

# TELEMETRY SYSTEMS IN CHANNELS

Jordon Navarrot

Reclamation District 108



- ▶ Irrigated Lands 48,000 acres
- ▶ Sacramento River Supply 232,000 acre-feet
- ▶ Earthen Canals 84 miles
- ▶ Concrete Lined Canals 35 miles
- ▶ Pipelines 4 miles
- ▶ Drains 301 miles
- ▶ Levees 90 miles

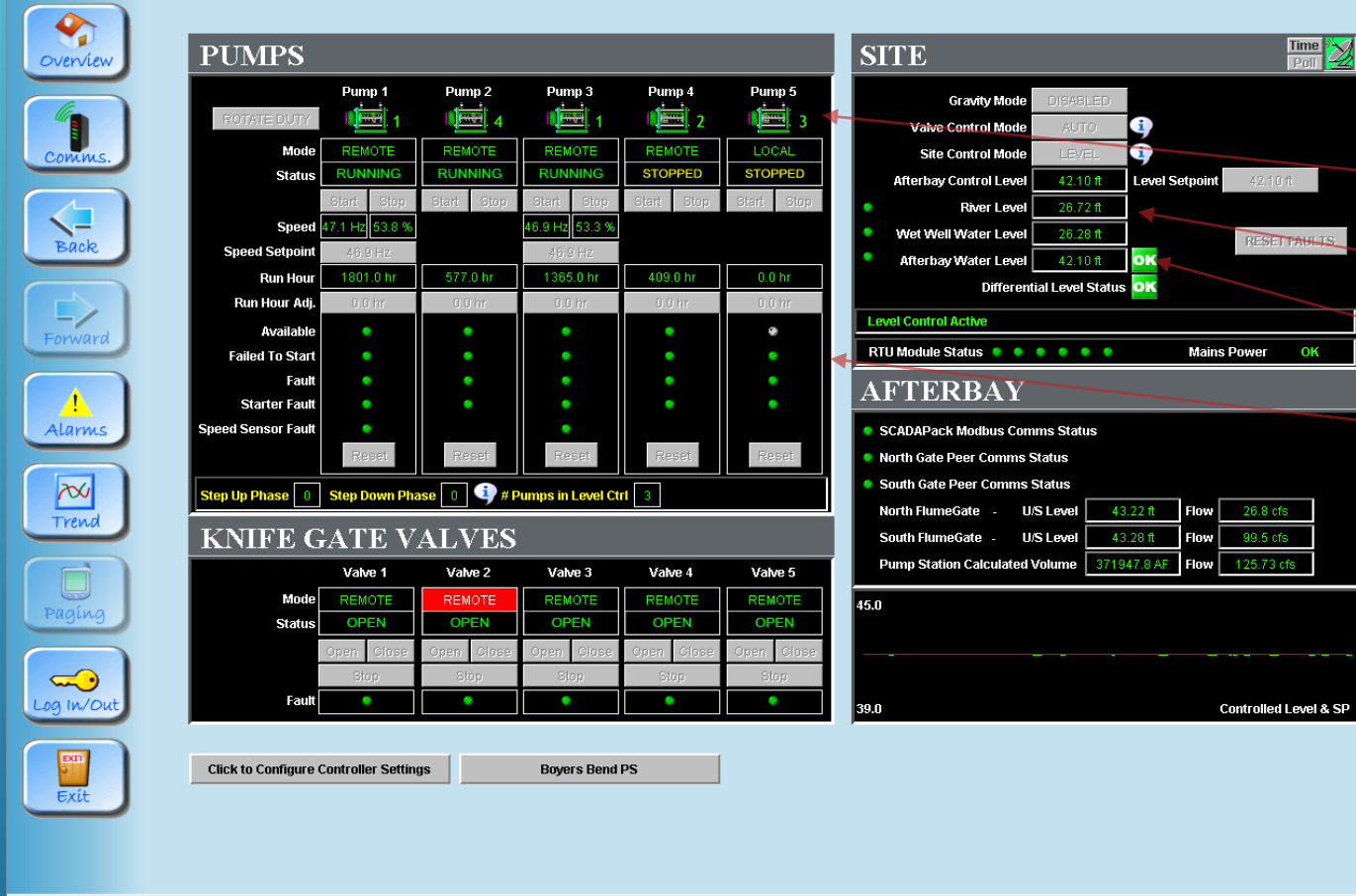
# RECLAMATION DISTRICT 108



- ▶ Constructed in 2008
- ▶ 300 cfs capacity
- ▶ Fish screen

# POUNDSTONE PUMPING PLANT

## EMERY POUNDSTONE PS



Pump status

River Elevation

Canal Elevation

Alarms

Trending

