Putting Title 22 Water to Beneficial Use in the Central Valley

North Valley Regional Recycled Water Program (NVRRWP)

Presenters:
Will Wong, City of Modesto
Carrie Del Boccio, RMC Water and Environment

Presentation Overview

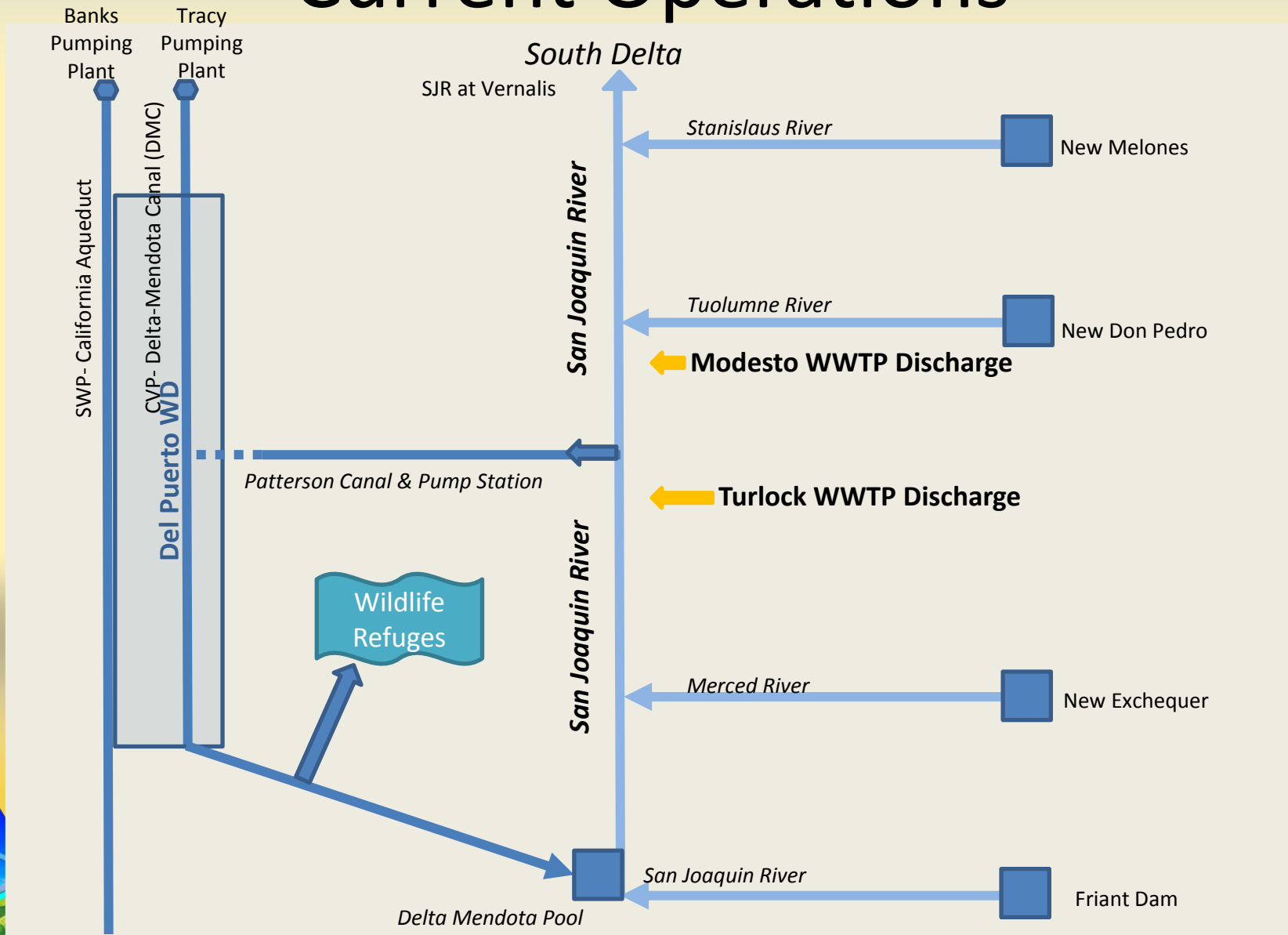
- Introduction
- Need for the NVRRW Program
- Alternatives Considered
- Conceptual Solution and Benefits
- Implementation Challenges
  - Securing Water Rights
  - Approval for Use of USBR Facilities
  - Obtaining a New NPDES Permit
- Next Steps
- Questions

Introduction

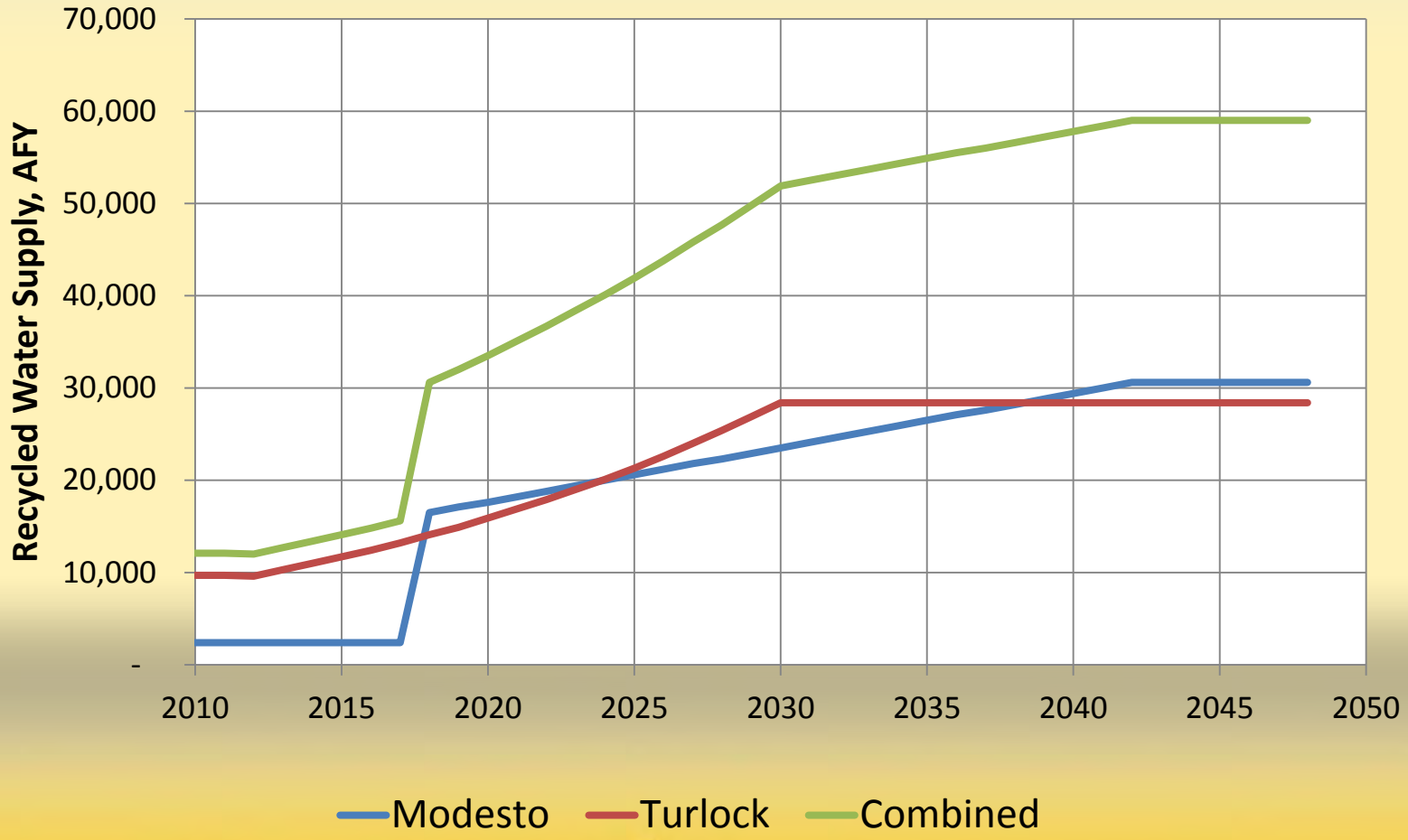
North Valley Regional Recycled Water Program

- Del Puerto Water District
- City of Ceres
- City of Modesto
- City of Turlock
- Stanislaus County
- Possible Participation by USBR

