Seepage and Conveyance Technical Feedback Group Meeting

August 20, 2014
Agenda

- Introductions
- Restoration Flow Update
- SJRRP Updates
- Status of Seepage Projects
- Site Evaluation and Preliminary Designs
- SJR Levee Evaluations Update
- Wrap-up, Action Items
RESTORATION FLOW SCHEDULE
• SJRECWA Releases
  – To Mendota Pool
  – No flow below Sack Dam
• Critical Water Year Type
  – No water for SJRRP
Hydrographs

San Joaquin River Flows at the Upstream End of Reach 4, as Reported by Exhibit B of the Stipulation of Settlement

1. NRDC v. Rodgers, Stipulation of Settlement CIV NO. S-98-1858 - LK/KGS, Exhibit B, September 13, 2006
2. Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement
Fisheries Actions

• 54,000 spring-run Chinook salmon bred in the hatchery below Friant were released this spring
• Immature “jack” fish
• Spring-run are an endangered species
• 10j Rule protects landowners from ESA actions if conducting any lawful activity
• No fishing – unlawful activity
Phase 1 Projects

- Reach 2B
- Arroyo Canal / Sack Dam
- Reach 4B
- Mud and Salt Sloughs
Reach 2B

- Public Draft EIS/R – March 2015
- Will contain a Preferred Alternative
- Construction in 2017
Arroyo Canal / Sack Dam

• Signed FONSI – September 4, 2013
• Financial Assistance ongoing
• Sack Dam has subsided by 1.5 feet in the past 2.5 years
Reach 4B

- Environmental Compliance contract back on
- Public Draft
- Construction
Mud and Salt Sloughs

• On hold pending assessment of need scheduled for 2020 / 2021
• “Modifications to enable the deployment of seasonal barriers to prevent adult anadromous fish from entering false migration pathways in the area of Salt and Mud Sloughs.”
SEEPAGE PROJECT STATUS

Brian Heywood
Seepage Project Approach

• Split potential areas of impact into seepage parcel groups
• Prioritize parcel groups based on most at-risk properties
• Initiate first tier of priority parcel groups

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<tr>
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<th># Projects</th>
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<td><strong>Total</strong></td>
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Seepage Project Process

1. Site Evaluation (6-9 mo.)
   - Reclamation
   - Land Owner
   - Site Visit
   - Prepare Methods Report
   - Review Methods Report
   - Land owner Provides Site Data
   - Install Site-Specific Wells
   - Perform Hydraulic Conductivity Testing
   - Collect Groundwater Level Data
   - Prepare Site Evaluation Report
   - Review Site Evaluation Report
   - Final Site Evaluation Report

2. Project Design (9+ mo.)
   - Reclamation
   - Land Owner
   - Preliminary Design and Costing
   - Plan Formulation Meeting
   - Design Data Collection
   - Environmental Compliance
   - Prepare Project Report (60% Design)
   - Review Project Report
   - Final Project Report

3. Final Design, Construction (Varies)
   - Reclamation
   - Land Owner, 3rd Party
   - Bid, Award
   - Final Design
   - Review of Final Design
   - Pre-Construction Meeting
   - Pre-Construction Survey
   - Construction
   - Construction Inspection
   - Project Completion

Opt. Financial Assistance (Varies)
   - Reclamation
   - Land Owner
   - Initial Meeting, Objectives
   - Supply DUNS Number
   - Completed SF-424
   - Reclamation Contracting
   - Signed Financial Agreement
   - Invoicing
   - Reporting
   - Close-Out

Contact
Contact the Seepage Hotline to schedule further discussion or a site visit.
Phone: 916-978-4398
Email: interimflows@restoresjr.net

Preliminary draft – subject to change
Priority Parcel Groups and Projects Initiated

Parcel Group 167
- Site Evaluation and Preliminary Design Reports completed
- Existing drain line
- Appraisal completed
- Negotiating easement

Preliminary draft – subject to change
Monitoring for Site Evaluations

- Groundwater monitoring wells
- Soil salinity
- River flow/stage
- Aerial mapping
- Levee testing (DWR)
- Refuge operations
- Cropping patterns
- Refuge operations
Priority Parcel Groups and Projects Initiated

