February 15, 2018

Joint Workshop of Board of Directors of

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Agenda

- **Presentations on existing and proposed water bank and groundwater recharge facilities within the Antelope Valley**
    - AVEK's Eastside Water Bank (Jon Bozigian, AVEK)
    - AVEK's Westside Water Bank (Justin Livesay, AVEK)
    - AVEK's High Desert Water Bank (Matt Knudson, AVEK)
    - PWD's Palmdale Regional Groundwater Recharge & Recovery Project (Peter Thompson, PWD)
    - Upper Amargosa Creek Recharge Project (Tom Barnes, AVEK)
- **Presentation on AVEK proposed replacement water and supply programs**
    - AVEK (Dwayne Chisam, AVEK General Manager)
- **Presentation on the feasibility of developing a joint groundwater recharge project within Big Rock Creek**
    - AVSWCA (Matt Knudson, AVEK & Peter Thompson, PWD)

Benefits of Groundwater Recharge/Banking

Wet Years: Store surplus State Water Project (SWP) water during wet years.

Dry Years: Recover stored water for beneficial use at time of need.

Geo-purification/SAT: High quality recovered water, no treatment required.

Resiliency against drought and SWP outages or interruptions.

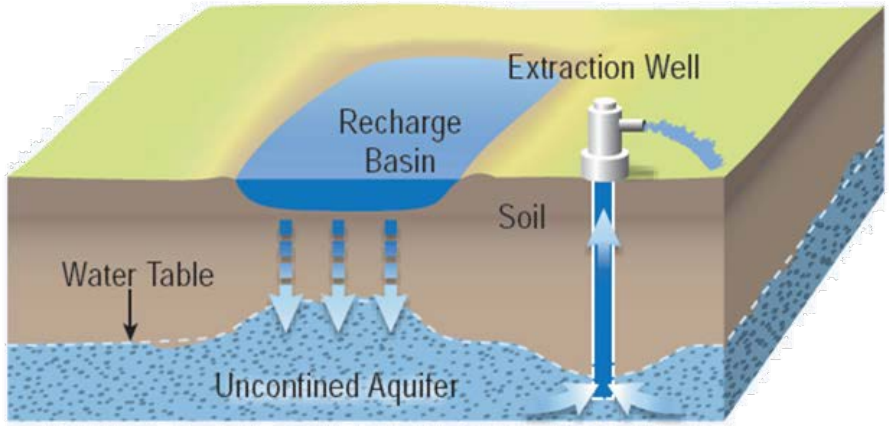
New yield from capturing water that otherwise would have spilled.

Transfers: Ability to execute water transfers and exchanges with partners throughout the state.

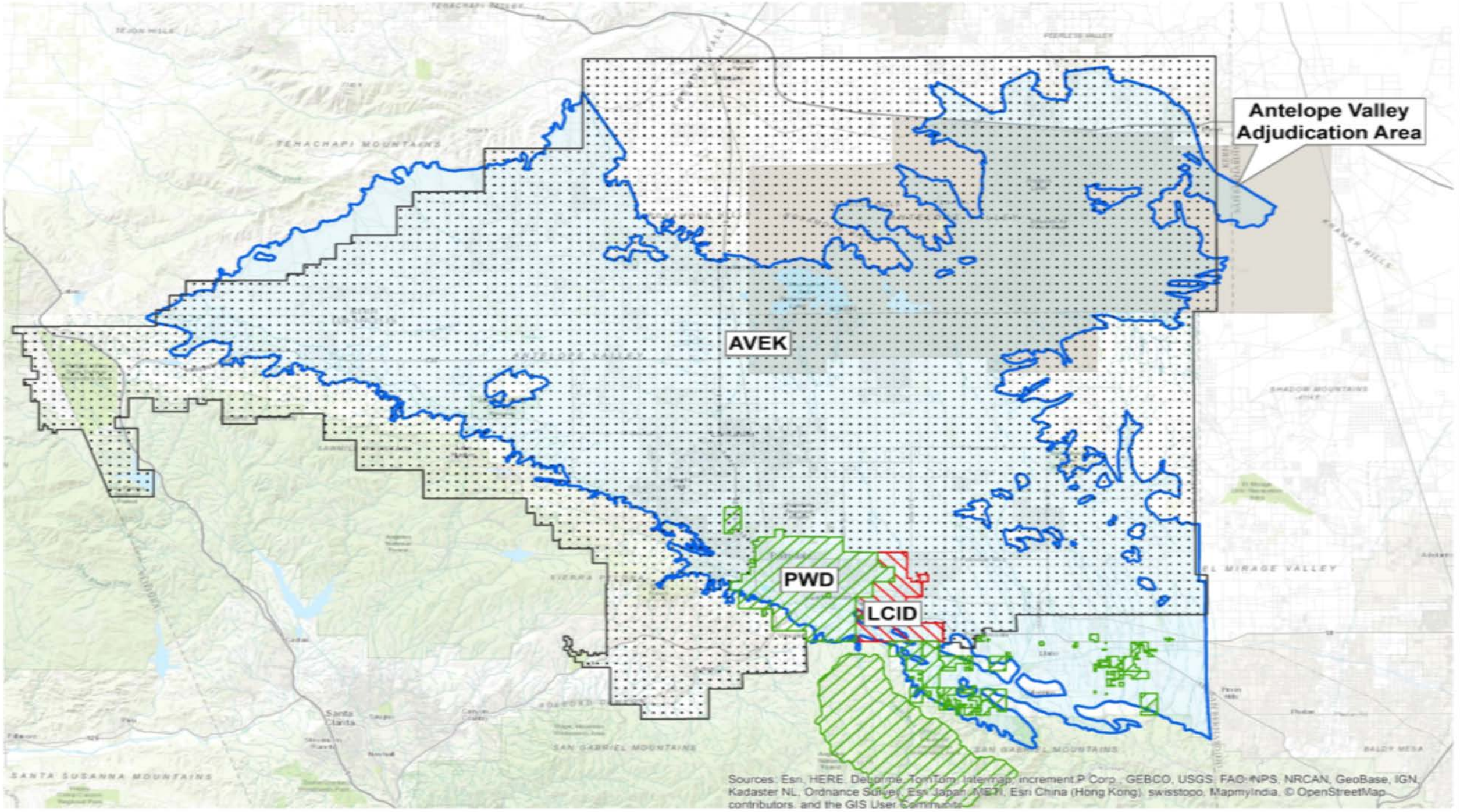
Recovery of stored/banked water under nearly any condition.

Low cost, relative to other alternatives.

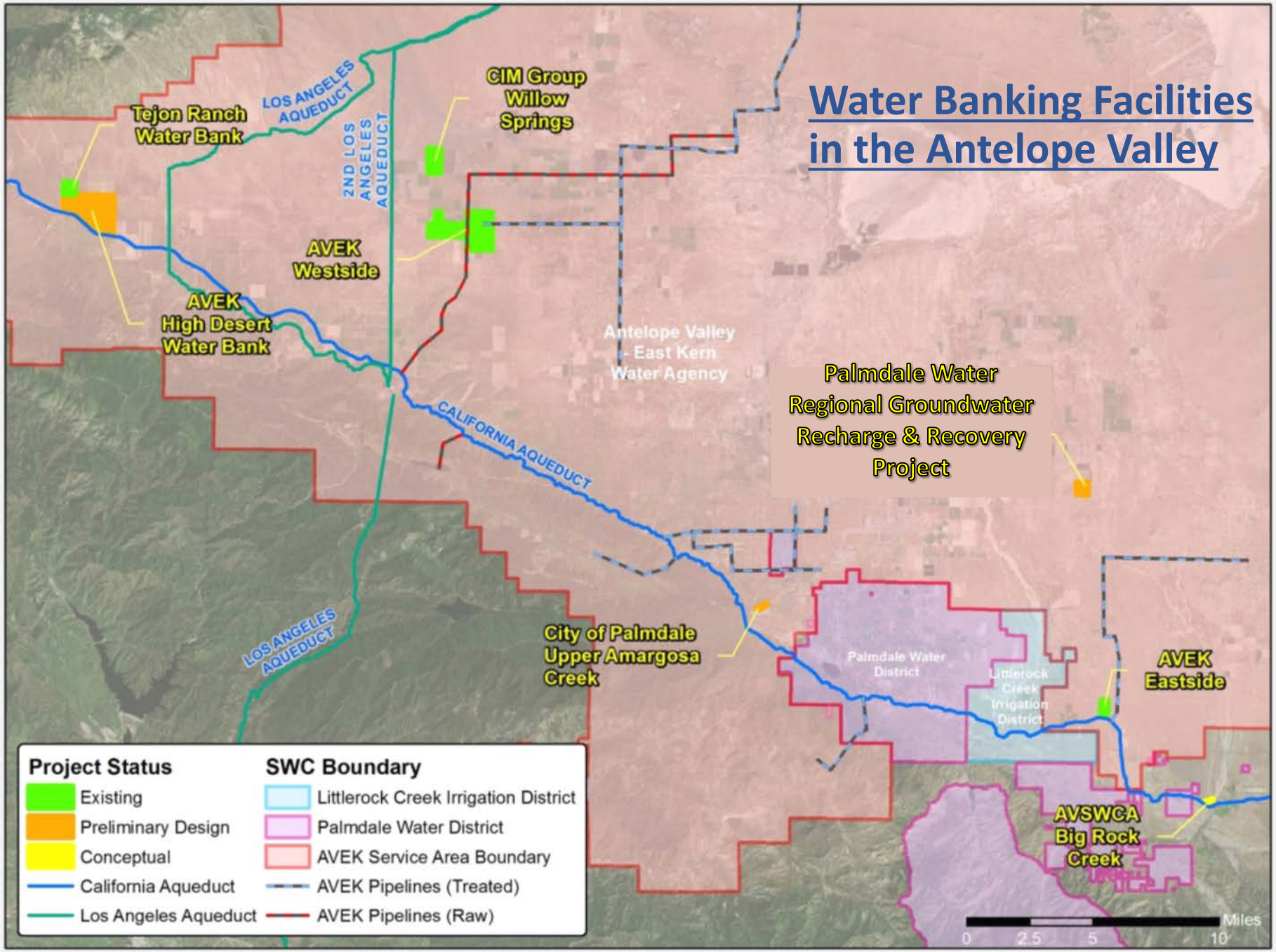
Regulatory certainty due to the recently-completed groundwater adjudication.



Source: California Department of Water Resources, CA Water Plan 2009


Antelope Valley
Adjudication Area
AVEK
PWD
LCID
TEHACHAPI MOUNTAINS
SANTA SUSANNA MOUNTAINS
SAN GABRIEL MOUNTAINS
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Water Banking Facilities in the Antelope Valley



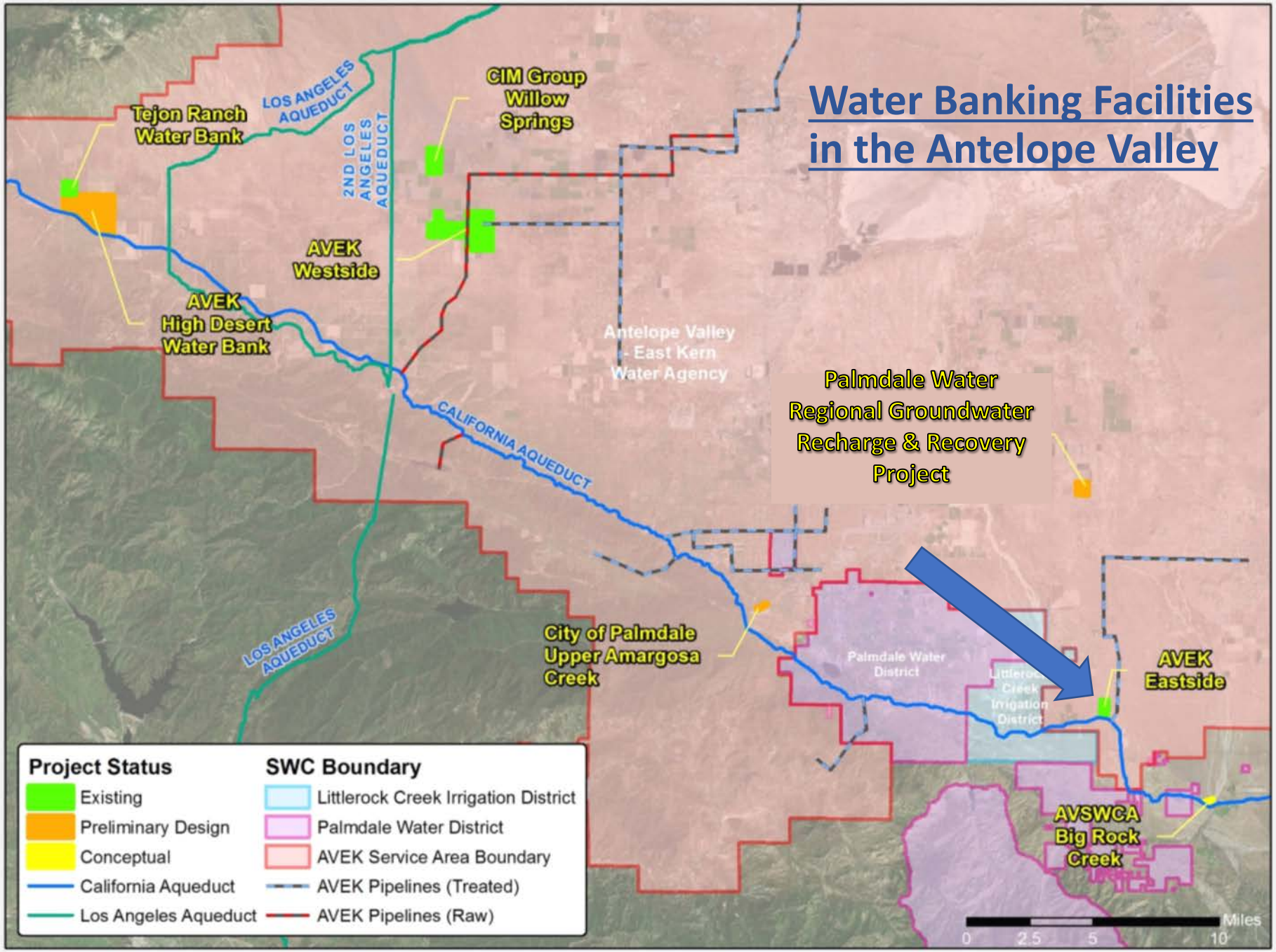
Water Banking Facilities in the Antelope Valley

