	5.3	1.9
25	8.5	3.9	7.4	3.4	17.9	1.4	12.3	41		9.1	6.9	5.4
26	7.5	10.4	6.4	3.0	23	1.5	13.9	12.6	14.7	7.1	5.1	3.7
27	6.1	8.3	6.2	2.8	13.9	2.1	32	9.9	7.8	24	7.6	2.6
28	33	3.6	7.2	2.5	26	2.0	18.0	8.8	4.7	10.2	3.0	14.5
29	5.1	4.7	5.4	3.9	10.5	1.3	19.0	-------	4.5	24	2.6	14.4
30	3.2	14.7	4.9	2.4	9.6	2.2	16.3	-------	5.4	8.8	12.0	12.8
31	11.1	105	-------	2.7	-------	1.4	34	-------	43	-------	3.0	-------

NOTE.—Low-water gage-height record useless Feb. 4 to June 7. Discharge estimated by comparison with flow of Right Branch Feb. 4–14, Mar. 2–5, 10, 13–25, Apr. 8–10, 14, and May 2–5. Daily discharge May 6 to June 7 ascertained from gage-height record estimated by comparison with graph for Right Branch station. Braced figures show mean discharge for periods indicated.

Monthly discharge of Left Branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	33	1.6	4.96	7.67	154	472
August	105	2.8	11.4	17.6	354	1,080
September	131	4.9	21.3	33.0	640	1,960
October	91	2.4	8.75	13.5	271	832
November	107	2.4	13.8	21.4	415	1,270
December	54	1.3	5.78	8.94	179	550
January	303	1.2	41.8	64.7	1,290	3,980
February	69	----------	14.9	23.1	417	1,280
March	43	----------	7.12	11.0	221	677
April	126	----------	20.1	31.1	604	1,850
May	13.9	2.2	5.65	8.74	175	538
June	21	1.1	5.04	7.80	151	464
The year	303	1.1	13.4	20.7	4,880	15,000

MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the island of Oahu at points other than regular gaging stations are listed below:

Miscellaneous measurements on Oahu during the year ending June 30, 1923

Date	Stream	Tributary to—	Locality	Gage height	Discharge	Million gallons per day
				Feet	*Sec.-ft.*	
Aug. 27	Palolo	Manoa Stream	Old dam in upper end of valley, near Honolulu.	-------	0.4	0.25
27	Palolo tunnel	Palolo hill water supply.	At 3-foot rectangular weir in upper end of valley, near Honolulu.	0.095	.3	.2
June 28	Makawao	Kailua Stream	40 feet below highway bridge near Kailua	[a]	1.85	1.2
28	Kaimi	Makawao Stream	300 feet above highway bridge, near Kailua.	-------	1.9	1.2
28	Kamakalepo	Kailua Stream	150 feet below gaging station operated from 1912 to 1915, 30 feet above ditch intake, near Kailua.	3.62	1.05	.7
28	Rice ditch	Diverts from Pohakea Stream.	100 feet from gaging station on Kailua Stream, near Kailua.	-------	.15	.08
Oct 30	Kawainui	Kailua Stream	Submerged weir at outlet of Kawainui swamp, near Kailua.	[b].90	3.2	2.1
Dec. 12	----do----	----do----	----do----	[b].875	10.9	8.0
Feb. 4	----do----	----do----	----do----	[b]2.38	46	30
June 19	----do----	----do----	----do----	[c]	[d]3.5	[d]2.3
28	South Branch of Kawainui.	Kawainui Stream	300 feet above road, 100 feet above confluence with North Branch, near Kailua.	-------	.25	.15
28	North Branch of Kawainui.	----do----	700 feet above road, 125 feet above ditch intake, near Kailua.	-------	.5	.35
Mar. 6	Honua (Waianae)	Pacific Ocean	At main diversion dam, elevation 430 feet, Waianae Valley.	-------	4.22	2.73
7	----do----	----do----	----do----	-------	2.99	1.93
27	----do----	----do----	----do----	-------	2.14	1.38
7	Kanewai	Honua (Waianae) Stream.	Below tunnels No. 4 and 5, Waianae Valley.	-------	.025	.015

[a] Water surface at bridge 1.2 feet below top of footing at downstream end of right abutment.
[b] Depth of water over crest of submerged weir.
[c] Water surface 1.2 feet below top of old weir forming control for measurements of Oct. 30, Dec. 12, and Feb. 4. Old weir altered prior to measurement of June 19 and new crest is level with top of old weir.
[d] Leakage through altered weir.

Miscellaneous measurements on Oahu during the year ending June 30, 1923—Contd.

Date	Stream	Tributary to—	Locality	Gage height	Discharge	Million gallons per day
				Feet	*Sec.-ft.*	
Mar. 7	Kanewai	Honua (Waianae) Stream.	Above flume intake, at elevation 1,320 feet, Waianae Valley.		2.24	1.51
27	do	do	do		3.23	2.09
7	Kalalua	do	At road crossing, elevation 830 feet, Waianae Valley.		.67	.43
7	West Branch of Kalalua.	Kalalua Stream	Above tunnel No. 15 at elevation 1,510 feet, Waianae Valley.		.34	.22
27	do	do	do		.41	.26
7	do	do	Below tunnel No. 15, at elevation 1,480 feet, and above pipe-line diversion dam, Waianae Valley.		.65	.42
27	do	do	do		.74	.48
7	East Branch of Kalalua.	do	At lower end of pipe-line tunnel, Waianae Valley.		.018	.012
7	Hiu	Honua (Waianae) Stream.	At road crossing, elevation 570 feet, Waianae Valley.		.10	.065
7	Kumaipo	do	do		.66	.43
27	do	do	do		1.25	.81
27	Power plant tailrace.	Cane fields	At power plant, opposite day engineer's house, Waianae Valley.		3.28	2.12
7	Tunnel No. 3 discharge.	Kanewai Stream	At outlet, Waianae Valley		.07	.045
7	Tunnel No. 6 discharge.	do	At trail crossing, elevation 1,600 feet, near Mountain House, Waianae Valley.		.76	.49
27	do	do	do		.94	.61
7	Spring No. 7 discharge.	do	do		.035	.025

ISLAND OF MOLOKAI

HALAWA STREAM NEAR HALAWA, MOLOKAI

LOCATION.—750 feet below confluence of two main branches and 2 miles above mouth of stream and Halawa schoolhouse.

RECORDS AVAILABLE.—June 25–30, 1923. For old station 500 feet upstream, August 28, 1917, to June 24, 1923.

GAGE.—Stevens continuous water-stage recorder at both old and new locations.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Recorder located at lower end of pool about 60 feet long at foot of steep rapids. One channel at all stages; banks not subject to overflow. Control formed of rocks and small boulders grouted in place; shifts slightly owing to encroachment of hono-hono grass. At old location stream was confined to one channel at all stages; straight for 150 feet above and 100 feet below gage. Control composed of large boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 1,550 million gallons per day or 2,400 second-feet, at 10 a. m. March 31 (gage height, 11.65 feet); minimum discharge not recorded.

1917–1923: Maximum discharge recorded on March 31, 1923; minimum discharge recorded, 0.8 million gallons per day or 1.2 second-feet, October 13–15 and 19, 1917 (gage height, 0.35 foot, on old gage).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of water-supply project for Halawa village and amount of water avilable for irrigation on leeward side of island.

UTILIZATION.—Water used for irrigation of taro and for domestic supply.

ACCURACY.—Old location: Stage-discharge relation not permanent. Standard rating curve well defined below 150 million gallons per day; used direct July 1 to January 14; indirect method for shifting control used January 15 to June 24. Operation of water-stage recorder not satisfactory. Daily discharge, July 1 to January 14 ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. For period January 15 to June 24, daily discharge ascertained in a similar manner except that the gage-height graph was corrected, before entering rating table, by an amount determined from the plotted position of individual discharge measurements with reference to the standard rating curve. Records good for ordinary stages July 1 to January 14; fair, January 15 to June 24.

New location: Stage-discharge relation permanent. Rating curve wel defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good.

Discharge measurements of Halawa Stream near Halawa, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 30	John McCombs	0.33	7.9	5.1	Jan. 31	E. D. Burchard	1.58	49	31.5
Sept. 16	Karl Jetter	.99	25	16.3	Mar. 18	Francis Kanahele	.24	6.1	4.0
Oct. 28	E. D. Burchard	.50	11.2	7.2	May 5	E. D. Burchard	.84	8.1	5.2
Dec. 16	Francis Kanahele	.25	7.1	4.6					

Discharge, in million gallons per day, of Halawa Stream near Halawa, Molokai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.8	5.3	8.5	4.5	7.8	82	22	24	7.2			
2	3.7		9.2	4.9	11.2	15.4	45	11.8	6.7	80	8.0	3.1
3	3.8		19.2	6.2	27	14.0	12.3	9.2	6.2			
4	3.6		9.2	35	8.5	10.9	7.2	7.8	6.2			
5	4.2	10	25	66	39	21	5.8	7.2	5.3		5.3	11
6	3.7		10.2	24	29	36	6.2	6.7	9.7		5.3	
7	3.5		23	30	18.5	12.9	6.7	6.2	6.7	40	4.9	
8	3.6		11.6	13.7	43	9.2	7.2	6.2	10.4		7.3	
9	3.6		16.5	8.5	34	7.8	6.2	24	10.0		8.6	
10	3.6	50	19.5	6.7	20	6.7	12.5	34	6.7		4.9	3.0
11	22		48	23	42	6.2	65	11.8	10.2		4.5	
12	14.0	32	86	13.1	19.0	6.2	128	88	7.2		4.2	
13	4.9	10.9	78	6.7	53	7.6	174	14.5	5.8	25	4.2	
14	4.2	7.8	20	5.8	16.4	6.2	400	7.8	5.8		4.2	
15	8.1	7.8	11.8	57	21	5.3	105	6.7	4.9		4.2	
16	14.5	7.2	12.9	29	70	4.9	40	8.4	4.5		4.2	6.5
17	5.3	6.2	10.9	16.5	15.2	4.9	79	6.2	4.5		3.8	
18	9.9	6.7	10.9	9.2	14.0	7.7	84	5.8	4.2	70	5.1	
19	21	22	8.5	32	12.9	7.5		12.0	4.2		4.2	
20	5.8	12.6	14.0	10.9	9.2	7.2	90	9.2	4.2		3.8	
21	4.5	8.5	20	10.0	11.8	5.3		27	9.1		3.8	3.5
22	4.2	8.5	22	26	7.8	4.5		9.2	4.9		3.8	
23	4.9	6.2	8.5	9.2	6.7	4.2		54	8.9		3.8	
24	4.5	5.8	6.7	18.2	6.7	4.2		11.0	10.9	40	3.7	
25	4.2	5.3	5.8	8.5	99	4.2		57	8.5		3.7	11
26	5.3	6.7	5.3	11.8	39	22	18	19.1	36		3.6	8.8
27	41	4.9	10.0	9.2	37	6.2		17.5	132		3.5	5.9
28	39	4.9	8.0	7.8	17.5	7.8		10.2	14.2		3.4	10.5
29	7	14.0	5.3	22	10.9	6.2		-------	7.8	9.5	3.3	9.8
30		10.7	4.9	7.8	8.5	5.3		-------	7.2			7.9
31	9.2	35	-------	7.2	-------	4.9	65	-------	250	-------	-------	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated by comparison with flow of Papalaua Stream, because of lack of gage-height record.

Monthly discharge of Halawa Stream near Halawa, Molokai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	41	3.5	8.95	13.8	278	851
August	----------	----------	15.8	24.4	489	1,500
September	86	4.9	18.3	28.3	549	1,680
October	66	4.5	17.4	26.9	540	1,660
November	99	6.7	26.6	41.2	797	2,450
December	82	4.2	11.4	17.6	354	1,080
January	400	5.8	59.6	92.2	1,850	5,670
February	88	5.8	18.3	28.3	512	1,570
March	250	4.2	20.0	30.9	619	1,900
April	----------	----------	44.8	69.2	1,340	4,120
May	----------	----------	4.84	7.49	150	460
June	----------	----------	5.96	9.22	179	549
The year	400	----------	21.0	32.5	7,660	23,500

PAPALAUA STREAM NEAR WAILAU, MOLOKAI

LOCATION.—A quarter of a mile above mouth, 2 miles east of Wailau landing, 5 miles by foot trail west of Halawa village, and 6½ miles due north of Pukoo village.

RECORDS AVAILABLE.—September 17, 1919, to June 30, 1923. Records for the years ending June 30, 1920 to 1922, are revised in this paper.

GAGE.—Stevens continuous water-stage recorder; installed May 22, 1920. Prior to this date Gurley printing water-stage recorder was used.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge near station.

CHANNEL AND CONTROL.—Bed rock and boulder-strewn. Banks high and rocky. Control composed of large boulders and gravel; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum and minimum stages for the years ending June 30, 1920 to 1923, as revised, follow:

Year	Maxima					Minima				
	Day	Hour	Stage	Discharge		Day	Hour	Stage	Discharge	
				Million gallons per day	Sec.-ft.				Million gallons per day	Sec.-ft.
		a. m.	*Feet*				*p. m.*	*Feet*		
1919–20	Oct. 6	1	5.84	620	959	Feb. 26–27	----------	1.02	1.0	1.6
1920–21	Dec. 24	10.30	8.58	1,140	1,760	June 25	----------	.68	1.3	2.0
1921–22	Nov. 21	1.45	6.50	720	1,110	Oct. 19	10	.86	1.9	2.9
1922–23	Mar. 31	10	8.34	1,080	1,670	June 11	11–12	.69	1.4	2.2

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water in stream available for irrigation on leeward side of island.

UTILIZATION.—Entire flow now wastes into sea.

ACCURACY.—1922–23: Stage-discharge relation not permanent. Standard rating curve well defined below 200 million gallons per day; was used direct July 1 to October 4, November 26 to March 31, and June 5–30; indirect method for shifting control used for intervening periods. Operation of water-stage recorder not satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day, except for periods for which shifting-control method was used. Records fair.

1919–1922: Stage-discharge relation changed October 5, 1919, and December 23, 1920. Three rating curves used, all well defined below 200 million gallons per day. Operation of water-stage recorder satisfactory except as indicated in footnote to tables of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage by averaging discharge for intervals of the day. Records good except those for exceptionally high stages and those estimated which are fair.

Discharge measurements of Papalaua Stream near Wailau, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 30	E. D. Burchard	1.04	4.4	2.9	Feb. 5	E. D. Burchard	0.94	3.8	2.5
Sept. 17	Karl Jetter	1.31	11.2	7.2	May 5	do	.97	4.9	3.2
Nov. 2	E. D. Burchard	1.46	13.8	8.9	June 26	M. H. Carson	1.06	5.7	3.7
Dec. 16	M. H. Carson	.90	3.4	2.2					

Discharge, in million gallons per day, of Papalaua Stream near Wailau, Molokai, for the years ending June 30, 1920–1923

Day	Sept.	Oct.	Nov.	Feb.	Mar.	Apr.	May	June
1919-20								
1		2.6	3.1			23	2.2	7.3
2		3.4	6.6			31	2.0	6.0
3		2.9	2.8			12.7	1.9	6.3
4		3.5	2.0			12.0	1.8	4.2
5		64				10.1	1.7	3.2
6		126				6.8	1.6	2.3
7		12.0				8.0		1.7
8		10.3				4.4		1.4
9		4.6				3.8		1.4
10		3.7				3.3	1.6	2.9
11		3.1				3.0		1.7
12		2.7				6.6		2.9
13		2.5				5.5		9.2
14		2.4				3.5		3.3
15		2.3				3.1		15.1
16		2.0				4.6		6.3
17		2.0				2.8		14.5
18	2.9	1.8				2.6	2.5	5.7
19	2.8	1.8				44		7.7
20	2.8	1.7				8.7		3.2
21	2.7	2.7				3.7		2.4
22	2.5	2.0			94	2.8		3.3
23	2.5	1.8			47	105	1.7	2.4
24	3.5	2.7			42	6.8	2.2	2.2
25	2.6	2.0			57	4.4	1.5	2.0
26	2.4	1.7		1.1	19.6	3.7	1.4	1.9
27	2.4	2.2			7.1	3.1	1.3	2.9
28	2.4	2.3			5.1	2.8	1.3	3.0
29	2.4	2.3			4.3	2.6	1.2	2.5
30	2.4	2.7			4.0	2.4	1.0	7.5
31		3.4			5.1		1.5	

Discharge, in million gallons per day, of Papalaua Stream near Wailau, Molokai, for the years ending June 30, 1920–1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920-21												
1	8.0	3.0	29	1.8	10.1	15.3	8.8	5.7	1.9	4.9	3.8	1.8
2	3.0	7.1	4.8	4.3	17.3	5.7	11.8	4.5	5.9	4.5	10.4	1.8
3	2.0	5.6	4.0	3.2	8.5	6.4	11.2	11.0	1.9	4.5	31	1.7
4	1.7	6.1	3.3	2.4	8.5	9.4	12.2	11.5	1.6	4.5	24	1.6
5	1.5	3.3	3.2	3.4	4.8	10.4	41	6.5	1.6	4.4	28	1.6
6	1.3	2.4	10.3	5.4	3.3	21	116	14.1	1.6	103	6.5	1.6
7	1.2	2.0	28	10.1	2.7	7.3	23	10.4	1.6	14.8	4.9	2.4
8	1.9	2.4	4.5	3.0	27	11.2	19.1	5.6	1.5	24	5.2	1.8
9	3.9	1.7	3.6	2.2	5.0	9.6	19.5	5.6	1.5	10.9	3.7	1.6
10	5.9	1.5	9.9	1.8	3.9	7.8	8.8	11.1	1.6	6.6	2.8	1.5
11	1.8	1.6	12.1	20	11.4	7.0	9.7	16.5	1.6	6.1	2.4	1.5
12	5.1	13.2	8.0	13.8	5.7	8.9	17.1	4.9	1.6	5.4	2.5	1.5
13	1.8	7.9	13.5	3.0	3.9	18.2	47	4.2	1.6	6.1	2.3	1.4
14	1.8	12.6	5.5	2.3	3.2	9.3	265	4.1	1.5	6.3	2.0	1.6
15	5.6	3.9	4.7	8.4	2.6	6.1	176	8.2	1.5	4.5	3.4	4.8
16	7.5	2.5	5.9	6.3	2.0	4.3	182	4.4	1.5	20	3.4	1.9
17	16.5	2.2	3.4	17.5	1.6	3.6	153	3.4	1.5	10.3	9.6	1.7
18	3.3	1.7	3.2	79	1.8	3.2	40	12.4	1.4	4.6	9.4	1.6
19	4.6	1.6	2.5	8.6	1.8	2.9	49	5.6	4.5	2.8	9.5	2.1
20	5.4	13.3	2.2	4.5	73	2.9	30	4.4	2.1	32	9.2	4.2
21	7.1	17.7	2.3	3.9	62	3.7	15.9	5.8	14.5	4.8	41	1.7
22	21	25	2.0	3.6	53	3.2	13.7	6.4	5.9	3.8	8.1	1.6
23	14.0	27	2.0	2.6	11.2	39	14.0	3.4	5.0	4.9	6.5	1.4
24	6.7	41	1.9	38	7.5	191	18.8	2.8	71	30	40	1.4
25	5.5	19.0	2.6	16.2	7.6	132	59	2.6	11.2	5.6	6.3	1.5
26	2.7	13.0	3.0	4.2	13.6	10.6	46	2.4	48	3.8	4.1	1.7
27	15.9	26	2.5	4.5	42	7.0	82	2.2	8.5	12.5	3.0	25
28	10.9	8.7	1.7	4.2	32	6.1	18.5	2.0	6.3	4.4	2.5	7.2
29	3.7	4.8	2.2	3.2	26	5.1	11.6	-------	4.1	10.3	2.3	14.2
30	5.4	6.5	2.7	3.6	46	4.8	8.5	-------	26	20	2.1	5.1
31	3.3	10.5	-------	8.0	-------	4.5	6.8	-------	7.7	-------	1.9	-------
1921-22												
1	3.1	12.9	4.2	103	3.8	14.0		105	9.2		4.2	3.1
2	11.8	10.4	3.0	99	33	9.0		31	6.3	3.0	3.6	2.8
3	17.2	6.8	2.5	15.2	25	21		20	17.1		4.1	4.8
4	14.8	6.1	2.5	11.6	7.9	13.9	25	9.2	47		10.5	3.1
5	4.9	21	9.6	6.6	4.6	7.4		7.4	40		10.8	2.5
6	36	7.4	3.6	7.9	3.6	6.6		11.2	40		6.3	2.4
7	5.7	29	4.0	72	3.0	4.8		10.7	28		3.8	2.4
8	30	7.2	13.3	7.9	2.6	4.8		8.0	35		3.5	2.5
9	5.4	5.1	35	5.2	4.5	4.2		56	31		2.9	2.5
10	4.5	4.4	8.5	4.5	4.5	3.2		14.9	27	11	21	2.3
11	7.8	17.1	15.8	3.6	2.6	2.9		15.0	38		45	2.3
12	3.7	16.3	6.3	3.0	19.2	178	7.0	12.7	15.0		11.8	2.3
13	2.8	5.9	4.4	2.6	7.2	192		7.4	10.2		8.3	3.5
14	2.2	4.2	16.1	2.5	3.5	32		5.9			4.9	13.0
15	5.5	3.4	15.0	2.4	2.7	11.1		5.1			3.8	6.4
16	8.0	2.8	11.7	2.4	2.3	7.0		5.1	6.5		3.4	2.6
17	21	4.5	12.2	4.8	2.3	159		4.4			4.8	2.2
18	34	4.2	7.7	2.5	2.2	107		3.7		25	4.7	2.2
19	27	32	5.2	2.1	192	16.1		3.1			4.6	2.1
20	15.9	5.9	7.6	5.8	74	8.3		2.9			18.3	8.9
21	6.6	13.6	10.8	7.7	246	6.6		60			7.3	19.4
22	19.2	15.2	15.0	6.5	72	75	20	19.0			3.8	4.3
23	18.3	4.6	10.6	12.1	17.4	56		9.8			3.2	12.5
24	6.3	6.1	6.5	31	10.9			23			41	3.7
25	8.7	5.4	6.3	8.3	20			11.4	3.0	7.5	39	2.3
26	8.5	19.8	5.2	6.3	26			8.7			35	2.2
27	14.1	9.7	31	5.2	19.5	40	36	9.3			13.8	2.1
28	28	4.8	23	22	10.6		118	99			9.4	2.1
29	48	4.1	9.2	15.0	6.6		46	-------			5.9	2.1
30	15.3	6.9	12.9	5.9	7.3		98	-------			4.5	2.1
31	6.8	11.0	-------	5.9	-------		45	-------			3.8	-------

Discharge, in million gallons per day, of Papalaua Stream near Wailau, Molokai, for the years ending June 30, 1920–1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1922–23												
1	2.1				5.5	61	15.8	10.6	4.5	178	4.8	2.0
2	2.1				9.4	7.6	32	4.5	3.8	49	4.2	1.9
3	2.1				15.3	7.4	8.9	3.6	3.4	13.7	6.6	1.7
4	2.1	7.0		20	5.9	5.6	4.2	2.8	4.5	15.0	3.7	12.1
5	2.1		10		25	20	2.9	2.4	3.1	6.8	3.1	14.1
6	2.1				11.9	22	5.1	2.2	10 1	5.2	2.8	2.8
7	2.1				11.4	6.8	6.4	2.0	5.5	157	4.4	1.8
8	1.9				34	4.9	6.3	1.9	14.0	17.6	6.3	1.7
9	1.9				18.5	3.8	4.8	39	11.4	7.7	16.7	1.6
10	1.9	35			7.9	3.1	3.7	33	5.6	5.9	4.9	1.5
11	14.8			7.5	34	2.7	50	6.8	8.5	49	3.0	1.5
12	5.8				7.2	2.5	106	75	6.6	12.1	2.5	1.5
13	2.2				46	3.4	84	10.0	3.8	6.8	2.3	1.6
14	2.1		30		9.9	2.5	383	4.6	3.7	6.1	2.2	2.3
15	6.3				15.6	2.2	67	3.6	2.8	5.4	2.6	2.5
16	13.0				34	2.1	16.1	9.3	2.7	9.2	4.2	3.3
17	3.5				6.5	2.2	56	3.5	2.1	16.7	3.1	5.4
18	9.5		7.0		6.6	3.2	65	2.9	1.9	116	11.1	2.3
19	14.5		5.2	19	5.2	3.0	85	16.1	1.9	31	5.1	1.8
20	3.5	5.5			3.7	4.3	184	8.8	1.8	70	3.2	1.7
21	2.8				6.6	2.3	58	29	3.0	10.4	5.9	1.6
22	2.8				3.4	2.1	31	8.1	2.0	7.9	6.1	1.6
23	2.6				2.6	2.1	11.6	46	10.2	7.2	3.2	1.5
24	3.1				3.4	2.1	7.4	7.8	9.2	52	2.7	1.6
25	3.0		7.0		80	2.1	5.7	74	5.7	34	2.8	3.7
26	3.2			8.0	62	7.9	8.0	13.4	37	49	2.2	3.0
27	54				19.1	2.8	19.4	11.9	132	27	2.6	2.2
28	29				9.7	4.4	5.9	7.0	7.7	9.2	2.2	9.0
29	5.2				5.7	2.8	5.1	-------	4.2	7.2	2.0	9.8
30	3.5	16			4.5	2.4	4.8	-------	4.2	5.7	2.3	9.0
31	7.0		-------		-------	2.2	29	-------	225	-------	2.2	-------

NOTE.—No gage-height record Nov. 5, 1919, to Feb. 25, 1920, and Feb. 27 to Mar. 21, 1920; discharge not determined. For other periods of no record, as indicated by braced figures, mean discharge was estimated by comparison with flow of Halawa Stream near Halawa. Gage-height graph partly estimated owing to plugged intake Dec. 29–31, 1920; Jan. 1, Feb. 1–3, 8–28, Mar. 1–23, 28–29, 31, Apr. 1–6, 10–26, 28, 29, and May 1, 1922; Feb. 2–4, Mar. 15–17, Apr. 5, 6, 10, 11, 14–16, 30, and May 1–5, 1923.

Monthly discharge of Papalaua Stream near Wailau, Molokai, for the years ending June 30, 1920–1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1919–20						
October	126	1.7	9.07	14.0	281	863
April	105	2.4	11.2	17.3	337	1,030
May	----------	1.0	1.93	2.99	59.8	184
June	15.1	1.4	4.55	7.04	136	419
1920–21						
July	21	1.2	5.81	8.99	180	553
August	41	1.5	9.51	14.7	295	905
September	29	1.7	5.98	9.25	180	551
October	79	1.8	9.45	14.6	293	899
November	73	1.6	16.6	25.7	499	1,530
December	191	2.9	18.6	28.8	578	1,770
January	265	6.8	49.5	76.6	1,540	4,710
February	16.5	2.0	6.49	10.0	182	558
March	71	1.4	7.99	12.4	248	760
April	103	2.8	12.7	19.6	380	1,170
May	41	1.9	9.41	14.6	292	895
June	25	1.4	3.35	5.18	100	308
The year	265	1.2	13.0	20.1	4,770	14,600

Monthly discharge of Papalaua Stream near Wailau, Molokai, for the years ending June 30, 1920–1923—Continued

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1921–22						
July	48	2.2	14.2	22.0	441	1,350
August	32	2.8	9.93	15.4	308	945
September	35	2.5	10.6	16.4	319	976
October	103	2.1	15.8	24.4	490	1,500
November	246	2.2	27.9	43.2	836	2,570
December		2.9	40.6	62.8	1,260	3,860
January	118		23.8	36.8	737	2,260
February	105	2.9	20.7	32.0	579	1,780
March	47		13.4	20.7	415	1,270
April			11.1	17.2	333	1,020
May	45	2.9	11.2	17.3	347	1,070
June	19.4	2.1	4.22	6.53	127	389
The year	246	2.1	17.0	26.3	6,190	19,000
1922–23						
July	54	1.9	6.83	10.6	212	650
August			11.6	17.9	360	1,100
September			13.3	20.6	399	1,220
October			13.4	20.7	416	1,270
November	80	2.6	17.0	26.3	510	1,570
December	61	2.1	6.56	10.1	204	624
January	383	2.9	44.3	68.5	1,370	4,210
February	75	1.9	15.7	24.3	440	1,350
March	225	1.8	17.5	27.1	542	1,660
April	178	5.2	32.9	50.9	988	3,030
May	16.7	2.0	4.23	6.54	131	402
June	14.1	1.5	3.60	5.57	108	331
The year	383	1.5	15.6	24.1	5,680	17,400

WAIAKEAKUA STREAM NEAR WAILAU, MOLOKAI

LOCATION.—Half a mile above confluence with Pulena Stream, 3 miles south of Wailau landing, and 4 miles northwest of Pukoo village.

RECORDS AVAILABLE.—October 30, 1919, to June 30, 1923. Records for year ending June 30, 1921, are revised in this paper.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at station.

CHANNEL AND CONTROL.—Stream bed rocky and boulder strewn. Banks steep, high, and covered with vegetation. Control formed of boulders, cobblestones, and gravel; shifts during severe floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year ending June 30, 1923, about 710 million gallons per day or 1,100 second-feet, at 1.15 p. m. March 31 (gage height, 7.15 feet); minimum discharge recorded, 2.2 million gallons per day or 3.4 second-feet, for several hours July 1 and 4 (gage height, 1.08 feet).

1919–1923: Maximum discharge recorded on March 31, 1923; minimum discharge recorded, 1.3 million gallons per day or 2.0 second-feet, March 7, 1920 (gage height, 0.92 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigation of west end of Molokai.

UTILIZATION.—Small amount being used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—1922–23: Stage-discharge relation changed October 4. Rating curve used prior to that date well defined between 2 and 150 million gallons per day; curve used thereafter well defined between 3 and 15 million gallons per day and fairly well defined between 15 and 150 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except for extremely high stages.

1920–21: Revised records published below supersede records published in Water-Supply Paper 535, page 72. The accuracy paragraph as given in the above-mentioned report applies as well to the revised records given below.

Discharge measurements of Waiakeakua Stream near Wailau, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 9	E. D. Burchard	2.81	93	60	Feb. 1	E. D. Burchard	1.70	13.0	8.4
Sept. 17	M. H. Carson	1.39	7.8	5.0	Mar. 14	Francis Kanahele	1.46	7.4	4.8
Oct. 30	E. D. Burchard	1.43	7.0	4.5	May 2	E. D. Burchard	1.47	7.6	4.9
Dec. 18	Francis Kanahele	1.40	6.2	4.0	June 16	M. H. Carson	1.32	5.5	3.5

Discharge, in million gallons per day, of Waiakeakua Stream near Wailau, Molokai, for the years ending June 30, 1921 and 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920–21												
1	5.8	3.3	7.4		3.6	10.5	7.3	9.4	4.2	4.2	5.4	3.5
2	2.5	3.5	3.8		8.4	6.7	8.6	8.7	7.5	3.9	5.4	3.4
3	2.1	4.2	3.4		5.7	6.3	8.4	8.9	4.8	3.8	6.8	3.3
4	1.9	3.6	3.1		4.5	5.8	8.9	8.6	4.3	3.7	10.8	3.2
5	1.9	2.9	3.2		3.6	7.0	21	7.5	4.1	3.8	13.9	3.1
6	1.8	2.6	6.1		3.1	10.0	58	10.6	4.0	15.8	7.1	3.1
7	1.7	2.5	7.7		2.9	5.4	18.6	8.1	4.0	14.2	6.1	3.7
8	2.0	2.2	3.9	2.8	15.8	7.4	12.8	7.0	3.9	10.3	5.7	3.1
9	2.3	2.1	3.6		5.5	6.1	15.1	6.7	3.8	8.7	4.8	3.0
10	2.3	2.0	4.1		4.8	5.5	10.7	9.0	3.7	5.9	4.4	2.9
11	1.8	2.3	8.7		3.8	4.8	10.1	9.3	3.6	5.2	4.1	2.9
12	1.8	5.2	6.2		3.5	4.3	10.3	6.7	3.6	5.0	4.0	2.9
13	1.6	3.4	5.8		3.2	6.0	22	6.3	3.5	4.6	4.1	2.8
14	1.8	5.8	4.8		3.0	6.0	99	6.2	3.4	4.3	3.8	3.1
15	1.8	2.9	4.3		2.8	4.4	72	7.1	3.4	4.0	3.9	3.8
16	2.4	2.2	4.3		2.6	3.8	80	6.1	3.4	7.7	3.9	3.0
17	6.9	2.2	3.8	6.5	2.5	3.5	80	5.7	3.4	5.0	4.8	2.9
18	2.4	2.0	3.6		2.5	3.3	30	6.1	3.5	4.2	4.8	2.7
19	2.3	1.9	3.4		2.4	3.1	28	5.5	3.7	3.8	4.1	3.2
20	2.5	7.4	3.4	3.3	19.8	3.3	17.5	5.4	3.6	12.7	4.4	2.7
21	3.4	6.3	3.6	3.0	21	3.1	13.8	6.4	4.1	5.6	13.0	2.7
22	6.4	7.8	3.1	2.9	22	2.9	12.5	6.3	4.3	5.2	6.8	2.6
23	4.8	9.7	3.2	2.5	9.2	9.8	13.0	5.2	3.7	5.3	6.0	2.6
24	3.2	12.4	3.1	3.9	6.1	84	13.8	5.0	8.8	15.5	12.4	2.6
25	3.4	9.4	3.2	4.1	6.0	71	29	4.7	5.1	7.0	6.2	2.6
26	3.1	8.0	3.1	2.6	9.2	15.0	26	4.6	4.3	5.7	5.2	2.7
27	7.4	15.9	3.0	3.1	7.6	10.7	47	4.5	3.8	6.7	4.5	10.7
28	5.8	8.0	2.9	2.7	11.3	9.1	17.5	4.3	3.6	5.1	4.3	3.8
29	3.8	5.5	3.1	2.4	12.4	8.0	13.6	-------	3.5	6.0	4.1	6.7
30	5.0	4.7		2.5	26	7.4	11.5	-------	7.2	10.2	3.8	3.5
31	3.5	4.7	-------	3.3	-------	7.0	10.3	-------	7.9	-------	3.7	-------
1922–23												
1	2.2	3.5	3.8	3.2	4.9	18.9	7.0	8.9	5.3	107	5.3	3.3
2	2.2	3.4	4.3	3.1	6.2	7.0	12.4	7.6	4.9	42	4.9	3.2
3	2.3	7.8	6.1	3.7	6.5	6.6	5.3	6.8	4.7	11.7	5.6	3.1
4	2.2	4.0	4.7	10.1	7.4	5.8	3.8	6.4	4.5	9.1	4.8	4.7
5	2.8	3.5	7.8	15.7	19.6	7.9	3.6	6.0	4.2	7.6	4.6	5.9

Discharge, in million gallons per day, of Waiakeakua Stream near Wailau, Molokai, for the years ending June 30, 1921 and 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1922–23												
6	2.3	3.2	4.8	8.1	10.4	11.3	3.7	5.8	6.1	6.6	4.5	3.6
7	2.5	3.1	8.3	8.8	14.0	7.3	3.8	5.4	4.7	18.3	4.5	3.3
8	2.5	7.5	4.6	5.9	24	6.0	3.6	5.3	8.7	9.3	4.3	3.2
9	2.5	35	4.3	4.1	16.2	5.3	3.1	8.4	6.4	6.8	6.6	3.1
10	2.3	10.3	6.8	3.5	9.8	4.9	3.5	9.5	5.4	6.2	4.3	3.0
11	5.9	14.5	13.2	4.3	10.5	4.7	22	5.9	8.5	10.3	4.1	2.9
12	4.2	11.0	22	3.6	7.8	4.8	43	14.4	5.8	7.6	4.0	3.0
13	2.7	6.3	23	3.0	10.4	6.0	52	7.0	4.7	5.9	3.9	3.0
14	2.8	5.0	9.7	2.8	6.8	4.6	209	5.6	5.3	5.4	3.9	3.2
15	2.9	4.8	6.9	6.9	9.4	4.1	64	5.2	4.2	5.2	3.9	3.1
16	4.5	4.2	7.5	8.1	14.4	4.0	27	4.9	3.9	5.8	4.1	3.2
17	2.9	4.1	5.6	5.8	7.1	3.9	39	4.7	3.6	7.8	4.0	3.7
18	3.5	4.3	5.9	3.5	7.1	3.9	43	4.5	3.5	26	5.1	3.1
19	5.4	7.5	5.5	9.5	7.6	3.3	39	5.9	3.5	22	4.1	2.9
20	3.1	4.6	5.2	4.9	5.8	3.1	57	5.3	3.2	22	3.8	2.9
21	2.9	4.1	5.2	5.3	6.6	2.9	50	7.4	3.2	10.0	3.9	2.9
22	2.9	4.0	8.2	7.7	4.9	2.8	19.4	5.9	3.2	7.9	3.7	2.8
23	2.9	3.6	4.7	4.8	4.6	2.7	12.8	10.0	5.4	7.1	3.6	2.9
24	2.8	3.5	4.1	7.0	4.2	2.6	11.2	5.6	6.0	8.1	3.6	2.9
25	2.9	3.3	3.8	4.8	11.6	2.5	9.1	24	4.6	8.1	3.7	3.3
26	2.9	3.2	3.6	4.9	16.7	4.5	11.2	10.7	6.2	14.7	3.5	3.7
27	9.5	3.1	4.8	4.2	10.5	2.9	10.0	7.1	16.7	7.9	3.4	3.1
28	21	3.4	3.7	5.7	7.1	2.9	7.9	6.0	6.2	6.5	3.4	3.7
29	4.7	6.6	3.4	7.3	5.4	2.6	7.3	-------	4.7	6.2	3.3	4.2
30	3.8	4.8	3.1	4.6	5.1	2.7	7.0	-------	4.5	5.6	3.5	5.4
31	4.3	7.0	-------	5.3	-------	2.7	24	-------	119	-------	3.4	-------

NOTE.—Gage-height record lacking or valueless Sept. 28 to Oct. 19, 1920; discharge estimated by comparison with flow of Pulena Stream. Water-stage recorder did not operate properly Jan. 4–27, Aug. 6–9, and Oct. 18, 1922; discharge estimated by comparison with flow of Pulena Stream, or by estimating gage-height graph. Braced figures show mean discharge for periods indicated.

Monthly discharge of Waiakeakua Stream near Wailau, Molokai, for the years ending June 30, 1921 and 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1920–21						
July	7.4	1.6	3.21	4.97	99.4	305
August	15.9	1.9	5.05	7.81	157	480
September	8.7	----------	4.20	6.50	126	387
October	----------	----------	3.48	5.38	108	331
November	26	2.4	7.83	12.1	235	721
December	84	2.9	11.0	17.0	341	1,050
January	99	7.3	26.7	41.3	826	2,540
February	10.6	4.3	6.78	10.5	190	583
March	8.8	3.4	4.38	6.78	136	417
April	15.8	3.7	6.77	10.5	203	623
May	13.9	3.7	5.88	9.10	182	559
June	10.7	2.6	3.43	5.31	103	316
The year	99	1.6	7.41	11.5	2,710	8,310
1922–23						
July	21	2.2	3.95	6.11	122	376
August	35	3.1	6.26	9.69	194	596
September	23	3.1	6.82	10.6	205	628
October	15.7	2.8	5.81	8.99	180	553
November	24	4.2	9.42	14.6	283	867
December	18.9	2.5	5.01	7.75	155	477
January	209	3.1	26.3	40.7	815	2,500
February	24	4.5	7.51	11.6	210	645
March	119	3.2	9.06	14.0	281	862
April	107	5.2	14.2	22.0	425	1,310
May	6.6	3.3	4.17	6.45	129	397
June	5.9	2.8	3.41	5.28	102	314
The year	209	2.2	8.50	13.2	3,100	9,520

PULENA STREAM NEAR WAILAU, MOLOKAI

LOCATION.—Half a mile above confluence with Waiakeakua Stream, 3 miles south of Wailau landing, and 4 miles northwest of Pukoo village.

RECORDS AVAILABLE.—October 30, 1919, to June 30, 1923. Records for the years ending June 30, 1921 and 1922, are revised in this paper.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge near station.

CHANNEL AND CONTROL.—Channel rocky and boulder strewn. Banks steep, high, and fairly clean. Control of boulders and gravel; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum recorded during year ending June 30, 1923, about 1,270 million gallons per day or 1,960 second-feet, at 8.10 p. m. April 11 (gage height, 9.24 feet); minimum recorded, 5.0 million gallons per day or 7.7 second-feet, from 5 p. m. to 7 p. m. July 8 (gage height, 1.14 feet).

1919–1923: Maximum estimated 1,400 million gallons per day or 2,170 second-feet, about noon December 24, 1920 (gage height, 11.5 feet); minimum recorded, 3.0 million gallons per day or 4.6 second-feet, June 28 and July 14, 1920 (gage height, 0.89 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigation on west end of Molokai.

UTILIZATION.—Small amount being used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—1922–23: Stage-discharge relation changed October 4, January 14, March 31, May 1, and during period of no record May 3 to June 16. Five rating curves used, all of which are well or fairly well defined for ordinary stages; for high stages they are subject to error. Operation of water-stage recorder satisfactory except during May and June. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good except for extremely high stages and those estimated.

1920–21 and 1921–22: Revised records published below supersede records published in Water-Supply Papers 535 and 555. Stage-discharge relation changed several times. Rating curves used are well or fairly well defined below 100 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Records good except those for extremely high stages and those estimated, which are fair.

