Paso Robles Groundwater Basin Supplemental Supply Options Study

December 15, 2016

GEOSCIENCE

RMC water and environment

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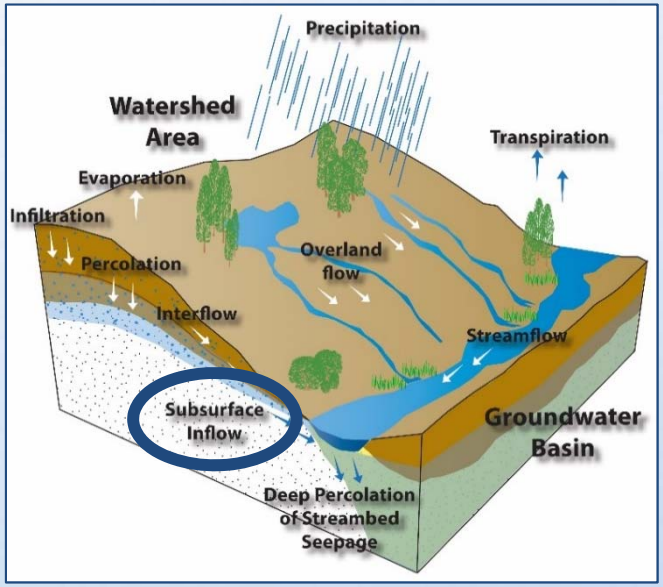
Agenda

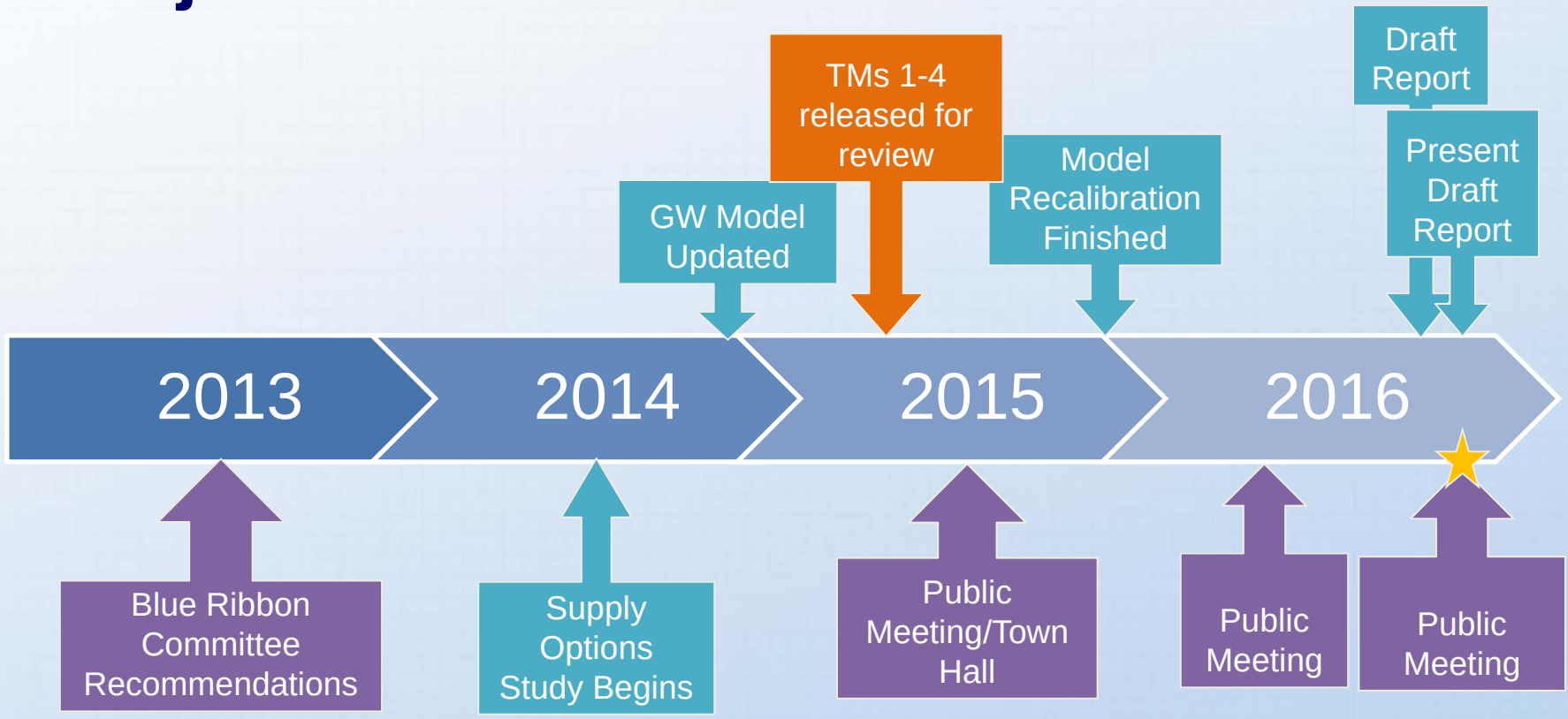
- Overview
- Groundwater Model Study update
  - What's changed since July's results
  - New results
- Supply Options Study
  - Nacimiento Water Project (NWP) Delivery
  - State Water Project (SWP) Delivery
  - Recycled Water (RW) Delivery
  - Combined Supply Option Scenarios
- Next steps

Overview



- Groundwater model update
  - Model update complete 2014
    - Peer review recommendations
  - Refinement of model in 2015/16, presented July 2016
  - Model runs – completed Nov 2016
- Supply options study
  - Goal to develop supplemental water supply options for potential use in Paso Basin
  - Identify sources and quantities available
  - Develop strategies and prioritization of options to maximize benefits

Projects Timeline



SLOCFWCD Actions

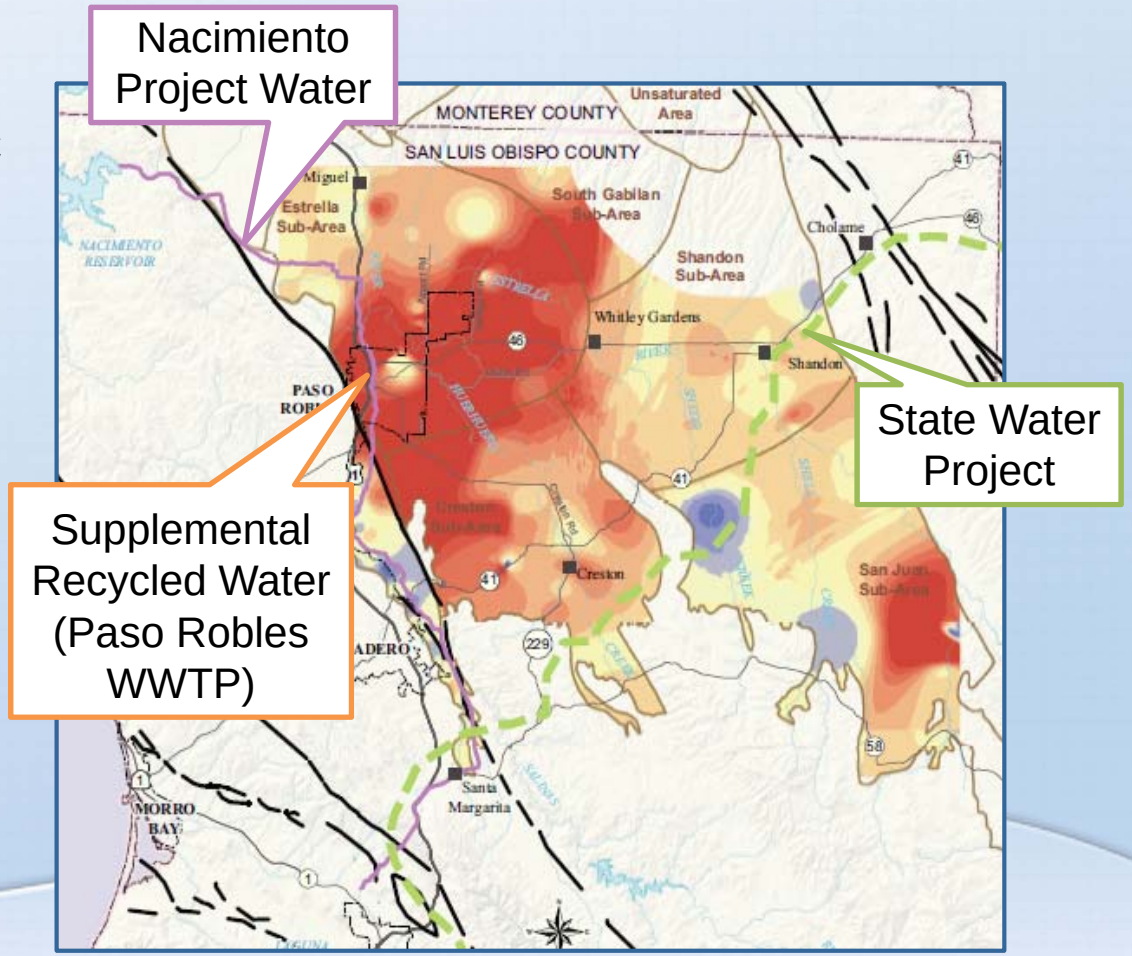
Supply Options Study/Groundwater Modeling Activities

Today's Meeting

Supply Study and Groundwater Study are closely connected

Model refinement and predictive alternatives to help define benefits of supplemental supplies

- Targeted specific subareas and specific activities
- Declining trends:
  - Estrella Subarea
  - Creston Subarea
  - Shandon Subarea
  - San Juan Subarea
- Iterative modeling to determine how much water needed to stabilize basin

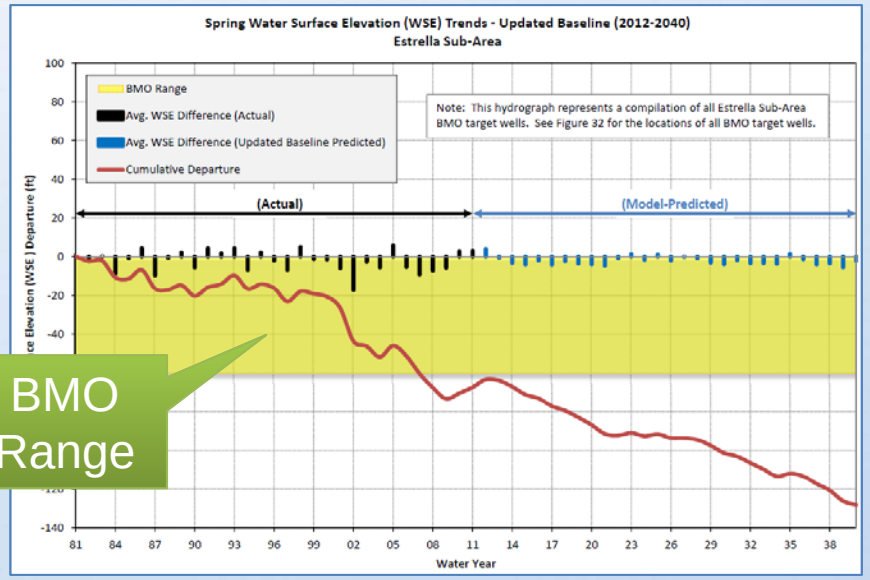


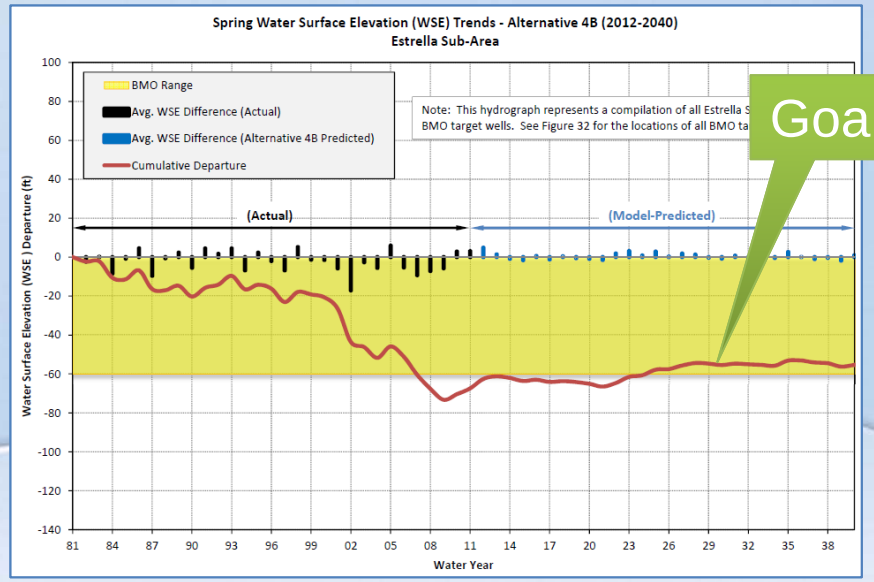
Model runs developed in coordination with advisory committees

