San Joaquin River Restoration Program

Water Management Technical Feedback Meeting

Visalia, CA

March 18, 2016
Agenda

• Introductions
• Long-term Recapture/Recirculation of Restoration Flows EIS
  – New Facility Screening
• 2016 Restoration Flows Outlook
  – Restoration Flows
  – Unreleased Restoration Flows
  – 2016 Recapture/Recirculation
• Part III Projects
• 2016 Meeting Dates
• Adjourn
LONG-TERM RECAPTURE AND RECIRCULATION OF RESTORATION FLOWS EIS
Overview

• Initial Alternatives Technical Memorandum

• Recapture Facility Investigation
  – Existing Facility Capacity
  – New Facility Location and Size

• Next Steps and Schedule
Initial Alternatives TM

- Distributed to the Settling Parties, Friant Contractors and Cooperating Agencies in February
- 32 Recapture, Recirculation and Storage Options
- Evaluated options to formulate 4 Action Alternatives
<table>
<thead>
<tr>
<th>Summary of Initial Alternatives</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recapture</strong></td>
</tr>
<tr>
<td>Delta Diversions</td>
</tr>
<tr>
<td>Recapture w/in Restoration Area</td>
</tr>
<tr>
<td><strong>Recirculation</strong></td>
</tr>
<tr>
<td>Alternative 2</td>
</tr>
<tr>
<td>Direct Delivery</td>
</tr>
<tr>
<td>FKC Exchanges (Kings River, Kaweah/Tule River, Kern River)</td>
</tr>
<tr>
<td>Transfers</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td><strong>Storage</strong></td>
</tr>
<tr>
<td>Storage in San Luis</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Recapture Facility Investigation

Refinement of existing and new recapture facility options

- Clarify existing and potential expanded capacity and timing
- Field investigation of the potential sites for new facility
- Study sizing options
PID Existing and Expanded Facilities

• Facility with diversion and fish screen capacity of up to 195 cfs
• Conveyance capacity to DMC of 35 cfs
Reclamation Assumes:

- That the District will construct a fish screen with a 347 cfs capacity, and
- The District’s pump station upgrade currently underway will increase conveyance capacity to the DMC from 185 cfs to 250 cfs
BCID Existing and Expanded Facilities

- Facility and fish screen capacity of up to 250 cfs
- Conveyance capacity to the DMC of 62 cfs
### Combined Capacity To Recirculate at Existing Intakes (cfs)

<table>
<thead>
<tr>
<th>Existing Diversions¹</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patterson Irrigation District</td>
<td>25</td>
<td>38</td>
<td>15</td>
<td>14</td>
<td>16</td>
<td>38</td>
<td>99</td>
<td>82</td>
<td>25</td>
<td>5</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>West Stanislaus Irrigation District²</td>
<td>241</td>
<td>241</td>
<td>246</td>
<td>246</td>
<td>243</td>
<td>228</td>
<td>210</td>
<td>157</td>
<td>131</td>
<td>109</td>
<td>100</td>
<td>234</td>
</tr>
<tr>
<td>Banta Carbona Irrigation District</td>
<td>8</td>
<td>11</td>
<td>6</td>
<td>5</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>274</td>
<td>290</td>
<td>267</td>
<td>265</td>
<td>265</td>
<td>266</td>
<td>309</td>
<td>239</td>
<td>156</td>
<td>114</td>
<td>110</td>
<td>272</td>
</tr>
</tbody>
</table>

1. Available unused capacity calculated utilizing in-district monthly water demand values provided by the districts.
2. Inclusion of West Stanislaus ID in Alternative 3 is contingent on their completion of the river diversion fish screen currently under design.
## Combined Capacity To Recirculate at Expanded Existing Intakes (cfs)

<table>
<thead>
<tr>
<th>Expanded Existing Diversions¹</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
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</thead>
<tbody>
<tr>
<td>Patterson Irrigation District</td>
<td>45</td>
<td>58</td>
<td>35</td>
<td>34</td>
<td>36</td>
<td>58</td>
<td>119</td>
<td>102</td>
<td>45</td>
<td>25</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td>West Stanislaus Irrigation District²</td>
<td>278</td>
<td>278</td>
<td>283</td>
<td>283</td>
<td>280</td>
<td>265</td>
<td>247</td>
<td>194</td>
<td>168</td>
<td>146</td>
<td>137</td>
<td>271</td>
</tr>
<tr>
<td>Banta Carbona Irrigation District</td>
<td>63</td>
<td>66</td>
<td>61</td>
<td>60</td>
<td>61</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>72</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>386</td>
<td>402</td>
<td>379</td>
<td>377</td>
<td>377</td>
<td>378</td>
<td>421</td>
<td>351</td>
<td>268</td>
<td>226</td>
<td>222</td>
<td>384</td>
</tr>
</tbody>
</table>

1. Expanded capacity calculated using the existing in-district monthly water demand values provided by the districts combined with the conveyance segment with the smallest capacity increase realized.