Project Lead	Project Name	Status	Recharge (AFY)	Recovery (AFY)	Total Storage (AF)
AVEK	Eastside Water Bank	Operational	2,000	1,800	6,700
AVEK	High Desert Water Bank	Preliminary Design	70,000	70,000	280,000
AVEK	Westside Water Bank	Operational	50,000	36,000	150,000
AVSWCA	Big Rock Creek	Conceptual			
CIM Group	Willow Springs Water Bank	Funding	250,000	225,000	1,000,000
City of Palmdale	Upper Amargosa Creek	Preliminary Design	3,400-9,400		
Palmdale Water District	Palmdale Regional Groundwater Recharge & Recovery Project	Preliminary Design	50,000	24,250	300,000
Tejon Ranch Co.	Tejon Ranch Water Bank	Existing	8,000		60,000

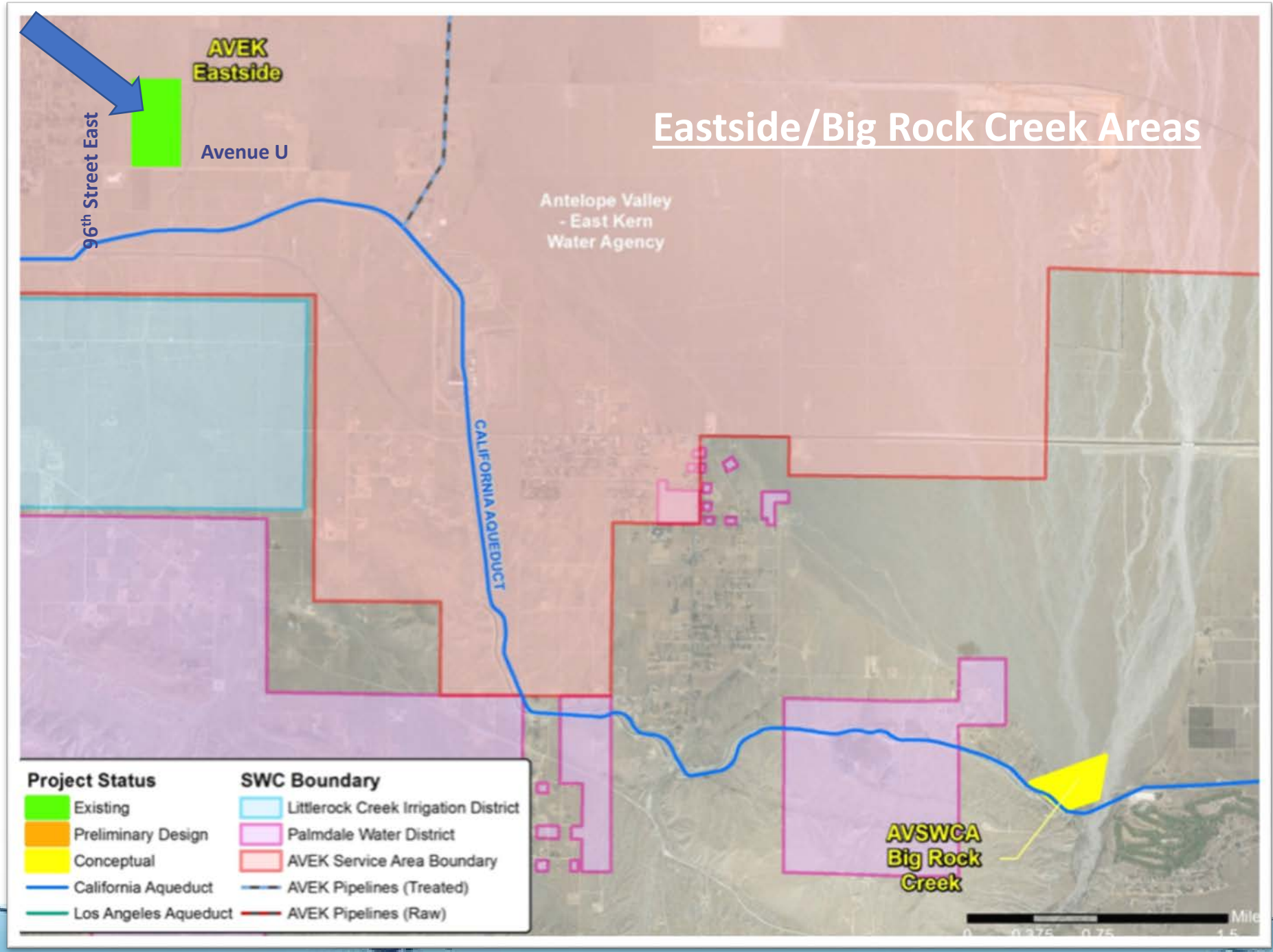
Eastside Water Bank Overview

- Joint Workshop
- February 15, 2018

Water Banking Facilities in the Antelope Valley



Eastside/Big Rock Creek Areas



Eastside Water Bank

- Location:
  - 9859 E Avenue U, Littlerock, CA
- Completion Date:
  - 2015
- Recharge Facility Size:
  - 3 Ponds (2 Acres Each)
- Recharge Rate:
  - 0.75 Feet per Day
- Annual Recharge Capacity:
  - Approx. 2,000 Acre-Feet

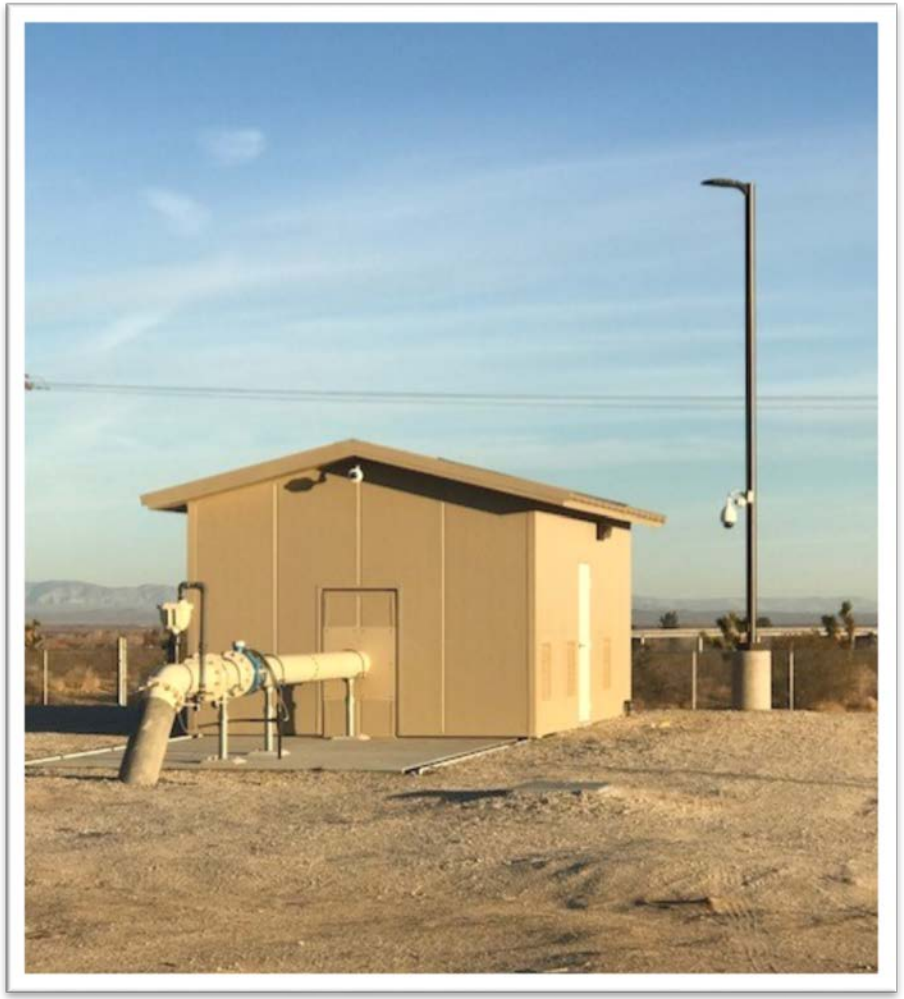
Project Description

- A groundwater recharge and recovery project that allows AVEK the ability to recover stored imported SWP water, disinfect with 12 ½% sodium hypochlorite, move the disinfected high-quality potable water to the Eastside Water Treatment Plant Clearwell (via 2 miles of 20” pipeline) and blend with conventional-treated SWP water.

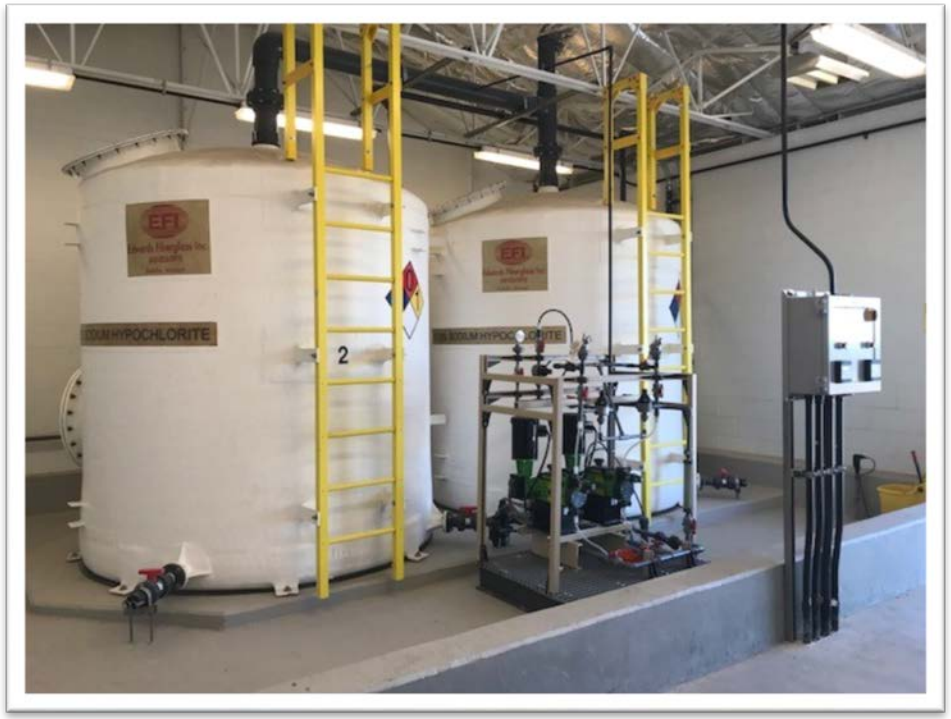
- Geo-purification: This is an effective method of disinfection by-product control, specifically THMs.

- A secondary benefit of the project is the ability to recover stored groundwater and pump it directly into the east branch of the California aqueduct via (3) fixed speed booster pumps, (1) 100,000 gallon air gap tank, and 1 ½ miles of bi-directional 20” pipeline.

