CHAPTER 6. DEVELOPMENT OF PRELIMINARY ALTERNATIVES

The process of developing preliminary alternatives for the SRWRS is summarized in the following steps:

- Developing measures (i.e., partial solutions) for each cost-sharing partner's identified water supply needs
- Screening the measures for each cost-sharing partner by considering institutional issues and constructibility (implementability) issues
- Combining the retained measures into preliminary alternatives that fully address the identified planning objectives, and satisfy planning criteria and constraints

This chapter describes the above process and resulting preliminary alternatives for the SRWRS.

DEVELOPMENT OF MEASURES AS PARTIAL SOLUTIONS

Formulation of preliminary alternatives begins with identifying viable measures, which are partial solutions to the identified water supply reliability problems. Measures address a portion of the identified planning objectives within the planning constraints set forth for the SRWRS, as previously discussed, and fit in the following four categories:

- Surface storage
- Water conservation and recycling
- Groundwater use
- Surface water diversion

Surface Storage Measures

Surface storage measures would increase water supply availability to allow allocation of additional water rights and contract entitlements, and modify the timing of water supply availability. However, surface storage measures were eliminated from consideration in the SRWRS because they did not address the identified water supply reliability problem, even though they could improve overall efficiency and water supply shortages in statewide water management.

This finding is consistent with the conclusions of the ARWRI, stating that the Placer-Sacramento region has sufficient water rights and contract entitlements for planned development. Therefore, conjunctive management, discussed below, could be a more environmentally friendly alternative for water supply reliability. The resulting WFA is a programmatic approach that demonstrates the feasibility of the concept of conjunctive management.

Water Conservation and Recycling Measures

As previously mentioned in **Chapter 3**, projected demands for the SRWRS cost-sharing partners reflect a projected demand reduction of 25.6 percent due to implementation of BMPs for water conservation that are consistent with urban conservation goals of the California Urban Water Conservation Council, the CVPIA,

and CALFED Bay-Delta Program. The water conservation measures are currently administrated through RWA's WEP. Therefore, no additional measures for conservation were developed for the SRWRS.

The WFA does not include specific mandates regarding use of recycled water. PCWA and Roseville considered and included the planned use of recycled water as an alternate source of water supply in assessing water supply needs. SSWD and Sacramento have not adopted a policy regarding use of recycled water. Thus, no additional measures for recycled water use would be developed for the SRWRS.

Groundwater Use Measures

Groundwater supply is available in the Placer-Sacramento region, and continues to be a critical component of local water supply for agricultural and M&I uses. All SRWRS cost-sharing partners have access to groundwater, which is the main water source for SSWD and a supplemental water source for PCWA, Roseville, and Sacramento.

However, groundwater measures were removed from further consideration in the SRWRS because they are inconsistent with the identified planning objectives. As previously mentioned, the SRWRS is being developed under WFA Elements I and II with planning objectives to further increase use of the cost-sharing partners' surface water rights and contract entitlements to enhance the regional conjunctive use and groundwater management envisioned by the WFA for long-term water supply reliability.

Additional use of groundwater also could compromise the management goals of safe yield established in the WFA. Particularly, with the threat of uncontrolled Aerojet contamination, the region is seeking greater collaboration in diversifying water sources to ensure water supply reliability. Additional use of groundwater is not consistent with the direction of regional planning.

Other partner-specific reasons exist for removing groundwater measures from further consideration. For PCWA, using groundwater for new urban development in unincorporated Placer County areas is not consistent with the Placer County General Plan. Thus, PCWA has limited its groundwater use and is not seeking groundwater options in the SRWRS. The only opportunity for groundwater use in PCWA's service area is for the incorporated City of Lincoln (Lincoln). However, Lincoln is located near the edge of the Placer-Sutter groundwater basin, where groundwater development may be limited, and because of hydrogeological connectivity, Lincoln's groundwater supply reliability would be subject and sensitive to groundwater management of the basin in the County of Sacramento. Therefore, despite groundwater availability, long-term water supply reliability for Lincoln would still require a successful conjunctive use program on a Placer-Sacramento regional scale.

For SSWD, increasing use of groundwater is reverting to its current conditions and thus, this measure would address the water supply reliability problem.

For Roseville, and Sacramento, increasing groundwater use for unmet demand is a feasible option for water supply; however, it would be inconsistent with their long-term policy for reducing groundwater reliance.

Surface Water Diversion Measures

As previously mentioned, the cost-sharing partners have unused existing water rights and contract entitlements that can be used to resolve water supply reliability problems identified in the SRWRS. Therefore, these measures focus on location(s) where diversions can be made.

Identified Surface Water Diversion Measures

The partnership of Reclamation and the SRWRS cost-sharing partners broadens the range of diversion point options for PCWA, SSWD, and Roseville, whose water rights and/or contract entitlements are on the

American River. However, SSWD and Roseville will not develop a diversion on a river other than the American River without PCWA because the intended diversions are based on their MFP contract entitlements. Sacramento is unique among cost-sharing partners, owning water rights on both the American and Sacramento rivers. In other words, Sacramento does not rely on Reclamation's water rights on the Sacramento River in evaluating its options for additional diversions from the Sacramento River.

Due to the different attributes associated with the cost-sharing partners' water rights and contract entitlements, diversion location measures are best developed in a comprehensive and purveyor-specific manner by considering available sources of surface water around the study area from the American, Feather, and Sacramento rivers. Bear River was not considered as a potential source because it is a tributary of the Feather River and carries significantly less flow.