2. Inclusion of West Stanislaus ID in Alternative 4 is contingent on their completion of the river diversion fish screen currently under design.
New Recapture Facility Site ID

- Eleven potential sites capable of diverting 1,000 cfs.
- Three sites near the Stanislaus River were screened due to issues with geomorphic stability and habitat sensitivity.
New Recapture Facility Site ID

- Site surveys of 8 remaining sites to develop a preliminary ranking
- Next steps on site refinement include:
  - Evaluation of land use availability
  - Conveyance path routing
  - On-ground surveys of sites and conveyance paths for sensitive species

Preliminary Draft, Subject to Revision
New Recapture Facility Size Evaluation

Evaluation compared:

• Recently built diversions in California for facility footprint and cost

• Restoration Flow volume potentially recaptured

• Modeled DMC conveyance capacity to recirculate recaptured Restoration Flows

• Proportion of total river flow potentially diverted by a 1,000 cfs and a 500 cfs facility
## Capacity and Cost Comparison

<table>
<thead>
<tr>
<th>Project:</th>
<th>Capacity of Intake: (CFS)</th>
<th>Construction Cost: (MILLION)</th>
<th>Length of Fish Screen: (LF)</th>
<th>Total Facility Footprint (ac)</th>
<th>Number/Size of Pumps</th>
<th>Time to Construct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeport Regional Water Project</td>
<td>286</td>
<td>85*</td>
<td>160</td>
<td>10</td>
<td>8 - 36 cfs</td>
<td>3 years</td>
</tr>
<tr>
<td>Woodland Davis</td>
<td>400</td>
<td>60*</td>
<td>200</td>
<td>3</td>
<td>5 - 80 cfs 4 - 20 cfs</td>
<td>Currently in Construction (app. 4 years)</td>
</tr>
<tr>
<td>TCCA Fish Passage Improvement Project at Red Bluff</td>
<td>2,500</td>
<td>200</td>
<td>1,118</td>
<td>30</td>
<td>10 - 218 cfs 1 - 80 cfs</td>
<td>2 Years</td>
</tr>
<tr>
<td>CCWD Middle River Intake and PS (former Alternative Intake Project)</td>
<td>250</td>
<td>99</td>
<td>110</td>
<td>3</td>
<td>5 - 50 cfs</td>
<td>3 years</td>
</tr>
<tr>
<td>New SJRRP Recapture Facility</td>
<td>1,000</td>
<td>160</td>
<td>500</td>
<td>12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diversion</td>
<td>Water Year Type 1</td>
<td>Wet (20%)</td>
<td>Normal-Wet (30%)</td>
<td>Normal-Dry (30%)</td>
<td>Dry (15%)</td>
<td>Critical-High (5%)</td>
</tr>
<tr>
<td>-------------------</td>
<td>------------------</td>
<td>-----------</td>
<td>------------------</td>
<td>------------------</td>
<td>-----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Total Restoration Flow</td>
<td></td>
<td>482,655</td>
<td>293,300</td>
<td>188,274</td>
<td>127,132</td>
<td>50,827</td>
</tr>
<tr>
<td>100 cfs</td>
<td></td>
<td>63,551</td>
<td>61,736</td>
<td>61,736</td>
<td>61,736</td>
<td>8,132</td>
</tr>
<tr>
<td>200 cfs</td>
<td></td>
<td>104,997</td>
<td>91,082</td>
<td>88,851</td>
<td>86,619</td>
<td>15,769</td>
</tr>
<tr>
<td>300 cfs</td>
<td></td>
<td>130,732</td>
<td>104,719</td>
<td>99,512</td>
<td>94,306</td>
<td>21,471</td>
</tr>
<tr>
<td>400 cfs</td>
<td></td>
<td>153,939</td>
<td>115,826</td>
<td>107,645</td>
<td>99,463</td>
<td>24,645</td>
</tr>
<tr>
<td>500 cfs</td>
<td></td>
<td>176,651</td>
<td>126,438</td>
<td>115,281</td>
<td>104,124</td>
<td>27,819</td>
</tr>
<tr>
<td>600 cfs</td>
<td></td>
<td>197,874</td>
<td>135,562</td>
<td>121,430</td>
<td>107,297</td>
<td>30,992</td>
</tr>
<tr>
<td>700 cfs</td>
<td></td>
<td>219,097</td>
<td>144,686</td>
<td>127,579</td>
<td>110,471</td>
<td>34,166</td>
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<tr>
<td>800 cfs</td>
<td></td>
<td>240,321</td>
<td>153,811</td>
<td>133,728</td>
<td>113,645</td>
<td>37,339</td>
</tr>
<tr>
<td>900 cfs</td>
<td></td>
<td>261,544</td>
<td>162,935</td>
<td>139,876</td>
<td>116,818</td>
<td>40,513</td>
</tr>
<tr>
<td>1,000 cfs</td>
<td></td>
<td>282,768</td>
<td>172,059</td>
<td>146,025</td>
<td>119,992</td>
<td>43,687</td>
</tr>
</tbody>
</table>