Current Operations



Recycled Water Supplies

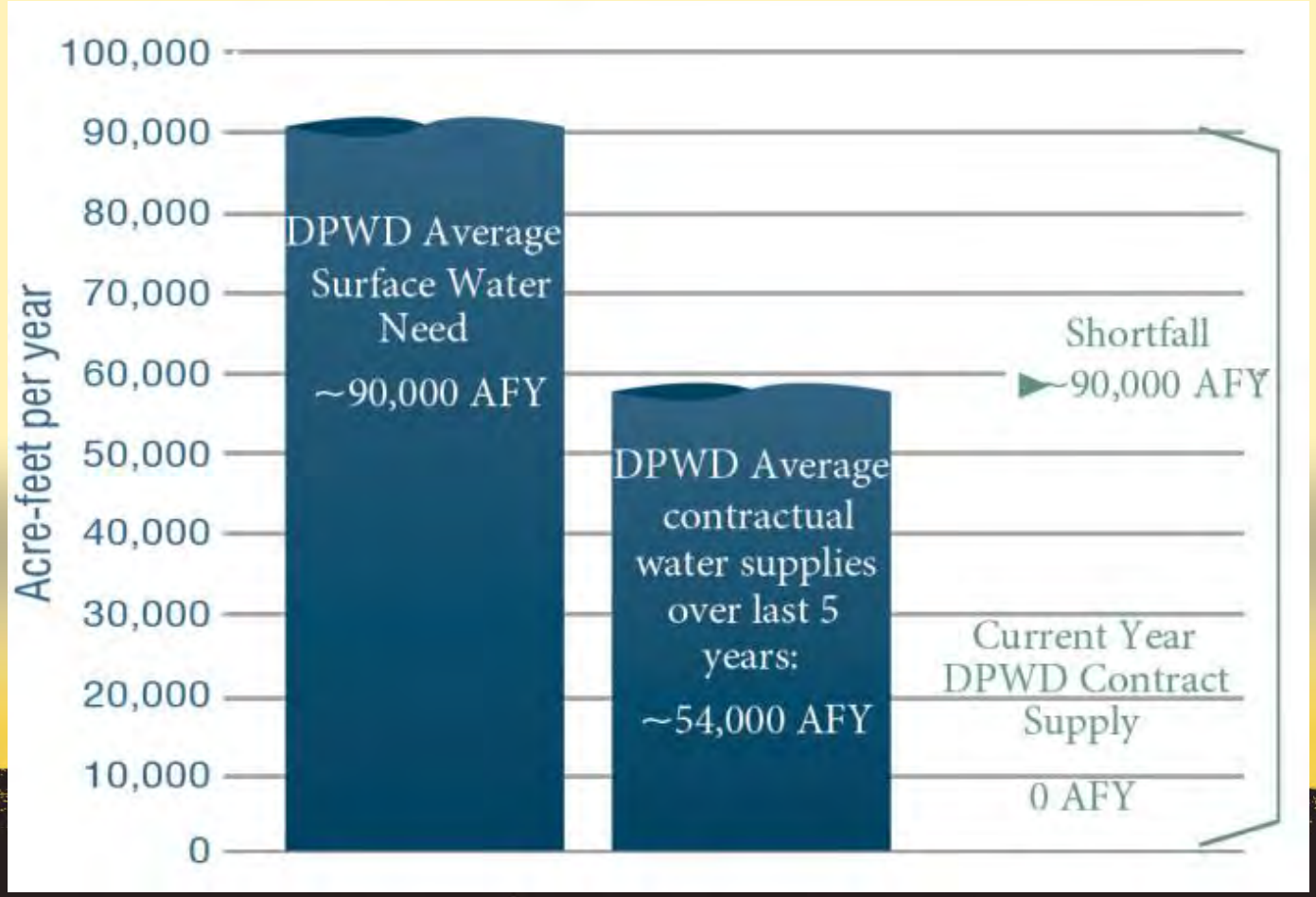


Need for the Program

Together the partners can work through their challenges

- Del Puerto Water District
  - Primary water source is Federal allocations from the Central Valley Project (CVP)
  - CVP allocations have been restricted due to drought and environmental concerns
- Cities of Modesto and Turlock
  - Experiencing more stringent discharge requirements
  - Both cities treat to tertiary levels with minimal reuse

Del Puerto Water Customers Have Experienced Significant Shortages and Decreased Reliability in the Last 20 Years, Particularly During the Last 5 Years

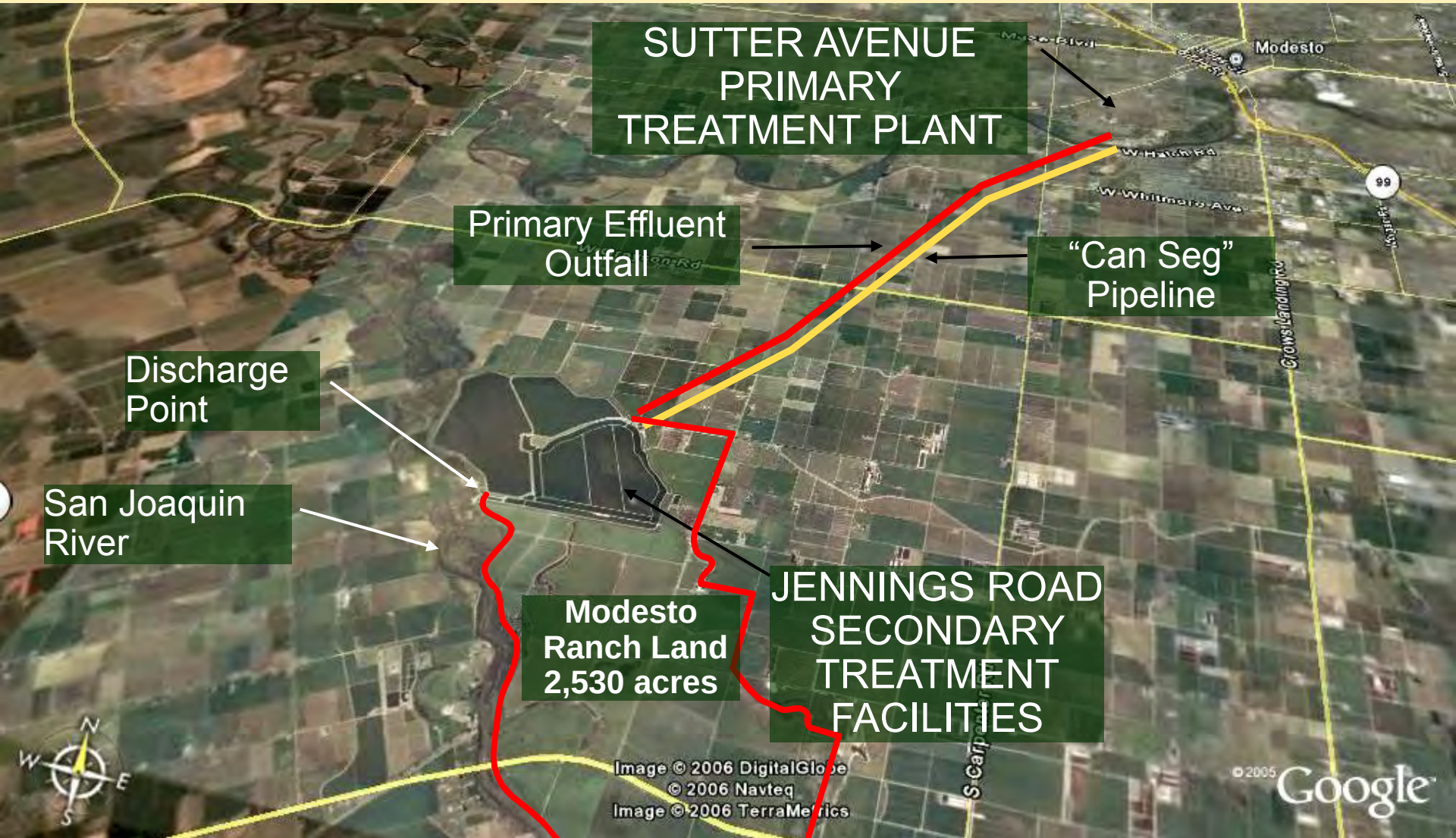


Primary Crops in Del Puerto

- Almonds (15,000 ac)
- Tomatoes (5,000 ac)
- Beans (3,000 ac)
- Apricots (2,500 ac)
- Barley/Oats (2,500 ac)
- Alfalfa (2,000 ac)
- Walnuts (2,000 ac)
- Other – Misc. (3,500 ac)
- Fallowed (7,500 ac)

- **Total = 43,000 acres**

Modesto's existing wastewater system includes two separate treatment facilities



Modesto's Wastewater Story

- Currently disposes secondary-treated wastewater in two ways
  - Stored ponds and irrigate 2,530 acres on City-owned land (Ranch)
  - Disinfected and seasonally discharged to San Joaquin River
- NPDES permit (2008) limitations will not allow secondary-treated effluent disposal into San Joaquin River
  - Implementing phased tertiary treated (recycled water) improvements to allow year round disposal
  - Compliance date is June 2018

Modesto's Phase 2 BNR/Tertiary Treatment project

- Phase 2 BNR/Tertiary Treatment facility (Wastewater Fund/SRF Loan)
  - 12.6 MGD of recycled Water
  - Design started 2008
  - Construction began 2012
  - Expected completion 2016

Turlock's Wastewater Story

- Currently disposes tertiary-treated wastewater to San Joaquin River (SJR)
  - Tertiary process - cloth media filters with chlorine disinfection
- Recently upgraded outfall into SJR from an open drain to a close pipeline (Harding Drain Bypass Pipeline) for compliance with NPDES permit (2010)

North Valley Regional Recycled Water Program Partnership was established to:

- Provide a regional solution for a local water supply crisis
- Make recycled water available for agricultural irrigation and potentially wildlife refuges
- Provide long-term, reliable water supplies to Del Puerto Water District to mitigate on-going and severe contractual water supply shortages
- Reduce reliance on Delta conveyance and groundwater pumping to meet unmet water supply needs