Discharge measurements of Pulena Stream near Wailau, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 9	E. D. Burchard.	2.62	124	80	Feb. 1	E. D. Burchard.	2.00	63	41
Sept. 18	M. H. Carson...	1.90	46.5	30	Mar. 14	Francis Kanahele	1.76	34.5	22.4
Oct. 30	E. D. Burchard.	1.49	17.1	11.1	May 2	E. D. Burchard.	1.10	21.4	13.8
Dec. 19	M. H. Carson...	1.34	11.7	7.6	June 16	M. H. Carson...	.77	15.3	9.9

Discharge, in million gallons per day, of Pulena Stream near Wailau, Molokai, for the years ending June 30, 1921–1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920-21												
1	15.6	9.2	13.9	5.0				23	8.5	10.8	16.6	6.3
2	,5.2	11.1	8.4	5.4	25			22	15.7	8.8	15.7	6.5
3	4.1	13.6	7.4	6.2		20	17	19.6	9.6	8.5	20	6.5
4	3.8	12.1	6.8	5.4				21	8.0	19.8	31	6.3
5	3.9	7.6	8.4	5.2		27		18.7	8.0	10.8	28	5.8
6	3.4	7.8	16.3	8.6	9.5	39		22	8.2	71	18.3	5.6
7	3.3	5.6	32	7.4		21		19.1	7.8	48	17.0	7.5
8	4.1	5.1	11.8	4.5		36		16.1	7.0	55	16.1	6.1
9	4.0	4.6	10.2	5.1	35	31	40	15.7	7.2	37	12.7	5.4
10	4.8	4.1	12.1	5.5		22		17.0	7.2	26	10.5	4.7
11	3.3	4.2	32	5.6		17.2		18.7	6.8	18.3	9.9	4.7
12	3.9	8.4	25	5.5		14.3		14.2	6.8	16.6	9.3	4.7
13	3.3	9.6	18.0	5.4		18.7		13.5	6.8	13.5	8.0	4.6
14	3.4	12.5	13.2	4.8		26	225	14.2	7.0	11.7	7.2	6.0
15	3.9	5.8	11.1	13.8	7	17.6	207	22	7.0	9.6	8.2	9.7
16	5.6	4.7	11.3	25		12.4	189	12.7	7.5	25	8.2	5.4
17	22	4.5	8.6	14.0		9.9	234	12.0	7.8	15.3	12.4	4.7
18	5.2	4.1	8.0	34		8.6	114	14.2	7.5	11.7	15.3	4.4
19	6.2	4.1	7.4	16.2		7.4	71	12.4	7.8	9.0	11.7	7.8
20	6.3	22	6.6	8.6		7.0	55	12.4	7.2	38	10.5	5.1
21	9.7	25	7.2	7.0	80	9.0	47	20	12.7	18.7	22	4.4
22	15.9	23	6.4	6.4		6.2	44	20	7.8	17.0	15.0	4.1
23	13.1	34	6.4	6.1		47	36	11.4	7.8	17.4	12.7	4.0
24	7.4	29	6.1	9.9		145	30	10.5	22	34	24	3.9
25	6.1	35	6.0				68	10.2	10.8	22	15.7	3.9
26	7.2	29	6.0		25		59	9.9	7.8	19.1	12.0	10.2
27	11.4	57	5.8	7.5		35	55	9.3	7.8	13.5	9.3	23
28	15.4	27	5.0				39	9.0	7.2	11.4	8.2	13.1
29	9.3	16.2	5.8				31	-------	9.6	21	8.5	10.4
30	13.6	12.1	6.6				28	-------	19.6	35	7.5	6.5
31	7.6	10.2	-------		-------		26	-------	15.0	-------	6.8	-------
1921-22												
1	5.6	23	7.5	31	12.2	22	22	200	35	8.7	9.4	9.2
2	17.2	22	6.5	137	22	17.0	19.6	113	24	9.0	8.5	8.7
3	23	16.1	6.1	45	35	42	15.3	80	34	11.0	10.7	8.3
4	18.8	14.2	6.5	48	19.3	28	94	48	39	9.6	18.1	8.0
5	9.0	38	14.2	26	13.8	22	62	40	107	16.0	28	7.6
6	8.2	20	6.8	21	11.6	18.7	31	35	80	11.0	15.0	7.2
7	6.5	19.6	6.5	29	10.7	15.3	22	31	109	9.9	11.0	6.8
8	14.8	13.8	9.6	18.9	9.9	13.8	17.8	26	117	9.6	9.9	7.2
9	7.2	10.8	12.7	15.3	10.1	12.4	17.0	66	95	8.5	9.0	8.3
10	7.0	10.5	9.3	13.1	9.6	11.1	13.8	45	74	17.2	11.0	6.8
11	9.6	24	10.8	11.6	9.0	10.2	11.7	45	70	21	21	6.8
12	6.1	28	8.0	10.4	13.7	214	11.1	55	48	8.2	11.0	7.6
13	5.4	13.5	6.8	9.6	10.1	304	10.2	38	35	23	9.2	7.8
14	5.1	11.7	11.5	9.2	8.3	129	10.5	30	27	23	8.5	7.4
15	10.7	9.6	9.6	8.5	7.6	55	9.6	25	23	15.0	8.3	6.5
16	12.1	9.0	11.7	9.0	7.6	37	8.8	22	21	19.7	8.3	5.9
17	36	9.0	13.1	10.1	7.2	77	8.8	19.7	22	18.8	9.0	5.8
18	68	9.6	9.6	8.0	7.0	63	11.4	18.1	17.6	15.7	8.3	5.6
19	45	41	7.5	7.6	78	38	32	16.4	15.7	11.9	9.7	5.4
20	42	16.6	16.9	8.0	72	26	47	15.3	14.6	15.3	22	16.0
21	20	14.8	22	8.3	281	22	65	29	13.8	11.6	12.5	18.1
22	20	17.5	35	9.6	276	112	43	24	12.8	11.0	9.0	8.3
23	25	10.5	24	12.3	105	105	44	17.6	12.2	9.4	10.1	14.0
24	14.2	10.2	17.4	60	55	223	22	26	11.6	10.9	49	7.4
25	13.1	10.5	14.6	21	56	162	23	16.4	10.7	11.9	18.5	6.5
26	12.4	13.0	13.5	16.8	129	84	62	14.6	10.1	9.2	39	5.8
27	21	11.1	23	13.5	76	47	89	30	9.6	8.5	19.7	5.6
28	37	8.5	30	16.4	43	37	204	106	9.4	22	15.3	5.6
29	60	8.0	21	16.4	29	36	120	-------	9.4	13.8	12.2	5.8
30	38	10.8	22	14.9	23	27	176	-------	9.4	11.9	10.7	5.4
31	22	12.8	-------	20	-------	24	126	-------	9.0	-------	9.6	-------

Discharge, in million gallons per day, of Pulena Stream near Wailau, Molokai, for the years ending June 30, 1921–1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1922–23												
1	5.4	6.5	8.3	7.6	19.7	29	13.0	52	26	261	15.6	
2	5.3	6.1	9.6	7.0	18.7	15.0	41	31	24	97	14.5	
3	5.4	16.0	21	12.9	19.5	17.4	18.2	26	22	48		
4	5.3	10.1	16.1	20	21	14.0	9.9	24	24	42		12
5	7.8	7.0	16.1	35	70	31	8.3	22	20	36		
6	5.6	6.5	11.6	17.4	53	39	17.4	19.2	24	30		
7	5.3	6.1	20	19.0	54	22	14.8	17.1	21	65		
8	5.3	14.4	11.3	16.2	62	15.8	12.3	15.4	40	45		
9	5.9	52	11.9	10.8	34	13.6	10.2	25	32	31		
10	5.3	23	29	8.8	25	11.9	9.9	28	26	23		
											13	
11	9.1	42	41	8.8	42	10.8	42	18.8	27	31		9.0
12	8.0	35	38	10.9	27	11.0	153	34	24	25		
13	5.8	16.8	59	8.3	43	13.6	61	23	21	21		
14	6.5	12.2	28	7.0	26	9.9	340	17.5	24	19.3		
15	6.1	14.6	18.9	27	24	8.8	441	16.3	18.4	18.4		
16	6.1	11.0	17.6	23	35	8.3	59	15.8	16.7	20		
17	5.6	10.7	14.6	11.9	21	8.1	122	14.7	15.4	29		11.2
18	8.0	11.9	21	9.6	20	7.6	121	13.0	14.7	59		8.1
19	12.4	13.5	15.3	18.4	22	7.4	59	14.7	15.0	55		8.1
20	6.3	11.0	12.2	9.4	16.6	7.4	99	14.0	13.6	61		7.8
21	5.9	10.4	10.7	9.1	24	7.0	74	15.8	12.6	39		7.8
22	5.8	14.7	14.4	16.6	15.8	6.5	74	16.3	12.6	28		7.6
23	5.6	8.7	9.9	13.6	13.3	6.3	36	29	17.9	24		7.4
24	6.5	8.5	8.7	18.2	11.9	6.3	24	17.9	19.8	30		7.2
25	7.0	7.6	8.3	13.0	30	6.1	19.8	98	17.9	45	11	8.2
26	7.2	6.8	7.8	14.3	28	7.0	18.8	61	17.1	45		11.6
27	9.7	6.7	11.9	10.2	22	6.5	19.8	36	39	28		6.5
28	26	8.0	9.0	20	17.4	6.3	16.7	31	23	21		6.5
29	7.8	15.0	7.4	22	13.3	6.1	15.4	-------	17.5	18.8		10.4
30	6.7	9.2	7.0	12.3	11.9	7.9	14.7	-------	18.4	16.8		6.8
31	11.3	12.5	-------	21	-------	6.1	53	-------	304	-------		-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Waiakeakua Stream. Variable corrections, based on comparison with gage-height graph of Waiakeakua Stream, were applied to gage-height graph during period Jan. 18 to Apr. 3, 1921, owing to partly plugged intake of well.

Monthly discharge of Pulena Stream near Wailau, Molokai, for the years ending June 30, 1921–1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1920–21						
July	22	3.3	7.48	11.6	232	712
August	57	4.1	14.8	22.9	458	1,410
September	32	5.0	11.0	17.0	330	1,010
October	34	4.5	8.81	13.6	273	838
November	-------	-------	24.9	38.5	746	2,290
December	145	6.2	27.3	42.2	847	2,600
January	234	-------	64.1	99.2	1,990	6,100
February	23	9.0	15.7	24.3	441	1,350
March	22	6.8	9.27	14.3	288	882
April	71	8.5	22.4	34.7	674	2,060
May	31	6.8	13.8	21.4	428	1,310
June	23	3.9	6.71	10.4	201	618
The year	234	3.3	18.9	29.2	6,900	21,200

Monthly discharge of Pulena Stream near Wailau, Molokai, for the years ending June 30, 1921–1923—Continued

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1921-22						
July	68	5.1	20.6	31.9	640	1,960
August	41	8.0	15.7	24.3	488	1,490
September	35	6.1	13.8	21.4	414	1,270
October	137	7.6	22.1	34.2	686	2,100
November	281	7.0	48.3	74.7	1,450	4,450
December	304	10.2	65.6	101	2,030	6,240
January	204	8.8	46.8	72.4	1,450	4,450
February	200	14.6	44.0	68.1	1,230	3,780
March	117	9.0	36.3	56.2	1,130	3,450
April	23	8.5	13.7	21.2	412	1,260
May	49	8.3	14.6	22.6	452	1,390
June	18.1	5.4	7.85	12.1	235	723
The year	304	5.1	29.1	45.0	10,600	32,600
1922-23						
July	26	5.3	7.42	11.5	230	706
August	52	6.1	14.0	21.7	434	1,330
September	59	7.0	17.2	26.6	516	1,580
October	35	7.0	14.8	22.9	459	1,410
November	70	11.9	28.0	43.3	841	2,580
December	39	6.1	12.1	18.7	374	1,150
January	441	8.3	65.1	101	2,020	6,190
February	98	13.0	26.7	41.3	746	2,290
March	304	12.6	30.6	47.3	949	2,910
April	261	16.8	43.7	67.6	1,310	4,020
May			12.3	19.0	381	1,170
June			9.24	14.3	277	851
The year	441	5.3	23.4	36.2	8,540	26,200

PELEKUNU STREAM NEAR PELEKUNU, MOLOKAI

LOCATION.—Half a mile above confluence with Lanipuni Stream, 2 miles south of Pelekunu landing, 6 miles north of Kamalo village, and 12 miles by trail northwest of Pukoo village.

RECORDS AVAILABLE.—December 1, 1919, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 1,000 feet below station.

CHANNEL AND CONTROL.—Stream bed rocky with scattered boulders. Banks steep and rocky. Control large boulders wedged into cleft in rock ledge; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 750 million gallons per day or 1,160 second-feet, at 6.30 p. m. February 25 (gage height, 8.57 feet); minimum discharge recorded, 2.6 million gallons per day or 4.0 second-feet several times during period July 27 to August 26 (gage height, 1.48 feet). A higher discharge may have been recorded during period of no record in January.

1919–1923: Maximum discharge recorded, about 1,020 million gallons per day or 1,580 second-feet, at 10.20 a. m. December 24, 1920 (gage height, 8.35 feet); minimum discharge recorded, 1.8 million gallons per day or 2.8 second-feet from 5 to 9 p. m. March 7 and July 13, 1920 (gage height, 1.65 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigating West Molokai.

UTILIZATION.—Small amount of water used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—Stage-discharge relation changed January 11 and February 26. Rating curve used prior to January 11, well defined below 50 million gallons per day; curve used January 12 to February 25, based on one discharge measurement and form of previous curve and therefore subject to error; curve used subsequent to February 25, well defined between 2 and 20 million gallons per day. Operation of water-stage recorder satisfactory except during January. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good for ordinary stages; estimated records fair; high-stage records subject to error.

Discharge measurements of Pelekunu Stream near Pelekunu, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 10	E. D. Burchard	1.76	7.8	5.0	Mar. 15	Francis Kanahele	3.22	14.7	9.5
Oct. 31	do	1.74	7.5	4.8	May 3	E. D. Burchard	3.20	14.1	9.1
Dec. 19	M. H. Carson	1.62	5.3	3.4	June 17	M. H. Carson	3.07	9.7	6.3
Feb. 2	E. D. Burchard	2.05	25.5	16.5					

Discharge, in million gallons per day, of Pelekunu Stream near Pelekunu, Molokai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.0	2.8	2.8	3.7	8.1	12.3	3.5	30	12.7	205	10.9	4.2
2	2.9	2.7	3.2	3.3	6.6	7.5	12.7	16.3	10.9	120	9.7	3.9
3	2.9	6.4	5.8	4.7	8.3	11.2	7.1	12.1	8.8	48	9.2	3.7
4	2.9	3.9	4.7	7.0	8.4	8.3	4.4	9.8	9.2	27	7.7	4.1
5	3.4	2.9	4.1	12.8	21	11.4	4.0	8.2	7.2	19.7	7.0	4.5
6	2.9	2.6	3.3	7.0	17.2	13.5	8.2	7.5	10.5	16.3	6.6	3.7
7	2.8	2.6	5.4	6.7	21	9.4	6.4	6.9	7.4	65	6.5	3.4
8	2.8	6.4	3.3	7.5	18.3	7.5	5.3	6.0	36	34	6.1	3.3
9	3.0	11.8	3.5	5.0	12.4	6.6	4.4	11.2	37	20	6.1	3.3
10	2.9	7.0	8.4	4.2	9.6	5.8	4.4	15.1	19.2	16.3	5.6	3.1
11	3.5	13.9	9.4	4.0	16.7	5.3	13.5	8.6	14.9	16.9	5.4	3.0
12	3.5	10.2	6.2	4.2	12.4	5.3	55	25	10.9	14.0	5.2	3.4
13	2.9	5.3	16.5	3.7	16.3	5.4		15.3	9.2	11.1	5.1	3.4
14	3.9	4.2	8.4	3.6	11.4	4.4		10.1	18.1	10.4	4.8	5.6
15	3.2	5.5	5.4	15.7	10.6	4.2	95	8.1	9.9	9.7	4.9	5.6
16	2.9	4.2	5.0	12.6	13.9	4.1		8.6	8.1	10.6	5.9	4.5
17	2.8	4.0	4.7	7.5	9.4	3.9		6.4	7.0	18.8	6.1	6.8
18	3.3	3.9	6.4	5.8	8.6	3.8	40	6.0	6.5	42	11.7	4.1
19	4.1	4.4	4.4	6.4	8.1	3.7		7.9	6.5	48	5.6	3.6
20	2.9	3.9	4.0	4.8	7.4	3.6		6.4	5.4	60	4.8	3.8
21	2.8	3.9	3.7	4.7	14.6	3.5		7.0	5.1	29	4.9	3.4
22	2.7	5.9	3.7	6.6	7.9	3.3	16	6.0	4.8	19.4	5.1	3.2
23	2.6	3.5	3.4	4.8	6.7	3.3		17.5	5.7	15.2	4.5	3.2
24	3.2	3.4	3.3	5.4	6.0	3.2	10.5	8.4	6.1	18.9	4.5	3.2
25	3.5	3.2	3.2	5.1	12.7	3.2	8.2	144	6.3	32	6.4	4.9
26	3.4	2.9	3.1	6.6	11.4	3.2	6.6	74	6.6	52	4.5	6.1
27	3.0	2.9	4.1	4.5	8.4	3.1	6.0	29	44	25	4.9	3.4
28	6.1	2.9	3.5	5.5	7.4	3.0	5.3	17.2	14.9	18.0	4.2	3.3
29	2.9	3.5	3.0	7.4	7.0	3.0	5.6	-------	9.7	15.8	4.1	4.5
30	2.8	2.9	2.9	4.7	6.4	3.6	5.5	-------	9.2	12.7	4.9	3.4
31	4.1	3.2	-------	7.3	-------	3.0	45	-------	200	-------	4.5	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Lanipuni Stream. Record paper torn and gage-height graph estimated for part of day Jan. 24, 25, 28, 29, 31, and Feb. 1.

Monthly discharge of Pelekunu Stream near Pelekunu, Molokai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	6.1	2.6	3.21	4.97	99.6	305
August	13.9	2.6	4.74	7.33	147	451
September	16.5	2.8	4.96	7.67	149	457
October	15.7	3.3	6.22	9.62	198	592
November	21	6.0	11.1	17.2	334	1,020
December	13.5	3.0	5.57	8.62	173	530
January		3.5	26.1	40.4	810	2,480
February	144	6.0	18.9	29.2	529	1,620
March	200	4.8	18.3	28.3	568	1,740
April	205	9.7	35.0	54.2	1,050	3,220
May	11.7	4.1	6.05	9.36	187	576
June	6.8	3.0	3.99	6.17	120	367
The year		2.6	11.9	18.4	4,360	13,400

LANIPUNI STREAM NEAR PELEKUNU, MOLOKAI

LOCATION.—Half a mile above junction with Pelekunu Stream, 2 miles south of Pelekunu landing, 6 miles north of Kamalo village, and 13 miles by trail northwest of Pukoo village.

RECORDS AVAILABLE.—December 1, 1919, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 200 feet below gage.

CHANNEL AND CONTROL.—Channel rocky and boulder strewn. Banks high and rocky. Control of boulders and gravel; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 530 million gallons per day or 820 second-feet, at 11 a. m. January 14 (gage height, about 3.70 feet); a higher discharge may have occurred during periods of no record. Minimum discharge recorded, 2.6 million gallons per day or 4.0 second-feet, at 11 a. m. December 29 and 5 p. m. to 11 p. m. December 31 (gage height, 0.45 foot).

1919–1923: Maximum discharge recorded, about 1,250 million gallons per day or 1,930 second-feet, at 10 a. m. December 24, 1920 (gage height, 5.90 feet); minimum discharge recorded, 1.9 million gallons per day or 2.9 second-feet, at 3.30 p. m. July 13, 1920 (gage height, 0.68 foot) and at 3 p. m. November 18, 1921 (gage height, 0.12 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for irrigating West Molokai.

UTILIZATION.—Small amount of water used for irrigation of taro. Most of flow wastes into sea.

ACCURACY.—Stage-discharge relation changed by floods of January 14 and March 31. Rating curve used prior to January 14 fairly well defined for ordinary stages; curve used January 15 to March 31 poorly defined; curve used subsequent to March 31 well defined between 5 and 50 million gallons per day. Operation of water-stage recorder satisfactory except during period January to April. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair to poor.

Discharge measurements of Lanipuni Stream near Pelekunu, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 10	E. D. Burchard	0.78	12.3	8.0	Feb. 2	E. D. Burchard	0.11	9.4	6.1
Sept. 18	Karl Jetter	.68	9.0	5.8	May 3	do	.85	8.4	5.4
Oct. 31	E. D. Burchard	.60	6.4	4.1	June 17	M. H. Carson	.83	11.6	7.5
Dec. 19	Francis Kanahele	.56	6.4	4.2					

Discharge, in million gallons per day, of Lanipuni Stream near Pelekunu, Molokai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.6	3.3	3.3	3.8	6.7	10.5	2.9	8.0			9	6.1
2	3.5	3.2	3.9	3.5	5.0	6.4	19.1					5.5
3	3.5	8.0	6.1	6.9	6.2	8.6	4.3	5.9			7.5	5.3
4	3.6	4.0	4.6	17.0	7.1	6.4	3.3	5.7	85	85	6.7	7.3
5	3.9	3.5	4.8	20	29	9.3	3.1	5.6			6.4	6.6
6	3.4	3.3	3.8	8.2	18.4	10.4	3.9	5.6			6.3	5.6
7	3.4	3.3	6.7	8.7	14.3	6.9	3.9	5.5			6.4	5.5
8	3.4	12.6	4.3	7.5	12.6	5.6	3.8	5.4			6.3	5.3
9	3.5	32	6.3	5.3	7.1	5.1	3.5	11.0		35	6.4	5.2
10	3.4	12.0	17.2	4.6	5.8	4.8	4.3	9.4	25		6.1	5.0
11	5.4	23	13.2	4.3	21	4.5	31	6.3			6.1	5.0
12	3.8	12.7	6.2	4.0	7.7	4.6	85	23			5.9	5.8
13	3.4	6.0	9.6	3.8	29	4.6	18.8	8.5	8.5		5.9	5.9
14	4.0	4.8	5.8	3.7	10.4	4.2	330	6.7		11	5.8	8.1
15	3.5	5.1	4.6	30	11.4	3.9	130	6.0	6.4		5.9	7.1
16	3.3	4.2	4.5	15.0	21	3.8	16	6.5	6.3		6.6	6.7
17	3.3	4.0	4.2	7.5	8.8	3.8	50	5.6	6.1		6.4	7.3
18	3.8	3.9	5.8	5.3	7.5	3.6	70	5.5	6.1		10.9	5.9
19	4.8	4.9	4.3	5.3	6.9	3.6	16		6.1		6.3	5.8
20	3.5	4.3	3.9	4.5	6.1	3.4	45		5.9	40	6.1	5.9
21	3.4	4.2	3.7	4.5	15.5	3.1	16	8	5.9		6.7	5.8
22	3.4	5.2	4.1	5.3	6.6	2.9	12		5.9		7.1	5.6
23	3.4	3.7	3.6	4.8	5.6	2.8	8		6.9		6.1	5.6
24	3.4	3.7	3.5	5.3	5.1	2.8	6.5		6.8		6.4	5.9
25	3.6	3.5	3.5	5.9	51	2.8	5.5		6.5		7.6	8.1
26	3.5	3.4	3.4	5.8	15.4	2.8		60	7.2		5.9	9.2
27	3.6	3.3	4.6	4.5	8.5	2.8			42	25	6.1	6.4
28	6.1	3.4	3.7	6.2	6.6	2.8	7.5				5.6	6.4
29	3.4	4.2	3.4	5.6	6.0	2.7		-------	70		5.5	7.5
30	3.3	3.5	3.3	4.2	5.6	2.8		-------			6.1	6.6
31	4.3	3.6	-------	7.6	-------	2.6		-------	-------	-------	6.1	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Pelekunu Stream. Gage-height graph estimated for part of each day Jan. 12–25 and Mar. 27.

Monthly discharge of Lanipuni Stream near Pelekunu, Molokai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	6.1	3.3	3.72	5.76	115	354
August	32	3.2	6.45	9.98	200	614
September	17.2	3.3	5.33	8.25	160	491
October	30	3.5	7.37	11.4	229	701
November	51	5.0	12.3	19.0	368	1,130
December	10.5	2.6	4.67	7.23	145	444
January	330	2.9	30.2	46.7	937	2,870
February	----------	5.4	15.2	23.5	426	1,310
March	----------	5.9	18.8	29.1	583	1,790
April	----------	----------	39.8	61.6	1,200	3,660
May	----------	5.5	6.62	10.2	205	630
June	9.2	5.0	6.27	9.70	188	577
The year	330	2.6	13.0	20.1	4,750	14,600

WAIKOLU STREAM AT ELEVATION 650 FEET, NEAR KALAUPAPA, MOLOKAI

LOCATION.—2 miles above mouth of stream and 5 miles southeast of Kalaupapa.

RECORDS AVAILABLE.—July 1, 1920, to June 30, 1923, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Stream bed of gravel and boulders. Right bank vertical rock; left bank sloping and formed of loose material. Control formed of unstable boulders.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 592 million gallons per day or 916 second-feet, at 1.15 a. m. January 12 (gage height, 7.16 feet); stage undoubtedly rose considerably higher on January 14 but recorder was not operating properly. Minimum discharge recorded, 2.9 million gallons per day or 4.5 second-feet, from December 25 to January 1 (gage height, 1.78 feet).

1920–1923: Maximum stage recorded, about 13.0 feet at 10.20 a. m. December 24, 1920 (data insufficient for determination of discharge); minimum discharge 2.4 million gallons per day or 3.7 second-feet, at noon October 2, 1920 (gage height, 1.95 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water available for proposed power and irrigation project for leper settlement and for irrigation of the west end of Molokai.

UTILIZATION.—Part of water used for water supply of leper settlement and for irrigation of taro. Remainder wastes into sea.

ACCURACY.—Stage-discharge relation changed by floods of November 11, January 14, and March 31. Four rating curves used, all fairly well defined for ordinary stages. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection, or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair.

Discharge measurements of Waikolu Stream at elevation 650 feet, near Kalaupapa, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 31	E. D. Burchard	1.98	9.0	5.8	Dec. 17	M. H. Carson	1.80	4.6	3.0
Sept. 19	M. H. Carson	1.92	7.3	4.7	Mar. 20	Francis Kanahele	2.13	7.9	5.1
Nov. 1	E. D. Burchard	1.97	8.6	5.6	May 4	E. D. Burchard	2.03	9.0	5.8

Discharge, in million gallons per day, of Waikolu Stream at elevation 650 feet, near Kalaupapa, Molokai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	5.4	5.9	5.0	4.6	5.9	5.7	2.9					5.4
2	5.4	5.4	5.0	4.5	4.7	4.4	25					5.3
3	5.4	6.4	5.9	5.0	5.4	5.3	4.8				6.2	5.2
4	5.4	6.9	6.4	12.2	5.0	5.0	3.8					5.4
5	5.4	5.9	5.9	12.6	12.1	4.4	3.4	5.5	5.5		6.0	5.4
6	5.4	5.9	5.4	6.4	9.0	5.3	4.9			26	5.9	5.3
7	5.4	5.4	6.1	5.9	10.6	3.7	3.9				5.9	5.2
8	5.4	5.9	5.4	7.2	8.0	3.4	3.9				5.9	5.1
9	5.4	18.3	5.4	5.4	5.4	3.3	3.6				5.8	5.1
10	5.9	9.5	6.0	4.8	4.8	3.1	8.2				5.8	5.0
11	5.9	15.5	9.8	4.8	28	3.1	92		11.5		5.8	5.0
12	5.9	10.1	5.9	4.7	5.9	3.1	105	14			5.8	5.0
13	5.9	6.4	16.4	4.6	22	3.1	15.5				5.7	5.0
14	6.4	5.9	6.9	4.6	5.7	3.1				7	5.7	5.2
15	6.4	5.9	5.0	39	4.7	3.0					5.7	5.2
16	5.9	6.4	4.9	9.6	10.7	3.0					5.7	5.3
17	5.9	5.9	4.8	5.9	4.3	3.0					5.9	6.6
18	5.9	5.4	5.0	5.0	3.6	3.0			5.1		9.5	5.4
19	5.9	5.9	5.4	5.0	3.5	3.0	60	7			6.7	5.1
20	5.9	6.4	4.9	4.9	3.6	3.0					6.0	5.0
21	5.9	5.9	4.8	4.6	12.4	3.0			5.3		5.8	4.9
22	5.9	6.9	4.8	4.9	3.9	3.0			5.3		5.8	4.8
23	5.9	5.9	4.8	4.8	3.4	3.0			5.3	11.5	5.7	4.7
24	5.9	5.4	4.8	4.7	3.3	3.0			5.4		5.5	4.7
25	5.9	5.4	4.7	4.7	23	2.9			5.6		5.9	4.9
26	5.9	5.4	4.6	5.9	7.4	2.9		19	6.4		5.6	5.4
27	5.9	5.4	4.8	4.9	4.1	2.9			83		5.5	4.9
28	6.4	5.4	4.8	4.7	3.5	2.9	11		9.3		5.4	
29	5.9	5.4	4.7	4.9	3.4	2.9			6.2		5.4	4.9
30	5.4	5.0	4.6	4.7	3.4	2.9			5.9		5.4	
31	5.9	5.9		4.5		2.9			200		5.3	

NOTE.—Braced figures show mean discharge for periods indicated; estimated because of lack of gage height record by comparison with flow at lower station on this stream.

Monthly discharge of Waikolu Stream at elevation 650 feet, near Kalaupapa, Molokai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	6.4	5.4	5.79	8.96	179	551
August	18.3	5.0	6.79	10.5	210	646
September	16.4	4.6	5.76	8.91	173	530
October	39	4.5	6.77	10.5	210	644
November	28	3.3	7.69	11.9	231	708
December	5.7	2.9	3.43	5.31	106	326
January		2.9	32.7	50.6	1,010	3,110
February			10.9	16.9	305	937
March	200		15.9	24.6	494	1,510
April			15.4	23.8	463	1,420
May		5.3	5.93	9.18	184	564
June	6.6	4.7	5.14	7.95	154	473
The year		2.9	10.2	15.8	3,720	11,400

WAIKOLU STREAM AT PIPE-LINE CROSSING, NEAR KALAUPAPA, MOLOKAI

LOCATION.—At 300-foot elevation, 1 mile above mouth of stream and 4 miles southeast of Kalaupapa.

RECORDS AVAILABLE.—June 2, 1919, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Stream bed composed of sand, gravel, and boulders. Right bank steep and rocky; left bank is overflowed at high stages. Control is concrete casing of 8-inch water main and is permanent, except for slight changes caused by flood damage and subsequent repairs.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 1,100 million gallons per day or 1,700 second-feet, at 7.40 a. m. January 14 (gage height, 9.89 feet); minimum discharge recorded, 4.7 million gallons per day or 7.3 second-feet, at 10 p. m. December 12 (gage height, 4.19 feet).

1919–1923: Maximum discharge recorded, about 1,270 million gallons per day or 1,960 second-feet, at 10.30 a. m. December 24, 1920 (gage height, 10.20 feet); minimum discharge recorded, 2.8 million gallons per day or 4.3 second-feet, from 6 to 8 a. m. September 26, 1921 (gage height, 3.92 feet).

DIVERSIONS.—Intake ditch for Kalaupapa water supply diverts about 2.5 million gallons per day at about 500-foot elevation. Some of this water returns to stream just below station.

REGULATION.—By diversion only.

OBJECT OF STATION.—To determine amount of water available for proposed power and irrigation project for leper settlement.

UTILIZATION.—Part of water used for irrigation of taro. Remainder wastes into sea.

ACCURACY.—Stage-discharge relation not permanent; changed by reconstruction of control on October 4, by flood on January 14 and February 25, and owing to some unknown cause on May 17. Rating curve used July 1 to October 4, well defined between 4 and 50 million gallons per day; standard curve used October 5 to January 14, poorly defined; curves used January 15 to February 25, February 26 to May 17, and May 18 to June 30, poorly defined. Operation of water-stage recorder satisfactory, but considerable difficulty was experienced in keeping intake of well open. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day, except for period September 26 to January 10 for which shifting-control method was used and for various other periods for which it was necessary to apply gage-height corrections owing to plugged or partly plugged intake. Records good from July to September; for remainder of year they are subject to error owing to plugged intake, use of shifting-control method, and poorly defined rating curves.

Discharge measurements of Waikolu Stream at pipe-line crossing near Kalaupapa, Molokai, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
July 31	E. D. Burchard	4.05	13.2	8.5	Mar. 20	Francis Kanahele	4.18	12.6	8.1
Nov. 1	do	4.27	15.3	9.9	May 4	E. D. Burchard	4.25	16.9	10.9
Dec. 17	Francis Kanahele	4.20	7.9	5.1	June 28	M. H. Carson	4.30	14.6	9.4
Feb. 4	E. D. Burchard	4.17	15.6	10.1					

Discharge, in million gallons per day, of Waikolu Stream at pipe-line crossing, near Kalaupapa, Molokai, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	9.8	9.0	7.9	7.1	9.7	7.0	5.6	12.5	12.0	114	12.4	10.7
2	9.8	8.6	8.3	7.1	8.6	6.7	27	10.6	10.6	47	12.4	10.7
3	9.8	10.2	9.0	7.1	9.3	6.7	7.8	10.6	9.7	14.4	12.0	10.2
4	9.8	11.0	9.4	14.5	8.9	7.0	6.3	10.2	9.2	12.4	11.5	13.1
5	9.8	9.4	8.6	21	16.2	6.3	6.3	10.2	8.8	11.0	11.5	11.1
6	9.4	9.0	8.3	10.7	14.5	8.2	7.0	10.2	8.4	12.0	12.0	10.2
7	9.4	8.6	9.4	9.3	14.5	5.9	5.9	10.2	8.4	84	12.0	10.2
8	9.4	9.0	8.6	11.6	12.6	5.6	5.9	10.2	35	19.3	12.0	10.7
9	9.4	21.0	8.3	8.9	9.3	5.6	5.6	19.1	25	12.0	12.0	10.7
10	9.4	15.0	9.7	7.8	8.6	5.3	13.1	21	14.5	11.5	12.4	10.2
11	9.4	20.0	14.1	8.6	22	5.0	74	15.5	8.4	14.9	12.4	10.2
12	9.4	15.5	9.0	8.6	12.1	5.0	83	41	8.0	13.8	12.4	9.3
13	9.4	10.2		8.2	19.5	5.0	18.9	15.5	7.3	12.4	12.4	8.9
14	10.2	9.4		8.6	10.2	5.0	244	13.5	12.6	12.4	12.4	8.9
15	10.2	9.4		38	8.9	5.0	65	12.0	7.3	12.0	12.4	8.6
16	9.4	9.8	11.5	15.0	13.1	5.0	34	14.0	7.7	12.0	12.0	9.7
17	9.4	9.4		9.7	8.2	5.0	70	13.0	7.7	18.9	12.0	11.1
18	9.4	9.0		8.6	7.0	5.3	72	12.5	8.0	29	16.2	10.2
19	9.4	9.4		8.2	6.7	5.3	35	14.0	8.0	25	13.5	9.3
20	9.4	10.2	7.9	8.2	6.7	5.3	67	13.5	8.0	26	11.6	10.2
21	9.4	9.4	7.9	8.2	13.1	5.3	33	13.5	8.0	13.3	9.3	
22	9.4	11.0	7.9	8.6	7.0	5.3	27	13.0	8.4	12.8	10.2	
23	9.4	9.0	7.9	8.6	5.9	5.3	18.8	17.1	8.0	12.8	11.1	
24	9.0	8.6	7.9	8.2	5.9	5.3	14.0	13.0	8.0	14.4	11.1	9.7
25	9.0	8.3	7.5	8.2	23	5.3	12.5	73	8.4	23	11.6	
26	9.4	8.3	7.5	9.3	10.7	5.3	12.5	16.3	10.4	25	10.2	
27	9.4	8.3	7.9	8.2	6.7	5.3	14.0	15.0	80	14.4	10.2	9.7
28	9.8	8.3	7.5	8.2	5.6	5.3	12.0	14.4	13.6	12.8	9.7	9.7
29	9.4	8.3	7.1	8.2	5.6	5.3	12.0	------	11.0	12.4	11.1	9.7
30	9.0	7.9	7.1	8.2	5.6	5.3	13.0	------	12.0	12.4	11.1	9.7
31	9.0	7.9	------	7.8	------	5.3	35	------	123	------	11.6	------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow at upper station on this stream. See under "Accuracy" in station description.

Monthly discharge of Waikolu Stream at pipe-line crossing, near Kalaupapa, Molokai, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	10.2	9.0	9.48	14.7	294	902
August	21	7.9	10.3	15.9	318	980
September	----------	7.1	9.17	14.2	275	844
October	38	7.1	10.3	15.9	318	980
November	23	5.6	10.5	16.2	316	967
December	8.2	5.0	5.60	8.66	174	533
January	244	5.6	34.1	52.8	1,060	3,240
February	73	10.2	16.6	25.7	465	1,430
March	123	7.3	16.6	25.7	515	1,580
April	114	11.0	22.2	34.3	667	2,040
May	16.2	9.3	11.8	18.3	365	1,120
June	13.1	8.6	10.0	15.5	301	921
The year	244	5.0	13.9	21.5	5,070	15,500

ISLAND OF MAUI

HONOKAHAU STREAM NEAR HONOKAHAU, MAUI

LOCATION.—1,000 feet above intake of Honokahau ditch at elevation 910 feet, 6 miles southeast of Honokahau.

RECORDS AVAILABLE.—March 7, 1913, to September 19, 1920, and May 2, 1922, to June 30, 1923. Staff gage readings at old site on diversion dam August 13 to December 31, 1911.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 600 feet below gage.

CHANNEL AND CONTROL.—Bed of stream composed of small boulders and gravel. One channel at all stages; curved above and below gage. Left bank high and clean; right bank medium high, sloping, and covered with vegetation. Control composed of large boulders and coarse gravel; shifts during extremely high stages.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during period May 1, 1922, to June 30, 1923, 1,370 million gallons per day or 2,120 second-feet, at 12.45 a. m. January 14, 1923 (gage height, 6.60 feet); minimum discharge recorded, 8.6 million gallons per day or 13.3 second-feet, at 7 a. m. July 5, 1922 (gage height, 1.42 feet).

1913–1920; 1922–23: Maximum stage recorded, 8.25 feet at 7.30 a. m. January 18, 1916 (discharge, from extension of rating curve, 1,900 million gallons per day or 2,940 second-feet); minimum stage recorded, 1.19 feet from 10 a. m. to 2 p. m. August 11, 1920 (discharge, 5.1 million gallons per day or 7.9 second-feet).

DIVERSIONS.—None above station. All ordinary stream flow and inflow from two development tunnels below gage is diverted into Honokahau ditch 1,000 feet below station.

REGULATION.—None.

OBJECT OF STATION.—To determine resources of stream.

UTILIZATION.—Normal flow of stream diverted into Honokahau ditch for irrigation of sugar cane and for development of power.

ACCURACY.—Stage-discharge relation permanent during period. Rating curve well defined between 6 and 100 million gallons per day and fairly well defined between 100 and 500 million gallons per day. Operation of water-stage recorder satisfactory except during August, September, December, and January. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which should be used with caution owing to fact that there are no adjacent stations with which to compare the flow of this stream.

Discharge measurements of Honokahau Stream near Honokahau, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 10	S. B. Hall	1.70	24.8	16.0	Jan. 16	John McCombs	1.86	37	23.8
Sept. 23	John McCombs	1.54	20.8	13.4	Apr. 16	do	1.57	21	13.6

Discharge, in million gallons per day, of Honokahau Stream near Honokahau, Maui, for the years ending June 30, 1922 and 1923

Day	May	June	Day	May	June	Day	May	June
1922			1922			1922		
1	18	14.6	11	24	15.6	21	17.4	19.8
2	17.8	14.6	12	17.4	17.4	22	15.6	13.6
3	17.4	14.6	13	15.6	11.3	23	17.8	24
4	29	14.6	14	15.3	10.4	24	25	11.9
5	26	14.6	15	16.4	10.6	25	35	11.3
6	18.1	14.2	16	16.4	10.9	26	43	10.9
7	17.0	13.9	17	16.4	10.6	27	23	10.6
8	32	16.4	18	15.6	10.1	28	17.8	10.6
9	16.7	17.8	19	18.1	10.6	29	15.6	10.4
10	35	15.0	20	33	15.3	30	15.0	10.4
						31	14.6	

Discharge, in million gallons per day, of Honokahau Stream near Honokahau, Maui, for the years ending June 30, 1922 and 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1922-23												
1	10.4	12.2			23	22		19.5	12.2	64	14.2	15.2
2	10.1	12.6		29	13.6	12.9		15.0	11.9	63	15.5	12.2
3	9.6	85			17.7	29	16	14.2	11.9	15.3	22	12.2
4	9.1	18.6	15	41	17.6	17.9		13.9	11.6	14.6	14.6	64
5	10.6	12.2		71	86	24		13.9	12.2	13.2	13.6	23
6	10.4	11.6		38	36			13.6	15.2	12.6	13.9	13.6
7	10.6	13.9		32	39			13.2	13.2	44	13.6	11.9
8	10.6	73		17.4	44		35	13.2	53	29	13.2	11.6
9	23	43		16.0	17.0			33	29	13.9	13.2	11.6
10	13.6	33		13.6	13.9			45	16.7	12.9	12.6	11.3
			40									
11	17.8	45		13.6	22		36	16.7	16.1	49	12.6	11.3
12	15.6	42		13.9	16.2		179	37	13.2	30	12.6	13.8
13	13.9	15.6		12.9	32		20	17.8	11.9	15.6	12.2	15.6
14	13.6	14.2		12.9	19.2		286	14.6	13.6	31	12.2	15.5
15	12.6	17.0		47	26		115	13.9	12.2	13.9	13.2	21
16	12.6	15.3		72	46		26	13.6	11.9	15.3	26	15.0
17	12.9	17.0		18.5	16.4		149	13.2	11.6	30	25	17.6
18	15.3	15.2	25	25	13.2		155	12.9	11.6	82	19.0	13.2
19	17.0	34		17.0	18.8	13	94	15.6	14.2	23	15.3	12.2
20	13.6	14.2		13.9	13.6		99	14.2	11.6	58	15.6	13.6
21	12.6	14.2		13.6	19.9		27	40	11.3	23	18.2	11.9
22	16.9	16.7		84	12.9		21	17.9	32	21	22	11.6
23	16.0	12.9		19.7	12.2		23	35	67	48	14.6	11.6
24	21			23	11.9		17.0	13.6	31	29	15.0	15.9
25	26			20	70		15.6	54	20	16.7	14.2	18.1
			14									
26	17.2			17.8	51		15.3	32	31	40	13.6	19.3
27	28	14		14.2	17.8		15.0	15.0	41	19.2	15.3	19.4
28	34			13.6	14.2		14.6	13.9	16.7	18.1	12.6	34
29	13.6			15.0	12.9		14.2	-------	12.9	16.4	11.9	36
30	13.6			13.9	12.6		14.2	-------	12.2	16.7	13.9	18.6
31	17.0	-------		45	-------		51	-------	71	-------	16.0	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow at station on Hoolawanui Stream near Huelo. Discharge estimated for May 1, 1922. Gage-height graph partly estimated May 2, 4, 5, June 12, and 13, 1922.

