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Water-Supply Paper 465

SURFACE WATER SUPPLY OF HAWAII

JULY 1, 1916, TO JUNE 30, 1917

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Prepared in cooperation with the
TERRITORY OF HAWAII

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SURFACE WATER SUPPLY OF HAWAII, JULY 1, 1916, TO JUNE 30, 1917.

AUTHORITY FOR INVESTIGATIONS.

This volume contains results of measurements of the flow of certain streams and ditches and records of rainfall in the Territory of Hawaii made during the year ending June 30, 1917. 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 commissioners 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 commissioners 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.

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 presented to either party for payment according as it may be convenient or according to the balance remaining in the respective allotments.

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 of the 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.

[1] The United States Geological Survey also cooperated with the Territory of Hawaii in mapping several islands. The whole of the islands of Kauai and Oahu and a part of the island of Hawaii have been mapped.

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—Hawaiian Sugar Co., Mr. Charles Rice, Makee Sugar Co., Kauai Electric Co., Waimea Sugar Co., and Lihue Plantation Co.; Island of Oahu—United States Army Constructing Quartermaster Department, Wahiawa Water Co., Kahuku Plantation, Laie Plantation, Koolau Agricultural Co., Kaneohe Ranch Co., and Maunawili Ranch; Island of Maui—Wailuku Sugar Co., Pioneer Mill Co., Olowalu Sugar Co., Honolua Ranch, and East Maui Irrigation Co.

SCOPE OF WORK.

The investigations of stream and ditch flow in 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 four 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 warrant definite conclusions.

Special intensive investigations of the discharge of many 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 the United States Army and private corporations.

FIELD METHODS OF MEASURING STREAM FLOW.

BASE DATA.

In making plans for power, irrigation, municipal water supply, and other projects involving the use of water from surface streams it is necessary to have data from which both the total flow of the stream and its distribution from day to day throughout the year can be

obtained. The data necessary for obtaining such information are daily gage heights, which give the fluctuations of rise and fall of the stream, and measurements of discharge at various stages, from which a rating curve and table can be prepared giving the discharge for any stage. Such a rating is possible from the fact that so long as the conditions at the controlling section in the stream remain the same the discharge will be approximately the same for any given gage height.

Points at which discharge measurements are made and records of daily fluctuations of stage are kept for determining the daily flow are termed gaging stations.

Gaging stations may be divided into two classes, known as weir stations and velocity-area stations. At weir stations the head of water on the crest of the weir is measured and the discharge computed by means of a formula. The discharge at velocity-area stations is obtained by measuring the velocity of the current and the area of cross section, the product of the two giving the discharge.

The data presented in this paper were collected at both weir and velocity-area stations.

WEIR MEASUREMENTS.

Unquestionably a weir properly constructed and of a type for which accurate coefficients have been determined is one of the most convenient and reliable means of measuring small quantities of water. In practice, however, weirs rarely conform to the requirements imposed by the experimenter who derived the coefficients. If the crest of the weir is sharp and clean and sufficiently high above the bottom of the leading channel, if the end contractions are complete and the velocity of approach is wanting or negligibly small, and if the head on the crest is measured at a distance back of the overfall at least as great as the length of the weir crest, the Francis formula will give good results. On the other hand, if these essential conditions are not complied with—if the weir is improperly constructed and there is leakage around and under it, and especially if the velocity of approach is considerable and the contractions are imperfect, the Francis formula will not give accurate results.

Observations made on various types of weirs in Hawaii show that not all the weirs in use in the Territory are giving accurate results. If the error is known, so that corrections can be made, the trouble is largely mitigated, but faulty weir records are too often accepted without investigation as to their accuracy.

VELOCITY-AREA METHOD.

The velocity-area method of measurement consists in determining the mean or average velocity of the water passing a given cross-section area. The area of the cross section at right angles to the direction of flow is ascertained by soundings which are taken at such distances

apart as will show the contour of the stream bed. The depths are recorded and also their distances from some arbitrarily chosen initial point on one side of the stream.

The method of making the soundings depends on the size and stage of the stream. On ditches and small streams, where the depths and velocities are not large, a graduated rod may be used; on large streams, which must be measured from bridges or cables, a lead weight and sounding line must be used. The size of weights—whether 10 or 15 pounds—depends on the swiftness of the current; and the weights are torpedo shaped, so as to offer as little resistance as possible to the moving water.

On streams whose beds are permanent or nearly so a standard cross section is usually constructed from careful soundings and referred to the zero of the gage, so that the depths for any stage can be found by adding the gage height at that stage to the depths below the zero of the gage. This method is especially useful at high stages, when it is difficult to make accurate soundings.

After the cross-section area of the stream has been measured by soundings and horizontal distances, the velocity is determined at a number of points. These measurements of velocity should be made at frequent intervals across the stream and close enough to take account of any abrupt change in the velocity. For convenience, the velocities are usually observed in the same verticals at which soundings are made. On some streams fairly good measurements of velocities may be made by means of subsurface floats. This method is applicable, however, only to channels of uniform cross-section area over a considerable distance, and is very unsatisfactory for use on natural streams like those of Hawaii.[1]

The velocity of flow is best determined by the current meter, which is a form of water wheel actuated by the current and of such size and shape that it can easily be placed at any point in the stream.

The penta-recording current meter consists of six cups attached to a vertical shaft which revolves on a conical hardened-steel point when immersed in moving water. The revolutions are indicated electrically or acoustically. The rating, or relation between the velocity of moving water and the revolutions of the wheel, is determined for each meter by drawing it through still water for a given distance at different speeds and noting the number of revolutions for each run. From these data a rating table is prepared which gives the velocity in feet per second of moving water for any number of revolutions in a given time. The ratio of revolutions per second to velocity of flow in feet per second is very nearly a constant for all speeds and is approximately 0.45.

[1] Further information regarding the float method is given in Water-Supply Paper 95 and in textbooks on stream flow.

Three classes of methods of measuring velocity with current meters are in general use—multiple-point, single-point, and integration.

The two principal multiple-point methods in general use are the vertical velocity curve and 0.2 and 0.8 depth.

In the vertical velocity-curve method a series of velocity determinations are made in each vertical at regular intervals, usually about 10 to 20 per cent of the depth apart. By plotting these velocities as abscissas and their depths as ordinates, and drawing a smooth curve among the resulting points, the vertical velocity curve is developed. This curve shows graphically the magnitude and changes in velocity from the surface to the bottom of the stream. The mean velocity in the vertical is then obtained by dividing the area bounded by this velocity curve and its axis by the depth. This method of obtaining the mean velocity in the vertical is probably the best known, but on account of the length of time required to make a complete measurement its use is largely limited to the determination of coefficients for purposes of comparison.

In the second multiple-point method the meter is held successively at 0.2 and 0.8 depth, and the mean of the velocities at these two points is taken as the mean velocity for that vertical. On the assumption that the vertical velocity curve is a common parabola with horizontal axis, the mean of velocities at 0.22 and 0.79 depth will give closely the mean velocity in the vertical. Actual observations under a wide range of conditions show that this multiple-point method gives very closely the mean velocity of water flowing in open channels and that in a completed measurement it seldom varies as much as 1 per cent from the result obtained by the vertical velocity-curve method. It is very extensively used by the United States Geological Survey.

In the single-point method the meter is held either at the depth of the thread of mean velocity or at an arbitrary depth for which the coefficient for reducing to mean velocity has been determined or must be assumed.

Extensive experiments by means of vertical velocity curves show that the thread of mean velocity generally occurs between 0.5 and 0.7 total depth. In general practice the thread of mean velocity is considered to be at 0.6 depth, and at this point the meter is held in most of the measurements made by the single-point method. A large number of vertical velocity curve measurements, taken on many streams and under varying conditions, show that the average coefficient for reducing the velocity obtained at 0.6 depth to mean velocity is practically unity. The variation of the coefficient from unity in individual measurements is, however, greater than in the 0.2 and 0.8 method and the general results are not so satisfactory.

In the other principal single-point method the meter is held near the surface, usually 1 foot below, or low enough to be out of the effect of the wind of other disturbing influences. This is known as the subsurface method. The coefficient for reducing the velocity taken at the subsurface to the mean has been found to be in general from about 0.85 to 0.95, depending on the stage, velocity, and channel conditions. The higher the stage the larger the coefficient. This method is especially adapted for flood measurements, or for measurements when the velocity is so great that the meter can not be kept in the correct position for the other methods.

The vertical integration method consists in moving the meter at a slow but uniform speed from the surface to the bottom and back again to the surface and noting the number of revolutions and the time taken in the operation. This method has the advantage that the velocity at each point of the vertical is measured twice. It is useful as a check on the point methods. In using the Price meter great care should be taken that the vertical movement of the meter is not rapid enough to vitiate the accuracy of the resulting velocity determination.

In practical work on rough streams, such as many of those in Hawaii, the meter should be held at 0.6 depth if the depth is 1 foot or less. If the depth is greater the meter should be held at two points in the vertical, 0.2 and 0.8 from the surface.

When the mean velocities in the different verticals have been found, the average of two adjacent means is taken as the mean velocity for that individual section. The area of the section is computed by mulitplying the width of the section by the mean depth. The discharge of each section is then the product of the area multiplied by the mean velocity, and the total discharge of the stream results from summing up the discharge of the individual sections. In practice the work is tabulated in such a way as to render the computation very simple.[1]

Current-meter measurements are not practicable where there are eddies, cross currents, swirls, or passages for the water underneath stones. It is usually possible, however, to improve the channel by removing boulders and rocks, so that a satisfactory measuring section may be obtained, even on rough, steep streams such as exist in Hawaii.

Three kinds of velocity-area gaging stations are in general use in Hawaii, according to the means provided for making the observations of depth and velocity. They are wading, bridge, and cable stations.

A wading station is one at which measurements are made only by wading—that is, no means exist for getting above the water at any stage except by wading. Such stations are usually on ditches or wide, shallow streams, which do not fluctuate greatly. On many streams

[1]For a discussion of methods of computing the discharge of a stream see Engineering News, June 25, 1908.

however, measurements are made at low stages by wading, even though other means exist for making measurements at higher stages.

A bridge station is one at which the meter is used from a bridge. In some places highway or other bridges are available from which to make measurements, but generally they are not at the right place on the stream. Special bridges are then built.

A cable station is one at which measurements are made from a cable spanning the stream. Cable stations are used on large streams, such as Hanapepe, Wailua, and Hanalei rivers on the island of Kauai, and Wailuku River on the island of Hawaii. The cable supports the car from which a man works above the water. Distances are marked off on the cable itself or on a small auxiliary cable stretched taut above it.

A suitable place for a gaging station having been selected, a staff gage is set in the edge of the stream, either vertical or inclined, but graduated into tenths, half-tenths, or hundredths of feet vertically. The gage is securely fastened to rocks or trees to prevent displacement by floods and is so placed that the zero, or reference datum, is well below extreme low water. The datum is also referred to a permanent bench mark as an additional precaution. A water-stage recorder is then installed or an observer is engaged to record the heights of water morning and evening, and the mean of the two readings is used as the mean gage height for the day. Owing to the rapid rise and fall of most of the streams in Hawaii, two gage-height readings a day will not as a rule give a true mean for the 24 hours. For this reason, and also owing to the fact that many of the gaging stations are necessarily situated in the mountains at points remote from all habitations and difficult of access, it has generally been found necessary to use water-stage recorders. These instruments are of various types, some requiring weekly visits and others operating for a month without attention.

The essential features of water-stage recorders comprise a float free to rise and fall with fluctuations of the water surface, a device for transferring the motion of the float to the record sheet (either directly or through a reducing mechanism), the recording device, and the clock. The instruments may be designed for any range of stage.

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." They 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. Other units may be computed from this by the use of factors given in the table of equivalents.

"Gallons per minute" is generally used in connection with pumping and city water supply, the United States gallon of 231 cubic inches being the unit of quantity and 1 minute the unit of time.

The "miner's inch" is the unit for the rate of discharge of water that passes through an orifice 1 inch square under a head which varies locally. It is commonly used by miners and irrigators throughout the West, and is defined by statute in each State in which it is used.

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly, both as regards time and area.

"Run-off in inches" is the depth to which the drainage area would be covered if all the water flowing from it is a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

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 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.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting discharge in second-feet into run-off in acre-feet.

Discharge (second-feet).	Run-off (acre-feet).				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	1.983	55.54	57.52	59.50	61.49
2	3.967	111.1	115.0	119.0	123.0
3	5.950	166.6	172.6	178.5	184.5
4	7.934	222.1	230.1	238.0	246.0
5	9.917	277.7	287.6	297.5	307.4
6	11.90	333.2	345.1	357.0	368.9
7	13.88	388.8	402.6	416.5	430.4
8	15.87	444.3	460.2	476.0	491.9
9	17.85	499.8	517.7	535.5	553.4

NOTE.—For a part of a month multiply discharge for one day by the number of days.

1,000,000 United States gallons per day equals 1.55 second-feet.

1,000,000 United States gallons equals 3.07 acre-feet.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year (365 days) covers 1 square mile 1.131 feet, or 13.572 inches, deep.

1 second-foot for one year (365 days) equals 31,536,000 cubic feet.

1 second-foot for one year (365 days) equals 724 acre-feet.

1 second-foot equals about 1 acre-inch per hour.

1 second-foot for one day covers 1 square mile 0.03719 inch deep.

1 second-foot for one day equals 1.983 acre-feet.

1,000,000 cubic feet equals 22.95 acre-feet.

1 acre-foot equals 325,850 gallons.

1 inch deep on 1 square mile equals 2,323,200 cubic feet.

1 inch deep on 1 square mile equals 0.0737 second-foot per year.

1 foot equals 0.3048 meter.

1 mile equals 1.60935 kilometers.

1 mile equals 5,280 feet.

1 acre equals 0.4047 hectare.

1 acre equals 43,560 square feet.

1 acre equals 209 feet square, nearly.

1 square mile equals 2.59 square kilometers.

1 cubic foot equals 0.0283 cubic meter.

1 cubic foot equals 7.48 gallons.

1 cubic foot of water weighs 62.5 pounds.

1 cubic meter per minute equals 0.5886 second-foot.

1 horsepower equals 550 foot-pounds per second.

1 horsepower equals 76.0 kilogram-meters per second.

1 horsepower equals 746 watts.

1 horsepower equals 1 second-foot falling 8.80 feet.

1⅓ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

OFFICE METHODS OF COMPUTING AND STUDYING DISCHARGE AND RUN-OFF.

At the end of each year the field or base data for current-meter gaging stations, consisting of water-stage record sheets, daily gage heights, discharge measurements, and notes from observers' books, are assembled. The measurements are plotted on cross-section paper, and rating curves are drawn wherever feasible. The rating tables prepared from these curves are then applied to the tables of daily gage heights to obtain the daily discharge, and from these applications the tables of monthly discharge and run-off are computed.

Rating curves are drawn and studied with special reference to the class of channels which they represent. The discharge measurements for all classes of stations, when plotted with gage heights in feet as ordinates and discharge in million gallons per day as abscissas, define rating curves which are generally more or less parabolic in form.

For every rating table the following assumptions are made for the period of application of the table: (*a*) That the discharge is a function of and increases gradually with the stage; (*b*) that the discharge is the same whenever the stream is at a given stage, and hence such changes in conditions of flow as may have occurred during the period of application are either compensating or negligible, except that the rating, as stated in the footnote to each table, is not applicable for periods during which the channel was obstructed; (*c*) that the increased and decreased discharge due to change of slope on rising and falling stages is either negligible or compensating.

As already stated, the gaging stations may be divided into several classes, as indicated in the following paragraphs:

The stations of class 1 represent the most favorable conditions for an accurate rating and are also the most economical to maintain. The bed of the stream is usually composed of rock and is not subject to the deposits of sediment and loose material. This class includes also many stations located in a pool below which is a permanent rocky riffle that controls the flow like a weir. Provided the control is sufficiently high and close to the gage to prevent cut and fill at the gaging point from materially affecting the slope of the water surface, the gage height will, for all practical purposes, be a true index of the discharge. Discharge measurements made at such stations usually plot within 2 or 3 per cent of the mean discharge curve, and the rating developed from that curve represents a very high degree of accuracy.

Class 2 comprises mainly stations on rough, mountainous streams with steep slopes. The beds of such streams are, as a rule, comparatively permanent during low and medium stages, and when the flow is sufficiently well defined by an adequate number of discharge

measurements before and after each flood the stations of this class give nearly as good results as those of class 1. As it is seldom possible to make measurements covering the time of change at flood stage, the assumption is often made that the curves before and after the flood converged to a common point at the highest gage height recorded during the flood. Hence the only uncertain period occurs during the period of actual change in conditions of flow.

Class 3 includes those stations where the stream bed is of a shifting character, or the controlling section below the gage frequently changes, owing to cutting out by the current and the filling in of sand, gravel, and drift. In some places in Hawaii changes are caused by the growth of vegetation in the stream bed. No absolute rule can be laid down for stations of this class. Each rating curve must be constructed mainly from the measurements made in the current year, the engineer being guided largely by the history of the station and the following general law: If all measurements ever made at a station of this class are plotted on cross-section paper they will define a mean curve which may be called a standard curve. It has been found in practice that if after a change caused by high stage a relatively constant condition of flow occurs at medium and low stages, all measurements made after the change will plot on a smooth curve which is practically parallel to the standard curve with respect to ordinates or gage heights. This law of the parallelism of rating curves is the fundamental basis of all ratings and estimates at stations with semipermanent and shifting channels. It is not absolutely correct, but, with few exceptions, answers all the practical requirements of estimates made at low and medium stages after a change at a high stage. This law appears to hold equally true whether the change occurs at the measuring section or at some controlling point below. The change is, of course, fundamentally due to change in the channel caused by cut, or fill, or both, at or near the measuring section. For all except small streams the changes in section usually occur at the bottom. The following simple but typical examples illustrate this law:

(*a*) If 0.5 foot of planking were to be nailed on the bottom of a well-rated wooden flume of rectangular section there would result, other conditions of flow being equal, new curves of discharge, area, and velocity, each plotting 0.5 foot above the original curves when referred to the original gage. In other words, this condition would be analogous to a uniform fill or cut in a river channel which either reduces or increases discharge, area, and velocity for any gage height. In practice, however, such ideal conditions rarely exist.

(*b*) If a cut or fill occurs at the measuring section, there is a marked tendency toward decrease or increase, respectively, of the velocity.

In other words, the velocity has a compensating effect, and if the compensation is exact at all stages the discharge at a given stage will be the same under both the new and the old conditions.

(*c*) If change along the crest of a weir or rocky control is uniform, the area curve will remain the same as before the change, and it can be shown that here again the change in velocity curve is such that it will produce a new discharge curve essentially parallel to the original discharge curve with respect to their ordinates.

In actual practice, of course, such simple changes of section do not occur. The changes are complicated and lack uniformity, a cut at one place being largely offset by a fill at another, and vice versa. If these changes are very radical and involve large percentages of the total area—as, for example, on small streams—there may result a wide departure from the law of parallelism of rating curves. In complicated changes of section the corresponding changes in velocity which tend to produce a new parallel discharge curve may interfere with each other materially, causing eddies, boils, backwater, and radical changes in slope. In such extreme conditions, however, the measuring section would more properly fall under class 4 and would require very frequent measurements of discharge. Special stress is laid on the fact that in the lack of other data to the contrary the utilization of this law will yield the most accurate results.

At low or medium stages slight changes of an oscillating character are usually averaged by a mean curve drawn among them parallel to the standard curve, and if the individual measurements do not vary more than 5 per cent from the rating curve the results are considered good for stations of this class.

Class 4 comprises stations on streams that have soft, muddy, or sandy beds. Good results can be obtained from such sections only by frequent discharge measurements, the frequency ranging from a measurement every two or three weeks to a measurement every day, according to the rate of diurnal change in conditions of flow. These measurements are plotted and a mean or standard curve drawn among them. It is assumed that there is a different rating curve for every day of the year and that the curves are parallel to the standard curve with respect to their ordinates. On the day of a measurement the rating curve for that day passes through that measurement. For days between successive measurements it is assumed that the rate of change is uniform, and hence the ratings for the intervening days are equally spaced between the ratings passing through the two measurements. This method must be modified or abandoned altogether under special conditions. Personal judgment and a knowledge of the conditions involved can alone dictate the course then to be pursued.

After the computations have been completed they are entered in tables and carefully studied and intercompared to eliminate or account for all gross errors so far as possible. Missing data are filled in, so far as feasible, by means of comparison with records for adjacent streams The attempt is made to complete records for years or periods of discharge, thus eliminating fragmentary and disjointed records. Full notes accompanying such estimates follow the daily and monthly discharge tables.

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 mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. 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" and "Total in acre-feet" given in the columns under these heads are computed from the mean discharge in million gallons per day.

Owing to the volcanic formation of the Hawaiian Islands there is such wide diversity in the character and porosity of the rocks of the various drainage basins that the determination of a general relation between rainfall and run-off is of no value. For this reason information concerning drainage areas has been omitted in the 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 and (2) on the accuracy of observations of stage, measurements of discharge, 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 "good," "fair," "poor," or "approximate" indicates that the probable errors are within 5, 10, 15, and 20 per cent, respectively.

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

DIVISION OF WORK.

The data were collected and prepared for publication under the direction of G. K. Larrison, district engineer, Honolulu, Hawaii, by C. T. Bailey, office engineer, W. V. Hardy, R. C. Rice, R. D. Klise, H. A. R. Austin, D. E. Horner, E. E. Goo, and John Kaheaku.

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, 1917.

KAUAI ISLAND.

Waimea River near Waimea, 1910–
  Poomau River:
    Kawaikoi Stream near Waimea, 1909–1917.
      Waiakoali Stream near Waimea, 1909–1912.
    Mohihi Stream near Waimea, 1909–1912.
  Waiahulu Stream near Waimea, 1916–
  Koaie Stream near Waimea, 1916–
  Waialae River near Waimea, 1910–1916.
  Waialae River at elevation 800 feet, near Waimea, 1916–

Waimea River tributaries—Continued.
Kekaha ditch at Camp No. 1, near Waimea, 1910–1915.
Kekaha ditch at flume No. 3, near Waimea, 1910–1912.
Kekaha ditch at flume No. 4, near Waimea, 1916–
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–
Kamenehune ditch near Waimea, 1911–
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.
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–
Hanapepe ditch at weir near Hanapepe, 1910–
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, 1910–11.
South Fork of Wailua River near Lihue, 1911–
Hanamaulu ditch near Lihue, 1910–
Lihue ditch near Lihue, 1910–
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, 1911–1913.
Kapaa River near Kealia, 1910–
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.

Kalihiwai River near Hanalei, 1914–
Kalihiwai River near Kilauea, 1912–1914.
Hanalei River at elevation 625 feet, near Hanalei, 1914–
Hanalei River near Hanalei, 1911–
China ditch near Hanalei, 1911–
Kuna ditch near Hanalei, 1912–13. 1916–
Lumahai River near Hanalei, 1914–1917.
Lumahai River near Wainiha, 1912.
Waioli Stream near Hanalei, 1914–
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.
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–
West Branch of Manoa Stream near Honolulu, 1913–
East Branch of Manoa Stream near Honolulu, 1913–
East Manoa ditch near Honolulu, 1915–1916.
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, 1912–1916.
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.

Kaneohe Stream tributaries—Continued.
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–
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 Waiahole, near Waikane, 1911–12.
Waihi Stream near Waikane, 1911.
Halona Stream near Waikane, 1911.
Waianu Stream near Waikane, 1911.
Waikane Stream near Waikane, 1911–1912.
Kahana Stream near Kahana, 1914–1917.
East Branch of Kahana Stream near Kahana, 1914–1917.
Punaluu Stream at elevation 539 feet, near Punaluu, 1915–
Punaluu Stream at elevation 250 feet, near Punaluu, 1914–
Punaluu Stream near Hauula, 1906–7.
Waihoi Stream near Punaluu, 1915–
Kaluanui Stream near Hauula, 1906–7, 1915–17.
Kaipapau Stream near Hauula, 1906–7.
Koloa Stream near Laie, 1914–
Wailele Stream near Laie, 1914–
East Branch of Kahawainui Stream near Laie, 1914–
East Branch of Malaekahana Stream near Kahuku, 1914–
Middle Branch of Malaekahana Stream near Kahuku, 1914–
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–
Wahiawa reservoir ditch near Wahiawa, 1910–11.

MAUI ISLAND.

West Maui.

Iao Stream near Wailuku, 1910–1915.
Maniania 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–

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–
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–
Honolua ditch near Honokahau, 1911–12.
Honokawai Stream near Lahaina, 1911; 1912–
Honokawai Stream at weir No. 1, near Lahaina, 1901.
Honokawai ditch near Lahaina, 1912–
Kahoma Stream near Lahaina, 1911–12; 1913–
Kahoma Stream at weir No. 1, near Lahaina, 1901.
Kahoma Stream at weir No. 2, near Lahaina, 1901.
Kahoma development tunnel near Lahaina, 1911–
Lahainaluna Stream above pipe line intake, near Lahaina, 1916–
Lahainaluna 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–
Kauaula Stream at weir No. 3, near Lahaina, 1901.
Kauaula ditch near Lahaina, 1911–
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–
Waikapu Stream near Waikapu, 1910–1917.
Palolo (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.
West Kopiliula Stream near Keanae, 1914–1917.
East Wailuaiki Stream near Keanae, 1913–1917.
West Wailuaiki Stream near Keanae, 1914–1917.
East Wailuanui Stream near Keanae, 1914–1917.
West Wailuanui Stream near Keanae, 1913–1917.
Koolau ditch near Keanae, 1910–1912.
Koolau ditch at Alo division weir, near Huelo, 1908–1911.
Spreckels ditch region:
Honomanu Stream near Keanae, 1913–
Haipuaena Stream near Huelo, 1910–
Puohakamoa Stream near Huelo, 1910–
Alo Stream near Huelo, 1910–

Spreckels ditch region—Continued.
Waikamoi Stream near Huelo, 1910–
Oopuola Stream near Huelo, 1910–1915.
Spreckels ditch at station No. 1, near Huelo, 1910–1913.
Spreckels ditch at station No. 2, near Huelo, 1911–1913.
Spreckels ditch at station No. 3, near Huelo, 1910–1913.
Spreckels ditch at station No. 4, near Huelo, 1910–1913.
Spreckels ditch at station No. 5, near Huelo, 1911–1913.
Spreckels ditch at station No. 6, near Huelo, 1911–1913.
Spreckels ditch at station No. 7, near Huelo, 1911–1912.
Spreckels ditch at station No. 8, near Huelo, 1911–1913.
Center ditch region:
Center ditch near Huelo, 1910–1912.
Hamakua ditch region:
Nailiilihaele Stream near Huelo, 1910–1912; 1913–
Kailua Stream near Huelo, 1910–1912; 1913–
Oanui Stream near Huelo, 1910–11; 1913–1916.
Hoolawaliilii 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.
Opana ditch near Huelo, 1910–1912.
New Hamakua ditch at Nailiilihaele weir, near Huelo, 1910–1912.
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.
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 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–

HAWAII ISLAND.

Hilo group:
81 stations at elevation 2,700 feet, in forest back of Hilo, 1911–1913.
Wailuku River near Hilo, 1911–1913.
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–
Upper Hamakua ditch at main weir, at Puualala, Waimea, 1913–
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.

Hamakua group—Continued.
Waipio River tributaries—Continued.
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 1,120 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 elevation at 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 ditch at Awini weir, near Kohala, 1907–
Kohala ditch at Niulii weir, near Kohala, 1907–
Kehena ditch at Honokane mauka, near North Kohala, 1912–13.

GAGING-STATION RECORDS.

ISLAND OF KAUAI.

WAIMEA RIVER NEAR WAIMEA, KAUAI.

LOCATION.—250 feet above ford, about 2 miles north of Waimea.
RECORDS AVAILABLE.—July 9, 1910, to June 30, 1917.
GAGE.—Vertical and inclined staff installed October 5, 1911. July 9, 1910, to October 4, 1911, staff gage about 1 mile downstream.
DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.
CHANNEL AND CONTROL.—One channel at all stages; straight for 500 feet above and below gage; banks high; bed of stream sandy. Control composed of sand, gravel, and boulders; shifting.
EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 18.0 feet at 4 p. m., December 18 (discharge, approximately 10,000 million gallons per day, or 15,500 second-feet); minimum stage recorded, 4.4 feet September 3–7 and 9 (discharge, 1.0 million gallons per day, or 1.55 second-feet). Maximum stage recorded, 18.8 feet at 4.30 p. m., January 25, 1916 (discharge, computed from extension of the rating curve, approximately 10,700 million gallons per day, or 16,600 second-feet); channel practically dry at times, as all water is diverted above.
DIVERSIONS.—Large number of diversions above station.
REGULATION.—By diversions.
UTILIZATION.—All water passing this station is wasted, as none is diverted below.
ACCURACY.—Gage read twice daily. Records fair for all stages below 1,500 million gallons per day.

Discharge measurements of Waimea River near Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 30	W. V. Hardy	4.35	0.95	0.6
Sept. 25	do	5.69	104	67
Oct. 25	D. E. Horner	6.90	470	304
Nov. 18	W. V. Hardy	6.73	411	265
Dec. 2	D. E. Horner	6.48	315	204
Jan. 26	do	6.14	205	133
Feb. 12	do	5.62	85	55
27	do	5.54	77	50
Mar. 7	do	6.05	184	119
17	do	6.54	357	231
Apr. 23	W. V. Hardy	5.85	134	86
May 24	do	5.45	77	50
June 13	D. E. Horner	5.36	63	41

Daily discharge, in million gallons, of Waimea River near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	80	1.5	1.5	2.0	18	1,210	208	74	51	119	336	186
2	94	1.5	1.5	2.0	14	186	260	1,080	38	94	119	87
3	102	74	1.0	1.5	14	87	246	260	56	74	46	68
4	197	27	1.0	2.0	137	46	232	220	176	62	30	51
5	21	27	1.0	3.0	702	62	156	197	186	46	24	146
6	74	4.0	1.0	336	156	34	110	186	156	38	24	166
7	3.0	2.5	1.0	62	436	275	62	156	146	38	18	146
8	2.5	2.0	1.5	18	530	186	51	119	186	30	14	119
9	2.5	2.0	1.0	6.0	128	275	46	94	260	38	14	74
10	2.5	2.0	6.0	6.0	68	336	208	80	94	34	14	51
11	2.0	2.5	2.0	6.0	34	74	166	80	94	962	12	38
12	2.0	4.0	2.5	6.0	128	68	137	62	80	119	10	30
13	16	10	2.0	10	34	102	119	56	186	80	7.0	30
14	12	7.0	2.0	12	21	80	94	436	137	68	8.5	30
15	24	12	2.0	8.5	21	46	46	156	290	56	10	21
16	102	7.0	2.0	8.5	42	34	401	128	511	51	7.0	87
17	102	3.0	2.0	12	21	176	634	94	232	62	8.5	110
18	110	21	2.0	10	384	3,000	208	800	336	34	1,050	94
19	16	146	12	10	68	775	119	305	726	27	570	68
20	6.0	87	34	27	24	384	1,600	176	2,960	24	232	34
21	3.0	30	38	12	679	220	401	128	1,080	21	102	24
22	3.0	6.0	6.0	10	146	401	232	128	656	18	74	21
23	3.0	5.0	56	10	62	473	166	87	384	62	80	18
24	3.0	3.0	7.0	42	38	454	436	80	305	119	51	14
25	2.5	2.5	27	336	18	473	176	68	166	68	46	12
26	2.0	2.0	12	51	74	401	146	56	220	74	42	10
27	2.0	5.0	30	12	51	232	128	51	186	56	38	10
28	2.0	3.0	7.0	305	62	119	166	46	137	46	102	10
29	2.0	2.0	6.0	679	232	208	186	.....	94	34	119	10
30	2.0	2.0	2.5	87	290	156	119	.....	87	27	232	10
31	2.0	2.0	.....	46	.....	110	87	.....	74	.....	232	.....

NOTE.—Discharge determined from rating curves well defined below 500 million gallons per day and fairly well defined below 1,500 million gallons per day, applicable July 1 to May 18 and May 19 to June 30.

Monthly discharge of Waimea River near Waimea, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	197	2.0	32.2	49.8	997	3,060
August	146	1.5	16.3	25.2	506	1,550
September	56	1.0	9.02	14.0	270	830
October	679	1.5	69.0	107	2,140	6,560
November	702	14	154	238	4,630	14,200
December	3,000	34	345	534	10,700	32,800
January	1,600	46	237	367	7,350	22,500
February	1,080	46	193	299	5,400	16,600
March	2,960	38	332	514	10,300	31,600
April	962	18	86.0	133	2,580	7,920
May	1,050	7.0	118	183	3,670	11,200
June	186	10	59.2	91.6	1,780	5,450
The year	3,000	1.0	138	214	50,300	154,000

KAWAIKOI STREAM NEAR WAIMEA, KAUAI.

LOCATION.—Eight miles northeast of Knudsen's mountain house and about 27 miles, by horse trail, north of Waimea.

RECORDS AVAILABLE.—April 13, 1909, to June 30, 1917.

GAGE.—Barrett & Lawrence 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 below station; banks high and wooded. Control composed of rock ledge and large boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 15.2 feet December 18, 1916 (discharge not determined); minimum stage recorded, 1.55 feet October 3 to 6, 1913 (discharge, 2.6 million gallons per day, or 4 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane, rice, and taro; power development and domestic supply.

ACCURACY.—Records fair below 40 million gallons per day. Records after December 17 too incomplete to warrant publication.

Discharge measurements of Kawaikoi Stream near Waimea, Kauai, during the year ending June 30, 1917.

[Made by D. E. Horner.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Sept. 1	1.95	8.8	5.7	Feb. 1	1.94	17.5	11
Oct. 2	1.89	5.8	3.8	Apr. 2	1.85	15.6	10
Dec. 8	2.36	27	18	May 24	1.90	18.6	12

Daily discharge, in million gallons, of Kawaikoi Stream, near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	11	.....	5.0	9.5	60	16	51	.....	9.5	32	5.9	51
2	.....	29	5.0	5.0	9.5	51	17	32	.....	5.9	19	5.9	34
3	.....	39	5.0	5.0	9.5	39	18	27	.....	9.5	14	5.9	.....
4	.....	27	5.0	5.0	9.5	36	19	12	.....	48	29	11	.....
5	.....	19	5.9	32	9.5	27	20	9.5	.....	34	32	12	.....
6	.....	11	5.0	48	11	19	21	9.5	.....	29	34	8.0	.....
7	.....	19	19	17	12	19	22	7.0	.....	17	60	12	.....
8	.....	17	11	130	14	19	23	7.0	.....	19	27	17	.....
9	9.5	9.5	7.0	144	9.5	60	24	5.9	.....	16	54	23	.....
10	12	7.0	5.0	48	27	27	25	5.9	.....	17	48	42	.....
11	14	7.0	23	117	14	32	26	5.0	.....	9.5	19	199	.....
12	11	23	12	92	8.0	60	27	5.0	.....	12	11	51	.....
13	11	27	5.9	34	48	39	28	7.0	.....	8.0	17	32	.....
14	23	.....	5.0	25	11	60	29	5.0	.....	7.0	48	25	.....
15	25	.....	8.0	32	7.0	54	30	5.0	.....	5.9	14	48	.....
							31	7.0	.....	.....	9.5	.....	.....

NOTE.—Discharge determined from rating curve fairly well defined below 40 million gallons per day. Gage heights not recorded on days for which discharge is not given.

Monthly discharge of Kawaikoi Stream near Waimea, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July 9–31	51	5.0	13.3	20.6	306	939
August 1–13	39	7.0	18.9	29.2	246	754
September 2–30	48	5.0	12.7	19.7	369	1,130
October	144	5.0	3.89	6.02	121	370
November	199	5.9	23.6	36.5	707	2,170
December 1–17	60	19	40.4	62.5	687	2,110

WAIAHULU STREAM NEAR WAIMEA, KAUAI.

LOCATION.—In Waimea Canyon, half a mile above confluence with Koaie Stream, 12 miles north of Waimea.

RECORDS AVAILABLE.—October 27, 1915, to October 21, 1916.

GAGE.—Gurley printing water-stage recorder. Gage shelter destroyed by flood December 18, 1916, and recorder lost.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 200 feet above and below gage; banks high. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Flood December 18, 1916, reached a stage of about 15 feet (discharge not estimated); minimum stage recorded, 1.8 feet October 3, and 4, 1916 (discharge, 13 million gallons per day, or 26 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—For irrigation of sugar cane, rice, and taro, and for power and domestic supply.

ACCURACY.—Records fair below 40 million gallons per day.

Discharge measurements of Waiahulu Stream near Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 18	D. E. Horner	2.30	48	31
19	do	2.14	41	26
Aug. 9	do	1.96	28	18
11	do	1.91	25	16
Oct. 22	do	2.02	35	23
23	do	2.25	50	32
Mar. 27	W. V. Hardy	3.12	63	41

Daily discharge, in million gallons, of Waiahulu Stream near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Date.	July.	Aug.	Sept.	Oct.
1	102	18	16	14	16	77	26	18	14
2	50	29	14	14	17	54	22	16	14
3	59	54	14	13	18	46	59	14	14
4	77	32	14	13	19	26	26	54	18
5	32	29	14	59	20	22	68	43	18
6	24	19	14	112	21	22	50	46	18
7	22	19	19	36	22	22	32	24	.....
8	19	24	19	22	23	18	22	29	.....
9	19	18	16	29	24	18	18	24	.....
10	19	16	14	24	25	18	18	24	.....
11	24	16	22	18	26	16	18	19	.....
12	22	22	22	18	27	16	16	22	.....
13	22	32	16	22	28	16	16	18	.....
14	32	22	14	18	29	16	18	16	.....
15	32	40	16	16	30	16	18	14	.....
					31	16	18	.....	.....

NOTE.—Discharge determined from rating curve fairly well defined below 40 million gallons per day. Gage-height records Oct. 22 to Dec. 18 lost with recorder.

Monthly discharge of Waiahulu Stream near Waimea, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	102	16	31.4	48.6	974	2,990
August	68	16	26.9	41.6	835	2,560
September	54	14	20.8	32.2	625	1,920
October 1–21	112	13	25.0	38.7	524	1,610
The period	.....	.....	.....	.....	2,960	9,080

KOAIE RIVER NEAR WAIMEA, KAUAI.

LOCATION.—About one-third mile above confluence with Waimea River, 12 miles north of Waimea.

RECORDS AVAILABLE.—October 21, 1915, to June 30, 1917; record fragmentary.

GAGE.—Gurley printing water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage; banks steep and high. Control composed of large boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.7 feet at 3 a. m. March 4 (discharge, approximately 650 million gallons per day, or 1,000 second-feet); minimum stage recorded 2.3 feet June 25–30 (discharge, 16 million gallons per day, or 25 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane, rice, and taro and for power development and domestic supply.

ACCURACY.—Records fair for all stages.

Discharge measurements of Koaie River near Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 19	W. V. Hardy	2.32	42	27
Aug. 9	D. E. Horner	2.15	36	24
10	do	2.08	28	18
Oct. 22	do	2.20	33	22
23	do	2.53	56	36
Mar. 29	W. V. Hardy	2.50	42	27
May 22	D. E. Horner	2.76	74	48

Daily discharge, in million gallons, of Koaie River near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Mar.	Apr.	May.	June.
1		20	17	55		108	16	51
2		35	17	60		39	16	35
3		60	20	26		25	16	28
4		32	20	20		39	16	32
5		32	28	20		35	19	43
6		24	22	19		28	28	39
7			26	19		22	150	51
8		22	20	24		22	144	43
9		19	18	24		22		28
10		19	18	20		19		25
11		19	19	24		19		25
12		19	17	24		28		22
13		24	17			39		22
14		22	24			35		22
15		28	38			32		22
16		64	26			28		39
17		32	28			25		49
18		24	41			22		39
19	26	20	30			22		32
20	26	19	26			72		25
21	26	18	35			43	39	22
22	22	18	38			22	35	19
23	20	17	26			22	32	19
24	19	17	30			22	28	19
25	18	18	20			19	25	16
26	18	18	18		28	19	25	16
27	18	18	18		25	16	25	16
28	20	17	17		25	16	51	16
29	19	17	17		25	16	35	16
30	18	17	17		28	16	55	16
31	19	17			25		55	

NOTE.—Discharge determined from fairly well defined rating curves applicable as follows: July 19 to Oct. 12, Mar. 26 to May 8, and May 21 to June 30. Gage heights not recorded on days for which discharge is not given.

Monthly discharge of Koaie River near Waimea, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July 19–31	26	18	20.7	32.0	269	826
August	64	17	24.1	37.3	749	2,290
September	41	17	23.6	36.5	708	2,170
October 1–12	60	19	27.9	43.2	335	1,030
March 26–31	28	25	26.0	40.2	156	479
April	108	16	29.7	46.0	892	2,730
June	51	16	28.2	43.6	845	2,600

WAIALAE RIVER AT ELEVATION 800 FEET, NEAR WAIMEA, KAUAI.

LOCATION.—Half a mile above confluence with Waimea River and 10 miles north of Waimea.

RECORDS AVAILABLE.—December 31, 1915, to June 30, 1917.

GAGE.—Gurley printing water-gage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight in vicinity of gage; banks steep and high. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 6.55 feet at 10.30 p. m. December 18, 1916 (discharge not determined); minimum stage recorded, 1.1 feet June 27–30 (discharge, 7.5 million gallons per day, or 11.6 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane, rice, and taro, and for power and domestic supply.

ACCURACY.—Records July 1 to October 29 and March 27 to June 30, good for low and medium stages; October 30 to February 20, poor because of insufficient current-meter measurements.

Discharge measurements of Waialae River at elevation 800 feet, near Waimea, Kauai during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 18	D. E. Horner	2.20	26	17
19	.....do	2.06	14	9.2
Aug. 9	.....do	1.94	8.9	5.7
Oct. 21	.....do	2.12	16	11
23	.....do	2.23	25	16
Mar. 28	W. V. Hardy	1.32	22	14
May 19	D. E. Horner	2.05	93	60
26	.....do	1.58	38	24

Daily discharge, in million gallons, of Waialae River at elevation 800 feet, near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	18	6.0	5.0	6.0	16	88	128	46	.....	114	.....	42
2	16	7.0	5.0	5.0	7.0	54	135	284	.....	26	.....	21
3	9.0	24	5.0	5.0	6.0	21	94	101	.....	17	.....	17
4	34	11	5.0	5.0	30	16	108	88	.....	29	.....	21
5	11	11	5.0	21	54	9.0	65	82	.....	32	.....	29
6	7.0	7.0	4.2	88	9.0	5.0	55	88	.....	26	.....	29
7	7.0	6.0	4.2	50	46	116	35	88	.....	21	.....	50
8	6.0	6.0	6.0	16	58	93	26	82	.....	21	.....	38
9	6.0	6.0	11	9.0	27	78	35	88	.....	19	.....	19
10	6.0	5.0	9.0	7.0	21	68	46	94	.....	17	.....	17
11	6.0	5.0	7.0	7.0	58	50	94	76	.....	12	.....	15
12	6.0	5.0	6.0	21	160	30	65	82	.....	29	.....	13
13	18	6.0	6.0	68	128	30	29	121	.....	26	.....	13
14	24	6.0	5.0	21	88	24	17	65	.....	29	.....	13
15	11	6.0	5.0	16	54	21	15	35	.....	24	.....	13
16	27	6.0	5.0	14	27	18	38	50	.....	17	.....	21
17	24	6.0	5.0	14	11	21	108	65	.....	13	.....	29
18	21	16	5.0	14	63	312	82	164	.....	12	.....	21
19	9.0	9.0	14	16	30	302	204	101	.....	12	.....	19
20	9.0	21	9.0	16	38	121	400	94	.....	50	.....	13
21	9.0	11	6.0	11	104	101	204	.....	.....	32	26	12
22	7.0	11	11	9.0	98	108	135	.....	.....	15	21	10
23	7.0	7.0	6.0	19	83	164	88	.....	.....	13	21	8.8
24	6.0	6.0	5.0	24	54	230	172	.....	.....	12	21	8.8
25	6.0	6.0	11	73	27	142	114	.....	.....	10	17	8.8
26	6.0	5.0	14	18	27	114	101	.....	.....	10	15	8.8
27	5.0	5.0	14	11	21	108	94	.....	12	.....	15	7.5
28	5.0	5.0	9.0	73	24	108	94	.....	12	.....	29	7.5
29	6.0	5.0	7.0	116	27	121	88	.....	12	.....	21	7.5
30	5.0	5.0	6.0	83	122	108	76	.....	13	.....	35	7.5
31	5.0	5.0	.....	42	.....	108	46	.....	.....	.....	.....	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1 to Oct. 29 and Oct. 30 to Dec. 17 well defined below 30 million gallons per day; Dec. 18, 1916, to June 30, 1917, fairly well defined. Gage heights Feb. 21 to Mar. 7 unreliable. No record Mar. 8–26. Gage heights Apr. 27 to May 20 were lost.

Monthly discharge of Waialae River at elevation 800 feet, near Waimea, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	34	5.0	11.0	17.0	342	1,050
August	24	5.0	7.94	12.3	246	755
September	14	4.2	7.18	11.1	215	661
October	116	5.0	29.0	44.9	898	2,760
November	160	6.0	50.6	78.3	1,520	4,660
December	312	5.0	93.2	144	2,890	8,870
January	400	15	96.5	149	2,990	9,180
February 1–20	284	35	94.7	146	1,890	5,810
April 1–26	114	10	24.5	37.9	638	1,950
May 21–30	35	15	22.1	34.2	221	678
June	50	7.5	18.0	27.8	540	1,660

KEKAHA DITCH AT FLUME NO. 4, NEAR WAIMEA, KAUAI.

LOCATION.—About a mile below intake, 7 miles, by trail, north of Waimea.
RECORDS AVAILABLE.—February 25, 1916, to June 30, 1917.
GAGE.—Vertical staff at lower end of flume.
DISCHARGE MEASUREMENTS.—Made from cross beam near lower end of flume.
CHANNEL AND CONTROL.—Straight wooden flume 8 feet wide and 4 feet deep.
EXTREMES OF DISCHARGE.—Maximum stage recorded, 3.1 feet frequently (discharge, 62 million gallons per day, or 96 second-feet); water occasionally shut off.
DIVERSIONS.—Ditch diverts from Waimea River.
REGULATION.—By head gates.
UTILIZATION.—Irrigation of sugar cane.
ACCURACY.—Gage read twice daily. Records good above 30 million gallons per day.

Discharge measurements of Kekaha ditch at flume No. 4, near Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 18	D. E. Horner	2.97	88	57
Oct. 21	do	2.91	88	57
Mar. 26	W. V. Hardy	2.82	88	57
30	do	2.85	90	58
May 27	D. E. Horner	2.85	89	58

Daily discharge, in million gallons, of Kekaha ditch at flume No. 4, near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	58	42	31	32	35	56	34	46	55	60	60	56
2	58	51	31	31	35	55	34	44	55	60	58	56
3	58	58	30	30	35	55	45	11	56	60	58	32
4	58	58	30	29	35	55	45	.....	58	58	58	56
5	58	58	30	31	45	55	45	.....	60	58	58	56
6	58	48	30	34	56	55	46	.....	60	58	58	56
7	53	45	39	34	58	55	48	39	60	60	58	56
8	50	55	55	50	58	53	48	39	60	60	53	56
9	44	44	50	51	58	53	48	39	62	58	51	56
10	45	35	55	50	58	53	42	39	62	58	50	58
11	48	35	50	40	46	53	37	39	62	58	46	56
12	51	46	51	45	35	53	40	58	62	56	46	56
13	58	58	35	58	60	53	40	58	62	58	46	56
14	60	55	32	46	58	53	14	39	62	58	46	58
15	62	53	31	50	55	53	46	39	62	56	46	58
16	62	58	32	51	58	53	48	51	62	56	50	58
17	62	53	31	53	60	53	48	51	24	60	55	60
18	58	58	32	58	60	30	48	45	24	58	60	56
19	58	58	58	58	58	15	32	50	24	58	58	56
20	58	58	58	58	58	8.0	19	46	14	58	60	56
21	58	58	58	58	35	11	29	50	14	56	60	56
22	50	58	58	53	35	35	40	50	14	56	60	56
23	45	53	58	58	35	35	39	50	14	56	58	56
24	42	45	58	58	46	25	45	50	14	56	60	53
25	39	39	56	58	58	32	40	53	22	56	60	53
26	35	37	58	58	58	35	44	53	40	55	58	50
27	35	35	58	55	58	35	25	56	62	55	58	50
28	39	31	56	58	58	35	46	60	62	60	58	48
29	39	32	48	55	58	35	46	.....	62	60	58	46
30	35	37	39	46	56	35	46	.....	60	60	56	46
31	35	35	.....	55	.....	35	46	.....	62	.....	62	.....

NOTE.—Discharge determined from rating curve well defined above 30 million gallons per day, applicable July 1 to Feb. 3 and Feb. 7 to June 30. Water turned out of ditch Feb. 4–6.

Monthly discharge of Kekaha ditch at flume No. 4, near Waimea, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	62	35	50.6	78.3	1,570	4,810
August	58	31	47.9	74.1	1,490	4,560
September	58	30	44.6	69.0	1,340	4,110
October	58	29	48.4	74.9	1,500	4,600
November	60	35	50.6	78.3	1,520	4,660
December	56	8	42.5	65.8	1,320	4,040
January	48	14	40.4	62.5	1,250	3,840
February (25 days)	60	11	46.2	71.5	1,160	3,550
March	62	14	47.5	73.5	1,470	4,520
April	60	55	57.9	89.6	1,740	5,330
May	62	46	55.6	86.0	1,720	5,290
June	60	32	54.1	83.7	1,620	4,980
The year					17,700	54,300

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

LOCATION.—About 7½ miles below intake, 2 miles by trail from Waimea, and half a mile below diversion for Waimea domestic supply.

RECORDS AVAILABLE.—July 20, 1916, to June 30, 1917.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Channel cut in lava rock; fairly straight in vicinity of gage. Control is old wooden weir.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.6 feet December 1 (discharge, 50 million gallons per day, or 77 second-feet); water shut off December 24, 25, and 31.

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

REGULATION.—By head gates.

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

ACCURACY.—Rating curve is well defined for all stages, but records for the higher stages may be somewhat in error, owing to unrecorded fluctuations in stage, as gage is read but once daily.

Discharge measurements of Kekaha ditch below tunnel No. 12, Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 30	W. V. Hardy	2.27	42	27
Sept. 3	do	2.12	37	24
Oct. 25	D. E. Horner	3.48	69	45
Nov. 5	W. V. Hardy	2.97	59	38
Dec. 2	D. E. Horner	3.54	73	47
Jan. 29	do	3.18	66	43
Feb. 12	do	2.99	61	39
17	do	2.59	51	33
17	do	2.80	56	36
27	do	3.12	64	41
Mar. 6	do	3.34	70	45
23	do	1.18	18	11
Apr. 23	W. V. Hardy	3.03	60	39
May 28	D. E. Horner	2.96	59	38
June 1	do	2.88	57	37

Daily discharge, in million gallons, of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, for the year ending June 30, 1912.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	.....	38	31	30	40	50	35	46	43	38	43	37
2	.....	41	29	28	32	48	35	46	43	40	40	33
3	.....	47	29	27	32	46	34	46	44	41	43	23
4	.....	46	28	26	34	45	41	46	43	41	42	35
5	.....	46	28	25	39	43	30	46	44	41	41	37
6	.....	44	28	38	44	43	38	46	45	41	40	43
7	.....	38	27	33	44	42	35	46	45	43	40	41
8	.....	44	44	32	46	46	37	32	43	41	38	42
9	.....	39	44	36	43	46	37	29	43	43	39	38
10	.....	35	46	40	43	46	42	35	45	42	39	40
11	.....	34	36	35	43	44	30	35	42	38	38	40
12	.....	33	46	32	31	43	28	35	42	36	36	39
13	.....	45	45	40	38	42	31	27	43	38	36	39
14	.....	44	32	38	41	41	9.0	29	43	38	38	39
15	.....	44	31	38	40	41	28	29	43	40	37	38
16	.....	46	33	36	43	41	42	28	43	39	38	41
17	.....	41	31	24	41	41	43	28	41	28	40	43
18	.....	46	29	40	44	46	42	28	26	38	38	38
19	.....	45	45	41	42	18	42	29	31	38	46	39
20	28	45	46	42	44	6	36	31	47	40	41	38
21	28	46	46	43	47	27	18	38	14	40	40	37
22	28	43	46	41	47	22	23	38	14	40	41	36
23	38	43	42	40	29	38	31	38	14	40	41	37
24	36	35	45	44	31	.....	46	38	14	42	41	38
25	36	32	45	47	40	.....	39	38	14	44	39	35
26	35	29	43	46	42	14	39	38	43	45	38	34
27	33	29	44	43	42	30	39	35	43	43	38	35
28	34	29	44	43	42	32	39	35	43	41	38	36
29	35	29	32	38	46	35	39	.....	44	40	14	38
30	32	31	32	37	47	28	39	.....	43	39	37	38
31	32	32	.....	40	.....	.....	39	.....	43	.....	36	.....

NOTE.—Discharge determined from well-defined rating curve. No flow Dec. 24, 25, and 31.

Monthly discharge of Kekaha ditch below tunnel No. 12, near Waimea, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July 20–31	38	28	32.9	50.9	395	1,210
August	47	29	39.3	60.8	1,220	3,740
September	46	27	37.6	58.2	1,130	3,460
October	47	24	36.9	57.1	1,140	3,510
November	47	29	40.6	62.8	1,220	3,740
December (28 days)	50	6	37.3	57.7	1,040	3,210
January	46	9	35.0	54.2	1,090	3,330
February	46	27	36.2	56.0	1,020	3,110
March	47	14	37.7	58.3	1,170	3,590
April	45	28	39.9	61.7	1,200	3,670
May	46	14	38.6	59.7	1,200	3,670
June	43	23	37.6	58.2	1,130	3,460
The period	.....	.....	.....	.....	13,000	39,700

WAIMEA DITCH NEAR WAIMEA, KAUAI.

LOCATION.—Half a mile below intake, at lower portal of tunnel No. 22, 2½ miles north of Waimea.

RECORDS AVAILABLE.—February 28, 1916, to June 30, 1917.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made from foot plank 10 feet below gage.

CHANNEL AND CONTROL.—Clean channel about 4 feet wide in solid rock. Control, solid rock.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.3 feet June 20, 1916 (discharge, 7 million gallons per day, or 11 second-feet); ditch occasionally dry.

DIVERSIONS.—Ditch diverts from Waimea River.

UTILIZATION.—Irrigation of sugar cane and domestic supply.

ACCURACY.—Gage read twice daily. Records good for all stages.

Discharge measurements of Waimea ditch near Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 30	W. V. Hardy	0.88	4.6	3.0
Sept. 3	do	.88	5.3	3.4
26	D. E. Horner	1.02	7.2	4.6
27	do	1.22	8.6	5.6
Oct. 15	W. V. Hardy	.42	1.1	.7
Nov. 3	do	.66	3.3	2.1
26	do	1.14	6.8	4.4
Dec. 2	D. E. Horner	.98	6.4	4.1
Jan. 28	do	.72	3.6	2.3
Feb. 12	do	.34	.6	.4
Mar. 10	do	.94	6.1	3.9
Apr. 23	W. V. Hardy	.91	5.3	3.4
May 28	D. E. Horner	1.17	7.8	5.1
June 1	do	.55	2.0	1.3
5	do	1.11	5.96	3.8

Daily discharge, in million gallons, of Waimea ditch near Waimea, Kauai, for the years ending June 30, 1916 and 1917.

Date.	Mar.	Apr.	May.	June.	Date.	Mar.	Apr.	May.	June.
1916.					1916.				
1		3.9	4.3	4.8	16		5.2	3.1	6.1
2		3.5	4.3	5.2	17		4.3	5.2	6.1
3		4.3	5.6	5.2	18		4.3	4.3	4.3
4		4.8	4.3	5.2	19		5.2	4.8	5.2
5		3.9	5.2	5.2	20	2.3	3.5	5.2	7.0
6		3.1	5.2	4.8	21	1.9	3.9	5.2	6.1
7		2.7	3.9	4.8	22	1.2	3.9	5.2	5.2
8		2.7	4.3	5.2	23	2.3	3.1	4.8	5.2
9		2.7	4.3	5.2	24	2.7	2.7	5.2	4.3
10		3.1	5.2	5.2	25	2.7	3.5	4.8	5.2
11		3.1	4.3	5.4	26	2.3	2.7	4 3	6.1
12		3.1	3.9	5.4	27	1.9	3.1	3.9	6.1
13		2.7	3.5	5.6	28	1.9	3.1	4 3	6.1
14		5.2	4.3	5.6	29	3.5	3.1	5.2	6.1
15		5.2	3.5	5.6	30	3.5	3.5	5.2	6.1
					31	3.5		5.0	

Daily discharge, in million gallons, of Waimea ditch near Waimea, Kauai, for the years ending June 30, 1916 and 1917—Continued.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1916–17.												
1	6.2	3.5	3.5	3.5	4.2	3.5	.....	1.3	0.6	3.8	1.0	1.0
2	6.2	3.5	3.5	3.5	3.8	4.2	.....	.....	.8	3.8	2.2	1.0
3	5.5	5.5	3.5	3.2	1.9	3.2	.....	.....	1.9	4.2	2.9	2.2
4	6.2	4.8	3.2	3.2	2.6	3.8	.....	.....	.....	2.9	2.9	3.8
5	5.5	5.5	3.2	3.5	3.5	4.5	.....	1.6	3.5	2.6	2.9	4.2
6	4.8	4.4	3.2	4.5	4.2	4.2	.....	2.9	4.2	2.9	2.9	4.2
7	4.8	3.2	2.9	3.8	4.2	4.2	.....	2.9	4.2	2.9	2.9	2.9
8	4.2	3.8	4.5	3.5	3.8	2.2	.....	2.6	4.5	2.9	2.9	3.2
9	4.2	3.5	4.2	3.5	3.5	2.2	1.9	2.2	4.8	2.9	2.9	2.6
10	4.2	3.2	5.8	4.8	3.5	2.2	2.2	1.6	4.5	3.5	3.2	.....
11	4.2	3.2	4.2	2.2	3.5	2.9	1.0	1.0	4.2	4.2	3.5	2.9
12	5.2	3.2	4.8	1.6	3.5	3.5	1.6	.6	3.5	2.9	3.5	4.2
13	6.2	4.2	3.8	1.3	2.9	5.2	1.0	.6	3.5	2.9	3.5	4.8
14	4.5	4.8	3.5	.6	3.5	4.8	.....	2.9	3.5	3.2	3.5	4.8
15	4.2	4.2	3.5	1.3	3.8	2.9	.....	.5	4.2	4.8	3.5	4.8
16	4.8	5.5	3.5	1.0	4.2	3.8	.6	.....	1.0	4.8	3.5	5.5
17	4.8	3.8	3.5	3.5	3.5	4.8	.6	.....	2.2	4.2	4.0	5.2
18	4.8	5.8	3.2	4.2	4.2	5.5	.6	.....	2.9	3.2	4.8	4.8
19	4.8	5.5	5.8	4.2	3.8	.....	1.3	.....	.6	3.2	3.5	4.8
20	4.2	5.5	6.2	4.5	3.2	.....	.....	.....	3.5	3.5	3.8	4.8
21	4.8	4.8	5.5	4.2	4.2	.....	.....	.....	.....	2.9	3.5	4.5
22	4.8	4.5	5.2	3.5	3.5	.....	.....	1.0	.....	2.9	2.9	4.5
23	4.2	4.5	5.5	4.2	3.5	.....	.....	.5	.....	3.5	2.9	4.2
24	4.2	3.5	4.8	4.2	3.5	.....	.....	.4	.....	3.5	4.8	4.2
25	4.2	3.5	4.2	5.5	4.5	.....	1.6	.4	.....	3.2	3.5	4.2
26	3.5	3.5	4.8	4.2	4.8	.....	.8	.4	.....	1.6	3.8	4.2
27	3.2	3.5	4.8	3.2	3.8	.....	.4	.6	.....	1.9	3.5	4.2
28	3.8	3.5	3.2	2.9	4.2	.....	1.0	1.6	.....	1.6	4.8	4.2
29	4.2	3.5	3.8	4.5	4.2	.....	2.2	.....	2.6	1.6	4.2	4.2
30	3.5	3.5	3.5	4.8	4.2	.....	1.6	.....	2.2	.6	3.5	4.8
31	3.5	3.5	.....	4.5	.....	.....	1.3	.....	2.2	.....	1.0	.....

NOTE.—Discharge determined from a well-defined rating curve; interpolated July 12, Aug. 1, 6, and 27. No flow on days for which discharge is not given.

Monthly discharge of Waimea ditch near Waimea, Kauai, for the years ending June 30, 1916 and 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
1916.						
March 20–31	3.5	1.2	2.48	3.84	30	91
April	5.2	2.7	3.64	5.63	109	335
May	5.6	3.1	4.57	7.07	142	435
June	7.0	4.3	5.45	8.43	164	502
The period	7.0	1.2	4.31	6.67	445	1,360
1916–17.						
July	6.2	3.2	4.63	7.16	143	440
August	5.8	3.2	4.14	6.41	128	394
September	6.2	2.9	4.16	6.44	125	383
October	5.5	.6	3.45	5.34	107	328
November	4.8	1.9	3.72	5.76	112	342
December (18 days)	5.5	2.2	3.76	5.82	68	208
January (16 days)	2.2	.4	1.23	1.90	20	60
February (19 days)	2.9	.4	1.35	2.09	26	79
March (22 days)	4.8	.6	2.96	4.58	65	200
April	4.8	.6	3.07	4.75	92	283
May	4.8	1.0	3.30	5.11	102	314
June (29 days)	5.5	1.0	3.96	6.13	115	352
The year	.....	.....	.....	.....	1,100	3,380

KAMENEHUNE DITCH NEAR WAIMEA, KAUAI.

LOCATION.—200 feet below wire suspension bridge across Waimea River, about 3 miles above Waimea; reached by wagon road up the right side of Waimea River.

RECORDS AVAILABLE.—October 9, 1911, to June 30, 1917.

GAGE.—Vertical staff on right bank.

DISCHARGE MEASUREMENTS.—Made from plank.

CHANNEL AND CONTROL.—Straight for 50 feet above and below gage; mud bottom. Stage-discharge relation affected by growth of grass and weeds in channel; current sluggish.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 1.8 feet at 7.30 a. m. July 4, 1916 (discharge, 5.5 million gallons per day, or 8.5 second-feet); ditch occasionally dry.

DIVERSIONS.—Diverts from Waimea River.

REGULATION.—By head gates.

UTILIZATION.—Irrigation of rice and taro.

ACCURACY.—Gage read twice daily. Record poor, owing to instability of stage-discharge relation due to vegetal growth in channel and frequent cleaning of ditch.

Discharge measurements of Kamenehune ditch near Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height. (feet)	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 30	W. V. Hardy	0.80	1.4	0.9
Sept. 26	do	1.11	2.9	1.9
Oct. 3	do	.98	2.3	1.5
25	D. E. Horner	1.44	5.3	3.4
Nov. 29	do	1.16	3.8	2.5
Dec. 1	do	.84	1.8	1.2
29	W. V. Hardy	.90	.7	.45
Jan. 27	D. E. Horner	.86	1.5	.95
29	do	.95	1.4	.85
Feb. 12	W. V. Hardy	.66	.4	.25
Mar. 6	D. E. Horner	1.27	5.3	3.4
Apr. 24	W. V. Hardy	1.10	2.8	1.8

Daily discharge, in million gallons, of Kamenehune ditch near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	4.0	1.6	0.8	2.0	1.2	2.8	0.6	1.0	0.6	1.8	2.5	2.0
2	3.5	1.8	.6	1.6	1.0	2.2	.45	3.5	1.2	1.8	2.2	1.8
3	4.0	2.2	1.2	1.4	1.0	1.8	.1	2.5	1.0	1.6	2.2	1.8
4	4.8	2.2	1.2	1.8	1.6	1.2	.3	2.2	2.8	1.4	1.8	1.6
5	1.6	2.2	1.0	2.2	3.0	1.4	.02	2.0	2.5	1.4	2.2	2.0
6	1.8	1.8	1.0	2.0	2.2	1.0	.3	2.2	2.8	1.2	2.0	2.0
7	2.0	1.6	1.0	1.8	2.5	2.5	.1	1.8	2.8	1.0	2.0	2.0
8	1.8	1.4	1.0	2.2	2.8	2.5	.02	1.4	3.0	1.0	2.0	2.0
9	2.2	1.6	1.4	2.2	2.0	2.8	.45	1.2	2.8	1.8	1.8	2.2
10	2.0	1.4	1.6	2.2	1.2	3.2	2.5	.8	2.2	1.6	2.0	2.2
11	2.0	1.4	1.0	2.0	1.8	2.0	1.8	.8	2.2	2.8	2.0	2.2
12	2.5	1.8	1.4	2.0	1.6	1.6	1.6	.45	2.0	2.5	1.8	2.0
12	3.5	3.0	1.2	2.0	1.2	2.0	1.2	.8	2.8	2.8	2.8	2.2
14	3.5	1.6	1.4	1.8	1.2	2.0	1.2	3.8	2.5	1.8	3.0	2.0
15	3.2	3.0	1.2	1.8	1.6	1.2	.3	3.0	2.8	2.2	3.0	2.0
16	4.2	1.8	1.4	1.6	1.6	.8	1.2	2.5	2.5	2.0	2.8	2.8
17	3.5	1.8	1.4	1.8	1.2	2.0	1.8	2.2	1.8	1.8	2.5	2.8
18	2.5	3.0	1.0	1.8	2.5	4.5	1.4	3.2	2.5	1.2	2.5	2.8
19	1.6	3.2	2.2	1.8	1.6	.....	.8	2.8	2.2	1.2	2.5	2.5
20	2.0	2.2	3.0	2.5	1.4	.....	.....	2.8	3.8	1.0	2.2	1.8
21	2.0	2.0	3.0	2.0	3.0	.....	.....	2.2	2.2	2.0	2.0	2.0
22	2.2	1.6	2.2	1.8	2.0	.8	.....	2.2	1.8	3.0	2.8	1.8
23	2.0	1.2	3.0	2.0	1.6	.6	.....	1.6	1.6	3.0	2.8	1.6
24	1.6	1.2	3.0	2.5	1.2	.3	2.0	1.2	1.4	3.0	2.5	1.6
25	1.2	1.0	2.8	3.8	.8	.15	1.4	1.2	1.4	2.5	2.5	2.2
26	1.4	1.0	2.0	2.2	1.8	.1	.6	1.2	1.4	2.5	2.5	2.8
27	1.2	1.8	2.2	2.0	1.6	.1	.45	1.2	1.4	2.5	2.5	2.8
28	1.2	1.6	2.0	3.8	1.8	.1	1.0	1.4	1.4	2.2	3.0	2.8
29	1.2	.8	1.6	2.8	2.5	.45	1.2	.....	1.6	2.2	3.0	2.5
30	1.2	1.0	1.6	1.4	2.8	.05	1.2	.....	1.6	2.0	2.8	2.5
31	1.2	.8	.....	1.0	.....	.02	.8	.....	1.6	.....	2.2	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1 to Dec. 18 and Jan. 29 to June 30, fairly well defined; Dec. 19 to Jan. 28, poorly defined. No flow on days for which discharge is not given.

Monthly discharge of Kamenehune ditch near Waimea, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	4.8	1.2	2.34	3.62	73	223
August	3.2	.8	1.76	2.72	55	167
September	3.0	.6	1.65	2.55	49	152
October	3.8	1.0	2.06	3.19	64	196
November	3.0	.8	1.78	2.75	53	164
December (28 days)	4.5	.02	1.43	2.21	40	123
January (27 days)	2.5	.02	.92	1.42	25	76
February	3.8	.45	1.90	2.94	53	163
March	3.8	.6	2.07	3.20	64	197
April	3.0	1.0	1.96	3.03	59	180
May	3.0	1.8	2.40	3.71	74	228
June	2.8	1.6	2.18	3.37	65	201
The year					674	2,070

MAKAWELI RIVER NEAR WAIMEA, KAUAI.

LOCATION.—Half a mile above confluence with Waimea River and 2 miles northeast of Waimea. Reached by wagon road up Makaweli River.

RECORDS AVAILABLE.—October 6, 1911, to June 30, 1917.

GAGE.—Vertical staff on right bank.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 500 feet above and below gage; banks low, with gentle slope; current swift. Control composed of boulders; fairly permanent between extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 13.5 feet December 18,1916 (discharge, approximately 7,500 million gallons per day, or 11,600 second-feet); minimum stage recorded, 3.0 feet December 16–19, 1912 (discharge, 1.9 million gallons per day, or 3.0 second-feet).

DIVERSIONS.—There are many small diversions above station for irrigation of sugar cane, rice, and taro.

REGULATION.—None.

UTILIZATION.—Water passing station is wasted.

ACCURACY.—Rating curves fairly well defined for low and medium stages. Records below 500 million gallons per day, fair; those for high and fluctuating stages probably considerably in error as gage is read only once daily.

Discharge measurements of Makaweli River near Waimea, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 30	W. V. Hardy	3.08	12	7.8
Sept. 25	do	3.35	25	16
28	do	3.38	38	25
Nov. 15	do	4.08	138	89
Dec. 2	D. E. Horner	3.91	121	78
Jan. 28	do	3.48	61	40
Mar. 7	do	3.78	100	65
Apr. 24	W. V. Hardy	3.56	62	40
May 28	D. E. Horner	3.43	50	38
June 1	do	4.08	153	99
5	do	4.16	166	107
13	do	3.30	39	25

Daily discharge, in million gallons, of Makaweli River near Waimea, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	9.2	11	9.2	14	25	116	157	52	39	130	39	82
2	12	90	9.2	12	22	109	139	176	36	39	36	76
3	12	53	32	12	22	102	216	216	25	36	47	47
4	244	44	14	12	850	36	186	109	66	32	43	43
5	19	40	12	12	139	36	148	82	52	28	36	148
6	16	14	12	12	130	32	82	56	52	25	56	123
7	16	14	12	11	200	380	61	61	39	32	56	66
8	16	12	11	148	1,380	116	61	56	47	88	47	47
9	11	12	11	22	328	76	52	71	123	61	39	71
10	11	12	9.2	16	148	61	61	52	66	47	39	61
11	11	9.2	14	16	112	52	47	52	43	39	32	226
12	168	9.2	158	14	105	39	52	47	47	515	32	88
13	75	90	105	12	90	47	52	56	61	116	43	71
14	22	12	98	12	98	66	43	82	315	66	32	61
15	16	12	11	19	90	52	39	56	710	139	28	47
16	105	11	9.2	19	16	32	52	52	365	176	32	66
17	139	12	9.2	12	222	32	166	47	130	61	61	61
18	98	112	32	12	148	4,570	32	226	139	39	620	166
19	28	105	12	16	130	1,575	950	328	66	66	575	95
20	28	28	11	14	352	226	950	266	395	61	290	71
21	25	16	11	14	226	157	123	216	365	39	88	61
22	12	12	139	16	139	123	116	166	216	28	52	52
23	12	12	32	28	123	1,370	139	139	130	39	43	71
24	12	12	19	28	56	665	139	148	102	39	39	56
25	11	12	16	442	36	236	88	139	71	290	32	52
26	11	12	148	233	28	139	166	71	395	88	43	157
27	9.2	11	120	148	25	157	116	47	236	56	130	82
28	16	11	22	1,950	22	196	47	36	166	36	39	61
29	14	11	14	130	22	226	47	.....	82	32	43	56
30	12	11	12	58	22	116	71	.....	52	43	226	82
31	11	9.2	.....	36	.....	95	66	.....	39	.....	236	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1 to Nov. 19, fairly well defined; Nov. 20 to June 11, fairly well defined; and June 12–30, poorly defined.

