STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102703 (East Maui, Honopou Haiku Ditch, restore)

Date of Field Investigation: October 27, 2008 **Time** (24-hour)**:** 1200 - 1300	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Carl Freedman (Consultant at haiku Design & Analysis); EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent), Nelson Akiu (Keanae Supervisor), Walter Andrade (Field Crew), and Jacob Tamsing (Field Crew); Honopou community - Lynn Scott, Beatrice Kekahuna, Sanford Kekahuna, Boni Kekahuna, and Wanda Vierra
Hydrologic Unit:	Honopou (6034)
Stream Name:	Honopou Stream

Findings:

At approximately 1200 hours, CWRM staff met with Carl Freedman, Garret Hew and EMI staff, and members of the Honopou community at the Haiku Ditch diversion on Honopou Stream. While the EMI Field Crew went to gather banana leaves and other tools for building of the berm wall, CWRM staff took a volumetric measurement of the water flowing through the three 4-inch (O.D.) PVC pipes that bypasses the ditch. With a stopwatch, staff recorded the number of seconds each of the pipes took to fill a 2 gallon bucket. This process was repeated 5 times, making a total of 5 measurements per pipe. As computed back in the Honolulu Office, the flow from the pipes was 0.130 cubic feet per second (0.084 million gallons per day).

The goal was to build a berm on the lip of the Haiku Ditch diversion grating structure on Honopou Stream. EMI staff began by placing banana stalks on the upstream edge of the ditch intake structure. With the help of Sanford Kekahuna, EMI staff piled large boulders on top of the leaves. The boulders were taken from Honopou Stream upstream and downstream of Haiku Ditch. The purpose of the banana stalks was to minimize seepage of stream water between the boulders when the water level in the stream rises over the ditch. This way, more water could potentially be pushed through the three 4-inch bypass pipes.

CWRM staff videotaped this event.

Staff crew left the Haiku Ditch diversion on Honopou Stream at approximately 1300 hours, and continued further upstream to document flow restoration at Lowrie Ditch on Honopou Stream. Refer to Field Investigation Report FI2008102704 (East Maui, Honopou Lowrie Ditch, restore) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081027013	EMI staff building a berm wall at Haiku Ditch on Honopou Stream by first placing banana leaves on the ditch grating structure.
20081027015	EMI staff building a berm wall at Haiku Ditch on Honopou Stream.
20081027017	EMI staff building a berm wall at Haiku Ditch on Honopou Stream.
20081027018	EMI staff building a berm wall at Haiku Ditch on Honopou Stream.
20081027020	Sanford Kekahuna helping EMI staff to gather boulders for building a berm wall at Haiku Ditch on Honopou Stream.
20081027021	EMI staff building a berm wall at Haiku Ditch on Honopou Stream.
20081027025	EMI staff building a berm wall at Haiku Ditch on Honopou Stream.
20081027031	Completed berm wall at Haiku Ditch on Honopou Stream.
20081027033	Completed berm wall at Haiku Ditch on Honopou Stream.
20081027035	Completed berm wall at Haiku Ditch on Honopou Stream, near the three 4-inch bypass pipes.
20081027038	Completed berm wall at Haiku Ditch on Honopou Stream.
20081027039	Completed berm wall at Haiku Ditch on Honopou Stream.
20081027040	Completed berm wall at Haiku Ditch on Honopou Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081027013.JPG

20081027015.JPG

20081027017.JPG

20081027018.JPG

20081027020.JPG

20081027021.JPG

20081027025.JPG

20081027031.JPG

20081027033.JPG

20081027035.JPG

20081027038.JPG

20081027039.JPG

IMAGE CONTACT SHEET

20081027040.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102704 (East Maui, Honopou Lowrie Ditch, restore)

Date of Field Investigation: October 27, 2008 **Time** (24-hour)**:** 1310 - 1400	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Carl Freedman (Consultant at haiku Design & Analysis); EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), and Henry Robello (Field Superintendent); Honopou community - Lynn Scott, Beatrice Kekahuna, Sanford Kekahuna, Boni Kekahuna, and Wanda Vierra
Hydrologic Unit:	Honopou (6034)
Stream Name:	Honopou Stream

Findings:

At approximately 1310 hours, CWRM staff, Carl Freedman, Garret Hew and EMI staff, and members of the Honopou community arrived at the Lowrie Ditch diversion on Honopou Stream. The purpose of the field visit was to document the flow release just upstream of the Lowrie Side Ditch intake located on the left bank of the stream. Henry Robello and Garret Hew proceeded to lift up the Lowrie Side Ditch bypass sluice gate with a metal bar. Once the gate was opened, water from the upstream side of the sluice gate flowed through the gate. Then, Dean Uyeno measured the dimensions of the sluice gate opening to be 17 x 14 inches (W x H).

CWRM staff videotaped the flow release event.

CWRM staff walked upstream of the ditch to assess the condition of Honopou Stream. The stream had very little water but the stream was flowing into a pool downstream of the ditch.

Staff crew left the Lowrie Ditch diversion on Honopou Stream at approximately 1400 hours, and continued to Puolua (Huelo) Stream to take pre-restoration flow measurement. Refer to Field Investigation Report FI2008102705 (East Maui, Huelo IIFS Site A, pre-release) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081027049	CWRM staff, EMI staff, and members of the Honopou community arrived at the Lowrie Ditch diversion structure on Honopou Stream.
20081027050	Lowrie Ditch diversion intake (downstream side) on Honopou Stream.
20081027052	EMI staff Garret Hew and Henry Robello opening the Lowrie Ditch sluice gate on Honopou Stream.
20081027054	EMI staff Garret Hew and Henry Robello opening the Lowrie Ditch sluice gate on Honopou Stream.
20081027057	Looking from the top of the Lowrie Ditch sluice gate on Honopou Stream.
20081027058	Lowrie Ditch sluice gate on Honopou Stream.
20081027060	Lowrie Ditch sluice gate on Honopou Stream.
20081027061	Lowrie Ditch sluice gate on Honopou Stream.
20081027063	Honopou Stream upstream of Lowrie Ditch.
20081027065	Honopou Stream upstream of Lowrie Ditch.
20081027067	Dean Uyeno taking physical measurements of the Lowrie Ditch diversion intake on Honopou Stream.
20081027069	Dean Uyeno taking physical measurements of the Lowrie Ditch sluice gate on Honopou Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081027049.JPG

20081027050.JPG

20081027052.JPG

20081027054.JPG

20081027057.JPG

20081027058.JPG

20081027060.JPG

20081027061.JPG

20081027063.JPG

20081027065.JPG

20081027067.JPG

20081027069.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102705 (East Maui, Huelo IIFS Site A)

Date of Field Investigation: October 27, 2008 **Time** (24-hour)**:** 1430 - 1600	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Ernie Schupp (Huelo farmer)
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Puolua (Huelo) Stream

Findings:

At approximately 1430 hours, CWRM staff arrived at Ernie Schupp's residence. CWRM staff prepared IIFS Site A on Puolua (Huelo) Stream for flow measurement. The entire flow measurement was completed in 23 minutes. Gage height readings were not recorded as a reference point was not established during the field investigation on October 23, 2008 (refer to Field Investigation Report FI2008102303 for more information). In addition to flow measurement, CWRM staff also recorded wind velocity, air temperature, water temperature and weather conditions. The weather was sunny with no rain. As computed back in the Honolulu Office, the flow at IIFS Site A was 0.047 cubic feet per second (0.030 million gallons per day).

CWRM staff took a volumetric measurement of the water flowing through the two 5.4-inch (O.D.) PVC pipes that bypasses Haiku Ditch on Puolua (Huelo) Stream. With a stopwatch, staff recorded the number of seconds each of the pipes took to fill a 2 gallon bucket. This process was repeated 5 times, making a total of 5 measurements per pipe. As computed back in the Honolulu Office, the flow from the pipes was 0.063 cubic feet per second (0.041 million gallons per day).

Back on the dirt road by Ernie Schupp's taro loi, CWRM staff mentioned to Garret Hew that staff would drop by a hardware store in Wailuku to pick up a cap for the PVC pipe on the concrete-reinforced masonry (CRM) wall of the gage pool at Honopou Stream IIFS Site B. Garret Hew said that he would check the EMI Office for a cap so that CWRM staff would not need to purchase one from the warehouse.

CWRM staff concluded the field investigation at 1600 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
18	20.903285	-156.225661	Haiku Ditch on Huelo Stream
19	20.903252	-156.225375	IIFS Site A Measurement Site on Huelo Stream

Attachments:

Brief Description:

1. Discharge Measurement and Gage Inspection Notes

Recommendations:

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DU

Sta. No. HUELO IIFS SITE A

Sta. Name _____

Date 10/27 , 20 08 Party Chui Liang (M), Dean, Ed.

Width 1.75 Area 0.496 Vel. 0.09 G.H. _____ Disch. 0.047 CFS

Method Wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 14:03				
	Finish	REW @ 14:26				
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated ____

Weather: Sunny

Air Temp. 25 °C at 14:11

Water Temp. 22 °C at 14:15

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 15 ft. mi. upstr., downstr. of gage. arrival

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: laminar, uniform flow.

Cross section: uniform, pebbles

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: 2 rocks were placed downstream of measuring point

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@	@ 14:03									.80
												.85
	~~2.2~~		~~.09~~ .11			~~40~~						
	~~2.3~~		~~.14~~			~~40~~						
												.90
	1.05	.125	0									.92
	1.3	.175	.14			40						
	1.4	.1	.22			40		.14		.022	.003	.94
	1.5	.1	.33			40		.09		.033	.003	.96
	1.6	.1	.40			40		.11		.04	.004	.97
	1.7	.1	.40			40		.12		.04	.005	.98
	1.8	.1	.40			40		.10		.04	.004	.99
	1.9	.1	.40			40		.11		.04	.004	
	2.0	.1	.40			40		.10		.04	.004	
⊙	2.1	.1	.40			40		.10		.04	.004	1.00
	2.2	.1	.40			40		.10		.04	.004	
	2.3	.1	.40			40		.07		.04	.003	
	2.4	.1	.35			40		.09		.035	.003	.99
	2.5	.1	.31			40		.06		.031	.002	.98
	2.6	.1	.28			40		.08		.028	.002	.97
	2.7	.1	.27			40		.09		.027	.002	.96
	2.8	.05	0									
	1.75	1.75					AVE =	0.09		.496	.047	.94
												.92
	REW	@ 14:26										.90
												.85
												.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102801 (East Maui, Honopou IIFS Site A)

Date of Field Investigation: October 28, 2008 **Time** (24-hour)**:** 0740 - 0920	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew (EMI Water Resources Manager) and Henry Robello (Field Superintendent) Honopou community - Beatrice Kekahuna, and Wanda Vierra
Hydrologic Unit:	Honopou (6034)
Stream Name:	Honopou Stream

Findings:

On October 27, 2008, CWRM staff documented the flow release at Lowrie Side Ditch bypass sluice gate on Honopou Stream. Refer to Field Investigation Report FI2008102704 (East Maui, Honopou Lowrie Ditch, restore) for more information. Since flow was restored, the following flow measurements represent post-release flow conditions.

At approximately 0740 hours, CWRM staff arrived at the Haiku Ditch diversion on Honopou Stream. CWRM staff took a volumetric measurement of the water flowing through the three 4-inch (O.D.) PVC pipes that bypasses the ditch. With a stopwatch, staff recorded the number of seconds each of the pipes took to fill a 2 gallon bucket. This process was repeated 5 times, making a total of 5 measurements per pipe. As computed back in the Honolulu Office, the flow from the pipes was 0.121 cubic feet per second (0.078 million gallons per day).

CWRM staff then walked to a large pond downstream from Haiku Ditch on Honopou Stream.

Staff then drove to the bridge that crosses Honopou Stream further downstream to measure flow at IIFS Site A. Staff met with Garret Hew, Henry Robello, and members of the Honopou community at the bridge. CWRM staff prepared IIFS Site A on Honopou Stream for flow measurement. CWRM staff checked the downstream gage pool for debris and there was none. Staff noticed that the water level in the gage pool was considerable lower than the water level observed in previous field visits, during which the water overtopped the concrete-reinforced masonry (CRM) wall of the gage pool. Since the water level in the gage pool was low, and that water was not spilling over the CRM wall, Garret Hew noticed leakage at the center of the wall footing that was not apparent in previous field visits when the water overtopped the wall. When CWRM staff returned to the Honolulu Office, Matt Wong of the USGS-Maui Office contacted Chui Ling Cheng regarding the leakage. He mentioned that a gage pool with multiple leakages may not be stable enough for gage height readings. CWRM staff plans to return to this site in November to investigate this issue further.

The entire flow measurement was completed in 20 minutes. Gage height readings were taken at the downstream gage pool at the start and finish of flow measurement. In addition to flow measurement, staff crew also recorded wind velocity, air temperature, water temperature and weather conditions. The weather was overcast with vog and no rain. As computed back in the Honolulu Office, the flow at IIFS Site A was 0.060 cubic feet per second (0.039 million gallons per day), with no change in gage height.

Staff crew left Honopou IIFS Site A at approximately 0920 hours, and continued further downstream to conduct flow measurement at IIFS Site B on Honopou Stream. Refer to Field Investigation Report FI2008102802 (East Maui, Honopou IIFS Site B) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081028001	Pond downstream of Haiku Ditch on Honopou Stream.
20081028002	Pond downstream of Haiku Ditch on Honopou Stream.
20081028005	Pond downstream of Haiku Ditch on Honopou Stream.
20081028006	Gage pool and reference point on Honopou Stream IIFS Site A.
20081028009	Gage pool and reference point on Honopou Stream IIFS Site A.
20081028010	Gage pool and reference point on Honopou Stream IIFS Site A. Water level was below the CRM wall.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
6	20.916212	-156.245203	Bridge on Honopou Stream
7	20.916187	-156.245174	IIFS Site A Reference Point on Honopou Stream
8	20.916096	-156.245077	IIFS Site A Flow Measurement on Honopou Stream

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Measurement and Gage Inspection Notes

Recommendations:

IMAGE CONTACT SHEET

20081028001.JPG

20081028002.JPG

20081028005.JPG

20081028006.JPG

20081028009.JPG

20081028010.JPG

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DDU

Sta. No. HONOPOU HFS SITE A

Sta. Name _____

Date 10/28 , 20 08 Party Chui , Dean , Ed (M)

Width 2.8 Area 0.902 Vel. 0.07 G.H. .05 Disch. 0.06 CFS

Method Wading No. secs. 40 G.H. change 0 in 1 hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 8:25				
		GHT =	1.00 -	.95 =	.05	
	Finish	REW @ 9:08				
		GHT =	1.00 -	.95 =	.05	
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated _____

Weather: VOG, overcast

Air Temp. 21 °C at 8:39

Water Temp. 21.5 °C at 8:47

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 60 ft, mi. upstr., downstr. of gage. control

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: laminar, & fairly uniform

Cross section: bedrock, cobbles, fairly uniform

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: control , no debris

Remarks: water did not go over control due to low flow

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

	ANGLE COEF-FICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVA-TION DEPTH	REVO-LUTIONS	TIME IN SEC-ONDS	VELOCITY AT POINT	VELOCITY MEAN IN VER-TICAL	ADJUST-ED FOR HOR. ANGLE OR	AREA	DISCHARGE	.80
		LEW	@	8:25				GHT = 1.00 -	0.95 =		0.05		
													.85
		2.6	.05	0									
		~~2.7~~		~~0.32~~			~~40~~		~~.04~~				
		~~2.8~~											.90
		2.7	.1	0.18				½(.03)=	.02		.018	0	.92
		2.8	.1	0.42			40		.03		.042	.001	
		2.9	.1	0.45			40		.03		.045	.001	.94
		3.0	.1	0.42			40		.06		.042	.003	.96
		3.1	.1	0.37			40		.05		.037	.002	.97
		3.2	.1	0.37			40		.05		.037	.002	.98 .009
		3.3	.1	0.39			40		.07		.039	.003	.99
		3.4	.1	0.36			40		.09		.036	.003	
		3.5	.1	0.35			40		.08		.035	.003	.018
⊙		3.6	.1	0.35			40		.07		.035	.002	1.00
		3.7	.1	0.36			40		.07		.036	.003	
		3.8	.1	0.35			40		.06		.035	.002	
		3.9	.1	0.35			40		.07		.035	.002	.99 .027
		4.0	.1	0.42			40		.07		.042	.003	.98
		4.1	.1	0.42			40		.09		.042	.004	.97
		4.2	.1	0.40			40		.08		.040	.003	.96 .037
		4.3	.1	0.40			40		.09		.040	.004	
		4.4	.1	0.40			40		.10		.040	.004	.94
		4.5	.1	0.35			40		.10		.035	.004	.92 .049
		4.6	.1	0.32			40		.10		.032	.003	.90
		4.7	.1	0.31			40		.08		.031	.002	
		4.8	.1	0.28			40		.07		.028	.002	
		4.9	.1	0.28			40		.06		.028	.002	.85
		5.0	.1	0.21			40		.06		.021	.001	
		5.1	.1	0.21			40		.03		.021	.001	.06
		5.2	.15	0.20			40		.01		.03	0	.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	5.4	.1	0									.80
	2.8	2.8					AVE = .07			.902	0.06	.85
	REW	@	9:08				GHT = 1.00 -	.95 =	.05			
												.90
												.92
												.94
												.96
												.97
												.98
												.99
⊙												1.00
												.99
												.98
												.97
												.96
												.94
												.92
												.90
												.85
												.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102802 (East Maui, Honopou IIFS Site B)

Date of Field Investigation: October 28, 2008 **Time** (24-hour)**:** 0930 - 1100	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew (EMI Water Resources Manager) and Henry Robello (Field Superintendent) Honopou community - Beatrice Kekahuna, and Wanda Vierra
Hydrologic Unit:	Honopou (6034)
Stream Name:	Honopou Stream

Findings:

On October 27, 2008, CWRM staff documented the flow release at Lowrie Side Ditch bypass sluice gate on Honopou Stream. Refer to Field Investigation Report FI2008102704 (East Maui, Honopou Lowrie Ditch, restore) for more information. Since flow was restored, the following flow measurements represent post-release flow conditions.

At approximately 0930 hours, CWRM staff, Garret Hew, Henry Robello, and members of the Honopou community arrived at the property of Melissa and Barron Souza. From Melissa Souza's property, everyone hiked to IIFS Site B on Honopou Stream. CWRM staff prepared the site for flow measurement. CWRM staff checked the upstream gage pool for debris and there was none. The entire flow measurement was completed in 30 minutes. Gage height readings were taken at the downstream gage pool at the start and finish of flow measurement. In addition to flow measurement, CWRM staff also recorded wind velocity, air temperature, water temperature and weather conditions. The weather was sunny with cool air temperatures and no rain. As computed back in the Honolulu Office, the flow at IIFS Site A was 0.151 cubic feet per second (0.098 million gallons per day), with a no change in gage height.

On the previous day, Garret Hew offered to bring the cap for the pipe (see Field Investigation Report FI2008102705 (East Maui, Huelo IIFS Site A). CWRM staff and Garret Hew capped the PVC pipe that is part of the concrete-reinforced masonry (CRM) wall of the gage pool on Honopou Stream. They used PVC cement to prevent any leakage from the pipe.

Staff crew left Honopou Stream IIFS Site B at approximately 1100 hours, and drove to Haiku Ditch on Puolua (Huelo) Stream to document the flow release. Refer to Field Investigation Report FI2008102803 (East Maui, Huelo Haiku Ditch, restore) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081028011	IIFS Site B on Honopou Stream.
20081028012	CRM wall of the gage pool on Honopou Stream at IIFS Site B.
20081028013	Capped PVC pipe at the CRM wall of the gage pool on Honopou Stream at IIFS Site B.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
12	20.931867	-156.244694	IIFS Site B Flow Measurement on Honopou Stream
11	20.931827	-156.244678	IIFS Site B Reference Point on Honopou Stream

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Measurement and Gage Inspection Notes

Recommendations:

IMAGE CONTACT SHEET

20081028011.JPG

20081028012.JPG

20081028013.JPG

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DDM

Sta. No. HONOPOU HFS SITE B

Sta. Name _____

Date 10/29 , 20 08 Party Chui , Dean, Ed

Width 1.3 Area 0.605 Vel. 0.25 G.H. 0.83 Disch. 0.151

Method Wading No. secs. 40 G.H. change 0 in .5 hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 10:00				
		GHT = 1.00 - 0.17 = 0.83				
	Finish	REW @ 10:26				
		GHT = 1.00 - 0.17 = 0.83				
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated ____

Weather: overcast

Air Temp. 26 °C at 10:02

Water Temp. 22.5 °C at 10:14

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 15 ft, mi. upstr., downstr. of gage. control

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: laminar, fairly uniform

Cross section: cobbles, rocky, fairly uniform.

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: concrete

Remarks: noticed water level drop from yesterday.

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@	10:07				GHT = 1.00 -		0.17 =	0.83		.80
												.85
	3.1	.05	0.19			EST =	½(2ft) = .15			.010	.002	
	3.2	.1	0.51			40		0.29		.051	.015	
	3.3	.1	0.58			40		0.27		.058	.016	.90
	3.4	.1	0.60			40		0.27		.060	.016	.92
	3.5	.1	0.58			40		0.25		.058	.015	
	3.6	.1	0.58			40		0.24		.058	.014	.94
	3.7	.1	0.58			40		0.23		.058	.013	.96
	3.8	.1	0.60			40		0.24		.060	.014	.97
	3.9	.1	0.59			40		0.22		.059	.013	.98
	4.0	.1	0.55			40		0.25		.055	.014	.99
	4.1	.1	0.55			40		0.24		.055	.013	.145
	4.2	.15	0.23			40		0.25		.023	.006	
0	4.4	.1	0				AVE = .25			.605	.151	1.00
	1.3	1.3										
	REW	@	10:28				GHT = 1.00		- 0.17 =	0.83		.99
												.98
												.97
												.96
												.94
												.92
												.90
												.85
												.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102803 (East Maui, Huelo Haiku Ditch, restore)

Date of Field Investigation: October 28, 2008 **Time** (24-hour)**:** 1130 - 1200	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Ernie Schupp (Huelo farmer); EMI - Garret Hew (EMI Water Resources Manager) and Henry Robello (Field Superintendent)
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Puolua (Huelo) Stream

Findings:

At approximately 1130 hours, CWRM staff, Garret Hew and Henry Robello, arrived at the Haiku Ditch diversion on Puolua (Huelo) Stream. CWRM staff took a volumetric measurement of the water flowing through the two 5.4-inch (O.D.) PVC pipes that bypasses Haiku Ditch on Puolua (Huelo) Stream. With a stopwatch, staff recorded the number of seconds each of the pipes took to fill a 2 gallon bucket. This process was repeated 5 times, making a total of 5 measurements per pipe. As computed back in the Honolulu Office, the flow from the pipes was 0.062 cubic feet per second (0.040 million gallons per day).

The purpose of the field visit was to document the flow release at the ditch. Henry Robello proceeded to lift up the Haiku Ditch sluice gate with a metal bar. Once the gate was opened, water from the upstream side of the sluice gate flowed through the gate opening. Water slowly stopped flowing from the two pipes that bypasses Haiku Ditch on Puolua (Huelo) Stream.

CWRM staff videotaped the flow release event.

Staff crew left the Haiku Ditch diversion on Puolua (Huelo) Stream at approximately 1200 hours, and continued to document opening of Haiku Ditch sluice gate on Hanehoi Stream. Refer to Field Investigation Report FI2008102804 (East Maui, Hanehoi Haiku Ditch, restore) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081028015	Garret Hew and Henry Robello inspecting the Haiku Ditch sluice gate on Puolua (Huelo) Stream.
20081028016	The two PVC pipes that bypasses Haiku Ditch on Puolua (Huelo) Stream.
20081028017	Haiku Ditch on Puolua (Huelo) Stream.
20081028019	CWRM staff conducting volumetric measurement of the water flowing through the two PVC pipes that bypasses Haiku Ditch on Puolua (Huelo) Stream.
20081028022	Henry Robello opening the Haiku Ditch sluice gate on Puolua (Huelo) Stream.
20081028023	Haiku Ditch on Puolua (Huelo) Stream. Haiku Ditch sluice gate opened.
20081028025	Henry Robello opening the Haiku Ditch sluice gate on Puolua (Huelo) Stream.
20081028026	Haiku Ditch sluice gate on Puolua (Huelo) Stream opened.
20081028027	The two PVC pipes that bypasses Haiku Ditch on Puolua (Huelo) Stream, after the sluice gate was opened.
20081028028	Haiku Ditch on Puolua (Huelo) Stream after the sluice gate was opened..

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081028015.JPG

20081028016.JPG

20081028017.JPG

20081028019.JPG

20081028022.JPG

20081028023.JPG

20081028025.JPG

20081028026.JPG

20081028027.JPG

20081028028.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102804 (East Maui, Hanehoi Haiku Ditch, restore)

Date of Field Investigation: October 28, 2008 **Time** (24-hour)**:** 1200 - 1300	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Huelo community - Ernie Schupp, Neola Caveny, and Ken Meade; EMI - Garret Hew (EMI Water Resources Manager) and Henry Robello (Field Superintendent)
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Hanehoi Stream

Findings:

At approximately 1200 hours, CWRM staff, Ernie Schupp, Garret Hew and Henry Robello, met with Neola Caveny and her friend Ken Meade outside of the Door of Faith Church on Huelo Road. Following EMI staff, everyone drove to the Haiku Ditch diversion on Hanehoi Stream. The purpose of the field visit was to document the opening of the Haiku Ditch sluice gate on Hanehoi Stream. The stream was dry. Henry Robello proceeded to lift up the Haiku Ditch sluice gate with a metal bar. Dean Uyeno measured the dimensions of the sluice gate opening to be 2 x 1.38 feet (W x H).

CWRM staff videotaped the event.

CWRM staff and Ernie Schupp hiked to IIFS Site B on Hanehoi Stream, both the flow measurement and reference point locations.

Staff crew left the Haiku Ditch diversion on Hanehoi Stream at approximately 1300 hours, and returned to Puolua (Huelo) Stream to take post-release flow measurements. Refer to Field Investigation Report FI2008102805 (East Maui, Huelo IIFS Site A) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081028033	Haiku Ditch diversion intake structure on Hanehoi Stream.
20081028035	Haiku Ditch diversion structure on Hanehoi Stream.
20081028037	Henry Robello opening the Haiku Ditch sluice gate on Hanehoi Stream.
20081028038	Henry Robello opening the Haiku Ditch sluice gate on Hanehoi Stream.
20081028040	Haiku Ditch sluice gate on Hanehoi Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081028033.JPG

20081028035.JPG

20081028037.JPG

20081028038.JPG

20081028040.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008102805 (East Maui, Huelo IIFS Site A)

Date of Field Investigation: October 28, 2008	**Time** (24-hour)**:** 1320 - 1340
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Ernie Schupp (Huelo farmer)
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Puolua (Huelo) Stream

Findings:

At approximately 1320 hours, 1.5 hours following the flow release at the Haiku Ditch on Puolua (Huelo) Stream (refer to Field Investigation Report FI2008102803 for more information), CWRM staff returned to IIFS Site A on the stream. CWRM staff prepared the site for flow measurement. The entire flow measurement was completed in 20 minutes. Gage height readings were not recorded as a reference point was not established during the field investigation on October 23, 2008 (refer to Field Investigation Report FI2008102303 for more information). In addition to flow measurement, CWRM staff also recorded wind velocity, air temperature, water temperature and weather conditions. The weather was overcast with no rain. As computed back in the Honolulu Office, the flow at IIFS Site A was 0.055 cubic feet per second (0.036 million gallons per day).

Staff crew left the IIFS Site A on Puolua (Huelo) Stream at approximately 1340 hours, and continued to Palauhulu Stream to take flow measurements. Refer to Field Investigation Report FI2008102806 (East Maui, Palauhulu IIFS Site B) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Discharge Measurement and Gage Inspection Notes

Recommendations:

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DDU

Huelo (Correction made 11/20/08)

Sta. No. ~~HANEHOI~~ HFS SITE B

Sta. Name _____

Date 10/29 , 20 08 Party Chui, Dean, Ed (M)

Width 1.8 Area 0.58 Vel. 0.09 G.H. _____ Disch. 0.055 CFS

Method Wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 13:12				
	Finish	REW @ 13:33				
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated ____

Weather: overcast

Air Temp. 26 °C at 13:12

Water Temp. 22.5 °C at 13:17

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 15 ft. mi. upstr., downstr. of ~~gage~~ culvert

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: laminar, fairly uniform

Cross section: fairly uniform, dirt, little pebbles

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: 2 rocks downstream (2 ft) of measuring point.

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@	13:12									.80
												.85
	~~0.3~~											
	0.25	.075	0									
	0.4	.175	0.1			EST=	½(.09)=.05			.018	.001	.90
	0.6	.15	0.25			40		0.09		.038	.003	.92
	0.7	.1	0.37			40		0.13		.037	.005	
	0.8	.1	0.40			40		0.11		.04	.004	.94
	0.9	.1	0.40			40		0.13		.04	.005	.96
	1.0	.1	0.40			40		0.14		.04	.006	.97
	1.1	.1	0.40			40		0.12		.04	.005	.98
	1.2	.1	0.41			40		0.11		.041	.005	.99
	1.3	.1	0.41			40		0.10		.041	.004	
	1.4	.1	0.42			40		0.08		.042	.003	
⊙	1.5	.1	0.42			40		0.07		.042	.003	1.00
	1.6	.1	0.40			40		0.09		.040	.004	
	1.7	.1	0.36			40		0.08		.036	.003	.051
	1.8	.1	0.33			40		0.07		.033	.002	.99
	1.9	.1	0.29			40		0.05	.557	.029	.001	.98
	2.0	.075	0.30			40		0.04		.023	.001	.97
	2.05	.025	0				AVE=	0.09		~~.58~~	.055	.96
	1.8	1.8								0.579		
												.94
	REW	@	13:33									.92
												.90
												.85
												.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008111701 (East Maui, Palauhulu IIFS Site B, pre-release)

Date of Field Investigation: November 17, 2008 **Time** (24-hour)**:** 0900 - 1010	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	
Hydrologic Unit:	Piinaau (6053)
Stream Name:	Palauhulu Stream

Findings:

CWRM staff departed Oahu for Maui at 0520 hours.

At 0900 hours, CWRM staff arrived at the Hana Highway bridge that crosses Palauhulu Stream. The bridge is near the entrance to Piinaau Road. Staff hiked upstream approximately 100 yards from the bridge on Hana Highway, crossed the stream to the right bank, and hiked back downstream to the measurement site directly below the bridge (IIFS Site B).

Staff prepared the site for flow measurement. Flow measurement was completed in 30 minutes. Staff also recorded wind velocity, air temperature, water temperature and weather conditions. Weather was sunny with no rain. As computed back in the Honolulu Office, the flow at the IIFS site was 2.133 cubic feet per second (1.379 million gallons per day), with no gage height readings.

Staff left Palauhulu IIFS Site B at approximately 1010 hours, and proceeded on to document flow restoration at the Koolau Ditch bypass sluice gate on Kano Stream. Refer to Field Investigation Report FI2008111702 (East Maui, Kano Koolau Ditch, restore) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
26	20.856333	-156.146474	IIFS Site B on Palauhulu Stream at Hana Highway

Attachments:

Brief Description:

1. Discharge Measurement and Gage Inspection Notes

Recommendations:

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by CHU

Checked by DBM

Sta. No. PALAUHULU IIFS SITE B

Sta. Name _____

Date 11/17/08 ,20 08 Party Dean (H), Ed, Chui

Width 5.00 Area 3.312 Vel. 0.64 G.H. _____ Disch. 2.133

Method wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 0921				
	Finish	REW @ 0958				
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated _____

Weather: Sunny

Air Temp. 23 °C at 0924

Water Temp. 19 °C at 0925

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 1 (ft.) mi. upstr., downstr. of bridge gage.

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: Fairly uniform, parts laminar

Cross section: bedrock

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: _____

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@	0921									
	2.05	.075	0									.85
	2.2	.175	0.19			40		0.50		.033	.017	
	2.4	.20	0.77			40		0.59		.154	.091	
	2.6	.20	0.90			40		0.60		.180	.108	.90
	2.8	.20	0.92			40		0.61		.184	.112	.92
	3.0	.20	0.88			40		0.60		.176	.106	
	3.2	.20	0.85			40		0.60		.170	.102	.94
	3.4	.20	0.85			40		0.51	1.067	.170	.087	.96
	3.6	.20	0.83			40		0.47		.166	.078	.97
	3.8	.20	0.80			40		0.56		.160	.090	.98
	4.0	.20	0.72			40		0.64		.144	.092	.99 .883
	4.2	.20	0.75			40		0.66		.150	.099	
	4.4	.20	0.88			40		0.64		.176	.113	
⊙	4.6	.20	0.80			40		0.66		.160	.106	1.00
	4.8	.20	0.77			40		0.66		.154	.102	
	5.0	.20	0.77			40		0.72		.154	.111	
	5.2	.20	0.71			40		0.71		.142	.101	.99
	5.4	.20	0.68			40		0.76		.136	.103	
	5.6	.20	0.68			40		0.76		.136	.103	.98
	5.8	.20	0.69			40		0.76		.138	.105	.97
	6.0	.20	0.65			40		0.79	3.013	.130	.103	.96 1.826
	6.2	.20	0.56			40		0.75		.112	.0824	.94
	6.4	.20	0.38			40		0.74		.076	.056	.92
	6.6	.20	0.33			40		0.62		.066	.041	.90
	6.8	.225	0.20			40		0.51		.045	.023	
	7.05	.125	0			40						
												.85
	5.00	5.00					AVE =	0.64		3.312	2.133	
	REW	@	0958									.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008111702 (East Maui, Kano Koolau Ditch, restore)

Date of Field Investigation: November 17, 2008 **Time** (24-hour)**:** 1010 - 1500	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent), and Nelson Akiu (Keanae Supervisor)
Hydrologic Unit:	Piinaau (6053)
Stream Name:	Kano Stream (tributary of Palauhulu Stream)

Findings:

The purpose of the field visit was to document flow release at the Koolau Ditch bypass sluice gate on Kano Stream, a tributary of Palauhulu Stream. At 1010 hours, CWRM staff met with Garret Hew and EMI staff at the junction of Hana Highway and Piinaau Road. Staff drove up Piinaau Road, and then turned left onto Kano Road. The switch-back trail to the Koolau Ditch bypass sluice gate on Kano Stream begins near the end of Kano Road, along the side of the mountain. EMI staff had previously cleared the trail for the safety of CWRM staff. At the end of the trail is Kano Falls, a cascading waterfall directly upstream of Koolau Ditch. The sluice gate is located inside a tunnel, on the right bank at the foot of the waterfall (inside the pool). At approximately 1200 hours, Nelson Akiu and Garret Hew proceeded to lift up the bypass sluice gate. Once the gate was opened, water from the ditch flowed through the gate and out the side of the mountain, creating a waterfall. Very little water was flowing into the ditch. CWRM staff videotaped the flow release event.

CWRM staff measured the dimensions of the sluice gate to be 1.1 x 6.8 feet (W x H). The sluice gate was opened to a height of 0.45 feet.

According to the trip schedule, CWRM staff had planned to take flow measurements at Kano Stream near Koolau Ditch to estimate the amount of water that would be lost to the losing sections downstream from the ditch, before reaching IIFS Site B on Palauhulu Stream. However, the stream section near the ditch was mostly large boulders, without any well-defined sections suitable for flow measurements. Therefore, staff decided to take flow measurements near the Koolau Ditch bypass sluice gate to approximate the discharge that would flow into Kano Stream. Depth and velocity measurements were taken 3 feet downstream from the sluice gate at only three points along the cross section due to the turbulent flow conditions.

Number	Width of section (ft)	Depth of water (ft)	Velocity (ft/sec)	Discharge (CFS)
1	3.00	0.55	3.68	6.072
2	3.00	0.55	3.96	6.534
3	3.00	0.40	3.33	3.996

CFS = cubic feet per second

As computed back in the Honolulu Office, the average discharge was 5.534 CFS (3.577 million gallons per day). This flow measurement represents a very rough estimate of the discharge in Kano Stream. It does not have the same accuracy as the previous flow estimates where depth and velocity measurements were taken at equal intervals along the cross section.

On the drive back, CWRM staff stopped along Kano Road right before merging with Piinaau Road to access Palauhulu Stream downstream from Kano Falls and Koolau Ditch. Staff hiked from the road to the left bank of the stream, and continued to hike downstream. Staff located a suitable site for flow measurements and made necessary preparations. The site was not flagged because this location was not intended to be an IIFS site. Flow measurement was completed in 30 minutes. Staff recorded wind velocity, air temperature, water temperature and weather conditions. Weather was partly cloudy. As computed back in the Honolulu Office, the flow was 2.802 CFS (1.811 million gallons per day), with no gage height readings. Heavy rain began to fall as staff were hiking back to Kano Road.

CWRM staff were scheduled to return to IIFS Site B on Palauhulu Stream on the third day of the field visit (Wednesday, Nov. 19) and take flow measurements. However, heavy rain fell on East Maui the following day (Tuesday). Most of the streams in East Maui had flow velocities too high for taking measurements. Instead, staff documented the high flow events by taking photographs, descriptions, and GPS waypoints.

Staff concluded the field investigation at 1500 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081117001	The 2001 landslide that covered part of Piinaau Stream.
20081117002	View of Keanae Valley from the hiking trail near Kano Road.
20081117004	Kano Falls upstream of Koolau Ditch on Kano Stream.
20081117005	The pond of Kano Falls upstream from Koolau Ditch.
20081117008	Cascading waterfall of Kano Falls upstream of Koolau Ditch on Kano Stream.
20081117011	The radio gate on the right bank of Kano Stream near the waterfall.
20081117013	Radio gate on the right bank of Kano Stream near the waterfall. This gate controls the water level in Koolau Ditch.
20081117015	Remnants of a concrete-reinforced masonry (CRM) wall on the left bank of Kano Stream near the waterfall.
20081117019	An open tunnel that is part of the Koolau Ditch on the left bank of Kano Stream near the waterfall.
20081117022	Cascading waterfall of Kano Falls upstream of Koolau Ditch on Kano Stream. Photo taken from the right bank.
20081117024	The top part of the cascading waterfall of Kano Falls upstream of Koolau Ditch on Kano Stream. Photo taken from the right bank.
20081117026	Tunnel that leads to the Koolau Ditch bypass sluice gate on Kano Stream.
20081117027	Koolau Ditch bypass sluice gate on Kano Stream.
20081117028	Tunnel downstream the Koolau Ditch bypass sluice gate on Kano Stream, where water from Kano Stream exits on the side of the mountain.
20081117032	End of the tunnel downstream the Koolau Ditch bypass sluice gate on Kano Stream, where water from Kano Stream exits on the side of the mountain.
20081117033	Water from Kano Stream flowing into Koolau Ditch.
20081117034	EMI staff opening the Koolau Ditch bypass sluice gate on Kano Stream.
20081117035	Tunnel downstream the Koolau Ditch bypass sluice gate on Kano Stream, where water from Kano Stream exits on the side of the mountain. The sluice gate has already opened.
20081117037	Koolau Ditch bypass sluice gate opened on Kano Stream.
20081117046	CWRM staff taking flow measurements 3 feet downstream from the Koolau Ditch bypass sluice gate on Kano Stream.
20081117047	Koolau Ditch bypass sluice gate opened on Kano Stream.
20081117048	Water from Kano Stream no longer flowing into Koolau Ditch after the Koolau Ditch bypass sluice gate was opened.
20081117053	Water from Kano Stream flowed through the bypass sluice gate and out the side of the mountain.
20081117055	Upstream from the measurement site on Palauhulu Stream. This location is downstream from Koolau Ditch.
20081117057	Downstream from the measurement site on Palauhulu Stream. This location is downstream from Koolau Ditch.
20081117058	CWRM staff preparing the site on Palauhulu Stream for flow measurement.
20081117059	CWRM staff preparing the site on Palauhulu Stream for flow measurement.
20081117061	CWRM staff taking flow measurement at Palauhulu Stream, downstream from the Koolau Ditch.
20081117063	CWRM staff taking flow measurement at Palauhulu Stream, downstream from the Koolau Ditch.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI20081117wp.shp	Waypoints recorded during the field visit from Nov. 17-19, 2008.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
001	20.81567106	-156.16222948	Pool below Kano Falls, near Koolau Ditch intake at Kano Stream
002	20.81569428	-156.16190384	Access tunnel to Koolau Ditch bypass sluice gate
003	20.81781037	-156.16314051	Start of trail to Koolau Ditch intake at Kano Stream
005	20.81855167	-156.16347067	Flow measurement site on Palauhulu Stream, downstream from Koolau Ditch
006	20.82588055	-156.16540278	Bridge across Hauolo Wahine Stream
008	20.8563569	-156.14677216	EMI access gate on Piinaau Road

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Measurement and Gage Inspection Notes

Recommendations:

IMAGE CONTACT SHEET

20081117001.JPG

20081117002.JPG

20081117004.JPG

20081117005.JPG

20081117008.JPG

20081117011.JPG

20081117013.JPG

20081117015.JPG

20081117019.JPG

20081117022.JPG

20081117024.JPG

20081117026.JPG

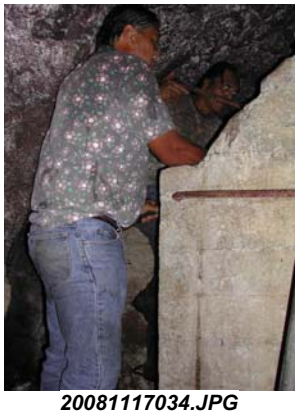
IMAGE CONTACT SHEET


20081117027.JPG


20081117028.JPG


20081117032.JPG


20081117033.JPG


20081117034.JPG


20081117035.JPG


20081117037.JPG


20081117046.JPG


20081117047.JPG


20081117048.JPG


20081117053.JPG


20081117055.JPG

IMAGE CONTACT SHEET

20081117057.JPG

20081117058.JPG

20081117059.JPG

20081117061.JPG

20081117063.JPG

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by CHui

Checked by DBM

Sta. No. PALAUHULU DOWNSTR OF KOOLAU DITCH

Sta. Name _____

Date 11/17 , 20 08 Party Dean, Chui, Ed

Width 5.75 Area 3.706 Vel. 0.76 G.H. _____ Disch. 2.802

Method Wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 1453				
	Finish	REW @ 1523				
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated ____

Weather: overcast

Air Temp. 26 °C at 1503

Water Temp. 20 °C at 1516

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 1/4 ft., (mi) upstr., downstr. of waterfall gage.