1. Computed using Restoration Flow Hydrograph for Reach 5
Note:
Developed utilizing a weighted average of the flows from the Restoration Flow Hydrograph for Reach 5
Volume Potentially Recirculated in DMC (AF)

<table>
<thead>
<tr>
<th>Diversion</th>
<th>Wet (20%)</th>
<th>Normal-Wet (30%)</th>
<th>Normal-Dry (30%)</th>
<th>Dry (15%)</th>
<th>Critical-High (5%)</th>
<th>Critical-Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Restoration Flow</td>
<td>482,655</td>
<td>293,300</td>
<td>188,274</td>
<td>127,132</td>
<td>50,827</td>
<td>0</td>
</tr>
<tr>
<td>100 cfs</td>
<td>36,571</td>
<td>35,191</td>
<td>40,334</td>
<td>43,037</td>
<td>6,149</td>
<td>0</td>
</tr>
<tr>
<td>200 cfs</td>
<td>60,994</td>
<td>53,774</td>
<td>58,315</td>
<td>60,637</td>
<td>12,298</td>
<td>0</td>
</tr>
<tr>
<td>300 cfs</td>
<td>78,921</td>
<td>66,212</td>
<td>70,005</td>
<td>70,482</td>
<td>18,446</td>
<td>0</td>
</tr>
<tr>
<td>400 cfs</td>
<td>95,307</td>
<td>76,068</td>
<td>81,080</td>
<td>77,674</td>
<td>24,595</td>
<td>0</td>
</tr>
<tr>
<td>500 cfs</td>
<td>111,491</td>
<td>84,969</td>
<td>92,154</td>
<td>84,815</td>
<td>30,744</td>
<td>0</td>
</tr>
<tr>
<td>600 cfs</td>
<td>127,012</td>
<td>93,625</td>
<td>103,105</td>
<td>90,630</td>
<td>36,893</td>
<td>0</td>
</tr>
<tr>
<td>700 cfs</td>
<td>141,871</td>
<td>102,200</td>
<td>113,573</td>
<td>96,267</td>
<td>43,041</td>
<td>0</td>
</tr>
<tr>
<td>800 cfs</td>
<td>155,359</td>
<td>108,894</td>
<td>120,532</td>
<td>98,160</td>
<td>45,107</td>
<td>0</td>
</tr>
<tr>
<td>900 cfs</td>
<td>168,202</td>
<td>114,844</td>
<td>125,184</td>
<td>98,160</td>
<td>45,107</td>
<td>0</td>
</tr>
<tr>
<td>1,000 cfs</td>
<td>181,045</td>
<td>120,795</td>
<td>129,328</td>
<td>98,160</td>
<td>45,107</td>
<td>0</td>
</tr>
</tbody>
</table>

1. Calculated in CalSim as the minimum of available RF (after losses) and available capacity in the DMC above San Luis Reservoir.
Flow Potentially Recirculated in DMC (cfs)

Note:
Calculated in CalSim as the minimum of available restoration flows (after losses) and available capacity in the DMC above San Luis with a weighted average of the flows from the Restoration Flow Hydrograph for Reach 5.
### Potential Recapture Sites

