SAN JOAQUIN RIVER RESTORATION PROGRAM

Anticipated Future Flows – Seepage Projects

Restoration Goal Technical Feedback Group Meeting

July 17, 2014

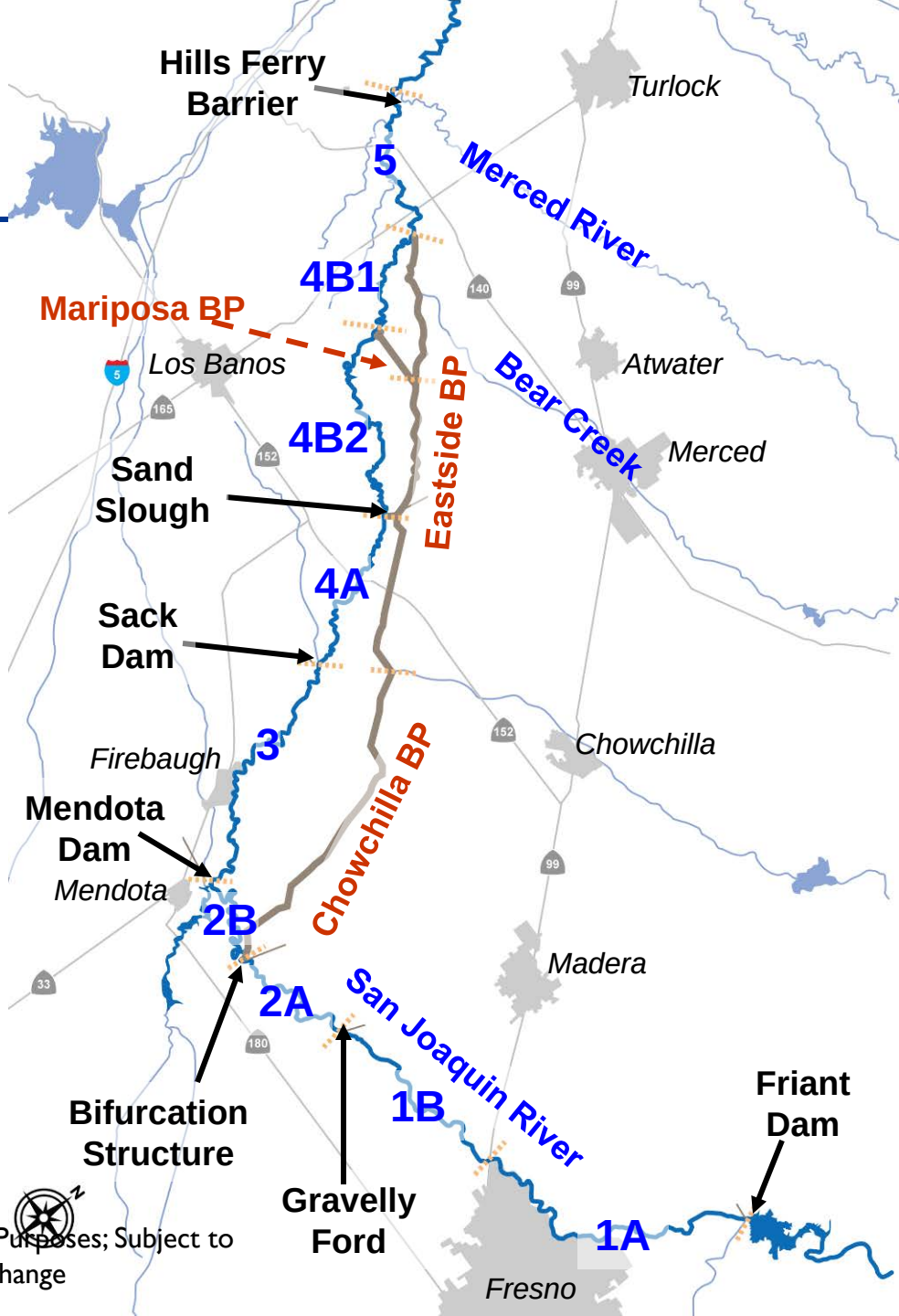
For Discussion Purposes; Subject to Change

Agenda

- Flowage
- Seepage Management
- Seepage Project Approach

Area

- 150 miles of River
- Historically Disconnected Reaches
- Water Supply Infrastructure
- Flood Control Bypasses
- Urban Areas
- Agriculture



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FLOWAGE EASEMENTS

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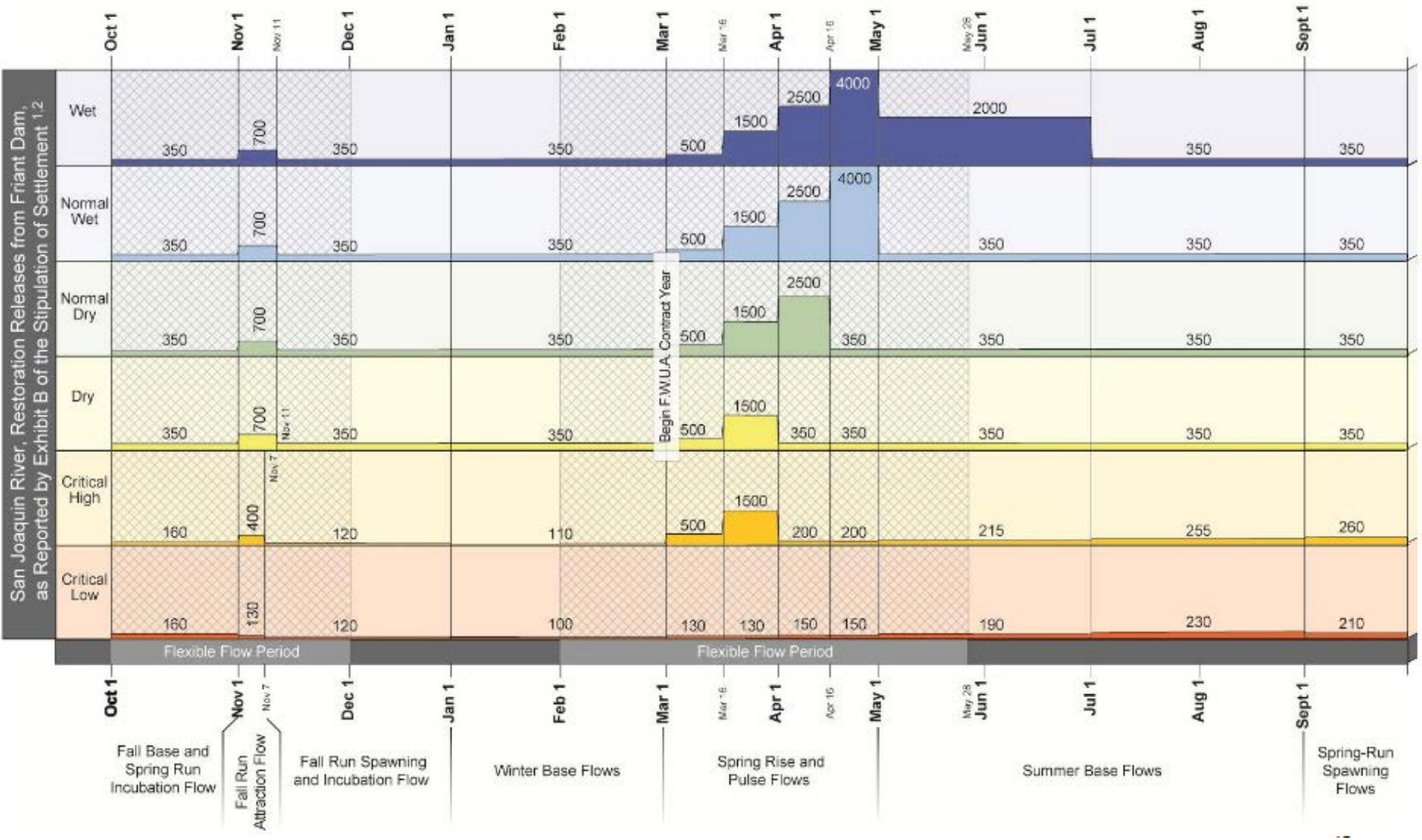
Restoration Flows