## POUNDSTONE PUMPING PLANT - HMI

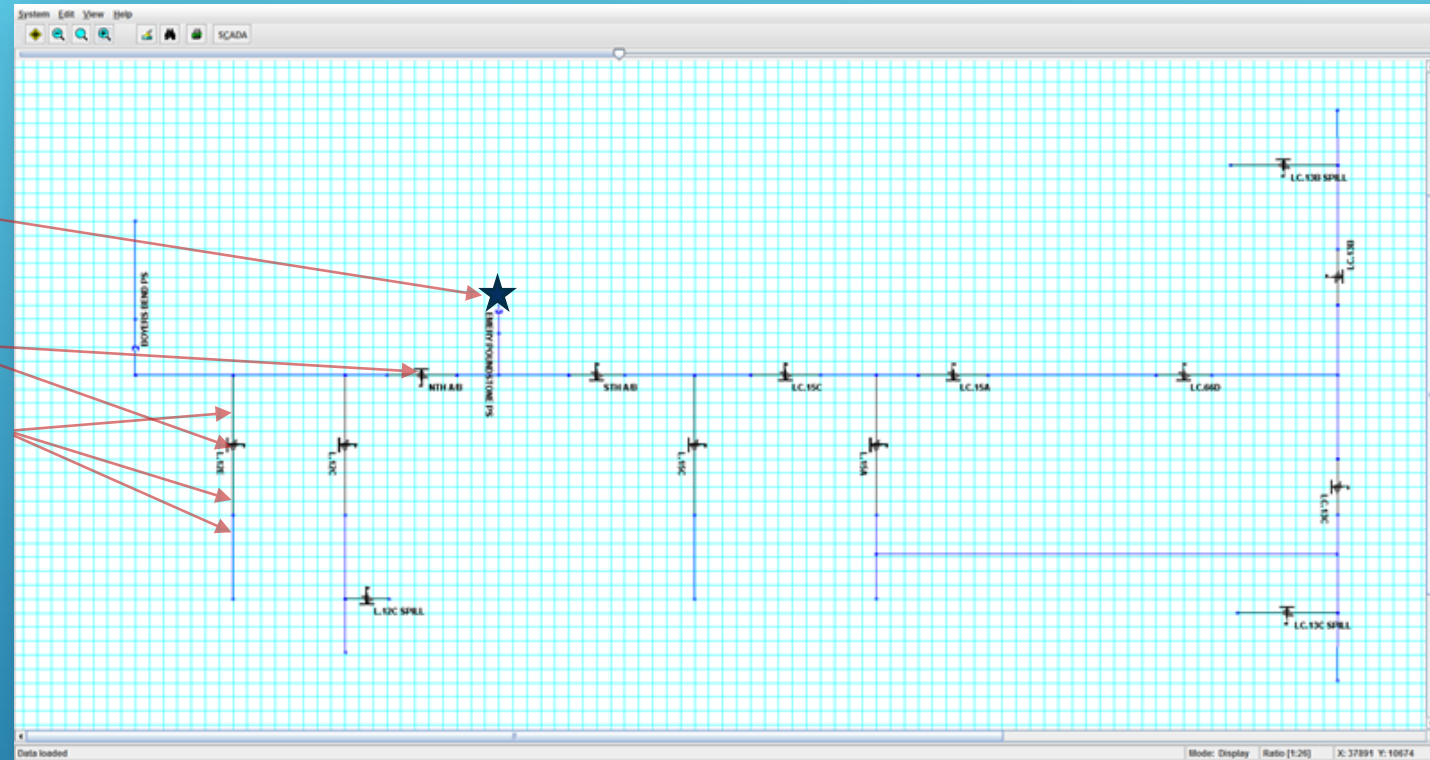




- ▶ Solar powered
- ▶ Mechanically driven
- ▶ Radio communication

## RUBICON FLUMEGATE

- ▶ Poundstone Pumping Plant
- ▶ Rubicon FlumeGates
- ▶ Lateral Deliveries



# RUBICON – SYSTEM DIAGRAM

- ▶ Screw gate in canal
- ▶ Weir box in field
- ▶ Portable velocity sensor

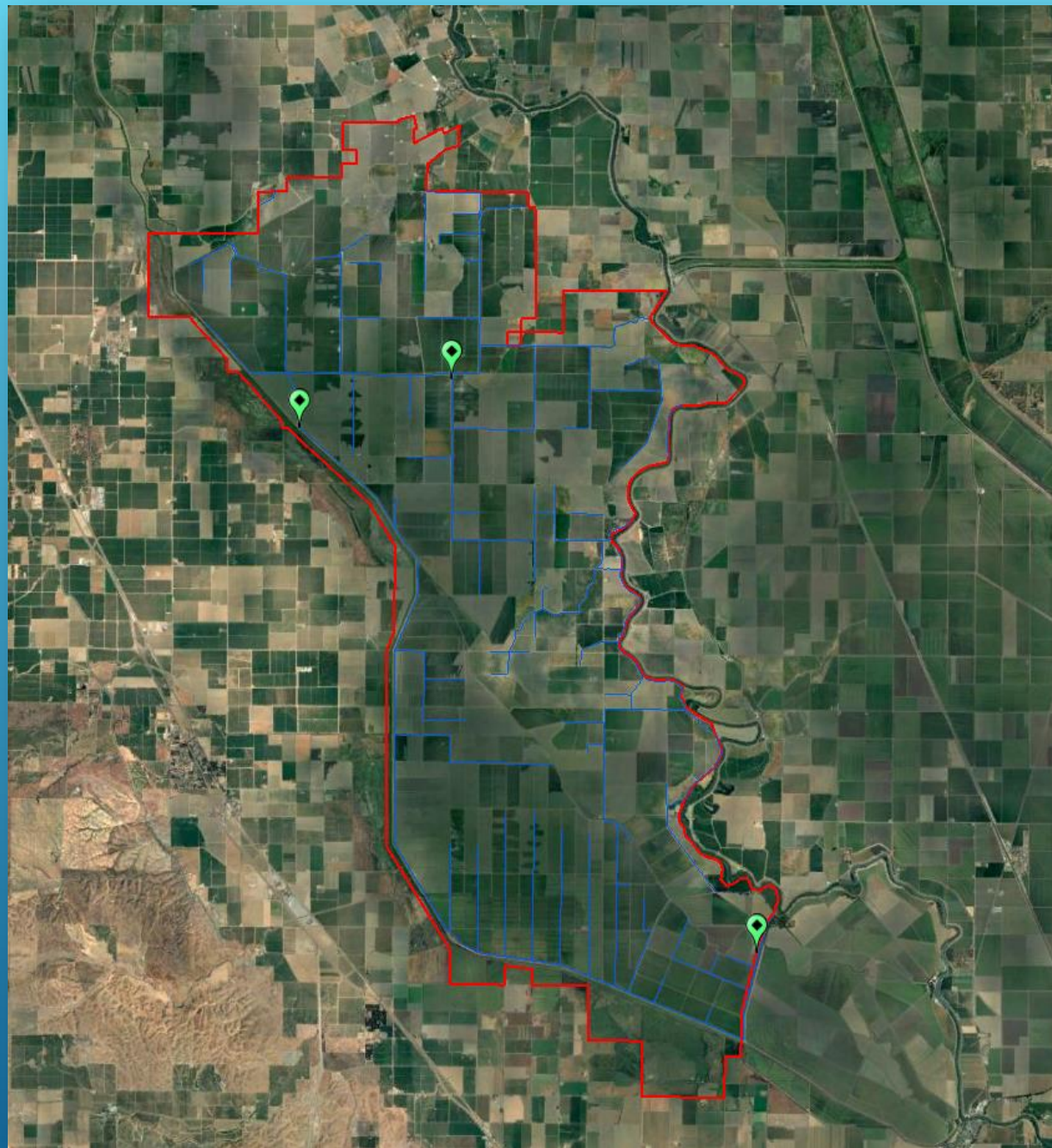


## FIELD DELIVERY



- ▶ Three reuse pumping stations drain water back in to field-delivery canals
- ▶ Reuse totals 60,000 acre feet annually, accounting for nearly 1/3 of the districts total use