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: parts laminar, non-uniform velocity

Cross section: bedrock, pebbles, cobbles

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: _____

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

	ANGLE COEF-FICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVA-TION DEPTH	REVO-LUTIONS	TIME IN SEC-ONDS	VELOCITY AT POINT	VELOCITY MEAN IN VER-TICAL	ADJUST-ED FOR HOR. ANGLE OR	AREA	DISCHARGE		
		LEW	@	1453										
		4.7	.20	0									.85	
		~~4.9~~		~~0.1~~			~~EST=~~				~~.048~~			
		5.1	.30	0.16			EST=	.5(.26)	0.13		.048	.006		
		5.3	.20	0.25			40		0.26		.050	.013	.90	
		5.5	.20	0.38			40		0.31		.076	.024	.92	
		5.7	.20	0.54			40		0.28		.108	.030		
		5.9	.20	0.43			40		0.44		.086	.038	.94	
		6.1	.20	0.50			40		0.56		.100	.056	.96	
		6.3	.20	0.60			40		0.67		.120	.080	.97	
		6.5	.20	0.56			40		0.72		.112	.081	.98	
		6.7	.20	0.46			40		0.76		.092	.070	.99	.398
		6.9	.20	0.45			40		0.73	.892	.090	.066		
		7.1	.20	0.50			40		0.63		0.100	.063		
⊙		7.3	.20	0.70			40		0.49		0.140	.069	1.00	
		~~7.5~~		~~0.80~~			~~40~~		—					
		7.5	.20	0.90			40		0.46		0.180	.083		
		7.7	.20	0.92			40		0.72		0.184	.132	.99	
		7.9	.20	0.90			40		0.84		0.180	.151		
		8.1	.20	0.90			40		0.98		0.180	.176	.98	
		8.3	.20	0.92			40		1.02		0.184	.188	.97	
		8.5	.20	0.90			40		0.98		0.180	.176	.96	1.326
		8.7	.20	0.92			40		0.97		0.184	.178		
		8.9	.20	1.03			40		0.95	2.6	0.206	.196	.94	
		9.1	.20	1.18			40		0.89		0.236	.210	.92	
		~~9.3~~		~~1.05~~			~~40~~		—				.90	2.086
		9.3	.20	1.15			40		0.90		0.230	.207		
		9.5	.20	1.01			40		0.86		0.202	.174	.85	
		9.7	.20	1.01			40		0.85	3.43	0.202	.172		2.639
		9.9	.20	0.60			40		0.76		0.120	.091		
		10.1	.20	0.45			40		0.70		0.090	.063	.80	
		10.3	.175	0.15			EST=	.5(0.7)	0.35		0.026	.009		

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	10.45	0.075	0									
												.85
	5.75	5.75					AVG=	0.76		3.706	2.802	
	REW @ 1523											
												.90
												.92
												.94
												.96
												.97
												.98
												.99
⊙												1.00
												.99
												.98
												.97
												.96
												.94
												.92
												.90
												.85
												.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

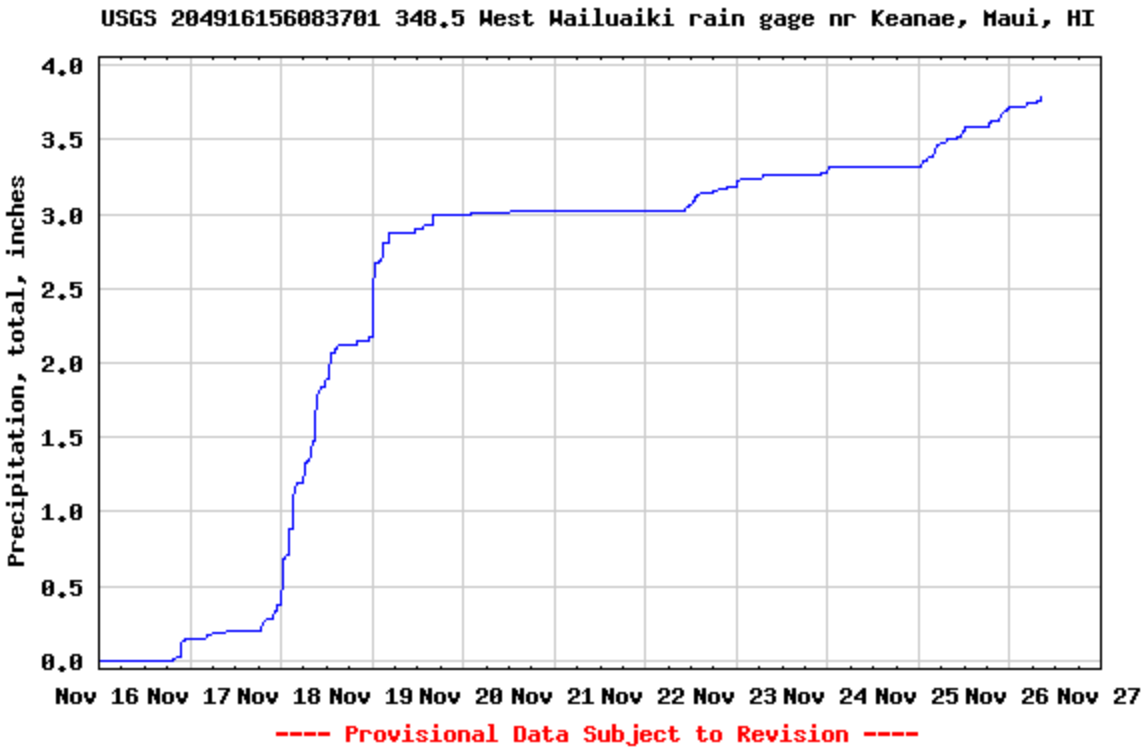
FI2008111801 (East Maui, Palauhulu, high flow)

Date of Field Investigation: November 18, 2008 **Time** (24-hour)**:** 0900 - 0910	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Skippy Hau (DAR)
Hydrologic Unit:	Piinaau (6053)
Stream Name:	Palauhulu Stream

Findings:

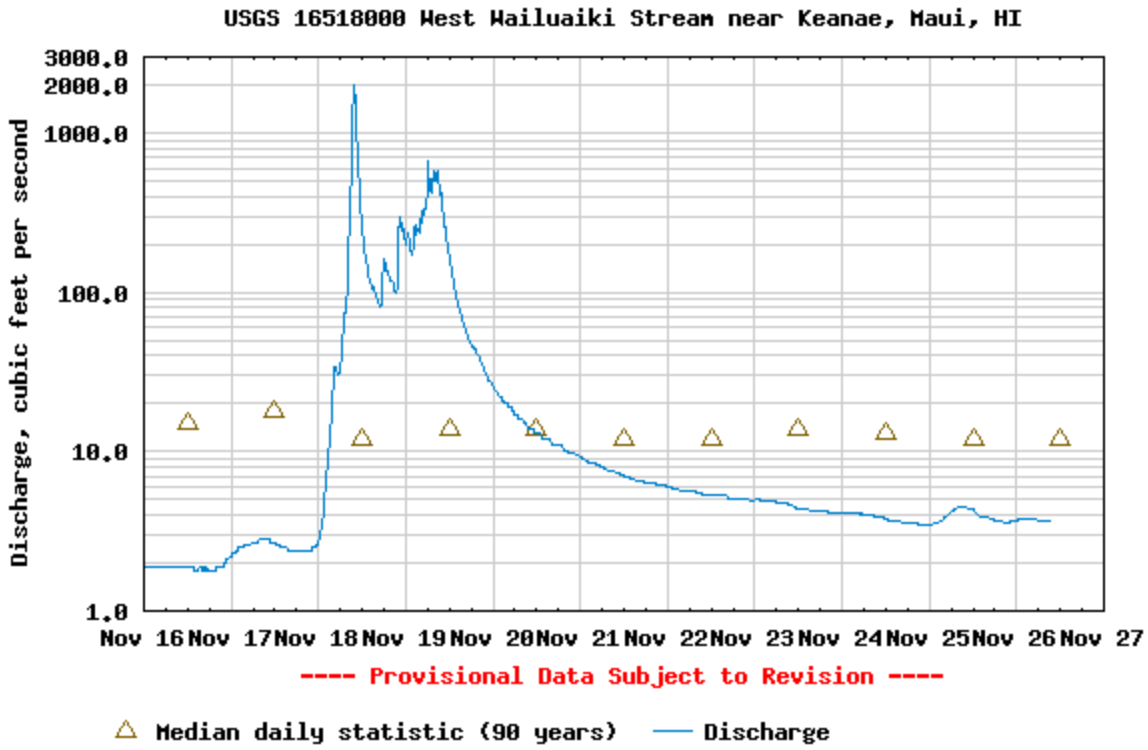
At 0900 hours, CWRM staff and Skippy arrived at the Hana Highway bridge that crosses Palauhulu Stream. Staff observed Palauhulu Stream from the bridge and determined the flow velocities in the stream to be too high for taking measurements.

Heavy rain fell on East Maui on the morning of Nov. 18. USGS rain gage (Station 204916156083701) in West Wailuaiki near Keanae recorded 1.8 inches of rain on Nov 18, and 0.82 inches on Nov. 19. Most of the rain fell on the early morning of Nov. 18, between 12AM and 3:30AM.



Source: USGS National Water Information System [http://waterdata.usgs.gov/hi/nwis/]

The nearest USGS active streamgage with real-time data is located on West Wailuaiki Stream (Station 16518000). At approximately 12:00AM on Nov. 18, discharge in West Wailuaiki Stream began to increase from 2.7CFS to a peak flow of 2,010 CFS at 9:45AM. By Nov. 26, streamflow returned to normal conditions at 3.7 CFS.



Source: USGS National Water Information System [http://waterdata.usgs.gov/hi/nwis/]

Staff left Palauhulu Stream at 0910 hours, and continued to document high flows in Wailuanui Stream. Refer to Field Investigation Report FI2008111802 (East Maui, Wailuanui, high flow) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081118001	IIFS Site B on Palauhulu Stream during high flows.
20081118002	Palauhulu Stream upstream of IIFS Site B during high flows.
20081118003	Palauhulu Stream downstream of IIFS Site B during high flows.
20081118004	Palauhulu Stream downstream of IIFS Site B during high flows.
20081118005	Palauhulu Stream downstream of IIFS Site B, near the Hana Highway during high flows.
20081118006	Palauhulu Stream upstream of IIFS Site B during high flows.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
26	20.856333	-156.146474	IIFS Site B on Palauhulu Stream at Hana Highway

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

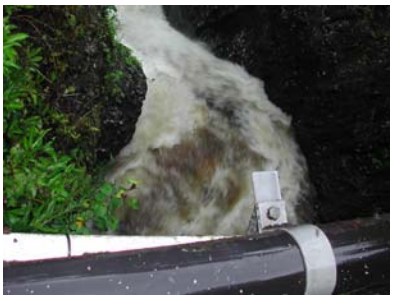
IMAGE CONTACT SHEET

20081118001.JPG

20081118002.JPG

20081118003.JPG

20081118004.JPG



20081118005.JPG

20081118006.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008111803 (East Maui, Lakini and Kualani)

Date of Field Investigation: November 18, 2008 **Time** (24-hour)**:** 1030 - 1500	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	DAR - Skippy Hau; Wailua Valley - Ed Wendt and Carl Wendt
Hydrologic Unit:	Waiokamilo (6055)
Stream Name:	Kualani Stream

Findings:

The purpose of the field visit was to get a better understanding of the Lakini taro patch, its auwai, and Kualani Stream. At 1030 hours, CWRM staff, Skippy, Ed and Carl Wendt arrived at the Hana Highway bridge that crosses Waiokamilo Stream and Kualani Stream. Staff took photographs of both streams upstream and downstream from the bridge. The streams had high flows from the heavy rain*. Downstream from the bridge, Kualani Stream is diverted at Dam 4 for the Na Moku Project taro loi. Kualani Stream continues to flow downstream from the bridge for about 80 feet and then merges with Waiokamilo Stream. Staff walked down Wailua Road from Hana Highway to see the auwai for the Na Moku Project. Water that exits the Na Moku Project taro lois, continues under Wailua Road to more taro fields in the valley.

The next destination was the Lakini taro patch. Kikokiko Falls on Waiokamilo Stream could be seen while walking up the taro patch from Hana Highway. At the end of Lakini is Dam 1 where Kualani Stream is diverted for the taro patch. Dean Uyeno and Ed Wendt continued to hike up Kualani Stream from the dam for another 200 feet. The streambank was heavily vegetated with California grass. Photos were taken at the point where water diverted from Waiokamilo Stream (at Dam 2) enters Kualani Stream. Dean continued further upstream past the inflow from Waiokamilo, however the area was heavily overgrown with California grass and difficult to continue further. Kualani Stream is relatively small, however water was flowing beneath the California grass. Upon their return, the group walked to the concrete diversion box near Lakini. Water outflow from Lakini flows under Hana Highway to a concrete junction box which distributes the water into an Upper Ditch, Lower Ditch, and a third ditch for the Wailua taro patches. At the time of this visit, water to the Upper Ditch was blocked off by a wooden board. Carl Wendt indicated that normal water flow is insufficient to meet the water needs to taro loi serviced by the upper ditch.

At approximately 1330, everyone arrived at Wailua Valley State Wayside. Following Ed and Carl Wendt, CWRM staff and Skippy hiked mauka along the service road to Wailua Valley in search of Kualani Stream. The service road continues in an open pasture where Kualani Stream crosses. That part of the stream is very narrow and overgrown with vegetation. Then, everyone hiked into the forest and found Kualani Stream. Dean Uyeno, Chui Ling Cheng, and Skippy Hau continued to hike upstream along Kualani Stream to Kualani Falls. CWRM staff was not able to take GPS coordinates of the waterfall because the satellite signal was blocked by the mountain. From the waterfall, CWRM staff and Skippy hiked downstream and met up with the rest of the group. The group continued to hike downstream until the stream reaches the open pasture near the service road.

Staff left Wailua Valley State Wayside at 1500 hours, and continued to document high flows in Wailuanui Stream. Refer to Field Investigation Report FI2008111804 (East Maui, Wailuanui, high flow) for more information.

*Heavy rain fell on East Maui on the morning of Nov. 18. USGS rain gage (Station 204916156083701) in West Wailuaiki near Keanae recorded 1.8 inches of rain on Nov 18, and 0.82 inches on Nov. 19. Most of the rain fell on the early morning of Nov. 18, between 12AM and 3:30AM. The nearest USGS active stream gage with real-time data is located on West Wailuaiki Stream (Station 16518000). At approximately 12:00AM on Nov. 18, discharge in West Wailuaiki Stream began to increase from 2.7CFS to a peak flow of 2,010 CFS at 9:45AM. By Nov. 26, streamflow returned to 3.7 CFS. Refer to FI2008111801 (East Maui, Palauhulu, high flow) for real-time rainfall and discharge graphs.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081118015	Waiokamilo Stream downstream from Hana Highway.
20081118017	Waiokamilo Stream downstream from Hana Highway.
20081118019	Waiokamilo Stream upstream from Hana Highway.
20081118021	Waiokamilo Stream upstream from Hana Highway.
20081118022	Kualani Stream downstream from Hana Highway.
20081118024	Kualani Stream upstream from Hana Highway.
20081118026	Kualani Stream upstream from Hana Highway.
20081118028	Bridge on Hana Highway that crosses Waiokamilo Stream and Kualani Stream.
20081118029	Dam 4 of the auwai for the Na Moku Project, downstream from Hana Highway.
20081118030	Kualani Stream and the auwai for the Na Moku Project, downstream from Hana Highway but upstream from Dam 4.
20081118031	Auwai for the Na Moku Project, downstream from Hana Highway.
20081118032	Kualani Stream and the auwai for the Na Moku Project, downstream from Hana Highway but upstream from Dam 4.
20081118033	Auwai for the Na Moku Project, downstream from Hana Highway.
20081118034	Confluence of Kualani Stream and Waiokamilo Stream downstream from Hana Highway.
20081118038	Auwai for the Na Moku Project, downstream from Hana Highway.
20081118045	Lakini taro patch.
20081118049	Dam 1 upstream of the Lakini taro patch. Kualani Stream flows into the auwai for Lakini.
20081118051	Kualani Stream upstream of Dam 1.
20081118052	Kualani Stream upstream of Dam 1.
20081118055	Kualani Stream upstream of Dam 1.
20081118057	Kualani Stream upstream of Dam 1.
20081118058	Kualani Stream upstream of Dam 1.
20081118059	Concrete diversion box downstream of Hana Highway.
20081118061	Concrete diversion box downstream of Hana Highway.
20081118065	Taro patches in Wailua Valley.
20081118066	Kikokiko Falls on Waiokamilo Stream.
20081118068	Kualani Stream upstream from Hana Highway.
20081118070	Kualani Stream upstream from Hana Highway, on the way to Kualani Falls.
20081118071	Kualani Stream upstream from Hana Highway, on the way to Kualani Falls.
20081118072	Kualani Falls on Kualani Stream.
20081118075	Kualani Falls on Kualani Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI20081117wp.shp	Waypoints recorded during the field visit from Nov. 17-19, 2008.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
009	20.84859886	-156.13569514	Dam 4 on Kualani Stream to divert water to the Na Moku Project
010	20.84718358	-156.13481705	Water from the Na Moku Project auwai flows under Wailua Road
011	20.84544727	-156.1391966	Downstream auwai outflow from Lakini taro patch
012	20.84506379	-156.13927924	Upstream auwai outflow from Lakini taro patch
013	20.84485651	-156.13977679	Main auwai intake to Lakini taro patch that splits to upper and lower taro patches
014	20.8444613	-156.14018273	Dam 1 on Kualani Stream diverting water for Lakini taro patch
015	20.84361129	-156.14040786	Inflow to Kualani Stream from Waiokamilo Stream
016	20.84523194	-156.13900892	Concrete diversion box below Hana Highway
017	20.8388057	-156.14144512	Kualani Stream crossing the service road

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

Flagging tape of a different color. Staff used yellow flagging tape to mark the trail to Kualani Stream. However, the tpae cannot be easily distinguished from the trees in the forest.

IMAGE CONTACT SHEET

20081118015.JPG

20081118017.JPG

20081118019.JPG

20081118021.JPG

20081118022.JPG

20081118024.JPG

20081118026.JPG

20081118028.JPG

20081118029.JPG

20081118030.JPG

20081118031.JPG

20081118032.JPG

IMAGE CONTACT SHEET

20081118033.JPG

20081118034.JPG

20081118037.JPG

20081118038.JPG

20081118045.JPG

20081118049.JPG

20081118051.JPG

20081118052.JPG

20081118055.JPG

20081118057.JPG

20081118058.JPG

20081118059.JPG

IMAGE CONTACT SHEET

20081118061.JPG

20081118065.JPG

20081118066.JPG

20081118068.JPG

20081118070.JPG

20081118071.JPG

20081118072.JPG

20081118075.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008111807 (East Maui, Honopou IIFS Site A)

Date of Field Investigation: November 18, 2008 **Time** (24-hour)**:** 1730 - 1800	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Skippy Hau (DAR)
Hydrologic Unit:	Honopou (6034)
Stream Name:	Honopou Stream

Findings:

At 1730 hours, CWRM staff and Skippy arrived at the Haiku Ditch diversion intake on Honopou Stream. Due to the high flows from the heavy rain*, debris had collected on the upstream side of the berm that EMI constructed on Oct. 27, 2008 (refer to FI2008102703 for more information). The berm did not wash downstream. Water was flowing over the berm and Haiku Ditch. The water level at the ditch was higher than the opening of the control gate at the right bank of the stream. Backflow of water from the control gate was apparent.

CWRM staff drove down Honopou Road to IIFS Site A on Honopou stream. Flow velocities in Honopou Stream were too high for taking flow measurements. Water flowed pass the CRM wall of the gage pool. The reference point was no longer visible.

Staff concluded the field visit at 1800 hours.

*Heavy rain fell on East Maui on the morning of Nov. 18. USGS rain gage (Station 204916156083701) in West Wailuaiki near Keanae recorded 1.8 inches of rain on Nov 18, and 0.82 inches on Nov. 19. Most of the rain fell on the early morning of Nov. 18, between 12AM and 3:30AM. The nearest USGS active streamgage with real-time data is located on West Wailuaiki Stream (Station 16518000). At approximately 12:00AM on Nov. 18, discharge in West Wailuaiki Stream began to increase from 2.7CFS to a peak flow of 2,010 CFS at 9:45AM. By Nov. 26, streamflow returned to 3.7 CFS. Refer to FI2008111801 (East Maui, Palauhulu, high flow) for real-time rainfall and discharge graphs.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081118126	Haiku Ditch diversion intake on Honopou Stream.
20081118127	Haiku Ditch diversion intake on Honopou Stream.
20081118128	Honopou Stream downstream from Haiku Ditch.
20081118130	Haiku Ditch east of the control gate and Honopou Road.
20081118134	Control gate at the Haiku Ditch diversion intake on Honopou Stream.
20081118136	Gage pool of IIFS Site A on Honopou Stream.
20081118137	Honopou Stream downstream of the bridge that crosses Honopou Road.
20081118139	Gage pool and reference point of IIFS Site A on Honopou Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
6	20.916212	-156.245203	Bridge on Honopou Stream
7	20.916187	-156.245174	IIFS Site A Reference Point on Honopou Stream
8	20.916096	-156.245077	IIFS Site A Flow Measurement on Honopou Stream

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081118126.JPG

20081118127.JPG

20081118128.JPG

20081118130.JPG

20081118134.JPG

20081118136.JPG

20081118137.JPG

20081118139.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008111904 (East Maui, Huelo IIFS Site A)

Date of Field Investigation: November 19, 2008 **Time** (24-hour)**:** 1315 - 1400	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Ernie Schupp (Huelo farmer)
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Puolua (Huelo) Stream

Findings:

On the way to IIFS Site A on the Puolua (Huelo) Stream, CWRM staff saw that Hanehoi Stream was flowing. During the previous field visit on Oct. 24, 2008, Hanehoi Stream was dry (refer to FI2008102401 for more information). Although not planned in the trip schedule, CWRM staff was prepared to conduct a field visit on Hanehoi Stream and possibly estimate discharge in the stream.

At approximately 1315 hours, CWRM staff arrived at IIFS Site A on the Puolua (Huelo) Stream. Despite the heavy rain*, the stream had relatively low flow. This is because the stream is still diverted at Lowrie Ditch upstream.

CWRM staff prepared the IIFS site for flow measurement. Flow measurement was completed in 30 minutes. Gage height readings were not recorded as a reference point was not established during the field investigation on October 23, 2008 (refer to Field Investigation Report FI2008102303 for more information). CWRM staff recorded wind velocity, air temperature, water temperature and weather conditions. The weather was overcast with no rain. As computed back in the Honolulu Office, the flow at IIFS Site A was 0.244 cubic feet per second (0.158 million gallons per day).

Staff left the IIFS Site A on Puolua (Huelo) Stream at approximately 1400 hours, and continued to Hanehoi Stream to take flow measurements. Refer to Field Investigation Report FI2008111905 (East Maui, Hanehoi IIFS Site B) for more information.

*Heavy rain fell on East Maui on the morning of Nov. 18. USGS rain gage (Station 204916156083701) in West Wailuaiki near Keanae recorded 1.8 inches of rain on Nov 18, and 0.82 inches on Nov. 19. Most of the rain fell on the early morning of Nov. 18, between 12AM and 3:30AM. The nearest USGS active streamgage with real-time data is located on West Wailuaiki Stream (Station 16518000). At approximately 12:00AM on Nov. 18, discharge in West Wailuaiki Stream began to increase from 2.7CFS to a peak flow of 2,010 CFS at 9:45AM. By Nov. 26, streamflow returned to 3.7 CFS. Refer to FI2008111801 (East Maui, Palauhulu, high flow) for real-time rainfall and discharge graphs.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
18	20.903285	-156.225661	Haiku Ditch on Huelo Stream
19	20.903252	-156.225375	IIFS Site A Measurement Site on Huelo Stream

Attachments:

Brief Description:

1. Discharge Measurement and Gage Inspection Notes

Recommendations:

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by CHW

Checked by DDM

Sta. No. HUELO HFS SITE A

Sta. Name _____

Date 11/19 , 2008 Party Chui (M), Dean, Ed, Skippy, Ernie

Width 1.9 Area 0.719 Vel. 0.34 G.H. _____ Disch. .244

Method Wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 1340				
	Finish	REW @ 1407				
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated ____

Weather: Sunny (partly)

Air Temp. _____ °C at _____

Water Temp. 22 °C at 1355

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 15 (ft), mi. upstr., downstr. of gage. (stream)

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: fairly uniform, laminar

Cross section: pebbles, dirt

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: _____

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE		
	LEW	@ 1340										.80	
												.85	
	0.65	.075	0										
	0.80	.125	0.13			EST =	½(.36) =	0.18		.016	.003		
	0.90	.10	0.20			40		0.36		.020	.007	.90	
	1.00	.10	0.24			40		0.39		.024	.009	.92	
	1.10	.10	0.30			40		0.41		.030	.012		
	1.20	.10	0.40			40		0.38		.040	.015	.94	
	1.30	.10	0.47			40		0.41		.047	.019	.96	
	1.40	.10	0.47			40		0.40		.047	.019	.97	
	1.50	.10	0.48			40		0.38		.048	.018	.98	
	1.60	.10	0.49			40		0.34	.321	.049	.017	.99	.119
	1.70	.10	0.50			40		0.36		.050	.018		
	1.80	.10	0.50			40		0.31		.050	.016		
⊙	1.90	.10	0.52			40		0.32	.473	.052	.017	1.00	.17
	2.00	.10	0.50			40		0.33		.050	.017		
	2.10	.10	0.47			40		0.32		.047	.015		
	2.20	.10	0.45			40		0.30	.615	.045	.014	.99	.216
	2.30	.10	0.39			40		0.28		.039	.011	.98	
	2.40	.10	0.38			40		0.25		.038	.010	.97	
	2.50	.075	0.36			40		0.27		.027	.007	.96	
	2.55	.025	0										
												.94	
	1.9	1.9					AVE =	0.34		0.719	0.244	.92	
												.90	
	REW	@ 1407											
												.85	
												.80	

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008111905 (East Maui, Hanehoi IIFS Site B)

Date of Field Investigation: November 19, 2008 **Time** (24-hour)**:** 1420 - 1610	
CWRM Staff:	Ed Sakoda, Dean Uyeno, Chui Ling Cheng
Individuals Present:	Skippy Hau (DAR staff)
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Hanehoi Stream

Findings:

At approximately 1420 hours, CWRM staff and Skippy arrived at the Haiku Ditch diversion intake on Hanehoi Stream. Staff had previously informed Garret Hew (EMI Water Resource Manager) that staff would be hiking from the EMI gate on Hana Highway to the stream. During the previous field visit on Oct. 24, 2008, Hanehoi Stream was dry (refer to FI2008102401 for more information). At this field visit, Hanehoi Stream was flowing due to the heavy rain*.

CWRM staff and Skippy hiked downstream to the IIFS Site B established on Oct. 24, 2008 (refer to FI2008102401 for more information). Water level at the measurement location and the gage pool was over 3 feet deep. Water was dirty so the reference point in the gage pool was barely visible underwater. Staff was scheduled to meet with a resident in Honopou at 1600 hours. Due to time limitations, staff took a rough measurement immediately upstream of the Haiku Ditch bypass sluice gate. This location was selected for flow measurement because flow was confined to a 4 feet long concrete channel before flowing through the bypass sluice gate. However, the turbulent flow observed at the sluice gate may have resulted in errors in velocity measurements.

CWRM staff prepared the site for flow measurement. The entire flow measurement was completed in 30 minutes. Staff also recorded wind velocity, air temperature, water temperature and weather conditions. The weather was overcast with rain near the end of the measurement. As computed back in the Honolulu Office, the flow was 4.711 cubic feet per second (3.045 million gallons per day).

Staff left Hanehoi at 1600 hours, and continued to document high flows at the Haiku Ditch diversion intake on Honopou Stream. Refer to Field Investigation Report FI2008111906 (East Maui, Honopou Haiku Ditch) for more information.

*Heavy rain fell on East Maui on the early morning of Nov. 18. USGS rain gage (Station 204916156083701) in West Wailuaiki near Keanae recorded 1.8 inches of rain on Nov 18, and 0.82 inches on Nov. 19. Most of the rain fell on the early morning of Nov. 18, between 12AM and 3:30AM. The nearest USGS active streamgage with real-time data is located on West Wailuaiki Stream (Station 16518000). At approximately 12:00AM on Nov. 18, discharge in West Wailuaiki Stream began to increase from 2.7CFS to a peak flow of 2,010 CFS at 9:45AM. By Nov. 26, streamflow returned to 3.7 CFS. Refer to FI2008111801 (East Maui, Palauhulu, high flow) for real-time rainfall and discharge graphs.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081119064	Haiku Ditch on Hanehoi Stream.
20081119065	Hanehoi Stream upstream of Haiku Ditch.
20081119066	Hanehoi Stream upstream of Haiku Ditch.
20081119067	Haiku Ditch diversion intake on Hanehoi Stream.
20081119068	Haiku Ditch on Hanehoi Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
25	20.902082	-156.223372	IIFS Site B Measurement Site on Hanehoi Stream
24	20.901837	-156.223664	IIFS Site B Reference Point on Hanehoi Stream
23	20.901496	-156.224056	Haiku Ditch on Hanehoi Stream

Attachments:

Brief Description:

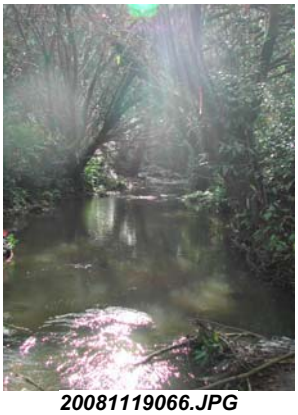
1. Image Contact Sheet
2. Discharge Measurement and Gage Inspection Notes

Recommendations:

IMAGE CONTACT SHEET

20081119064.JPG

20081119065.JPG



20081119066.JPG

20081119067.JPG

20081119068.JPG

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DPM

Sta. No. HANEHOI IIFS B

Sta. Name (2 feet upstream of ditch gate)

Date 11/19 , 20 08 Party Dean(M), Ed, Chui, Skippy

Width 2.65 Area 2.054 Vel. 2.29 G.H. _____ Disch. 4.711 CFS

Method Wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 1544				
	Finish	REW @ 1615				
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated _____

Weather: partly cloudy, raining near 1600 hrs

Air Temp. _____ °C at _____

Water Temp. 20 °C at 1602

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 2 (ft.) mi. upstr., downstr. of gage.

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: turbulent flow

Cross section: pebbles, cobbles, fairly even @ 0.80 feet

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: Diversion gate structure (downstream of measurement point)

Remarks: water level further downstream rather high. No enough time to make measurement.

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75 .80 .85 .90 .92 .94 .96 .97 .98 .99 1.00

River at -

ANGLE COEF-FICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@ 1544										
												.85
	1.1	.05	0.70					0		.035	0	
	1.2	.10	0.70			40		0.13		.070	.009	
	1.3	.10	0.70			40		0.50		.070	.035	.90
	1.4	.10	0.75			40		1.02		.075	.077	.92
	1.5	.10	0.75			40		1.56		.075	.117	
	1.6	.10	0.80			40		2.09		.080	.167	.94
	1.7	.10	0.80			40		2.06		.080	.165	.96
	1.8	.10	0.80			40		2.57		.080	.206	.97
	1.9	.10	0.80			40		3.16		.080	.253	.98
	2.0	.10	0.85			40		3.05		.085	.259	.99 1.288
	2.1	.10	0.80			40		2.92		.080	.234	
	2.2	.10	0.80			40		3.05		.080	.244	
⊙	2.3	.10	0.80			40		3.44		.080	.275	1.00
	2.4	.10	0.80			40		3.61		.080	.289	
	2.5	.10	0.80			40		3.73		.080	.298	
	2.6	.10	0.80			40		3.66		.080	.293	.99
	2.7	.10	0.80			40		3.45	1.29	.080	.276	.98 3.197
	~~2.8~~	~~.10~~	~~0.85~~			~~40~~		~~2.87~~		~~.085~~	~~.244~~	.97
	~~2.9~~	~~.10~~	~~0.85~~			~~40~~		~~2.14~~		~~.085~~	~~.182~~	.96 ~~3.623~~
	~~3.0~~	~~.10~~	~~0.85~~			~~40~~		~~2.25~~		~~.085~~		
	~~3.1~~	~~.10~~	~~0.85~~			~~40~~		~~2.21~~		.085		.94
	~~3.2~~											.92
	2.8	.10	0.85			40		3.09		.085	.263	.90
	2.9	.10	0.85			40		2.52		.085	.214	
	3.0	.10	0.85			40		2.42		.085	.206	3.89
	3.1	.10	0.85			40		2.48	1.63	.085	.211	.85
	3.2	.10	0.85			40		2.24		.085	.190	
	3.3	.10	0.85			40		1.49		.085	.127	
												.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE
	3.4	.10	0.80			40		1.40		.080	.112
	3.5	.10	0.80			40		1.35		.080	.108
	3.6	.125	0.75			40		0.78		.094	.073
	3.75	.075	~~0~~ > 0.75 DNM			40			DNM	~~.087~~ .056	0 DNM
	2.65	2.65					AVG:	~~2.29~~ 2.23 DNM		~~2.054~~ 2.11 DNM	4.711
	REW	@	1615								

.80 .85 .90 .92 .94 .96 .97 .98 .99 1.00 .99 .98 .97 .96 .94 .92 .90 .85 .80

4.53

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008120803 (East Maui, Wailuanui IIFS Site)

Date of Field Investigation: December 8, 2008	**Time** (24-hour)**:** 1450 - 1600
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	
Hydrologic Unit:	Wailuanui (6056)
Stream Name:	Wailuanui Stream

Findings:

At approximately 1450 hours, CWRM staff arrived at the Hana Highway bridge that crosses Wailuanui Stream. CWRM staff hiked down from the bridge to the stream via a small trail that begins on the right bank of the stream, on the downstream side of the bridge. The trail condition was hazardous because of the loose rocks and large boulders on the hill. The IIFS site is below the Hana Highway bridge.

CWRM staff prepared the site for flow measurement. Flow measurement was completed in 40 minutes. Staff also recorded air temperature, water temperature and weather conditions. As computed back in the Honolulu Office, the flow at IIFS Site was 2.803 cubic feet per second (1.812 million gallons per day), with no gage height readings.

According to the flow measurements taken at East Wailuanui tributary (1.067 cubic feet per second, refer to FI2008120801) and at West Wailuanui (1.235 cubic feet per second, refer to FI208120802), the stream gained 0.501 cubic feet per second (0.324 million gallons per day) of flow between Koolau Ditch and the IIFS Site on this day. Calculations are shown below:

Flow at IIFS Site	–	(	Flow at E. Wailuanui	+	Flow at W. Wailuanui	)	=	Flow gains
2.803 CFS	–	(	1.067 CFS	+	1.235 CFS	)	=	0.501 CFS

CWRM staff concluded the field investigation at 1600 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
0	20.832394	-156.138458	IIFS Site Flow Measurement on Wailuanui Stream
4	20.833606	-156.13696	Parking area near IIFS Site on Wailuanui Stream

Attachments:

Brief Description:

1. Discharge Measurement and Gage Inspection Notes

Recommendations:

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DDL

Sta. No. Wailuanui IIFS Site

Sta. Name _____

Date 12/8 , 20 08 Party Dean (M) Chui, Ed

Width 11.3 Area 11.278 Vel. .249 G.H. / Disch. 2.803 CFS

Method Wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW	@	1502		
	Finish	REW	@	1542		
					~	40 min
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated _____

Weather: Overcast

Air Temp. 26 °C at 1533

Water Temp. 19 °C at 1542

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 60 (ft) mi. upstr., downstr. of waterfall gage.

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: parts laminar, parts (sides) no flow.

Cross section: bedrock, not uniform.

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: _____

Remarks: Rocks pushed to bank, channel wider

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

River at -

ANGLE COEF-FICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@	1503									.80
	0.2	.15	0							0	0	.85
	~~0.4~~		~~0.5~~			~~40~~						
	0.5	.40	0.62	.6		40		0		.248	0	
	1.0	.50	0.70	.6		40		0		.350	0	.90
	1.5	.50	0.93	.6		40		.04		.465	.019	.92
	2.0	.50	1.20	.6		40		.06		.600	.036	
	2.5	.50	1.50	.8		40	.09	.145		.750	.109	.94 .164
				.2		40	.20					.96
	3.0	.50	1.80	.8		40	.07	.240		.900	.216	.97
				.2		40	.41					.98
	3.5	.50	1.92	.8		40	.08	.145		.960	.139	.99
				.2		40	.21					
	4.0	.50	1.82	.8		40	.14	.265		.910	.241	
⊙				.2		40	.39					1.00
	4.5	.50	1.90	.8		40	.23	.375	6.133	.950	.356	1.116
				.2		40	.52					
	5.0	.50	1.08	.6		40	.	.50		.540	.270	.99
	5.5	.50	0.68	.6		40		.19		.340	.065	.98
	6.0	.50	0.94	.6		40		.13	7.183	.470	.061	.97 1.512
	6.5	.50	0.93	.6		40		.54		.465	.251	.96
	7.0	.50	1.06	.6		40		.34		.530	.180	
	7.5	.50	0.80	.6		40		.46		.400	.184	.94
	8.0	.50	0.90	.6		40		.41		.450	.185	.92
	8.5	.50	0.69	.6		40		.33		.345	.114	.90
	9.0	.50	0.70	.6		40		.21		.350	.074	2.5
	9.5	.50	0.60	.6		40		.33	10.323	.300	.099	
	10.0	.50	0.57	.6		40		.28	10.608	.285	.080	.85 2.679
	10.5	.50	0.67	.6		40		.19		.335	.064	2.743
	11.0	.50	0.67	.6		40		.18	11.278	.335	.060	2.803
	11.5	.25	0							0		.80
	11.3	11.3					AVE=	0.25 ~~.249~~		11.278	2.803	

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	REW	@	1542									.80
												.85
												.90
												.92
												.94
												.96
												.97
												.98
												.99
⊙												1.00
												.99
												.98
												.97
												.96
												.94
												.92
												.90
												.85
												.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008120903 (East Maui, Waiokamilo Koolau Ditch)

Date of Field Investigation: December 9, 2008 **Time** (24-hour)**:** 1230 - 1550	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent);
Hydrologic Unit:	Waiokamilo (6055)
Stream Name:	Waiokamilo Stream

Findings:

The purpose of this field visit was to document the Koolau Ditch major and minor diversion structures on Waiokamilo Stream and its tributaries. The following lists the diversions that were visited with a brief description of each.

1. Time: 1230 hours. Minor diversion (K-22a) on a tributary of Waiokamilo Stream. Water from the stream used to pond upstream of a concrete wall about 1 foot high and 6 feet wide. When the water level in the pond reached high enough, water would flow through a 6-inch aluminum and PVC pipe on the right stream bank. The pipe transported water from this stream to a tributary of East Waiokamilo Stream further East. At this field visit, about one foot of the concrete wall on the left bank was broken to allow continuous flow of water in the stream through the diversion structure. A section of the PVC pipe on the right bank was broken to sever diversion of streamflow. Based on staff's observation, minor diversion K-22a is no longer functional and not diverting water from this tributary of Waiokamilo Stream. See photos 20081209031 – 20081209042.
2. Time: 1320 hours. Major diversion (K-22, #10 intake) on a tributary of East Waiokamilo Stream, formerly referred to as Kualani Stream. In the next field visit (refer to FI2008120904), CWRM staff confirmed that this stream is not Kualani Stream and that the headwaters of Kualani begins below Koolau Ditch. The diversion structure is concrete with a metal grate on the streambed at the left bank. Water would pond upstream from the sluice gate and flow through the metal grate into Koolau Ditch. A 6-inch PVC pipe is on the left bank. This pipe originates from the minor diversion (K-22a) on a tributary of Waiokamilo Stream as described in #1. At this field visit, the PVC pipe was broken and no water flowed in the pipe. The metal grate on the left bank was sealed with concrete. Based on staff's observation, major diversion (K-22, #10 intake), formerly referred to as Kualani Stream, is no longer functional and not diverting from this tributary of East Waiokamilo Stream. See photos 20081209043 – 20081209054.
3. Time: 1358 hours. Minor diversion on a tributary of Waiokamilo Stream. A small PVC pipe crosscut intake that used to divert water from a tributary of Waiokamilo Stream. The diversion outfall was along the side of the service road. At this field visit, the PVC pipe was not capped and water was seen flowing out of the pipe. Based on staff's observation, the pipe is no longer diverting water from this tributary of Waiokamilo Stream. See photo 20081209055.
4. Time: 1400 hours. Koolau Ditch major diversion (K-23, #11 intake) on Waiokamilo Stream. Water from Waiokamilo Stream used to fall down a cliff and directly into Koolau Ditch. A wooden gate was built closer to the service road in the access tunnel. At this field visit, the wooden gate was moved closer to the ditch. As a result, water from the stream fell outside of the ditch and flowed downstream through the access tunnel. Based on staff's observation, this water is no longer diverted into the ditch. However, there was a small gap between the wooden gate and the ground, allowing water from the ditch to flow through the gate and downstream in the access tunnel. EMI staff used mud and vegetation to seal the leakage temporarily. See photos 20081209056 - 20081209065.
5. Time: 1422 hours. Water from Waiokamilo Stream flowed from above a cliff and then goes under the service road. Below the waterfall was a pond and a small PVC pipe was submerged in the pond. CWRM staff observed the other end of the pipe and it was not capped. According to EMI, this water was never diverted and that the pipe was mistakenly discarded there. Based on staff's observation, this water is not diverted into Koolau Ditch. See photos 20081209068 - 20081209076.
6. Time: 1425 hours. Koolau Ditch major diversion (K-24, #12 intake) on Waiokamilo Stream. The diversion structure is concrete with a sluice gate mounting (head wall) that was on the service road. Water from the stream would flow down the side of the mountain and into the ditch. With the sluice gate removed and the

intake sealed with cement, water continued to flow downstream. Based on staff's observation, major diversion #12 intake (K-24) is no longer functional and not diverting water from Waiokamilo Stream. See photos 20081209077 - 20081209084.

7. Time: 1435 hours. Minor diversion on Waiokamilo Stream. This is a crosscut #12 intake diversion structure with a small PVC pipe that captured seepage and transported water into Koolau Ditch. Very little water was observed. Based on staff's observation, this crosscut intake is no longer in operation. See photos 20081209085 and 20081209086.
8. Time: 1440 hours. Koolau Ditch major diversion (K-25, Kikokiko intake) on Waiokamilo Stream and the minor diversions. Water from Waiokamilo Stream would flow down a small waterfall and into the main intake structure on the left bank below the falls. A minor diversion (K-25a) is located on the left bank of the stream under the service road bridge. The diversion structure is a concrete catchment basin with a 2-inch pipe intake that would capture seepage and transported that water via a PVC pipe into another catchment basin below the service road. A second minor diversion (K-25c) begins mauka of the service road bridge on the left bank and then crossed over to the right bank. The diversion structure is a concrete catchment basin with a 6-inch pipe intake that would capture seepage and transported that water to Koolau Ditch. A third minor diversion (K-25d) is located further West along the service road. This diversion structure is a concrete catchment basin with a 4-inch PVC pipe that would capture seepage and transported that water to Koolau Ditch. A fourth minor diversion (K-25e) is located 20 feet West of minor diversion K-25d. This diversion structure is a concrete catchment basin with a 3-inch PVC pipe that would capture seepage and transported that water to Koolau Ditch. Based on staff's observation, the Kikokiko intake and the minor diversions are no longer functional because either the intakes were cemented and / or the pipes were severed. See photos 20081209088 and 20081209102.
9. Time: 1543 hours. Koolau Ditch minor diversion (K-23a) on Waiokamilo Stream. The diversion structure is a 4-inch PVC pipe intake located east of #11 intake (K-23). The outfall of the minor diversion was not capped and very little water was flowing out of the pipe. Based on staff's observation, this minor intake is no longer in operation. See photo 20081209104.
10. Time: 1548 hours. Koolau Ditch #10 crosscut minor intake (K-22d) on Waiokamilo Stream. The outfall of the minor diversion was not capped and no water was flowing out of the pipe. Based on staff's observation, this minor intake is no longer in operation. See photo 20081209105.

Staff completed documentation of the Waiokamilo diversion structures at 1550 hours. Staff continued to locate Kualani Stream from the service road. Refer to Field Investigation Report FI2008120904 (East Maui, Kualani) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081209031	View of Keanae Valley from the service road.
20081209035	Minor diversion on a tributary of Waiokamilo Stream (K-22a). A 6-inch aluminum PVC pipe diverts water to a tributary of East Waiokamilo Stream, formerly known as Kualani Stream.
20081209037	Tributary of Waiokamilo Stream downstream of the minor diversion K-22a.
20081209038	Minor diversion on a tributary of Waiokamilo Stream (K-22a). A 6-inch aluminum PVC pipe diverts water to a tributary of East Waiokamilo Stream, formerly known as Kualani Stream.
20081209039	Concrete wall of the minor diversion on a tributary of Waiokamilo Stream (K-22a). This section of the concrete wall is broken sever diversion of water and allow continuous flow of water in the stream.
20081209040	Minor diversion on a tributary of Waiokamilo Stream (K-22a). This section of the 6-inch aluminum PVC pipe is broken sever diversion of water from the stream.
20081209041	Minor diversion on a tributary of Waiokamilo Stream (K-22a). This section of the 6-inch aluminum PVC pipe is broken sever diversion of water from the stream.
20081209042	Minor diversion on a tributary of Waiokamilo Stream (K-22a). A 6-inch aluminum PVC pipe diverts water to a tributary of East Waiokamilo Stream, formerly known as Kualani Stream.
20081209043	Tributary of East Waiokamilo Stream upstream of the Koolau Ditch major diversion #10 intake (K-22).
20081209045	Koolau Ditch major diversion (K-22, #10 intake) on a tributary of East Waiokamilo Stream. Metal grate on the left streambank has been sealed with concrete.
20081209046	Koolau Ditch major diversion (K-22, #10 intake) on a tributary of East Waiokamilo Stream.
20081209047	Koolau Ditch major diversion (K-22, #10 intake) on a tributary of East Waiokamilo Stream.
20081209049	Koolau Ditch major diversion (K-22, #10 intake) on a tributary of East Waiokamilo Stream.
20081209050	Koolau Ditch major diversion (K-22, #10 intake) on a tributary of East Waiokamilo Stream.
20081209051	Tributary of East Waiokamilo Stream downstream of the Koolau Ditch major diversion (K-22, #10 intake).
20081209052	Koolau Ditch major diversion (K-22, #10 intake) on a tributary of East Waiokamilo Stream. A 6-inch PVC pipe outfall is located on the left bank. This pipe transported water from a tributary of Waiokamilo Stream at minor diversion K-22a to this stream.
20081209054	Tributary of East Waiokamilo Stream downstream of the Koolau Ditch major diversion (K-22, #10 intake). With the diversion structure sealed shut, water was seen flowing through the sluice gate and out the side of

	the mountain.
20081209055	Minor diversion on a tributary of Waiokamilo Stream. A #10 crosscut intake pipe that used to divert water from Waiokamilo Stream.
20081209056	Koolau Ditch major diversion on Waiokamilo Stream (K-23, #11 intake).
20081209059	Koolau Ditch major diversion on Waiokamilo Stream (K-23, #11 intake).
20081209060	Waiokamilo Stream downstream from Koolau Ditch major diversion #11 intake (K-23).
20081209061	Board gates of the Koolau Ditch access tunnel at #11 intake (K-23) to prevent water from flowing into the ditch.
20081209062	Waiokamilo Stream above the Koolau Ditch major diversion #11 intake (K-23).
20081209063	Waiokamilo Stream above the Koolau Ditch major diversion #11 intake (K-23). Water from the stream was falling outside of the access tunnel and flowing downstream.
20081209064	Waiokamilo Stream downstream from Koolau Ditch major diversion #11 intake (K-23)and the access tunnel.
20081209065	Ken Kawahara in front of the board gates of the Koolau Ditch access tunnel at #11 intake (K-23).
20081209068	Tributary of Waiokamilo Stream flowed from above a cliff and then under the service road.
20081209074	Tributary of Waiokamilo Stream flowed from above a cliff and then under the service road. Below the waterfall was a pond and a small PVC pipe was submerged in the pond.
20081209076	Tributary of Waiokamilo Stream flowed from above a cliff and then under the service road. Below the waterfall was a pond and a small PVC pipe was submerged in the pond.
20081209077	Seepage near the Koolau Ditch access tunnel and major diversion structure on Waiokamilo Stream (K-24, #12 intake).
20081209079	Upstream of the Koolau Ditch major diversion structure on Waiokamilo Stream (K-24, #12 intake).
20081209081	Sluice gate mounting (head wall) of the Koolau Ditch major diversion structure on Waiokamilo Stream (K-24, #12 intake).
20081209082	Water from Waiokamilo Stream flowed downstream of the Koolau Ditch major diversion structure (K-24, #12 intake).
20081209083	Downstream of the Koolau Ditch major diversion structure on Waiokamilo Stream (K-24, #12 intake).
20081209084	Akeke Springs viewed from the service road.
20081209085	Koolau Ditch #12 crosscut intake on Waiokamilo Stream.
20081209086	Downstream from the Koolau Ditch #12 crosscut intake on Waiokamilo Stream.
20081209088	Koolau Ditch Kikokiko intake structure on Waikamilo Stream (K25). PVC pipe and catchment basin below the service road that used to capture seepage from upstream.
20081209089	
20081209090	Bridge where Waiokamilo Stream crosses the service road.
20081209091	Waiokamilo Stream upstream of the service road.
20081209092	Minor diversion K-25c on the right bank of Waiokamilo Stream at Kikokiko intake.
20081209093	Waiokamilo Stream downstream of the service road.
20081209094	Koolau Ditch Kikokiko minor intake structure on Waikamilo Stream. PVC pipe and catchment basin below the service road that used to capture seepage from upstream. The pipe from minor diversion K-25c can be seen in this photo.
20081209096	Koolau Ditch Kikokiko minor intake structure K-25a on Waikamilo Stream. PVC pipe and catchment basin below the service road bridge that used to capture seepage from upstream.
20081209098	Koolau Ditch Kikokiko minor intake structure K-25d on Waikamilo Stream. PVC pipe and catchment basin further West along the service road that used to capture seepage and transport to Koolau Ditch.
20081209099	Koolau Ditch Kikokiko minor intake structure K-25e on Waikamilo Stream. PVC pipe and catchment basin 20 feet West of minor diversion K-25d along the service road that used to capture seepage and transport to Koolau Ditch.
20081209101	Main Kikokiko 6-inch intake pipe that used to divert water from Waiokamilo Stream to Koolau Ditch.
20081209102	Main Kikokiko 6-inch intake pipe that used to divert water from Waiokamilo Stream to Koolau Ditch.
20081209104	Koolau Ditch minor diversion on Waiokamilo Stream (K-23a). The diversion structure is a 4-inch PVC pipe intake located East of #11 intake.
20081209105	Koolau Ditch #10 crosscut minor intake on Waiokamilo Stream (K-22d).

