Today’s Workshop Agenda

1. Introductions
2. SGMA and Cawelo GSA Updates
3. Groundwater Model
4. Groundwater Budget
5. Native and Sustainable Yields
6. Allocation Concepts
7. Minimum Groundwater Levels
8. Survey
Introductions

• General Manager – David Ansolabehere
• Board of Directors
• CGSA & CWD Staff
• Legal Counsel
• Consultants
  o Todd Groundwater
  o Hamilton Resource Economics
There are 10 GSAs in the Kern County Subbasin

1. Buena Vista WSD
2. Cawelo GSA
3. Greenfield County
4. Henry Miller WD
5. KGA GSA
6. Kern River GSA
7. McFarland GSA
8. Olcese GSA
9. Pioneer GSA
10. Semitropic WSD
11. West Kern WD
SGMA & Cawelo GSA Updates

- Kern Groundwater Authority GSA is Largest in our Subbasin
  - Umbrella GSA for most water districts and some GSAs, and each entity will have a “chapter” within the umbrella GSP
  - Cawelo GSA is a member of the KGA GSA and will have its own chapter
  - Coordination occurring within KGA and its members

- Other Non-KGA GSAs
  - Other GSAs are developing their own independent GSPs
  - The KGA GSA and other GSA are required to coordinate and submit a coordination agreement with their GSPs
  - Most key coordination issues (such as basin water budget, sustainable yield, monitoring network and data management) remain unresolved but all GSAs are participating in regular meetings and meeting with subgroups.

- SGMA Coverage for Non-Districted Areas
  - Kern County no longer managing non-districted areas (“white land” areas)
  - Need KCWA and water districts to provide coverage through KGA or otherwise State gets involved
SGMA & Cawelo GSA Updates

- Cawelo GSA is preparing to modify GSA boundary to incorporate some White Land area
- Expanded area includes agriculture, open land, and oilfields
SGMA & Cawelo GSA Updates

Current Cawelo GSA 45,574 Acres
White Land Area up to 20,883 Acres
New Cawelo GSA Area 64,901 Acres

- Minimal Water Demand in White Land Area
- If assume a max of 2 inch/acre water demand, that equates to 0.17 AF/acre

- Expanded Area landowners/operators are required to sign a Land Inclusion Agreement with Cawelo GSA
- Executing a Joint Powers Agreement with County of Kern to provide authority to cover White Land areas
- Move forward with GSA boundary modification with DWR and in coordination with the KGA and KRGSA
Groundwater Model

• Water Budget Model for the Subbasin
  • SGMA requires a basin level water budget for surface and groundwater supplies
  • Todd Groundwater was contracted through the KRGSA to develop the model for the entire basin
  • Used DWR’s C2VSim model that covers the Central Valley and refined it to better fit the conditions of the southern end of the valley
  • Data was provided by water districts, local agencies, GSAs, and obtained from many other publicly available sources
  • Model was peer reviewed by Woodard and Curan
  • The model only represents volumes of water entering and leaving the basin and the change in aquifer storage. It does not consider or determines who “owns” the water.

• The Model is not perfect and can’t account for every potential variable that impacts a basin water budget. It will never be perfect but will continue to be refined and improved
Groundwater Model
## Groundwater Model
(For Years 1995-2014)

### Basin GW Budget

<table>
<thead>
<tr>
<th>Model Outputs</th>
<th>Annual Averages (AF/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Percolation</td>
<td>1,195,814</td>
</tr>
<tr>
<td>Managed Recharge and Seepage</td>
<td>532,401</td>
</tr>
<tr>
<td>Net GW/SW Interactions</td>
<td>106,969</td>
</tr>
<tr>
<td>Subsurface Inflow</td>
<td>17,680</td>
</tr>
<tr>
<td>Subsurface Outflow</td>
<td>-90,844</td>
</tr>
<tr>
<td>GW Pumping</td>
<td>-2,041,218</td>
</tr>
<tr>
<td>Change in GW Storage</td>
<td>-279,198</td>
</tr>
</tbody>
</table>