Eastside Water Bank Well Sites



Eastside Water Bank Pump Room & Disinfection Equipment



Eastside Water Bank Control Site

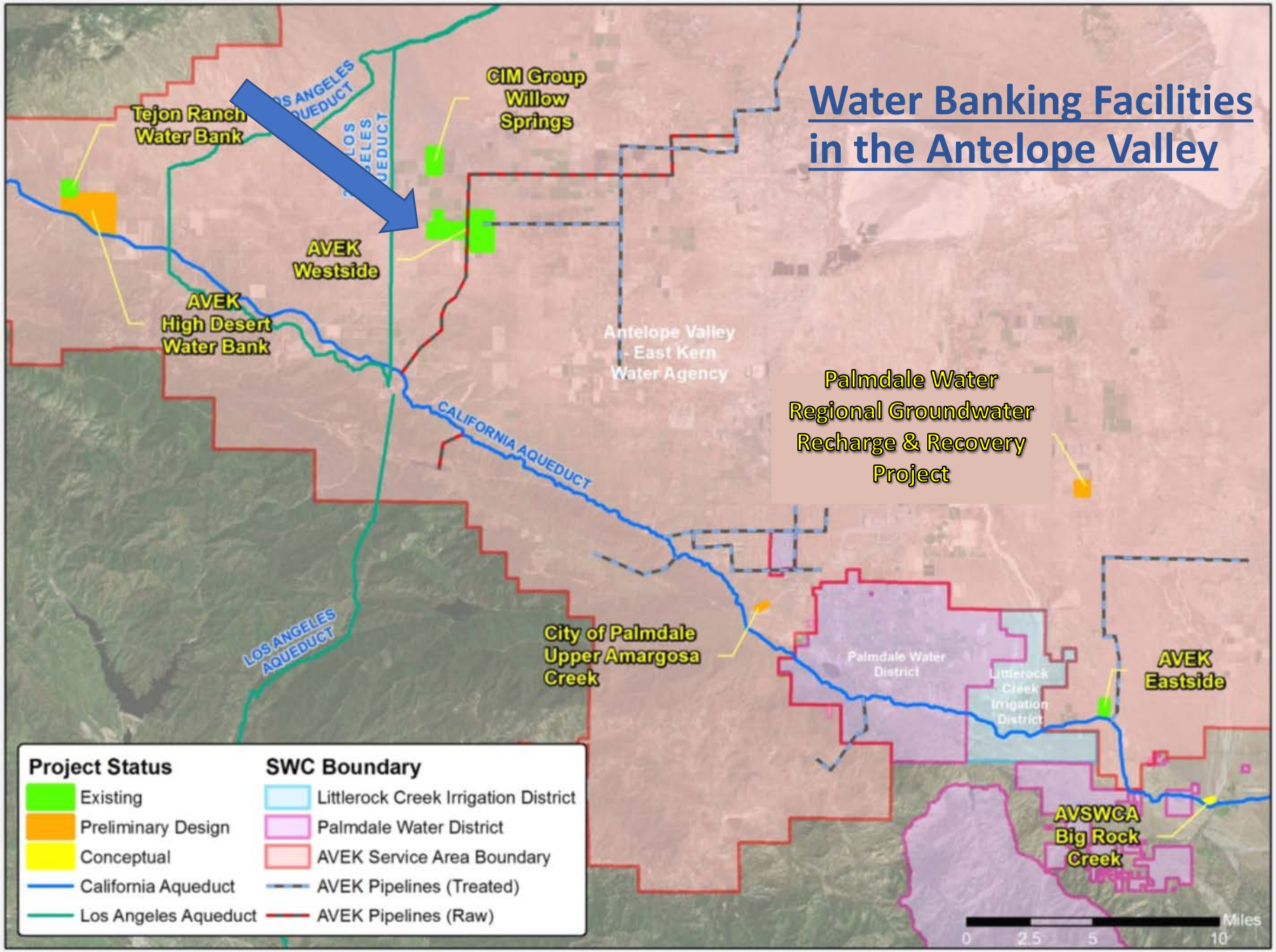
Eastside Water Bank Overview

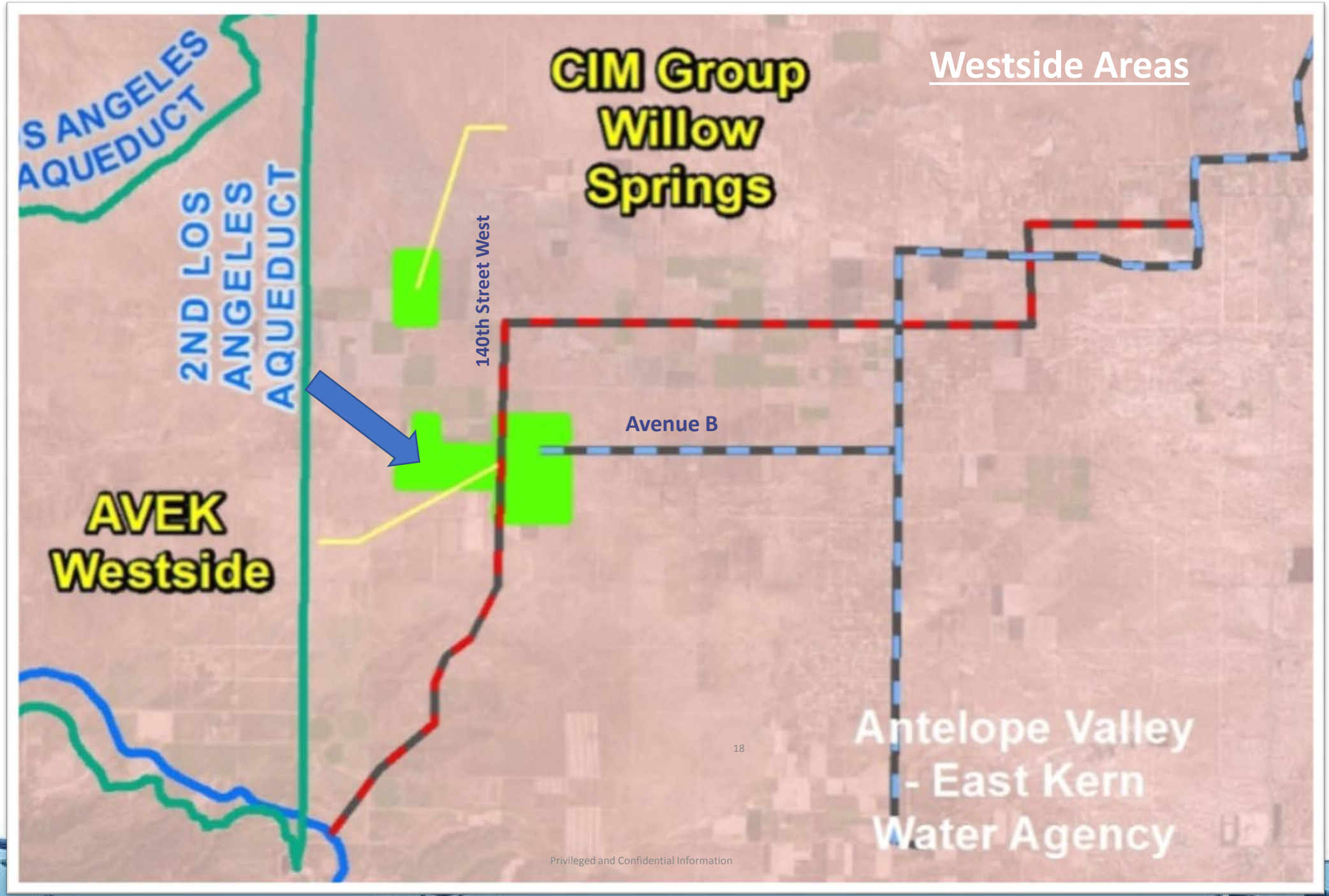
Questions?

Westside Water Bank Overview

- Joint Workshop
- February 15, 2018

Water Banking Facilities in the Antelope Valley



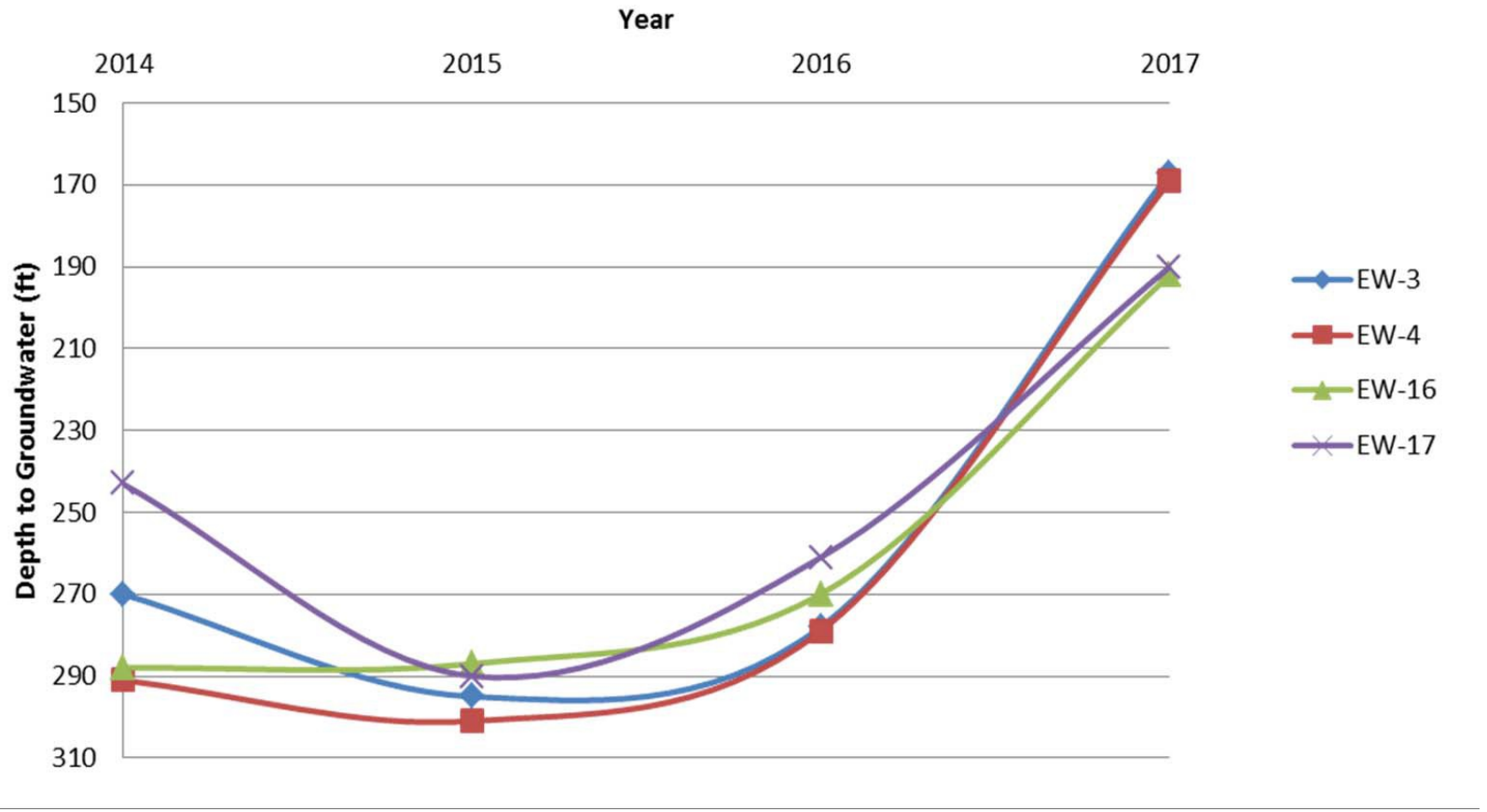


Westside Water Bank

- Groundwater Storage & Recovery using State Water Project Supplies
  - Project Start: 2010
  - Project Facilities:
    - 7 Turnouts from West Feeder Pipeline
    - 1,200 Acres of Recharge Basins
    - 11 Groundwater Recovery Wells
    - Two 4-Million Gallon Storage Tanks
    - Treatment and Control Building
    - 5-1/2 Miles of Well Collection Pipelines
    - 5-1/2 Miles of Transmission Pipelines
    - Two Solar Fields

Groundwater Level Monitoring

- Static groundwater levels monitored monthly
- Discontinue recharge if groundwater aquifer approaches 75 feet below ground surface
- Additional capacity available for further recharge



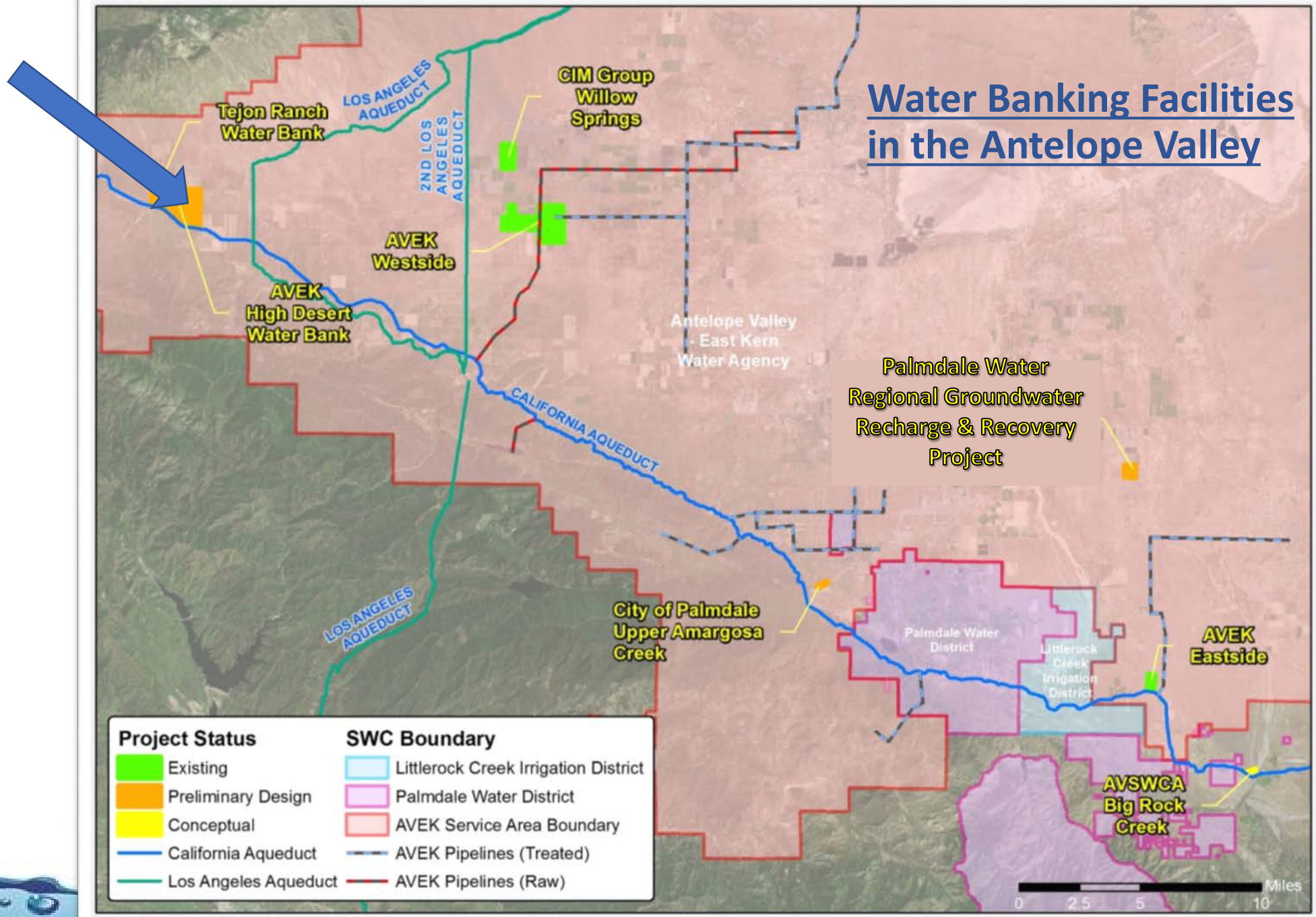
Westside Water Bank Overview

Questions?