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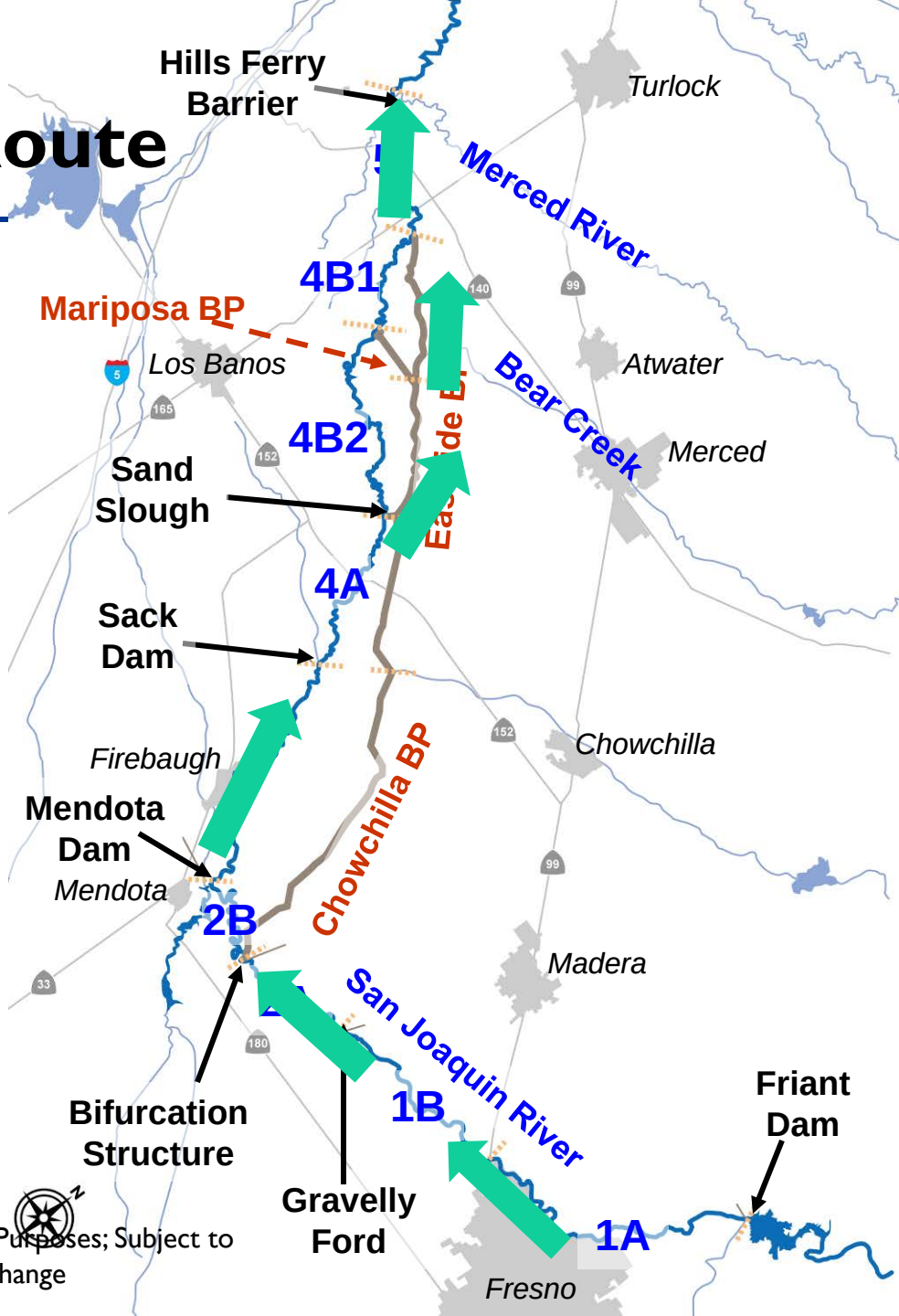
Current Flow Route

- San Joaquin River through Reach 4A
- Eastside Bypass
- Reach 5



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Flowage Easements

- Eastside Bypass contains some private property
- Current flood flowage easements with the State of California
- Flowage easements with landowners who own property in the Eastside Bypass
- Reconnect the San Joaquin River
- By 2015

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SEEPAGE MANAGEMENT

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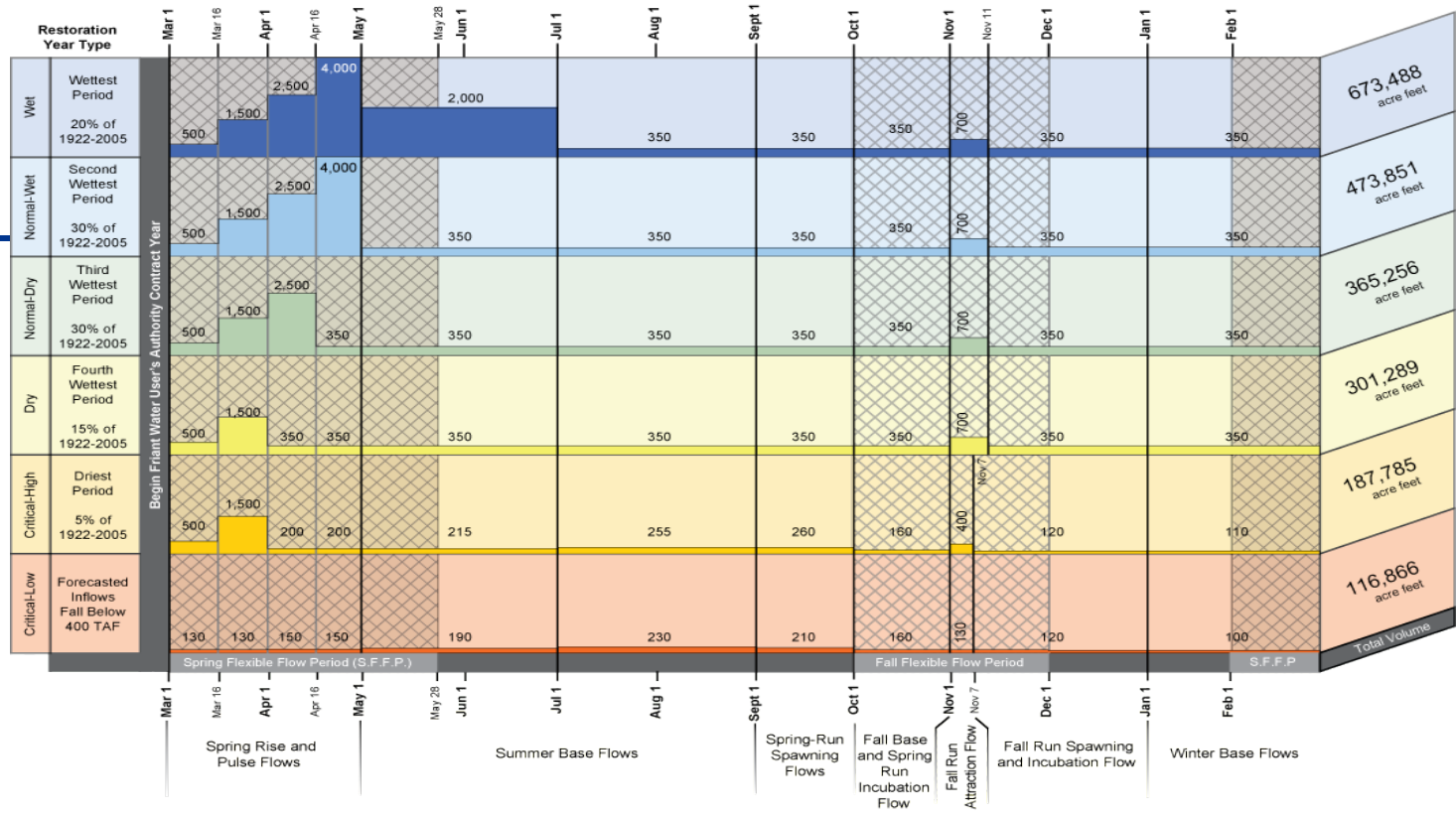
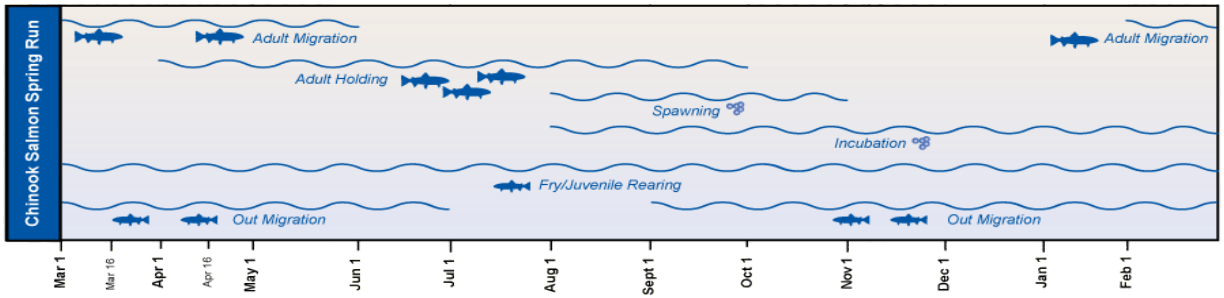
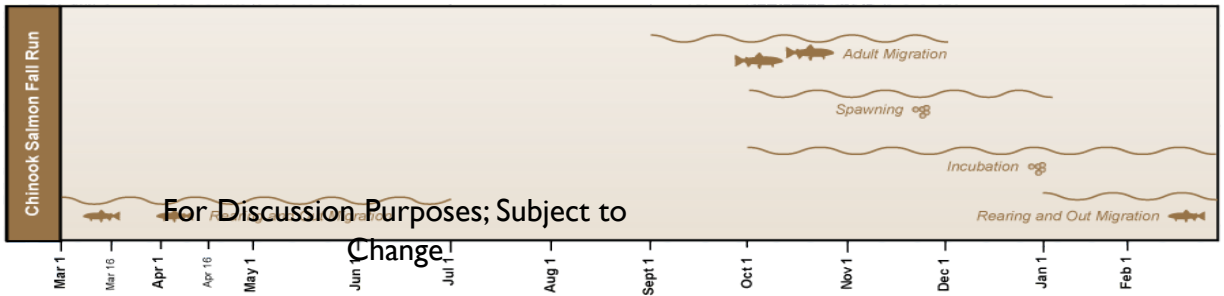
Friant Release Schedule with Fisheries Migration Timing