- Irrigation return flows and precipitation
- GW banking, intentional recharge, system seepage
- Natural water channel seepage
- Basin boundary conditions – East, West, and South
- Basin boundary conditions – North
- Calculated value to balance Supply/Demand
- Average annual groundwater overdraft
## Groundwater Model
(For Years 1995-2014)

### Agriculture Water Budget

<table>
<thead>
<tr>
<th>Model Outputs</th>
<th>Annual Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated Ag. Acres</td>
<td>786,641</td>
</tr>
<tr>
<td>Crop Water Requirement</td>
<td>-2,143,264</td>
</tr>
<tr>
<td>Ag. Surface Water Deliveries</td>
<td>1,351,909</td>
</tr>
<tr>
<td>Precipitation Infiltration</td>
<td>448,180</td>
</tr>
<tr>
<td>Net GW Consumption</td>
<td>-343,175</td>
</tr>
</tbody>
</table>

- **Total farmed acres in the basin**: 786,641
- **Average crop water consumption**: -2,143,264
- **Surface water delivered to crops**: 1,351,909
- **Precipitation total that infiltrates the 786,641 acres**: 448,180
- **Annual GW deficit due to agriculture beyond return flows from all surface inputs**: -343,175

**Agricultural demand on GW = 0.44 AF/Acre**
## Groundwater Model
(For Years 1995 - 2014)

### Urban GW Budget

<table>
<thead>
<tr>
<th>Model Outputs</th>
<th>Annual Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Area</td>
<td>96,449</td>
</tr>
<tr>
<td>Urban Indoor Use</td>
<td>-59,349</td>
</tr>
<tr>
<td>Urban Outdoor Use</td>
<td>-92,506</td>
</tr>
<tr>
<td>Urban Surface Water Deliveries</td>
<td>38,292</td>
</tr>
<tr>
<td>Precipitation</td>
<td>38,146</td>
</tr>
<tr>
<td>Net GW Consumption</td>
<td>-75,417</td>
</tr>
</tbody>
</table>

- **Total urban area acres in the basin**
- **Water usage for residential, commercial & industrial**
- **Water used for outdoor irrigation**
- **Surface water delivered for water service**
- **Precipitation total over the 96,449 acres**
- **Annual GW deficit due to urban use beyond urban return flows**

**Urban demand on GW = 0.78 AF/Acre**
## Cawelo Groundwater Model
(For Years 1995-2014)

### Preliminary CWD GW Budget

<table>
<thead>
<tr>
<th>Model Outputs</th>
<th>Annual Averages (AF/Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deep Percolation</td>
<td>54,173</td>
</tr>
<tr>
<td>Managed Recharge and Seepage</td>
<td>6,213</td>
</tr>
<tr>
<td>Net GW/SW Interactions</td>
<td>8,575</td>
</tr>
<tr>
<td>Subsurface Inflow</td>
<td>42,471</td>
</tr>
<tr>
<td>Subsurface Outflow</td>
<td>-50,398</td>
</tr>
<tr>
<td>GW Pumping</td>
<td>-75,739</td>
</tr>
<tr>
<td>Change in GW Storage</td>
<td>-14,705</td>
</tr>
</tbody>
</table>

- Irrigation return flows and precipitation
- GW banking, intentional recharge, system seepage
- Poso creek channel seepage
- Subsurface flows generally from the East and South
- Subsurface flows generally to the West and North
- Calculated value to balance Supply/Demand
- Average annual groundwater overdraft
Cawelo Groundwater Model  
(For Years 1995-2014)

Preliminary CWD Ag. Water Budget

<table>
<thead>
<tr>
<th>Model Outputs</th>
<th>Annual Averages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Irrigated Ag. Acres</td>
<td>33,196</td>
</tr>
<tr>
<td>Crop Water Requirement</td>
<td>-99,724</td>
</tr>
<tr>
<td>Ag. Surface Water Deliveries</td>
<td>68,490</td>
</tr>
<tr>
<td>Precipitation Infiltration</td>
<td>21,291</td>
</tr>
<tr>
<td>Net GW Consumption</td>
<td>-9,943</td>
</tr>
</tbody>
</table>

