



South Fork Kings GSA  
Technical Workshop  
Projects and Management Actions  
April 18, 2019

Geosyntec<sup>®</sup>  
consultants



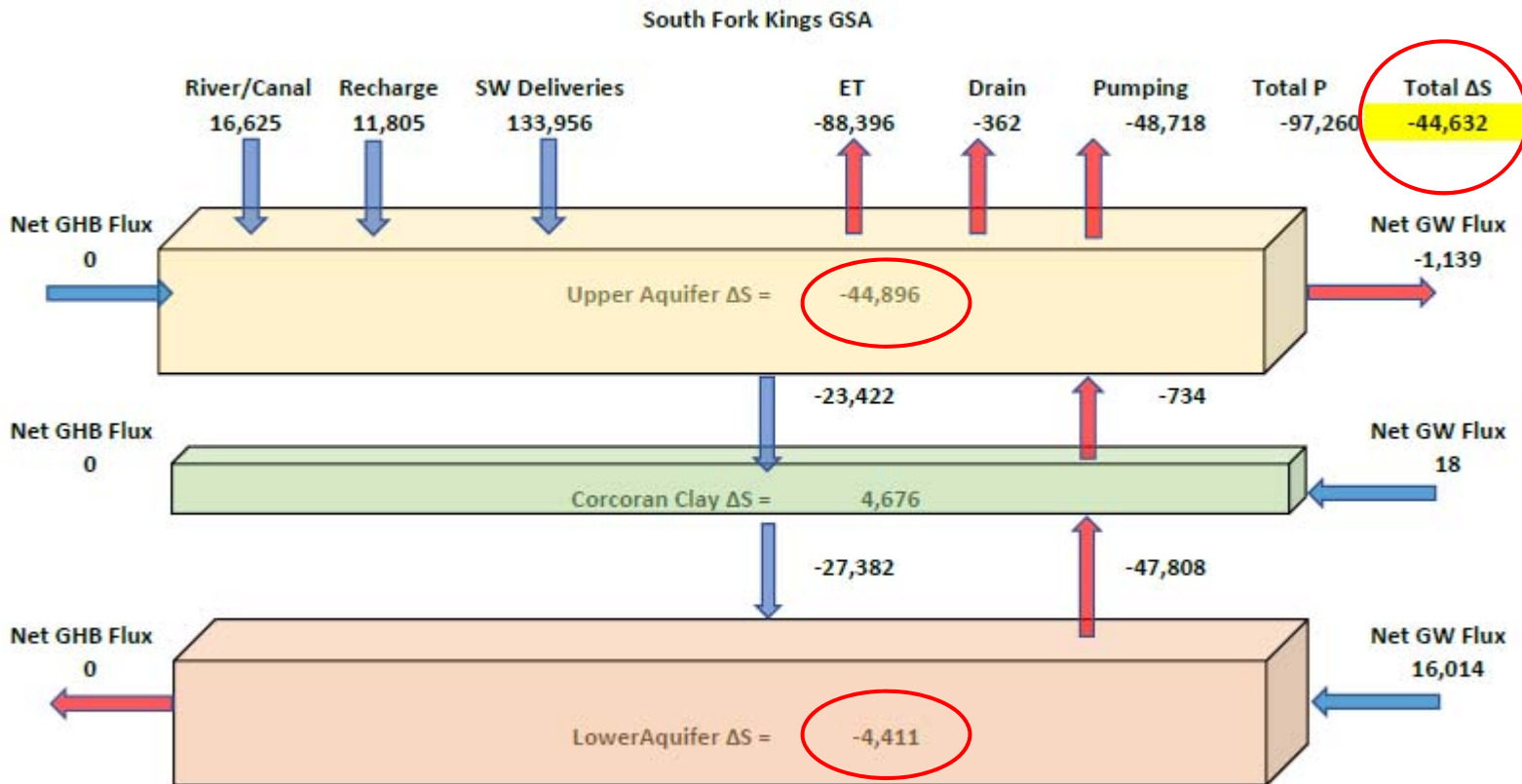
- Tulare Lake Subbasin Water Budget Update
- Projects and Management Actions
  - Summary of Water Budget Improvements
  - Aquifer Storage and Recovery (ASR)
  - Water Banking
- If we have time
  - Surrounding GSA Activities
  - Monitoring network