## REUSE



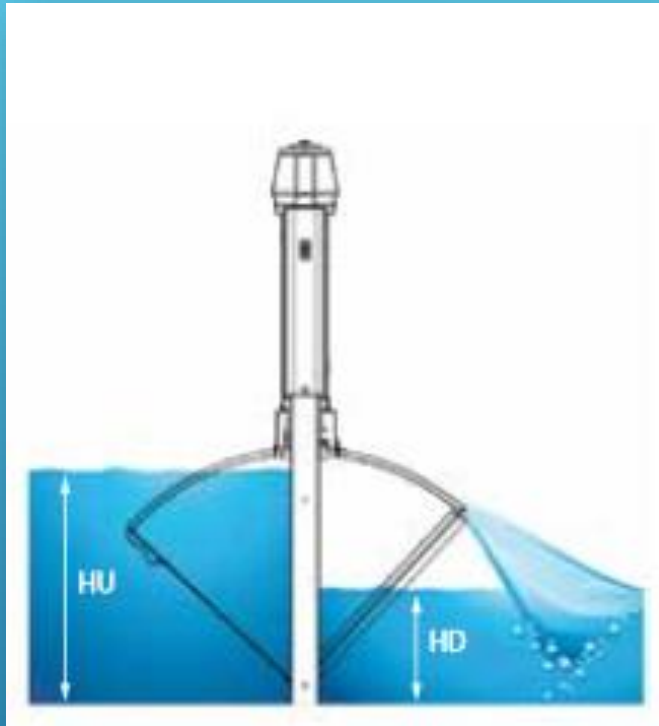




# SYCAMORE SLOUGH REUSE FACILITY

- ▶ Rubicon
- ▶ Telemetry
- ▶ Remote Tracker

## TECHNOLOGIES IN DETAIL



Control objective		Gate action
Local	Position	Moves to a desired set-point and stays there
	Flow	Maintains a constant flow regardless of upstream or downstream levels
	Upstream level	Maintains a desired level in the pool immediately upstream
	Downstream level	Maintains a desired level in the pool immediately downstream

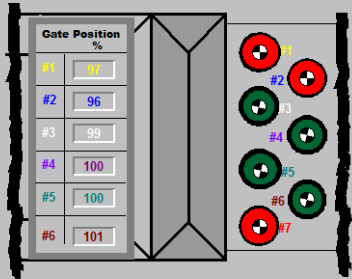
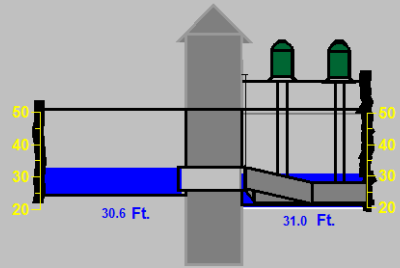
## RUBICON – FLUMEGATE CAPABILITIES





WILKINS SLOUGH PUMPING PLANT

## Wilkins Slough Pumps



Pump Monitoring		
Pump #1	Pump Cycles	258
<input type="button" value="Reset"/>	Pump runtime Hr.	4663:44
Pump #2	Pump Cycles	353
<input type="button" value="Reset"/>	Pump runtime Hr.	3055:51
Pump #3	Pump Cycles	239
<input type="button" value="Reset"/>	Pump runtime Hr.	4683:11
Pump #4	Pump Cycles	229
<input type="button" value="Reset"/>	Pump runtime Hr.	10538:22
Pump #5	Pump Cycles	246
<input type="button" value="Reset"/>	Pump runtime Hr.	10331:10
Pump #6	Pump Cycles	67
<input type="button" value="Reset"/>	Pump runtime Hr.	4516:17
Pump #7	Pump Cycles	48
<input type="button" value="Reset"/>	Pump runtime Hr.	2423:09
Total	Pump Cycles	1440
	Pump runtime Hr.	40211:46

Setup

Power

Operation

Pump Trending

Close

## Wilkins Setup

### Pump Start Timers

#1 10 Sec.

#2 10 Sec.

#3 10 Sec.

#4 0 Sec.

#5 0 Sec.

#6 10 Sec.

#7 10 Sec.

### Level

Current Level 30.59

### Level Control

High Limit 30.62 Ft.

Low Limit 30.52 Ft.

### Gate Control

Gate Move 25 Sec.

Delay 8 Min.

### VFD Control

VFD Step 25 %

Delay 8 Min.

### Alarms

Hi Hi Alarm 30.85 Ft.

Hi Alarm 30.80 Ft.

Lo Alarm 30.40 Ft.

Lo Lo Alarm 30.35 Ft.

Out of Band 7200 Sec.

Sub Comm. 20 Min.

