

# WAIKAPŪ STREAM FLOW SUMMARIES

EXHIBIT 5

**Waikapū Stream Flow  
(1910-1917)  
USGS Station # 16650000, # 16648000, and # 16649000**

Waikapū Stream Flow for 1910-1917 as calculated  
by adding the Stream Post-Diversion Flow to the Waikapū Ditch and Palolo Ditch Flows<sup>8</sup>

		1910												For the Year
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov. (10 days)	Dec.	
Stream Post-Diversion	Max	--	--	--	--	--	--	--	--	--	--	--	113.00	--
	Min	--	--	--	--	--	--	--	--	--	--	--	1.10	--
	Mean	--	--	--	--	--	--	--	--	--	--	--	16.60	--
Waikapū Ditch	Max	--	--	--	--	--	--	--	--	--	--	6.50	6.50	--
	Min	--	--	--	--	--	--	--	--	--	--	2.90	--	--
	Mean	--	--	--	--	--	--	--	--	--	--	3.81	3.42	--
Palolo Ditch	Max	--	--	--	--	--	--	--	--	--	--	2.70	3.80	--
	Min	--	--	--	--	--	--	--	--	--	--	2.40	1.00	--
	Mean	--	--	--	--	--	--	--	--	--	--	2.46	2.28	--
Total Flow		--	--	--	--	--	--	--	--	--	--	--	22.30	--

		1911												For the Year
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Stream Post-Diversion	Max	34.00	58.00	14.00	16.00	18.00	21.00	27.00	19.00	80.00	16.00	9.00	2.50	80.00
	Min	1.80	1.60	1.00	1.00	1.70	2.40	0.30	0.40	0.60	0.30	0.30	0.40	0.30
	Mean	8.85	9.50	2.76	4.60	6.53	8.60	4.99	3.85	12.40	2.22	1.03	0.70	5.45
Waikapū Ditch	Max	5.90	5.30	5.30	5.30	6.50	5.30	5.30	5.30	5.30	5.30	7.10	5.30	7.10
	Min	2.90	2.90	4.30	3.90	4.30	4.30	4.30	4.30	4.30	4.30	3.50	2.90	2.90
	Mean	4.06	4.55	4.44	4.33	4.62	5.05	4.93	4.70	4.83	4.51	4.12	3.48	4.47
Palolo Ditch	Max	2.70	3.80	3.40	3.40	3.60	2.80	3.00	3.10	3.50	2.50	2.80	2.80	10.40
	Min	0.60	--	0.60	0.60	2.30	2.50	2.30	2.10	2.20	2.20	1.90	1.90	0.60
	Mean	2.21	2.91	2.74	2.58	2.71	2.70	2.51	2.42	2.40	2.25	2.24	2.17	4.04
Total Flow		15.12	16.96	9.94	11.51	13.86	16.35	12.43	10.97	19.63	8.98	7.39	6.35	13.96

**Waikapū Stream Flow  
(1910-1917)  
USGS Station # 16650000, # 16648000, and # 16649000**

Waikapū Stream Flow for 1910-1917 as calculated  
by adding the Stream Post-Diversion Flow to the Waikapū Ditch and Paloto Ditch Flows\*

in millions of gallons per day		1912												For the Year
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Stream Post-Diversion	Max	0.30	49.00	29.00	57.00	0.60	0.80	16.50	1.80	0.20	0.60	21.50	0.30	57.00
	Min	0.10	0.10	0.10	0.20	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	Mean	0.19	4.06	4.57	8.53	0.16	0.17	0.72	0.23	0.13	0.16	0.21	0.14	1.59
Waikapū Ditch	Max	4.50	8.30	8.80	10.40	6.10	5.80	8.10	6.50	3.70	5.40	6.50	4.50	10.40
	Min	1.80	1.90	4.10	4.50	3.60	3.50	3.50	2.90	2.70	0.60	2.50	2.30	0.60
	Mean	2.41	4.24	6.20	6.79	4.27	4.24	4.13	3.79	2.97	2.89	3.63	2.87	4.04
Paloto Ditch	Max	2.80	3.80	3.60	3.90	2.90	2.60	3.30	2.50	2.30	2.70	3.80	2.50	3.90
	Min	2.30	2.50	2.20	2.30	2.30	2.30	2.30	2.20	2.10	1.90	1.90	1.80	1.80
	Mean	2.40	2.83	2.79	2.74	2.40	2.38	2.38	2.34	2.11	2.11	2.22	2.00	2.39
Total Flow		5.00	11.13	13.56	18.06	6.83	6.79	7.23	6.36	5.21	5.16	6.06	5.01	8.02