Monthly discharge of Makaweli River near Waimea, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	244	9.2	38.8	60.0	1,200	3,690
August	112	9.2	26.8	41.5	832	2,550
September	158	9.2	37.5	58	1,120	3,450
October	1,950	11	113	175	3,500	10,800
November	1,380	16	177	274	5,310	16,300
December	4,570	32	363	562	11,200	34,500
January	950	32	150	232	4,660	14,300
February	328	36	111	172	3,100	9,510
March	710	25	151	234	4,670	14,400
April	515	25	82.9	128	2,490	7,630
May	620	28	102	158.	3,150	9,700
June	226	43	81.5	126	2,450	7,500
The year	4,570	9.2	120	186	43,700	134,000

OLOKELE DITCH AT TUNNEL NO. 12, NEAR MAKAWELI, KAUAI.

LOCATION.—About 2 miles below intake, 10 miles northeast of Makaweli.

RECORDS AVAILABLE.—July 24, 1904, to June 30, 1917.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made from plank across ditch.

CHANNEL AND CONTROL.—Concrete flume of rectangular section; ditch mostly in rock tunnel; straight for 50 feet above and below gage. Control probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.40 feet, June 25, 1916 (discharge, 82 million gallons per day, or 127 second-feet); water sometimes shut off.

DIVERSIONS.—Ditch diverts all low-water flow of Olokele River.

REGULATION.—Flow regulated by head gates.

UTILIZATION.—For irrigation of sugar cane and for domestic supply.

ACCURACY.—Rating curve well defined. Records for low and medium stages good; those of high and fluctuating stages may be considerably in error as gage is read only once daily.

COOPERATION.—Gage-height records furnished by Hawaiian Sugar Co.

Discharge measurements of Olokele ditch at tunnel No. 12, near Makaweli, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Gage height.	
			Second-feet.	Million gallons per day.
July 20	W. V. Hardy	4.00	113	73
Jan. 24	D. E. Horner	1.90	41	26
Feb. 20	do	1.51	28	18
20	do	1.43	26	17
21	do	1.31	22	14
Mar. 12	do	2.69	68	44
May 29	W. V. Hardy	3.08	83	54

Daily discharge, in million gallons, of Olokele ditch at tunnel No. 12, near Makaweli, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	72	54	41	48	41	72	61	17	43	17	46	28
2	68	72	66	41	54	72	61	17	43	46	46	28
3	50	72	43	43	54	72	68	17	43	46	46	28
4	72	52	43	43	72	72	70	17	43	46	46	66
5	54	54	43	43	72	72	70	17	43	46	46	72
6	48	50	41	72	72	59	54	17	43	46	46	72
7	46	54	72	54	72	59	50	17	43	46	46	72
8	43	52	50	46	72	72	68	17	43	46	46	72
9	43	68	72	46	72	57	54	17	43	46	46	68
10	43	48	50	43	72	70	61	17	43	46	66	57
11	50	50	57	43	72	54	61	17	43	46	48	54
12	54	63	46	43	54	19	54	43	43	46	48	54
13	72	54	43	50	46	17	52	43	43	46	46	52
14	72	54	41	52	50	39	50	17	43	46	48	54
15	72	72	41	63	48	39	59	17	43	46	50	68
16	72	50	41	72	50	39	50	17	17	68	66	50
17	72	52	41	57	72	39	61	17	17	68	72	28
18	72	72	48	63	68	39	28	17	17	68	72	28
19	59	52	61	72	41	39	28	17	17	61	46	59
20	72	72	52	72	52	39	24	17	17	52	46	50
21	59	66	57	68	72	28	24	17	17	50	66	46
22	52	54	50	52	72	28	24	17	17	50	54	46
23	50	46	46	63	54	.....	28	17	17	52	57	46
24	46	46	72	68	50	.....	24	43	17	59	52	43
25	43	43	72	72	50	28	24	43	17	54	48	43
26	43	46	61	66	72	28	24	43	17	28	48	41
27	72	46	72	52	63	61	24	43	17	28	50	41
28	59	46	72	72	72	61	46	43	17	28	59	41
29	46	52	63	72	72	61	46	.....	17	28	50	43
30	59	43	50	72	72	61	46	.....	17	48	50	43
31	54	43	.....	61	.....	61	17	.....	17	.....	50	.....

NOTE.—Discharge determined from a well-defined rating curve. Ditch dry Dec. 23 and 24.

Monthly discharge of Olokele ditch at tunnel No. 12, near Makaweli, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	72	43	57.7	89.3	1,790	5,490
August	72	43	54.8	84.8	1,700	5,210
September	72	41	53.6	82.9	1,610	4,930
October	72	41	57.5	89.0	1,780	5,470
November	72	41	61.8	95.6	1,860	5,690
December (29 days)	72	17	50.2	77.7	1,460	4,470
January	70	17	45.5	70.4	1,410	4,330
February	43	17	23.5	36.4	658	2,020
March	43	17	29.6	45.8	917	2,820
April	68	17	46.8	72.4	1,400	4,310
May	72	46	51.8	80.1	1,610	4,930
June	72	28	49.8	77.1	1,490	4,580
The year					17,700	54,200

OLOKELE DITCH AT WEIR, NEAR MAKAWELI, KAUAI.

LOCATION.—About 5 miles below intake and 7 miles northeast of Makaweli.

RECORDS AVAILABLE.—January 1, 1912, to June 30, 1917.

GAGE.—Vertical staff showing head on weir.

DISCHARGE MEASUREMENTS.—Made by 12-foot sharp-crested weir, with end contractions; computations checked by current-meter measurements.

CHANNEL AND CONTROL.—Pool at weir.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 26½ inches May 27, 1916 (discharge, 84 million gallons per day, or 130 second-feet); ditch occasionally dry.

DIVERSIONS.—Diverts all low-water flow of Olokele River.

REGULATION.—By head gates.

UTILIZATION.—For irrigation of sugar cane and for domestic supply.

ACCURACY.—Conditions for measurement by weir good. Records for low and medium stages good, but those for high stages may be in error as gage is read only once daily.

COOPERATION.—Gage-height records copied from records of Hawaiian Sugar Co.

Daily discharge, in million gallons, of Olokele ditch at weir, near Makaweli, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	60	49	38	43	45	64	45	22	.....	18	43	36
2	62	57	40	42	46	65	49	24	38	25	41	32
3	49	64	51	40	48	64	49	24	38	38	40	26
4	51	56	38	38	51	64	61	18	38	38	38	32
5	58	58	38	37	66	66	56	23	38	38	37	59
6	45	49	37	58	66	59	51	23	38	39	40	57
7	38	45	40	54	65	50	45	20	35	39	41	60
8	38	56	56	45	63	64	42	19	38	43	40	62
9	38	54	47	42	62	58	45	16	37	43	39	60
10	38	48	60	40	63	54	51	.....	42	39	44	57
11	41	45	49	39	60	52	55	23	40	38	46	53
12	41	54	45	39	60	44	50	14	40	46	42	51
13	60	54	40	45	44	43	47	36	40	44	41	49
14	62	52	38	42	45	28	46	26	44	41	44	46
15	62	55	38	58	45	33	44	14	40	44	48	46
16	62	55	36	50	44	36	44	17	36	52	46	51
17	64	45	43	59	45	39	48	16	14	60	53	51
18	64	59	45	59	59	40	33	18	16	56	58	35
19	61	56	58	62	63	45	24	.....	13	54	55	43
20	54	58	58	64	54	39	.....	13	18	49	42	50
21	61	62	48	62	56	.....	.....	.....	14	44	51	44
22	56	56	50	52	66	26	.....	15	17	44	48	41
23	48	45	59	56	52	.....	21	16	14	49	48	41
24	43	41	59	64	55	.....	24	15	16	53	50	39
25	40	39	58	54	49	.....	20	15	20	48	46	39
26	39	45	60	64	64	.....	27	23	20	42	42	38
27	45	40	60	51	63	.....	24	38	19	28	45	37
28	57	51	64	60	60	.....	39	.....	18	24	50	35
29	47	43	59	64	64	.....	38	.....	16	7.5	48	38
30	50	43	47	58	64	.....	41	.....	15	16	47	39
31	49	40	.....	58	.....	47	.....	.....	17	.....	50	.....

NOTE.—No flow on days for which discharge is not given.

Monthly discharge of Olokele ditch at weir, near Makaweli, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	64	38	51.1	79.1	1,580	4,860
August	64	39	50.8	78.6	1,570	4,830
September	64	36	48.6	75.2	1,460	4,470
October	64	37	51.6	79.8	1,600	4,910
November	66	44	56.2	87.0	1,690	5,170
December (22 days)	66	26	49.1	76.0	1,080	3,310
January (27 days)	61	20	41.4	64.1	1,120	3,430
February (24 days)	38	13	20.3	31.4	488	1,500
March (30 days)	44	13	27.6	42.7	829	2,540
April	60	7.5	40.0	61.9	1,200	3,680
May	58	37	45.3	70.1	1,400	4,310
June	62	26	44.9	69.5	1,350	4,130
The year	.....	.....	.....	.....	15,400	47,100

HANAPEPE RIVER AT KOULA, NEAR ELEELE, KAUAI.

LOCATION.—200 feet above ford, half a mile above the siphon at Koula, and 5 miles north of Eleele.

RECORDS AVAILABLE.—August 18, 1910, to December 15, 1916.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 200 feet above and 400 feet below gage; banks high and wooded. Control composed of boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period of record, December 18, 1916; water-stage recorder and shelter carried away by flood and stage not recorded; minimum stage recorded, 0.95 foot December 30 and 31, 1913 (discharge, 7.1 million gallons per day, or 11 second-feet).

DIVERSIONS.—Hanapepe ditch diverts part of flow above station.

REGULATION.—By diversions.

UTILIZATION.—Flow at low stages is diverted for irrigation of sugar cane, rice, and taro.

ACCURACY.—Records good for all stages.

Discharge measurements of Hanapepe River at Koula, near Eleele, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 9	W. V. Hardy	1.10	26	17
Oct. 20	.....do	2.22	201	130

Daily discharge, in million gallons, of Hanapepe River at Koula, near Eleele, Kauai, for the year ending June 30, 1917.

Date.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Date.	July	Aug.	Sept.	Oct.	Nov.	Dec.
1....	144	24	12	21	56	153	16....	128	28	12	28	32	.....
2....	50	114	14	14	40	114	17....	153	40	24	36	56	.....
3....	50	80	12	13	36	74	18....	100	74	32	56	231	.....
4....	128	80	11	12	200	286	19....	45	50	32	144	62	.....
5....	36	40	11	40	171	86	20....	74	80	16	107	50	.....
6....	24	21	12	74	100	62	21....	74	45	24	56	144	.....
7....	18	40	32	24	332	162	22....	40	24	100	62	56	.....
8....	14	32	13	14	308	74	23....	24	18	50	62	36	.....
9....	14	32	45	14	242	50	24....	18	28	32	171	40	.....
10....	16	18	18	13	93	40	25....	16	16	62	286	93	.....
11....	13	18	21	24	144	28	26....	16	16	144	74	114	.....
12....	36	21	13	32	86	36	27....	50	16	128	80	62	.....
13....	80	18	12	18	56	32	28....	21	13	136	600	93	.....
14....	107	24	12	21	40	24	29....	24	14	62	320	93	.....
15....	56	100	12	21	36	21	30....	32	13	32	162	308	.....
							31....	28	12	.....	100	.....	.....

NOTE.—Discharge determined from well-defined rating curve.

Monthly discharge of Hanapepe River at Koula, near Eleele, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	153	13	52.5	81.2	1,630	4,990
August	114	12	37.1	57.4	1,150	3,530
September	144	11	37.9	58.6	1,140	3,490
October	600	12	87.1	135	2,700	8,290
November	332	32	114	176	3,410	10,500
December 1-15	286	21	82.8	128	1,240	3,810
The period	.....	.....	.....	.....	11,300	34,600

HANAPEPE DITCH AT KOULA, NEAR ELEELE, KAUAI.

LOCATION.—At the first flume below siphon at Koula, 4 miles below intake and 4 miles north of Eleele.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1917.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made in flume.

CHANNEL AND CONTROL.—Wooden flume; straight for 20 feet above and below gage; some vegetal growth on bottom and sides of flume. Control fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.14 feet August and November (discharge, 34 million gallons per day, or 53 second-feet); ditch occasionally dry.

Maximum stage recorded during period of record, 4.97 feet November 30, 1913 (discharge, 67 million gallons per day, or 104 second-feet).

DIVERSIONS.—Diverts part of flow of Hanapepe River.

REGULATION.—By head gates.

UTILIZATION.—For domestic supply and irrigation of sugar cane.

ACCURACY.—Discharge ascertained from fairly well defined rating curve. Records fair for low and medium stages; those for high stages probably somewhat in error owing to fluctuation of stage not shown by the one daily gage reading.

Daily discharge, in million gallons, of Hanapepe ditch at Koula near Eleele, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	34	34	30	33	33	34	17	10	28	22	22	18
2	34	34	33	33	33	34	17	16	28	22	22	16
3	33	34	30	32	33	33	34	14	30	22	22	16
4	34	34	30	32	33	33	21	12	29	22	22	31
5	34	34	29	32	33	33	25	15	21	22	22	33
6	33	34	28	33	33	33	22	12	21	22	22	33
7	33	34	34	33	33	33	22	11	21	22	31	33
8	34	34	32	33	33	33	22	12	21	22	32	33
9	32	34	34	32	33	33	22	12	18	22	32	33
10	34	34	32	30	33	33	22	12	18	22	33	33
11	34	34	33	31	33	33	22	.....	18	22	32	33
12	34	34	31	33	33	33	22	22	22	22	32	33
13	34	34	29	33	33	33	7.3	22	22	22	32	33
14	34	34	28	33	33	33	7.3	12	23	22	32	33
15	34	34	27	32	33	33	22	3.0	24	22	33	33
16	34	34	27	33	33	33	22	3.0	2.3	33	33	33
17	34	34	33	33	33	33	22	3.0	2.3	33	33	33
18	34	34	33	33	33	33	14	.....	2.3	33	33	33
19	34	34	33	33	33	.....	13	4.6	2.3	33	33	33
20	34	34	33	33	34	.5	.7	3.4	.....	33	33	33
21	33	34	33	33	34	.7	.7	3.4	.....	33	33	33
22	34	33	33	33	34	.7	10	2.6	.....	33	33	33
23	33	33	33	33	33	.7	10	2.3	1.0	33	33	33
24	34	33	32	33	34	3.0	10	12	.....	33	33	33
25	34	34	33	33	34	6.0	10	.....	.....	17	33	33
26	34	33	33	33	34	22	10	21	1.2	.....	33	33
27	34	33	.....	33	34	16	10	26	2.3	4.2	33	33
28	34	32	9.6	33	34	16	10	28	2.3	4.2	33	33
29	34	33	33	33	34	19	10	.....	2.3	8.2	33	33
30	34	32	33	33	34	16	10	.....	2.3	22	33	32
31	34	31	.....	33	.....	16	10	.....	2.3	.....	18	.....

NOTE.—Discharge determined from fairly well-defined rating curve. No flow on days for which discharge is not given.

Monthly discharge of Hanapepe ditch at Koula, near Eleele, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	34	32	33.8	52.3	1,050	3,220
August	34	31	33.6	52.0	1,040	3,200
September (29 days)	34	9.6	30.7	47.5	892	2,730
October	33	30	32.7	60.6	1,010	3,110
November	34	33	33.3	51.5	1,000	3,070
December (30 days)	34	.5	23.8	36.8	713	2,190
January	34	.7	15.4	23.8	477	1,470
February (25 days)	28	2.3	11.8	18.3	294	905
March (26 days)	30	1.0	14.1	21.8	367	1,130
April (29 days)	33	4.2	23.5	36.4	683	2,090
May	33	18	30.1	46.6	934	2,860
June	33	16	31.3	48.4	938	2,880
The year					9,400	28,900

HANAPEPE DITCH AT WEIR, NEAR HANAPEPE, KAUAI.

LOCATION.—About 2½ miles northeast of Hanapepe, below the last siphon across Hanapepe River.

RECORDS AVAILABLE.—January, 1910, to June 30, 1917.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made by 12-foot sharp-crested weir with end contractions.

CHANNEL AND CONTROL.—Weir conditions good.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 19 inches December 29–31 (discharge, 50 million gallons per day, or 77 second-feet); ditch frequently dry.

DIVERSIONS.—Ditch diverts from Hanapepe River.

UTILIZATION.—For irrigation of sugar cane and for domestic use.

ACCURACY.—Records fair.

COOPERATION.—Gage-height records copied from records kept by Hawaiian Sugar Co.

40532°—18—WSP 465——4

Daily discharge, in million gallons, of Hanapepe ditch at weir near Hanapepe, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	27	27	30	27	29	27	18	.....	.....	.....	18	.....
2	27	27	24	27	26	27	18	.....	20	.....	18	15
3	27	27	23	27	29	27	24	.....	20	18	18	.....
4	27	27	24	27	27	27	27	.....	20	20	18	.....
5	27	28	23	27	29	27	25	.....	20	20	20	27
6	27	27	23	.....	28	29	22	.....	18	20	23	27
7	23	27	24	.....	30	27	21	.....	18	20	23	27
8	27	27	23	27	27	27	21	.....	20	20	23	27
9	27	27	23	27	27	27	22	.....	18	20	23	27
10	27	27	26	27	.....	27	21	.....	18	20	23	27
11	27	27	26	27	27	27	21	.....	18	20	23	27
12	27	27	26	27	29	27	21	.....	18	20	23	30
13	28	27	23	27	.....	27	.....	.....	18	20	23	29
14	29	27	23	.....	29	27	.....	18	18	20	23	29
15	29	27	23	27	29	27	.....	.....	18	20	23	29
16	29	27	21	27	29	27	.....	.....	.....	20	23	29
17	29	27	23	27	29	9	.....	.....	.....	24	23	29
18	27	27	27	27	29	27	.....	.....	.....	24	.....	29
19	27	27	28	27	29	54	.....	.....	.....	.....	29	29
20	27	27	27	.....	29	26	.....	.....	.....	.....	30	29
21	29	27	26	.....	29	.....	.....	.....	.....	24	30	29
22	27	27	26	27	26	.....	.....	.....	.....	24	30	29
23	28	27	.....	23	27	.....	.....	.....	.....	24	30	28
24	28	27	27	27	27	2.1	.....	.....	.....	.....	30	28
25	27	26	27	28	27	.....	.....	.....	.....	.....	28	.....
26	27	.....	.....	28	27	5.5	.....	18	.....	.....	.....	27
27	27	27	.....	27	27	42	.....	18	.....	.....	.....	27
28	29	27	.....	29	27	51	.....	23	.....	.....	.....	27
29	27	27	.....	20	27	52	.....	.....	.....	24	.....	27
30	27	27	.....	27	27	52	.....	.....	.....	34	.....	27
31	27	27	.....	27	.....	52	.....	.....	.....	.....	.....	.....

NOTE.—No flow on days for which discharge is not given.

Monthly discharge of Hanapepe ditch at weir near Hanapepe, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	29	23	27.4	42.4	848	2,610
August (30 days)	28	26	27.0	41.8	810	2,490
September (24 days)	30	21	24.8	38.4	596	1,830
October (26 days)	29	20	26.7	41.3	695	2,130
November (28 days)	30	26	27.9	43.2	782	2,400
December (27 days)	54	2.1	29.9	46.3	807	2,480
January (12 days)	27	18	21.8	33.7	261	803
March (14 days)	20	18	18.7	28.9	262	803
April (21 days)	34	18	21.7	33.6	456	1,400
May (24 days)	30	18	24.0	37.1	575	1,770
June (26 days)	30	15	27.5	42.5	715	2,190
The year	.....	.....	.....	.....	6,810	20,900

SOUTH FORK OF WAILUA RIVER NEAR LIHUE, KAUAI.

LOCATION.—One mile above Waiehu Falls and about 7 miles northeast of Lihue.

RECORDS AVAILABLE.—December 10, 1911, to June 30, 1917.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 600 feet above and below station; right bank steep and high; left bank slopes gently. Control composed of gravel and small boulders; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 15.1 feet at 6 p. m. December 18, 1916 (discharge, computed from extension of rating curve, approximately 11,000 million gallons per day, or 17,000 second-feet); minimum stage recorded, 3.09 feet February 14 and 15, 1912 (discharge, 2.9 million gallons per day, or 4.5 second-feet).

Minimum stage recorded during year, 2.85 feet September, May, and June (discharge, 26 million gallons per day, or 40 second-feet).

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

REGULATION.—By diversions above station.

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

ACCURACY.—Discharge ascertained from well-defined rating curve and a continuous gage-height record. Records good for all stages except extreme floods, for which they are fair.

Discharge measurements of South Fork of Wailua River near Lihue, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 22	D. E. Horner	3.42	108	70
Oct. 24	W. V. Hardy	4.46	419	271
Nov. 3	do	3.75	192	124
5	do	4.11	304	197
Dec. 22	D. E. Horner	4.02	268	173
24	do	6.25	1,300	840
Jan. 20	do	5.25	687	444
Feb. 9	do	3.30	104	67
Mar. 8	do	2.99	54	35
29	do	3.64	161	104
Apr. 5	W. V. Hardy	3.32	118	76
June 29	D. E. Horner	2.90	47	30

Daily discharge, in million gallons, of South Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	242	50	37	88	172	396	182	76	50	136	.....	.....
2	136	110	41	76	136	320	192	454	50	102	.....	136
3	110	110	33	65	127	263	344	136	50	102	.....	154
4	222	145	29	60	320	584	263	127	50	76	.....	136
5	102	88	26	102	252	308	296	182	50	70	.....	110
6	82	65	26	172	163	285	172	118	41	60	37	202
7	76	95	41	88	469	788	136	88	60	55	37	584
8	65	88	33	76	516	296	127	76	45	55	37	296
9	65	88	55	76	439	232	110	65	320	65	33	344
10	65	60	37	76	222	232	110	65	76	55	37	192
11	65	55	37	76	344	192	102	60	76	60	26	154
12	88	55	33	82	222	202	88	55	136	136	26	127
13	163	50	26	70	172	212	82	82	252	182	26	102
14	212	55	26	76	182	182	76	76	396	70	29	82
15	118	202	26	76	172	163	76	60	1,620	136	26	118
16	154	76	26	76	145	202	212	55	469	136	41	182
17	242	70	41	95	172	202	454	50	344	65	60	454
18	202	95	55	182	636	1,850	192	192	232	55	212	136
19	95	102	45	296	252	1,540	424	102	252	50	.....	102
20	127	110	37	202	222	956	332	65	1,380	41	.....	82
21	118	88	45	136	584	904	154	65	726	37	.....	41
22	76	65	136	136	252	904	127	60	344	88	.....	37
23	60	55	88	145	192	618	145	60	252	110	.....	41
24	50	70	70	296	182	533	212	60	.....	65	.....	41
25	45	60	127	516	274	192	127	60	.....	136	.....	37
26	50	55	396	182	320	136	102	60	.....	88	.....	33
27	88	55	285	172	212	163	95	60	.....	76	.....	33
28	60	50	242	550	296	202	102	55	.....	65	.....	33
29	55	50	192	601	567	454	102	.....	.....	55	.....	29
30	65	41	118	308	726	252	88	.....	102	202	.....	26
31	60	37	.....	232	.....	192	76	.....	95	.....	.....	.....

NOTE.—Discharge determined from well-defined rating curve. Gage-height record unreliable on days for which discharge is not given.

Monthly discharge of South Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	242	45	108	167	3,360	10,300
August	202	37	77.3	120	2,400	7,350
September	396	26	80.3	124	2,410	7,390
October	601	60	174	269	5,380	16,600
November	726	127	298	461	8,940	27,400
December	1,850	136	450	696	14,000	42,800
January	454	76	171	265	5,300	16,300
February	454	50	95.1	147	2,660	8,170
April	202	37	87.6	136	2,630	8,070
May 6–18	212	26	48.2	74.6	627	1,920
June 2–30	584	26	139	215	4,040	12,400

HANAMAULU DITCH NEAR LIHUE, KAUAI.

LOCATION.—In flume 180 feet below point where Kauai Electric Co.'s power line crosses the South Fork of Wailua River, about 6 miles northwest of Lihue.

RECORDS AVAILABLE.—July 1, 1910, to June 30, 1917.

GAGE.—Vertical staff. New datum September 30, 1911.

DISCHARGE MEASUREMENTS.—Made in flume.

CHANNEL AND CONTROL.—Wooden flume; straight for 20 feet above and below gage. Control is rock section at end of flume; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.56 feet at 1.15 p. m. July 17 (discharge, 27 million gallons per day, or 42 second-feet).

1910–1917: Maximum stage recorded, 2.80 feet August 6, 1913 (discharge, 36 million gallons per day, or 56 second-feet); ditch occasionally dry.

DIVERSIONS.—Ditch diverts part of flow of South Fork of Wailua River.

REGULATION.—By head gates.

UTILIZATION.—For irrigation of sugar cane and for domestic supply.

ACCURACY.—Gage read once daily. Records fair for all stages.

Discharge measurements of Hanamaulu ditch near Lihue, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 21	D. E. Horner	2.40	36	24
Aug. 23	do	2.39	30	19
Oct. 29	W. V. Hardy	1.29	14	8.8
Nov. 19	do	1.02	8.5	5.5
22	do	.78	6.3	4.0
Dec. 19	D. E. Horner	.55	3.4	2.2
21	do	.62	4.6	3.0
Jan. 18	do	2.00	28	18
Feb. 6	do	.86	5.5	3.6
6	do	1.24	10.3	6.7
8	do	.92	7.4	4.8
8	do	1.56	19	12
Mar. 27	do	.48	2.7	1.8
Apr. 3	W. V. Hardy	2.04	27	17

Daily discharge, in million gallons, of Hanamaulu ditch near Lihue, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	23	24	23	23	6.1	5.6	2.9	5.6	18	4.8	19	12
2	22	26	24	23	11	4.4	2.6	7.1	18	4.8	17	9.4
3	22	25	23	22	11	4.0	4.0	4.8	18	17	15	9.4
4	24	26	23	22	12	5.2	6.1	4.8	18	16	14	9.4
5	23	25	24	22	11	4.8	8.8	5.6	18	16	21	9.4
6	22	24	24	23	11	4.8	5.6	5.2	18	18	20	9.4
7	24	24	25	22	13	4.4	5.2	6.1	19	18	20	9.4
8	23	25	24	22	12	4.0	5.2	5.2	18	18	19	2.3
9	23	25	24	22	14	3.6	5.2	12	24	18	18	10
10	23	24	24	22	12	3.6	5.2	12	15	18	20	11
11	22	24	24	22	11	3.6	4.8	12	15	18	18	10
12	23	24	23	24	11	4.8	4.8	11	14	21	17	10
13	24	24	22	23	10	4.8	4.8	11	15	21	17	17
14	24	24	22	23	10	4.4	4.8	3.6	15	16	17	16
15	23	26	22	23	10	4.4	4.8	3.6	26	19	18	17
16	24	26	22	23	4.4	4.4	6.1	14	2.0	21	17	17
17	26	26	24	23	5.6	4.4	7.6	14	1.4	21	19	16
18	24	25	24	24	7.6	5.2	5.6	14	1.2	18	23	17
19	23	26	24	25	5.6	2.3	5.6	6.6	6.1	18	14	16
20	24	26	23	25	4.8	1.4	5.6	6.6	10	18	14	16
21	24	25	23	24	4.8	4.0	5.6	6.6	5.6	21	13	15
22	23	24	24	24	4.0	5.6	5.6	6.1	3.2	21	12	14
23	24	24	25	24	4.0	5.6	5.6	6.1	2.9	21	12	18
24	25	24	24	24	4.0	4.8	5.2	5.6	2.6	18	12	17
25	25	23	23	26	4.0	3.2	4.4	5.6	2.0	24	12	17
26	25	24	26	24	4.4	3.2	4.4	5.6	2.3	21	12	17
27	25	24	26	14	4.0	3.2	4.0	5.6	2.0	13	12	17
28	25	24	26	14	4.4	3.2	4.0	18	1.7	12	12	17
29	24	24	24	10	4.4	3.2	4.4	.....	1.7	12	12	17
30	25	24	23	7.6	6.1	3.2	4.0	.....	5.6	20	13	17
31	26	24	.....	6.6	.....	3.2	4.0	.....	5.6	.....	12	.....

NOTE:—Discharge determined from fairly well defined rating curves.

Monthly discharge of Hanamaulu ditch near Lihue, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	26	22	23.8	36.8	737	2,260
August	26	23	24.6	38.1	763	2,340
September	26	22	23.7	36.7	712	2,180
October	26	6.6	21.2	32.8	656	2,020
November	14	4.0	7.91	12.2	237	728
December	5.6	1.4	4.08	6.31	126	388
January	8.8	2.6	5.05	7.81	156	480
February	18	3.6	8.00	12.4	224	687
March	26	1.2	10.5	16.2	325	999
April	24	4.8	17.8	27.5	534	1,640
May	23	12	15.8	24.4	491	1,500
June	18	2.3	13.7	21.2	412	1,260
The year	26	1.2	14.7	22.7	5,370	16,480

LIHUE DITCH NEAR LIHUE, KAUAI.

LOCATION.—At point where Kauai Electric Co.'s power line crosses ditch, 1½ miles below intake and about 5 miles northwest of Lihue.

RECORDS AVAILABLE.—July 1, 1910, to April 30, 1917, when station was discontinued.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel cut in clay and gravel; ditch clean with low grade. Stage-discharge relation sometimes affected by backwater caused by inflow of Kanaha ditch 260 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 1.6 feet April, May, and June, 1916 (discharge, 14 million gallons per day, or 22 second-feet); ditch occasionally dry.

DIVERSIONS.—Part of flow diverted above station into ditch at lower level.

REGULATION.—By head gates.

UTILIZATION.—Irrigation of sugar cane and for domestic supply.

ACCURACY.—Gage read once daily. Rating curve well defined. Records fair for all stages.

Discharge measurements of Lihue ditch near Lihue, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second feet.	Million gallons per day.
July 21	D. E. Horner	1.38	11.1	7.2
Aug. 4	W. V. Hardy	1.51	12.5	8.1
23	D. E. Horner	1.50	11.7	7.6
Oct. 13	W. V. Hardy	1.40	12.0	7.8
Nov. 19	.....do	.80	3.4	2.2
19	.....do	.86	3.8	2.5
Dec. 21	D. E. Horner	.59	1.1	.7
Jan. 17	.....do	.45	.6	.4

Daily discharge, in million gallons, of Lihue ditch near Lihue, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Mar.	Apr.
1	8.9	7.2	8.4	8.4	7.8	4.0	.....	.....	.....
2	8.4	7.8	8.4	8.4	7.8	4.0	.....	.....	.....
3	8.4	7.8	8.4	8.4	7.8	3.6	.....	1.2	1.0
4	9.4	8.4	8.4	7.8	6.7	4.0	.....	1.0	6.2
5	8.9	8.4	8.4	7.8	3.6	4.0	.....	1.2	5.7
6	8.4	8.4	8.4	7.8	4.0	3.6	.....	5.7	5.7
7	8.4	8.4	8.9	7.2	4.4	4.0	.....	6.7	5.2
8	8.4	8.4	8.4	6.2	4.0	3.6	.....	7.2	5.2
9	8.4	8.4	8.4	6.2	3.6	3.6	.....	8.4	5.2
10	8.4	8.4	8.9	7.8	3.2	3.6	.....	7.2	7.2
11	8.4	8.4	8.4	8.4	3.2	3.6	.....	7.8	7.2
12	8.4	8.4	8.4	8.4	2.8	3.6	.....	7.8	7.8
13	8.9	7.8	7.8	7.8	2.8	3.6	.....	8.4	7.8
14	8.4	7.8	7.8	7.8	2.8	3.2	.....	8.4	7.2
15	8.4	8.9	7.8	7.8	2.8	3.2	.....	11.6	8.4
16	8.9	8.4	7.2	7.8	2.8	3.2	.....	.....	8.4
17	9.4	7.8	8.4	7.8	2.4	3.2	0.4	.....	7.8
18	8.9	8.4	8.4	7.8	2.8	3.2	.6	.....	7.8
19	7.2	7.8	8.4	7.8	2.4	2.4	.6	.....	7.8
20	7.2	7.8	7.8	7.8	2.4	.8	.6	.....	7.2
21	7.2	7.2	8.4	7.2	2.4	1.0	.4	.....	8.4
22	6.7	7.2	8.4	7.2	2.0	1.0	.2	.....	8.4
23	8.4	8.4	8.9	7.2	4.0	.8	.2	.....	8.4
24	8.4	8.4	8.4	7.2	4.0	1.4	.....	.....	8.4
25	8.4	7.8	7.8	8.4	3.6	1.0	.....	.....	8.4
26	8.4	8.4	8.4	8.4	4.0	.8	.....	.....	7.7
27	7.8	8.4	8.9	8.4	3.6	.8	.....	.....	7.7
28	8.4	8.4	6.7	8.4	4.0	.8	.....	.....	7.7
29	7.8	8.4	6.2	7.8	4.0	.8	.....	.....	7.2
30	7.8	8.4	6.2	.....	4.4	.8	.....	.....	8.4
31	7.8	8.4	.....	.....	.....	.....	.....	.....	.....

NOTE.—Discharge determined from well-defined rating curve. No flow on days for which discharge is not given.

Monthly discharge of Lihue ditch near Lihue, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	9.4	6.7	8.30	12.8	257	790
August	8.9	7.2	8.15	12.6	252	775
September	8.9	6.2	8.12	12.6	244	748
October (29 days)	8.4	6.2	7.77	12.0	225	692
November	7.8	2.0	3.87	5.99	116	356
December (30 days)	4.0	.8	2.57	3.98	77	237
January (7 days)	.6	.2	.43	.67	3	9
March (13 days)	11.6	1.0	6.35	9.82	83	253
April (28 days)	8.4	1.0	7.12	11.0	200	612
The period					1,460	4,470

NOTE.—See footnote to daily-discharge table.

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

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

RECORDS AVAILABLE.—September 21, 1914, to June 30, 1917. For old station at elevation 500 feet, December 28, 1910, to September 25, 1914.

GAGE.—Stevens 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 stage recorded during year, 7.45 feet at 11.45 p. m. December 18 (discharge, approximately 1,600 million gallons per day, or 2,480 second-feet); minimum stage recorded, 1.35 feet September 14–16 (discharge, 19 million gallons per day, or 29 second-feet).

Maximum stage recorded during period of record, 9.5 feet at 6.30 p. m. September 26, 1914 (discharge, computed from extension of rating curve, approximately 2,200 million gallons per day, or 3,400 second-feet); minimum stage recorded, 1.3 feet April, 1916 (discharge, 13 million gallons per day, or 20 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Determinations based on well-defined rating curves and a continuous record of gage height. Records good for all stages.

Discharge measurements of North Fork of Wailua River at elevation 650 feet, near Lihue, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 19	D. E. Horner	2.05	96	62
20	.....do	1.90	73	47
21	.....do	1.80	62	40
24	.....do	1.58	40	26
Sept. 24	W. V. Hardy	2.00	94	61
Oct. 13	.....do	1.62	57	37
Nov. 6	.....do	1.48	45	29
7	.....do	2.04	103	67
Dec. 19	D. E. Horner	2.55	198	128
19	.....do	2.49	182	118
20	.....do	2.13	115	74
Jan. 19	.....do	4.10	707	457
Mar. 27	.....do	2.22	135	87
Apr. 4	W. V. Hardy	1.52	42	27
June 27	D. E. Horner	1.47	46	30

Daily discharge, in million gallons, of North Fork of Wailua River at elevation of 650 feet near Lihue, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	94	35	23	49	.....	.....	82	38	25	64	106	.....
2	56	68	28	38	.....	.....	72	106	25	46	49	.....
3	60	64	23	38	.....	.....	113	42	25	56	38	.....
4	88	88	21	35	.....	.....	82	38	32	42	60	.....
5	49	56	21	49	.....	.....	113	38	30	38	32	.....
6	42	42	21	52	.....	72	60	35	32	35	30	.....
7	38	60	30	38	77	166	49	32	49	32	28	.....
8	38	49	21	32	94	77	46	32	32	32	28	.....
9	35	46	38	32	49	68	42	32	100	38	28	.....
10	35	35	25	35	38	77	42	32	52	32	35	.....
11	35	32	23	30	.....	52	38	30	56	46	28	.....
12	49	32	21	35	.....	64	35	30	88	68	28	.....
13	60	30	21	38	.....	64	32	46	150	113	25	.....
14	64	35	19	35	.....	52	30	35	248	64	28	.....
15	49	68	19	35	.....	49	30	30	436	88	25	.....
16	56	35	19	42	.....	52	94	30	228	64	32	.....
17	106	46	25	.....	.....	64	191	28	128	46	46	.....
18	100	46	32	.....	.....	319	68	77	77	42	135	.....
19	56	46	32	.....	.....	158	282	38	100	35	182	.....
20	82	49	25	.....	.....	77	120	32	358	32	.....	.....
21	68	38	28	.....	.....	64	64	30	182	30	.....	.....
22	46	32	60	.....	.....	64	52	28	100	52	.....	.....
23	38	30	49	.....	.....	174	94	28	72	60	.....	.....
24	35	30	46	.....	.....	191	100	28	82	35	.....	.....
25	35	28	52	.....	.....	72	56	28	100	46	.....	.....
26	35	30	113	.....	.....	60	49	25	200	32	.....	.....
27	56	30	106	.....	.....	52	42	25	100	30	.....	30
28	38	28	100	.....	.....	68	46	25	64	30	.....	30
29	42	25	88	.....	.....	142	38	.....	52	28	.....	28
30	42	25	60	.....	.....	82	35	.....	49	113	.....	28
31	38	23	.....	.....	.....	64	32	.....	46	.....	.....	.....

NOTE.—Discharge determined from well-defined rating curves applicable July 1 to Sept. 28 and Sept. 29 to June 30. No record on days for which discharge is not given.

Monthly discharge of North Fork of Wailua River at elevation 650 feet near Lihue, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	106	35	53.7	83.1	1,660	5,110
August	88	23	41.3	63.9	1,280	3,930
September	113	19	39.6	61.3	1,190	3,650
October 1–16	52	30	38.3	59.3	613	1,880
December 6–31	319	49	94.0	145	2,440	7,500
January	282	30	71.9	111	2,230	6,840
February	106	25	36.4	56.3	1,020	3,130
March	436	25	107	166	3,320	10,200
April	113	28	49.0	75.8	1,470	4,510
May 1–19	182	25	50.7	78.4	963	2,960

KANAHA DITCH NEAR LIHUE, KAUAI.

LOCATION.—500 feet above point where Kauai Electric Co.'s power line crosses ditch, and about 9 miles north of Lihue.

RECORDS AVAILABLE.—August 6, 1910, to June 30, 1917.

GAGE.—Vertical staff. New datum May 28, 1913.

DISCHARGE MEASUREMENTS.—Made in flume 100 feet above gage.

CHANNEL AND CONTROL.—Cut in soft lava rock; straight for 30 feet above and 10 feet below gage. Control composed of soft lava rock; fairly permanent between times of cleaning ditch.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.45 feet at 11 a. m., September 27 (discharge, 18 million gallons per day, or 28 second-feet); no flow March 17–25.

Maximum stage recorded during period of record, 2.6 feet July 24–26, 1913 (discharge, 22 million gallons per day, or 34 second-feet).

DIVERSIONS.—Ditch diverts part of flow of North Fork of Wailua River.

REGULATION.—By head gates.

UTILIZATION.—For irrigation of sugar cane and for domestic supply.

ACCURACY.—Records based on well-defined rating curves; good for low and medium stages; those for high and fluctuating stages may be somewhat in error as gage is read only once daily.

Discharge measurements of Kanaha ditch near Lihue, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons. per day.
Nov. 7	W. V. Hardy	0.71	8.1	5.2
Dec. 20	D. E. Horner	.80	8.2	5.3
Feb. 7	do	.47	3.8	2.4
7	do	.66	7.0	4.5
7	do	.98	10	6.5
Mar. 28	do	.50	4.2	2.7
June 27	do	1.78	23	15

Daily discharge, in million gallons, of Kanaha ditch near Lihue, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	15	14	13	13	10	6.7	4.2	4.6	7.0	7.0	17	15
2	15	16	16	13	9.8	6.4	4.2	6.7	11	7.8	13	14
3	14	15	14	16	9.8	6.4	4.2	5.6	11	8.8	12	15
4	16	16	14	16	10	6.7	3.9	5.6	11	7.4	16	14
5	14	15	14	16	8.8	6.4	6.0	3.9	11	7.0	14	14
6	15	15	13	15	8.8	6.4	5.3	3.2	13	6.7	13	14
7	14	14	16	15	9.2	8.8	5.0	6.7	15	6.7	13	15
8	14	14	14	15	8.4	6.7	5.0	6.4	13	6.7	13	16
9	14	14	16	15	7.4	6.4	4.6	6.0	14	6.4	12	15
10	14	14	16	15	7.4	6.4	4.6	5.6	14	12	15	16
11	13	13	15	15	7.0	6.0	4.6	5.3	14	13	13	15
12	15	15	15	15	7.4	6.0	4.6	5.0	14	15	12	15
13	16	14	14	15	7.4	7.0	4.6	4.6	14	16	12	13
14	16	13	14	14	7.4	6.0	4.6	4.6	15	14	12	16
15	15	16	14	16	7.4	6.0	6.7	4.2	7.8	16	14	16
16	16	16	14	16	7.4	6.0	8.4	3.9	3.6	15	13	17
17	16	15	17	16	7.4	5.6	7.4	6.0	.....	14	16	16
18	14	15	16	16	8.8	6.7	6.0	6.7	.....	13	16	15
19	14	15	17	16	7.4	5.3	6.4	6.7	.....	13	16	16
20	15	16	16	16	7.0	5.3	6.0	6.4	.....	12	14	16
21	15	15	15	16	6.7	5.3	6.0	5.6	.....	14	15	15
22	13	14	16	16	6.0	5.3	5.6	5.0	.....	16	15	14
23	13	14	17	15	6.0	5.3	6.7	4.2	.....	16	15	16
24	15	14	16	16	5.6	8.1	6.0	3.9	.....	15	14	16
25	14	14	15	17	6.0	5.6	5.6	3.9	.....	16	14	15
26	15	14	15	14	6.0	4.6	5.6	7.4	1.8	15	14	15
27	16	14	18	15	5.6	4.6	5.6	7.4	3.9	14	15	14
28	15	13	17	17	6.0	4.6	5.3	6.7	6.0	14	15	14
29	15	14	16	14	5.6	4.6	5.3	.....	4.6	14	14	14
30	14	13	15	13	6.7	5.0	5.3	.....	4.2	14	16	14
31	14	13	.....	10	.....	4.6	5.0	.....	7.4	.....	15	.....

NOTE.—Daily discharge determined from well-defined rating curves applicable July 1 to June 7 and June 8–30. No flow Mar. 17–25.

Monthly discharge of Kanaha ditch near Lihue, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	16	13	14.6	22.6	454	1,390
August	16	13	14.4	22.3	447	1,370
September	18	13	15.3	23.7	458	1,410
October	17	10	15.1	23.4	467	1,440
November	10	5.6	7.48	11.6	224	689
December	8.8	4.6	5.96	9.22	185	567
January	8.4	3.9	5.43	8.40	168	517
February	7.4	3.2	5.42	8.39	152	466
March (22 days)	15	1.8	9.83	15.2	216	664
April	16	6.4	12.2	18.9	366	1,120
May	17	12	14.1	21.8	438	1,340
June	17	13	15.0	23.2	450	1,380
The period					4,030	12,400

NOTE.—See footnote to daily-discharge table.

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

LOCATION.—400 feet above confluence with North Fork, 600 feet above gaging station on North Fork, and about 8 miles north of Lihue.

RECORDS AVAILABLE.—July 27, 1912, to June 30, 1917.

GAGE.—Stevens water-stage recorder December 31, 1914, to June 30, 1917; staff 250 feet below present site July 27, 1912, to September 30, 1914.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 30 feet above and 120 feet below gage; banks low and wooded. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 8.9 feet at 8 a. m. March 3, 1916 (discharge, approximately 3,000 million gallons per day, or 4,640 second-feet); minimum stage recorded, 1.6 feet March, 1915 (discharge, 7 million gallons per day, or 11 second-feet).

Maximum stage recorded during year, 6.85 feet, December 18 (discharge, approximately 1,700 million gallons per day, or 2,630 second-feet); minimum stage recorded, 1.75 feet October 4 (discharge, 8.5 million gallons per day, or 13 second-feet).

DIVERSIONS.—None.

REGULATION.—None.

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

ACCURACY.—Records based on well-defined rating curve; good for all stages.

Discharge measurements of East Branch of North Fork of Wailua River near Lihue, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet.)	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 16	D. E. Horner	2.00	30	20
18	do	2.10	40	26
24	do	1.96	26	17
Sept. 4	W. V. Hardy	1.87	20	13
24	do	2.82	187	121
Oct. 13	do	2.00	31	20
Nov. 7	do	2.55	108	70
8	do	2.39	82	53
Dec. 20	D. E. Horner	2.44	97	62
21	do	2.32	62	40
22	do	2.24	59	38
Jan. 18	do	2.28	69	45
June 27	do	2.02	36	23

Daily discharge, in million gallons, of East Branch of North Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	54	.....	10	12	.....	48	.....	.....	43	20	26
2	30	.....	12	10	.....	60	.....	.....	43	20	26
3	38	.....	12	10	.....	90	.....	.....	54	20	26
4	43	.....	12	8.5	.....	74	.....	.....	38	23	26
5	30	.....	12	10	43	54	.....	.....	30	23	23
6	23	.....	12	15	.....	43	.....	.....	26	23	66
7	23	.....	12	12	.....	38	20	.....	26	23	43
8	20	.....	15	12	82	34	20	.....	26	23	30
9	20	.....	15	12	140	31	20	.....	23	23	26
10	20	.....	18	10	66	34	20	38	26	23	26
11	20	.....	15	10	48	34	20	.....	23	26	23
12	26	.....	12	10	60	26	18	.....	23	26	23
13	34	.....	12	12	38	23	18	.....	26	23	20
14	43	.....	12	.....	34	23	23	.....	26	23	18
15	26	.....	12	.....	38	23	18	.....	30	23	20
16	26	.....	18	.....	38	66	18	.....	23	30	26
17	66	23	20	.....	30	129	15	.....	20	34	26
18	54	23	20	.....	140	54	.....	.....	23	60	26
19	34	30	43	.....	300	129	.....	.....	30	34	23
20	38	30	18	.....	54	118	.....	.....	20	26	23
21	48	30	15	.....	48	54	.....	.....	26	26	23
22	30	23	26	.....	151	43	.....	.....	20	23	23
23	26	20	23	.....	60	34	.....	.....	20	20	23
24	20	18	26	.....	48	90	.....	.....	23	20	26
25	20	20	20	.....	43	43	.....	.....	34	20	23
26	18	20	30	.....	38	38	.....	.....	30	18	.....
26	20	20	20	.....	140	38	.....	.....	23	18	23
28	20	20	20	.....	151	.....	.....	.....	23	18	23
29	.....	20	20	.....	82	.....	.....	38	20	18	20
30	.....	18	12	.....	60	.....	.....	34	20	23	20
31	.....	18	.....	.....	54	.....	.....	34	.....	26	.....

NOTE.—Discharge determined from rating curve well defined below 150 million gallons per day. No record on days for which discharge is not given.

Monthly discharge of East Branch of North Fork of Wailua River near Lihue, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July 1–28	66	18	31.1	48.1	870	2,670
August 17–31	30	18	22.2	34.3	333	1,020
September	43	10	17.5	27.1	524	1,610
October 1–13	15	8.5	11.0	17.0	144	439
January 1–27	129	23	54.6	84.5	1,470	4,520
February 7–17	23	15	19.1	29.6	210	645
April	54	20	27.3	42.2	818	2,510
May	60	18	24.4	37.7	756	2,320

KAPAA RIVER NEAR KEALIA, KAUAI.

LOCATION.—A quarter of a mile below confluence of two main branches, 1½ miles above intake of Kapahi ditch and 6 miles northwest of Kealia.

RECORDS AVAILABLE.—June 23, 1915, to June 30, 1917. July 23, 1910, to May 16, 1915, at old station about a mile downstream.

GAGE.—Friez water-stage recorder; July 23, 1910, to May 16, 1915, vertical staff about a mile below present site.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage; right bank vertical; left bank high with gentle slopes. Control fairly permanent between extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded at present site, 9.2 feet at 1 a. m. March 4, 1916 (discharge, approximately 850 million gallons per day, or 1,320 second-feet); minimum stage recorded, 1.65 feet August 28 and 29, 1915 (discharge, 11 million gallons per day, or 17 second-feet).

Maximum stage recorded during year, 8.75 feet at 12.15 a. m. March 20 (discharge approximately 800 million gallons per day, or 1,240 second-feet); minimum stage recorded, 1.7 feet September and March (discharge, 12 million gallons per day, or 18.6 second-feet).

Maximum stage recorded during period of record at old staff gage site, 13 feet, ascertained from flood marks, December 3, 1914 (discharge, roughly estimated by extension of previous rating curve, 1,200 million gallons per day, or 1,860 second-feet); minimum stage recorded, 1.35 feet February, March, and April, 1914 (discharge, 6.2 million gallons per day, or 9.6 second-feet).

DIVERSIONS.—Very small irrigation ditch diverts water above station.

REGULATION.—Practically none.

UTILIZATION.—For irrigation of sugar cane and for domestic supply.

ACCURACY.—Records fair for entire year.

Discharge measurements of Kapaa River near Kealia, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 3	W. V. Hardy	2.07	31	20
Nov. 25	do	2.85	110	71
Dec. 28	D. E. Horner	3.13	149	96

Daily discharge, in million gallons, of Kapaa River near Kealia, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	78	17	12	17	16	48	18	20	13	44	28	34
2	24	31	16	16	18	37	20	31	12	31	22	28
3	37	22	12	14	18	31	40	17	12	52	20	31
4	28	37	12	14	40	48	24	16	20	26	18	28
5	17	20	12	18	26	52	34	14	17	24	18	37
6	16	17	12	17	22	56	20	14	22	22	17	48
7	14	26	14	14	48	112	17	13	28	22	17	78
8	14	20	13	16	65	37	16	13	17	20	17	44
9	14	18	13	18	34	40	14	13	74	26	17	48
10	14	16	14	16	28	40	17	13	28	24	17	37
11	16	14	14	16	56	26	18	13	28	24	17	28
12	24	14	14	14	28	44	14	13	40	24	17	26
13	31	14	13	14	22	56	14	14	107	24	17	26
14	34	18	18	14	20	31	13	13	112	26	18	24
15	18	34	14	16	31	26	13	13	164	26	20	48
16	18	17	17	16	22	34	78	13	83	31	24	65
17	48	20	14	22	31	34	78	13	48	22	26	112
18	40	20	20	40	97	142	26	18	34	20	31	37
19	20	26	20	48	56	78	83	14	56	20	48	31
20	26	22	16	24	83	37	44	14	224	20	83	24
21	40	18	17	20	164	31	22	17	132	18	26	24
22	20	16	34	24	48	28	18	13	56	34	24	22
23	17	14	20	26	28	48	24	13	34	20	24	20
24	17	14	18	65	24	74	24	13	28	20	22	20
25	16	13	18	48	48	31	20	13	40	26	24	20
26	16	13	26	22	44	26	26	13	34	20	28	20
27	26	13	40	28	26	26	18	13	24	20	40	20
28	18	13	34	40	40	52	18	13	24	20	74	20
29	18	14	22	24	107	88	17	.....	22	20	37	20
30	18	13	18	20	74	34	16	.....	22	56	65	18
31	18	13	.....	20	.....	22	14	.....	22	.....	40	.....

NOTE.—Discharge determined from fairly well defined rating curves applicable July 1 to Nov. 21 and Nov. 22 to June 30. Discharge Oct. 29 to Nov. 4 determined from records of flow of Kapahi ditch.

Monthly discharge of Kapaa River near Kealia, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	78	14	24.4	37.8	755	2,320
August	37	13	18.6	28.8	577	1,770
September	40	12	17.9	27.7	537	1,650
October	65	14	23.3	36.1	721	2,220
November	164	16	45.5	70.4	1,360	4,190
December	142	22	47.4	73.3	1,470	4,510
January	83	13	26.4	40.8	818	2,510
February	31	13	14.7	22.7	411	1,260
March	224	12	50.9	78.8	1,580	4,840
April	56	18	26.1	40.4	782	2,400
May	83	17	28.9	44.7	896	2,750
June	112	18	34.6	53.5	1,040	3,190
The year	224	12	30.0	46.4	10,900	33,600

KAPAHI DITCH NEAR KEALIA, KAUAI.

LOCATION.—500 feet below intake and about 4 miles west of Kealia.

RECORDS AVAILABLE.—April 15, 1909, to May 2, 1914; May 10, 1915, to June 30, 1917.

GAGE.—Stevens 8-day water-stage recorder, installed May 10, 1915, to replace original Watson recorder.

DISCHARGE MEASUREMENTS.—Made by 20-foot sharp-crested weir immediately below gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 1.98[1] feet at 2 a. m., September 16, 1915 (discharge, 120 million gallons per day, or 186 second-feet); water shut off November 23 and 24, 1916.

DIVERSIONS.—Ditch diverts part of flow of Kapaa River.

REGULATION.—Flow regulated by head gates.

UTILIZATION.—For irrigation of sugar cane and for domestic supply.

ACCURACY.—Conditions at weir fairly good. Records fair for all stages.

[1] Determinations of maximum discharge supersede those published in Water-Supply Paper 430, which were based on extension of rating curve.

Daily discharge, in million gallons, of Kapahi ditch near Kealia, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	June.
1	25.2	12.5	11.7	12.1	12.9	5.3	5.0	7.4	11.7	10.9	.....
2	20.0	20.0	12.9	11.3	14.2	7.0	5.0	7.8	11.7	8.1	.....
3	17.5	18.5	9.7	10.5	13.7	6.4	8.9	7.4	11.7	8.9	.....
4	16.5	20.0	9.7	9.7	22.5	6.7	10.5	7.0	16.0	10.9	.....
5	15.2	20.0	9.3	13.7	17.5	6.7	8.9	8.9	14.2	15.2	.....
6	13.7	15.2	9.3	12.1	13.3	15.2	8.9	10.1	15.2	13.7	.....
7	12.9	21.0	10.1	10.5	22.5	8.9	11.7	10.1	15.2	13.7	.....
8	11.7	18.5	10.9	10.5	11.7	12.9	11.7	12.9	14.7	5.3	.....
9	11.3	18.0	10.9	14.2	11.7	9.3	11.7	12.9	14.2	4.4	16.0
10	11.3	15.2	10.9	10.9	11.7	8.9	8.9	12.9	16.0	7.0	16.0
11	12.1	13.3	10.9	10.9	15.2	8.9	7.4	12.1	16.0	16.0	15.6
12	17.5	13.3	10.1	10.5	12.9	8.9	7.4	11.7	15.2	15.2	15.6
13	25.2	12.9	9.7	10.1	15.2	7.0	7.4	10.9	10.9	15.2	15.2
14	25.2	15.2	15.2	10.1	10.9	6.4	7.4	11.7	8.5	12.9	15.2
15	17.5	30.8	10.9	10.9	8.9	6.4	7.4	11.7	8.1	10.9	.....
16	15.2	17.0	12.9	10.9	8.9	6.4	7.8	8.9	6.7	11.3	.....
17	17.5	18.0	10.9	17.5	8.5	6.0	6.4	8.9	6.4	11.7	.....
18	17.5	19.0	15.2	27.8	9.3	5.3	.....	12.9	6.4	12.5	.....
19	16.5	22.5	15.2	33.8	8.9	5.3	.....	12.9	10.9	12.9	.....
20	17.0	20.0	10.9	17.5	8.9	6.4	5.3	10.9	9.3	12.1	.....
21	15.2	18.0	12.9	15.2	9.3	6.7	5.3	10.9	10.9	10.9	.....
22	13.7	15.2	25.2	17.5	8.5	6.7	5.6	12.9	8.1	17.5	.....
23	13.3	13.7	15.2	18.5	.....	6.4	6.7	12.1	7.0	14.2	.....
24	12.5	12.9	12.9	39.8	.....	6.7	6.7	11.7	5.3	12.5	11.7
25	11.3	12.5	12.9	33.8	10.9	6.4	6.7	11.7	5.3	11.7	11.3
26	11.3	12.5	20.0	17.5	7.8	7.0	6.7	11.7	5.3	11.7	10.9
27	13.3	12.9	27.8	18.5	5.3	8.9	10.9	12.1	12.9	11.7	10.5
28	12.9	12.5	27.8	22.5	4.4	7.0	12.1	12.5	16.0	11.7	11.3
29	13.3	12.9	17.5	20.0	4.7	5.3	8.9	.....	16.0	.....	11.3
30	13.3	12.5	13.7	16.0	4.1	5.0	7.4	.....	15.2	.....	10.5
31	13.3	12.1	.....	15.2	.....	5.0	7.4	.....	15.2	.....	.....

NOTE.—Discharge determined by weir formula, $Q=3.33\ LH^{\frac{3}{2}}$. No record on days for which discharge is not given, except Nov. 23 and 24, when water was shut off.

Monthly discharge of Kapahi ditch near Kealia, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	25.2	11.3	15.5	24.0	480	1,470
August	30.8	12.1	16.4	25.4	509	1,560
September	27.8	9.3	13.8	21.4	413	1,270
October	39.8	9.7	16.5	25.5	510	1,570
November (28 days)	22.5	4.1	11.2	17.3	314	962
December	15.2	5.0	7.27	11.2	225	692
February	12.9	7.0	10.9	16.9	306	937
March	16.0	5.3	11.5	17.8	356	1,090
April 1–28	17.5	4.4	11.8	18.3	331	1,010

NOTE.—See footnote to daily-discharge table.

ANAHOLA RIVER NEAR KEALIA, KAUAI.

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

RECORDS AVAILABLE.—August 22 to November 2, 1910; December 28, 1912, to June 30, 1917. Fragmentary record December 15, 1910, to December 28, 1912, at dam a quarter of a mile below present site.

GAGE.—Friez water-stage recorder August 22 to November 2, 1910, and December 28, 1912, to June 30, 1917. From December 15, 1910, to December 28, 1912, an inclined staff.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

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 from low-water channel then rises abruptly. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.35 feet at 1 a. m. March 20 (discharge, approximately 850 million gallons per day, or 1,320 second-feet); minimum stage recorded, 1.6 feet, September and October (discharge, 3.6 million gallons per day, or 5.6 second-feet).

Maximum stage recorded during period of record, 12.9 feet at 7.30 p. m. September 26, 1914 (discharge, estimated from extension of rating curve, approximately, 1,450 million gallons per day, or 2,240 second-feet); minimum stage recorded, 1.3 feet February 27 and 28, 1915 (discharge, 2 million gallons per day, or 3.1 second-feet).

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

REGULATION.—None except by diversions.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Determinations based on fairly well defined rating curves and continuous gage-height record. Records fair below 120 million gallons per day.

Discharge measurements of Anahola River near Kealia, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height.	Discharge.	
		Feet.	Second-feet.	Million gallons per day.
Aug. 3	W. V. Hardy	1.79	10	6.5
Oct. 18	....do	2.05	29	19
Nov. 21	....do	3.06	139	90
Dec. 6	....do	2.02	16	10
27	D. E. Horner	1.92	21	13
June 7	....do	2.33	47	30
9	....do	1.99	19	12

Daily discharge, in million gallons, of Anahola River near Kealia, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	14	4.8	4.2	4.8	5.4	14	20	14	9.5	26	16	12
2	8.0	6.0	4.2	4.8	5.4	14	20	18	8.0	14	9.5	11
3	9.5	6.0	3.6	4.2	5.4	11	46	14	8.0	16	9.5	11
4	11	9.5	4.2	4.2	6.0	14	33	12	9.5	12	8.0	11
5	7.0	7.0	4.2	4.2	6.0	16	42	12	9.5	12	7.0	9.5
6	6.0	5.4	3.6	4.2	5.4	18	20	12	11	11	7.0	16
7	6.0	8.0	3.6	3.6	5.4	60	16	12	26	11	7.0	50
8	5.4	6.0	3.6	4.2	7.0	37	16	11	37	11	7.0	16
9	5.4	7.0	3.6	4.8	6.0	23	16	9.5	114	11	7.0	12
10	5.4	5.4	3.6	4.2	7.0	20	20	9.5	.....	11	7.0	9.5
11	5.4	4.8	3.6	3.6	8.0	12	18	9.5	.....	11	7.0	9.5
12	6.0	4.8	3.6	3.6	7.0	12	12	9.5	.....	9.5	7.0	9.5
13	6.0	5.4	3.6	3.6	6.0	23	12	11	.....	9.5	7.0	9.5
14	16	5.4	4.2	5.4	5.4	14	11	16	.....	16	7.0	8.0
15	8.0	9.5	3.6	4.2	8.0	11	11	9.5	.....	9.5	7.0	9.5
16	8.0	6.0	3.6	4.8	6.0	12	80	9.5	.....	9.5	9.5	33
17	9.5	6.0	3.6	6.0	5.4	12	114	9.5	.....	8.0	8.0	46
18	16	6.0	4.2	14	46	75	42	12	65	8.0	18	11
19	8.0	6.0	4.2	8.0	14	55	114	11	60	7.0	37	9.5
20	8.0	6.0	4.2	5.4	16	23	65	16	239	7.0	55	9.5
21	11	6.0	4.2	7.0	114	18	33	16	148	7.0	16	8.0
22	7.0	5.4	6.0	6.0	33	16	29	11	80	16	12	8.0
23	6.0	4.8	6.0	6.0	14	20	26	9.5	50	9.5	11	8.0
24	6.0	4.8	4.8	18	11	46	26	9.5	37	8.0	9.5	8.0
25	5.4	4.8	4.8	12	14	18	29	9.5	42	11	9.5	46
26	5.4	4.8	4.2	7.0	12	16	18	9.5	42	9.5	9.5	14
27	5.4	4.8	6.0	6.0	9.5	23	18	12	23	11	12	46
28	5.4	4.8	11	6.0	20	26	18	9.5	16	9.5	26	14
29	6.0	4.8	5.4	6.0	46	97	29	.....	16	8.0	14	12
30	6.0	4.8	4.8	5.4	18	37	18	.....	14	20	20	11
31	5.4	4.8	.....	5.4	.....	26	16	.....	14	.....	18	.....

NOTE.—Discharge determined from rating curves fairly well defined below 120 million gallons per day applicable July 1 to Dec. 18, Dec. 19 to Mar. 9, Mar. 18 to June 30. Gage height not recorded Mar. 10–17.

Monthly discharge of Anahola River near Kealia, Kauai, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	16	5.4	7.66	11.9	238	729
August	9.5	4.8	5.79	8.96	180	551
September	11	3.6	4.47	6.92	134	412
October	18	3.6	6.02	9.31	187	573
November	114	5.4	15.7	24.3	472	1,450
December	97	11	26.4	40.8	819	2,510
January	114	11	31.9	49.4	988	3,030
February	18	9.5	11.6	17.9	326	997
April	26	7.0	11.3	17.5	340	1,040
May	55	7.0	13.1	20.3	405	1,250
June	50	8.0	16.3	25.2	488	1,500

ANAHOLA DITCH ABOVE KANEHA RESERVOIR, NEAR KEALIA, KAUAI.

LOCATION.—At lower end of third tunnel above Kaneha reservoir, 7 miles from Kealia.

RECORDS AVAILABLE.—May 30, 1915, to June 30, 1917.

GAGE.—Stevens 8-day water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from wooden footbridge at gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded, 3.72 feet at 4.30 a. m. January 26, 1916 (discharge, 53 million gallons per day, or 82 second-feet); minimum stage recorded, 1.0 foot January 1, 1916 (discharge, 0.9 million gallons per day, or 1.4 second-feet).

DIVERSIONS.—Ditch diverts from Anahola River.

REGULATION.—By head gates. When Kaneha reservoir is full water is turned out of ditch at spillway just below gage.

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

ACCURACY.—Discharge ascertained from well-defined rating curve and a continuous gage-height record. Records good except for days when water was turned out at spillway.

Discharge measurements of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Oct. 9	W. V. Hardy	1.70	11	7.2
Nov. 19	do	1.84	14	9.4
Dec. 26	D. E. Horner	1.36	5.9	3.8
29	do	.99	2.6	1.7
Mar. 8	W. V. Hardy	1.49	7.0	4.5
Apr. 1	do	1.76	13	8.5
May 30	do	1.53	7.9	5.1

Daily discharge, in million gallons, of Anahola ditch above Kaneha reservoir, near Kealia, Kauai, for the year ending June 30, 1917.

Date.	July	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	23	3.0	4.9	8.2	5.4	3.9	1.9	9.6	11	5.4
2	7.0	2.6	7.6	8.2	4.4	7.0	1.9	12	4.9	4.9
3	14	2.6	4.9	7.6	4.9	3.9	1.9	9.6	3.9	5.9
4	.....	2.2	8.9	8.9	4.9	3.9	4.9	5.9	3.4	5.9
5	.....	3.0	7.6	7.6	5.9	3.4	4.4	4.4	3.0	4.9
6	.....	2.2	4.9	8.9	6.4	3.4	6.4	3.9	3.0	6.4
7	.....	1.9	8.2	12	5.9	3.0	14	3.9	2.6	8.2
8	3.9	2.2	11	10	5.4	2.6	7.0	4.9	2.6	7.0
9	3.4	4.9	9.6	8.9	4.9	2.6	18	7.0	2.6	7.0
10	3.9	2.2	5.9	8.2	5.9	2.6	3.9	5.4	2.6	6.4
11	4.4	2.2	9.6	6.4	5.9	2.6	3.4	5.9	2.2	5.4
12	6.4	1.9	5.9	7.6	4.9	2.6	3.4	7.0	2.2	5.4
13	5.9	2.2	4.9	9.6	3.9	3.0	8.9	9.6	2.2	5.4
14	12	3.9	3.9	7.6	3.9	4.9	3.9	22	2.6	4.9
15	4.4	2.2	8.9	5.9	3.4	2.6	5.9	13	3.0	5.9
16	4.4	2.2	4.9	7.6	5.9	2.6	3.4	9.6	4.4	8.2
17	10	7.0	4.4	7.0	3.4	2.2	4.4	4.4	4.4	8.2
18	14	15	24	11	2.6	3.9	3.4	3.9	14	7.0
19	4.9	12	8.2	9.6	3.9	3.0	9.6	3.4	20	5.9
20	5.4	7.0	.....	8.9	4.4	3.0	12	3.0	14	4.9
21	8.2	9.6	.....	7.6	4.9	4.4	4.4	3.0	5.9	4.4
22	.....	7.0	10	7.6	5.4	2.6	4.9	10	4.4	3.9
23	.....	8.2	7.6	8.2	4.9	2.2	4.9	4.4	3.9	3.4
24	.....	28	6.4	8.9	4.9	1.9	4.4	3.9	3.4	3.0
25	.....	16	7.6	7.6	5.4	1.9	4.9	5.4	3.0	3.0
26	.....	6.4	8.2	6.4	4.9	1.9	5.4	3.9	3.0	2.6
27	.....	5.9	5.9	3.9	5.4	3.4	7.0	4.9	5.9	2.6
28	.....	7.0	7.6	3.0	6.4	3.0	6.4	4.4	9.6	3.0
29	.....	8.2	9.6	4.4	7.6	.....	5.9	3.9	7.6	2.6
30	.....	7.0	8.2	3.9	4.9	.....	5.4	15	5.4	2.2
31	.....	5.4	.....	5.4	3.9	.....	5.4	.....	4.4	.....

NOTE.—Discharge determined from rating curve well defined below 20 million gallons per day. No record July 4–7 and Nov. 20 and 21. Record sheets July 22 to Sept. 30 lost by observer. Water spilling below gage Nov. 22, 29 and 30, Dec. 1–3, 7–10, 18–31, Jan. 1, 2, 16–22, 30 and 31, Feb. 1–7, 20, 21, Mar. 9, 13–27, Apr. 2, 3, 7–18, and May 19–21.

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Monthly discharge of Anahola ditch above Kaneha reservoir near Kealia, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
October	28	1.9	6.16	9.53	191	586
December	12	3.0	7.63	11.8	237	726
January	7.6	2.6	4.99	7.72	155	475
February	7.0	1.9	3.14	4.86	*88	270
March	18	1.9	5.86	9.07	182	557
April	22	3.0	6.91	10.7	207	636
May	20	2.2	5.33	8.25	165	507
June	8.2	2.2	5.13	7.94	154	472

NOTE.—See footnote to daily-discharge table.

KALIHIWAI RIVER NEAR HANALEI, KAUAI.

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

RECORDS AVAILABLE.—March 13, 1914, to June 30, 1917.

GAGE.—Stevens 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 stage recorded during year, 8.4 feet at 3 a. m. March 20 (discharge, approximately 2,000 million gallons per day, or 3,090 second-feet); minimum stage recorded, 0.75 foot September 4 and 6 (discharge, 7 million gallons per day, or 11 second-feet).

Maximum stage recorded during period of record, 14.4 feet at 6.30 a. m. September 25, 1914 (discharge, computed from extension of rating curve, approximately 4,000 million gallons per day, or 6,200 second-feet); minimum stage recorded, 0.95 foot March 13, 1914 (discharge, 6.5 million gallons per day, or 10 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Discharge ascertained from well-defined rating curve and a continuous gage-height record. Records good below 600 million gallons per day.