# Water Budget Update.... The Model is DONE! .... (for now)

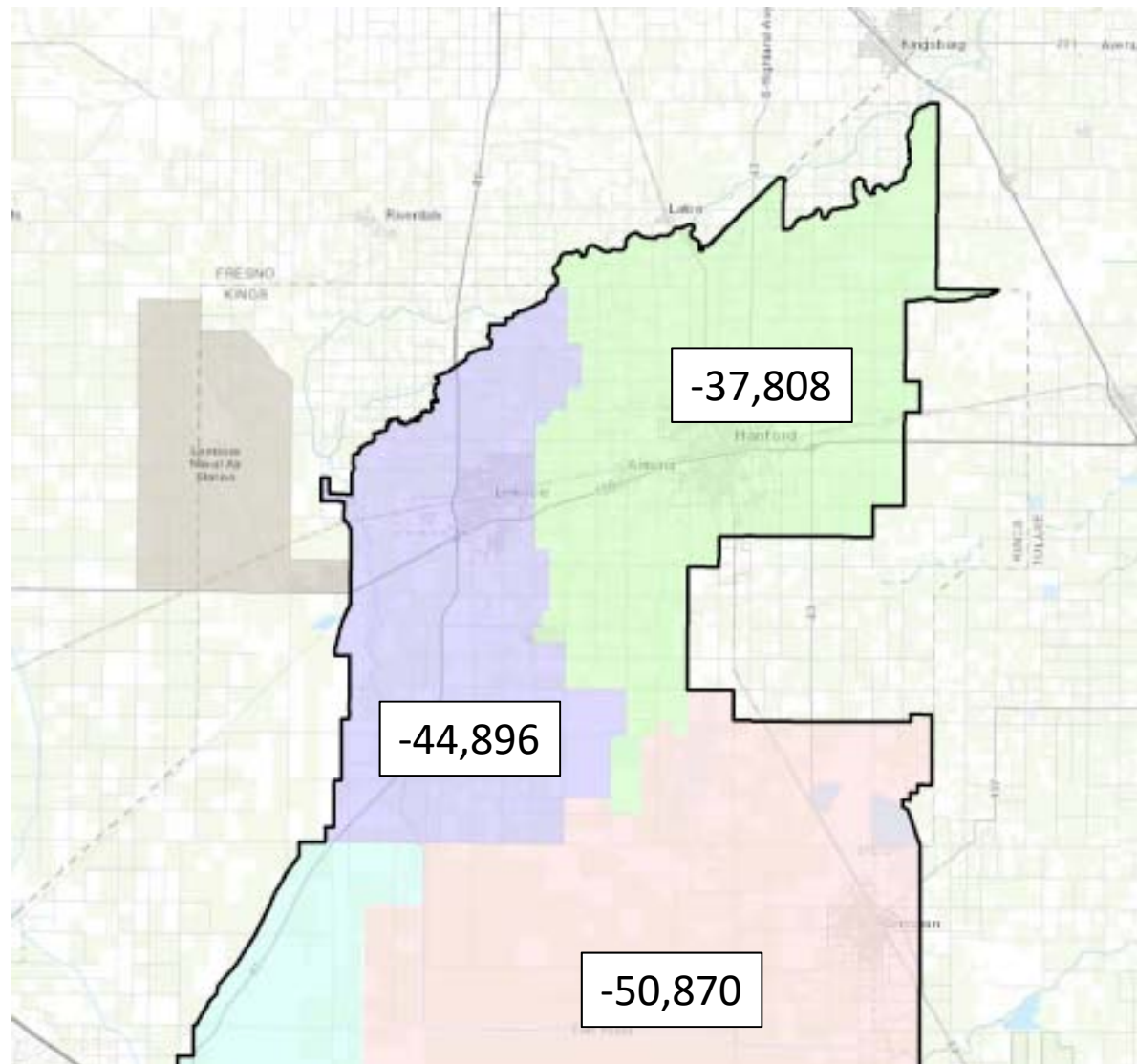


# SFKGSA Zone Budget



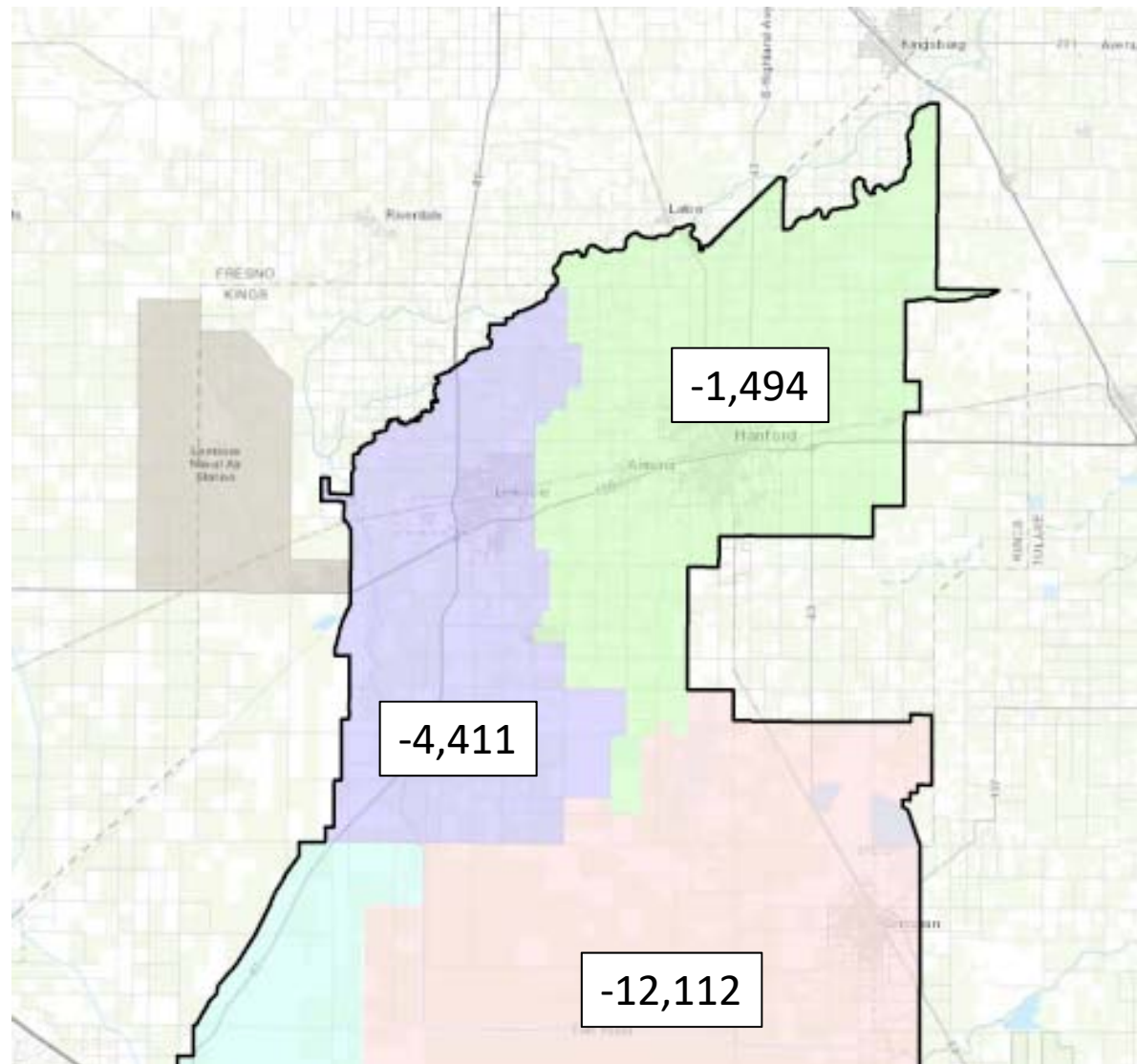
Version 7 Model Water Balance (Wood, 3/27/2019)

# Upper Aquifer Overdraft :



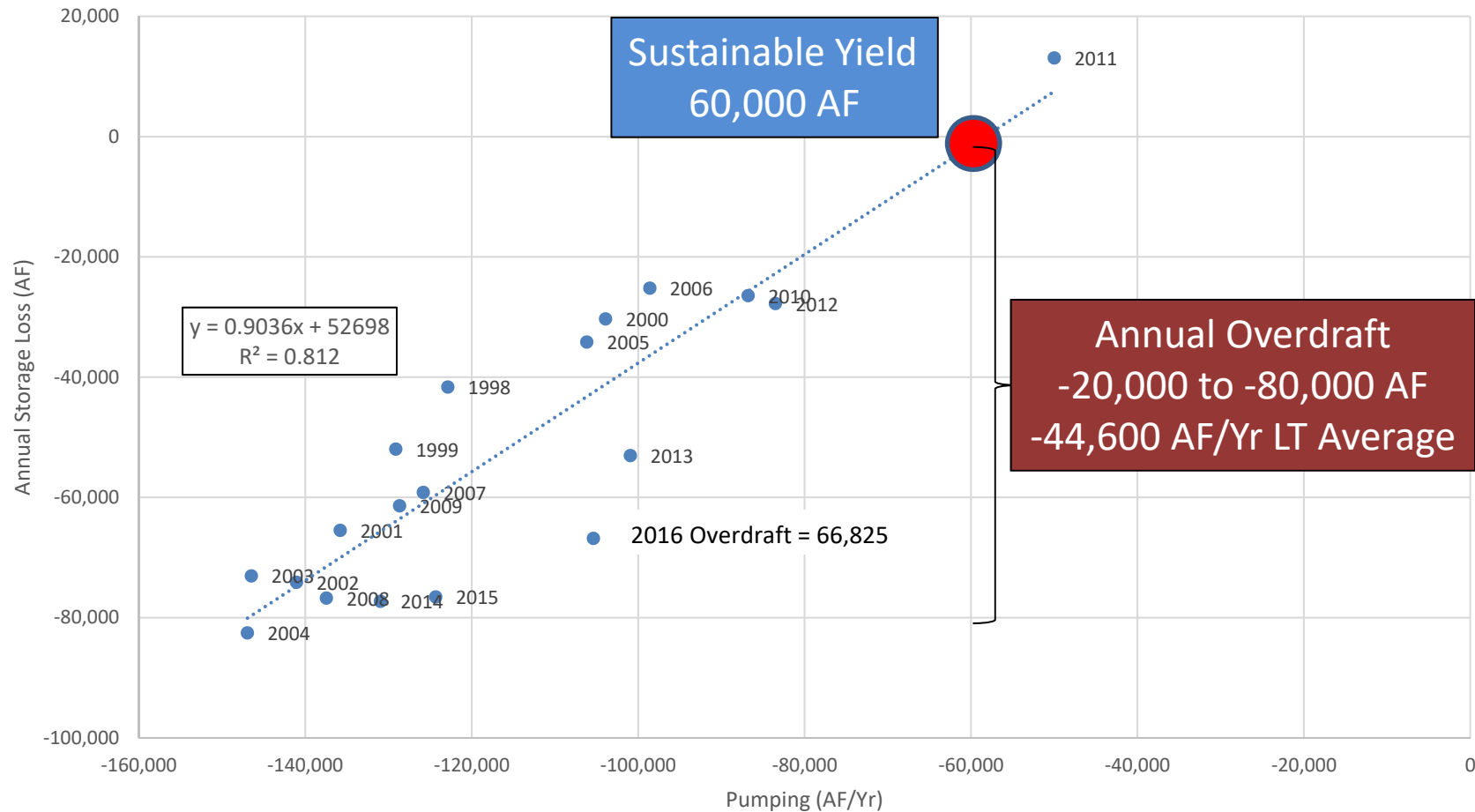


# Lower Aquifer Overdraft



# Pumping vs Storage Loss

SFKGSA Pumping vs Annual Storage Loss  
(1998-2016 Base Period)