The following 12 potential diversion locations or river reaches were identified (see **Figure 6-1**):

1. Feather River near Nicolaus
2. Feather River from Nicolaus to the confluence with the Sacramento River
3. Natomas' Sankey Diversion on the Sacramento River
4. Natomas' Elkhorn Diversion on the Sacramento River
5. Sacramento River from the Feather River confluence to the American River confluence
6. Sacramento's Sacramento River WTP on the Sacramento River
7. Freeport Diversion of EBMUD and the County of Sacramento
8. Sacramento River from the American River confluence to Freeport
9. Sacramento's Fairbairn WTP on the American River
10. American River from Nimbus Dam to the Sacramento River confluence
11. Folsom Dam on the American River
12. PCWA's ARPS on the North Fork American River

Initial Screening of Surface Water Diversion Measures

Initial screening of measures was based on initial assessments of institutional requirements and constructibility. Major considerations for each surface water diversion measure by cost-sharing partner are summarized in **Table 6-1**. Surface water diversion measures are summarized below:

Several surface water diversion measures were not retained for any of the SRWRS cost-sharing partners, including the following:

2. Feather River from Nicolaus to the confluence with Sacramento River
6. Sacramento River WTP
7. Freeport Diversion
8. Sacramento River from the American River confluence to Freeport

9. Fairbairn WTP

10. American River from Nimbus Dam to the confluence with the Sacramento River

Surface water diversion measures retained for at least one of the SRWRS cost-sharing partners include the following:

1. Feather River near Nicolaus

3. Sankey Diversion (for PCWA, SSWD, and Roseville only)

4. Elkhorn Diversion

5. Sacramento River from the Feather River confluence to the American River confluence (with an Elverta Diversion location identified near Elverta Road for its advantageous bathymetric conditions)

11. Folsom Dam (for PCWA and SSWD only)

12. ARPS (for PCWA only)

Combined Elkhorn/Elverta Measure for Developing Preliminary Alternatives

A further combination of Measures 4 (Elkhorn) and 5 (Elverta) into an Elkhorn/Elverta measure for developing a preliminary alternative is a result of considering the less-than-2-mile distance between these two locations. Institutional considerations are similar for these two locations and both allow all cost-sharing partners to develop joint diversion and treatment facilities for the SRWRS.[18]

[18] Later analyses of alternatives suggest significant differences in engineering considerations at these two locations, as described in **Chapter 7**.

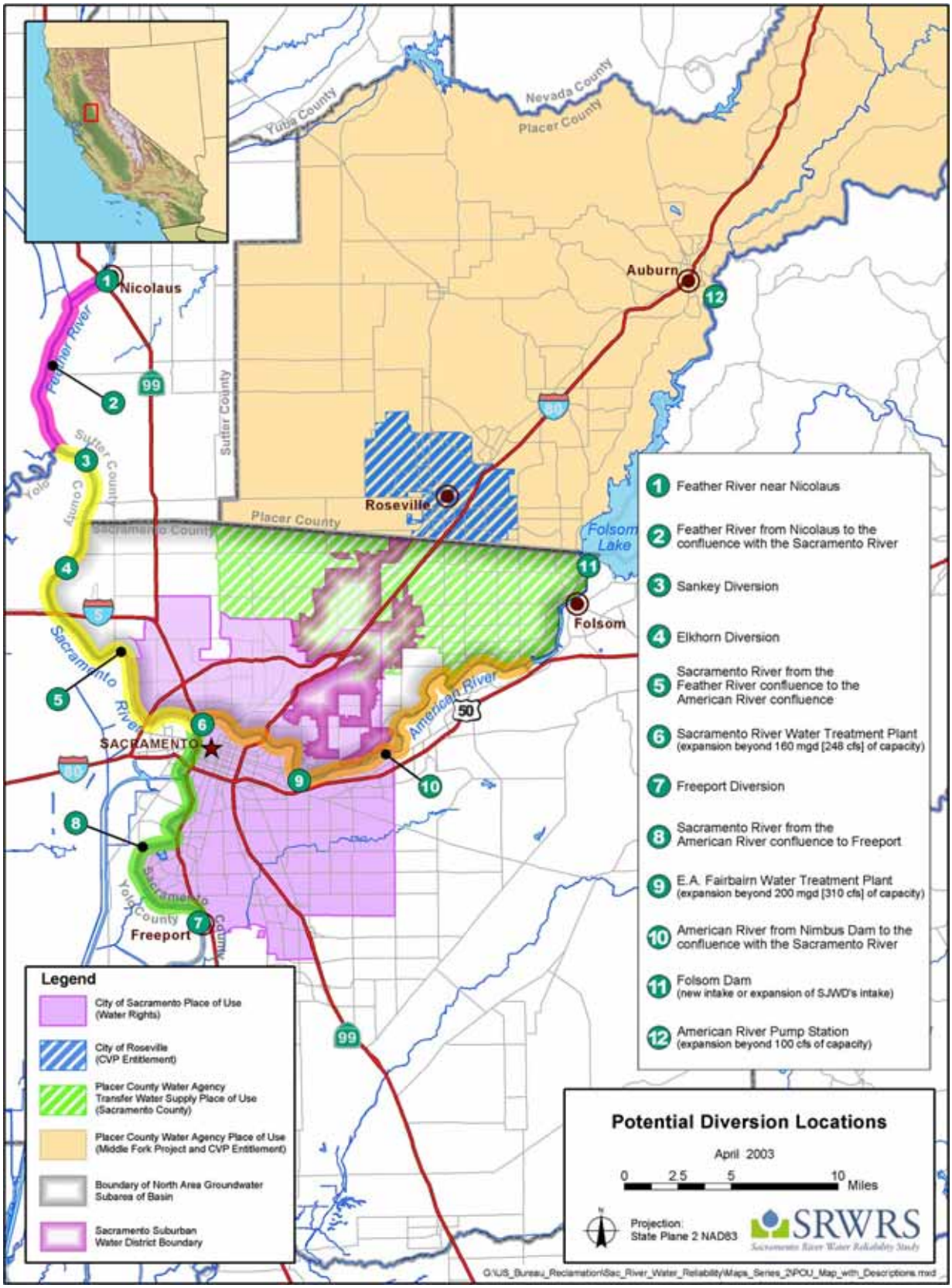

Figure 6-1. Potential Surface Water Diversion Locations for the Cost-Sharing Partners