- All flows released up to "then current" channel capacities







For Discussion Purposes; Subject to Change

Capacity Limitations

- Groundwater Seepage
  - Seepage Management Plan groundwater level thresholds
  - Seepage Projects
- Levee Stability
  - Hydraulic Analysis in Channel Capacity Advisory Group Report
  - Levee Stability Projects

Seepage Management

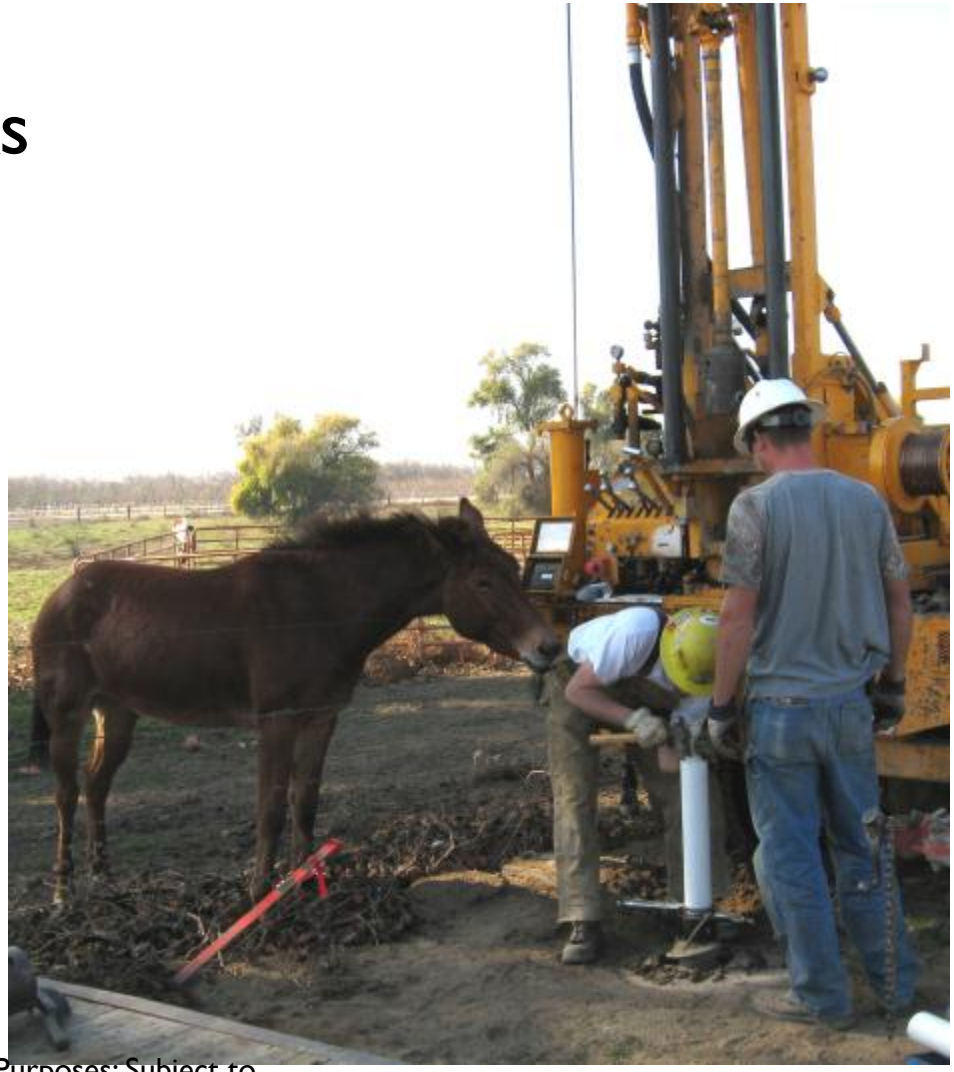
- Reduce or avoid material adverse impacts
  - Waterlogging (disease, anoxia, temperature)
  - Root zone salinity
- Goal 1: Keep flows low to avoid impacts
- Goal 2: Build projects to allow higher flows

Seepage Management Goal 1

- Limit Restoration Flow releases to avoid impacts based on groundwater seepage thresholds
  - Seepage Management Plan (SMP)
  - December 2010 through March 2011: 5 public meetings
  - Peer Review in 2012
  - Peer Review findings in February 2013
  - Revisions to SMP per peer review findings in April 2013

