**Discussion Item:**

# **Freeport Element** of the American River Use Strategy - Phase 1 Engineering Feasibility Study

San Joaquin County

Board of Supervisors

August 9, 2011

*South Fork American River*

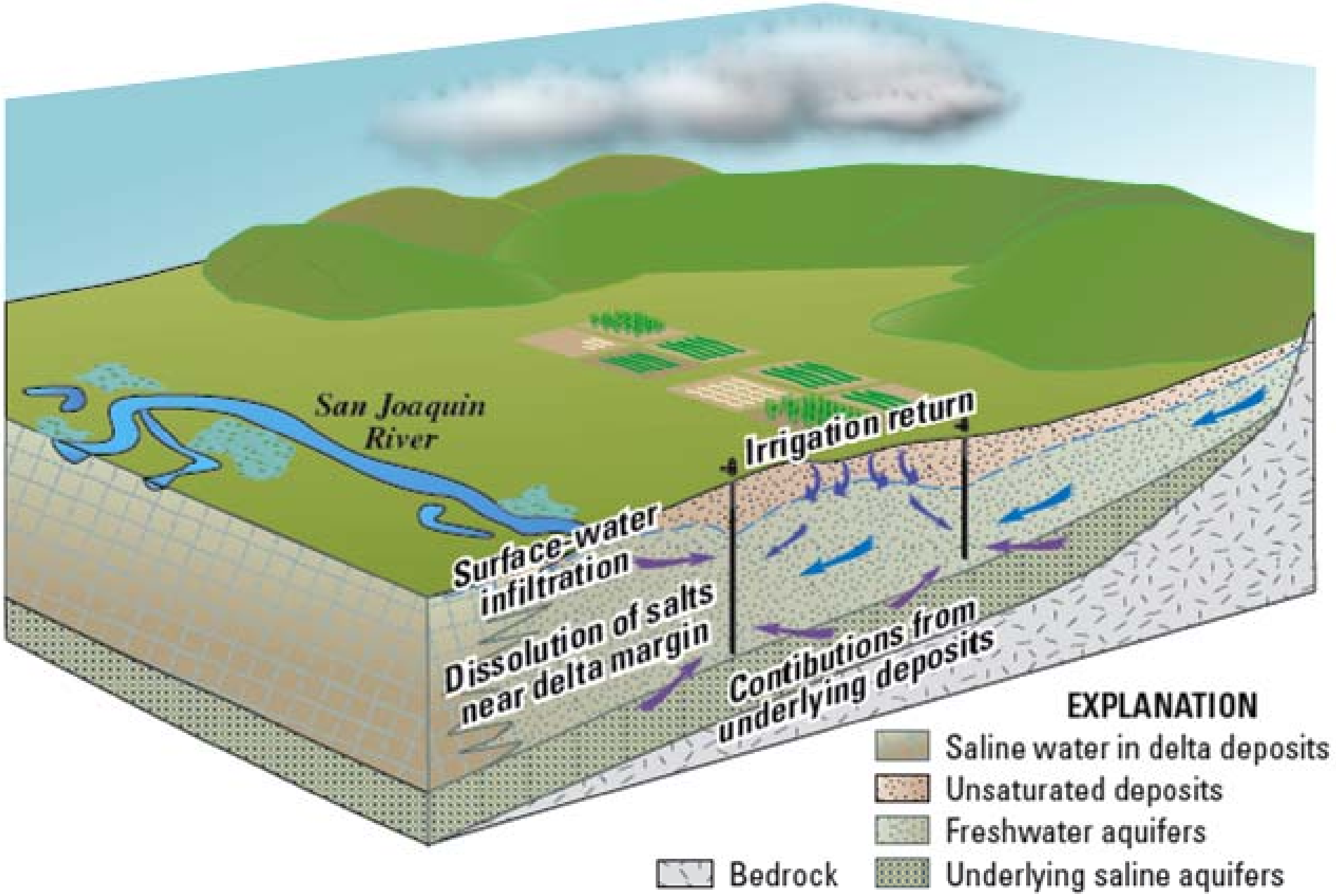
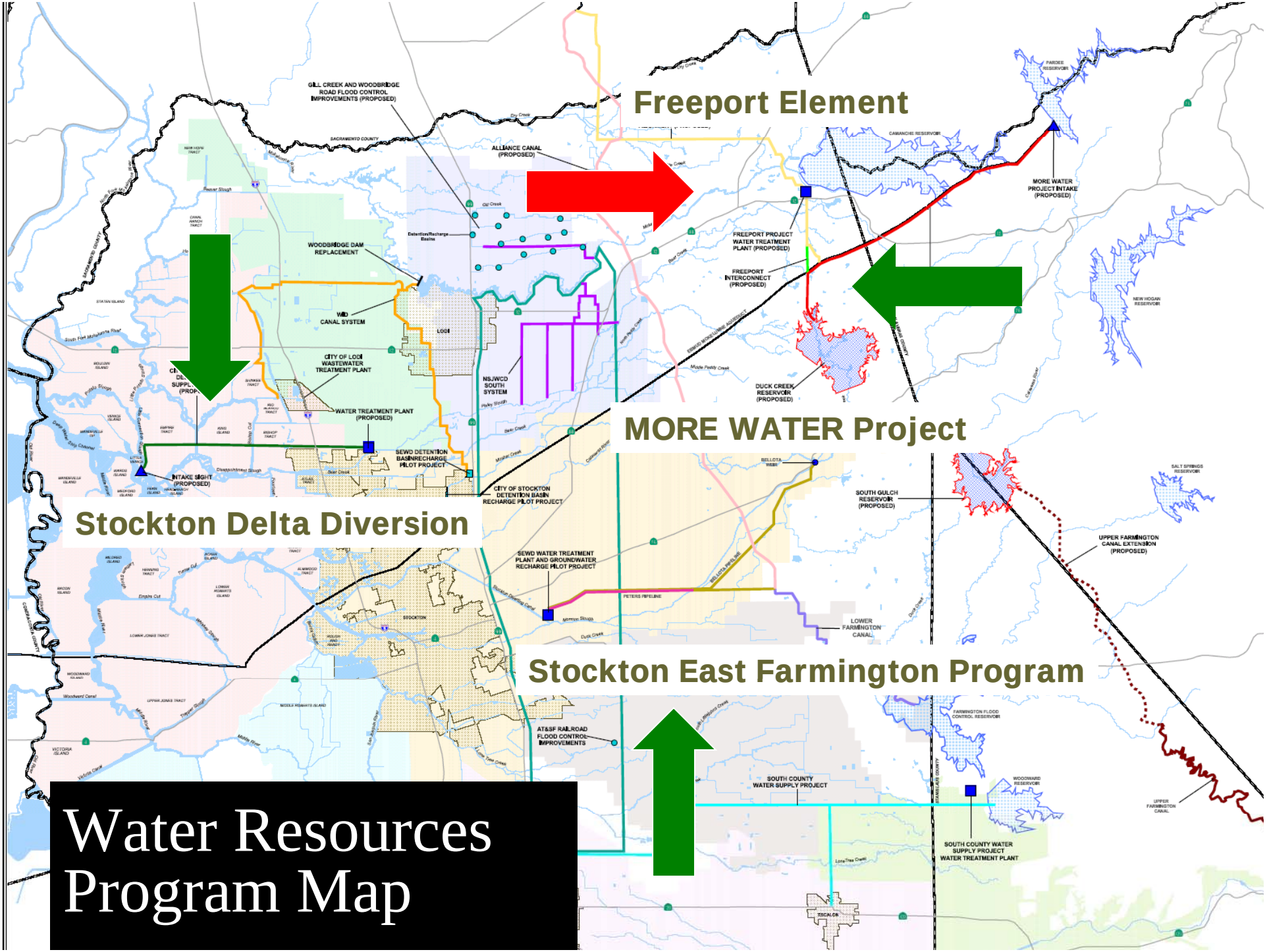



**Figure 2.** Sources of high-chloride water to wells, Eastern San Joaquin Ground-Water Subbasin, California.


Freeport Element
MORE WATER Project
Stockton Delta Diversion
Stockton East Farmington Program
GILL CREEK AND WOODBRIDGE ROAD FLOOD CONTROL IMPROVEMENTS (PROPOSED)
ALLIANCE CANAL (PROPOSED)
WOODBRIDGE DAM REPLACEMENT
WID CANAL SYSTEM
CITY OF LODI WASTEWATER TREATMENT PLANT
WATER TREATMENT PLANT (PROPOSED)
INTAKE SIGHT (PROPOSED)
SEWD DETENTION BASIN/RECHARGE PILOT PROJECT
NSJWCD SOUTH SYSTEM
CITY OF STOCKTON DETENTION BASIN RECHARGE PILOT PROJECT
FREEPORT PROJECT WATER TREATMENT PLANT (PROPOSED)
FREEPORT INTERCONNECT (PROPOSED)
MORE WATER PROJECT INTAKE (PROPOSED)
DUCK CREEK RESERVOIR (PROPOSED)
SEWD WATER TREATMENT PLANT AND GROUNDWATER RECHARGE PILOT PROJECT
SOUTH GULCH RESERVOIR (PROPOSED)
UPPER FARMINGTON CANAL EXTENSION (PROPOSED)
LOWER FARMINGTON CANAL
AT&SF RAILROAD FLOOD CONTROL IMPROVEMENTS
SOUTH COUNTY WATER SUPPLY PROJECT
SOUTH COUNTY WATER SUPPLY PROJECT WATER TREATMENT PLANT
Water Resources Program Map

