A Joint Study By:

U.S. Bureau of Reclamation
Mid-Pacific Region

California Department
of Water Resources

Upper San Joaquin River Basin Storage Investigation

Public Workshop

California Bay-Delta Authority

July 15, 2004

Meeting Objectives

- Review Investigation Approaches
  - Review of Phase 1
  - Public, Agency, Stakeholder Involvement
  - Alternatives Formulation
- Update on Analysis of Storage Options
- Discuss Development of Operational Scenarios

Agenda

- Welcome and Introductions
- Investigation Overview
- Conjunctive Management / Groundwater Storage
- Surface Storage Option Screening
- Hydropower Considerations
- Flood Damage Reduction Evaluation
- Development of Operational Scenarios
- Next Steps

Participation Principles

- **Participate** – Attend the workshops
- **Learn** – Learn about resources, people, roles, and process
- **Represent** – Bring issues and interests forward from others whose interests you share
- **Cooperate** – Work with others in the workshops to share information and consider options
- **Educate** – Report back to others who share your interests

Workshop Ground Rules

- Commit to Being Fully Present
  - No cell phones, pagers, voicemail, etc.
  - Ask for what you need from the meeting process and participants
- Honor Our Time Limits
  - Keep comments and discussion concise
  - Stay focused on the topic – Use the parking lot for other issues
- Respect Each Other
  - Listen carefully to other participants
  - Respond to ideas and issues, not individuals
- Support Constructive Discussion
  - Suggest improvements and solutions
  - Build on others' ideas – Use "and" instead of "but"

Agenda

Welcome and Introductions

Investigation Overview

Conjunctive Management / Groundwater Storage

Surface Storage Option Screening

Hydropower Considerations

Flood Damage Reduction Evaluation

Development of Operational Scenarios

Next Steps

Investigation Overview

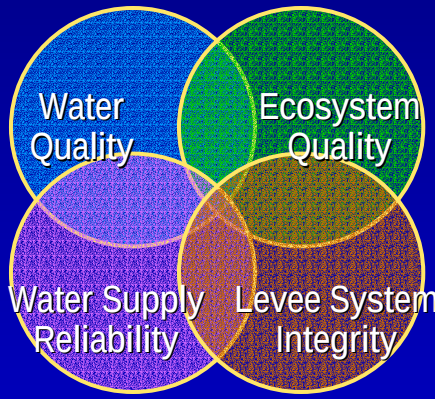
- Phase 1 Summary
  - Approach
  - Findings
- Feasibility Study and EIS/EIR
  - Summary of public scoping
  - Agency and stakeholder involvement
  - Alternatives formulation overview

CALFED Bay-Delta Program Goals

"Develop a long-term comprehensive plan that will restore ecological health and improve water management for beneficial uses of the Bay-Delta system."

CALFED Programs to Meet Inter-Related Objectives

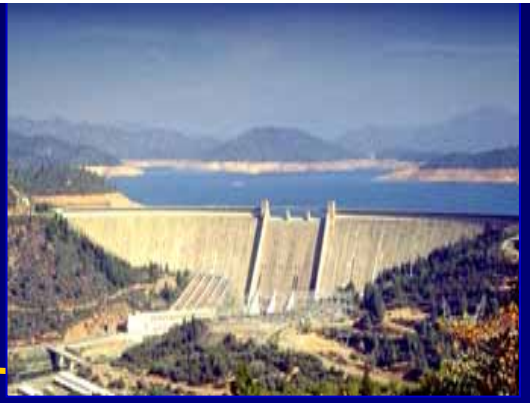
- Ecosystem Restoration
- Water Quality
- Watershed Management
- Delta Levee Integrity



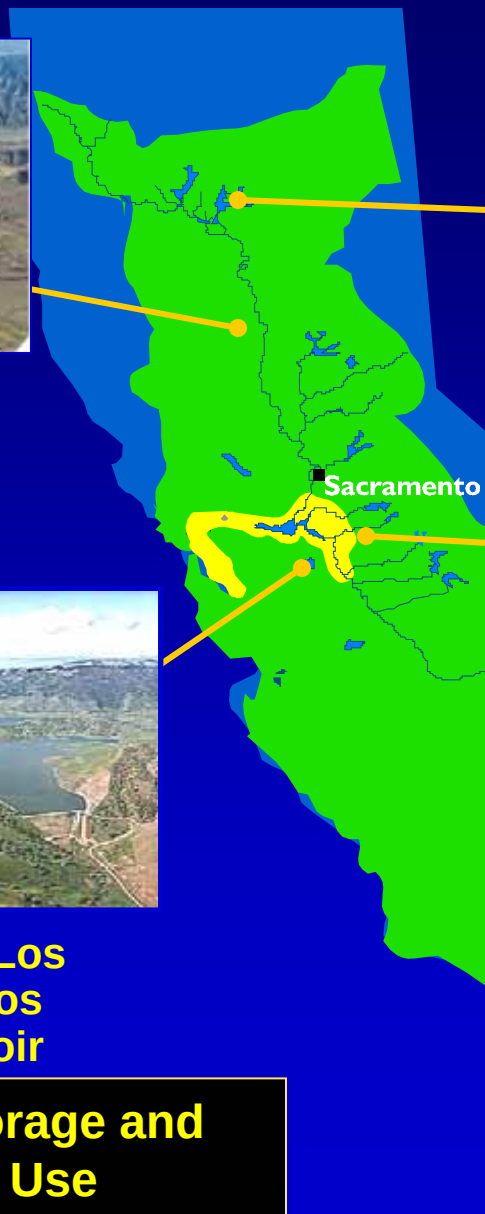
- Water Use Efficiency
- Conveyance
- Storage
- Water Transfers

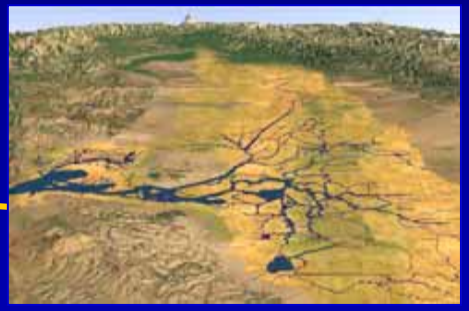
CALFED Storage Program

North of Delta Off-Stream Storage



Raise Shasta Dam





In-Delta Storage

Expand Los Vaqueros Reservoir

Upper San Joaquin River Basin Storage

Groundwater Storage and Conjunctive Use

(1 Million acre-feet)

Upper San Joaquin River Basin Storage Investigation
Area of Influence

- San Joaquin River
  - Friant to Merced River
  - Merced River to Delta
- Eastern San Joaquin Valley
  - CVP Friant Division
  - Groundwater basin
- South of Delta Service Area

Objectives for Upper San Joaquin Storage

Enlarge Millerton Lake by 250 to 700 TAF

OR

Develop a functionally equivalent program to store San Joaquin River flow

- Contribute to restoration of the San Joaquin River
- Improve water quality of the San Joaquin River
- Facilitate conjunctive water management and exchanges that improve urban water quality

Other Potential Benefits of Additional Storage

- Flood protection below Friant Dam
- Hydropower generation
- Recreation

Phase 1 Planning Approach

CALFED Agencies
Planning Team
Stakeholders

Plan Formulation Strategy

Planning Process

- Phase I Study Purpose → Problems and Opportunities

Operations Studies

- Modeling Tools and Assumptions → Initial Evaluations

Surface Storage Options

- Initial Options Screening → Options Modeling

Conjunctive Management Options

- Evaluate Theoretical Opportunities → Begin CM Formulation

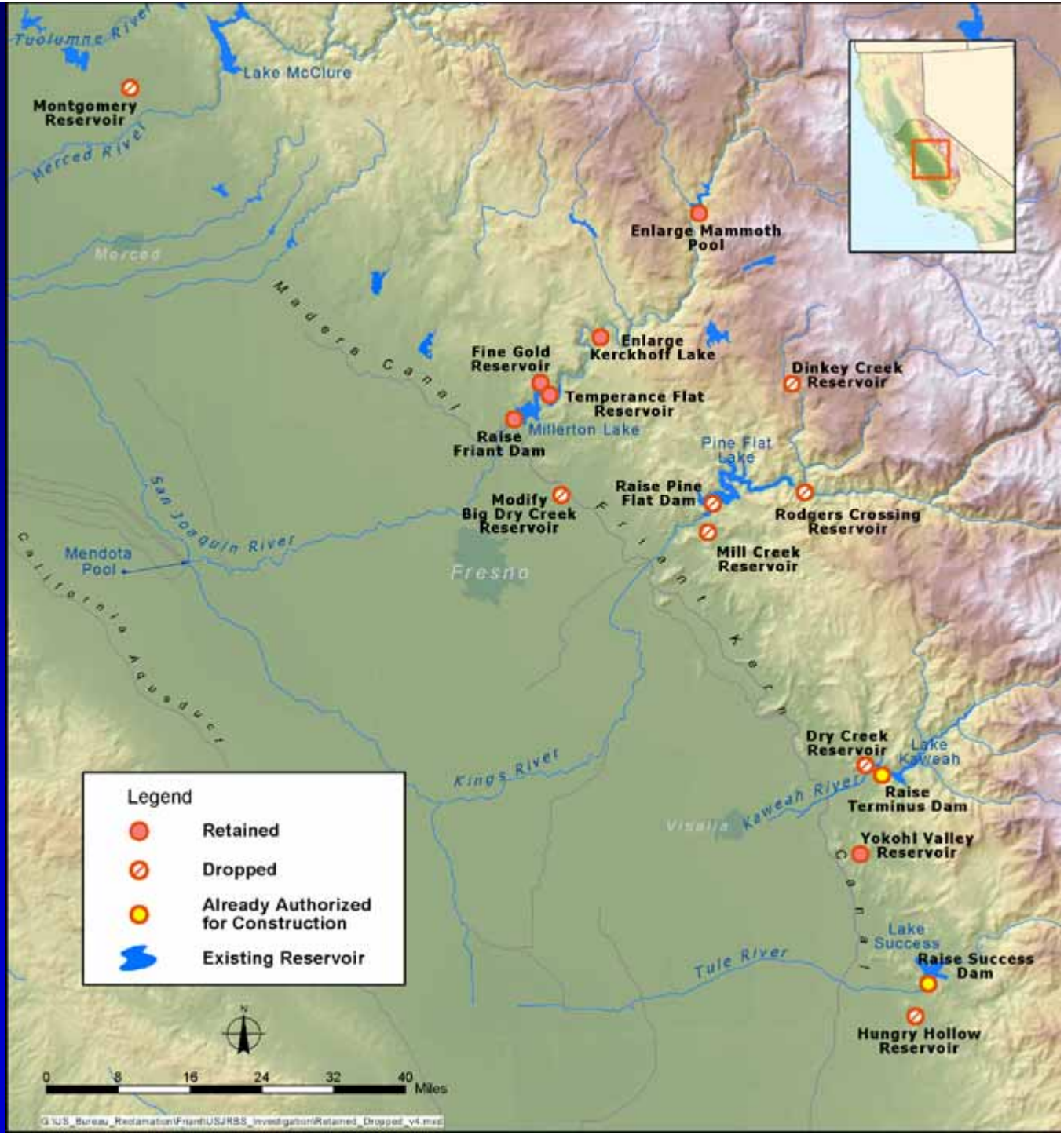
Options Carried Forward → Model Refinement / Cost Estimates → Phase 1 Report

Key Findings from Phase 1

- Six surface storage options will be studied further
  - Preliminary engineering, environmental, and hydrologic studies show that potential sites may be viable
  - Costs are within range of other projects under consideration elsewhere in California
- Additional water supply in the upper San Joaquin River basin could be developed with additional storage for:
  - River restoration
  - River water quality
  - Water supply reliability
- Public support for continued study of storage is strong
- Regional interest in conjunctive management is high

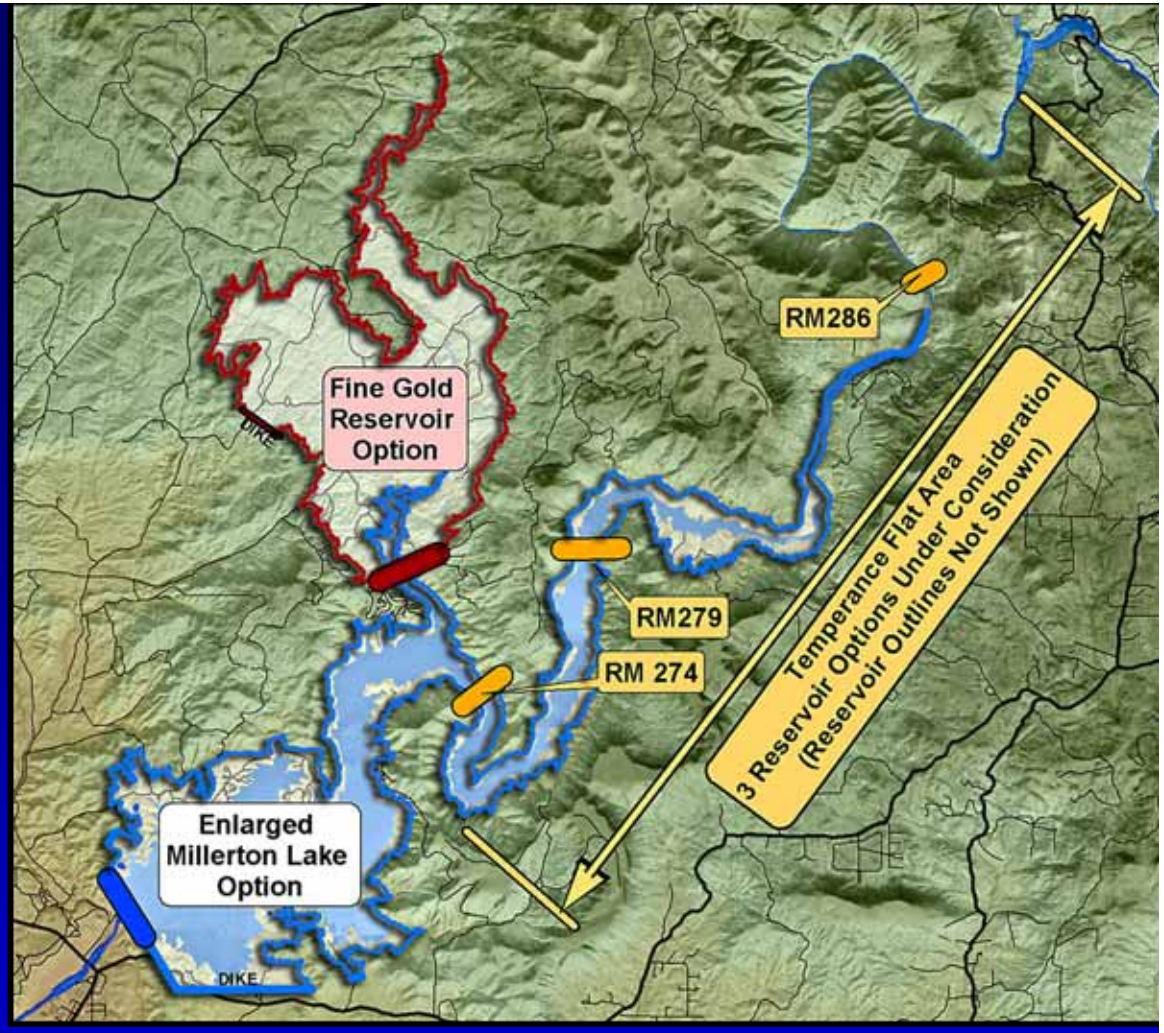
Initial Screening of Surface Storage Options

- 17 sites identified
- 2 sites already authorized for construction
- 8 sites dropped
- 7 sites retained

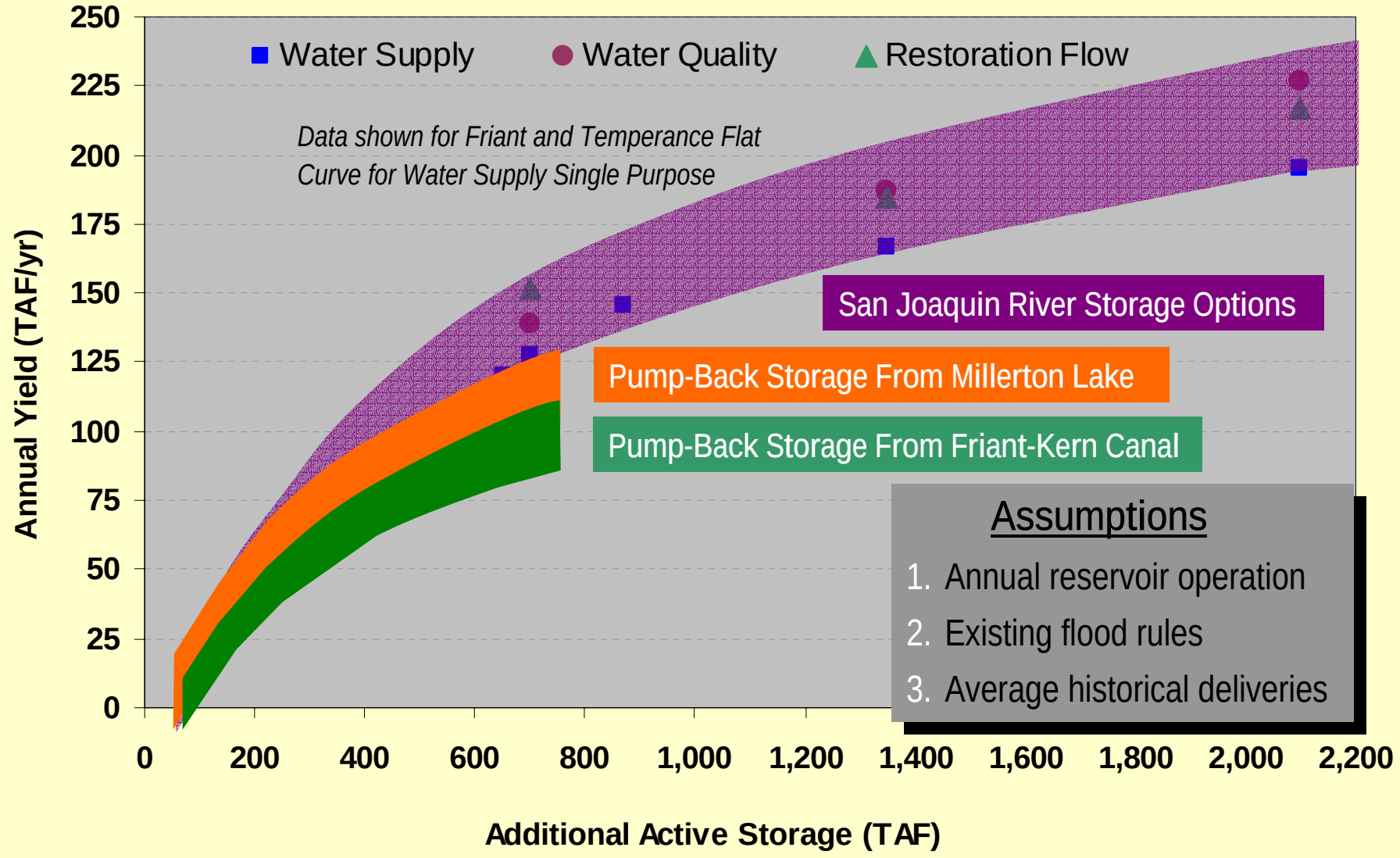


Retained Surface Storage Options

- San Joaquin River
  - Raise Friant Dam
  - Temperance Flat
    - RM274
    - RM279
    - RM286
  - Mammoth Pool
- Off-stream
  - Fine Gold Creek
  - Yokohl Valley



Water Supply From Additional Surface Storage



Groundwater Storage and Conjunctive Management

- Theoretical Analysis
  - Additional conjunctive management is possible
- Stakeholder Interviews
  - Friant and non-Friant contractors
  - Interest in regional conjunctive management
  - No specific projects were identified for inclusion
  - Many stated that institutional barriers limit opportunities

Investigation Overview

- Phase 1 Summary
  - Approach
  - Findings
- Feasibility Study and EIS/EIR
  - Summary of public scoping
  - Agency and stakeholder involvement
  - Alternatives formulation overview

Summary of Scoping Process

- NOI / NOP - January 2004
- Public scoping meetings - March 2004
  - Sacramento
  - Modesto
  - Friant area
  - Visalia
- Comments on flip charts and deposited cards
- Comment period closed April 16, 2004

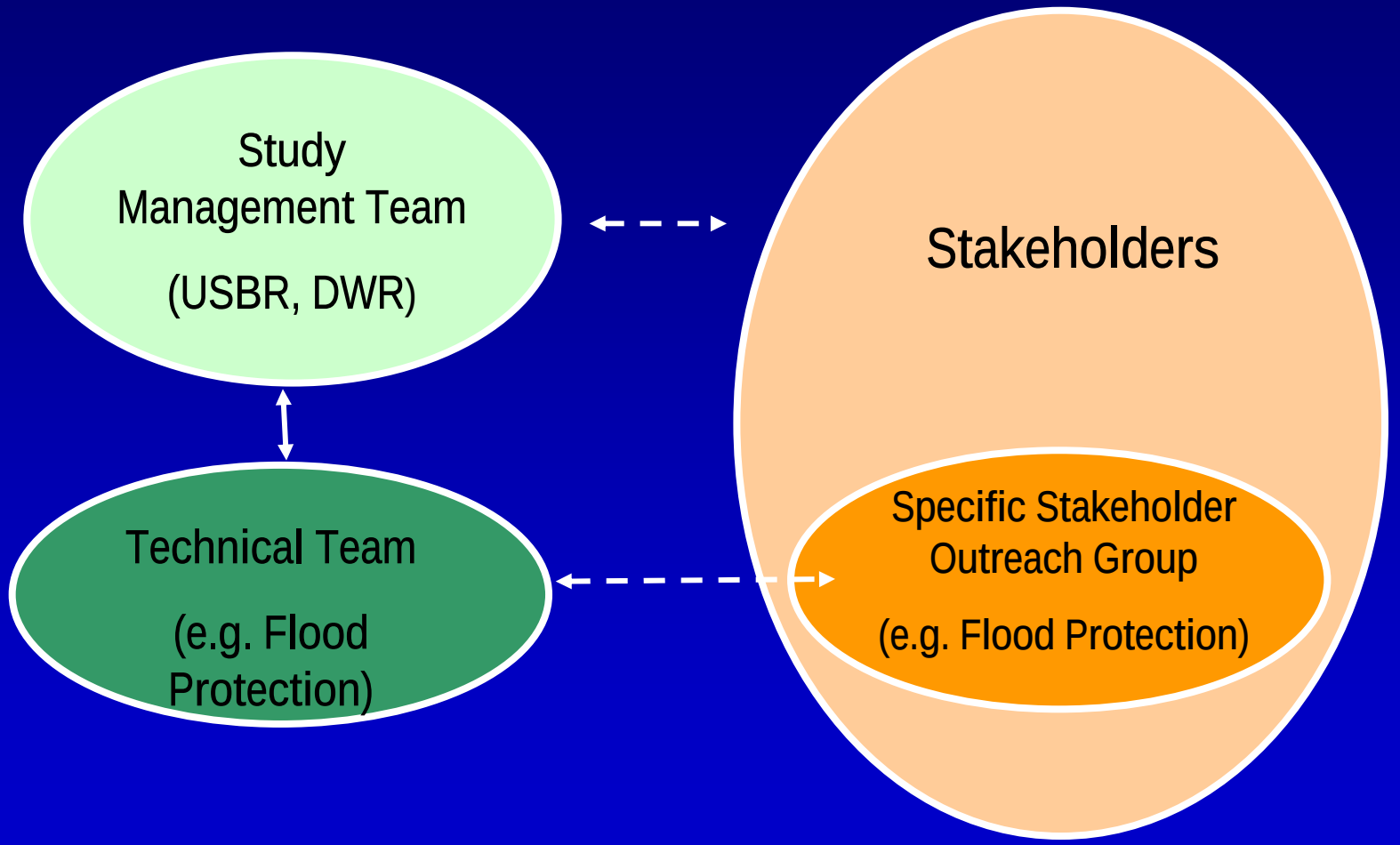
Summary of Scoping Comments

- Primary areas of interest
  - Project purposes and beneficiaries
  - Range and formulation of alternatives
  - Affected resources
  - Additional storage options
- Scoping report being prepared

Cooperating Agencies

Federal	State of California	Local or Regional
• BLM • Forest Service • Western Area Power Administration • NOAA Fisheries • BIA • USEPA • USACE • USFWS	• State Water Resources Control Board • Department of Fish and Game • The Reclamation Board • Dept of Food and Agriculture	• Friant Water Authority • San Joaquin River Exchange Contractors Water Authority • San Luis and Delta Mendota Water Authority • Madera-Chowchilla Water & Power Authority