Comm. Delay 00:02:00 HMS

Comm.2 Delay 00:02:00 HMS

### Alarms Active

Off On

### VFD Sequence

Step 1 4

Step 2 5

### Pump Sequence

Step 3 6

Step 4 7

Step 5 3

Step 6 1

Step 7 2

### Sensor Calibration

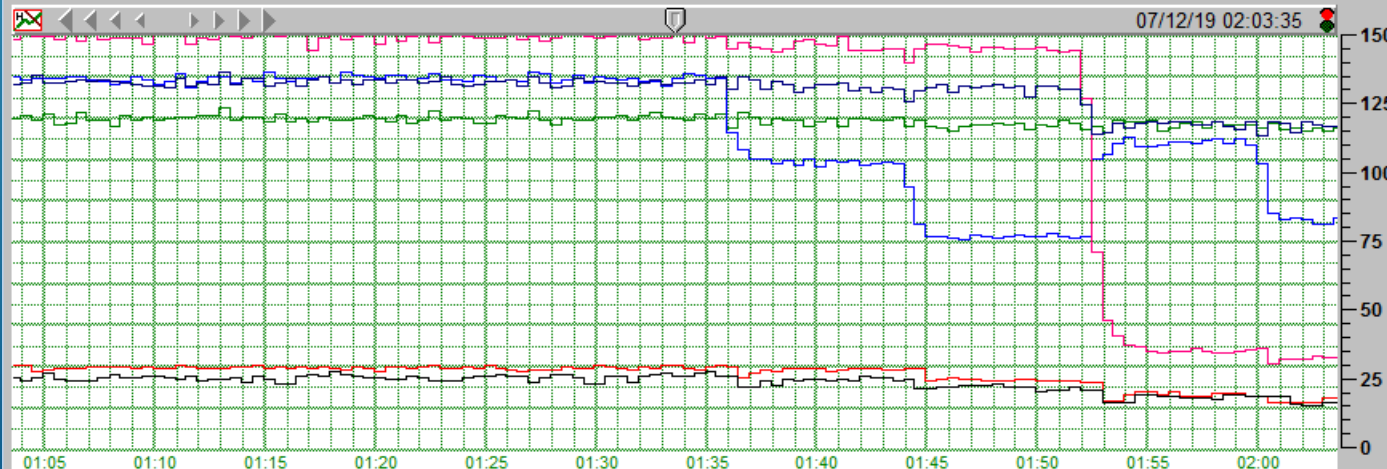
Offset 29700 Div. 14182

Sub Station Trending

Operation

Close

## Wilkin Slough Meter Flow



01:00 Trend Width HH:MM

Close

Introduced in State Senate January 9, 2015 (following drought)

Everyone must file annual use reports

For Diverters >1000 AF/yr - hourly monitoring required on measurement devices.

Devices must meet 15% accuracy requirement (10% if installed after 1/1/16)

Effective Jan. 1 2020:

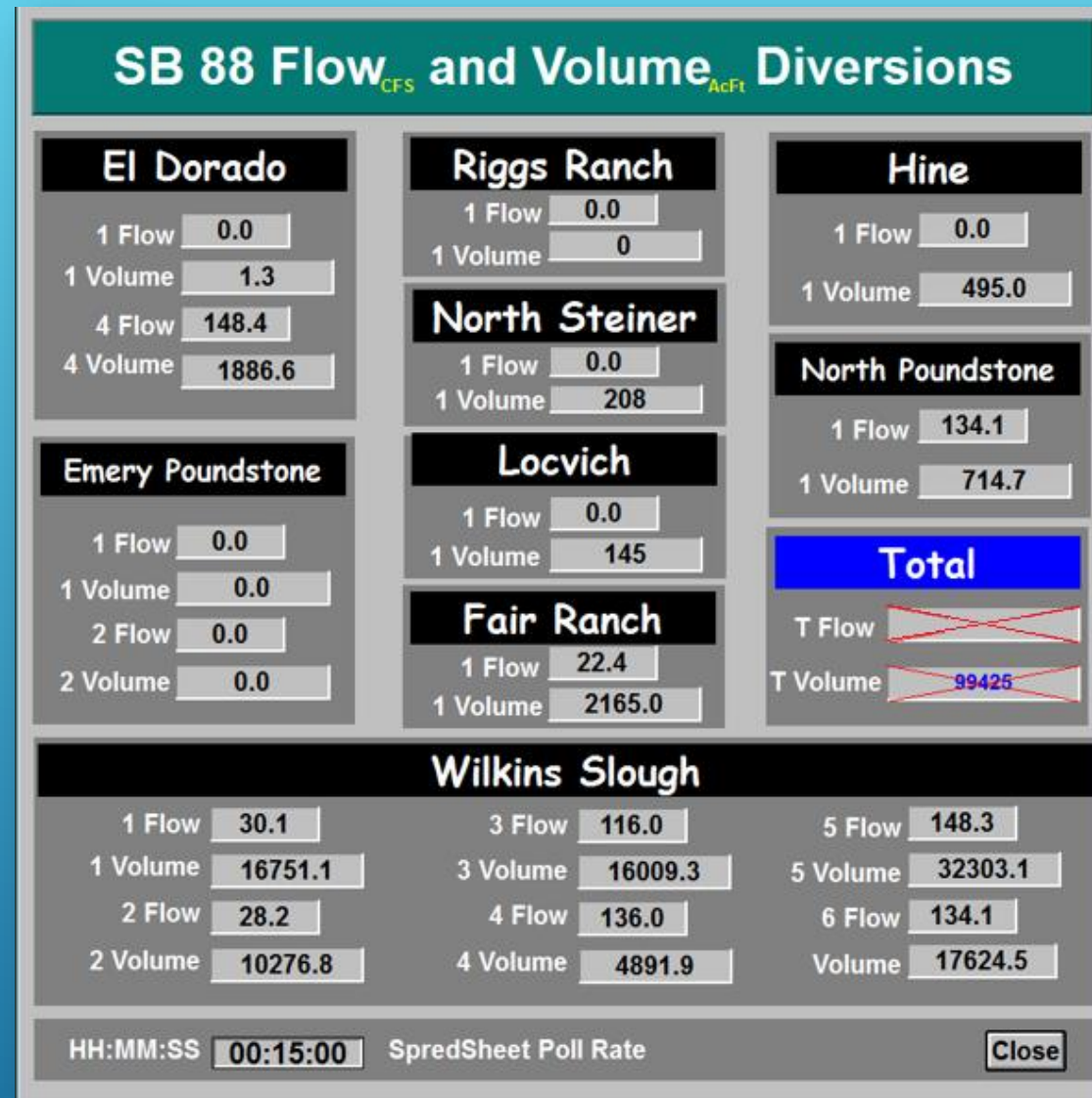
Sites must have telemetry

Data must be posted to a public website

**SENATE BILL 88**  
**(SB 88)**



- ▶ As of 2019:
  - ▶ 100% compliant with 2017 and 2018 objectives
  - ▶ 90% completion of 2020 telemetry requirements
    - ▶ Still working on data transmission from Rubicon