Alternatives Analysis

5 Primary Alternatives Were Considered

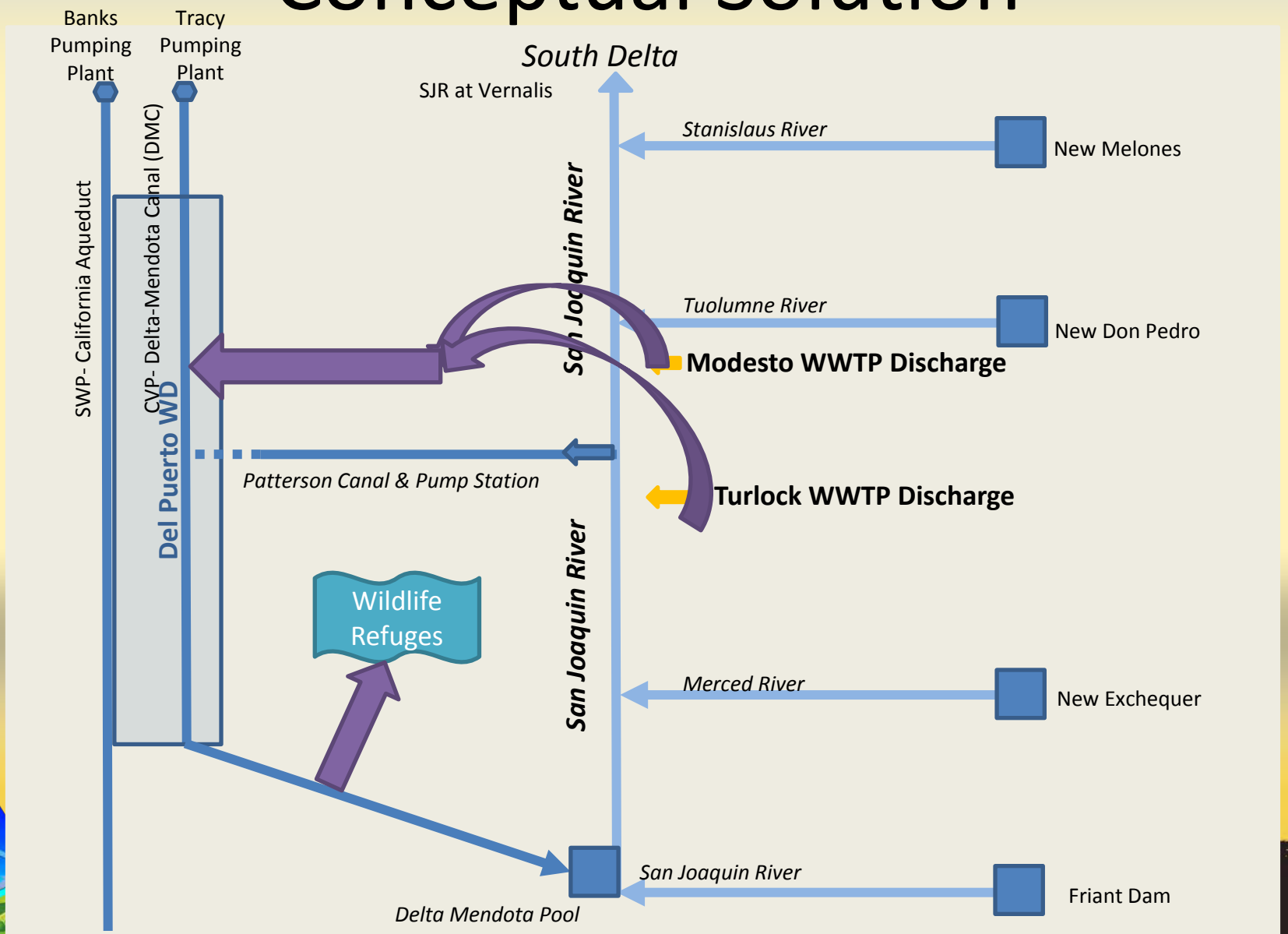
	Alternative	Water Quality to Customers
1	Pipeline to DMC	Tertiary blended with DMC water
2	Pipeline to DPWD growers	Tertiary
3	SJR Conveyance to DMC diversion	Tertiary blended with San Joaquin River
4	Pipeline to Patterson Irrigation District Canal for conveyance to DMC	Tertiary blended with San Joaquin River then DMC water
5	Pipeline to DMC with GW storage and modified operations	Tertiary blended with DMC water

Primary Considerations

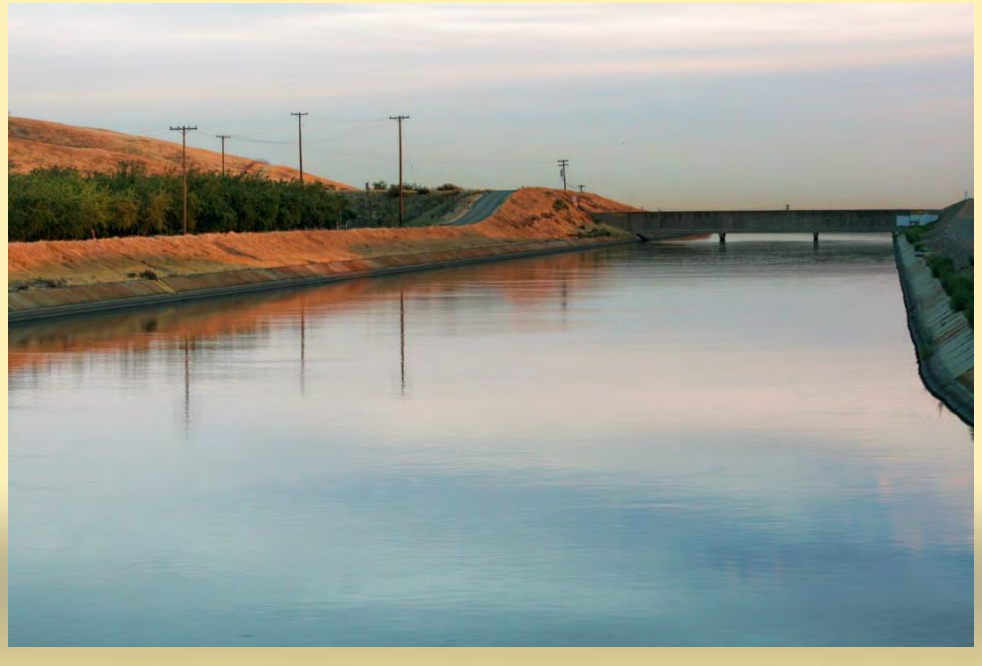
	Alternative	Year Round?	Removes Flow from SJR?	Expands partnership group?
1	Pipeline to DMC	Yes	Yes	No
2	Pipeline to DPWD growers	No	Yes	No
3	SJR Conveyance to DMC diversion	Yes	No	Yes
4	Pipeline to Patterson Irrigation District Canal for conveyance to DMC	Yes	Yes	Yes
5	Pipeline to DMC with GW storage and modified operations	No	Yes	No

Conceptual Solution

Conceptual Solution

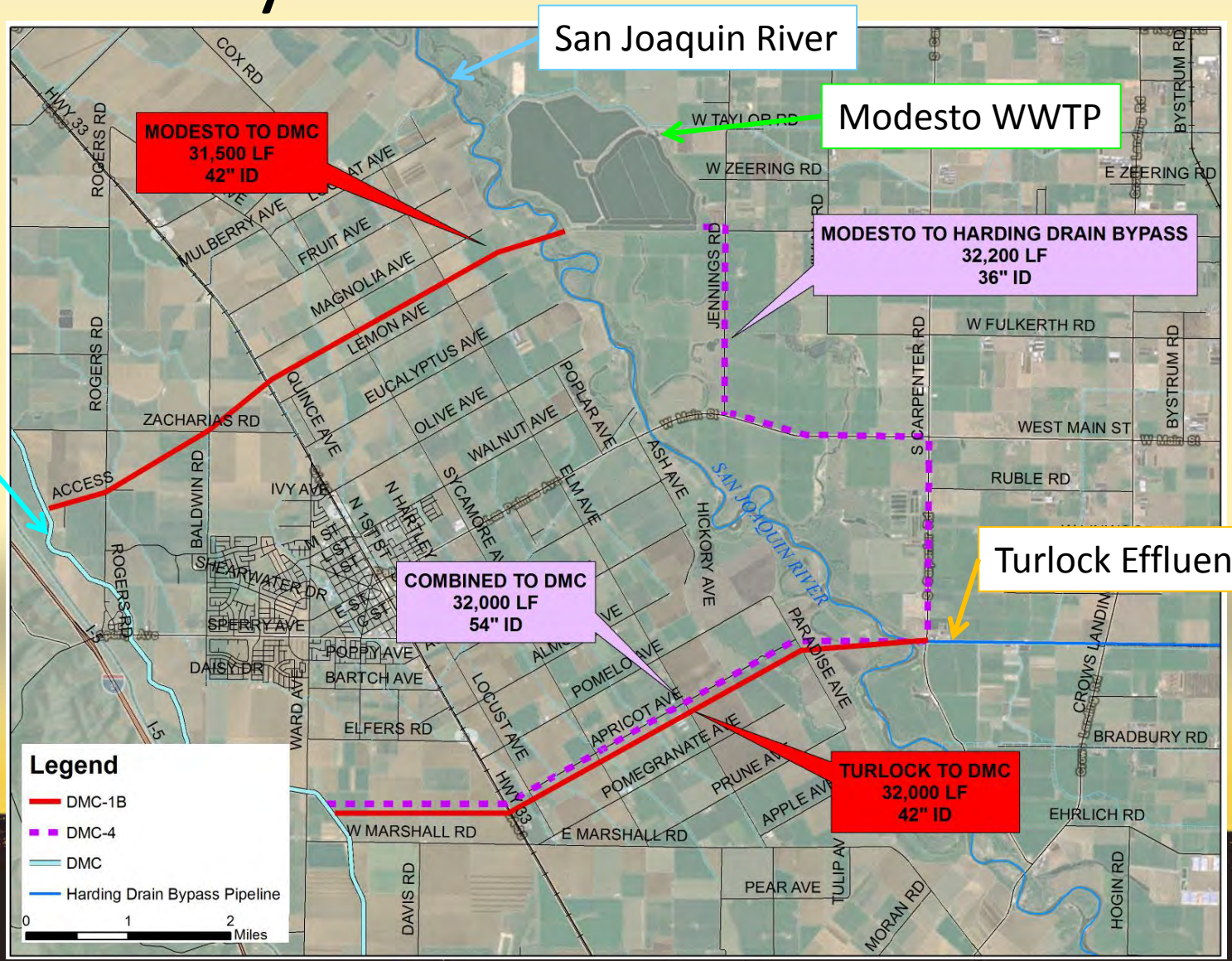


Delta-Mendota Canal



- Primary source of water to DPWD and refuges
- Owned by U.S. Bureau of Reclamation (Federal) under Central Valley Project, operated by San Luis Delta-Mendota Water Authority
- Max capacity of 4,600 cfs