Stakeholder and Agency Involvement



Alternatives Formulation Overview

- Screen Storage Options
- Develop Operational Scenarios
- Define Alternatives
- Determine Benefits and Costs
- Evaluate Initial Alternatives
- Define Final Alternatives
- Conduct Impact Analysis
- Evaluate Final Alternatives
- Recommend Preferred Alternative

Alternatives Report

Plan Formulation Report

Draft FR/ EIS/EIR

Final FR/ EIS/EIR

Schedule

- Alternatives Report - Fall 2004
- Plan Formulation Report - Fall 2005
- Draft EIS/EIR - Fall 2007
- Final EIS/EIR - Fall 2008
- ROD - Early 2009

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Conjunctive Management / Groundwater Storage Evaluation

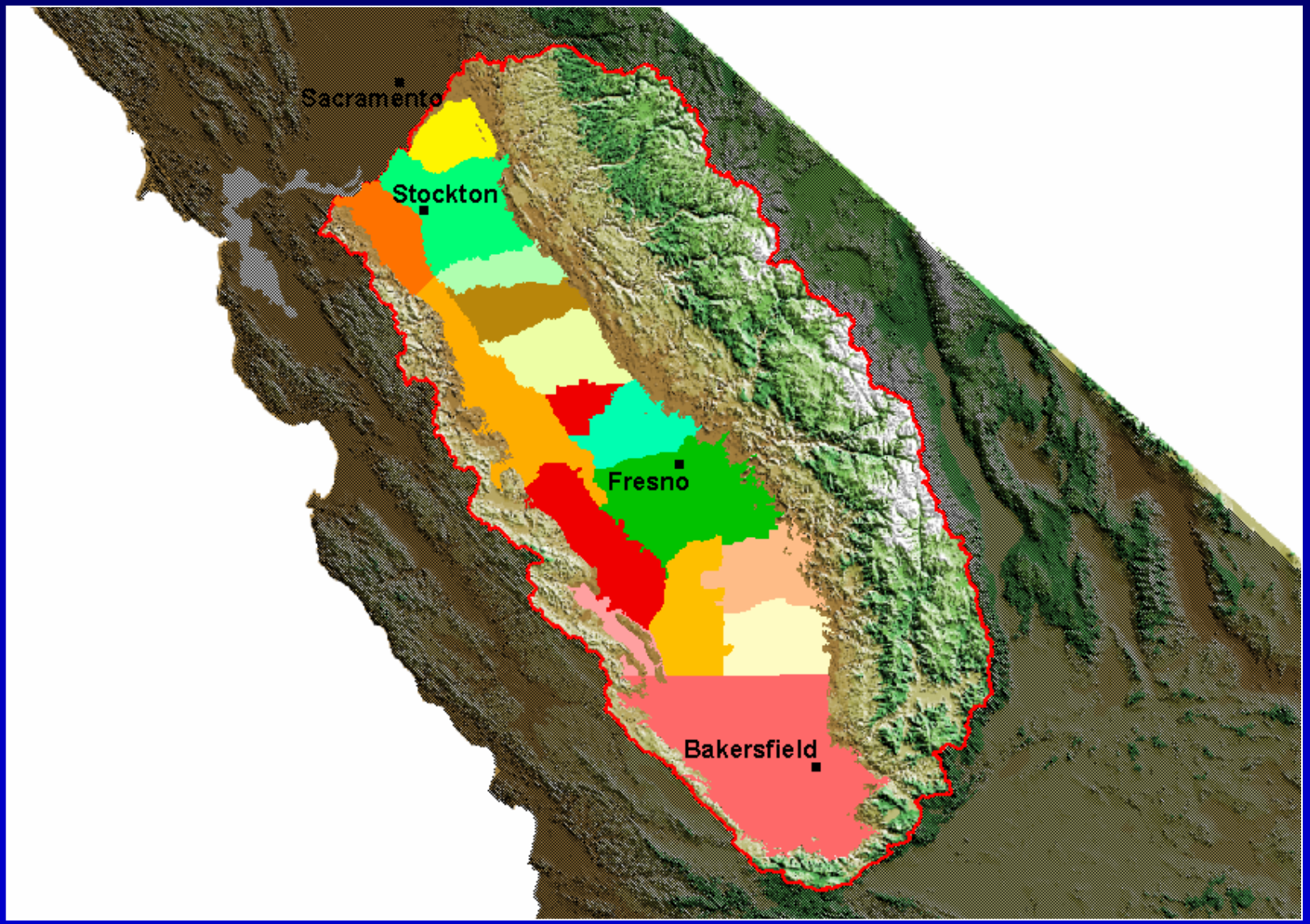
Purpose:

To identify and evaluate locally supported groundwater options that can contribute to ecosystem restoration, water supply reliability, and water quality improvements

Scope:

Regional groundwater evaluation of the San Joaquin and Tulare Lake Hydrologic Regions, including projects and programs that complement the USJRB storage investigation

Study Area with Groundwater Basins



Summary of Findings to Date (1)

- Local agencies have recently developed or expanded numerous conjunctive use projects
- The cumulative benefits of these projects to the region have not been evaluated
- Additional opportunities exist in the region to develop conjunctive management programs
- In most cases, additional facilities or modified operations will be required

Summary of Findings to Date (2)

- Groundwater programs can be enhanced by new surface storage
- Most stakeholders support and have interest in developing new groundwater projects
- Continued local control and assurances are crucial
- Economics and potential impacts need to be better understood

Conjunctive Management / Groundwater Storage Next Steps and Schedule

Complete ongoing stakeholder interviews	Late Summer 2004
Follow-up mtgs & formulate opportunities	Fall 2004
Opportunities Report	Early 2005
Technical evaluations & modeling	Thru Summer 2005
Groundwater workshop(s)	Spring 2005
Alternatives Report	Fall 2005

Potential Projects

- Expansion of existing groundwater banks
- Reservoir reoperation
- New groundwater storage facilities
- In lieu programs
- Conveyance improvements
- Combinations of the above
- Above with new surface storage

Items To Be Evaluated

- Regional yield
- Yield at Friant
- Institutional and legal issues
- Required facilities
- Potential benefits
- Cost
- Other

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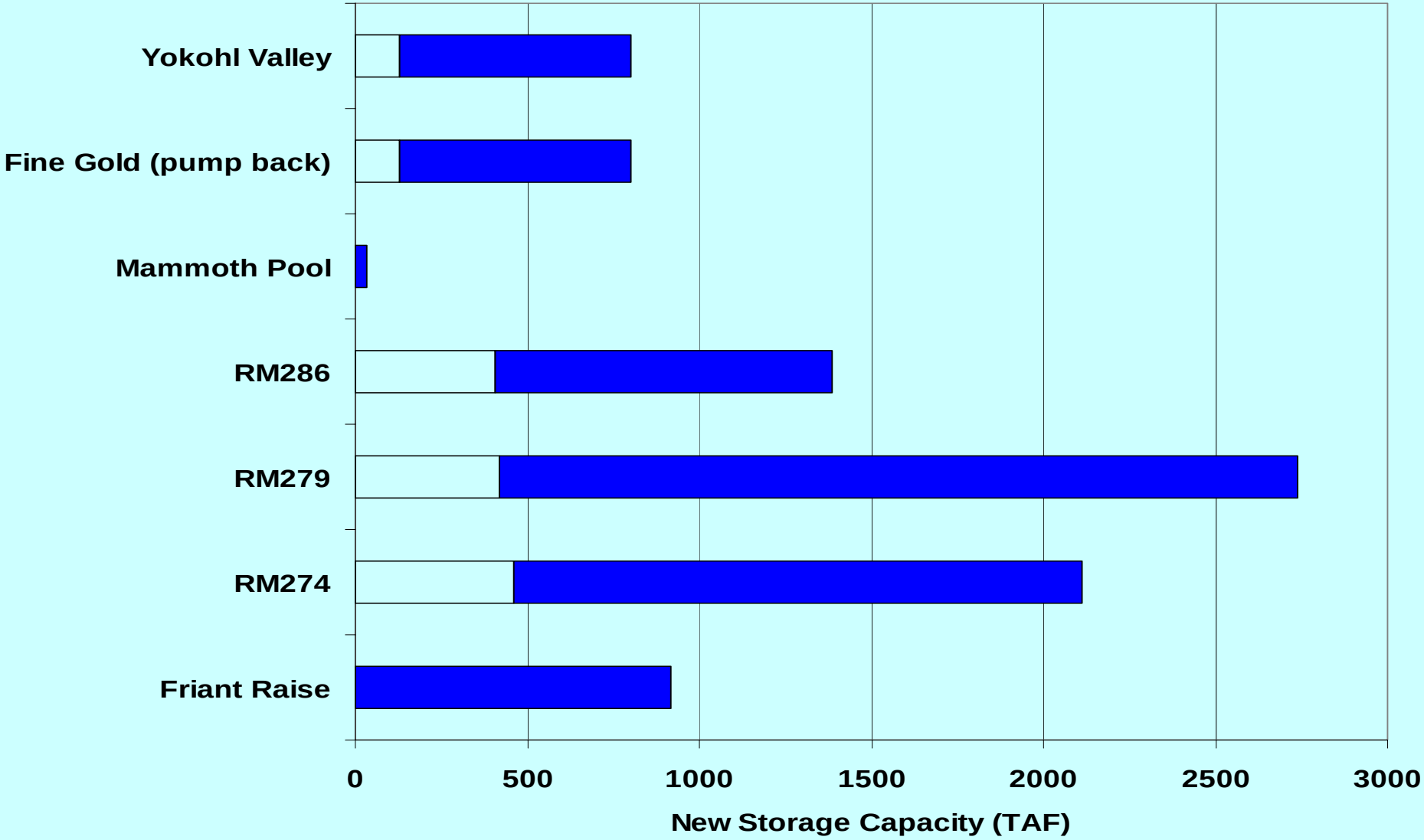
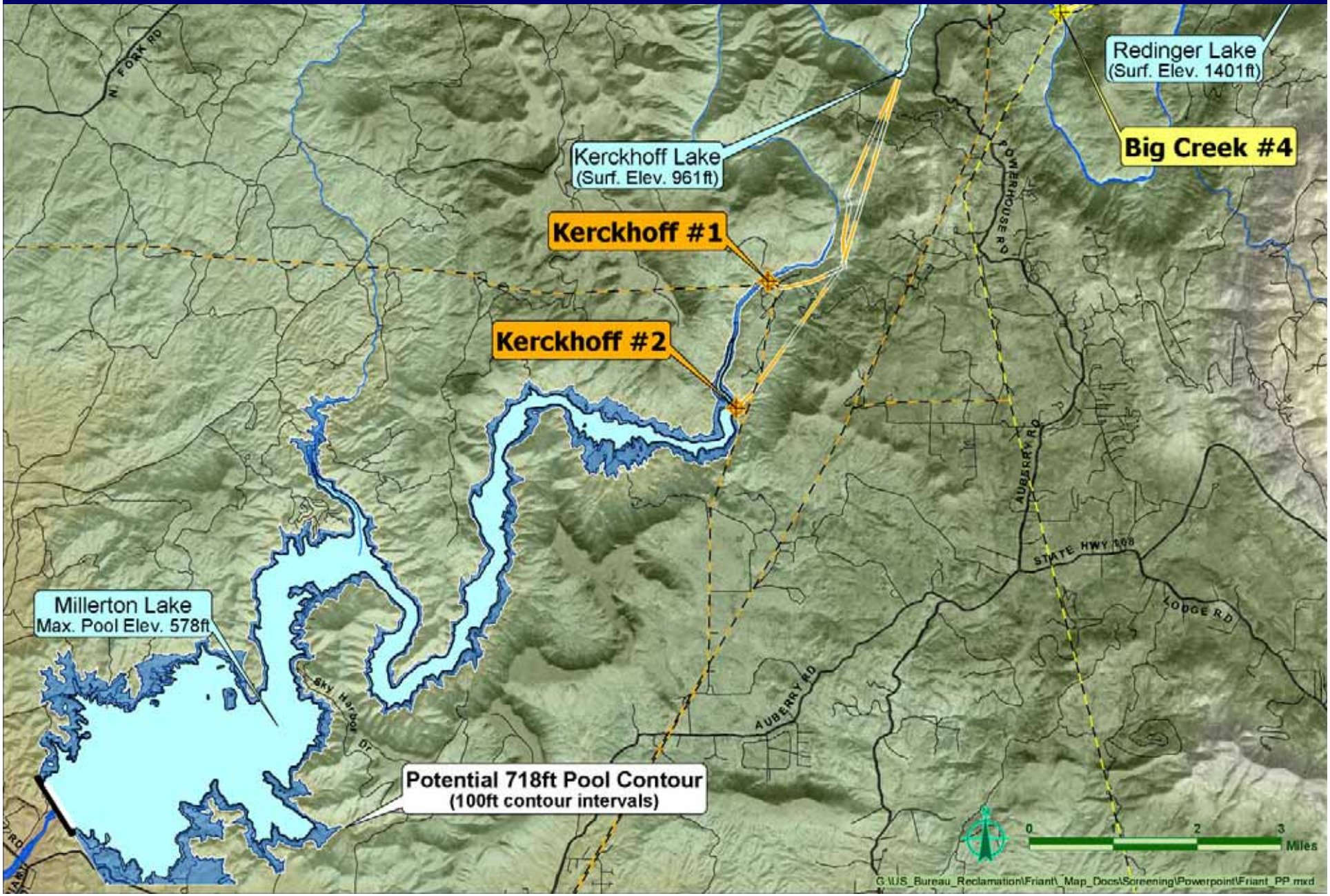
Surface Storage Options Screening Approach

- Begin with options retained from Phase 1
- Narrow range of sizes at potential reservoir sites
  - Hydropower impacts and generation
  - Environmental considerations
  - Cost
- Compare retained options
- Select reservoir options for initial alternatives

Surface Storage Options Retained from Phase 1: Range of Potential New Storage Considered

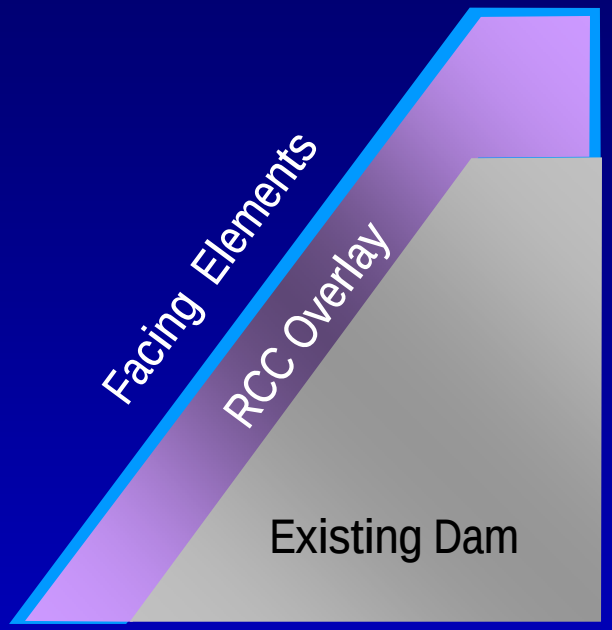


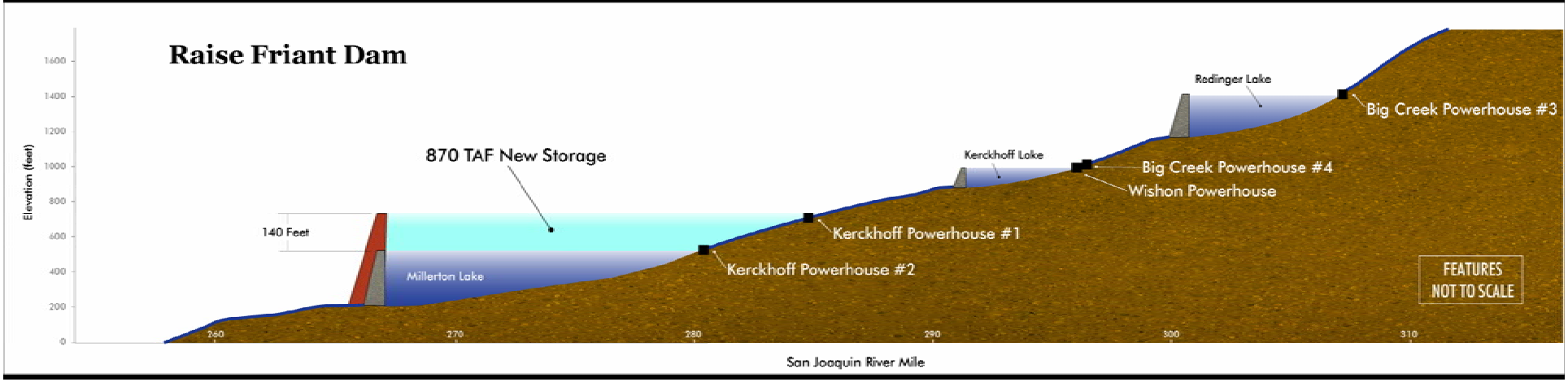
Raise Friant Dam



Raise Friant Dam

- Raise up to 140 feet
- Concrete overlay on main dam
- Embankments
- No construction in reservoir



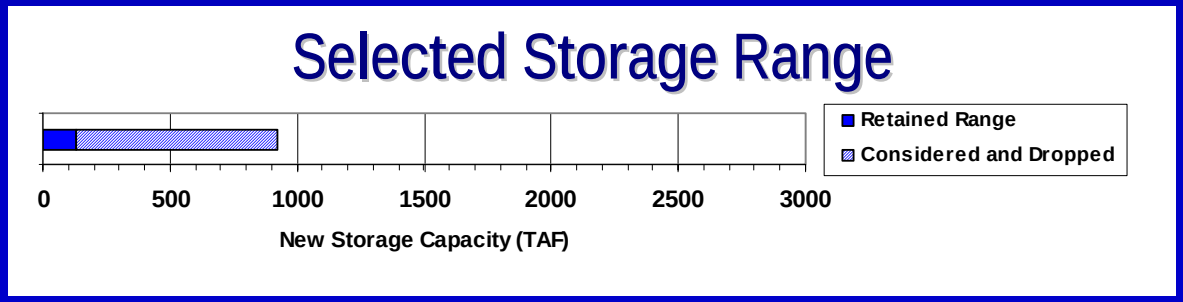


Raise Friant Issues

- Potential impacts to Kerckhoff Power Project
- Millerton Lake area residences
- Recreational facilities
- Dike construction requirements
- Environmental impacts

Narrowed Range of Storage Sizes
Raise Friant Dam

- Upper Limit defined by elevation of Kerckhoff No. 2 (+130 TAF)
  - 25 ft raise
  - Gross pool elevation 603 ft
  - Kerckhoff Power Project would remain functional
  - Maximum raise without flooding Kerckhoff No. 2 Powerhouse
- Lower Limit not considered