Discharge measurements of Kalihiwai River near Hanalei, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 25	D. E. Horner	1.00	22	14
Sept. 22	W. V. Hardy	1.12	26	17
Jan. 14	D. E. Horner	.98	19	12
June 19	....do	1.32	44	28

Daily discharge, in million gallons, of Kalihiwai River near Hanalei, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	58	13	8	13	24	53	22	15	15	22	43	.....
2	24	27	9	12	24	38	30	27	20	20	22	.....
3	43	27	8	10	20	43	63	17	17	34	.....	.....
4	43	53	7	10	34	101	34	15	17	13	.....	.....
5	22	53	8	12	27	53	53	13	15	.....	.....	.....
6	20	17	7	10	20	58	27	13	20	.....	.....	.....
7	17	34	12	9	48	63	22	12	30	.....	.....	.....
8	15	22	9	9	68	34	20	12	20	.....	.....	.....
9	15	20	9	12	68	30	20	12	119	.....	.....	.....
10	17	15	9	9	34	27	22	12	34	.....	.....	.....
11	15	15	10	8	43	20	20	12	30	.....	.....	.....
12	24	15	9	8	24	24	17	10	30	.....	.....	.....
13	30	15	8	9	20	38	15	10	95	.....	.....	.....
14	34	17	9	12	17	22	13	13	131	.....	.....	.....
15	20	34	9	10	30	17	13	12	144	.....	.....	.....
16	24	17	9	12	20	27	78	12	151	.....	.....	.....
17	68	20	10	22	22	30	119	12	73	24	.....	.....
18	48	20	13	48	95	166	38	15	53	22	.....	.....
19	24	30	13	53	27	73	138	12	48	20	.....	.....
20	27	27	12	27	48	34	63	10	234	17	.....	22
21	30	15	12	24	151	27	34	13	131	17	.....	22
22	20	17	30	22	53	24	24	9	68	30	.....	20
23	15	13	17	27	30	48	30	9	68	17	.....	17
24	13	12	15	73	24	63	43	9	17	15	.....	17
25	13	10	15	73	43	24	24	9	13	17	.....	17
26	12	9	43	30	34	20	27	9	24	15	.....	17
27	22	9	48	30	22	20	22	10	17	17	.....	17
28	15	9	53	68	58	27	22	15	15	15	.....	17
29	13	9	22	73	83	83	22	.....	13	15	.....	15
30	12	8	15	53	78	34	17	.....	13	43	.....	15
31	15	8	.....	34	.....	24	17	.....	12	.....	.....	.....

NOTE.—Discharge determined from rating curve well defined below 600 million gallons per day. Gage heights not recorded on days for which discharge is not given.

Monthly discharge of Kalihiwai River near Hanalei, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	68	12	24.8	38.4	768	2,360
August	53	8	19.7	30.5	610	1,870
September	53	7	15.3	23.7	458	1,410
October	73	8	26.5	41.0	822	2,520
November	151	17	43.0	66.5	1,290	3,960
December	166	17	43.4	67.1	1,340	4,130
January	138	13	35.8	55.4	1,110	3,410
February	27	9	12.5	19.3	349	1,070
March	234	12	54.4	84.2	1,690	5,180
June 20-30	22	15	17.8	27.5	196	602

HANALEI RIVER AT ELEVATION 625 FEET,[1] NEAR HANALEI, KAUAI.

LOCATION.—Two miles west of Kauai Electric Co.'s power line and 10 miles south of Hanalei. Trail to station leaves power line at pole No. 485.

RECORDS AVAILABLE.—January 26, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder; datum raised 6.0 feet January 15, 1915.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage. Stream bed rough; right bank steep and high; left bank slopes gently. Control composed of boulders; shifting.

[1] Corrected elevation; formerly published as 750 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.05 feet at 11 a. m. March 14 (discharge, approximately 2,260 million gallons per day, or 3,500 second-feet); minimum stage recorded, 0.6 foot September 4, 5, and 19 (discharge, 29 million gallons per day, or 45 second-feet).

Maximum stage recorded during period of record, 9.7 feet (new datum) September 26, 1914 (discharge, computed from extensions of rating curve, approximately 3,800 million gallons per day, or 5,880 second-feet); minimum stage recorded, 0.4 foot (new datum) March, 1914 (discharge, 24 million gallons per day, or 37 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation, power, and domestic supply.

ACCURACY.—Records good.

Discharge measurements of Hanalei River at elevation 625 feet, near Hanalei, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Sept. 29	W. V. Hardy	1.27	124	80
Nov. 15	D. E. Horner	1.43	158	102
Jan. 15	....do	.76	65	42
June 19	....do	1.02	109	70

Daily discharge, in million gallons, of Hanalei River at elevation 625 feet, near Hanalei, Kauai, for the year ending June 30, 1912.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	59	43	32	50	82	152	102	48	65	.....	224	236
2	54	76	34	43	70	118	148	158	65	.....	119	128
3	110	102	32	40	59	82	128	79	72	.....	72	102
4	110	102	32	37	70	183	190	.....	86	.....	94	86
5	64	82	29	43	126	102	148	.....	86	.....	65	102
6	50	64	29	43	88	82	168	.....	79	.....	48	102
7	43	64	37	37	143	110	102	.....	110	.....	43	224
8	40	76	37	37	255	88	79	.....	102	.....	39	390
9	37	70	43	40	194	70	65	.....	390	.....	35	190
10	37	54	40	37	102	102	59	.....	605	.....	39	110
11	37	46	37	37	110	59	59	.....	249	.....	27	79
12	46	43	37	40	88	59	53	.....	236	.....	27	65
13	64	43	37	43	64	64	48	.....	625	.....	24	65
14	102	40	34	40	50	76	43	.....	935	.....	31	53
15	64	70	32	40	64	59	39	.....	465	.....	31	65
16	64	70	32	40	54	54	249	.....	262	.....	39	119
17	228	54	34	46	50	76	505	.....	148	72	43	276
18	143	76	32	64	183	118	168	.....	79	65	224	110
19	76	76	29	110	88	835	935	94	79	53	505	72
20	82	88	34	88	88	201	372	86	128	48	249	59
21	88	102	37	70	335	128	148	86	119	43	128	43
22	70	76	70	59	118	110	119	86	79	48	79	39
23	54	54	59	70	76	148	128	86	94	65	65	35
24	46	43	54	88	64	445	290	79	79	48	59	31
25	43	40	50	390	70	224	128	79	59	48	59	31
26	43	37	152	134	95	110	102	65	212	43	48	27
27	50	34	143	82	64	94	86	72	138	43	79	27
28	43	34	143	318	88	86	79	79	94	43	110	27
29	43	34	88	410	152	236	72	.....	79	39	94	27
30	43	32	59	172	228	224	65	.....	.....	79	148	27
31	43	32	.....	126	.....	128	53	.....	.....	.....	158	.....

NOTE.—Discharge determined from fairly well defined rating curves applicable as follows: July 1 to Dec. 18 and Dec. 19 to June 30. Gage heights not recorded Feb. 4–18 and Mar. 30 to Apr. 16.

Monthly discharge of Hanalei River at elevation 625 feet, near Hanalei, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	228	37	67.0	104	2,080	6,370
August	102	32	59.9	92.7	1,860	5,700
September	152	29	51.3	79.4	1,540	4,720
October	410	37	92.7	143	2,870	8,820
November	335	50	111	172	3,320	10,200
December	835	54	149	230	4,620	14,200
January	935	39	159	246	4,930	15,100
Mar. 1–29	935	59	201	311	5,820	17,900
Apr. 17–30	79	39	52.6	81.4	737	2,260
May	505	24	96.9	150	3,000	9,220
June	390	27	98.2	152	2,950	9,040

HANALEI RIVER NEAR HANALEI, KAUAI.

LOCATION.—About 5 miles up the river from Hanalei.

RECORDS AVAILABLE.—December 28, 1911, to June 30, 1917.

GAGE.—Inclined and vertical staff on left bank.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 500 feet above and below gage; banks low, wooded, and not subject to overflow. Control composed of boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 14.55 feet December 18 (discharge, approximately 8,000 million gallons per day, or 12,400 second-feet); minimum stage recorded, 6.6 feet in September (discharge, 53 million gallons per day, or 82 second-feet).

Maximum stage recorded during period of record, 17.52 feet at 4 p. m. September 26, 1914 (discharge, computed from extension of rating curve, approximately 14,000 million gallons per day, or 21,700 second-feet); minimum stage recorded, 6.21 feet March 25, 1914 (discharge, 26 million gallons per day, or 40 second-feet).

DIVERSIONS.—China ditch diverts water above station.

REGULATION.—By diversions only.

UTILIZATION.—Most of the water passing the station is wasted, but a small amount is diverted for irrigation of rice and taro.

ACCURACY.—Gage read twice daily. Discharge determined from rating curve well defined below 1,000 million gallons per day. Records fair for all stages.

Discharge measurements of Hanalei River near Hanalei, Kauai, during the year ending June 30, 1917.

[Made by D. E. Horner.]

Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.
July 28	6.71	134	69
Apr. 26	6.88	143	92
May 9	6.76	113	73

Daily discharge, in million gallons, of Hanalei River near Hanalei, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	320	73	53	95	164	400	180	108	73	134	1,060	320
2	120	164	63	84	370	320	200	320	63	120	148	148
3	164	148	53	73	520	180	320	134	63	200	120	148
4	164	200	63	73	320	580	295	120	108	120	180	148
5	120	120	53	73	295	460	680	120	95	108	108	180
6	95	95	53	73	270	400	180	108	148	108	95	270
7	84	200	95	63	345	645	164	95	295	108	84	1,240
8	73	148	63	63	1,140	430	148	84	120	95	73	460
9	73	95	95	95	610	164	134	84	715	120	73	430
10	73	95	73	73	220	164	180	84	148	148	95	200
11	84	95	73	63	180	148	164	84	148	134	95	164
12	73	84	53	63	164	180	134	73	550	320	84	148
13	164	84	73	73	134	200	120	84	890	270	84	108
14	270	84	53	95	120	148	108	84	3,500	164	95	108
15	148	200	53	73	200	120	108	84	3,670	164	63	108
16	164	95	53	95	148	180	1,240	73	2,600	180	73	645
17	610	148	73	120	120	148	1,170	73	370	134	120	1,400
18	270	164	73	164	460	2,450	295	73	320	120	820	220
19	134	148	73	370	164	785	2,350	84	180	108	1,600	164
20	148	200	63	164	148	270	460	73	1,360	95	750	148
21	180	134	63	120	1,030	200	245	84	785	95	925	148
22	108	134	680	148	295	220	220	73	370	108	490	120
23	95	84	245	164	180	370	148	73	220	164	148	95
24	84	180	95	370	148	750	295	180	180	95	134	95
25	73	84	95	960	220	245	245	148	245	95	120	84
26	148	73	960	200	220	180	164	148	1,030	95	134	84
27	370	73	245	220	148	245	148	120	245	95	108	84
28	73	63	220	785	220	270	164	108	220	95	95	84
29	73	73	134	680	320	1,400	164	.....	164	95	164	84
30	63	63	108	320	550	295	164	.....	148	180	295	84
31	95	63	.....	245	.....	200	134	.....	134	.....	400	.....

NOTE.—Discharge determined from rating curve well defined below 1,000 million gallons per day.

Monthly discharge of Hanalei River near Hanalei, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	610	63	152	235	4,710	14,500
August	200	63	118	183	3,660	11,200
September	960	53	138	214	4,150	12,700
October	960	63	202	313	6,260	19,200
November	1,140	120	314	486	9,420	28,900
December	2,450	120	411	636	12,700	39,100
January	2,350	108	346	535	10,700	32,900
February	320	73	106	164	2,980	9,110
March	3,670	63	618	956	19,200	58,800
April	320	95	136	210	4,070	12,500
May	1,600	63	285	441	8,830	27,100
June	1,400	84	257	398	7,720	23,700
The year	3,670	53	259	401	94,400	290,000

CHINA DITCH NEAR HANALEI, KAUAI.

LOCATION.—Just below intake, about 5 miles south of Hanalei.

RECORDS AVAILABLE.—March 17, 1914, to June 30, 1917. December 28, 1911, to September 30, 1913, at old station a quarter of a mile below present station.

GAGE.—Vertical staff on left bank.

DISCHARGE MEASUREMENTS.—Made from plank.

CHANNEL AND CONTROL.—Cut in clay and gravel; subject to growth of grass and weeds which affects stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.55 feet June 7 (discharge, 32 million gallons per day, or 50 second-feet); minimum stage recorded, 0.45 foot January 15 (discharge, 8.8 million gallons per day, or 13.6 second-feet).

DIVERSIONS.—Ditch diverts part of flow of Hanalei River.

REGULATION.—By head gates.

UTILIZATION.—Irrigation of rice and taro.

ACCURACY.—Gage read twice daily. Stage-discharge relation rather unstable owing to growth of aquatic plants. Records July 1 to October 31 poor; those for November 1 to June 30 fair for all stages.

Discharge measurements of China ditch near Hanalei, Kauai, during the year ending June 30, 1917.

[Made by D. E. Horner.]

Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.
July 28	1.80	39	25
Nov. 26	1.55	32	20
Apr. 26	1.48	30	19
May 10	1.18	24	16

Daily discharge, in million gallons, of China ditch near Hanalei, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	28	26	22	20	22	22	10	22	16	18	24	21
2	25	27	22	18	22	22	11	14	16	18	18	20
3	26	27	21	18	20	21	12	11	16	21	17	19
4	25	28	22	18	24	24	12	10	18	18	19	19
5	24	26	20	18	23	22	14	10	18	18	16	19
6	23	26	21	18	22	20	10	10	18	18	16	20
7	23	24	23	16	24	24	10	10	21	18	16	27
8	23	22	22	16	25	21	9.6	16	18	17	16	22
9	22	26	23	17	24	20	9.6	16	22	18	16	22
10	23	25	22	16	22	20	12	16	18	18	16	19
11	24	24	22	16	22	18	10	16	18	18	16	18
12	26	24	20	16	21	18	9.6	16	21	22	16	18
13	27	25	19	18	19	20	9.1	16	22	22	16	18
14	28	24	19	18	18	18	9.1	18	28	18	16	21
15	28	23	19	18	22	18	8.8	18	27	21	17	24
16	28	25	19	19	19	19	21	17	24	19	18	26
17	28	26	21	21	18	18	21	16	17	18	20	28
18	27	27	22	22	24	24	11	18	16	18	26	22
19	25	26	22	24	22	18	25	18	14	18	27	20
20	26	27	21	22	20	12	14	17	23	17	22	19
21	26	26	21	22	25	12	11	18	18	17	22	19
22	25	26	20	21	23	12	10	16	16	17	19	19
23	24	24	26	22	21	14	9.6	16	14	16	19	18
24	23	24	23	24	20	19	12	16	14	16	18	18
25	24	24	23	26	22	11	10	16	14	17	18	18
26	25	24	26	22	22	10	10	16	20	19	18	18
27	26	23	20	22	19	11	11	18	15	18	18	18
28	25	23	21	26	22	12	12	16	14	18	19	18
29	25	22	22	26	23	18	12	.....	14	17	18	18
30	26	22	22	26	24	12	11	.....	14	16	20	18
31	25	22	.....	24	.....	11	10	.....	16	.....	22	.....

NOTE.—Discharge July 1 to Oct. 31 determined by shifting-control method; Nov. 1 to June 30 from well-defined rating curve.

Monthly discharge of China ditch near Hanalei, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	28	22	25.3	39.1	783	2,410
August	28	22	24.8	38.4	768	2,360
September	26	19	21.5	33.3	646	1,980
October	26	16	20.3	31.4	630	1,930
November	25	18	21.8	33.7	654	2,010
December	24	10	17.5	27.1	541	1,660
January	25	8.8	11.9	18.4	367	1,130
February	22	10	15.6	24.1	437	1,340
March	28	14	18.1	28.0	560	1,720
April	22	16	18.1	28.0	544	1,670
May	27	16	18.7	28.9	579	1,780
June	28	18	20.1	31.1	604	1,850
The year	28	8.8	19.5	30.2	7,110	21,800

KUNA DITCH NEAR HANALEI, KAUAI.

LOCATION.—A quarter of a mile below intake and about 3 miles southeast of Hanalei.

RECORDS AVAILABLE.—July 1, 1916, to June 30, 1917. January 17, 1912, to September 30, 1913, at old site 500 feet below intake.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Channel about 5 feet wide and 3 feet deep, cut in firm earth. Stage-discharge relation sometimes affected by growth of grass in channel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.3 feet April 3 (discharge, 36 million gallons per day, or 56 second-feet); minimum stage recorded, 0.9 foot January 25 (discharge, 3.2 million gallons per day, or 5 second-feet).

DIVERSIONS.—None above station.

REGULATION.—By head gates.

UTILIZATION.—Irrigation of rice and taro.

ACCURACY.—Gage read twice daily. Determinations based on rating curves well defined between 10 and 25 million gallons per day. Records fair for ordinary stages.

Discharge measurements of Kuna ditch near Hanalei, Kauai, during the year ending June 30, 1917.

[Made by D. E. Horner.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 28	2.19	28	18	Jan. 16	1.82	20	13
Nov. 20	1.87	20	13	Apr. 12	2.26	16	17
26	1.91	22	14	May 10	2.67	30	19

Daily discharge, in million gallons, of Kuna ditch near Hanalei, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	20	18	14	12	13	18	6.6	9.8	18	30	.....	15
2	18	24	15	12	13	16	10	12	18	24	16	18
3	18	24	6.1	10	12	14	6.6	10	18	33	18	11
4	20	25	9.8	10	14	.....	5.6	9.8	23	26	.....	11
5	20	20	14	11	14	15	.....	9.8	21	27	16	11
6	16	19	14	10	15	14	5.6	17	24	25	15	28
7	15	26	20	10	15	.....	5.6	24	24	24	14	.....
8	14	23	16	9.8	.....	14	5.2	22	21	24	14	.....
9	12	20	23	11	18	14	5.2	22	.....	14	14	.....
10	15	20	17	10	14	14	6.1	21	18	24	19	11
11	18	19	17	10	14	13	5.6	21	20	24	19	11
12	20	18	14	9.8	14	14	4.8	21	.....	22	18	11
13	23	19	14	11	12	14	5.2	20	.....	26	18	11
14	25	18	14	11	12	13	4.8	24	.....	26	18	10
15	21	25	14	10	14	12	4.8	21	.....	27	19	11
16	21	20	8.6	11	12	14	.....	20	.....	24	23	.....
17	.....	22	16	12	12	14	.....	20	20	24	24	.....
18	23	20	18	12	16	.....	5.6	22	18	22	.....	.....
19	19	18	18	16	15	.....	.....	21	17	21	.....	12
20	20	26	17	13	14	14	4.8	20	.....	20	.....	15
21	20	23	15	12	.....	14	4.4	21	.....	19	18	15
22	18	21	.....	12	17	14	4.0	19	19	21	17	18
23	15	18	19	13	14	15	3.6	19	17	18	12	18
24	17	18	20	16	14	.....	4.0	18	15	21	11	18
25	15	18	20	.....	16	15	3.2	18	21	21	12	23
26	15	17	.....	14	17	13	11	18	.....	23	12	23
27	18	17	18	14	14	14	10	20	20	21	12	22
28	18	16	17	.....	.....	12	12	18	18	24	17	23
29	17	17	20	.....	18	.....	12	.....	17	23	17	22
30	17	15	13	17	.....	7.6	10	.....	16	21	21	21
31	19	15	.....	14	.....	7.1	9.8	.....	15	.....	21	.....

NOTE.—Discharge determined from rating curves well defined between 10 and 25 million gallons per day, applicable July 1 to April 3 and April 4 to June 30. On days for which discharge is not given the gage was inaccessible on account of high water in Hanalei River.

LUMAHAI RIVER NEAR HANALEI, KAUAI.

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

RECORDS AVAILABLE.—May 23, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and 100 feet below gage; stream bed very rough; right bank vertical; left bank slopes gently. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9.0 feet at 3 a. m. December 19, 1916 (discharge, computed from extension of rating curve, approximately 4,600 million per day, or 7,120 second-feet); minimum stage recorded, 0.6 foot April, 1915 (discharge, 20 million gallons per day, or 31 second-feet).

Minimum stage recorded during year, 0.55 foot September 13–17 (discharge, 30 million gallons per day, or 46 second-feet).

DIVERSIONS.—None above station.

REGULATIONS.—None.

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

ACCURACY.—Determination of discharge based on a continuous record of gage heights and well-defined rating curves. Records good for all stages.

Discharge measurements of Lumahai River near Hanalei, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 27	W. V. Hardy	0.67	68	44
Sept. 27	.....do	1.18	178	115
Apr. 18	.....do	.40	84	54
26	D. E. Horner	.22	53	34
27	.....do	.30	57	37
30	.....do	.68	117	75
May 1	.....do	2.11	606	392
1	.....do	1.65	357	231
June 15	.....do	.40	75	48

Daily discharge, in million gallons, of Lumahai River near Hanalei, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	70	39	39	178	102	178	297	43	43	47	113	77
2	50	78	39	178	120	148	218	101	39	47	66	52
3	63	102	34	178	120	102	369	56	43	43	47	47
4	158	70	34	178	189	200	280	52	107	47	47	56
5	158	78	34	178	102	168	248	47	95	43	43	89
6	86	50	34	178	70	158	156	47	113	47	43	126
7	70	63	56	178	86	200	140	47	95	47	43	89
8	56	78	44	178	78	111	89	47	72	47	39	107
9	56	50	44	189	44	94	66	47	101	52	39	77
10	56	44	39	189	56	200	61	47	61	.....	43	61
11	56	39	34	178	86	102	56	47	52	.....	43	52
12	50	44	34	212	120	148	56	43	47	.....	39	47
13	86	50	30	225	168	148	47	52	66	.....	43	47
14	86	39	30	225	178	158	47	66	248	.....	43	43
15	148	78	30	212	250	148	43	47	148	.....	43	52
16	86	56	30	225	265	212	218	47	113	.....	56	140
17	120	44	30	200	280	225	428	47	101	47	77	148
18	178	78	39	178	362	790	107	61	95	47	428	89
19	138	63	50	138	200	790	280	56	95	47	314	66
20	78	78	39	178	158	264	165	47	77	43	101	56
21	78	78	44	178	450	264	83	56	61	43	66	47
22	78	63	56	225	129	264	66	47	52	43	52	47
23	63	44	70	295	78	468	61	43	56	47	52	43
24	56	39	63	345	63	468	140	43	52	39	47	43
25	50	34	56	265	78	264	72	43	47	39	47	39
26	50	34	50	138	86	218	61	43	107	36	43	39
27	39	34	102	78	86	194	56	47	52	43	52	39
28	39	39	148	111	295	297	56	52	47	39	56	43
29	39	39	138	178	398	369	56	.....	47	43	47	39
30	39	39	168	63	432	194	52	.....	43	56	56	39
31	39	39	.....	94	.....	165	47	.....	43	.....	56	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1 to Dec. 19, well defined below 300 million gallons per day; Dec. 20 to June 30, well defined below 600 million gallons per day. Gage heights not recorded Apr. 10–16.

Monthly discharge of Lumahai River near Hanalei, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	178	39	78.0	121	2,420	7,420
August	102	34	54.9	84.9	1,700	5,220
September	168	30	54.6	84.5	1,640	5,030
October	345	63	185	286	5,740	17,600
November	450	44	171	265	5,130	15,700
December	790	94	249	385	7,710	23,700
January	428	43	133	206	4,120	12,700
February	101	43	50.8	78.6	1,420	4,370
March	248	39	78.0	121	2,420	7,420
May	428	39	73.7	114	2,280	7,010
June	148	39	64.6	100	1,940	5,950

WAIOLI STREAM NEAR HANALEI, KAUAI.

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

RECORDS AVAILABLE.—June 30, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

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

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and 20 feet below gage; right bank steep; left bank slopes gently. Control composed of boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 6.15 feet at 6.30 a. m. December 19, 1916 (discharge, computed from extension of rating curve, approximately 1,200 million gallons per day, or 1,860 second-feet); minimum stage recorded, 0.6 foot July 22, 1914 (discharge, 2.0 million gallons per day, or 3.1 second-feet).

Minimum stage recorded during year, 1.0 foot November 13 (discharge, 6.0 million gallons per day, or 9.3 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Determinations of discharge based on well-defined rating curve and a continuous record of gage heights. Records good for all stages.

Discharge measurements of Waioli Stream near Hanalei, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Sept. 30	W. V. Hardy	1.26	22	14
Nov. 21	D. E. Horner	2.80	402	260
Apr. 19	.....do	1.28	18	12
20	.....do	1.20	17	11
June 14	.....do	1.20	16	10.5

Daily discharge, in million gallons, of Waioli Stream near Hanalei, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	18	14	9.5	14	16	32	16	11	11	16	94	.....
2	14	14	9.5	14	14	28	48	22	8.0	19	43	.....
3	14	16	9.5	11	19	16	53	11	8.0	19	28	86
4	14	14	11	11	28	72	86	9.5	28	16	25	.....
5	32	14	14	11	48	19	32	8.0	32	14	22	.....
6	19	14	11	11	35	11	32	8.0	35	11	19	.....
7	25	14	11	9.5	25	25	16	8.0	39	9.5	16	.....
8	25	14	9.5	9.5	39	14	11	8.0	28	9.5	16	.....
9	14	22	11	11	35	16	11	8.0	28	9.5	14	.....
10	11	22	9.5	11	16	25	7.0	8.0	16	9.5	14	19
11	11	32	9.5	11	11	11	22	8.0	14	11	14	16
12	22	19	9.5	11	9.5	16	16	8.0	16	11	14	.....
13	32	14	9.5	14	6.0	19	11	8.0	59	11	14	.....
14	19	32	11	11	25	22	9.5	28	78	11	22	.....
15	28	22	16	9.5	11	11	8.0	11	35	16	16	.....
16	32	14	11	16	.....	16	94	9.5	25	22	35	.....
17	43	14	11	16	.....	32	226	8.0	22	19	35	.....
18	25	14	14	16	.....	59	35	8.0	14	16	179	.....
19	25	14	11	28	336	310	102	16	19	16	138	.....
20	35	16	8.0	22	336	35	53	9.5	22	11	53	.....
21	39	16	8.0	19	179	28	22	19	35	11	32	.....
22	43	53	8.0	39	28	32	16	14	22	11	22	.....
23	48	19	8.0	25	14	65	14	9.5	22	16	22	.....
24	53	19	8.0	53	11	168	53	8.0	14	22	22	.....
25	35	25	9.5	59	16	59	19	8.0	16	19	25	.....
26	19	22	11	48	19	16	16	8.0	86	16	22	.....
27	22	28	14	43	11	11	16	9.5	35	25	.....	.....
28	16	22	16	59	43	22	28	32	28	25	.....	.....
29	16	16	9.5	78	48	78	32	.....	22	25	.....	.....
30	11	14	14	25	86	35	22	.....	14	43	.....	.....
31	16	11	.....	22	.....	22	14	.....	14	.....	.....	.....

NOTE.—Discharge determined from rating curve well defined below 350 million gallons per day. Gage height not recorded on days for which discharge is not given.

Monthly discharge of Waioli stream near Hanalei, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	53	11	25.0	38.7	776	2,380
August	53	11	19.2	29.7	594	1,830
September	16	8.0	10.7	16.6	322	985
October	78	9.5	23.8	36.8	738	2,260
December	310	11	42.7	66.1	1,320	4,060
January	226	7.0	36.8	56.9	1,140	3,500
February	32	8.0	11.6	17.9	324	997
March	86	8.0	27.3	42.2	845	2,600
April	43	9.5	16.3	25.2	490	1,500
May 1–26	179	14	36.8	56.9	956	2,930

WAINIHA RIVER (EAST AND WEST CHANNELS), NEAR WAINIHA, KAUAI.

LOCATION.—Just northeast of Kauai Electric Co.'s power house, 2 miles south of Wainiha.

RECORDS AVAILABLE.—East Channel, February 25, 1912, to December 18, 1916; West Channel, December 30, 1911, to December 18, 1916.

GAGE.—Inclined staff in each channel.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge over each channel.

CHANNEL AND CONTROL.—The river divides a short distance above power house and a station is maintained on each channel to obtain total flow. Fish dams built by the natives at the point where the river divides shift the water from one channel to the other. Control for east channel composed of boulders; fairly permanent; control for west channel composed of boulders; shifting.

EXTREMES OF DISCHARGE.—East channel: Maximum stage recorded during period of record, 15.0 feet December 18, 1916 (discharge, computed from extension of rating curve, approximately 3,000 million gallons per day, or 4,640 second-feet); minimum stage recorded, 6.5 feet August 3–6, 1913 (discharge, 3 million gallons per day, or 4.6 second-feet).

West channel: Maximum stage recorded during period of record, 9.0 feet at 5 p. m. September 26, 1914, and December 18, 1916 (discharge, 1,500 million gallons per day, or 2,320 second-feet); minimum stage recorded, 5.4 feet, frequently (discharge, 53 million gallons per day, or 82 second-feet).

DIVERSIONS.—Water diverted for power development above stations is returned to river again just above station on west channel.

REGULATION.—None except by diversions.

UTILIZATION.—Part of water passing stations is used for irrigation of rice and taro.

ACCURACY.—East channel: Records fair below 500 million gallons per day.

West channel: Records fair below 400 million gallons per day.

Gages read twice daily.

Discharge measurements of east channel of Wainiha River near Wainiha, Kauai, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 26	W. V. Hardy	7.55	59	38
Nov. 24	D. E. Horner	8.09	104	67

Daily discharge, in million gallons, of east channel of Wainiha River near Wainiha, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	236	37	42	42	42	137	16	270	48	37	48	42	164
2	73	92	55	37	37	120	17	345	73	42	48	42	55
3	92	106	42	32	382	79	18	174	164	55	42	420	.....
4	164	99	42	32	450	73	19	48	92	113	155	55	.....
5	48	48	42	59	214	73	20	85	113	52	55	55	.....
6	48	48	42	48	395	55	21	59	73	52	55	740	.....
7	40	155	92	42	510	184	22	48	48	155	55	146	.....
8	37	52	42	.....	282	73	23	40	42	63	48	73	.....
9	37	52	92	55	247	184	24	37	42	48	137	73	.....
10	37	45	55	48	73	73	25	37	42	85	358	79	.....
11	42	37	55	37	358	55	26	37	42	155	73	113	.....
12	42	37	42	32	48	73	27	55	42	73	55	73	.....
13	174	45	42	37	42	63	28	48	42	184	420	214	.....
14	155	128	42	42	42	55	29	37	42	55	120	258	.....
15	68	113	42	42	146	55	30	42	42	42	184	792	.....
							31	37	42	.....	73	.....	.....

NOTE.—Discharge determined from rating curve fairly well defined below 500 million gallons per day. Gage height not recorded Oct. 8.

Monthly discharge of east channel of Wainiha River near Wainiha, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	345	37	86.8	134	2,690	8,260
August	164	37	67.2	104	2,080	6,390
September	184	37	66.0	102	1,980	6,080
November	792	37	215	333	6,440	19,800
December 1–17	184	55	92.4	143	1,570	4,820

The following discharge measurement was made of the west channel of Wainiha River by W. V. Hardy:

July 26, 1916: Gage height, 5.48 feet; discharge, 65 million gallons per day, or 101 second-feet.

Daily discharge, in million gallons, of west channel of Wainiha River near Wainiha, Kauai, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	180	67	67	67	85	166	16	180	85	60	76	85	128
2	105	116	85	60	76	116	17	262	116	67	76	85	85
3	116	128	67	53	245	105	18	152	180	105	67	279	806
4	152	128	67	53	279	105	19	85	128	152	140	105	.....
5	85	85	67	95	152	105	20	116	140	85	95	105	.....
6	85	85	67	85	262	85	21	105	105	85	95	482	.....
7	67	140	116	67	386	140	22	95	85	166	95	152	.....
8	67	85	67	.....	245	105	23	67	67	95	85	105	.....
9	67	85	116	95	196	140	24	67	67	85	128	105	.....
10	67	76	85	76	105	105	25	67	67	128	279	105	.....
11	76	67	85	60	405	85	26	67	67	166	105	128	.....
12	76	67	67	53	85	105	27	95	67	105	85	105	.....
13	152	76	67	60	85	95	28	85	67	166	350	152	.....
14	140	152	67	67	85	85	29	67	67	85	128	196	.....
15	95	152	67	67	128	85	30	76	67	67	212	462	.....
							31	67	67	.....	105	.....	.....

NOTE.—Discharge determined from a rating curve well defined below 400 million gallons per day. Gage height not recorded Oct. 8.

Monthly discharge of west channel of Wainiha River near Wainiha, Kauai, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	262	67	103	159	3,180	9,800
August	180	67	95.2	147	2,950	9,060
September	166	60	92.5	143	2,770	8,520
November	482	76	182	282	5,470	16,800
December 1–18	806	85	147	227	2,650	8,120

Miscellaneous measurements on Kauai for the year ending June 30, 1917.

Date.	Stream.	Locality.	Gage height (feet).	Discharge.	
				Second-feet.	Million gallons per day.
July 26	Wainiha River	50 feet below diversion dam at intake of Kauai Electric Co.'s ditch.		9.4	6.1
Aug. 3	Tributary	Discharges into Anahola ditch 1.6 miles below intake.		3.0	1.9
3	do	Discharges into Anahola ditch 2.0 miles below intake.		1.1	.7
3	Anahola ditch	Intake, near Kealia		10.2	6.6
3	do	Flume, 1.6 miles below intake		10.2	6.6
3	do	2.5 miles below intake		11.6	7.5
Apr. 24	Opaikaa	One-fourth mile above falls, near Kapaa		13.9	9.0
Sept. 3	Mohihi	Elevation 3,300 feet, near Waimea	3.69	1.9	1.2
Dec. 9	do	do	4.14	13.4	8.6
Feb. 1	do	do	4.08	9.3	6.0
Apr. 3	do	do	4.12	11.3	7.3
Sept. 2	Waiakoali	Elevation 3,400 feet, near Waimea	1.26	1.3	8.5
Dec. 9	do	do	1.70	9.3	6.0
July 25	Wainiha Canal	Intake	4.10	79	51
Sept. 5	do	do	3.77	75	49
Oct. 22	do	do	4.72	89	57
23	do	do	4.70	91	59
28	do	do	4.83	90	58
29	do	do	4.85	90	58
Aug. 31	Kauaikanana	Elevation, 3,300 feet, near Waimea	.34	.9	.6
Dec. 5	do	do	.82	3.6	2.3
8	do	do	1.12	6.8	4.4
Nov. 6	Kaholalele ditch	About 1,500 feet below intake, near Lihue	1.29	4.5	2.9
Dec. 22	do	do	.96	1.8	1.2
23	do	do	.60	.75	.5
Jan. 19	do	do	1.15	3.8	2.5

ISLAND OF OAHU.

KALIHI STREAM NEAR HONOLULU, OAHU.

LOCATION.—At Kioi pool, about three-eighths 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 8, 1913, to June 30, 1917.

GAGE.—Gurley weight-driven water-stage recorder installed December 4, 1913. Friez recorder in use September 8 to November 22, 1913.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 500 feet above gage.

CHANNEL AND CONTROL.—Water drops over a 10-foot fall into pool at gage. Channel in solid rock, with steep, high banks; two channels at stage of 6.0 feet and over. The high-water control is solid rock, but gravelsometimes collects in the low-water control and affects the stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 12.5 feet at 1 a. m. March 19, 1917 (discharge, approximately 400 million gallons per day, or 619 second-feet); minimum stage recorded, 2.50 feet November 1, 1913 (discharge, 0.5 million gallons per day, or 0.8 second-feet).

Minimum stage recorded during year, 2.2 feet October, February, and March (discharge, 1.0 million gallons per day, or 1.55 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Records good for all stages, as sufficient current-meter measurements were made to give well-defined curves covering the periods between changes in control.

Discharge measurements of Kalihi Stream near Honolulu, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Sept. 22	H. A. R. Austin	2.48	4.24	2.7
Nov. 29	do	2.74	8.74	5.6
Jan. 31	do	2.43	4.24	2.7
Mar. 13	do	3.06	11	7.1
Apr. 4	R. D. Klise	3.06	6.22	4.0
26	do	2.57	3.64	2.4
May 17	H. A. R. Austin	2.58	4.0	2.6
June 7	do	3.03	3.3	2.1
27	do	2.91	2.56	1.7

Daily discharge, in million gallons, of Kalihi Stream near Honolulu, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1.9	3.0	2.2	1.6	3.0	3.5	4.6	2.2	1.0	4.6	7.0	4.6
2	1.9	7.6	3.0	1.6	2.6	39	4.0	2.2	1.0	4.6	4.6	3.0
3	4.6	4.0	1.9	1.6	2.2	7.6	5.8	2.2	1.3	4.0	8.3	3.0
4	4.0	6.4	1.9	1.3	9.7	21	4.6	1.9	2.6	3.5	9.0	2.6
5	2.6	3.0	1.6	1.3	8.3	7.6	8.3	1.9	1.6	5.8	3.5	2.6
6	1.9	3.5	1.6	5.2	7.6	10	4.0	2.6	1.9	3.5	3.0	2.6
7	1.9	5.8	2.2	1.9	7.6	21	3.5	1.9	1.3	3.0	2.6	2.2
8	1.6	4.6	1.6	1.6	4.0	8.3	3.0	1.6	1.0	3.0	2.2	2.2
9	1.6	4.0	1.6	4.0	3.5	6.4	4.0	1.6	23	5.8	2.2	5.2
10	1.6	3.5	1.6	1.9	7.6	6.4	54	1.6	3.5	3.0	2.2	2.6
11	1.9	2.6	1.3	1.3	5.2	4.6	6.4	1.3	10	11	2.2	2.6
12	1.9	2.6	2.2	1.3	3.0	4.6	4.0	1.3	58	5.2	1.9	2.2
13	1.9	2.2	1.9	1.3	3.0	6.4	3.5	4.6	11	3.5	1.9	1.9
14	1.6	5.8	1.3	1.0	2.6	4.6	3.0	3.5	32	3.0	4.6	1.9
15	1.6	5.2	1.3	1.6	5.8	4.0	2.6	1.9	22	3.0	2.2	7.0
16	5.8	4.0	1.6	1.3	3.0	3.5	7.0	1.6	9.7	4.6	1.9	13
17	18	4.0	1.6	1.3	16	11	6.4	1.6	9.0	3.5	1.9	3.0
18	4.0	3.0	1.3	2.2	38	16	3.0	2.6	8.3	3.0	17	4.0
19	3.0	3.5	1.6	2.6	5.8	17	14	1.6	68	2.6	21	2.6
20	2.6	3.0	1.3	1.9	4.0	6.4	14	1.6	68	2.6	5.8	2.2
21	2.6	3.5	1.6	1.6	3.5	5.2	5.2	1.3	13	3.5	3.5	2.2
22	2.2	2.6	1.9	1.3	3.0	4.6	4.0	1.3	8.3	3.5	3.0	2.2
23	1.9	2.2	1.3	3.5	3.0	12	3.5	1.3	7.0	7.6	3.0	1.9
24	1.9	3.5	2.2	1.9	3.0	10	9.0	1.0	8.3	3.5	2.6	1.9
25	1.9	2.2	2.2	2.2	3.0	4.6	3.5	1.0	15	2.2	2.2	1.9
26	1.9	2.2	5.8	1.9	9.0	4.0	19	1.0	10	2.2	2.6	1.6
27	2.2	2.2	5.2	5.8	3.0	16	4.6	1.0	6.4	1.9	2.2	1.6
28	2.2	2.2	3.0	24	10	26	3.5	1.0	5.8	18	4.6	1.6
29	1.9	1.9	2.2	10	6.4	16	3.0	.....	3.5	38	2.6	1.6
30	1.9	1.9	1.6	9.0	5.2	5.8	2.6	.....	5.2	10	10	1.6
31	3.0	2.2	.....	4.0	.....	4.6	2.6	.....	4.6	.....	9.7	.....

NOTE.—Discharge determined from well-defined rating curves applicable; July 1 to Mar. 12, Mar. 13–20, Mar. 21 to Apr. 26, Apr. 27 to May 19, and May 20 to June 30.

Monthly discharge of Kalihi Stream near Honolulu, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	18	1.6	2.89	4.47	90	275
August	7.6	1.9	3.48	5.38	108	331
September	5.8	1.3	2.05	3.17	62	189
October	24	1.0	3.32	5.14	103	316
November	38	2.2	6.39	9.89	192	588
December	39	3.5	10.2	15.8	318	970
January	54	2.6	7.10	11.0	220	675
February	4.6	1.0	1.79	2.77	50	154
March	68	1.0	13.6	21.0	421	1,290
April	38	1.9	5.77	8.93	173	531
May	21	1.9	4.87	7.54	151	463
June	13	1.6	2.97	4.60	89	273
The year	68	1.0	5.41	8.37	1,980	6,060

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 June 30, 1917.

GAGE.—Inclined staff on right bank.

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 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, but original dimensions were maintained.

CHANNEL AND CONTROL.—Channel in solid rock; straight for about 75 feet above and below weir; banks high and covered with vegetation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 6.0 feet at 4 p. m. April 5, 1914 (no estimate of discharge possible, as entire weir was overflowed); minimum stage recorded, 0.10 foot in November. 1913, September, 1915, July and August, 1916 (discharge, 0.15 million gallon per day, or 0.25 second-foot).

DIVERSIONS.—Most of the flow at low and medium stages is diverted above station for domestic supply and for power development. An irrigation ditch diverts low-water discharge at point 300 feet below station.

REGULATION.—Amount diverted above station varies.

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

ACCURACY.—Records good below 4 million gallons per day, but only fair for larger flow owing to varying velocity of approach and uncertainties resulting from use of compound weir.

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Daily discharge, in million gallons, of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1.1	3.4	1.3	0.9	4.0	3.4	5.6	4.3	2.0	7.6	20	10
2	1.1	11	1.1	.75	1.8	28	5.6	4.3	1.8	7.6	18	5.6
3	2.3	4.0	1.1	.75	1.5	4.3	4.0	4.3	4.3	7.6	11	5.6
4	3.7	6.5	1.1	.75	4.3	34	6.5	4.3	4.3	7.6	7.6	6.5
5	3.4	3.4	1.1	.55	15	2.5	5.6	4.3	3.7	10	8.9	7.6
6	1.8	3.4	1.1	1.1	4.8	2.0	5.6	4.3	3.4	8.9	10	7.6
7	1.3	3.7	2.0	.9	3.7	18	4.8	4.3	2.5	7.6	8.9	5.6
8	1.1	3.4	.4	.75	4.0	5.6	3.7	4.3	2.0	6.5	7.6	24
9	1.1	3.4	.4	.75	3.4	4.8	3.7	4.3	5.6	7.6	6.5	15
10	.9	4.0	.4	.75	5.6	2.0	62	4.3	3.7	6.5	6.5	11
11	.55	3.4	.4	.55	3.7	1.8	6.5	4.3	3.1	28	5.6	8.9
12	.15	1.3	.4	.55	1.8	2.3	6.5	6.5	18	10	5.6	7.6
13	.4	.15	.4	.55	1.5	2.0	6.5	7.6	7.6	7.6	5.6	6.5
14	.4	1.5	.4	.55	1.5	4.0	6.5	4.3	32	7.6	16	8.9
15	.4	4.0	.4	.9	1.5	3.7	5.6	4.3	13	15	7.6	6.5
16	4.0	3.1	.4	.9	.....	3.7	4.8	4.0	8.9	16	5.6	16
17	4.8	3.7	.4	.9	6.5	4.3	4.8	4.0	6.5	10	5.6	10
18	2.8	3.1	.4	1.8	32	26	4.8	4.0	10	5.6	16	15
19	1.1	2.5	.4	1.3	4.0	26	4.8	3.1	.....	5.6	.....	6.5
20	1.5	2.3	.4	.9	3.1	5.6	32	2.8	26	5.6	13	5.6
21	1.3	2.0	.55	.75	3.1	4.8	7.6	2.8	8.9	4.8	8.9	4.8
22	1.3	.75	.55	.75	2.8	5.6	5.6	2.8	15	15	7.6	4.3
23	1.1	.9	.55	1.1	2.5	7.6	4.8	2.5	18	6.5	5.6	4.3
24	1.3	.75	.55	1.1	2.5	10	4.8	2.5	24	6.5	5.6	4.3
25	1.3	.9	.9	1.1	2.3	5.6	5.6	2.0	37	4.8	5.6	4.3
26	1.3	.9	7.6	.4	3.4	4.8	28	2.0	28	4.8	5.6	4.3
27	2.0	1.1	4.3	3.7	3.1	22	5.6	2.0	18	4.8	4.8	4.3
28	1.1	1.1	.9	24	20	32	6.5	2.0	11	34	4.3	4.3
29	1.3	1.3	.9	16	22	13	4.8	.....	10	104	4.8	4.0
30	2.5	1.3	.75	6.5	5.6	8.9	4.8	.....	8.9	22	48	4.0
31	3.4	1.5	.....	4.0	.....	6.5	.....	.....	7.6	.....	30	.....

NOTE.—Weir undergoing repairs Nov. 16; gage height not recorded Mar. 19 and May 19.

Monthly discharge of Nuuanu Stream below reservoir No. 2 wasteway, near Honolulu, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	4.8	0.15	1.67	2.58	52	159
August	11	.15	2.70	4.18	84	257
September	7.6	.4	1.05	1.62	32	97
October	24	.4	2.46	3.81	76	234
December	34	1.8	9.83	15.2	305	935
January 1–30	62	3.7	8.93	13.8	268	822
February	7.6	2.0	3.80	5.88	106	327
April	104	4.8	13.2	20.4	396	1,220
June	24	4.0	7.76	12.0	233	714

MANOA STREAM AT COLLEGE OF HAWAII, NEAR HONOLULU, OAHU.

LOCATION.—In gorge about half a mile southeast of College of Hawaii and 3 miles east of Honolulu post office.

RECORDS AVAILABLE.—March 23, 1909, to November 24, 1910; November 1, 1912, to April 26, 1913; September 10, 1913, to June 30, 1917.

GAGE.—Vertical staff on left bank. The weir used during 1909 and 1910 was destroyed by flood of November 24, 1910. Several changes in gage datum previous to 1912.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel straight and confined in the vicinity of station; stream bed composed of rock; clean and fairly permanent; left bank composed of rock nearly vertical; right bank slopes gently and is covered with vegetation.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 6.1 feet from high-water mark of flood March 19, 1917 (discharge, from extension of rating curve, 260 million gallons per day, or 402 second-feet); minimum daily discharge, March, 1914 (0.2 million gallons per day, or 0.3 second-foot).

Minimum stage recorded during year, 0.7 foot June 28–30 (discharge, 0.8 million gallons per day, or 1.2 second-feet).

DIVERSIONS.—Nearly all the low water flow is diverted above and below the station for irrigation.

REGULATION.—None.

UTILIZATION.—Records show water available for storage at this reservoir site; the low-water flow of the stream is extensively used for irrigation of rice and taro in upper and lower Manoa Valley.

ACCURACY.—Gage read twice daily. Records good for low and medium stages, but may be considerably in error for high and fluctuating stages.

COOPERATION.—Gage-height record furnished by College of Hawaii.

Discharge measurements of Manoa Stream at College of Hawaii, near Honolulu, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 29	H. A. R. Austin	1.28	5.35	3.5
Jan. 11	do	1.78	15.3	9.9
Mar. 8	College of Hawaii	.96	2.10	1.4
23	do	1.70	21.9	14
Apr. 30	H. A. R. Austin	1.74	18.5	12
May 14	do	1.85	22.1	14
14	do	1.72	17.4	11
June 30	do	.71	1.2	.8

Daily discharge, in million gallons, of Manoa Stream at College of Hawaii, near Honolulu, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	7.4	15	5.8	4.6	4.1	24	8.3	5.2	2.6	6.0	10	8.4
2	5.8	20	13	4.6	4.6	36	8.3	4.1	2.2	6.0	10	3.4
3	8.3	20	5.2	2.6	4.6	23	9.2	3.6	2.6	5.3	12	3.4
4	17	56	4.1	1.8	18	58	7.4	3.1	3.1	5.3	9.2	4.0
5	7.4	26	2.6	3.6	17	18	7.4	2.6	2.6	5.3	7.6	3.4
6	7.4	17	3.6	3.1	23	20	6.6	1.8	2.6	4.6	7.6	4.6
7	5.8	13	13	3.6	12	23	4.6	1.5	2.6	4.6	6.8	4.0
8	5.2	8.3	3.6	2.6	11	17	3.1	2.6	6.6	4.6	4.6	3.4
9	4.6	7.4	4.6	2.6	13	15	2.6	2.2	2.2	4.6	1.6	4.0
10	4.1	11	3.6	2.6	11	17	78	1.8	1.8	4.0	1.6	3.4
11	4.6	11	2.6	2.6	10	13	15	1.8	1.8	26	1.6	4.6
12	4.6	5.2	2.6	2.2	8.3	8.3	7.4	2.6	16	21	2.4	4.6
13	10	5.8	3.6	1.8	6.6	10	5.8	2.6	11	15	4.0	4.6
14	6.6	32	3.1	1.5	5.8	11	4.1	3.1	20	10	2.9	4.6
15	5.8	20	2.6	1.5	6.6	7.4	3.1	3.1	23	7.6	2.0	4.0
16	50	13	2.6	1.5	9.2	7.4	32	1.8	16	4.0	1.6	3.4
17	20	12	2.6	2.6	5.2	32	23	2.6	15	3.4	4.6	3.4
18	23	13	3.1	3.6	7.4	42	13	2.6	38	2.9	7.6	3.4
19	36	17	6.6	6.6	26	28	13	15	101	3.4	6.0	2.9
20	8.3	16	5.2	5.2	10	22	34	8.3	57	3.4	8.4	2.9
21	5.8	23	4.6	4.1	11	16	17	4.6	33	4.0	7.6	2.4
22	5.8	10	7.4	4.1	8.3	32	11	3.1	15	6.8	5.3	1.4
23	5.2	7.4	4.6	3.6	5.8	23	8.3	2.6	13	7.6	4.6	1.4
24	4.6	6.6	5.2	3.1	4.6	16	5.2	2.6	12	10	4.6	1.1
25	4.6	5.8	7.4	9.2	5.8	11	2.6	2.2	11	9.2	3.4	1.0
26	5.2	5.8	24	4.6	5.8	8.3	23	1.8	20	7.6	3.4	1.0
27	4.6	5.2	11	4.6	4.6	40	22	1.8	15	7.6	3.4	.9
28	4.1	5.2	7.4	20	13	82	12	1.8	18	6.8	3.4	.8
29	4.6	5.2	5.2	8.3	6.6	13	8.3	.....	22	6.0	3.4	.8
30	4.6	7.4	3.6	23	5.8	11	6.6	.....	10	6.0	13	.8
31	32	4.6	.....	6.6	.....	9.2	5.8	.....	7.6	.....	15	.....

NOTE.—Discharge determined from rating curves well defined below 20 million gallons per day, applicable: July 1 to Mar. 19 and Mar. 20 to June 30.

Monthly discharge of Manoa Stream at College of Hawaii, near Honolulu, Oahu, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	50	4.1	10.4	16.1	323	989
August	56	4.6	13.7	21.2	425	1,300
September	24	2.6	5.80	8.97	174	534
October	23	1.5	4.90	7.58	152	466
November	26	4.1	9.49	14.7	285	874
December	82	7.4	22.4	34.7	694	2,130
January	78	2.6	13.2	20.4	408	1,260
February	15	1.5	3.30	5.11	92	284
March	101	1.8	16.3	25.2	504	1,550
April	26	2.9	7.29	11.3	219	671
May	15	1.6	5.78	8.94	179	550
June	8.4	.8	3.07	4.75	92	283
The year	101	.8	9.72	15.0	3,550	10,900

WEST BRANCH OF MANOA STREAM NEAR HONOLULU, OAHU.

LOCATION.—At diversion dam at R. W. Shingle's bungalow, 300 feet above highway bridge, about one-eighth mile above confluence with East Branch of Manoa stream, 4 miles northeast of Honolulu post office.

RECORDS AVAILABLE.—May 29, 1913, to June 30, 1917.

GAGE.—Watson water-stage recorder in use June 17 to October 20, 1914; replaced October 20, 1914, by a Friez water-stage recorder, which was replaced May 9, 1915, by a Stevens 8-day water-stage recorder; all at same site and datum. Vertical staff gage (at different datum) 150 feet upstream from highway bridge, about 25 feet above a small irrigation ditch diverting from right bank, read from May 29, 1913, to June 16, 1914.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Small masonry diversion dam with wide, rounded crest acts as control and forms a large, quiet pool in the vicinity of the gage for low and medium stages. Leaves and small débris lodge on control and growth of grass on sides at times affects the stage-discharge relation slightly. Channel clean and stream confined in the vicinity of the gage. A short distance upstream the natural slope is steep and the channel is filled with boulders.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 4.65 feet 12.15 a. m. March 20, 1917 (discharge, 200 million gallons per day, or 309 second-feet); minimum stage recorded, December, 1913 (discharge, 0.05 million gallons per day, or 0.08 second-foot).

Minimum stage recorded during year, 1.0 foot August 12 and 25–27 (discharge, 0.3 million gallons per day, or 0.46 second-foot).

DIVERSIONS.—None above station.

REGULATION.—At low water pool at gage is lowered slightly for short periods by the operation of a small hydraulic ram used for pumping water for domestic use and also for filling a swimming pool.

UTILIZATION.—Records on West and East Branches of Manoa stream together show amount of surface water available in upper Manoa Valley above nearly all diversions. Practically the entire low water flow of Manoa stream is utilized at lower elevations in Manoa Valley for rice and taro irrigation.

ACCURACY.—Records good except for extreme low-water periods, when regulation at control and lack of sensitiveness of control section prevented refined accuracy of low-water estimates.

Discharge measurements of West Branch of Manoa Stream near Honolulu, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 29	H. A. R. Austin	1.09	1.75	1.1
Jan. 10	do	1.51	17.8	11
Mar. 14	R. C. Rice	1.28	7.99	5.2
Apr. 30	H. A. R. Austin	1.19	5.23	3.4

Daily discharge, in million gallons, of West Branch of Manoa Stream near Honolulu, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	2.3	3.2	1.4	1.4	1.4	5.6	3.2	1.4	1.4	3.2	5.6	3.2
2	1.4	6.9	3.2	1.4	1.4	19	3.2	.6	1.4	3.2	4.4	1.4
3	5.6	2.3	1.4	1.4	1.4	14	3.2	.6	2.3	3.2	2.3	1.4
4	2.3	4.4	.6	1.4	6.9	12	4.4	.6	3.2	2.3	2.3	1.4
5	1.4	.6	.6	1.4	6.9	5.6	5.6	.6	2.3	3.2	2.3	1.4
6	1.4	1.4	.6	3.2	6.9	4.4	2.3	1.4	2.3	2.3	1.4	3.2
7	.6	1.4	3.2	2.3	4.4	6.9	1.4	1.4	2.3	1.4	2.3	2.3
8	.6	.6	1.4	1.4	5.6	4.4	1.4	1.4	1.4	1.4	1.4	4.4
9	.6	.6	1.4	2.3	4.4	3.2	1.4	.6	1.4	2.3	1.4	12
10	.6	1.4	.6	1.4	4.4	3.2	11	.6	1.4	1.4	1.4	3.2
11	.6	.6	.6	1.4	5.6	2.3	3.2	.6	4.4	8.2	1.4	5.6
12	1.4	.3	2.3	1.4	3.2	2.3	2.3	.6	8.2	3.2	1.4	2.3
13	2.3	.6	1.4	1.4	3.2	3.2	2.3	2.3	4.4	2.3	1.4	1.4
14	1.4	5.6	.6	1.4	3.2	2.3	1.4	1.4	9.6	2.3	4.4	2.3
15	1.4	5.6	.6	1.4	4.4	2.3	1.4	.6	6.9	1.4	2.3	2.3
16	6.9	1.4	.6	1.4	3.2	2.3	2.3	.6	4.4	2.3	1.4	1.4
17	8.2	3.2	.6	1.4	11	5.6	2.3	.6	3.2	2.3	2.3	1.4
18	3.2	1.4	.6	1.4	11	9.6	1.4	1.4	2.3	1.4	5.6	2.3
19	2.3	2.3	3.2	1.4	4.4	14	4.3	1.4	14	1.4	11	1.4
20	1.4	2.3	.6	1.4	3.2	5.6	6.9	1.4	21	1.4	5.6	.6
21	1.4	2.3	1.4	1.4	3.2	3.2	2.3	.6	5.6	1.4	3.2	.6
22	1.4	.6	1.4	1.4	3.2	4.4	2.3	.6	3.2	5.6	2.3	.6
23	.6	.6	1.4	2.3	3.2	4.4	2.3	.6	3.2	6.9	3.2	.6
24	.6	.6	1.4	3.2	3.2	8.2	2.3	.6	3.2	3.2	2.3	.6
25	1.4	.3	2.3	2.3	17	3.2	2.3	.6	6.9	2.3	2.3	.6
26	.6	.3	6.9	3.2	8.2	3.2	12	.6	5.6	1.4	2.3	.6
27	1.4	.3	4.4	6.9	4.4	11	3.2	.6	3.2	1.4	2.3	.6
28	1.4	.6	2.3	6.9	9.6	11	1.4	.6	4.4	5.6	2.3	1.4
29	.6	1.4	2.3	5.6	6.9	8.2	1.4	.....	6.9	9.6	2.3	1.4
30	2.3	1.4	1.4	4.4	4.4	4.4	1.4	.....	3.2	3.2	6.9	1.4
31	4.4	2.3	.....	2.3	.....	4.4	1.4	.....	3.2	.....	5.6	.....

NOTE.—Discharge determined from rating curve well defined below 20 million gallons. Discharge Sept. 9–10 and Oct. 15–21 determined by comparison with records of flow of East Branch.

Monthly discharge of West Branch of Manoa Stream near Honolulu, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	8.2	0.6	2.00	3.09	62	190
August	6.9	.3	1.83	2.83	57	174
September	6.9	.6	1.69	2.61	51	156
October	6.9	1.4	2.31	3.57	72	220
November	17	1.4	5.31	8.22	159	489
December	19	2.3	6.24	9.65	193	594
January	12	1.4	3.14	4.86	97	299
February	2.3	.6	.89	1.38	25	76
March	21	1.4	4.72	7.30	146	449
April	9.6	1.4	3.02	4.67	91	278
May	11	1.4	3.12	4.83	97	297
June	12	.6	2.11	3.26	63	194
The year	21	.3	3.05	4.72	1,110	3,420

EAST BRANCH OF MANOA STREAM NEAR HONOLULU, OAHU.

LOCATION.—At highway bridge 400 feet above confluence with West Branch of Manoa stream, in upper Manoa Valley, and 4 miles northeast of Honolulu post office From May 29, 1913, to May 19, 1914, station was 200 feet upstream from bridge.

RECORDS AVAILABLE.—May 29, 1913, to June 30, 1917.

GAGE.—Stevens 8-day water-stage recorder. Watson water-stage recorder from May 29, 1913, to September 28, 1914. Vertical staff gage 200 feet upstream on right bank at different datum was read from May 29, 1913, to May 19, 1914.

DISCHARGE MEASUREMENTS.—Made by wading for low and ordinary high-water stages; flood measurements may be made from highway bridge.

CHANNEL AND CONTROL.—Channel steep just above gage, but slope is reduced for 30 feet past gage to control, which is a riffle of small boulders and gravel, and control shifts considerably. At low and medium stages stream past gage is fairly wide and deep and velocity is well distributed. Banks are fairly steep and covered with vegetation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.2 feet at 4 p. m. March 19, 1917 (discharge, from extension of rating curve, 400 million gallons per day, or 619 second-feet); minimum daily discharge, March, 1914, 0.9 million gallons per day, or 1.4 second-feet.

Minimum stage recorded during year, 1.3 feet March 5–9 (discharge, 1 million gallons per day, or 1.55 second-feet).

DIVERSIONS.—East Manoa ditch diverts a quarter of a mile above station for irrigation.

REGULATION.—None.

UTILIZATION.—Records on East and West branches of Manoa stream together show amount of surface water available in upper Manoa Valley above nearly all diversions. Practically the entire low-water flow of Manoa stream is utilized at lower elevations in Manoa Valley for irrigation of rice and taro.

ACCURACY.—Rating curves well defined. Gage-height record continuous. Records good for all stages.

Discharge measurements of East Branch of Manoa Stream near Honolulu, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 13	H. A. R. Austin	1.54	5.22	3.4
Aug. 29	.....do	1.43	3.16	2.0
Sept. 29	.....do	1.50	4.50	2.9
Dec. 4	.....do	1.75	10.1	6.5
Jan. 10	.....do	2.32	41	26
Feb. 23	.....do	1.38	2.45	1.6
Mar. 14	R. C. Rice	1.54	5.29	3.4
19	.....do	1.99	17.2	11
May 14	H. A. R. Austin	1.71	8.0	5.2
June 13	.....do	1.53	3.96	2.6
21	.....do	1.47	2.67	1.7

Daily discharge, in million gallons, of East Branch of Manoa Stream near Honolulu, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	2.4	4.5	2.4	3.0	2.4	3.0	2.4	2.4	1.4	3.5	5.0	2.8
2	2.4	6.2	3.8	2.4	2.4	15	2.4	1.8	1.4	3.5	5.9	2.2
3	9.4	4.5	1.8	2.4	2.4	14	2.4	1.8	1.4	3.5	4.2	2.2
4	5.4	8.2	1.8	1.8	5.4	14	2.4	1.4	1.4	2.8	3.5	2.2
5	3.8	4.5	1.8	1.8	3.8	5.4	3.0	1.4	1.0	2.8	3.5	2.2
6	3.0	7.2	1.8	2.4	3.8	4.5	2.4	1.4	1.0	2.8	3.5	2.8
7	3.0	4.5	3.0	1.8	3.0	6.2	1.8	1.4	1.0	2.2	3.5	2.8
8	3.0	3.8	1.8	1.8	3.0	3.8	1.8	1.4	1.0	2.2	2.8	4 2
9	2.4	3.8	1.8	2.4	2.4	3.0	1.8	1.4	1.0	2.8	2.8	5.9
10	2.4	3.8	1.4	1.8	2.4	3.0	17	1.4	1.4	2.2	2.2	2.8
11	3.0	3.8	1.4	1.8	3.0	3.0	3.8	1.4	3.0	6.8	2.2	4.2
12	2.4	3.0	2.4	1.8	2.4	3.0	3.0	1.4	3.0	3.5	2.2	2.8
13	3.0	3.0	1.4	1.8	2.4	4.5	2.4	3.0	3.0	2.8	2.2	2.8
14	2.4	8.2	1.4	1.8	2.4	3.0	2.4	1.8	6.2	2.2	3.5	2.2
15	2.4	9.4	1.4	1.8	3.0	3.0	2.4	1.4	5.4	1.7	2.2	2.2
16	7.2	4.5	1.4	1.8	2.4	2.4	3.0	1.4	3.8	1.7	2.2	2.2
17	8.2	5.4	1.4	2.4	6.2	4.5	2.4	1.4	3.0	1.7	2.2	2.2
18	4.5	3.8	1.4	2.4	8.2	6.2	1.8	1.8	3.0	1.7	3.5	2.2
19	4.5	5.4	2.4	2.4	3.0	8.2	3.0	1.8	15	1.7	5.0	2.2
20	3.8	4.5	1.4	2.4	2.4	3.8	6.2	1.8	14	1.2	2.8	1.7
21	3.8	6.2	1.8	2.4	2.4	3.0	3.0	1.8	5.0	1.7	2.2	1.7
22	3.0	3.8	2.4	2.4	1.8	3.8	1.8	1.4	3.5	3.5	2.2	1.7
23	2.4	3.8	1.4	2.4	1.8	3.8	1.8	1.4	3.5	3.5	2.2	1.7
24	2.4	3.8	1.4	3.0	1.8	5.4	2.4	1.4	3.5	2.2	2.2	1.7
25	3.0	3.0	1.8	2.4	1.8	3.0	1.8	1.4	5.0	1.7	2.2	1.7
26	3.0	3.0	5.4	2.4	4.5	2.4	14	1.4	4.2	1.7	2.2	1.7
27	3.0	3.0	3.8	4.5	2.4	5.4	4.5	1.4	3.5	1.7	1.7	1.7
28	3.8	3.0	3.8	5.4	6.2	9.4	3.0	1.4	4.2	5.9	2.2	1.7
29	3.0	2.4	3.0	3.0	3.0	5.4	3.0	.....	5.0	11	2.2	1.7
30	3.0	2.4	3.0	2.4	3.0	3.0	2.4	.....	3.5	3.5	5.0	1.7
31	6.2	3.0	.....	2.4	.....	3.0	2.4	.....	4.2	.....	3.5	.....

NOTE.—Discharge determined from well-defined rating curves applicable July 1 to Mar. 19 and Mar. 20 to June 30. Discharge Jan. 7–13 determined by comparison with records of flow of West Branch.

Monthly discharge of East Branch of Manoa Stream near Honolulu, Oahu, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	9.4	2.4	3.72	5.76	115	354
August	9.4	2.4	4.50	6.96	139	428
September	5.4	1.4	2.17	3.36	65	200
October	5.4	1.8	2.41	3.73	75	229
November	8.2	1.8	3.17	4.90	95	292
December	15	2.4	5.20	8.05	161	495
January	17	1.8	3.48	5.38	108	331
February	3.0	1.4	1.59	2.46	45	137
March	15	1.0	3.76	5.82	116	358
April	11	1.2	2.99	4.63	90	275
May	5.9	1.7	2.99	4.63	93	284
June	5.9	1.7	2.39	3.70	72	220
The year	17	1.0	3.22	4.98	1,170	3,600

MAKAWAO SPRING NEAR KAILUA, OAHU.

LOCATION.—Fifteen feet above flume joining Makawao ditch, three-fourths of a mile south of Maunawili ranch, and about 3 miles south of Kailua.

RECORDS AVAILABLE.—February 12, 1914, to November 30, 1916.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made by a 1-foot sharp-crested wier with end contractions.

CHANNEL AND CONTROL.—Water emerges from ground directly into pool back of weir.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, January 1–31, 1916 (discharge, 0.5 million gallons per day, or 0.77 second-foot); minimum stage recorded, 0.29 foot frequently (discharge, 0.32 million gallons per day, or 0.50 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane by Waimanalo Sugar Co.

ACCURACY.—Gage read once daily. Flow steady and conditions at weir good. Records good.

Monthly discharge of Makawao Spring near Kailua, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	0.35	0.32	0.33	0.51	10	31
August	.34	.34	.34	.53	11	32
September	.34	.34	.34	.53	10	31
October	.32	.32	.32	.50	10	30
November	.32	.32	.32	.50	10	29
The period					51	153

MAIN SPRING NEAR KAILUA, OAHU.

LOCATION.—At head of Makawao ditch, 1 mile south of Maunawili ranch, and about 3 miles south of Kailua.

RECORDS AVAILABLE.—February 12, 1914, to November 30, 1916.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made by a 1-foot sharp-crested wier with end contractions.

CHANNEL AND CONTROL.—Water emerges from ground directly into pool back of weir.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 0.60 foot January 1–31, 1916 (discharge, 0.88 million gallons per day, or 1.36 second-feet); minimum stage recorded, 0.39 foot March 17–28, 1914 (discharge, 0.48 million gallons per day, or 0.74 second-foot).

DIVERSIONS.—None.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane by Waimanalo Sugar Co.

ACCURACY.—Gage read once daily. Records fair. There is a small amount of seepage around weir and a velocity of approach of about 0.4 foot per second.

Monthly discharge of main spring near Kailua, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	0.78	0.70	0.74	1.14	23	70
August	.72	.67	.69	1.07	21	66
September	.67	.67	.67	1.04	20	62
October	.63	.63	.63	.97	20	60
November	.63	.63	.63	.97	19	58
The period					103	316

HAIKU STREAM NEAR HEEIA, OAHU.

LOCATION.—Sixty feet above intake of reservoir ditch, 1½ miles west of Heeia.

RECORDS AVAILABLE.—January 29, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder installed April 28, 1914, at same location and datum as staff gage; original staff-gage datum was raised 0.88 foot March 29, 1914.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 20 feet above and 40 feet below station; banks steep and high; stream bed of solid rock. Control is smooth, solid-rock ledge; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 6.5 feet at 1 a. m. March 20, 1917 (estimated discharge, 250 million gallons per day, or 390 second-feet); minimum stage recorded, 0.6 foot July 16, 1916, and February 9–12, 1917 (discharge, 1.4 million gallons per day, or 2.2 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Low flow diverted below station for domestic supply and for irrigation of taro and rice.

ACCURACY.—Rating curves are well defined for low and medium stages; records good. High-water extension of rating curve not based on measurements, and determinations above 16 million gallons per day may be considerably in error.

Discharge measurements of Haiku Stream near Heeia, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Mar. 2	H. A. R. Austin	0.69	2.80	18
Apr. 30	.....do	.81	5.14	3.3

Daily discharge, in million gallons, of Haiku Stream near Heeia, Oahu, for the year ending June 30, 1917.