# American River Application History

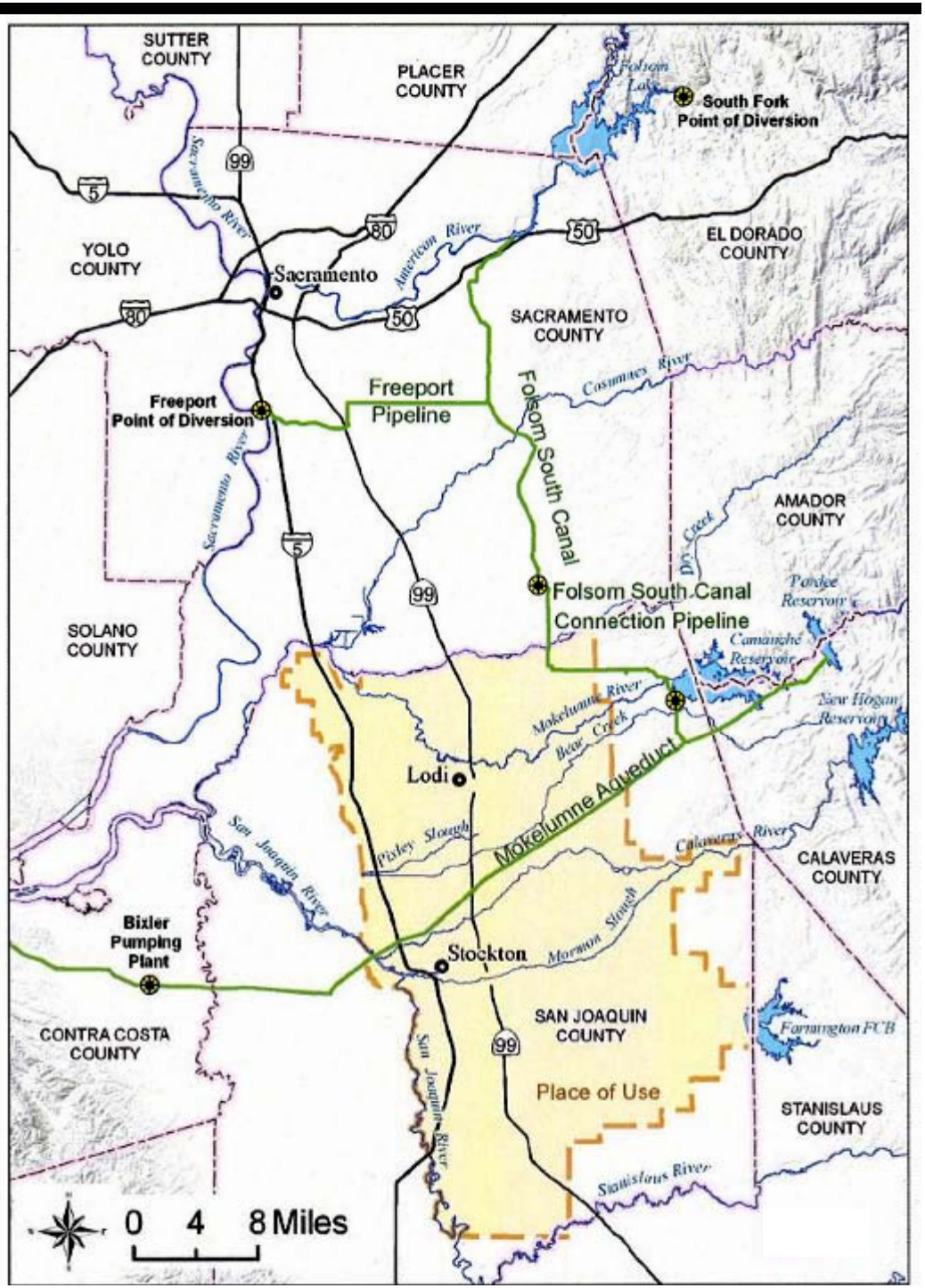
- **Application 29657 filed by County in 1990**
- **Following Failure of Auburn Dam Project/Folsom South CVP**
- **Diversion December – June**
- **Original Sites – South Fork & Nimbus Dam**
- **Diversion Site Amended in 2003 to Freeport on Sacramento River**

# Application 29657 – Current Status

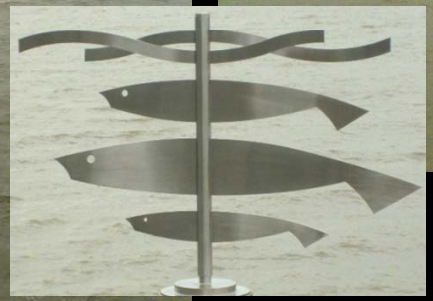
- Oct 2010
  - Cancellation Notice of Water Right Application
- Nov 2010
  - Petition for Reconsideration
- Feb 2011
  - Writ of Mandate
- June 2011
  - Reinstatement

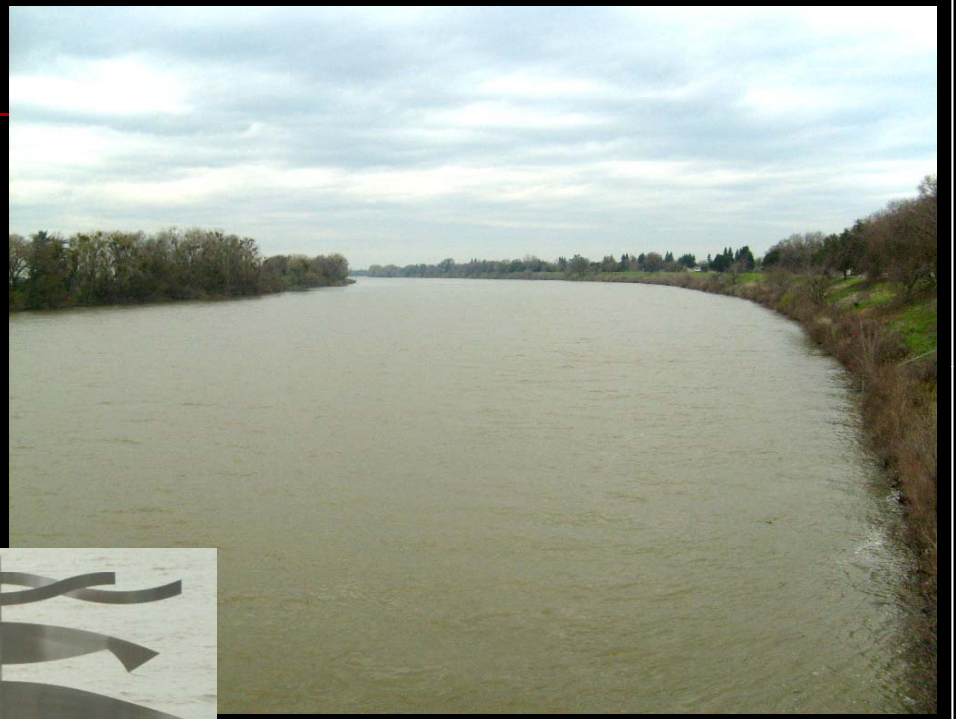
# FRWA Freeport Project

- Project Facilities
  - Water intake facility & pumping plant
  - 72 to 84-inch pipeline
  - 155 cfs EBMUD FSCC pipeline



# Sacramento River Intake





16 Fish Screens: approx. 10 ft. each

Fish Screen Cap: 290 cfs

# Pump Station & Sediment Basins

- Eight vertical turbine pumps w/ 2,000 hp motors
- 185 mgd/day
- Three sediment settling basins

# Sacramento Co. Treatment Plant, Pipeline & Pumping Stations

# Freeport Facility Costs

- Total Freeport Project Cost = $922 M
- EBMUD Cost = $481M
  - Construction $346M
  - Non-Construction $135M (28%)
  - Dry Year Supply

Cost Sharing Formulas

- Frequency of use
- Volume conveyed
- Sunk cost/maintenance
- Water banking contract

# Groundwater Banking Authority JPA (2001)

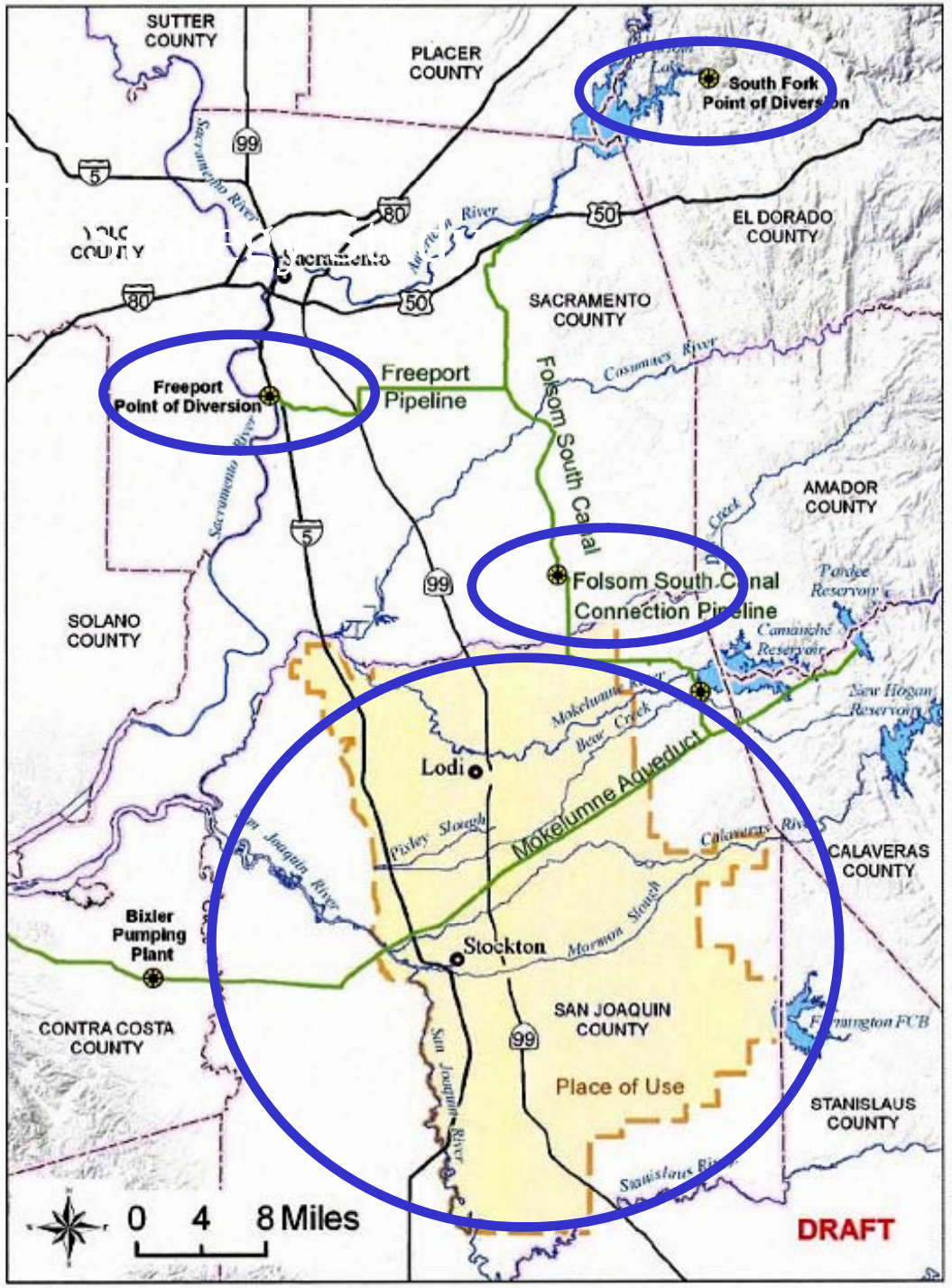
- Section 1.03. Goal. …The Authority's short-term goals are as follows:
- (a) To participate in the design and implementation of the Freeport Regional Diversion Project so as to provide benefits to project participants and San Joaquin County.