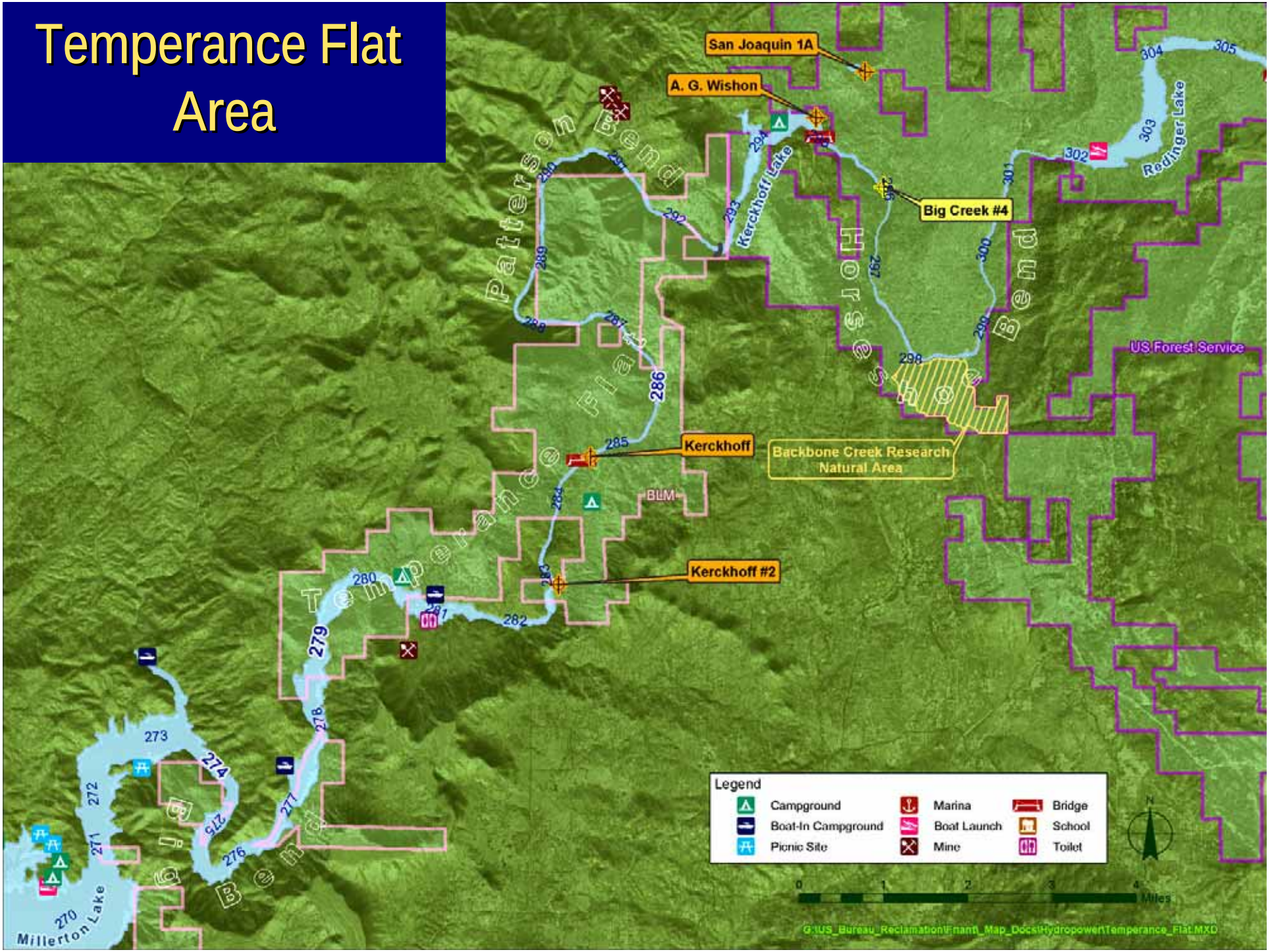
Temperance Flat Dam Site Options

RM 274

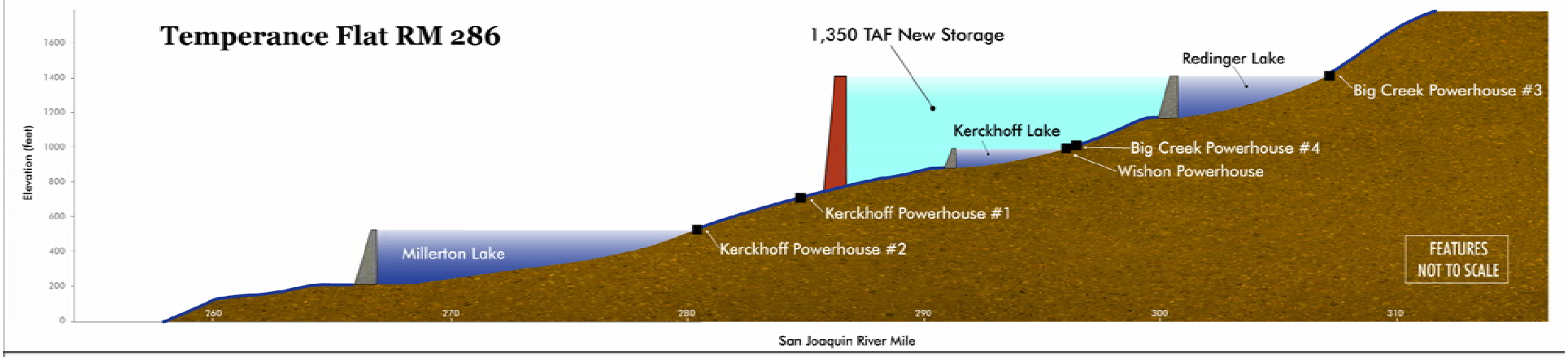
RM 279

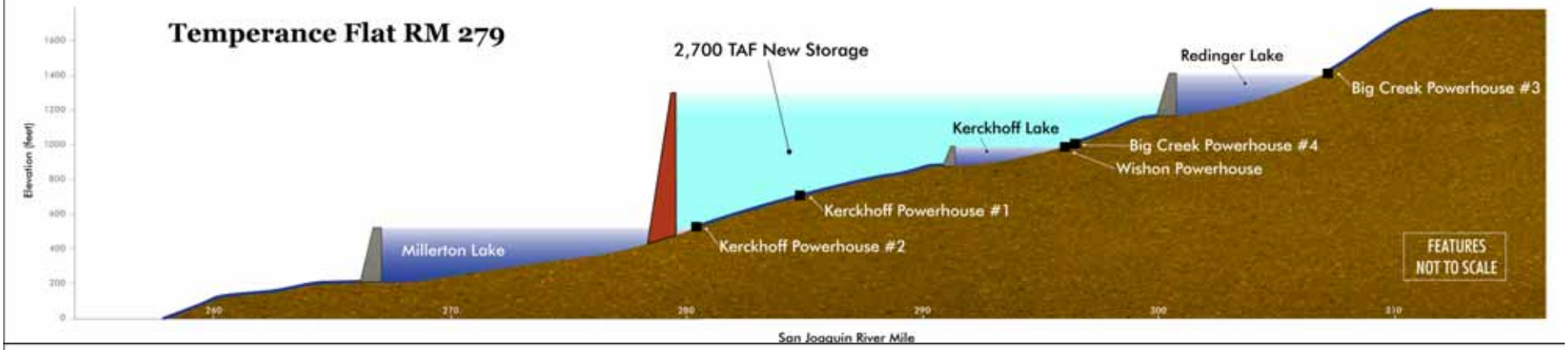
RM 286

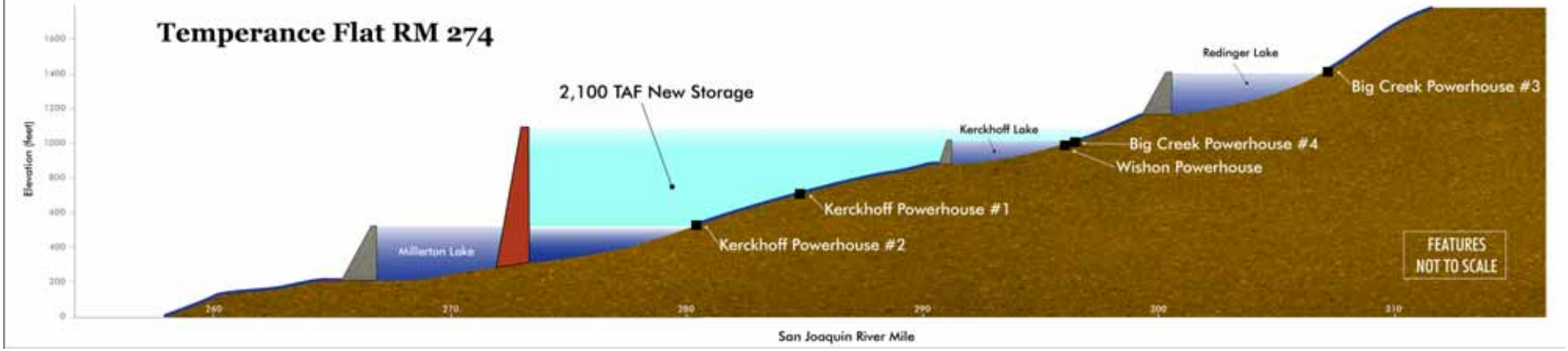
Temperance Flat Area



Temperance Flat Reservoir Options



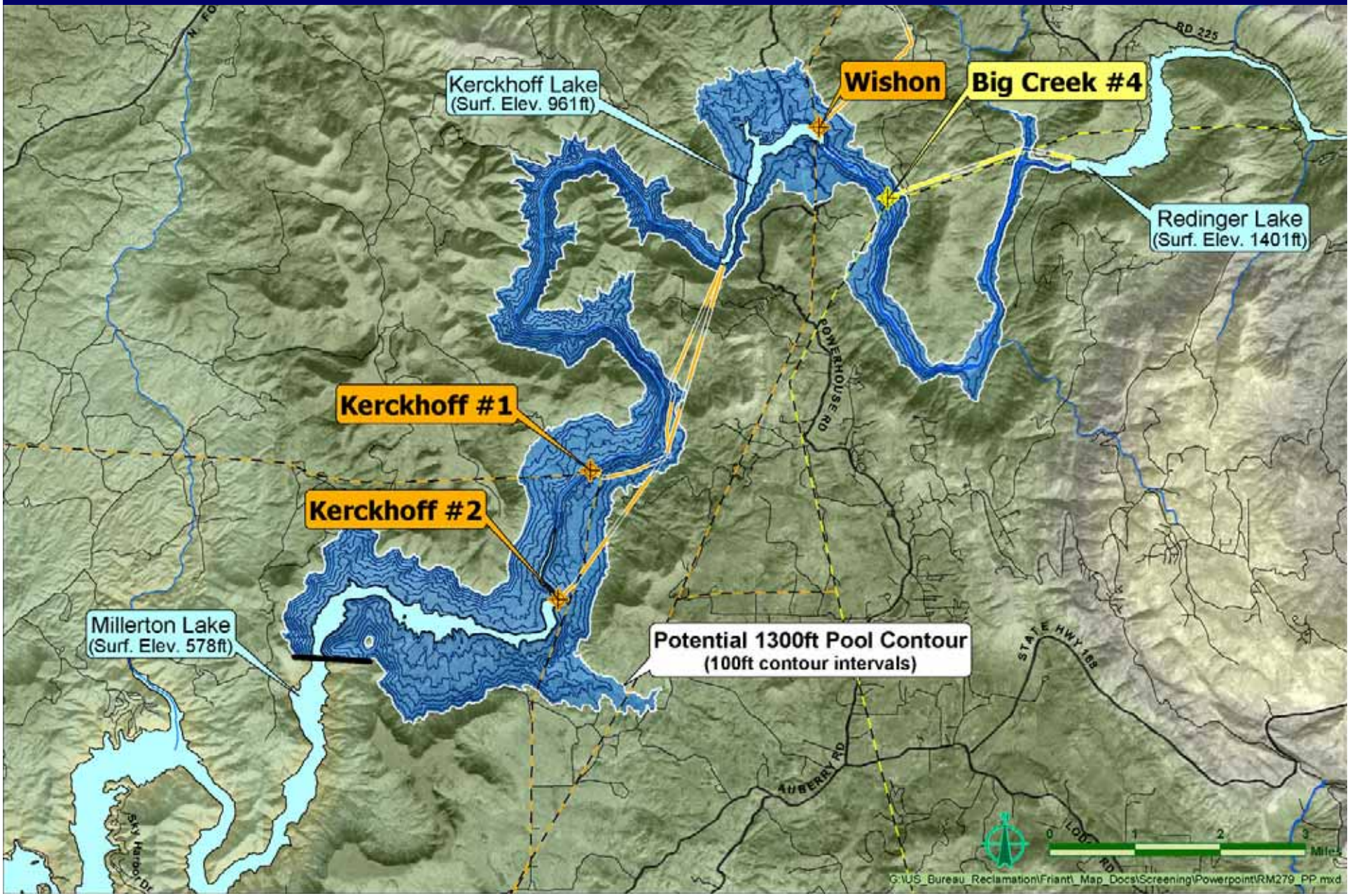




Temperance Flat Reservoir Issues

- Potential impacts to existing hydropower facilities
  - Reduced generation
  - Inundation
- Potential for replacement and new hydropower generation
- Environmental resources in SJR reaches
  - Big Bend
  - Temperance Flat
  - Patterson Bend
  - Horseshoe Bend

RM 279


Kerckhoff Lake
(Surf. Elev. 961ft)
Wishon
Big Creek #4
Redinger Lake
(Surf. Elev. 1401ft)
Kerckhoff #1
Kerckhoff #2
Millerton Lake
(Surf. Elev. 578ft)
Potential 1300ft Pool Contour
(100ft contour intervals)
POWERHOUSE RD
AUBERRY RD
STATE HWY 168
RD 225
Miles
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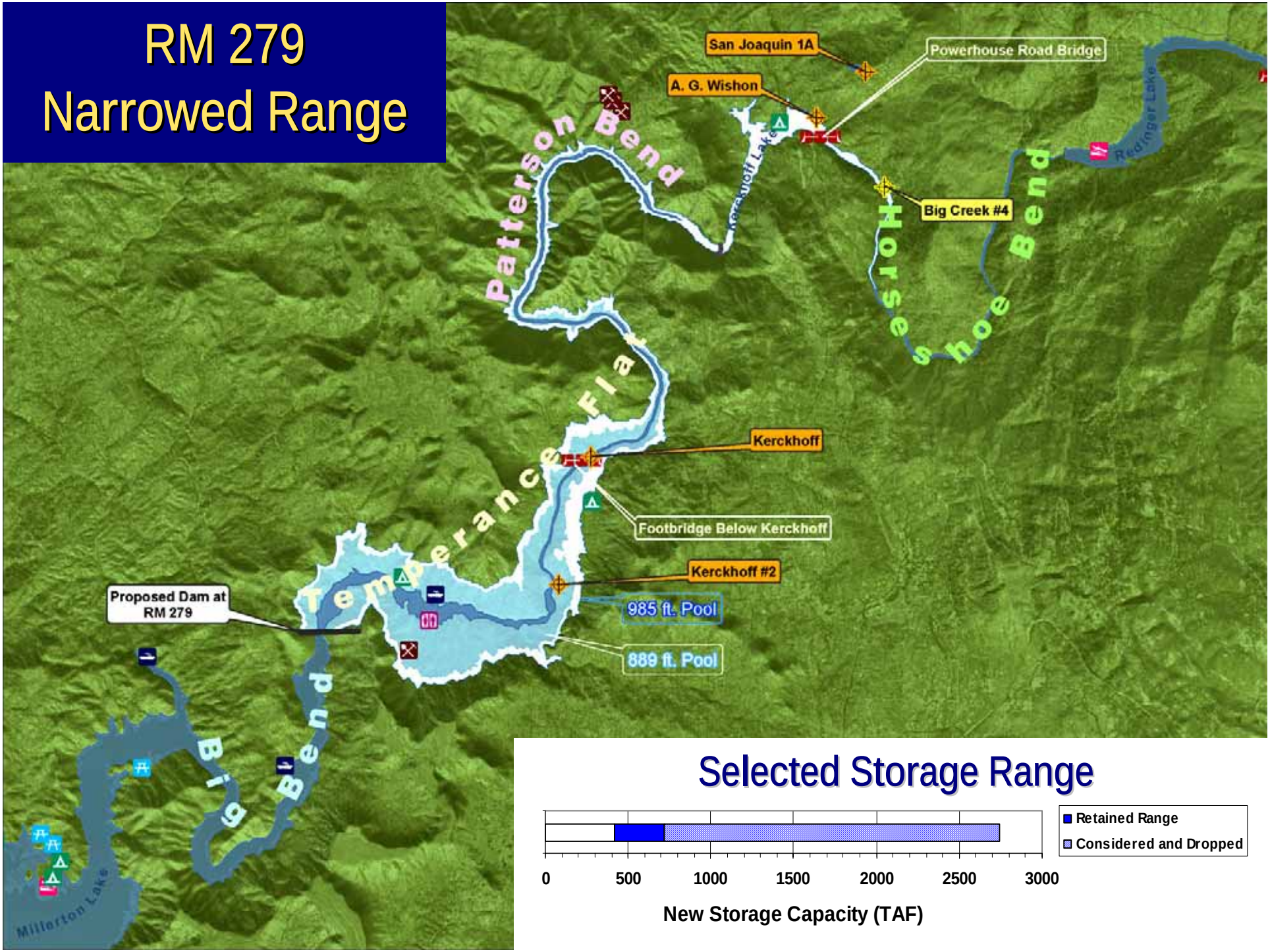
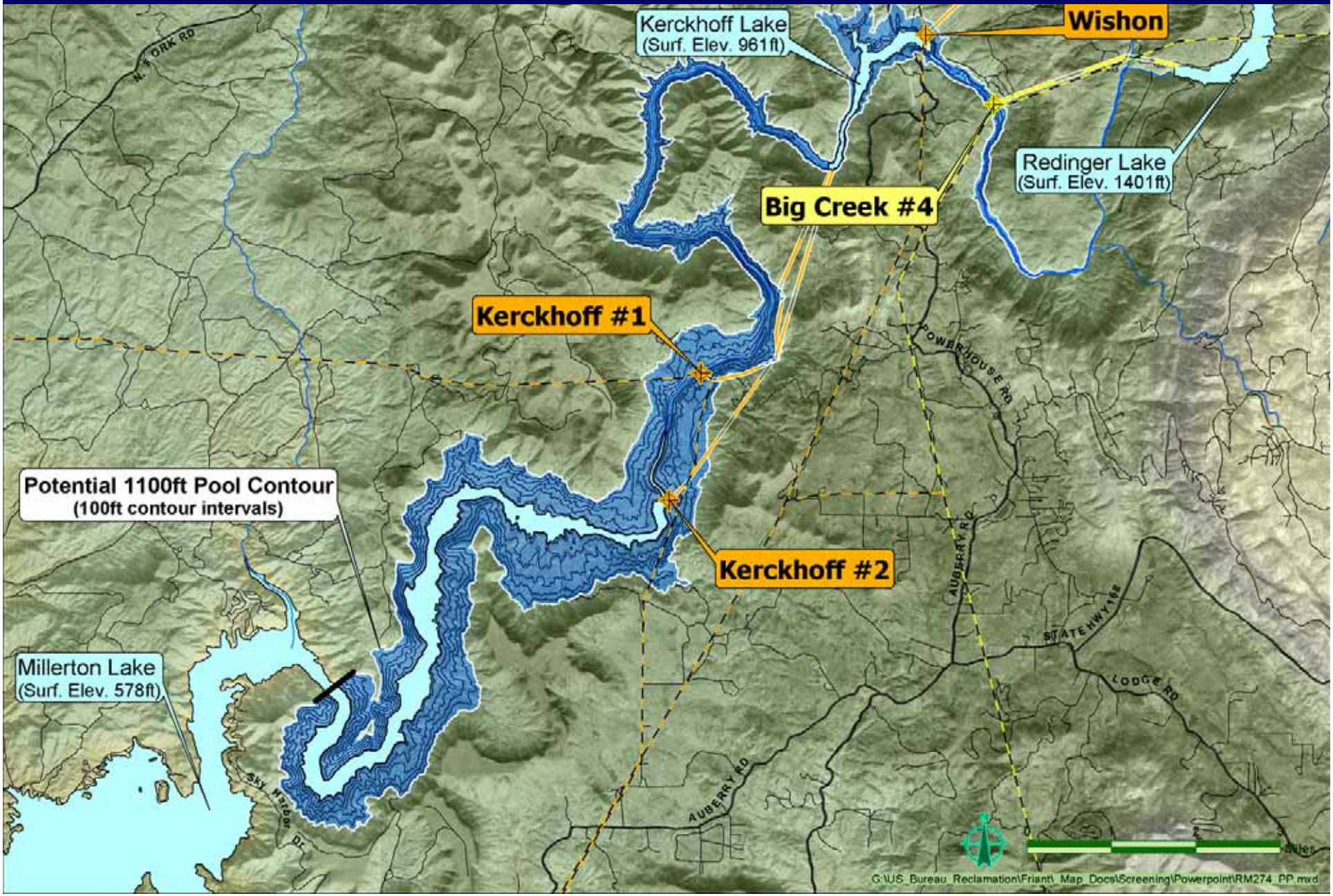
Narrowed Range of Storage Sizes
Temperance Flat - RM 279

- Upper Limit defined by elevation of Kerckhoff Lake (720 TAF)
  - Higher elevation would inundate Powerhouse Rd Bridge, Big Creek No. 4, and Wishon Powerhouses
  - RM 274 site would support larger storage capacities with similar impacts to Temperance Flat area
- Lower Limit defined by Base of Kerckhoff Dam (420 TAF)
  - Smaller sizes would have similar environmental and power impacts and costs

RM 279 Narrowed Range



RM 274


Kerckhoff Lake
(Surf. Elev. 961ft)
Wishon
Redinger Lake
(Surf. Elev. 1401ft)
Big Creek #4
Kerckhoff #1
Kerckhoff #2
Potential 1100ft Pool Contour
(100ft contour intervals)
Millerton Lake
(Surf. Elev. 578ft)
N. FORK RD
POWERHOUSE RD
AUBERRY RD
STATE HWY 168
LODGE RD
Sky Harbor Dr.
Miles
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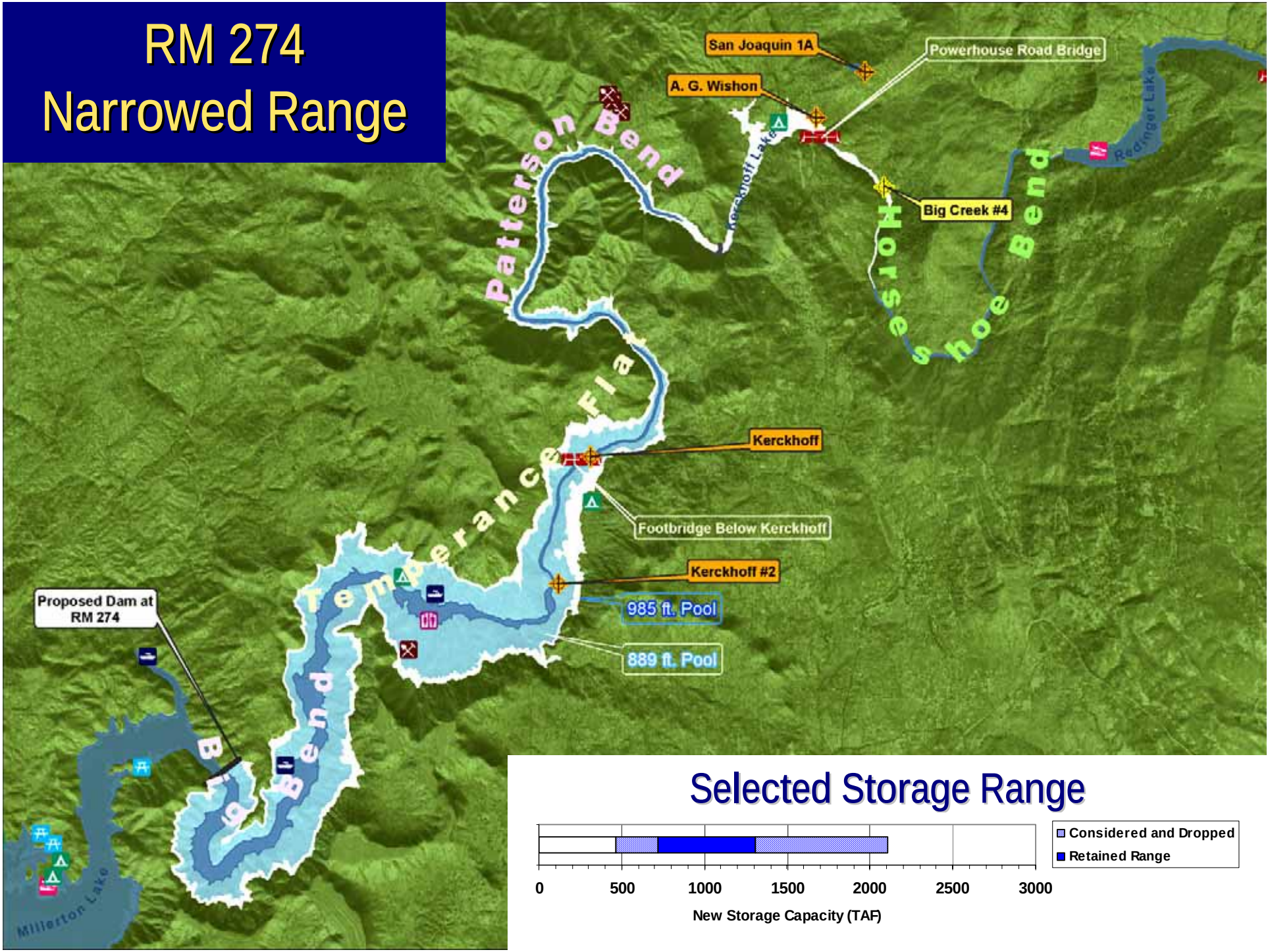
Narrowed Range of Storage Sizes
Temperance Flat - RM 274

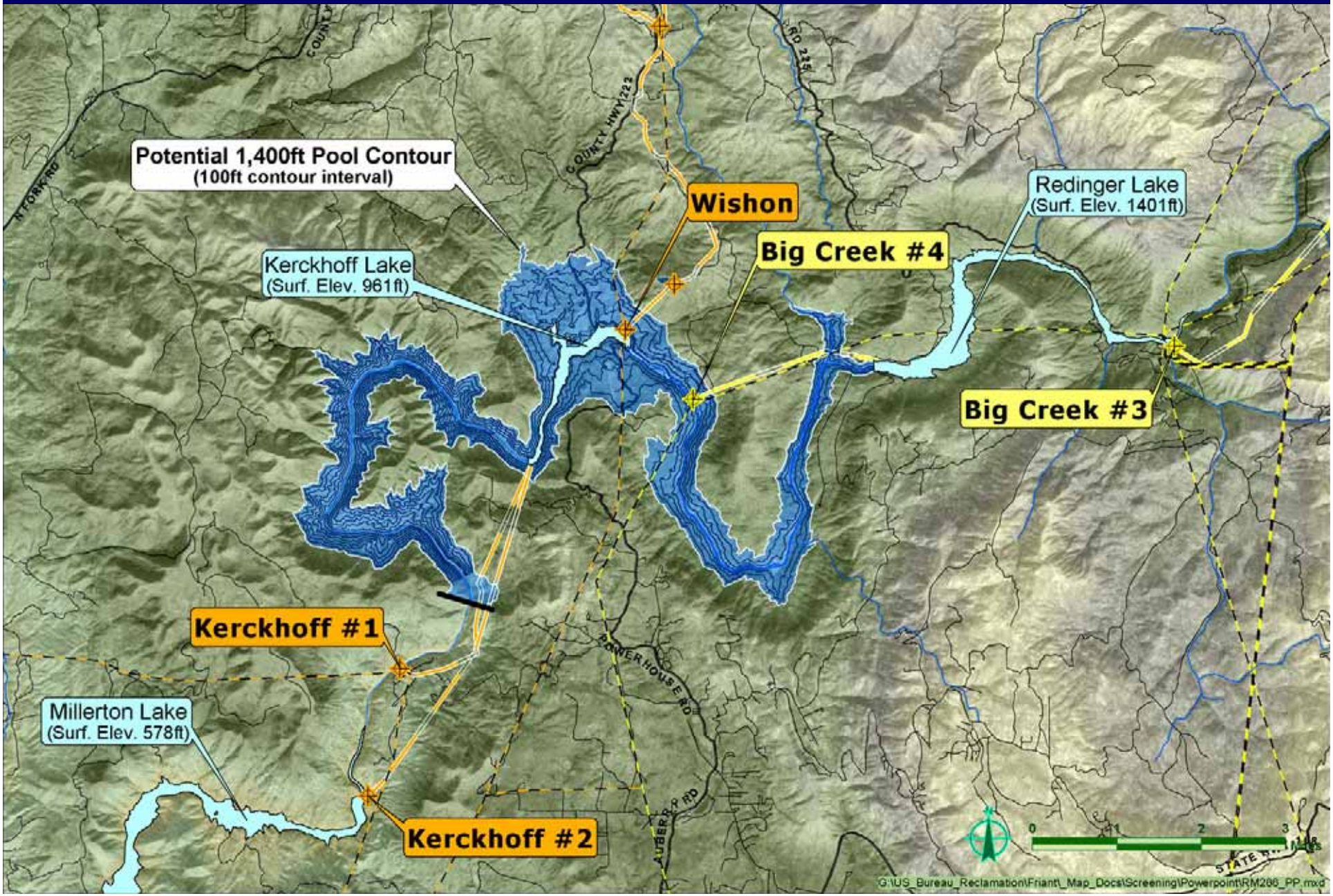
- Upper Limit defined by elevation of Kerckhoff Lake (1,300 TAF)
  - Higher elevation would inundate Powerhouse Road Bridge, Big Creek No. 4, and Wishon Powerhouses
- Lower Limit defined by maximum size of RM 279 option (720 TAF)
  - Smaller sizes would have
    - Greater impacts to Millerton Lake than RM 279 option at similar size
    - Similar impacts to Temperance Flat and Patterson Bend
    - Higher replacement energy costs than RM 279 option at similar size