Date.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.0	2.4	3.0	2.4	2.4	2.4	2.4	2.4	2.1	2.1	2.6	2.1
2	3.0	3.0	3.0	2.4	2.4	5.0	2.4	2.4	2.1	2.1	3.9	2.1
3	3.0	3.0	3.0	2.4	2.4	5.7	2.4	2.4	2.1	2.1	2.6	2.1
4	3.0	3.0	3.0	2.4	3.6	5.7	2.4	2.4	2.1	2.1	2.6	2.1
5	3.0	2.4	3.0	2.4	3.0	3.0	2.4	1.9	2.1	2.1	2.6	2.6
6	2.4	3.0	2.4	2.4	2.4	3.0	2.4	3.0	2.1	2.1	2.1	2.1
7	2.4	3.0	2.4	2.4	3.0	6.4	2.4	1.9	2.1	2.1	2.1	2.1
8	2.4	3.0	2.4	2.4	2.4	3.0	2.4	1.9	2.1	2.1	2.1	2.1
9	3.0	2.4	2.4	2.4	2.4	3.0	3.0	1.4	11	2.1	2.1	2.1
10	2.4	2.4	2.4	2.4	2.4	2.4	14	1.4	5.3	2.1	2.6	2.1
11	3.0	2.4	2.4	2.4	2.4	2.4	3.6	1.4	2.1	3.2	2.6	2.1
12	2.4	2.4	2.4	1.9	2.4	2.4	2.4	1.4	22	2.1	2.6	2.1
13	2.4	2.4	2.4	1.9	2.4	2.4	2.4	3.0	3.9	2.1	2.6	2.1
14	1.9	3.0	2.4	1.9	2.4	2.4	2.4	2.4	7.6	2.1	3.2	2.6
15	1.9	3.0	3.0	1.9	3.0	2.4	2.4	1.9	3.2	2.1	3.2	3.2
16	1.4	3.0	3.0	1.9	2.4	2.4	3.6	1.9	4.6	2.1	3.2	2.6
17	4.3	3.0	3.0	1.9	3.0	3.0	3.0	1.9	3.2	2.1	3.2	2.6
18	3.0	3.0	3.0	2.4	7.8	3.6	2.4	3.6	3.2	2.1	4.6	2.6
19	3.0	3.0	2.4	2.4	3.0	3.0	6.4	2.4	26	2.1	11	2.6
20	3.0	3.0	3.0	2.4	3.0	3.0	5.7	2.4	16	2.1	3.9	2.6
21	3.0	3.0	3.0	2.4	2.4	2.4	3.0	2.4	3.9	2.1	3.2	2.6
22	3.0	3.0	2.4	1.9	2.4	2.4	3.0	2.4	3.2	2.1	3.2	2.6
23	2.4	3.0	2.4	2.4	2.4	2.4	2.4	2.4	2.6	2.1	3.2	2.6
24	3.0	4.3	2.4	2.4	2.4	3.6	2.4	3.0	2.6	2.6	3.2	2.6
25	3.0	3.6	2.4	2.4	2.4	3.0	2.4	3.0	3.2	2.1	2.6	2.6
26	3.0	3.6	3.6	2.4	3.0	2.4	5.7	3.0	2.6	2.1	2.6	2.6
27	2.4	3.6	3.0	2.4	2.4	3.0	3.0	3.0	2.1	2.1	2.6	2.6
28	2.4	3.6	2.4	3.6	3.0	7.1	3.0	2.4	2.1	6.0	2.1	2.6
29	2.4	3.6	2.4	3.0	3.0	3.6	3.0	.....	2.1	7.6	2.1	2.6
30	2.4	3.6	2.4	2.4	2.4	3.0	3.0	.....	2.1	3.2	27	2.6
31	2.4	3.0	.....	2.4	.....	3.0	2.4	.....	2.1	.....	5.3	.....

NOTE.—Discharge determined from rating curves well defined below 16 million gallons per day, applicable July 1 to Feb. 28 and Mar. 1 to June 30.

Monthly discharge of Haiku Stream near Heeia, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	4.3	1.4	2.69	4.16	83	256
August	4.3	2.4	3.02	4.67	94	287
September	3.6	2.4	2.68	4.15	80	247
October	3.6	1.9	2.35	3.64	73	224
November	7.8	2.4	2.80	4.33	84	258
December	7.1	2.4	3.31	5.12	102	315
January	14	2.4	3.35	5.18	104	319
February	3.6	1.4	2.32	3.59	65	199
March	26	2.1	4.95	7.66	154	471
April	7.6	2.1	2.50	3.87	75	230
May	27	2.1	3.95	6.11	122	376
June	3.2	2.1	2.42	3.74	73	223
The year	27	1.4	3.04	4.70	1,110	3,400

KAHANA STREAM NEAR KAHANA, OAHU.

LOCATION.—Half a mile above confluence with East Branch of Kahana stream, 1½ miles above mouth of stream, and south of Kahana.

RECORDS AVAILABLE.—June 19, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and 150 feet below gage; stream bed of gravel and boulders; right bank steep and high; left bank slopes gently. Control composed of large and small boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 7.5 feet at 3 a. m. March 9, 1917 (discharge, approximately 1,400 million gallons per day, or 2,170 second-feet); minimum stage recorded, 0.8 foot September 4–11, 1916 (discharge, 11 million gallons per day, or 17 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane, taro, and rice.

ACCURACY.—Owing to instability of control, good rating curves were not developed. Records fair for low and medium stages.

Discharge measurements of Kahana Stream near Kahana, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Sept. 26	H. A. R. Austin	1.15	33.8	22
Nov. 8	do	1.04	25.0	16
Dec. 7	do	3.40	347	224
Mar. 6	do	.78	18.8	12
Apr. 10	do	.86	24	16
May 9	R. D. Klise	.95	24	16

Daily discharge, in million gallons, of Kahana Stream near Kahana, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	13	18	16	16	16	18	20	15	13	21	24	28
2	13	20	13	14	14	53	16	18	13	28	22	26
3	16	22	12	14	14	71	18	20	13	25	20	22
4	14	20	11	14	24	62	18	15	13	21	18	20
5	14	18	11	14	18	39	26	15	13	19	16	20
6	13	20	11	14	20	81	18	14	13	19	16	24
7	13	22	11	13	20	62	14	13	12	17	18	26
8	13	18	11	13	22	33	13	13	12	19	15	34
9	13	18	11	13	24	28	14	13	104	21	15	64
10	13	16	11	12	30	24	58	13	32	16	15	26
11	14	15	11	12	20	20	20	13	35	23	28	22
12	14	15	20	14	18	20	16	13	110	17	16	20
13	14	14	12	13	16	24	16	16	60	30	16	20
14	14	69	12	13	16	16	14	16	60	65	22	18
15	14	58	13	12	16	16	14	14	35	24	16	26
16	26	22	13	12	14	13	22	13	32	24	16	24
17	69	24	14	16	22	13	24	13	28	20	16	16
18	26	20	13	22	33	53	16	15	25	18	51	16
19	20	18	13	20	16	28	18	14	70	16	110	16
20	20	16	13	20	14	20	22	14	85	15	43	15
21	18	16	13	18	13	20	16	13	56	16	24	15
22	18	16	28	16	13	16	14	13	41	56	22	15
23	16	14	20	16	12	18	20	13	35	28	28	14
24	16	13	13	24	12	26	26	13	35	22	22	14
25	18	12	13	22	12	14	26	13	70	24	20	14
26	18	12	30	18	16	14	53	13	65	20	18	14
27	20	12	36	22	14	14	26	14	35	18	22	14
28	18	12	24	26	26	18	20	13	32	37	18	14
29	16	12	22	24	22	20	18	.....	32	56	18	13
30	18	12	16	22	18	18	16	.....	25	31	43	13
31	18	13	.....	20	.....	18	16	.....	23	.....	56	.....

NOTE.—Discharge determined from rating curves applicable as follows: July to Aug. 14, Jan. 27 to Mar. 9, and Apr. 15 to June 30, well defined below 200 million gallons per day; Aug. 15 to Jan. 26, poorly defined; Mar. 10 to Apr. 14, poorly defined. Discharge July 31 to Aug. 6, Sept. 23–25, Oct. 4–8, 29–31, Nov. 7, 14–18, Dec. 2, 4–21, 28–31, Jan. 1 and 2, and Feb. 7–11 determined by comparison with records of flow of Kaluanui stream.

Monthly discharge of Kahana Stream near Kahana, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	69	13	18.1	28.0	560	1,720
August	69	12	19.6	30.3	607	1,860
September	36	11	15.6	24.1	467	1,440
October	26	12	16.7	25.8	519	1,590
November	33	12	18.2	28.2	545	1,680
December	81	13	28.7	44.4	890	2,730
January	58	13	20.9	32.3	648	1,990
February	20	13	14.1	21.8	395	1,210
March	110	12	39.6	61.3	1,230	3,770
April	65	15	25.5	39.5	766	2,350
May	110	15	25.9	40.1	804	2,460
June	64	13	20.8	32.2	623	1,920
The year	110	11	22.1	34.2	8,050	24,700

EAST BRANCH OF KAHANA STREAM NEAR KAHANA, OAHU.

LOCATION.—Just above headquarters of Kahana Agricultural Co., 500 feet above confluence with main Kahana Stream, and 1 mile south of Kahana.

RECORDS AVAILABLE.—April 30, 1914, to March 8, 1917, when station was discontinued.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made by wading or from cable.

CHANNEL AND CONTROL.—Two channels at high stages; straight for 50 feet above and below gage; left bank steep and high; right bank low and is overflowed at high stages. Control is a riffle of small boulders; not well defined; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.62 feet at 6 p. m. November 10, 1915 (discharge, approximately 200 million gallons per day, or 309 second-feet); minimum stage recorded, 1.14 feet June, 1915 (discharge, 0.8 million gallons per day, or 1.2 second feet).

Minimum stage recorded during year, 1.0 foot September, October, and February (discharge, 1.2 million gallons per day, or 1.9 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of taro.

ACCURACY.—Gage read twice daily. Records are poor owing to instability of control and infrequency of discharge measurements.

Discharge measurements of East Branch of Kahana Stream near Kahana, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Sept. 26	1.12	2.69	1.7	Dec. 21	1.14	5.09	3.3
Nov. 8	1.20	4.00	2.6				

Daily discharge, in million gallons, of East Branch of Kahana Stream near Kahana, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	1.7	2.2	1.7	1.7	2.2	2.2	4.4	4.4	1.2
2	1.7	2.2	1.7	1.7	2.2	16	4.4	3.3	1.2
3	2.2	7.4	1.7	1.7	1.7	16	4.4	5.9	1.2
4	1.7	4.4	1.7	1.2	4.4	20	4.4	4.4	1.2
5	1.7	2.2	1.7	1.2	3.3	12	5.9	3.3	1.2
6	1.7	2.2	1.7	1.7	3.3	9.0	4.4	2.2	1.2
7	1.7	2.2	1.7	1.7	3.3	24	3.3	2.2	1.2
8	1.7	2.2	1.2	1.7	3.3	20	3.3	1.7	3.3
9	1.7	2.2	1.2	1.7	3.3	12	3.3	1.7	.....
10	1.7	2.2	1.2	1.2	3.3	7.4	.....	1.7	.....
11	1.7	2.2	1.2	1.2	3.3	4.4	16	1.7	.....
12	1.7	1.7	1.2	1.2	3.3	4.4	5.9	1.7	.....
13	1.7	1.7	1.2	1.2	2.2	4.4	4.4	1.7	.....
14	1.7	9.0	1.2	1.2	2.2	4.4	3.3	2.2	.....
15	1.7	11	1.2	1.2	2.2	4.4	3.3	1.7	.....
16	1.7	5.9	1.2	1.2	4.4	3.3	5.9	1.2	.....
17	9.0	5.9	1.2	1.2	5.9	3.3	4.4	1.2	.....
18	5.9	4.4	1.7	1.7	7.4	11	4.4	1.2	.....
19	3.3	3.3	1.2	2.2	5.9	11	4.4	1.7	.....
20	2.2	3.3	1.2	3.3	3.3	3.3	7.4	1.2	.....
21	2.2	2.2	1.2	2.2	2.2	3.3	5.9	1.2	.....
22	2.2	2.2	5.9	2.2	2.2	3.3	4.4	1.2	.....
23	1.7	2.2	3.3	2.2	2.2	3.3	16	1.2	.....
24	1.7	2.2	1.2	2.2	2.2	5.9	5.9	1.2	.....
25	2.2	3.3	1.7	1.7	2.2	5.9	9.0	1.2	.....
26	2.2	2.2	1.7	2.2	2.2	4.4	26	1.2	.....
27	2.2	1.7	1.7	2.2	2.2	3.3	12	1.2	.....
28	2.2	1.7	1.7	3.3	16	14	7.4	1.2	.....
29	1.7	1.7	2.2	3.3	4.4	16	7.4	.....	.....
30	1.7	1.7	1.7	3.3	3.3	7.4	5.9	.....	.....
31	2.2	1.7	.....	3.3	.....	5.9	4.4	.....	.....

NOTE.—Discharge determined from poorly defined rating curves applicable as follows: July 1 to Aug. 15 and Dec. 9 to Mar. 8, and Aug. 16 to Dec. 8.

Monthly discharge of East Branch of Kahana Stream near Kahana, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	9.0	1.7	2.27	3.51	70	216
August	11	1.7	3.25	5.03	101	309
September	5.9	1.2	1.68	2 60	50	155
October	3.3	1.2	1.91	2.95	59	182
November	16	1.7	3.65	5.65	110	336
December	24	2.2	8.55	13.2	265	813
February	5.9	1.2	2.00	3.09	56	172
March 1–8	3.3	1.2	1.46	2.26	12	36

PUNALUU STREAM AT ELEVATION 539 FEET,[a] NEAR PUNALUU, OAHU.

LOCATION.—About a quarter of a mile below confluence of Kalena and Pio branches of the stream, and 5 miles by road and foot trail south of Punaluu railroad station.

RECORDS AVAILABLE.—April 27, 1915, to June 30, 1917.

GAGE.—Friez water-stage recorder substituted for 8-day Stevens recorder February 16, 1916.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 150 feet above gage.

CHANNEL AND CONTROL.—One channel at all stages, straight for several hundred feet above and below station; composed of boulders and gravel; right bank slopes sharply; left bank vertical; both banks fairly clean up to extreme flood stages. Control composed of large boulders; fairly permanent.

[a] Elevation given in Water-Supply Paper 430 as 600 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.04 feet at 8 p. m. November 10, 1915 (discharge, approximately 300 million gallons per day, or 464 second-feet); minimum stage recorded, 0.7 foot September, 1916 (discharge, 2.0 million gallons per day, or 3.1 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Part of low-water flow is diverted at low elevation for irrigation of sugar cane, rice, and taro. Station was established to determine the feasibility of a project to divert the water of the upper Punaluu Valley to augment the water diverted from the Kahana Valley by the Waiahole Water Co.

ACCURACY.—Determinations based on rating curve well defined below 6 million gallons per day. Records good for low and medium stages.

Discharge measurements of Punaluu Stream at elevation 539 feet, near Punaluu, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 11	H. A. R. Austin	0.73	3.39	2.2
Sept. 27	do	.87	6.22	4.0
Nov. 9	do	.88	6.21	4.0
Feb. 12	R. D. Klise	.80	4.86	3.1
13	do	.80	4.80	3.1
14	do	.88	6.82	4.4
15	do	.82	5.30	3.4
Apr. 11	H. A. R. Austin	.91	7.28	4.7

Daily discharge, in million gallons, of Punaluu Stream at elevation 539 feet, near Punaluu Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	2.5	2.5	3.0	3.0	4.6	4.6	5.5	4.6	2.5	6.4	8.5	7.4
2	2.5	3.8	3.0	3.0	4.6	12	3.8	5.5	2.5	9.8	8.5	7.4
3	3.0	4.6	3.0	3.0	3.8	9.8	4.6	5.5	2.5	7.4	7.4	7.4
4	3.0	4.6	2.5	3.0	4.6	14	4.6	4.6	2.5	6.4	7.4	7.4
5	3.0	3.8	2.5	3.0	4.6	9.8	5.5	3.8	2.5	6.4	6.4	6.4
6	2.5	6.4	2.5	3.0	4.6	17	4.6	3.8	2.5	5.5	8.5	7.4
7	2.5	5.5	2.5	3.0	3.8	14	4.6	3.8	2.5	5.5	9.8	8.5
8	2.5	3.8	2.5	3.0	4.6	8.5	4.6	3.8	2.5	5.5	6.4	9.8
9	2.5	3.8	2.5	2.5	7.4	7.4	4.6	3.8	19	5.5	6.4	16
10	2.5	3.0	2.0	2.5	9.8	6.4	11	3.8	4.6	5.5	6.4	8.5
11	2.5	3.0	2.5	2.5	5.5	5.5	6.4	3.8	7.4	7.4	11	6.4
12	3.0	3.0	3.8	3.0	4.6	5.5	5.5	3.0	40	5.5	6.4	5.5
13	3.0	3.0	2.5	3.0	4.6	6.4	4.6	4.6	14	17	6.4	5.5
14	3.8	9.8	2.5	2.5	3.8	4.6	4.6	4.6	17	17	7.4	5.5
15	3.0	11	2.5	2.5	5.5	4.6	4.6	3.8	12	9.8	6.4	6.4
16	4.6	6.4	3.0	2.5	4.6	3.8	8.5	3.0	12	7.4	6.4	6.4
17	9.8	5.5	2.0	2.5	7.4	3.8	6.4	3.0	9.8	7.4	6.4	5.5
18	5.5	5.5	2.0	3.8	17	12	4.6	3.8	8.5	7.4	14	5.5
19	3.8	4.6	2.0	3.8	6.4	7.4	4.6	3.0	24	6.4	17	5.5
20	3.8	4.6	2.0	3.8	5.5	5.5	6.4	3.0	21	6.4	12	5.5
21	3.8	3.8	2.0	3.0	4.6	5.5	4.6	3.0	19	7.4	9.8	4.6
22	3.0	3.8	4.6	3.0	4.6	5.5	3.8	3.0	12	16	8.5	4.6
23	3.0	3.8	3.0	3.0	4.6	4.6	6.4	3.0	9.8	7.4	9.8	4.6
24	3.0	3.8	2.5	3.8	3.8	6.4	8.5	3.0	12	7.4	7.4	4.6
25	2.5	3.0	3.0	4.6	3.8	4.6	8.5	3.0	34	8.5	7.4	4.6
26	2.5	3.0	8.5	3.0	3.8	3.8	16	3.0	16	7.4	6.4	4.6
27	2.5	3.0	7.4	4.6	3.8	4.6	7.4	3.0	9.8	6.4	6.4	3.8
28	2.5	3.0	5.5	12	6.4	6.4	6.4	3.0	8.5	12	7.4	3.8
29	2.5	3.0	5.5	7.4	5.5	8.5	5.5	.....	8.5	19	7.4	3.8
30	2.5	3.0	3.8	7.4	5.5	5.5	4.6	.....	7.4	11	7.4	3.8
31	3.8	3.0	.....	5.5	.....	5.5	4.6	.....	7.4	.....	7.4	.....

NOTE.—Discharge determined from rating curve well defined below 6 million gallons per day. Discharge Jan. 9–16 and 24–26 computed by comparison with records obtained at lower Punaluu station.

Monthly discharge of Punaluu Stream at elevation 539 feet, near Punaluu, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	9.8	2.5	3.25	5.03	101	309
August	11	2.5	4.34	6.72	134	413
September	8.5	2.0	3.22	4.98	97	296
October	12	2.5	3.75	5.80	116	357
November	17	3.8	5.46	8.45	164	503
December	17	3.8	7.21	11.2	224	686
January	16	3.8	6.00	9.28	186	571
February	5.5	3.0	3.66	5.66	103	314
March	40	2.5	11.4	17.6	354	1,080
April	19	5.5	8.60	13.3	258	792
May	17	6.4	8.21	12.7	254	781
June	16	3.8	6.22	9.62	187	573
The year	40	2.0	5.96	9.22	2,180	6,680

PUNALUU STREAM AT ELEVATION 250 FEET, NEAR PUNALUU, OAHU.

LOCATION.—About 1½ miles by road and horse trail south of Punaluu railroad station.

RECORDS AVAILABLE.—May 14, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable about 150 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 200 feet above and below gage; bed composed of large boulders; right bank slopes gradually and is covered with small trees and vegetation; left bank slopes sharply and is covered with vegetation. Control composed of large boulders; apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.85 feet at 5 a. m. September 23, 1914 (discharge, approximately 700 million gallons per day, or 1,080 second-feet); minimum stage recorded, 1 foot March, August, and September, 1915 (discharge, 10 million gallons per day, or 15 second-feet).

Minimum stage recorded during year, 1.05 feet July, August, September, October, and March (discharge, 12 million gallons per day, or 18.6 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Part of low-water flow is diverted for irrigation of sugar cane, rice, and taro.

ACCURACY.—Stage-discharge relation constant; rating curve good. Records good for all stages except for several short periods when discharge was estimated because there was no gage-height record.

Discharge measurements of Punaluu Stream at elevation 250 feet, near Punaluu, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 11	H. A. R. Austin	1.07	20	13
Nov. 9	do	1.13	24.8	16
Jan. 5	do	1.19	28.3	18
May 13	R. D. Klise	1.27	32.8	21

Daily discharge, in million gallons, of Punaluu Stream at elevation 250 feet, near Punaluu, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	14	14	14	14	16	19	22	22	12	25	31	28
2	14	16	14	14	16	42	16	22	12	25	28	25
3	14	19	14	14	14	34	19	25	12	28	25	22
4	14	16	12	14	16	46	19	19	12	25	25	22
5	14	14	12	14	16	34	19	19	12	22	22	22
6	12	16	12	14	16	55	19	19	12	22	25	28
7	12	19	12	12	14	46	19	16	12	22	31	31
8	12	14	12	12	16	31	19	16	14	22	22	34
9	12	14	12	12	19	28	19	16	60	22	22	28
10	12	14	12	12	28	25	34	16	19	19	19	25
11	12	14	12	19	19	22	25	16	28	25	28	22
12	14	14	14	16	16	22	22	16	100	19	19	22
13	14	12	12	19	14	25	19	22	38	38	22	22
14	14	28	12	14	14	19	19	19	42	42	25	19
15	12	38	12	14	14	19	19	16	34	28	22	25
16	16	22	14	14	14	16	31	16	38	22	22	25
17	31	19	12	14	22	16	31	16	28	22	22	22
18	19	19	12	14	50	42	22	19	25	22	55	22
19	16	19	12	16	22	28	22	16	64	19	64	19
20	14	16	12	16	19	19	28	16	69	19	34	19
21	14	16	12	16	16	19	22	14	50	22	28	19
22	14	16	16	14	16	19	19	14	34	42	25	19
23	14	16	14	14	14	19	31	14	28	25	28	19
24	12	14	12	16	14	25	31	14	31	22	25	19
25	12	14	12	16	14	19	31	14	55	31	22	19
26	12	14	25	14	14	16	50	14	38	22	22	16
27	12	14	25	16	14	19	31	16	31	22	22	16
28	12	14	19	38	22	25	28	14	28	42	22	16
29	12	14	19	28	19	28	25	.....	28	50	22	16
30	12	14	14	22	19	19	25	.....	25	38	31	16
31	14	14	.....	19	.....	19	22	.....	25	.....	42	.....

NOTE.—Discharge determined from rating curve well defined below 100 million gallons per day. Discharge Dec. 1–7, 11–19, Jan. 1–3, 6–10, Mar. 9–12, and June 6–8 determined by comparison with records of flow of Punaluu Stream at elevation 539 feet.

Monthly discharge of Punaluu Stream at elevation 250 feet, near Punaluu, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	31	12	13.9	21.5	432	1,320
August	38	12	16.7	25.8	517	1,590
September	25	12	13.9	21.5	418	1,280
October	38	12	16.2	25.1	501	1,540
November	50	14	17.9	27.7	537	1,650
December	55	16	26.3	40.7	815	2,500
January	50	16	24.5	37.9	758	2,330
February	25	14	17.0	26.3	476	1,460
March	100	12	32.8	50.7	1,020	3,120
April	50	19	26.8	41.5	804	2,470
May	64	19	27.5	42.5	852	2,620
June	34	16	21.9	33.9	657	2,020
The year	100	12	21.3	33.0	7,780	23,900

WAIHOI STREAM NEAR PUNALUU, OAHU.

LOCATION.—Half a mile above confluence with Punaluu Stream, 3 miles by road and trail from Government highway, and 6 miles by road and trail south of Hauula.

RECORDS AVAILABLE.—April 27, 1915, to June 30, 1917.

GAGE.—Vertical staff. New datum January 19, 1916. Stevens 8-day water-stage recorder in use April 27 to November 9, 1915.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL CONTROL.—One channel at all stages; very steep and rough; both banks high and wooded. Control composed of large boulders; shifts somewhat owing to growth of grass and roots at the banks.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.46 feet at 2 p. m. November 3, 1915 (discharge, approximately 9.0 million gallons per day, or 14 second-feet); minimum daily discharge, November 13–24, 1916 (2.5 million gallons per day, or 3.9 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Station established in connection with contemplated plan for development of Punaluu waters.

ACCURACY.—Flow so steady that water-stage recorder was removed November 9, 1915, and only weekly readings of staff gage were made after that; for this reason some of the higher stages were doubtless not recorded. Records fair.

Discharge measurements of Waihoi Stream near Punaluu, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 11	0.82	5.0	3.2	Mar. 7	0.81	5.1	3.3
Sept. 27	.78	4.8	3.1				

Monthly discharge of Waihoi Stream near Punaluu, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	4.1	3.2	3.58	5.54	111	341
August	3.6	3.2	3.42	5.29	106	325
September	3.5	3.1	3.27	5.06	98	301
October	3.1	2.9	3.08	4.77	96	293
November	3.6	2.5	2.76	4.27	83	254
December	3.5	3.0	3.18	4.92	98	303
January	4.3	3.2	3.38	5.23	105	322
February	3.3	3.2	3.28	5.07	92	282
March	4.5	3.2	4.08	6.31	126	388
April	4.1	4.1	4.10	6.34	123	377
May	4.3	4.1	4.25	6.58	132	404
June	4.3	3.9	4.10	6.34	123	377
The year	4.5	2.5	3.54	5.48	1,290	3,970

NOTE.—Determinations based on rating curves fairly well defined for ordinary stage, applicable as follows: July 1 to Aug. 15 and Dec. 8 to Mar. 9, Aug. 16 to Dec. 7, Mar. 10 to June 30. Discharge interpolated between weekly observations of gage height.

KALUANUI STREAM NEAR HAUULA, OAHU.

LOCATION.—At Castle's rest house, 5 miles from Government road and 7½ miles by road and trail south of Hauula.

RECORDS AVAILABLE.—April 28, 1915, to June 30, 1917.

GAGE.—Stevens continuous water-stage recorder installed February 17, 1916, in place of 8-day Stevens recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 25 feet above and below gage; bed composed of boulders and gravel; right bank slopes gently; left bank steep and high. Control composed of large boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorder, 4.8 feet at 2 a. m. March 9, 1917 (discharge, approximately 200 gallons per day, or 309 second-feet); minimum stage recorded, 0.75 foot February 25 and 26, 1917 (discharge, 0.25 million gallons per day, or 0.39 second-foot).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane and rice.

ACCURACY.—Records based on well-defined rating curve and a continuous record of gage height; good for all stages.

Discharge measurements of Kaluanui Stream near Hauula, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Sept. 27	H. A. R. Austin	1.28	3.57	2.3
Jan. 5	....do	1.42	5.67	3.7
May 12	R. D. Klise	1.04	.6	.35

Daily discharge, in million gallons, of Kaluanui Stream near Hauula, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	1.0	2.6	1.7	1.0	2.6	2.1	4.0	0.8	0.4	1.3	3.2	2.1
2	.8	4.7	2.1	1.0	1.7	16	3.2	1.0	.35	1.0	2.6	1.3
3	4.7	2.1	.8	.65	1.7	9.2	3.2	1.0	.4	1.3	3.2	1.3
4	2.1	4.7	.8	.65	4.0	9.2	2.6	.8	3.2	.8	2.1	.8
5	1.7	1.3	.65	.5	3.2	3.2	2.1	.65	.8	.8	1.3	.8
6	1.0	2.1	.5	.65	2.6	5.7	2.1	.5	.6	.6	1.0	1.0
7	.8	2.6	.5	.5	4.7	6.7	1.3	.5	.6	.6	1.3	1.3
8	.8	1.3	.5	.65	4.0	2.6	1.0	.5	1.0	.5	1.0	1.7
9	.65	1.0	2.1	1.3	4.0	2.6	1.0	.5	14	2.1	.8	5.7
10	.65	.8	.65	.65	3.2	2.6	9.2	.45	2.6	.6	.8	1.7
11	1.0	1.7	.5	.45	2.1	1.7	2.1	.45	2.1	3.2	1.3	1.7
12	2.6	1.7	1.0	3.2	1.7	1.7	1.3	.45	20	2.1	.6	1.0
13	1.0	1.0	.65	1.3	1.3	3.2	1.0	1.3	4.7	2.6	1.7	1.0
14	1.3	8.0	.5	1.0	1.3	2.1	.8	3.2	8.0	3.2	3.2	.8
15	.65	11	.45	.8	4.0	1.7	.8	.65	6.7	3.2	1.7	3.2
16	2.6	2.1	1.7	.65	1.7	2.6	4.7	.5	8.0	2.6	1.7	4.0
17	12	4.0	.5	.8	8.0	3.2	3.2	.45	4.0	1.7	2.1	1.3
18	2.6	3.2	.45	2.1	12	11	1.0	.65	4.0	1.3	11	1.7
19	1.7	3.2	.65	2.6	2.6	4.0	1.0	.8	12	1.0	5.7	1.0
20	1.7	2.6	.65	2.6	2.6	2.1	8.0	.45	15	1.0	2.6	.8
21	1.3	2.6	.65	2.1	1.7	1.7	1.3	.4	5.7	1.7	1.7	.8
22	1.0	2.1	3.2	1.7	1.3	2.1	1.0	.35	3.2	8.0	1.0	.6
23	.8	1.7	2.1	2.1	1.3	4.0	4.7	.3	2.1	2.6	4.0	.6
24	.65	1.3	1.0	4.7	1.3	5.7	2.6	.3	2.1	2.1	1.7	.6
25	.8	1.3	1.3	2.6	2.1	2.1	1.7	.25	14	6.7	1.0	.5
26	.8	.8	5.7	2.6	2.6	1.7	11	.25	4.7	2.6	.8	.5
27	2.1	.8	4.7	4.0	1.7	3.2	3.2	.3	2.1	2.1	1.0	.5
28	1.7	.8	2.1	14	5.7	6.7	1.7	1.7	2.6	24	1.7	.6
29	.8	.8	2.1	4.0	3.2	4.7	1.3	.....	2.6	24	.8	.5
30	1.3	.8	1.0	4.0	3.2	2.1	1.7	.....	1.3	8.0	4.0	.5
31	2.1	1.3	.....	2.6	.....	1.7	.8	.....	2.1	.....	4.0	.....

NOTE.—Discharge determined from well-defined rating curve. Discharge Jan. 3-5 determined by comparison with records of flow of Punaluu Stream.

Monthly discharge of Kaluanui Stream near Hauula, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	12	0.65	1.76	2.72	55	167
August	11	.8	2.45	3.79	76	233
September	5.7	.45	1.37	2.12	41	126
October	14	.45	2.18	3.37	67	207
November	12	1.3	3.10	4.80	93	285
December	16	1.7	4.16	6.44	129	396
January	11	.8	2.73	4.22	85	260
February	3.2	.25	.69	1.07	19	59
March	20	.35	4.87	7.54	151	463
April	24	.5	3.78	5.85	113	348
May	11	.6	2.28	3.53	71	217
June	5.7	.5	1.33	2.06	40	122
The year	24	.25	2.58	3.99	940	2,880

KOLOA STREAM NEAR LAIE, OAHU.

LOCATION.—At elevation about 500 feet, 3 miles by horse trail southwest of Laie.

RECORDS AVAILABLE.—July 30, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder on left bank.

DISCHARGE MEASUREMENTS.—Made by wading or from cable about 20 feet below gage.

CHANNEL AND CONTROL.—Channel straight for a hundred feet above station; right bank clean and perpendicular; left bank clean with gradual slope to above high-water stage. On October 23, 1915, a reinforced concrete control 33 feet long having a low-water notch 16 feet in length was completed.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.2 feet at 11 a. m. November 11 (discharge, computed by extension of rating curve, approximately 300 million gallons per day, or 464 second-feet); minimum stage recorded, 0.1 foot October 1–8 (discharge, 0.3 million gallons per day, or 0.46 second-foot).

Maximum stage recorded during period of record, 5.3 feet at 9 a. m. September 25, 1914 (discharge, approximately 755 million gallons per day, or 1,170 second-feet); minimum discharge, less than 0.1 million gallons per day, or 0.15 second-foot.

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Stream is not perennial in its lower course. A small part of the flood discharge is diverted at low elevation for irrigation of sugar cane. Station was established to determine whether the total discharge of the streams would justify the construction of a large flood-water storage project in the vicinity.

ACCURACY.—Records based on rating curve well defined below 40 million gallons per day; good below that limit. Discharge for days of decided fluctuation in stage computed hourly.

Discharge measurements of Koloa Stream near Laie, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Sept. 6	C. T. Bailey	0.13	0.5	0.3
Nov. 11	H. A. R. Austin	.22	2.49	1.6
Jan. 4	do	.28	3.43	2.2
Mar. 9	do	.38	5.97	3.9
Apr. 12	do	.22	1.73	1.1

Daily discharge, in million gallons, of Koloa Stream near Laie, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	0.6	2.2	1.0	0.3	1.6	2.2	1.6	1.0	0.6	1.0	4.0	1.6
2	.6	2.2	.6	.3	1.6	13	2.2	1.0	.6	1.0	3.1	1.6
3	.6	1.0	.6	.3	1.0	4.0	4.0	1.6	.6	1.0	3.1	1.0
4	.6	3.1	.6	.3	2.2	5.3	3.1	1.0	2.2	1.0	3.1	1.0
5	.6	1.0	.6	.3	3.1	8.1	6.6	1.0	1.0	1.0	2.2	1.0
6	.6	1.0	.6	.3	2.2	15	2.2	1.0	.6	1.0	2.2	1.0
7	.6	1.0	.6	.3	4.0	11	1.6	.6	.6	1.0	2.2	1.0
8	.6	.6	.6	.3	2.2	3.1	1.6	.6	14	1.0	2.2	1.0
9	.6	.6	1.6	1.0	1.6	4.0	1.6	.6	19	1.0	2.2	3.1
10	.6	.6	1.0	1.0	2.2	4.0	12	.6	3.1	1.0	2.2	1.6
11	.6	.6	.6	.6	1.0	2.2	4.0	.6	1.6	1.0	2.2	1.6
12	.6	.6	1.6	7.9	1.0	1.6	2.2	.6	24	6.0	2.2	1.0
13	.6	.6	1.0	1.6	1.0	5.3	1.6	1.0	3.1	2.2	1.6	.6
14	.6	.6	1.0	1.0	1.0	2.2	1.6	3.1	4.0	2.2	2.2	.6
15	.6	8.1	.6	1.0	3.1	1.6	1.6	.6	4.0	2.2	1.6	5.0
16	.6	1.0	1.0	1.0	1.6	1.6	7.9	.6	11	3.1	1.6	8.8
17	8.1	.6	.6	1.6	14	1.6	14	.6	3.1	1.0	1.6	1.6
18	1.0	1.0	.6	3.1	31	9.6	2.2	1.6	3.1	1.0	13	1.6
19	.6	1.0	.6	4.0	2.2	4.0	1.6	1.6	12	1.0	8.9	1.0
20	.6	1.0	.6	1.6	1.6	2.2	9.6	.6	19	1.0	2.2	1.0
21	.6	.6	.6	1.6	1.6	1.6	2.2	.6	4.0	1.0	1.6	1.0
22	.6	.6	1.0	1.0	1.6	1.0	1.6	.6	2.2	6.6	1.0	1.0
23	.6	.6	1.0	1.6	1.0	1.6	14	.6	1.6	2.2	3.1	1.0
24	.6	.6	1.0	2.2	1.6	9.0	2.2	.6	1.0	2.2	1.6	1.0
25	.6	.6	1.0	2.2	2.2	1.6	1.6	.6	5.3	9.6	1.0	.6
26	.6	.6	1.0	1.6	2.2	1.6	9.6	.6	2.2	3.1	1.0	.6
27	.6	.6	1.0	5.3	1.6	6.1	2.2	1.6	1.0	5.3	1.0	.6
28	.6	.6	1.6	9.6	5.3	4.5	1.6	1.6	1.6	19	3.1	.6
29	.6	.6	.6	2.2	1.6	12	1.6	.....	1.0	24	1.6	.6
30	.6	.6	.6	1.6	2.2	2.2	1.6	.....	1.0	8.1	1.6	.6
31	1.0	.6	.....	1.6	.....	1.6	1.6	.....	1.0	.....	3.1	.....

NOTE.—Discharge determined from rating curve well defined below 40 million gallons per day. Discharge July 1–27, Aug. 8 to Sept. 5, Sept. 18 to Oct. 5, Oct. 15 to Nov. 10, Dec. 3–6, and Apr. 23 to May 14 determined by comparison with records of flow of Wailele Stream.

Monthly discharge of Koloa Stream near Laie, Oahu, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	8.1	0.6	0.87	1.35	27	83
August	8.1	.6	1.13	1.75	35	108
September	1.6	.6	.85	1.32	25	78
October	9.6	.3	1.88	2.91	58	179
November	31	1.0	3.34	5.17	100	308
December	15	1.0	4.66	7.21	144	443
January	14	1.6	3.95	6.11	123	376
February	3.1	.6	.95	1.47	27	82
March	24	.6	4.81	7.44	149	458
April	24	1.0	3.73	5.77	112	343
May	13	1.0	2.69	4.16	83	256
June	8.8	.6	1.48	2.29	44	136
The year	31	.3	2.54	3.93	927	2,850

WAILELE STREAM NEAR LAIE, OAHU.

LOCATION.—About 3 miles by horse trail southwest of Laie and about 525 feet above sea level.

RECORDS AVAILABLE.—July 30, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder on right bank.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 20 feet above gage.

CHANNEL AND CONTROL.—Channel straight for about 50 feet above gage; right bank sloping and clean; left bank nearly vertical. Control consists of concrete slab 32 feet long with low-water notch 14 feet long.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.85 feet at 9 a. m. September 23, 1914 (discharge, approximately 295 million gallons per day, or 456 second-feet); stream occasionally dry.

Maximum stage recorded during year, 3.25 feet at 3 a. m. November 18 (discharge, approximately 140 million gallons per day, or 217 second-feet); minimum stage recorded, 0.2 foot October 6–8 (discharge 0.1 million gallons per day, or 0.15 second-foot).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Stream not perennial. A small part of the flood discharge is diverted at low elevations for sugar-cane irrigation. Station was established to determine whether the total flood discharge of streams at 500 feet above sea level will justify the construction of a large flood-water storage project in the vicinity.

ACCURACY.—Records based on rating curve well defined below 6 million gallons per day and continuous record of gage height; good for medium stages; determinations of daily discharge for periods of extreme low water may be somewhat in error because of the small amount of water involved and lack of sensitiveness of control; discharge for days of decided fluctuation in stage computed hourly.

Discharge measurements of Wailele Stream near Laie, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Nov. 11	0.28	1.07	0.7	Mar. 9	.48	3.57	2.3
Dec. 6	.55	6.83	4.4	Apr. 12	.30	1.20	.8
Jan. 4	.36	2.09	1.4				

Daily discharge, in million gallons, of Wailele Stream near Laie, Oahu, for the year ending June 30, 1917.

Date.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	.....	0.8	1.3	0.8	0.4	0.4	0.8	2.7	0.8
2	.....	.8	7.6	1.3	.4	.4	.8	2.0	.4
3	.....	.4	2.7	2.0	.4	.4	.8	2.0	.4
4	.....	1.3	3.5	2.0	.4	1.3	.8	2.0	.4
5	.....	2.0	4.4	2.7	.4	.4	.4	1.3	.4
6	0.1	1.3	7.6	1.3	.4	.4	.4	1.3	.4
7	.1	2.7	5.4	1.3	.4	.4	.4	1.3	.4
8	.1	1.3	2.7	.8	.4	2.7	.4	1.3	.4
9	.4	.8	2.7	.8	.4	7.6	.8	1.3	.8
10	.4	1.3	2.7	5.4	.4	2.0	.8	1.3	.4
11	.4	.8	2.0	2.7	.4	1.3	.8	1.3	.4
12	2.0	.4	1.3	1.3	.4	11	.8	1.3	.4
13	1.3	.4	3.5	1.3	.4	2.0	1.3	.8	.4
14	.4	.4	2.0	.8	2.0	2.0	1.3	1.3	.4
15	.4	1.3	1.3	.8	.4	2.0	1.3	.8	2.0
16	.4	.8	1.3	4.4	.4	4.4	1.3	.8	5.2
17	.8	4.4	1.3	3.5	.4	2.0	.8	1.3	.8
18	2.0	16	5.4	1.3	.8	2.0	.8	6.5	.8
19	2.7	2.0	2.7	1.3	.8	5.9	.8	4.0	.8
20	.8	1.3	2.0	5.4	.4	7.7	.8	1.3	.4
21	.8	.8	1.3	1.3	.4	2.7	.8	.8	.4
22	.4	.8	1.3	1.3	.4	1.3	2.7	.4	.4
23	.8	.8	1.3	7.9	.4	.8	1.3	1.3	.4
24	1.3	.8	4.4	2.0	.4	.8	1.3	.8	.4
25	1.3	1.3	1.3	1.3	.4	2.7	9.1	.4	.4
26	.8	1.3	1.3	4.4	.4	1.3	2.0	.4	.4
27	7.8	.8	2.7	1.3	.8	.8	3.5	.4	.4
28	6.5	3.5	2.7	.8	.8	.8	9.8	1.3	.4
29	1.3	.8	4.4	1.3	.....	.8	12	.8	.4
30	.8	1.3	1.3	1.3	.....	.8	4.4	.4	.4
31	.8	.....	1.3	.8	.....	.8	.....	1.3	.....

NOTE.—Discharge determined from rating curve well defined below 6 million gallons per day. Gage height record July 1 to Oct. 5 unreliable. Discharge Nov. 17, 26–30, Dec. 1–6, and Feb. 13 to Mar. 9 determined by comparison with records of flow of Koloa Stream.

Monthly discharge of Wailele Stream near Laie, Oahu, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
October 6–31	7.8	0.1	1.34	2.07	35	107
November	16	.4	1.76	2.72	53	162
December	7.6	1.3	2.80	4.33	87	266
January	7.9	.8	2.09	3.23	65	199
February	2.0	.4	.51	.79	14	44
March	11	.4	2.25	3.48	70	214
April	12	.4	2.11	3.26	63	194
May	6.5	.4	1.43	2.21	44	136
June	5.2	.4	.68	1.05	20	63
The period					451	1,380

EAST BRANCH OF KAHAWAINUI STREAM NEAR LAIE, OAHU.

LOCATION.—Half a mile above junction with West Branch of Kahawainui Stream, 3 miles by horse trail southwest of Laie, about 500 feet above sea level.

RECORDS AVAILABLE.—July 29, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder. Datum raised 0.6 foot November 1, 1915.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 10 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for several feet above station; bed composed of large boulders; free from vegetation; right bank clean and nearly perpendicular; left bank sloping and fairly clean. Control prior to October 26, 1915, consisted of a natural dam of large boulders. On November 1, 1915, a reinforced concrete control, 32 feet long with a low-water notch 15 feet long was completed.

EXTREME OF DISCHARGE.—Maximum stage recorded during year, 2.5 feet at 4 a. m. November 18 (discharge, approximately 150 million gallons per day, or 232 second-feet).

Maximum stage recorded during period of record, 5.1 feet at 7 a. m. September 25, 1914 (discharge, approximately 340 million gallons per day, or 526 second-feet); channel frequently dry.

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Part of the flood discharge is diverted at low elevations to irrigate sugar cane. Station was established to determine whether total flood discharge at this elevation is sufficient to justify a large flood water stored from project near Kahuku.

ACCURACY.—Determinations based on a fairly well defined rating curve. Records good except for very low stages for which they may be in error because of small amount of water involved. Discharge for days of decided fluctuation in stage computed hourly.

Discharge measurements of East Branch of Kahawainui Stream near Laie, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Nov. 10	0.32	0.93	0.6	Mar. 8	.36	1.29	.85
Dec. 6	.49	3.16	.0	Apr. 12	.32	1.11	.7
Jan. 6	.33	.53	.35				

Daily discharge, in million gallons, of East Branch of Kahawainui Stream near Laie, Oahu, for the year ending June, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1		0.1				0.7	0.4	0.4		0.2	0.1	
2		.4				3.9	.7	.4		.2		
3		.2				2.8	1.6	.4		.2		
4		.7				2.1	1.1	.4	0.4	.2	.7	
5					0.1	4.8	1.6	.2	.2	.2		
6						6.4	.7	.2	.1	.2		
7					.2	2.1	.4	.1	.1			
8						1.1	.4	.1	7.2			
9						1.1	.4		4.3	.2		
10					.7	1.1	4.2		.7	.2		
11					.4	.4	1.1		.2	.4		
12	1.1			2.8	.2	.4	.7		9.6	.4		
13				.6	.2	1.6	.4	.1	1.1	.2		
14		.7		.1	.1	.7	.4	1.1	1.1	.4	.2	
15		3.5			.2	.4	.4	.2	1.1	.4	.4	0.7
16	5.0	.2			.2	.4	3.7	.1	4.5	.7	.4	4.2
17	28	.1			4.6	.4	3.8		1.1	.4	.7	.4
18	2.1	.4		1.1	16	2.1	.4	.9	1.6	.2	4.3	.4
19	.2	.2		2.1	1.1	.7	.4	.4	4.9	.1	1.1	.2
20	.1	.1		.4	.7	.2	5.0	.1	6.6		.7	
21	.1	.1		.2	.7	.2	.7		2.8		.2	
22				.2	.7	.2	.7		1.1	1.1	.1	
23				.2	.4	.4	5.1		.4	.2	.2	
24				.7	.4	2.1	.4		.2	.4	.1	
25				1.1	.7	.4	.4		1.1	6.2		
26				.4	1.1	.2	2.8		.4	.7		
27				3.3	.4	.7	.7	.3	.2	1.6		
28				8.4	1.6	1.1	.7	.4	.7	4.5		
29				.2	.7	3.2	1.1		.4	4.2		
30				.1	1.1	.4	1.1		.4	.4		
31				.1		.4	.4		.2			

NOTE.—Discharge determined from rating curve fairly well defined below 80 million gallons per day. No flow on days for which discharge is not given.

Monthly discharge of East Branch of Kahawainui Stream near Laie, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	28	0	1.18	1.83	37	112
August	3.5	0	.22	.34	7	21
October	8.4	0	.71	1.10	22	68
November	16	0	1.08	1.67	32	99
December	6.4	.2	1.38	2.14	43	131
January	5.1	.4	1.35	2.09	42	128
February	1.1	0	.21	.32	6	18
March	9.6	0	1.70	2.63	53	162
April	6 2	0	.80	1.24	24	74
May	4.3	0	.30	.46	9	29
June	4.2	.2	.20	.31	6	18
The year	28	0	.77	1.19	281	860

EAST BRANCH OF MALAEKAHANA STREAM NEAR KAHUKU, OAHU.

LOCATION.—About three-quarters of a mile above junction with Middle Branch of Malaekahana stream and 3½ miles by horse trail south of Kahuku, about 375 feet above sea level.

RECORDS AVAILABLE.—July 31, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder. Original staff gage, established on July 31, 1914, was washed out by flood September 24, 1914. From September 25, 1914, to May 28, a reference point consisting of 20-penny nail in kukui tree on left bank 50 feet upstream, at same datum as staff gage, was used to check gage heights. On May 28, 1915, a new staff gage was established at the original datum.

DISCHARGE MEASUREMENTS.—Made by wading or from cable about 5 feet upstream from staff gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for several hundred feet above gage; bed composed of loose boulders and gravel; right bank at gage clean and nearly vertical; left bank has gradual slope and above ordinary flood stages is covered with small trees and vegetation; cross section same for several hundred feet upstream. Reinforced concrete control completed November 9, 1915, is 33 feet long with a 14-foot notch for low water. Original control consisted of a concrete slab 2 feet wide, with a small notch for low flow, between large boulders, about 6 feet below gage; this control was destroyed by the flood September 24, 1914.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.15 feet at 6 p. m. March 8, 1916 (discharge, computed by extension of the rating curve, approximately 90 million gallons per day, or 139 second-feet).

Maximum stage recorded during period of record, 5.05 feet at 5 a. m. September 25, 1914 (discharge, approximately 378 million gallons per day, or 585 second-feet); channel frequently dry.

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Stream not perennial. A small part of the flood discharge is diverted at low elevations for irrigation of sugar cane. Station was established to determine whether the total flood discharge at an elevation of about 350 feet above sea level will justify the construction of a large flood-water storage project near Kahuku.

ACCURACY.—Records based on rating curve well defined below 12 million gallons per day; good below that limit except for very low stages for which they may be in error because of small amount of water involved. Discharge for days of decided fluctuation in stage computed hourly.

Discharge measurements of East Branch of Malaekahana Stream near Kahuku, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.
Nov. 10	0.13	0.78	0.50
Jan. 6	.16	1.00	.64

Daily discharge, in million gallons, of East Branch of Malaekahana Stream near Kahuku, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1			0.3		0.3	0.3	1.0	1.0	0.3	0.3	1.0	0.3
2		0.3				3.5	1.8	1.0	.3	.3	1.0	.3
3		.3				2.6	2.6	.3	.3	.3	1.0	.3
4		1.0			.3	3.5	1.8	.3	1.0	.3	4.2	.3
5					1.8	6.6	2.6	.3	1.0	.3	1.0	.3
6					.3	8.9	1.0	.3	.3	.3	.3	.3
7		.3			1.8	4.5	1.0	.3	.3	.3	.3	.3
8					1.0	1.8	1.0	.3	9.9	.3	.3	.3
9					.3	1.8	1.0	.3	4.5	.3	.3	.3
10					1.0	1.8	6.5	.3	1.0	.3	.3	.3
11					.3	1.0	2.6	.3	.3	.3	1.0	.3
12				3.0	.3	1.0	1.0	.3	8.8	.3	.3	.3
13				1.0	.3	1.8	1.0	.3	1.8	.3	.3	.3
14				.3	.3	1.0	.3	1.8	1.8	.3	.3	.3
15		5.3			1.0	1.0	.3	.3	1.0	.3	.3	1.8
16		.3			1.0	.3	5.7	.3	5.5	1.8	.3	9.1
17	5.5		.3		4.0	.3	5.2	.3	1.8	.3	1.0	1.0
18	.3	.3			11	3.5	1.0	1.0	1.8	.3	3.5	.3
19		.3		1.0	1.0	1.8	1.0	1.0	4.5	.3	1.8	.3
20		.3		.3	.3	1.0	5.5	.3	7.5	.3	1.0	.3
21				.3	.3	.3	1.0	.3	2.6	.3	1.0	.3
22			.3		.3	.3	1.0	.3	1.0	1.8	1.0	.3
23			.3		.3	.3	5.7	.3	1.0	.3	1.0	.3
24			.3		.3	3.5	1.0	.3	.3	.3	1.0	.3
25			.3	1.0	.3	1.0	1.0	.3	3.5	4.6	1.0	.3
26			.3	.3	1.0	.3	4.5	.3	1.0	1.0	1.0	.3
27			.3	2.3	.3	1.0	1.8	1.0	1.0	1.8	1.0	.3
28			1.0	6.9	1.0	3.5	1.0	1.0	1.0	7.5	1.0	.3
29				1.0	.3	2.6	1.8		1.0	8.6	1.0	.3
30				.3	.3	1.0	1.0		1.0	3.5	.3	.3
31				.3		.3	1.0		.3		.3	

NOTE.—Discharge determined from rating curve well defined below 12 million gallons per day. Discharge interpolated Jan. 31 to Feb. 6. No flow on days for which discharge is not given.

Monthly discharge of East Branch of Malaekahana Stream near Kahuku, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	5.5	0	0.19	0.29	6	18
August	5.3	0	.27	.42	8	26
September	1.0	0	.11	.17	3	10
October	6.9	0	.58	.90	18	55
November	11	0	1.02	1.58	31	94
December	8.9	.3	2.00	3.09	62	190
January	6.5	.3	2.09	3.23	65	199
February	1.8	.3	.50	.77	14	43
March	9.9	.3	2.17	3.36	67	206
April	8.6	.3	1.24	1.92	37	114
May	4.2	.3	.94	1.45	29	89
June	9.1	.3	.67	1.04	20	62
The year	11	0	.99	1.53	360	1,110

MIDDLE BRANCH OF MALAEKAHANA STREAM NEAR KAHUKU, OAHU.

LOCATION.—About a mile above junction with East Branch of Malaekahana Stream; 3½ miles by horse trail south of Kahuku, about 440 feet above sea level.

RECORDS AVAILABLE.—July 31, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder. Gage datum lowered 1 foot September 25, 1914, to avoid minus readings.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 15 feet downstream from staff gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for several hundred feet above gage; bed composed of loose boulders and gravel; free from vegetation; at the gage right bank clean and nearly vertical; left bank slopes gradually and above ordinary flood stages is covered with trees and vegetation. Reinforced concrete control completed November 20, 1915, replacing concrete control washed out September 24, 1914.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 3.40 feet at 9.30 p. m. January 7, 1916 (discharge, approximately 200 million gallons per day, or 309 second-feet); channel dry greater part of the time.

Maximum stage recorded during year, 0.96 foot at 3 a. m. December 6 (discharge, approximately 40 million gallons per day, or 62 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Stream not perennial. A small part of the flood discharge is diverted at low elevations for irrigation of sugar cane. Station was established to determine whether the total flood discharge at an elevation of about 400 feet above sea level will justify the construction of a large flood-water storage project near Kahuku.

ACCURACY.—Determinations are based on rating curve well defined for low and medium stages. Records only fair on account of the small amount of water involved. Discharge for days of decided fluctuation in stage computed hourly.

The following discharge measurement was made by H. A. R. Austin:

January 6, 1917: Gage height, 0.26 foot; discharge, 0.9 second-foot, or 0.6 million gallons per day.

Daily discharge, in million gallons, of Middle Branch of Malaekahana Stream near Kahuku, Oahu, for the year ending June 30, 1917.

Date.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1					0.05			0.05	
2					.05			.05	
3			0.05		.05				
4			.5		.05			.4	
5					.05				
6			4.0	0.5	.05				
7				.5	.05				
8				.5	.05	0.3			
9				.5	.05				
10				2.5	.05				
11				.5				.2	
12				.5		.3			
13				.5					
14				.5	.05				
15				.5	.05				
16				2.5		.2			2.2
17				2.5					
18		1.3		.5				.05	
19				.5				.05	
20				2.5		.6		.05	
21				.5		.4		.05	
22				.5					
23				.5					
24				.05					
25				.05			1.2		
26				.5					
27	.9			.05			.1		
28	1.3			.05	.6		1.2		
29				.05			2.5		
30				.05			.5		
31				.05					

NOTE.—Discharge determined from rating curve well defined below 8 million gallons per day. No flow during August and September, or on days for which discharge is not given, except July 10–25, and Dec. 7 to Jan. 5, for which gage heights were not recorded.

Monthly discharge of Middle Branch of Malaekahana Stream near Kahuku, Oahu, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
October	1.3	0	0.07	0.11	2	7
November	1.3	0	.04	.06	1	4
December 1–6	4.0	0	.76	1.18	5	14
January 6–31	2.5	0.05	.69	1.07	18	55
February	.6	0	.04	.06	1	3
March	.6	0	.06	.09	2	6
April	2.5	0	.18	.28	6	17
May	.4	0	.03	.05	1	3
June	2.2	0	.07	.11	2	6

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

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

RECORDS AVAILABLE.—May 29, 1913, to June 30, 1917.

GAGE.—Stevens water-stage recorder on left bank.

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 stage recorded during year, 5.75 feet at 5 p. m. April 14 (discharge, approximately 400 million gallons per day, or 619 second-feet); minimum stage recorded, 1.4 feet February 28 to March 2 (discharge, 0.7 million gallons per day, or 1.1 second-feet).

Maximum stage recorded during period of record, 6.9 feet 10 p. m. November 8, 1914 (discharge, estimated by extension of rating curve, 560 million gallons per day, or 866 second-feet); minimum daily discharge, March, 1914 (0.2 million gallons per day, or 0.3 second-feet).

DIVERSIONS.—None above station; entire low-water flow below station diverted.

REGULATION.—None.

UTILIZATION.—Wahiawa Water Co.'s ditch diverts entire low-water flow of both right and left branches of North Fork at their confluence below gaging station on each branch for domestic water supply and irrigation in vicinity of Wahiawa. Discharge from North Fork is impounded in Wahiawa reservoir for irrigation of sugar cane on Waialua plantation.

ACCURACY.—Records based on well-defined rating curve and continuous record of gage height; good for all stages.

Discharge measurements of right branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Sept. 1	2.03	12.2	7.9	Mar. 1	1.39	0.79	0.5
Jan. 3	1.99	12	7.7	May 2	2.02	12.7	8.2

Daily discharge, in million gallons, of right branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.8	8.0	5.2	4.5	10	7.0	12	3.0	0.7	7.0	6.0	26
2	3.0	10	6.0	3.8	9.0	26	12	5.2	.7	8.0	6.0	18
3	8.0	9.0	3.0	3.0	7.0	12	12	7.0	1.0	13	5.2	9.0
4	7.0	12	2.5	3.0	16	22	9.0	3.8	3.0	5.2	7.0	5.2
5	4.5	7.0	2.5	2.5	13	8.0	16	2.5	1.2	5.2	5.2	6.0
6	3.0	12	2.5	2.5	10	8.0	9.0	2.5	1.0	3.8	3.8	14
7	2.5	20	2.5	2.5	14	20	6.0	2.5	1.0	3.8	12	10
8	2.5	9.0	2.0	2.0	20	8.0	5.2	2.5	1.2	3.8	3.8	20
9	2.5	7.0	3.8	2.0	20	7.0	4.5	2.0	8.0	6.0	5.2	36
10	2.0	5.2	2.5	2.0	34	7.0	26	2.0	1.6	3.0	6.0	10
11	2.5	5.2	2.5	1.6	12	5.2	8.0	2.0	14	14	32	10
12	7.0	6.0	8.0	5.2	9.0	5.2	6.0	2.0	59	9.0	7.0	8.0
13	5.2	5.2	2.5	4.5	8.0	9.0	4.5	3.0	18	26	7.0	7.0
14	3.8	36	2.0	3.8	6.0	6.0	4.5	5.2	29	101	10	6.0
15	2.0	18	2.0	4.5	9.0	4.5	3.8	2.0	32	32	8.0	9.0
16	14	8.0	2.5	4.5	6.0	4.5	9.0	2.0	16	24	8.0	9.0
17	39	12	4.5	4.5	29	5.2	7.0	1.6	10	18	7.0	5.2
18	18	9.0	3.8	9.0	36	42	3.8	2.5	8.0	12	44	7.0
19	8.0	8.0	4.5	9.0	10	32	4.5	2.5	32	9.0	44	4.5
20	7.0	8.0	2.5	7.0	8.0	9.0	9.0	1.6	26	7.0	18	4.5
21	10	7.0	3.8	4.5	7.0	8.0	3.8	1.6	18	7.0	10	3.8
22	4.5	6.0	16	3.8	6.0	10	3.0	1.2	8.0	18	8.0	3.8
23	3.8	4.5	5.2	5.2	5.2	13	3.8	1.2	6.0	10	20	3.0
24	3.8	4.5	3.8	12	4.5	12	22	1.0	18	9.0	9.0	3.0
25	3.8	3.8	13	14	8.0	6.0	7.0	1.0	66	7.0	7.0	2.5
26	3.0	3.8	18	4.5	12	5.2	20	1.0	36	5.2	6.0	2.5
27	5.2	3.8	12	20	9.0	7.0	6.0	1.0	12	5.2	6.0	2.5
28	4.5	3.8	7.0	47	14	9.0	4.5	.7	10	9.0	7.0	2.5
29	3.0	3.0	6.0	32	13	14	4.5	.....	9.0	26	6.0	2.0
30	3.8	3.0	4.5	53	12	6.0	3.8	.....	6.0	9.0	12	2.0
31	12	4.5	.....	16	.....	4.5	3.0	.....	6.0	.....	44	.....

NOTE.—Discharge determined from well-defined rating curve. Discharge Sept. 11–21, 26–30, Oct. 1–10, and June 2–7 determined by comparison with record of flow of left branch.

Monthly discharge of right branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	39	2.0	6.54	10.1	203	622
August	36	3.0	8.46	13.1	262	805
September	18	2.0	5.22	8.08	157	481
October	53	1.6	9.46	14.6	293	900
November	36	4.5	12.6	19.5	377	1,160
December	42	4.5	11.0	17.0	342	1,050
January	26	3.0	8.17	12.6	253	777
February	7.0	.7	2.36	3.65	66	203
March	66	.7	14.8	22.9	458	1,410
April	101	3.0	13.9	21.5	416	1,280
May	44	3.8	12.3	19.0	380	1,170
June	36	2.0	8.40	13.0	252	773
The year	101	.7	9.48	14.7	3,460	10,600

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

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

RECORDS AVAILABLE.—May 25, 1913, to June 30, 1917.

GAGE.—Stevens water-stage recorder on left bank.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 7.3 feet at 10 p. m. March 19, 1917 (discharge, approximately 850 million gallons per day, or 1,320 second-feet); minimum stage recorded, 0.85 foot February 9 and 10, 1915 (discharge, 0.25 million gallons per day, or 0.37 second-foot).

Minimum stage recorded during year 1.05 feet February 26 to March 2 (discharge, 0.8 million gallons per day, or 1.2 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—The entire low flow of the North Fork is diverted immediately below confluence of the right and left branches, and is impounded in Wahiawa reservoir for sugar-cane irrigation on Waialua Agricultural Co.'s plantation.

ACCURACY.—Records July 1 to March 11 good; March 12 to June 30, fair.

Discharge measurements of left branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Aug. 2	2.25	58	37	Feb. 1	1.26	4.72	3.1
Oct. 3	1.46	8.68	5.6	Apr. 2	1.39	9.93	6.4
Dec. 1	1.52	11.8	7.6	June 2	1.87	39.0	25

Daily discharge, in million gallons, of left branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	9.0	28	12	9.0	14	10	12	2.6	0.8	8.8	8.8	19
2	7.9	34	12	6.8	10	58	10	4.8	.8	10	6.5	27
3	15	15	5.8	5.8	9.0	21	23	4.8	1.5	17	6.5	13
4	15	21	4.8	5.8	38	34	15	3.2	5.8	6.5	12	7.5
5	9.0	15	4.8	4.8	23	12	19	2.6	2.6	6.5	8.8	8.8
6	6.8	15	4.0	4.8	19	12	9.0	2.0	2.0	5.5	6.5	21
7	4.8	26	4.8	4.8	34	28	7.9	2.0	1.5	4.6	12	15
8	4.0	15	4.0	4.0	28	12	5.8	2.0	1.5	5.5	6.5	40
9	4.0	14	7.9	4.0	23	9.0	5.8	2.0	12	13	5.5	48
10	4.0	9.0	4.8	4.0	34	10	42	2.0	2.0	4.6	6.5	13
11	4.0	10	4.8	3.2	17	7.9	9.0	1.5	34	21	30	21
12	10	10	15	9.0	12	7.9	6.8	1.5	70	10	7.5	10
13	14	12	4.8	5.8	10	14	5.8	4.8	24	17	10	10
14	9.0	76	4.0	5.8	10	7.9	4.8	2.6	40	148	17	7.5
15	4.0	34	4.0	6.8	15	6.8	4.8	1.5	19	30	13	17
16	26	14	4.8	9.0	9.0	6.8	10	1.5	15	36	13	13
17	86	28	7.9	21	50	9.0	9.0	1.5	12	24	12	7.5
18	38	15	6.8	26	46	67	4.8	3.2	8.8	15	74	10
19	14	17	9.0	19	14	81	5.8	2.0	52	12	70	6.5
20	15	15	4.8	17	10	14	12	1.5	40	10	27	5.5
21	19	12	6.8	12	9.0	10	4.8	1.5	24	8.8	13	5.5
22	9.0	9.0	23	10	7.9	14	4.0	1.5	13	21	10	4.6
23	6.8	7.9	15	14	7.9	23	4.0	1.0	12	17	24	4.6
24	6.8	6.8	10	21	7.9	21	12	1.0	24	13	10	3.8
25	10	6.8	34	28	10	9.0	4.8	1.0	99	8.8	8.8	3.8
26	7.9	6.8	34	12	26	7.9	21	.8	52	7.5	7.5	3.8
27	21	6.8	23	28	12	6.8	6.8	.8	15	6.5	7.5	3.2
28	12	5.8	14	58	28	10	4.0	.8	13	13	7.5	5.5
29	6.8	4.8	12	34	14	21	4.0	.....	15	40	7.5	3.2
30	9.0	5.8	7.9	42	14	9.0	3.2	.....	8.8	12	17	3.2
31	19	7.9	.....	19	.....	6.8	2.6	.....	7.5	.....	40	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1 to Mar. 11, well defined; Mar. 12 to May 19 and May 20 to June 30, fairly well defined. Discharge Mar. 24–28 and Apr. 2–4 determined by comparison with records obtained on right branch.

Monthly discharge of left branch of North Fork of Kaukonahua Stream near Wahiawa, Oahu, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	86	4.0	13.8	21.4	427	1,310
August	76	4.8	16.2	25.1	503	1,540
September	34	4.0	10.4	16.1	310	958
October	58	3.2	14.7	22.7	454	1,400
November	50	7.9	18.7	28.9	562	1,720
December	81	6.8	18.3	28.3	567	1,740
January	42	2.6	9.47	14.7	294	901
February	4.8	.8	2.07	3.20	58	178
March	99	.8	20.3	31.4	629	1,930
April	148	4.6	18.4	28.5	553	1,690
May	74	5.5	16.3	25.2	506	1,550
June	48	3.2	12.0	18.6	362	1,100
The year	148	.8	14.3	22.1	5,220	16,000

SOUTH FORK OF KAUKONAHUA STREAM ABOVE UNITED STATES ARMY RESERVOIR, NEAR WAHIAWA, OAHU.[1]

LOCATION.—About one-eighth mile above United States Army ditch intake, 5 miles by trail above United States Army reservoir, and 10 miles east of Wahiawa by road to reservoir and trail along ditch.

RECORDS AVAILABLE.—June 18, 1913, to April 5, 1917. Station discontinued on account of backwater from new dam.

GAGE.—Stevens water-stage recorder.

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

CHANNEL AND CONTROL.—Channel in vicinity of gage is straight and has been cleared of boulders; banks steep; flow is confined past the gage. Natural control at head of long riffle has been improved for low-water stages by construction of a low rock-fill dam.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.5 feet at 3 a. m. March 9 (discharge, approximately 600 million gallons per day, or 928 second-feet); minimum stage recorded, 1.25 feet February and March (discharge, 0.8 million gallons per day, or 1.2 second-feet).

Maximum stage recorded during period of record, 7.05 feet 11 p. m. November 20, 1913 (estimated discharge, 900 million gallons per day, or 1,390 second-feet by extension of rating curve); minimum daily discharge, March, 1915 (0.15 million gallons per day, or 0.25 second-foot).

DIVERSIONS.—None above gage. United States Army diverts all the low-water flow one-eighth of a mile below station.

REGULATION.—None.

UTILIZATION.—Low-water flow past this station is diverted one-eighth of a mile down stream into United States Army ditch, and impounded in United States Army storage reservoir of 21 million gallons capacity (64 acre-feet), 5 miles downstream, and carried thence by pipe line for water supply for cantonment at Castner. Records show amount of water available for additional water-supply for Castner. Discharge from South Fork is impounded in Wahiawa reservoir for sugar-cane irrigation on Waialua Plantation.

ACCURACY.—Rating curve well defined for low and medium stages. Gage height of record continuous. Records good below 50 million gallons per day and fair above that limit.

[1] Called South Fork of Kaukonahua stream near Wahiawa, Oahu, in Water-Supply Paper 373.

Discharge measurements of South Fork of Kaukonahua Stream, above United States Army reservoir, near Wahiawa, Oahu, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.	
		Second-(feet).	Million gallons per day.
Sept. 7	1.62	9.4	6.1
Nov. 13	1.59	9.37	6.1

Daily discharge, in million gallons, of South Fork of Kaukonahua Stream above United States Army reservoir, near Wahiawa, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1	9.0	64	13	6.0	9.0	11	7.5	2.8	0.8	4.8
2	7.5	44	15	6.0	7.5	84	13	4.8	.8	3.5
3	9.0	28	6.0	4.8	7.5	22	20	3.5	1.0	7.5
4	9.0	38	6.0	3.5	38	31	9.0	2.8	6.0	6.0
5	7.5	17	3.5	2.8	34	11	9.0	2.8	2.0	7.5
6	4.8	34	3.5	2.8	17	11	9.0	2.0	1.0	.....
7	3.5	17	6.0	3.5	20	31	6.0	2.0	1.0	.....
8	3.5	17	3.5	2.8	11	11	4.8	2.0	1.0	.....
9	3.5	13	3.5	2.0	11	9.0	6.0	2.0	17	.....
10	3.5	9.0	3.5	2.0	17	9.0	52	2.0	2.0	.....
11	3.5	9.0	3.5	2.0	9.0	6.0	11	2.0	9.0	.....
12	7.5	15	11	9.0	7.5	4.8	7.5	2.0	84	.....
13	13	11	3.5	3.5	6.0	17	6.0	2.8	22	.....
14	6.0	28	3.5	2.0	6.0	6.0	6.0	4.8	34	.....
15	3.5	31	3.5	2.0	11	4.8	4.8	2.0	15	.....
16	22	9.0	3.5	2.8	6.0	4.8	13	2.0	13	.....
17	44	25	2.8	15	48	13	11	2.0	11	.....
18	15	20	6.0	20	44	52	4.8	3.5	7.5	.....
19	7.5	15	7.5	11	11	60	6.0	3.5	56	.....
20	7.5	20	3.5	6.0	9.0	15	13	2.0	44	.....
21	9.0	17	4.8	6.0	7.5	15	4.8	2.0	17	.....
22	6.0	11	13	4.8	6.0	17	3.5	1.5	9.0	.....
23	4.8	9.0	13	7.5	6.0	28	3.5	1.0	6.0	.....
24	3.5	7.5	11	7.5	6.0	25	9.0	1.0	4.8	.....
25	4.8	6.0	17	20	4.8	11	3.5	1.0	17	.....
26	6.0	6.0	22	9.0	13	11	22	.8	15	.....
27	11	9.0	13	11	7.5	13	6.0	.8	3.5	.....
28	9.0	7.5	9.0	41	28	34	3.5	.8	4.8	.....
29	3.5	6.0	7.5	15	17	15	3.5	.....	17	.....
30	13	6.0	6.0	11	11	9.0	2.8	.....	4.8	.....
31	34	20	.....	9.0	.....	6.0	2.8	.....	3.5	.....

NOTE.—Discharge determined from rating curve well defined below 50 million gallons per day.

Monthly discharge of South Fork of Kaukonahua Stream, near Wahiawa, Oahu, above United States Army reservoir, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	44	3.5	9.51	14.7	295	905
August	64	6.0	18.4	28.5	569	1,750
September	22	2.8	7.60	11.8	228	700
October	41	2.0	8.11	12.5	251	772
November	48	4.8	14.5	22.4	436	1,340
December	84	4.8	19.3	29.9	597	1,840
January	52	2.8	9.17	14.2	284	872
February	4.8	.8	2.22	3.43	62	191
March	84	.8	13.9	21.5	430	1,320
April 1–5	7.5	3.5	5.86	9.07	29	90
The period	.....	.....	.....	.....	3,180	9,780

SOUTH FORK OF KAUKONAHUA STREAM BELOW UNITED STATES ARMY RESERVOIR, NEAR WAHIAWA, OAHU.