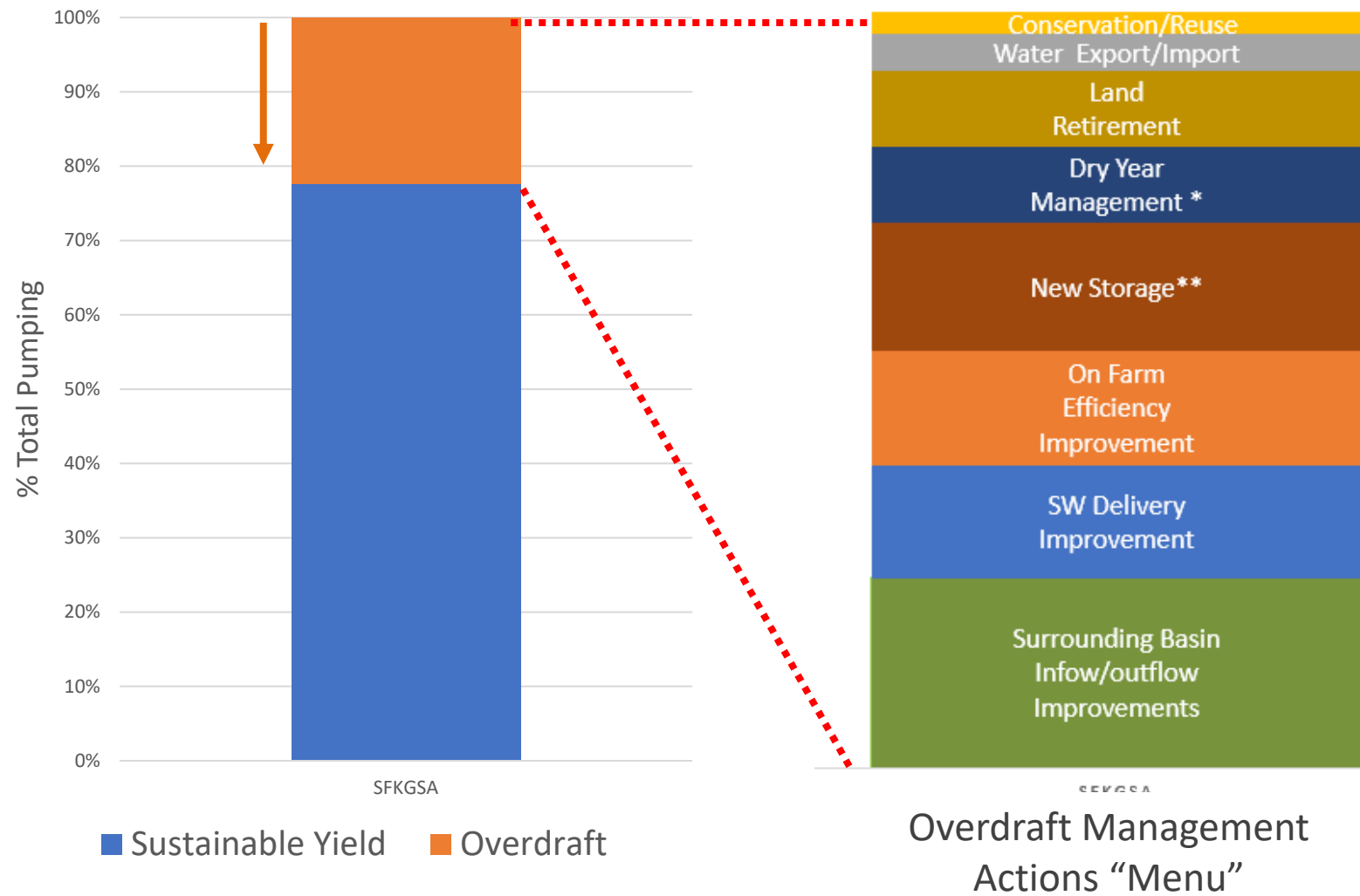


# Projects and Management Actions

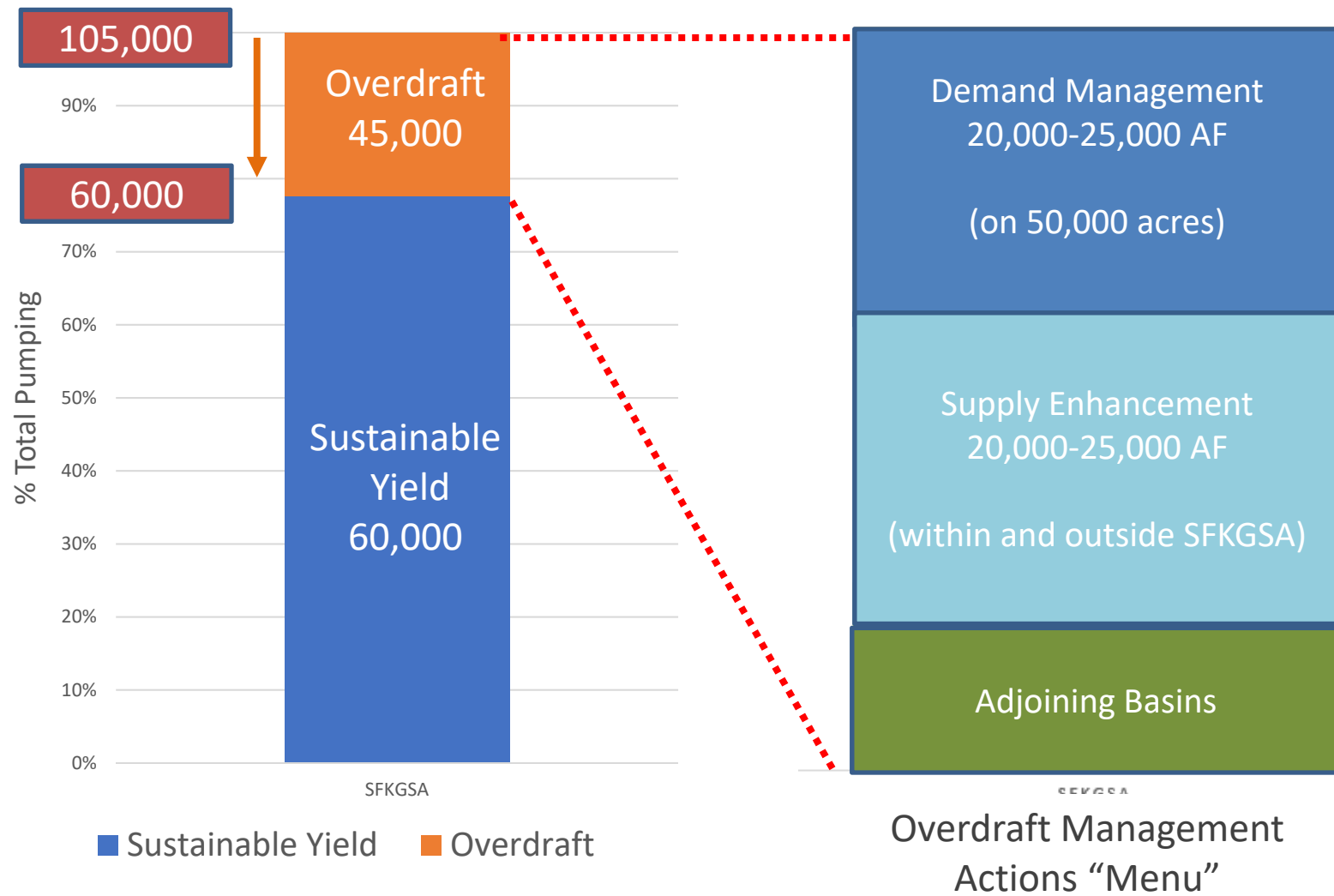




# Overdraft Reduction Menu

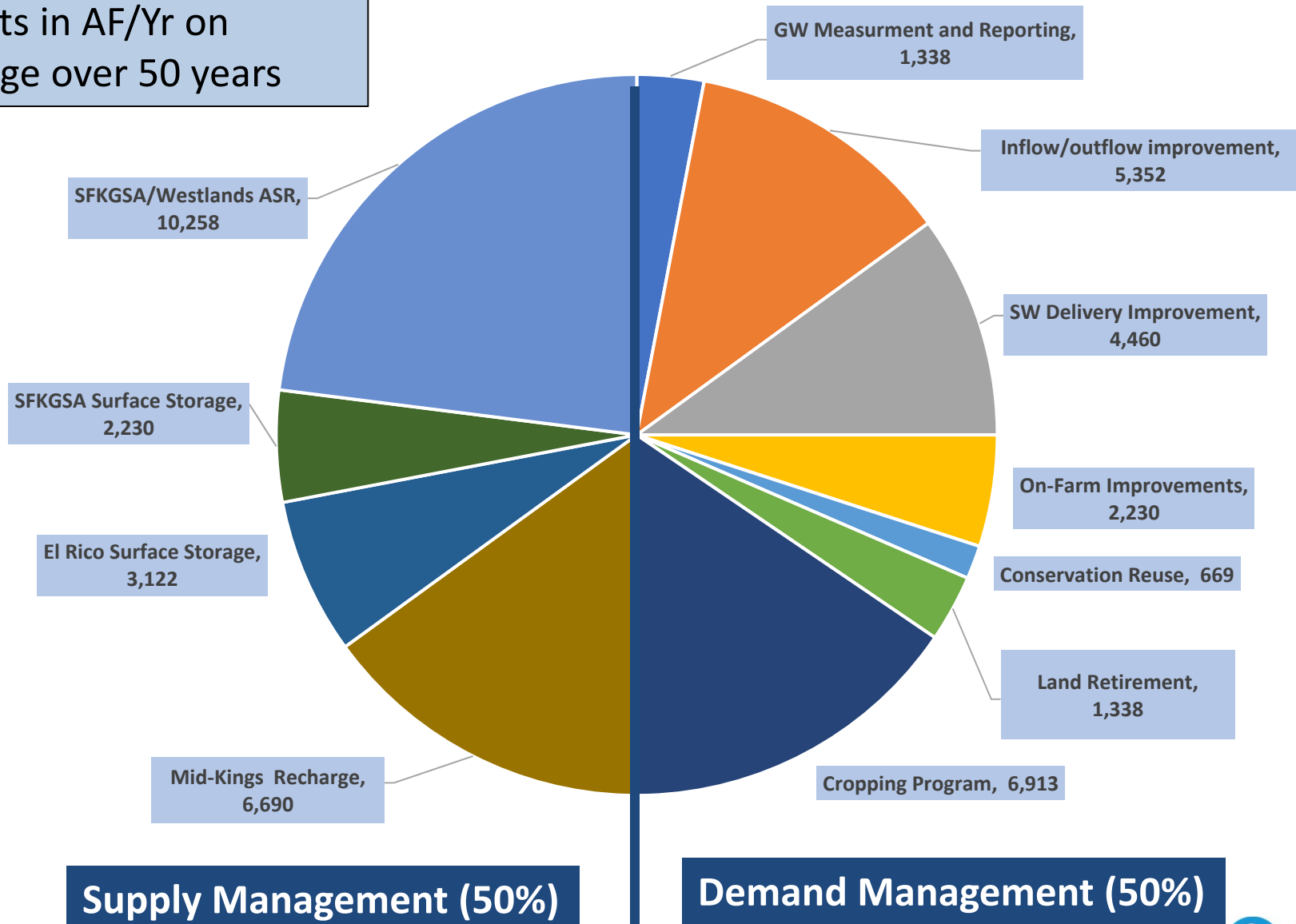


# SFKGSA Overdraft Reduction Targets



# SFKGSA Overdraft Reduction Targets

Targets in AF/Yr on  
average over 50 years



**Supply Management (50%)**

**Demand Management (50%)**



# Demand Management Actions

- **GW measurement and reporting – 1,340 AF/Y**
  - Incentive to reduce pumping (leaky pipe example )
  - GSA or County ordinance
  - Equivalent to 1% current pumping or 140 gal saved per acre
- **Improvements from other GSA's – 5,000 AF/Y**
  - Estimated and requires further integration of water balances between GSA's
  - Equivalent to 30% improvement of boundary inflow/outflow
- **On-farm improvements - 2,230 AF/Y**
  - Grower support/outreach
  - Irrigation efficiency improvements & water treatment
  - Equivalent to 1% of current demand or 0.6 inches saved per acre
  - Grants & partnerships