Monthly discharge of Honokahau Stream near Honokahau, Maui, for the years ending June 30, 1922 and 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1922						
May	43	14.6	21.1	32.6	655	2,010
June	24	10.1	13.6	21.0	407	1,250
The period					1,060	3,260
1922-23						
July	34	9.1	15.4	23.8	479	1,470
August	85	11.6	22.6	35.0	700	2,150
September			23.7	36.7	711	2,180
October	84	12.9	27.2	42.1	842	2,590
November	86	11.9	25.6	39.6	767	2,360
December	29		14.3	22.1	444	1,360
January	286		53.0	82.0	1,640	5,040
February	54	12.9	20.9	32.3	585	1,800
March	71	11.3	21.3	33.0	661	2,030
April	82	12.6	29.3	45.3	878	2,700
May	26	11.9	15.4	23.8	477	1,470
June	64	11.3	17.7	27.4	532	1,630
The year	286	9.1	23.9	37.0	8,720	26,800

HONOKAWAI DITCH NEAR LAHAINA, MAUI

LOCATION.—75 feet below intake on Honokawai Stream, 25 feet inside of ditch tunnel, 2¼ miles above Pioneer Mill Co.'s power house and 7½ miles northeast of Lahaina.

RECORDS AVAILABLE.—May 28, 1921, to June 30, 1923. At station 1½ miles downstream, November 14, 1918, to May 27, 1921; at station half a mile downstream on old ditch line, July 1, 1912, to December 31, 1917. Records not comparable.

GAGE.—Gurley weekly water-stage recorder; installed April 15, 1919. Stevens continuous recorder, November 14, 1918, to April 15, 1919. Staff gage prior to November 14, 1918.

DISCHARGE MEASUREMENTS.—Made from plank across ditch.

CHANNEL AND CONTROL.—Concrete-lined ditch section in tunnel a quarter of a mile long; subject to backwater from collection of gravel at a point where tunnel widens, about 500 feet below gage.

EXTREMES OF DISCHARGE.—Maximum recorded during year, 69 million gallons per day or 107 second-feet, at 4.15 p. m. September 10 (gage height, 2.71 feet); minimum recorded, 1.4 million gallons per day or 2.2 second-feet, at 9 a. m. February 26 (gage height, 0.06 foot).

1921–1923 (present station): Maximum and minimum discharge for period same as for 1922–23 above.

1912–1923: Maximum discharge for period recorded at present station on September 10, 1922; minimum discharge, 0.32 million gallons per day or 0.5 second-foot, occurred at station 1½ miles downstream at 9 p. m. November 14, 1918.

DIVERSIONS.—Flood-water diversion ditch 1½ miles below station diverts part of flood flow when floodgates are open. Gates 30 feet above station may also be used to divert flood water.

REGULATION.—By head gates and by floodgates noted under "Diversions."

OBJECT OF STATION.—Most of drainage area in Territorial lands. Data valuable in relation to Territorial lease to Pioneer Mill Co.

UTILIZATION.—Water used for development and irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent; high-water rating entirely changed August 2; other changes occurred January 14, March 23, April 18, and June 21. Rating curve used July 1 to August 2, well defined between 2 and 40 million gallons per day; curve used August 3 to January 14, March 24 to April 18, and June 22–30, well defined between 3 and 17 million gallons per day; curve used January 14 to March 23, fairly well defined between 3 and 15 million gallons per day; curve used April 19 to June 21, fairly well defined for ordinary stages. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for all stages prior to August 2; thereafter they are good below about 20 million gallons per day; above that quantity they are subject to error owing to poor definition of rating curve.

Honokawai ditch diverts from Honokawai Stream at elevation about 1,570 feet. The water is carried southwest through a tunnel about 1¼ miles long to elevation about 1,550 feet. Here the general course of the ditch changes to north of west and the water is carried down a small gulch to power house No. 1 at elevation about 950 feet and thence nearly due south to the vicinity of Lahaina where the water is used by the Pioneer Mill Co. for irrigation and development of sugar cane. The system comprises about 5½ miles of main ditch.

Discharge measurements of Honokawai ditch near Lahaina, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 7	William Maxwell[a]	0.55	10.6	6.8	Feb. 27	John McCombs	0.42	5.4	3.5
Oct. 2	John McCombs	.36	7.2	4.7	Apr. 17	do	.31	6.0	3.9
Nov. 9	do	.34	7.5	4.9	May 30	do	.32	5.5	3.5
Jan. 17	do	1.08	18.3	11.8	June 21	do	.22	5.4	3.5

[a] Engineer for Pioneer Mill Co.

Discharge, in million gallons per day, of Honokawai ditch near Lahaina, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	6.4	5.9	5.9	4.6	6.6	6.3	3.9	3.0	3.6	20	3.8	4.2
2	6.3	11.2	10.9	4.6	4.2	4.4	5.0	3.1	3.5	11.1	3.6	3.6
3	6.3	17.3	9.2	5.1	5.0	12.6	4.4	3.2	3.3	5.4	4.9	3.5
4	6.3	8.2	8.8	8.2	7.4	5.5	3.9	3.2	3.2	4.7	3.8	13.7
5	6.2	7.2	9.5	9.2	12.7	5.2	3.8	3.1	3.1	4.6	3.5	6.3
6	6.2	7.0	6.0	7.8	12.5	5.1	4.4	3.1	3.8	4.4	3.5	3.8
7	6.2	7.6	9.9	5.8	10.5	5.0	6.0	3.1	4.6	10.3	3.5	3.6
8	6.2	33	5.6	4.6	7.5	4.3	8.8	3.1	20	7.0	3.5	3.5
9	10.4	40	9.6	4.4	4.4	4.2	6.7	4.0	9.8	4.3	3.5	3.7
10	6.8	15.7	16.7	4.0	4.1	4.2	8.4	9.7	4.6	4.1	3.5	3.9
11	6.6	21	19.2	4.0	4.2	4.2	7.8	4.3	4.1	12.7	3.5	3.6
12	6.8	22	8.6	4.0	4.7	4.0	32	9.0	3.4	8.2	3.5	3.8
13	6.3	7.8	7.0	4.0	4.7	3.9	4.8	4.4	2.9	4.3	3.5	4.2
14	6.2	7.0	6.4	4.0	4.7	3.9	13.9	3.3	3.7	8.5	3.5	5.3
15	6.0	8.3	8.4	11.0	5.6	4.0	3.7	2.8	3.2	4.3	3.5	6.6
16	5.6	7.4	6.9	16.8	11.9	4.0	4.0	2.8	3.0	4.4	8.0	5.1
17	5.4	8.0	6.7	5.0	5.2	4.0	10.4	2.8	3.0	16.0	7.2	6.1
18	5.5	7.0	18.0	8.0	4.6	4.0	7.2	2.8	3.0	32	6.4	4.5
19	7.3	12.4	6.7	4.9	5.4	4.0	4.7	2.9	3.3	14.3	4.2	4.2
20	6.3	7.2	12.1	4.3	4.2	4.0	5.8	2.8	3.0	10.6	4.3	4.3
21	6.0	6.4	8.8	4.4	5.1	3.9	5.1	9.5	2.8	8.4	5.2	3.8
22	6.2	8.3	5.1	19.2	4.1	3.7	4.0	4.0	5.7	8.2	8.2	3.5
23	6.9	5.8	4.9	7.5	3.9	3.8	4.9	9.8	17.5	14.1	4.1	3.5
24	10.7	5.6	4.8	7.2	3.8	3.8	3.9	3.4	11.5	5.6	3.9	3.7
25	12.5	5.4	4.6	6.4	13.2	3.8	3.7	3.8	9.2	3.9	3.9	4.0
26	8.3	5.2	4.6	5.9	9.6	3.8	3.3	3.4	10.4	12.1	3.7	3.9
27	9.2	5.2	7.2	4.9	4.6	3.8	3.2	3.8	9.4	4.4	4.0	3.6
28	11.5	5.2	8.4	4.8	4.2	3.9	3.2	3.7	4.9	5.3	3.6	4.4
29	6.0	5.1	6.0	4.6	4.0	3.9	3.1	-------	4.1	4.8	3.5	4.4
30	5.7	5.2	4.6	4.3	3.8	3.9	3.1	-------	4.0	4.6	3.9	5.2
31	6.5	9.8	-------	4.0	-------	3.9	3.1	-------	19.0	-------	4.5	-------

NOTE.—Daily discharge Sept. 30 to Oct. 7 and Oct. 28 to Nov. 15, ascertained from occasional staff gage readings made by employee of Pioneer Mill Co. Gage height estimated for December 12.

Monthly discharge of Honokawai ditch near Lahaina, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	12.5	5.4	7.06	10.9	219	672
August	40	5.1	10.6	16.4	328	1,001
September	19.2	4.6	8.37	13.0	251	771
October	19.2	4.0	6.37	9.86	198	606
November	13.2	3.8	6.21	9.61	186	572
December	12.6	3.7	4.48	6.93	139	426
January	32	3.1	6.14	9.50	190	584
February	9.8	2.8	4.21	6.51	118	362
March	20	2.8	6.15	9.52	191	585
April	32	3.9	8.75	13.5	263	806
May	8.2	3.5	4.30	6.65	133	409
June	13.7	3.5	4.58	7.09	138	422
The year	40	2.8	6.45	9.98	2,350	7,220

KANAHA STREAM[2] ABOVE PIPE-LINE INTAKE, NEAR LAHAINA, MAUI

LOCATION.—200 feet above intake of pipe line supplying Lahaina and Lahainaluna school and 2½ miles northeast of Lahaina, at elevation 1,057 feet.

RECORDS AVAILABLE.—February 29, 1916, to June 30, 1923. From August 5, 1911, to January 18, 1916, at a station about a mile downstream.

GAGE.—Stevens continuous water-stage recorder; installed August 27, 1919, to replace Gurley printing water-stage recorder previously used. Gage datum raised 0.48 foot on June 21, 1923.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; fairly straight near gage; filled with large boulders; banks steep and high. Control composed of large boulders; fairly permanent. Control stabilized to some extent by grouting, on June 21, 1923.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 120 million gallons per day or 186 second-feet, at 3 p. m. September 11 (gage-height, 3.92 feet); minimum discharge recorded, 2.0 million gallons per day or 3.1 second-feet, from December 24 to January 1 (gage-height, 0.95 foot).

1916–1923: Maximum discharge recorded, 314 million gallons per day or 486 second-feet, at 10.30 a. m. November 26, 1918 (gage-height, 3.79 feet); minimum recorded, 1.8 million gallons per day or 2.8 second-feet, August 9–11 and 17–19, 1920 (gage-height, 0.92 foot), and at 11 p. m. November 14, 1921 (gage height, 0.93 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—Data valuable with relation to Territorial agreement with Pioneer Mill Co. pertaining to division of water.

UTILIZATION.—Water used for domestic supply, development of power, and irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent; changed gradually during periods July 1 to September 18 and February 27 to April 30; changed by grouting on control and changing gage datum on June 20. Standard rating curve used July 1 to June 20, well defined between 1.5 and 60 million gallons per day; used direct September 19 to February 26 and May 1 to June 20; indirect method for shifting control used for intervening periods. Curve used June 21–30, well defined between 2 and 20 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day; for days during periods of shifting control the discharge thus obtained was corrected on basis of the plotting of individual discharge measurements with respect to the standard curve. Records good except those for high stages and for periods of shifting control.

Discharge measurements of Kanaha Stream above pipe-line intake, near Lahaina, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 22	1.01	3.9	2.5	May 30	0.62	6.0	3.9
Feb. 27	.50	5.0	3.2	June 22	.42	3.5	2.2
Apr. 15	.52	4.4	2.9				

[2] "Lahainaluna Stream" in previous reports. Decision of U. S. Geographic Board.

Discharge, in million gallons per day, of Kanaha Stream above pipe-line intake, near Lahaina, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.6	3.3	2.7	2.3	3.1	2.2	2.1	4.0	3.1	13.7	2.7	2.9
2	3.6	3.3	4.2	2.3	3.0	2.2	4.4	2.9	2.8	12.5	2.7	2.3
3	3.6	11.0	5.0	8.6	3.3	5.0	2.5	2.9	2.7	3.4	3.1	2.2
4	3.6	3.5	4.9	6.3	15.0	2.8	2.1	2.8	2.7	3.3	2.5	6.5
5	4.2	3.3	4.1	7.3	24	2.3	2.1	2.8	2.6	3.2	2.3	3.3
6	3.6	3.2	2.6	4.9	12.0	2.7	2.2	2.8	3.6	2.9	2.3	2.3
7	3.5	3.7	3.7	4.2	5.8	2.9	3.3	2.8	3.0	2.9	2.2	2.2
8	3.5	14.0	2.5	3.0	3.7	2.2	4.9	2.8	23	3.1	2.2	2.2
9	5.4	14.5	3.3	2.5	2.8	2.2	3.9	2.8	15.3	2.9	2.2	2.1
10	3.6	5.6	10.2	2.4	2.5	2.2	3.1	3.3	8.6	2.8	2.2	2.1
11	3.5	9.9	19.8	2.3	2.5	2.2	8.6	2.9	7.8	4.4	2.2	2.1
12	3.5	5.3	3.6	2.3	2.5	2.2	25	4.8	3.1	3.9	2.2	2.2
13	3.6	3.2	2.6	2.3	2.4	3.4	2.8	3.0	2.9	2.9	2.2	2.7
14	3.5	3.0	2.5	2.2	2.3	2.2	34	2.8	4.2	3.3	2.2	4.2
15	3.6	3.3	2.6	5.6	2.3	2.2	27	2.7	2.9	2.8	2.2	4.1
16	3.7	3.1	2.6	8.7	4.2	2.2	8.6	2.7	2.9	3.3	5.6	4.9
17	3.7	3.3	3.4	2.5	2.7	2.2	39	2.7	2.8	9.5	5.8	6.0
18	5.8	3.0	9.4	2.7	2.3	2.1	9.8	2.7	2.8	16.3	6.4	2.7
19	5.0	3.9	2.9	2.4	2.9	2.1	4.9	2.7	2.8	9.6	3.5	2.2
20	3.5	2.8	2.7	2.3	2.3	2.1	7.7	2.7	2.7	4.4	4.1	2.4
21	3.4	2.9	2.5	2.4	2.7	2.1	4.2	4.3	2.8	3.8	4.8	2.3
22	3.4	3.9	2.4	10.9	2.3	2.1	3.7	3.4	4.7	6.8	4.4	2.3
23	3.4	2.6	2.2	3.0	2.2	2.1	4.4	4.8	10.2	5.6	3.5	2.3
24	4.8	2.6	2.2	3.7	2.2	2.1	3.1	2.9	6.3	3.5	2.7	2.6
25	7.0	2.6	2.2	4.2	2.7	2.0	2.8	9.5	3.7	3.1	3.5	3.0
26	4.2	2.6	2.2	3.3	3.1	2.0	2.7	7.0	4.1	8.5	2.9	4.0
27	3.9	2.5	4.8	2.5	2.3	2.0	2.7	3.4	2.8	3.2	3.8	2.6
28	5.6	2.5	2.7	2.4	2.2	2.0	2.8	2.9	2.8	5.3	2.3	3.0
29	3.3	2.7	2.3	2.4	2.2	2.0	2.8	-------	2.8	4.3	2.2	3.8
30	3.3	2.7	2.3	2.4	2.2	2.0	2.8	-------	2.8	6.7	4.8	2.7
31	3.3	3.2	-------	3.3	-------	2.0	11.6	-------	12.2	-------	4.6	-------

Monthly discharge of Kanaha Stream above pipe-line intake, near Lahaina, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	7.0	3.3	3.97	6.14	123	378
August	14.5	2.5	4.42	6.84	137	420
September	19.8	2.2	4.04	6.25	121	372
October	10.9	2.2	3.79	5.86	118	361
November	24	2.2	4.19	6.48	126	386
December	5.0	2.0	2.32	3.59	72.0	221
January	39	2.1	7.79	12.1	242	741
February	9.5	2.7	3.49	5.40	97.8	300
March	23	2.6	5.08	7.86	158	483
April	16.3	2.8	5.40	8.36	162	497
May	6.4	2.2	3.24	5.01	100	308
June	6.5	2.1	3.01	4.66	90.2	277
The year	39	2.0	4.24	6.56	1,550	4,740

OLOWALU DITCH NEAR OLOWALU, MAUI

LOCATION.—425 feet above intake to penstock of hydroelectric power station, 1 mile above Olowalu, and 7 miles east of Lahaina.

RECORDS AVAILABLE.—July 28, 1916, to June 30, 1923. Replaces old station in tailrace of power house, for which records are available August 12, 1911, to June 30, 1916.

GAGE.—Stevens continuous water-stage recorder; installed June 9, 1919, to replace staff gage installed July 28, 1916. Recorder ratio changed from 1:6 to 5:12 on May 31, 1923.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel about 3.5 feet wide cut in earth and rock; straight for 50 feet above and below gage. Control not well defined.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 11.2 million gallons per day or 17.3 second-feet, at noon January 14 (gage height, 1.32 feet); minimum discharge, no flow, when water was turned out of ditch November 6 and part of day November 7, 9, and 10.

1916–1923: Maximum discharge recorded, 18 million gallons per day or 28 second-feet, at 3 a. m. December 25, 1920 (gage height, 1.53 feet); minimum discharge recorded, ditch occasionally dry.

DIVERSIONS.—None.

REGULATION.—By head gates.

OBJECT OF STATION.—Data valuable in relation to Territorial lease to Olowalu Co.

UTILIZATION.—After passing through power house water is used for irrigation of sugar cane. A small amount is sometimes diverted for irrigation at higher levels and does not pass through power house.

ACCURACY.—Stage-discharge relation changed January 15. Rating curve used prior to that date, fairly well defined between 1 and 10 million gallons per day; curve used thereafter, well defined between 2 and 10 million gallons per day. Operation of water-stage recorder satisfactory except for one short period. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good above 1 million gallons per day.

Olowalu ditch diverts from Olowalu Stream at elevation about 450 feet. The water is carried about 1 mile southwestward along the side of Olowalu Gulch to a point where it drops about 200 feet to a power house; thence it continues southwestward for about 1 mile to a point near Olowalu where the water is used for irrigation of sugar cane by the Olowalu Co.

Discharge measurements of Olowalu ditch near Olowalu, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 22	0.48	6.1	3.9	Jan. 18	1.32	12.9	8.3
Nov. 12	.62	6.7	4.4	Apr. 15	1.13	10.8	7.0
Dec. 4	.53	6.2	4.0	May 31	.77	7.3	4.7

Discharge, in million gallons per day, of Olowalu ditch near Olowalu, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.3	2.8	2.9	2.6	3.8	3.5	2.3	5.9	7.8	1.3	5.6	4.4
2	3.2	2.8	3.4	2.6	3.3	3.4	2.4	4.7	5.6	2.8	5.6	3.9
3	3.1	7.4	3.6	4.1	3.2	4.0	2.5	4.4	5.3	3.9	5.6	3.9
4	3.1	5.6	3.1	3.9	3.8	4.2	2.3	4.2	4.7	5.0	5.3	4.7
5	2.9	3.6	4.2	10.0	2.8	4.0	2.3	3.9	4.7	7.4	5.3	4.8
6	2.9	3.1	3.5	9.5	.0	3.8	2.2	3.6	4.4	6.5	5.3	5.0
7	2.9	3.1	3.8	8.0	2.5	3.5	2.8	3.6	4.2	6.2	5.0	4.4
8	2.9	5.3	3.1	5.6	8.6	3.2	2.6	3.4	4.2	5.6	5.0	4.2
9	3.4	10.5	2.8	4.4	2.0	3.0	3.0	4.2	5.8	4.7	5.0	3.9
10	3.1	10.0	5.3	3.8	3.7	2.9	3.5	4.4	7.4	4.2	4.7	3.9
11	3.1	10.2	10.0	4.8	5.2	2.8	3.5	3.9	7.4	6.3	4.7	3.6
12	3.3	9.5	9.5	4.2	4.4	2.7	11.0	4.2	6.8	7.8	4.7	3.6
13	3.3	6.6	7.0	3.6	4.0	3.1	8.5	3.9	6.2	7.4	4.7	3.6
14	3.4	4.8	4.8	3.2	3.6	2.7	10.0	3.6	7.4	7.8	4.4	3.6
15	3.3	4.3	4.8	4.4	3.7	2.6	7.1	3.6	6.8	7.1	4.7	3.9
16	3.0	4.0	3.9	10.0	7.5	2.6	5.6	3.4	6.2	6.5	5.0	3.6
17	2.9	4.0	3.6	7.0	4.8	2.5	8.4	3.2	5.6	6.8	5.3	3.9
18	2.9	3.9	6.6	5.2	3.9	2.5	8.2	3.2	5.3	7.8	4.7	3.6
19	2.9	5.7	4.8	4.3	3.7	2.5	8.1	3.2	5.0	7.8	4.4	3.4
20	2.8	4.4	4.0	3.8	3.4	2.4	8.1	2.9	4.7	7.8	4.4	3.4
21	2.8	3.9	3.8	3.7	3.6	2.4	7.8	4.3	4.4	7.4	4.4	3.4
22	3.0	3.8	3.5	10.0	3.1	2.3	7.8	5.9	5.8	7.1	4.4	
23	2.9	3.3	3.2	8.5	3.0	2.3	7.8	5.6	7.8	6.8	4.2	
24	3.3	3.1	3.0	6.6	2.9	2.3	7.1	5.0	7.8	6.5	4.0	
25	3.3	3.1	2.9	5.6	3.7	2.3	6.5	4.5	7.1	6.5	4.2	
26	3.8	3.1	2.8	5.2	8.0	2.6	5.9	4.0	7.4	7.8	4.2	4
27	3.2	2.8	3.5	4.3	4.4	2.4	5.3	5.3	6.5	7.1	4.2	
28	4.9	2.7	3.0	3.9	3.9	2.4	5.0	6.2	5.3	6.5	3.9	
29	3.3	2.8	2.8	3.7	3.5	2.3	4.7	-------	5.0	6.2	3.9	
30	2.9	2.8	2.6	3.5	3.2	2.2	4.2	-------	4.7	5.9	3.9	
31	2.9	2.9	-------	3.4	-------	2.2	5.2	-------	4.2	-------	4.3	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated, because of lack of gage-height record, by comparison with records of flow of Kanaha Stream. Gage-height graph partly estimated Nov. 5–7.

Monthly discharge of Olowalu ditch near Olowalu, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	4.9	2.8	3.16	4.89	98.0	301
August	10.5	2.7	4.71	7.29	146	448
September	10.0	2.6	4.19	6.48	126	386
October	10.0	2.6	5.27	8.15	163	501
November	8.6	.0	3.91	6.05	117	360
December	4.2	2.2	2.83	4.38	87.6	269
January	11.0	2.2	5.54	8.57	172	527
February	6.2	2.9	4.22	6.53	118	363
March	7.8	4.2	5.85	9.05	182	557
April	7.8	1.3	6.28	9.72	188	578
May	5.6	3.9	4.68	7.24	145	445
June	----------	3.4	3.96	6.13	119	365
The year	11.0	.0	4.55	7.04	1,660	5,100

HANAWI STREAM NEAR NAHIKU, MAUI

LOCATION.—200 feet above Koolau ditch intake and trail, 2 miles southwest of Nahiku post office, 6½ miles east of Upper Keanae, and 11½ miles by road and trail west of Hana.

RECORDS AVAILABLE.—January 9, 1914, to January 6, 1916, and November 1, 1921, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder. Datum raised 0.12 foot November 1, 1921.

DISCHARGE MEASUREMENTS.—Made from footbridge 100 feet above gage or by wading.

CHANNEL AND CONTROL.—Channel at gage is a pool with nearly vertical rock walls. Control is rock ledge; permanent.

EXTREMES OF DISCHARGE.—Maximum recorded during year, about 472 million gallons per day or 730 second-feet, at 3.30 a. m. November 8, 1922 (gage height, 6.51 feet); a stage probably at least 2 feet higher occurred on January 14 when recorder was not operating properly. Minimum recorded, 1.5 million gallons per day or 2.3 second-feet, for several hours July 16, 17, 20, and 21 (gage height, 0.20 foot).

1914–1916; 1921–1923: Maximum stage, about 20 feet during flood of January 18, 1916 (determination of discharge not feasible); minimum recorded in July, 1922.

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Normal flow is diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 50 million gallons per day and fairly well defined above that quantity to 150 million gallons per day. Operation of water-stage recorder satisfactory except during January and February. Daily discharge ascertained by applying to rating table mean daily gage heights obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated and those for extremely high stages which are fair.

Discharge measurements of Hanawi Stream near Nahiku, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 17	0.39	4.4	2.8	Nov. 24	0.76	9.9	6.4
Nov. 3	.60	7.0	4.5	Apr. 9	.91	10.6	6.8

Discharge, in million gallons per day, of Hanawi Stream near Nahiku, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.8	1.7	1.7	2.2	4.3	7.5	2.5		3.9	66	11.0	6.6
2	1.8	1.8	1.8	2.7	4.0	6.1	2.7		3.7	20	9.6	4.9
3	1.8	5.0	1.8	10.3	4.1	6.6	5.8		3.9	7.0	9.6	4.5
4	1.8	2.7	2.2	7.9	8.5	6.2	4.5		4.3	10.2	6.3	5.7
5	1.8	2.2	2.9	11.7	40	5.7	3.2	5.7	3.5	8.1	5.5	4.5
6	1.8	2.1	2.1	8.8	64	5.3	3.5		3.8	6.6	13.0	3.9
7	1.8	2.4	3.2	8.0	52	5.2	3.2		4.3	22	7.2	3.8
8	1.8	5.1	2.1	5.1	72	4.8	3.0		54	13.7	6.3	3.7
9	1.8	7.3	6.9	3.9	9.6	4.6	3.5		77	7.8	5.7	3.5
10	1.7	9.6	46	3.5	7.5	4.5	7.5		22	7.3	5.6	3.5
11	1.8	9.1	15.7	3.2	7.2	4.2	21	14	5.8	15.4	5.6	3.4
12	1.7	6.4	4.6	2.9	7.2	4.1			5.2	9.6	5.3	3.6
13	1.6	3.5	3.2	2.7	11.7	3.9			4.4	7.8	5.2	4.1
14	1.6	2.9	2.7	2.7	8.8	3.8			3.9	8.8	5.0	8.0
15	1.6	2.6	4.0	9.8	10.3	3.5			3.6	7.3	4.9	6.2
16	1.6	2.5	2.7	10.6	16.6	3.4	120	4.0	3.5	6.8	6.3	7.9
17	1.6	2.4	2.5	3.4	10.3	3.3			3.3	8.5	6.8	9.6
18	1.6	2.5	6.3	3.9	8.8	3.2			3.4	17.2	6.3	6.4
19	1.7	4.4	4.7	3.1	10.3	3.1			3.2	15.0	5.5	5.3
20	1.6	2.7	4.1	2.7	8.2	3.0		5.7	3.0	14.0	5.1	4.7
21	1.6	2.4	3.0	2.9	7.7	2.8		5.5	3.0	8.7	6.1	4.4
22	1.7	2.4	2.7	54	7.0	2.7		4.5	5.5	9.4	9.4	4.7
23	1.6	2.2	2.4	9.1	6.3	2.7		30	22	7.3	8.4	4.4
24	2.1	2.2	2.3	8.9	6.1	2.7		5.7	18.5	7.2	7.3	3.9
25	2.6	2.0	2.2	7.1	63	2.6		4.7	10.0	18.6	23	3.7
26	2.4	1.9	2.2	6.6	19.0	2.7	16	5.4	7.3	36	8.8	3.7
27	1.8	1.8	2.2	4.9	8.8	2.5		4.6	17.4	75	8.1	3.7
28	2.4	1.8	2.1	5.0	16.0	2.5		4.3	9.1	14.3	6.7	3.7
29	1.8	1.9	2.0	7.8	15.0	2.4		-------	6.1	15.2	6.1	4.1
30	1.7	1.8	1.9	4.7	14.0	2.5		-------	5.2	23	7.0	3.7
31	1.8	1.7	-------	4.7	-------	2.4		-------	81	-------	8.2	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Kapaula Stream.

Monthly discharge of Hanawi Stream near Nahiku, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.6	1.6	1.80	2.79	55.8	171
August	9.6	1.7	3.26	5.04	101	310
September	46	1.7	4.81	7.44	144	443
October	54	2.2	7.25	11.2	225	690
November	72	4.0	17.6	27.2	528	1,620
December	7.5	2.4	3.89	6.02	120	370
January	----------	2.5	42.5	65.8	1,320	4,040
February	----------	----------	7.50	11.6	210	644
March	81	3.0	13.1	20.3	405	1,250
April	75	6.6	16.5	25.5	494	1,520
May	23	4.9	7.58	11.7	235	721
June	9.6	3.4	4.79	7.41	144	441
The year	----------	1.6	10.9	16.9	3,980	12,200

KAPAULA STREAM NEAR NAHIKU, MAUI

LOCATION.—150 feet above Koolau ditch intake, 300 feet above ditch trail, 2½ miles southwest of Nahiku post office, and 6 miles east of Upper Keanae.

RECORDS AVAILABLE.—November 1, 1921, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge at gage.

CHANNEL AND CONTROL.—One channel at all stages; fairly straight for 75 feet above gage and curving to right over a series of falls below. Banks nearly perpendicular for 20 feet with little vegetation. Control is rock ledge; probably permanent.

EXTREMES OF DISCHARGE.—Maximum during year, from extension of rating curve, 800 million gallons per day or 1,240 second-feet, at 3.30 p. m. January 14 (gage height, 7.55 feet); minimum recorded, 0.9 million gallons per day, or 1.4 second-feet, for several hours July 15–18, 20, and 21 (gage height, 0.45 foot).

1921–1923: Maximum, from extension of rating curve, 930 million gallons per day or 1,440 second-feet, at 2.45 a. m. December 13, 1921 (gage height, 8.45 feet); minimum recorded in July, 1922.

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 1 and 35 million gallons per day; extended above 35 million gallons per day and subject to considerable error at high stages. Operation of water-stage recorder satisfactory except for period November to January. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records good for ordinary stages except those estimated, which are fair; high-stage records subject to error and should be used with caution.

Discharge measurements of Kapaula Stream near Nahiku, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Sept. 17[a]	John McCombs	0.58	2.0	1.3	Jan. 9[a]	John McCombs	0.75	5.1	3.3
18	do	1.12	16.8	10.9	Apr. 9[a]	M. H. Carson	.82	6.0	3.9

[a] Discredited owing to seepage loss between gage and measuring section.

Discharge, in million gallons per day, of Kapaula Stream near Nahiku, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.1	1.1	1.2	1.3	2.8			6.7	2.4	59	9.4	6.9
2	1.1	1.1	1.2	1.4	2.3			5.2	2.2	18.1	9.2	3.8
3	1.1	4.1	1.2	21	2.3			4.3	2.8	5.4	9.7	3.5
4	1.1	2.8	1.4	10.1	15.5			4.0	3.5	11.7	5.1	5.2
5	1.1	1.8	2.2	13.6	62		2.3	3.6	2.4	7.1	4.5	3.8
6	1.0	1.5	2.0	8.9	85			3.4	2.4	4.4	17.4	2.9
7	1.0	1.4	3.0	7.3	50			3.0	3.9	35	4.4	2.4
8	1.0	4.0	2.3	4.0	55	2.8		2.8	63	15.2	3.8	2.2
9	1.1	8.5	7.6	2.9	6.1			18.2	43	4.9	3.4	2.1
10	1.1	10.2	73	2.1	4.9		6.6	57	13.4	4.1	3.0	1.9
11	1.1	14.9	17.2	1.8	5.7		28	6.2	5.9	18.9	2.8	1.8
12	1.1	6.5	3.9	1.6	6.3		163	4.0	4.3	6.5	2.6	1.9
13	1.0	2.9	2.6	1.5	13.9		75	4.3	3.6	4.1	2.3	2.1
14	1.0	1.9	1.8	1.4	6.3		237	3.1	2.9	6.4	2.2	5.8
15	1.0	1.7	2.7	13.5	8.2		184	2.7	3.0	4.0	2.2	4.7

Discharge, in million gallons per day, of Kapaula Stream near Nahiku, Maui, for the year ending June 30, 1923– Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
16	0.9	1.6	2.4	10.0	18.8		26	2.4	3.5	3.5	3.2	7.3
17	.9	1.5	1.9	2.7	6.7		196	2.2	3.5	7.6	4.6	10.2
18	.9	1.7	8.1	2.9	5.2		177	2.1	3.2	23	4.1	4.9
19	1.0	3.8	5.1	2.3	6.9		82	5.0	2.8	14.0	3.5	3.5
20	1.0	2.6	4.3	1.7	4.7		96	6.1	2.4	11.7	2.9	2.8
21	1.0	1.8	2.9	1.6	4.7		22	4.8	2.1	4.9	3.5	2.4
22	1.1	1.7	2.1	70	4.0		14.3	3.8	7.3	6.6	7.6	2.8
23	1.0	1.4	1.8	9.1	3.5	1.6	9.4	39	41	4.4	6.5	3.0
24	1.3	1.4	1.6	9.6	3.2		10.2	3.6	19.0	4.6	5.5	2.4
25	1.5	1.4	1.4	5.8	78		10.7	2.8	14.0	9.1	35	2.2
26	1.8	1.2	1.3	5.4	27		11.4	4.1	6.5	35	7.9	2.3
27	1.6	1.2	1.4	3.2			13.3	3.8	32	67	7.0	2.4
28	1.8	1.2	1.3	3.7	13		12.0	3.1	7.9	12.9	4.7	2.6
29	1.2	1.3	1.2	7.2			10.2	-------	3.9	15.3	4.4	3.0
30	1.2	1.2	1.1	2.6			14.9	-------	3.2	28	7.2	2.6
31	1.1	1.2	-------	2.8	-------		11.8	-------	57	-------	9.0	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Hanawi Stream. Gage-height graph partly estimated Nov. 2, 3, and 26.

Monthly discharge of Kapaula Stream near Nahiku, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.8	0.9	1.14	1.76	35.2	108
August	14.9	1.1	2.92	4.52	90.6	278
September	73	1.1	5.37	8.31	161	494
October	70	1.3	7.52	11.6	233	715
November	85	2.3	18.0	27.9	541	1,660
December	-------	-------	2.18	3.37	67.6	207
January	237	-------	46.2	71.5	1,430	4,400
February	57	2.1	7.55	11.7	211	649
March	63	2.1	11.9	18.4	368	1,130
April	67	3.5	15.1	23.4	452	1,390
May	35	2.2	6.41	9.92	199	610
June	10.2	1.8	3.51	5.43	105	323
The year	237	.9	10.7	16.6	3,900	12,000

KOOLAU DITCH AT NAHIKU WEIR, NEAR NAHIKU, MAUI

LOCATION.—Between Kapaula and Waiohue streams, three-quarters of a mile southwest of Nahiku post office, 6 miles east of Upper Keanae, and 12 miles by road and trail west of Hana.

RECORDS AVAILABLE.—February 12, 1919, to June 30, 1923. Gage readings made by east Maui Irrigation Co. available January 1, 1912, to February 11, 1919.

GAGE.—Stevens continuous water-stage recorder since April 27, 1922, when the Geological Survey began operating the station. Prior to that date Friez seven-day water-stage recorder was used, but discharge record is determined from twice-daily staff gage readings made by East Maui Irrigation Co.'s ditchman.

DISCHARGE MEASUREMENTS.—Made by weir at gage (see under "Channel and control") or from plank across ditch near gage.

CHANNEL AND CONTROL.—Open concrete-lined ditch below weir. Gage operates in weir basin into which the water discharges from a tunnel. Control formed by sharp-crested rectangular weir, 13.1 feet long, installed February 12, 1919; has complete end contractions and a free fall at all stages; velocity of approach negligible.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 44.8 million gallons per day or 69.3 second-feet, sometime during period of no record April 21 to May 26 (gage height, 1.41 feet); clock was stopped but pencil continued to operate thus giving the range of stage during the period. Minimum discharge recorded, no flow, 8.30 a. m. to 3 p. m. January 26, 9 a. m. to 3 p. m. January 27, and 10 a. m. to 5 p. m. January 28.

1919–1923: Maximum discharge recorded, 47.8 million gallons per day or 74.0 second-feet, during morning of September 3, 1919 (gage height, 1.48 feet); minimum discharge recorded, no flow, when intake gates are occasionally closed.

DIVERSIONS.—None near station except spillways.

REGULATION.—By gates at intervals.

OBJECT OF STATION.—To determine amount of water diverted through Koolau ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Weir rating curve well defined. Operation of water-stage recorder satisfactory except during April and May. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of day. Records excellent except those estimated which are fair.

Koolau ditch, at elevation about 1,200 feet, diverts the ordinary flow of all streams on the windward side of the crater of Haleakala between Makapipi and Alo streams inclusive. The continuation of the ditch west of Alo Stream, called Wailoa ditch, diverts the ordinary flow of all streams between Waikamoi and Halehaku streams inclusive. The general course of the ditch is northwestward along the side of Haleakala. The water is carried to a point near Paia where it is distributed for the irrigation of sugar cane, the development of power, and for domestic purposes on the plantations of Hawaiian Commercial & Sugar Co. and Maui Agricultural Co. The system comprises about 18 miles of main ditch which has a maximum carrying capacity of 145 million gallons per day; it is the most important of the East Maui Irrigation Co.'s ditches. Koolau ditch proper is about 8 miles long and has a carrying capacity of about 100 million gallons per day.

Discharge measurements of Koolau ditch at Nahiku weir, near Nahiku, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 17	0.52	16.5	10.7
Apr. 10	.94	39	25.5

Discharge, in million gallons per day, of Koolau ditch at Nahiku weir, near Nahiku, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	4.5	3.8	4.9	6.6	18.1	28	6.6	17.4	14.2	38		24
2	4.3	4.1	5.1	6.8	15.6	23	6.6	16.0	13.2	36		18.5
3	4.5	15.3	5.1	20	15.3	24	9.5	14.2	15.6	28		17.8
4	4.5	10.3	5.4	18.9	21	23	9.3	13.2	16.4	32		23
5	4.5	6.8	8.1	28	34	21	9.3	19.3	13.2	32	28	18.5
6	4.3	6.1	6.8	28	36	18.9	10.1	23	13.6	24		15.6
7	4.1	5.9	10.7	26	36	18.1	9.3	21	15.0	30		14.6
8	4.1	14.2	7.3	19.2	32	16.7	9.3	19.9	34	36		13.6
9	4.3	26	14.1	15.0	28	15.6	13.0	22	34	28		12.6
10	4.3	28	34	12.6	28	14.6	19.4	38	30	26		11.6
11	4.3	28	32	11.3	26	13.9	16.2	30	21	34	16	11.0
12	4.1	24	22	10.1	26	13.9	32	23	18.9	32		11.6
13	3.8	15.3	16.7	9.3	32	13.2	26	23	16.4	26		12.6
14	3.8	12.0	12.9	8.7	28	12.3	24	19.6	14.6	30		24
15	3.4	9.8	15.0	12.2	28	11.6	13.6	18.5	13.9	26		21
16	3.4	9.3	12.0	19.6	34	11.0	14.2	16.7	13.9	23		24
17	3.2	8.1	10.7	10.7	30	10.4	26	14.6	13.2	24		30
18	3.2	8.4	19.5	13.9	28	9.8	24	13.2	12.6	36		22
19	3.4	15.6	17.8	11.0	32	9.3	24	18.0	11.6	38		17.8
20	3.2	10.7	17.8	9.5	28	9.0	22	21	11.0	36	22	15.6
21	3.0	8.7	13.9	9.3	26	8.7	12.3	20	10.1			14.6
22	3.4	7.9	11.6	32	24	8.1	10.7	17.4	15.2			15.3
23	3.0	7.3	10.4	30	23	7.9	9.3	36	30			15.0
24	4.3	7.3	9.3	32	22	7.6	9.0	23	28		24	12.9
25	5.5	6.6	8.4	26	30	7.3	9.3	18.1	30		34	12.6
26	5.9	6.1	7.9	24	34	7.3	5.6	19.6	28	28	30	12.9
27	4.7	6.1	7.6	18.9	34	6.8	3.5	17.8	36		28	12.6
28	6.3	5.6	7.1	19.2	30	6.6	2.6	16.4	32		24	12.9
29	4.5	6.1	6.6	30	26	6.3	13.0	-------	24		22	15.0
30	4.1	5.6	6.1	18.9	24	6.1	18.9	-------	21		26	12.9
31	4.1	5.1	-------	18.5	-------	6.1	18.9	-------	28	-------	28	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Koolau ditch at Keanae.

Monthly discharge of Koolau ditch at Nahiku weir, near Nahiku, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	6.3	3.0	4.13	6.39	128	393
August	28	3.8	10.8	16.7	334	1,030
September	34	4.9	12.2	18.9	367	1,120
October	32	6.6	17.9	27.7	556	1,700
November	36	15.3	27.6	42.7	829	2,540
December	28	6.1	12.8	19.8	396	1,220
January	32	2.6	14.1	21.8	438	1,340
February	38	13.2	20.4	31.6	570	1,750
March	36	10.1	20.3	31.4	629	1,930
April	38	----------	29.8	46.1	895	2,740
May	----------	----------	23.5	36.4	728	2,240
June	30	11.0	16.5	25.5	496	1,520
The year	38	2.6	17.4	26.9	6,370	19,500

WAIOHUE STREAM NEAR NAHIKU, MAUI

LOCATION.—200 feet aboveKoolau ditch intake, 300 feet above ditch trail, 4 miles southwest of Nahiku post office, and 5 miles east of Upper Keanae.