RM 274 Narrowed Range



Selected Storage Range

RM 286


Potential 1,400ft Pool Contour
(100ft contour interval)
Wishon
Big Creek #4
Redinger Lake
(Surf. Elev. 1401ft)
Kerckhoff Lake
(Surf. Elev. 961ft)
Big Creek #3
Kerckhoff #1
Millerton Lake
(Surf. Elev. 578ft)
Kerckhoff #2
POWER HOUSE RD
AUBERRY RD
N FORK RD
COUNTY HWY 222
RD 225
0
1
2
3
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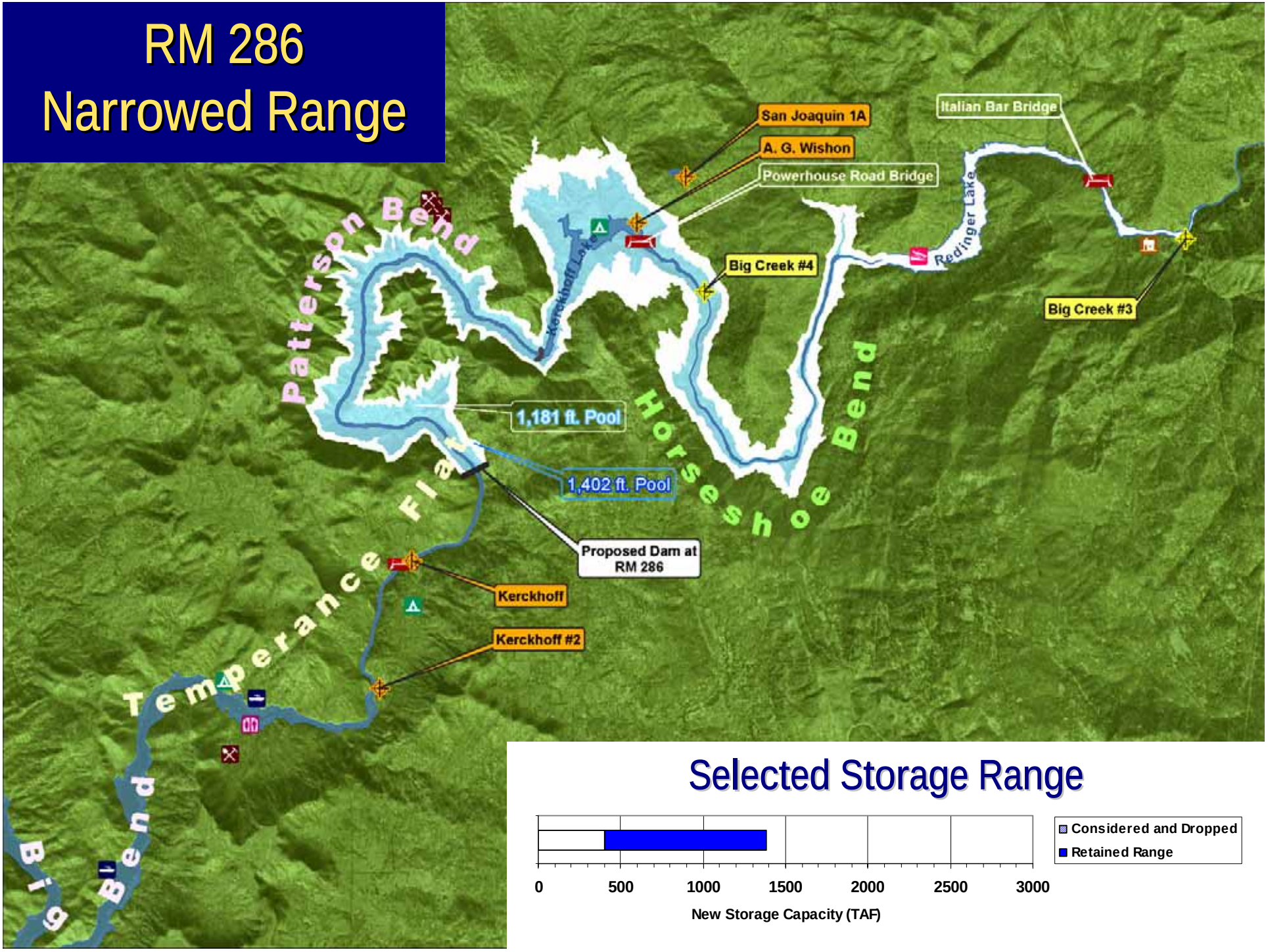
Narrowed Range of Storage Sizes
Temperance Flat - RM 286

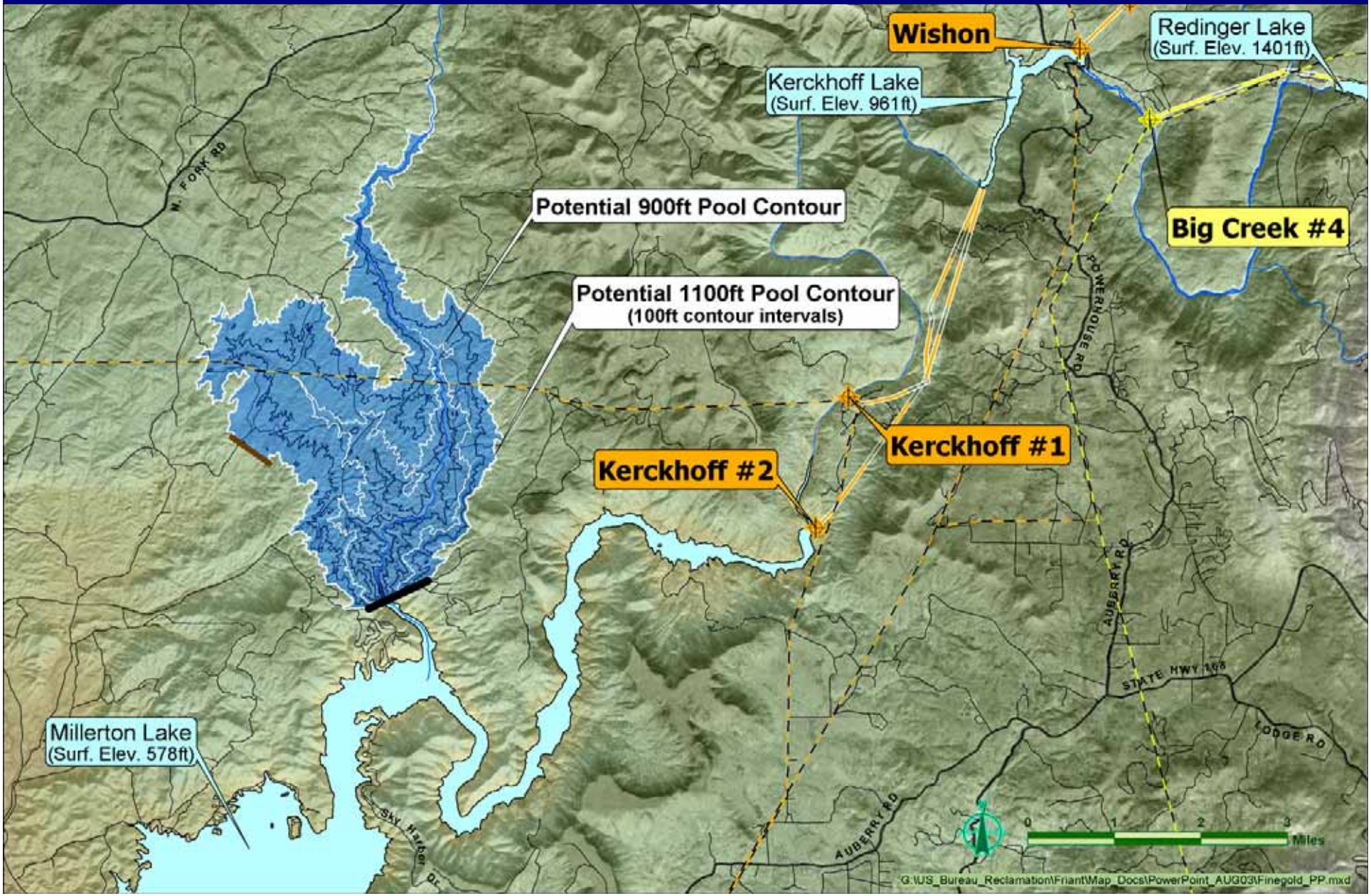
- Upper Limit defined by elevation of Redinger Lake (1,390 TAF)
  - Higher elevations would inundate Big Creek No. 3 Powerhouse
- Lower Limit defined by base of Redinger Dam (405 TAF)
  - Smaller sizes would have similar environmental and power impacts

RM 286 Narrowed Range



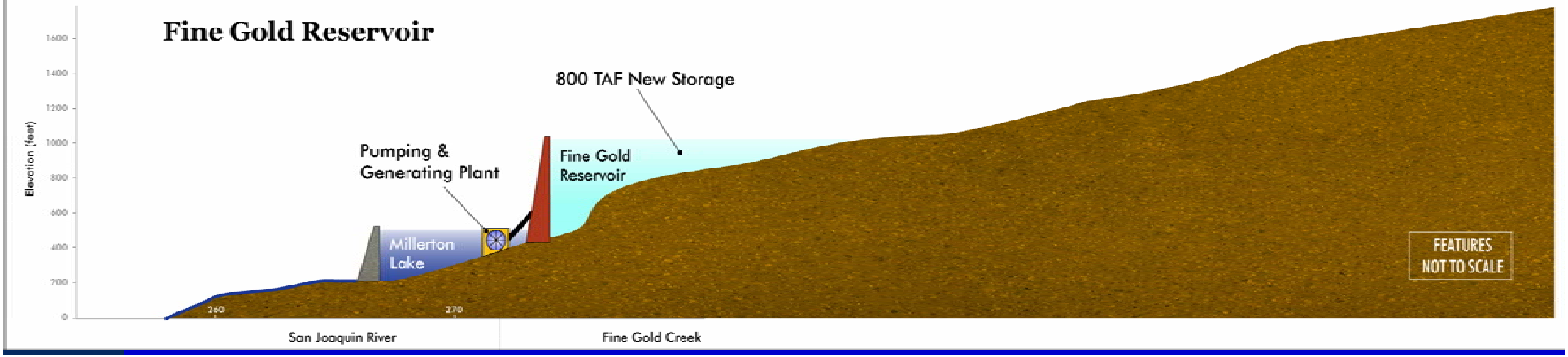
Selected Storage Range

Fine Gold Reservoir

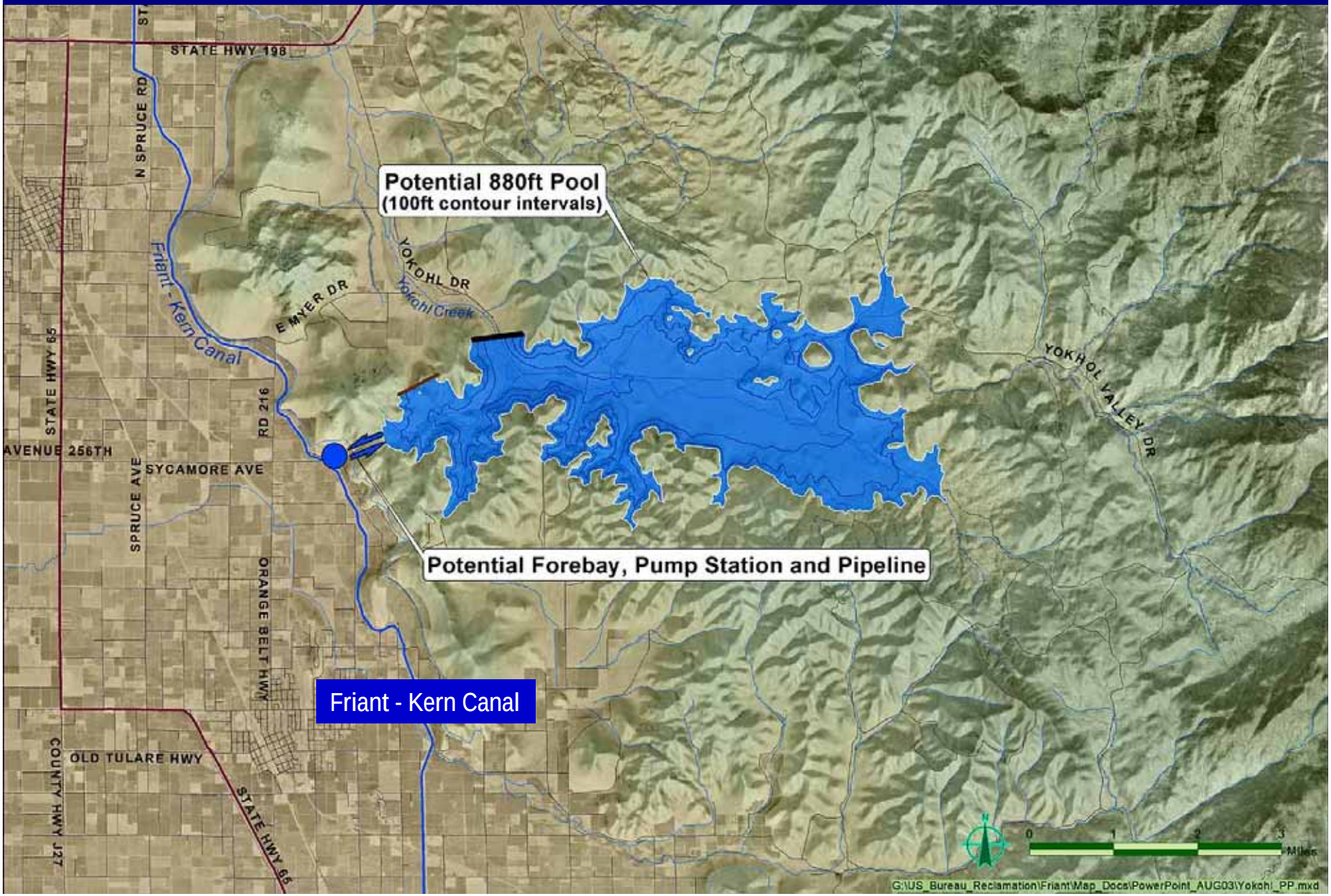


Fine Gold Reservoir Issues

- Nearby Millerton Lake area residences
- Operation would affect Millerton Lake levels and recreation
- Environmental impacts
  - Pristine watershed with endangered species
- Storage sizes range from 130 TAF to 800 TAF

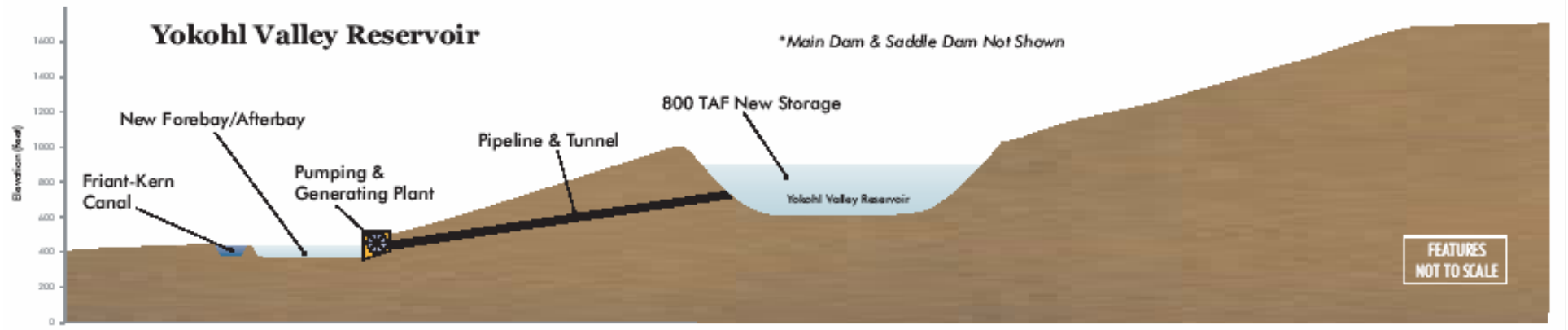


Yokohl Valley Reservoir

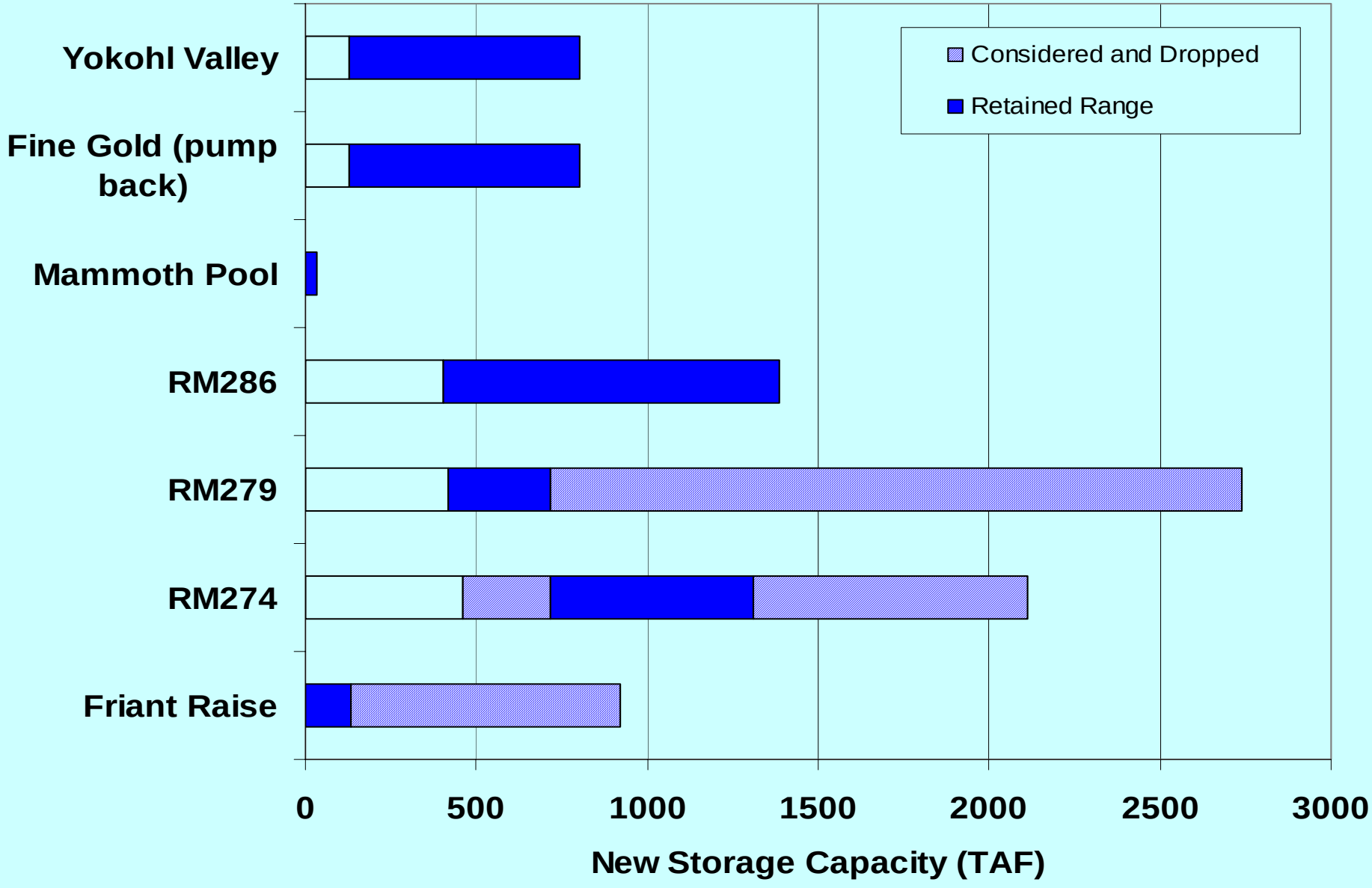


Yokohl Valley Reservoir Issues

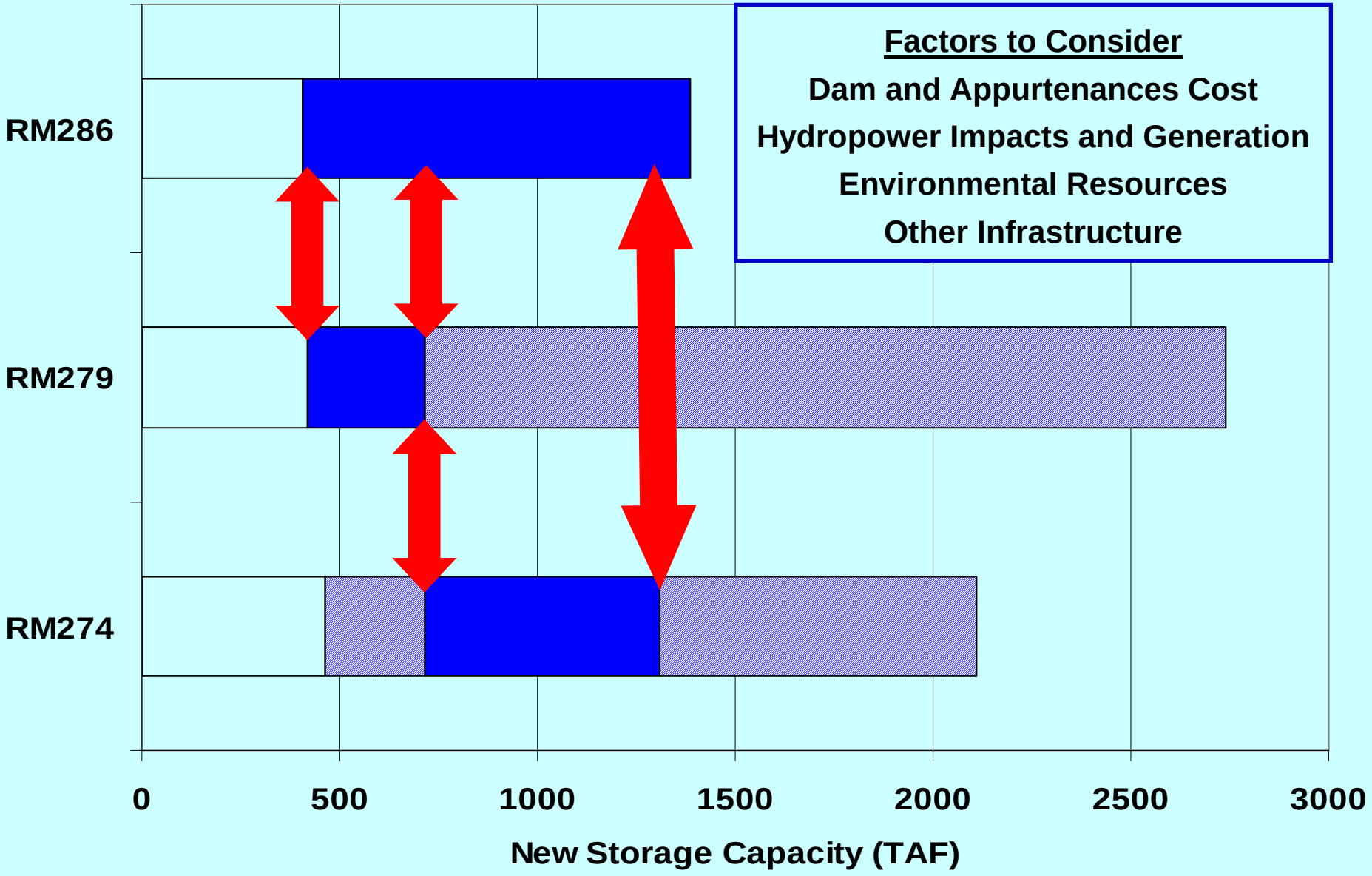
- Environmental impacts
  - Ephemeral stream
  - Grazing land
  - Cultural resources
- Potential yield may be limited by Friant-Kern Canal conveyance capacity
- Storage sizes up to 800 TAF