Parcel Group 168
- Site Evaluation and Preliminary Design Reports completed
- Appraisal Completed
- Working on 60% Design
- Hydraulic conductivity testing
Hydraulic Conductivity Testing

- 47 Hand augered holes
  - Multiple holes per site
    - Testing, Classification
    - 6 to 17.5 ft bgs

- Hyd. Conductivity Testing
  - 18 “pump-out” tests
  - 15 “pump-in tests
Priority Parcel Groups and Projects Initiated

Parcel Group 164
- Site Evaluation and Preliminary Design Reports completed
- Appraisal completed
- Negotiating realty action
Priority Parcel Groups and Projects Initiated

Parcel Group 159
• Site Evaluation Report completed
• Preliminary and 60% Design underway
Parcel Group 154
- Site Evaluation Report underway
- Planning for hydraulic conductivity testing
- Geophysics sand stringer investigation ongoing (but no water to flows to monitor)
Priority Parcel Groups and Projects Initiated

Parcel Groups 101-103, 111, 112, 115, 142
- Site visits discussing monitoring
- Invasive species in the channel
- Planning for hydraulic conductivity testing
Priority Parcel Groups and Projects Initiated

Parcel Group 87
- Site Evaluation and Preliminary Design Reports Complete
- Scheduling Plan Formulation meeting
- Beginning 60% Design Report
- Completed hydraulic conductivity testing
- Additional landowner involved
Priority Parcel Groups and Projects Initiated

Parcel Groups 66 and 74
- Site Evaluation report underway
- Planning for hydraulic conductivity testing
Priority Parcel Groups and Projects Initiated

**Parcel Group 53**
- Met with property owners
- Evaluating potential realty options
- Appraisal underway

**Parcel Group 40**
- Property recently sold
- Met with new owner
- Developing list and map of targeted monitoring
- Work with new landowner on next steps
Priority Parcel Groups and Projects Initiated

Parcel Group 33
- Wells installed November 2013
- Site Evaluation just underway

Preliminary draft – subject to change
Priority Parcel Groups and Projects Initiated

Parcel Groups 14, 21, 24, 26
- Site Evaluation Report completed
- Preliminary Design Reports under review
- Hydraulic conductivity testing planned
# Seepage Projects Summary

## Flow

<table>
<thead>
<tr>
<th>Flow</th>
<th># Sites*</th>
<th>Site Visits Performed</th>
<th>Site Evaluations Begun / Completed</th>
<th>Preliminary Designs Begun / Completed</th>
<th>60 % Designs</th>
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</table>

*Based on initial parcel prioritization.

## Sites Completed/Sites in Planning Stage

<table>
<thead>
<tr>
<th>Hyd. Cond. Testing for 60% Design</th>
<th>Sites Completed</th>
<th>Sites in Planning Stage</th>
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<tr>
<td>2</td>
<td>2</td>
<td>4</td>
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Preliminary draft – subject to change
SITE EVALUATIONS
Site Evaluations

• Purpose
  – Evaluate the property’s susceptibility to seepage damage from Restoration flows in the SJR/Bypasses
  – Provide direction on preferred seepage mitigation designs
Level of Protection

SJRRP Hydrograph

San Joaquin River, Restoration Releases from Friant Dam, as Reported by Exhibit B of the Stipulation of Settlement

Flexible Flow Period

Fall Base and Spring Run Incubation Flow
Fall Run Spawning and Incubation Flow
Winter Base Flows
Spring Rise and Pulse Flows
Summer Base Flows
Spring-Run Spawning Flows

Total Volume

Preliminary draft – subject to change
Level of Protection

• 4,500 cfs design flow
  – Based on 4,500 cfs design capacity from the Settlement
  – Water surface elevation from the SJRRP HEC-RAS Model,
  – Protection intended for Restoration Flows, not Flood Flows

• Pre-existing shallow groundwater
  – Addressed during Site Evaluation
  – SJRRP designs are not intended to improve existing conditions
Wet Year Restoration Hydrograph vs. 2010/2011 Flood Flows