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
62	20.826608	-156.148956	EMI Diversion Intake K-22a
63	20.825728	-156.148713	EMI Diversion Intake K-22
64	20.825253	-156.152109	EMI Diversion Intake K-23a
65	20.825189	-156.152246	EMI Diversion Intake K-23
66	20.825028	-156.153359	Tributary to Waiokamilo Stream
67	20.824967	-156.153979	EMI Diversion Intake K-24
68	20.825016	-156.156391	EMI Diversion Intake K-25
69	20.82667	-156.149231	EMI Diversion Intake K-22d
70	20.826736	-156.149705	EMI Diversion Intake K-22e
71	20.826463	-156.1502	EMI Diversion Intake K-22f
72	20.826265	-156.150514	EMI Diversion Intake K-22g

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081209031.JPG

20081209035.JPG

20081209037.JPG

20081209038.JPG

20081209039.JPG

20081209040.JPG

20081209041.JPG

20081209042.JPG

20081209043.JPG

20081209045.JPG

20081209046.JPG

20081209047.JPG

IMAGE CONTACT SHEET

20081209049.JPG

20081209050.JPG

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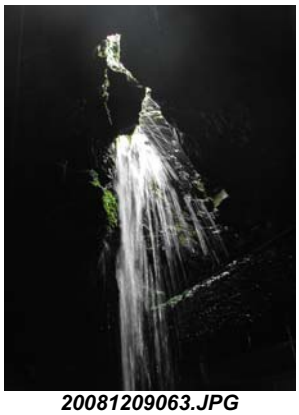
20081209060.JPG

20081209061.JPG

20081209062.JPG



20081209063.JPG

IMAGE CONTACT SHEET

20081209064.JPG

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20081209085.JPG

IMAGE CONTACT SHEET

20081209086.JPG

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20081209101.JPG

IMAGE CONTACT SHEET

20081209102.JPG

20081209104.JPG

20081209105.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008120904 (East Maui, Kualani)

Date of Field Investigation: December 9, 2008 **Time** (24-hour)**:** 1600 - 1720	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent);
Hydrologic Unit:	Waiokamilo (6055)
Stream Name:	Kualani Stream

Findings:

The purpose of this field visit was to locate Kualani Stream, tributary of Waiokamilo Stream, near Koolau Ditch. CWRM staff had a GPS unit to pinpoint their location in relation to the ditch, service road, and the stream. Waypoints taken during this field visit were compared to those taken at Kualani Stream near Hana Highway and the Lakini taro patch in the downstream areas (refer to FI2008111803). The goal was to map out Kualani Stream from the headwaters to its confluence with Waiokamilo Stream, and to verify whether Kualani Stream was diverted at Koolau Ditch.

Kualani Stream crosses the service road approximately 1,100 feet west of West Wailuanui Stream. Upstream of the service road, Kualani Stream is a small waterfall and drops into a pond. The stream continues to flow downstream under the road. In order to access Kualani Stream above the waterfall, CWRM staff drove another 1,000 feet further west on the service road and began to hike into the forest in search of the stream. Staff hiked mauka for about 1,000 feet and then headed east for another 600 feet. The GPS unit indicated that staff were hiking above and parallel to the Koolau Ditch tunnel. Staff reached a deep gulch and found a stream below. Staff originally thought that the stream was Kualani Stream but later confirmed that it was West Wailuanui Stream. Staff headed West and then makai for 600 feet until reaching a slope. After hiking 100 feet down the steep slope, the terrain flattens out and water was seen seeping into a small streambed. Staff concluded that it was the headwaters of Kualani Stream. Staff continued to hike downstream for 300 feet, and then veered east into the forest and back on the service road. From there, staff hiked on the road to return to their vehicles.

Back in the Honolulu Office, CWRM staff plotted the waypoints taken with the GPS unit during the hike against the USGS quad map, Koolau Ditch, and the stream layer. Based on the map, the headwaters of Kualani Stream begins 650 feet makai of Koolau Ditch. Since Kualani Stream begins below Koolau Ditch, the stream is not diverted at the ditch. According to the photos taken earlier of the Koolau Ditch diversions on Waiokamilo Stream (refer to FI2008120903), the stream that is formerly believed to be Kualani Stream is actually a tributary of East Waiokamilo Stream. With the coordinates taken in this field visit, CWRM staff plans to re-evaluate the geographic location of the stream and possibly create a new GIS layer of this stream.

Staff concluded the field visit at 1720 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081209106	Small waterfall in Kualani Stream at the service road.
20081209107	Small waterfall in Kualani Stream at the service road.
20081209108	Small waterfall in Kualani Stream at the service road.
20081209109	Small waterfall in Kualani Stream at the service road.
20081209110	The brush that CWRM staff hiked through to locate Kualani Stream.
20081209111	The brush that CWRM staff hiked through to locate Kualani Stream.
20081209112	Headwaters of Kualani Stream, 650 feet makai of Koolau Ditch.
20081209113	Headwaters of Kualani Stream, 650 feet makai of Koolau Ditch.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
77	20.827438	-156.144607	Kualani Stream at EMI Service Road
78	20.826859	-156.144668	Kualani Stream
79	20.826648	-156.144803	Kualani Stream
80	20.826139	-156.144918	Kualani Stream, seepage begins to appear
81	20.824898	-156.14587	Kualani Stream, approx. over Koolau Ditch

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081209106.JPG

20081209107.JPG

20081209108.JPG

20081209109.JPG

20081209110.JPG

20081209111.JPG

20081209112.JPG

20081209113.JPG

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008121002 (East Maui, East Wailuanui Koolau Ditch)

Date of Field Investigation: December 10, 2008 **Time** (24-hour)**:** 1030 - 1120	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Amanda Martin (President of Na Moku); EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent); DOCARE officers
Hydrologic Unit:	Wailuanui (6056)
Stream Name:	East Wailuanui Tributary

Findings:

At 1030 hours, CWRM staff arrived at the Koolau Ditch bypass sluice gate on East Wailuanui tributary. The purpose of this field visit was to document the adjustment of the sluice gate. Following the adoption of IIFS, EMI had expressed interest in lowering the sluice gate so that the ditch could capture high flows during high rainfall events. CWRM staff was present to ensure that the height of the sluice gate opening after adjustment would allow enough flow to pass through, and satisfy the IIFS at the selected site further downstream on Wailuanui Stream. In other words, no water from the stream is diverted unless the IIFS is met.

CWRM staff measured the dimensions of the sluice gate opening to be 3.0 x 2.0 feet (W x H). The depth of water at the sluice gate was 0.11 feet, which was 0.015 feet lower than the water depth recorded on Monday, Dec. 8, 2008 (refer to FI2008120801). Staff also measured the gap between each notch on the sluice gate adjustment structure to be 0.18 feet.

Staff took flow measurements about 15 feet downstream of the sluice gate. This site was selected on Monday, Dec. 8, 2008 (refer to FI2008120801). The site was not flagged because this location was not intended to be an IIFS site. Flow measurement was completed in 20 minutes. Staff also recorded air temperature, water temperature and weather conditions. As computed back in the Honolulu Office, the flow was 0.921 cubic feet per second (0.595 million gallons per day), with no gage height readings. The flow was 0.146 cubic feet per second (0.944 million gallons per day) lower than the discharge recorded on Monday, Dec. 8, 2008.

The recorded flow measurement is an estimate of the discharge in East Wailuanui tributary. Staff compared this flow with the discharge in West Wailuanui tributary (refer to FI2008121003) and that at the IIFS Site on Wailuanui Stream (refer to FI2008121001) to assess flow gains or losses in the stream reach between Koolau Ditch and the IIFS Site. This is discussed in Field Investigation Report FI2008121001 (East Maui, Wailuanui IIFS Site).

Based on Field Investigation Report FI2008121001, the discharge at the IIFS Site on Wailuanui Stream was 2.076 cubic feet per second (1.342 million gallons per day). Since the adopted IIFS of 3.05 cubic feet per second (1.97 million gallons per day) was not attained, no water from the stream can be diverted. However, the sluice gate can be lowered to a height that during average flow conditions, so that enough flow passes the sluice gate to satisfy the IIFS at the selected site further downstream on Wailuanui Stream. The height of the opening was estimated by 1) calculating the flow velocity at the sluice using the discharge measured 15 feet downstream from the sluice gate;

Flow at E. Wailuanui	÷	(	Depth of water	x	Width of sluice gate	)	=	Flow velocity
0.921 CFS	÷	(	0.11 feet	x	3 feet	)	=	2.79 feet / sec

and 2) calculating the discharge in E. Wailuanui using increments of the notch gap on the sluice gate adjustment structure.

Flow velocity	x	(	Height of sluice gate	x	Width of sluice gate	)	=	Flow at E. Wailuanui
2.79 feet / sec	x	(	0.18 feet	x	3 feet	)	=	1.51 CFS
2.79 feet / sec	x	(	0.36 feet	x	3 feet	)	=	3.01 CFS

As previously measured, each notch is 0.18 feet. If the sluice gate was opened to a height of 0.18 feet, only 1.51 cubic

feet per second of flow would pass the sluice gate. Not accounting for the possibility of flow gains below Koolau Ditch and head build-up behind the sluice gate during higher flows that may increase flow velocity, opening the sluice gate to a height of 0.36 feet (2 notches) was a more conservative approach.

The final height of the sluice gate opening after adjustment was 0.35 feet. CWRM staff fluorescent yellow flagging tape to mark the height of the sluice gate opening.

Staff left East Wailuanui tributary at approximately 1120 hours, and proceeded to West Wailuanui tributary. Refer to Field Investigation Report FI2008121003 (East Maui, West Wailuanui Koolau Ditch) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081210001	Downstream side of the Koolau Ditch bypass sluice gate on East Wailuanui Stream.
20081210002	Downstream side of the Koolau Ditch bypass sluice gate on East Wailuanui Stream.
20081210003	East Wailuanui Stream downstream of the Koolau Ditch bypass sluice gate.
20081210005	Upstream side of the Koolau Ditch bypass sluice gate on East Wailuanui Stream.
20081210006	Ken Kawahara, Amanda Martin, Dexter Tom, and Mark Vaught at the Koolau Ditch bypass sluice gate on East Wailuanui Stream.
20081210008	EMI staff adjusting the Koolau Ditch bypass sluice gate on East Wailuanui Stream.
20081210011	CWRM staff measuring the height of the Koolau Ditch bypass sluice gate opening on East Wailuanui Stream.
20081210012	Upstream side of the Koolau Ditch bypass sluice gate on East Wailuanui Stream after gate adjustment.
20081210013	East Wailuanui Stream downstream of the Koolau Ditch bypass sluice gate after adjustment.
20081210014	Upstream side of the Koolau Ditch bypass sluice gate on East Wailuanui Stream after gate adjustment.
20081210016	Notches of the Koolau Ditch bypass sluice gate on East Wailuanui Stream.
20081210020	Notches of the Koolau Ditch bypass sluice gate on East Wailuanui Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
74	20.820689	-156.140675	Flow measurement site on East Wailuanui Stream below Koolau Ditch intake

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Measurement and Gage Inspection Notes

Recommendations:

IMAGE CONTACT SHEET

20081210001.JPG

20081210002.JPG

20081210003.JPG

20081210005.JPG

20081210006.JPG

20081210008.JPG

20081210011.JPG

20081210012.JPG

20081210013.JPG

20081210014.JPG

20081210016.JPG

20081210020.JPG

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DDW

Sta. No. E. Wailuanui

Sta. Name _____

Date 12/10, 20 08 Party Dean (M), Ed, Chui

Width 3.63 Area 1.912 Vel. .48 G.H. ~ Disch. .921 CFS

Method Wading No. secs. 40 G.H. change ~ in ~ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW	@ 1044			
	Finish	REW	@ 1105		~	20 min
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated _____

Weather: Sunny

Air Temp. 20 °C at 1044

Water Temp. 19 °C at 1105

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 20 ft, mi. upstr., downstr. of gage. sluice gate

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: fairly uniform, laminar

Cross section: cobbles, dirt, bedrock, fairly uniform

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____, Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____, min _____.

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: _____

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEF-FICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@	1044									.80
												.85
	4.07	.015	0							0		
	4.10	.115	.47			40		.35		.054	.019	
	4.3	.2	.51			40		.34		.102	.035	.90
	4.5	.2	.51			40		.49		.102	.050	.92
	4.7	.2	.49			40		.48		.098	.047	
	4.9	.2	.52			40		.54	.46	.104	.056	.94 .207
	5.1	.2	.53			40		.54		.106	.057	.96
	5.3	.2	.54			40		.48	.674	.108	.052	.97
	5.5	.2	.54			40		.51		.108	.055	.98
	5.7	.2	.61			40		.55	.904	.122	.067	.99 .438
	5.9	.2	.60			40		.54		.120	.065	.503
	6.1	.2	.60			40		.59	1.144	.120	.071	.574
⊙	6.3	.2	.64			40		.50		.128	.064	1.00 .638
	6.5	.2	.62			40		.46	1.396	.124	.057	
	6.7	.2	.54			40		.48	1.504	.108	.052	.747
	6.9	.2	.53			40		.52		.106	.055	.99 .802
	7.1	.2	.61			40		.43	1.732	.122	.052	.98 .854
	7.3	.2	.52			40		.47	1.836	.104	.049	.97 .903
	7.5	.15	.32			40		.25	1.884	.048	.012	.96 .915
	7.6	.1	.28			40		.20	1.912	.028	.006	.921
	7.7	.05	0							0		.94
												.92
	3.63	3.63					Ave=	.48		1.912	0.921	.90
	REW	@	1105									
												.85
												.80

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008121003 (East Maui, West Wailuanui Koolau Ditch)

Date of Field Investigation: December 10, 2008 **Time** (24-hour)**:** 1220 - 1340	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Amanda Martin (President of Na Moku); EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent); DOCARE officers
Hydrologic Unit:	Wailuanui (6056)
Stream Name:	West Wailuanui Tributary

Findings:

At 1220 hours, CWRM staff arrived at the Koolau Ditch bypass sluice gate on West Wailuanui tributary. The purpose of this field visit was to document the adjustment of the sluice gate. Following the adoption of IIFS, EMI had expressed interests in lowering the sluice gate so that the ditch could capture high flows during high rainfall events. CWRM staff was present to ensure that the height of the sluice gate opening after adjustment would allow enough flow to pass through, and satisfy the IIFS at the selected site further downstream on Wailuanui Stream. In other words, no water from the stream is diverted until the IIFS is met.

CWRM staff measured the dimensions of the sluice gate opening to be 2.8 x 3.0 feet (W x H). The depth of water at the sluice gate on the left bank was 0.31 feet and at the right bank was 0.17 feet. The average water depth was 0.24 feet, which was 0.06 feet lower than the water depth recorded on Monday, Dec. 8, 2008 (refer to FI2008120802). Staff also measured the gap between each notch on the sluice gate adjustment structure to be 0.18 feet.

Staff took flow measurements about 2 feet upstream of the sluice gate. This site was selected on Monday, Dec. 8, 2008 (refer to FI2008120802). The site was not flagged because this location was not intended to be an IIFS site. Flow measurement was completed in 30 minutes. Staff also recorded air temperature, water temperature and weather conditions. As computed back in the Honolulu Office, the flow was 1.242 cubic feet per second (0.803 million gallons per day), with no gage height readings. The flow was 0.007 cubic feet per second (0.005 million gallons per day) lower than the discharge recorded on Monday, Dec. 8, 2008.

The recorded flow measurement is an estimate of the discharge in West Wailuanui tributary. Staff compared this flow with the discharge in East Wailuanui tributary (refer to FI2008121002) and flow at the IIFS Site on Wailuanui Stream (refer to FI2008121001) to assess flow gains or losses in the stream reach between Koolau Ditch and the IIFS Site. This is discussed in Field Investigation Report FI2008121001 (East Maui, Wailuanui IIFS Site).

Based on Field Investigation Report FI2008121001, the discharge at the IIFS Site on Wailuanui Stream was 2.076 cubic feet per second (1.342 million gallons per day). Since the adopted IIFS of 3.05 cubic feet per second (1.97 million gallons per day) was not attained, no water from the stream can be diverted. However, the sluice gate can be lowered to a height that during average flow conditions, so that enough flow passes the sluice gate to satisfy the IIFS at the selected site further downstream on Wailuanui Stream. The height of the opening was estimated by 1) calculating the flow velocity at the sluice using the discharge measured 2 feet upstream from the sluice gate;

Flow at W. Wailuanui	÷	(	Depth of water	x	Width of sluice gate	)	=	Flow velocity
1.242 CFS	÷	(	0.24 feet	x	2.8 feet	)	=	1.85 feet / sec

and 2) calculating the discharge in E. Wailuanui using increments of the notch gap on the sluice gate adjustment structure.

Flow velocity	x	(	Height of sluice gate	x	Width of sluice gate	)	=	Flow at W. Wailuanui
1.85 feet / sec	x	(	0.18 feet	x	2.8 feet	)	=	0.93 CFS
1.85 feet / sec	x	(	0.36 feet	x	2.8 feet	)	=	1.86 CFS

As previously measured, each notch is 0.18 feet. If the sluice gate was opened to a height of 0.18 feet, only 0.93 cubic

feet per second of flow would pass the sluice gate. Not accounting for the possibility of flow gains below Koolau Ditch and head build-up behind the sluice gate during higher flows that may increase flow velocity, opening the sluice gate to a height of 0.36 feet (2 notches) was a more conservative approach.

The final height of the sluice gate opening after adjustment was 0.35 feet. CWRM staff used fluorescent yellow flagging tape to mark the height of the sluice gate opening.

Staff left East Wailuanui tributary at approximately 1340 hours, and proceeded to locate Kaleiomaui Stream from the service road. Refer to Field Investigation Report FI2008121004 (East Maui, Kaleiomaui) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081210022	CWRM staff conducting flow measurement at the Koolau Ditch bypass sluice gate on West Wailuanui Stream.
20081210024	CWRM staff conducting flow measurement at the Koolau Ditch bypass sluice gate on West Wailuanui Stream.
20081210025	CWRM staff conducting flow measurement at the Koolau Ditch bypass sluice gate on West Wailuanui Stream.
20081210026	Koolau Ditch bypass sluice gate on West Wailuanui Stream before gate adjustment.
20081210029	Koolau Ditch bypass sluice gate on West Wailuanui Stream before gate adjustment.
20081210030	EMI staff adjusting the Koolau Ditch bypass sluice gate on West Wailuanui Stream.
20081210033	CWRM staff measuring the height of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after the adjustment.
20081210034	CWRM staff measuring the height of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after the adjustment.
20081210039	Notches of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after adjustment.
20081210040	Notches of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after adjustment.
20081210041	Notches of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after adjustment.
20081210046	Dean Uyeno, Dexter Tom, Amanda Martin, Ken Kawahara, and Garret Hew at the Koolau Ditch bypass sluice gate on West Wailuanui Stream.
20081210048	Amanda Martin, Ken Kawahara, and Garret Hew at the Koolau Ditch bypass sluice gate on West Wailuanui Stream.
20081210051	CWRM staff flagging the height of the Koolau Ditch bypass sluice gate opening after adjustment.
20081210052	Notches of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after adjustment.
20081210053	Notches of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after adjustment.
20081210054	Amanda Martin, Ken Kawahara, and Garret Hew at the Koolau Ditch bypass sluice gate on West Wailuanui Stream.
20081210055	Notches of the Koolau Ditch bypass sluice gate on West Wailuanui Stream after adjustment.
20081210057	Koolau Ditch (#8) minor diversion intake on Wailuanui Stream.
20081210059	Koolau Ditch (#7) diversion intake on Wailuanui Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Measurement and Gage Inspection Notes

Recommendations:

IMAGE CONTACT SHEET

20081210022.JPG

20081210024.JPG

20081210025.JPG

20081210026.JPG

20081210029.JPG

20081210030.JPG

20081210033.JPG

20081210034.JPG

20081210039.JPG

20081210040.JPG

20081210041.JPG

20081210046.JPG

IMAGE CONTACT SHEET

20081210048.JPG

20081210051.JPG

20081210052.JPG

20081210053.JPG

20081210054.JPG

20081210055.JPG

20081210057.JPG

20081210059.JPG

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DPM

Sta. No. W. Wailuanui

Sta. Name _____

Date 12/10 , 20 08 Party Dean (M) Chui, Ecl.

Width 3.55 Area 1.141 Vel. 1.09 G.H. ✓ Disch. 1.242 CFS

Method Wading No. secs. 40 G.H. change ✓ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW @ 1250				
	Finish	REW @ 1323			~	30 min
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated ____

Weather: sunny

Air Temp. 23 °C at 1302

Water Temp. 20.5 °C at 1315

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 1.5 ft, mi. upstr., downstr. of gage. Sluice gate

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: laminar in center, angled flow on sides.

Cross section: dirt, cobbles, pebbles, bedrock.

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____ , Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____ , min _____ .

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: _____

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
	LEW	@	1250									.80
												.85
	4.05	.075	0							0	—	
	3.9	.125	.32			40		.29		.040	.012	
	3.8	.10	.38			40		.23		.038	.009	.90
	3.7	.10	.38			40		.35		.038	.013	.92
	3.6	.10	.37			40		.47	.153	.037	.017	
	3.5	.10	.38			40		.44		.038	.017	.94 .068
	3.4	.10	.33			40		.64	.224	.033	.021	.96 .089
	3.3	.10	.36			40		.70		.036	.025	.97
	3.2	.10	.34			40		.66	.294	.034	.022	.98 .136
	3.1	.15	.34			40		.73		.051	.037	.99
	2.9	.20	.32			40		.81		.064	.052	
	2.7	.20	.30			40		.86		.060	.052	
⊙	2.5	.20	.32			40		1.07		.064	.068	1.00
	2.3	.20	.31			40		1.08	.595	.062	.067	.412
	2.1	.20	.32			40		1.14		.064	.073	
	1.9	.20	.32			40		1.28		.064	.082	.99
	1.7	.20	.34			40		1.23		.068	.084	.98
	1.5	.15	.35			40		1.40		.053	.074	.97
	1.4	.10	.33			40		1.47		.033	.049	.96
	1.3	.10	.32			40		1.61	.909	.032	.052	
	1.2	.10	.32			40		1.55		.032	.050	.94 .876
	1.1	.10	.32			40		1.80		.032	.058	.92
	1.0	.10	.32			40		1.85	1.005	.032	.059	.90 .993
	0.9	.10	.33			40		1.86	1.038	.033	.061	1.054
	0.8	.10	.30			40		2.10	1.068	.030	.063	1.117
	0.7	.10	.30			40		2.14		.030	.064	.85
	0.6	.10	.28			40		2.18		.028	.061	
	0.5	.05	.29					0		.015	0	
	3.55	3.55					AVE=	1.09		1.141	1.242	.80
	REW	@	1323									

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008121004 (East Maui, Kaleiomaui)

Date of Field Investigation: December 10, 2008 **Time** (24-hour)**:** 1550 - 1615	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent); DOCARE officers
Hydrologic Unit:	Piinaau (6053)
Stream Name:	Kaleiomaui Stream

Findings:

The purpose of this field visit was to locate Kaleiomaui Stream near Koolau Ditch. During a previous field visit on Nov. 17, 2008, CWRM staff saw a tributary of Palauhulu Stream that crosses a bridge at the service road (Piinaau Road). At the time, the tributary was dry. Back in the Honolulu Office, CWRM staff found that the tributary could possibly be Kaleiomaui Stream. In this visit, staff wanted to examine this tributary stream, and verify that the stream is not diverted at Koolau Ditch.

At 1550, CWRM staff, EMI staff, and DOCARE officers arrived at the Koolau Ditch bypass gate, where the ditch daylights into open ditch. The water temperature at the gate was 20°C. While CWRM staff were inspecting the open ditch and the bypass gate, EMI staff Henry Robello hiked further east. When he returned, he reported the presence of a dry streambed and a large pond approximately 300 feet from the bypass gate. CWRM staff hiked to the location of the dry streambed. Based on the location of Koolau Ditch and the coordinates of Kaleiomaui Stream taken from the bridge on the service road (refer to FI2008111702), the dry streambed is Kaleiomaui Stream. The stream continues to be dry upstream from Koolau Ditch (tunnel). Immediately downstream from the ditch, water drops into a large pond and continues to seep downstream. The downstream streambed was relatively dry.

Staff left Kaleiomaui Stream at 1620 hours, and continued to document Koolau Ditch diversion intakes on Piinaau Stream. Refer to Field Investigation Report FI2008121005 (East Maui, Piinaau Koolau Ditch) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081210062	Koolau Ditch daylights into open ditch near Kaleiomaui Stream.
20081210063	Koolau Ditch daylights into open ditch near Kaleiomaui Stream.
20081210064	Downstream from the Koolau Ditch bypass gate where the ditch daylights into open ditch near Kaleiomaui Stream.
20081210065	Koolau Ditch bypass gate where the ditch daylights into open ditch near Kaleiomaui Stream.
20081210066	Koolau Ditch bypass gate where the ditch daylights into open ditch near Kaleiomaui Stream.
20081210069	Koolau Ditch daylights into open ditch near Kaleiomaui Stream.
20081210070	Koolau Ditch daylights into open ditch near Kaleiomaui Stream.
20081210071	Large pond in Kaleiomaui Stream downstream from Koolau Ditch.
20081210073	Large pond in Kaleiomaui Stream downstream from Koolau Ditch.
20081210075	Large pond in Kaleiomaui Stream downstream from Koolau Ditch.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
55	20.825877	-156.165388	Fork at Piinaau Road
60	20.8248	-156.168997	Koolau Ditch daylights, bypass gate on right bank of ditch
61	20.824275	-156.168629	Kaleiomaui Stream

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081210062.JPG

20081210063.JPG

20081210064.JPG

20081210065.JPG

20081210066.JPG

20081210069.JPG

20081210070.JPG

20081210071.JPG

20081210073.JPG

20081210075.JPG

STATE OF HAWAII
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Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2008121005 (East Maui, Piinaau Koolau Ditch)

Date of Field Investigation: December 10, 2008 **Time** (24-hour)**:** 1630 - 1700	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew (Water Resources Manager), Mark Vaught (Operations Manager), Henry Robello (Field Superintendent); DOCARE - 3 officers
Hydrologic Unit:	Piinaau (6053)
Stream Name:	Piinaau Stream

Findings:

The purpose of this field visit was to document the Koolau Ditch major and minor diversion intakes on Piinaau Stream. At 1630, CWRM staff, EMI staff, and DOCARE officers arrived at bridge where Piinaau Stream crosses the service road. Approximately a 0.25 miles further west on the service road, the landslide that occurred in 2003 covered the road and a relatively long stretch of Piinaau Stream.

Downstream from Koolau Ditch, Piinaau Stream was dry. Upstream from the ditch, the stream was relatively dry with ponded water. Remnants of an old bridge still exist in the middle of the stream about 100 feet upstream of the ditch. Staff hiked up the left bank of the stream and passed the outfall of a minor diversion (K-31a) that transports water around a losing reach of the stream. The minor diversion is a 6-inch steel and PVC pipe that begins further upstream, diverts water around a losing reach, and drops the water back in the stream near Koolau Ditch. From the minor diversion intake, staff hiked 100 feet downstream in the losing reach where the stream drops into a pond. Garret Hew suspects that the pond could possibly be a sink hole.

The major diversion intake (K-31) is directly below the bridge where Piinaau Stream crosses the service road. The intake is concrete with a metal grate. When the stream is full, water is ponded in front of the grate. When the level of the water reaches a specific height, the water will spill into the ditch through the metal grate.

Staff left concluded the field visit at 1700 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20081210079	The 2003 landslide that covered the service road (Piinaau Road) and a section of Piinaau Stream in the valley.
20081210080	Keanae valley below Koolau Ditch.
20081210081	Section of Piinaau Stream covered by the 2003 landslide.
20081210082	Piinaau Stream upstream from Koolau Ditch.
20081210084	Outfall of minor diversion (K-31a) that transports water around the losing reach, from upstream reaches to Piinaau Stream immediately upstream of the ditch.
20081210085	Piinaau Stream upstream of minor diversion (K-31a).
20081210086	Minor diversion (K-31a) on Piinaau Stream. Six inch steel and PVC pipe diversion to main Piinaau Stream intake.
20081210088	Piinaau Stream (losing reach) downstream of minor diversion (K-31a).
20081210090	Piinaau Stream (losing reach) downstream of minor diversion (K-31a).
20081210091	Possibly a sink hole on Piinaau Stream, downstream of minor diversion (K-31a).
20081210092	Minor diversion (K-31a) on Piinaau Stream. Six inch steel and PVC pipe diversion to main Piinaau Stream intake.
20081210093	Koolau Ditch intake structure on the right bank of Piinaau Stream.
20081210095	Section of Piinaau Stream covered by the 2003 landslide.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
East_Maui_POI.shp	Points of interest (POI) recorded with the GPS unit during the field visit. The file includes POI recorded from all the East Maui field investigations.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
75	20.828528	-156.174357	EMI Diversion Intake K-31 on Piinaau Stream
76	20.827211	-156.17516	EMI Diversion Intake K-31a on Piinaau Stream
82	20.828305	-156.174906	Outflow from Intake K-31a to Piinaau Stream

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20081210079.JPG

20081210080.JPG

20081210081.JPG

20081210082.JPG

20081210084.JPG

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20081210088.JPG

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20081210091.JPG

20081210092.JPG

20081210093.JPG

IMAGE CONTACT SHEET

20081210095.JPG

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FIELD INVESTIGATION REPORT

FI2009020901 (East Maui, Wailua Valley Taro)

Date of Field Investigation:	February 9, 2009 **Time** (24-hour)**:** 1000 - 1730
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Alan Murakami, Ed Wendt, Amanda Martin, Kimo Day, Steven Hookano
Hydrologic Unit:	Wailuanui (6056)
Stream Name:	

Findings:

CWRM staff departed Oahu for Maui at 0600 hours.

The purpose of this field visit was to get a better understanding of the taro patches in Wailua Valley, with main focus on water flow from the sources and through the taro patches before water returns to the stream. CWRM staff had previously digitized the Wailua Valley taro patches from available aerial imagery. Maps were prepared to help staff collect additional data in the field, which included 1) water flow from the upper, lower, and middle ditches to the taro patches; 2) flow through the patches in the valley; 3) auwai system and location in relation to the patches; 4) locations of return flow from the auwai to the stream; and 5) operator of the general area where taro was cultivated at the time of the field visit.

At 1000, CWRM staff met with Alan Murakami, Ed Wendt, Amanda Martin, Steven Hookano and Kimo Day in Wailua Valley. Staff began data collection at the southwestern end of the valley, where most of the patches were fed by Wailuanui Stream (intake at Wakani Falls / Pond). A majority of the patches were operated by Kimo Day (upper patches) and Bush Martin (lower patches). From the auwai, Kimo Day led Alan Murakami and staff to the intake at Wakani Pond. On the way to the intake, water level in the auwai was less than one foot. At Wakani Pond, Alan Murakami inspected the intake and pulled out rocks, debris and a large log that were clogging the intake. Hiking back from Wakani Pond, water level in the auwai was about 2 feet. This event clearly illustrated the importance of auwai and intake maintenance in optimizing water flow to the taro patches.

The taro patches to the north were fed by water from Waiokamilo/Kualani Streams (flowing through Lakini). Staff hiked about 400 meters northwest along the lower ditch until reaching a location where the entire Wailua Valley could be viewed. Steven Hookano explained the overlay of the valley, who maintained each general area where taro was cultivated at the time. The middle ditch could be seen to run across the center of the valley. It mainly feeds taro patches belonging to the Nakanelua and Young (Steven Hookano's uncle) families. The upper patches in the center of the valley were overgrown with grass whereas most of the lower patches were cultivated at the time of the visit. Hiking back along the lower ditch, the farmers explained that pumpkin (instead of taro) was planted along the lower ditch due to the lack of water.

After lunch at approximately 1400, Steven Hookano led staff to the center of the valley. Staff collected information on water flow, primary patch operators, and whether the patches were in cultivation. The same survey was done to the lower patches in the center of the valley where a majority of the patches were maintained by Steven Hookano.

Staff concluded the field investigation at 1730 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090209001	Wailua Valley taro patches fed by Waikani Falls / Pond.
20090209002	Wailua Valley taro patches fed by Lakini.
20090209008	Auwai dividing the patches that are fed by Waikani Falls / Pond (left) and those fed by Lakini (right).
20090209012	Lower patches fed by Lakini.
20090209016	Pipe outflow from taro patch to auwai.
20090209024	Taro patches belonging to Kimo Day. These patches were fed by Waikani Falls / Pond.
20090209026	Taro patches belonging to Kimo Day. These patches were fed by Waikani Falls / Pond.
20090209031	Taro patches belonging to Kimo Day, and a 6-inch pipe that took water from Waikani Falls / Pond to the taro patches.
20090209032	General area fed by Waikani Falls / Pond.

20090209033	General area fed by Lakini.
20090209035	A 6-inch pipe with water from Waikani Falls / Pond to the taro patches.
20090209048	Intake pipe (6-inch) at the beginning of the auwai taking water from Waikani Falls / Pond.
20090209049	Where water from Waikani Falls / Pond splits into two pipes.
20090209051	Where water from Waikani Falls / Pond outflows into the auwai.
20090209057	Waikani Falls.
20090209058	Wailuanui Stream downstream of Waikani Falls.
20090209065	Alan Murakami clearing the intake at Waikani Pond.
20090209069	Where water from Waikani Falls / Pond outflows into the auwai **after clearing of the intake at Waikani Pond**.
20090209070	Location where water from Waikani Falls / Pond outflows into the auwai **after clearing of the intake at Waikani Pond**.
20090209077	Where water from Waikani Falls / Pond outflows into the auwai **after clearing of the intake at Waikani Pond**.
20090209080	Auwai full with water from Waikani Falls / Pond **after clearing of the intake at Waikani Pond**.
20090209100	Lower ditch in Wailua Valley.
20090209114	Pumpkin patch along the lower ditch in Wailua Valley.
20090209118	Overlooking the center of Wailua Valley at the lower ditch.
20090209120	Taro patches belonging to Nakanelua and Young families. These patches were fed by the middle ditch.
20090209134	Middle ditch in Wailua Valley.
20090209139	Young's family taro patches in the center of Wailua Valley.
20090209148	Steven Hookano's taro patches in Wailua Valley.
20090209149	Middle ditch in Wailua Valley.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI20090209wp.shp	Waypoints recorded with the GPS unit during the field visit.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
027	20.835936	-156.13598	Waikani Pond: Outflow of 8-inch cast-iron pipe to unlined auwai
028	20.836238	-156.135933	Waikani Pond: Waste gate on auwai
029	20.837203	-156.135644	Auwai from Waikani Pond: Water flows into two10-inch PVC pipes
030	20.837478	-156.13579	Auwai from Waikani Pond: Water outflow from two 10-inch PVC pipes
031	20.838253	-156.135995	Auwai from Waikani Pond: Culvert, auwai flows across in concrete flume
032	20.83852	-156.136169	Auwai from Waikani Pond: Culvert, auwai flows across in concrete flume
033	20.838857	-156.136381	Auwai from Waikani Pond: Culvert, auwai flows across in 6-inch PVC pipe
035	20.839259	-156.136662	Wailua Valley taro patches: Y-Junction on 6-incch PVC pipe

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090209001.jpg

20090209002.jpg

20090209008.jpg

20090209012.jpg

20090209016.jpg

20090209024.jpg

20090209026.jpg

20090209031.jpg

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20090209033.jpg

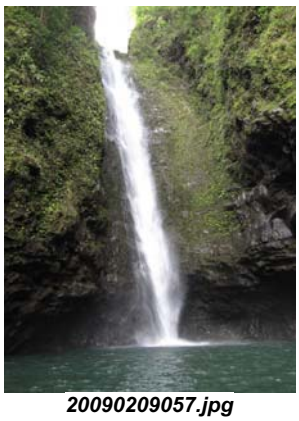
20090209035.jpg

20090209048.jpg

IMAGE CONTACT SHEET

20090209049.jpg

20090209051.jpg



20090209057.jpg

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20090209077.jpg

20090209080.jpg

20090209100.jpg

20090209114.jpg

20090209118.jpg

IMAGE CONTACT SHEET

20090209120.jpg

20090209134.jpg

20090209139.jpg

20090209148.jpg

20090209149.jpg

STATE OF HAWAII
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COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2009021001 (East Maui, Waiokamilo Terminal Waterfall)

Date of Field Investigation: February 10, 2009	**Time** (24-hour)**:** 0930 - 1100
CWRM Staff:	Ed Sakoda, Dean Uyeno, Ronnie Torres, and Chui Ling Cheng
Individuals Present:	Elaine Wender, Ed Wendt, Amanda Martin, Steven Hookano
Hydrologic Unit:	Waiokamilo (6055)
Stream Name:	Waiokamilo Stream

Findings:

The purpose of this field visit was to view the terminal waterfall at Waiokamilo Stream. At 0930, Ed Wendt, Amanda Martin, Steven Hookano, and CWRM staff met with Elaine Wender. From her residence, staff hiked downstream along Waiokamilo Stream towards the top of the terminal waterfall. Elaine Wender showed staff three spring-fed ponds in the stream above the waterfall.

Staff then hiked across the stream to the northwest side of the cliff, and looked down at the terminal waterfall. The waterfall was relatively dry. Water was seen seeping out at four locations near the bottom of the cliff.

While driving out from Elaine Wender's property, Elaine showed staff the trailhead to a losing section (pond) on Waiokamilo Stream. A future investigation may be conducted here, so a GPS waypoint was recorded.

Staff left Waiokamilo Stream at 1100 hours, and continued to map out the taro patches in Wailua Valley. Refer to Field Investigation Report FI2009021002 (East Maui, Wailua Valley Taro) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
2009021002	Spring-fed pond approximately 80 feet upstream of the terminal waterfall at Waiokamilo Stream.
2009021003	Spring-fed pond approximately 50 feet upstream of the terminal waterfall at Waiokamilo Stream.
2009021007	Spring-fed pond approximately 5 feet upstream of the terminal waterfall at Waiokamilo Stream.
2009021008	Waiokamilo Stream upstream from the terminal waterfall.
2009021018	Terminal waterfall and seepage at Waiokamilo Stream.
2009021020	Terminal waterfall at Waiokamilo Stream.
2009021028	Seepage at four locations neart he bottom of the cliff at Waiokamilo Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI20090209wp.shp	Waypoints recorded with the GPS unit during the field visit.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
045	20.84881	-156.131054	Trailhead to losing pond on Waiokamilo Stream.

Attachments:

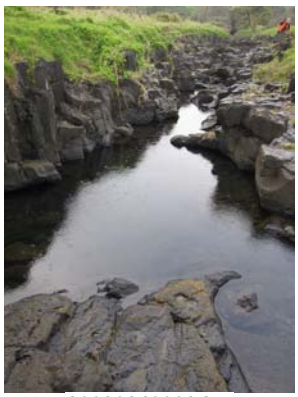
Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090210002.jpg



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FIELD INVESTIGATION REPORT

FI2009021002 (East Maui, Wailua Valley Taro)

Date of Field Investigation:	February 10, 2009 **Time** (24-hour)**:** 1115 - 1200
CWRM Staff:	Ed Sakoda, Dean Uyeno, Ronnie Torres, and Chui Ling Cheng
Individuals Present:	Ed Wendt, Amanda Martin, and Steven Hookano
Hydrologic Unit:	Wailuanui (6056)
Stream Name:	

Findings:

The purpose of this field visit was to get a better understanding of the taro patches in Wailua Valley, with main focus on water flow from the sources and through the taro patches before water returns to the stream. CWRM staff had previously digitized the Wailua Valley taro patches from available aerial imagery. Maps were prepared to help staff collect additional data in the field, which included 1) water flow from the upper, lower, and middle ditches to the taro patches; 2) flow through the patches in the valley; 3) auwai system and location in relation to the patches; 4) locations of return flow from the auwai to the stream; and 5) operator of the general area where taro was cultivated at the time of the field visit.

On the previous day (Feb. 9, 2009), CWRM staff collected field data from taro patches in the sourthwestern end and the center of the valley. During this field visit, staff was to collect field data for the taro patches in the northern end of the valley. The patches there were operated by the Sinenci and Kaauamo families. Most of the patches were not in cultivation, and those in cultivation were fed by a second outflow of Lakini.

Staff left Wailua Valley at 1200 hours, and continued to Waiokamilo Stream. Refer to Field Investigation Report FI2009021003 (East Maui, Waiokamilo Stream) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090210039	Outflow from Lakini to the taro patches in the Northern end of Wailua Valley.
20090210040	Outflow from Lakini to the taro patches in the Northern end of Wailua Valley.
20090210041	Outflow from Lakini to the taro patches in the Northern end of Wailua Valley.
20090210042	Outflow from Lakini to the taro patches in the Northern end of Wailua Valley.
20090210043	Taro patches in the Northern end of Wailua Valley.
20090210044	Taro patches in the Northern end of Wailua Valley.
20090210045	Taro patches in the Northern end of Wailua Valley.
20090210046	Taro patches in the Northern end of Wailua Valley.
20090210047	Taro patches in the Northern end of Wailua Valley.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI20090209wp.shp	Waypoints recorded with the GPS unit during the field visit.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
046	20.845776	-156.135841	Auwai divergence
047	20.845706	-156.135991	Inflow to upper auwai
049	20.845111	-156.136846	Inflow from auwai; inflow of water from Lakini.

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090210039.jpg

20090210040.jpg

20090210041.jpg

20090210042.jpg

20090210043.jpg

20090210044.jpg

20090210045.jpg

20090210046.jpg

20090210047.jpg

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FIELD INVESTIGATION REPORT

FI2009021003 (East Maui, Waiokamilo Stream)

Date of Field Investigation: February 10, 2009	**Time** (24-hour)**:** 1230 - 1330
CWRM Staff:	Ed Sakoda, Dean Uyeno, Ronnie Torres, and Chui Ling Cheng
Individuals Present:	
Hydrologic Unit:	Waiokamilo (6055)
Stream Name:	Waiokamilo Stream

Findings:

The purpose of this field visit was to determine if and where Kualani Stream joins with Waiokamilo Stream upstream from Hana Highway. At approximately 1230, CWRM staff hiked upstream on Waiokamilo Stream from Hana Highway for about 360 feet to the diversion dam. The stream splits into two branches 60 feet upstream from the diversion dam. The dam is a low concrete structure approximately 7.0 feet long that directs the most of the water into the Kualani Stream reach. Due to the configuration of the stream channel, water flowing down Kualani stream (downstream of Lakini) would likely flow naturally back into the Waiokamilo reach if the diversion dam were not there. Staff continued to hike upstream (Waiokamilo reach) for another 350 feet and reached a pond at the foot of a dry waterfall approximately 60 feet high. Water was seen leaking near the base of falls, and staff believe this to be Waiokamilo Spring. On the way downstream, Dean Uyeno attempted to hike upstream on the Kualani reach but was eventually blocked by a field of hau. Two PVC pipes, which did not appear to be currently diverting water, were seen 120 feet upstream of the Waiokamilo/Kualani convergence.

Findings from this field visit verify that Kualani Stream joins with Waiokamilo Stream about 400 feet upstream from Hana Highway. However, streamflow is somewhat controlled just downstream of the convergence, where a concrete diversion dam directs the majority of normal streamflow towards the Kualani Stream reach. A sufficiently high flow would be needed to overtop the dam to push more water into the Waiokamilo Stream reach.

Staff left Waiokamilo Stream at 1330 hours, and continued to Keanae. Refer to Field Investigation Report FI2009021005 (East Maui, Keanae) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090210048	Diversion dam on Waiokamilo Stream 360 feet upstream from Hana Highway.
20090210050	Diversion dam on Waiokamilo Stream 360 feet upstream from Hana Highway.
20090210051	Water overflowing the diversion dam on Waiokamilo Stream 360 feet upstream from Hana Highway.
20090210052	Waiokamilo Stream splits 10 upstream from the diversion dam above Hana Highway.
20090210054	Waiokamilo Stream upstream of diversion dam above Hana Highway.
20090210056	Pond 710 feet upstream from Hana Highway on Waiokamilo Stream.
20090210059	Small waterfall at Kualani Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI20090209wp.shp	Waypoints recorded with the GPS unit during the field visit.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
055	20.848181	-156.137151	Concrete dam on Waiokamilo
056	20.848345	-156.138134	Waiokamilo pond

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090210048.jpg

20090210050.jpg

20090210051.jpg

20090210052.jpg

20090210054.jpg

20090210056.jpg

20090210059.jpg

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FIELD INVESTIGATION REPORT

FI2009021005 (East Maui, Waiokamilo Stream)

Date of Field Investigation: February 10, 2009 **Time** (24-hour)**:** 1400 - 1600	
CWRM Staff:	Ed Sakoda, Dean Uyeno, Ronnie Torres, and Chui Ling Cheng
Individuals Present:	Isaac Kanoa, Gladys Kanoa
Hydrologic Unit:	Piinaau (6053), Waiokamilo (6055)
Stream Name:	Piinaau Stream, Palauhulu Stream, Waiokamilo Stream

Findings:

The purpose of this field visit was, in part, to familiarize Ronnie Torres, Geologist of CWRM's Survey Branch, with the conditions of Piinaau Stream, Palauhulu Stream, and Waiokamilo Stream near Dam 3. At 1400 hours, staff met with Isaac and Gladys Kanoa at their residence. Isaac Kanoa led staff to the junction of Palauhulu and Piinaau Streams. Both streams were flowing.