# Demand Management Actions

- **SW delivery improvement – 4,460 AF/Y**
  - Lemoore Canal system improvements in selected areas
  - Piping or canal extensions if appropriate
  - Delivery scheduling optimization
  - Equivalent to 5% net efficiency improvement or 45 AF per mile
  - Grants and partnerships
- **Conservation/Re-use – 670 AF/Y (0.6 MGD)**
  - City of Lemoore, Industrial (e.g. Leprino)
  - Equivalent to 5% of demand or 50 gallons per person per yr
  - Grants and partnerships
- **Land retirement – 1,340 AF/Y**
  - Opt-in with incentives
  - Equivalent to 500 acres or two 250 acre solar farms

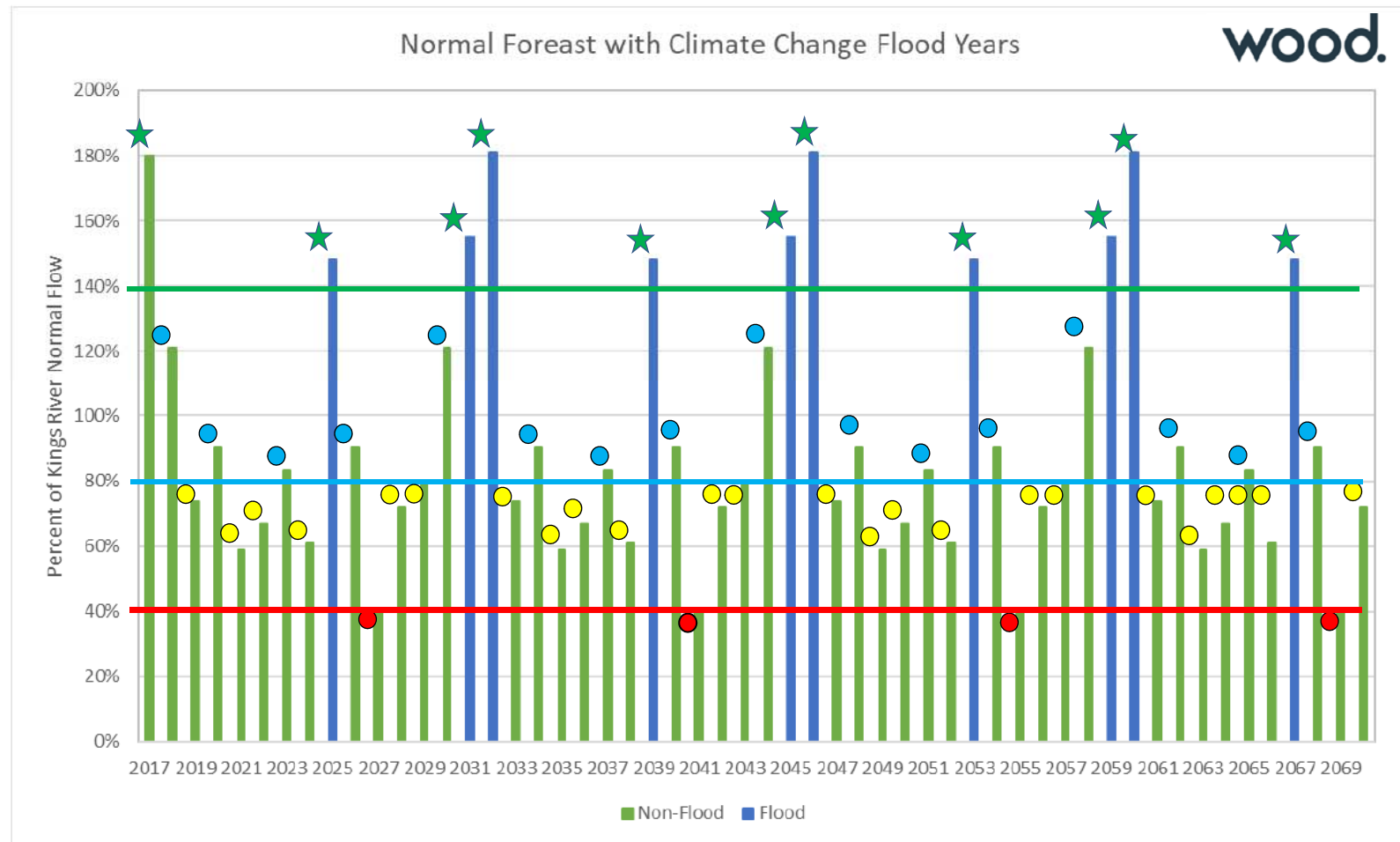
- **Cropping Program – 7,000 AF**
  - Optimize crop type, crop rotation, and fallowing frequency and tie to forecast hydrology
  - Fallowing targets based on year classification
  - Target 15,000 acres registered in program (27% of area)
  - Year class based on forecast hydrology (% Kings River supply)
    - Extreme Dry : <40% ; 12,750 acres fallow ; 4 yrs out of 50
    - Normal/Dry : 40-80% ; 7,500 acres fallow ; 24 years out of 50
    - Normal/Wet : 80-140% Kings River Supply ; 22 years out of 50
  - Opt-in with incentives (compensation for fallowing)





# Forecast Hydrology from Wood

## 2017 -2070 Forecast Kings River Hydrology



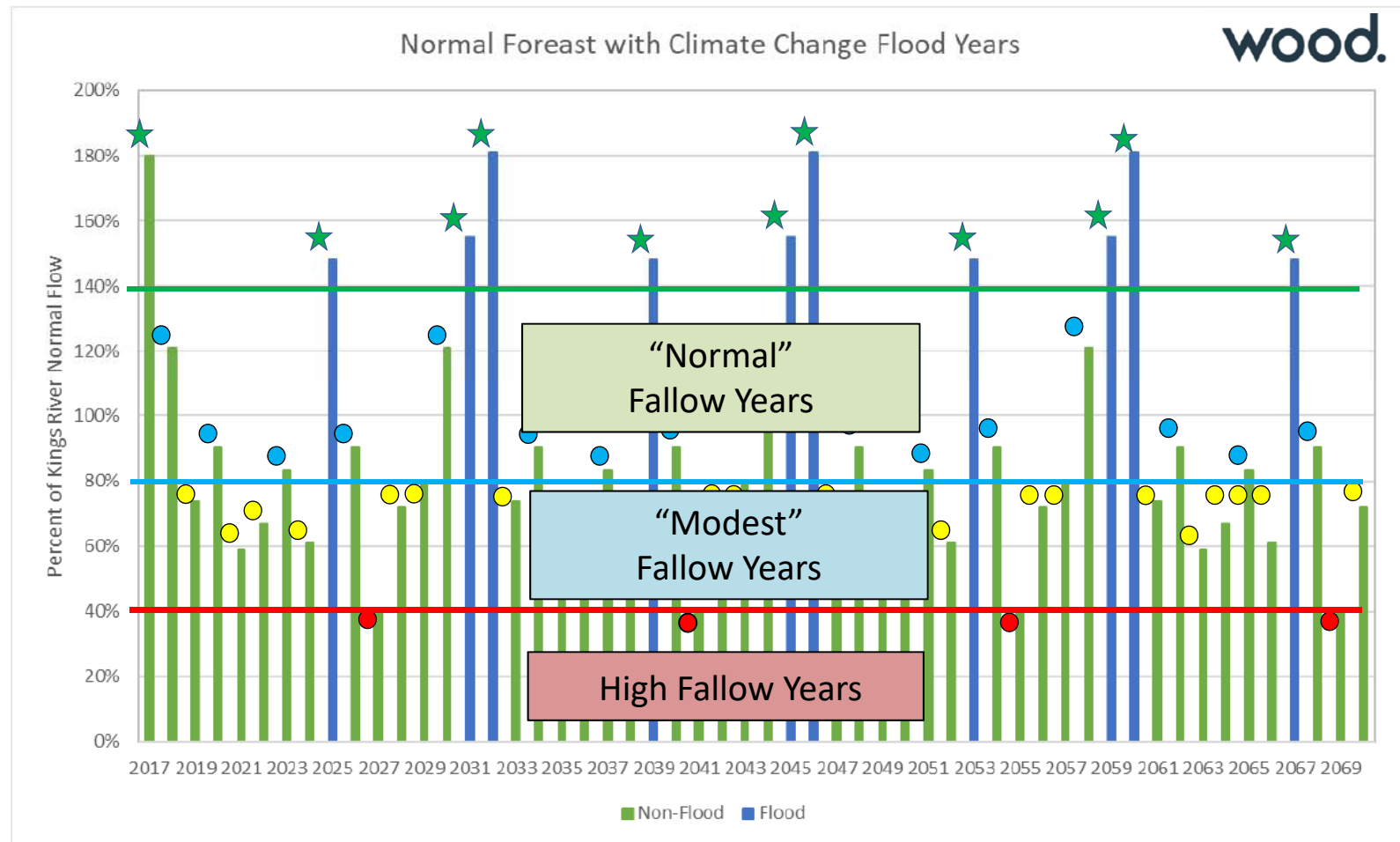
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Storage project yields and cropping program demand reduction targets are based on this forecast hydrology