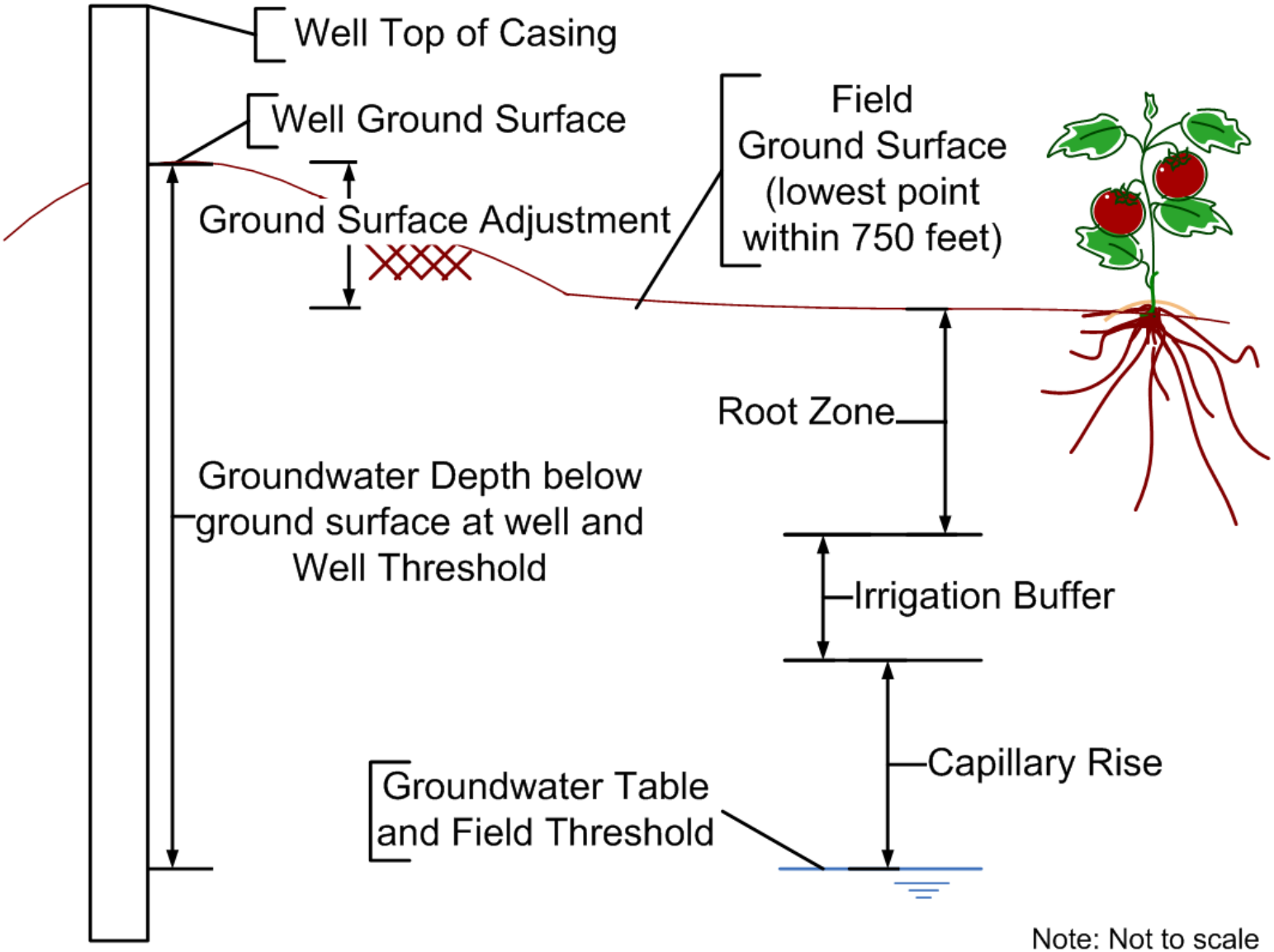
Seepage Management Plan

- Seepage impacts
- Locations of known risks
- Operations conceptual model
- Monitoring program
- Thresholds
- Triggers, site visit, and response
- Site evaluation and projects

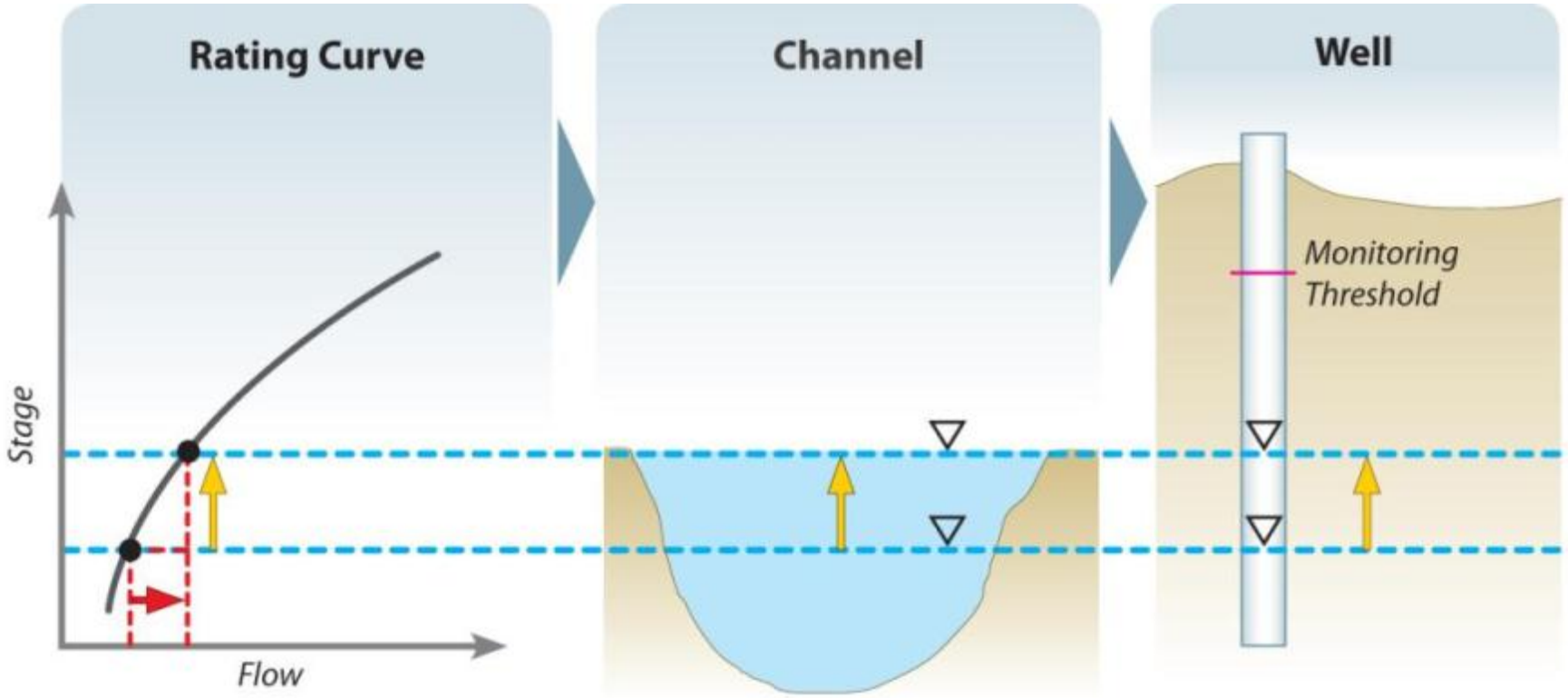


Monitor for Impacts

Over 200 shallow groundwater monitoring wells installed by the SJRRP since 2009

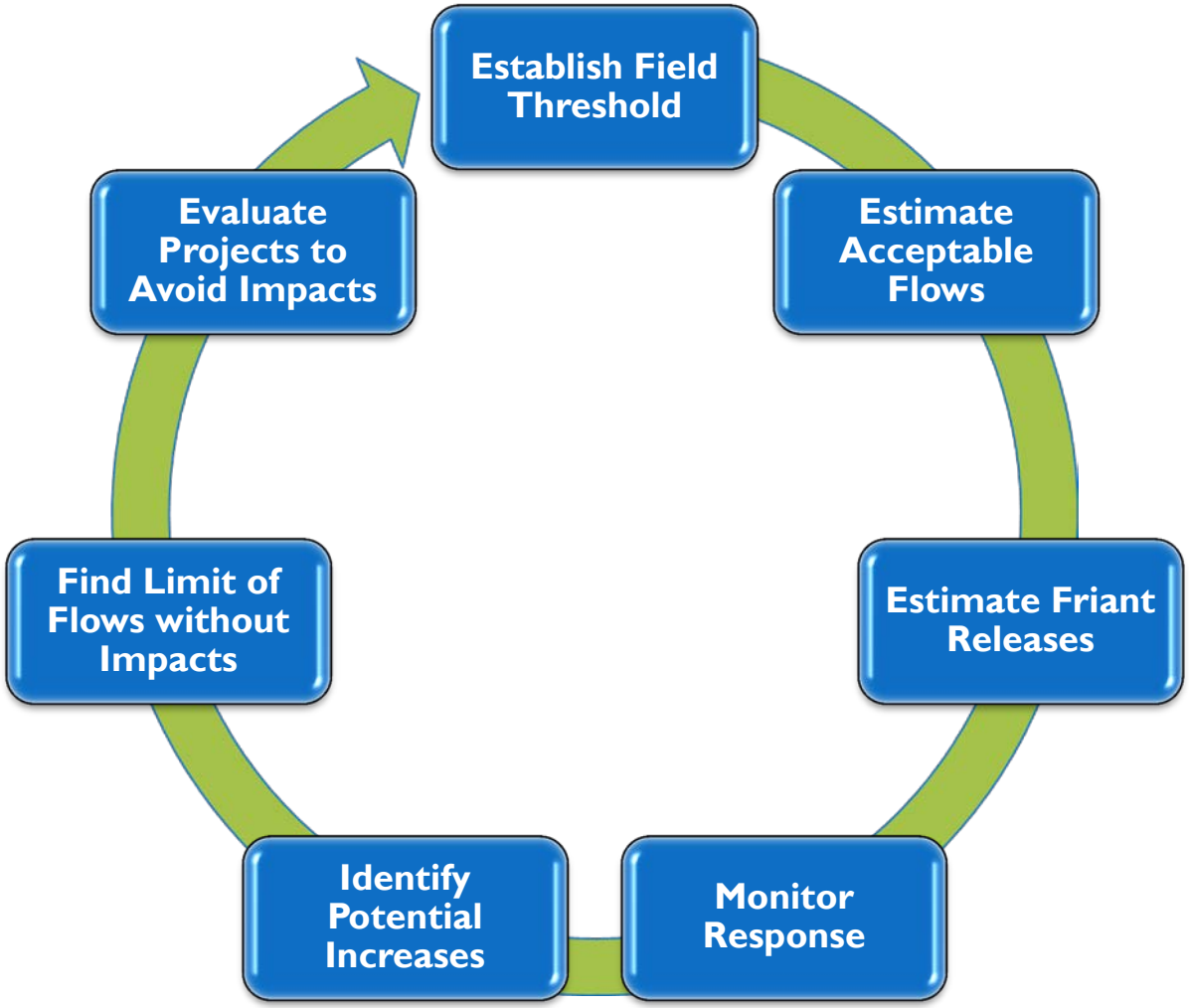


Operations Conceptual Model



- Thresholds identify potential problems so that Reclamation can establish operating criteria to manage flows