Narrowed Range of Surface Storage Options



Next Screening Step - Compare Retained Options



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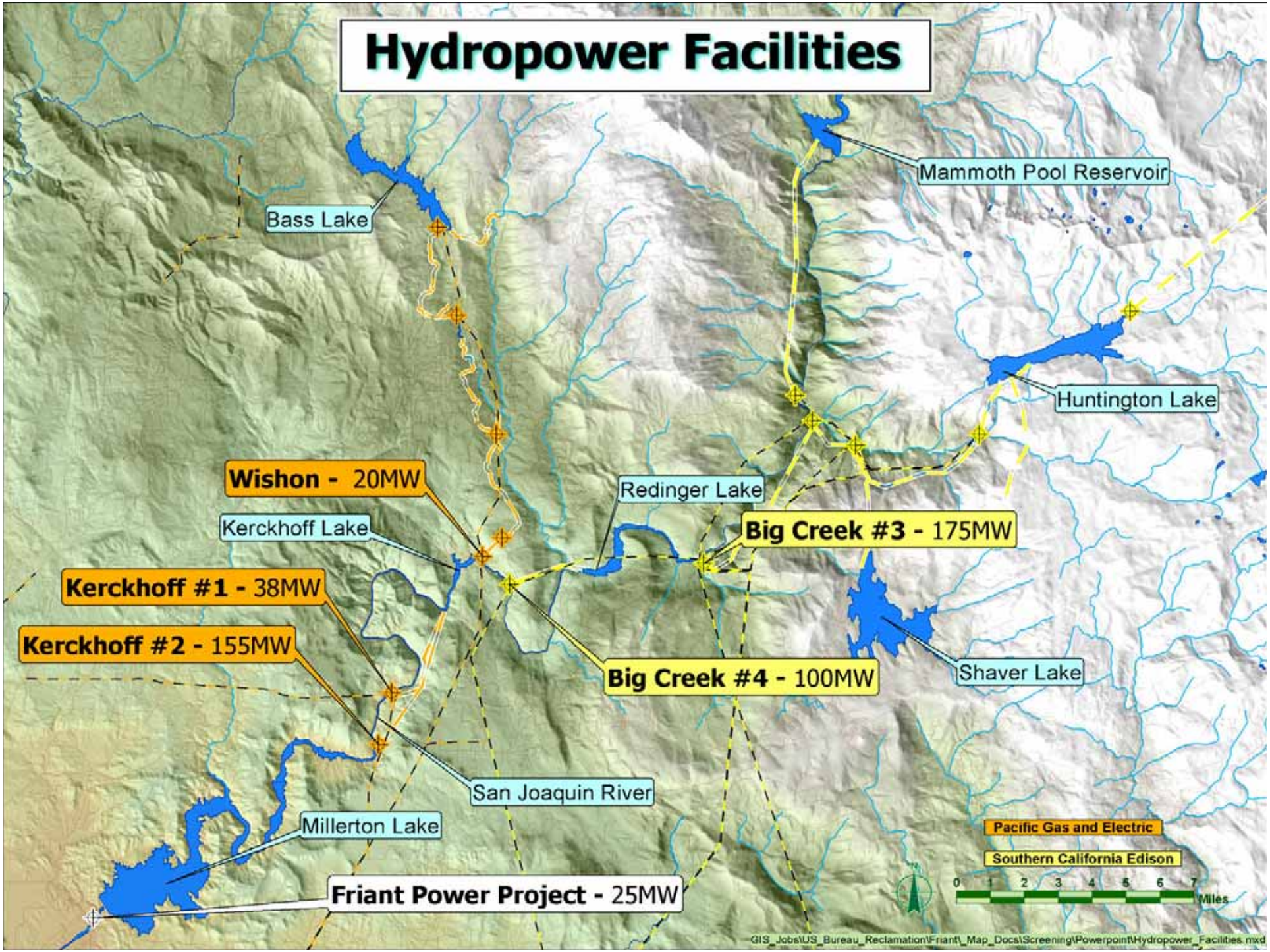
Hydropower Considerations

- Hydropower baseline
- Potential power generation and use
- Options that avoid power impacts


Hydropower Facilities
Mammoth Pool Reservoir
Bass Lake
Huntington Lake
Wishon - 20MW
Redinger Lake
Kerckhoff Lake
Big Creek #3 - 175MW
Kerckhoff #1 - 38MW
Kerckhoff #2 - 155MW
Big Creek #4 - 100MW
Shaver Lake
San Joaquin River
Millerton Lake
Friant Power Project - 25MW
Pacific Gas and Electric
Southern California Edison
0 1 2 3 4 5 6 7
Miles
GIS_Jobs\US_Bureau_Reclamation\Friant_Map_Docs\Screening\Powerpoint\Hydropower_Facilities.mxd

Hydropower Operations Baseline

- Represents existing hydropower facilities
- Similar level of detail to water operations analysis
  - Monthly time-step water volume
  - 1922 - 1994 hydrologic record
- Basis of comparison for storage options

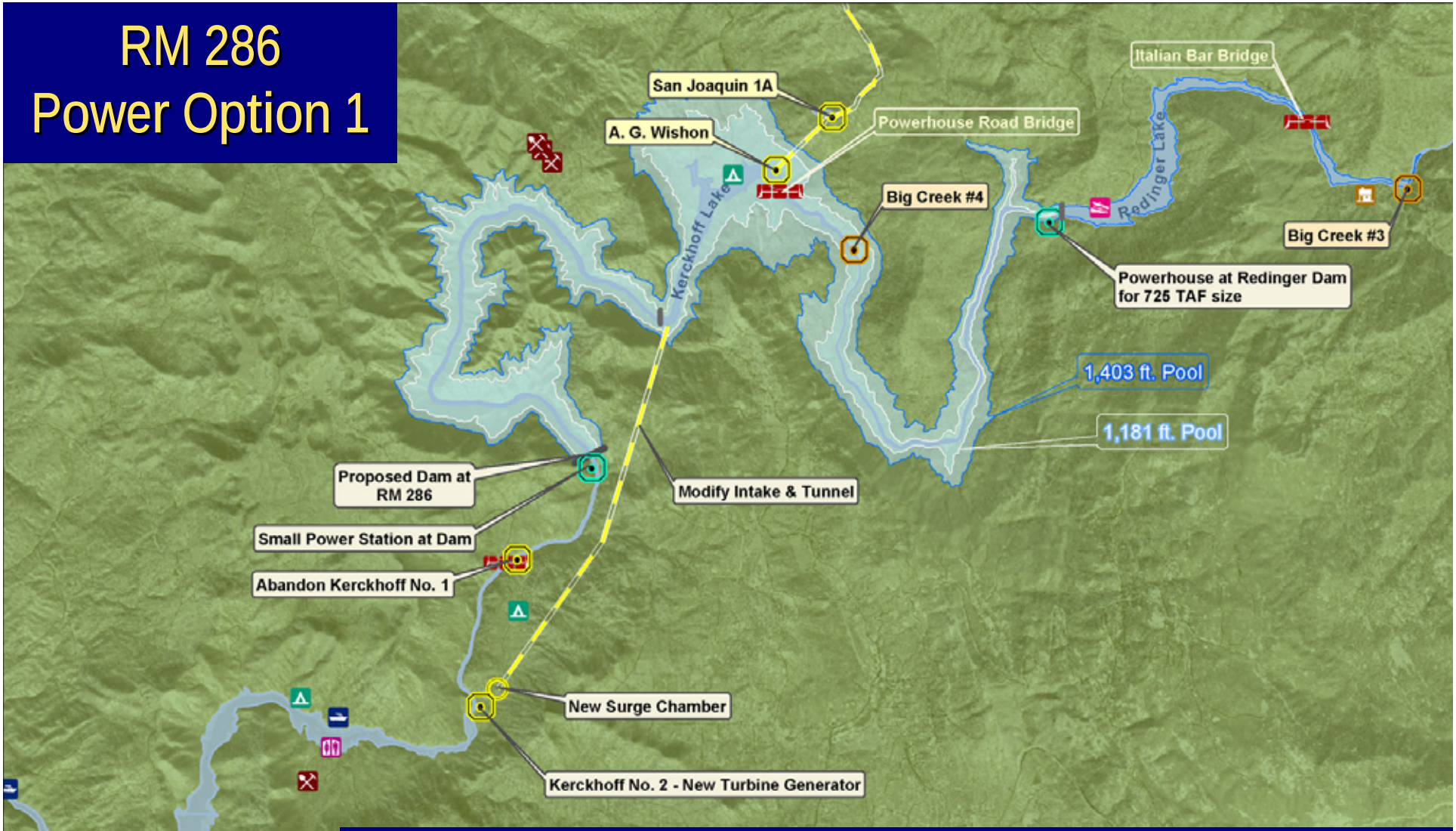
Hydropower Baseline - Preliminary Results

Facility	Estimated Generation 1922-1994 (GWh/yr)	Recent Generation 1994-2002 (GWh/yr)
Big Creek No. 4	420	470
Wishon	50	70
Kerckhoff	140	50
Kerckhoff No. 2	370	530
TOTAL	980	1120

Temperance Flat Options Hydropower Generation

Capacity (TAF)	Elevation (ft msl)	New Generation (GWh/yr)	Lost Generation (GWh/yr)
RM 274 - Power Station at Dam			
725	850	210	470
1350	975	270	470
RM 279 - Power Station at Dam			
725	975	390	470
1350	1100	450	980
RM 286 - Multiple Power Station Options			
725	1250	480 - 870	980
1350	1400	560 - 770	980
**Values exclude additional power generation at Friant*			

RM 286
Power Option 1



Use Existing Kerckhoff No. 2 Facilities to Maximum Extent

- Modify intake and tunnel
- New surge chamber
- New turbine-generator
- Abandon Kerckhoff No. 1
- Small power station at dam
- Powerhouse at Redinger Dam for 725 TAF size

RM 286
Power Option 2

New Power Station at Millerton Lake

Modify Kerckhoff No. 2 intake and tunnel

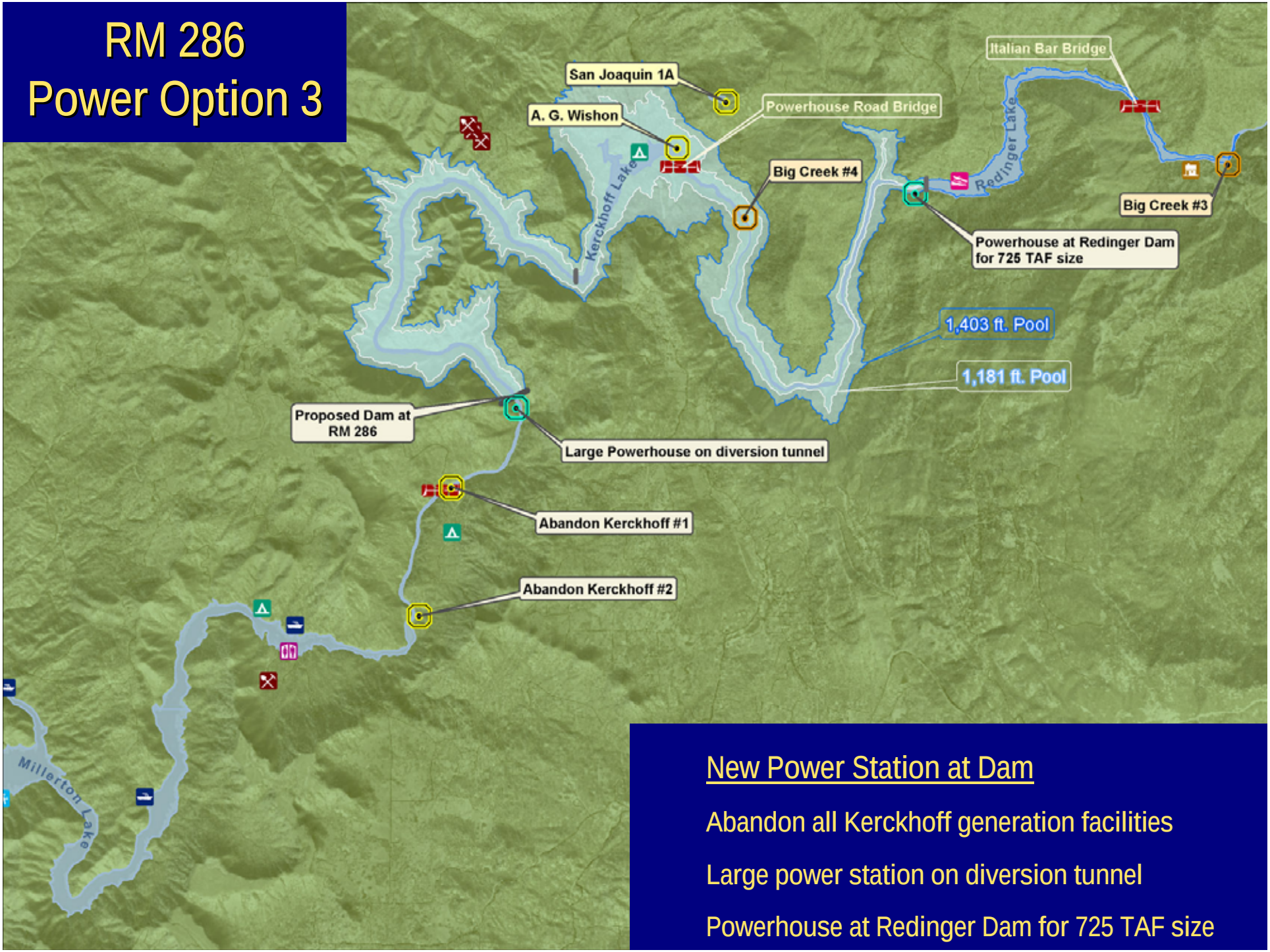
Abandon Kerckhoff No. 1

New surge chamber

Millerton Lake power station

Powerhouse at Redinger Dam for 725 TAF size

RM 286
Power Option 3



New Power Station at Dam

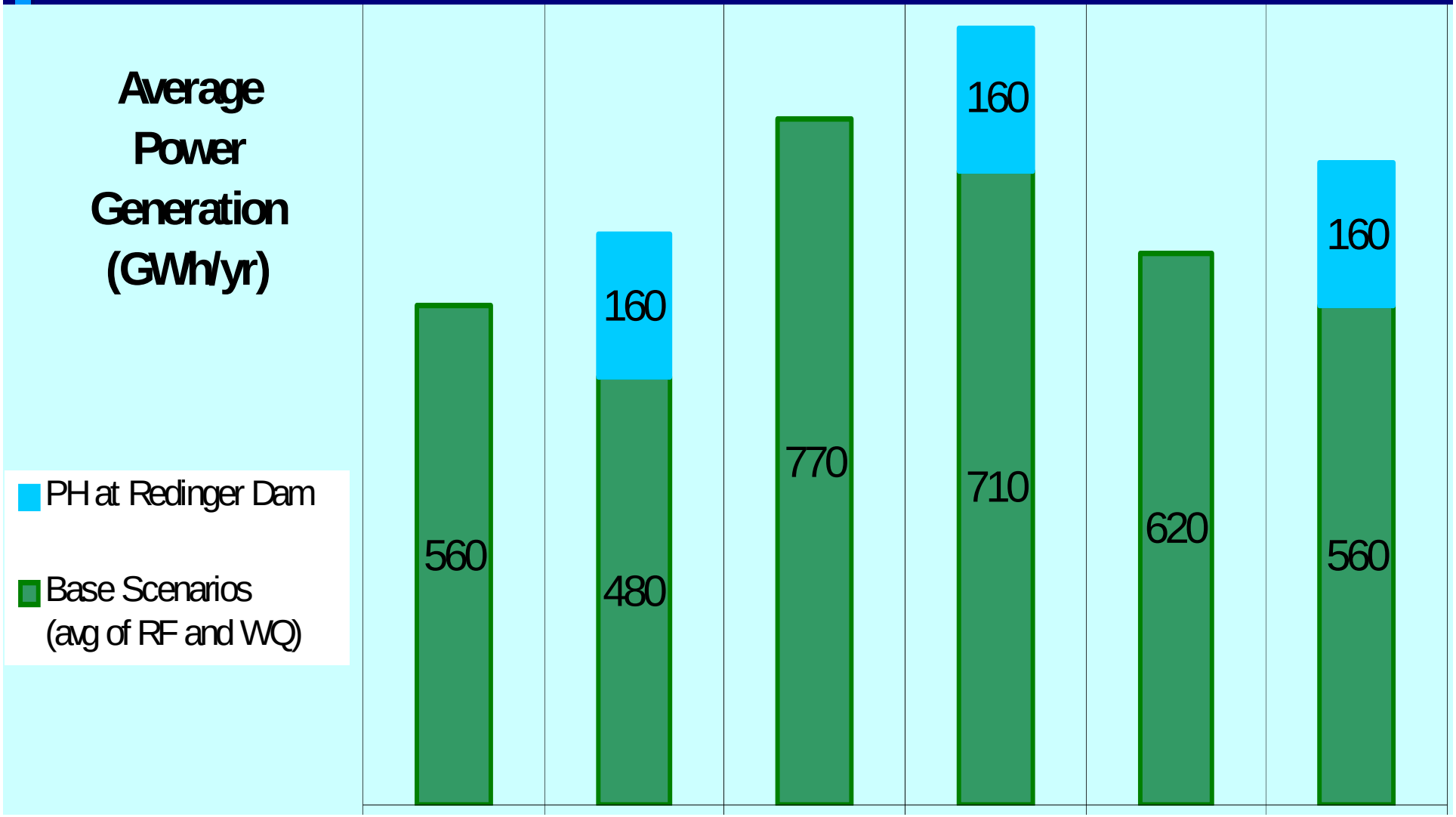
Abandon all Kerckhoff generation facilities

Large power station on diversion tunnel

Powerhouse at Redinger Dam for 725 TAF size

Temperance Flat RM 286 Power Option Summary

Feature	K2 Retrofit + PH @ TF 286		PH @ Millerton Lake		PH @ TF 286	
	1350 TAF	725 TAF	1350 TAF	725 TAF	1350 TAF	725 TAF



Off-Stream Reservoir Options Power Effects

Option	Capacity (TAF)	Elevation (ft msl)	New Generation (GWh/yr)	Pumping Energy (GWh/yr)
Fine Gold	800	1110	95	165
Yokohl	800	860	70	140

Additional Suggested Storage Options

- Options would avoid hydropower impacts
  - RM 315 Reservoir
    - Upstream extent at base of Mammoth Pool Dam
    - 200 TAF
  - Storage sites on tributaries to Mammoth Pool
  - Fine Gold Creek Reservoir
    - Tunnel from Kerckhoff Lake (limited to 260 TAF)
    - Potential pumping for larger sizes
- Options have not yet been evaluated in Investigation

Agenda

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Flood Damage Reduction Evaluation