Model Run		Recycled Water	State Water	Nacimiento Water
1	Conservation			
2	Salinas River recharge			X
3	Offset basin pumping with recycled water	X		
4	Offset pumping in Estrella Subarea	X		X
5	Additional releases to Huer Huero Creek	X	X	X
6	Additional releases to Estrella River	X	X	X
7	Offset pumping in Creston Subarea		X	X
8	Offset pumping in Shandon Subarea		X	

General goal to stabilize basin

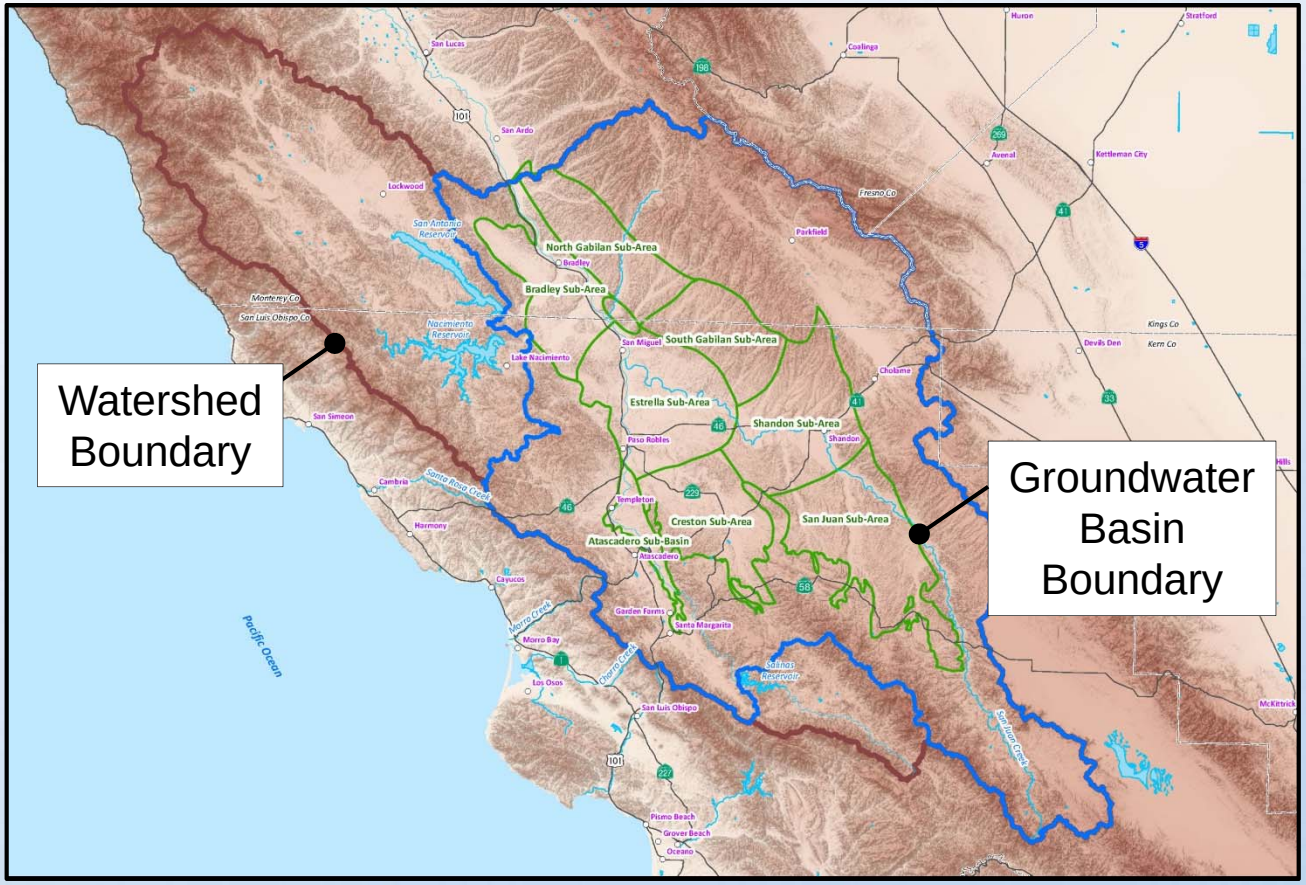
- Basin Management Objectives (BMOs) established in Paso Robles Groundwater Basin Management Plan 2011
- Goal = How much water is needed to stabilize the basin (BMO wells) by 2040; may exceed available supply
- Consistent with Sustainable Groundwater Management Act (SGMA) requirements





GROUNDWATER MODEL STUDY UPDATE

Paso Robles groundwater basin model



- Developed in 2005 by Fugro, ETIC and Cleath and Assoc.
- Updated in 2014 by GSSI and Todd GW (Incorporated watershed model)
- Refined and recalibrated groundwater model in 2016 by GSSI

Revisions based on comments from July meeting

City of Paso Robles

- NWP operations understanding

Atascadero Mutual Water Company (MWC)

- Location of percolation basin corrected

Water Surface Elevations (WSE)

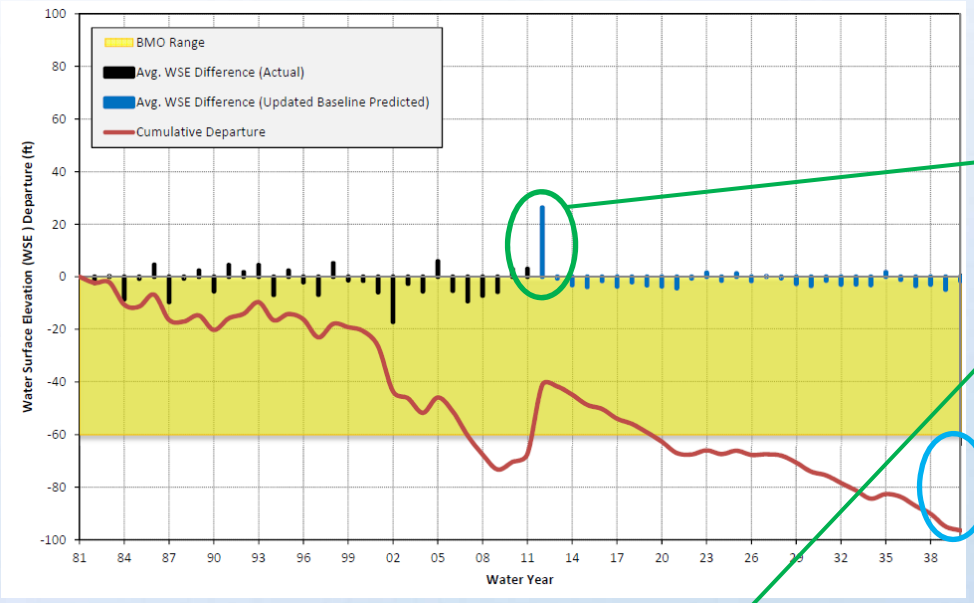
- Transition between historical and predicted WSE adjusted so no big spike in Model Year 1 (2012) output

Effects: Revised baseline run

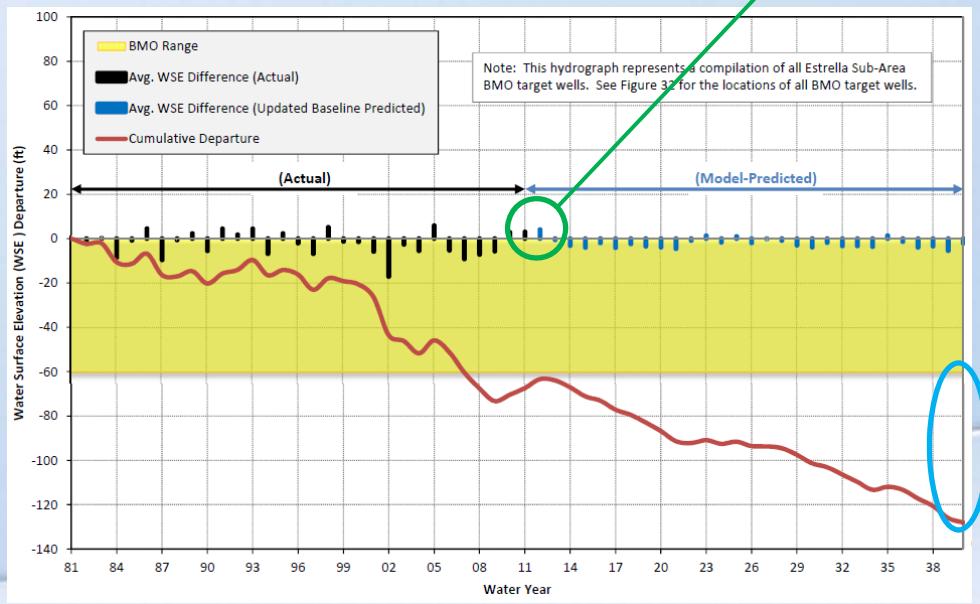
- Total average change in storage is 2,191 AFY greater deficit than July 2016 draft.
  - Nov 2016 Revised: -32,844 AFY
  - July 2016 model run: -30,653 AFY
  - 2014 model: -26,159 AFY

Effects: Estrella BMO hydrograph baseline

July 2016



Nov 2016

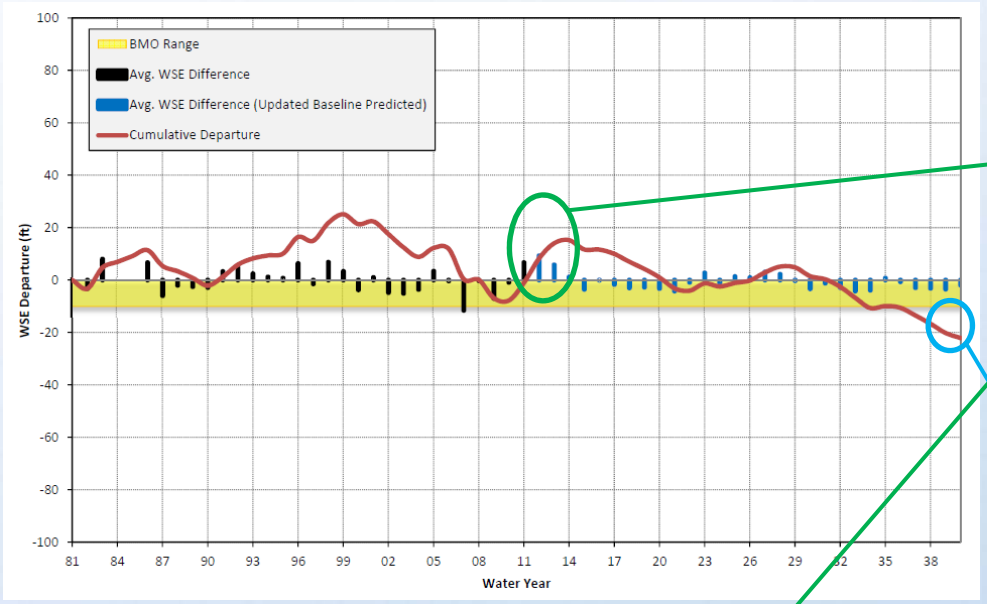


Note: model transition between historical & predicted

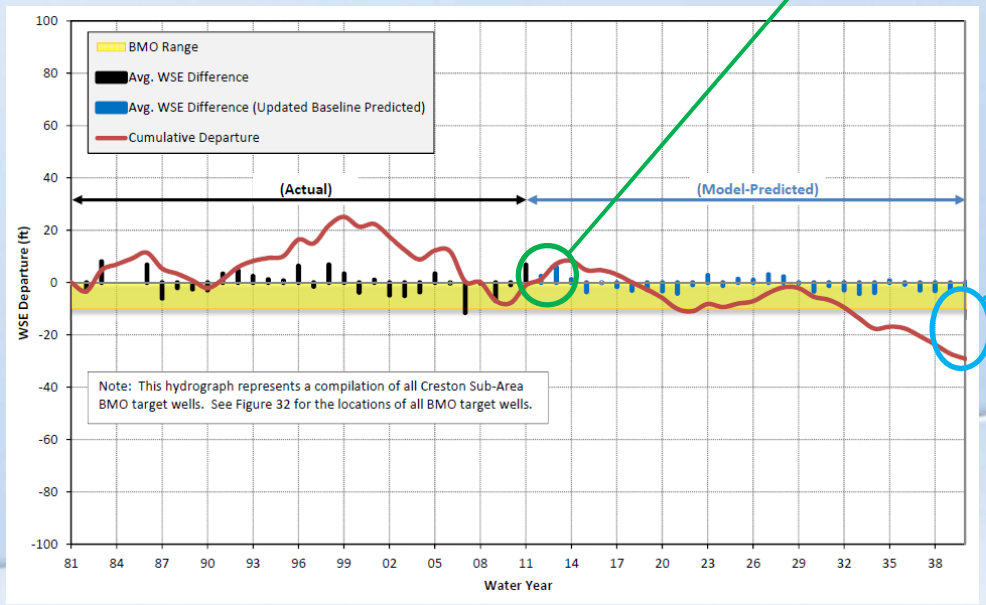
Increase in deficit from -40 ft to -70 ft (outside BMO range)