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Table 6-1. Preliminary Screening of Measures by Cost-Sharing Partner

Measure	Major Considerations of Institutional Requirements and Constructibility by Cost-Sharing Partner							
	PCWA		SSWD		Roseville		Sacramento	
	Retained?	Summary of Considerations	Retained?	Summary of Considerations	Retained?	Summary of Considerations	Retained?	Summary of Considerations
1. Feather River near Nicolaus	YES	Reclamation must approve a change in points of delivery for PCWA's CVP contract, and a further exchange agreement with the SWP is required.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, and further secure an additional exchange agreement with the SWP.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River. Reclamation must secure an additional exchange agreement with the SWP.	NO	Sacramento has water rights on the Sacramento River where flow is greater and requires no SWP involvement. No clear engineering or environmental benefits exist to justify the additional cost and institutional requirements.
2. Feather River from Nicolaus to confluence with Sacramento River	NO	Reclamation must approve a change in points of delivery for PCWA's CVP contract, and a further exchange agreement with the SWP is required. Unfavorable bathymetric conditions incur greater risks of sedimentation and safety, especially flooding.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, and further secure an additional exchange agreement with the SWP. Unfavorable bathymetric conditions incur greater risks of sedimentation and safety, especially flooding. SSWD will not develop a diversion at this location without PCWA.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, and further secure an additional exchange agreement with the SWP. Unfavorable bathymetric conditions incur greater risks of sedimentation and safety, especially flooding. Roseville will not develop a diversion at this location without PCWA.	NO	Sacramento has water rights on the Sacramento River where flow is greater and requires no SWP involvement. Unfavorable bathymetric conditions incur greater risks of sedimentation and safety, especially flooding. No clear engineering or environmental benefits exist to justify the additional cost and institutional requirements.
3. Sankey Diversion	YES	Reclamation must approve a change in points of delivery for PCWA's CVP contract. Coordination with NMWC is required for using its facility.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River. Coordination with NMWC is required for using its facility.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River. Coordination with NMWC is required for using its facility.	NO	The SWRCB must include this location as an authorized point of diversion in Sacramento's water right permits. Compared with Measures 4 and 5, no clear engineering or environmental benefits exist to justify the additional cost and institutional requirements to coordinate with Sutter County and NMWC.
4. Elkhorn Diversion	YES	Reclamation must approve a change in points of delivery for PCWA's CVP contract. Coordination with NMWC is required for using its facility.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River. Coordination with NMWC is required for using its facility.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River. Coordination with NMWC is required for using its facility.	YES	The SWRCB will need to include this location as an authorized point of diversion in Sacramento's water right permits. Coordination with NMWC is required.
5. Sacramento River from Feather River confluence to American River confluence (with identified Elverta Diversion location)	YES	Reclamation must approve a change in points of delivery for PCWA's CVP contract.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River.	YES	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River.	YES	The SWRCB must include this location as an authorized point of diversion in Sacramento's water right permits.

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Table 6-1. Preliminary Screening of Measures by Cost-Sharing Partner (Cont'd)

Measure	Major Considerations of Institutional Requirements and Constructibility by Cost-Sharing Partner							
	PCWA		SSWD		Roseville		Sacramento	
	Retained?	Summary of Considerations	Retained?	Summary of Considerations	Retained?	Summary of Considerations	Retained?	Summary of Considerations
6. Sacramento River WTP	NO	Reclamation must approve a change in points of delivery for PCWA's CVP contract. The southern location is disadvantageous and costly for delivering water to PCWA's service area in Placer County. Due to its downtown location, further expansion of the Sacramento River WTP beyond 160 mgd would incur high costs and create a major disturbance in a developed urban area.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, or the SWRCB must approve an additional point of diversion for PCWA's MFP water rights. The southern location is disadvantageous and costly for delivering water to SSWD's service area north of the American River. Due to its downtown location, further expansion of the Sacramento River WTP beyond 160 mgd would incur high costs and create a major disturbance in a developed urban area. SSWD will not develop a diversion at this location without PCWA.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, or the SWRCB must approve an additional point of diversion for PCWA's MFP water rights. The southern location is disadvantageous and costly for delivering water to Roseville's service area in Placer County. Due to its downtown location, further expansion of the Sacramento River WTP beyond 160 mgd would incur high costs and create a major disturbance in a developed urban area. Roseville will not develop a diversion at this location without PCWA.	NO	Due to its downtown location, further expansion of the Sacramento River WTP beyond 160 mgd would incur high costs and create a major disturbance in a developed urban area.
7. Freeport Diversion	NO	Reclamation must approve a change in points of delivery for PCWA's CVP contract. The southern location is disadvantageous and costly for delivering water to PCWA's service area in Placer County. Construction of facilities and pipelines would create a major disturbance in a developed urban area. Coordination with the Freeport Regional Water Authority is required.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, or the SWRCB must approve an additional point of diversion for PCWA's MFP water rights. The southern location is disadvantageous and costly for delivering water to SSWD's service area north of the American River. Coordination with the Freeport Regional Water Authority is required. SSWD will not develop a diversion at this location without PCWA.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, or the SWRCB must approve an additional point of diversion for PCWA's MFP water rights. The southern location is disadvantageous and costly for delivering water to Roseville's service area in Placer County. Construction of facilities and pipelines would create a major disturbance in a developed urban area. Coordination with the Freeport Regional Water Authority is required. Roseville will not develop a diversion at this location without PCWA.	NO	The southern location is disadvantageous for delivering water to north of the American River where primary future demands were identified. In addition to higher costs, construction of facilities and pipelines would create a major disturbance in a developed urban area. Coordination with the Freeport Regional Water Authority is required.
8. Sacramento River from American River confluence to Freeport	NO	Reclamation must approve a change in points of delivery for PCWA's CVP contract. The southern location is disadvantageous and costly for delivering water to PCWA's service area in Placer County. Construction of facilities and pipelines would create a major disturbance in a developed urban area.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, or the SWRCB must approve an additional point of diversion for PCWA's MFP water rights. The southern location is disadvantageous and costly for delivering water to SSWD's service area north of the American River. SSWD will not develop a diversion at this location without PCWA.	NO	Reclamation must approve an exchange agreement with PCWA to exchange PCWA's MFP delivery to Folsom Lake for a CVP delivery from the Sacramento River, or the SWRCB must approve an additional point of diversion for PCWA's MFP water rights. The southern location is disadvantageous and costly for delivering water to Roseville's service area in Placer County. Construction of facilities and pipelines would create a major disturbance in a developed urban area. Roseville will not develop a diversion at this location without PCWA.	NO	The southern location is disadvantageous for delivering water to north of the American River where primary future demands were identified. In addition to higher costs, construction of facilities and pipelines would create a major disturbance in a developed urban area.