Development of Operational Scenarios

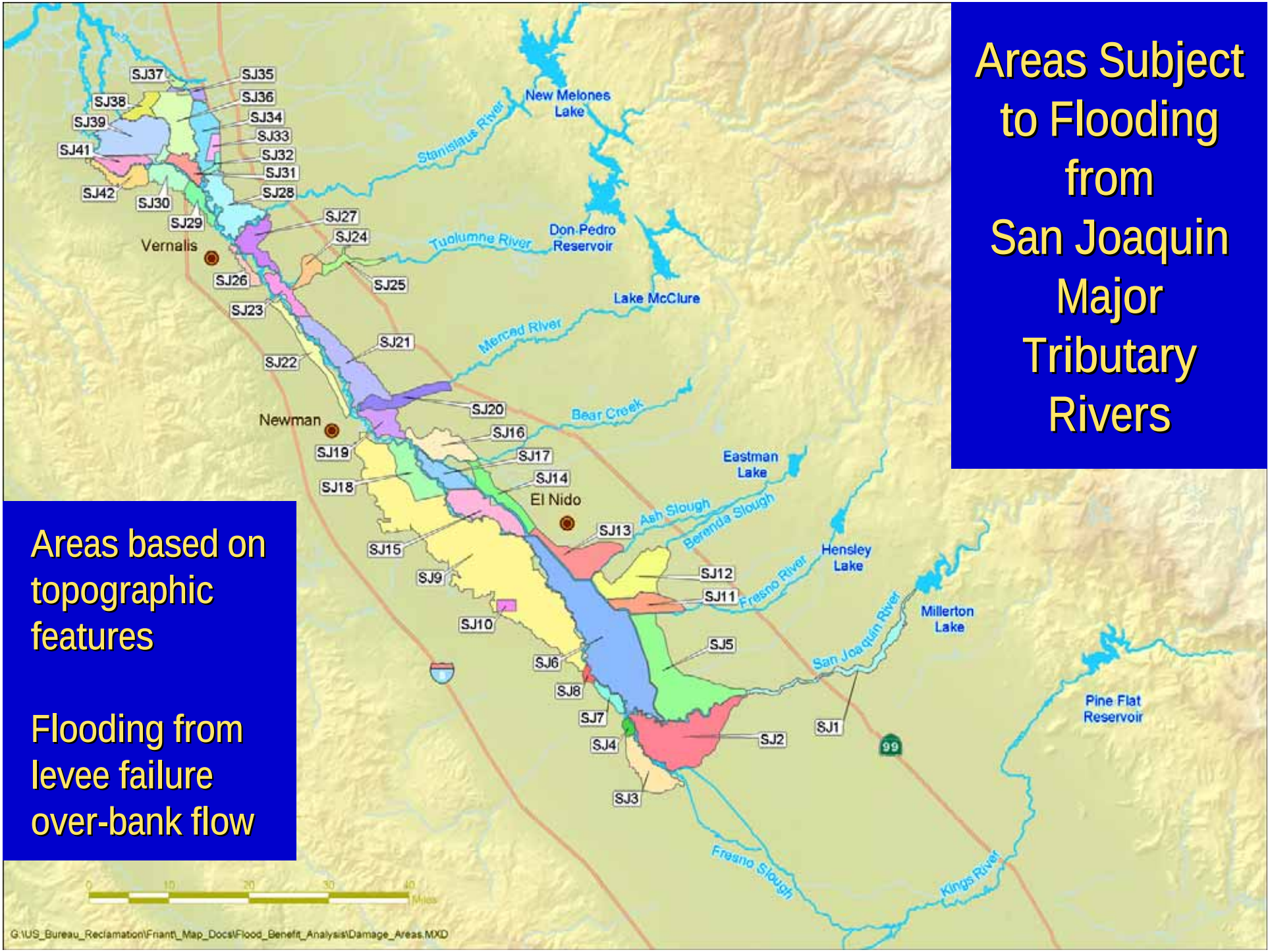
Next Steps

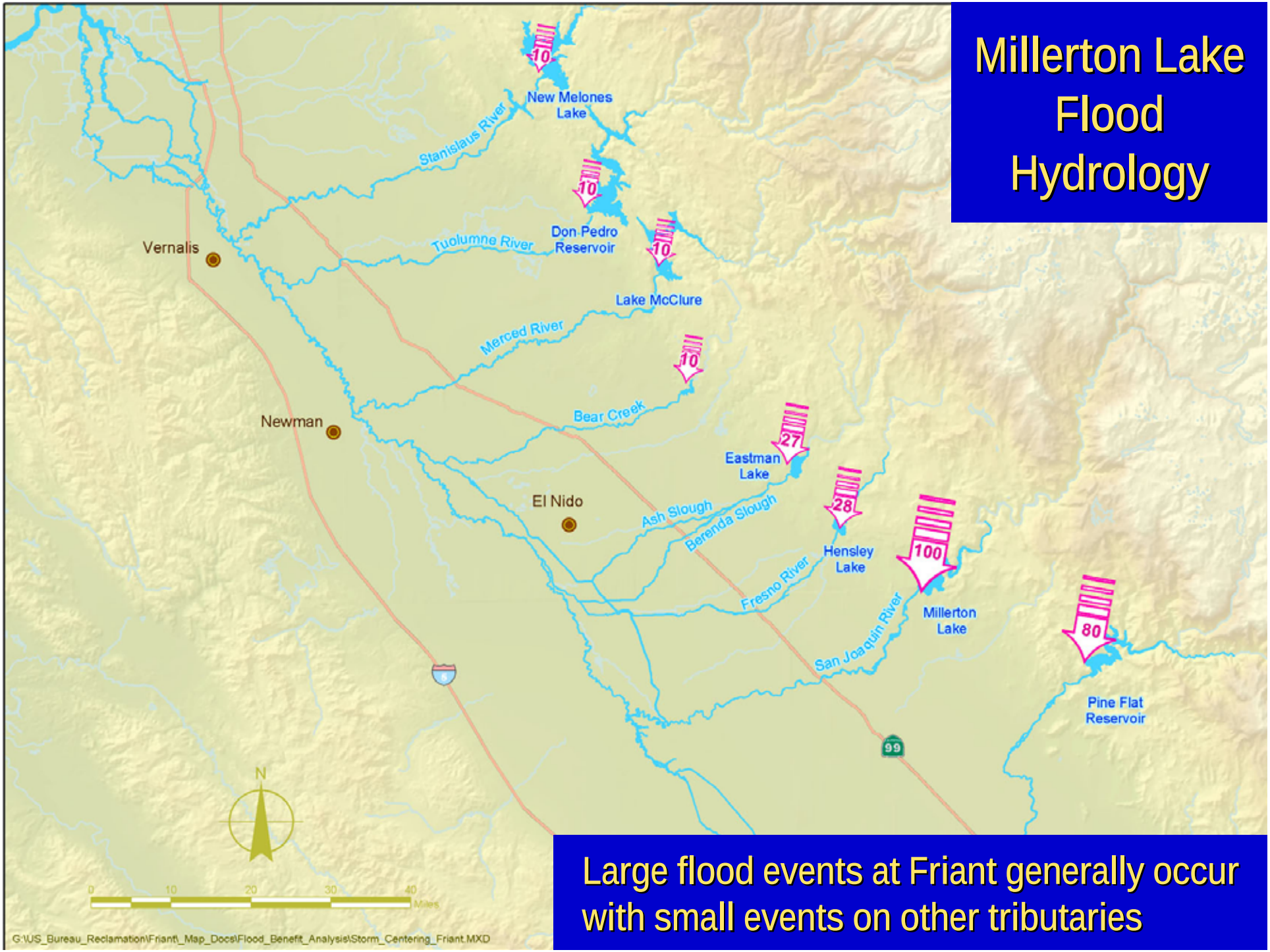
Flood Damage Reduction Overview

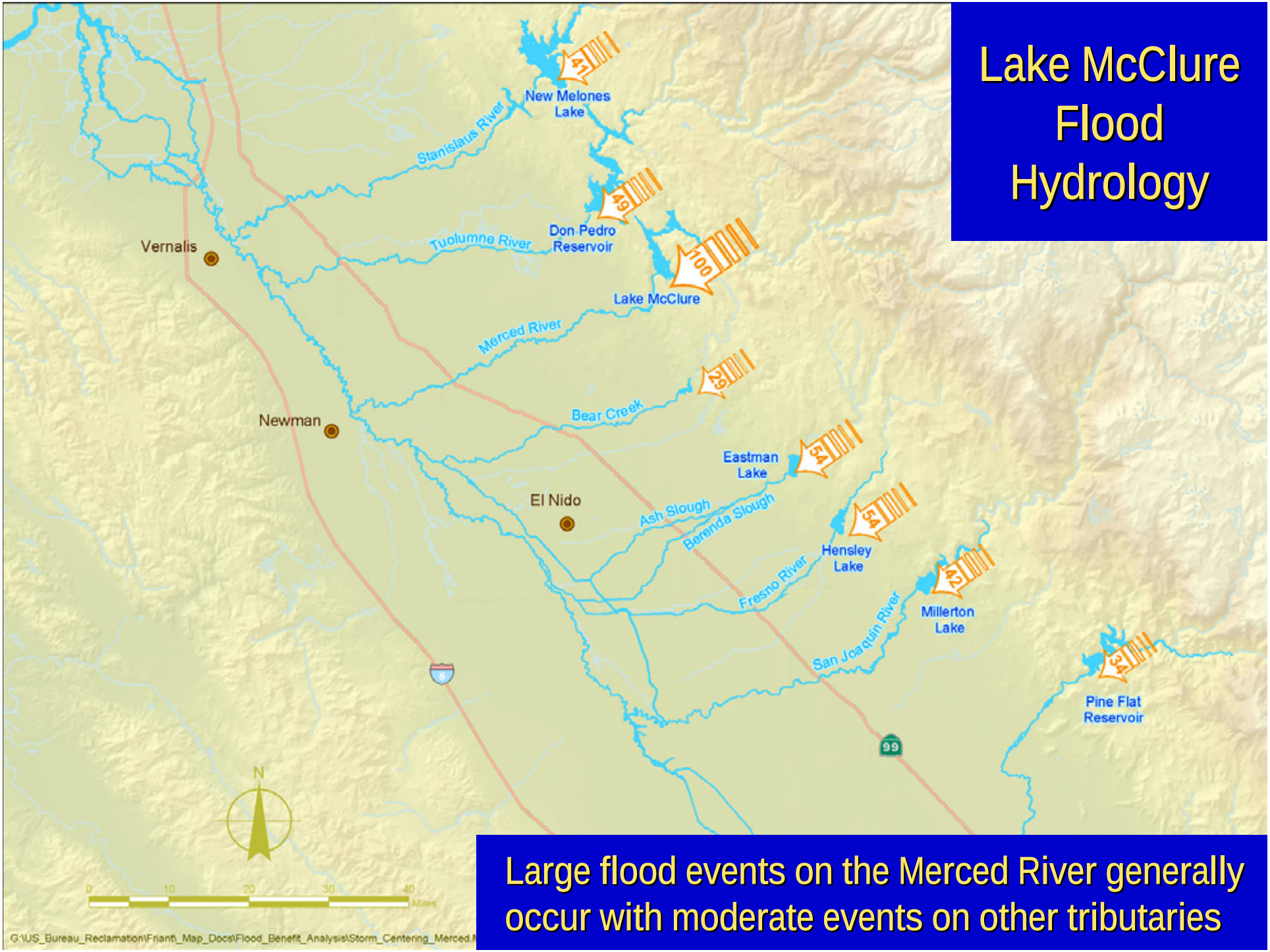
- Estimate potential benefits of new dedicated flood storage
- System-wide approach
  - Entire San Joaquin River Basin
  - Major flood management features
    - 7 Major reservoirs
    - East Side Bypass
- Identify potential changes in flood damages
  - Residential
  - Commercial
  - Agricultural

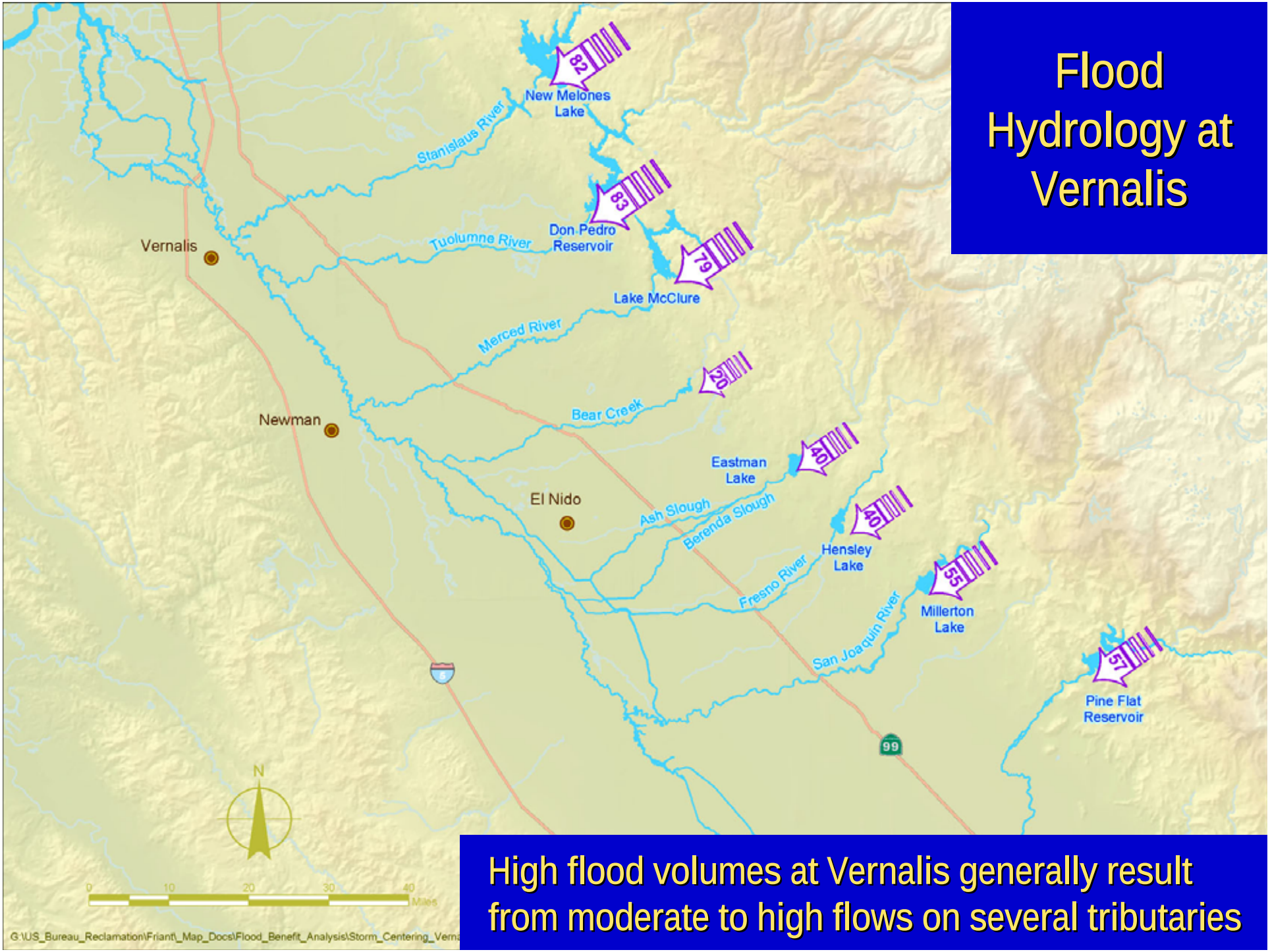
Analysis Approach

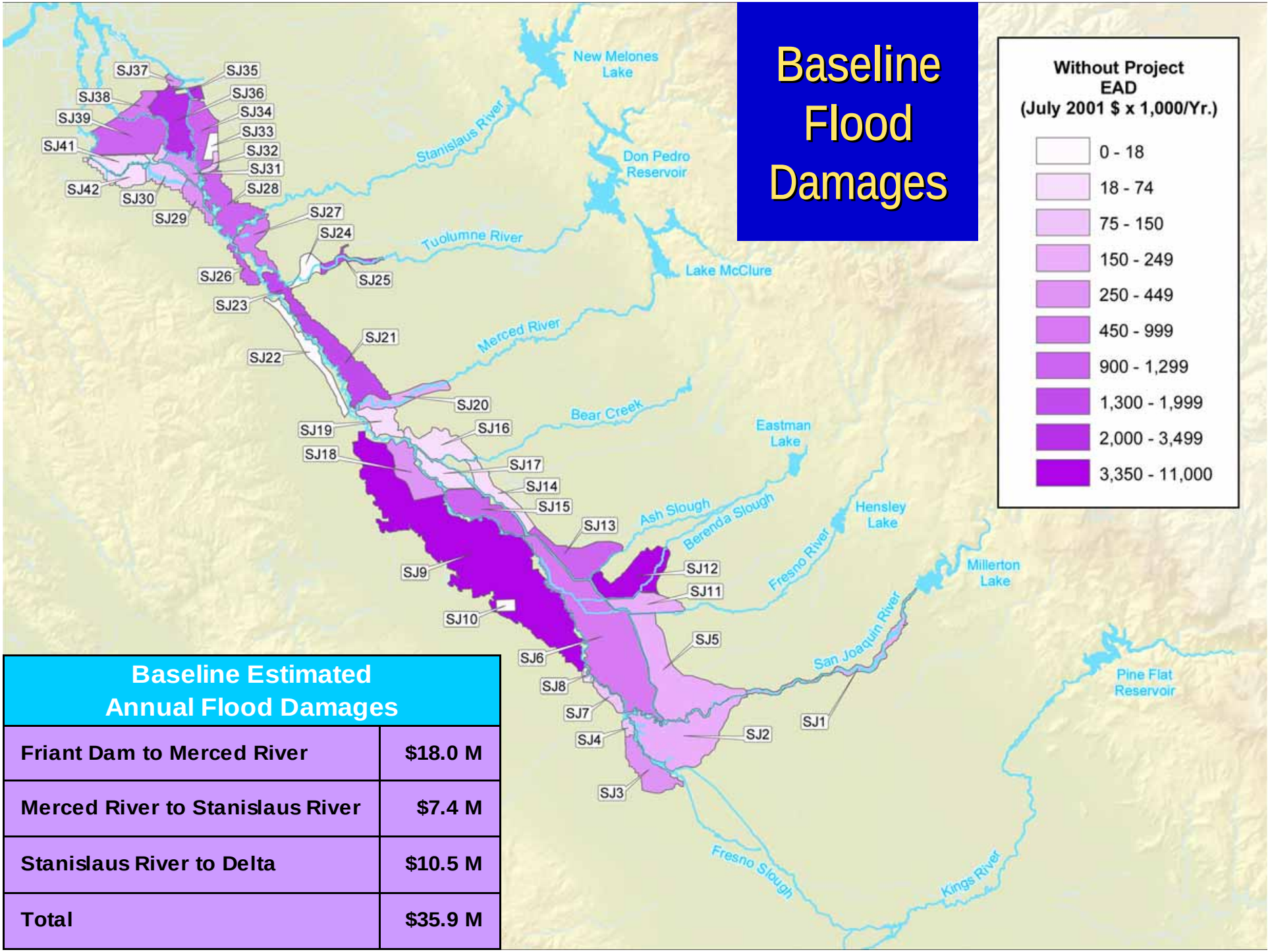
- Tools
  - Hydrology and reservoir models (Corps)
  - Hydraulic river models (Corps)
  - Flood damage analysis model (DWR)
- Methodology
  - Apply basin-wide flood hydrology
  - Identify maximum hydraulic effects
  - Estimate flood damages
- First step - establish baseline conditions


Areas Subject to Flooding from San Joaquin Major Tributary Rivers
Areas based on topographic features
Flooding from levee failure over-bank flow
SJ37
SJ35
SJ38
SJ36
SJ39
SJ34
SJ41
SJ33
SJ32
SJ31
SJ42
SJ30
SJ28
SJ29
SJ27
SJ24
Vernalis
SJ26
SJ25
SJ23
SJ21
SJ22
SJ20
Newman
SJ16
SJ19
SJ17
SJ18
SJ14
El Nido
SJ13
SJ15
SJ9
SJ12
SJ11
SJ10
SJ5
SJ6
SJ8
SJ7
SJ4
SJ2
SJ1
SJ3
New Melones Lake
Stanislaus River
Tuolumne River
Don Pedro Reservoir
Lake McClure
Merced River
Bear Creek
Eastman Lake
Ash Slough
Berenda Slough
Fresno River
Hensley Lake
Millerton Lake
San Joaquin River
Pine Flat Reservoir
Fresno Slough
Kings River
99
0 10 20 30 40 Miles
G:\US_Bureau_Reclamation\Friant_Map_Docs\Flood_Benefit_Analysis\Damage_Areas.MXD


Millerton Lake Flood Hydrology
New Melones Lake
Stanislaus River
Don Pedro Reservoir
Tuolumne River
Lake McClure
Merced River
Bear Creek
Vernalis
Newman
El Nido
Eastman Lake
Ash Slough
Berenda Slough
Hensley Lake
Fresno River
Millerton Lake
San Joaquin River
Pine Flat Reservoir
10
10
10
10
27
28
100
80
99
N
0 10 20 30 40
Miles
G:\US_Bureau_Reclamation\Friant_Map_Docs\Flood_Benefit_Analysis\Storm_Centering_Friant.MXD
Large flood events at Friant generally occur with small events on other tributaries


Lake McClure Flood Hydrology
New Melones Lake
41
Stanislaus River
Don Pedro Reservoir
49
Tuolumne River
Vernalis
Lake McClure
100
Merced River
29
Bear Creek
Newman
Eastman Lake
54
El Nido
Ash Slough
Berenda Slough
Hensley Lake
54
Fresno River
Millerton Lake
42
San Joaquin River
Pine Flat Reservoir
34
99
N
0 10 20 30 40
Miles
G:\US_Bureau_Reclamation\Friant_Map_Docs\Flood_Benefit_Analysis\Storm_Centering_Merced.
Large flood events on the Merced River generally occur with moderate events on other tributaries


Flood Hydrology at Vernalis
New Melones Lake
Stanislaus River
Don Pedro Reservoir
Tuolumne River
Vernalis
Lake McClure
Merced River
Bear Creek
Newman
Eastman Lake
El Nido
Ash Slough
Berenda Slough
Hensley Lake
Fresno River
Millerton Lake
San Joaquin River
Pine Flat Reservoir
99
N
0 10 20 30 40
Miles
High flood volumes at Vernalis generally result from moderate to high flows on several tributaries



Baseline Estimated Annual Flood Damages	
Friant Dam to Merced River	$18.0 M
Merced River to Stanislaus River	$7.4 M
Stanislaus River to Delta	$10.5 M
Total	$35.9 M

Next Steps for Flood Damage Analysis

- Simulate effects of additional flood storage at Friant
  - Consider multiple sizes of additional flood space
- Identify extent of downstream hydraulic effects
- Estimate changes in flood damages
- Consider other types of flood management actions
  - Changes in objective releases

Agenda

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Flood Damage Reduction Evaluation

Development of Operational Scenarios

Next Steps

Steps in Development of Operational Scenarios

- Incorporate related work where possible
- Develop analytical approach
- Identify issues to resolve

Sources of Relevant Information

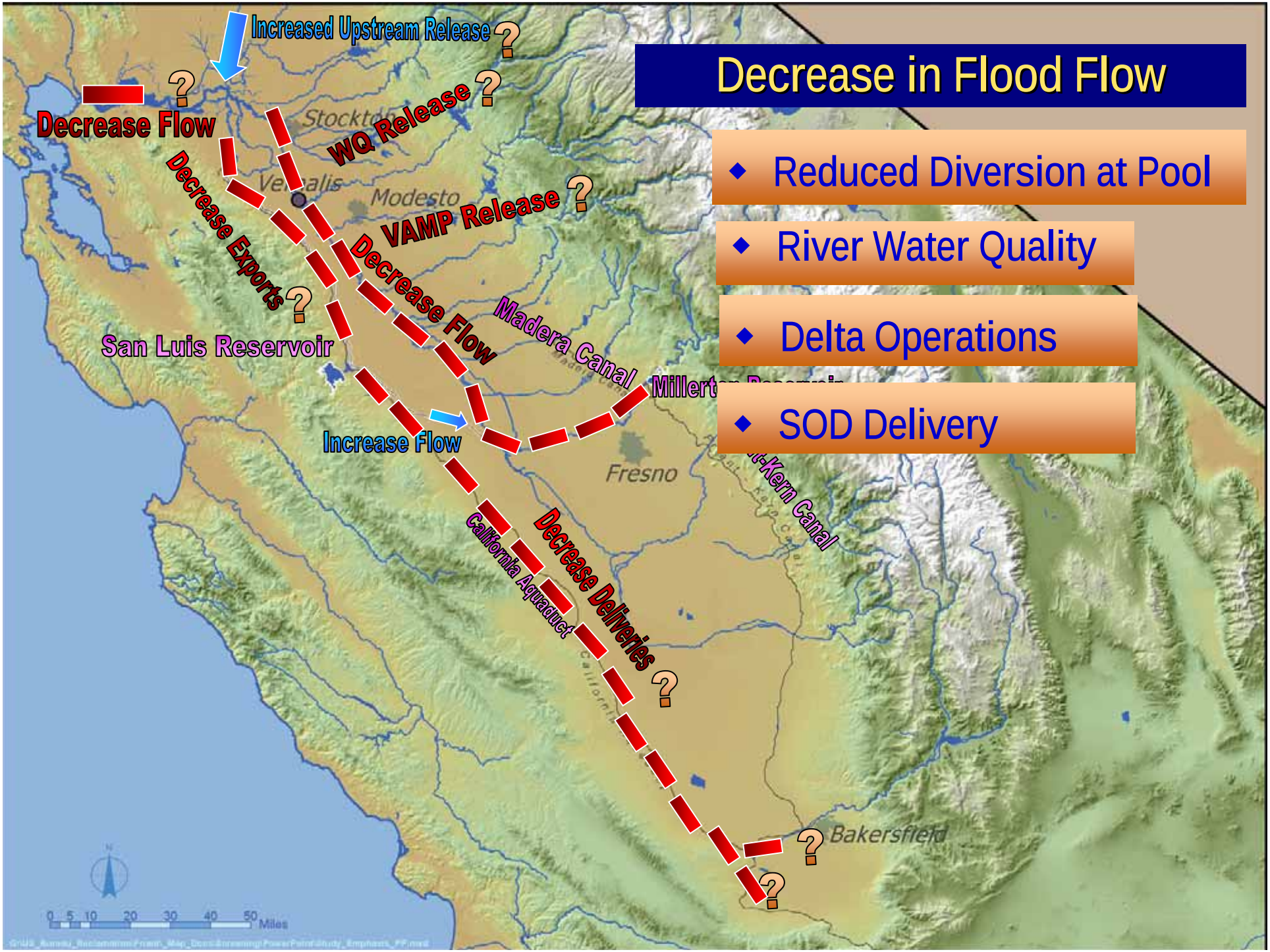
- FWUA / NRDC restoration strategies
- RMC restoration plan
- FWUA / MWD exchange studies
- East Side integrated resources plan

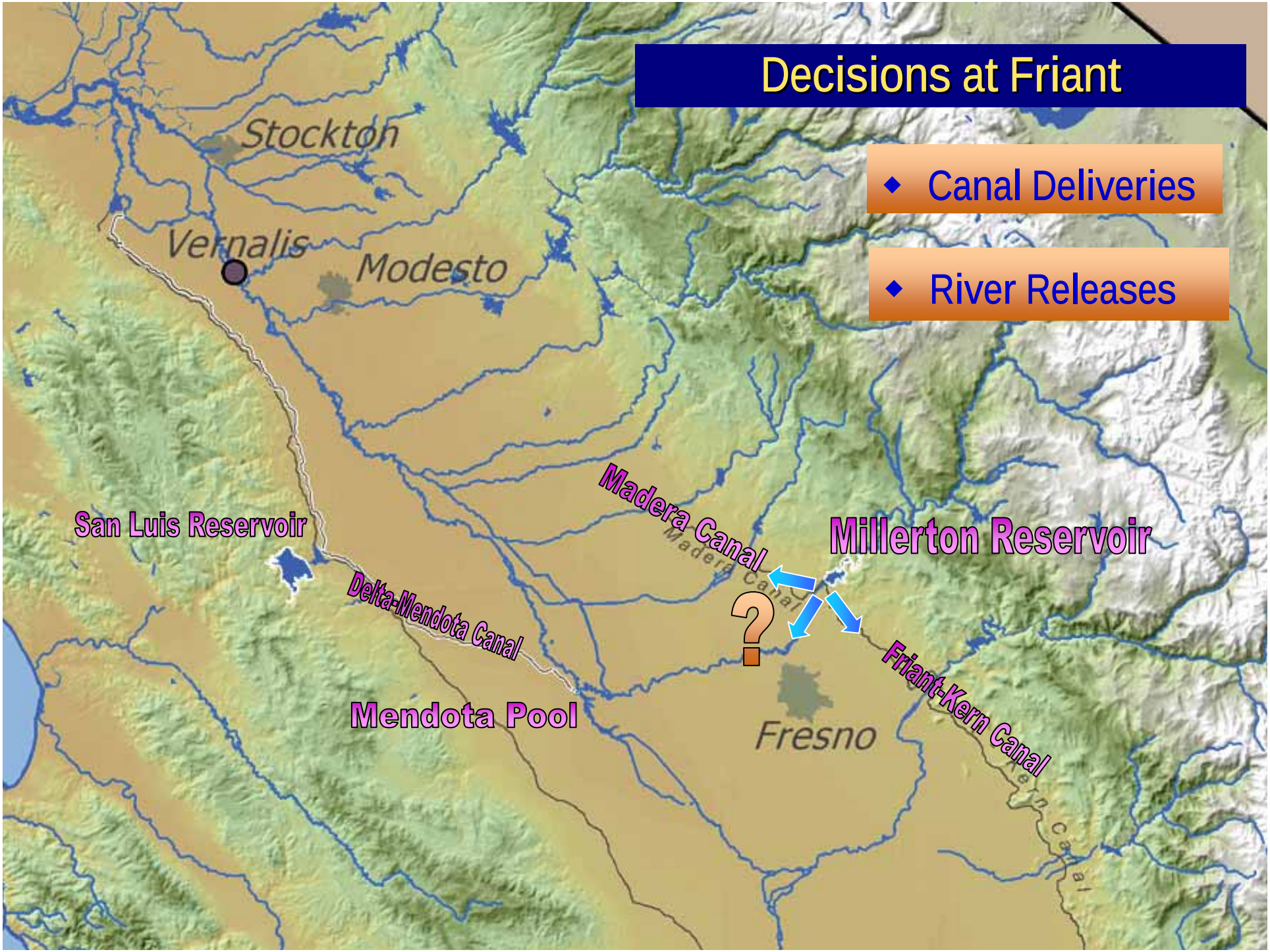
Information Needed to Begin Operational Scenario Development