#### Diversion as a % of Historic and Restoration Flow

<table>
<thead>
<tr>
<th>Restoration Year Type</th>
<th>Maximum</th>
<th>Weighted Average</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1,000 cfs Diversion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet</td>
<td>33%</td>
<td>18%</td>
<td>2%</td>
</tr>
<tr>
<td>Normal Wet</td>
<td>44%</td>
<td>26%</td>
<td>9%</td>
</tr>
<tr>
<td>Normal Dry</td>
<td>48%</td>
<td>24%</td>
<td>10%</td>
</tr>
<tr>
<td>Dry</td>
<td>51%</td>
<td>29%</td>
<td>12%</td>
</tr>
<tr>
<td>Critical High</td>
<td>65%</td>
<td>16%</td>
<td>0%</td>
</tr>
<tr>
<td>Critical Low</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>500 cfs Diversion</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet</td>
<td>33%</td>
<td>12%</td>
<td>2%</td>
</tr>
<tr>
<td>Normal Wet</td>
<td>40%</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>Normal Dry</td>
<td>41%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Dry</td>
<td>41%</td>
<td>26%</td>
<td>12%</td>
</tr>
<tr>
<td>Critical High</td>
<td>41%</td>
<td>10%</td>
<td>0%</td>
</tr>
<tr>
<td>Critical Low</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>
## Conclusions

<table>
<thead>
<tr>
<th>Facility Type</th>
<th>500 cfs</th>
<th>500 cfs + Existing Facilities</th>
<th>1,000 cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Restoration Flows Recaptured and Recirculated</td>
<td>28%</td>
<td>50%</td>
<td>55%</td>
</tr>
<tr>
<td>AF Per Year (Weighted Avg)</td>
<td>65,109 AF</td>
<td>116,316 AF</td>
<td>128,225 AF</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction Costs(^1)</td>
<td>$80 million</td>
<td>$80 million(^2)</td>
<td>$160 million</td>
</tr>
</tbody>
</table>

1. Does not include costs for annual O&M
2. Does not include annual costs associated with conveying Restoration Flow using existing District owned facilities
Next Steps and Schedule

- Development of the Project Description
- Analysis of Alternatives in the EIS

**August 2015**
- Conduct Public Scoping

**January 2016**
- Develop Initial Alternatives

**Feb - Mar 2016**
- Evaluate Alternatives

**August 2016**
- Select Alternatives for EIS

**November 2015**
- Scoping Report

**March 2016**
- Initial Alternatives Report

**October 2016**
- Project Description Memo

**Stakeholder Outreach**
Questions?
RESTORATION FLOWS
OUTLOOK 2016
2016 Restoration Year Actions

- Restoration Year: March - February
- Restoration Flows allocation
- Measuring Restoration Flows and losses in the Restoration Area
- Managing Unreleased Restoration Flows (URFs)
- Preparing for the recapture of Restoration Flows (Paragraph 16)
Measurement of Restoration Flows

- Restoration Flow Guidelines (RFG) identifies gages to be used for measuring and monitoring Restoration Flows, and for calculating seepage and diversion losses.
• RFG describes processes for determining Restoration Year Type and Flow Schedules

• Reclamation provides the first default flow schedules to RA in January

• RA recommends releases at Friant Dam

*Values shown for the RF Allocation in the following slides include water diverted by holding contractors in Reach 1
2016 Restoration Year Type

Current Forecast:
Normal-Dry year type

1,160 TAF – 90% forecast from DWR
1,414 TAF – 90% forecast from NWS

(March 17, 2016)
2016 Restoration Allocation

- Allocation limitations due to potential Exchange Contractor deliveries from Friant
- Provisional Restoration Allocation 1/26/16:
  - 9,445 AF through February 29
  - RA schedule of 2,380 AF
- Provisional Restoration Allocation 2/22/16:
  - Schedule remaining balance of 9,445 AF
  - RA schedule of up to 7,000 AF
- Full Restoration Allocation planned on 3/18/16:
  - 261,400 AF
  - RA schedule TBD
**Reach 4 Constraint: up to 70 cfs**
- Due to requirement (per Settlement Act) to protect adjacent lands from damage resulting from Restoration Flows
- *Kangaroo Rat surveys required due to burrow hole sighting and markings*
- *Eastside Bypass Conveyance Project to limit Restoration Flows from June - August*

**Reach 2 Constraint: 1,120 cfs**
- Due to seepage and levee stability challenges in Reach 2B caused by Restoration Flows
- *SJRRRP Reach 2B and Mendota Pool Bypass Project will allow for full conveyance of Restoration Flows*
Effects of Channel Constraints