# Forecast Hydrology from Wood

## 2017 -2070 Forecast Kings River Hydrology



3

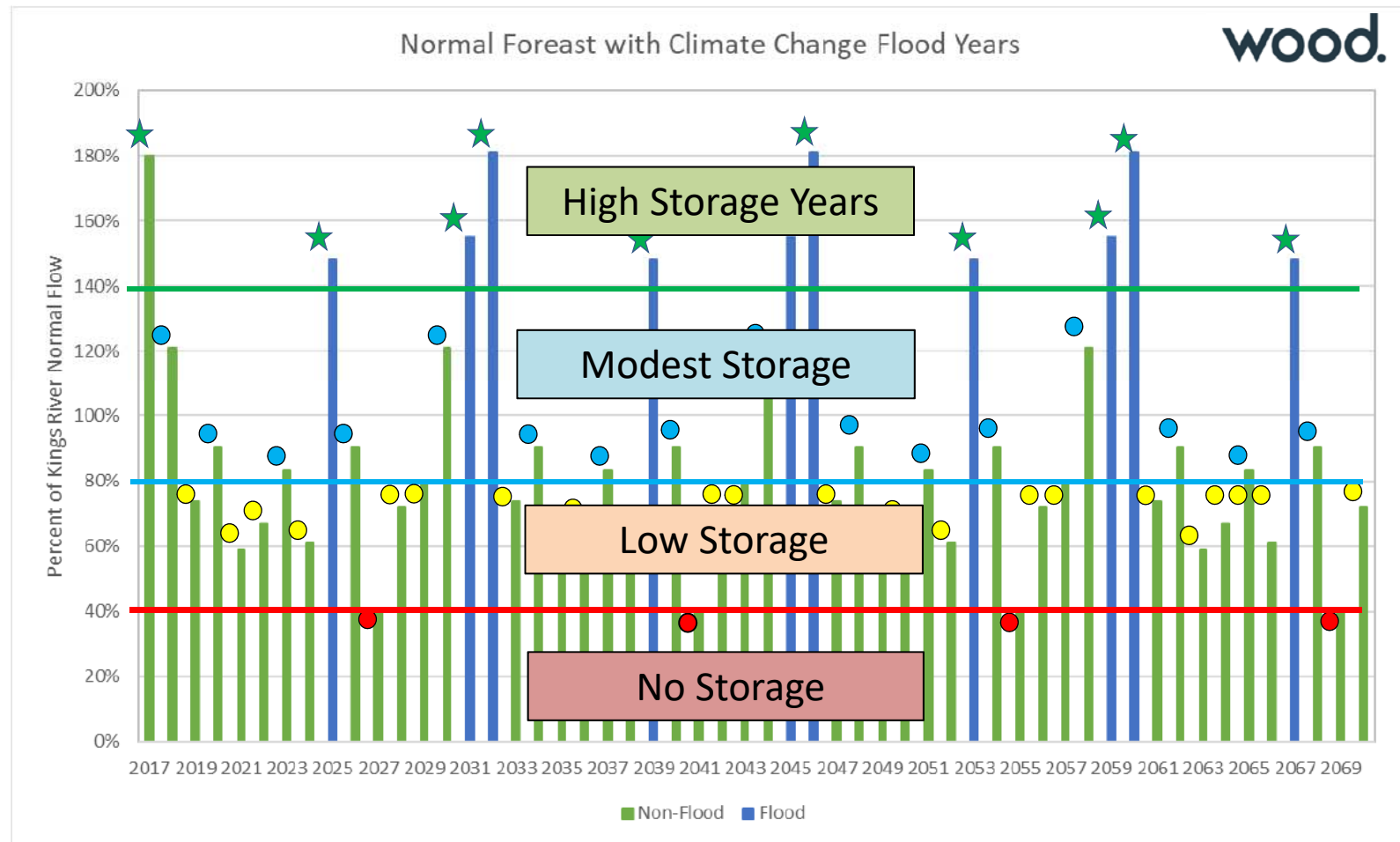
Storage project yields and cropping program demand reduction targets are based on this forecast hydrology



- **Storage and Aquifer Recharge – 21,000 AF**
  - Variety of storage and recharge projects
  - Storage volume targets based on year classification
  - Year class based on forecast hydrology (% Kings River supply)
    - Extreme Dry : <40% ; No Storage; 4 yrs out of 50
    - Normal/Dry : 40-80% ; Low – Modest storage; 24 yrs out of 50
    - Normal/Wet : 80-140+% ; Modest to high storage ; 22 yrs out of 50

# Forecast Hydrology from Wood

## 2017 -2070 Forecast Kings River Hydrology



3

Storage project yields and cropping program demand reduction targets are based on this forecast hydrology



- **Local groundwater recharge (flood flows) : 6,300 AF/Y**
  - Participate in Mid-Kings GSA recharge project(s)
  - 1,560 acres of recharge ponds currently identified
  - SFKGSA Finances upsize of program by 20%
- **Local surface water storage (flood flows) : 5,000 AF/Y**
  - Joint El Rico/SFKGSA GSA storage project
    - 6,400 acres of recharge ponds currently identified
    - SFKGSA upsize program by 50%
    - Focus on Southern portion of GSA (Stratford)
- **Groundwater storage : 10,000 AF/Y**
  - SFKGSA Aquifer Storage and Recovery project
  - Joint effort with Westlands/Westside GSA

- **Financing Plan**
  - GSA Operations
  - Demand management programs
  - Supply management projects
- **Water bank/trading platform**
  - Method for integrating and financing all of the above actions
  - Prospectus, plan, and framework
  - Pilot program



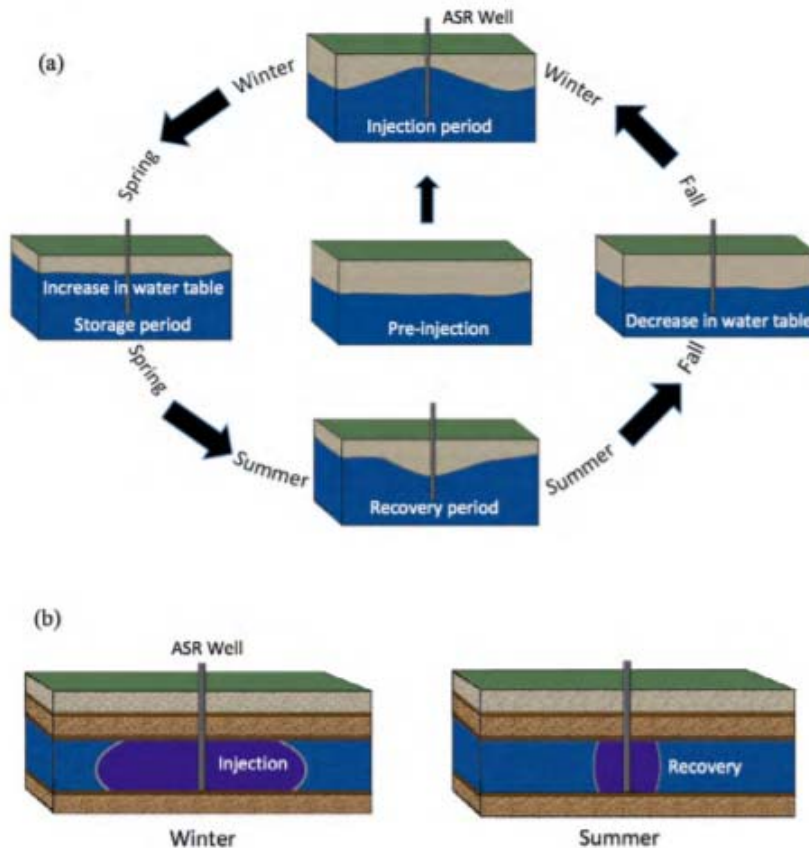
# Aquifer Storage and Recovery SFKGSA's "Big" Supply Management Action

## Overview

- SFKGSA Monitoring Network Status
- Tulare Lake Subbasin Water Budget Update
- Projects and Management Actions
  - Summary of Water Budget Improvements
  - Aquifer Storage and Recovery (ASR)
  - Water Banking
- Surrounding GSA Activities (if we have time)