Preferred Alternatives for Delivering Recycled Water to the DMC

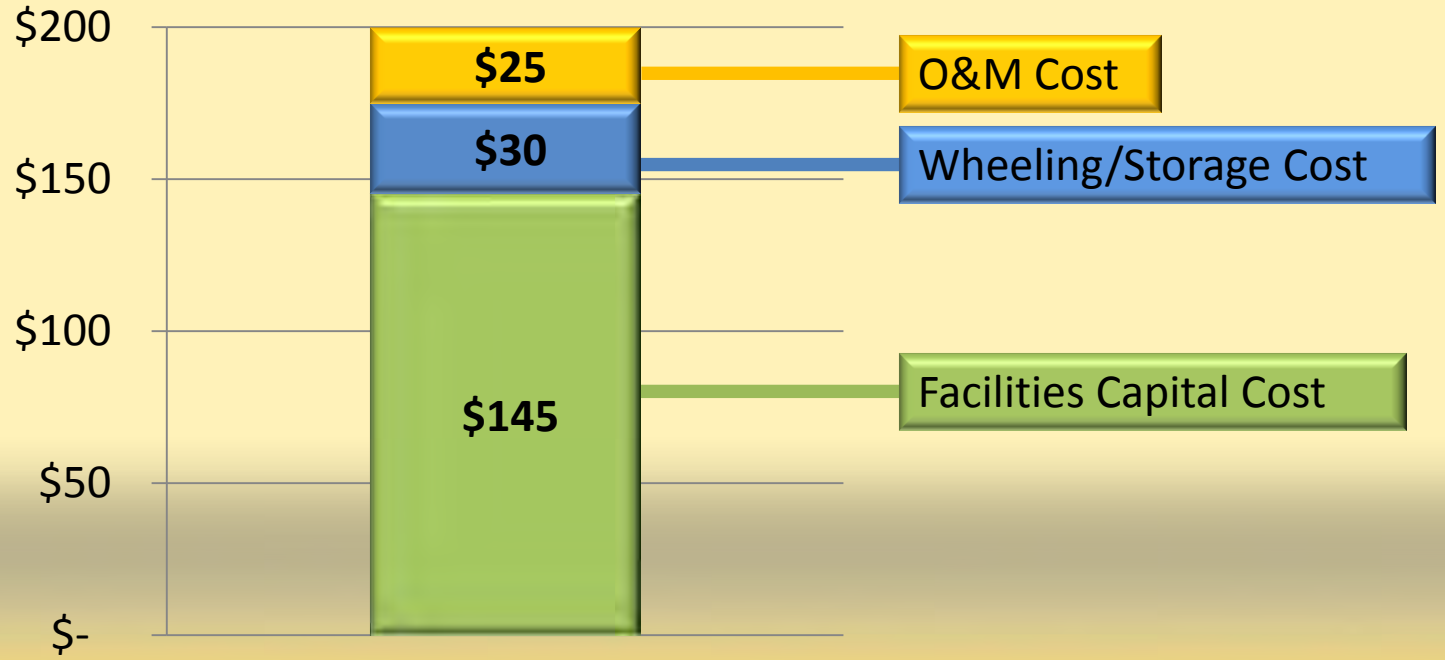


Estimated Project Costs

	Single Pipeline Alternative	Dual Pipeline Alternative
Base Construction	$74 M	$ 79 M
Implementation Costs	$22 M	$ 23 M
Total Capital Cost	$96 M	$102M

Depending on grants and financing mechanisms, the first year water cost is estimated at $180-320 per acre-foot

The Cost of Water from the NVRRWP Includes the Cost of Winter Storage



All Costs are per Acre-Foot

Benefits of the Program

Implementation Challenges

Implementation Challenges

- Securing Water Rights
- Obtaining a New NPDES Permit
- Approval for Use of USBR Facilities

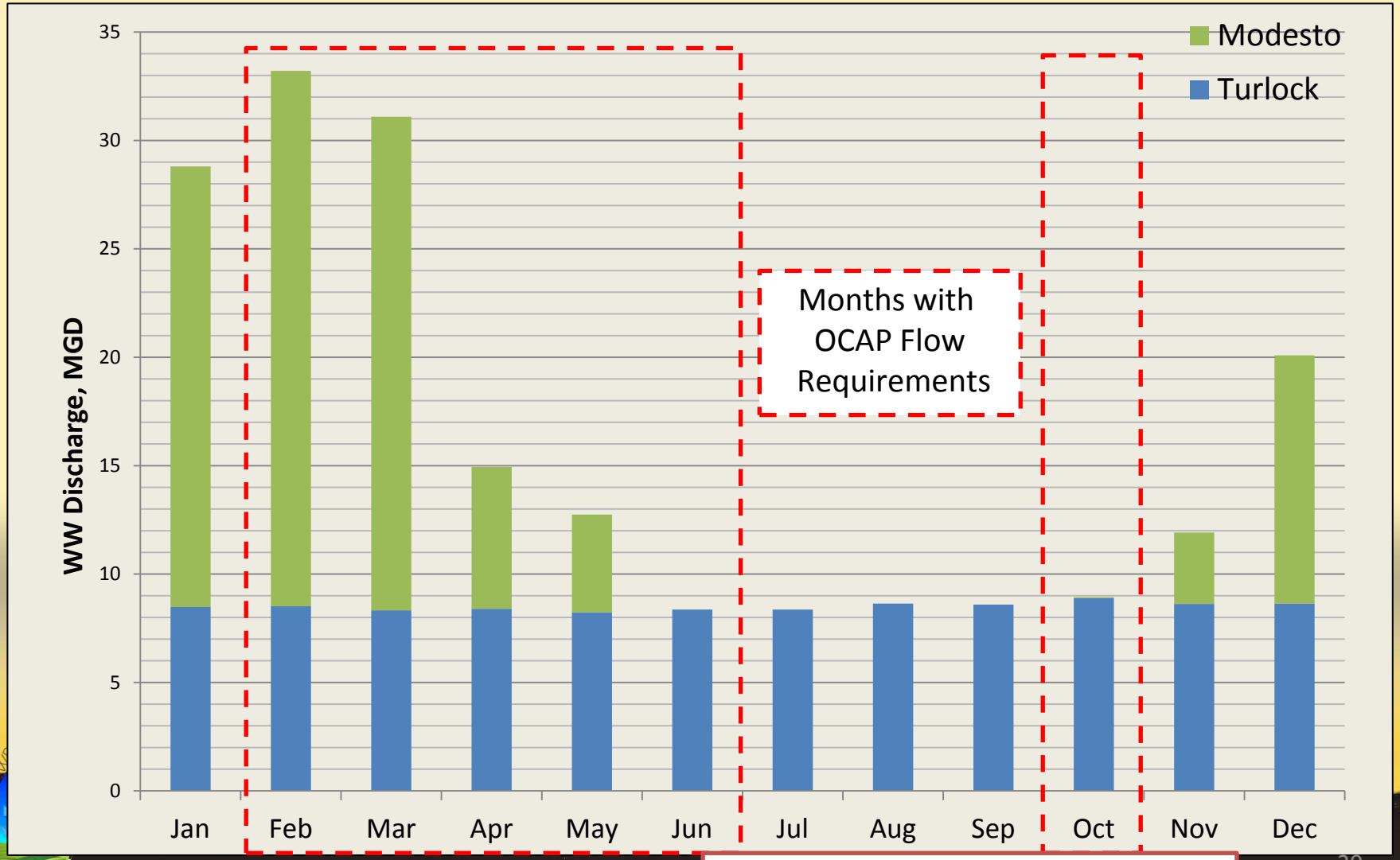
Securing Water Rights

- Modesto and Turlock will file petitions with the State Water Board to change their discharge locations (CA Water Code Section 1211)
- Removal of discharges from the San Joaquin River requires evaluating both flow and fish habitat impacts
- Initial work in both areas shows no significant impacts

Average Monthly Discharges to San Joaquin River (2000-2012)

Annual Average Discharge = 18.3 TAFY

Monthly Average Discharge Range = 12.9 cfs to 51.4 cfs



OCAP = Operations Criteria and Plan

OCAP Requirements at Vernalis Base flow standards (cfs)

Year Type	All	W	AN	BN	D	C
Feb-Apr14 and May16-Jun		2,130 or 3,420	2,130 or 3,420	1,420 or 2,280	1,420 or 2,280	710 or 1,140

- Minimum monthly average flow rate in cfs
- 7-day running average >= 80% of the objective
- Take the higher objective if X2 is required to be west of Chipps Island

Flow Analysis Methodology

- Compare Vernalis flows with OCAP San Joaquin River flow requirements:
  - Measured flows with recycled water
  - Calculated flows without recycled water
- Use the following data:
  - Daily flow measurements at Vernalis 2003-2013
  - Monthly RW discharge measurements 2003-2013

San Joaquin River Water Year Index

- Number of years for each year type:
  - Wet (3)
  - Above Normal (1)
  - Below Normal (2)
  - Dry (2)
  - Critical (2)