RECORDS AVAILABLE.—October 9, 1921, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 150 feet above station and curving to left just below. Banks covered with brush and subject to overflow at high stages. Control for low stages is solid rock ledge; may scour at the ends during high stages.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 525 million gallons per day or 812 second-feet at 2.35 p. m. January 14 (gage height, 5.50 feet); minimum discharge recorded, 1.9 million gallons per day or 2.9 second-feet, for several hours July 15–23 (gage height, 0.55 foot).

1921–1923: Maximum discharge recorded, about 630 million gallons per day or 975 second-feet, at 3 a. m. December 13, 1921; minimum discharge recorded July 15–23, 1922.

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 2.5 and 30 million gallons per day; extended above 30 million gallons per day and subject to considerable error at high stages. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for ordinary stages; high-stage records subject to error and should be used with caution.

Discharge measurements of Waiohue Stream near Nahiku, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 18	1.05	11.3	7.3	Jan. 9	0.74	4.3	2.8
Nov. 3	.89	7.0	4.5	Apr. 10[a]	.98	10.7	6.9

[a] Discredited owing to unmeasurable inflow between gage and measuring section.

Discharge, in million gallons per day, of Waiohue Stream near Nahiku, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.4	2.1	2.4	3.7	5.3	7.0	2.7	6.1	4.0	21	7.2	5.6
2	2.3	2.4	2.7	3.9	4.8	5.1	3.0	5.8	4.0	11.4	7.2	5.3
3	2.3	6.3	2.6	9.6	4.8	5.8	3.6	5.3	4.5	6.8	8.7	5.3
4	2.3	3.1	3.1	8.1	7.4	5.3	3.3	5.0	4.2	10.6	6.6	7.5
5	2.3	2.5	3.7	8.3	25	4.7	3.2	4.8	3.8	7.0	7.5	5.8
6	2.2	2.4	3.0	7.2	31	4.6	3.4	4.7	4.1	6.2	9.9	5.1
7	2.2	2.7	4.7	7.0	26	4.5	3.4	4.5	4.6	19.2	6.6	5.0
8	2.1	6.2	3.1	5.6	34	4.2	3.4	4.2	15.5	9.9	6.1	4.7
9	2.3	8.5	3.4	5.0	8.0	4.0	3.4	18.3	11.3	6.6	5.6	4.6
10	2.1	6.5	30	5.0	7.0	3.9	5.3	28	6.1	6.2	5.3	4.4
11	2.3	7.4	8.4	4.8	8.1	3.8	17.2	5.6	5.3	14.0	5.0	4.2
12	2.1	5.2	4.4	4.6	7.4	3.8	86	5.0	5.1	7.2	4.7	4.2
13	2.1	3.3	3.6	4.4	11.9	3.9	37	5.1	5.1	6.4	4.6	4.6
14	2.0	3.0	3.2	4.2	7.2	3.5	127	4.5	5.0	8.5	4.2	7.9
15	2.0	2.9	5.4	6.3	7.4	3.4	106	4.4	5.0	6.1	4.2	5.8
16	2.0	2.9	4.1	6.6	9.8	3.3	16.9	4.2	5.0	5.8	5.1	7.0
17	2.0	2.7	4.1	4.4	6.8	3.2	94	4.0	4.7	10.1	6.1	7.2
18	2.0	3.1	5.8	5.4	6.6	3.2	92	3.9	4.6	20	5.6	5.1
19	2.0	5.8	5.1	4.5	7.4	3.1	51	7.6	4.6	13.5	5.0	4.7
20	1.9	3.2	5.9	4.2	5.9	3.0	54	5.7	4.5	12.5	4.5	4.5

Discharge, in million gallons per day, of Waiohue Stream near Nahiku, Maui, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
21	1.9	3.0	4.8	4.2	6.1	3.0	18.3	7.2	4.4	7.0	4.7	4.5
22	2.1	2.9	4.5	46	5.3	2.8	14.0	4.8	6.2	8.5	6.6	4.7
23	2.0	2.8	4.2	9.2	5.0	2.7	10.6	21	18.3	6.2	5.9	4.6
24	2.3	2.8	4.1	8.3	4.8	2.7	8.9	4.6	9.1	6.2	5.3	4.4
25	3.0	2.7	4.0	5.8	44	2.7	7.8	4.2	10.1	5.9	10.0	4.4
26	2.6	2.6	3.8	5.8	13.2	2.7	7.6	4.2	7.0	13.5	5.8	4.6
27	2.5	2.6	3.9	5.0	6.2	2.7	8.0	4.6	22	42	5.6	4.5
28	2.9	2.6	3.7	5.7	5.6	2.6	7.6	4.4	7.2	6.4	5.6	4.7
29	2.3	3.0	3.5	9.2	5.3	2.6	7.0	-------	5.9	9.5	5.6	5.4
30	2.2	2.6	3.4	5.1	5.0	2.6	9.4	-------	5.6	11.3	6.1	4.5
31	2.2	2.5	-------	5.6	-------	2.6	7.4	-------	18.4	-------	6.4	-------

Monthly discharge of Waiohue Stream near Nahiku, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	3.0	1.9	2.22	3.43	68.9	211
August	8.5	2.1	3.62	5.60	112	344
September	30	2.4	4.95	7.66	149	456
October	46	3.7	7.18	11.1	223	683
November	44	4.8	11.1	17.2	332	1,020
December	7.0	2.6	3.65	5.65	113	347
January	127	2.7	26.5	41.0	822	2,520
February	28	3.9	6.85	10.6	192	589
March	22	3.8	7.26	11.2	225	691
April	42	5.8	10.8	16.7	326	994
May	10.0	4.2	6.04	9.35	187	575
June	7.9	4.2	5.16	7.98	155	475
The year	127	1.9	7.96	12.3	2,900	8,900

WEST KOPILIULA STREAM NEAR KEANAE, MAUI

LOCATION.—600 feet above Koolau ditch crossing and highway bridge, 4½ miles by trail east of Upper Keanae, and 7 miles east of Keanae post office.

RECORDS AVAILABLE.—January 3, 1914, to September 17, 1917, and October 1, 1921, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder at same datum as Friez recorder used prior to September 17, 1917.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge 200 feet below gage or by wading.

CHANNEL AND CONTROL.—Channel straight for 200 feet below gage; falls above with channel divided. Stream bed composed of loose boulders. Left bank covered with vegetation and subject to overflow; right bank steep. Control composed of medium-sized boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 1,640 million gallons per day or 2,540 second-feet, at 2.30 p. m. January 14 (gage height, 7.54 feet); minimum discharge recorded, 1.4 million gallons per day or 2.2 second-feet, for several hours July 15–21, 30, and August 1 and 2 (gage height, 1.15 feet).

1914–1917; 1921–1923: Maximum discharge recorded, about 2,000 million gallons per day or 3,090 second-feet, at 5.30 a. m. January 18, 1916 (gage height, 9.25 feet); minimum discharge recorded, 0.6 million gallons per day or 0.9 second-foot, September 15–17, 1917 (gage height, 0.6 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed slightly for low stages during flood of January 14. Two rating curves used well defined between 2 and 700 million gallons per day. Operation of water-stage recorder satisfactory except during October and May. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair.

Discharge measurements of West Kopiliula Stream near Keanae, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 17	1.41	4.7	3.0
Jan. 9	1.47	5.3	3.4
Apr. 10	1.79	11.8	7.6

Discharge, in million gallons per day, of West Kopiliula Stream near Keanae, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	2.2	1.6	1.8	2.8		6.1	2.3	5.0	3.2	142	14.7	12.8
2	2.2	1.8	2.2	3.5	4.3	4.6	2.6	4.7	3.2	42	12.9	7.3
3	2.2	4.7	2.1	35		5.0	8.5	4.3	3.4	13.0	13.0	7.1
4	2.1	2.4	2.7	14.5	15.3	4.4	4.7	3.9	6.6	16.0	8.4	8.2
5	2.1	1.9	3.6	21	77	4.1	3.2	3.8	3.2	12.6		5.2
6	1.9	1.9	2.4	12.7	124	3.9	3.0	3.4	3.6	9.1		4.5
7	2.0	2.4	4.2	10.6	86	3.8	3.2	3.2	5.1	45		4.1
8	1.9	5.9	2.6	6.0	103	3.6	3.5	3.1	104	26		3.9
9	2.1	8.2	15.5	4.2	12.3	3.4	5.2	22	144	10.4		3.4
10	1.8	8.4	82	3.7	8.5	3.4	9.4	66	61	8.1	6.5	3.3
11	1.9	14.3	25	3.5	8.7	3.2	59	9.8	14.2	20		3.2
12	1.8	6.3	7.8	3.3	8.5	3.2	225	6.2	9.7	10.2		3.6
13	1.7	3.0	5.3	3.2	14.1	3.4	74	6.2	7.0	6.5		4.5
14	1.6	2.6	3.6	3.0	9.3	2.9	463	4.1	5.2	8.1		8.1
15	1.6	2.5	5.6	13.1	10.8	2.8	448	3.6	6.6	5.2		5.0
16	1.6	2.4	3.4	22	26	2.7	59	3.2	9.7	4.7		9.5
17	1.5	2.2	3.3	4.4	12.3	2.6	358	3.1	8.4	7.8		12.8
18	1.6	2.6	11.5	4.8	8.5	2.6	281	2.9	7.0	17.0	4.6	6.0
19	1.7	5.0	7.0	3.6	8.1	2.5	88	7.8	5.7	11.8		4.7
20	1.6	2.6	5.5	3.3	6.2	2.4	153	8.5	4.7	10.4		4.1
21	1.6	2.2	3.8	3.3	6.2	2.4	50	6.1	4.1	5.4		3.9
22	1.8	2.3	3.4		5.2	2.3	30	3.4	11.8	6.6		6.3
23	1.6	2.1	3.2		4.8	2.3	13.0	31	51	4.7	7.5	4.1
24	2.0	2.2	3.0		4.4	2.2	10.4	4.8	35	4.5		3.4
25	2.7	1.9	2.9		95	2.3	8.8	3.9	18.5	6.1	36	3.4
26	2.5	1.9	2.8	19	29	2.4	8.4	5.2	10.4	48	11.0	3.6
27	1.8	1.9	3.0		9.8	2.2	7.8	4.7	39	58	10.1	3.4
28	2.4	1.9	2.8		6.5	2.1	6.8	3.8	15.1	15.2	7.3	3.4
29	1.6	2.4	2.6		5.4	2.1	6.2	-------	8.4	15.4	5.7	3.9
30	1.5	1.9	2.4		4.8	2.3	8.1	-------	6.8	31	9.4	3.1
31	1.7	1.8	-------		-------	2.1	7.2	-------	109	-------	15.2	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with East and West Wailuaiki Streams.

Monthly discharge of West Kopiliula Stream near Keanae, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.7	1.5	1.88	2.91	58.3	179
August	14.3	1.6	3.39	5.25	105	323
September	82	1.8	7.57	11.7	227	697
October		2.8	12.0	18.6	372	1,140
November	124		24.1	37.3	723	2,220
December	6.1	2.1	3.07	4.75	95.3	292
January	463	2.3	77.8	120	2,410	7,400
February	66	2.9	8.49	13.1	238	730
March	144	3.2	23.4	36.2	725	2,230
April	142	4.5	20.7	32.0	621	1,910
May	36		8.65	13.4	268	823
June	12.8	3.1	5.33	8.25	160	491
The year	463	1.5	16.4	25.4	6,000	18,400

EAST WAILUAIKI STREAM NEAR KEANAE, MAUI

LOCATION.—1,000 feet above Koolau ditch crossing and trail, 3¾ miles east of Upper Keanae, and 6¼ miles east of Keanae post office.

RECORDS AVAILABLE.—December 21, 1913, to October 23, 1917, and July 1, 1922, to June 30, 1923. Fragmentary unpublished record, October 21, 1921, to June 30, 1922.

GAGE.—Stevens continuous water-stage recorder; used at both old and new stations except for period December 21, 1913, to April 17, 1914, when Friez recorder was operated. Station was reestablished on October 21, 1921, at old location; flood of December 24, 1921, destroyed station and shifted channel; station moved upstream a short distance on April 25, 1922; landslide on May 1, 1922, demolished shelter; shelter repaired and recorder reinstalled July 9, 1922.

DISCHARGE MEASUREMENTS.—Made by wading 1,000 feet below gage near ditch intake or from footbridge 100 feet above ditch intake.

CHANNEL AND CONTROL.—Recorder operates in pool at foot of 10-foot falls. Left bank steep and high; right bank sloping and may be subject to overflow at extremely high stages. Control composed of boulders; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum discharge during year, estimated 1,500 million gallons per day or 2,300 second-feet, at 2.30 p. m. January 14 (gage height, 7.50 feet); at this stage the float wire became disengaged from float wheel and a higher stage may have occurred, although by time comparison with flow of adjacent streams it is probable that the crest stage was not much higher. Minimum discharge recorded, 1.0 million gallons per day or 1.6 second-feet, from 11 p. m. August 1 to 1 a. m. August 2 (gage height, 0.37 foot).

1913–1917; 1922–23: Maximum discharge from extension of rating curve, 1,900 million gallons per day or 2,940 second-feet, at 8 a. m. January 18, 1916 (gage height, 8.35 feet); minimum discharge recorded, 1.0 million gallons per day or 1.6 second-feet, October 22 and 23, 1917 (gage height, 0.5 foot) and from 11 p. m. August 1 to 1 a. m. August 2, 1922 (gage height, 0.37 foot).

Flood of December 24, 1921, may have been the highest on record but owing to destruction of station and loss of recorder no data is available for determining the crest discharge.

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow is diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed by flood of January 14. Rating curve used prior to that date, well defined between 2 and 15 million gallons per day; curve used after that date, well defined between 2.5 and 175 million gallons per day. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for ordinary stages when recorder operated properly; estimated records and high-stage records uncertain.

Discharge measurements of East Wailuaiki Stream near Keanae, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 17	John McCombs	0.85	6.3	4.1
Apr. 11	M. H. Carson	1.46	20.1	13.0

Discharge, in million gallons per day, of East Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		1.1		3.1	6.6	11.6	1.6		5.7		15.5	12.4
2		1.7		6.3	5.8	7.7	2.2		5.4		15.5	8.4
3		12.0		94	6.2	8.9	28		5.6		14.4	10.3
4		2.8		53	27	7.5	11.0		10.4	40	9.9	10.7
5	1.4	1.6	6.5	62	181	6.2	3.3	7	5.7		13.1	7.8
6		1.6		35		5.6	3.2		5.9		20	6.7
7		3.4		28		5.2	3.7		7.3		9.2	6.1
8				12.9	160	4.6	5.0		92		8.4	5.9
9	1.4			8.0		4.4	13.8		128	30	7.8	5.6
10	1.3			6.0		4.0	23		55		7.2	5.0
11	1.4			4.9		3.6	91		17.8	28	6.7	5.0
12	1.3			4.2		3.7	442		11.5	11.8	6.4	5.8
13	1.3	15	45	3.6	20	4.5	171		8.4	9.2	6.0	7.5
14	1.2			3.2		3.2		19	7.2	10.4	5.7	11.5
15	1.1			43		2.9			6.7	7.9	5.9	8.1
16	1.1			55		2.8			15.3	7.2	9.2	15.0
17	1.1			6.4		2.6			10.7	12.5	9.2	18.2
18	1.2		36	7.5		2.5	380		8.1	23	7.8	8.4
19	1.3		20	4.8		2.3			6.3	15.5	7.0	7.1
20	1.1		14.3	3.8	18	2.2			5.5	13.4	7.0	6.3
21	1.1		7.2	3.7		2.0		10.4	12.0	9.9	8.1	6.0
22	1.3		5.2	216		1.9		7.2		9.2	13.2	11.6
23	1.1	3.8	4.3	40		1.8		41		7.8	10.7	6.6
24	1.6		3.7	29		1.8		8.3	35	7.6	10.7	5.5
25	5.3		3.1	20	219	1.8		6.6		8.3	41	5.2
26	3.1		3.0	21	83	2.2		7.5		50	14.4	5.5
27	1.3		3.8	11.6	27	1.6	18	8.1		35	12.4	5.2
28	2.1		2.6	10.8	12.9	1.6		6.5		18.2	9.9	5.2
29	1.2		2.2	17.8	10.2	1.5		-------	60	18.8	8.4	6.0
30	1.1	2.7	2.0	7.7	8.7	1.8		-------		32	12.4	4.7
31	1.2		-------	8.2	-------	1.5		-------		-------	17.8	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of West Wailuaiki and West Kopilula Streams.

Monthly discharge of East Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	5.3	1.1	1.50	2.32	46.4	143
August		1.1	7.23	11.2	224	688
September			18.8	29.1	564	1,730
October	216	3.1	26.8	41.5	830	2,550
November		5.8	54.9	84.9	1,650	5,050
December	11.6	1.5	3.73	5.77	116	355
January		1.6	153	237	4,740	14,600
February			13.6	21.0	380	1,170
March		5.4	29.2	45.2	906	2,780
April		7.2	23.2	35.9	696	2,140
May	41	5.7	11.3	17.5	351	1,080
June	18.2	4.7	7.78	12.0	233	716
The year		1.1	29.4	45.5	10,700	33,000

WEST WAILUAIKI STREAM NEAR KEANAE, MAUI

LOCATION.—500 feet above Koolau ditch crossing and trail bridge, 3 miles east of Upper Keanae, and 5½ miles east of Keanae post office.

RECORDS AVAILABLE.—January 1, 1914, to October 22, 1917, and November 1, 1921, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder. Datum unchanged.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge 90 feet below station or by wading.

CHANNEL AND CONTROL.—Gage located on a pool at base of a falls. Control at outlet of pool composed of boulders and rock ledge; probably permanent. Banks are nearly vertical rock walls; not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 13.75 feet at 1.45 p. m. January 14. At this stage the recorder float-wire became disengaged from float wheel. A careful examination of floodmarks by the hydrographer when the recorder was next inspected on February 20 indicated that the crest stage of the flood was actually very close to 13.5 feet. The discrepancy between the elevation of the floodmarks and the pencil gage height can probably be accounted for by "creeping" of the float wire resulting from surge which must have been quite pronounced before and at the peak of the rise. On February 20 it was impossible to check this apparent discrepancy since the relation between pencil and staff gage was entirely destroyed when the float wire became disengaged from the float wheel. A crest stage of 13.5 feet has therefore been accepted as correct, the corresponding discharge being estimated at 4,500 million gallons per day or 6,960 second-feet. Minimum discharge recorded, 0.3 million gallons per day or 0.45 second-foot, from noon to 1 p. m. July 26 (gage height, 0.44 foot).

1914–1917; 1921–1923: Maximum and minimum discharge recorded, same as above for 1922–1923.

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow is diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 30 million gallons per day; fairly well defined between 30 and 500 million gallons per day; extended for higher stages. Operation of water-stage recorder satisfactory except during January and February. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good below 500 million gallons per day; high-stage records uncertain; estimated records fair.

Discharge measurements of West Wailuaiki Stream near Keanae, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Nov. 3	0.89	6.2	4.0
Jan. 10	1.70	35.5	23.1
Apr. 12	1.35	20.3	13.1

Discharge, in million gallons per day, of West Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.3	0.5	1.3	4.2	5.8	8.1	2.2		5.8	122	18.2	14.5
2	1.2	1.3	2.2	6.4	5.3	6.5	3.2		5.5	51	16.5	8.6
3	1.2	6.5	2.0	64	5.7	6.8	21		8.9	17.1	15.1	11.2
3	1.0	3.1	4.3	26	25	6.2	10.2		13.9	21	10.6	10.4
5	1.4	1.7	7.3	40	117	5.5	5.1	6	6.1	16.6	9.5	7.6
6	.9	1.6	4.5	22	171	5.1	4.5		6.0	11.1	20	6.4
7	1.0	3.0	7.9	19.8	154	5.0	4.9		7.1	74	9.0	5.7
8	.9	9.9	4.8	11.1	132	4.6	5.5		143	30	7.9	5.4
9	1.7	15.0	29	7.8	17.6	4.4	13.2		211	12.8	7.9	4.9
10	1.0	16.7	155	6.5	11.3	4.1	16.3		74	10.2	6.7	4.5
11	1.2	35	58	5.8	11.2	3.9	119		19.4	35	6.0	4.4
12	1.0	13.8	16.4	5.1	13.1	3.7	382		12.8	14.3	5.4	5.3
13	.7	6.0	11.1	4.8	23	4.9	154		9.6	10.2	5.0	6.8
14	.8	4.8	7.8	4.4	15.4	3.7			7.6	10.8	4.6	8.8
15	.8	4.2	10.6	30	15.5	3.4		16	11.7	8.1	4.5	7.1
16	.6	4.0	6.4	34	42	3.3			17.2	7.3	7.3	15.2
17	.6	3.6	6.0	7.6	17.7	3.0			11.5	10.4	8.0	18.6
18	1.0	4.1	21	7.9	11.9	2.9			9.4	19.4	6.0	9.2
19	1.5	9.6	14.0	5.7	11.1	2.7	260		7.4	14.6	5.8	7.0
20	.8	4.9	10.6	4.9	8.8	2.7			6.4	12.8	5.8	6.2
21	.6	3.9	7.3	4.6	9.0	2.5		10.7	5.5	8.6	7.1	5.7
22	.9	3.5	6.0	156	7.4	2.2		7.1	18.0	8.8	10.6	15.0
23	.4	3.0	5.1	26	6.7	2.1		43	104	6.8	9.2	7.0
24	1.3	3.0	4.6	17.9	6.1	2.1		9.2	35	6.2	9.4	5.5
25	2.1	2.4	4.1	15.7	184	2.2		6.8	25	7.1	45	5.1
26	3.2	2.1	3.9	17.1	53	3.0		7.6	14.1	51	15.9	5.3
27	1.0	1.9	4.9	10.0	19.6	2.1		8.6	68	50	15.3	5.0
28	2.0	1.9	3.9	8.1	10.6	1.9		6.7	22	16.7	9.8	4.9
29	.8	3.0	3.3	10.2	8.4	1.8		-------	11.7	17.1	8.4	5.5
30	.6	1.9	3.0	6.8	7.3	2.4		-------	9.2	35	15.0	4.8
31	.7	1.5	-------	6.7	-------	2.1		-------	140	-------	22	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of East Wailuaiki and West Kopiliula Streams.

Monthly discharge of West Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	3.2	0.4	1.10	1.70	34.2	105
August	35	.5	5.72	8.85	177	544
September	155	1.3	14.2	22.0	426	1,310
October	156	4.2	19.2	29.7	596	1,830
November	184	5.3	37.6	58.2	1,130	3,460
December	8.1	1.8	3.71	5.74	115	353
January		2.2	111	172	3,440	10,600
February			12.1	18.7	340	1,040
March	211	5.5	33.8	52.3	1,050	3,220
April	122	6.2	23.9	37.0	716	2,200
May	45	4.5	11.2	17.3	348	1,070
June	18.6	4.4	7.72	11.9	232	711
The year		.4	23.5	36.4	8,590	26,400

EAST WAILUANUI STREAM NEAR KEANAE, MAUI

LOCATION.—125 feet above Koolau ditch intake, 250 feet above trail, 2½ miles east of Upper Keanae, and 5 miles east of Keanae post office.

RECORDS AVAILABLE.—November 23, 1921, to June 30, 1923. For station 500 feet upstream, January 1, 1914, to October 24, 1917.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading just above ditch intake or from suspension footbridge 500 feet above gage.

CHANNEL AND CONTROL.—One channel at all stages. Control is rock ledge at outlet of pool formed at foot of 12-foot falls; probably permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 590 million gallons per day or 913 second-feet, at 2.45 p. m. January 14 (gage height, 4.66 feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, for several hours July 16, 17, 20, and 21 (gage height, 0.30 foot).

1921–1923: Maximum discharge recorded, from extension of rating curve, 715 million gallons per day or 1,110 second-feet, at 1.30 a. m. December 13, 1921 (gage height, 5.30 feet); minimum discharge recorded in July, 1922.

DIVERSIONS.—None above station.

REGULATION.—None.

OBJECT OF STATION.—To determine amount of water diverted into Koolau ditch in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow diverted into Koolau ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 20 million gallons per day; extension above that quantity subject to error. Operation of water-stage recorder satisfactory except during December and part of January. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by means of the discharge integrator. Records good except those for high stages and those estimated.

Discharge measurements of East Wailuanui Stream near Keanae, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 18	0.70	9.4	6.1
Nov. 4	.58	5.2	3.4
Apr. 12	.57	5.0	3.2
May 25	.79	14.2	9.2

Discharge, in million gallons per day, of East Wailuanui Stream near Keanae, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	0.6	0.9	1.6	2.0	2.8		1.6	1.9	7.1	3.5	3.1
2	.4	.9	1.3	2.1	2.0	2.0		1.3	1.8	7.5	4.5	2.4
3	.4	5.6	1.2	11.9	1.9	2.3		1.2	1.9	2.6	5.0	3.2
4	.4	2.0	2.7	9.6	5.1	2.1		1.2	2.1	5.0	3.0	4.0
5	.5	1.3	3.2	9.4	26		2.4	1.1	1.7	3.4	3.9	2.8
6	.4	1.3	1.8	8.0	27			1.1	1.8	2.4	14.2	2.3
7	.4	2.0	4.4	6.6	26			.9	1.9	15.8	3.3	2.0
8	.4	8.2	2.0	3.6	23			1.0	9.6	6.6	2.8	1.9
9	.6	11.5	9.0	2.6	4.6			23	6.4	2.6	2.4	1.8
10	.4	8.2	43	2.3	3.0		3.0	24	3.1	2.3	2.0	1.7
11	.6	11.2	11.4	1.9	3.5		20	3.5	2.6	12.7	1.9	1.6
12	.5	5.6	3.6	1.8	3.1		81	2.6	2.3	4.0	1.7	2.0
13	.4	2.6	2.6	1.7	10.3		38	2.8	1.9	2.8	1.6	2.8
14	.4	2.1	2.3	1.6	3.8		101	2.0	1.8	4.2	1.4	4.9
15	.4	2.0	6.2	4.7	3.3		38	1.7	1.8	2.4	1.6	3.3
16	.3	1.9	2.4	4.7	7.8		9.2	1.4	1.7	2.1	2.8	5.6
17	.3	1.8	2.3	1.9	3.5	1.2	54	1.4	1.6	5.1	3.3	6.5
18	.4	1.9	6.7	2.3	2.6		93	1.4	1.4	14.1	2.3	3.3
19	.5	5.4	4.1	1.8	2.8		46	10.8	1.4	8.7	2.4	2.6
20	.4	2.0	6.4	1.6	2.1		47	4.8	1.2	7.3	2.4	2.3
21	.4	1.8	3.3	1.7	2.1		8.0	7.2	1.2	3.8	2.8	2.1
22	.5	1.8	2.4	49	1.8		5.3	3.5	6.8	3.8	4.7	2.4
23	.4	1.6	2.0	9.4	1.7		3.6	28	12.0	3.0	3.5	2.1
24	.7	1.6	1.9	6.3	1.6		2.8	3.3	5.8	2.6	8.5	1.9
25	2.1	1.3	1.8	4.3	40		2.4	2.6	7.4	2.3	11.4	1.9
26	1.5	1.3	1.7	3.8	14.3		2.3	2.3	3.8	6.7	3.8	2.0
27	.7	1.2	1.8	2.6	4.3		2.1	2.3	27	18.0	3.5	1.9
28	1.3	1.1	1.6	2.9	2.8		2.0	2.1	5.0	6.8	3.0	1.9
29	.7	1.6	1.3	4.3	2.4		1.9	-------	2.6	6.4	2.6	2.8
30	.6	1.1	1.3	2.3	2.1		2.0	-------	2.1	8.8	3.3	2.0
31	.7	1.0	-------	2.3	-------		1.9	-------	3.1	-------	4.5	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of West Wailuaiki Stream.

Monthly discharge of East Wailuanui Stream near Keanae, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.1	0.3	0.58	0.90	18.1	55
August	11.5	.6	3.02	4.67	93.5	287
September	43	.9	4.55	7.04	137	419
October	49	1.6	5.50	8.51	171	523
November	40	1.6	7.88	12.2	236	725
December	2.8	----------	1.34	2.07	41.6	127
January	101	----------	18.9	29.2	586	1,800
February	28	.9	5.00	7.74	140	430
March	27	1.2	4.09	6.33	127	389
April	18	2.1	6.03	9.33	181	555
May	14.2	1.4	3.63	5.62	113	345
June	6.5	1.6	2.70	4.18	81.1	249
The year	101	.3	5.27	8.15	1,920	5,900

KOOLAU DITCH NEAR KEANAE, MAUI

LOCATION.—5 feet above portal of tunnel in west side of Keanae Valley, a quarter of a mile above ditch foreman's house, and 3 miles southwest of Keanae post office.

RECORDS AVAILABLE.—January 1, 1910, to December 31, 1912, and November 2, 1917, to June 30; 1923.

GAGE.—Stevens continuous water-stage recorder installed November 4, 1922. Gurley printing recorder used June 23 to November 3, 1922; Friez recorder used November 2, 1917, to June 23, 1922. Gage was moved to present location on March 25, 1922. East Maui Irrigation Co. has obtained staff gage readings at this location since about 1904.

DISCHARGE MEASUREMENTS.—Made from plank 20 feet above gage.

CHANNEL AND CONTROL.—Concrete-lined ditch; straight for 100 feet above gage. Control not well defined but probably fairly permanent as ditch enters long tunnel 5 feet below gage.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 147 million gallons per day or 227 second-feet, at 3.30 p. m. April 9 (gage height, 5.51 feet); minimum discharge recorded, 1.4 million gallons per day or 2.2 second-feet, from 10 a. m. to noon January 30 (gage height, 0.39 foot).

1910–1912; 1917–1923: Maximum discharge recorded, 175 million gallons per day or 271 second-feet, at 7.15 p. m. January 4, 1922 (gage height, 6.36 feet). Ditch occasionally dry when gates are closed.

DIVERSIONS.—None near station except spillways.

REGULATION.—By gates at intervals.

OBJECT OF STATION.—To determine amount of water diverted through ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed January 23 when ditch was cleaned. Rating curves well defined. Operation of water-stage recorders unsatisfactory. Daily discharge, July 1 to November 3, ascertained by applying to rating table mean daily gage height obtained by averaging hourly printed gage heights or, for days of considerable fluctuation in stage, by averaging discharge for hourly intervals of the day; discharge for remainder of year ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for irregular intervals of the day. Records good except those estimated which are fair.

For description of ditch see under Koolau ditch at Nahiku weir, near Nahiku, Maui.

Discharge measurements of Koolau ditch near Keanae, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 19	3.25	111	72	Jan. 11	2.40	69	44.5
Nov. 23	2.87	92	59	Apr. 12	3.78	140	91

Discharge, in million gallons per day, of Koolau ditch near Keanae, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	13.4	31	16	43	60	79	17.6	8.0	47	88	81	90
2	13.2					64	22	7.8	45	70	95	65
3	13.2				49	65	54	7.3	61	89	108	68
4	12.9	32			75	64	51	7.5	64	102	84	88
5	13.8	18.5			93	57	30	36	45	102	73	66
6	12.5	17.1	31	81	114	51	28	50	48	82	108	56
7	12.5	24			115	51	34	47	56	91	78	50
8	12.3	71			114	45	37	45	119	101	68	47
9	14.0	89			97	42	61	54	120	102	65	45
10	12.5	93			89	39	80	116	112	80	59	42
11		98	80	34	87	36	62	89	95	105	56	39
12					96	33	99	72	76	86	53	45
13					104	41	91	79	65	84	47	56
14					97	32	80	59	53	96	45	86
15		46			93	28	9.9	52	58	74	45	75
16					126	27	21	47	73	65	67	
17					106	26	110	45	62	84	78	
18	10				92	26	83	42	56	104	64	75
19			52	41	94	24	78	70	50	97	59	
20		38			78	23	28	86	42	94	56	
21					78	21	2.8	75	39	89	65	
22					67	21	2.2	63	59	94	84	
23					62	18.7	2.0	109	105	78	84	
24					57	17.6	2.0	74	97	77	78	
25					89	17.6	2.0	59	108	78	99	
26		19	24	81	83	18.7	1.8	63	96	95	94	45
27	18				82	17.6	2.0	62	99	90	95	
28					85	16.4	1.8	54	96	86	78	
29					73	14.2	2.0	-------	83	84	71	
30					65	14.2	4.0	-------	73	82	90	
31			-------	-------	-------	14.2	7.5	-------	90	-------	102	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of this ditch at Nahiku weir. Discharge Dec. 14 to Jan. 7 ascertained from twice-daily staff gage readings furnished by East Maui Irrigation Co.

Monthly discharge of Koolau ditch near Keanae, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	----------	----------	12.8	19.8	396	1,220
August	98	----------	37.8	58.5	1,170	3,600
September	----------	----------	40.9	63.3	1,230	3,770
October	----------	----------	59.5	92.1	1,840	5,660
November	126	49	86.0	133	2,580	7,920
December	79	14.2	33.7	52.1	1,040	3,210
January	110	1.8	35.7	55.2	1,110	3,400
February	116	7.3	56.4	87.3	1,580	4,850
March	120	39	73.9	114	2,290	7,030
April	105	65	88.3	137	2,650	8,130
May	108	45	75.1	116	2,330	7,140
June	----------	39	58.1	89.9	1,740	5,350
The year	126	1.8	54.7	84.6	20,000	61,300

HONOMANU STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At end of Haiku-uka boundary line trail and 8 miles east of Kailiili.

RECORDS AVAILABLE.—October 9, 1919, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and below station; narrows into a gorge below station. Control composed of 2-man boulders; subject to shifts.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 1,290 million gallons per day or 2,000 second-feet, at 2.45 p. m. January 14 (gage height, 9.93 feet); minimum discharge recorded, 0.15 million gallons per day or 0.25 second-foot, from 11 a. m. to 1 p. m. July 8 and 5 to 6 p. m. July 17 (gage height, 0.57 foot).

1919–1923: Maximum discharge recorded on January 14, 1923; minimum discharge recorded, 0.03 million gallons per day or 0.05 second-foot, at 10 a. m. April 3 and noon April 5, 1920 (gage height, 0.28 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple land above and Territorial lands below.

UTILIZATION.—Water picked up below by East Maui Irrigation Co.'s ditches for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Two rating curves used; one, applicable July 1 to September 22 and November 7 to January 20, well defined below 100 million gallons per day; the other, applicable September 11 to November 6 and January 21 to June 30, well defined below 5 million gallons per day and fairly well defined up to 100 million gallons per day on basis of form of other curves. Operation of water-stage recorder satisfactory except during June. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averging discharge for intervals of day. Records good for ordinary stages; high-stage records subject to error.

Discharge measurements of Honomanu Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 21	1.03	3.0	1.9
Nov. 21	.91	2.8	1.85
June 14	.87	1.35	.9

Discharge, in million gallons per day, of Honomanu Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.2	0.2	0.6	0.6	0.5	1.1	0.2	1.4	1.2	28	3.2	2.7
2	.2	.3	1.0	1.1	.4	1.2	2.7	1.0	1.2	45	3.4	1.3
3	.2	2.9	1.2	30	.6	1.1	7.3	.9	16.9	3.3	3.6	1.6
4	.2	2.2	2.7	10.0	18.2	1.0	2.5	.8	5.8	3.7	2.3	2.9
5	.2	.6	7.1	16.8	67	.7	.9	.8	1.5	4.2	1.5	1.9
6	.2	.3	2.3	6.7	78	1.1	.9	.7	1.3	1.6	1.9	1.0
7	.2	1.4	3.6	5.0	65	.8	1.1	.6	1.7	18.2	1.3	.8
8	.2	5.2	1.7	1.6	16.8	.6	4.6	.6	108	8.4	1.6	.8
9	.2	11.0	9.6	1.1	4.5	.5	9.4	34	122	2.2	1.5	.8
10	.2	6.4	91	1.1	2.9	.4	5.3	49	50	1.4	1.0	.6

Discharge, in million gallons per day, of Honomanu Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
11	0.2	30	35	0.8	3.1	0.3	53	3.9	6.4	17.4	0.9	0.5
12	.6	6.1	8.0	1.2	4.5	.3	80	1.6	3.9	3.4	.8	.8
13	.3	1.9	2.9	.8	7.5	.6	41	2.1	2.3	1.6	.7	1.2
14	.2	1.3	1.3	.6	5.0	.6	322	1.2	1.6	1.4	.6	
15	.2	1.0	2.6	19.0	5.1	.3	304	1.0	1.6	1.1	.6	
16	.2	1.0	1.4	15.1	22	.3	46	.8	1.6	1.0	1.4	
17	.2	.8	1.3	1.4	5.9	.3	242	.8	1.5	1.2	1.9	
18	.5	1.1	8.7	1.2	2.6	.3	140	.7	1.8	2.0	1.0	
19	1.0	5.1	2.3	1.0	1.9	.3	39	1.1	1.4	2.4	.8	
20	.3	1.7	6.2	.6	1.7	.2	83	2.8	1.1	4.7	1.1	
21	.2	.8	4.8	.5	1.6	.2	13.2	1.6	.9	2.0	1.6	2.4
22	.2	.7	1.9	46	1.4	.2	8.2	1.5	4.2	1.2	1.8	
23	.2	.5	1.0	5.8	1.0	.2	3.7	4.9	32	1.0	1.9	
24	.2	.4	1.0	3.2	.8	.2	2.7	4.4	11.1	.8	2.3	
25	1.4	3.4	1.0	3.6	59	.2	2.1	2.1	4.0	1.1	17.3	
26	2.1	1.7	.8	3.5	21	.8	1.7	10.1	3.0	15.6	3.1	
27	.5	.8	1.2	1.1	5.3	.3	1.5	3.7	23	4.1	3.0	
28	2.2	.5	.8	.8	1.9	.3	1.2	1.8	5.7	1.9	1.7	
29	.7	1.6	.5	1.0	1.3	.2	1.1	-------	2.0	2.3	1.6	
30	.3	1.4	.4	.7	1.0	.2	1.0	-------	1.4	8.3	3.6	
31	.3	1.0	-------	.5	-------	.2	1.0	-------	10.0	-------	4.2	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated, because of lack of gage height record, by comparison with flow at lower station on this stream.

Monthly discharge of Honomanu Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.2	0.2	0.45	0.70	14.0	43
August	30	.2	3.01	4.66	93.3	286
September	91	.4	6.80	10.5	204	626
October	46	.5	5.88	9.10	182	559
November	78	.4	13.6	21.0	408	1,250
December	1.2	.2	.48	.74	15.0	46
January	322	.2	45.9	71.0	1,420	4,370
February	49	.6	4.85	7.50	136	417
March	122	.9	13.7	21.2	425	1,300
April	45	.8	6.35	9.82	190	585
May	17.3	.6	2.36	3.65	73.2	225
June	----------	----------	1.92	2.97	57.7	177
The year	322	.2	8.82	13.6	3,220	9,880

HONOMANU STREAM NEAR KEANAE, MAUI

LOCATION.—500 feet above Spreckels ditch intake and trail bridge and 6 miles south of Keanae post office.

RECORDS AVAILABLE.—November 15, 1913, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder. Datum raised 1.345 feet on May 12, 1922.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 200 feet above and below gage; stream bed filled with large boulders and very rough; right bank vertical wall of rock; left bank steep and high. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during the year, about 1,170 million gallons per day or 1,810 second-feet, from 3 to 4.30 p. m. January 14 (gage height, 8.73 feet); minimum discharge recorded, 0.25 million gallons per day or 0.4 second-foot, for several hours December 24 and 25 (gage height, 0.52 foot).

1913–1923: Maximum recorded on January 14, 1923; minimum recorded, 0.17 million gallons per day or 0.26 second-foot, on July 14, 1920 (gage height, 1.77 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—Data valuable in relation to Territorial water licenses to ditch company.

UTILIZATION.—Ordinary flow is diverted by Spreckels ditch for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Two rating curves used; one, applicable July 1 to January 14 and April 12 to June 17, well defined below 500 million gallons per day; the other, applicable January 15 to April 11 and June 18–30, fairly well defined below 500 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage by averaging discharge for intervals of day. Records good.

Discharge measurements of Honomanu Stream near Keanae, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 19	1.71	24	15.5	Feb. 15	0.90	3.3	2.1
Nov. 2	.90	2.1	1.35	Apr. 13	1.7	4.7	3.1
Jan. 11	1.05	3.9	2.5				

Discharge, in million gallons per day, of Honomanu Stream near Keanae, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	0.6	0.8	1.6	2.0	2.4	0.5	2.3	3.9	42	7.2	7.4
2	.4	1.0	1.3	3.3	1.7	2.2	2.9	2.3	3.9	65	9.7	3.1
3	.4	7.9	1.3	56	2.0	2.1	11.6	2.0	32	8.0	9.2	5.5
4	.4	3.0	5.2	33	31	1.9	5.2	1.7	14.6	9.0	5.5	6.7
5	.5	1.0	11.3	36	111	1.5	1.4	1.6	4.7	9.9	3.4	6.5
6	.4	.8	3.4	18.4	136	1.5	1.4	1.6	3.9	4.6	6.9	3.3
7	.4	3.0	6.7	14.0	123	1.3	2.2	1.6	5.2	36	3.0	2.9
8	.4	13.9	2.4	5.5	41	1.1	5.4	1.5	128	19.4	3.2	2.8
9	.5	23	26	3.6	9.9	1.0	16.8	30	146	6.2	3.0	2.8
10	.4	15.8	152	3.1	5.5	.9	10.1	119	64	4.4	2.1	2.5
11	.5	46	65	2.3	5.7	.8	65	33	14.8	32	1.9	2.5
12	.6	10.4	17.3	3.1	7.4	.8	174	5.9	9.0	8.2	1.6	3.1
13	.6	2.4	6.7	2.0	16.1	1.4	68	5.0	5.6	3.1	1.5	5.5
14	.5	1.6	2.9	1.5	8.6	1.0	405		4.3	4.2	1.3	5.2
15	.4	1.4	12.1	40	7.6	.8	425	3.0	4.3	2.3	1.4	5.5
6	.4	1.4	3.7	33	38	.7	49	2.6	4.2	2.2	3.6	8.8
7	.4	1.2	2.9	3.9	10.8	.6	240	2.6	3.8	3.6	4.9	16.1
8	.6	1.4	25	3.9	4.7	.6	274	2.5	4.0	8.2	2.3	6.9
9	1.0	10.7	8.6	2.6	3.9	.6	128	11.8	3.5	6.3	2.3	4.8
20	.6	2.1	16.0	1.9	3.1	.5	180	11.7	3.0	8.4	2.4	3.5

Discharge, in million gallons per day, of Honomanu Stream near Keanae, Maui, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
21	0.4	1.2	10.0	1.5	2.8	0.5	53	8.8	2.6	4.4	3.9	3.0
22	.5	1.1	4.4	116	2.2	.4	19.8	6.0	15.9	2.8	5.2	8.4
23	.4	1.0	2.3	21	1.6	.4	9.0	30	63	2.3	3.7	6.7
24	.6	.9	1.9	10.8	1.5	.3	6.2	12.7	24	2.1	4.9	3.5
25	6.2	3.4	1.7	10.8	101	.3	4.7	7.1	13.7	2.3	31	
26	2.9	1.6	1.6	10.3	39	1.0	3.5	16.2	8.2	25	7.2	3.1
27	.9	1.0	2.4	4.4	11.5	.6	3.3	9.5	53	9.6	6.1	2.8
28	2.2	.8	1.7	2.9	4.4	.5	2.6	5.9	14.7	5.8	3.2	3.4
29	.9	1.3	1.2	4.4	2.4	.4	2.4	-------	5.8	5.8	3.4	4.4
30	.7	1.6	1.1	2.4	1.7	.4	2.3	-------	4.2	19.9	6.5	4.0
31	.6	1.0	-------	2.2	-------	.5	2.2	-------	10.8	-------	9.5	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with records of flow of upper station on this stream.