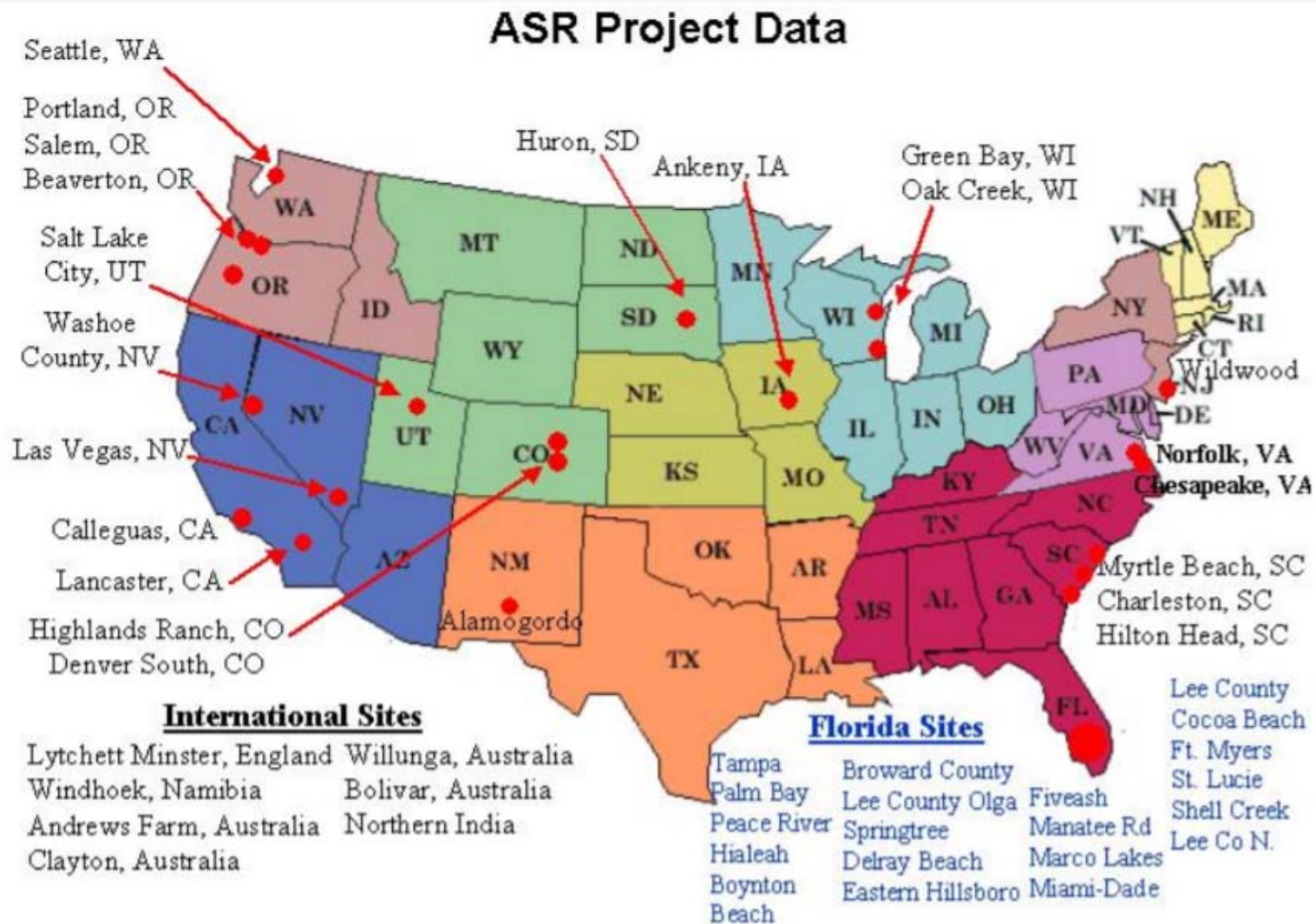


# Aquifer Storage and Recovery

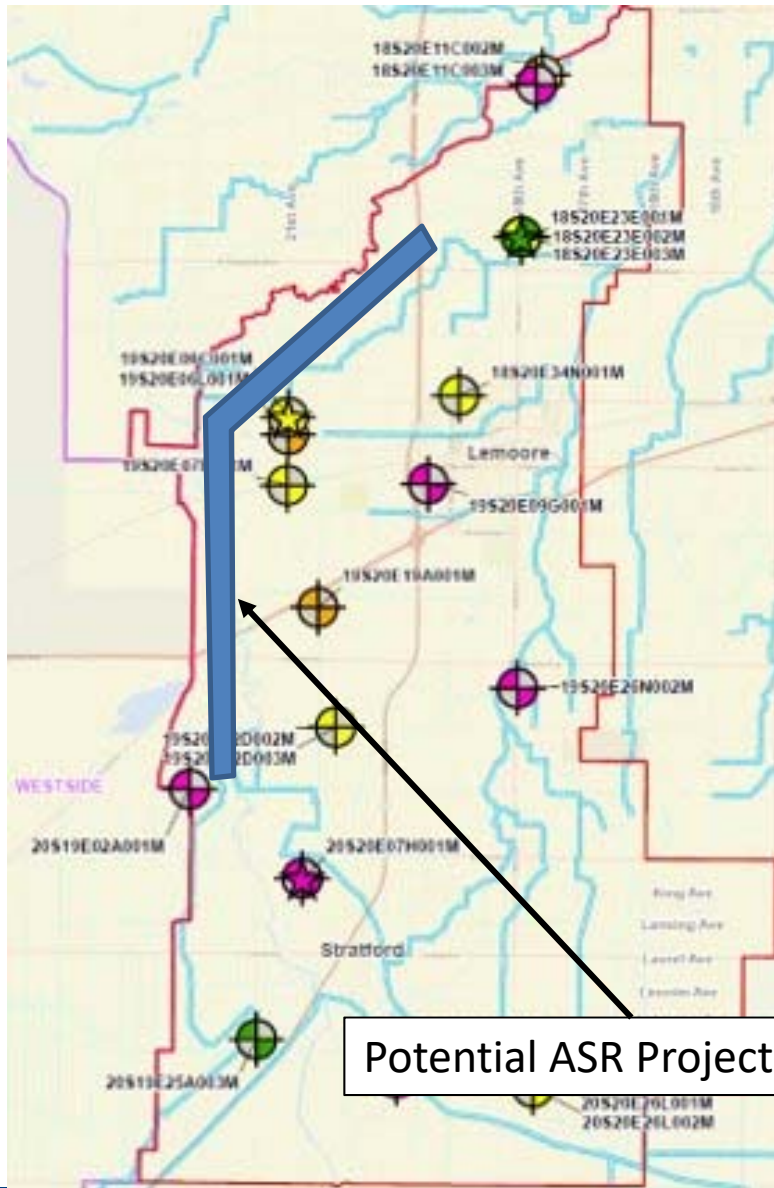


- Inject water into an aquifer for storage and subsequent withdrawal
- No evaporative loss compared to surface storage or recharge basins
- No “perching” concerns compared to recharge basins
- Has a good track record for municipal use by injecting treated drinking water

# ASR Sites Nationally



# Aquifer Storage and Recovery

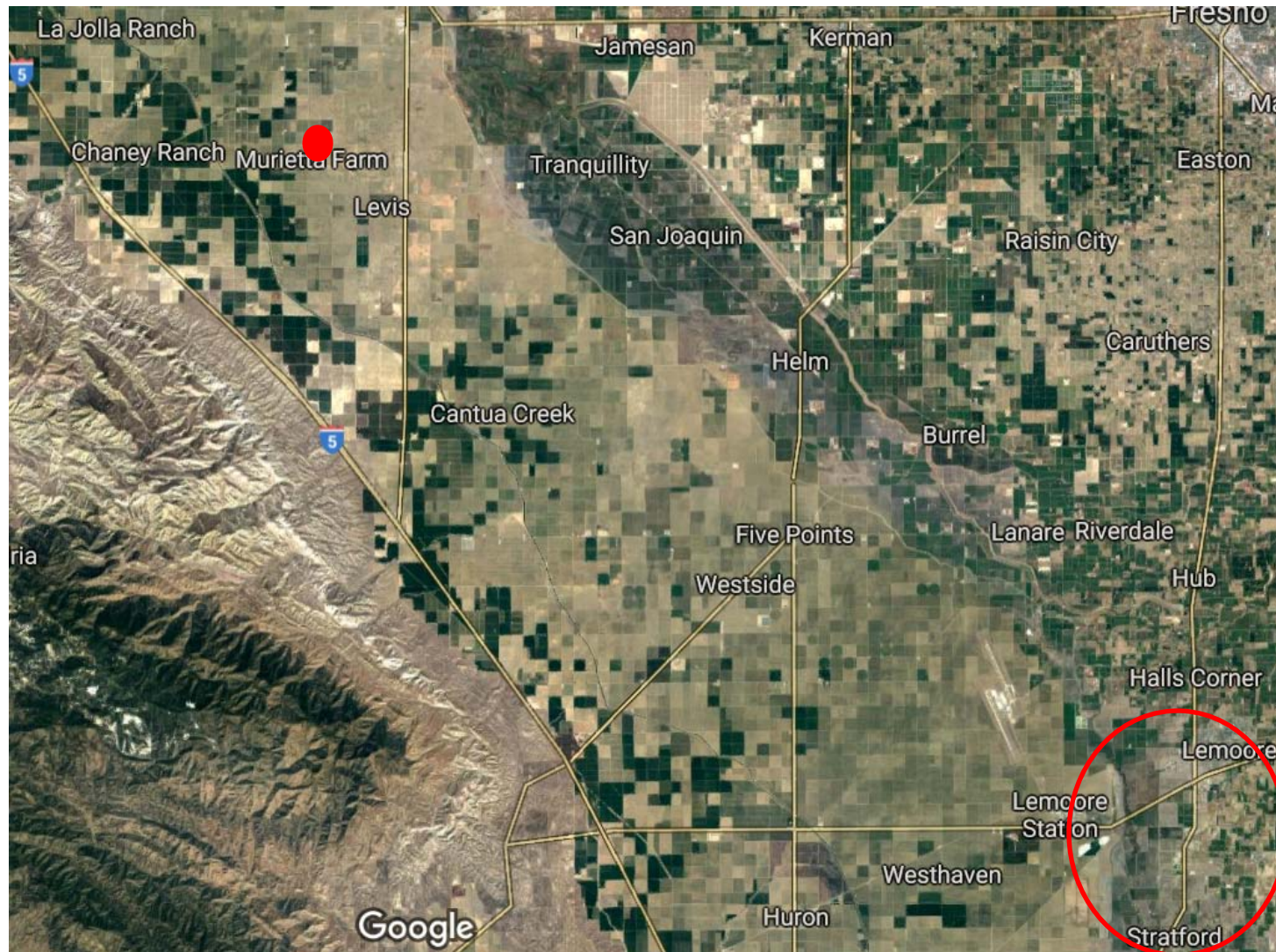


- Utilize “excess” water when available, possibly including A-zone aquifer.
- Injection into B-Zone aquifer to increase aquifer storage and improve hydraulic gradient
- Partnership Project with Westside Basin