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Table 6-1. Preliminary Screening of Measures by Cost-Sharing Partner (Cont'd)

Measure	Major Considerations of Institutional Requirements and Constructibility by Cost-Sharing Partner							
	PCWA		SSWD		Roseville		Sacramento	
	Retained?	Summary of Considerations	Retained?	Summary of Considerations	Retained?	Summary of Considerations	Retained?	Summary of Considerations
9. Fairbairn WTP	NO	Reclamation must approve a change in points of delivery for PCWA's CVP contract. Due to its urban location, further expansion of the Fairbairn WTP beyond 200 mgd would incur high costs and create a major disturbance in a developed urban area. This location would incur additional facility costs and provides no apparent advantages compared with PCWA's current diversion points at Folsom Dam (for CVP and MFP delivery) and at ARPS (for MFP delivery).	NO	The SWRCB must approve an additional point of diversion for PCWA's MFP water rights. This location would incur additional facility costs and would provide no apparent advantages compared with SSWD's current diversion point at Folsom Dam.	NO	This measure is not consistent with Roseville's Water Forum PSA to limit diversions from the American River.	NO	This measure is not consistent with Sacramento's Water Forum PSA to limit diversions from the American River.
10. American River from Nimbus Dam to confluence with Sacramento River	NO	Reclamation must approve a change in points of delivery for PCWA's CVP contract. This location would incur additional facility costs and would provide no apparent advantages compared with PCWA's current diversion points at Folsom Dam (for CVP and MFP delivery) and at ARPS (for MFP delivery).	NO	The SWRCB must approve the additional point of diversion for PCWA's MFP water rights. This location would incur additional facility costs and would provide no apparent advantages compared with SSWD's current diversion point at Folsom.	NO	This measure is not consistent with Roseville's Water Forum PSA to limit diversions from the American River.	NO	This measure is not consistent with Sacramento's Water Forum PSA to limit diversions from the American River.
11. Folsom Dam	YES	This location is the current authorized point of delivery for PCWA's CVP entitlements.	YES	This location is the current diversion point for SSWD, using shoulder capacity of SJWD's facility. The SWRCB must amend PCWA's MFP water rights to allow additional diversions in non-wet years from this location.	NO	This measure is not consistent with Roseville's Water Forum PSA to limit diversions from the American River.	NO	This measure is not consistent with Sacramento's Water Forum PSA to limit diversions from the American River.
12. ARPS	YES	This location is the current authorized point of diversion under PCWA's MFP water right permits. PCWA must have MFP contractors divert its CVP entitlements at Folsom Dam in lieu of MFP delivery to divert its MFP water at this location.	NO	The location is a currently authorized point of diversion under PCWA's MFP water right permits. The SWRCB must amend PCWA's MFP water rights to allow additional diversions in non-wet years from this location. This location would incur additional facility costs and would provide no apparent advantages compared with SSWD's current diversion point at Folsom Dam.	NO	This measure is not consistent with Roseville's Water Forum PSA to limit diversions from the American River.	NO	This measure is not consistent with Sacramento's Water Forum PSA to limit diversions from the American River.

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PRELIMINARY ALTERNATIVES

In addition to the No-Project/No-Action Alternative, five preliminary action alternatives, listed below were identified based on an initial assessment of measures. Retained measures were combined to address the planning objectives fully, and satisfy the identified planning criteria and constraints.

- Elkhorn/Elverta Diversion Alternative
- Sankey Diversion Alternative
- Feather River Diversion Alternative
- ARPS Alternative
- Folsom Dam Alternative

Each action alternative contains a package of water supply infrastructure components, including new or expanded diversions from the Sacramento, Feather, or American rivers, and new or expanded water treatment and pumping facilities, storage tanks, and major transmission and distribution pipelines.

Among these action alternatives, the Elkhorn/Elverta Diversion Alternative is the only alternative that can accommodate all cost-sharing partners in a comprehensive plan with a single diversion. In other action alternatives, cost-sharing partners share facilities to a greater or lesser degree. A summary description of each preliminary alternative is provided below; more details are available in the **2004 SRWRS Phase 1 Engineering Report**.