Year	SJR Year Type
2003	BN
2004	D
2005	W
2006	W
2007	C
2008	C
2009	BN
2010	AN
2011	W
2012	D

Lower Base Flow Requirements

(No additional impact without RW)

Year	SJR Year Type	Month	Average Monthly Flow at Vernalis (with RW)	Average Monthly Flow at Vernalis (without RW)	Lower Baseflow Requirements	Upper Baseflow Requirements
			cfs	cfs	cfs	cfs
2003	BN	A	2,033	1,993	1,420	2,280
		M	2,169	2,133	1,420	2,280
		J	2,229	2,216	1,420	2,280
2004	D	F	2,125	2,075	1,420	2,280
		M	3,274	3,214	1,420	2,280
		A	2,395	2,358	1,420	2,280
		M	2,159	2,147	1,420	2,280
		J	1,466	1,452	1,420	2,280
2005	W	F	5,373	5,297	2,130	3,420
		M	7,547	7,501	2,130	3,420
		A	12,236	12,203	2,130	3,420
		M	12,567	12,551	2,130	3,420
		J	10,317	10,301	2,130	3,420
2006	W	F	6,494	6,442	2,130	3,420
		M	11,760	11,720	2,130	3,420
		A	24,576	24,560	2,130	3,420
		M	25,045	25,030	2,130	3,420
		J	16,067	16,052	2,130	3,420
2007	C	F	2,501	2,453	710	1,140
		M	2,507	2,461	710	1,140
		A	1,885	1,852	710	1,140
		M	2,942	2,909	710	1,140
		J	1,874	1,859	710	1,140
2008	C	F	2,315	2,245	710	1,140
		M	2,165	2,121	710	1,140
		A	2,013	1,999	710	1,140
		M	2,087	2,083	710	1,140
		J	1,155	1,141	710	1,140
2009	BN	F	1,501	1,464	1,420	2,280
		M	1,489	1,445	1,420	2,280
		A	1,228	1,208	1,420	2,280
		M	2,034	2,021	1,420	2,280
		J	1,301	1,288	1,420	2,280
2010	AN	F	2,533	2,484	2,130	3,420
		M	2,998	2,928	2,130	3,420
		A	3,442	3,429	2,130	3,420
		M	4,474	4,462	2,130	3,420
		J	3,894	3,882	2,130	3,420
2011	W	F	8,698	8,650	2,130	3,420
		M	12,973	12,882	2,130	3,420
		A	27,660	27,648	2,130	3,420
		M	10,475	10,463	2,130	3,420
		J	10,529	10,517	2,130	3,420
2012	D	F	1,587	1,553	1,420	2,280
		M	1,594	1,582	1,420	2,280
		A	2,238	2,209	1,420	2,280
		M	2,428	2,417	1,420	2,280
		J	1,443	1,432	1,420	2,280
2013	C	F	2,306	2,255	710	1,140
		M	1,575	1,527	710	1,140

Year	SJR Year Type	Month	Average Monthly Flow at Vernalis (with RW)	Average Monthly Flow at Vernalis (without RW)	Lower Baseflow Requirements	Upper Baseflow Requirements
			cfs	cfs	cfs	cfs
2009	BN	F	1,501	1,464	1,420	2,280
		M	1,489	1,445	1,420	2,280
		A	1,228	1,208	1,420	2,280
		M	2,034	2,021	1,420	2,280
		J	1,301	1,288	1,420	2,280

Not meeting the minimum flow requirements (with RW)

Not meeting the minimum flow requirements (without RW)

Flow Summary & Conclusions

- Project impacts are analyzed in a very conservative manner
- Project impacts are observed only one month out of total of 120 months (less than 1% of the time). This impact was 8 cfs for Pulse flow
- Project impacts are observed only 2 days out of 3,650 days of record (less than 0.1% of the time)
- Given the range and frequency of Base and Pulse flow impacts on Vernalis Flows, the project impacts are virtually negligible; Project is not impacting the Reclamation operations of the New Melones Reservoir

Potential Effects on Fisheries

- Study completed by Hanson Environmental
- Addressed potential effect of reduction in freshwater discharges to San Joaquin River
- Used Chinook salmon as indicator species
- Determined that predicted changes would be less than significant

Used 3 Independent Analyses for Potential Effects on Fisheries Analysis

- Predicted change in juvenile salmon survival as a function of river flow
- Predicted change in adult salmon escapement as a function of river flow
- Changes in river habitat based on stage-discharge relationships developed by USGS

Note: Use of CDFW SalSim model was considered, but model was determined not to be suitable (per discussions with CDFW)

Juvenile survival vs. flow

- Predicted change in survival is so small, it's well within natural observed variability in survival; both with and without Head of Old River Barrier (HORB)
- Mean predicted survival with HORB:

	March	April	May
Baseflow survival	0.063	0.024	0.062
Adjusted flow survival	0.058	0.022	0.060
Net change	0.005	0.002	0.002

- No net change without HORB

Adult escapement vs. flow

- Reduced flow estimated to reduce escapement by 0.52%
- Mean predicted change in adult escapement:

	March	April	May
Base flow escapement	16,986	16,373	16,968
Adjusted escapement	16,909	16,336	16,936
Difference	77	37	31
% Change	0.45%	0.22%	0.19%

Change in Stage Height

- Reduction estimated to range from 0.02 to 0.08 feet
- Mean change in stage height (in feet):

	March	April	May
Base stage height	11.60	11.17	11.59
Adjusted stage height	11.55	11.14	11.57
Change in stage	0.05	0.03	0.02
% Change	0.43%	0.27%	0.17%

Aquatic Impacts Summary and Conclusions

- Magnitude of predicted changes is small (typically less than 1% of current baseline)
- Change is well within observed natural variation
- Magnitude of predicted change would not be detectable in field studies and is considered less than significant

Next Steps on Water Rights

- Confirm flow and habitat analysis in EIR/EIS
- File Petition for Change Applications (will be finalized after EIR/EIS is finalized)

Obtaining a New NPDES Permit

- Use of the DMC creates an unusual permitting scenario
  - DMC is a concrete-lined engineered channel
  - DMC is also listed by the Regional Water Quality Control Board as having a variety of beneficial uses
- Permit therefore is an NPDES Permit with the DMC as the receiving body

Recycled Water Meets Agricultural Irrigation Requirements

Quality of recycled water is generally better than San Joaquin River water quality and similar to Delta-Mendota Canal water quality:

Constituent	Recycled Water	San Joaquin River near Patterson	Delta Mendota Canal
Boron (mg/L)	0.20	0.59	0.19
Nitrate (as N) (mg/L)	6.7	13.3	3.6
Selenium (µg/L)	0.8	1.9	0.8
Total Dissolved Solids (mg/L)	544	679	275

Next Steps on NPDES

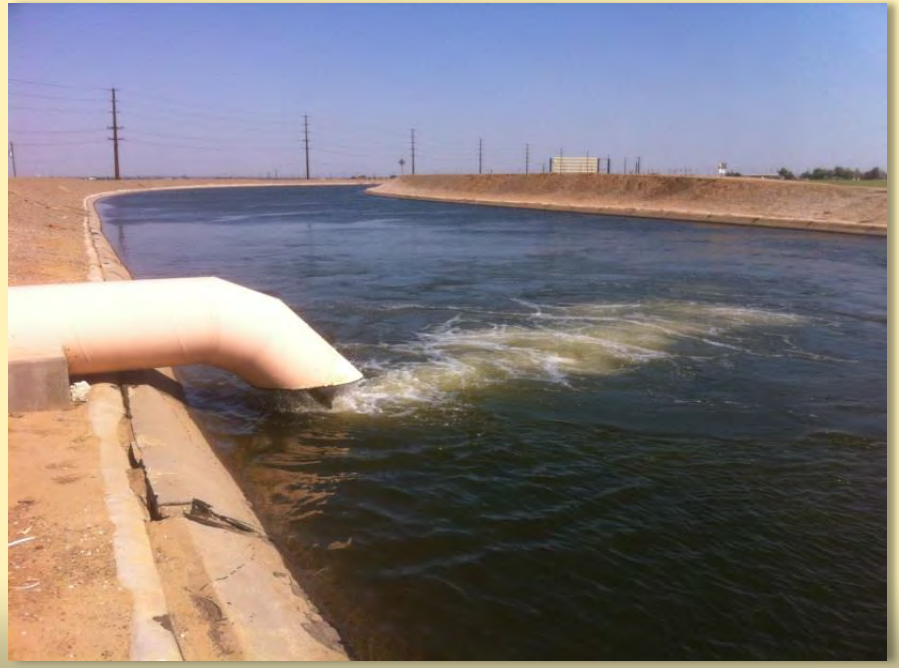
- Bring USBR up to speed on NPDES process
- Gather background WQ data for Modesto, Turlock and DMC
- Prepare Report of Waste Discharge (ROWD)

Approval for the Use of USBR Facilities

- Warren Act or Exchange Agreement with Reclamation to allow conveyance and storage in the DMC
- Agreements can be on the order of 5-40 years in length

Type of Connection to DMC is under development

- Will depend on NPDES permitting requirements and USBR preferences
- May require dye testing of the DMC for mixing zone analysis