Effects: Creston BMO hydrograph baseline

July 2016



Nov 2016

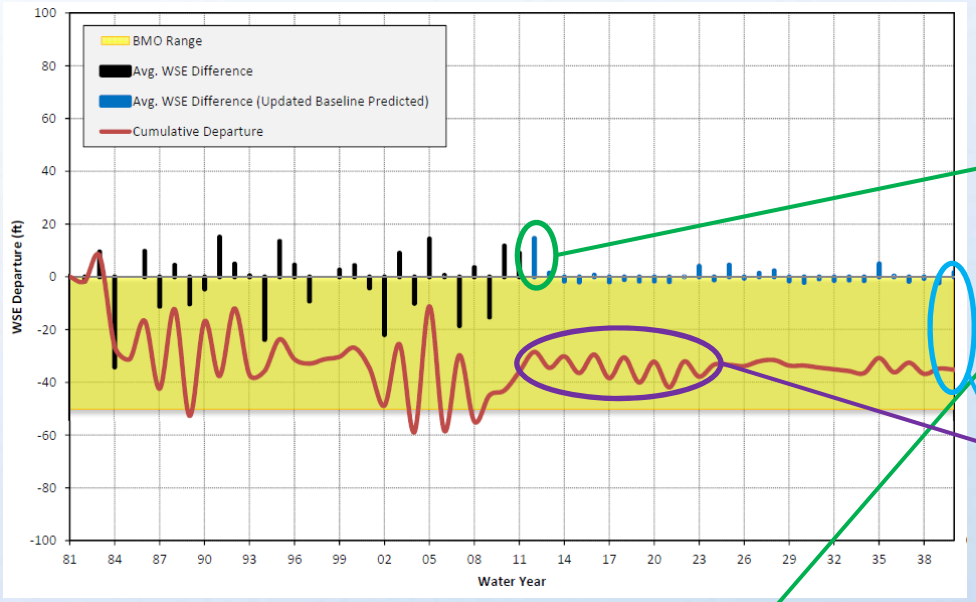


Note: model transition between historical & predicted

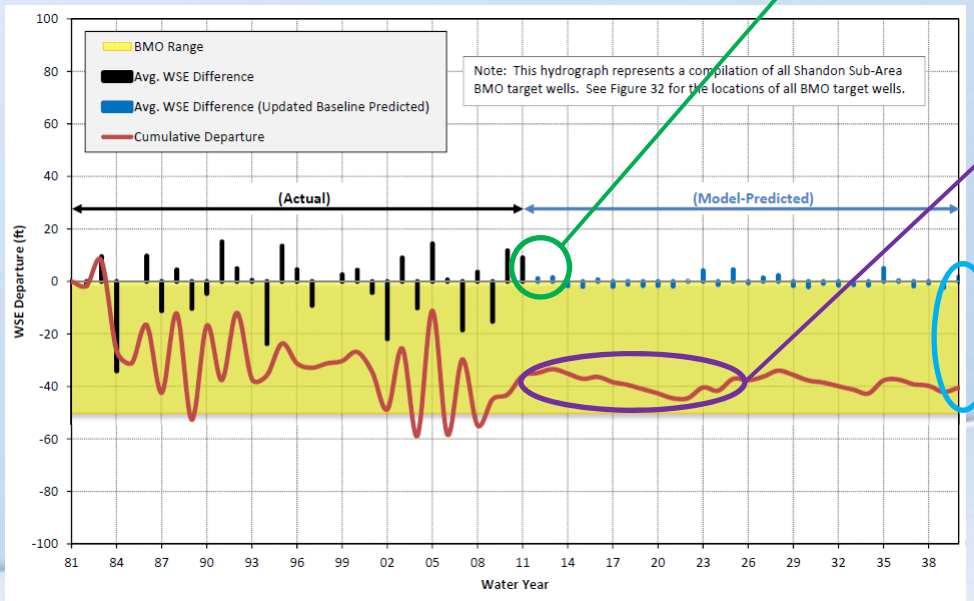
Small increase in deficit from -10 ft to -20 ft (outside BMO range)

Effects: Shandon BMO hydrograph baseline

July 2016



Nov 2016



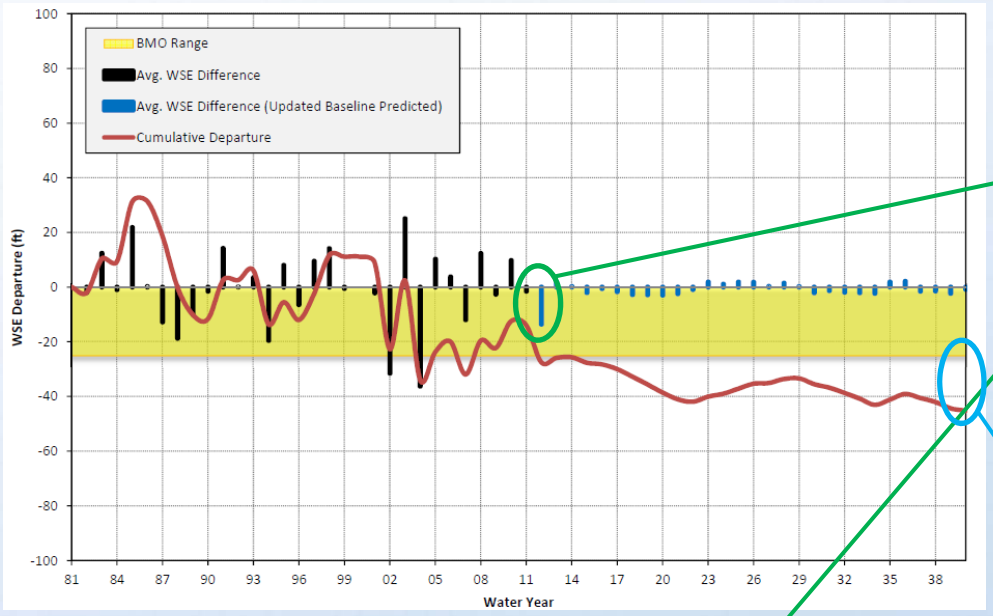
Note: model transition between historical & predicted

Reduction of noise

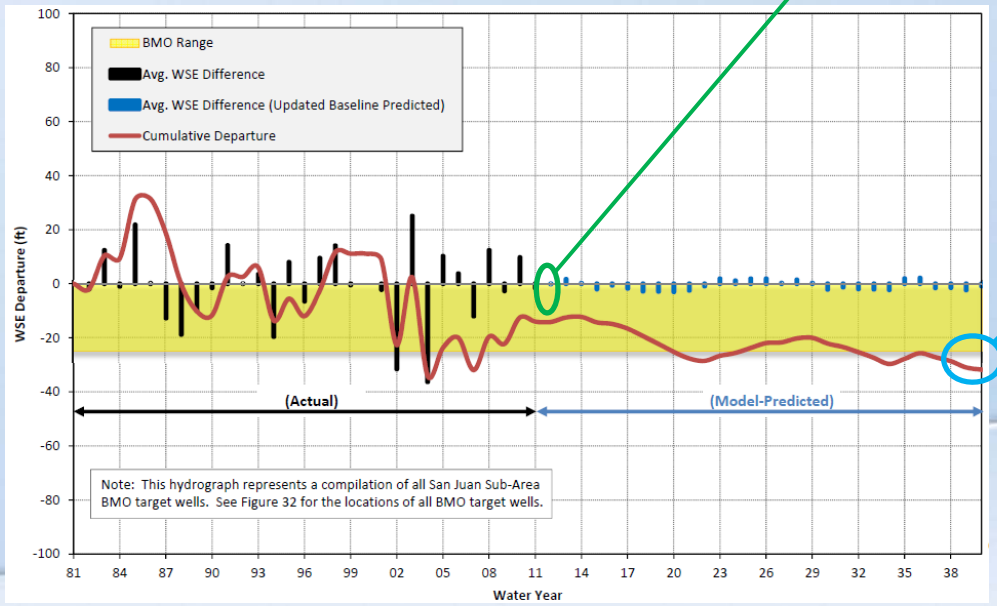
Small increase in deficit but still within BMO Range

Effects: San Juan BMO hydrograph baseline

July 2016



Nov 2016

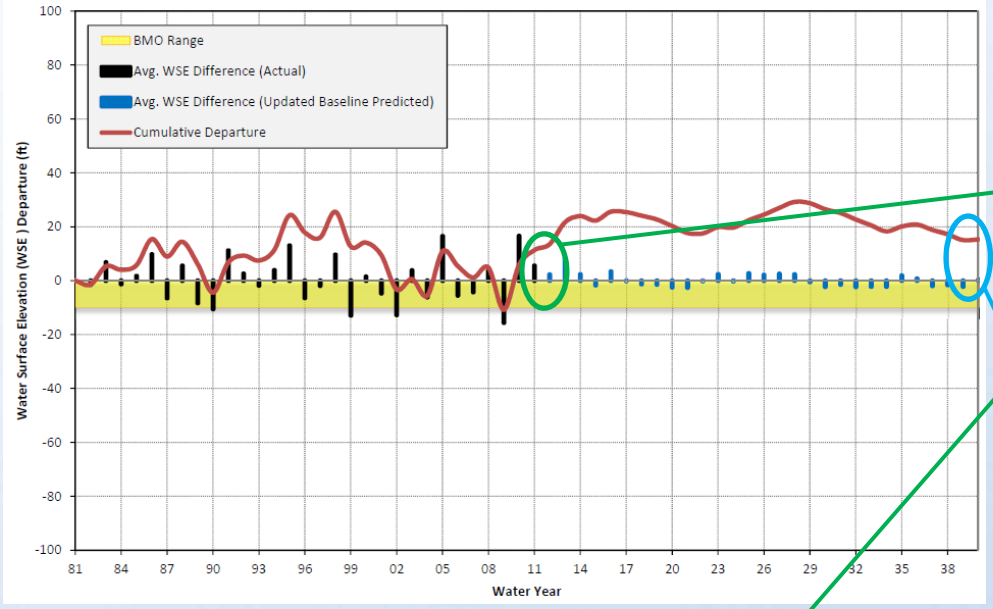


Note: model transition between historical & predicted

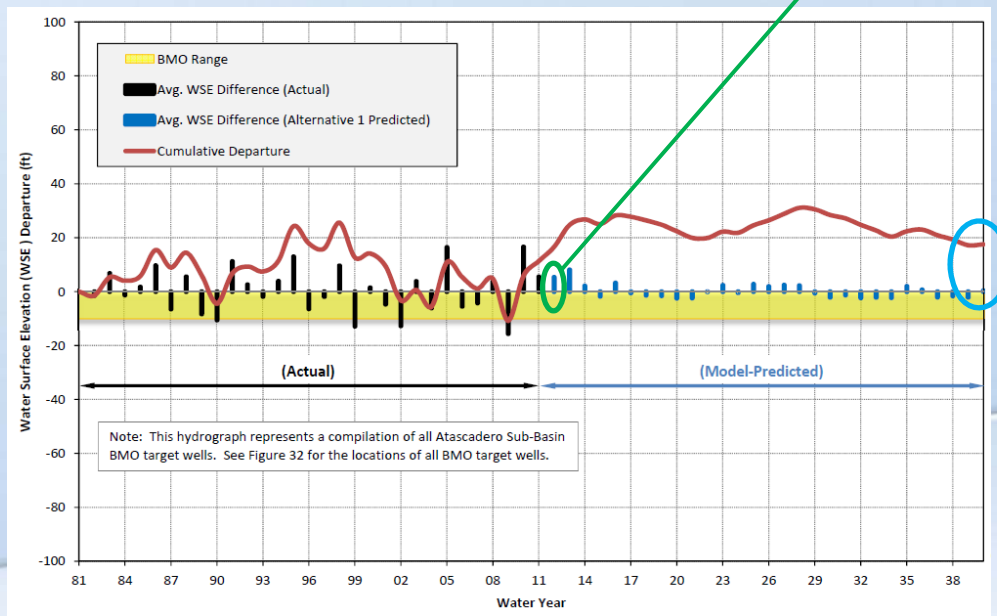
Decrease in deficit from -15 ft to -5 ft (outside BMO range)