High Desert Water Bank Overview

- Joint Workshop
- February 15, 2018

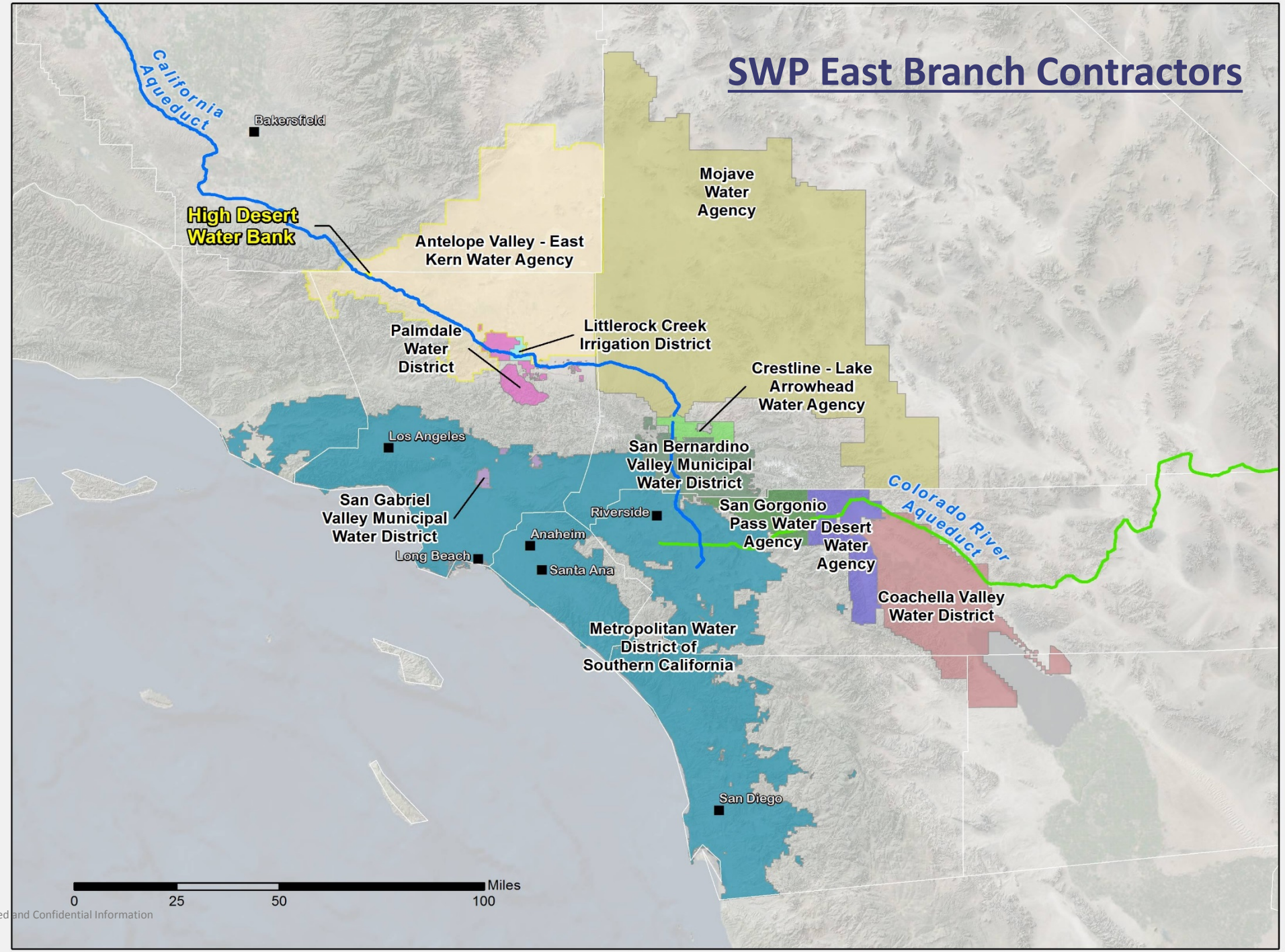
Water Banking Facilities in the Antelope Valley



High Desert Water Bank Profile

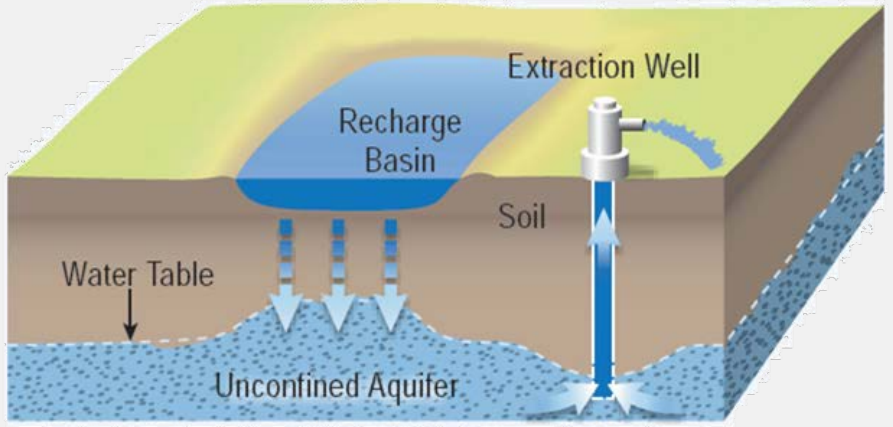
- **Objective:** Provide water banking services and water reliability benefits to partner agencies.
- **Capacity:**
  - Annual Recharge: 70,000 AF.
  - Total Storage: 280,000 AF.
  - Annual Recovery: 70,000 AF.
- **Location:** Adjacent to the East Branch of the California Aqueduct, enabling water delivery and return without development of additional conveyance.

SWP East Branch Contractors



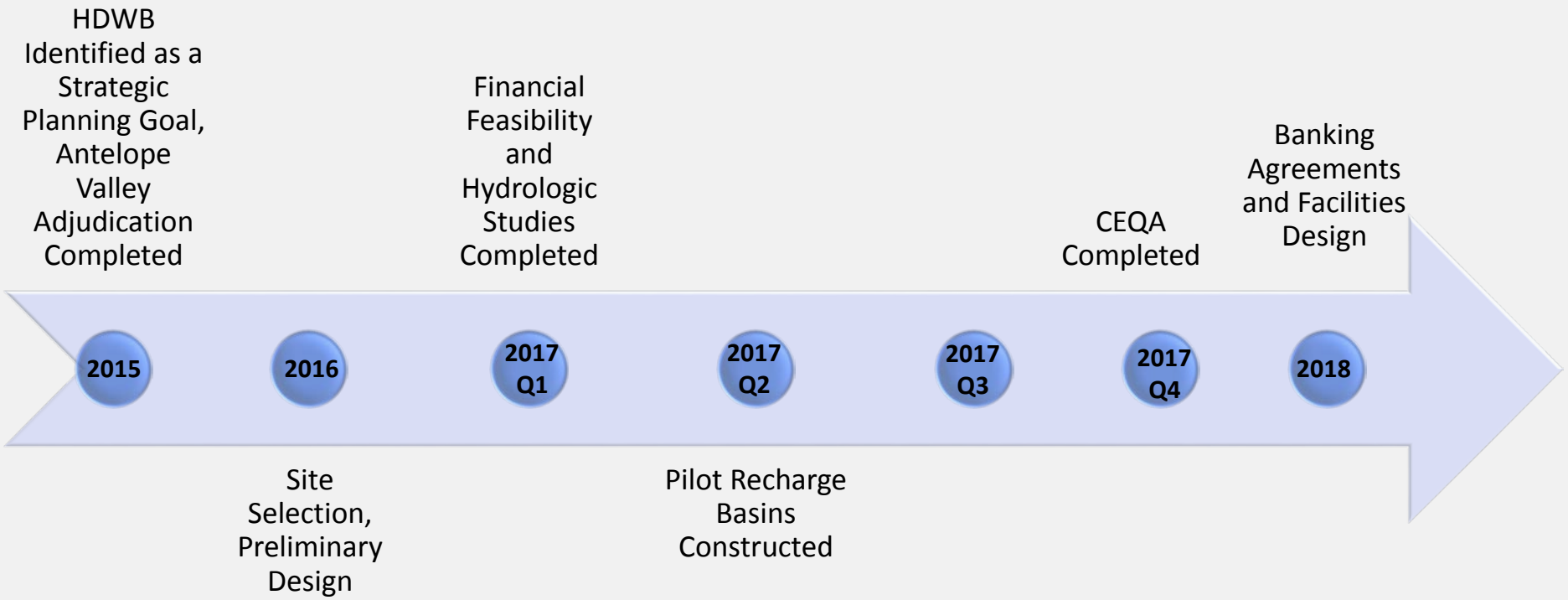
High Desert Water Bank Operations

- **Banking Partnerships:** Enter into long-term water banking agreements providing partner agencies with committed capacity in the High Desert Water Bank.
- **Wet Years:** Store surplus State Water Project (SWP), Central Valley Project (CVP), and/or other types of water delivered to AVEK by banking partners.
- **Dry Years**: Recover and return stored water to banking partners directly or by exchange using AVEK's SWP Table A allocation.



Source: California Department of Water Resources, CA Water Plan 2009

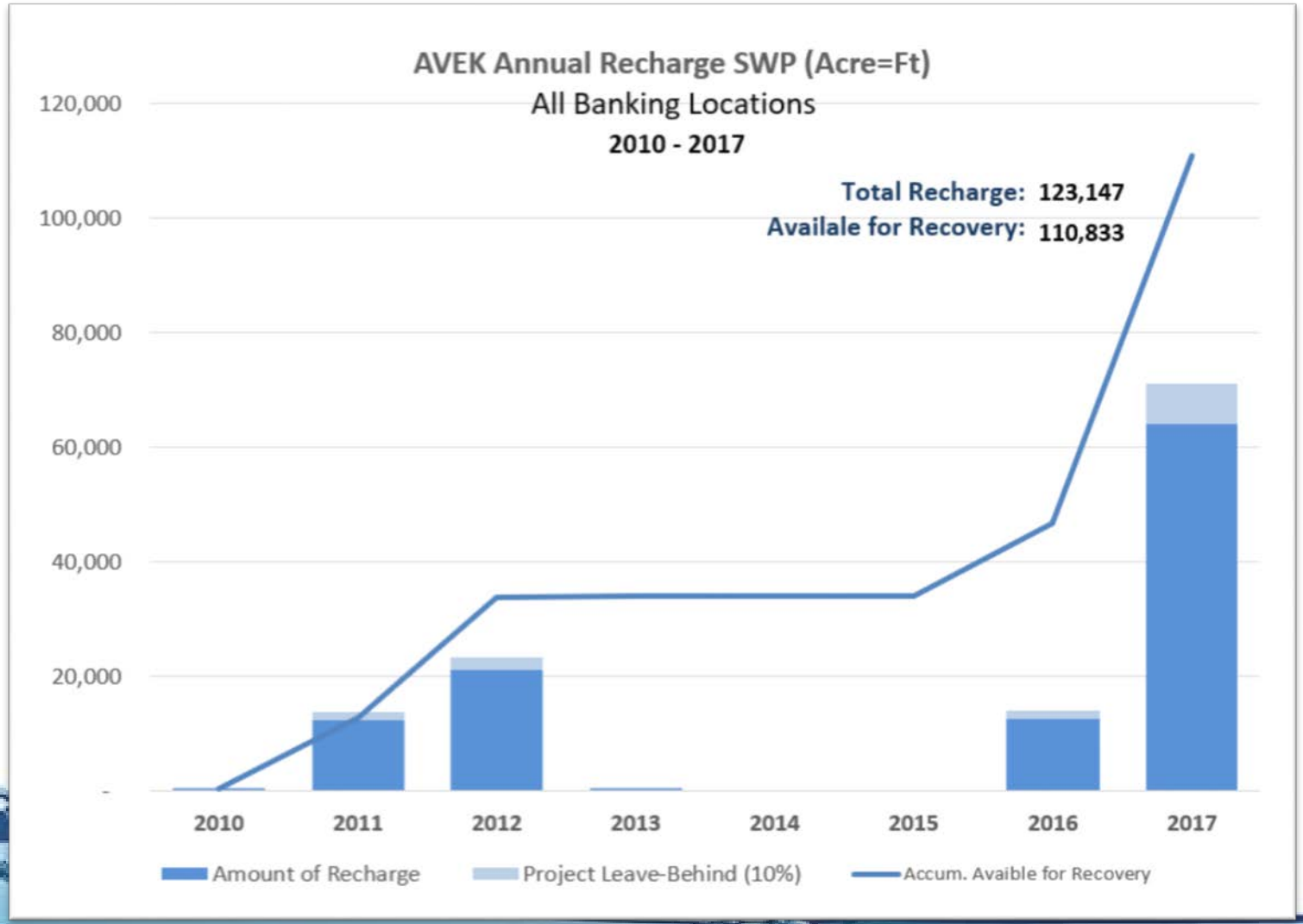
HDWB Development Timeline



High Desert Water Bank Overview

Questions?

AVEK Water Banking Overview
Recharge Quantities

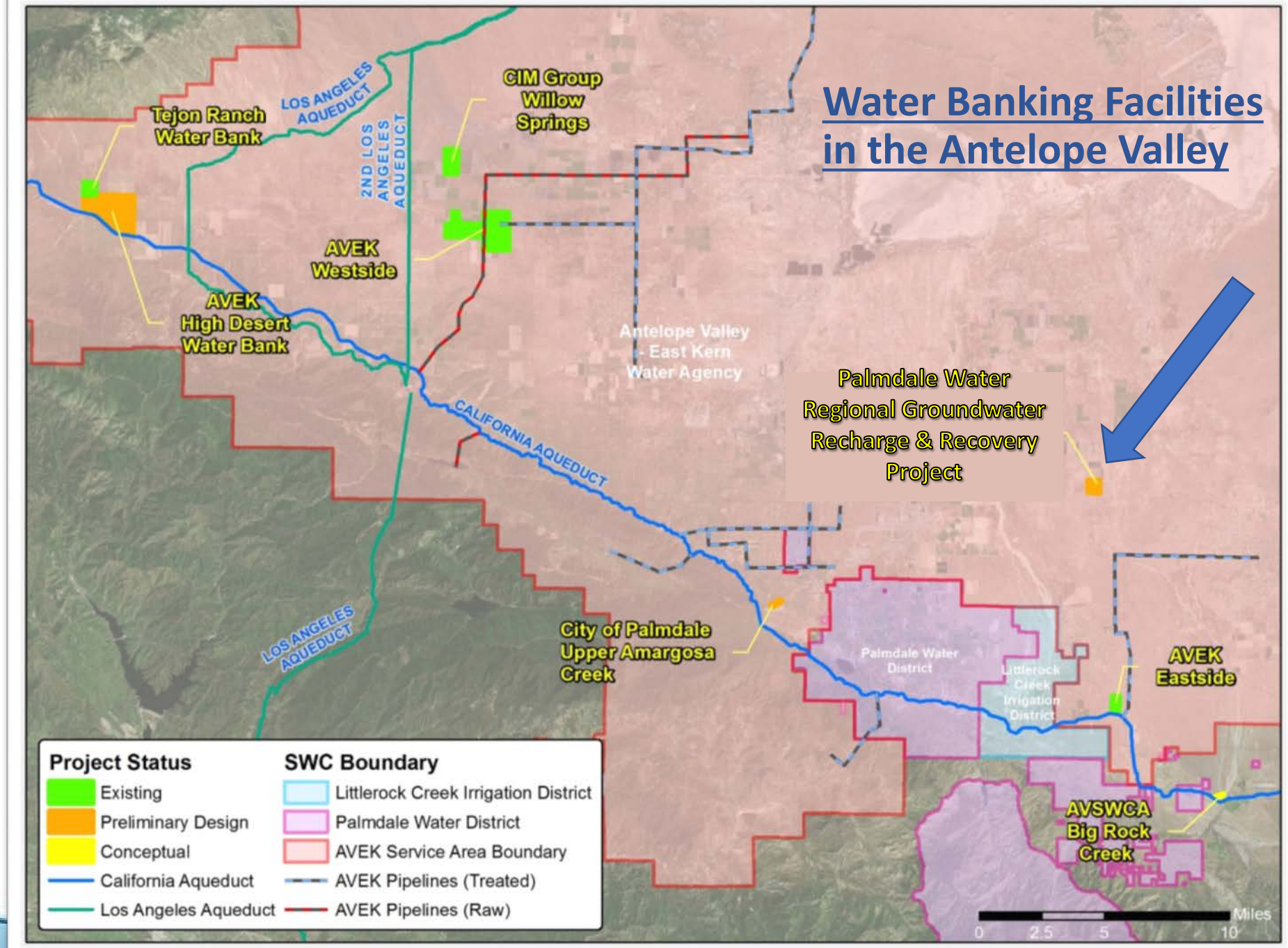


Year	Amount of Recharge	Amount Available for Recovery
2010	413	371
2011	13,731	12,358
2012	23,384	21,046
2013	371	333
2014	0	0
2015	0	0
2016	14,086	12,677
2017	71,163	64,047
TOTAL	123,147	110,833

