Central Maui Ground-Water Availability Study

September 8, 2004

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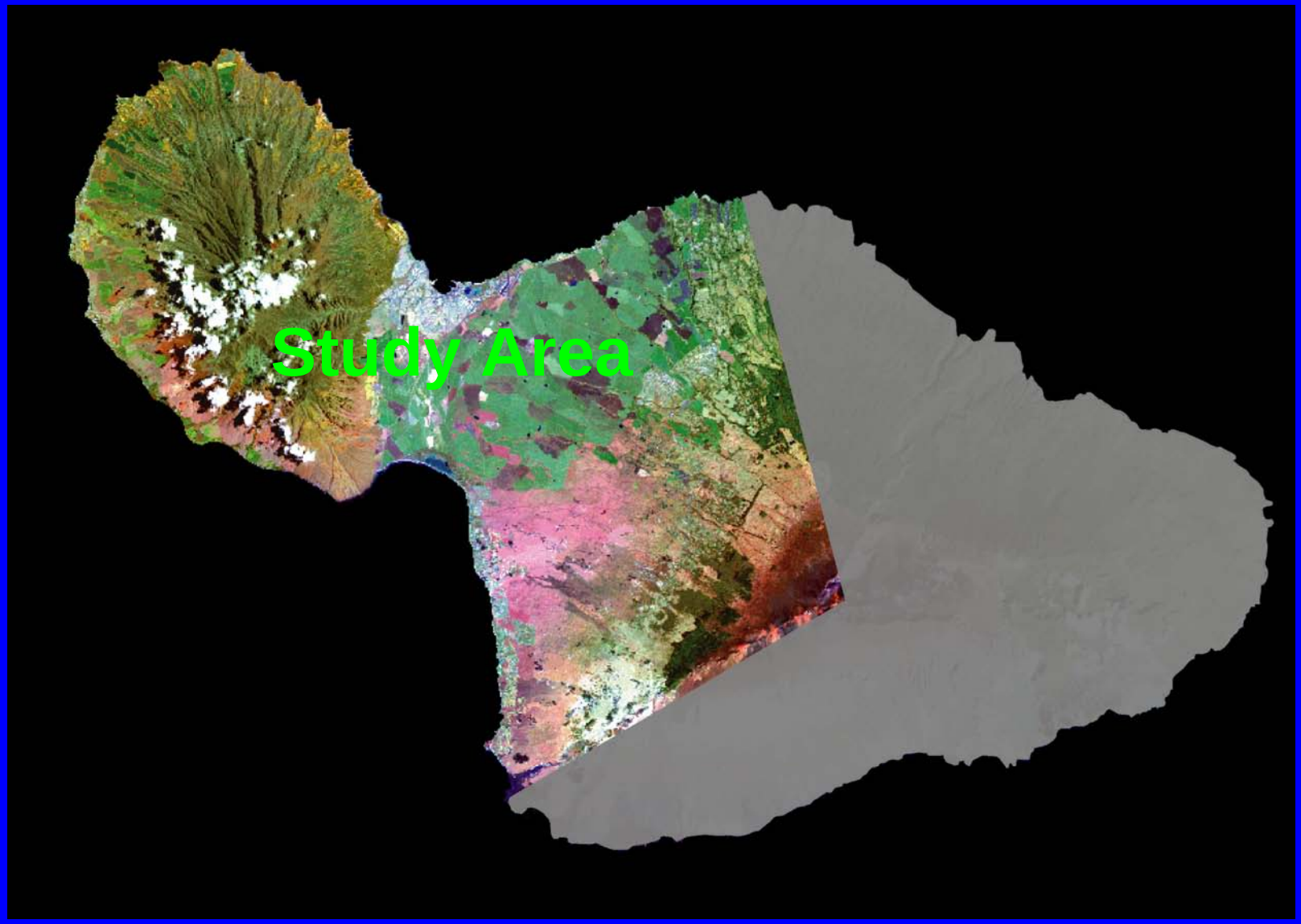

Study Area

Study Objectives

- Improve understanding of regional flow
- Estimate ground-water recharge
- Estimate effects of selected pumping scenarios on the ground-water system

Study Approach

1. Analyze existing data
2. Collect climate, ground-water, and streamflow data
3. Compute recharge with a water budget
4. Develop numerical ground-water model

1. Analysis of existing data

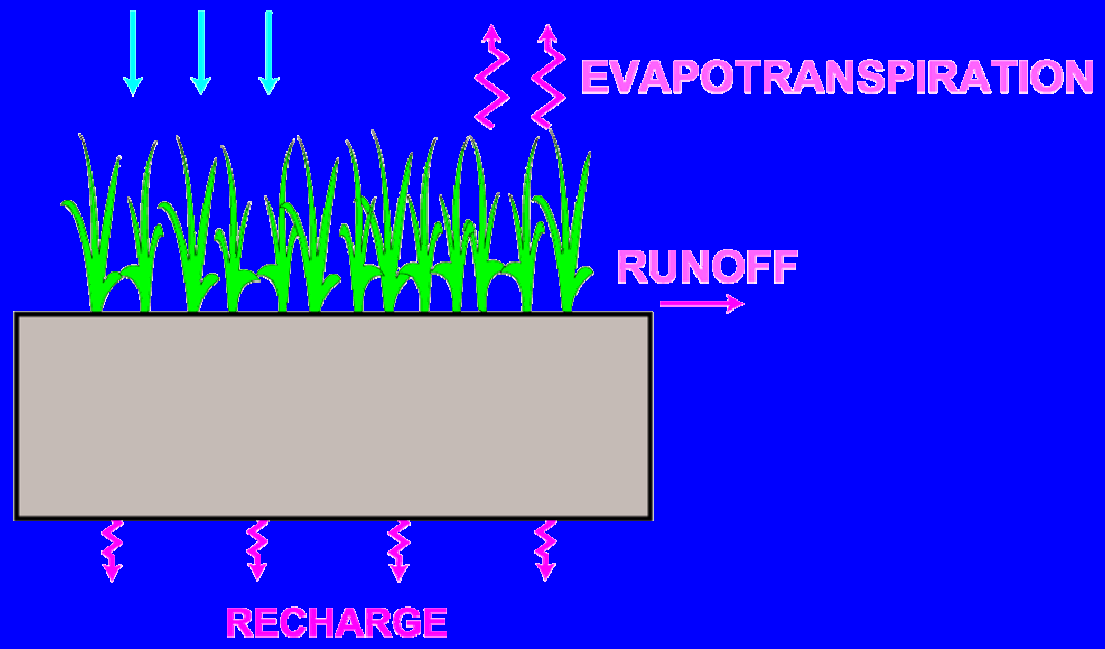
- Identify data needs
- Formulate preliminary conceptual model of the ground-water system

2. Data collection

Need	Purpose
climate	recharge
streamflow	ground-water discharge
water levels, salinity, pumping	aquifer properties and connection between areas