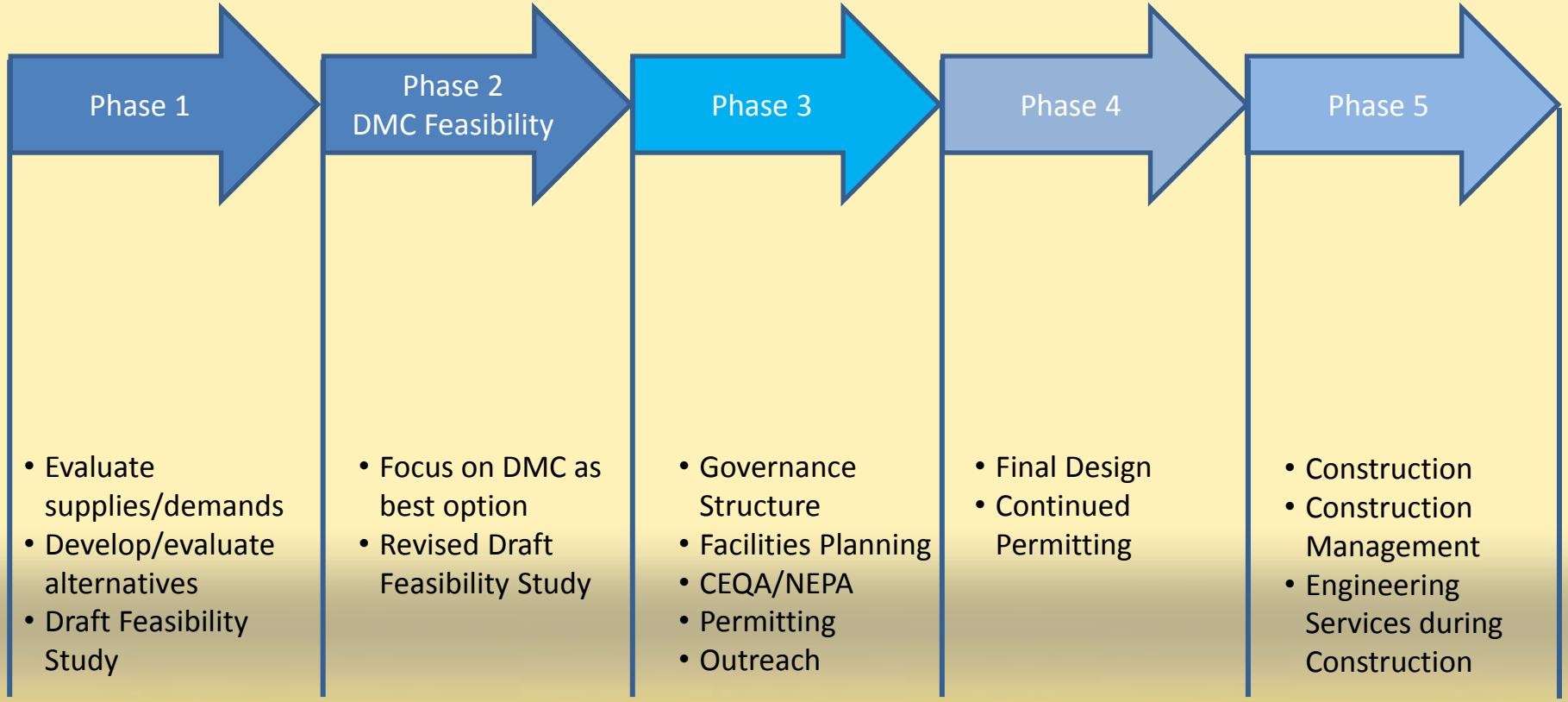
Gooseneck-style discharge into DMC near Patterson, California

Next Steps on USBR Coordination

- Provide project background and information to all necessary departments within USBR
- Focus on Water Rights and NPDES permit before Exchange Contract can be completed

Program Phases – What's Next?

Present phase focuses on environmental review and permitting before final design can begin



Questions?

For additional information,
contact Carrie Del Boccio
cdelboccio@rmcwater.com
(925) 627-4100