PWD's Palmdale Regional Groundwater Recharge & Recovery Overview

- Joint Workshop
- February 15, 2018

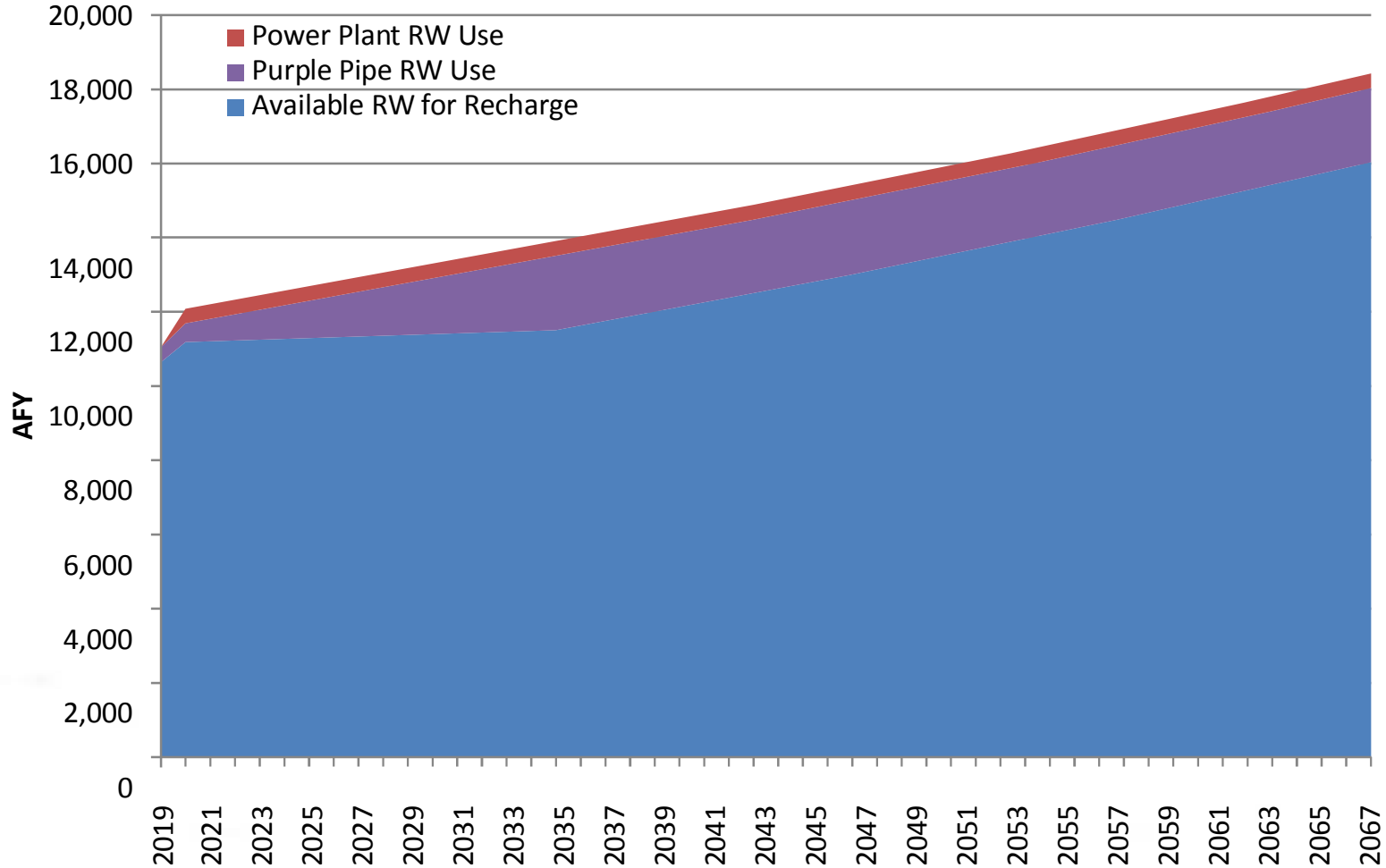
Water Banking Facilities in the Antelope Valley



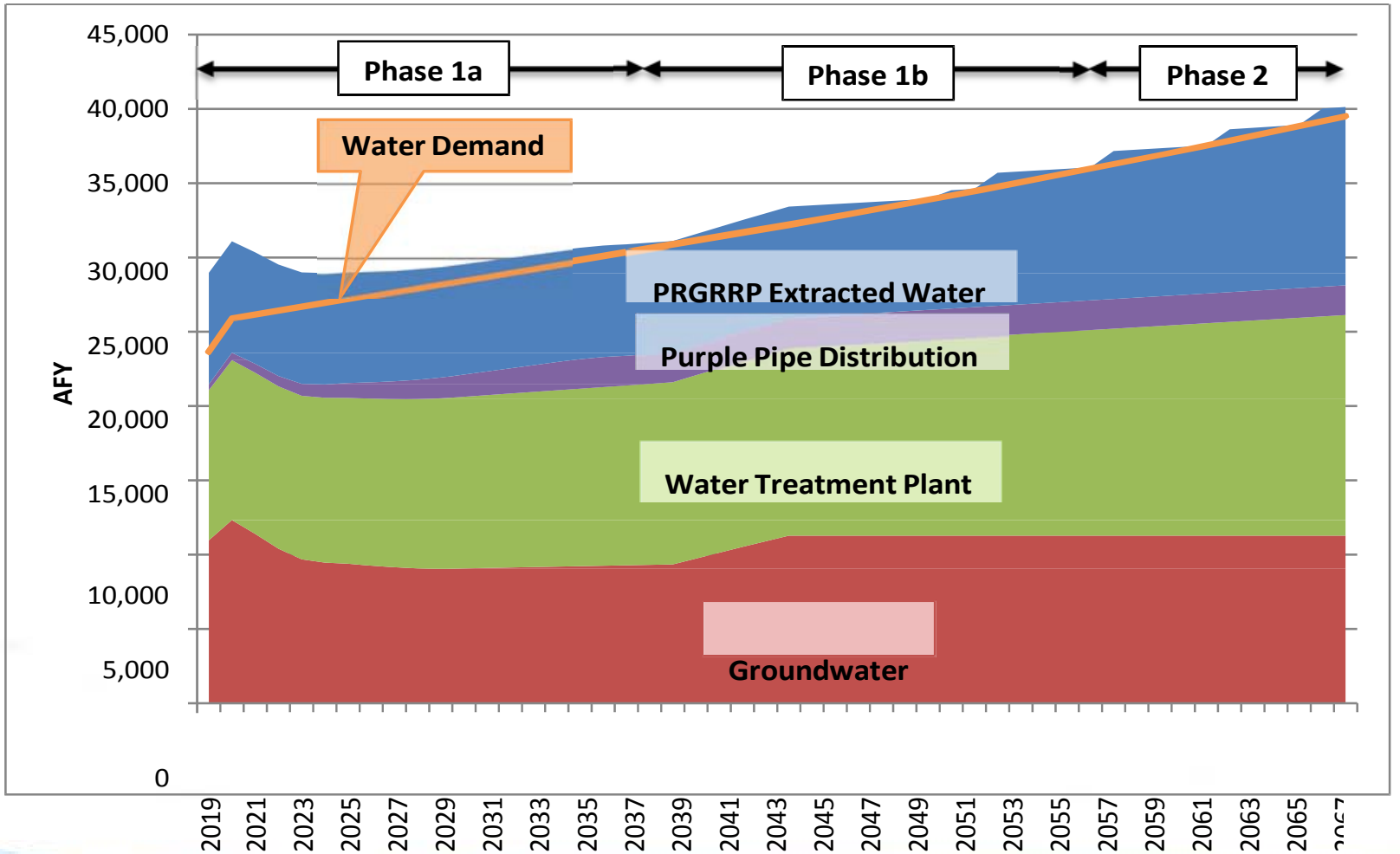
Palmdale Regional Groundwater Recharge & Recovery Project

- **Project Benefits:**
  - Wet Year Storage of SWP Water
  - New Stable/Local Supply of Water
  - Phase-able to Grow with Demand or Partners
  - Versatility of Pumping to System or Back to SWP
- **Build Out Capacity:**
  - Annual Recharge: 52,000 AF
  - Annual Recovery: 31,000 AF
  - Total Storage: TBD
- **Location:**
  - North of the East Branch Aqueduct in North East Palmdale overlying the Lancaster Sub-basin

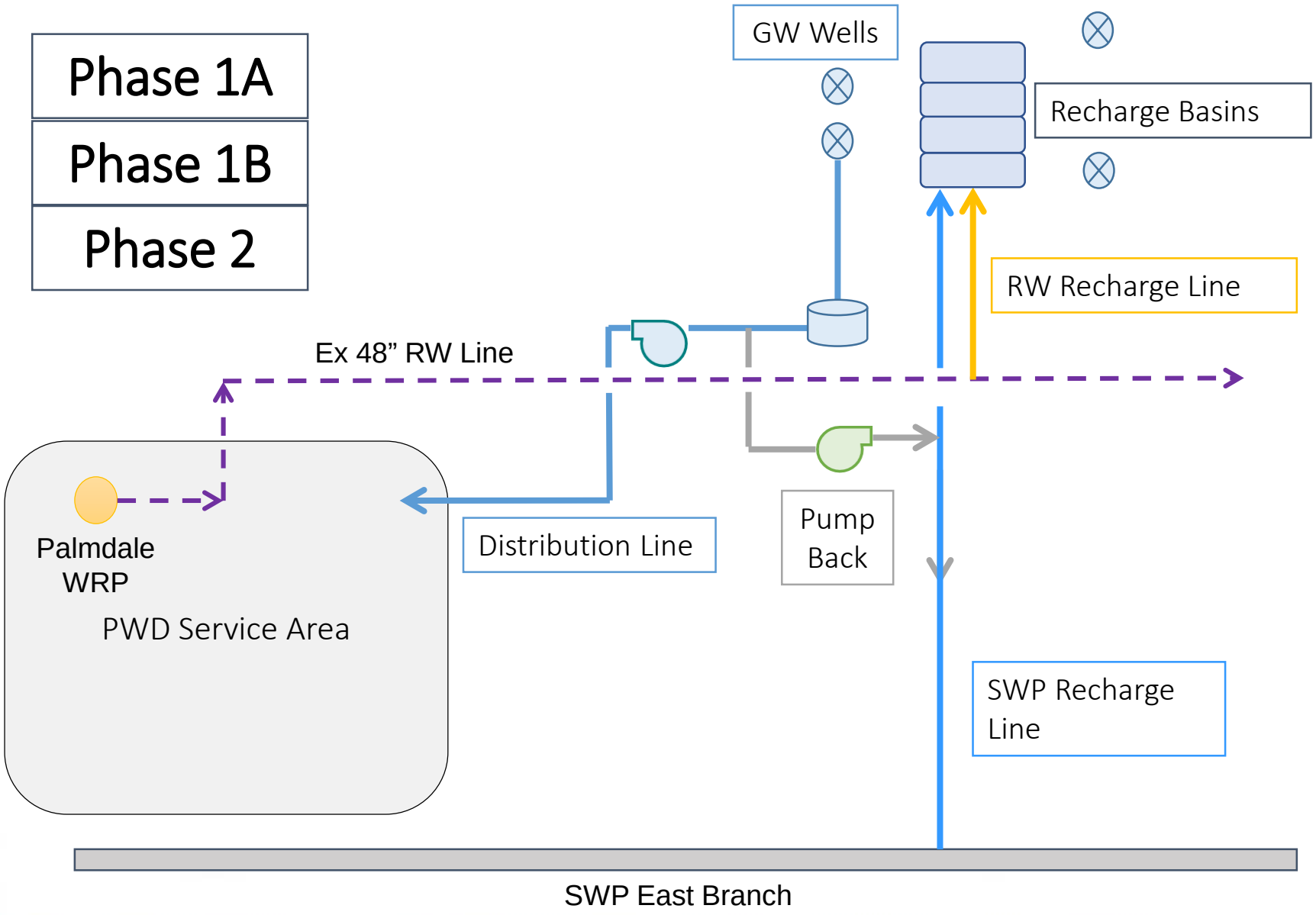
New Supply-Tertiary Treated Recycled Water Projected Availability



PRGRRP Supply Versus Long-term Demand



Phased Project Schematic



PRGRRP Phasing Summary

Phase 1A
2019-2038 (estimated)

- 3,600 AFY RW Recharge
- 4,700 AFY SWP Recharge
- 7,500 AFY Extraction

Phase 1B
2039-2058(estimated)

- 6,600 AFY RW Recharge
- 8,200 AFY SWP Recharge
- 8,100 AFY Extraction

Phase 2
2059-2068(estimated)