3. Water Budget

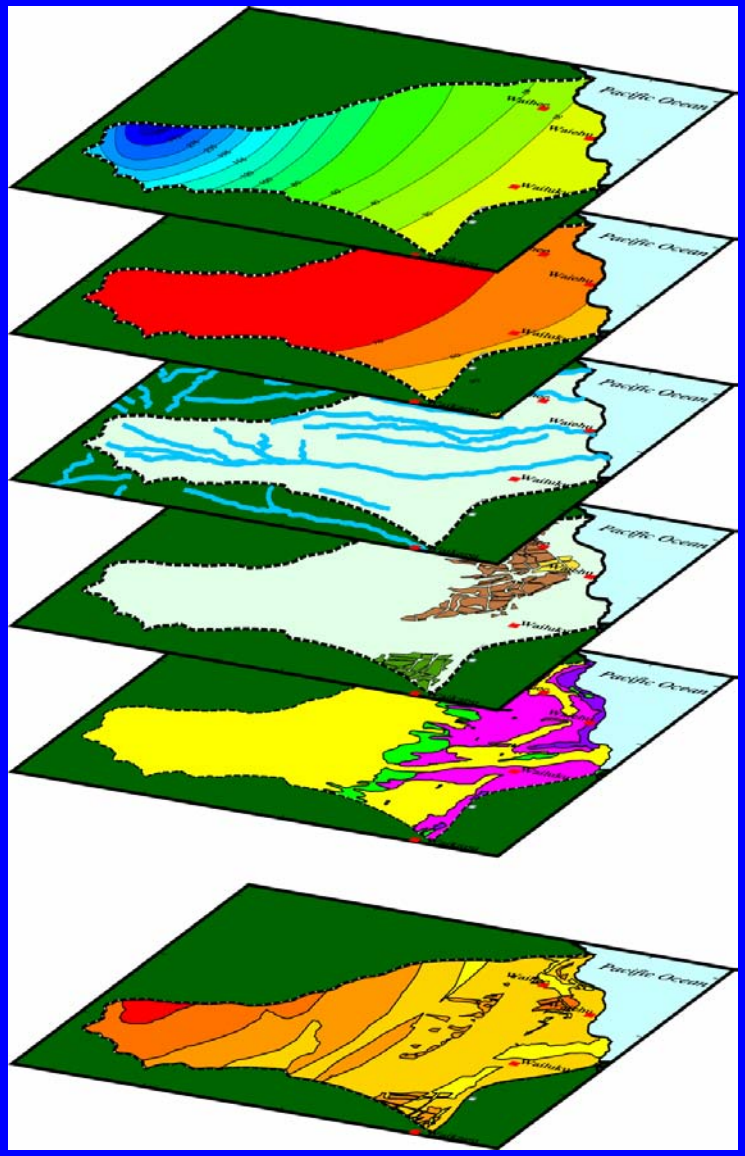
RAINFALL + FOG DRIP + IRRIGATION



RAINFALL + FOG DRIP + IRRIGATION =

EVAPOTRANSPIRATION + RUNOFF + RECHARGE

GIS Water Budget



Rainfall+Fog Drip

Evaporation

Runoff

Land cover

Soils

↓

Recharge

4. Numerical Ground-Water Model

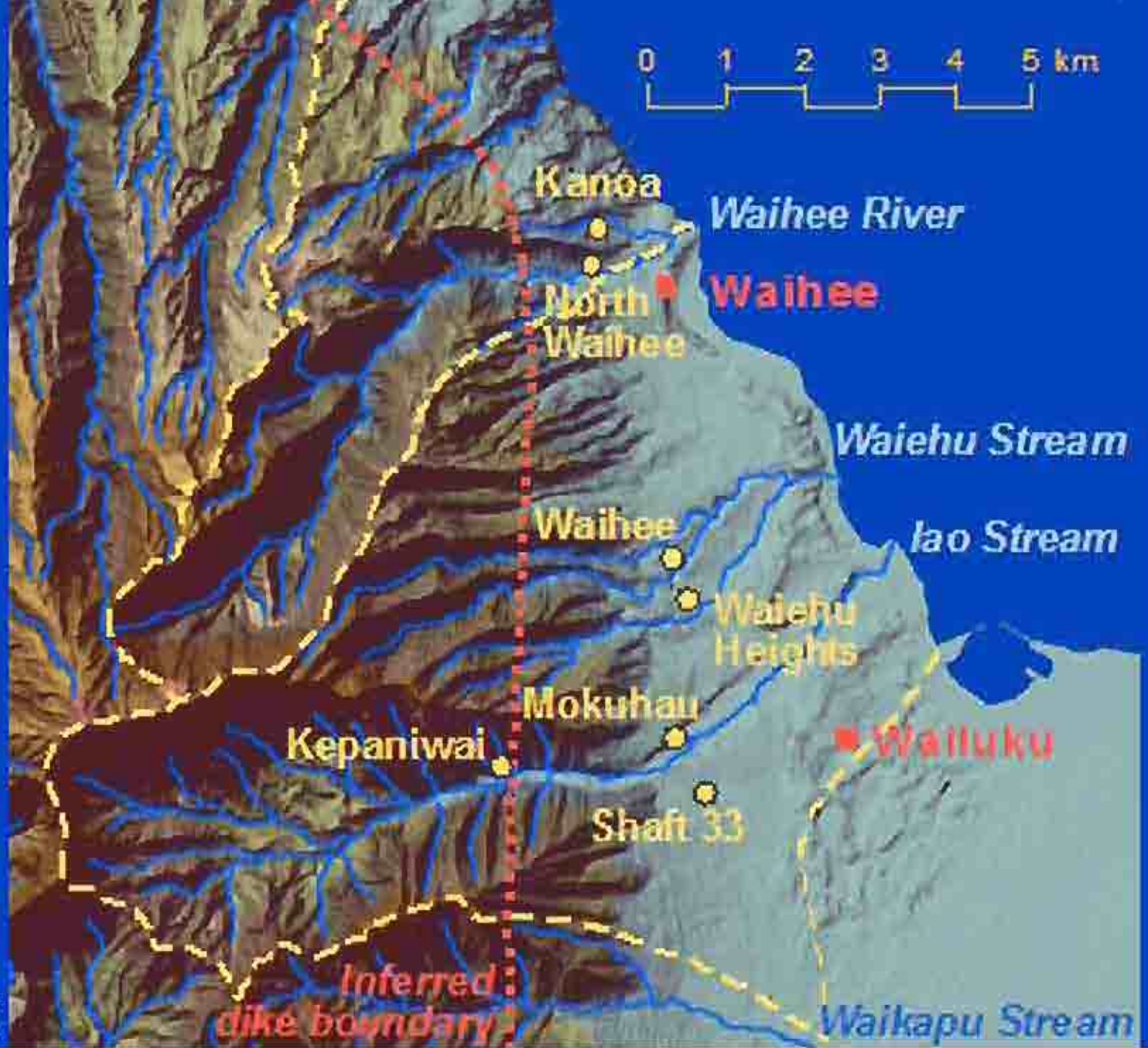
- Mathematical representation of a ground-water system
- Best tool for understanding a system
- Predictive management approach

Time Lines

Task	2003	2004	2005	2006	2007
Data review					
Data collection					
Water budget					
Numerical model					

Products

Report	2003	2004	2005	2006	2007
Ground-water and surface-water resources			●		
Water budget				●	
Numerical models					●



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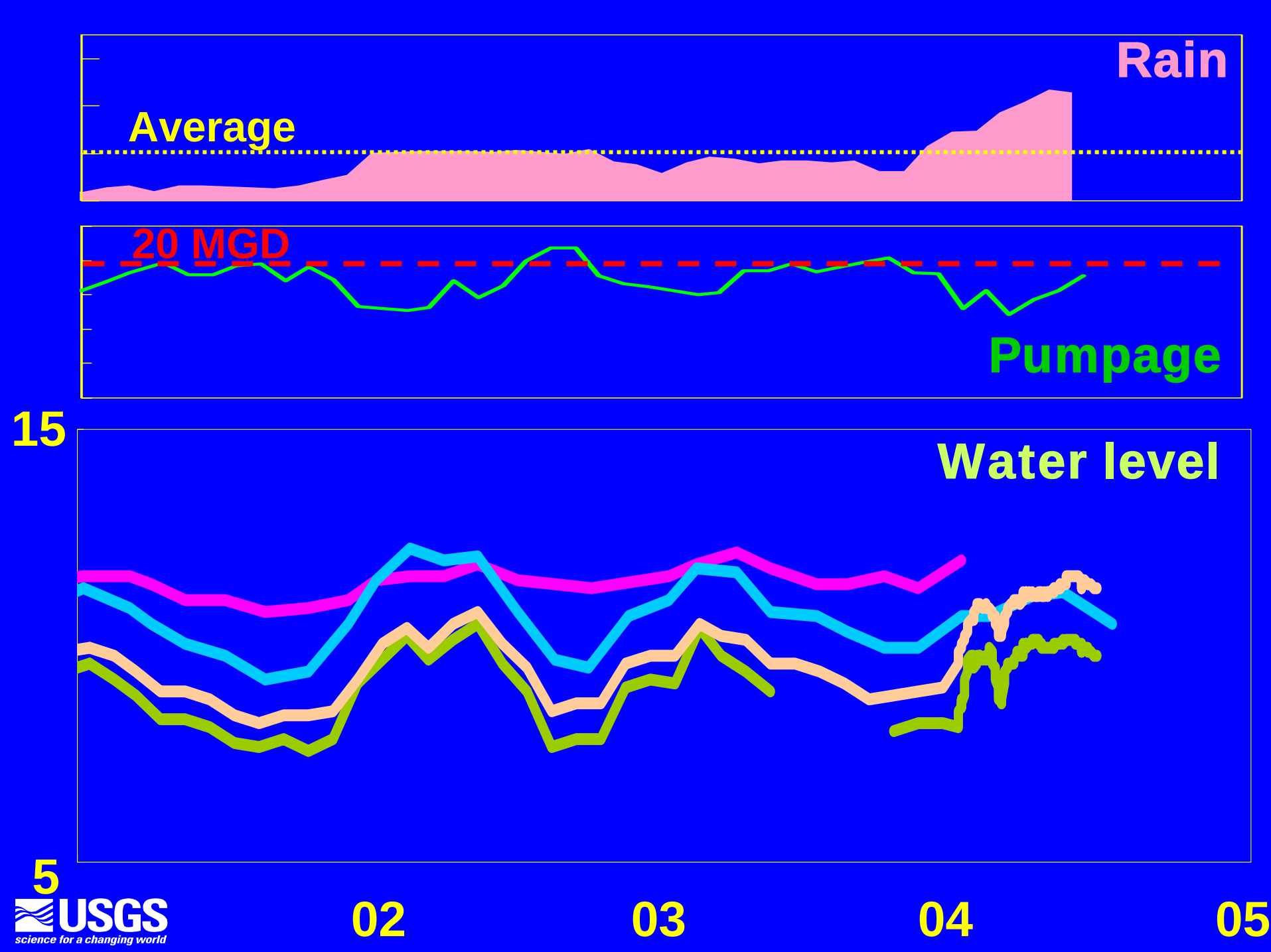