Effects: Atascadero BMO hydrograph baseline

July 2016



Nov 2016



Note: small change in model transition between historical and predicted

Slight increase in water surface elevations

Overall effect showed that more water was needed throughout the basin

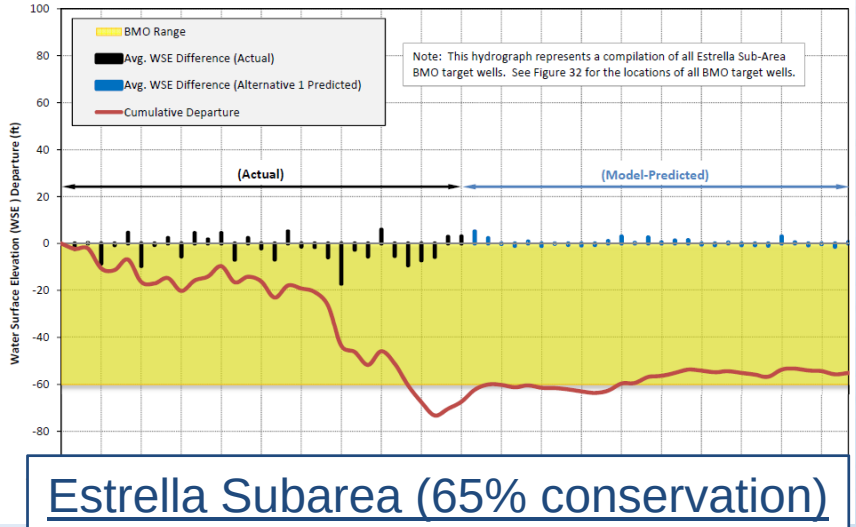
Modeling Run	Amount of Supply Needed to Reach Composite BMOs	
	July 2016 Model	Nov 2016 Model
1) Conservation	24,000 AFY	35,100 AFY
2) Salinas River(1)	4,899 AFY	5,133 AFY(1)
3) RW	4,059 AFY	4,059 AFY
4) Offset Pumping Estrella (2)	20,495 AFY	25,974 AFY
5) Huer Huero Creek Recharge	15,572 AFY	30,597 AFY
6) Estrella River Recharge (2)	28,813 AFY	49,309 AFY
7) Offset Pumping Creston	4,377 AFY	4,377 AFY

Notes:

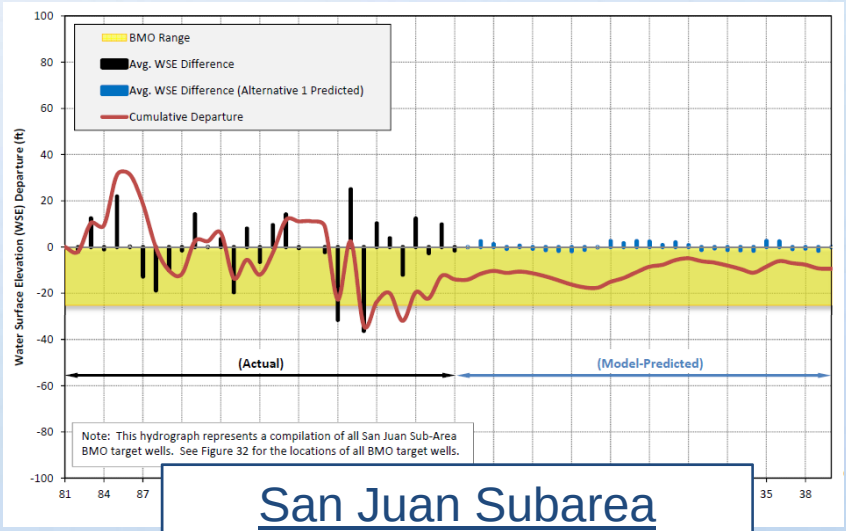
(1) Composite BMO range not reached in either July or Nov 2016 model

(2) Composite BMO range not reached in July 2016 model. Additional percolation basins added in Nov 2016 model.

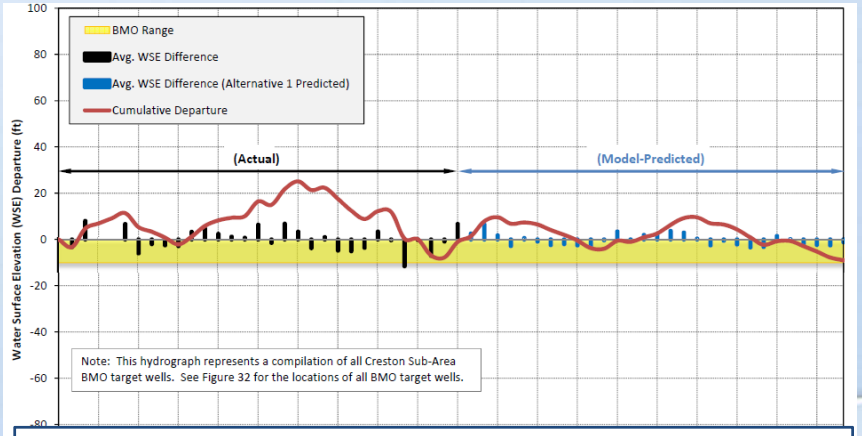
Conservation run shows where supplemental supplies are needed



Estrella Subarea (65% conservation)
27,000 AFY



San Juan Subarea
(40% conservation)
3,900 AFY

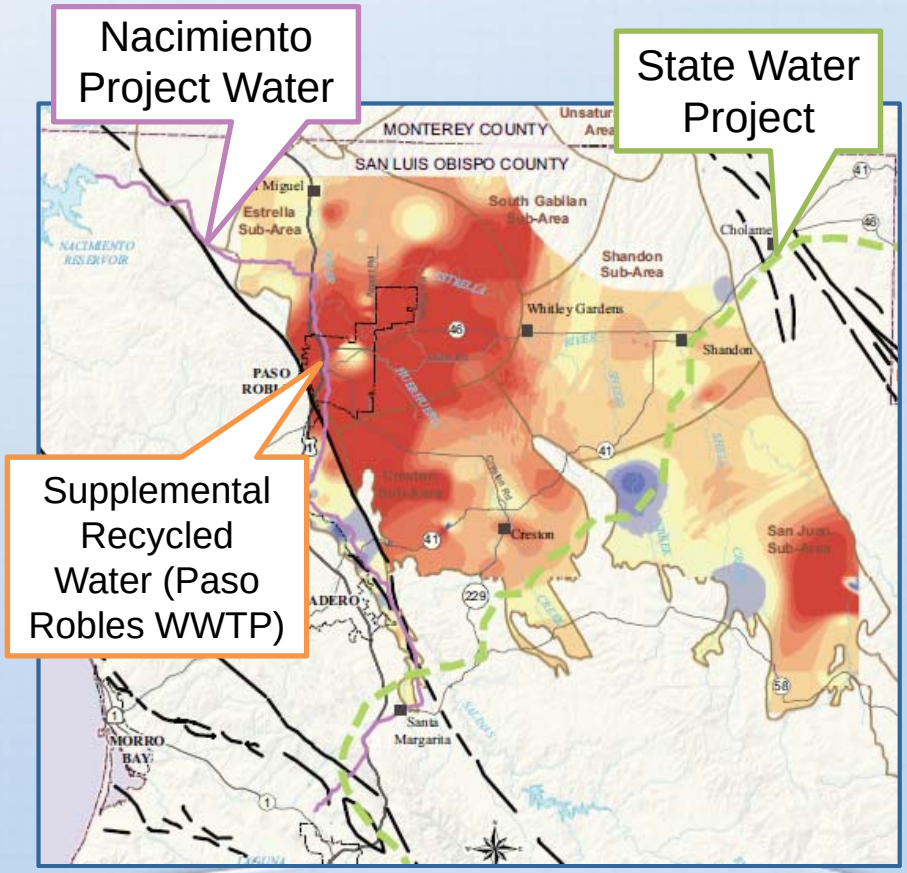


Creston Subarea (25% conservation)
4,100 AFY

SUPPLY OPTIONS STUDY

Basin solution: A combo of delivery, recharge, and conservation in multiple sub-areas

- Direct delivery is most beneficial (but high infrastructure costs)
- Recharge basins less effective than direct delivery
  - Important to be able to capture water during non-irrigation season
- Basin requires more water than what is currently available to stabilize
- Focus on areas of greatest need
- Maximize delivery of available water



Comments received in July and changes made on Supply Options Scenarios

1. Consider supplying NWP water to Creston (not just SWP)

2. Identify ways to maximize use of each water type to maximize water into basin

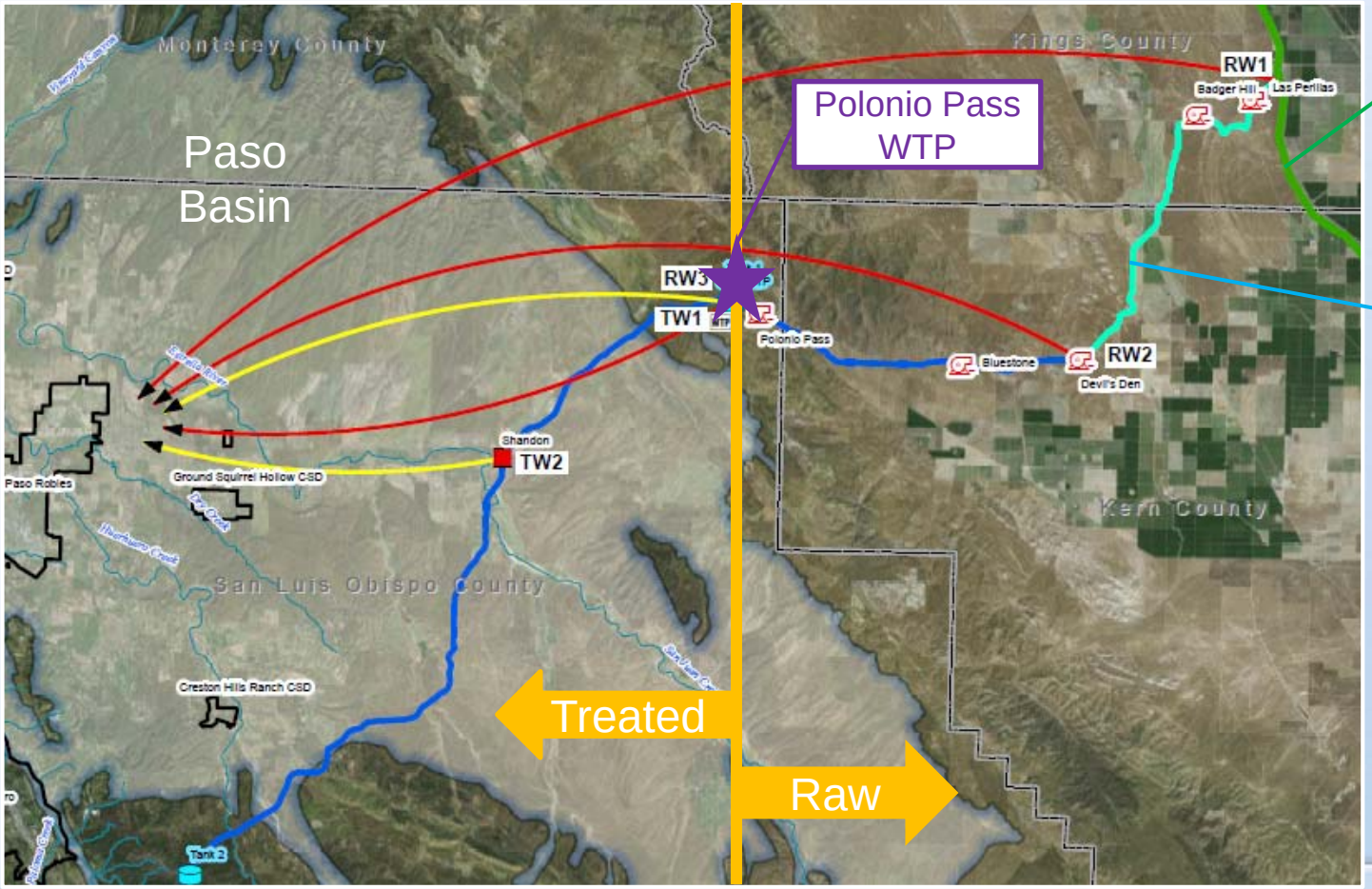
- Direct deliveries to reduce pumping
- Off season recharge to use wet season availability
- Spread water into different subareas - focus on areas of greatest decline

Team developed combination projects to "book-end" the options

Scenario	NWP	RW	SWP	Notes	Direct Delivery vs Recharge
A	Direct deliveries in Estrella Subarea (Airport recharge in off-seasons)		Direct deliveries in Creston Subarea. Recharge in Shandon in off-season.	Combination of Alternatives 4A, 7, and 8.	Maximizes Direct Delivery
B	Direct deliveries in Estrella & Creston Subarea (Airport recharge in off-seasons)		Direct deliveries in San Juan Subarea. Recharge in Creston Subarea in off-season	Combination of Alternatives 4A, 5B1, and 7B.	Maximizes Direct Delivery
C	Recharge near Huer Huero Creek (Estrella Subarea)		Recharge near Huer Huero Creek (Creston Subarea)	Combination of 5A1 and 5B1	Maximizes Recharge
D	Recharge near airport (Estrella Subarea)		Direct deliveries in San Juan Subarea. Recharge in Creston Subarea in off-season	Combination of Alternatives 4, 5B1, 7A, and 7B	Combination of Recharge and Direct Delivery