Thereafter, Gladys Kanoa and staff visited Dam 3 on Waiokamilo Stream. Compared to the conditions observed during last year's field visits, the stream channel at the downstream end of the USGS gage pool at Dam 3 was observed to be wider during this field visit. This could be the result of high flows from heavy rains that occurred throughout the months of November to January.

From Dam 3, Gladys Kanoa and staff hiked upstream to a losing section where water from Waiokamilo Stream flows into a pond and disappears underground. It is unknown where that water returns to the surface, if at all. Originally, staff planned to measure the amount of streamflow gained from blocking the flow into this losing section by creating a small temporary dam upstream. However, staff discovered another location where the stream leaked quite a large amount of flow into this losing section (see image 20090210074). This leak was not observed during the previous field visits. Due to the multiple leakages observed, staff was unable to measure the amount of flow gained from diverting water away from the losing section upstream from Dam 3.

Staff continued to hike upstream on Waiokamilo Stream for about 400 feet to a large pond. According to Gladys Kanoa, water from this pond used to split into two branches. Facing mauka, the water from the pond currently flows to the right branch. The left branch was completely blocked by gravel, trees, and other debris (see images 20090210090 and 20090210092).

Last stop was Dam 2 where Gladys Kanoa briefly explained the purpose of the dam.

Staff left Waiokamilo Stream at 1600 hours, and continued to Keanae Arboretum. Refer to Field Investigation Report FI2009021006 (East Maui, Keanae Arboretum) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090210069	Dam 3 on Waiokamilo Stream.
20090210071	Waiokamilo Stream upstream of Dam 3.
20090210072	USGS gaging station gage pool at dam 3 on Waiokamilo Stream.
20090210073	Losing section upstream from Dam 3 on Waiokamilo Stream.
20090210074	Where the stream leaks into the losing section upstream from Dam 3 on Waiokamilo Stream.
20090210083	Waiokamilo Stream upstream of the losing section upstream from Dam 3 on Waiokamilo Stream.
20090210085	Large pond about 400 feet upstream of Dam 3 on Waiokamilo Stream.
20090210090	Location where the large pond (see image 2009021085) flows into two branches of Waiokamilo Stream.
20090210092	Location where the large pond (see image 2009021085) flows into two branches of Waiokamilo Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090210069.jpg

20090210071.jpg

20090210072.jpg

20090210073.jpg

20090210074.jpg

20090210083.jpg

20090210085.jpg

20090210090.jpg

20090210092.jpg

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2009021006 (East Maui, Keanae Arboretum)

Date of Field Investigation: February 10, 2009	**Time** (24-hour)**:** 1600 - 1830
CWRM Staff:	Ed Sakoda, Dean Uyeno, Ronnie Torres, and Chui Ling Cheng
Individuals Present:	
Hydrologic Unit:	Piinaau (6053)
Stream Name:	Piinaau Stream

Findings:

The purpose of this field visit was to get a better understanding of the of the taro patches in Keanae Valley, with main focus on water flow from the source and through the taro patches before water returns to the stream. CWRM staff collected the following information: 1) water flow through the patches; 2) auwai system and location in relation to the patches; 4) locations of return flow from the auwai to the stream; and 5) where flow enters the auwai from the stream.

Most of the patches in the arboretum were overgrown, and the three patches in cultivation were fed by Piinaau Stream. Staff hiked 400 feet upstream from the taro patches to where Piinaau Stream was diverted into the auwai. Almost 80 percent of the water from the stream was diverted. Upstream from the auwai is a series of small waterfalls. Staff crossed the stream and continued to hike upstream on a trail parallel to Kuo Stream, a tributary of Piinaau Stream. At about 850 feet upstream from the auwai, Kuo Stream flowed along strike of a steeply dipping basalt unit (see images 20090210130 and 20090210138).

Staff concluded the field visit at 1830 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090210100	Overgrown taro patches at Keanae Arboretum.
20090210101	Outflow from the Keanae Arboretum taro patches into Piinaau Stream.
20090210102	Taro patches in cultivation at Keanae Arboretum.
20090210107	Auwai for the taro patches at Keanae Arboretum.
20090210114	Location where Piinaau Stream was diverted into the auwai for taro patches at Keanae Arboretum.
20090210115	Location where Piinaau Stream was diverted into the auwai for taro patches at Keanae Arboretum.
20090210116	Auwai downstream from the point of diversion on Piinaau Stream.
20090210117	Piinaau Stream downstream of auwai for the taro patches at Keanae Arboretum.
20090210120	Piinaau Stream upstream of auwai for the taro patches at Keanae Arboretum.
20090210125	Pipe auwai 30 feet downstream from the point of diversion on Piinaau Stream.
20090210130	Part of Kuo Stream (tributary of Piinaau Stream) that flowed along strike of a steeply dipping basalt unit.
20090210138	Part of Kuo Stream (tributary of Piinaau Stream) that flowed along strike of a steeply dipping basalt unit.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI20090209wp.shp	Waypoints recorded with the GPS unit during the field visit.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
057	20.849515	-156.15079	Keanae Arboretum auwai intake
058	20.850501	-156.15042	Keanae Arboretum inflow to upstream-most kalo loi

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090210100.jpg

20090210101.jpg

20090210102.jpg

20090210107.jpg

20090210114.jpg

20090210115.jpg

20090210116.jpg

20090210117.jpg

20090210120.jpg

20090210125.jpg

20090210130.jpg

20090210138.jpg

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2009021102 (East Maui, Hanehoi Haiku Ditch)

Date of Field Investigation:	February 11, 2009 **Time** (24-hour)**:** 0900 - 0945
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Garret Hew
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Hanehoi Stream

Findings:

At 0900 hours, Garret Hew and CWRM staff arrived at the Haiku Ditch bypass sluice gate on Hanehoi Stream. Following the adoption of IIFS, EMI had expressed interests in lowering the sluice gate so that the ditch could capture high flows during high rainfall events. Although not originally planned in this field visit schedule, CWRM staff decided to allow the adjustment of the Haiku Ditch bypass sluice gate on Hanehoi Stream during this field visit instead of scheduling an entirely separate trip. Similar to the previous field visits, CWRM staff documented the adjustment of the sluice gate. Staff had to ensure that the height of the sluice gate opening after adjustment would allow enough flow to pass through, and satisfy the IIFS at the selected site further downstream on Hanehoi Stream. In other words, no water from the stream can be diverted unless the IIFS is met.

CWRM staff measured the dimensions of the sluice gate opening to be 2.0 x 1.37 feet (W x H). Hanehoi Stream was relatively dry. Flow was not sufficient for taking a flow measurement.

Since the adopted IIFS of 0.63 cubic feet per second (0.41 million gallons per day) was not attained, no water from the stream could be diverted. However, the sluice gate could be lowered to a height that, during average flow conditions, allows enough flow to bypass the sluice gate to satisfy the IIFS at the selected site further downstream on Hanehoi Stream. The height of the opening was estimated by calculating the discharge in Hanehoi Stream at an arbitrary but conservative estimate of flow velocity at 1.5 cubic feet per second (0.646 million gallons per day).

Flow velocity	x	(	Height of sluice gate	x	Width of sluice gate	)	=	Flow at Hanehoi
1.50 feet / sec	x	(	0.27 feet	x	2.0 feet	)	=	0.81 CFS

If the bypass sluice gate was adjusted to a height of 0.27 feet, at a flow velocity of 1.5 feet per second, the flow was calculated to be 0.81 cubic feet per second (0.524 million gallons per day). This flow is above the IIFS adopted for Hanehoi Stream. The final height of the sluice gate opening after adjustment was 0.27 feet.

CWRM staff videotaped the event.

Staff left Hanehoi Stream at approximately 0945 hours, and continued to measure streamflow at the IIFS Site A on Puolua (Huelo) Stream. Refer to Field Investigation Report FI2009021103 (East Maui, Huelo IIFS Site A) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090211012	Hanehoi Stream upstream of Haiku Ditch.
20090211013	Hanehoi Stream downstream of Haiku Ditch.
20090211014	Haiku Ditch at Hanehoi Stream.
20090211015	Haiku Ditch bypass sluice gate at Hanehoi Stream.
20090211016	Haiku Ditch bypass sluice gate at Hanehoi Stream.
20090211017	CWRM staff Dean Uyeno taking physical measurement of the Haiku Ditch bypass sluice gate at Hanehoi Stream.
20090211024	Haiku Ditch bypass sluice gate at Hanehoi Stream after adjustment.
20090211026	Haiku Ditch bypass sluice gate at Hanehoi Stream after adjustment.
20090211029	Haiku Ditch bypass sluice gate at Hanehoi Stream after adjustment.
20090211030	Haiku Ditch bypass sluice gate at Hanehoi Stream after adjustment.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090211012.jpg

20090211013.jpg

20090211014.jpg

20090211015.jpg

20090211016.jpg

20090211017.jpg

20090211024.jpg

20090211026.jpg

20090211029.jpg

20090211030.jpg

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2009021103 (East Maui, Huelo IIFS Site A)

Date of Field Investigation: February 11, 2009 **Time** (24-hour)**:** 1000 - 1200	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Ernie Schupp, Garret Hew
Hydrologic Unit:	Hanehoi (6037)
Stream Name:	Puolua (Huelo) Stream

Findings:

At 1000 hours, CWRM staff met with Ernie Schupp at IIFS Site A on Puolua (Huelo) Stream. Staff prepared the site for flow measurement. Flow measurement was completed in one hour. Gage height readings were not recorded as a reference point was not established during the field investigation on October 23, 2008 (refer to Field Investigation Report FI2008102303 for more information). CWRM staff recorded water temperature and weather conditions. The water temperature was 21 degrees Celsius and the weather was sunny. As computed back in the Honolulu Office, the flow at IIFS Site A was 0.380 cubic feet per second (0.246 million gallons per day). This is the highest flow staff has recorded during all field visits.

Following the adoption of IIFS, EMI had expressed interests in lowering the sluice gate so that the ditch could capture high flows during high rainfall events. Although not originally planned in the field visit schedule, CWRM staff decided to allow the adjustment of the Haiku Ditch bypass sluice gate on Puolua (Huelo) Stream during this field visit instead of scheduling an entirely separate trip. Similar to the previous field visits, CWRM staff was present to document the adjustment of the sluice gate. Staff had to ensure that the height of the sluice gate opening after adjustment would allow enough flow to pass through, and satisfy the IIFS at the selected site further downstream on Puolua (Huelo) Stream. In other words, no water from the stream can be diverted unless the IIFS is met.

CWRM staff measured the dimensions of the sluice gate opening to be 2.0 x 1.13 feet (W x H). The depth of water at the sluice gate on the left bank was 0.5 feet.

As previously measured, discharge at the IIFS Site A on Puolua (Huelo) Stream was 0.380 cubic feet per second (0.246 million gallons per day). Since the adopted IIFS of 0.89 cubic feet per second (0.57 million gallons per day) was not attained, no water from the stream could be be diverted. However, the sluice gate could be lowered to a height that, during average flow conditions, allows enough flow bypass the sluice gate to satisfy the IIFS at the selected site further downstream on Puolua (Huelo) Stream. For simplicity, the bypass sluice gate was lowered to the height of the water at approximately 0.50 feet.

The final height of the sluice gate opening after adjustment was 0.50 feet. CWRM staff used fluorescent yellow flagging tape to mark the height of the sluice gate opening.

CWRM staff videotaped the event.

Staff left the IIFS Site A on Puolua (Huelo) Stream at approximately 1200 hours, and continued to Honopou Stream to take flow measurements. Refer to Field Investigation Report FI2009021104 (East Maui, Honopou IIFS Site A) for more information.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090211031	CWRM staff Ed Sakoda taking flow measurement at IIFS Site A on Puolua (Huelo) Stream.
20090211032	Puolua (Huelo) Stream upstream from IIFS Site A.
20090211033	Puolua (Huelo) Stream downstream from IIFS Site A.
20090211034	Haiku Ditch bypass sluice gate at Puolua (Huelo) Stream.
20090211035	Haiku Ditch at Puolua (Huelo) Stream.
20090211036	Puolua (Huelo) Stream downstream from Haiku Ditch bypass sluice gate.
20090211039	Ernie Schupp and Garret Hew at the Haiku Ditch bypass sluice gate on Puolua (Huelo) Stream.
20090211040	Ernie Schupp and Garret Hew at the Haiku Ditch bypass sluice gate on Puolua (Huelo) Stream.
20090211042	Haiku Ditch bypass sluice gate on Puolua (Huelo) Stream.

20090211044	Haiku Ditch bypass sluice gate on Puolua (Huelo) Stream after adjustment.
20090211045	Haiku Ditch bypass sluice gate on Puolua (Huelo) Stream after adjustment.
20090211046	Haiku Ditch bypass sluice gate on Puolua (Huelo) Stream after adjustment.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Measurement and Gage Inspection Notes

Recommendations:

IMAGE CONTACT SHEET

20090211031.jpg

20090211032.jpg

20090211033.jpg

20090211034.jpg

20090211035.jpg

20090211036.jpg

20090211039.jpg

20090211040.jpg

20090211042.jpg

20090211044.jpg

20090211045.jpg

20090211046.jpg

Form 9-275F
(Apr. 2001)

U.S. DEPARTMENT OF THE INTERIOR
U.S. Geological Survey
WATER RESOURCES DIVISION
DISCHARGE MEASUREMENT AND GAGE INSPECTION NOTES

Meas. No. _____

Comp. by Chui

Checked by DDu

Sta. No. Huelo IIFS Site A

Sta. Name Huelo (Puolua) Stream, IIFS Site A

Date 2/10, 20 09 Party Dean, Ed, (M) Chui

Width 3.4 Area 2.09 Vel. .18 G.H. _____ Disch. .380 CFS

Method Wading No. secs. 40 G.H. change _____ in _____ hrs.

Method coef. _____ Horiz. angle coef. _____ Susp. _____ Tags checked _____

Meter Type _____ Meter No. _____ Meter _____ ft. above bottom of wt.

Rating used _____ Spin test before meas. _____ ; after _____

Meas. plots _____ % diff. from rating no. _____ Indicated shift _____

GAGE READINGS						
Time					Inside	Outside
	Start	LEW	@ 10	15		
	Finish	REW	@ 1114			
Weighted MGH						
GH correction						
Correct MGH						

Samples collected: water quality, sediment, biological, other _____

Measurements documented on separate sheets: water quality, aux./base gage, other _____

Rain gage serviced/calibrated ____

Weather: Sunny

Air Temp. _____ °C at _____

Water Temp. 21 °C at 1116

Check bar/chain found _____

Changed to _____ at _____

Correct _____

Wading, cable, ice, boat, upstr., downstr., side bridge, 5 ft. mi. upstr., downstr. of ~~gage~~ control.

Measurement rated excellent (2%), good (5%), fair (8%), poor (> 8%); based on following conditions: Flow: Fairly uniform overall, with a little angled flow @ edges

Cross section: Cobbles, pebbles, small rocks, fairly uniform, fairly flat and even.

Gage operating: _____ Record Removed _____

Battery voltage: _____ Intake/Orifice cleaned/purged: _____

Bubble-gage pressure, psi: Tank _____, Line _____ ; Bubble-rate _____ /min.

Extreme-GH indicators: max _____, min _____.

CSG checked: _____ HWM height on stick _____ Ref. elev. _____ HWM elev. _____

HWM inside/outside: _____

Control: 8 feet upstream of auwai. Constructed with rocks & boulders back in October when Matt was with CWRM.

Remarks: _____

GH of zero flow = GH _____ - depth at control _____ = _____ ft., rated _____

Sheet No. _____ of _____ sheets

River at -

ANGLE COEFFICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVATION DEPTH	REVOLUTIONS	TIME IN SECONDS	VELOCITY AT POINT	VELOCITY MEAN IN VERTICAL	ADJUSTED FOR HOR. ANGLE OR	AREA	DISCHARGE	
LEW	@	1015										.80
												.85
vertical wall build w/ rock →	1.85	.125	.15					0		.019		
	2.1	.175	.33			40		.53		.058	.031	
	2.2	.10	.39			40		.56		.039	.022	.90
	2.3	.10	.43			40		.43		.043	.018	.92
	2.4	.10	.72			40		.41		.072	.030	
	2.5	.10	.74			40		.27		.074	.020	.94
	2.6	.10	.75			40		.21	.361	.075	.016	.96
	2.7	.10	.79			40		.18		.079	.014	.97
	2.8	.10	.79			40		.21		.079	.017	.98
	2.9	.10	.80			40		.27		.080	.022	.99
	3.0	.10	.80			40		.20	.679	.080	.016	.206
	3.1	.10	.78			40		.20		.078	.016	
⊙	3.2	.10	.78			40		.22		.078	.017	1.00
	3.3	.10	.75			40		.25		.075	.019	
	3.4	.10	.77			40		.19	.967	.077	.015	.273
	3.5	.10	.77			40		.13		.077	.010	.99
	3.6	.10	.77			40		.13	1.101	.077	.010	.98 .293
	3.7	.10	.75			40		.10		.075	.008	.97
	3.8	.10	.74			40		.10	1.29	.074	.007	.96 .308
	3.9	.10	.71			40		.11		.071	.008	
	4.0	.10	.70			40		.09		.070	.006	.94
	4.1	.10	.70			40		.10	1.501	.070	.007	.92 .329
	4.2	.10	.70			40		.10		.070	.007	.90
	4.3	.10	.65			40		.12	1.636	.065	.008	.344
	4.4	.10	.62			40		.10		.062	.006	
	4.5	.10	.60			40		.11		.060	.007	.85
	4.6	.10	.59			40		.07		.059	.004	.361
	4.7	.10	.55			40		.09	1.872	.055	.005	.366
												.80

.0 .10 .20 .30 .40 .50 .60 .70 .75

River at -

ANGLE COEF-FICIENT	DIST. FROM INITIAL POINT	WIDTH	DEPTH	OBSERVA-TION DEPTH	REVO-LUTIONS	TIME IN SEC-ONDS	VELOCITY AT POINT	VELOCITY MEAN IN VER-TICAL	ADJUST-ED FOR HOR. ANGLE OR	AREA	DISCHARGE	
										1.272	.366	.80
	4.8	.10	.43			40		.10	1.915	.043	.004	.370
	4.9	.10	.42			40		.09	1.957	.042	.004	.85 .374
	5.0	.10	.40			40		.07	1.997	.040	.003	.377
	5.1	.125	.39			40		.07		.049	.003	
	5.25	.075	.32					O		.024		.90
												.92
	3.4	3.4					AVE=	.18		2.09	.380	.94
REW	@	1114										.96
												.97
												.98
												.99
⊙												1.00
												.99
												.98
												.97
												.96
												.94
												.92
												.90
												.85
												.80

.61 mgd

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2009032301 (East Maui, Low Flow Channel)

Date of Field Investigation: March 23, 2009 **Time** (24-hour)**:** 0900 - 1530	
CWRM Staff:	Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Honopou community - Lynn Scott, Beatrice Kekahuna, Sanford Kekahuna, and Boni Kekahuna EMI Staff - Garret Hew and staff from the HC&S Pump and Power section
Hydrologic Unit:	Honopou (6034)
Stream Name:	Honopou Stream

Findings:

CWRM staff departed Oahu for Maui at 0600 hours.

The purpose of this field visit was to document the installation of the low-flow bypass channel on Haiku Ditch in Honopou Stream. In November of 2008, CWRM staff met with EMI staff to discuss the design of the low-flow bypass channel. It was in agreement between the two parties and the Honopou community that the bypass channel would be installed on the Haiku Ditch intake structure in Honopou Stream as a pilot project. Since then, EMI staff has been working to construct the bypass channel in their shop. Because the openings of the Haiku Ditch intake grating structure are not of uniform width, the bypass channel had to be constructed in pieces and assembled on-site to achieve the perfect fit on the intake grating.

EMI staff began the installation work at approximately 0730 hours. EMI staff had to close the Lowrie Ditch bypass gate to decrease the amount of water reaching the work site. By the time CWRM staff arrived to Honopou, the low-flow bypass channel was placed on top of the Haiku Ditch intake structure and EMI staff was welding one of the anchor brackets to the main bypass channel (see image 20090323006). There were a total of six anchor brackets (3 on each side of the channel) to secure the bypass channel on the intake structure. A separate piece of metal was welded on the upstream side of the bypass channel and over the side of the intake structure to prevent high water from flowing underneath the bypass channel and lifting it up. During the installation, EMI staff had to pump out more water to draw down the level of water on the upstream side of the intake structure.

In order to determine the head (level of water) needed to meet the IIFS established at two sites further downstream, two 2-in x 4-in pieces of wood were installed along the upstream side of the intake structure as a temporary measure to channel stream water into the bypass channel. Mud and other debris were used to fill holes and gaps between the wood and the intake structure to prevent stream water from entering the ditch. When the installation was complete, the intakes of the 3 pipes on the left streambank were plugged to channel stream water into the bypass channel. When the level of water needed to satisfy the IIFS established at the two sites on Honopou Stream have been determined, EMI plans to replace the 2-in x 4-in pieces of wood with a more permanent structure.

CWRM staff videotaped parts of the installation work.

Upon returning to Honolulu, Garret Hew informed CWRM staff that EMI staff had reopened the Lowrie Ditch bypass gate on Honopou Stream that same day. As a result, more water flowed through the low-flow bypass channel on Haiku Ditch.

During the installation, CWRM staff visited Kekahuna's taro loi with the purpose of mapping water flow through the taro patches before water returns to the stream. Coincidentally, one of the Maui USGS staff was conducting field work in the same area. He offered to show CWRM staff the temperature probe that was installed in the auwai near the last taro loi, and the stream gaging station installed at the start of the auwai. He also showed CWRM staff the temperature data logger and how he downloaded the data from the logger to his computer. After the Maui USGS staff left, CWRM staff continued to map water flow in the taro loi.

Staff concluded the field visit at 1530 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20090323004	Low-flow bypass channel, upstream side
20090323005	Low-flow bypass channel, downstream side
20090323006	EMI staff welding an anchor bracket onto the main low-flow bypass channel
20090323008	Low-flow bypass channel (downstream side) with one of the anchor brackets in place
20090323009	EMI staff installing 2in x 4in wood onto the upstream side of the intake structure
20090323010	EMI staff welding an anchor bracket onto the main low-flow bypass channel
20090323015	EMI staff installing 2in x 4in wood onto the upstream side of the intake structure
20090323018	Left streambank where EMI staff transported the low-flow bypass channel onto the ditch intake structure
20090323020	EMI staff placing the pump line downstream of the ditch
20090323025	EMI staff operating the pump
20090323026	EMI staff operating the pump
20090323029	The pump used to pump water from the above the ditch downstream
20090323030	Pump water line upstream of the ditch
20090323031	Pump water line downstream of the ditch
20090323036	EMI staff installing the low-flow bypass channel
20090323038	EMI staff installing the low-flow bypass channel
20090323039	EMI staff welding an anchor bracket onto the main low-flow bypass channel
20090323040	A piece of metal welded on the upstream side of the bypass channel and over the side of the intake structure to prevent high water from flowing underneath the bypass channel and lifting it up
20090323042	Low-flow bypass channel, upstream side
20090323043	USGS temperature probe in Kekahuna's auwai
20090323046	USGS stream gage at the beginning of Kekahuna's auwai
20090323047	USGS stream gage at the beginning of Kekahuna's auwai
20090323053	Kekahuna's taro loi
20090323058	EMI staff sanding the low-flow bypass channel
20090323061	EMI staff completing the installation of the low-flow bypass channel
20090323065	EMI staff completing the installation of the low-flow bypass channel
20090323067	Metal that was welded on the upstream side of the bypass channel and over the side of the intake structure to prevent high water from flowing underneath the bypass channel and lifting it up
20090323070	One of the anchor brackets of the low-flow bypass channel
20090323074	Downstream view of the low-flow bypass channel. Rocks were placed beneath the intake structure to minimize the amount of water back-flowing into the ditch.
20090323080	Completed low-flow bypass channel
20090323087	First water entering the low-flow bypass channel
20090323090	First water entering the low-flow bypass channel
20090323092	First water entering the low-flow bypass channel
20090323094	First water entering the low-flow bypass channel and flowing downstream
20090323102	First water entering the low-flow bypass channel and flowing downstream
20090323106	EMI staff using mud and other debris to fill holes and gaps between the wood and the intake structure to prevent stream water from entering the ditch
20090323109	Water flowing through the bypass channel while the 3 pipes were plugged

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20090323004.jpg

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20090323010.jpg

20090323015.jpg

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IMAGE CONTACT SHEET

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IMAGE CONTACT SHEET

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20090323102.jpg

20090323106.jpg

IMAGE CONTACT SHEET

20090323109.jpg

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2009110901 (East Maui, Makapipi)

Date of Field Investigation: November 9, 2009 **Time** (24-hour)**:** 0730 - 1745	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	Hawaii State House Representative – Mele Carroll Nahiku Community - Kumu Kamalu, Mapu Kekahuna, Corinna Kekahuna, Lihau Kekahuna, Jimmy Kaho`okele, Tommy Ko`omoa, Kekoa Ko`omoa, Kalei Johnson, Paul Bodnar, Allen Caster, and Michael Behrens.
Hydrologic Unit:	Makapipi
Stream Name:	Makapipi Stream

Findings:

Staff arrived in Maui at 0730 hours.

The purpose of this field visit was to meet with residents of the Lower Nahiku community and to gather additional information on lower Makapipi Stream (downstream from Hana Highway). Community members showed Commission staff the following sites along Lower Makapipi Stream.

1. Une Pond. Residents claimed that Une Pond has been dry since the year 2000.
2. Spring upstream of Une Pond.
3. Haita Pond. This is the first large pond located below Hana Highway.
4. Unnamed Stream by the property of Michael Behrens.
5. Wahine Mo Pond. Residents claimed that this pond has traditionally been used for washing clothes.
6. Mouth of Makapipi Stream at Nahiku Landing.
7. Mouth of Hanawi Stream as seen from Nahiku Landing.
8. Pond upstream of Haita Pond.

Staff concluded the field visit at 1745 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20091109001	Makapipi Stream upstream of Lower Nahiku Road.
20091109002	Makapipi Stream downstream of Lower Nahiku Road.
20091109003	Une Pond.
20091109004	Une Pond.
20091109005	Spring upstream from Une Pond.
20091109006	Haita Pond.
20091109007	Haita Pond.
20091109009	Water from Haita Pond continues to flow downstream.
20091109010	Existing taro loi wall.
20091109011	Nahiku community taro loi.
20091109012	Makapipi Stream splits.
20091109013	Makapipi Stream splits.
20091109014	Property of Michael Behrens.
20091109015	Property of Michael Behrens.
20091109016	Unnamed stream at the property of Michael Behrens.
20091109017	Unnamed stream at the property of Michael Behrens.
20091109020	Unnamed pond downstream from Une Pond.
20091109021	Wahine Mo Pond.
20091109022	Wahine Mo Pond.
20091109023	Wahine Mo Pond.
20091109024	Wahine Mo Pond.
20091109026	Mouth of Makapipi Stream.
20091109027	Mouth of Makapipi Stream.
20091109029	Makapipi coast.
20091109030	Makapipi coast.

20091109031	Outlet of the unnamed pond (photo 20091109020) downstream from Une Pond.
20091109033	View of Hanawi Stream mouth from Makapipi.
20091109034	Lunch meeting.
20091109035	Lunch meeting.
20091109039	Pond upstream from Haita Pond.
20091109041	Pond upstream from Haita Pond.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

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IMAGE CONTACT SHEET

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IMAGE CONTACT SHEET

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20091109041.jpg

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2009111601 (East Maui, Makapipi)

Date of Field Investigation: November 16, 2009 **Time** (24-hour)**:** 0730 - 1600	
CWRM Staff:	Ken Kawahara, Ed Sakoda, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	EMI Staff - Garret Hew, Henry Robello
Hydrologic Unit:	Makapipi, Hanawi
Stream Name:	Makapipi Stream, Hanawi Stream

Findings:

Staff arrived in Maui at 0730 hours.

The purpose of this field visit was to gather additional information on upper Makapipi Stream (upstream from Hana Highway), as well as visit the EMI diversions on Makapipi and Hanawi Streams. Staff met with EMI staff at the top of Lower Nahiku Road and first drove to the EMI major diversion on the main branch of Makapipi Stream, which is also known as west Makapipi Stream.

Staff then visited the start of EMI's Koolau Ditch on the left bank of east Makapipi Stream. A development tunnel (Makapipi tunnel 2) is located on the right bank of the stream. Water from this development tunnel is conveyed to the Koolau Ditch via a pipe crossing under a waterfall on east Makapipi Stream (see photo 20091116011). The Koolau Ditch also receives water from Kuhiwa Well (via a pipe) located further east in the hydrologic unit (see photo 20091116032). Addition water input is seepage captured in a concrete collection box and conveyed to the ditch via a pipe. As the Koolau Ditch daylights, the County of Maui Department of Water Supply diverts water from the ditch to serve the Lower Nahiku Community. This water is chlorine treated.

Heading back to Hana Highway, staff took photos of Makapipi Stream at high flow conditions. Staff also visited Wahine Mo Pond and drove to Nahiku Landing to view the mouth of Makapipi Stream at high flow.

Next, staff visited the Hanawi Pump Station on Hanawi Stream (see photo 20091116061). Maui Land & Pineapple Company used to divert water for irrigating their pineapple fields. Further upstream, staff visited EMI's major diversion on Hanawi Stream. The diversion intake grate is located on the right bank of the stream. Staff took a short hike from the right bank of the stream to a small tributary stream where there was a minor diversion (see photo 20091116083).

Staff concluded the field visit at 1600 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20091116001	(West or main) Makapipi Stream upstream of the EMI major diversion.
20091116002	(West or main) Makapipi Stream downstream of the EMI major diversion.
20091116003	(West or main) Makapipi Stream downstream of the EMI major diversion.
20091116004	EMI major diversion at (West or main) Makapipi Stream.
20091116007	Small bridge at the EMI major diversion on (West) Makapipi Stream.
20091116008	Seepage captured at a collection box near the East Makapipi Stream.
20091116009	Collection box that captures seepage and conveys the water to the EMI Koolau Ditch (tunnel).
20091116011	Waterfall on East Makapipi Stream.
20091116012	Waterfall on East Makapipi Stream.
20091116013	Pipe located below the waterfall (see photo 20091116012) conveying water from a development tunnel to the Koolau Ditch (tunnel).
20091116015	Pipe conveying water from Kuhiwa Well to the start of the Koolau Ditch (tunnel).
20091116016	Pipe located below the waterfall (see photo 20091116012) conveying water from a development tunnel to the Koolau Ditch (tunnel).
20091116018	Pipe conveying water from Kuhiwa Well to the start of the Koolau Ditch (tunnel).
20091116021	Start of the Koolau Ditch (tunnel) near East Makapipi Stream.
20091116023	Development tunnel – Makapipi tunnel 2.
20091116027	East Makapipi Stream.
20091116032	Right bank of East Makapipi Stream. Kuhiwa Well is located further east.
20091116033	East Makapipi Stream.

20091116037	East Makapipi Stream. The pipes above the stream convey water from Kuhiwa Well to the Koolau Ditch.
20091116039	County pipeline diverting water from the Koolau Ditch to the Nahiku Community.
20091116041	County pipeline diverting water from the Koolau Ditch to the Nahiku Community.
20091116044	County control water tank.
20091116046	Makapipi Stream (at high flow) upstream from Hana Highway.
20091116047	Makapipi Stream (at high flow) downstream from Hana Highway.
20091116049	Wahine Mo Pond on Makapipi Stream at high flow.
20091116050	Wahine Mo Pond on Makapipi Stream at high flow.
20091116051	Wahine Mo Pond on Makapipi Stream at high flow.
20091116052	Wahine Mo Pond on Makapipi Stream at high flow.
20091116053	Outlet of the unnamed pond downstream from Une Pond.
20091116055	Makapipi coast.
20091116056	Mouth of Makapipi Stream at high flow.
20091116057	Mouth of Makapipi Stream at high flow.
20091116058	Mouth of Makapipi Stream at high flow.
20091116059	Makapipi coast.
20091116061	Hanawi Pump.
20091116063	Hanawi Stream (at high flow) upstream from Hana Highway.
20091116064	Hanawi Stream (at high flow) at Hana Highway.
20091116066	EMI major diversion on Hanawi Stream.
20091116067	EMI major diversion on Hanawi Stream.
20091116072	EMI major diversion intake grate on Hanawi Stream.
20091116075	EMI major diversion on Hanawi Stream.
20091116082	EMI minor diversion on a tributary of Hanawi Stream.
20091116083	Tributary of Hanawi Stream.
20091116088	This flume was used to measure the amount of water diverted by the Nahiku Pump.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

IMAGE CONTACT SHEET

20091116001.jpg

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IMAGE CONTACT SHEET

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20091116046.jpg

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IMAGE CONTACT SHEET

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IMAGE CONTACT SHEET

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20091116088.jpg

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010020201 (East Maui, Diversions)

Date of Field Investigation: February 2, 2010	**Time** (24-hour)**:** 0630 - 1630
CWRM Staff:	Dean Uyeno, Diane England, and Chui Ling Cheng
Individuals Present:	DAR Staff – Lance Nishiura EMI Staff – Garret Hew, Mark Vaught, Henry Robello
Hydrologic Unit:	East Maui
Stream Name:	Multiple Streams

Findings:

Staff arrived in Maui at 0630 hours.

The purpose of this field visit was to document the physical dimensions of and how water flows past the EMI diversion structures in 17 petitioned streams in east Maui. The streams include Alo, Waikamoi, Wahinepee, Puohokamoa, Haipuaena, Pnalau/Kolea, Honomanu, Nuaailua, West Wailuaiki, East Wailuaiki, Kopiliula, Waiohue, Paakea, Waiaaka, Kapaula, Hanawi, and Makapipi. Documentation was completed in three days. The following is a list of streams and the respective diversions that staff visited on the first day of the field visit.

1. Makapipi Stream, K-1 intake into Koolau Ditch.
   Diversion structure consists of a 15 feet (L) x 5 feet (H) dam. Intake and sluice gate (3 x 1.83 feet, W x H) situate on the left bank. Water flows down a small waterfall before reaching the diversion. Makapipi Stream had ponded water downstream of the diversion.
2. Hanawi Stream, K-4 intake into Koolau Ditch.
   Diversion structure consists of a 38 feet (L) dam. Intake and sluice gate (2.97 x 4 feet, W x H) situate on the right bank, with the intake grate about 30 feet upstream of the sluice gate. Minor diversion on the right bank consists of 2 white pipes that transmit seepage flow into the gravel basin. Water flows down a waterfall before reaching the diversion. Hanawi stream was flowing downstream of the diversion, mostly likely a result of the open sluice gate at the time of the visit.
3. Kapaula Stream, K-7 intake into Koolau Ditch.
   Diversion structure consists of a 19.5 feet (L) x 2.7 feet (H) dam. Intake grate (3 x 19 feet, W x L) situates on the right bank with no sluice gate. Water flows down a small cascading waterfall before reaching the diversion. Downstream of the diversion appears to have an existing diversion dam. According to Garret Hew, the stream is losing upstream of the old dam. Therefore, the diversion dam was moved further upstream from the losing section.
4. Waiaaka Stream, K-9 intake into Koolau Ditch.
   Waiaaka Stream is used to convey water from a development tunnel into the Koolau Ditch. The stream was dry downstream from the diversion. No physical measurements were recorded.
5. Paakea Stream, K-10 intake into Koolau Ditch.
   Diversion structure consists of a 24 feet (L) x 3.6 feet (H) dam. Intake (2.7 x 1.05 feet, W x H) and sluice gate (3.1 x 2.5 feet, W x H) situate on the left bank. The dividing wall between the gravel basin and the ditch has an opening with diameter of 0.7 feet. Paakea Stream had ponded water downstream of the diversion.
6. Waiohue Stream, K-13 intake into Koolau Ditch.
   The intake (2.4 x 2.1 feet, W x H) is further upstream from the sluice gate (1.4 x 5.9 feet, W x H). Water flows from a waterfall into the plunge pool, where it is diverted into the intake grate and then through a short tunnel into the gravel basin downstream from the intake. The dividing wall of the diversion structure has two openings with diameters 1.3 feet and 0.8 feet diameter.
7. Puakaa Stream, K-14 intake into Koolau Ditch.
   Diversion structure consists of a 46 feet (L) x 2.3 feet (H) dam. Intake (5.7 x 5.2 feet, W x H) and sluice gate (2 x 4 feet, W x H) situate on the left bank, with the sluice gate further downstream from the intake. The dividing wall between the gravel basin and the ditch has an opening with diameter of 1.6 feet. Puakaa Stream was dry downstream from the diversion.
8. Kopiliula Stream, K-15 intake into Koolau Ditch.
   Diversion structure is located by Hana Highway and consists of a 25.5 feet (L) x 2 feet (H) dam. Intake

and sluice gate situate on the left bank. Water from Kopiliula flows downstream and co-mingles with the ditch water (diverted from Makapipi, Hanawi, Kapaula, Waiaaka, Paakea, Waiohue, and Puakaa Streams) in the gravel basin and then flows back into the Koolau Ditch (tunnel) on the left bank. Kopiliula Stream had ponded water downstream from the diversion.

9. East Wailuaiki Stream, K-16 intake into Koolau Ditch.
   Diversion dam consists of two walls, one man-made dam (34 feet – L, 4.4 feet – H), and a natural dam (61 feet – L, 5.5 feet – H). Intake (5 x 4 feet, W x H) and sluice gate (3 x 2 feet, W x H) situate on the left bank. The dividing wall between the gravel basin and the ditch is 42 feet (L) x 5 feet (H) and has two openings. East Wailuaiki Stream had ponded water downstream from the diversion.
10. West Wailuaiki Stream, K-17 intake into Koolau Ditch.
    Diversion structure consists of a 30 feet (L) x 2 feet (H) dam. Intake (4.5 x 3 feet, W x H) and sluice gate (5.5 x 3 feet, W x H) situate on the right bank. The dividing wall between the gravel basin and the ditch is 33.5 feet in length. Water flows down a waterfall into a tunnel that runs further downstream into the intake and sluice structures. Past the diversion, water flows down a waterfall. West Wailuaiki Stream had ponded water downstream from the diversion.

Staff concluded the field visit at 1630 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100202001	Small waterfall on Makapipi Stream upstream of K-1 intake into Koolau Ditch.
20100202002	Diversion structure (K-1 intake) on Makapipi Stream. Intake and sluice gate on the left bank.
20100202003	Downstream view of Makapipi Stream from the diversion structure.
20100202004	Makapipi Stream downstream of diversion.
20100202006	K-1 intake into Koolau Ditch on the left bank of Makapipi Stream.
20100202007	Diversion dam on Hanawi Stream.
20100202008	Minor diversion and sluice gate on the right bank of Hanawi Stream.
20100202009	Hanawi Stream upstream of diversion.
20100202010	Diversion structure (K-4 intake) on Hanawi Stream.
20100202011	Minor diversion on Hanawi Stream.
20100202013	Hanawi Stream downstream of diversion.
20100202014	K-4 intake into Koolau Ditch on the right bank of Hanawi Stream.
20100202016	Hanawi Stream downstream of diversion with water flowing past the sluice gate.
20100202018	Kapaula Stream about 150 feet downstream of diversion.
20100202019	Diversion dam on Kapaula Stream.
20100202020	Kapaula Stream immediately downstream of diversion dam.
20100202021	Kapaula Stream upstream of diversion.
20100202022	K-7 intake into Koolau Ditch on the right bank of Kapaula Stream.
20100202025	K-7 intake into Koolau Ditch on the right bank of Kapaula Stream.
20100202031	K-9 intake into Koolau Ditch on Waiaaka Stream. Water drops directly into the open ditch.
20100202032	K-9 intake into Koolau Ditch on Waiaaka Stream. Water drops directly into the open ditch.
20100202033	Waiaaka Stream upstream of the diversion.
20100202034	Waiaaka Stream downstream of the diversion.
20100202036	Diversion dam on Paakea Stream. K-10 intake and sluice gate on the left bank of the stream.
20100202037	Gravel basin and sluice of the diversion structure (K-10 intake) on Paakea Stream.
20100202038	Paakea Stream upstream of diversion.
20100202039	Paakea Stream downstream of diversion.
20100202040	CWRM staff measuring the dimensions of the control gate at the K-10 intake on Paakea Stream.
20100202042	CWRM staff measuring the dimensions of the sluice gate at the diversion structure (K-10 intake) on Paakea Stream.
20100202043	CWRM staff measuring the diameter of the opening on the dividing wall of the diversion structure (K-10 intake) on Paakea Stream.
20100202048	K-13 intake into Koolau Ditch on Waiohue Stream.
20100202053	Waterfall and pond at the Koolau Ditch K-13 intake on Waiohue Stream.
20100202054	Close up of K-13 intake into Koolau Ditch on Waiohue Stream.
20100202059	Gravel basin and K-13 intake on Waiohue Stream.
20100202062	Dividing wall at the diversion structure (K-13 intake) on Waiohue Stream.
20100202063	K-14 intake into Koolau Ditch on the left bank of Puakaa Stream.
20100202064	Puakaa Stream upstream of diversion.
20100202065	Puakaa Stream downstream of diversion.
20100202068	Gravel basin, control gate, and sluice gate downstream of the main K-14 intake on Puakaa Stream.
20100202069	Gravel basin, control gate, and sluice gate downstream of the main K-14 intake on Puakaa Stream.
20100202070	Channel where water from the sluice gate flows down into Puakaa Stream.
20100202074	Diversion structure (K-15 intake) on Kopiliula Stream.