Monthly discharge of Honomanu Stream near Keanae, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	6.2	0.4	0.84	1.30	26.1	80
August	46	.6	5.27	8.15	164	501
September	152	.8	13.3	20.6	399	1,220
October	116	1.5	14.7	22.7	455	1,400
November	136	1.5	24.6	38.1	737	2,260
December	2.4	.3	.94	1.45	29.0	89
January	425	.5	70.1	108	2,170	6,670
February	119	1.5	12.2	18.9	343	1,050
March	146	2.6	21.9	33.9	679	2,080
April	65	2.1	12.1	18.7	363	1,110
May	31	1.3	5.19	8.03	161	494
June	16.1	2.5	4.94	7.64	148	455
The year	425	.3	15.6	24.1	5,680	17,400

HAIPUAENA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—50 feet upstream from Haiku-uka boundary-line trail crossing and 7½ miles by trail east of Kailiili.

RECORDS AVAILABLE.—June 3, 1922, to June 30, 1923, at present site; May 27, 1919, to June 2, 1922, at site 250 feet upstream. Records comparable.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above gage and 100 feet below. Artificial control composed of heavy boulders anchored with concrete; shifts owing to deposition of gravel in pool above.

EXTREMES OF DISCHARGE.—Maximum stage during year occurred while clock was stopped January 2–21. The recorder pencil continued to operate and shows that a stage of more than 5 feet was reached, discharge probably 150 million gallons per day or 232 second-feet. Minimum discharge recorded, 0.1 million gallons per day or 0.15 second-foot from 7 to 8 p. m. July 23 (gage height, 0.71 foot).

1919–1923: Maximum discharge recorded in January 1923; minimum discharge recorded 0.06 million gallons per day or 0.09 second-foot, at 1.30 p. m. May 27, 1920 (gage height, 0.15 foot).

DIVERSIONS.—Entire low-water flow at 4,200-foot elevation (about 1½ miles above station) diverted into Kula pipe line.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple land above and Territorial lands below.

UTILIZATION.—Water diverted below into East Maui Irrigation Co.'s ditches for the irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed during flood of January. Rating curve used prior to flood, fairly well defined below 4 million gallons per day; curve used after flood fairly well defined below 6 million gallons per day; both curves subject to error for higher stages. Operation of water-stage recorder satisfactory except during January and June. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair for low stages; subject to error for high stages and should be used with caution.

Discharge measurements of Haipuaena Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 21	1.18	2.7	1.75
Jan. 21	1.22	5.8	3.8
June 14	.75	.7	.45

Discharge, in million gallons per day, of Haipuaena Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.1	0.2	0.4	0.9	1.0	1.0		0.7	0.5	7.8	2.0	
2	.1	.3	.6	1.6	.8	1.0		.4	.5	11.5	2.2	
3	.1	1.9	.7	12.7	1.0	1.0		.3	6.0	1.1	2.2	
4	.1	.8	1.6	6.9	8.0	.9		.3	3.3	1.3	1.2	
5	.2	.3	4.5	7.1	20	.8		.3	.6	2.0	.8	
6	.1	.2	1.4	5.0	19.8	.9	2.0	.2	.5	.7	1.0	
7	.1	1.0	2.4	4.3	15.4	.7		.2	.7	5.7	.6	
8	.1	3.3	1.0	2.1	10.2	.6		.2	23	4.6	.8	1.0
9	.2	5.0	4.5	1.6	2.4	.6		7.8	24	1.0	.6	
10	.2	3.2	25	1.6	1.9	.5		16.7	10.3	.7	.5	
11	.2	9.2	10.3	1.6	2.5	.5		1.8	2.7	7.2	.4	
12	.4	3.0	4.0	1.7	2.8	.4		.7	1.5	1.0	.4	
13	.2	1.0	2.2	1.0	5.4	.6		1.0	.8	.8	.3	
14	.2	.8	1.4	.9	2.9	.6		.5	.6	.6	.3	
15	.2	.7	2.8	8.2	2.8	.4		.4	.6	.5	.3	.5
16	.2	.6	1.6	6.4	8.6	.4	2.5	.3	.5	.4	.6	3.2
17	.2	.6	1.5	1.8	3.1	.4		.3	.7	.5	.9	4.0
18	.4	.6	5.7	1.6	1.9	.4		.3	.7	1.2	.4	.8
19	.6	3.3	2.3	1.3	1.6	.4		.5	.5	1.5	.3	.5
20	.2	1.0	3.6	1.0	1.4	.3		1.2	.4	3.1	.4	.5
21	.2	.6	2.8	.9	1.6	.3		.7	.4	1.0	.7	.4
22	2	.5	1.8	14.8	1.2	.3	3.2	.6	2.2	.5	.8	3.8
23	.1	.4	1.3	4.3	1.0	.3	1.4	3.0	10.4	.5	.8	.8
24	.2	.4	1.3	3.2	.9	.3	1.0	1.1	6.3	.5	1.3	.5
25	1.2	.7	1.2	3.5	14.6	.3	.8	.8	2.4	.5	8.7	.4
26	1.0	.6	1.0	3.4	7.8	.6	.7	4.6	1.4	8.1	1.8	.4
27	.3	.4	1.7	1.7	3.2	.4	.6	1.8	9.9	2.4	1.8	.4
28	1.2	.3	1.0	1.3	1.6	.4	.5	.8	3.5	.6	.8	.5
29	.4	1.0	.8	1.7	1.2	.3	.5	-------	1.0	1.3	.8	.6
30	.2	.8	.7	1.2	1.0	.3	.4	-------	.7	5.6	2.6	.6
31	.2	.5	-------	1.0	-------	.3	.4	-------	1.6	-------	2.8	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of lower station on this stream.

Monthly discharge of Haipuaena Stream at Haiku-Uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.2	0.1	0.30	0.46	9.3	29
August	9.2	.2	1.39	2.15	43.2	132
September	25	.4	3.04	4.70	91.1	280
October	14.8	.9	3.43	5.31	106	326
November	20	.8	4.92	7.61	148	453
December	1.0	.3	.52	.80	16.2	50
January	----------	----------	9.82	15.2	304	934
February	16.7	.2	1.70	2.63	47.5	146
March	24	.4	3.81	5.89	118	362
April	11.5	.4	2.47	3.82	74.2	227
May	8.7	.3	1.26	1.95	39.1	120
June	4.0	----------	1.06	1.64	31.9	98
The year	----------	.1	2.82	4.36	1,030	3,160

HAIPUAENA STREAM NEAR HUELO, MAUI

LOCATION.—200 feet above inflow of Spreckels ditch and 7 miles by trail east of Huelo.

RECORDS AVAILABLE.—October 19, 1913, to June 30, 1923; also records of combined flow of stream and Spreckels ditch at staff-gage station 600 feet below present site December 18, 1910, to September 30, 1913.

GAGE.—Stevens continuous water-stage recorder installed June 16, 1914, to replace original Friez recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 200 feet above and below gage; right bank high with steep slope; left bank nearly vertical. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 494 million gallons per day or 764 second-feet, at 3 p. m. January 14 (gage height, 5.50 feet); minimum discharge recorded 0.5 million gallons per day or 0.8 second-foot, for several hours July 7, 8, and 17 (gage height, 0.20 foot).

1913–1923: Maximum discharge recorded, 530 million gallons per day or 820 second-feet, at 7.40 p. m. January 16, 1921 (gage height, 5.67 feet); minimum discharge recorded, 0.3 million gallons per day or 0.5 second-foot, frequently during December, 1919 (gage height, 0.20 foot).

DIVERSIONS.—See under "Diversions" in description of station on this stream at Haiku-uka boundary.

REGULATION.—None.

OBJECT OF STATION.—Data valuable in relation to water valuation appraisal under Territorial lease to ditch company.

UTILIZATION.—Ordinary flow diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined below 25 million gallons per day; fairly well defined above that quantity on basis of form of previous curves. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation, by averaging discharge for intervals of the day. Records good except for extremely high stages.

Discharge measurements of Haipuaena Stream near Huelo, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 16	John McCombs	0.84	5.4	3.5
Nov. 16	do	1.45	24.8	16.0
Apr. 6	M. H. Carson	.81	6.1	3.9

Discharge, in million gallons per day, of Haipuaena Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.8	0.8	1.2	3.0	3.5	4.0	1.3	3.6	3.5	16.4	6.7	7.7
2	.7	1.4	1.8	3.6	3.3	3.5	3.1	2.6	3.4	29	7.9	5.0
3	.7	7.6	1.9	25	3.6	3.1	8.3	2.3	16.1	5.4	9.0	6.0
4	.7	3.3	4.7	19.1	21	2.9	4.9	2.2	11.4	6.0	5.9	10.1
5	.7	1.7	8.8	17.9	57	2.7	2.4	2.2	4.3	6.2	5.2	7.0
6	.5	1.3	3.7	12.5	67	3.1	2.6	2.2	4.2	3.8	9.9	4.4
7	.6	2.9	7.5	10.7	50	2.6	3.3	1.9	4.2	19.5	4.8	3.9
8	.5	10.3	3.4	5.8	23	2.3	4.2	1.7	50	13.5	4.3	3.5
9	.9	14.8	13.1	4.4	7.5	2.2	10.2	23	48	5.3	3.9	3.2
10	.6	10.6	80	3.9	5.6	2.0	7.7	57	24	4.3	3.1	2.6
11	.6	19.6	24	3.6	6.9	1.8	25	8.3	8.6	19.4	2.8	2.4
12	.8	7.4	8.6	3.9	6.8	1.8	94	4.2	6.5	7.7	2.5	3.1
13	.7	3.4	5.3	3.0	12.9	2.6	41	3.8	4.8	4.4	2.2	4.8
14	.6	3.0	4.0	2.6	7.7	1.9	170	3.3	4.2	6.4	2.2	5.4
15	.6	2.5	11.0	25	8.5	1.6	142	2.8	3.9	4.0	2.4	5.4
16	.6	2.2	4.8	15.4	21	1.5	25	2.6	3.7	3.4	5.2	10.4
17	.5	1.9	4.2	4.6	8.6	1.5	119	2.5	3.5	6.0	6.0	12.0
18	.7	2.2	14.9	4.8	5.6	1.4	125	2.3	3.6	12.5	4.4	5.4
19	1.1	7.9	7.7	3.6	4.9	1.5	47	25	3.6	8.8	4.8	4.3
20	.7	2.6	11.1	3.1	4.0	1.4	74	8.1	3.0	9.4	3.8	3.8
21	.6	2.0	7.1	3.7	4.2	1.3	15.2	8.7	2.6	5.9	4.3	3.3
22	.8	1.9	5.0	62	3.5	1.2	9.2	5.8	10.0	5.0	6.5	7.6
23	.6	1.6	3.6	15.4	3.1	1.2	6.2	28	37	3.8	5.8	3.7
24	.9	1.6	3.2	9.8	2.9	1.1	5.0	6.2	16.8	3.3	6.2	2.8
25	4.2	1.4	3.0	8.8	55	1.3	4.4	4.6	12.6	3.1	22	2.6
26	2.6	1.8	2.6	7.9	25	2.4	3.9	10.1	8.0	16.3	7.7	2.8
27	1.2	1.4	3.3	5.0	8.8	1.5	3.7	7.0	38	9.3	7.4	2.7
28	2.4	1.3	2.6	4.6	4.9	1.3	3.4	4.5	11.7	7.7	5.3	3.3
29	1.2	2.2	2.1	5.3	4.0	1.2	3.2	-------	5.8	7.2	5.0	4.5
30	.9	1.9	1.9	3.8	3.5	1.2	2.8	-------	4.4	15.0	7.6	4.0
31	.9	1.6	-------	4.0	-------	1.2	2.6	-------	4.7	-------	9.2	-------

NOTE.—Gage-height graph estimated because of partly plugged well intake July 1–4, Dec. 3–7, 9–12, 20–25, 28, 29, and June 6–11.

Monthly discharge of Haipuaena Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	4.2	0.5	0.96	1.49	29.9	91
August	19.6	.8	4.07	6.30	126	387
September	80	1.2	8.54	13.2	256	786
October	62	2.6	9.86	15.3	306	938
November	67	2.9	14.8	22.9	443	1,360
December	4.0	1.1	1.95	3.02	60.3	186
January	170	1.3	31.3	48.4	970	2,980
February	57	1.7	8.45	13.1	236	726
March	50	2.6	11.8	18.3	366	1,120
April	29	3.1	8.93	13.8	268	822
May	22	2.2	5.94	9.19	184	565
June	12.0	2.4	4.92	7.61	148	453
The year	170	.5	9.30	14.4	3,390	10,400

SPRECKELS DITCH AT HAIPUAENA WEIR, NEAR HUELO, MAUI

LOCATION.—Between Haipuaena and Puohakamoa Streams on Spreckels ditch trail 7 miles southeast of Huelo.

RECORDS AVAILABLE.—April 23, 1922, to June 30, 1923. The East Maui Irrigation Co. obtained records at this station prior to April 23, 1922.

GAGE.—Stevens continuous water-stage recorder; installed May 26, 1922, to replace Friez seven-day recorder used since April 23, 1922.

DISCHARGE MEASUREMENTS.—Made by weir just below gage or by current meter at section 90 feet above weir.

CHANNEL AND CONTROL.—Control formed by 6-foot, sharp-crested, trapezoidal weir with side slopes 1:4; permanent. Recorder operates in weir basin 16 by 65 feet.

EXTREMES OF DISCHARGE.—Maximum discharge during period of record, estimated 54 million gallons per day or 84 second-feet, at 11 a. m. September 10 (gage height estimated, 2.57 feet); minimum discharge recorded, 1.1 million gallons per day or 1.7 second-feet, at 4 a. m. January 16 (gage height, 0.19 foot).

DIVERSIONS.—Ditch diverts water from a dozen or more streams east of Nailiilihaele Stream.

REGULATION.—By head gates at intake in Haipuaena Stream.

OBJECT OF STATION.—To determine amount of water diverted through ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Weir rating curve well defined. Operation of water-stage recorder unsatisfactory at times. Daily discharge April 23 to June 30, 1922, ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day; daily discharge for the year ending June 30, 1923, ascertained by integrating recorder graph with discharge integrator. Records excellent for periods during which recorder operated; estimated records fair.

Spreckels ditch diverts water from all streams on the windward side of the crater of Haleakala between Nuaailua Gulch and Kailua Stream. It diverts above Koolau ditch as far as Puohakamoa Stream; beyond Puohakamoa Stream to Kailua Stream it diverts below Koolau (Wailoa) and New Hamakua ditches, and above Center ditch. At Kailua Stream the water is diverted into Lowrie ditch and carried to the vicinity of Paia for irrigation of sugar cane. Spreckels ditch proper is about 6 miles long and has a rated carrying capacity of 45 million gallons per day. It was originally one of the main irrigation ditches on East Maui but with the completion of Koolau (Wailoa) and Haiku ditches it was abandoned west of Kailua Stream and became mainly a storm-water ditch east of Kailua Stream.

The following discharge measurement was made by John McCombs:

September 16, 1922: Gage height, 1.09 feet; discharge, 21.7 second-feet or 14.0 million gallons per day.

Discharge, in million gallons per day, of Spreckels ditch at Haipuaena weir, near Huelo, Maui, for the years ending June 30, 1922 and 1923

Day	Apr.	May	June	Day	Apr.	May	June	Day	Apr.	May	June
1922				11		14.5	7.0	21			5.4
1		13.2		12		11.9	11.2	22			5.0
2		13.8		13		10.2	12.7	23	13.6	11	4.2
3		15.4		14		9.4	7.7	24	13.1		4.2
4		20		15		8.8	6.9	25	15.1		4.1
5		19.6	7.0	16		8.0	6.3	26	13.1		
6		16.5		17		7.5	5.6	27	11.3		
7		15.5		18		7.6	5.1	28	19.6	14	3.7
8		17.3		19		8.0	4.9	29	20		
9		13.2		20		13.4	4.8	30	14.5		
10		14.5						31			

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1922–23												
1	2.7	4.4	5.3	10.6	11.4	11	3.5	6.4	9.0	23		
2	2.9	8.4	8.4	13.4	10.4	11.2	10.0	4.7	8.8	23		16
3	3.1	22	8.0	23	12.6	11.5	21	4.1	16.0	17.2		
4	2.8	15.2	12.6	21	18.3	10.4	17.4	3.7	17.4	18.4	14	
5	3.7	9.1	22	24		8.7	9.7	3.4	10.2			16
6	3.1	7.7	14.3	22	18	8.7	10.8	3.4	9.9			13.2
7	3.3	13.2	21	21		8.3	13.6	3.2	10.6			10.4
8	3.1	21	13.0	17.4		7.2	13.5	3.1	26			10.8
9	5.5	26	18.5	14.5		6.7	22	10.9	27			9.5
10	3.3	23	32	12.8		6.2	23	21	21	15		8.5
11	3.6	24	23	11.4		5.8	14.6	13.9	16.7		9	7.9
12	4.7	20	18.7	11.7		5.8	8.5	12.9	14.0			11.5
13	3.6	14.3	16.7	9.3		10.4	11.2	13.8	11.0			15.8
14	3.3	12.0	13.6	8.5		6.7	10.2	11.0	10.0			16.9
15	2.9	10.5	21	11.6		5.7	1.2	9.0	9.3			15.8
16	2.8	10.2	15.9	24	12	5.1	11.4	8.1	9.0			17.8
17	2.6	8.7	14.4	15.2		4.8	28	7.4	8.3		14	18.8
18	3.5	9.1	23	15.1		4.6	26	7.0	8.6			15.5
19	6.5	19.3	19.8	12.5		4.5	19.7	13.3	8.9	13		13.3
20	3.7	12.0	20	10.2		4.4	18.2	16.3	6.3		13.4	11.7
21	3.1	9.0	18.6	9.4		4.1	9.0	14.8	5.4		15.0	10.7
22	5.9	8.6	13.8	27		3.9	7.5	13.6	11.1		17.0	13.4
23	3.5	7.2	11.1	21		3.7	5.6	21	23		17.1	12.3
24	6.3	7.0	9.7	18.9		3.5	4.8	14.2	22		16.9	10.2
25	10.6	7.3	9.2	18.0		3.8	4.9	11.9	22		21	9.6
26	12.4	8.7	8.3	18.2		9.0	6.2	14.1	19.8		18	10.7
27	6.6	6.5	10.7	15.1	13	4.9	4.5	15.2	26			9.7
28	13.5	5.9	8.5	12.9		4.1	3.1	11.2	22	16		11.7
29	6.6	10.1	7.1	16.0		3.7	3.6		16.4		17	13.5
30	4.9	8.5	6.5	12.2		3.7	5.5		13.5			12.2
31	5.3	6.1		12.6		3.4	5.1		13.4			

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage height record, by comparison with flow of Puohakamoa intake of Koolau ditch and Puohakamoa Stream

Monthly discharge of Spreckels ditch at Haipuaena weir, near Huelo, Maui, for the years ending June 30, 1922 and 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1922						
April 23–30					120	368
May		7.6	12.8	19.8	397	1,220
June	12.7		6.12	9.47	184	563
The period					701	2,150

Monthly discharge of Spreckels ditch at Haipuaena Weir, near Huelo, Maui, for the years ending June 30, 1922 and 1923—Continued

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1922–23						
July	13.5	2.6	4.82	7.46	149	459
August	26	4.4	12.1	18.7	375	1,150
September	32	5.3	14.8	22.9	445	1,360
October	27	8.5	15.8	24.4	490	1,500
November	----------	----------	13.4	20.7	401	1,230
December	11.5	3.4	6.31	9.76	196	600
January	28	1.2	11.4	17.6	353	1,080
February	21	3.1	10.4	16.1	293	894
March	27	5.4	14.6	22.6	453	1,390
April	23	----------	15.2	23.5	455	1,400
May	21	----------	13.9	21.5	429	1,320
June	18.8	7.9	13.0	20.1	391	1,200
The year	32	1.2	12.1	18.7	4,430	13,600

PUOHAKAMOA STREAM NEAR HUELO, MAUI

LOCATION.—150 feet above Spreckels ditch inflow and trail crossing and 7 miles east of Huelo.

RECORDS AVAILABLE.—June 13, 1913, to June 30, 1923; December 18, 1910, to June 18, 1913, at station 150 feet downstream.

GAGE.—Stevens continuous water-stage recorder installed November 23, 1917, replacing Barrett and Lawrence water-stage recorder installed June 13, 1913. Old staff gage station was 150 feet downstream at trail bridge below inflow from Spreckels ditch.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 200 feet above gage. Inflow of Spreckels ditch must be deducted from measurements made at trail bridge at old station.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage. Banks steep and high. Stream bed very rough and steep. Control composed of large boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum discharge during year, from extension of rating curve, 1,100 million gallons per day or 1,700 second-feet, at 2.30 p. m. January 14 (gage height, about 7.85 feet); minimum discharge not determined as well intake would not function below 1.2 feet.

1910–1923: Maximum discharge recorded on January 14, 1923; minimum discharge recorded, 0.4 million gallons per day or 0.6 second-foot, October 26, 1917 (gage height, 0.25 foot).

DIVERSIONS.—Kula pipe line diverts small amount of water above station at elevation 4,300 feet.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for water valuation appraisal in connection with Territorial water license to ditch company.

UTILIZATION.—Ordinary flow of stream is diverted by East Maui Irrigation Co.'s ditches for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined below 100 million gallons per day. Operation of water-stage recorder satisfactory except that well intake did not function below 1.2 feet (discharge, 2.0 million gallons per day). Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair, and those for unusually high stages which are subject to error.

Discharge measurements of Puohakamoa Stream near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 16	1.94	13.4	8.7	Jan. 5	1.52	5.9	3.8
Nov. 16	3.03	71	46	Apr. 5	2.17	18.8	12.2

Discharge, in million gallons per day, of Puohakamoa Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		2.2	2.1	4.1	5.4	9.7	3.9	8.9	7.9	33	15.4	13.8
2				5.5	5.1	7.6		6.5	7.3	66	17.2	8.6
3		18.9	2.7	45	5.8	7.5	15.6	5.7	36	13.3	19.5	9.9
4		6.8	7.6	32	38	6.8	9.5	5.5	25	12.8	12.3	20
5		2.8	16.6	43	116	5.8	4.1	5.1	9.7	13.3	9.7	12.7
6		2.0	6.9	24	143	5.8	4.5	4.9	8.6	8.6	21	8.2
7		4.5	12.6	21	121	5.3	5.6	4.7	8.5	42	9.7	6.5
8		24	5.2	10.5	53	4.6	9.3	4.7	46	31	8.5	6.2
9		34	24	6.9	18.0	4.4	18.3	41	62	11.4	7.8	5.7
10		26	172	5.8	13.3	4.0	14.6	162	36	8.9	6.5	5.0
11		40	61	6.6	19.3	3.8	57	20	16.6	46	5.8	4.5
12		17.4	17.3	7.0	16.0	3.8	210	12.3	12.3	18.3	5.1	6.4
13	1.5	7.8	10.5	4.2	29	5.5	93	14.3	8.9	10.5	4.9	10.7
14		5.6	7.3	3.7	16.6	3.9	343	9.2	8.2	14.5	4.4	12.3
15		4.7	24	51	16.5	3.2	250	7.5	7.3	8.9	4.7	12.0
16		4.4	8.6	39	47	3.1	54	6.5	6.4	7.5	10.5	25
17		4.4	7.4	7.6	19.2	2.9	272	6.1	6.0	13.1	12.5	28
18		3.8	32	8.1	12.3	2.7	270	5.4	5.9	32	7.1	11.4
19		16.0	14.0	5.7	10.5	2.6	54	41	6.8	19.5	8.7	8.3
20		5.6	21	4.6	8.9	2.2	155	17.5	5.0	19.5	7.3	6.9
21		3.7	12.3	5.7	8.9	2.1	32	22	4.5	12.6	8.9	5.9
22		3.5	8.2	138	7.6		19.5	14.9	19.6	11.8	14.7	15.0
23		2.8	6.2	34	6.4	2.2	14.3	73	83	8.1	12.3	7.3
24		2.5	5.2	19.5	6.2		11.4	15.4	47	6.8	12.8	5.5
25		2.2	4.9	16.6	122		10.5	11.4	26	6.4	39	5.0
26	9.9	2.4	4.4	15.4	64	3.7	8.9	24	16.4	42	16.6	5.3
27	1.4	2.0	5.5	9.7	23		8.8	18.0	86	22	14.3	4.8
28	5.1	2.0	4.1	8.1	12.3		7.8	10.5	26	16.8	10.5	5.9
29	2.0	3.7	3.2	9.7	9.7	2.1	7.5	-------	12.3	15.4	9.7	7.4
30	1.5	3.1	3.0	6.4	8.5		6.7	-------	9.7	36	14.1	6.3
31		2.2	-------	6.4	-------		6.5	-------	11.2	-------	19.5	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, by comparison with flow of Haipuaena Stream, because of loss of gage-height record due to plugged intake. Gage-height graph estimated for part of day Apr. 26.

Monthly discharge of Puohakamoa Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	9.9	----------	1.90	2.94	58.9	181
August	40	----------	8.49	13.1	263	808
September	172	----------	17.1	26.5	512	1,570
October	138	3.7	19.5	30.2	605	1,860
November	143	5.1	32.8	50.7	982	3,020
December	9.7	----------	3.88	6.00	120	369
January	343	----------	63.9	98.9	1,980	6,080
February	162	4.7	20.6	31.9	578	1,770
March	86	4.5	21.7	33.6	672	2,060
April	66	6.4	20.3	31.4	608	1,870
May	39	4.4	12.0	18.6	371	1,140
June	28	4.5	9.68	15.0	290	891
The year	343	----------	19.3	29.9	7,040	21,600

EAST BRANCH OF PUOHAKAMOA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—On left bank of stream 200 yards downstream from trail crossing and 7 miles by trail southeast of Kailiili.

RECORDS AVAILABLE.—October 9, 1919, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder. Datum lowered 3.50 feet on April 16, 1920.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 5 feet below gage.

CHANNEL AND CONTROL.—Bed of stream boulder-strewn; banks steep and high. Pool at station 20 feet wide by 35 feet long, clear and smooth. Control large boulders; subject to shift during floods.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 67 million gallons per day or 104 second-feet, at 2 p. m. January 14 (gage height, 6.14 feet); minimum discharge recorded, 0.1 million gallons per day or 0.15 second-foot, several times during period July 1–24 (gage height, 3.90 feet); an equally low stage may have occurred during period of no record in December.

1919–1923: Maximum discharge, about 102 million gallons per day or 158 second-feet, March 22, 1920 (gage height, 3.27 feet old datum, estimated by comparison with West and Middle branches of Puohakamoa Stream); minimum discharge recorded, no flow, several days in December, 1919, and on July 14, 1920.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple land above and Territorial lands below.

UTILIZATION.—Water picked up below by East Maui Irrigation Co.'s ditches for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 10 million gallons per day. Operation of water-stage recorder satisfactory except during December. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for ordinary stages; high-stage records uncertain; estimated records fair.

Discharge measurements of East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 21	4.08	0.9	0.6
Jan. 21	4.26	2.2	1.45
June 14	4.02	*.2	.1

* Estimated on basis of two velocity observations.

Discharge, in million gallons per day, of East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.1	0.1	0.2	0.4	0.4	0.6	0.1	0.4	0.5	1.4	1.0	1.0
2	.1	.2	.3	.5	.4	.6	.9	.4	.5	2.8	1.0	.6
3	.1	8	.3	3.2	.4		1.6	.4	2.1	.8	1.0	.6
4	.1	4	.6	2.6	2.4		.8	.4	1.0	.8	.8	.8
5	.1	.2	.8	2.6	2.8		.5	.4	.5	.8	.7	.6
6	.1	.2	.4	1.5	1.6		.4	.4	.5	.6	.7	.5
7	.1	.4	.6	1.2	1.4		.4	.4	.6	2.4	.6	.4
8	.1	1.4	.3	.6	1.7		1.0	.4	4.2	1.4	.6	.4
9	.1	1.6	2.4	.5	.8		1.0	4.8	2.3	.8	.6	.4
10	.1	1.3	8.9	.5	.6		1.3	5.1	1.6	.6	.6	.4
11	.1	2.4	2.2	.5	.8		4.4	.8	1.1	3.1	.5	.3
12	.1	.9	.8	.5	.7		11.9	.6	.8	1.0	.5	.4
13	.1	.5	.5	.4	1.4		4.5	.5	.6	.7	.5	.5
14	.1	.4	.4	.4	.8		20	.4	.5	.6	.5	.4
15	.1	.3	.9	4.9	1.2		17.5	.4	.5	.5	.5	.5
16	.1	.3	.5	2.2	2.2	.2	3.4	.4	.5	.5	.6	1.5
17	.1	.3	.8	.6	1.0		17.2	.4	.5	.5	1.0	1.4
18	.2	.3	2.0	.6	.6		13.9	.4	.5	.8	.6	.8
19	.2	1.1	.8	.5	.6		4.9	.8	.4	.7	.6	.5
20	.1	.4	.9	.4	.6		5.5	.6	.4	.6	.6	.5
21	.1	.3	.6	.4	.6		1.7	.6	.4	.6	.8	.4
22	.1	.3	.5	8.0	.5		1.4	.5	1.4	.5	1.0	1.1
23	.1	.2	.5	1.4	.5		1.0	1.5	6.4	.5	.8	.6
24	.2	.2	.4	1.0	.5		1.0	.5	1.3	.4	1.0	.5
25	.8	.2	.4	1.0	6.7		.8	.5	1.0	.4	3.9	.4
26	.2	.2	.4	.8	2.9		.7	1.1	.7	1.8	1.2	.4
27	.2	.2	.4	.5	1.2		.6	.7	3.5	.8	.9	.4
28	.3	.2	.4	.5	.8		.6	.6	1.1	.6	.8	.4
29	.2	.3	.3	.5	.6		.5	-------	.7	.7	.7	.5
30	.1	.3	.3	.4	.6		.5	-------	.6	2.4	1.0	.5
31	.1	.2	-------	.4	-------		.5	-------	.7	-------	1.2	-------

NOTE.—Braced figures show mean discharge for period indicated; estimated, by comparison with flow of Middle and West branches of this stream, because of loss of record due to sticky float-wheel.

Monthly discharge of East Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	0.8	0.1	0.15	0.23	4.6	14
August	2.4	.1	.52	.80	16.1	50
September	8.9	.2	.96	1.49	28.8	88
October	8.0	.4	1.27	1.96	39.5	121
November	6.7	.4	1.24	1.92	37.3	114
December	-------	-------	.23	.36	7.0	22
January	20	-------	3.89	6.02	120	370
February	5.1	.4	.87	1.35	24.4	75
March	6.4	.4	1.21	1.87	37.4	115
April	3.1	.4	1.00	1.55	30.1	92
May	3.9	.5	.86	1.33	26.8	82
June	1.5	.3	.59	.91	17.7	54
The year	20	-------	1.07	1.66	390	1,200

MIDDLE BRANCH OF PUOHAKAMOA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At trail crossing 200 feet above Haiku-uka boundary line and 6¾ miles southeast of Kailiili.

RECORDS AVAILABLE.—March 14, 1919, to June 30, 1923. Records for the period March 14 to June 30, 1919, published in Water-Supply Paper 555.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension bridge just above gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 25 feet above and below control. Right bank vertical; left bank 1½ on 1 slope. Stream bed composed of gravel and boulders. Control probably shifting.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 181 million gallons per day, or 280 second-feet, at 1.40 p. m. November 7 and 2 p. m. January 14 (gage height, 8.47 feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, for several hours July 7–11 (gage height, 4.11 feet).

1919–1923: Maximum discharge recorded, 207 million gallons per day, or 320 second-feet, at 5 p. m. March 22, 1920 (gage height, 8.47 feet); minimum discharge recorded, 0.06 million gallons per day or 0.09 second-foot, at noon December 22, 1919 (gage height, 3.91 feet), and from 7 to 9 p. m. July 14, 1920 (gage height, 4.06 feet).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee-simple land above and Territorial lands below.

UTILIZATION.—Water picked up below by East Maui Irrigation Co.'s ditches for the irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed during flood of January 14. Rating curve used prior to flood well defined below 20 million gallons per day; curve used after flood well defined below 5 million gallons per day and fairly well defined between 5 and 20 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for ordinary stages.

Discharge measurements of Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 21	4.46	3.1	2.0	Jan. 21	4.68	5.5	3.5
Nov. 21	4.38	2.2	1.4	June 14	4.28	.9	.6

Discharge, in million gallons per day, of Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923.

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.3	0.3	0.4	0.6	0.9	1.2	0.3	1.4	1.0	5.9	2.2	1.9
2	.3	.3	.6	1.0	.8	1.3	1.3	.8	1.0	10.5	2.3	1.0
3	.3	1.5	.8	8.9	1.0	1.1	3.6	.7	6.3	1.6	2.2	1.0
4	.3	1.3	1.6	4.8	7.4	1.1	1.9	.6	3.3	1.6	1.6	1.8
5	.3	.4	3.8	4.8	18.1	1.0	.8	.6	1.1	2.2	1.0	1.5
6	.3	.3	1.5	3.4	18.4	1.2	.7	.6	.9	1.0	1.3	.9
7	.2	.9	2.3	3.0	20	.8	.8	.6	1.1	6.3	1.0	.7
8	.2	2.9	1.1	1.5	7.6	.8	2.0	.6	20	4.0	1.0	.7
9	.3	4.8	4.2	1.2	3.1	.7	4.9	12.0	17.7	1.3	.9	.6
10	.2	3.4	24	1.1	2.2	.6	4.7	14.7	7.8	1.1	.8	.6
11	.3	7.9	6.9	1.4	2.6	.6	10.4	2.2	3.0	8.1	.7	.6
12	.4	3.0	3.0	1.5	3.3	.6	22	1.3	1.8	2.4	.6	.7
13	.3	1.2	1.9	.9	4.6	.8	11.4	1.6	1.2	1.2	.6	.9
14	.3	.8	1.2	.8	3.3	.6	60	1.0	1.0	1.2	.6	.8
15	.3	.7	2.0	7.6	2.8	.5	55	.9	1.0	.9	.6	.9
16	.3	.7	1.3	7.2	9.4	.4	9.3	.8	.9	.7	1.0	3.4
17	.3	.6	1.2	1.5	3.7	.4	48	.7	1.0	.9	1.3	4.0
18	.5	.7	4.8	1.3	2.1	.4	36	.7	1.0	1.3	.8	1.2
19	.6	2.9	1.9	1.1	1.9	.4	12.0	1.0	1.0	1.6	.7	.9
20	.3	1.0	2.8	1.0	1.9	.4	19.4	1.0	.8	2.2	.8	.8
21	.3	.6	2.0	.8	1.6	.3	4.2	1.2	.7	1.0	1.0	.6
22	.3	.4	1.4	15.1	1.3	.3	2.5	1.2	2.0	.8	1.1	4.6
23	.3	.4	1.0	3.5	1.1	.3	1.8	3.1	14.6	.7	1.3	1.1
24	.3	.4	1.0	2.5	1.0	.3	1.5	1.5	5.0	.7	1.6	.7
25	1.0	.4	1.0	2.7	16.1	.4	1.3	1.1	2.4	.9	9.0	.6
26	1.2	.6	.8	2.6	8.2	.6	1.2	5.0	1.6	6.1	2.2	.6
27	.4	.4	1.1	1.4	3.3	.4	1.0	2.4	10.1	2.2	2.2	.6
28	1.2	.3	.8	1.2	1.7	.4	1.0	1.4	3.3	1.2	1.1	.8
29	.5	.8	.6	1.4	1.4	.3	.9	-------	1.3	1.5	1.2	.9
30	.3	.9	.5	1.1	1.2	.3	.9	-------	1.1	5.2	2.6	.9
31	.3	.7	-------	1.0	-------	.3	.8	-------	1.8	-------	2.8	-------

Monthly discharge of Middle Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.2	0.2	0.40	0.62	12.4	38
August	7.9	.3	1.34	2.07	41.5	127
September	24	.4	2.58	3.99	77.5	238
October	15.1	.6	2.84	4.39	87.9	270
November	20	.8	5.07	7.84	152	467
December	1.3	.3	.61	.94	18.8	58
January	60	.3	10.4	16.1	322	989
February	14.7	.6	2.17	3.36	60.7	186
March	20	.7	3.77	5.83	117	359
April	10.5	.7	2.54	3.93	76.3	234
May	9.0	.6	1.55	2.40	48.1	147
June	4.6	.6	1.21	1.87	36.3	111
The year	60	.2	2.88	4.46	1,050	3,220

WEST BRANCH OF PUOHAKAMOA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At trail crossing 500 feet above Haiku-uka boundary line and 6½ miles by trail southeast of Kailiili.

RECORDS AVAILABLE.—March 15, 1919, to June 30, 1923. Records for the period March 15 to June 30, 1919, published in Water-Supply Paper 555.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension bridge 200 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 30 feet above and 50 feet below gage. Right bank vertical; left bank 1 on 1½ slope. Stream bed rock and gravel. Control composed of large boulders; shifts occasionally.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 217 million gallons per day or 336 second-feet, at 1.45 p. m. January 14 (gage height, 7.50 feet); minimum discharge recorded, 0.3 million gallons per day or 0.45 second-foot, for several hours July 4–8, 10, 11, and 23 (gage height, 3.56 feet).

1919–1923: Maximum discharge estimated 250 million gallons per day or 387 second-feet at 5.30 p. m. March 22, 1920; recorder float stuck at gage height 5.62 feet but from shape of the graph and comparison with Middle and East branches of Puohakamoa Stream it is estimated that a stage of 8 feet was reached. Minimum discharge recorded, 0.08 million gallons per day or 0.12 second-foot, at 8.30 a. m. December 22 and 2 a. m. December 23, 1919 (gage height, 3.48 feet).

DIVERSIONS.—Small amount of water diverted by Kula pipe line above station at elevation 4,300 feet.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed during flood of January 14. Rating curve used prior to flood, well defined below 25 million gallons per day; curve used after flood, well defined below 10 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 20	4.40	19.5	12.6	Nov. 20	3.78	1.95	1.25	June 14	3.62	1.3	0.85
21	3.83	2.5	1.6	Jan. 21	4.01	8.0	5.2				

Discharge, in million gallons per day, of West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	0.4	0.5	0.7	1.0	1.1	0.4	2.0	1.1	7.0	2.9	2.7
2	.3	.4	.9	1.1	.9	1.1	2.4	1.6	1.1	14.0	3.4	1.5
3	.3	2.4	.9	14.3	1.1	.9	4.9	1.1	6.8	2.0	3.0	1.6
4	.3	1.1	2.0	7.5	11.8	.9	1.7	1.0	3.4	2.0	2.2	3.0
5	.4	.6	4.6	9.0	30	.8	.8	.9	1.2	2.3	1.7	2.0
6	.3	.4	1.5	5.6	30	.8	.8	.9	1.1	1.5	2.1	1.3
7	.3	1.4	2.4	4.6	27	.8	1.0	.9	1.3	6.7	1.5	1.1
8	.3	4.3	1.0	1.9	8.2	.7	3.8	.8	24	5.2	1.5	1.2
9	.4	5.6	6.0	1.4	2.7	.6	4.5	13.2	22	1.9	1.4	1.1
10	.3	3.7	36	1.1	2.0	.6	3.5	19.6	9.7	1.4	1.2	.9
11	.4	10.6	13.2	2.4	3.0	.6	18.8	2.5	3.1	8.9	1.1	.9
12	.5	2.9	4.0	1.7	3.3	.6	30	1.8	2.1	3.1	1.0	1.1
13	.4	1.1	2.1	.9	5.8	.8	18.2	2.3	1.5	1.8	1.0	1.5
14	.4	1.2	1.4	.9	3.1	.6	78	1.5	1.3	2.0	.9	1.3
15	.4	.8	3.2	12.6	2.8	.6	64	1.2	1.2	1.5	.9	1.4
16	.5	.7	1.5	9.4	10.9	.5	14.3	1.0	1.2	1.3	1.8	4.8
17	.4	.7	1.3	1.7	3.5	.5	64	1.0	1.2	1.3	2.2	4.6
18	.6	.7	7.1	1.5	1.8	.5	45	1.0	1.2	2.7	1.2	1.8
19	.6	3.4	2.8	1.2	1.5	.5	16.7	1.8	1.2	2.4	1.0	1.3
20	.4	1.1	3.7	1.0	1.2	.4	27	1.6	1.0	3.2	1.4	1.2
21	.4	.7	2.1	.9	1.3	.4	5.9	1.8	.9	1.9	1.8	1.0
22	.4	.7	1.3	25	1.1	.4	4.2	1.5	2.9	1.4	2.1	5.3
23	.3	.6	1.1	4.8	1.0	.4	2.7	4.9	16.8	1.1	2.0	1.6
24	.5	.6	.9	3.8	.9	.4	2.1	2.4	6.8	1.2	2.6	1.2
25	2.3	.6	.9	4.1	23	.5	2.0	1.7	3.3	1.1	11.4	1.0
26	1.1	.7	.8	3.8	10.5	.6	1.6	6.0	2.0	7.6	3.0	1.0
27	.5	.6	1.1	2.0	3.4	.5	1.5	2.7	12.3	2.5	2.7	1.0
28	1.3	.5	.8	1.4	1.6	.5	1.4	1.5	3.9	1.8	1.8	1.0
29	.6	1.0	.6	1.7	1.3	.4	1.2	-------	2.0	2.2	1.6	1.5
30	.4	.8	.6	1.3	1.1	.4	1.2	-------	1.5	6.6	3.4	1.2
31	.4	.6	-------	1.1	-------	.4	1.1	-------	1.9	-------	3.7	-------

Monthly discharge of West Branch of Puohakamoa Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.3	0.3	0.52	0.80	16.1	49
August	10.6	.4	1.64	2.54	50.9	156
September	36	.5	3.54	5.48	106	326
October	25	.7	4.21	6.51	130	401
November	30	.9	6.56	10.1	197	604
December	1.1	.4	.61	.94	18.8	58
January	78	.4	13.7	21.2	425	1,300
February	19.6	.8	2.86	4.43	80.2	246
March	24	.9	4.55	7.04	141	433
April	14.0	1.1	3.32	5.14	99.6	306
May	11.4	.9	2.24	3.47	69.5	213
June	5.3	.9	1.74	2.69	52.1	160
The year	78	.3	3.80	5.88	1,390	4,250

PUOHAKAMOA INTAKE OF KOOLAU DITCH NEAR HUELO, MAUI

LOCATION.—20 feet below Puohakamoa Stream intake on short feeder canal to Koolau ditch, 7 miles southeast of Huelo.