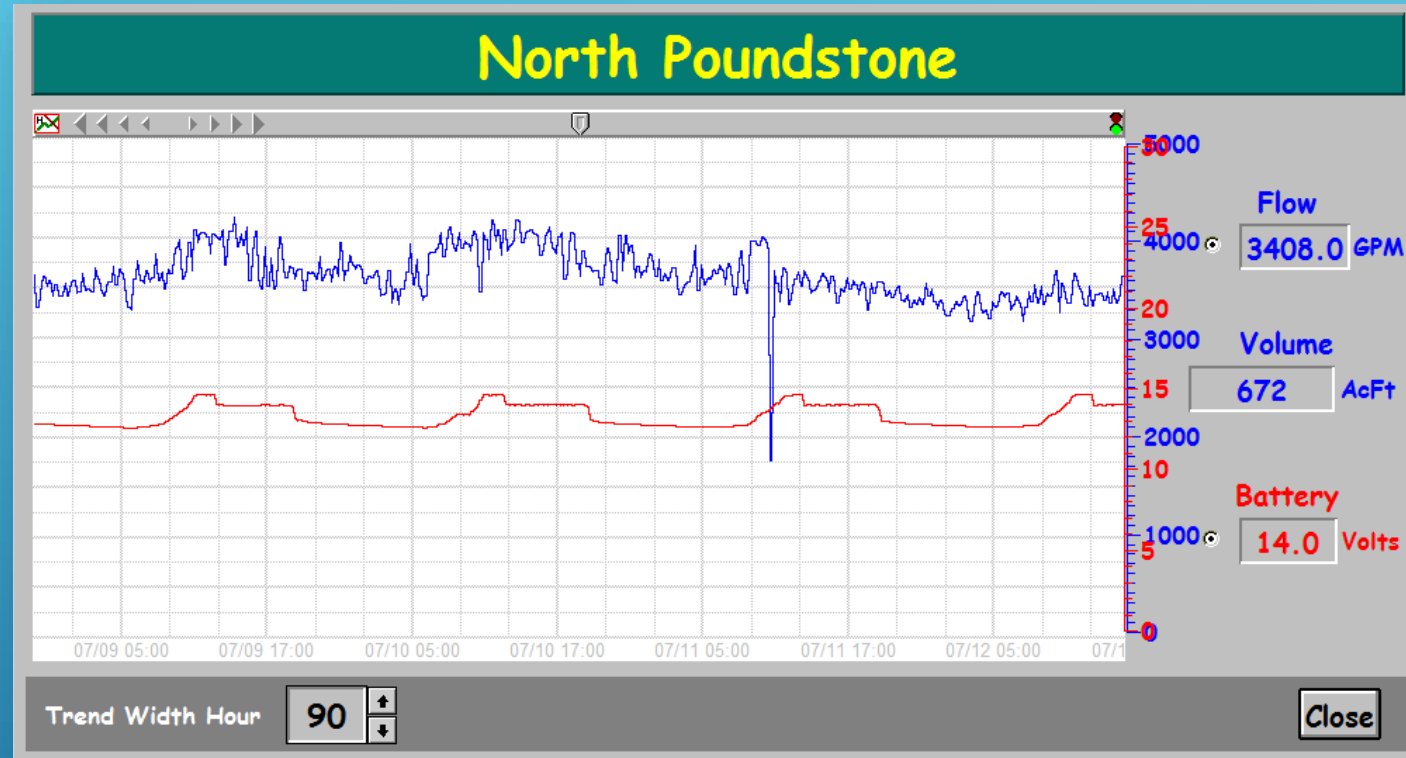


SB 88  
ALL DISTRICT DIVERSIONS HMI

- ▶ Local meter-head for USBR reading
- ▶ 4-20 ma output for communicating flow rate



## SB 88 SINGLE PUMP DIVERSION HARDWARE



SB 88  
SINGLE PUMP DIVERSION HMI



- ▶ California Water Commission adopted July 11, 2012
- ▶ Requires Agencies over 25,000 acres to:
- ▶ Measure the volume of water delivered to customers with sufficient accuracy
  - ▶ Existing device must be +/- 12%
  - ▶ New or replacement device must be:
    - ▶ +/- 5% using laboratory certification
    - ▶ +/- 10% using field verification
- ▶ Adopt a pricing structure for water customers based at least in part on quantity delivered

## FIELD LEVEL MEASUREMENT – SB X7-7



Class I (330 foot range minimum)  
Bluetooth wireless communication  
between computer and water velocity  
sensor.



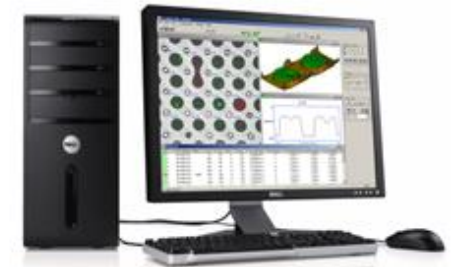
Ruggedized computer mounted in operator  
vehicle acts as windows platform for user  
interface, sensor hub and safe storage for logged  
measurement data.

Global Positioning System (GPS) for  
self-location and site selection





Operator deploys wirelessly controlled water  
velocity sensor in preinstalled mounting  
bracket at delivery outfall.


Automated transfer of data from  
remotes via WWAN to District data  
server. Combined data transferred  
back to remotes.