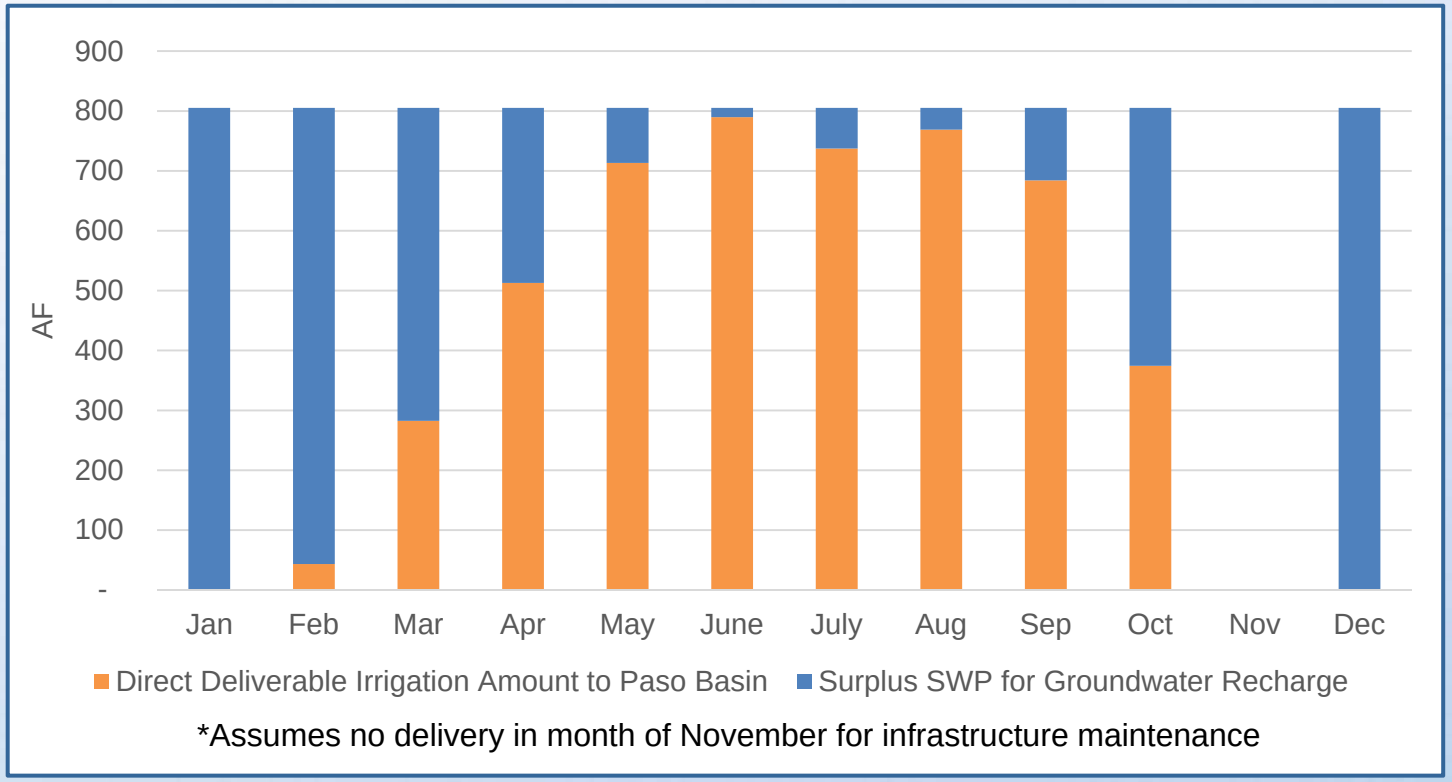
STATE WATER PROJECT (SWP)

SWP water – Type and availability



- Average deliverable SWP to Paso Basin = 8,860 AFY

SWP – Average year expected timing



	Long-Term Average (AFY)	Average Dry Year (AFY)
2020	9,470	4,280
2030	8,860	3,970
2040	8,860	3,970

SWP water – Contractual issues

- Procurement Methods
  - Negotiate with current subcontractor to receive surplus water when available – less reliable, but likely a lower unit cost
  - Negotiate directly with District or Central Coast Water Agency (CCWA) and become a subcontractor – more reliable, likely higher unit costs

SWP water – Contractual issues

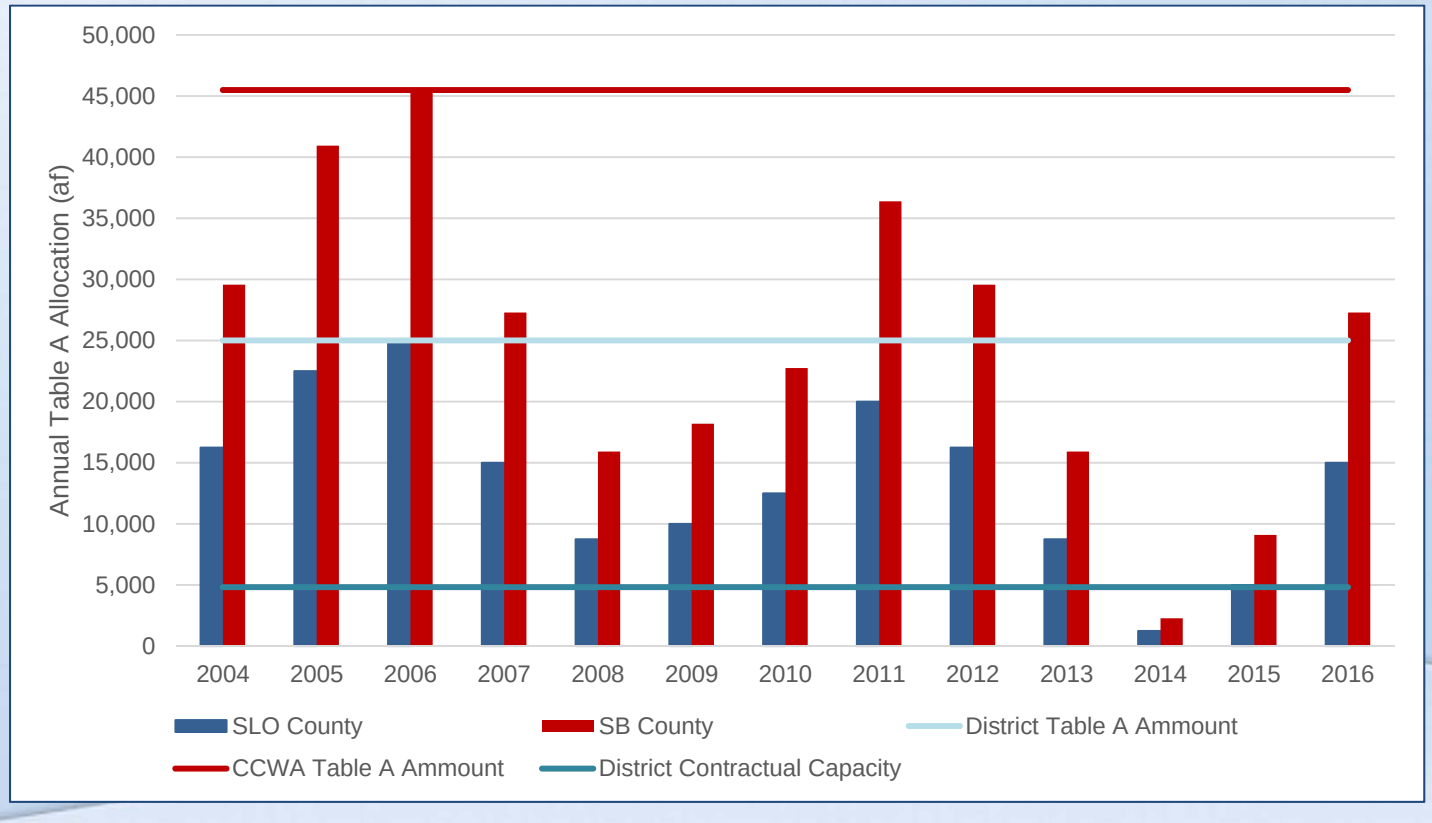
Procurement Methods

- Negotiate with current subcontractor to receive surplus water when available – less reliable, but likely a lower unit cost

- Negotiate directly with District or Central Coast Water Agency (CCWA) and become a subcontractor – more reliable, likely higher unit costs

SWP water – Reliability

- Variable Table A allocation, but long term reliability of approximately 60%
- SWP provides diversity in supply portfolio



SWP water – Cost

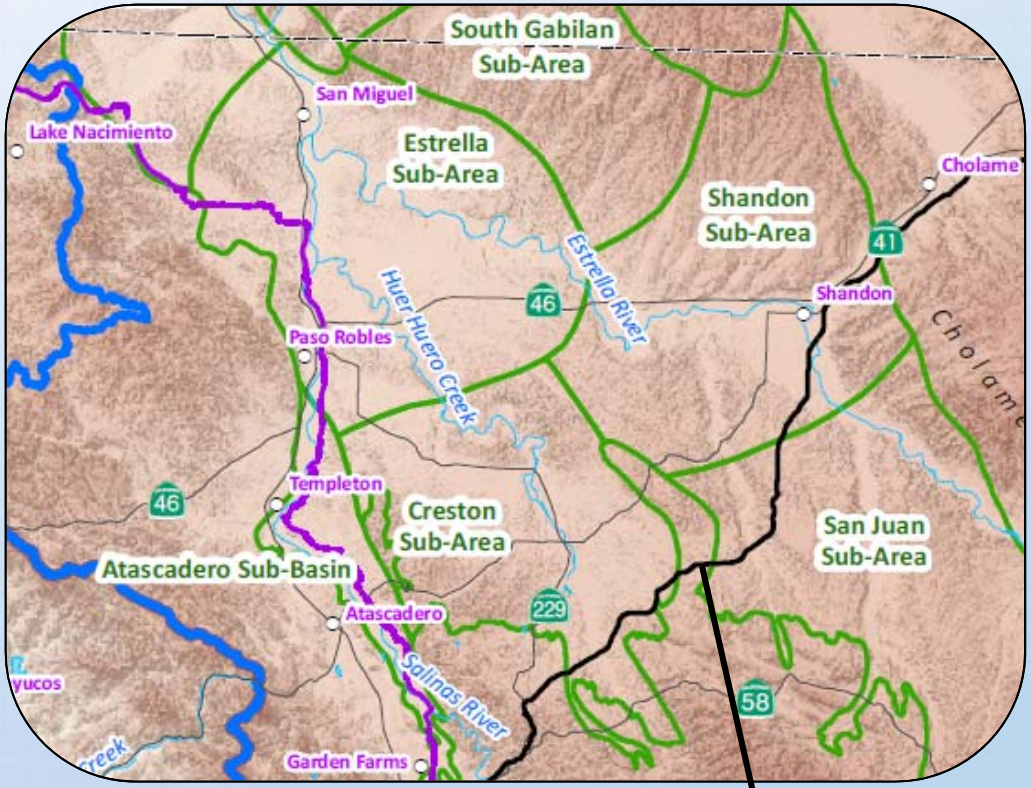
Turnout Location[(1)]	Water Quality	Estimated Unit Cost ($/AF)
RW1 – Phase 1 Turnout	Raw	$467
RW3 – PPWTP	Raw	$1,793
TW1 – PPWTP	Treated	$2,292
TW2 – Reach 2 Turnout (Shandon)	Treated	$2,503

- Costs were developed based on analysis of historical costs and anticipated future costs for existing subcontractors
- These costs are intended to be a starting points for negotiations
- Raw water is less expensive than treated water
- Infrastructure cost to pipe raw water from before PPWTP is ~$700/AF

- *Study uses $2,500/AF as a conservative estimate*

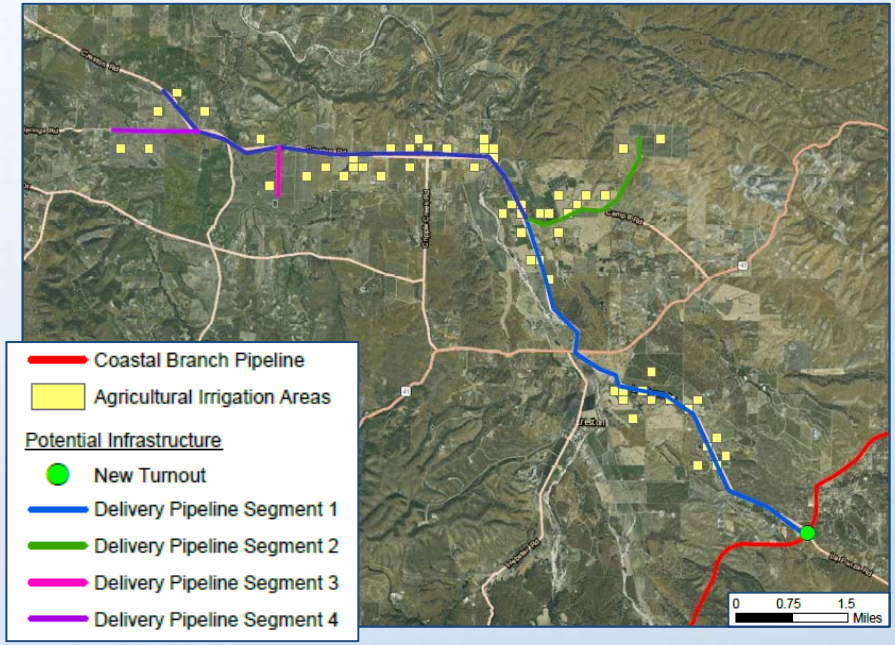
SWP water – Potential infrastructure

- Scenario A – Direct Delivery to Creston, Off-Season Recharge in Shandon
- Scenario B – Direct Delivery in Creston and San Juan, Off-Season Recharge in Creston
- Scenario C – Recharge in Creston, Direct Deliveries only along the route
- Scenario D – Same as B.