Limits full release of Restoration Flows from Friant Dam
- Primarily Reach 2 channel capacity

URF Generation
- Restoration Flows that cannot be released from Friant Dam due to channel capacity constraints and without delaying completion of Phase 1 improvements
- SJRRP is preparing for URFs by:
  - Completing environmental coverage
  - Securing agreements with Friant contractors to purchase/exchange URFs
  - Coordinating with Friant Dam Operations
- Required to best achieve the Restoration Goal
Quantifying URFs

- Total Release from Friant Dam
- Losses in Reach 2
- Flows into Mendota Pool
- Reach 2 Constraint
- Up to 4500 cfs
2016 URF Sales and Exchanges

- Actual URF volume is subject to RA Recommendation
- Total estimated URF Volume: 134,000 to 180,000 AF

- Sales Volume:
  - Tier 1: ~80-120 TAF, starting in late March
  - Tier 2: TBD, available early May
  - Exchanges: ~10 TAF

- Pricing:
  - Tier 1: $60/AF and RWA Offset
  - Tier 2: $150/AF, based on rate table, no RWA Offset
  - Exchanges: TBD

- Distribution:
  - Tier 1: Based on Total C1 and C2 amounts
  - Tier 2: TBD
  - Exchanges: TBD
Questions?
PREPARING FOR RECAPTURE
2016 Recapture Locations

South-of-Delta Facilities

Lower San Joaquin River:
• Patterson Irrigation District
• Banta-Carbona Irrigation District

In the Restoration Area (Mendota Pool)
Mendota Pool Recapture

Restoration Flows Available
• Limited to flows originating at Friant Dam
• Less 5% operational loss
• Less flows conveyed past Sack Dam
• Less Exchange Contractor deliveries

Recapture Opportunities
• San Joaquin Exchange Contractors
• Other Water Users
  – Westlands WD
  – Mendota Pool groundwater pumpers
  – Groundwater banks

Preliminary Draft, Subject to Revision
Lower San Joaquin River Recapture

Restoration Flows at Merced River Confluence
- Releases from Sack Dam minus wet-up losses in Reach 4 and Eastside Bypass
- Limited to flows originating at Friant Dam

Recapture Opportunities
- Patterson ID maximum ~40 cfs
- Banta-Carbona ID maximum ~65 cfs
- Limited by in-district use of their facilities
- SJRRP is obtaining environmental coverage and temporary point of diversion
Recapture at the Delta Facilities

**Restoration Flows** remaining after any recapture on the lower San Joaquin River

**Recapture at CVP/SWP Pumps**
- Subject to use for SOD CVP (per Settlement Act)
- Subject to USBR and DWR compliance with BiOps and D-1641 objectives
- 2016 recapture limited due to pumping constraints
- SJRRP PEIS/R provides environmental coverage
## Banked 2013 Restoration Flows

<table>
<thead>
<tr>
<th>Entity</th>
<th>Amount originally banked</th>
<th>Amount Available in 2016</th>
<th>Amount Remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meyers Water Bank</td>
<td>588</td>
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Part III
Friant Kern Canal
• Project on hold to determine next steps

Madera Canal
• Feasibility Report and NEPA analysis underway, scheduled to be completed late Summer 2016
FKC Reverse Flow Pump-Back Project

- $2.38M in drought funding announced in February 2015
- Additional $1M additional drought funding announced in 2016
- USBR/FWA Financial Assistance Agreement in process
Groundwater Financial Assistance

Tulare ID - Cordeniz Basin Construction & Exchange Program

• 60-acre basin
• Groundbreaking: December 2015
• Complete: December 2016
Pixley ID - Joint Groundwater Bank
• 560-acre bank with 4.5 mile pipeline to new FKC turnout
• Financial Assistance Agreement modification in process

Porterville ID - In-Lieu Project
• Area 1: 1,450 acres connected to Wood-Central Ditch
• Area 2: 720 acres connected to FKC
• Financial Assistance Agreement modification in process

Shafter-Wasco ID - Madera Avenue Intertie
• 270-acre bank to include Madera Avenue intertie at Kimberlina Avenue
• Financial Assistance Agreement modification in process
NEXT MEETINGS
Next Meetings

<table>
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<tr>
<th>Date</th>
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<td>Visalia, CA</td>
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