Elkhorn/Elverta Diversion Alternative

This proposed project (see **Figure 6-2**) encompasses constructing a joint diversion from the Sacramento River and treatment facilities to serve the cost-sharing partners. The diversion facility would consist of expanding the existing Elkhorn Diversion owned by NMWC on the east bank of the Sacramento River, or constructing a new diversion near Elverta Road, within 2 miles upstream of the existing Elkhorn Diversion. The infrastructure plan of the Elkhorn/Elverta Diversion Alternative includes a raw water intake and pump station located on the Sacramento River, a new joint WTP of the same capacity, raw water pipelines, and treated water pipelines to the connecting point(s) of each cost-sharing partner's existing water distribution system. It is anticipated that the intake and WTP would be owned and operated by Sacramento.

Sankey Diversion Alternative

A Sankey Diversion alternative (see **Figure 6-3**) assumes that PCWA, SSWD, and Roseville would divert water from the Sacramento River near the confluence of the Sacramento River and the NCC, and build separate treatment, storage, and transmission facilities to meet their needs. This new diversion would be located at or near the second diversion that NMWC is developing under its CALFED-supported ABFSHIP. Sacramento would divert separately from the Sacramento River at the Elkhorn/Elverta site through a new intake, and construct its own treatment and transmission facilities to serve its needs.

Feather River Diversion Alternative

A Feather River Diversion Alternative (see **Figure 6-4**) assumes that PCWA, SSWD, and Roseville would divert water from the Feather River near Nicolaus through a new diversion and build separate treatment, storage, and transmission facilities to meet their needs. The CVP would not be able to supply water directly to any diversion location on the Feather River and thus, a further agreement with the SWP and possibly a modification to the COA would be required for this alternative. Sacramento would divert separately from the

Sacramento River at the Elkhorn/Elverta site through a new intake, and construct its own treatment and transmission facilities to serve its needs.

ARPS Alternative

An ARPS alternative (see **Figure 6-5**) assumes that PCWA would expand its ARPS near Auburn,[19] expand its Foothill Phase II WTP[20] with a like capacity increment, and expand transmission facilities to serve its needs. The CVP would not be able to provide a reliable water supply to PCWA at this location and thus, PCWA would divert from its MFP water rights. PCWA's CVP contract entitlement would be diverted at Folsom Dam by SSWD, Roseville, or SJWD in lieu of MFP water delivery.

SSWD would divert from existing SJWD diversion facilities at Folsom Dam using shoulder capacity. Roseville would increase use of groundwater to satisfy its needs for this alternative, but would have no additional surface water diversions. Sacramento would divert separately from the Sacramento River at the Elkhorn/Elverta site through a new intake, and construct its own treatment and transmission facilities to serve its needs.

Folsom Dam Alternative

A Folsom Dam alternative (see **Figure 6-6**) assumes that PCWA and SSWD would use the existing or expanded diversion, treatment, and transmission facilities of SJWD at Folsom Dam. Roseville would increase use of groundwater to satisfy its needs in this alternative, but not have any additional surface water diversions. Sacramento would divert separately from the Sacramento River at the Elkhorn/Elverta site through a new intake, and construct its own treatment and transmission facilities to serve its needs.

[19] The ARPS is currently under construction and will have a diversion capacity of 100 cfs. It is anticipated that construction will be completed in 2007.

[20] As a separate effort, PCWA is currently evaluating the feasibility of a new water treatment facility in the Auburn area for its approved diversions from the American River and PG&E canal system. It is anticipated that the associated environmental review process will be completed in 2005.