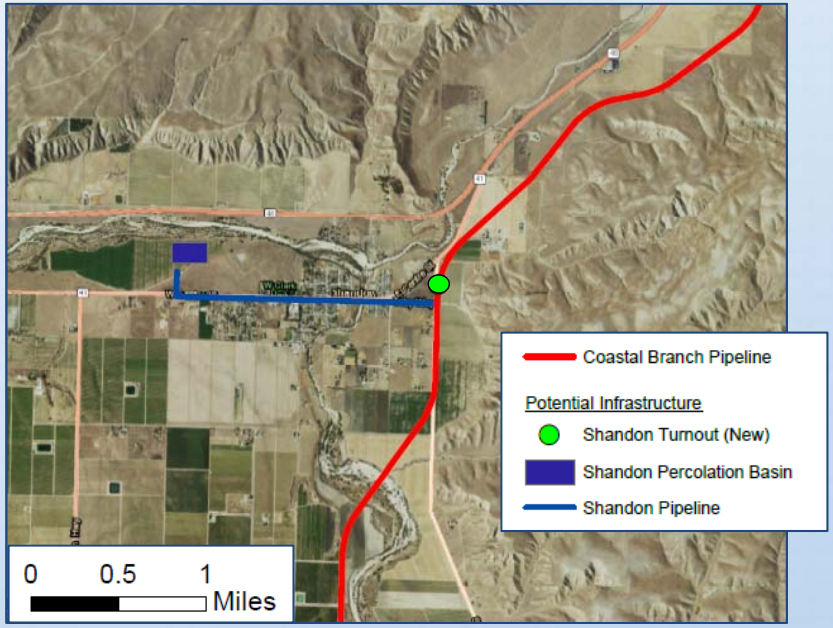


SWP – Coastal Branch Pipeline

Scenario A – Direct delivery to Creston, off-season recharge in Shandon



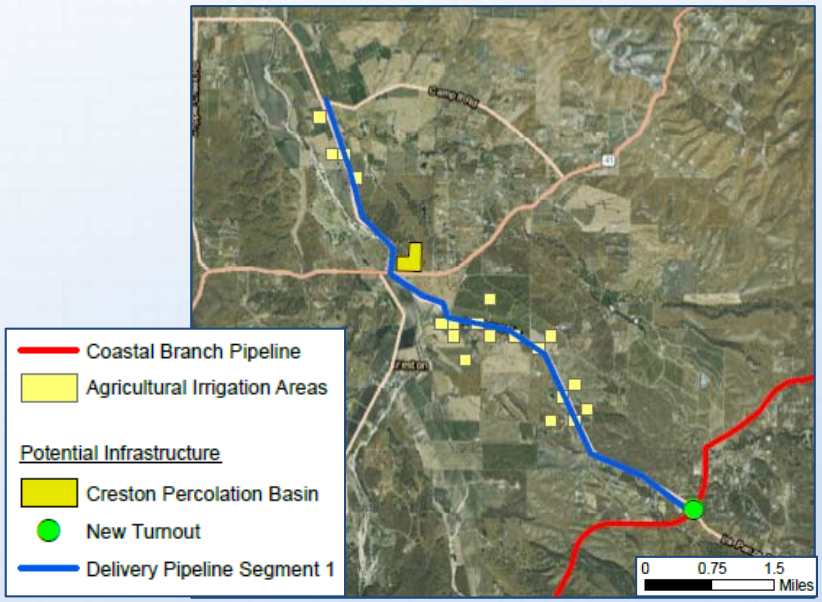
Creston Subarea



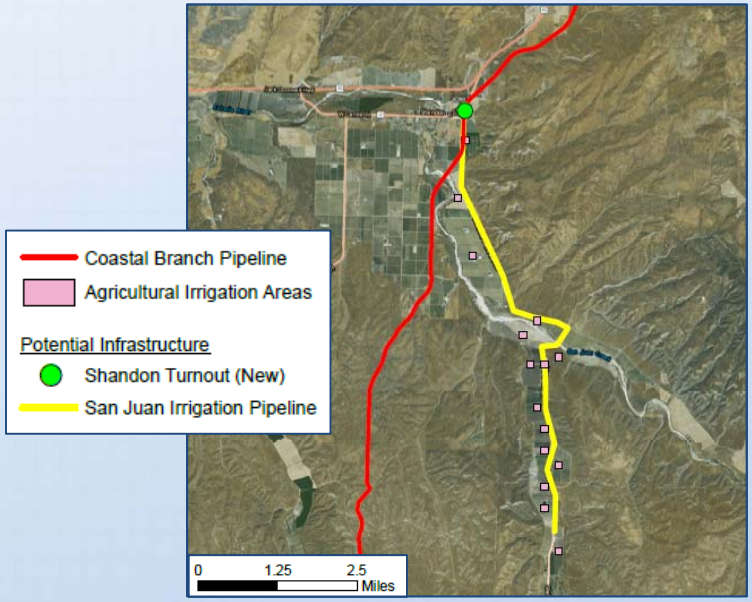
Shandon Subarea

Item	Amount of Water Delivered (AFY)	Length of Pipe (LF)
Creston Direct Deliveries	4,377	87,200
Shandon GW Basin	4,481	9,300
Total	**8,858**	**96,500**

Scenario B – Direct delivery to Creston and San Juan, off-season recharge in Creston



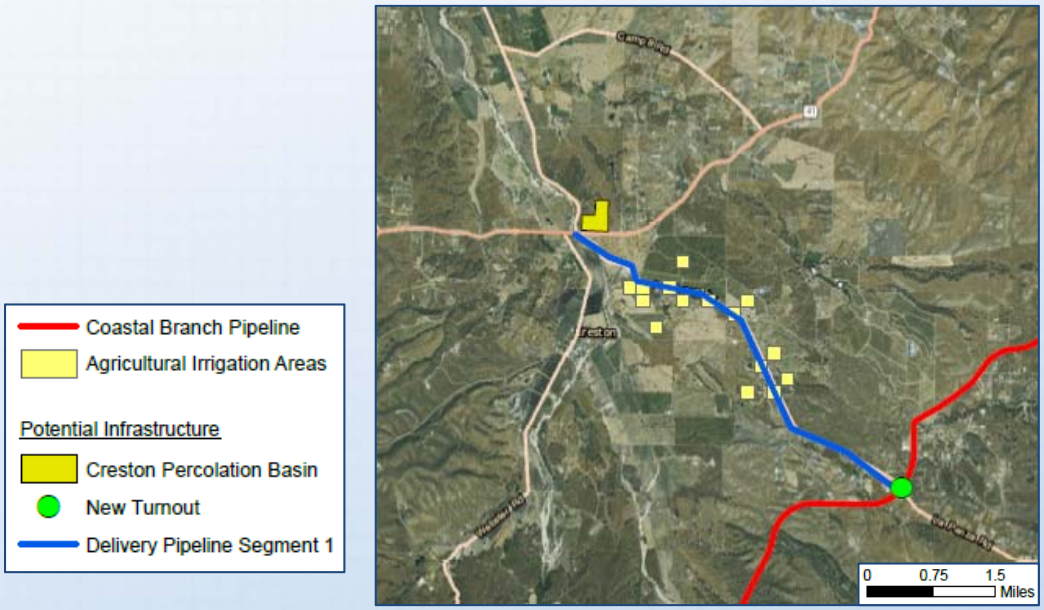
Creston Subarea



San Juan Subarea

Item	Amount of Water Delivered (AFY)	Length of Pipe (LF)
Creston Direct Deliveries	1,000	3,600
Creston GW Basin	3,949	22,300
San Juan Direct Deliveries	3,909	45,100
Total	**8,858**	**91,000**

Scenario C – Recharge in Creston, direct deliveries along route

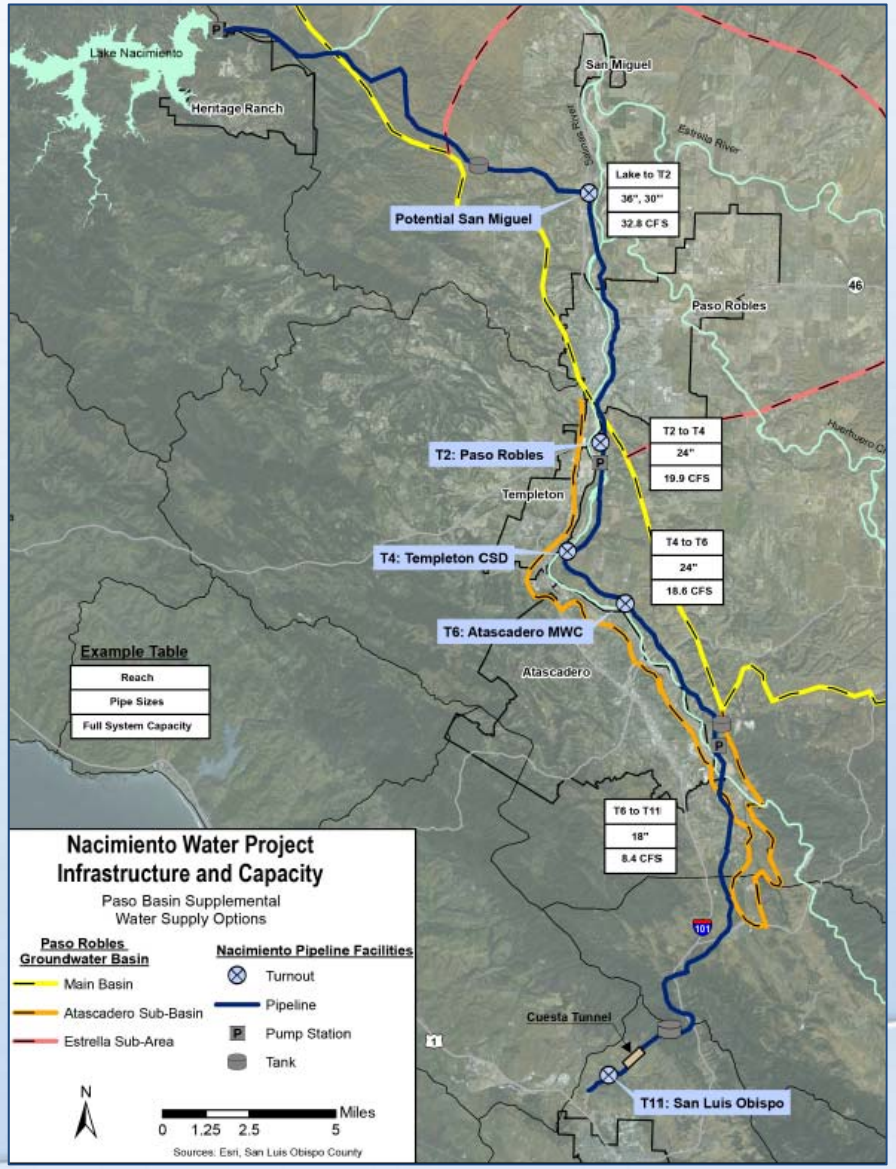


Creston Subarea

Item	Amount of Water Delivered (AFY)	Length of Pipe (LF)
Creston Direct Deliveries	765	-
Creston GW Basin	8,093	22,300
Total	**8,858**	**22,300**

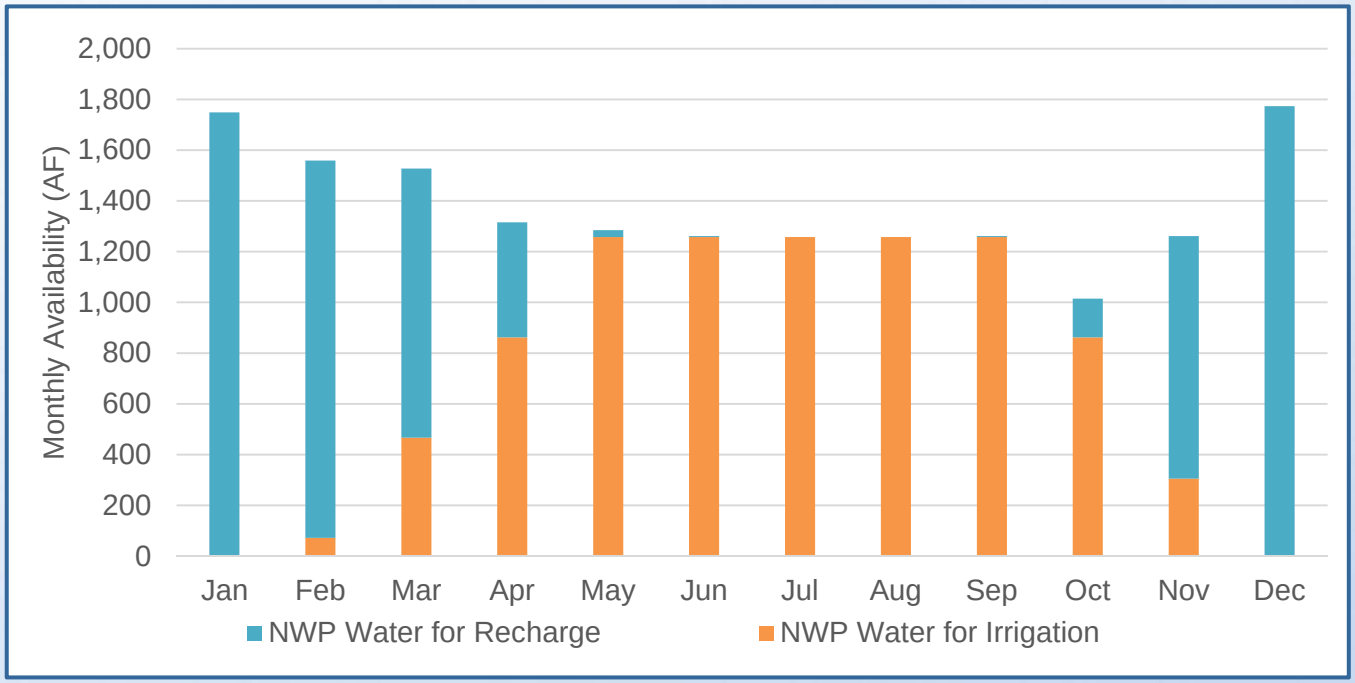
NACIMIENTO WATER PROJECT (NWP)

NWP water – Availability



- Fully Allocated
- Long-term average of ~7,100 AFY surplus water available

NWP – Average year expected timing



	Normal Year (AFY)	Dry Year (AFY)
2020	10,135	5,577
2030	8,473	4,045
2040	7,269	2,852
Average Supply	**8,626**	**4,158**
Long-Term Average	**7,100**	

Long-term average assumes 1 in every 3 years is dry.