20100202075	Diversion structure (K-15 intake) on Kopiliula Stream.
20100202077	Kopiliula Stream upstream of diversion.
20100202079	Kopiliula Stream downstream of diversion.
20100202080	K-15 intake into Koolau Ditch on the left bank of Kopiliula Stream.
20100202082	Sluice gate on the left bank of the diversion structure (K-15 intake) on Kopiliula Stream.
20100202083	Diversion structure (K-16 intake) on East Wailuaiki Stream.
20100202084	Gravel basin of the diversion (K-16 intake) on the left bank of East Wailuaiki Stream.
20100202085	K-16 intake into Koolau Ditch on the left bank of East Wailuaiki Stream.
20100202087	East Wailuaiki Stream downstream of diversion.
20100202089	Dividing wall and gravel basin of the diversion (K-16 intake) on the left bank of East Wailuaiki Stream.
20100202091	Sluice gate at the diversion structure (K-16) on the left bank of East Wailuaiki Stream.
20100202092	Sluice gate at the diversion structure (K-16) on the left bank of East Wailuaiki Stream.
20100202095	East Wailuaiki Stream downstream of diversion.
20100202097	Koolau Ditch diversion structure (K-17 intake) on West Waikuaiki Stream.
20100202098	Koolau Ditch diversion structure (K-17 intake) on West Waikuaiki Stream.
20100202099	K-17 intake (right bank) into a short tunnel on West Wailuaiki Stream.
20100202100	Diversion dam on West Wailuaiki Stream.
20100202101	Gravel basin and sluice gate of the diversion structure (K-17 intake) on the right bank of West Wailuaiki Stream.
20100202104	West Wailuaiki Stream by the EMI access road.
20100202105	Gravel basin and sluice gate of the diversion structure (K-17 intake) on the right bank of West Wailuaiki Stream.
20100202106	West Wailuaiki Stream downstream of diversion intake.
20100202107	Diversion structure (K-17 intake) on West Wailuaiki Stream.
20100202111	Waterfall on West Wailuaiki Stream upstream of diversion by the bridge.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet
2. Diversion Sketches

Recommendations:

IMAGE CONTACT SHEET

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IMAGE CONTACT SHEET

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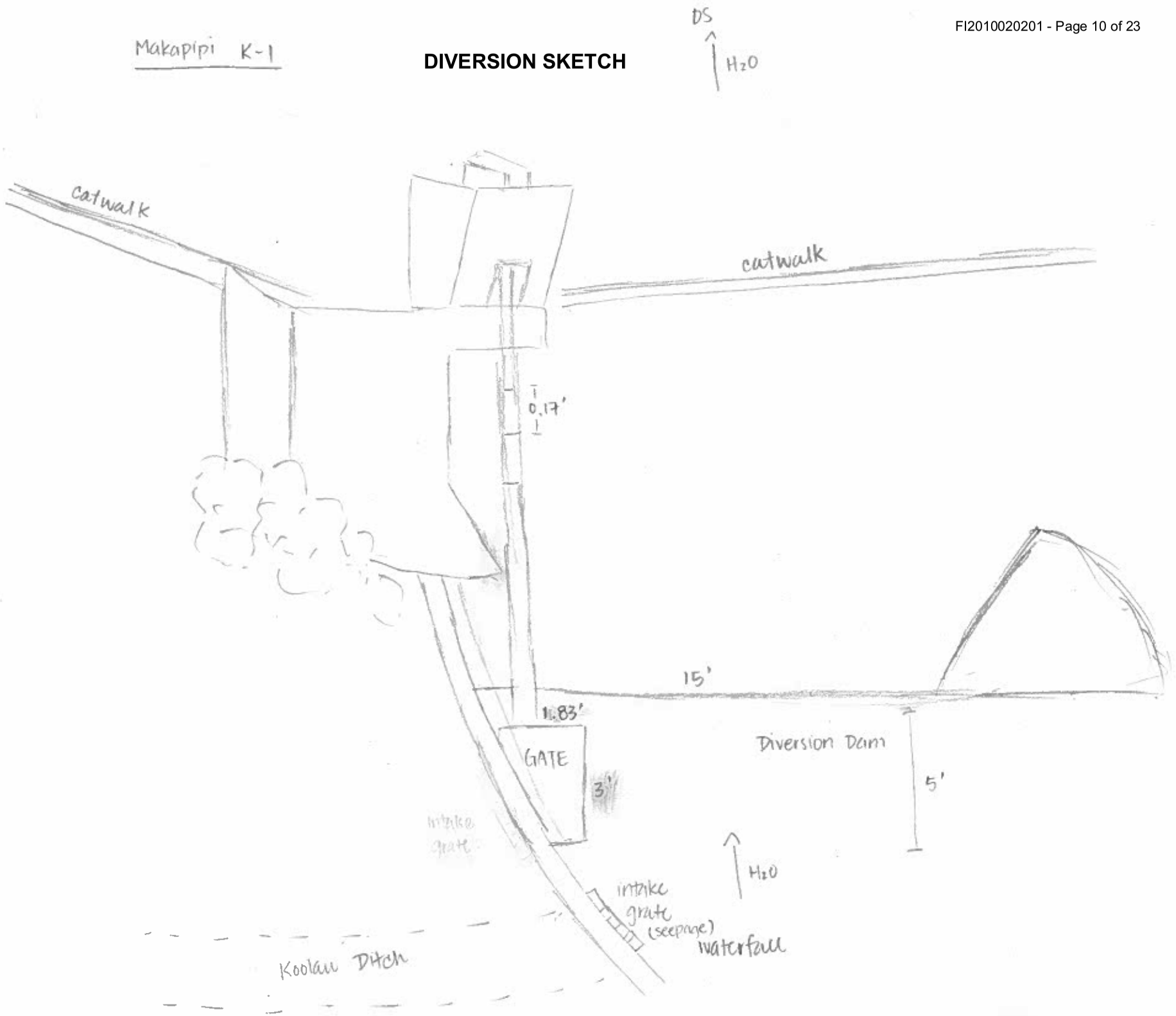
20100202111.jpg

Makapipi K-1

DIVERSION SKETCH

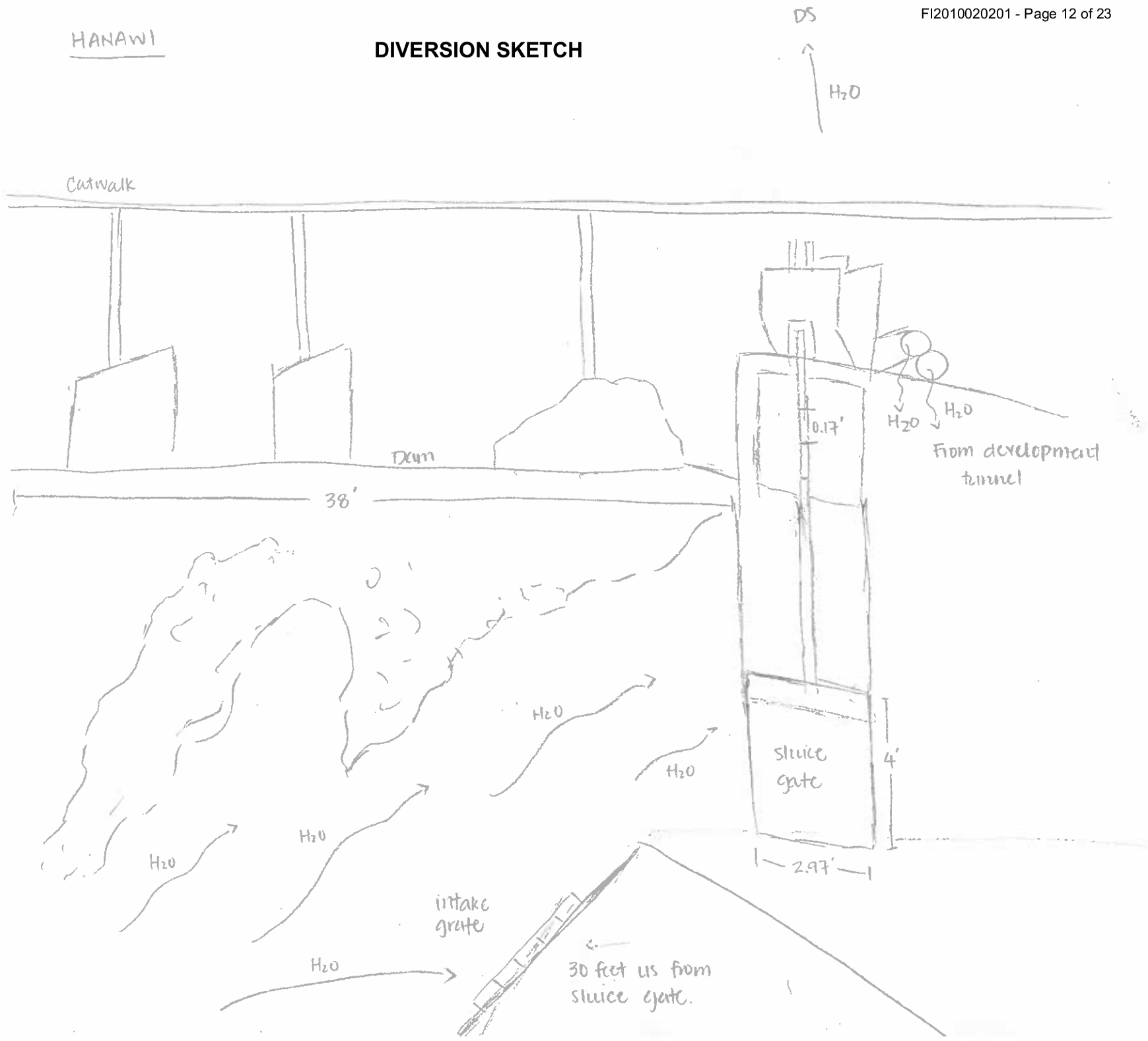


DIVERSION SKETCH

× sink hole by highway
× mostly open

HANAWI

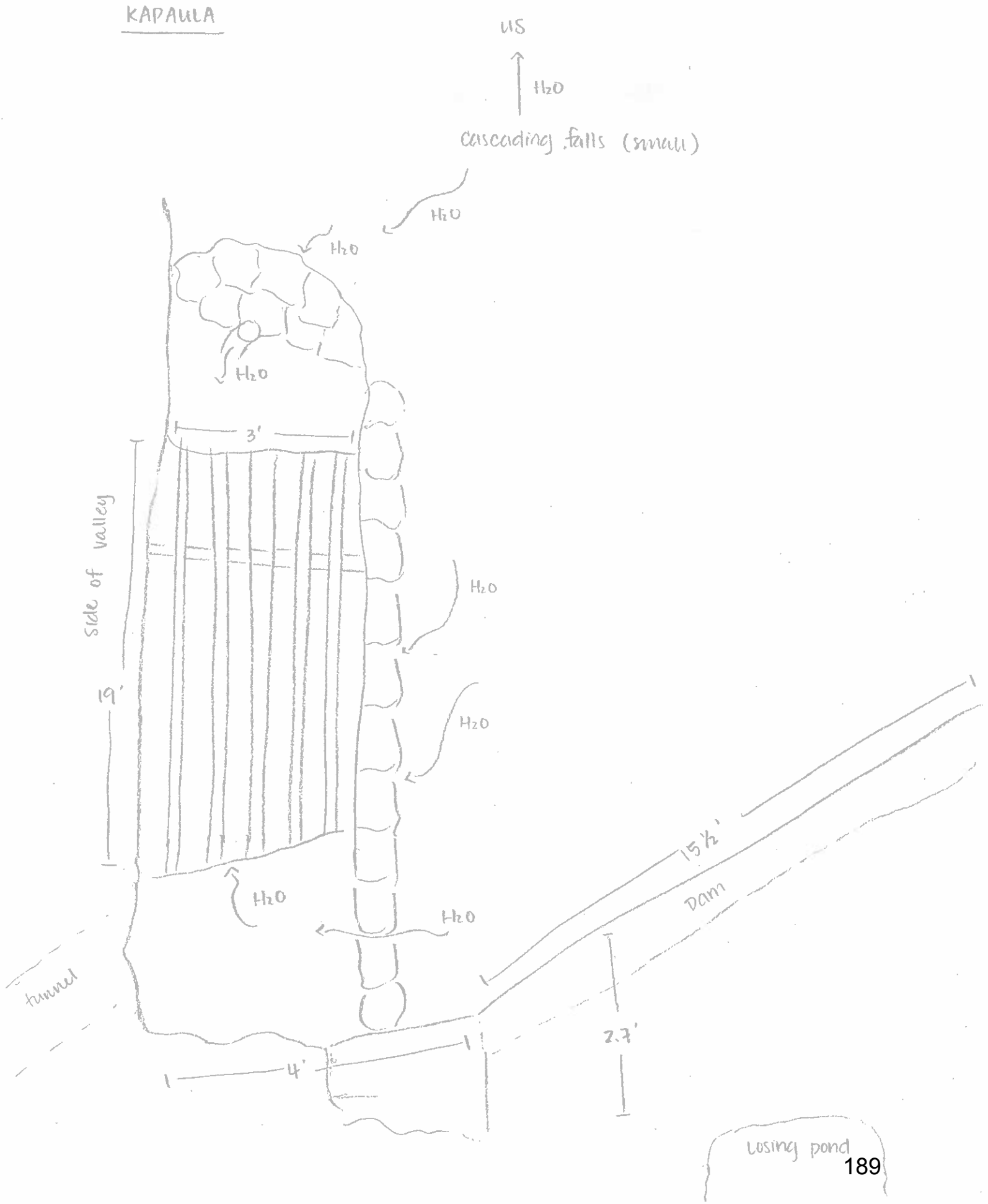
DIVERSION SKETCH



DIVERSION SKETCH

- gate was open by mistake.
- with water, critters can climb up diversion
- waterfall upstream.
- how long is dry reach below diversion?

DIVERSION SKETCH

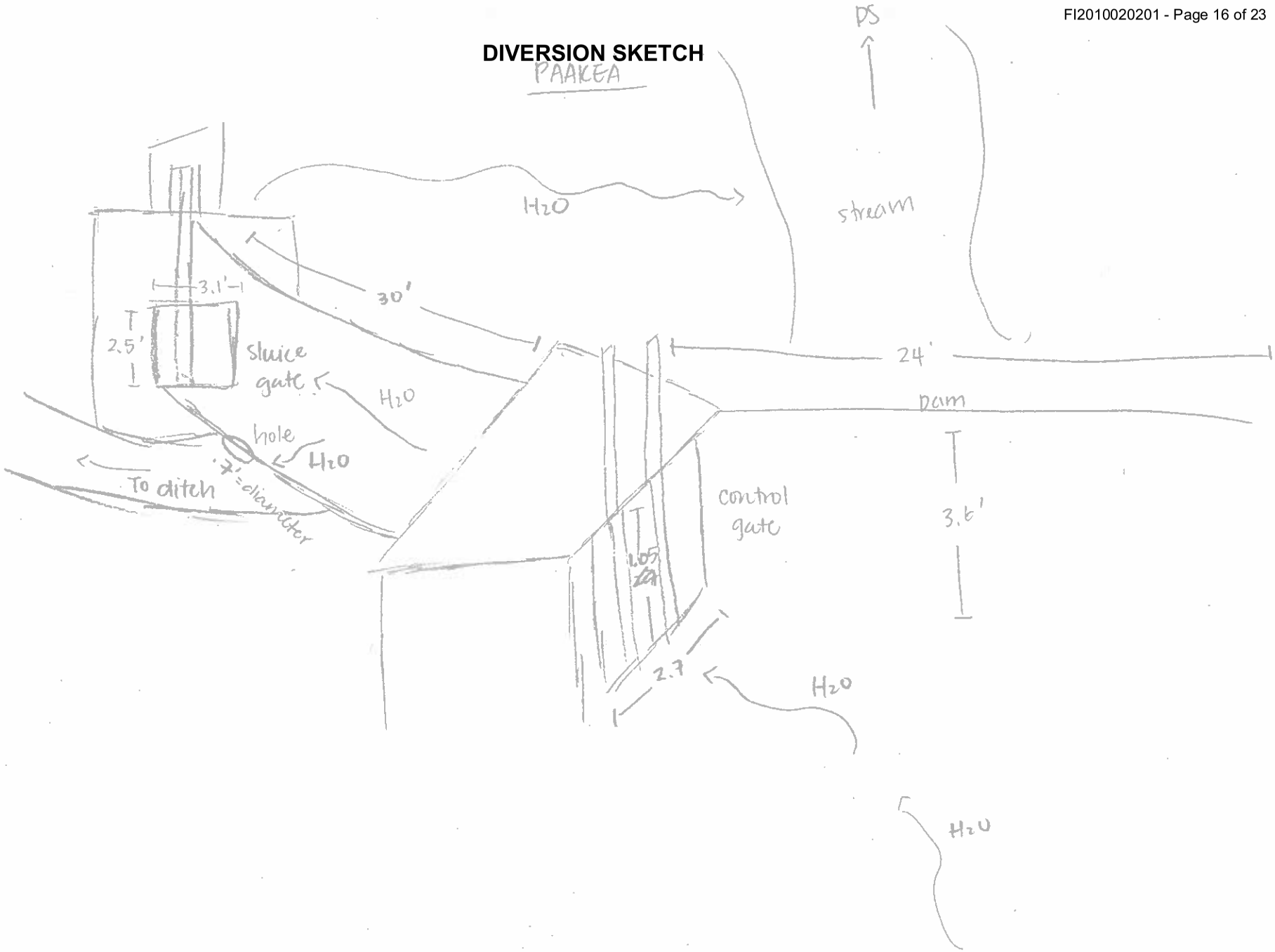


DIVERSION SKETCH

× losing section downstream so moved dam further upstream.

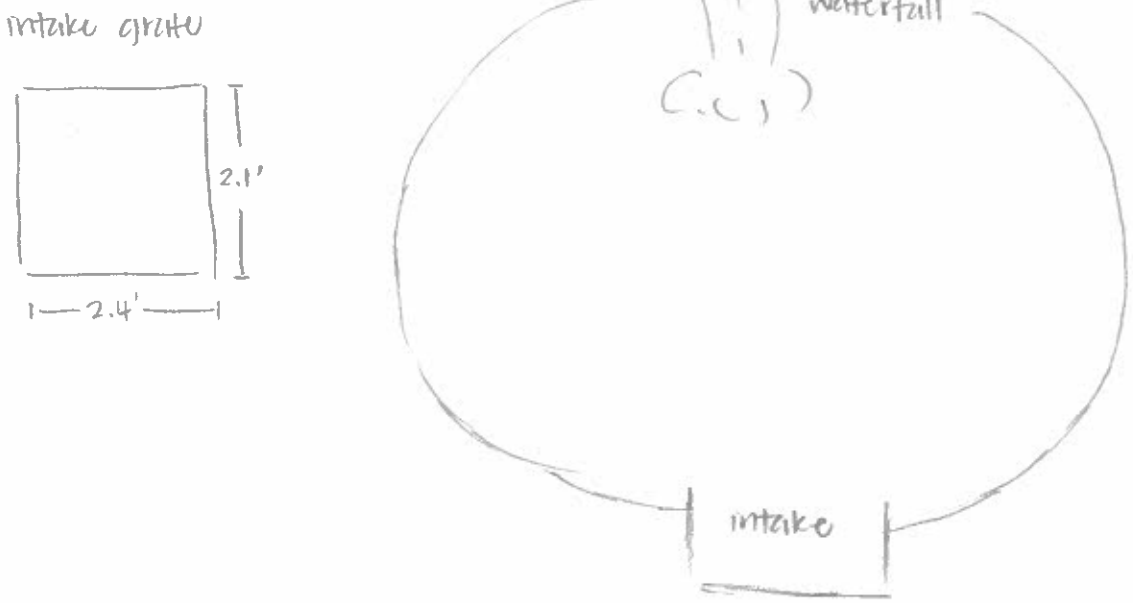
× no sluice gate.

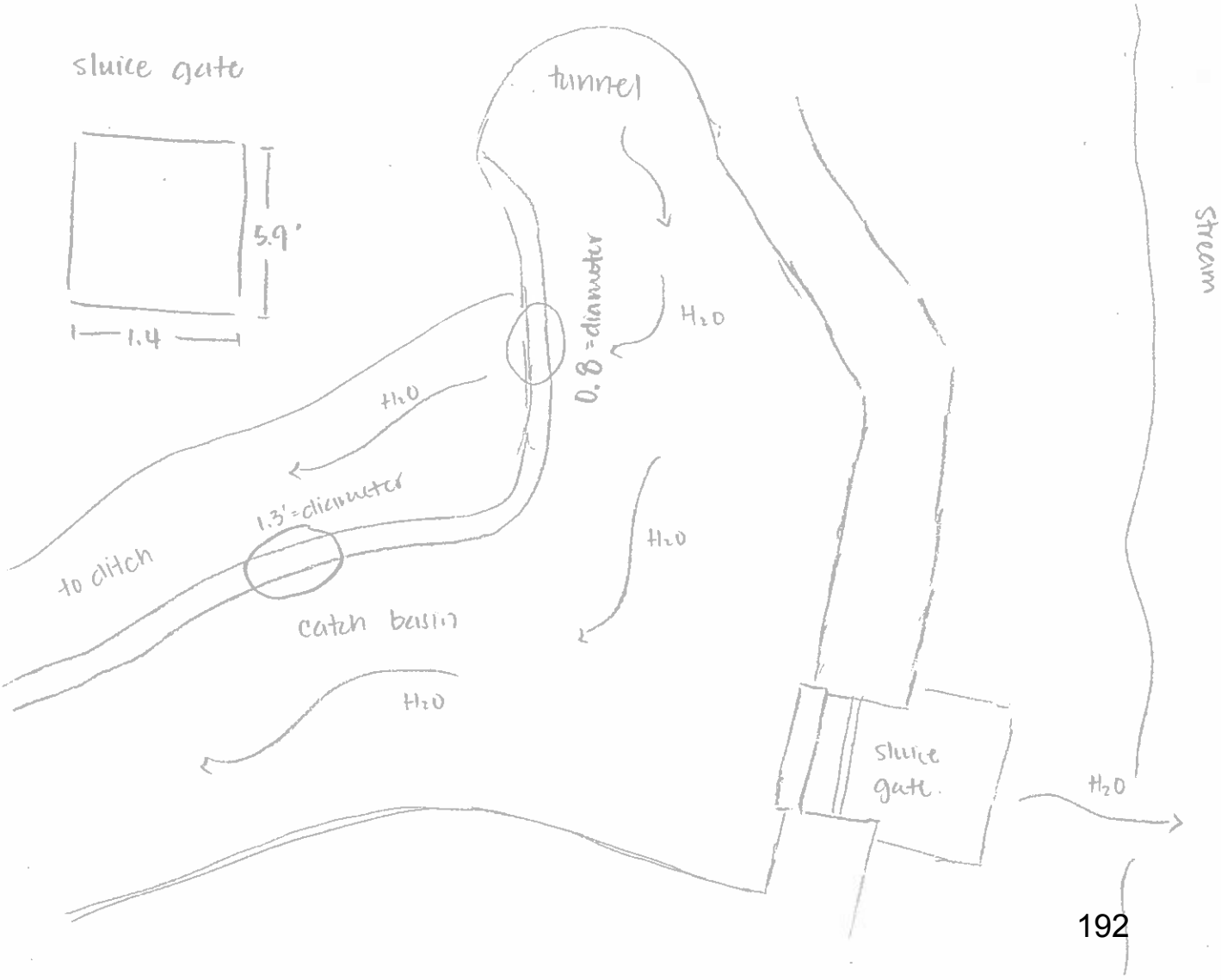
DIVERSION SKETCH



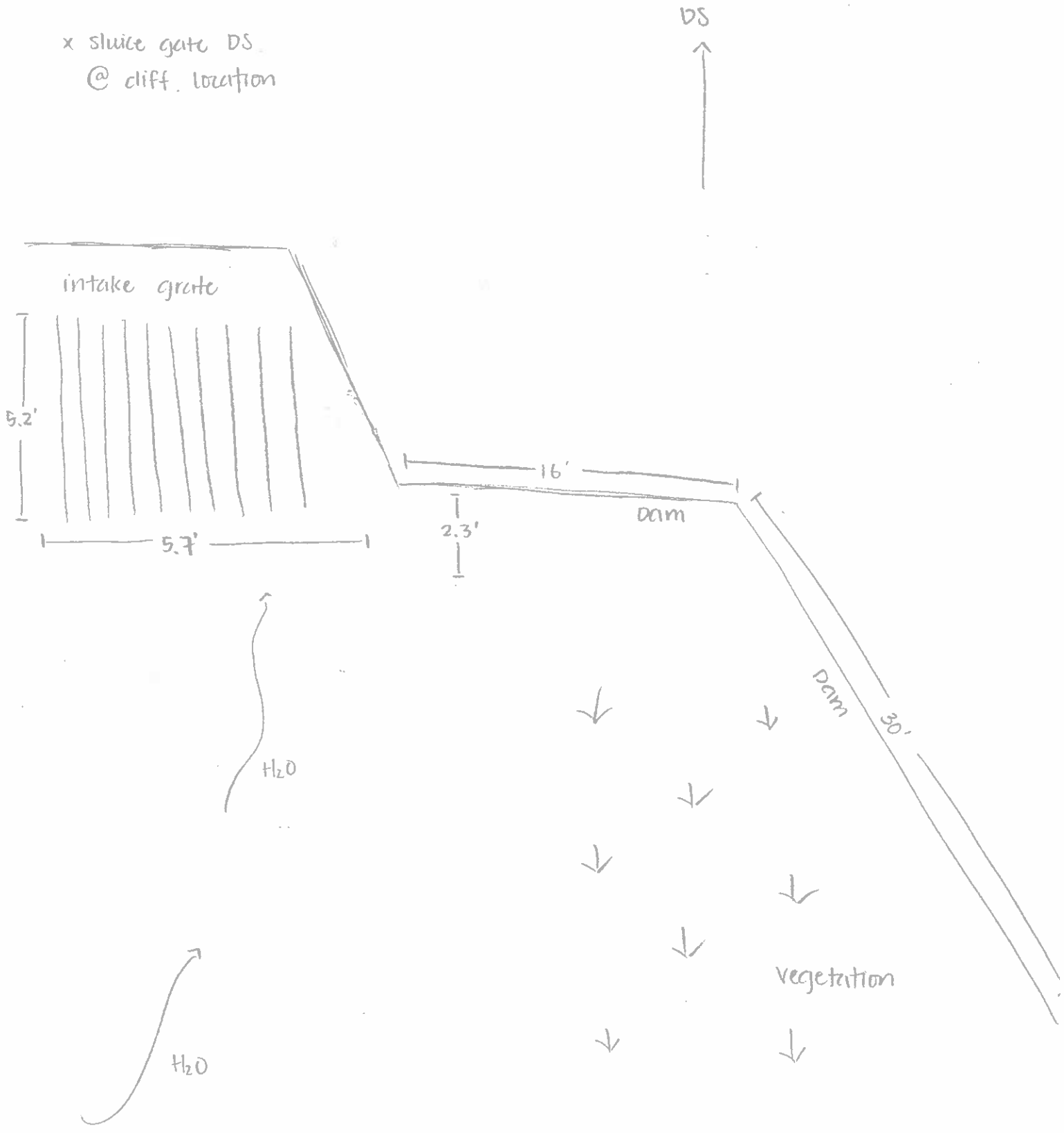
DIVERSION SKETCH

WAIOHUE

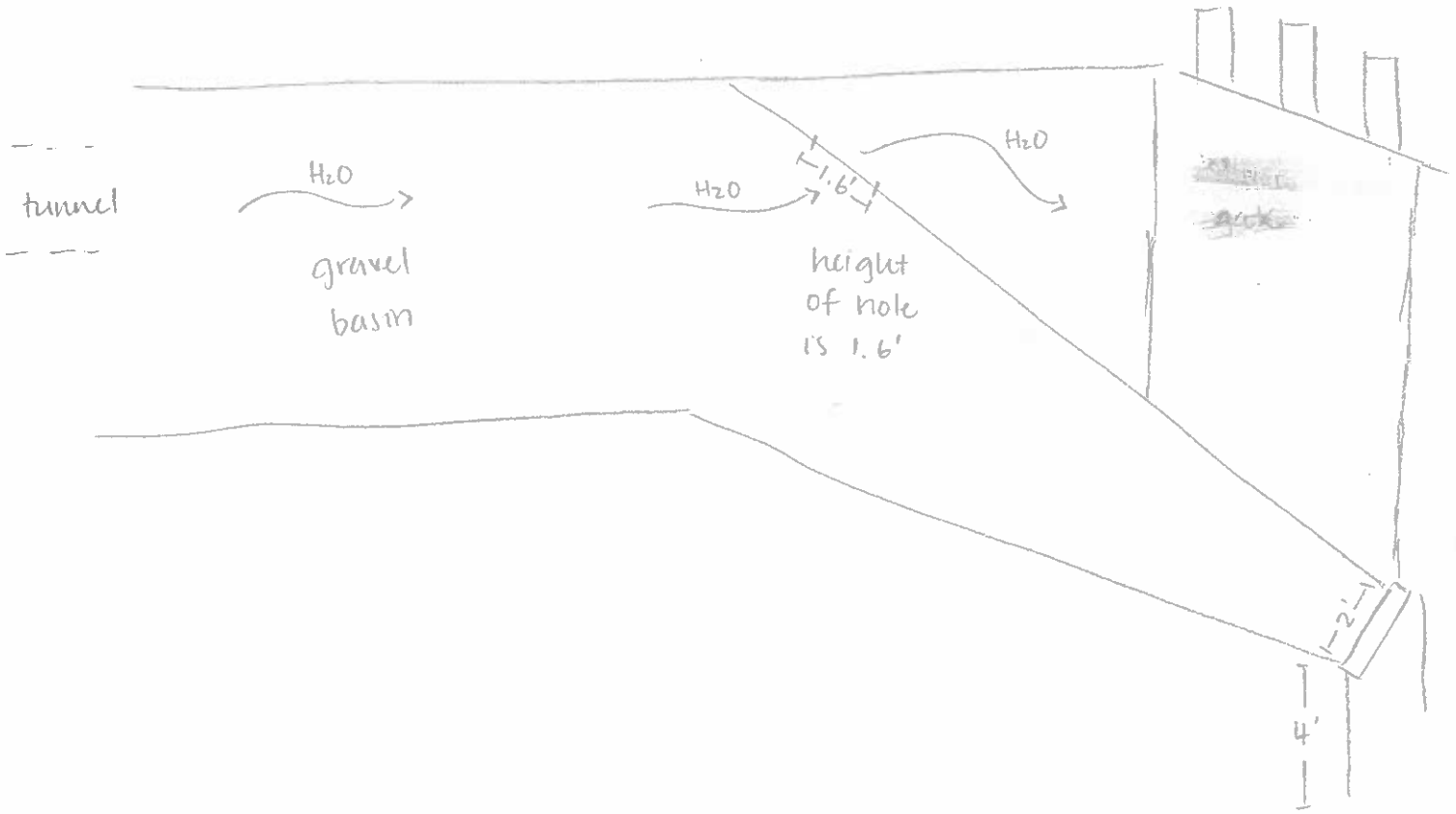




DIVERSION SKETCH

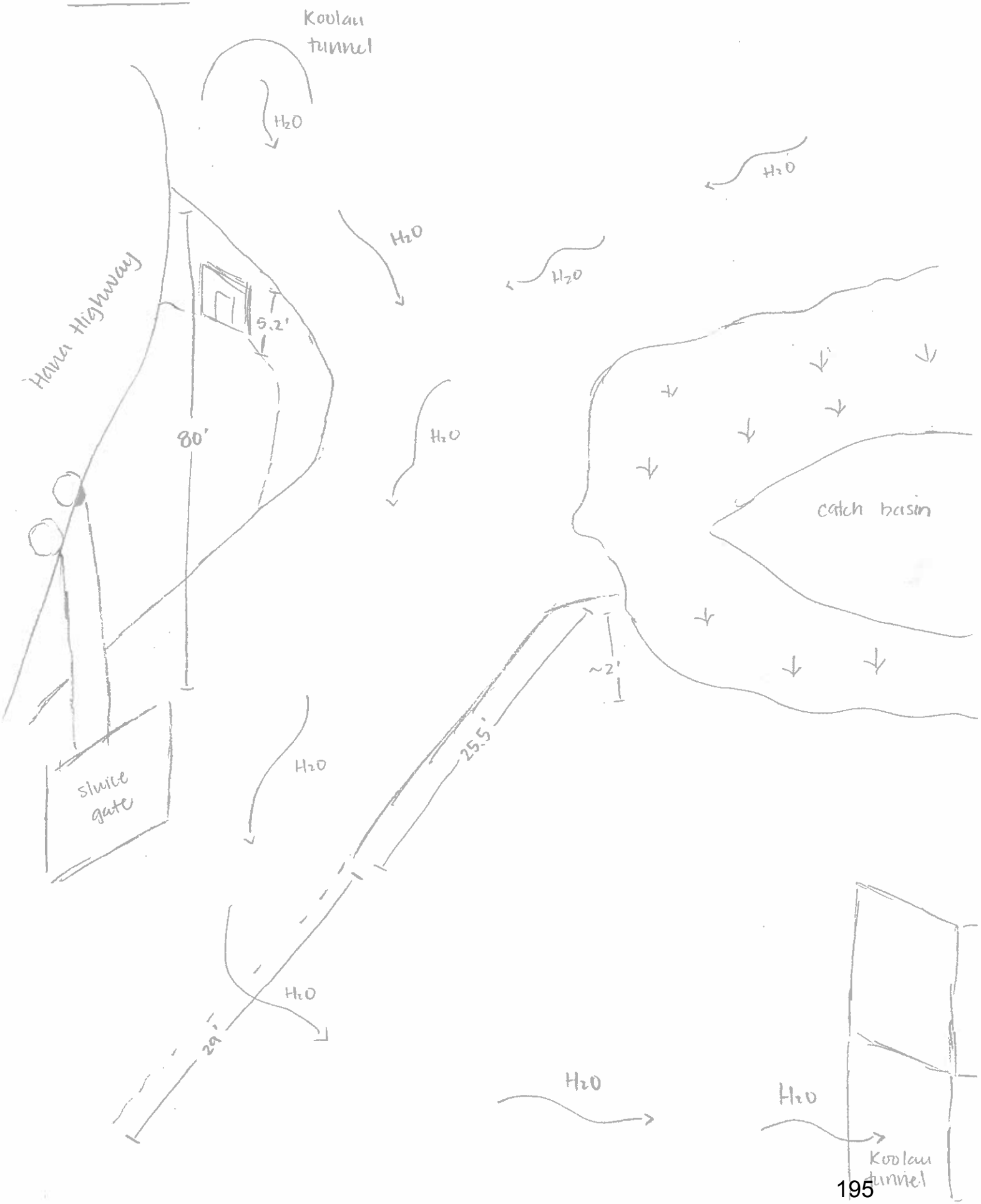


DIVERSION SKETCH

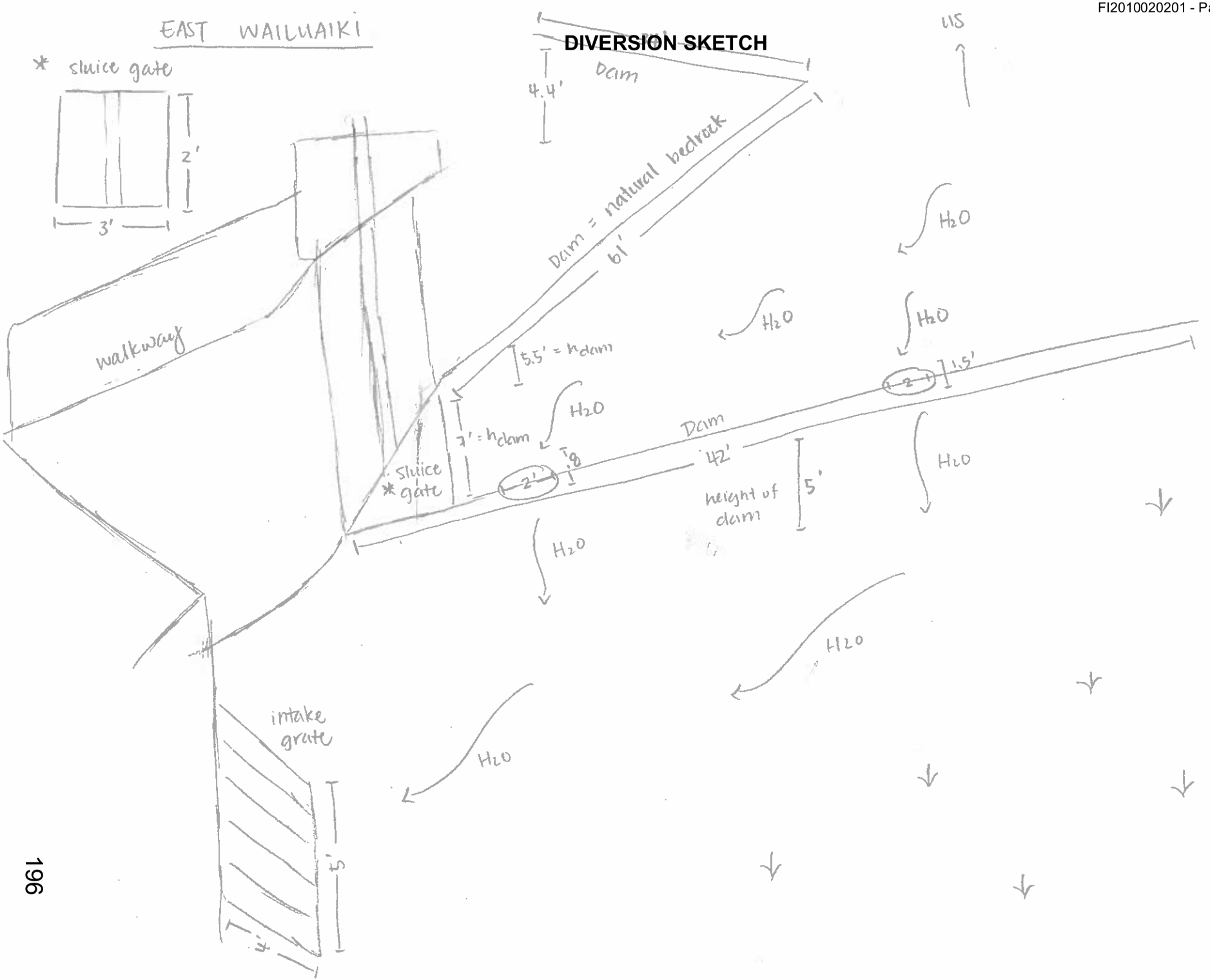


KOPILIULA

DIVERSION SKETCH

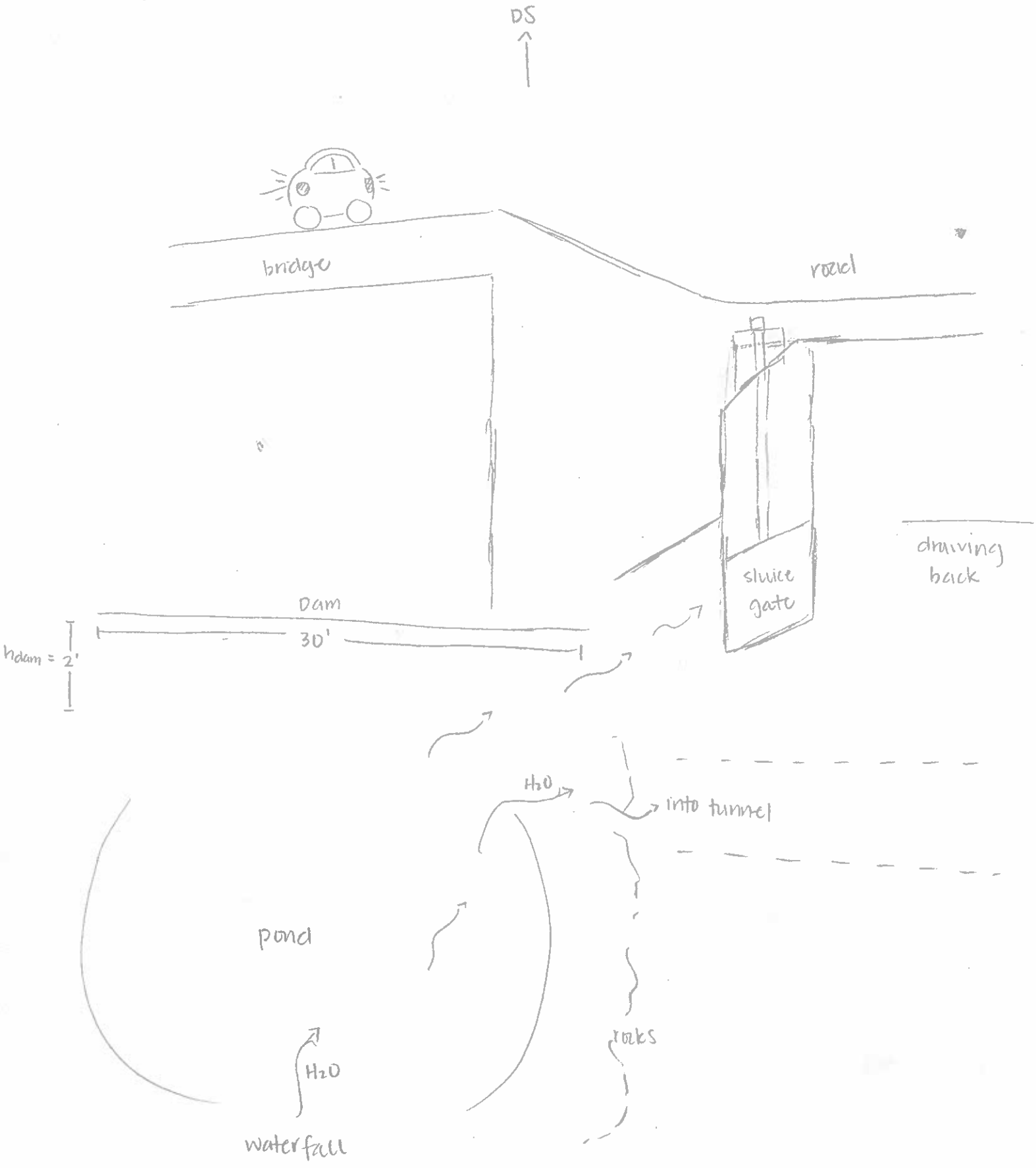


DIVERSION SKETCH



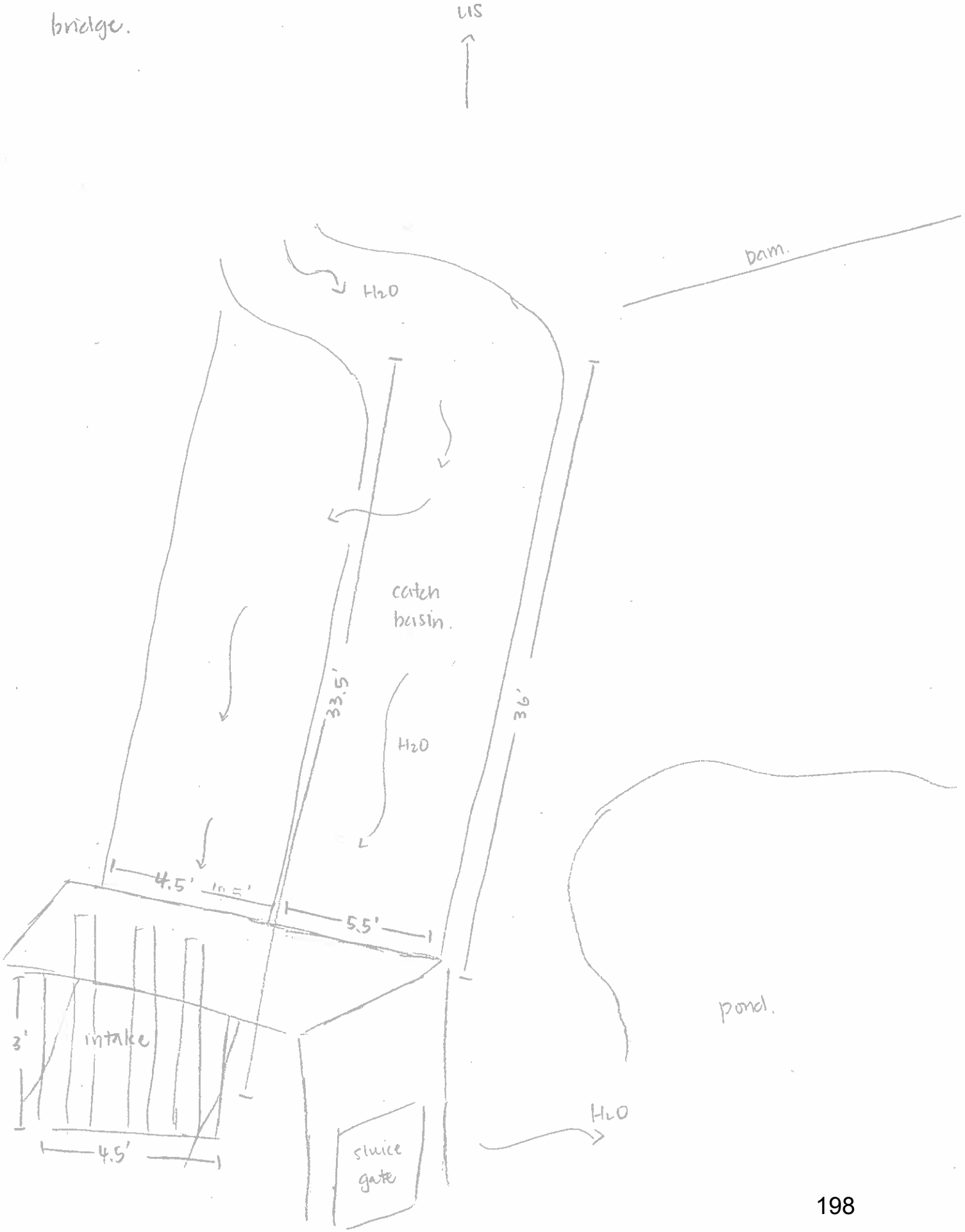
WEST WAILUAIKI

DIVERSION SKETCH



DIVERSION SKETCH

x waterfall downstream of bridge.



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010020301 (East Maui, Diversions)

Date of Field Investigation: February 3, 2010	**Time** (24-hour)**:** 0730 - 1630
CWRM Staff:	Dean Uyeno, Diane England, and Chui Ling Cheng
Individuals Present:	DAR Staff – Lance Nishiura EMI Staff – Garret Hew, Mark Vaught, Henry Robello
Hydrologic Unit:	East Maui
Stream Name:	Multiple Streams

Findings:

The purpose of this field visit was to document the physical dimensions of and how water flows past the EMI diversion structures in 17 petitioned streams in east Maui. The streams include Alo, Waikamoi, Wahinepee, Puohokamoa, Haipuaena, Pnalau/Kolea, Honomanu, Nuaailua, West Wailuaiki, East Wailuaiki, Kopiliula, Waiohue, Paakea, Waiaaka, Kapaula, Hanawi, and Makapipi. Documentation was completed in three days. The following is a list of streams and the respective diversions that staff visited on the second day of the field visit.

1. Nuaailua Stream, S-1 intake into Spreckels Ditch.
   Diversion structure consists of a 25 feet (L) x 3.3 feet (H) dam. Intake (1.7 x 2.32 feet, W x H) situate on the left bank without a sluice gate. Two minor diversion pipes sit adjacent to the diversion dam, with diameters 0.62 feet and 0.5 feet. Nuaailua Stream marks the start of the Spreckels Ditch.
2. Honomanu Stream, Banana Intake (S-2 intake) into Spreckels Ditch.
   Diversion structure consists of a 16 feet (L) x 2.7 feet (H) dam. Intake (2.3 x 3.3 feet, W x H) and sluice gate (2.5 x 2.7 feet, W x H) situate on the left bank. The dividing wall has a height of 3.2 feet. Honomanu Stream continues as a waterfall downstream from the diversion.
3. Honomanu Stream, Center Intake (S-3 intake) into Spreckels Ditch.
   Diversion structure is below a waterfall and consists of a 24 feet (L) x 2.7 feet (H) dam, 5 feet (W) x 4.5 feet (H) intake, and 2.6 feet (W) x 2.7 feet (H) sluice gate. A black pipe on the right bank collects seepage and discharges into this diversion. Honomanu Stream continues as a waterfall downstream from the diversion, and the stream was dry.
4. Honomanu Stream, S-4 main intake into Spreckels Ditch.
   Diversion structure consists of a curved dam about 66 feet in length. Intake (4 x 3 feet, W x H) and sluice gate (4 x 3 feet, W x H) situate on the left bank. The dividing wall is 37 feet in length. Downstream from the diversion, the stream was dry but continues as a waterfall if the stream flowed.
5. Honomanu Stream, High Falls Intake (S-5 intake) into Spreckels Ditch.
   Diversion structure consists of a dam about 23 feet in length. Intake (4.2 x 2.4 feet, W x H) and sluice gate (2.6 x 2.7 feet, W x H) situate on the left bank. The dividing wall (16 x 2.6 feet, W x H) has two short pipes of diameter 0.37 feet. On the right is another pipe (ID of 3 inches) that captured seepage and discharges into the gravel basin of this diversion. Downstream from the diversion, the stream was relatively dry but continues as a waterfall if the stream flowed.
6. Uluini Stream (tributary of Honomanu Stream), S-6 intake into Spreckels Ditch.
   Diversion structure consists of an intake grate (11 x 4 feet) that spans the entire stream channel. Gravel basin and the sluice gate (2 x 4 feet, W x H) situate on the left stream bank. The dividing wall is about 5.5 feet in height. The stream was relatively dry downstream from the diversion.
7. Punalau/Kolea Stream, S-7 intake into Spreckels Ditch.
   Diversion structure consists of a 35 x 6 feet (W x H) dam with a valve (0.4 feet ID) that returns water to the stream. The intake (8 feet wide) is on the left stream bank. At the time of the field visit, the valve was open; thus, Kolea Stream downstream from the diversion was flowing.
8. Haipuaena Stream, S-8 intake into Spreckels Ditch.
   Haipuaena Stream drops directly into Spreckels Ditch. The diversion structure does not have a sluice gate or gravel basin. The diversion dam is 63 feet in length, and the control gate at the intake 5 feet wide.
9. Puohokamoa Stream, K-33 intake into Koolau Ditch.
   Diversion structure consists of a 41 feet (L) x 3.2 feet (H) dam. Intake (10 x 5 feet, W x H) is on the left stream bank, with no sluice gate. The control (radio) gate is connected to a float in the Koolau Ditch. When the ditch is full, the float rises and the control gate shuts to allow water flow downstream to the next

ditch level, i.e., Spreckels Ditch. The Koolau and Spreckels Ditch are situated at different elevations. The intakes on Puohokamoa Stream into these two ditches are about 200 feet apart, with the Koolau Ditch intake upstream from the Spreckels Ditch intake.