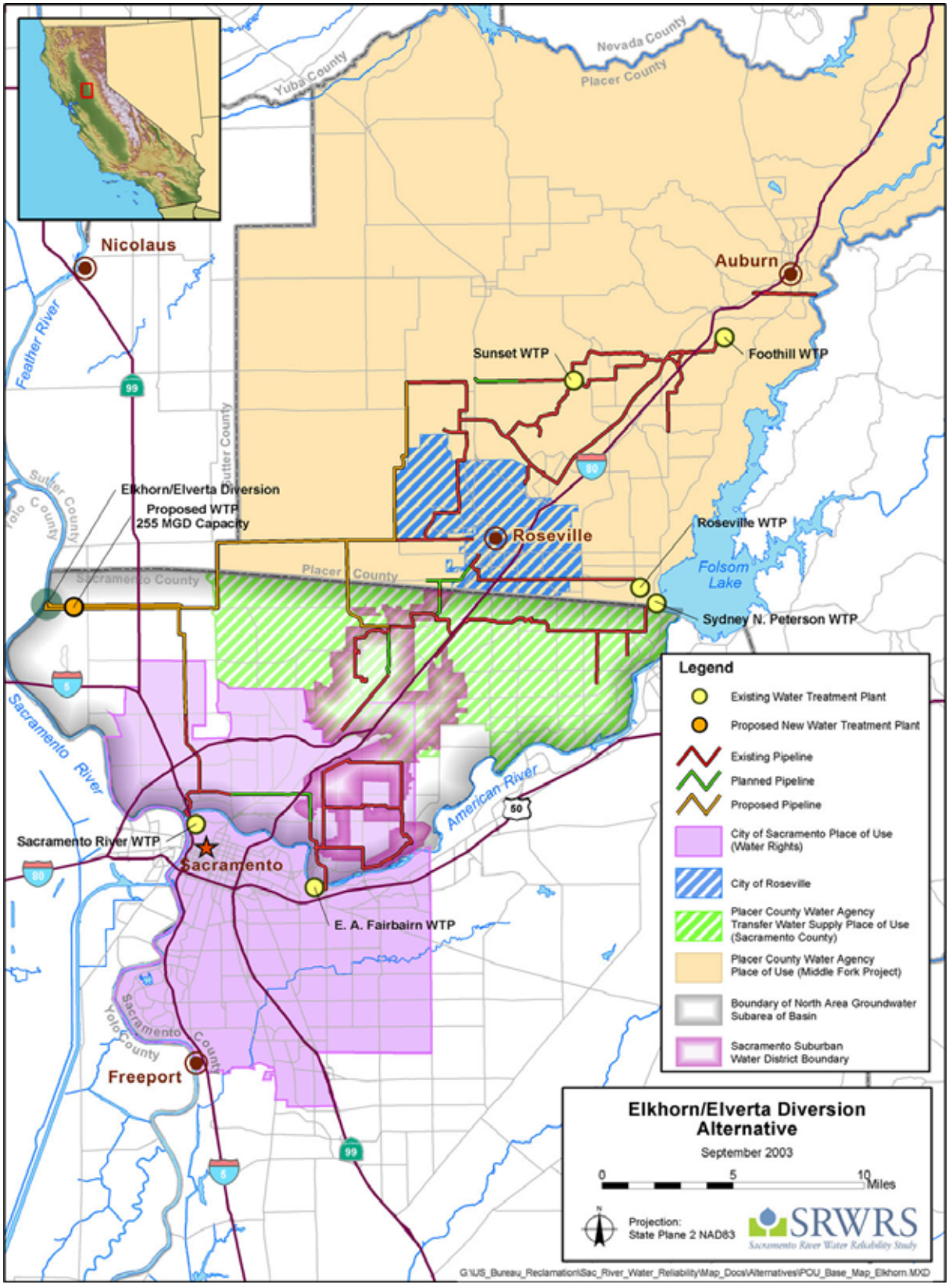

Figure 6-2. Preliminary Alternative: Elkhorn/Elverta Diversion Alternative

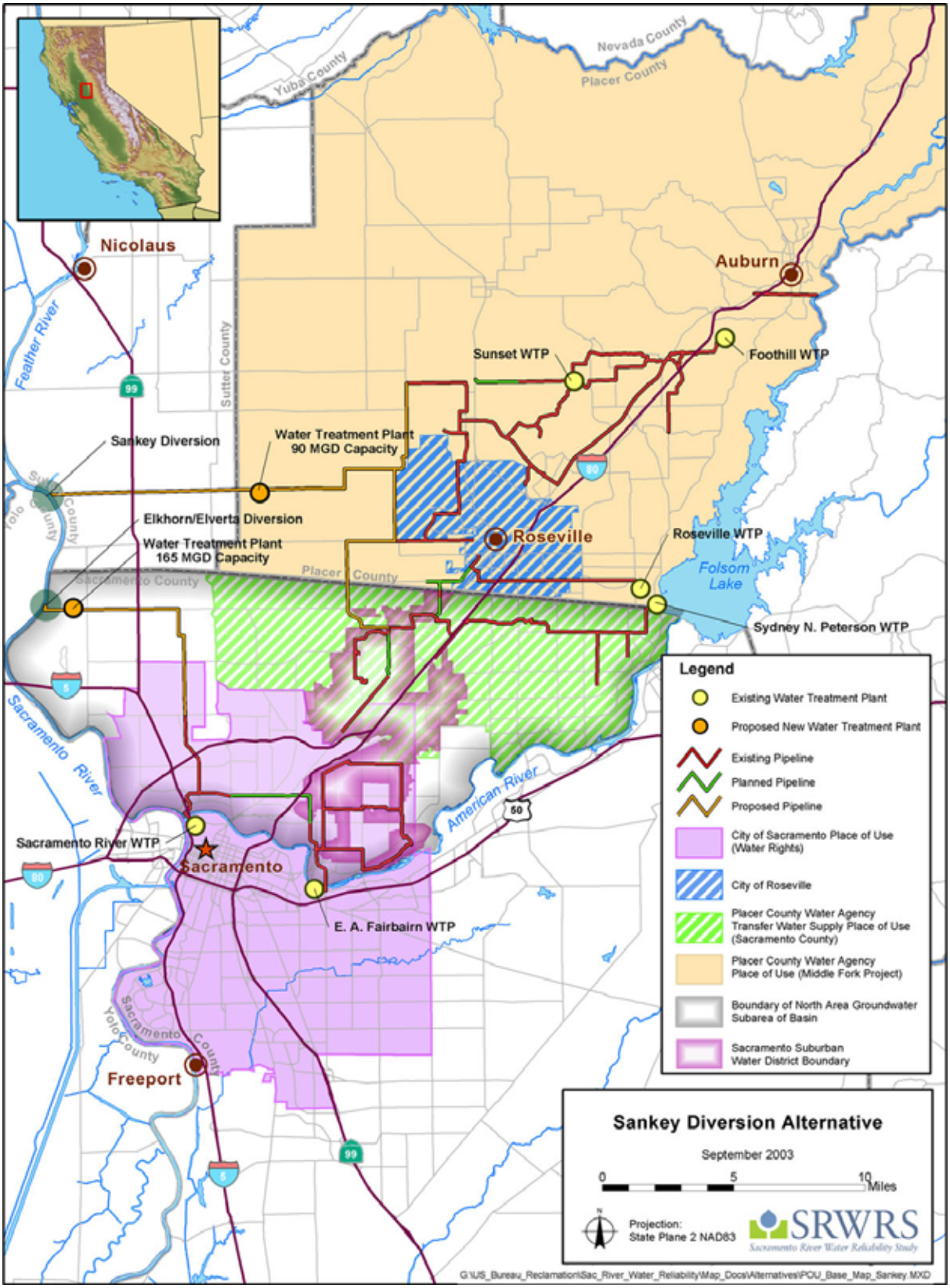

Figure 6-3. Preliminary Alternative: Sankey Diversion Alternative