in millions of gallons per day		1913												For the Year
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov. (10 days)	Dec.	
Stream Post-Diversion	Max	0.20	32.30	0.20	52.00	117.00	17.50	3.90	34.00	0.50	0.60	95.00	115.00	117.00
	Min	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
	Mean	0.13	3.04	0.14	6.66	5.78	1.03	0.36	1.95	0.12	0.15	6.01	8.86	2.84
Waikapū Ditch	Max	2.90	7.10	3.30	8.90	8.10	7.20	5.80	7.00	4.70	2.70	11.00	9.40	11.00
	Min	1.80	1.80	1.90	2.30	3.70	2.50	2.70	2.30	2.30	1.80	1.80	1.00	1.00
	Mean	2.07	3.55	2.68	4.57	5.03	4.01	3.55	3.78	2.91	1.95	5.17	3.03	3.52
Paloto Ditch	Max	2.20	2.90	1.80	3.10	2.30	2.50	2.40	3.00	1.80	2.10	3.90	4.50	4.50
	Min	1.70	1.60	1.60	1.60	1.60	1.60	1.60	1.30	1.30	1.30	1.60	0.50	0.50
	Mean	1.87	1.96	1.66	1.95	1.82	1.80	1.74	1.82	1.56	1.55	1.87	1.70	1.77
Total Flow		4.07	8.55	4.48	13.18	12.63	6.84	5.65	7.55	4.59	3.65	13.07	13.59	8.13

**Waikapū Stream Flow  
(1910-1917)  
USGS Station # 16650000, # 16648000, and # 16649000**

Waikapū Stream Flow for 1910-1917 as calculated  
by adding the Stream Post-Diversion Flow to the Waikapū Ditch and Palolo Ditch Flows<sup>8</sup>

in millions of gallons per day		1914												For the Year
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Stream Post-Diversion	Max	47.00	0.60	140.00	68.00	220.00	49.00	40.00	94.00	56.00	63.00	94.00	31.00	220.00
	Min	0.20	0.10	0.10	0.20	0.20	1.30	1.30	1.80	5.20	3.60	1.80	2.30	0.10
	Mean	5.95	0.19	4.83	5.86	17.70	8.96	14.20	16.80	16.70	9.73	10.50	6.41	9.89
Waikapū Ditch	Max	7.00	4.50	12.00	14.00	16.00	14.00	14.00	15.00	14.00	13.00	15.00	9.00	3.60
	Min	1.80	1.00	2.70	3.20	3.20	6.40	7.80	7.10	6.40	6.40	0.00	5.20	0.10
	Mean	3.21	2.72	3.78	5.64	7.35	8.66	10.30	9.44	8.71	7.96	6.53	6.56	2.05
Palolo Ditch	Max	3.60	3.60	1.80	2.70	3.00	2.70	2.70	2.70	2.70	2.70	3.00	2.40	16.00
	Min	1.60	1.60	0.10	0.70	0.70	1.30	2.40	1.60	1.60	2.10	1.60	1.00	0.00
	Mean	2.53	2.22	1.13	1.77	1.92	1.89	2.45	2.19	2.29	2.29	2.28	1.89	6.76
Total Flow	Mean	11.69	5.13	9.74	13.27	26.97	19.51	26.95	28.43	27.70	19.98	19.31	14.86	18.70

in millions of gallons per day		1915												For the Year
		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Stream Post-Diversion	Max	17.00	98.00	7.10	66.00	3.60	15.00	34.00	3.60	9.70	40.00	77.00	105.00	105.00
	Min	1.00	1.00	1.00	1.00	0.65	0.65	1.00	0.50	0.30	0.50	1.00	1.00	0.30
	Mean	3.62	3.62	2.41	7.31	1.18	2.01	2.82	0.81	1.24	6.35	9.66	10.50	4.75
Waikapū Ditch	Max	8.40	11.00	7.80	14.00	7.10	8.40	11.00	7.00	7.70	9.20	10.00	12.00	14.00
	Min	4.50	3.90	5.20	5.20	3.90	3.90	4.10	3.40	2.20	3.40	4.10	0.00	0.00
	Mean	5.66	5.54	5.91	7.51	5.39	5.33	5.84	3.90	4.11	5.76	6.00	5.87	5.64
Palolo Ditch	Max	3.00	3.60	3.00	3.30	3.00	3.00	3.00	3.00	3.60	3.30	3.30	3.00	3.60
	Min	1.30	2.10	2.10	2.70	2.70	2.10	2.10	2.70	2.40	2.20	1.30	2.20	1.30
	Mean	1.95	2.88	2.19	2.89	2.96	2.88	2.88	2.64	2.78	2.73	2.47	2.38	2.60
Total Flow	Mean	11.23	19.04	10.51	17.71	9.53	10.22	11.54	7.35	8.13	14.84	18.13	18.75	12.99