LOCATION.—About 600 feet upstream from highway bridge on road from Castner to United States Army reservoir, about one-fourth mile above gulch entering from northeast, 2½ miles east of Castner, and 2 miles southeast of Wahiawa.

RECORDS AVAILABLE.—July 23, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable directly over concrete control 50 feet downstream from gage.

CHANNEL AND CONTROL.—Reinforced concrete slab 26 feet long, extending from bank to bank; 4 feet wide, with rectangular low-water section 7.5 feet wide near left bank, to confine extreme low flow. Downstream side of concrete slab protected from undermining by apron of discarded fence posts. Banks high. Bed composed of gravel; channel straight and fairly smooth in vicinity of gaging station.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 10.35 feet at 7 a. m., August 5, 1914 (discharge, about 1,400 million gallons per day, or 2,170 second-feet, estimated by extension of rating curve); minimum daily discharge, March and June, 1915, and March and June, 1916 (1.0 million gallons per day, or 1.5 second-feet).

DIVERSIONS.—United States Army ditch diverts water from stream near headwaters.

REGULATION.—Practically none.

UTILIZATION.—Water diverted at about 1,130 feet above sea level by the United States Army ditch is impounded in United States Army reservoir and carried by pipe line to the cantonment of Castner for water supply. An additional supply is pumped into this pipe line during periods of extreme low water from the stream just below the highway bridge below the gaging station. Wahiawa reservoir, into which the stream empties, supplies water for sugar-cane irrigation on Waialua plantation.

ACCURACY.—Discharge ascertained from well-defined rating curve and a continuous record of gage height. Below 120 million gallons per day records good.

Discharge measurements of South Fork of Kaukonahua Stream below United States Army reservoir, near Wahiawa, Oahu, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 7	H. A. R. Austin	1.38	36.2	23
Dec. 5	do	1.17	24	16
Feb. 27	do	.50	3.1	2.0
Mar. 14	do	1.96	134	86
Apr. 14	do	2.21	144	93
May 18	R. D. Klise	1.66	57	37

Daily discharge, in million gallons, of South Fork of Kaukonahua Stream below United States Army reservoir, near Wahiawa, Oahu, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	14	96	17	7.8	14	14	12	6.8	1.6	14	10	10
2	12	70	19	8.9	12	114	19	10	1.6	11	7.8	12
3	14	38	10	5.8	10	38	28	8.9	1.6	10	19	14
4	14	34	10	5.8	55	42	14	5.8	4.9	7.8	12	7.8
5	12	19	7.8	4.9	90	16	14	5.8	4.9	7.8	14	8.9
6	7.8	23	7.8	4.9	31	14	14	4.0	2.6	6.8	5.8	23
7	6.8	28	16	5.8	38	114	10	4.0	2.1	5.8	4.9	11
8	5.8	19	8.9	2.6	19	26	11	4.0	2.1	10	4.0	10
9	7.8	17	11	3.3	17	14	11	4.0	21	23	3.3	14
10	6.8	16	11	4.9	23	14	147	4.0	7.8	8.9	3.3	8.9
11	5.8	17	8.9	3.3	14	10	23	4.0	8.9	16	5.8	19
12	8.9	23	14	8.9	12	19	14	4.0	133	16	4.9	10
13	17	19	8.9	10	11	12	12	5.8	31	7.8	6.8	8.9
14	11	28	6.8	5.8	10	10	12	8.9	50	42	23	6.8
15	8.9	38	5.8	5.8	11	7.8	11	4.0	23	16	12	11
16	34	16	5.8	5.8	12	7.8	31	4.0	17	21	12	16
17	75	34	4.9	21	42	19	19	4.0	17	14	16	6.8
18	21	38	7.8	28	108	75	12	6.8	16	10	60	6.8
19	14	26	17	19	17	85	12	6.8	120	8.9	96	5.8
20	12	46	8.9	11	12	23	42	4.0	182	7.8	42	4.9
21	12	23	8.9	11	11	23	12	4.0	28	8.9	14	4.9
22	10	17	19	10	11	26	11	2.6	17	12	11	4.0
23	6.8	14	17	12	10	38	10	1.6	12	10	10	4.0
24	6.8	12	14	11	11	34	16	1.6	11	10	8.9	3.3
25	8.9	11	19	28	12	16	10	1.6	19	4.9	8.9	3.3
26	7.8	11	28	12	19	16	28	1.6	26	4.0	7.8	2.6
27	16	14	14	12	11	19	14	1.6	11	4.0	6.8	2.6
28	12	12	14	70	38	50	10	1.6	12	5.8	6.8	4.0
29	7.8	11	10	38	16	23	8.9	.....	23	28	5.8	3.3
30	46	10	7.8	19	42	14	7.8	.....	12	11	7.8	2.6
31	46	26	.....	16	.....	10	6.8	.....	10	.....	19	.....

NOTE.—Discharge determined from rating curve well defined below 120 million gallons per day. Discharge July 1–7, Dec. 4 and 5, 9 and 10, 14–31, Jan. 1–6, and Feb. 8–26 determined by comparison with records obtained at station above United States Army reservoir.

Monthly discharge of South Fork of Kaukonahua Stream below United States Army reservoir, near Wahiawa, Oahu, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	75	5.8	15.8	24.4	489	1,500
August	96	10	26.0	40.2	806	2,470
September	28	4.9	12.0	18.6	359	1,100
October	70	2.6	13.3	20.6	412	1,270
November	108	10	24.6	38.1	739	2,260
December	114	7.8	30.4	47.0	944	2,890
January	147	6.8	19.4	30.0	602	1,850
February	10	1.6	4.49	6.95	126	386
March	182	1.6	26.7	41.3	829	2,540
April	42	4.0	12.1	18.7	363	1,110
May	96	3.3	15.1	23.4	469	1,440
June	23	2.6	8.34	12.9	250	768
The year	182	1.6	17.5	27.1	6,390	19,600

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 for the year ending June 30, 1917.

Date.	Stream.	Locality.	Gage height (feet).	Discharge.	
				Second-feet.	Million gallons per day.
Feb. 12	Punaluu	Elevation 800 feet, near Punaluu		4.00	*a* 2.59
13	do	do		3.65	*a* 2.36
14	do	do		4.89	*a* 3.16
15	do	do		4.12	*a* 2.66
June 11	Waihoi (north fork)	Elevation 560 feet, near Punaluu		3.5	2.3
11	Waihoi (south fork)	do		1.4	0.9
July 13	East Manoa ditch	100 feet below intake, Manoa Valley	0.93	2.1	1.4
Aug. 29	do	do	1.25	1.9	1.2
Sept. 29	do	do	1.32	1.2	.8

a Total of 4 branches.

ISLAND OF MAUI.

SOUTH WAIEHU STREAM NEAR WAILUKU, MAUI.

LOCATION.—Previous to January 18, 1916, 300 feet above intake of South Waiehu ditch, about 3 miles west of Wailuku. On January 18, 1916, the gage was washed out and station was reestablished April 25, 1916, 500 feet downstream.

RECORDS AVAILABLE.—March 19, 1913, to March 31, 1917, when station was discontinued.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENT.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 45 feet above gage; bed of stream very rough and steep; banks high and covered with vegetation. Control composed of boulders and gravel; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 6 feet at 5 p. m. January 9, 1916 (discharge, computed from extension of rating curve, approximately 150 million gallons per day, or 232 second-feet); minimum stage recorded, 0.5 foot July, 1913 (discharge, 1.5 million gallons per day, or 2.3 second-feet).

DIVERSIONS.—A small taro ditch diverts about 0.1 second-foot above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane and taro.

ACCURACY.—Gage read twice daily. Records poor, as gage-height record is believed to be unreliable.

Discharge measurements of South Waiehu Stream near Wailuku, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons. per day.
July 24	0.89	6.6	4.3	Dec. 13	0.83	6.22	4.0
Aug. 19	.89	6.1	4.0	Jan. 26	.87	5.18	3.3
Sept. 15	.87	6.95	4.5	Mar. 17	.70	4.34	2.8
Oct. 16	.79	5.41	3.5	18	.83	9.24	6.0

Monthly discharge of South Waiehu Stream near Wailuku, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	7.7	5.0	5.28	8.17	164	502
August	6.3	5.0	5.45	8.43	169	518
September	7.0	4.5	5.48	8.48	164	505
October	9.1	4.0	5.13	7.94	159	488
November	7.7	4.0	4.95	7.66	149	456
December	9.1	4.0	4.88	7.55	151	464
January	4.5	4.0	4.06	6.28	126	386
February	5.0	4.0	4.25	6.58	119	365
March	17	4.0	4.61	7.13	143	439

NOTE.—Discharge determined from poorly defined rating curve.

NORTH WAIEHU DITCH NEAR WAILUKU, MAUI.

LOCATION.—About 4 miles by road and trail northwest of Wailuku; one-quarter of a mile below intake.

RECORDS AVAILABLE.—April 25, 1916, to June 30, 1917. Also from December 1, 1910, to July 8, 1912, at old location a short distance below present site.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel about 3.5 feet wide cut in earth and gravel; control not well defined.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.55 feet December 23–25, 1916 (discharge, approximately 11 million gallons per day, or 17 second-feet); water occasionally shut off.

DIVERSIONS.—None above station; ditch diverts water from North Waiehu Stream.

REGULATION.—By headgates.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Gage read twice daily. Record good for discharge below 6 million gallons per day.

Discharge measurements of North Waiehu ditch near Wailuku, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 24	0.80	7.5	4.9	Jan 26	0.68	5.09	3.3
Aug. 12	.82	6.7	4.3	Feb. 16	.72	5.30	3.4
Sept 15	.73	5.6	3.6	Mar. 24	.65	4.57	3.0
Dec. 13	.71	5.24	3.4				

Daily discharge, in million gallons, of North Waiehu ditch near Wailuku, Maui, for the year ending June 30, 1916.

Date.	Apr.	May.	June.	Date.	Apr.	May.	June.	Date.	Apr.	May.	June.
1	.....	4.0	4.9	11	.....	4.0	5.4	21	.....	4.4	4.9
2	.....	4.0	4.9	12	.....	4.0	5.4	22	.....	4.4	4.9
3	.....	4.0	4.9	13	.....	4.0	4.9	23	.....	4.4	4.9
4	.....	4.0	4.9	14	.....	4.0	4.9	24	.....	4.4	5.4
5	.....	4.0	4.9	15	.....	4.0	4.9	25	.....	4.4	4.9
6	.....	4.0	4.9	16	.....	4.0	5.4	26	4.0	4.4	4.9
7	.....	4.0	5.4	17	.....	4.0	5.4	27	4.0	4.4	4.9
8	.....	4.0	5.4	18	.....	4.0	5.4	28	4.0	4.4	4.9
9	.....	4.0	5.4	19	.....	4.0	5.4	29	4.0	4.4	4.9
10	.....	4.0	5.4	20	.....	4.0	5.4	30	4.0	4.9	4.9
								31	.....	4.9	.....

Daily discharge, in million gallons, of North Waiehu ditch near Wailuku, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	4.9	4.9	3.8	3.4	3.4	3.0	2.2	3.4	3.4	3.4	4.2	3.4
2	4.9	6.0	3.8	3.4	3.4	3.0	3.0	3.4	3.4	3.4	3.4	3.4
3	4.9	3.0	4.2	3.4	3.4	3.0	3.4	3.4	3.4	3.4	3.4	3.4
4	5.4	4.2	4.2	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4
5	5.4	4.2	4.2	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.0
6	5.4	4.2	4.2	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.0
7	4.9	4.2	3.4	3.4	3.4	3.4	3.0	3.4	3.4	3.4	3.4	3.0
8	4.9	4.2	3.4	3.4	3.0	3.4	3.0	3.4	3.4	3.4	3.4	3.4
9	4.9	4.2	3.4	3.4	3.4	3.4	3.0	3.8	3.4	3.4	3.4	3.4
10	5.4	4.2	4.2	3.4	3.0	3.4	3.4	3.4	3.4	3.4	3.4	3.4
11	4.9	4.2	3.4	3.4	3.0	3.0	3.4	3.8	3.4	3.4	3.4	3.4
12	4.9	4.2	3.4	3.4	3.0	3.4	3.4	3.8	3.4	3.4	3.4	3.4
13	4.9	4.2	3.4	3.4	3.0	4.2	3.4	3.4	3.4	3.4	3.4	3.4
14	4.9	4.6	3.4	3.4	3.0	4.2	3.4	3.4	4.2	3.4	3.4	3.4
15	4.9	4.6	3.4	3.4	3.0	3.8	3.0	3.4	3.4	3.4	3.4	3.4
16	4.9	4.2	3.4	3.4	3.8	2.2	3.0	3.4	3.4	3.4	3.4	3.4
17	5.4	4.2	3.4	3.4	3.8	2.2	3.0	3.4	3.4	3.4	3.4	3.4
18	4.9	4.2	3.4	3.4	3.4	1.9	3.0	1.3	3.8	3.4	3.8	3.4
19	5.4	4.2	3.8	3.4	3.4	1.9	3.0	1.3	3.0	3.4	3.4	3.4
20	5.4	4.2	3.4	3.4	3.4	1.9	3.0	2.2	3.8	3.4	3.4	3.4
21	4.9	3.8	3.4	3.4	3.0	3.0	3.0	3.4	3.8	3.4	3.4	3.4
22	4.9	3.8	3.4	3.4	3.4	3.4	3.0	3.0	3.4	3.4	3.4	3.4
23	4.9	3.8	3.4	3.4	3.4	11	3.0	3.0	3.4	3.4	3.8	3.0
24	4.9	3.8	3.4	3.4	3.4	11	3.0	3.0	3.4	3.4	3.4	3.0
25	4.9	3.8	3.4	3.4	3.4	11	3.0	3.4	3.4	3.4	3.4	3.0
26	4.9	3.8	3.4	3.4	3.4	3.4	3.0	3.0	3.4	2.6	3.4	3.0
27	3.5	3.8	3.4	3.4	3.4	3.0	3.0	3.4	3.4	1.6	3.4	3.4
28	4.9	3.8	3.4	3.4	3.8	3.0	3.0	3.4	3.8	3.4	3.4	3.4
29	4.9	3.8	3.4	3.4	3.4	3.0	3.4	.....	3.8	3.4	3.4	3.4
30	4.9	3.8	3.4	3.4	3.4	3.0	3.4	.....	3.8	3.4	3.4	3.0
31	4.9	3.8	.....	3.4	.....	3.0	3.4	.....	3.8	.....	3.4	.....

NOTE.—Discharge determined from rating curves well defined below 5 million gallons per day, applicable Apr. 26 to Aug. 2, 1916, and Aug. 3, 1916, to June 30, 1917.

Monthly discharge of North Waiehu ditch near Wailuku, Maui, for year ending June 30, 1916.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
April 26–31	4.0	4.0	4.00	6.19	20	61
May	4.9	4.0	4.17	6.45	129	397
June	5.4	4.9	5.10	7.89	153	470
The period	5.4	4.0	4.58	7.09	302	928

Monthly discharge of North Waiehu ditch near Wailuku, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	5.4	3.5	4.97	7.69	154	473
August	6.0	3.0	4.13	6.39	128	393
September	4.2	3.4	3.57	5.52	107	329
October	3 4	3.4	3.40	5.26	105	323
November	3.8	3.0	3.33	5.15	100	307
December	11.0	1.9	3.85	5.96	119	366
January	3.4	2.2	3.13	4.84	97	298
February	3.8	1.3	3.19	4.94	89	274
March	4.2	3.0	3.50	5.42	109	333
April	3.4	1.6	3.31	5.12	99	305
May	4.2	3.4	3.45	5.34	107	328
June	3.4	3.0	3.29	5.09	99	303
The year	11.0	1.3	3.60	5.57	1,310	4,030

WAIHEE STREAM NEAR WAIHEE, MAUI.

LOCATION.—About 300 feet above intake of Waihee canal, 3 miles west of Waihee, and 7 miles northwest of Wailuku.

RECORDS AVAILABLE.—April 1, 1913, to June 30, 1917.

GAGE.—Stevens water-stage recorder installed January 15, 1916, replacing Barrett & Lawrence water-stage recorder. Datum raised 2.0 feet August 18, 1915.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 250 feet below gage.

CHANNEL AND CONTROL.—Channel at gage is a pool at foot of low waterfall; banks mostly of solid rock, steep and high. Control composed of boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9 feet (new datum), estimated gage height of flood of January 18, 1916; no estimate of discharge possible; minimum stage recorded, 2.59 feet August 5, 1913 (discharge, 21 million gallons per day, or 32 second-feet).

Minimum stage recorded during year, 2.25 feet March 21 (discharge, 23 million gallons per day, or 36 second-feet).

DIVERSIONS.—None above station.

REGULATION.—Natural flow of stream is increased by development tunnels near headwaters.

UTILIZATION.—Irrigation of sugar cane and taro.

ACCURACY.—Records fair for low and medium stages. There were several changes in control during year and good rating curves were not developed, but frequent discharge measurements give fair rating curves for ordinary stages.

Discharge measurements of Waihee Stream near Waihee, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 18	H. A. R. Austin	2.42	84	54
Aug. 19	do	2.40	94	61
Sept. 16	do	2.32	62	40
Oct. 14	do	2.24	57	37
Dec. 13	do	2.47	90	58
Jan. 14	do	2.26	59	38
Feb. 17	do	2.16	47	30
Mar. 17	do	2.38	48	31
18	do	3.03	164	106
Apr. 21	do	2.37	52.3	34
May 19	do	2.32	51.1	33
June 19	C. T. Bailey	2.28	48.9	32

Daily discharge, in million gallons, of Waihee Stream near Waihee, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	58	75	75	69	58	42	42	38	33	47	58	38
2	52	102	63	52	52	102	42	33	33	52	42	58
3	58	95	47	42	42	204	47	33	52	30	42	33
4	58	58	42	42	42	82	69	33	42	38	38	38
5	75	52	38	38	110	42	47	33	33	33	33	33
6	52	42	47	38	82	42	42	33	33	26	33	52
7	52	42	63	38	47	38	42	33	30	26	33	42
8	47	52	47	38	42	42	38	33	52	26	33	88
9	47	42	38	38	47	63	38	33	110	26	33	95
10	58	47	47	38	42	177	52	33	38	26	33	52
11	63	58	42	38	42	47	58	33	82	38	42	69
12	52	63	42	52	38	52	42	33	58	30	38	38
13	58	69	42	42	38	82	38	33	47	42	33	33
14	52	224	42	38	38	102	38	58	44	52	38	33
15	58	102	63	38	58	58	38	33	41	38	38	30
16	63	63	42	38	38	69	38	33	37	30	33	30
17	95	69	38	58	95	82	38	30	33	38	42	30
18	58	58	38	42	42	52	38	38	134	30	63	42
19	88	63	69	38	38	88	38	42	42	38	52	30
20	52	63	42	38	38	58	42	33	33	45	52	30
21	52	63	47	38	38	110	38	33	23	52	52	30
22	47	63	58	52	42	118	33	30	30	33	52	58
23	42	58	69	58	42	284	33	30	26	33	110	33
24	42	58	63	42	47	95	33	30	26	30	75	30
25	47	52	69	38	42	63	33	30	63	26	47	30
26	82	63	52	102	47	52	42	30	47	26	38	26
27	88	58	69	75	47	63	38	33	26	26	38	38
28	63	58	47	63	126	88	38	52	26	88	38	38
29	47	52	47	52	63	52	42	.....	30	244	38	42
30	42	52	42	58	47	42	38	.....	30	186	42	33
31	95	75	.....	38	.....	42	38	.....	38	.....	38	.....

NOTE.—Discharge determined from poorly-defined rating curves applicable as follows: July 1 to Aug. 14, 1916, and Sept. 1, 1916, to Mar. 9, 1917; Aug. 15–31, 1916; Mar. 10 to Apr. 30, 1917; May 1 to June 30, 1917. Discharge interpolated Mar. 14–16 and estimated by comparison with records of neighboring streams June 21–30.

Monthly discharge of Waihee Stream near Waihee, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	95	42	59.5	92.1	1,840	5,660
August	224	42	67.5	104	2,090	6,420
September	75	38	51.0	78.9	1,530	4,700
October	102	38	47.5	73.5	1,470	4,520
November	126	38	52.3	80.9	1,570	4,820
December	284	38	81.7	126	2,530	7,770
January	69	33	41.1	63.6	1,270	3,910
February	58	30	34.6	53.5	969	2,970
March	134	23	44.3	68.5	1,370	4,210
April	244	26	48.5	75	1,460	4,470
May	110	33	44.4	68.7	1,380	4,220
June	95	26	41.7	64.5	1,250	3,840
The year	284	23	51.3	79.4	18,700	57,500

HONOKAHAU STREAM NEAR HONOKAHAU, MAUI.

LOCATION.—1,000 feet above intake of Honokahau ditch, about 6 miles southeast of Honokahau.

RECORDS AVAILABLE.—March 6, 1913, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from cable 400 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet below gage, but makes sharp bend 50 feet above gage; right bank slopes gently; left bank is vertical wall of rock. Control composed of large boulders; seldom shifts.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 8.25 feet at 7.30 a. m., January 18, 1916 (discharge computed from extension of rating curve, approximately 1,900 million gallons per day, or 2,940 second-feet); minimum stage recorded, 1.00 foot October 31, 1913, and October 6, 1915 (discharge, 10 million gallons per day, or 15.5 second-feet).

Maximum stage recorded during year, 6.35 feet at 11.45 p. m. March 8 (discharge approximately 1,000 million gallons per day, or 1,550 second-feet); minimum stage recorded, 1.6 feet June 26 (discharge, 11 million gallons per day, or 17 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Low flow of stream all diverted by Honokahau ditch for irrigation of sugar cane and for power development.

ACCURACY.—Records based on rating curves well defined for ordinary stages and continuous gage-height record; good for all stages below 60 million gallons per day; fair for higher stages.

Discharge measurements of Honokahau Stream near Honokahau, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 26	H. A. R. Austin	2.52	95	61
Oct. 24	do	1.80	27.6	18
Dec. 15	do	1.93	35.5	23
Jan. 13	R. C. Rice	1.86	29	19
Mar. 26	H. A. R. Austin	1.91	33	21
May 24	do	2.20	55	36
June 26	C. T. Bailey	1.62	18.8	12

Daily discharge, in million gallons, of Honokahau Stream near Honokahau, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	27	52	52	38	41	20	21	17	16	25	30	19
2	27	77	52	27	38	82	21	17	16	36	19	40
3	30	68	22	18	32	149	23	17	30	17	17	16
4	24	35	20	18	24	64	36	17	28	23	16	16
5	38	27	20	16	95	20	23	17	17	19	16	14
6	24	22	24	16	64	18	21	17	17	14	16	23
7	24	20	52	16	30	18	21	17	16	14	14	23
8	22	24	38	16	24	18	21	17	21	14	14	43
9	20	22	20	18	22	35	19	17	33	14	16	43
10	30	24	27	16	20	163	25	17	16	14	14	25
11	35	38	30	16	27	30	30	17	46	30	21	36
12	27	35	24	20	20	24	25	17	33	19	17	16
13	32	38	20	22	20	35	19	17	25	23	14	14
14	30	240	18	18	18	68	19	30	23	43	16	14
15	32	77	32	18	30	30	19	17	21	23	19	14
16	41	35	20	20	44	41	19	17	19	17	14	12
17	82	38	16	32	95	64	21	16	16	25	19	12
18	35	32	20	24	27	30	19	17	58	17	30	19
19	52	35	48	22	20	64	19	30	21	14	23	14
20	24	35	20	22	16	44	23	16	16	23	23	12
21	24	35	22	16	16	82	21	16	14	25	23	12
22	20	35	32	24	16	90	21	16	14	17	21	25
23	18	32	32	41	16	360	21	16	16	16	58	14
24	18	32	38	22	24	62	19	16	19	14	46	12
25	20	27	44	22	22	33	21	14	43	14	19	12
26	44	35	27	68	35	25	25	14	30	14	16	11
27	68	32	32	68	32	33	21	14	16	12	16	16
28	41	32	27	35	100	58	21	36	17	36	16	16
29	24	27	27	38	41	25	23	.....	25	128	21	17
30	24	27	24	48	24	21	23	.....	21	98	16	14
31	82	44	.....	22	.....	21	19	.....	30	.....	19	.....

NOTE.—Discharge determined from rating curves well defined below 60 million gallons per day, applicable July 1 to Dec. 23 and Dec. 24 to June 30. Discharge Aug. 12 to Sept. 1, Dec. 21 to Jan. 7, Jan. 10 and 11, Feb. 11–16, Mar. 14–16, and May 16–21 determined by comparison with records of flow of Waihee Stream.

Monthly discharge of Honokahau Stream near Honokahau, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	82	18	33.5	51.8	1,040	3,190
August	240	20	43.0	66.5	1,330	4,090
September	52	16	29.3	45.3	880	2,700
October	68	16	26.4	40.8	817	2,500
November	100	16	34.4	53.2	1,030	3,170
December	360	18	58.9	91.1	1,830	5,600
January	36	19	21.9	33.9	679	2,080
February	36	14	18.1	28.0	506	1,560
March	58	14	23.6	36.5	733	2,250
April	128	12	26.6	41.2	798	2,450
May	58	14	20.6	31.9	639	1,960
June	43	11	19.1	29.6	574	1,760
The year	360	11	29.7	46.0	10,900	33,300

HONOLUA STREAM NEAR HONOKAHAU, MAUI.

LOCATION.—300 feet above Honokahau ditch crossing, about 2 miles south of Honokahau.

RECORDS AVAILABLE.—March 12, 1913, to June 30, 1917.

GAGE.—Vertical staff on right bank.

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

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage. Stream bed very rough and on steep grade; right bank high and nearly vertical; left bank high with gentle slope. Control composed of large boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.2 feet at 6 p. m. January 9, 1916 (discharge, computed from extension of rating curve, approximately 200 million gallons per day, or 309 second-feet); minimum stage recorded, 0.25 foot October 23 and 24, 1913 (discharge, 0.15 million gallons per day, or 0.25 second-feet).

Minimum stage recorded during year, 0.45 foot frequently (discharge, 0.3 million gallons per day, or 0.46 second-foot).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Ordfnary flow is diverted by Honokahau ditch for irrigation of sugar cane.

ACCURACY.—Discharge determined from rating curves fairly well defined between 1 and 10 million gallons per day, and a reliable gage-height record of two readings daily. Records fair except for very low stages for which they may be considerably in error because of the small amount of water involved.

Discharge measurements of Honolua Stream near Honokahau, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 26	1.00	1.4	0.9	Mar. 26	1.07	3.7	2.4
Sept. 10	1.04	2.15	1.4	May 24	1.42	13.4	8.7
Dec. 15	1.30	5.8	3.7				

Daily discharge, in million gallons, of Honolua Stream near Honokahau, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	2.0	5.1	3.6	2.0	2.4	0.8	3.5	0.7	0.6	0.7	6.0	0.4
2	2.0	5.1	7.9	1.4	2.0	2.0	2.8	.5	.4	2.3	3.5	.7
3	2.0	6.8	1.4	.8	2.0	4.4	3.5	.4	1.8	.6	2.3	.4
4	2.0	6.0	.8	.8	1.6	5.1	7.1	.4	4.2	.4	1.5	.4
5	2.4	2.0	.7	.6	3.6	2.4	6.0	.4	.7	.8	.8	.3
6	1.6	1.6	.8	.6	4.4	1.6	4.2	.4	.4	.4	.8	.7
7	1.4	1.1	6.0	.5	3.6	1.4	2.3	.3	.3	.4	.5	1.2
8	1.1	1.1	3.0	.5	1.6	1.4	1.8	.3	.3	.3	.4	4.2
9	1.0	1.0	.8	.5	1.1	2.0	1.2	.3	3.5	.3	.4	5.1
10	1.4	1.0	1.1	.4	1.0	6.8	1.5	.3	.8	.4	.4	4.2
11	2.0	2.4	.8	.4	1.1	3.6	7.1	.3	1.8	.6	.4	5.1
12	2.0	2.0	1.0	.4	.8	2.0	4.2	.3	2.8	.6	.5	.6
13	1.4	3.0	1.0	.8	.7	1.6	1.2	.3	1.8	.6	.4	.4
14	2.0	6.8	.7	.5	.5	9.0	1.2	1.5	2.8	1.0	.4	.4
15	2.0	6.0	.5	.5	.5	3.0	1.0	1.0	.8	.8	.5	.4
16	2.4	2.0	1.6	.5	3.0	2.4	.8	.3	.6	.4	.4	.3
17	3.0	2.0	.8	.8	4.4	4.4	.8	.3	.5	.5	.5	.3
18	2.4	1.0	.7	.6	1.6	3.0	.7	.3	1.8	.4	2.3	.4
19	2.4	3.0	4.4	.6	.8	2.4	.7	2.8	1.5	.3	1.0	.3
20	2.0	3.0	2.0	.8	.7	2.4	.8	.5	1.2	.5	1.0	.3
21	1.6	2.4	1.1	.5	.5	3.0	.8	.4	.6	.6	1.8	.3
22	1.1	3.0	1.6	.8	.4	3.6	.7	.3	.4	1.5	.5	1.0
23	1.1	1.1	4.4	2.4	.4	6.8	.6	.3	.3	.4	7.1	.4
24	1.0	1.0	3.0	1.1	.5	7.1	.5	.3	.3	.6	8.2	.3
25	1.0	1.6	3.0	.7	1.0	5.1	.4	.3	.7	.3	1.2	.3
26	1.4	1.6	2.4	1.4	1.0	4.2	1.2	.3	3.5	.3	.4	.3
27	2.4	1.1	3.0	3.6	1.6	6.0	.8	.3	.8	.3	.4	.3
28	2.4	1.0	1.4	2.4	4.4	8.2	.7	2.3	.6	.4	.4	.3
29	2.4	.8	.8	1.4	3.0	5.1	.7	.....	.5	36	.4	.4
30	2.4	.7	.8	3.0	1.1	4.2	2.8	.....	.5	32	.3	.4
31	4.4	1.6	.....	1.0	.....	4.2	1.2	.....	.8	.....	.4	.....

NOTE.—Discharge determined from rating curves fairly well defined between 1 and 10 million gallons per day, applicable July 1 to Dec. 23 and Dec. 24 to June 30.

Monthly discharge of Honolua Stream near Honokahau, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	4.4	1.0	1.93	2.99	60	184
August	6.8	.7	2.51	3.88	78	239
September	7.9	.5	2.04	3.16	61	188
October	3.6	.4	1.04	1.61	32	99
November	4.4	.4	1.71	2.65	51	157
December	9.0	.8	3.85	5.96	119	366
January	7.1	.4	2.03	3.14	63	193
February	2.8	.3	.58	.90	16	50
March	4.2	.3	1.21	1.87	38	115
April	36	.3	2.82	4.36	85	260
May	8.2	.3	1.45	2.24	45	138
June	5.1	.3	1.00	1.55	30	92
The year	36	.3	1.00	2.88	678	2,080

HONOKAWAI STREAM NEAR LAHAINA, MAUI.

LOCATION.—500 feet below confluence with Amalu Stream, about 8 miles northeast of Lahaina.

RECORDS AVAILABLE.—May 13, 1913, to March 15, 1917, when gage was washed out.

GAGE.—Vertical staff on right bank.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 150 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; filled with large boulders and very rough; very narrow at gage. Control a rock ledge; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.9 feet at 3 p. m. January 8, 1916 (discharge computed from extension of rating curve, approximately 150 million gallons per day, or 232 second-feet); stream occasionally dry.

Minimum stage recorded during year, 1.0 foot frequently (discharge, 0.2 million gallons per day, or 0.3 second-foot).

DIVERSIONS.—Most of the natural flow is diverted into Honokawai ditch half a mile above gage.

REGULATION.—Natural flow of stream is increased by a development tunnel a short distance above intake of Honokawai ditch.

UTILIZATION.—Irrigation of sugar cane and taro.

ACCURACY.—Discharge ascertained from rating curve well defined below 40 million gallons per day and a gage-height record of two readings daily. Records fair.

Daily discharge, in million gallons, of Honokawai Stream near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	1.2	9.0	2.3	1.0	1.2	0.4	0.6	0.3	0.3
2	.4	17	5.8	.7	2.3	3.9	.6	.3	.3
3	1.4	12	2.6	.4	1.4	8.4	1.4	.3	1.2
4	.7	2.6	.6	.4	.7	12	3.4	.3	2.6
5	2.0	1.4	.4	.3	41	1.2	3.0	.3	.6
6	.6	.7	.7	.3	19	.3	1.7	.3	.6
7	.4	.7	16	.6	2.6	.2	.7	.3	.3
8	.3	.7	10	.6	2.0	.3	.7	.3	.3
9	.2	.7	.7	.6	.7	.3	.4	.3	1.4
10	1.7	2.0	1.4	.6	.3	24	.4	.2	.4
11	3.0	6.4	1.2	.6	5.3	2.3	2.3	.2	.3
12	1.4	5.3	.7	.6	.7	.6	1.7	.2	1.0
13	1.4	2.6	.4	.4	.3	.4	.6	.2	1.2
14	1.4	5.3	.4	.4	.3	2.0	.4	4.4	7.1
15	1.2	1.0	.3	.4	3.0	.6	.3	.4	11
16	3.4	.4	2.0	.3	32	1.7	.2	.3	.....
17	10	3.0	.4	1.7	8.4	4.8	.2	.3	.....
18	2.0	.7	.2	3.9	1.0	2.6	.2	.3	.....
19	2.3	8.4	21	.7	.3	9.7	.2	2.0	.....
20	.7	4.8	1.7	.7	.3	3.9	.3	.6	.....
21	1.2	1.4	.7	.3	.2	25	.2	.4	.....
22	.4	2.6	.7	.6	.2	28	.2	.3	.....
23	.2	.7	5.8	2.6	.2	30	.2	.3	.....
24	.2	.6	9.7	.4	.2	12	.2	.3	.....
25	.2	.6	2.3	1.7	1.0	4.4	.2	.3	.....
26	1.0	1.2	1.2	7.8	24	1.7	6.4	.3	.....
27	11	1.0	.7	7.8	1.0	.6	.4	.3	.....
28	8.4	2.3	1.0	2.0	4.8	11	.4	3.9	.....
29	1.7	.6	.6	1.0	.7	2.6	.4	.....	.....
30	.7	.4	.6	3.0	.7	.6	1.0	.....	.....
31	24	3.0	.....	.7	.....	.4	.2	.....	.....

NOTE.—Discharge determined from a rating curve well defined below 40 million gallons per day.

Monthly discharge of Honokawai Stream near Lahaina, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	24	0.2	2.73	4.22	85	260
August	17	.4	3.20	4.95	99	304
September	21	.2	3.07	4.75	92	283
October	7.8	.3	1.39	2.15	43	132
November	41	.2	5.19	8.03	156	478
December	30	.2	6.32	9.78	196	601
January	6.4	.2	.94	1.45	29	89
February	4.4	.2	.64	.99	18	55
March 1–15	11	.3	1.91	2.95	29	88
The period	.....	.....	.....	.....	747	2,290

HONOKAWAI DITCH NEAR LAHAINA, MAUI.

LOCATION.—250 feet below junction with Amalu wooden flume, 1,000 feet below intake, 2 miles above Pioneer Mill Co.'s power house, and about 7 miles northeast of Lahaina.

RECORDS AVAILABLE.—July 1, 1912, to June 30, 1917.

GAGE.—A graduated rod which the observer places in center of flume at each reading.

DISCHARGE MEASUREMENTS.—Made in flume near gage.

CHANNEL AND CONTROL.—Semicircular galvanized iron flume 3 feet in diameter; straight for 100 feet above and below gage; flume clean and uniform in section and grade. Stage-discharge relation stable.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 1.67 feet August 12, 193 (discharge, 15 million gallons per day, or 23 second-feet); minimum stage recorded, 0.80 foot May 15, 1913 (discharge, 2.4 million gallons per day, or 3.8 second-feet).

Maximum stage recorded during year, 1.45 feet July 11, 17, 31, and September 19 and 24 (discharge, 9.0 million gallons per day, or 14 second-feet); minimum stage recorded, 0.95 foot June 27 (discharge, 3.6 million gallons per day, or 5.6 second-feet).

DIVERSIONS.—Ditch diverts all low-water flow from Honokawai and Amalu streams.

REGULATION.—Flow controlled by head gates.

UTILIZATION.—Power development and irrigation of sugar cane.

ACCURACY.—Gage read twice daily. Records are fair for all stages. Great care has to be taken in making measurements on account of slope of flume, but a fairly good rating curve has been developed. On account of the uniform conditions the extension of the rating curve probably good.

Daily discharge, in million gallons, of Honokawai ditch near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	6.6	8.4	7.2	7.2	7.2	6.0	5.5	4.5	5.0	6.6	6.0	6.0
2	6.6	8.4	7.2	7.2	7.2	7.8	5.5	4.5	4.5	6.0	5.0	7.2
3	6.6	8.4	7.2	6.0	7.2	7.2	6.0	4.0	6.0	6.0	5.0	5.5
4	6.0	7.2	6.0	6.0	6.6	7.2	7.2	4.0	7.2	5.0	4.5	5.0
5	7.2	7.2	6.0	5.5	8.4	5.5	6.0	4.0	5.0	6.0	5.0	4.5
6	6.0	6.0	6.0	5.5	7.8	5.5	6.0	4.0	5.0	5.0	4.0	4.5
7	5.5	6.0	8.4	5.5	6.6	5.0	5.5	4.0	4.5	5.0	5.0	6.0
8	5.5	6.0	7.8	5.5	6.6	5.5	5.5	4.0	4.5	5.0	4.5	7.2
9	5.0	6.0	6.6	5.5	6.0	5.5	5.0	4.0	6.0	5.0	4.0	6.0
10	6.6	7.2	6.6	5.5	5.5	7.8	5.0	4.0	5.0	5.0	4.5	6.0
11	7.2	7.2	6.6	5.5	7.2	7.2	6.0	4.0	4.5	7.8	5.0	6.0
12	7.2	7.8	6.6	5.5	6.0	6.0	6.0	4.0	6.0	6.0	6.0	5.0
13	6.6	7.2	6.0	6.0	5.5	6.0	5.0	4.0	6.0	7.2	6.0	4.5
14	7.8	7.2	6.0	6.0	5.5	7.2	5.0	6.6	7.2	7.2	5.0	4.0
15	7.2	6.6	6.0	6.0	7.2	6.0	4.5	4.5	7.2	7.2	5.5	4.0
16	8.4	6.0	7.2	5.5	7.8	6.6	4.5	4.0	.....	6.0	5.0	4.0
17	8.4	7.2	6.0	7.2	7.8	7.2	4.5	4.0	.....	6.0	5.0	4.0
18	7.2	6.0	5.5	7.8	7.2	7.2	4.5	4.0	.....	6.6	6.0	5.5
19	8.4	7.8	8.4	7.2	6.0	7.8	4.5	6.0	.....	5.5	5.0	5.0
20	6.6	7.2	7.2	7.2	5.0	7.2	4.5	5.0	.....	6.0	5.0	4.5
21	7.2	6.0	6.6	5.5	5.0	7.8	4.5	4.5	.....	6.0	6.0	4.0
22	5.0	7.2	6.6	6.0	5.0	7.8	4.5	4.0	.....	5.0	5.0	6.0
23	5.0	6.0	8.4	7.8	5.0	7.2	4.5	4.0	.....	6.0	6.0	4.0
24	5.0	6.0	8.4	6.6	5.0	7.2	4.5	4.0	5.5	6.0	6.0	4.0
25	5.0	6.0	7.2	7.2	6.0	7.2	4.5	4.0	5.5	6.0	5.0	4.0
26	6.0	5.5	6.6	8.4	8.4	6.6	7.2	4.0	5.5	7.2	4.0	3.6
27	8.4	6.0	6.0	7.8	6.0	6.0	5.0	4.0	5.0	5.5	4.0	3.6
28	8.4	7.2	6.6	7.2	7.8	7.2	4.5	7.2	5.5	5.0	4.0	4.0
29	7.2	6.0	6.0	6.0	6.0	6.0	4.5	.....	7.2	5.0	5.0	4.0
30	6.6	6.0	6.0	7.8	6.0	6.0	6.0	.....	6.6	5.0	5.0	4.0
31	8.4	7.2	.....	6.0	.....	5.5	4.5	.....	7.2	.....	5.0	.....

NOTE.—Discharge determined from fairly well defined rating curve. No record Mar. 16–23.

Monthly discharge of Honokawai ditch near Lahaina, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	8.4	5.0	6.74	10.4	209	641
August	8.4	5.5	6.78	10.5	210	645
September	8.4	5.5	6.76	10.5	203	622
October	8.4	5.5	6.44	9.96	200	613
November	8.4	5.0	6.48	10.0	194	597
December	7.8	5.0	6.64	10.3	206	632
January	7.2	4.5	5.17	8.00	160	492
February	7.2	4.0	4.39	6.79	123	377
April	7.8	5.0	5.89	9.11	177	542
May	6.0	4.0	5.03	7.78	156	479
June	7.2	3.6	4.85	7.50	146	447

KAHOMA STREAM NEAR LAHAINA, MAUI.

LOCATION.—About 125 feet above intake of Pioneer Mill Co.'s upper ditch, 3½ miles east of Lahaina.

RECORDS AVAILABLE.—August 3, 1911, to June 30, 1917.

GAGE.—Vertical staff on left bank.

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

CHANNEL AND CONTROL.—Channel at gage is a pool at foot of rapids; right bank high and wooded; left bank a vertical wall of rock. Control composed of large and small boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 8.5 feet at 7 a. m. January 18, 1916 (discharge, estimated from extension of rating curve, 700 million gallons per day, or 1,080 second-feet); maximum stage recorded during year, 4.4 feet at 7 a. m. March 18 (discharge, approximately 250 million gallons per day, or 387 second-feet); minimum stage recorded, 1.2 feet frequently (discharge, 3.5 million gallons per day, or 5.4 second-feet).

DIVERSIONS.—None above station at present. Before November 24, 1914, the minimum flow of the stream and water from Kahoma development tunnel was diverted above station; since that date all water passes the gage.

REGULATION.—Natural flow of the stream is largely increased by a development tunnel about 300 feet above station.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Gage read twice daily. Records fair for ordinary stages. Extension of rating curve not confirmed by measurements; estimates above 20 million gallons per day roughly approximate only.

Discharge measurements of Kahoma Stream near Lahaina, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Oct. 25	1.33	8.8	5.7	Jan. 23	1.20	5.0	3.3
25	1.42	13.2	8.5				

Daily discharge, in million gallons, of Kahoma Stream near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	6.4	49	6.4	4.4	6.4	4.4	3.5	4.4	4.4	5.3	13	5.3
2	6.4	13	17	4.4	6.4	21	4.4	3.5	4.4	17	5.3	31
3	5.3	15	5.3	4.4	24	12	7.6	3.5	10	13	4.4	4.4
4	4.4	7.6	5.3	4.4	90	15	19	3.5	6.4	5.3	4.4	4.4
5	5.3	7.6	5.3	4.4	28	4.4	17	3.5	4.4	5.3	4.4	3.5
6	4.4	6.4	5.3	4.4	10	3.5	19	3.5	4.4	4.4	3.5	4.4
7	3.5	4.4	26	4.4	8.8	3.5	5.3	3.5	4.4	4.4	4.4	4.4
8	3.5	4.4	17	4.4	3.5	3.5	3.5	3.5	4.4	4.4	4.4	3.5
9	3.5	5.3	5.3	4.4	3.5	3.5	3.5	3.5	4.4	4.4	4.4	4.4
10	7.6	6.4	7.6	4.4	10	37	3.5	3.5	4.4	4.4	4.4	3.5
11	6.4	15	5.3	4.4	4.4	6.4	6.4	3.5	15	56	15	4.4
12	5.3	34	6.4	4.4	3.5	15	5.3	3.5	5.3	5.3	6.4	3.5
13	8.8	17	5.3	4.4	8.8	3.5	3.5	3.5	4.4	4.4	4.4	3.5
14	6.4	17	4.4	4.4	3.5	5.3	3.5	8.8	12	4.4	5.3	3.5
15	15	7.6	4.4	5.3	3.5	4.4	3.5	4.4	19	6.4	6.4	3.5
16	13	4.4	4.4	19	40	26	3.5	4.4	6.4	7.6	4.4	3.5
17	21	6.4	4.4	6.4	26	112	3.5	4.4	4.4	31	24	3.5
18	7.6	10	5.3	10	6.4	10	3.5	4.4	127	13	6.4	5.3
19	19	15	12	5.3	4.4	12	3.5	6.4	6.4	4.4	4.4	3.5
20	5.3	8.8	7.6	5.3	3.5	8.8	4.4	4.4	5.3	6.4	4.4	3.5
21	6.4	6.4	5.3	4.4	3.5	60	4.4	4.4	4.4	5.3	6.4	3.5
22	4.4	6.4	5.3	5.3	3.5	74	4.4	4.4	4.4	4.4	6.4	3.5
23	4.4	5.3	7.6	6.4	3.5	70	3.5	4.4	8.8	4.4	21	3.5
24	4.4	5.3	15	4.4	3.5	12	3.5	4.4	6.4	4.4	7.6	12
25	4.4	4.4	6.4	5.3	5.3	6.4	3.5	4.4	17	4.4	4.4	3.5
26	6.4	5.3	5.3	13	28	5.3	3.5	4.4	6.4	4.4	3.5	3.5
27	6.4	6.4	5.3	28	21	3.5	4.4	4.4	4.4	3.5	4.4	3.5
28	10	6.4	4.4	5.3	49	13	5.3	4.4	6.4	3.5	4.4	3.5
29	6.4	5.3	4.4	4.4	6.4	7.6	5.3	.....	19	17	17	3.5
30	7.6	5.3	4.4	10	5.3	4.4	5.3	.....	5.3	43	4.4	4.4
31	17	5.3	.....	6.4	.....	3.5	3.5	.....	7.6	.....	4.4	.....

NOTE.—Discharge determined from a rating curve well defined between 2 and 10 million gallons per day.

Monthly discharge of Kahoma Stream near Lahaina, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	21	3.5	7.61	11.8	236	724
August	49	4.4	10.2	15.8	316	970
September	26	4.4	7.45	11.5	223	686
October	28	4.4	6.64	10.3	206	632
November	90	3.5	14.1	21.8	424	1,300
December	112	3.5	18.4	28.5	571	1,760
January	19	3.5	5.60	8.66	174	533
February	8.8	3.5	4.24	6.56	119	364
March	127	4.4	11.2	17.3	347	1,070
April	56	3.5	10.0	15.5	301	921
May	24	3.5	7.02	10.9	218	668
June	31	3.5	5.03	7.78	151	463
The year	127	3.5	9.00	13.9	3,290	10,100

KAHOMA DEVELOPMENT TUNNEL NEAR LAHAINA, MAUI.

LOCATION.—At portal of the lower of two development tunnels of Pioneer Mill Co., 3½ miles east of Lahaina.

RECORDS AVAILABLE.—August 1, 1911, to June 30, 1917.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—A 4-foot sharp-crested weir with end contractions measures discharge from development tunnel and amount diverted from stream by small pipe; measurements checked by current meter.

CHANNEL AND CONTROL.—Deep pool at weir confined by rock and concrete walls.

EXTREMES OF DISCHARGE.—Maximum discharge during period of record, 6.5 million gallons per day, or 10 second-feet, August, 1911; minimum discharge, 1.7 million gallons per day, or 2.6 second-feet.

DIVERSIONS.—Small amount diverted from Kahoma Stream also passes over weir.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Records good. No velocity of approach; good weir. Gage read twice daily.

Daily discharge, in million gallons, of Kahoma development tunnel near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	3.4	4.3	4.4	4.1	3.6	3.1	2.9	2.9	3.5	3.6	3.0	2.6
2	3.4	4.3	4.4	4.1	3.6	3.1	2.8	2.9	3.5	3.6	3.0	2.6
3	3.4	4.3	4.4	4.1	3.6	3.1	2.8	3.0	3.5	3.6	3.0	2.6
4	3.4	4.3	4.4	4.1	3.6	3.1	2.8	3.0	3.5	3.6	2.9	2.6
5	3.4	4.4	4.4	4.1	3.6	3.1	2.8	3.0	3.5	3.6	2.9	2.6
6	3.5	4.4	4.4	4.1	3.5	3.1	2.8	3.0	3.5	3.6	2.9	2.6
7	3.5	4.4	4.4	4.1	3.5	3.1	2.8	3.0	3.5	3.6	2.9	2.6
8	3.5	4.4	4.4	4.1	3.5	3.1	2.8	3.0	3.5	3.6	2.8	2.6
9	3.6	4.4	4.4	4.1	3.5	3.1	2.8	3.0	3.6	3.6	2.8	2.6
10	3.7	4.4	4.4	4.1	3.5	3.1	2.8	3.1	3.6	3.5	2.8	2.6
11	3.7	4.4	4.4	4.0	3.5	3.1	2.8	3.1	3.6	3.5	2.8	2.6
12	3.8	4.4	4.4	4.0	3.5	3.0	2.8	3.1	3.6	3.5	2.8	2.6
13	3.8	4.4	4.4	4.0	3.5	3.0	2.8	3.2	3.6	3.4	2.8	2.5
14	3.9	4.4	4.4	4.0	3.5	3.0	2.8	3.2	3.6	3.4	2.8	2.5
15	3.9	4.4	4.3	4.0	3.5	3.0	2.8	3.2	3.6	3.4	2.8	2.5
16	3.9	4.4	4.3	4.0	3.5	3.0	2.8	3.2	3.6	3.4	2.8	2.5
17	3.9	4.4	4.3	4.0	3.5	3.0	2.8	3.2	3.6	3.3	2.8	2.5
18	4.0	4.4	4.3	4.0	3.5	3.0	2.8	3.2	3.6	3.3	2.8	2.5
19	4.0	4.4	4.3	3.9	3.5	2.9	2.8	3.3	3.6	3.3	2.8	2.5
20	4.0	4.4	4.3	3.9	3.5	2.9	2.8	3.3	3.6	3.3	2.8	2.5
21	4.1	4.4	4.2	3.8	3.4	2.9	2.8	3.3	3.6	3.2	2.8	2.4
22	4.1	4.4	4.2	3.8	3.4	2.9	2.8	3.4	3.6	3.2	2.8	2.4
23	4.1	4.4	4.2	3.8	3.3	2.9	2.8	3.4	3.6	3.2	2.7	2.4
24	4.2	4.4	4.2	3.8	3.3	2.9	2.8	3.4	3.6	3.2	2.7	2.4
25	4.2	4.4	4.2	3.7	3.2	2.9	2.8	3.4	3.6	3.1	2.7	2.4
26	4.2	4.4	4.2	3.7	3.2	2.9	2.8	3.4	3.6	3.1	2.7	2.4
27	4.3	4.4	4.1	3.7	3.2	2.9	2.8	3.5	3.6	3.1	2.7	2.3
28	4.3	4.4	4.1	3.7	3.2	2.9	2.8	3.5	3.6	3.1	2.7	2.3
29	4.3	4.4	4.1	3.7	3.1	2.9	2.8	.....	3.6	3.1	2.7	2.3
30	4.3	4.4	4.1	3.7	3.1	2.9	2.9	.....	3.6	3.0	2.7	2.3
31	4.3	4.4	.....	3.7	.....	2.9	2.9	.....	3.6	.....	2.7	.....

Monthly discharge of Kahoma development tunnel near Lahaina, Maui for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	4.3	3.4	3.87	5.99	120	368
August	4.4	4.3	4.39	6.79	136	418
September	4.4	4.1	4.30	6.65	129	396
October	4.1	3.7	3.93	6.08	122	374
November	3.6	3.1	3.43	5.31	103	316
December	3.1	2.9	2.99	4.63	93	284
January	2.9	2.8	2.81	4.35	87	267
February	3.5	2.9	3.19	4.94	89	274
March	3.6	3.5	3.57	5.52	111	340
April	3.6	3.0	3.37	5.21	101	320
May	3.0	2.7	2.80	4.33	87	266
June	2.6	2.3	2.49	3.85	75	237
The year	4.4	2.3	3.43	5.31	1,250	3,860

LAHAINALUNA STREAM ABOVE PIPE-LINE INTAKE, NEAR LAHAINA, MAUI.

LOCATION.—200 feet above intake of pipe line supplying Lahaina and Lahainaluna school, about 2½ miles northeast of Lahaina.

RECORDS AVAILABLE.—February 29, 1916, to June 30, 1917.

GAGE.—Gurley printing water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; fairly straight in vicinity of gage; filled with large boulders; banks steep and high. Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 3.3 feet at 11.30 p. m. December 21, 1916 (discharge, approximately 300 million gallons per day, or 464 second-feet); minimum stage recorded, 0.95 foot March 22, 1917 (discharge, 3.4 million gallons per day, or 5.3 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Domestic supply, power development, and irrigation of sugar cane.

ACCURACY.—Records based on continuous record of gage height and fairly well-defined rating curve; fair for low and medium stages. Extension of rating curve above 15 million gallons per day not based on discharge measurements. Discharge record prior to July 1, 1916, not reliable owing to faulty working of water-stage recorder.

Discharge measurements of Lahainaluna Stream above pipe-line intake, near Lahaina, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 25	H. A. R. Austin	1.30	9.2	6.0
Aug. 17	do	1.39	13	8.3
Sept. 9	do	1.25	8.75	5.7
Oct. 23	do	1.49	20.4	13
Dec. 14	do	1.31	8.2	5.3
Jan. 22	do	1.26	8.5	5.5
Feb. 10	do	1.23	8.1	5.2
Mar. 27	do	1.13	7.1	4.6
Apr. 20	do	1.27	8.85	5.7
June 20	C. T. Bailey	1.10	5.82	3.8

Daily discharge, in million gallons, of Lahainaluna Stream above pipe-line intake, near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	17	13	8.6	5.4	7.3	4.9	6.0	5.4	4.9	4.6	6.0	4.6
2	11	17	17	5.4	8.6	5.4	6.0	5.4	4.9	5.4	4.9	11
3	11	17	5.4	4.9	7.3	21	6.0	5.4	13	5.4	4.6	4.6
4	8.6	6.0	5.4	4.9	6.0	21	6.0	5.4	7.3	4.6	4.6	4.6
5	11	6.0	5.4	4.9	37	7.3	13	5.4	5.4	4.9	4.6	4.6
6	7.3	5.4	5.4	4.9	21	5.4	11	5.4	5.4	4.6	4.6	4.6
7	7.3	5.4	11	4.9	5.4	5.4	7.3	5.4	4.9	4.6	4.6	4.6
8	6.0	5.4	7.3	4.9	5.4	5.4	6.0	5.4	4.9	4.6	4.6	4.6
9	6.0	5.4	5.4	4.9	4.9	5.4	6.0	5.4	4.9	4.6	4.6	4.6
10	6.0	8.6	6.0	4.9	4.9	21	6.0	5.4	4.9	4.9	4.6	4.6
11	6.0	13	7.3	4.9	6.0	11	13	5.4	17	21	5.4	4.6
12	6.0	17	6.0	6.0	4.9	6.0	6.0	5.4	5.4	4.9	4.6	4.2
13	6.0	17	6.0	6.0	4.9	6.0	6.0	5.4	4.9	4.6	4.9	4.2
14	5.4	11	6.0	4.9	4.9	6.0	5.4	8.6	4.9	4.6	4.9	4.2
15	5.4	6.0	6.0	4.9	4.9	5.4	5.4	5.4	5.4	6.0	4.9	4.2
16	6.0	5.4	6.0	6.0	17	26	5.4	4.9	4.9	5.4	4.6	4.2
17	7.3	7.3	6.0	8.6	17	21	5.4	4.9	4.9	8.6	11	4.2
18	6.0	8.6	6.0	6.0	4.9	11	5.4	6.0	26	5.4	4.9	4.6
19	5.4	13	31	6.0	4.6	21	5.4	11	4.9	4.6	4.6	4.2
20	6.0	11	7.3	6.0	4.6	11	6.0	5.4	3.6	5.4	4.6	4.2
21	5.4	5.4	6.0	4.9	4.6	100	5.4	4.9	3.6	4.9	4.9	4.2
22	5.4	6.0	7.3	6.0	4.6	84	5.4	4.9	3.4	4.6	4.9	4.9
23	5.4	5.4	8.6	8.6	4.6	50	5.4	4.9	3.9	4.6	6.0	4.2
24	5.4	5.4	8.6	5.4	5.4	21	5.4	4.9	3.6	4.6	6.0	4.2
25	5.4	5.4	6.0	5.4	4.6	8.6	5.4	4.9	4.2	4.6	4.6	4.2
26	7.3	5.4	5.4	13	4.6	11	5.4	4.9	4.9	4.6	4.6	4.2
27	21	5.4	5.4	7.3	4.6	11	7.3	4.9	4.6	4.9	4.6	4.6
28	11	7.3	5.4	5.4	7.3	17	6.0	4.9	4.6	7.3	4.9	4.6
29	7.3	5.4	4.9	4.9	7.3	7.3	7.3	.....	7.3	17	4.9	4.6
30	8.6	5.4	4.9	13	5.4	6.0	7.3	.....	4.9	11	4.6	4.2
31	43	6.0	.....	5.4	.....	6.0	5.4	.....	4.6	.....	4.6	.....

NOTE.—Discharge determined from rating curve fairly well defined below 15 million gallons per day. Discharge July 1–25, Oct. 11–23, Nov. 26–30, Dec. 1–14, and Dec. 26 to Jan. 4 determined by comparison with records of flow of Ukumehame stream.

Monthly discharge of Lahainaluna Stream above pipe-line intake, near Lahaina, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	43	5.4	8.90	13.8	276	847
August	17	5.4	8.42	13.0	261	801
September	31	4.9	7.57	11.7	227	697
October	13	4.9	6.08	9.41	189	578
November	37	4.6	7.82	12.1	234	720
December	100	4.9	17.7	26.4	548	1,680
January	13	5.4	6.53	10.1	202	621
February	11	4.9	5.56	8.60	156	478
March	26	3.4	6.19	9.58	192	589
April	21	4.6	6.23	9.64	187	574
May	11	4.6	5.05	7.81	157	480
June	11	4.2	4.64	7.18	139	427
The year	100	3.4	7.58	11.7	2,770	8,490

KAUAULA STREAM NEAR LAHAINA, MAUI.

LOCATION.—350 feet above Kauaula ditch intake, about 3 miles east of Lahaina.

RECORDS AVAILABLE.—March 7, 1912, to June 30, 1917.

GAGE.—Vertical staff installed April 20, 1916, to replace vertical staff installed April 29, 1913, and washed out January 18, 1916. Old gage was 250 feet above present location.

DISCHARGE MEASUREMENTS.—Made by wading or from foot bridge.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below station; stream bed composed of boulders and coarse gravel; right bank slopes gently; left bank is of rock and nearly vertical. Control shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.0 feet at 6 a. m. January 9, 1916 (discharge, computed from extension of rating curve, approximately 600 million gallons per day or 928 second-feet); minimum stage recorded, 0.89 foot April, 1914 (discharge, 4.2 million gallons per day, or 6.5 second-feet).

Minimum stage recorded during year, 1.4 feet April, May, and June (discharge, 5.4 million gallons per day, or 8.4 second-feet).

DIVERSIONS.—None above station.

REGULATION.—Natural flow of stream is increased by a development tunnel in mountains above station.

UTILIZATION.—Power development and irrigation of sugar cane.

ACCURACY.—Gage read twice daily. Records poor on account of instability of control.

Discharge measurements of Kauaula Stream near Lahaina, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 27	1.50	14	9.2	Jan. 23	1.44	8.9	5.8
Aug. 18	1.48	12	7.6	Mar. 27	1.43	8.4	5.4
Oct. 23	1.49	12.7	8.2	May 25	1.47	9.0	5.8

Daily discharge, in million gallons, of Kauaula Stream near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	9.7	10	7.8	7.8	7.8	7.8	7.4	6.2	5.8	5.8	8.0	5.4
2	9.2	9.7	9.7	7.8	8.3	9.2	7.4	6.2	5.8	5.8	6.2	8.5
3	9.2	11	8.3	7.4	8.3	10	7.4	5.8	6.2	5.8	6.2	5.8
4	9.2	9.7	7.8	7.4	7.8	10	8.4	5.8	6.2	5.4	5.8	5.4
5	9.2	9.2	7.8	7.4	11	8.3	7.4	5.8	6.2	5.5	6.2	5.4
6	8.8	8.8	7.8	7.4	8.8	7.8	7.4	5.8	5.8	5.4	5.8	5.4
7	8.8	8.8	9.2	7.4	8.8	7.8	7.4	5.8	5.8	5.4	5.8	5.4
8	8.8	8.8	8.4	7.4	8.3	8.3	7.0	5.8	5.8	5.4	5.8	5.8
9	8.8	9.2	7.8	7.4	7.8	7.8	7.0	5.8	5.8	5.4	5.4	5.8
10	8.8	9.2	7.8	7.4	7.4	11	7.0	5.8	5.8	5.4	5.4	5.4
11	8.8	9.2	7.8	7.4	7.8	8.8	8.3	5.8	7.4	7.8	5.8	6.6
12	8.8	11	7.8	7.4	7.4	8.3	7.4	5.8	6.6	7.4	5.8	5.8
13	8.8	11	7.8	7.4	7.4	7.8	7.4	5.8	5.8	5.8	5.4	5.4
14	8.8	11	7.8	7.4	7.4	7.8	6.6	6 6	5.8	5.4	6.2	5.4
15	9.2	8.8	7.4	7.4	7.4	8.3	6.6	5.8	5.8	5.8	5.8	5.4
16	9.2	8.3	7.4	7.4	8.8	11	6.6	5.8	5.8	5.4	5.4	5.4
17	13	8.3	7.4	7.8	9.2	9.2	6.6	5.8	5.8	6.6	7.0	5.4
18	9.7	8.3	7.4	8.3	7.8	8.3	6.6	6.2	9.7	6.2	6.2	5.8
19	10	8.3	8.3	7.4	7.4	9.7	6.6	7.0	7.4	5.4	5.8	5.4
20	9.2	8.8	8.3	7.4	7.4	9.2	7.0	5.8	7.4	5.4	5.8	5.4
21	9.2	8.3	7.8	7.4	7.4	15	6.2	5.8	5.8	5.8	6.2	5.4
22	8.8	8.3	7.8	7.8	7.4	20	6.2	6.8	5.5	5.4	6.2	5.4
23	8.8	7.8	8.8	8.4	7.4	16	6.2	5.8	6.2	5.4	6.6	5.4
24	8.8	7.8	8.3	7.4	7.4	12	6.2	5.8	6.6	5.4	8.5	5.4
25	8.8	7.8	8.3	7.4	7.4	8.8	6.2	5.8	6.6	5.4	6.6	5.4
26	9.2	7.8	7.8	8.8	9.7	8.8	6.2	5.8	5.8	5.4	5.8	5.4
27	10	7.8	7.8	8.8	7.8	8.3	6.6	5.8	5.8	5.4	5.8	5.4
28	9.7	7.8	7.4	7.8	11	8.8	7.0	5.8	5.8	5.8	6.6	5.4
29	9.2	8.3	7.4	7.4	8.3	8.3	6.6	.....	7.4	9.5	6.2	5.4
30	8.8	7.8	7.4	7.8	8.3	8.3	6.6	.....	6.2	9.0	6.2	5.4
31	12	7.8	.....	7.4	.....	7.8	6.2	.....	6.2	.....	5.4	.....

NOTE.—Discharge determined from poorly defined rating curves applicable as follows: July 1 to Aug. 4, 1916, Aug. 15 to Dec. 23, 1916, Jan. 21 to Mar. 18, 1917, Apr. 1 to June 30, 1917. Method for shifting channels Dec. 24, 1916, to Jan. 20, 1917, and Mar. 19–31, 1917. Discharge Sept. 8, Oct. 23, Jan. 28 and 30, Feb. 19, Mar. 12, Apr. 5, 12, 17, 18, 29, and 30, May 1, 14, 21, 23, 25, 28–30, and June 2 and 11 was taken from Kauaula ditch record as being more accurate than stream record; all water being diverted.

Monthly discharge of Kauaula Stream near Lahaina, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	13	8.8	9.33	14.4	289	888
August	11	7.8	8.86	13.7	275	843
September	9.7	7.4	7.95	12.3	239	732
October	8.8	7.4	7.63	11.8	236	726
November	11	7.4	8.15	12.6	244	750
December	20	7.8	9.63	14.9	298	916
January	8.4	6.2	6.89	10.7	214	655
February	7.0	5.8	5.91	9.14	166	508
March	9.7	5.5	6.28	9.72	195	597
April	9.5	5.4	5.97	9.24	179	550
May	8.5	5.4	6.13	9.48	190	583
June	8.5	5.4	5.61	8.68	168	516
The year	20	5.4	7.38	11.4	2,690	8,260

KAUAULA DITCH NEAR LAHAINA, MAUI.

LOCATION.—About 100 feet below intake, which is uppermost on the stream, about 3 miles east of Lahaina.

RECORDS AVAILABLE.—October 16, 1911, to June 30, 1917.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made in flume at gage.

CHANNEL AND CONTROL.—Straight wooden flume 3 feet wide.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.58 feet at 6 a. m. Aug. 12 (discharge, 10 million gallons per day, or 15.5 second-feet); maximum stage recorded during period of record, 1.70 feet April 7, 1912 (discharge, 16 million gallons per day, or 24 second-feet); water occasionally turned off.

DIVERSIONS.—Ditch diverts all low flow from Kauaula stream.

REGULATION.—Flow regulated by head gates.

UTILIZATION.—Power development and irrigation of sugar cane.

ACCURACY.—Gage read twice daily. Records fair for all stages.

Discharge measurements of Kauaula ditch near Lahaina, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 27	1.41	14	9.1	Jan. 23	1.03	8.9	5.8
Aug. 18	1.30	12	7.6	Mar. 28	.99	8.4	5.4
Oct. 23	1.38	12.7	8.2	May 25	.90	9.0	5.8

Daily discharge, in million gallons, of Kauaula ditch near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	8.2	8.6	7.6	7.2	7.6	6.2	6.9	5.8	5.2	5.5	8.0	4.8
2	8.6	8.2	9.1	6.9	7.6	8.0	6.9	5.8	4.8	5.5	5.8	8.5
3	7.8	9.4	8.0	6.6	8.0	8.0	6.6	5.5	6.2	5.5	5.3	5.8
4	7.8	9.0	6.9	6.2	6.6	8.4	8.4	5.5	5.2	5.2	5.3	4.8
5	7.8	9.0	6.9	6.2	8.4	7.6	8.0	5.5	6.2	5.5	5.8	4.8
6	8.2	8.2	6.9	6.2	7.6	6.6	7.2	5.5	5.2	5.2	4.4	4.8
7	7.8	7.8	9.1	6.2	7.6	6.6	6.9	5.5	5.2	5.2	4.0	4.4
8	7.4	8.2	8.4	6.2	7.6	7.2	6.9	5.5	5.2	5.2	4.4	5.8
9	7.0	8.2	7.6	6.2	6.2	6.9	6.6	5.5	5.2	4.8	4.0	5.8
10	7.0	8.6	6.9	6.2	6.2	6.6	6.6	5.2	4.8	4.8	4.0	4.8
11	7.8	8.2	6.9	6.2	6.6	7.6	8.0	5.2	6.6	6.6	4.8	6.6
12	7.8	9.8	6.9	5.8	6.2	6.9	7.2	5.2	6.6	7.2	5.3	5.3
13	7.4	8.8	6.9	5.8	5.8	6.6	6.6	5.2	5.5	5.2	4.4	4.4
14	7.8	8.4	6.9	5.8	5.8	6.6	6.2	6.6	5.2	5.2	6.2	4 4
15	8.2	8.8	6.9	5.8	5.8	6.9	6.2	5.2	5.2	5.5	5.8	4.0
16	7.8	7.6	6.6	6.6	7.6	8.0	6.2	5.2	5.2	5.2	4.4	4.0
17	9.0	7.6	6 2	7.2	8.4	7.2	6.2	5.2	5.2	6.6	6.6	4.0
18	8.6	8.0	6.2	8.0	6.9	7.2	6.2	5.8	8.4	6.2	5.8	4.8
19	8.6	8.0	7.6	6.6	6.6	8.0	5.8	6.9	7.2	5.2	4.8	4.0
20	8.6	8.4	6.9	6.2	5.8	8.4	6.9	5.5	7.2	5.2	4.4	4.0
21	8.6	8.0	6.9	6.2	5.5	8.4	5.8	5.5	5.8	5.5	6.2	4.0
22	7.4	7.6	6.9	6.9	5.5	7.6	5.8	5.2	5.5	5.2	6.2	4.0
23	7.4	7.2	8.0	8.4	5.5	7.6	5.8	5.2	6.2	5.2	6.6	4.0
24	7.0	7.2	7.6	6.2	5.8	7.6	5.5	5.2	6.6	5.2	8.5	4.0
25	7.0	7.2	8.0	6.2	5.8	7.6	5.5	5.2	6.6	5.2	6.6	4.0
26	7.0	6.9	6.9	8.0	8.0	8.4	6.2	5.2	5.8	4.8	4.8	3.6
27	9.0	6.9	6.9	8.4	6.6	8.0	6.6	5.2	5.5	3.6	4.8	4.0
28	9.0	7.2	6.6	7.2	8.4	7.6	6.9	5.2	5.5	4.4	6.6	4.0
29	8.2	7.6	6.6	6.2	7.6	8.0	6.6	.....	7.2	9.5	6.2	4.0
30	8.2	6.9	6.6	6.9	7.6	7.6	6.6	.....	5.8	9.0	6.2	4.0
31	8.6	6.9	.....	6.6	.....	7.6	5.8	.....	5.8	.....	4.8	.....

NOTE.—Discharge determined from fairly well defined rating curves applicable as follows: July 1 to Aug. 12, 1916, Aug. 13, 1916, to Apr. 26, 1917, Apr. 27 to June 30, 1917.

Monthly discharge of Kauaula ditch near Lahaina, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	9.0	7.0	7.95	12.3	247	756
August	9.8	6.9	8.01	12.4	248	762
September	9.1	6.2	7.21	11.2	216	664
October	8.4	5.8	6.62	10.2	205	630
November	8.4	5.5	6.84	10.6	205	630
December	8.4	6.2	7.47	11.6	232	711
January	8.4	5.5	6.57	10.2	204	625
February	6.9	5.2	5.47	8.46	153	470
March	8.4	4.8	5.86	9.07	182	557
April	9.5	3.6	5.54	8.57	166	510
May	8.5	4.0	5.52	8.54	171	525
June	8.5	3.6	4.65	7.19	139	428
The year	9.8	3.6	6.49	10.0	2,370	7,270

LAUNIUPOKO STREAM NEAR LAHAINA, MAUI.