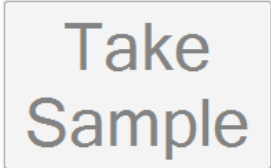
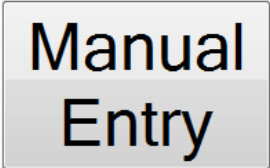
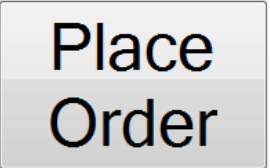
District data server stores farm-gate delivery  
measurement data (either custom developed  
or off-the-shelf database application).

# REMOTE TRACKER

Home Reports  Sensor  GPS Sites





ALL ALL 100DE G1 

Canal: 10S Last Flow: 0.00 cfs  
Last Msmt: 1.1 days Pend. Flow: None

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Autos

Start:  Sample:  Locate:  Alert: 

- ▶ GPS automatically populates measurement site within 300 feet of designated location
- ▶ Bluetooth connects Remote Tracker device to Toughbook
  - ▶ 40 second flow sample

## LAPTOP MEASUREMENT INTERFACE



Home
Reports
Sensor
GPS
Sites

S-A
10R
ALL

Report: Canal Management
Down Stream
Off Deliveries

Period: Today (from 12:00 a.m. until 11:59 p.m.)

Totals(cfs) HDG: 30 CL: 0 LST: 30 ORD: 30 CHG: +0

Rte.	Canal	Name	LST	ORD	CHG	Days	Measurement
S-A	10R	87B G1	3.9	3.9	+0.00	000.0	2018/05/25 12
S-A	10R	86A G2	2.8	2.8	+0.00	002.1	2018/05/23 12
S-A	10R	85F G1	21.6	21.6	+0.00	002.1	2018/05/23 11
S-A	10R	85G G1	2.0	2.0	+0.00	002.2	2018/05/23 09

- Instantaneous access to district-wide delivery flow

# LAPTOP MEASUREMENT INTERFACE

- ▶ All field measurements download to Water Information System(WIS) computer daily for review
- ▶ Volumes computed at WIS transfer to Water Accounting Database when invoices are created

## FIELD LEVEL MEASUREMENT

### REMOTE TRACKER SOFTWARE



Reclamation District Number 108  
975 Wilson Bend Rd  
P.O. Box 50  
Grimes, CA 95950  
Ph: 530.437.2221

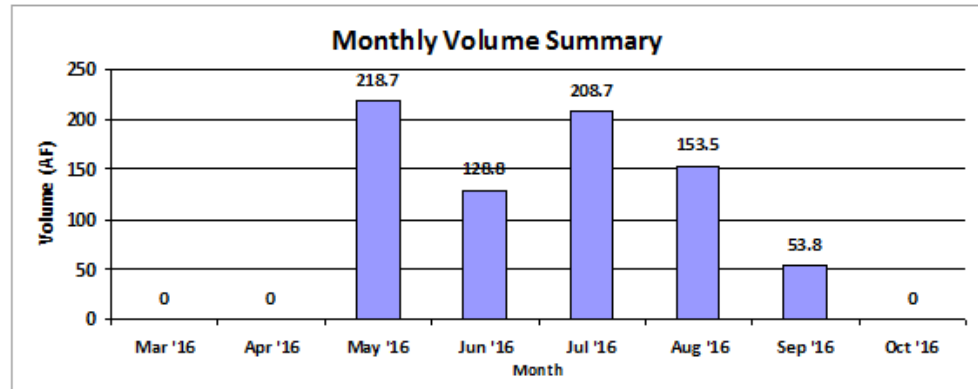
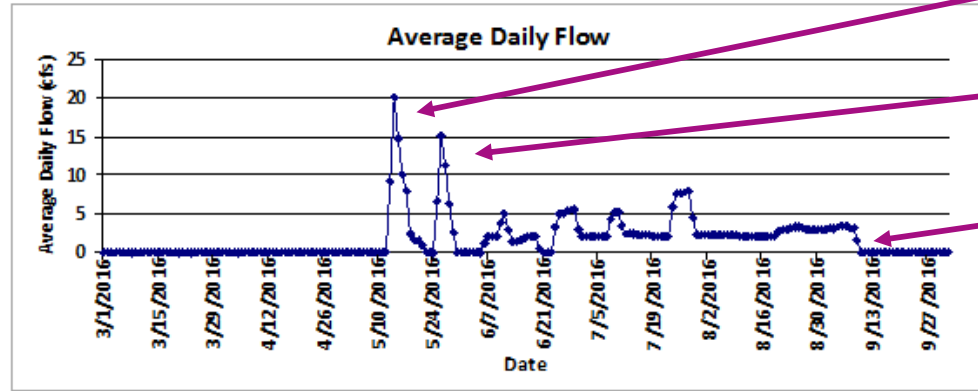
Fx: 530.437.2248

www.rd108.org

Field: Sample

Report Period: 3/1/2016 - 10/1/2016

FieldID	Crop	Volume (AF)	Farmed Acreage	Farmed App (af/ac)	Standby Acreage	Standby App (af/ac)
Sample	Rice	763.3	140	5.45	140	5.45



Note: In cases where a field has multiple turnouts, the field volume is calculated as the sum of the turnout volumes. In cases where one turnout serves two or more fields, the volume measured at the turnout is apportioned to individual fields based on irrigated acreage. Consequently, individual field volume quantities may be different than actual quantities. Average Daily Flow shows average daily delivery rates for the selected field in cubic feet per second (cfs).

