Sustainable Groundwater Management Act Workshop

September 2018
Changes in Management & Staff

General Manager
Aaron Fukuda

District Engineer
Bill Sario

Assistant Engineer
Jeremy Barroll
2018 Tulare ID Surface Water Run

101,900 AF
Total Surface Water Diverted to the District

56,000 AF (54%)
Water Delivered to Farm Turnouts

Kaweah River (AF), 41,300

CVP (AF), 60,600

45,900 AF (45%)
Water Delivered for Groundwater Recharge

2017 Water Year:
- Total Surface Water: 400,000 AF
- Farm Turnout: 171,500 AF
- Groundwater Recharge: 220,000 AF
<table>
<thead>
<tr>
<th>Time Period</th>
<th>Description</th>
<th>Solutions</th>
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<tbody>
<tr>
<td>Late 1800’s</td>
<td>Plentiful Underground Supplies, Surface Water Developing but Unstable</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; Way Out: Deeper Wells</td>
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<tr>
<td>1920’s</td>
<td>Running Short</td>
<td>2&lt;sup&gt;nd&lt;/sup&gt; Way Out: Surface Water Projects such as CVP, Terminus Dam, SWP</td>
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<tr>
<td>1940’s</td>
<td>Groundwater Supplies Unstable</td>
<td>3&lt;sup&gt;rd&lt;/sup&gt; Way Out: Capitalize on Wet-Year Surface Water Resources (Groundwater Recharge)</td>
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<tr>
<td>1990’s</td>
<td>CVP/SWP Supplies Eroding &amp; Pumping Accelerates</td>
<td></td>
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<td>2014</td>
<td>Sustainable Groundwater Management Act</td>
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</table>
1922 – 2017 historical depth to groundwater

18’ Increase
Historical Depth to Groundwater In Tulare ID

Tulare Irrigation District

Period of Sustainability???

Acre-Fl

Year

Crop Irrigation Requirement (acre-ft)

Effective Precipitation (acre-ft)

CVP Project Deliveries (acre-ft)

Kaweah & St. Johns Rivers (acre-ft)

Average Depth To Groundwater (ft)

Linear (Average Depth To Groundwater (ft))

0 50 100 150 200 250 300

0 50,000 100,000 150,000 200,000 250,000 300,000 350,000 400,000 450,000 500,000 550,000 600,000 650,000 700,000 750,000

Groundwater Metering Context

- Sustainable Groundwater Management Act (SGMA) §10725.8 Measurement Devices and Reporting
  - May require the use of a water-measuring device
  - All costs of water-measuring device borne by owner/operator
  - May require annual statements from owner/operator
  - May use any other reasonable method for measurement

- Pumping data used for:
  - Annual reporting (aggregated)
  - Tracking of Pumping Allocations
  - Penalties in the event of exceedance of pumping allocations
  - Water budgets

- Other MKGSA members currently measure at the extraction point and at the use
- Tulare Irrigation District must identify a water-measurement method
  - Coordinates with other MKGSA members
  - Coordinates with other Kaweah Sub-Basin members
## Preliminary Metering Options

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<th>Communications Alternatives</th>
<th>Post Processing Alternatives</th>
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<td>• Utilization of Power Records</td>
<td>• LoRa Network</td>
<td>• Waterfind USA</td>
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<td>• Propeller Meters</td>
<td>• Cellular Data Network</td>
<td>• Kii</td>
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<td>• Magmeters</td>
<td>• Field Retrieval</td>
<td>• Storm</td>
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<td>• Satellite Imagery</td>
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District Groundwater Well Survey

- July 2017 – Intern conducted a visual survey of groundwater wells
  - Survey from public roads
  - No groundwater well measurements were taken
  - Approximately 60 groundwater wells had existing meters