Total farmed acres in CWD

Average crop water consumption

Surface water delivered to crops

Precipitation total that infiltrates the 33,196 acres

Annual GW deficit due to agriculture beyond return flows from all surface inputs

Agricultural demand on GW = 0.30 AF/Acre
Cawelo Groundwater Model  
(For Years 1995-2014)

Preliminary Urban GW Budget

<table>
<thead>
<tr>
<th>Model Outputs</th>
<th>Annual Averages</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban Area</td>
<td>229</td>
<td>Total urban area acres in the CWD area</td>
</tr>
<tr>
<td>Urban GW Pumping</td>
<td>-391</td>
<td>Domestic and commercial water use</td>
</tr>
<tr>
<td>Urban Surface Water Deliveries</td>
<td>0</td>
<td>Surface water delivered for water service</td>
</tr>
<tr>
<td>Precipitation</td>
<td>124</td>
<td>Precipitation total over the 229 acres</td>
</tr>
<tr>
<td>Infiltration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net GW Consumption</td>
<td>-267</td>
<td>Annual GW deficit beyond urban return flows</td>
</tr>
</tbody>
</table>

Urban demand on GW = 1.17 AF/Acre
# Cawelo’s Water Budget - DRAFT

<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Cawelo GSA Area</td>
<td>45,574 Acres</td>
</tr>
<tr>
<td>Surface Water Delivered per Year</td>
<td>68,490 AF</td>
</tr>
<tr>
<td>Precipitation Infiltration</td>
<td>29,167 AF (@60% = 17,501)</td>
</tr>
<tr>
<td>Managed and Natural Recharge</td>
<td>9,200 AF *</td>
</tr>
<tr>
<td>ET Demand for Entire GSA Area</td>
<td>108,956 AF</td>
</tr>
<tr>
<td>Net GW Demand</td>
<td>-2,099 AF (-13,766 AF)</td>
</tr>
</tbody>
</table>

Annual GW deficit demand from 2,000 to 14,000 AF per year
Native and Sustainable Yields

Native Groundwater Yield
- The basin groundwater supply that comes from natural recharge such as subsurface flows into the basin and precipitation infiltration within the basin ()
- Recharge from small watersheds and streams (non-appropriated or permitted waters) (?)
- Does not include surface water stored in the ground such as irrigation return flows or banked water

Sustainable Yield
- The amount of GW that can be pumped without causing undesirable results, exceeding minimum GW thresholds and meets sustainability goals
- Can be inclusive of surface water stored in the ground, irrigation return flows and native yield

SGMA requires the Groundwater Sustainability Plan to establish a Sustainable Yield for the Basin
Native and Sustainable Yields

• The GSAs and GSP participants are currently discussing moving forward with a range for the initial Sustainable Yield

• Potential Sustainable Yield range of 0.25 AF/Acre to 0.75 AF/Acre for the basin

• With too many unknowns and variables, it provides a starting point and allows the GSAs to work on filling data gaps and refine water budget models to determine a better yield number in the future

• Sustainable Yields will be different for different management areas and will need to be based on the local water budgets

Note:
Draft information provided by KGA. After the Workshop, it was revised that the 0.25 – 0.75 AF range would be for native yield, not sustainable yield.
Cawelo Sustainable Yield

Based on Cawelo’s potential water budget deficit of 2,000 to 14,000 AF per year:

GW pumping for the full CWD area = 75,739 AF/year
Less budget deficit, the allowable pumping = 61,739 to 73,739 AF/year
Using 45,574 total acres = 1.35 to 1.62 AF/Acre

Allowable sustainable pumping is about 1.5 AF/Acre or 68,361 AF/Year for whole CWD area but...
Sustainable Yield Allocations

How should the Sustainable Yield be allocated among the different landowners in the Cawelo GSA?
CAWELO GSA