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by adding the Stream Post-Diversion Flow to the Waikapū Ditch and Palolo Ditch Flows<sup>8</sup>

		1916												For the Year
in millions of gallons per day		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Stream Post-Diversion (275 days)	Max	63.00	--	--	56.00	170.00	24.00	16.00	25.00	9.00	3.00	8.00	55.00	55.00
	Min	1.80	--	--	3.40	5.60	4.80	2.00	2.00	0.90	0.90	0.60	0.60	0.60
	Mean	16.00	--	--	25.30	22.00	8.40	3.55	3.88	2.37	1.08	1.38	7.86	7.86
Waikapū Ditch	Max	11.00	7.70	8.40	8.40	7.70	9.20	9.20	12.00	7.70	7.00	7.70	9.20	12.00
	Min	0.00	2.20	3.40	1.70	0.50	5.50	2.50	4.20	3.60	3.00	2.50	3.00	0.00
	Mean	6.20	7.22	6.46	5.79	4.05	6.75	5.96	5.71	4.57	3.75	3.83	5.23	5.43
Palolo Ditch	Max	2.70	1.50	1.30	2.00	3.00	3.30	3.30	3.30	3.00	3.30	3.30	3.80	3.80
	Min	0.00	3.60	0.05	0.05	0.90	3.00	2.70	2.40	1.20	3.00	2.40	1.20	0.00
	Mean	1.26	1.08	0.77	1.53	1.90	3.19	3.07	2.81	2.50	3.07	2.86	3.00	2.25
Total Flow		7.46	8.30	7.23	7.32	27.95	18.34	12.58	12.40	9.44	7.90	8.07	16.09	15.54

		1917												For the Year
in millions of gallons per day		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.	
Stream Post-Diversion	Max	4.20	5.00	220.00	44.00	9.00	2.50	--	--	--	--	--	--	--
	Min	0.90	3.60	0.90	0.90	0.40	0.40	--	--	--	--	--	--	--
	Mean	1.47	1.28	8.97	3.46	1.10	0.73	--	--	--	--	--	--	--
Waikapū Ditch	Max	5.50	5.20	4.80	8.40	6.20	7.70	--	--	--	--	--	--	--
	Min	2.50	2.50	0.00	0.00	2.50	2.50	--	--	--	--	--	--	--
	Mean	3.62	3.10	2.35	3.30	3.91	3.59	--	--	--	--	--	--	--
Palolo Ditch	Max	2.20	2.20	2.00	3.30	2.40	2.40	--	--	--	--	--	--	--
	Min	1.60	1.20	0.00	1.60	1.80	2.00	--	--	--	--	--	--	--
	Mean	1.89	1.62	1.81	2.19	2.17	2.17	--	--	--	--	--	--	--
Total Flow		6.98	5.00	13.13	8.95	7.18	6.49	--	--	--	--	--	--	--

**Waikapū Stream Flow  
(1910-1917)**

**USGS Station # 16650000, # 16648000, and # 16649000**

- <sup>8</sup> "Stream post-diversion" data from Territorial Planning Board, Surface Water Resources of the Territory of Hawai'i 1901-1938 (1939) ("Surface Water Resources") at 241-2. Data originally collected by USGS station called "Waikapū Stream Near Waikapū, Maui" in W. Martin & C. Pierce, USGS, Water Resources of Hawai'i 1909-1911 (1913) ("Martin & Pierce") at 225, and identified as Station No. 16650000 in Fontaine, USGS, Evaluation of the Surface-Water Quantity, Surface-Water Quality, and Rainfall Data-Collection Programs in Hawai'i, 1994 (1996) ("Fontaine") at 96. "The discharge at this station gives the flow of the stream below the South Side and Palolo ditches" Martin & Pierce at 225.
- "Waikapū Ditch" data from Surface Water Resources at 243. Data originally collected by station called "South Side Waikapū Ditch Near Waikapū, Maui" in Martin & Pierce at 228 and identified as Station No. 16648000 in Fontaine at 96.
- "Palolo ditch" data from Surface Water Resources at 242-43. Data originally collected by station called "Palolo (Everett) Ditch Near Waikapū, Maui" in Martin & Pierce at 231 and identified as Station No. 16649000 in Fontaine at 96. "The records at this station show the amount of water diverted on the north side above the gaging station on Waikapū Stream." Martin & Pierce at 231.
- According to N. Grover USGS, Surface Water Supply of Hawai'i July 1, 1913, to June 30, 1915 at 253 (1917), "Nearly all low-water flow is diverted above station by South Side Waikapū Ditch and Palolo ditch."