Seepage Approach



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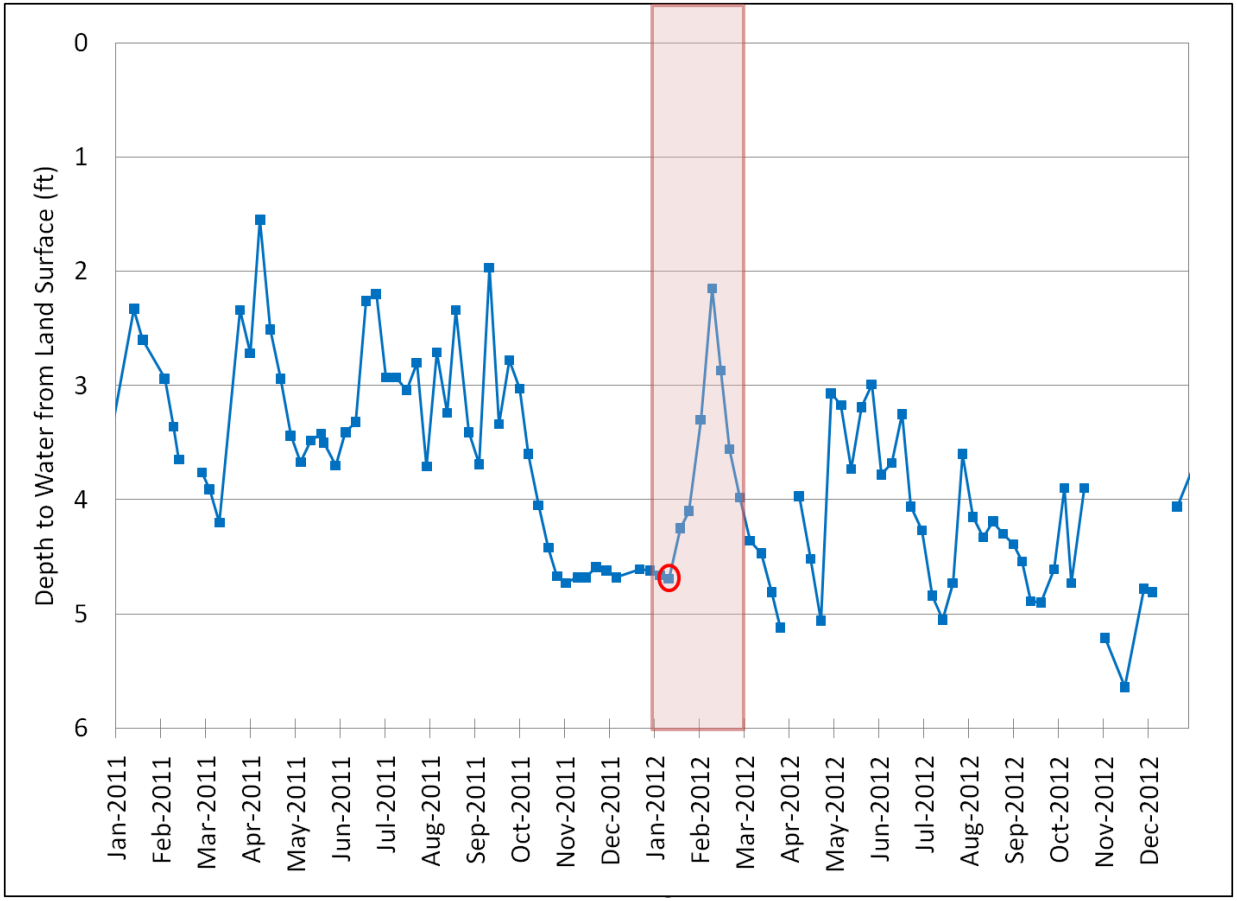
Current Flow Restrictions

- 4.7 foot threshold in MW-10-90 is approximately 70 cfs in the Eastside Bypass



SEEPAGE PROJECT APPROACH

Seepage Management Goal 2

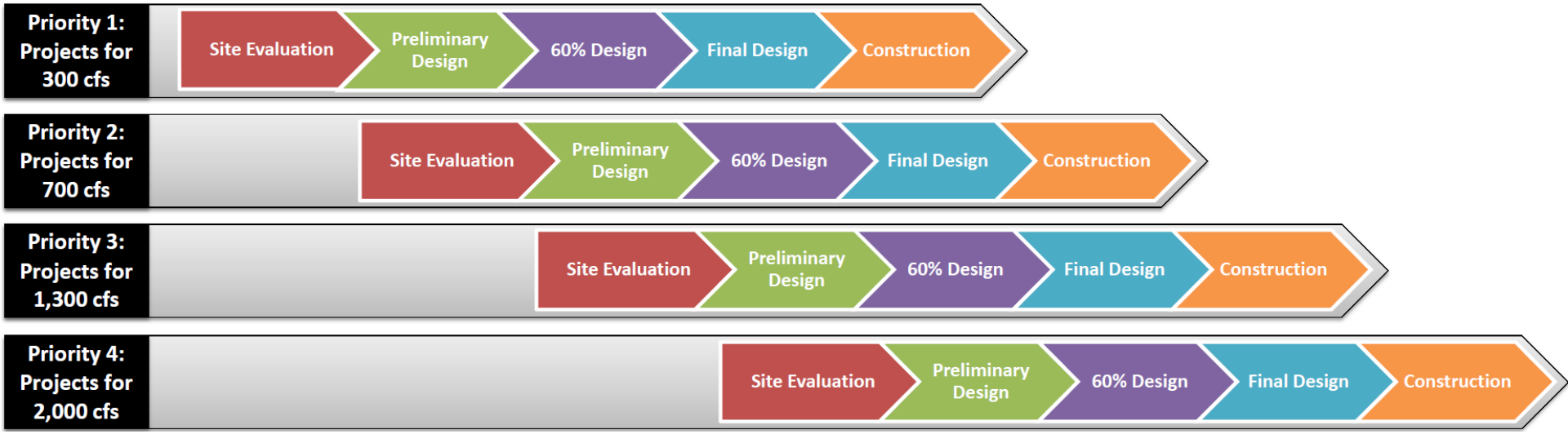
- Identify locations and mitigate to allow increased flows without groundwater impacts
  - Areas vulnerable to seepage; Seepage Project Handbook (SPH)
  - March 2011 through December 2011: 6 public meetings
  - Periodic updates on seepage projects since April 2012
  - Currently updating SPH based on new information

Seepage Project Handbook

- Introduction
- Site Evaluation
- Environmental Compliance
- Design
- Plan Formulation
- Design Data Collection
- Construction
- Financial Assistance

Seepage Project Approach

- Split impacted areas into seepage parcel groups
- Prioritize parcel groups
- Initiate first tier of priority parcel groups