Flow at El Nido Road

- Avg. Daily Flow at El Nido Road
- Wet Year Restoration Flows
- Critical Low Year Restoration Flows

Preliminary draft – subject to change
Site Evaluation Data Evaluated

Conceptual Model of Factors Influencing Groundwater Levels
Site Evaluations Data Evaluated

- Monitoring wells
  - Construction
  - Geologic logs
  - Groundwater quality
  - Groundwater levels
  - Depth to barrier

- Soil borings
  - Geologic logs
  - Hydraulic conductivity
  - Depth to barrier
Site Evaluations Data Evaluated

Measured Groundwater Levels

SJR Flow
Site Evaluations Data Evaluated

Example Hydrograph from Monitoring Well Data

Depth to Water Below Ground Surface (ft)

Measured Groundwater Levels

SJR Stage (i.e., elevation)

Average Daily Stage in the ESBP at El Nido Road (ft)

Preliminary draft – subject to change
Site Evaluations Data Evaluated Cont.

- Climate
- Irrigation practices
- Soils and salinity
- DWR (NULE) levee assessments
  - Geomorphic assessment
  - Geotechnical assessment
  - Cone penetration testing (CPT)
- Topography
  - LiDAR
- Subsidence
- Historic Observations
  - Past locations on the SJR (historic maps)
  - Past impacts due to flooding events (landowner reported, 2011 observations)
  - Paleo-channel mapping
  - Groundwater Model
- HEC-RAS hydraulic model
  - Determination of water surface elevations in relation to nearby ground

Preliminary draft – subject to change
Seepage Threshold

• Shallower of two methods
  – Agricultural method
    • Effective root zone
    • Capillary fringe
  – Historical groundwater method
Data Evaluation

• Does the data indicate a possible seepage impact influenced by SJRRP Restoration Flows?
• Which seepage projects are feasible based upon the data?
• Which alternatives will be effective in mitigating the impacts from SJRRP Restoration Flows?
• Develop initial screening of seepage project alternatives
• Present findings to the landowner
Seepage Project Alternatives

• Physical
  – Slurry walls; sheet piles
  – Seepage plug
  – Drainage ditch
  – Interceptor lines
  – Shallow groundwater pumps
  – Buildup of low lying areas
  – Channel conveyance improvements

• Non-Physical
  – Seepage easements
Project Alternative Screening

• Alternatives reviewed, but typically not selected
  – Sheet piles
    • Expensive compared to slurry walls
  – Seepage plug
    • Needs site dewatering, expensive
  – Buildup of low lying areas
    • Need proper borrow material, ag soil suitability, expensive
  – Shallow groundwater pumps
    • Expensive
  – Drainage Ditch
    • Levee safety criteria places ditch away from toe and into farmed field
Project Alternative Screening

• Alternatives typically not screened out
  – Slurry walls
  – Interceptor lines
  – Pumping of existing wells to supplement other options
  – Seepage easements
Slurry Wall Preliminary Design

- Located in the center of the existing levee embankments
- Depth to barrier determined by utilizing geologic information from geologic logs
- Extend from the top surface of the embankment to depths 5 feet into the barrier
- 3 feet in width
- Soil-bentonite slurry, sand-cement could be used if needed/required

Preliminary draft – subject to change
CONSTRUCT 3.0’ WIDE SLURRY WALLS WITH A SAND/CEMENT MIXTURE OR A SOIL AND BENTONITE MIXTURE IF SOIL CONDITIONS ARE SUITABLE, TYP. FOR SHEET PILE OPTION, DRIVE PILES TO SAME DEPTH AS SLURRY WALL.
Drainage Ditch Preliminary Design

- Trapezoidal shaped ditch with 4-foot bottom width and 1.5:1 side slopes
- Invert depths of at least one foot below the seepage threshold
- Ditch sized for same flows as the interceptor line
- Discharges to local canals or ESBP/SJR/Sand Slough
- DWR Urban Levee Design Criteria followed for set-backs from the toe of the levees
  - 20-foot drive path, 50-foot set back from edge of field
  - Ditch invert above an additional 10:1 sloped surface past the 70 feet
Drainage Ditch – Typical Detail

Preliminary draft – subject to change
Interceptor Line Preliminary Design

- USBR Drainage Manual methodology followed
- Channel water surface elevation from SJRRP HEC-RAS model
- Pipe invert depths of at least one foot below the seepage threshold (typically of 6 to 9.5 feet)
- HDPE single wall drainage pipe, diameters of 8-, 10-, 12-, and 15-inches
- Minimum pipe slope of 1 foot per 1,000 feet, except in special site conditions
- Well graded engineered sand and gravel filter, minimum 4-inches thick placed all around the pipe
Interceptor Line Prelim. Design Cont.