# Freeport Elemen
## of the American River U

**Water to be Appropriated under Application 29657**

(acre-feet per year)

| | |
|---|---|
| Direct Diversion | 147,000 |
| Storage | 147,000 |
| Total | 147,000 |
| Diversion Rate 350 cfs | |
| Period of Diversion or Collection | Dec 1- Jun 30 |
| Priority Date | Feb 9, 1990 |



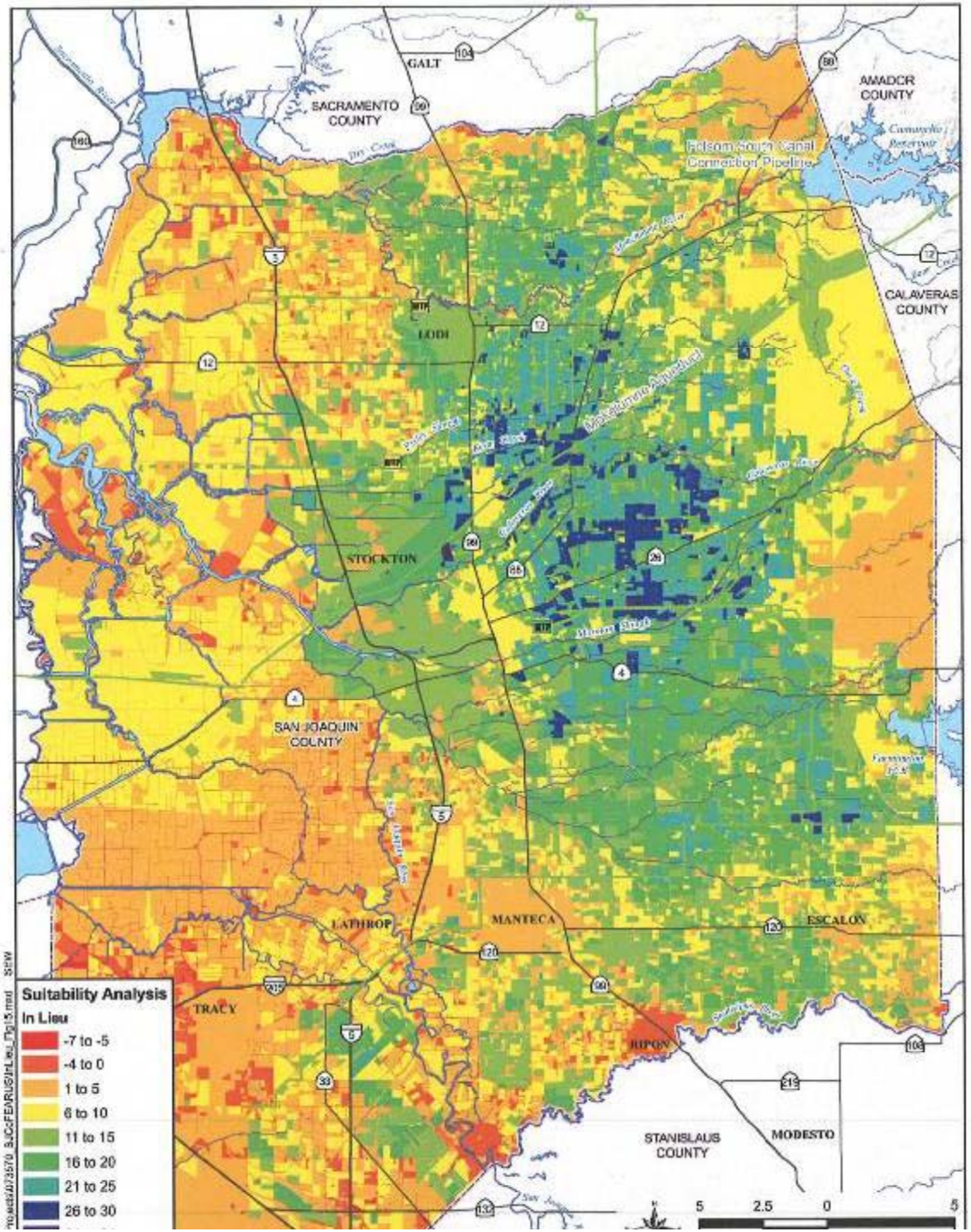
# Engineering Feasibility Analyses

- Determine water availability
- Feasibility Analysis
- Develop alternatives
- Develop engineering adequate for:
  - Cost comparison
  - Environmental comparison
- Performance Measures (30)
- Environmental assessment

| Alternatives | |
|---|---|
| C1 | **Water Treatment Plants** |
| C2 | **Water Treatment Plants via Jack Tone Pipeline** |
| C2b | **Jack Tone Canal** |
| G1a | **Ag In-Lieu** |
| G1b | **Ag In-Lieu w/ MORE Water & Duck Creek Reservoir** |
| G1c | **Ag In-Lieu w/ Small Duck Creek Reservoir** |
| G2 | **Recharge Ponds** |
| G2b | **Enhanced Yield** |
| R1 | **Regional Banking** |
| R1b | **Enhanced Yield** |