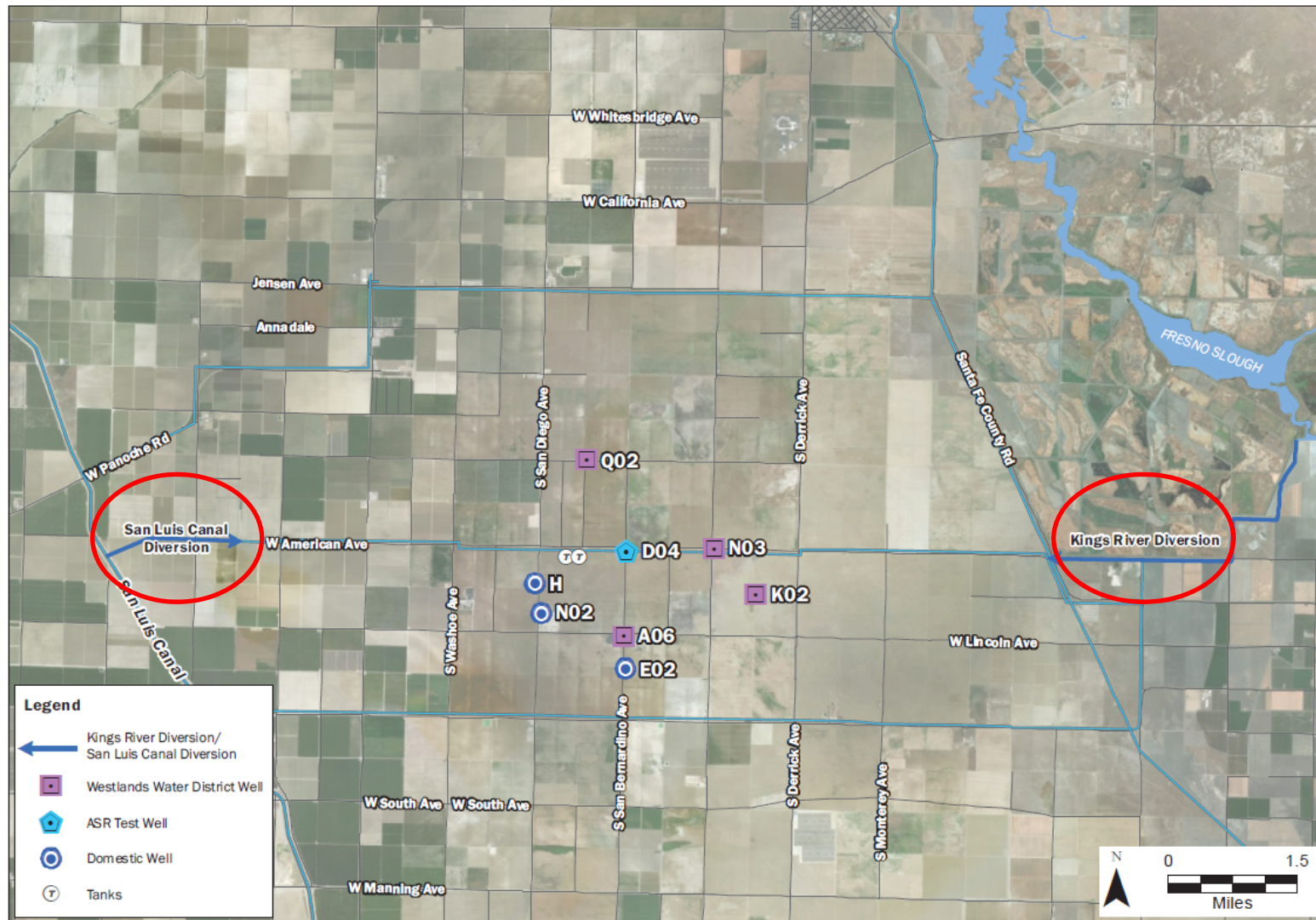
# Westlands ASR Pilot Test Location

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# Westlands ASR Pilot Test



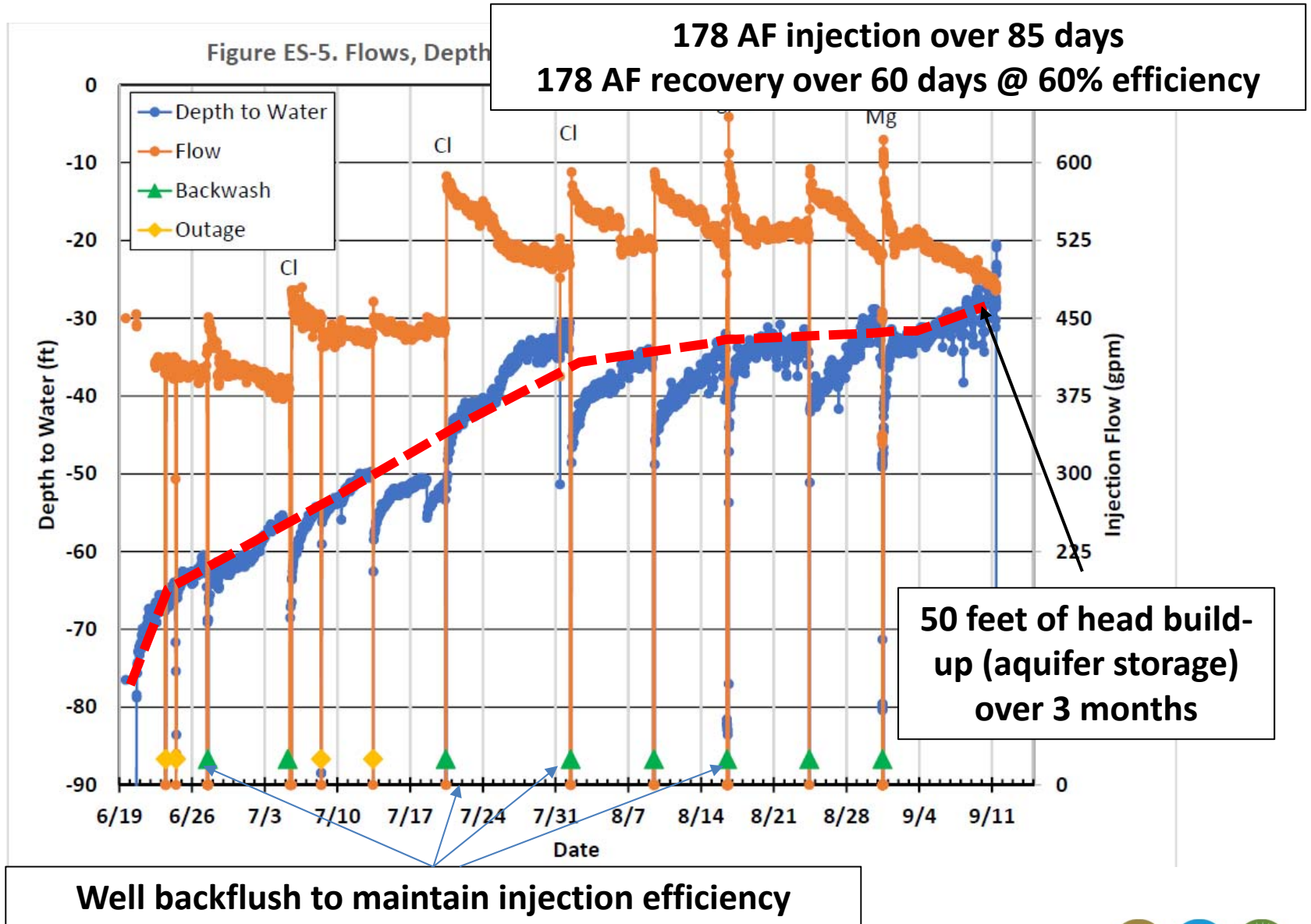


# ASR Site with Wellhead Treatment System

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# ASR Pilot Project Performance

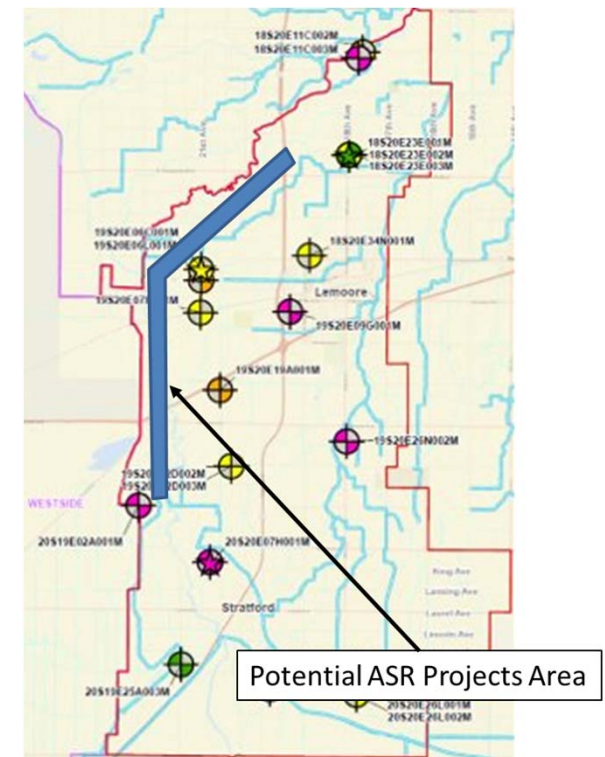


- Regional Board approved intermittent chlorination - no full drinking water treatment required.
- Monitoring for multiple constituents, including pathogens
- Modeling of % recovery of injected water
- Approval as EPA Class V injection well
- Pilot test was exempt from CEQA