- A channel distance flow-path adjustment was made for a river compared to a canal
- Manholes spaced to allow a maximum 1,000 feet pipe run from the manhole for maintenance purposes
- Electric driven submersible pumps
- Dual discharges to local irrigation canals or drains and the SJR/Sand Slough/ESBP facilities
- Installation would be by a “tile drain” trenching machine
Interceptor Line – Example Site Plan
Interceptor Line – Photos

Drain Sump, Submersible Pump

Drain Installation
Cost Estimates

• Discussed methods with local contractors that do the type of work being estimated
  – Inquip Associates: slurry walls
  – Viking Drillers: shallow pumping
  – McElvaney/LIDCO Imperial Valley: interceptor lines
  – M.A. McClish: sheet piles
• Approach similar to methods used by contractors to review, evaluate, and bid work
• Estimated materials and hours for equipment/labor

Preliminary draft – subject to change
Cost Estimates

• Rates developed from Granite Construction labor rate sheet (union wages) and equipment rate sheet, or Caltrans standard rates – all with 15% markup

• Local area material suppliers plug sales tax and 15% markup
  – Granite Materials & Local Ready Mix Suppliers: aggregates related materials & ready mix concrete
  – Groeniger: PVC/DIP pipe, valves, fittings, etc.
  – Piranha Precast: RCP pipe & precast materials

• 25% contingency
Present Worth Cost Development

- 50 year economic analysis
- Federal Water Resource Planning 2013 discount rate 3.75%
- Operations & maintenance costs included
- 25% contingency cost added to replacements

- No design or mobilization costs included in replacement costs
- Replacement frequency

<table>
<thead>
<tr>
<th>Project Item</th>
<th>Replacement Frequency</th>
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</thead>
<tbody>
<tr>
<td>Discharge Piping</td>
<td>20 years</td>
</tr>
<tr>
<td>Submersible Pumps</td>
<td>15 years</td>
</tr>
<tr>
<td>Wells</td>
<td>25 years</td>
</tr>
<tr>
<td>Electrical Motors, Controls, Connections</td>
<td>15 years</td>
</tr>
<tr>
<td>Drainage Sump &amp; Manhole Structures</td>
<td>40 years</td>
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<tr>
<td>Interceptor Lines</td>
<td>40 years</td>
</tr>
<tr>
<td>Slurry Wall, Sheet Piles, Seepage Plug</td>
<td>50 years +</td>
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</table>

Preliminary draft – subject to change
O&M Cost Assumptions

- Electric cost of $0.18/KWH (average PG&E small agricultural rate)
- Pumps operate 365 days/yr, seven days/wk, 24 hrs/day
- Hydro-jetting of interceptors every four years
- Clean out ditches every 5 years and remove one foot of sediment
- Weed spraying annually for easement area and drainage ditch
# Summary of Costs

<table>
<thead>
<tr>
<th>Seepage Project Alternative</th>
<th>Unit</th>
<th>Estimated Initial Cost Range ($/unit)**</th>
<th>Present Worth Cost Range ($/unit)**</th>
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<tr>
<td>Slurry Walls</td>
<td>foot</td>
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<td>Sheet Piles</td>
<td>foot</td>
<td>$2,300 - $2,600</td>
<td>$2,300 - $2,600</td>
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<tr>
<td>Seepage Plug</td>
<td>foot</td>
<td>$1,900 - $2,200</td>
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<tr>
<td>Drainage Ditch</td>
<td>foot</td>
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<tr>
<td>Interceptor Lines</td>
<td>foot</td>
<td>$180 - $250</td>
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<td>Shallow Groundwater Pumps</td>
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<td>Seepage Easements</td>
<td>acre</td>
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<tr>
<td>Buildup of Low Lying Areas (4-foot)*</td>
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<td>Channel Conveyance Improvements</td>
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Notes:
*Approximately 3,000 cubic yard/acre for 4-foot buildup, and 7,900 cubic yard/acre for 7-foot buildup