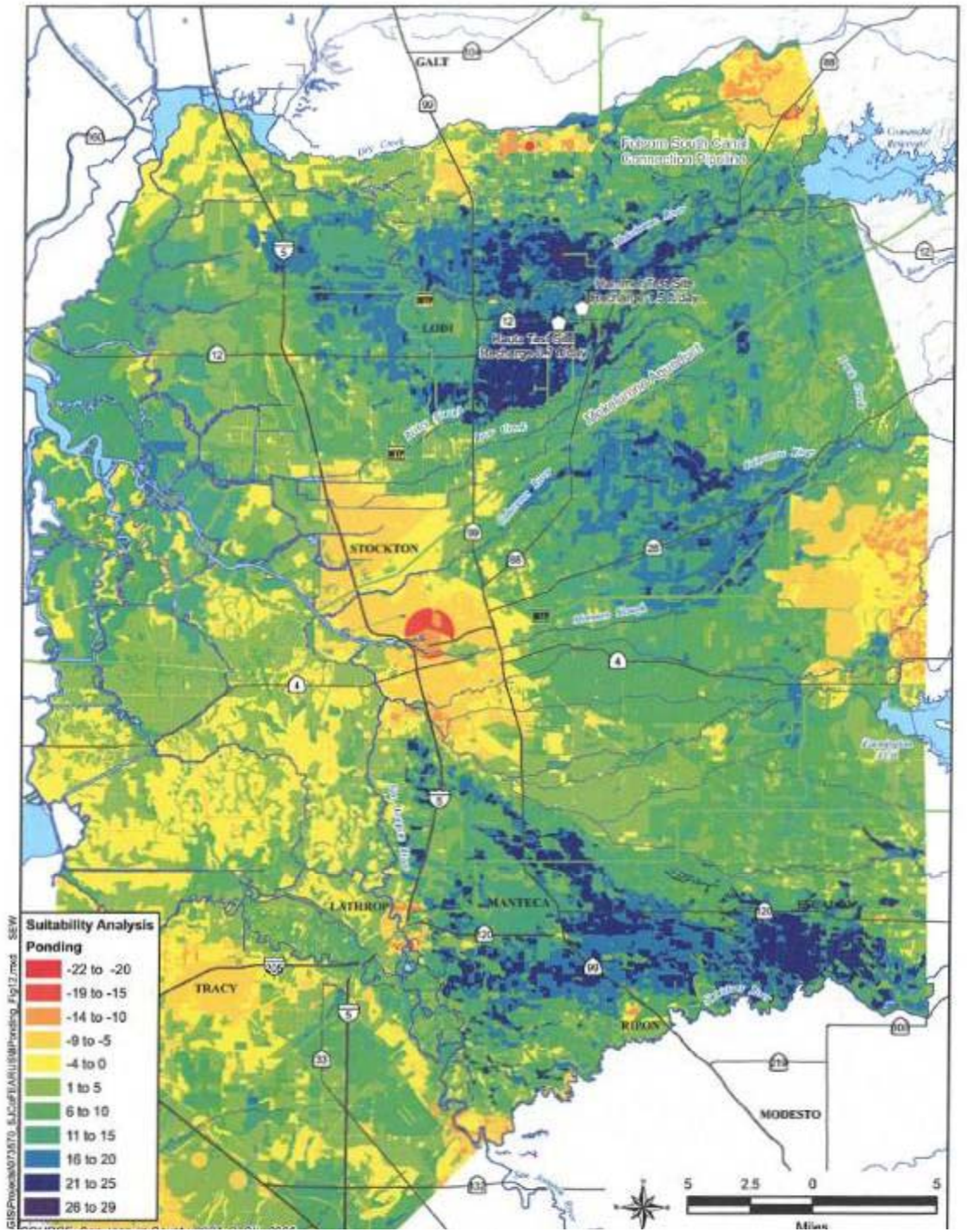
# Analysis

## Ag In-Lieu Suitability



# Analysis Con

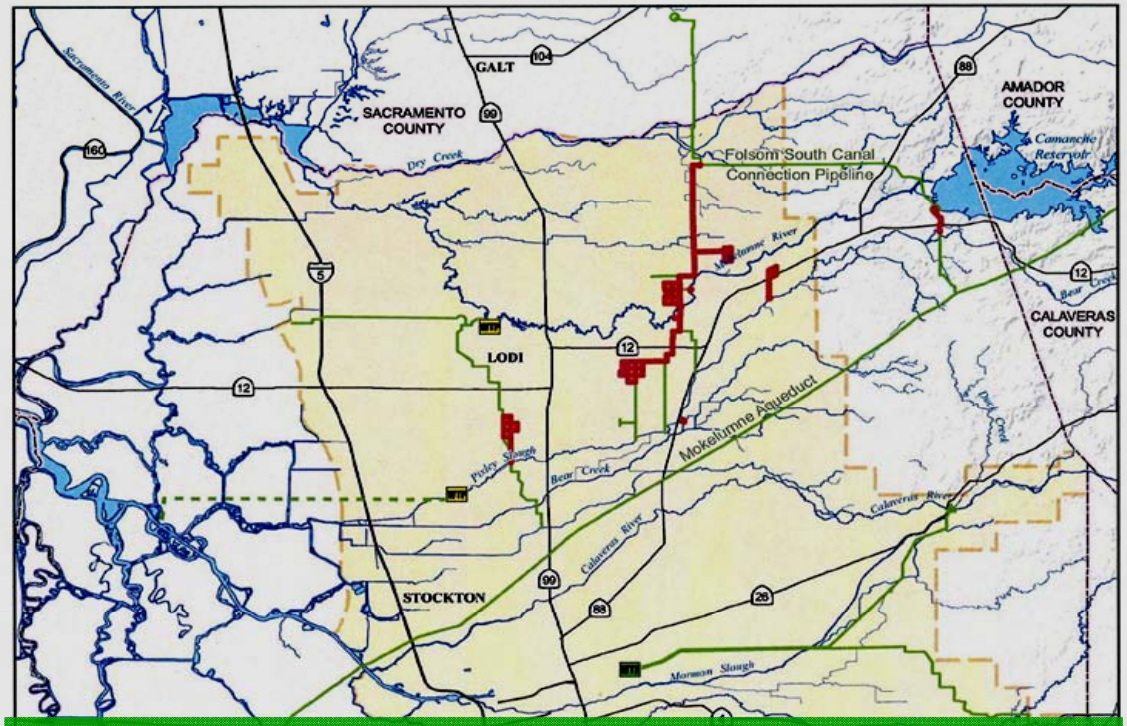
Recharge
Pond
Suitability



# Alternatives

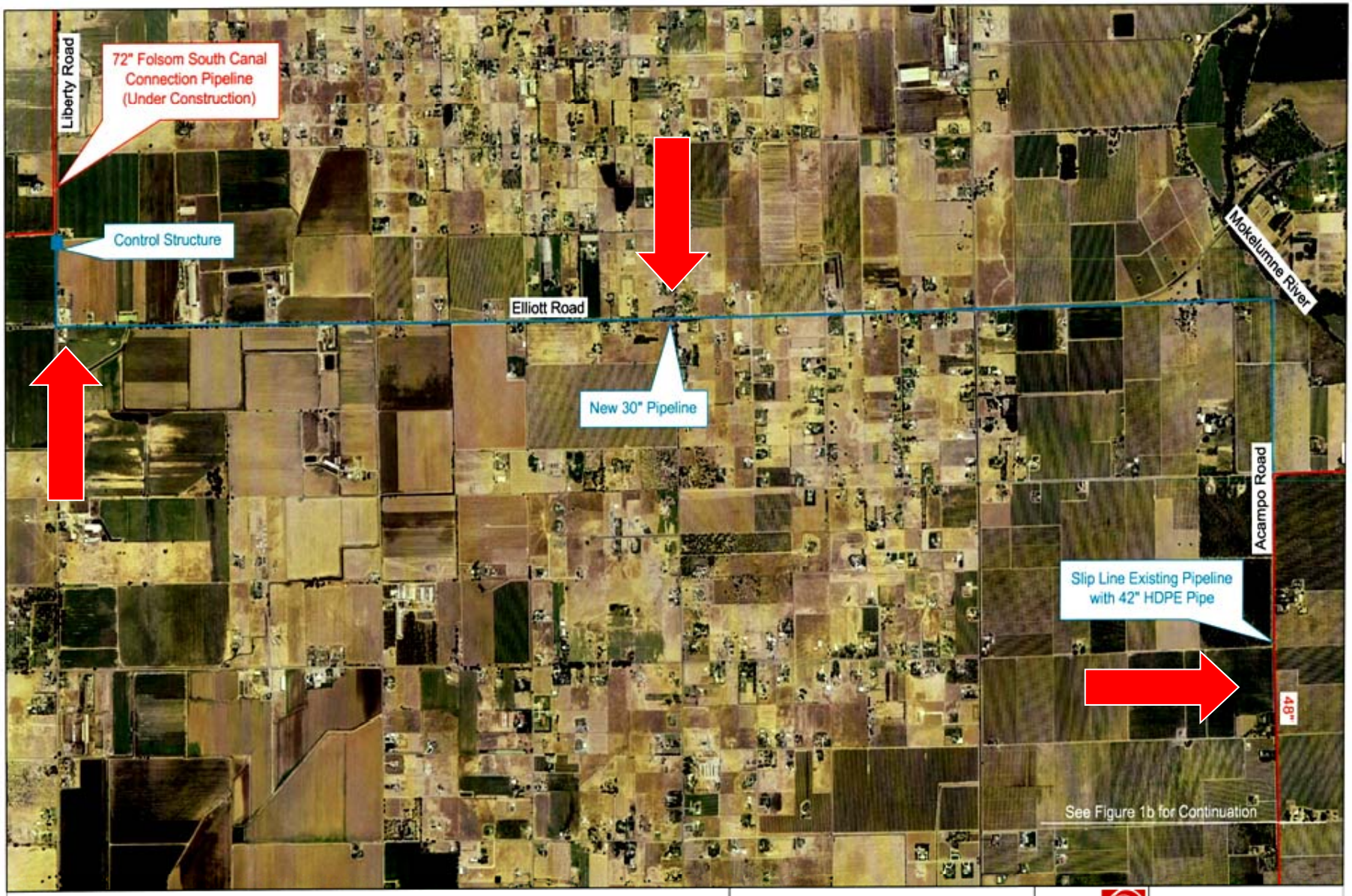
## Recharge Pond Project

- Bear Ck/Pixley
- 44 kaf/yr




**Recommendation: Carry Forward**

- **Maximizes use of American River supply**
- **Moderate unit cost ($250/af). Unit cost drops (to $220/af) for enhanced yield variant**
- **Lowest number of "Low" ratings (1), related to permanent removal of prime agricultural land from production**
- **High reliability**
- **Moderate energy requirements ($60/af)**