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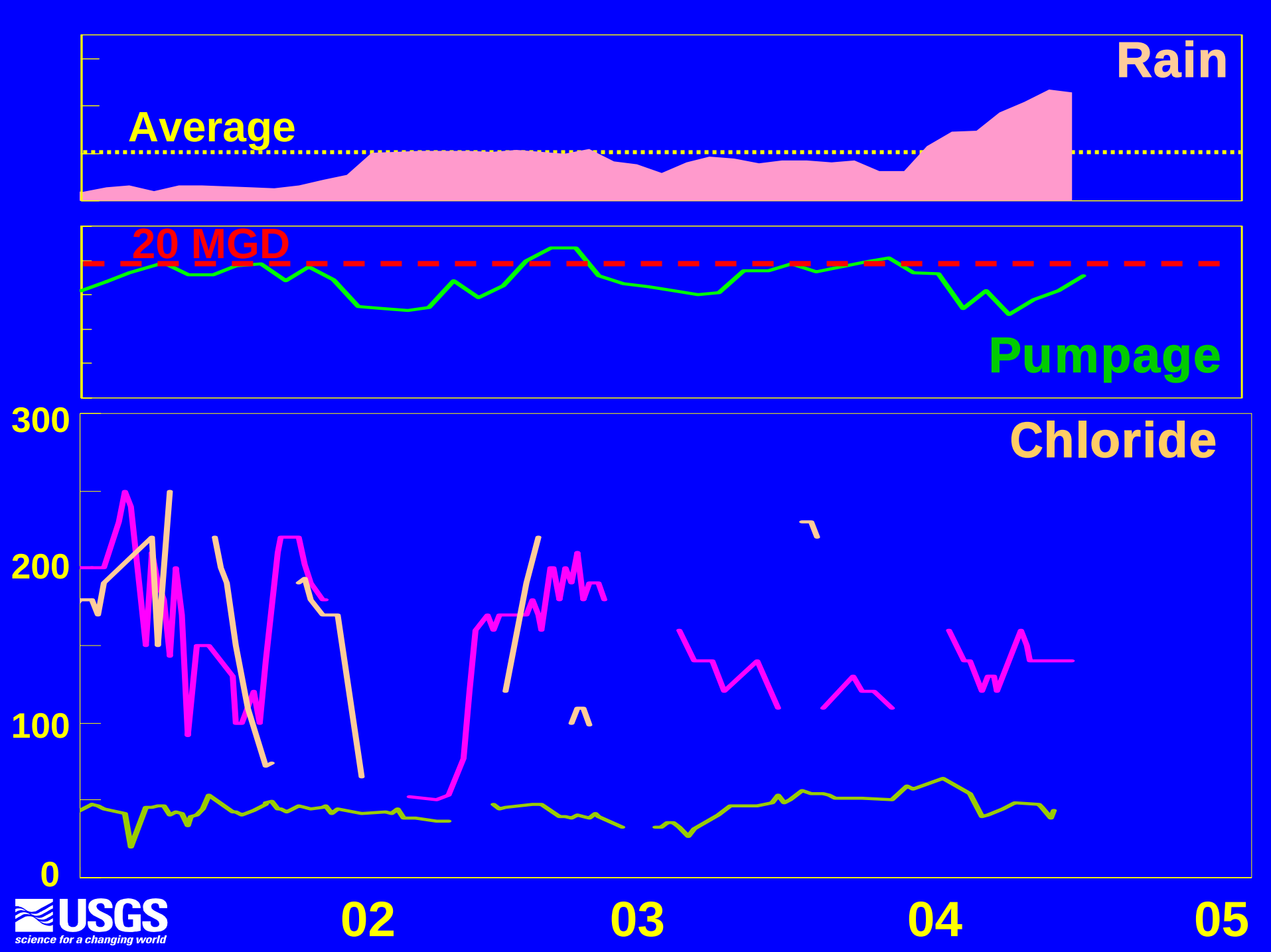
Rain
Average
20 MGD
Pumpage
Chloride
300
200
100
0
02
03
04
05
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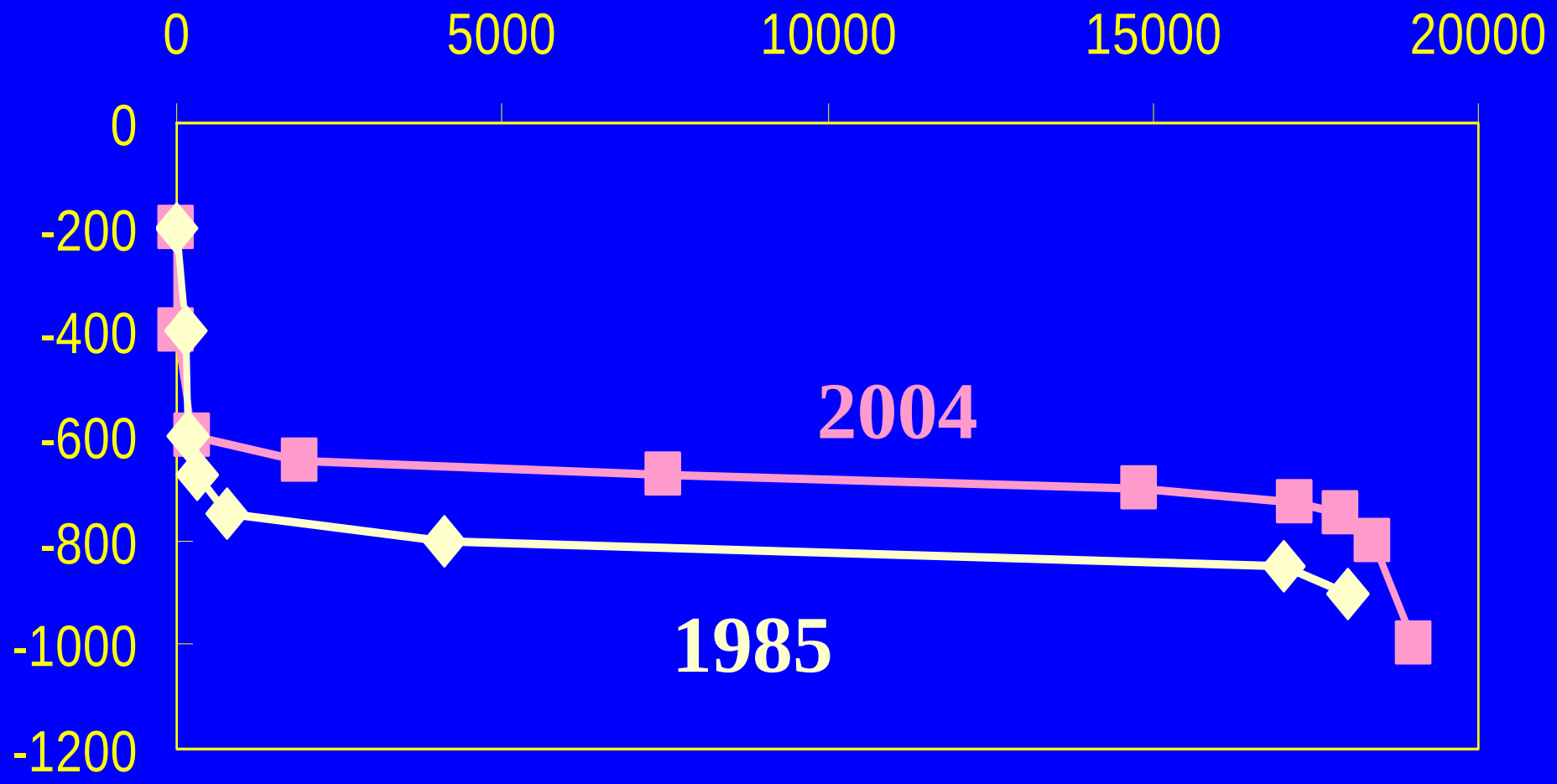
Waiehu Deep Monitor Well



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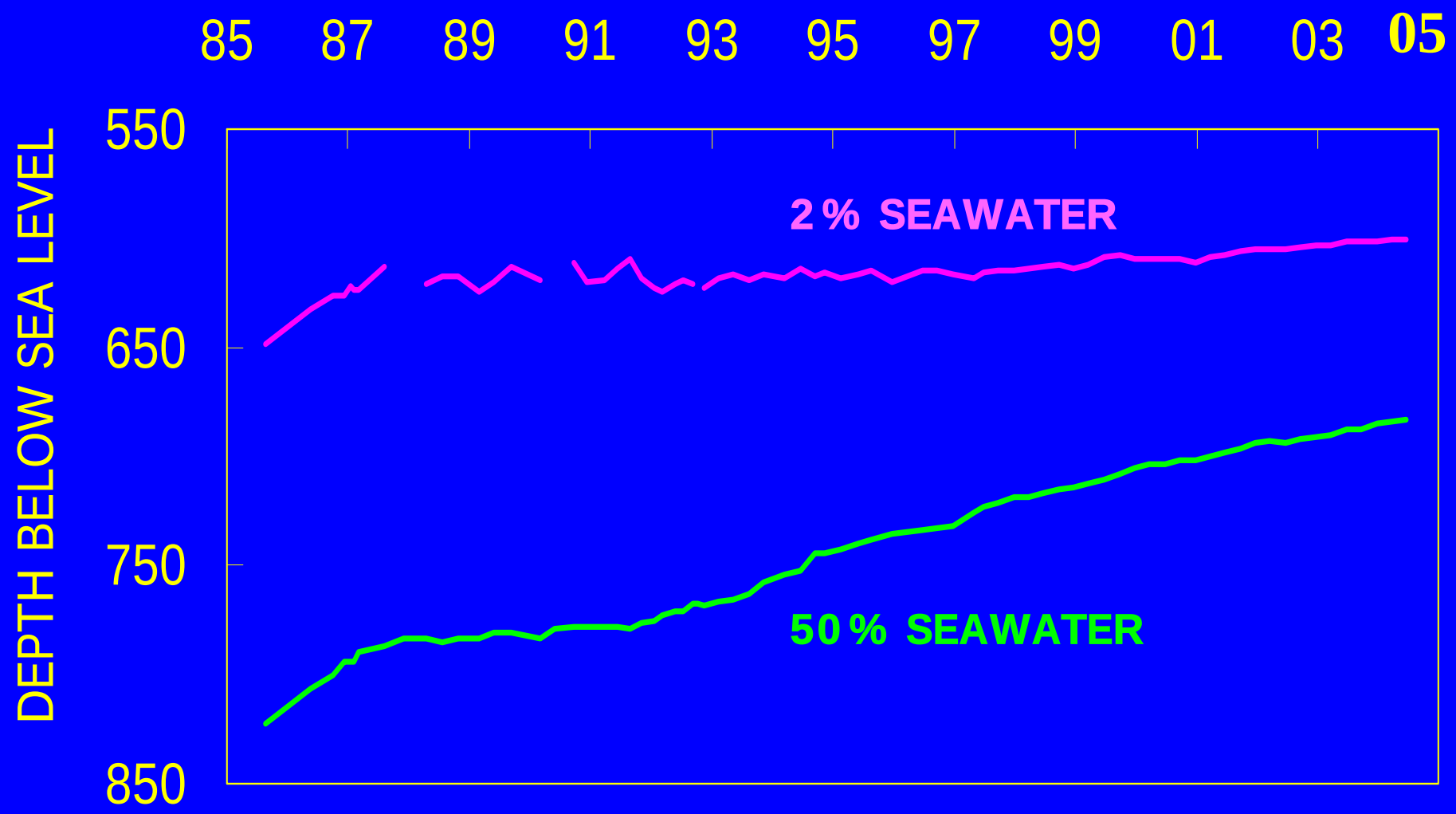
Waiehu Deep Monitor Well



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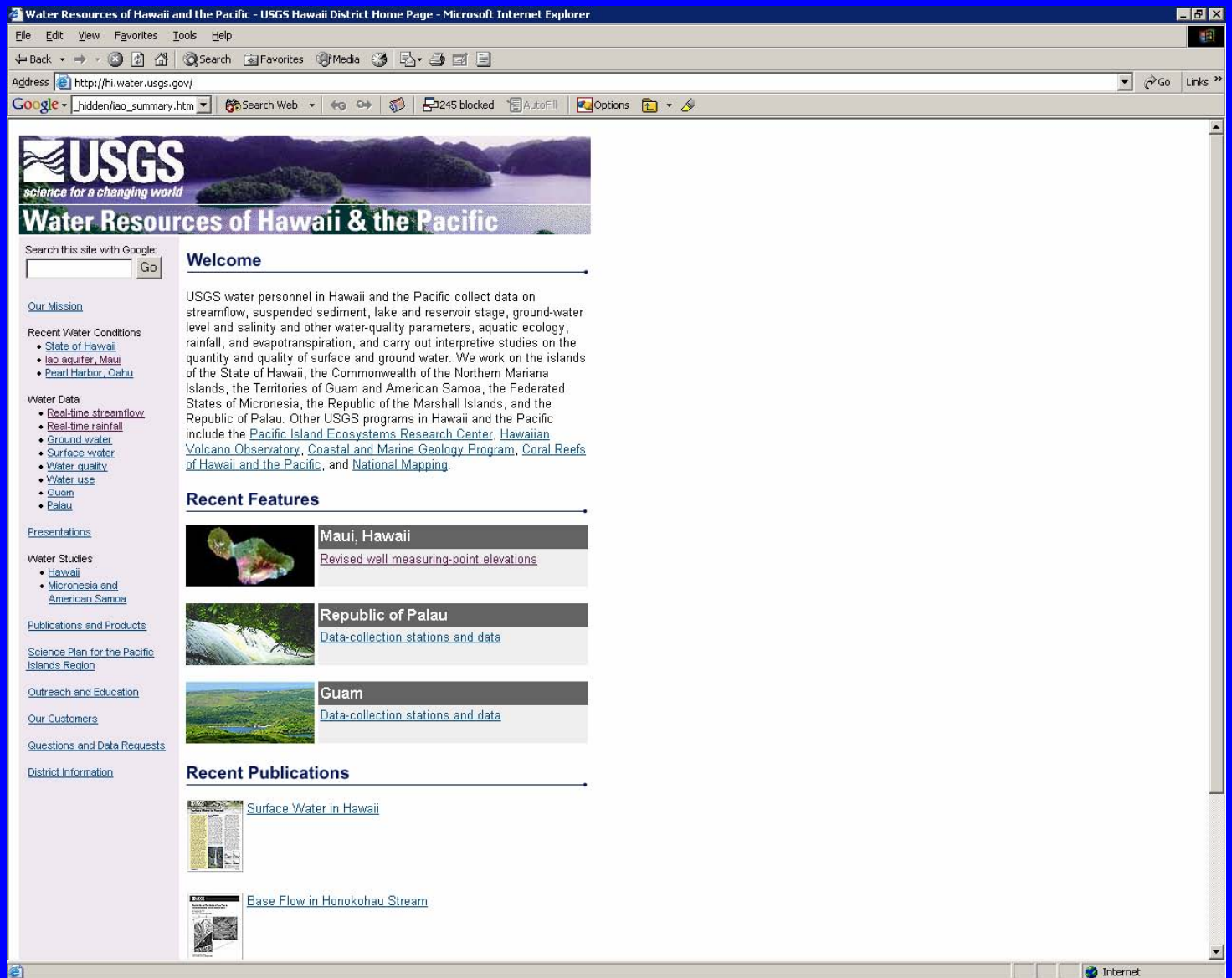
Iao and Waihee web pages