<table>
<thead>
<tr>
<th>Groundwater Well Discharge Sizing</th>
<th>6”</th>
<th>8”</th>
<th>10”</th>
<th>12”</th>
<th>Unknown</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>92</td>
<td>292</td>
<td>204</td>
<td>12</td>
<td>177</td>
<td>777</td>
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</tbody>
</table>
Utilization of Energy Records

- Utilizing energy bills and pump characteristics you can estimate groundwater pumping
- Subject to accurately knowing pumping depth and pump efficiency
- Accuracy Range: 7-10% +/-
- Implementation through District efforts or vendor (PowWow Energy)
- Cost Estimate
  - Development: $160,000 to $250,000
  - Annual: $330,000+
Propeller Meters

- Velocity of water rotates propeller that turns shaft that creates pulse
- Totalizer/registers indicate flow and volume
  - Can be outfitted with elec. output signals
- Wear and tear lead to mechanical failures
  - Requires robust maintenance program
- Accuracy: ± 2%
  - Straight pipe requirement upstream and downstream
  - Straightening vanes can improve accuracy
- Implementation
  - Landowner Installation
  - District Installation
- Maintenance Program is critical
- Cost Estimate
  - Development Costs: $4.36 million
  - Annual Costs: $250,000
Magmeters

- Water moves through a magnetic field creating a voltage that is proportional to the velocity of the water
  - Voltage is converted to flow and volume
  - Transmitter converts signal for output
- Must be installed with straight pipe requirements upstream and downstream
- Accuracy: +/- 1% or less
- Flanged or Insertion Alternatives
- Cost Estimate
  - Development Costs: $3.32 million
  - Annual Costs: $150,000
Satellite Imagery

- KDWCD ET Study
  - Crop ET determined by remote (satellite imagery)
  - Using Crop Consumptive Use Fraction (CCUF) they could model the pumping extractions
  - Aggregated accuracy at approximately 7%

- Cal Poly ITRC
  - Using same approach to determine ET
  - Use the Crop ET to establish a consumptive allocation
    - Not vetted or approved by DWR

- Costs Estimate
  - Development Costs: $60,000 - $100,000
  - Annual Costs: $10,000 - $40,000
Data Acquisition

Field Acquisition
- District Staff field collects data from 800 wells
- Data can be physically field recorded or downloaded
- Fairly time intensive operation by a dedicated staff

LoRa Network
- Long range, low power, cost effective wireless network
- Central Valley Senet network
- Battery powered (7-10) Years

Cellular Network
- Verizon network with modems for each well
- Monthly data charges (expensive)
- Equipment costs are fairly expensive
Post-Processing Software

- Once a method is identified for measuring or estimating groundwater pumping how do you maintain and display the information?
- No SGMA specific software developed
- Researched:
  - Waterfind USA
  - Kii
  - STORM
Groundwater Measurement Demonstration Project

- Phase 1 – Identify Demonstration systems for measurement of groundwater extraction
- Phase 2 – Develop and present Groundwater Measurement 2018/19 Demonstration Scope of Work and Budget
- Phase 3 – Acquire demonstration units
- Phase 4 – Install demonstration units on voluntary wells

Ph 1
Nov 2018 - Jan 2019

Ph 2
Feb 2019

Ph 3
Mar 2019

Ph 4
Mar.-Apr. 2019

Ph 5
Summer 2019

Ph 6
Sept. 2019

Ph 7
Dec. 2019
The Tulare ID Solutions

**Groundwater Recharge Basins**
- Martin Basin, Swall Basin, Cordeniz Basin, Okieville Basin
- Total = 230 Acres

**On-Farm Recharge**
- Grower participation in on-farm Recharge: 2017 had 600 Acres and achieved 6,800 AF in 3 months
- GRAT Tool and Crop Buy-Out Program

**Surface Water Storage Projects**
- Temperance Flat Reservoir & McKay Point Reservoir

**Groundwater Market**
- Groundwater credit program to allow for the marketing of credits for ability to forgo groundwater pumping
Thank You