Freeport Element of the American River Use Strategy

San Joaquin County
Public Works Department

GEI Consultants

Project 073570

Alternative C-1
Lodi WTP Connection
Pipeline

August 2008

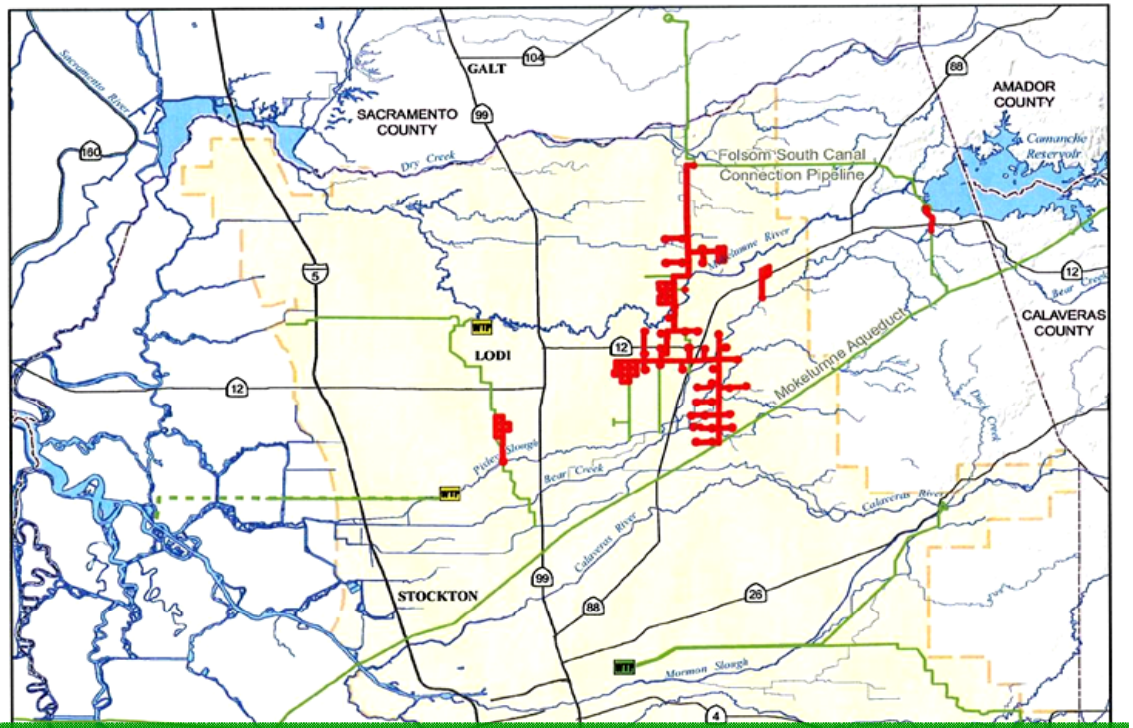
Figure 1a

# Dedicated Recharge Basins

# Alternatives

## Regional Banking Project (Recharge ponds + Injection wells)

- Shared costs w/ Project Partners
  - AWA, CCWD, EBMUD, others
- 58 kaf/yr



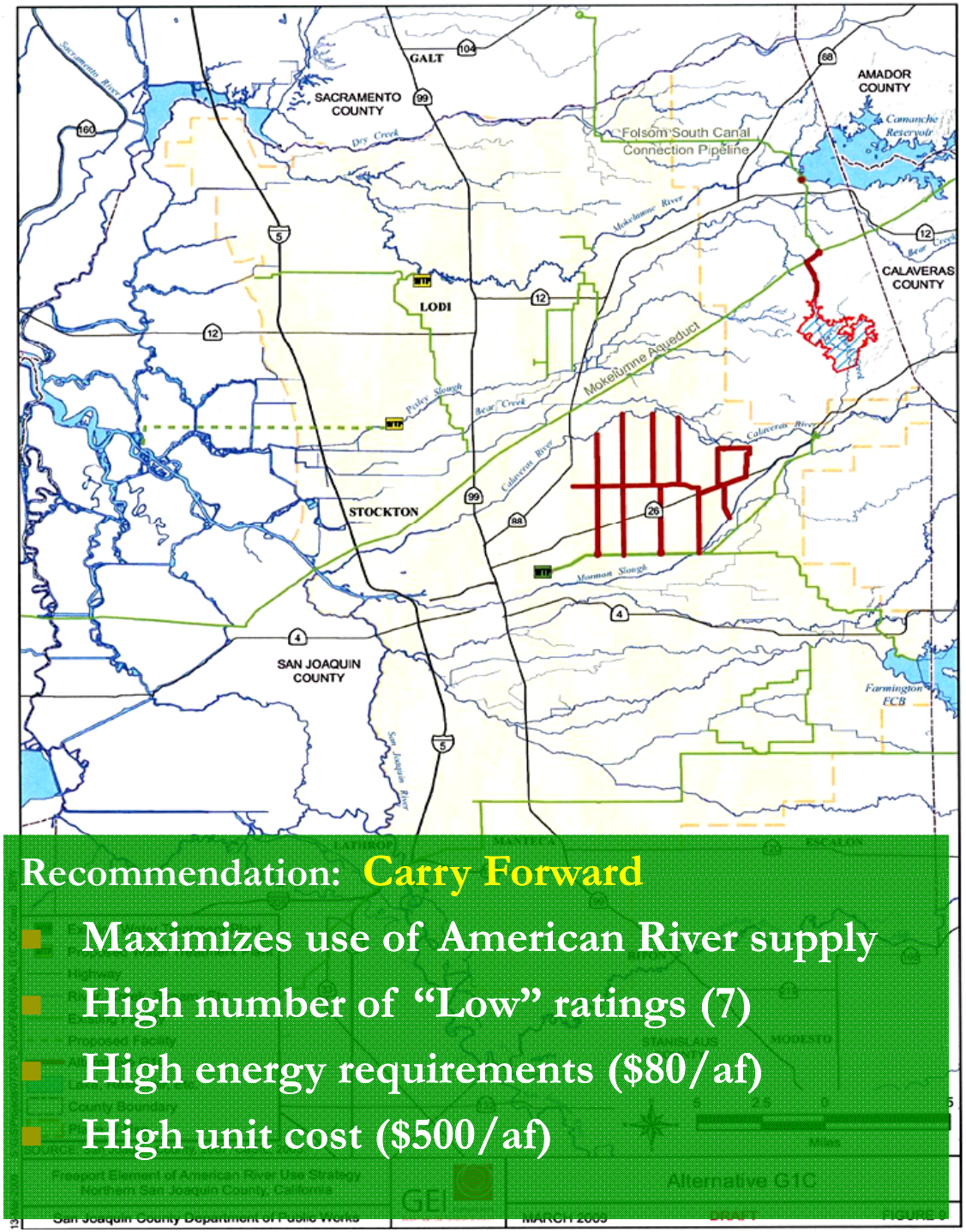

**Recommendation: Carry Forward**

- **Maximizes use of American River supply**
- **Water bankers leave water behind – highest yield.**
- **Low number of "Low" ratings (2), related to permanent loss of farmland and difficultly to negotiate regional banking agreement**
- **Moderately low unit cost ($170/af). Unit cost drops (to $150/af) for enhanced yield variant**
- **Moderate energy requirements ($60/af)**

# Alternatives

Ag In-Lieu w/
75 kaf Duck Creek Reservoir

- 43 kaf/yr



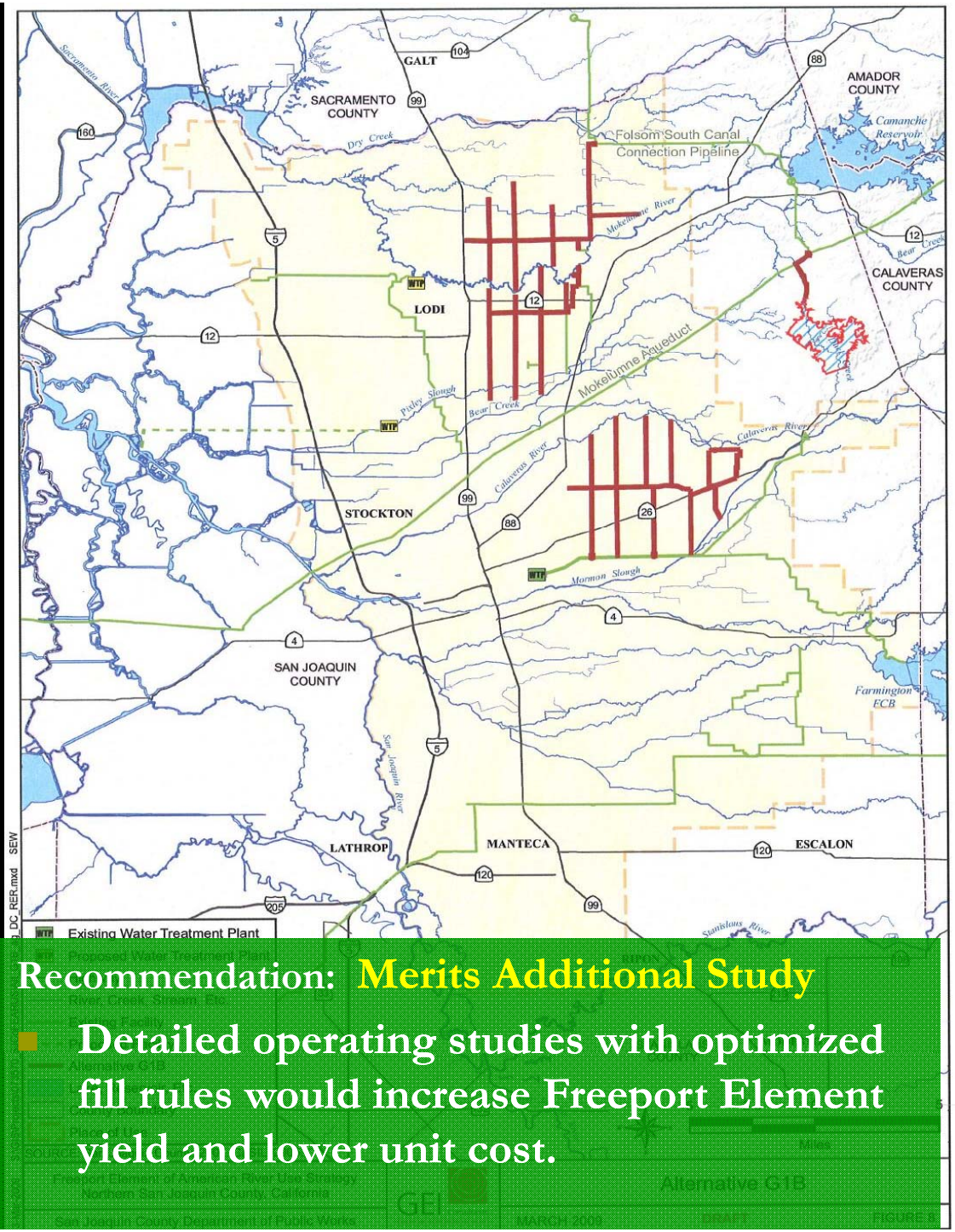

Recommendation: **Carry Forward**

- Maximizes use of American River supply
- High number of "Low" ratings (7)
- High energy requirements ($80/af)
- High unit cost ($500/af)

# Alternatives

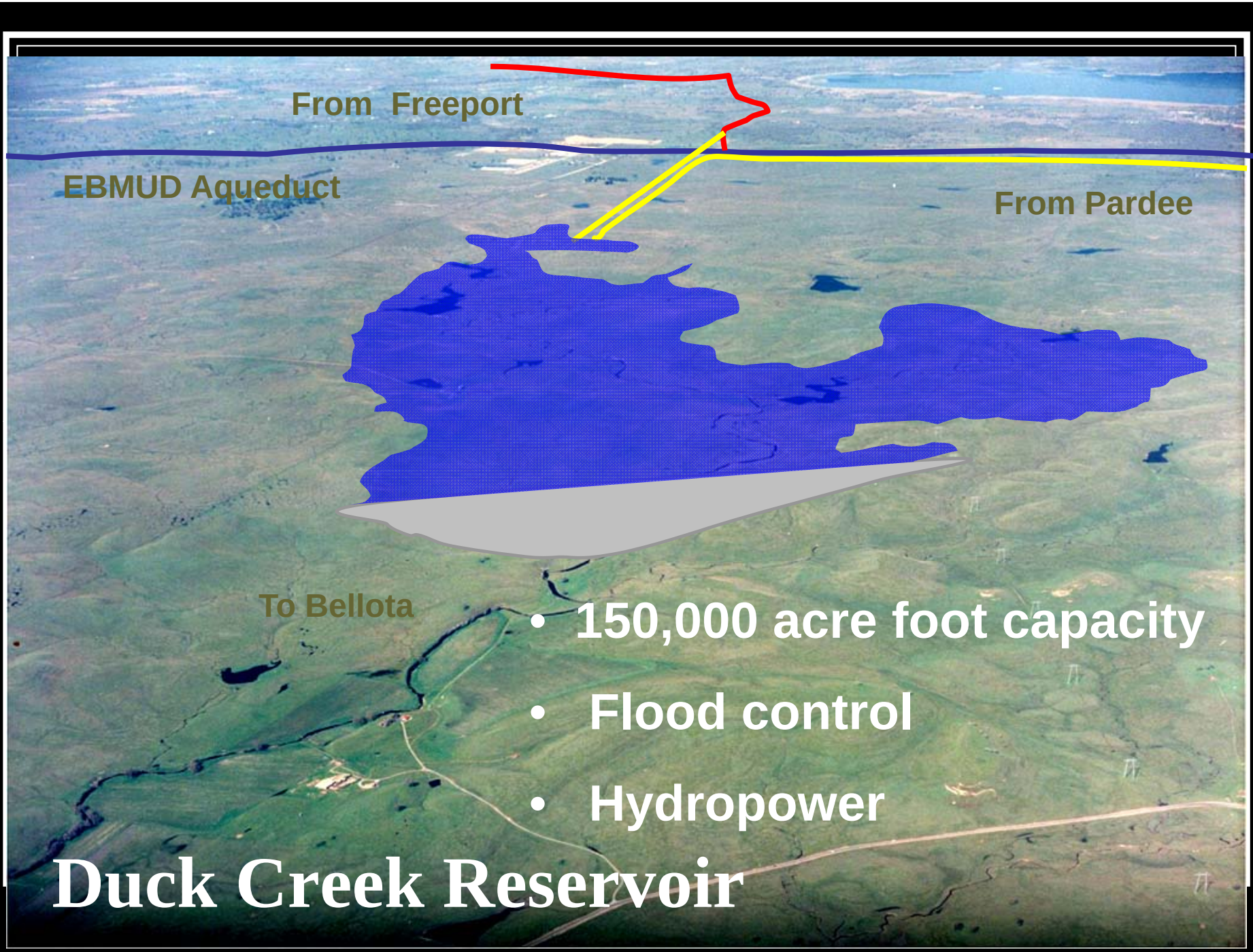
## Freeport Element & MORE WATER Project