http://hi.water.usgs.gov



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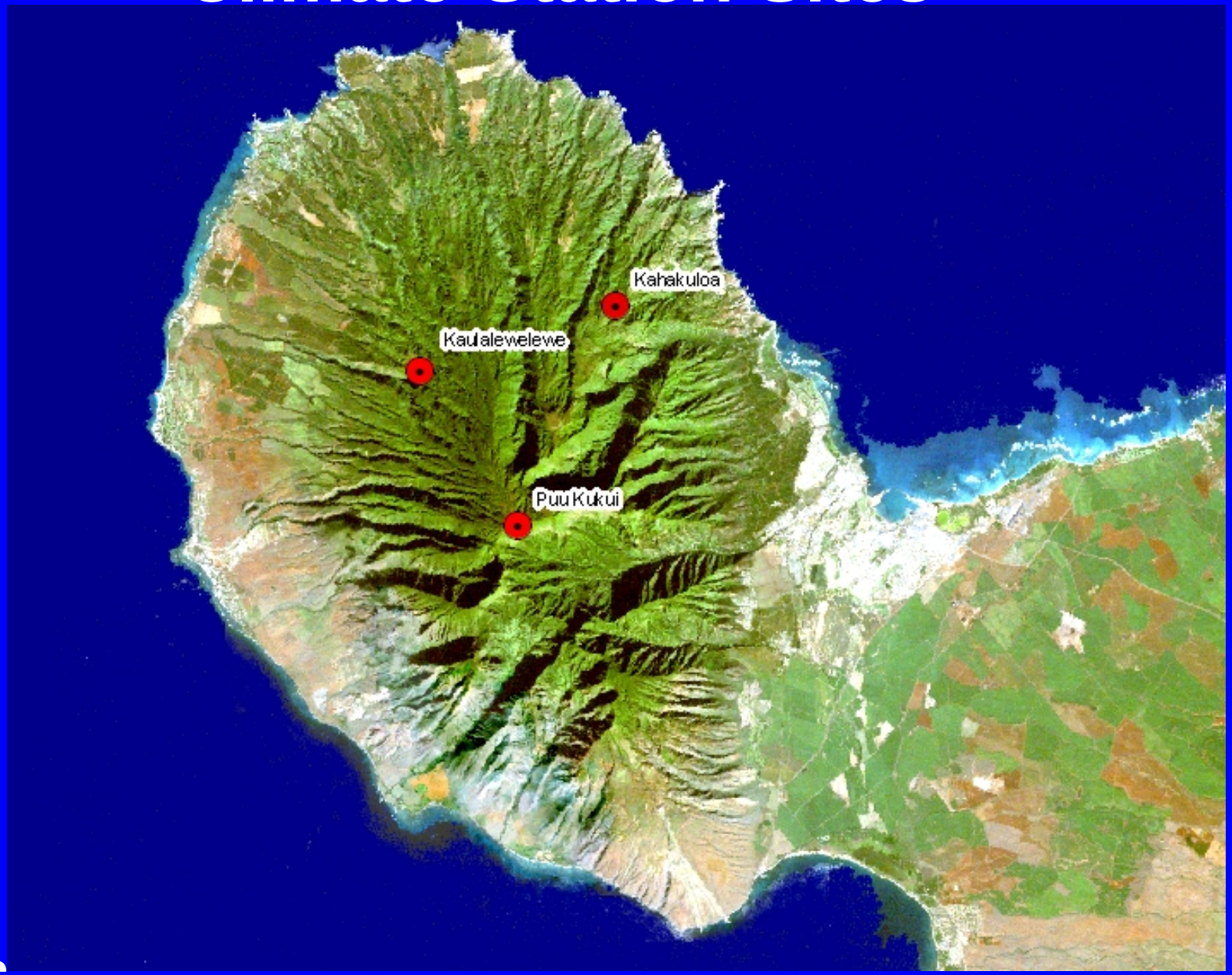
Climate-Station Sites



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Data Collection Equipment

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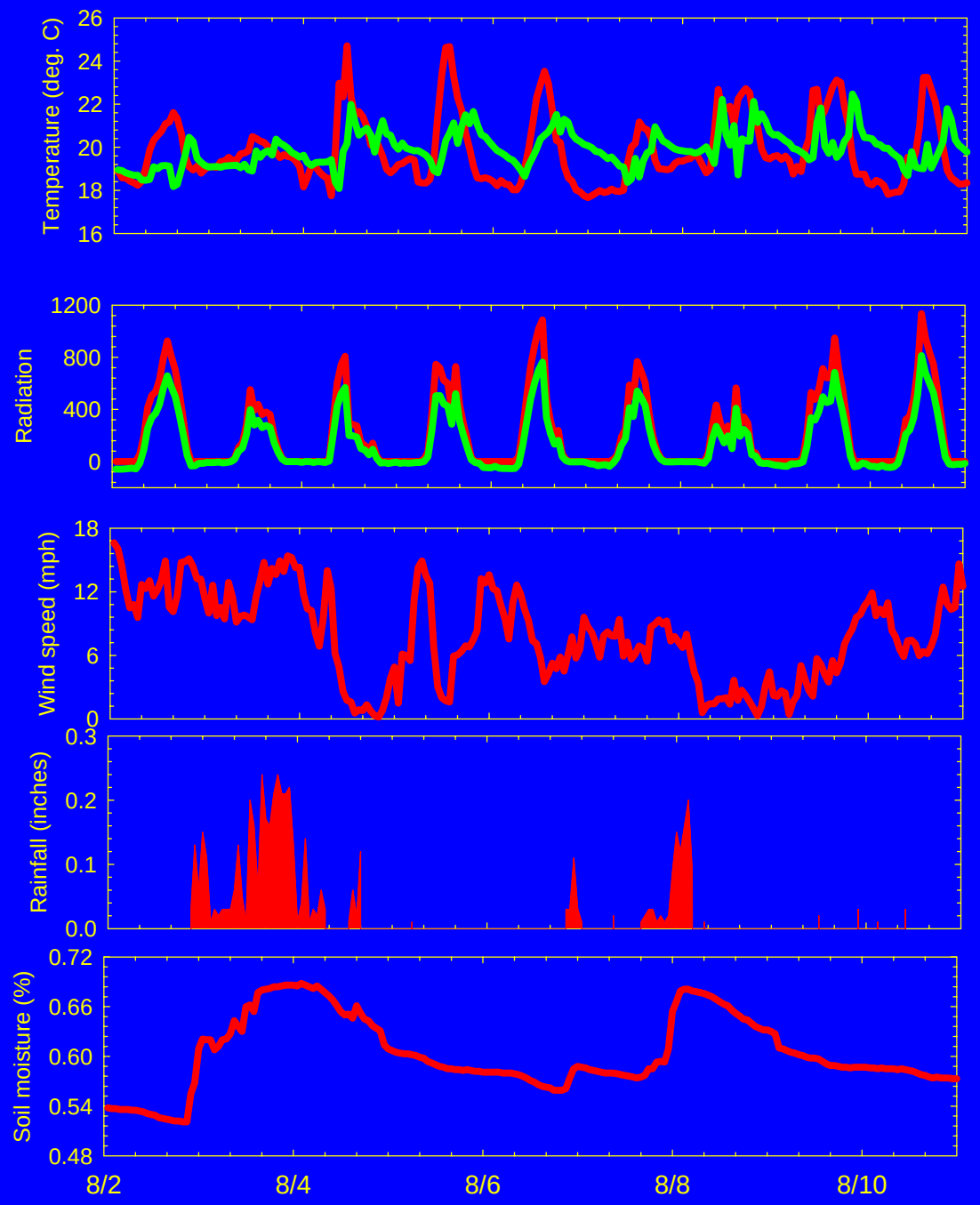