Abbreviations: ac - acre; AF - acre-feet; cfs - cubic feet per second; RT - RemoteTracker

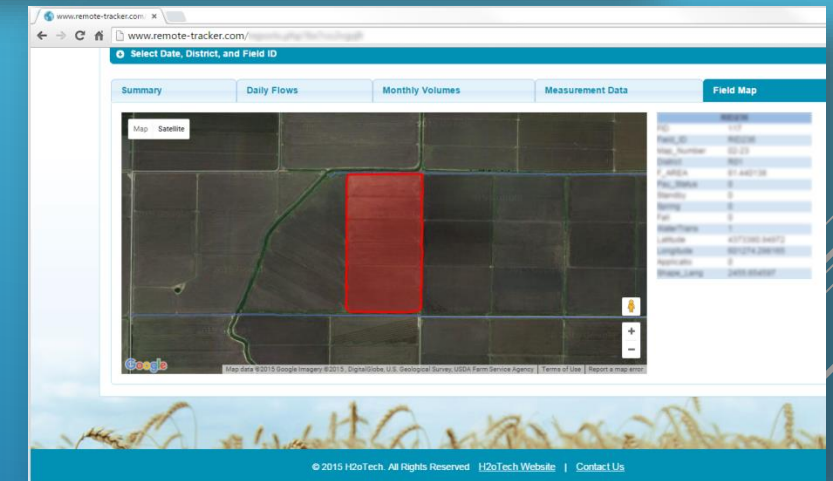
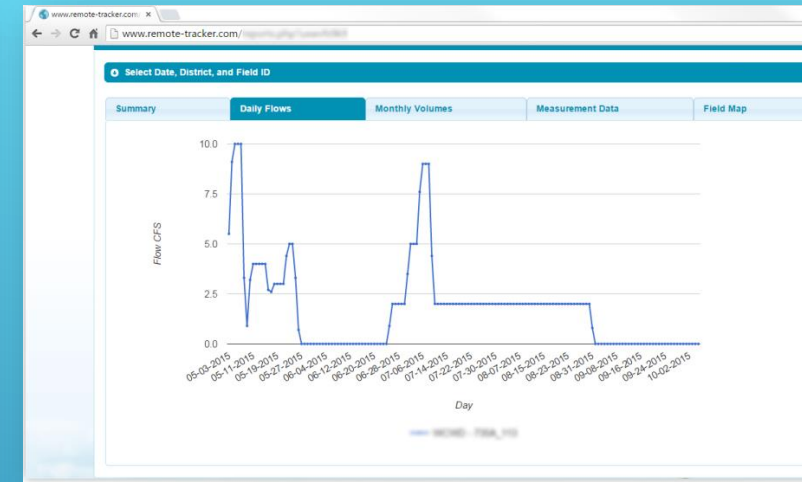
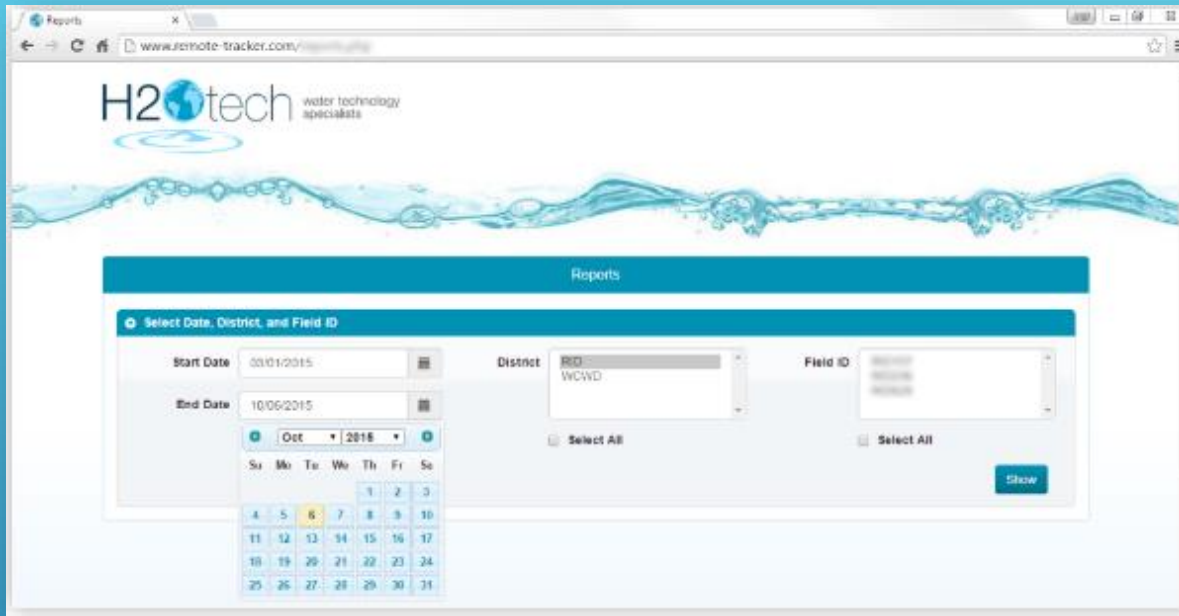
Field: Sample