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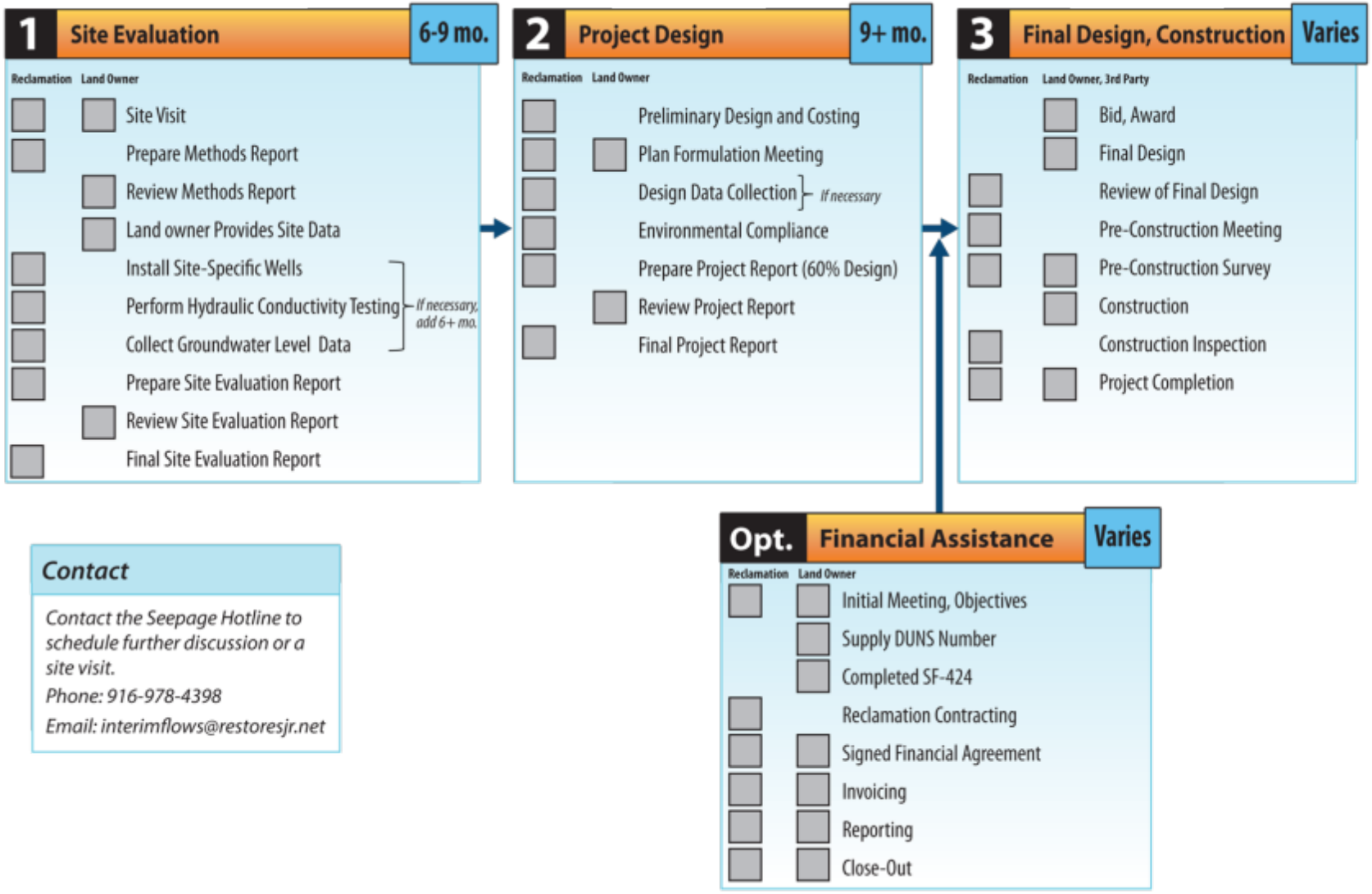
Seepage Project Process



Contact

Contact the Seepage Hotline to schedule further discussion or a site visit.

Phone: 916-978-4398

Email: interimflows@restoresjr.net

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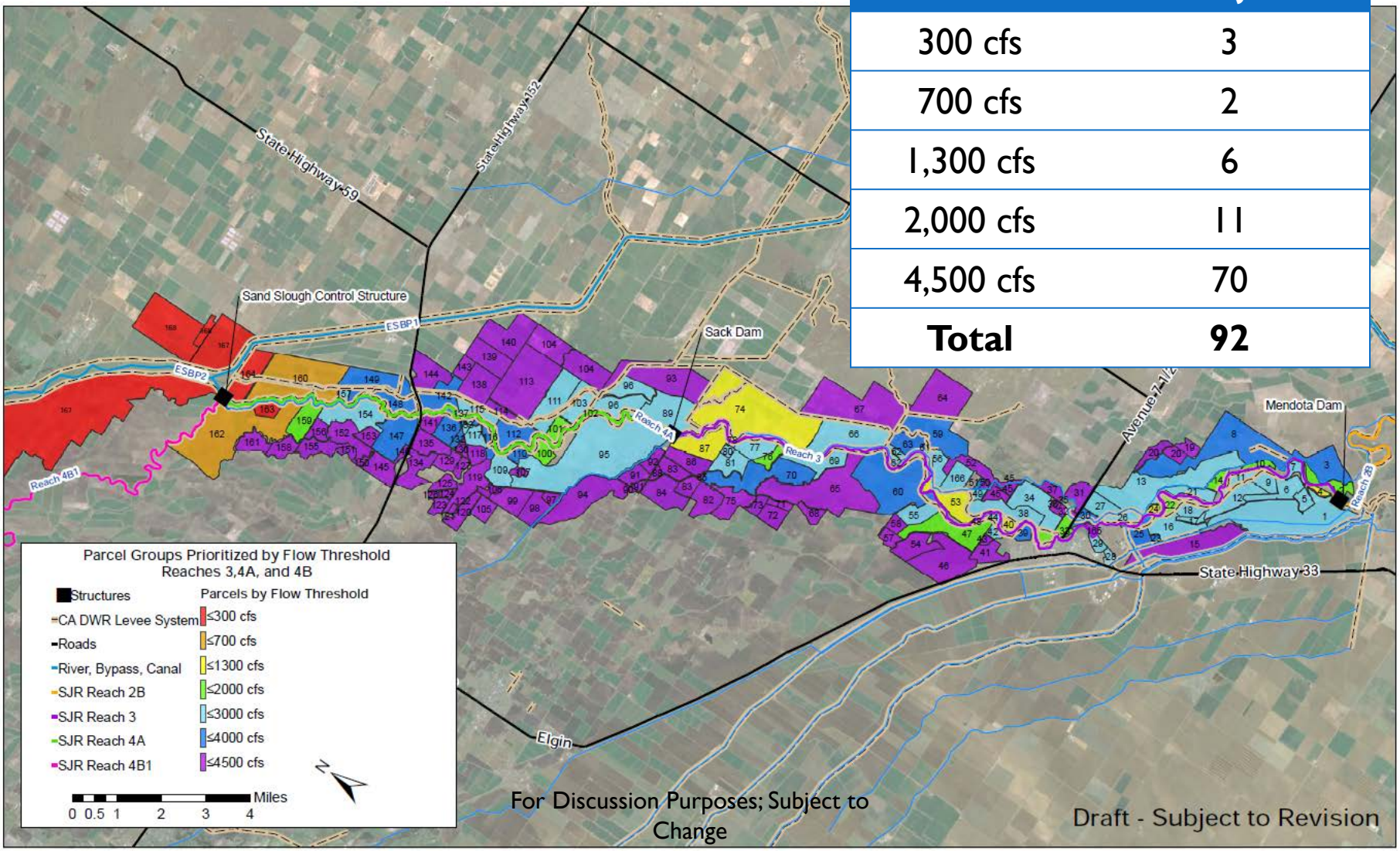
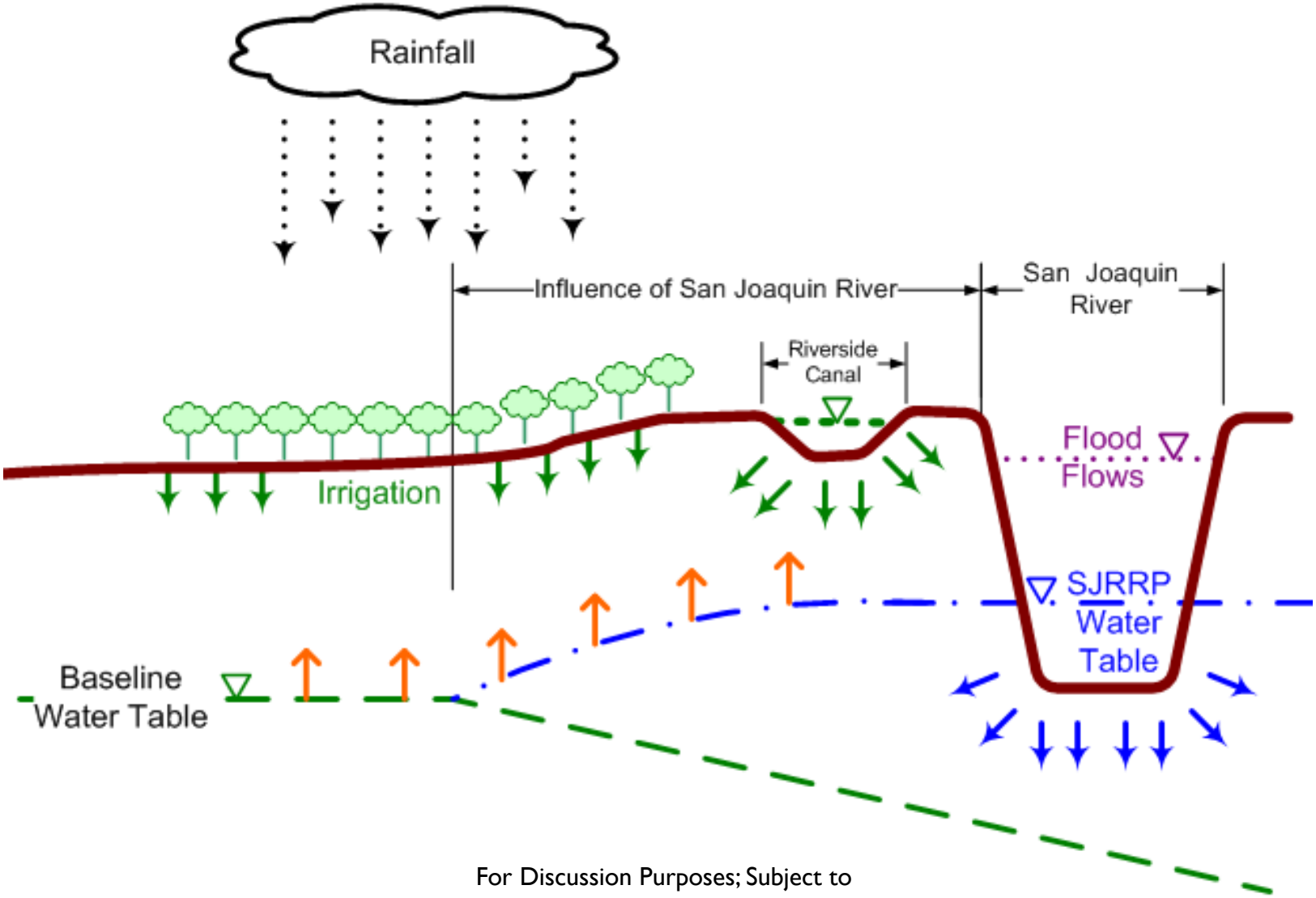
Priority Locations