RECORDS AVAILABLE.—March 23, 1922, to June 30, 1923. East Maui Irrigation Co. previously obtained records at this location.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made in short channel between Puohakamoa Stream and head gates in Koolau ditch. When all water is being diverted into ditch measurements may be made by wading in stream about 300 feet above intake.

CHANNEL AND CONTROL.—Control formed by 6-foot sharp-crested trapezoidal weir 21 feet below gage; some velocity of approach; permanent. Recorder operates in weir basin 14 by 40 feet. Below weir channel slopes downward at 30° entering Koolau ditch in tunnel.

EXTREMES OF DISCHARGE.—1922–23: Maximum discharge recorded, 88 million gallons per day or 136 second-feet, at 8 a. m. October 22, 1922 (gage height, 3.04 feet); a higher stage may have occurred during period of no record September 4–15. Minimum discharge recorded, 0.5 million gallons per day or 0.8 second-foot, from 2 p. m. January 27 to 1.45 p. m. January 28, 1923 (gage height, 0.08 foot; water turned out of ditch).

DIVERSIONS.—During high water Spreckels ditch intake 120 feet downstream takes water wasted at this intake above.

REGULATION.—Entire flow of Spreckels ditch empties into Puohakamoa Stream about 400 feet above station. During ordinary stages station measures all water carried by this ditch and the stream.

OBJECT OF STATION.—To determine amount of water diverted into ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Weir rating curve well defined. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Recorders good for periods during which recorder operated; estimated records fair except for period January 11–23 for which they are poor owing to uncertainty regarding intake gate operations.

Discharge measurements of Puohakamoa intake of Koolau ditch near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 16	1.51	38.5	25
29	.98	20.4	13.2
Nov. 15	1.32	32.5	21

Discharge, in million gallons per day, of Puohakamoa intake of Koolau ditch near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	4.7	6.6	8.8	17.8	22	18		17.8				26
2	4.5	13.0	11.7	24	18.9	16.6	20	12.5		30		23
3	4.4	36	14.1	40	23	16.6		10.8				23
4	4.4	25		40	31	17.8		10.3			25	28
5	5.4	13.9		44	38	16.6	15.4	9.7		26		25
6	4.4	11.4		42	38		17.8		25	23		22
7	4.5	21		40	32		23			26		18.9
8	4.5	36		32	27		20			30		17.8
9	8.3	44	30	25	23	12	30			25		16.6
10	5.1	40		23	22		30	18		24		13.9
11	5.7	42		22	22					28	16	13.0
12	7.6	38		23	22					26		18.9
13	5.4	26		16.6	23							24
14	5.1	22		15.0	22							25
15	4.5	18.9		29	22			14.5				25
16	4.4	17.8	26	40	24			13.2				26
17	4.3	15.4	24	26	22		18	11.9	15		25	28
18	5.7	15.4	31	30	22			11.2				25
19	9.6	32	30	22	20			18.3		20		23
20	5.5	23	30	17.8	20			26			23	20
21	4.5	15.4	28	17.7	20	9.5		25			24	17.8
22	7.6	15.0	25	21	18.9			25			26	22
23	5.1	11.9	22	1.7	17.8			30			26	22
24	9.0	11.7	18.9	23	17.8		.5	25			25	16.6
25	16.8	10.3	17.8	30	22		.5	24			30	15.4
26	21	14.3	15.4	30	22		.5	24	30		26	17.8
27	10.5	10.5	22	26			.5	26			26	16.6
28	23	9.4	15.4	24	20		5.5	24		25	24	20
29	10.1	16.5	13.0	26			13.2				24	23
30	7.4	16.6	11.7	23			14.3				25	20
31	8.1	10.5		24			14.1				26	

NOTE.—Operation of recorder float-wheel hindered by mud-dauber wasp's nest Sept. 28–29; friction clutch on recorder slipped May 25–26; discharge estimated by comparison with flow of Koolau ditch at Wahinepe. Braced figures show mean discharge for periods indicated; estimated because clock stopped, by comparison with flow of Spreckels ditch at Haipuaena weir and Puohakamoa Stream.

Monthly discharge of Puohakamoa intake of Koolau ditch near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	23	4.3	7.45	11.5	231	709
August	44	6.6	20.6	31.9	640	1,960
September		8.8	24.2	37.4	725	2,230
October	44	1.7	26.3	40.7	816	2,500
November	38	17.8	23.1	35.7	692	2,130
December			11.3	17.5	350	1,080
January		.5	16.1	24.9	499	1,530
February			18.6	28.8	521	1,600
March			23.7	36.7	735	2,250
April			23.8	36.8	713	2,190
May	30		22.8	35.3	708	2,170
June	28	13.0	21.1	32.6	633	1,940
The year		.5	19.9	30.8	7,260	22,300

MANUEL LUIS DITCH AT PUOHAKAMOA GULCH, NEAR HUELO, MAUI

LOCATION.—In Puohakamoa Gulch at lower portal of tunnel between Haipuaena and Puohakamoa Streams, 6 miles east of Huelo.

RECORDS AVAILABLE.—December 15, 1917, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by rectangular sharp-crested weir 4.5 feet long set in concrete, with full contractions.

CHANNEL AND CONTROL.—Weir basin 25 feet long, 8.3 feet wide, and 1.9 feet deep below crest of weir; made by enlarging tunnel.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 116 million gallons per day or 179 second-feet, at 2.10 p. m. January 14 (gage height, 4.93 feet); minimum discharge recorded, 0.1 million gallons per day or 0.15 second-foot, on several days during July (gage height, 0.05 foot).

1919–1923: Maximum discharge recorded on January 14, 1923; minimum discharge recorded, 0.05 million gallons per day or 0.08 second-foot, at 6.30 p. m. March 3, 1920 (gage height, 0.03 foot).

DIVERSIONS.—Ditch is an extension of Center ditch and picks up water not diverted by ditches at higher elevations.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—To determine amount of water diverted by ditch from areas involved under Territorial water license.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve for weir well defined. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair.

Manuel Luis ditch, at elevation about 500 feet, diverts the flow of Kolea, Haipuaena, and Puohakamoa Streams below Koolau and Spreckels ditches and discharges into Waikamoi Stream. The water is then picked up by Center ditch (see Center ditch at Waikamoi, near Huelo) and carried to Kailua Stream where it is diverted into Lowrie ditch (see Lowrie ditch at Opana weir, near Huelo) and carried to the vicinity of Paia for use in irrigation and development of sugar cane on the plantations of Hawaiian Commercial & Sugar Co. The system comprises about 20 miles of main ditch. Manuel Luis ditch proper is about 1½ miles long and has a rated carrying capacity of 30 million gallons per day.

No discharge measurements were made at this station during the year.

Discharge, in million gallons per day, of Manuel Luis ditch at Puohakamoa Gulch, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.2	0.2		0.7	2.4	5.3	0.4	1.0	1.3	27		10.6
2	.2	.2		1.2	1.4	2.0	.7	.8	1.2	27		1.9
3	.2	13.2		22	1.6	2.1	7.7	.7	13.1	8.6		4.7
4	.2	2.3		17.7	15.6	2.1	3.4	.6	11.2	13.3	13	16.3
5	.2	.4	2.7	26	40	1.4	.6		1.3	15.7		5.4
6	.2			25	42	1.3	.7		1.5	4.6		1.3
7	.2			20	42	1.3	1.2		1.5	16.9		1.0
8	.2			4.9	34	.9	1.7		35			.9
9	.4			1.9	13.3	.9	9.5		37			.7
10	.2	11		1.3	6.8	.8	9.9		27			.6
11	.3			1.1	7.0	.7	8.9	3.8	13.7	13	2.4	.6
12	.4			.9	9.6	.8	53		5.6			.9
13	.2			.8	17.9	1.4	38		2.1			2.1
14	.2		16	.7	11.7	.7	63		1.5	14.8		9.8
15	.2			9.6	9.0	.6	56		1.3	3.4		5.9
16	.1			19.0	28	.6	22		2.2	2.7		15.2
17	.1			1.2	13.4	.6	52		1.4			24
18	.1	2.9		2.9	6.0	.6	54		1.1			4.7
19	.3			1.1	6.3	.5	39	13.3	1.1		5.5	1.6
20	.2		11.1	.7	3.2	.5	47	15.1	.8			1.1
21	.1		4.5	2.3	3.1	.5	16.4	10.6	.7	11		.9
22	.2		1.7	39	2.1	.4	8.4	5.7	9.5			6.9
23	.2		1.1	22	1.6	.4	5.5	26	30		6.6	1.4
24	.3		.9	19.3	1.4	.3	4.3	9.2	23		5.0	.7
25	5.0		.8	14.0	26	.4	4.2	3.2	24		29	.7
26	2.7		.7	14.0	26	.7	3.6	9.2	14.8		11.6	.8
27	.5	.5	.8	3.3	12.6	.4	3.3	6.3	35		11.2	.7
28	1.4		.7	2.2	5.0	.4	3.4	2.1	21	20	3.5	.8
29	.4		.5	9.1	4.1	.4	2.6	-------	6.2		3.0	2.5
30	.2		.5	1.9	2.1	.3	1.3	-------	3.5		10.3	1.0
31	.3		-------	2.7	-------	.4	1.1	-------	6.5	-------	27	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Center ditch below Kolea reservoir.

Monthly discharge of Manuel Luis ditch at Puohakamoa Gulch, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	5.0	0.1	0.50	0.77	15.6	48
August	-------	.2	4.35	6.73	135	414
September	-------	.5	7.36	11.4	221	678
October	29	.7	9.31	14.4	288	886
November	42	1.4	13.2	20.4	395	1,220
December	5.3	.3	.96	1.49	29.7	91
January	63	.4	16.9	26.1	523	1,610
February	-------	-------	5.61	8.68	157	482
March	37	.7	10.8	16.7	335	1,030
April	-------	2.7	13.7	21.2	411	1,260
May	29	-------	8.25	12.8	256	785
June	24	.6	4.19	6.48	126	386
The year	63	.1	7.92	12.3	2,890	8,890

KOOLAU DITCH AT WAHINEPE, NEAR HUELO, MAUI

LOCATION.—Between Puohakamoa and Waikamoi Streams, half a mile below Puohakamoa intake, and 7 miles southeast of Huelo.

RECORDS AVAILABLE.—March 25, 1922, to June 30, 1923. East Maui Irrigation Co. previously obtained records at this site.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank across ditch.

CHANNEL AND CONTROL.—Ditch section in rock tunnel; probably permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded, about 120 million gallons per day or 186 second-feet, at 2 a. m. May 6 (gage height, about 5.55 feet); minimum discharge estimated 5 million gallons per day or 7.5 second-feet, January 15, 16, and 20–28.

1922–23: Maximum and minimum same as above.

DIVERSIONS.—Flood water diverted at gage through a cross-cut channel, and at Puohakamoa intake half a mile upstream. Other flood water waste-gates along course of ditch.

REGULATION.—Complete regulation by various intake gates and by flood water waste gates.

OBJECT OF STATION.—To determine amount of water diverted through Koolau ditch from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 25 and 80 million gallons per day. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair.

For description of this ditch see Koolau ditch at Nahiku weir, near Nahiku, Maui.

Discharge measurements of Koolau ditch at Wahinepe, near Huelo, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 16	E. D. Burchard	3.91	116	75
29	John McCombs	2.44	59	38.5
Jan. 3	do	3.58	104	67

Discharge, in million gallons per day, of Koolau ditch at Wahinepe, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	17.5	18.4		47	77	93	26	21	64	110		104
2	16.6	28		64	67	80	41		62	107	105	88
3	16.6	104		101	72	83	83	17	77	104		91
4	16.6	62		110	101	80	77		96	107		110
5	18.4	34		113	113	70	47	40	67	107	107	93
6	16.6	30		113	113	64	52	59	67	99	116	77
7	16.6	47		113	113	64	59	54	75	101	104	70
8	16.6	93	70	104	110	56	56	52	110	110	96	67
9	22	113		83	110	52	91	62	110	83	88	62
10	16.6	110		70	104	49	96	113	110	99	80	56
11	18.4	113		64	101	47	77	107	110	107	72	52
12	20	107		62	107	44	113	93	101	104	64	64
13	16.6	75		52	110	59	107	101	88	99	62	80
14	16.6			47	107	44	98	77	72	104	56	101
15	16.6			63	107	39	21	67	72	91	59	99
16	15.8		77	110	110	37	22	59	85	83		101
17	15.8		70	75	110	35	110	54	75	93	87	110
18	16.6		104	83	107	34	107	52	72	107		96
19	22		101	64	107	32	104	70	67	107		83
20	16.6		93	52	96	30	49	101	54	107	77	72
21	16.6		91	49	96	28		93	49	104	88	67
22	20	30	72	103	85	27		91	66	104	99	83
23	16.6		62	101	77	26		110	110	99	104	75
24	24		54	107	72	26		101	110	93	101	62
25	43		49	110	96	27	1.5	85	110	96	113	59
26	50		47	110	104	37		85	110	110	110	63
27	23		54	96	98	26		93	110	113	110	59
28	50		44	83	101	24		77	110	110	99	64
29	24		37	104	91	23		-------	104	110	96	75
30	19.4		34	80	83	25	16	-------	93	110	107	64
31	21		-------	80	-------	24		-------	99	-------	110	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow at Puohakamoa intake of this ditch. Gage-height graph partly estimated July 3, 4, 6, 7, 15–18, 21, 22, Jan. 15, 16, 20, Feb. 14, 15, and Apr. 30.

Monthly discharge of Koolau ditch at Wahinepe, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	50	15.8	21.2	32.8	657	2,020
August	113	-------	47.6	73.6	1,470	4,530
September	104	-------	68.0	105	2,040	6,260
October	113	47	84.3	130	2,610	8,020
November	113	67	98.2	152	2,940	9,040
December	93	23	44.7	69.2	1,380	4,250
January	113	-------	48.3	74.7	1,500	4,600
February	113	-------	70.3	109	1,970	6,040
March	110	49	87.3	135	2,700	8,310
April	113	83	103	159	3,080	9,480
May	-------	56	93.1	144	2,890	8,860
June	110	52	78.2	121	2,350	7,200
The year	113	-------	70.1	108	25,600	78,600

WAIKAMOI STREAM ABOVE WAILOA DITCH, NEAR HUELO, MAUI

LOCATION.—250 feet above Wailoa ditch intake, one-fourth mile from Spreckels ditch trail, and 4½ miles southeast of Huelo.

RECORDS AVAILABLE.—January 28, 1922, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from suspension footbridge at gage or by wading.

CHANNEL AND CONTROL.—One channel at all stages. Banks high, steep, and covered with vegetation; not subject to overflow. Control composed of boulders and solid rocks; may shift occasionally.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 1,500 million gallons per day or 2,320 second-feet, at 3 p. m. January 14 (gage height, 9.87 feet); minimum discharge recorded, 0.5 million gallons per day or 0.8 second-foot, at 9 a. m. July 4 (gage height, 0.47 foot).

1922–23: Maximum and minimum recorded same as above.

DIVERSIONS.—A small amount of water is diverted by Haleakala ranch pipe line above station at elevation 5,300 feet and by Kula pipe line at elevation 4,300 feet.

REGULATION.—By diversion only.

OBJECT OF STATION.—To determine feasibility of additional diversions or flood storage; also to assist valuation appraisers in relation to Territorial water license to ditch company.

UTILIZATION.—Low water is all diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 1 and 40 million gallons per day. Operation of water-stage recorder satisfactory except during May. Daily discharge, below 1 foot, ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection; above 1 foot it was ascertained by integrating recorder graph with discharge integrator. Records good except for high stages.

Discharge measurements of Waikamoi Stream above Wailoa ditch, near Huelo, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge		Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day				Second-feet	Million gallons per day
Aug. 7	S. B. Hall	0.87	3.0	1.9	Jan. 3	John McCombs	1.15	7.4	4.8
Sept. 15	John McCombs	1.65	21.9	14.2	June 30	do	1.12	5.4	3.5
Nov. 15	do	1.42	12.6	8.1					

Discharge, in million gallons per day, of Waikamoi Stream above Wailoa ditch, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.7	1.0	1.3	2.6	3.5	4.6	1.1	6.3	5.9	51	11.3	10.1
2	.6	1.6	1.8	3.6	3.3	4.3	3.3	3.7	4.7	72	11.1	4.7
3	.6	10.3	2.1	34	3.5	4.3	11.7	2.6	22	11.2		4.2
4	.6	4.7	4.4	22	25	3.7	7.5	2.2	23	7.9		10.5
5	.8	2.0	14.3	29	78	2.8	2.7	2.0	6.0	10.2		10.1
6	.6	1.5	6.3	20	84	3.0	2.8	2.0	4.8	6.3		4.6
7	.6	3.6	10.0	17.0	83	2.8	3.4	1.8	4.9	21		3.4
8	.6	13.6	4.3	7.8	31	2.2	5.0	1.7	72	26		3.1
9	1.1	22	14.3	5.2	11.6	2.0	18.3	21	108	7.9		2.8
10	.8	17.0	90	4.0	8.0	1.8	11.0	79	62	5.8		2.4
11	.8	30	43	8.2	9.3	1.7	32	17.1	17.3	23	50	2.2
12	1.0	13.5	15.4	7.5	14.0	1.7	99	6.5	10.6	15.9		3.0
13	.8	5.0	7.6	3.9	19.2	2.6	47	9.1	6.3	6.3		4.9
14	.7	3.4	5.4	2.9	12.6	2.1	349	5.2	5.1	7.2		5.7
15	.6	3.1	12.5	17.7	10.2	1.6	368	3.7	4.5	4.6		5.8
16	.7	2.7	5.8	32	34	1.4	45	3.2	4.0	3.8		13.7
17	.7	2.3	4.8	6.0	15.0	1.4	163	2.8	3.7	5.6		18.5
18	1.0	2.5	22	5.4	8.1	1.3	148	2.5	4.0	15.6		7.1
19	1.5	10.3	10.0	4.2	6.6	1.3	59	14.4	4.5	12.2	4.4	4.5
20	.9	4.0	10.9	3.2	5.5	1.2	117	9.6	3.3	15.9	3.6	3.7

Discharge, in million gallons per day, of Waikamoi Stream above Wailoa ditch, near Huelo, Maui, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
21	0.7	2.3	9.1	4.7	5.4	1.2	32	9.5	2.6	9.5	5.0	3.4
22	.9	2.1	5.5	64	4.8	1.1	25	8.5	7.2	7.1	7.5	12.7
23	.7	1.7	3.8	20	3.5	1.1	11.3	33	42	4.9	6.5	7.2
24	1.0	1.7	3.2	12.8	3.2	1.0	8.3	11.4	35	3.7	7.2	3.5
25	5.4	1.4	3.4	11.8	50	1.7	6.3	8.2	14.7	4.4	36	2.9
26	4.6	1.8	2.7	13.2	37	2.1	5.3	22	10.0	27	11.7	3.1
27	1.6	1.4	3.7	6.6	15.1	1.3	4.7	17.8	52	16.5	9.8	2.7
28	3.5	1.3	2.8	4.9	7.0	1.2	3.9	8.5	22	10.1	6.1	3.4
29	1.6	2.4	2.1	6.0	5.1	1.0	3.5	-------	8.3	10.1	5.6	4.1
30	1.1	2.7	1.8	4.2	4.1	1.1	3.1	-------	6.0	24	8.0	4.3
31	1.1	1.6	-------	4.2	-------	1.1	2.8	-------	5.5	-------	11.4	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated, because of lack of gage-height record, by comparison with flow of East and West Branches of this stream at Haiku-uka boundary.

Monthly discharge of Waikamoi Stream above Wailoa ditch, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	5.4	0.6	1.22	1.89	37.9	116
August	30	1.0	5.63	8.71	174	536
September	90	1.3	10.8	16.7	324	994
October	64	2.6	12.5	19.3	389	1,190
November	84	3.2	20.0	30.9	601	1,840
December	4.6	1.0	1.99	3.08	61.7	189
January	368	1.1	51.6	79.8	1,600	4,910
February	79	1.7	11.3	17.5	315	971
March	108	2.6	18.8	29.1	582	1,790
April	72	3.7	14.9	23.1	447	1,370
May	36	----------	7.26	11.2	225	691
June	18.5	2.2	5.74	8.88	172	528
The year	368	.6	13.5	20.9	4,930	15,100

EAST BRANCH OF WAIKAMOI STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—200 feet above Haiku-uka boundary-line trail crossing, at elevation 3,020 feet, 5½ miles east of Kailiili.

RECORDS AVAILABLE.—May 26, 1918, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge just above control.

CHANNEL AND CONTROL.—Channel has gravel and boulder bed with steep high banks of hardpan. Control is broad-crested concrete weir, completed June 3, 1922; permanent for low stages but drowned out at high stages.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 155 million gallons per day or 240 second-feet, at 1.05 a. m. November 7 and 1.30 p. m. January 14 (gage height, 7.18 feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, at 3 p. m. July 4 (gage height, 3.89 feet).

1918–1923: Maximum discharge recorded, 230 million gallons per day or 356 second-feet, at 5.20 p. m. March 22, 1920 (gage height, 7.92 feet); minimum discharge recorded, 0.07 million gallons per day or 0.11 second-foot, April 15, 1919 (gage height, 3.77 feet).

DIVERSIONS.—A little water is diverted above station by Kula pipe line.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 15 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 20	4.36	4.4	2.9	Jan. 20	4.70	11.1	7.2
21	4.13	2.0	1.3	June 14	4.10	1.05	.65

Discharge, in million gallons per day, of East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.2	0.3	0.3	0.4	0.6	0.9	0.3	1.6	0.9	4.6	2.2	2.0
2	.2	.3	.6	1.0	.5	.8	2.4	.8	.9	9.0	3.0	1.1
3	.2	2.0	.6	7.2	.7	.7	4.2	.7	5.5	1.5	2.3	1.2
4	.2	.8	1.6	5.2	7.0	.7	1.4	.6	2.3	1.8	1.6	2.6
5	.2	.3	3.4	4.3	13.9	.6	.6	.6	1.0	1.7	1.2	1.6
6	.2	.3	.9	3.2	13.3	.7	.7	.6	.9	1.0	1.5	.9
7	.2	1.0	2.0	2.6	14.8	.6	.8	.5	1.2	6.1	1.1	.8
8	.2	3.6	.7	1.0	4.6	.5	3.2	.5	13.0	3.2	1.0	.8
9	.2	4.5	4.3	.7	1.7	.5	2.6	12.1	8.5	1.4	.9	.7
10	.2	2.7	19.2	.6	1.3	.5	3.0	12.3	4.7	1.0	.8	.7
11	.2	5.8	5.6	2.3	2.3	.4	11.8	1.9	2.9	8.0	.7	.6
12	.3	2.1	2.0	1.2	2.0	.4	17.1	1.3	1.6	2.0	.7	.8
13	.3	.7	1.2	.6	4.2	.7	11.6	1.8	1.2	1.2	.6	1.4
14	.2	.5	.8	.5	2.1	.5	48	.9	1.0	1.2	.6	1.0
15	.2	.5	2.4	9.1	2.5	.4	35	.8	.9	.9	.6	1.1
16	.3	.5	1.0	4.5	6.9	.4	7.9	.7	.8	.8	1.5	4.5
17	.2	.4	.8	.9	2.1	.4	37	.6	.9	1.1	1.8	4.1
18	.4	.5	5.0	.9	1.2	.4	12.8	.6	.9	2.1	.8	1.3
19	.5	2.7	1.6	.6	1.1	.4	9.8	1.1	.9	1.8	.7	.9
20	.3	.7	2.6	.6	.9	.3	16.2	1.1	.7	2.0	1.0	.8
21	.3	.4	1.3	.5	1.2	.3	4.0	1.2	.6	1.2	1.4	.7
22	.2	.4	.8	14.1	.9	.3	2.7	1.2	2.8	.9	1.7	4.1
23	.2	.4	.6	2.9	.7	.3	2.1	4.0	15.8	.8	1.6	1.2
24	.3	.4	.6	2.1	.7	.3	1.7	3.9	3.3	.9	2.6	.7
25	1.8	.4	.6	2.4	15.5	.4	1.5	1.1	2.6	.9	9.5	.7
26	.9	.5	.5	2.1	6.6	.4	1.2	4.6	1.6	6.2	2.2	.7
27	.3	.4	.8	.9	2.2	.4	1.1	2.2	9.4	2.0	2.2	.7
28	1.0	.3	.5	.7	1.2	.3	1.0	1.3	2.7	1.4	1.4	.7
29	.3	.9	.4	1.0	.9	.3	.9	-------	1.3	2.1	1.3	1.3
30	.3	.6	.4	.6	.8	.3	.9	-------	1.0	6.2	2.8	1.1
31	.3	.4	-------	.6	-------	.3	.9	-------	1.8	-------	3.7	-------

Monthly discharge of East Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.8	0.2	0.35	0.54	10.8	33
August	5.8	.3	1.14	1.76	35.3	108
September	19.2	.3	2.10	3.25	63.1	193
October	14.1	.4	2.43	3.76	75.3	231
November	15.5	.5	3.81	5.89	114	351
December	.9	.3	.46	.71	14.4	44
January	48	.3	7.88	12.2	244	750
February	12.3	.5	2.16	3.34	60.6	186
March	15.8	.6	3.02	4.67	93.6	287
April	9.0	.8	2.50	3.87	75.0	230
May	9.5	.6	1.77	2.74	55.0	168
June	4.5	.6	1.36	2.10	40.8	125
The year	48	.2	2.42	3.74	883	2,710

WEST BRANCH OF WAIKAMOI STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At Haiku-uka boundary line trail crossing, at elevation 3,000 feet, 5 miles east of Kailiili.

RECORDS AVAILABLE.—May 28, 1918, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from suspension footbridge 35 feet above gage.

CHANNEL AND CONTROL.—Channel is solid rock with steep rock and hardpan banks. Control is solid rock ledge.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 980 million gallons per day or 1,520 second-feet, at 3.35 p. m. January 14 (gage height, 6.29 feet); minimum discharge recorded, 0.18 million gallons per day or 0.3 second-foot, from 6 to 8 p. m. July 17 and for several hours July 23 (gage height, 0.39 foot).

1918–1923: Maximum discharge recorded 2,020 million gallons per day or 3,130 second-feet, at noon December 6, 1918 (gage height, 9.85 feet); minimum discharge recorded, 0.06 million gallons per day or 0.09 second-foot, at 8.30 p. m. December 22, 1919 (gage height, 0.33 foot).

DIVERSIONS.—A small amount of water is diverted by Haleakala ranch pipe line above station at elevation 5,300 feet and by Kula pipe line at elevation 4,300 feet.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 200 million gallons per day. Operation of water-stage recorder satisfactory except for a few short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair.

Discharge measurements of West Branch of Waikamoi Stream at Haiku-uka boundary near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 20	0.68	5.5	3.6
Jan. 20	1.84	97	63

Discharge, in millions gallons per day, of West Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.5	0.5	0.7	1.1	1.3	1.5	0.5	4.2	2.7	46		6.9
2	.4	.5	.9	1.6	1.1	1.8	2.1	1.8	2.1	64		3.0
3	.4	2.1	1.1	30	1.3	1.7	6.0	1.4	17.8	5.7		2.8
4	.4	1.5	1.7	14.7	28	1.5	2.8	1.2	10.8	3.8	3.5	5.9
5	.4	.8	8.0	17.3	71	1.3	1.1	1.2	2.3	5.5		6.5
6	.4	.6	3.5	12.1	72	1.5	1.0	1.1	1.5	3.2		3.0
7	.4	1.5	4.2	9.8		1.3	1.2	1.0	1.9	13.3	1.7	2.3
8	.4	4.7	2.0	4.0		1.1	3.5	1.0	94	14.2	1.6	2.1
9	.4	8.2	6.9	2.6		1.0	11.8	31	143	4.0	1.5	2.0
10	.4	6.1	84	2.3		1.0	5.0	55	63	2.6	1.4	1.8
11	.4	22	33	6.4		.9	32	7.2	10.5	18.3	1.3	1.7
12	.5	5.8	9.6	4.4		.9	76	2.8	5.2	7.6	1.2	2.0
13	.4	1.6	4.0	2.5	7.0	1.2	31	4.0	2.6	3.0	1.2	2.5
14	.3	1.1	2.5	1.7		1.0	293	2.0	2.0	2.0	1.1	2.0
15	.3	1.1	3.8	19.2		.9	296	1.5	1.7	1.5	1.1	1.8
16	.3	.9	2.1	18.9		.8	41	1.3	1.6	1.4	2.0	6.8
17	.3	.8	2.5	3.3		.8	163	1.2	1.5	1.4	2.6	9.4
18	.5	.8	10.4	2.6		.7	130	1.0	1.7	1.9	1.7	2.8
19	.7	4.0	3.8	2.1		.8	36	1.3	1.6	2.1	1.5	1.7
20	.4	1.3	4.8	1.6	2.5	.7	102	1.2	1.1	7.2	1.7	1.3
21	.3	9	3.6	1.4	2.5	.7	24	1.4	.8	2.6	2.3	1.3
22	.3	.8	2.0	44	2.1	.6	14.5	1.8	2.4	2.0	2.6	
23	.2	.7	1.4	9.7	1.5	.6	6.0	7.4	36	1.6	3.0	
24	.4	.7	1.4	5.8	1.3	.6	4.2	6.0	17.3	1.5	4.4	
25	1.8	.7	1.6	7.0	46	.6	2.8	3.6	5.1		27	
26	1.6	.9	1.2	7.3	19.2	.7	2.1	22	3.5		7.9	25
27	.7	.7	1.5	3.2	7.2	.6	1.8	7.6	33	7.0	6.7	
28	1.4	.6	1.2	1.8	3.2	.6	1.5	4.0	9.0		3.5	
29	.8	1.1	1.1	2.0	2.1	.6	1.4	-------	3.2		4.0	
30	.7	1.2	1.0	1.6	1.6	.5	1.3	-------	2.0		5.6	
31	.5	.8	-------	1.3	-------	.5	1.4	-------	10.9	-------	8.0	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of East Branch of this stream and main stream above Wailoa ditch.

Monthly discharge of West Branch of Waikamoi Stream at Haiku-uka boundary, near Kailiili, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.8	0.2	0.55	0.85	16.9	52
August	22	.5	2.42	3.74	75.0	230
September	84	.7	6.85	10.6	206	631
October	44	1.1	7.85	12.1	243	747
November	72	1.1	11.8	18.3	355	1,090
December	1.8	.5	.94	1.45	29.0	89
January	296	.5	41.8	64.7	1,300	3,980
February	55	1.0	6.29	9.73	176	540
March	143	.8	15.9	24.6	492	1,510
April	64	1.4	8.61	13.3	258	793
May	27	1.1	3.79	5.86	118	361
June	9.4	----------	3.07	4.75	92.1	283
The year	296	.2	9.20	14.2	3,360	10,300

ALO STREAM NEAR HUELO, MAUI

LOCATION.—300 feet above Spreckels ditch inflow and trail crossing and 5 miles east of Huelo.

RECORDS AVAILABLE.—December 18, 1910, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder installed April 5, 1920, to replace Friez water-stage recorder installed June 18, 1914. Prior to June 18, 1914, vertical staff at trail bridge 300 feet downstream from present site. Datum lowered 0.05 foot May 19, 1922.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Channel at gage in a fairly large pool at foot of rapids. Banks steep and high. Control, at outlet of pool, composed of rock ledge and large boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 390 million gallons per day or 603 second-feet, at 4.15 p. m. January 12 (gage height, 3.63 feet); minimum discharge recorded, 0.4 million gallons per day or 0.6 second-foot, 3 to 5 a. m. and 11 p. m. July 21 and 9 to 10 a. m. January 1 (gage height, 0.48 foot).

1910–1923: Maximum discharge from extension of rating curve, 638 million gallons per day or 987 second-feet, at 7 p. m. December 9, 1916 (gage height, 4.35 feet); minimum discharge recorded, 0.06 million gallons per day or 0.1 second-foot, November 4, 1911 (gage height, 1.34 feet, old datum).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—Ordinary flow diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed slightly April 26. Two rating curves used, both well defined below 75 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of Alo Stream near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 15	0.87	4.3	2.8	Jan. 3	0.74	2.2	1.4
Nov. 15	.81	2.9	1.9	Apr. 6	.75	2.8	1.85

Discharge, in million gallons per day, of Alo Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.5	0.7	0.7	1.2	2.2	2.9	0.5	1.0	1.2	6.9	3.4	2.2
2	.5	1.6	.8	1.7	1.6	1.6	.8	.8	1.2	15.1	3.1	1.8
3	.5	10.3	.9	4.6	1.9	1.8	2.7	.7	13.2	3.3	6.8	1.9
4	.5	2.6	1.2	4.4	5.0	1.6	1.5	.7	3.0	3.7	2.6	8.8
5	.6	1.4	2.4	8.2	25	1.3	1.0	.7	1.5	2.3	4.4	3.3
6	.5	1.2	1.1	7.3	34	1.2	1.4	.6	1.7	1.6	8.2	2.0
7	.5	1.6	6.0	5.8	21	1.2	2.2	.6	1.7	22	2.1	1.6
8	.5	7.6	1.3	2.5	25	1.1	1.5	.6	9.1	6.2	1.7	1.4
9	1.1	14.7	2.5	1.8	4.7	1.0	1.8	16.8	3.6	2.4	1.3	1.2
10	.6	8.6	51	1.6	2.9	1.0	4.1	23	2.8	2.0	1.2	1.0
11	.6	7.6	12.2	1.4	5.3	.9	2.8	2.6	2.1	8.5	1.1	.9
12	.7	5.3	3.3	1.3	2.9	1.0	95	2.5	1.7	3.0	1.0	1.5
13	.6	2.3	2.1	1.2	7.6	1.3	38	2.0	1.4	2.3	.9	2.2
14	.5	1.9	1.7	1.1	3.3	.8	82	1.1	1.4	7.6	.9	5.1
15	.5	1.6	2.4	2.6	4.1	.8	21	.9	1.2	2.4	.9	2.6
16	.5	1.5	1.7	2.6	8.7	.7	5.4	.8	1.2	2.0	2.6	3.3
17	.5	1.4	1.8	1.2	3.6	.7	33	.8	1.2	9.5	3.5	3.8
18	.6	1.2	6.0	2.5	2.5	.6	68	.7	1.1	23	2.7	2.0
19	.7	6.0	3.3	1.2	2.5	.6	38	19.4	1.4	11.8	4.1	1.4
20	.6	1.4	4.9	1.0	1.8	.6	71	8.6	1.1	12.2	2.3	1.0
21	.5	1.2	2.4	5.5	1.9	.6	6.8	10.7	1.0	8.7	2.2	.8
22	.7	1.2	1.8	46	1.5	.6	4.0	2.5	2.5	7.0	5.4	.7
23	.6	1.1	1.5	15.0	1.4	.5	2.8	34	11.1	3.9	4.6	.6
24	.9	1.0	1.4	6.3	1.4	.5	2.1	2.3	4.8	2.8	3.5	.7
25	2.5	1.0	1.2	3.9	40	.6	1.8	1.6	10.3	2.3	6.1	.7
26	1.3	.8	1.2	3.0	16.9	1.0	1.6	4.6	5.3	17.8	3.0	.8
27	1.1	.8	1.4	1.9	4.2	.6	1.5	2.0	38	10.4	2.8	.9
28	2.7	.8	1.0	1.9	2.3	.5	1.3	1.4	5.4	10.0	2.5	1.2
29	.9	1.5	.9	4.0	1.8	.5	1.2	-------	2.8	6.0	2.2	1.8
30	.8	.8	.8	1.6	1.6	.5	1.0	-------	2.0	6.7	2.5	1.2
31	1.0	.8	-------	2.4	-------	.5	1.0	-------	2.3	-------	3.2	-------

NOTE.—Record paper torn May 8–14 and June 19–24; gage-heights estimated by comparison with gage-height graph for Kaaiea Stream.

Monthly discharge of Alo Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	2.7	0.5	0.79	1.22	24.6	75
August	14.7	.7	2.95	4.56	91.5	281
September	51	.7	4.03	6.24	121	371
October	46	1.0	4.73	7.32	147	450
November	40	1.4	7.95	12.3	239	732
December	2.9	.5	.94	1.45	29.1	89
January	95	.5	16.0	24.8	497	1,520
February	34	.6	5.14	7.95	144	442
March	38	1.0	4.46	6.90	138	424
April	23	1.6	7.45	11.5	223	686
May	8.2	.9	2.99	4.63	92.8	284
June	8.8	.6	1.95	3.02	58.4	180
The year	95	.5	4.95	7.66	1,810	5,530

SPRECKELS DITCH BELOW KAAIEA GULCH, NEAR HUELO, MAUI

LOCATION.—1,000 feet below intake in Kaaiea Stream and 2½ miles by trail southeast of ditch superintendent's house at Huelo.

RECORDS AVAILABLE.—December 15, 1917, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Ditch section below gage. During heavy rains stage-discharge relation is affected by two small streams which enter ditch a short distance below gage.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 82 million gallons per day or 127 second-feet, at 6 a. m. January 20 (gage height, 4.47 feet); minimum discharge recorded practically no flow, at about 11 p. m. August 1 (gage height, 0.13 foot).

1917–1923: Maximum discharge recorded, 110 million gallons per day or 170 second-feet, at 7.30 p. m. January 16, 1921 (gage height, 5.65 feet); minimum discharge, no flow, when water is occasionally turned out of ditch.

DIVERSIONS.—Ditch diverts water from a dozen or more streams east of Nailiilihaele.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—To determine discharge of ditch at boundary between Territorial lands above and fee simple lands below.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed slightly November 25. Standard rating curve well defined below 50 million gallons per day; was used direct after November 25; prior to that date a parallel curve was used, in fact, by applying a constant correction to gage heights before entering rating table for standard curve. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

For description of this ditch see "Spreckels ditch at Haipuaena weir, near Huelo, Maui."

Discharge measurements of Spreckels ditch below Kaaiea Gulch, near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 15	0.93	9.8	6.3	Jan. 3	0.43	0.55	0.35
Nov. 15	.51	1.6	1.05	Apr. 4	1.15	14.1	9.1

Discharge, in million gallons per day, of Spreckels ditch below Kaaiea Gulch, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.05		0.4	0.7	1.0	1.5	0.05	1.3	0.9	10.1	1.2	0.2
2	.05		.3	.6	.6	.6	.2	.9	.6	15.5	.9	.2
3	.05		.3	11.2	.7	.6	1.4	.7	7.1	8.5	2.6	.1
4	.1	0.2	.4	3.2	2.3	.6	.6	.6	1.5	9.4	.9	1.1
5	.2		.7	8.7	12.5	.5	.4	.6	.9	9.1	.9	.3
6	.1		.5	2.4	22	.4	.3		1.2	8.2	4.5	.2
7	.1		1.8	2.6	21	.4	.4	2.2	.9	14.7	1.1	.2
8	.1	4.2	.6	1.5	24	.4	.6		5.8	9.3	.8	.1
9	.4	8.3	2.7	.9	3.8	.3	4.1		7.7	7.0	.8	.1
10	.2	4.1	19.0	.6	2.8	.2	.6		9.5	6.3	.6	.1
11	.2	12.3	15.0	.7	3.2	.2	2.4	.7	1.1	7.9	.6	.1
12	.2	2.2	6.3	.6	2.8	.3	50		.6	2.6	.5	.2
13	.1	1.0	2.7	.5	5.1	.3	24		.5	1.3	.4	.2
14	.1	.8	2.3	.4	2.0	2	38	5	.4	2.2	.4	.6
15	.05	.7	1.9	4.6	1.7	.2	24	.4	.4	.9	.4	.6
16	.05	.6	1.2	14.8	10.4	.2	22	.4	.4	.7	.6	.6
17	.05	.6	1.2	.5	2.1	.2	30	.4	.3	1.3	1.0	.2
18	.05	.6	4.5	1.3	1.3	.1	32	.4	.2	7.9	.7	
19	.1	3.1	1.2	.5	1.4	.2	32	8.3	.4	5.5	.6	
20	.05	2.2	1.2	.4	.9	.2	34	4.1	.2	6.6	.6	
21	.05	1.9	.8	1.5	1.0	.1	8.8	3.4	.2	2.8	.6	
22	.2	2.0	.6	37	.8	.1	7.0	1.5	.2	2.7	1.1	
23	.1	1.3	.6	7.9	.6	.1	6.3	10.2	2.2	1.6	.8	.2
24	.2	.4	.6	4.2	.6	.1	5.8	3.0	1.6	1.2	.6	
25	.1	.4	.6	2.8	19.3	.2	5.3	1.9	6.3	.9	3.6	
26	.3	.3	.5	2.3	17.5	.2	4.8	2.7	8.0	9.4	.7	
27	.2	.3	.6	1.6	3.9	.1	3.9	2.4	29	6.5	.6	
28	.4	.4	.6	1.3	1.7	.1	3.4	1.3	10.4	2.8	.4	.4
29		.6	.5	1.6	1.3	.1	2.8	-------	8.0	2.2	.3	.6
30	.05	.4	.5	.9	.9	.1	2.3	-------	6.6	2.7	.4	.4
31		.4	-------	1.4	-------	.1	1.7	-------	6.7	-------	.3	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Kaaiea Stream. Daily discharge Jan. 28 to Feb. 5 determined from estimated gage-height record.