10. Puohokamoa Stream, S-9 intake into Spreckels Ditch.
    Diversion structure consists of 37 feet (L) x 3.5 feet (H) dam. The intake (4 x 2 feet, W x H) is on the left stream bank. Water from Puohokamoa Stream flows past the gravel basin, into the Spreckels Ditch, and eventually ends up in Alo Stream (tributary of Waikamoi Stream). The Koolau Ditch by Puohokamo Stream has a lower capacity. Therefore, the excess water captured by the Spreckels Ditch will continue to Alo Stream, where the Koolau Ditch has a higher capacity.
11. Punalau/Kolea Stream, ML-1 intake into Manuel Luis Ditch.
    Diversion structure consists of a 39 feet (L) x 4.6 feet (H) dam, with the intake (4 x 1.8 feet, W x H) and sluice gate (3.8 x 4 feet, W x H) on the left stream bank. The dividing wall is 27 feet in length and 3.3 feet high with one opening for water to flow from the gravel basin to the intake. If water is allowed to flow past the sluice gate, the water flows in a waterfall before continuing downstream. Punalau Stream was dry downstream from the diversion.
12. Haipuaena Stream, ML-2 intake into Manuel Luis Ditch.
    Haipuaena Stream drops directly into Manuel Luis Ditch. The diversion structure does not have a sluice gate or gravel basin. The diversion dam is located on the opposite side of the EMI access road, and it is 36 feet in length and 6 feet high. Haipuaena Stream was dry downstream from the diversion.
13. Puohokamoa Stream, ML-3 intake into Manuel Luis Ditch.
    Puohokamoa Stream drops directly into Manuel Luis Ditch. The diversion structure does not have a sluice gate or gravel basin. The diversion dam is 30 feet in length and 6 feet high. Puohokamoa Stream was dry downstream from the diversion.
14. Waihinepee Stream, ML-5 intake Manuel Luis Ditch.
    Wahinepee Stream drops directly into Manuel Luis Ditch. The diversion structure does not have a sluice gate or gravel basin. The diversion dam, which is also the ditch wall, is 17.5 feet in length and 8 feet high. Wahinepee Stream was dry downstream from the diversion.

Staff concluded the field visit at 1630 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100203006	Diversion structure (S-1 intake) at Nuaailua Stream.
20100203007	Nuaailua Stream upstream of diversion (S-1 intake).
20100203008	S-1 intake into Spreckels Ditch on the left bank of Nuaailua Stream.
20100203009	Nuaailua Stream downstream of diversion (S-1 intake).
20100203010	Honomanu Stream downstream from the diversion structure (S-2 intake).
20100203011	S-2 intake into Spreckels Ditch on the left bank of Honomanu Stream. Active dam on the far right followed by three other abandoned dams.
20100203012	S-2 intake into Spreckels Ditch on the left bank of Honomanu Stream.
20100203013	Honomanu Stream upstream from the diversion (S-2 intake).
20100203015	Gravel basin and dividing wall of the diversion structure (S-2 intake) on Honomanu Stream.
20100203016	S-3 intake into Spreckels Ditch on Honomanu Stream.
20100203017	Sluice gate of the diversion structure (S-3 intake) on the right bank of Honomanu Stream.
20100203018	Honomanu Stream downstream from the diversion. The stream was dry.
20100203019	S-3 intake into Spreckels Ditch on Honomanu Stream.
20100203020	Minor diversion of seepage flow on the right bank of Honomanu Stream.
20100203021	Diversion dam (S-4 intake) on Honomanu Stream.
20100203022	Honomanu Stream downstream from the diversion.
20100203023	Diversion dam (S-4 intake) on Honomanu Stream.
20100203024	Gravel basin of the diversion structure (S-4 intake) on the right bank of Honomanu Stream.
20100203025	Dividing wall between the gravel basin and the intake on Honomanu Stream.
20100203026	Sluice gate of the diversion structure (S-4 intake) on the right bank of Honomanu Stream.
20100203027	Honomanu Stream downstream from the diversion.
20100203038	S-5 intake into Spreckels Ditch on the left bank of Honomanu Stream.
20100203041	Honomanu Stream downstream from the diversion.
20100203043	Diversion structure (S-5 intake) on Honomanu Stream.
20100203045	High Falls above diversion structure (S-5 intake) on Honomanu Stream.
20100203064	S-6 intake into Spreckels Ditch on Uluini Stream.
20100203065	Uluini Stream upstream from the diversion.
20100203066	Uluini Stream downstream from the diversion.
20100203067	Gravel basin and sluice gate of the diversion structure (S-6 intake) on Uluini Stream.
20100203072	Spreckels Ditch near S-6 intake on Uluini Stream.

20100203074	Spreckels Ditch and S-6 intake on Uluini Stream.
20100203076	Diversion dam (S-7 intake) on Kolea Stream.
20100203077	Kolea Stream upstream from the diversion.
20100203078	S-7 intake into Koolau Ditch on Kolea Stream.
20100203079	Kolea Stream downstream from the diversion.
20100203080	Diversion structure (S-7 intake) on Kolea Stream.
20100203081	Kolea Stream downstream from the EMI access road.
20100203083	Kolea Stream diverted into the Spreckels Ditch.
20100203084	Control gate of the S-8 intake into Spreckels Ditch on the left bank of Haipuaena Stream.
20100203085	Haipuaena Stream upstream from diversion.
20100203086	Control gate of the S-8 intake into Spreckels Ditch on the left bank of Haipuaena Stream.
20100203087	Haipuaena Stream downstream from diversion.
20100203088	Diversion structure (S-8 intake) on the left bank of Haipuaena Stream.
20100203094	K-33 intake into Koolau Ditch on the left bank of Puohokamoa Stream.
20100203095	K-33 intake into Koolau Ditch on the left bank of Puohokamoa Stream.
20100203096	Puohokamoa Stream downstream from the K-33 intake into Koolau Ditch, but upstream from the S-9 intake into Spreckels Ditch.
20100203097	Diversion dam for the K-33 intake on Puohokamoa Stream.
20100203098	Puohokamoa Stream upstream from the K-33 intake into Koolau Ditch.
20100203100	Diversion dam, gravel basin, and dividing wall of the Spreckels Ditch diversion on the left bank of Puohokamoa Stream.
20100203101	Puohokamoa Stream downstream from the S-9 intake into Spreckels Ditch.
20100203107	Diversion dam for the K-33 intake on Puohokamoa Stream.
20100203108	Dividing wall for the K-33 intake on Puohokamoa Stream.
20100203109	Puohokamoa Stream upstream from the K-33 intake into Koolau Ditch.
20100203112	Diversion dam for the ML-1 intake on Punalau Stream.
20100203113	Punalau Stream downstream from the diversion (ML-1 intake).
20100203114	Diversion dam, gravel basin, and dividing wall of the ML-1 intake into Manuel Luis Ditch on the left bank of Punalau Stream.
20100203115	Punalau Stream upstream from the diversion (ML-1 intake).
20100203116	Diversion structure (ML-1 intake) on Punalau Stream. Intake and sluice gate on the left stream bank.
20100203117	Diversion dam, gravel basin, and dividing wall of the ML-1 intake into Manuel Luis Ditch on the left bank of Punalau Stream.
20100203119	Diversion dam of the ML-2 intake into Manuel Luis Ditch on Haipuaena Stream.
20100203120	Haipuaena Stream upstream from the diversion.
20100203121	ML-2 intake into the Manuel Luis Ditch on Haipuaena Stream.
20100203122	Haipuaena Stream downstream from the diversion (ML-2 intake).
20100203123	Puohokamoa Stream upstream from the diversion (ML-3 intake).
20100203125	Diversion dam and ML-3 intake into the Manuel Luis Ditch on Puohokamoa Stream.
20100203129	Puohokamoa Stream downstream from the diversion (ML-3 intake).
20100203140	ML-5 intake into the Manuel Luis Ditch on Wahinepee Stream. Waterfall drops directly into the ditch.

Video Listing:

File Name:	**Brief Description:**
2010020301	Nuaailua Stream, S-1 Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203101912.*
2010020302	Honomanu Valley, Trib. To Honomanu Stream, S-2 (Banana) Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203103701, 20100203103830, 20100203104002, 20100203104306, 20100203104530, 20100203104636.*
2010020303	Trib. To Honomanu Stream, S-3 (Center) Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203110644, 20100203110750.*
2010020304	Honomanu Stream, S-4 (Main) Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203111804, 20100203111943, 20100203112112, 20100203112235.*
2010020305	Trib. To Honomanu Stream, S-5 (High Falls) Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203113329.*
2010020306	Trib. To Honomanu Stream, S-6 (Uluini) Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203120541, 20100203120715, 20100203121516.*
2010020307	Punalau/Kolea Stream, K-32 Intake, Koolau Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203122931.*
2010020308	Haipuaena Stream, S-8 Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203124953, 20100203125140.*
2010020309	Puohokamoa Stream, K-33 Intake, Koolau Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203130138, 20100203134856, 20100203135408.*
2010020310	Puohokamoa Stream, S-9 Intake, Spreckels Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203140514.*

2010020311	Punalau/Kolea Stream, ML-1 Intake, Manuel Luis Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203144409, 20100203144524, 20100203145606.*
2010020312	Haipuaena Stream, ML-2 Intake, Manuel Luis Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203151023.*
2010020313	Puohokamoa Stream, ML-3 Intake, Manuel Luis Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203152734, 20100203153033.*
2010020314	Wahinepee Stream, ML-5 Intake, Manuel Luis Ditch, Feb. 3, 2010. *Compiled from the original m2ts files: 20100203160306.*

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI2010020201	GPS shapefile provided by DAR for field investigations FI2010020201, FI2010020301, FI2010020401. See DAR report for specific waypoint information.

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet
2. Diversion Sketches

Recommendations:

20100203006.jpg

20100203007.jpg

20100203008.jpg

20100203009.jpg

20100203010.jpg

20100203011.jpg

20100203012.jpg

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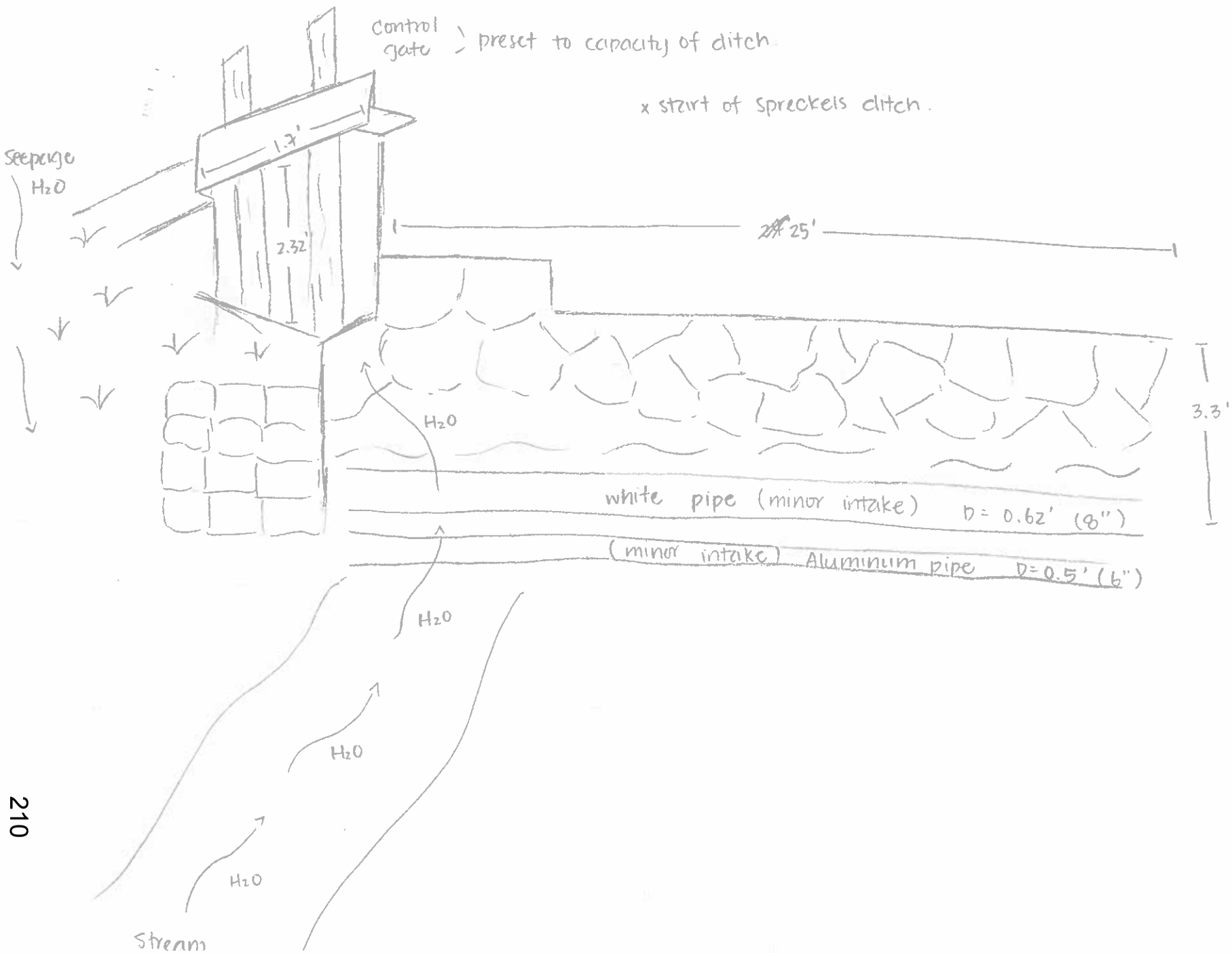
20100203140.jpg

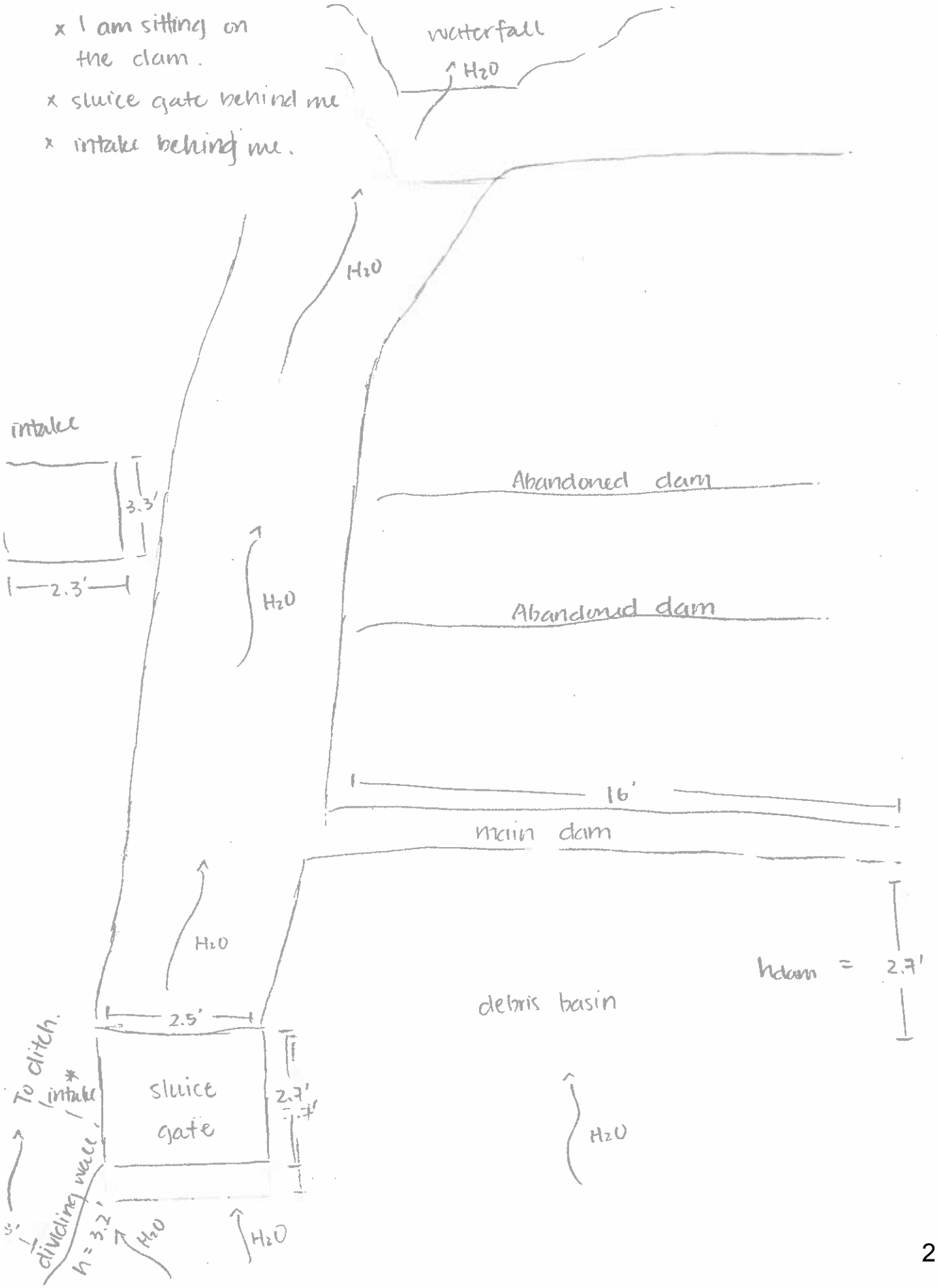
NUAAILUA (Spreckels Ditch)



HONOMANU (Banana Intake) x top view

DS

x I am sitting on the dam.
x sluice gate behind me
x intake behind me.

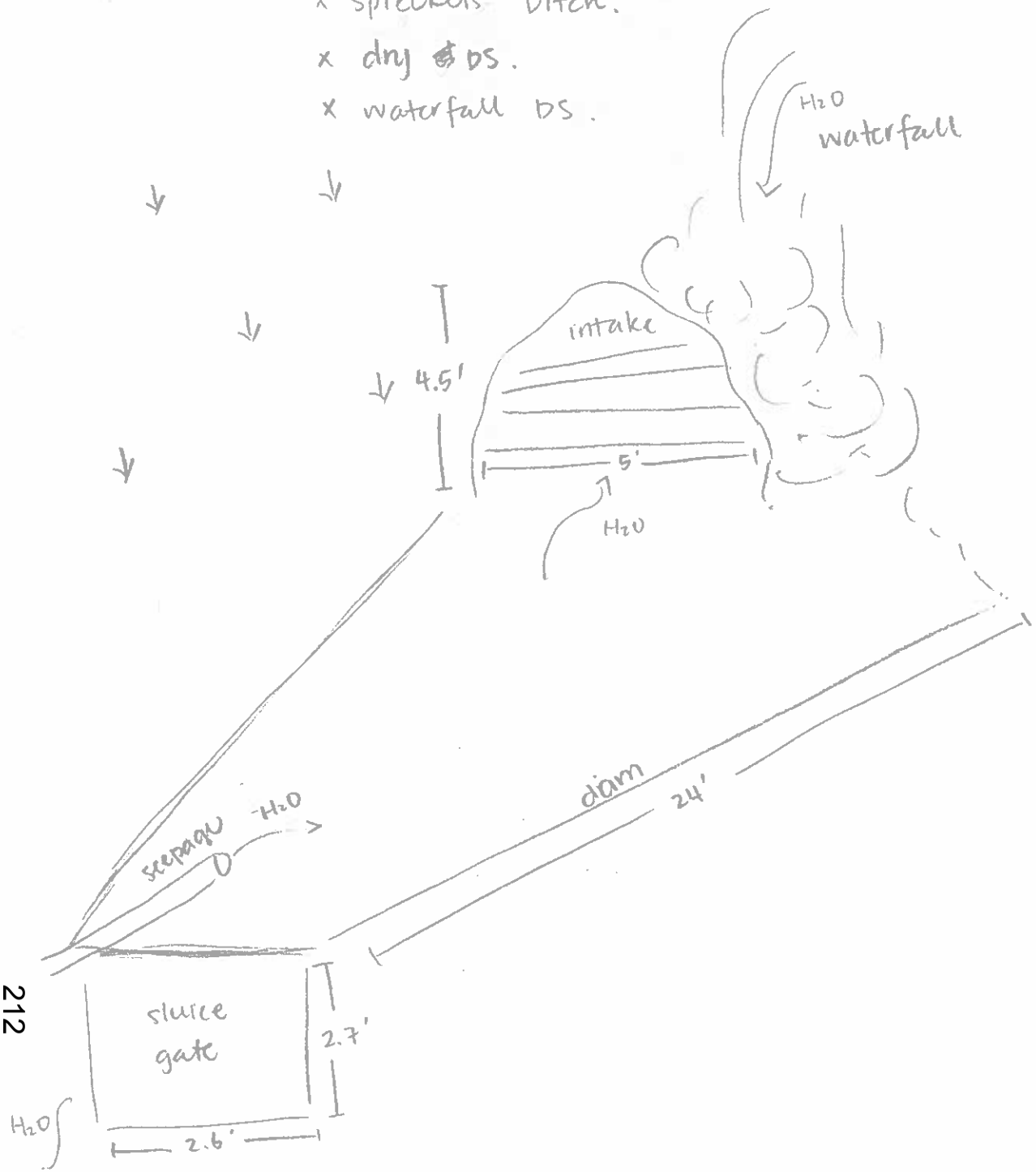


HONOMANU (Center Honomanu intake) S-3 ?

x Spreckels Ditch.

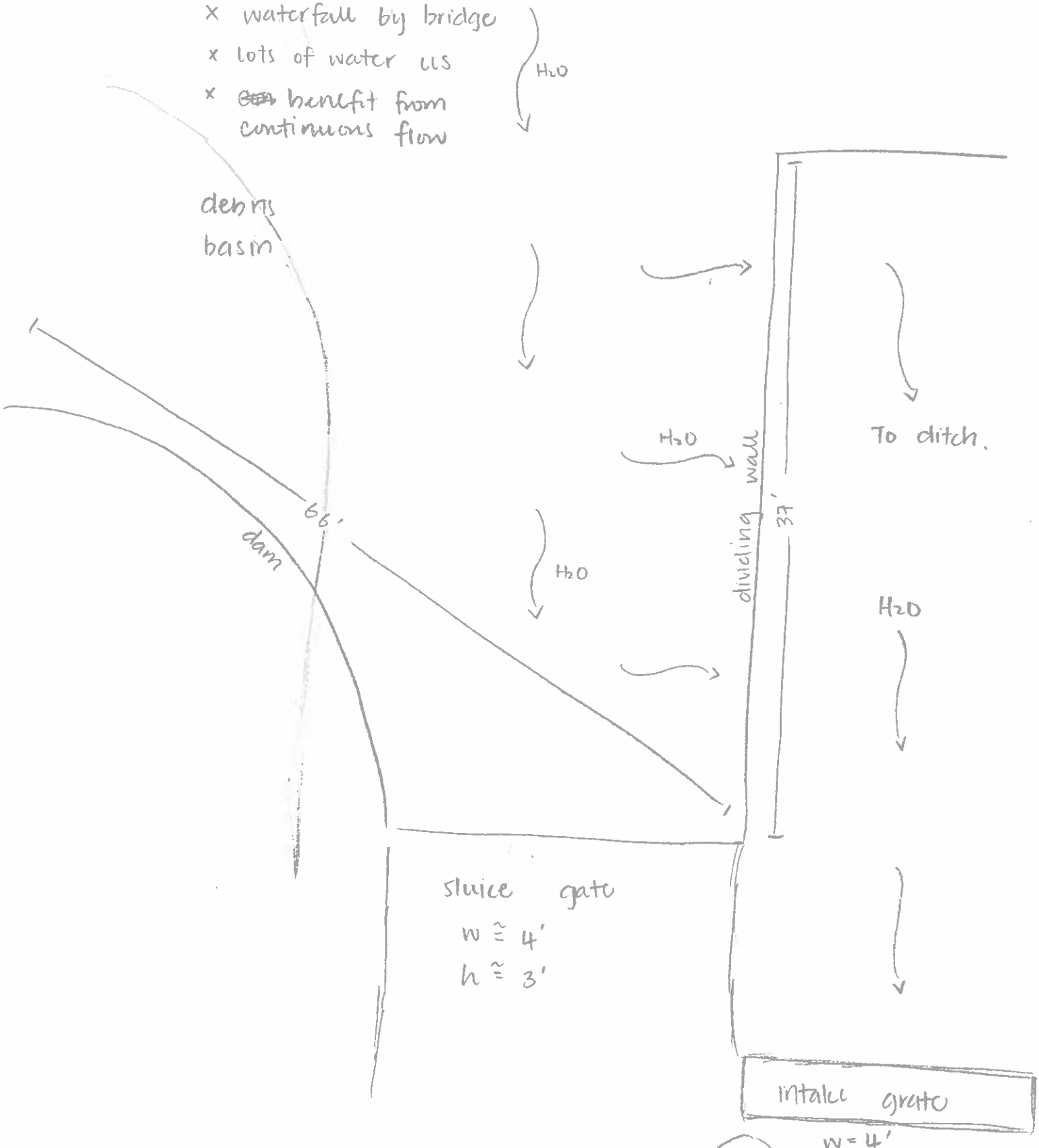
x dry DS.

x waterfall DS.



HONOMANU (main intake)

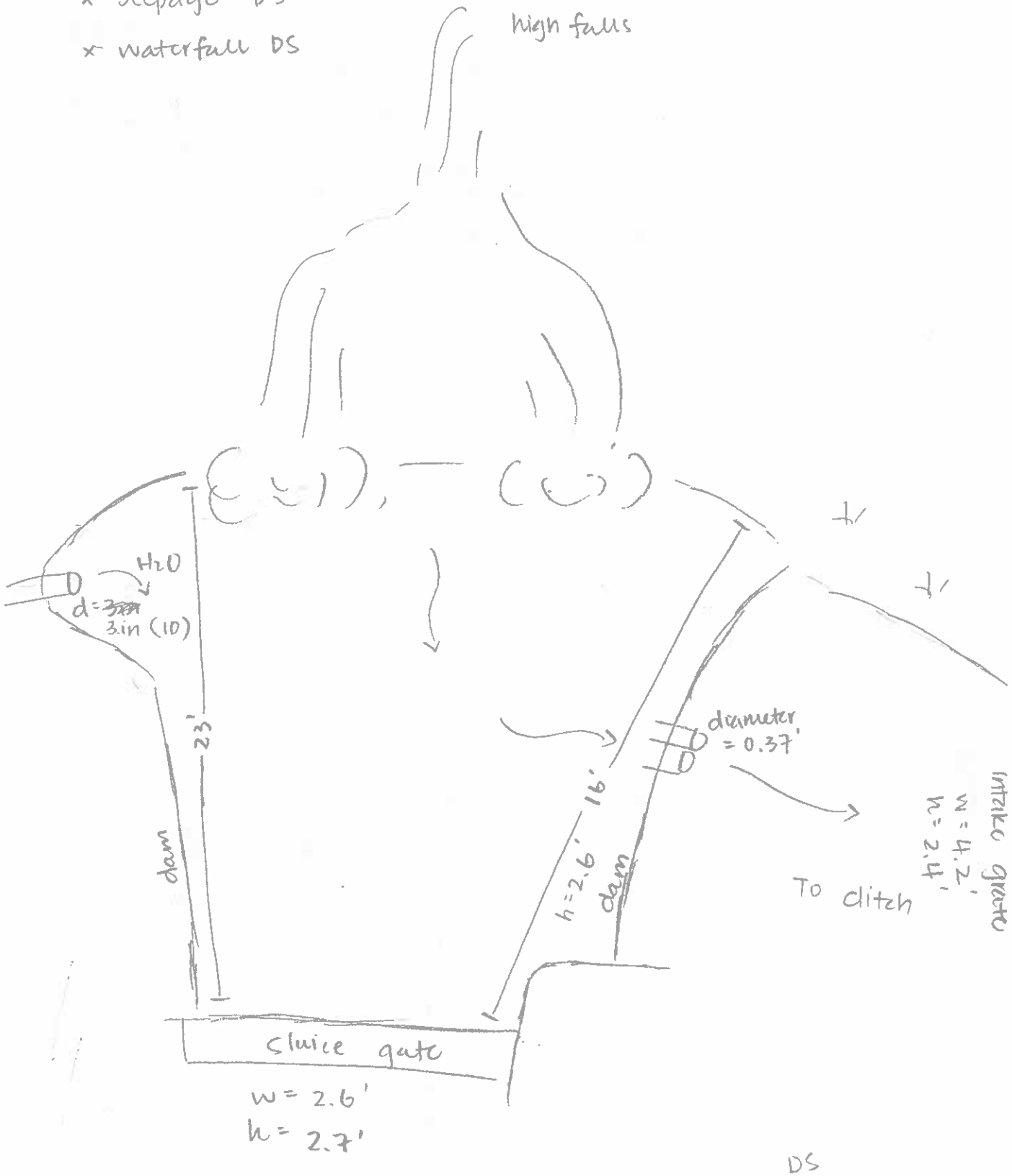
- x spreckels Ditch.
- x dry ds.
- x waterfall by bridge
- x lots of water us
- x ~~ben~~ benefit from continuous flow

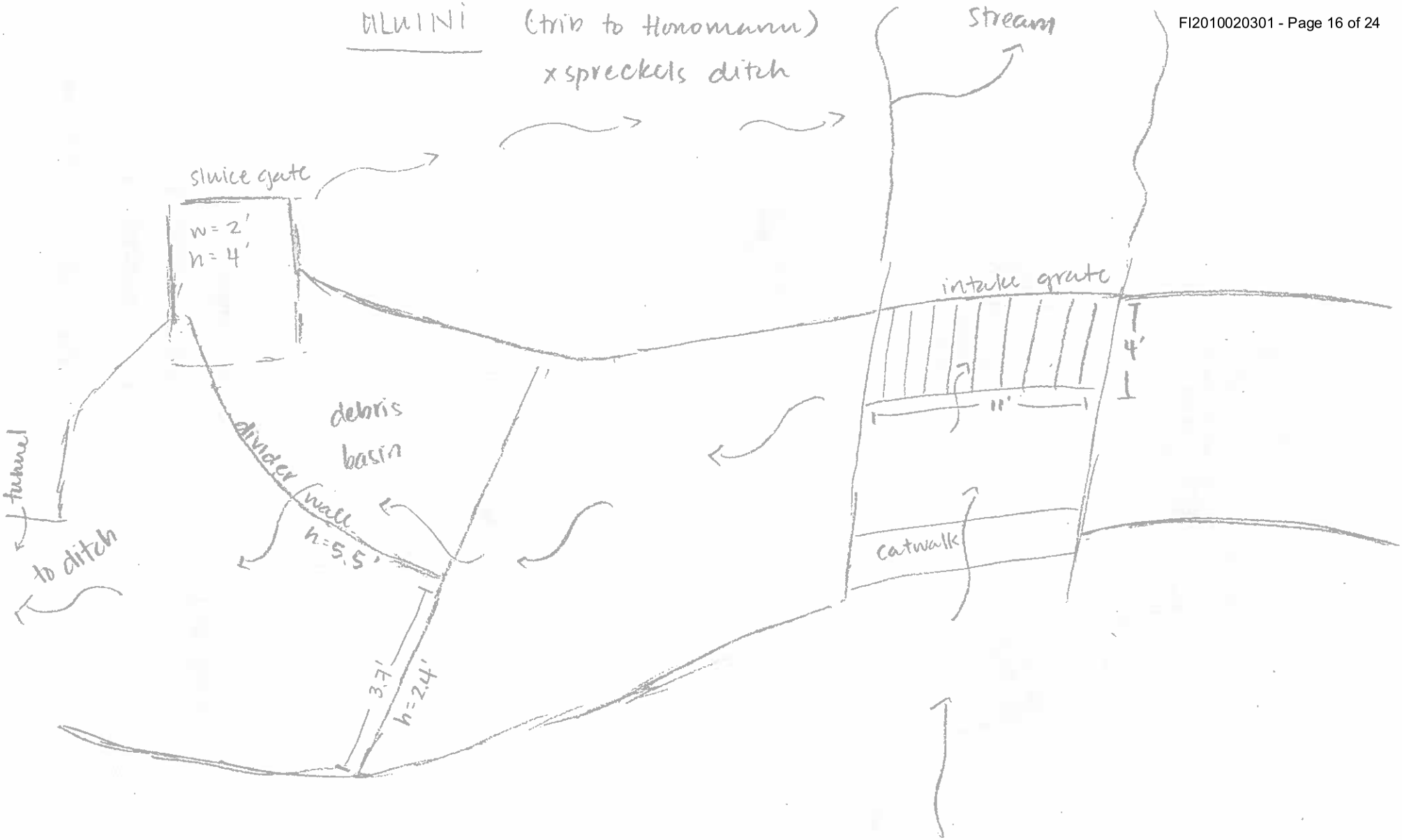


US

HONOMANU (High Falls)

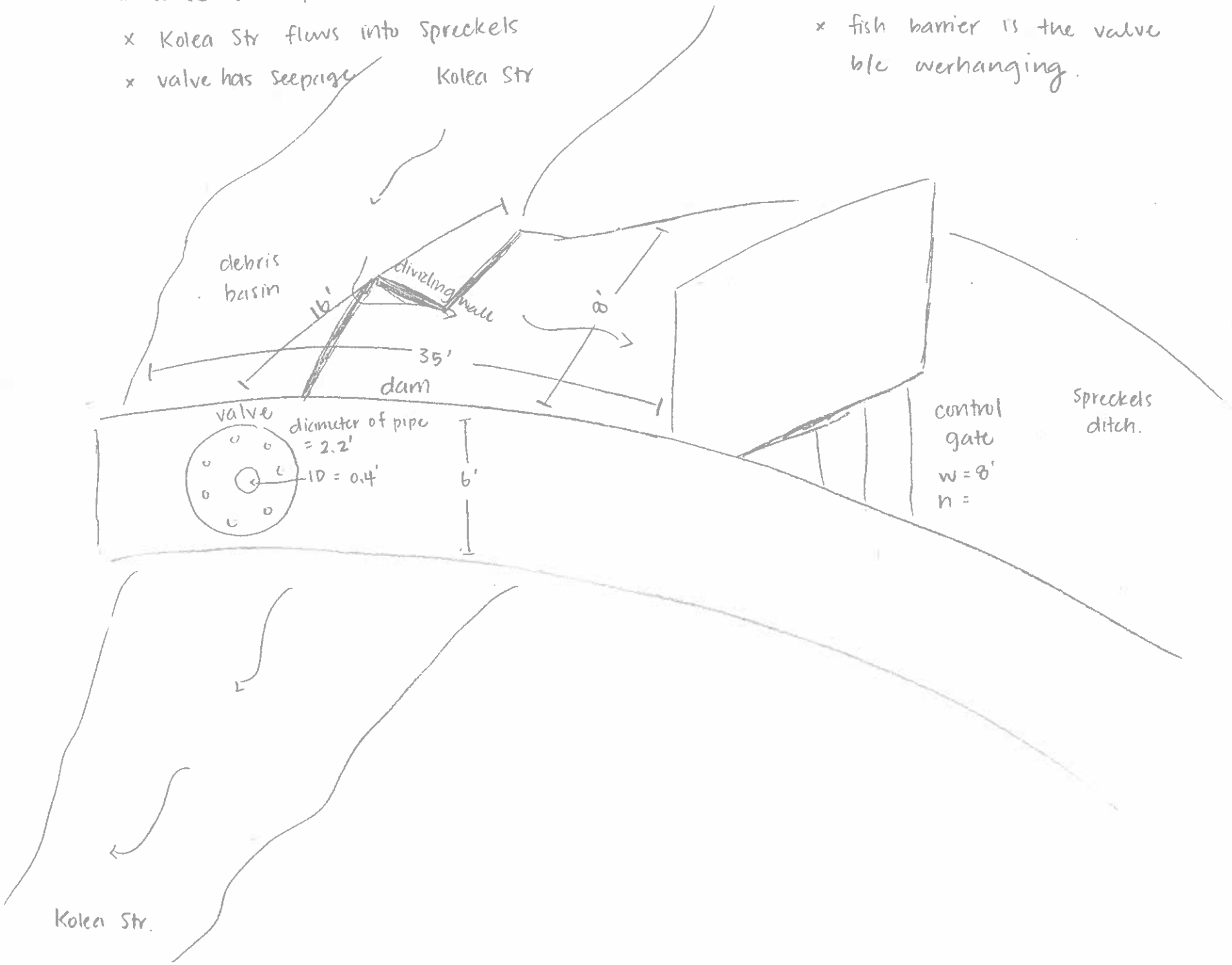
- x spreckels ditch
- x seepage DS
- x waterfall DS




ALUINI (trib to Honomanu)
x spreckels ditch
Stream
sluice gate
w = 2'
h = 4'
intake grate
4'
11'
debris basin
divider wall
h=5.5'
tunnel
to ditch
catwalk
3.7'
h=2.4'
Stream

KOLEA (Koolau ditch)

- x valve was open
- x Kolea Str flows into Spreckels
- x valve has seepage
- x dividing wall, h = 2.6'
- x fish barrier is the valve b/c overhanging.



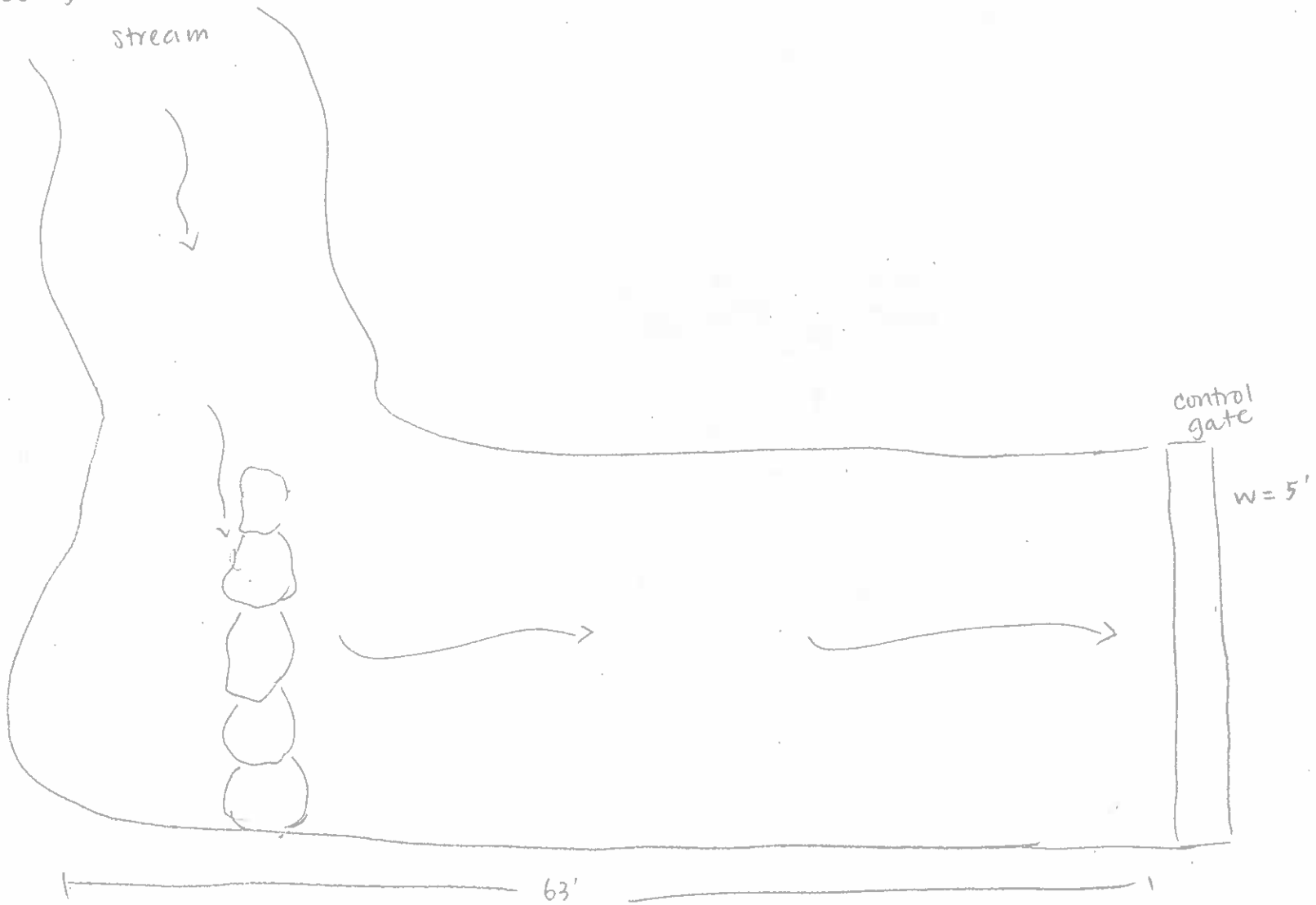
HAIPUAENA

x spreckels ditch

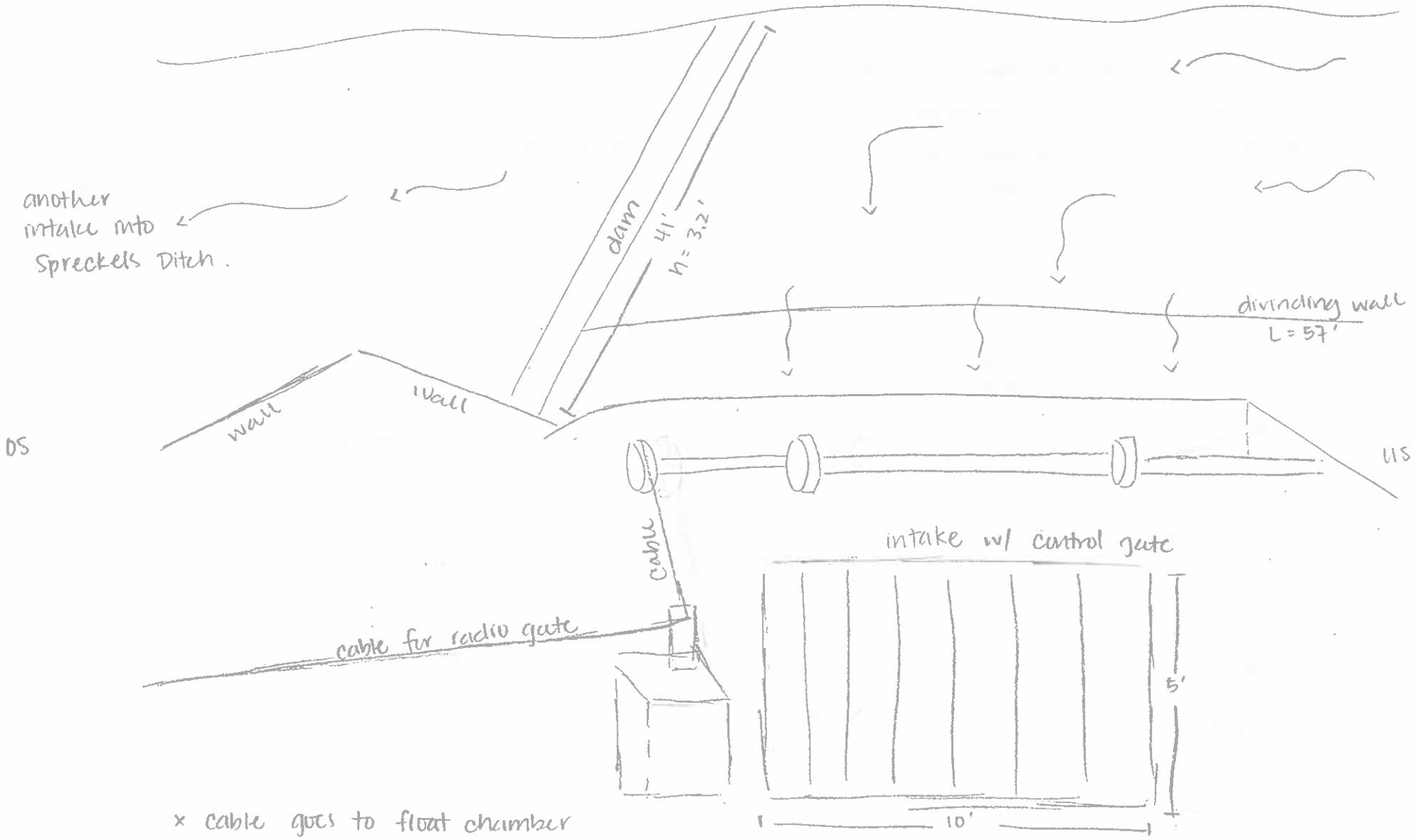
x no sluice gate

x stream drops straight into spreckels Ditch

x no debris basin



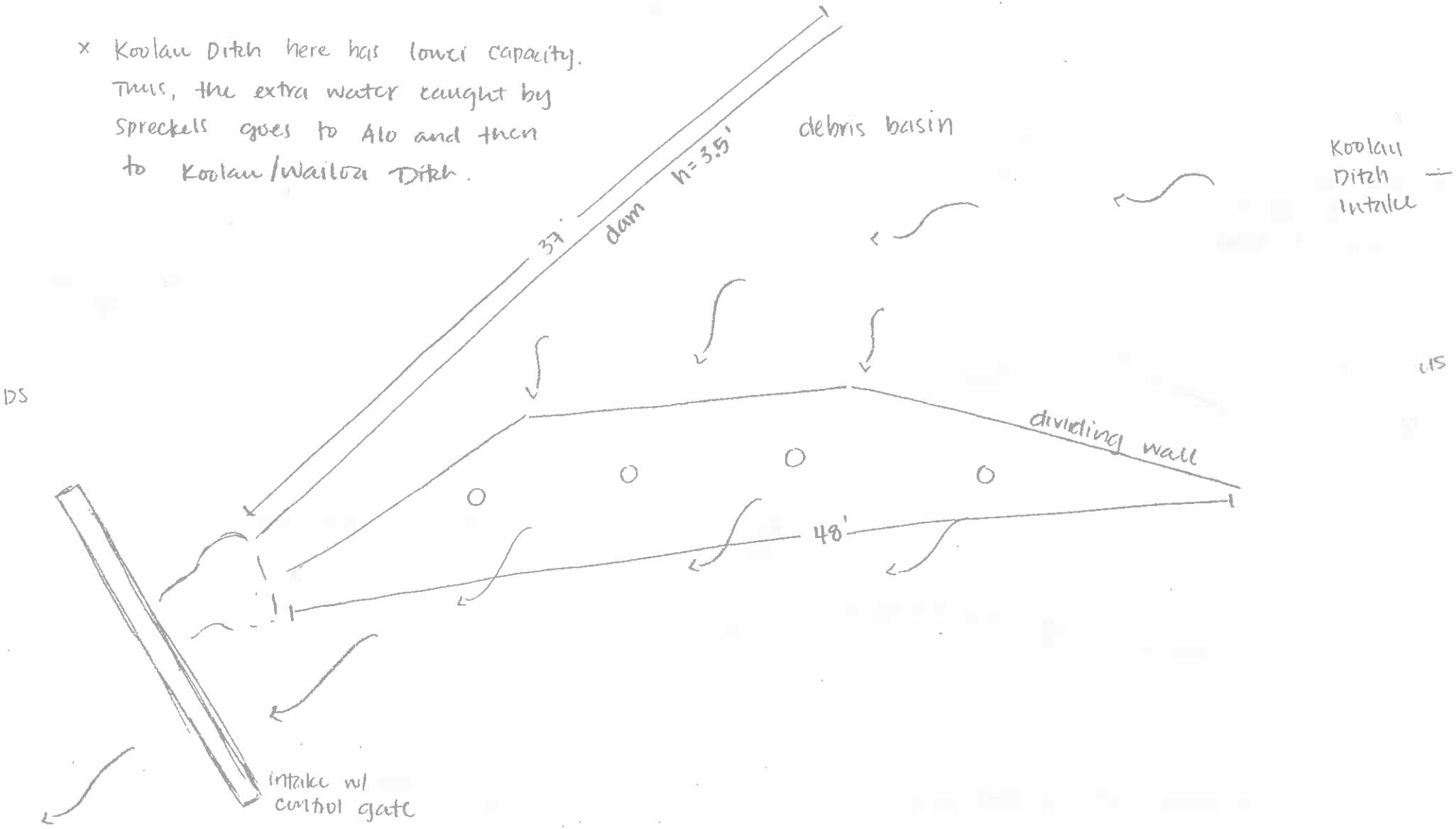
PUOHOKAMOA (Koolau Ditch)



× cable goes to float chamber in Koolau Ditch. when float goes up, control gate shuts and wate flows in stream to the next intake - Spreckels.