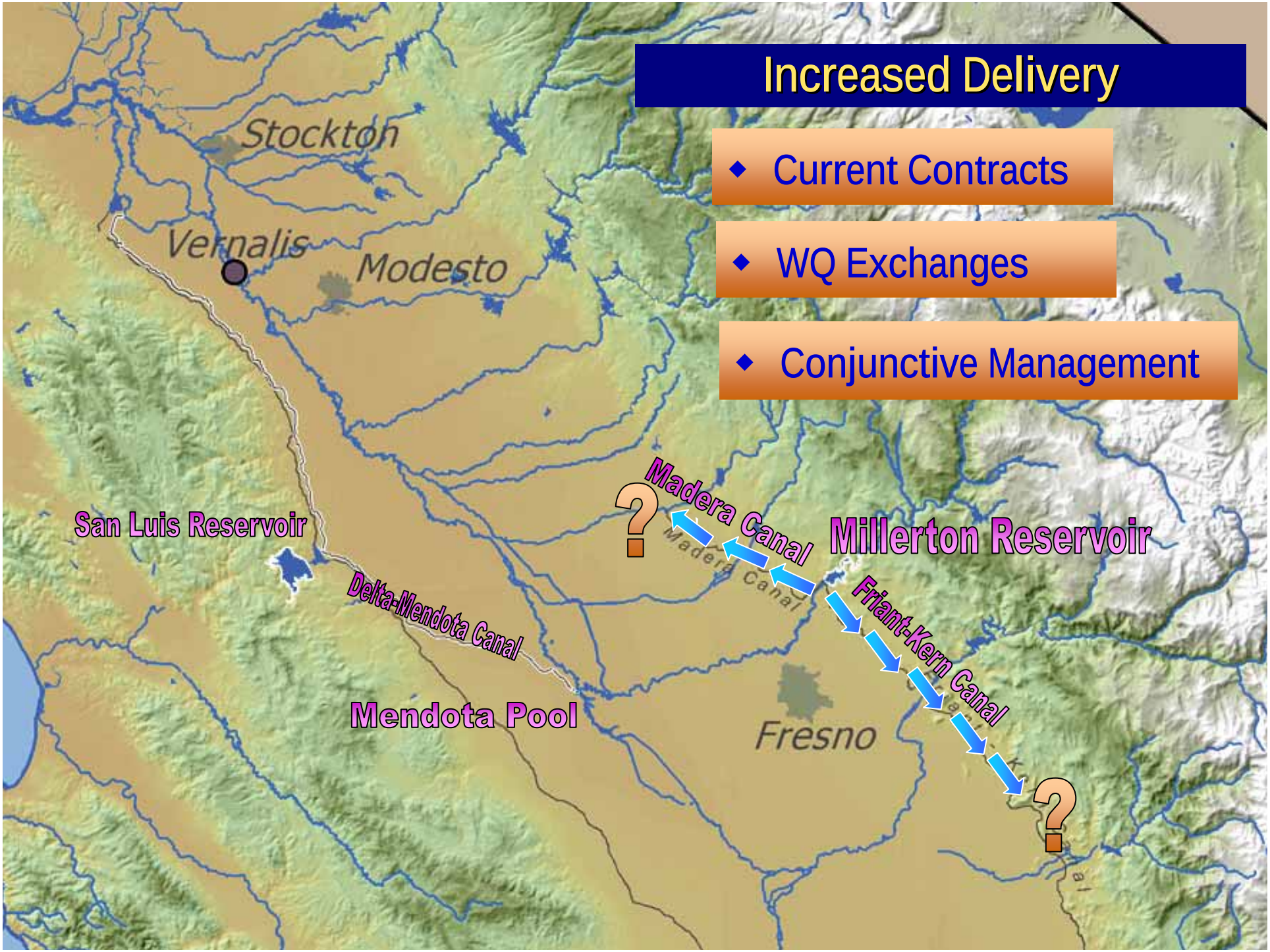
- Preliminary questions
  - What are the key decision points for operations?
  - Do we understand the range of scenarios adequately?
- Desired input
  - Range of operating approaches
  - Operating criteria and assumptions

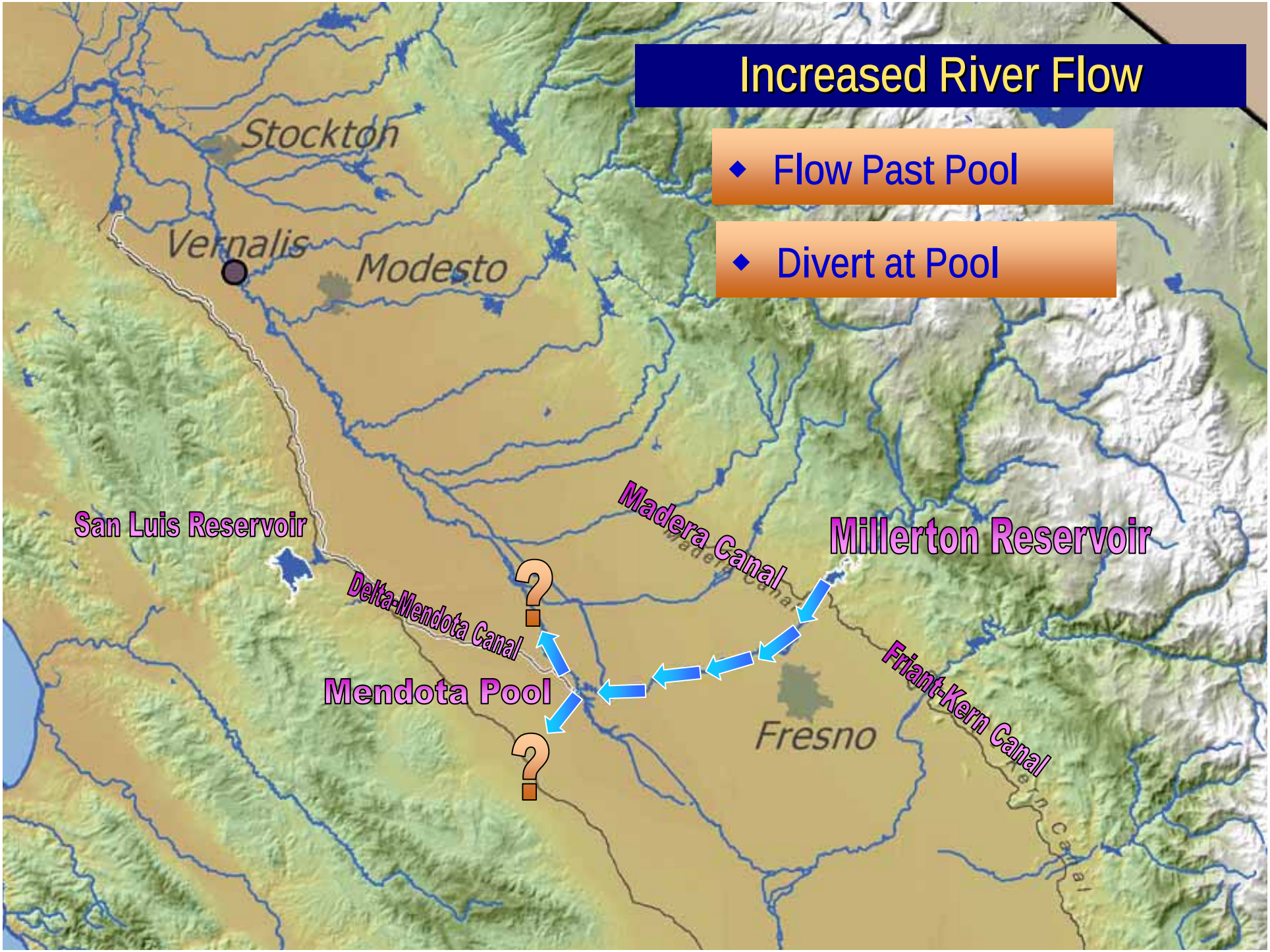
Operational Criteria are Needed

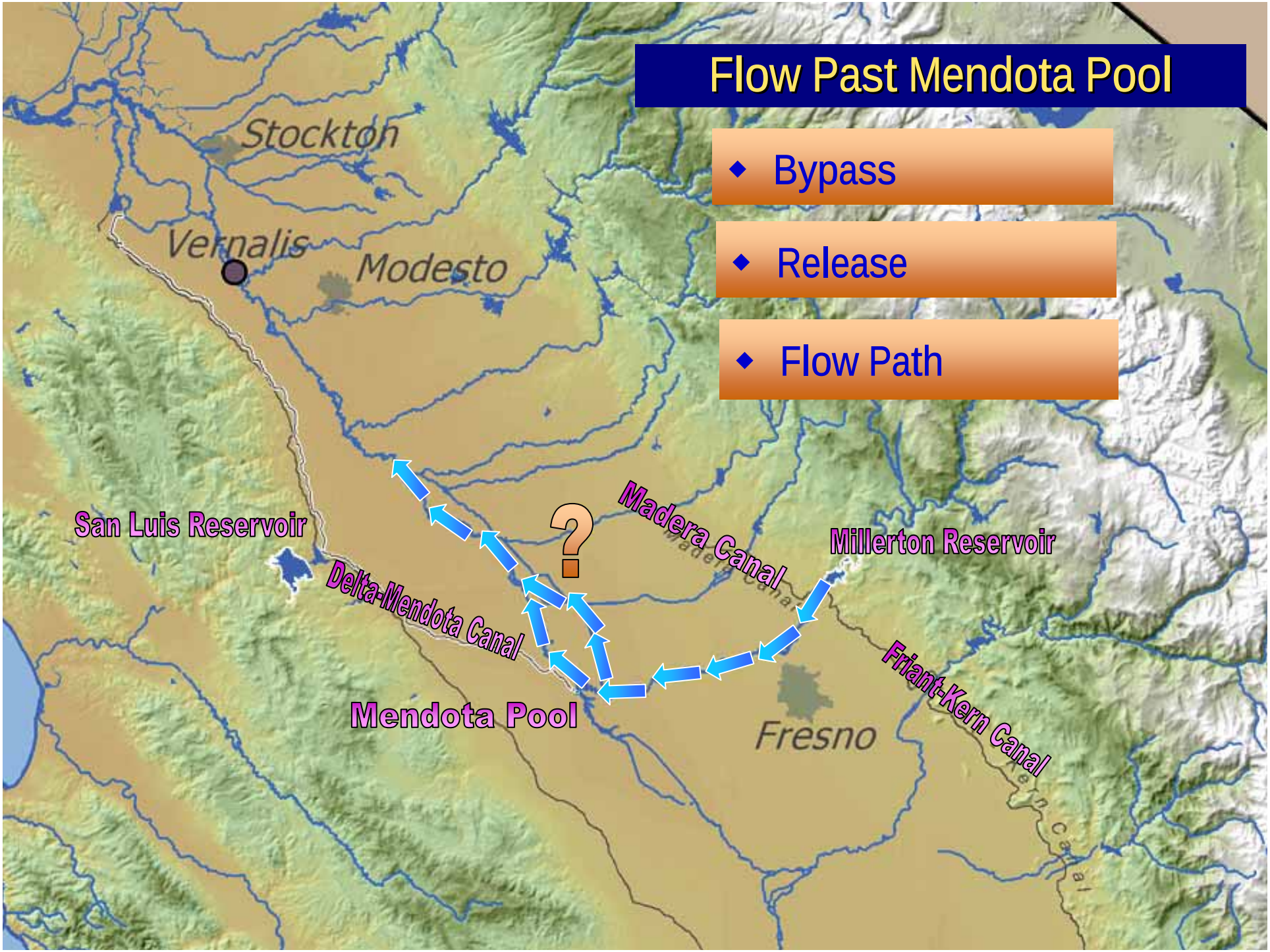
- Single purpose evaluations were completed in Phase 1
  - Helpful in developing understanding of water supply increase
  - Did not address mutual benefits or full degree of benefits
- Need to develop multiple-purpose operational criteria

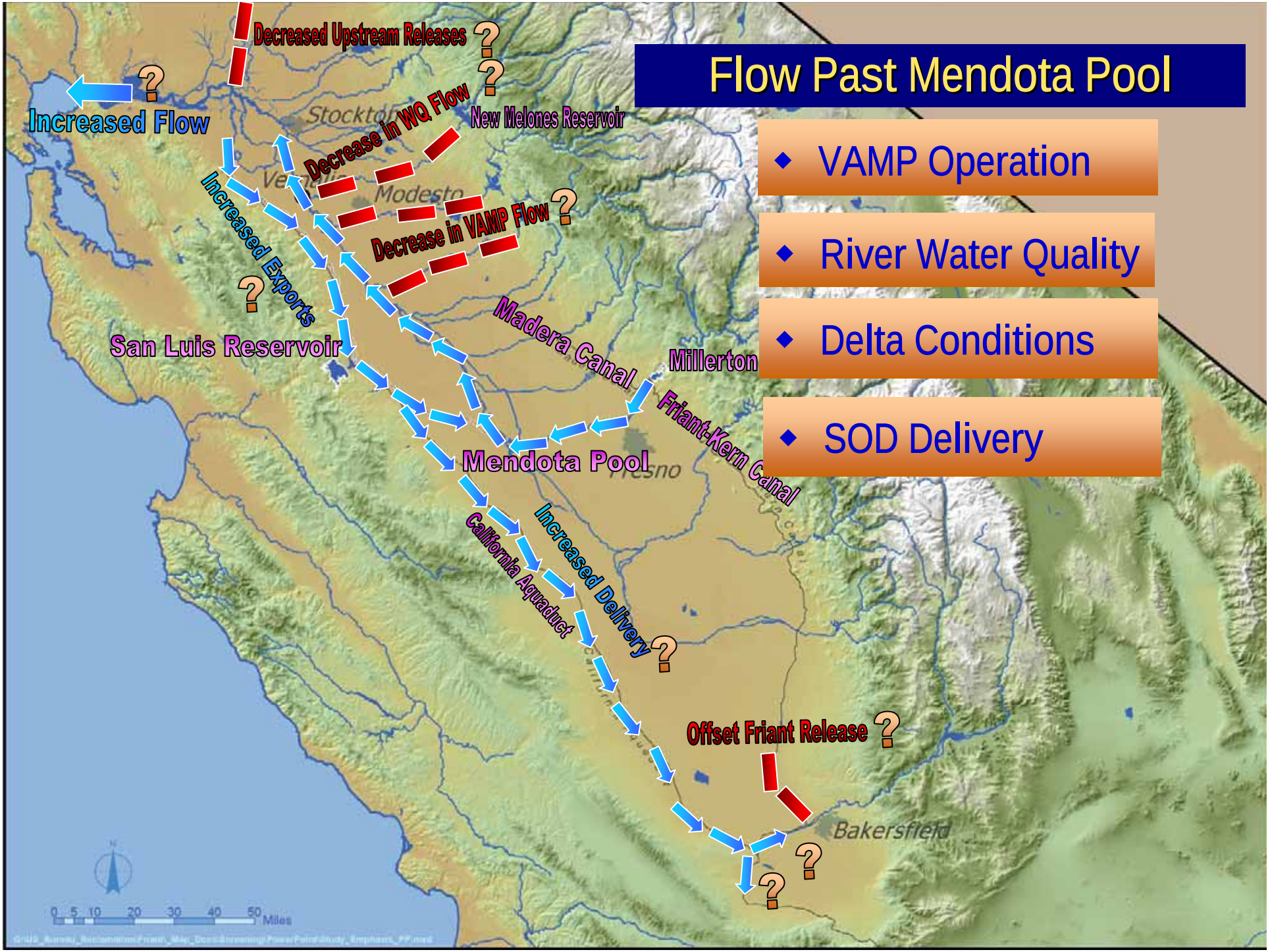

Decrease in Flood Flow
Reduced Diversion at Pool
River Water Quality
Delta Operations
SOD Delivery
Increased Upstream Release
Decrease Flow
WQ Release
Decrease Exports
VAMP Release
Decrease Flow
Madera Canal
San Luis Reservoir
Increase Flow
Fresno
California Aqueduct
Decrease Deliveries
Bakersfield
Stockton
Modesto
0 5 10 20 30 40 50 Miles

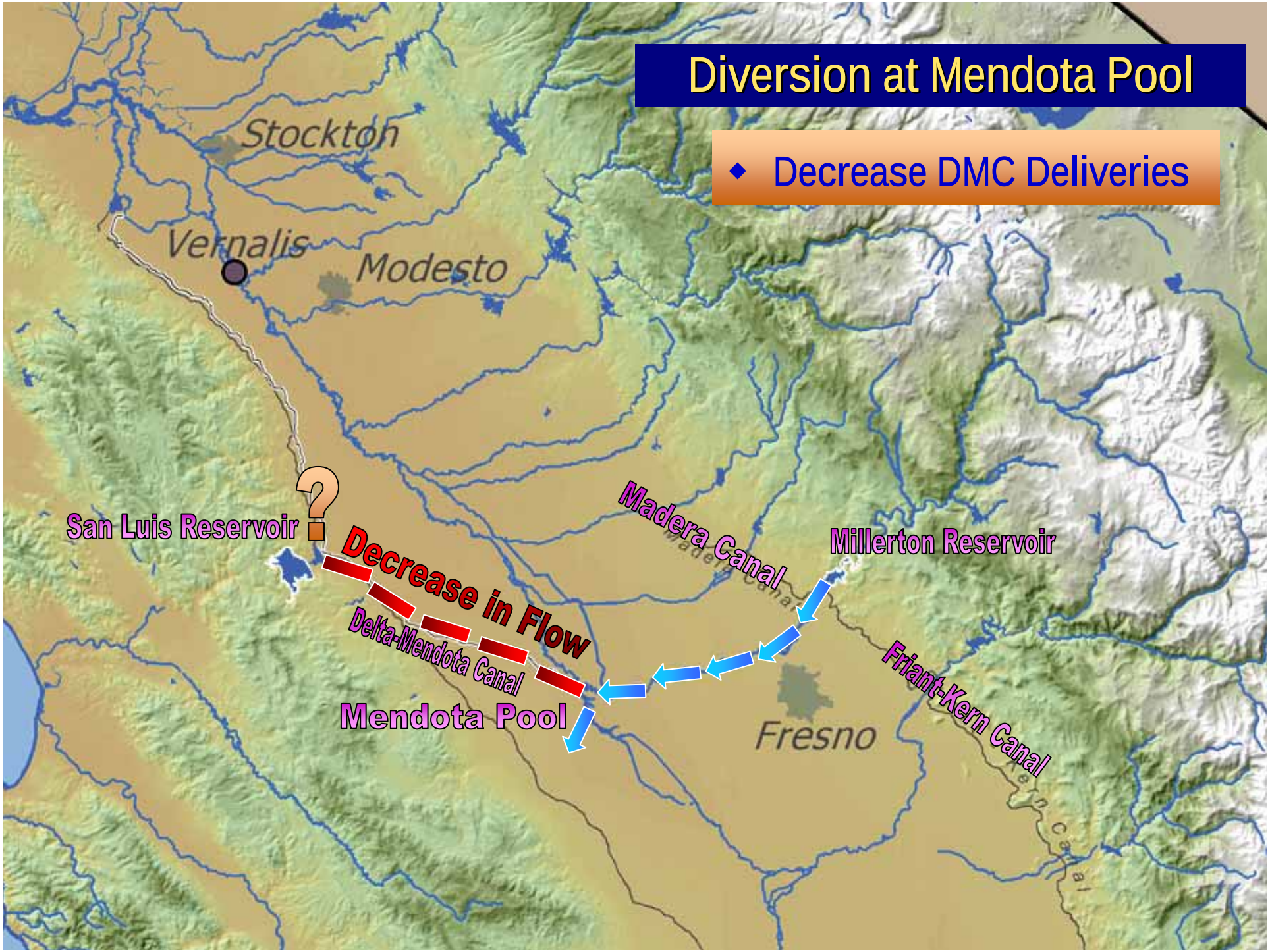

Decisions at Friant
Canal Deliveries
River Releases
Stockton
Vernalis
Modesto
San Luis Reservoir
Madera Canal
Millerton Reservoir
Delta-Mendota Canal
?
Friant-Kern Canal
Mendota Pool
Fresno

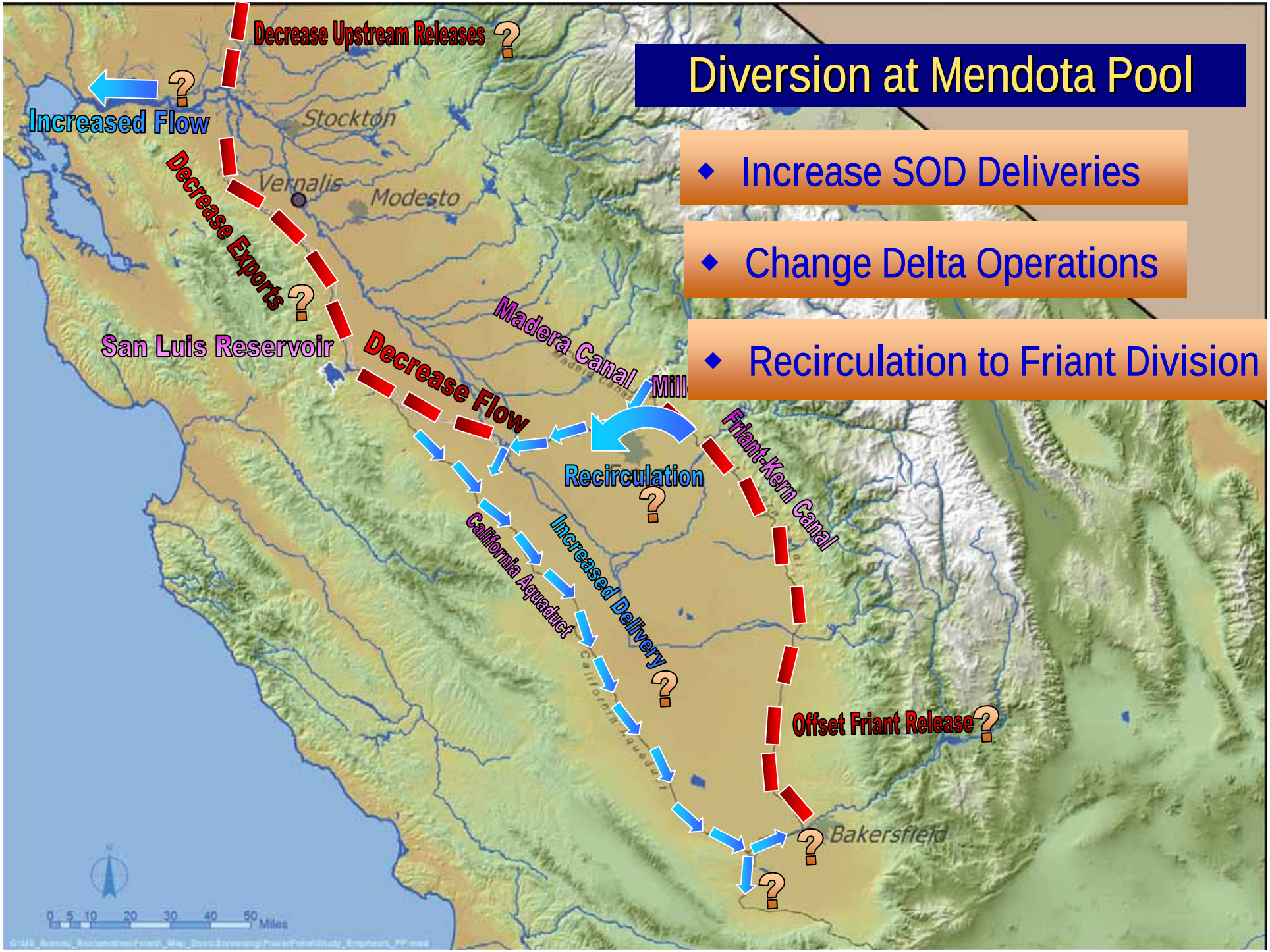

Increased Delivery
Current Contracts
WQ Exchanges
Conjunctive Management
Stockton
Vernalis
Modesto
San Luis Reservoir
Madera Canal
Millerton Reservoir
Delta-Mendota Canal
Friant-Kern Canal
Mendota Pool
Fresno


Increased River Flow
Flow Past Pool
Divert at Pool
Stockton
Vernalis
Modesto
San Luis Reservoir
Madera Canal
Millerton Reservoir
Delta-Mendota Canal
Mendota Pool
Fresno
Friant-Kern Canal
?
?