Back Up Slides

Impact of Grant Programs

	2018 Base Cost	2018 w/ $10M Prop 84 Grant
SRF – 20 yr	$267	$245
SRF – 30 yr	$213	$196
USBR	$180	$167

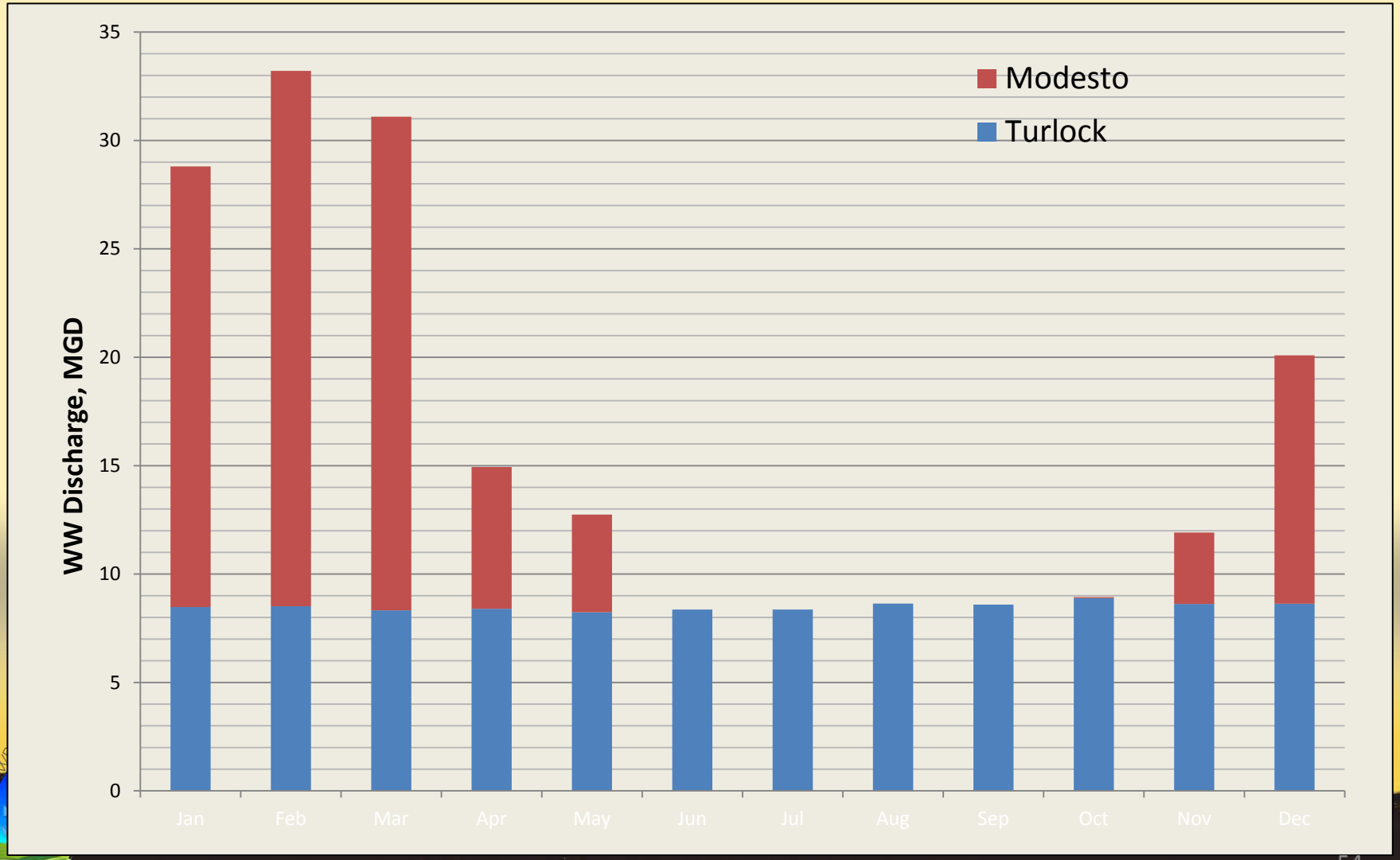
Costs are shown as $ per acre-foot

Comparison of Financing Scenarios

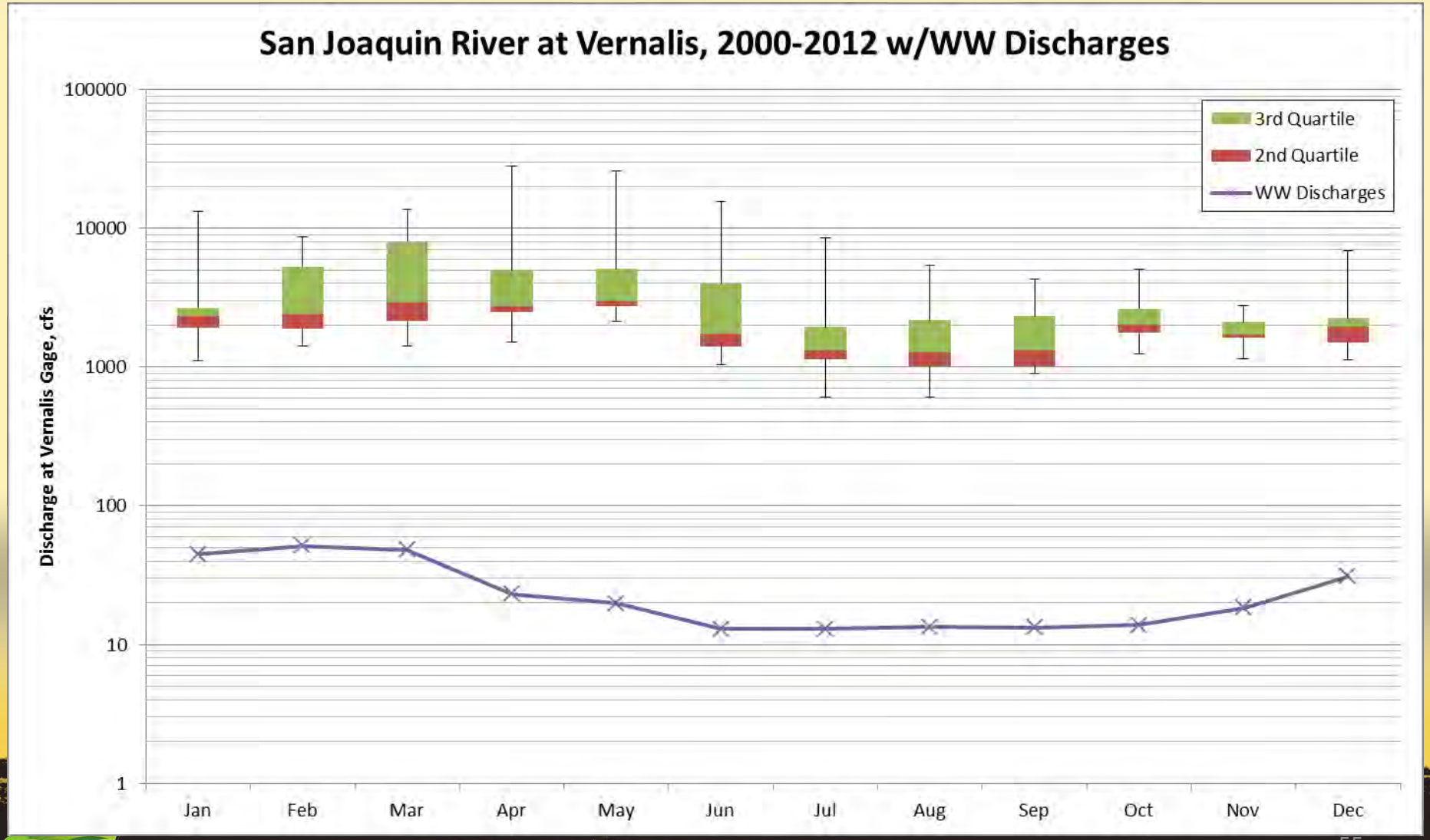
	Rate	2018 (30,600 AF)	2028 (47,700 AF)	2038 (56,600 AF)	2048 (59,000 AF)
Bonds – 30 yr	5%	$321	$234	$215	$79
SRF – 20 yr	2.5%	$267	$199	$71	$79
SRF – 30 yr	2.5%	$213	$164	$156	$79
USBR – 30 yr	1%	$180	$143	$139	$79

Costs are shown as $ per acre-foot

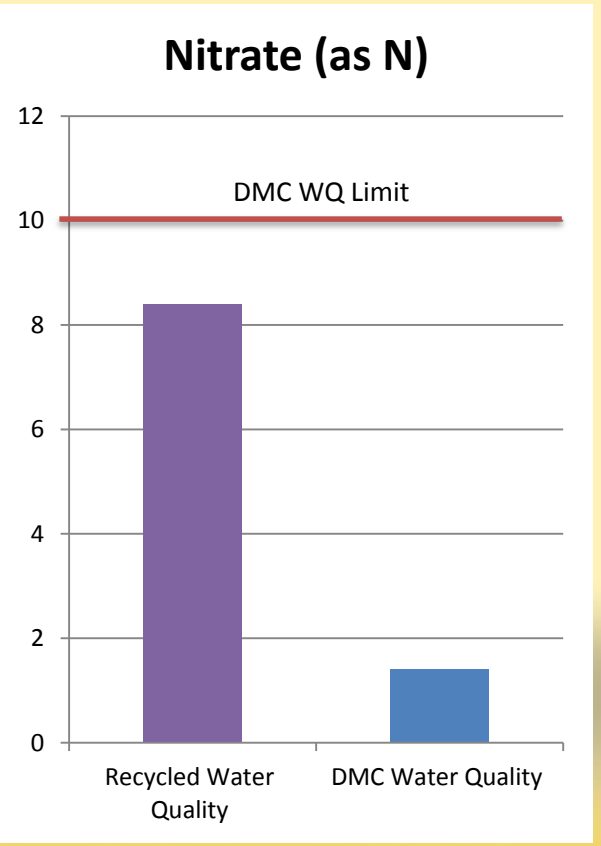
Average Monthly Discharges to San Joaquin River (2000-2012)

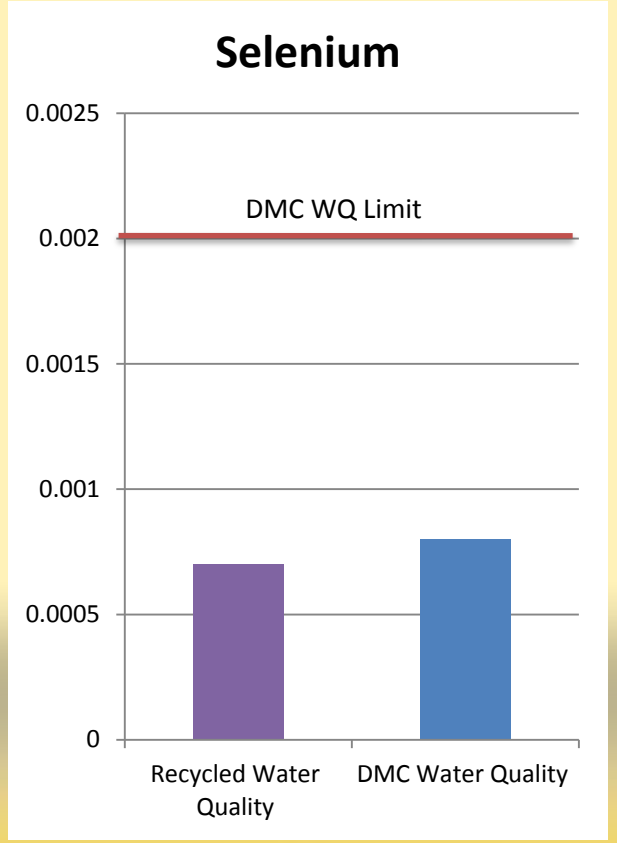


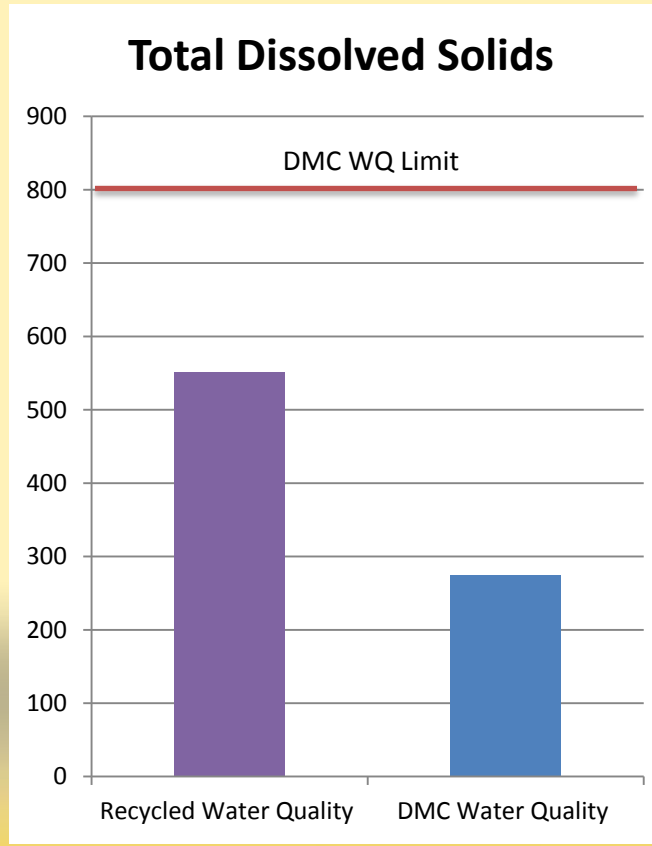
Observed Vernalis Flows compared to WWTP Discharges



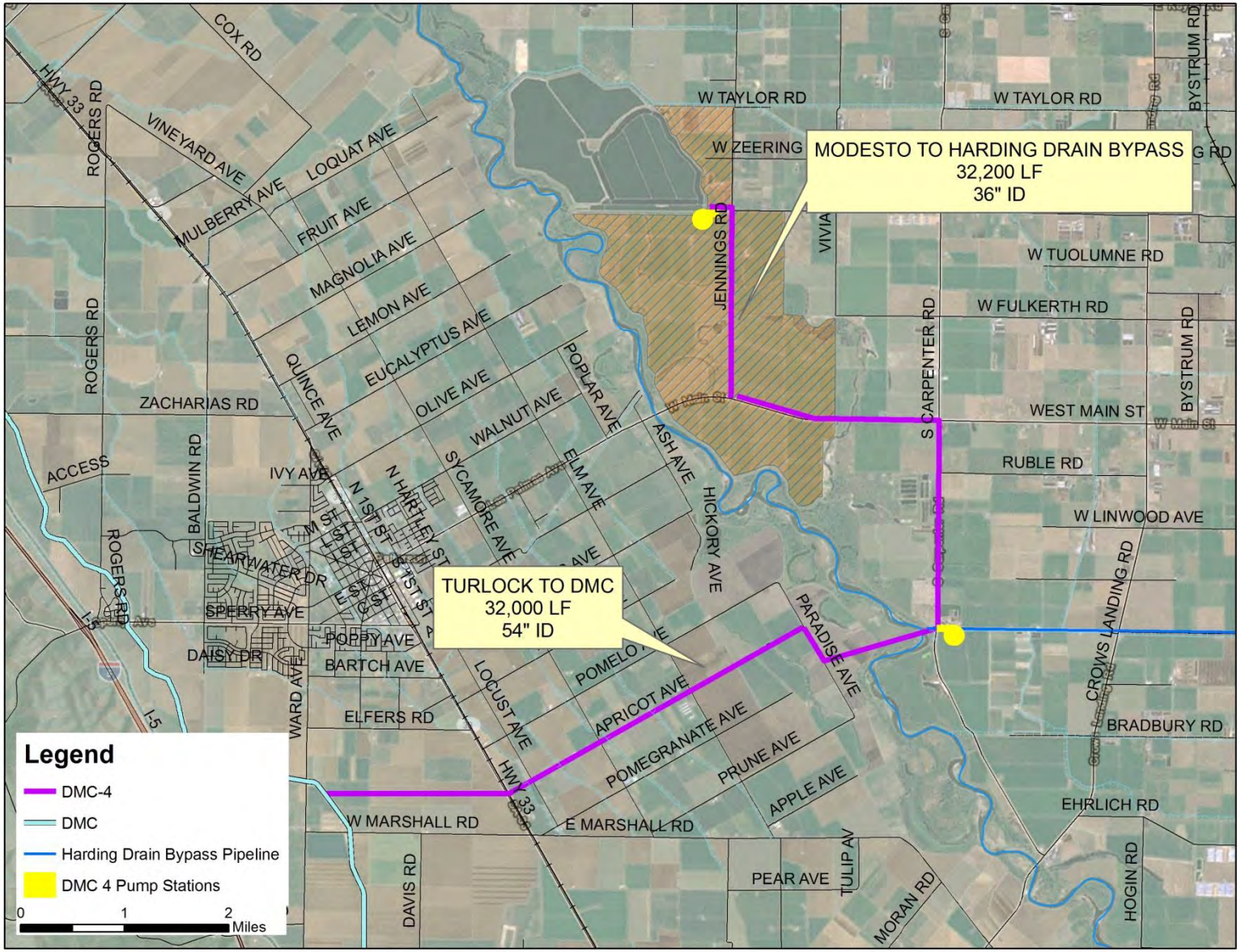
Comparing Recycled Water Quality to DMC Water Quality