PUOHOKAMOA (Spreckels ditch)

× Koolau Ditch here has lower capacity. Thus, the extra water caught by Spreckels goes to Alo and then to Koolau/Wailoa Ditch.



PUNALAU (Manuel Luis Ditch)

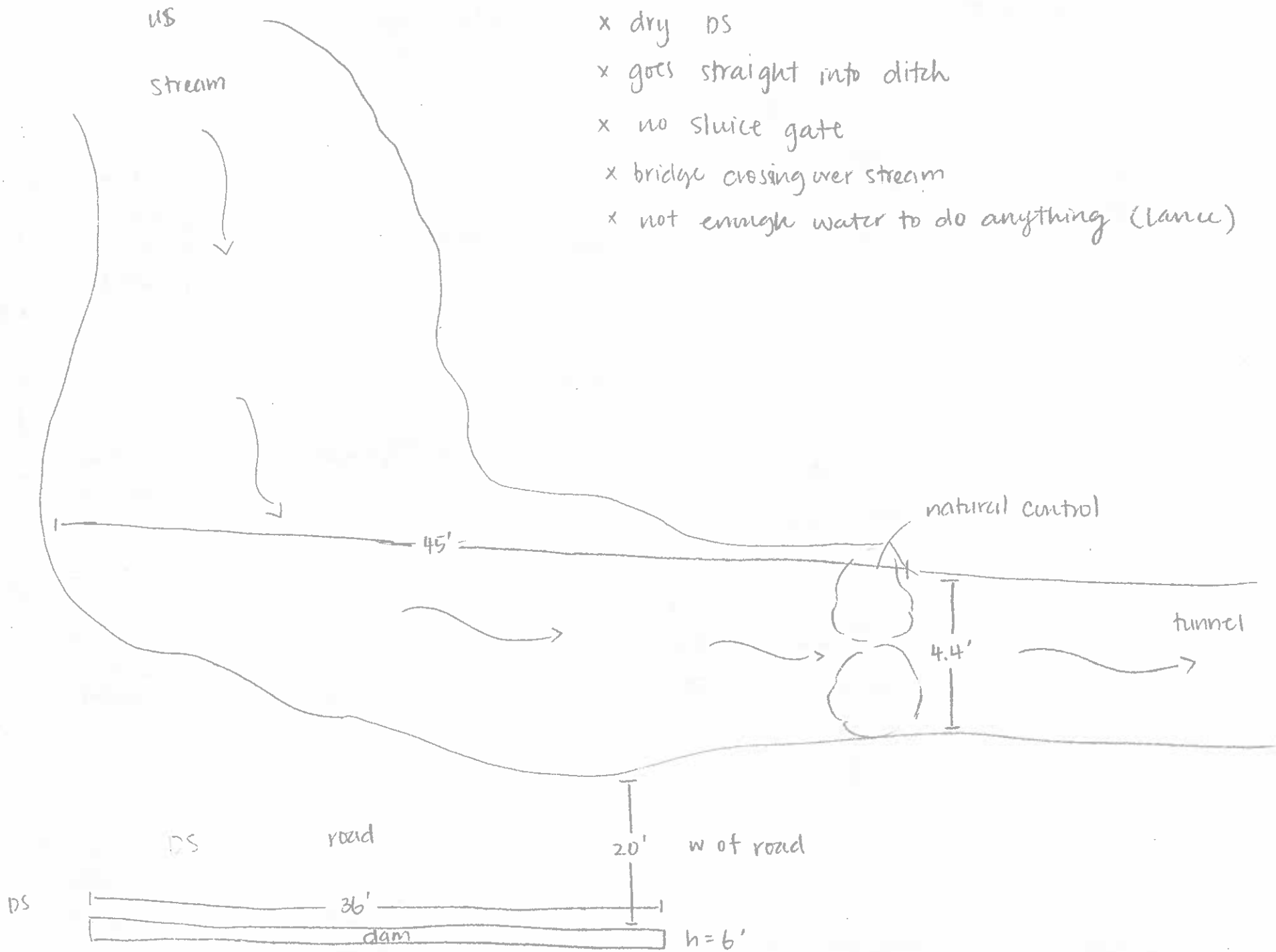
US

x has sluice gate.

x dry DS

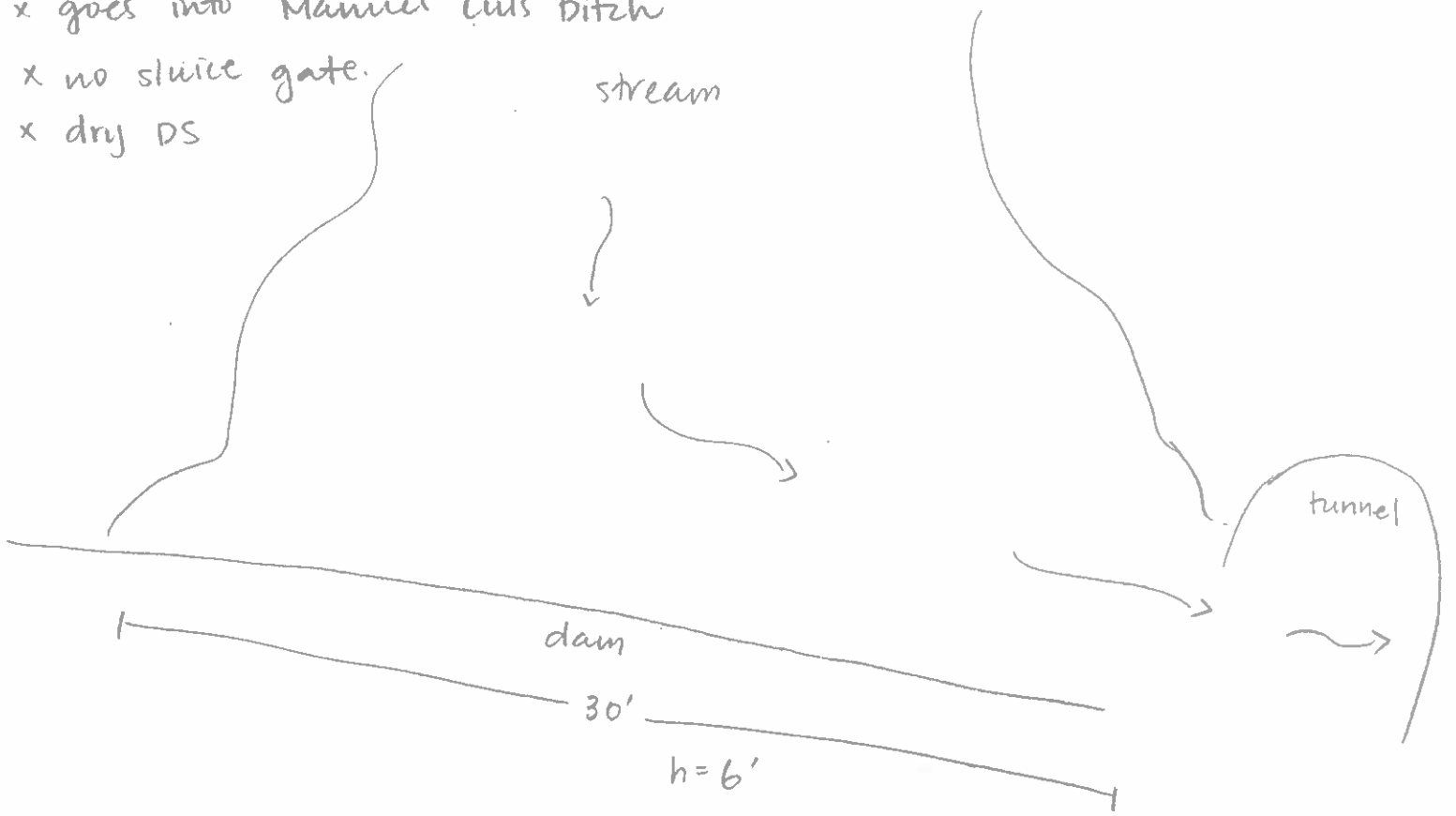
HAIPUAENA (Manuel Luis Ditch)

Diversion ML-2.



PUOHOKAMOA (Manuel Luis Ditch) US

- x water from Haipuaena
- x goes into Manuel Luis Ditch
- x no sluice gate.
- x dry DS

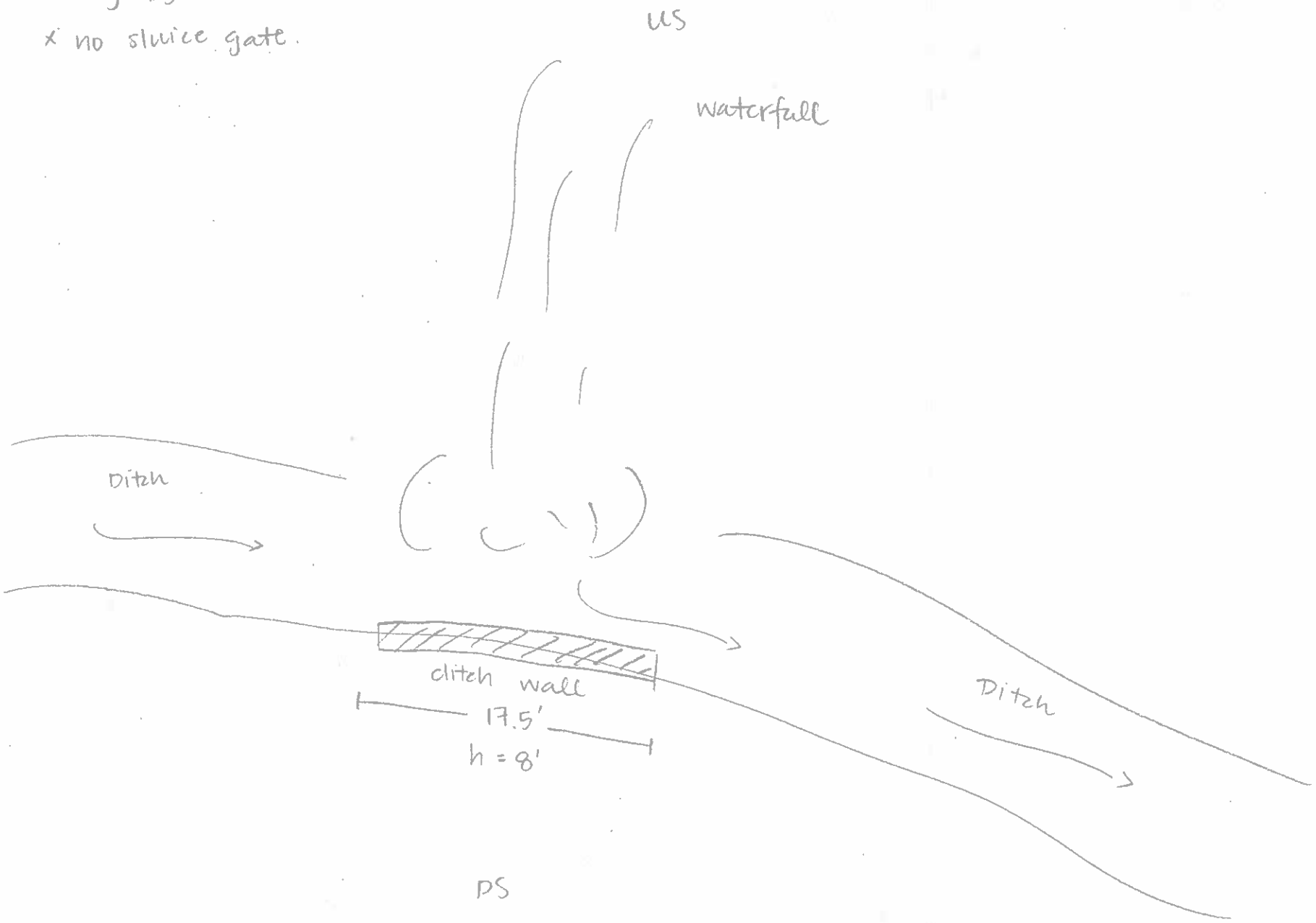


DS

WAHINEPEE (Manuel Luis Ditch)

× dry DS ML-5

× no sluice gate.



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010020401 (East Maui, Diversions)

Date of Field Investigation: February 4, 2010 **Time** (24-hour)**:** 0730 - 1430	
CWRM Staff:	Dean Uyeno, Diane England, and Chui Ling Cheng
Individuals Present:	DAR Staff – Lance Nishiura EMI Staff – Garret Hew, Mark Vaught, Henry Robello
Hydrologic Unit:	East Maui
Stream Name:	Multiple Streams

Findings:

The purpose of this field visit was to document the physical dimensions of and how water flows past the EMI diversion structures in 17 petitioned streams in east Maui. The streams include Alo, Waikamoi, Wahinepee, Puohokamoa, Haipuaena, Punalau/Kolea, Honomanu, Nuaailua, West Wailuaiki, East Wailuaiki, Kopiliula, Waiohue, Paakea, Waiaaka, Kapaula, Hanawi, and Makapipi. Documentation was completed in three days. The following is a list of streams and the respective diversions that staff visited on the third day of the field visit.

1. Waikamoi Stream, C-1 intake into Center Ditch.
   Diversion structure consists of a 80 feet (L) x 6 feet (H) dam. Intake and sluice gate (3.8 x 4.7 feet, W x H) situate on the left stream bank. The dividing wall is 50 feet (L) x 3 feet (H), and has three openings with diameter of 0.6 feet. This section of the Waikamoi Stream is used for conveying water from the Manuel Luis Ditch to the Center Ditch. Downstream from the diversion, Waikamoi Stream was dry but would continue as a waterfall when there is flow.
2. Alo Stream (tributary to Waikamoi), W-1 intake into Wailoa Ditch.
   Diversion structure consists of a 36 feet (L) x 8 feet (H) dam. The intake grate (8 x 10 feet) spans across the stream channel and is about 6.5 feet above the stream. The control gate, gravel basin, and two sluice gates (3 x 3 feet, W x H) are situated on the left stream bank. This section of Alo Stream is used to convey water from Spreckels Ditch to the Wailoa Ditch.
3. Alo Stream (tributary to Waikamoi), NH-1 intake into New Hamakua Ditch.
   Diversion structure consists of a 10 feet tall curved dam, of about 26 feet from the intake to the sluice gate. The dividing wall (43 feet in length) and the intake (5 x 2.2 feet, W x H) are situated on the left stream bank. The sluice gate (3 x 4.4 feet, W x H) is on the right stream bank. During normal flows, much of the water from Alo Stream has already been diverted at the Wailoa Ditch level. Therefore, this stretch of the stream is most often dry. However during high flows, when the Wailoa Ditch is full, the excess water from the Wailoa Ditch and the stream itself is diverted into the New Hamakua Ditch via this intake. Alo Stream was dry downstream from this diversion and would continue as a waterfall if flow was present.
4. Waikamoi Stream, W-2 intake into Wailoa Ditch.
   Diversion structure consists of a 50 feet (L) x 4 feet (H) dam. The dividing wall, about 41 feet in length and 2.1 feet in height, is on the left stream bank. Water flows into two inlets and is transported to the Wailoa Ditch further downstream (by the swinging bridge). A minor diversion is located on the right stream bank. At the Wailoa Ditch by the swinging bridge, the radio gate (with float chamber) controls the water entering the New Hamakua Ditch (via a cross-tunnel) when Wailoa Ditch is full. The two sluice gates are 4 x 4 feet (W x H). Waikamoi Stream was dry downstream from the diversion.
5. Waikamoi Stream, Skimming Dam Intake (S-10 intake) into Spreckels Ditch.
   Diversion structure consists of a 31 feet (L) x 4.7 feet (H) dam. The dividing wall is 41 feet (L) x 1.8 feet (H) and has one opening that is 3 inches wide. The intake (6.8 x 4 feet, W x H) is located on the left stream bank, with no sluice gate. This diversion diverts excess water from Waikamoi to Kolea Stream. The stream was dry downstream from the diversion.
6. Kolea Stream, Kolea Power House Intake (K-32 intake) into Koolau Ditch.
   Diversion structure consists of a 50 feet (L) x 13 feet (H) dam with the intake grate (17 x 28 feet), control gate (9.5 x 1.3 feet, W x H), dividing wall, and gravel basin on the left stream bank. There are two sluice gates on the left stream bank, each 3.6 feet wide x 5 feet high. Kolea Stream was dry downstream from the diversion. The power house was no longer in operation.

Staff concluded the field visit at 1430 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100204003	Diversion structure (C-1 intake into Center Ditch) on the left bank of Waikamoi Stream.
20100204004	Waikamoi Stream downstream from the diversion (C-1 intake).
20100204005	Waikamoi Stream upstream from the diversion (C-1 intake).
20100204006	Dividing wall and C-1 intake into Center Ditch on the left bank of Waikamoi Stream.
20100204007	Sluice gate of the C-1 intake into Center Ditch on the left bank of Waikamoi Stream.
20100204008	Sluice gate of the C-1 intake into Center Ditch on the left bank of Waikamoi Stream.
20100204009	Diversion structure (C-1 intake into Center Ditch) on the left bank of Waikamoi Stream.
20100204010	Waikamoi Stream downstream from the diversion (C-1 intake).
20100204016	W-1 intake into Wailoa Ditch on Alo Stream.
20100204017	Control gate and gravel basin of the diversion (W-1 intake) on the left bank of Alo Stream.
20100204018	Alo Stream upstream from the diversion (W-1 intake).
20100204019	W-1 intake into Wailoa Ditch on Alo Stream. The intake spans across the stream channel.
20100204020	W-1 intake into Wailoa Ditch on Alo Stream. The intake spans across the stream channel.
20100204021	Diversion dam of the W-1 intake into Wailoa Ditch on Alo Stream.
20100204022	Sluice gates of the diversion structure (W-1 intake) on the left bank of Alo Stream.
20100204023	Diversion structure (W-1 intake) on Alo Stream.
20100204024	Diversion structure (W-1 intake) on Alo Stream.
20100204025	Alo Stream upstream from diversion (W-1 intake).
20100204026	Diversion structure (NH-1 intake into New Hamakua Ditch) on Alo Stream.
20100204027	Diversion dam of the NH-1 intake into New Hamakua Ditch on Alo Stream.
20100204028	Dividing wall, gravel basin, and intake of the diversion (NH-1 intake) on the left bank of Alo Stream.
20100204029	Alo Stream downstream from the NH-1 intake into New Hamakua Ditch.
20100204031	Diversion structure (NH-1 intake into New Hamakua Ditch) on Alo Stream.
20100204032	Dividing wall and intake of the diversion (NH-1 intake) on the left bank of Alo Stream.
20100204033	Alo Stream downstream from the NH-1 intake into New Hamakua Ditch.
20100204034	Swinging bridge on the way to the W-2 intake into Wailoa Ditch on Waikamoi Stream.
20100204036	Waikamoi Stream upstream from the W-2 intake into Wailoa Ditch.
20100204037	Gravel basin, dividing wall, and W-2 intake into Wailoa Ditch on the left bank of Waikamoi Stream.
20100204038	Diversion dam and downstream view of Waikamoi Stream at the W-2 intake diversion structure.
20100204040	W-2 intake into Wailoa Ditch on the left bank of Waikamoi Stream.
20100204042	W-2 intake into Wailoa Ditch on the left bank of Waikamoi Stream.
20100204043	Waikamoi Stream downstream from the sluice gates of the W-2 intake diversion structure.
20100204044	Radio control gate of the W-2 intake diversion structure on Waikamoi Stream.
20100204045	Waikamoi skimming dam of the S-10 intake into Spreckels Ditch on Waikamoi Stream.
20100204046	S-10 intake into Spreckels Ditch on the left bank of Waikamoi Stream.
20100204047	Waikamoi Stream upstream from the S-10 intake into Spreckels Ditch.
20100204048	Waikamoi Stream downstream from the S-10 intake into Spreckels Ditch.
20100204049	Waterfall on Waikamoi Stream upstream from the S-10 intake into Spreckels Ditch.
20100204050	Waikamoi skimming dam, dividing wall, and gravel basin of the S-10 intake into Spreckels Ditch on Waikamoi Stream.
20100204054	Diversion structure (K-32 intake into Koolau Ditch) on the left bank of Kolea Stream.
20100204055	Diversion dam of the K-32 intake into Koolau Ditch of Kolea Stream.
20100204056	K-32 intake into Koolau Ditch of Kolea Stream.
20100204057	K-32 intake into Koolau Ditch of Kolea Stream.
20100204059	Sluice gate of the K-32 diversion intake into Koolau Ditch of Kolea Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet
2. Diversion Sketches

Recommendations:

IMAGE CONTACT SHEET

20100204003.jpg

20100204004.jpg

20100204005.jpg

20100204006.jpg

20100204007.jpg

20100204008.jpg

20100204009.jpg

20100204010.jpg

20100204016.jpg

20100204017.jpg

20100204018.jpg

20100204019.jpg

IMAGE CONTACT SHEET

20100204020.jpg

20100204021.jpg

20100204022.jpg

20100204023.jpg

20100204024.jpg

20100204025.jpg

20100204026.jpg

20100204027.jpg

20100204028.jpg

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20100204031.jpg

20100204032.jpg

IMAGE CONTACT SHEET

20100204033.jpg

20100204034.jpg

20100204036.jpg

20100204037.jpg

20100204038.jpg

20100204040.jpg

20100204042.jpg

20100204043.jpg

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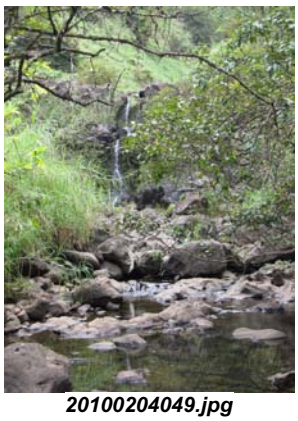
20100204045.jpg

20100204046.jpg

20100204047.jpg

IMAGE CONTACT SHEET

20100204048.jpg



20100204049.jpg

20100204050.jpg

20100204054.jpg

20100204055.jpg

20100204056.jpg

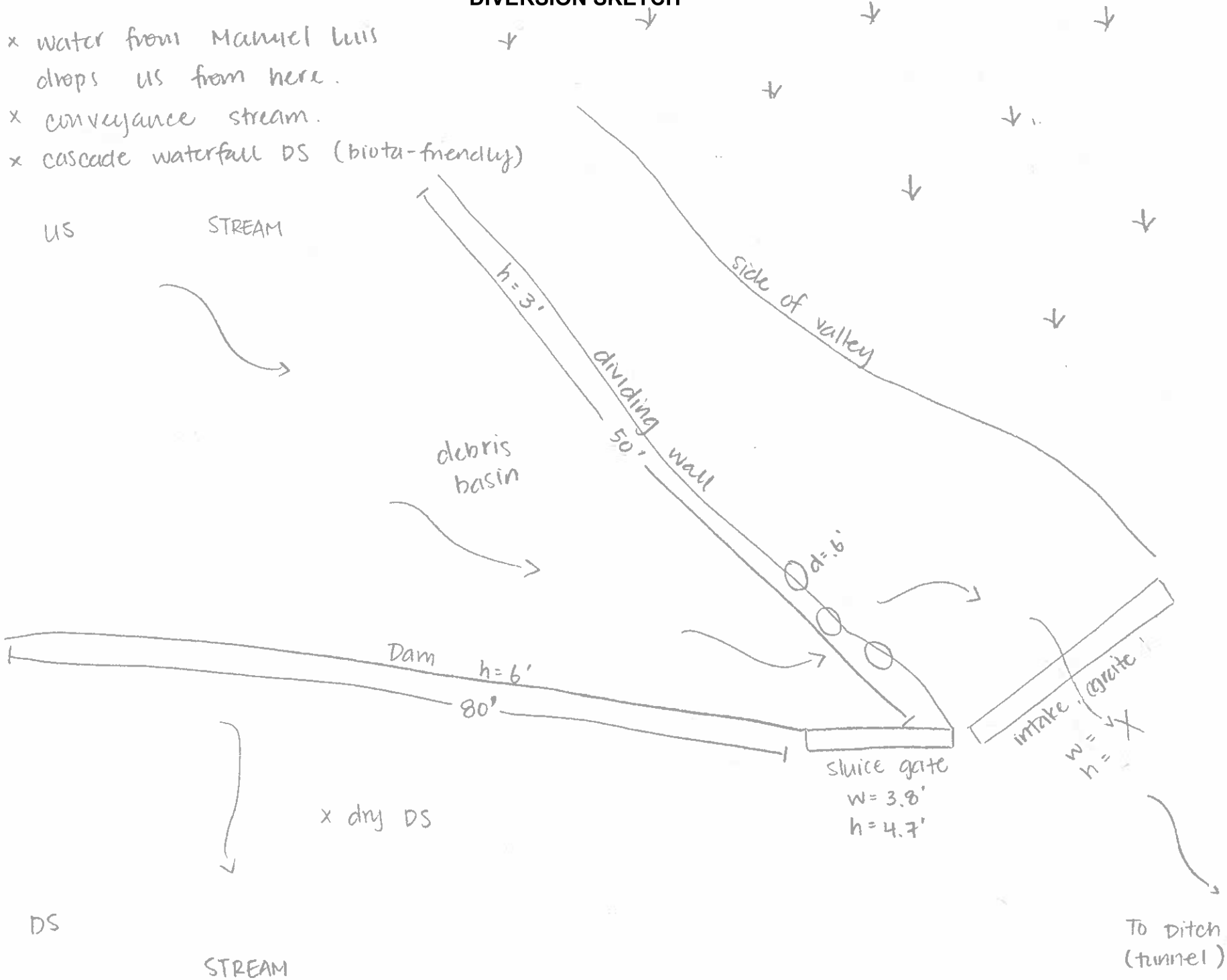
20100204057.jpg

20100204059.JPG

WAIKAMOI (C-1, Center Ditch)

DIVERSION SKETCH

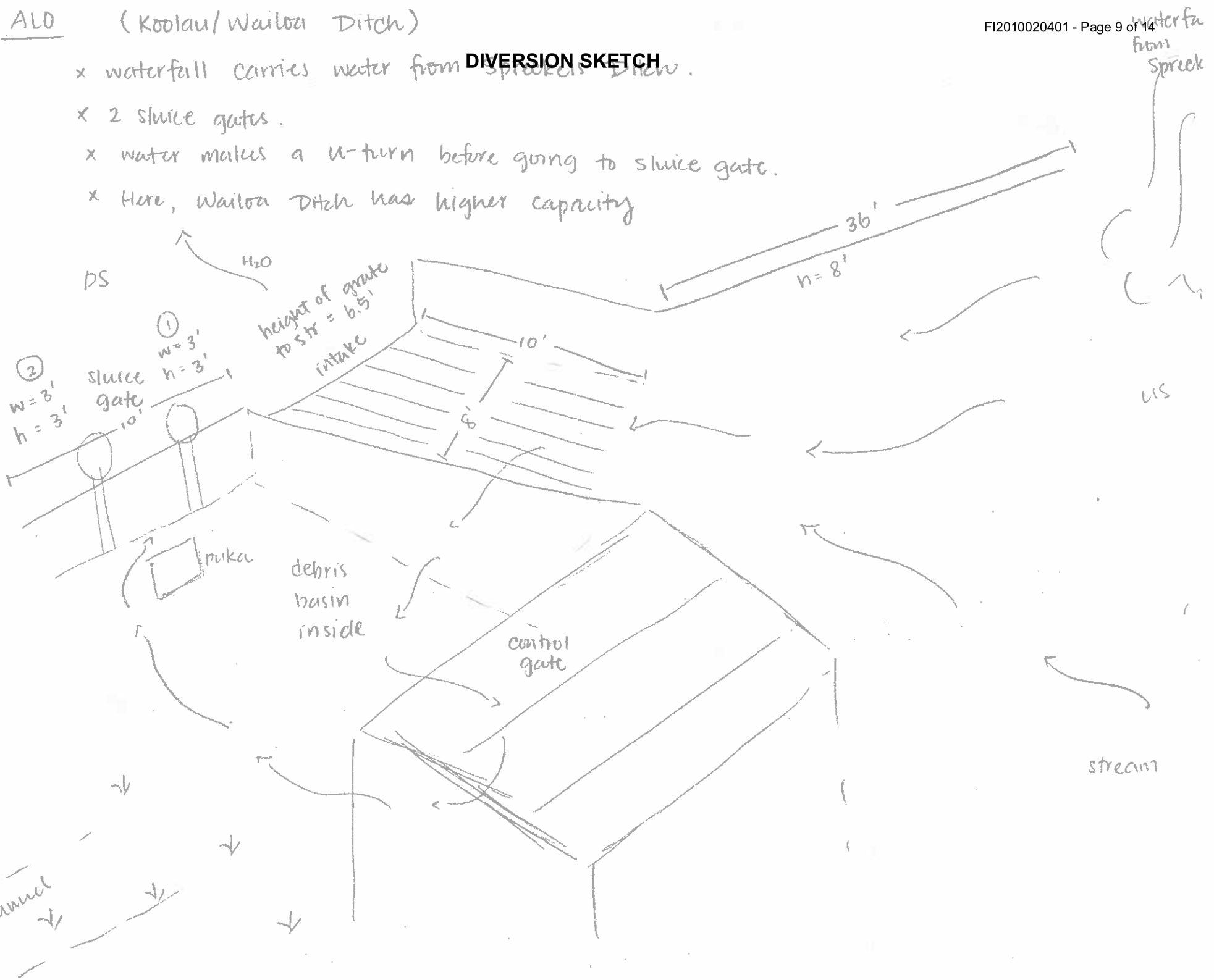
- × water from Manuel Luis drops us from here.
- × conveyance stream.
- × cascade waterfall DS (biota-friendly)



ALO (Koolau/Wailoa Ditch)

DIVERSION SKETCH

- x waterfall carries water from Spreckels Ditch.
- x 2 sluice gates.
- x water makes a u-turn before going to sluice gate.
- x Here, Wailoa Ditch has higher capacity



ALO (New Hamakua Ditch)
NH-1

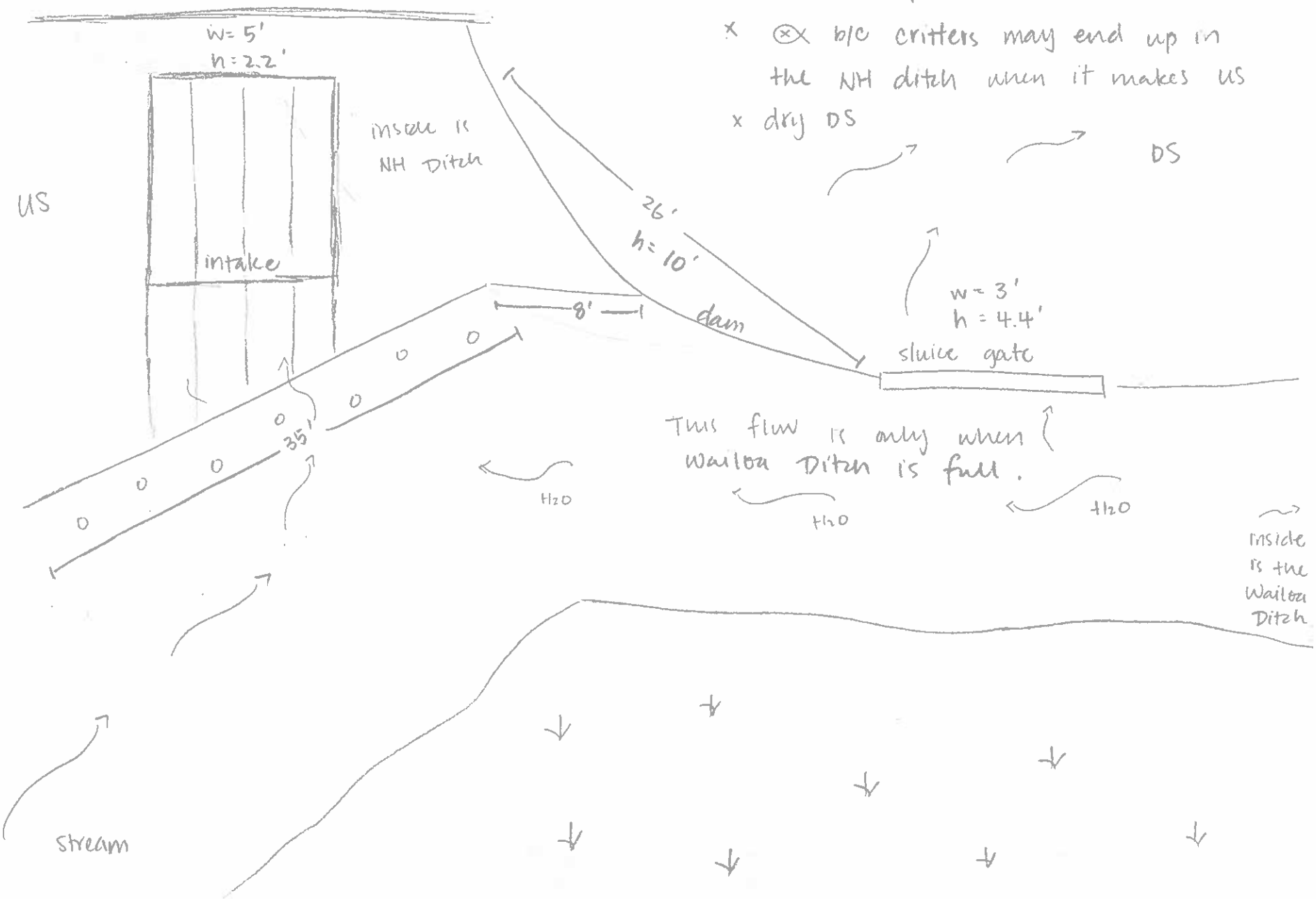
DIVERSION SKETCH

x If needed, water flows into the NH from Koolau / Wailoa Ditch.

x 100 ft waterfall DS.

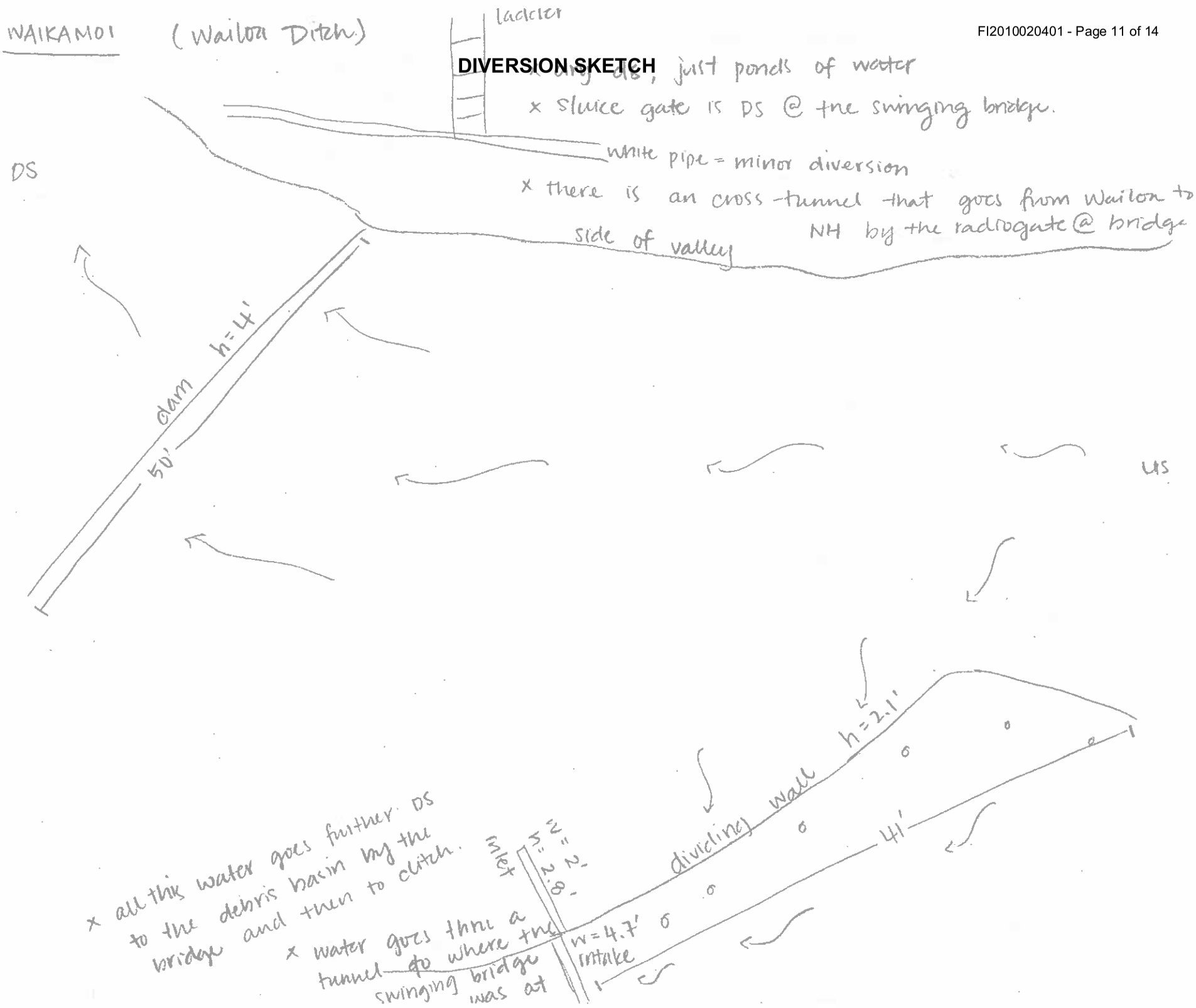
x ⊗x b/c critters may end up in the NH ditch when it makes us

x dry DS



WAIKAMOI (Wailoa Ditch)

DIVERSION SKETCH



× sluice gate is DS @ the swinging bridge.

white pipe = minor diversion

× there is an cross-tunnel that goes from Wailoa to NH by the radiogate @ bridge.

× all this water goes further DS to the debris basin by the bridge and then to clitch.

× water goes thru a tunnel to where the swinging bridge was at

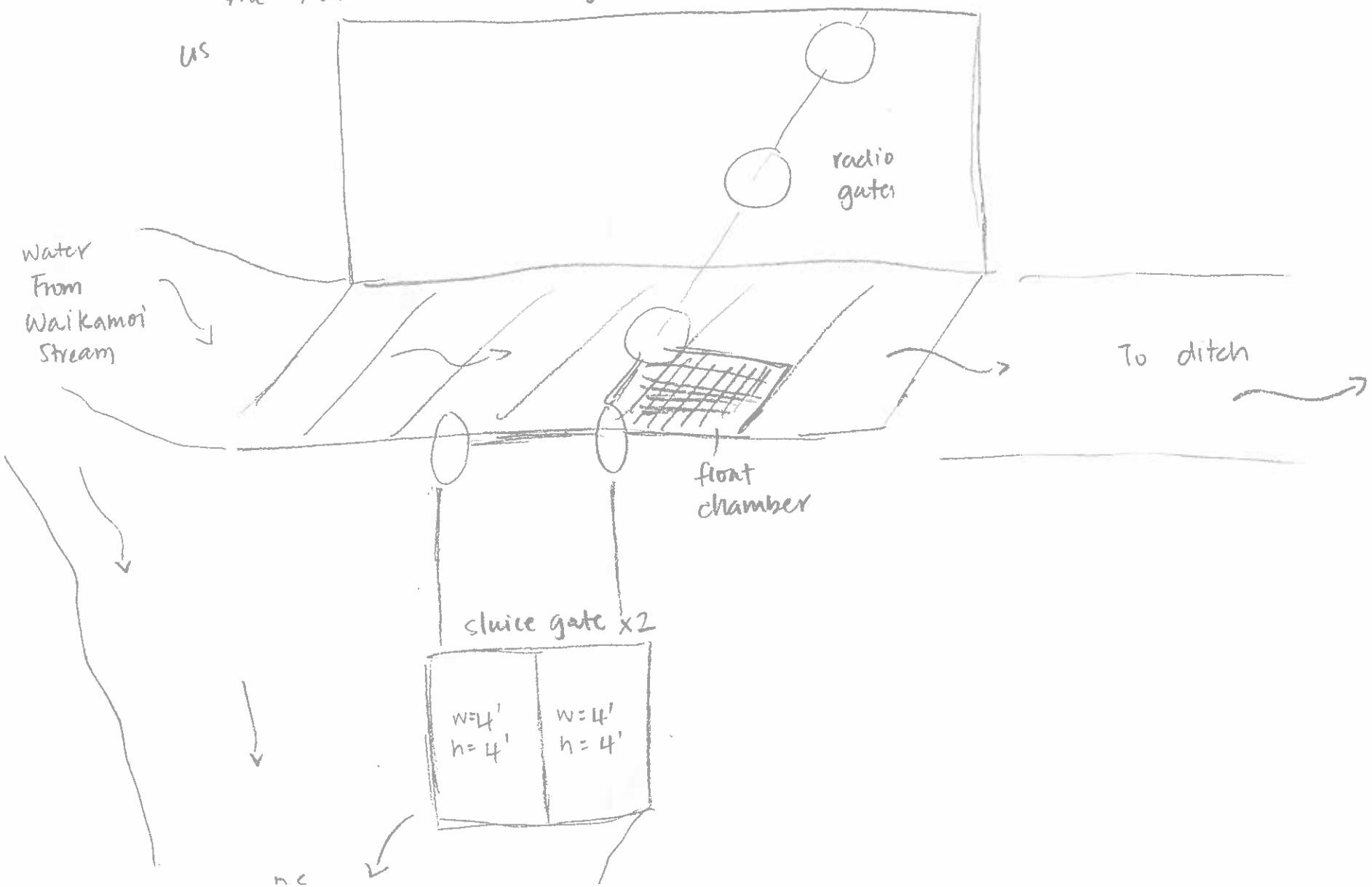
WAIKAMOI (Waiolu Ditch Continued)

DIVERSION SKETCH

× this is the sluice gate further DS.

× also where the water goes into the ditch.

× ⊗× biota goes into the ditch; however, can make upstr if the section between the intake & sluice gate have water.



WAIKAMOI (Spreckles Ditch) AKA: Waikamoi skimming dam

DIVERSION SKETCH

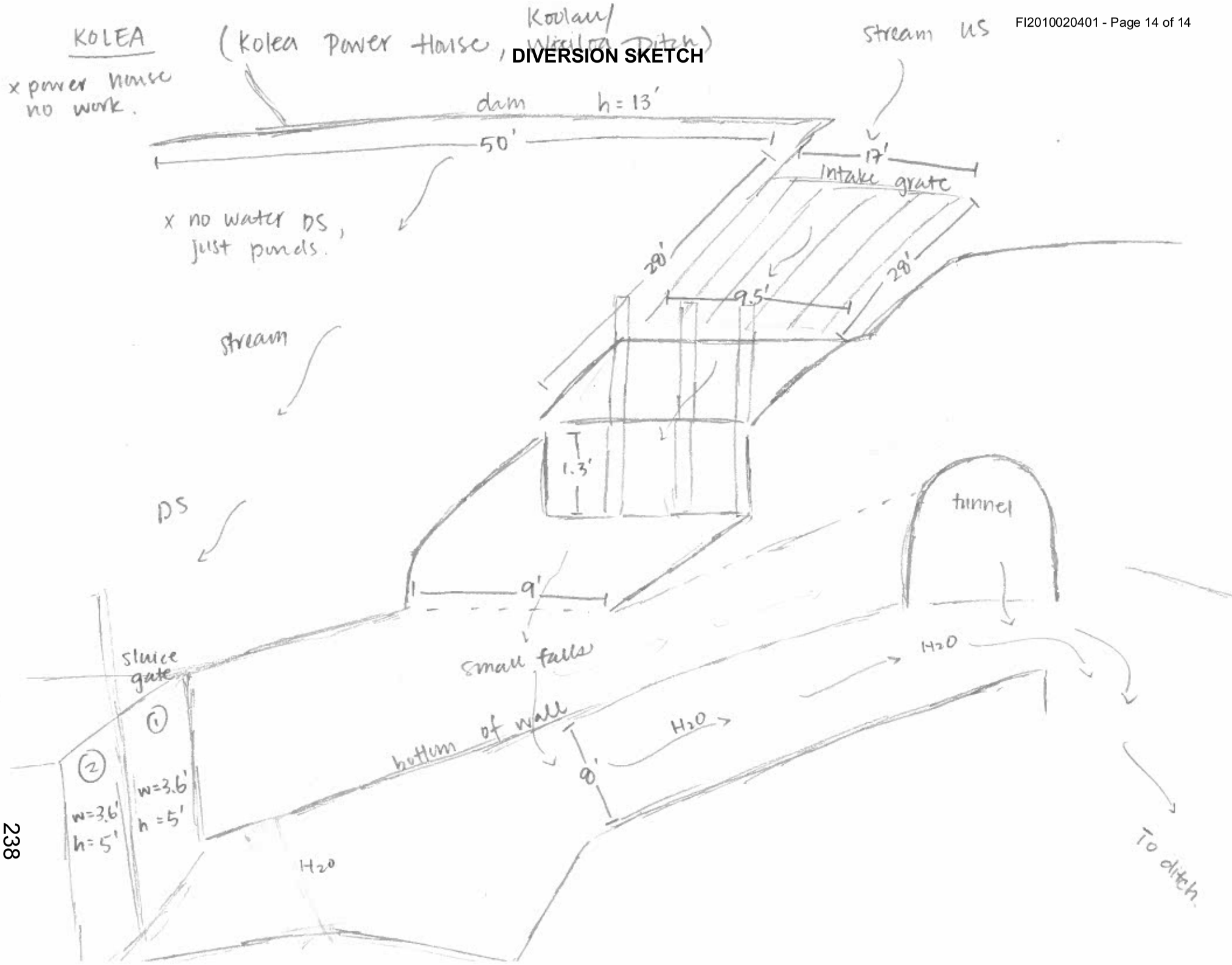
x diverts excess water to Kotea Stream

x no sluice gate.

x dry DS

x no waterfall DS

DIVERSION SKETCH



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010062301 (East Maui)

Date of Field Investigation: June 23, 2010 **Time** (24-hour)**:** 0600 - 1100	
CWRM Staff:	Ken Kawahara, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	DAR Staff – Robert Nishimoto, Glenn Higashi USGS Staff - Clarence (Buzz) Edwards, Richard Castro EMI Staff – Garret Hew, Mark Vaught, Henry Robello
Hydrologic Unit:	Honopou
Stream Name:	Honopou Stream

Findings:

Staff arrived in Maui at 0600 hours.