Cawelo Water District

Expanded Area

CWD Service Area

Non-Service Area

Ag/Open

Oilfields

Surface Surplus (Wet Years)

District Surface Water Deliveries

Surface Surplus (Wet Years)

District Stored Surface Water In the Ground

Native GW Yield
Sustainable Yield Allocations

• Water Budget indicates there is almost enough groundwater supplies to cover current operations
• Approximately 2,000 to 14,000 AF short
• Develop District programs to acquire additional new water supplies and/or to decrease demand

Propose
• Allow groundwater allocations or “credits” associated with lands to be transferable to other lands in the Cawelo GSA, provided their current demands are met
• Landowners determine the terms for transfer, Cawelo GSA only acts as a bookkeeper to track GW allocation transfers
• Maybe a need to establish an over-pump fee during periods of drought if transferable GW allocations are not available to acquire make-up water
Allocations ???

• Native Yield to be allocated evenly to landowners based on land surface acres throughout full Cawelo GSA
• Cawelo Water District surface water stored in the ground to be allocated to in District lands owners evenly among both the Service Area and Non-Service Area Landowners
• Initially, GW allocations not to be transferable to outside the Cawelo GSA (Native GW & Cawelo stored water)
• Surface water deliveries continue under current CWD policies

• Programs to be developed that give private landowners opportunities to bank or store privately owned surface water within the GSA and potentially allow some portion to be transferred out of GSA

• Need to consider future CWD projects and who pays for them
Allocation Implementation?

- No pumping restrictions in the first couple of years, establish tracking and monitoring programs and develop a mock GW transfer program
- In parallel, CWD will begin/continue developing programs to close the water supply deficit
- If necessary, year three would be the “soft” start for potential pumping restrictions or required GW or other supply acquisitions
- The goal is to be sustainable by 2040 and therefore to incrementally close the water supply deficit
- As the model and data improve during this time we could see the water budget significantly change so need to plan accordingly
- Need to consider future availability of water supplies
Questions or Comments?

• Not done yet but will take a break for question or comments or concerns
Minimum Groundwater Thresholds

• When setting Sustainable Management Criteria, need to consider Sustainability Indicators, Undesirable Results and Minimum Thresholds

• Minimum Thresholds are groundwater elevation limits that when exceeded potentially cause undesirable results

• Undesirable Results occur when any of the Sustainability Indicators become significant and unreasonable
Minimum Groundwater Thresholds

Sustainability Indicators

- Chronic lowering of water levels
- Depletion of groundwater in storage
- Degradation of groundwater quality
- Land subsidence from groundwater pumping
Minimum Groundwater Thresholds

• Need to Establish Minimum Thresholds and Coordinate with neighbors

• Management areas north of the Kern River are developing a methodology that would set minimum thresholds based on status quo and drought period projections (worse case scenario)

• Includes evaluation of impacts to groundwater wells and potential mitigation measures

• Apply this methodology to Cawelo?
Minimum Groundwater Thresholds

Spring Levels - 2006 to 2016, CWD Data

- D = 8.1 ft/yr (161 ft/20yr)
- N = 7.8 ft/yr (156 ft/20yr)
- S = 8.4 ft/yr (168 ft/20yr)
Minimum Groundwater Thresholds

• Using worse case scenario (preliminary)
  • 5% of Ag wells – Bottom of screens would dewater
  • 40% of domestic wells – Bottom of screens would dewater
  • 0% of municipal wells – Bottom of screens would dewater

• Exceeding the Minimum Threshold would determine the area is not sustainable

• Set Measurable Objectives at historical lows – Goal to keep long-term water levels at this goal

• If levels were to approach Minimum Thresholds should GSA implement management projects or mitigation measures?

• Need to further evaluate potential subsidence impacts.
Questions, comments and discussion?
Agriculture Focused Stakeholder Survey

• If you haven’t already, please take a Agriculture Stakeholder Survey form and take the time to complete it and submit to the KGA.

• It is also available on the KGA website at:

http://www.kerngwa.com/