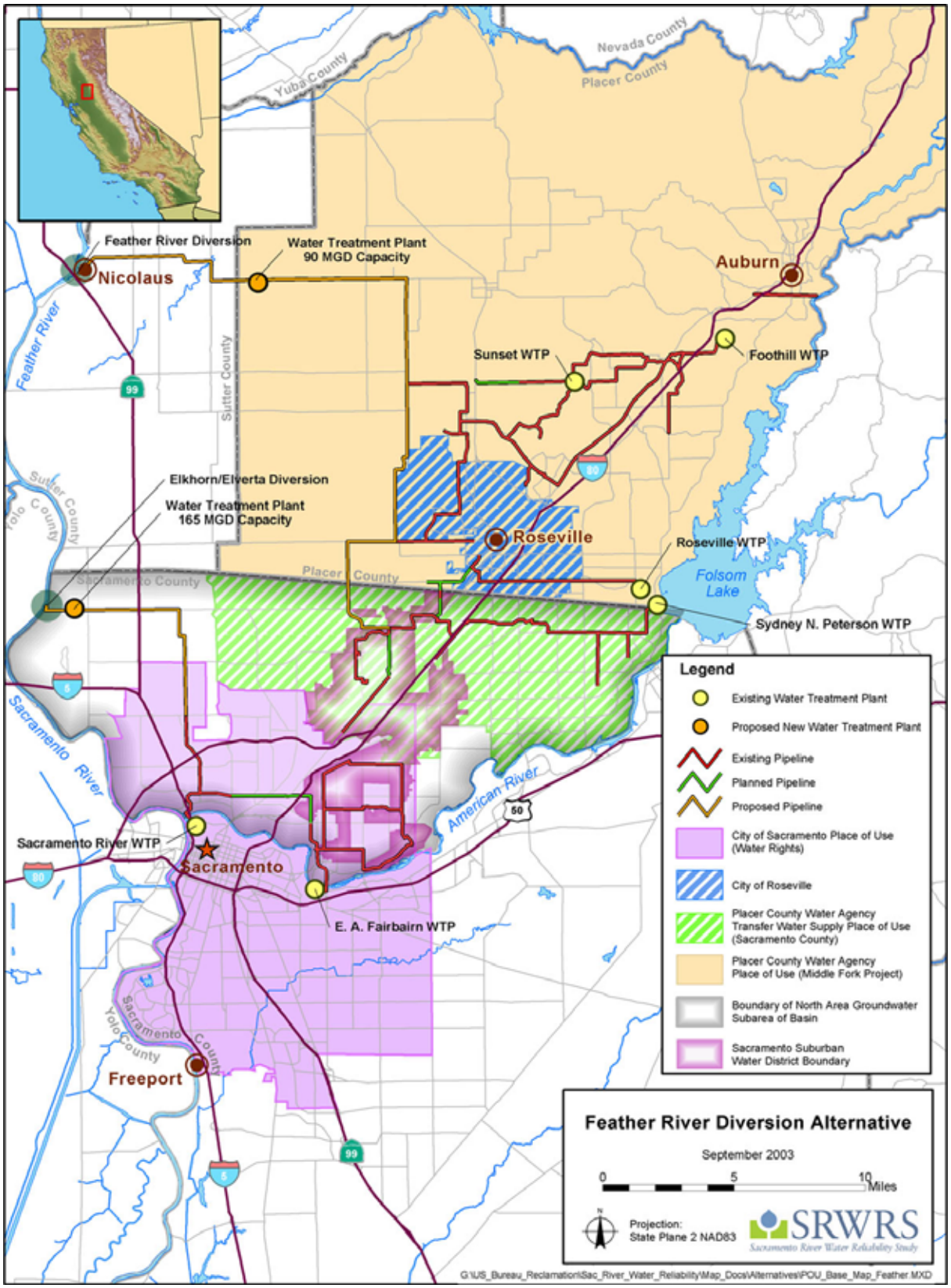

Figure 6-4. Preliminary Alternative: Feather River Diversion Alternative

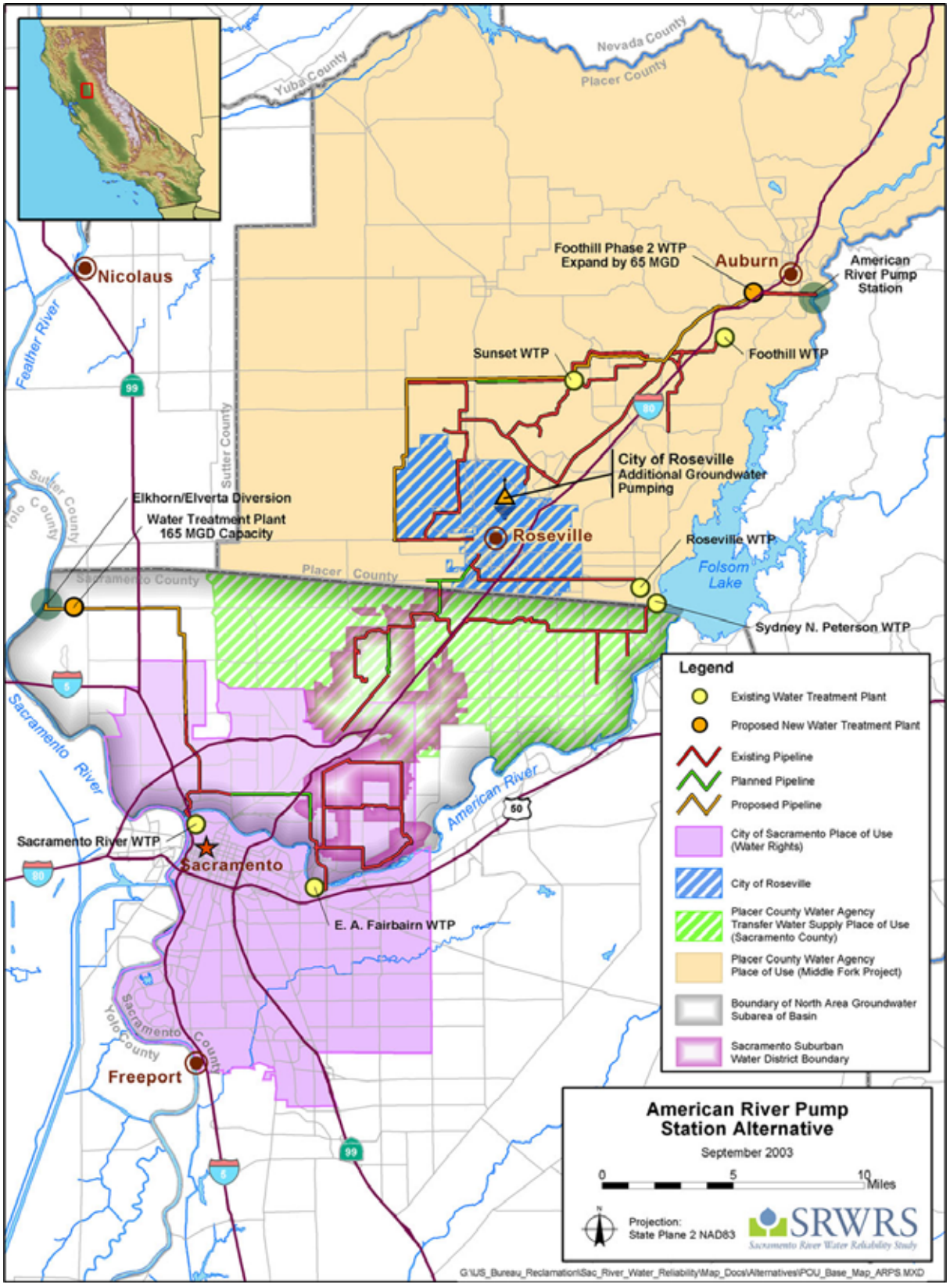