Flow	# Projects
300 cfs	3
700 cfs	2
1,300 cfs	6
2,000 cfs	11
4,500 cfs	70
Total	**92**



Site Evaluation Conceptual Model



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Seepage Project Alternatives

- Physical
  - Cut-off wall (e.g., slurry walls, sheet piles)
  - Seepage Plug
  - Drainage ditch
  - Interceptor lines
  - Shallow groundwater pumps
  - Buildup of low lying areas
- Non-Physical
  - Seepage easements
  - Acquisition
  - License Agreements

Project Alternative Screening

- Alternatives reviewed, but typically not selected
  - Sheet piles
    - Expensive compared to slurry walls
  - Seepage plug
    - Needs site dewatering, expensive, could harm levees
  - Buildup of low lying areas
    - Need proper borrow material, ag soil suitability, expensive
  - Shallow groundwater pumps
    - Expensive

Project Alternative Screening

- Alternatives typically not screened out
  - Slurry walls
  - Drainage ditch
  - Interceptor lnes
  - Pumping of existing wells to supplement other options
  - Realty Actions

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Seepage Project Costs

Seepage Project Alternative	Unit	Estimated Initial Cost Range ($/unit)**	Present Worth Cost Range ($/unit)**
Slurry Walls	foot	$1,100 - $1,300	$1,100 - $1,300
Sheet Piles	foot	$2,300 - $2,600	$2,300 - $2,600
Seepage Plug	foot	$1,900 - $2,200	$1,900 - $2,200
Drainage Ditch	foot	$190 - $450	$390 - $760
Interceptor Lines	foot	$180 - $250	$390 - $490
Shallow Groundwater Pumps	foot	$640 - $840	$1,300 - $1,600
Seepage Easements	acre	Based upon appraisal	Based upon appraisal
Buildup of Low Lying Areas (4-foot)*	acre	$31,000	$31,000
Buildup of Low Lying Areas (7-foot)*	acre	$58,000	$58,000

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

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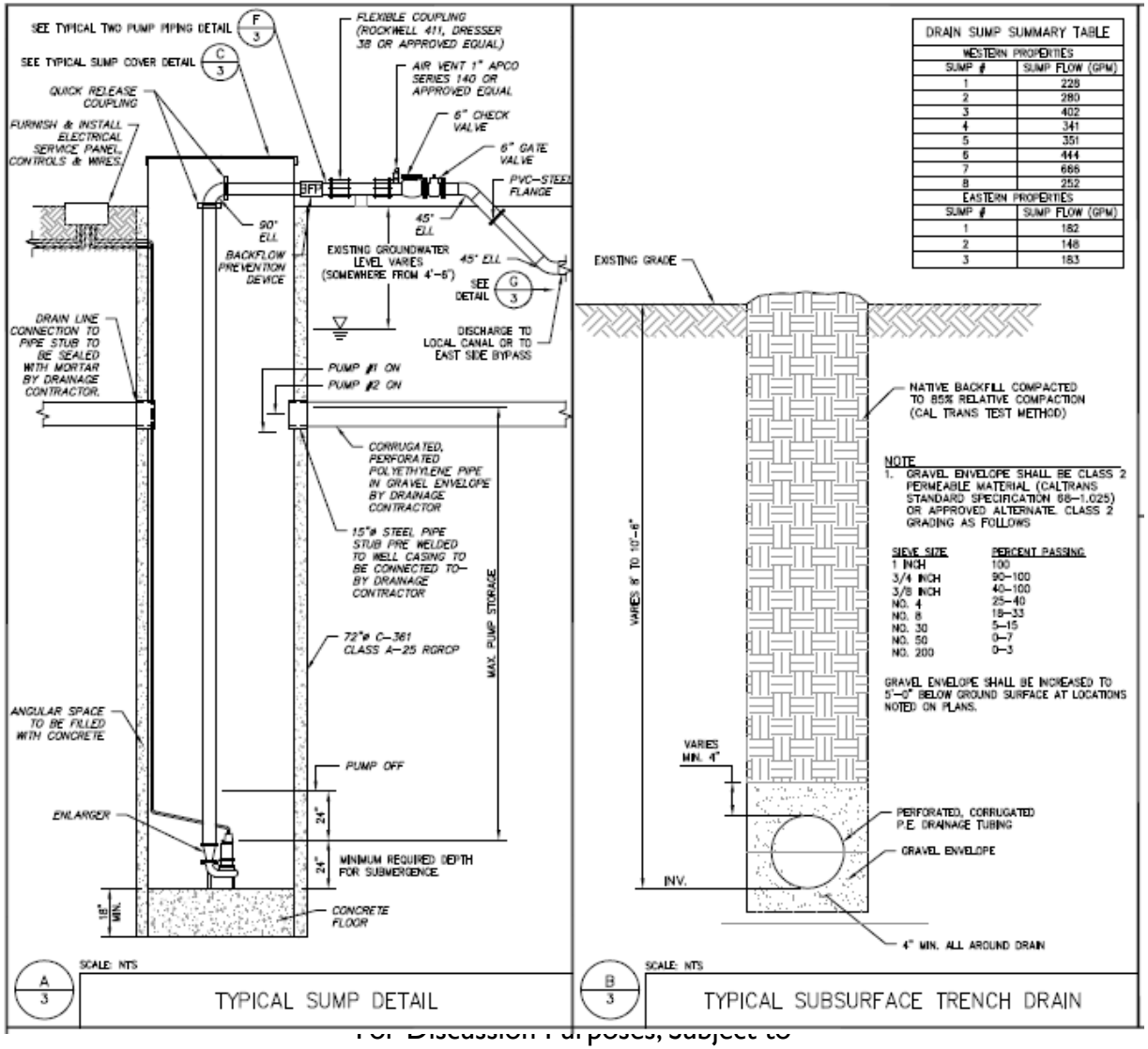
Interceptor Line – Typical Details