Monthly discharge of Spreckels ditch below Kaaiea Gulch, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	0.4	----------	0.129	0.200	4.0	12
August	12.3	----------	1.63	2.52	50.5	155
September	19.0	0.3	2.34	3.62	70.1	215
October	37	.4	3.85	5.96	119	366
November	24	.6	5.64	8.73	169	519
December	1.5	.1	.29	.45	8.9	28
January	50	.05	11.3	17.5	349	1,080
February	10.2	.4	2.02	3.13	56.6	174
March	29	.2	3.86	5.97	120	367
April	15.5	.7	5.59	8.65	168	515
May	4.5	.3	.95	1.47	29.5	90
June	1.1	----------	.28	.43	8.5	26
The year	50	----------	3.16	4.89	1,150	3,550

CENTER DITCH BELOW KOLEA RESERVOIR, NEAR HUELO, MAUI

LOCATION.—200 feet below head gates at spillway crossing of Kolea reservoir, half a mile below intake in Waikamoi Stream, and 3½ miles by trail east of Huelo.

RECORDS AVAILABLE.—May 1, 1922, to June 30, 1923. For station half a mile upstream at Waikamoi, March 6, 1918, to April 30, 1922; see "Regulation" below.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank just above gage or by wading.

CHANNEL AND CONTROL.—Channel slightly curved in immediate vicinity of gage, developing into somewhat sharper curve below gage. Bed composed of rock and hardpan. Control formed by excavated ditch section; may shift slightly.

EXTREMES OF DISCHARGE.—Maximum discharge recorded, 84 million gallons per day or 130 second-feet, at 5 a. m. January 12 (gage height, 5.02 feet); stage may have been higher during periods when recorder did not operate properly. Minimum discharge recorded, 0.38 million gallons per day or 0.6 second-foot, at noon February 19 (gage height, 0.49 foot).

DIVERSIONS.—Ditch diverts water that arises in streams below or passes Spreckels ditch.

REGULATION.—Flow regulated by head gates and by release of water from Kolea reservoir. The flow at this station is the same as that at the old station at Waikamoi except for the occasional addition of water from Kolea reservoir.

OBJECT OF STATION.—The discharge at this station less the discharge at the Manuel Luis ditch station gives amount of water diverted from Territorial lands under water license No. 974.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 45 million gallons per day; contains a reversal between 3 and 7 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averging discharge for intervals of the day. Records good.

Center ditch, at elevation about 500 feet, diverts below all other main ditches on the windward side of the crater of Haleakala between Waikamoi and Kailua Streams. It picks up the water from Manuel Luis ditch (see Manuel Luis ditch at Puohakamoa Gulch, near Huelo) at Waikamoi Stream. At Kailua Stream the flow of the ditch is diverted into Lowrie ditch and carried to a point near Paia where it is used for irrigation of sugar cane. Center ditch proper is about 3 miles long and has a carrying capacity of 100 million gallons per day.

Discharge measurements of center ditch below Kolea reservoir, near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 19	2.95	59	38	Jan. 2	0.76	2.2	1.45
30	.74	2.2	1.4	June 28	.85	3.5	2.2
Nov. 23	.97	6.8	4.4				

Discharge, in million gallons per day, of Center ditch below Kolea reservoir, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.7	1.0	0.8	2.9	7.5	16.5	1.4	9.0	4.7	58	22	28
2	1.6	1.0	.8	3.4	4.0	8.3	2.8	1.6	4.7	58	24	6.2
3	1.6	20	1.0	40	5.2	13.0	15.6	1.8	23	30	32	8.2
4	1.6	5.8	3.0	26	25	8.0	11.7	1.6	25	27	18.0	28
5	2.2	1.4	14.7	34	69	5.0	2.7	1.6	5.4	32	13.5	15.2
6	1.6	1.3	3.9	31	71	3.1	2.8	1.4	5.4	16.3	33	4.0
7	1.4	1.6	14.3	29	58	3.4	4.3	1.4	4.7	29	13.1	2.7
8	1.5	14.8	2.0	15.0	54	1.9	4.1	1.4	54	54	8.8	2.4
9	3.1	45	19.6	6.2	36	1.6	23	2.0	67	24	6.9	2.1
10	1.8	29	67	3.0	25	1.5	22	42	47	18.8	12.7	2.1
11	2.1	33	56	17.2	18.2	1.3	11.0	20	24	44	4.3	1.9
12	2.4	24	30	2.7	28	1.3	70	9.8	7.1	26	3.4	2.7
13	1.6	6.4	14.1	2.4	35	5.4	54	7.1	.9	14.7	2.9	6.8
14	1.6	4.0	6.9	2.1	27	2.6	66	2.0	.9	25	2.6	18.7
15	1.5	3.1	22	2.2	20	1.8	18.6	.8	.8	10.2	2.6	15.6
16	1.4	3.1	10.2	36	39	1.5	9.4	.6	.7	7.3	12.6	20
17	1.3	10.1	8.9	5.2	32	1.3	28	.5	.6	17.2	18.3	30
18	1.4	2.5	30	9.7	22	1.3	28	.4	.6	43	8.0	14.4
19	2.1	17.1	19.1	2.6	21	1.3	16.3	.5	5.6	36	9.0	5.0
20	1.6	4.5	17.2	8.1	10.8	1.5	44	18.8	6.7	36	4.5	4.2
21	1.0	4.1	12.2	25	12.3	1.3	22	17.8	2.0	25	8.1	2.5
22	1.2	8.1	7.0	63	10.8	1.2	18.8	14.2	8.7	23	19.2	12.4
23	1.0	1.6	3.8	42	5.0	1.1	15.5	38	32	13.5	19.9	7.0
24	1.2	1.4	2.7	37	4.7	1.1	13.1	21	38	10.5	13.8	2.5
25	4.7	1.2	1.9	30	39	1.2	12.3	10.1	29	10.8	40	2.4
26	6.2	1.2	1.8	28	56	2.9	11.6	20	28	48	25	2.5
27	1.2	1.0	2.1	12.0	31	1.7	21	18.0	57	34	23	2.4
28	4.2	1.2	2.0	7.4	20	1.6	21	8.1	48	28	10.8	2.5
29	1.2	2.4	1.6	19.0	11.0	1.5	6.0	-------	25	26	10.1	6.6
30	1.0	1.2	1.7	9.4	7.9	1.4	2.6	-------	12.3	35	18.8	3.6
31	1.1	1.0	-------	13.0	-------	1.4	3.8	-------	13.7	-------	26	-------

NOTE.—Record lacking or valueless Oct. 4–21, Nov. 14–16, 26–30, Dec. 1–3, and Feb. 3–9; discharge determined by referring East Maui Irrigation Co.'s gage-height record at Punaluu to Survey station by means of gage-height relationship curve. Gage heights Feb. 14–19 corrected for effect of partly plugged intake on basis of Punaluu record.

Monthly discharge of Center ditch below Kolea reservoir, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	6.2	1.0	1.91	2.96	59.1	182
August	45	1.0	8.16	12.6	253	776
September	67	.8	12.6	19.5	378	1,160
October	63	2.1	18.2	28.2	564	1,730
November	71	4.0	26.8	41.5	805	2,470
December	16.5	1.1	3.16	4.89	98.0	301
January	70	1.4	18.8	29.1	583	1,790
February	42	.4	9.70	15.0	272	834
March	67	.6	18.8	29.1	582	1,790
April	58	7.3	28.7	44.4	860	2,640
May	40	2.6	15.1	23.4	467	1,440
June	30	1.9	8.75	13.5	263	806
The year	71	.4	14.2	22.0	5,190	15,900

NAILILIHAELE STREAM NEAR HUELO, MAUI

LOCATION.—200 feet above Wailoa ditch intake, 700 feet above New Hamakua ditch trail, and 3 miles south of Huelo.

RECORDS AVAILABLE.—October 8, 1913, to June 30, 1918, and August 6, 1919, to June 30, 1923. Also at old staff-gage station below New Hamakua ditch from December 9, 1910, to December 31, 1912.

GAGE.—Stevens continuous water-stage recorder installed December 13, 1917, replacing original Barrett and Lawrence water-stage recorder. Datum lowered 0.50 foot March 20, 1922, to eliminate negative gage heights.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge just above gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage. Stream bed very rough and steep. Banks steep and high and covered with dense vegetation. Control concrete and large boulders; permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 840 million gallons per day, or 1,300 second-feet, at 2 p. m. January 14 (gage height, 5.55 feet); minimum discharge recorded, 2.2 million gallons per day, or 3.4 second-feet, from 5 p. m. to 6 p. m. July 21 (gage height, 0.275 foot).

1913–1923: Maximum discharge from extension of rating curve, 1,800 million gallons per day, or 2,790 second-feet, at 6.30 p. m. May 1, 1916 (gage height, 6.3 feet); minimum discharge recorded, 0.45 million gallons per day or 0.7 second-foot, from 11 a. m. to 7 p. m. July 14, 1920 (gage height, −0.52 foot).

DIVERSIONS.—Low flow of left branch of stream diverted above station by Old Hamakua ditch from about March 1, 1918, to February 28, 1922.

REGULATION.—None.

OBJECT OF STATION.—To determine feasibility of additional diversions or flood storage. Also to assist valuation appraisers in relation to Territorial water license to ditch company.

UTILIZATION.—Ordinary flow is diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed during flood of September 10. Rating curve used prior to that date, well defined between 0.5 and 80 million gallons per day; curve used after that date, well defined between 0.5 and 25 million gallons per day and fairly well defined between 25 and 80 million gallons per day on basis of form of previous curve. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except for high stages.

Discharge measurements of Nailiilihaele Stream near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 14	0.77	17.4	11.2
Jan. 5	.58	7.3	4.7
Apr. 7	.74	16.7	10.8

Discharge, in million gallons per day, of Nailiilihaele Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.2	4.0	5.3	8.0	11.6	14.4	2.5	7.0	7.7	28	15.4	11.6
2	3.0	5.0	7.0	10.8	9.9	10.3	4.4	5.2	7.0	55	16.5	8.6
3	3.0	43	7.6	30	11.2	10.3	14.4	5.0	27	13.9	24	9.5
4	2.9	18.6	10.1	28	30	9.5	10.3	4.5	17.4	12.5	12.9	31
5	3.5	9.8	23	42	90	8.0	5.8	4.3	8.0	12.0	12.5	15.4
6	2.9	7.6	13.5	32	98	7.7	8.6	4.1	8.6	9.9	27	9.5
7	3.0	12.0	28	28	96	7.4	11.2	4.0	8.3	43	11.6	8.3
8	2.9	37	13.0	16.0	60	6.4	10.7	3.7	43	28	9.9	7.7
9	5.5	58	24	12.0	28	5.8	15.0	47	27	12.5	8.6	6.7
10	3.3	44	116	10.8	18.6	5.3	17.9	76	21	10.3	7.7	6.1
11	3.5	45	67	14.0	24	5.0	26		12.9	34	7.4	5.5
12	3.8	31	26	11.6	19.2	5.2	167		10.8	16.7	6.4	7.7
13	2.9	19.4	16.5	9.0	35	6.4	89		8.6	11.2	5.8	13.9
14	2.8	16.7	12.0	7.7	20	5.0	232	8.5	7.7	22	5.3	20
15	2.8	14.6	28	23	21	4.3	111		7.0	10.8	5.5	15.4
16	2.8	13.5	12.5	32	43	3.8	37		6.4	9.5	12.9	20
17	2.5	12.1	12.0	10.8	20	3.7	121	4.1	6.1	22	14.4	28
18	3.0	11.6	36	14.4	14.9	3.6	157	4.0	5.5	52	9.9	13.4
19	3.4	29	20	9.9	14.4	3.5	102	47	6.7	34	15.1	10.3
20	2.6	14.6	23	8.0	11.6	3.4	165	21	5.3	31	9.5	9.5
21	2.4	11.6	17.0	16.1	12.9	3.1	40	28	4.8	19.2	9.9	8.0
22	3.3	11.6	12.5	106	12.5	3.0	24	12.5	14.7	21	22	7.7
23	2.8	9.4	10.8	49	9.0	2.9	16.5	78	58	12.9	17.0	7.0
24	4.1	9.4	9.5	31	8.3	2.7	13.4	12.9	24	9.9	14.9	6.7
25	14.6	7.9	8.3	23	89	3.1	11.2	8.6	31	8.6	33	6.4
26	13.5	7.6	7.7	19.8	59	4.6	9.9	23	18.4	38	14.9	7.0
27	5.8	6.7	9.5	14.4	26	3.0	8.6	16.0	89	26	14.4	6.4
28	14.2	6.7	7.4	13.4	15.4	2.8	8.0	10.3	24	28	11.6	7.4
29	5.2	10.3	6.4	18.6	12.5	2.6	7.4	-------	13.4	22	10.3	9.0
30	4.1	7.6	5.5	11.2	10.8	2.8	6.4	-------	10.8	33	11.6	7.7
31	4.8	6.4	-------	12.5	-------	2.7	6.1	-------	11.6	-------	13.9	-------

NOTE.—Braced figure shows mean discharge for period indicated; estimated, because of lack of gage-height record, by comparison with flow of Alo Stream.

Monthly discharge of Nailiilihaele Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	14.6	2.4	4.45	6.89	138	423
August	58	4.0	17.5	27.1	542	1,660
September	116	5.3	19.8	30.6	595	1,820
October	106	7.7	21.7	33.6	673	2,060
November	98	8.3	31.1	48.1	932	2,860
December	14.4	2.6	5.24	8.11	162	499
January	232	2.5	47.1	72.9	1,460	4,480
February	78	3.7	17.0	26.3	477	1,460
March	89	4.8	17.8	27.5	552	1,690
April	55	8.6	22.9	35.4	687	2,110
May	33	5.3	13.3	20.6	412	1,270
June	31	5.5	11.0	17.0	331	1,010
The year	232	2.4	19.1	29.6	6,960	21,300

KAILUA STREAM AT HAIKU-UKA BOUNDARY, NEAR KAILIILI, MAUI

LOCATION.—At trail crossing 100 feet above Haiku-uka boundary line and 1½ miles by horse trail southeast of Kailiili.

RECORDS AVAILABLE.—July 11, 1918, to June 30, 1923. Revised records for the year ending June 30, 1921, are published in this paper.

GAGE.—Stevens continuous water-stage recorder. Datum raised 3.58 feet on February 23, 1923.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge just below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 25 feet above and 50 feet below bridge. Right bank low; left bank steep. Control for low stages is concrete slab, 1.5 feet thick, across stream 15 feet below gage; permanent. Control for high stages is crest of falls 100 feet below gage; may shift.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 370 million gallons per day or 572 second-feet, at 3 p. m. January 14 (gage height, 11.12 feet, old datum, or 7.54 feet, present datum); minimum discharge recorded, 0.01 million gallons per day or 0.015 second-foot, from 7 p. m. to midnight July 23 (gage height, 4.15 feet, old datum, or 0.57 foot, present datum).

1918–1923: Maximum discharge recorded, about 500 million gallons per day or 770 second-feet, January 16, 1921 (gage height, 9.6 feet); minimum discharge recorded, 0.002 million gallons per day or 0.003 second-foot, at 1 a. m. and 1.50 p. m. December 22, 1919, and 2.20 p. m. July 13, 1920.

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To determine discharge of stream at boundary between fee simple lands above and Territorial lands below.

UTILIZATION.—Water picked up by East Maui Irrigation Co.'s ditches for irrigation of cane lands.

ACCURACY.—1922–23: Stage-discharge relation permanent except for change in datum on February 23. Rating curve well defined below 80 million gallons per day. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

1920–21: Records published below for the period January 28 to June 30 supersede records published in Water-Supply Paper 535, page 126. For the period July 1 to January 27 the revised records are the same as those given in Water-Supply Paper 535. Stage-discharge relation for medium and high stages changed during flood of January 16. Rating curves used prior and subsequent to that date well defined below 80 million gallons per day. Operation of water-stage recorder satisfactory except as noted in footnote to daily-discharge table. Records good.

Discharge measurements of Kailua Stream at Haiku-uka boundary, near Kailiili, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 20 [a]	4.28	1.35	0.85
Jan. 20	6.03	112	72
June 13	.69	.3	.2

[a] Discredited; poor measuring section.

NOTE.—Gage datum raised 3.58 feet on February 23, 1923.

Discharge, in million gallons per day, of Kailua Stream at Haiku-uka boundary, near Kailiili, Maui, for the years ending June 30, 1921 and 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920-21												
1	0.05	0.3	0.3	0.6	0.3	5.5	0.6	1.4	0.08	1.0	0.25	0.06
2	.02	.5	.3	.3	.6	2.1	.9	1.2	17.6	.45	.2	.06
3	.01	.9	.3	.2	1.1	1.4	2.6	1.0	4.7	.35	.25	.06
4	.01	1.2	.4	.2	.6	1.2	11.8	.8	1.0	.25	.25	.06
5	.01	.5	.3	.15	.5	1.2	40	.6	.35	.25	.25	.05
6	.005	.3	2.0	.15	.3	4.9	74	.6	.2	37	.2	.05
7	.005	.2	6.4	.3	.4	2.6	60	.45	.15	76	.2	.04
8	.01	.15	2.1	.3	102	32	10.0	.35	.1	24	.15	.04
9	.01	.09	1.9	.2	29	22	14.6	.35	.15	14.6	.15	.04
10	.005	.09	1.1	.2	9.6	28	22	.25	.1	2.7	.1	.05
11	.005	.09	8.2	11.8	3.4	4.3	26	.25	.1	1.8	.08	.06
12	.005	.15	4.8	8.1	1.4	2.1	8.1	.2	.1	3.2	.08	.04
13	.005	2.2	2.1	.9	1.1	2.9	13.3	.2	.08	3.0	.08	.04
14	.005	3.1	1.4	.5	.9	68	29	.2	.08	1.4	.06	.04
15	.07	.5	.9	11.5	.8	17.2		.25	.08	.8	.06	.04
16	.05	.3	.6	9.6	.5	2.8	60	.25	.06	2.7	.06	.04
17	2.6	.2	.5	3.4	.5	1.6		.2	.06	1.4	.06	.04
18	.9	.15	.4	1.9	.4	1.1		.45	.08	.8	.1	.03
19	.3	.09	.3	1.2	.3	.9		.25	.08	.6	.1	.04
20	.15	.9	.3	.9	13.1	.8		.2	.06	.45	.1	.04
21	.8	2.3	.2	.8	24	.8	5.0	.15	.08	.45	.08	.03
22	7.8	.8	.2	.6	18.3	.8		.1	.06	.45	.1	.03
23	5.2	.6	.2	.5	5.2	6.0		.1	.05	1.4	.15	.04
24	2.6	.8	.2		2.3	30		.1	1.1	.8	.8	.03
25	.8	1.1	.15	4.0	1.9	82		.1	.8	.45	.45	.02
26	.4	2.0	.15		6.7	8.1	25	.08	.35	.35	.25	.02
27	.3	9.1	.09		1.9	3.4		.08	4.2	.35	.15	.05
28	.2	1.9	.09	.8	1.4	1.6	2.7	.08	1.8	.25	.1	2.7
29	.3	.6	.09	.5	2.8	1.1	1.8	-------	2.0	.2	.08	.8
30	.4	.5	1.8	.4	43	.8	1.4	-------	15.8	.35	.08	.2
31	.4	.4	-------	.4	-------	.6	2.2	-------	5.0	-------	.08	-------
1922-23												
1	.02	.02	.04	.1	.35	.6	.05	3.0	1.2	16.4	2.2	1.8
2	.02	.02	.05	.2	.25	.6	.1	1.0	.8	37	2.2	.8
3	.02	.05	.05	12.0	.25	.45	1.8	.6	9.5	3.7	1.8	.35
4	.02	.05	.15	4.9	12.7	.45	1.0	.35	9.0	2.0	.8	1.6
5	.03	.04	1.2	7.6	40	.35	.2	.35	1.6	2.7	.6	1.4
6	.02	.03	.8	4.3	42	.35	.1	.25	1.0	1.6	.6	.45
7	.02	.05	.8	3.5	38	.25	.1	.25	.8	7.1	.35	.25
8	.02	.6	.45	1.4	8.2	.25	.6	.2	53	9.7	.25	.2
9	.03	2.5	1.6	.8	3.2	.25	5.3	16.0	67	2.2	.25	.15
10	.02	2.5	38	.45	2.0	.2	1.8	40	32	1.4	.2	.15
11	.03	9.9	21	2.4	3.1	.2	13.6	6.3	6.0	9.2	.2	.1
12	.03	2.2	5.0	2.0	3.8	.15	38	2.2	3.0	4.4	.15	.15
13	.02	.45	1.2	.6	5.4	.2	14.5	3.5	1.6	1.6	.15	.35
14	.02	.15	.45	.35	3.2	.2	127	1.4	1.2	1.2	.1	.2
15	.02	.1	1.0	6.7	2.0	.15	134	.8	.8	.8	.15	.2
16	.02	.1	.35	9.4	9.3	.15	27	.6	.6	.8	.2	2.8
17	.02	.1	.25	1.0	3.7	.1	94	.45	.45	.6	.35	4.3
18	.02	.1	3.6	.6	1.6	.1	75	.35	.35	1.0	.15	1.2
19	.02	.35	1.2	.35	1.0	.1	24	.45	.45	1.0	.1	.35
20	.02	.25	.6	.35	1.0	.1	57	.6	.35	3.6	.15	.25
21	.02	.1	.8	.25	1.0	.1	14.0	.8	.2	1.6	.2	.2
22	.02	.05	.35	21	.8	.1	6.9	1.2	1.4	.6	.25	3.5
23	.02	.05	.25	4.3	.6	.1	3.5	3.2	23	.35	.35	1.6
24	.02	.05	.25	4.3	.45	.1	2.5	3.2	13.4	.45	1.2	.35
25	.03	.05	.2	1.8	22	.05	1.8	2.2	3.0	.8	14.4	.2
26	.05	.05	.2	2.5	9.4	.1	1.4	16.6	1.8	11.1	3.0	.2
27	.02	.05	.2	1.0	3.2	.05	1.2	7.4	28	3.9	1.8	.2
28	.04	.04	.15	.8	1.4	.05	1.0	2.7	8.0	1.4	.6	.2
29	.03	.05	.1	.6	1.0	.05	.6	-------	2.2	1.2	.6	.2
30	.02	.1	.1	.35	.8	.05	.6	-------	1.4	5.9	.6	.2
31	.02	.05	-------	.35	-------	.05	.6	-------	1.4	-------	1.8	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of adjacent streams.

Monthly discharge of Kailua Stream at Haiku-uka boundary, near Kailiili, Maui, for the years ending June 30, 1921 and 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
1920–21						
July	7.8	0.005	0.756	1.17	23.4	72
August	9.1	.09	1.03	1.59	32.0	98
September	8.2	.09	1.26	1.95	37.8	116
October	11.8	.15	2.34	3.62	72.4	223
November	102	.3	9.14	14.1	274	841
December	82	.6	10.9	16.9	338	1,040
January		.6	21.5	33.3	666	2,050
February	1.4	.08	.366	.566	10.2	31
March	17.6	.05	1.82	2.82	56.4	173
April	76	.2	5.93	9.18	178	546
May	.8	.06	.165	.255	5.1	16
June	2.7	.02	.161	.249	4.8	15
The year		.005	4.65	7.19	1,700	5,220
1922–23						
July	.05	.02	.024	.037	.73	2
August	9.9	.02	.652	1.01	20.2	62
September	38	.04	2.68	4.15	80.4	247
October	21	.1	3.10	4.80	96.2	295
November	42	.25	7.39	11.4	222	680
December	.6	.05	.194	.300	6.00	18
January	134	.05	20.9	32.3	649	1,990
February	40	.2	4.14	6.41	116	356
March	67	.2	8.85	13.7	274	842
April	37	.35	4.51	6.98	135	415
May	14.4	.1	1.15	1.78	35.8	109
June	4.3	.1	.797	1.23	23.9	73
The year	134	.02	4.55	7.04	1,660	5,090

KAILUA STREAM NEAR HUELO, MAUI

LOCATION.—About 400 feet above Wailoa ditch intake and 1 mile south of Huelo.

RECORDS AVAILABLE.—December 8, 1910, to June 30, 1918, and July 1, 1919, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder installed March 7, 1918, replacing Barrett and Lawrence water-stage recorder installed October 8, 1913, at same location and datum as original staff gage.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Channel at gage is a large, deep pool with high, sloping banks, at foot of low waterfall. Control at outlet of pool is solid rock ledge and large boulders; seldom shifts.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 1,070 million gallons per day or 1,660 second-feet, at 3 p. m. January 14 (gage height, 8.70 feet); minimum discharge recorded, 0.55 million gallons per day or 0.85 second-foot, at 5 p. m. July 18 and 4 to 5 p. m. July 21 (gage height, 0.82 foot).

1910–1923: Maximum discharge recorded, about 1,500 million gallons per day or 2,300 second-feet, at about 2 a. m. February 1, 1922 (gage height estimated, 10.5 feet; float washed out of stilling well at gage height about 8.5 feet). Minimum discharge recorded, 0.07 million gallons per day or 0.11 second-foot, from 3 to 4 a. m. June 27, 1921 (gage height, 0.57 foot).

DIVERSIONS.—Nearly all low-water flow diverted by Old Hamakua ditch above station from February 5, 1918, to February 28, 1922.

REGULATION.—By diversion only.

OBJECT OF STATION.—Data valuable in connection with Territorial water leases to ditch company.

UTILIZATION.—Ordinary flow of stream is diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 350 million gallons per day. Operation of water-stage recorder unsatisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair.

Discharge measurements of Kailua Stream near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 14	1.51	8.3	5.4	Jan. 12	4.72	422	273
Nov. 17	1.89	24.9	16.1	Apr. 7	1.57	11.6	7.5
26[a]	2.09	48	31				

[a] Discredited; poor measuring section.

Discharge, in million gallons per day, of Kailua Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.8	0.8		2.4		6.8	1.0		6.6	26	10.8	8.2
2	.8	.9		3.7		5.8	1.3		5.8	90	11.0	5.6
3	.7	10.3				5.5	6.8		28	11.1	12.9	5.5
4	.7	4.5				4.8	7.4		20	7.9	8.2	13.2
5	.8	1.7	3.1			4.1	2.8		7.3	8.2	6.6	9.8
6	.8	1.2				3.5	3.1		6.4	6.4	10.5	5.6
7	.7	2.2			30	3.2	3.9		6.0	28	6.4	5.0
8	.7	12.2				2.8	3.6		95	28	5.6	4.8
9	1.2	22				2.6	17.5	14	108	8.2	5.2	4.4
10	.9	20				2.4	10.3		54	6.4	4.5	4.1
11	.8		40			2.3	35		12.3	24	4.4	3.8
12	.8					2.1	196		8.7	13.8	4.2	4.2
13	.8					2.3	68		6.4	6.8	4.5	6.4
14	.7		5.6		15.7	2.0			5.6	8.7	4.5	7.7
15	.7		14.1		11.2	1.8			5.2	6.0	4.7	7.5
16	.7	8.0	6.0	10	35	1.7			4.5	5.2	6.4	11.3
17	.6		4.8		16.5	1.5	130	4.0	4.5	7.5	7.3	19.4
18	.6		23		10.0	1.6		3.6	4.5	19.4	5.2	8.9
19	.8		10.8		8.2	1.5		30	4.7	14.2	6.2	6.6
20	.7		8.7		6.8	1.4		9.8	4.5	12.3	5.0	5.3
21	.6		7.5		7.3	1.3		15.2	4.5	8.6	5.2	4.8
22	.6		5.2		6.0	1.2		9.0	7.7	8.2	10.2	5.7
23	.7		4.0		5.0	1.2		51	76	5.8	7.9	6.4
24	.8		3.2		4.4	1.2		9.5	39	5.2	9.1	4.5
25	2.3		2.8		93	1.2		7.3	15.5	5.0	36	4.1
26	5.2	1.0	2.5		57	1.5	9.5	39	10.2	28	12.0	4.1
27	1.3		3.1		21	1.2		16.6	89	14.4	9.5	4.1
28	2.4		2.6		10.2	1.1		9.5	20	11.6	6.8	4.1
29	1.2		2.1		7.9	1.1		-------	8.4	10.8	6.0	4.5
30	1.0		1.9		6.4	1.0		-------	6.6	25	6.2	4.5
31	.9		-------		-------	1.0		-------	6.4	-------	8.2	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of this stream at station at Haiku-uka boundary.

Monthly discharge of Kailua Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	5.2	0.6	1.04	1.61	32.3	99
August	22	----------	5.61	8.68	174	534
September	----------	1.9	11.1	17.2	333	1,020
October	----------	----------	9.55	14.8	296	909
November	93	4.4	23.7	36.7	712	2,180
December	6.8	1.0	2.35	3.64	72.7	224
January	----------	1.0	48.1	74.4	1,490	4,580
February	51	3.6	15.3	23.7	428	1,310
March	108	4.5	22.0	34.0	681	2,090
April	90	5.0	15.4	23.8	461	1,420
May	36	4.2	8.10	12.5	251	771
June	19.4	3.8	6.47	10.0	194	596
The year	----------	.6	14.0	21.7	5,130	15,700

HOOLAWALIILII STREAM NEAR HUELO, MAUI

LOCATION.—400 feet above New Hamakua ditch crossing and 4 miles by trail west of Huelo.

RECORDS AVAILABLE.—April 6, 1911, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder installed June 19, 1914, at same location and datum as original staff gage. Datum lowered 0.52 foot May 14, 1922.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Channel at gage is a pool about 100 feet long and 20 feet wide formed by concrete control about 20 feet long at brink of falls over which water makes a drop of about 50 feet. Banks slope gently and are covered with dense growth of vegetation.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, about 215 million gallons per day or 333 second-feet, at 4 a. m. February 23 (gage height, 3.78 feet); minimum discharge recorded, 1.1 million gallons per day or 1.7 second-feet, for several hours during latter part of July and August 1 and 2.

1911–1923: Maximum discharge recorded, about 485 million gallons per day or 750 second-feet, at 11 a. m. November 21, 1921 (gage height, 4.82 feet); minimum discharge recorded, 0.5 million gallons per day or 0.8 second-foot, at 9 p. m. December 11, 1919 (gage height, 0.02 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—All water during low and medium stages picked up by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 30 million gallons per day; extended above that point and subject to error. Operation of water-stage recorder satisfactory except during December to February and during May. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good for ordinary stages except those estimated which are fair; high-stage records subject to error.

Discharge measurements of Hoolawaliilii Stream near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 12	0.84	6.3	4.1
Jan. 6	.70	3.0	1.95
May 16	.77	3.8	2.5

Discharge, in million gallons per day, of Hoolawaliilii Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.4	1.2	1.7	2.4	2.9				4.9	3.6	4.0	2.2
2	1.4	1.2	1.6	2.2	2.8				4.7	11.7	3.4	2.1
3	1.4	1.7	1.6	2.6	2.6		1.5		5.8	3.6	4.2	2.1
4	1.4	1.5	1.6	2.6	3.1				5.8	3.5	3.2	2.8
5	1.4	1.4	1.6	4.2	8.3	2.8		2.1	4.7	3.4	2.9	2.4
6	1.4	1.4	1.7	3.2	15.9		1.7		4.5	3.1	4.5	2.1
7	1.3	1.4	2.2	3.6	18.9		1.7		4.5	7.8	3.1	1.8
8	1.4	1.7	1.8	2.9	9.5		1.7		6.4	6.6	2.9	1.8
9	1.4	4.0	2.1	2.6	6.1		1.8		6.9	4.2	2.5	1.8
10	1.4	3.2	14.7	2.5	4.7		2.1		5.6	3.8	2.2	1.7
11	1.4	3.2	8.9	2.5	4.2		1.9		5.1	4.7		1.6
12	1.4	2.6	4.8	2.5	3.8		38		4.7	4.0		1.8
13	1.3	2.2	3.2	2.4	4.0		13.6	3.9	4.0	3.6		1.9
14	1.3	2.1	2.9	2.2	3.6		52		4.0	4.5	2.2	2.2
15	1.4	2.1	3.1	2.6	3.4	1.9	19.8		3.6	3.6		2.1
16	1.3	1.9	2.5	2.8	4.0		8.0		3.4	3.4		2.2
17	1.3	1.9	2.4	2.2	3.2		13.2	2.2	3.1	3.6	2.6	2.8
18	1.3	1.9	3.2	2.4	2.9			2.2	3.1	9.8	2.6	2.4
19	1.3	2.6	2.8	2.2	2.9			13.4	2.9	9.5	2.9	2.1
20	1.3	2.2	2.6	2.1	2.8			5.3	2.8	10.1	2.6	1.9
21	1.3	1.9	2.6	2.6	2.6		28	7.3	2.5	6.1	2.6	1.9
22	1.3	1.9	2.5	18.4	2.5			5.6	2.8	6.6	3.1	1.9
23	1.3	1.8	2.4	8.2	2.2			33	3.6	4.9	2.9	1.8
24	1.2	1.8	2.1	5.3	2.2			7.7	3.6	4.2	2.6	1.8
25	1.1	1.8	2.1	4.0	8.6			5.8	4.5	3.8	3.8	1.8
26	1.2	1.8	2.1	3.8	8.9	1.6		7.8	4.7	5.6	2.8	1.8
27	1.3	1.9	1.9	3.2	5.8			6.1	26	5.6	2.8	1.8
28	1.4	1.8	2.4	3.1	4.9			5.3	7.2	5.1	2.5	1.8
29	1.2	1.8	2.2	3.4	4.5		3.8		5.1	5.3	2.5	1.8
30	1.2	1.8	2.2	2.9	4.0				4.2	5.1	2.4	1.7
31	1.2	1.7		2.8					3.8		2.4	

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Hoolawanui and Honopou Streams.

Monthly discharge of Hoolawaliilii Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.4	1.1	1.32	2.04	40.9	126
August	4.0	1.2	1.98	3.06	61.4	188
September	14.7	1.6	2.98	4.61	89.5	274
October	18.4	2.1	3.56	5.51	110	339
November	18.9	2.2	5.19	8.03	156	478
December			2.05	3.17	63.7	195
January			13.2	20.4	410	1,260
February	33		5.35	8.28	150	460
March	26	2.5	5.11	7.91	158	486
April	11.7	3.1	5.35	8.28	160	493
May	4.5		2.81	4.35	87.2	267
June	2.8	1.6	2.00	3.09	59.9	184
The year		1.1	4.24	6.56	1,550	4,750

HOOLAWANUI STREAM NEAR HUELO, MAIU

LOCATION.—200 feet above intake of Wailoa ditch and 5 miles by trail west of Huelo at elevation 1,240 feet.

RECORDS AVAILABLE.—December 12, 1910, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder installed June 20, 1914, 200 feet upstream from original staff, which it replaced.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—Stream drops over a low waterfall into a large circular pool with gently sloping banks. Control at outlet of pool composed of boulders; shifts during severe floods.

EXTREMES OF DISCHARGE.—Maximum discharge estimated 275 million gallons per day or 425 second-feet, at about 3 a. m. February 23 (gage height estimated, 5.5 feet; recorder did not operate during period February 22–28); minimum discharge recorded, 0.3 million gallons per day or 0.5 second-foot, from 11 p. m. August 1 to 3 a. m. August 2 (gage height, −0.02 foot).

1910–1923: Maximum discharge recorded, about 550 million gallons per day or 851 second-feet, at 3 a. m. February 1, 1922 (gage height, 8.40 feet) minimum discharge recorded, 0.15 million gallons per day or 0.2 second-foot, at 7 p. m. October 25, 1917 (gage height, −0.19 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—All water during low and medium stages picked up by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation changed by encroachment of grass on control, effective August 3. Rating curve used prior to that date, fairly well defined for ordinary stages; curve used after that date, well defined below 100 million gallons per day. Operation of water-stage recorder satisfactory except during January and February. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good except those estimated which are fair.

Discharge measurements of Hoolawanui Stream near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 13	0.65	7.4	4.8	Apr. 3	0.90	13.6	8.8
Nov. 14	.79	9.4	6.1	May 16	.57	5.6	3.6
27	.94	13.3	8.6	June 7	.46	4.4	2.9
Jan. 6	.26	1.85	1.2				

Discharge, in million gallons per day, of Hoolawanui Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.6	0.5	0.8	2.1	4.0	5.4	0.9		6.6	8.6	6.9	3.4
2	.6	.5	.9	2.3	3.4	4.5	.9		6.2	22	6.6	3.0
3	.6	2.1	.9	4.8	3.6	4.4	1.4		8.2	9.0	7.5	3.0
4	.6	1.0	.9	4.4	5.1	4.1	1.4		7.9	7.7	5.8	5.4
5	.7	.6	1.2	9.1	22	3.6	1.2	2.6	6.6	6.6	5.1	4.2
6	.6	.6	.9	6.5	33	3.3	1.5		5.8	5.8	7.0	3.1
7	.6	.8	1.8	6.2	47	3.1	1.4		5.4	12.3	4.9	2.8
8	.6	1.8	.9	4.5	19.6	2.8	1.4		12.0	11.0	4.4	2.6
9	1.1	5.5	2.0	3.6	11.5	2.7	2.4		13.4	7.1	4.1	2.4
10	.6	5.0	29	3.2	8.7	2.5	2.4		12.3	6.3	3.8	2.2
11	.6	5.4	14.2	7.0	8.1	2.2	2.7		9.0	8.1	3.5	2.1
12	.6	3.5	6.8	4.3	7.4	2.2	47	6	7.1	6.8	3.2	2.5
13	.6	2.1	4.5	3.2	8.8	2.1	21		6.1	5.5	2.9	3.0
14	.5	1.7	3.8	2.8	7.1	1.8	95		5.3	6.6	2.7	4.1
15	.5	1.6	5.2	3.7	6.6	1.8	64		4.8	5.1	2.7	3.5
16	.5	1.4	3.4	8.5	9.9	1.6			4.3	4.5	3.8	3.9
17	.5	1.4	3.2	3.9	7.2	1.6		3.4	4.0	5.8	3.5	6.6
18	.6	1.3	6.6	3.9	6.1	1.5		3.2	3.8	11.5	3.2	4.2
19	.6	2.6	4.4	3.1	5.8	1.4		18.5	3.8	10.4	4.0	3.5
20	.5	1.4	4.1	2.8	5.0	1.4	42	7.6	3.3	9.7	3.2	3.1
21	.5	1.2	3.5	3.2	5.0	1.2		11.6	2.9	7.8	3.0	2.8
22	.5	1.3	3.0	23	4.4	1.2			3.2	7.7	5.2	2.6
23	.5	1.1	2.8	13.0	4.0	1.2			10.3	6.3	4.3	2.5
24	.6	1.0	2.5	8.0	3.6	1.2			14.4	5.5	4.1	2.4
25	.6	1.0	2.3	6.9	23	1.2		20	8.0	5.1	7.4	2.3
26	.8	1.0	2.1	6.5	16.4	1.4			6.8	8.9	4.8	2.2
27	.5	.9	2.6	5.4	9.4	1.1	5		34	7.0	4.5	2.1
28	.8	.9	2.1	4.9	7.1	1.0			12.7	7.6	3.9	2.1
29	.5	1.1	1.9	5.4	5.9	1.0		-------	8.7	7.2	3.6	2.2
30	.5	.9	1.8	4.3	5.3	1.0		-------	6.8	10.5	3.6	2.1
31	.6	.9	-------	4.3	-------	1.0		-------	6.2	-------	3.5	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Hoolawaliilii and Honopou Streams.

Monthly discharge of Hoolawanui Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	1.1	0.5	0.60	0.93	18.5	57
August	5.5	.5	1.68	2.60	52.1	160
September	29	.8	4.00	6.19	120	368
October	23	2.1	5.64	8.73	175	537
November	47	3.4	10.5	16.2	314	967
December	5.4	1.0	2.15	3.33	66.5	205
January	----------	.9	21.2	32.8	658	2,020
February	----------	----------	9.04	14.0	253	777
March	34	2.9	8.06	12.5	250	767
April	22	4.5	8.13	12.6	244	749
May	7.5	2.7	4.41	6.82	137	420
June	6.6	2.1	3.06	4.73	91.9	282
The year	----------	.5	6.52	10.1	2,380	7,310

HONOPOU STREAM NEAR HUELO, MAUI

LOCATION.—200 feet above New Hamakua ditch crossing and 6 miles west of Huelo, at elevation 1,250 feet.

RECORDS AVAILABLE.—December 12, 1910, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder; installed June 19, 1914, at same site as original staff gage.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge at gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and below gage. Right bank is overflowed during floods; left bank steep and high. Control an old iron weir set in concrete; permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 340 million gallons per day or 526 second-feet, at 2.45 a. m. February 23 (gage height, 4.22 feet); minimum discharge recorded, 0.3 million gallons per day or 0.45 second-foot, from 3 to 5 p. m. August 1 (gage height, 0.12 foot).

1910–1923: Maximum discharge recorded, 658 million gallons per day or 1,020 second-feet, at 3.25 a. m. February 1, 1922 (gage height, 5.50 feet); minimum recorded, 0.15 million gallons per day or 0.23 second-foot, from 2 to 8 p. m. July 14, 1920 (gage height, 0.05 foot).

DIVERSIONS.—None.

REGULATION.—None.