- 5,700 AFY RW Recharge
- 6,800 AFY SWP Recharge
- 10,800 AFY Extraction

Palmdale Regional Groundwater Recharge & Recovery Project

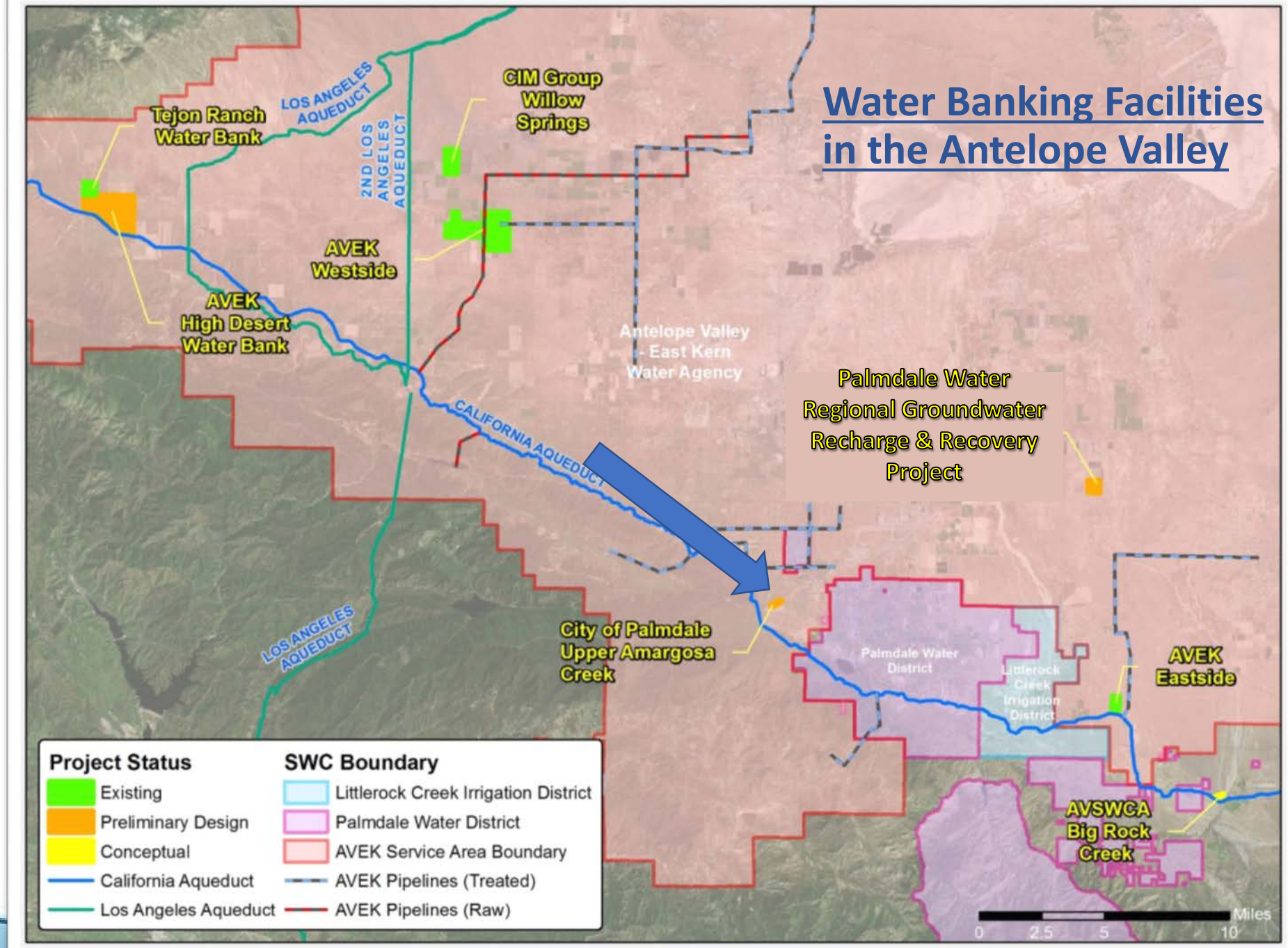
Questions?

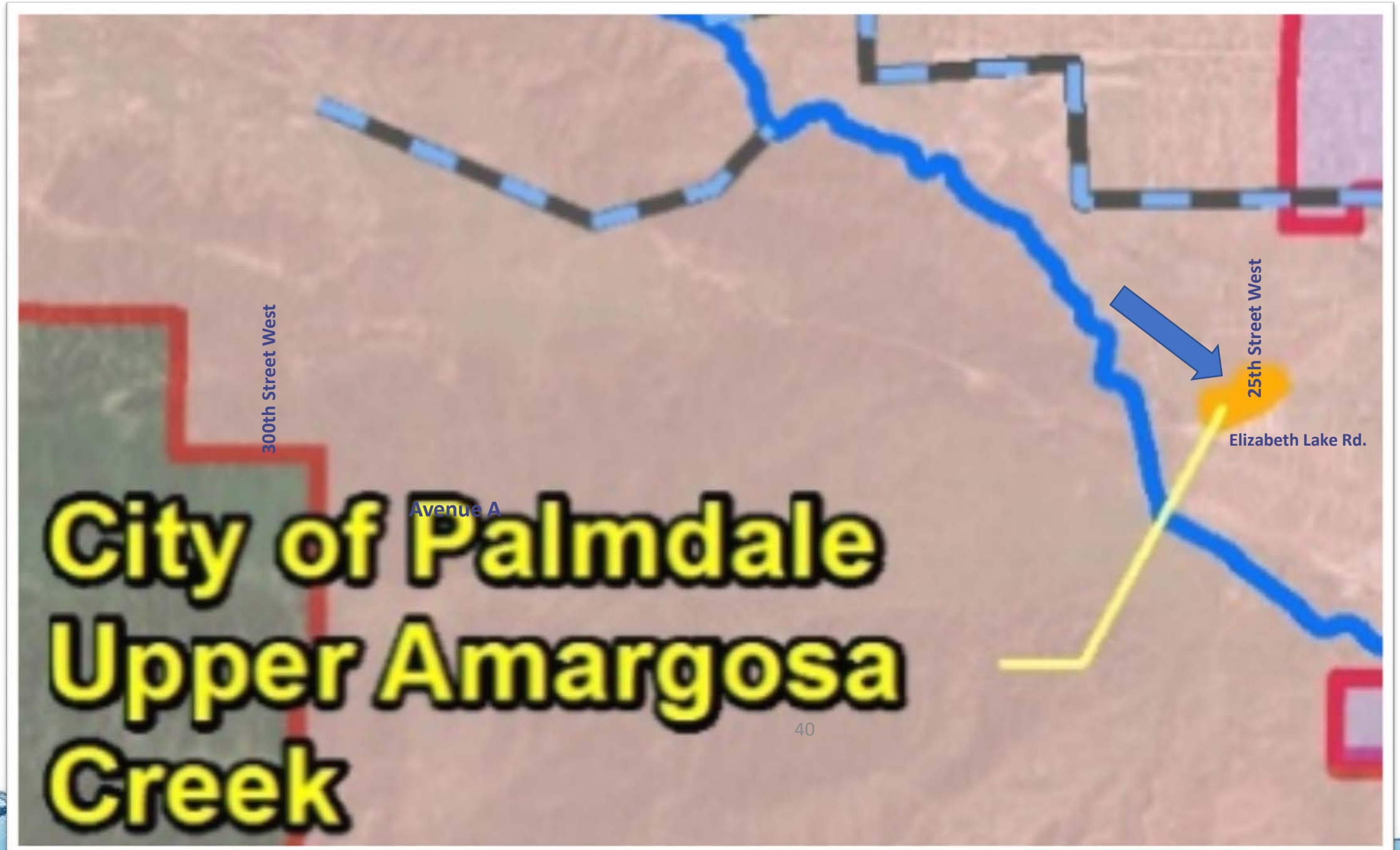
- Joint Workshop
- February 15, 2018

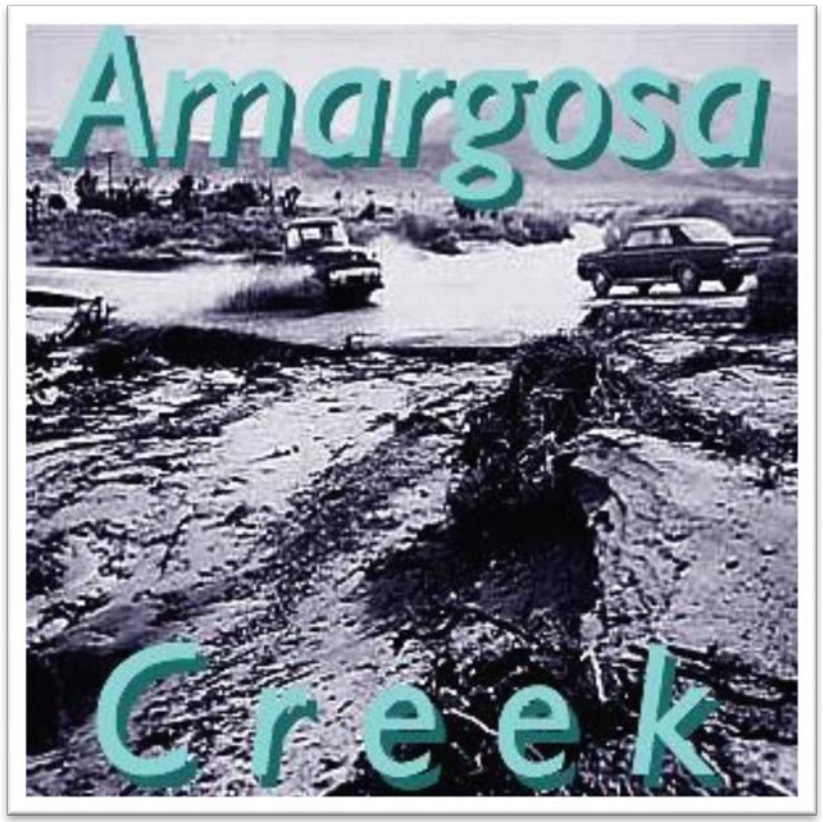
Upper Amargosa Creek Recharge Project Overview

- Joint Workshop
- February 15, 2018

Water Banking Facilities in the Antelope Valley



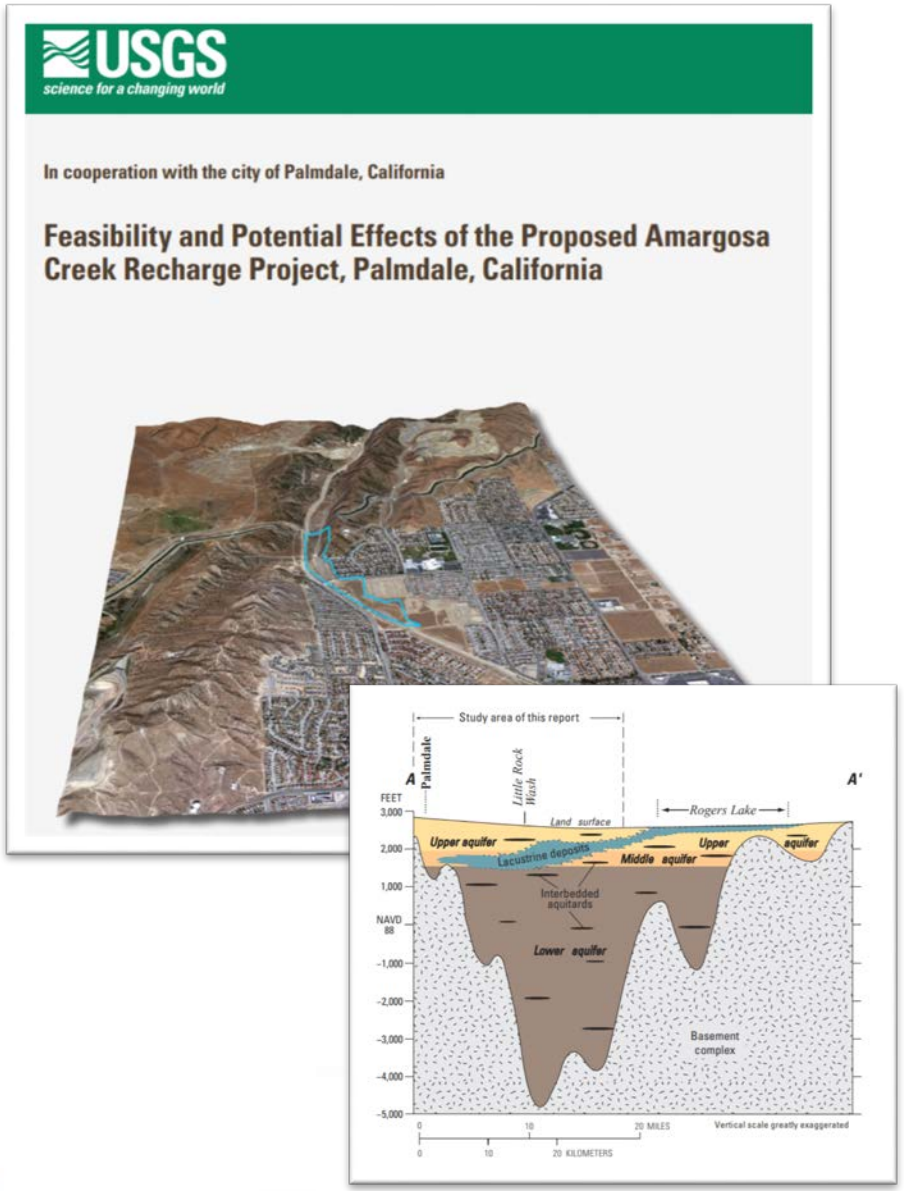

300th Street West
Avenue A
25th Street West
Elizabeth Lake Rd.
City of Palmdale
Upper Amargosa
Creek



February 1969 – Amargosa Creek in the Antelope Valley, courtesy Water Resources Center Archives (WRCA) Historic Flood Photographs

The Background

- In 2006, City of Palmdale proposed Project
- Project located near 25th Street West, North Side of Elizabeth Lake Road
- Cooperative agreement with Partners executed December, 2013
- USGS Feasibility Study completed
- Project part of Antelope Valley Integrated Regional Water Management Plan (AV-IRWMP)
- Project is receiving $6.5 Million through Proposition No. 1E



The Objectives

- Recharge local Antelope Valley groundwater aquifer system with available State Water Project Water
- Recover water later for beneficial use
- Flood Protection & Habitat Restoration
- Give local citizens a creek-side community Nature Park