Waikapū Stream Flow  
(1911-1917)

USGS Station # 16650000, # 16648000, and # 16649000

Approximate baseflow  
of Waikapū Stream for 1911-1917

in millions of gallons per day	Q <sub>90</sub>	Q <sub>75</sub>	Q <sub>50</sub>	Waikapū Ditch (Mean Flow)*	Palolo Ditch (Mean Flow)*	Total Flow
1911	.3 to .6	0.80	2 to 3	4.47	2.48	7.25 to 7.3
1912	.1 to .2	.1 to .2	1 to 2	4.04	2.39	6.53 to 6.54
1913	.1 to .2	.1 to .2	1 to 2	3.52	1.77	5.30 to 5.31
1914	.2 to .3	.6 to .8	4 to 6	6.76	2.05	9.01 to 14.01
1915	.6 to .8	1 to 1.5	1 to 1.5	5.64	2.60	8.84 to 9.74
1916	.8 to 1.0 (257 days)	1 to 1.5 (257 days)	2 to 3 (257 days)	5.43	2.25	8.48 to 10.05
1917 (18. days)	.3 to .6	0.80	.8 to 1.0	3.31	1.98	5.59 to 5.64
Total Flow (2,295 days)	.1 to .2 (2,295 days)	.2 to .3 (2,295 days)	1 to 1.5 (2,295 days)	4.83 (2,555 days)	2.24 (2,555 days)	7.17 to 8.39 (2,555 days)

\* Mean flow is used for ditch flows in line with the recognition that, unlike streams, "ditch flows tend to follow the normal distribution because high flows are truncated by the limits of ditch intakes and carrying capacity." Commission on Water Resources Management, Water Resources Protection Plan at V-36 (1990).

Data from Surface Water Resources at 241-43; see note 8.

**Waikapū Stream Flow  
(1963-1997)  
USGS Station # 16650500**

Yearly peak stream flows in Waikapū Stream for 1963-2002 <sup>9</sup>

in millions of gallons per day	Date	Flow
<b>1963</b>	Jan. 16, 1963	206.72
<b>1964</b>	May 25, 1964	67.18
<b>1965</b>	Feb. 04, 1965	540.06
<b>1966</b>	Nov. 14, 1965	418.61
<b>1967</b>	Mar. 24, 1967	468.35
<b>1968</b>	Nov. 24, 1967	420.55
<b>1969</b>	Nov. 29, 1968	383.08
<b>1970</b>	Dec. 28, 1969	293.28
<b>1971</b>	Jan. 28, 1971	617.58
<b>1972</b>	Feb. 24, 1972	646.00
<b>1973</b>	Oct. 03, 1972	357.24
<b>1974</b>	Nov. 12, 1973	576.88
<b>1975</b>	Aug. 17, 1975	186.05
<b>1976</b>	Mar. 04, 1976	195.74
<b>1977</b>	Apr. 04, 1977	186.05
<b>1978</b>	Oct. 24, 1977	268.74
<b>1979</b>	Feb. 10, 1979	697.68
<b>1980</b>	Jan. 08, 1980	665.38
<b>1981</b>	Aug. 04, 1981	146.64
<b>1982</b>	Jan. 07, 1982	613.05
<b>1983</b>	Dec. 23, 1982	512.28
<b>1984</b>	Dec. 25, 1983	697.68
<b>1985</b>	Mar. 13, 1985	199.61
<b>1986</b>	Oct. 18, 1985	587.86
<b>1987</b>	May 5, 1987	729.98
<b>1988</b>	Jan. 28, 1988	652.46
<b>1990</b>	Oct. 08, 1989	634.37
<b>1991</b>	Jan. 27, 1991	549.10
<b>1992</b>	Feb. 14, 1992	129.20
<b>1993</b>	Dec. 31, 1992	96.90
<b>1994</b>	Mar. 10, 1994	164.73
<b>1995</b>	Jan. 29, 1995	167.96
<b>1996</b>	Mar. 31, 1996	129.20
<b>1997</b>	Jan. 04, 1997	387.60
<b>Average Peak</b>		<b>399.82</b>

<sup>9</sup> Surface Water Data for USA: Peak Streamflow Statistics available at [http://nwis.waterdata.usgs.gov/hi/nwis/peak?site\\_no=16650500&agency\\_cd=USGS&format=html](http://nwis.waterdata.usgs.gov/hi/nwis/peak?site_no=16650500&agency_cd=USGS&format=html).

Data originally collected by USGS station called "Waikapū Stream Near Kihei, Maui" and identified as Station No. 16650500. The station is located 35 feet above sea level and measures the highest surface water levels for each year in the Waikapū Stream. Information available at [http://nwis.waterdata.usgs.gov/hi/nwis/peak?site\\_no=16650500&agency\\_cd=USGS&format=html](http://nwis.waterdata.usgs.gov/hi/nwis/peak?site_no=16650500&agency_cd=USGS&format=html).