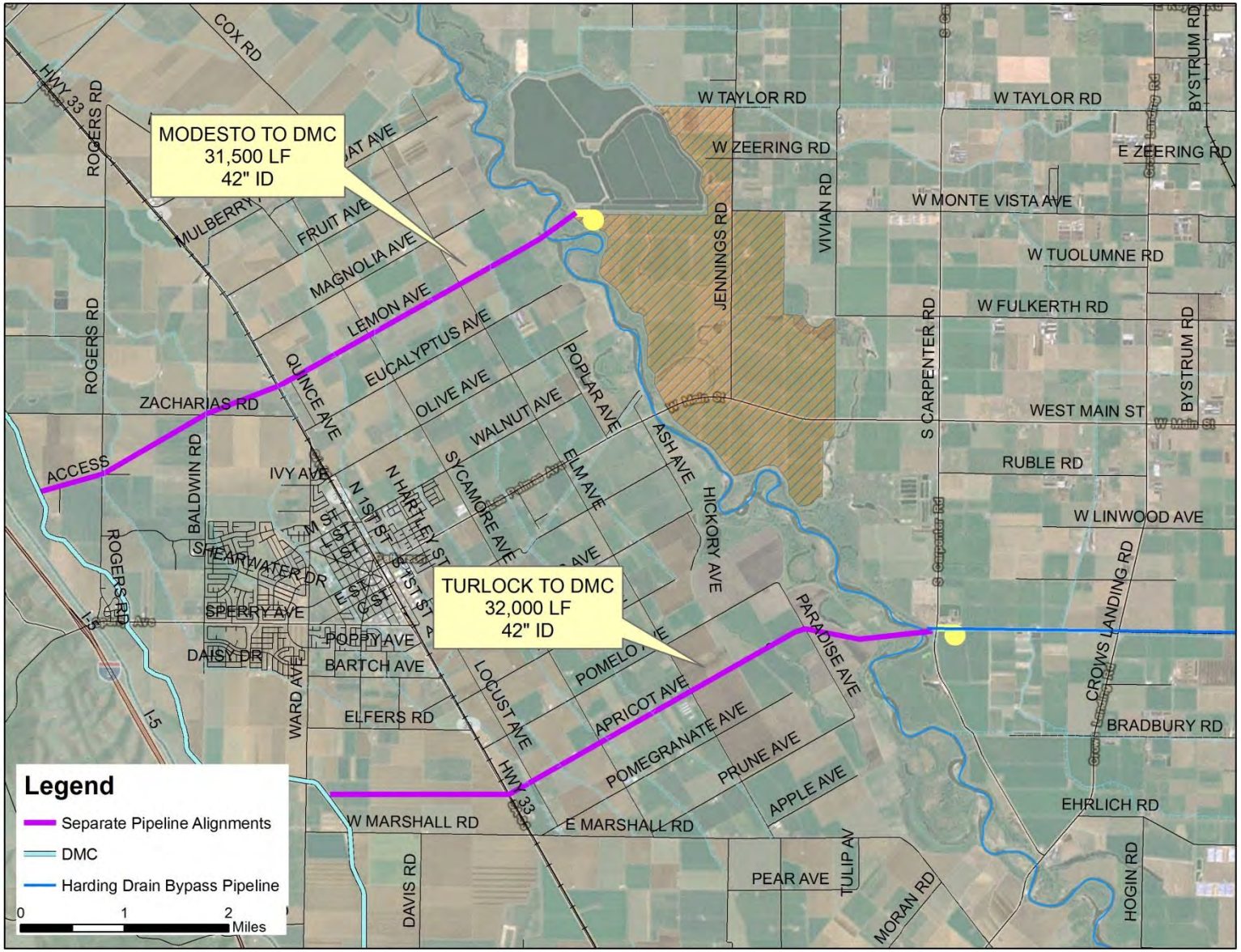




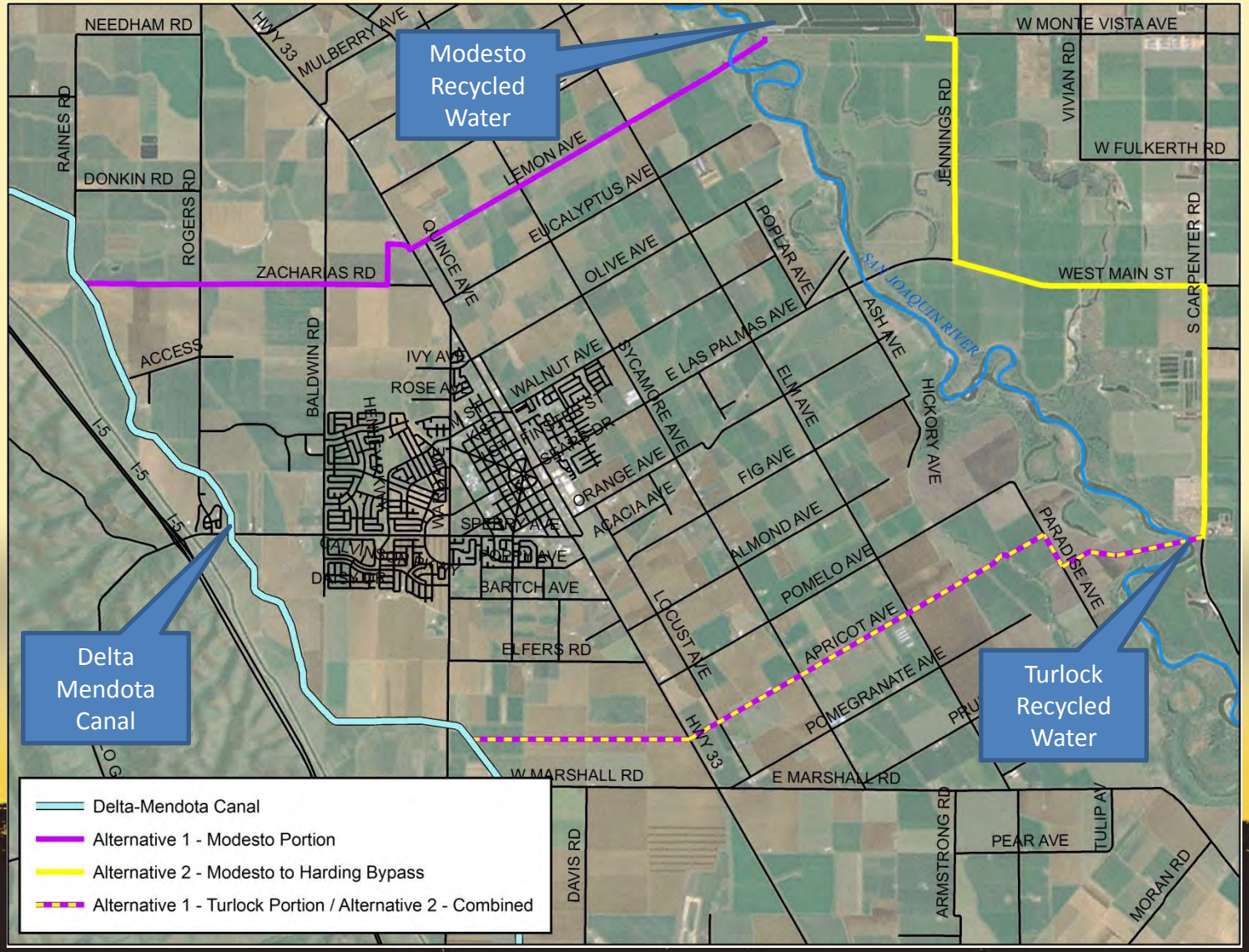
Single Pipeline to DMC



Dual Pipelines to DMC



Alternatives for Delivering Recycled Water to the Delta Mendota Canal



Cities discharges represent less than 1% of San Joaquin River Flows