Report Period: 3/1/2016 - 10/1/2016

### Report Period Measurement Data

SiteID	CommonName	DateTime	Flow (cfs)	Meter (AF)	Method
10P_0931_L01_01	Sample G1	5/13/2016 1:04:08 PM	20.24		RT
10P_0931_L01_01	Sample G1	5/15/2016 11:15:58 AM	9.98		RT
10P_0931_L01_01	Sample G1	5/17/2016 2:01:28 PM	4.96		RT
10P_0931_L01_01	Sample G1	5/18/2016 6:28:18 AM	1.52		RT
10P_0931_L01_01	Sample G1	5/21/2016 12:41:46 PM	0.00		Shutoff
10P_0931_L01_01	Sample G1	5/25/2016 1:29:38 PM	15.10		RT
10P_0931_L01_01	Sample G1	5/27/2016 1:34:36 PM	6.25		RT
10P_0931_L01_01	Sample G1	5/29/2016 9:47:30 AM	0.00		Shutoff
10P_0931_L01_01	Sample G1	6/6/2016 8:43:52 AM	2.04		RT2
10P_0931_L01_01	Sample G1	6/9/2016 1:13:56 PM	1.91		RT2
10P_0931_L01_01	Sample G1	6/10/2016 9:41:16 AM	5.07		RT
10P_0931_L01_01	Sample G1	6/12/2016 10:29:50 AM	1.38		RT
10P_0931_L01_01	Sample G1	6/15/2016 10:41:16 AM	1.69		RT2
10P_0931_L01_01	Sample G1	6/16/2016 8:47:38 AM	1.98		RT
10P_0931_L01_01	Sample G1	6/20/2016 7:11:24 AM	0.00		Shutoff
10P_0931_L01_01	Sample G1	6/24/2016 8:45:24 AM	5.14		RT
10P_0931_L01_01	Sample G1	6/27/2016 11:12:12 AM	5.57		RT
10P_0931_L01_01	Sample G1	6/30/2016 6:15:42 AM	2.13		RT
10P_0931_L01_01	Sample G1	7/3/2016 8:13:34 AM	2.06		RT
10P_0931_L01_01	Sample G1	7/6/2016 7:24:20 AM	1.96		RT
10P_0931_L01_01	Sample G1	7/8/2016 6:06:56 AM	5.15		RT
10P_0931_L01_01	Sample G1	7/11/2016 8:17:16 AM	2.43		RT
10P_0931_L01_01	Sample G1	7/15/2016 11:00:34 AM	2.26		RT
10P_0931_L01_01	Sample G1	7/18/2016 7:19:14 AM	2.12		RT
10P_0931_L01_01	Sample G1	7/21/2016 8:05:04 AM	2.03		RT
10P_0931_L01_01	Sample G1	7/24/2016 7:56:44 AM	7.74		RT
10P_0931_L01_01	Sample G1	7/27/2016 1:47:56 PM	7.94		RT
10P_0931_L01_01	Sample G1	7/29/2016 9:50:58 AM	2.25		RT
10P_0931_L01_01	Sample G1	8/1/2016 3:30:42 PM	2.29		RT2
10P_0931_L01_01	Sample G1	8/6/2016 9:03:40 AM	2.19		RT
10P_0931_L01_01	Sample G1	8/10/2016 1:07:00 PM	2.00		RT2



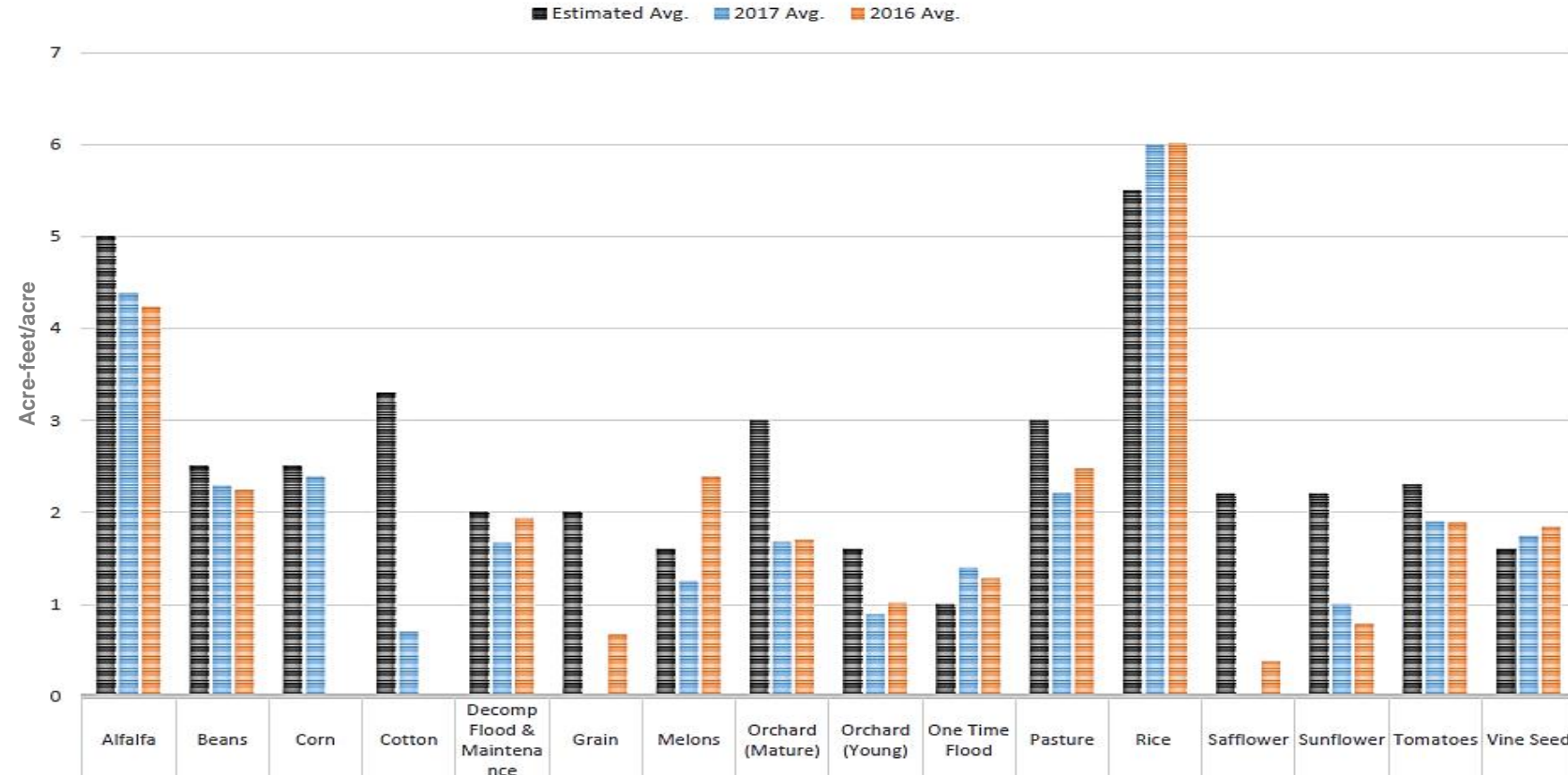


- View real-time water measurement data on a computer or mobile device

# FIELD LEVEL MEASUREMENT

## GROWER ACCESS TO MEASUREMENT DATA

## CROP APPLICATION RATES RD108



- ▶ Adjust crop-duty charge
- ▶ Compare irrigation practices
- ▶ Understand geographical differences

# WATER MEASUREMENT REPORT

## DATA WITH A PURPOSE

- ▶ Rubicon
- ▶ Telemetry
- ▶ Remote Tracker

# QUESTIONS?