OBJECT OF STATION.—To furnish data for appraisal of water value under Territorial lease to ditch company.

UTILIZATION.—Ordinary flow is diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined below 25 million gallons per day; fairly well defined above that point. Operation of water-stage recorder satisfactory except during part of May and June. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records good.

Discharge measurements of Honopou Stream near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 13	0.39	3.1	2.0
28	.24	1.4	.9
Nov. 14	.49	4.7	3.0

Discharge, in million gallons per day, of Honopou Stream near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	0.4	0.3	0.5	1.0	1.9	2.3	0.5	1.8	4.4	4.2	2.9	
2	.4	.3	.5	1.1	1.7	1.9	.4	1.5	4.0	11.1	2.6	
3	.3	1.0	.5	1.5	1.8	1.7	.6	1.4	4.6	4.0	3.2	
4	.4	.5	.5	1.4	2.1	1.5	.7	1.2	3.6	3.6	2.3	1.4
5	.3	.4	.5	3.1	6.4	1.4	.7	1.2	3.0	3.1	2.2	
6	.3	.4	.5	1.7	14.2	1.3	.7	1.1	2.9	2.8	3.6	
7	.3	.4	.7	1.9	24	1.2	.7	1.0	2.8	6.8	2.1	1.1
8	.3	.8	.5	1.5	8.9	1.1	.7	1.0	4.5	3.7	1.9	1.0
9	.5	2.6	.7	1.4	5.9	1.0	.8	1.6	4.5	2.8	1.8	1.0
10	.4	1.8	12.4	1.3	4.7	1.0	1.0	10.1	3.2	2.5	1.6	1.0
11	.4	1.6	5.3	1.4	4.4	.9	.8	2.4	3.2	3.2	1.5	.9
12	.4	1.1	2.6	1.4	3.6	.9	30	3.0	2.8	2.4	1.5	1.1
13	.4	.7	2.0	1.2	4.1	.8	10.0	2.1	2.4	2.0	1.3	1.2
14	.3	.7	1.8	1.2	3.2	.7	62	1.8	2.2	2.9	1.2	1.5
15	.4	.6	1.9	1.4	3.0	.7	25	1.6	2.1	2.1	1.2	1.3
16	.3	.6	1.5	1.7	3.2	.6	10.4	1.5	2.0	1.9	1.5	1.3
17	.3	.6	1.4	1.8	2.8	.6	17.2	1.5	1.9	2.3		2.0
18	.3	.6	2.3	1.4	2.5	.6	34	1.4	1.8	6.0		1.4
19	.3	1.0	1.6	1.2	2.4	.6	24	10.7	1.7	5.3		1.3
20	.3	.6	1.5	1.2	2.2	.5	73	3.3	1.5	5.2		1.2
21	.3	.6	1.4	7.2	2.0	.5	16.8	6.2	1.5	3.9	1.5	1.2
22	.3	.5	1.2	16.2	1.8	.5	10.4	3.6	1.6	4.2		1.2
23	.3	.5	1.2	5.6	1.7	.5	7.3	42	2.4	3.2		1.1
24	.3	.5	1.2	3.5	1.7	.5	5.5	8.3	1.9	2.9		1.1
25	.3	.5	1.1	3.1	7.6	.5	4.2	5.9	2.8	2.5		1.1
26	.4	.5	1.0	2.9	6.6	.6	3.6	10.0	2.2	4.4		1.1
27	.4	.5	1.1	2.4	3.5	.5	3.0	6.8	24	3.2	1.7	1.1
28	.4	.5	1.0	2.3	2.9	.5	2.6	5.2	5.7	3.8		1.1
29	.3	.5	.9	2.4	2.4	.5	2.3	-------	4.2	3.1		1.1
30	.3	.5	.9	2.9	2.2	.5	2.0	-------	3.3	3.5		1.0
31	.3	.5	-------	1.9	-------	.5	1.9	-------	3.3	-------		-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated, because of lack of gage-height record, by comparison with flow of Hoolawaliili and Hoolawanui Streams.

Monthly discharge of Honopou Stream near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	0.5	0.3	0.34	0.53	10.6	32
August	2.6	.3	.72	1.11	22.2	68
September	12.4	.5	1.67	2.58	50.2	154
October	16.2	1.0	2.54	3.93	78.7	242
November	24	1.7	4.51	6.98	135	415
December	2.3	.5	.87	1.35	26.9	83
January	73	.4	11.4	17.6	353	1,080
February	42	1.0	4.97	7.69	139	427
March	24	1.5	3.61	5.59	112	343
April	11.1	1.9	3.75	5.80	113	345
May	----------	1.2	1.82	2.82	56.3	173
June	2.0	.9	1.23	1.90	36.8	113
The year	73	.3	3.11	4.81	1,130	3,490

WAILOA DITCH AT HONOPOU, NEAR HUELO, MAUI

LOCATION.—100 feet below intake of Honopou Stream, half a mile west of Lupi, and 7 miles southwest of Huelo.

RECORDS AVAILABLE.—November 19, 1922, to June 30, 1923.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from plank across ditch at mouth of adit tunnel through which recorder operates or in concrete viaduct at Halehaku Gulch 1 mile below gage.

CHANNEL AND CONTROL.—Concrete-lined ditch in tunnel.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during period, 160 million gallons per day or 248 second-feet, at 6 p. m. February 26 (gage height, 5.44 feet); minimum discharge recorded, ditch dry, January 23–28.

DIVERSIONS.—This ditch as a continuation of Koolau ditch diverts the ordinary flow of all streams on windward Haleakala between Hanawi Stream and Halehaku Gulch.

REGULATION.—Flow regulated by gates.

OBJECT OF STATION.—To determine total amount of water diverted through the Koolau-Wailoa ditch system from Territorial lands.

UTILIZATION.—Water used for irrigation of sugar cane, for development of power, and for domestic supply.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except for a few short periods. Daily discharge ascertained by integrating recorder graph with discharge integrator. Records excellent.

Wailoa ditch, at elevation about 1,200 feet, diverts the ordinary flow of all streams on the windward side of the crater of Haleakala between Waikamoi and Halehaku Streams inclusive. As the continuation of Koolau ditch it carries also the flow of all streams east of Waikamoi as far as Hanawi Stream. The Koolau-Wailoa system comprises about 18 miles of main ditch, Wailoa ditch proper being about 10 miles long with a rated carrying capacity of 145 million gallons per day The general course of the ditch is northwestward along the side of Haleakala. The water is carried to a point near Paia where it is distributed for the irrigation of sugar cane, development of power, and domestic supply on the plantations of Hawaiian Commercial & Sugar Co. and Maui Agricultural Co. The Koolau-Wailoa system is the most important of the East Maui Irrigation Co.'s ditch lines and is the largest ditch system in the Hawaiian Islands.

Discharge measurements of Wailoa ditch at Honopou, near Huelo, Maui, during the year ending June 30, 1923

Date	Made by—	Gage height (feet)	Discharge	
			Second-feet	Million gallons per day
Sept. 13*	E. D. Burchard	4.46	206	133
28	John McCombs	3.18	118	76
June 11	do	3.32	119	77

* Discredited; velocity too high for satisfactory handling of meter on rod.

Discharge, in million gallons per day, of Wailoa ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1923

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		130	39	52		62	132	132
2		118	53	41	120	84	130	116
3		120	102	38		58	143	116
4		116	104	36		52	125	143
5		102	62	57	114	49	122	129
6		96	80	71	110	45	147	110
7		94	90	67	115	79	127	100
8		84	78	64	154	67	120	94
9		78	121	107	147	43	115	86
10		72	121	139	137	47	107	81
11		68	103	116	141	119	101	75
12		66	151	117	138	141	97	92
13		83	148	120	121	130	90	116
14		65	153	101	108		85	136
15		59	156	89	103	123	86	132
16		56	140	81	113	119	126	137
17		54	159	74	99	132	132	146
18		52	156	71	92	157	115	132
19	137	51	155	106	92	153	127	118
20	128	50	140	125	80	153	115	105
21	130	45	88	125	76	144	123	98
22	118	43	63	127	102	141	133	110
23	110	42	30	151	151	137	136	106
24	102	40	0	139	128	132	136	90
25	144	42	0	122	110	123	153	87
26	146	60	0	134	66	149	145	91
27	138	42	0	139	121	142	141	88
28	138	40		124	62	140	131	92
29	132	37	.5	-------	52	141	126	105
30	124	39		-------	45	146	135	94
31	-------	39		-------	46	-------	140	-------

NOTE.—Braced figures show mean discharge for periods indicated; estimated, because of lack of gage-height record, by comparison with flow of Koolau ditch at Nahiku weir, Keanae, and Wahinepe.

Monthly discharge of Wailoa ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
November 19–30	146	102	129	200	1,550	4,750
December	130	37	67.2	104	2,080	6,390
January	159	0	80.5	125	2,490	7,660
February	151	36	97.6	151	2,730	8,390
March	154	45	107	166	3,300	10,200
April	157	43	111	172	3,330	10,200
May	153	85	124	192	3,840	11,800
June	146	75	109	169	3,260	10,000
The period	-------	-------	-------	-------	22,600	69,400

NEW HAMAKUA DITCH AT HONOPOU, NEAR HUELO, MAUI

LOCATION.—600 feet below Honopou Stream crossing, 15 feet above tunnel portal and 7 miles by road and trail west of Huelo.

RECORDS AVAILABLE.—May 14, 1921, to June 30, 1923. January 25, 1918, to May 13, 1921, from station 300 feet upstream. Records comparable.

GAGE.—Stevens continuous water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from lehua logs across ditch just above gage.

CHANNEL AND CONTROL.—Sides and bottom of ditch composed of hardpan; fairly smooth. Channel straight for 25 feet above and about 1,000 feet below station. No well-defined control; stage-discharge relation affected by deposition of mud and gravel on ditch bottom and by caving of tunnel roof.

EXTREMES OF DISCHARGE.—Maximum discharge recorded, 116 million gallons per day or 179 second-feet, at 2.30 a. m. February 23 (gage height, 5.46 feet); minimum discharge recorded, 0.2 million gallons per day or 0.3 second-foot, from 7.30 to 10 p. m. November 24 (gage height, 0.33 foot).

1918–1923: Maximum discharge recorded, 124 million gallons or 192 second-feet, at 2.40 a. m. February 1, 1922 (gage height, 6.15 feet); minimum discharge recorded on November 24, 1922.

DIVERSIONS.—Ditch receives small amount of seepage and, during floods, the waste water from Wailoa ditch intakes.

REGULATION.—Flow regulated by gates.

OBJECT OF STATION.—To determine amount of water diverted from Territorial lands above to fee simple lands below.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Stage-discharge relation not permanent. Rating curve used July 1 to September 15, well defined below 100 million gallons per day. Standard curve used September 15 to June 30, fairly well defined; was used direct except for period November 9 to December 4 for which a parallel curve was used. Operation of water-stage recorder satisfactory except for part of July. Daily discharge ascertained by applying to rating table mean daily gage height obtained from recorder graph by inspection or, for days of considerable fluctuation in stage, by averaging discharge for intervals of the day. Records fair to good.

New Hamakua ditch, at elevation about 500 feet, diverts from all streams on the windward side of Haleakala, below Wailoa ditch, between Waikamoi and Halehaku Streams inclusive. The water is carried to Paia where it is distributed for the irrigation of sugar cane. The system comprises about 14 miles of main ditch and has a carrying capacity of 75 million gallons per day. Upon completion of Wailoa ditch New Hamakua ditch was abandoned west of Halehaku and became a storm-water ditch east of Halehaku.

Discharge measurements of New Hamakua ditch at Honopou, near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge		Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day			Second-feet	Million gallons per day
Sept. 13	1.95	37	23.8	Jan. 6	0.08	1.25	0.8
28	.18	1.75	1.15	May 17	1.16	15.3	9.9
Nov. 14	*2.16	29	18.9				

* Stage-discharge relation affected by backwater from tunnel débris below gage.

Discharge, in million gallons per day, of New Hamakua ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.2	0.7	1.2	1.6	6.0	8.0	0.4	1.9	2.3	52	12.5	5.9
2	1.2	.7	1.2	1.6	3.0	4.4	.4	1.4	1.9	61	11.8	3.0
3	1.2	26	1.2	14.1	2.5	3.3	3.5	1.3	25	52	26	1.5
4	1.2	7.8	1.4	35	15.0	3.0	5.9	1.3	26	49	11.8	23
5	.7	1.2	4.2	62	83	2.3	.7	1.3	3.3	49	8.7	11.4
6	.6	1.0	1.8	59	90	2.0	.7	1.2	3.2	46	39	1.5
7	.6	1.0	17.0	57	96	1.9	1.0	1.1	2.4	42	8.2	.5
8	.6	13.7	2.6	41	82	1.7	1.0	1.5	45	41	9.8	.4
9	1.4	51	7.2	21	37	1.6	10.3	10.9	24	39	8.7	.4
10	1.0	40	64	5.6	22	1.6	11.7	76	18.1	44	5.1	.4
11		26	63	7.2	16.1	1.5	3.4	29	15.5	44	3.6	.4
12		18.2	32	2.9	19.4	1.4	91	18.5	9.8	39	1.0	.5
13		8.8	26	1.4	32	1.8	54	18.9	6.7	39	.8	3.7
14		2.0	17.4	1.3	23	1.4	89	4.8	4.2	37	.7	10.9
15		1.9	24	6.9	14.2	1.1	43	1.6	5.7	9.2	.7	9.5
16		1.8	15.5	31	41	1.0	26	1.4	9.8	6.6	5.4	14.9
17	.8	1.8	13.2	1.8	23	1.0	40	1.2	8.7	21	11.1	29
18		1.6	38	9.2	11.1	.9	61	1.0	8.7	73	5.4	11.0
19		17.4	23	8.7	9.8	.9	46	31	8.7	54	8.7	3.8
20		4.3	19.3	1.3	6.9	.9	70	26	11.1	56	4.3	.7
21		1.7	11.7	1.6	6.9	.8	25	28	.9	18.1	10.0	.5
22		1.7	4.8	85	2.2	.8	12.1	17.2	5.3	27	21	3.9
23		1.5	1.2	54	.3	.7	30	69	27	10.7	14.6	2.4
24	1.1	1.5	1.2	39	.6	.7	46	16.2	21	7.2	9.1	.4
25	1.0	1.4	1.0	28	37	.6	41	6.8	25	11.8	44	.4
26	5.2	1.4	1.0	32	56	1.0	37	28	46	39	15.8	.4
27	1.0	1.4	1.2	10.4	32	.7	33	14.8	66	22	14.6	.4
28	3.3	1.3	1.3	4.6	11.8	.6	27	8.4	54	28	9.2	.5
29	1.0	1.5	1.2	16.7	7.7	.5	30	-------	52	20	8.2	3.0
30	.8	1.4	1.5	6.7	4.1	.5	37	-------	46	25	7.7	1.4
31	.8	1.3	-------	7.7	-------	.4	26	-------	46	-------	2.5	-------

NOTE.—Braced figures show mean discharge for period indicated; estimated, because of lack of gage-height record, by comparison with flow of Honopou Stream.

Monthly discharge of New Hamakua ditch at Honopou, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	5.2	0.6	1.11	1.72	34.3	106
August	51	.7	7.84	12.1	243	746
September	64	1.0	13.3	20.6	399	1,220
October	85	1.3	21.2	32.8	657	2,020
November	96	.3	26.4	40.8	792	2,430
December	8.0	.4	1.58	2.44	49.0	150
January	91	.4	29.1	45.0	903	2,770
February	76	1.0	15.0	23.2	420	1,290
March	66	.9	20.3	31.4	629	1,930
April	73	6.6	35.4	54.8	1,060	3,260
May	44	.7	11.0	17.0	340	1,050
June	29	.4	4.86	7.52	146	447
The year	96	.3	15.5	24.0	5,670	17,400

NEW HAMAKUA DITCH AT HALEHAKU WEIR, NEAR HUELO, MAUI

LOCATION.—Just above crossing of Halehaku Stream, 7 miles by trail west of Huelo post office

RECORDS AVAILABLE.—January 1, 1910, to May 30, 1923, when station was discontinued.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by 25-foot Cipolletti weir.

CHANNEL AND CONTROL.—Large pool at weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—Halehaku weir is one of four weirs which measure water diverted from Territorial lands through Kauhikoa, New Hamakua, Lowrie, and Haiku ditches by the East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge records copied from records of East Maui Irrigation Co.

For description of this ditch see New Hamakua ditch at Honopou, near Huelo. The following discharge measurement was made by John McCombs:

November 29, 1922: Gage height, 1.17 feet; discharge, 116 second-feet or 75 million gallons per day.

Discharge, in million gallons per day, of New Hamakua ditch at Halehaku weir, near Huelo, Maui, for the period July 1, 1922, to May 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1	15.5	12.5	13.8	24.8	59.7	67.6	13.6	40.1	48.9	66.5	50.8
2	4.8	12.1	15.3	32.8	51.2	62.5	17.6	36.0	49.6	67.7	49.7
3	-------	72.9	19.2	58.2	49.4	63.5	40.0	33.6	59.9	65.9	65.3
4	-------	54.1	19.3	68.5	62.2	59.8	52.1	32.4	58.9	64.6	48.6
5	-------	30.8	48.8	70.3	74.4	49.6	33.4	31.6	49.4	63.6	44.6
6	-------	18.0	45.2	71.0	71.6	45.3	37.3	39.1	49.1	61.7	71.2
7	-------	26.5	54.5	68.8	66.8	43.9	35.4	37.6	49.1	66.0	45.5
8	-------	53.3	43.4	69.0	29.8	35.9	33.7	39.7	56.6	63.7	56.7
9	-------	65.7	35.7	67.5	38.5	35.2	52.3	49.1	51.4	59.8	63.1
10	-------	46.9	71.1	60.6	69.1	33.4	56.9	77.5	51.6	60.2	56.7
11	-------	51.9	69.6	58.7	70.0	32.0	51.7	68.2	51.3	62.8	55.8
12	-------	48.4	65.4	50.3	69.5	30.0	25.6	65.5	49.7	58.1	49.7
13	-------	49.9	66.0	38.6	70.0	35.3	67.8	54.2	49.4	63.2	45.4
14	-------	46.3	63.0	33.6	68.3	31.2	56.1	48.5	50.5	71.5	42.7
15	-------	34.6	66.8	38.2	72.0	25.7	37.4	48.8	48.9	51.1	45.6
16	-------	36.0	60.4	68.2	76.5	24.3	49.5	48.0	51.2	45.1	48.2
17	-------	33.4	39.8	55.4	69.5	22.9	58.0	45.1	47.4	54.6	42.5
18	-------	28.5	65.9	66.2	68.8	21.3	64.0	43.6	50.0	73.5	48.1
19	-------	50.7	63.2	54.6	68.3	20.1	66.5	47.2	49.8	70.3	43.1
20	-------	45.2	62.7	43.3	65.4	21.1	46.9	50.4	48.1	74.5	54.6
21	-------	27.6	64.1	36.3	67.2	18.7	30.4	53.1	43.3	56.5	66.4
22	-------	32.5	57.0	74.8	59.4	16.9	25.9	49.9	44.5	63.2	71.5
23	3.6	20.7	40.4	67.9	54.2	16.3	40.7	57.3	68.1	49.6	72.8
24	11.1	19.2	33.4	71.2	53.9	16.2	43.0	48.0	63.5	45.8	64.5
25	18.0	17.3	31.2	66.1	69.7	15.4	40.6	50.4	72.5	47.2	81.4
26	35.2	17.9	31.9	69.8	75.2	24.6	38.7	52.2	70.6	63.8	71.0
27	15.8	17.6	31.8	57.8	71.2	18.0	35.6	49.0	79.3	57.0	69.4
28	33.9	17.4	30.8	52.4	67.0	14.6	32.8	51.2	69.0	56.8	65.8
29	18.7	21.4	23.9	64.2	68.1	14.1	40.4	-------	67.1	56.9	64.7
30	12.9	18.9	22.1	52.6	65.8	13.9	46.8	-------	65.6	63.6	68.7
31	12.3	15.9	-------	62.3	-------	15.4	46.8	-------	61.6	-------	-------

NOTE.—No flow July 3–22.

Monthly discharge of New Hamakua ditch at Halehaku weir, near Huelo, Maui, for the period July 1, 1922, to May 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July (11 days)	35.2	3.6	16.5	25.5	182	557
August	72.9	12.1	33.7	52.1	1,040	3,210
September	71.1	13.8	45.2	69.9	1,360	4,160
October	74.8	24.8	57.2	88.5	1,770	5,440
November	76.5	29.8	64.1	99.2	1,920	5,900
December	67.6	13.9	30.5	47.2	945	2,900
January	67.8	13.6	42.5	65.8	1,320	4,040
February	77.5	31.6	48.1	74.4	1,350	4,130
March	79.3	43.3	55.7	86.2	1,730	5,300
April	74.5	45.1	60.8	94.1	1,820	5,600
May 1–30	81.4	42.5	57.5	89.0	1,720	5,290
The period (314 days)					15,200	46,500

NOTE.—No flow July 3–22.

KAUHIKOA DITCH AT OPANA WEIR, NEAR HUELO, MAUI

LOCATION.—A short distance below crossing of Opana Stream and 8 miles by road west of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1923.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—By 25-foot sharp-crested weir, and by current meter from plank across ditch 100 feet below gage.

CHANNEL AND CONTROL.—Large pool at weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—Opana weir is one of four weirs which measure water diverted from Territorial lands through Kauhikoa, New Hamakua, Lowrie, and Haiku ditches, by East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Kauhikoa ditch at elevation about 900 feet diverts from all streams on the windward side of the crater of Haleakala between Halehaku and Maliko Streams inclusive, above Lowrie and Haiku ditches. The water is carried to the vicinity of Paia and distributed for irrigation of sugar cane. The ditch comprises about 6 miles of main channel and has a carrying capacity of 90 million gallons per day. Kauhikoa ditch replaced Old Hamakua ditch west of Halehaku.

Discharge measurements of Kauhikoa ditch at Opana weir, near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 26	0.16	6.0	3.9
Nov. 29	.69	48	31

Discharge, in million gallons per day, of Kauhikoa ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.1	5.9	6.7	9.1	10.3	67.9	7.2	4.7	18.2	73.4	50.5	8.1
2	9.6	6.0	6.7	10.5	10.6	24.3	7.5	4.0	12.5	80.0	49.0	9.6
3	13.0	15.5	6.7	15.8	11.6	21.4	8.5	3.4	18.6	65.4	51.8	10.8
4	13.3	16.7	6.7	25.2	14.5	15.5	12.9	2.8	38.9	61.8	46.6	31.3
5	15.0	7.6	7.1	45.8	69.2	12.4	9.5	4.2	20.1	58.2	45.6	19.0
6	13.5	5.8	7.2	47.1	87.4	11.8	9.8	4.8	16.7	51.8	54.5	6.4
7	13.4	6.6	23.6	65.3	90.2	11.4	10.1	4.5	15.5	60.8	46.7	4.8
8	12.7	12.5	18.6	64.4	92.8	10.7	9.7	3.8	46.9	63.6	35.2	4.6
9	16.6	34.3	11.8	16.1	79.6	10.4	14.6	6.6	55.9	46.3	16.4	3.5
10	15.3	38.8	55.0	10.3	44.0	10.2	16.3	44.9	43.8	52.6	20.9	2.4
11	15.0	40.4	84.4	17.3	40.5	10.1	15.8	29.5	35.8	58.9	13.8	2.2
12	16.7	35.1	63.0	14.4	46.1	10.1	81.6	19.6	29.8	52.3	4.8	2.5
13	14.1	18.9	30.7	10.8	55.2	10.3	62.6	34.7	22.8	48.7	15.9	6.4
14	13.2	2.9	9.8	9.8	55.7	10.1	54.9	20.2	16.3	51.8	23.6	14.5
15	12.5	14.8	18.7	11.2	43.3	9.4	21.9	9.4	15.8	47.8	20.8	13.9
16	11.3	13.0	13.8	21.3	57.6	9.2	34.2	6.7	19.4	46.8	36.1	16.5
17	10.6	7.6	27.2	8.9	42.7	9.0	79.3	5.5	15.7	49.1	48.8	32.9
18	11.4	7.4	33.4	11.7	42.3	8.8	87.5	5.3	13.2	64.8	38.5	15.0
19	14.6	16.2	24.0	12.0	41.1	8.6	68.4	28.2	13.1	61.9	37.8	6.4
20	13.0	17.6	21.9	11.0	27.4	8.2	40.6	36.2	8.2	65.3	12.8	2.8
21	11.7	12.3	20.0	11.7	23.0	8.2	24.8	31.2	6.2	53.1	7.2	2.4
22	13.0	2.4	18.1	57.7	20.9	7.8	24.3	33.1	4.9	54.0	28.1	5.4
23	12.1	8.8	12.8	45.3	7.4	7.1	26.9	64.5	26.6	49.1	29.5	5.0
24	6.9	9.8	10.2	43.8	6.9	7.4	26.9	31.5	21.2	47.5	23.0	2.2
25	8.7	9.6	9.9	48.2	45.4	7.4	10.8	26.4	19.6	45.8	39.2	2.2
26	10.8	9.8	8.9	47.5	82.2	8.3	9.9	41.5	18.1	61.6	32.0	2.2
27	7.2	6.8	10.5	37.3	89.1	8.0	6.6	43.6	75.9	57.2	29.3	2.2
28	7.0	6.3	9.8	28.5	63.6	7.8	6.1	28.9	77.8	55.3	25.9	2.1
29	6.3	6.7	9.3	35.7	67.7	7.6	5.2	-------	62.2	53.9	21.5	3.3
30	5.9	6.7	7.3	30.9	65.8	7.4	4.6	-------	53.6	55.3	15.0	3.6
31	5.9	6.7	-------	21.7	-------	7.2	4.4	-------	53.3	-------	8.1	-------

Monthly discharge of Kauhikoa ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	16.7	1.1	11.3	17.5	351	1,080
August	40.4	2.4	13.2	20.4	410	1,260
September	84.4	6.7	19.8	30.6	594	1,820
October	65.3	8.9	27.3	42.2	846	2,600
November	92.8	6.9	47.8	74.0	1,430	4,400
December	67.9	7.1	12.1	18.7	374	1,150
January	87.5	4.4	25.9	40.1	803	2,460
February	64.5	2.8	20.7	32.0	580	1,780
March	77.8	4.9	28.9	44.7	897	2,750
April	80.0	45.8	56.5	87.4	1,690	5,200
May	54.5	4.8	30.0	46.4	929	2,850
June	32.9	2.1	8.14	12.6	244	749
The year	92.8	1.1	25.1	38.8	9,150	28,100

LOWRIE DITCH AT OPANA WEIR, NEAR HUELO, MAUI

LOCATION.—A short distance west of Halehaku Gulch and 8 miles by road northwest of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1923.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by sharp-crested weir 16⅓ feet long, with bottom and end contractions and by current meter from plank across ditch 100 feet below gage.

CHANNEL AND CONTROL.—Large pool back of weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—Opana weir is one of four weirs which measure water diverted from Territorial lands through Kauhikoa, New Hamakua, Lowrie, and Haiku ditches by East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Lowrie ditch at elevation about 500 feet, a continuation of Manuel Luis and Center ditches, diverts from streams on the windward side of the crater of Haleakala between Kailua and Halehaku Streams, inclusive, below Wailoa and New Hamakua ditches, and above Haiku ditch. At Kailua Stream it receives the combined flow of Manuel Luis and Center ditches. The water is carried to the vicinity of Paia and distributed for the irrigation of sugar cane. The ditch comprises about 15 miles of main channel and has a carrying capacity of 65 million gallons. With the completion of Wailoa ditch, Lowrie ditch became mainly a storm-water ditch or reservoir feeder.

Discharge measurements of Lowrie ditch at Opana weir, near Huelo, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 26	1.08	67	43.5
29	1.32	92	59

Discharge, in million gallons per day, of Lowrie ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	17.0	14.1	10.8	44.9	52.8	53.1	22.0	41.6	55.4	33.3	54.0	45.6
2	14.7	18.9	28.8	46.7	49.9	52.0	27.3	29.8	55.0	46.5	54.2	53.9
3	14.1	51.4	27.6	50.0	52.4	52.6	48.9	24.1	54.7	30.8	54.0	51.5
4	12.6	28.0	33.0	52.0	52.7	52.4	49.4	21.4	55.0	26.3	54.1	55.2
5	16.2	19.2	51.7	52.5	53.8	52.5	36.3	33.1	54.5	25.6	53.2	54.7
6	12.8	19.4	37.5	53.1	53.9	51.0	41.2	38.6	54.4	21.8	54.2	53.0
7	13.2	29.2	47.5	50.5	54.2	50.6	45.3	37.0	54.2	27.7	54.1	42.3
8	12.3	27.3	22.7	28.6	54.1	48.8	37.3	41.8	54.6	38.8	48.3	43.0
9	23.7	52.3	40.7	49.4	53.4	44.0	52.0	39.4	55.2	24.4	50.6	45.2
10	13.5	52.4	53.0	42.4	53.4	41.9	49.9	55.6	54.7	22.1	47.1	42.3
11	14.3	52.2	53.1	45.3	53.3	38.8	45.9	54.6	53.9	40.8	44.5	39.9
12	15.8	52.2	53.6	51.3	53.8	38.4	55.0	55.1	53.8	52.8	50.9	44.4
13	12.6	50.0	53.6	44.8	53.4	48.7	55.8	53.9	53.9	44.5	15.6	47.9
14	12.4	46.8	53.9	41.0	53.8	37.0	53.4	53.8	53.9	49.4	.7	53.4
15	11.4	36.4	53.8	43.8	53.7	34.8	21.1	53.8	52.5	45.9	.8	54.0
16	12.0	33.2	46.2	53.4	54.0	32.6	16.3	52.2	53.8	43.4	3.9	54.2
17	11.2	30.5	45.4	52.1	53.8	30.8	11.3	57.2	52.4	45.4	4.6	54.8
18	13.3	34.7	53.6	48.9	53.4	29.4	12.2	42.9	49.9	52.2	.6	53.3
19	17.9	51.3	53.6	41.7	53.5	29.6	11.3	45.2	48.6	52.2	16.0	51.9
20	12.7	38.2	53.7	37.7	52.7	26.9	22.9	51.3	40.3	53.4	52.5	48.0

Discharge, in million gallons per day, of Lowrie ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1923—Continued

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
21	10.4	31.4	53.4	43.4	53.2	25.1	9.4	55.0	47.1	53.3	53.2	43.7
22	15.0	34.4	46.1	53.8	52.8	24.3	6.5	55.0	41.9	54.0	52.6	46.8
23	11.8	29.9	49.2	54.1	53.2	23.8	6.4	55.7	53.5	54.8	52.8	51.5
24	12.4	31.5	47.5	53.2	52.7	22.4	6.2	55.2	53.8	54.1	55.0	46.2
25	20.4	27.4	44.6	53.8	53.2	23.5	5.6	55.0	53.8	53.4	55.7	44.4
26	32.0	29.5	39.7	53.7	53.2	36.2	12.3	55.4	52.3	54.0	55.6	43.4
27	16.4	24.9	48.5	51.8	51.7	23.0	19.5	55.5	53.1	54.1	55.5	42.8
28	27.8	23.5	37.5	53.4	53.4	22.9	29.4	55.4	41.6	53.9	51.2	49.2
29	17.2	37.1	33.7	53.8	53.6	20.2	44.4	-------	24.8	54.0	50.6	49.9
30	16.2	28.8	30.2	49.5	53.5	21.7	32.8	-------	20.3	54.0	54.6	45.6
31	19.4	22.8	-------	49.1	-------	20.8	25.4	-------	28.1	-------	55.1	-------

Monthly discharge of Lowrie ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	32.0	10.4	15.6	24.1	483	1,480
August	52.4	14.1	33.9	52.5	1,050	3,230
September	53.8	10.8	43.4	67.1	1,300	4,000
October	54.1	23.6	48.2	74.6	1,490	4,590
November	54.2	49.9	53.2	82.3	1,600	4,900
December	53.1	20.2	35.8	55.4	1,110	3,410
January	55.8	5.6	29.4	45.5	912	2,800
February	57.2	21.4	47.3	73.2	1,320	4,060
March	55.4	20.3	49.4	76.4	1,530	4,700
April	54.8	21.8	43.9	67.9	1,320	4,040
May	55.7	.6	42.1	65.1	1,310	4,010
June	55.2	39.9	48.7	75.4	1,460	4,480
The year	57.2	.6	40.8	63.1	14,900	45,700

HAIKU DITCH AT MANAWAI GULCH, NEAR PEAHI, MAUI

LOCATION.—In bottom of western branch of Manawai Gulch just west of Keaaula-Opana boundary, a quarter of a mile north of Peahi, and 8 miles by road northwest of Huelo.

RECORDS AVAILABLE.—October 7, 1914, to June 30, 1923, at present site. January 1, 1910, to October 7, 1914, at Peahi weir, on old Haiku ditch.

GAGE.—Friez water-stage recorder, installed about October 21, 1914. Daily staff gage readings prior to that date.

DISCHARGE MEASUREMENTS.—Made from concrete footbridge across ditch.

CHANNEL AND CONTROL.—Control is submerged concrete weir across ditch, installed between October 21 and November 18, 1914; rated by engineers of East Maui Irrigation Co. Shifts slightly on account of gradual accumulation of tunnel débris on upstream side of control.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None.

REGULATION.—By gates at frequent intervals.

OBJECT OF STATION.—To determine amount of water diverted from Territorial lands by East Maui Irrigation Co.

UTILIZATION.—Water used for irrigation of sugar cane.
ACCURACY.—Records good.
COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Haiku ditch, at elevation about 250 feet, diverts from all streams on the windward side of the crater of Haleakala, below all other main ditches, between Kailua Stream and Maliko Gulch. The water is carried to the vicinity of Paia and distributed for irrigation of sugar cane. The ditch comprises about 16 miles of main channel and has a carrying capacity of 87 million gallons per day. Haiku ditch replaced Spreckels ditch west of Kailua Stream.

Discharge measurements of Haiku ditch at Manawai Gulch, near Peahi, Maui, during the year ending June 30, 1923

[Made by John McCombs]

Date	Gage height (feet)	Discharge	
		Second-feet	Million gallons per day
Sept. 26	1.71	9.1	5.9
Nov. 28	3.94	116	75
Jan. 25	3.84	112	72

Discharge, in million gallons per day, of Haiku ditch at Manawai Gulch, near Peahi, Maui, for the year ending June 30, 1923

Day	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.8	2.4	4.2	9.2	32.1	62.8	6.0	41.8	60.0	89.2	88.9	58.8
2	3.7	2.1	3.8	13.6	20.6	53.3	7.1	29.6	46.8	90.0	79.4	30.3
3	3.5	63.9	4.0	47.7	20.3	53.7	28.8	10.9	58.1	90.0	90.0	18.2
4	3.4	28.8	4.2	65.3	59.1	26.9	38.0	9.2	89.8	89.3	78.5	72.2
5	4.6	12.2	32.7	79.8	89.3	25.9	15.6	12.4	57.8	88.8	49.4	52.9
6	3.4	10.1	23.3	88.9	90.0	18.9	17.9	12.4	46.1	77.9	87.1	34.6
7	3.2	26.4	53.3	75.9	89.0	17.8	20.7	13.1	46.4	74.6	64.2	30.9
8	3.1	41.7	29.0	45.8	90.0	15.1	11.7	21.6	85.6	89.9	50.0	21.3
9	5.5	75.6	33.3	50.9	90.0	12.4	52.4	18.3	90.0	81.5	55.9	9.3
10	4.0	84.9	83.2	53.1	85.2	11.6	55.8	90.0	90.0	76.2	54.6	7.9
11	4.2	80.2	85.9	30.0	76.2	10.9	30.5	88.9	90.0	86.8	25.6	6.9
12	4.7	79.1	80.8	23.2	90.0	11.3	87.3	65.1	81.1	86.4	16.4	10.0
13	3.5	22.5	59.5	14.8	90.0	17.2	88.2	29.6	56.1	90.0	30.2	21.3
14	2.9	15.2	49.2	9.3	90.0	10.4	65.5	42.3	40.8	77.7	38.2	39.2
15	2.2	29.9	65.2	16.3	67.2	9.6	13.7	25.2	33.4	48.7	39.8	41.3
16	2.1	25.3	53.3	61.8	90.0	9.1	30.0	17.1	25.0	34.8	62.1	43.4
17	2.2	17.9	31.3	47.1	88.2	8.8	90.0	13.6	18.5	45.3	76.2	84.7
18	2.1	8.6	56.6	57.6	77.3	8.6	90.0	12.7	18.0	90.0	56.8	55.3
19	2.6	43.1	59.3	35.0	78.1	8.4	90.0	75.0	29.9	90.0	56.7	40.1
20	2.4	29.1	57.4	33.1	75.8	8.8	89.0	89.1	39.1	90.0	24.1	32.2
21	2.4	9.1	56.9	10.8	63.8	7.5	89.5	83.0	22.4	90.0	44.4	19.9
22	3.0	16.2	27.9	88.2	35.5	7.2	88.4	86.1	21.5	89.9	62.0	21.1
23	2.6	7.3	9.8	90.0	27.4	6.8	82.7	87.8	88.9	78.7	69.5	20.8
24	3.2	5.2	10.0	88.2	20.8	6.3	82.6	90.0	86.1	57.3	47.8	9.7
25	3.2	4.4	8.2	87.6	83.6	6.7	85.1	85.4	88.5	45.4	88.2	16.1
26	30.0	4.1	7.9	88.3	90.0	11.6	67.2	72.6	89.4	82.6	71.1	10.5
27	4.2	2.7	9.9	55.5	87.5	6.7	61.5	90.0	89.2	90.0	69.5	7.4
28	10.9	2.8	8.7	46.8	84.2	6.3	47.3	85.0	90.0	90.0	49.4	9.7
29	6.5	7.8	6.7	74.6	68.6	6.2	37.1	-------	87.9	90.0	51.7	14.2
30	3.3	5.7	7.3	55.9	57.7	6.1	43.9	-------	73.5	90.0	53.1	11.5
31	3.2	4.8	-------	45.9	-------	6.0	25.1	-------	66.9	-------	62.8	-------

Monthly discharge of Haiku ditch at Manawai Gulch, near Peahi, Maui, for the year ending June 30, 1923

Month	Discharge				Total run-off	
	Million gallons per day			Second-feet (mean)	Million gallons	Acre-feet
	Maximum	Minimum	Mean			
July	30.0	2.1	4.50	6.96	140	428
August	84.9	2.1	24.8	38.4	769	2,360
September	85.9	3.8	34.1	52.8	1,020	3,140
October	90.0	9.2	51.3	79.4	1,590	4,880
November	90.0	20.3	70.2	109	2,110	6,460
December	62.8	6.0	15.4	23.8	479	1,470
January	90.0	6.0	52.9	81.8	1,640	5,030
February	90.0	9.2	49.9	77.2	1,400	4,290
March	90.0	18.0	61.5	95.2	1,910	5,850
April	90.0	34.8	79.7	123	2,390	7,340
May	90.0	16.4	57.9	89.6	1,790	5,510
June	84.7	6.9	28.4	43.9	852	2,610
The year	90.0	2.1	44.1	68.2	16,100	49,400

MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the island of Maui at points other than regular gaging stations are listed below.

Miscellaneous measurements on Maui during the year ending June 30, 1923

Date	Stream	Tributary to—	Locality	Gage height	Discharge	Million gallons per day
				Feet	*Sec.-ft.*	
July 10	West Wailuanui	Pacific Ocean	125 feet above Koolau ditch crossing, 2 miles east of Upper Keanae.	0.54	0.6	0.4
Sept. 18	do	do	do	1.06	7.3	4.7
Jan. 10	do	do	do	.90	4.4	2.8
Apr. 12	do	do	do	.93	6.5	4.2
Sept. 14	Kaaiea	do	1,000 feet above Wailoa ditch intake, 4 miles southeast of Huelo.	.59	2.4	1.6
Nov. 17	do	do	do	.67	4.2	2.7
Jan. 15	do	do	do	.52	1.2	.8
May 10	do	do	do	.60	2.7	1.8
June 6	Wailoa ditch		Halehaku Gulch, near Peahi	2.70	84	54
Sept. 26	New Hamakua ditch.		Opana Gulch, near Peahi	2.57	51	33
Nov. 29	do		do	4.44	109	70
June 4	Wailoa ditch		do	2.69	122	79
16	do		do	2.38	103	67
16	do		do	2.38	103	67
18	do		do	2.72	123	80
18	do		do	2.72	121	78
Sept. 25	New Hamakua ditch		Maliko Gulch, near Hamakuapoko.	1.74	45.5	29.5
Nov. 28	do		do	[a]	104	67
Jan. 25	do		do	[b]2.37	73	47.5
Sept. 25	Kauhikoa ditch		do	1.13	15.4	10.0
25	Lowrie ditch		do	1.13	74	47.5
Nov. 28	do		do	1.34	89	58
Sept. 25	Haiku ditch		do	.26	10.1	6.5
Nov. 28	do		do	1.21	118	76
Jan. 25	do		do	.48	28.5	18.4

[a] New gage installed 1,000 feet above old gage used for measurement of Sept. 25; new gage not read.
[b] Read on old gage; new gage read 3.21 feet.

ISLAND OF HAWAII

MISCELLANEOUS MEASUREMENTS

Measurements of streams and ditches on the island of Hawaii at points other than regular gaging stations are listed below.

Miscellaneous measurements on Hawaii during the year ending June 30, 1923

Date	Stream	Tributary to—	Locality	Gage height	Discharge	Million gallons per day
				Feet	*Sec.-ft.*	
Aug. 31	Wailuku River	Pacific Ocean	At gaging station at Pukamaui, near Hilo.	2.08	22.1	14.3
Dec. 18	do	do	do	1.92	10.5	6.8
22	do	do	do	1.79	*8.8	5.7
30	do	do	do	1.58	6.5	4.2
Jan. 8	do	do	do	2.50	31.5	20.3
9	do	do	do	3.14	68	44
Feb. 2	do	do	do	3.50	144	93
Apr. 9	do	do	do	3.01	51	32.5
10	do	do	do	2.99	48.5	31.5
10	do	do	do	2.59	33.5	21.6
10	do	do	do	2.58	33	21.5

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