NWP water – Contractual issues

Fully Allocated – Main option for receiving water is negotiating with a current participant

Potential to become participant if another participant gives up allocation

NWP water – Reliability

Since only realistic procurement is through subcontracts with participants, availability is subject to the usage of the participants

Historically very reliable supply

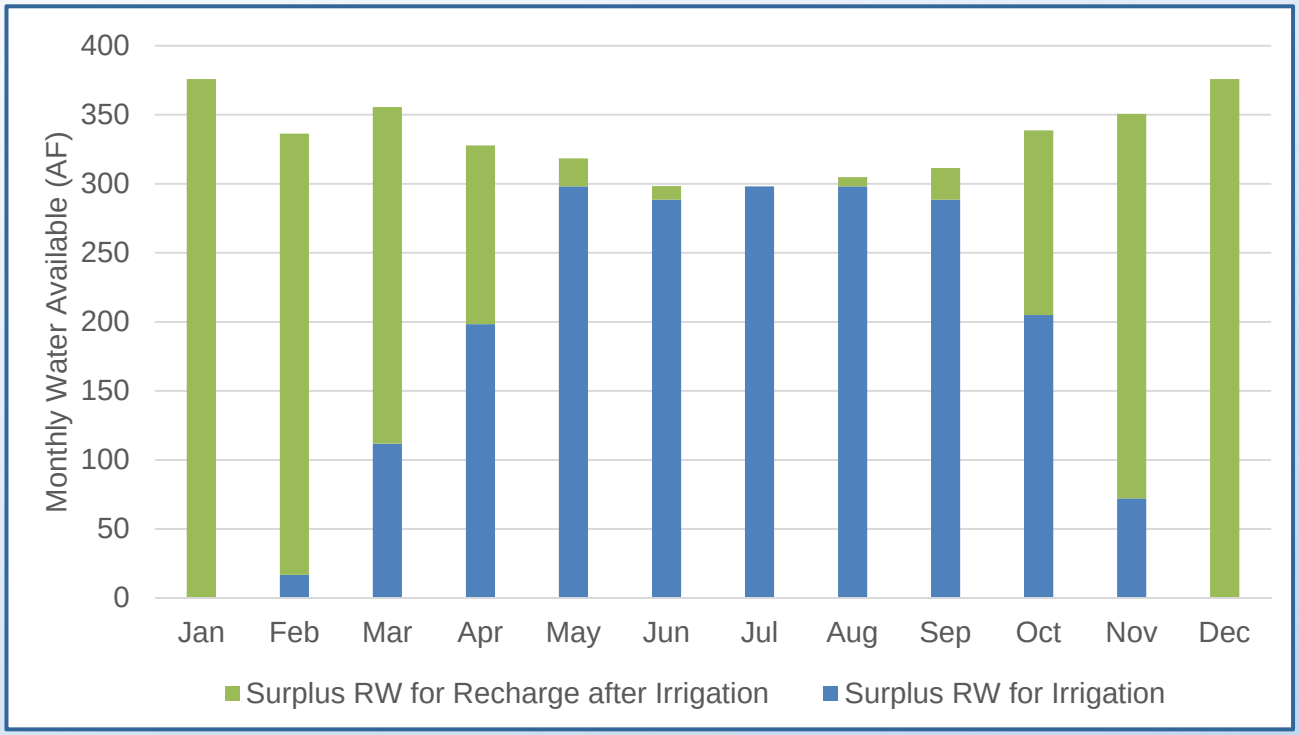
NWP water – Cost

Location	For Participants	For Non-Participants
City of Paso Robles	$216 /AF	$1,299/AF
Templeton CSD	$234 /AF	$1,967/AF
Atascadero MWC	$235 /AF	$1,554/AF

- These costs are starting points for negotiations
- No surplus water sales have occurred since full allocation in April 2016
- *Study uses $2,000 / AF as a conservative estimate*

RECYCLED WATER (RW)

Recycled water – Availability and timing



	Estimated Production (AFY)	Estimated Paso Robles Reuse (AFY)	Extra for Supply (AFY)
2020	3,360	430	2,930
2030	4,410	430	3,980
2040	5,500	430	5,070
Average	**4,960**	**430**	**4,000**

Recycled water – Contractual issues

Requires negotiations with City of Paso Robles

Currently, Paso Robles does not intend to blend with NWP water for in-City reuse

Need to have discussions about blending with NWP or the need to build a separate parallel pipeline

Recycled water – Reliability

Amount of recycled water available will decrease if Paso Robles decides to use more for municipal reuse

Recycled water usually consider drought-proof supply

- However conservation can decrease volume

Recycled water – Cost

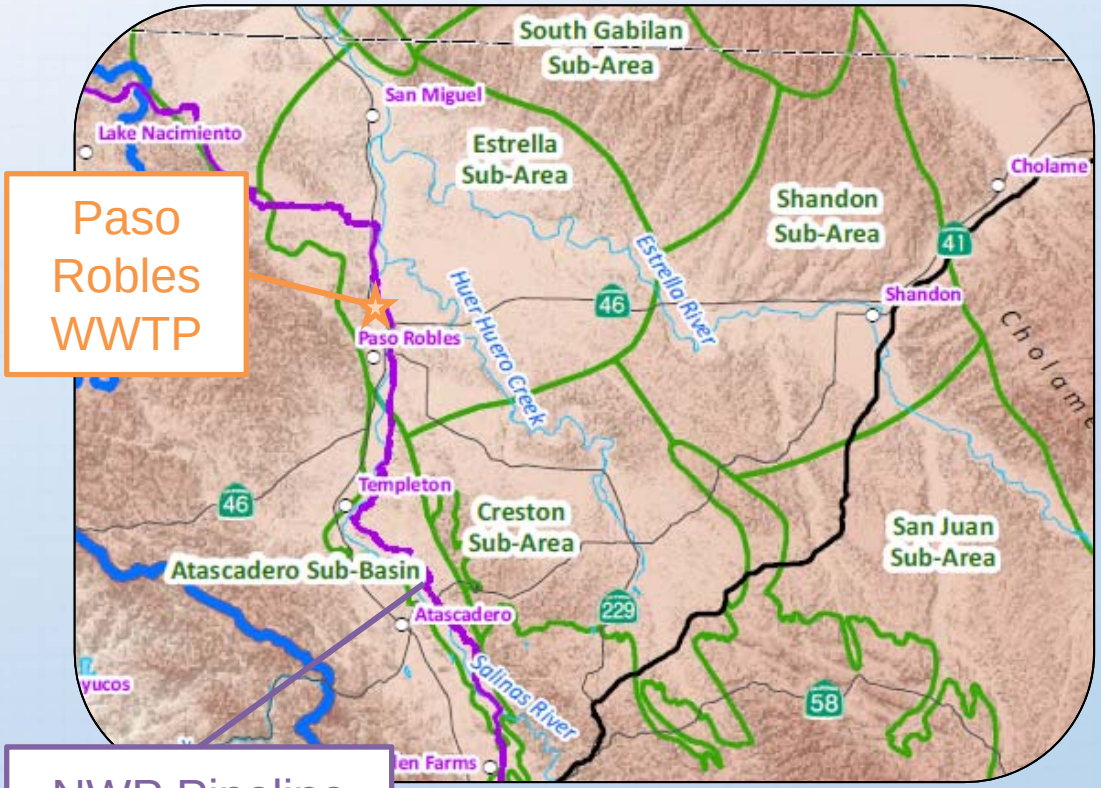
Potential costs include some combination of Capital and O&M costs for City treatment and distribution

Capital cost sharing could potentially bring the cost of RW up to $2,000/AF

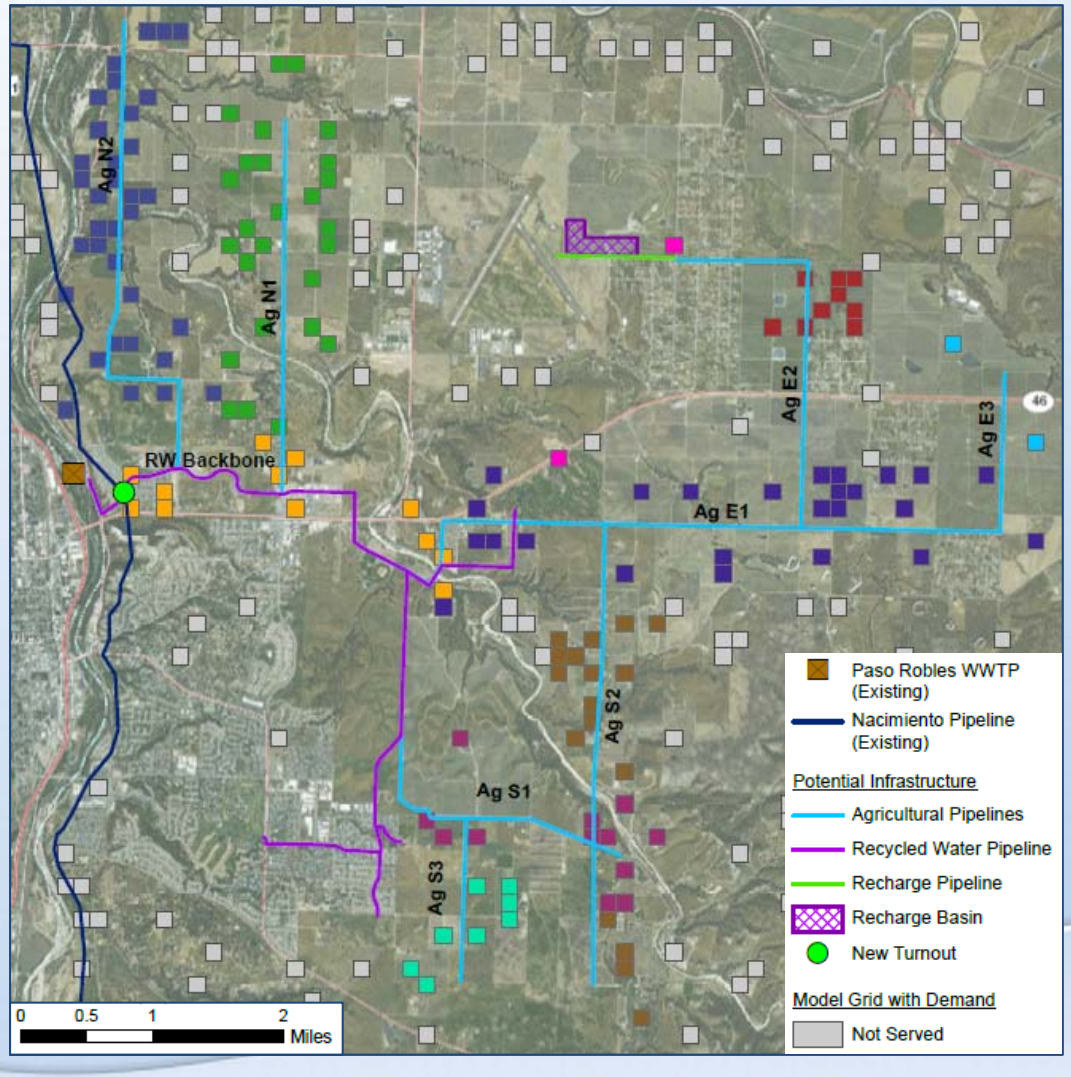
Study uses $2,000/AF as a conservative estimate as discussed with the City of Paso Robles

RW/NWP water – Potential infrastructure

- RW and NWP infrastructure combined to minimize infrastructure
- Scenario A – Direct delivery to Estrella, off-season recharge in Estrella
- Scenario B – Direct Delivery in Estrella and Creston, off-season recharge in Estrella
- Scenario C – Recharge in Estrella (no direct delivery available along route)
- Scenario D – Direct deliveries and groundwater recharge in Estrella.