Flow Past Mendota Pool
Bypass
Release
Flow Path
Stockton
Vernalis
Modesto
San Luis Reservoir
Delta-Mendota Canal
?
Madera Canal
Millerton Reservoir
Friant-Kern Canal
Mendota Pool
Fresno


Flow Past Mendota Pool
VAMP Operation
River Water Quality
Delta Conditions
SOD Delivery
Decreased Upstream Releases
Increased Flow
New Melones Reservoir
Decrease in WQ Flow
Increased Exports
Decrease in VAMP Flow
San Luis Reservoir
Madera Canal
Millerton
Friant-Kern Canal
Mendota Pool
California Aquaduct
Increased Delivery
Offset Friant Release
Stockton
Modesto
Fresno
Bakersfield
0 5 10 20 30 40 50 Miles


Diversion at Mendota Pool
Decrease DMC Deliveries
Stockton
Vernalis
Modesto
San Luis Reservoir
?
Decrease in Flow
Delta-Mendota Canal
Mendota Pool
Madera Canal
Millerton Reservoir
Friant-Kern Canal
Fresno


Diversion at Mendota Pool
Increase SOD Deliveries
Change Delta Operations
Recirculation to Friant Division
Decrease Upstream Releases
Increased Flow
Decrease Exports
San Luis Reservoir
Decrease Flow
Madera Canal
Recirculation
Friant-Kern Canal
California Aqueduct
Increased Delivery
Offset Friant Release
Stockton
Vernalis
Modesto
Bakersfield
0 5 10 20 30 40 50 Miles

Next Steps for Water Operations Evaluations

- Determine sensitivity for operational decisions
  - Review initial modeling results
  - Identify magnitude of effects
- Develop multiple-purpose operating criteria and assumptions
  - Establish reasonable range of operating scenarios
- Obtain input from cooperating agencies

Agenda

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Next Steps

Next Steps

- Continue Identifying Groundwater Options
- Continue Screening Surface Storage Options
  - Identify and compare tradeoffs
  - Select preferred or representative sizes
- Develop Operational Scenarios for Storage Options
- Alternatives Report
- Next Stakeholder Workshop

A Joint Study By:

U.S. Bureau of Reclamation
Mid-Pacific Region

California Department
of Water Resources

Upper San Joaquin River Basin Storage Investigation

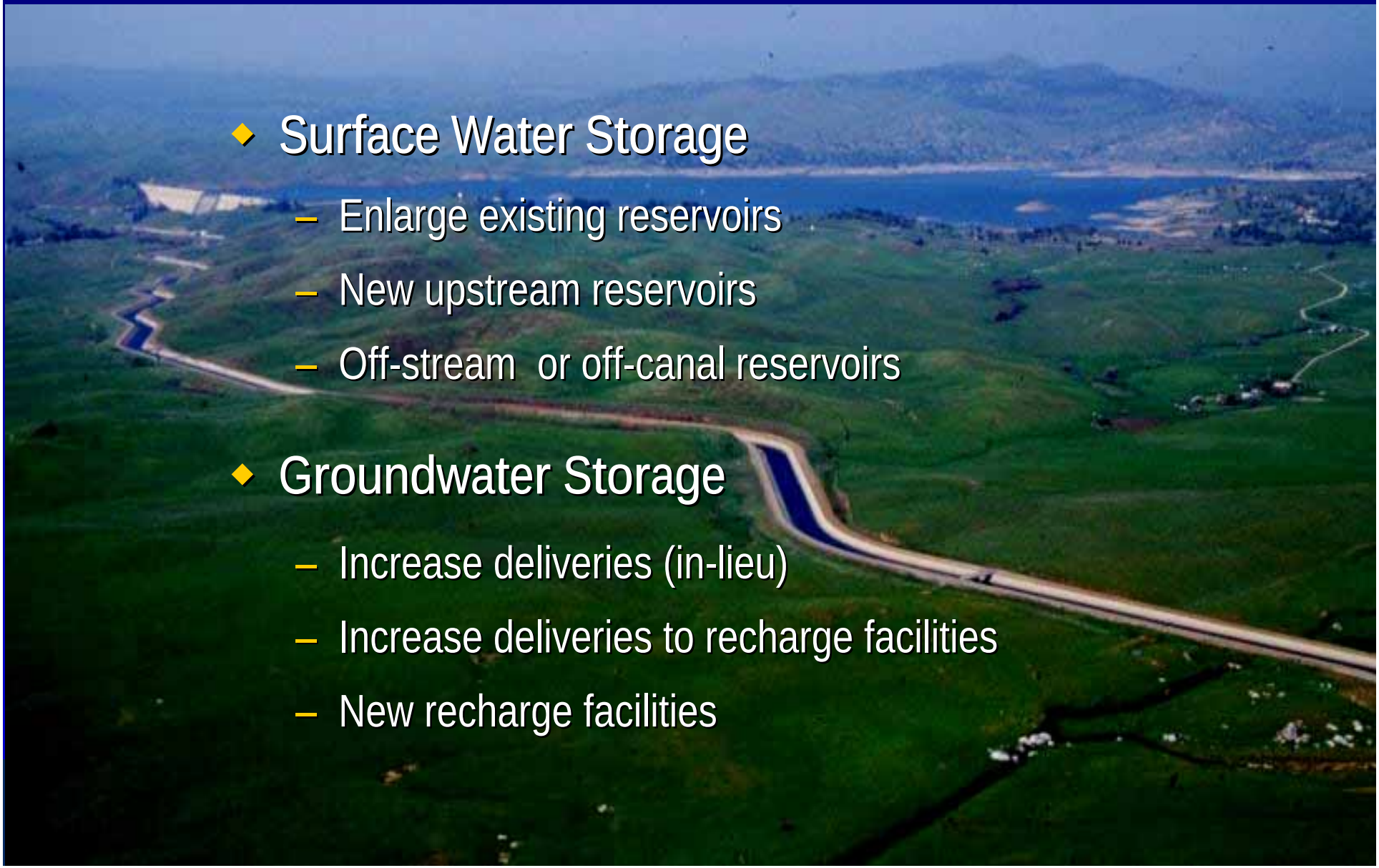
Public Workshop

California Bay-Delta Authority

July 15, 2004

Reserve Slides

Opportunities to Store San Joaquin River Water



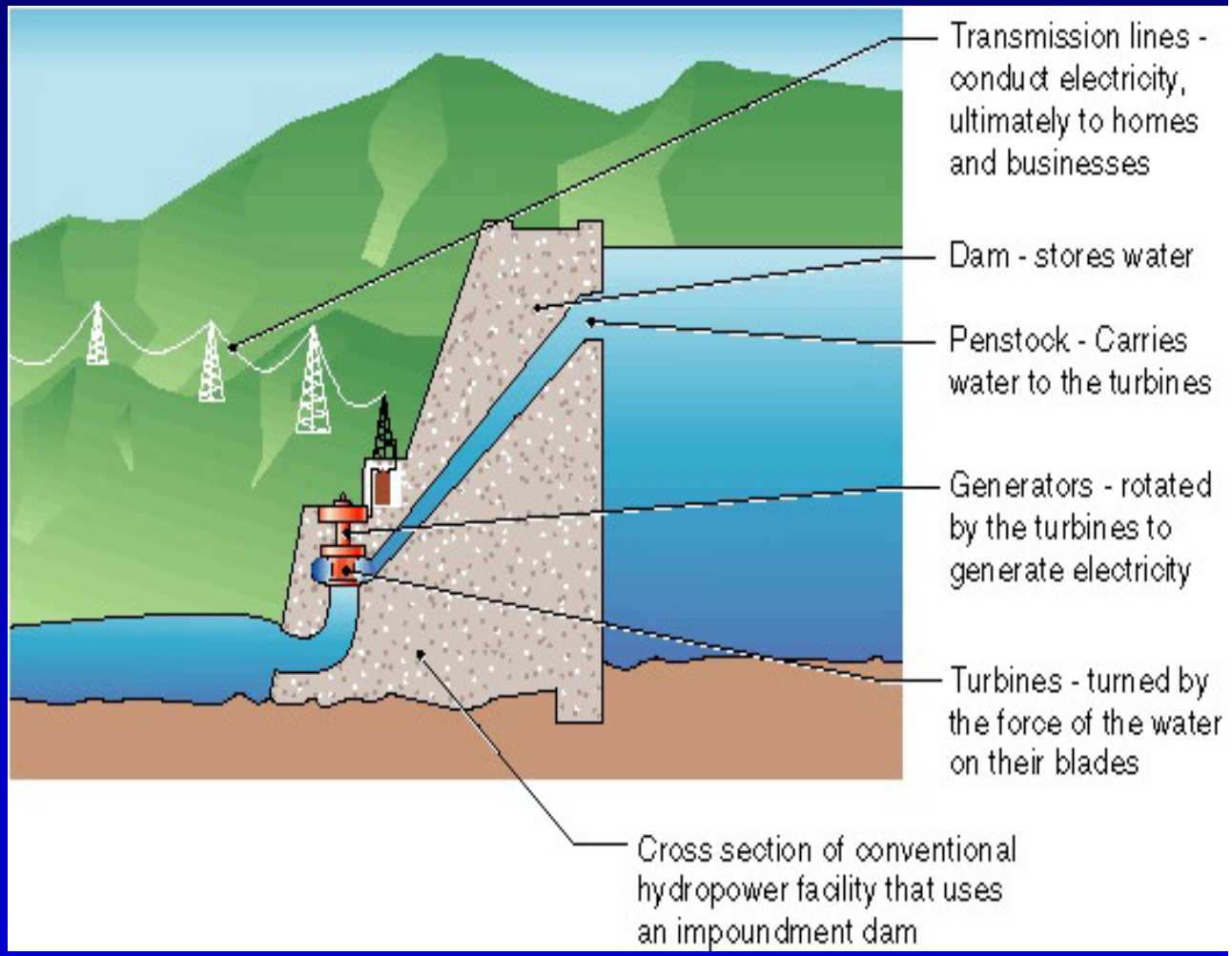
- Surface Water Storage
  - Enlarge existing reservoirs
  - New upstream reservoirs
  - Off-stream or off-canal reservoirs
- Groundwater Storage
  - Increase deliveries (in-lieu)
  - Increase deliveries to recharge facilities
  - New recharge facilities

Temperance Flat Reservoir & Enlarged Kerckhoff Lake

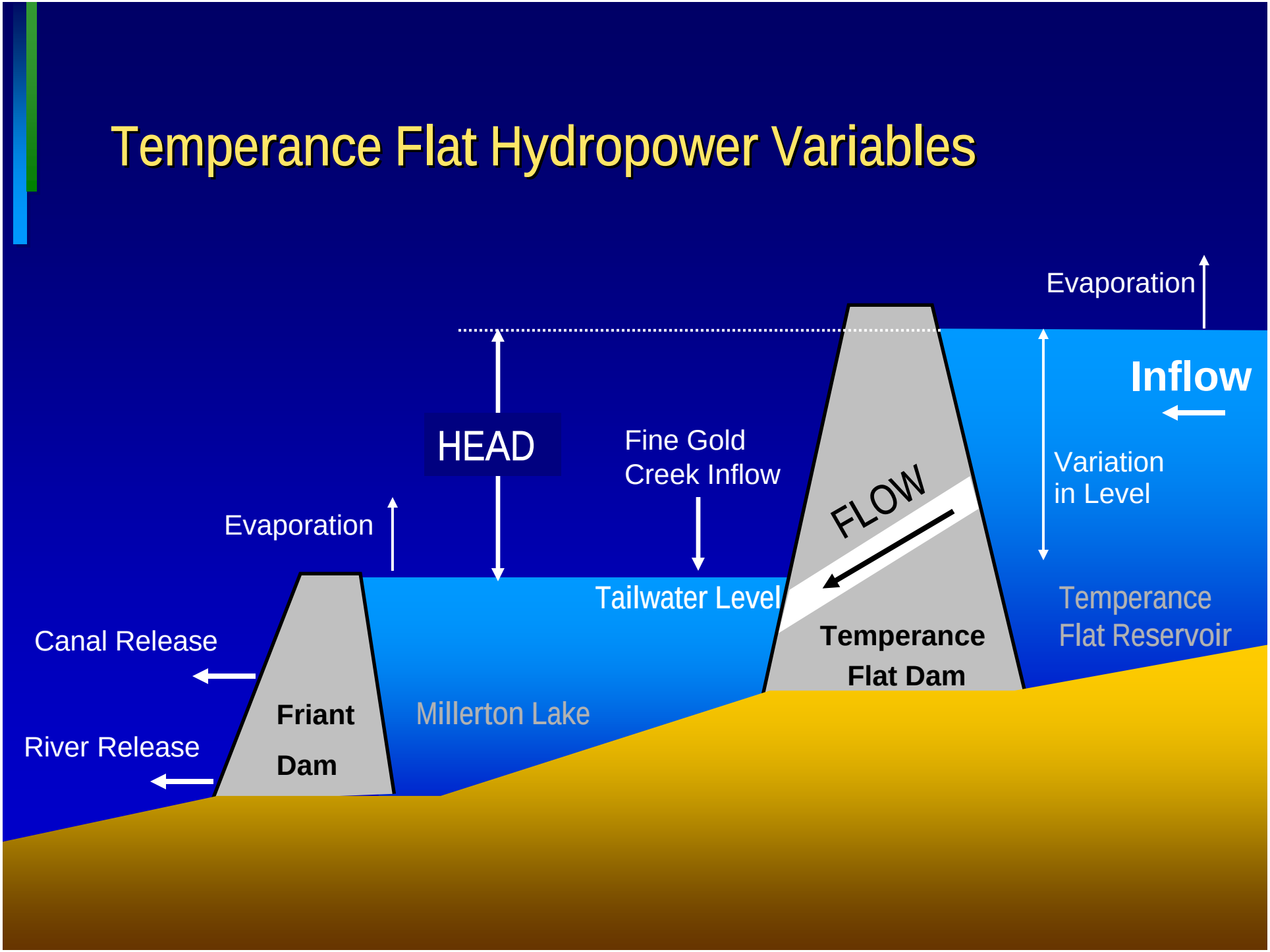
- 3 Dam Sites
  - RM 274
  - RM 279
  - RM 286
- Key Concerns
  - Design and Construction
  - Environmental resources
  - Hydropower generation

Hydropower Background

- Generation affected by
  - Head
  - Flow
- Head depends on reservoir levels
- Flow depends upon reservoir operations



Temperance Flat Hydropower Variables



Proposed Revised Agenda: Budget

Agenda (6/15)

- Welcome and Introductions (30 mins; 5 slides)
- Investigation Approaches (4 sections; 45 mins; 15 slides)
  - Phase 1 Overview (15 mins; 5 slides)
  - Phase 2 (30 mins; 10 slides)
    - Scoping (6 mins; 2 slides)
    - Agency Involvement (18 mins; 6 slides)
    - Formulation (6 mins; 2 slides)
- Storage Options Analysis Update (6 sections; 150 mins; ? slides)
  - Review Retained Surface Storage Options (20 mins; 7 slides)
  - Conjunctive Management / Groundwater Storage
  - Potential Flood Damage Reduction Accomplishments
  - Lunch Break ? → Potential Hydropower Accomplishments
  - Construction and Real Estate Cost Estimates
  - Preliminary Screening Results
- Development of Operational Scenarios (60 mins; ? slides)
- Next Steps and Wrap Up (10 mins)

Key:

Gold = determined

White = undetermined

Ave section:

25 mins;

8 slides

List of Technical Teams

- Hydropower
- Flood Protection
- Conjunctive Management
- Water Operations
- Reservoir Area Environmental Resources
- Downstream SJR Environmental Resources
- Engineering
- Economics

Example: Flood Protection Team

- Objective
  - Identify economic benefits of additional flood storage space
- Technical Team Agencies
  - Reclamation
  - DWR
  - USACE
- Stakeholder Outreach Group
  - Lower San Joaquin Levee District
  - San Joaquin River Parkway and Conservation Trust
  - San Joaquin River Resources Management Coalition
  - Madera and Fresno Counties

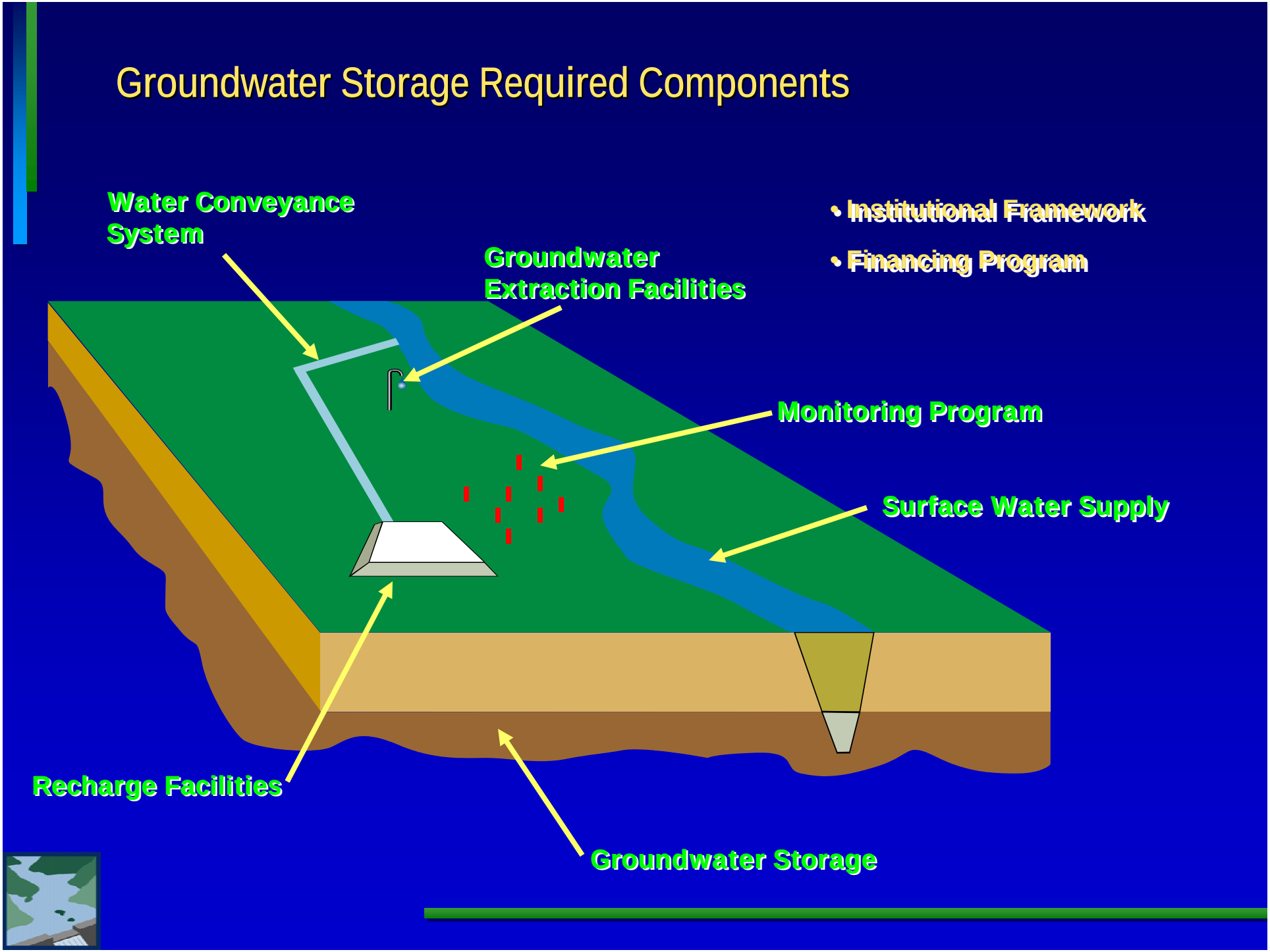
Technical Teams: Stakeholder Outreach Schedule

Topical Focus	Initial Stakeholder Outreach Method	Anticipated Outreach Date
Hydropower	Outreach Subgroup	June 2004
Flood Protection	Outreach Subgroup	early July 2004
Water Operations	Stakeholder Workshop	July 15, 2004
Conjunctive Management	Stakeholder Workshop	July 15, 2004
Engineering	Stakeholder Workshop	July 15, 2004
Reservoir Area Environmental Resources	Outreach Subgroup	Fall 2004
Economics	Stakeholder Workshop	Fall 2004
Downstream SJR Environmental Resources	TBD	TBD

Cooperating Agency (CA) Involvement

- CAs will participate in technical team(s)
  - Assist with seamless review of analysis
  - Potential technical tasks include:
    - data collection
    - development of evaluation tools
    - identification of impacts and mitigation
    - identification and quantification of benefits
- CAs will participate in relevant stakeholder outreach meetings

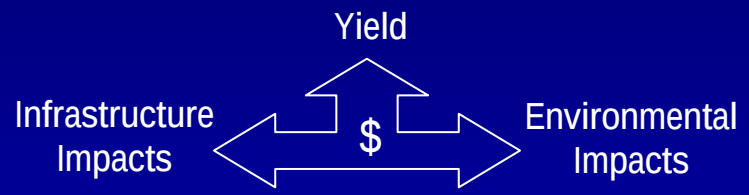
Groundwater Storage Required Components



Alternative Formulation Process

Narrow Range of Reservoir Sizes at Each Option Location

Evaluate Tradeoffs



Screen Out Options

Identify Preferred Sizes

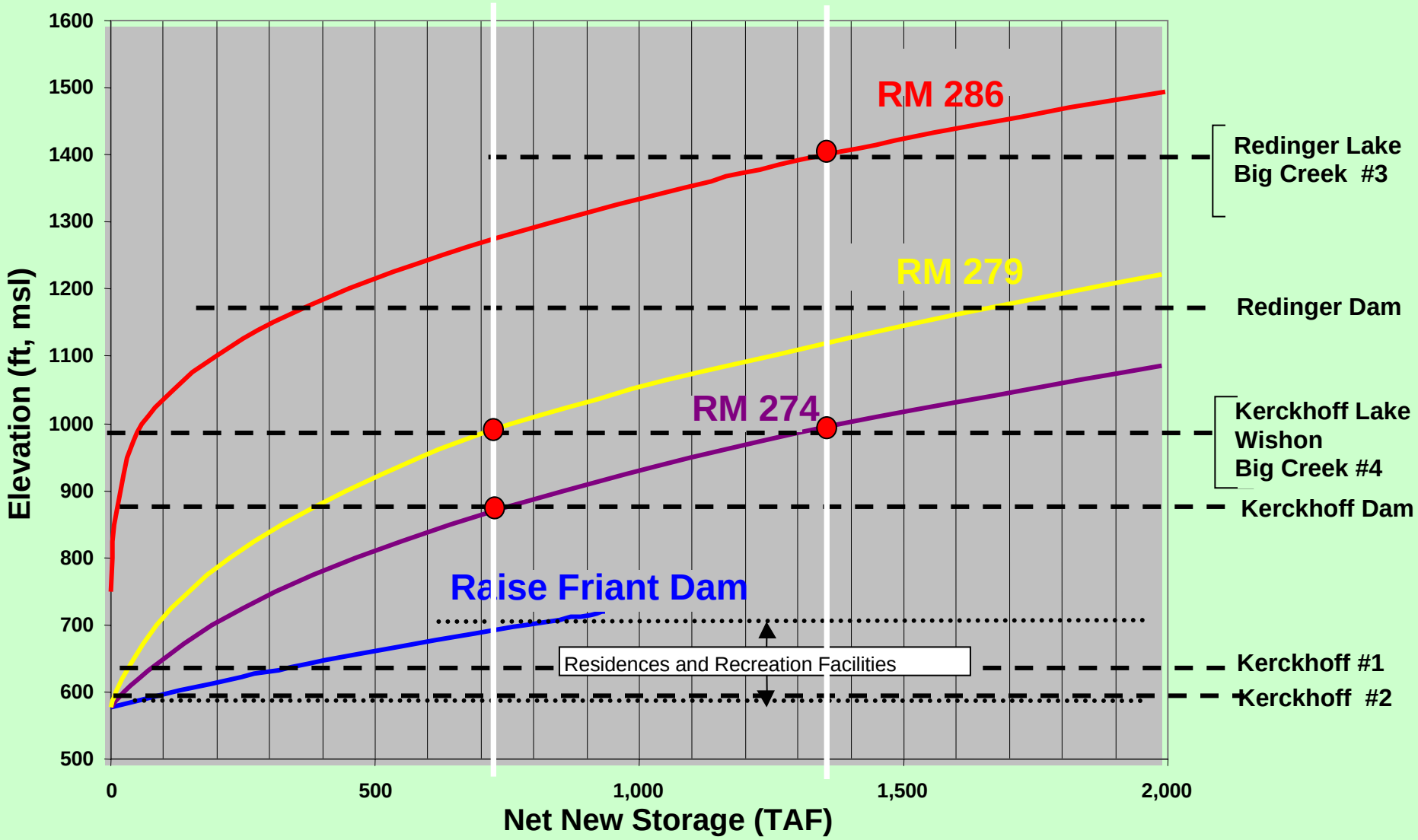
Retained Storage Options + Operational Scenarios

ALTERNATIVES

Analysis of Potential Hydroelectric Energy Generation and Impacts

- Focus
  - Energy generation potential
  - Impacts to existing operations
- Major Assumptions
  - Analysis based on CALSIM monthly output
- Limitations
  - Indicative only, dependent upon simplifying assumptions
  - Energy value not estimated
  - Potential impacts not analyzed in system context

Potentially Affected Power Facilities



Friant Power Project Baseline - Preliminary Results

Facility	Estimated Generation 1922-1994 (GWh/yr)	Recent Generation (GWh/yr)
Friant-Kern No. 1	50	?
Madera	20	?
River Outlet	20	?
TOTAL	90	?

Raise Friant Option Hydropower Generation

Additional Capacity (TAF)	Elevation (ft msl)	Additional Generation (GWh/yr)	Impacted Generation (GWh/yr)
132	603	20	0
340	638	40	580
870	718	80	580

Temperance Flat, Yokohl, and Fine Gold options would also allow for increased generation at Friant Power Project (not yet quantified)