The Costs

- Total Cost Estimate: $14,500,000
  - Includes Design, Construction, & Contingency
  - 72% of costs for recharge facilities
  - 16% of costs for flood control
  - 12% of costs for habitat restoration
  - Construction cost estimate: $9,620,000

- Project Costs Breakdown
  - $6,500,000 from Proposition 1E
  - $3,000,000 from City of Palmdale
  - $5,000,000 from Project Partners

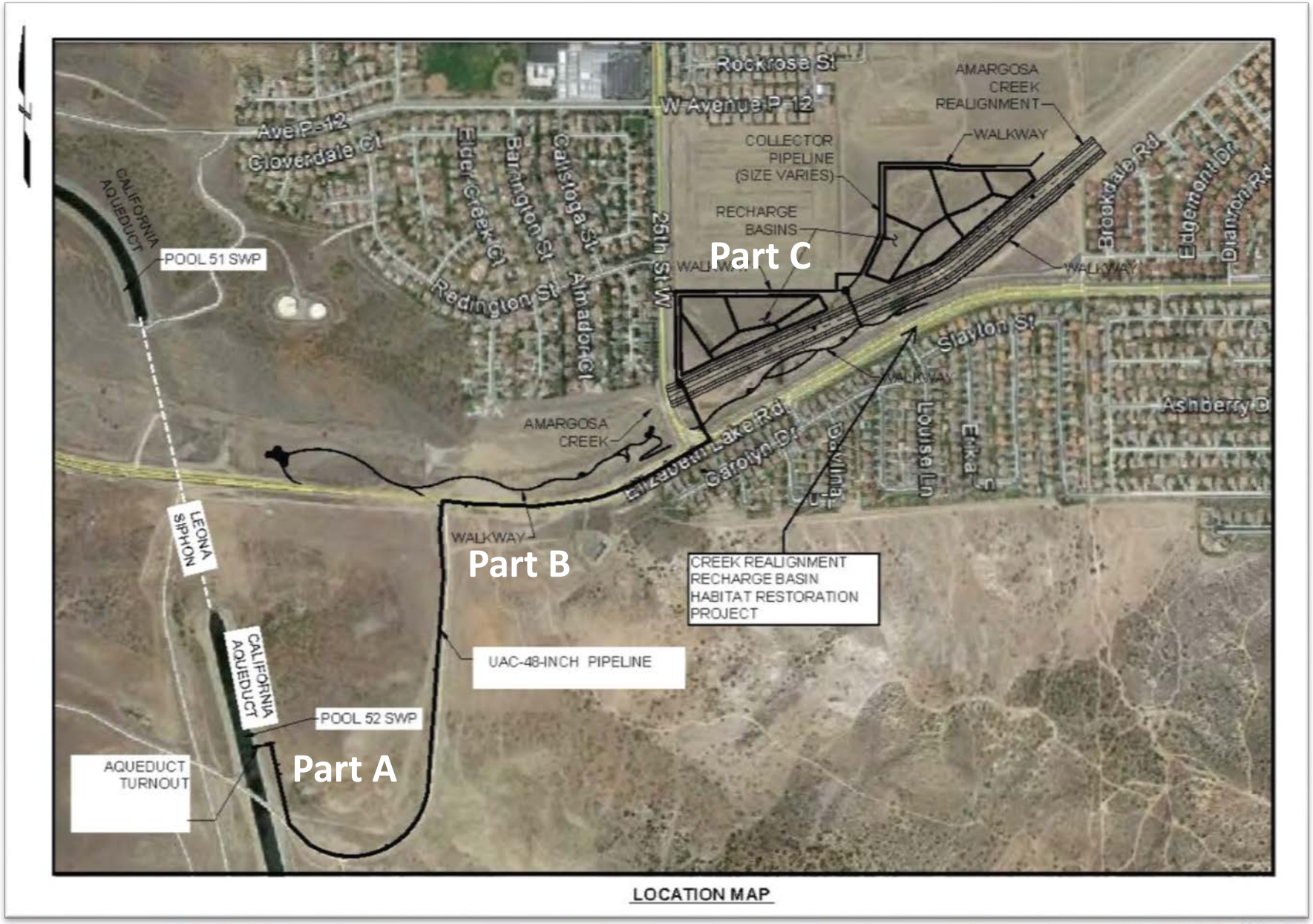
The Costs

Agency	Budgeted Amount	Spent to date
AVEK Water Agency	$ 2,500,000	$ 279,926
Palmdale Water District	$ 1,250,000	$ 139,963
LA County WWD40	$ 1,250,000	$ 139,963
City of Palmdale	$ 1,500,000	$ 1,028,000
Proposition 1E Grant	$ 6,500,000	-0-
TOTAL	**$ 13,000,000**	**$ 1,587,852**

- City of Palmdale has contributed another $3,000,000 towards environmental, monitoring wells, property, etc.

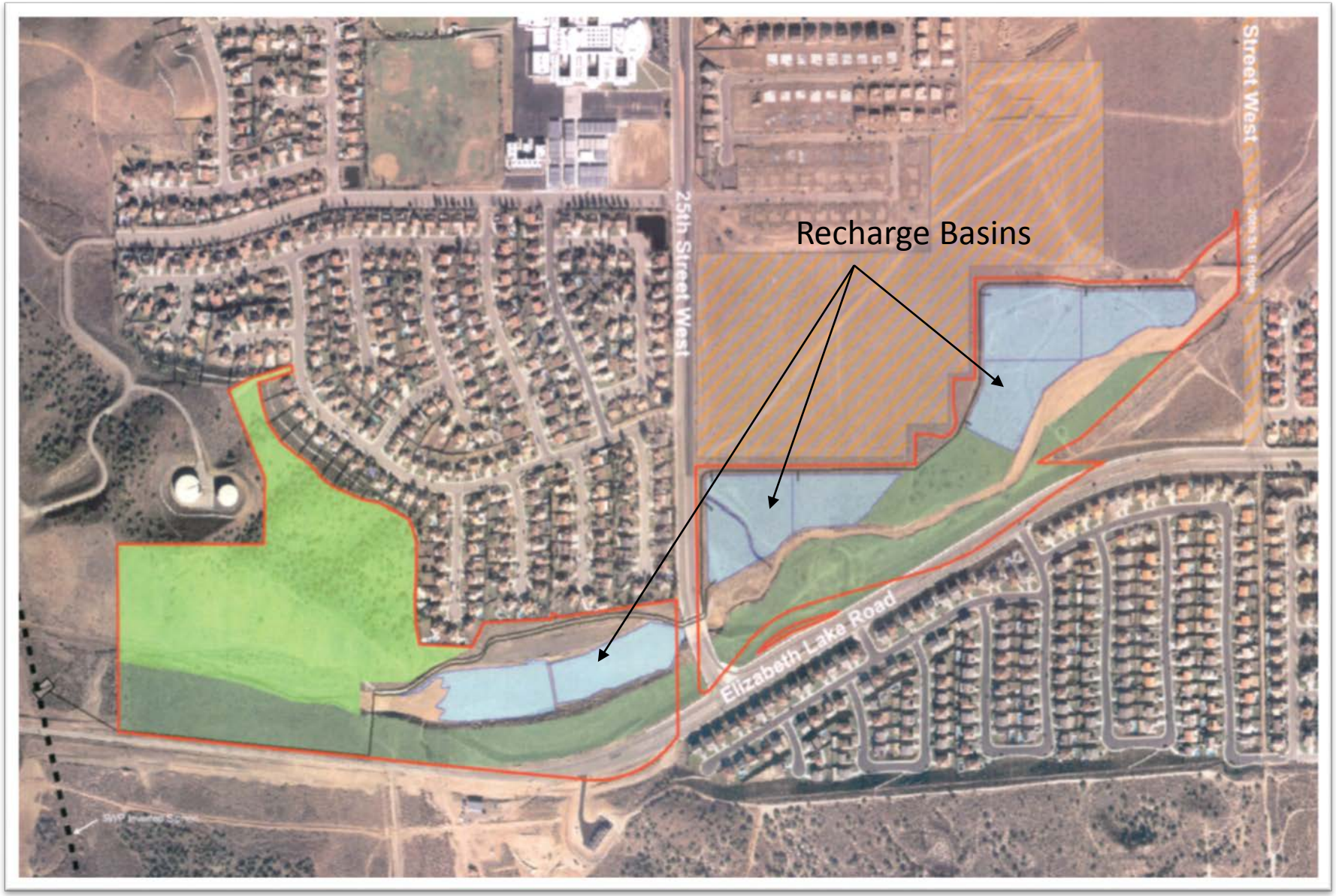
The Project

- Part A: The Aqueduct Turnout
- Part B: The 48” Conveyance Pipeline
- Part C: The Creek Realignment & Recharge Basins



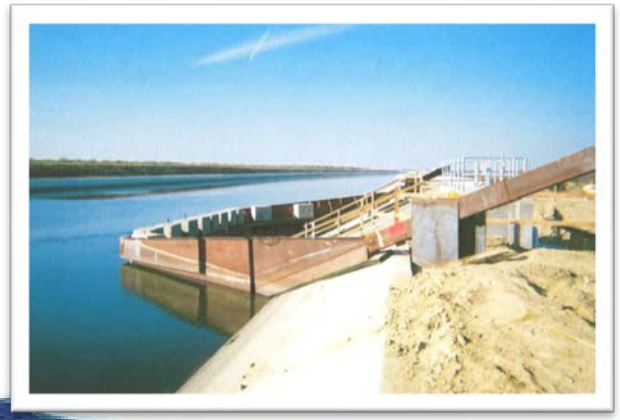
The Project

- Approx. 75 acres along Amargosa Creek
- Recharge facility of 11 off-channel basins
- Preliminary USGS model results show recharge rate between 3,400 & 9,400 acre-ft/yr



The Status

- August 2017:
  - Plans & Specifications submitted for all three parts of the Project
- December 2017:
  - Requested design changes made
    - DWR request relocation of SWP turnout.
    - CDFW request revised Streambed Alteration Agreement
    - Realignment of conveyance pipeline
    - City of Palmdale to generate two (2) additional environmental & engineering documents



The Status

- January 2018:
  - Supplemental EIR (SEIR) completed
  - SEIR released for circulation & 45-day public comment period
- February 2018:
  - Updated Geotechnical Report Addendum to be submitted for review
  - City of Palmdale encroachment permit required
- February 2018:
  - Geotechnical Report review completed by DWR
  - Part A “Turnout Project” out for bid
  - Part C Realignment & Basins out for bid
- March 2018:
  - Supplemental EIR (SEIR) 45-day review period ends
- April 2018:
  - Part B 48” Conveyance Pipeline out for bid

Upper Amargosa Creek Recharge Project Overview

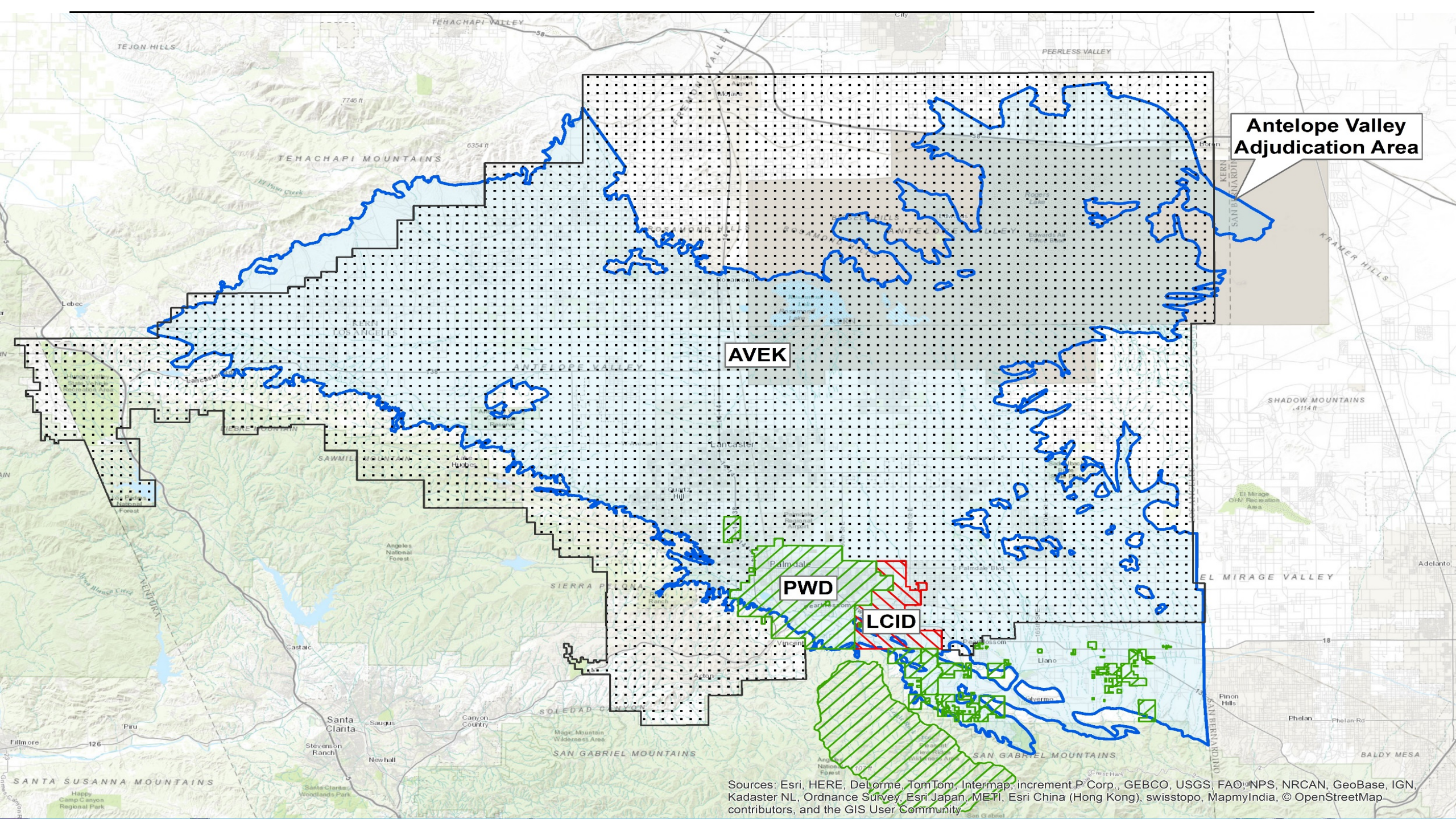
Questions?