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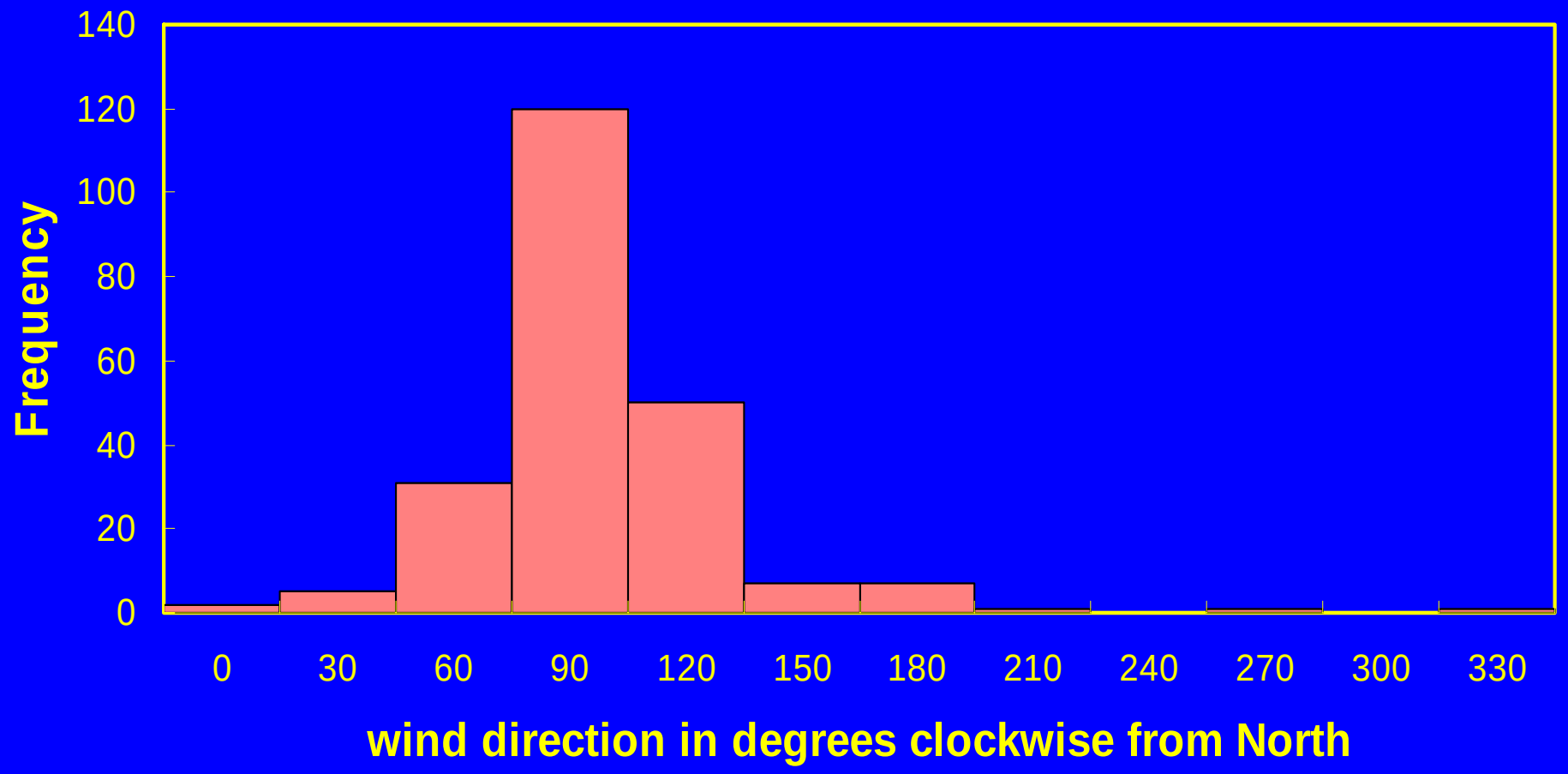
Wind Direction Histogram



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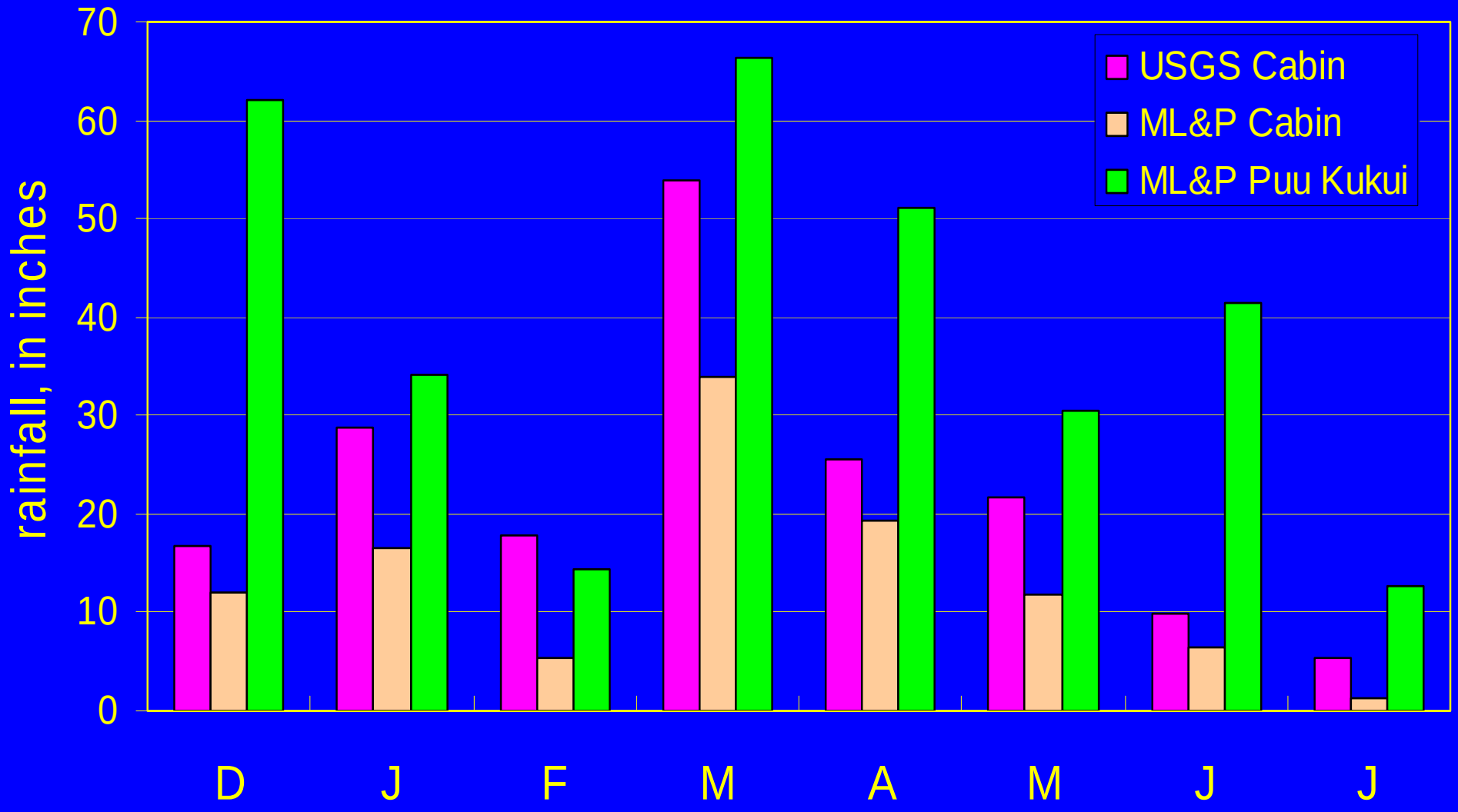