LOCATION.—About 175 feet above Pioneer Mill Co.'s ditch intake, 1 mile above storage reservoir, and about 5½ miles southeast of Lahaina.

RECORDS AVAILABLE.—July 25, 1911, to June 30, 1917.

GAGE.—Vertical staff on right bank. New datum April 21, 1916.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and below gage; stream bed rough and steep. Control composed of small boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.0 feet estimated gage height of flood of January 18, 1916 (determination of discharge not possible); minimum stage recorded, 0.4 foot frequently during 1913–14 (discharge, 0.5 million gallons per day, or 0.75 second-feet).

Minimum stage recorded during year, 0.5 foot frequently (discharge, 0.9 million gallons per day, or 1.4 second-feet).

DIVERSIONS.—None above station.

REGULATION.—Nearly all low-water flow of stream is derived from a development tunnel above station.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Gage read once daily. Records fair for ordinary stages.

Discharge measurements of Launiupoko Stream near Lahaina, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 27	1.05	5.4	3.5	Oct. 23	0.82	1.71	1.1
Aug. 10	.89	2.3	1.5	Jan. 24	.82	1.5	1.0
Sept. 11	.85	2.0	1.3	May 25	.49	1.37	.9

Daily discharge, in million gallons, of Launiupoko Stream near Lahaina, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	2.2	2.2	1.6	1.2	0.9	0.9	1.2	1.6	0.9	0.9	0.9	0.9
2	1.6	2.2	2.2	1.2	1.2	1.2	1.2	1.2	.9	.9	.....	.9
3	1.6	3.4	1.6	1.2	.9	1.2	1.2	1.2	.9	.9	.....	.....
4	1.6	2.8	1.6	1.2	.9	2.8	3.4	1.2	.9	.9	.....	.....
5	1.6	2.8	1.2	.9	5.6	1.2	1.2	1.2	.9	.9	.....	.9
6	1.6	2.8	1.2	.9	1.6	.9	1.2	.9	.9	.9	.....	.....
7	1.6	2.2	1.6	.9	1.2	.9	.9	.9	.9	.9	.....	.....
8	1.6	2.2	1.6	.9	.9	2.8	.9	.9	.9	.9	.9	.....
9	1.6	2.2	1.2	.9	.9	2.8	.9	.9	.9	.9	.....	.9
10	1.6	2.2	1.2	.9	.9	.....	.9	.9	.9	.9	.....	.....
11	1.6	2.2	1.2	.9	.9	1.2	1.6	.9	2.8	1.2	.....	.9
12	1.6	3.4	1.2	.9	.9	.9	1.2	.9	1.2	1.2	.....	.....
13	1.6	3.4	1.2	1.2	.9	.9	1.2	.9	.9	.....	.....	.....
14	1.6	2.8	1.2	1.2	.9	.9	1.2	2.2	.9	.....	.....	.9
15	1.6	2.2	1.2	.9	.9	1.2	.9	.9	.9	.9	.9	.9
16	1.6	2.2	1.2	1.2	.9	1.6	.9	.9	.9	.9	.....	.9
17	3.4	2.2	1.2	1.2	1.6	1.2	.9	.9	.9	.9	.....	.9
18	2.8	1.6	1.2	.9	.9	1.2	.9	.9	11.0	.....	.....	.9
19	2.8	1.6	1.2	.9	.9	.9	.9	4.0	6.4	.....	.....	.....
20	2.2	1.6	1.6	.9	.9	1.2	1.2	1.2	1.2	.9	.....	.9
21	2.2	1.6	1.2	.9	.9	5.6	.9	.9	1.2	.....	.....	.....
22	2.2	1.6	1.2	1.2	.9	5.6	.9	.9	1.2	.....	.....	.....
23	2.2	1.6	1.2	.9	.9	8.1	.9	.9	1.2	.9	.....	.....
24	2.2	1.6	1.2	.9	.9	6.4	.9	.9	1.2	.....	.9	.....
25	2.2	1.6	1.2	1.2	.9	3.4	1.2	.9	1.2	.....	.....	.9
26	2.2	1.6	1.2	.9	.9	2.2	1.6	.9	1.2	.....	.9	.....
27	2.8	1.6	1.2	1.2	.9	2.2	5.6	.9	.9	.....	.9	.9
28	2.2	1.6	1.2	.9	.9	2.2	3.4	.9	.9	.....	.9	.....
29	2.2	1.6	1.2	.9	.9	2.2	2.8	.....	.9	4.0	.9	.9
30	2.2	1.6	1.2	.9	.9	1.6	2.2	.....	.9	2.2	.9.	.9
31	5.6	1.6	.....	1.2	.....	1.6	1.6	.....	.9	.....	.9	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1 to Mar. 18, well defined between 1 and 4 million gallons per day; Mar. 19 to June 30, poorly defined. Gage heights recorded intermittently after Apr. 12.

Monthly discharge of Launiupoko Stream near Lahaina, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	5.6	1.6	2.12	3.28	66	202
August	3.4	1.6	2.12	3.28	66	202
September	2.2	1.2	1.31	2.03	39	121
October	1.2	.9	1.02	1.58	32	97
November	5.6	.9	1.12	1.73	34	103
January	5.6	.9	1.48	2.29	46	141
February	4.0	.9	1.14	1.76	32	98
March	11.0	.9	1.54	2.38	48	147

OLOWALU DITCH NEAR OLOWALU, MAUI.

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

RECORDS AVAILABLE.—July 28, 1916, to June 30, 1917. Replaces old station in tailrace from power house, for which records are available August 12, 1911, to June 30, 1916.

GAGE.—Vertical staff.

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 stage recorded during year, 0.98 foot at 5.30 a. m. July 31 (discharge, 8.1 million gallons per day, or 12.5 second-feet); minimum stage recorded, 0.3 foot August and April (discharge, 2.8 million gallons per day, or 4.3 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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.—Gage read twice daily. Records good for all stages.

Discharge measurements of Olowalu ditch near Olowalu, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 28	0.72	9.3	6.0	Oct. 21	0.48	6.15	4.0
Aug. 18	.53	6.9	4.5	Jan. 26	.67	8.6	5.6
Sept. 9	.68	8.55	5.5	May 23	.57	6.4	4.1

Daily discharge, in million gallons, of Olowalu ditch near Olowalu, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	.....	7.0	5.4	4.6	4.6	4.6	5.0	3.8	3.5	3.2	5.8	4.6
2	.....	6.6	6.2	4.6	4.6	5.0	5.0	3.8	3.5	3.2	6.2	4.6
3	.....	6.2	5.4	4.2	4.6	5.4	5.0	3.5	3.8	3.2	5.8	4.2
4	.....	6.2	5.4	4.2	4.2	5.8	4.6	3.5	3.8	3.5	5.8	3.8
5	.....	5.8	5.0	4.2	5.0	5.8	4.6	3.5	4.6	3.5	5.8	3.8
6	.....	5.4	5.0	4.2	4.6	5.4	4.2	3.5	4.6	3.5	5.8	3.8
7	.....	5.4	5.8	4.2	4.6	5.0	4.2	3.8	4.6	3.5	5.4	3.5
8	.....	5.0	5.4	4.2	4.2	5.8	4.2	3.5	4.2	3.5	5.4	4.2
9	.....	4.6	5.4	4.2	4.2	5.8	4.2	3.5	4.2	3.2	5.0	4.2
10	.....	3.8	5.4	4.2	3.8	6.2	4.2	3.5	4.2	3.2	4.6	4.2
11	.....	4.6	5.0	3.8	3.8	6.2	5.0	3.8	4.6	3.2	4.6	4.2
12	.....	5.4	5.0	4.2	3.8	5.0	5.0	4.6	5.0	3.2	4.6	4.2
13	.....	6.6	5.0	4.6	3.8	5.8	4.6	4.6	4.6	3.2	4.6	3.8
14	.....	7.4	5.0	5.0	3.5	5.4	4.6	4.6	4.6	3.2	4.2	3.8
15	.....	7.4	5.0	4.6	3.8	5.4	4.6	4.2	4.6	2.8	4.2	3.5
16	.....	7.0	4.6	5.0	3.8	5.4	4.2	4.2	4.2	2.8	4.2	3.8
17	.....	5.8	4.6	5.4	5.8	5.0	4.2	4.2	4.6	3.2	4.2	4.2
18	.....	5.0	4.6	5.4	5.8	5.0	4.2	4.6	7.0	3.2	4.2	3.8
19	.....	4.2	5.8	5.0	5.0	.....	4.2	5.4	4.2	3.2	4.2	3.8
20	.....	3.8	5.8	5.0	4.6	5.8	4.6	5.4	.....	3.2	3.5	3.5
21	.....	3.5	5.4	4.6	4.6	6.6	4.6	5.4	3.8	3.2	3.2	3.2
22	.....	3.5	5.0	4.2	4.2	7.0	4.6	5.0	3.8	3.2	3.2	3.2
23	.....	3.2	5.0	4.2	4.2	7.4	4.2	4.6	3.5	2.8	3.5	3.2
24	.....	4.2	5.4	4.6	4.2	7.8	4.2	4.2	3.5	2.8	4.2	3.2
25	.....	4.2	5.4	4.2	4.2	7.4	4.2	4.2	3.5	2.8	3.8	3.5
26	.....	3.5	5.4	5.0	4.2	7.0	4.6	4.2	3.2	2.8	3.8	3.5
27	.....	3.2	5.0	5.4	4.6	7.0	4.6	4.2	3.2	3.8	3.8	3.8
28	5.8	2.8	5.0	4.6	4.6	7.0	5.0	3.8	3.5	4.2	4.6	3.5
29	5.0	3.2	4.6	4.6	4.6	5.8	5.0	.....	3.2	5.4	5.4	3.8
30	4.6	3.8	4.6	4.6	4.6	5.4	4.2	.....	3.2	5.4	5.4	3.5
31	7.8	5.0	.....	4.6	.....	5.4	4.2	.....	3.2	.....	5.0	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 28, 1916, to Mar. 19, 1917, well defined between 3 and 7 million gallons per day; Mar. 21 to June 30, 1917, fairly well defined. Ditch broken Dec. 19 and Mar. 20.

Monthly discharge of Olowalu ditch near Olowalu, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
August	7.4	2.8	4.95	7.66	153	471
September	6.2	4.6	5.19	8.03	156	478
October	5.4	3.8	4.56	7.06	141	434
November	5.8	3.5	4.40	6.81	132	405
January	5.0	4.2	4.51	6.98	140	429
February	5.4	3.5	4.18	6.47	117	359
April	5.4	2.8	3.37	5.21	101	310
May	6.2	3.2	4.65	7.19	144	442
June	4.6	3.2	3.80	5.88	114	350

UKUMEHAME STREAM NEAR OLOWALU, MAUI.

LOCATION.—Half a mile above upper ditch intake, 2 miles above Government road at the 14-mile post, and 4 miles by road and trail east of Olowalu.

RECORDS AVAILABLE.—August 14, 1911, to June 30, 1917.

GAGE.—Gurley printing water-stage recorder installed February 20, 1916; replaced vertical staff installed April 23, 1913, 200 feet below present gage and washed out January 18, 1916.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 900 feet below gage.

CHANNEL AND CONTROL.—One channel at all stages; straight for 50 feet above and below gage; right bank is steep and high; left bank slopes gradually; very rough stream bed composed of boulders and gravel. Control somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9.0 feet estimated gage height of flood of January 18, 1916; no estimate of discharge possible; minimum stage recorded, 0.60 foot October 4 and 5, 1913 (discharge, 2.3 million gallons per day, or 3.6 second-feet).

Maximum stage recorded during year, 4.55 feet at 9 a. m. March 18 (discharge approximately 150 million gallons per day, or 232 second-feet); minimum stage recorded, 0.5 foot April and June (discharge, 4.1 million gallons per day, or 6.3 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Records, July 1, 1916, to January 11, 1917, good; those for remainder of year, fair. Several shifts in control occurred, but frequent discharge measurements gave fair results for ordinary stages.

Discharge measurements of Ukumehame Stream near Olowalu, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 28	H. A. R. Austin	0.98	19	12
Aug. 17	do	.90	15	10
Sept. 9	do	.80	11.6	7.5
Oct. 21	do	.72	8.23	5.3
Dec. 16	do	1.01	20.8	13
Jan. 25	do	.84	8.3	5.4
Feb. 10	do	.96	8.6	5.6
12	do	.62	8.0	5.2
Mar. 27	do	.57	7.9	5.1
Apr. 20	do	.58	8.38	5.4
May 23	do	.57	7.84	5.1
June 20	C. T. Bailey	.50	6.33	4.1

Daily discharge, in million gallons, of Ukumehame Stream near Olowalu, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	14	14	10	6.2	6.2	6.2	7.4	5.0	7.4	6.2	8.7	5.0
2	13	14	15	6.2	6.2	7.4	7.4	5.0	7.4	6.2	8.7	5.0
3	13	18	10	6.2	6.2	16	7.4	5.0	8.7	5.0	7.4	5.0
4	12	13	8.7	6.2	6.2	16	7.4	5.0	8.7	5.0	6.2	5.0
5	13	10	8.7	6.2	13	10	7.4	5.0	8.7	5.0	8.7	5.0
6	10	8.7	10	6.2	12	7.4	6.2	5.0	8.7	5.0	7.4	5.0
7	10	8.7	15	6.2	8.7	7.4	6.2	5.0	7.4	5.0	6.2	4.1
8	8.7	7.4	13	6.2	7.4	7.4	6.2	5.0	7.4	5.0	6.2	5.0
9	8.7	7.4	10	6.2	6.2	7.4	6.2	5.0	7.4	5.0	6.2	5.0
10	8.7	7.4	7.4	6.2	6.2	16	8.7	5.0	7.4	5.0	6.2	5.0
11	8.7	7.4	7.4	5.0	6.2	13	20	5.0	10	6.2	6.2	6.2
12	8.7	10	7.4	7.4	6.2	8.7	8.7	5.0	10	5.0	5.0	5.0
13	8.7	12	7.4	6.2	6.2	8.7	8.7	5.0	8.7	5.0	5.0	5.0
14	7.4	15	6.2	6.2	5.0	8.7	7.4	13	8.7	5.0	5.0	4.1
15	7.4	13	6.2	5.0	6.2	7.4	7.4	8.7	7.4	5.0	5.0	4.1
16	8.7	10	6.2	5.0	7.4	12	7.4	8.7	7.4	5.0	5.0	4.1
17	10	8.7	6.2	6.2	12	12	7.4	7.4	7.4	5.0	6.2	4.1
18	8.7	7.4	6.2	6.2	7.4	8.7	7.4	10	27	5.0	5.0	4.1
19	7.4	7.4	8.7	5.0	6.2	8.7	7.4	13	14	5.0	5.0	4.1
20	8.7	7.4	7.4	5.0	6.2	8.7	8.7	10	10	5.0	5.0	4.1
21	7.4	8.7	7.4	5.0	6.2	20	7.4	8.7	8.7	5.0	5.0	4.1
22	7.4	12	6.2	5.0	6.2	22	7.4	8.7	7.4	5.0	5.0	5.0
23	7.4	15	8.7	6.2	6.2	28	7.4	8.7	7.4	5.0	6.2	4.1
24	7.4	12	8.7	5.0	6.2	22	7.4	8.7	6.2	5.0	5.0	4.1
25	7.4	8.7	8.7	5.0	6.2	20	7.4	8.7	6.2	5.0	5.0	4.1
26	8.7	8.7	7.4	8.7	5.0	13	6.2	7.4	6.2	5.0	5.0	4.1
27	13	8.7	7.4	8.7	5.0	13	15	7.4	6.2	4.1	7.4	5.0
28	13	10	7.4	7.4	10	12	14	7.4	5.0	7.4	7.4	5.0
29	10	8.7	6.2	6.2	10	10	16	.....	5.0	18	6.2	4.1
30	8.7	7.4	6.2	6.2	7.4	8.7	8.7	.....	6.2	13	5.0	4.1
31	16	8.7	.....	6.2	.....	8.7	6.2	.....	5.0	.....	5.0	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1, 1916, to Jan. 11, 1917, well defined between 4 and 16 million gallons per day; Feb. 12 to Mar. 18, 1917, and Mar. 19 to June 30, 1917, poorly defined. Shifting-control method used Jan. 12 to Feb. 11. Discharge determined by comparison with record of Lahainaluna Stream Sept. 1–10.

Monthly discharge of Ukumehame Stream near Olowalu, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	16	7.4	9.74	15.1	302	927
August	18	7.4	10.2	15.8	316	970
September	15	6.2	8.38	13.0	251	772
October	8.7	5.0	6.09	9.42	189	579
November	13	5.0	7.19	11.1	216	662
December	28	6.2	12.1	18.6	375	1,150
January	20	6.2	8.52	13.2	264	811
February	13	5.0	7.20	11.1	202	619
March	27	5.0	8.36	12.9	259	795
April	18	4.1	5.87	9.08	176	540
May	8.7	5.0	6.02	9.31	186	573
June	6.2	4.1	4.59	7.10	138	423
The year	28	4.1	7.87	12.2	2,870	8,820

WAIKAPU STREAM NEAR WAIKAPU, MAUI.

LOCATION.—300 feet below intake of Palolo ditch, 1½ miles west of Waikapu, and 4 miles by road southwest of Wailuku.

RECORDS AVAILABLE.—December 1, 1910, to June 30, 1917.

GAGE.—Vertical staff on left bank installed April 26, 1916, to replace staff gage at old location 200 feet downstream. Old gage washed out January 7, 1916.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and 25 feet below gage; left bank high and nearly vertical; right bank slopes gently. Control composed of large boulders; fairly permanent between extreme floods.

EXTREMES OF DISCHARGE.—Highest flood on record occurred morning of January 18, 1916, when water reached a height of about 10 feet, datum of old gage; discharge not estimated. Minimum stage recorded, 0.25 foot (old datum) February 26 to March 4, 1914 (discharge, 0.1 million gallons per day, or 0.15 second-foot).

Minimum stage for the year, 1.0 foot May and June (discharge, 0.4 million gallons per day, or 0.6 second-foot).

DIVERSIONS.—Nearly all low-water flow is diverted above station by South Side Waikapu ditch and Palolo ditch.

REGULATION.—Natural flow has been increased by development tunnels near the headwaters.

UTILIZATION.—Flow at low and medium stages is diverted for irrigation of sugar cane.

ACCURACY.—Record fair for low and medium stages; those for high and fluctuating stages roughly approximate only, as gage is read but twice daily.

Discharge measurements of Waikapu Stream near Waikapu, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons. per day.
July 24	H. A. R. Austin	0.91	2.9	1.9
Aug. 17	....do	.95	3.7	2.4
Sept. 16	....do	.78	1.65	1.1
Oct. 14	....do	.85	1.28	.74
Jan. 20	....do	.83	2.86	1.8
Mar. 24	....do	1.33	4.07	2.6
May 26	....do	1.02	.59	.38
June 27	C. T. Bailey	1.02	.77	.5

Daily discharge, in million gallons, of Waikapu Stream near Waikapu, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.6	5.1	2.0	1.2	0.9	0.6	2.0	1.2	0.9	1.2	9.0	0.4
2	3.6	8.0	9.0	1.6	.9	1.6	1.6	1.2	.9	1.2	5.1	.4
3	3.6	10	4.2	1.2	.9	13	1.6	1.2	.9	.9	.9	.4
4	5.1	3.6	3.0	.9	.9	8.0	2.0	.9	1.2	.9	.9	.4
5	6.0	3.0	3.0	.9	8.0	1.2	1.6	.9	1.2	1.2	.9	.4
6	3.6	2.5	2.5	.9	1.6	.9	1.6	.9	.9	.9	.9	.4
7	3.6	2.5	7.0	.9	.9	.9	1.6	.9	.9	.9	.6	.4
8	3.0	2.5	3.0	.9	.9	1.2	1.6	.6	.9	.9	.6	2.0
9	3.0	2.0	3.0	.9	.6	.9	1.2	.6	.9	.9	.6	2.0
10	3.0	2.0	2.0	.9	.6	42	1.2	.9	.9	.9	.6	.9
11	3.6	2.0	2.0	.9	.6	3.0	4.2	.6	1.6	1.2	.6	2.5
12	3.0	3.0	2.0	.9	.6	2.5	1.6	.6	1.2	1.2	.6	.6
13	3.0	7.0	1.6	1.2	.6	1.2	1.2	.9	.9	.9	.6	.6
14	2.5	25	1.6	.9	.6	3.0	1.2	6.0	.9	6.0	.6	.4
15	2.0	7.0	1.6	.9	.6	2.5	1.2	1.2	.9	.9	.6	.4
16	2.0	3.0	1.6	.9	.9	14	1.2	1.2	.9	.9	.6	.4
17	3.6	2.5	.9	1.2	7.0	3.6	.9	1.2	.9	1.2	.6	.4
18	2.5	2.5	.9	.9	1.6	3.0	.9	1.6	220	.9	.9	.4
19	2.5	2.5	2.5	.9	.9	1.6	1.2	2.0	9.0	.9	.9	.4
20	2.0	2.0	3.0	.9	.6	1.2	1.2	1.6	5.1	1.2	.9	.4
21	2.0	2.0	1.2	.9	.6	13	.9	1.6	3.6	1.2	1.2	.4
22	2.0	2.0	1.2	1.2	.6	16	.9	1.2	3.6	.9	1.2	2.5
23	2.0	2.0	2.5	1.2	.6	55	.9	1.2	3.6	.9	1.2	.6
24	2.0	2.0	2.0	.9	.6	19	.9	1.2	8.0	.9	.4	.4
25	2.0	2.0	2.0	.9	.6	22	.9	1.2	1.2	.9	.4	.4
26	2.5	2.5	1.2	3.0	.6	3.6	1.6	1.2	1.2	.9	.4	.4
27	8.0	2.0	1.2	1.6	.6	1.6	2.0	.9	1.2	.9	.6	1.2
28	4.2	2.0	1.2	1.2	4.2	2.0	3.0	1.2	1.2	.9	.4	.9
29	2.5	2.0	.9	.9	2.0	2.0	1.2	.....	1.2	44	.4	.6
30	2.0	2.0	1.2	.9	.9	2.0	1.2	.....	1.2	27	.4	.4
31	16	2.0	.....	.9	.....	1.6	1.2	.....	1.2	.....	.4	.....

NOTE.—Discharge determined from rating curves fairly well defined below 4 million gallons per day, applicable July 1 to Mar. 18 and Mar. 19 to June 30.

Monthly discharge of Waikapu Stream near Waikapu, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	16	2.0	3.55	5.49	110	338
August	25	2.0	3.88	6.00	120	369
September	9.0	.9	2.37	3.67	71	218
October	3.0	.9	1.08	1.67	34	103
November	8.0	.6	1.38	2.14	42	127
December	55	.6	7.86	12.2	244	748
January	4.2	.9	1.47	2.27	46	140
February	6.0	.6	1.28	1,98	36	110
March	220	.9	8.97	13.9	278	853
April	44	.9	3.46	5.35	104	319
May	9.0	.4	1.10	1.70	34	105
June	2.5	.4	.73	1.13	22	67
The year	220	.4	3.12	4.83	1,140	3,500

PALOLO DITCH NEAR WAIKAPU, MAUI.

LOCATION.—200 feet below intake, 1½ miles west of Waikapu, and 5½ miles by road southwest of Wailuku.

RECORDS AVAILABLE.—November 21, 1910, to June 30, 1917.

GAGE.—Vertical staff on left bank.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Channel is cut in earth and soft rock; fairly straight for 50 feet above and below gage; clean and usually free from vegetation. Control a small wooden culvert 1 foot below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.18 feet at 9 a. m. December 26 (discharge, 3.7 million gallons per day, or 5.7 second-feet); maximum stage recorded during period of record, 1.33 feet at 2 p. m. December 7, 1913 (discharge, 4.7 million gallons per day, or 7.3 second-feet); ditch occasionally dry.

DIVERSIONS.—None above station.

REGULATION.—Water may be turned out of ditch by gates.

UTILIZATION.—Irrigation of sugar cane and taro.

ACCURACY.—Gage read twice daily. Discharge determined from well-defined rating curve and reliable gage heights. Records good for all stages.

Discharge measurements of Palolo ditch near Waikapu, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 24	0.98	4.0	2.6	Mar. 24	.64	1.75	1.1
Oct. 14	1.04	4.15	2.7	May 26	.90	3.46	2.2
Jan. 20	.76	2.44	1.6				

Daily discharge, in million gallons, of Palolo ditch near Waikapu, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	3.3	2.7	2.7	3.3	3.0	2.7	1.6	2.2	2.0	2.0	1.8	2.2
2	3.3	2.7	3.0	3.3	3.0	3.0	1.6	2.0	2.0	2.0	2.0	2.2
3	3.3	2.7	2.0	3.3	3.0	3.3	1.6	1.8	2.0	2.0	2.0	2.2
4	3.3	2.7	1.2	3.3	3.0	3.3	1.8	1.8	2.0	2.0	1.8	2.2
5	3.3	2.7	1.2	3.0	3.3	2.7	1.8	1.8	2.0	2.2	2.2	2.2
6	3.3	2.7	1.2	3.0	3.3	2.7	1.6	2.0	2.0	2.2	2.2	2.2
7	3.3	2.7	1.3	3.0	3.0	2.7	1.6	2.0	2.0	2.2	2 2.	2.2
8	3.3	2.4	1.2	3.0	3.0	2.7	1.6	2.0	2.0	2.2	2.2	2.2
9	3.3	2.4	1.2	3.0	3.0	2.7	1.6	2.0	2.0	2.2	2.2	2.4
10	3.3	2.4	3.0	3.0	3.0	3.6	2.2	2.0	2.0	2.2	2.2	2.2
11	3.3	2.4	3.0	3.0	2.7	2.7	2.2	2.0	2.0	2.2	2.2	2.4
12	3.3	2.7	3.0	3.0	2.7	1.2	2.0	1.8	2.0	2.2	2.2	2.2
13	3.3	2.7	3.0	3.0	2.7	2.4	1.8	2.0	2.0	2.2	2.2	2.2
14	3.3	3.0	3.0	3.0	2.7	1.8	1.8	1.2	2.0	2.2	2.2	2.2
15	3.0	2.7	3.0	3.0	2.7	1.6	1.8	1.2	2.0	2.2	2.2	2.2
16	3.0	2.7	3.0	3.0	3.0	3.3	1.6	1.2	2.0	2.2	2.2	2.2
17	3.3	3.3	3.0	3.0	3.3	3.3	1.6	1.3	2.0	2.2	2.2	2.2
18	3.0	3.3	3.0	3.0	3.0	3.3	1.6	1.6	.....	2.2	2.2	2.0
19	3.0	3.3	3.0	3.0	2.7	3.0	1.6	1.2	.....	2.2	2.2	2.0
20	3.0	3.0	3.0	3.0	2.7	3.3	1.8	1.2	.3	2.2	2.2	2.0
21	3.0	3.0	2.7	3.0	2.7	3.3	1.8	1.2	1.2	2.2	2.2	2.0
22	2.7	3.0	2.7	3.0	2.7	3.3	2.2	1.2	2.0	2.2	2.2	2.2
23	2.7	3.0	2.7	3.0	2.7	3.3	2.2	1.2	2.0	2.2	2.2	2.2
24	2.7	3.0	2.7	3.0	2.7	3.6	2.2	1.2	2.0	2.2	2.4	2.2
25	2.7	3.0	2.7	3.0	2.7	3.3	2.2	1.2	2.0	2.2	2.4	2.0
26	2.7	3.0	2.7	3.3	2.4	3.8	2.2	1.2	2.0	2.2	2.2	2.0
27	3.0	3.0	2.7	3.3	2.4	3.6	2.2	2.0	2.0	2.2	2.2	2.2
28	2.7	2.7	2.7	3.3	3.0	3.6	2.2	2.0	2.0	2.2	2.2	2.2
29	2.7	2.7	2.7	3.0	3.0	3.3	2.2	.....	2.0	3.3	2.2	2.2
30	2.7	2.7	2.7	3.0	2.7	3.3	2.2	.....	2.0	1.6	2.2	2.2
31	3.0	2.7	.....	3.0	.....	3.3	2.2	.....	2.0	.....	2.2	.....

NOTE.—Discharge determined from well-defined rating curve. No flow Mar. 18 and 19; intake damaged by flood.

Monthly discharge of Palolo ditch near Waikapu, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	3.3	2.7	3.07	4.75	95	292
August	3.3	2.4	2.81	4.35	87	267
September	3.0	1.2	2.50	3.87	75	230
October	3.3	3.0	3.07	4.75	95	292
November	3.3	2.4	2.86	4.43	86	263
December	3.8	1.2	3.00	4.64	93	285
January	2.2	1.6	1.89	2.92	59	180
February	2.2	1.2	1.62	2.51	46	139
March (29 days)	2.0	.3	1.91	2.95	56	170
April	3.3	1.6	2.19	3.39	66	202
May	2.4	1.8	2.17	3.36	67	206
June	2.4	2.0	2.17	3.36	65	200
The year					890	2,730

SOUTH SIDE WAIKAPU DITCH NEAR WAIKAPU, MAUI.

LOCATION.—One mile below intake, 1½ miles west of Waikapu, and about 5½ miles by road southwest of Wailuku.

RECORDS AVAILABLE.—November 21, 1910, to June 30, 1917.

GAGE.—Vertical staff on right bank.

DISCHARGE MEASUREMENTS.—Made from plank over ditch at gage.

CHANNEL AND CONTROL.—Channel is cut in earth and soft rock; section fairly uniform; banks vertical. Control not well defined but fairly permanent between times of cleaning ditch.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 0.98 foot August 14 (discharge, 12 million gallons per day, or 19 second-feet); ditch dry April 14.

Maximum stage recorded during period of record, 1.25 feet at 9 a. m. May 8, 1914 (discharge, 16 million gallons per day, or 25 second-feet); ditch occasionally dry.

DIVERSIONS.—None above station.

REGULATION.—Practically none.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Gage read twice daily. Discharge determined from well-defined rating curve and reliable gage-height record. Records good for all stages.

Discharge measurements of South Side Waikapu ditch near Waikapu, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 24	H. A. R. Austin	0.51	7.2	4.7
Sept. 16	do	.43	5.8	3.8
Oct. 14	do	.36	5.27	3.4
Jan. 20	do	.39	5.46	3.5
Mar. 24	do	.09	1.46	.95
May 26	do	.46	4.58	3.0
June 27	C. T. Bailey	.40	6.26	4.0

Daily discharge, in million gallons, of South Side Waikapu ditch near Waikapu, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	6.2	7.7	4.8	4.2	3.6	3.0	4.2	3.0	2.5	3.0	3.6	3.0
2	5.5	8.4	7.7	4.8	3.6	5.5	3.6	3.0	2.5	3.0	2.5	3.6
3	6.2	9.2	6.2	3.6	3.6	8.4	3.6	2.5	3.0	3.0	4.8	3.0
4	2.5	7.0	4.8	3.6	3.6	7.0	3.6	2.5	4.2	3.0	4.2	3.0
5	7.0	6.2	4.2	3.6	7.7	4.8	3.6	2.5	3.6	3.6	4.2	3.0
6	6.2	5.5	4.2	3.6	5.5	4.2	3.6	2.5	3.6	3.0	3.6	3.0
7	5.5	5.5	7.0	3.6	4.2	3.6	3.6	2.5	3.0	3.0	3.6	3.0
8	4.8	5.5	4.8	3.6	3.6	4.2	3.0	2.5	3.0	2.5	3.6	6.2
9	4.8	5.5	4.2	3.0	3.6	3.6	3.0	2.5	3.0	2.5	3.6	6.2
10	5.5	5.5	4.2	3.6	3.0	9.2	3.0	2.5	3.0	3.0	3.6	4.2
11	6.2	4.8	4.2	3.0	3.0	6.2	5.5	2.5	4.8	3.6	3.6	7.7
12	5.5	7.0	4.2	3.0	3.0	5.5	4.2	2.5	3.6	3.6	3.6	3.6
12	4.8	7.7	4.2	3.6	3.0	5.5	3.6	2.5	3.0	3.0	3.6	3.0
14	5.5	12.0	3.6	3.0	2.5	6.2	3.6	6.2	3.0	.....	3.6	3.0
15	5.5	6.2	4.2	3.0	2.5	5.5	3.6	3.6	2.5	3.0	3.6	3.0
16	5.5	5.5	4.2	3.0	3.6	5.5	3.6	3.6	2.5	3.0	3.0	2.5
17	6.2	5.5	3.6	4.2	7.7	3.0	3.6	3.0	2.5	3.6	3.6	2.5
18	6.2	4.8	3.6	3.0	4.8	3.6	3.6	4.2	.....	3.0	4.2	2.5
19	6.2	4.8	5.5	3.0	3.6	4.8	4.2	5.5	.....	3.0	4.2	2.5
20	5.5	4.8	4.2	3.0	3.6	4.2	3.0	4.2	.....	4.8	4.2	2.5
21	5.5	4.8	4.2	3.0	3.0	7.0	3.0	3.6	.....	3.6	6.2	2.5
22	5.5	4.2	3.6	3.6	3.0	7.7	3.0	3.0	.....	3.0	4.2	7.0
23	5.5	4.2	5.5	4.8	3.0	7.0	2.5	3.0	.....	3.0	5.5	3.0
24	4.8	4.2	5.5	3.6	3.0	3.0	2.5	3.0	.....	3.0	5.5	3.0
25	4.8	4.2	4.8	3.0	2.5	4.8	2.5	3.0	.....	3.0	4.8	2.5
26	5.5	4.8	4.2	7.0	2.5	6.2	3.6	2.5	3.6	3.0	4.2	2.5
27	7.0	4.2	4.2	5.5	2.5	4.8	3.6	2.5	3.0	3.0	4.2	4.8
28	7.0	4.2	3.6	5.5	7.0	4.8	4.8	2.5	3.0	3.6	4.2	4.8
29	5.5	4.2	3.6	4.2	5.5	4.8	4.2	.....	3.0	8.4	3.6	3.6
30	4.8	4.2	4.2	3.6	3.6	4.2	5.5	.....	3.6	5.5	3.6	3.0
31	9.2	4.8	.....	3.6	.....	4.2	3.6	.....	3.6	.....	3.0	.....

NOTE.—Discharge determined from well-defined rating curve. Ditch dry on days for which discharge is not given.

Monthly discharge of South Side Waikapu ditch near Waikapu, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	9.2	2.5	5.69	8.80	176	541
August	12.0	4.2	5.71	8.83	177	543
September	7.7	3.6	4.57	7.07	137	421
October	7.0	3.0	3.75	5.80	116	357
November	7.7	2.5	3.83	5.93	115	353
December	9.2	3.0	5.23	8.09	162	498
January	5.5	2.5	3.62	5.60	112	344
February	6.2	2.5	3.10	4.80	87	266
March (23 days)	4.8	2.5	3.18	4.92	73	224
April (29 days)	8.4	2.5	3.42	5.29	99	304
May	6.2	2.5	3.98	6.16	124	379
June	7.7	2.5	3.59	5.55	108	331
The year					1,490	4,560

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 6 miles east of Keanae post office.

RECORDS AVAILABLE.—January 3, 1914, to June 30, 1917.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 300 feet below gage.

CHANNEL AND CONTROL.—Channel at gage is a large pool at foot of falls; banks rock and nearly vertical. Control at outlet of pool composed of large boulders; seldom shifts.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9.25 feet at 5.30 a. m. January 18, 1916 (discharge, computed from extension of rating curve, approximately 2,000 million gallons per day, or 3,090 second-feet); minimum stage recorded, 0.55 foot March 21, 1914 (discharge, 1.8 million gallons per day, or 2.8 second-feet).

Maximum stage recorded during year, 7.0 feet at 5 a. m. March 9 (discharge, approximately 1,400 million gallons per day, or 2,166 second-feet); minimum stage recorded during year, 0.8 foot February 23–26 (discharge, 2.0 million gallons per day, or 3.1 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Records good for all stages except extreme floods.

Discharge measurements of West Kopiliula Stream near Keanae, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 15	H. A. R. Austin	1.59	26	17
Sept. 14	do	1.22	11	7.2
Dec. 10	do	4.72	780	504
Jan. 16	R. C. Rice	1.14	7.8	5.0
Mar. 20	H. A. R. Austin	1.41	17.7	11

Daily discharge, in million gallons, of West Kopiliula Stream near Keanae, Maui, for the year ending June 30, 1917.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	17	40	18	22	25	27	12	3.8	4.4	5.0	11	3.3
2	11	33	22	9.0	75	35	12	3.8	3.3	4.4	9.0	14
3	12	35	11	5.0	53	53	16	3.3	11	4.4	7.0	6.0
4	10	16	9.0	4.4	33	25	50	3.3	29	5.0	5.0	6.0
5	11	11	14	4.4	174	14	29	2.8	10	11	4.4	10
6	8.0	14	14	4.4	75	11	38	2.8	5.0	5.0	4.4	9.0
7	8.0	11	38	3.8	22	9.0	33	2.8	4.4	5.0	3.8	5.0
8	8.0	10	22	4.4	17	9.0	16	2.8	23	4.4	3.8	7.0
9	8.0	10	14	4.4	12	38	12	2.8	85	3.8	3.8	5.0
10	8.0	11	12	3.3	11	250	11	2.8	80	5.0	3.8	4.4
11	14	20	9.0	3.3	10	46	10	2.8	25	14	3.8	7.0
12	9.0	27	8.0	8.0	9.0	22	10	2.8	17	5.0	5.0	3.8
13	16	35	8.0	3.8	8.0	22	9.0	2.8	14	4.4	3.8	3.3
14	17	33	7.0	3.3	8.0	33	8.0	10	12	10	9.0	3.3
15	20	18	7.0	3.8	20	31	7.0	2.8	22	8.0	9.0	3.3
16	31	11	6.0	3.8	96	40	6.0	2.8	7.0	7.0	12	2.8
17	43	12	6.0	8.0	85	102	5.0	2.4	5.0	8.0	43	2.8
18	18	14	7.0	5.0	17	116	4.4	2.4	31	6.0	80	3.3
19	14	22	23	5.0	11	80	4.4	2.8	29	5.0	17	2.8
20	10	25	9.0	5.0	8.0	57	4.4	2.8	12	7.0	10	2.8
21	8.0	25	8.0	3.8	8.0	210	4.4	3.3	7.0	6.0	10	2.4
22	8.0	20	17	3.8	7.0	400	3.8	2.4	5.0	4.4	9.0	4.4
23	7.0	17	17	3.8	7.0	490	3.8	2.0	5.0	5.0	10	2.8
24	5.0	17	12	3.8	10	40	3.8	2.0	5.0	3.8	8.0	2.8
25	5.0	11	8.0	4.4	7.0	22	6.0	2.0	12	3.8	5.0	2.4
26	7.0	9.0	10	27	14	17	70	2.0	12	3.8	4.4	2.4
27	10	10	9.0	29	23	20	9.0	3.8	5.0	3.8	4.4	4.4
28	10	11	7.0	16	31	29	6.0	23	5.0	16	4.4	5.0
29	9.0	8.0	6.0	17	25	18	5.0	.....	9.0	210	3.8	3.3
30	16	7.0	7.0	23	57	16	5.0	.....	10	40	3.3	2.8
31	80	16	.....	17	.....	12	3.8	.....	8.0	.....	3.3	.....

NOTE.—Discharge determined from well-defined rating curve. Discharge July 13–14, 22–28, Aug. 2–5, 29–31, Sept. 9–12, Dec. 22–23, 25–26, Jan. 25–26, and Mar. 16 determined by comparison with records of East Wailuaiki stream.

Monthly discharge of West Kopiliula Stream near Keanae, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	80	5.0	14.8	22.9	458	1,410
August	40	7.0	18.0	27.8	559	1,710
September	38	6.0	12.2	18.9	365	1,120
October	29	3.3	8.47	13.1	263	806
November	174	7.0	31.9	49.4	958	2,940
December	490	9.0	74.0	114	2,294	7,040
January	70	3.8	13.5	20.9	418	1,280
February	23	2.0	3.78	5.85	106	325
March	85	3.3	16.5	25.5	512	1,570
April	210	3.8	14.1	21.8	424	1,300
May	80	3.3	10.1	15.6	314	961
June	14	2.4	4.59	7.10	138	423
The year	490	2.0	18.7	28.9	6,810	20,900

EAST WAILUAIKI STREAM NEAR KEANAE, MAUI.

LOCATION.—1,000 feet above Koolau ditch crossing and trail, 3¾ miles east of Upper Keanae, and about 6¼ miles east of Keanae post office.

RECORDS AVAILABLE.—December 21, 1913, to June 30, 1917.

GAGE.—Stevens water-stage recorder, installed April 17, 1914, to replace original Friez recorder.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 800 feet below gage.

CHANNEL AND CONTROL.—Channel at gage is a large pool at foot of falls; banks are nearly vertical walls of rock. Control composed of large boulders and rock ledge; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 8.35 feet at 8 a. m. January 18, 1916 (discharge, computed from extension of rating curve, approximately 1,900 million gallons per day, or 2,940 second-feet); minimum stage recorded, 0.60 foot March 5–8, 1914, and August 14 and 15, 1195 (discharge, 2.5 million gallons per day or 3.9 second-feet).

Maximum stage recorded during year, 6.2 feet at 7 a. m. December 23 (discharge, approximately 1,300 million gallons per day, or 2,010 second-feet); minimum stage recorded, 0.75 foot, February 18 and 24–27 (discharge, 3.3 million gallons per day, or 5.1 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Determinations based on continuous record of gage height and rating curves well defined for low and medium stages; good for all except flood stages, for which they are fair.

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Discharge measurements of East Wailuaiki Stream near Keanae, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Sept. 14	1.06	15	9.8	Mar. 20	1.12	14.9	9.6
Dec. 10	4.45	957	618	Apr. 18	1.05	12.7	8.2

Daily discharge, in million gallons, of East Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	19	44	20	18	20	30	14	6.0	8.2	5.0	14	4.4
2	17	48	27	12	48	40	14	5.0	4.4	4.4	9.4	15
3	17	52	14	8.2	48	62	15	5.0	5.0	4.4	9.4	7.0
4	14	22	12	8.2	27	30	56	5.0	30	6.0	7.0	7.0
5	15	18	18	7.2	155	16	30	5.0	12	8.2	6.0	9.4
6	12	14	18	7.2	88	12	33	4.4	7.0	5.0	5.0	12
7	12	12	44	7.2	22	11	33	4.4	5.0	4.4	5.0	7.0
8	11	12	24	7.2	18	9.6	17	3.8	14	4.4	5.0	8.2
9	9.4	11	20	7.2	14	44	14	3.8	86	4.4	5.0	7.0
10	11	12	18	6.1	12	296	12	4.4	36	3.8	5.0	6.0
11	15	20	14	6.1	11	48	12	3.8	15	14	5.0	11
12	14	30	12	20	11	22	11	3.8	15	6.0	7.0	6.0
13	19	36	11	8.2	9.6	20	9.4	3.8	14	5.0	5.0	5.0
14	22	36	9.6	7.2	8.2	33	9.4	9.4	12	8.2	9.4	5.0
15	17	22	9.6	7.2	16	33	8.2	4.4	22	8.2	11	4.4
16	24	16	9.6	7.2	95	36	7.0	3.8	12	7.0	11	4.4
17	51	16	9.6	12	95	102	7.0	3.8	6.0	8.2	40	3.8
18	22	16	9.6	9.6	18	102	7.0	3.3	30	8.2	93	5.0
19	17	22	33	8.2	12	81	6.0	3.8	30	7.0	15	4.4
20	14	27	16	8.2	11	52	6.0	4.4	12	8.2	11	3.8
21	11	24	11	7.2	9.6	210	6.0	5.0	7.0	7.0	9.4	3.8
22	11	22	18	7.2	9.6	366	6.0	4.4	5.0	6.0	11	7.0
23	9.4	22	22	8.2	8.2	418	6.0	3.8	5.0	6.0	12	4.4
24	8.2	18	22	7.2	11	73	6.0	3.3	5.0	5.0	11	4.4
25	8.2	12	18	7.2	9.6	27	9.4	3.3	11	5.0	8.2	3.8
26	9.4	12	11	36	18	22	86	3.3	12	5.0	6.0	3.8
27	14	12	11	48	24	22	12	3.3	6.0	4.4	6.0	8.2
28	14	11	9.6	14	33	30	8.2	36	5.0	15	5.0	9.4
29	11	11	8.2	11	22	19	7.0	.....	9.4	250	5.0	6.0
30	19	11	8.2	27	48	15	7.0	.....	9.4	47	5.0	5.0
31	93	22	.....	22	.....	14	6.0	.....	7.0	.....	4.4	.....

NOTE.—Discharge determined from rating curves applicable as follows: July 1–31 and Dec. 23, 1916, to June 30, 1917, well defined below 20 million gallons per day; Aug. 1 to Dec. 23, 1916, well defined. Discharge Mar. 12–20 determined by comparison with records of flow of West Kopiliula Stream.

Monthly discharge of East Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	93	8.2	18.1	28.0	561	1,720
August	52	11	21.4	33.1	663	2,040
September	44	8.2	16.3	25.2	488	1,500
October	48	6.1	12.2	18.9	377	1,160
November	155	8.2	31.1	48.1	932	2,860
December	418	9.6	74.1	115	2,300	7,050
January	86	6.0	15.5	24.0	481	1,470
February	36	3.3	5.48	8.48	154	471
March	86	4.4	14.8	21.8	457	1,410
April	250	3.8	16.0	24.8	480	1,470
May	93	4.4	11.7	18.1	361	1,110
June	15	3.8	6.39	9.89	192	588
The year	418	3.3	20.4	31.6	7,450	22,800

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 June 30, 1917.

GAGE.—Stevens water-stage recorder.

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

CHANNEL AND CONTROL.—Channel at gage is a large deep pool at foot of low waterfall; banks are nearly vertical walls of rock to above high water. Control at outlet of pool composed of rock ledge and large boulders; probably permanent.

EXTREMES OF DISCHARGE.—Flood of January 18, 1916, carried away gage shelter and must have reached a stage of about 13 feet (discharge, possibly 4,000 million gallons per day, or 6,190 second-feet); minimum stage recorded, 0.8 foot March 7–12, 1914 (discharge, 1.6 million gallons per day, or 2.5 second-feet).

Maximum stage recorded during year, 7.9 feet at 3 a. m. March 9 (discharge, approximately 1,500 million gallons per day, or 2,320 second-feet); minimum stage recorded, 0.9 foot February 11–13, 17 and 18, 24–26 (discharge, 2.5 million gallons per day, or 3.7 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Determinations based on well-defined rating curves and continuous gage-height record. Records good for all stages.

Discharge measurements of West Wailuaiki Stream near Keanae, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
Aug. 15	H. A. R. Austin	1.81	32	21
Oct. 19	do	1.31	11	7.1
Dec. 10	do	6.30	1,040	673
Jan. 17	R. C. Rice	1.15	9.3	6.0

Daily discharge, in million gallons, of West Wailuaiki Stream near Keanae, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	21	55	21	16	23	36	12	4.2	8.5	5.8	18	4.2
2	15	44	29	11	68	46	11	3.5	5.0	5.0	11	21
3	16	46	14	7.5	62	72	15	3.5	21	5.0	9.8	9.8
4	12	20	12	6.5	36	34	65	3.5	34	8.5	6.5	11
5	15	15	20	5.8	228	18	31	3.0	15	11	5.8	18
6	9.8	18	18	5.0	84	14	44	3.0	7.5	6.5	5.0	15
7	9.8	15	62	5.0	25	11	36	3.0	5.0	7.5	4.2	8.5
8	9.8	12	29	5.8	18	11	18	3.0	21	5.8	4.2	9.8
9	9.8	12	25	5.8	12	52	14	3.0	84	5.0	4.2	7.5
10	9.8	15	21	5.0	11	392	11	3.0	36	8.5	3.5	6.5
11	18	25	16	5.0	9.8	62	9.8	2.5	16	34	3.5	12
12	11	36	12	9.8	8.5	25	8.5	2.5	9.8	6.5	6.5	6.5
13	20	46	9.8	5.8	6.5	21	7.5	2.5	7.5	7.5	4.2	5.0
14	21	44	8.5	5.0	6.5	41	6.5	11	5.8	7.5	14	5.0
15	25	21	7.5	5.8	27	38	5.8	3.5	11	7.5	12	4.2
16	41	14	6.5	5.8	123	55	5.8	3.0	6.5	6.5	15	3.5
17	58	14	5.8	9.8	80	123	5.8	2.5	6.5	7.5	58	3.5
18	23	15	6.5	7.5	18	112	5.0	2.5	36	7.5	97	5.0
19	18	27	41	7.5	11	97	4.2	3.0	27	5.8	18	3.5
20	12	34	16	5.8	8.5	68	4.2	4.2	14	8.5	11	3.5
21	8.5	27	11	5.0	7.5	344	4.2	8.5	7.5	6.5	12	3.0
22	7.5	23	18	5.0	6.5	545	4.2	3.5	5.8	5.8	12	6.5
23	6.5	23	25	6.5	5.8	728	3.5	3.0	6.5	5.8	14	3.5
24	5.8	20	27	5.0	8.5	58	3.5	2.5	5.8	5.0	12	3.0
25	5.8	12	20	5.0	7.5	36	7.5	2.5	11	4.2	9.8	3.0
26	7.5	11	11	49	18	25	92	2.5	12	4.2	6.5	3.0
27	12	9.8	9.8	44	27	23	14	3.5	5.8	4.2	6.5	8.5
28	14	9.8	8.5	14	38	34	8.5	52	5.8	25	6.5	8.5
29	11	9.8	7.5	14	34	20	5.8	.....	12	310	5.8	5.0
30	29	7.5	7.5	25	76	15	5.8	.....	12	62	5.0	3.5
31	129	21	.....	23	.....	12	4.2	.....	8.5	.....	4.2	.....

NOTE.—Discharge determined from well defined rating curves applicable as follows: July 1 to Dec. 23, 1916, and Dec. 24, 1916, to June 30, 1917. Discharge July 6–20, Aug. 1–14, Oct. 11–18, Nov. 29 to Dec. 10, Dec. 23 and 24, and Apr. 14–17 determined by comparison with records of flow of West Kopiliula Stream.

Monthly discharge of West Wailuaiki Stream near Keanae, Maui, for year ending June 30 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	129	5.8	19.7	30.5	612	1,870
August	55	7.5	22.6	35.0	702	2,150
September	62	5.8	17.5	27.1	526	1,610
October	49	5.0	10.9	16.9	337	1,040
November	228	5.8	36.5	56.5	1,090	3,360
December	728	11	102	158	3,170	9,700
January	92	3.5	15.3	23.7	473	1,460
February	52	2.5	5.28	8.17	148	454
March	84	5.0	15.2	23.5	470	1,450
April	310	4.2	20.0	30.9	600	1,840
May	97	3.5	13.1	20.3	406	1,250
June	21	3.0	7.02	10.9	210	646
The year	728	2.5	24.0	37.1	8,750	26,800

EAST WAILUANUI STREAM NEAR KEANAE, MAUI.

LOCATION.—1,000 feet above Koolau ditch crossing, 2½ miles east of Upper Keanae and 5 miles east of Keanae post office.

RECORDS AVAILABLE.—January 1, 1914, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

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

CHANNEL AND CONTROL.—Channel at gage a small deep pool at foot of rapids; right bank vertical wall of rock; left bank steep and high. Control at outlet is ledge of rock; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 5.1 feet at 5.45 a. m. December 23, 1916 (discharge, computed from extension of rating curve, approximately 430 million gallons per day or 665 second-feet); minimum stage recorded, 0.75 foot April 7, 1915 (discharge, 0.25 million gallons per day, or 0.4 second-foot).

Minimum stage recorded during year, 0.9 foot February 12–19 and May 6–11 (discharge, 0.7 million gallons per day, or 1.1 second feet).

DIVERSIONS.—None above station.

REGULATION.—None.

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

ACCURACY.—Determinations based on a well-defined rating curve and a continuous record of gage height. Records good for all stages.

Discharge measurements of East Wailuanui Stream near Keanae, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height.	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Sept. 14	1.15	3.0	1.95	Jan. 17	1.03	2.4	1.6
Dec. 10	1.95	56	36				

Daily discharge, in million gallons, of East Wailuanui Stream near Keanae, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	5.2	12	8.0	4.4	3.7	7.0	3.0	1.6	2.0	2.0	3.0	1.6
2	4.4	17	10	2.5	10	12	3.0	1.3	1.6	1.6	2.0	5.2
3	4.4	15	5.2	1.6	9.0	36	3.7	1.3	2.0	1.3	1.6	2.0
4	3.7	7.0	3.7	1.3	5.2	10	12	1.3	4.4	1.6	1.0	2.0
5	3.7	7.0	6.0	1.3	27	4.4	7.0	1.3	2.0	4.4	1.0	3.0
6	3.0	5.2	7.0	1.3	15	3.0	6.0	1.0	1.6	2.0	.7	4.4
7	2.5	4.4	12	1.3	6.0	3.7	7.0	1.0	1.6	1.6	.7	2.5
8	2.5	3.7	8.0	1.0	4.4	3.0	3.7	1.0	3.7	1.3	.7	3.7
9	2.0	3.7	6.0	1.3	3.0	19	3.0	1.0	15	1.3	.7	3.0
10	2.5	3.7	6.0	1.3	3.0	53	2.5	1.0	4.4	1.3	.7	2.0
11	6.0	7.0	4.4	1.3	2.5	12	2.5	1.0	3.0	6.0	.7	6.0
12	3.0	9.0	3.7	2.5	2.0	10	2.0	.7	3.0	2.0	1.6	2.5
13	9.0	14	2.5	1.3	1.6	9.0	2.0	.7	2.0	1.6	1.0	2.0
14	3.7	21	2.5	1.3	1.6	12	1.6	.7	1.6	2.5	2.0	1.6
15	5.2	7.0	2.5	1.3	3.7	9.0	1.6	.7	4.4	3.0	1.6	1.3
16	19	5.2	2.5	1.6	10	9.0	1.6	.7	2.5	2.5	2.5	1.3
17	12	5.2	2.0	3.7	14	17	1.3	.7	1.6	3.0	9.0	1.3
18	7.0	7.0	2.0	3.0	3.7	25	1.6	.7	2.5	3.0	23	1.6
19	5.2	8.0	9.0	2.0	3.0	23	1.6	.7	2.0	2.5	4.4	1.3
20	3.7	9.0	3.0	2.0	2.0	12	1.6	1.0	1.6	3.0	3.0	1.3
21	3.0	9.0	2.5	1.6	2.0	29	1.6	1.0	1.6	2.0	3.7	1.0
22	3.0	10	4.4	1.6	1.6	38	1.3	1.0	1.3	2.0	4.4	3.0
23	2.5	7.0	6.0	2.5	1.6	60	1.3	1.0	1.3	2.0	5.2	1.6
24	2.5	5.2	4.4	1.6	3.0	19	1.3	1.0	1.3	1.6	3.7	1.3
25	2.0	3.7	3.7	1.6	2.0	7.0	3.0	1.0	3.0	1.3	3.0	1.3
26	3.0	3.7	1.6	12	4.4	5.2	23	1.0	6.0	1.3	2.0	1.3
27	6.0	3.7	1.3	14	8.0	6.0	3.7	1.0	2.0	1.3	2.0	3.0
28	6.0	3.7	1.0	4.4	10	8.0	2.5	17	2.0	3.0	2.0	3.7
29	4.4	3.0	1.0	4.4	6.0	5.2	2.0	.....	3.0	56	1.6	2.0
30	7.0	3.0	1.0	8.0	12	4.4	1.6	.....	3.0	10	1.6	1.6
31	27	8.0	.....	5.2	.....	3.7	1.6	.....	2.5	.....	1.6	.....

NOTE.—Discharge determined from a well-defined rating curve.

Monthly discharge of East Wailuanui Stream near Keanae, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	27	2.0	5.62	8.70	174	535
August	21	3.0	7.45	11.5	231	709
September	12	1.0	4.43	6.85	133	408
October	14	1.0	3.04	4.70	94	289
November	27	1.6	6.03	9.33	181	555
December	60	3.0	15.3	23.7	475	1,460
January	23	1.3	3.59	5.55	111	342
February	17	.7	1.55	2.40	43	133
March	15	1.3	2.89	4.47	90	275
April	56	1.3	4.27	6.61	128	393
May	23	.7	2.96	4.58	92	282
June	6.0	1.0	2.31	3.57	69	213
The year	60	.7	4.99	7.72	1,820	5,590

WEST WAILUANUI STREAM NEAR KEANAE, MAUI.

LOCATION.—Fifty feet above Koolau ditch crossing and intake, 2 miles east of Upper Keanae and 4½ miles east of Keanae post office.

RECORDS AVAILABLE.—December 19, 1913, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

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

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above gage; waterfall 50 feet below gage; banks steep and high. Control low concrete dam 30 feet long.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 7.03 feet at 6.30 a. m., January 18, 1916 (discharge, computed from extension of rating curve, approximately 760 million gallons per day, or 1,180 second-feet); minimum discharge recorded, 0.7 million gallons per day, or 1.1 second-feet, February, 1914, July and August, 1915, October, 1916, April and May, 1917.

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Irrigation of sugar cane, rice, and taro.

ACCURACY.—Record July 1 to April 29 based on a well-defined rating curve and a continuous gage-height record; good for all stages; record April 30 to May 22, fair.

Discharge measurements of West Wailuanui Stream near Keanae, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 21	1.13	6.8	4.4	Feb. 14	1.36	24	15
Sept. 14	1.12	5.85	3.8	Mar. 21	1.06	3.8	2.4
Jan. 17	1.08	2.75	1.8	May 21	1.00	13.3	8.6

Daily discharge, in million gallons, of West Wailuanui Stream near Keanae, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.
1	9.3	12	12	7.0	4.8	15	4.8	3.2	4.8	3.2	12
2	7.0	25	15	4.8	25	21	4.8	3.2	3.2	3.2	4.8
3	7.0	15	7.0	3.2	21	39	15	3.2	4.8	3.2	3.2
4	4.8	7.0	3.2	3.2	12	12	18	3.2	9.3	7.0	1.8
5	4.8	7.0	3.2	1.8	120	7.0	9.3	3.2	4.8	3.2	1.8
6	3.2	4.8	1.8	1.8	45	4.8	15	3.2	3.2	3.2	1.8
7	3.2	4.8	1.8	1.8	12	4.8	9.3	3.2	3.2	3.2	1.8
8	3.2	4.8	1.8	1.8	7.0	4.8	7.0	3.2	7.0	3.2	1.8
9	3.2	4.8	1.8	1.8	4.8	21	4.8	3.2	25	3.2	1.8
10	3.2	4.8	1.8	1.8	4.8	140	4.8	3.2	9.3	4.8	1.8
11	4.8	9.3	1.8	1.8	3.2	18	4.8	3.2	7.0	7.0	.7
12	3.2	12	4.8	4.8	3.2	12	3.2	3.2	7.0	1.8	1.8
13	9.3	15	7.0	3.2	3.2	9.3	3.2	3.2	4.8	1.8	.7
14	4.8	21	3.2	1.8	3.2	25	3.2	7.0	3.2	3.2	3.2
15	4.8	9.3	3.2	1.8	12	12	1.8	3.2	9.3	3.2	3.2
16	18	7.0	3.2	1.8	45	39	3.2	3.2	4.8	3.2	3.2
17	18	9.3	3.2	4.8	45	69	3.2	1.8	3.2	3.2	21
18	9.3	9.3	3.2	3.2	9.3	45	3.2	1.8	4.8	1.8	57
19	7.0	12	12	3.2	4.8	34	3.2	1.8	4.8	1.8	9.3
20	4.8	12	4.8	1.8	3.2	69	3.2	3.2	3.2	3.2	4.8
21	4.8	12	3.2	1.8	3.2	186	3.2	3.2	1.8	1.8	4.8
22	3.2	15	7.0	.7	1.8	276	3.2	3.2	1.8	1.8	4.8
23	3.2	9.3	9.3	.7	3.2	140	3.2	3.2	1.8	1.8	.....
24	3.2	7.0	7.0	1.8	3.2	25	3.2	3.2	3.2	1.8	.....
25	1.8	3.2	7.0	1.8	7.0	15	4.8	3.2	7.0	.7	.....
26	1.8	3.2	4.8	12	12	9.3	45	3.2	3.2	.7	.....
27	4.8	3.2	3.2	12	15	18	7.0	3.2	1.8	.7	.....
28	3.2	3.2	3.2	3.2	9.3	9.3	7.0	29	3.2	4.8	.....
29	1.8	3.2	3.2	3.2	18	7.0	4.8	.....	3.2	120	.....
30	18	3.2	3.2	4.8	18	7.0	4.8	.....	3.2	51	.....
31	21	12	.....	4.8	.....	4.8	3.2	.....	3.2	.....	.....

NOTE.—Discharge determined from rating curves, applicable as follows: July 1 to Apr. 29, well defined; Apr. 30 to May 22, fairly well defined. Discharge Aug. 19 to Sept. 13, and Feb. 14 to Mar. 19 determined by comparison with records of flow of East Wailuanui Stream. Control washed out Apr. 29. No record May 23 to June 30.

Monthly discharge of West Wailuanui Stream near Keanae, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	21	1.8	6.44	9.96	200	613
August	25	3.2	9.05	14.0	281	861
September	15	1.8	4.90	7.58	147	451
October	12	.7	3.35	5.18	104	319
November	120	1.8	16.0	24.8	479	1,470
December	276	4.8	41.9	64.8	1,300	3,990
January	45	1.8	6.92	10.7	214	658
February	29	1.8	4.11	6.36	115	353
March	25	1.8	5.16	7.98	160	491
April	120	.7	8.42	13.0	253	775
May 1-22	57	.7	6.69	10.4	147	452
The period	.....	.....	.....	.....	3,400	10,400

HONOMANU STREAM NEAR KEANAE, MAUI.

LOCATION.—Five hundred feet above Spreckels ditch intake and trail bridge, about 6 miles south of Keanae post office.

RECORDS AVAILABLE.—November 15, 1913, to June 30, 1917.

GAGE.—Stevens water-stage recorder.

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 stage recorded during period of record, 9.9 feet at 9 p. m., May 1, 1916 (discharge, computed from extension of rating curve, approximately 1,200 million gallons per day, or 1,860 second-feet); minimum stage recorded, 2.20 feet April 7 and 8, 1915 (discharge, 0.25 million gallons per day, or 0.4 second-feet).

Maximum stage recorded during year, 8.85 feet at 5.30 a. m. December 23 (discharge, approximately 1,000 million gallons per day, or 1,550 second-feet); minimum stage recorded, 2.05 feet February 10–13 (discharge, 0.9 million gallons per day, or 1.4 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Natural flow is diverted by Spreckels ditch for irrigation of sugar cane.

ACCURACY.—Records below 10 million gallons per day based on a well-defined rating curve and a continuous gage-height record; good; records for higher stages fair.

Discharge measurements of Honomanu Stream near Keanae, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 20	2.65	10.4	6.7	Feb. 13	2.05	1.4	0.9
Sept. 13	2.60	9.35	6.0	Mar. 19	2.30	3.8	2.5
Oct. 20	2.38	4.38	2.8	May 20	2.50	6.3	4.1
Dec. 9	5.01	300	194				

Daily discharge, in million gallons, of Honomanu Stream near Keanae, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	11	35	11	8.7	8.7	13	3.3	1.4	4.3	6.4	25	2.5
2	8.7	38	21	9.7	30	30	2.9	1.1	2.5	5.7	9.7	30
3	11	41	8.7	7.1	35	41	3.8	1.1	15	2.5	9.7	7.9
4	7.9	13	7.1	5.7	14	21	44	1.1	25	7.1	5.0	8.7
5	9.7	9.7	12	5.7	134	7.9	18	1.1	8.7	9.7	3.3	18
6	7.9	8.7	11	5.0	73	6.4	25	1.1	3.8	4.3	3.8	9.7
7	7.1	7.1	41	5.0	13	5.7	18	1.1	2.9	4.3	3.3	8.7
8	6.4	6.4	13	5.0	8.7	5.7	7.1	1.1	2.9	3.3	2.5	11
9	5.7	6.4	11	4.3	5.7	23	5.0	1.1	5.0	2.9	2.5	7.1
10	7.1	6.4	8.7	4.3	5.0	262	4.3	.9	2.9	2.9	2.1	5.0
11	18	9.7	7.9	3.8	5.7	35	5.7	.9	2.5	8.7	2.5	8.7
12	9.7	21	7.1	5.0	4.3	11	6.4	.9	2.1	3.8	5.7	4.3
13	13	21	6.4	6.4	3.8	13	3.8	.9	3.3	2.9	4.3	3.8
14	14	25	5.7	5.0	3.3	21	3.3	8.7	2.9	4.3	12	2.5
15	15	13	9.7	5.7	5.7	15	2.9	2.5	5.0	4.3	6.4	2.5
16	23	7.9	5.0	5.7	95	20	2.5	1.7	2.9	3.8	11	2.5
17	30	7.9	3.8	9.7	107	68	2.5	1.4	2.1	5.7	35	1.7
18	11	7.9	4.3	7.1	13	35	2.5	1.1	2.5	3.8	38	3.3
19	7.9	15	32	5.7	5.7	44	2.5	2.9	2.5	2.9	6.4	2.5
20	7.1	16	7.9	3.3	4.3	28	2.1	5.7	2.1	5.0	4.3	1.7
21	6.4	13	5.7	2.9	3.8	195	2.1	7.9	2.1	3.8	6.4	1.7
22	5.0	8.7	8.7	2.5	3.3	345	2.1	2.1	1.7	4.3	7.1	7.1
23	5.0	11	12	3.8	2.9	395	1.7	1.7	1.7	3.3	12	2.9
24	4.3	8.7	13	4.3	5.7	55	1.7	1.4	2.1	2.9	11	2.1
25	4.3	6.4	9.7	3.3	5.7	14	2.5	1.4	2.1	2.5	7.9	1.7
26	4.3	6.4	7.1	23	13	7.9	21	1.4	5.0	2.5	3.8	1.7
27	7.9	6.4	7.9	16	15	9.7	3.8	2.1	2.5	2.1	3.3	8.7
28	7.9	6.4	6.4	5.7	25	16	2.1	35	2.5	9.7	5.0	7.1
29	7.1	7.1	5.0	4.3	18	7.9	2.1	.....	7.9	271	3.3	3.8
30	16	5.7	5.0	20	23	5.0	1.7	.....	5.7	89	2.9	2.5
31	95	13	.....	13	.....	3.8	1.7	.....	3.8	.....	2.5	.....

NOTE.—Discharge determined from a rating curve well defined below 10 million gallons per day; fairly well defined for higher stages.

Monthly discharge of Honomanu Stream near Keanae, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	95	4.3	12.7	19.6	394	1,210
August	41	5.7	13.2	20.4	409	1,260
September	41	3.8	10.5	16.2	315	967
October	23	2.5	6.99	10.8	217	665
November	134	2.9	23.0	35.6	690	2,120
December	395	3.8	56.8	87.9	1,760	5,400
January	44	1.7	6.71	10.4	208	638
February	35	.9	3.24	5.01	91	278
March	25	1.7	4.45	6.88	138	423
April	271	2.1	16.2	25.1	485	1,490
May	38	2.1	8.31	12.9	258	791
June	30	1.7	6.05	9.36	181	557
The year	395	.9	14.1	21.8	5,150	15,800

HAIPUAENA STREAM NEAR HUELO, MAUI.

LOCATION.—200 feet above inflow of Spreckels ditch, about 7 miles by trail east of Huelo.

RECORDS AVAILABLE.—October 19, 1913, to June 30, 1917; 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 water-stage recorder installed June 16, 1914, to replace original Friez recorder.

DISCHARGE MEASUREMENTS.—Made by wading of 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 stage recorded during period of record, 5.1 feet at 4.30 a. m. March 1, 1916 (discharge, computed from extension of rating curve, 350 million gallons per day, or 542 second-feet); minimum stage recorded, 0.2 foot March 8, 1914 (discharge 1.0 million gallons per day, or 1.5 second-feet).

Maximum stage recorded during year, 4.85 feet at 6 a. m. December 23 (discharge, approximately 320 million gallons per day, or 495 second-feet); minimum stage recorded, 0.35 foot February 13 (discharge, 1.6 million gallons per day, or 2.5 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Ordinary flow diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Rating curve well defined. Records good for all stages.

Discharge measurements of Haipuaena Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.
Aug. 14	1.76	58	37
Sept. 13	.76	7.55	4.9

Daily discharge, in million gallons, of Haipuaena Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	11	30	12	9.5	9.5	15	5.2	2.5	5.9	5.2	15	3.4
2	7.6	30	26	9.5	24	28	5.2	2.5	4.0	5.2	6.8	18
3	8.6	35	8.6	5.2	28	40	5.9	2.5	8.6	3.4	5.2	5.9
4	6.8	13	7.6	4.5	13	20	28	2.5	18	5.9	4.5	5.9
5	7.6	9.5	12	4.5	66	9.5	13	2.2	7.6	9.5	3.4	8.6
6	5.9	7.6	9.5	4.0	43	7.6	16	2.2	5.2	4.5	3.0	8.6
7	5.2	6.8	18	4.0	13	6.8	15	2.2	4.5	4.5	3.0	5.9
8	4.5	5.9	16	4.0	11	6.8	7.6	1.8	5.2	4.0	2.5	9.5
9	4.5	5.2	11	4.0	7.6	24	5.9	1.8	7.6	4.0	2.5	7.6
10	5.2	5.2	11	3.4	6.8	93	5.2	1.8	5.2	3.4	2.5	5.9
11	15	11	7.6	3.4	6.8	22	5.2	1.8	4.5	9.5	3.0	11
12	7.6	18	6.8	4.0	5.9	11	5.9	1.8	4.0	4.5	4.5	5.9
13	11	22	5.9	4.0	5.2	12	4.0	1.6	4.0	4.0	4.0	4.5
14	12	28	5.2	3.0	4.5	18	4.0	5.9	4.0	4.5	5.9	4.5
15	12	13	7.6	3.4	7.6	15	3.4	2.5	6.8	5.2	5.2	4.0
16	20	8.6	5.9	3.4	49	18	3.4	2.2	5.2	4.5	5.2	3.4
17	32	8.6	4.5	8.6	52	40	3.0	2.2	4.0	5.9	22	3.4
18	13	9.5	5.2	6.8	11	30	3.0	1.8	3.4	4.5	28	4.5
19	11	16	30	5.2	6.8	35	3.0	3.0	3.0	4.0	6.8	3.4
20	6.8	18	9.5	4.0	5.2	24	3.0	4.5	3.0	5.2	5.9	3.0
21	5.9	15	6.8	3.4	4.5	81	2.5	5.9	2.5	4.5	6.8	3.0
22	5.2	11	11	3.4	4.5	118	2.5	3.0	2.5	5.2	6.8	6.8
23	5.2	9.5	13	5.2	4.0	132	2.5	2.2	2.5	4.0	12	4.0
24	4.5	8.6	15	4.5	6.8	35	2.5	2.2	3.0	3.0	8.6	3.4
25	4.0	5.9	12	3.4	5.9	13	4.0	2.2	3.4	3.0	6.8	3.0
26	4.5	5.9	6.8	24	12	9.5	18	2.2	5.2	3.0	4.5	3.0
27	9.5	5.9	6.8	18	15	11	4.5	2.2	3.4	2.5	4.5	8.6
28	8.6	5.9	5.9	7.6	24	15	3.4	32	3.4	5.9	4.5	7.6
29	6.8	5.9	5.2	7.6	18	8.6	3.4	.....	6.8	101	4.0	5.2
30	13	5.2	4.5	22	22	6.8	3.0	.....	5.9	38	3.4	4.0
31	56	12	.....	13	.....	5.9	3.0	.....	5.2	.....	3.4	.....