- 150 kaf Duck Creek Reservoir




**Recommendation: Merits Additional Study**

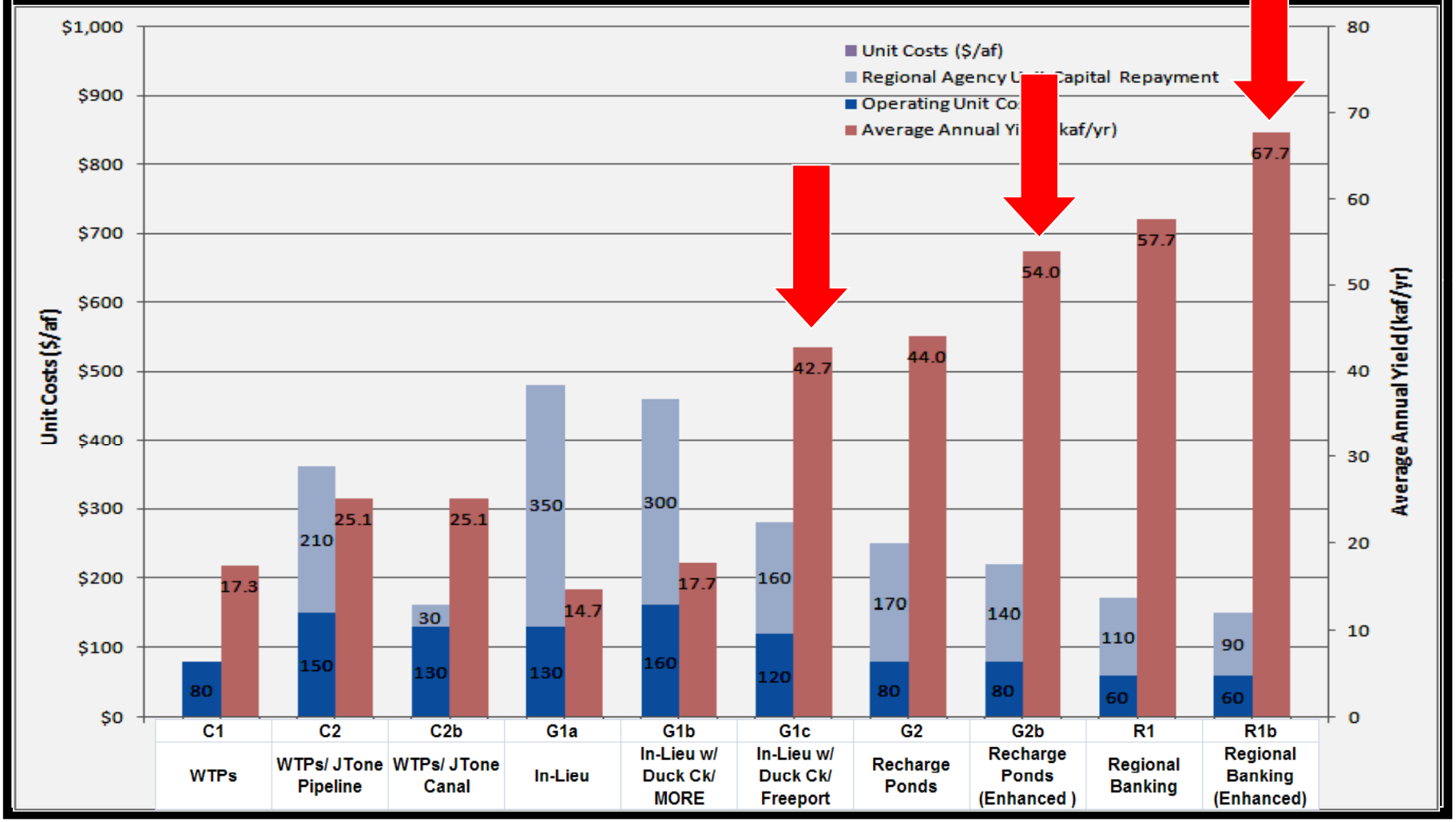
- **Detailed operating studies with optimized fill rules would increase Freeport Element yield and lower unit cost.**


From Freeport
EBMUD Aqueduct
From Pardee
To Bellota
• 150,000 acre foot capacity
• Flood control
• Hydropower
Duck Creek Reservoir