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Climate station history

Kaulalewelewe

Photo removed for smaller size

5/03: site selected

6/03: ML&P permission

9/03: conservation district approval

11/03: installed

Climate station history

Puu Kukui

Photo removed for smaller size

5/03: site selected

6/03: ML&P permission

9/03: conservation district approval

11/03; 1/04; 2/04; 6/04; 8/04: failed installation trips

Climate station history

Kahakuloa

Photo removed for smaller size

2/04: site selected

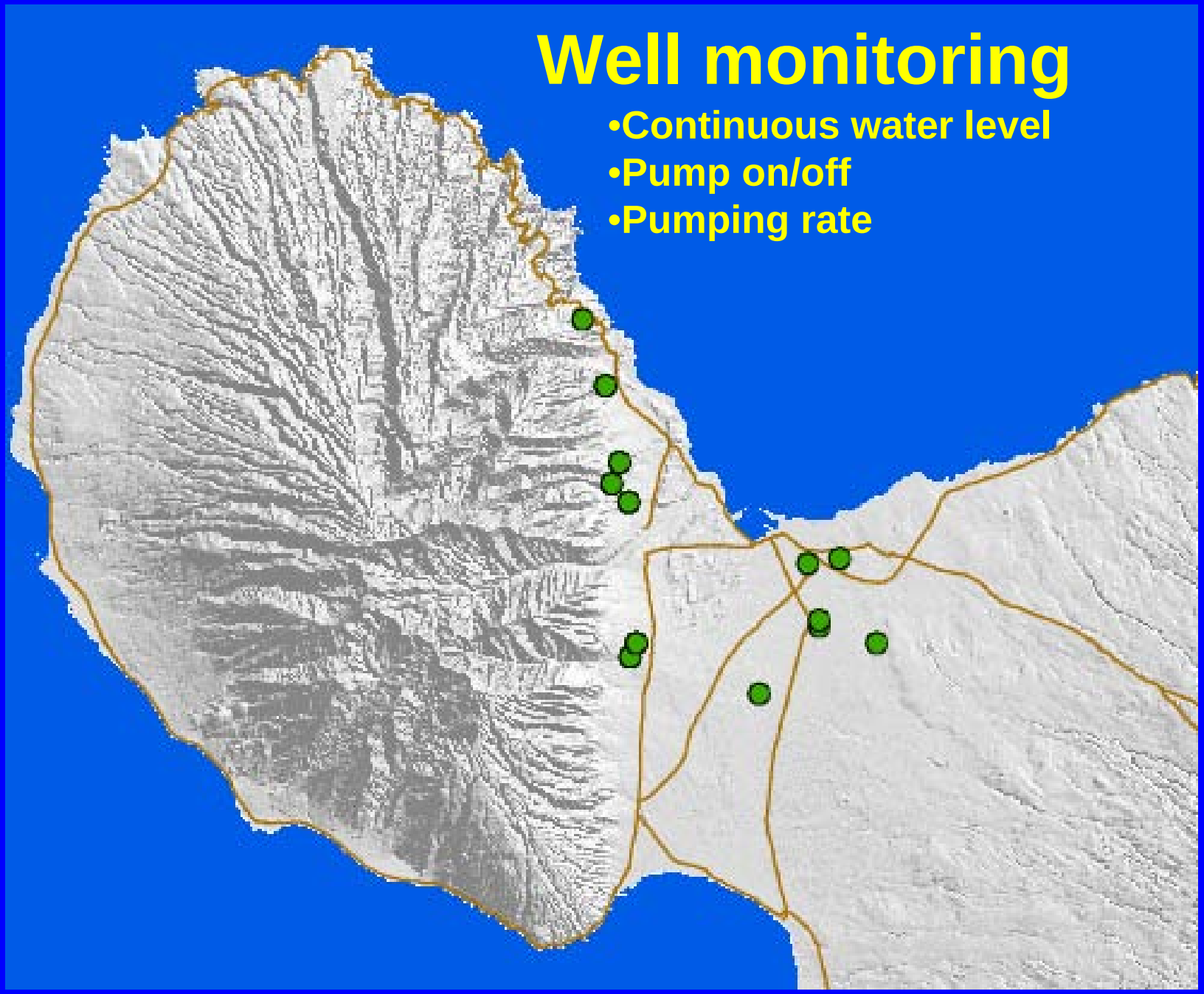
4/04: Landowner & CDUA permission

6/04: NARS permit approved but access denied by Maui DLNR/NARS

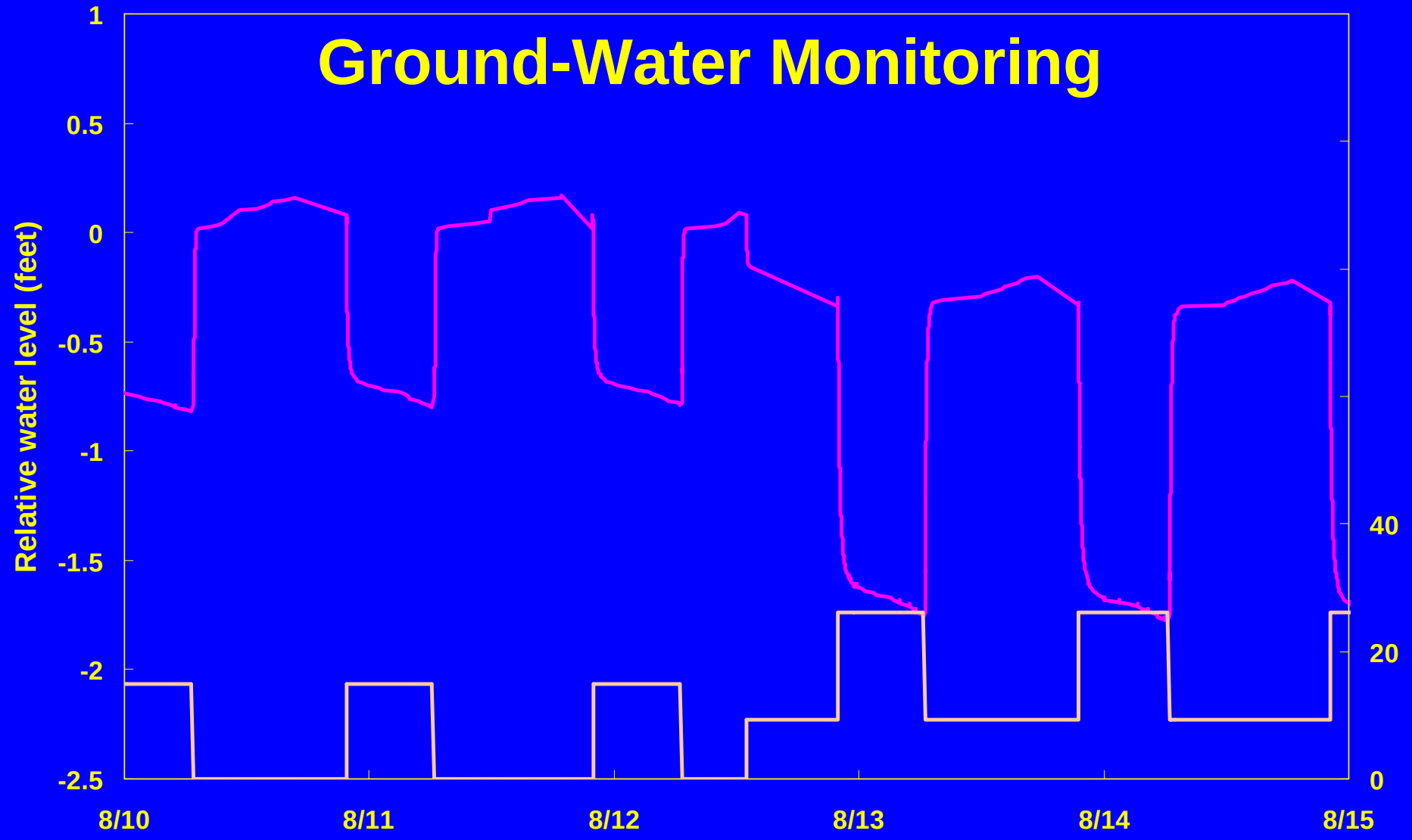
8/04: Access approved

Well monitoring

- Continuous water level
- Pump on/off
- Pumping rate



Ground-Water Monitoring



Pump 6

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Quantifying Ground-Water Discharge to Streams

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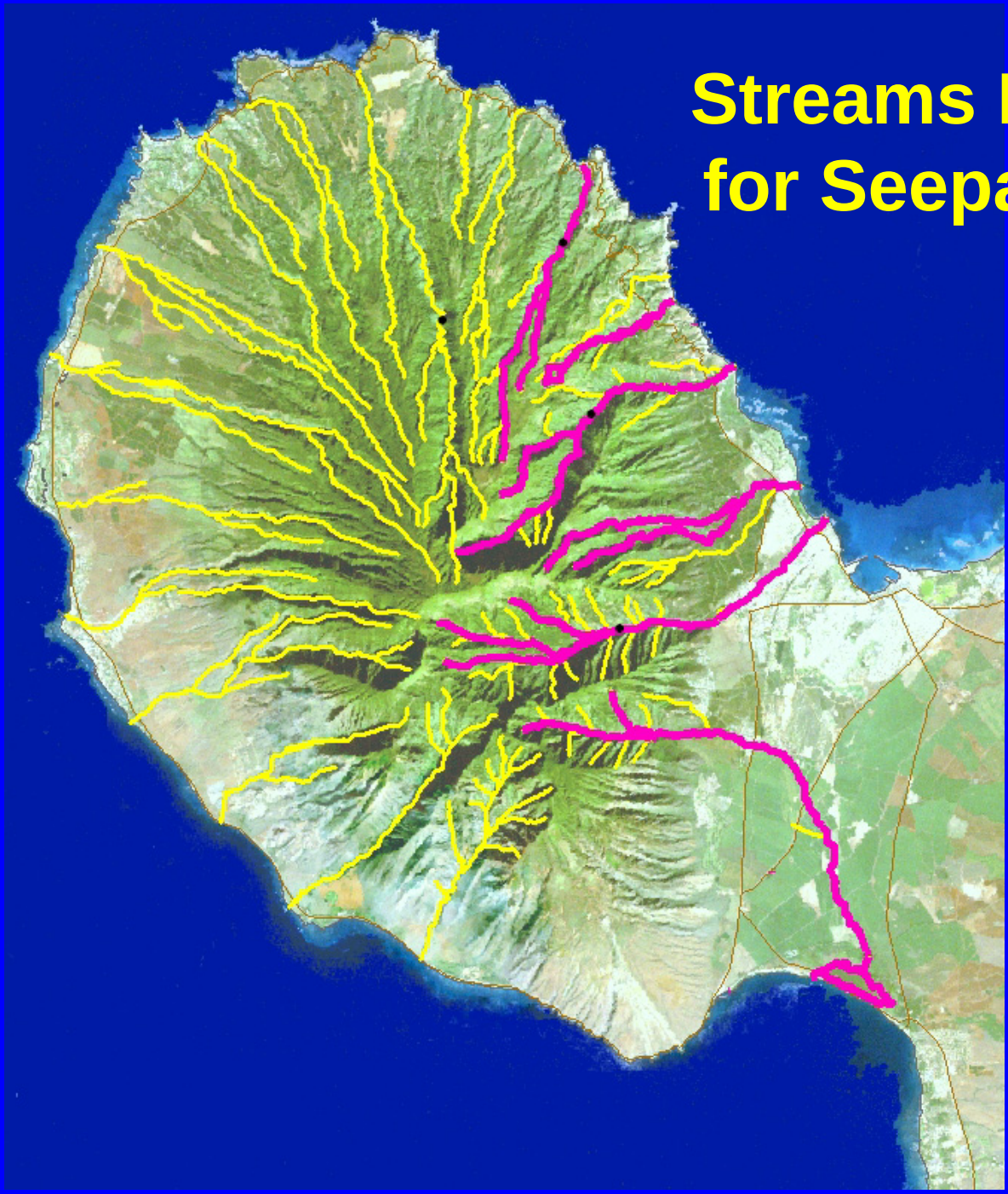
Streams Proposed for Seepage Runs



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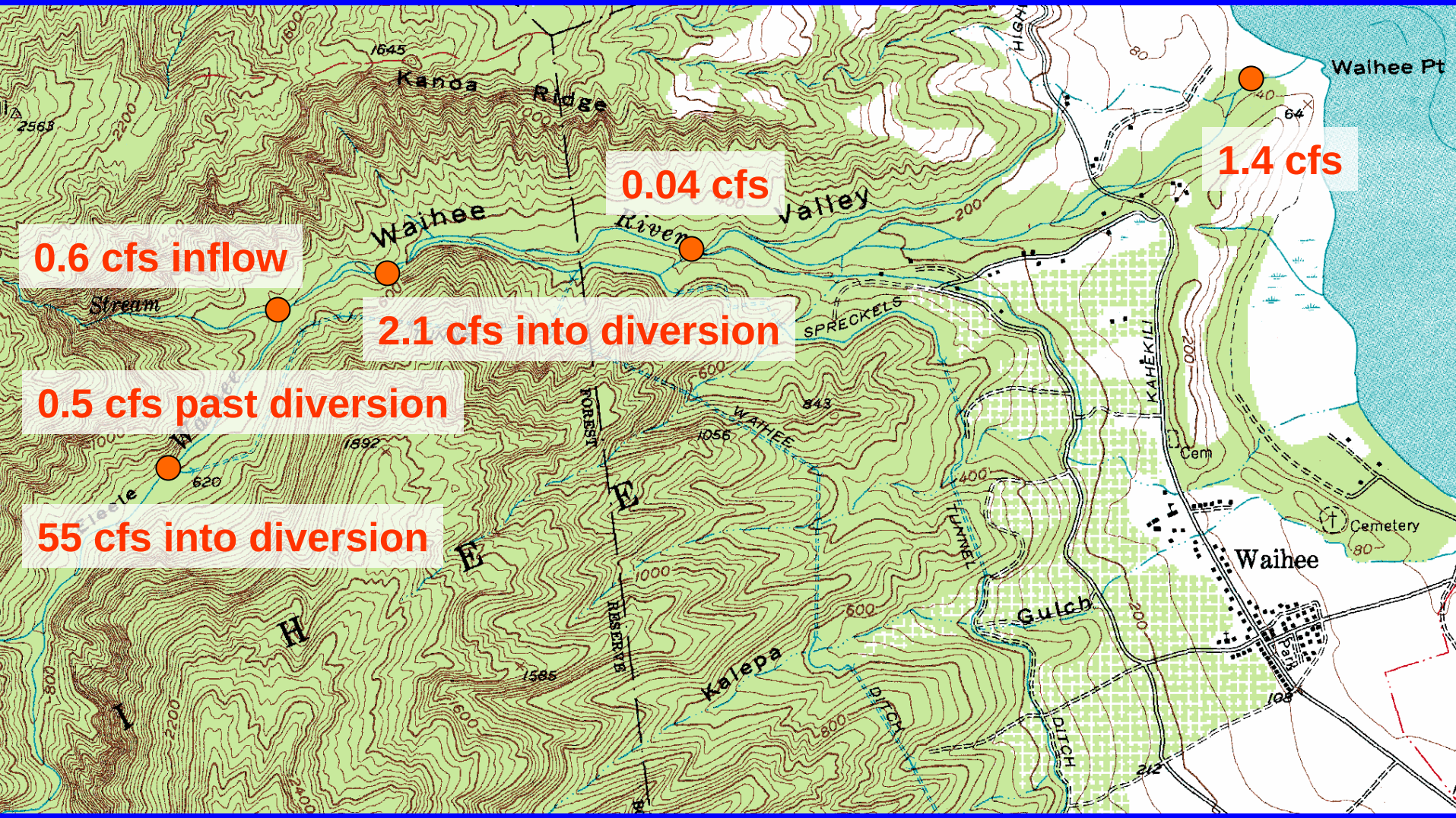
Waihee River flow measurements