NOTE.—Discharge determined from a well-defined rating curve.

Monthly discharge of Haipuaena Stream near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	56	4.0	10.7	16.6	330	1,020
August	35	5.2	12.6	19.5	392	1,200
September	30	4.5	10.2	15.8	307	939
October	24	3.0	6.79	10.5	210	646
November	66	4.0	16.4	25.4	493	1,510
December	132	5.9	29.4	45.5	912	2,800
January	28	2.5	6.26	9.69	194	596
February	32	1.6	3.61	5.58	101	310
March	18	2.5	5.08	7.86	158	483
April	101	2.5	9.05	14.0	272	833
May	28	2.5	6.59	10.2	204	627
June	18	3.0	5.85	9.05	176	539
The year	132	1.6	10.3	15.9	3,750	11,500

PUOHAKAMOA STREAM NEAR HUELO, MAUI.

LOCATION.—150 feet above Spreckels ditch inflow and trail crossing, about 7 miles east of Huelo.

RECORDS AVAILABLE.—June 13, 1913, to June 30, 1917 (new station); December 18, 1910, to June 18, 1913 (old station).

GAGE.—Barrett & 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 below gage. Inflow of Spreckels ditch must be deducted from measurements made at footbridge.

CHANNEL AND CONTROL.—One channel at all stages; curves 100 feet above and below gage; banks steep and high; stream bed very rough and steep. Control composed of large boulders; seldom shifts.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 7.55 feet at 10 a. m. May 1, 1916 (discharge, computed from extension of rating curve, approximately 800 million gallons per day, or 1,240 second-feet); minimum stage recorded, 0.9 foot February 23–26, 1917 (discharge, 1.8 million gallons per day, or 2.8 second-feet).

Maximum stage recorded during year, 7.2 feet at 11 a. m. December 23 (discharge, approximately 750 million gallons per day, or 1,160 second-feet).

DIVERSIONS.—Kula pipe line diverts small amount of water above station at elevation 4,300 feet.

REGULATION.—None.

UTILIZATION.—Ordinary flow of stream is diverted by East Maui Irrigation Co.'s ditches for irrigation of sugar cane.

ACCURACY.—Determinations based on a fairly well defined rating curve and continuous gage-height record. Records fair for all stages.

Discharge measurements of Puohakamoa Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
July 20	2.08	22	14	Mar. 22	1.01	4.1	2.7
Oct. 18	1.87	19.9	13	Apr. 17	1.94	22.3	14
Dec. 11	2.74	53	34	May 20	1.80	16.6	11
Feb. 13	.92	3.0	1.9				

Daily discharge, in million gallons, of Puohakamoa Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	26	71	24	19	20	24	14	4.0	8.5	7.2	.....	4.5
2	20	77	44	19	44	59	14	4.0	4.5	7.2	.....	26
3	20	84	17	11	53	98	17	4.0	13	4.0	.....	13
4	18	30	14	9.1	33	40	77	4.0	20	9.7	.....	12
5	20	22	23	7.8	180*	19	36	3.6	11	16	.....	18
6	15	18	22	7.2	65	15	48	3.6	6.0	7.8	.....	16
7	14	16	77	6.6	26	14	40	3.1	4.0	6.6	.....	12
8	13	14	30	6.6	20	14	22	3.1	6.6	5.0	.....	19
9	11	14	23	6.6	16	40	15	3.1	9.1	4.5	.....	14
10	14	14	23	6.0	14	244	14	2.8	5.0	5.0	.....	11
11	33	26	17	6.0	14	48	14	2.8	4.0	18	.....	20
12	18	44	14	6.0	11	24	16	2.4	4.0	7.2	.....	11
13	30	59	5.0	5.5	9.7	28	11	1.8	4.0	5.0	.....	9.1
14	20	71	10	5.5	8.5	33	9.1	8.5	3.6	6.6	.....	7.2
15	26	30	14	5.0	19	36	7.8	3.6	10	8.5	.....	6.6
16	65	18	13	5.0	142	30	7.8	2.4	5.5	7.2	.....	5.5
17	65	18	9.1	5.0	84	84	7.2	2.1	4.0	11	.....	5.0
18	28	20	11	9.7	18	77	6.6	1.8	4.5	7.8	.....	9.1
19	22	36	65	9.1	14	77	6.0	4.5	4.0	5.5	15	6.0
20	16	36	18	6.0	13	53	6.0	6.0	3.1	9.7	12	5.0
21	14	30	14	5.0	10	165	5.5	8.5	2.8	7.2	16	4.0
22	12	22	18	5.0	9.1	244	5.0	2.8	2.4	7.2	15	14
23	10	18	26	8.5	8.5	329	5.0	1.8	3.1	6.0	20	8.5
24	9.7	18	26	7.8	16	105	5.0	1.8	3.1	4.5	18	5.0
25	9.1	14	20	5.0	12	33	8.5	1.8	4.5	3.6	14	4.5
26	9.7	14	13	20	23	23	28	1.8	8.5	3.6	9.7	4.0
27	18	13	16	48	36	19	11	2.1	3.6	2.8	8.5	16
28	18	13	11	15	44	30	7.2	44	4.0	7.8	9.7	14
29	15	13	9.1	9.7	33	20	6.0	.....	11	65	7.2	10
30	22	9.7	8.5	53	44	16	5.5	.....	11	30	6.0	6.0
31	135	16	.....	22	.....	14	5.0	.....	9.7	.....	5.0	.....

NOTE.—Discharge determined from fairly well defined rating curve. No record May 1–18.

Monthly discharge of Puohakamoa Stream near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	135	9.1	24.7	38.2	766	2,350
August	84	9.7	29.0	44.9	899	2,760
September	77	5.0	21.2	32.8	635	1,950
October	53	5.0	11.6	17.9	361	1,100
November	180	8.5	34.7	53.7	1,040	3,190
December	329	14	66.3	103	2,060	6,310
January	77	5.0	15.5	24.0	480	1,470
February	44	1.8	4.85	7.50	136	417
March	20	2.4	6.39	9.89	198	608
April	65	2.8	9.91	15.3	297	912
May 19–31	20	5.0	12.0	18.6	156	479
June	26	4.0	10.5	16.2	316	967

ALO STREAM NEAR HUELO, MAUI.

LOCATION.—300 feet above Spreckels ditch inflow and trail crossing, about 5 miles east of Huelo.

RECORDS AVAILABLE.—December 18, 1910, to June 30, 1917.

GAGE.—Friez water-stage recorder installed June 18, 1914. Prior to June 18, 1914, vertical staff at trail bridge 300 feet downstream from present site.

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

CHANNEL AND CONTROL.—Channel at gage is a fairly large pool at foot of rapids; bank steep and high. Control at outlet of pool composed of rock ledge and large boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.35 feet at 7 p. m. December 9, 1916 (discharge, computed from extension of rating curve, approximately 550 million gallons per day, or 850 second-feet); minimum stage recorded, 1.34 feet (old datum) November 4, 1911 (discharge, 0.06 million gallons per day, or 0.1 second-foot).

Minimum stage recorded during year, 0.45 foot February 7–13, 15–18, and 22–26 (discharge, 0.8 million gallons per day, or 1.2 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Ordinary flow upstream diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Determinations based on well-defined rating curve and continuous gage-height record. Records good for all stages except extreme floods.

Discharge measurements of Alo Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.
Dec. 11	0.93	8.3	5.4
Mar. 22	.54	1.57	1.0

Daily discharge, in million gallons, of Alo Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	5.4	11	6.2	7.0	4.7	6.2	3.3	1.3	1.6	2.1	5.4	1.3
2	4.0	14	7.0	4.7	7.0	12	2.6	1.0	1.3	1.6	3.3	4.0
3	3.3	14	2.6	2.6	8.2	47	4.0	1.0	2.1	1.6	2.6	1.6
4	2.6	6.2	2.1	2.1	6.2	9.3	9.3	1.0	3.3	2.1	2.1	1.6
5	4.0	5.4	2.1	2.1	34	5.4	7.0	1.0	2.1	2.6	2.1	1.6
6	2.6	4.0	4.0	1.6	16	4.0	6.2	1.0	1.3	1.6	2.1	3.3
7	2.1	4.0	9.3	1.6	7.0	3.3	5.4	.8	1.3	1.6	1.6	1.6
8	2.1	2.6	6.2	1.6	5.4	2.6	3.3	.8	3.3	1.6	1.6	6.2
9	1.6	2.6	4.0	1.6	4.0	16	2.6	.8	4.7	1.3	1.3	5.4
10	2.1	2.6	5.4	1.3	3.3	34	2.6	.8	1.6	1.3	1.3	2.6
11	6.2	6.2	3.3	1.3	3.3	7.0	2.1	.8	1.6	6.2	1.6	6.2
12	2.6	8.2	3.3	1.6	2.6	4.7	2.1	.8	2.6	2.1	2.1	2.6
13	6.2	16	2.6	1.3	2.1	6.2	1.6	.8	1.6	1.6	1.6	2.1
14	3.3	30	2.1	1.3	2.1	8.2	1.6	1.3	1.6	2.6	2.1	1.6
15	5.4	8.2	2.6	1.0	4.7	4.7	1.6	.8	5.4	3.3	1.3	1.6
16	12	4.7	2.1	1.6	9.3	8.2	1.3	.8	2.1	2.6	2.1	1.3
17	12	5.4	1.6	6.2	12	14	1.0	.8	1.6	4.0	6.2	1.3
18	6.2	5.4	2.1	3.3	4.7	18	1.3	.8	2.1	2.6	16	2.1
19	5.4	7.0	11	2.1	3.3	16	1.3	1.6	1.6	2.1	4.0	1.3
20	4.0	8.2	3.3	2.1	2.6	9.3	1.0	1.6	1.3	2.6	2.6	1.3
21	3.3	7.0	2.6	1.6	2.1	18	1.0	1.3	1.3	2.1	4.7	1.0
22	2.6	5.4	6.2	2.1	2.1	38	1.0	.8	1.3	2.1	3.3	2.6
23	2.1	4.0	7.0	4.7	1.6	42	1.0	.8	1.3	2.1	7.0	1.3
24	2.1	3.3	7.0	2.1	4.7	9.3	1.0	.8	1.3	1.6	4.7	1.0
25	1.6	2.6	5.4	2.1	2.1	4.7	4.0	.8	4.0	1.6	3.3	1.0
26	2.1	3.3	3.3	12	4.7	3.3	9.3	.8	2.6	1.6	2.6	1.0
27	5.4	2.6	3.3	11	8.2	4.7	2.1	1.6	1.6	1.6	2.1	2.6
28	4.7	2.6	2.6	4.0	12	4.7	1.6	9.3	1.6	5.4	2.1	2.6
29	3.3	2.1	2.1	5.4	8.2	3.3	1.3	.....	2.6	74	1.6	2.6
30	4.7	1.6	2.1	11	11	2.6	1.3	.....	2.6	11	1.6	1.3
31	16	6.2	.....	5.4	.....	3.3	1.3	.....	4.7	.....	1.3	.....

NOTE.—Discharge determined from rating curve well defined below 50 million gallons per day.

Monthly discharge of Alo Stream near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	16	1.6	4.55	7.04	141	433
August	30	1.6	6.66	10.3	206	634
September	11	1.6	4.15	6.42	124	382
October	12	1.0	3.53	5.46	109	336
November	34	1.6	6.64	10.3	199	611
December	47	2.6	11.9	18.4	370	1,130
January	9.3	1.0	2.78	4.30	86	264
February	9.3	.8	1.28	1.98	36	110
March	5.4	1.3	2.23	3.45	69	212
April	74	1.3	5.01	7.75	150	461
May	16	1.3	3.14	4.86	97	299
June	6.2	1.0	2.25	3.48	68	207
The year	74	.8	4.54	7.02	1,660	5,080

WAIKAMOI STREAM NEAR HUELO, MAUI.

LOCATION.—500 feet above Spreckels ditch intake and 5 miles by trail east of Huelo post office.

RECORDS AVAILABLE.—December 18, 1910, to June 30, 1917.

GAGE.—Friez water-stage recorder installed October 14, 1913, at new datum, to replace original staff.

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

CHANNEL AND CONTROL.—One channel at all stages; straight for 100 feet above and below gage; banks high and covered with vegetation. Water drops over a fall at control, which is rock ledge and boulders and fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 7.57 feet at 5 a. m. January 18, 1916 (discharge, computed from extension of rating curve, approximately 1,800 million gallons per day, or 2,780 second-feet); minimum stage recorded, 1.08 feet September 28, 1912 (discharge, 0.3 million gallons per day, or 0.5 second-foot).

Maximum stage recorded during year, 4.95 feet at 4 a. m. December 23 (discharge, approximately 830 million gallons per day, or 1,280 second-feet); minimum stage recorded, 0.05 foot February 11–13 and 26 (discharge, 0.8 million gallons per day, or 1.2 second-feet).

DIVERSIONS.—A small amount of water is diverted by Kula pipe line above station at elevation 4,300 feet.

REGULATION.—None.

UTILIZATION.—Low water is all diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Records based on a fairly well defined rating curve and continuous gage-height record; fair below 100 million gallons per day.

Discharge measurements of Waikamoi Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Aug. 14	1.72	114	73	Mar. 19	.42	4.21	2.7
Sept. 13	.68	15	9.7	Mar. 22	.29	3.05	2.0
Oct. 20	.39	5.77	3.7	May 20	.76	16.6	11

Daily discharge, in million gallons, of Waikamoi Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	20	58	25	14	16	28	7.4	1.6	7.4	6.4	45	5.4
2	16	62	38	16	42	58	6.4	1.4	3.0	7.4	20	28
3	16	62	16	7.4	45	49	7.4	1.4	12	4.0	18	10
4	13	25	12	5.4	22	25	45	1.6	28	6.4	13	10
5	14	18	20	4.7	126	12	34	1.4	13	12	8.7	16
6	10	14	22	4.0	72	8.7	42	1.4	6.4	5.4	8.7	14
7	6.4	12	62	3.5	20	7.4	28	1.2	4.0	4.7	7.4	10
8	5.4	8.7	28	3.5	16	7.4	13	1.2	4.7	4.0	6.4	16
9	4.7	8.7	22	3.5	12	25	8.7	1.0	6.4	3.5	5.4	13
10	6.4	10	20	3.0	10	148	7.4	1.0	4.0	3.0	5.4	8.7
11	28	22	16	2.6	10	34	10	.8	2.6	13	5.4	13
12	14	45	12	4.0	6.4	18	16	.8	3.5	4.7	7.4	8.7
13	22	42	10	2.6	4.7	28	7.4	.8	4.7	3.5	8.7	6.4
14	20	53	7.4	2.2	4.7	38	5.4	12	4.7	4.0	14	5.4
15	28	22	10	3.0	4.7	18	4.0	4.7	7.4	4.7	13	4.7
16	38	13	12	3.5	88	38	3.5	1.9	5.4	4.0	12	4.7
17	53	18	6.4	14	53	72	3.0	1.4	2.6	6.4	42	4.7
18	22	20	6.4	10	16	49	2.6	1.2	2.6	5.4	45	4.7
19	16	31	53	7.4	10	53	2.2	3.5	2.6	3.5	13	4.7
20	10	34	18	4.0	8.7	45	1.9	5.4	2.6	5.4	12	4.7
21	7.4	25	12	2.6	6.4	180	1.9	7.4	1.9	4.0	12	4.0
22	6.4	18	16	2.6	5.4	240	1.6	3.0	1.9	5.4	10	6.4
23	5.4	16	25	4.7	4.0	347	1.6	1.4	2.2	4.7	16	5.4
24	4.7	16	25	4.7	7.4	67	1.6	1.0	2.2	3.5	16	4.7
25	4.0	12	22	3.0	10	25	3.5	1.0	2.6	3.0	12	4.0
26	5.4	12	13	7.4	18	16	25	.8	4.0	3.0	8.7	3.5
27	14	10	10	25	22	14	6.4	1.2	3.0	2.6	7.4	12
28	14	10	8.7	14	58	28	3.5	42	3.0	6.4	10	10
29	10	10	6.4	13	38	16	2.6	.....	6.4	172	7.4	7.4
30	28	6.4	5.4	34	53	10	2.2	.....	6.4	77	6.4	4.7
31	93	20	.....	22	.....	8.7	1.9	.....	4.7	.....	5.4	.....

NOTE.—Discharge determined from a rating curve fairly well defined below 100 million gallons per day. Discharge Nov. 28 to Dec. 2 and Dec. 12–16 determined by comparison with records of flow of Alo Stream.

Monthly discharge of Waikamoi Stream near Huelo, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	93	4.0	17.9	27.7	555	1,700
August	62	6.4	23.7	36.7	734	2,250
September	62	5.4	18.7	28.9	560	1,720
October	34	2.2	8.11	12.5	251	772
November	126	4.0	27.0	41.8	809	2,490
December	347	7.4	55.3	85.6	1,710	5,260
January	45	1.6	9.91	15.3	307	943
February	42	.8	3.70	5.72	104	318
March	28	1.9	5.35	8.28	166	509
April	172	2.6	13.1	20.3	393	1,210
May	45	5.4	13.6	21.0	422	1,290
June	28	3.5	8.50	13.2	255	783
The year	347	.8	17.2	26.6	6,270	19,200

NAILIILIHAELE STREAM NEAR HUELO, MAUI.

LOCATION.—300 feet above New Hamakua ditch, about 3 miles south of Huelo.

RECORDS AVAILABLE.—October 8, 1913, to June 30, 1917. Also at old staff-gage station below New Hamakua ditch from December 9, 1910, to December 31, 1912.

GAGE.—Barrett & Lawrence water-stage recorder installed October 8, 1913.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge 150 feet below 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 composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 6.3 feet at 6.30 p. m. May 1, 1916 (discharge, computed from extension of rating curve, approximately 1,800 million gallons per day, or 2,780 second-feet); minimum stage recorded, 0.73 foot October 29 to November 1, 1913 (discharge, 2.3 million gallons per day, or 3.6 second-feet).

Maximum stage recorded during year, 3.95 feet at 8 p. m. December 9 (discharge, approximately 450 million gallons per day, or 696 second-feet); minimum stage recorded, 0.3 foot February 21 (discharge, 3.0 million gallons per day, or 4.6 second-feet).

DIVERSION.—None above station.

REGULATION.—None.

UTILIZATION.—Ordinary flow diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Determinations based on well-defined rating curve and a continuous gage-height record. Records fair for all stages.

Discharge measurements of Nailiilihaele Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons. per day.
July 19	1.01	45	29	Dec. 11	1.12	50	32
Aug. 14	2.15	223	144	Jan. 19	.52	10.1	6.5
Sept. 12	.86	28	18	Feb. 15	.37	6.3	4.1
Oct. 17	1.12	54.5	35	Mar. 22	.48	9.3	6.0

Daily discharge, in million gallons, of Nailiilihaele Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	32	72	45	20	32	38	12	5.6	7.8	12	45	9.0
2	26	35	78	35	58	62	12	5.6	5.6	10	29	49
3	26	84	38	20	78	137	16	5.6	10	10	20	18
4	20	109	35	16	45	49	53	5.6	16	16	20	16
5	20	62	38	16	183	29	35	5.6	9.0	29	16	14
6	18	45	38	16	109	23	32	5.6	6.6	16	20	26
7	16	38	62	12	53	20	38	5.6	4.6	10	14	16
8	14	42	62	12	45	16	20	4.6	12	9.0	12	32
9	12	62	38	12	38	72	16	3.8	26	9.0	12	29
10	12	58	45	10	35	167	16	4.6	9.0	9.0	9.0	20
11	32	32	23	7.8	32	45	14	4.6	6.6	32	9.0	38
12	18	84	18	6.6	32	29	14	4.6	5.6	16	9.0	20
13	32	53	18	6.6	26	35	10	4.6	5.6	12	9.0	12
14	26	78	16	6.6	26	38	7.8	4.6	5.6	10	9.0	10
15	26	42	23	6.6	42	32	6.6	4.6	16	16	9.0	9.0
16	38	29	16	6.6	84	32	6.6	4.6	9.0	14	9.0	9.0
17	84	23	14	20	84	72	6.6	4.6	6.6	14	32	7.8
18	42	29	12	16	26	72	6.6	4.6	6.6	16	84	7.8
19	26	45	45	12	18	78	6.6	3.8	5.6	12	23	7.8
20	23	29	20	10	16	49	5.6	3.8	4.6	16	18	7.8
21	20	29	20	9.0	14	123	5.6	3.0	4.6	16	20	7.8
22	20	29	14	9.0	14	160	5.6	3.8	5.6	16	23	20
23	14	20	32	12	10	231	5.6	3.8	6.6	16	32	16
24	10	18	29	10	14	116	5.6	3.8	6.6	14	26	10
25	12	26	26	7.8	16	42	14	4.6	6.6	7.8	20	9.0
26	12	26	20	38	29	32	38	3.8	4.6	7.8	20	7.8
27	14	18	16	53	38	26	9.0	3.8	4.6	7.8	16	20
28	20	18	14	18	67	45	6.6	49	4.6	84	16	26
29	16	18	14	14	32	26	6.6	.....	4.6	175	14	23
30	18	14	12	72	53	23	5.6	.....	7.8	96	12	12
31	144	14	.....	26	.....	18	5.6	.....	16	.....	12	.....

NOTE.—Discharge determined from well-defined rating curve. Discharge July 23–31, Aug. 12–19, 22–24 27–31, and Apr. 25–30 determined by comparison with record of flow of Kailua Stream.

Monthly discharge of Nailiilihaele Stream near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	144	10	27.2	42.1	843	2,590
August	109	14	41.3	63.9	1,280	3,930
September	78	12	29.4	45.5	881	2,710
October	72	6.6	17.3	26.8	537	1,650
November	183	10	45.0	69.6	1,350	4,140
December	231	16	62.5	96.7	1,940	5,950
January	53	5.6	14.3	22.1	442	1,360
February	49	3.0	6.15	9.52	172	528
March	26	4.6	8.08	12.5	251	769
April	175	7.8	24.3	37.6	728	2,240
May	84	9.0	20.0	30.9	619	1,900
June	49	7.8	17.0	26.3	510	1,560
The year	231	3.0	26.2	40.5	9,550	29,300

KAILUA STREAM NEAR HUELO, MAUI.

LOCATION.—About 800 feet above New Hamakua ditch crossing, 1 mile south of Huelo.

RECORDS AVAILABLE.—June 17, 1913, to June 30, 1917.

GAGE.—Barrett & Lawrence water-stage recorder installed October 1, 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; will seldom shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9.5 feet May 1, 1916 (discharge, computed from extension of the rating curve, approximately 1,000 million gallons per day, or 1,550 second-feet); minimum stage recorded, 1 foot March 5 and 6, 1914 (discharge, 0.6 million gallons per day, or 0.9 second-feet.

Maximum stage recorded during year, 6.1 feet at 5.30 a. m. April 20 (discharge, approximately 450 million gallons per day, or 696 second-feet); minimum stage recorded, 1.2 feet December and February (discharge, 1.1 million gallons per day, or 1.7 second-feet).

DIVERSIONS.—A small amount of water is diverted by Old Hamakua ditch above station.

REGULATION.—None.

UTILIZATION.—Ordinary flow of stream is diverted by ditches of East Maui Irrigation Co for irrigation of sugar cane.

ACCURACY.—Rating curve is well defined below 20 million gallons per day, but determinations are only fair for all stages because of lack of sensitiveness of water-stage recorder.

Discharge measurements of Kailua Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons. per day.
Sept. 12	1.67	13.8	8.9	Mar 23	1.32	3.54	2.3
Dec. 12	1.91	26.7	17				

Daily discharge, in million gallons, of Kailua Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	20	55	18	12	13	16	5.3	2.9	6.4	8.7	42	3.6
2	14	55	34	22	37	48	5.3	2.2	5.3	13	24	37
3	14	66	13	12	52	66	7.4	2.2	5.3	6.4	20	10
4	12	24	8.7	8.7	26	37	42	2.2	8.7	16	12	7.4
5	12	16	14	8.7	150	18	26	2.2	4.4	16	7.4	7.4
6	10	13	14	8.7	90	13	26	2.2	2.9	10	7.4	10
7	8.7	24	62	6.4	26	13	34	2.2	1.6	8.7	5.3	6.4
8	7.4	26	26	6.4	20	10	13	2.2	6.4	7.4	4.4	7.4
9	6.4	42	14	6.4	14	34	10	2.2	14	7.4	3.6	7.4
10	6.4	37	16	5.3	13	216	7.4	2.2	4.4	6.4	3.6	5.3
11	20	20	13	3.6	10	162	7.4	1.6	2.9	18	3.6	12
12	10	62	8.7	2.9	10	20	12	1.6	2.2	10	3.6	5.3
13	20	37	7.4	2.9	7.4	16	7.4	1.1	2.2	7.4	3.6	4.4
14	14	55	7.4	2.9	7.4	20	7.4	3.6	2.2	7.4	3.6	4.4
15	14	26	8.7	2.9	30	20	5.3	3.6	8.7	6.4	5.3	3.6
16	24	16	8.7	2.9	150	20	5.3	2.2	4.4	6.4	4.4	3.6
17	62	13	5.3	12	66	52	5.3	2.2	2.9	6.4	24	3.6
18	16	16	5.3	12	20	52	4.4	1.6	2.9	5.3	45	4.4
19	13	30	48	12	12	55	3.6	1.1	2.2	4.4	8.7	3.6
20	12	32	13	12	7.4	32	3.6	1.1	1.6	7.4	8.7	2.9
21	10	22	8.7	12	6.4	94	3.6	1.1	1.6	5.3	8.7	2.2
22	8.7	18	8.7	12	5.3	130	3.6	1.1	2.2	5.3	8.7	10
23	7.4	12	16	12	5.3	223	3.6	1.1	2.2	5.3	10	6.4
24	5.3	10	13	12	12	86	3.6	1.1	2.2	5.3	10	3.6
25	6.4	10	14	13	13	5.3	10	1.1	2.2	3.6	7.4	3.6
26	6.4	10	10	14	26	1.6	24	1.1	3.6	3.6	6.4	2.9
27	7.4	10	7.4	14	37	1.1	6.4	1.1	2.9	3.6	5.3	7.4
28	12	10	7.4	13	48	2.2	4.4	32	2.2	62	6.4	8.7
29	8.7	10	6.4	13	20	4.4	5.3	.....	5.3	145	5.3	6.4
30	10	7.4	7.4	13	34	5.3	5.3	.....	6.4	70	5.3	4.4
31	116	7.4	.....	13	.....	3.6	4.4	.....	6.4	.....	4.4	.....

NOTE.—Discharge determined from rating curve well defined below 20 million gallons per day and fairly well defined between 20 and 200 million gallons per day. Discharge July 1–17, Aug. 7–13, Oct. 1–17, Nov. 28–30, Dec. 15–24, Jan. 16–26, Feb. 19–23, 27 and 28, and Mar. 3–22 determined by comparison with records of flow of Nailiilihaele Stream.

Monthly discharge of Kailua Stream near Huelo, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	116	5.3	16.6	25.7	514	1,580
August	66	7.4	25.5	39.5	792	2,430
September	62	5.3	14.8	22.9	444	1,360
October	22	2.9	9.80	15.2	304	932
November	150	5.3	32.3	50.0	968	2,970
December	223	1.1	47.6	73.6	1,480	4,530
January	42	3.6	10.1	15.6	312	961
February	32	1.1	2.93	4.53	82	252
March	14	1.6	4.15	6.42	129	395
April	145	3.6	16.3	25.2	488	1,500
May	45	3.6	10.3	15.9	318	980
June	37	2.2	6.84	10.6	205	630
The year	223	1.1	16.5	25.5	6,030	18,500

HOOLAWALIILII STREAM NEAR HUELO, MAUI.

LOCATION.—400 feet above New Hamakua ditch crossing, about 4 miles by trail west of Huelo.

RECORDS AVAILABLE.—April 5, 1911, to June 30, 1917.

GAGE.—Stevens water-stage recorder installed June 19, 1914, 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 pool about 100 feet long and 10 feet wide formed by concrete control 12 feet long 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 stage recorded during period of record, 2.9 feet at 5 p. m., January 8, 1916 (discharge, computed from extension of rating curve, approximately 520 million gallons per day, or 805 second-feet); minimum stage recorded, 0.07 foot June 2 and 3, 1913 (discharge, 0.85 million gallons per day, or 1.3 second-feet).

Maximum stage recorded during year, 1.8 feet at 8 p. m., December 9 (discharge, approximately 250 million gallons per day, or 387 second-feet); minimum stage recorded, 0.05 foot August, September, February, and March (discharge, 1.3 million gallons per day, or 2.0 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

ACCURACY.—Record good below and fair above 20 million gallons per day.

Discharge measurements of Hoolawaliilii Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date.	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Sept. 12	0.15	5.95	3.9	Feb. 15	0.06	2.22	1.4
Oct. 17	.11	4.40	2.8	May 22	.16	5.48	3.5
Dec. 12	.24	8.15	5.3				

Daily discharge, in million gallons, of Hoolawaliilii Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	12	9.0	2.2	4.8	6.5	6.5	2.2	3.2	1.3	3.2	23	2.2
2	9.0	12	3.2	3.2	6.5	9.0	2.2	2.2	1.3	3.2	12	3.2
3	9.0	15	2.2	3.2	9.0	40	2.2	2.2	1.3	3.2	9.0	2.2
4	6.5	9.0	2.2	3.2	6.5	19	4.8	2.2	1.3	3.2	6.5	2.2
5	6.5	6.5	1.3	3.2	40	9.0	4.8	2.2	1.3	3.2	4.8	2.2
6	6.5	6.5	2.2	3.2	23	6.5	2.2	2.2	1.3	3.2	4.8	3.2
7	4.8	6.5	3.2	3.2	12	4.8	4.8	2.2	1.3	3.2	4.8	2.2
8	4.8	4.8	3.2	3.2	9.0	4.8	3.2	2.2	3.2	3.2	3.2	3.2
9	4.8	4.8	3.2	3.2	6.5	9.0	2.2	2.2	4.8	3.2	3.2	3.2
10	4.8	3.2	3.2	3.2	6.5	23	2.2	2.2	2.2	3.2	3.2	3.2
11	4.8	4.8	3.2	3.2	6.5	9.0	2.2	2.2	2.2	4.8	3.2	3.2
12	3.2	6.5	3.2	2.2	4.8	6.5	2.2	1.3	2.2	3.2	3.2	3.2
13	6.5	12	3.2	2.2	4.8	6.5	2.2	1.3	2.2	3.2	3.2	3.2
14	4.8	28	3.2	2.2	4.8	6.5	2.2	1.3	2.2	3.2	3.2	3.2
15	4.8	12	4.8	2.2	4.8	4.8	2.2	1.3	3.2	3.2	3.2	2.2
16	6.5	6.5	3.2	2.2	6.5	6.5	2.2	1.3	2.2	3.2	3.2	2.2
17	9.0	6.5	3.2	2.2	9.0	9.0	2.2	1.3	2.2	3.2	4.8	2.2
18	6.5	6.5	3.2	2.2	4.8	15	2.2	1.3	3.2	3.2	15	3.2
19	4.8	6.5	9.0	2.2	4.8	15	2.2	2.2	2.2	2.2	4.8	2.2
20	4.8	6.5	4.8	2.2	4.8	12	2.2	1.3	2.2	3.2	3.2	2.2
21	3.2	4.8	4.8	2.2	3.2	28	2.2	1.3	2.2	3.2	3.2	2.2
22	3.2	4.8	4.8	2.2	2.2	34	2.2	1.3	2.2	3.2	3.2	2.2
23	3.2	3.2	4.8	2.2	2.2	91	2.2	1.3	2.2	3.2	4.8	2.2
24	3.2	3.2	6.5	2.2	3.2	40	2.2	1.3	2.2	3.2	3.2	2.2
25	3.2	3.2	4.8	2.2	3.2	12	3.2	1.3	2.2	3.2	3.2	2.2
26	3.2	2.2	4.8	4.8	3.2	6.5	6.5	1.3	3.2	3.2	3.2	2.2
27	3.2	2.2	4.8	4.8	6.5	6.5	3.2	1.3	2.2	3.2	3.2	2.2
28	3.2	2.2	4.8	3.2	9.0	6.5	3.2	4.8	2.2	6.5	3.2	2.2
29	3.2	2.2	4.8	6.5	6.5	4.8	3.2	.....	2.2	66	3.2	3.2
30	3.2	1.3	4.8	12	6.5	3.2	3.2	.....	2.2	34	3.2	2.2
31	12	2.2	.....	6.5	.....	3.2	3.2	.....	3.2	.....	2.2	.....

NOTE.—Discharge determined from a rating curve well defined below 20 million gallons per day.

Monthly discharge of Hoolawaliilii Stream near Huelo, Maui, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	12	3.2	5.43	8.40	168	517
August	28	1.3	6.60	10.2	205	628
September	9.0	1.3	3.89	6.02	117	358
October	12	2.2	3.40	5.26	105	323
November	40	2.2	7.56	11.7	227	696
December	91	3.2	14.8	22.9	458	1,410
January	6.5	2.2	2.82	4.36	87	268
February	4.8	1.3	1.85	2.86	52	159
March	4.8	1.3	2.24	3.47	70	213
April	66	2.2	6.45	9.98	194	594
May	23	2.2	5.07	7.84	157	482
June	3.2	2.2	2.57	3.98	77	237
The year	91	1.3	5.25	8.12	1,920	5,880

HOOLAWANUI STREAM NEAR HUELO, MAUI.

LOCATION.—500 feet above crossing of New Hamakua ditch, about 5 miles by trail west of Huelo.

RECORDS AVAILABLE.—December 12, 1910, to June 30, 1917.

GAGE.—Stevens 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; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.4 feet at 11.30 p. m. May 1, 1916 (discharge, computed from extension of rating curve, approximately 440 million gallons per day, or 680 second-feet); minimum stage recorded, 0.04 foot September and October, 1912 (discharge, 1.0 million gallons per day, or 1.6 second-feet).

Maximum stage recorded during year, 4.2 feet at 7 a. m. December 23 (discharge, approximately 300 million gallons per day, or 464 second-feet); minimum stage recorded, 0.05 foot October and February (discharge, 1.1 million gallons per day, or 1.7 second-feet).

DIVERSIONS.—None above station.

REGULATION.—None.

ACCURACY.—Determinations based on well-defined rating curve and continuous gage-height record. Records good for all stages below 60 million gallons per day.

Discharge measurements of Hoolawanui Stream near Huelo, Maui, during the year ending June 30, 1917.

Date.	Made by—	Gage height (feet).	Discharge.	
			Second-feet.	Million gallons per day.
July 19	H. A. R. Austin	0.54	12	7.8
Jan. 19	R. C. Rice	.24	4.4	2.8

Daily discharge, in million gallons, of Hoolawanui Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	16	19	6.8	3.4	4.2	10	5.9	2.2	2.8	2.2	32	2.2
2	13	19	13	3.4	6.8	18	5.0	1.8	2.2	1.8	18	2.8
3	12	26	5.9	2.2	10	32	5.9	1.8	2.2	1.8	12	2.2
4	9.0	16	5.0	2.2	6.8	24	14	1.8	5.0	2.2	9.0	2.2
5	9.0	12	5.0	2.2	42	13	10	1.8	2.8	4.2	6.8	2.2
6	7.9	9.0	5.0	2.2	32	10	10	1.8	2.8	2.2	2.8	2.8
7	6.8	7.9	18	1.8	18	7.9	13	1.8	1.8	2.2	5.0	2.2
8	5.9	6.8	12	1.8	12	7.9	9.0	1.8	2.2	1.8	4.2	2.8
9	5.9	6.8	6.8	1.8	9.0	18	6.8	1.8	9.0	1.8	3.4	2.8
10	5.9	5.9	7.9	1.8	6.8	64	5.9	1.8	2.8	1.8	3.4	2.8
11	7.9	7.9	5.9	1.8	5.9	30	5.9	1.8	2.8	4.2	3.4	2.8
12	5.9	12	5.0	1.8	5.0	14	5.9	1.4	2.8	2.8	2.8	2.8
13	9.0	16	5.0	1.8	5.0	12	5.0	1.4	2.2	2.2	2.8	2.8
14	6.8	23	4.2	1.8	4.2	12	4.2	1.8	2.2	2.2	2.8	2.8
15	7.9	13	5.0	1.8	5.0	10	3.4	1.1	3.4	2.8	2.8	2.2
16	16	9.0	4.2	1.8	16	13	3.4	1.1	2.8	1.8	3.4	2.2
17	18	9.0	3.4	1.8	28	23	3.4	1.1	2.2	2.2	5.0	2.2
18	10	9.0	3.4	2.2	12	24	2.8	1.1	2.8	1.8	16	2.8
19	9.0	13	16	1.8	7.9	23	2.8	2.2	2.2	1.8	4.2	2.2
20	6.8	13	5.0	1.4	5.9	18	2.8	1.4	1.8	2.8	3.4	2.2
21	5.9	9.0	4.2	1.4	5.0	52	2.2	1.4	1.8	2.2	4.2	2.2
22	5.0	7.9	5.0	1.4	4.2	74	2.2	1.1	1.8	2.2	4.2	4.2
23	4.2	6.8	5.9	1.8	4.2	136	2.2	1.1	1.8	2.2	4.2	2.2
24	4.2	5.9	5.9	1.4	5.0	58	2.2	1.1	1.8	2.2	3.4	1.8
25	3.4	5.0	5.0	1.1	5.0	24	3.4	1.1	1.8	1.8	3.4	1.8
26	3.4	5.0	4.2	5.0	7.9	18	5.9	1.1	1.8	1.8	2.8	1.8
27	4.2	5.0	3.4	5.9	13	14	2.8	1.1	1.4	1.8	2.8	3.4
28	4.2	4.2	3.4	2.2	18	13	2.2	14	1.4	3.4	2.8	2.8
29	3.4	4.2	2.8	4.2	12	9.0	2.2	.....	2.2	52	2.2	3.4
30	5.0	3.4	2.8	14	14	7.9	2.8	.....	2.2	32	2.2	2.2
31	30	5.0	.....	5.9	.....	6.8	2.2	.....	3.4	.....	2.2	.....

NOTE.—Discharge determined from rating curve well defined below 60 million gallons per day. Discharge Oct. 12–17 and June 1–21 estimated by comparison with records of flow of Hoolawaliilii Stream.

Monthly discharge of Hoolawanui Stream near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	30	3.4	8.44	13.1	262	803
August	26	3.4	10.2	15.8	315	970
September	18	2.8	6.17	9.55	185	568
October	14	1.1	2.75	4.25	85	262
November	42	4.2	11.0	17.0	331	1,010
December	136	6.8	25.7	39.8	796	2,440
January	14	2.2	5.01	7.75	155	477
February	14	1.1	1.96	3.03	55	168
March	9	1.4	2.59	4.01	80	246
April	52	1.8	4.94	7.64	148	455
May	32	2.2	5.73	8.87	178	545
June	4.2	1.8	2.53	3.91	76	233
The year	136	1.1	7.30	11.3	2,670	8,180

HONOPOU STREAM NEAR HUELO, MAUI.

LOCATION.—200 feet above New Hamakua ditch crossing, about 6 miles west of Huelo.

RECORDS AVAILABLE.—December 10, 1910, to June 30, 1917.

GAGE.—Stevens water-stage recorder, installed June 19, 1914, at same location and datum as original staff.

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; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 3.7 feet at 10 p. m., May 1, 1916 (discharge, computed from extension of rating curve, approximately 160 million gallons per day, or 248 second-feet); minimum stage recorded, 0.4 foot September and October, 1912 (discharge, 0.4 million gallons per day, or 0.6 second-foot).

Maximum stage recorded during year, 3.15 feet at 7 p. m., April 30 (discharge, approximately 120 million gallons per day, or 186 second-feet); minimum stage recorded, 0.1 foot October and February (discharge, 0.5 million gallons per day, or 0.77 second-foot).

DIVERSIONS.—None above station.

REGULATION.—None.

UTILIZATION.—Ordinary flow is diverted by ditches of East Maui Irrigation Co. for irrigation of sugar cane.

ACCURACY.—Discharge determined from rating curve well defined for low stages. Records for medium and flood stages fair.

Discharge measurements of Honopou Stream near Huelo, Maui, during the year ending June 30, 1917.

[Made by H. A. R. Austin.]

Date	Gage height (feet).	Discharge.		Date.	Gage height (feet).	Discharge.	
		Second-feet.	Million gallons per day.			Second-feet.	Million gallons per day.
Mar. 23	0.19	1.96	1.3	May 22	0.26	2.53	1.6
Apr. 19	.18	1.55	1.0				

Daily discharge, in million gallons, of Honopou Stream near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	5.5	4.6	1.8	1.8	1.8	3.0	2.4	1.3	1.3	1.3	17	1.8
2	4.6	6.5	2.4	1.8	2.4	5.5	1.8	.8	.8	1.3	9.5	2.4
3	3.8	6.5	1.3	1.3	3.0	17	2.4	.8	1.3	1.3	6.5	1.8
4	3.0	4.6	1.3	.8	2.4	9.5	3.0	.8	1.8	1.3	5.5	1.3
5	2.4	3.8	1.3	.8	22	6.5	2.4	.8	1.3	1.3	4.6	1.3
6	1.8	3.0	1.8	.8	12	4.6	3.0	.8	1.3	1.3	3.8	1.8
7	1.8	3.0	3.0	.8	6.5	3.8	3.0	.8	1.3	1.3	3.0	1.3
8	1.3	2.4	3.0	.8	5.5	3.8	3.0	.8	3.0	1.3	3.0	1.8
9	1.3	2.4	1.8	.5	3.8	6.5	3.0	.8	3.8	1.3	3.0	2.4
10	1.3	1.8	2.4	.5	3.8	13	3.0	.8	1.8	1.3	2.4	1.8
11	2.4	3.0	1.8	.5	3.8	8.5	3.0	.8	1.8	1.8	2.4	1.8
12	.8	3.8	1.3	.5	3.0	5.5	3.0	.8	1.8	1.3	2.4	1.3
13	2.4	6.5	1.3	.5	2.4	4.6	2.4	.8	1.8	1.3	1.8	1.3
14	1.3	11	1.3	.5	2.4	4.6	2.4	.8	1.8	1.3	1.8	1.3
15	1.3	4.6	2.4	.5	3.0	3.8	2.4	.8	3.0	1.3	1.8	1.3
16	3.0	3.8	1.3	.5	3.8	4.6	1.8	.5	1.8	1.3	2.4	1.3
17	3.8	3.8	1.3	.8	4.6	6.5	1.8	.5	1.3	1.3	4.6	1.3
18	2.4	3.0	1.3	.8	2.4	8.5	1.3	.8	2.4	1.3	6.5	1.3
19	2.4	4.6	6.5	.5	1.8	7.5	1.3	1.8	1.8	1.3	2.4	1.3
20	2.4	3.8	2.4	.5	1.8	6.5	1.3	.8	1.8	1.8	1.8	1.3
21	1.8	3.0	1.8	.5	1.8	15	1.3	.8	1.3	1.3	2.4	1.3
22	1.8	3.0	2.4	.5	1.3	22	1.3	.8	1.3	1.3	1.8	1.3
23	1.8	2.4	2.4	.8	1.3	38	1.3	.5	1.3	1.3	2.4	.8
24	1.3	2.4	3.0	.5	1.8	19	1.3	.5	1.3	1.3	2.4	.8
25	1.3	1.8	2.4	.5	1.3	12	2.4	.5	1.3	1.3	1.8	.8
26	1.3	1.8	2.4	2.4	1.8	8.5	3.8	.5	1.3	1.3	1.8	.8
27	1.8	1.8	2.4	1.8	3.8	6.5	1.3	.8	1.3	1.3	1.8	1.3
28	1.3	1.8	1.8	.8	6.5	5.5	1.3	5.5	1.3	3.0	1.8	1.3
29	1.3	1.3	1.8	3.0	3.8	3.8	1.3	.....	1.3	24	1.8	2.4
30	1.8	1.3	1.8	5.5	4.6	3.0	1.3	.....	1.3	19	1.8	.8
31	7.5	1.8	.....	1.8	.....	3.0	1.3	.....	1.3	.....	1.3	.....

NOTE.—Discharge determined from rating curve well defined below 5 million gallons per day. Discharge Dec. 25 to Jan. 1 and Mar. 30 to Apr. 19 determined by comparison with records of flow of Hoolawanui stream.

Monthly discharge of Honopou Stream near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	7.5	0.8	2.32	3.59	72	221
August	11	1.3	3.51	5.43	109	334
September	6.5	1.3	2.11	3.26	63	194
October	5.5	.5	1.08	1.67	34	103
November	22	1.3	4.01	6.20	120	369
December	38	3.0	8.71	13.5	270	829
January	3.8	1.3	2.12	3.28	66	202
February	5.5	.5	.96	1.49	27	82
March	3.8	.8	1.65	2.55	51	157
April	24	1.3	2.74	4.24	82	252
May	17	1.3	3.46	5.35	107	329
June	2.4	.8	1.43	2.21	43	132
The year	38	.5	2.86	4.43	1,040	3,200

NEW HAMAKUA DITCH AT HALEHAKU WEIR, NEAR HUELO, MAUI.

LOCATION.—Just above crossing of Halehaku Stream, about 7 miles by trail west of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1917.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by 25-foot Cippoletti weir.

CHANNEL AND CONTROL.—Large pool at weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None above station.

REGULATION.—By gates at frequent intervals.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Daily discharge, in million gallons, of New Hamakua ditch at Halehaku weir, near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	69.6	70.1	74.9	54.5	53.8	56.8	40.1	31.4	44.1	36.7	68.2	48.6
2	69.6	72.1	61.0	53.6	56.9	59.8	40.3	29.7	28.4	39.1	54.9	54.0
3	68.7	72.4	53.4	53.8	59.8	64.3	41.6	28.5	28.5	32.1	48.5	66.2
4	69.0	70.4	53.7	53.7	57.6	67.4	44.2	27.5	35.6	30.5	54.5	65.4
5	71.1	69.7	54.3	54.0	70.6	57.1	54.3	26.2	40.4	50.7	55.4	63.0
6	69.3	69.7	54.5	53.1	70.1	53.5	54.5	25.1	33.0	56.8	52.0	66.7
7	69.5	69.1	63.0	46.0	65.8	53.5	55.0	24.2	27.3	46.1	50.4	65.8
8	70.3	68.6	55.1	45.5	53.6	55.8	53.3	23.5	40.3	42.4	50.4	66.9
9	66.0	65.6	53.7	48.2	53.6	56.7	53.8	23.0	55.3	38.8	48.2	70.1
10	71.0	71.5	54.3	44.2	53.9	69.7	53.7	22.3	48.1	35.8	45.3	65.3
11	70.5	73.0	53.9	37.7	54.2	65.5	53.9	21.4	38.8	55.5	46.4	67.6
12	66.7	71.1	53.8	36.2	54.2	56.4	54.0	34.7	44.1	56.1	53.5	64.9
13	67.6	70.2	53.8	50.0	52.3	54.3	53.5	33.3	37.8	48.0	59.8	61.7
14	68.4	69.0	53.8	39.3	41.7	54.1	53.1	26.9	35.7	51.4	57.1	52.4
15	69.7	70.8	54.4	38.4	39.8	54.3	50.0	28.7	41.6	58.9	65.8	44.7
16	71.2	73.0	52.8	39.2	53.7	56.5	47.4	27.5	43.9	56.9	62.5	44.3
17	68.3	71.7	53.6	50.0	70.1	58.6	45.3	27.3	36.1	55.8	68.8	39.7
18	68.9	72.3	54.7	53.8	58.3	59.3	41.8	26.5	41.8	59.8	71.4	40.6
19	69.1	71.5	56.4	53.6	53.7	59.3	39.6	38.0	36.5	52.0	65.0	42.3
20	69.3	71.5	53.8	53.4	53.7	58.4	37.8	36.8	29.0	50.9	60.0	34.4
21	69.2	70.0	53.8	50.2	53.5	60.9	36.3	39.0	28.4	55.7	66.9	30.9
22	67.0	71.4	54.8	48.9	48.0	62.5	34.6	23.6	26.6	53.2	65.1	43.0
23	65.7	69.7	54.4	53.2	41.4	29.4	33.1	18.8	30.5	58.9	63.2	51.0
24	66.5	70.1	53.3	52.9	41.8	.....	33.4	20.8	31.7	56.3	68.7	39.5
25	64.8	69.8	53.7	47.6	51.2	5.2	42.7	22.1	37.6	45.0	68.0	37.7
26	66.5	71.4	53.6	53.2	51.5	33.9	52.4	25.0	46.8	39.9	64.0	32.4
27	70.2	70.2	53.9	54.4	60.0	33.8	48.6	25.0	31.0	37.2	55.9	43.6
28	69.5	68.7	53.6	53.8	58.7	36.3	42.2	50.8	25.6	43.0	55.0	62.5
29	67.9	63.3	53.7	53.7	54.2	28.9	37.2	.....	30.8	69.5	51.9	57.7
30	69.5	64.9	53.5	62.2	58.5	40.5	39.6	.....	39.4	67.6	49.9	57.4
31	73.8	70.3	.....	53.4	.....	39.8	33.4	.....	50.0	.....	49.2	.....

NOTE.—No flow Dec. 24.

Monthly discharge of New Hamakua ditch at Halehaku weir, near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	73.8	64.8	68.9	106	2,130	6,550
August	73.0	63.3	70.1	108	2,170	6,670
September	74.9	52.8	55.2	85.4	1,660	5,080
October	62.2	36.2	49.7	76.9	1,540	4,730
November	70.6	39.8	54.9	84.9	1,650	5,050
December (30 days)	69.7	5.2	51.4	79.5	1,540	4,730
January	55.0	33.1	45.2	69.9	1,400	4,300
February	50.8	18.8	28.1	43.5	788	2,410
March	55.3	25.6	36.9	57.1	1,140	3,510
April	69.5	30.5	49.4	76.4	1,480	4,550
May	71.4	45.3	57.9	89.6	1,800	5,510
June	70.1	30.9	52.7	81.5	1,580	4,850
The year					18,900	57,900

KAUHIKOA[1] DITCH AT OPANA WEIR, NEAR HUELO, MAUI.

LOCATION.—A short distance below crossing of Opana Stream, about 8 miles by road west of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1917.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—By 25-foot sharp-crested weir.

CHANNEL AND CONTROL.—Large pool at weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None above station.

REGULATION.—By gates at frequent intervals.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Daily discharge, in million gallons, of Kauhikoa ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Feb.	Mar.	Apr.	June.
1	41.8	47.6	13.4	19.9	22.5	40.2	.....	4.2	.....	.....
2	31.4	54.3	40.4	21.6	24.1	55.0	.....	.....	.....	13.6
3	29.0	63.3	28.1	18.2	42.0	68.2	.....	.....	.....	4.1
4	20.6	37.3	24.5	16.7	27.5	61.6	.....	8.3	.....	2.5
5	17.3	24.9	23.3	14.3	66.8	49.7	.....	8.2	4.2	.7
6	12.4	16.3	24.9	3.0	62.8	41.1	.....	2.0	1.3	5.2
7	8.4	12.5	50.8	.....	41.5	31.8	.....	.....	.....	2.1
8	3.2	9.9	48.3	.....	38.6	22.9	.....	.....	.....	6.3
9	.9	8.5	31.7	.....	28.2	27.1	.....	5.7	.....	9.6
10	3.9	7.0	35.6	.....	22.5	84.5	.....	1.2	.....	1.6
11	12.6	16.4	28.5	.....	20.3	68.3	.....	.....	1.9	8.0
12	5.1	37.9	26.0	.3	15.1	49.2	.....	.....	3.8	5.5
13	19.1	43.8	23.2	6.9	3.6	38.9	.....	.....	.....	1.2
14	8.3	56.0	22.0	.....	.....	46.5	.....	.....	.....	.....
15	9.1	37.5	28.8	.....	.....	43.6	.....	1.7	.....	.....
16	24.4	22.6	23.5	.....	30.8	48.4	.....	1.7	.....	.....
17	46.2	21.0	19.8	9.0	62.2	65.8	.....	.....	1.5	.....
18	20.7	19.5	18.4	14.7	23.7	73.3	.....	5.0	6.1	.....
19	15.0	33.3	58.7	12.9	19.0	69.4	.....	.....	.4	.....
20	9.4	32.4	31.5	11.8	12.7	60.8	.....	.....	.....	.....
21	7.5	21.8	26.1	2.2	8.4	87.3	.....	.....	.....	.....
22	4.2	17.0	26.6	.....	.8	80.8	.....	.....	.....	1.7
23	.5	11.7	31.7	8.5	.....	.....	.....	.....	.....	1.2
24	.....	8.5	32.0	6.8	13.3	.....	.....	.....	.....	.....
25	.....	7.1	29.5	.....	11.7	.....	.....	.....	.....	.....
26	.....	6.8	24.5	14.3	13.8	.....	.....	.....	.....	.....
27	5.3	6.5	22.5	29.9	37.9	.....	.....	.....	.....	.....
28	5.3	5.8	21.2	16.8	58.8	.....	9.7	.....	7.9	.6
29	4.2	5.0	18.7	22.3	43.7	.....	.....	.....	74.1	2.4
30	7.5	4.5	17.6	46.5	49.6	.....	.....	.....	75.4	.3
31	60.3	7.2	.....	28.3	.....	.....	.....	.....	.....	.....

NOTE.—No flow on days for which discharge is not given.

[1] New alinement of Old Hamakua ditch west of Halehaku Gulch.

Monthly discharge of Kauhikoa ditch at Opana weir, near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July (28 days)	60.3	0.5	15.5	24.0	434	1,330
August	63.3	4.5	22.7	35.	704	2,160
September	58.7	13.4	28.4	43.9	852	2,610
October (21 days)	46.5	.3	15.5	24.0	325	999
November (27 days)	66.8	.8	29.7	46.0	802	2,460
December (22 days)	87.3	22.9	55.2	85.4	1,210	3,730
February (1 day)					10	30
March (9 days)	8.3	1.2	4.22	6.53	38	117
April (10 days)	75.4	.4	17.7	27.4	177	543
June (17 days)	13.6	.3	39.2	60.7	67	2,050
The year					4,620	16,000

LOWRIE DITCH AT OPANA WEIR, NEAR HUELO, MAUI.

LOCATION.—A short distance west of Halehaku Gulch, about 7 miles by road northwest of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1917.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by sharp-crested weir 16⅓ feet long, with bottom and end contractions.

CHANNEL AND CONTROL.—Large pool back of weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None above station.

REGULATION.—By gates at frequent intervals.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Daily discharge, in million gallons, of Lowrie ditch at Opana weir, near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	58.1	58.8	57.7	57.6	52.6	54.4	48.1	27.7	41.2	37.3	52.8	41.5
2	58.2	58.8	56.6	57.5	57.1	57.3	43.4	17.0	27.0	46.6	52.2	52.2
3	58.1	59.0	55.4	55.2	55.8	56.4	46.8	16.7	36.6	31.9	58.1	51.1
4	58.0	58.9	54.9	53.2	56.4	58.6	58.1	15.7	55.8	34.7	57.6	46.4
5	58.0	59.0	58.3	51.3	59.2	59.0	58.6	14.7	49.0	57.0	57.7	53.9
6	58.0	58.8	58.4	52.5	58.8	55.4	58.0	13.9	27.6	53.6	55.4	55.8
7	57.7	58.6	57.8	48.3	58.4	53.2	58.8	13.6	30.4	54.2	55.4	53.1
8	58.3	58.7	58.5	51.9	58.1	52.6	54.5	12.9	43.4	47.5	45.3	54.9
9	58.1	58.1	58.5	50.7	57.9	53.8	54.3	13.0	55.7	44.4	46.0	56.7
10	58.0	58.4	59.1	45.2	57.9	59.4	48.4	12.4	40.4	41.3	42.7	54.7
11	57.3	58.8	58.8	41.0	57.8	59.0	57.4	11.7	30.7	57.4	48.2	56.7
12	54.0	58.8	58.1	43.5	52.2	55.7	58.9	11.8	51.5	50.6	57.6	54.7
13	58.9	59.2	58.1	44.3	49.8	58.7	48.8	11.6	39.1	48.7	50.1	48.1
14	58.9	59.8	56.7	41.3	45.8	46.4	53.7	45.7	39.0	56.7	57.0	46.9
15	58.8	58.9	54.2	51.0	42.5	52.7	39.1	35.4	54.3	50.9	54.7	39.5
16	59.0	58.9	56.9	49.6	57.6	58.9	35.7	27.3	43.4	51.5	55.8	33.7
17	59.2	59.1	51.3	56.3	54.4	59.3	27.0	25.2	34.1	54.5	57.7	31.6
18	58.6	58.7	40.0	55.8	50.9	59.5	21.0	22.9	39.6	51.6	54.7	50.2
19	58.5	59.1	6.7	55.5	53.9	56.8	19.7	39.4	38.0	44.0	57.4	34.7
20	58.4	58.8	11.6	53.2	51.5	20.8	19.3	36.5	33.2	53.6	55.1	32.2
21	58.3	58.8	57.5	47.5	46.0	18.9	18.7	35.8	28.8	43.8	55.9	31.3
22	55.8	58.8	56.7	54.1	46.2	18.3	18.2	20.7	35.0	51.0	50.2	43.2
23	58.6	58.8	58.2	53.3	40.0	23.9	17.0	16.3	33.6	49.4	53.8	38.2
24	58.3	58.8	58.2	50.0	48.8	4.6	18.0	11.3	33.3	33.8	57.4	33.1
25	56.4	58.7	58.1	46.7	49.6	1.6	43.0	10.3	39.0	35.5	57.6	29.4
26	56.7	58.1	58.0	56.1	50.8	1.6	56.1	16.5	47.9	38.8	53.2	27.1
27	54.9	57.9	57.7	56.6	47.1	7.1	42.0	14.8	27.0	36.7	52.3	47.1
28	50.4	58.1	56.4	56.1	56.8	14.8	25.2	52.9	31.1	44.9	55.5	53.7
29	57.8	58.1	54.5	56.2	54.8	6.9	21.1	.....	46.3	61.0	44.8	46.9
30	58.9	55.8	51.0	57.4	58.8	24.7	30.9	.....	49.8	60.1	37.0	25.6
31	58.8	58.0	.....	56.5	.....	39.3	32.4	.....	49.0	.....	35.4	.....

Monthly discharge of Lowrie ditch at Opana weir, near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	59.2	50.4	57.6	89.1	1,790	5,480
August	59.8	55.8	58.6	90.7	1,820	5,570
September	59.1	6.7	53.1	82.2	1,590	4,890
October	57.6	41.0	51.8	80.1	1,610	4,930
November	59.2	40.0	52.9	81.8	1,590	4,870
December	59.5	1.6	40.3	62.4	1,250	3,830
January	58.9	17.0	39.7	61.4	1,230	3,780
February	52.9	10.3	21.6	33.4	604	1,860
March	55.8	27.0	39.7	61.4	1,230	3,780
April	61.0	31.9	47.4	73.3	1,420	4,360
May	58.1	35.4	52.4	81.1	1,620	4,990
June	56.7	25.6	44.1	68.2	1,320	4,060
The year	61.0	1.6	46.8	72.4	17,100	52,400

HAIKU DITCH AT PEAHI WEIR, NEAR HUELO, MAUI.

LOCATION.—In Peahi about 8 miles by road northwest of Huelo post office.

RECORDS AVAILABLE.—January 1, 1910, to June 30, 1917.

GAGE.—Friez water-stage recorder.

DISCHARGE MEASUREMENTS.—Made by sharp-crested weir, 16⅓ feet long, with bottom and end contractions.

CHANNEL AND CONTROL.—Large pool at weir.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—None above station.

REGULATION.—By gates at frequent intervals.

UTILIZATION.—Irrigation of sugar cane.

ACCURACY.—Records good.

COOPERATION.—Daily-discharge record copied from records of East Maui Irrigation Co.

Daily discharge, in million gallons, of Haiku ditch at Peahi weir near Huelo, Maui, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	60.1	73.9	63.9	59.2	54.2	55.5	26.8	2.0	1.4	0.9	82.6	13.7
2	62.2	77.7	63.3	58.3	50.3	64.6	18.3	2.0	1.2	.9	80.3	46.4
3	70.4	84.6	60.6	29.9	68.6	76.3	20.6	2.0	.9	3.3	71.4	36.3
4	69.9	75.3	48.5	28.3	69.7	72.8	70.9	1.9	.9	4.4	53.0	31.3
5	79.1	73.5	49.5	22.1	84.3	58.4	71.0	1.7	.9	34.1	25.3	32.2
6	69.1	71.2	62.4	5.4	76.3	46.9	62.2	1.2	.9	6.5	36.8	58.2
7	47.8	58.9	70.0	4.6	58.7	46.8	69.4	1.0	.9	3.5	29.9	20.2
8	30.6	53.9	77.3	5.1	61.1	42.9	27.9	1.0	2.3	3.1	33.6	54.9
9	23.1	44.1	69.4	6.6	37.4	32.2	6.3	1.0	.9	2.6	22.3	59.5
10	39.6	42.2	69.8	4.7	36.4	76.8	2.8	1.0	.9	2.6	11.2	20.9
11	68.4	65.2	61.4	3.7	34.5	72.9	4.8	1.0	.9	52.1	12.6	55.2
12	59.7	66.2	54.0	10.2	24.8	53.2	2.7	1.0	.9	20.5	32.4	55.1
13	80.1	68.1	46.2	17.1	8.0	65.2	2.6	1.0	.9	8.2	20.8	16.4
14	74.1	87.7	37.4	3.4	6.1	59.6	2.4	1.3	.9	25.3	32.4	14.4
15	74.7	74.1	44.5	4.3	8.5	55.3	2.4	1.2	1.0	38.2	35.1	16.0
16	78.3	68.9	43.9	4.7	81.7	54.5	2.3	1.1	.9	23.9	35.1	25.7
17	85.2	69.7	34.1	54.7	78.3	74.9	2.3	1.1	.9	36.6	67.4	10.6
18	76.7	68.4	39.6	45.1	47.2	81.5	2.1	1.1	.9	30.5	77.1	12.5
19	73.8	71.4	62.6	24.5	28.6	71.3	2.3	1.1	.9	14.2	54.9	9.4
20	61.2	71.4	74.1	15.1	30.0	67.9	2.2	1.1	.9	37.9	21.0	8.2
21	51.8	69.3	53.7	6.4	26.8	68.9	2.2	1.2	.9	20.4	37.0	7.5
22	32.0	68.0	51.0	14.3	7.2	70.2	2.0	1.3	.9	22.9	29.1	26.1
23	26.8	62.8	67.8	30.9	5.8	75.1	1.7	1.3	.9	44.4	55.9	13.1
24	23.1	65.3	67.0	13.0	19.7	45.1	1.6	1.3	.9	31.3	66.5	11.4
25	26.9	56.7	65.8	4.4	26.6	30.0	1.6	1.3	.9	18.5	42.3	10.7
26	34.4	55.7	62.9	54.9	39.6	28.4	1.5	1.3	.9	9.5	17.3	9.1
27	61.6	53.0	48.3	68.7	45.9	30.2	1.3	1.2	.9	8.3	13.6	24.9
28	68.4	58.9	38.6	66.7	68.5	29.9	1.1	1.3	.9	27.5	15.9	37.6
29	49.6	51.9	31.7	53.8	57.5	28.9	1.1	.....	.9	84.4	13.1	23.4
30	66.3	46.0	31.6	77.3	75.7	29.6	1.5	.....	.9	81.1	23.5	26.1
31	85.5	60.3	.....	69.3	.....	37.6	1.6	.....	.9	.....	17.1	.....

Monthly discharge of Haiku ditch, at Peihi weir near Huelo, Maui, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	85.5	23.1	58.4	90.4	1,810	5,560
August	87.7	42.2	65.0	101	2,010	6,180
September	77.3	31.6	55.0	85.1	1,650	5,060
October	77.3	3.4	28.0	43.3	867	2,660
November	84.3	5.8	43.9	67.9	1,320	4,040
December	81.5	28.4	55.0	85.1	1,700	5,230
January	71.0	1.1	13.5	20.9	420	1,280
February	2.0	1.0	1.29	2.00	36	111
March	2.3	.9	.97	1.50	30	92
April	84.4	.9	23.3	36.1	698	2,150
May	82.6	11.2	37.6	58.2	1,170	3,580
June	59.5	7.5	26.2	40.5	787	2,410
The year	87.7	.9	34.3	53.1	12,500	38,400

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 for the year ending June 30, 1917.

Date.	Stream,	Locality.	Gage height (feet).	Discharge.	
				Second-feet.	Million gallons per day.
July 28	Olowalu ditch	In tailrace of power house	0.70	7.6	4.9
July 24	North Waiehu	¼ mile below intake of North Waiehu ditch.	.85	.3	.2
Aug. 12	do	do	.54	.35	.25
Sept. 15	do	do	.53	.21	.15
Oct. 16	do	do	.48	.12	.08
Dec. 13	do	do	.94	.98	.65
Jan. 26	do	do	.59	.34	.22
Feb. 16	do	do	.33	.05	.03
May 24	do	do	.71	.37	.24
Dec. 11	Spreckels ditch	Just east of Puohakamoa Stream		33.3	21.5

ISLAND OF HAWAII.

UPPER HAMAKUA DITCH AT PUUALALA AND RESERVOIR NO. 3 WEIRS, NEAR KUKUIHAELE, HAWAII.

LOCATION.—Puualala weir is in Lalakea tract, adjacent to forest reserve and close to Kaala Mountain and Pacific sugar mill fence. Reservoir No. 3 weir is on a branch from main ditch just before it enters reservoir No. 3, about 1 mile south of Puualala or main weir.

RECORDS AVAILABLE.—January 1, 1913, to June 30, 1917. Records given herewith show the combined flow of the main ditch and its diversion to reservoir No. 3 which occurs above the main weir.

GAGE.—Watson water-stage recorder at each weir.

DISCHARGE MEASUREMENTS.—Made by sharp-crested weirs with good stilling basins above.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

DIVERSIONS.—This ditch diverts all natural run-off from upper headwaters of Waipio Gulch.

UTILIZATION.—Irrigation of sugar cane and domestic supply.

ACCURACY.—Records good.

COOPERATION.—Records furnished by the Hawaiian Irrigation Co.

Daily discharge, in million gallons, of Upper Hamakua ditch, at Puualala and reservoir No. 3 weirs, near Kukuihaele, Hawaii, for the year ending June 30, 1917.

Day.	July.	Aug..	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	15.8	16.5	12.8	23.5	31.0	1.0	31.1	0.8	13.6	13.9	15.8	7.3
2	9.5	22.5	30.8	18.5	17.2	.5	.....	.6	3.5	7.8	5.5	14.8
3	6.8	28.0	15.0	8.5	11.5	13.5	.....	.6	15.4	7.3	4.3	6.5
4	9.8	13.8	8.5	4.5	6.0	22.2	.....	.6	18.0	4.7	3.6	5.0
5	24.5	10.8	12.2	2.5	3.8	7.5	31.1	.6	9.7	3.9	2.9	3.7
6	24.5	7.0	19.2	2.5	19.8	5.2	12.0	.6	4.2	11.0	5.2	6.6
7	11.2	7.0	19.0	1.8	12.8	3.2	8.5	.5	2.0	17.9	3.2	9.7
8	6.5	7.5	11.8	1.8	6.0	2.0	5.8	.7	1.8	5.6	3.0	25.3
9	4.2	13.0	9.5	1.8	4.8	1.8	22.0	.6	1.8	3.6	1.9	18.8
10	10.5	20.0	7.5	1.5	3.5	35.5	8.1	.7	1.2	8.0	2.4	9.2
11	20.5	8.8	5.5	.5	3.5	33.2	11.2	.7	9.1	16.8	6.1	14.8
12	13.5	19.5	10.5	.8	4.8	12.0	4.7	.5	10.0	15.3	5.5	13.1
13	7.8	18.2	4.8	3.5	3.5	7.0	1.9	.4	9.0	9.7	5.7	5.2
14	21.2	20.2	3.2	2.2	2.0	7.0	14.5	7.1	8.7	13.7	5.6	6.4
15	10.0	19.5	1.8	3.0	6.0	10.0	7.3	4.9	3.6	14.7	5.2	5.5
16	9.2	9.2	2.2	1.8	28.8	23.5	2.4	1.7	6.8	11.4	3.9	11.7
17	22.2	8.0	1.8	1.2	18.5	26.0	6.4	.9	1.6	12.1	13.5	7.4
18	17.2	14.5	9.2	3.0	10.0	27.2	16.9	.5	2.3	15.4	18.3	6.2
19	13.0	11.8	30.5	5.2	5.5	26.2	22.6	.5	1.9	15.6	11.5	15.5
20	16.2	11.2	13.5	8.0	2.5	19.2	23.4	1.6	1.2	11.8	7.4	13.7
21	17.0	10.5	11.8	4.2	3.0	35.5	11.1	21.7	.8	18.2	20.3	11.4
22	7.2	9.0	13.8	3.5	3.0	44.2	6.0	4.8	.7	13.4	26.4	25.6
23	7.0	11.5	20.0	10.5	1.8	43.8	3.7	1.9	6.6	8.9	15.7	16.9
24	6.5	9.2	20.0	8.5	1.8	24.0	2.2	1.1	17.7	7.7	10.8	5.6
25	14.2	5.0	20.0	6.0	1.8	7.0	1.8	8.0	14.6	6.8	7.3	3.2
26	14.8	3.8	12.5	7.2	3.0	6.8	2.0	.5	4.6	6.2	5.4	3.0
27	24.0	4.5	15.5	17.2	15.8	6.5	15.8	.3	2.6	3.9	5.2	2.6
28	19.0	5.0	14.8	11.8	13.5	11.0	5.7	27.5	5.9	2.7	5.6	1.3
29	15.8	12.0	11.2	5.0	11.0	29.5	3.4	.....	14.9	5.6	3.7	1.3
30	19.2	6.2	13.0	4.5	6.5	19.0	2.8	.....	18.0	19.1	2.9	2.3
31	26.5	5.0	.....	6.2	.....	15.8	3.4	.....	18.0	.....	1.6	.....