# Conclusions

- ASR is feasible in aquifer system
- Numerous, but not unexpected, operational considerations
- Programmatic CEQA necessary for widespread use

We are discussing possibility of further exploration of this concept with Westlands as a joint SGMA implementation project



# Water Bank



## Water Banking Concepts for GSP Implementation

### South Fork Kings GSA

March 28, 2019

Presented by  
**Geosyntec**  
consultants  
Bob Anderson, Amer Hussain

Presented by  
**Aspect**  
CONSULTING  
Dan Haller

earth+water

# Why Water Banking in SFK?

- Provides a mechanism to implement project and management actions to achieve overdraft reduction (45,000 AF/Yr)
- Provides a pathway with less regulatory controls
- Focuses on incentives to encourage participation
- Can create business rules to discourage or prevent unwanted transactions or projects
- Becomes the platform for managing sustainable yield (60,000 AF/Yr)

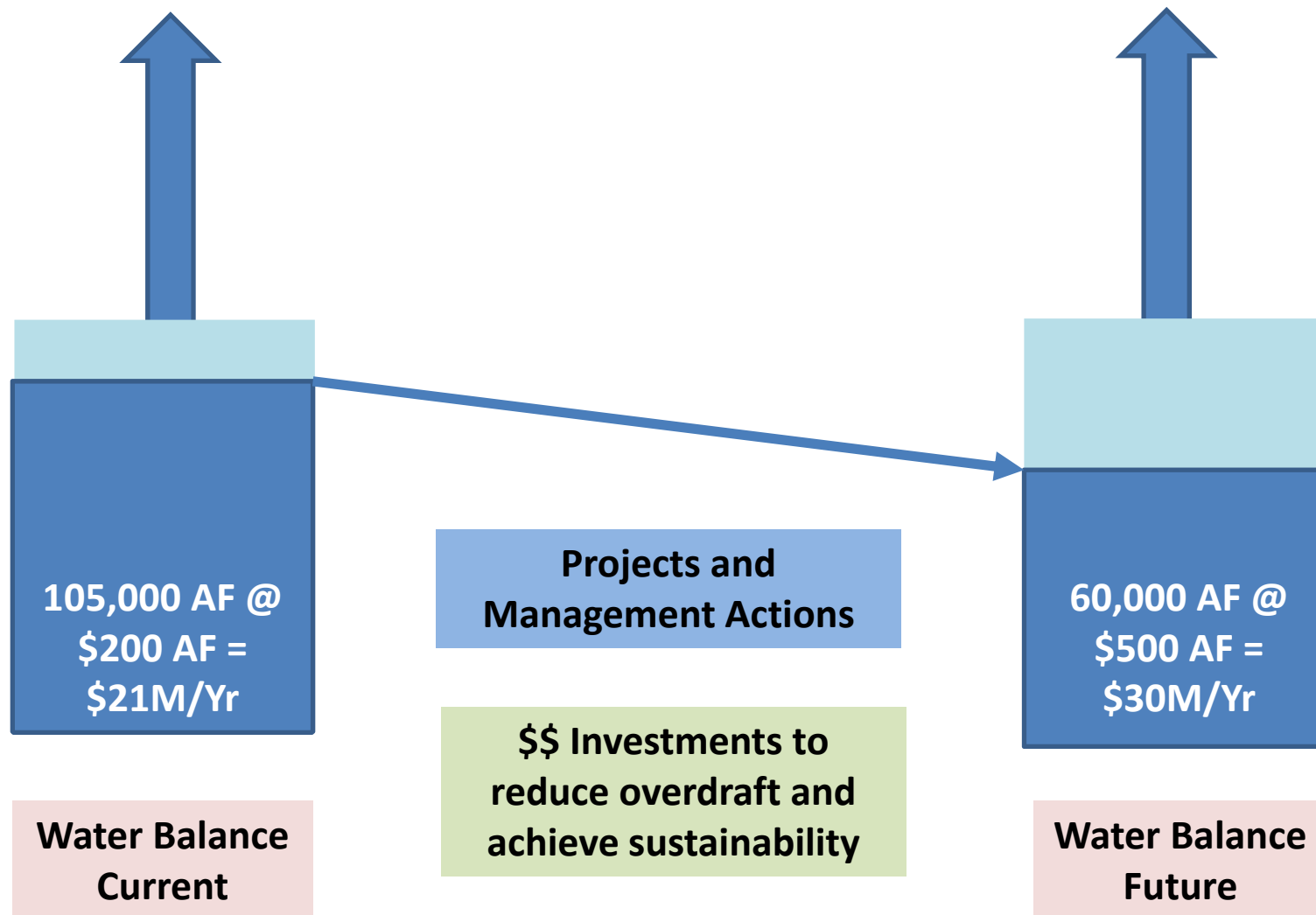


# What is a Water Bank?

- Groundwater banks redistribute the authority to withdraw groundwater from sellers to buyers
- The aquifer itself, managed by the GSA, can be a “buyer” of groundwater



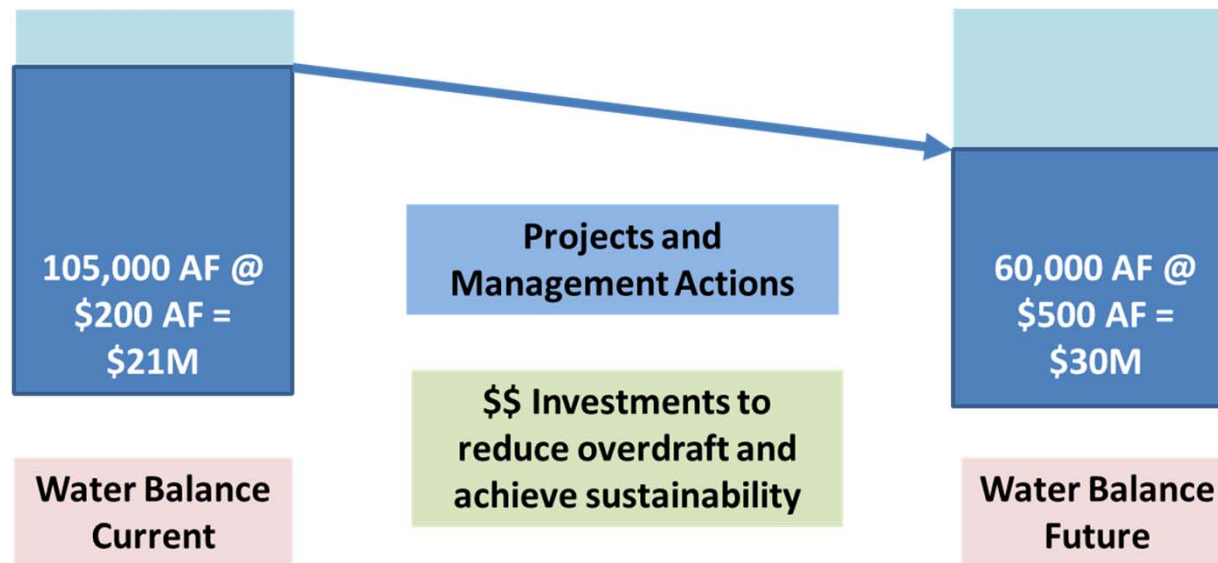
# Bank Value Analogy



# What creates “value” in the water bank?

The bank can “oversee” the re-distribution of aquifer storage credits and debits, with the aim of:

1. Achieving sustainable pumping targets by 2040
2. providing financial mechanisms that incentivize and fund projects
3. Establishing a platform for managing the value created from sustainable pumping after 2040



# Why would it work?

A water bank can help achieve sustainable yield and then maintain the resulting yield and value if.....

- If there is a financial incentive to do so
  - What's in it for me?
  - Financial benefit or avoided cost (now or in the future)
- If there is a time incentive to do so
  - Why should I do this now?
  - Pay less/get more now, vs pay more/get less later
- If an aquifer credit is required as part of transactions
  - The aquifer needs to be part of the “win”
- If it avoids more stringent regulation in the future
  - The alternatives are stop pump orders, taxation, or state intervention



# Who runs the bank?

- Public entity, private entity or quasi-governmental NGO
- The banker needs to have ability, trust, and authority to enforce the rules of the bank, certify transactions, maintain the accounting system, and report/verify results
- “Transaction fees” include
  - financial compensation to the banker
  - overdraft mitigation to the aquifer
  - Fee and value structure may shift when aquifer achieves sustainable yield

Transactions that can be facilitated, certified, and monetized via a water bank

- Fallowing
- On-farm efficiency
- Irrigation efficiency improvements
- Aquifer recharge (surface or injection)

# NEXT STEPS



# NEXT STEPS

1. Submit the Pie Chart to Wood for final Forecast Model Run
2. Meeting with TAG to discuss the Actions and expected yield (the Pie Chart)
3. Prepare Projects & Management Actions Memo
  - Demand Management Actions
  - Supply Management Actions
  - Financing/Water Bank Options