June 16, 2004

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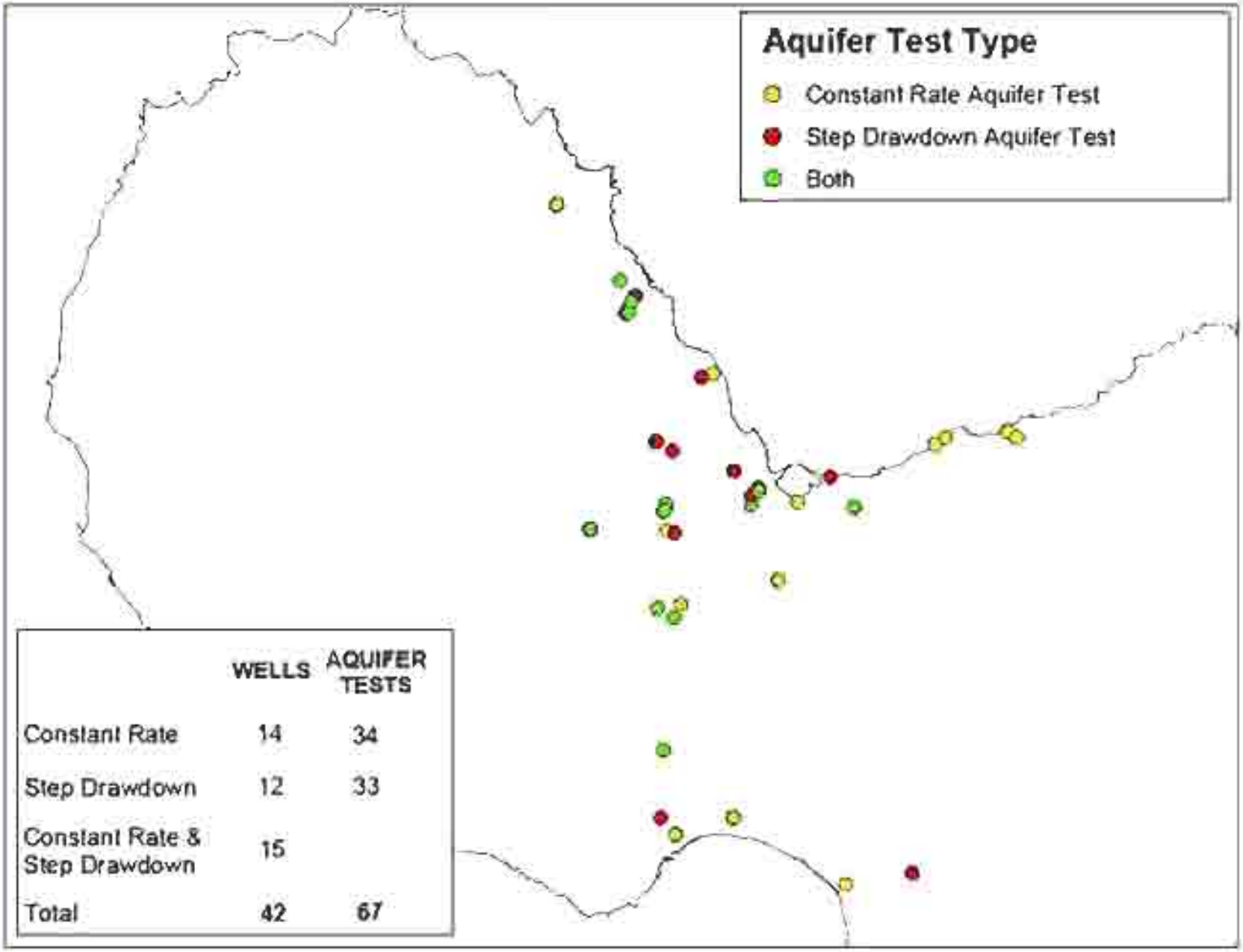

	WELLS	AQUIFER TESTS
Constant Rate	14	34
Step Drawdown	12	33
Constant Rate & Step Drawdown	15	
Total	42	67

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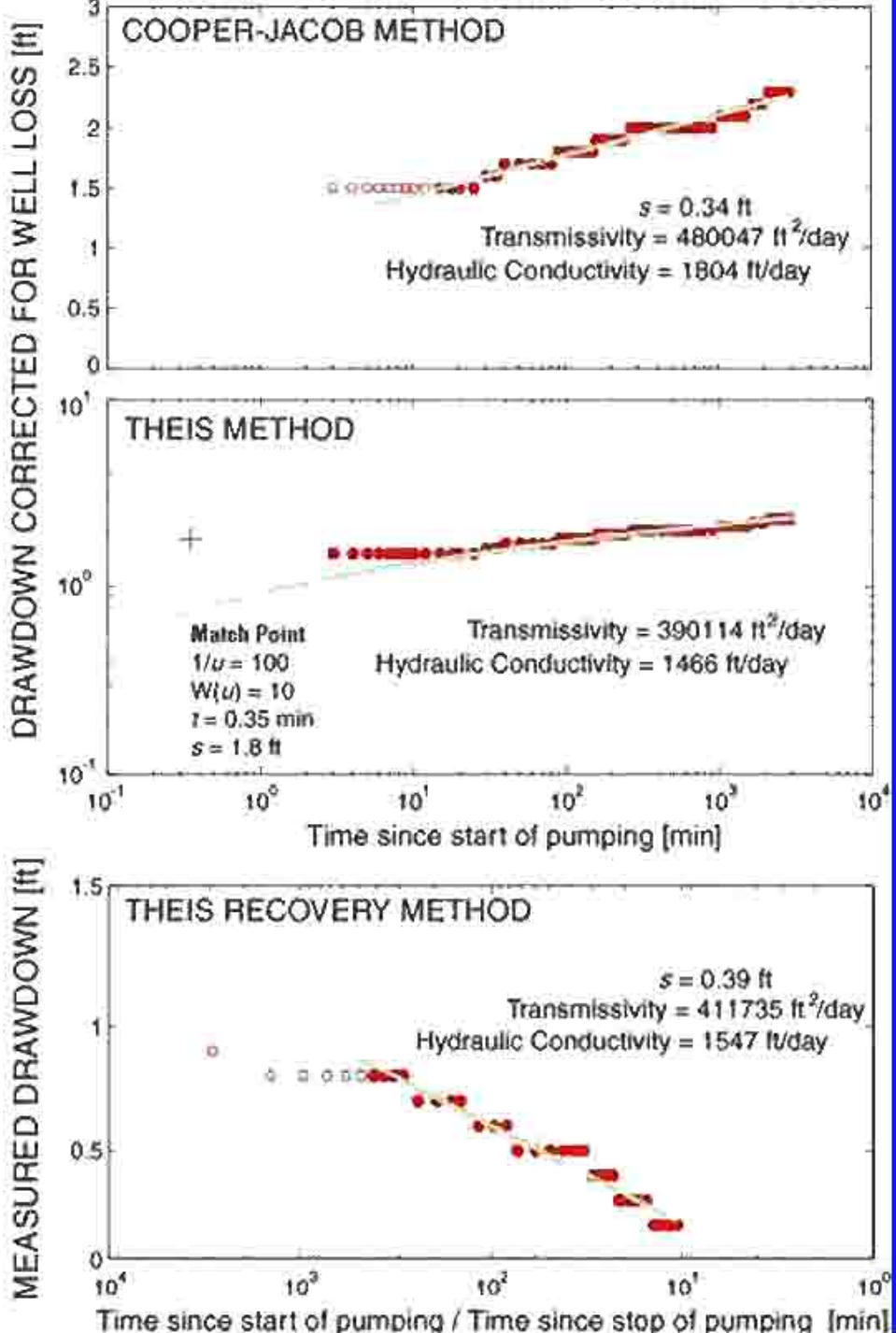
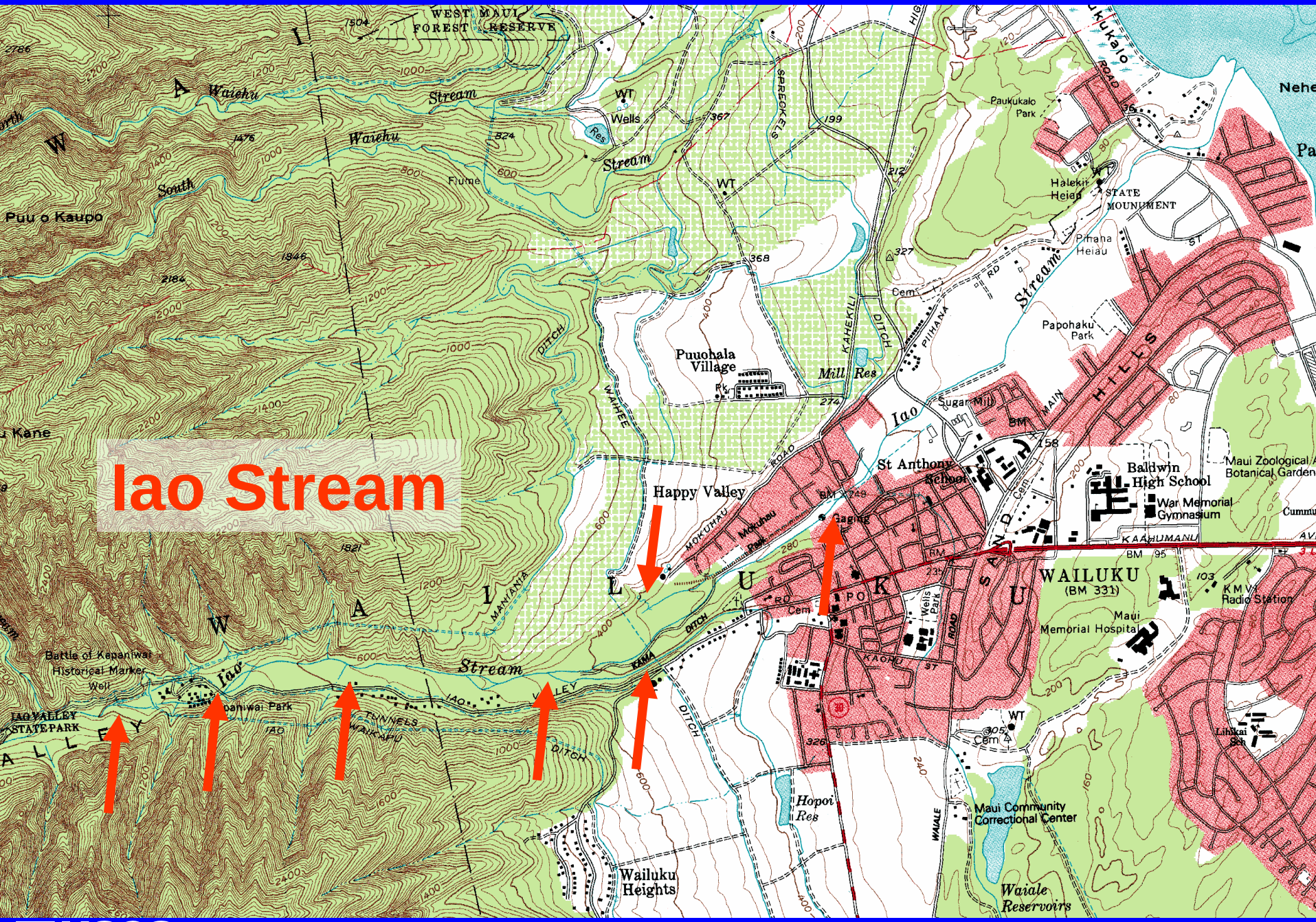
AQUIFER TEST ANALYSIS