NOTE.—No flow Jan. 2–4.

Monthly discharge of Upper Hamakua ditch at Puualala and reservoir No. 3 weirs, near Kukuihaele, Hawaii, for the year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	26.5	4.2	14.4	22.3	445	1,370
August	28.0	3.8	11.9	18.4	369	1,130
September	30.8	1.8	12.7	19.6	382	1,170
October	23.5	.5	5.83	9.02	181	555
November	31.0	1.8	8.76	13.6	263	806
December	44.2	.5	17.0	26.3	527	1,620
January (28 days)	31.1	1.8	10.3	15.9	288	885
February	27.5	.3	3.25	5.03	91	279
March	18.0	.7	7.41	11.5	230	705
April	19.1	2.7	10.4	16.1	313	958
May	26.4	1.6	7.59	11.7	235	722
June	25.6	1.3	9.17	14.2	275	844
The year	.....	.....	.....	.....	3,600	11,000

LOWER HAMAKUA DITCH AT MAIN WEIR, NEAR KUKUIHAELE, HAWAII.

LOCATION.—Just below portal of last tunnel from Waipio Gulch, half a mile southwest of Pacific sugar mill, at Kukuihaele. This ditch diverts all natural run-off from headwaters of the Waipio basin below the Upper Hamakua ditch.

RECORDS AVAILABLE.—July 18, 1910, to June 30, 1917.

GAGE.—Watson water-stage recorder.

DISCHARGE.—Measured by weir consisting of six 5-foot panels, sharp-crested and with a good stilling basin above. Current-meter measurements made in ditch below weir have checked determinations by weir formulas within 2 per cent.

EXTREMES OF DISCHARGE.—See monthly-discharge table.
UTILIZATION.—Irrigation of sugar cane and domestic supply.
ACCURACY.—Records good.
COOPERATION.—Records furnished by the Hawaiian Irrigation Co.

Daily discharge, in million gallons, of Lower Hamakua ditch at main weir, near Kukuihaele, Hawaii, for the year ending June 30, 1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	53.2	53.0	47.0	40.2	59.0	34.2	34.9	32.3	41.4	40.5	39.2	38.1
2	49.0	55.5	60.2	55.2	53.2	33.8	34.9	31.8	34.6	41.4	37.1	42.7
3	46.8	55.5	54.5	46.0	48.2	49.5	37.4	31.3	39.9	36.6	34.1	36.1
4	47.5	53.8	47.8	40.5	38.8	53.5	35.6	31.3	41.5	34.9	33.1	35.3
5	54.0	43.5	49.5	38.5	40.5	40.5	35.7	31.1	38.9	37.9	33.0	33.0
6	52.8	49.5	52.5	37.5	59.5	36.0	39.2	31.1	34.4	40.1	32.7	39.7
7	48.8	42.2	55.5	36.8	49.5	34.0	39.2	31.1	32.5	43.2	31.5	46.3
8	46.5	49.2	50.0	36.2	40.5	35.2	38.9	30.5	32.1	34.1	31.4	54.2
9	42.5	50.5	46.8	35.8	42.0	32.8	38.4	30.6	32.0	38.2	31.4	49.6
10	45.2	54.0	45.5	35.5	36.8	50.5	38.2	30.6	31.3	37.6	34.2	41.9
11	53.2	57.2	42.5	34.8	38.0	40.0	38.7	30.5	35.7	39.1	36.5	45.1
12	52.5	58.5	50.0	35.0	41.2	38.2	38.9	30.1	34.9	43.5	35.6	46.7
13	45.0	60.5	41.5	35.0	36.2	39.2	38.5	29.9	34.5	37.3	35.9	37.1
14	53.0	52.5	39.0	34.8	34.5	37.5	38.0	35.8	36.4	42.2	34.2	33.0
15	43.5	60.5	38.0	37.0	34.2	42.0	36.0	33.8	32.8	47.1	35.4	31.9
16	45.5	56.2	38.0	37.0	60.8	41.2	35.4	31.9	35.1	42.5	32.6	36.3
17	54.5	51.0	36.8	34.5	57.0	41.5	35.0	31.2	33.7	43.2	37.1	35.5
18	53.2	55.5	42.2	34.8	47.5	35.5	34.7	30.9	31.7	41.8	35.4	33.2
19	49.2	55.0	56.0	38.8	41.2	34.5	34.5	30.1	31.8	47.4	36.6	39.0
20	50.5	50.0	49.0	40.0	38.8	35.5	40.2	31.3	31.5	40.4	34.2	39.6
21	52.0	51.8	44.2	43.8	36.0	34.8	36.6	40.8	30.6	47.7	43.9	33.2
22	44.8	49.8	48.0	36.0	34.5	34.8	36.2	38.2	29.9	50.3	51.7	42.9
23	45.2	50.5	53.2	41.0	34.2	34.2	34.4	30.2	35.1	43.2	47.0	39.3
24	48.2	49.0	52.2	42.8	33.8	36.5	34.0	30.9	44.2	35.8	38.7	36.8
25	48.0	46.8	54.2	36.2	33.5	35.0	33.8	30.5	40.6	33.8	37.4	34.2
26	49.0	41.2	50.5	35.5	34.5	36.2	33.5	29.6	33.2	32.8	34.2	32.9
27	53.2	41.0	52.5	33.8	38.0	36.0	33.4	29.7	31.3	32.2	34.6	31.6
28	43.5	44.5	52.5	20.0	54.2	34.5	33.0	43.3	34.6	31.6	35.9	31.8
29	36.8	50.2	50.2	37.5	39.2	35.0	33.3	.....	38.7	33.3	31.7	32.9
30	50.2	46.2	46.2	36.2	34.8	34.5	33.8	.....	40.7	36.0	31.1	33.6
31	51.0	46.2	.....	44.5	.....	35.0	33.5	.....	40.7	.....	30.9	.....

Monthly discharge of Lower Hamakua ditch at main weir, near Kukuihaele, Hawaii, for year ending June 30, 1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
July	54.5	36.8	48.7	75.4	1,510	4,630
August	60.5	41.0	51.0	78.9	1,580	4,850
September	60.2	36.8	48.2	74.6	1,450	4,440
October	55.2	20.0	37.8	58.5	1,170	3,600
November	60.8	33.5	42.3	65.4	1,270	3,890
December	53.5	32.8	37.8	58.5	1,170	3,600
January	40.2	33.0	36.1	55.9	1,120	3,430
February	43.3	29.6	32.2	49.8	900	2,770
March	44.2	29.9	35.4	54.8	1,100	3,370
April	50.3	31.6	39.5	61.1	1,190	3,640
May	51.7	30.9	35.8	55.4	1,110	3,410
June	54.2	31.6	38.1	58.9	1,140	3,510
The year	60.8	20.0	40.3	62.4	14,700	45,100

KOHALA DITCH AT AWINI WEIR, NEAR KOHALA, HAWAII.

LOCATION.—At elevation 1,880 feet in east branch of Honokanenui Gulch, Kohala district.
RECORDS AVAILABLE.—July 1, 1907, to June 30, 1917.
GAGE.—Vertical staff showing head on weir.
DISCHARGE MEASUREMENTS.—Measured by a sharp-crested weir consisting of three 5-foot panels.

EXTREMES OF DISCHARGE.—See monthly-discharge tables.
UTILIZATION.—For irrigation of sugar cane and for domestic supply.
ACCURACY.—Records good.
COOPERATION.—Records furnished by the Kohala Ditch Co.

Daily discharge, in million gallons, of Kohala ditch at Awini weir, near Kohala, Hawaii, for the years ending June 30, 1914–1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1914.												
1	16.9	3.3	5.2	0.9	.....	6.6	5.2	15	1.5	7.0	7.0	17
2	19.5	4.4	3.7	.9	.....	9.8	4.4	13	1.2	11	6.6	17
3	16.9	8.4	4.8	.9	11.5	9.8	4.0	10	.9	7.9	5.8	16
4	14.6	6.2	4.8	.9	18.3	10.5	10	11	.9	7.0	9.8	16
5	12.5	5.8	3.7	.5	13.6	20.7	21	9.8	.9	7.0	21	21
6	20.7	5.2	3.0	.5	10.5	20.7	17	9.3	.9	5.2	21	18
7	20.7	4.0	6.2	.5	7.0	20.7	10	8.4	.9	16	21	17
8	16.9	4.0	6.2	1.5	5.2	20.7	9.3	8.4	.9	14	21	16
9	14.6	3.3	5.2	1.2	20.1	20.1	21	7.5	.9	11	17	21
10	12.0	4.0	6.2	2.1	20.1	19.5	21	7.0	17	11	21	21
11	10.5	4.0	7.9	1.5	20.1	16.9	18	6.6	12	16	21	21
12	14.6	16.9	7.0	.9	20.1	14.1	21	6.2	7.0	11	21	18
13	16.9	20.7	7.9	.7	15.2	12.5	21	6.2	16	7.9	21	17
14	14.6	20.7	6.2	.5	12.0	11.5	18	6.2	14	5.2	21	16
15	14.6	16.9	4.8	.5	10.5	20.7	17	5.2	9.3	4.4	21	16
16	12.5	15.2	4.0	1.5	12.0	20.7	10	5.2	6.6	3.7	21	15
17	10.5	12.5	3.7	1.2	20.1	20.7	14	4.8	11	3.3	21	21
18	8.4	7.5	7.9	.9	20.1	20.7	13	4.0	10	3.3	21	21
19	8.4	5.8	11.5	.7	20.1	16.9	11	3.3	6.2	21	21	21
20	7.5	4.8	7.0	.5	16.3	14.1	11	3.0	4.8	21	21	21
21	6.6	4.8	5.2	.5	20.1	12.5	8.8	3.0	4.4	21	21	18
22	7.9	4.0	4.4	.5	14.6	10.5	21	3.0	4.0	21	17	21
23	7.5	3.3	3.3	.5	13.6	15.7	21	2.7	3.3	21	17	21
24	6.6	2.7	2.7	.5	13.6	14.1	17	2.4	2.7	21	15	21
25	5.8	4.0	1.8	.5	12.5	12.5	14	2.4	18	21	15	21
26	6.2	2.1	1.8	.5	12.5	10.5	10	2.0	17	16	15	21
27	5.8	2.1	1.8	.3	11.0	9.8	8.8	2.0	11	13	14	21
28	5.8	2.1	1.2	.2	9.8	7.9	11	1.8	8.4	13	21	18
29	5.2	2.1	1.2	.....	8.4	6.6	21	.....	10	9.8	17	21
30	4.4	5.8	1.2	.....	7.5	6.2	21	.....	17	8.4	15	18
31	4.4	5.8	.....	.....	.....	6.2	17	.....	10	.....	15	.....
1915.												
1	18	18	21	21	21	19	15	16	7.5	17	17	5.2
2	21	18	21	21	18	18	15	16	6.6	15	16	10
3	18	21	21	21	16	16	16	13	10	13	15	9.8
4	21	21	21	18	14	15	21	9.3	10	10	13	7.9
5	21	21	21	18	13	18	21	16	10	8.4	13	5.2
6	21	21	21	21	10	16	17	16	14	7.5	10	5.2
7	21	21	21	21	9.3	15	15	15	14	8.4	9.8	4.8
8	21	21	19	21	9.3	13	15	15	14	8.4	9.8	4.8
9	21	21	18	21	8.8	13	13	14	14	21	9.3	4.8
10	21	21	18	21	8.4	11	13	19	11	21	16	4.8
11	21	21	17	18	8.4	10	21	21	8.4	21	18	4.8
12	21	21	16	17	8.4	18	17	21	9.3	18	18	4.8
13	21	21	17	15	7.9	21	15	21	9.3	16	16	4.8
14	21	21	17	14	7.9	21	13	21	21	13	10	6.2
15	21	21	16	18	21	18	11	17	21	10	10	5.8
16	19	21	16	17	21	16	10	17	17	10	10	9.3
17	18	21	17	17	17	15	9.3	17	14	21	10	12
18	17	21	21	18	14	13	8.4	21	13	18	9.3	9.2
19	16	21	21	17	21	10	7.5	21	9.3	18	9.3	9.2
20	15	21	21	16	21	21	7.0	21	8.8	21	9.3	13
21	15	21	19	16	19	21	6.6	17	7.5	18	9.3	12
22	18	21	18	15	18	18	12	16	6.6	21	9.3	8.4
23	18	21	17	14	18	16	12	15	6.6	21	9.3	21
24	21	21	16	13	21	15	11	15	6.6	18	9.3	21
25	21	21	16	13	21	21	11	14	6.6	18	9.1	18
26	21	21	16	11	21	21	10	10	5.8	21	7.0	18
27	21	21	21	18	21	21	8.8	10	5.8	21	7.0	21
28	21	21	21	18	21	21	8.4	9.8	4.8	18	7.6	17
29	21	21	19	17	21	21	7.9	.....	4.8	18	7.6	11
30	21	21	18	15	21	18	7.0	.....	4.8	18	5.8	9.8
31	21	21	.....	18	.....	17	7.6	.....	4.4	.....	5.8	.....

Daily discharge, in million gallons, of Kohala ditch at Awini weir, near Kohala, Hawaii, for the years ending June 30, 1914–1917—Continued.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1916.												
1	17	14	3.3	21	17	8.4	12	7.5	4.4	6.2	21	21
2	16	14	3.3	21	17	5.7	11	7.5	4.4	6.2	21	21
3	13	16	3.3	15	17	21	12	7.5	3.3	6.2	21	21
4	10	16	3.3	10	21	17	14	5.2	3.0	5.8	21	21
5	13	15	3.3	7.9	17	14	21	4.4	12	4.8	21	18
6	15	14	3.3	5.2	15	12	17	3.7	12	4.4	21	16
7	16	11	2.7	5.2	13	21	15	3.7	12	4.4	21	12
8	21	8.4	2.7	4.4	10	17	21	3.0	9.3	4.0	21	10
9	21	7.9	2.0	4.4	17	14	21	3.0	5.2	17	21	9.3
10	16	6.6	2.0	6.6	17	12	21	3.0	3.0	14	21	8.8
11	14	6.6	2.0	9.3	17	12	21	2.4	3.0	10	18	7.9
12	13	5.8	4.8	8.8	15	10	17	2.1	3.0	7.5	17	18
13	11	5.8	5.2	6.2	15	8.4	15	2.1	18	4.0	16	16
14	11	5.2	3.3	4.4	15	7.9	18	2.1	17	3.7	15	21
15	14	5.2	3.7	3.7	17	7.0	17	1.8	21	17	14	18
16	21	5.2	5.2	3.7	15	7.9	15	1.5	15	16	12	17
17	21	4.8	3.3	3.0	11	9.3	17	1.5	10	14	16	18
18	16	4.4	3.0	2.7	13	9.3	21	1.5	10	14	14	21
19	11	4.4	3.0	3.7	21	9.3	21	1.5	8.4	21	12	18
20	10	4.0	7.0	3.7	21	21	21	1.5	8.4	21	12	18
21	8.4	4.0	5.8	14	21	21	17	1.5	7.0	21	10	21
22	7.0	4.4	5.2	14	17	21	15	1.5	9.3	17	9.8	21
23	9.3	4.8	5.2	11	14	17	12	1.5	12	12	12	21
24	9.3	4.4	2.7	21	12	14	10	1.2	8.8	16	10	18
25	6.6	4.0	2.7	17	10	10	10	.9	8.8	15	9.8	17
26	6.6	4.0	2.0	13	10	21	18	.9	8.8	14	9.3	21
27	11	4.0	5.8	13	8.8	21	10	10	8.8	12	7.9	21
28	16	4.0	14	21	10	17	12	7.9	8.8	21	7.5	21
29	11	4.0	15	21	10	12	10	4.8	6.2	21	16	21
30	13	4.0	21	21	8.8	10	9.8	.....	8.8	21	17	21
31	16	4.0	.....	21	.....	14	8.8	.....	8.8	.....	17	.....
1917.												
1	20.7	20.7	7.5	9.3	16.9	5.8	12.5	7.9	14.6	20.7	13.6	4.0
2	16.9	20.7	20.7	8.4	14.1	5.2	10.5	6.2	11.5	11.5	9.8	7.0
3	11.0	20.7	14.6	7.5	11.0	16.9	8.8	6.2	16.9	11.0	6.6	5.8
4	12.5	20.7	12.5	6.6	7.9	12.5	20.7	4.8	14.6	11.0	4.4	6.2
5	12.5	16.9	10.5	5.8	7.9	8.8	20.7	4.8	11.5	11.5	4.4	5.2
6	12.5	14.6	9.3	5.2	14.6	6.6	18.9	4.0	9.3	11.5	2.7	3.7
7	11.0	14.6	14.6	4.8	12.5	5.2	16.9	4.0	7.5	13.6	2.7	5.2
8	10.5	18.3	12.0	4.8	8.8	4.4	14.1	4.0	5.2	12.0	2.1	10.5
9	9.8	16.9	10.5	4.8	6.6	3.7	11.0	3.3	4.8	8.4	2.1	10.5
10	9.3	16.9	11.0	3.7	4.0	20.7	9.8	3.3	4.4	9.3	2.1	9.8
11	14.6	20.7	9.8	3.3	3.7	16.9	10.5	3.3	4.8	11.0	2.1	9.8
12	12.5	20.7	9.8	3.3	3.7	12.5	9.8	3.0	7.0	11.5	2.1	9.8
13	11.0	20.7	8.8	3.3	3.3	11.0	10.5	3.0	6.2	8.8	2.1	7.9
14	20.7	20.7	7.9	3.3	3.3	8.4	8.4	3.3	7.9	7.5	2.7	6.2
15	16.9	20.7	6.6	3.3	3.3	8.8	7.4	3.3	6.6	11.0	2.7	5.2
16	18.9	16.9	5.8	3.3	16.9	10.5	7.0	3.3	9.8	11.5	2.1	3.7
17	20.7	15.7	4.8	2.7	14.1	16.9	7.0	3.0	7.5	13.6	4.8	3.3
18	20.7	20.7	5.8	2.4	10.5	20.7	7.0	2.7	6.6	11.5	10.5	1.5
19	18.9	16.9	16.9	2.7	9.3	20.7	6.6	2.7	6.6	13.6	12.5	5.2
20	16.9	14.1	14.6	2.7	7.0	20.7	6.6	2.5	4.4	12.0	9.3	5.2
21	14.6	12.5	10.5	2.7	6.2	20.7	6.2	10.5	4.4	12.0	9.3	5.2
22	14.6	10.5	9.3	2.7	6.2	20.7	6.2	7.9	4.0	12.5	14.1	7.9
23	12.5	8.8	9.3	3.3	6.2	20.7	5.8	5.8	3.7	12.5	10.5	8.4
24	11.0	7.9	9.3	5.8	5.2	20.7	5.8	4.0	15.7	11.0	9.8	11.0
25	9.3	7.5	10.5	4.8	4.4	16.9	5.8	4.0	11.0	8.4	8.4	9.3
26	9.3	7.5	9.3	6.6	5.8	14 6	5.8	3.3	7.4	5.8	6.2	5.2
27	20.7	7.5	9.3	6.6	8.4	11 0	5.8	3.3	7.4	5.8	6.2	3.7
28	20.7	7.5	9.3	6.6	14.6	11.0	5.8	16.9	7.4	7.5	4.8	3.7
29	16.9	7.9	9.3	5.2	9.3	20.7	5.8	.....	8.8	5.8	4.8	3.7
30	20.7	7.9	8.8	6.6	6.6	20.7	10.5	.....	20.7	11.0	4.8	3.3
31	20.7	7.9	.....	10.5	.....	15.7	8.4	.....	16.9	.....	4.4	.....

NOTE.—No flow Oct. 29 to Nov. 2, 1913.

Monthly discharge of Kohala ditch at Awini weir, near Kohala, Hawaii, for years ending June 30, 1914–1917.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
1914.						
July	20.7	4.4	11.3	17.5	350	1,080
August	20.7	2.1	6.85	10.6	212	652
September	11.5	1.2	4.72	7.30	142	435
October (28 days)	2.1	.2	.80	1.24	22	69
November (28 days)	20.1	5.2	14.2	22.0	396	1,220
December	20.7	6.2	14.2	22.0	440	1,350
January	21	4.0	14.4	22.3	448	1,370
February	15	1.8	6.05	9.36	169	520
March	18	.9	7.38	11.4	229	702
April	21	3.3	12.0	18.6	359	1,100
May	21	5.8	17.5	27.1	543	1,660
June	21	15	18.9	29.2	568	1,740
The year	.....	.....	.....	.....	3,880	11,900
1915.						
July	21	15	19.8	30.6	613	1,880
August	21	18	20.8	32.2	645	1,980
September	21	16	18.7	28.9	562	1,720
October	21	11	17.4	26.9	539	1,660
November	21	7.9	15.9	24.6	477	1,460
December	21	10	17.0	26.3	527	1,620
January	21	6.6	12.3	19.0	382	1,170
February	21	9.3	16.2	25.1	454	1,390
March	21	4.4	9.89	15.3	306	941
April	21	7.5	16.3	25.2	488	1,500
May	18	5.8	10.8	16.7	336	1,030
June	21	4.8	9.96	15.4	299	917
The year	21	4.4	15.4	23.8	5,630	17,300
1916.						
July	21	3.6	13.4	20.7	414	1,270
August	16	4.0	7.09	11.0	220	675
September	21	2.0	4.97	7.69	149	458
October	21	2.7	10.9	16.9	337	1,040
November	21	8.8	14.8	22.9	443	1,360
December	21	5.7	13.6	21.0	422	1,290
January	21	8.8	15.5	24.0	481	1,470
February	10	.9	3.33	5.15	97	297
March	21	3.0	8.98	13.9	278	854
April	21	3.7	12.4	19.2	371	1,140
May	21	7.5	15.6	24.1	482	1,480
June	21	7.9	17.8	27.5	534	1,640
The year	21	.9	11.6	17.9	4,230	13,000
1917.						
July	20.7	9.3	15.1	23.4	470	1,440
August	20.7	7.5	14.9	23.1	462	1,420
September	20.7	4.8	10.3	15.9	309	948
October	10.5	2.4	4.92	7.61	153	468
November	16.9	3.3	8.41	13.0	252	774
December	20.7	3.7	13.9	21.5	430	1,320
January	20.7	5.8	9.57	14.8	297	910
February	16.9	2.5	4.80	7.43	134	412
March	20.7	3.7	8.87	13.7	275	844
April	20.7	5.8	10.8	16.7	325	994
May	14.1	2.1	5.96	9.22	185	567
June	11.0	1.5	6.24	9.65	187	574
The year	20.7	1.5	9.53	14.7	3,480	10,700

KOHALA DITCH AT NIULII WEIR, NEAR KOHALA, HAWAII.

LOCATION.—At elevation 1,000 feet, 3½ miles south of Niulii, Kohala district.

RECORDS AVAILABLE.—July 1, 1907, to June 30, 1917.

GAGE.—Vertical staff showing head on weir.

DISCHARGE MEASUREMENTS.—Measured by sharp-crested weir consisting of three 5-foot panels.

EXTREMES OF DISCHARGE.—See monthly-discharge table.

UTILIZATION.—For irrigation of sugar cane and for domestic supply.
ACCURACY.—Records good.
COOPERATION.—Records furnished by Kohala Ditch Co.

Daily discharge, in million gallons, of Kohala ditch at Niulii weir, near Kohala, Hawaii, for the years ending June 30, 1914–1917.

Date.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1914.												
1	10.6	9.9	9.5	6.8	6.0	9.9	16	27	9.9	18	18	27
2	8.0	10.2	8.2	6.3	6.0	13.0	16	25	9.3	27	18	27
3	10.6	12.0	8.5	6.3	14.7	12.2	14	24	8.6	22	16	27
4	12.8	11.8	8.5	6.8	9.1	13.1	24	27	8.6	18	20	27
5	14.9	11.5	8.2	7.3	13.9	6.8	27	24	8.6	18	27	27
6	6.8	10.6	8.2	7.3	10.6	6.8	27	22	8.6	16	27	27
7	6.8	9.2	10.3	6.7	9.5	6.8	24	21	8.6	27	27	27
8	10.6	9.2	11.1	7.1	8.1	6.8	23	21	8.6	27	27	27
9	12.8	9.2	10.6	7.4	6.1	7.4	27	19	8.6	26	27	27
10	12.4	9.2	11.1	14.4	7.4	8.0	27	16	27	25	27	27
11	11.5	9.2	14.0	8.4	7.4	10.6	27	16	23	27	27	27
12	12.8	10.6	11.7	9.0	7.4	13.3	27	16	16	25	27	27
13	10.6	6.8	11.6	8.0	12.3	14.9	27	16	27	20	27	27
14	12.8	6.8	9.6	7.3	13.3	16.0	27	16	27	16	27	27
15	12.8	10.6	8.5	7.3	11.5	6.8	27	15	20	15	27	27
16	10.3	12.3	7.8	6.2	11.6	6.8	24	16	16	14	27	27
17	11.5	12.8	7.5	6.5	7.4	6.8	27	14	24	13	27	27
18	13.6	12.1	14.0	6.8	7.4	6.8	27	13	21	13	27	27
19	12.8	10.7	16.0	7.1	7.4	10.6	25	13	15	27	27	27
20	12.1	9.9	10.2	7.3	11.1	13.3	27	12	13	27	27	27
21	12.2	9.9	8.8	7.3	7.4	14.9	24	12	13	27	27	27
22	14.0	9.2	8.1	7.3	12.8	15.6	27	12	12	27	27	27
23	14.5	9.2	7.2	7.3	13.9	11.7	27	11	11	27	27	27
24	13.0	9.2	7.2	8.2	13.9	13.3	27	11	9.9	27	27	27
25	10.7	9.2	6.9	8.2	14.9	12.8	27	11	27	27	27	27
26	12.6	9.1	7.5	6.7	14.9	13.1	24	11	27	27	27	27
27	11.5	8.5	6.9	6.8	16.5	12.2	24	11	23	26	27	27
28	11.5	8.5	6.5	7.0	13.8	11.6	25	11	20	24	27	27
29	12.1	9.1	7.4	6.6	12.8	11.4	27	.....	24	23	27	27
30	11.3	10.0	7.4	6.6	11.3	11.1	27	.....	27	19	27	27
31	11.3	10.0	.....	6.6	.....	11.1	27	.....	24	.....	27	.....
1915.												
1	27	27	27	27	27	27	27	27	24	27	27	16
2	27	27	27	27	27	27	27	27	23	27	27	24
3	27	27	27	27	27	27	27	24	24	24	27	24
4	27	27	27	27	27	27	27	20	24	21	27	20
5	27	27	27	27	27	27	27	27	24	20	27	16
6	27	27	27	27	27	27	27	27	27	19	25	16
7	27	27	27	27	27	27	27	27	27	20	22	16
8	27	27	27	27	27	27	27	27	27	20	26	16
9	27	27	27	27	26	27	27	27	27	24	24	16
10	27	27	27	27	23	27	27	27	24	27	27	16
11	27	27	27	27	23	27	27	27	22	27	27	16
12	27	27	27	27	23	27	27	27	25	27	27	16
13	27	27	27	27	22	27	27	27	24	27	26	16
14	27	27	27	27	22	27	27	27	27	24	23	19
15	27	27	27	27	27	27	27	27	27	22	25	17
16	27	27	27	27	27	27	27	27	27	22	25	23
17	27	27	27	27	27	27	27	27	27	27	25	26
18	27	27	27	27	27	27	27	27	27	27	25	22
19	27	27	27	27	27	27	25	27	25	27	22	22
20	27	27	27	27	27	27	24	27	24	27	22	27
21	27	27	27	27	27	27	24	27	23	27	22	26
22	27	27	27	27	27	27	25	27	22	27	22	20
23	27	27	27	27	27	27	26	27	22	27	22	27
24	27	27	27	24	27	27	26	27	22	27	22	27
25	27	27	27	24	27	27	27	27	22	27	20	27
26	27	27	27	24	27	27	25	25	21	27	19	27
27	27	27	27	27	27	27	24	27	21	27	19	27
28	27	27	27	27	27	27	24	26	19	27	18	27
29	27	27	27	27	27	27	22	.....	19	27	18	24
30	27	27	27	27	27	27	20	.....	19	27	17	24
31	27	27	.....	27	.....	27	19	.....	18	.....	17	.....

40532°—18—WSP 465——12

Daily discharge, in million gallons, of Kohala ditch at Niulii weir, near Kohala, Hawaii, for the years ending June 30, 1914–1917—Continued.

Day.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1916.												
1	27	27	13	27	27	24	26	22	16	18	27	27
2	27	27	13	27	27	22	25	22	16	17	27	27
3	25	27	13	27	27	27	27	22	14	17	27	27
4	23	27	13	24	27	27	27	20	13	16	27	27
5	26	27	13	18	27	27	27	19	26	15	27	27
6	27	27	13	15	27	27	27	18	26	14	27	27
7	27	27	12	15	27	27	27	18	24	14	27	27
8	27	22	12	13	25	27	27	16	20	13	27	26
9	27	21	11	13	27	27	27	16	16	27	27	25
10	27	19	11	19	27	25	27	16	13	27	27	24
11	27	19	11	21	27	25	27	16	13	23	27	24
12	26	17	16	20	27	24	27	15	13	17	27	27
13	24	17	17	16	27	22	27	14	27	14	27	27
14	24	16	14	15	27	21	27	14	27	13	27	27
15	27	16	15	14	27	20	27	13	27	27	27	27
16	27	16	16	14	27	21	27	12	27	27	27	27
17	27	16	14	13	26	24	27	12	24	27	27	27
18	27	15	13	13	27	24	27	12	24	27	27	27
19	24	15	13	14	27	24	27	12	19	27	27	27
20	23	14	20	14	27	27	27	12	19	27	27	27
21	20	14	16	27	27	27	27	12	17	27	27	27
22	18	15	16	27	27	27	27	12	20	27	27	27
23	20	16	16	25	27	27	27	12	26	25	26	27
24	20	15	12	27	27	27	27	12	23	27	27	27
25	17	14	12	27	27	23	27	11	23	27	27	27
26	17	14	11	24	25	27	27	11	23	26	26	27
27	24	14	16	27	24	27	27	27	23	25	25	27
28	27	14	24	27	27	27	27	22	23	27	24	27
29	24	14	26	27	26	24	27	16	16	27	27	27
30	26	14	27	27	25	24	26	.....	23	27	27	27
31	27	14	.....	27	.....	27	24	.....	23	.....	27	.....
1917.												
1	27.4	27.4	19.5	23.6	27.4	16.5	27.4	20.3	27.4	27.4	27.4	14.6
2	27.4	27.4	27.4	22.0	27.4	15.7	24.4	16.5	24.4	24.4	22.0	19.5
3	27.4	27.4	27.4	20.3	23.6	27.4	22.8	16.5	27.4	23.6	18.0	17.2
4	27.4	27.4	22.8	18.8	21.1	27.4	27.4	13.9	27.4	23.6	15.7	18.0
5	27.4	27.4	27.4	17.2	21.1	24.4	27.4	13.9	25.3	24.4	15.7	16.5
6	27.4	27.4	22.0	16.5	27.4	18.8	27.4	13.2	22.7	24.4	13.9	13.9
7	27.4	27.4	27.4	15.7	27.4	17.2	27.4	13.2	18.8	27.4	13.9	16.0
8	24.4	27.4	24.4	15.7	22.8	15.7	27.4	13.2	15.7	25.3	13.2	24.4
9	23.6	27.4	22.8	15.7	19.5	14.6	23.6	12.5	14.6	20.3	13.2	24.4
10	22.0	27.4	23.6	14.6	15.7	27.4	22.0	12.5	13.9	22.0	13.2	23.6
11	27.4	27.4	22.0	13.9	14.6	27.4	25.3	12.5	14.6	23.6	13.2	23.6
12	27.4	27.4	22.0	13.9	14.6	27.4	23.6	11.9	21.1	24.4	13.2	23.6
13	23.6	27.4	20.3	14.6	13.2	25.3	24.4	11.9	16.5	21.1	13.2	20.3
14	27.4	27.4	18.0	14.6	13.2	19.5	21.1	16.5	22.0	19.5	13.9	17.2
15	27.4	27.4	16.5	14.6	13.9	22.8	20.3	15.7	18.0	23.6	13.9	16.5
16	27.4	27.4	15.7	14.6	27.4	25.3	19.5	15.7	24.4	24.4	13.2	13.9
17	27.4	27.4	14.6	13.2	27.4	27.4	19.5	13.9	22.0	27.4	18.0	13.2
18	27.4	27.4	15.7	12.5	26.1	27.4	19.5	13.2	18.0	24.4	24.4	9.9
19	27.4	27.4	27.4	13.2	20.3	27.4	18.8	13.2	19.5	27.4	27.4	15.7
20	27.4	27.4	27.4	13.2	18.0	27.4	18.8	12.5	16.5	25.3	24.4	16.5
21	27.4	27.4	22.8	13.2	15.7	27.4	18.0	27.4	14.6	25.3	22.0	15.7
22	27.4	27.4	22.0	13.2	15.7	27.4	18.0	18.8	14.6	27.4	27.4	20.3
23	25.3	27.4	22.0	13.9	15.7	27.4	17.2	15.7	13.2	27.4	24.4	22.0
24	24.4	27.4	22.0	19.5	14.6	27.4	17.2	13.2	27.4	23.6	23.6	27.4
25	22.8	21.1	23.6	15.7	13.9	27.4	17.2	13.2	24.4	20.3	21.1	22.8
26	22.8	20.3	22.0	17.2	16.5	27.4	17.2	11.9	18.8	18.0	16.5	15.7
27	27.4	20.3	22.0	18.0	18.8	25.3	17.2	11.9	21.1	18.0	16.5	13.9
28	27.4	20.3	22.0	18.0	27.4	25.3	17.2	27.4	18.0	19.5	14.6	13.9
29	27.4	21.1	22.0	16.5	23.6	27.4	27.4	.....	22.0	18.0	14.6	13.9
30	27.4	21.1	20.3	18.0	17.2	27.4	21.1	.....	27.4	23.6	14.6	13.2
31	27.4	21.1	.....	24.4	.....	27.4	.....	.....	27.4	.....	13.9	.....

Monthly discharge of Kohala ditch at Niulii weir, near Kohala, Hawaii, for years ending June 30, 1914–17.

Month.	Discharge.				Total run-off.	
	Million gallons per day.			Second-feet (mean).	Million gallons.	Acre-feet.
	Maximum.	Minimum.	Mean.			
1914.						
July	14.9	6.8	11.7	18.1	362	1,110
August	12.8	6.8	9.89	15.3	306	941
September	16.0	6.5	9.30	14.4	279	856
October	14.4	6.2	7.38	11.4	229	702
November	16.5	6.0	10.7	16.6	320	985
December	15.6	6.8	10.8	16.7	336	1,030
January	27.0	14	25.0	38.7	776	2,380
February	27.0	11	16.5	25.5	463	1,420
March	27.0	8.6	17.0	26.3	526	1,620
April	27.0	13	22.5	34.8	675	2,070
May	27.0	16	25.8	39.9	801	2,450
June	27.0	27	27.0	41.8	810	2,490
The year	27.0	8.6	16.1	24.9	5,880	18,100
1915.						
July	27	27	27.0	41.8	837	2,570
August	27	27	27.0	41.8	837	2,570
September	27	27	27.0	41.8	810	2,490
October	27	24	26.7	41.3	828	2,540
November	27	22	26.2	40.5	787	2,410
December	27	27	27.0	41.8	837	2,570
January	27	19	25.7	39.8	797	2,440
February	27	20	26.5	41.0	743	2,280
March	27	18	23.7	36.7	734	2,250
April	27	19	25.2	39.0	756	2,320
May	27	17	23.3	36.1	722	2,220
June	27	16	21.3	33.0	640	1,960
The year	27	16	25.6	39.6	9,330	28,600
1916.						
July	27	17	24.5	37.9	759	2,330
August	27	14	18.4	28.5	570	1,750
September	27	11	15.0	23.2	449	1,380
October	27	13	20.8	32.2	644	1,980
November	27	24	26.6	41.2	799	2,450
December	27	20	25.1	38.8	779	2,390
January	27	24	26.8	41.5	830	2,550
February	27	11	15.7	24.3	456	1,400
March	27	13	20.8	32.2	644	1,980
April	27	13	22.4	34.7	672	2,060
May	27	24	26.8	41.5	830	2,550
June	27	24	26.7	41.3	801	2,460
The year	27	11	22.5	34.8	8,230	25,300
1917.						
July	27.4	22.0	26.4	40.8	819	2,510
August	27.4	20.3	25.9	40.1	803	2,460
September	27.4	14.6	22.2	34.3	665	2,040
October	24.4	12.5	16.3	25.2	506	1,550
November	27.4	13.2	20.0	30.9	601	1,840
December	27.4	14.6	24.5	37.9	760	2,330
January	27.4	17.2	21.8	33.7	677	2,070
February	27.4	11.9	15.1	23.4	422	1,300
March	27.4	13.2	20.6	31.9	639	1,960
April	27.4	18.0	23.5	36.4	705	2,160
May	27.4	13.2	17.7	27.4	550	1,680
June	27.4	9.9	17.9	27.7	537	1,650
The year	27.4	9.9	21.0	32.5	7,680	23,600

RAINFALL.

GENERAL CONDITIONS.

The rainfall of the Hawaiian Islands is extremely variable, ranging from a few inches at several low-level, leeward localities to nearly 600 inches per annum, at elevations exceeding 2,000 feet on the windward sides of the islands. Valleys on the same sides of the islands and within a few miles of each other may have a variation in mean annual precipitation of several hundred per cent. The rainfall may also vary greatly in the same valley at different elevations. As a rule the zones of heaviest precipitation are on the windward sides of the islands, 2,000 to 3,000 feet above sea level.

Most of the daily rain gages maintained by the United States Weather Bureau are at low levels. Lack of funds and the absence of residents have prevented the bureau from maintaining stations at high levels, but it obtains a number of daily records from occupants and caretakers of mountain houses and ranches. The data furnished by the Weather Bureau are therefore generally of little value in determining stream run-off.

When high levels have been accessible and funds available high-level rain gages, which are read at monthly, bimonthly, or longer intervals, have been established by this office and some valuable records obtained. To determine the precipitation throughout the Territory accurately would require the installation of thousands of gages and the construction of hundreds of miles of trails. For this reason and because of the extreme and variable porosity of the soil, it is impossible to determine any consistent relation between rainfall and stream run-off.

Acknowledgment for cooperation in furnishing rainfall data is due the following companies and individuals:

Kauai: Kekaha Sugar Co.; Hawaiian Sugar Co.; Grove Farm Plantation; W. F. Sanborn, of Princeville Ranch; Kauai Electric Co.; J. McClellan.

Oahu: F. Meyer; United States Army; Koolau Agricultural Co.; Hawaii Preserving Co.

Maui: Wailuku Sugar Co.; Honolua Ranch; Hawaiian Commercial & Sugar Co.; Maui Board of Supervisors; Pioneer Mill Co.; Olowalu Sugar Co.

Hawaii: Hawaii Mill Co.; W. S. May; C. F. Clark; C. R. Willard; Honokaa Sugar Co.; Pacific Sugar Mill; Hawaiian Irrigation Co.; Kukaiau Ranch Co.; Waiakea Sugar Co.

The tables on pages 185–188 show the precipitation at stations maintained by the Geological Survey and precipitation data furnished from private sources which are not included in United States Weather Bureau records, to which those interested in further data are referred.

RAINFALL STATIONS IN HAWAII.

KAUAI.

1. Waialeale, on summit of ridge at headwaters of Hanapepe, Wainiha, Hanalei, and Olokele streams, and North and South forks of Wailua River; about 25 miles by road and trail northeast of Waimea; 5,075 feet above sea level.

2. Intake of Kauai Electric Co.'s canal, 6 miles back of Hanalei; 700 feet above sea level; records furnished by Kauai Electric Co.

3. About 50 feet below Kauai Electric Co.'s power house, at tailrace, 7 miles west of Hanalei; 125 feet above sea level; records furnished by Kauai Electric Co.

4. Summit Camp (Wainiha Ridge), Hanalei; about 30 feet southwest of house at Summit camp on power line; 6 miles from Kapaka; 1,900 feet above sea level; gage read by employee of Kauai Electric Co.

5. Kapaka, at lineman's camp, about 50 feet north of house, and 5 miles south of Hanalei; 635 feet above sea level; gage read by employee of Kauai Electric Co.

6. About 40 feet north of Sanborn's residence, 2 miles from Hanalei; 105 feet above sea level; records furnished by Princeville ranch.

7. Pilaa, about 200 feet north of Government road and 200 feet west of assistant overseer's house; about 2 miles south of Kilauea; 300 feet above sea level. Gage read by Mr. Buch, an employee of Kilauea Sugar Plantation Co.

8. Kaloko, on embankment of Kaloko reservoir about 3 miles southeast of Kilauea; 740 feet above sea level. Gage read by Mr. Buch, an employee of Kilauea Sugar Plantation Co.

9. Residence of W. S. Newlun, about 4½ miles west of Kapaa; 375 feet above sea level.

10. Mount Nonou, near house of Elmer M. Cheatham on west slope of Mount Nonou, about 4 miles west of Kapaa; 350 feet above sea level.

11. North Wailua, at stream-gaging station on North Wailua River, about 1 mile upstream from Kanaha ditch intake, and about 10 miles northwest of Lihue; 650 feet above sea level.

12. Waiahi, on South Wailua River, near Lihue Electric Co.'s power plant, 7 miles from Lihue; 600 feet above sea level.

13. Aakukui, near plantation camp, about 5 miles southwest of Lihue; 350 feet above sea level; records furnished by Grove Farm.

14. Reservoir No. 6, on Grove Farm Plantation, about 5 miles west of Lihue; 400 feet above sea level.

15. At ditchman's house, 500 feet west of Papuaa Reservoir, 6 miles west of Lihue; 500 feet above sea level.

16. Hiloa-Manawaiopuna divide, on ridge between east and west branches of Hanapepe Stream, about 10 miles northeast of Eleele; 2,080 feet above sea level.

17. Hanapepe Valley, on the left bank of Hanapepe ditch, 3 miles above Koula, and about 8 miles north of Eleele; 530 feet above sea level; records furnished by Hawaiian Sugar Co.

18. Camp No. 2, about 2 miles northwest of Hanapepe and 7 miles southeast of Waimea; 250 feet above sea level; records furnished by Hawaiian Sugar Co.

19. Olokele mauka, on ridge on left side of Olokele Stream above intake of Olokele ditch, and about 18 miles by road and trail from Waimea; 2,100 feet above sea level; records furnished by Hawaiian Sugar Co.

20. Keanakua, near Halekua camp, on ridge about 16 miles by road and trail northeast of Waimea; 4,450 feet above sea level.

21. Kahana, near Halekua camp, on ridge about 16 miles by road and trail via Kaholuamanu from Waimea; 3,750 feet above sea level.

22. Kaholuamanu, about 12 miles by road and trail northeast of Waimea; 3,650 feet above sea level.

23. Waimea, in Mr. J. McClellan's yard; 10 feet above sea level; Mr. McClellan aids in obtaining record.

24. Camp No. 7, about 2 miles northeast of Waimea; 150 feet above sea level; records furnished by Hawaiian Sugar Co.

25. Pali trail, half a mile mauka of Kekaha ditch where trail crosses and about 2 miles mauka from Waimea; 850 feet above sea level; records furnished by Kekaha Sugar Co.

26. Hukipo, 3 miles northwest of Waimea; 400 feet above sea level; records furnished by Kekaha Sugar Co.

27. Waialae, near Kaholuamanu; 14 miles by road and trail north of Waimea, near Waialae gaging station; 3,600 feet above sea level.

28. Mohiki-Koaie divide, on ridge about 24 miles by road and trail north of Waimea; 3,950 feet above sea level.

29. Mohihi, on ridge at head of Mohihi Valley and about 23 miles by road and trail northeast of Waimea; 3,500 feet above sea level.

30. Kilohana, near Alakai swamp, about 23 miles by road and trail northeast of Waimea; 4,023 feet above sea level.

31. Waiakoali, about 22 miles by road via Halemanu north of Waimea; 3,450 feet above sea level.

32. Paukahana, about 21 miles north of Waimea by road and trail; 3,723 feet above sea level.

33. Lehuamakanoi, about 22 miles by road and trail north of Waimea; 3,932 feet above sea level.

34. Puu Lua, near wagon road from Kekaha to Halemanu, about 12 miles north of Waimea; 3,500 feet above sea level.

35. Kokee, on mesa half a mile above Knudsen's camp, near head of Kokee Stream and about 19 miles north of Waimea; 3,550 feet above sea level.

36. At residence of C. E. French, 3 miles northwest of Kapaa; 350 feet above sea level.

37. At office of Koloa Sugar Co.; 240 feet above sea level.

38. At the stream, gaging station on Kalihiwai River, 10 miles from Hanalei via Kauai Electric Co.'s power line trail; 700 feet above sea level.

OAHU.

1. Nuuanu Pali, on the water reservation, near the Pali road, about 200 yards toward Honolulu, from top of Pali; 1,136 feet above sea level.

2. Manoa, at residence of E. H. Hipple, in upper Manoa Valley, about 500 feet west of highway bridge over the East Branch of Manoa Stream; 300 feet above sea level.

3. Residence of J. K. Maui in upper Kalihi Valley; 550 feet above sea level.

4. At elevation 970 feet in upper Kalihi Valley, about 2 miles above Catholic orphanage.

5. Ditch tenders' house at U. S. Army reservoir in upper valley of the South Kaukonahua Stream; 1,200 feet above sea level.

6. Wahiawa Water Co.'s intake, about 150 yards downstream on left bank of North Fork of Kaukonahua Stream from Wahiawa Water Co.'s ditch intake, on trail 8 miles north of Wahiawa; 1,200 feet above sea level. (Described in Water-Supply Paper 430 as at Waialua Agricultural Co.'s ditch intake.)

7. Hawaiian Preserving Co.'s office, Wahiawa; 950 feet above sea level; records are furnished by Hawaiian Preserving Co.

8. Makaha, near Waianae, on property of Waianae plantation; 1,300 feet above sea level; records furnished by F. Meyer, manager Waianae plantation.

9. About 250 feet from Koloa Stream gaging station, 3 miles by trail southwest of Laie; 550 feet above sea level.

10. Ditch and trail tender's house in upper Punaluu Valley, about 2 miles from Punaluu Railroad station; 300 feet above sea level.

11. On left bank of Maole Stream, at head of first falls in Hillebrand Glen, about 2¼ miles from end of Nuuanu Valley street car line; 1,200 feet above sea level.

MAUI.

1. In H. B. Penhallow's yard, Wailuku; 300 feet above sea level.

2. Yard at Wailuku Sugar Co.'s office, Wailuku; 175 feet above sea level.

3. Waikamoi Gulch, on Kula pipe line at reservoir; 3 miles from Olinda and 7 miles from Makawao; 4,200 feet above sea level.

4. Puohakamoa, on Kula pipe line, about 1,000 feet below intake at Puohakamoa Gulch; 4 miles east of Olinda and 8 miles from Makawao; 4,300 feet above sea level.

5. Olinda, on Kula pipe line, 4 miles east of Makawao; 4,000 feet above sea level.

6. Olowalu Sugar Co.'s mill in Olowalu; 10 feet above sea level.

7. West slope of Puu Kukui at top of left bank of Honokawai Gulch; about 6 miles east of Kaanapali and 10 miles from Lahaina; 4,300 feet above sea level.

8. West slope of Puu Kukui, about one-half of a mile south of Honokawai Gulch; about 4½ miles east of Kaanapali and 8½ miles from Lahaina; 2,500 feet above sea level.

9. Honokawai Gulch at junction with Amalu Stream; on trestle supporting Honokawai flume about 1,000 feet below intake; about 3½ miles from Kaanapali and 7½ miles from Lahaina; 1,500 feet above sea level.

10. On ridge between Honokahau and Kahakuloa gulches, beside trail leading to top of Mount Eke; about 12 miles from Honokahau; 2,300 feet above sea level.

11. Honokahau Gulch, at ditchman's house on left bank of stream, 150 feet below ditch intake; about 8 miles from Honokahau; 800 feet above sea level.

12. Rim of extinct crater of Mount Eke; 14 miles by trail from Honokahau; 4,500 feet above sea level.

13. In Waihee Gulch, on bank of Spreckel's ditch; about 5 miles from Wailuku; 275 feet above sea level.

14. Waihee, on roof of building formerly used as plantation office; 3½ miles from Wailuku; 125 feet above sea level.

15. Iao Valley, on small plateau or tableland between north and south branches of Iao Stream, about 1 mile above the junction; about 4 miles west of Wailuku; 1,500 feet above sea level.

HAWAII.

1. Kemole House, 12 miles southeast of Waimea; 5,500 feet above sea level; records furnished by Parker ranch.

2. Pohakuloa, 20 miles southeast of Waimea; 5,700 feet above sea level; records furnished by Parker ranch.

3. Puuhinei Paddock, 14 miles south of Waimea; 1,500 feet above sea level; records furnished by Parker ranch.

4. Puuanuanu Paddock, 14 miles south-southeast of Waimea; 7,500 feet above sea level; records furnished by Parker ranch.

5. Punohu Paddock, 10 miles east of Waimea; 4,200 feet above sea level; records furnished by Parker ranch.

6. Kaauhuhu, on property of W. S. May, about 3 miles northwest of Hawi; 1,400 feet above sea level; records furnished by W. S. May.

7. Kohala Mountain pipe line, 3 miles north of Waimea; 3,700 feet above sea level; records furnished by Parker ranch.

8. Upper Kawainui, in the Kohala Mountains, near the line of the upper Hamakua ditch, near Kukuihaele; 4,080 feet above sea level; records furnished by Hawaiian Irrigation Co.

9. Lower Kawainui, in Waipio Valley, near the line of the lower Hamakua ditch, near Kukuihaele; 1,040 feet above sea level; records furnished by Hawaiian Irrigation Co.

10. Upper Alakahi, in Waipio Valley, Kohala Mountains, near the line of the upper Hamakua ditch; 3,870 feet above sea level; records furnished by Hawaiian Irrigation Co.

11. Lower Alakahi, in Waipio Valley, Kohala Mountains, on the line of the lower Hamakua ditch, near Kukuihaele; 1,030 feet above sea level; records furnished by Hawaiian Irrigation Co.

12. Upper Koiawe, on the line of the upper Hamakua ditch, Waipio Valley, near Kukuihaele; 3,350 feet above sea level; records furnished by Hawaiian Irrigation Co.

13. Lower Koiawe, near the line of the lower Hamakua ditch in Waipio Valley near Kukuihaele; 1,000 feet above sea level; records furnished by Hawaiian Irrigation Co.

14. Waimea, in Waipio Valley, along the line of the lower Hamakua ditch, near Kukuihaele; 980 feet above sea level; records furnished by Hawaiian Irrigation Co.

15. Puu Alala; on Upper Hamakua ditch, at east boundary of Government land, about 5 miles northeast of Waimea village; 2,800 feet above sea level.

16. Ahuloa homesteads, at ditch tender's house, near the Parker ranch, Honokaa; 2,551 feet above sea level; records furnished by civil engineer's officer of Honokaa Sugar Co. and Pacific Mill.

17. Upper Hope A, on lands of Kukaiau Ranch Co.; 5,000 feet above sea level. Referred to in previous reports as "Upper Hapea."

18. Lower Hope A, on lands of Kukaiau Ranch Co.; 4,000 feet above sea level. Referred to in previous reports as "Lower Hapea."

19. Kaala, on lands of Kukaiau Ranch Co.; 5,500 feet above sea level.

20. Puu Kea, on lands of Kukaiau Ranch Co.; 8,565 feet above sea level.

21. Halepuila, on lands of Kukaiau Ranch Co; 6,000 feet above sea level.

22. Puu Kihe, on top of Kihe Hill, on the side of Mauna Kea, about 10 miles south of Kukaiau; 7,822 feet above sea level; records furnished by Kukaiau Ranch Co.

23. Umikoa, on property of Kukaiau Ranch Co., near ranch house; 3,400 feet above sea level; records furnished by Kukaiau Ranch Co.

Island of Kauai.

No.	Station.	Records available.	Gage.	Readings.	Year ending June 30.	Precipitation.											
						July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Year.
1	Waialeale	Sept. 9, 1910–June 30, 1917 [a].	10 : 1	Irregular	1917													[b]574.0
2	Intake Wainiha power canal.	Feb. 1, 1907–June 30, 1917	Records furnished by Kauai Electric Co.	Daily	1917	15.00	13.51	10.82	12.73	39.68	[c]37.00	(d)	(d)	42.90	18.70	12.10	15.41	
3	Power house, Wainiha.	do	do	do	1917	7.17	9.10	4.95	9.97	26.43	44.66	20.73	6.57	21.16	9.80	7.86	6.63	175.0
4	Summit camp, Hanalei.	Sept. 18, 1910–June 30, 1917	do	do	1917	14.72	12.66	11.84	15.80	22.54	26.72	18.39	4.32	32.97	11.00	16.16	17.45	204.6
5	Kapaka	do	do	do	1917	9.77	8.82	6.19	12.42	16.90	25.75	19.83	5.47	29.47	7.58	11.35	9.38	162.9
6	Sanborn's house, Hanalei.	Mar. 11, 1910–June 30, 1917	Records furnished by W. F. Sanborn.	do	1917	6.19	4.98	4.69	7.72	14.77	19.20	12.11	3.93	20.25	4.61	7.13	7.38	113.0
7	Pilaa	June 1, 1914–June 30, 1917	Records furnished by T. B. Buch.	do	1917	3.73	3.70	8.40	5.40	10.40	11.40	12.11	2.47	19.95	2.27	7.23	3.62	90.7
8	Kaloko	do	do	do	1917	6.00	2.25	2.30	2.42	6.62	8.71	15.80	2.80	24.00	5.20	11.00	5.40	92.5
9	Newlun's house	do	do	do	1917													82.2
10	Mount Nonou	Feb. 1, 1915–June 30, 1917	Records furnished by E. M. Cheatham.	Monthly	1917	4.7	3.4	4.4	5.2	10.5	11.4	7.4	3.6	19.5	2.7	6.5	5.5	84.8
11	North Wailua	Sept. 25, 1914–June 30, 1917.	2 : 1	Irregular	1917													113.1
12	Waiahi	Aug. 8, 1910–June 30, 1917	2 : 1	Monthly	1917	10.20	9.20	11.20	11.10	15.40	20.80	13.00	2.20	19.50	7.00	12.40	9.20	141.2
13	Aakukui	June 1, 1909–June 30, 1917	Records furnished by Grove Farm.	Daily	1917	3.50	2.70	3.50	6.42	9.38	10.86	6.58	4.86	14.28	5.52	6.63	4.74	79.0
14	Reservoir No. 6	Jan. 1, 1914–June 30, 1917	do	do	1917	4.48	3.50	3.72	8.61	9.50	11.91	6.76	4.67	14.80	8.04	8.18	5.63	89.8
15	Papuaa	July 1, 1915–June 30, 1917	do	do	1916	2.50	7.50	11.55	10.56	14.61	11.61	17.88	3.04	16.10	3.92	9.82	6.89	120.5
					1917	7.54	6.91	7.22	11.25	13.33	17.01	8.88	7.89	22.63	10.43	10.78	8.40	112.4
16	Hiloa-Manawaiopuna divide.	Aug. 24, 1910–June 30, 1917.	2 : 1	Monthly	1917	21.80	18.0	18.2	29.4	33.4	51.6	22.6	9.6	27.8	17.2	20.2	15.6	287.4
17	Hanapepe Valley	Jan. 1, 1905–June 30, 1917	Records furnished by Hawaiian Sugar Co.	Daily	1917	10.56	9.15	8.73	13.97	20.34	25.83	13.86	7.51	20.01	7.88	13.97	8.51	160.3
18	Camp No. 2	do	do	do	1917	1.39	1.28	1.48	2.53	1.94	5.15	7.04	4.07	8.30	2.13	0	1.08	36.4
19	Olokele mauka	Apr. 1, 1911–June 30, 1917	do	Monthly	1917	11.20	8.80	9.95	23.50	23.50	24.30	19.20	14.80	23.50	12.30	18.25	9.50	198.8
20	Keanakua	Sept. 6, 1910–June 30, 1917	2 : 1	Irregular	1917													147.0
21	Kahana	Aug. 1, 1910–June 30, 1917	2 : 1	do	1917													147.4
22	Kaholuamanu	Mar. 11, 1913–June 30, 1917	2 : 1	do	1917													89.4
23	Waimea	Jan. 1, 1913–June 30, 1917	Records furnished by Jas. McClellan.	Daily	1917	.15	.10	.37	1.90	.71	4.50	5.77	3.47	9.24	3.85	3.03	.23	33.3

[a] Broken record. [b] July 14, 1916–Aug. 13, 1917. [c] Record Dec. 1–20. [d] No record.

Records of rainfall—Continued.

Island of Kauai—Continued.

No.	Station.	Records available.	Gage.	Readings.	Year ending June 30.	Precipitation.											
						July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Year.
24	Camp No. 7	Jan. 1, 1914–June 30, 1917	Records furnished by Hawaiian Sugar Co.	Daily	1917	11.00	0	0.41	1.66	1.84	5.72	5.41	3.02	8.44	2.76	3.10	0.10	43.5
25	Pali trail	Jan. 1, 1911–June 30, 1917	Records furnished by Kekaha Sugar Co.	do	1917	T.	T.	T.	1.40	.50	1.85	5.75	3.90	1.40	1.55	1.50	0	17.8
26	Hukipo	do	do	do	1917	T.	T.	T.	1.90	1.00	1.65	5.95	3.90	7.90	2.25	1.25	0	25.8
27	Waialae	July 31, 1910–June 30, 1917	2 : 1	Irregular	1917													122.6
28	Mohihi-Koaie divide.	June 24, 1910–June 30, 1917	2 : 1	do	1917													138.2
29	Mohihi	June 21, 1910–June 30, 1917	2 : 1	do	1917													127.9
30	Kilohana	June 18, 1910–June 30, 1917	5 : 1	do	1917													244.0
31	Waiakoali	June 4, 1910–June 30, 1917	2 : 1	do	1917													109.2
32	Paukahana	do	2 : 1	do	1917													115.6
33	Lehuamakanoi	June 18, 1910–June 30, 1917	5 : 1	do	1917													170.0
34	Puu Lua	June 5, 1910–June 30, 1917	2 : 1	do	1917													55.6
35	Kokee	June 6, 1910–June 30, 1917	2 : 1	do	1917													73.9
36	Konohiki	June 1, 1916–June 30, 1917	Records furnished by C. E. French.	Monthly	1917	4.75	3.36	3.75	4.20	8.80	10.40	7.80	2.80	20.20	3.40	6.90	4.00	80.4
37	Koloa	July 1, 1916–June 30, 1917	Records furnished by M. J. Teves.	Daily	1917	4.69	5.08	3.93	6.03	9.85	10.72	6.68	4.98	14.14	3.69	6.49	2.31	78.6
38	Kalihiwai	May 26, 1914–June 30, 1917	2 : 1	Irregular	1917													a230.0

Island of Oahu.

1	Nuuanu Pali	Sept. 23, 1910–June 30, 1917	2 : 1	Monthly	1917	5.6	7.8	6.9	7.3	8.9	16.0	14.0	5.0	30.0	12.0	13.9	3.7	131.1
2	Manoa	May 17, 1915–June 30, 1917	1 : 10	Daily	1917	12.99	18.85	9.15	9.28	16.56	23.84	13.56	3.44	21.00	15.43	12.78	6.90	163.8
3	Kalihi	Sept. 8, 1914–June 30, 1917	1 : 10	do	1917	9.62	10.56	7.75	11.78	15.47	23.14	12.65	3.16	29.12	10.71	11.14	5.16	150.3
4	Kalihi mauka	Feb. 7, 1917–June 30, 1917	2 : 1	Monthly	1917								3.2	36.6	14.2	13.2	7.0	
5	Army reservoir	Aug. 1, 1914–June 30, 1917	1 : 10	Daily	1917	10.27	15.36	9.95	12.80	14.85	24.23	15.90	3.35	17.02	7.03	14.78	5.89	151.3
6	Wahiawa Water Co.'s intake.	May 30, 1913–June 30, 1917	2 : 1	Monthly	1917	23.1	21.9	18.8	32.7	30.4	35.3	17.6	6.0	36.1	28.6	29.2	11.3	291.0
7	Hawaii Preserving Co.	May 1, 1913–June 30, 1917	Records furnished by Hawaii Preserving Co.	Daily	1917	2.74	2.87	1.63	4.66	5.29	12.42	11.92	2.88	12.58	1.68	5.45	1.48	65.6

8	Makaha	Aug. 1, 1912–June 30, 1917	Records furnished by F. Meyer.	do	1917	3.67	2.70	2.42	6.24	6.52	10.93	14.52	4.36	13.54	9.01	5.89	2.10	81.9
9	Koloa	Oct. 30, 1915–June 30, 1917	2 : 1	Irregular	1917	.....	.....	5.45	3.25	8.85	9.45	8.85	10.65	14.25	13.75	11.65	3.65	.....
10	Upper Punaluu Valley.	Apr. 28, 1915–June 30, 1917	1 : 10	Daily	1917	7.36	10.54	7.40	10.34	10.31	16.92	15.05	6.07	26.65	12.65	9.57	4.55	137.4
11	Hillebrand Glen No. 2.	May 6, 1916–June 30, 1917	2 : 1 [b]	Monthly	1917	10.55	14.02	9.44	15.35	15.78	25.86	14.07	3.80	34.20	14.40	18.80	7.00	183.3

Island of Maui.

1	Penhallow's residence, Wailuku.	Nov. 1, 1896–June 30, 1917	Records furnished by Wailuku Sugar Co.	Daily	1917	0.54	0.24	0	.59	1.24	8.75	2.44	4.22	4.14	5.32	0.46	0.31	28.2
2	Wailuku	May 1, 1887–June 30, 1917	do	do	1917	.68	.06	.12	.27	.92	7.31	2.42	3.89	3.65	3.97	.91	.08	24.3
3	Waikamoi Gulch	Oct. 12, 1910–June 30, 1917	Records furnished by Maui County Engineer.	do	1917	.....	19.73	23.28	10.98	43.38	[c]75.32	13.00	6.49	10.12	20.44	12.37	11.48	.....
4	Puohakamoa	May 1, 1911–June 30, 1917	do	do	1917	.....	29.43	21.68	8.79	37.79	[c]71.69	12.40	6.06	8.81	19.36	17.42	9.68	.....
5	Olinda	Sept. 26, 1910–June 30, 1917	do	do	1917	.....	2.06	4.18	2.42	7.50	30.10	4.43	5.15	6.00	6.97	7.70	1.90	.....
6	Olowalu	Jan. 1, 1907–June 30, 1917	Records furnished by Olowalu Co.	do	1917	.15	0	.14	0	0	4.82	10.72	4.23	16.63	1.05	.87	.11	33.7
7	Puukukui (upper slope).	Oct. 11, 1913–June 30, 1917	Records furnished by Pioneer Mill Co.	Monthly	1917	23.0	33.0	20.4	21.2	30.6	[c]50	14.5	8.0	30.0	27.0	24.0	16.0	.....
8	Puukukui (lower slope):	Oct. 13, 1913–June 30, 1917	do	do	1917	7.8	11.4	3.2	9.9	14.6	29.6	8.0	8.0	6.0	9.8	6.6	1.2	116.1
9	Honokawai Gulch.	Oct. 17, 1911–Mar. 14, 1917	do	do	1917	9.23	.....	6.46	7.06	14.44	28.61	7.30	4.41	[d]2.96	.....	.....	.....	.....
10	Honokahau Ridge.	Mar. 10, 1913–June 30, 1917	2 : 1	do	1917	11.0	13.4	9.6	9.4	11.6	27.0	6.0	6.8	10.6	4.6	21.6	4.6	136.2
11	Honokahau Gulch	Feb. 1, 1907–June 30, 1917	Records furnished by Honolua ranch.	Daily	1917	11.67	17.77	11.61	11.61	16.34	40.08	5.93	6.67	13.69	18.42	11.30	6.23	171.3
12	Mount Eke	Mar. 10, 1913–June 30, 1917	5 : 1 [e]	Monthly	1917	25.6	24.8	25.4	20.0	24.2	[c]50.0	11.4	7.2	23.4	14.2	32.5	10.0	.....
13	Waihee (upper)	July 1, 1915–June 30, 1917	Records furnished by H. C. & S. Co.	Daily	1917	1.44	.39	.30	.48	1.74	7.30	2.14	4.53	4.72	4.17	.32	.16	27.7
14	Waihee (lower)	Jan. 1, 1899–Oct. 31, 1907 Jan. 1, 1910–June 30, 1917	Records furnished by Wailuku Sugar Co.	do	1917	1.69	.80	.82	1.10	0	8.43	2.82	4.47	6.14	3.65	.45	.79	31.2
15	Iao Valley Tableland.	Apr. 12, 1911–June 30, 1917	2 : 1	Irregular	1917	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	111.7

[a] Approximate.
[b] A daily rain gage was maintained by the Water Commission of Territory of Hawaii at this station until Jan. 1, 1917.
[c] Gage overflowed.
[d] Gage carried away by freshet Mar. 15, 1917.
[e] Monthly gage 2 : 1 replaced by "150-inch" gage 5: 1 Apr. 28, 1917.

Records of rainfall—Continued

Island of Hawaii.

No.	Station.	Records available.	Gage.	Readings.	Year ending June 30.	Precipitation.											
						July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	Year.
1	Kemole House	Sept. 1, 1914–June 30, 1917	Records furnished by Parker ranch.	Monthly	1917	4.0	0.8	0.8	1.8	2.8	3.2	2.4	1.0	6.5	3.5	6.0	2.4	35.2
2	Pohakuloa	do	do	do	1917	0	.4	0	2.2	0	34.2	1.6	.8	.8	10.2	6.2	.2	56.6
3	Puuhinei paddock	do	do	do	1917	0	2.4	.6	2.8	1.2	3.4	2.0	2.1	2.8	.1	6.1	.7	24.2
4	Puuanuanu paddock.	do	do	do	1917	.8	4.0	.....	2.0	2.0	3.8	1.6	1.5	7.0	9.1	9.4	3.2	.....
5	Punohu paddock	Nov. 1, 1914–June 30, 1917	do	do	1917	4.0	1.6	1.2	2.4	3.5	15.0	2.6	3.4	14.5	2.5	2.4	1.8	54.9
6	Kaauhuhu	Mar. 18, 1913–June 30, 1917	Records furnished by W. S. May, Hawi.	Daily	1917	4.75	4.47	3.40	1.90	2.01	8.50	5.97	5.14	.....	4.19	5.95	3.50	.....
7	Kohala Mountain pipe line.	Sept. 1, 1914–June 30, 1917	Records furnished by Parker ranch.	Monthly	1917	10.0	10.0	7.0	5.0	8.8	21.5	16.0	4.0	10.8	5.5	8.0	10.0	116.6
8	Upper Kawainui	Sept. 1, 1910–June 30, 1917	Records furnished by Hawaiian Irrigation Co.	Daily	1917	18.80	19.55	13.48	8.06	10.28	27.49	5.46	5.86	10.48	11.99	8.00	12.18	151.6
9	Lower Kawainui	do	do	do	1917	14.32	10.34	7.89	4.85	8.59	28.93	3.61	8.21	3.92	15.00	4.54	7.72	117.9
10	Upper Alakahi	Jan. 1, 1913–June 30, 1917	do	do	1917	18.68	15.27	11.61	6.66	7.58	25.22	3.76	5.56	10.03	13.72	8.12	11.55	137.8
11	Lower Alakahi	Sept. 1, 1910–June 30, 1917	do	do	1917	8.48	7.63	5.36	3.30	6.66	22.64	2.77	6.01	3.35	10.28	4.24	5.66	86.4
12	Upper Koiawe	Jan. 1, 1912–June 30, 1917	do	do	1917	13.91	10.85	7.79	4.67	5.89	20.03	3.26	4.64	6.62	12.49	6.34	7.87	104.4
13	Lower Koiawe	Sept. 1, 1910–June 30, 1917	do	do	1917	7.74	6.71	5.31	2.51	4.00	18.44	2.32	5.00	2.19	7.69	3.15	4.13	69.2
14	Waima	Apr. 1, 1913–June 30, 1917	do	do	1917	2.14	3.95	2.14	.78	2.64	16.80	.42	3.47	.80	4.50	.65	4.81	43.1
15	Puu Alala	July 1, 1915–June 30, 1917	do	do	1917	4.71	3.95	2.98	2.18	6.69	29.48	2.97	6.41	6.42	12.31	4.57	4.47	87.1
16	Ahualoa Homesteads.	Jan. 1, 1912–June 30, 1917	do	do	1917	7.00	5.61	3.59	.25	6.55	39.00	2.78	7.65	2.10	3.41	.87	1.06	79.9
17	Upper Hope A	Mar. 1, 1902–June 30, 1917	Records furnished by Kukaiau ranch.	Irregular	1917	0	.82	.25	.60	4.30	16.65	0	3.10	4.11	3.81	6.42	0	.....
18	Lower Hope A	Apr. 1, 1909–June 30, 1917	do	do	1917	.75	0	1.18	.25	5.30	24.00	0	2.20	3.80	4.20	.80	0	.....
19	Kaala	Jan. 14, 1913–June 30, 1917	do	do	1917	.84	2.59	1.24	1.07	6.96	16.62	2.40	4.60	3.45	2.30	4.26	.47	46.8
20	Puu Kea	June 1, 1914–June 30, 1917	do	Monthly	1917	.....	.....	.05	.....	3.00	9.80	.....	.....	3.40	4.20	3.90	0	.....
21	Halepiula	Dec. 1, 1914–June 30, 1917	do	do	1917	.....	1.53	.30	1.00	4.41	18.12	2.65	.10	5.15	2.40	6.00	.14	.....
22	Puu Kihe	Mar. 1, 1903–June 30, 1917	do	do	1917	.....	.50	.20	.....	6.40	17.10	.30	.....	9.70	2.00	4.90	0	.....
23	Umikoa	Jan. 1, 1895–June 30, 1917	do	Daily	1917	.69	2.73	.25	.57	7.84	34.55	1.80	5.24	3.51	1.36	3.99	.46	63.0

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