# Duck Creek Reservoir Site

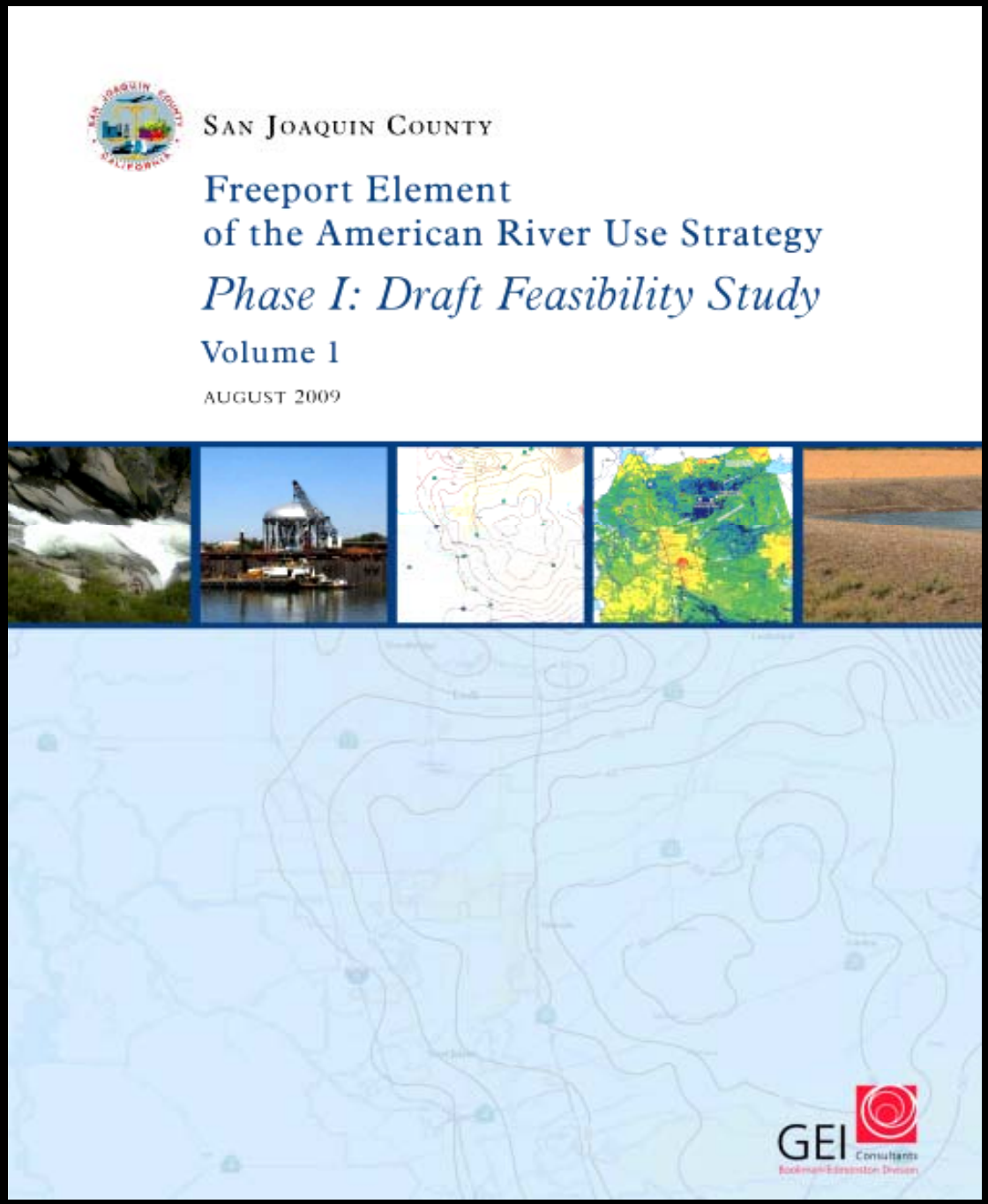
**Spring 2011 = 426,000 acre feet**

# Est. Unit Cost and Project Yield



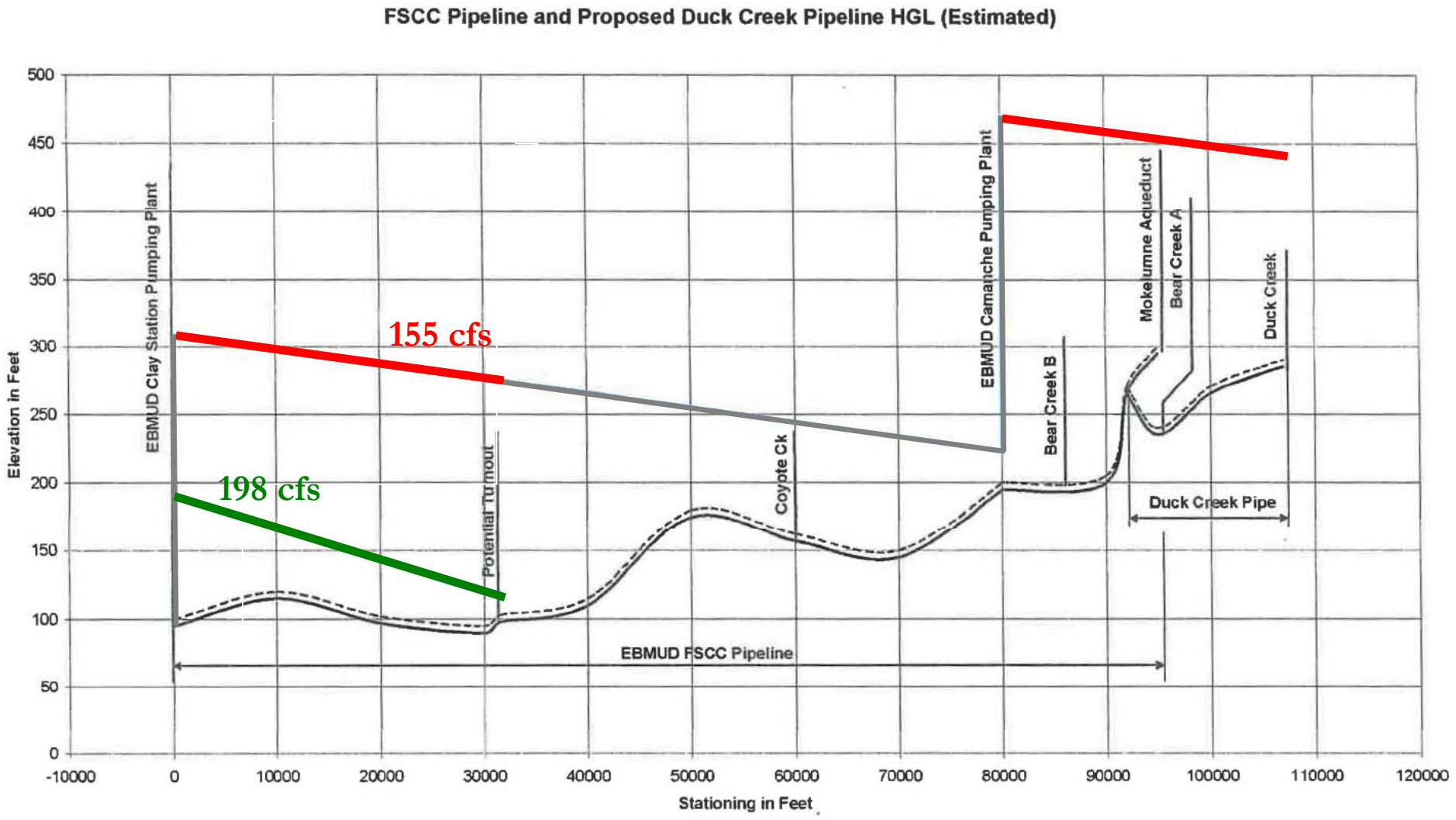
# Staff Recommendations:

- Accept the Phase 1 Engineering Feasibility Study Report
- Complete Phase 2 Scoping and Contract Negotiations
  - To Carry Forward Promising Alternatives into Project Level Environmental Analysis
- Engage with EBMUD, SCWA, & FRWA for Access and Use of the Freeport Project


San Joaquin County
Freeport Element
of the American River Use Strategy
Phase I: Draft Feasibility Study
Volume 1
AUGUST 2009
GEI Consultants

# Questions?

# Freeport Pipeline Hydraulic Gradeline



# Freeport Alternatives

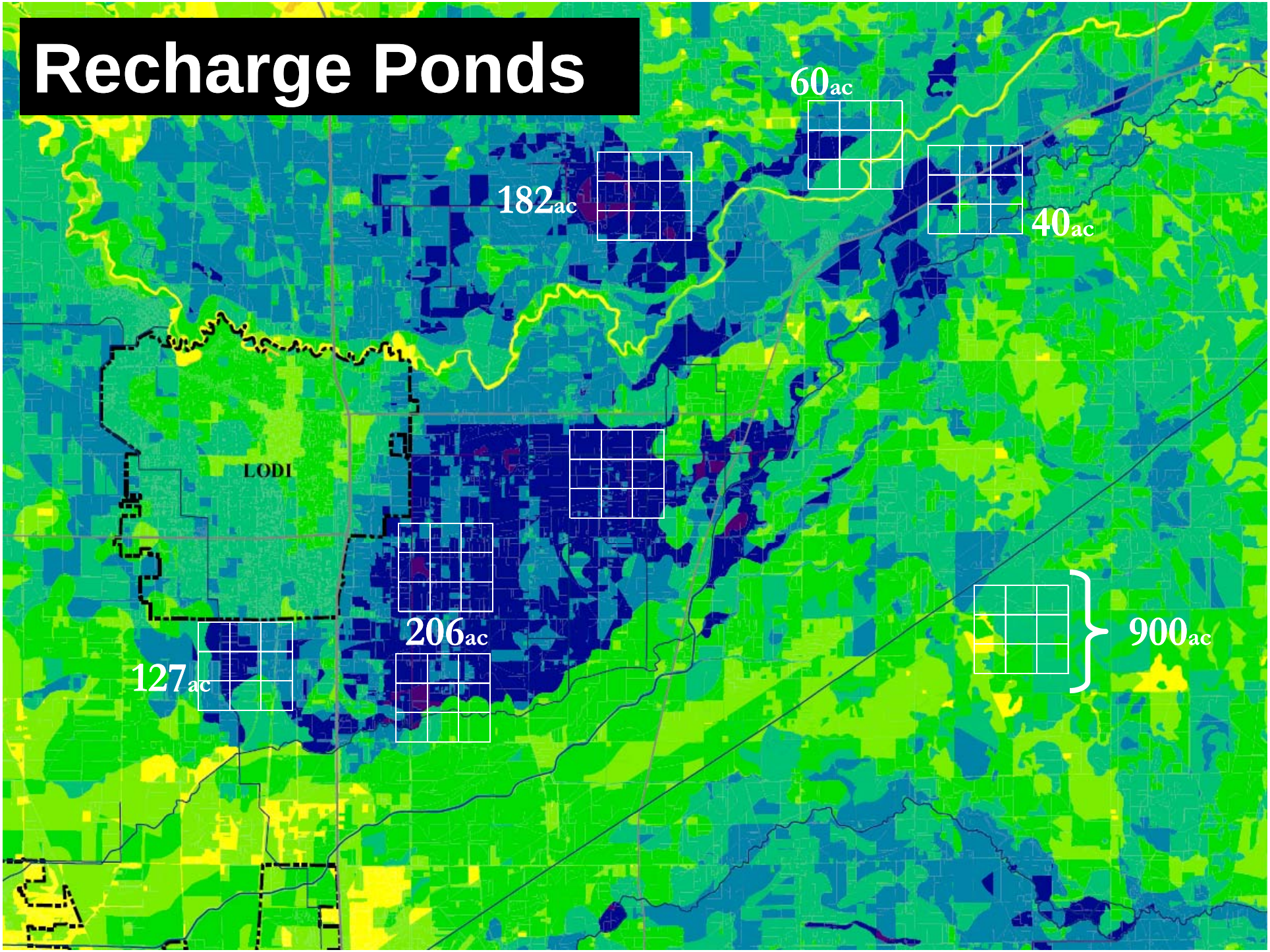
| Alternative | Recharge Method | Max Diversion Rate (cfs) | Max Recharge Rate (cfs) | Water Source(s) |
|---|---|---|---|---|
| C1 | Delivery to Water Treatment Plants | 79 | 79 | American River\1 |
| C2 | Delivery to Water Treatment Plants via Jack Tone Pipeline | 155 | 155 | American River\1 |
| G1a | Ag In-Lieu (w/o storage) | 155 | 155 | American River\1 |
| G1b | Ag In-Lieu (w/150 kaf Duck Creek Reservoir) | 1,155 | 355 | American\1 & Mokelumne Rivers\2 |
| G1c | Ag In-Lieu (w/75 kaf Duck Creek Reservoir) | 155 | 200 | American River\1 |
| G2 | Recharge Ponds | 155 | 155 | American River\1 |
| R1 | Regional Banking | 182 | 182 | American\1 & Mokelumne Rivers\3 |

Key:

\1 San Joaquin County water right filing 29657 on the South Fork American River (diverted from the Sacramento River at Freeport)

\2 Mokelumne River Power and Water Authority water right filing 29835 on the Mokelumene River

\3 EBMUD, Amador Co, and Calaveras Co water rights


Recharge Ponds
60ac
182ac
40ac
LODI
206ac
127ac
900ac

# Performance Measures (30)

- Reliability and Sustainability
- Economics
- Compatibility
- Environmental Constraints
- Implementability