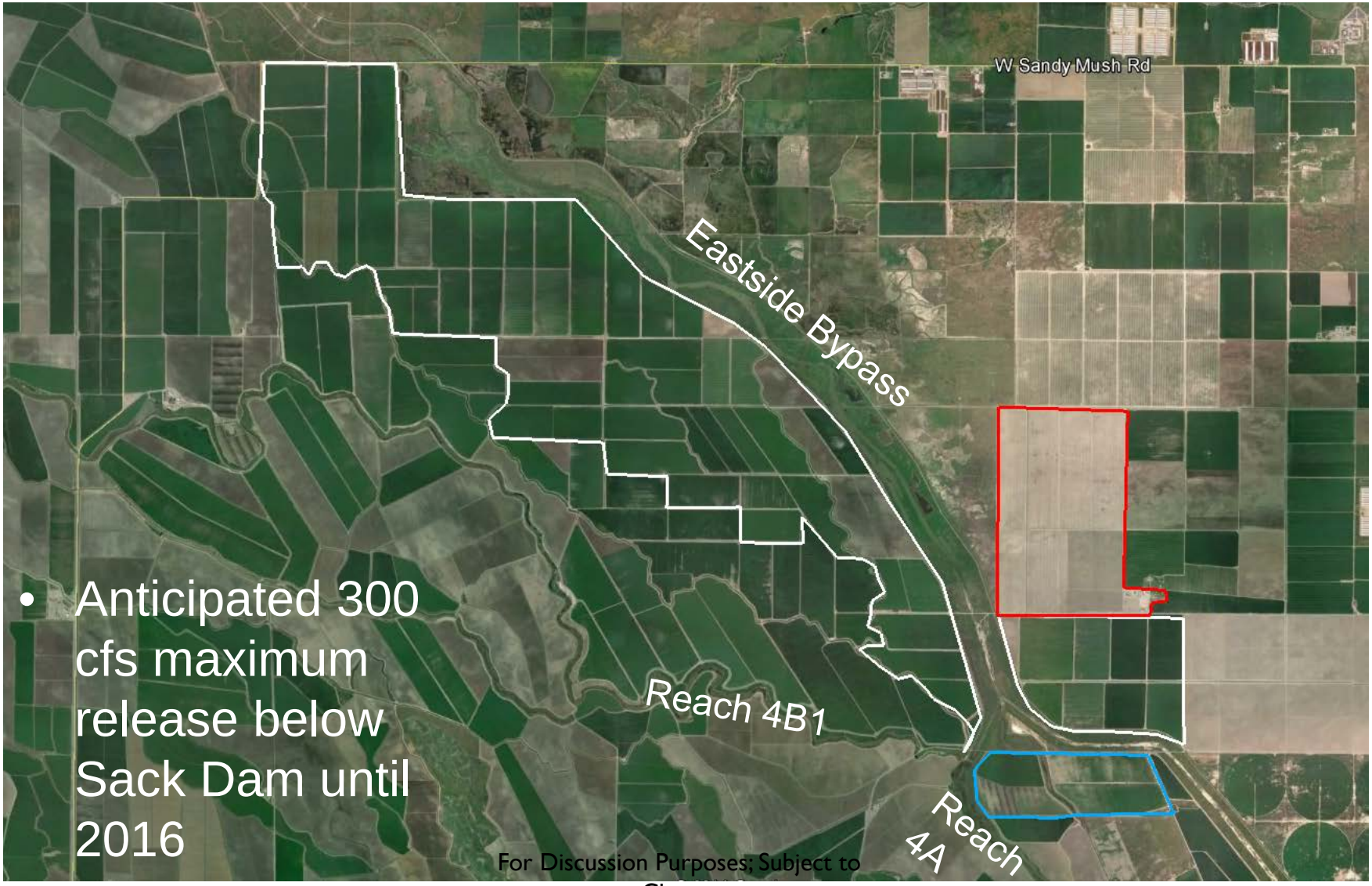
For Discussion Purposes, Subject to Change

Interceptor Line – Photos

Drain Sump,
Submersible Pump

Drain Installation

Next Flow Constraint – 300 cfs



- Anticipated 300 cfs maximum release below Sack Dam until 2016

For Discussion Purposes; Subject to Change

Seepage Project Approach

- Prioritize parcel groups based on most at-risk properties
- Initiated first tier of priority parcel groups – 300 cfs in 2015
- Next 2 projects – 700 cfs in 2017

Flow	# Projects
300 cfs	3
700 cfs	2
1,300 cfs	6
2,000 cfs	11
4,500 cfs	70
Total	**92**

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Seepage Projects Summary

Flow	# Projects*	Site Visits Performed	Targeted Monitoring Begun	Site Evaluations Begun	Preliminary Designs Begun
>300 cfs	3	3	3	3	3
300 - 700 cfs	2	2	2	1	1
700 - 1,300 cfs	6	5	3	2	2
1,300 - 2,000 cfs	11	4	3	1	
2,000 - 4,500 cfs	70	1	1		
Total	**92**	**14**	**11**	**6**	**6**

*Based on initial parcel prioritization.

QUESTIONS

REALTY ACTIONS

Purpose and Objective

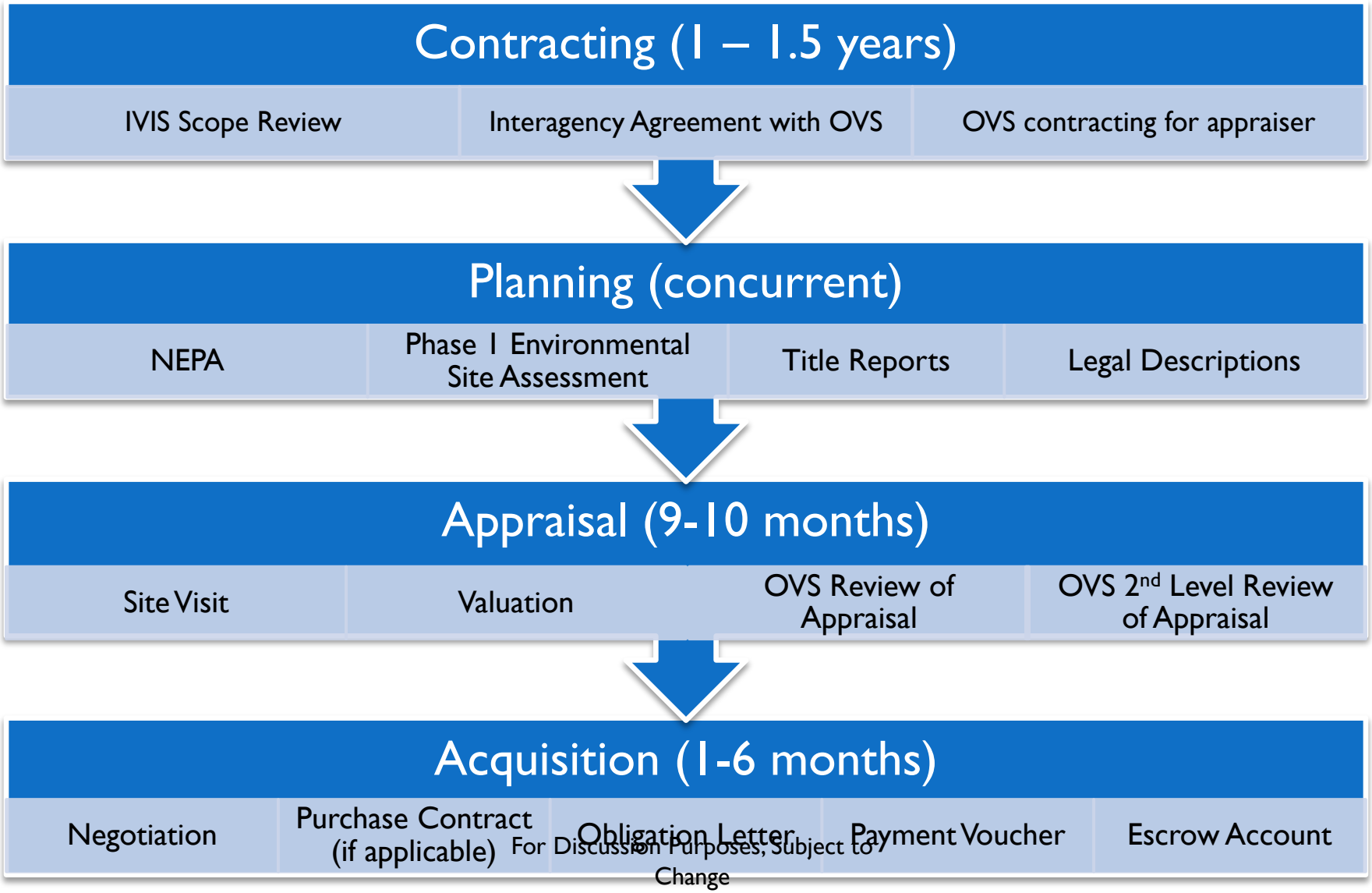
- Variety of options available for groundwater seepage mitigation
- Realty Actions include:
  - Seepage License Agreements (Rentals)
  - Seepage Easements (Permanent)
  - Acquisition
- Compensate for higher groundwater levels under the property

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



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Schedule Optimization

- Others pay for appraisals
  - Risky – OVS may not approve
- Landowner Relationships
- Address SJRRP longevity