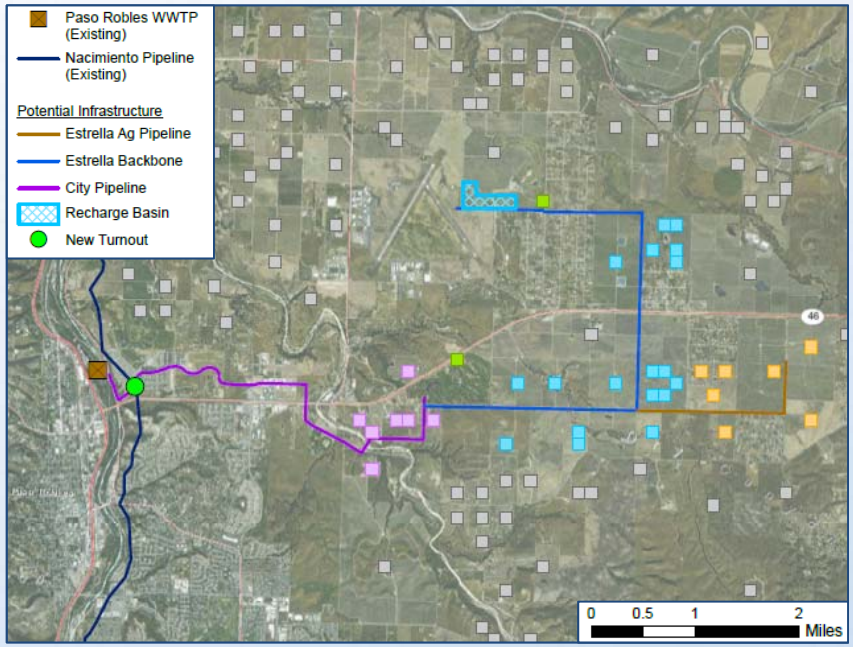
Scenario A – Direct delivery and off-season recharge in Estrella



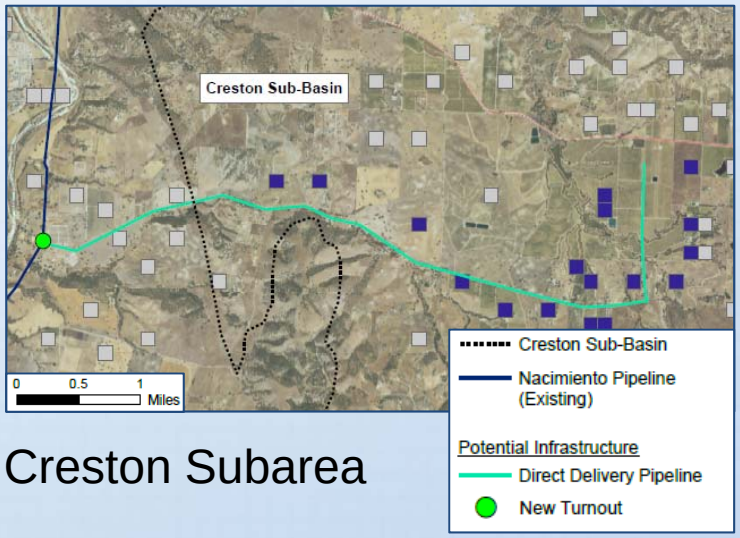
Item	Amt Water (AFY)
NWP Direct Deliveries	2,050
RW Direct Deliveries	2,050
NWP Recharge	5,050
RW Recharge	1,950
Total	**11,100**

Item	Pipe Length (LF)
Backbone Pipeline	55,600
Ag delivery pipeline	45,300
Total	**100,900**

Scenario B – Direct delivery in Creston and Estrella; Off-season recharge in Estrella



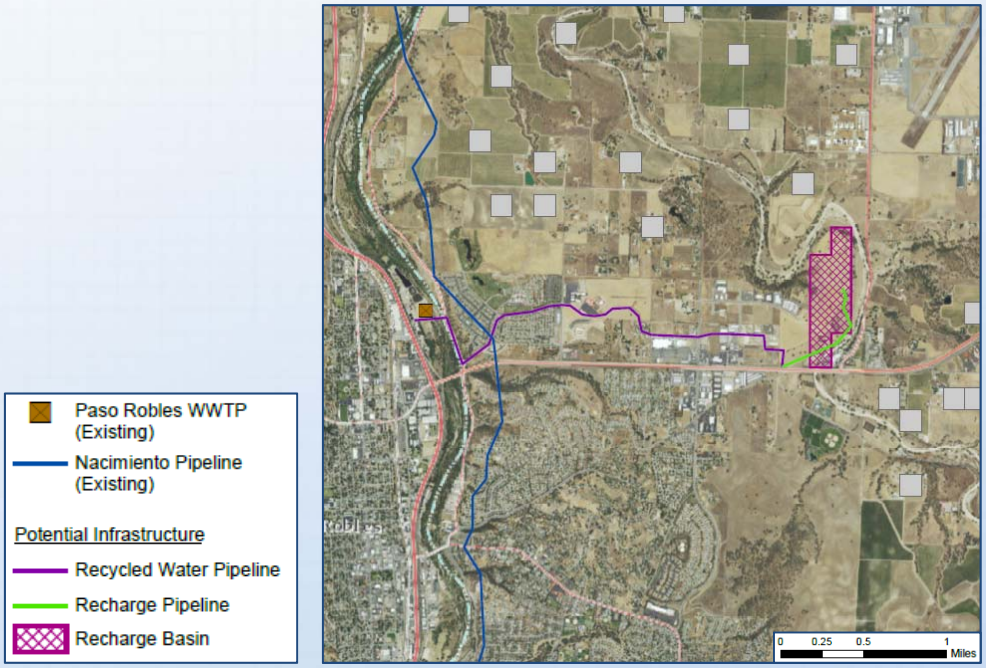
Estrella Subarea



Creston Subarea

Item	Amount of Water Delivered (AFY)	Length of Pipe (LF)
RW/NWP Direct to Estrella	4,100	100,900
RW/NWP Recharge in Estrella	5,500	--
NWP to Creston (Direct)	1,500	55,600
Total	**11,100**	**156,500**

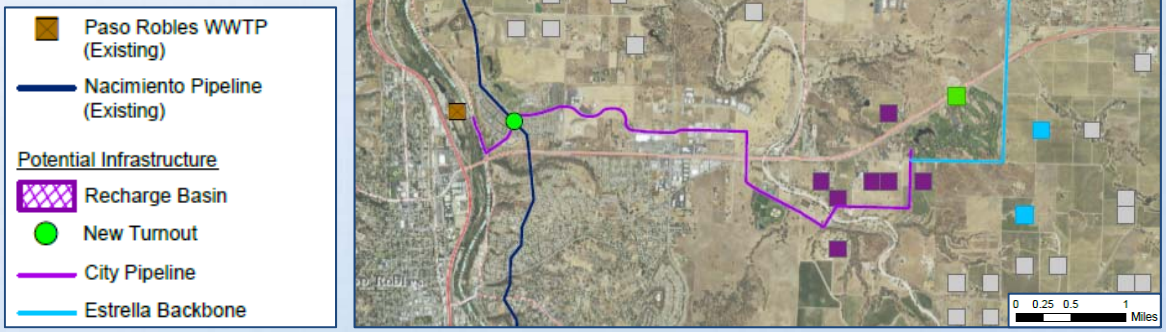
Scenario C – Recharge in Estrella



Estrella Subarea

Item	Amount of Water Delivered (AFY)	Length of Pipe (LF)
RW/NWP Recharge in Estrella	11,100	18,400
Total	**11,100**	**18,400**

Scenario D – Recharge and direct delivery in Estrella



Estrella Subarea

Item	Amount of Water Delivered (AFY)	Length of Pipe (LF)
RW/NWP Recharge in Estrella	10,320	37,900
RW/NWP Direct in Estrella	780	8,300
Total	**11,100**	**46,200**

COMBINED SUPPLY OPTION SCENARIOS

Overview

Scenario	NWP	RW	SWP	Notes	Direct Delivery vs Recharge
A	Direct deliveries in Estrella Subarea (Airport recharge in off-seasons)		Direct deliveries in Creston Subarea. Recharge in Shandon in off-season	Combination of Alternatives 4A, 7, and 8	Maximizes Direct Delivery
B	Direct deliveries in Estrella & Creston Subarea (Airport recharge in off-seasons)		Direct deliveries in San Juan Subarea. Recharge in Creston Subarea in off-season	Combination of Alternatives 4, 5B1, and 7B	Maximizes Direct Delivery
C	Recharge near Huer Huero Creek (Estrella Subarea)		Recharge near Huer Huero Creek (Creston Subarea)	Combination of Alternative 5A1 and 5B1	Maximizes Recharge
D	Recharge near airport (Estrella Subarea)		Direct deliveries in San Juan Subarea. Recharge in Creston Subarea in off-season	Combination of Alternatives 4A, 5B1, 7A, and 7B	Combination of Recharge and Direct Delivery

Scenario costs (total supply – 19,960 AFY)

Scenario	Predicted Benefit (AFY)	Total Project Cost	Annualized Project Cost[1]	O&M Cost[2]	Water Purchase Cost	Total Annual Cost	Unit Cost ($/AFY of Benefit)
Scenario A - Maximize Direct Delivery	15,133	$145.1M	$9.4M	$2.0M	$44.4M	$55.8M	$3,687
Scenario B - Maximize Direct Delivery (San Juan)	17,413	$146.3M	$9.5M	$1.6M	$44.4M	$55.4M	$3,183
Scenario C - Maximize Recharge	13,563	$53.2M	$3.5M	$1.4M	$44.4M	$49.2M	$3,628
Scenario D - Combination of Direct Delivery and Recharge	17,045	$99.9M	$6.5M	$1.5M	$44.4M	$52.3M	$3,071

1) Assumes a 30-year term and 5% interest rate (typical for bond financing). Should the project be funded with a State Revolving Fund (SRF) loan, this annualized cost will be lower.
2) These O&M costs include only costs pertaining to pumping, pipeline, and recharge basin maintenance.

Comparison with other new supplies

Component	Estimated Supply (AFY)	Predicted Benefit (AFY)(1)	Supply Unit Cost ($/AF)	Benefit Unit Cost ($/AF)
Pismo Beach - GW Recharge (3)	930	698	$1,900	$2,700
Pismo Beach - GW injection(3)	930	698	$2,100	$2,800
Santa Barbara - RW(4)	2,900 to 7,600	N/A	$300 to $2,200	N/A
Santa Barbara - Desalination(2)	3,125	3,125	$2,300	$2,300
Pure Water Monterey (5)	3,500	N/A	$2,500	N/A
Santa Barbara - SW Capture(4)	2,100 to 56,000	N/A	$12 to $2,800	N/A
Monterey Peninsula Water Supply Project(6)	10,600	10,600	$3,800	$3,800
Pismo Beach - RW Irrigation(3)	17	17	$15,900	$15,900

Notes:

(1) Most comparison projects did not provide a predicted benefit.
(2) Santa Barbara Desalination Project Bid Documents (March 2015).
(3) Information and costs from the Pismo Beach Final Draft 2015 Urban Water Management Plan (June 2016)
(4) Information and costs from the December 2015 Long Term Supplemental Water Supply Alternatives Report prepared for the County of Santa Barbara, CA.
(5) Yield from the Pure Water Monterey Groundwater Recharge Joint Public Hearing (August 2016). Costs from Amended CalAm MPWSP Application (March 2016).
(6) Information and costs from the Amended Application of the California-American Water Company for the Approval of the Monterey Peninsula Water Supply Project (March 2016)

Key Findings

- Most cost effective alternative is combination of direct delivery and groundwater recharge (Scenario B and D)
- SWP delivery to Creston Subarea highly effective (with direct delivery along the way)
- Water purchase comprises majority of annual cost of each scenario
- Capital cost difference between recharge option and full direct delivery is approximately $100M
- GSA can mix and match individual scenario components to phase implementation or create new scenarios.

NEXT STEPS

Next Steps

- ***Basin management entity(s)/ groundwater sustainability agency(s) review***
- Develop funding
- Water procurement discussions
- Supplemental studies - pipeline alignments, geotechnical studies, Environmental Impact Report
- Preliminary design
- Land acquisition/right-of-way discussions
- Permitting
- Final design
- Construction and operation

Applicability to SGMA – Questions to answer

- What is the definition of sustainability over time?
- Do the existing, completed studies (including this one) provide enough information to proceed with developing a plan and fulfill regulatory requirements?
- What methods should be used to meet groundwater sustainability?
- If supplemental water supplies are included in the GSP, what is the preferred method of delivery into the Basin?
- How to fairly distribute the costs and benefits of implementing the GSP?

Next steps for supply options