3/16/09 rev7

SJCO Freeport Element of the American River Use Strategy

| | Performance Measures | 0 No Action | C1 WTPs | C2 WTPs/ JTone Pipeline | G1a In-Lieu | G1b In-Lieu w/ Duck Ck/ MORE | G1c In-Lieu w/ Duck Ck/ Freeport | G2 In-Lieu w/ Duck Ck/ Freeport | R1 Recharge Ponds |
|---|---|---|---|---|---|---|---|---|---|
| Reliability and Sustain-ability | 1. Water Availability | (L-) 0 | (L+) 17.3 | (M) 25 | (L+) 14.7 | (M-) 17.7 | (H-) 42.7 | (H-) 44 | (H+) 55.6 |
| | 2. Availability of Conveyances | (M) | (M+) Bear Ck, Duck Ck, Belota PL | (M-) Bear Ck | (M+) NSJ dist sys, Belota PL | (H-) NSJ dist sys, Belota PL, Dk Ck | (M+) NSJ dist sys, Belota PL | (M) NSJ dist sys | (M) NSJ dist sys |
| | 3. Water Quality | (M+) None/ continued saline migration | (L+) Potable treatment | (L+) Potable treatment | (H) None | (H) None | (H) None | (H) None | (M) Injection |
| | 4. Adaptability to Climate Change - increased flood flows | (M+) | (L+) Bear Ck, Pixley Sl, Duck Ck | (M-) Bear Ck/ Pixley Sl | (M+) Duck Ck | (H+) Duck Ck Reservoir | (H+) Half-size Duck Ck Res | (M) Bear Ck/ Pixley Sl | (M) Bear Ck/ Pixley Sl |
| | 5. Hydrology and Water Quality - water quantity | (L-) Continued decline | (M) Need fully-redundant GW | (M) Need fully-redundant GW | (M) Need fully-redundant GW | (M+) Need fully-redundant GW | (H-) Need fully-redundant GW | (H) | (M+) More dry year drawdown |
| Economics | 6. Life-cycle Capital, Operations and Maintenance Costs including Banking Revenues, Mitigation and | (M+) Well deepening | (H-) 80 | (L+) 270 | (M) 200 | (M) 190 | (L) 330 | (M) 170 | (M+) 140 |
| | 7. Power Cost Sensitivity to Energy Prices | (L-) Increased pumping lift | (H-) 90 | (L) 310 | (M) 210 | (M-) 220 | (L-) 380 | (M) 210 | (M) 180 |
| Compati-bility | 8. Compatibility with Existing Cultural Practices | (H) 0 / 0 | (H) 0 / 0 | (H) 0 / 0 | (H) 0 / 0 | (H) 0 / 0 | (M) 0 / 2,498 | (L) 746 / 443 | (L) 746 / 444 |
| | 9. Compatibility with Existing Facilities | (H-) | (M) WTP | (M) WTP | (M) In-Lieu | (H-) In-Lieu/ Ponds | (M+) In-Lieu | (H+) Ponds | (H) Ponds/ Injection wells |
| | 10. Compatibility with Anticipated Future Facilities | (L-) Potential loss of prime recharge sites | (L) | (H-) Jack Tone PL | (M) | (H-) Duck Ck Res | (M+) Half-size Duck Ck Res | (H-) Recharge ponds | (H) Regioal Project/ Ponds |
| | 11. Compatibility with Planned Growth and Land Uses | (L) Overdraft may limit planned growth | (H) 0 / 0 | (H) 0 / 0 | (H) 0 / 0 | (H) 0 / 0 / Duck Ck Res | (L+) 1,480 / 0 / Half-size Duck Ck Res | (M+) 0 / 1 | (M+) 0 / 1 / Regional banking |
| Environ-mental Constraints | 13. Agricultural Resources | (H) 0 / 0 | (H) Temp 37 / Perm 0 | (H) Temp 102 / Perm 0 | (H) Temp 229 / Perm 0 | (H-) Temp 390 / Perm 0 | (H) Temp 207 / Perm 0 | (L) Temp 58 / Perm 746 | (L) Temp 129 / Perm 746 |
| | 14. Air Quality - Energy Use/ Greenhouse gases | (H-) 0 | (M+) 2400 | (M) 6200 | (L-) 21000 | (M) 5900 | (M) 8500 | (M) 6200 | (M+) 3,300 (incl EBMUD offset) |
| | 15. Biological Resources - terrestrial species | (H) 0 | (L-) California tiger salamander, midvalley fairy shrimp, vernal pool tadpole shrimp | (M+) Midvalley fairy shrimp, vernal pool tadpool shrimp | (L) California tiger salamander, Sanford's arrowhead, midvalley fairy shrimp, vernal pool tadpool shrimp | (M+) Sanford's arrowhead, Swainson's hawk, midvalley fairy shrimp, prairie falcon, vernal pool tadpole shrimp | (M+) Swainson's hawk, prairie falcon | (H-) Vernal pool tadpole shrimp | (M+) Sanford's arrowhead, Swainson's hawk, vernal pool tadpole shrimp |
| | 16. Biological Resources - riparian areas and oak trees | (H+) 0 | (H-) 3 ac/ 0 Riparian/ 132 Oaks | (M) 5 ac/ 0.5 Riparian / 309 Oaks | (M) 5 ac/ 0 Riparian / 295 Oaks | (L-) 13 ac/ 0 Riparian/ 548 Oaks | (H-) 1 ac / 0 Riparian / 243 Oaks | (H-) 4 ac/ 0 Riparian / 159 Oaks | (M-) 9 ac/ 0.3Riparian/ 364 Oaks |
| | 17. Biological Resources - wetlands, including vernal pools | (H+) 0 | (M+) 0.5 wetlands + vernal pools | (H+) 0.4 wetlands | (M+) 0.2 wetlands + vernal pools | (M+) 0.6 wetlands + vernal pools | (L-) 23.4 wetlands + vernal pools | (M) 3.0 wetlands | (M) 3.0 wetlands |
| | 18. Biological Resources - aquatic species | (H) 0 | (M-) 60 ft disturbed habitat; Delta effects (<1 mo.) | (M+) 125 ft disturbed habitat; Delta effects | (M-) 0 ft disturbed habitat; Delta effects; scent (<1 mo.) | (M+) 0 ft disturbed habitat; Delta effects; scent (>1 mo.) | (M) 0 ft disturbed habitat; Delta effects; scent (>1 mo.) | (M+) 113 ft disturbed habitat; Delta effects | (M+) 113 ft disturbed habitat; Delta effects |
| | 20. Cultural Resources | (H) 0 / 0 | (M+) 0 / 1 | (L-) 1 / 3 | (M) 1 / 1 | (L) 1 / 2 | (L-) 1 / 2 | (H) 0 / 0 | (H-) 0 / 0 |
| | 23. Hydrology and Water Quality - water withdrawals and quality | (H+) 0 | (M+) Sac: 22 kaf/yr, 79 cfs; Mok: 0 kaf/yr, 0 cfs; 34 miles | (H-) Sac: 44 kaf/yr, 155 cfs; Mok: 0 AF/yr, 0 cfs; 2 miles | (H) Sac: 15 kaf/yr, 155 cfs; Mok: 0 kaf/yr, 0 cfs; 10 miles | (L) Sac: 28 kaf/yr, 155 cfs;Mok: 88 kaf/yr, 1155 cfs; 9 miles | (M+) Sac: 43 kaf/yr, 155 cfs; Mok: 0 kaf/yr, 0 cfs; 9 miles | (M) Sac: 44 kaf/yr, 155 cfs; Mok: 0 kaf/yr, 0 cfs; 24 miles | (M-) Sac: 44 kaf/yr, 155 cfs; Mok: 25 kaf/yr, 177 cfs; 24 miles |
| | 24. Hydrology and Water Quality - drainage and flooding | (H+) 0 | (M-) 3 / Use of Sac River Water (minor); Potential water qual reduction in | (M) 6 / Use of Sac River Water (minor) / 9 | (M-) 5 / Use of Sac River Water (minor); Potential water qual reduction in | (M-) 13 / Use of Sac River Water (minor); Potential water qual reduction in | (M-) 1 / Use of Sac River Water (minor); Potential water qual reduction in | (M) 4 / Use of Sac River Water (minor) / 1 | (M) 9 / Use of Sac River Water (minor) / 5 |
| | 25. Construction Impacts | (H+) 0 / 0 / 0 | (H-) 3 Crossings / 61 Driveways / 12 pipes | (M-) 3 Crossings / 137 Driveways / 24 pipes | (M) 1 Crossing / 115 Driveways / 44 pipes | (L) 2 Crossings / 194 Driveways / 83 pipes | (L-) Reservoir/ 2 Crossings / 84 Driveways / 29 pipes | (H-) Ponds/ 1 Crossing / 31 Driveways / 13 pipes | (M+) Ponds/ 1 Crossing / 105 Driveways / 31 pipes |
| Implement-ability | 26-27. Technical Feasibility | | (L) Purveyor demand | (L) Purveyor demand | (H-) Dual supply | (M+) Dual supply, Duck Ck Res | (M+) Dual supply, Duck Ck Res | (H) Percolation rates | (H-) Percolation, Injects/extract |
| | | | (M+) 2x Freeport PL tap, MokR xing | (M) Freeport PL tap, 2 MokR xing, Cal R xing | (M+) 2x Freeport PL tap, MokR xing | (M-) 2x Freeport PL tap, Duck Ck Res | (M+) Freeport PL tap, Half-size Duck Ck Res | (H-) Freeport PL tap, MokR xing | (M-) 2x Freeport PL tap, MokR xing, MokAq tap Bixler PP |
| | 28. Institutional and Permitting Issues | | (M) 15 permits / 8 approvals | (M) 15 permits / 7 approvals | (M) 15 permits / 6 approvals | (M) 15 permits / 6 approvals | (L) 16 permits / 6 approvals | (M) 14 permits / 6 approvals | (L) 15 permits / 7 approvals |
| | 29. Flexibility to Adapt to Changing Conditions | (L-) | (L+) | (M-) Jack Tone PL | (M) | (M+) Multiple sources | (M) | (M+) | (H) Flexible banking facilities; Multiple sources |
| | 30. Public Acceptance / Public Support | | (M-) | (M-) Jack Tone PL | (M+) | (M+) Duck Ck Res | (H-) Half-size Duck Ck Res | (H-) Recharge ponds | (M+) Regional Project/ Ponds |
| | 31. Land Availability | (M) Potential loss of prime recharge sites | (H-) | (M-) | (H-) | (M) Duck Ck Res | (M) Half-size Duck Ck Res | (M+) Recharge ponds | (M) |
| | 32 - 34. Equity and Community Values | | (H) Known beneficiaries | (H-) Known beneficiaries | (M+) Intermittent, distributed benefits | (M+) Intermittent, distributed benefits | (H-) Known beneficiaries | (M) Beneficiaries less defined | (M+) Beneficiaries less defined; |
| | | (L) Saline migration | (M) | (M-) | (M+) | (M+) | (M+) | (H) | (H-) |
| | | (L+) N/A | (M) | (M) | (M) | (M) | (M) | (M) | (M) |
| | Overall | (M) | (M) | (M) | (M+) | (M) | (M) | (M+) | (M+) |

# Performance Measure Weighting

| Standard | 0<br>No Action | C1<br>WTPs | C2<br>WTPs/ JTone Pipeline | G1a<br>In-Lieu | G1b<br>In-Lieu w/ Duck Ck/ MORE | G1c<br>In-Lieu w/ Duck Ck/ Freeport | G2<br>Recharge Ponds | R1<br>Regional Banking |
|---|---|---|---|---|---|---|---|---|
| Evenly Weighted x1 | M | M | M | M+ | M | M | M+ | M+ |
| Reliability/Sustainability Weighted x15 | M- | M- | M- | M+ | M+ | H- | M+ | M+ |
| Economics Weighted x36 | M- | M+ | L+ | M | M | L+ | M | M+ |
| Compatibility Weighted x19 | M | M+ | M+ | M+ | H- | M | M+ | M+ |
| Environmental Weighted x8 | H- | M | M | M | M | M | M+ | M |
| Implementalbility Weighted x9 | L+ | M | M | M+ | M | M | M+ | M+ |
| Cost & Yield (Unit Cost) x36 | M- | M | M- | M- | M | M | M+ | H- |

# Regional Banking