for Mokuhau 1 well (6-5330-09), Maui, Hawaii



Plans for the next 6 months

1. Flow measurements on Iao and Waikapu Streams
2. Compile land-use and irrigation data
3. Finish weather station installation
4. Continue ground-water monitoring



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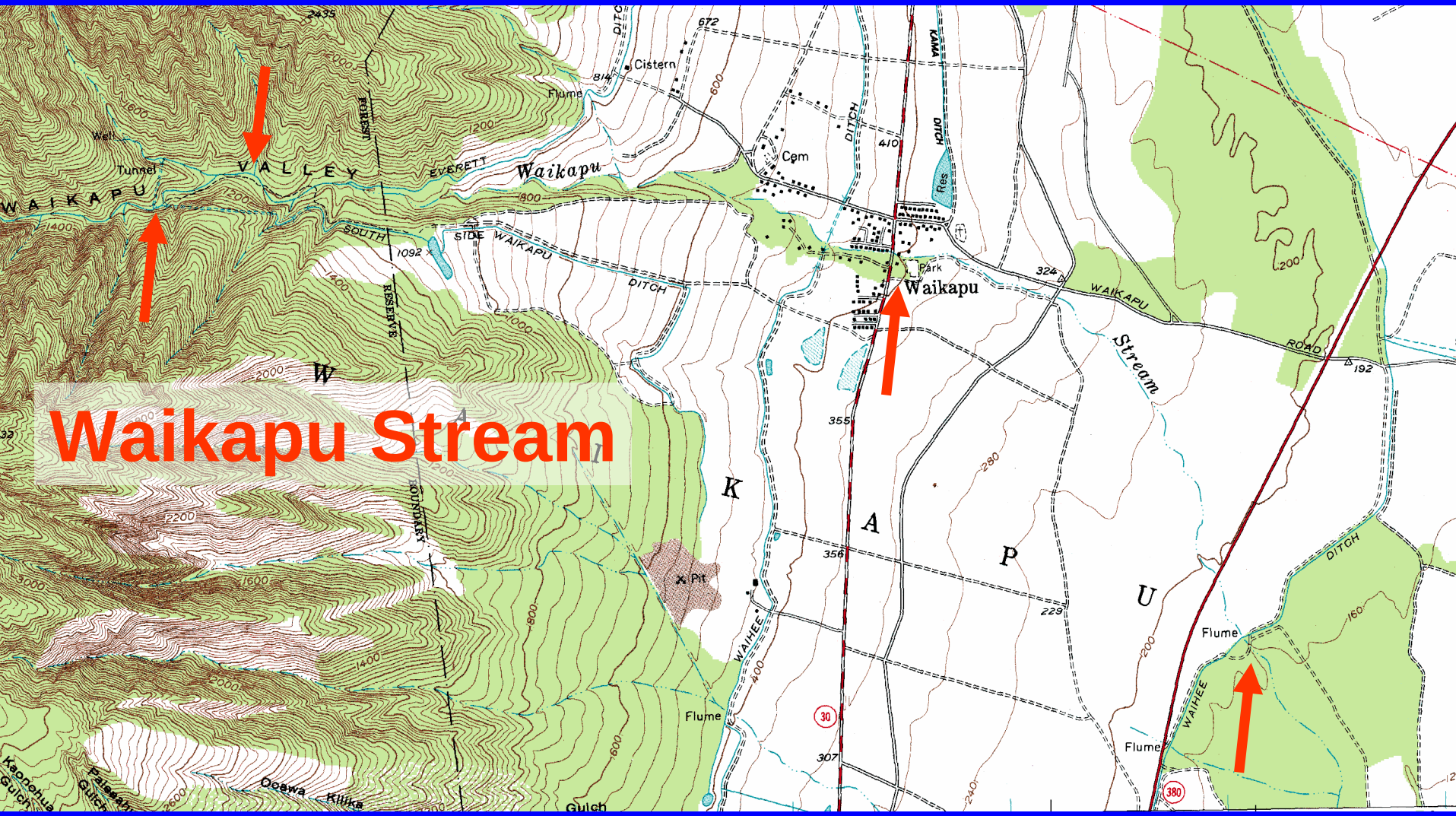

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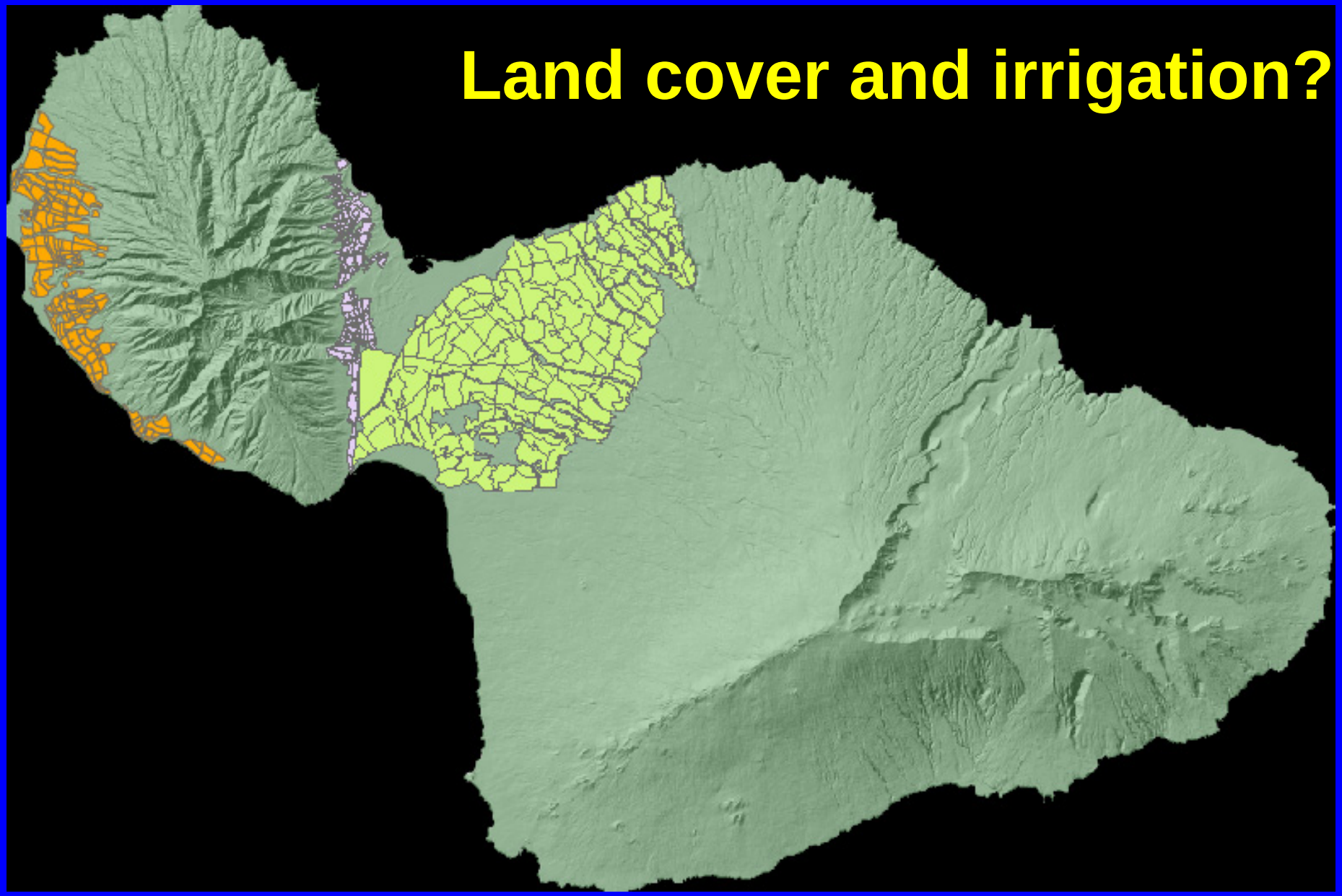
Land cover and irrigation?