Figure 6-5. Preliminary Alternative: ARPS Alternative

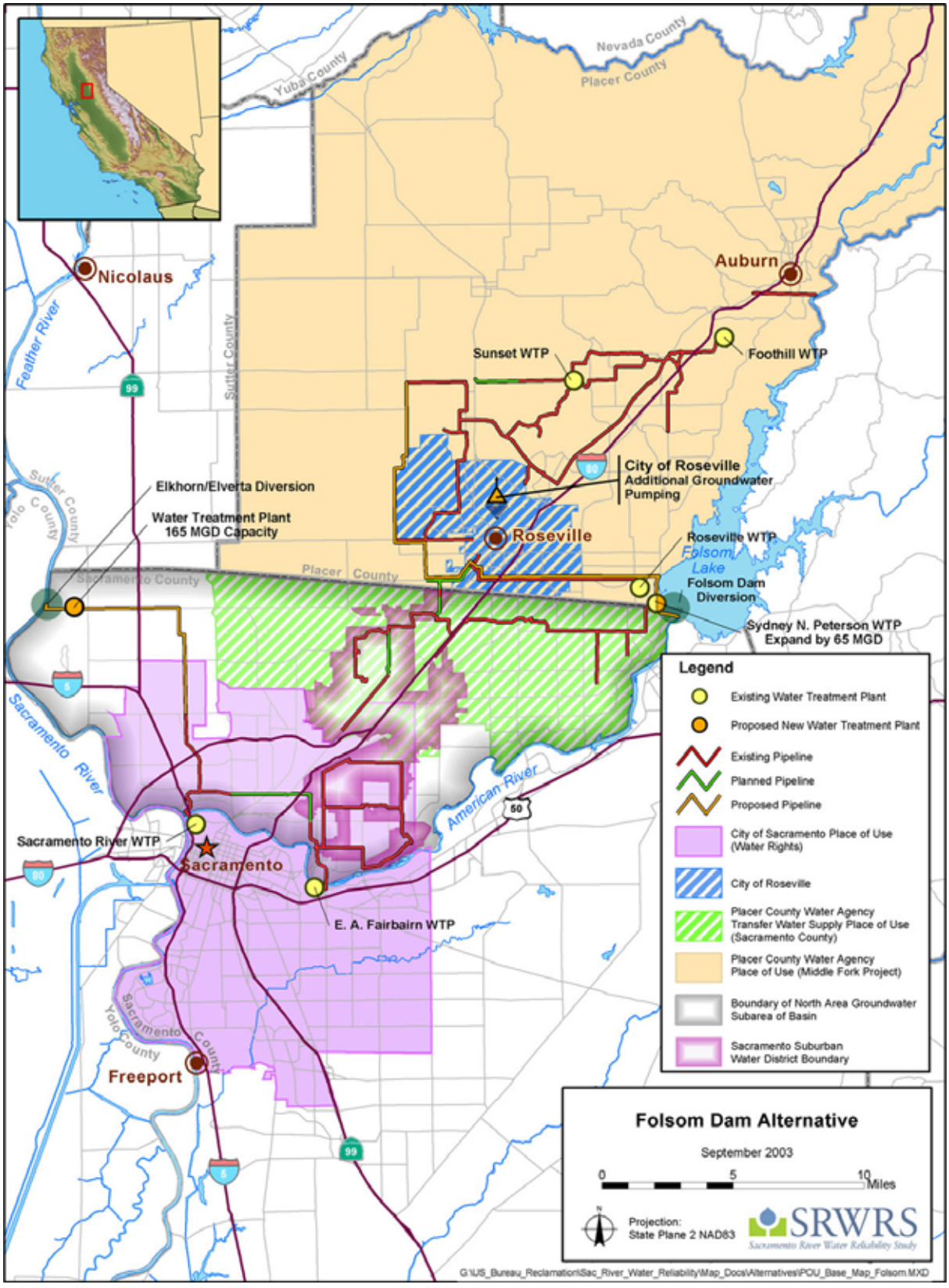

Figure 6-6. Preliminary Alternative: Folsom Dam Alternative

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