**Costs from preliminary designs prepared
n/a: not addressed in this analysis
Hydraulic Conductivity Investigation

- Performed most tests along edge of property at SJR
- Tested historic channels
- Tests spaced about every 1,000 feet
- In areas of known seepage, tests about 500 feet apart
- Hand augered 4-inch hole to 15-foot or less and logged soils
Hydraulic Conductivity Investigation

• Pump in tests performed in dry hole above the water table
• Pump out tests performed if water table encountered
  – Constant Flow (not able to drain the hole)
  – Hand Auger method (pump is able to evacuate the borehole)
60% Design Documents

- Topographic survey along proposed interceptor alignment conducted
- Weighted hydraulic conductivity values applied across the site
- Interceptor pipelines, sumps, pumps and discharge lines sized

- Plans for construction prepared – plan view, profiles and details
- Standard specifications
- Quantities and cost estimate
Purpose and Objective

• Variety of options available for groundwater seepage mitigation

• Realty Actions include:
  – Seepage License Agreements (Rentals)
  – Seepage Easements (Permanent)
  – Acquisition

• Compensate for higher groundwater levels under the property
Realty Process

• Goal: Maintain “arms-length” relationship with appraiser
• Solution: Office of Valuation Services (OVS)
• Reclamation contracts with OVS to:
  – Write a scope of work
  – Hire an appraiser
  – Review and revise the appraisal
  – Approve the appraisal for government use
# Land Acquisition Process

## Contracting (8 – 16 months)
- IVIS Scope Review
- Interagency Agreement with OVS
- OVS contracting for appraiser

## Planning (concurrent)
- NEPA
- Phase 1 Environmental Site Assessment
- Title Reports
- Legal Descriptions

## Appraisal (6-10 months)
- Site Visit
- Valuation
- OVS Review of Appraisal
- OVS 2nd Level Review of Appraisal

## Acquisition (1-3 months)
- Negotiation
- Purchase Contract (if applicable)
- Obligation Letter
- Payment Voucher
- Escrow Account
Requests of Landowner

• Appraiser site visit access
• Answer appraiser questions
• HAZMAT site visit access
• Interview by Reclamation HAZMAT
• Negotiation
• Land ownership, if necessary
Valuation

• Reclamation must offer the appraised value as a minimum

• Appraisals based on market value, comparison properties for a change in the highest and best use pre and post acquisition

• Reclamation can pay more than the appraised value, with justification

• Landowner may, at their own cost, obtain their own appraisal, which Reclamation will consider
Licenses and Easements

• License Agreements
  – Temporarily allow higher groundwater levels
  – Rental rates for property

• Seepage Easements
  – Permanently allow higher groundwater levels
  – Encumbrance on deed
  – Recorded with the County

Preliminary draft – subject to change
Easement Language

• the permanent right
• regardless of future crop changes or other improvements made by the Grantor
• to raise groundwater levels
• as a result of water released in a manner consistent with the San Joaquin River Restoration Settlement Act, or any amendment of that statute, or to comply with any court order requiring releases from Friant Dam in order to comply with California Fish and Game Code Section 5937 or any other laws intended to protect fish in the San Joaquin River,
• and the right to raise groundwater levels as a result of refuge water supply in the San Joaquin River
Realty Agreements Summary

- Compensation may provide additional flexibility to the landowner for seepage project construction
- Reclamation will negotiate on terms
- Each parcel is unique and we will consider special circumstances brought to our attention during negotiations
Contact

• Technical Feedback Group: Katrina Harrison
  – 916-978-5465
  – KHarrison@usbr.gov

• Seepage Concerns: Seepage Hotline
  – 916-978-4398
  – InterimFlows@restoresjr.net