The purpose of this field investigation was to visit the diversion modification at New Hamakua Ditch on Honopou Stream, and to document flow release at the Wailoa Ditch on Honopou Stream. At 0730 hours, staff met with EMI staff and the Honopou residents at the Haiku Ditch on Honopou Stream. From there, everyone drove to the Lowrie Ditch for a pre-release flow measurement. USGS staff selected a measurement cross section upstream from the Lowrie Ditch intake on Honopou Stream. Flow measurement was completed in 20 minutes. The estimated discharge was 0.45 cubic feet per second (0.29 million gallons per day).

At 0930 hours, staff arrived at the New Hamakua Ditch on Honopou Stream. The EMI staff had modified this diversion the previous week in an effort to allow water to flow downstream first before going into the ditch. Refer to the Image Contact Sheet for pictures of the diversion modification. At 0955 hours, streamflow was released from the sluice gate at the Wailoa Ditch diversion on Honopou Stream. By 1053 hours, streamflow reached the diversion dam of the New Hamakua Ditch on Honopou Stream. Staff departed Honopou Stream at 1130 hours.

* Note: Post-release flow measurement was conducted the following day.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100623002	USGS staff conducting pre-release flow measurement upstream from the Lowrie Ditch intake on Honopou Stream.
20100623004	USGS staff conducting pre-release flow measurement upstream from the Lowrie Ditch intake on Honopou Stream.
20100623008	Measurement cross section for the pre-release flow measurement upstream from the Lowrie Ditch intake on Honopou Stream.
20100623014	Modification of the New Hamakua Ditch intake on Honopou Stream.
20100623015	Pond downstream from the New Hamakua Ditch intake on Honopou Stream.
20100623016	Modification of the New Hamakua Ditch intake on Honopou Stream.
20100623018	Modification of the New Hamakua Ditch intake on Honopou Stream.
20100623022	Honopou Stream downstream from the Wailoa Ditch intake.
20100623024	Wailoa Ditch intake on Honopou Stream.
20100623025	Honopou Stream upstream from the New Hamakua Ditch intake.
20100623026	EMI staff opening the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623029	EMI staff opening the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623030	Flow release from the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623031	Flow release from the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623032	Flow release from the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623035	The community witnessed the flow release from the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623037	Flow release from the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623038	Flow release from the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623040	CWRM staff taking measurements of the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623041	CWRM staff taking measurements of the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623042	CWRM staff taking measurements of the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623044	CWRM staff taking measurements of the sluice gate at the Wailoa Ditch diversion on Honopou Stream.

20100623046	Behind the sluice gate at the Wailoa Ditch diversion on Honopou Stream.
20100623051	Flow reaching the diversion dam of the New Hamakua Ditch intake on Honopou Stream.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Summary

Recommendations:

Image Contact Sheet

20100623002.jpg

20100623004.jpg

20100623008.jpg

20100623014.jpg

20100623015.jpg

20100623016.jpg

20100623018.jpg

20100623022.jpg

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20100623029.jpg

Image Contact Sheet

20100623030.jpg

20100623031.jpg

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20100623051.jpg

AquaCalc Pro Discharge Summary

(●) Original AquaCalc Values ( ) Re-Calculated Values

Gage ID: **LOWRIE** User ID: **RICH** Beg Time: **06/23/10 08:27**

Discharge Summary		Measurement Information				Meter Information	
Vertical Count:	15	End Time:	06/23/10 08:47	Measure time:	40	Meter name:	BUZZMAG
Section Velocity:	0.49	Meas Time:	0.33	Measure standard:	SAE	Meter id:	P05410
Section Width:	2.85	Section Diff:	0.45	Measure equipment:	TopSet Rod	Meter type:	PYGMY
Section Area:	0.92	Beg Gage height:	0.00	Sounding Weight:	NA	Meter Standard:	SAE
Section Q:	0.45	End Gage height:	0.00	Measure ice:	No	Meter Revs/Pulses:	1/1
Section Diff:	0.45	Beg Staff height:	0.00	Flood Measurement:	No	Meter Const.S1:	0.9604
Section Pct Err:	0.00%	End Staff height:	0.00	Flood Coef:	0.00	Meter Const.O1:	0.0312
Section Quality:	na	Estimated Q:	0.00	Max Vertical Q:	5%	Meter Const.C1:	0.0000
Section WetPerim:	3.15	Adjusted Q:	0.00	Percent Slope:	0.00	Meter Const.S2:	0.0000
Section Hyd Rad:	0.29	**AquaCalc**		Measure Start at:	LEW	Meter Const.O2:	0.0000
Section Manning:	0.000	S/N:	000000F2952F			Meter Const.C1:	0.0000
Section Chezy:	0.000	Firmware Version:	AQP-1V1.2.1			Meter Const.S3:	0.0000
		File Version:	V1.5			Meter Const.O3:	0.0000

Vertical Number	Distance	Total Depth	Ice Draft	Effective Depth	Observation Location	Time	Revolutions	Horiz Angle	HC:VF	Method Coef	Clock Tme	Measured Velocity	Obs Velocity	Vertical Velocity	Sub-section Area	Sub-Section Q	Sub-Section % of Total Q
1	0.40	0.00	0.00	0.00	E	0.00	0	0	0.00	0.00	08:27			0.00	0.00	0.00	0.00%
2	0.60	0.20	0.00	0.20	0.6	41.49	5	0	1.00	1.00	08:29	0.15	0.15	0.15	0.04	0.01	2.20%
3	0.80	0.25	0.00	0.25	0.6	41.54	13	0	1.00	1.00	08:30	0.33	0.33	0.33	0.05	0.02	4.40%
4	1.00	0.25	0.00	0.25	0.6	41.61	18	0	1.00	1.00	08:32	0.45	0.45	0.45	0.05	0.02	4.40%
5	1.20	0.30	0.00	0.30	0.6	41.21	13	0	1.00	1.00	08:33	0.33	0.33	0.33	0.06	0.02	4.40%
6	1.40	0.42	0.00	0.42	0.6	41.08	17	0	1.00	1.00	08:34	0.43	0.43	0.43	0.08	0.04	8.90%
7	1.60	0.45	0.00	0.45	0.6	40.92	34	0	1.00	1.00	08:35	0.83	0.83	0.83	0.09	0.07	15.60%
8	1.80	0.43	0.00	0.43	0.6	40.01	46	0	1.00	1.00	08:36	1.14	1.14	1.14	0.09	0.10	22.20%
9	2.00	0.40	0.00	0.40	0.6	41.43	32	0	1.00	1.00	08:37	0.77	0.77	0.77	0.08	0.06	13.30%
10	2.20	0.38	0.00	0.38	0.6	45.89	11	0	1.00	1.00	08:41	0.26	0.26	0.26	0.08	0.02	4.40%
11	2.40	0.40	0.00	0.40	0.6	41.00	16	0	1.00	1.00	08:43	0.41	0.41	0.41	0.08	0.03	6.70%
12	2.60	0.40	0.00	0.40	0.6	45.41	7	0	1.00	1.00	08:44	0.18	0.18	0.18	0.08	0.01	2.20%
13	2.80	0.40	0.00	0.40	0.6	42.25	13	0	1.00	1.00	08:45	0.33	0.33	0.33	0.08	0.03	6.70%
14	3.00	0.30	0.00	0.30	0.6	41.19	9	0	1.00	1.00	08:47	0.24	0.24	0.24	0.07	0.02	4.40%
15	3.25	0.00	0.00	0.00		0.00	0	0	0.00	0.00	08:47			0.00	0.00	0.00	0.00%

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010062302 (East Maui)

Date of Field Investigation: June 23, 2010	**Time** (24-hour)**:** 1130 - 1630
CWRM Staff:	Ken Kawahara, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	DAR Staff – Robert Nishimoto, Glenn Higashi USGS Staff - Clarence (Buzz) Edwards, Richard Castro EMI Staff – Garret Hew, Mark Vaught, Henry Robello
Hydrologic Unit:	Multiple
Stream Name:	West Wailuaiki, East Wailuaiki, and Waikamoi Streams

Findings:

The purpose of this field investigation was to show DAR staff the diversions that need to be modified according to the May Commission decision on implementing interim IFS for 6 east Maui streams: Waikamoi, West Waikuaiki, East Waikuaiki, Waiohue, Hanawi, and Makapipi streams. For this field investigation, staff visited the following sites:

1. Koolau Ditch intake on West Wailuaiki Stream
2. Koolau Ditch intake on East Wailuaiki Stream
3. Center Ditch intake on Waikamoi Stream

After seeing some of the diversions, DAR proposed a few solutions for meeting seasonal flow requirements. In the wet season, EMI will likely open sluice gates to meet the interim IFS. In the dry season, EMI could install pipes that would convey water from an upstream location and drop water onto the dam wall to create a wetted pathway allowing for the upstream migration of native fauna. DAR would field test this method to confirm its feasibility.

Staff concluded the field investigation at 1630 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

Recommendations:

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010062401 (East Maui, Makapipi)

Date of Field Investigation: June 24, 2010	**Time** (24-hour)**:** 0830 - 1000
CWRM Staff:	Ken Kawahara, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	DAR Staff – Robert Nishimoto, Glenn Higashi USGS Staff - Clarence (Buzz) Edwards, Richard Castro EMI Staff – Garret Hew, Mark Vaught, Henry Robello
Hydrologic Unit:	Makapipi
Stream Name:	Makapipi Stream

Findings:

The purpose of this field visit was to accompany USGS staff in selecting potential sites for monitoring interim IFS on Makapipi Stream. In a previous site visit, USGS staff selected a site about 100 feet upstream from Hana Highway as the interim IFS location. During this field visit, USGS staff selected a second location for the installation of a second staff gage for the purpose of providing the Nahiku residents a way to monitor the flow in the stream. The second staff gage would be located by the bridge on Lower Nahiku Road.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100624001	Makapipi Stream upstream from the bridge on Lower Nahiku Road.
20100624002	Makapipi Stream at the bridge on Lower Nahiku Road.
20100624008	Potential site for the second staff gage on Makapipi Stream immediately downstream from the bridge on Lower Nahiku Road.
20100624011	Very flow in Makapipi Stream downstream from the bridge on Lower Nahiku Road.
20100624013	Potential site for the second staff gage on Makapipi Stream viewed from the bridge on Lower Nahiku Road.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

Image Contact Sheet

20100624001.jpg

20100624002.jpg

20100624008.jpg

20100624011.jpg

20100624013.jpg

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010062402 (East Maui)

Date of Field Investigation: June 24, 2010 **Time** (24-hour)**:** 1000 - 1300	
CWRM Staff:	Ken Kawahara, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	DAR Staff – Robert Nishimoto, Glenn Higashi USGS Staff - Clarence (Buzz) Edwards, Richard Castro EMI Staff – Garret Hew, Mark Vaught, Henry Robello
Hydrologic Unit:	Hanawi, Waiohue
Stream Name:	Hanawi and Waiohue Streams

Findings:

The purpose of this field investigation was 1) to show DAR staff the diversions that need to be modified according to the May Commission decision on implementing interim IFS for 6 east Maui streams - Waikamoi, West Waikuaiki, East Waikuaiki, Waiohue, Hanawi, and Makapipi streams; and 2) to accompany USGS staff in selecting potential sites for monitoring interim IFS.

At 1000 hours, staff arrived at the Koolau Ditch diversion intake on Hanawi Stream. DAR staff inspected the diversion and proposed that EMI could use the existing pipes for the minor diversion and drop water onto the dam wall to create a wetted pathway allowing for the upstream migration of native fauna. DAR would field test this method to determine its feasibility.

At 1200 hours, staff arrived at Pua Kaa State Park and walked to Waiohue Stream for the purpose of selecting a site for monitoring interim IFS established at the May Commission meeting. USGS staff selected a site beneath Hana Highway on the right stream bank for installation of a staff gage.

At 1230 hours, staff left Pua Kaa State Park and headed for the Koolau Ditch diversion intake on Waiohue Stream. DAR staff inspected the diversion and proposed that in the wet season, EMI could open sluice gates to meet the interim IFS. In the dry season, EMI could install pipes that would convey water from an upstream location and drop water onto the dam wall to create a wetted pathway allowing for the upstream migration of native fauna. DAR would field test this method to determine its feasibility.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100624016	Minor diversion intake at the tributary of Hanawi Stream.
20100624019	Minor diversion intake from a tributary of Hanawi Stream dropped into the Koolau Ditch by the major diversion.
20100624020	Minor diversion intake from a tributary of Hanawi Stream dropped into the Koolau Ditch by the major diversion.
20100624022	Hanawi Stream upstream from the Koolau Ditch intake.
20100624028	Potential site for installation of a staff gage on Waiohue Stream, beneath Hana Highway.
20100624033	Waiohue Stream upstream from Hana Highway.
20100624034	Waterfall on Waiohue Stream upstream from the Koolau Ditch intake.
20100624036	Koolau Ditch intake diversion dam on Waiohue Stream.
20100624037	Koolau Ditch intake on Waiohue Stream.
20100624040	Waiohue Stream downstream from the Koolau Ditch intake.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:
Brief Description:
1. Image Contact Sheet

Recommendations:

Image Contact Sheet

20100624016.jpg

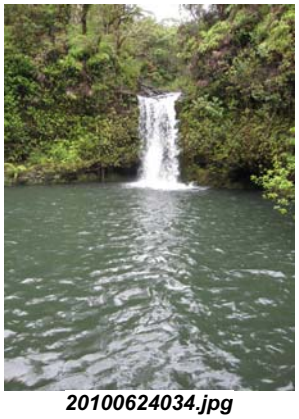
20100624019.jpg

20100624020.jpg

20100624022.jpg

20100624028.jpg

20100624033.jpg



20100624034.jpg

20100624036.jpg

20100624037.jpg

20100624040.jpg

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COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010062303 (East Maui, Honopou)

Date of Field Investigation: June 24, 2010	**Time** (24-hour)**:** 1500 - 1600
CWRM Staff:	Ken Kawahara, Dean Uyeno, and Chui Ling Cheng
Individuals Present:	DAR Staff – Glenn Higashi USGS Staff - Clarence (Buzz) Edwards, Richard Castro EMI Staff – Garret Hew, Henry Robello
Hydrologic Unit:	Honopou
Stream Name:	Honopou Stream

Findings:

The purpose of this field investigation was to conduct a flow measurement following yesterday's release on Honopou Stream. Prior to the release, discharge on Honopou Stream upstream from the Lowrie Ditch intake was 0.45 cubic feet per second (0.29 million gallons per day).

At 1600 hours, staff arrived at Honopou Stream upstream from the Lowrie Ditch intake to conduct a post-release discharge measurement. USGS staff measured the flow at the same cross section that was used for the pre-release measurement. The post-release measurement was 2.03 cubic feet per second (1.31 million gallons per day), almost five times the pre-release flow measurement. This increase in flow can be attributed to the flow release at Wailoa Ditch and rainfall that occurred the previous night.

Staff concluded the field investigation at 1600 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100624056	USGS staff conducting flow measurement on Honopou Stream upstream from Lowrie Ditch intake.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:

Attachments:

Brief Description:

1. Image Contact Sheet
2. Discharge Summary

Recommendations:

Image Contact Sheet

20100624056.jpg

AquaCalc Pro Discharge Summary

◉ Original AquaCalc Values ○ Re-Calculated Values

Gage ID: **LOWRIE** User ID: **RICH** Beg Time: **06/24/10 15:06**

Discharge Summary		Measurement Information				Meter Information	
Vertical Count:	15	End Time:	06/24/10 15:21	Measure time:	40	Meter name:	BUZZMAG
Section Velocity:	1.33	Meas Time:	0.25	Measure standard:	SAE	Meter id:	P05410
Section Width:	2.90	Section Diff:	2.03	Measure equipment:	TopSet Rod	Meter type:	PYGMY
Section Area:	1.53	Beg Gage height:	0.00	Sounding Weight:	NA	Meter Standard:	SAE
Section Q:	2.03	End Gage height:	0.00	Measure ice:	No	Meter Revs/Pulses:	1/1
Section Diff:	2.03	Beg Staff height:	0.00	Flood Measurement:	No	Meter Const.S1:	0.9604
Section Pct Err:	0.00%	End Staff height:	0.00	Flood Coef:	0.00	Meter Const.O1:	0.0312
Section Quality:	na	Estimated Q:	0.00	Max Vertical Q:	5%	Meter Const.C1:	0.0000
Section WetPerim:	3.59	Adjusted Q:	0.00	Percent Slope:	0.00	Meter Const.S2:	0.0000
Section Hyd Rad:	0.43	**AquaCalc**		Measure Start at:	LEW	Meter Const.O2:	0.0000
Section Manning:	0.000	S/N:	000000F2952F			Meter Const.C1:	0.0000
Section Chezy:	0.000	Firmware Version:	AQP-1V1.2.1			Meter Const.S3:	0.0000
		File Version:	V1.5			Meter Const.O3:	0.0000

Vertical Number	Distance	Total Depth	Ice Draft	Effective Depth	Observation Location	Time	Revolutions	Horiz Angle	HC:VF	Method Coef	Clock Tme	Measured Velocity	Obs Velocity	Vertical Velocity	Sub-section Area	Sub-Section Q	Sub-Section % of Total Q
1	0.40	0.00	0.00	0.00	E	0.00	0	0	0.00	0.00	15:06			0.00	0.00	0.00	0.00%
2	0.60	0.40	0.00	0.40	0.6	40.25	69	0	1.00	1.00	15:07	1.68	1.68	1.68	0.08	0.13	6.40%
3	0.80	0.40	0.00	0.40	0.6	40.02	68	0	1.00	1.00	15:08	1.66	1.66	1.66	0.08	0.13	6.40%
4	1.00	0.45	0.00	0.45	0.6	40.04	76	0	1.00	1.00	15:09	1.85	1.85	1.85	0.09	0.17	8.40%
5	1.20	0.50	0.00	0.50	0.6	40.59	73	0	1.00	1.00	15:10	1.76	1.76	1.76	0.10	0.18	8.90%
6	1.40	0.63	0.00	0.63	0.6	40.42	41	0	1.00	1.00	15:11	1.01	1.01	1.01	0.13	0.13	6.40%
7	1.60	0.65	0.00	0.65	0.6	40.01	45	0	1.00	1.00	15:12	1.11	1.11	1.11	0.13	0.14	6.90%
8	1.80	0.70	0.00	0.70	0.6	40.20	59	0	1.00	1.00	15:14	1.44	1.44	1.44	0.14	0.20	9.90%
9	2.00	0.70	0.00	0.70	0.6	40.74	65	0	1.00	1.00	15:15	1.56	1.56	1.56	0.14	0.22	10.80%
10	2.20	0.65	0.00	0.65	0.6	40.30	90	0	1.00	1.00	15:16	2.18	2.18	2.18	0.13	0.28	13.80%
11	2.40	0.62	0.00	0.62	0.6	40.45	75	0	1.00	1.00	15:17	1.81	1.81	1.81	0.12	0.22	10.80%
12	2.60	0.60	0.00	0.60	0.6	40.47	38	0	1.00	1.00	15:18	0.93	0.93	0.93	0.12	0.11	5.40%
13	2.80	0.60	0.00	0.60	0.6	40.84	23	0	1.00	1.00	15:19	0.57	0.57	0.57	0.12	0.07	3.40%
14	3.00	0.60	0.00	0.60	0.6	42.59	13	0	1.00	1.00	15:21	0.32	0.32	0.32	0.15	0.05	2.50%
15	3.30	0.00	0.00	0.00		0.00	0	0	0.00	0.00	15:21			0.00	0.00	0.00	0.00%

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FIELD INVESTIGATION REPORT

FI2010091501 (East Maui, Palahulu)

Date of Field Investigation: September 15, 2010 **Time** (24-hour)**:** 0830 - 1230	
CWRM Staff:	Dean Uyeno and Chui Ling Cheng
Individuals Present:	EMI - Garret Hew and Nelson Akiu Keanae - Gladys Kanoa, Issac Kanoa, and Val Diehl
Hydrologic Unit:	Palauhulu
Stream Name:	Palauhulu Stream

Findings:

The purpose of this field visit was to survey Palauhulu Stream and identify the losing reaches of the stream. Staff met with the Kanoa's, Val, and EMI staff at the entrance to Piinaau Road. After driving a short distance on the EMI access Road, everyone began hiking from the road across the field to "Big Pond" which was dry (see photo 20100915001). Everyone continued to cross the field in the downstream direction until reaching the top of the waterfall at Store Spring on Palauhulu Stream, about 0.5 miles upstream from Hana Highway (see photo 20100915006). The stream was dry above the waterfall but the spring down below had flow (see photo 20100915002).

Afterwards, Issac Kanoa lead the group to "Opae Pond" where the Kanoa's collect opae. In the past, Issac has seen water flow into the pond but not out of the pond. However on the day of the field visit, water was flowing out of the pond (see photo 20100915011). Staff began hiking downstream from the "Opae Pond" for about 600 feet where the flow in the stream decreased significantly (see photo 20100915015). Issac Kanoa was able to find a trail that lead the group back to the EMI road where the cars were parked.

Everyone continued in the upstream direction by car and reached a possible old USGS gaging station location with a weir (see photo 20100915017). This is located about 0.6 miles upstream from the "Opae Pond".

Prior to departing Keanae, CWRM staff recorded the gage height of the staff gage on Palauhulu Stream by Hana Highway. The gage height reading on Palauhulu Stream was 2.06 feet at 1228 hours.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20100915001	"Big Pond" on Palauhulu Stream, about 0.8 miles upstream from Hana Highway
20100915002	Top of the waterfall at Store Spring on Palauhulu Stream, about 0.5 miles upstream from Hana Highway
20100915003	Top of the waterfall at Store Spring on Palauhulu Stream, about 0.5 miles upstream from Hana Highway
20100915004	Top of the waterfall at Store Spring on Palauhulu Stream, about 0.5 miles upstream from Hana Highway
20100915005	Top of the waterfall at Store Spring on Palauhulu Stream, about 0.5 miles upstream from Hana Highway
20100915006	Upstream of the waterfall at Store Spring on Palauhulu Stream, about 0.5 upstream miles from Hana Highway
20100915007	Top of the waterfall at Store Spring on Palauhulu Stream, about 0.5 miles upstream from Hana Highway
20100915008	Upstream of the waterfall at Store Spring on Palauhulu Stream, about 0.5 upstream miles from Hana Highway
20100915009	Upstream of the waterfall at Store Spring on Palauhulu Stream, about 0.5 upstream miles from Hana Highway
20100915010	Everyone that was present at the site visit
20100915011	"Opae Pond" on Palauhulu Stream where the Kanoas collect opae, about 1.6 miles from Hana Highway
20100915012	"Opae Pond" on Palauhulu Stream where the Kanoas collect opae, about 1.6 miles from Hana Highway
20100915013	"Opae Pond" on Palauhulu Stream where the Kanoas collect opae, about 1.6 miles from Hana Highway
20100915014	"Opae Pond" on Palauhulu Stream where the Kanoas collect opae, about 1.6 miles from Hana Highway
20100915015	Palauhulu Stream downstream from "Opae Pond" where the stream is losing, about 600 feet downstream from "Opae Pond"
20100915016	Palauhulu Stream downstream from "Opae Pond" where the stream is losing, about 600 feet downstream from "Opae Pond"
20100915017	Upper Palauhulu Stream where there was a possible USGS gaging station, about 0.6 miles upstream from "Opae Pond"
20100915018	Upper Palauhulu Stream where there was a possible USGS gaging station, about 0.6 miles upstream from "Opae Pond"

20100915019	Palauhulu Stream downstream from the USGS gaging station weir, about 0.6 miles upstream from “Opae Pond”
20100915020	Palauhulu Stream downstream from the USGS gaging station weir, about 0.6 miles upstream from “Opae Pond”
20100915022	Staff gage on Palauhulu Stream by Hana Highway
20100915023	Palauhulu Stream (Ching’s pond) downstream from the staff gage
20100915024	Staff gage on Palauhulu Stream by Hana Highway
20100915025	Palauhulu Stream below Hana Highway
20100915026	Staff gage on Palauhulu Stream by Hana Highway
20100915027	Staff gage on Palauhulu Stream by Hana Highway
20100915028	Staff gage on Palauhulu Stream by Hana Highway

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
FI2010091501.shp	

Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
047	20.8460164	-156.14659103	“Big Pond” on Palauhulu Stream, about 0.8 miles from Hana Highway
048	20.85009671	-156.14511221	Top of the waterfall at Store Spring on Palauhulu Stream, about 0.5 miles from Hana Highway
049	20.83565284	-156.15022349	“Opae Pond” on Palauhulu Stream where the Kanoas collect opae, about 1.6 miles from Hana Highway
050	20.83688197	-156.14865507	Palauhulu Stream downstream from “Opae Pond” where the stream is losing, about 600 downstream from “Opae Pond”
051	20.83011392	-156.15551054	Upper Palauhulu Stream where there was a possible USGS gaging station, about 0.6 miles upstream from “Opae Pond”

Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

20100915001.JPG

20100915002.JPG

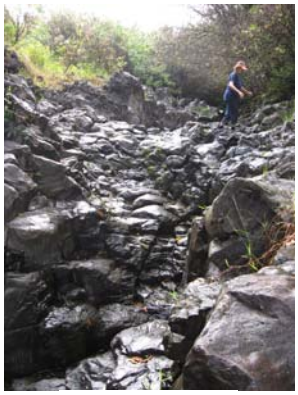
20100915003.JPG

20100915004.JPG

20100915005.JPG

20100915006.JPG

20100915007.JPG



20100915008.JPG

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20100915028.JPG

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DEPARTMENT OF LAND AND NATURAL RESOURCES
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Stream Protection and Management Branch

FOR STAFF USE ONLY

FIELD INVESTIGATION REPORT

FI2011042601

File ID: _____

Doc ID: _____

Date of Field Investigation: 04/26/2011	**Time** (24-hour)**:** 0825
CWRM Staff:	Dean Uyeno
Individuals Present:	Division of Aquatic Resources: Robert Nishimoto, Glenn Higashi, Skippy Hau East Maui Irrigation Co. (EMI): Garret Hew, Mark Vaught, Kai Andaya
Reference:	
TMK Parcels (9-digit)**:**	

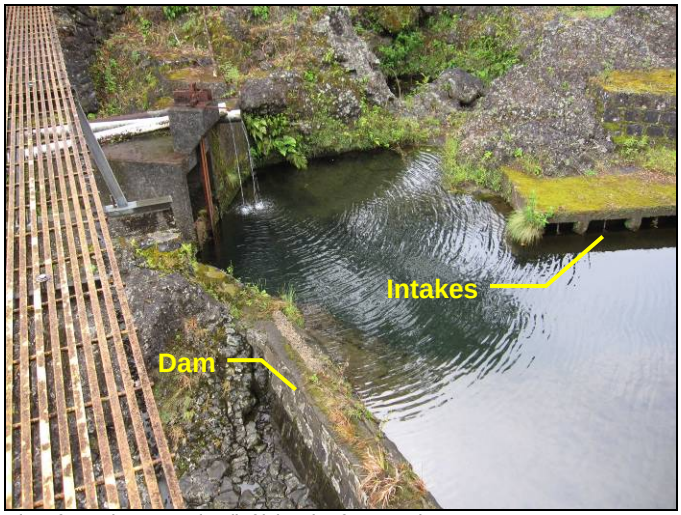
Findings:

The purpose of this field investigation was to meet with DAR and EMI staff in the field to discuss and agree upon specific diversion modifications to achieve biological connectivity for streams in East Maui. The proposed modifications are listed below by location and may be subject to change based on the actual conditions encountered during site-specific reconnaissance, fabrication, and installation/construction.

Hanawi Stream at Koolau Ditch Intake:

- There are currently two 6 in. PVC pipes on the right bank of the diversion structure which convey water from other (i.e., spring/seep) sources. These sources are considered minor diversions not directly from Hanawi Stream. EMI plans to extend one of the existing pipes with elbows and short sections of pipe and secured along the sluice gate structure to drop water onto the top of the diversion dam.

Diversion dam with minor diversion pipes in the foreground.

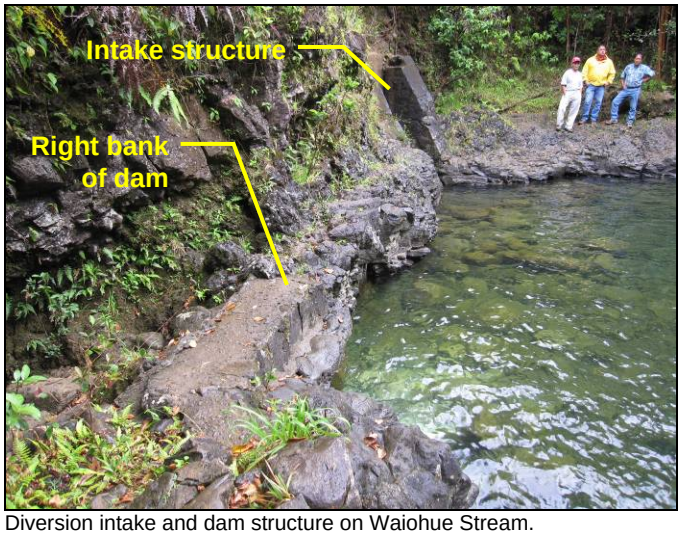


View from the opposite (left) bank of Hanawi Stream.

Waiohue Stream at Koolau Ditch Intake:

- At the time of this site visit, the level of the water was approximately 3 ft. below the concrete dam structure.
- EMI also intends to construct a pipe along one of the stream banks starting from atop the waterfall to drop water onto the top of the diversion dam. The pipe installation initially discussed in the field was the right bank; however, EMI will scout trails to the top of the waterfall to determine the best route to convey the pipe.

Waterfall and pool upstream of the Waiohue Stream diversion intake.

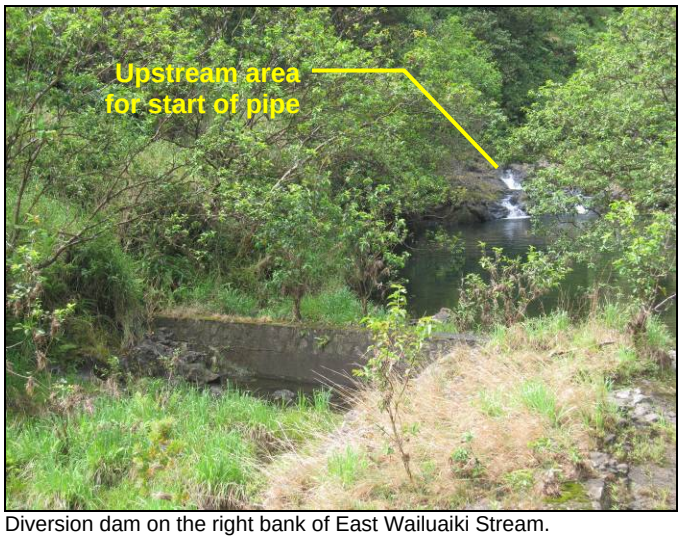


Diversion intake and dam structure on Waiohue Stream.

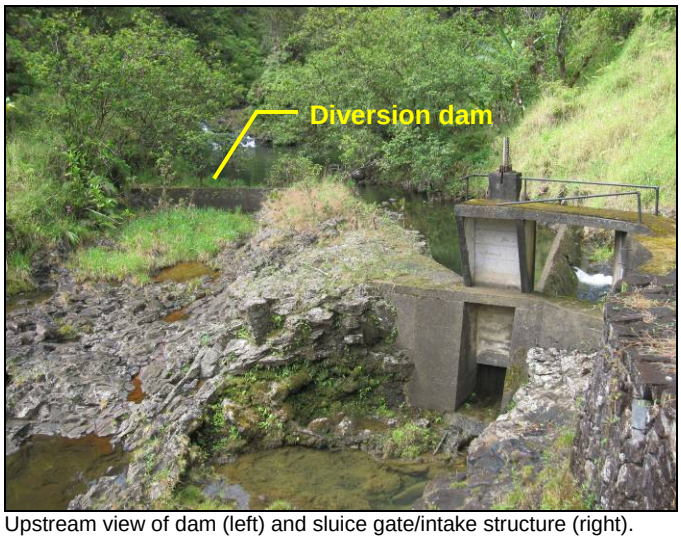
Panoramic view of right bank of Waiohue Stream with waterfall and diversion intake (left), and possible location for bypass pipe installation.

East Wailuaiki Stream at Koolau Ditch Intake:

- EMI plans to install a pipe along the right bank of East Wailuaiki Stream starting from a section of stream higher in elevation than the height of the diversion dam. Water from the pipe will be dropped onto the top of the diversion dam approximately 5 ft. from the right bank of the stream.



Diversion dam on the right bank of East Wailuaiki Stream.

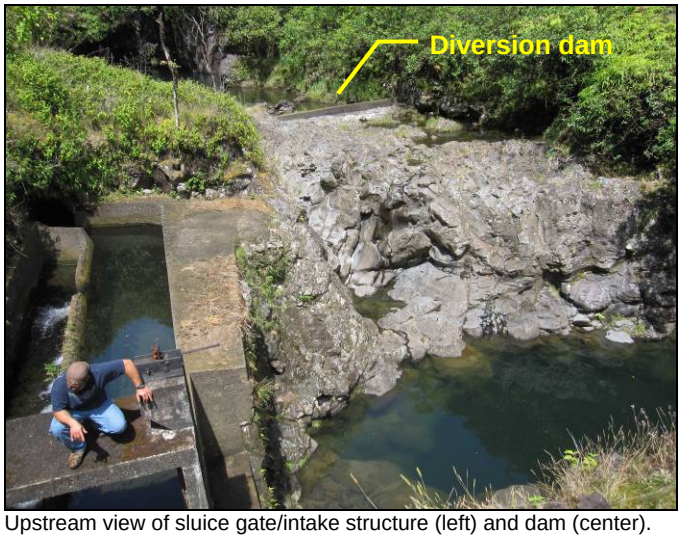


Upstream view of dam (left) and sluice gate/intake structure (right).

West Wailuaiki Stream at Koolau Ditch Intake:

- EMI plans to install a pipe along the left bank of West Wailuaiki Stream from atop the waterfall and drop water onto the top of the diversion dam nearest the left bank. EMI will scout trails to the top of the waterfall to determine the best route to convey the pipe. This site may require "trial-and-error" due to high flow events and the stability of the installation.

Diversion dam facing the left bank of West Wailuaiki Stream.



Upstream view of sluice gate/intake structure (left) and dam (center).


Panoramic view of left bank of West Wailuaiki Stream with waterfall and diversion dam (right), and possible location for bypass pipe installation.

Waikamoi Stream at Center Ditch Intake:

- No action is proposed for this stream, since the dry season interim instream flow standard is 0 cfs.


Manual Luis Ditch drops water into Waikamoi Stream on the right bank.


Upstream view of Waikamoi Stream and diversion dam from left bank.

Image Listing: (Attach PDF of image contact sheet)

File Name:	**Brief Description:**
20110426001	Koolau Ditch diversion intake on Hanawi Stream towards the right bank, with diversion dam at center.
20110426002	The Koolau Ditch diversion dam on Hanawi Stream towards the left bank, with two 6 in. PVC pipes conveying water from minor diversion sources in the foreground. Sluice gate is located at the bottom right.

20110426003	DAR and HC&S staff discuss potential modifications.
20110426004	Close-up of the minor diversion conveyance pipes (6 in. PVC). Diversion dam at middle left and sluice gate at bottom right.
20110426005	Hanawi Stream below the Koolau Ditch diversion dam.
20110426006	Top view of minor diversion conveyance pipes, with sluice gate at top.
20110426007	Hanawi Stream above the Koolau Ditch diversion dam, with intake at bottom left.
20110426008	Pool on Hanawi Stream at Koolau Ditch diversion intake, with conveyance pipes in the upper left, diversion intake at middle right, and dam at bottom left.
20110426009	Waiaohue Stream above Koolau Ditch diversion intake.
20110426010	Koolau Ditch diversion intake on Waiohue Stream.
20110426011	Koolau Ditch diversion intake is located on the right bank of the pool on Waiohue Stream, with intake at upper center and dam at bottom center.
20110426012	Koolau Ditch diversion dam on Waiohue Stream
20110426013	Left bank of the pool on Waiohue Stream at the Koolau Ditch diversion intake.
20110426014	Waiohue Stream channel just below the Koolau Ditch diversion dam.
20110426015	Right bank of the pool on Waiohue Stream.
20110426016	Right bank of the pool on Waiohue Stream, with intake at middle left.
20110426017	Waiohue Stream channel approximately 40 ft. downstream of the diversion dam.
20110426018	Waiohue Stream channel approximately 40 ft. downstream, looking upstream towards the diversion dam.
20110426019	Koolau Ditch diversion intake on East Wailuaiki Stream towards the right bank, with sluice gate at left.
20110426020	Upstream of the diversion intake on East Wailuaiki Stream, with an upstream diversion dam at upper left.
20110426021	Upstream of the diversion intake on East Wailuaiki Stream, with an upstream diversion dam at center.
20110426022	Downstream of the diversion intake on East Wailuaiki Stream, from the left bank, with bridge crossing at top.
20110426023	Upstream view of the diversion intake on East Wailauiki Stream, with sluice gate at right.
20110426024	Downstream pool on East Wailuaiki Stream below bridge crossing.
20110426025	Koolau Ditch diversion dam on West Wailuaiki Stream, towards the left bank.
20110426026	Downstream of the diversion dam on West Wailuaiki Stream
20110426027	Koolau Ditch diversion dam on West Wailuaiki Stream, towards the left bank.
20110426028	Close-up of the left bank wing wall at the diversion dam on West Wailuaiki Stream.
20110426029	Koolau Ditch diversion intake on West Wailuaiki Stream, with diversion dam at top and debris basin at left.
20110426030	Downstream of the diversion intake on West Wailuaiki Stream.
20110426031	Koolau Ditch diversion intake on West Wailuaiki Stream, from the bridge crossing, with diversion dam at upper right and debris basin at left.
20110426032	Manuel Luis Ditch conveys water and terminates at the right bank of Waikamoi Stream, approximately 150 ft. upstream of the Center Ditch diversion intake
20110426033	Waikamoi Stream upstream of the Manuel Luis Ditch inflow.
20110426034	Waikamoi Stream downstream of the Manuel Luis Ditch inflow.
20110426035	Center Ditch diversion intake and dam on Waikamoi stream facing the left bank.
20110426036	Close-up of diversion dam nearest the right bank on Waikamoi Stream.
20110426037	Center Ditch diversion intake and sluice gate (at right) on Waikamoi Stream.
20110426038	Upstream view of the Center Ditch diversion dam on Waikamoi Stream.
20110426048	Panoramic of the right bank of Waiohue Stream above the Koolau Ditch diversion intake.
20110426049	Panoramic of the left bank of West Wailuaiki Stream above the Koolau Ditch diversion intake.

GPS Listing:

Shapefiles: (List file names of all shapefiles created and a brief description of each)

File Name:	Brief Description:
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Waypoints: (List all waypoints in decimal degrees and provide a brief description of each)

WP No.	Latitude	Longitude	Brief Description:
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Attachments:

Brief Description:

1. Image Contact Sheet

Recommendations:

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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
Stream Protection and Management Branch

FOR STAFF USE ONLY

FIELD INVESTIGATION REPORT

FI2011042701

File ID: _____

Doc ID: _____

Date of Field Investigation: 04/27/2011 **Time** (24-hour)**:** 0830	
CWRM Staff:	Dean Uyeno
Individuals Present:	Division of Aquatic Resources: Robert Nishimoto, Glenn Higashi, Skippy Hau East Maui Irrigation Co. (EMI): Garret Hew, Mark Vaught Others: Lyn Scott, Lucienne DeNaie
Reference:	--
TMK Parcels (9-digit)**:**	--

Findings:

The purpose of this field investigation was to meet with DAR and EMI staff in the field to discuss and agree upon specific diversion modifications to achieve biological connectivity for streams in East Maui. The proposed modifications are listed below by location and may be subject to change based on the actual conditions encountered during site-specific reconnaissance, fabrication, and installation/construction.

Honopou Stream at Haiku Ditch Diversion Intake:

- EMI intends to use cement to construct a small channel in the diversion intake structure where there is currently an opening nearest the right bank of the stream. The concrete berm on the upstream end of the channel will also be chipped away to allow water to flow downstream in the channel. The channel should be kept fairly rough (i.e., not smooth).
- EMI will also construct a small concrete berm near at the base of the water drop from the low-flow bypass channel to prevent water from flowing back into the Haiku Ditch.

Right bank of the Haiku Ditch diversion intake on Honopou Stream.

Concrete berm proposed for modification.

Honopou Stream at New Hamakua Ditch Diversion Intake:

- No actions are proposed for this site since bypass provides flow downstream.

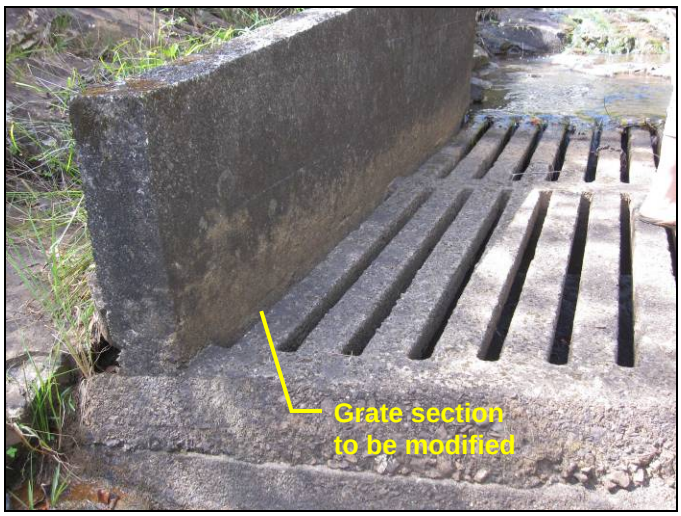
Overflow bypass from the New Hamakua Ditch diversion intake.

Downstream view from above the New Hamakua Ditch intake bypass.

Honopou Stream at Wailoa Ditch Diversion Intake:

- One option discussed was to place an iron 'H' beam on the right bank edge of the diversion intake grates, and bolted into the wing wall.
- The preferred option is to fill the first intake grate section (from the right bank) with cement, and leave the concrete slightly depressed to allow the section to fill with water and pool. Upon filling, the section would be expected to overflow down the intake apron to provide a wetted face for connectivity.

Downstream view of the Wailoa Ditch diversion intake.



Close-up of the right bank of the Wailoa Ditch intake grate.

Note: At the time of the site visit, the sluice gate bypassing water from the Wailoa Ditch intake was wide open. EMI indicated that they had not opened the gate more than the height which had been agreed to at a previous visit.

Image Listing: (Attach PDF of image contact sheet)

File Name:	Brief Description:
20110427001	DAR and EMI staff inspect the right bank portion of the Haiku Ditch diversion on Honopou Stream (upstream view).
20110427002	Close-up of right bank portion of the Haiku Ditch diversion.
20110427003	Close-up of right bank portion, upstream edge of the Haiku Ditch diversion.
20110427004	View of the right bank portion of the Haiku Ditch diversion (downstream view).
20110427005	View of the Haiku Ditch diversion on Honopou Stream from the right bank, with three bypass pipes at bottom and lowflow-bypass channel at center.
20110427006	Close-up of the right bank portion, downstream edge of the Haiku Ditch diversion.
20110427007	Bypass flow adjacent to the New Hamakua Ditch diversion on Honopou Stream from the left bank (upstream view).

20110427008	Honopou Stream above New Hamakua Ditch diversion, with Wailoa Ditch diversion at top center (upstream view).
20110427009	Wailoa Ditch diversion on Honopou Stream (downstream view).
20110427010	Close-up of the right bank portion, upstream edge of the Wailoa Ditch diversion.
20110427011	View of the right bank portion of the Wailoa Ditch diversion (downstream view).
20110427012	Close-up of the right bank portion, downstream edge of the Wailoa Ditch diversion.
20110427013	View of the right bank portion of the Wailoa Ditch diversion (upstream view).
20110427014	Open sluice gate below the Wailoa Ditch diversion intake (upstream view).
20110427015	Honopou Stream below Wailoa Ditch diversion, with New Hamakua Ditch diversion at top center (downstream view).
20110427016	New Hamakua Ditch diversion located on left bank of Honopou Stream. Wetted areas due to leakage from modifications and spring seeps on the left bank.
20110427017	Bypass flow adjacent to the New Hamakua Ditch diversion on Honopou Stream from the right bank (upstream view).
20110427018	Bypass flow approximately 100 ft. downstream of New Hamakua Ditch flowing across roadway.

GPS Listing:

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Civil No. 19-1-0019-01 (JPC)

Defendant A&B/EMI's Exhibit AB-151

FOR IDENTIFICATION _____

RECEIVED IN EVIDENCE _____

CLERK _____