AVEK Water Agency
New Water Supply Programs

- Joint Workshop
- February 15, 2018

New Water Supply Programs

- Property Owners and Water Suppliers within the AVEK service area may be negatively impacted by the groundwater use restrictions contained in the Antelope Valley Groundwater Adjudication Judgement
- Some Property Owners and Water Suppliers may be short on groundwater supplies during the Rampdown
- While other Smaller Pumpers usually on individual lots might find it difficult to drill a new well and to develop their property using groundwater supplies
- Some vacant land owners may find it even more difficult since their access to groundwater supplies was prohibited by the Judgement and water wells can not be drilled to supply groundwater


Antelope Valley Adjudication Area
AVEK
PWD
LCID
TEHACHAPI VALLEY
TEJON HILLS
TEHACHAPI MOUNTAINS
PEERLESS VALLEY
ROSAMOND HILLS
ROSAMOND VALLEY
ANTELOPE VALLEY
KRAMER HILLS
SHADOW MOUNTAINS
EL MIRAGE VALLEY
SIERRA PELONA
SAWMILL MOUNTAIN
SOLEDAD CANYON
SAN GABRIEL MOUNTAINS
SANTA SUSANNA MOUNTAINS
SAN BERNARDINO MOUNTAINS
BALDY MESA
Lebec
Lancaster
Palmdale
Vincent
Acton
Castaic
Santa Clarita
Saugus
Canyon Country
Newhall
Stevenson Ranch
Fillmore
Piru
Pearblossom
Llano
Pinon Hills
Phelan
Adelanto
Boron
Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

New Water Supply Programs

- The Antelope Valley Groundwater Adjudication Judgement affects the use of groundwater supplies for all AVEK Property Owners and Water Suppliers
- The AVEK ACT passed by Legislature in 1959 grants every Property Owner and Water Supplier in the AVEK service area access to Imported Water Supplies
- The AVEK ACT requires that the Board allocate water based on the proportional share of the taxes paid by each property owner
- The question then becomes can AVEK develop new water supply using imported water that can replace groundwater supplies that are restricted or no longer available

New Water Supply Programs

- This is the basis for two proposed programs to assist our Property Owners and Water Suppliers to address water supply issues associated with the Antelope Valley Groundwater Adjudication Judgement
    - ***Replacement Water***
    - ***AVEK Water Supply for small and non pumper***
- These programs would not be viable without the Boards vision and investment in water banking infrastructure over the last ten years

Replacement Water Program

- This program is for any Groundwater Producer (Property Owner or Water Supplier) that is within the AVEK service area that is required by the Watermaster to acquire or pay for Replacement Water

  - This Program, subject to approval by the Watermaster Board would allow any Property Owner or Water Supplier within the AVEK service area to acquire replacement water from the AVEK water banks to satisfy their replacement water obligations to the Watermaster

  - These program is fairly straight forward. AVEK would import water from outside the area and place water within the groundwater basin via the water banks operated by AVEK

Replacement Water Program

- When AVEK receives a request from Property Owners or Water Supplier for Replacement Water, AVEK would notify the Watermaster that an equivalent amount of banked water would be released to the groundwater basin satisfying the replacement water obligation for the property owner or Water Supplier
- Additional provisions would need to be established for pumping reductions within the cone of depression to assure that the replacement water benefits would be realized in this area
- There are several ways to accomplish requirement that would be further developed as the plan evolves.

Replacement Water Program

- AVEK is bound to recover costs only, therefore with this program the cost would limited to cost of importing the water to the AVEK service area and any distribution and banking costs
- The current agricultural water rate for non treated raw water is consistent with the recovery costs necessary to facilitate this program.
- This is the agency's lowest water rate
- Groundwater banking has a loss factor of 10% for incidental losses in the banking process.
- This additional cost of 10% would need to be added to the agricultural rate
- The Cost for Replacement Water is proposed to be $415 per acre foot

AVEK Water Supply Program for Small and Non Pumpers

- This program is designed to assist small and non pumpers that need water supplies other than groundwater to serve their properties.
- This program would generally be used by individual lot owners within the AVEK service.
- This program would operate similar to the Replacement Water program and imported water from outside the area would be placed in the AVEK groundwater banks.
- Small and Non Pumpers that would like to access this water would sign up with AVEK and enter into water supply agreement.

AVEK Water Supply for Small and Non- Pumpers

- The cost recovery for this program is the same as the Replacement Water Program, $415 per acre foot.
- Assuming one acre foot per household, the monthly cost would be in the $35 per month range, plus electric costs for pumping

Program Benefits

- AVEK Property Owners and Water Suppliers would have access to imported water supplies to meet groundwater use restrictions contained in the Antelope Valley Groundwater Adjudication Judgement
- Help to maintain property values within the AVEK service area
- Help the Watermaster Board to comply with the Judgement requirements.
- Provide Property owners certainty of available water supply

AVEK Water Agency
New Water Supply Programs

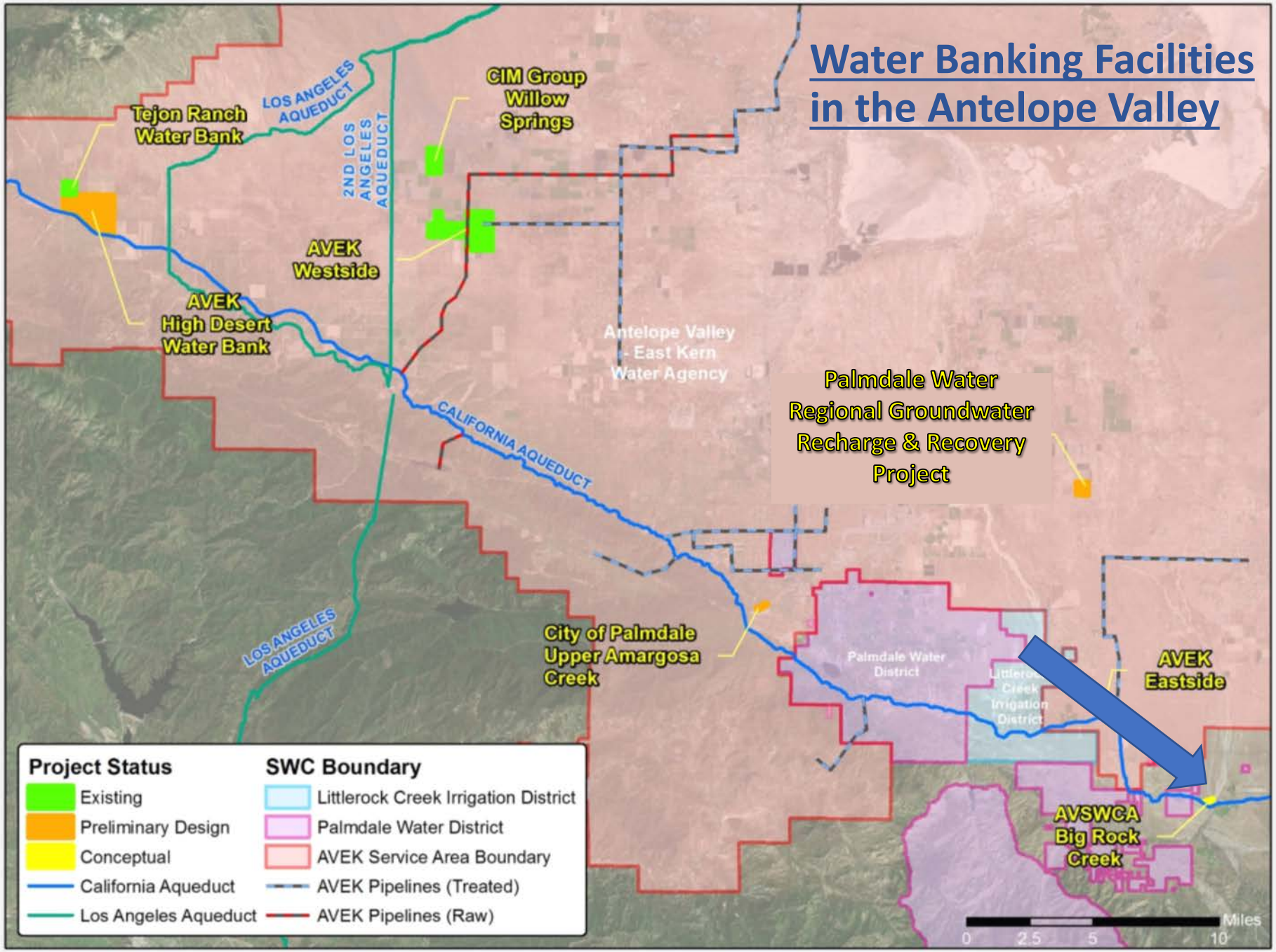
Questions?

- Joint Workshop
- February 15, 2018

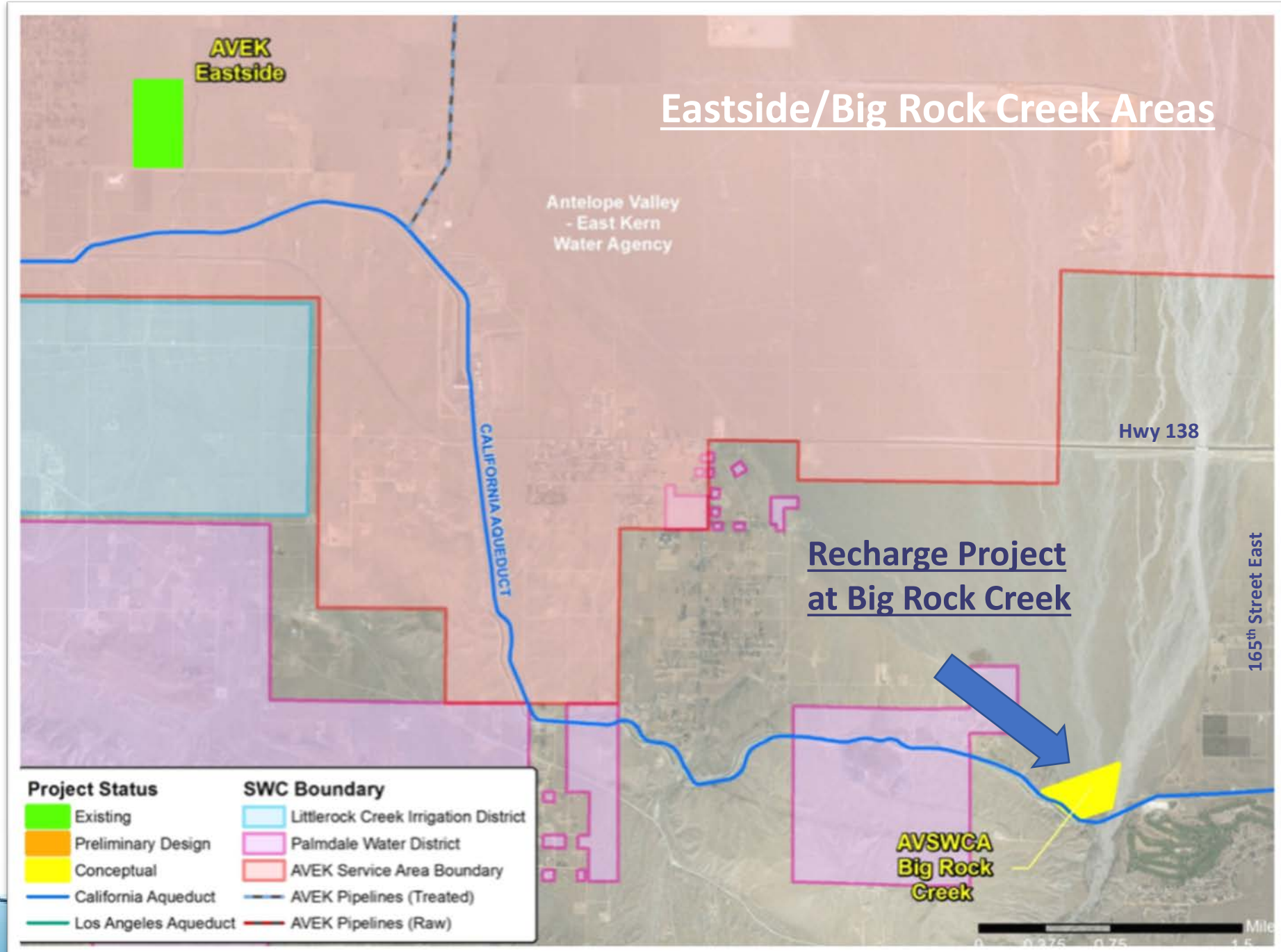
Feasibility of Developing a Joint Groundwater Recharge Project at Big Rock Creek

- Joint Workshop
- February 15, 2018

Water Banking Facilities in the Antelope Valley



Eastside/Big Rock Creek Areas



Big Rock Creek Recharge - *Concept*

- Potential location to recharge SWP water during wet years within the Antelope Valley Groundwater Basin
- Recovery of stored would occur outside the Big Rock Creek area
- Not a banking facility in the same way as WWB/EWB/PRGRRP
  - *Assumption*: Watermaster determines that we have "one big basin" and water may be recovered at locations other than where it was recharged
  - Water could be recovered via existing wells and future wells
  - Some limits are expected (e.g. pumping would not be allowed in areas that would cause material harm to the basin)

Big Rock Creek Recharge – *Benefits*

- Another option to store SWP water when SWP allocation exceeds demand or existing infrastructure capacity
  - Stored water could be used to supplement demand during drought years
  - Stored water could be purchased as “replacement water” by the Watermaster
- No capital investment to recover stored water
  - Recovery can be done with existing infrastructure

Big Rock Creek Recharge – *Benefits* *(con't)*

- Relatively low initial investment
  - Siphon/temporary turnout already exists, permanent turnout plans previously approved by DWR
  - Recharge could potentially occur within the creek vs. construction of recharge basins
- Natural recharge area - should percolate well
- Project promotes a sustainable groundwater basin
- Low impact to surrounding area
  - No development or commercial impacts

Big Rock Creek Recharge – *Next Steps*

- Create MOU
  - Framework for project development, operation, & funding
- Select consultants
  - CEQA Compliance
  - Feasibility and Engineering

Feasibility of Developing a Joint Groundwater Recharge Project at Big Rock Creek

Questions?

- Joint Workshop
- February 15, 2018

February 15, 2018

Joint Workshop of Board of Directors of

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